IBM Maintenance Information

3350 Disk Storage

INDEX	OLT	DEV-I	HDA	R/W	MICFL
MLX	OPER	DATA	ACC	RPI	
LGND	PANEL			PWR	
START	CTL-I			LOC	
FSI				INST	
MSG					
SENSE					
MICRO					
VOL. R01	VOL. R02	VOL. R03	VOL. R04	VOL. R05	VOL. R06

Volumes R01 through R06 accompany each Control Module and support all 3350s attached.

3350	AA000A Seq. 1 of 2	2358623 Part No.	441300 31 Mar 76				

PREFACE

MAINTENANCE INFORMATION MANUAL ORDERING PROCEDURE (IBM Internal)

Individual pages of the 3350 Maintenance Information Manual can be ordered from the San Jose plant by using the Wiring Diagram/Logic Page Request (Order No. 120-1679). In the columns headed "Logic Page" enter the page identifier information: sequence number, sheet number, part number, and EC number. Groups of pages can be ordered by including a description (section, volume, etc.) and the machine serial number.

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

SAFETY

CE SAFETY PRACTICES

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

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

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

ARTIFICIAL RESPIRATION

General Considerations

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

Rescue Breathing for Adults

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

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

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

INDEX

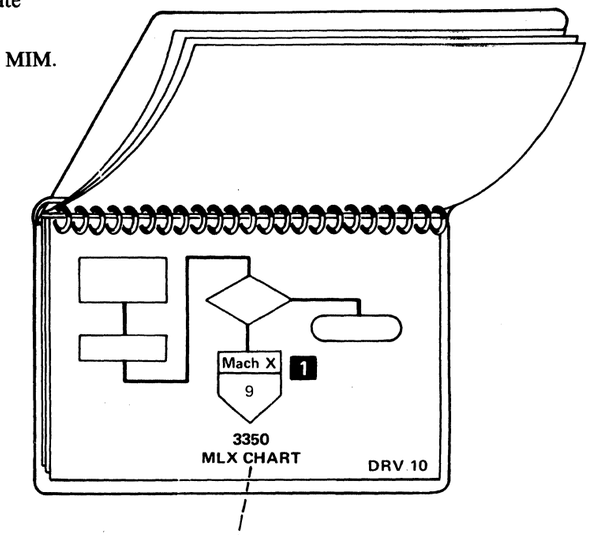
INDEX **INDEX 2**

MAINTENANCE LIBRARY CROSS REFERENCE

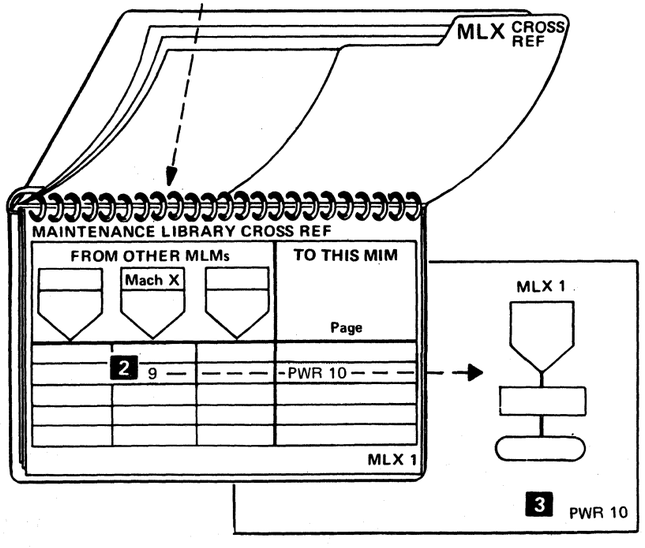
USE THIS PAGE WHEN ENTERING THIS MIM FROM OTHER MAINTENANCE LIBRARY MANUALS.

1. Note exit number on page of MIM you are leaving.
2. Find that exit number in the appropriate column of the chart on this page.
3. Proceed to the referenced page in this MIM.

Machine X Maintenance Library



3350 Maintenance Library



FROM OTHER MLMs						TO THIS MIM
3880	ISCSA	3830-3	370/135	ISC	3830-2	Page
5	264	264	1	3	3	START 100, Entry A
			6	6	6	START 100, Entry B
				7, 12	7, 12	START 101, Entry C
				8	8	START 101, Entry B
				9, 15	9, 15	CTL-I 840, Entry A
				14, 20	14, 20	SENSE 100, Entry A
	260	260				MSG 9
	261	261				MSG 9
	262	262				MSG 9
	263	263				CTL-I 100, Entry A
	266	266				FSI 50
	267	267				FSI 50
	268	268				FSI 50
	269	269				CTL-I 100, Entry A
	272	272				START 100, Entry A
	274	274		10	10	RPI 100, Entry B
	277	277				SENSE 101, Entry B
	278	278				SENSE 101, Entry B
	279	279				SENSE 101, Entry B
1, 2, 3, 4				5	5	START 110, Entry A
6						PWR 9, Entry B

3350 MIM EXIT LISTING

USE THIS PAGE WHEN TRACING BACK FROM OTHER MAINTENANCE LIBRARY MANUALS TO LOCATE A LINE THAT EXITED FROM THIS MIM.

Exit	Page(s)
1	CTL-I 20, 30, 42, 60, 70, 80, 90
2	SENSE 100, SENSE 106
3	CTL-I 100
4	MSG 22, R/W 300
5	START 101
6	
7	SENSE 103, START 101
8	
9	SENSE 100
10	MICRO 11, PANEL 152
11	
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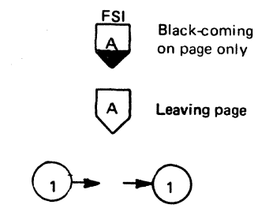
LGND CONTENTS

MAINTENANCE ANALYSIS PROCEDURE (MAP) LEGEND

FLOWCHART SYMBOLS



External Page Connector

Connection between diagrams on separate pages. Letter keys are used to identify corresponding points. Below the symbol is the page number of the connecting point.

Internal Page Connector

Connection between several parts of the same diagram. Line-of-sight arrows assist in locating other connector(s).

Terminal Block

Beginning or end of flow path.

Decision Block

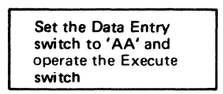
Branch to alternate paths.

Annotation Block (Supplementary)

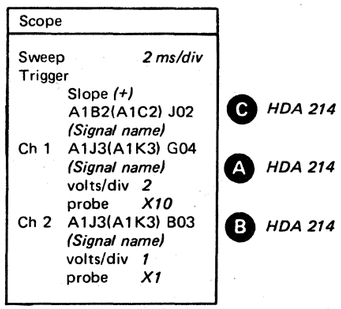
Descriptive comment or explanatory note.

Annotation Block (In Line)

Descriptive comment or explanatory note.

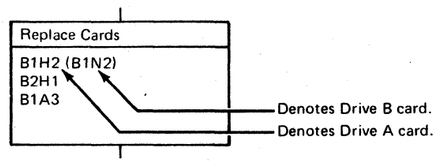


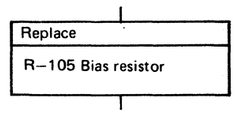
General Purpose Action Block

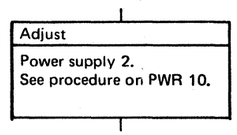


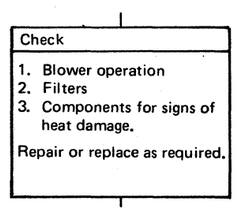
Scope Setup Block

Shows how to set up to scope.
Keys outside the block reference the test points being scoped and the MIM page showing the diagram of those test points.



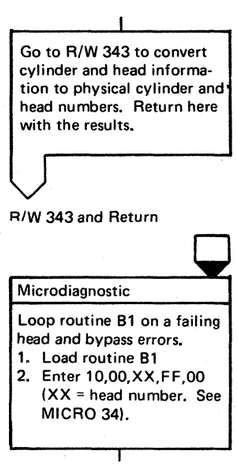






Specific Action Blocks

Denotes special CE actions: Replacing Cards, Checking, Running Microdiagnostics, Adjusting, or Installing.



Return Block

This special block is used as a reminder that, after branching to another page, returning to this flowchart is necessary to complete the analysis.

MAINTENANCE ANALYSIS PROCEDURE (MAP) LEGEND

FLOWCHART EXAMPLE

Controller Address	Message Byte 3 Bits 0 1 2 3	Bits 4 5 6 7	Hex Value
0	0 0 0 –	– 1 1 1	07
1	0 0 1 –	– 1 1 0	26
2	0 1 0 –	– 1 0 1	45
3	0 1 1 –	– 1 0 0	64

The controller address is determined by jumpers on the A2G2 card. See INST 6 for jumper locations.

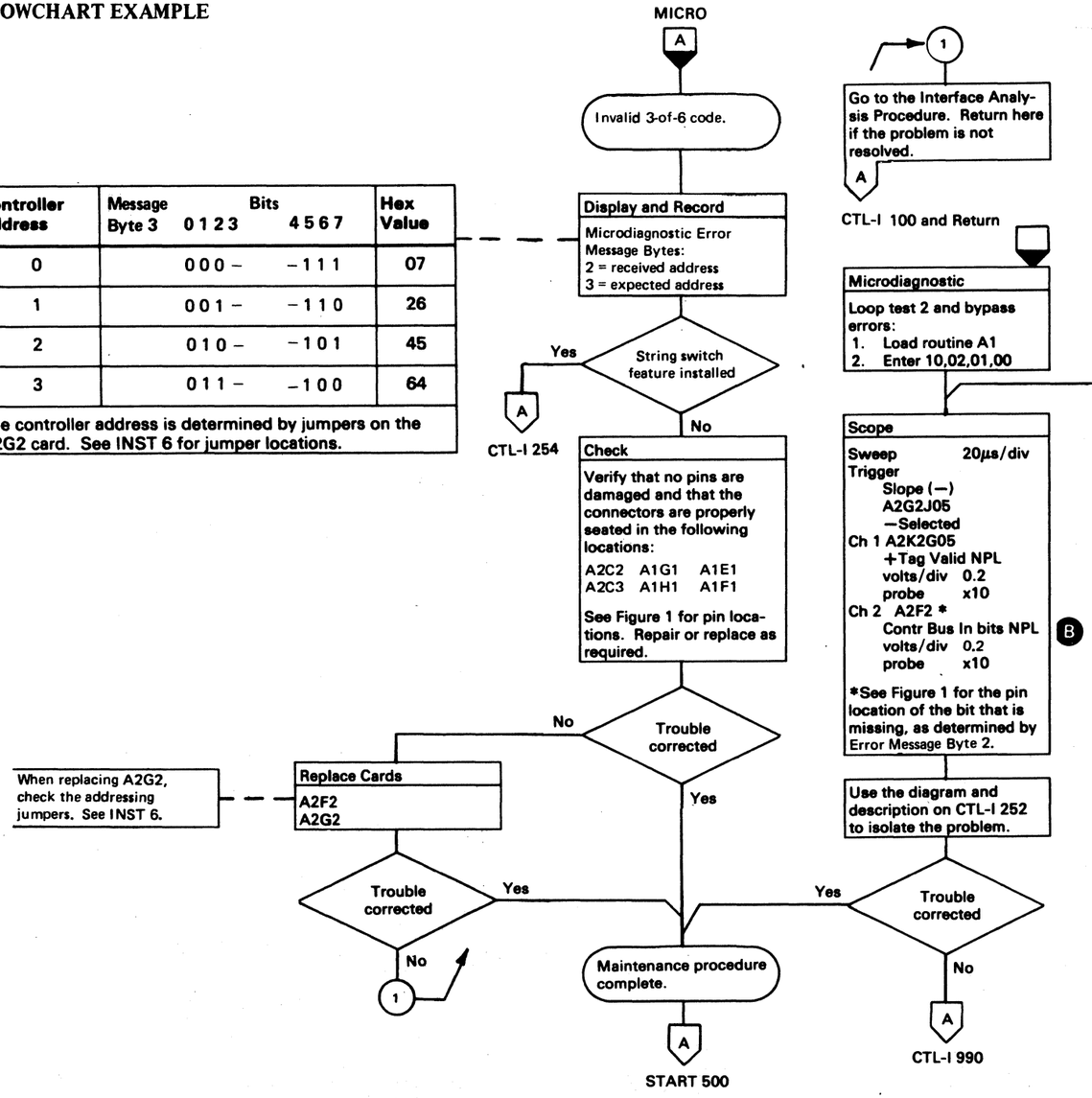
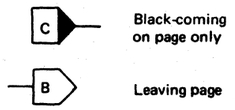


Figure 1. Pin Locations

Line Name	Card A2G2 Pins (A)	Card A2F2 Pins (B)	Conn A2C3 Pins (C)	Conn A1H1 Pins (D)	Conn A1F1 Pins (E)
+Contr Bus In Bit 0	S02	D06	D05	J04	J04
+Contr Bus In Bit 1	U05	B03	B05	G05	G05
+Contr Bus In Bit 2	U02	D10	D06	J06	J06
+Contr Bus In Bit 3	M12	D09	B09	G08	G08
+Contr Bus In Bit 4	M13	J02	D10	J09	J09
+Contr Bus In Bit 5	P13	J07	B10	G10	G10
+Contr Bus In Bit 6	S09	J11	D11	J11	J11
+Contr Bus In Bit 7	U13	J03	B12	G12	G12
+Contr Bus In Bit P	G08	J12	B02	G03	G03

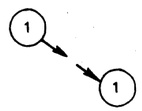
MAINTENANCE ANALYSIS PROCEDURE (MAP) LEGEND

DIAGRAM SYMBOLS



External Page Connectors

Connection between diagrams on separate pages. Letter keys are used to identify corresponding points.



Internal Page Connectors

Connection between several parts of the same diagram. Line-of-sight arrows assist in locating other connector(s).

Test Points

Used on diagrams to indicate key test points or key circuit parts.

CHANNEL INTERFACE (CHL–I)

CONTROL INTERFACE (CTL–I)

DEVICE INTERFACE (DEV–I)

Interface Between Two Functional Units

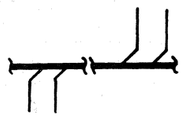
(For examples of their use, see OPER 3.)

DEV BUS IN DEV BUS IN

CTL BUS OUT CTL BUS OUT

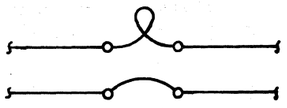
READ ⇔ WRITE ⇔ READ

Channel Buses and Read/Write Bus



Bus or Cable

(Multiple lines entering and exiting.)



Interboard Connector

(Trilead or jumper.)

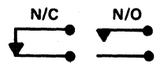
Solenoid

Identified by name, for example, Brake Solenoid.

Relay or Contactor

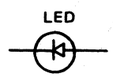
Type indicated by letter code.

P = Pick	H = Hold
PL = Pick Lower	LP = Latch Pick
PU = Pick Upper	LU = Latch Upper



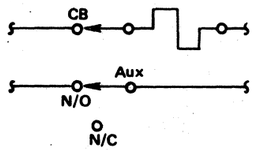
Relay Contacts

Shown in the de-energized position.
N/C = Normally Closed (break).
N/O = Normally Open (make).



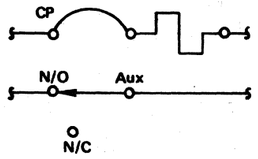
LED (Light Emitting Diode)

Indicator (lamp)



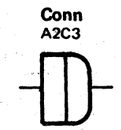
Circuit Breaker (CB) with Aux Points

Electrically or manually tripped, handle generally higher current, and may have auxiliary points (aux). N/O points make contact when associate CB is positioned to conduct current.



Circuit Protector (CP) with Aux Points

Normally tripped electrically, handle lower current, and may have auxiliary points (aux). N/O points make contact when associate CP is positioned to conduct current.



Connector (multiple line)

Disconnect

MAINTENANCE ANALYSIS PROCEDURE (MAP) LEGEND

DIAGRAM SYMBOLS

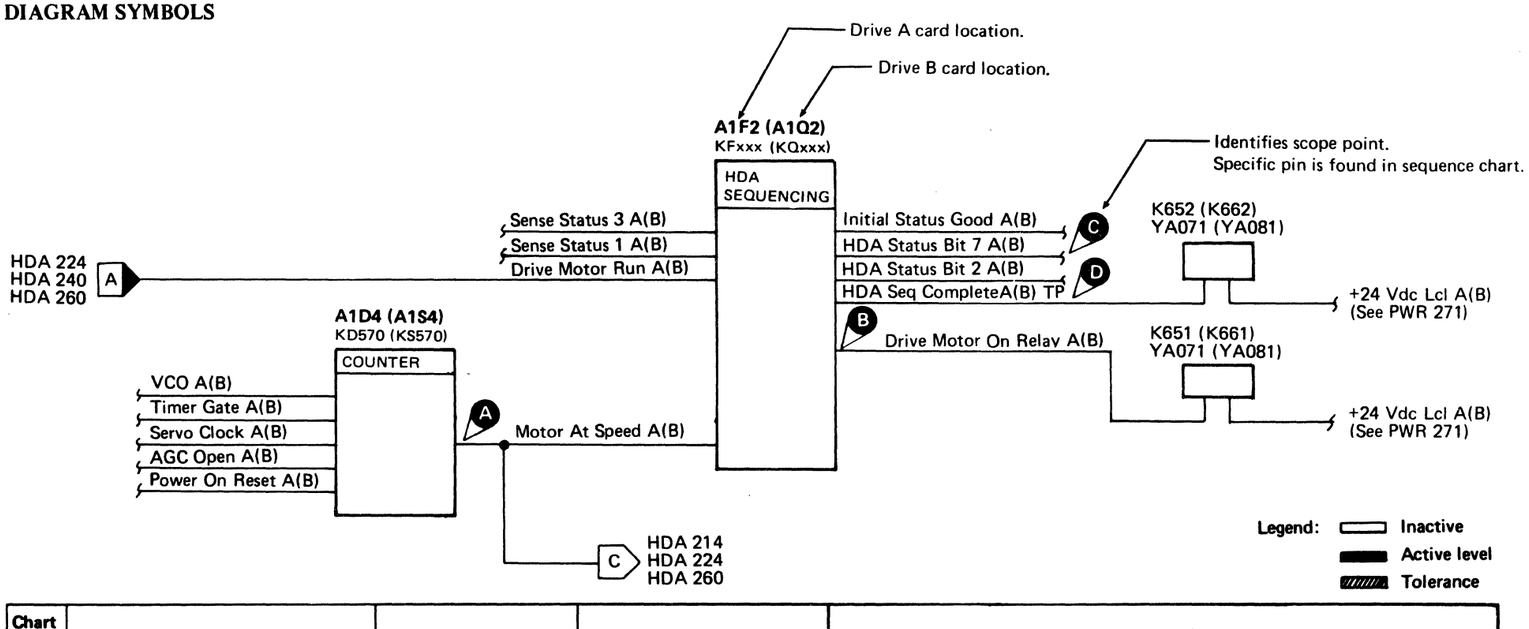


Chart Line No.	Line Name	ALD	Test Point		
1	+VCO A(B)	KD570 (KS570)	A1D4 (A1S4) D13		
2	+AGC Open A(B)	KD570 (KS570)	A1D4 (A1S4) B11		
3	+Timer Gate A(B)	KD570 (KS570)	A1D4 (A1S4) J13		
4	+Servo Clock A(B)	KD570 (KS570)	A1D4 (A1S4) G10		
5	−Drive Motor On Relay A(B)	KF260 (KQ260)	A1F2 (A1Q2) U13	B	
6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

Block Diagrams

Show the cards that relate to a specific failure in Drive A. The information in the parentheses applies to Drive B. This diagram also shows the ALD references, line names, and test points for each card.

Sequence Charts

The heavy black lines show the active state for the test point shown.

For example: HDA Seq Complete A(B) TP (chart line no. 11) goes minus when Motor At Speed A(B) is active (chart line no. 6).

STORAGE ELEMENT LINE DEFINITIONS

Inputs to blocks are identified by letters inside the block, adjacent to each input. Examples of line designations are shown on this page.

AC Coupled FF: The J, T, and K input sources provide an ac triggered flip flop. At least one of the inputs must have a positive transition to cause the FF output to change. However, input sources T and J must both be down simultaneously prior to the positive transition in order to set the FF. Input sources T and K must both be down simultaneously prior to the positive transition in order to reset the FF. If J and K are both down, then the FF changes states with each positive shift of input source T; input source T may be a clock timing pulse. If J and K are both up, then no transition occurs with positive shift of input source T. If J is down and K is up, a positive shift of T or J sets the FF if it is not already set. Conversely, if J is up and K is down, then a positive shift of T or K resets the FF if it is not already reset.

S Set: When set is active, all outputs are at the polarity shown.

R Reset: When reset is active, all outputs are at a polarity opposite to that shown.

C Control: When active, the control input permits the output to change with changes to the data input line. When inactive, the control line holds the output at whatever polarity it possessed at the moment the control line became inactive.

CD Controlled Data: When the associated control input is the polarity shown, a CD input at the polarity shown sets the storage element. Likewise, a CD input at its opposite polarity resets the storage element, when a control input is active. If multiple CD inputs to the storage element, any one active CD input can set the storage element.

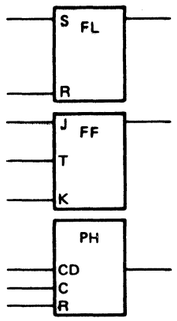
G Gate: Represents the AND function without the use of the AND logic symbol. When multiple gating lines are required, gates are identified by the same numerals used to identify its related gated dependent line. A G1 gate controls an input or output line marked with a 1.

G Gate (input): When at the polarity shown, G Gate allows dependent inputs of the polarity indicated to affect the storage element. In all other cases, it can be considered inactive.

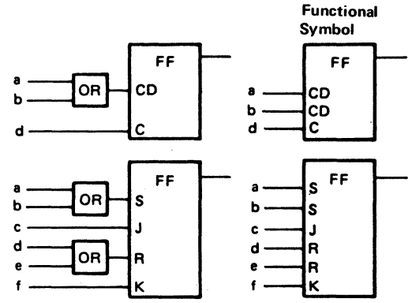
G Gate (output): The dependent output is at the polarity shown when the associated gating line is at its indicated polarity. In all other conditions the output stands opposite to the polarity shown.

STORAGE ELEMENTS

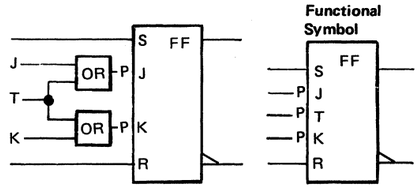
Basic Storage Symbols



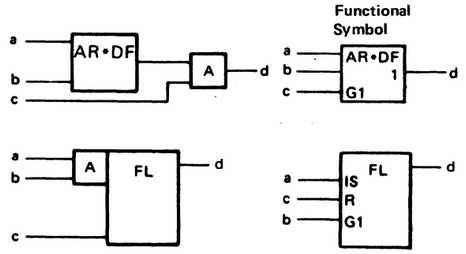
Inherent-OR In The FF



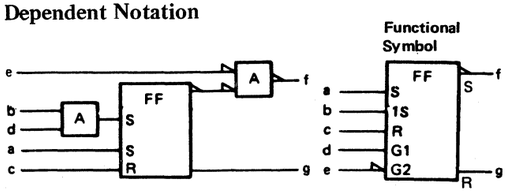
AC Coupled FF



Single Function Application

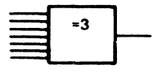


Dependent Notation

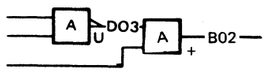


Note: If the outputs can be determined for simultaneous set/reset, an S or R below an output indicates the FF condition, either set or reset. Multiple set (or reset) inputs are considered to br ORed.

Special Notations



An equal sign (=) followed by a number specifies the number of input lines of the polarity shown required to produce the indicated output.



A plus (+) or minus (◺) under an output line indicates the extreme potential that may be forced by an external source.

A loading character (L or U) under the output line indicates that the external load cannot be isolated from the driving circuit without affecting the output of the driver.

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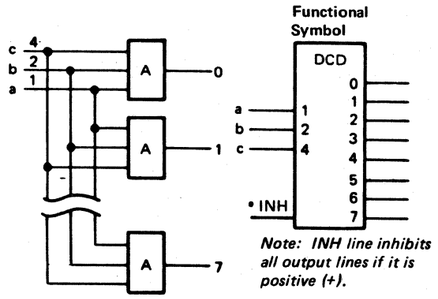
DECODE

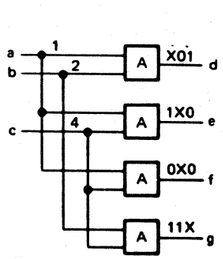


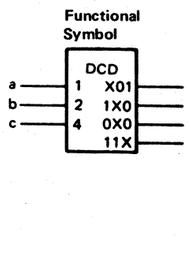
Note: INH line inhibits all output lines if it is positive (+).

The decimal sum of the line values of those inputs that are at their active level equals the value of the active output line. If no input lines are active, the 0 output line is active. If all input lines are active, the 7 output line is active.

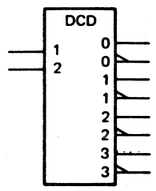
Note: The decimal sum value existing at the decoder inputs agrees with the decimal number shown at the output line labels. Only one output can be active at any given time.

Output Value	Input Line Condition
0	$\bar{a}\ \bar{b}\ \bar{c}$
1	$a\ \bar{b}\ \bar{c}$
2	$\bar{a}\ b\ \bar{c}$
3	$a\ b\ \bar{c}$
4	$\bar{a}\ \bar{b}\ c$
5	$a\ \bar{b}\ c$
6	$\bar{a}\ b\ c$
7	$a\ b\ c$

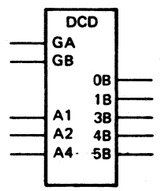




Note: The rightmost digit on the output line corresponds to the topmost digit on the input line (an X in any position means the input line has no effect).

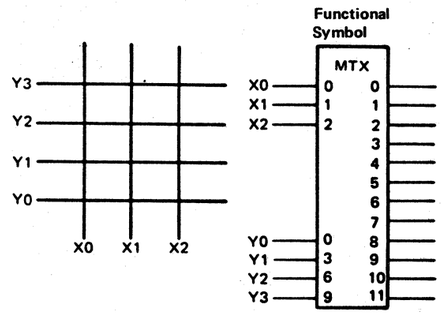


Multiple output lines can be associated with a given output (sum).



A decoder shown with gating lines.

MATRIX



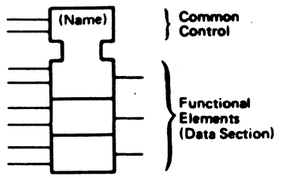
Active Input Lines							Active Output
X0	X1	X2	Y0	Y1	Y2	Y3	
X			X				0
	X		X				1
		X	X				2
X				X			3
	X			X			4
		X		X			5
X					X		6
	X				X		7
		X			X		8
X						X	9
	X					X	10
		X				X	11

Note: The matrix (MTX) is a functional logic block with two or more groups of inputs. The decimal numbered output is active when it equals the decimal sum of one active line from each input group (shown in Chart). If any input group does not have an active input, then there is no active output from the matrix block.

AUTOMATED LOGIC DIAGRAMS

ELEMENTS WITH COMMON INPUTS/OUTPUTS

Element Description

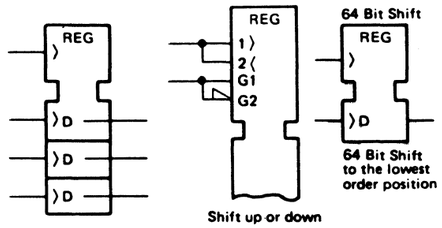


COMMON CONTROL SECTION: Used only for dependancy (gating) and/or common lines for the register. There are no outputs from the common control section.

NAME: May be any of the following-selector (SEL), register (REG), decoder (DCD), matrix (MTX), multiregister (MREG), and delay (DLY).

DATA SECTION: A group of vertically stacked function elements. The number of stacked elements varies with the number of inputs.

Shift Register (REG)



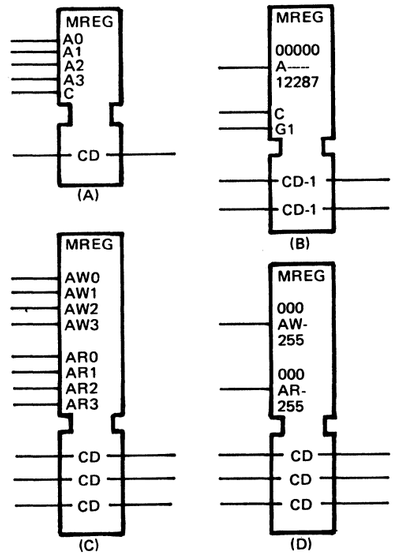
DEFINITION: The control input causes the data in each bit position to shift one position, as indicated by one of the following designations.

Greater than (): When this line becomes active, the data content shifts from the top (upper-most) bit position. Similarly, the contents of each bit position shifts down the symbol.

Less than (): When the line becomes active, the data content shifts from the bottom to the next bit position above and similarly for each bit position in the shift register symbol.

Note: A time difference in shifting is indicated by a trailing edge symbol (¬).

Multiregister (MREG)



DEFINITION: The MREG functional logic block represents groups of associated storage elements in addressable word configuration. The MREG requires address inputs. All functional lines used for storage elements including the dependency notation are applicable.

Addresses are previously decoded and the resultant address line(s) is handled by a single flowline representing all addresses.

Address notation A, AR, or AW must prefix the data. This indicates the data is dependent on an address.

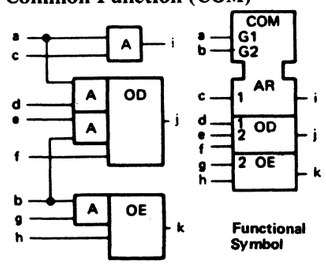
- A = Read Only Storage (ROS) or when the read/write address is identical.
- AW = Write address. AW must be shown as data input dependent (for example, AWCD).
- AR = Read address. AR must be shown as data output dependent.

The numeric address span is specified in the common section.

The G replaces the C to control the data information in the MREG. The C is reserved for the condition that would place a zero in all storage cells not addressed.

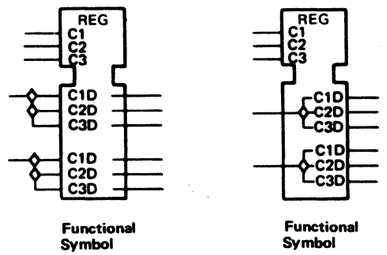
Example	Input Lines Needed	Output Lines Needed
(A)	A(0,1,2,3) C CD	A(0,1,2,3) CD (data)
(B)	A(0-12287) C CD	A(0-12287) G1 (gate) CD (data)
(C)	AW(0,1,2,3) CD	AR(0,1,2,3) CD (data)
(D)	AW(0-255) CD	AR(0-255) CD (data)

Common Function (COM)



DEFINITION: Common Function block may be associated with any group of basic logic elements functionally related by their dependent gating. Each functional element contains the proper letter(s) that makes it an approved logic symbol. The common section may contain the letters COM at the very top line.

Multicontrol Register (REG)



The multiple control inputs are designated by sequential numbers shown entering the common section; for example, C1, C2.

The control data enters the data section of the symbol and is normally diagrammed as multiple outputs.

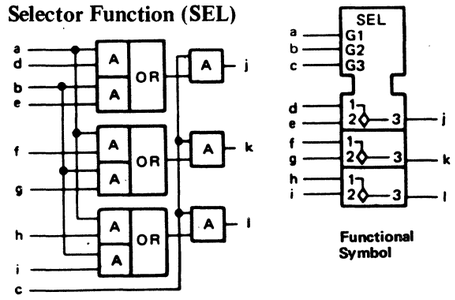
The "C" designator must be a suffix to differentiate it from a gate.

Example:

C1D = Storage Data controlled by C1.

Note: The "◇" symbol represents the OR function connection in the data section.

Selector Function (SEL)



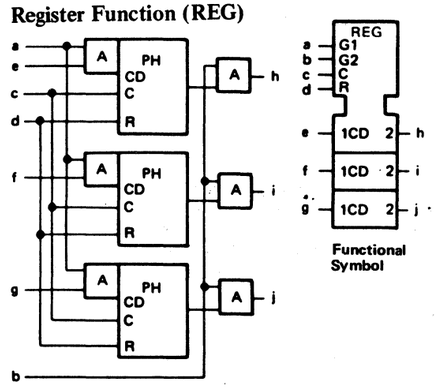
DEFINITION: A selector is a functional logic block that consists of two or more OR blocks having input and/or output signals dependent upon common gates.

Example:

Output line "j" is active when line "c" is active and lines "d" and "a" or lines "e" and "b" are active.

Note: The "◇" symbol represents the OR function connection in the data section.

Register Function (REG)



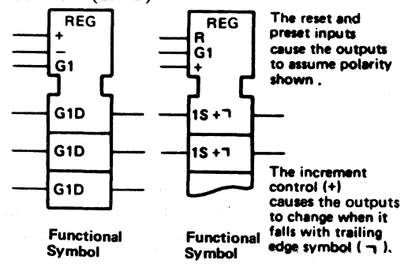
DEFINITION: A register logic block consisting of a group of associated storage elements with common input and/or output gating or other common input lines such as reset.

Note: Descriptive nomenclature such as bit 1, may be placed in each logic element.

Example:

Output "h" is active when input lines "e" and "a" are active and the output gate line "b" is active.

Counter (REG)



DEFINITION: A register to be incremented or decremented under control of input lines drawn to the common section of the symbol with the follow notations.

+n: When this line goes to its indicated polarity the decimal quantity n is added to the binary count contained in the register. The n need not appear when it is a one.

–n: When this line goes to its indicated polarity, the decimal quantity n is subtracted from the binary count contained in the register, The n need not appear when it is a one.

ABBREVIATIONS AND DEFINITIONS

A

A	AND function (logic block)
A2	control module
A2F	control module with fixed heads installed
A * OR	AND * OR function (logic block)
AC, ac	alternating current
ACC	access
addr	address
ALD	Automated Logic Diagram
AM	Address Marker
amps	amperes
AP-1	Analysis Program
AR	Amplifier (logic block)
asm	assembly
assm	assembler
attn	attention

B

B2	satellite module
B2F	satellite module with fixed heads installed
BCD	binary coded decimal
BI	Bus In
BO	Bus Out
BSCA	bit significant controller address
BSDA	bit significant device address
BS	Bootstrap
BSM	basic storage module
BTU	British Thermal Unit
Bus In	bus entering a functional unit
Bus Out	bus leaving a functional unit
byte	eight bits plus a parity bit

C

C	capacitor
C2	alternate control module
C2F	alternate control module with fixed heads installed
CA	controller address
CAR	Cylinder Address Register
CB	circuit breaker
CC=3	condition code 3
CCB	Correction Code Byte
CCHH	cylinder (2 bytes), head (2 bytes)
ccw	counterclockwise
CCW	Channel Command Word
CDS	Configuration Data Set
CE	Customer Engineer
CFEALD	Condensed Field Engineering Automated Logic Diagram
chan	channel
chaining	sequential linking of instructions or data
CHK-1	Check 1
CHK-2	Check 2
CHL-1	channel interface
clk	clock
cm	centimeters
corr	correction
CP	circuit protector
CPU	Central Processing Unit
CR	diode; rectifier (semiconductor)
CSW	Channel Status Word
CTL-I	control interface
ctlr	controller
CU	control unit
CUA	Channel Unit Address
CV	converter
cw	clockwise
cylinder	a vertical surface formed of tracks on a storage device that can be accessed without repositioning the access mechanism

D

DA	device address
DAC	digital-to-analog converter
DC, dc	direct current
DCB	Detection Code Byte
DCD	decoder (logic block)
decrement	decrease by regular consecutive steps
Delta, Δ	A three-terminal circuit configuration (usually refers to the primary winding arrangement of a transformer). Also used to indicate a change in some dimension, such as: Δt = change in time; Δd = change in distance.
DEV-I	device interface
DIFF	Difference Counter
DIO	Device Input/Output
dld, dlyd	delayed
D_L	data length
DOS	Disk Operating System
drive	mechanical assembly to control one HDA
Drive A	left drive in a module
Drive B	right drive in a module
drop	de-energize relay

E

EC	edge connector, engineering change
ECB	Event Control Block (OS/VS only)
ECC	Error Correction Code
EL	Error Log
EOF	end of file
EPO	emergency power off
ERP	error recovery program
EREP	Environmental Record Editing and Printing
Error Code	Error Symptom Code generated by a microdiagnostic failure
EXIO	execute input/output
ext	external

F

F	Flag Byte
FEALD	Field Engineering Automated Logic Diagram
FF	Flip-Flop (logic block)
FL	Flip Latch (logic block)
FPM	file protect mode
FRIEND	Fast Running Interpreter Enabling Natural Diagnosis
FRU	field replaceable unit
FSC	Fault Symptom Code
FSI	Fault Symptom Index

G

g	grams
G1	gap between index point and R0
G2	gap between count area and key area
G3	gap between data area and address marker of the following record
G4	gap after data area of the last record on track
glitch	spurious signal
gnd	ground

H

H	henries
HA	Home Address
HAR	Head Address Register
hard error	a malfunction that is detected internally and considered to be of a catastrophic magnitude
HDA	head/disk assembly
head	an electromechanical device that records, reads, or erases a storage medium
hex	hexadecimal
Hz	hertz, cycles per second

I

ID	identifier
IFA	integrated file adapter
IMPL	initial microprogram load
increment	increase by regular consecutive steps
int	internal
IPO	immediate power off
I/O	input/output
IPL	initial program load
ISC	integrated storage control
IW	Write current

J

J	connection, receptacle
JCL	job control language

K

K	relay (contactor)
K_L	key length

L

L	inductor
LB	laminar bus
LED	light emitting diode
LIM	limiter (logic block)
LOC	location
loop	microdiagnostic test loop
LR	line receiver (logic block)
LT	line terminator (logic block)

M

M	meter
map	maintenance analysis procedure
Mb	megabyte
MICFL	microdiagnostic flowchart
MICRO	Microdiagnostic Error Code Dictionary
MIM	maintenance information manual
MLX	maintenance library cross reference index
module	serial numbered frame containing two drives
modulo	number system to a base other than ten
MPL	microprogram load
ms	milliseconds
MSG	message
MST	monolithic system technology
MST-1	voltage level (see divider tabs)
M/T	multiple track
μs	microsecond

N

N	inverter (logic block)
N/C	normally closed point
N/O	normally open point
N OR	inverter - OR (logic block)
NOP	no operation
NPL	voltage level (see divider tabs)
ns	nanoseconds

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ABBREVIATIONS AND DEFINITIONS

O

OBR	outboard recording
OE	exclusive OR function
offline	isolated control of a unit from a primary function
OLT	online test
OLTEP	online test executive program
OLTSEP	online test standalone executive program
online	unit is available to a primary function
op	operation
OR	OR function
OR * FL	OR flip latch function (logic block)
OS	operating system

P

P	plug (connector)
PA	physical address
par	parity
parameter	constant value for a given purpose
P bit	parity bit
PC	parity check
PG	parity generator
PH	polarity hold (logic block)
pick	energize relay
PLD	power line dip
PLO	phase locked oscillator
P/N	part number
P/P	peak-to-peak
PS	power supply
PSW	Program Status Word
PWR	power

Q

Q	transistor

R

R	resistor
raw data	data as it is read from the storage medium
R0	Record 0
RCVR	receiver (logic block)
Rd	Read
RDCKD	Read Count Key Data
RDHA	Read Home Address
reg	register, regulator
RESV	Reserved
RPS	Rotational Position Sensing
R/W	read/write

S

S	switch
SCR	silicon controlled rectifier
SCRID	SCR indicator driver
SD	skip displacement
SEL	selector (logic block)
seq	sequence
SERDES	serializer/deserializer
servo	head positioning system
SERVOUT	Service Out
SFM	Set File Mask
SIO	start input/output
SIP	Seek in progress
SK	Seek
SL	system library
SLT	solid logic technology
soft error	internally recoverable malfunction that is transparent to the user
SOSP	standalone/online support program that is transparent to the user
spindle	contained in the HDA
SS	single shot (logic block)
SWFE	string switch feature
sync bit	generated by the storage control during Read and Write operations
SYSPRINT	a printer (program assignment)

T

T	transformer or terminal
TB	terminal board
TIC	transfer in channel
TP	test point
TR	Track Used Counter
track	a location on a storage medium accessable by one R/W head
truncate	to end an operation before completing the function

U

UC	Unit Check
UCW	Unit Command Word
unsuppr	unsuppressible

V

V	voltage amplifier (logic block)
VCM	voice coil motor
VCO	voltage controlled oscillator
VFO	variable frequency oscillator

W

WCKD	Write Count Key Data
word	four bytes
Write	Write operation
wraparound	advance according to some sequence with automatic restart provisions
Wye	a three terminal circuit configuration (usually refers to the primary winding arrangement of a transformer)

X

XEQ	execute
XOR	exclusive OR function (logic block)

Z

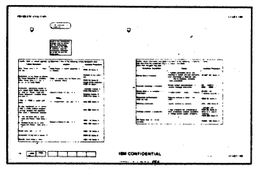
Z	impedance network

ABBREVIATIONS AND DEFINITIONS LGND 18

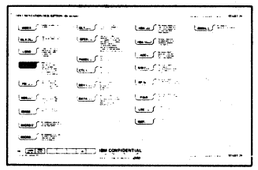
START CONTENTS

3350 MAINTENANCE INFORMATION MANUAL

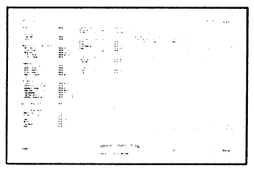
ORGANIZATION OF INFORMATION



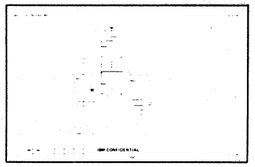
The START section describes the MIM and the 3350 maintenance philosophy. All problem analysis begins on START 100.



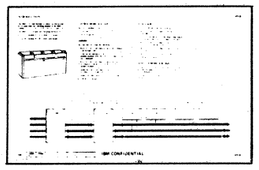
Documentation description on START 20 defines each section of the manual.
Where practical, documentation is arranged in sections corresponding to natural breakdown of machine elements.



Page 1 of each section shows the contents of that section and where related information can be found in other sections of the manual.



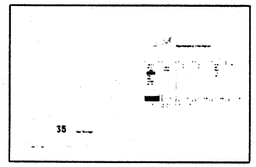
Maintenance analysis procedures in each section are entered after the START section and lead the reader through a detailed analysis of each problem. These procedures consist of flow charts, block diagrams, and timing charts.



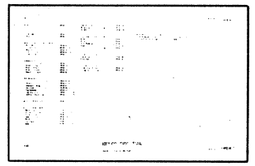
The OPER section describes the functional operation of the 3350. The information is presented logically; each subject is presented in the order in which it occurs in overall machine operation.

The LGND section defines each symbol used throughout the manual and shows examples of the diagrams used. This section also includes a glossary of special words and abbreviations.

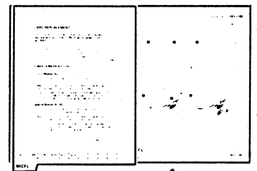
HOW TO FIND INFORMATION



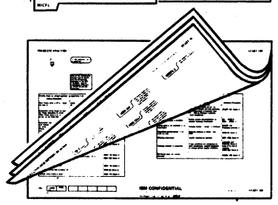
Title page in the front of each volume shows the location of each section by volume.



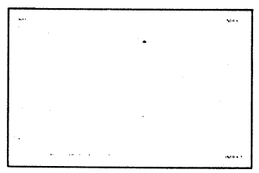
Page 1 of each section shows the contents of that section and where related information can be found in other sections of the manual.



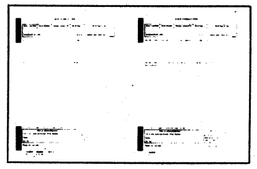
Divider tabs make it easy to locate sections. The tabs also contain useful information about scoping and voltage levels.



Page numbers and titles in "thumbing" position allow rapid scanning.



The alphabetic subject index gives references to specific subjects in the manual.



MIM Feedback forms are located in the front of Volume R01. This is a simple and quick means of sending comments and suggestions directly to the author.

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3350 MAINTENANCE INFORMATION MANUAL

HOW TO PERFORM A TASK

To install the machine:

Go to INST 1.

To troubleshoot or repair the machine:

Go to START 100.

To analyze a console message:

Go to MSG 9 for OS/VS.
Go to MSG 13 for DOS/VS.

To run microdiagnostics:

Go to MICRO 8.

To run online tests:

Go to OLT 1.

To analyze a diagnostic error message:

Go to MICRO 12 for microdiagnostic error messages.
Go to OLT 40 for online test error messages.

To analyze an EREP printout:

Go to MSG 22.

To analyze Sense Bytes:

Go to SENSE 100.

To power off a drive:

Go to PANEL 20.

To learn how the machine operates:

Go to OPER 1.

To remove and replace mechanical parts:

Go to HDA 700.

To operate the CE Panel:

Go to PANEL 20.

To run FRIEND:

Go to OLT 26.

To assign alternate tracks:

Go to OLT 30.

To review the maintenance philosphy:

Go to START 50.

DOCUMENTATION DESCRIPTION (By section)

INDEX — Alphabetical subject index of the MIM.

MLX CROSS REFERENCE — Pages for cross-referencing other MLMs (3830-2, ISC, IFAs, etc.).

LGND — Glossary of technical terms. Abbreviations. Legend of symbols used in the MIM, including FEALD circuit symbology.

START — MIM starting point:
Documentation description.
How to use the MIM.
Maintenance philosophy.
Entry point for troubleshooting and exits to MAPs within functional area MIM sections.

FSI FAULT SYMPTOM — Fault Symptom Code description, generation instructions, and index to tie the symptom code to the proper analysis procedures.

MSG SYSTEM MESSAGES — Presents and explains basic console error message format, EREP summaries, OBR error record, and logging mode error record.

SENSE DATA — Summary and detailed description of sense data.

MICRO OPER. INST. — Microdiagnostic operating instructions and brief routine and test descriptions.

MICRO ERROR DICT. — Microdiagnostic Error Code Dictionary. Defines error codes and ties codes to analysis procedures.

OLT DIAGNOSTIC — Online and Inline tests. Contains error messages and operating procedures.

OPER ATIONS — Description of 3350 operations to tie functional units together. Provides high level description of complete subsystem operation, including some command descriptions allowing the CE to obtain an overview without going to the system documentation.

PANEL CE OPER. — Description, operation, and maintenance of CE and Operator Panels.

CTL-I NTERFACE — Maintenance (MAPs) for the control interface and associated circuits. (Tag decodes, addressing, bus assembly circuits, etc.)

DEV-I NTERFACE — Maintenance (MAPs) for device interface and associated circuits. (Tag decodes, selection, bus assembly circuits, etc.)

DATA CONTROL — Maintenance (MAPs) for the controller circuits involved with data transfer. Includes read/write control, error detection and correction, SERDES, and PLO/VFO.

HDA HEAD/DISK ASSEMBLY — Maintenance (MAPs) and theory for the HDA, drive motor power sequencing, air system, and HDA Ready sequence.

HDA REMOVALS AND ADJUSTMENTS — Removals, replacements, and adjustments for all mechanical components in the machine.

ACC ESS — Maintenance (MAPs), adjustments, and theory for servo circuits and head positioning mechanics.

R/W DRIVE READ/WRITE — Maintenance (MAPs) for drive read/write circuits. Includes R/W safety, R/W data, and address conversion information.

RPI ROTATIONAL POSITION INDEX — Maintenance (MAPs) for the Index detection and checking, and rotational position sensing circuits.

PWR — Maintenance (MAPs), adjustments, and theory for power supplies, distribution, and sequencing.

LOC ATIONS — Shows structural and component locations.

INST ALLATION — Installation instructions.

MICFL — Microdiagnostic routine descriptions and flowcharts.

3350 MAINTENANCE PHILOSOPHY

The main objective of the 3350 maintenance philosophy, incorporated in the Maintenance Information Manual (MIM), is to help the CE repair hardware failures quickly. To accomplish this objective, emphasis is placed on "how to fix" rather than "how it works". For each failure, the "how to fix" approach utilizes the CE's resources, the failure isolation techniques, and the individual analysis procedures.

RESOURCES

Although the maintenance philosophy is designed for the Product Trained CE, it is recogonized that there are significant differences in skill levels, experience, and natural ability among CEs. Additional maintenance procedures and sections of the MIM are provided to allow each individual CE to continue with the maintenance procedure until he has exhausted his recources, or until existing policies dictate that he request assistance.

TECHNIQUES

The normal card-isolation technique is to replace or swap the specified cards within a particular maintenance procedure until the failing card is located. At the CE's discretion, and/or depending on the customer's requirements, cards may be swapped between drives and/or modules to speed the isolation. In certain areas where it is not practical to rapidly swap or replace components, information is provided to allow isolation of the failing replaceable unit. (These areas include the Power and Head/Disk Assembly.)

Scoping procedures are provided if components are not available for replacement or swapping. Keep in mind that swapping or replacing is the primary card-isolation technique and that scoping is the secondary technique.

PROCEDURES

Maintenance Analysis Procedures (MAPs) are provided to assist the CE in making decisions (based on sense data, microdiagnostic results, customer data, or visual indications) to isolate the failure to the smallest possible area. MAPs are composed of analysis flowcharts, functional diagrams, and descriptions. Analysis flowcharts and functional diagrams reference other material in the MIM and ALDs to provide a more complete path to failure isolation. The descriptions are provided to help the CE understand the failing operation.

The MAPs are made up of the following interacting parts:

Start
Flowcharts
- Entry
- Microdiagnostics
- Replace Or Order
- Isolation
- Interaction With Other MAP Parts

Diagrams
Routines
- Microdiagnostics
- Online Tests (OLTs)
- Special Utility Microdiagnostics

Scoping Procedures
Support Material And References
Support Theory

Start

START 100 is always the beginning page for all maintenance activity. This page lists symptoms from visual indications, sense data, console messages, or customer information to point to the correct analysis procedure.

Flowcharts

(For a complete coverage of the blocks used in the flowcharts, see LGND 4.)

ENTRY

Entry into the flowcharts is made from START, the Microdiagnostic Error Code Dictionary, or another flowchart.

MICRODIAGNOSTICS

The MAP flowcharts show the CE when to run microdiagnostics. If the tests fail, a base or reference point is established (even on intermittent errors). The microdiagnostics are also run to verify repairs.

MICRO 10

Microdiagnostics
Run device checkout microdiagnostics. Start with routine A1.

REPLACE OR ORDER

Replace or Order blocks attempt to call out all possible Field Replaceable Units (FRUs) for a given symptom. The FRUs listed in the Replace or Order blocks are arranged with the most probable unit first, the next most probable unit second, and so on.

Replace or Order
A1H2 A1K2 A1F2(A1E2) If parts are not readily available, order them and continue below.

The Replace or Order blocks appear early in the MAP flowcharts so that:

- They may be used as a shopping list for ordering parts as soon as possible.
- They may be used as a starting point for intermittent failures.

ISOLATION

The MAPs usually list several possible field replaceable units. The CE has the option of three methods to follow when replacing FRUs.

- Replace the first FRU on the list and retest to see if the problem is resolved. If not, reinstall the original FRU, replace the second FRU, and so on until the failing FRU is located.
- Replace half of the FRUs and determine if the failing FRU is among that group. If it is, continue the isolation to the failing FRU. If the failing FRU is not among the first group, reinstall the original FRUs and replace the remaining half. Continue the isolation for that group.
- Replace all the FRUs, return the machine to the customer and defer the isolation procedure until a more opportune time. The CE must use his knowledge of the customer situation, good fiscal management of his territory, and parts availability to determine the best method for each incident.

INTERACTION WITH OTHER MAP PARTS

The flowchart is the focal point of the Maintenance Analysis Procedure. Since the other MAP components are all integral parts of the procedure, they are tied to the flowcharts in some way, either directly or by reference.

Diagrams

The block diagrams and timing charts support the flowcharts. They give more detail, such as interconnections between cards, and show specific test points for each function. Where necessary, detailed descriptions and scoping information are provided. See LGND 10 for examples.

Routines

MICRODIAGNOSTICS

Microdiagnostics are the CE's primary tool to help him to duplicate a customer failure and isolate it to a particular functional failure. The microdiagnostic philosophy is provided on MICFL 1 and 2. MICRO 20 through MICRO 88 give run instructions and routine summaries.

ONLINE TESTS (OLTs)

OLTs are secondary tests that allow the CE to test the HDA concurrently with customer programs. (See OLT 1.)

SPECIAL UTILITY MICRODIAGNOSTICS

Special utility microdiagnostics available to the CE are:

- Dynamic Servo Adjustment
- Reformat CE Tracks Utility
- Tag Cycle Utility
- Device Status Display
- String Switch Test
- Control Interface Bringup Utility

Detailed test descriptions are given in the MICFL section. Operating instructions and routine summaries are presented in MICRO. (See MICRO 1.)

3350 MAINTENANCE PHILOSOPHY

Scoping Procedures

Scoping is used in conjunction with ALDs, diagrams, flowcharts, sense information, and theory of operation. Each MAP handles scoping according to the particular needs of that MAP. Scoping to find a failure is the secondary diagnostic procedure. Swapping or replacing is the primary diagnostic procedure.

MIM page reference	ALD page reference	Scope
		Sweep 2 ms/div
		Trigger
		Slope (+)
		A1K2(A1L2)J02
		Signal name
		Ch 1 A1G2(A1P2)G04
		Signal name
		volts/div 0.2
		probe x10
		Ch 2 A1D2(A1S2)B03
		Signal name
		volts/div 0.5
		probe x1

Support Material And References

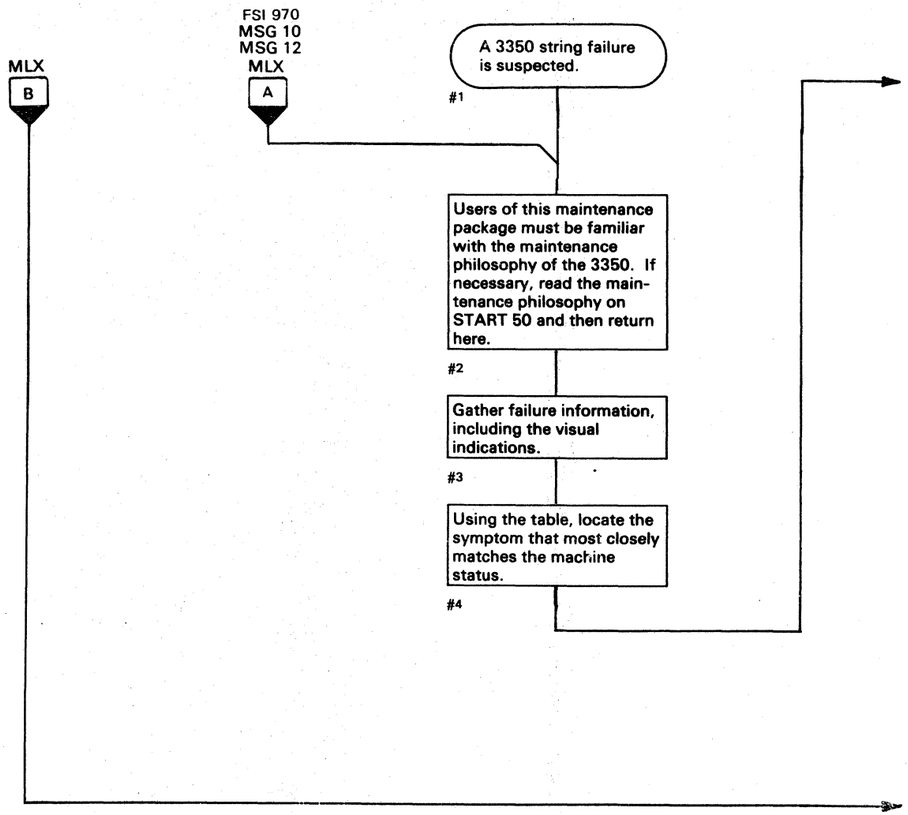
Special references and information, EREP summaries, locations, and sense data are provided in the following MIM sections:

INDEX
MLX
LGND
MSG
SENSE
MICFL
LOC
INST

A summary of the contents of these sections is located on START 20.

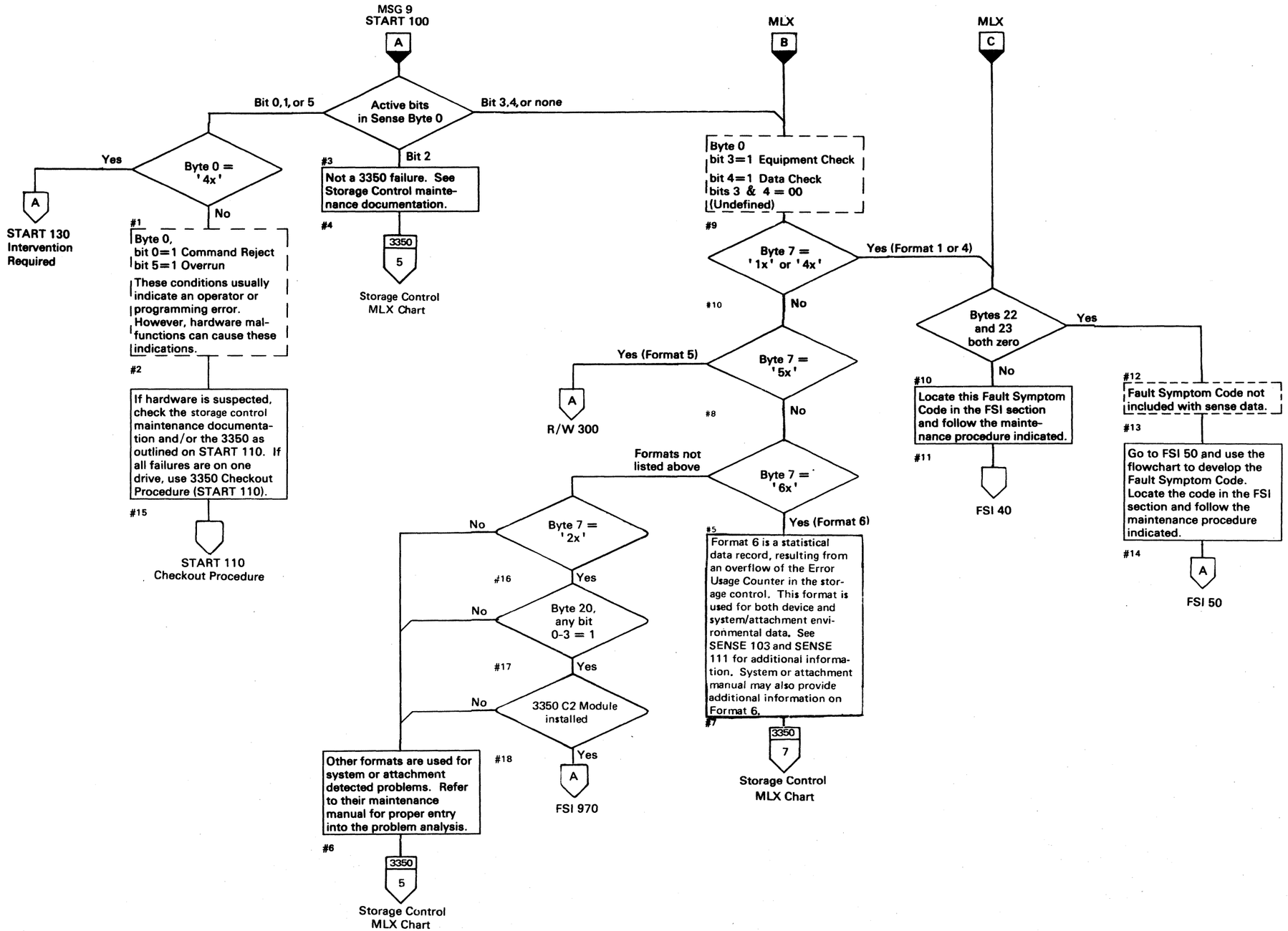
Support Theory

A high-level theory of operation is presented in the OPER section of the MIM to provide a basic overview of 3350 operation.

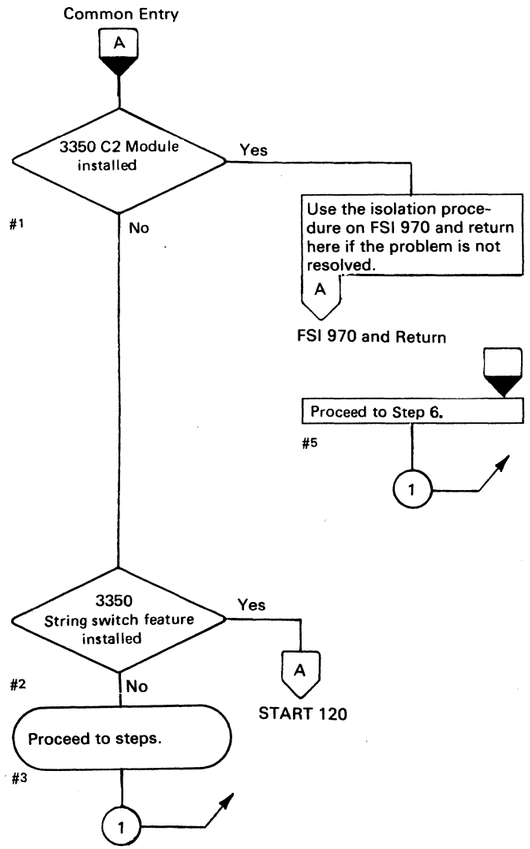


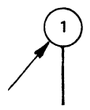
This table must be read from top to bottom for symptom priority.

Symptom/Condition	Notes	Analysis Procedure
Main power lamp is off or it does not stay on.	Located inside Power On switch assembly on A2 Module.	PWR 10, Entry A If the C2 Module is installed, see PWR 310, Entry A.
Drive(s) fails to come Ready. For drives dropping Ready, continue the analysis below in sequence.		START 140, Entry A
Ready lamp fails to turn off.		HDA 110, Entry A
Access mechanism out of control. (Noisy or erratic. Suspect that operation may result in mechanism damage.)		ACC 600, Entry B
Noisy drive or blower.	Check with covers open.	HDA 110, Entry A
3350 string fails to power off.		PWR 22, Entry B If the C2 Module is installed, see PWR 322, Entry B.
Sense data is available.	If multiple controllers are on one interface of a switch unit and confusing error information is received, see CTL-I 240 for Multiple Controller Check procedure.	START 101, Entry A
Condition Code 3 is indicated for a 3350 and the storage control is operational.	Indicates that the controller cannot be selected.	CTL-I 190, Entry A
Console message is available.	Review system documentation for console message information.	OS – MSG 9 DOS – MSG 12
Drive intermittently drops Ready and no sense data is available.		ACC 570, Entry C
Sense data is not available., Storage Control MLM procedure requests a 3350 checkout.	Includes system "hangs" or timeouts.	START 110, Entry A (Checkout procedure)
Degraded performance. Error rates are high.	Requires analysis of history. Run EREP.	MSG 20
Missing interrupts.	Usually reported by operator.	DEV-I 274, Entry A
Voltage problem is suspected.	If logic problems are unresolved by other procedures, suspect possibility of voltage (power supply) problems.	Controller only, PWR 90, Entry B. Drive of A2 and B2 modules, PWR 290, Entry B. If the C2 Module is installed, see PWR 390, Entry B.
CE Panel does not function correctly.		PANEL 150, Entry A



3350 CHECKOUT PROCEDURE (Without String Switch Feature)





3350 CHECKOUT PROCEDURE

1. The drive to be tested must be varied offline from the system to run in Inline mode (time sharing with an operating system such as OS or DOS).
2. Select the drive to be tested by setting the CE Mode switch to the A or B position.
3. Check that the Power Sequence Complete LEDs and Ready lamps are on. If the lamps are not on and all switches are in their correct position, go to START 100 and analyze the problem.
4. Ensure that the correct microdiagnostic disk is loaded into the storage control reader. See MICRO 8 through 12 for complete details on the use of the 3350 CE Panel for loading and running microdiagnostics.
5. Enter routine number A1 to run the microdiagnostics listed below. These routines are linked together and the complete sequence runs without intervention. If the routine cannot be loaded successfully, go to PANEL 150 to analyze the problem. Refer to the MICFL section for detailed test descriptions.

   A1 Control Interface and Logic tests
   A2 Device Interface and Logic tests
   B8 HDA/Control Logic tests
   A5 Index/Sector tests
   AD Gap Counter tests
   AF Format Read/Write tests
   B9 Dynamic Servo test
   AE ECC tests
   BB 3330 Compatibility Mode and other special tests

   If errors occur, refer to the Error Code Dictionary (in the MICRO section of the MIM) and follow the instructions for the error(s) received. After obtaining all information from the first error, restart the test to see if the same Error Code occurs a second time. Intermittent errors do not always stop on the best Error Code to provide easy analysis. It is usually best to use the lowest-order Error Code obtainable (that is, the Error Code in the earliest test routine in the sequence). Record all information from all Error Codes and look for some common element that might be helpful. For example: if the same bit position in the received information is always incorrect, it might indicate a Bus In problem.
6. To complete the Checkout procedure, the following microdiagnostics should be run. These are not linked. Enter routine and any required parameter(s) as defined in the description in the MICRO section of the MIM (start on MICRO 28). Run the routine to completion.

   AB Random Seek test
   B1 Read test
   B2 Write test
7. If a storage control MLM requests a 3350 checkout and no errors were detected, return to the storage control MLM.

ADDITIONAL TESTING

HDA Checkout Procedure From The System

If it is desired to test an HDA, the following online tests are available:

T3350-PSA Pack Scan A (OLT 20)
T3350-PSB Pack Scan B (OLT 24)
T3350-PSC Skip Displacement (OLT 25)
T3350-WT Write Test (OLT 26)

Refer to OLT 5 for running instructions. If other tests are desired, use FRIEND. See OLT 26 for a summary of FRIEND operation.

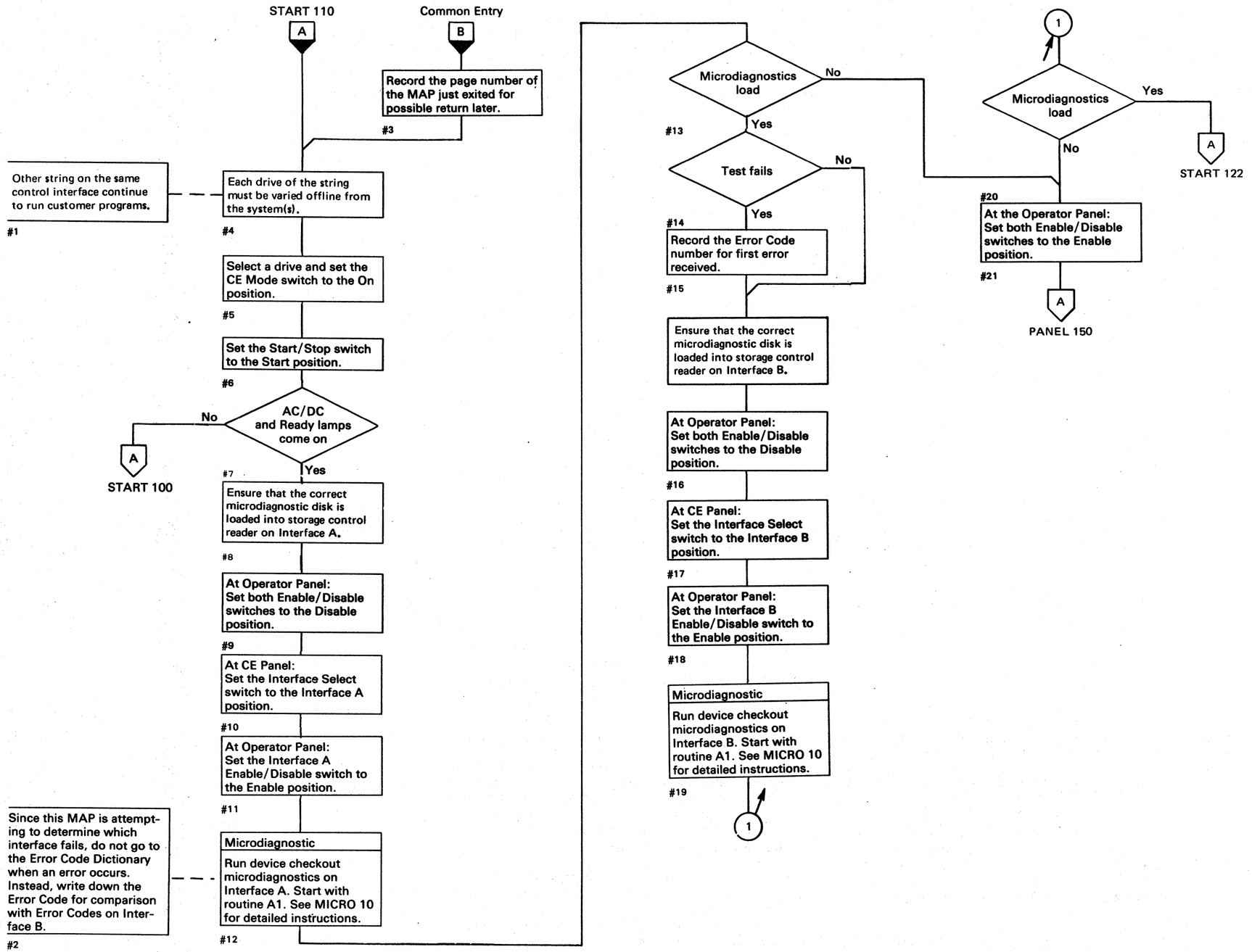
3350 CHECKOUT PROCEDURE

The Checkout procedure for a 3350 with the string switch feature has two primary objectives:

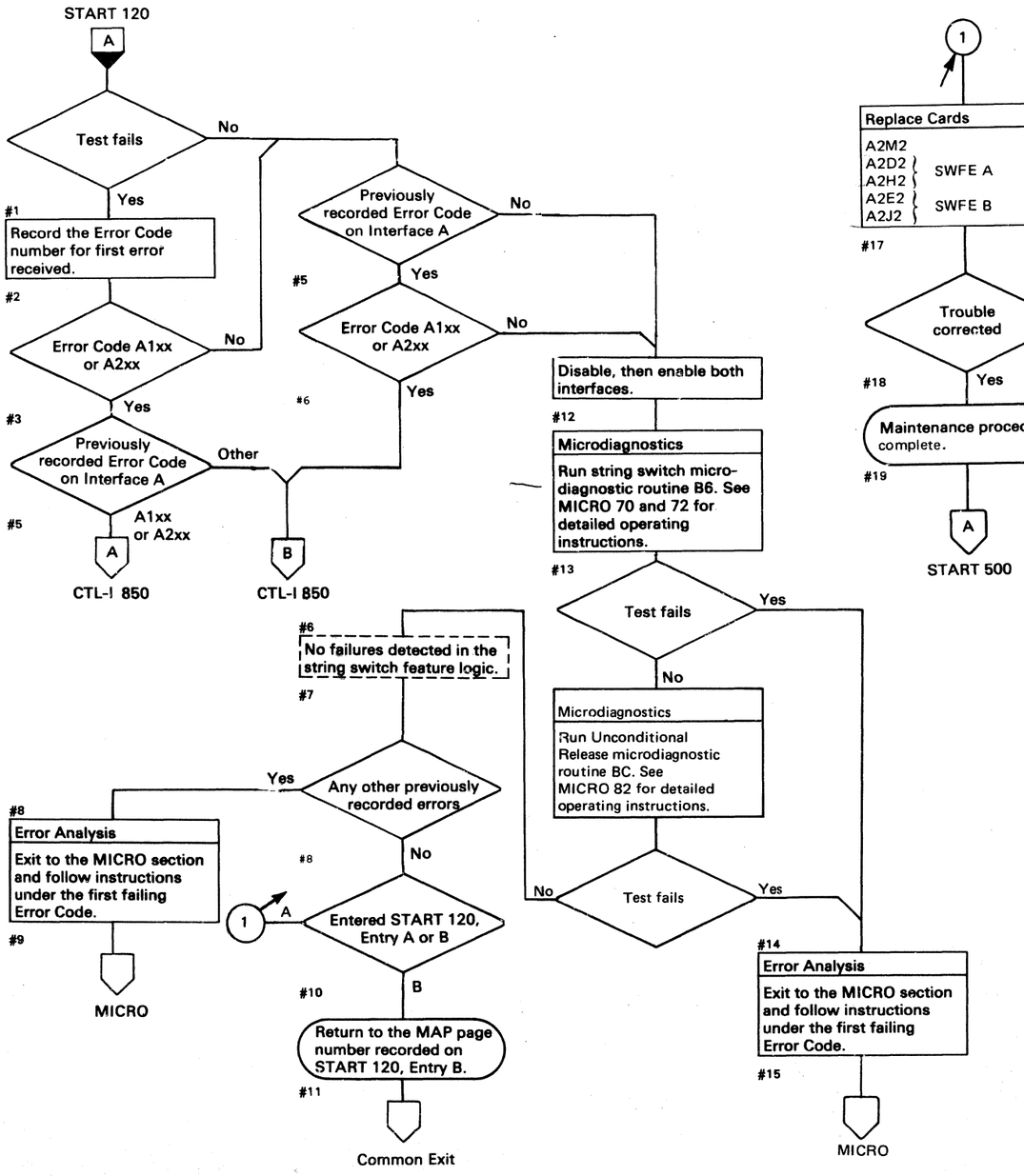
1. To determine, as rapidly as possible, which of the following areas is at fault:
   a. Interface A
   b. Interface B
   c. String switch common electronics
   d. The controller
   e. The drive(s) and/or the device interface
2. To check the entire string for undefined failures after installation and to verify repair actions.

Note: *If one string switch interface is "hung":*

1. *Set the Enable/Disable switch of the "hung" interface to the Disable position.*
2. *Set the Interface Select switch on the CE Panel to that interface.*
3. *Operate the Execute switch on the CE Panel.*
4. *Set the Enable/Disable switch to the Enable position.*



3350 CHECKOUT PROCEDURE (With String Switch Feature)



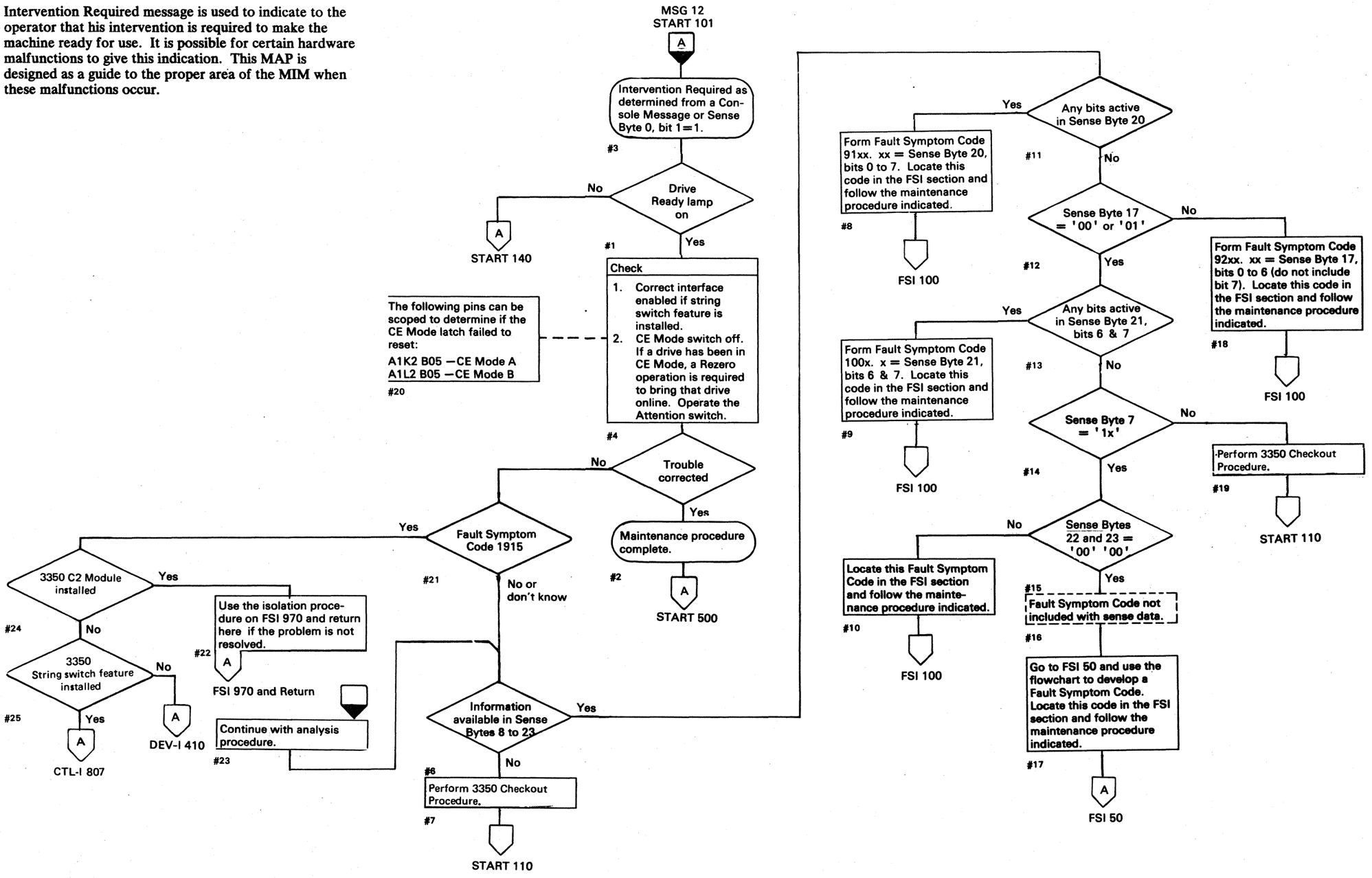
Single Drive Checkout Procedure

1. The drive to be tested must be varied offline from the system to run in Inline mode (time sharing with an operating system such as OS or DOS).
2. At the drive to be tested, set the Power switch to the On position and set the Interface Select switch to the interface being used.
3. Set the Start/Stop switch to the Start position. Check that the AC/DC and Ready lamps are on. If the lamps are not on and all switches are in their correct position, go to START 100 and analyze the problem.
4. Load the correct 3350 microdiagnostic disk into the storage control reader of the interface being used. See MICRO 8 through 12 for complete details on the use of the 3350 CE Panel for loading and running microdiagnostics.
5. Continue with Step 5 on START 110 under 3350 Without String Switch Feature.

Note: *The string switch feature can be disabled by following the instructions on CTL-I 855. The 3350 can then be checked by following the procedure on START 110.*

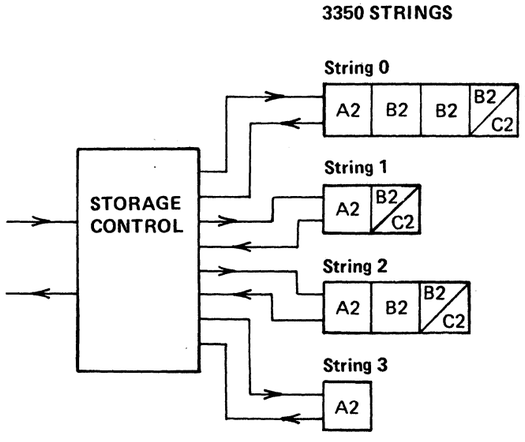
INTERVENTION REQUIRED

Intervention Required message is used to indicate to the operator that his intervention is required to make the machine ready for use. It is possible for certain hardware malfunctions to give this indication. This MAP is designed as a guide to the proper area of the MIM when these malfunctions occur.



DRIVE READY FAILURE

DISK STORAGE SUBSYSTEM DESCRIPTION



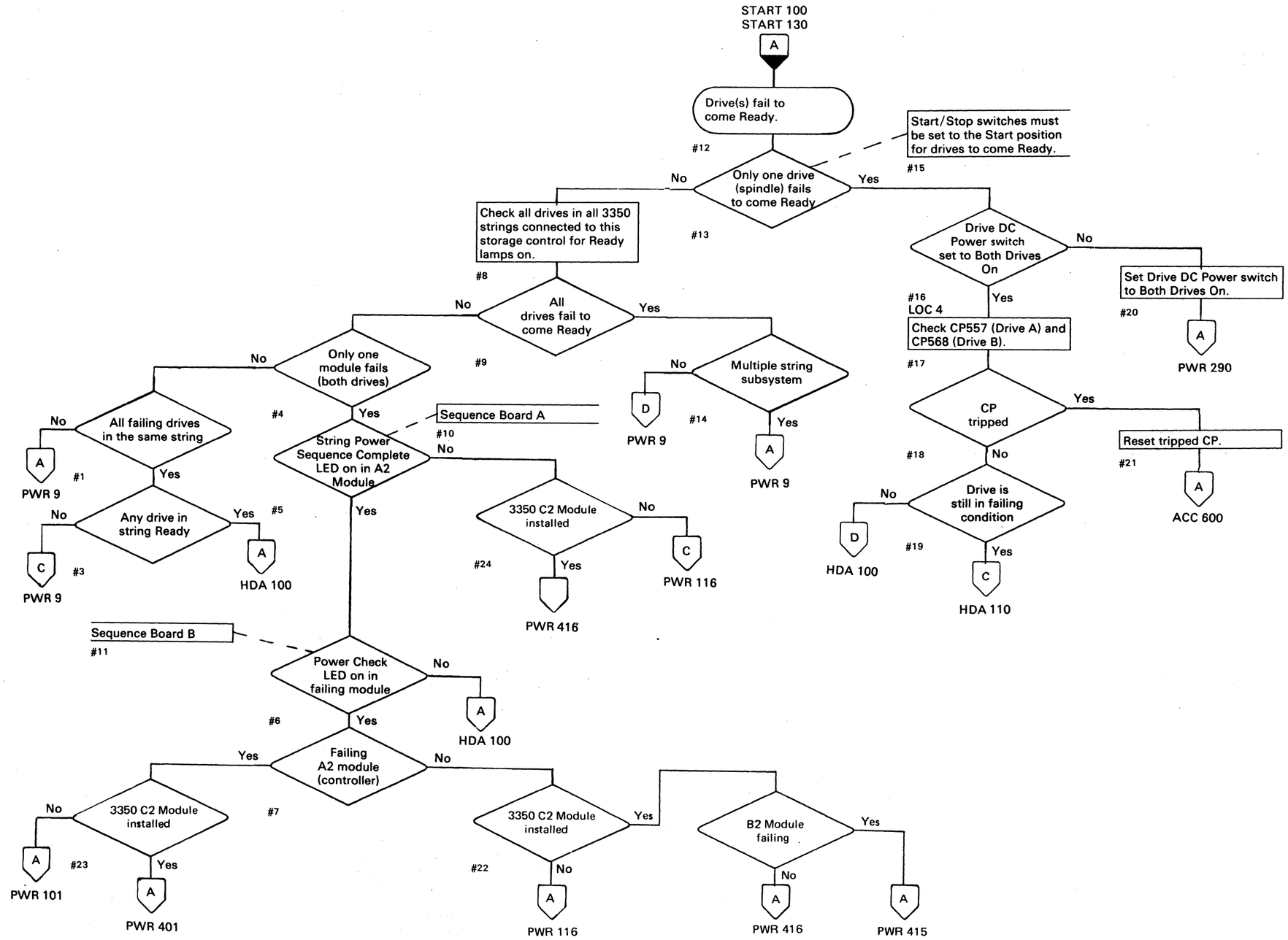
The disk subsystem power-on sequence is initiated from the controlling System/370 to first start the storage control. The System/370 may wait for a Power Complete from the storage control or may advance to the next subsystem without a response from the storage control.

Storage Control Power On initiates a power-on sequence in the A2 Module of String 0. After String 0 power sequence is complete, a signal from String 0 releases the storage control to then start String 1. Therefore, if one string does not start, the following string is prevented from powering on.

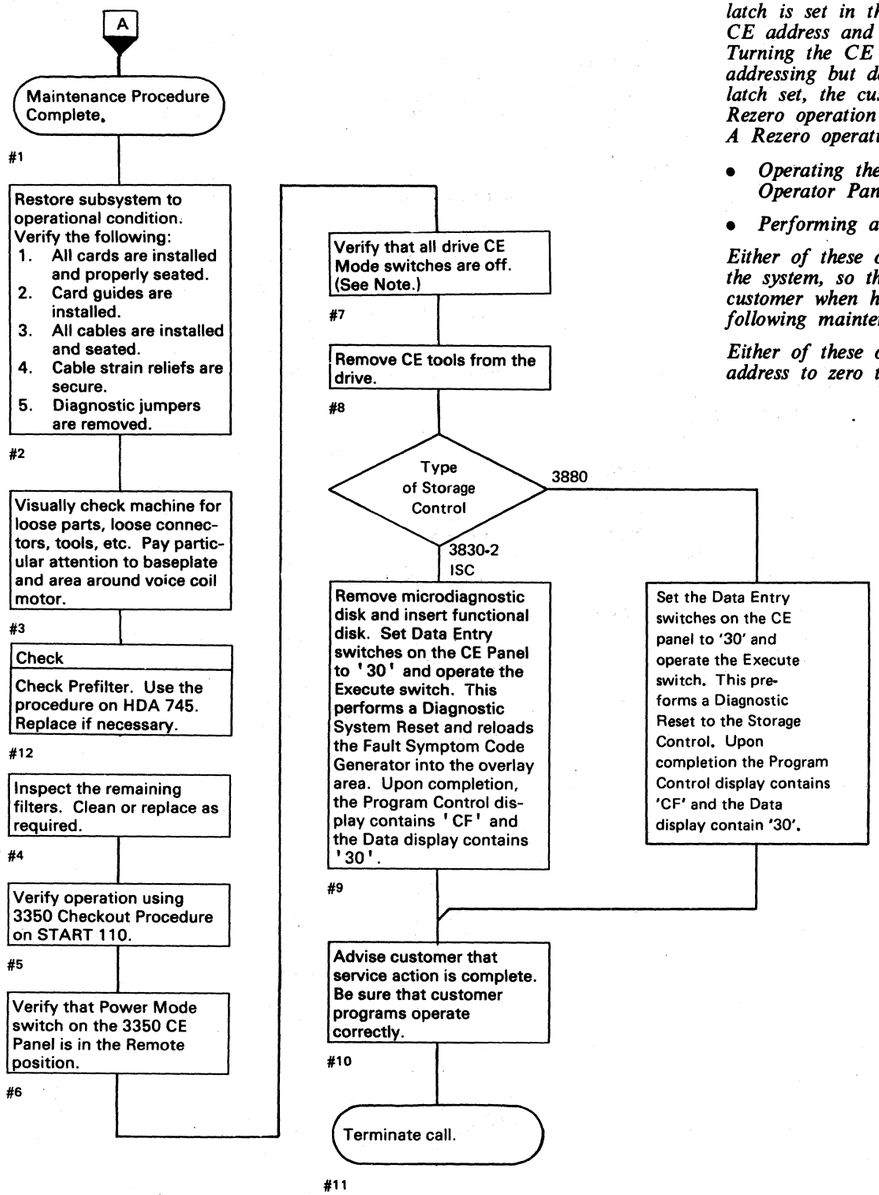
The following is a brief description of the string power-on sequence:

1. The storage control activates relays to light the Power On indicator on the Operator Panel.
2. The String Power Sequence Complete LED on the Sequence Panel Board A comes on.
3. String Power Sequence Complete in the storage control advances Start Power On in the next string.
4. The A2 Module drives come Ready, followed by the next B2 Module with the Start/Stop switches in the Start position.

For a complete description of the power-on sequence, see PWR 6 (if a C2 Module is installed, see PWR 306).



MAINTENANCE PROCEDURE COMPLETE



Note: *When a 3350 drive is switched to CE Mode, a latch is set in the drive to allow selection with the CE address and to prevent interrupts to the system. Turning the CE Mode switch off prevents CE addressing but does not reset the latch. (With the latch set, the customer cannot address the drive.) A Rezero operation must take place to reset the latch. A Rezero operation can be initiated by:*

- *Operating the Attention switch on the Operator Panel.*
- *Performing an HDA load cycle.*

Either of these operations generates an interrupt to the system, so they are usually performed by the customer when he is placing the device back online following maintenance activity.

Either of these operations also resets the cylinder address to zero to correspond to the access position.

FSI CONTENTS

FAULT SYMPTOM INDEX USAGE

INTRODUCTION

This page defines the proper use of the Fault Symptom Index (FSI) format and briefly describes how the Fault Symptom Code (FSC) is generated.

The Fault Symptom Codes are listed in sequence within the FSI section. The two high-order numbers of the Fault Symptom Code are the two high-order numbers of the FSI pages. For example, FSC 4944 would be found on an FSI page between 490 and 499.

FSC DETECTION

There are two ways an FSC is received:

- System detection.
- Microdiagnostic background detection.

System Detection

These errors are detected by the system and are posted on the system log (EREP) as an FSC.

Microdiagnostic Background Detection

When running microdiagnostics, it is possible for a hardware failure to occur in an area that has not been previously tested nor is it the main hardware area being tested. This is called a background error and the analysis of the Error Code received gives instructions to run microdiagnostic routine B3. Routine B3 analyzes the status bytes and FSI 60 shows how to develop the FSC.

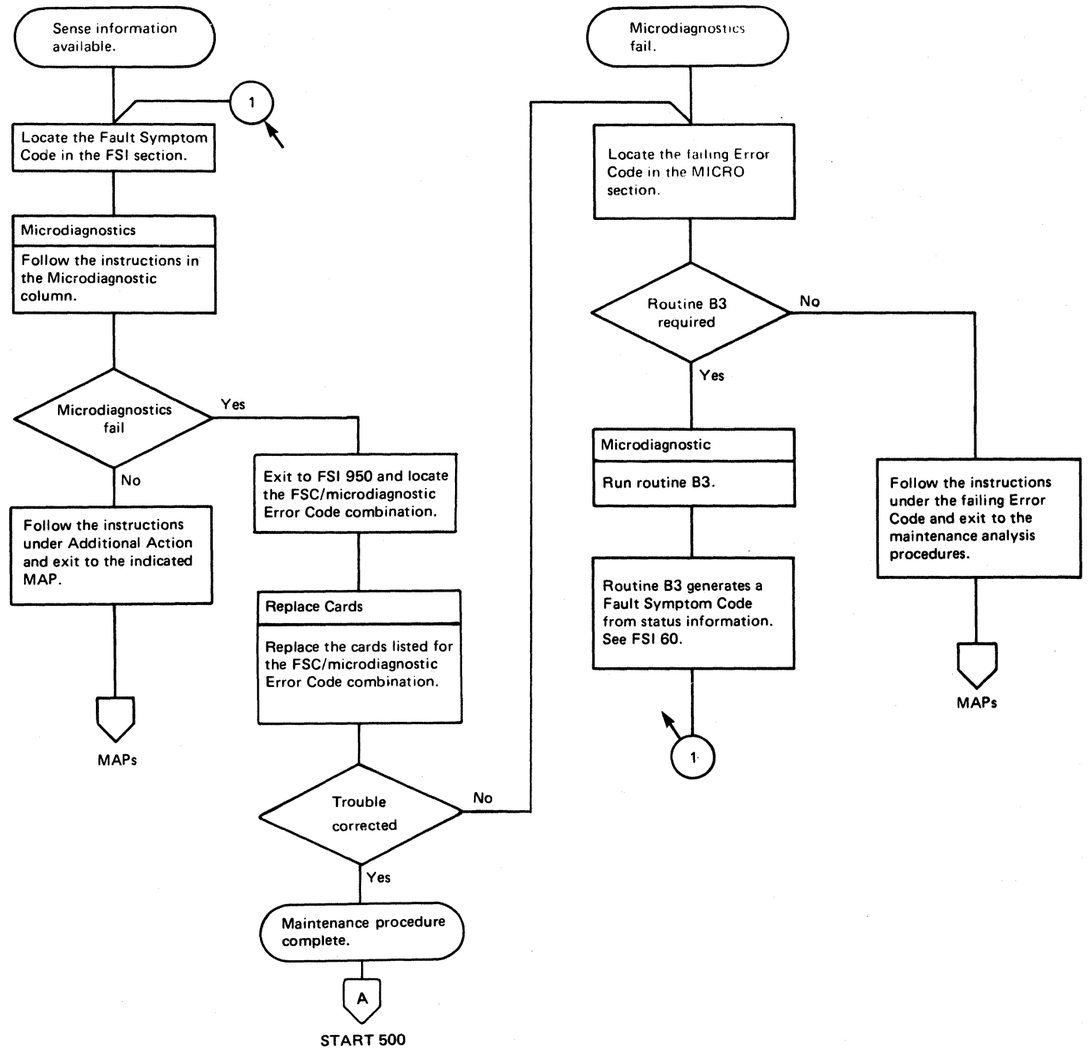
FSI USAGE

The procedure for using the FSI section is to locate the FSC and follow the instructions in each column from left to right.

The flowchart on this page shows the procedure to follow in analyzing both types of FSC.

POSSIBLE CAUSES

The cards listed in the Possible Causes column are in the order of their probability of causing that FSC. The dashed line in the list separates the high probability cards from the low.



FAULT SYMPTOM CODE GENERATION

This chart illustrates how the storage control microprogram develops a Fault Symptom Code from sense information. The 4-character hexidecimal code is presented in Sense Bytes 22 and 23. The chart can be used to manually develop a symptom code if the generator microprogram code is not available in the storage control.

To reload the Fault Symptom Code Generator: (3830-2 and ISC only)

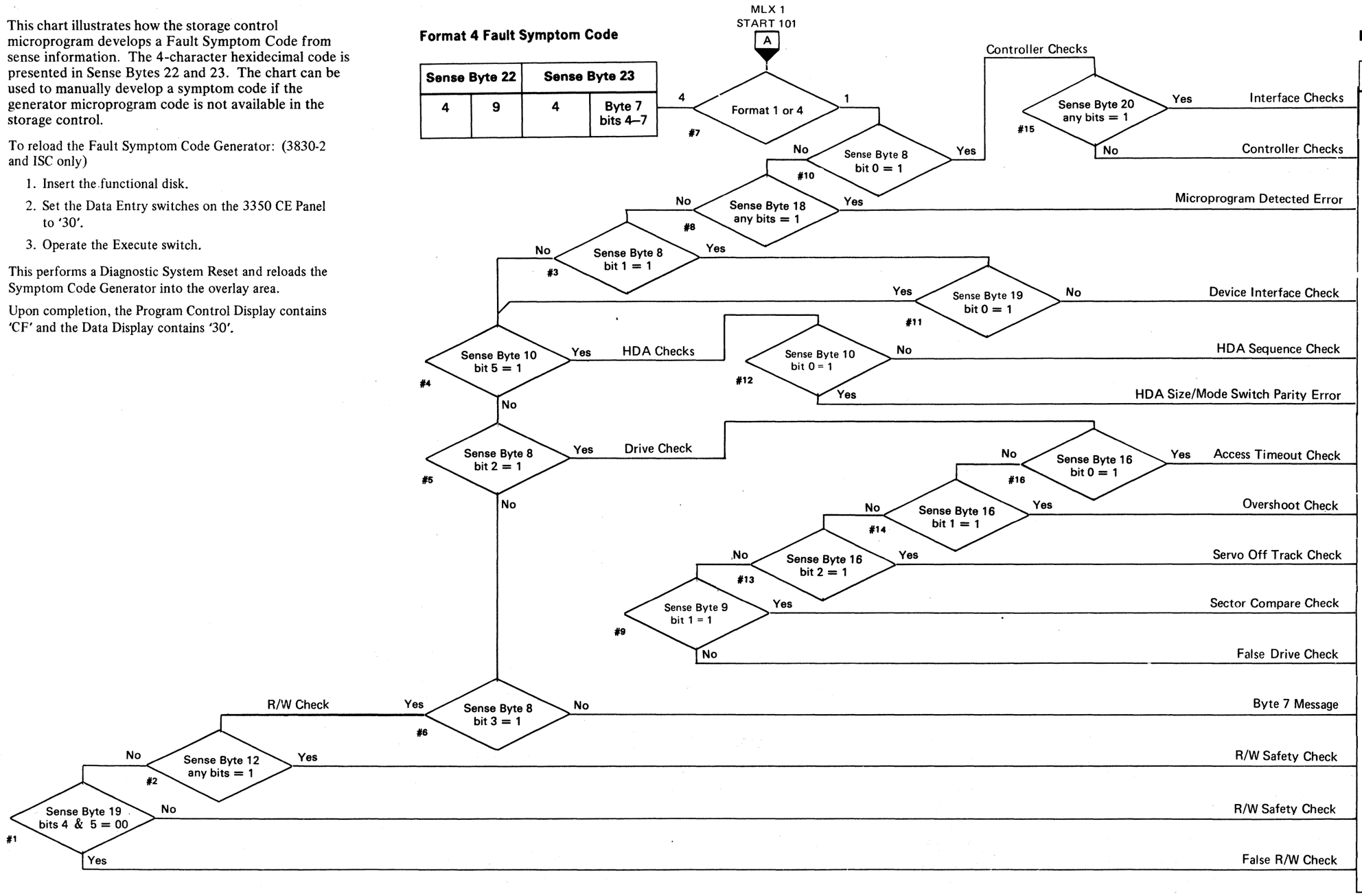
1. Insert the functional disk.
2. Set the Data Entry switches on the 3350 CE Panel to '30'.
3. Operate the Execute switch.

This performs a Diagnostic System Reset and reloads the Symptom Code Generator into the overlay area.

Upon completion, the Program Control Display contains 'CF' and the Data Display contains '30'.

Format 4 Fault Symptom Code

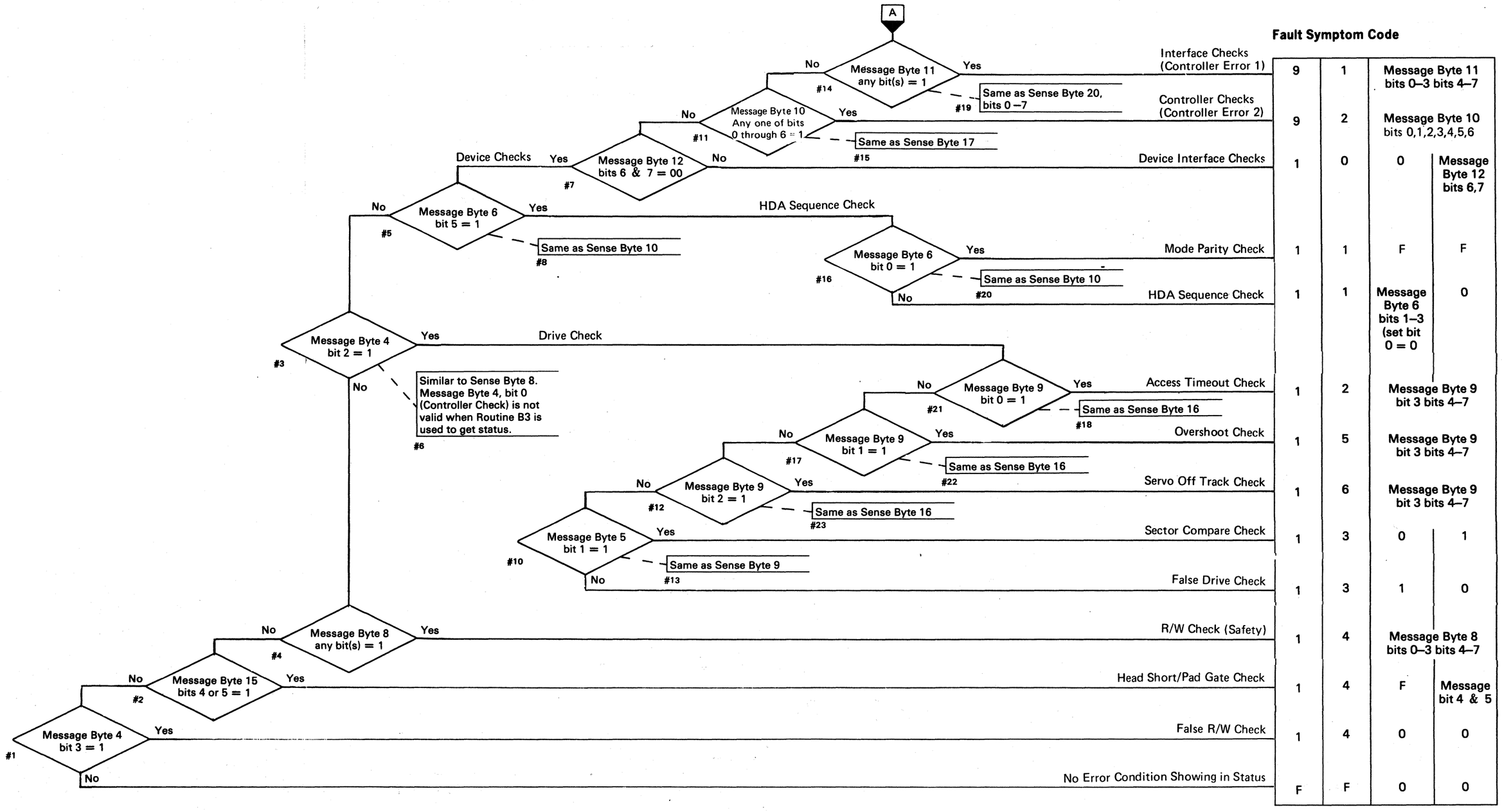
Sense Byte 22		Sense Byte 23	
4	9	4	Byte 7 bits 4–7



Format 1 Fault Symptom Code

Sense Byte 22		Sense Byte 23	
9	1	Byte 20 bits 0–3	Byte 20 bits 4–7
9	2	Byte 17 bits 0–3	Byte 17 bits 4–6
9	0	Byte 18 bits 0–3	Byte 18 bits 4–7
1	0	0	Byte 21 bits 6–7
1	1	Byte 10 bits 1–3	0
1	1	F	F
1	2	Byte 16 bit 3	Byte 16 bits 4–7
1	5	Byte 16 bit 3	Byte 16 bits 4–7
1	6	Byte 16 bit 3	Byte 16 bits 4–7
1	3	0	1
1	3	1	0
1	9	Byte 7 bits 0–3	Byte 7 bits 4–7
1	4	Byte 12 bits 0–3	Byte 12 bits 4–7
1	4	F	Byte 19 bits 4–5
1	4	0	0

B3 MICRODIAGNOSTIC SYMPTOM CODE GENERATION (Pass 1)



Fault Symptom Code			
9	1	Message Byte 11 bits 0–3	bits 4–7
9	2	Message Byte 10 bits 0,1,2,3,4,5,6	
1	0	0	Message Byte 12 bits 6,7
1	1	F	F
1	1	Message Byte 6 bits 1–3 (set bit 0 = 0	0
1	2	Message Byte 9 bit 3	bits 4–7
1	5	Message Byte 9 bit 3	bits 4–7
1	6	Message Byte 9 bit 3	bits 4–7
1	3	0	1
1	3	1	0
1	4	Message Byte 8 bits 0–3	bits 4–7
1	4	F	Message bit 4 & 5
1	4	0	0
F	F	0	0

3350

AL0050 Seq. 2 of 2	2358280 Part No.

441300 31 Mar 76	441306 1 Apr 77	441309 15 Jul 79	441310 27 Jun 80	

B3 MESSAGE DISPLAY — PASS 2

PROGRAM CONTROL DISPLAY HEX VALUE	MESSAGE B3 BYTE	DATA DISPLAY	0	1	2	3	4	5	6	7	DETAILED DESCRIPTION
E1	1	Physical Drive Identification	A	B	C	D	E	F	G	H	Sense Byte 4 SENSE 106
E2	2	Sense HAR	Fixed Heads (32 to 59)	Fixed Heads (0 to 31)	HAR 16	HAR 8	HAR 4	HAR 2	HAR 1	1	
E3	3	Sense Difference Counter	128	64	32	16	8	4	2	1	
E4	4	Drive Status		Device ** Interface Check	Drive ** Check	Read/Write** Check	Online *	Attention	Busy	Seek Complete, Search Sector or Pad Complete	Sense Byte 8 SENSE 106
E5	5	Checks/Status (Sense Status 1)	Pad In Progress	Sector** Compare Check	Motor at ** Speed Latched	Air Switch ** Latched	Write Enable	Fixed Head HDA Installed	Spindle Mode 2	Spindle Mode 1	Sense Byte 9 SENSE 107
E6	6	HDA Sequence Control (Sense Status 2)	HDA** Mode Parity	HDA* Latch 4	HDA* Latch 2	HDA Latch 1	HDA Timer Check Latch	HDA Sequence Check Latch		Odd Track	Sense Byte 10 SENSE 107
E7	7	Loaded Switch Status (Sense Status 3)	Drive Start * Latch	Guardband Pattern	Target Velocity	Track* Crossing		Air* Switch		Motor at * Speed	Sense Byte 11 SENSE 107
E8	8	R/W Safety (Sense R/W)	Multiple ** Head Select Check	Capable/ ** Enable Check	Write ** Overrun	Index ** Check	R/W ** Interlock Check	Control ** Check	Write ** Transition Check	Write Current ** on Read Check	Sense Byte 12 SENSE 107
E9	9	Access Status (Sense Status 4)	Access ** Timeout Check	Overshoot ** Check	Servo Off ** Track Check	Rezero Mode Latch	Servo * Latch	Linear * Mode Latch	Control * Latch	Wait Latch	Sense Byte 16 SENSE 108
EA	10	Controller Checks (Controller Error 2)	01 = Missing Servo Input** 10 = Phase Error during Write** 11 = Missing data input**		SERDES ** Check	Gap ** Counter Check	Write ** Data Check	Monitor ** Check	ECC ** Check	ECC* Zeros Detected	Sense Byte 17 SENSE 108
EB	11	Control Interface Checks (Controller Error 1)	Control Interface** Tag Bus Parity Check	Control Interface** Bus Out Parity Check	Device ** Selection Check	Device Bus In Parity Check **	Control Interface Bus In Parity Check **	I Write ** Fail	3330 Mode ** Index Check	Reorient ** Counter Check	Sense Byte 20 SENSE 109
EC	12	Device Interface Checks							Device Bus ** Out Parity Check	Device Tag ** Bus Parity Check	Sense Byte 21 SENSE 109
ED	13	Target Address Register	Rotational Position Sensing	64	32	16	8	4	2	1	
EE	14	Sense Cylinder Address Register (Switch Feature)	256	128	64	32	16	8	4	2	
EF	15	Status (Sense Status 0)	Direction Bit 1 = IN	Difference 512	Difference 256	Cylinder Address 512	Head Short ** Check	Pad Gate ** Check	1.2 Mb File	1 (Always On)	Sense Byte 19 SENSE 108 (Bits 4–7 Only)
CE		Routine Number	1	0	1	1	0	0	1	1	MICRO 36

**Indicators that are normally on with no error condition, Ready lamp on, and HDA sequence at State 6.*

*** Error or check condition.*

FAULT SYMPTOM CODE	ERROR DESCRIPTION	MICRODIAGNOSTICS	ADDITIONAL ACTION	POSSIBLE CAUSES (Listed in order of probability)		MAP	
				A1 Board (Drive)	A2 Board (Controller)	Section	Entry
1000	False Device Interface Check	If the 3350 C2 Module is installed, exit to FSI 970. Run Link Series starting with routine A1. See MICRO 10 for detailed instructions. **Note:** *If the microdiagnostics fail to load, exit to PANEL 150, Entry A.* Microdiagnostics fail? YES 1. Display and record the Error Message Bytes. See MICRO 12 for detailed instructions. 2. Exit to FSI 950. NO Follow the instructions in the Additional Action column.	1. Replace cards listed in the Possible Causes column in the order shown. For single drive failures, replace cards on A1 Board first. For multiple drive failures, replace cards on A2 Board in the controller first. 2. Check the cable connector seating for cable group 1. See FSI 940 for cable group locations and DEV-I 100 for cable diagram. 3. Exit to MAP Entry.	A1K2 (A1L2)*	A2L2	**DEV-I 116**	**C**
1001	Device Interface Check – Tag Bus Parity error			A1K2 (A1L2)*	A2L2	**DEV-I 140**	**B**
1002	Device Interface Check – Bus Out Parity error			A1K2 (A1L2)*	A2F2 A2G2* A2L2	**DEV-I 400**	**A**
1003	Device Interface Check – Tag Bus and Bus Out Parity error		1. Replace cards listed in Possible Causes column in the order shown. For single drive failures, replace cards on A1 Board first. For multiple drive failures, replace cards on A2 Board in the controller first. 2. Check the cable connector seating for the following cable groups: Group 0 – Device Bus In Group 1 – Device Bus Out See FSI 940 for cable group locations and DEV-I 100 for cable diagram. 3. Exit to MAP Entry.	A1K2 (A1L2)*	A2G2* A2L2	**DEV-I 112**	**B**

When replacing A1K2, A1L2, A2G2, A2D2, or A2E2, check the addressing jumpers. See INST 6.

FAULT SYMPTOM CODES – 11XX

FAULT SYMPTOM CODE	ERROR DESCRIPTION	MICRODIAGNOSTICS	ADDITIONAL ACTION	POSSIBLE CAUSES (Listed in order of probability)		MAP	
				A1 Board (Drive)	A2 Board (Controller)	Section	Entry
11FF	HDA Mode Parity Check This indicates that either multiple or no format mode was detected.	Was this FSC generated by running routine B3? YES Run microdiagnostic routine BA. See MICRO 76 for instructions. Exit to the MICRO section and follow the instructions under the first failing Error Code. NO Run Link Series starting with routine A1. See MICRO 10 for detailed instructions. **Note:** *If the microdiagnostics fail to load, exit to PANEL 150, Entry A.* Microdiagnostics fail? YES 1. Display and record the Error Message Bytes. See MICRO 12 for detailed instructions. 2. Exit to FSI 950. NO Follow the instructions in the Additional Action column.	1. Remove dc power from the failing unit. Connect an ohmmeter between D08 and the following pins to verify that only one is grounded: A1F2 (A1Q2) S08 A1F2 (A1Q2) G08 A1F2 (A1Q2) M08 2. Replace cards listed in Possible Causes column in the order shown. 3. Exit to MAP Entry.	A1C2 (A1T2)** A1F2 (A1Q2) A1D4 (A1S4)** --- A1K2 (A1L2)* A1E2 (A1R2) A1D2 (A1S2)** A1C4 (A1T4)** A1H2 (A1N2)		HDA 305	A
11XX	HDA Sequence Check This indicates either an initial status problem was detected during the sequence from State 0 to State 6 (Ready), or a run status problem was detected while in State 6.		1. Swap or replace the following relays: K652 (K662) K632 K631 K633 K651 (K661) 2. Replace cards listed in the Possible Causes column in the order shown. 3. Exit to MAP Entry.	A1C2 (A1T2)** A1F2 (A1Q2) A1D4 (A1S4)** --- A1K2 (A1L2)* A1E2 (A1R2) A1D2 (A1S2)** A1C4 (A1T4)** A1H2 (A1N2)		HDA 110	B

When replacing A1K2, A1L2, A2G2, A2D2, or A2E2, check the addressing jumpers. See INST 6.

**When replacing A1C2 (A1T2), A1C4 (A1T4), A1D2 (A1S2), A1D4 (A1S4), or Pwr Amp P532 (P542), the servo velocity gain must be adjusted. See ACC 800, Entry B for the procedure.*

FAULT SYMPTOM CODE	ERROR DESCRIPTION	MICRODIAGNOSTICS	ADDITIONAL ACTION	POSSIBLE CAUSES (Listed in order of probability)		MAP	
				A1 Board (Drive)	A2 Board (Controller)	Section	Entry
1200	Access timeout error during Recalibrate, State 0 – Move Out	Was this FSC generated by running routine B3? YES Exit to ACC 301, Entry B. NO Run Link Series starting with routine A1. See MICRO 10 for detailed instructions. **Note:** *If the microdiagnostics fail to load, exit to PANEL 150, Entry A.* Microdiagnostics fail? YES 1. Display and record the Error Message Bytes. See MICRO 12 for detailed instructions. 2. Exit to FSI 950. NO Loop the following microdiagnostic routines individually to check for intermittent failures: Routine B8 – Enter B8, 06, 00. Routine B9 – Enter B9, 06, 00. Routine AB – Enter AB, 06, 00. Microdiagnostics fail? YES 1. Display and record the Error Message Bytes. See MICRO 12 for detailed instructions. 2. Exit to FSI 950. NO Follow the instructions in the Additional Action column.	1. Check the cable connector seating for the following cable groups: Group 3 – Servo Power Amp Group 5 – HDA Servo Group 6 – HDA Head Select See FSI 940 for cable group locations. 2. Check the –36 volt CP at: CP557 Drive A CP568 Drive B (For details, see LOC 4.) 3. Verify that the bobbin pushrod is removed from the voice coil motor (VCM). (For details, see INST 3.) 4. Check that the VCM terminals A and B are tight. (For details, see LOC 6.) 5. Check that the belt-in-place spring is installed. (For details, see HDA 760.) 6. Verify that the Servo Gain adjustment is correct. (For details, see ACC 800, Entry A.) 7. Replace cards listed in the Possible Causes column in the order shown or exit to the MAP Entry for further isolation.	A1E2 (A1R2) A1D2 (A1S2)** --- A1D4 (A1S4)** A1C2 (A1T2)** A1C4 (A1T4)** A1G2 (A1P2)** A1F2 (A1Q2)		ACC 700	
1201	Access timeout error during Recalibrate, State 1 – Reset			A1E2 (A1R2) --- A1C2 (A1T2)** A1C4 (A1T4)** A1F2 (A1Q2) A1K2 (A1L2)* A1H2 (A1N2)		ACC 700	
1206	Access timeout error during Rezero, State 6 – Rezero Linear Mode			A1D2 (A1S2)** A1C4 (A1T4)** A1E2 (A1R2) A1D4 (A1S4)** A1C2 (A1T2)** Pwr Amp P532 (P542)** A1G2 (A1P2) A1F2 (A1Q2)		ACC 700	
1208	Access timeout error during Seek, State 8 – Decelerate			A1E2 (A1R2) --- A1C2 (A1T2)** A1C4 (A1T4)** A1D2 (A1S2)** A1D4 (A1S4)** A1G2 (A1P2) Pwr Amp P532 (P542)**		ACC 700	
120A	Access timeout error during Seek, State A – Accelerate			A1E2 (A1R2) --- A1C2 (A1T2)** A1C4 (A1T4)** A1D2 (A1S2)** A1D4 (A1S4)** A1G2 (A1P2) Pwr Amp P532 (P542)**		ACC 700	

When replacing A1K2, A1L2, A2G2, A2D2, or A2E2, check the addressing jumpers. See INST 6.

***When replacing A1C2 (A1T2), A1C4 (A1T4), A1D2 (A1S2), A1D4 (A1S4), or Pwr Amp P532 (P542), the servo velocity gain must be adjusted. See ACC 800, Entry B for the procedure.*

FAULT SYMPTOM CODES – 12XX

FAULT SYMPTOM CODE	ERROR DESCRIPTION	MICRODIAGNOSTICS	ADDITIONAL ACTION	POSSIBLE CAUSES (Listed in order of probability)		MAP	
				A1 Board (Drive)	A2 Board (Controller)	Section	Entry
120C	Access timeout error during Seek, State C – Seek Linear Mode	Was this FSC generated by running routine B3? YES Exit to ACC 301, Entry B. NO Run Link Series starting with routine A1. See MICRO 10 for detailed instructions. **Note:** *If the microdiagnostics fail to load, exit to PANEL 150, Entry A.* Microdiagnostics fail? YES 1. Display and record the Error Message Bytes. See MICRO 12 for detailed instructions. 2. Exit to FSI 950. NO Loop the following microdiagnostic routines individually to check for intermittent failures: Routine B8 – Enter B8, 06, 00. Routine B9 – Enter B9, 06, 00. Routine AB – Enter AB, 06, 00. Microdiagnostics fail? YES 1. Display and record the Error Message Bytes. See MICRO 12 for detailed instructions. 2. Exit to FSI 950. NO Follow the instructions in the Additional Action column.	1. Check the cable connector seating for the following cable groups: Group 3 – Servo Power Amp Group 5 – HDA Servo Group 6 – HDA Head Select See FSI 940 for cable group locations. 2. Check the –36 volt CP at: CP557 Drive A CP568 Drive B (For details, see LOC 4.) 3. Verify that the bobbin pushrod is removed from the voice coil motor (VCM). (For details, see INST 3.) 4. Check that the VCM terminals A and B are tight. (For details, see LOC 6.) 5. Check that the belt-in-place spring is installed. (For details, see HDA 760.) 6. Verify that the Servo Gain adjustment is correct. (For details, see ACC 800, Entry A.) 7. Replace cards listed in the Possible Causes column in the order shown or exit to the MAP Entry for further isolation.	A1E2 (A1R2) A1C2 (A1T2)** A1C4 (A1T4)** A1D2 (A1S2)** A1D4 (A1S4)** A1G2 (A1P2) Pwr Amp P532 (P542)**		**ACC 700**	
120E	Invalid timeout error posted during Seek, State E – On Track			A1E2 (A1R2) A1C4 (A1T4)** – – – – – – – – – – A1C2 (A1T2)** A1D2 (A1S2)** A1D4 (A1S4)** A1K2 (A1L2)* A1H2 (A1N2)		**ACC 700**	
1210	Access timeout error during Rezero, State 10 – Move Out			A1D4 (A1S4)** A1D2 (A1S2)** A1G2 (A1P2) – – – – – – – – – – A1E2 (A1R2) A1C2 (A1T2)** Pwr Amp P532 (P542)** A1C4 (A1T4)** A1F2 (A1Q2) A1H2 (A1N2) A1J4 (A1M4)	A2D2*	**ACC 700**	
1212	Access timeout error during Rezero, State 12 – Turn Around			A1E2 (A1R2) A1C4 (A1T4)** A1D4 (A1S4)** – – – – – – – – – – A1C2 (A1T2)** A1D2 (A1S2)** Pwr Amp P532 (P542)** A1G2 (A1P2) A1F2 (A1Q2) A1H2 (A1N2) A1J4 (A1M4)		**ACC 700**	

When replacing A1K2, A1L2, A2G2, A2D2, or A2E2, check the addressing jumpers. See INST 6.

***When replacing A1C2 (A1T2), A1C4 (A1T4), A1D2 (A1S2), A1D4 (A1S4), or Pwr Amp P532 (P542), the servo velocity gain must be adjusted. See ACC 800, Entry B for the procedure.*

FAULT SYMPTOM CODE	ERROR DESCRIPTION	MICRODIAGNOSTICS	ADDITIONAL ACTION	POSSIBLE CAUSES (Listed in order of probability)		MAP	
				A1 Board (Drive)	A2 Board (Controller)	Section	Entry
1216	Access timeout error during Rezero, State 16 – Move In	Was this FSC generated by running routine B3? YES Exit to ACC 301, Entry B. NO Run Link Series starting with routine A1. See MICRO 10 for detailed instructions. **Note:** *If the microdiagnostics fail to load, exit to PANEL 150, Entry A.*	1. Check the cable connector seating for the following cable groups: Group 3 – Servo Power Amp Group 5 – HDA Servo Group 6 – HDA Head Select See FSI 940 for cable group locations. 2. Check the –36 volt CP at: CP557 Drive A CP568 Drive B (For details, see LOC 4.) 3. Verify that the bobbin pushrod is removed from the voice coil motor (VCM). (For details, see INST 3.) 4. Check that the VCM terminals A and B are tight. (For details, see LOC 6.) 5. Check that the belt-in-place spring is installed. (For details, see HDA 760.) 6. Verify that the Servo Gain adjustment is correct. (For details, see ACC 800, Entry A.) 7. Replace cards listed in the Possible Causes column in the order shown or exit to the MAP Entry for further isolation.	A1C4 (A1T4)** A1D4 (A1S4)** A1E2 (A1R2) – – – – – – – – – – A1C2 (A1T2)** A1D2 (A1S2)** Pwr Amp P532 (P542)** A1G2 (A1P2) A1F2 (A1Q2) A1H2 (A1N2) A1J4 (A1M4)		ACC 700	
12XX	Access timeout error during an invalid control state	Microdiagnostics fail? YES 1. Display and record the Error Message Bytes. See MICRO 12 for detailed instructions. 2. Exit to FSI 950. NO Loop the following microdiagnostic routines individually to check for intermittent failures: Routine B8 – Enter B8, 06, 00. Routine B9 – Enter B9, 06, 00. Routine AB – Enter AB, 06, 00. Microdiagnostics fail? YES 1. Display and record the Error Message Bytes. See MICRO 12 for detailed instructions. 2. Exit to FSI 950. NO Follow the instructions in the Additional Action column.		A1E2 (A1R2) A1K2 (A1L2)* A1F2 (A1Q2) A1G2 (A1P2) A1H2 (A1N2) A1J4 (A1M4)		ACC 700	

When replacing A1K2, A1L2, A2G2, A2D2, or A2E2, check the addressing jumpers. See INST 6.

**When replacing A1C2 (A1T2), A1C4 (A1T4), A1D2 (A1S2), A1D4 (A1S4), or Pwr Amp P532 (P542), the servo velocity gain must be adjusted. See ACC 800, Entry B for the procedure.*

FAULT SYMPTOM CODE	ERROR DESCRIPTION	MICRODIAGNOSTICS	ADDITIONAL ACTION	POSSIBLE CAUSES (Listed in order of probability)		MAP	
				A1 Board (Drive)	A2 Board (Controller)	Section	Entry
1301	Sector Compare This indicates that a Sector Compare was not received within two Index Marks (one complete revolution of the disk).	Was this FSC generated by running routine B3? YES Exit to RPI 300, Entry A. NO If the 3350 C2 Module is installed, exit to FSI 970. Run Link Series starting with routine A1. See MICRO 10 for detailed instructions. **Note:** *If the microdiagnostics fail to load, exit to PANEL 150, Entry A.* Microdiagnostics fail? YES 1. Display and record the Error Message Bytes. See MICRO 12 for detailed instructions. 2. Exit to FSI 950. NO Follow the instructions in the Additional Action column.	1. Check the cable connector seating for the following cable groups: Group 5 – HDA Servo Group 6 – HDA Head Select See FSI 940 for cable group locations and R/W 370 for cable diagrams. 2. Replace cards listed in the Possible Causes column in the order shown. 3. Exit to MAP Entry.	A1J4 (A1M4) --- A1E2 (A1R2) A1D4 (A1S4)** A1K2 (A1L2)* A1G2 (A1P2) A1C2 (A1T2)**		RPI 306	A
1310	False Drive Check This indicates that a Drive Check occurred without a Sector Compare or Access Check.		1. Replace cards listed in the Possible Causes column in the order shown. For single drive failures, replace cards on A1 Board first. For multiple drive failures, replace cards on A2 Board in the controller first. 2. Exit to MAP Entry.	A1J4 (A1M4) A1E2 (A1R2) --- A1D4 (A1S4)** A1K2 (A1L2)* A1G2 (A1P2) A1C2 (A1T2)**	A2L2 A2G2*	RPI 308	A

When replacing A1K2, A1L2, A2G2, A2D2, or A2E2, check the addressing jumpers. See INST 6.

***When replacing A1C2 (A1T2), A1C4 (A1T4), A1D2 (A1S2), A1D4 (A1S4), or Pwr Amp P532 (P542), the servo velocity gain must be adjusted. See ACC 800, Entry B for the procedure.*

FAULT SYMPTOM CODE	ERROR DESCRIPTION	MICRODIAGNOSTICS	ADDITIONAL ACTION	POSSIBLE CAUSES (Listed in order of probability)		MAP	
				A1 Board (Drive)	A2 Board (Controller)	Section	Entry
1400	False Read/Write Check. Sense Bytes 12 and 19 (B3 Message Bytes 8 and 15)	Was this FSC generated by running routine B3? YES Exit to R/W 100, Entry A. NO If the 3350 C2 Module is installed, exit to FSI 970. Run Link Series starting with routine A1. See MICRO 10 for detailed instructions. **Note:** *If the microdiagnostics fail to load, exit to PANEL 150, Entry A.* Microdiagnostics fail? YES 1. Display and record the Error Message Bytes. See MICRO 12 for detailed instructions. 2. Exit to FSI 950. NO Run routine B2 Microdiagnostics fail ? YES Exit to the MICRO section and follow instructions under the first failing Error Code. NO Exit to MAP Entry.		A1D4 (A1S4)** A1H2 (A1N2) --- A1G2 (A1P2)		R/W 100	B
1401	Write Current on Read			A1H2 (A1N2) A1G2 (A1P2) --- A1J2 (A1M2) A1B4 (A1U4)†			
1402	Write Transition Check			A1J2 (A1M2) A1H2 (A1N2) A1G2 (A1P2) A1B4 (A1U4)†	A2T2 A2Q2 A2P2 --- A2S2		
1404	Control Check			A1H2 (A1N2)	A2F2 A2Q2 A2L2		
1408	Delta I Write Check			A1H2 (A1N2) A1J2 (A1M2) --- A1G2 (A1P2) A1B4 (A1U4)†	A2Q2		
1410	Index Check			A1D4 (A1S4)** --- A1H2 (A1N2) A1J2 (A1M2) A1G2 (A1P2) A1K2 (A1L2)* A1J4 (A1M4)			

*When replacing A1K2, A1L2, A2G2, A2D2, or A2E2, check the addressing jumpers. See INST 6.

**When replacing A1C2 (A1T2), A1C4 (A1T4), A1D2 (A1S2), A1D4 (A1S4) or Pwr Amp P532 (P542), the servo velocity gain must be adjusted. See ACC 800, Entry B for procedure.

†This card used only on fixed head models at EC level 451140 or later.

FAULT SYMPTOM CODES – 14XX

FAULT SYMPTOM CODE	ERROR DESCRIPTION	MICRODIAGNOSTICS	ADDITIONAL ACTION	POSSIBLE CAUSES (Listed in order of probability)		MAP	
				A1 Board (Drive)	A2 Board (Controller)	Section	Entry
1420	Write Overrun	Was this FSC generated by running routine B3? YES Exit to R/W 100, Entry A. NO If the 3350 C2 Module is installed, exit to FSI 970. Run Link Series starting with routine A1. See MICRO 10 for detailed instructions. **Note:** *If the microdiagnostics fail to load, exit to PANEL 150, Entry A.* Microdiagnostics fail? YES 1. Display and record the Error Message Bytes. See MICRO 12 for detailed instructions. 2. Exit to FSI 950. NO Run routine B2. Microdiagnostics fail ? YES Exit to the MICRO section and follow instructions under the first failing Error Code. NO Exit to MAP Entry.		A1H2 (A1N2) A1D4 (A1S4)** A1J2 (A1M2) A1J4 (A1M4)	A2P2 A2Q2 A2F2		
1440	Capable/Enable Check			A1H2 (A1N2) A1E2 (A1R2) A1F2 (A1Q2) A1D4 (A1S4)** A1G2 (A1P2)			
1480	Multiple Chip Select			A1G2 (A1P2) A1H2 (A1N2)			
14F4	Pad Gate Check			A1H2 (A1N2) A1G2 (A1P2) A1J2 (A1M2) A1J4 (A1M4)		R/W 100	B
14F8	Head Short Check			A1H2 (A1N2) A1G2 (A1P2)			
14XX	Multiple Read/Write Checks			A1H2 (A1N2) A1D4 (A1S4)** A1K2 (A1L2)* A1G2 (A1P2) A1E2 (A1R2)			

When replacing A1K2, A1L2, A2G2, A2D2, or A2E2, check the addressing jumpers. See INST 6.

***When replacing A1C2 (A1T2), A1C4 (A1T4), A1D2 (A1S2), A1D4 (A1S4) or Pwr Amp P532 (P542), the servo velocity gain must be adjusted. See ACC 800, Entry B for procedure.*

FAULT SYMPTOM CODE	ERROR DESCRIPTION	MICRODIAGNOSTICS	ADDITIONAL ACTION	POSSIBLE CAUSES (Listed in order of probability)		MAP	
				A1 Board (Drive)	A2 Board (Controller)	Section	Entry
1500	Overshoot Check during Rezero	Was this FSC generated by running routine B3? YES Exit to ACC 301, Entry B. NO Run Link Series starting with routine A1. See MICRO 10 for detailed instructions. **Note:** *If the microdiagnostics fail to load, exit to PANEL 150, Entry A.* Microdiagnostics fail ? YES 1. Display and record the Error Message Bytes. See MICRO 12 for detailed instructions. 2. Exit to FSI 950. NO Loop the following microdiagnostic routines individually to check for intermittent failures: Routine B8 – Enter B8, 06, 00. Routine B9 – Enter B9, 06, 00. Routine AB– Enter AB, 06, 00 Microdiagnostics fail? YES 1. Display and record the Error Message Bytes. See MICRO 12 for detailed instructions. 2. Exit to FSI 950. NO Follow the instructions in the Additional Action column.	1. Check the cable connector seating for the following cable groups: Group 3 – Servo Power Amp Group 5 – HDA Servo Group 6 – HDA Head Select See FSI 940 for cable group locations. 2. Check the –36 volt CP at: CP557 Drive A CP568 Drive B (For details, see LOC 4.) 3. Verify that the bobbin pushrod is removed from the voice coil motor (VCM). (For details, see INST 3.) 4. Check the HDA carriage for binding. (For details, see HDA 712.) 5. Check that the VCM terminals A and B are tight. (For details, see LOC 6.) 6. Check that the belt-in-place spring is installed. (For details, see HDA 760.) 7. Verify that the Servo Gain adjustment is correct. (For details, see ACC 800, Entry A.) 8. Replace cards listed in the Possible Causes column in order shown or exit to the MAP Entry for further isolation.	A1E2 (A1R2) A1C2 (A1T2)** A1C4 (A1T4)** A1D2 (A1S2)** A1D4 (A1S4)** Pwr Amp P532 (P542)** A1G2 (A1P2) A1F2 (A1Q2) A1H2 (A1N2) Pulser Card P535***		ACC 700	
1506	Recalibrate – Track 0 Overshoot Check						
1508	Overshoot Check during Seek, State 8 – Decelerate			A1D2 (A1S2)** A1G2 (A1P2) A1E2 (A1R2) – – – – – – – – – – A1C2 (A1T2)** A1C4 (A1T4)** A1D4 (A1S4)** A1K2 (A1L2)* Pwr Amp P532 (P542)* Pulser Card P535***		ACC 700	
150A	Overshoot Check during Seek, State A – Accelerate			A1C4 (A1T4)** A1E2 (A1R2) A1G2 (A1P2) A1K2 (A1L2)* – – – – – – – – – – A1C2 (A1T2)** A1D2 (A1S2)** A1D4 (A1S4)** Pwr Amp P532 (P542)** Pulser Card P535***			
150C	Overshoot Check during Seek, State C – Linear Mode			A1E2 (A1R2) A1G2 (A1P2) A1D2 (A1S2)** – – – – – – – – – – A1C2 (A1T2)** A1C4 (A1T4)** A1D4 (A1S4)** A1K2 (A1L2)* Pwr Amp P532 (P542)* Pulser Card P535***			

**Possible Causes (Additional Action column):*

**When replacing A1K2, A1L2, A2G2, A2D2, or A2E2, check the addressing jumpers. See INST 6.*

***When replacing A1C2 (A1T2), A1C4 (A1T4), A1D2 (A1S2), A1D4 (A1S4) or Pwr Amp P532 (P542), the servo velocity gain must be adjusted. See ACC 800, Entry B for procedure.*

****To determine if the pulser card is defective either unplug the connector from P535 (drives will run when connector is removed) or rotate the connector by 180 degrees (moving the problem from one drive to the other).*

FAULT SYMPTOM CODES – 15XX

FAULT SYMPTOM CODE	ERROR DESCRIPTION	MICRODIAGNOSTICS	ADDITIONAL ACTION	POSSIBLE CAUSES (Listed in order of probability)		MAP	
				A1 Board (Drive)	A2 Board (Controller)	Section	Entry
150E	Overshoot Check – Lost servo track following	Was this FSC generated by running routine B3? YES Exit to ACC 301, Entry B. NO Run Link Series starting with routine A1. See MICRO 10 for detailed instructions. **Note:** *If the microdiagnostics fail to load, exit to PANEL 150, Entry A.* Microdiagnostics fail? YES 1. Display and record the Error Message Bytes. See MICRO 12 for detailed instructions. 2. Exit to FSI 950. NO Loop the following microdiagnostic routines individually to check for intermittent failures: Routine B8 – Enter B8, 06, 00. Routine B9 – Enter B9, 06, 00. Routine AB– Enter AB, 06, 00. Microdiagnostics fail? YES 1. Display and record the Error Message Bytes. See MICRO 12 for detailed instructions. 2. Exit to FSI 950. NO Follow the instructions in the Additional Action column.	1. Check the cable connector seating for the following cable groups: Group 3 – Servo Power Amp Group 5 – HDA Servo Group 6 – HDA Head Select See FSI 940 for cable group locations. 2. Check the –36 volt CP at: CP557 Drive A CP568 Drive B (For details, see LOC 4.) 3. Verify that the bobbin pushrod is removed from the voice coil motor (VCM). (For details, see INST 3.) 4. Check the Voice Coil using the procedure on HDA 708. 5. Check that the belt-in-place spring is installed. (For details, see HDA 760.) 6. Verify that the Servo Gain adjustment is correct. (For details, see ACC 800, Entry A.) 7. Replace cards listed in the Possible Causes column in order shown or exit to the MAP Entry for further isolation.	A1E2 (A1R2) A1C2 (A1T2)** A1C4 (A1T4)** A1D2 (A1S2)** A1D4 (A1S4)** A1G2 (A1P2) Pwr Amp P532 (P542)**		ACC 700	
1510	Overshoot Check during Rezero						
1512	Overshoot Check during Rezero					ACC 700	
1516	Overshoot Check during Rezero						
15XX	Overshoot Check during an invalid state						

***When replacing A1C2 (A1T2), A1C4 (A1T4), A1D2 (A1S2), A1D4 (A1S4) or Pwr Amp P532 (P542), the servo velocity gain must be adjusted. See ACC 800, Entry B for procedure.*

FAULT SYMPTOM CODE	ERROR DESCRIPTION	MICRODIAGNOSTICS	ADDITIONAL ACTION	POSSIBLE CAUSES (Listed in order of probability)		MAP	
				A1 Board (Drive)	A2 Board (Controller)	Section	Entry
160E	Servo Off Track error during On Track state	Was this FSC generated by running routine B3? YES Exit to ACC 301, Entry B. NO If the 3350 C2 Module is installed, exit to FSI 970. Run Link Series starting with routine A1. See MICRO 10 for detailed instructions. **Note:** *If the microdiagnostics fail to load, exit to PANEL 150, Entry A.* Microdiagnostics fail? YES 1. Display and record the Error Message Bytes. See MICRO 12 for detailed instructions. 2. Exit to FSI 950. NO Loop the following microdiagnostic routines individually to check for intermittent failures: Routine B8 – Enter B8, 06, 00. Routine B9 – Enter B9, 06, 00. Routine AB – Enter AB, 06, 00. Microdiagnostics fail? YES 1. Display and record the Error Message Bytes. See MICRO 12 for detailed instructions. 2. Exit to FSI 950. NO Follow the instructions in the Additional Action column.	1. Check the cable connector seating for the following cable groups: Group 0 – Device Bus In Group 1 – Device Bus Out Group 3 – Servo Power Amp Group 5 – HDA Servo Group 6 – HDA Head Select See FSI 940 for cable group locations. 2. Check the –36 volt CP at: CP557 Drive A CP568 Drive B (For details, see LOC 4.) 3. Verify that the bobbin pushrod is removed from the voice coil motor (VCM). (For details, see INST 3.) 4. Check the Voice Coil using the procedure on HDA 708. 5. Check that the belt-in-place spring is installed. (For details, see HDA 760.) 6. Check for excessive vibration caused by the drive motor or drive motor brake. (For details, see HDA 715 or 720.) 7. Verify that the Servo Gain adjustment is correct. (For details, see ACC 800, Entry A.) 8. Replace cards listed in the Possible Causes column in the order shown or exit to the MAP Entry for further isolation.	A1E2 (A1R2) --- A1C2 (A1T2)** A1C4 (A1T4)** A1D2 (A1S2)** A1D4 (A1S4)** Pwr Amp P532 (P542)** Go Home Pulser P535***		ACC 700	
16XX	Servo Off Track error during an invalid control state or Set Read*Write active during access motion			A1E2 (A1R2) A1K2 (A1L2)* A1H2 (A1N2) --- A1F2 (A1Q2) A1G2 (A1P2) A1C4 (A1T4)** A1J4 (A1M4)	A2L2 A2G2* A2D2* A2T2	ACC 700	

When replacing A1K2, A1L2, A2G2, A2D2, or A2E2, check the addressing jumpers. See INST 6.

**When replacing A1C2 (A1T2), A1C4 (A1T4), A1D2 (A1S2), A1D4 (A1S4) or Pwr Amp P532 (P542), the servo velocity gain must be adjusted. See ACC 800, Entry B for the procedure.*

***The pulser card is common to both drives. The connector on top of the pulser card is split (one side for drive A and one side for drive B). Reversing the connector will swap the A and B drive pulse circuits. See LOC 4 and 14.*

FAULT SYMPTOM CODE	ERROR DESCRIPTION	MICRODIAGNOSTICS	ADDITIONAL ACTION	POSSIBLE CAUSES (Listed in order of probability)		MAP	
				A1 Board (Drive)	A2 Board (Controller)	Section	Entry
1910	Error Alert	Follow instructions in the Additional Action column.	1. If there are other device types attached to the storage control, verify that this 3350 is the failing unit. This may be done by checking the channel/unit address on the console or by checking the EREP log information sheet. See the MSG section. 2. Verify that the correct functional microprogram has been loaded. 3. Exit to MAP Entry.		A2D2* } SWFE A2E2* } A2G2* A2L2 --- A2F2 A2Q2	CTL-I 805	A
1911	Transmit Target error	Was this FSC generated by running routine B3? YES Exit to RPI 200, Entry C. NO If the 3350 C2 Module is installed, exit to FSI 970. Run Link Series starting with routine A1. See MICRO 10 for detailed instructions.	1. Replace cards listed in the Possible Causes column in the order shown. 2. Check the cable connector seating for the following cable groups: Group 0 – Device Bus In Group 1 – Device Bus Out See FSI 940 for cable group locations and DEV-I 100 for cable diagram. 3. Exit to MAP Entry.	A1J4 (A1M4) --- A1K2 (A1L2)* A1H2 (A1N2) A1E2 (A1R2) A1G2 (A1P2)		RPI 200	A
1912	Microprogram detected error (detailed information is in Sense Byte 18)	**Note:** *If the microdiagnostics fail to load, exit to PANEL 150, Entry A.* Microdiagnostics fail? YES 1. Display and record the Error Message Bytes. See MICRO 12 for detailed instructions. 2. Exit to FSI 950. NO Follow the instructions in the Additional Action column.	1. Form Fault Symptom Code 900X, where X equals bits 4-7 of Sense Byte 18. 2. Exit to FSI 900 and locate 900X.				
1913	Difference Counter or HAR failed to reset on a Rezero operation		1. Replace cards listed in the Possible Causes column in the order shown. For single drive failures, replace cards on the A1 Board first. For multiple drive failures, replace cards on the A2 Board in the controller first. 2. Check the cable connector seating for cable group 0. See FSI 940 for cable group locations and DEV-I 100 for a cable diagram. 3. Exit to MAP Entry.	A1G2 (A1P2) A1K2 (A1L2)* --- A1H2 (A1N2) A1E2 (A1R2) A1C2 (A1T2)**	A2F2 A2G2* A2L2	DEV-I 180	C

When replacing A1K2, A1L2, A2G2, A2D2, or A2E2, check the addressing jumpers. See INST 6.

***When replacing A1C2 (A1T2), A1C4 (A1T4), A1D2 (A1S2), A1D4 (A1S4) or Pwr Amp P532 (P542), the servo velocity gain must be adjusted. See ACC 800, Entry B for procedure.*

FAULT SYMPTOM CODE	ERROR DESCRIPTION	MICRODIAGNOSTICS	ADDITIONAL ACTION	POSSIBLE CAUSES (Listed in order of probability)		MAP	
				A1 Board (Drive)	A2 Board (Controller)	Section	Entry
1914	Sync Out timing error	If the 3350 C2 Module is installed, exit to FSI 970. Is the string switch feature installed on this 3350? YES Exit to CTL-I 807, Entry A. NO Run Link Series starting with routine A1. See MICRO 10 for detailed instructions. **Note:** *If the microdiagnostics fail to load, exit to PANEL 150, Entry A.* Microdiagnostics fail? YES 1. Display and record the Error Message Bytes. See MICRO 12 for detailed instructions. 2. Exit to FSI 950. NO Follow the instructions in the Additional Action column.	1. Replace cards listed in the Possible Causes column in the order shown. For single drive failures, replace cards on the A1 Board first. For multiple drive failures, replace cards on the A2 Board in the controller first. 2. Check the cable connector seating for cable group 9. See FSI 940 for cable group locations and CTL-I 105 through 116 for a cable diagram. 3. Exit to MAP Entry.		A2S2 A2G2* A2P2 --- A2Q2 A2K2 A2M2 (SWFE)	DATA 230	C
1915	Unexpected File status at initial selection		Exit to MAP Entry.	A1K2 (A1L2)* A1E2 (A1R2) A1D4 (A1S4)** A1G2 (A1P2) A1H2 (A1N2) A1F2 (A1Q2) A1C2 (A1T2)** --- A1D2 (A1S2)**	A2L2 A2F2 A2G2* --- A2K2 A2D2* A2E2* A2H2 A2J2 A2M2 } SWFE	START 130	A
1916	Transmit CAR error	Run Link Series starting with routine A1. See MICRO 10 for detailed instructions. **Note:** *If the microdiagnostics fail to load, exit to PANEL 150, Entry A.* Microdiagnostics fail? YES 1. Display and record the Error Message Bytes. See MICRO 12 for detailed instructions. 2. Exit to FSI 950. NO Follow the instructions in the Additional Action column.	1. Replace cards listed in the Possible Causes column in the order shown. For single drive failures, replace cards on the A1 Board first. For multiple drive failures, replace cards on the A2 Board in the controller first. 2. Exit to MAP Entry.	A1G2 (A1P2) A1K2 (A1L2)*		DEV-I 194	D
1917	Transmit HAR error			A1G2 (A1P2) A1K2 (A1L2)* --- A1H2 (A1N2)		DEV-I 230	D
1918	Transmit Difference Counter error			A1G2 (A1P2) A1K2 (A1L2)* --- A1H2 (A1N2)		DEV-I 240	D

*When replacing A1K2, A1L2, A2G2, A2D2, or A2E2, check the addressing jumpers. See INST 6.

**When replacing A1C2 (A1T2), A1C4 (A1T4), A1D2 (A1S2), A1D4 (A1S4), or PWR Amp P532 (P542), the servo velocity gain must be adjusted. See ACC 800, Entry B for procedure.

FAULT SYMPTOM CODE	ERROR DESCRIPTION	MICRODIAGNOSTICS	ADDITIONAL ACTION	POSSIBLE CAUSES (Listed in order of probability)		MAP	
				A1 Board (Drive)	A2 Board (Controller)	Section	Entry
1919	Unexpected file status during Read IPL		Exit to START 110 and perform the Subsystem Checkout Procedure.				
191A	Seek Verification check	If the 3350 C2 Module is installed, exit to FSI 970. Run Link Series starting with routine A1. See MICRO 10 for detailed instructions. **Note:** *If the microdiagnostics fail to load, exit to PANEL 150, Entry A.* Microdiagnostics fail? YES 1. Display and record the Error Message Bytes. See MICRO 12 for detailed instructions. 2. Exit to FSI 950. NO Run the following microdiagnostics: Routine B1 – Enter B1, 00. Routine AB– Enter AB, 00. Microdiagnostics fail? YES 1. Display and record the Error Message Bytes. See MICRO 12 for detailed instructions. 2. Exit to FSI 950. NO Follow the instructions in the Additional Action column.	1. Check the cable connector seating for the following cable groups: Group 3 – Servo Pwr Amp Group 5 – HDA Servo Group 6 – HDA Head Select See FSI 940 for cable group locations and LOC 6 for the location on the machine. 2. Check the –36 volt CP at: CP557 Drive A CP568 Drive B (For details, see LOC 4.) 3. Verify that the bobbin pushrod is removed from the voice coil motor (VCM). (For details, see INST 3.) 4. Check that the VCM terminals A and B are tight. (For details, see LOC 6.) 5. Check that the belt-in-place spring is installed. (For details, see HDA 760.) 6. Verify that the Servo Gain adjustment is correct. (For details, see ACC 800, Entry A.) 7. Replace cards listed in the Possible Causes column in the order shown or exit to the MAP Entry for further isolation.	A1C4 (A1T4)** A1D2 (A1S2)** A1E2 (A1R2) A1G2 (A1P2) --- A1C2 (A1T2)** A1D4 (A1S4)** Pwr Amp P532 (P542)** A1K2 (A1L2)* A1H2 (A1N2) A1J2 (A1M2)	A2L2 A2Q2 A2F2	ACC 700	

When replacing A1K2, A1L2, A2G2, A2D2, or A2E2, check the addressing jumpers. See INST 6.

***When replacing A1C2 (A1T2), A1C4 (A1T4), A1D2 (A1S2), A1D4 (A1S4) or Pwr Amp P532 (P542), the servo velocity gain must be adjusted. See ACC 800, Entry B for procedure.*

FAULT SYMPTOM CODE	ERROR DESCRIPTION	MICRODIAGNOSTICS	ADDITIONAL ACTION	POSSIBLE CAUSES (Listed in order of probability)		MAP	
				A1 Board (Drive)	A2 Board (Controller)	Section	Entry
191B	Sector Compare Check if Byte 9, bit 1 is on (B3 Message Byte 5, bit 1) Access Timeout if Byte 16, bit 0 is on (B3 Message Byte 9, bit 1) Access Overshoot if Byte 16, bit 1 is on (B3 Message Byte 9, bit 0)	Was this FSC generated by running routine B3? YES Follow instructions in the Additional Action column. NO Run Link Series starting with routine A1. See MICRO 10 for detailed instructions. **Note:** *If the microdiagnostics fail to load, exit to PANEL 150, Entry A.* Microdiagnostics fail? YES 1. Display and record the Error Message Bytes. See MICRO 12 for detailed instructions. 2. Exit to FSI 950. NO Follow the instructions in the Additional Action column.	Go to FSC 1301 on FSI 130. Go to FSC 12YY starting on FSI 120. *YY* = Sense Byte 16 or B3 Message Byte 9, bit 3 to 7. Go to FSC 15YY starting on FSI 150. *YY* = Sense Byte 16 or B3 Message Byte 9, bits 3 to 7.				
191C	No interrupt from drive (missing Device Attention)	Run Link Series starting with routine A1. See MICRO 10 for detailed instructions. **Note:** *If the microdiagnostics fail to load, exit to PANEL 150, Entry A.* Microdiagnostics fail? YES 1. Display and record the Error Message Bytes. See MICRO 12 for detailed instructions. 2. Exit to FSI 950. NO Follow the instructions in the Additional Action column.	1. Replace cards listed in the Possible Causes column in the order shown. For single drive failures, replace cards on the A1 Board first. For multiple drive failures, replace cards on the A2 Board in the controller first. 2. Check for a missing or unstable −12 V at A1C4 (A1T4) D06. See PWR 290, Entry B for voltage tolerances and procedures. 3. Exit to MAP Entry.	A1C4 (A1T4)** A1E2 (A1R2)		DEV-I 274	A
191D	Defect Skipping Reorientation error		Exit to MAP Entry.			DATA 304	A

***When replacing A1C2 (A1T2), A1C4 (A1T4), A1D2 (A1S2), A1D4 (A1S4) or Pwr Amp P532 (P542), the servo velocity gain must be adjusted. See ACC 800, Entry B for procedure.*

FAULT SYMPTOM CODE	ERROR DESCRIPTION	MICRODIAGNOSTICS	ADDITIONAL ACTION	POSSIBLE CAUSES (Listed in order of probability)		MAP	
				A1 Board (Drive)	A2 Board (Controller)	Section	Entry
191E	Unable to determine device format mode	If the 3350 C2 Module is installed, exit to FSI 970. Is the string switch feature installed on this 3350? YES Exit to CTL-I 807, Entry A. NO Run Link Series starting with routine A1. See MICRO 10 for detailed instructions. **Note:** *If the microdiagnostics fail to load, exit to PANEL 150, Entry A.* Microdiagnostics fail? YES 1. Display and record the Error Message Bytes. See MICRO 12 for detailed instructions. 2. Exit to FSI 950. NO Follow the instructions in the Additional Action column.	1. Replace cards listed in the Possible Causes column in the order shown. For single drive failures, replace cards on the A1 Board first. For multiple drive failures, replace cards on the A2 Board in the controller first. 2. Check the cable connector seating for the following cable groups: Group 0 – Device Bus In Group 1 – Device Bus Out Group 8 – Control Interface Bus In See FSI 940 for cable group locations and CTL-I 105 through 116 for cable diagram. 3. Exit to MAP Entry.	A1K2 (A1L2)* A1G2 (A1P2) --- A1F2 (A1Q2) A1H2 (A1N2)	A2G2* A2F2 --- A2K2 A2E2* } SWFE A2D2* } SWFE	DEV-I 430	
191F	Retry Reorientation Check		1. Replace cards listed in the Possible Causes column in the order shown. 2. Exit to MAP Entry.		A2T2 A2R2 A2R4	DATA 316	B

Whenever replacing A1K2, A1L2, A2G2, A2D2, or A2E2, check the addressing jumpers. See INST 6.

FAULT SYMPTOM CODE	ERROR DESCRIPTION	MICRODIAGNOSTICS	ADDITIONAL ACTION	POSSIBLE CAUSES (Listed in order of probability)		MAP	
				A1 Board (Drive)	A2 Board (Controller)	Section	Entry
4940	ECC Data Check – HA field	If the 3350 C2 Module is installed, exit to FSI 970. Run Link Series starting with routine A1. See MICRO 10 for detailed instructions. **Note:** *If the microdiagnostics fail to load, exit to PANEL 150, Entry A.* Microdiagnostics fail? YES 1. Display and record the Error Message Bytes. See MICRO 12 for detailed instructions. 2. Exit to FSI 950. NO Exit to MAP Entry.	Exit to MAP Entry:	A1J2 (A1M2) A1H2 (A1N2) A1G2 (A1P2)	A2P2 A2S2 A2Q2 --- A2R4 A2K2 A2T2	R/W 300	D
4941	ECC Data Check – Count field				A2T2 A2S2		
4942	ECC Data Check – Key field			A1J2 (A1M2) A1H2 (A1N2) A1G2 (A1P2)	A2P2 A2Q2 A2R4 A2K2		
4943	ECC Data Check – Data field						
4944	No Sync Byte Found – HA field			A1G2 (A1P2) A1H2 (A1N2) --- A1J2 (A1M2) A1J4 (A1M4) A1D4 (A1S4)**	A2S2 A2P2 A2T2 A2Q2 --- A2K2		
4945	No Sync Byte Found – Count field						

***When replacing A1C2 (A1T2), A1C4 (A1T4), A1D2 (A1S2), A1D4 (A1S4), or Pwr Amp P532 (P542), the servo velocity gain must be adjusted. See ACC 800, Entry B for the procedure.*

FAULT SYMPTOM CODE	ERROR DESCRIPTION	MICRODIAGNOSTICS	ADDITIONAL ACTION	POSSIBLE CAUSES (Listed in order of probability)		MAP	
				A1 Board (Drive)	A2 Board (Controller)	Section	Entry
4946	No Sync Byte Found – Key field	If the 3350 C2 Module is installed, exit to FSI 970. Run Link Series starting with routine A1. See MICRO 10 for detailed instructions. **Note:** *If the microdiagnostics fail to load, exit to PANEL 150, Entry A.* Microdiagnostics fail? YES 1. Display and record the Error Message Bytes. See MICRO 12 for detailed instructions. 2. Exit to FSI 950. NO Exit to MAP Entry.	Exit to MAP Entry.	A1G2 (A1P2) A1H2 (A1N2) --- A1J2 (A1M2) A1J4 (A1M4)	A2S2 A2P2 A2T2 A2Q2 --- A2K2	R/W 300	D
4947	No Sync Byte Found – Data field						
4949	No AM Found during retry When reorienting on the failing record during a retry operation, an Address Mark was not detected.			A1J2 (A1M2) A1H2 (A1N2) A1G2 (A1P2) A1J4 (A1M4)	A2K2 --- A2T2 A2S2 A2P2 A2Q2		

FAULT SYMPTOM CODES – 90XX

FAULT SYMPTOM CODE	ERROR DESCRIPTION	MICRODIAGNOSTICS	ADDITIONAL ACTION	POSSIBLE CAUSES (Listed in order of probability)		MAP	
				A1 Board (Drive)	A2 Board (Controller)	Section	Entry
9001	Tag Valid missing on Read/Write operation	If the 3350 C2 Module is installed, exit to FSI 970. Run Link Series starting with routine A1. See MICRO 10 for detailed instructions. **Note:** *If the microdiagnostics fail to load, exit to PANEL 150, Entry A.* Microdiagnostics fail? YES 1. Display and record the Error Message Bytes. See MICRO 12 for detailed instructions. 2. Exit to FSI 950. NO Follow the instructions in the Additional Action column.	1. Replace cards listed in the Possible Causes column in the order shown. For single drive failures, replace cards on the A1 Board first. For multiple drive failures, replace cards on the A2 board in the controller first. 2. Exit to MAP Entry.	A1K2 (A1L2)* A1E2 (A1R2)	A2Q2 --- A2T2 A2K2	CTL-I 430	D
9002	Normal or Check End missing following Read/Write or ECC operation	If the 3350 C2 Module is installed, exit to FSI 970. Is the string switch feature installed on this 3350 ? YES Exit to CTL-I 807, Entry A. NO Run Link Series starting with routine A1. See MICRO 10 for detailed instructions. **Note:** *If the microdiagnostics fail to load, exit to PANEL 150, Entry A.* Microdiagnostics fail ? YES 1. Display and record the Error Message Bytes. See MICRO 12 for detailed instructions. 2. Exit to FSI 950. NO Follow the instructions in the Additional Action column.	1. Replace cards listed in the Possible Causes column in the order shown. For single drive failure, replace cards on the A1 Board first. For multiple drive failures, replace cards on the A2 Board in the controller first. 2. Check the cable connector seating for the following cable groups: Group 7 – Control Interface Tag In Group 8 – Control Interface Bus In Group A – Control Interface Tag See FSI 940 for cable group locations and CTL-I 105 through 116 for cable diagrams. 3. Exit to MAP Entry.	A1H2 (A1N2)	A2Q2 A2P2 --- A2S2 A2L2 A2T2 A2G2* A2M2 (SWFE) A2K2 A2F2	CTL-I 810	
9003	No response from controller on a Control operation		1. Replace cards listed in the Possible Causes column in the order shown. For single drive failures, replace cards on the A1 Board first. For multiple drive failures, replace cards on the A2 Board in the controller first. 2. Check the cable connector seating for cable group 1. See FSI 940 for cable group locations and DEV-I 100 for cable diagram. 3. Exit to MAP Entry.	A1K2 (A1L2)*	A2F2 A2Q2 --- A2D2* } SWFE A2E2* } A2H2 } A2J2 } A2L2 A2G2* A2S2 A2P2	DEV-I 400	

When replacing A1K2, A1L2, A2G2, A2D2, or A2E2, check the addressing jumpers. See INST 6.

FAULT SYMPTOM CODE	ERROR DESCRIPTION	MICRODIAGNOSTICS	ADDITIONAL ACTION	POSSIBLE CAUSES (Listed in order of probability)		MAP	
				A1 Board (Drive)	A2 Board (Controller)	Section	Entry
9004	Timeout waiting for Index	If the 3350 C2 Module is installed, exit to FSI 970. Run Link Series starting with routine A1. See MICRO 10 for detailed instructions. **Note:** *If the microdiagnostics fail to load, exit to PANEL 150, Entry A.* Microdiagnostics fail? YES 1. Display and record the Error Message Bytes. See MICRO 12 for detailed instructions. 2. Exit to FSI 950.	1. Replace cards listed in the Possible Causes column in the order shown. For single drive failures, replace cards on the A1 Board first. For multiple drive failures, replace cards on the A2 Board in the controller first. 2. Check the cable connector seating for the following cable groups: Group 0 – Device Bus In Group 7 – Control Interface Tag In Group 8 – Control Interface Bus In See FSI 940 for cable group locations and CTL-I 105 through 116 for cable diagrams. 3. Exit to MAP Entry.	A1H2 (A1N2) A1D4 (A1S4)** A1K2 (A1L2)*	A2Q2 A2F2 A2P2 --- A2N2 A2S2 A2L2 A2K2	RPI 160	D
9005	ECC Hardware Check	NO Follow the instructions in the Additional Action column.	1. Replace cards listed in the Possible Causes column in the order shown. For single drive failures, replace cards on the A1 Board first. For multiple drive failures, replace cards on the A2 Board in the controller first. 2. Check the cable connector seating for the following cable groups: Group 1 – Device Bus Out Group C – CE Panel Data See FSI 940 for cable group locations and DEV-I 100 for a cable diagram. 3. Exit to MAP Entry.		A2Q2 A2K2 --- A2L2 A2P2	DATA 150	A

*When replacing A1K2, A1L2, A2G2, A2D2, or A2E2, check the addressing jumpers. See INST 6.

**When replacing A1C2(A1T2), A1C4(A1T4), A1D2(A1S2), A1D4(A1S4), or Pwr Amp P532(P542), the servo velocity gain must be adjusted. See ACC 800, Entry B for the procedure.

FAULT SYMPTOM CODE	ERROR DESCRIPTION	MICRODIAGNOSTICS	ADDITIONAL ACTION	POSSIBLE CAUSES (Listed in order of probability)		MAP	
				A1 Board (Drive)	A2 Board (Controller)	Section	Entry
9006	Multiple controllers selected	If the 3350 C2 Module is installed, exit to FSI 970. Is the string switch feature installed on this 3350? YES Exit to CTL-I 807, Entry A. NO Run Link Series starting with routine A1. See MICRO 10 for detailed instructions. **Note:** *If the microdiagnostics fail to load, exit to PANEL 150, Entry A.* Microdiagnostics fail? YES 1. Display and record the Error Message Bytes. See MICRO 12 for detailed instructions. 2. Exit to FSI 950. NO Follow the instructions in the Additional Action column.	1. Replace cards listed in the Possible Causes column in the order shown. For single drive failures, replace cards on the A1 Board first. For multiple drive failures, replace cards on the A2 Board in the controller first. 2. Check the cable connector seating for the following cable groups: Group 7 – Control Interface Tag In Group 8 – Control Interface Bus In Group 9 – Control Interface Bus Out See FSI 940 for cable group locations and CTL-I 105 through 116 for cable diagrams. 3. Exit to MAP Entry.	*When replacing A1K2, A1L2, A2G2, A2D2, or A2E2, check the addressing jumpers. See INST 6. **When replacing A1C2 (A1T2), A1C4 (A1T4), A1D2 (A1S2), A1D4 (A1S4) or Pwr Amp P532 (P542), the servo velocity gain must be adjusted. See ACC 800, Entry B for procedure.	A2F2 A2G2* A2D2* (SWFE) A2E2* (SWFE) --- A2L2 A2M2 (SWFE) A2K2	CTL-I 820	

FAULT SYMPTOM CODE	ERROR DESCRIPTION	MICRODIAGNOSTICS	ADDITIONAL ACTION	POSSIBLE CAUSES (Listed in order of probability)		MAP	
				A1 Board (Drive)	A2 Board (Controller)	Section	Entry
9007	Preselection Check	If the 3350 C2 Module is installed, exit to FSI 970. Is the string switch feature installed on this 3350? YES Exit to CTL-I 807, Entry A. NO Run Link Series starting with routine A1. See MICRO 10 for detailed instructions. **Note:** *If the microdiagnostics fail to load, exit to PANEL 150, Entry A.* Microdiagnostics fail? YES 1. Display and record the Error Message Bytes. See MICRO 12 for detailed instructions. 2. Exit to FSI 950. NO Follow the instructions in the Additional Action column.	1. Replace cards listed in the Possible Causes column in the order shown. For single drive failures, replace cards on the A1 Board first. For multiple drive failures, replace cards on the A2 Board in the controller first. 2. Check voltages at the following locations for proper tolerances: A2K2 B11 for +6 V A2L2 B11 for +6 V A2K2 B06 for –4 V See PWR 90, Entry B for procedure. 3. Check the cable connector seating for the following cable groups: Group 0 – Device Bus In Group 7 – Control Interface Tag In Group 8 – Control Interface Bus In See FSI 940 for cable group locations and CTL-I 105 through 116 for cable diagrams. 4. Exit to MAP Entry.		A2K2 A2G2* A2M2 (SWFE) A2P2 A2Q2 --- A2L2 A2N2 A2S2 A2F2	CTL-I 825	A
9008	Repetitive Command Overruns on G1 Operations	If the 3350 C2 Module is installed, exit to FSI 970. Is the string switch feature installed on this 3350? YES Exit to CTL-I 807, Entry A. NO Run Link Series starting with routine A1. See MICRO 10 for detailed instructions. **Note:** *If the microdiagnostics fail to load, exit to PANEL 150, Entry A.* Microdiagnostics fail? YES 1. Display and record the Error Message Bytes. See MICRO 12 for detailed instructions. 2. Exit to FSI 950. NO Follow the instructions in the Additional Action column.	During orientation, it appears that two drives have the same address. 1. Check the addressing jumpers at A1K2 (A1L2) on all drives to verify that none are the same. See INST 6. 2. Verify that the system configuration is not allowing two drives to be selected with the same address. 3. Replace cards listed in Possible Causes column in the order shown. 4. Check the cable connector seating for the following cable groups: Group 0 – Device Bus In Group 8 – Control Interface Bus In See FSI 940 for cable group locations and CTL-I 105 through 116 for cable diagrams. 5. Exit to MAP Entry.		A2Q2 A2K2 --- A2P2 A2L2 A2F2 A2M2 (SWFE)	DATA 218	A

* *When replacing A1K2, A1L2, A2G2, A2D2, or A2E2, check the addressing jumpers. See INST 6.*

FAULT SYMPTOM CODE	ERROR DESCRIPTION	MICRODIAGNOSTICS	ADDITIONAL ACTION	POSSIBLE CAUSES (Listed in order of probability)		MAP	
				A1 Board (Drive)	A2 Board (Controller)	Section	Entry
9009	Repetitive Command Overruns on G2 or G3 operations.	If the 3350 C2 Module is installed, exit to FSI 970. Run Link Series starting with routine A1. See MICRO 10 for detailed instructions. **Note:** *If the microdiagnostics fail to load, exit to PANEL 150, Entry A.* Microdiagnostics fail? YES 1. Display and record the Error Message Bytes. See MICRO 12 for detailed instructions. 2. Exit to FSI 950. NO Follow the instructions in the Additional Action column.	1. Replace cards listed in the Possible Causes column in the order shown. 2. Exit to MAP Entry.		A2P2 A2Q2 A2K2	DATA 232	B
900A	Physical Address Check – incorrect physical address returned after a drive selection	If the 3350 C2 Module is installed, exit to FSI 970. Is the string switch feature installed on this 3350? YES Exit to CTL-I 807, Entry A. NO Run Link Series starting with routine A1. See MICRO 10 for detailed instructions. **Note:** *If the microdiagnostics fail to load, exit to PANEL 150, Entry A.* Microdiagnostics fail? YES 1. Display and record the Error Message Bytes. See MICRO 12 for detailed instructions. 2. Exit to FSI 950. NO Follow the instructions in the Additional Action column.	1. Replace cards listed in the Possible Causes column in the order shown. For single drive failures, replace cards on the A1 Board first. For multiple drive failures, replace cards on the A2 Board in the controller first. 2. Exit to MAP Entry.	A1K2 (A1L2)*	A2G2* A2H2 A2J2 A2D2* A2E2* } SWFE	DEV-I 112	B

When replacing A1K2, A1L2, A2G2, A2D2, or A2E2, check the addressing jumpers. See INST 6.

FAULT SYMPTOM CODE	ERROR DESCRIPTION	MICRODIAGNOSTICS	ADDITIONAL ACTION	POSSIBLE CAUSES (Listed in order of probability)		MAP	
				A1 Board (Drive)	A2 Board (Controller)	Section	Entry
900B	Busy missing after Seek Start is issued	If the 3350 C2 Module is installed, exit to FSI 970. Run Link Series starting with routine A1. See MICRO 10 for detailed instructions. **Note:** *If the microdiagnostics fail to load, exit to PANEL 150, Entry A.* Microdiagnostics fail? YES 1. Display and record the Error Message Bytes. See MICRO 12 for detailed instructions. 2. Exit to FSI 950. NO Loop microdiagnostic routine B8 to check for intermittent failures: Enter B8, 06, 00. Microdiagnostics fail? YES 1. Display and record the Error Message Bytes. See MICRO 12 for detailed instructions. 2. Exit to FSI 950. NO Follow the instructions in the Additional Action column.	1. Check the cable connector seating for the following cable groups: Group 0 – Device Bus In Group 3 – Servo Power Amp Group 5 – HDA Servo Group 6 – HDA Head Select See FSI 940 for cable group locations and R/W 370 for cable diagrams. 2. Check the –36 volt CP at: CP557 Drive A CP568 Drive B (For details, see LOC 4.) 3. Verify that the bobbin pushrod is removed from the voice coil motor (VCM). (For details, see INST 3.) 4. Check that the VCM terminals A and B are tight. (For details, see LOC 6.) 5. Check that the belt-in-place spring is installed. (For details, see HDA 760.) 6. Replace cards listed in Possible Causes column in the order shown or exit to the MAP Entry for further isolation.	A1E2 (A1R2) --- A1K2 (A1L2)* A1H2 (A1N2) A1J4 (A1M4) A1G2 (A1P2) A1C2 (A1T2)** A1C4 (A1T4)** A1D2 (A1S2)** A1D4 (A1S4)**	A2F2	ACC 700	

When replacing A1K2, A1L2, A2G2, A2D2, or A2E2, check the addressing jumpers. See INST 6.

***When replacing A1C2 (A1T2), A1C4 (A1T4), A1D2 (A1S2), A1D4 (A1S4), or Pwr Amp P532 (P542), the servo velocity gain must be adjusted. See ACC 800, Entry B for procedure.*

FAULT SYMPTOM CODE	ERROR DESCRIPTION	MICRODIAGNOSTICS	ADDITIONAL ACTION	POSSIBLE CAUSES (Listed in order of probability)		MAP	
				A1 Board (Drive)	A2 Board (Controller)	Section	Entry
900E	Device Interface failure	If the 3350 C2 Module is installed, exit to FSI 970. Run Link Series starting with routine A1. See MICRO 10 for detailed instructions. **Note:** *If the microdiagnostics fail to load, exit to PANEL 150, Entry A.* Microdiagnostics fail? YES 1. Display and record the Error Message Bytes. See MICRO 12 for detailed instructions. 2. Exit to FSI 950. NO Follow the instructions in the Additional Action column.	1. Replace cards listed in the Possible Causes column in the order shown. For single drive failures, replace cards on the A1 Board first. For multiple drive failures, replace cards on the A2 Board in the controller first. 2. Check the cable connector seating for cable group 0. See FSI 940 for cable group locations and DEV-I 100 for cable diagram. 3. Exit to MAP Entry.	A1K2 (A1L2)* A1H2 (A1N2) A1E2 (A1R2) --- A1F2 (A1Q2)	A2F2 --- A2L2	DEV-I 170	B
900F	Attention Check – Device Attention failed to reset	If the 3350 C2 Module is installed, exit to FSI 970. Is the string switch feature installed on this 3350? YES Exit to CTL-I 807, Entry A. NO Run Link Series starting with routine A1. See MICRO 10 for detailed instructions. **Note:** *If the microdiagnostics fail to load, exit to PANEL 150, Entry A.* Microdiagnostics fail? YES 1. Display and record the Error Message Bytes. See MICRO 12 for detailed instructions. 2. Exit to FSI 950. NO Follow the instructions in the Additional Action column.	1. Replace cards listed in the Possible Causes column in the order shown. For single drive failures, replace cards on the A1 Board first. For multiple drive failures, replace cards on the A2 Board in the controller first. 2. Check the cable connector seating for the following cable groups: Group 0 – Device Bus In Group 1 – Device Bus Out Group 8 – Control Interface Bus In See FSI 940 for cable group locations and DEV-I 100 and CTL-I 105 through 116 for cable diagrams. 3. Exit to MAP Entry.	A1K2 (A1L2)* A1H2 (A1N2) A1J4 (A1M4) A1E2 (A1R2) --- A1F2 (A1Q2) A1G2 (A1P2) *When replacing A1K2, A1L2, A2G2, A2D2, or A2E2, check the addressing jumpers. See INST 6.	A2F2 A2G2* --- A2L2 A2D2* } SWFE A2E2* } A2H2 } A2J2 }	DEV-I 420	A

FAULT SYMPTOM CODE	ERROR DESCRIPTION	MICRODIAGNOSTICS	ADDITIONAL ACTION	POSSIBLE CAUSES (Listed in order of probability)		MAP	
				A1 Board (Drive)	A2 Board (Controller)	Section	Entry
9101	Reorient Counter Check	If the 3350 C2 Module is installed, exit to FSI 970. Is the string switch feature installed on this 3350? YES Exit to CTL-I 807, Entry A. NO Run Link Series starting with routine A1. See MICRO 10 for detailed instructions. **Note:** *If the microdiagnostics fail to load, exit to PANEL 150, Entry A.* Microdiagnostics fail? YES 1. Display and record the Error Message Bytes. See MICRO 12 for detailed instructions. 2. Exit to FSI 950. NO Follow the instructions in the Additional Action column.	During orientation, it appears that two drives have the same address. 1. Check the addressing jumpers at A1K2 (A1L2) on all drives to verify that none are the same. See INST 6. 2. Verify that the system configuration is not allowing two drives to be selected with the same address. 3. Replace cards listed in the Possible Causes column in the order shown. 4. Exit to MAP Entry.		A2R2 --- A2P2 A2F2 A2K2	DATA 308	C
9102	Track Used Counter Check	1. Replace cards listed in the Possible Causes column in the order shown. For single drive failures, replace cards on the A1 Board first. For multiple drive failures, replace cards on the A2 Board in the controller first. 2. Exit to MAP Entry.			A2N2 A2P2 --- A2Q2 A2S2 A2R2 A2F2 A2K2	DATA 326	A
9104	I Write Fails			A1H2 (A1N2)	A2Q2 A2P2 --- A2F2 A2K2 A2M2 (C2)	DATA 140	A
9108	Control Bus In Parity Check	1. Replace cards listed in the Possible Causes column in the order shown. For single drive failures, replace cards on the A1 Board first. For multiple drive failures, replace cards on the A2 Board in the controller first. 2. Check the cable connector seating for the following cable groups: Group 1 – Device Bus Out Group 8 – Control Interface Bus In See FSI 940 for cable group locations. 3. Exit to MAP Entry.		A1K2 (A1L2)*	A2K2 A2F2 A2S2 --- A2G2* A2P2 A2L2 A2N2	CTL-I 830	
9110	Device Bus In Parity Check	1. Replace cards listed in the Possible Causes column in the order shown. For single drive failures, replace cards on the A1 Board first. For multiple drive failures, replace cards on the A2 Board in the controller first. 2. Check the cable connector seating for the following cable groups: Group 0 – Device Bus In Group 1 – Device Bus Out See FSI 940 for cable group locations and DEV-I 100 for cable diagram. 3. Exit to MAP Entry.		A1H2 (A1N2) A1K2 (A1L2)*	A2F2 A2K2 --- A2G2*	DEV-I 235	B
9118	Device Bus In Parity Check and Control Bus In Parity Check			A1K2 (A1L2)*	A2K2 A2F2	DEV-I 235	C
9120	One of eight (1-of-8) Drives Selected Check The number of drives selected is less than or greater than one.			A1K2 (A1L2)*	A2G2* A2L2 --- A2K2 A2F2 A2D2* A2E2*	DEV-I 112	B

When replacing A1K2, A1L2, A2G2, A2D2, or A2E2, check the addressing jumpers. See INST 6.

FAULT SYMPTOM CODES – 91XX

FAULT SYMPTOM CODE	ERROR DESCRIPTION	MICRODIAGNOSTICS	ADDITIONAL ACTION	POSSIBLE CAUSES (Listed in order of probability)		MAP	
				A1 Board (Drive)	A2 Board (Controller)	Section	Entry
9140	Control Interface Bus Parity Check	If the 3350 C2 Module is installed, exit to FSI 970. Is the string switch feature installed on this 3350? YES Exit to CTL-I 807, Entry A. NO Run Link Series starting with routine A1. See MICRO 10 for detailed instructions. **Note:** *If the microdiagnostics fail to load, exit to PANEL 150, Entry A.* Microdiagnostics fail? YES 1. Display and record the Error Message Bytes. See MICRO 12 for detailed instructions. 2. Exit to FSI 950. NO Follow the instructions in the Additional Action column.	1. Replace the cards listed in the Possible Causes column in the order shown 2. Check the cable connector seating for cable group 9. See FSI 940 for cable group locations. 3. Exit to MAP Entry.		A2D2* } SWFE A2E2* } A2G2* A2K2 A2F2	CTL-I 414	A
9180	Control Interface Tag Bus Parity Check		1. Replace cards listed in the Possible Causes column in the order shown. 2. Check the cable connector seating for the following cable groups: Group A – Control Interface Tag Out Group C – CE Panel Data See FSI 940 for cable group locations. 3. Exit to MAP entry.		A2D2* } SWFE A2E2* } A2G2* A2H2 } SWFE A2J2 } A2K2 A2L2 A2F2	CTL-I 414	B
91FF	Control Interface Bus In Assembly failure	If the 3350 C2 Module is installed, exit to FSI 970. Run Link Series starting with routine A1. See MICRO 10 for detailed instructions. **Note:** *If the microdiagnostics fail to load, exit to PANEL 150, Entry A.* Microdiagnostics fail? YES 1. Display and record the Error Message Bytes. See MICRO 12 for detailed instructions. 2. Exit to FSI 950. NO Follow the instructions in the Additional Action column.	1. Replace cards listed in the Possible Causes column in the order shown. For single drive failures, replace cards on the A1 Board first. For multiple drive failures, replace cards on the A2 Board in the controller first. 2. Exit to MAP Entry.		A2P2 A2Q2 --- A2K2 A2F2 A2L2	CTL-I 531	A
91XX	Some failures cause multiple Fault Symptom Codes		Exit to FSI 914, Entry A.				

When replacing A1K2, A1L2, A2G2, A2D2, or A2E2, check the addressing jumpers. See INST 6.

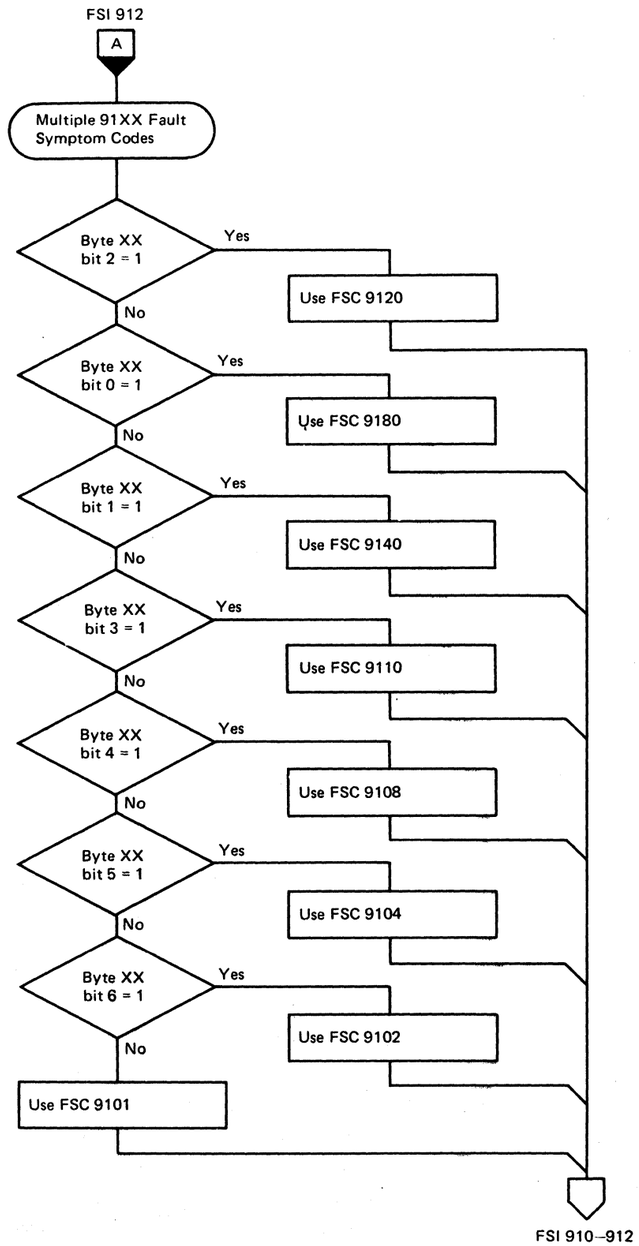
MULTIPLE FAULT SYMPTOM CODES

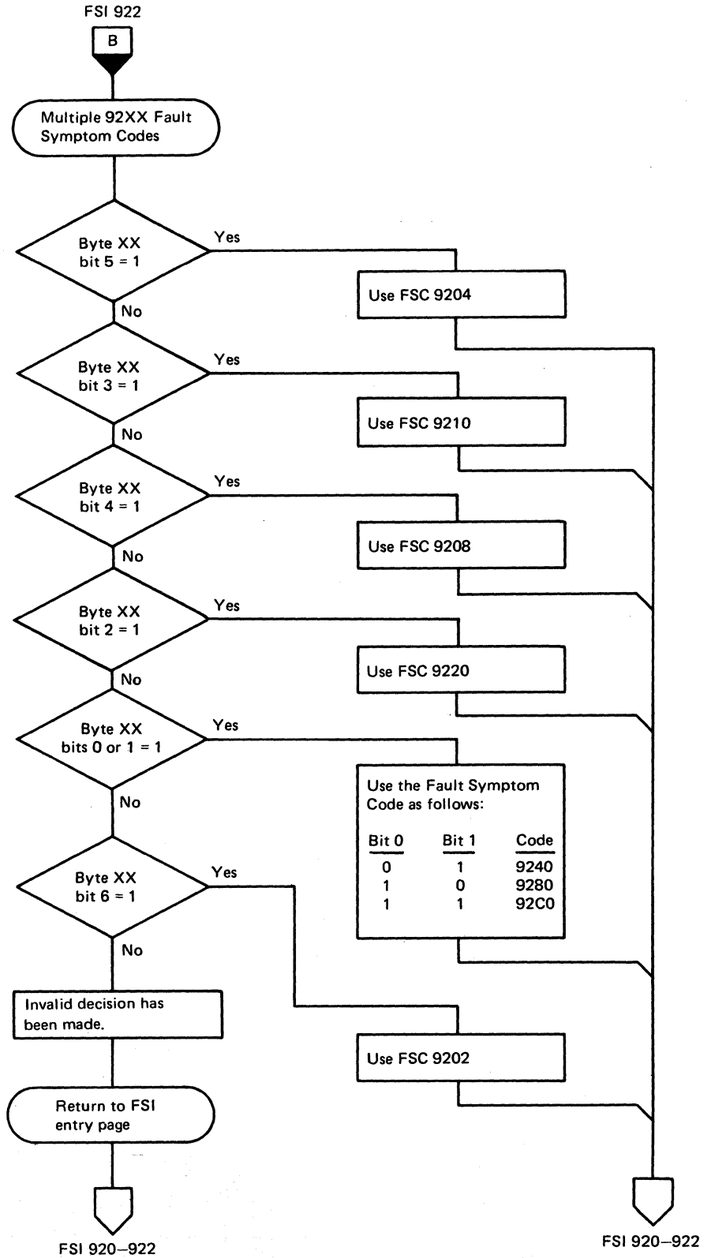
Some malfunctions cause multiple error indications (two or more Fault Symptom Codes at the same time). To properly analyze these malfunctions, a priority of the most meaningful Fault Symptom Code must be established. The flowchart on this page is designed to identify the most meaningful error indicator bit for combinations of 91XX or 92XX Fault Symptom Codes, where XX is the byte with the multiple error bits on.

Follow the decision blocks at the right and form a new Fault Symptom Code which allows troubleshooting one error at a time.

If the trouble is not corrected, return to the decision block where the Yes exit was taken (on the initial entry decision), and continue by taking the No exit path this time.

It is suggested that a list of the Fault Symptom Codes used during the analysis be kept. This list enables the retracing of the error condition paths that are followed.





FAULT SYMPTOM CODE	ERROR DESCRIPTION	MICRODIAGNOSTICS	ADDITIONAL ACTION	POSSIBLE CAUSES (Listed in order of probability)		MAP	
				A1 Board (Drive)	A2 Board (Controller)	Section	Entry
9200	False Controller error	If the 3350 C2 Module is installed, exit to FSI 970. Is the string switch feature installed on this 3350? YES Exit to CTL-I 807, Entry A. NO Run Link Series starting with routine A1. See MICRO 10 for detailed instructions. **Note:** *If the microdiagnostics fail to load, exit to PANEL 150, Entry A.* Microdiagnostics fail? YES 1. Display and record the Error Message Bytes. See MICRO 12 for detailed instructions. 2. Exit to FSI 950. NO Follow the instructions in the Additional Action column.	1. Replace cards listed in the Possible Causes column in the order shown. 2. Exit to MAP Entry.		A2K2 A2R2 A2F2 --- A2L2 A2G2* A2D2* } SWFE A2E2* } A2N2 A2P2 A2Q2	CTL-I 845	
9201	ECC Zero Compare. This indicates the normal completion of a Read or Write operation. *No action required.*		No action required.				
9202	ECC Hardware Check	If the 3350 C2 Module is installed, exit to FSI 970. Run Link Series starting with routine A1. See MICRO 10 for detailed instructions. **Note:** *If the microdiagnostics fail to load, exit to PANEL 150, Entry A.* Microdiagnostics fail? YES 1. Display and record the Error Message Bytes. See MICRO 12 for detailed instructions. 2. Exit to FSI 950. NO Follow the instructions in the Additional Action column.	1. Replace cards listed in the Possible Causes column in the order shown. 2. Exit to MAP Entry.		A2S2 A2R4 A2P2 A2N2 --- A2Q2 A2K2 A2T2	DATA 122	C
9204	Monitor Check				A2P2 A2L2 A2S2 --- A2K2 A2Q2 A2N2	DATA 302	A
9208	Write Data Check				A2N2 A2S2 --- A2G2* A2P2 A2K2 Capacitor from A2R2D13 to A2R2D08	DATA 124	C
9210	Gap Counter Check				A2P2 A2S2 --- A2G2* A2K2	DATA 58	C

When replacing A1K2, A1L2, A2G2, A2D2, or A2E2, check the addressing jumpers. See INST 6.

FAULT SYMPTOM CODE	ERROR DESCRIPTION	MICRODIAGNOSTICS	ADDITIONAL ACTION	POSSIBLE CAUSES (Listed in order of probability)		MAP	
				A1 Board (Drive)	A2 Board (Controller)	Section	Entry
9220	Shift Register error	If the 3350 C2 Module is installed, exit to FSI 970. Run Link Series starting with routine A1. See MICRO 10 for detailed instructions. **Note:** *If the microdiagnostics fail to load, exit to PANEL 150, Entry A.* Microdiagnostics fail? YES 1. Display and record the Error Message Bytes. See MICRO 12 for detailed instructions. 2. Exit to FSI 950. NO Follow the instructions in the Additional Action column.	1. Verify that the –4 V distribution plugs are properly seated at A2S2 B06 and G06. 2. Replace cards listed in the Possible Causes column in the order shown. 3. Exit to MAP Entry.		A2S2 A2T2 --- A2K2 A2P2 A2F2	DATA 214	A
9240	Missing servo input		1. Replace cards listed in the Possible Causes column in the order shown. For single drive failures, replace cards on the A1 Board first. For multiple drive failures, replace cards on the A2 Board in the controller first. 2. Check the cable connector seating for cable group 2. See FSI 940 for cable group locations and DEV-I 100 for cable diagram. 3. Exit to MAP Entry.	A1H2 (A1N2)	A2T2 A2Q2 --- A2P2 A2R2 A2N2	DATA 288	C
9280	Phase error during Write			A1C2 (A1T2)**	A2Q2 A2T2 --- A2R2 A2S2 A2F2 A2K2	DATA 60	C
92C0	Missing data during VFO Fast Sync	Was this FSC generated by running routine B3? YES Exit to R/W 300, Entry D. NO If the 3350 C2 Module is installed, exit to FSI 970. Run Link Series starting with routine A1. See MICRO 10 for detailed instructions. **Note:** *If the microdiagnostics fail to load, exit to PANEL 150, Entry A.* Microdiagnostics fail? YES 1. Display and record the Error Message Bytes. See MICRO 12 for detailed instructions. 2. Exit to FSI 950. NO Follow the instructions in the Additional Action column.	Exit to MAP Entry	A1J2 (A1M2) A1H2 (A1N2) --- A1K2 (A1L2)* A1G2 (A1P2)	A2Q2 A2P2 --- A2F2 A2T2 A2S2 A2R2	R/W 300	D
92XX	Some failures cause multiple Fault Symptom Codes		Exit to FSI 914, Entry B				

When replacing A1K2, A1L2, A2G2, A2D2, or A2E2, check the addressing jumpers. See INST 6.

**When replacing A1C2 (A1T2), A1C4 (A1T4), A1D2 (A1S2), A1D4 (A1S4), or Pwr Amp P532 (P542), the servo velocity gain must be adjusted. See ACC 800, Entry B for procedure.*

FAULT SYMPTOM CODE	ERROR DESCRIPTION	MICRODIAGNOSTICS	ADDITIONAL ACTION	POSSIBLE CAUSES (Listed in order of probability)		MAP	
				A1 Board (Drive)	A2 Board (Controller)	Section	Entry
93XX	Invalid Fault Symptom Code	If the 3350 C2 Module is installed, exit to FSI 970. Is the string switch feature installed on this 3350? YES Exit to CTL-I 807, Entry A. NO Run Link Series starting with routine A1. See MICRO 10 for detailed instructions. **Note:** *If the microdiagnostics fail to load, exit to PANEL 150, Entry A.* Microdiagnostics fail? YES 1. Display and record the Error Message Bytes. See MICRO 12 for detailed instructions. 2. Exit to FSI 950. NO Follow the instructions in the Additional Action column.	Replace cards listed in the Possible Causes column in the order shown.		A2G2* A2D2* A2F2* } SWFE		

When replacing A1K2, A1L2, A2G2, A2D2, or A2E2, check the addressing jumpers. See INST 6.

CABLE CHART

This chart shows every cable and connector in the 3350. When directed to check cables, check every connector in the group.

See CTL-I 993 for cable checking hints.

Cable Group No.	Cable Group Name		Cable Connector Locations					Reference Diagrams
0	Device Bus In		01A-A2V4	01A-A1V2	01A-A1A2	01E-A1A2	01E-A1V2	DEV-I 100
1	Device Bus Out		01A-A2V5	01A-A1V3	01A-A1A3	01E-A1A3	01E-A1V3	
2	Device R/W Data		01A-A2V2	01A-A1U3	01A-A1B3	01E-A1B2	01E-A1U2	
3	Servo Power Amp	Drive A Drive B	01A-A1A4 01A-A1V4	P532 P542				LOC 4, 14
4	HDA Sequence Control	Drive A Drive B	01A-A1A5 01A-A1V5	P635 P636				LOC 4, 14
5	HDA Servo	Drive A Drive B	01A-A1B2 01A-A1U2	01C-A1A3 01D-A1A3				LOC 6
6	HDA Head Select	Drive A Drive B	01A-A1Y3 01A-A1Y4	01C-A1A2 01D-A1A2				R/W 370
7	Control Interface Tag In	Basic SWFE A SWFE B	01A-A2C2 01A-A2A2 01A-A2B2	01B-A1G2 01B-A1G2 01B-A1C2	01B-A1E2 01B-A1E2 01B-A1A2			CTL-I 105 to 116
8	Control Interface Bus In	Basic SWFE A SWFE B	01A-A2C3 01A-A2A3 01A-A2B3	01B-A1H2 01B-A1H2 01B-A1D2	01B-A1F2 01B-A1F2 01B-A1B2			CTL-I 105 to 116
9	Control Interface Bus Out	Basic SWFE A SWFE B	01A-A2C4 01A-A2A4 01A-A2B4	01B-A1H1 01B-A1H1 01B-A1D1	01B-A1F1 01B-A1F1 01B-A1B1			CTL-I 105 to 116
A	Control Interface Tag Out	Basic SWFE A SWFE B	01A-A2C5 01A-A2A5 01A-A2B5	01B-A1G1 01B-A1G1 01B-A1C1	01B-A1E1 01B-A1E1 01B-A1A1			CTL-I 105 to 116
B	CE Panel Switch	Basic	01A-A2U4					
C	CE Panel Data		01A-A2U5					
D	SWFE Panel Switch	SWFE	01A-A2V3					

DESCRIPTION

The chart that starts on FSI 952 contains combinations of Fault Symptom Codes and microdiagnostic Error Codes. The flowchart on this page shows how to use that chart.

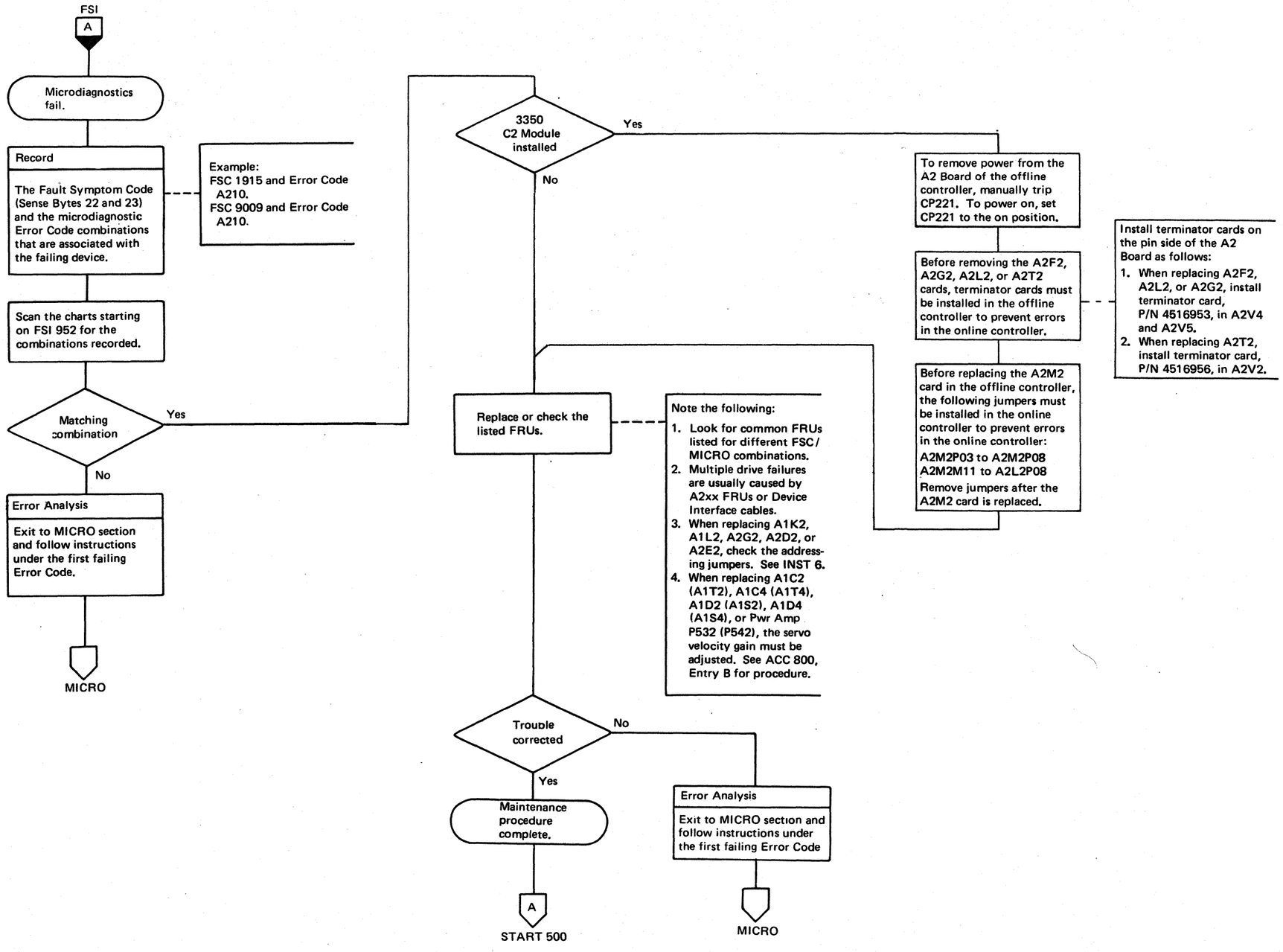
LEGEND

Cbl Grp X – This refers to one of the specific cable groups shown on FSI 940.

HANG – No Fault Symptom Code available but the CPU is in a hang condition.

NOLD – Microdiagnostics cannot be loaded.

TOUT – Functional microcode timed out.



FSC/ERROR CODE MATRIX

Fault Symptom Code	Micro Error Code	FRU 1	FRU 2	FRU 3	FRU 4
HANG	A120	A2G2	A2F2		
HANG	A212	CBL GRP 0	A1K2(L2)	A2G2	
HANG	A240	A2G2	A2F2	CBL GRP 0	
HANG	A258	A2G2			
HANG	A260	A2G2			
HANG	B829	A1C4(T4)			
HANG	BA62	A1C4(T4)			
HANG	NOLD	A2F2	A2G2		
TOUT	A158	CBL GRP 0	A1H2(N2)		
TOUT	A211	A1K2(L2)	A1E2(R2)		
TOUT	A223	A1J4(M4)	A1G2(P2)		
TOUT	A227	A1K2(L2)	A1H2(N2)	A1E2(R2)	
TOUT	A258	A2K2			
TOUT	A514	A1J4(M4)	A1G2(P2)		
TOUT	A553	A1J4(M4)	A1E2(R2)		
TOUT	AD9D	A1H2(N2)			
TOUT	B8F5	A2S2			
TOUT	B810	A1F2(Q2)			
TOUT	B821	A1E2(R2)			
TOUT	B825	A1E2(R2)			
TOUT	B829	A1E2(R2)			
TOUT	B845	A1E2(R2)			
TOUT	B861	A1K2(L2)	A1E2(R2)		
TOUT	B862	A1K2(L2)			
TOUT	BA21	A1F2(Q2)			
TOUT	BB16	A1H2(N2)			
TOUT	NOLD	A2L2	A2G2		
0000	A121	A2K2	CBL GRP 7		
0000	A123	A2Q2	A2P2		
0000	A125	A2K2			
0000	A130	A2G2	CBL GRP A		
0000	A151	A2F2	CBL GRP 8		
0000	A152	A2Q2			
0000	A153	A2F2	CBL GRP 8		
0000	A157	A2P2			
0000	AD04	A1F2(Q2)	CBL GRP 4		
0000	AD1A	A2Q2	A2P2		
0000	AD15	A2Q2	A2P2		
0000	AD17	A2G2	A2S2	A2P2	CBL GRP A
0000	AD18	A2P2	A2S2		
0000	AD48	A2G2	CBL GRP A	A2P2	
0000	AF1B	A2P2			
0000	AF26	A2K2			
0000	AF84	A2N2			
0000	B1FD	A1J2(M2)			
0000	B8D3	A2P2			
0000	B8D4	A2G2	CBL GRP A		
0000	B844	A1C4(T4)			
0000	BBFB	A1J2(M2)			
0000	NOLD	A2G2	CBL GRP 9	CBL GRP A	A2F2
1000	A215	CBL GRP 1	A2L2	A1K2(L2)	
1000	NOLD	A2L2			

Fault Symptom Code	Micro Error Code	FRU 1	FRU 2	FRU 3	FRU 4
1001	A217	CBL GRP 1	A2L2	A1K2(L2)	
1001	A223	A2L2	CBL GRP 1	A1K2(L2)	
1001	A230	CBL GRP 1	A2L2	A1K2(L2)	
1001	NOLD	A2L2			
1002	A216	A2F2	A1K2(L2)	CBL GRP 1	A2G2
1002	A227	A2F2	CBL GRP 1	A1K2(L2)	
1002	A231	A2F2	A2G2	A1K2(L2)	CBL GRP 0
1002	A232	A2F2	A1K2(L2)	CBL GRP 1	
1002	A235	A1K2(L2)			
1003	A15B	A2G2			
1003	A157	A2G2			
1003	A212	CBL GRP 1	A2L2		
1100	CBTP	A1C2(T2)			
1150	B810	A1F2(Q2)			
1150	B833	A1E2(R2)			
1150	B837	A1D2(S2)			
1150	BA14	A1F2(Q2)	CBL GRP 4		
1150	BA35	A1D4(S4)	A1F2(Q2)	A1C2(T2)	CBL GRP 4
1150	BA55	A1E2(R2)			
1150	BA89	A1E2(R2)	A1D4(S4)	A1C2(T2)	A1F2(Q2)
1150	CBTP	A1C4(T4)			
1170	B829	A1C2(T2)			
1170	BA62	A1C2(T2)			
1178	A235	A1K2(L2)			
1178	B810	A1K2(L2)			
1178	BA35	A1K2(L2)			
11FF	A234	A1K2(L2)			
1200	A292	A1G2(P2)			
1200	B811	A1E2(R2)			
1200	B831	A1D2(S2)	A1C4(T4)	A1E2(R2)	
1200	B837	A1E2(R2)	A1D2(S2)		
1200	BA62	A1D2(S2)	A1C4(T4)		
1201	B811	A1E2(R2)			
1201	B8F2	A1E2(R2)			
1201	BA72	A1E2(R2)			
1206	B829	A1C4(T4)			
1206	B837	A1D2(S2)	A1C4(T4)		
1206	B840	A1D4(S4)			
1206	B841	A1C4(T4)			
1206	B842	A1D2(S2)			
1206	B844	A1D2(S2)	A1E2(R2)	A1C4(T4)	A1C2(T2)
1206	B873	A1E2(R2)			
1206	BA62	A1C4(T4)	A1D2(S2)	A1C2(T2)	A1D4(S4)
1208	B881	A1E2(R2)			

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Fault Symptom Code	Micro Error Code	FRU 1	FRU 2	FRU 3	FRU 4
120A	B873	A1D4(S4)	A1E2(R2)		
120A	B874	A1E2(R2)			
120A	B8A5	A1C4(T4)	A1E2(R2)		
120A	BA62	A1C4(T4)			
120E	A235	A1E2(R2)			
120E	B811	A1E2(R2)	A1C4(T4)		
120E	B845	A1E2(R2)			
120E	BA62	A1C4(T4)			
1210	A294	A1G2(P2)			
1210	B811	A1F2(Q2)			
1210	B821	A1E2(R2)			
1210	B832	A1D4(S4)			
1210	B837	A1C4(T4)			
1210	B838	A1D2(S2)			
1210	B839	A1D4(S4)	A1D2(S2)	A1E2(R2)	
1210	B842	A1C4(T4)	A1D4(S4)		
1210	B888	A1D2(S2)			
1210	B892	A1G2(P2)			
1210	B893	A1D2(S2)	A1G2(P2)		
1210	B931	A1G2(P2)	A1D2(S2)		
1210	B8A9	A1D2(S2)	A1G2(P2)		
1210	BA62	A1D4(S4)	A1C4(T4)	A1F2(Q2)	
1210	BA89	A1D4(S4)			
1212	B837	A1C4(T4)	A1E2(R2)		
1212	B841	A1E2(R2)	A1C4(T4)	A1D4(S4)	
1212	B852	A1E2(R2)	A1D4(S4)		
1212	B8B4	A1E2(R2)			
1212	BA62	A1C4(T4)			
1216	B829	A1C4(T4)			
1216	B833	A1D4(S4)	A1C2(T2)		
1216	B842	A1C4(T4)	A1D4(S4)	A1E2(R2)	
1216	BA62	A1C4(T4)	A1D4(S4)		
1216	BA89	A1D4(S4)			
1301	B811	A1J4(M4)			
1310	A135	A2L2	A2G2		
1310	A542	A1J4(M4)			
1310	A553	A1J4(M4)			
1310	A563	A1J4(M4)			
1310	B811	A1E2(R2)			
1310	NOLD	A2L2			
1400	B8D9	A1H2(N2)	A1D4(S4)		
1401	B8DB	A1H2(N2)	A1G2(P2)	A1B4(A1U4)†	
1402	AD15	A1J2(M2)	A2T2	A1H2(N2)	A1G2(P2)
1402	AFAA	A2Q2	A2P2		
1402	BB17	A1J2(M2)			
1402	BBFA	A1H2(N2)			

Fault Symptom Code	Micro Error Code	FRU 1	FRU 2	FRU 3	FRU 4
1404	A254	A1H2(N2)			
1404	A530	A1H2(N2)			
1404	B8DB	A1H2(N2)			
1404	BBFA	A1H2(N2)			
1408	AD15	A1H2(N2)	A1J2(M2)	A1B4(A1U4)†	
1410	B8DB	A1D4(S4)			
1410	B8F4	A1D4(S4)			
1410	B8F5	A1D4(S4)			
1440	AD15	A1H2(N2)			
1440	B8DB	A1H2(N2)	A1E2(R2)		
1440	B8F4	A1H2(N2)			
1480	B8DB	A1G2(P2)	CBL GRP 5	A1H2(N2)	CBL GRP 6
14F4	AD28	A2Q2			
14F4	AD88	A1H2(N2)			
14F4	AD94	A1H2(N2)			
14F8	B8DA	A1G2(P2)	A1H2(N2)		
1508	B881	A1E2(R2)			
1508	B8A9	A1D2(S2)	A1G2(P2)		
1508	B917	A1G2(P2)	A1D2(S2)		
1508	B931	A1D2(S2)	A1G2(P2)		
150A	A236	A1K2(L2)	A1G2(P2)		
150A	B837	A1C4(T4)			
150A	B874	A1C4(T4)			
150A	B887	A1E2(R2)			
150A	BA62	A1C4(T4)			
150C	B886	A1D2(S2)	A1G2(P2)		
150C	B8AB	A1E2(R2)			
1600	A240	A1K2(L2)	CBL GRP 0		
1601	B811	A1H2(N2)	A1E2(R2)		
1601	B818	A1H2(N2)			
1601	B829	A1E2(R2)			
160E	B844	A1E2(R2)			
1610	A158	CBL GRP 1	A2L2		
1610	A240	A1K2(L2)	CBL GRP 1		
1610	B827	A1E2(R2)			
1610	B862	A1K2(L2)	A1E2(R2)		
1610	NOLD	CBL GRP A	A2G2		
1910	A1A1	A2G2	CBL GRP 9		
1910	A141	A2L2	A2G2		
1910	A15B	A2G2			
1910	A157	A2Q2	A2L2	A2G2	
1910	A158	A2F2			
1910	A159	A2L2	A2F2		
1910	B511	A2F2	CBL GRP 8		
1910	NOLD	A2G2	CBL GRP 9	CBL GRP A	A2L2

† *This card used only on fixed head models at EC level 451140 or later.*

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Fault Symptom Code	Micro Error Code	FRU 1	FRU 2	FRU 3	FRU 4
1911	A514	A1J4(M4)			
1911	A515	A1J4(M4)	A1K2(L2)		
1911	B834	A1E2(R2)			
1913	A150	A2F2			
1913	A212	A2G2			
1913	A234	A1G2(P2)	A1K2(L2)		
1913	A235	A1G2(P2)	A1H2(N2)	A2F2	CBL GRP 0
1913	A275	A1G2(P2)	A1K2(L2)		
1913	B820	A1E2(R2)			
1913	B873	A1G2(P2)			
1913	B8F4	A2L2			
1913	BA89	A1C2(T2)			
1913	NOLD	A2F2			
1914	A124	A2S2			
1914	A152	A2K2			
1914	AD18	A2S2	A2P2		
1914	AD28	A2Q2			
1914	AD48	A2P2	A2G2	A2S2	CBL GRP 9
1914	AF1B	A2S2	A2P2		
1914	B1F9	A2P2			
1914	B8D2	A2G2	A2S2	CBL GRP 9	
1915	A135	A2G2			
1915	A140	A2K2	A2G2		
1915	A141	A2L2	A2G2		
1915	A150	A2F2	A2L2	CBL GRP 8	
1915	A210	CBL GRP 1	A1K2(L2)	A2L2	A2F2
1915	A216	A2F2	CBL GRP 1	A1K2(L2)	
1915	A220	A1K2(L2)	A1H2(N2)		
1915	A227	A2F2	CBL GRP 1	A1K2(L2)	
1915	A231	CBL GRP 1	A1K2(L2)		
1915	A234	A1K2(L2)			
1915	A235	CBL GRP 0	A1H2(N2)	A2F2	A1K2(L2)
1915	B810	A1D4(S4)	A1F2(Q2)		
1915	B811	A1F2(Q2)			
1915	B820	A1E2(R2)			
1915	B822	A1K2(L2)	A1E2(R2)		
1915	B827	A1K2(L2)	A1F2(Q2)		
1915	B829	A1E2(R2)			
1915	B837	A1D2(S2)			
1915	B844	A1E2(R2)			
1915	BA35	A1C2(T2)	CBL GRP 5	A1D4(S4)	
1915	BA62	A1F2(Q2)			
1915	BA83	A1F2(Q2)			
1915	BA86	A1F2(Q2)			
1915	BA89	A1D4(S4)	A1C2(T2)		
1915	NOLD	A2G2	A2L2		
1917	A234	A1K2(L2)	A1G2(P2)		
1917	A235	A1G2(P2)	A1H2(N2)		
1917	A282	A1K2(L2)	A1G2(P2)		

Fault Symptom Code	Micro Error Code	FRU 1	FRU 2	FRU 3	FRU 4
1918	A220	A1H2(N2)			
1918	A235	A1G2(P2)	A1K2(L2)		
1918	A260	A2K2	A2G2		
1918	A292	A1G2(P2)	A1K2(L2)		
1918	A293	A1G2(P2)			
1918	B8A6	A1G2(P2)			
191A	AF53	A2Q2	A2L2		
191A	B827	A1C4(T4)	A1E2(R2)		
191A	B837	A1E2(R2)	A1G2(P2)	A1C4(T4)	
191A	B839	A1C4(T4)	A1D2(S2)		
191A	B842	A1C4(T4)			
191A	B844	A1C4(T4)	A1D2(S2)		
191A	B873	A1C4(T4)	A1E2(R2)	A1G2(P2)	
191A	B874	A1C4(T4)	A1D2(S2)	A1E2(R2)	
191A	B880	A1D2(S2)	A1C4(T4)		
191A	B881	A1D2(S2)			
191A	B8A9	A1D2(S2)	A1G2(P2)		
191A	B8AB	A1C4(T4)			
191A	B8AD	A1G2(P2)	A1D2(S2)		
191A	B917	A1G2(P2)			
191A	B931	A1D2(S2)	A1G2(P2)		
191A	BA62	A1C4(T4)			
191C	B827	A1E2(R2)	A1C4(T4)		
191C	B829	A1C4(T4)			
191C	BA62	A1C4(T4)			
191E	A151	A2F2			
191E	A153	A2F2			
191E	A157	CBL GRP 8			
191E	A211	A1K2(L2)			
191E	A215	A2K2	A2G2	CBL GRP 1	A1K2(L2)
191E	A216	CBL GRP 1	CBL GRP 0		
191E	A221	A1H2(N2)	CBL GRP 0		
191E	A225	CBL GRP 0	A2F2		
191E	A232	CBL GRP 1			
191E	A234	A1G2(P2)	A1K2(L2)		
191E	A235	A1K2(L2)	A1G2(P2)		
191E	A275	A1G2(P2)	A1K2(L2)		
191E	A542	A1K2(L2)			
191E	AD04	A1F2(Q2)			
191E	AF76	A1F2(Q2)			
191E	B806	A1G2(P2)			
191E	B810	A1F2(Q2)			
191E	BA83	A1F2(Q2)			
4940	A152	A2Q2	A2K2		
4940	AD15	A1J2(M2)	CBL GRP 6		
4940	AD18	A2P2			
4940	AD78	A2S2			
4940	AF1B	A2S2	A2Q2	A2P2	A2R4
4940	B1FD	A2R4	A2Q2		
4941	AF1B	A2T2	A2S2		
4941	AFAB	A2T2			

Fault Symptom Code	Micro Error Code	FRU 1	FRU 2	FRU 3	FRU 4
4944	A124	A2P2			
4944	A530	A1G2(P2)	A1H2(N2)	CBL GRP 5	
4944	AD1A	A2S2	A2P2	A2Q2	A2T2
4944	AD15	A2P2	A2Q2	A2T2	A2S2
4944	AD18	A2S2			
4944	AD57	A2P2			
4944	AD78	A2T2	A2S2		
4944	AF1B	A2S2	A2P2	A2Q2	A2T2
4944	AF2B	A2T2			
4944	AFAA	A1J4(M4)	A1H2(N2)		
4944	B109	A2P2	A2Q2		
4944	B1FD	A2P2	A2Q2	A2S2	A1G2(P2)
4944	B1FF	A2Q2			
4944	B8D2	A2P2			
4944	B8D6	A2S2	A2P2		
4944	B8E2	A2T2	A2S2		
4949	AFA8	A2K2			
9001	A140	A2Q2	A2T2		
9001	B821	A1K2(L2)	A1E2(R2)		
9002	A130	A2L2	A2G2		
9002	A131	A2Q2			
9002	A140	A2T2	A2S2		
9002	A141	A2K2	CBL GRP 7		
9002	A14C	A2L2			
9002	A157	A2Q2	A2G2		
9002	A254	A2S2			
9002	AD17	A2P2	A2S2	A2Q2	
9002	AD1F	A2K2	CBL GRP 8		
9002	AD48	A2Q2			
9002	AD57	A2P2	A2Q2		
9002	AD58	A2Q2			
9002	AD67	A2P2	A2Q2		
9002	AD68	A2Q2			
9002	AF26	A2P2	A2K2	CBL GRP 7	A2Q2
9002	AF46	A2Q2			
9002	B6D3	A2P2	A2Q2	A2S2	A2G2
9002	B8D6	A2P2	A2S2		
9002	NOLD	A2L2	A2F2	CBL GRP 8	
9003	A210	CBL GRP 1	A1K2(L2)		
9003	A216	A2F2	CBL GRP 1		
9003	A232	A2F2	CBL GRP 1		
9003	A250	A2L2			
9003	A254	A2Q2	A2F2	A2P2	A2S2
9003	A255	A2L2	A2G2		
9003	NOLD	A2F2	A2P2	A2G2	A2L2

Fault Symptom Code	Micro Error Code	FRU 1	FRU 2	FRU 3	FRU 4
9004	A254	A2L2	A2Q2	A2F2	A1K2(L2)
9004	A521	A1H2(N2)			
9004	A532	A2F2			
9004	AD0A	A2K2			
9004	AD0D	A2Q2	A2F2	A2K2	CBL GRP 7
9004	AD15	A2Q2	A2P2		
9004	AF16	A2N2	A2P2		
9004	AF1A	A2P2			
9004	AF2B	A2S2	A2P2		
9004	B832	A1H2(N2)	A1D4(S4)		
9004	B8DD	A2P2	A2Q2		
9004	B8E4	A2S2	A2Q2		
9004	B8F5	A1D4(S4)			
9004	BA62	A1D4(S4)			
9004	NOLD	A2F2	CBL GRP 8		
9005	A124	A2Q2			
9005	A130	A2K2	A2L2		
9005	A152	A2Q2	A2K2	A2L2	
9005	A157	A2Q2			
9005	A227	CBL GRP 1	A2F2		
9005	AE30	A2K2	A2Q2		
9005	AF97	A2K2			
9005	NOLD	CBL GRP C	A2K2		
9006	A120	A2F2	A2G2	CBL GRP 8	
9006	A140	A2K2	CBL GRP 7		
9006	A254	A2F2			
9006	NOLD	A2F2	A2G2	A2L2	CBL GRP 8
9007	A111	A2K2	CBL GRP 7		
9007	A112	A2K2	CBL GRP 7		
9007	A113	CBL GRP 7	A2K2		
9007	A114	A2K2	CBL GRP 7		
9007	A115	CBL GRP 7	A2L2		
9007	A116	A2K2	CBL GRP 7		
9007	A117	CBL GRP 8	A2K2		
9007	A122	A2G2	A2K2	CBL GRP A	
9007	A123	A2P2	A2K2		
9007	A126	A2Q2	A2N2	A2K2	A2S2
9007	A152	A2G2			
9007	A158	CBL GRP 0	A2F2		
9007	A233	A2G2			
9007	NOLD	A2G2	CBL GRP 8	A2F2	
9008	A131	A2L2	A2K2		
9008	A152	A2K2	A2Q2	A2P2	
9008	A158	CBL GRP 0	A2F2		
9008	AD15	A2Q2			
9008	AD1A	A2P2			
9008	AF46	A2P2			
9008	NOLD	A2K2	A2F2	CBL GRP 8	
900A	A130	A2G2			
900B	A221	CBL GRP 0	A2F2		
900B	A225	A1H2(N2)	CBL GRP 0		
900B	A542	A1J4(M4)			
900B	A556	A1J4(M4)	A1E2(R2)		
900B	B820	A1E2(R2)			
900B	B827	A1E2(R2)	A1K2(L2)		

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Fault Symptom Code	Micro Error Code	FRU 1	FRU 2	FRU 3	FRU 4
900E	A135	A2L2	A2F2		
900E	A158	CBL GRP 0	A1H2(N2)	A2F2	
900E	A210	A1K2(L2)			
900E	A222	A1K2(L2)	A1F2(Q2)		
900E	A233	A1E2(R2)	A1K2(L2)		
900E	A2A0	A1K2(L2)			
900E	B511	A2F2			
900E	B811	A1F2(Q2)			
900E	B821	CBL GRP 4			
900E	B831	A1E2(R2)			
900E	BA62	A1F2(Q2)			
900E	NOLD	A2F2			
900F	A158	A1H2(N2)	CBL GRP 0		
900F	A222	A1K2(L2)			
900F	A223	A1K2(L2)	A1G2(P2)	A1F2(Q2)	
900F	A224	A1K2(L2)	CBL GRP 1		
900F	A235	A1F2(Q2)			
900F	A542	A1J4(M4)			
900F	B1FD	A1H2(N2)			
900F	B810	A1F2(Q2)			
900F	B813	A1E2(R2)	A1J4(M4)	A1K2(L2)	
900F	B814	A1H2(N2)	A1E2(R2)	A1J4(M4)	
900F	B821	A1E2(R2)			
900F	B832	A1H2(N2)			
900F	B833	A1K2(L2)			
900F	BA61	A1F2(Q2)			
900F	NOLD	A2G2	A2F2	CBL GRP 8	
9100	A234	CBL GRP 0			
9101	A130	A2P2			
9101	B8D7	A2R2			
9102	AD15	A2S2	A2N2		
9102	AD19	A2S2			
9102	AE44	A2P2			
9102	AF1A	A2P2			
9102	AF4A	A2N2			
9102	AF6B	A2S2	A2P2	A2N2	
9102	AF76	A2N2	A2F2	A2Q2	
9102	AF84	A2Q2			
9102	AF9A	A2Q2			
9102	AFAA	A2N2	A2P2	A2S2	
9102	AFBA	A2N2			
9102	AFBB	A2N2			
9102	AFFA	A2N2			
9102	B109	A2P2			
9102	B8D7	A2P2	A2N2		
9102	BB21	A2R2			
9102	BB51	A2N2			
9102	BBFA	A2N2			

Fault Symptom Code	Micro Error Code	FRU 1	FRU 2	FRU 3	FRU 4
9104	A157	A2Q2	A2P2		
9104	AD15	A2Q2	A2F2	A1H2(N2)	
9104	AF1A	A2P2			
9104	AF6A	A2F2			
9104	AF76	A2P2			
9104	AF9A	A2P2			
9104	AFFA	A2Q2			
9104	B8DB	A1H2(N2)			
9108	A125	A2S2	A2P2		
9108	A132	A2K2	A2F2		
9108	A151	A2F2	A2K2	A2L2	
9108	A152	A2K2			
9108	A153	A2F2			
9108	A157	A2K2	A2S2	A2F2	A2L2
9108	A210	A1K2(L2)			
9108	A218	A2G2	A2F2		
9108	A231	CBL GRP 1	A2F2		
9108	A233	A2F2			
9108	AD0D	A2K2			
9108	AD0F	A2F2	A2G2		
9108	AD1A	A2S2			
9108	AD78	A2S2			
9108	AF1A	A2K2	A2F2		
9108	B8D7	A2F2	A2K2		
9108	BB51	A2N2			
9108	NOLD	A2F2	A2K2	CBL GRP 8	
9109	NOLD	A2K2	A2F2		
910A	NOLD	A2K2	A2F2		
910C	NOLD	A2K2	A2F2		
9110	A158	A2F2			
9110	A15B	A2K2			
9110	A220	CBL GRP 0	A1H2(N2)	A2F2	
9110	A234	A2F2	CBL GRP 0	A1H2(N2)	
9110	A235	CBL GRP 0	A2F2	A1H2(N2)	
9110	A260	A2K2	A2G2		
9110	A281	CBL GRP 0	A1H2(N2)	A2F2	
9118	A260	A1K2(L2)	CBL GRP 1		
9118	NOLD	A2K2	A2F2		
9120	A15B	A2K2	A2G2		
9120	A210	A1K2(L2)	CBL GRP 0	A2G2	
9120	A212	A1K2(L2)	CBL GRP 0	CBL GRP 1	
9120	A216	A2L2			
9120	A223	A2L2			
9120	A224	CBL GRP 1	A2L2		
9128	A212	CBL GRP 0	A1K2(L2)		
9128	B511	A2F2	A2K2		
9140	A133	A2G2	A2K2		
9140	NOLD	A2G2	CBL GRP 9		
9148	NOLD	A2F2	A2K2		

FSC/ERROR CODE MATRIX

Fault Symptom Code	Micro Error Code	FRU 1	FRU 2	FRU 3	FRU 4
9180	A131	A2K2	A2G2		
9180	NOLD	CBL GRP A	A2G2	CBL GRP C	A2L2
9188	NOLD	A2K2	A2F2		
9200	A130	A2L2	A2K2	A2P2	
9200	A140	A2Q2			
9200	A150	A2K2	A2F2		
9200	A158	A2F2			
9200	A15B	A2R2	A2K2	A2N2	
9200	A216	CBL GRP 1	A2F2		
9200	NOLD	CBL GRP A	A2G2		
9202	A15B	A2S2	A2P2A2K2		
9202	AD17	A2P2			
9202	AD1A	A2P2	A2S2		
9202	AD78	A2R4	A2S2	A2Q2	
9202	AF1A	A2S2	A2R4	A2P2	
9202	AF4C	A2R4			
9202	AF9A	A2Q2	A2P2		
9202	B8D6	A2S2	A2P2		
9204	A141	A2L2			Capacitor from A2R2D13 to A2R2D08
9204	A15B	A2L2	A2K2		
9204	AD17	A2S2	A2P2		
9204	AD1A	A2N2			
9204	AD78	A2P2			
9204	AF1A	A2S2			
9204	AFBA	A2Q2			
9204	AFCA	A2P2			
9204	B8D6	A2P2	A2L2	A2S2	
9206	B8DD	A2P2	A2Q2		
9208	A157	A2S2	A2N2		
9208	A15B	A2S2	A2K2		
9208	AD0D	A2N2			
9208	AD1A	A2N2	A2S2	A2P2	A2G2
9208	AD78	A2N2	A2S2	A2G2	
9208	AF61	A2S2			
9208	AF6A	A2N2			
9208	AF78	A2N2			
920A	AD1A	A2S2	A2N2		
920A	AD78	A2N2	A2S2		
920A	AF6A	A2N2			
9210	A15B	A2P2	A2K2		
9210	AD15	A2P2			
9210	AD17	A2P2			
9210	AD18	A2P2	A2G2		
9210	AD48	A2P2			
9210	AF1A	A2G2	A2P2		
9210	AF1B	A2P2			
9210	B109	A2P2			
9210	B8D6	A2S2	A2P2		
9214	B8D6	A2P2			

Fault Symptom Code	Micro Error Code	FRU 1	FRU 2	FRU 3	FRU 4
9220	A15B	A2S2	A2K2		
9220	AD15	A2S2	A2T2		
9220	AD1A	A2T2	A2S2		
9220	AD78	A2T2	A2S2		
9220	AF1A	A2S2			
9222	AD78	A2T2			
9240	A140	A2Q2			
9240	A15B	A2Q2	A2R2		
9240	A15C	A2Q2			
9240	B8D6	A2T2	A1H2(N2)	CBL GRP 2	A2Q2
9280	A140	A2Q2			
9280	A15C	A2Q2			
9280	AD15	A2T2			
9280	B8D6	A2R2			
92C0	A232	CBL GRP 1	A2F2	A1K2(L2)	
92C0	A235	A1K2(L2)			
92C0	A530	A1H2(N2)			
92C0	AD14	A2P2	A2Q2		
92C0	AD15	A2Q2	CBL GRP 2	A1J2(M2)	A1H2(N2)
92C0	AD25	A2P2	A2Q2		
92C0	AD28	A2P2			
92C0	AD88	A1H2(N2)			
92C0	AF1A	A2Q2	A1J2(M2)	A2F2	A1H2(N2)
92C0	AFAA	A2Q2			
92C0	B2E4	A1J2(M2)			
92C0	B8D6	A2S2	A2P2		

PRIMARY/ALTERNATE SWITCH

Analysis Procedure

Figure 1 shows the A2 controller (A2 Board) online. The Primary LED is on and the Alternate LED is off.

Use the table below and scope the line with the failing LED. The conditions for correct operations are given as follows:

Primary LED	LED On	LED Off
Switch Common (H)	Approximately –4 Vdc	Ground
+Pwr On Reset (A)	–Level (MST-1)	–Level (MST-1)
Online Latch (B)	–Level (MST-1)	+Level (MST-1)
Lamp Driver (C)	Approximately +2 Vdc	Ground
Return Side of LED (K)	Ground	Ground

Alternate LED	LED On	LED Off
Switch Common (G)	Approximately –4 Vdc	Ground
+Pwr On Reset (D)	–Level (MST-1)	–Level (MST-1)
Online Latch (E)	–Level (MST-1)	+Level (MST-1)
Lamp Driver (F)	Approximately +2 Vdc	Ground
Return Side of LED (J)	Ground	Ground

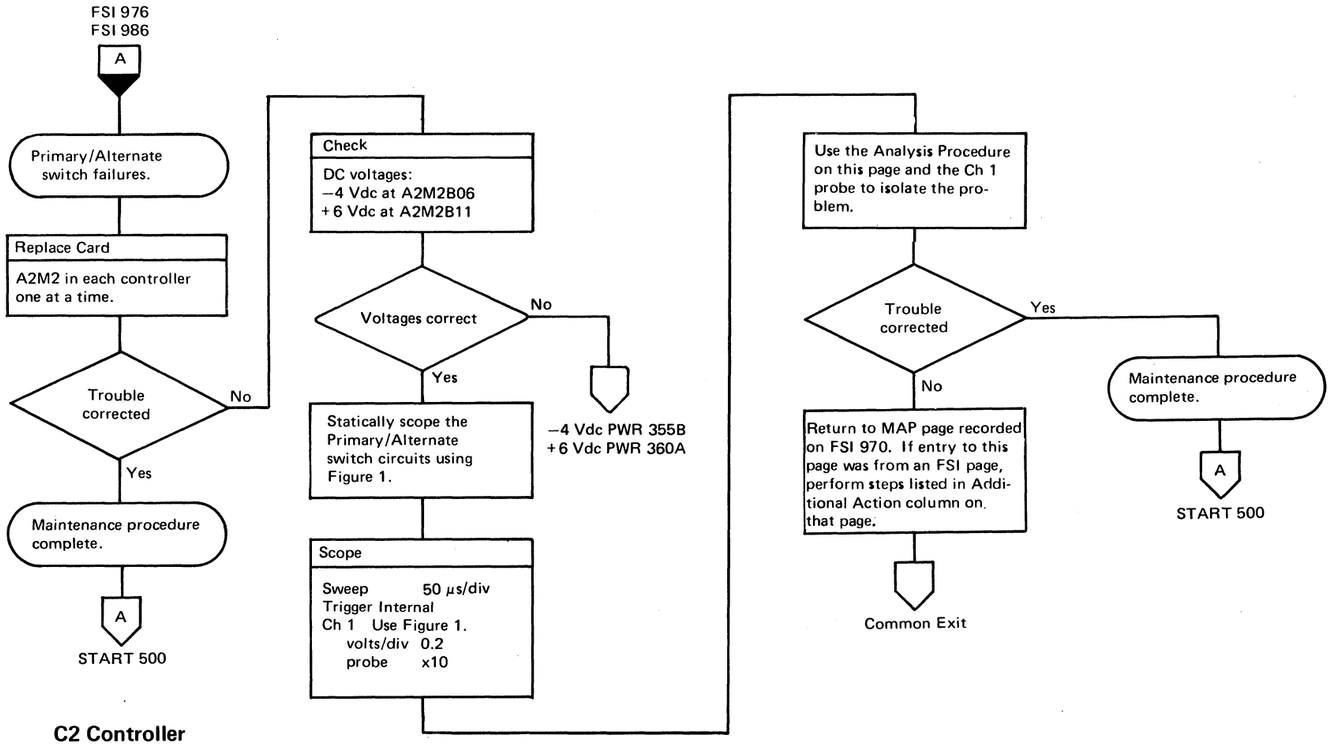
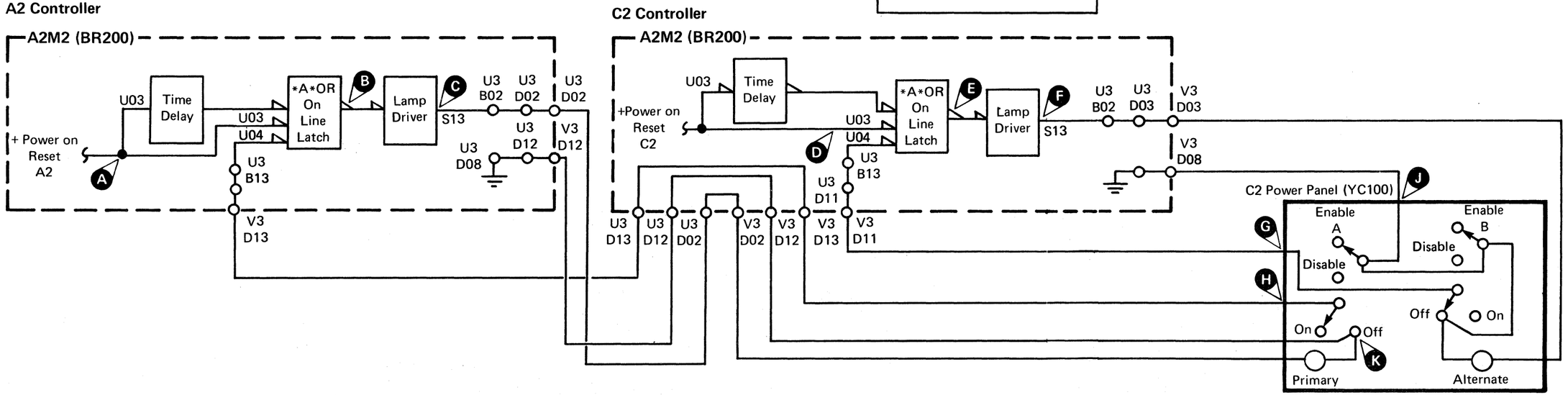


Figure 1. Primary/Alternate Switch Circuits



3350 C2 PROBLEM ANALYSIS

Analysis Procedure

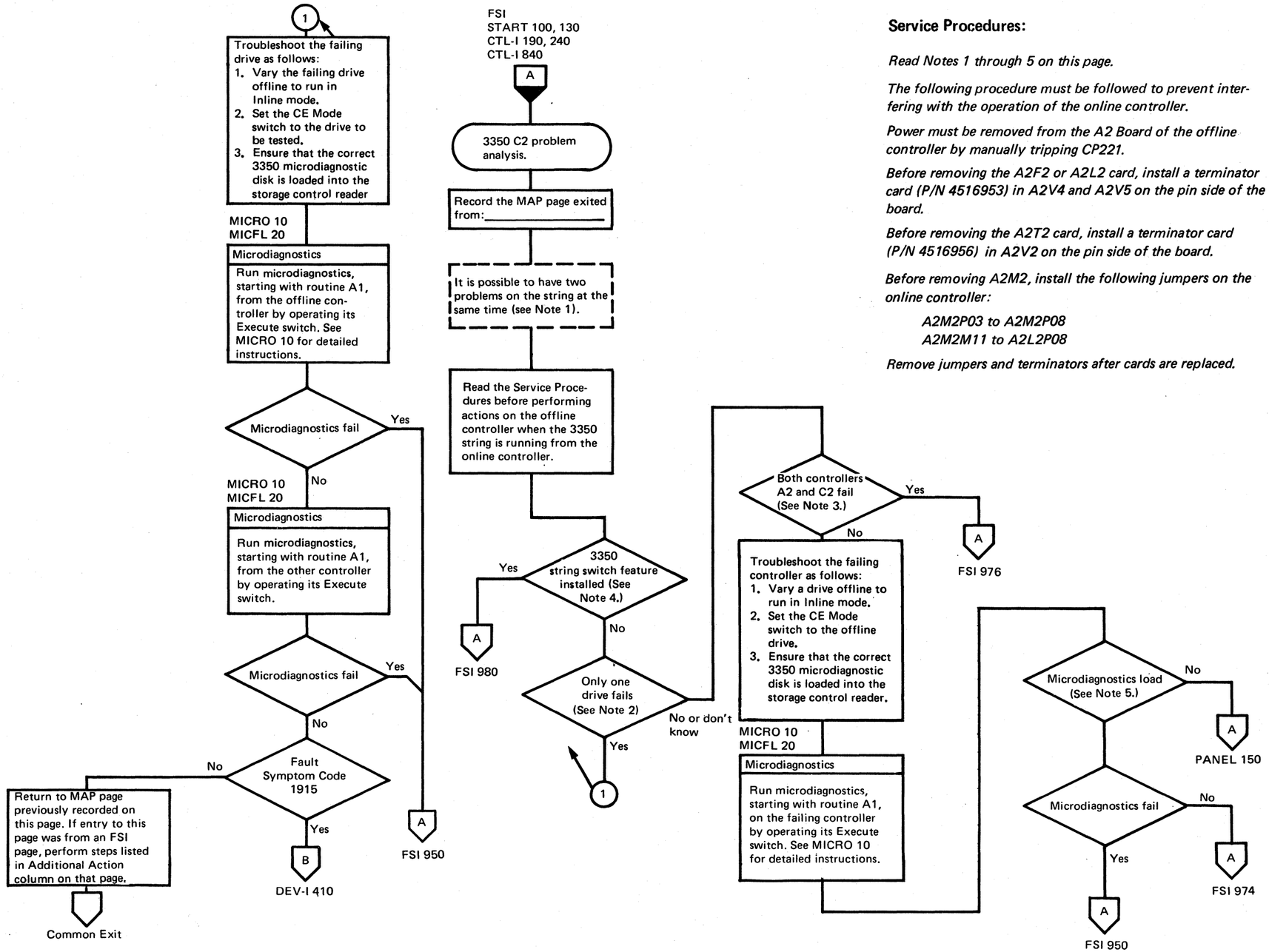
The analysis procedure for the 3350 C2 Module has two objectives.

1. To allow the customer to run online while the problem is being isolated.
2. To determine as soon as possible which of the following areas are at fault:

   A2 Controller
   C2 Controller
   Storage control
   Control interface cables
   A drive or drives
   Device interface cables

Notes:

1. *The following example shows how two problems may exist on a string at the same time:*
   - *a. The C2 Module has a problem and is offline; the A2 Module is online.*
   - *b. A drive starts failing.*
   - *c. Run microdiagnostics on the C2 Module; expecting to get an Error Code related to the drive failure.*
   - *d. An A140 Error Code occurs that indicates the C2 controller is failing.*
   - *e. Run microdiagnostic on the A2 Module. An A210 Error Code occurs indicating a drive error. Troubleshoot one problem at a time.*
2. *If only one drive is failing, it is not necessary to run the drive online from both controllers. The drive exhibits the same failure running from either controller.*
3. *An attempt must be made to run the string online from both controllers to answer the question correctly. Take the No path if one controller can run all drives online.*
4. *If the string switch feature is installed on only one controller board:*
   - *a. Take the No path if troubleshooting the controller without the string switch feature.*
   - *b. Take the Yes path if troubleshooting the controller with the string switch feature. (Run microdiagnostics on the interface attached to both controller boards. Microdiagnostics can be run from the other interface only if the controller it is attached to is ONLINE.)*
5. *Microdiagnostics can be loaded and run on the failing controller while the other controller is running online.*



Service Procedures:

Read Notes 1 through 5 on this page.

The following procedure must be followed to prevent interfering with the operation of the online controller.

Power must be removed from the A2 Board of the offline controller by manually tripping CP221.

Before removing the A2F2 or A2L2 card, install a terminator card (P/N 4516953) in A2V4 and A2V5 on the pin side of the board.

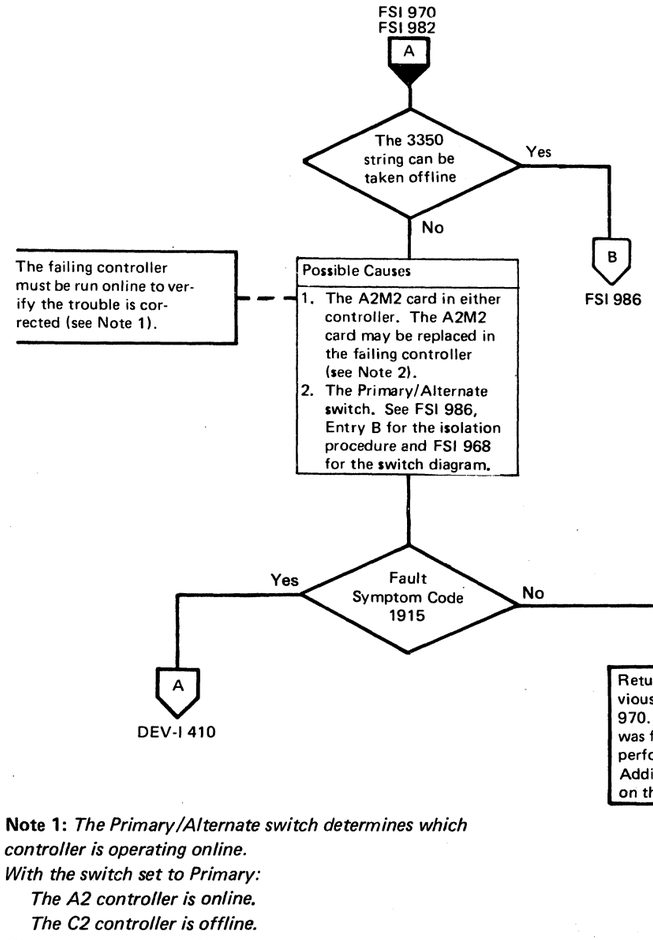
Before removing the A2T2 card, install a terminator card (P/N 4516956) in A2V2 on the pin side of the board.

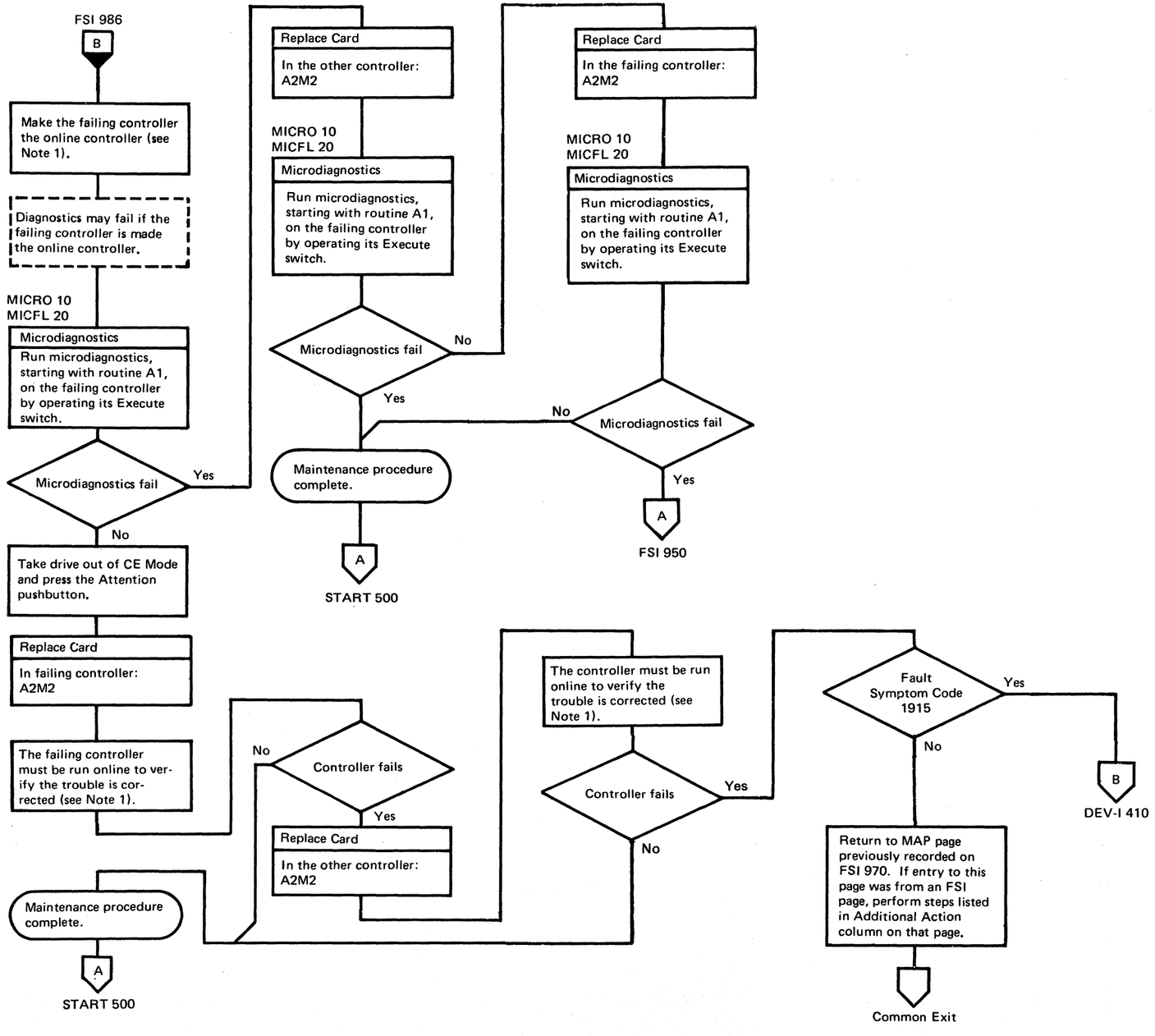
Before removing A2M2, install the following jumpers on the online controller:

A2M2P03 to A2M2P08
A2M2M11 to A2L2P08

Remove jumpers and terminators after cards are replaced.

3350 C2 PROBLEM ANALYSIS





Note 1: *The Primary/Alternate switch determines which controller is operating online.*
With the switch set to Primary:
The A2 controller is online.
The C2 controller is offline.
With the switch set to Alternate:
The A2 controller is offline.
The C2 controller is online.

To change the status of the controllers:
1. *Power off the 3350 string.*
2. *Change the Primary/Alternate switch setting.*
3. *Power on the 3350 string.*

Note 2: *Before replacing the A2M2 card, install the following jumpers on the online controller:*
A2M2P03 to A2M2P08
A2M2M11 to A2L2P08
Remove jumpers after the A2M2 card is replaced.

Note 1: *Take the No path if some drives run from the A2 controller and some drives run from the C2 controller.*

Example: If a cable is open on the device interface between drives 3 and 4 (see Figure 1). A2 controller will run online with drives 0, 1, 2, and 3. The C2 controller will run online with drives 4, 5, 6, and 7.

Note 2: *The Primary/Alternate switch determines which controller is operating online.*
With the switch set to Primary:
The A2 controller is online.
The C2 controller is offline.
With the switch set to Alternate:
The A2 controller is offline.
The C2 controller is online.

To change the status of the controllers:
1. *Power off the 3350 string.*
2. *Change the Primary/Alternate switch setting.*
3. *Power on the 3350 string.*

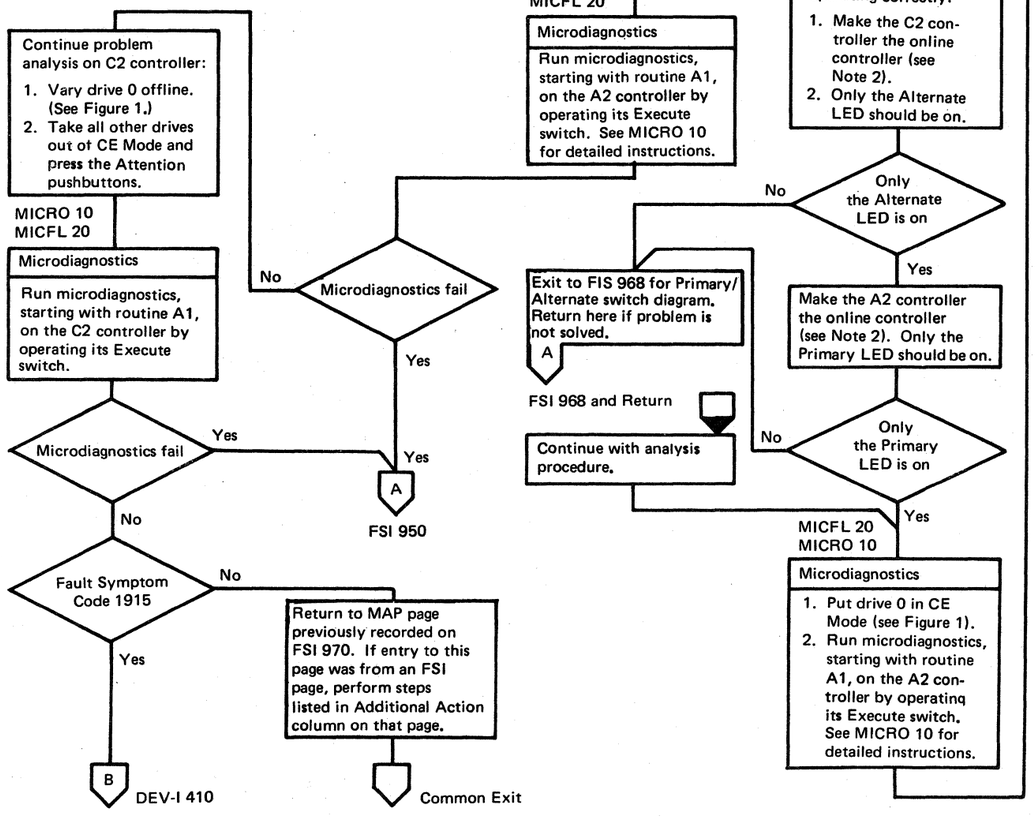
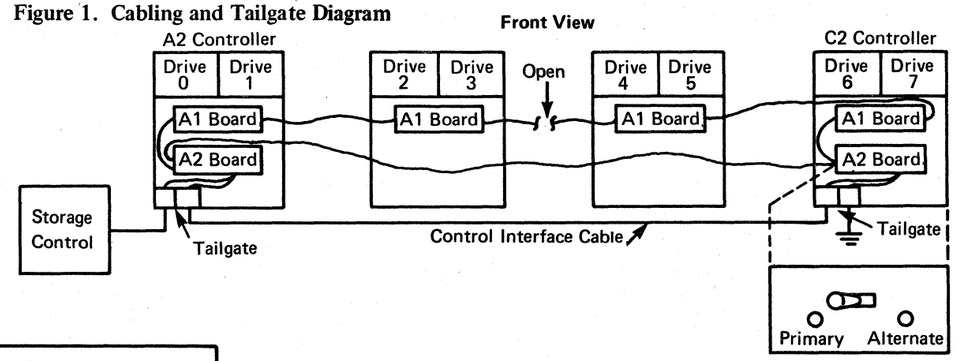
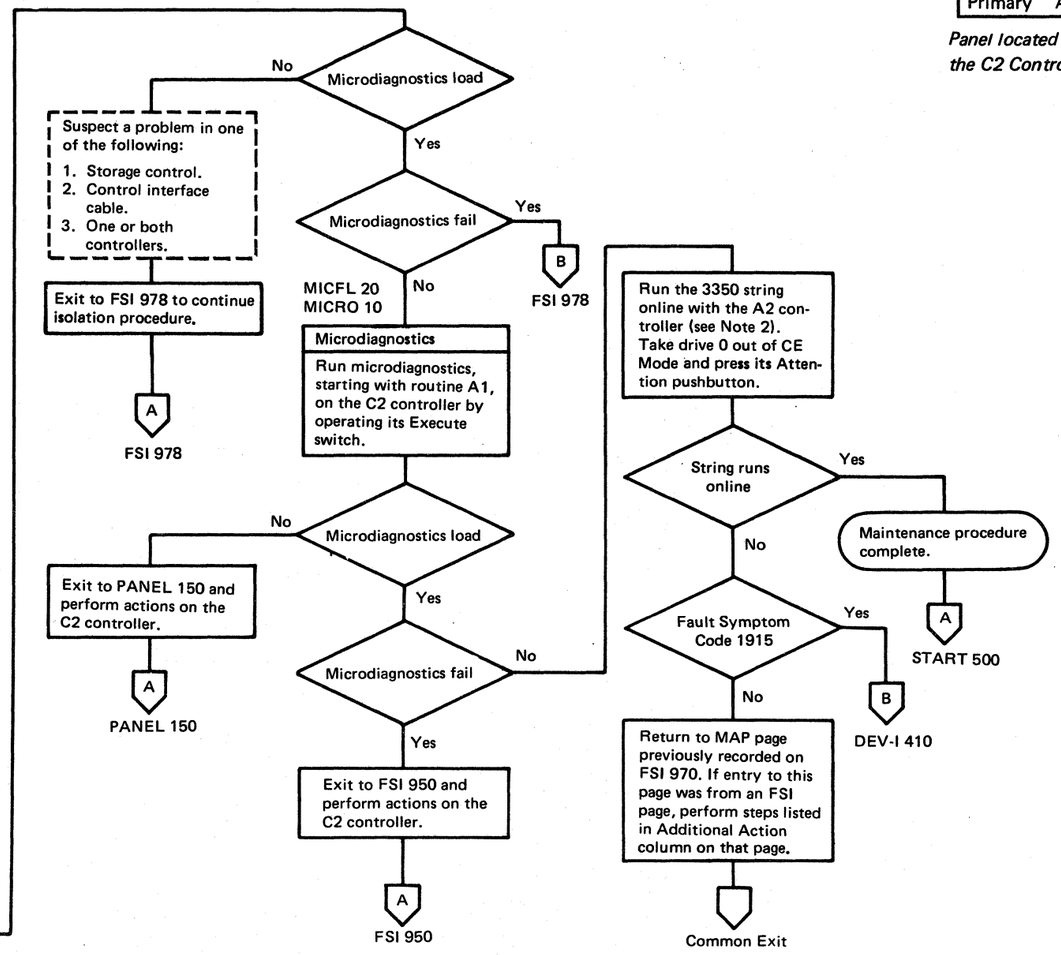


Figure 1. Cabling and Tailgate Diagram



Panel located on front of the C2 Controller.



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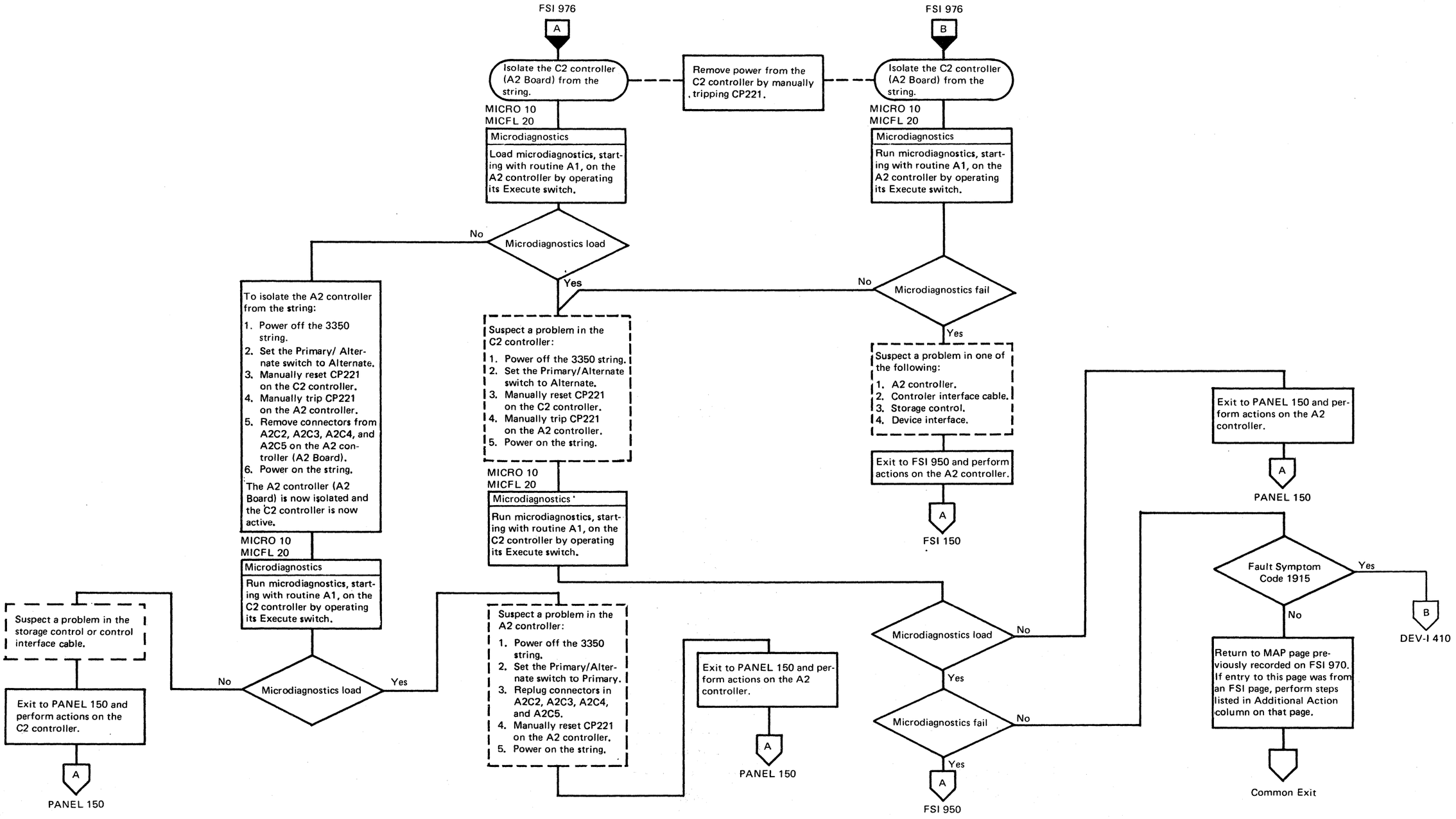
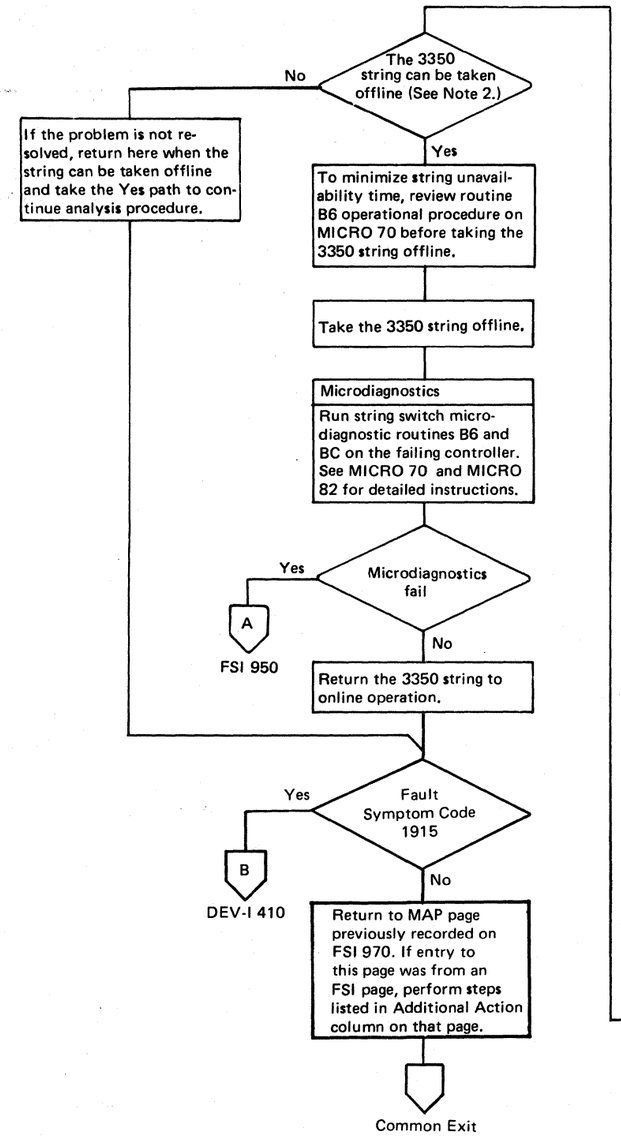
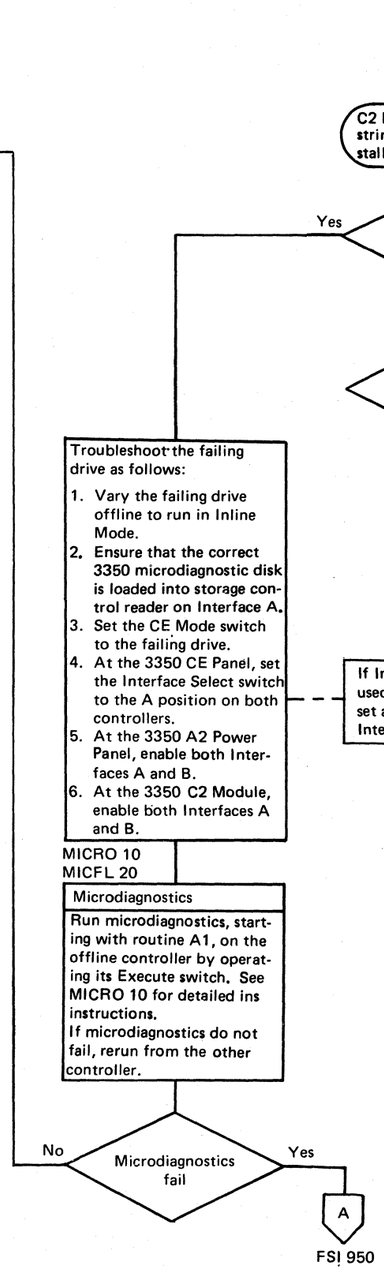
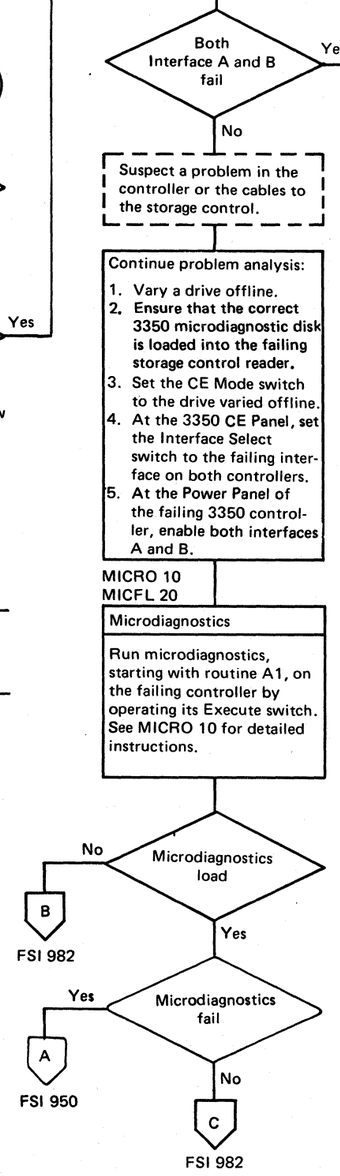
3350 C2 PROBLEM ANALYSIS

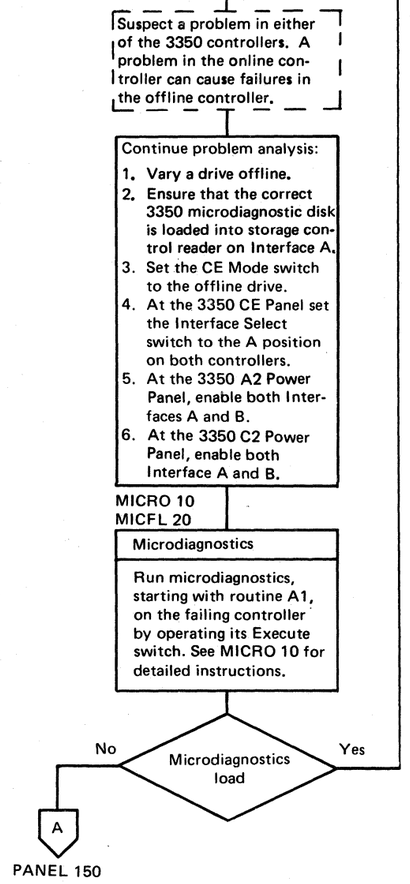


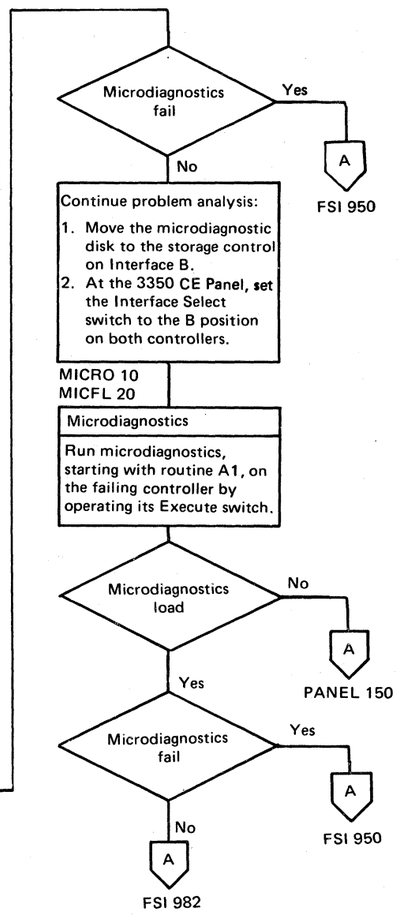
3350 C2 PROBLEM ANALYSIS (SWFE)











Note 1: *To answer the question correctly, an attempt must be made to run the string online from both controllers. If one controller can run all drives online, take the Yes path.*

Note 2: *String switch microdiagnostic routines B6 and BC cannot be run on the offline controller (3350 A2/C2) concurrent with customer operation on the online controller as Tag Bus Parity errors will occur. To run routine B6 on the offline controller, it is necessary to take the 3350 string offline.*

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3350 C2 PROBLEM ANALYSIS (SWFE)

FSI 980

A

Can the 3350 string be taken offline (See Note 2.)

No

If the problem is not resolved, return here when the string can be taken offline and take the Yes path to continue analysis procedure.

Yes

To minimize string unavailability time, review routine B6 operational procedure on MICRO 70 before taking the 3350 string offline.

Take the 3350 string offline.

Microdiagnostics

Run string switch microdiagnostic routines B6 and BC on the failing controller. See MICRO 70 and MICRO 82 for detailed instructions.

Microdiagnostics fail

Yes → A → FSI 950

No

Return the 3350 string to online operation.

On the failing controller, disable and then enable both interfaces.

MICRO 70
MICRO 82
MICRO 520

Microdiagnostics

Run string switch microdiagnostic routines B6 and BC on the failing controller. See MICRO 70 and MICRO 82 for detailed instructions.

Microdiagnostics fail

No → A → FSI 974

Yes → A → FSI 950

FSI 980

B

Replace Cards

Interface A:
A2D2 (See Note 1.)
A2H2
A2M2

Interface B:
A2E2 (See Note 1.)
A2J2
A2M2

Before replacing the A2M2 card, install the following jumpers on the online controller:
A2M2P03 to A2M2P08
A2M2M11 to A2L2P08
Remove jumpers after the A2M2 card is replaced.

Trouble corrected

No → A → PANEL 150

Yes

Maintenance procedure complete.

A → START 500

FSI 980

C

Microdiagnostics fail

Yes → A → FSI 950

No

Can the 3350 string be taken offline (See Note 2.)

No

If the problem is not resolved, return here when the string can be taken offline and take the Yes path to continue analysis procedure.

Yes

To minimize string unavailability time, review routine B6 operation procedure on MICRO 70 before taking the 3350 string offline.

Take the 3350 string offline.

Microdiagnostics

Run string switch microdiagnostic routine B6 on the failing controller. See MICRO 70 for detailed instructions.

Microdiagnostics fail

Yes → A → FSI 950

No

Return the 3350 string to online operation.

On the failing controller, disable and then enable both interfaces.

MICRO 70
MICRO 82
MICFL 520

Microdiagnostics

Run string switch microdiagnostic routines B6 and BC on the failing controller. See MICRO 70 and MICRO 82 for detailed instructions.

1

1

Microdiagnostics fail

Yes → A → FSI 950

No

Replace Cards

Interface A:
A2D2 (See Note 1.)
A2H2
A2M2

Interface B:
A2E2 (See Note 1.)
A2J2
A2M2

Before replacing the A2M2 card, install the following jumpers on the online controller:
A2M2P03 to A2M2P08
A2M2M11 to A2L2P08
Remove jumpers after the A2M2 card is replaced.

The failing controller must be run online with the failing storage control to verify that the problem is corrected.

Trouble corrected

No

Yes

Maintenance procedure complete.

A → START 500

FSI 984

D

Microdiagnostics fail

Yes

Suspect a problem in the online controller.

Exit to FSI 950 and perform actions on the online controller.

A → FSI 950

No

Fault Symptom Code 1915

No

Return to MAP page previously recorded on FSI 970. If entry to this page was from an FSI page, perform steps listed in Additional Action column on that page.

Common Exit

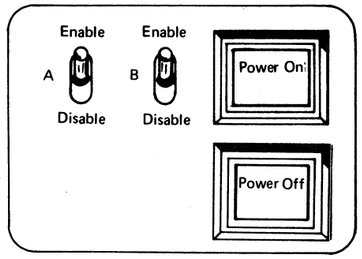
Yes

B → DEV-I 410

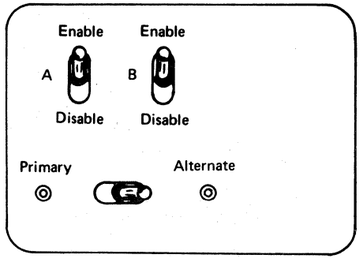
Note 1: *When replacing the A2D2 or A2E2 card, check the addressing jumpers. See INST 6.*

Note 2: *String switch microdiagnostic routine B6 cannot be run on the offline controller (3350 A2/C2) concurrent with customer operation on the online controller as Tag Bus Parity errors will occur. To run routine B6 on the offline controller, it is necessary to take the 3350 string offline.*

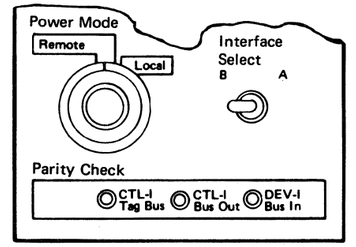
3350 Power Panel (A2)

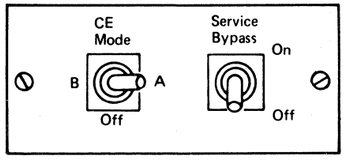


3350 Power Panel (C2)

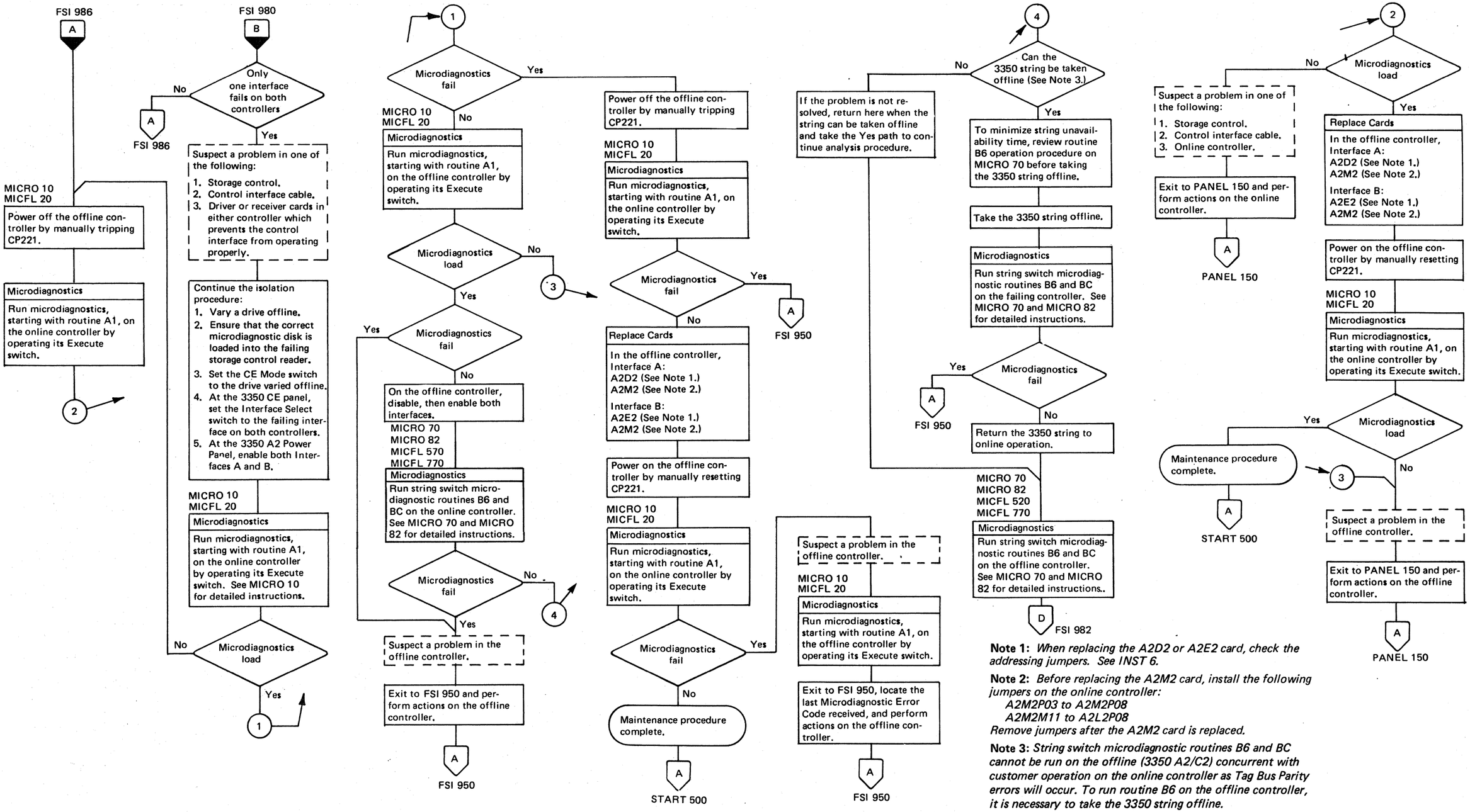


3350 CE Panel





3350 C2 PROBLEM ANALYSIS (SWFE) FSI 984



Note 1: *When replacing the A2D2 or A2E2 card, check the addressing jumpers. See INST 6.*

Note 2: *Before replacing the A2M2 card, install the following jumpers on the online controller:*
A2M2P03 to A2M2P08
A2M2M11 to A2L2P08
Remove jumpers after the A2M2 card is replaced.

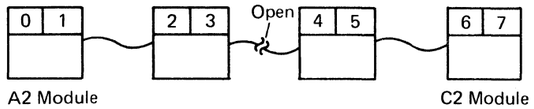
Note 3: *String switch microdiagnostic routines B6 and BC cannot be run on the offline (3350 A2/C2) concurrent with customer operation on the online controller as Tag Bus Parity errors will occur. To run routine B6 on the offline controller, it is necessary to take the 3350 string offline.*

3350 C2 PROBLEM ANALYSIS (SWFE)

Note 1: *Take the No path if some drives run from the A2 controller and some drives run from the C2 controller.*

Example: If a cable is open on the device interface between drives 3 and 4 (see Figure 1). The A2 controller will run online with drives 0, 1, 2, and 3. The C2 controller will run online with drives 4, 5, 6, and 7.

Figure 1. 3350 String

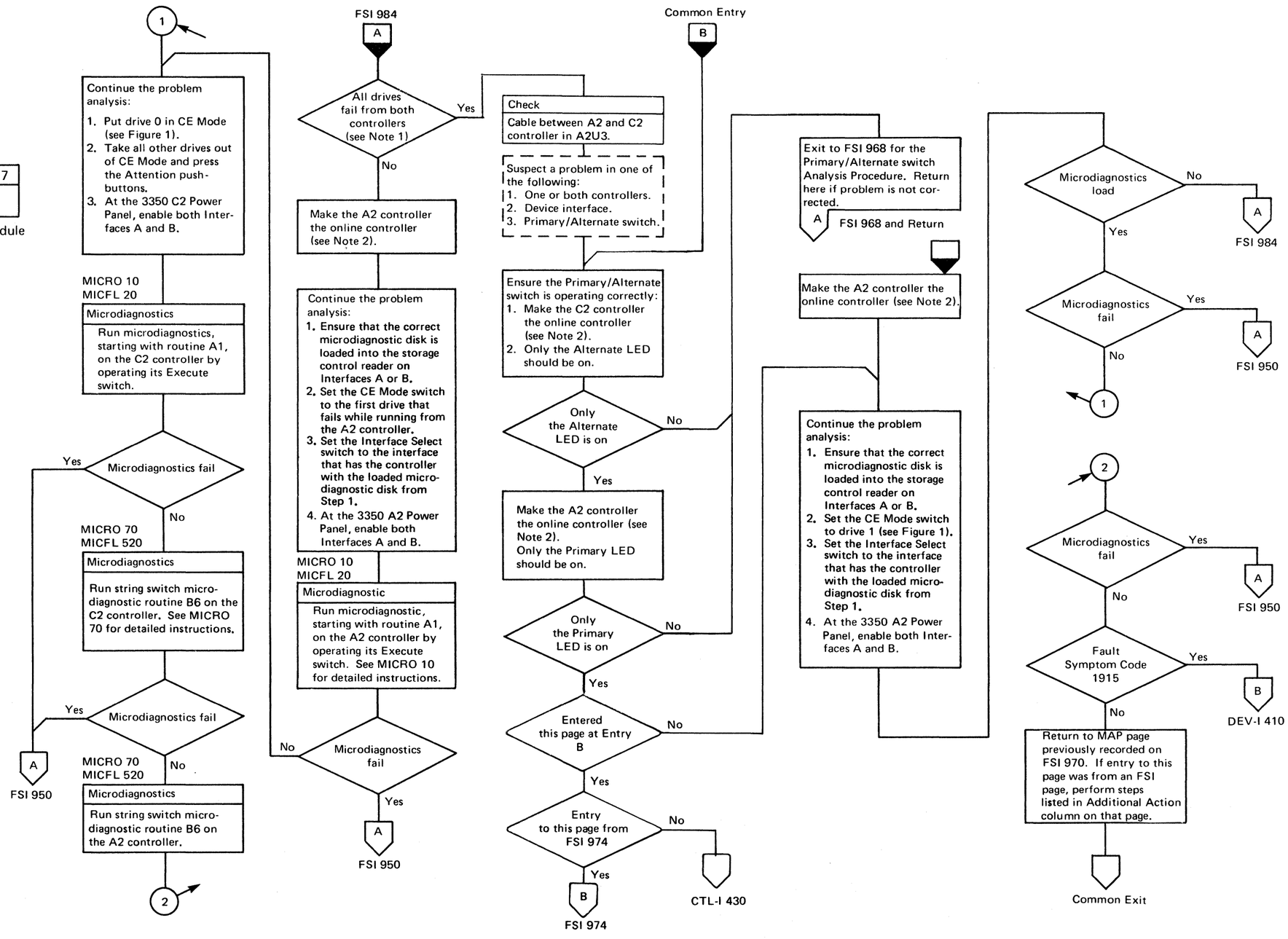


Note 2: *The Primary/Alternate switch determines which controller is operating online.*

With the switch set to Primary:
The A2 controller is online.
The C2 controller is offline.

With the switch set to Alternate:
The A2 controller is offline.
The C2 controller is online.

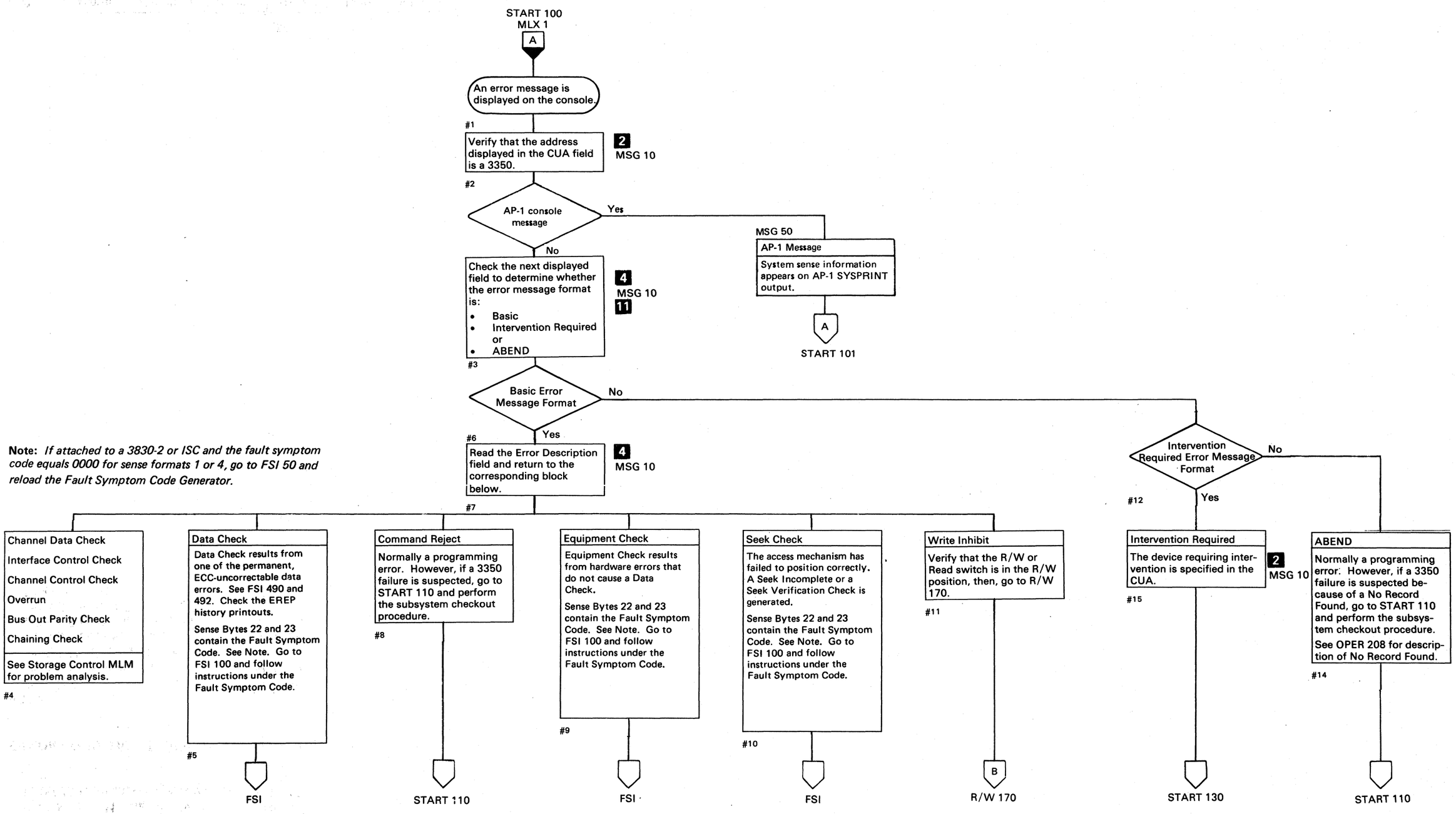
To change the status of the controllers:
1. *Power off the 3350 string.*
2. *Change the Primary/Alternate switch setting.*
3. *Power on the 3350 string.*



MSG CONTENTS

OS/VS CONSOLE ERROR MESSAGE ANALYSIS **MSG 9**

Note: *If attached to a 3830-2 or ISC and the fault symptom code equals 0000 for sense formats 1 or 4, go to FSI 50 and reload the Fault Symptom Code Generator.*



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OS/VS CONSOLE ERROR MESSAGE ANALYSIS

BASIC ERROR MESSAGE FORMAT

I E A 0 0 0 I	CUA(3)	,	Error Description(3)	,	CMD(2)	,	CSW Stat(4)	,	Sense Data(0 to 24)	,	Seek Address(6)	,	Volume ID(6)	,	Job ID(8)
1	2	3	4		5		6		7		8		9		10

The basic error message format contains the following fields:

1 Message Identifier

The message identifier identifies the type of error message. The content of each message identifier is unique to an operating system.

2 Channel/Unit Address (CUA)

The three characters in the channel/unit address contain the system logical device address.

3 End-of-Field Comma

The end of each field (except the last) is marked by a comma. More than one comma in sequence indicates that one or more fields have been omitted.

4 Error Description

The three characters in the error description contain one of the following:

Error Description	Condition	No. of Lines*	Sense Data	Seek Address
CDC	Channel Data Check	1	N/A	Yes
ICC	Interface Control Check	1	N/A	Yes
CCC	Channel Control Check	1	N/A	Yes
OVR	Overrun	2	0–8 Δ (Line 2)	Yes
BOC	Bus Out Parity Check	2	0–7 Δ (Line 2)	Yes
CHC	Chaining Check	1	N/A	Yes
DCK	Data Check	2	0–23 Δ (Line 2)	N/A
CMD	Command Reject	2	0–8 Δ (Line 2)	Yes
EQC	Equipment Check	2	0–23 Δ (Line 2)	N/A
SKC	Seek Check	2	0–23 Δ (Line 2)	Yes
WRI	Write Inhibit	2	0–8 Δ (Line 2)	Yes

* A basic error message is displayed on one or two lines.
Δ The message identifier and the CUA are displayed with the sense data and the seek address on line 2.

5 Command Code (CMD)

The two characters in the command code contain the command code of the failing CCW.

6 Unit/Channel Status Word (CSW Stat)

The first two characters in the unit/channel status word contain the unit status. The last two characters contain the channel status.

7 Sense Data

The sense data contains 0 to 24 bytes of sense information. When the sense data contains more than 6 bytes, it is displayed on line 2 of a two-line display. Sense data is displayed in hexadecimal pairs.

8 Seek Address (BBCCHH)

The six bytes in the seek address contain the logical address of the track where an error occurs. If an error occurs when trying to obtain the seek address, the six bytes in the seek address contain the last successful seek address. See R/W 400 to convert the logical address to a physical address when in 3330-1 or 3330-11 Compatability Mode.

9 Volume ID (Volume Label)

The six characters in the volume identifier contain the customer identification for the following:

- HDA in native mode
- Logical volume in 3330-1 or 3330-11 Compatability Mode.

10 Job ID

The eight characters in the job identifier contain the name of the job.

INTERVENTION REQUIRED ERROR MESSAGE FORMATS

The intervention required error message formats contain an Intervention Required field 11 not found in the basic error message format.

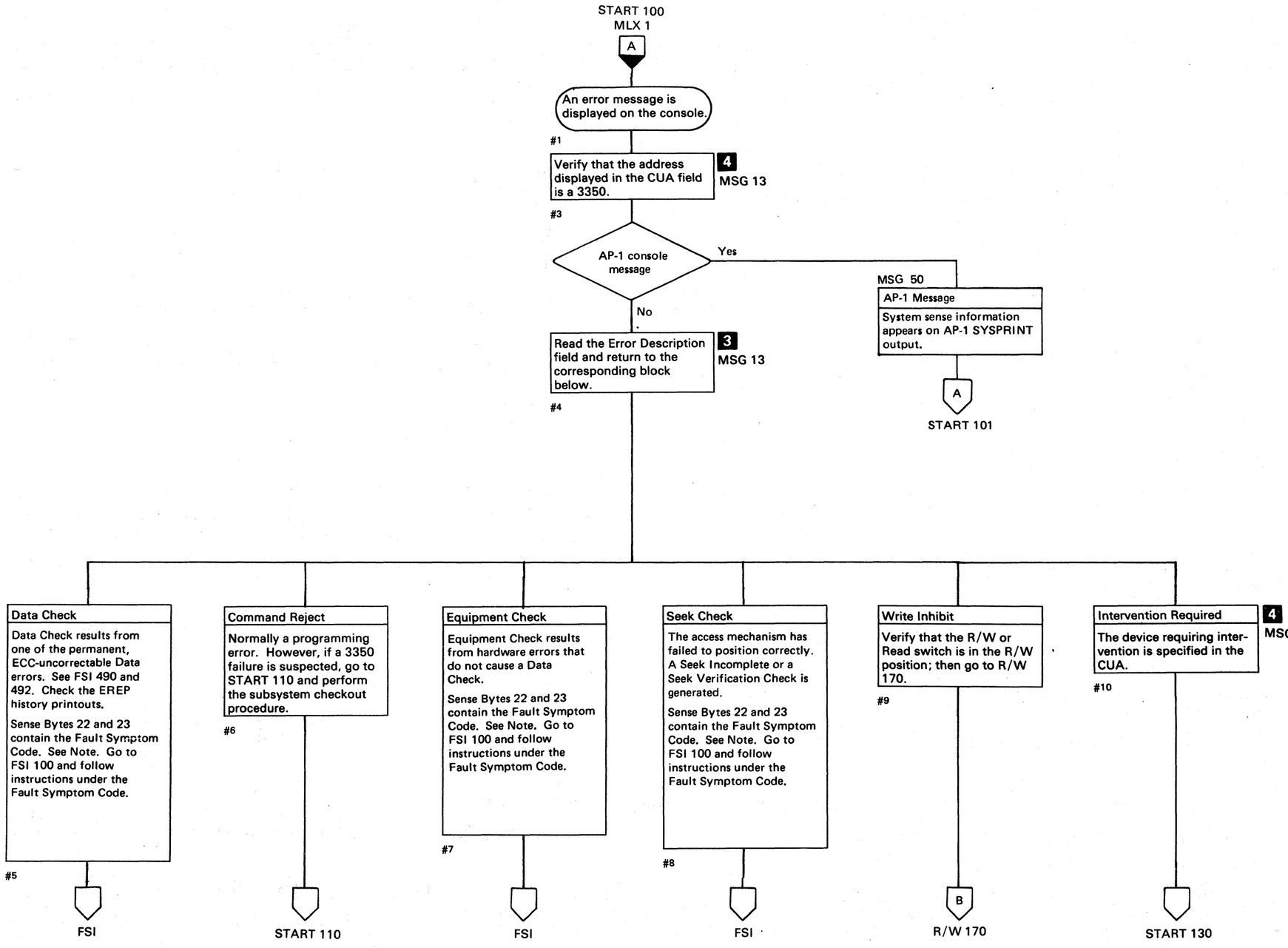
Device Intervention Required

I E A 0 0 0 A	CUA(3)	,	INT REQ	,	CMD(2)	,	CSW Stat(4)	,	Sense Data(6)	,	Volume ID(6)	,	Job ID(8)
	2		11										

Controller Not Available

I E A 0 0 0 A	CUA(3)	,	INT REQ	,	CC=3/No Paths Available	,	,	,	Job ID (8)
	2		11						

DOS/VS CONSOLE ERROR MESSAGE ANALYSIS **MSG 12**



Note: *If attached to a 3830-2 or ISC and the fault symptom code equals 0000 for sense formats 1 or 4, go to FSI 50 and reload the Fault Symptom Code Generator.*

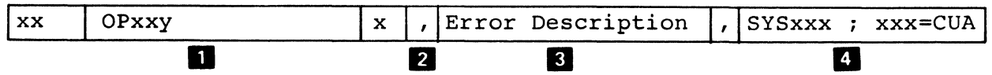
DOS/VS CONSOLE ERROR MESSAGE ANALYSIS **MSG 12**

DOS/VS CONSOLE ERROR MESSAGE ANALYSIS

DOS/VS ERROR MESSAGE FORMAT

The DOS/VS error message is displayed on three lines. When the error description 3 contains Intr Reqd (intervention required), only line 1 of the DOS/VS error message is displayed.

Line 1



Line 1 of the DOS/VS error message contains the following fields.

1 Message Identifier

The message identifier contains the following subfields:

- xx, the partition modifier, indicates the partition from which the message was issued.
- OPxxy, the error message code. The xx indicates the type of error. The y indicates the type of operator action required.
- x, the operator response, indicates how the operator should reply to y, the type of operator action required.

2 End-of-Field Comma

The end of each field (except the last) is marked by a comma.

3 Error Description

The error description contains one of the following statements:

Data Check

Cmd Reject

Equip Check

Seek Check

Write Inhibit

Intr Reqd

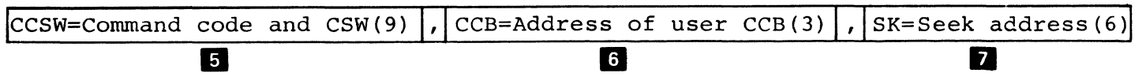
Only line 1 of the DOS/VS error message is displayed when the error description contains Intr Reqd (intervention required).

4 System Assignment and Channel/Unit Address (CUA)

SYSxxx, the system assignment, contains the type of system (for example, S/360 or S/370) to which the device is connected.

xxx, the channel/unit address, contains the address of the device where the error occurred.

Line 2



Line 2 of the DOS/VS error message contains the following fields:

5 Command Code and Channel Status Word (CCSW)

The first byte, the command code, contains the command of the failing CCW.

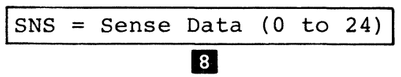
The remaining eight bytes, the channel status word, contain information about the end of the previous CCW.

6 Address of the User Command Control Block (CCB)

7 Seek Address

The six bytes in the seek address contain the logical address of the track where an error occurred. If an error occurs when trying to obtain the seek address, the six bytes in the seek address contain the last successful seek address.

Line 3



Line 3 of the DOS/VS error message contain sense data.

8 Sense Data

The sense data contains 0 through 24 bytes of sense information. When sense data contains less than 24 bytes, the remaining bytes are displayed as zeros. When all Sense Bytes are zero, only the first byte of zeros is displayed.

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ERROR CONDITION TABLE

The error condition table is a supplementary aid for the CE in interpreting 3350 error messages.

The error condition table lists the following:

- Sense Byte 0, 1, or 2.
- An active sense bit in the Sense Byte. Storage control sets the sense bit.
- The error condition indicated by the Sense Byte/Active Sense Bit combination.
- A description of the error condition.
- An indication of whether the error condition is logged or not.

ERROR CONDITION TABLE

Sense Byte	Active Sense Bit	Error Condition	Description	Logged
0	0	Command Reject	Programming error.	No
0 1	0 6	Command Reject Write Inhibit	The selected drive received a Write command while the R/W or Read switch was in the Read (Write inhibit position).	No
0	1	Intervention Required	The drive is offline in Not Ready or in CE Mode.	No
0 10	1 4 & 5	Intervention Required Drive Power-off	The Power-Off switch on the module is activated or a sequence error occurred.	Yes
0	2	Bus Out Parity	Bus Out Parity error.	Yes
0	3	Equipment Check	This indicates a hardware error.	Yes
0 1	3 0	Equipment Check Permanent	This indicates an uncorrectable hardware error. Sequence error.	Yes
0 1	4 0	Data Check Permanent	This indicates an uncorrectable data error. Storage control issued the maximum number of retries.	Yes
0 1	4 7	Data Check Operation Incomplete	This indicates a data error in the second or in a subsequent overflow segment, excluding the data area of the overflow segment.	No

ERROR CONDITION TABLE (Continued)

Sense Byte	Active Sense Bit	Error Condition	Description	Logged
0 1 2	4 7 1	Data Check Operation Incomplete Correctable	This indicates a correctable data error in the data area of any but the last overflow segment.	Yes
0 2	4 1	Data Check Correctable	This indicates a correctable data error in any data area.	Yes
0	5	Overrun	This indicates a data overrun in the second or in a subsequent overflow segment, or a data overrun during a Format Write command.	Yes
0 1	5 0	Overrun Permanent	Storage control issued the maximum number of retries for a service overrun condition.	Yes
1	1	Invalid Track Format	The capacity of a track has been exceeded.	No
1	2	End of Cylinder	A cylinder boundary has been detected during a multitrack operation.	No
1 1	2 7	End of Cylinder Operation Incomplete	A cylinder boundary has been detected during an overflow operation.	No
1	4	No Record Found	This indicates a programming error. The searched data does not exist on the track being searched.	No
1	5	File Protected	File Mask has been violated during a Seek command or during a Read/Search multitrack operation.	No
1 1	5 7	File Protected Operation Incomplete	File Mask has been violated during a Read overlfow or a Write overflow operation.	No
1	7	Operation Incomplete	After initiation of data transfer during an overflow operation, one of the following has occurred: • A defective or an alternate track has been detected. • A seek error has been detected in the second or in a subsequent overflow segment.	No
2	3	Environmental Data Present	Drive error or drive usage statistical data is present.	Yes

EREP (Environmental Record Editing and Printing)

EREP is a program in the operating system (OS/VS) or in the disk operating system (DOS/VS) under which the 3350 is running. EREP edits and prints performance data collected by the Error Recovery Programs (ERPs).

There are two types of performance data collected by the Error Recovery Programs:

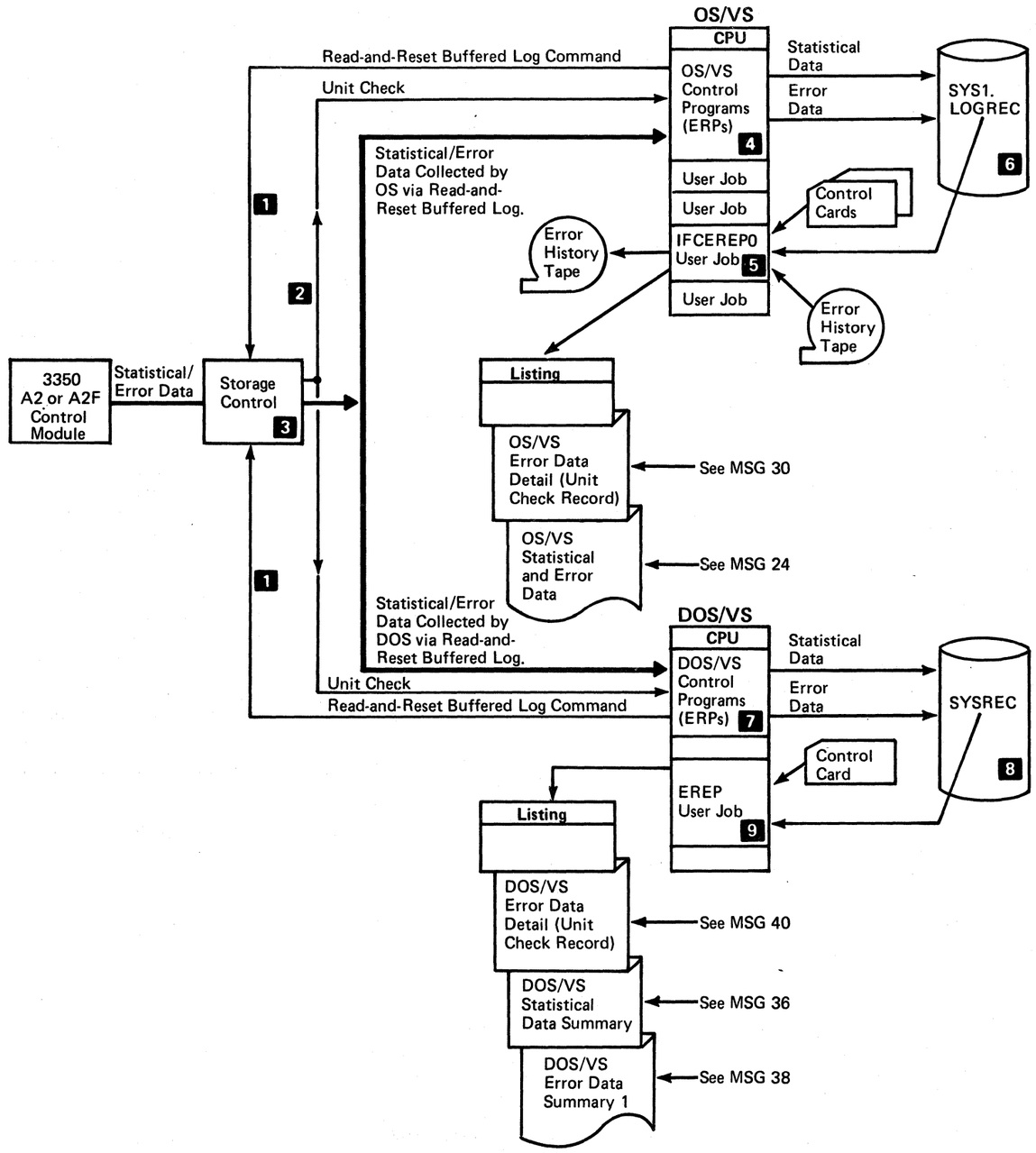
Statistical Data

Error Data

HOW TO RUN EREP

Most installations have an established procedure for processing performance data. This procedure should not only include JCL statements for the execution of the EREP program, but should also define the operating practices necessary to periodically print accumulated error records via EREP. Examples of the JCL required to execute EREP are described in the following:

- *System/370 Diagnostic Reference Summary,* Order No. SY25-0512.
- *OS/VS2 System Programming Library: SYS1.LOGREC Error Recording,* Order No. GC28-0677.
- *OS/VS1 SYS1.LOGREC Error Recording,* Order No. GC28-0668.
- *DOS/VS Serviceability Aids and Debugging Procedures,* Order No. GC33-5380.
- *IBM Virtual Machine Facility/370: OLTSEP and Error Recording Guide,* Order No. GC20-1809.



EREP (ENVIRONMENTAL RECORD EDITING AND PRINTING)

STATISTICAL DATA COLLECTION

The statistical data contains the following:

Sense Bytes 0 through 7 (see SENSE 100).

Sense Bytes 8 through 23 (see SENSE 103).

Statistical data is collected as a result of one of the following:

- The operator issued a Halt EOD (End-of-Day) command for OS/VS or an ROD (Record on Demand) command for DOS/VS.
- The EREP program is executed.
- A drive error counter in storage control exceeded 64 data retry checks or 8 seek errors.
- A drive usage counter in storage control exceeded $2^{31}-1$ bytes read or $2^{15}-1$ access motions.
- A volume Demount is issued by the system.

Halt EOD or ROD Statistical Data Logging

Halt EOD command, ROD command, or the EREP program cause statistical data to be logged as follows:

1. When the operator issues a Halt EOD or an ROD command, the operating system (OS/VS or DOS/VS) initiates the Read-and-Reset Buffered Log 1 sense command.
2. Read-and-Reset Buffered Log reads the statistical data (Sense Bytes) in the buffered log in storage control 3.
3. The sense bytes are logged in the SYS1.LOGREC (OS/VS) 6 or in the SYSREC (DOS/VS) 8 along with the following:

   Date and time the Sense Bytes were collected.

   Type of device from which the Sense Bytes originated.

   Physical Drive address from which the Sense Bytes originated.

   Volume ID (customer label).
4. Read-and-Reset Buffered Log 1 resets the Sense Bytes in the buffered log in storage control 3.

Drive Error or Drive Usage Statistical Data Logging

Drive error or drive usage statistical data is logged as follows:

1. When a drive error or drive usage counter in storage control 3 exceeds a certain value, the next Start I/O command to the drive is not executed. Instead storage control sends a Unit Check 2 to the operating system (OS/VS or DOS/VS).
2. Format 6 Sense Bytes are sent to the 3350 Error Recovery Procedures (ERPs) in the OS/VS or DOS/VS control programs 4 or 7 for analysis.
3. The Sense command resets the Sense Bytes in the buffered log in storage control 3.
4. The ERPs determine that the Sense Bytes contain drive error or drive usage statistical data (see SENSE 100, Byte 2, bit 3 and Byte 7 for Format 6).
5. The operating system re-issues the Start I/O command.
6. The drive error or drive usage statistical data is logged in the SYS1.LOGREC (OS/VS) 6 or in the SYSREC (DOS/VS) 8 along with the following:

   Date and time the Sense Bytes were collected.

   Type of device from which the Sense Bytes originated.

   Channel/Unit address of the device from which the Sense Bytes originated.

   Physical Drive address from which the Sense Bytes originated.

   Volume ID (customer label).

FORCED LOGGING MODE

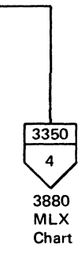
Forced logging mode is used to collect additional drive error data concerning highly intermittent Seek Checks or highly intermittent Data Checks. In forced logging mode, the value in the drive error counter in storage control is disregarded.

3830-2/ISC

Forced logging mode is initiated by placing the 3830 CE Mode switch in the FORCED LOGGING position.

3880

Refer to 3880 documentation (3880 Storage Control, 3350 MLX ENTRY 4) for instructions on how to place the 3880 in Forced Logging Mode.



ERROR DATA COLLECTION

The error data contains the following:

Sense Bytes 0 through 7 (see SENSE 100).

Sense Bytes 8 through 23 (see SENSE 103).

Error data is collected as a result of one of the following:

- Equipment Check
- Permanent Uncorrectable Data Check
- Correctable Data Check
- Bus Out Parity Check
- Overrun

Error Data Logging

Error data is logged as follows:

1. When the operating system (OS/VS or DOS/VS) detects an I/O interrupt caused by a Unit Check 2, the error data (Sense Bytes) is sent to the 3350 Error Recovery Procedures (ERPs) in the OS/VS or DOS/VS control programs 4 or 7.
2. The Sense Bytes are recorded in the SYS1.LOGREC (OS/VS) 6 or the SYSREC (DOS/VS) 8 along with the following:

   Data and time the Sense Bytes were collected.

   Type of device from which the Sense Bytes originated.

   Program ID (job name).

   Channel/Unit address of the device from which the Sense Bytes originated.

   Physical Drive address from which the Sense Bytes originated.

   Volume ID (customer label).

   Failing CCW.

   CSW.

   Last Seek Address.

STATISTICAL AND ERROR DATA RETRIEVAL, EDITING, AND PRINTING

Statistical data and error data are retrieved, edited, and printed from SYS1.LOGREC 6 by IFCEREPO (OS/VS) 5 or from SYSREC 8 by EREP (DOS/VS) 9.

OS/VS STATISTICAL AND ERROR DATA SUMMARY

This page shows an example of an OS/VS statistical and error data summary. The following pages explain the contents of the summary.

```
                                        2          3          4          4          4
1 SUMMARY OF I/O RECORDS   TYPE OBR/MDR   SOURCE-OUTBOARD   DEVICE TYPE 3350   MODEL-0145   SERIAL NO.-010054

   5        DAY YEAR     DAY YEAR                    6
  DATE RANGE- 162   75 TO 162   75      TOTAL NUMBER OF RECORDS 0058                    11
7 PHYSICAL  8 BUS OUT    EQUIP. CK.  9 EQUIP. CK.    DATA 10 DATA CHECK OVERRN  12 INV.  13 SEEK CHK  14 STATISTICAL
  ADDRESS   PARITY          C.U.         DRIVE        CHECK  CORR RETRY          TRACK
                          TEMP  PERM   TEMP  PERM     PERM                      FMT.

   143        0002        0002  0001   0000  0000     0000   0000 0032  0003     0000      00002         0016

xxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxx
                                        16         17         18         18         18
15 FAULT SYMPTOM CODE SUMMARY   TYPE-OBR   SOURCE-OUTBOARD   DEVICE TYPE 3350   MODEL-0145   SERIAL NO.-010054
   SEQUENCE BY SYMPTOM CODE

19 FAULT          20 PHYSICAL          21 OCCURRENCES    22 DATE/TIME
   SYMPTOM           CHANNEL/                             LAST ENTRY
   CODE              UNIT ADDRESS

   0000                143                 00003           200/75   00:10:05:44
   0900                143                 00002           200/75   00:09:35:91
   120A                143                 00002           200/75   00:09:02:00
   2380                143                 00003           200/75   00:09:40:21
   4942                143                 00032           200/75   00:10:59:99
   5353                143                 00005           200/75   00:09:22:01

   NOTE: IF SYMPTOM CODE IS 0, REFER TO DETAIL OBR RECORD

xxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxx
23 SUMMARY OF I/O STATISTICAL RECORDS BY VOLUME ID          22 DEVICE TYPE    3350

                                                                                                                    32
24 VOLUME ID  25 PHYSICAL  26 TOTAL      27 ACCESS   28 TOTAL     29 RETRY     30 MEGABYTES   31 CORRECTABLE  MEGABYTES
                DRIVE      ACCESSES      ERRORS      MEGABYTES    READ         READ/RETRY     READ            READ/CORR
                           X1000                     READ         ERRORS       ERRORS         ERRORS          ERRORS

   335001       143        00001       00002       00031        00002        00015          00001           -N/A-

   TOTALS                  00001       00002       00031        00002        00015          00001           -N/A-

33 TOTAL OVERRUNS   CHNL A      TOTAL OVERRUNS CHNL  B      TOTAL OVERRUNS  CHNL C      TOTAL OVERRUNS  CHNL D
                COMMAND 00002                COMMAND 00000               COMMAND 00000               COMMAND 00000
                DATA    00000                DATA    00000               DATA    00000               DATA    00000

   NOTE:  ALL ZEROS IN MEGABYTES READ/XXXX ERROR COLUMNS INDICATE THAT THERE WAS LESS THAN ONE MEGABYTE READ PER ERROR
   NOTE:  N/A IS AN INDICATION OF EITHER NO RETRY READ ERRORS OR CORRECTABLE READ ERRORS IN THE RESPECTIVE COUNTERS
```

OS/VS STATISTICAL AND ERROR DATA SUMMARY

The OS/VS statistical and error data summary contains the following:

- Summary of I/O Records
- Fault Symptom Code Summary
- Summary of I/O Statistical Records by Volume ID

1 SUMMARY OF I/O RECORDS

The summary of I/O records contains the following data:

Type of I/O Record

Source of Record

Device Type, CPU Model, and Serial Number

Data Range

Total Number of Records

Physical Address

Error Data Record Counts

Statistical Data Record Count

2 Type of I/O Record

There are two types of I/O record:

- OBR (Outboard Record), which contains error data.
- MDR (Miscellaneous Data Record), which contains statistical data.

3 Source of I/O Record

The source of the I/O record for the 3350 is the OBR/MDR records.

4 Device Type, CPU Model, and Serial Number

The type, model, and serial number are self-explanatory.

5 Date Range

The date range indicates the day and the year time period when the OS/VS statistical and error data were logged.

6 Total Number of Records

The total number of records contains the sum of the number of times error data and statistical data were logged.

7 Physical Address

The physical address is the Channel/Unit address from which the error data and the statistical data came. It is the base (lowest) address for all statistical data compiled on the drive. For example, statistics for address 2B0 (3330-1 Compatibility Mode) are logged for address 290.

8 – 13 Error Record Data Counts

The error record data counts indicate how many times each of the following occurred:

Bus Out Parity

Equipment Check

Data Check

Overrun

Invalid Track Format

Seek Check

Each error record data count that contains an entry has a corresponding Fault Symptom Code 19 . For example, there are 0002 entries in the Seek Chk error record data count 13 . The third entry, 120A, under Fault Symptom Code 19 corresponds to the Seek Chk error record data count 13 .

Locate the Fault Symptom Code in the FSI section for an analysis procedure of the error.

Note: *Each entry in the error record data count is treated in detail by a unit check record. See OS/VS error data detail (unit check record) on MSG 30.*

BUS OUT PARITY

Bus Out parity indicates how many parity errors occurred on Bus Out. (See the storage control MLM for further analysis.)

EQUIPMENT CHECK

Equipment Check indicates how many temporary and permanent hardware errors occurred in each of the following:

Storage Control (See the storage control MLM for further analysis.)

Controller Temporary if recovered by ERP retry.

Drive Permanent if retry failed.

DATA CHECK

Data Check indicates how many of each of the following occurred:

Permanent Data Check -Sense Byte 1, bit 0 set by storage control.

Correctable Data Check -Format 53, no retry.

Retry during logging mode

OVERRUN

Overrun indicates how many times a service (data) overrun occurred during the following:

A record overflow operation in a second or subsequent overflow segment.

A Write Format operation.

INVALID TRACK FORMAT

Invalid track format indicates that Index was detected during one of the following:

A Write command.

A Read or Search command. In this case, an Index was detected in the gap following a Count field or a Key field.

An invalid track format is usually a programming error.

SEEK CHECK

A Seek Check indicates how many times Seek Verification Check or Seek Incomplete errors occurred.

14 Statistical Data Record Count

The statistical data record count indicates how many Miscellaneous Data Records (MDR) have been recorded in the LOGREC.

15 FAULT SYMPTOM CODE SUMMARY

The Fault Symptom Code Summary contains the following data:

Type of Record

Source of Record

Device Type, CPU Model, and Serial Number

Fault Symptom Code

Physical Channel/Unit Address (CUA)

Occurrences

Date/Time Last Entry

16 Type of Record

The Fault Symptom Code Summary is from OBR, the type of record in which error data is logged.

17 Source of Record

The source of the record for the Fault Symptom Code Summary is the OBR.

18 Device Type, CPU Model, and Serial Number

The device type, CPU model, and serial number are self-explanatory.

19 Fault Symptom Code

The Fault Symptom Code is a number generated by storage control. Storage control generates this number from sense information and places the number in Sense Bytes 22 and 23.

The Fault Symptom Code provides an entry to the Fault Symptom Index (FSI) pages in the MIM.

Each Fault Symptom Code entry is covered in detail on a unit check record. (See OS/VS Error Data Detail on MSG 30.)

Note: *A Fault Symptom Code of 0000 indicates that the Fault Symptom Code Generator did not operate when a fault was logged. For details concerning a 0000 Fault Symptom Code, see the OS/VS Error Data Detailed (Unit Record) Output. For details on how to generate the Fault Symptom Code, see FSI 50.*

5x5x symptom codes are developed by EREP to allow correctible data checks to be included in this report. This symptom code is not used to isolate Format 5 errors.

OS/VS STATISTICAL AND DATA SUMMARY (Continued)

20 Physical Channel/Unit Address

The physical channel/unit address identifies the device from which the error data came. It is the base (lowest) address for all statistical data compiled on the drive. For example, statistics for address 2B0 (3330-1 Compatibility Mode) are logged for address 290.

21 Occurrences

Occurrences indicates how many times a Fault Symptom Code was generated.

22 Date/Time of Last Entry

Date/time of last entry indicates when the last entry for each Fault Symptom Code was made in the Fault Symptom Code Summary.

23 SUMMARY OF I/O STATISTICAL RECORDS BY VOLUME ID

The statistical record summary contains the following data:

Volume ID

Physical Drive

Total Accesses

Access Errors

Total Megabytes Read

Retry Read Errors

Megabytes Read/Retry Errors

Correctable Read Errors

Megabytes Read/Corr Errors

Total Overruns

24 Volume ID

Volume ID contains the customer serial number (label) of the volume that was running when the statistical data was collected.

25 Physical Drive

Physical drive contains the physical address of the drive from which the statistical data was obtained. For additional detail, see Physical Address 7 .

26 Total Accesses

Total accesses indicates how many thousands of access operations occurred during the date range 5 in the I/O record summary.

27 Access Errors

Access errors indicates how many access errors occurred during the date range 5 in the I/O record summary.

28 Total Megabytes Read

Total megabytes read indicates how many megabytes of data were read from the indicated volume during the date range 5 in the I/O record summary.

29 Retry Read Errors

Retry read errors indicates how many retry read errors occurred while reading from the indicated volume during the date range 5 in the I/O record summary.

30 Megabytes Read/Retry Errors

Megabytes read/retry errors indicates how many megabytes of data were read during all retry errors that occurred during the date range 5 in the I/O record summary. If no read/retry errors occured, –NA– appears in this column. Low values (approaching 1) may indicate failing drive performance.

31 Correctable Read Errors

Correctable read errors indicates how many correctable read errors occurred while reading from the indicated volume during the date range 5 in the I/O record summary.

32 Megabytes Read/Corr Errors

Megabytes read/corr errors indicates how many megabytes of data were read during all correctable errors that occurred during the date range 5 in the I/O record summary. If no read/retry errors occurred, –NA– appears in this column. Low values (approaching 1) may indicate failing drive performance.

33 Total Overruns

Total overruns indicates how many command and data overruns occurred on storage control interfaces during the date range 5 in the I/O record summary.

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OS/VS ERROR DATA DETAIL (UNIT CHECK RECORD)

This page shows an example of an OS/VS unit check record. This example contains data concerning one of the 32 data check retries shown on MSG 24 [10] .

An actual EREP OS/VS printout contains one unit check record for each entry in the error record data counts [8] through [13] on MSG 24.

```
[1] ---RECORD ENTRY TYPE - UNIT CHECK  [2] SOURCE - OUTBOARD          [3] MODEL- 0155   [3] SERIAL NO.   010017
 [4] VS 1 REL.   05                          [5] LOGGING MODE
                          DAY YEAR                    HH MM SS.TH              [7] JOB  IDENTITY EREP3350
                  [6] DATE- 165   75          [6] TIME 22 36 50 26                          C5D9C5D7F3F3F5F0

[8] DEVICE TYPE IS AN EMULATED      3330M11
    PHYSICAL  CHANNEL UNIT ADDRESS  000143
    LOGICAL   CHANNEL UNIT ADDRESS  000143
    PHYSICAL DRIVE                  D
    VOLUME LABEL                    333101

                          [9] LOGGING MODE   DATA CHECK-RETRY    .

[10] ERROR SYMPTOM CODE- 4942
[11] SENSE BYTE DATA-  FORMAT 4

  BYTE 0   00    BYTE 1   00    BYTE 2   18    BYTE 3   00    BYTE 4   10    BYTE 5   02    BYTE 6   00    BYTE 7   42
----------UNIT CHECK DESCRIPTION-----------  RESTART CMND   PHYSICAL ID    CYL( 1 TO 128)--HEAD---------  FORMAT/MSG
                    [12]                          [13]           [14]           [15]           [16]

COMMAND REJ 0  PERM ERROR  0              0   00000000     DRIVE A     0  CYL 128     0  CE CYL 1024 0  FORMAT  8   0
INTERVN REQ 0  INV TRK FMT 0  CORRECTABLE 0               DRIVE B     0  CYL  64     0  CYL 512/256 0  FORMAT  4   1
BUS OUT PAR 0  END OF CYL  0              0               DRIVE C     0  CYL  32     0  DIF/CYL 256 0  FORMAT  2   0
EQUIPMNT CK 0              0  ENV DATA PR 1               DRIVE D     1  CYL  16     0  HEAD 16     0  FORMAT  1   0
DATA CHECK  0  NO REC FND  0  EMULATION   1               DRIVE E     0  CYL   8     0  HEAD 8      0  MESSAGE 8   0
OVERRUN     0  FILE PROTCT 0              0               DRIVE F     0  CYL   4     0  HEAD 4      0  MESSAGE 4   0
            0  WRT INHIBIT 0              0               DRIVE G     0  CYL   2     1  HEAD 2      0  MESSAGE 2   1
            0  OP INCOMPLT 0              0               DRIVE H     0  CYL   1     0  HEAD 1      0  MESSAGE 1   0

[17] BYTE 8   00    BYTE 9   02    BYTE 10  00    BYTE 11  00    BYTE 12  F8    BYTE 13  01    BYTE 14  00    BYTE 15  00
----------------------CCHHR READ FROM COUNT-----------------------------  SECTOR NUMBER

CYL  -     0  CYL 128     0  HEAD -     0  HEAD -     0  RECORD -    1  SECTOR -    0     00000000        00000000
CYL  -     0  CYL  64     0  HEAD -     0  HEAD -     0  RECORD 64   1  SECTOR 64   0
CYL  -     0  CYL  32     0  HEAD -     0  HEAD -     0  RECORD 32   1  SECTOR 32   0
CYL  -     0  CYL  16     0  HEAD -     0  HEAD 16    0  RECORD 16   1  SECTOR 16   0
CYL  -     0  CYL   8     0  HEAD -     0  HEAD  8    0  RECORD  8   1  SECTOR  8   0
CYL  -     0  CYL   4     0  HEAD -     0  HEAD  4    0  RECORD  4   0  SECTOR  4   0
CYL 512    0  CYL   2     1  HEAD -     0  HEAD  2    0  RECORD  2   0  SECTOR  2   0
CYL 256    0  CYL   1     0  HEAD -     0  HEAD  1    0  RECORD  1   0  SECTOR  1   1

  BYTE 16  00    BYTE 17  00    BYTE 18  00    BYTE 19  00    BYTE 20  00    BYTE  21 00    BYTE 22  49    BYTE 23  42
                                                                                -----ERROR SYMPTOM CODE----
 00000000        00000000        00000000        00000000        00000000        0000000        01001001 [18] 01000010

  HEX DUMP OF RECORD
  HEADER    30440800    00000000    0075165F    22365026    01010017    015502A0

     0000   00000000    00000000    00000000    00000000    0000A7A8    02000000    03000143    3050200D
     0020   00000141    000A0018    F3F3F3F1    F0F10000    00000000    02000000    00020000    00000000
     0040   00001800    10020042    00020000    F8010001    00000000    00004942
```

OS/VS ERROR DATA DETAIL (UNIT CHECK RECORD)

The OS/VS error data detail (unit check record) contains the following:

1 Record Entry Type – Unit Check

The record entry type indicates a unit check record.

2 Source of the Unit Record

The source of the 3350 unit record is the outboard part of the outboard recorder/miscellaneous data recorder(OBR/MDR).

3 Model and Serial Number

The model and the serial number of the CPU are self-explanatory.

4 VS1 Rel.05

VS1 Rel.05 identifies the operating system being used.

5 Logging Mode

Logging mode indicates that the unit check record is printing the detail of an error (data check retry) that occurred during logging mode.

6 Date/Time

Date/time indicates the day, year, hour, minute, second and the tenth of a second that the data check retry occurred.

7 Job Identity

The job identity indicates the job ID that can be used to recreate the error.

8 Device/Address Data

Physical Channel Unit Addres = Primary address from UCB.

Logical Channel Unit Address = last used address (actual) to which a START I/O was issued.

Physical Drive = drive location within the string (A-H).

Volume Label = last known label from UCB.

9 Logging Mode - Data Check Retry

Logging mode – data check retry indicates the type of error that the unit check printout is treating.

10 Error Symptom Code

The Error Symptom Code is the same as the Fault Symptom Code from Sense Bytes 22 and 23. The Fault Symptom Code provides an entry to the FSI section.

11 Sense Byte Data - Format 4

Sense Byte Data – Format indicates the error format. See the SENSE section for error format descriptions.

12 Unit Check Description

The unit check description indicates the error and an action for subsystem recovery. In the example there is no error indicated, but environmental (statistical) data present is indicated. This means that an error/usage counter, in this case the data check retry counter, overflowed and caused logging mode.

13 Restart Command

Restart command indicates whether a Read or Write command was in progress when an operation incomplete is indicated in bit 7 of byte 1 under unit check description.

14 Physical ID

Physical ID indicates the physical drive in the string where the error occurred (described in 8) .

15 Cylinder (1 to 128)

Cylinder 1 to 128 indicates the low-order portion of the cylinder address where the error occurred.

16 Head

Head indicates the high-order portion of the cylinder address and the head that was selected when the error occurred.

17 Sense Bytes 8 – 21

The contents of Sense Bytes 8 through 21 vary depending upon the error 9 and 10 and the format 11 . See the SENSE section for the explanation of the contents of Sense Bytes 8 through 21.

18 Error Symptom Code

The hex value of the Error Symptom Code is the Fault Symptom Code.

DOS/VS STATISTICAL DATA SUMMARY

This page shows and explains an example of a DOS/VS statistical data summary.

```
                                --EREP SUMMARY --

                          1 FILE DATE RANGE   FIRST   75/167    LAST   75/167

2 DEVICE TYPE 3330  3 NORMALIZED CUA 1C8     4 TOTAL RECORDS 00002

5 TOTAL OVERRUNS  CHNL A                      TOTAL OVERRUNS  CHNL B
                  COMMAND   000000                            COMMAND   000000
                  DATA      000000                            DATA      000000

                  6 TOTAL     7 ACCESS   8 TOTAL     9 RETRY    10 MEGABYTES   11 CORRECTABLE   12 MEGABYTES
                    ACCESSES    ERRORS     MEGABYTES   READ       READ/RETRY     READ             READ/CORR
                    (X1000)                READ        ERRORS     ERRORS         ERRORS           ERRORS
   TOTALS           000000      000000     000000      000002     000000         000000           000000
13 VOLUME ID
   3330 01          000000      000000     000000      000002     000000         000000           000000

   NOTE:  ALL ZEROS IN MEGABYTES READ/XXX COLUMNS INDICATE THAT THERE WAS LESS THAN ONE
          MEGABYTE READ PER ERROR.
```

1 File Date Range

File date range indicates the year/day time period during which the statistical data was logged.

2 Device Type

Device type indicates, in this case, 3330-1 Compatability Mode.

3 Normalized CUA

Normalized CUA (channel/unit address) identifies the device from which the statistical data came.

4 Total Records

Total records indicates the total number of entries in the statistical data counts 6 through 13 .

5 Total Overruns

Total overruns indicates how many command and data overruns occurred on the storage control interfaces during the file data range.

6 Total Accesses

Total accesses indicates how many thousands of access operations occurred during the file data range.

7 Access Errors

Access errors indicates how many access errors occurred during the file date range.

8 Total Megabytes Read

Total megabytes read indicates how many megabytes of data were read during the file data range.

9 Retry Read Errors

Retry read errors indicates how many retry read errors occurred during the file data range.

10 Megabytes Read/Retry Errors

Megabytes read/retry errors indicates how many megabytes of data were read during all retry errors that occurred during the file data range.

11 Correctable Read Errors

Correctable read errors indicates how many correctable read errors occurred during the file data range.

12 Megabytes Read/Corr Errors

Megabytes read/corr errors indicates how many megabytes of data were read during all correctable errors that occurred during the file data range.

13 Volume ID

The volume ID contains the customer serial number (label) of the volume that was running when the statistical data was obtained.

To the right of the volume ID are seven indications that normally contain the same data as found in 6 through 12 .

In the rare case when a volume ID is changed during a file data range, the indications to the right of volume ID display the portion of the total errors that occurred during the time each label was installed.

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DOS/VS ERROR DATA SUMMARY

This page shows and explains an example of a DOS/VS error data summary.

```
                              --EREP SUMMARY--

 1 DEVICE TYPE 3330 2 NORMALIZED CUA 1C8  3 FILE DATE RANGE    FIRST 75/167    LAST 75/167

          4 VOLUME LABELS ENCOUNTERED - MAXIMUM OF 10
                              VOLUME  COUNT
                              333001   002

                          5 TOTAL RECORDS - 00002

                          6 SENSE BYTE 7 SUMMARY

   VALUE/COUNT     VALUE/COUNT     VALUE/COUNT     VALUE/COUNT
    00   000        00   000        18   000        40   000
    01   000        0D   000        19   000        41   000
    02   000        0E   000        1A   000        42   000
    03   000        0F   000        1B   000        43   000
    04   000        10   001        1C   000        44   000
    05   000        11   000        1D   000        45   000
    06   000        12   000        20   000        46   000
    07   000        13   000        21   000        47   000
    08   000        14   000        22   000        50   000
    09   000        15   000        23   000        51   000
    0A   000        16   000        24   000        52   000
    0B   001        17   000        30   000        53   000
```

1 Device Type

Device type indicates, in this case, 3330-1 Compatability Mode.

2 Normalized CUA

Normalized CUA (channel/unit address) identifies the device from which the error data came.

3 File Date Range

File date range indicates the year/day time period during which the error data was logged.

4 Volume Labels Encountered

Volume labels encountered contains the following:

- Volume
- Count

VOLUME

Volume contains the customer serial number (label) of the volume that was running when the error data was obtained.

COUNT

Count contains the number of errors that occurred during the time that the volume was labeled as indicated.

5 Total Records

Total records indicates how many error indications are in the Sense Byte 7 summary 6 .

6 Sense Byte 7 Summary

Sense Byte 7 summary contains the following:

- Value
- Count

VALUE

Value is a two-digit number. The first digit indicates the error format code (0 through 6). The second digit indicates the message code (0 through F). See SENSE 100 for detail concerning Sense Byte 7.

COUNT

Count indicates how many errors occurred of the type indicated by the message code.

Note: *Each error entry under count is treated in detail on a unit check record. (See DOS/VS Error Data Detail on MSG 40.)*

DOS/VS ERROR DATA DETAIL (UNIT CHECK RECORD)

This page shows an example of a DOS/VS unit check record. This example contains data concerning one of the two errors indicated in the count column under Sense Byte 7 summary 6 on MSG 38.

An actual EREP DOS/VS printout contains one unit check record for each entry in the count column under Sense Byte 7 summary 6 on MSG 38.

```
                                --- I/O DEVICE EDITING ---

                    1 TASK IDENTITY - RTPDK                                  DAY  YEAR          HH MM SS
2 RECORD TYPE - UNIT CHECK                                          3 DATE - 167   75     TIME - 02 07 29

4 CPU MODEL 0155    SERIAL 010017
5 DOS RELEASE LEVEL 32

6 FAILING CHANNEL/UNIT ADDRESS  0161    7 DEVICE TYPE  3330

                  CC   DA    FL    CT                                                  K    CA     US CS  CT
8 FAILING CCW     11 010208  60 00 0001                                    9 CSW     10 0146C0  0E 00 0000

10 NUMBER OF I/O RETRIES - 00001     11 NUMBER OF SIOS - 00000839
12 PHYSICAL DRIVE  B
   PHYSICAL CONTROL UNIT  1
13 VOLUME LABEL - 222222

14 EQUIPMENT CHECK-CODE - TEMPORARY
15 ERROR SYMPTOM CODE - 9210

                                                                    M  B B  C C  H H  R
16 SENSE BYTE DATA FORMAT 1              17 LAST SEEK ADDRESS       00 0000 0004 0006 00

 BYTE 0     10   BYTE 1    00   BYTE 2    08   BYTE 3    00   BYTE 4     40   BYTE 5   04   BYTE 6  06   BYTE 7    10
----------UNIT CHECK DESCRIPTION----------  RESTART CMND  PHYSICAL ID     CYL(1 TO 128)-HEAD-------  FORMAT/MSG
                  18                            19              20              21             22          23

CMND REJECT  0  PERM ERROR  0  BIT 0       0   00000000   CODE 1/8     0  CYL 128     0   REVERSE   0  FORMAT  8   0
INTRVN REQD  0  INV TRK FMT 0  CORRECTABLE 0              CODE 1/8     1  CYL 64      0   CYL 256   0  FORMAT  4   0
BUS OUT PAR  0  END OF CYL  0  BIT 2       0              CODE 1/8     0  CYL 32      0   DIF 256   0  FORMAT  2   0
EQUIP CHK    1  BIT 3       0  ENV DATA PR 0              CODE 1/8     0  CYL 16      0   HEAD 16   0  FORMAT  1   1
DATA CHECK   0  NO REC FND  0  EMULATION   1              CODE 1/8     0  CYL 8       0   HEAD 8    0  MESSAGE 8   0
OVERRUN      0  FILE PROT   0  BIT 5       0              CODE 1/8     0  CYL 4       1   HEAD 4    1  MESSAGE 4   0
BIT 6        0  WRT INHIBIT 0  BIT 6       0              CODE 1/8     0  CYL 2       0   HEAD 2    1  MESSAGE 2   0
BIT 7        0  OP INCOMP   0  BIT 7       0              CODE 1/8     0  CYL 1       0   HEAD 1    0  MESSAGE 1   0

24 BYTE 8    89   BYTE 9    0A   BYTE 10   60   BYTE 11   B5   BYTE 12    00   BYTE 13  00   BYTE 14 00   BYTE 15   00
   FILE STATUS     CHECK STATUS   SEQ CONTRL     LD SW STAT     RD/WR SFTY     DCI BUS OUT    DCI BUS IN      DCI TAG BUS

CTLR CK      1                0  HDA MODE    0  DR STR SW   1  MLT HD SL CK 0  BIT 0     0  BIT 0     0  BIT 0       0
INF CK       0  SEC CMP CK  0  0  LAT 4       1  GRD BAND    0  CPB/ENB CK   0  BIT 1     0  BIT 1     0  BIT 1       0
DRV CK       0  MTR SPD LT  0  0  LAT 2       1  TRGT VELO   1  WRT OVRRN    0  BIT 2     0  BIT 2     0  BIT 2       0
R/W CK       0  AIR SW LT   0  0  LAT 1       0  TRK CRSSNG  1  INDX CK      0  BIT 3     0  BIT 3     0  BIT 3       0
ONLINE       1  WRT ENAB    1  1  HDA TIMER   0  BIT 4       0  DELTA I CK   0  BIT 4     0  BIT 4     0  BIT 4       0
HDA ATTN     0  FHF         0  0  HDA SEQ     0  AIR SW      1  CTL CK       0  BIT 5     0  BIT 5     0  BIT 5       0
BSY/INDX MK  0  3330        1  1  BIT 6       0  BIT 6       0  WRT TRNS CK  0  BIT 6     0  BIT 6     0  BIT 6       0
SK CMPL      1  3350        0  0  ODD TRK     0  MTR SPD SW  1  I WRT/RD CK  0  BIT 7     0  BIT 7     0  BIT 7       0

BYTE 16      0E   BYTE 17   11   BYTE 18   00   BYTE 19   83   BYTE 20    00   BYTE 21  00   BYTE 22 92   BYTE 23 10
ACCESS STAT       CTLR CK        U-CODE ERR     STATUS         INTFC CK       DRIVE INTF CK  ----ERROR SYMPTOM CODE----

ACC TM OUT   0  VFO PHASE CK0  0  BIT 0       0  SET R/W/ON  1  CI TB PR CK   0  BIT 0     0   10010010 25 00010000
OVRSHT CK    0                0  BIT 1       0  BIT 1       0  CI BO PR CK   0  BIT 1     0
SRVO OFF TK  0  SERDES CK    0  0  BIT 2       0  BIT 2       0  DRV SEL CK    0  BIT 2     0
REZERO MODE  0  CTR CK       1  BIT 3       0  BIT 3       0  DV BI PR CK   0  BIT 3     0
SERVO LT     1  WR DATA CK    0  CODE 8      0  HD SHRT CK  0  CI BI PR CK   0  BIT 4     0
LIN MD LT    1  MNTR CK       0  CODE 4      0  PAD GT CK   0  I WRT FL       0  BIT 5     0
CTL LT       1  ECC CK        0  CODE 2      0  MAD 1200    1  T.R. CK       0  DV BO PR CK 0
WAIT LT      0  ZERO ECC DT   1  CODE 1      0  FHF         1  REOR CTR CK   0  DV TB PR CK 0
```

DOS/VS ERROR DATA DETAIL (UNIT CHECK RECORD)

The DOS/VS error data detail (unit check record) contains the following:

1 Task Identity

Task identity indicates the name of the job running when the error occurred.

2 Record Type

Record type indicates a unit check record.

3 Date/Time

Date/time indicates the day, year, hour, minute, and second that the error occurred.

4 CPU Model and Serial Number

The CPU model and serial number are self-explanatory.

5 DOS Release Level

The DOS release level is self-explanatory.

6 Failing Channel/Unit Address

Failing channel/unit address indicates the logical address of the drive where the error originated.

7 Device Type

Device type indicates, in this case, 3330-1 Compatibility Mode.

8 Failing CCW

Failing CCW (Channel Command Word) indicates which CCW was in process when the error occurred.

9 CSW

CSW (Channel Status Word) indicates how the last I/O operation ended when the error occurred.

10 Number of I/O Retries

Number of I/O retries indicates how many I/O retries were issued by the system ERPs (Error Recovery Programs) before the error was logged.

11 Number of SIOs

Number of SIOs (Start I/Os) indicates how many SIOs were executed by the system before the error occurred.

12 Physical Drive/Control Unit

Physical drive and physical control unit indicate the drive in the string where the error occurred and the storage control to which the drive was logically connected.

13 Volume Label

Volume label contains the volume ID.

14 Equipment Check-Code-Temporary

Equipment check-code-temporary indicates the error that is an equipment check of a temporary duration.

15 Error Symptom Code

Error symptom code is the same as the Fault Symptom Code. The Fault Symptom Code provides an entry to the FSI pages.

16 Sense Byte Data Format 1

Sense Byte data format indicates the error format. See the SENSE section for error format description.

17 Last Seek Address

Last Seek address indicates one of the following:

- Address on the disk where the error occurred.
- Last successful Seek operation before the error occurred.

18 Unit Check Description

Unit check description indicates the error and an action for subsystem recovery. The example shows an Equipment Check.

19 Restart Command

Restart command indicates whether a Read or Write command was in progress when an operation incomplete is indicated in bit 7 of Byte 1 under Unit Check description.

20 Physical ID

Physical ID indicates the location of the physical drive in the string where the error occurred.

21 Cylinder (1 to 128)

Cylinder 1 to 128 indicates the low-order portion of the cylinder address where the error occurred.

22 Head

Head indicates the high-order portion of the cylinder address and the head that was selected when the error occurred.

23 Format/Message

Format indicates the format of Sense Bytes 8 through 23; in this case, Format 1-Equipment Check.

24 Sense Bytes 8 – 21

The contents of Sense Bytes 8 through 21 vary depending upon the error 14 and 15, and the format 16. See the SENSE section for the explanation of the contents of Sense Bytes 8 through 21.

25 Error Symptom Code

Error symptom code is the same as Fault Symptom Code.

OS/VS AND DOS/VS ANALYSIS PROGRAM-1 (AP-1)

AP-1 is an online utility program designed to be run by the customer to verify correct drive operation and ensure that data is readable from the entire volume.

AP-1 is run when the customer suspects single drive failures. AP-1 output (error messages and Head Error tables) should be available when the CE arrives.

The AP-1 program executes two basic testing steps:

1. Drive Test issues Seek, Read, and Write commands to the logical device under test.
2. Data Verification Test (optional) reads the disk surface of the entire logical volume to detect data reading errors.

Output of AP-1 detected errors are printed in the form of console and diagnostic messages. These messages are available following AP-1 execution on suspected single drive failures.

See OS/VS and DOS/VS Analysis Program-1 (AP-1) Users Guide (GC26-3855) for operational information.

DESCRIPTION

Drive Test

The Drive testing sequence is as follows:

1. Seek and read with each physical movable head on physical cylinder 4.
2. Seek and read with all fixed heads.

Note: *Errors that occur during Steps 1 or 2 cause AP-1 to terminate without testing on the CE tracks.*

3. Seek to the CE cylinder and read with all heads.
4. Write on the CE cylinder with all heads.
5. Read on the CE cylinder with all heads.
6. Read multitrack.
7. Test Skip Defect ability.
8. Reformat CE tracks with standard CE data.

Data Verification Test (Optional)

The Data Verification testing sequence is as follows.

FOR OS:

1. Read data on entire cylinder.
2. Read R0s on entire cylinder.
3. Repeat Steps 1 and 2 for each cylinder.

FOR DOS:
Read R0 and all data on each cylinder.

When AP-1 detects an error, a message is printed at the operator console, and a detailed diagnostic message, including the test that failed and a physical head matrix, is printed on the system printer.

OS/VS AND DOS/VS ANALYSIS PROGRAM-1 (AP-1)

DIAGNOSTIC MESSAGES

The AP-1 program prints diagnostic messages on the system printer, not on the operator console. The message contains the failing test name and is followed by information appropriate to the error:

1. The Channel Command Word (CCW) at the failure.
2. The Channel Status Word (CSW) at the failure.
3. The Sense Bytes.
4. The Event Control Block (ECB) completion code if an OS/VS system.

MSG 60 shows the diagnostic messages in alphabetical order, the corresponding channel program that was executing at the time and the meaning of each message. For a description of the channel programs, see MSG 75.

Console Messages

Messages to the operator are printed at the operator console during the AP-1 program. For a description of the console messages, see MSG 125.

Drive Test Messages

During the Drive test, diagnostic messages are issued on SYSPRINT for each error detected during execution of a channel program (see MSG 60).

Event Control Block (ECB) Code

The ECB is a return code from the control program (OS/VS only). It is possible for an error code to be returned without a valid CSW or sense information. If AP-1 detects an error and the status (CSW) or sense information does not appear to be valid, AP-1 should be rerun. Have a system programmer investigate the ECB Code returned in this message (see the Diagnostic Message Issued columns in the tables on MSG 60).

Event Control Block (ECB) Code Definitions

Hex Digit	Description
80	W – Waiting for completion of an event.
40	C – The event has completed.
	One of the following completion codes will appear at the completion of a channel program:
7F	Channel program has terminated without error. (CSW contents useful.)
41	Channel program has terminated with permanent error. (CSW contents useful.)
42	Channel program has terminated because a direct access extent address has been violated. (CSW contents do not apply.)
43	I/O ABEND condition occurred while loading the error recovery routine. (CSW contents do not apply.)
44	Channel program has been intercepted because of a permanent error associated with device end for previous request. You may reissue the intercepted request. (CSW contents do not apply.)
48	Request element for channel program has been made available after it has been purged. (CSW contents do not apply.)
4B	One of the following errors occurred during tape error recovery processing: • The CSW command address in the IOB was zeros. • An unexpected load point was encountered. (CSW contents do not apply in either case.)
4F	Error recovery routines have been entered because of a direct access error but are unable to read Home Addresses or Record 0. (CSW contents do not apply.)
50	Channel program terminated with error. Input block was a DOS-embedded checkpoint record. (CSW contents do not apply.)

Movable and Fixed Head Error Table

In addition to the diagnostic messages, if errors associated with the Read/Write circuitry occurred during the Drive test, AP-1 produces two tables to summarize the errors; a Movable Head Error table and a Fixed Head Error table. These tables are printed on SYSPRINT after the Drive test is completed. MSG 65 shows the format of the Movable Head Error table. The physical heads or tracks are listed in the first column on the left. A 1 is placed in the column corresponding to the type of error detected for a specific head. See MSG 65 for the format of the Fixed Head Error table.

Note: *If the drive does not have fixed heads, the test will be performed on the corresponding movable heads. Errors during the test are recorded in the Fixed Head Error table. To convert to movable head address, see MSG 70.*

Data Verification Test Messages

During the Data Verification test, diagnostic messages are issued on SYSPRINT if an error is detected. See MSG 70 for a list of messages that may be issued.

OS/VS AND DOS/VS ANALYSIS PROGRAM-1 (AP-1) MSG 55

DRIVE TEST MESSAGES

Use the error information presented here and in the Physical Head Error tables on MSG 65 to aid in analyzing drive failures. See the Channel Command Word (CCW) chain that was used, starting on MSG 75.

Use the Channel Command Word chain and the address (track) to re-create the failure. The Physical Head Error tables provide information supplementing the console and the Environmental Record Editing and Printing (EREP) output.

Diagnostic Message Issued	Channel Program Name	Meaning
AMDET DATA COMPARE ERROR**	AMDET	An error is detected when the wrong record is read.
AMDET TEST*	AMDET	An error is detected when AP-1 attempts to detect an Address Mark and fails.
CLEANUP TEST*	CLEANUP	An error is detected when AP-1 has completed its test and an error occurs during the cleanup of track 1 on the CE cylinder.
FTWRT TEST*	FTWRT	An error is detected when AP-1 attempts to write a full track of data on the CE cylinder and fails.
RDMT DATA COMPARE ERROR*	RDMT	An error is detected when a drive error caused the wrong record to be read.
RDMT TEST*	RDMT	An error is detected when AP-1 attempts to read records on the CE cylinder using the multitrack command and fails.
RECAL TEST*	RECAL	An error is detected when AP-1 attempts to recalibrate the access arm to cylinder 0, head 0 and fails.
RHA HA INCORRECT**	RHA	An error is detected when AP-1 reads a Home Address other than the one expected.
RHA TEST*	RHA	An error is detected when AP-1 attempts to read the CE cylinder Home Address and fails.
RHAFT TEST*	RHAFH	An error is detected when AP-1 attempts to read all the Home Addresses under the fixed heads and fails.
RHAMH TEST*	RHAMH	An error is detected when AP-1 attempts to read Home Addresses under all the movable heads and fails.
RPS TEST*	RPS	An error is detected when AP-1 attempts to read sector or to set sector and fails.
RR01 DATA COMPARE ERROR**	RR01	An error is detected when the record read does not compare equally with the same record previously written.
RR01 TEST*	RR01	An error is detected when AP-1 attempts to read Records 0 and 1 on the CE cylinder and fails.
SD TEST*	SD	An error is detected when AP-1 attempts to write a record with nonzero SD (skip displacement) bytes and rereads it.
SKINCR TEST*	SKINCR	An error is detected when AP-1 attempts to move the access arm and fails.
SKMAX TEST*	SKMAX	An error is detected when AP-1 attempts to move the access arm from cylinder 0 to the maximum cylinder address and fails.
SKRAN TEST*	SKRAN	An error is detected when AP-1 attempts to move the access arm randomly from one cylinder address to another and fails.

Diagnostic Message Issued	Channel Program Name	Meaning
SK192 TEST*	SK192	An error is detected when AP-1 attempts to move the access arm from cylinder 0 to physical cylinder 192 and fails.
SNS TEST*	SNS	An error is detected when AP-1 attempts to obtain sense information and fails.
WRT TEST*	WRT	An error is detected when AP-1 attempts to write Records 0 and 1 on the CE cylinder and fails.
WRT WRITE INHIBIT SWITCH ON	WRT	An error is detected when AP-1 attempts to write a record and fails because the R/W or Read switch is in the Read position, or the Read/Write position is defective.
WRTPAD READ WRONG RECORD**	WRTPAD	An error is detected when AP-1 attempts to write a record using the Write Count, Key, and Data command, and read it back. The record read back (which should have been overwritten with zeros) was not as expected.
WRTPAD TEST*	WRTPAD	An error is detected when AP-1 attempts to write a record using the Write Count, Key, and Data command and fails.

*The diagnostic message is followed by:

Failing CCW = hhhh hhhh hhhh hhhh. Failing CCW = is followed by 8 bytes of the failing CCW in hexadecimal digits.

CSW = hh hhhh hhhh hhhh. CSW = is followed by 7 bytes of the CSW in hexadecimal digits.

SNS = hhhh hhhh hhhh hhhh hhhh hhhh hhhh hhhh hhhh hhhh hhhh hhhh. SNS = is followed by 24 bytes of the sense information displayed in hexadecimal digits. For a detailed explanation of sense information, see SENSE 100.

ECB = hh. For a description of the ECB, see MSG 55/

**The diagnostic message is followed by:

EXP = hhhh hhhh hhhh hhhh. EXP = is the expected results and REC = is the received results. EXP = and REC = are followed by 8 bytes of data as follows.

Test Name	Data Expected
AMDET	R2 count
RDMT	R0 count or R1 count
RHA	Home Address CCHH
RR01	R0 count, R1 count, or first 8 bytes of R1 data
WRTPAD	R1 count

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PHYSICAL HEAD ERROR TABLES

Movable Head Error Table

Head Number	Data Check	Seek Verification Check	Write Check	Data Check CE Cylinder	Data Compare Error
1 00	2	3	4	5	6
01					
02					
03					
04					
05					
06					
07					
08					
09					
10					
11					
12					
13					
14					
15					
16					
17					
18					
19					
20					
21					
22					
23					
24					
25					
26					
27					
28					
29					

1 Physical movable head address.

2 A 1 in this column indicates that a Data Check occurred while reading the Home Address on cylinder 4 with the specified movable head. Errors logged in this column cause the test to terminate before performing Write tests on the CE cylinder.

3 A 1 is this column indicates that a Seek Verification Check occurred while reading the Home Address on cylinder 4 with the specified movable head. Errors logged in this column cause the test to terminated before performing Write tests on the CE cylinder.

4 A 1 in this column indicates that a Write Check occurred while writing on the CE cylinder with the specified movable head.

5 A 1 in this column indicates that a Data Check occurred while reading the data previously written on the CE cylinder on the specified movable head.

6 A 1 in this column indicates that data successfully written and read on the CE cylinder did not compare with the pattern written on the specified movable head.

Fixed Head Error Table

Head Number	Data Check	Seek Verification Check	Head Number	Data Check	Seek Verification Check
1 00	2	3	1 30	2	3
01			31		
02			32		
03			33		
04			34		
05			35		
06			36		
07			37		
08			38		
09			39		
10			40		
11			41		
12			42		
13			43		
14			44		
15			45		
16			46		
17			47		
18			48		
19			49		
20			50		
21			51		
22			52		
23			53		
24			54		
25			55		
26			56		
27			57		
28			58		
29			59		

1 Physical fixed head address. (If this drive does not have fixed heads, these errors occurred on movable heads. See MSG 70 to convert physical fixed head numbers to physical movable head numbers.)

2 A 1 in this column indicates that an uncorrectable Data Check occurred while reading the Home Address on the specified fixed head.

3 A 1 in this column indicates that a Seek Verification Check occurred while reading the Home Address on the specified fixed head.

Physical Fixed Head Numbers To Physical Movable Head Numbers If Fixed Heads Are Not Installed

Head Number From Fixed Head Error Table	Physical Movable Head Number		Head Number From Fixed Head Error Table	Physical Movable Head Number	
	3350[1]	3330 (Compatibility Modes)[2]		3350[3]	3330 (Compatibility Modes)[4]
0	0	20	30	0	11
1	1	21	31	1	12
2	2	22	32	2	13
3	3	23	33	3	14
4	4	24	34	4	15
5	5	25	35	5	16
6	6	26	36	6	17
7	7	27	37	7	18
8	8	28	38	8	0
9	9	29	39	9	1
10	10	20	40	10	2
11	11	21	41	11	3
12	12	22	42	12	4
13	13	23	43	13	5
14	14	24	44	14	6
15	15	25	45	15	7
16	16	26	46	16	8
17	17	27	47	17	9
18	18	28	48	18	10
19	19	0	49	19	11
20	20	1	50	20	12
21	21	2	51	21	13
22	22	3	52	22	14
23	23	4	53	23	15
24	24	5	54	24	16
25	25	6	55	25	17
26	26	7	56	26	18
27	27	8	57	27	Not Used
28	28	9	58	28	Not Used
29	29	10	59	29	Not Used

1. The head numbers listed below are on physical cylinder 1.

2. The first 10 head numbers listed below (20-29) are on physical cylinder 0. The next 20 head numbers (20-28 and 0-10) are on physical cylinder 1.

3. The head numbers listed below are on physical cylinder 2.

4. The first 8 head numbers listed below (11-18) are on physical cylinder 1. The next 19 head numbers (0-18) are on physical cylinder 2.

DATA VERIFICATION TEST MESSAGES

Error messages from the Data Verification portion of the AP-1 test are the result of Errors detected may or may not be duplicates of errors that were detected during normal use of the volume. This information should be used to supplement other available Data Check information.

Diagnostic Message Issued	Meaning
DATAVER DATA CHECK CCHH - *hhhh hhhh*[1,2]	A Data Check was detected during the Data Verification test. The Probable cause is a media problem but a drive error may have occurred. The condition that caused the drive error is intermittent or marginal and was not detected during the Drive test. Go to R/W 300, Entry D.
DATAVER DATA CHECKS EXCEEDED THRESHOLD	The number of tracks with Data Checks for the device has exceeded the number of alternate tracks on the volume.
DATAVER DATA FORMAT UNACCEPTABLE ON CYL *hhhh hhhh*[1,2]	Data on the cylinder is written in a format other than the IBM standard format, or an intermittent drive error occurred during the Data Verification test, or the volume under test was accessed by another program and the other program erased an EOD record after it has been read by the Data Verification test and before it has been reread by the test.
DATAVER TEST[2]	A drive error was detected during the Data Verification test.

[1]The logical volume cylinder and head is represented by *hhhh hhhh*. This value is in hexadecimal.

[2]The diagnostic message is followed by: FAILING CCW = *hhhh hhhh hhhh hhhh* CSW = *hh hhhh hhhh hhhh* ECB = *hh* =*hhhh hhhh hhhh hhhh hhhh hhhh hhhh hhhh hhhh hhhh hhhh hhhh* where FAILING CCW = is followed by 8 bytes of the failing CCW in hexadecimal digits, CSW = is followed by 7 bytes of the CSW in hexadecimal digits. ECB = is followed by 2 hexadecimal digits representing the ECB code returned (see MSG 55), and SNS = is followed by 24 bytes of the sense information received in hexadecimal digits.

CHANNEL PROGRAMS FOR AP-1 TESTS

Data Verification Test

Channel Program Name	Channel Program Description Number
READBLD1	1
READBLD2	2
READBLD3	3

Drive Tests In Order Of Execution

Channel Program Name	Channel Program Description Number
RECAL	4
SNS	5
RECAL	4
RHAMH	6
RHAFH	7
RPS	8
SK192	9
SKINCR	10
SKMAX	11
SKRAN	12
RHA	13
WRT	14
RR01	15
RDMT	16
FTWRT	17
AMDET	18
WRTPAD	19
SD	20
CLEANUP	21

Channel Program Descriptions

1. Channel Program for Data Verification Test – READBLD1

   This channel program reads all Count, Key, and Data fields of all records on the volume. The Seek Address is modified to read each succeeding cylinder until all the Count, Key and Data areas on the logical volume have been read. The data is read from the beginning to the end of the cylinder or to an end-of-data record.

   CCWs 1, 2, and 3 are built by IOS (part of the operating system). CCW3 transfers control to the first CCW (CCW4) of the channel program built by routine READBLD1.

CCW No.	Command Code Hex	Command Code Description	Address	Flags Hex	Flags Description	Count	Comments	
1	07	Seek	AP1SEEK	40	CC	6	Seek to cylinder 0	
2	1F	Set File Mask	X'40'	40	CC	1	Set File Mask to Read Only	
3	08	TIC	CCW4	40	CC		Transfer control to channel program	
4	1A	Read Home Address	buffer	40	CC	5	Position on Home Address	Use CCWs 4 through 9 if DOS/VS
5	16	Read R0	buffer +8	80	CD	8	Read Count for Record 0	
6	16	Read R0	000	70	SLI, SKIP, CC	65535	Read data of Record 0 (no data transferred)	
7	5E	Read Multiple Count, Key, Data	000	70	SKI, SKIP, CC	65535	Read all records on track	
8	9A	Read Home Address Multitrack	buffer	40	CC	5	Position on Home Address of next track	
9	08	TIC	CCW5	00			Repeat to end-of-cylinder or EOD	
4	1A	Read Home Address	000	50	CC, SKIP	5	Position on Home Address	Use CCWs 4 through 7 if OS/VS
5	92	Read Count, Multitrack	buffer	40	CC	8	Count for restart on EOD	
6	0E	Read Key	000	70	CC, SKIP, SLI	65535		
7	08	TIC	CCW2	00		0	Repeat to end-of-cylinder or EOD	

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2. Channel Program for Data Verification Test – READBLD2

   This CCW chain is used to determine the disk address of the end-of-data record encountered by READBLD1 CCW chain. This CCW chain is also used for reading alternate tracks. The File Mask is set to No Seeks so this CCW chain will stop at the end of the track.

   CCWs 1, 2, and 3 are built by IOS (part of the operating system). CCW3 transfers control to the first CCW (CCW4) of the channel program built by routine READBLD2.

CCW No.	Command Code Hex	Command Code Description	Address	Flags Hex	Flags Description	Count	Comments	
1	07	Seek	AP1SEEK	40	CC	6	Seek to cylinder 0	
2	1F	Set File Mask	X'58'	40	CC	1	Set File Mask to Read Only, No Seeks	
3	08	TIC	CCW4	40	CC		Transfer control to channel program	
4	1A	Read Home Address	buffer	40	CC	5	Position on Home Address	Use CCWs 4 through 9 if DOS/VS
5	16	Read R0	buffer +8	80	CD	8	Read Count for Record 0	
6	16	Read R0	000	70	SLI, SKIP, CC	65535	Read data of Record 0 (no data transferred)	
7	92	Read Count, Multitrack	buffer +8	40	CC	8	Count for restart on EOD	
8	0E	Read Key, Data	000	70	SLI, SKIP, CC	65535	No data is transferred	
9	08	TIC	CCW7	00				
4	31	Search ID Equal	AP1SEEK +2	40	CC	5	Search on EOD record	Use CCWs 4 through 8 if OS/VS
5	08	TIC	CCW1	00				
6	92	Read Count, Multitrack	buffer	40	CC	8	Count for restart on EOD	
7	0E	Read Key and Data	000	70	CC, SKIP, SLI	65535		
8	08	TIC	CCW3	00			Repeat to EOD or end-of-cylinder	

3. Channel Program for Data Verification Test – READBLD3

   This CCW chain is used to restart the READBLD1, READBLD2, or READBLD3 CCW chain when it is broken by an end-of-data record or correctable Data Check. The File Mask is set to No Seeks so this CCW chain will stop at the end of the track.

   CCWs 1, 2, and 3 are built by IOS (part of the operating system). CCW3 transfers control to the first CCW (CCW4) of the channel program built by routine READBLD3.

CCW No.	Command Code Hex	Command Code Description	Address	Flags Hex	Flags Description	Count	Comments	
1	07	Seek	AP1SEEK	40	CC	6	Seek to cylinder 0	
2	1F	Set File Mask	X'58'	40	CC	1	Set File Mask to Read Only, No Seeks	
3	08	TIC	CCW4	40	CC		Transfer control to channel program	
4	31	Search ID Equal	buffer +8	40	CC	5	Search on EOD record or correctable Data Check	Use CCWs 4 through 8 if DOS/VS
5	08	TIC	CCW4	00			Repeat search if ID not equal	
6	92	Read Count, Multitrack	buffer +8	40	CC	8	Count for restart on EOD	
7	0E	Read Key and Data	000	70	CC, SKIP, SLI	65535	No data is transferred	
8	08	TIC	CCW6	00			Repeat to EOD or end-of-cylinder	
4	16	Read R0	buffer	80	CD	8	Read the Count for Record 0	Use CCWs 4 through 9 if OS/VS
5	16	Read R0	000	70	SLI, CC, SKIP	65535	Read data of Record 0 (no data is transferred)	
6	23	Set Sector	buffer +8	40	CC	1	Set sector to 127 for the 3350 and 3330 Compatibility Modes, set sector to 063 for 3344.	
7	96	Read R0 Multitrack	buffer	80	CD	8	Read Count of Record 0	
8	16	Read R0	000	70	SLI, CC, SKIP	65535	Read data of record 0 (no data is transferred)	
9	08	TIC	CCW3	00				

4. Channel Program for Drive Test – RECAL

This test issues the Recalibrate command which causes the the access arm to move to cylinder 0 on the logical volume.

CCWs 1, 2, and 3 are built to IOS (part of the operating system). CCW3 transfers control to the first CCW (CCW4) of the channel program built by the RECAL routine.

CCW No.	Command Code		Address	Flags		Count	Comments
	Hex	Description		Hex	Description		
1	07	Seek	AP1SEEK	40	CC	6	Seek to cylinder 0
2	1F	Set File Mask	X'40'	40	CC	1	Set File Mask to Read Only
3	08	TIC	CCW4	40	CC		Transfers control to channel program
4	13	Recalibrate	000	60	SLI,CC	1	
5	03	No Operation	000	00		1	To get ending status

5. Channel Program for Drive Test – SNS

The CCW chain obtains 24 bytes of sense information from the storage control. The sense information is used to determine the drive features.

CCWs 1, 2, and 3 are built by IOS (part of the operating system). CCW3 transfers control to the first CCW (CCW4) of the channel program built by the SNS routine.

CCW No.	Command Code		Address	Flags		Count	Comments
	Hex	Description		Hex	Description		
1	07	Seek	AP1SEEK	40	CC	6	Seek to cylinder 0
2	1F	Set File Mask	X'40'	40	CC	1	Set File Mask to Read Only
3	08	TIC	CCW4	40	CC		Transfers control to channel program
4	04	Sense I/O	buffer	00		24	

6. Channel Program for Drive Test – RHAMH

This CCW reads the Home Addresses under all the movable heads. The Seek Address is dynamically altered by AP-1 to cover physical tracks 00 through 29. The logical tracks read are: for the 3330-1 Compatibility Mode, cylinder 0 tracks 0-18 and cylinder 4 tracks 0-9; for the 3344, cylinder 0 track 0, cylinder 0 odd-numbered tracks, and cylinders 11-14 odd-numbered tracks.

CCWs 1, 2, and 3 are built by IOS (part of the operating system). CCW3 transfers control to the first CCW (CCW4) of the channel program built by the RHAMH routine.

CCW No.	Command Code		Address	Flags		Count	Comments
	Hex	Description		Hex	Description		
1	07	Seek	AP1SEEK	40	CC	6	Seek to cylinder 0
2	1F	Set File Mask	X'40'	40	CC	1	Set File Mask to Read Only
3	08	TIC	CCW4	40	CC		Transfers control to channel program
4	1A	Read Home Address	000	10	SKIP	5	

7. Channel Program for Drive Test – RHAFH

This CCW chain reads all fixed head Home Addresses. The Seek Address is dynamically altered by AP-1 to cover all 60 physical fixed heads. The logical tracks read are: for the 3330-1 Compatibility Mode, cylinders 1-3 tracks 0-18; for the 3344, cylinders 1-10 even numbered tracks. This test is performed only for the 3344 devices that have fixed heads installed. This test is always performed for the 3350.

CCWs 1, 2, and 3 are built by IOS (part of the operating system). CCW3 transfers control to the first CCW (CCW4) of the channel program built by the RHAMH routine.

CCW No.	Command Code		Address	Flags		Count	Comments
	Hex	Description		Hex	Description		
1	07	Seek	AP1SEEK	40	CC	6	Seek to cylinder 1
2	1F	Set File Mask	X'40'	40	CC	1	Set File Mask to Read Only
3	08	TIC	CCW4	40	CC		Transfers control to channel program
4	1A	Read Home Address	000	10	SKIP	5	

8. Channel Program for Drive Test – RPS

This CCW chain issues a Read Sector and a Set Sector command.

CCWs 1, 2, and 3 are built by IOS (part of the operating system). CCW3 transfers control to the first CCW (CCW4) of the channel program built by routine RPS.

CCW No.	Command Code		Address	Flags		Count	Comments
	Hex	Description		Hex	Description		
1	07	Seek	AP1SEEK	40	CC	6	Seek to cylinder 0
2	1F	Set File Mask	X'40'	40	CC	1	Set File Mask to Read Only
3	08	TIC	CCW4	40	CC		Transfers control to channel program
4	22	Read Sector	buffer	40	CC	1	Read random sector
5	03	No Operation	000	40	CC	1	Disorient drive
6	23	Set Sector	buffer	40	CC	1	Set to sector read
7	03	No Operation	000	00		1	Bring in channel end and device end

9. Channel Program for Drive Test – SK192

This CCW chain seeks to physical cylinder 192 and causes heavy power dissipation. This test is not run on the 3344 because the 3344 cannot seek across 192 physical cylinders.

CCWs 1, 2, and 3 are built by IOS (part of the operating system). CCW3 transfers control to the first CCW (CCW4) of the channel program built by routine SK192.

CCW No.	Command Code		Address	Flags		Count	Comments
	Hex	Description		Hex	Description		
1	07	Seek	AP1SEEK	40	CC	6	Seek to cylinder 0
2	1F	Set File Mask	X'40'	40	CC	1	Set File Mask to Read Only
3	08	TIC	CCW4	40	CC		Transfers control to channel program
4	07	Seek	buffer	40	CC	6	Seek to physical cylinder 192
5	07	Seek	AP1SEEK	40	CC	6	Seek to cylinder 0
6	23	Set Sector	buffer	40	CC	1	Set sector 0
7-102							The set of CCWs 4, 5, and 6 are repeated 32 times before CCW 103 is performed
103	03	No Operation	000	00		1	To get device end

10. Channel Program for Drive Test – SKINCR

This CCW chain tests the incremental seek capability. A pair of CCW commands (Seek and Read Home Address) is performed 50 times with the cylinder address being incremented each time.

CCWs 1, 2, and 3 are built by IOS (part of the operating system). CCW3 transfers control to the first CCW (CCW4) of the channel program built by routine SKINCR.

CCW No.	Command Code		Address	Flags		Count	Comments
	Hex	Description		Hex	Description		
1	07	Seek	AP1SEEK	40	CC	6	Seek to cylinder 0
2	1F	Set File Mask	X'40'	40	CC	1	Set File Mask to Read Only
3	08	TIC	CCW4	40	CC		Transfers control to channel program
4	07	Seek	buffer	40	CC	6	Seek to logical cylinder 11
5	1A	Read Home Address	000	50	SKIP CC	5	Verify Seek
6-106							Repeat the set of CCWs 4 and 5 48 times incrementing the physical cylinder by 1 and the CCW address by 8 each time
107	07	Seek	buffer +392	40	CC	6	Seek to cylinder *n**
108	1A	Read Home Address	000	10	SKIP	5	Verify Seek

*Seek to logical cylinder 256 for the 3344, and logical cylinder 84 for the 3330-1 Compatibility Mode.

11. Channel Program for Drive Test – SKMAX

This CCW chain tests the maximum seek capability. A pair of CCW commands (Seek and Read Home Address) is performed 50 times from cylinder 0 to the maximum cylinder address.

CCWs 1, 2, and 3 are built by IOS (part of the operating system). CCW3 transfers control to the first CCW (CCW4) of the channel program built by routine SKMAX.

CCW No.	Command Code		Address	Flags		Count	Comments
	Hex	Description		Hex	Description		
1	07	Seek	AP1SEEK	40	CC	6	Seek to cylinder 0
2	1F	Set File Mask	X'40'	40	CC	1	Set File Mask to Read Only
3	08	TIC	CCW4	40	CC		Transfers control to channel program
4	07	Seek	buffer	40	CC	6	Seek to high cylinder of logical volume
5	1A	Read Home Address	000	50	SKIP, CC	5	Verify Seek
6	07	Seek	AP1SEEK	40	CC	6	Seek to cylinder 0
7	1A	Read Home Address	000	50	SKIP, CC	5	Verify Seek
8-103							Repeat the set of CCWs 4-7 24 times. The command chaining bit is turned off in the last CCW executed.

12. Channel Program for Drive Test – SKRAN

This CCW chain tests the random seek capability. The test is run 50 times, each time a new cylinder address is derived from table RANTBL.

CCWs 1, 2, and 3 are built by IOS (part of the operating system). CCW3 transfers control to the first CCW (CCW4) of the channel program built by routine SKRAN.

CCW No.	Command Code		Address	Flags		Count	Comments
	Hex	Description		Hex	Description		
1	07	Seek	AP1SEEK	40	CC	6	Seek to cylinder 0
2	1F	Set File Mask	X'40'	40	CC	1	Set File Mask to Read Only
3	08	TIC	CCW4	40	CC		Transfers control to channel program
4	1A	Read Home Address	000	10	SKIP	5	

13. Channel Program for Drive Test – RHA

This CCW chain reads the Home Addresses on the CE cylinder. This CCW chain is repeated for the following tracks: for the 3330-1 Compatibility Mode, tracks 00-18 and 20-29; for the 3344, logical CE cylinders 0-4 even numbered tracks and logical CE cylinder 0 odd numbered tracks.

CCWs 1, 2, and 3 are built by IOS (part of the operating system). CCW3 transfers control to the first CCW (CCW4) of the channel program built by routine RHA.

CCW No.	Command Code		Address	Flags		Count	Comments
	Hex	Description		Hex	Description		
1	07	Seek	AP1SEEK	40	CC	6	Seek to cylinder *
2	1F	Set File Mask	X'44'	40	CC	1	Set File Mask to Read Only on CE cylinder
3	08	TIC	CCW4	40	CC		Transfers control to channel program
4	07	Seek	AP1CESK	40	CC	6	Seek to CE cylinder on physical volume
5	1A	Read Home Address	buffer	00		5	Read Home Address to compare

*If fixed heads are installed, seek to cylinder 1; if fixed heads are not installed, seek to cylinder 695 for the 3344 and cylinder 403 for the 3330-1 Compatibility Mode.

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14. Channel Program for Drive Test – WRT

This CCW chain writes R0 and R1 on the CE cylinder. This CCW chain is repeated for the following tracks: for the 3330-1 Compatibility Mode, tracks 00-18 and 20-29, for the 3344, logical CE cylinders 0-4 even numbered tracks and logical CE cylinder 0 odd numbered tracks.

CCWs 1, 2, and 3 are built by IOS (part of the operating system). CCW3 transfers control to the first CCW (CCW4) of the channel program built by routine WRT.

CCW No.	Command Code		Address	Flags		Count	Comments
	Hex	Description		Hex	Description		
1	07	Seek	AP1SEEK	40	CC	6	Seek to cylinder*
2	1F	Set File Mask	X'C4'	40	CC	1	Set File Mask to allow writing on CE cylinder
3	08	TIC	CCW4	40	CC		Transfers control to channel program
4	07	Seek	AP1CESK	40	CC	6	Seek to CE cylinder on physical volume
5	39	Search Home Address Equal	AP1CESK +2	40	CC	4	Validate if on correct track
6	08	TIC	CCW5	00			Repeat search is Home Address Not Found
7	15	Write Record 0	Buffer	40	CC	16	Write R0
8	1D	Write Count, Key, and Data	buffer +16	00		264	Write R1

*If fixed heads are installed, seek to cylinder 1; if fixed heads are not installed, seek to cylinder 695 for the 3344 and cylinder 403 for the 3330-1 Compatibility Mode.

15. Channel Program for Drive Test – RR01

This CCW chain reads R0 and R1 on the CE cylinder. This CCW chain is repeated for the following tracks: for the3330-1 Compatibility Mode, tracks 00-18 and 20-29; for the 3344, logical CE cylinders 0-4 even numbered tracks and logical CE cylinder 0 odd numbered tracks.

CCWs 1, 2, and 3 are built by IOS (part of the operating system). CCW3 transfers control to the first CCW (CCW4) of the channel program built by routine RR01.

CCW No.	Command Code		Address	Flags		Count	Comments
	Hex	Description		Hex	Description		
1	07	Seek	AP1SEEK	40	CC	6	Seek to cylinder*
2	1F	Set File Mask	X'44'	40	CC	1	Set File Mask to Read Only on CE cylinder
3	08	TIC	CCW4	40	CC		Transfers control to channel program
4	07	Seek	AP1CESK	40	CC	6	Seek to CE cylinder on physical volume
5	1A	Read Home Address	000	50	CC, SKIP	5	Verify Seek
6	16	Read R0	000	50	CC, SKIP	16	Read Record 0 for a Count compare
7	1E	Read Count, Key, and Data	000	50	CC, SKIP	264	
8-46							Repeat the set of CCWs 5-7 13 times
47	1A	Read Home Address	000	50	CC, SKIP	5	Position to Home Address
48	16	Read R0	buffer	40	CC	16	Read Record 0 for a Count compare
49	1E	Read Count, Key, and Data	buffer +8	00		264	Read for the Count and first 8 bytes of data are compared

*If fixed heads are installed, seek to cylinder 1; if fixed heads are not installed, seek to cylinder 695 for the 3344 and cylinder 403 for the 3330-1 Compatibility Mode.

16. Channel Program for Drive Test – RDMT

This CCW chain performs a multitrack read on the device.

CCWs 1, 2, and 3 are built by IOS (part of the operating system). CCW3 transfers control to the first CCW (CCW4) of the channel program built by routine RDMT.

CCW No.	Command Code Hex	Command Code Description	Address	Flags Hex	Flags Description	Count	Comments
1	07	Seek	AP1SEEK	40	CC	6	Seek to cylinder*
2	1F	Set File Mask	X'44'	40	CC	1	Set File Mask to Read Only on CE cylinder
3	08	TIC	CCW4	40	CC		Transfers control to channel program
4	07	Seek	AP1CESK	40	CC	6	Seek to CE cylinder, track 0 on physical volume
5	16	Read R0	buffer	40	CC	16	Read Record 0 for a Count compare
6	92	Read Count, Multitrack	buffer +8	40	CC	8	Read Record 1 for a Count compare
7-17							Repeat CCW3 11 times incrementing the buffer address by 8 each time
18	03	No Operation	000	40	CC	1	Force drive to lose orientation
19	12	Read Count	buffer +104	00		8	Read record 1 Count on track 11 again

*If fixed heads are installed, seek to cylinder 1; if fixed heads are not installed, seek to cylinder 695 for the 3344 and cylinder 403 for the 3330-1 Compatibility Mode.

17. Channel Program for Drive Test – FTWRT

This CCW chain tests the full track Read/Write capability.

CCWs 1, 2, and 3 are built by IOS (part of the operating system). CCW3 transfers control to the first CCW (CCW4) of the channel program built by routine FTWRT.

CCW No.	Command Code Hex	Command Code Description	Address	Flags Hex	Flags Description	Count	Comments
1	07	Seek	AP1SEEK	40	CC	6	Seek to cylinder**
2	1F	Set File Mask	X'04'	40	CC	1	Set File Mask to write on CE cylinder
3	08	TIC	CCW4	40	CC		Transfers control to channel program
4	07	Seek	AP1CESK	40	CC	6	Seek to CE cylinder, track 1 on physical volume
5	31	Search ID Equal	AP1CESK +2	40	CC	5	Search for ID equal on R0
6	08	TIC	CCW5	00			Repeat search if ID not equal
7	ID	Write Count, Key, and Data	buffer	80	CD	8	Write R1 Count
8	ID	Write Count, Key, and Data	000	40	CC	*n**	Write a full track of data
9	1E	Read Count, Key, and Data	000	10	SKIP	*n*+8*	Read R1 Count full track of data back back (no data is transferred)

*For the 3330-1 Compatibility Mode, *n*=13030; for the 3344, *n*=8368.

**If fixed heads are installed, seek to cylinder 1; if fixed heads are not installed, seek to cylinder 695 for the 3344 and cylinder 403 for the 3330-1 Compatibility Mode.

18. Channel Program for Drive Test – AMDET

This CCW chain detects the presence of an address amrk.

CCWs 1, 2, and 3 are built by IOS (part of the operating system). CCW3 transfers control to the first CCW (CCW4) of the channel program built by routine AMDET.

CCW No.	Command Code Hex	Command Code Description	Address	Flags Hex	Flags Description	Count	Comments
1	07	Seek	AP1SEEK	40	CC	6	Seek to cylinder*
2	1F	Set File Mask	X'04'	40	CC	1	Set File Mask to write on CE cylinder
3	08	TIC	CCW4	40	CC		Transfers control to channel program
4	07	Seek	AP1CESK	40	CC	6	Seek to CE cylinder, track 1 on physical volume
5	31	Search ID Equal	AP1CESK +2	40	CC	5	Search for ID equal on Record 0
6	08	TIC	CCW5	00			Repeat search if ID is not equal
7	ID	Write Count, Key, and Data	buffer	80	CD	8	Write Record 1 Count
8	ID	Write Count, Key, and Data	000	40	CC	1024	Write Record 1 Data
9	ID	Write Count, Key, and Data	buffer +8	80	CD	8	Write Record 2 Count
10	ID	Write Count, Key, and Data	000	40	CC	1024	Write Record 2 Data
11	31	Search ID Equal	buffer	40	CC	5	Search for ID equal on Record 1
12	08	TIC	CCW11	00			Repeat search if ID is not equal
13	03	No Operation	000	40	CC	1	Force drive to lose orientation
14	12	Read Count	buffer +16	00		8	Read Record 2 Count

*If fixed heads are installed, seek to cylinder 1; if fixed heads are not installed, seek to cylinder 695 for the 3344 and cylinder 403 for the 3330-1 Compatibility Mode.

19. Channel Program for Drive Test – WRTPAD

This CCW chain test the Write Padding capability.

CCWs 1, 2, and 3 are built by IOS (part of the operating system). CCW3 transfers control to the first CCW (CCW4) of the channel program built by routine WRTPAD.

CCW No.	Command Code Hex	Command Code Description	Address	Flags Hex	Flags Description	Count	Comments
1	07	Seek	AP1SEEK	40	CC	6	Seek to cylinder*
2	1F	Set File Mask	X'04'	40	CC	1	Set File Mask to write on CE cylinder
3	08	TIC	CCW4	40	CC		Transfers control to channel program
4	07	Seek	AP1CESK	40	CC	6	Seek to CE cylinder, track 1 on physical volume
5	31	Search ID Equal	AP1CESK +2	40	CC	5	Search for ID equal on Record 0
6	08	TIC	CCW5	00			Repeat search if ID is not equal
7	ID	Write Count, Key, and Data	buffer	40	CC	264	Write Record 1 Count
8	ID	Write Count, Key, and Data	buffer +8	40	CC	8	Write Record 2 Count
9	31	Search ID Equal	AP1CESK +2	40	CC	5	Search for ID equal on Record 0
10	08	TIC	CCW9	00			Repeat Search if ID is not equal
11	ID	Write Count, Key, and Data	buffer	40	CC	264	Write new Record 1
12	1A	Read Home Address	000	50	CC, SKIP	5	Reposition head
13	12	Read Count	000	50	CC, SKIP	8	Read Record 1 Count
14	12	Read Count	buffer +24	00		8	Read Record 1 Count again

*If fixed heads are installed, seek to cylinder 1; if fixed heads are not installed, seek to cylinder 695 for the 3344 and cylinder 403 for the 3330-1 Compatibility Mode.

20. Channel Program for Drive Test – SD

This CCW chain performs the Skip Displacement test.

CCWs 1, 2, and 3 are built by IOS (part of the operating system). CCW3 transfers control to the first CCW (CCW4) of the channel program built by routine SD.

CCW No.	Command Code		Address	Flags		Count	Comments
	Hex	Description		Hex	Description		
1	07	Seek	AP1SEEK	40	CC	6	Seek to CE cylinder
2	1F	Set File Mask	X'04'	40	CC	1	Set File Mask to write on CE cylinder
3	08	TIC	CCW4	40	CC		Transfers control to channel program
4	07	Seek	AP1CESK	40	CC	6	Seek to CE cylinder, track 1
5	39	Search Home Address equal	AP1CESK +2	40	CC	4	Verify Seek
6	08	TIC	CCW5	00			Repeat search if Home Address not equal
7	19	Write Home Address	buffer +x*	40	CC	11−x*	Write Home Address with zeros in SD (Skip Displacement) bytes of Home Address
8	15	Write R0	Buffer +11	40	CC	y*	Write R0 where Data is a dummy R1 record with SD information to be tested
9	1A	Read Home Address	0	50	SKIP, CC	5	Read Home Address to position head
10	0F	Space Count	Buffer +11+y*	40	CC	3	Space across R0 count and indicate R0 Data length = 8
11	1E	Read Count, Key, and Data	0	10	SKIP	264	Read dummy R1 (written as R0 Data)

*x+0 for 3330-1 Compatibility Mode; 4 for 3344.
y=847 for 3330-1 Compatibility Mode; 513 for 3344.

21. Channel Program for CLEANUP

This CCW chain restores track 1 of the CE cylinder.

CCWs 1, 2, and 3 are built by IOS (part of the operating system). CCW3 transfers control to the first CCW (CCW4) of the channel program built by routine CLEANUP.

CCW No.	Command Code		Address	Flags		Count	Comments
	Hex	Description		Hex	Description		
1	07	Seek	AP1SEEK	40	CC	6	Seek to cylinder*
2	1F	Set File Mask	X'C4'	40	CC	1	Set File Mask to allow writing on CE cylinder
3	08	TIC	CCW4	40	CC		Transfers control to channel program
4	07	Seek	AP1CESK	40	CC	6	Seek to CE cylinder, track 1 on physical volume
5	39	Search Home Address equal	AP1CESK	40	CC	4	Verify Seek
6	08	TIC	CCW5	00			Repeat search if Home Address not equal
7	15	Write R0	buffer	40	CC	16	Write Record 0
8	ID	Write Count, Key, and Data	buffer +16	00		264	Write Record 1

*If fixed heads are installed, seek to cylinder 1; if fixed heads are not installed, seek to cylinder 695 for the 3344 and cylinder 403 for the 3330-1 Compatibility Mode.

CONSOLE MESSAGES

See OS/VS and DOS/VS Analysis Program-1 (AP-1) Users Guide (GC26-3855) for all other console messages not described.

Message Number		Description
OS/VS	DOS/VS	
IAP001A	8701A	xxx DO YOU WANT TO RUN DATA VERIFICATION TEST, YES OR NO Cause: This message asks the operator if the Data Verification test should be run. System Action: The system waits for the operator to reply by typing Yes of No on the system console. Operator Response: A Yes reply causes AP-1 to run the Data Verification test. A No reply ends the AP-1 test.
IAP003I	8703I	xxx SUSPECTED DRIVE PROBLEM (xxx The controller address of failing drive.) Cause: During the Drive tests, AP-1 detected hardware problems. See SYSPRINT output for details of the error. A Data Check occurring during the RHAMH test results in this message. If a Data Check occured, analyze the sense information and error tables in the SYSPRINT output, then: 1. Use the 3350 Checkout Procedure on START 110. 2. If the checkout is ok, attempt to restore the Home Address(es) on the volume. See INTDK (initialize disk) on OLT 30. If no Data Check occurred during the RHAMH test, go to MSG 9, Entry B.
IAP004I	8704I	xxx DATA FORMAT UNACCEPTABLE, TESTING TERMINATED Cause: One of the following: • The Count field in a record specifies an incorrect track or an incorrect record number. The volume was probable not written according to IBM standards. AP-1 cannot be run on this volume. • In an OS/VS system, the Error Recovery Procedure (ERP) was unable to recover from the error and either went into a loop or returned with inconsistent error information. • A program writing on the volume under test erased an end-of-data record read by AP-1, which AP-1 expects to read again. For further information, see the console output and AP-1 SYSPRINT or SYSLST printer output, then: 1. Use the 3350 Checkout Procedure on START 110. 2. Run OLT T3350PSA to determine the extent of the damage. 3. If Steps 1 and 2 show no failures or errors, the volume should be restored from a backup volume.

OS/VS AND DOS/VS ANALYSIS PROGRAM-1 (AP-1) MSG 125

Message Number		Description
OS/VS	DOS/VS	
IAP005I	8705I	xxx ERROR READING DATA xxx = The controller address of the failing drive. Cause: AP-1 detected Data Checks while reading. This message is followed by a message on the printer that identifies the track and cylinder number on which each Data Check occurred. The cause of the problem could be a damaged disk surface or an intermittent Read/Write circuitry failure. For further information, see the console output and AP-1 SYSPRINT or SYSLST printer output, then: 1. Use the 3350 Checkout Procedure on START 110. 2. If the checkout is ok, use the SYSPRINT output and go to MSG 9, Entry B. 3. If no failure can be found, have the user perform one of the following, depending on the customer procedures. • Restore the entire volume from a backup volume. • Rebuild the track that has the error (see OLT 30). • Assign an alternate track and then restore the track (see OLT 30). • Rebuild the data volume.
IAP006I	8706I	xxx ALL DATA READ WITHOUT ERRORS Cause: The volume was successfully read during the Data Verification test. Every record on the volume was read (without data transfer) by AP-1, and no errors were detected. If data problems persist, further analysis is needed. Use any available data to locate the symptom in the Symptom/Condition column in the table on START 100 that most closely matches the machine status.
IAP008I	8708I	xxx WRITE TESTS BYPASSED Cause: The CE cylinder is incorrectly formatted. AP-1 does not issue Write commands during the Drive tests. Home Addresses must be rewritten on the CE tracks that are in error (use microdiagnostic routine B0).

Message Number		Description
OS/VS	DOS/VS	
IAP009I	8709I	xxx I/O TIMEOUT, TESTING TERMINATED Cause: AP-1 attempted to access the drive, and received no response during a period of 1 to 2 minutes. To AP-1, the drive appears to be unavailable for basic testing. When the timeout occurred during the Data Verification tests, this message is followed by message IAP004I/8704I DATA FORMAT UNACCEPTABLE. When the timeout occurred during the Drive tests, this message is followed by message IAP003I/8703I SUSPECTED DRIVE PROBLEMS. Verify that the drive has power on and the Power On and Ready lamps are on, and that a path is available from the central processing unit (CPU) to the drive. Then rerun AP-1. For further information, see the console output and the AP-1 SYSPRINT or SYSLST printer output. If the problem persists, use the 3350 Checkout Procedure on START 110.
IAP010I	8710I	xxx NO DRIVE PROBLEMS FOUND Cause: The AP-1 program successfully completed executing the basic Drive tests and did not detect any problems. System Action: Processing continues with the Data Verification test if specified by the operator. If a problem is still suspected, use the 3350 Checkout Procedure on START 110.
IAP017I	8717I	xxx DEVICE NOT READY, TESTING TERMINATED Cause: The device to be tested is not Ready. Operator Response: Make the device Ready, and when the Ready lamp is on, rerun the AP-1 program. If the error persists, use the 3350 Checkout Procedure on START 110.

SENSE CONTENTS

SENSE CONTENTS SENSE 1

MLX A

Byte	Bit 0	Bit 1	Bit 2	Bit 3	Bit 4	Bit 5	Bit 6	Bit 7
0	Command Reject	Intervention Required	Channel Bus Out Parity	Equipment Check	Data Check	Overrun	Not Used	Not Used
1	Permanent Error	Invalid Track Format	End of Cylinder	Not Used	No Record Found	File Protected	Write Inhibited	Operation Incomplete
2	Not Used	Correctable	Alternate Controller (C2 Module)	Environmental Data Present	Compatibility Mode	Not Used	Not Used	Not Used
3	RESTART COMMAND (Provided only when Byte 1 bit 7, Operation Incomplete, is active)							
4	PHYSICAL DRIVE IDENTIFICATION							
	A	B	C	D	E	F	G	H
5	LOW-ORDER LOGICAL CYLINDER ADDRESS							
	128	64	32	16	8	4	2	1
6	HIGH-ORDER LOGICAL CYLINDER ADDRESS (See SENSE 106.) 512 ←3330-11→ 256; 256 ←3330-1→ 0			Log. Trk 16	AND Log. Trk 8	LOGICAL TRACK Log. Trk 4	Log. Trk 2	Log. Trk 1
7	FORMAT (bits 0 to 3 hex)				MESSAGE CODE (bits 4 to 7 hex)			

When attached to a 3880 sense bytes 4 and 5, format 6, have a unique meaning. See 3880 Storage Control manual for definition.

3350 2 3880 MLX Chart

MESSAGE CODE FOR BYTE 7 (Bits 4-7 Hex)

B

Format 1 – SENSE 101
Format 4,5 – SENSE 102
Format 6 – SENSE 103

Note: *See Storage Control MLM for sense data and/or messages for Formats 0, 2, and 3.*

3350 9 Storage Control MLX CHART

MESSAGES, determined by format and message code (Byte 7)

	Format 1	Format 4	Format 5
0	Not Used	HA Field – Data Check	Not Used
1	Transmit Target Error	Count Field – Data Check	
2	Microprogram Detected Error	Key Field – Data Check	
3	Transmit Difference High Error	Data Field – Uncorrectable Data Check	Data Field – Correctable Data Check
4	Sync Out Timing Error	HA Field – No Sync Byte Found	
5	Unexpected Drive Status at Initial Selection	Count Field – No Sync Byte Found	
6	Transmit CAR Error	Key Field – No Sync Byte Found	
7	Transmit Head Error	Data Field – No Sync Byte Found	
8	Transmit Difference Error	Not Used	Not Used
9	Drive Status not as expected during Read IPL	AM Detection failure on retry	
A	Seek Verification Check on physical address		
B	Seek Incomplete or Sector Compare Check		
C	No Interrupt from drive	Not Used	
D	Defect Skipping Reorientation Check		
E	Unable to determine device type		
F	Retry Reorientation Check		

SENSE DATA SUMMARY - FORMAT 1

MLX 1
SENSE 100
B

FORMAT 1 – DRIVE EQUIPMENT CHECKS

	Byte	Bit 0	1	2	3	4	5	6	7
Drive Status	8	Controller Check	Device Interface Check	Drive Check	Read/Write Check	Online	HDA Attention	Busy	Seek Complete or Search Sector or Pad Complete
Check Status	9	Pad-In-Progress	Sector Compare Check	Motor At Speed Latched	Air Switch Latched	Write Enable	Fixed Head HDA Installed	Spindle Mode 2 Bit	Spindle Mode 1 Bit
HDA Sequence Control	10	Mode Size Check	HDA 4 Latch	HDA 2 Latch	HDA 1 Latch	HDA Timer Check Latch	HDA Sequence Check Latch	Not Used	Odd Physical Track
Load Switch Status	11	Drive Start Switch	Guardband Pattern	Target Velocity	Track Crossing	Not Used	Air Switch	Not Used	Motor At Speed
Read/Write Safety	12	Multiple Chip Select Check	Capable/ Enable Check	Write Overrun	Index Check	Delta I Write	Control Check	Write Transition Check	Write Current during Read Check
	13	CONTROL INTERFACE BUS OUT (For Message Code 2 (Byte 7), see Sense Byte 18)				EXPECTED DRIVE STATUS/DATA (When Message Code (Byte 7) is 1, 3, 5, 6, 7, 8, and 9)			
	14	CONTROL INTERFACE BUS IN (At the time an error was detected)							
	15	CONTROL INTERFACE TAG BUS (At the time an error was detected)							
Access Status	16	Access Timeout Check	Overshoot Check	Servo Off-Track Check	Rezero Mode Latch	Servo Latch	Linear Mode Latch	Control Latch	Wait Latch
Controller Checks	17	VFO detected Errors (See SENSE 108)		SERDES Check	Gap Counter Check	Write Data Check	Monitor Check	ECC Hardware Check	ECC Zeros Detected
Microprogram Detected Errors	18	Not Used	Not Used	Not Used	Not Used	CODED ERROR CONDITION (Bits 4-7 Hex)			
Status	19	Set R/W On	Not Used	Not Used	Not Used	Head Short Check	Pad Gate Check	1.2 Mb File	1 (Always On)
Interface Checks	20	Control Interface Tag Bus Parity Check	Control Interface Bus Out Parity Check	Drive Selection Check	Device Bus In Parity Check	Control Interface Bus In Parity Check	I Write Fail	3330 Mode Index Check	Reorient Counter Check
	21	Not Used	Not Used	Not Used	Not Used	Not Used	Not Used	Device Bus Out Parity Check	Device Tag Parity Check
	22	FAULT SYMPTOM CODE							
	23	FAULT SYMPTOM CODE							

Or

1	5	6	7
I Write Sense	Pad in Progress	Index Mark	3330 Modes

If Set R/W is active (Byte 19, bit 0 on), the bits above are used.

PREVIOUS SEEK ADDRESS

If Message A or B (Byte 7) occurs, these bytes contain the access position prior to the last issued Seek argument (Bytes 5 and 6).

Or Previous Address (From)

Byte 14 or 21 Bit 0, 1 = 11

No – Movable Head

Yes – Fixed Head

Tracks 0–63

PRESENT ADDRESS

If Message A (Byte 7) occurs, these bytes contain the physical address of the track selected.

Or Present Address (Actual)

1 of 4 Possible Data Presentations

Bits 0 1 2 3 4 5 6 7

Low Physical Cylinder Address

128	64	32	16	8	4	2	1

High Physical Cylinder Addr		Physical Track Address					
512	256	32	16	8	4	2	1

0	0	0	0	0	0	0	0

1	1		Physical Track Address				
		32	16	8	4	2	1

1 Microprogram Error Messages, determined by Sense Byte 18, bits 4–7

0	Not Used
1	No Tag Valid on R/W operation †
2	No Normal or Check End on R/W or ECC operation
3	No Response from controller on Control operation †
4	Timed-out waiting for Index.
5	ECC Hardware Check †
6	Multiple or no controllers selected †
7	Preselection Check
8	Repetitive Command Overruns on G1 operations.
9	Repetitive Command Overrun on G2 or G3 operations.
A	Incorrect Drive Selection
B	Busy missing after Seek Start is issued
C,D	Not Used
E	Pre-selection DCI Check
F	Unresettable Interrupt

† *Bytes 13, 14, and 15 are valid for these Microprogram Error Messages.*

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SENSE 100 **FORMAT 4 – DATA CHECKS NOT PROVIDING DISPLACEMENT INFORMATION**

B

Byte	Bit 0	1	2	3	4	5	6	7
8	CYLINDER ADDRESS							
9	CYLINDER ADDRESS							
10	HEAD ADDRESS							
11	HEAD ADDRESS							
12	RECORD NUMBER							
13	SECTOR NUMBER							
14	Not Used							
15								
16								
17								
18								
19								
20								
21								
22	FAULT SYMPTOM CODE							
23	FAULT SYMPTOM CODE							

Count Identification

SENSE 100 **FORMAT 5 – DATA CHECKS PROVIDING DISPLACEMENT INFORMATION**

B

Byte	Bit 0	1	2	3	4	5	6	7
8	CYLINDER ADDRESS							
9	CYLINDER ADDRESS							
10	HEAD ADDRESS							
11	HEAD ADDRESS							
12	RECORD NUMBER							
13	SECTOR NUMBER							
14	Not Used							
15	RESTART DISPLACEMENT							
16	RESTART DISPLACEMENT							
17	RESTART DISPLACEMENT							
18	ERROR DISPLACEMENT							
19	ERROR DISPLACEMENT							
20	ERROR PATTERN							
21	ERROR PATTERN							
22	ERROR PATTERN							
23	Not Used							

SENSE DATA SUMMARY - FORMAT 6

SENSE 100 B

FORMAT 6 – USAGE AND OVERRUN ERROR STATISTICS

	Bit 0	1	2	3	4	5	6	7
Byte 8	NUMBER OF BYTES READ OR SEARCHED (Key and Data Fields Only)							
9	NUMBER OF BYTES READ OR SEARCHED (Key and Data Fields Only)							
10	NUMBER OF BYTES READ OR SEARCHED (Key and Data Fields Only)							
11	NUMBER OF BYTES READ OR SEARCHED (Key and Data Fields Only)							
12	Not Used							
13	Not Used							
14	NUMBER OF DATA CHECKS SUCCESSFULLY RETRIED							
15	NUMBER OF DATA CHECKS SUCCESSFULLY RETRIED							
16	NUMBER OF ACCESS MOTIONS							
17	NUMBER OF ACCESS MOTIONS							
18	Channel select for Bytes 20-23	← Not Used →						
19	NUMBER OF SEEK ERRORS RETRIED							
20	COMMAND OVERRUNS	CHANNEL A if Byte 18, bit 0 is 0 CHANNEL C if Byte 18, bit 0 is 1						
21	DATA OVERRUNS	CHANNEL A if Byte 18, bit 0 is 0 CHANNEL C if Byte 18, bit 0 is 1						
22	COMMAND OVERRUNS	CHANNEL B if Byte 18, bit 0 is 0 CHANNEL D if Byte 18, bit 0 is 1						
23	DATA OVERRUNS	CHANNEL B if Byte 18, bit 0 is 0 CHANNEL D if Byte 18, bit 0 is 1						

Not device-dependent information.
See Storage Control MLM.

3350 7

Storage Control
MLX CHART

Sense Byte 0

Sense Bytes 0 through 2 are generated when a Unit Check is presented. These bytes describe the error condition and identify specific action for subsystem error recovery.

BIT 0 – COMMAND REJECT

Sense Byte 7 identifies the error condition in more specific terms. Any one of the following conditions cause this bit to be generated:

Invalid command code or a command associated with an uninstalled feature has been issued.

Invalid command sequence.

Invalid or incomplete argument has been transferred by a control command.

Track formatted without a Home Address.

Write portion of the File Mask is violated.

A Write command was issued to a drive that had its Read Only switch on. Byte 1, bit 6 (Write Inhibited) is also set.

A Format Write command is attempted after R0 on a track flagged as defective.

BIT 1 – INTERVENTION REQUIRED

Bit 1 indicates that the addressed device is:

Not physically attached to the system.

Not available because the HDA is not Ready.

Not available because the device is in CE Mode.

A Diagnostic Write or Load Channel Command Word (CCW) is issued while an inline microdiagnostic is resident in the storage control.

BIT 2 – CHANNEL BUS OUT PARITY

The storage control has detected bad parity in data transferred from the channel. A parity error detected during command transfer is a Bus Out Check and not a Command Reject.

BIT 3 – EQUIPMENT CHECK

An unusual hardware condition originated in the channel, storage control, controller, or drive. (The conditions of this bit are defined in Sense Bytes 7 through 23.)

BIT 4 – DATA CHECK

If Byte 2, bit 1 is also on, a correctable data error has been detected in information received from the drive. (Correction information is provided in Sense Bytes 15 through 21.)

An uncorrectable data error has been detected in information received from the drive. (This condition is further defined in Sense Byte 7.)

BIT 5 – OVERRUN

A channel response to a data transfer request was not received in time by the storage control.

A command from the channel was received too late to be properly executed.

All Data Overrun conditions, other than those that occur in a second or subsequent segment of an overflow record, or those that occur during a Format Write, are retried by the storage control.

Detection of an overrun causes an immediate stop of data transfer. When writing, the remaining portion of the record area is padded with zeros.

BIT 6 – NOT USED

BIT 7 – NOT USED

Sense Byte 1

BIT 0 – PERMANENT ERROR

Bit 0 is set by ERPs when the specified number of retry actions is exhausted.

BIT 1 – INVALID TRACK FORMAT

An attempt was made to write data exceeding track capacity. Bit 1 is also posted during a Read or Search operation when the Index Point is detected in the gap after a Count or Key field. This indicates a programming error or an expected programming condition has been detected.

BIT 2 – END OF CYLINDER

One of the following conditions has occurred:

A Read Multitrack or Search Multitrack operation has attempted to continue beyond the addressable cylinder boundary.

An overflow operation has attempted to continue beyond the addressable cylinder boundary.Operation Incomplete (Byte 1, bit 7) is also included.

End of Cylinder indicates a programming error or an expected programming condition has been detected.

BIT 3 – NOT USED

BIT 4 – NO RECORD FOUND

One of the following has occurred:

The Index Point at the beginning of the selected logical track has been detected twice in the same command chain without an intervening Read operation in the Home Address field or in a Data field.

The Index Point at the beginning of the selected logical track has been detected twice in the same command chain without an intervening Write, Sense, or Control command.

The storage control always verifies that the access mechanism is properly positioned before posting this bit. This bit indicates a programming error or an expected programming condition has occurred.

See OPER 208 for a detailed description of No Record Found.

BIT 5 – FILE PROTECTED

One of the following has occurred:

A Seek command has violated the File Mask. Includes Seek to a CE track when mask bit 5=0.

A Read Multitrack or Search Multitrack operation has violated the File Mask.

An overflow operation has violated the seek portion of the File Mask. Operation Incomplete (Byte 1, bit 7) is also set.

File Protected indicates a programming error or an expected programming condition has been detected.

BIT 6 – WRITE INHIBITED

A Write command was received for a drive that had its Read Only switch on. Command Reject is also set.

BIT 7 – OPERATION INCOMPLETE

One of the following has occurred during the processing of an Overflow Record operation:

Overflow to a file-protected boundary. File Protected (Byte 1, bit 5) is also set.

Overflow past the cylinder boundary. End of Cylinder (Byte 1, bit 2) is also set.

A Correctable Data Check was detected in the Data field other than the last segment. Data Check (Byte 0, bit 4) and Correctable (Byte 2, bit 1) are also set.

A defective or alternate track condition was detected after initiation of data transfer.

An Uncorrectable Data Check was detected in a field associated with a segment other than the first.

A seek error was detected in the second or subsequent segment.

Sense Byte 3 provides the Restart command and Bytes 8 through 13 provide restart information.

Sense Byte 2

BIT 0 – NOT USED

BIT 1 – CORRECTABLE

Indicates the Data field Data Check posted in Byte 0, bit 4 is correctable. Sense Bytes 15 through 22 identify the error pattern, error pattern displacement, and restart displacement.

BIT 2 – ALTERNATE CONTROLLER (C2 MODULE)

Indicates the alternate controller (C2 module) was active during the Sense operation.

BIT 3 – ENVIRONMENTAL DATA PRESENT

Indicates Sense Bytes 8 through 23 have usage counter statistics under Format 6. Usage statistics include the number of bytes read/searched, number of overruns by channel, and number of access motion seeks.

BIT 4 – COMPATIBILITY MODE

Bit 4 is on when the 3350 is operating in either 3330-1 or 3330-11 Mode.

BITS 5 THRU 7 – NOT USED

SENSE DATA DESCRIPTION

Sense Byte 3

BITS 0 THRU 7 – RESTART COMMAND

Sense Byte 3 is provided when Operation Incomplete (Byte 1, bit 7) is set. This byte identifies the operation in progress when the interrupt occurred. The system recovery program uses this command, along with Channel Status Word (CSW) information, to construct a new Channel Command Word (CCW). The new CCW is issued to the storage control, after correcting the unusual conditions, to continue the operation following the point of interruption.

When Operation Incomplete is set, the Restart command is set to '06' to indicate a Read operation was in progress, or '05' to indicate a Write operation. Sense Byte 3 is zero when Operation Incomplete is not set.

Sense Byte 4

PHYSICAL DRIVE IDENTIFICATION

Sense Byte 4 identifies the physical drive that was selected when Unit Check was generated. The format of Byte 4 is as follows:

Bit Number	Physical Address
Bit 0	Drive A
Bit 1	Drive B
Bit 2	Drive C
Bit 3	Drive D
Bit 4	Drive E
Bit 5	Drive F
Bit 6	Drive G
Bit 7	Drive H

Sense Byte 5, Except for 3880, Format 6 See

Sense Byte 5 identifies the low-order eight bits of the cylinder address of the most current seek argument.

BITS 0 THRU 7 – LOGICAL CYLINDER LOW

3350 2 3880 MLX Chart

Sense Byte 6, Except for 3880, Format 6 See

Sense Byte 6 identifies the logical track address and cylinder of the most current seek argument.

3350 2 3880 MLX Chart

BIT 0 – CE CYLINDER

When this bit is a one, Byte 5 must be zero and Byte 6, bits 1 and 2 must be zero. Byte 6, bits 3 through 7 may indicate any valid head.

BIT 1 – LOGICAL CYLINDER HIGH

Bit 1 is a high-order bit of the cylinder address in Sense Byte 5.
(512 in 3350/3330-11 Modes or 256 in 3330-1.)

BIT 2 – LOGICAL CYLINDER HIGH

Bit 2 is a high-order bit of the cylinder address in Sense Byte 5.
(256 in 3350/3330-11 Modes or 0 in 3330-1.)

BITS 3 THRU 7 – LOGICAL TRACK

Bits 3 through 7 identify the logical track of the last seek (excluding retry seeks). The head address is updated during multitrack and overflow operations.
(See OPER 12.)

If an alternate track condition is detected and Operation Incomplete is posted during an overflow operation, Byte 6 is set to the head address of the defective track plus 1. This information is used by the ERPs to construct the seek argument to continue the operation.

Sense Byte 7

BITS 0 THRU 3 – FORMAT

Bits 0 through 3 identify the specific format of the remaining Sense Bytes (8 through 23). See Storage Control MLM for sense data for Formats 0, 2, and 3.

BITS 4 THRU 7 – MESSAGE CODE

Bits 4 through 7 provide an encoded message which describes the specific nature of the error condition. See SENSE 109 for a description of the messages.

FORMAT 1 – DRIVE EQUIPMENT CHECKS

Format 1 is generated under the following conditions:

Detection of Drive, Device Interface, or Controller Equipment checks. Byte 0, bit 3 (Equipment Check) is set.

No online indication in file status (Byte 8, bit 4). Byte 0, bit 1 (Intervention Required) is set.

Detection of seek errors.

Sense Byte 8 – Drive Status

BIT 0 – CONTROLLER CHECK

One of the following conditions has occurred:

Bus Out Parity Check
Device Bus In Parity Check
Shift Register error
Write Data Check
ECC Hardware Check
Tag Bus Parity Check
1-of-8 Check
Gap Counter Check
VFO Phase error (See Format 1, Byte 17, bit 0).
Monitor Check (See Format 1, Byte 17, bit 5).

BIT 1 – DEVICE INTERFACE CHECK or I WRITE SENSE

If Byte 19, bit 0 = 0:
A Device Tag Bus or Device Bus Out Parity error has been detected. Details can be determined using the Sense Interface Tag.

If Byte 19, bit 0 = 1:
The drive in Read/Write mode has sensed that write current is present at the Read/Write head.

BIT 2 – DRIVE CHECK

One or more of the following conditions has occurred in the drive:

Access error
Sector Non-Compare Check

The conditions causing Drive Check are reset by Check Reset and CE Reset.

BIT 3 – READ/WRITE CHECK

Read/Write safety circuits have detected a condition that could endanger data integrity. These conditions are:

Multiple heads selected
Write current while reading
No write current while writing
No transitions while writing data
Overrun while writing
Set Read/Write while not read/write enabled (not track following)
Write Gate on while not write enable
Read Gate and Write Gate on together
Write Gate and Unsquelch on together
Address Mark Control on without Read Gate
Read/Write Interlock not present
Index Check
Low Gain controls incorrect while reading

BIT 4 – ONLINE

The drive Start/Stop switch is in the Start position and the drive is Ready.

BIT 5 – HDA ATTENTION or PAD IN PROGRESS

If Byte 19, bit 0 = 0:
An HDA has been brought to the Ready condition following a Sequence Start signal, the drive Start/Stop switch has been set to the Start position, or the Attention switch has been operated. The Read/Write heads are positioned over track 0 with the Difference Counter, HAR, and CAR reset when this signal is present.

If Byte 19, bit 0 = 1:
The drive in Read/Write mode has been conditioned by the controller to pad to Index.

BIT 6 – BUSY or INDEX MARK

If Byte 19, bit 0 = 0:
The drive is performing a Rezero, Seek, Search Sector, or Pad operation. Busy is turned off by Seek Complete, Sector Complete, or Pad Complete. For a Search Sector operation, Busy is present again after Sector Compare has dropped if no Attention Reset is given.

If Byte 19, bit 0 = 1:
The drive in Read/Write mode has detected an Index Mark.

BIT 7 – SEEK COMPLETE, SEARCH SECTOR, PAD COMPLETE, or 3330 MODES

If Byte 19, bit 0 = 0:
A Seek, Rezero, or Pad operation initiated by the controlling system has been completed or a Search Sector operation is in progress. It is a result of Seek Complete or Seek Incomplete.

Seek Complete is the normal end of a Seek or Rezero operation initiated by the controlling system; the specified track has been reached and Drive Check is off.

Seek Incomplete is the abnormal end of a Seek or Rezero operation and is indicated by Drive Check appearing with Seek/Sector Complete. The access mechanism is in an undefined state.

Pad Complete occurs when the Pad Cue operation reaches sector 126 prior to Index.

If Byte 19, bit 0 = 1:
The drive in Read/Write mode is operating in 3330 Compatibility Mode.

Sense Byte 9 – Checks/Status

BIT 0 – PAD-IN-PROGRESS

Pad-In-Progress is present when the drive has been conditioned to Pad to the Index Byte by the controller and Index has not been passed.

BIT 1 – SECTOR COMPARE CHECK

This check indicates that two Index Marks have been detected without an intervening Sector Compare while performing a Search Sector operation.

BIT 2 – MOTOR AT SPEED LATCHED

Motor speed fell below 80% during a Ready sequence.

BIT 3 – AIR SWITCH LATCHED

Indicates that the switch failed while the drive was in a Ready state.

BIT 4 – WRITE ENABLE

Indicates that the R/W or Read switch on the Operator Panel is in the R/W position.

BIT 5 – FIXED HEADS INSTALLED

Indicates that fixed heads are installed.

BIT 6 – SPINDLE MODE 2 BIT

BIT 7 – SPINDLE MODE 1 BIT

Indicates the mode of operation:

Bit 6	Bit 7	Mode
0	1	Native
1	0	3330-1
1	1	3330-11

Sense Byte 10 – HDA Sequence Control

BIT 0 – MODE SIZE CHECK

Indicates that a parity error has occurred in the format selected for the HDA. This bit is generated if more than one mode is selected or if a jumper fails.

BITS 1 THRU 3 – HDA SEQUENCE LATCHES 4, 2, AND 1

The condition of these latches indicates the state of the HDA sequence. See HDA Sequence description, HDA 500 through 506, for further details.

BIT 4 – HDA TIMER CHECK LATCH

Indicates that more than 10 seconds has elapsed between HDA Sequence Control States during a start sequence.

BIT 5 – HDA SEQUENCE CHECK LATCH

The condition of this bit (on/off) along with bits 1 through 3 indicates the sequencing state of the HDA. See HDA Sequence description, HDA 500 through 506, for further details.

BIT 6 – NOT USED

BIT 7 – ODD PHYSICAL TRACK

If on, the current physical cylinder address is odd. If off, the current physical cylinder address is even. This bit also represents the low-order bit of the cylinder address.

Sense Byte 11 – Loaded Switch Status

BIT 0 – DRIVE START SWITCH

Indicates that the Start/Stop switch was set to start.

BIT 5 – AIR SWITCH

Indicates that the flapper valve is open and has transferred the Air switch.

BIT 7 – MOTOR AT SPEED

Indicates (by checking servo pulses) that the motor is turning at least 80% of its maximum RPM (3600 RPM). The condition of bits 5 and 7 are latch-stored for readout if an interlock fails during Ready, or if an HDA Sequence Check occurs (see Sense Byte 9, bits 2 and 3).

BIT 1 – GUARDBAND PATTERN

BIT 2 – TARGET VELOCITY

BIT 3 – TRACK CROSSING

Bits 1, 2, and 3 are status conditions of the servo system used for diagnostic purposes.

BITS 4 AND 6 – NOT USED

Sense Byte 12 – Read/Write Safety

BIT 0 – MULTIPLE CHIP SELECT CHECK

More than one chip has been selected in the selected drive.

BIT 1 – CAPABLE/ENABLE CHECK

One of the following conditions has occurred:

Set Read/Write was present while the drive was not read/write capable (track following).

Writing was attempted on a drive in the read only condition.

BIT 2 – WRITE OVERRUN

Writing through an Index Mark has been attempted. It is permissible to write into or out of an Index Mark, but not both.

BIT 3 – INDEX CHECK

An invalid Index Check was detected while Set Read/Write was present.

BIT 4 – DELTA I WRITE

Indicates that Read/Write cards or cables may be loose or missing.

BIT 5 – CONTROL CHECK

The Write Gate signal has been present with the Read Gate signals.

BIT 6 – WRITE TRANSITION CHECK

One of the following conditions has occurred:

Write transitions were not detected 4 microseconds (nominally) after Write Gate was turned on.

Write transitions were not present when Write Gate was turned off.

Write transitions were detected while reading.

BIT 7 – WRITE CURRENT DURING READ CHECK

Write Current was detected while reading.

Sense Byte 13 – Control Interface Bus Out

Byte 13 identifies the contents of Control Interface Bus Out at the time the error is detected for Message Code C and for Message Code 2 when Sense Byte 18 equals '01','03','05', or '06'. It also identifies the expected drive status/data for Message Codes 1, 3, 5, 6, 7, 8, and 9. For Message Codes A or B, this byte contains the access position (low-order physical cylinder) issued prior to the current logical seek argument (Sense Byte 5).

Sense Byte 14 – Control Interface Bus In

Byte 14 identifies the contents of Control Interface Bus In at the time the error is detected. For Message Codes A or B, this byte contains the access position (high-order physical cylinder/physica' head) issued prior to the current logical seek argument (Sense Byte 6).

Sense Byte 15 – Control Interface Tag Bus

Byte 15 identifies the contents of the Control Interface Tag Bus at the time the error is detected.

SENSE DATA DESCRIPTION

Sense Byte 16 – Access Status

BIT 0 – ACCESS TIMEOUT CHECK

An access operation (Seek or Rezero) was not completed within 200 milliseconds and has therefore been terminated, or Seek Start was issued to the drive while the servo was not track following.
Access Timeout Check causes a Drive Check.

BIT 1 – OVERSHOOT CHECK

During a Seek or Rezero operation, one of the following events caused a Drive Check:

Three track crossings were detected after the Difference Counter decremented to zero.

Three track crossings were detected after the access control advanced to Linear mode.

A Seek operation moved the carriage into the rezero pattern area.

BIT 2 – SERVO OFF TRACK CHECK

The servo has moved off track during a Read or Write operation. A Rezero operation is required to reset this bit.

BIT 3 – REZERO MODE LATCH

BIT 4 – SERVO LATCH

BIT 5 – LINEAR MODE LATCH

BIT 6 – CONTROL LATCH

BIT 7 – WAIT LATCH

Bits 3 through 7 indicate the current state of the access control. Depending on which latch is on, the access control may be in any one of nine states. See OPER 117 for a more detailed explanation of these bits.

Sense Byte 17 – Controller Checks

VFO Detected Errors

Bits 0,1	Meaning
01	Missing Servo Input
10	Phase Error during write
11	Missing data input (during VFO Fast Sync to Data)

BIT 2 – SERDES CHECK

SERDES Shift Register Parity did not match its predicted parity.

BIT 3 – GAP COUNTER CHECK

Incorrect parity was detected in the Gap Counter.

BIT 4 – WRITE DATA CHECK

A parity error was detected as data was transferred to the controller or through SERDES.

BIT 5 – MONITOR CHECK

An error has occurred in the bit ring and associated hardware for a period of three servo pulses.

BIT 6 – ECC HARDWARE CHECK

One of the following errors occurred:

An odd number of ECC Shift Register bits at B time.

Missing C pulse to the Shift Register.

Missing B pulse to the Shift Register.

BIT 7 – ECC ZEROS DETECTED

Used to validate the control function during the ECC Control operation.

Sense Byte 18 – Microprogram Detected Errors

BITS 0 THRU 3 – NOT USED

BITS 4 THRU 7

Indicate the error condition in hex code. The error conditions are as follows:

Hex 1 – Tag Valid missing on a Read/Write operation. Indicates Tag Valid was not received from the controller in response to the issuance of a Read/Write operation. Bytes 13 through 15 are valid.

Hex 2 – No Normal or Check End on a Read/Write or ECC operation. Indicates that neither Normal End nor Check End was received from the controller at the end of a Read, Write, or ECC operation. Bytes 13 through 15 are zero.

Hex 3 – No response from the controller on a Control operation. Indicates that neither Tag Valid, Normal End, nor Check End was received from the controller in response to an operation other than a Read/Write. Bytes 13 through 15 are valid.

Hex 4 – Timeout waiting for Index (40 ms timeout). Indicates that Index was not received from the controller or that it failed to drop. Bytes 13 through 15 are zero.

Hex 5 – ECC Hardware Check. Indicates one of the following:

Ending status was presented, but no ECC Zeros were detected.

Both ECC pattern bytes are equal to zero.

Bus in bit 4 under Check End was on without Bus In bit 3 to indicate an ECC Data Check.

Sync In was not received after the ECC Control tag was issued to the controller.

Bytes 13 through 15 are valid.

Hex 6 – Multiple or no controllers selected.Indicates that a controller or drive selection command was issued and it was found that more than one controller was selected, or no controllers were selected. Bytes 13 through 15 are valid.

Hex 7 – Preselection Check. Indicates one of the following lines was active prior to selection:

Selected Alert 1 (Error Alert)
Select Active
Index Alert
Sync In
Normal End
Check End
Tag Valid

Bytes 13 through 15 are zero.

Hex 8 – Repetitive Command Overruns on G1 operations. Indicates that an unexpected Check End was detected during a Read G1 operation on 2 successive attempts before Home Address data transfer was initiated. Bytes 13 through 15 are zero.

Hex 9 – Repetitive Command Overruns on G2 or G3 operations. The storage control is unable to recover from Command Overruns by using Command Retry.

Hex A – Physical Address Check. Indicates that the physical address returned (1-of-8 code) after drive selection was incorrect. Bytes 13 through 15 are zero.

Hex B – Busy missing after Seek Start is issued. Indicates that the drive failed to go Busy when Seek Start was issued for a non-zero cylinder difference seek. Bytes 13 through 15 are zero.

Hex C, D – Not Used

Hex E – Indicates that during pre-selection checking time, one or more bits of the DCI Bus were active when they should not have been active.

Hex F – Unresettable Interrupt. An attempt to reset Drive Attention was unsuccessful and the device was masked to inhibit further system interrupts.

Sense Byte 19 – Status

BIT 0 – SET READ/WRITE ON

Indicates that storage control has issued a Set Read/Write (Tag '85').

BITS 1 THRU 3 – NOT USED

BIT 4 – HEAD SHORT CHECK

Indicates that a short has been detected in a Read/Write head.

BIT 5 – PAD GATE CHECK

Turned on if Pad Gate and Write Gate occur simultaneously.

BIT 6 – 1.2 MEGABYTE FILE

This drive must be attached to a 1.2 megabyte controller.

BIT 7 – 1 (ALWAYS ON)

Sense Byte 20 – Interface Checks

BIT 0 – CONTROL INTERFACE TAG BUS PARITY CHECK

A parity error was detected on the Control Interface Tag Bus while Tag Gate was active.

BIT 1 – CONTROL INTERFACE BUS OUT PARITY CHECK

A parity error was detected on the Control Interface Bus Out while Tag Gate was active.

BIT 2 – DRIVE SELECTION CHECK

Indicates that more than one drive has been selected.

BIT 3 – DEVICE BUS IN PARITY CHECK

A parity error was detected on Device Bus In.

BIT 4 – CONTROL INTERFACE BUS IN PARITY CHECK

The controller detected bad parity on the Control Interface Bus In.

BIT 5 – I WRITE FAIL

The controller failed to detect I Write Sense from the device within approximately 9 microseconds after Write Gate is activated.

BIT 6 – 3330 MODE INDEX CHECK

In 3330 Mode, a psuedo Index is generated to indicate the proper track length. Any failure in this process causes a 3330 Mode Index Check.

BIT 7 – REORIENT COUNTER CHECK

Indicates an invalid condition in the Reorient Counter.

Sense Byte 21 – Device Interface Checks

BITS 0 THRU 5 – NOT USED

BIT 6 – DEVICE BUS OUT PARITY CHECK

Parity on Device Bus Out is checked by the drive except when the Set Read/Write Control is on.

BIT 7 – DEVICE TAG PARITY CHECK

If Equipment Check (Byte 0, bit 3) and Message A (Seek Verification on Physical Address) occur, Byte 7 contains the high-order physical cylinder/physical track of the track selected.

Sense Bytes 22 and 23 – Fault Symptom Code

Bytes 22 and 23 contain a hex code that provides entry to the Fault Symptom Index (FSI). The FSI lists possible failures and references MAPs. The Fault Symptom Code is a number generated from sense data by the storage control. The storage control places the code in Sense Bytes 22 and 23 in Sense Data Formats 1 and 4. FSI 50 shows how a Fault Symptom Code is generated by analyzing sense information.

FORMAT 1 – MESSAGES

Message 0 – Not Used

Message 1 – Transmit Target Error

Generated after a read back check of the drive Target Register detects it was improperly loaded during a Set Sector operation.

Message 2 – Microprogram Detected Error

Generated by the microprogram defined in Sense Byte 18.

Message 3 – Transmit Difference High Error

Generated when a read back check of Sense Status 0 detects that the direction bit and difference count of 512 and 256 were improperly loaded on a Set Difference High command. If the string switch feature is installed, cylinder address 512 is also wrong.

Message 4 – Sync Out Timing Error

Generated when the controller posts Data Overrun (bit 1 on Bus In when Check End is posted during a Read or Write operation).

Message 5 – Unexpected Drive Status at Initial Selection

Generated whenever the string receives status that is not expected from the drive during initial selection.

Message 6 – Transmit Cylinder Address Error

Generated after a read back check of the drive Cylinder Address Register (CAR) detects that CAR was improperly loaded during a Seek operation. CAR is installed only in machines with the string switch feature.

Message 7 – Transmit Head Error

Generated after a read back check of the drive Head Address Register (HAR) detects that HAR was improperly loaded during a Seek operation.

Message 8 – Transmit Difference Error

Generated after a read back check of the Difference Register detected that the register was improperly loaded during a Seek operation.

Message 9 – Drive Status Not as Expected During Read IPL

Generated whenever the storage control does not receive expected file status during the execution of a Read IPL command. The drive status checked after the internal recalibrate should be Online and Seek Complete.

Message A – Seek Verification Check on Physical Address

Generated whenever the storage control detects a difference between the current seek address and the physical address read from the Home Address and Count areas. See Sense Bytes 20 and 21 for the physical address.

Message B – Seek Incomplete/Sector Compare Check

SEEK INCOMPLETE

Generated when the drive has been unable to successfully complete a Seek operation. An equipment failure occurred that prevented the access mechanism from positioning correctly.

SECTOR NON-COMPARE

Generated if the drive failed to detect a Sector Compare between two Index Marks. Equipment Check (Byte 0, bit 3) is set.

Message C – No Interrupt From Drive

Generated whenever the storage control does not receive an interrupt from the drive within a specified time. Some of the conditions that cause this message are:

- An internal recalibrate associated with a Read IPL command or Seek Retry.
- Internal seeks due to defective/alternate track processing.
- Internal set sectors during Command Retry Reorientation.
- Internal seeks necessary to reposition the physical access to a logical device when in 3330 Compatibility Mode.
- Internal seeks caused by head switching operations that cross a physical cylinder boundary (compatibility modes).

Message D – Defect Skipping/Reorientation Check

Generated by the storage control if Check End or Error Alert is received from the controller during the Reorient operation.

Message E – Unable to Determine Device Type

Generated by the storage control when difficulties in the interface or elsewhere prevent distinguishing whether the connected device is a 3340, a 3344, or a 3350.

Message F – Retry Reorientation Check

Generated during Command Retry record reorientation if the PLO Reorient Counter does not indicate that reorientation has been accomplished in the proper range after orienting on the retry sector value.

SENSE DATA DESCRIPTION

FORMAT 4 – DATA CHECKS NOT PROVIDING DISPLACEMENT INFORMATION

Format 4 is generated under the following conditions:

Detection of ECC uncorrectable errors in the Data field.

Detection of ECC data errors in the Count, Key, or Home Address field. The Message Code in Byte 7 identifies the field that exhibits the error.

Sense Bytes 8 Thru 12 – Count ID

Bytes 8 through 12 contain the record ID (CCHHR) as obtained from the Count field of the record in which the error occurs.

Byte 12, the record number (R), is set to zero if the error occurred in Home Address. This byte is unreliable after a space count.

The contents of these bytes are unreliable if Byte 7 Message Code is 0, 1, 4, or 5.

Sense Byte 13 – Sector Number

Byte 13 contains the sector number of the record that was in error.

Sense Bytes 14 Thru 21 – Not Used

Set to zero.

Sense Bytes 22 and 23 – Fault Symptom Code

The Fault Symptom Code provides entry to the Fault Symptom Index (FSI). The FSI lists possible failures and references MAPs. The Fault Symptom Code is a number generated from sense information by the storage control, which places the code in Sense Bytes 22 and 23 in Sense Data Formats 1 and 4.

FORMAT 4 – MESSAGES

Message 0 – HA Field–Data Check

Generated when a data error, as detected by the ECC hardware, occurs in the Home Address field.

Message 1 – Count Field–Data Check

Generated when a data error, as detected by the ECC hardware, occurs in the Count field.

Message 2 – Key Field–Data Check

Generated when a data error, as detected by the ECC hardware, occurs in the Key field.

Message 3 – Data Field–Uncorrectable Data Check

Generated if an error occurs in the Data field that cannot be corrected by the ECC hardware.

Message 4 – HA Field–No Sync Byte Found

Generated if data synchronization on the Home Address field was unsuccessful.

Message 5 – Count Field–No Sync Byte Found

Generated if data synchronization on the Count field was unsuccessful.

Message 6 – Key Field–No Sync Byte Found

Generated if data synchronization on the Key field was unsuccessful.

Message 7 – Data Field–No Sync Byte Found

Generated if data synchronization on the Data field was unsuccessful.

Message 8 – Not Used

Message 9 – AM Detection Failure on Retry

Generated if Address Mark reorientation during Command Retry is unsuccessful.

Messages A Thru F – Not Used

FORMAT 5 – DATA CHECKS PROVIDING DISPLACEMENT INFORMATION

Generated under the following conditions:

ECC Correctable Data Checks in the Data fields.

ECC Uncorrectable Data Checks that have been successfully retried, but the system File Mask indicates a PCI Fetch.

Data Checks associated with the processing of the second or subsequent segment of an overflow record.

Sense Bytes 8 Thru 12 – Count ID

Bytes 8 through 12 contain the record ID (CCHHR) obtained from the Count field of the record in which the error occured. Byte 12 is unreliable after a space count.

Sense Byte 13 – Sector Number

Byte 13 contains the sector number of the record that was in error.

Sense Byte 14 – Not Used

Set to zero.

Sense Bytes 15 Thru 17 – Restart Displacement

This parameter identifies the number of bytes processed by the storage control between the initiation of data transfer and the end of the Data field in error. The restart displacement includes the first byte transferred, but excludes all intermediate Home Address, Count, and Key fields that may have been clocked. Truncation within the operation does not affect the value of this parameter.

Sense Bytes 18 and 19 – Error Displacement

Bytes 18 and 19 specify the location of the first byte in error within the Data field in relation to the end of that field.

Sense Bytes 20 Thru 22 – Error Pattern

Bytes 20 through 22 identify the bits of a Correctable Data Check that were in error. A logical 1 represents an incorrect bit. Byte 22 is always zero.

Sense Byte 23 – Not Used

Set to zero.

FORMAT 5 – MESSAGES

Messages 0 Thru 2 – Not Used

Set to zero.

Message 3 – Data Field-Correctable Data Check

Generated if the correctable error occurred in the Data field.

Messages 4 Thru F – Not Used

FORMAT 6 – USAGE AND OVERRUN ERROR STATISTICS

Format 6 is generated if the usage statistics or overrun errors require off-loading due to a counter overflow condition, or if a Read and Reset Buffered Log command is issued.

Sense Bytes 8 Thru 11 – Bytes Read/Searched

Bytes 8 through 11 provide an accumulated count of the number of bytes processed by the subsystem in Read or Search operations. Only Key and Data field counts are accumulated.

Sense Bytes 12 and 13 – Not Used

Set to zero.

Sense Bytes 14 and 15 – Retry Data Checks

Bytes 14 and 15 identify the number of initial ECC Uncorrectable Data Checks for all fields that were successfully retried.

Sense Bytes 16 and 17 – Access Motions

Bytes 16 and 17 provide a count of the number of access motions processed by the subsystem.

Sense Byte 18 – Channel Select

BIT 0 – CHANNEL SELECT

Indicates to which pair (A and B or C and D) of interfaces the information in Sense Bytes 20 through 23 applies. If bit 0 = 0, the information applies to interfaces A and B. If bit 0 = 1, the information applies to interfaces C and D.

BITS 1 THRU 7 – NOT USED

Sense Byte 19 – Seek Errors

Indicates the total number of seek errors retried by the storage control.

Sense Byte 20 – Command Overrun A(C)

Indicates the number of channel A(C) Command overruns detected by the storage control.

Sense Byte 21 – Data Overrun A(C)

Indicates the number of channel A(C) Data Overruns detected by the storage control.

Sense Byte 22 – Command Overrun B(D)

Indicates the number of channel B(D) Command Overruns detected by the storage control.

Sense Byte 23 – Data Overrun B(D)

Indicates the number of channel B(D) Data Overruns detected by the storage control.

MICRO CONTENTS

MICRODIAGNOSTIC DISK LOADING

3830-2 STORAGE CONTROL

1. At the 23FD Drive, replace the 3830-2 microprogram disk with the correct 3350 microdiagnostic disk.
2. Programs can now be run from the 3350 CE Panel. If problems are found while doing Step 1, refer to the 3830-2 MLM. It is not unusual for the Check 2 lamp on the 3830-2 CE Panel to turn on while maintenance programs are running.

   Caution: Return the Functional Program disk in the 23FD before returning the 3350 to the customer. Reload the Fault Symptom Code (FSC) generator into the Storage Control overlay area by executing the '30' option (see START 500).

INTEGRATED STORAGE CONTROL

1. At the ISC 23FD Drive, replace the ISC disk with the 3350 microdiagnostic disk.
2. Programs can now be run from the 3350 CE Panel. If problems are found while doing Step 1, refer to the ISC MLM. It is not unusual for the Check 2 lamp on the ISC CE Panel to turn on while maintenance programs are running.

Caution: Return the Functional Program disk in the 23FD before returning the 3350 to the customer. Reload the Fault Symptom Code (FSC) generator into the Storage Control overlay area by executing the '30' option (see START 500).

3880 STORAGE CONTROL

A separate microdiagnostic diskette is not required. The 3350 microdiagnostics are resident on the 3880 functional diskette. See the functional diskette label to ensure that the correct diskette is installed for the 3350. 3350 microdiagnostics can be run from the 3350 CE Panel as described on MICRO 10.

Caution: Reset diagnostic control with '30' run option (see START 500) after maintenance activity is complete.

MICRODIAGNOSTIC RATE SELECTOR

Purpose

The storage control microdiagnostics provide a variable run rate for drive microdiagnostics during concurrent maintenance. A run rate may be selected that is most compatible with the customer needs. For example, if microdiagnostics cause system degradation to the degree of impacting customer operation, the microdiagnostic rate may be reduced to minimize degradation. However, if it is desired to reduce the drive down time, an increased microdiagnostic rate may be selected.

Caution must be exercised when selecting a faster rate. Unless an alternate path is available to the string of drives, a faster rate will probably impact customer operation.

Note: *The rate selection has no effect on stand-alone run times.*

Theory

System utilization of the storage control directly affects the run rate of microdiagnostics. Regardless of the rate selected, if the system has not attempted to select the storage control while microdiagnostics are being run, the diagnostic monitor proceeds immediately into the next diagnostic routine. If however, the system attempts to select the storage control while microdiagnostics are being run, the storage control forces a specified amount of time for system utilization.

Operation

The range of run rates are from approximately 1.5 minutes to several hours (depending on system utilization) to run the linked series. The customer should be consulted before deciding to either increase or reduce the microdiagnostic rate. The customer should be made aware that a faster rate could degrade system performance (depending upon utilization) and reduce downtime. Also, a slower rate, while lessening the impact the microdiagnostics have on system performance, may increase the downtime.

For complete operating instructions, see the 3830-2 or ISC MLM (MICRO section).

MICRODIAGNOSTIC ROUTINES

A0	CE Panel Test
A1	Control Interface and Logic Tests
A2	Drive Interface and Logic Tests
A5	Drive Index and Sector Tests
A7	Dynamic Servo Adjustment Routine
A9	Incremental Seek Tests
AA	Cylinder Seek Tests
AB	Random Seek Tests
AD	Gap Counter and Data Transfer Tests
AE	ECC Logic Tests
AF	Format Read/Write Tests
*B0	Reformat CE Tracks Utility Routine
*B1	Read Tests
*B2	Write Tests
*B3	Device Status Display Utility Routine
*B4	Tag Cycle Utility Routine
B6	String Switch Tests
B8	HDA/Control Logic Tests
B9	Dynamic Servo Tests
BA	HDA State Analysis Tests
BB	3330 Compatibility Mode and Other Special Tests
BC	Unconditional Reserve Test
BD	Vibration Tolerance Tests
*BF	Control Interface Bringup Routine 3830-2, ISC, and 3880.

Linked Series:
A1, A2, B8, A5, AD, AF, B9, AE, BB

*Utility Routines

Microdiagnostic Error Code Format

The microdiagnostic Error Code format follows the pattern below, except where noted in the Error Code Dictionary.

Example:

AF85 AF = routine number
8 = test number
5 = error number

LOADING PROCEDURES
(From 3350 CE Panel)
Preliminary

The microdiagnostics can be used only if the functional microcode is in the storage control. If the system has been in use, the code will be loaded. If this is not the case, load (IMPL) the functional microprogram.

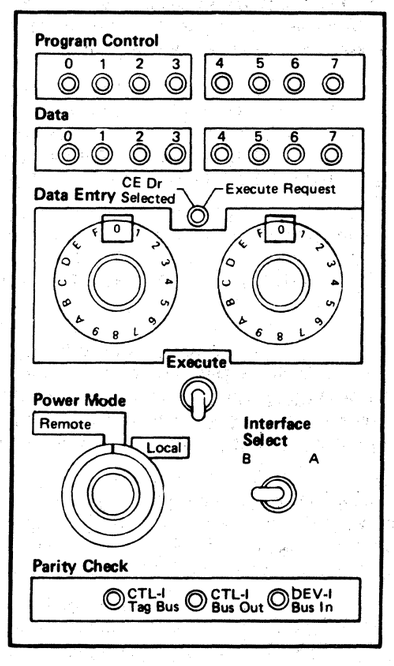
For storage control requirements or references to storage control documentation for system requirements, see MICRO 8.

The recommended microdiagnostic running sequence for general checkout is shown on START 110. Follow the MAP instructions for other maintenance operations.

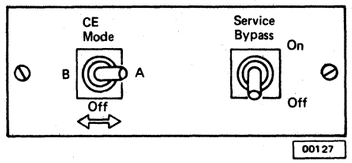
Procedure

This procedure outlines operations at the CE Panel on the 3350 A2 Module.

Note: *If correct results are not obtained when running the microdiagnostics, recheck all previous steps. See PANEL 150, Entry A if the controls do not work correctly.*



1 Turn on the CE Mode switch for the drive to be tested (A or B). (The CE Mode latch, set by the CE Mode switch, must be reset after the microdiagnostics are run; see Note on START 500.)



2 Set Data Entry switches to the required routine number. (The running descriptions start on MICRO 20.)

3 Operate the Execute switch. The routine designated by the Data Entry switches is loaded from the microdiagnostic disk.

82 DIAGNOSTIC LOADING

Program Control: 0 1 2 3 4 5 6 7

The display of '82' may occur too quickly to be seen.

CA READY FOR EXECUTION

Data: 0 1 2 3 4 5 6 7

The diagnostic is loaded. The routine number is shown in the Data display.

Is 'CA' and correct routine number displayed?

NO — YES → Proceed to Step 4

↓

UNABLE TO LOAD ROUTINE

Check Program Control display. (See MICRO 11 for a summary.) If unable to solve problem, turn to Panel Checkout Procedure on PANEL 150, Entry A.

4 Are parameters required (addresses, test loops, etc.)?

NO — YES → ENTER PARAMETERS

↓

Are run options required (dynamic error display, loop routines, etc.)?

NO — YES → SELECT RUN OPTIONS

↓

5 Set Data Entry switches to '00'.

ENTER PARAMETERS

Parameters are entered to loop tests for scoping or to define seek addresses, etc. The microdiagnostic descriptions (MICRO 20 through 84) specify the available parameters.

A. Set '10' in the Data Entry switches.

B. Operate the Execute switch.

Dx STORAGE CONTROL READY TO ACCEPT PARAMETERS

Program Control: 0 1 2 3 4 5 6 7

Program Control bits 4 through 7 indicate the parameter byte number needed.

C. Set Data Entry switches to the parameter value for the byte number indication display bits 4 through 7 ('1' through 'F'). See MICRO 20 through 84 for the required parameter values.

D. Operate the Execute switch.

E. If program control display = 'CA', proceed to step F, otherwise more parameters are required. Return to step C.

CA DIAGNOSTIC READY FOR EXECUTION

Program Control: 0 1 2 3 4 5 6 7

All parameters, as specified in the routine descriptions (MICRO 20) must be entered.

F. If run options (for dynamic error display, etc.) are required, go to Select Run Options, otherwise, return to Step 5.

SELECT RUN OPTIONS

Run options may be selected at any time except when parameters are being entered. Options are reset if a new routine is loaded.

A. Set Data Entry switches for the desired run option.

B. Operate the Execute switch.

CA DIAGNOSTIC READY FOR EXECUTION

Program Control: 0 1 2 3 4 5 6 7

Return to step 5.

6 Operate the Execute switch to start microdiagnostic.

8C MICRODIAGNOSTIC RUNNING

Program Control: 0 1 2 3 4 5 6 7

Routine number is in the Data display.

CF NORMAL COMPLETION

Program Control: 0 1 2 3 4 5 6 7

E1 ERROR OCCURRED or MESSAGE AVAILABLE

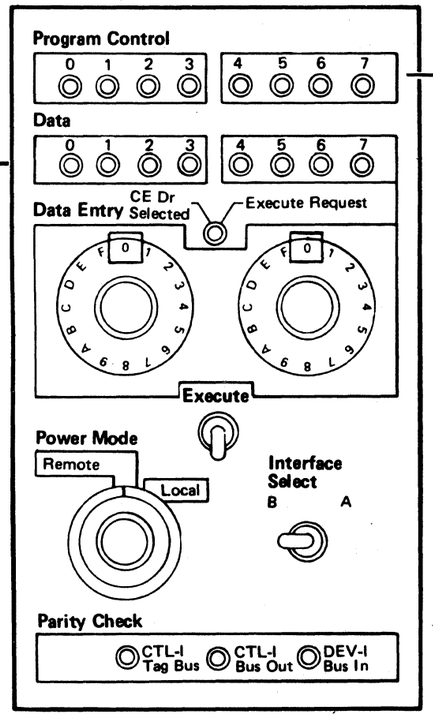
Program Control: 0 1 2 3 4 5 6 7

To determine error code or to display messages, see MICRO 12.

7 Refer to START 500 for procedures to return device to an online status after running the microdiagnostics.

RUN OPTIONS

Data Entry Switches (Hex)	Description
01	Dynamic error display, repeat test after error. Can be used when looping tests (parameter entry).
02	Loop routine. All routines linked to looped routine also run. See descriptions on MICRO 20 for linking information.
03	Dynamic error display and loop routine (including linking routines).
04	Inhibit routine linking. See descriptions (MICRO 20 through 84) for linking information.
05	Inhibit routine linking, dynamic error display. Repeat test after error.
06	Loop single routine (inhibit linking).
07	Loop single routine (inhibit linking) and dynamic error display.
08	Reset run options (allows linking, no looping, and error stops as if no run options were selected.
	Bit significance of run option entry: 0 1 2 3 4 5 6 7 7 — Dynamic error display (repeat test after error) 6 — Loop routine 5 — Inhibit linking (4) 4 — Reset run options



PROGRAM CONTROL DATA DISPLAY SUMMARY

Program Control Display (Hex)	Description	Data Display
82	The routine specified in the Data Entry switches is now loading.	Routine Number
8C	The microdiagnostic is running.	Routine Number
8D	Dynamic error display. Errors are displayed as they occur, but execution is not stopped because of the dynamic error display run option.	Error Number
C0	An invalid routine number was set in the Data Entry switches, or an incorrect microdiagnostic disk is installed.	Routine Number
	The routine execution was interrupted by a system or selective reset. Restart the microprogram.	'00'
CA	Microdiagnostic (routine series, routine, or test) is ready for execution.	Routine Number
CE	Routine stopped because of: 1. Manual intervention required. 2. Error or message display complete.	Routine Number
CF	**All Systems** Normal end of routine or end of series of linked routines.	Routine Number
	3830-2 or ISC only Normal end of control option '30' and Fault Symptom Code generator overlay complete. **3880** Normal end of '30' option.	'30'
DX	Parameter entry required. Bits 4 through 7 of Program Control display indicate parameter byte number needed.	Routine Number
E1 or EX	Error or message stop. If bits 4 through 7 of the Program Control display = '01', it indicates the first Error Message Byte is in the Data display lamps. If control option '20' is used to display additional bytes, bits 4 through 7 of the Program Control display indicate the byte number displayed in the Data lamps.	Error Number or Message Byte
FX	An error was detected by the storage control. Verify: 1. Proper microdiagnostic disk is correctly installed. If the disk is not correct or not properly installed, reinstall the correct disk and execution will continue. 2. Disk reader door is securely closed. Refer to the storage control MLM if the correct disk is installed and an FXXX error occurs. → 3350 10 Storage Control MLX Chart	N/A

CONTROL OPTIONS

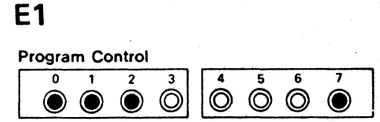
Data Entry Switches (Hex)	Description
00	**Start/Stop** Starts (or resumes) execution if the routine is stopped. Stops execution if the routine is running or if an error message display is in progress.
10	Parameter entry control (see Enter Parameters, MICRO 10).
20	Start or advance error or message display (see Display Message Bytes, MICRO 12).
30	Reset diagnostic control When attached to a 3880 Storage Control, the Program Control/Data display will be 'CF30' after completion. When the storage control is a 3830-2 or ISC, control option '30' must be selected with the *functional* microprogram disk installed before returning the subsystem to the customer. The purpose is to reload the Fault Symptom Code generator into the diagnostic overlay area. If control option '30' is selected: 1. Program Control/Data display should then display 'CF30' to indicate reload completion. For any other display, see below. 2. With the microdiagnostic disk installed, a B511 error occurs, see Microdiagnostic Error Code Dictionary. 3. With no disk installed, an FXXX error occurs. To recover, insert the disk in the reader and execution continues. 4. With the correct disk installed and an FXXX error occurs, refer to the storage control documentation. → 3350 10 Storage Control MLX Chart

DETERMINING ERROR CODE

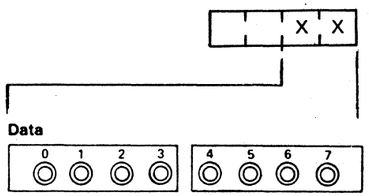
These procedures are for every routine except B3.

Entry into the Microdiagnostic Error Code Dictionary (MICRO 100 through 999) is by an Error Code consisting of four hex characters. To develop the code:

When E1 is displayed in the Program Control lamps,



The Data display lamps contain the last two hex characters of the Error Code number.

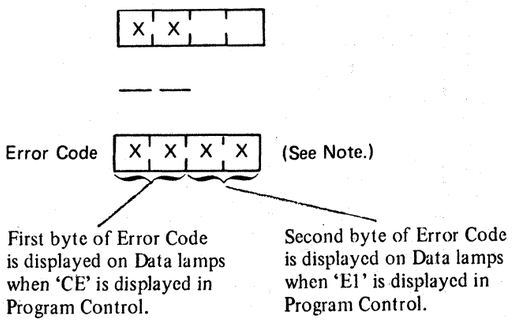


1 Record the Data display

2 Set '20' in the Data Entry switches.

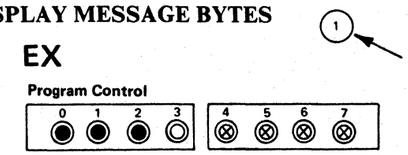
3 Go to Display Message Bytes, then return here.

4 Record the routine number from the Data display. If the display is the last byte of routine B3, pass 2, this is the end of the message display. No Error Code is generated by B3, pass 2.



5 Look up the Error Code in the Microdiagnostic Error Code Dictionary (starts on MICRO 100) to determine analysis procedure.

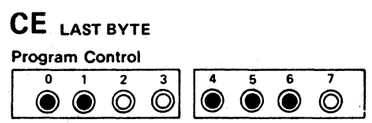
DISPLAY MESSAGE BYTES

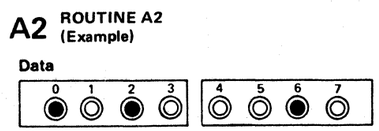


The Data display contains a Message Byte. The byte number 'x' is indicated in bits 4 through 7 of the Program Control display.

1 Operate the Execute switch to display and record the next byte in the Data lamps. Bits 4 through 7 of Program Control increments by 1 to indicate byte number.

2 Repeat Step 1 until all Message Bytes have been recorded.





The last byte contains the routine number (for example, 'A2').

For Tag/Bus value details, see OPER 98 through 101.

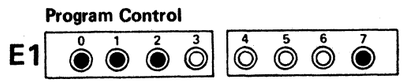
Note: *The Microdiagnostic Error Code format follows the pattern below, except where noted in the Error Code Dictionary.*

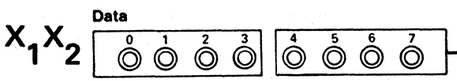
Example:

AF85 AF = routine number
8 = test number
5 = error number

B3 – DETERMINE FAULT SYMPTOM CODE (FSC) FROM B3 MICRO UTILITY

Pass 1 of B3 generates an FSC for entering maintenance procedures from the Fault Symptom Index (FSI) starting at FSI 100. The results consist of a 4-hex character code. Pass 2 of B3 permits a display of the Message Bytes. For a B3 description, see MICRO 64, FSI 60, and FSI 65



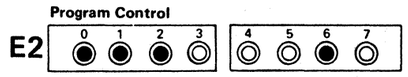


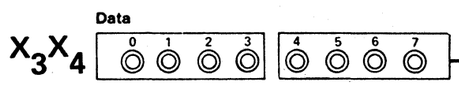
B3 is stopped and Byte 1 of FSC or Error Code is available.

1 Record Data display. Use display as first two hex characters of FSC. If display is 'FF', there is no error information to generate an FSC. Continue to read out Message Bytes.

2 Set '20' in the Data Entry switches.

3 Operate the Execute switch.



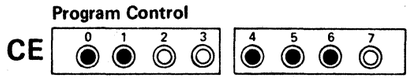


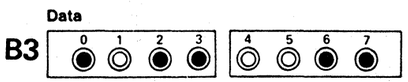
4 Record Data display. Use display as last two hex characters of FSC. Disregard Steps 4 and 5 if Step 1 display was 'FF'.

5 Use FSC to enter maintenance procedures by going to FSI 100 and proceed until FSC is found.

6 Set '00' in the Data Entry switches.

7 Operate the Execute switch.



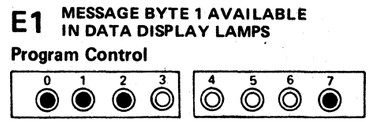


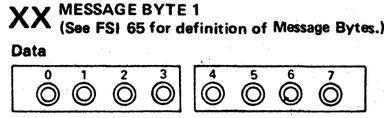
8 To obtain supporting Message Bytes, continue with B3, pass 2.

B3, PASS 2 – READING MESSAGE BYTES

1 Set '00' in the Data Entry switches.

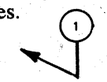
2 Operate the Execute switch.

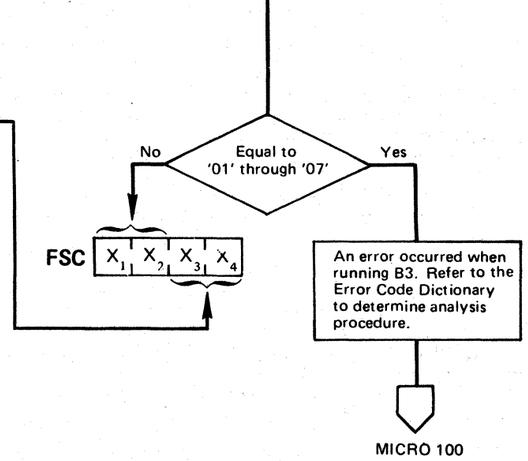




Data display lamps contain Message Byte 1 as indicated by the 1 in bits 4 through 7 of the Program Control display lamps.

3 Set '20' in the Data Entry switches, and go to Display Message Bytes.





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441300 31 Mar 76	441309 15 Jul 79	441310 27 Jun 80		

RUNNING INSTRUCTIONS – A0, A1, AND A2

Routine ID (Hex)	Routine Name	Test No.	Test Name	Routine Description	Parameters				Prerequisites	Reference Notes
					Byte No.	Default Value (Hex)	Value Limits (Hex)	Description		
A0	CE Panel Test	1	Single Test Routine	Routine A0 tests the following: CE Panel Data Entry switches. CE Panel lamps and registers.					The control interface must be operative to the point of loading and starting this routine.	See MICFL 10 for flowchart and detailed description. Use PANEL 152, Entry D for running instructions.
A1	Control Interface and Logic Tests	1 2 3 4 5	Pre-selection Selection Controller Tag Bus, Bus Out Parity Check Valid Tags Bus In Assembler	Routine A1 tests the following: Interface lines for always active/inactive conditions. 3-of-6 code for validity on selection. Controller tag decoder for Tag Valid returned on all controller tags. The four registers in the Bus In Assembler.	1	00	00–05	Test Number. (Allows looping a single test within this routine.) 00 (default)=Run all tests.	Control interface must be operative to the point of loading and starting this routine.	See MICFL section for flowchart and detailed description. Drive in CE Mode and/or HDA Ready not required.
A2	Device Interface and Logic Tests	1 2 3 4 5 6 7 8 9 A B	Drive Selection Drive Tag Bus and Bus Out Parity Bus Out/Bus In Wrap Drive Selection/ Rejection Drive Valid Tags Drive Invalid Tags Bus In Parity Check Head Address Register Difference Counter Part 1 Difference Counter Part 2 Optional CAR Test	Routine A2 tests the following: The ability to select a device. Set and reset of checkers used by test. Verifies that at least one complete path exists between Bus Out and Bus In. Ensures that drive selection does not occur with Bus Out bit 4 active under Tag '83'. Tag decoders for Tag Valid returned on all device valid tags. No Tag Valid returned on all invalid tags. Bus In parity checking circuits. Hardware counters in the device. CAR on string switch machines.	1	00	00–0B	Test number. (Allows looping a single test within this routine.) 00 (default)=Run all tests.	Routine A1 must run error free.	See MICFL section for flowchart and detailed description. Device Must be in CE Mode. HDA Ready is not required.

RUNNING INSTRUCTIONS – A5, A7, AND A9

Routine ID (Hex)	Routine Name	Test No.	Test Name	Routine Description	Parameters				Prerequisites	Reference Notes
					Byte No.	Default Value (Hex)	Value Limits (Hex)	Description		
A5	Drive Index/ Sector Tests	1 2 3 4 5 6	Target Register Index Force Multichip Check Force Sector Compare Check Test Sector Compare Attention Sector Compare	Routine A5 tests the following: Target Register Index and Sector Checks by forcing checking circuits to set and reset. Width of an Index pulse and the time between Indexes to verify that the rotational period is within specification. The set and reset of Sector Compare Check. The generation of Busy from a Set Target operation. Sector Compare Attention. The duration of a sector and compares it to the specification. Verifies that Sector Compare is active for sectors 1, 2, 4 8, 16, 32, 64, and 127. Multichip Check by using a diagnostic command.	1	00	00–06	Test number. (Allows looping a single test within this routine.) 00 (default)=Run all tests.	Routines A1, A2, and B8 must run error free. HDA must be Ready.	See MICFL section for flowchart and detailed description.
A7	Dynamic Servo Adjustment Routine		Fine Adjustment	Routine A7 is used to adjust the servo velocity to specifications. The difference count range is from '08' through '0A' for a 192-cylinder Forward Seek. Routine A7 is not designed to be looped. After each adjustment, re-run routine A7 to check the adjustment.				None	Routines A1 and A2 must run error free. HDA must be Ready.	See MICFL section for flowchart and detailed description. Refer to MICRO 240 and ACC 800, Entry C, for details required for adjustment. Do not use loop option.
A9	Incremental Seek Test			Routine A9 seeks and verifies access position by reading the Home Address. *This routine loops indefinitely until stopped by the CE or an error occurs.*	1	01	01–FF	Desired increment. (Program defaults to one-cylinder seeks if no parameter is entered.)	Routines A1, A2, B8, A5, AD, AF, B9, AE, and BB (linked series) must run error free. HDA must be Ready.	See MICFL section for flowchart and detailed description.

Routine ID (Hex)	Routine Name	Test No.	Test Name	Routine Description	Parameters				Prerequisites	Reference Notes
					Byte No.	Default Value (Hex)	Value Limits (Hex)	Description		
AA	Cylinder Seek Test			Routine AA seeks between two cylinders as specified by the parameter entry. The access position is verified by reading the Home Address. If no cylinders are specified by the parameter entry, the program defaults to a no-motion seek. *This routine loops indefinitely until stopped by the CE or an error occurs.* *This routine uses head 00 only.*	1 2 3 4	00 00 00 00	00–02 00–FF 00–02 00–FF	From cylinder address high (Physical Address) From cylinder address low To cylinder address high (Physical Address) To cylinder address low *See Reference Notes.*	Routines A1, A2, B8, A5, AD, AF, B9, AE, and BB (linked series) must run error free. HDA must be Ready.	*The maximum physical cylinder address that can be entered is 560 (decimal).* Parameter 1 and 3: 0000 00XX — Cylinder Address 512 bit. Cylinder Address 256 bit. Parameter 2 and 4: ZZZZ ZZZZ — Cylinder Address bits 128→0.
AB	Random Seek Test			Routine AB executes 1792 seeks using a random number generator as a seek argument. The Home Address is read after each seek and compared to the random number to verify access position. The program terminates on completion of the 1792nd seek.					Routines A1, A2, B8, A5, AD, AF, B9, AE, and BB (linked series) must run error free. HDA must be Ready.	See MICFL section for flowchart and detailed description.

RUNNING INSTRUCTIONS – AD AND AE

Routine ID (Hex)	Routine Name	Test No.	Test Name	Routine Description	Parameters				Prerequisites	Reference Notes
					Byte No.	Default Value (Hex)	Value Limits (Hex)	Description		
AD	Gap Counter and Data Transfer Tests	1	Data Transfer Checkers Check	Routine AD tests the following: Operation of the Diagnostic Write Inhibit to the device.	1	00	00–0B	Test number. (Allows looping a single test within this routine.) 00 (default)=Run all tests.	Routines A1, A2, B8, and A5 must run error free. HDA must be Ready and Read/Write enabled.	See MICFL section for flowchart and detailed description.
		2	G1 Gap Tolerance	Gap Counter Check.						
		3	Extended G1 Gap Tolerance	Write Data Check.						
		4	Modulo-16 Counter	Compares the length of the G1 gap to the specification (118±3 microseconds).						
		5	G2 Gap Tolerance	Compares the length of the extended G1 gap to the specification (262±7 microseconds).						
		6	G3 Gap Tolerance	Modulo-16 Counter.						
		7	Data Transfer	Compares the G2 gap to the specification (75-79 microseconds).						
		8	Write Safety Checkers Check	Compares the G3 gap to the specification (77-82 microseconds).						
		9	Pad Gate Check and Head Short Check	The data path from the interface through SERDES.						
		A	Skip Defect Gap Tolerance	Control Check.						
		B	Write Fail Latch Test	Write Overrun Check.						
				Transition Check.						
				Write Current Check.						
				Pad Gate.						
				Head Short Check.						
				Extended G2 gap and Extended Special G2 gap for proper gap tolerance.						
				Write Fail Latch.						
AE	Error Correction Code (ECC) Test			Routine AE tests the following:	1	00	00–06	Test number. (Allows looping a single test within this routine.) 00 (default)=Run all tests.	Routines A1, A2, B8, A5, AD, and AF must run error free. HDA must be Ready and Read/Write enabled.	See MICFL section for flowchart and detailed description.
		1	ECC Reset	Test 1–The set and reset of the ECC registers.						
		2	ECC Pattern Register Check	Test 2–Bit patterns in the ECC Pattern Register.						
		3	ECC Read Normal Data	Test 3–The ECC hardware while reading an error-free data pattern.	2	00	00–02	Loop control. 00=Loop write and read. 01=Loop write phase only. 02=Write one time and loop read phase.		
		4	ECC Read Correctable Data Check	Test 4–The ECC hardware while reading a correctable Data Check pattern.						
		5	ECC Read Uncorrectable Data Check	Test 5–The ECC hardware while reading an uncorrectable Data Check pattern.						
		6	ECC Write Bus Burst (ECC Check Pattern)	Test 6–The ECC pattern written after writing a 1-byte data pattern, by reading back 7 bytes, and then performing a byte-by-byte Compare.						

RUNNING INSTRUCTIONS – AF MICRO 32

Routine ID (Hex)	Routine Name	Test No.	Test Name	Routine Description	Parameters				Prerequisites	Reference Notes
					Byte No.	Default Value (Hex)	Value Limits (Hex)	Description		
AF	Format Read/Write Tests			Routine AF tests the following:	1	00	00–0F	Test number. (Allows looping a single test within this routine.) See Reference Notes 1 through 4 for prerequisites required by certain tests.	*Routines A1, A2, B8, A5, and AD must run error free.* *HDA must be Ready and Read/Write Enabled.*	*See MICFL section for flowchart and detailed description.* **Note 1:** *Since all tests that write in routine AF depend on the access being positioned on the CE track (that is, physical cylinder 560), it is imperative that the access is not mechanically repositioned off of this cylinder. Every precaution has been included to detect any movement of the access electrically, including HDA Ready condition while running routine AF.* **Note 2:** *Test 9 depends upon successful completion of test 8 in order to run error free. Observe caution when using the loop test option.* **Note 3:** *Test B depends upon successful completion of Test A in order to run error free. Observe caution when using the loop test option.* **Note 4:** *Test 6 depends on the proper placement of the G1 Record (HA) on the track. Test E formats a G1 record.*
		1	Read G1 Unoriented Status	Test 1 – Ability to orient on Index and to reset unoriented status.						
		2	Oriented/Unoriented Border Line	Test 2 – Verifies that Orientation is maintained for the specified time and that Lost Orientation occurs at the specified time.						
					2	00	00–FF	**Password parameter.** (Valid password= '02'.) **Caution** ***Extreme caution must be exercised when overriding the default parameter. In normal operation, the Home Address is read to verify access position on the CE cylinder. If it is impossible to read the Home Address on this cylinder without error, the program terminates with an error. The CE can elect to continue testing with routine AF by entering the valid password parameter. Again, caution must be observed as this allows the possibility of destroying customer data. The procedure is as follows:*** 1. ***Reload routine AF.*** 2. ***Enter parameters: 10,0E,02,00*** 3. ***Reload routine AF and run in default mode.***	
		3	Force Command Over run and Check End	Test 3 – Verifies the operation of Command Overrun in both Read and Write mode.						
		4	Force Sync-Out Timing Error and Force Status Overrun	Test 4 – The Sync Out timing and Status Overrun checkers.						
		5	Test Allow HAR Function	Test 5 – The Allow HAR function in the window past the Index Format operation.						
		6	Write Full Track G2	Test 6 – The successful writing of a full track R0 Count field. See Reference Note 4.						
		7	Write G2-Force Track Overrun	Test 7 – The operation of the Track Overrun checker by attempting to write into Index.						
		8	Write G2/Format Write G2	Test 8 – The operation of the Write G2 and Format Write G2 commands.						
		9	Read G2/Clock G2 Force No Sync Found	Test 9 – The operation of the Read G2 and Clock G2 commands. This test also verifies the operation of the No Sync Found checkers. See Reference Note 2.						
		A	Format Write G3/Read G3	Test A – The operation of Format Write G3 and Read G3 commands.						
		B	Clock G3/Read G3 AM Search	Test B – The operation of Clock G3 and Read G3 AM Search commands. See Reference Note 3.						
		C	Format Erase, Force No AM Found	Test C – The operation of the Format Erase Command. This test also verifies operation of the No AM Found checker by searching for the AM on the previously erased track.						
		D	Special Format Write G1/Read G1	Test D – The operation of the special Format Write G1 and the Read G1 commands.						
		E	Format Write G1/Read G1	Test E – The operation of the Format Write G1 command.						
		F	Skip Displacement Fields	Test F – The operation of commands used for defect skipping, Special Write G2, Special Read G2, Write G4, and Read G4.						

DESCRIPTION

Introduction

Routine B0 is a utility microprogram designed to format one track or all tracks on the CE cylinder.

The formatting steps are as follows:

1. Verify access position
2. Write Home Address (G1)
3. Write R0 Count (G2)
4. Write R0 Data (G2)
5. Write R1 Count (G3)
6. Write R1 Data (G2), see Figure 1
7. Read Home Address (G1)
8. Read R0 Count (G2)
9. Read R0 Data (G2)
10. Read R1 Count (G3)
11. Read R1 Data (G2)
12. Steps 1 through 11 are repeated for each CE track if the entire CE cylinder is being formatted.
13. All fields on all tracks on the CE cylinder are read, even if only one track is being formatted.

The data patterns consist of:

1. Standard Home Address (14 Bytes)
2. Standard R0 Count field (18 Bytes)
3. An R0 Data field of zeros (8 Bytes)
4. Standard R1 Count field (18 Bytes)
5. An R1 Data field, see Figure 1 (256 Bytes)

Options

Routine B0 does not run in default mode. Parameters must be entered. There are two run options:

1. Format entire CE cylinder.
2. Format single CE track.

OPERATING INSTRUCTIONS

Refer to the flowchart on MICRO 54 for the running instruction logic of routine B0.

Parameters			
Byte No.	Default Value (Hex)	Value Limits (Hex)	Description
1	None	00 or 10	Bit Control Switches 0 Must be zero 1 Must be zero 2 Must be zero 3 Format entire cylinder if a one 4 Must be zero 5 Must be zero 6 Must be zero 7 Must be zero
2	None	02	High Cylinder Address (This byte must be '02'.)
3	None	30	Low Cylinder Address (This byte must be '30'.)
4	None	XX	This byte is not used when formatting the entire cylinder. If formatting a single track, see Figure 2 for head values.
5	None	00 or 5D	PASSWORD (5D) This byte must be entered if the entire CE cylinder is to be formatted or if the access position cannot be verified during the formatting of a single CE track.

Figure 1. R1 Data Field

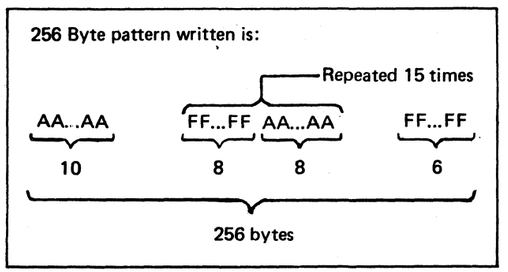
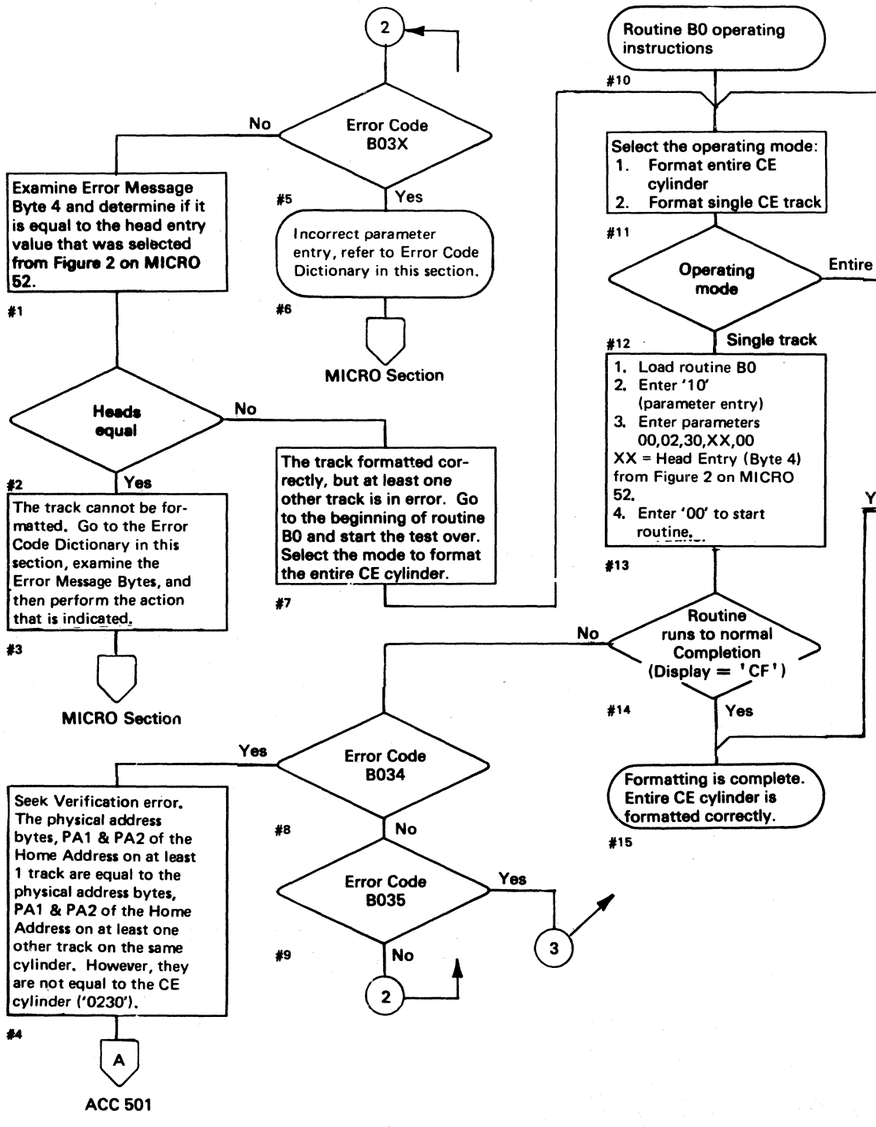


Figure 2. Movable Head Chart

Physical Head Number		Byte 4 Parameter
Dec	Hex	Hex
00	00	00
01	01	02
02	02	04
03	03	06
04	04	08
05	05	0A
06	06	0C
07	07	0E
08	08	10
09	09	12
10	0A	14
11	0B	16
12	0C	18
13	0D	1A
14	0E	1C
15	0F	1E
16	10	20
17	11	22
18	12	24
19	13	26
20	14	28
21	15	2A
22	16	2C
23	17	2E
24	18	30
25	19	32
26	1A	34
27	1B	36
28	1C	38
29	1D	3A

ROUTINE B0 RUNNING INSTRUCTIONS



DESCRIPTION

Introduction

This routine can read data from any cylinder and/or head on the selected CE drive (including fixed heads). Correct operation is verified by not receiving any of the following:

- Equipment Check
- No Data Found
- No Sync Byte Found
- ECC Data Check

Correct operation is further verified by receiving the correct physical address (PA bytes in the Home Address and R0 Count areas). No customer data is transferred or stored.

Default Mode

In Default Mode, the routine seeks to cylinder 4 and reads the entire cylinder. If the drive is equipped with fixed heads, the routine also seeks to the fixed-head cylinders and reads all the fixed-head tracks.

All ECC Data Check, No Sync Byte Found, and No Data Found errors are accumulated in a summary log. The summary log may be displayed at the completion of the run. Refer to Error Codes B1FD, B1FE, and B1FF in the Error Code Dictionary in this section.

Options

1. *Test Cylinder:* This option is the same as the Default mode except the cylinder number may be selected.
2. *Test Cylinder/Suppress Summary Logging:* This option is the same as Test Cylinder except the routine stops on the first error. The routine can be instructed to continue to the next track address in error by using the '00' option. This option is useful for gathering additional information pertaining to the failures on a particular head.
3. *Test Track:* This option is used for performing Read operations on a specific track and stopping on an error.
4. *Scope Loop:* This option is useful for scoping a single track. All errors are bypassed.

OPERATING INSTRUCTIONS

Default Mode – Basic Operation

1. Verify that the correct microdiagnostic disk is installed.
2. Load routine B1.
3. Enter '00' in the Data Entry switches and operate the Execute switch.

Test Cylinder

1. Verify that the correct microdiagnostic disk is installed.
2. Load routine B1.
3. Enter '10' in the Data Entry switches (parameter entry) and operate the Execute switch.
4. Enter the control byte:

   For movable heads – '90'

   For fixed heads – 'B0'
5. If the physical cylinder is not known, go to R/W 400 to convert Sense Bytes 5 and 6 to the physical cylinder. The CE cylinder is '0230'.
6. Enter the high-order physical cylinder byte from Step 5, or enter:

   For cylinder 4 – '00'

   For CE cylinder – '02'

   For fixed heads – '00'
7. Enter the low-order physical cylinder byte from Step 5, or enter:

   For cylinder 4 – '04'

   For CE cylinder – '30'

   For fixed heads – '00'
8. Enter '00'
9. Enter '00'

Test Cylinder – Loop and Accumulate Errors

1. Perform Steps 1 through 8 as in Test Cylinder operation.
2. Enter '03' to loop the routine and suppress errors.
3. Enter '00' to start routine B1.
4. Enter '08' to reset the loop option. Let the routine run to its normal completion or to an error stop. If Error Codes B1FD, B1FE, or B1FF are indicated, a summary of the failing heads is in the display bytes. See the Error Code Dictionary in the MICRO section for details concerning these Error Codes.

Test Cylinder/Suppress Summary Logging

1. Verify that the correct microdiagnostic disk is installed.
2. Load routine B1.
3. Enter '10' in the Data Entry switches (parameter entry) and operate the Execute switch.
4. Enter the control byte:

   For movable heads and summary log Data Checks – '90'

   For movable heads and summary log Seek Verification Checks – '94'

   For fixed heads and summary log Data Checks – 'B0'

   For fixed heads and summary log Seek Verification Checks – 'B4'
5. If the physical cylinder is not known, go to R/W 400 to convert Sense Bytes 5 and 6 to the physical cylinder. The CE cylinder is '0230'.
6. Enter the high-order physical cylinder byte from Step 5, or enter:

   For cylinder 4 – '00'

   For CE cylinder – '02'

   For fixed heads – '00'
7. Enter the low-order physical cylinder byte from Step 5, or enter:

   For cylinder 4 – '04'

   For CE cylinder – '30'

   For fixed heads – '00'
8. Enter '00'
9. Enter '00'

After an error occurs, the message display may be read out by using the error display control option '20' (refer to MICRO 10 through 12). The routine may be continued by using control option '00'. The routine steps to the next head and continues.

RUNNING INSTRUCTION – B1

OPERATING INSTRUCTION – Continued

Parameters for Test Track and Scope Loop

There are four ways the parameters can be entered:

- Test Track – Logical
- Test Track – Physical
- Scope Loop – Logical
- Scope Loop – Physical

The parameter data to be entered will be one of two types. First there is the logical data. This data is determined from the channel unit address and Sense Bytes 5 and 6. The second type of data is the physical. Physical data is determined from the physical cylinder and head numbers.

Parameter data must be entered either in the logical format or the physical format but not in a combination of both types.

Note: *The physical cylinder and head numbers may be determined after the program has run whether or not an error has occurred. The physical cylinder and head numbers are found by displaying the Message Bytes using control option '20'. The Message Bytes displayed are:*

1. *Error Number (if an error occurred)*
2. *Physical Cylinder High--------(PA1)*
3. *Physical Cylinder Low--------(PA2)*
4. *HAR value--------------------(PA3)*

   Use the Physical Head Charts on MICRO 58 to convert HAR values to the physical head values. The HAR values are in the same format as Byte 4 Parameters.

Test Track – Logical

1. Verify that the correct microdiagnostic disk is installed.
2. Load routine B1.
3. Enter '10' in the Data Entry switches (parameter entry) and operate the Execute switch.
4. Enter '00' for logical type parameters.
5. Enter 'XX' ('XX' = unit address, low-order byte of the Channel Unit Address (CUA) from the system printout or from the identification sticker on the Operator Panel).
6. Enter Sense Byte 5.
7. Enter Sense Byte 6.
8. Enter '00' and operate the Execute switch to start the routine.
9. See Note.

Test Track – Physical

1. Verify that the correct microdiagnostic disk is installed.
2. Load routine B1.
3. Enter '10' in the Data Entry switches (parameter entry) and operate the Execute switch.
4. Enter the control byte:

   For movable heads – '80'

   For fixed heads – 'A0'
5. Enter the high-order cylinder address. The range is '00' through '02'. The CE cylinder is '02'.
6. Enter the low-order cylinder address. The range is '00' through 'FF'. The CE cylinder is '30'.
7. Enter the head address byte. See the Physical Head Charts on MICRO 58.
8. Enter '00' and operate the Execute switch to start the routine.

Scope Loop – Logical

1. Verify that the correct microdiagnostic disk is installed.
2. Load routine B1.
3. Enter '10' in the Data Entry switches (parameter entry) and operate the Execute switch.
4. Enter '40' for logical type parameters.
5. Enter 'XX' ('XX' = unit address, low-order byte of the Channel Unit Address (CUA) from the system printout or from the identification sticker on the Operator Panel).
6. Enter Sense Byte 5.
7. Enter Sense Byte 6.
8. Enter '00' and operate the Execute switch to start the routine.

Scope Loop – Physical

1. Verify that the correct microdiagnostic disk is installed.
2. Load routine B1.
3. Enter '10' in the Data Entry switches (parameter entry) and operate the Execute switch.
4. Enter the control byte:

   For movable heads – 'C0'

   For fixed heads – 'E0'
5. Enter the high-order cylinder address. The range is '00' through '02'. The CE cylinder is '02'.
6. Enter the low-order cylinder address. The range is '00' through 'FF'. The CE cylinder is '30'.
7. Enter the head address byte. See the Physical Head Charts on MICRO 58.
8. Enter '00' and operate the Execute switch to start the routine.

Parameters				Prerequisites	Reference Notes
Byte No.	Default Value (Hex)	Value Limits (Hex)	Description		
1	98	XX	**Bit Control Switches** 0 Select physical address mode 1 Select scope loop 2 Select fixed head(s) 3 Read entire cylinder and/or all fixed heads 4 If bit 3 = 1, advance to fixed heads if they are installed 5 For summary log Data Checks – 0. For summary log Seek Verification Checks – 1. 6 Suppress summary logging 7 Must be 0		**Note:** *Routine B1 requires a standard HA and R0 on all tracks being read. If while running on the CE cylinders, track format problems are suspected or track addressing problems are experienced, run routine B2 in Default mode. Routine B2 will read the HA, write R0 and R1, then read HA, R0 and R1. If routine B2 generates errors while reading the HAs, routine B0 should be run. Routine B0 will write the HA(s), R0(s), and R1(s) on the CE track(s). Refer to MICRO 52 for running instructions.*
2	00	00–02	If Byte 1, bit 0 = 0, enter logical unit address. If Byte 1, bit 0 = 1, enter the high physical cylinder number: 00 = cylinder 0 – 255 01 = cylinder 256 – 511 02 = cylinder 512 – 560 Default = cylinder 4		
3	04	00–FF	If Byte 1, bit 0 = 0, enter Sense Byte 5. If Byte 1, bit 0 = 1, enter the low physical cylinder number. (Default = cylinder 4.)		
4	00 OR	00–3A	If Byte 1, bit 0 = 0, enter Sense Byte 6. If Byte 1, bit 0 = 1, and if Byte 1, bit 2 = 0, enter the movable physical head. (See Physical Head Charts for correct entry.)		
4	00	40–B6	If Byte 1, bit 0 = 1, and if Byte 1, bit 2 = 1, enter the fixed physical heads. (See Physical Head Charts for correct entry.)		

PHYSICAL HEAD CHARTS

To be used to enter head number (Byte 4) if the physical address mode is selected. (Byte 1, bit 0 = 1.)

Movable Head

Head Number		Byte 4 Parameter (HAR Value)
Dec	Hex	Hex
00	00	00
01	01	02
02	02	04
03	03	06
04	04	08
05	05	0A
06	06	0C
07	07	0E
08	08	10
09	09	12
10	0A	14
11	0B	16
12	0C	18
13	0D	1A
14	0E	1C
15	0F	1E
16	10	20
17	11	22
18	12	24
19	13	26
20	14	28
21	15	2A
22	16	2C
23	17	2E
24	18	30
25	19	32
26	1A	34
27	1B	36
28	1C	38
29	1D	3A

Fixed Head

Head Number		Byte 4 Parameter (HAR Value)
Dec	Hex	Hex
00	00	40
01	01	42
02	02	44
03	03	46
04	04	48
05	05	4A
06	06	4C
07	07	4E
08	08	50
09	09	52
10	0A	54
11	0B	56
12	0C	58
13	0D	5A
14	0E	5C
15	0F	5E
16	10	60
17	11	62
18	12	64
19	13	66
20	14	68
21	15	6A
22	16	6C
23	17	6E
24	18	70
25	19	72
26	1A	74
27	1B	76
28	1C	78
29	1D	7A

Fixed Head continued

Head Number		Byte 4 Parameter (HAR Value)
Dec	Hex	Hex
30	1E	7C
31	1F	7E
32	20	80
33	21	82
34	22	84
35	23	86
36	24	88
37	25	8A
38	26	8C
39	27	8E
40	28	90
41	29	92
42	2A	94
43	2B	96
44	2C	98
45	2D	9A
46	2E	9C
47	2F	9E
48	30	A0
49	31	A2
50	32	A4
51	33	A6
52	34	A8
53	35	AA
54	36	AC
55	37	AE
56	38	B0
57	39	B2
58	3A	B4
59	3B	B6

RUNNING INSTRUCTIONS – B2

DESCRIPTION

Introduction

Routine B2 is a utility microprogram designed to format one track or all tracks on the CE cylinder.

The formatting steps are as follows:

1. Read Home Address (G1)
2. Verify access position
3. Write R0 Count (G2)
4. Write R0 Data (G2)
5. Write R1 Count (G3)
6. Write R1 Data (G2), see Figure 1
7. Read Home Address (G1)
8. Read R0 Count (G2)
9. Read R0 Data (G2)
10. Read R1 Count (G3)
11. Read R1 Data (G2)
12. Steps 1 through 11 are repeated for each CE track if the entire CE cylinder is being formatted.
13. All fields on all tracks on the CE cylinder are read, even if only one track is being formatted.

The data patterns consist of:

1. Standard Home Address (14 Bytes)
2. Standard R0 Count field (18 Bytes)
3. An R0 Data field of zeros (8 Bytes)
4. Standard R1 Count field (18 Bytes)
5. An R1 Data field, see Figure 1 (256 Bytes)

Options

1. *Default Mode.* Each track of the CE cylinder is written and verified, then the entire CE cylinder is read again and checked for errors.
2. *Single Track Mode.* The track selected by the parameter Byte 4 is written and verified. Then the entire CE cylinder is read back and checked for errors.

OPERATING INSTRUCTIONS

Default Mode

1. Verify that the correct microdiagnostic disk is installed.
2. Load routine B2.
3. Enter '00' in the Data Entry switches and operate the Execute switch to start the routine.

Single Track Mode

1. Verify that the correct microdiagnostic disk is installed.
2. Load routine B2.
3. Enter '10' in the Data Entry switches (parametcr entry) and operate the Execute switch.
4. Enter parameter bytes as follows: '00, 02, 30, XX'.

   Where XX = The physical head value selected from the Movable Head Chart (Figure 2).
5. Enter '00' in the Data Entry switches and operate the Execute switch to start the routine.

Parameters			
Byte No.	**Default Value (Hex)**	**Value Limits (Hex)**	**Description**
1	10	00 or 10	Bit Control Switches 0 Must be zero 1 Must be zero 2 Must be zero 3 Format entire CE cylinder if a one 4 Must be zero 5 Must be zero 6 Must be zero 7 Must be zero
2	02	02	High Cylinder Address (This byte must be '02')
3	30	30	Low Cylinder Address (This byte must be '30')
4	00	00–3A	Selected Head Address (Movable only) Not used if Byte 1 bit 3 = 1. (See Figure 2 for head values.)

Figure 1. R1 Data Field

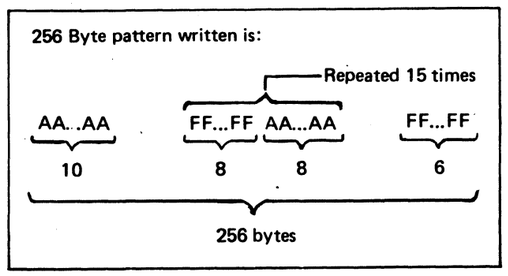


Figure 2. Movable Head Chart

Physical Head Number		Byte 4 Parameter
Dec	**Hex**	**Hex**
00	00	00
01	01	02
02	02	04
03	03	06
04	04	08
05	05	0A
06	06	0C
07	07	0E
08	08	10
09	09	12
10	0A	14
11	0B	16
12	0C	18
13	0D	1A
14	0E	1C
15	0F	1E
16	10	20
17	11	22
18	12	24
19	13	26
20	14	28
21	15	2A
22	16	2C
23	17	2E
24	18	30
25	19	32
26	1A	34
27	1B	36
28	1C	38
29	1D	3A

RUNNING INSTRUCTIONS – B3 MICRO 64

Routine ID (Hex)	Routine Name	Test No.	Test Name	Routine Description	Parameters				Prerequisites	Reference Notes
					Byte No.	Default Value (Hex)	Value Limits (Hex)	Description		
B3	**Device Status Display Utility Routine**			The device status display program is a utility that performs two functions: • Generates a Fault Symptom Code on pass 1 if the necessary error conditions stored in the device have not been reset. • Displays 15 bytes of device information on pass 2. See Reference Note 1. PASS 1 1. Place drive to be tested in CE Mode (CE Mode switch on). 2. Load routine B3. 3. When loaded, enter '00' in the Data Entry switches, and operate the Execute switch once. 4. Program Control display should contain 'E1'. 5. Data display: a. '01' to '07' = Error attempting to run B3 routine. See MICRO 100. b. 'FF' = Unable to generate Fault Symptom Code. Run pass 2. c. Other than above = Byte 1 of Fault Symptom Code. Enter '20' in the Data Entry switches, and operate the Execute switch once to display Byte 2 of the Fault Symptom Code. PASS 2 1. After successful completion of pass 1 (indicated by items 5b. or 5c. above), enter '00' in the Data Entry switches and operate the Execute switch twice. 2. Completion of pass 2 is indicated by 'E1' in the Program Control display, and the bit significant physical address of the drive in CE Mode in the Data display ('80', '40', '20', '10', '08', '04', '02', '01'). 3. Enter '20' in the Data Entry switches, and operate the Execute switch once for each of the remaining display bytes. As each byte is displayed, the Program Control display advances (E2, E3, etc.) to indicate which byte is displayed in the Data display. See Reference Note 1 for byte content. 4. After the last byte is displayed, operating the Execute switch results in 'CE' in the Program Control display and 'B3' in the Data display. 5. Any attempt to restart the routine (by entering '00' in the Data Entry switches and operating the Execute switch) will result in rerunning only pass 2.					Controller interface operative to the point of loading and starting this routine. See MICRO 12 for details of Error/Message display information.	See MICFL section for flowchart and detailed description. **Note 1:** *At the end of pass 2, the first of 14 bytes of logout are displayed. The content is as follows:* Byte No. – Description 1. E1 – Physical Drive Address 2. E2 – Head Address Register 3. E3 – Difference Counter 4. E4 – Drive Status 5. E5 – Check Status 6. E6 – HDA Sequence Control 7. E7 – Load Switch Status 8. E8 – Read/Write Safety 9. E9 – Access Status 10. EA – Controller Check 11. EB – Controller Interface Check 12. EC – Device Interface Check 13. ED – Target Register (RPS) 14. EE – Cylinder Address Register (String Switch) 15. EF – Sense Status 0 **Refer to FS1 65 for bit significance of the Message Bytes.** **Note 2:** *Reloading and restarting this routine will yield different results. This is because any error condition was reset during pass 1 (original execution of pass 1).*

RUNNING INSTRUCTIONS – B4 MICRO 68

Routine ID (Hex)	Routine Name	Test No.	Test Name	Routine Description	Parameters				Prerequisites	Reference Notes
					Byte No.	Default Value (Hex)	Value Limits (Hex)	Description		
B4	Tag Cycle Utility		This routine executes any valid tag/bus or delay commands entered by the CE through parameter entry. (Refer to OPER 98 through 101 for tag/bus summary.)	*Write Op (Tag '0F') under drive selection, Seek Start (Tag '8F', Bus '08), and Rezero (Tag '8F' Bus '02') cannot be used.* Each delay or tag command consists of two bytes of parameter entry, and up to seven commands may be entered at one time. These entries are referred to as the command string. Following the last command, zeros must be entered to complete the parameter field. Once execution has been started, the command string loops until the CE enters a '00' in the Data Entry switches and operates the Execute switch. The command format is as follows: **Control Byte (First Byte of Command)**				Each of the following commands contain a control byte and a Bus Out or delay value.	Control Interface operative to the point of loading and starting this routine.	See MICFL section for flowchart and detailed description.
					1 & 2	00	00–FF	1st Command		
					3 & 4	00	00–FF	2nd Command		
					5 & 6	00	00–FF	3rd Command		
					7 & 8	00	00–FF	4th Command		
					9 & A	00	00–FF	5th Command		
					B & C	00	00–FF	6th Command		
					D & E	00	00–FF	7th Command		
					F	00	00	End String Command		

Bits 0123	Bits 4567	Description
0000	0000	End command string.
0000	XXXX	Controller tag. XXXX = tag value.
0001	XXXX	Controller tag. CE switches are used for Bus Out.
0010	XXXX	Controller tag. Received Bus In is transmitted to the Data display lamps.
0011	MMMM	Execute a microsecond delay. MMMM = the base value multiplier (not used if zero).
0100	MMMM	Execute a millisecond delay. MMMM = the base value multiplier (not used if zero).
0101-0111		Not used.
1000	XXXX	Drive tag. XXXX = tag value.
1001	XXXX	Drive tag. CE switches are used for Bus Out.
1010	XXXX	Drive tag. Received Bus In transmitted to the Data display lamps.
1011-1111		Not used.

Bus Out or Base Delay Value (Second Byte of Command)

1. During a Tag command, the second byte is the Bus Out value, unless option code 0001 or 1001 has been selected.
2. During a delay command, the second byte is the base delay value. The base value is multiplied by 'MMMM' in the control byte to arrive at the total display value (see Note 1).

Note 1: *Example of delays:*

ENTRY IN HEX Byte 1	Byte 2	DELAY VALUE
30	C8	.... 200 usec
32	C8	.... 400 usec
40	C8	.... 200 msec
41	C8	.... 200 msec
43	64	.... 300 msec

64 hex is 100 decimal
100 x 3 = 300
4 = milliseconds total = 300 ms

The sum of all delay commands must not exceed 500 milliseconds.

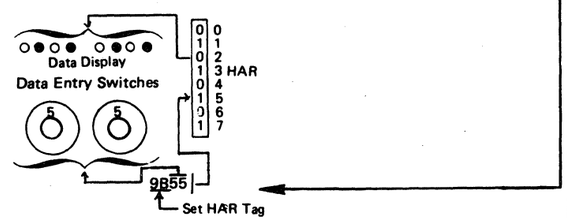
Note 2: *The controller address is also supplied for Select Controller tag.*

SAMPLE COMMAND STRING

Parameter Byte	(Hex)	
1	83	Tag (select drive), see Note 2
2	XX	Bus Out is supplied by the program (service drive only)
3	9B	Drive tag (set HAR CE switches to be used for Bus Out)
4	XX	Bus Out from CE switches
5	AF	Drive tag (Sense HAR) Bus In transmitted to Data display lamps
6	05	Bus Out for Sense HAR
7	8C	Drive tag (set difference to 'FF')
8	FF	Bus Out value
9	8F	Drive tag (sense difference)
A	09	
B	42	200 ms delay
C	64	
D	00	Filler for parameter field
E	00	
F	00	

AF05 Sense HAR

The run control option '00' must be entered to begin the program execution. The desired HAR value must be set in the Data Entry switches as soon as the '8C' message is displayed in the control lamps.



DESCRIPTION

Routine B6 checks those controller functions that are unique to a switchable controller interface. The routine must be run simultaneously on both controller interfaces.

Although the routine must be loaded and started on each controller interface, it is controlled exclusively from the interface designated as the Master. Control and error information is passed between the interfaces through registers in the service drive.

The routine contains 7 tests. Normally, tests 1 through 6 are run in sequence ending with Error Code B6E0. B6E0 is displayed to remind the CE to run test 7. Test 7 requires a special operating procedure. (See Figure 1 on this page.)

Normally, tests 1 through 6 execute 8 times before linking to the next test. Tests 3 through 6 execute once with each device address (0 through 7) on each of the 8 passes. Test 7 is run only once each time it is called.

Error information is displayed at the end of the test. The Error Code is developed by ORing the error data from both interfaces. Tests 3 through 6 develop a second error byte which indicates the failing register position. For details of a specific error, see the Error Code Dictionary in this section.

OPERATING THEORY

Prior to running any test, the two interfaces must be synchronized. Once synchronized, the routine executes short sequences of operations separated by fixed time delays. The operational and delay sequences are offset in time so that each operational sequence is executed during the time delay on the other interface. In actuality, the test execution alternates between the two interfaces.

One interface is referred to as the Master, the other as the Slave. There are two flowcharts for each test in the MICFL section. One flowchart is the Master, the other is the Slave. The flowcharts are identical except for the Error Codes.

OPERATING PROCEDURES

String switch microdiagnostic routine B6 cannot be run on the offline controller (3350 A2/C2) concurrent with customer operation on the online controller as Tag Bus Parity errors will occur. To run routine B6 on the offline controller, it is necessary to take the 3350 string offline.

To effectively run routine B6 microdiagnostics, two passes are required: Pass 1, in which interface A is the Master and B is the Slave; and Pass 2 in which B is the Master and A is the Slave.

Pass 1: (A = Master)

1. Set the CE Interface Select switch to the B interface position, then load and execute routine B6. Use standard operating procedures (MICRO 10), but **do not enter Run Options or Parameters at this time**. A few seconds after starting, the routine will display '8DFF' indicating it is ready to accept control information from the other interface.
2. Set the CE Interface Select switch to the A interface position. Routine B6 may now be loaded and run on interface A using standard operating procedure (MICRO 10). Run Options and/or Parameters may be entered if desired.
3. Test 7 requires a special operating procedure. See Figure 1 on this page. Looping routine B6 (Loop Run Option) runs tests 1 through 6 only. If a test is not run, the slave program must be stopped by entering the '00' control option on the slave interface.

Pass 2: (B = Master)

1. Set the CE Interface Select switch to the A interface position, then load and execute routine B6. Use standard operating procedures (MICRO 10), but **do not enter Run Options or Parameters at this time).** A few seconds after starting, the routine will display '8DFF' indicating it is ready to accept control information from the other interface.
2. Set the CE Interface Select switch to the B interface position. routine B6 may now be loaded and run on interface B using standard operating procedures (MICRO 10). Run Options and/or Parameters may be entered if desired.
3. Test 7 requires a special operating procedure. See Figure 1 on this page. Looping routine B6 (Loop Run Option) runs test 1 through 6 only. If a test is not run, the slave program must be stopped by entering the '00' control option on the slave interface.

RESTART PROCEDURES

To restart (Pass 1 or Pass 2), begin at Step 2. The Slave enters an idle loop when the Master is stopped. Restarting the Master restarts the Slave after both interfaces are resynchronized. Step 1 is repeated only if the service drive is made not Ready or after test 7 has been run. (See Error Codes B602 and B60E in the Error Code Dictionary in this section.)

Note: *To recover from improper starting or an unexpected 8DFF display, stop the service drive momentarily, then restart using Step 1 of the Operating Procedures.*

PARAMETER ENTRIES

See MICRO 72 for additional information on parameter entries.

Test 7

The Error Code in Figure 1 indicates test 6 has completed and test 7 may be run at this time. Test 7 may also be selected directly and run as indicated in the Operating Procedure given in Figure 1.

Figure 1. (Duplicate of Error Code on MICRO 534.)

B6E0	Tests 1 through 6 of the 3350 string switch routine have completed execution. Test 7 (Manual Switching test) may now be run. See Operating Procedure below. *If test 7 is not run at this time, the slave program must be stopped by entering the '00' control option for the slave interface.* **CAUTION** *Test 7 may "lock out" the customer for up to 1 minute. Become familiar with the Operating Procedure before running test 7. Perform Steps 4 and 5 as quickly as possible to minimize interference with the customer programs.* **OPERATING PROCEDURE** 1. Load routine B6. (Do not move the 3350 Interface Select switch.) 2. When 'CAB6' is displayed, enter '10 37 00 00 '. 3. Test 7 displays '3FFF'. Perform Steps 4 and 5 as quickly as possible because the customer is "locked out" from both interfaces while '3FFF' is displayed. 4. Proceed to the 3350 Power Panel and set both Enable/Disable switches to Disable. 5. Wait 3 to 5 seconds; then set both switches to Enable. 6. Return to the CE Panel. If the test detected an error, an Error Code is displayed. Refer to the Error Code Dictionary. If no error is detected, Error Message Code 'CFB6' is displayed. Routine B6 has run to completion. 7. After test 7 has run, routine B6 will halt on both interfaces. To restart the routine, start at the beginning of the Operating Procedure.

RUNNING INSTRUCTIONS – B6 AND B8

Routine ID (Hex)	Routine Name	Test No.	Test Name	Routine Description	Parameters				Prerequisites	Reference Notes
					Byte No.	Default Value (Hex)	Value Limits (Hex)	Description		
B6	String Switch Test *This routine can only be executed on 3350s with the string switch feature installed.*	1 2 3 4 5 6 7	Short Busy test Long Busy test (partial selection) Device assignment test Device End test Pack change interrupt test Address Decode test Manual Enable/Disable switch test	Routine B6 is a dynamic test of the string switch feature involving synchronized interaction between the two control interfaces, one chosen as master, the other as slave.	1	00	01–06 37	Test number. (Allows looping a single test within this routine.) If 00 (default) is entered, tests 1 through 6 are run. Refer to MICRO 70 for detailed operating instructions.	1. The customer must vary the facility off-line. 2. One drive must be in CE Mode and HDA Ready. 3. Both Control Interface Enable/Disable switches must be set to Enable. 4. The 3350 micro-diagnostic program disk must be inserted in the readers of both storage controls.	See MICFL section for detailed operating procedures and detailed description. If a single test is selected, it loops until halted by the CE or an error occurs. If the Bypass Error Stop option is selected, the test continues with the error number dynamically displayed. At the completion of testing, be sure that the diagnostic is stopped in both storage controls by entering the '00' control option over both interfaces.
					2	FF	00–07	Device address to be tested. If FF (default) is entered, all device addresses are tested.		
B8	HDA/Control Logic Tests	1 2 3 4 5 6 7 8 9 A B C D E F	HDA Status Access Timer Accuracy Rezero from outer stops - Part 1 Rezero from outer stops - Part 2 Rezero from Track 0 No Motion Seek Seek Movement basic Overshoot Check Safety test Difference Counter Verification - Part 1 Velocity Gain Calibration Check Overshoot Check test Unsuppressible Register Set Read/Write Tag Missing Servo Input and Missing Data Input Servo Off-Track Error Verification	Routine B8 tests the following: The ability to reset Drive Check and Attention. Access Safety Timer. Basic Rezero operations. No-motion seek response and select carriage movement after a Seek. Overshoot error detection circuits and Difference Counter stopping during a Seek. Servo acceleration velocity gain calibration and operation of the Track Following Timer. Unsuppressible Register. Set Read/Write Tag. The set and reset of missing data input errors. The set of Error Alert and Controller Check. The checking circuits for Servo Off Track, Set Read/Write operation, and Index.	1	00	00–0F	Test number. (Allows looping a single test within this routine.) 00 (default) = Run all tests	Routines A1 and A2 must run error free. The HDA must be Ready. Check disks to be sure they are spinning as the Ready lamp may be burned out.	See MICFL section for flowchart and detailed description.

RUNNING INSTRUCTIONS – B9 AND BA **MICRO 76**

Routine ID (Hex)	Routine Name	Test No.	Test Name	Routine Description	Parameters				Prerequisites	Reference Notes
					Byte No.	Default Value (Hex)	Value Limits (Hex)	Description		
B9	Dynamic Servo Tests	1	Rezero, Read Home Address	Routine B9 tests the following: Verification of access position by reading Home Address and comparing the two physical address bytes to the expected values. The Difference Counter during Seek operations. Various values are set into the Difference Counter and then compared to the program pulse counter. The odd bit is tested for the proper state after each Seek.	1	00	00–07	Test number. (Allows looping a single test within this routine.) 00 (default) = Run all tests	Routines A1, A2, B8, A5, AD, and AF must run error free. HDA must be Ready.	See MICFL section for flowchart and detailed description.
		2	Difference Counter Verification–Part 2							
		3	Incremental Seek Increment = 1		2	00	01–FF	Used for test 2 only. Specify the seek length (1 through 255). Hex '01' through 'FF'.		
		4	Incremental Seek Increment = 2							
		5	Incremental Seek Increment = 70							
		6	Incremental Seek Increment = 280							
		7	Incremental Seek Increment = 560							
BA	HDA State Analysis			Routine BA analyzes the following Status Bytes: Sense Status 1 (Tag '8F' Bus '83') Sense Status 2 (Tag '8F' Bus '43') Sense Status 3 (Tag '8F' Bus '23') Sense Status 4 (Tag '8F' Bus '13') The routine produces a unique error number according to the contents of the Status Bytes.				None	Routines A1, all tests, and routine A2, tests 1 through 7, must run error free.	See MICFL section for flowchart and detailed description.

Routine ID (Hex)	Routine Name	Test No.	Test Name	Routine Description	Parameters				Prerequisites	Reference Notes
					Byte No.	Default Value (Hex)	Value Limits (Hex)	Description		
BB	3330 Compatibility Mode and other special tests.			Routine BB tests the following:	1	'00'	'01–0B'	Test number.	Routines A1, A2, B8, A5, AD, AF, B9, and AE must run error free. HDA must be Ready.	
		1	Drive Write padding test	Test 1 – Writes a G3 gap, verifies Pad-In-Progress, and then verifies Pad Complete.	2	'00'		Option/Mode Byte. For tests 4, 5, 6, 7, and 8, Byte 2 allows the option of looping on the Write phase or the Read phase of these tests: Bit 0 = 1 Write phase Bit 1 = 1 Read phase Bit 0,1 = 0 Normal For test B, Byte 2 specifies the mode that the drive is in: '00' = No mode control '01' = Native Mode '02' = 3330-1 Compatibility Mode '03' = 3330-11 Compatibility Mode		
		2	Reorient Counter test	Test 2 – Reorient Counter, Index field and AM field.						
		3	Track Used Counter Reset test	Test 3 – Reads HA and verifies that TR Used Counter resets to zero.						
		4*	Track Used Counter Zeros test	Test 4 – TR Used Counter is loaded to zeroes.						
		5*	Track Used Counter Ones test	Test 5 – TR Used Counter is loaded to ones.						
		6*	Force Track Used Counter Check test	Test 6 – TR Used Counter is forced.						
		7*	Track Used Counter Serialization test (part 1)	Tests 7 and 8 – TR Used Counter is serialized to both ones and zeroes.						
		8*	Track Used Counter Serialization test (part 2)							
		9*	Track Used Counter Index test	Test 9 – Verifies that a TR Used Counter Index is generated at the correct point on the track.						
		A	Track Format test	Test A – Writes a valid R0 Count and Data field to clean the track.						
		B	Mode Select test	Test B – (Must be selected.) Compares the drive mode to the parameter entered by the CE.						
		*Test runs in 3330 Mode only.								

RUNNING INSTRUCTIONS – BC

DESCRIPTION

Routine BC (Unconditional Reserve microdiagnostic) checks only the ability of the hardware to release one path to a device by forcing the string switch to neutral. The function of device reserve contained in the UR (Unconditional Reserve) command is not checked as this is a normal device function checked by the string switch microdiagnostics.

Routine BC checks the ability of an interface to force the string switch to neutral when it is locked to the other interface. The routine must be run simultaneously on both controller interfaces. Although the routine must be loaded and started on each controller interface, it is controlled exclusively from the interface designated as the Master. Control and error information is passed between the interfaces through registers in the service drive.

Error information is displayed at the end of the test. The Error Code is developed by ORing the error data from both interfaces. For details of a specific error, see the Error Code Dictionary in this section.

OPERATING THEORY

Prior to running the test, the two interfaces must be synchronized. Once synchronized, the routine executes short sequences of operations separated by fixed time delays. The operational and delay sequences are offset in time so that each operational sequence is executed during the time delay on the other interface. In actuality, the test execution alternates between the two interfaces.

One interface is referred to as the Master, the other as the Slave. There are two flowcharts for each test in the MICFL section. One flowchart is the Master, the other is the Slave. The flowcharts are identical except for the Error Codes.

OPERATING PROCEDURES

String switch microdiagnostic routine BC cannot be run on the offline controller (3350 A2/C2) concurrent with customer operation on the online controller as Tag Bus Parity errors will occur. To run routine BC on the offline controller, it is necessary to take the 3350 string offline.

To effectively run routine BC microdiagnostics, two passes are required: Pass 1, in which interface A is the Master and B is the Slave; and Pass 2 in which B is the Master and A is the Slave.

Pass 1: (A = Master)

1. Set the CE Interface Select switch to the B interface position, then load and execute routine BC. Use standard operating procedures (MICRO 10), but do not enter Run Options or Parameters at this time. A few seconds after starting, the routine will display '8DFF' indicating it is ready to accept control information from the other interface.

2. Set the CE Interface Select switch to the A interface position. Routine BC may now be loaded and run on interface A using standard operating procedure (MICRO 10). Run Options and/or Parameters may be entered if desired.

   Caution: After routine BC terminates on the Master interface ('CF' or 'EX' in the Program Control display lamps) and testing is complete, the Slave program must be stopped by entering the '00' control option for the Slave interface.

Pass 2: (B = Master)

1. Set the CE Interface Select switch to the A interface position, then load and execute routine BC. Use standard operating procedures (MICRO 10), but do not enter Run Options or Parameters at this time). A few seconds after starting, the routine will display '8DFF' indicating it is ready to accept control information from the other interface.

2. Set the CE Interface Select switch to the B Interface position. Routine BC may now be loaded and run on Interface B using standard operating procedures (MICRO 10). Run Options and/or Parameters may be entered if desired.

   Caution: After routine BC terminates on the Master interface ('CF' or 'EX' in the Program Control display lamps) and testing is complete, the Slave program must be stopped by entering the '00' control option for the Slave interface.

RESTART PROCEDURES

To restart (Pass 1 or Pass 2), begin at Step 2. The Slave enters an idle loop when the Master is stopped. Restarting the Master restarts the Slave after both interfaces are resynchronized. Step 1 is repeated only if the service drive is made not Ready.

Note: *To recover from improper starting or an unexpected '8DFF' display, stop the service drive momentarily, then restart using Step 1 of the Operating Procedures.*

Caution: After routine BC terminates on the Master interface ('CF' or 'EX' in the Program Control display lamps) and testing is complete, the Slave program must be stopped by entering the '00' control option for the Slave interface.

PARAMETER ENTRIES

Entry 1. '00' – Execute test one time.
'01' – Loop Test 1.

Note: *Routine BC contails only test 1. Test 1 Error Codes have the following range – BC00 through BC20.*

RUNNING INSTRUCTIONS – BD AND BF **MICRO 84**

Routine ID (Hex)	Routine Name	Test No.	Test Name	Routine Description	Parameters				Prerequisites	Reference Notes
					Byte No.	Default Value (Hex)	Value Limits (Hex)	Description		
BD	Vibration Tolerance Test			Routine BD exercises the servo by issuing a series of forward and reverse seeks, both near the inner and outer regions of the disk. There is careful control over the time between the end of one seek and the start of the next seek (in the opposite direction). *Due to the timing requirements of this test, do not run inline with customer operation.*	1	00	00,80	Control Byte Bit 0 = 0 Time between seeks is incremented from the value entered in Byte 3 to the maximum value. Bit 0 = 1 Time between each seek is the value entered in Byte 3.	Routines A1, A2, and B8 must run error free. **This routine cannot be run concurrent with customer programs.**	See MICFL section for flowchart and detailed description.
					2	07	01–FF	Seek length in number of cylinders. ('00' = Invalid.)		
					3	1B	00–FF	Starting delay value in microseconds.		
					4	58	00–FF			
BF	Control Interface Bringup Routine	1 2 3	Active Control Bus In/Control Lines test Tag Bus/Control Bus Out test Control Lines test	Routine BF is an interface analysis test that checks for always active or missing interface control lines.					Controller must be capable of a Power-On Reset. Storage Control must be operational. *See CTL-I 100 for the complete Interface Analysis Procedure.*	See MICFL section for flowchart and detailed description.

Error Code	Error Description	CE Panel Lamp Display Byte	CE Panel Lamp Display Description	MAP Section	MAP Entry	MICFL
XX00	Lost Synchronization between the master and the slave. Rerun routine B6. Error Code XX00 valid only on routine B6.					
XX01	Invalid parameter entered by CE. Refer to MICRO 20 through 88 for valid parameters.					
XX02	Online status not present.	2	Drive Status Byte Expected xxxx 1xxx	**DEV-I 410**	**C**	
XX03	No physical address returned from CE drive after selection. 1. Suspect drive not in CE Mode; check CE Mode switch. 2. If not already run, run Linked Series 1 starting with routine A1.	2	Physical Drive ID Byte	**DEV-I 104**	**A**	
XX04	HDA is not Write enabled. Set R/W or Read switch on the Operator Panel to the R/W position. Rerun routine.	2	Received Checks/Status Byte Expected xxxx 1xxx	**R/W 172**	**C**	
XX05	Multiple drives selected (1-of-8 Check). This error can be caused by more than one drive returning its address on the Attention/Select Bus. Check that only one drive is in CE Mode. *Note: Byte 2 indicates physical drives selected.*	2	Physical Drive ID Byte	**DEV-I 112**	**A**	
XX06	Incorrect device type or microdiagnostic disk/drive feature incompatability.	2	Received xxxx xxyy Composite Bus In X = Bits 0 – 5 Tag '0A' Bus '80' Y = Bits 6 and 7 Tag '8F' Bus '03' Expected 0000 111x	**CTL-I 600**	**A**	
XX07	HDA sequence error. Make sure HDA is powered On and Ready.	2	HDA Status Expected 0110 000x	**HDA 110**	**A**	

Error Code	Error Description	CE Panel Lamp Display Byte	CE Panel Lamp Display Description	MAP Section	MAP Entry	MICFL
A001 to A007	Errors common to all routines. See XX00 through XX07 entries on the left side of this page.			**MICRO 100**		
A010	No Select Active received after Controller Select.	2	Bus In under Select Controller Tag '03' Bus '00'	**CTL-I 260**	**A**	10
A011	Bus In Parity Check in storage control.	2	Bus in under Read Control Tag '0A' Bus '40'	**PANEL 154**	**C**	10
A012	Value read from Data Entry switches does not equal expected value.	2 3	Bus In under Read Control Tag '0A' Bus '40' Expected value	**PANEL 154**	**B**	10

Error Code	Error Description	CE Panel Lamp Display Byte	CE Panel Lamp Display Description	MAP Section	MAP Entry	MICFL
A101 to A107	Errors common to all routines.			MICRO 100		
A111	Select Active was on prior to controller selection.			CTL-I 200	A	20
A112	Tag Valid was received prior to controller selection.			CTL-I 200	B	20
A113	Normal End was received prior to controller selection.			CTL-I 200	C	20
A114	Check End was received prior to controller selection.			CTL-I 200	D	20
A115	Error Alert was received prior to controller selection.			CTL-I 200	E	20
A116	Index Alert was received prior to controller selection.			RPI 160	A	20
A117	Sync In was received prior to controller selection.			DATA 230	A	20

Error Code	Error Description	CE Panel Lamp Display Byte	CE Panel Lamp Display Description	MAP Section	MAP Entry	MICFL
A120	Invalid 3-of-6 code returned. The following chart describes the addresses expected: 3-of-6 code for: Controller Address 0 0000 x111 1 0000 x110 2 0000 x101 3 0000 x100	2 3	Received controller address Expected controller address	CTL-I 250	A	20
A121	Select Active was off following a controller selection.			CTL-I 260	A	20
A122	With a controller selected, Tag Valid was received after dropping Tag Gate.			CTL-I 270	A	20
A123	With a controller selected, Normal End was received without receiving Tag Valid.			CTL-I 280	A	20
A124	With a controller selected, Check End was received.			CTL-I 280	B	20
A125	With a controller selected, Sync In was received.			DATA 230	A	20
A126	With a controller selected, Index Alert was received.			RPI 160	B	20

Error Code	Error Description	CE Panel Lamp Display Byte	CE Panel Lamp Display Description	MAP Section	MAP Entry	MICFL
A130	Control Tag Bus Parity error failed to come on after being forced.	2	Bus In under Sense Status (Controller Error 1) Tag '04' Bus '01' Expected 1xxx xxxx	**CTL-I 300**	**A**	20
A131	Control Tag Bus Parity error failed to reset following a Controller Reset.	2	Bus In under Sense Status (Controller Error 1) Tag '04' Bus '01' Expected 0xxx xxxx	**CTL-I 320**	**A**	20
A132	Control Bus Out Parity error failed to come on after being forced. Control Bus Out Parity error is forced by: 1. Placing a value on Bus Out. 2. Raising Tag Gate. 3. Changing the value on Bus Out. 4. Dropping Tag Gate.	2	Bus In under Sense Status (Controller Error 1) Tag '04' Bus '01' Expected x1xx xxxx	**CTL-I 300**	**B**	20
A133	Control Bus Out Parity error failed to reset following a Controller Reset.	2	Bus In under Sense Status (Controller Error 1) Tag '04' Bus '01' Expected x0xx xxxx	**CTL-I 320**	**B**	20
A134	Error Alert failed to come on after forcing Control Tag Bus Parity error.			**CTL-I 314**	**A**	20
A135	Controller check failed to come on after forcing Control Tag Bus Parity error.	2	Bus In under Read Status Tag '84' Bus '00' Expected 1xxx xxxx	**CTL-I 310**	**A**	20
A138	Controller Check failed to come on after forcing Control Bus Out Parity error.	2	Bus In under Read Status Tag '84' Bus '00' Expected 1xxx xxxx	**CTL-I 310**	**A**	20

Error Code	Error Description	CE Panel Lamp Display Byte	CE Panel Lamp Display Description	MAP Section	MAP Entry	MICFL
A140	Tag Valid was not received for a given controller tag. However, no Control Tag Bus or Control Bus Out Parity Checks were detected. Control Bus Out value was zero for all Immediate operation tags, and '20' for all Extended operation tags. **Note:** *If the Primary Controller Adapter feature is installed without the C2 Module, see the suggestions on INST 5, Step K.*	2 3 4	Not Used Not Used Controller tag that failed to give Tag Valid.	**CTL-I 430**	**A**	20
A141	Normal End was not received for a given controller tag. (Applies to Immediate operations.) Control Bus Out value was zero.	2 3 4	Not Used Not Used Controller tag that failed to give Normal End.	**CTL-I 400**	**A**	20
A142	Tag Valid was not received for a given controller tag. However, Control Tag Bus Parity error was detected.	2 3 4	Bus In under Sense Status (Controller Error 1) Tag '04' Bus '01' Expected 0xxx xxxx Failing tag	**CTL-I 410**	**A**	20
A143	Tag Valid was not received for a given controller tag. However, Control Bus Out Parity error was detected.	2 3 4	Bus In under Sense Status (Controller Error 1) Tag '04' Bus '01' Expected x0xx xxxx Failing Tag	**CTL-I 410**	**B**	20
A144	Tag Valid was not received for Display CE High tag. Control Bus Out was set to '8C'.			**CTL-I 430**	**B**	20
A145	Normal End was not received for Display CE High tag. Control Bus Out was set to '8C'.			**CTL-I 400**	**B**	20
A146	Tag Valid was not received for Display CE High tag. However, Control Tag Bus Parity error was detected.	2	Bus In under Sense Status (Controller Error 1) Tag '04' Bus '01' Expected 0xxx xxxx	**CTL-I 410**	**A**	20
A147	Tag Valid was not received for Display CE High tag. However, Control Bus Out Parity error was detected.	2	Bus In under Sense Status (Controller Error 1) Tag '04' Bus '01' Expected x0xx xxxx	**CTL-I 410**	**B**	20

Error Code	Error Description	CE Panel Lamp Display Byte	CE Panel Lamp Display Description	MAP Section	MAP Entry	MICFL
A148	Tag Valid was not received for Display CE Low tag. Control Bus Out was set to '8C'.			**CTL-I 430**	**C**	20
A149	Normal End was not received for Tag '0D'.			**CTL-I 400**	**C**	20
A14A	Tag Valid was not received for Display CE Low tag. However, Control Tag Bus Parity error was detected.	2	Bus In under Sense Status (Controller Error 1) Tag '04' Bus '01' Expected 0xxx xxxx	**CTL-I 410**	**A**	20
A14B	Tag Valid was not received for Display CE Low tag. However, Control Bus Out Parity error was detected.	2	Bus In under Sense Status (Controller Error 1) Tag '04' Bus '01' Expected x0xx xxxx	**CTL-I 410**	**B**	20
A14C	Normal End was received for one of the Extended Op tags.	2 3 4	Not Used Not Used Tag that gave Normal End.	**CTL-I 400**	**E**	20

Error Code	Error Description	CE Panel Lamp Display Byte	CE Panel Lamp Display Description	MAP Section	MAP Entry	MICFL
A150	Control Bus In Parity Check failed to come on after being forced.	2	Bus In under Sense Status (Controller Error 1) Tag '04' Bus '01' Expected xxxx 1xxx	**CTL-I 500**	**C**	20
A151	Control Bus In Parity Check failed to reset following Controller Reset.	2	Bus In under Sense Status (Controller Error 1) Tag '04' Bus '01' Expected xxxx 0xxx	**CTL-I 500**	**B**	20
A152	Control Bus In value received was other than '20'. Either Register Select bit is always active or Lost Orientation bit is always inactive.	2	Bus In under Sense Status (Lost Orientation) Tag '04' Bus '00' Expected 0010 0000	**CTL-I 510**	**A**	20
A153	Control Bus In Parity Check in the 3830-2/IFA.			**CTL-I 520**	**A**	20
A155	Control Bus In value received was other than '00'. If the received value is 'FF', Register Select bit is always active. If the received value is '20', Register Select bit is always inactive.	2	Bus In under Sense Status (ECC Low) Tag '04' Bus '80' Expected 0000 0000	**CTL-I 530**	**A**	20
A156	Control Bus In value received was other than '00'. If the received value is 'FF', Register Select bit is always active. If the received value is '20', Register Select bit is always inactive.	2	Bus In under Sense Status (ECC High) Tag '04' Bus '40' Expected 0000 0000	**CTL-I 530**	**A**	20
A157	Control Bus In value received was other than 'FF'.	2	Bus In under Read Op (Read G1) Tag '0E' Bus '49' Expected 1111 1111	**CTL-I 532**	**A**	20

Error Code	Error Description	CE Panel Lamp Display Byte	CE Panel Lamp Display Description	MAP Section	MAP Entry	MICFL
A158	Control Bus In value received was other than '00'. If the received value is '20', the Register Select bit is always inactive.	2	Bus In under Read Status Tag '84' Bus '00' Expected 0000 0000	**CTL-I 540**	**A**	20
A159	Error Alert on without a Controller Check after a Controller Reset.	2	Bus In under Read Status Tag '84' Bus '00' Expected 0000 0000	**CTL-I 314**	**B**	20
A15A	Controller Check on without an Error Alert after a Controller Reset.	2 3	Bus In under Sense Status (Controller Error 1) Tag '04' Bus '01' Bus In under Sense Status (Controller Error 2) Tag '04' Bus '02'	**CTL-I 550**	**A**	20
A15B	Error Alert and Controller Check on after a Controller Reset.	2 3	Bus In under Sense Status (Controller Error 1) Tag '04' Bus '01' Bus In under Sense Status (Controller Error 2) Tag '04' Bus '02'	**CTL-I 550**	**A**	20
A15C	Control Tag Bus Parity Check following a reset Read/Write.	2	Bus In under Sense Status (Controller Error 1) Tag '04' Bus '01' Expected 0xxx xxxx	**CTL-I 560**	**A**	20

Error Code	Error Description	CE Panel Lamp Display Byte	CE Panel Lamp Display Description	MAP Section	MAP Entry	MICFL
A1A1	False error stop. Microdiagnostics failed to load properly.			**PANEL 150**	**A**	

Error Code	Error Description	CE Panel Lamp Display Byte	CE Panel Lamp Display Description	MAP Section	MAP Entry	MICFL
A201 to A207	Errors common to all routines.			**MICRO 100**		
A210	Physical address not returned after issuing Select Drive Tag '83' to select a CE drive. Tag Valid was returned but no bits were active on the Attention/Select Bus. (Bus In = '00'.) **Note:** *This error can be caused by not having a drive in CE Mode.*	2	Bus In under Sense Status (Physical Address) Tag '04' Bus '10'	**DEV-I 104**	**A**	50
A211	Tag Valid not received when Select Tag '83' Bus '10' was issued to select a CE drive. Conditions existing during Tag '83' are: 1. Device Tag Bus equals 000 with the P bit on. 2. Bus Out bit 3 = 1, bit 4 = 0. 3. Enable functions (No Device Interface, Tag Bus, or Bus Out Parity error). 4. Select Hold from controller.	2	Bus In under Sense Interface Tag '89' Bus '00'	**DEV-I 116**	**B**	50
A212	File Selection Error indication is on, (1-of-8 Check). More than one drive returning its address on the Attention/Select Bus can cause this error. Check that only one drive is in CE Mode. Display Byte 2 contains the physical addresses received.	2	Bus In under Sense Status (Physical Address) Tag '04' Bus '10'	**DEV-I 112**	**A**	50
A215	Tag Valid not returned after Device Interface Checks.			**DEV-I 116**	**A**	50
A216	Tag Valid not returned with Bus Out Parity Check active.	2	Bus In under Sense Interface Tag '89' Bus '00' Expected xxxx xx0x	**DEV-I 124**	**A**	50
A217	Tag Valid not returned with Tag Bus Parity Check active.	2	Bus In under Sense Interface Tag '89' Bus '00' Expected xxxx xxx0	**DEV-I 120**	**A**	50
A218	Device type is other than 3350.	2	Bus In under Read Control (Device Type) Tag '0A' Bus '80' Expected 0000 1100	**CTL-I 600**	**A**	50

Error Code	Error Description	CE Panel Lamp Display Byte	CE Panel Lamp Display Description	MAP Section	MAP Entry	MICFL
A220	Device Interface Check not on after being forced by the inversion of Tag Bus Parity. Any one of the following could cause this error: 1. Failure to invert Tag Bus Parity. 2. Device Tag Bus Parity latch. 3. Device Interface Check latch. 4. Bus In bit 1 not returned under Tag '84'. Device Bus In Parity lamp on CE Panel should not be on at this time. 5. CE or Power On Reset always active.	2	Bus In under Sense Interface Tag '89' Bus '00' Expected xxxx xxx1	**DEV-I 160**	**A**	50
A221	Device Tag Bus Parity error not on after an Invert Tag Bus Parity was issued. The Device Tag Bus Parity latch is working but bit 7 was not returned on Bus In for Tag '89'.	2	Bus In under Sense Interface Tag '89' Bus '00' Expected xxxx xxx1	**DEV-I 160**	**A**	50
A222	Device Interface Check failed to reset following a Sense Interface (Tag '89). Device Interface Check failed to reset or Bus In bit 1 is faulty.	2	Bus In under Read Status Tag '84' Bus '00' Expected x0xx xxxx	**DEV-I 134**	**B**	50
A223	Device Tag Bus Parity error failed to reset following a Sense Interface (Tag '89'). Device Tag Bus Parity Check failed to reset or Bus In bit 7 is faulty.	2	Bus In under Sense Interface Tag '89' Bus '00' Expected xxxx xxx0	**DEV-I 137**	**B**	50
A224	Device Interface Check not on after being forced by the inversion of Bus Out Parity. Interface Check is correct but Device Bus Out Parity latch is not coming on.	2	Bus In under Sense Interface Tag '89' Bus '00' Expected xxxx xxx1	**DEV-I 130**	**A**	50
A225	Device Bus Out Parity error not on after an Invert Bus Out Parity was issued. The Device Bus Out Parity latch is working but bit 6 was not returned on Bus In for Tag '89'.	2	Bus In under Sense Interface Tag '89' Bus '00' Expected xxxx xx1x	**DEV-I 160**	**A**	50
A226	Device Interface Check failed to reset following a Sense Interface (Tag '89'). The Sense Interface line (Reset line) has previously been tested (Error Code A222). The Device Interface Check latch may be held up by the Device Bus Out Parity latch which should be reset.	2	Bus In under Read Status Tag '84' Bus '00' Expected x0xx xxxx	**DEV-I 130**	**D**	50
A227	Device Bus Out Parity error failed to reset following a Sense Interface (Tag '89'). Device Bus Out Parity error fails to reset or Device Bus In bit 6 is active.	2	Bus In under Sense Interface Tag '89' Bus '00' Expected xxxx xx0x	**DEV-I 130**	**C**	50

Error Code	Error Description	CE Panel Lamp Display Byte	CE Panel Lamp Display Description	MAP Section	MAP Entry	MICFL
A230	A Device Tag Bus Parity error occurred during Tag '8F' Bus '00'.	2	Bus In under Sense Interface Tag '89' Bus '00' Expected xxxx xxx0	**DEV-I 140**	**A**	50
A231	A Device Bus Out Parity error occurred during a Set HAR to '00' operation (Tag '8B' Bus '00').	2	Bus In under Sense Interface Tag '89' Bus '00' Expected xxxx xx0x	**DEV-I 150**	**B**	50
A232	A Device Bus Out Parity error occurred during a Set HAR to 'FF' operation (Tag '8B' Bus 'FF').	2	Bus In under Sense Interface Tag '89' Bus '00' Expected xxxx xx0x	**DEV-I 150**	**A**	50
A233	Active bits on Bus In following a Sense Interface command (Tag '89'). Tag '89' should reset any Device Bus Out or Device Tag Bus Parity error (bits 6 and 7).	2	Bus In under Sense Interface Tag '89' Bus '00' Expected 0000 0000	**DEV-I 170**	**A**	50
A234	Device Bus In not equal to Device Bus Out. Device Bus Out was set to zero. Both the Difference Counter and HAR are used to transfer the Bus Out value to Bus In. Both paths failed before the error was indicated.	2	Bus In under Sense HAR Tag '8F' Bus '05' Expected 0000 0000	**DEV-I 180**	**A**	50
A235	Device Bus In not equal to Device Bus Out. Device Bus Out was set to 'FF'. Both the Difference Counter and HAR are used to transfer the Bus Out value to Bus In. Both paths failed before the error was indicated.	2	Bus In under Sense HAR Tag '8F' Bus '05' Expected 1111 1111	**DEV-I 160**	**A**	50
A236	Device Bus In not equal to Device Bus Out. Bus Out value was a sliding 1s pattern (1,2,4,8,16,32,64,128). Both the Difference Counter and HAR are used to transfer the Bus Out value to Bus In. Both paths failed before the error was indicated. Suspect Enable Register Resets line failed.	2	Bus In under Sense HAR Tag '8F' Bus '05' Expected xxxx xxxx	**DEV-I 160**	**A**	50

Error Code	Error Description	CE Panel Lamp Display Byte	CE Panel Lamp Display Description	MAP Section	MAP Entry	MICFL
A240	Drive physical address was returned while Bus Out bit 4 under Tag '83' was turned on. Device Bus Out bit 4 should block the Attention/Select response, preventing an address bit from being placed on the Attention/Select Bus.	2	Bus In under Sense Status (Physical Address) Tag '04' Bus '10' Expected 0000 0000	**DEV-I 190**	**A**	50
A241	Physical address was not returned for the CE drive.	2	Bus In under Sense Status (Physical Address) Tag '04' Bus '10'	**DEV-I 104**	**B**	50
A242	Drive Selection error did not come on when forced. Another drive in the string must be ready. **To run this test successfully, the following conditions must be met:** 1. One drive in the string must have the CE Mode switch On. 2. All other drives must have the CE Mode latch reset. To reset the CE Mode latch: 1. Verify that the CE Mode switch is Off. 2. Make the drive Ready. 3. Press the Attention button.	2	Bus In under Sense Status (Controller Error 1) Tag '04' Bus '01' Expected xx1x xxxx	**DEV-I 260**	**A**	50

Error Code	Error Description	CE Panel Lamp Display Byte	CE Panel Lamp Display Description	MAP Section	MAP Entry	MICFL
A250	Tag Valid was not received but Device Tag Bus Parity error was on. This error applies to Tags '84' and '89' to '8F'.	2 3 4	Bus In under Sense Interface Tag '89' Bus '00' Expected xxxx xxx0 Not Used Drive Tag causing error	**DEV-I 140**	**A**	50
A251	Tag Valid was not received but Device Bus Out Parity error was on. This error applies to Tags '84' and '89' to '8F'.	2 3 4	Bus In under Sense Interface Tag '89' Bus '00' Expected xxxx xx0x Not Used Drive Tag causing error	**DEV-I 150**	**A**	50
A252	Tag Valid was not received and no Device Tag Bus or Device Bus Out Parity errors were detected. This error applies to Tags '84' and '89' to '8F'.	2	Failing Drive Tag	**CTL-I 610**	**A**	50
A253	Normal End was not received after receiving Tag Valid. This error applies to Tags '84' and '89' to '8F'.	2	Failing Drive Tag	**CTL-I 400**	**D**	50
A254	Interface Check was found to be active following a Set Read/Write.	2	Bus In under Read Status Tag '84' Bus '00' Expected x0xx xxxx	**DEV-I 200**	**A**	50
A255	Tag Valid was not received for Set Read/Write, Tag '85'.			**CTL-I 613**	**A**	50
A256	Tag Valid was not received but Device Tag Bus Parity error was on. This error applies to Tag '82' (Poll Device).	2 3 4	Bus In under Sense Interface Tag '89' Bus '00' Expected xxxx xxx0 Not Used Drive Tag causing error	**DEV-I 140**	**A**	50
A257	Tag Valid was not received but Device Bus Out Parity error was on. This error applies to Tag '82' (Poll Device).	2	Bus In under Sense Interface Tag '89' Bus '00' Expected xxxx xx0x	**DEV-I 150**	**A**	50

Error Code	Error Description	CE Panel Lamp Display Byte	CE Panel Lamp Display Description	MAP Section	MAP Entry	MICFL
A258	Tag Valid was not received for Poll Device Tag '82' without Control Tag Bus or Control Bus Out Parity errors.			**CTL-I 610**	**A**	50
A259	Normal End was not received after receiving Tag Valid. This error applies to Tag '82'.			**CTL-I 400**	**D**	50
A260	Tag Valid was received after forcing Control Tag Bus Parity error. This error applies to Tags '8A' to '8F'.	2	Failing Drive Tag	**CTL-I 610**	**B**	50
A270	Device Bus In Parity error did not come on after being forced. The Device Bus In Parity lamp on the CE Panel should be on.	2	Bus In under Sense Status (Controller Error 1) Tag '04' Bus '01' Expected xxx1 xxxx	**DEV-I 210**	**A**	50
A271	Device Bus In Parity error failed to reset following Controller Reset.	2	Bus In under Sense Status (Controller Error 1) Tag '04' Bus '01' Expected xxx0 xxxx	**DEV-I 210**	**A**	50
A273	Fixed head bit in HAR failed to set on. Set HAR command.	2	Bus In under Sense HAR Tag '8F' Bus '05' Expected x1xx xxxx	**DEV-I 220**	**B**	50
A274	Direction bit (Bus In bit 0) under Set DH failed to set on by a Tag '8F' Bus '8E' command. (DH = Difference High)	2	Bus In under Sense Status 0 Tag '8F' Bus '03' Expected 1xxx xxxx	**DEV-I 220**	**A**	50
A275	Direction bit (Bus In bit 0) under Set DH failed to reset by a Tag '8F' Bus '0E' command. (DH = Difference High)	2	Bus In under Sense Status 0 Tag '8F' Bus '03' Expected 0xxx xxxx	**DEV-I 220**	**A**	50

Error Code	Error Description	CE Panel Lamp Display Byte	CE Panel Lamp Display Description	MAP Section	MAP Entry	MICFL
A280	Device Bus In Parity error. Bus In not equal to Bus Out. Bus Out values used by this test are: all 0s, all 1s, sliding 1s pattern, and sliding 2s pattern.	2 3	Bus In under Sense HAR Tag '8F' Bus '05' Expected Bus Out value	**DEV-I 160**	**B**	50
A281	Device Bus In Parity error. Bus In equal to Bus Out. A parity bit may have been picked or dropped. Suspect a failure between the Device Bus In Parity Generator and the Controller Parity Checker.	2 3	Bus In under Sense HAR Tag '8F' Bus '05' Expected Bus Out value	**DEV-I 160**	**C**	50
A282	No Device Bus In Parity error. Bus In not equal to Bus Out. Bus Out value was set to zero. Suspect HAR is defective or Set HAR is always active.	2	Bus In under Sense HAR Tag '8F' Bus '05' Expected 0000 0000	**DEV-I 230**	**A**	50
A283	No Device Bus In Parity error. Bus In not equal to Bus Out. Bus Out value was set to 'FF'. Suspect HAR is defective or that the Set HAR or Sense HAR control lines failed to activate.	2	Bus In under Sense HAR Tag '8F' Bus '05' Expected 1111 1111	**DEV-I 230**	**B**	50
A284	No Device Bus In Parity error. Bus In not equal to Bus Out. Variable values on Bus Out. Suspect HAR is defective.	2 3	Bus In under Sense HAR Tag '8F' Bus '05' Expected Bus Out value	**DEV-I 230**	**C**	50

Error Code	Error Description	CE Panel Lamp Display Byte	CE Panel Lamp Display Description	MAP Section	MAP Entry	MICFL
A290	Device Bus In Parity error. Bus In not equal to Bus Out. Bus Out values used by this test are: all 0s, all 1s, sliding 1s pattern, and sliding 2s pattern.	2 3	Bus In under Sense Difference Counter Tag '8F' Bus '09' Expected Bus Out value	**DEV-I 160**	**B**	50
A291	Device Bus In Parity error. Bus In equal to Bus Out. A parity bit may have been picked or dropped on Device Bus In. Suspect a failure between the Device Bus In Parity Generator and the Controller Bus In Parity Checker.	2 3	Bus In under Sense Difference Counter Tag '8F' Bus '09' Expected Bus Out value	**DEV-I 160**	**C**	50
A292	No Device Bus In Parity error. Bus In not equal to Bus Out. Bus Out value was set to zero. Suspect Difference Counter is defective or Set Difference Counter is always active.	2	Bus In under Sense Difference Counter Tag '8F' Bus '09' Expected 0000 0000	**DEV-I 240**	**A**	50
A293	No Device Bus In Parity error. Bus In not equal to Bus Out. Bus Out value was set to 'FF'. Suspect Difference Counter is defective or that the Set Difference Counter or Sense Difference Counter control lines failed to activate.	2	Bus In under Sense Difference Counter Tag '8F' Bus '09' Expected 1111 1111	**DEV-I 240**	**B**	50
A294	No Device Bus In Parity error. Bus In not equal to Bus Out. Variable values on Bus Out. Suspect the Difference Counter.	2 3	Bus In under Sense Difference Counter Tag '8F' Bus '09' Expected Bus Out Value	**DEV-I 240**	**C**	50

Error Code	Error Description	CE Panel Lamp Display Byte	CE Panel Lamp Display Description	MAP Section	MAP Entry	MICFL
A2A0	Device Bus In not equal to Device Bus Out (variable Bus Out values).	2	Bus In under Sense Difference Counter Tag '8F' Bus '09'	**DEV-I 250**	**A**	50
		3	Expected Bus Out value			
A2A1	The '256' bit in the Set DH Register is reset to zero when the Difference Counter is decremented only 255 times. (DH = Difference High)	2	Bus In under Sense Status 0 Tag '8F' Bus '03' Expected xx1x xxxx	**DEV-I 250**	**B**	50
A2A2	The '256' bit in the Set DH Register failed to reset to zero when the Difference Counter decremented from '256' (Set DH bit 2 on) to '255'. (DH = Difference High)	2	Bus In under Sense Status 0 Tag '8F' Bus '03' Expected xx0x xxxx	**DEV-I 250**	**B**	50
A2A3	Either the Difference Counter '256', or '512' bit, or the CAR '512' bit failed to set on. Set DH command (Tag '8F' Bus '7E'). DH = Difference High.	2	Bus In under Sense Status 0 Tag '8F' Bus '03' Expected x111 xxxx	**DEV-I 250**	**B**	50
A2A4	Either Difference Counter '256' or '512' bit falied to reset. Set DH command (Tag '8F' Bus '0E'). (DH = Difference High)	2	Bus In under Sense Status 0 Tag '8F' Bus '03' Expected x000 xxxx	**DEV-I 250**	**B**	50
A2A5	Difference Counter '512' did not turn off when decrementing by 1 from count of '512'.	2	Bus In under Sense Status 0 Tag '8F' Bus '03' Expected x0xx xxxx	**DEV-I 250**	**B**	50
A2A6	Difference Counter '256' bit did not set on when decrementing by 1 from count of '512'.	2	Bus In under Sense Status 0 Tag '8F' Bus '03' Expected xx1x xxxx	**DEV-I 250**	**B**	50

Error Code	Error Description	CE Panel Lamp Display Byte	CE Panel Lamp Display Description	MAP Section	MAP Entry	MICFL
A2B0	Device Bus In Parity Check. Sense CAR value not equal to Set CAR value.	2	Bus In under Sense CAR Tag '8F' Bus '01'	**DEV-I 160**	**A**	50
		3	Expected CAR value			
A2B1	Device Bus In Parity Check. Sense CAR value equal to Set CAR value.	2	Bus In under Sense CAR Tag '8F' Bus '01'	**DEV-I 160**	**C**	50
		3	Expected CAR value			
A2B2	No Device Bus In Parity Check. Set CAR value not equal to Sense CAR value.	2	Bus In under Sense CAR Tag '8F' Bus '01' Expected 0000 0000	**DEV-I 194**	**A**	50
A2B3	Device Bus In not equal to 'FF' on Sense CAR. CAR was set to 'FF'.	2	Bus In under Sense CAR Tag '8F' Bus '01' Expected 1111 1111	**DEV-I 194**	**B**	50
A2B4	Set CAR value not equal to Sense CAR value. CAR set to variable patterns.	2	Bus In under Sense CAR Tag '8F' Bus '01'	**DEV-I 194**	**C**	50
		3	Expected CAR value.			

Error Code	Error Description	CE Panel Lamp Display Byte	CE Panel Lamp Display Description	MAP Section	MAP Entry	MICFL
A501 to A507	Errors common to all routines.			**MICRO 100**		
A512	Device Bus In Parity error. Bus In not equal to Bus Out. Bus Out values used by this test are: all 0s, all 1s, sliding 1s, and sliding 2s pattern. A parity bit was dropped between the Parity Generator and the controller, or the Parity Generator failed.	2 3	Bus In under Sense Target Tag '8F' Bus '0D' Expected Bus Out value	**DEV-I 160**	**B**	130
A513	Device Bus In Parity error. Bus In equal to Bus Out. A parity bit was picked up between the Parity Generator and the controller.	2 3	Bus In under Sense Target Tag '8F' Bus '0D' Expected Bus Out value	**DEV-I 160**	**B**	130
A514	No Device Bus In Parity error with Bus In not equal to Bus Out. Bus Out was set to '00'. Bus In expected was '80'. Suspect a failure in the Target register or between Bus In and the Parity Generator.	2	Bus In under Sense Target Tag '8F' Bus '0D' Expected 1000 0000	**RPI 200**	**A**	130
A515	No Device Bus In Parity error with Bus In not equal to Bus Out. Bus Out was set to '7F'. Bus In expected was 'FF'. Suspect a failure in the Target register or between Bus In and the Parity Generator.	2	Bus In under Sense Target Tag '8F' Bus '0D' Expected 1111 1111	**RPI 200**	**B**	130
A516	No Device Bus In Parity error with Bus In not equal to Bus Out. Variable values on Bus Out and Bus In. Suspect a failure in the Target register or between Bus In and the Parity Generator.	2 3	Bus In under Sense Target Tag '8F' Bus '0D' Expected Bus Out value	**RPI 200**	**C**	130
A517	Sector Counter value is incorrect (always zero) after a Transfer Sector Counter operation.	2	Bus In under Sense Target Tag '8F' Bus '0D' Expected x111 1111 (Bits 1-7 must = 1)	**RPI 232**	**A**	130

Error Code	Error Description	CE Panel Lamp Display Byte	CE Panel Lamp Display Description	MAP Section	MAP Entry	MICFL
A520	Index Mark was not received in 25 milliseconds.			**RPI 120**	**D**	130
A521	Index Mark pulse width greater than 18 microseconds.			**RPI 120**	**A**	130
A522	Index Mark pulse width less than 16 microseconds.			**RPI 120**	**B**	130
A523	Time between two consecutive Index Marks was less than 15.6 milliseconds. Time was based on 16.7 milliseconds ± 3%.			**RPI 120**	**C**	130
A524	Index Check was active after receiving Index. Early Index is suspected.	2	Bus In under Sense Read/Write Tag '8F' Bus '0B' Expected xxx0 xxxx	**RPI 100**	**A**	130
A525	Index Mark was not received within 16.7 milliseconds after first Index Mark.			**RPI 120**	**E**	130

Error Code	Error Description	CE Panel Lamp Display Byte	CE Panel Lamp Display Description	MAP Section	MAP Entry	MICFL
A530	Multichip Check failed to come on after being forced.	2	Bus In under Sense Read/Write Tag '8F' Bus '0B' Expected 1xxx xxxx	**R/W 182**	**A**	130
A531	Read/Write Check failed to come on after forcing Multichip Check.	2	Bus In under Read Status Tag '84' Bus '00' Expected xxx1 xxxx	**R/W 112**	**A**	130
A532	Error Alert was not active after detecting a Read/Write Check.			**DATA 50**	**A**	130
A533	Multichip Check failed to reset following a Read/Write Reset.	2	Bus In under Sense Read/Write Tag '8F' Bus '0B' Expected 0xxx xxxx	**R/W 182**	**B**	130
A534	Read/Write Check failed to reset following a Read/Write Reset.	2	Bus In under Read Status Tag '84' Bus '00' Expected xxx0 xxxx	**R/W 112**	**C**	130
A537	Multichip Check active following a Check Reset.	2	Bus In under Sense Read/Write Tag '8F' Bus '0B' Expected 0xxx xxxx	**R/W 182**	**B**	130
A538	Read/Write Check active following a Check Reset.	2	Bus In under Read Status Tag '84' Bus '00' Expected xxx0 xxxx	**R/W 112**	**B**	130

Error Code	Error Description	CE Panel Lamp Display Byte	CE Panel Lamp Display Description	MAP Section	MAP Entry	MICFL
A540	Index Mark was not received in 25 milliseconds.			**RPI 120**	**D**	130
A541	Sector Compare Check failed to reset after a Check Reset (Tag '8F' Bus '0C').	2	Bus In under Sense Status 1 Tag '8F' Bus '83' Expected x0xx xxxx	**RPI 300**	**B**	130
A542	Failed to detect Sector Compare Check after being forced.	2	Bus In under Sense Status 1 Tag '8F' Bus '83' Expected x1xx xxxx	**RPI 300**	**C**	130
A543	Failed to detect Drive Check after forcing Sector Compare Check.	2	Bus In under Read Status Tag '84' Bus '00' Expected xx1x xxxx	**RPI 300**	**D**	130
A544	Failed to receive an Attention when polling device after forcing a Sector Compare Check.	2	Bus In under Poll Device Tag '82' Bus 'x4' Expected 1xxx xxxx	**DEV-I 270**	**C**	130
A545	Sector Compare Attention failed to reset following an Attention Reset.	2	Bus In under Poll Device Tag '82' Bus 'x4' Expected 0xxx xxxx	**DEV-I 270**	**D**	130
A546	Sector Compare Check failed to reset following an Attention Reset after being forced on.	2	Bus In under Sense Status 1 Tag '8F' Bus '83' Expected x0xx xxxx	**RPI 300**	**B**	130
A547	Drive Check failed to reset following a Check Reset.	2	Bus In under Read Status Tag '84' Bus '00' Expected xx0x xxxx	**RPI 300**	**E**	130

Error Code	Error Description	CE Panel Lamp Display Byte	CE Panel Lamp Display Description	MAP Section	MAP Entry	MICFL
A550	Index Mark was not received in 25 milliseconds.			**RPI 120**	**D**	130
A551	Sector Compare Check was active following search for Sector Zero.	2	Bus In under Sense Status 1 Tag '8F' Bus '83' Expected x0xx xxxx	**RPI 236**	**E**	130
A552	Failed to receive Search Sector after issuing a Set Target.	2	Bus In under Read Status Tag '84' Bus '00' Expected xxxx xxx1	**RPI 225**	**A**	130
A553	Busy Attention was active after receiving Sector Compare Attention for Sector Zero.	2	Bus In under Read Status Tag '84' Bus '00' Expected xxxx xx0x	**RPI 300**	**A**	130
A554	Failed to receive Sector Compare Attention when polling device.	2	Bus In under Poll Device Tag '82' Bus 'x4' Expected 1xxx xxxx	**DEV-I 270**	**C**	130
A555	Sector Compare Attention failed to reset following an Attention Reset.	2	Bus In under Poll Device Tag '82' Bus 'x4' Expected 0xxx xxxx	**DEV-I 270**	**D**	130
A556	Failed to receive Busy Attention following a Set Target.	2	Bus In under Read Status Tag '84' Bus '00' Expected xxxx xx1x	**RPI 200**	**D**	130
A557	Search Sector failed to reset following an Attention Reset.	2	Bus In under Read Status Tag '84' Bus '00' Expected xxxx xxx0	**RPI 200**	**E**	130
A558	Busy Attention failed to reset following an Attention Reset.	2	Bus In under Read Status Tag '84' Bus '00' Expected xxxx xx0x	**RPI 200**	**F**	130

Error Code	Error Description	CE Panel Lamp Display Byte	CE Panel Lamp Display Description	MAP Section	MAP Entry	MICFL
A560	Index Mark was not received in 25 milliseconds.			**RPI 120**	**D**	130
A562	Failed to receive Sector Compare in one full revolution after initiating a Search Sector.	2	Sector that failed to give Sector Compare.	**RPI 236**	**E**	130
A563	Sector Compare duration was greater than 134 microseconds (based on +3% tolerance).	2	Failing Sector.	**RPI 236**	**C**	130
A564	Sector Compare duration was less than 126 microseconds (based on −3% tolerance).	2	Failing Sector.	**RPI 236**	**D**	130
A565	Target Register failed to reset to zero.	2	Bus In under Sense Target Tag '8F' Bus '0D' Expected x000 0000 (Bit 0 is RPS bit.)	**RPI 200**	**A**	130
A566	Device Bus In from Sense Target is not equal to 127 after transferring Sector Counter data to the Target Register during Sector 127 time.	2	Bus In under Sense Target Tag '8F' Bus '0D' Expected x111 1111 (Only bits 1-7 are tested for 127. Bit 0 is RPS bit.)	**RPI 236**	**A**	130
A567	Device Bus In from Sense Target is not equal to zero after transferring Sector Counter data to the Target Register during Sector Zero time.	2	Bus In under Sense Target Tag '8F' Bus '0D' Expected x000 0000 (Only bits 1-7 are tested for zero. Bit 0 is RPS bit.)	**RPI 236**	**B**	130

Error Code	Error Description	CE Panel Lamp Display Byte	CE Panel Lamp Display Description	MAP Section	MAP Entry	MICFL
A701 to A707	Errors common to all routines.			**MICRO 100**		
A711	Sense Status 2 not equal to '60' with HDA loaded. The HDA load sequence does not indicate normal loaded status. Verify that the HDA is loaded.	2	HDA Sequence Status Expected 0110 000x	**HDA 100**	**E**	180
A712	Adjustment out of specification. Servo Seek velocity too fast.	2	Number of microseconds less than the nominal value. Number displayed is in hex.	**ACC 800**	**C**	180
A713	Adjustment out of specification. Servo Seek velocity too slow (fine measurement). (Adjustment/verification mode.)	2	Number of microseconds greater than the nominal value. Number displayed is in hex.	**ACC 800**	**C**	180
A714	Failed to receive Busy status during a Rezero or Seek.	2	Bus In under Read Status Tag '84' Bus '00' Expected xxxx xx1x	**ACC 210**	**C**	180
A715	Access Timeout and/or Overshoot Check during a Seek. The timeout error occurred while the program was measuring the Seek velocity.	2	Bus In under Access Status Tag '8F' Bus '13' Expected 000x xxxx	**ACC 510**	**A**	180
A716	Access Timeout Check and/or Overshoot Check after a Seek. The Velocity Gain adjustment is within specification.	2	Bus In under Access Status Tag '8F' Bus '13' Expected 000x xxxx	**ACC 510**	**A**	180
A717	Access Timeout Check and/or Overshoot Check after a Rezero.	2	Bus In under Access Status Tag '8F' Bus '13' Expected 0000 1110	**ACC 301**	**A**	180
A718	Timeout waiting for track-crossing transitions on a Seek Start.	2	Bus In under Access Status Tag '8F' Bus '13'	**ACC 521**	**B**	180

Error Code	Error Description	CE Panel Lamp Display Byte	CE Panel Lamp Display Description	MAP Section	MAP Entry	MICFL
A901 to A907	Errors common to all routines.			**MICRO 100**		
A912	The received and expected physical address bytes of the Home Address do not match. PA1 = High Cylinder (0000 00YX). PA2 = Low Cylinder (CCCC CCCC) where X = 256 bit and Y = 512 bit. Note that physical head 0 is used to read the Home Address and is not displayed.	2 3 4 5 6	Not Used Received PA1 value Received PA2 value Expected PA1 value Expected PA2 value	**ACC 501**	**A**	200
A913	Microprogram timed-out waiting for a response from the controller during a Read G1. Run routine AD.					200
A914	Busy status was not received following a Rezero or Seek Start.	2	Bus In under Read Status Tag '84' Bus '00' Expected xxxx xx1x	**ACC 210**	**C**	200
A915	Drive Check was active after receiving Seek Complete from a Rezero.	2	Bus In under Access Status Tag '8F' Bus '13'	**ACC 301**	**A**	200
A916	Access Timeout and/or Overshoot Check or Servo Off Track error were active after receiving Seek Complete from a Seek.	2	Bus In under Access Status Tag '8F' Bus '13' Expected 000x xxxx	**ACC 510**	**A**	200
A917	Error Alert was active following a Set Read/Write or Read G1. Run routine B3.					200
A918	Normal End was not received for a Set Read/Write or Read G1.			**CTL-I 660**	**A**	200
A919	Check End was active following a Read G1.	2	Bus In on Check End	**CTL-I 630**	**A**	200

Error Code	Error Description	CE Panel Lamp Display Byte	CE Panel Lamp Display Description	MAP Section	MAP Entry	MICFL
AA01 to AA07	Errors common to all routines.			**MICRO 100**		
AA12	The received and expected physical address bytes of the Home Address do not match. PA1 = High Cylinder Address (0000 00YX). PA2 = Low Cylinder Address (CCCH HHHH) where X = 256 bit and Y = 512 bit. H = Physical Head.	2 3 4 5 6	Not Used Received PA1 value Received PA2 value Expected PA1 value Expected PA2 value	**ACC 501**	**A**	210
AA13	Microprogram timed-out waiting for a response from the controller during a Read G1. Run routine AD.					210
AA14	Busy status was not received following a Rezero.	2	Bus In under Read Status Tag '84' Bus '00' Expected xxxx xx1x	**ACC 210**	**C**	210
AA15	Drive Check was found to be active after receiving Seek Complete from a Rezero.	2	Bus In under Access Status Tag '8F' Bus '13' Expected 000x xxxx	**ACC 301**	**A**	210

Error Code	Error Description	CE Panel Lamp Display Byte	CE Panel Lamp Display Description	MAP Section	MAP Entry	MICFL
AA16	Access Timeout and/or Overshoot Check or Servo Off Track error were active after receiving Seek Complete from a Seek.	2	Bus In under Access Status Tag '8F' Bus '13' Expected 00xx xxxx	**ACC 510**	**A**	210
AA17	Error Alert was active following a Set Read/Write or Read G1.			**DATA 628**		210
AA18	Normal End was not received for a Set Read/Write or Read G1.			**CTL-I 660**	**A**	210
AA19	Check End was active following a Read G1.	2	Bus In on Check End	**CTL-I 630**	**A**	210
AA1A	The From cylinder address selected by the CE was greater than 560 (decimal).					210
AA1B	The To cylinder address selected by the CE was greater than 560 (decimal).					210

Error Code	Error Description	CE Panel Lamp Display Byte	CE Panel Lamp Display Description	MAP Section	MAP Entry	MICFL
AB01 to AB07	Errors common to all routines.			**MICRO 100**		
AB12	The received and expected physical address bytes of the Home Address do not match. PA1 = Low Cylinder Address (0000 00YX). PA2 = High Cylinder Address (CCCC CCCC) where X =256 bit and Y = 512 bit. Note that physical head 0 is used to read the Home Address and is not displayed.	2 3 4 5 6 7 8	Not Used Received PA1 value Received PA2 value Expected PA1 value Expected PA2 value Previous PA1 value Previous PA2 value	**ACC 501**	**A**	220
AB13	Microprogram timed-out waiting for a response from the controller during a Read G1. Run routine AD.					220
AB14	Busy status was not received following a Rezero.	2	Bus In under Read Status Tag '84' Bus '00' Expected xxxx xx1x	**ACC 210**	**C**	220
AB15	Drive Check was active after receiving Seek Complete from a Rezero.	2	Bus In under Access Status Tag '8F' Bus '13' Expected 000x xxxx	**ACC 301**	**A**	220
AB16	Access Timeout and/or Overshoot Check or Servo Off Track error were on after receiving Seek Complete from a Seek.	2	Bus In under Access Status Tag '8F' Bus '13' Expected 000x xxxx	**ACC 510**	**A**	220
AB17	Error Alert was active following a Set Read/Write or Read G1.			**DATA 628**	**A**	220
AB18	Normal End was not received for a Set Read/Write or Read G1.			**CTL-I 660**	**A**	220
AB19	Check End was active following a Read G1.	2	Bus In on Check End	**CTL-I 630**	**A**	220

Error Code	Error Description	CE Panel Lamp Display Byte	CE Panel Lamp Display Description	MAP Section	MAP Entry	MICFL
AD01 to AD07	Errors common to all routines.			**MICRO 100**		
AD08	Failed to raise Busy after a Rezero Start. Pre-initialization error. Occurred before execution of first test. To loop this error, any test (1 through 9) may be selected.	2	Bus In under Read Status Tag '84' Bus '00' Expected xxxx xx1x	**ACC 210**	**C**	240
AD09	Failed to raise Busy after a Seek Start. Pre-initialization error. Occurred before execution of first test. To loop this error, any test (1 through 9) may be selected.	2	Bus In under Read Status Tag '84' Bus '00' Expected xxxx xx1x	**ACC 210**	**C**	240
AD0A	Incorrect status following a Rezero. Expected Not Busy, Not Drive Check, and Seek Complete. Pre-initialization error. Occurred before execution of first test. To loop this error, any test (1 through 9) may be selected.	2	Bus In under Read Status Tag '84' Bus '00' Expected xx0x xx01	**ACC 301**	**B**	240
AD0B	Incorrect status following a Seek. Expected Not Busy, Not Drive Check, and Seek Complete. Pre-initialization error. Occurred before execution of first test. To loop this error, any test (1 through 9) may be selected.	2	Bus In under Read Status Tag '84' Bus '00' Expected xx0x xx01	**ACC 540**	**B**	240
AD0C	Failed to receive any End response following a Set Read/Write. Expected Normal End or Check End. Pre-initialization error. Occurred before execution of first test. To loop this error, any test (1 through 9) may be selected.			**CTL-I 640**	**A**	240
AD0D	Failed to orient on Index Alert within 21 milliseconds. Pre-initialization error. Occurred before execution of first test. To loop this error, any test (1 through 9) may be selected.			**RPI 160**	**C**	240
AD0E	Received Error Alert from Set Read/Write. Pre-initialization error. Occurred before execution of first test. To loop this error, any test (1 through 9) may be selected.			**DATA 628**	**A**	240
AD0F	Received Error Alert from a Seek. Pre-initialization error. Occurred before execution of first test. To loop this error, any test (1 through 9) may be selected.			**DATA 500**	**A**	240

Error Code	Error Description	Byte	CE Panel Lamp Display Description	MAP Section	MAP Entry	MICFL
AD12	Unexpected Attention Status received. Indicates unexpected access mechanism movement since last Seek. Reload routine AD. Exit to ACC 301, Entry B if routine AD continues to halt with this Error Code.	2	Bus In under Read Status Tag '84' Bus '00' Expected xxxx x00x			240
AD13	Received I Write Sense = 1 following a Set Read/Write and prior to initiating any Write.	2	Bus In under Read Status Tag '84 Bus '00' Expected x0xx xxxx	DATA 56	A	240
AD14	Failed to orient on Index Alert within 21 milliseconds.			RPI 160	C	240
AD15	Failed to receive I Write Sense = 1 during a Write G1, approximately 20 microseconds after Index. Physical head 1 was selected.	2	Bus In under Read Status Tag '84' Bus '00' Expected x1xx xxxx	DATA 54	A	240
AD16	Received I Write Sense = 1 during a Write G1 with Diagnostic Inhibit Write Gate active approximately 20 microseconds after Index.	2	Bus In under Read Status Tag '84' '00' Expected x0xx xxxx	DATA 56	B	240
AD17	No Check End or Normal End response received following a Write G1 in Diagnostic Invert Bus Out Parity mode within 21 milliseconds.	2		CTL-I 660	A	240
AD18	Unable to force Gap Counter error in Diagnostic Invert Bus Out Parity mode.	2 3	Bus In under Sense Status (Controller Error 2) Tag '04' Bus '02' Expected xxx1 xxxx Check End Byte	DATA 58	B	240
AD19	Gap Counter error is on when it should be off.	2	Bus In under Sense Status (Controller Error 2) Tag '04' Bus '02' Expected xxx0 xxxx	DATA 58	A	240
AD1A	No Write Data Check in Diagnostic Invert Bus Out Parity mode.	2	Bus In under Sense Status (Controller Error 2) Tag '04' Bus '02' Expected xxxx 1xxx	DATA 124	A	240
AD1B	No Controller error as a result of a Gap Counter error in Diagnostic Invert Bus Out Parity mode.	2	Bus In under Read Status Tag '84' Bus '00' Expected 1xxx xxxx	CTL-I 310	A	240
AD1C	Controller Reset did not reset Gap Counter error.	2	Bus In under Sense Status (Controller Error 2) Tag '04' Bus '02' Expected xxx0 xxxx	CTL-I 550	B	240
AD1D	Unable to force Phase error in Diagnostic Invert Bus Out Parity mode.	2	Bus In under Sense Status (Controller Error 2) Tag '04' Bus '02' Expected 10xx xxxx	DATA 60	A	240
AD1E	Phase error failed to reset by a Controller Reset.	2	Bus In under Sense Status (Controller Error 2) Tag '04' Bus '02' Expected 00xx xxxx	DATA 60	B	240
AD1F	No Sync In found before End conditions of a Write G1.			DATA 230	A	240

Error Code	Error Description	CE Panel Lamp Display Byte	CE Panel Lamp Display Description	MAP Section	MAP Entry	MICFL
AD22	Unexpected Attention Status received. Indicates unexpected access mechanism movement since last Seek. Reload routine AD. Exit to ACC 301, Entry B if routine AD continues to halt with this Error Code.	2	Bus In under Read Status Tag '84' Bus '00' Expected xxxx x00x			240
AD25	Failed to orient on Index Alert within 21 milliseconds.			**RPI 160**	**C**	240
AD26	Microprogram timed-out waiting for a response from the controller during a Write G1.			DATA 80	**A**	240
AD27	Abnormal End condition received while timing a G1 gap in Write mode.	2	Check End Byte Expected 0000 0000	**CTL-I 630**	**A**	240
AD28	G1 gap length out of tolerance. Bytes 2 and 3 are a 2-byte timer that measures the G1 gap length in microseconds. Expected timer decimal value is 93 to 100 microseconds or 005D to 0064 in hex.	2 3	Gap timer – Hi = xxxx xxxx ('00') Gap timer – Lo = xxxx xxxx ('5D' to '64')	DATA 84	**A**	240

Error Code	Error Description	CE Panel Lamp Display Byte	CE Panel Lamp Display Description	MAP Section	MAP Entry	MICFL
AD32	Unexpected Attention Status received. Indicates unexpected access mechanism movement since last Seek. Reload routine AD. Exit to ACC 301, Entry B if routine AD continues to halt with this Error Code.	2	Bus In under Read Status Tag '84' Bus '00' Expected xxxx x00x			240
AD35	Failed to orient on Index Alert within 21 milliseconds.			**RPI 160**	**C**	240
AD36	No Sync In received within 21 milliseconds during an extended G1.			**DATA 115**	**A**	240
AD37	Abnormal End condition received while timing an extended G1 gap in Write mode.	2	Check End Byte Expected 0000 0000	**CTL-I 630**	**A**	240
AD38	Extended G1 gap out of tolerance. Bytes 2 and 3 are a 2-byte timer that measures the extended G1 gap in microseconds. Expected timer decimal value is 197 to 209 microseconds or 00C5 to 00D1 in hex.	2 3	Gap timer – Hi = xxxx xxxx ('00') Gap timer – Lo = xxxx xxxx ('C5' to 'D1')	DATA 84	**A**	240

Error Code	Error Description	CE Panel Lamp Display Byte	CE Panel Lamp Display Description	MAP Section	MAP Entry	MICFL
AD42	Unexpected Attention Status received. Indicates unexpected access mechanism movement since last Seek. Reload routine AD. Exit to ACC 301, Entry B if routine AD continues to halt with this Error Code.	2	Bus In under Read Status Tag '84' Bus '00' Expected xxxx x00x			240
AD44	Failed to orient on Index Alert within 21 milliseconds.			RPI 160	C	240
AD46	Failed to receive any End response following a Write G1.			CTL-I 660	A	240
AD48	Sync In Counter not correct after a Write G1 of 'nn' bytes. 'nn' = Number of bytes written. Hex value of 'nn' = 01, 02, 04, 08, and 11. Expected Sync In Count (hex) = 02, 03, 05, 09, and 12.	2 3	Number of Sync Ins Received Number of Sync Ins Expected	DATA 104	A	240

Error Code	Error Description	CE Panel Lamp Display Byte	CE Panel Lamp Display Description	MAP Section	MAP Entry	MICFL
AD52	Unexpected Attention Status received. Indicates unexpected access mechanism movement since last Seek. Reload routine AD. Exit to ACC 301, Entry B if routine AD continues to halt with this Error Code.	2	Bus In under Read Status Tag '84' Bus '00' Expected xxxx x00x			240
AD53	No End response received from a Write G1 within 21 milliseconds.			CTL-I 660	A	240
AD54	Failed to orient on Index Alert within 21 milliseconds.			RPI 160	C	240
AD56	No Sync In received from a Write G2 following a successful orientation with a Write G1.			DATA 80	A	240
AD57	Abnormal End received while timing a G2 gap in Write mode.	2	Check End Byte Expected 0000 0000	CTL-I 630	A	240
AD58	G2 gap out of tolerance. Bytes 2 and 3 are a 2-byte timer that measures the G2 gap in microseconds. Expected timer decimal value is 60 to 64 microseconds or 003C to 0040 in hex.	2 3	Gap timer – Hi = xxxx xxxx ('00') Gap timer – Lo = xxxx xxxx ('3C' to '40')	DATA 84	A	240

Error Code	Error Description	CE Panel Lamp Display Byte	CE Panel Lamp Display Description	MAP Section	MAP Entry	MICFL
AD62	Unexpected Attention Status received. Indicates unexpected access mechanism movement since last Seek. Reload routine AD. Exit to ACC 301, Entry B if routine AD continues to halt with this Error Code.	2	Bus In under Read Status Tag '84' Bus '00' Expected xxxx x00x			240
AD63	No End response received from a Write G1 within 21 milliseconds.			CTL-I 660	A	240
AD64	Failed to orient on Index Alert within 21 milliseconds.			RPI 160	C	240
AD66	Microprogram timed-out waiting for a response from the controller during a Write G3.			DATA 80	A	240
AD67	Abnormal End received while timing a G3 gap in Write mode.	2	Check End Byte Expected 0000 0000	CTL-I 630	A	240
AD68	G3 gap out of tolerance. Bytes 2 and 3 are a 2-byte timer that measures the G3 gap in microseconds. Expected timer decimal value is 62 to 66 microseconds or 003E to 0042 in hex.	2 3	Gap timer – Hi = xxxx xxxx ('00') Gap timer – Lo = xxxx xxxx ('3E' to '42')	DATA 84	A	240

Error Code	Error Description	CE Panel Lamp Display Byte	CE Panel Lamp Display Description	MAP Section	MAP Entry	MICFL
AD72	Unexpected Attention Status received. Indicates unexpected access mechanism movement since last Seek. Reload routine AD. Exit to ACC 301, Entry B if routine AD continues to halt with this Error Code.	2	Bus In under Read Status Tag '84' Bus '00' Expected xxxx x00x			240
AD73	No End response from a Write G1 within 21 milliseconds. Expected Check End or Normal End response to a Write G1. Wrote a 4-byte data pattern of 'EB 6D B6 DB'			CTL-I 660	A	240
AD74	Failed to orient on Index Alert within 21 milliseconds.			RPI 160	C	240
AD76	Microprogram timed-out waiting for a response from the controller during a Write G1.			DATA 80	A	240
AD78	Write Data Check and/or ECC Hardware Check received from a Write G1 with Data field = 'EB 6D B6 DB'	2	Bus In under Sense Status (Controller Error 2) Tag '04' Bus '02' Expected xxxx 0x0x	DATA 124	B	240
AD79	Unexpected End response received from a Write G1 during Data Response mode.	2	Check End Byte Expected 0000 0000	CTL-I 630	A	240

Error Code	Error Description	CE Panel Lamp Display Byte	CE Panel Lamp Display Description	MAP Section	MAP Entry	MICFL
AD81	Unexpected Attention Status received. Indicates unexpected access mechanism movement since last Seek. Reload routine AD. Exit to ACC 301, Entry B if routine AD continues to halt with this Error Code.	2	Bus In under Read Status Tag '84' Bus '00' Expected xxxx x00x			240
AD82	Read/Write Check (bit 3) not = 0 following a Check Reset.	2	Bus In under Read Status Tag '84' Bus '00' Expected xxx0 xxxx	R/W 112	B	240
AD84	Control Check not = 1 after being forced.	2	Bus In under Sense Read/Write Tag '8F' Bus '0B' Expected xxxx x1xx	R/W 142	A	240
AD85	Control Check not = 0 following a Check Reset.	2	Bus In under Sense Read/Write Tag '8F' Bus '0B' Expected xxxx x0xx	R/W 142	B	240
AD86	Write Overrun Check not = 1 after being forced.	2	Bus In under Sense Read/Write Tag '8F' Bus '0B' Expected xx1x xxxx	R/W 162	A	240
AD87	Write Overrun Check not = 0 following a Check Reset.	2	Bus In under Sense Read/Write Tag '8F' Bus '0B' Expected xx0x xxxx	R/W 162	B	240
AD88	Transition Check not = 1 after being forced.	2	Bus In under Sense Read/Write Tag '8F' Bus '0B' Expected xxxx xx1x	R/W 124	A	240
AD89	Transition Check not = 0 following a Check Reset.	2	Bus In under Sense Read/Write Tag '8F' Bus '0B' Expected xxxx xx0x	R/W 124	B	240
AD8A	Write I on Read Check not = 1 after being forced.	2	Bus In under Sense Read/Write Tag '8F' Bus '0B' Expected xxxx xxx1	R/W 132	A	240
AD8B	Write I on Read Check not = 0 following a Check Reset.	2	Bus In under Sense Read/Write Tag '8F' Bus '0B' Expected xxxx xxx0	R/W 132	B	240
AD8C	Read/Write Check not = 1 after forcing a Control Check.	2	Bus In under Read Status Tag '84' Bus '00' Expected xxx1 xxxx	R/W 112	A	240
AD8D	Read/Write Check not = 1 after forcing a Write Overrun Check.	2	Bus In under Read Status Tag '84' Bus '00' Expected xxx1 xxxx	R/W 112	A	240
AD8E	Read/Write Check not = 1 after forcing a Transition Check.	2	Bus In under Read Status Tag '84' Bus '00' Expected xxx1 xxxx	R/W 112	A	240
AD8F	Read/Write Check not = 1 after forcing a Write Current Check.	2	Bus In under Read Status Tag '84' Bus '00' Expected xxx1 xxxx	R/W 112	A	240

Error Code	Error Description	CE Panel Lamp Display Byte	CE Panel Lamp Display Description	MAP Section	MAP Entry	MICFL
AD90	Drive Check active upon program entry. Test is aborted. Reload routine AD. Exit to ACC 301, Entry B if routine AD continues to halt with this Error Code.	2	Bus In under Read Status Tag '84' Bus '00' Expected xx0x xxxx			240
AD91	Unexpected Attention Status received. Indicates an unexpected access mechanism movement since last Seek. Reload routine AD. Exit to ACC 301, Entry B if routine AD continues to halt with this Error Code.	2	Bus In under Read Status Tag '84' Bus '00' Expected xxxx x00x			240
AD92	Pad Gate Check is active following a Check Reset.	2	Bus In under Sense Status 0 Tag '8F' Bus '03' Expected xxxx x0xx	**R/W 190**	**C**	240
AD93	Read/Write Check is active following a Check Reset with Pad Gate Check not active.	2	Bus In under Read Status Tag '84' Bus '00' Expected xxx0 xxxx	**R/W 112**	**B**	240
AD94	Pad Gate Check is not active after being forced.	2	Bus In under Sense Status 0 Tag '8F' Bus '03' Expected xxxx x1xx	**R/W 190**	**B**	240
AD95	Read/Write Check is not active after forcing a Head Short Check.	2	Bus In under Read Status Tag '84' Bus '00' Expected xxx1 xxxx	**R/W 112**	**A**	240
AD96	Pad Gate Check is not reset following a Check Reset.	2	Bus In under Sense Status 0 Tag '8F' Bus '03' Expected xxxx x0xx	**R/W 190**	**C**	240
AD97	Read/Write Check is not reset following a Check Reset after Pad Gate Check, Head Short Check, or Delta I Write Check was reset.	2	Bus In under Read Status Tag '84' Bus '00' Expected xxx0 xxxx	**R/W 112**	**B**	240
AD98	Head Short Check is not active after being forced.	2	Bus In under Sense Status 0 Tag '8F' Bus '03' Expected xxxx 1xxx	**R/W 202**	**A**	240
AD99	Head Short Check is not reset following a Check Reset. (Head = 0)	2	Bus In under Sense Read/Write Tag '8F' Bus '0B' Expected xxxx 0xxx	**R/W 202**	**B**	240

Error Code	Error Description	CE Panel Lamp Display Byte	CE Panel Lamp Display Description	MAP Section	MAP Entry	MICFL
AD9A	Head Short Check is not reset following a Check Reset.	2	Bus In under Sense Status 0 Tag '8F' Bus '03' Expected xxxx 0xxx	**R/W 202**	**B**	240
AD9B	Delta I Write Check occurred.	2	Bus In under Sense Read/Write Tag '8F' Bus '0B' Expected xxxx 0xxx	**R/W 150**	**A**	240
AD9C	Delta I Write Check is active following a Check Reset.	2	Bus In under Sense Read/Write Tag '8F' Bus '0B' Expected xxxx 0xxx	**R/W 152**	**B**	240
AD9D	Delta I Write Check is not active after being forced.	2	Bus In under Sense Read/Write Tag '8F' Bus '0B' Expected xxxx 1xxx	**R/W 152**	**A**	240
AD9E	Delta I Write Check is not reset following a Check Reset after being forced.	2	Bus In under Sense Read/Write Tag '8F' Bus '0B' Expected xxxx 0xxx	**R/W 152**	**B**	240
AD9F	Failed to Orient on Index Alert within 25 milliseconds.			**RPI 160**	**C**	240

Error Code	Error Description	CE Panel Lamp Display Byte	CE Panel Lamp Display Description	MAP Section	MAP Entry	MICFL
ADA2	Unexpected Attention Status received. Indicates unexpected access mechanism movement since last Seek. Reload routine AD. Exit to ACC 301, Entry B if routine AD continues to halt with this Error Code.	2	Bus In under Read Status Tag '84' Bus '00' Expected xxxx x00x			240
ADA3	Timeout waiting for End conditions from a Write G1.			**CTL-I 660**	**A**	240
ADA4	Failed to orient on Index Alert within 21 milliseconds.			**RPI 160**	**C**	240
ADA5	Timed-out waiting for first Sync In from a Write X Gap. See Figure 1 for meaning of values of X.	2 3 4	Not Used Not Used Gap number (X)	**DATA 80**	**A**	240
ADA6	Unexpected End response received for a Write X Gap. See Figure 1 for meaning of values of X.	2 3 4	Not Used Not Used Gap number (X)	**CTL-I 630**	**A**	240
ADA7	Gap time measured for Write X Gap was found to be out of tolerance. See Figure 1 for meaning of values of X.	2 3 4	Time measured (High) Time measured (Low) Gap number (X)	**DATA 132**	**A**	240
ADA8	X Gap failed to set or reset the Gap 128 latch. See Figure 1 for meaning of values of X.	2 3 4	Time measured (High) Time measured (Low) Gap number (X)	**DATA 132**	**B**	240
ADAA	Error Alert was received during a Write X Gap. See Figure 1 for meaning of values of X.	2 3 4	Not Used Not Used Gap number (X)	**DATA 628**	**A**	240
ADAB	Check End received after a Write X Gap. See Figure 1 for meaning of values of X.	2 3 4	Check End Byte Not Used Gap number (X)	**CTL-I 630**	**A**	240
ADAC	No End conditions received after a Write X Gap. See Figure 1 for meaning of values of X.	2 3 4	Not Used Not Used Gap number (X)	**CTL-I 660**	**A**	240
ADAD	Error Alert received after a Set Read/Write.			**DATA 628**	**A**	240
ADAE	No End conditions received after a Set Read/Write.			**CTL-I 640**	**A**	240

Figure 1. Byte 4 Gap Values

Byte 4 Gap Type Description
01 = G2 Special – 1st record written.
02 = G2 Special – 2nd record written.
03 = G4 – Test for proper gap.
05 = G2 – Test for Gap 128 latch on.
05 = G2 – Test for Gap 128 latch off.

Error Code	Error Description	CE Panel Lamp Display Byte	CE Panel Lamp Display Description	MAP Section	MAP Entry	MICFL
ADB2	Unexpected Attention Status received. Indicates unexpected access mechanism movement since last Seek. Reload routine AD. Exit to ACC 301, Entry B if routine AD continues to halt with this Error Code.	2	Bus In under Read Status Tag '84' Bus '00' Expected xxxx x00x			240
ADB3	Read/Write Check failed to come on when forced. Loop routine A5 test 3 for further analysis.	2	Bus In under Read Status Tag '84' Bus '00' Expected xxx1 xxxx			240
ADB4	I Write Fail, failed to come on when forced. (Write G1 while Read/Write Check is on.)	2	Bus In under Write Op Tag '0F' Bus '44' Expected xxxx x1xx	**DATA 140**	**B**	240
ADB5	I Write Fail, failed to reset following a Reset Diagnostic.	2	Bus In under Sense Status (Controller Error 1) Tag '04' Bus '01'	**DATA 140**	**B**	240
ADB6	Failed to orient on Index Alert within 21 milliseconds.			**RPI 160**	**C**	240

Error Code	Error Description	CE Panel Lamp Display Byte	CE Panel Lamp Display Description	MAP Section	MAP Entry	MICFL
AE01 to AE07	Errors common to all routines.			MICRO 100		
AE10	ECC Zeros Detect was off after G1 Gap Byte 53 time. At this time, the ECC Reset line should have been raised to reset the registers. No ECC Reset. No serial data to ECC required. Uses Zero Compare to set Zeros Detect.	2	Bus In under Sense Status (Controller Error 2) Tag '04' Bus '02' Expected xxxx xxx1	DATA 152	A	290
AE11	ECC Zeros Detect was on after the program received the fourth Sync In. ECC registers should be loaded with data at this time. **Note:** *This error could occur if the Home Address read contained zeros in the first 4 bytes.*	2	Bus In under Sense Status (Controller Error 2) Tag '04' Bus '02' Expected xxxx xxx0	DATA 152	A	290
AE21	ECC Low pattern register not equal to 'F5'.	2	Bus In under Sense Status (ECC Low) Tag '04' Bus '80' Expected 1111 0101	DATA 164	A	290
AE22	ECC High pattern register not equal to 'FD'.	2	Bus In under Sense Status (ECC High) Tag '04' Bus '40' Expected 1111 1101	DATA 164	A	290
AE23	Controller Bus In Parity Check was on after Sense ECC Low.	2	Bus In under Sense Status (Controller Error 1) Tag '04' Bus '01' Expected xxxx 1xxx	DATA 164	B	290
AE24	Controller Bus In Parity Check was on after Sense ECC High.	2	Bus In under Sense Status (Controller Error 1) Tag '04' Bus '01' Expected xxxx 1xxx	DATA 164	B	290

Error Code	Error Description	CE Panel Lamp Display Byte	CE Panel Lamp Display Description	MAP Section	MAP Entry	MICFL
AE30	Bus In at Normal End was not '00'.	2	Bus In under Normal End	DATA 174	A	290
AE31	ECC Low pattern register not equal to zero.	2	Bus In under Sense Status (ECC Low) Tag '04' Bus '80' Expected 0000 0000	DATA 178	A	290
AE32	ECC High pattern register not equal to zero.	2	Bus In under Sense Status (ECC High) Tag '04' Bus '40' Expected 0000 0000	DATA 178	A	290
AE33	ECC Zeros Detect was off.	2	Bus In under Sense Status (Controller Error 2) Tag '04' Bus '02' Expected xxxx xxx1	DATA 152	A	290
AE34	ECC Data Check was on after pattern was read back.	2	Bus In under Read Op (Check End) Tag '0E' Bus '00' Expected 0001 1000	DATA 152	A	290

Error Code	Error Description	CE Panel Lamp Display Byte	CE Panel Lamp Display Description	MAP Section	MAP Entry	MICFL
AE40	No Check End received after a forced correctable ECC Data Check was read.	2	Bus In under Check End Expected xxx1 1xxx	DATA 176	A	290
AE41	Bus In bit 3 (ECC Data Check) missing.	2	Bus In under Read Op (Check End) Tag '0E' Bus '00' Expected xxx1 xxxx	DATA 176	B	290
AE42	No AM Found bit should be on with an ECC Data Check bit.	2	Bus In under Read Op (Check End) Tag '0E' Bus '00' Expected xxxx 1xxx	DATA 176	D	290
AE43	After the ECC correction operation, the data was indicated as uncorrectable. (Normal End came on.)			DATA 152	A	290
AE44	Incorrect ECC counter value after correction operation. Expected '00'.	2 Expected 0000 0101 3 Expected 0000 0101	Counter high Counter low	DATA 152	A	290
AE45	ECC Zeros Detect was not on after an ECC Data Check was indicated to be correctable.	2	Bus In under Sense Status (Controller Error 2) Tag '04' Bus '02' Expected xxxx xxx1	DATA 152	A	290
AE46	ECC Low pattern register incorrect after a correctable ECC Data Check.	2	Bus In under Sense Status (ECC Low) Tag '04' Bus '80' Expected 1100 0000	DATA 178	A	290
AE47	ECC High pattern register incorrect after a correctable ECC Data Check.	2	Bus In under Sense Status (ECC High) Tag '04' Bus '40' Expected 0000 0011	DATA 178	A	290
AE4F	No Index Alert after 25 milliseconds wait during an ECC correction operation.			RPI 170	B	290

Error Code	Error Description	CE Panel Lamp Display Byte	CE Panel Lamp Display Description	MAP Section	MAP Entry	MICFL
AE50	No Check End received after a forced uncorrectable ECC Data Check was read.	2	Bus In under Check End Expected xxx1 1xxx	DATA 176	A	290
AE51	No ECC Data Check bit 3 after an ECC Data Check was forced.	2	Bus In under Read Op (Check End) Tag '0E' Bus '00' Expected xxx1 1xxx	DATA 176	B	290
AE52	An uncorrectable ECC Data Check was indicated to be correctable during an ECC correction operation. (Index Alert turned on.)			RPI 170	A	290
AE53	Normal End was not received by an ECC correction operation. (Normal End indicates an uncorrectable ECC Data Check.)			DATA 176	C	290
AE54	ECC Zeros Detect was on after an uncorrectable ECC Data Check was processed through correction cycle.	2	Bus In under Sense Status (Controller Error 2) Expected xxxx xxx0	DATA 152	A	290
AE60	ECC pattern read does not match what was written during a Write ECC burst. (Seven bytes written.) Record should read: '01 FF E7 FF 5F 5E FA' Byte pattern number: 1 2 3 4 5 6 7	2 3 4	Received first failing Data Byte Expected first failing Data Byte Byte pattern number of first failing byte.	DATA 202	A	290

Error Code	Error Description	CE Panel Lamp Display Byte	CE Panel Lamp Display Description	MAP Section	MAP Entry	MICFL
AEF1	Drive did not become Busy after a Seek Start or Rezero. Run Sense Display routine B3 to gather drive and controller error bytes. Error numbers '01' through '0E' (except '0A') should be detected by a prior routine. Pre-initialization error. Occurred before execution of first test. To loop this error, any test (1 through 9) may be selected.	2	Bus In under Read Status Tag '84' Bus '00' Expected xxxx xx1x	ACC 210	C	290
AEF2	Drive Check received after a Seek or Rezero. Run routines A2, B8, and B9. Pre-initialization error. Occurred before execution of first test. To loop this error, any test (1 through 9) may be selected. Exit to ACC 301, Entry B if routine AF continues to halt with this Error Code.	2	Bus In under Read Status Tag '84' Bus '00' Expected xx0x xxx1			290
AEF3	Microprogram timed-out waiting for a response from the controller. Error occurs with test 1 only.			DATA 80	A	290
AEF5	Read an incorrect HA prior to writing the test pattern. Should be cylinder 560, head 1. Run routine AF. Error may occur with tests 2, 3, 4, or 5.					290
AEF6	No Ending Status after a 25 millisecond wait after a Read G1, Write G2, or Set Read/Write. Error may occur with tests 1, 2, 3, 4, or 5.			CTL-I 660	A	290

Error Code	Error Description	CE Panel Lamp Display Byte	CE Panel Lamp Display Description	MAP Section	MAP Entry	MICFL
AEF8	Microprogram timed-out waiting for Index Alert or Index Mark. Error occurs in test 1 only.			RPI 120	D	290
AEF9	Error Alert received during one of the following Tags: Set Read/Write Read G1 Write G2 Read G2 Error Alert occurred other than an ECC Hardware Check. Error may occur in tests 1, 2, 3, 4, or 5.	2	Bus In under Read Status Tag '84' Bus '00' Expected 0000 xxxx	DATA 500	B	290
AEFA	ECC Hardware Check received during one of the following Tags: Set Read/Write Read G1 Write G2 Read G2 Error may occur in tests 2, 3, 4, or 5.	2	Bus In under Sense Status (Controller Error 2) Tag '04' Bus '02' Expected xxxx xx0x	DATA 122	A	290
AEFD	No status after a 25-millisecond wait during a Read G1 or Read G2 Error may occur in tests 2, 3, 4, or 5.			DATA 80	A	290
AEFE	Unexpected Check End received during a Read G1 or Read G2, other than ECC Data Check. **Note:** *ECC Data Checks during Read G1 are ignored.* Error may occur in tests 2, 3, 4, or 5.	2	Bus In under Read Op (Check End) Tag '0E' Bus 'XX' Expected 0001 1000	CTL-I 630	A	290

Error Code	Error Description	CE Panel Lamp Display Byte	CE Panel Lamp Display Description	MAP Section	MAP Entry	MICFL
AF01 to AF07	Errors common to all routines.			**MICRO 100**		
AF08	Failed to raise Busy following a Rezero start. Pre-initialization error. Occurred before execution of first test. To loop this error, any test (1 through F) may be selected.	?	Bus In under Read Status Tag '84' Bus '00' Expected xxxx xx1x	**ACC 210**	**C**	320
AF09	Failed to raise Busy following a Seek start. Pre-initialization error. Occurred before execution of first test. To loop this error, any test (1 through F) may be selected.	2	Bus In under Read Status Tag '84' Bus '00' Expected xxxx xx1x	**ACC 210**	**C**	320
AF0A	Incorrect status following a Rezero. Pre-initialization error. Occurred before execution of first test. To loop this error, any test (1 through F) may be selected.	2	Bus In under Read Status Tag '84' Bus '00' Expected xx0x xx01	**ACC 301**	**B**	320
AF0B	Incorrect status following a Seek. Pre-initialization error. Occurred before execution of first test. To loop this error, any test (1 through F) may be selected.	2	Bus In under Read Status Tag '84' Bus '00' Expected xx0x xx01	**ACC 540**	**B**	320

Error Code	Error Description	CE Panel Lamp Display Byte	CE Panel Lamp Display Description	MAP Section	MAP Entry	MICFL
AF0C	Failed to receive Normal End response following a Set Read/Write. Pre-initialization error. Occurred before execution of first test. To loop this error, any test (1 through F) may be selected.			**CTL-I 640**	**A**	320
AF0D	Failed to orient on Index. Pre-initialization error. Occurred before execution of first test. To loop this error, any test (1 through F) may be selected. Run routine A5, Index and Sector test.					320
AF0E	Received Error Alert following a Set Read/Write. Pre-initialization error. Occurred before execution of first test. To loop this error, any test (1 through F) may be selected.			**DATA 500**	**C**	320
AF0F	Physical address initially selected does not compare to current physical address. Pre-initialization error. Occurred before execution of first test. To loop this error, any test (1 through F) may be selected. Indicates unexpected access mechanism movement since last Seek. Reload routine AF. Exit to ACC 301, Entry B if routine AF continues to halt with this Error Code.	2	Bus In under Sense Status Tag '04' Bus '10'			320

Error Code	Error Description	CE Panel Lamp Display Byte	CE Panel Lamp Display Description	MAP Section	MAP Entry	MICFL
AF12	PA1,PA2, and PA3 compare incorrectly and no error condition was detected. Pre-initialization error. Occurred before execution of first test. To loop this error, any test (1 through F) may be selected.	2 3 4	Received xxxx xxxx = PA1 Received xxxx xxxx = PA2 Received xxxx xxxx = PA3 Expected 0000 0010 = PA1 Expected 0011 0000 = PA2 Expected 0000 0100 = PA3	**ACC 501**	**A**	320
AF15	Read G1 Unoriented is on following initiation of a Read G1 immediately after orientation on Index.	2	Bus In under Read Op (Tag Valid) Tag '0E' Bus '4E' Expected xxxx xx0x	**DATA 220**	**A**	320
AF16	Read G1 Unoriented is off following initiation of an Unoriented Read G1.	2	Bus In under Read Op (Tag Valid) Tag '0E' Bus '4E' Expected xxxx xx1x	**DATA 220**	**B**	320
AF17	**Unexpected Attention Status received.** Indicates unexpected access mechanism movement since last Seek. Reload routine AF. Exit to ACC 301, Entry B if routine AF continues to halt with this Error Code.	2	**Bus In under Read Status** **Tag '84' Bus '00'** Expected xxxx x00x			320
AF18	PA1,PA2, and PA3 bytes not equal to '02', '30', '02' and no error was detected. If the password (see MICRO 32) has been used prior to receiving this stop, suspect an access failure. Run access routines B8 and B9 to verify servo operations. Do not continue with routine AF. If the password has not been used prior to receiving this stop, loop routine AF test E (see MICRO 32) to restore the physical address of this location. Exit to ACC 501, Entry A if routine AF continues to halt with this Error Code.	2 3 4	Received xxxx xxxx = PA1 Received xxxx xxxx = PA2 Received xxxx xxxx = PA3 Expected 0000 0010 = PA1 Expected 0011 0000 = PA2 Expected 0000 0010 = PA3			320
AF19	Timeout failed to orient on Index.			**RPI 160**	**C**	320

Error Code	Error Description	CE Panel Lamp Display Byte	CE Panel Lamp Display Description	MAP Section	MAP Entry	MICFL
AF1A	Error Alert received following a Read G1. Pre-initialization error. Occurred before execution of first test. To loop this error, any test (1 through F) may be selected.	2	Operation number. See details on MICRO 411.	**DATA 500**	**C**	350
AF1B	Received Check End response following a Read G1. *This stop may be the result of improper format on the CE Cylinder. Reformat the CE Cylinder using routine B0. See MICRO 52.* Pre-initialization error. Occurred before execution of first test. To loop this error, any test (1 through F) may be selected.	2 3	Operation number. See details on MICRO 411. Check End Byte Expected 0000 0000	**CTL-I 630**	**B**	320
AF1C	Unexpected End response received during a Read G1. Pre-initialization error. Occurred before execution of first test. To loop this error, any test (1 through F) may be selected.	2 3	Operation number. See details on MICRO 411. Check End Byte	**CTL-I 630**	**B**	320
AF1E	Failed to receive any End response. Pre-initialization error. Occurred before execution of first test. To loop this error, any test (1 through F) may be selected.	2	Operation number. See details on MICRO 411.	**CTL-I 660**	**A**	320

Error Code	Error Description	CE Panel Lamp Display Byte	CE Panel Lamp Display Description	MAP Section	MAP Entry	MICFL
AF21	Unexpected Attention Status received. Indicates unexpected access mechanism movement since last Seek. Reload routine AF. Exit to ACC 301, Entry B if routine AF continues to halt with this Error Code.	2	Bus In under Read Status Tag '84' Bus '00' Expected xxxx x00x			320
AF24	Received Command Overrun or Unoriented status following an Oriented Write G2.	2	Check End Byte Expected 0x0x xxxx	CTL-I 680	A	320
AF26	Failed to receive Check End following an Unoriented Write G2.			CTL-I 680	A	320
AF28	Failed to receive Command Overrun status following an Unoriented Write G2.	2	Check End Byte Expected 1xxx xxxx	CTL-I 680	A	320
AF2A	Received Error Alert.	2	Operation number. See details on MICRO 411.	DATA 628	A	320
AF2B	Received Check End response.	2 3	Operation number. See details on MICRO 411. Check End Byte Expected 0000 0000	CTL-I 630	B	320
AF2C	Received an unexpected End response during a Read G1 or an Unoriented Write G2.	2 3	Operation number. See details on MICRO 411. Check End Byte	CTL-I 630	B	320
AF2E	Failed to receive any End response following a transfer of data.	2	Operation number. See details on MICRO 411.	CTL-I 680	A	320

Error Code	Error Description	CE Panel Lamp Display Byte	CE Panel Lamp Display Description	MAP Section	MAP Entry	MICFL
AF31	Unexpected Attention Status received. Indicates unexpected access mechanism movement since last Seek. Reload routine AF. Exit to ACC 301, Entry B if routine AF continues to halt with this Error Code.	2	Bus In under Read Status Tag '84' Bus '00' Expected xxxx x00x			320
AF32	Failed to orient on Index. Run routine A5, Index and Sector test.					320
AF34	Failed to receive Check End following an Unoriented Write G2.			CTL-I 680	B	320
AF36	Failed to receive Check End following an Unoriented Clock G2.			CTL-I 680	B	320
AF38	Failed to receive Command Overrun status following an Unoriented Write G2.	2	Check End Byte Expected 1xxx xxxx	CTL-I 680	A	320
AF3A	Failed to receive Command Overrun status following an Unoriented Clock G2.	2	Check End Byte Expected 1xxx xxxx	CTL-I 680	A	320

Error Code	Error Description	CE Panel Lamp Display Byte	CE Panel Lamp Display Description	MAP Section	MAP Entry	MICFL
AF41	Unexpected Attention Status received. Indicates unexpected access mechanism movement since last Seek. Reload routine AF. Exit to ACC 301, Entry B if routine AF continues to halt with this Error Code.	2	Bus In under Read Status Tag '84' Bus '00' Expected xxxx x00x			320
AF44	No End response received following a Read G1.			**CTL-I 660**	**A**	320
AF46	Failed to receive Check End following a Read G1.			**CTL-I 660**	**B**	320
AF48	Failed to receive Sync Out Timing error from End Status Byte after forcing the error during a Read G1.	2	Check End Byte Expected x1xx xxxx	DATA 230	**B**	320
AF49	Check End received following a Read G1.	2	Check End Byte	**CTL-I 630**	**A**	320
AF4A	Failed to receive Status Overrun on Bus In when forced.	2	Bus In under Write operation while Tag Valid is active. Tag '0F' Bus '24' Expected xxxx 1xxx	DATA 232	**A**	320
AF4C	Failed to reset Status Overrun on Bus In when Tag Valid is dropped.	2	Bus In under Write operation while Tag Valid is active. Tag '0F' Bus '24' Expected xxxx 0xxx	DATA 232	**A**	320

Error Code	Error Description	CE Panel Lamp Display Byte	CE Panel Lamp Display Description	MAP Section	MAP Entry	MICFL
AF51	Unexpected Attention Status received. Indicates unexpected access mechanism movement since last Seek. Reload routine AF. Exit to ACC 301, Entry B if routine AF continues to halt with this Error Code.	2	Bus In under Read Status Tag '84' Bus '00' Expected xxxx x00x			320
AF52	Failed to set HAR = '00'. Run routine A2. Test 8 tests HAR.	2	HAR value Tag '8F' Bus '05' Expected 0000 0000			320
AF53	Failed to set HAR = '02' approximately 10 microseconds after Index during a Read/Write. (Inside Allow HAR window.)	2	HAR value Tag '8F' Bus '05' Expected 0000 0010	**CTL-I 613**	**A**	320
AF54	Failed to prevent set HAR = '04' approximately 100 microseconds after Index during a Read/Write. (Outside Allow HAR window.)	2	HAR value Tag '8F' Bus '05' Expected 0000 0100	**CTL-I 612**	**A**	320
AF55	Failed to orient on Index within 21 milliseconds. Run routine A5, Index and Sector test.					320
AF57	Failed to transfer sector counter value to Target Register during the initiation of a Read G1.	2	Target Register value Tag '8F' Bus '0D' Expected 1000 0000	**RPI 230**	**A**	320

Error Code	Error Description	CE Panel Lamp Display Byte	CE Panel Lamp Display Description	MAP Section	MAP Entry	MICFL
AF81	Unexpected Attention Status received. Indicates unexpected access mechanism movement since last Seek. Reload routine AF. Exit to ACC 301, Entry B if routine AF continues to halt with this Error Code.	2	Bus In under Read Status Tag '84' Bus '00' Expected xxxx x00x			320
AF8A	Received Error Alert following a Read G1 or Write G2.	2	Operation number. See details on MICRO 411.	DATA 504	A	320
AF8B	Received Check End response following a Read G1 or Write G2. Test 6 depends on the proper placement of the G1 record on the track. A G1 record that occurs later than a normal extended G1 record causes this error. If not previously done, reformat G1 by looping routine AF test E and then rerun test 6.	2 3	Operation number. See details on MICRO 411. Check End Byte Expected 0000 0000	CTL-I 630	B	320
AF8C	Received unexpected End response during a transfer of data.	2 3	Operation number. See details on MICRO 411. Check End Byte Expected 0000 0000	CTL-I 630	B	320
AF8E	Failed to receive any End response following a transfer of data.	2	Operation number. See details on MICRO 411.	CTL-I 660	A	320

Error Code	Error Description	CE Panel Lamp Display Byte	CE Panel Lamp Display Description	MAP Section	MAP Entry	MICFL
AF71	Unexpected Attention Status received. Indicates unexpected access mechanism movement since last Seek. Reload routine AF. Exit to ACC 301, Entry B if routine AF continues to halt with this Error Code.	2	Bus In under Read Status Tag '84' Bus '00' Expected xxxx x00x			320
AF74	Failed to receive Check End following a Write G2 (forcing Track Overrun).			CTL-I 660	B	320
AF76	Failed to receive Track Overrun following a Write G2.	2	Check End Byte Expected xxx1 xxxx	DATA 244	A	320
AF7A	Received Error Alert.	2	Operation number. See details on MICRO 411.	DATA 628	A	320
AF7B	Received Check End response.	2 3	Operation number. See details on MICRO 411. Check End Byte Expected 0000 0000	CTL-I 630	B	320
AF7C	Received unexpected End response during a transfer of data.	2 3	Operation number. See details on MICRO 411. Check End Byte Expected 0000 0000	CTL-I 630	B	320
AF7E	Failed to receive any End response following a transfer of data.	2	Operation number. See details on MICRO 411.	CTL-I 660	A	320

Error Code	Error Description	Byte	CE Panel Lamp Display Description	MAP Section	MAP Entry	MICFL
AF81	Unexpected Attention Status received. Indicates unexpected access mechanism movement since last Seek. Reload routine AF. Exit to ACC 301, Entry B if routine AF continues to halt with this Error Code.	2	Bus In under Read Status Tag '84' Bus '00' Expected xxxx x00x			320
AF84	Failed to receive I Write Sense bit equal to one 5 milliseconds after initiating a Format G2.	2	Operation number. See details on MICRO 411.	DATA 254	A	320
		3	Bus In under Read Status Tag '84' Bus '00' Expected x1xx xxxx			
AF85	Failed to receive I Write Sense bit equal to zero after a Reset Read/Write.	2	Operation number. See details on MICRO 411.	DATA 254	A	320
		3	Bus In under Read Status Tag '84' Bus '00' Expected x0xx xxxx			
AF8A	Received Error Alert.	2	Operation number. See details on MICRO 411.	DATA 628	A	320
AF8B	Received Check End response.	2	Operation number. See details on MICRO 411.	CTL-I 630	B	320
		3	Check End Byte Expected 0000 0000			
AF8C	Received unexpected End response during a transfer of data.	2	Operation number. See details on MICRO 411.	CTL-I 630	B	320
		3	Check End Byte Expected 0000 0000			
AF8E	Failed to receive any End response following a transfer of data.	2	Operation number. See details on MICRO 411.	CTL-I 660	A	320
AF91	Unexpected Attention Status received. Indicates unexpected access mechanism movement since last Seek. Reload routine AF. Exit to ACC 301, Entry B if routine AF continues to halt with this Error Code.	2	Bus In under Read Status Tag '84' Bus '00' Expected xxxx x00x			320
AF96	Failed to receive Check End following a Read G2 on a field that did not exist.	2	Check End Byte Expected xxxx xxxx	CTL-I 630	A	320
AF97	Failed to receive No Sync Byte Found following a Read G2 on a field that did not exist.	2	Check End Byte Expected xxxx x1xx	DATA 264	A	320
AF98	Data Present did not come on when forced.			DATA 264	B	320
AF9A	Received Error Alert.	2	Operation number. See details on MICRO 411.	DATA 504	B	320
AF9B	Received Check End response. **Note:** *This error occurs if test 8 is not run immediately before test 9.*	2	Operation number. See details on MICRO 411.	CTL-I 630	B	320
		3	Check End Byte Expected 0000 0000			
AF9C	Received unexpected End response during a transfer of data.	2	Operation number. See details on MICRO 411.	CTL-I 630	B	320
		3	Check End Byte Expected 0000 0000			
AF9E	Failed to receive any End response following a transfer of data.	2	Operation number. See details on MICRO 411.	CTL-I 660	A	320

Error Code	Error Description	CE Panel Lamp Display Byte	CE Panel Lamp Display Description	MAP Section	MAP Entry	MICFL
AFA1	Unexpected Attention Status received. Indicates unexpected access mechanism movement since last Seek. Reload routine AF. Exit to ACC 301, Entry B if routine AF continues to halt with this Error Code.	2	Bus In under Read Status Tag '84' Bus '00' Expected xxxx x00x			320
AFA8	Data Present (bit 6=1) after a Read G2 on a field that did not exist.	2	Check End Byte Expected xxxx xx0x	DATA 264	C	320
AFA9	No Sync Byte Found (bit 5=0) after a Read G2 on a field that did not exist.	2	Check End Byte Expected xxxx x1xx	DATA 264	A	320
AFAA	Received Error Alert.	2	Operation number. See details on MICRO 411.	DATA 504	C	320
AFAB	Received Check End response.	2 3	Operation number. See details on MICRO 411. Check End Byte Expected 0000 0000	CTL-I 630	B	320
AFAC	Received unexpected End response during a transfer of data.	2 3	Operation number. See details on MICRO 411. Check End Byte Expected 0000 0000	CTL-I 630	B	320
AFAD	Failed to receive Check End from a Read G2 on a field that did not exist.	2	Check End Byte Expected xxxx x1xx	CTL-I 630	A	320
AFAE	Failed to receive any End response following a transfer of data.	2	Operation number. See details on MICRO 411.	CTL-I 660	A	320

Error Code	Error Description	CE Panel Lamp Display Byte	CE Panel Lamp Display Description	MAP Section	MAP Entry	MICFL
AFB1	Unexpected Attention Status received. Indicates unexpected access mechanism movement since last Seek. Reload routine AF. Exit to ACC 301, Entry B if routine AF continues to halt with this Error Code.	2	Bus In under Read Status Tag '84' Bus '00' Expected xxxx x00x			320
AFBA	Received Error Alert.	2	Operation number. See details on MICRO 411.	DATA 508	A	320
AFBB	Received Check End response. **Note:** *This error will occur if test A is not run immediately before test B.*	2 3	Operation number. See details on MICRO 411. Check End Byte Expected 0000 0000	CTL-I 630	B	320
AFBC	Received unexpected End response during a transfer of data.	2 3	Operation number. See details on MICRO 411. Check End Byte Expected 0000 0000	CTL-I 630	B	320
AFBE	Failed to receive any End response following a transfer of data.	2	Operation number. See details on MICRO 411.	CTL-I 660	A	320

Error Code	Error Description	CE Panel Lamp Display Byte	CE Panel Lamp Display Description	MAP Section	MAP Entry	MICFL
AFC1	Unexpected Attention Status received. Indicates unexpected access mechanism movement since last Seek. Reload routine AF. Exit to ACC 301, Entry B if routine AF continues to halt with this Error Code.	2	Bus In under Read Status Tag '84' Bus '00' Expected xxxx x00x			320
AFC4	Failed to receive Check End following a Read G3 AM Search after an erase operation.	2	Check End Byte	**CTL-I 630**	**A**	320
AFC5	Failed to receive No AM Found following a Read G3 AM Search after an erase operation.	2	Check End Byte Expected xxxx 1xxx	DATA 276	**A**	320
AFCA	Received Error Alert.	2	Operation number. See details on MICRO 411.	DATA 508	**B**	320
AFCB	Received Check End response.	2 3	Operation number. See details on MICRO 411. Check End Byte Expected 0000 0000	**CTL-I 630**	**B**	320
AFCC	Received unexpected End response during a transfer of data.	2 3	Operation number. See details on MICRO 411. Check End Byte Expected 0000 0000	**CTL-I 630**	**B**	320
AFCE	Failed to receive any End response following a transfer of data.	2	Operation number. See details on MICRO 411.	**CTL-I 660**	**A**	320

Error Code	Error Description	CE Panel Lamp Display Byte	CE Panel Lamp Display Description	MAP Section	MAP Entry	MICFL
AFD1	Unexpected Attention Status received. Indicates unexpected access mechanism movement since last Seek. Reload routine AF. Exit to ACC 301, Entry B if routine AF continues to halt with this Error Code.	2	Bus In under Read Status Tag '84' Bus '00' Expected xxxx x00x			320
AFDA	Received Error Alert.	2	Operation number. See details on MICRO 411.	DATA 628	**A**	320
AFDB	Received Check End response.	2 3	Operation number. See details on MICRO 411. Check End Byte Expected 0000 0000	**CTL-I 630**	**B**	320
AFDC	Received unexpected End response during a transfer of data.	2 3	Operation number. See details on MICRO 411. Check End Byte Expected 0000 0000	**CTL-I 630**	**B**	320
AFDE	Failed to receive any End response following a transfer of data.	2	Operation number. See details on MICRO 411.	**CTL-I 630**	**B**	320

Error Code	Error Description	CE Panel Lamp Display Byte	CE Panel Lamp Display Description	MAP Section	MAP Entry	MICFL
AFE1	Unexpected Attention Status received. Indicates unexpected access mechanism movement since last Seek. Reload routine AF. Exit to ACC 301, Entry B if routine AF continues to halt with this Error Code.	2	Bus In under Read Status Tag '84' Bus '00' Expected xxxx x00x			320
AFEA	Received Error Alert.	2	Operation number. See details on MICRO 411.	DATA 628	A	320
AFEB	Received Check End response following a Format Write G1.	2 3	Operation number. See details on MICRO 411. Check End Byte Expected 0000 0000	CTL-I 630	B	320
AFEC	Received unexpected End response during a transfer of data.	2 3	Operation number. See details on MICRO 411. Check End Byte Expected 0000 0000	CTL-I 630	B	320
AFEE	Failed to receive any End response following a transfer of data.	2	Operation number. See details on MICRO 411.	CTL-I 660	A	320

Error Code	Error Description	CE Panel Lamp Display Byte	CE Panel Lamp Display Description	MAP Section	MAP Entry	MICFL
AFF1	Unexpected Attention Status received. Indicates unexpected access mechanism movement since last Seek. Reload routine AF. Exit to ACC 301, Entry B if routine AF continues to halt with this Error Code.	2	Bus In under Read Status Tag '84' Bus '00' Expected xxxx x00x			320
AFFA	Received Error Alert.	2	Operation Code. See details on MICRO 411.	DATA 508	C	320
AFFB	Check End response received following a Read or Write.	2 3	Operation Code. See details on MICRO 411. Check End Byte Expected 0000 0000	CTL-I 630	B	320
AFFC	Received unexpected End response during a transfer of data.	2 3	Operation Code. See details on MICRO 411. Check End Byte Expected 0000 0000	CTL-I 630	B	320
AFFE	10 microseconds (minimum) timeout while waiting for Check End or Normal End response following a Read or Write. Failed to receive any End response following a transfer of data.	2	Operation Code. See details on MICRO 411.	CTL-I 660	A	320

DETAIL OF OPERATION NUMBER FOR AFxx ERRORS

OPERATION

This page defines the operations that occur during each test of routine AF.

The cross reference of Operation Description and Operation Number is found in Figure 1.

Example: Test 8 (4 operations)

Operation Description	Operation Number
RD G1	01
WR G2	02
WR G2	03
FM G2	04

Displayed in Byte 2 of the Error Message Display

ERROR CODES (Test 8 Example)

Routine AF8X has eight Error Codes associated with it. Seven of these Error Codes may occur with any of the four operations via the Operation Number found in Byte 2 of the Error Display.

The seven Error Codes are:

AF84
AF85
AF8A
AF8B
AF8C
AF8D
AF8E

See Error Code AF8X.

Figure 1.

Bytes from Message Display 1	Bytes from Message Display 2				
Error Code	Operation Number	Operation Description	Tag	Bus	Comments
AF1X	00	RD G1	'0E'	'4E'	**Initialization Seek** Verification uses head 02.
	01	RD G1	'0E'	'4E'	**Operations other than** Seek Verification use head 01.
AF2X	01	RD G1	'0E'	'4C'	
	02	WR G2	'0F'	'21'	
	03	RD G1	'0E'	'4E'	
	04	WR G2	'0F'	'21'	
AF3X	01	WR G2	'0F'	'21'	
	02	CL G2	'0E'	'21'	
AF4X	–	–	–	–	**No data written on disk. Test uses Diagnostic Inhibit Write Gate Mode. No data is displayed.**
AF5X	–	–	–	–	**No messages displaying operation number in test 5.**
AF6X	01	RD G1	'0E'	'4E'	
	02	WR G2	'0F'	'xx'	**Full Track for 3350 Mode = 19,624 bytes with Bus xx = '28'; and 3330 Compatibility Mode = 13,235** bytes with Bus xx = '23'.
AF7X	01	RD G1	'0E'	'4E'	
	02	WR G2	'0F'	'xx'	**Track Overrun for 3350 Mode = 19,840 bytes with Bus xx = '20'; and 3330 Compatibility Mode = 13,468** with Bus xx = '2C'.
AF8X	01	RD G1	'0E'	'4E'	
	02	WR G2	'0F'	'24'	
	03	WR G2	'0F'	'24'	
	04	FM G2	'0F'	'64'	
AF9X	01	RD G1	'0E'	'4E'	
	02	RD G2	'0E'	'64'	
	03	CL G2	'0E'	'24'	
	04	RD G2	'0E'	'64'	
AFAX	01	RD G1	'0E'	'4E'	
	02	FM G3	'0F'	'54'	
	03	RD G1	'0E'	'4E'	
	04	RD G3	'0E'	'54'	
	05	RD G2	'0E'	'64'	
AFBX	01	RD G1	'0E'	'4E'	
	02	CL G3	'0E'	'14'	
	03	RD G1	'0E'	'4E'	
	04	RD G3 AM Search	'0E'	'74'	
AFCX	01	RD G1	'0E'	'4E'	
	02	FM ER	'0F'	'71'	
	03	RD G1	'0E'	'4E'	
	04	RD G3 AM Search	'0E'	'71'	
AFDX	01	FM G1 Special	'0F'	'CC'	
	02	RD G1	'0E'	'4E'	
AFEX	01	FM G1	'0F'	'4E'	
	02	RD G1	'0E'	'4E'	
AFFX	01	RD G1	'0E'	'4E'	
	02	FM G2	'0F'	'6C'	
	03	FM G3	'0F'	'5C'	
	04	FM RE Orient	'0F'	'3A'	
	05	FM G3	'0F'	'5C'	
	06	WR G2 Special	'0F'	'EC'	
	07	WR G4	'0F'	'BC'	
	08	FMT G2	'0F'	'6C'	
	09	RD G1	'0E'	'4E'	
	0A	RD G2	'0E'	'6C'	
	0B	RD G3	'0E'	'5C'	
	0C	RD G2 Special	'0E'	'EC'	
	0D	RD G4	'0E'	'3C'	
	0E	RD G2	'0E'	'6C'	
	0F	RD G1	'0E'	'4E'	
	10	FMT Erase	'0F'	'71'	

Error Code	Error Description	CE Panel Lamp Display Byte	CE Panel Lamp Display Description	MAP Section	MAP Entry	MICFL
01 to 07	Errors common to all routines. (B0, B1, B2)			MICRO 100		
B009 B109 B209	Error Alert received during a Set Read/Write.	2 3 4	Current PA1 (physical cylinder high) Current PA2 (physical cylinder low) Current PA3 (HAR value)* *Find the Physical Head number by using the HAR value located in the chart on MICRO 58.	DATA 628	A	380
B00A B10A B20A	No End conditions received following a Set Read/Write.			CTL-I 660	A	380
B00C B10C B20C	Error Alert received during a Read/Write.			DATA 628	A	380
B00D B10D B20D	No End condition received following a Read/Write.			CTL-I 660	A	380
B010 B110 B210	No Busy received after initiating a Rezero.	2	Bus In under Read Status Tag '84' Bus '00' Expected xxxx xx1x	ACC 210	C	380
B011 B111 B211	Incorrect drive status after a Rezero.	2	Bus In under Read Status Tag '84' Bus '00' Expected xx0x xx01	ACC 301	B	380
B013 B113 B213	Incorrect drive status after a Seek.	2	Bus In under Read Status Tag '84' Bus '00' Expected xx0x xx01	ACC 301	B	380

Error Code	Error Description	CE Panel Lamp Display Byte	CE Panel Lamp Display Description	MAP Section	MAP Entry	MICFL
B030 B130 B230	Invalid movable head address was selected. See Note.					
B031 B131 B231	Invalid fixed head address was selected. See Note.					380
B032 B132 B232	Selection of a fixed head is not allowed under this routine. See Note.					380
B033 B133 B233	Fixed heads are not installed. See Note.					380
B034 B134 B234	Seek Verification error occurred during a write Home Address. 1. Two consecutive HAs were read with the same customer, alternate, or invalid address. (Not a CE address.) 2. No HA could be read and the password was invalid.	2 3 4 5 6 7 8 9	Current PA1 (physical cylinder high) Current PA2 (physical cylinder low) Current PA3 (HAR value)* Received PA1 (physical cylinder high) Received PA2 (physical cylinder low) Received PA3 (HAR value)* Bus In under Check End Record number of the last Count field read. *Find the Physical Head number by using the HAR value located in the chart on MICRO 58.	ACC 501	A	380
B035 B135 B235	Routine unable to verify access position. One of the following conditions exists: 1. No parameters were entered. See MICRO 52 for details. 2. Parameter Byte 1 was '10' and parameter Byte 5 (Password) was not equal to '5D'. See MICRO 52 for details. 3. Parameter entry is correct, but the routine cannot verify the access position. Run routine B0 on one head at a time with parameter Byte 5 set to '5D' until the problem is resolved. See MICRO 52 for details. See Note.					380
B036 B136 B236	Invalid cylinder address was selected. See Note.					380
	Note: *Invalid parameter entry. See the description of the desired routine on MICRO 52 through 60 for details.*					

Error Code	Error Description	CE Panel Lamp Display Byte	CE Panel Lamp Display Description	MAP Section	MAP Entry	MICFL
B0C0 B1C0 B2C0	No read data received during a read HA.	2 3 4 5	Current PA1 (physical cylinder high) Current PA2 (physical cylinder low) Current PA3 (HAR value)* Received PA1 (physical cylinder high)	R/W 300	B	380
B0C1 B1C1 B2C1	No read data received during a read Count field.	6 7	Received PA2 (physical cylinder low) Received PA3 (HAR value)*	R/W 300	B	380
B0C2 B2C2 B3C2	No read data received during a read Key field.	8 9	Bus In under Check End Record number of the last Count field read.	R/W 300	B	380
B0C3 B103 B2C3	No read data received during a read Data field.		* Find the Physical Head number by using the HAR value located in the chart on MICRO 58.	R/W 300	B	380
B0D0 B1D0 B2D0	Check End received during a write Home Address.			CTL-I 630	D	380
B0D1 B1D1 B2D1	Check End received during a write Count field.	2 3 4	Current PA1 (physical cylinder high) Current PA2 (physical cylinder low) Current PA3 (HAR value)*	CTL-I 630	D	380
B0D2 B1D2 B2D2	Check End received during a write Key field.	5 6	Record number of the current Count field being written. Bus In under Check End	CTL-I 630	D	380
B0D3 B1D3 B2D3	Check End received during a write Data field.		* Find the Physical Head number by using the HAR value located in the chart on MICRO 58.	CTL-I 630	D	380

Error Code	Error Description	Byte	CE Panel Lamp Display Description	MAP Section	MAP Entry	MICFL
B0E0 B1E0 B2E0	Data Check received during a read Home Address. (Read back check)			R/W 300	B	380
B0E1 B1E1 B2E1	Data Check received during a read Count field. (Read back check)			R/W 300	B	380
B0E2 B1E2 B2E2	Data Check received during a read Key field. (Read back check)			R/W 300	B	380
B0E3 B1E3 B2E3	Data Check received during a read Data field. (Read back check)			R/W 300	B	380
B0E4 B1E4 B2E4	No Sync Byte Found received during a read Home Address. (Read back check)	2 3 4	Current PA1 (physical cylinder high) Current PA2 (physical cylinder low) Current PA3 (HAR value)*	R/W 300	B	380
B0E5 B1E5 B2E5	No Sync Byte Found received during a read Count field. (Read back check)	5 6 7	Received PA1 (physical cylinder high) Received PA2 (physical cylinder low) Received PA3 (HAR value)*	R/W 300	B	380
B0E6 B1E6 B2E6	No Sync Byte Found received during a read Key field. (Read back check)	8 9	Bus In under Check End Record number of the last count field read.	R/W 300	B	380
B0E7 B1E7 B2E7	No Sync Byte Found received during a read Data field. (Read back check)		* Find the Physical Head number by using the HAR value located in the chart on MICRO 58.	R/W 300	B	380
B0E8 B1E8 B2E8	Other Check Ends received during a Read Home Address. (Read back check)			CTL-I 630	C	380
B0E9 B1E9 B2E9	Other Check Ends received during a read Count field. (Read back check)			CTL-I 630	C	380
B0EA B1EA B2EA	Other Check Ends received during a read Key field. (Read back check)			CTL-I 630	C	380
B0EB B1EB B2EB	Other Check Ends received during a read Data field. (Read back check)			CTL-I 630	C	380

MICRODIAGNOSTIC ERROR CODE DICTIONARY - (B0, B1, B2)

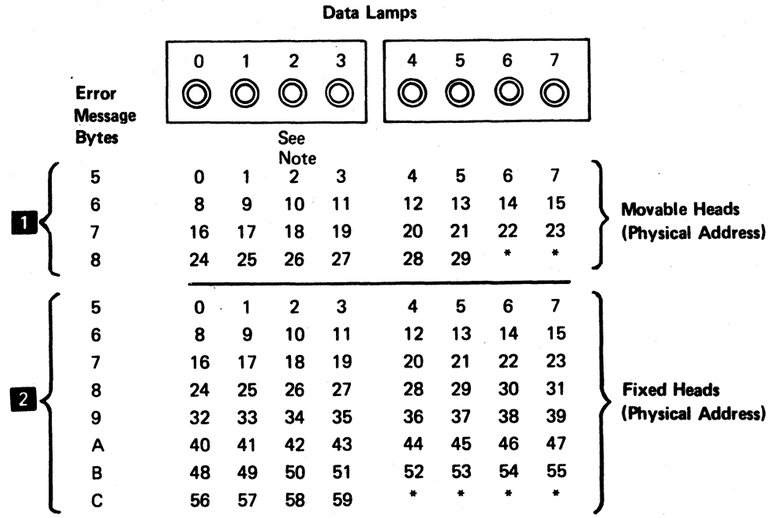
Error Code	Error Description	CE Panel Lamp Display Byte	CE Panel Lamp Display Description	MAP Section	MAP Entry	MICFL
B0F0 B1F0 B2F0	Data Check received during a read Home Address. (Read verification)		↑	R/W 300	B	380
B0F1 B1F1 B2F1	Data Check received during a read Count field. (Read verification)	2 3 4 5	Current PA1 (physical cylinder high) Current PA2 (physical cylinder low) Current PA3 (HAR value)* Received PA1 (physical cylinder high)	R/W 300	B	380
B0F2 B1F2 B2F2	Data Check received during a read Key field. (Read verification)	6 7	Received PA2 (physical cylinder low) Received PA3 (HAR value)*	R/W 300	B	380
B0F3 B1F3 B2F3	Data Check received during a read Data field. (Read verification)	8	Bus In under Check End	R/W 300	B	380
B0F4 B1F4 B2F4	No Sync Byte Found received during a read Home Address. (Read verification)	9	Record number of the last Count field read. *Find the Physical Head number by using the HAR value located in the chart on MICRO 58.	R/W 300	B	380
B0F5 B1F5 B2F5	No Sync Byte Found received during a read Count field. (Read verification)		↓	R/W 300	B	380

Error Code	Error Description	CE Panel Lamp Display Byte	CE Panel Lamp Display Description	MAP Section	MAP Entry	MICFL
B0F6 B1F6 B2F6	No Sync Byte Found received during a read Key field. (Read verification)		↑	R/W 300	B	380
B0F7 B1F7 B2F7	No Sync Byte Found received during a read Data field. (Read verification)	2 3 4 5	Current PA1 (physical cylinder high) Current PA2 (physical cylinder low) Current PA3 (HAR value)* Received PA1 (physical cylinder high)	R/W 300	B	380
B0F8 B1F8 B2F8	Other Check Ends received during a read Home Address. (Read verification)	6 7	Received PA2 (physical cylinder low) Received PA3 (HAR value)*	CTL-I 630	C	380
B0F9 B1F9 B2F9	Other Check Ends received during a read Count field. (Read verification)	8	Bus In under Check End	CTL-I 630	C	380
B0FA B1FA B2FA	Other Check Ends received during a read Key field. (Read verification)	9	Record number of the last Count field read. *Find the physical Head number by using the HAR value located in the chart on MICRO 58.	CTL-I 630	C	380
B0FB B1FB B2FB	Other Check Ends received during a read Data field. (Read verification)		↓	CTL-I 630	C	380
B0FC B1FC B2FC	Incorrect Home Address was read or incorrect physical address bytes in a Count field.			ACC 501	A	380

MICRODIAGNOSTIC ERROR CODE DICTIONARY - (B0, B1, B2)

Error Code	Error Description	CE Panel Lamp Display Byte	CE Panel Lamp Display Description	MAP Section	MAP Entry	MICFL
B0FD **B1FD** **B2FD**	No Sync Byte Found, ECC Data Checks, or no read data received during reading of a cylinder (Movable Heads). **Error Message Bytes displayed indicate failing heads. Each bit corresponds to a specific head. See Figure 1 (Movable Heads).** **See Note.**	2 3 4 5 6 7 8	Current PA1 (physical cylinder high) Current PA2 (physical cylinder low) See Figure 2. Error bits for heads 0-7 Error bits for heads 8-15 Error bits for heads 16-23 Error bits for heads 24-29 **Bits 6 and 7 of Byte 8 are not used.**	**R/W 300**	**B**	380
B0FE **B1FE** **B2FE**	No Sync Byte Found, ECC Data Checks, or no read data received duirng reading of a cylinder (Fixed Heads). **Error Message Bytes displayed indicate failing heads. Each bit corresponds to a specific head. See Figure 1 (Fixed Heads).**	2 3 4 5 6 7 8 9 A B C	Not Used Not Used See Figure 2. Error bits for heads 0-7 Error bits for heads 8-15 Error bits for heads 16-23 Error bits for heads 24-31 Error bits for heads 32-39 Error bits for heads 40-47 Error bits for heads 48-55 Error bits for heads 56-59 **Bits 4 through 7 of Byte C are not used.**	**R/W 300**	**B**	380
B0FF **B1FF** **B2FF**	BnFD and BnFE errors are both pending. Both movable and fixed heads failed. Display error bytes for errors BnFD and BnFE. (n=0,1,or 2.) *To display error BnFD after a BnFF error:* *1. Set '00' in the Data Entry switches.* *2. Operate the Execute switch twice.* *3. Record the display byte data.* *See MICRO 10 and 11 for details regarding control options.* *To display error BnFE after a BnFF error:* *1. Display and record BnFD error as shown above.* *2. Set '00' in the Data Entry switches.* *3. Operate the Execute switch twice.* *4. Record the display byte data.* *See Figure 1 for bit significance. Routine may be looped after error data display by setting '00' in the Data Entry switches and operating the Execute switch until the routine runs.*			**R/W 300**	**B**	380

Figure 1. CE Panel



* Not Used

Lamp on indicates the head failed. Refer to lamp and byte number for specific head number.

Note: *If head 1 (on the CE cylinder) is the only head failing, it is possible that microdiagnostic routine AF or BB has left the CE cylinder, track 1, formated incorrectly.* **Run routine B0 on head 1.** *See MICRO 52.*

Figure 2. Error Message (Byte 4)

Bit	Description
0	ECC Data Check
1	No Sync Found
2	No Data Present
3	Seek Verification
4	Not Used
5	Not Used
6	Not Used
7	Not Used

MICRODIAGNOSTIC ERROR CODE DICTIONARY

Error Code	Error Description	CE Panel Lamp Display Byte	CE Panel Lamp Display Description	MAP Section	MAP Entry	MICFL
B300	No drive selected, ('00' = physical drive ID). Expected '01', '02', '04', '08', '10', '20', '40', or '80'. Verify that the desired drive is in CE Mode; check the CE Mode switch. Occurs only on Pass 2.					500
B303, B305, B306, B307	Errors common to all routines. Occurs only on Pass 1.			**MICRO 100**		
B3XX	'XX' = first byte on the Fault Symptom Code generated by Pass 1 of routine B3. Display Message Byte 2 for second byte of the Fault Symptom Code. Message display procedure is on MICRO 12. B3 Fault Symptom Code generation is described on FSI 60 and 65. Occurs only on Pass 1.	2	Second byte of Fault Symptom Code.	**Record Fault Symptom Code and determine analysis procedure from Fault Symptom Index on FSI 100.**		500
B3XX	Normal termination of Pass 2. 'XX' = physical drive ID, should be: '01', '02', '04', '08', '10', '20', '40', or '80'. More than one bit active in 'XX' indicates more than one drive selected. Be sure that only the desired drive is in CE Mode. Use procedure on MICRO 12 to display device status Message Bytes. Bytes are described in the FSI section. Occurs only on Pass 2.	2 thru 15 16	Device status information Device status information B3 routine ID			500
B3FF	Unable to generate a Fault Symptom Code. Run Pass 2 of routine B3 to display 15 bytes of device status information. Set '00' in the Data Entry switches and operate the Execute switch twice to start Pass 2. See FSI 65 for description of Message Bytes. Occurs only on Pass 1.					500

Routine B3 is a utility microprogram that is run in two passes to perform two functions:

PASS 1 - Generates a Fault Symptom Code that provides the necessary device status conditions that have not been reset.

PASS 2 - Displays 15 bytes of device status information.

See MICRO 64 for description.

Error Code	Error Description	CE Panel Lamp Display Byte	CE Panel Lamp Display Description	MAP Section	MAP Entry	MICFL
B401 to B407	Errors common to all routines.			**MICRO 100**		
B411	Total delay values entered exceed 500 milliseconds. See MICRO 68.					510
B412	Tag '0F' (Write operation) was entered when a drive was selected. This tag is allowed only when the controller is selected. See MICRO 68.					510
B413	Illegal Rezero (Tag '8F' Bus '02') or Seek Start (Tag '8F' Bus '08') entered. See MICRO 68.					510

Error Code	Error Description	CE Panel Lamp Display Byte	CE Panel Lamp Display Description	MAP Section	MAP Entry	MICFL
B511	Microdiagnostic disk was loaded in the 3830-2 or Integrated Storage Control (ISC) 23FD when run option '30' was executed.* The functional microprogram disk must be used on these storage controls when using run option '30'. This loads the Fault Symptom Code Generator into the overlay area. 1. Insert the functional microprogram disk in the 23FD file (3830-2 or ISC only). 2. Set the Data Entry switches on the 3350 CE Panel to run option '30' and operate the Execute switch. This restores the Fault Symptom Code Generator in the storage control. *This Error Code may also be caused by faulty control interface (CTL-I) bits on Bus In. If '30' was not intentionally entered in the Data Entry switches prior to receiving this error, exit to PANEL 150, Entry A for further analysis.					

Error Code	Error Description	CE Panel Lamp Display Byte	CE Panel Lamp Display Description	MAP Section	MAP Entry	MICFL
B600	Lost synchronization between the master and the slave. Valid only if string switch feature is installed. Restart the test.					
B601 to B607	Errors common to all routines.			**MICRO 100**		
B608	Master received a short Busy indication for more than 12 milliseconds while waiting for the slave to synchronize. (Valid only if string switch feature is installed.) Restart the test. See MICFL 520. Error occurs with tests 2 to 7.					520
B609	If the string switch feature is not installed, do not run routine B6. Expected stop if string switch feature is not installed. The string switch feature is installed, but feature bit was not received.	2	Bus In under Status Control Tag '06' See OPER 102 for Bus In description. Expected xxx1 xxxx	**CTL-I 870**	★	520

★
Entry A if failure is on the master interface.
Entry B if failure is on the slave interface.
Entry C if failure is on both interfaces.

B6 tests have the following error stop ranges:

Test	Starting error	Ending Error
1	B615	B61F
2	B621	B63B
3	B63D	B663
4	B675	B68F
5	B6A1	B6AF
6	B6BD	B6E0
7	B6E1	B6FB

Error Code	Error Description	CE Panel Lamp Display Byte	CE Panel Lamp Display Description	MAP Section	MAP Entry	MICFL
B615	With the slave selected, the master failed to detect a Short Busy (Index Alert line) while attempting to select the controller.			CTL-I 850	B	520
B616	With the master selected, the slave failed to detect a Short Busy (Index Alert line) while attempting to select the controller.			CTL-I 850	B	520
B617	Both master and slave failed to detect the Short Busy indication.			CTL-I 850	A	520
B619	The Short Busy indication to the master does not become inactive when the slave de-selects.			CTL-I 850	B	520
B61A	The Short Busy indication to the slave does not become inactive when the master de-selects.			CTL-I 850	B	520
B61B	Both the master and slave failed to lose the Short Busy indication.			CTL-I 850	A	520
B61D	The master was unable to select the service drive.			CTL-I 850	B	520
B61E	The slave was unable to select the service drive.			CTL-I 850	B	520
B61F	Both master and slave were unable to select the service drive.			CTL-I 850	A	520

B6 tests have the following error stop ranges:

Test	Starting Error	Ending Error
1	B615	B61F
2	B621	B63B
3	B63D	B663
4	B675	B68F
5	B6A1	B6AF
6	B6BD	B6E0
7	B6E1	B6FB

Error Code	Error Description	CE Panel Lamp Display Byte	CE Panel Lamp Display Description	MAP Section	MAP Entry	MICFL
B621	The master failed to detect Tag Valid or Normal End while sending Tag '07'.			CTL-I 850	B	520
B622	The slave failed to detect Tag Valid or Normal End while sending Tag '07'.			CTL-I 850	B	520
B623	Both master and slave failed to detect Tag Valid or Normal End while sending Tag '07'.			CTL-I 850	A	520
B625	The master failed to detect Select Active during Partial Selection.			CTL-I 850	B	520
B626	The slave failed to detect Select Active during Partial Selection.			CTL-I 850	B	520
B627	Both the master and slave failed to detect Select Active during Partial Selection.			CTL-I 850	A	520

MICRODIAGNOSTIC ERROR CODE DICTIONARY

Error Code	Error Description	CE Panel Lamp Display Byte	CE Panel Lamp Display Description	MAP Section	MAP Entry	MICFL
B629	The Short Busy indication to the master fails to become inactive when the slave sets a Long Connection. Short Busy = +Index Alert NPL			CTL-I 850	B	520
B62A	The Short Busy indication to the slave fails to become inactive when the master sets a Long Connection. Short Busy = +Index Alert NPL			CTL-I 850	B	520
B62B	Both the master and slave failed to lose Short Busy when one device set the Long Connection. Short Busy = +Index Alert NPL			CTL-I 850	A	520
B62D	The master failed to detect a Partial Selection while the slave was selected with a Long Connection set. Partial selection indication = Bus In bit 3			CTL-I 850	B	520
B62E	The slave failed to detect a Partial Selection while the master was selected with a Long Connection set.			CTL-I 850	B	520
B62F	Both master and slave failed to detect a Partial Selection.			CTL-I 850	A	520

B6 tests have the following error stop ranges:

Test	Starting error	Ending Error
1	B615	B61F
2	B621	B63B
3	B63D	B663
4	B675	B68F
5	B6A1	B6AF
6	B6BD	B6E0
7	B6E1	B6FB

Error Code	Error Description	CE Panel Lamp Display Byte	CE Panel Lamp Display Description	MAP Section	MAP Entry	MICFL
B631	Master Device End Register bit was on after an undefined Set operation. Pass 1 Interface A = Master Pass 2 Interface B = Master			CTL-I 870	A	520
B632	Slave Device End Register bit was on after an undefined Set operation. Pass 1 Interface B = Slave Pass 2 Interface A = Slave			CTL-I 870	B	520
B633	Both master and slave Device End Register bits were on after an undefined Set operation.			CTL-I 870	C	520
B635	Master Pack Change bit for the CE drive address was on after an undefined Set operation. Pass 1 Interface A = Master Pass 2 Interface B = Master			CTL-I 870	A	520
B636	Slave Pack Change bit for the CE drive address was on after an undefined Set operation. Pass 1 Interface B = Slave Pass 2 Interface A = Slave			CTL-I 870	B	520
B637	Both master and slave Pack Change bits for the CE drive address were on after an undefined Set operation.			CTL-I 870	C	520

B6 tests have the following error stop ranges:

Test	Starting error	Ending Error
1	B615	B61F
2	B621	B63B
3	B63D	B663
4	B675	B68F
5	B6A1	B6AF
6	B6BD	B6E0
7	B6E1	B6FB

Error Code	Error Description	CE Panel Lamp Display Byte	CE Panel Lamp Display Description	MAP Section	MAP Entry	MICFL
B639	Master Device Assigned bit for the CE drive address was on after an undefined Set operation. Pass 1 Interface A = Master Pass 2 Interface B = Master			CTL-I 870	A	520
B63A	Slave Device Assigned bit for the CE drive address was on after an undefined Set operation. Pass 1 Interface B = Slave Pass 2 Interface A = Slave			CTL-I 870	B	520
B63B	Both master and slave Device Assigned bits for the CE drive address were on after an undefined Set operation.			CTL-I 870	C	520
B63D	Master failed to detect Tag Valid or Normal End while sending Tag '06'. Pass 1 Interface A = Master Pass 2 Interface B = Master			CTL-I 870	A	520
B63E	Slave failed to detect Tag Valid or Normal End while sending Tag '06'. Pass 1 Interface B = Slave Pass 2 Interface A = Slave			CTL-I 870	B	520
B63F	Both master and slave failed to detect Tag Valid or Normal End while sending Tag '06'.			CTL-I 870	C	520

Error Code	Error Description	CE Panel Lamp Display Byte	CE Panel Lamp Display Description	MAP Section	MAP Entry	MICFL
B641	The master does not detect the Switchable Interface indication (Bus In bit 3) while sending Tag '06'. Pass 1 Interface A = Master Pass 2 Interface B = Master			**CTL-I 870**	**A**	520
B642	The slave does not detect the Switchable Interface indication (Bus in bit 3) while sending Tag '06'. Pass 1 Interface B = Slave Pass 2 Interface A = Slave			**CTL-I 870**	**B**	520
B643	Both the master and slave failed to detect the Switchable Interface indication (Bus In bit 3) while sending Tag '06'.			**CTL-I 870**	**C**	520
B645	The master failed to detect Tag Valid while turning on a bit in the Assignment Register. Pass 1 Interface A = Master Pass 2 Interface B = Master			**CTL-I 870**	**A**	520
B646	The slave failed to detect Tag Valid while turning on a bit in the Assignment Register. Pass 1 Interface B = Slave Pass 2 Interface A = Slave			**CTL-I 870**	**B**	520
B647	Both master and slave failed to detect Tag Valid while turning on a bit in the Assignment Register.			**CTL-I 870**	**C**	520

B6 tests have the following error stop ranges:

Test	Starting error	Ending Error
1	B615	B61F
2	B621	B63B
3	B63D	B663
4	B675	B68F
5	B6A1	B6AF
6	B6BD	B6E0
7	B6E1	B6FB

Error Code	Error Description	CE Panel Lamp Display Byte	CE Panel Lamp Display Description	MAP Section	MAP Entry	MICFL
B649	One or more positions of the master Assignment Register failed to come on.	2	Failing positions of the Assignment Register (ones indicate failure).	**CTL-I 875**	**A**	520
B64A	One or more positions of the slave Assignment Register failed to come on.	2	Failing positions of the Assignment Register (ones indicate failure).	**CTL-I 875**	**B**	520
B64B	One or more positions of both the master and slave Assignment Registers failed to come on.	2	Failing positions of the Assignment Register (ones indicate failure).	**CTL-I 875**	**C**	520
B64D	The master failed to detect Tag Valid while turning off a bit in the Assignment Register Pass 1 Interface A = Master Pass 2 Interface B = Master			**CTL-I 870**	**A**	520
B64E	The slave failed to detect Tag Valid while turning off a bit in the Assignment Register. Pass 1 Interface B = Slave Pass 2 Interface A = Slave			**CTL-I 870**	**B**	520
B64F	Both the master and slave failed to detect Tag Valid while turning off a bit in the Assignment Register.			**CTL-I 870**	**C**	520

Error Code	Error Description	CE Panel Lamp Display Byte	CE Panel Lamp Display Description	MAP Section	MAP Entry	MICFL
B651	One or more positions of the master Assignment Register failed to turn off.	2	Failing positions of the Assignment Registers (ones indicate failure).	**CTL-I 875**	**A**	520
B652	One or more positions of the slave Assignment Register failed to turn off.	2	Failing positions of the Assignment Registers (ones indicate failure).	**CTL-I 875**	**B**	520
B653	One or more positions of both the master and slave Assignment Registers failed to turn off.	2	Failing positions of the Assignment Registers (ones indicate failure).	**CTL-I 875**	**C**	520
B655	The master detects an Assigned To Other Interface indication (Bus In bit 4) with both Assignment Registers reset.	2	Failing positions of the Assignment Registers (ones indicate failure).	**CTL-I 875**	**A**	520
B656	The slave detects an Assigned To Other Interface indication (Bus In bit 4) with both Assignment Registers reset.	2	Failing positions of the Assignment Registers (ones indicate failure).	**CTL-I 875**	**B**	520
B657	Both the master and slave detected an Assigned To Other Interface (Bus In bit 4) indication with both Assignment Registers reset.	2	Failing positions of the Assignment Registers (ones indicate failure).	**CTL-I 875**	**C**	520
B659	The master failed to receive Partial Selection indication while trying to select a drive that is assigned to the slave. Pass 1 Interface A = Master Pass 2 Interface B = Master			**CTL-I 880**	**A**	520
B65A	The slave failed to receive Partial Selection indication while trying to select a drive that is assigned to the master. Pass 1 Interface B = Slave Pass 2 Interface A = Slave			**CTL-I 880**	**B**	520

B6 tests have the following error stop ranges:

Test	Starting error	Ending Error
1	B615	B61F
2	B621	B63B
3	B63D	B663
4	B675	B68F
5	B6A1	B6AF
6	B6BD	B6E0
7	B6E1	B6FB

Error Code	Error Description	CE Panel Lamp Display Byte	CE Panel Lamp Display Description	MAP Section	MAP Entry	MICFL
B65B	Both master and slave failed to receive Partial Selection indication when the drive was assigned to the other interface.			**CTL-I 880**	**C**	520
B65D	The master failed to receive Tag Valid from a Tag '06' when the master has only Partial selection. Pass 1 Interface A = Master Pass 2 Interface B = Master			**CTL-I 870**	**A**	520
B65E	The slave failed to receive Tag Valid from a Tag '06' when the slave has only Partial Selection. Pass 1 Interface B = Slave Pass 2 Interface A = Slave			**CTL-I 870**	**B**	520
B65F	Both master and slave failed to receive a Tag Valid from a Tag '06' with Partial Selection.			**CTL-I 870**	**C**	520
B661	The master failed to receive Assigned To Other Interface indication while sending a Tag '06' (Bus In bit 4).			**CTL-I 875**	**A**	520
B662	The slave failed to receive Assigned To Other Interface indication while sending a Tag '06' (Bus In bit 4).			**CTL-I 875**	**B**	520
B663	Both the master and slave failed to receive Assigned To Other Interface indication while sending a Tag '06' (Bus In bit 4).			**CTL-I 875**	**C**	520

Error Code	Error Description	CE Panel Lamp Display Byte	CE Panel Lamp Display Description	MAP Section	MAP Entry	MICFL
B675	Master failed to detect Tag Valid while turning on a bit in the Device End Register. Pass 1 Interface A = Master Pass 2 Interface B = Master			CTL-I 870	A	520
B676	Slave failed to detect Tag Valid while turning on a bit in the Device End Register. Pass 1 Interface B = Slave Pass 2 1nterface A = Slave			CTL-I 870	B	520
B677	Both the master and slave failed to detect Tag Valid while turning on a bit in the Device End Register.			CTL-I 870	C	520

B6 tests have the following error stop ranges:

Test	Starting error	Ending Error
1	B615	B61F
2	B621	B63B
3	B63D	B663
4	B675	B68F
5	B6A1	B6AF
6	B6BD	B6E0
7	B6E1	B6FB

Error Code	Error Description	CE Panel Lamp Display Byte	CE Panel Lamp Display Description	MAP Section	MAP Entry	MICFL
B679	One or more positions of the master Device End Register failed to turn on.	2	Failing position(s) of the register (ones indicate failure).	CTL-I 870	A	520
B67A	One or more positions of the slave Device End Register failed to turn on.	2	Failing position(s) of the register (ones indicate failure).	CTL-I 870	B	520
B67B	One or more positions of the master and slave Device End Registers failed to turn on.			CTL-I 870	C	520
B67D	One or more positions of the master Device End Register failed to turn off.			CTL-I 875	A	520
B67E	One or more positions of the slave Device End Register failed to turn off.			CTL-I 875	B	520
B67F	One or more positions of the master and slave Device End Registers failed to turn off.			CTL-I 875	C	520

Error Code	Error Description	CE Panel Lamp Display Byte	CE Panel Lamp Display Description	MAP Section	MAP Entry	MICFL
B681	While polling devices from the master, an Interrupt indication was received from a device assigned to the slave. Pass 1 Interface A = Master Pass 2 Interface B = Master	2	Unexpected Interrupt (ones indicate failure).	CTL-I 880	A	520
B682	While polling devices from the slave, an Interrupt indication was received from a device assigned to the master. Pass 1 Interface B = Slave Pass 2 Interface A = Slave	2	Unexpected Interrupt (ones indicate failure).	CTL-I 880	B	520
B683	While polling devices from either the master or the slave, both received an Interrupt indication.			CTL-I 870	C	520
B685	Master failed to receive an expected Interrupt indication. Pass 1 Interface A = Master Pass 2 Interface B = Master	2	Position(s) of failing Interrupt (ones indicate failure).	CTL-I 870	A	520
B686	Slave failed to receive an expected Interrupt indication. Pass 1 Interface B = Slave Pass 2 Interface A = Slave	2	Position(s) of failing Interrupt (ones indicate failure).	CTL-I 870	B	520
B687	Both the master and the slave failed to receive an expected Interrupt indication.			CTL-I 870	C	520

B6 tests have the following error stop ranges:

Test	Starting error	Ending Error
1	B615	B61F
2	B621	B63B
3	B63D	B663
4	B675	B68F
5	B6A1	B6AF
6	B6BD	B6E0
7	B6E1	B6FB

Error Code	Error Description	CE Panel Lamp Display Byte	CE Panel Lamp Display Description	MAP Section	MAP Entry	MICFL
B689	Master failed to receive an expected Interrupt indication when a Poll Unsuppressible was issued with the Unsuppressible Register set.	2	Failing position(s) of the register (ones indicate failure).	CTL-I 870	A	520
B68A	Slave failed to receive an expected Interrupt indication when a Poll Unsuppressible was issued with the Unsuppressible Register set.	2	Failing position(s) of the register (ones indicate failure).	CTL-I 870	B	520
B68B	Both master and slave failed to receive an expected Interrupt indication when a Poll Unsuppressible was issued with the Unsuppressible Register set.			CTL-I 870	C	520
B68D	Master received an Interrupt indication when a Poll Unsuppressible was issued with the Unsuppressible Register reset. Pass 1 Interface A = Master Pass 2 Interface B = Master	2	Positions of failing Interrupt (ones indicate failure).	CTL-I 870	A	520
B68E	Slave received an Interrupt indication when a Poll Unsuppressible was issued with the Unsupressible Register reset. Pass 1 Interface B = Slave Pass 2 Interface A = Slave	2	Positions of failing Interrupt (ones indicate failure).	CTL-I 870	B	520
B68F	Both master and slave received an Interrupt indication when a Poll Unsuppressible was issued with the Unsuppressible Register reset.			CTL-I 870	C	520

Error Code	Error Description	CE Panel Lamp Display Byte	CE Panel Lamp Display Description	MAP Section	MAP Entry	MICFL
B6A1	One or more positions of the master Pack Change Register failed to turn on. Pass 1 Interface A = Master Pass 2 Interface B = Master	2	Failing position(s) of Pack Change Register (ones indicate failure).	**CTL-I 870**	**A**	520
B6A2	One or more positions of the slave Pack Change Register failed to turn on. Pass 1 Interface B = Slave Pass 2 Interface A = Slave	2	Failing position(s) of Pack Change Register (ones indicate failure).	**CTL-I 870**	**B**	520
B6A3	One or more positions of the master and slave Pack Change Registers failed to turn on.			**CTL-I 870**	**C**	520
B6A5	Master failed to receive an expected Pack Change Interrupt indication. Pass 1 Interface A = Master Pass 2 Interface B = Master	2	Failing position(s) of Pack Change Register (ones indicate failure).	**CTL-I 870**	**A**	520
B6A6	Slave failed to receive an expected Pack Change Interrupt indication. Pass 1 Interface B = Slave Pass 2 Interface A = Slave	2	Failing position(s) of Pack Change Register (ones indicate failure).	**CTL-I 870**	**B**	520
B6A7	Both the master and slave failed to receive an expected Pack Change Interrupt indication.			**CTL-I 870**	**C**	520

B6 tests have the following error stop ranges:

Test	Starting error	Ending Error
1	B615	B61F
2	B621	B63B
3	B63D	B663
4	B675	B68F
5	B6A1	B6AF
6	B6BD	B6E0
7	B6E1	B6FB

Error Code	Error Description	CE Panel Lamp Display Byte	CE Panel Lamp Display Description	MAP Section	MAP Entry	MICFL
B6A9	One or more positions of the master Pack Change Register failed to turn off.	2	Failing position(s) of Pack Change Register (ones indicate failure).	**CTL-I 880**	**C**	520
B6AA	One or more positions of the slave Pack Change Register failed to turn off.	2	Failing position(s) of Pack Change Register (ones indicate failure).	**CTL-I 880**	**C**	520
B6AB	One or more positions of the master and slave Pack Change Registers failed to turn off.			**CTL-I 880**	**D**	520
B6AD	Master received an unexpected Pack Change Interrupt indication during a poll.	2	Bit significant device address being tested when error occurred.	**CTL-I 880**	**C**	520
B6AE	Slave received an unexpected Pack Change Interrupt indication during a poll.	2	Bit significant device address being tested when error occurred.	**CTL-I 880**	**C**	520
B6AF	Both the master and slave received an unexpected Pack Change Interrupt indication during a poll.			**CTL-I 880**	**D**	520

Error Code	Error Description	CE Panel Lamp Display Byte	CE Panel Lamp Display Description	MAP Section	MAP Entry	MICFL
B6BD	Master Device End and Assignment Registers were set (turned on) in error. Pass 1 Interface A = Master Pass 2 Interface B = Master	2	Bit significant device address being tested when error occurred.	CTL-I 870	A	520
B6BE	Slave Device End and Assignment Registers were set (turned on) in error. Pass 1 Interface B = Slave Pass 2 Interface A = Slave	2	Bit significant device address being tested when error occurred.	CTL-I 870	B	520
B6BF	Device End and Assignment Registers were set (turned on) in error in both master and slave.			CTL-I 870	C	520
B6C1	Master received an Interrupt indication from one or more Device End Register positions that are not on. Pass 1 Interface A = Master Pass 2 Interface B = Master	2	Bit significant device address being tested when error occurred.	CTL-I 870	A	520
B6C2	Slave received an Interrupt indication from one or more Device End Register positions that are not on. Pass 1 Interface B = Slave Pass 2 Interface A = Slave	2	Bit significant device address being tested when error occurred.	CTL-I 870	B	520
B6C3	Both master and slave received an Interrupt indication from one or more Device End Register positions that are not on.			CTL-I 870	C	520
B6C5	Master received a Pack Change Interrupt indication from one or more register positions that are not on.	2	Bit significant device address being tested when error occurred.	CTL-I 880	C	520
B6C6	Slave received a Pack Change Interrupt indication from one or more register positions that are not on.	2	Bit significant device address being tested when error occurred.	CTL-I 880	C	520
B6C7	Both master and slave received a Pack Change Interrupt indication from one or more register positions that are not on.			CTL-I 880	D	520
B6C9	Master received an Assigned To This Interface indication from one or more register positions that are not on.			CTL-I 875	A	520

Error Code	Error Description	CE Panel Lamp Display Byte	CE Panel Lamp Display Description	MAP Section	MAP Entry	MICFL
B6CA	Slave received an Assigned To This Interface indication from one or more register positions that are not on.			CTL-I 875	B	520
B6CB	Both master and slave received an Assigned To This Interface indication from one or more register positions that are not on.			CTL-I 875	C	520
B6CD	Master received an Assigned To Other Interface indication from one or more register positions that are not on.			CTL-I 875	A	520
B6CE	Slave received an Assigned To Other Interface indication from one or more register positions that are not on.			CTL-I 875	B	520
B6CF	Both master and slave received an Assigned To Other Interface indication from one or more register positions that are not on.			CTL-I 875	C	520
B6E0	Tests 1 through 6 of the 3350 string switch routine have completed execution. Test 7 (Manual Switching test) may now be run. See the Operating Procedure on MICRO 70. *If test 7 is not run at this time, the slave program must be stopped by entering the '00' control option for the slave interface.* CAUTION *Test 7 may "lock out" the customer for up to 1 minute. Become familiar with the Operating Procedure before running test 7. Perform Steps 4 and 5 of the Operating Procedure on MICRO 70 as quickly as possible to minimize interference with the customer programs.*					*520*

B6 tests have the following error stop ranges:

Test	Starting error	Ending Error
1	B615	B61F
2	B621	B63B
3	B63D	B663
4	B675	B68F
5	B6A1	B6AF
6	B6BD	B6E0
7	B6E1	B6FB

Error Code	Error Description	CE Panel Lamp Display Byte	CE Panel Lamp Display Description	MAP Section	MAP Entry	MICFL
B6E1	Master Enable/Disable switch disabled the interface with the Disable Interlock latch still set (turned on).			**CTL-I 850**	**B**	520
B6E2	Slave Enable/Disable switch disabled the interface with the Disable Interlock latch still set (turned on).			**CTL-I 850**	**B**	520
B6E3	Both Enable/Disable switches disabled their respective interfaces with their Disable Interlock latch still set.			**CTL-I 850**	**A**	520
B6E5	Cannot disable the master with the Enable/Disable switch set to Disable and the Disable Interlock latch reset.			**CTL-I 850**	**B**	520
B6E6	Cannot disable the slave with the Enable/Disable switch set to Disable and the Disable Interlock latch reset.			**CTL-I 850**	**B**	520
B6E7	Cannot disable both the master and the slave with both Enable/ Disable switches set to Disable and the Disable Interlock latch reset.			**CTL-I 850**	**A**	520
B6E9	Cannot reselect from the master side after the Enable/ Disable switch is set to Enable.			**CTL-I 850**	**B**	520
B6EA	Cannot reselect from the slave side after the Enable/ Disable switch is set to Enable.			**CTL-I 850**	**B**	520
B6ED	None of the master interface registers were reset when disabled.			**CTL-I 850**	**B**	520
B6EE	None of the slave interface registers were reset when disabled.			**CTL-I 850**	**B**	520
B6EF	None of the interface registers were reset when both interfaces were disabled.			**CTL-I 850**	**A**	520

B6 tests have the following error stop ranges:

Test	Starting error	Ending Error
1	B615	B61F
2	B621	B63B
3	B63D	B663
4	B675	B68F
5	B6A1	B6AF
6	B6BD	B6E0
7	B6E1	B6FB

Error Code	Error Description	CE Panel Lamp Display Byte	CE Panel Lamp Display Description	MAP Section	MAP Entry	MICFL
B6F1	One or more Device End Registers for the master interface failed to reset when the interface was disabled. All other master interface registers reset correctly.			**CTL-I 850**	**B**	520
B6F2	One or more Device End Registers for the slave interface failed to reset when the interface was disabled. All other slave interface registers reset correctly.			**CTL-I 850**	**B**	520
B6F3	One or more Device End Registers for both interfaces failed to reset when the interfaces were disabled. All other interface registers reset correctly.			**CTL-I 850**	**A**	520
B6F5	One or more Pack Change Registers for the master interface failed to reset when the interface was disabled. All other interface registers reset correctly.			**CTL-I 850**	**B**	520
B6F6	One or more Pack Change Registers for the slave interface failed to reset when the interface was disabled. All other interface registers reset correctly.			**CTL-I 850**	**B**	520
B6F7	One or more Pack Change Registers for both interfaces failed to reset when both interfaces were disabled. All other interface registers reset correctly.			**CTL-I 850**	**A**	520
B6F9	One or more Assignment Registers for the master interface failed to reset when the interface was disabled. All other interface registers reset correctly.			**CTL-I 850**	**B**	520
B6FA	One or more Assignment Registers for the slave interface failed to reset when the interface was disabled. All other interface registers reset correctly.			**CTL-I 850**	**B**	520
B6FB	One or more Assignment Registers for both interfaces failed to reset when both interfaces were disabled. All other interface registers reset correctly.			**CTL-I 850**	**A**	520

Error Code	Error Description	CE Panel Lamp Display Byte	CE Panel Lamp Display Description	MAP Section	MAP Entry	MICFL
B801 to B807	Errors common to all routines.			**MICRO 100**		
B810	HDA sequence status is not in State 6 (Ready). HDA Sequence error. Check that the correct CE Mode switch is on and the Start/Stop switch on the drive is in the Start position.	2	Bus In under HDA Sequence and Control Tag '8F' Bus '43' Expected 0110 000x	**HDA 100**	**E**	630
B811	Drive Check failed to reset following a Check Reset.	2	Bus In under Read Status Tag '84' Bus '00' Expected xx0x xxxx	**ACC 100**	**A**	630
B812	Spindle Attention remained on following an Attention Reset.	2	Bus In under Read Status Tag '84' Bus '00' Expected xxxx x0xx	**ACC 200**	**A**	630
B813	Busy Attention remained on following an Attention Reset.	2	Bus In under Read Status Tag '84' Bus '00' Expected xxxx xx0x	**ACC 210**	**B**	630
B814	Seek Complete/Sector Compare Attention remained on following an Attention Reset.	2	Bus In under Read Status Tag '84' Bus '00' Expected xxxx xxx0	**ACC 220**	**B**	630

Error Code	Error Description	Byte	CE Panel Lamp Display Description	MAP Section	MAP Entry	MICFL
B820	Access Status received was other than 0000 0001 after a Servo Go Home.	2	Bus In under Sense Status 4 Tag '8F' Bus '13' Expected 0000 0001	**ACC 310**	**A**	630
B821	Access Timeout Check failed to come on after being forced by issuing a Seek Start to an access not in State 6 (Ready).	2	Bus In under Sense Status 4 Tag '8F' Bus '13' Expected 1xxx xxxx	**ACC 110**	**B**	630
B822	Drive Check failed to come on after forcing Access Timeout Check.	2	Bus In under Read Status Tag '84' Bus '00' Expected xx1x xxxx	**ACC 101**	**A**	630
B823	Access Timeout Check failed to reset following a Reset or Diagnostic Go Home.	2	Bus In under Sense Status 4 Tag '8F' Bus '13' Expected 0xxx xxxx	**ACC 110**	**A**	630
B824	Access Control not in State 1 (Wait) after a Timeout Check was forced and a Check Reset was issued.	2	Bus In under Sense Status 4 Tag '8F' Bus '13' Expected 0000 0001	**ACC 310**	**A**	630
B825	Odd Track bit on with Access Control in State 1 (Wait).	2	Bus In under Sense Status 2 Tag '8F' Bus '43' Expected xxxx xxx0	**ACC 310**	**B**	630
B826	Drive Check failed to reset following a Check Reset or Diagnostic Go Home.	2	Bus In under Read Status Tag '84' Bus '00' Expected xx0x xx1x	**ACC 100**	**A**	630
B827	Failed to get Busy indication following a Rezero.	2	Bus In under Read Status Tag '84' Bus '00' Expected xxxx xx1x	**ACC 210**	**C**	630
B828	Premature Drive Check was detected within 140 milliseconds following a Rezero.	2	Bus In under Read Status Tag '84' Bus '00' Expected xx0x xxxx	**ACC 110**	**C**	630

Error Code	Error Description	CE Panel Lamp Display Byte	CE Panel Lamp Display Description	MAP Section	MAP Entry	MICFL
B829	Access Timeout Check failed to come on after being forced. (180 ms delay Safety Timer.)	2	Bus In under Sense Status 4 Tag '8F' Bus '13' Expected 1xxx xxxx	**ACC 110**	**D**	630
B82A	Access Timeout Check failed to reset following a Check Reset.	2	Bus In under Sense Status 4 Tag '8F' Bus '13' Expected 0xxx xxxx	**ACC 110**	**A**	630
B82B	Seek Complete was not received with Access Timeout and Drive Check.	2	Bus In under Read Status Tag '84' Bus '00' Expected xxxx xxx1	**ACC 220**	**A**	630
B82C	Device Busy was not off after an Attention Reset.	2	Bus In under Read Status Tag '84' Bus '00' Expected xxxx xx0x	**ACC 210**	**B**	630
B831	Target Velocity indication not on.	2	Bus In under Sense Status 3 Tag '8F' Bus '23' Expected xx1x xxxx	**ACC 312**	**A**	630
B832	Any Index pulse not detected within 40 milliseconds. Indicates no servo input signal.		Bus In under Sense Status 4 Tag '8F' Bus '13' Expected 0000 0001	**ACC 314**	**A**	630
B833	Drive Status failed to indicate Busy after a Rezero.	2	Bus In under Read Status Tag '84' Bus '00' Expected xxxx xx1x	**ACC 210**	**C**	630
B834	Head Address Register failed to reset to zero after a Rezero.	2	Bus In under Sense HAR Tag '8F' Bus '05' Expected 0000 0000	**DEV-I 250**	**D**	630
B835	Difference Counter failed to reset to zero after a Rezero.	2	Bus In under Sense Difference Counter Tag '8F' Bus '09' Expected 0000 0000	**DEV-I 250**	**D**	630
B836	Sense Status 0 failed to indicate the Direction Bit, Difference '512', Difference '256', or CAR '512' bits equal to zero after a Rezero.	2	Bus In under Sense Status 0 Tag '8F' Bus '03' Expected 0000 xxxx	**DEV-I 250**	**C**	630
B837	Target Velocity failed to reset, indicating carriage movement after a Rezero.	2	Bus In under Sense Status 4 Tag '8F' Bus '13'	**ACC 332**	**A**	630

Error Code	Error Description	CE Panel Lamp Display Byte	CE Panel Lamp Display Description	MAP Section	MAP Entry	MICFL
B838	Track Crossing latch failed to change state after carriage movement was indicated during a Rezero.	2	Bus In under Sense Status 4 Tag '8F' Bus '13'	**ACC 332**	**B**	630
B839	High Velocity Overshoot Check detected during Rezero.	2	Bus In under Sense Status 4 Tag '8F' Bus '13' Expected x0x1 xxxx	**ACC 334**	**A**	630

Error Code	Error Description	CE Panel Lamp Display Byte	CE Panel Lamp Display Description	MAP Section	MAP Entry	MICFL
B840	Access Control failed to detect Guardband latch before the end of a Rezero.	2	Bus In under Sense Status 4 Tag '8F' Bus '13'	**ACC 344**	**A**	630
B841	Access Control failed to advance to State 16 (Move In) before the end of a Rezero.	2	Bus In Under Sense Status 4 Tag '8F' Bus '13'	**ACC 344**	**B**	630
B842	Access Control failed to advance out of State 16 (Move In) before the end of a Rezero.	2	Bus In under Sense Status 4 Tag '8F' Bus '13'	**ACC 352**	**A**	630
B844	Unexpected Access Status at the end of a Rezero.	2	Bus In under Sense Status 4 Tag '8F' Bus '13' Expected 0000 1110	**ACC 366**	**A**	630
B845	Invalid Drive Status at the end of a Rezero. Access Status is correct.	2	Bus In under Read Status Tag '84' Bus '00' Expected xxxx 1xx1	**ACC 220**	**A**	630
B846	Seek Complete failed to reset with an Attention Reset.	2	Bus In under Read Status Tag '84' Bus '00' Expected xxxx xxx0	**ACC 220**	**B**	630

Error Code	Error Description	CE Panel Lamp Display Byte	CE Panel Lamp Display Description	MAP Section	MAP Entry	MICFL
B851	Unexpected Access Status after a Rezero was initiated to recover from a previous access error.	2	Bus In under Sense Status 4 Tag '8F' Bus '13' Expected 0000 1110	**ACC 301**	**A**	630
B852	Unexpected State Advance after a Rezero was initiated from track 0.	2	Bus In under Sense Status 4 Tag '8F' Bus '13' Expected 0001 0000	**ACC 330**	**C**	630
B853	Target Velocity failed to turn off during a Rezero initiated from track 0.	2	Bus In under Sense Status 4 Tag '8F' Bus '13'	**ACC 330**	**D**	630
B854	Guardband pattern was not detected during a Rezero initiated from track 0.	2	Bus In under Sense Status 4 Tag '8F' Bus '13'	**ACC 330**	**E**	630
B855	Unexpected Access Status after a Rezero was initiated from track 0.	2	Bus In under Sense Status 4 Tag '8F' Bus '13' Expected 0000 1110	**ACC 301**	**A**	630
B856	Failed to sense track minus nine before an End operation.	2	Bus In under Sense Status 4 Tag '8F' Bus '13'	**ACC 301**	**A**	630
B857	More than nine track crossing pulses counted before reaching track 0.	2	Bus In under Sense Status 3 Tag '8F' Bus '23'	ACC 344	**A**	630
B860	Seek Complete was not received following a Seek Start. Both Head Address Register and Difference Counter were zero.	2	Bus In under Read Status Tag '84' Bus '00' Expected xxxx xxx1	**ACC 520**	**A**	630
B861	Attention was not active when polling device.	2	Bus In under Poll Device Tag '82' Bus '00' Expected 1xxx xxxx	**DEV-I 270**	**B**	630
B862	Attention failed to reset following an Attention Reset.	2	Bus In under Poll Device Tag '82' Bus '00' Expected 0xxx xxxx	**DEV-I 270**	**A**	630

Error Code	Error Description	CE Panel Lamp Display Byte	CE Panel Lamp Display Description	MAP Section	MAP Entry	MICFL
B871	Drive not Busy after a Rezero.	2	Bus In under Read Status Tag '84' Bus '00' Expected xxxx xx1x	ACC 210	C	630
B872	Access error after a Rezero.	2	Bus In under Sense Status 4 Tag '8F' Bus '13' Expected 0000 1110	ACC 301	A	630
B873	Drive failed to go Busy after a Seek.	2	Bus In under Read Status Tag '84' Bus '00' Expected xxxx xx1x	ACC 210	C	630
B874	Carriage movement not detected during a Seek.	2	Bus In under Sense Status 4 Tag '8F' Bus '13'	ACC 521	A	630
B875	Seek movement was in the wrong direction.	2	Bus In under Sense Status 4 Tag '8F' Bus '13'	ACC 521	C	630

Error Code	Error Description	CE Panel Lamp Display Byte	CE Panel Lamp Display Description	MAP Section	MAP Entry	MICFL
B880	Unexpected status after a Rezero.	2	Bus In under Sense Status 4 Tag '8F' Bus '13' Expected 0000 1110	ACC 301	A	630
B881	Unable to force Overshoot Check by seeking into the outer Guardband area.	2	Bus In under Sense Status 4 Tag '8F' Bus '13' Expected x1xx xxxx	ACC 120	E	630
B882	Failed to get Drive Check after a forced Overshoot Check.	2	Bus In under Read Status Tag '84' Bus '00' Expected xx1x xxxx	ACC 101	A	630
B883	Overshoot Check failed to reset after a Rezero was issued for error recovery.	2	Bus In under Sense Status 4 Tag '8F' Bus '13' Expected x0xx xxxx	ACC 120	A	630
B885	Track crossing pulse not active within 300 microseconds.			ACC 521	B	630
B886	Track crossing pulse remained active for more than 250 microseconds.			ACC 521	B	630
B887	Overshoot Check active too early.	2	Bus In under Sense Status 4 Tag '8F' Bus '13' Expected x0xx xxxx	ACC 120	D	630
B888	Unable to force Overshoot Check. Suspect Track Crossing Counter problems.	2	Bus In under Sense Status 4 Tag '8F' Bus '13' Expected x1xx xxxx	ACC 120	C	630

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Error Code	Error Description	CE Panel Lamp Display Byte	CE Panel Lamp Display Description	MAP Section	MAP Entry	MICFL
B890	Failed to reset CAR after a Rezero.	2	Bus In under Sense CAR Tag '8E' Bus '01' Expected 0000 0000	**DEV-I 250**	**D**	630
B891	Failed to get Device Busy after a Seek or Rezero.	2	Bus In under Read Status Tag '84' Bus '00' Expected xxxx xx1x	**ACC 210**	**C**	630
B892	Difference Counter failed to decrement or decremented more than once on a single track crossing pulse.	2 3	Received Difference Counter value. Expected Difference Counter value. Original Difference Counter value was 128.	**ACC 530**	**A**	630
B893	Access Check after a Rezero.	2	Bus In under Sense Status 4 Tag '8F' Bus '13' Expected 0000 1110	**ACC 301**	**A**	630
B894	Access Check after a Seek while waiting for track crossing pulses.			**ACC 542**	**A**	630
B895	Microprogram timed-out waiting for track crossing transitions after a Seek Start.			**ACC 521**	**B**	630

Error Code	Error Description	CE Panel Lamp Display Byte	CE Panel Lamp Display Description	MAP Section	MAP Entry	MICFL
B8A1	Failed to detect Device Busy after a Rezero.	2	Bus In under Read Status Tag '84' Bus '00' Expected xxxx xx1x	**ACC 210**	**C**	630
B8A2	Access error after a Rezero.	2	Bus In under Sense Status 4 Tag '8F' Bus '13' Expected 0000 1110	**ACC 301**	**A**	630
B8A3	Failed to detect Device Busy after a Seek.	2	Bus In under Read Status Tag '84' Bus '00' Expected xxxx xx1x	**ACC 210**	**C**	630
B8A4	Access Control failed to advance to State A (Accelerate) after a Seek.	2	Bus In under Sense Status 4 Tag '8F' Bus '13' Expected 0000 1010	**ACC 521**	**B**	630
B8A5	Access error during State A (Accelerate) of a Seek.	2	Bus In under Sense Status 4 Tag '8F' Bus '13' Expected 0000 1010	**ACC 540**	**B**	630
B8A6	Difference Counter value out of specification at state advance time.	2	Bus In under Sense Difference Counter Tag '8F' Bus '09' Expected value range is: > 0101 0100 ('54') and < 0111 1100 ('7C'). (84 to 124 decimal)	**ACC 542**	**A**	630
B8A7	Access error during State 8 (Decelerate) of a Seek.	2	Bus In under Sense Status 4 Tag '8F' Bus '13' Expected 0000 1000	**ACC 550**	**A**	630
B8A8	Difference Counter did not change during gain measurement subroutine.			**ACC 521**	**B**	630

Error Code	Error Description	CE Panel Lamp Display Byte	CE Panel Lamp Display Description	MAP Section	MAP Entry	MICFL
B8A9	Velocity Gain out of specification (too fast). Specification value in microseconds is 330 plus or minus 20.	2	Expected value is '14' or less (0001 0100). (14 hex equals 20 decimal.)	**ACC 800**	**B**	630
B8AA	Velocity Gain out of specification (too slow). Specification value is 330 microseconds plus or minus 20.	2	Expected value is '14' or less (0001 0100). (14 hex equals 20 decimal.)	**ACC 800**	**B**	630
B8AB	Access error during a Seek.	2	Bus In under Sense Status 4 Tag '8F' Bus '13' Expected 0000 1110	**ACC 510**	**A**	630
B8AC	Track Following Timer expired too early.			**ACC 366**	**A**	630
B8AD	Unexpected status after a Seek.	2	Bus In under Sense Status 4 Tag '8F' Bus '13' Expected 0000 1110	**ACC 510**	**A**	630

Error Code	Error Description	CE Panel Lamp Display Byte	CE Panel Lamp Display Description	MAP Section	MAP Entry	MICFL
B8B0	Failed to detect Device Busy after a Rezero.	2	Bus In under Read Status Tag '84' Bus '00' Expected xxxx xx1x	ACC 210	C	630
B8B1	Failed to detect Device Busy after a Seek.	2	Bus In under Read Status Tag '84' Bus '00' Expected xxxx xx1x	ACC 210	C	630
B8B2	Failed to get forced Overshoot Check.	2	Bus In under Sense Status 4 Tag '8F' Bus '13' Expected xx1x xxxx	ACC 120	F	630
B8B3	An unexpected Drive Check occurred during a Seek.	2	Bus In under Sense Status 4 Tag '8F' Bus '13' Expected 0000 1110	ACC 510	A	630
B8B4	Drive Check after a Rezero.	2	Bus In under Sense Status 4 Tag '8F' Bus '13' Expected 0000 1110	ACC 301	A	630

Error Code	Error Description	CE Panel Lamp Display Byte	CE Panel Lamp Display Description	MAP Section	MAP Entry	MICFL
B8C0	No Bit Significant Device Address was received during a Poll Device with the CE drive selected.	2	Bus In under Poll Device Tag '82' Bus '00' For expected value, see Figure 1.	DEV-I 112	A	630
B8C1	Incorrect Bit Significant Device Address was received during a Poll Device with the CE drive selected.	2	Bus In under Poll Device Tag '82' Bus '00' For expected value, see Figure 1.	CTL-I 620	A	630
B8C2	With the Unsuppressible Register set and the polling device unsuppressible, no Bit Significant Device Address was returned.	2	Bus In under Poll Device Tag '82' Bus '10' For expected value, see Figure 1.	CTL-I 620	A	630
B8C3	With the Unsuppressible Register set and the polling device unsuppressible, the Bit Significant Device Address returned was incorrect.	2	Bus In under Poll Device Tag '82' Bus '10' For expected value, see Figure 1.	CTL-I 620	A	630
B8C4	With the Unsuppressible Register reset and the polling device unsuppressible, a Bit Significant Device Address was returned.	2	Bus In under Poll Device Tag '82' Bus '10' Expected 0000 0000	CTL-I 620	A	630

Figure 1.

Select	Expected Value
0	'80'
1	'40'
2	'20'
3	'10'
4	'08'
5	'04'
6	'02'
7	'01'

The selected drive is the physical address of the drive in CE Mode.

Error Code	Error Description	CE Panel Lamp Display Byte	CE Panel Lamp Display Description	MAP Section	MAP Entry	MICFL
B8D0	Received an incorrect controller status byte.	2	Bus In under Sense Status (Controller Error 2) Tag '04' Bus '02' Expected 0000 000x	DATA 512	A	630
B8D1	Normal End was received prematurely for a Set Read/Write.			CTL-I 400	E	630
B8D2	Check End was received for a Set Read/Write.			CTL-I 635	A	630
B8D3	Normal End was not received within 500 microseconds after issuing a Set Read/Write with no error conditions set.			CTL-I 640	A	630
B8D4	Normal End was not reset by the Response line.			CTL-I 650	A	630
B8D5	Error Alert was active due to a check condition other than Controller Check or Read/Write Check.	2	Bus In under Read Status Tag '84' Bus '00'	DATA 628	A	630
B8D6	Error Alert was active due to Controller Check. However, the controller status byte was found to be other than 0000 000x.	2	Bus In under Sense Status (Controller Error 2) Tag '04' Bus '02' Expected 0000 000x	DATA 512	B	630
B8D7	Controller Check came on after the Set Read/Write operation with Error Alert active. Proper controller status was returned.	2	Bus In under Sense Status (Controller Error 1) Tag '04' Bus '01'	DATA 616	A	630
B8D8	Interface Check was active after a Set Read/Write with Error Alert inactive.	2	Bus In under Read Status Tag '84' Bus '00' Expected x0xx xxxx	DEV-I 200	A	630
B8D9	False Read/Write Check.	2	Bus In under Sense Read/Write Tag '8F' Bus '0B'	R/W 110	A	630
B8DA	Pad Gate Check or Head Short Check.	2	Bus In under Sense Status 0 Tag '8F' Bus '03' Expected xxxx 00xx	R/W 100	D	630
B8DB	Write Safety Check. Physical head 0 was selected.	2	Bus In under Sense Read/Write Tag '8F' Bus '0B'	R/W 100	C	630
B8DC	Monitor Check failed to come on when forced.	2	Bus In under Sense Status (Controller Error 2) Tag '04' Bus '02' Expected xxxx x1xx	DATA 292	A	630
B8DD	Monitor Check failed to reset.	2	Bus In under Sense Status (Controller Error 2) Tag '04' Bus '02' Expected xxxx x0xx	DATA 292	B	630
B8DE	Controller Check failed to set as a result of a Monitor Check.	2	Bus In under Read Status Tag '84' Bus '00' Expected 1xxx xxxx	DATA 292	B	630

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Error Code	Error Description	CE Panel Lamp Display Byte	CE Panel Lamp Display Description	MAP Section	MAP Entry	MICFL
B8E1	Controller Error 2 bits 0 and 1 are not equal to '00' following a Check Reset.	2	Bus In under Sense Status (Controller Error 2) Tag '04' Bus '02' Expected 00xx xxxx	DATA 300	B	630
B8E2	Unable to force Controller Error 2 bits 0 and 1 equal to '01'. (No Servo Input.)	2	Bus In under Sense Status (Controller Error 2) Tag '04' Bus '02' Expected 01xx xxxx	DATA 288	A	630
B8E3	Unable to force Controller Error 2 from No Servo Input.	2	Bus In under Read Status Tag '84' Bus '00' Expected 1xxx xxxx	DATA 300	A	630
B8E4	Unable to force Controller Error 2 bits 0 and 1 equal to '11'. (Missing Data Input.)	2	Bus In under Sense Status (Controller Error 2) Tag '04' Bus '02' Expected 11xx xxxx	DATA 288	A	630
B8E5	Unable to force Controller Error 2 from Missing Data Input.	2	Bus In under Read Status Tag '84' Bus '00' Expected 1xxx xxxx	DATA 300	A	630
B8E6	Check Reset unable to reset Controller Error 2 bits 0 and 1.	2	Bus In under Sense Status (Controller Error 2) Tag '04' Bus '02' Expected 00xx xxxx	DATA 288	B	630
B8E7	Controller Reset unable to reset Controller Error 2.	2	Bus In under Read Status Tag '84' Bus '00' Expected 0xxx xxxx	DATA 300	B	630

Error Code	Error Description	CE Panel Lamp Display Byte	CE Panel Lamp Display Description	MAP Section	MAP Entry	MICFL
B8F0	Busy indication failed to come on following a Rezero.	2	Bus In under Read Status Tag '84' Bus '00' Expected xxxx xx1x	ACC 210	C	630
B8F2	Servo Off Track error failed to come on after being forced.	2	Bus In under Sense Status 4 Tag '8F' Bus '13' Expected xx1x xxxx	ACC 130	B	630
B8F3	Drive Check failed to come on after being forced.	2	Bus In under Read Status Tag '84' Bus '00' Expected xx1x xxxx	ACC 101	A	630
B8F4	Capable/Enable Check failed to come on after being forced.	2	Bus In under Sense Read/Write Tag '8F' Bus '0B' Expected x1xx xxxx	R/W 172	A	630
B8F5	Index Check failed to come on after being forced.	2	Bus In under Sense Read/Write Tag '8F' Bus '0B' Expected xxx1 xxxx	RPI 100	C	630
B8F6	Read/Write Check failed to come on after being forced.	2	Bus In under Read Status Tag '84' Bus '00' Expected xxx1 xxxx	R/W 112	A	630

Error Code	Error Description	CE Panel Lamp Display Byte	CE Panel Lamp Display Description	MAP Section	MAP Entry	MICFL
B8F7	Drive Check failed to reset following a Check Reset.	2	Bus In under Read Status Tag '84' Bus '00' Expected xx0x xxxx	ACC 100	A	630
B8F8	Capable/Enable Check failed to reset following a Check Reset.	2	Bus In under Sense Read/Write Tag '8F' Bus '0B' Expected x0xx xxxx	R/W 172	B	630
B8F9	Index Check failed to reset following a Check Reset.	2	Bus In under Sense Read/Write Tag '8F' Bus '0B' Expected xxx0 xxxx	RPI 100	D	630
B8FA	Read/Write Check failed to reset following a Check Reset.	2	Bus In under Read Status Tag '84' Bus '00' Expected xxx0 xxxx	R/W 112	B	630
B8FB	Unexpected Access Status after a Rezero.	2	Bus In under Sense Status 4 Tag '8F' Bus '13' Expected 0000 1110	ACC 301	A	630

Error Code	Error Description	CE Panel Lamp Display Byte	CE Panel Lamp Display Description	MAP Section	MAP Entry	MICFL
B901 to B907	Errors common to all routines.			**MICRO 100**		
B910	Accessing error after a Rezero. (Tag '8F' Bus '02')	2	Bus In under Sense Status 4 Tag '8F' Bus '13' Expected 0000 1110	**ACC 301**	**A**	680
B912	Read/Write Check during a Read Home Address routine.	2	Bus In under Sense Read/Write Tag '8F' Bus '0B' Expected 0000 0000	**R/W 100**	**C**	680
B913	Physical address (PA) read does not compare to physical address expected after a Rezero. PA bytes should be all zeros.	2 3 4 5 6	Received PA1 value Received PA2 value Received PA3 value Expected PA1 value Expected PA2 value Expected PA3 0000 0000	**ACC 501**	**A**	680
B914	Timeout waiting for End response (Normal/Check End).			**CTL-I 660**	**A**	680
B915	Check End after a Read G1 on cylinder 0 track 0 (head 0).	2	Bus In under Check End (Read G1 only) Tag '0E' Bus '4E' Expected 0000 0000	**CTL-I 630**	**A**	680
B916	Error Alert after a Set Read/Write or Read G1.			**DATA 628**	**A**	680
B917	Busy not active during a Rezero.	2	Bus In under Read Status Tag '84' Bus '00' Expected xxxx xx1x	**ACC 210**	**C**	680

Error Code	Error Description	CE Panel Lamp Display Byte	CE Panel Lamp Display Description	MAP Section	MAP Entry	MICFL
B921	Failed to get Device Busy after a Rezero. (Tag '8F' Bus '02')	2	Bus In under Read Status Tag '84' Bus '00' Expected xxxx xx1x	**ACC 210**	**C**	680
B922	Difference Counter failed to decrement or decremented more than once on a single track crossing pulse. If Byte 4 of the logout is 00, the original Difference Counter value was '256'.	2 3 4	Received Difference Counter value Expected Difference Counter value Original Difference Counter value	**ACC 530**	**A**	680
B923	Access Check was detected during a Rezero.	2	Bus In under Sense Status 4 Tag '8F' Bus '13' Expected 0000 111x	**ACC 301**	**A**	680
B924	Guardband was detected while waiting for a track crossing pulse.	2	Bus In under Sense Status 3 Tag '8F' Bus '23' Expected x1xx xxxx	**ACC 510**	**A**	680
B925	Program timeout while waiting for Track Crossing latch to change states.			**ACC 521**	**B**	680

Error Code	Error Description	CE Panel Lamp Display Byte	CE Panel Lamp Display Description	MAP Section	MAP Entry	MICFL
B930	Odd Track did not set/reset for odd/even cylinder.	2	Bus In under Sense Status 2 Tag '8F' Bus '43' Received xxxx xxx0 or xxxx xxx1 Expected 0110 0001 or 0110 0000	**ACC 520**	**B**	680
B931	Access error after a Seek.	2	Bus In under Sense Status 4 Tag '8F' Bus '13' Expected 0000 1110	**ACC 510**	**A**	680
B933	Physical address read does not compare to expected physical address.	2 3 4 5 6	Received PA1 value Received PA2 value Received PA3 value Expected PA1 value Expected PA2 value Expected PA3 0000 0000	**ACC 501**	**A**	680
B934	Timeout waiting for End response (Normal/Check End).			**CTL-I 660**	**A**	680
B935	Check End after a Read G1.	2 3 4 5 6	Bus In under Check End (Read G1 only) Tag '0E' Bus '4E' Expected 0000 0000 Not Used Not Used Expected PA1 (physical cylinder high) Expected PA2 (physical cylinder low)	**CTL-I 630**	**A**	680
B936	Error Alert after a Set Read/Write or Read G1.			**DATA 628**	**A**	680

Error Code	Error Description	CE Panel Lamp Display Byte	CE Panel Lamp Display Description	MAP Section	MAP Entry	MICFL
B940	Odd Track did not reset for even cylinder.	2	Bus In under Sense Status 2 Tag '8F' Bus '43' Expected 0110 0000	**ACC 520**	**B**	680
B941	Access error after a Seek.	2	Bus In under Sense Status 4 Tag '8F' Bus '13' Expected 0000 1110	**ACC 510**	**A**	680
B943	Physical address read does not compare to expected physical address.	2 3 4 5 6	Received PA1 value Received PA2 value Received PA3 value Expected PA1 value Expected PA2 value Expected PA3 0000 0000	**ACC 501**	**A**	680
B944	Timeout waiting for End response (Normal/Check End).			**CTL-I 660**	**A**	680
B945	Check End after a Read G1.	2 3 4 5 6	Bus In under Check End (Read G1 only) Tag '0E' Bus '4E' Expected 0000 0000 Not Used Not Used Expected PA1 (physical cylinder high) Expected PA2 (physical cylinder low)	**CTL-I 630**	**A**	680
B946	Error Alert after a Set Read/Write or Read G1.			**DATA 628**	**A**	680

Error Code	Error Description	CE Panel Lamp Display Byte	CE Panel Lamp Display Description	MAP Section	MAP Entry	MICFL
B951	Access error after a Seek.	2	Bus In under Sense Status 4 Tag '8F' Bus '13' Expected 0000 1110	**ACC 510**	**A**	680
B953	Physical address read does not compare to expected physical address.	2 3 4 5 6	Received PA1 value Received PA2 value Received PA3 value Expected PA1 value Expected PA2 value Expected PA3 0000 0000	**ACC 501**	**A**	680
B954	Timeout waiting for End response (Normal/Check End).			**CTL-I 660**	**A**	680
B955	Check End after a Read G1.	2 3 4 5 6	Bus In under Check End (Read G1 only) Tag '0E' Bus '4E' Expected 0000 0000 Not Used Not Used Expected PA1 (physical cylinder high) Expected PA2 (physical cylinder low)	**CTL-I 630**	**A**	680
B956	Error Alert after a Set Read/Write or Read G1.			DATA 628	A	680

Error Code	Error Description	CE Panel Lamp Display Byte	CE Panel Lamp Display Description	MAP Section	MAP Entry	MICFL
B961	Access error after a Seek.	2	Bus In under Sense Status 4 Tag '8F' Bus '13' Expected 0000 1110	**ACC 510**	**A**	680
B963	Physical address read does not compare to expected physical address.	2 3 4 5 6	Received PA1 value Received PA2 value Received PA3 value Expected PA1 value Expected PA2 value Expected PA3 0000 0000	**ACC 501**	**A**	680
B964	Timeout waiting for End response (Normal/Check End).			**CTL-I 660**	**A**	680
B965	Check End after a Read G1.	2 3 4 5 6	Bus In under Check End (Read G1 only) Tag '0E' Bus '4E' Expected 0000 0000 Not Used Not Used Expected PA1 (physical cylinder high) Expected PA2 (physical cylinder low)	**CTL-I 630**	**A**	680
B966	Error Alert after a Set Read/Write or Read G1.			DATA 628	A	680

Error Code	Error Description	CE Panel Lamp Display Byte	CE Panel Lamp Display Description	MAP Section	MAP Entry	MICFL
B971	Access error after a Seek.	2	Bus In under Sense Status 4 Tag '8F' Bus '13' Expected 0000 1110	**ACC 510**	**A**	680
B973	Physical address read does not compare to expected physical address.	2 3 4 5 6	Received PA1 value Received PA2 value Received PA3 value Expected PA1 value Expected PA2 value Expected PA3 0000 0000	**ACC 501**	**A**	680
B974	Timeout waiting for End response (Normal/Check End).			**CTL-I 660**	**A**	680
B975	Check End after a Read G1.	2 3 4 5 6	Bus In under Check End (Read G1 only) Tag '0E' Bus '4E' Expected 0000 0000 Not Used Not Used Expected PA1 (physical cylinder high) Expected PA2 (physical cylinder low)	**CTL-I 630**	**A**	680
B976	Error Alert after a Set Read/Write or Read G1.			**DATA 628**	**A**	680

Error Code	Error Description	CE Panel Lamp Display Byte	CE Panel Lamp Display Description	MAP Section	MAP Entry	MICFL
BA01 to BA07	Errors common to all routines.			MICRO 100		
BA0F	Unable to determine state. State not 0 through 7. State latches probably changed while comparing. Reload routine.					710
BA11	HDA Sequence stopped in State 1. Conditions are correct to advance to next state.			HDA 210	A	710
BA12	HDA Sequence error in State 1. (Invalid status.) Inhibit HDA Recycle latch should not be on in State 1.			HDA 340	A	710
BA13	State 1 HDA Sequence error initial status is incorrect. Mode Parity Check is active. Format (Fmt) Mode Parity error.	2 3 4 5	Bus In under Sense Status 1 Tag '8F' Bus '83' Bus In under Sense Status 2 Tag '8F' Bus '43' Bus In under Sense Status 3 Tag '8F' Bus '23' Bus In under Sense Status 4 Tag '8F' Bus '13'	HDA 300	A	710
BA14	State 1 HDA Sequence error initial status is incorrect. Air switch is not active. Air indicator bit is not active.			HDA 330	B	710
BA15	State 1 HDA Sequence error initial status is incorrect. (Invalid status.) Motor At Speed is active. This is incorrect in State 1.			HDA 310	A	710
BA16	Initial status is good. Status of the HDA Sequence is correct to advance to State 3. Suspect the HDA Sequence Check latch.			HDA 340	A	710

Error Code	Error Description	CE Panel Lamp Display Byte	CE Panel Lamp Display Description	MAP Section	MAP Entry	MICFL
BA21	HDA Sequence stopped in State 2. Suspect Rezero Complete failure.	2	Bus In under Sense Status 1 Tag '8F' Bus '83'	HDA 230	A	710
BA22	HDA Sequence error in State 2. (Invalid status.)	3 4 5	Bus In under Sense Status 2 Tag '8F' Bus '43' Bus In under Sense Status 3 Tag '8F' Bus '23' Bus In under Sense Status 4 Tag '8F' Bus '13'	HDA 340	A	710

Error Code	Error Description	CE Panel Lamp Display Byte	CE Panel Lamp Display Description	MAP Section	MAP Entry	MICFL
BA31	HDA Sequence stopped in State 3. (Invalid Status.) Suspect that the 15 Second Timer is faulty.	2	Bus In under Sense Status 1 Tag '8F' Bus '83'	**HDA 222**	**A**	710
		3	Bus In under Sense Status 2 Tag '8F' Bus '43'			
		4	Bus In under Sense Status 3 Tag '8F' Bus '23'			
		5	Bus In under Sense Status 4 Tag '8F' Bus '13'			

Error Code	Error Description	CE Panel Lamp Display Byte	CE Panel Lamp Display Description	MAP Section	MAP Entry	MICFL
BA41	HDA Sequence stopped in State 4. (Invalid Status.) Suspect that the 15 Second Timer failed to turn off.	2	Bus In under Sense Status 1 Tag '8F' Bus '83'	**HDA 270**	**A**	710
		3	Bus In under Sense Status 2 Tag '8F' Bus '43'			
		4	Bus In under Sense Status 3 Tag '8F' Bus '23'			
		5	Bus In under Sense Status 4 Tag '8F' Bus '13'			

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Error Code	Error Description	CE Panel Lamp Display Byte	Description	MAP Section	Entry	MICFL
BA51	HDA Sequence stopped in State 5. (Invalid Status.) Suspect that the 15 Second Timer is faulty.	2	Bus In under Sense Status 1 Tag '8F' Bus '83'	**HDA 280**	**A**	710
		3	Bus In under Sense Status 2 Tag '8F' Bus '43'			
		4	Bus In under Sense Status 3 Tag '8F' Bus '23'			
		5	Bus In under Sense Status 4 Tag '8F' Bus '13'			

Error Code	Error Description	CE Panel Lamp Display Byte	CE Panel Lamp Display Description	MAP Section	MAP Entry	MICFL
BA60	Normal HDA Sequence status for Ready condition in State 6. This is the normal State 6 (Ready) and track following condition.	2	Bus In under Sense Status 1 Tag '8F' Bus '83'	**HDA 100**	**B**	710
BA61	State 6 HDA Sequence error. Inhibit HDA Recycle and/or HDA Sequence Check latch is active. (Invalid status.) Inhibit HDA Recycle or HDA Sequence Error latch should not be on in State 6 (Ready).	3	Bus In under Sense Status 2 Tag '8F' Bus '43'	**HDA 340**	**A**	710
		4	Bus In under Sense Status 3 Tag '8F' Bus '23'			
BA62	State 6 HDA Sequence error. (Incorrect access status.) HDA Sequence is in State 6 (Ready), but the access status is incorrect.	5	Bus In under Sense Status 4 Tag '8F' Bus '13'	**HDA 100**	**C**	710

Error Code	Error Description	Byte	CE Panel Lamp Display Description	MAP Section	MAP Entry	MICFL
BA71	State 7 HDA Sequence error. HDA Sequence Check latch (Invalid status.) Suspect Carriage Go Home problem.	2	Bus In under Sense Status 1 Tag '8F' Bus '83'	**HDA 250**	**A**	710
		3	Bus In under Sense Status 2 Tag '8F' Bus '43'			
		4	Bus In under Sense Status 3 Tag '8F' Bus '23'			
		5	Bus In under Sense Status 4 Tag '8F' Bus '13'			

Error Code	Error Description	CE Panel Lamp Display Byte	CE Panel Lamp Display Description	MAP Section	MAP Entry	MICFL
BA81	HDA Sequence error in State 0. (Invalid status.) HDA Sequence Check should not be on in State 0.			**HDA 340**	**A**	710
BA83	HDA Sequence stopped in State 0. Drive Start/Stop switch is not in the Start position. Drive Start/Stop latch is off.			**Drive A, HDA 201** **Drive B, HDA 202**	**A** **A**	710
BA86	HDA Sequence stopped in State 0. All Interlocks are correct. HDA Sequence locked in State 0. Conditions are correct to advance to next state.	2	Bus In under Sense Status 1 Tag '8F' Bus '83'	**Drive A, HDA 201** **Drive B, HDA 202**	**A** **A**	710
BA87	HDA Sequence error in State 0. Interlock failure in State 6 (Ready). Mode Parity Check is active. Format (Fmt) Mode Parity error occurred in State 6.	3 4	Bus In under Sense Status 2 Tag '8F' Bus '43' Bus In under Sense Status 3 Tag '8F' Bus '23'	**HDA 300**	**A**	710
BA88	HDA Sequence error in State 0. Interlock failure in State 6 (Ready). Motor At Speed latch is not active. Lost Motor At Speed in State 6 (Ready).	5	Bus In under Sense Status 4 Tag '8F' Bus '13'	**HDA 313**	**A**	710
BA89	HDA Sequence error in State 0. Interlock failure in State 6 (Ready). Air switch is not active. Lost Air in State 6 (Ready).			**HDA 330**	**A**	710
BA8A	HDA Sequence error in State 0. Inhibit HDA Recycle latch is active. (Invalid status.) Error indication received but initial status is good. Suspect Power On Reset.			**HDA 340**	**A**	710

Error Code	Error Description	CE Panel Lamp Display Byte	CE Panel Lamp Display Description	MAP Section	MAP Entry	MICFL
BA91	HDA Sequence is in State 0 and indicates a Format Mode Check occurred in State 3.			**HDA 300**	**A**	710
BA92	HDA Sequence is in State 0 and indicates Motor At Speed did not become active in State 3.	2	Bus In under Sense Status 1 Tag '8F' Bus '83'	**HDA 313**	**B**	710
BA93	HDA Sequence is in State 0 and indicates an Air switch failure occurred in State 3.	3 4	Bus In under Sense Status 2 Tag '8F' Bus '43' Bus In under Sense Status 3 Tag '8F' Bus '23'	**HDA 330**	**A**	710
BA94	HDA Sequence is in State 0 and indicates a Start/Stop switch failure occurred in State 3.	5	Bus In under Sense Status 4 Tag '8F' Bus '13'	**Drive A, HDA 201** **Drive B, HDA 202**	**A** **A**	710
BA95	HDA Sequence is in State 0. No error condition is indicated. The original error occurred in State 3. Suspect a faulty timer.			HDA 220	**A**	710

Error Code	Error Description	CE Panel Lamp Display Byte	CE Panel Lamp Display Description	MAP Section	MAP Entry	MICFL
BB01 to BB07	Errors common to all routines.			MICRO 100		740
BB08	Failed to detect Busy after a Rezero.	2	Bus In under Read Status Tag '84' Bus '00' Expected xxxx xx1x	ACC 210	C	740
BB09	Failed to detect Busy after a Seek.	2	Bus In under Read Status Tag '84' Bus '00' Expected xxxx xx1x	ACC 210	C	740
BB0A	Incorrect status following a Rezero. Expected Busy and Drive Check to be inactive, and Seek Complete to be active. Exit to ACC 301, Entry B if routine BB continues to halt with this Error Code.	2	Bus In under Read Status Tag '84' Bus '00' Expected xx0x xx01			740
BB0B	Incorrect status following a Seek.	2	Bus In under Read Status Tag '84' Bus '00' Expected xx0x xx01	ACC 540	B	740
BB0C	Error Alert detected after a Seek or transfer of data.			DATA 628	A	740
BB10	Failed to orient on Index within 25 milliseconds. Run routine A5 (Index and Sector test).					740
BB12	Pad In Progress is on before a Write G3.	2	Bus In under Read Status Tag '84' Bus '00' Expected xxxx x0xx	R/W 210	A	740
BB13	Pad In Progress is off after a Write G3.	2	Bus In under Read Status Tag '84' Bus '00' Expected xxxx x1xx	R/W 210	B	740
BB15	Error Alert detected during a Pad operation. Run routine B3. Display the Fault Symptom Code and refer to the FSI.					740

Error Code	Error Description	CE Panel Lamp Display Byte	CE Panel Lamp Display Description	MAP Section	MAP Entry	MICFL
BB16	Pad Complete not received. Index was passed.	2	Bus In under Read Status Tag '84' Bus '00' Expected xxxx xxx1	R/W 214	A	740
BB17	Failed to detect Pad Complete Attention.	2	Bus In under Poll Device Tag '82' Bus 'X4' (X = Controller Address) Expected 1xxx xxxx	R/W 214	C	740
BB1A	Pad Complete not reset after an Attention Reset.	2	Bus In under Read Status Tag '84' Bus '00' Expected xxxx xxx0	R/W 214	B	740

Error Code	Error Description	CE Panel Lamp Display Byte	CE Panel Lamp Display Description	MAP Section	MAP Entry	MICFL
BB20	Failed to receive Index Alert within 25 milliseconds.			**RPI 160**	**C**	740
BB21	Failed to receive Index Field within 17.2 milliseconds.	2	Bus In under Sense Status (Reorient Counter) Tag '04' Bus '04' Expected xxxx x1xx	**DATA 316**	**A**	740
BB22	Failed to receive Address Mark within 17.2 milliseconds.	2	Bus In under Sense Status (Reorient Counter) Tag '04' Bus '04' Expected xxxx xx1x	**DATA 316**	**A**	740
BB23	Index Field started early with respect to the Index.			**DATA 314**	**A**	740
BB24	Index Field started late with respect to the Index.			**DATA 314**	**A**	740
BB25	Address Mark Field was longer than 122 microseconds.			**DATA 312**	**A**	740
BB26	Address Mark Field was shorter than 112 microseconds.			**DATA 312**	**A**	740
BB27	Address Mark Field started late with respect to the Index.	2	Bus In under Sense Status (Reorient Counter) Tag '04' Bus '04' Expected xxxx xx1x	**DATA 310**	**A**	740
BB28	Reorient Counter Check failed to turn on when forced.	2	Bus In under Sense Status (Reorient Counter) Tag '04' Bus '01' Expected xxxx xxx1	**DATA 308**	**A**	740
BB29	Reorient Counter Check failed to reset after being forced.	2	Bus In under Sense Status (Controller Error 1) Tag '04' Bus '01' Expected xxxx xxx0	**DATA 308**	**B**	740

Error Code	Error Description	CE Panel Lamp Display Byte	CE Panel Lamp Display Description	MAP Section	MAP Entry	MICFL
BB31	TR Used Counter high is not equal to '00' after an initial Read HA in Native Mode.	2	Bus In under Sense Status (TR Used Counter high) Tag '04' Bus '20' Expected 0000 0000	**DATA 330**	**A**	740
BB32	TR Used Counter low is not equal to '00' after an initial Read HA in Native Mode.	2	Bus In under Sense Status (TR Used Counter low) Tag '04' Bus '08' Expected 0000 0000	**DATA 330**	**A**	740
BB33	TR Used Counter high is not equal to '00' after an initial Read HA in 3330 Compatibility Mode.	2	Bus In under Sense Status (TR Used Counter high) Tag '04' Bus '20' Expected 0000 0000	**DATA 328**	**A**	740
BB34	TR Used Counter low is not equal to '00' after an initial Read HA in 3330 Compatibility Mode.	2	Bus In under Sense Status (TR Used Counter low) Tag '04' Bus '08' Expected 0000 0000	**DATA 328**	**A**	740
BB41	TR Used Counter high is not equal to '00' after being loaded from a data pattern on a track.	2	Bus In under Sense Status (TR Used Counter high) Tag '04' Bus '20' Expected 0000 0000	**DATA 340**	**B**	740
BB42	TR Used Counter low is not equal to '00' after being loaded from a data pattern on a track.	2	Bus In under Sense Status (TR Used Counter low) Tag '04' Bus '08' Expected 0000 0000	**DATA 340**	**B**	740

Error Code	Error Description	CE Panel Lamp Display Byte	CE Panel Lamp Display Description	MAP Section	MAP Entry	MICFL
BB51	TR Used Counter high is not equal to 'FE' after being loaded from a data pattern on a track.	2	Bus In under Sense Status (TR Used Counter high) Tag '04' Bus '20' Expected 1111 1110	DATA 340	A	740
BB52	TR Used Counter low is not equal to 'FE' after being loaded from a data pattern on a track.	2	Bus In under Sense Status (TR Used Counter low) Tag '04' Bus '08' Expected 1111 1110	DATA 340	A	740
BB61	TR Used Counter Check is not active after being forced.	2	Bus In under Sense Status (Controller Error 1) Tag '04' Bus '01' Expected xxxx xx1x	DATA 350	A	740
BB62	Controller Check is not active after being forced by TR Used Counter Check.	2	Bus In under Read Status Tag '84' Bus '00' Expected 1xxx xxxx	DATA 348	A	740
BB63	TR Used Counter Check failed to reset after a Controller Reset.	2	Bus In under Sense Status (Controller Error 1) Tag '04' Bus '01' Expected xxxx xx0x	DATA 350	A	740
BB64	Controller Check failed to reset after a Controller Reset.	2	Bus In under Read Status Tag '84' Bus '00' Expected 0xxx xxxx	DATA 350	A	740
BB71	TR Used Counter high not equal to expected value following a Read G3. (Pattern = '3F0E')	2	Bus In under Sense Status (TR Used Counter high) Tag '04' Bus '20' Expected 0111 1110	DATA 360	A	740
BB72	TR Used Counter low not equal to expected value following a Read G3. (Pattern = '3F0E')	2	Bus In under Sense Status (TR Used Counter low) Tag '04' Bus '08' Expected 1000 1000	DATA 360	A	740

Error Code	Error Description	CE Panel Lamp Display Byte	CE Panel Lamp Display Description	MAP Section	MAP Entry	MICFL
BB81	TR Used Counter high not equal to expected value following a Read G3. (Pattern = '40F0')	2	Bus In under Sense Status (TR Used Counter High) Tag '04' Bus '20' Expected 1000 0010	DATA 360	A	740
BB82	TR Used Counter low not equal to expected value following a Read G3. (Pattern = '40F0')	2	Bus In under Sense Status (TR Used Counter low) Tag '04' Bus '08' Expected 0110 1010	DATA 360	A	740
BB91	Track Overrun error not active after being forced.	2	Bus In under Sense Status Tag '04' Bus '00' Expected xxx1 xxxx	DATA 380	A	740
BB92	Check End not active after forcing Track Overrun error.			DATA 382	A	740
BB93	Byte counter decremented to zero prior to receiving any End Condition during a Write G2. (13,300 bytes of data.)			DATA 380	B	740
BB94	Residual byte count greater than expected following a Write G2. End Condition was received. (13,300 bytes of data.)			DATA 386	A	740
BB95	Residual byte count less than expected following a Write G2. End Condition was received. (13,300 bytes of data.)			DATA 386	A	740
BB96	Index Alert not received following a Write G2 when the byte count exceeds the track capacity in 3330 Compatibility Mode. (13,300 bytes of data.)			DATA 384	A	740

Error Code	Error Description	CE Panel Lamp Display Byte	CE Panel Lamp Display Description	MAP Section	MAP Entry	MICFL
BBB0	Drive has Mode Control jumper wired and no FE parameter was entered, or the drive has no Mode Control jumper wired and an FE parameter was entered. Parameters are: 01 = 3350 Mode 02 = 3330-1 Compatibility Mode 03 = 3330-11 Compatibility Mode	2	Bus In under Sense Status 1 Tag '8F' Bus '83' Expected 0000 00xx	**DEV-I 280**	**A**	740
BBB1	An 01 parameter was entered and the drive is not wired for the 3350 Mode.	2	Bus In under Sense Status 1 Tag '8F' Bus '83' Expected 0000 0001	**DEV-I 280**	**B**	740
BBB2	An 02 parameter was entered and the drive is not wired for the 3330-1 Compatibility Mode.	2	Bus In under Sense Status 1 Tag '8F' Bus '83' Expected 0000 0010	**DEV-I 280**	**C**	740
BBB3	An 03 parameter was entered and the drive is not wired for the 3330-11 Compatibility Mode.	2	Bus In under Sense Status 1 Tag '8F' Bus '83' Expected 0000 0011	**DEV-I 280**	**D**	740

Error Code	Error Description	CE Panel Lamp Display Byte	CE Panel Lamp Display Description	MAP Section	MAP Entry	MICFL
BBF1	Access is not on the CE cylinder. The Home Address PA Bytes read do not equal the expected bytes. Restart routine BB.	2 3 4	Not Used Not Used Operation number. See MICRO 628 for details.			740
BBFA	Error Alert was received following a transfer of data.	2 3 4	Not Used Not Used Operation number. See MICRO 628 for details.	**DATA 318**	**A**	740
BBFB	Check End is active following a transfer of data.	2 3 4	Bus In under Check End Not Used Operation number. See MICRO 628 for details.	**CTL-I 630**	**A**	740
BBFC	Failed to receive any End status following a transfer of data.	2 3 4	Not Used Not Used Operation number. See MICRO 628 for details.	**CTL-I 280**	**A**	740

DETAIL OF OPERATION NUMBER FOR BBxx ERRORS

OPERATION

This page defines the operations that occur during each test of routine BB.

The cross reference of Operation Description and Operation Number is found in Figure 1.

Example: Test 5 (4 operations)

Operation Description	Operation Number
RD G1	51
WR G3	52
RD G1	53
RD G3	54

Displayed in Byte 4 of the Error Message Display

ERROR CODES (GENERAL)

Any and all tests of this routine may have associated with it some unique error numbers. There are four common error numbers which are shared with all tests of the routine:

BBF1,BBFA,BBFB, & BBFC

In order to further identify the failure causing the common errors, a unique operation number has been assigned to each Read/Write operation performed in each test of the routine.

This operation number will be found in Byte 4 of the error display.

Figure 1.

Bytes from Message Display 1	4			
Error Code	Operation		Tag	Bus
	Number	Description		
BB1X	11	RD G1	'0E'	'4E'
	12	FM G3	'0F'	'51'
BB2X	21	RD G1	'0E'	'4E'
	22	RD G1	'0E'	'4E'
	23	FM G3	'0F'	'51'
BB3X 3330 Compatibility Mode	31	RD G1	'0E'	'4E'
BB3X Native Mode	31	RD G1	'0E'	'4E'
	32	FM G3	'0F'	'5A'
BB4X	41	RD G1	'0E'	'4C'
	42	FM G3	'0F'	'XX'
	43	RD G1	'0E'	'4C'
	44	RD G3	'0E'	'XX'
BB5X	51	RD G1	'0E'	'4E'
	52	FM G3	'0F'	'5A'
	53	RD G1	'0E'	'4E'
	54	RD G3	'0E'	'51'
BB6X	61	RD G1	'0E'	'4E'
	62	FM G3	'0F'	'5A'
	63	RD G1	'0E'	'4E'
	64	RD G3	'0E'	'51'
BB7X	71	RD G1	'0E'	'4E'
	72	FM G3	'0F'	'5A'
	73	RD G1	'0E'	'4E'
	74	RD G3	'0E'	'51'
	75	FM G3	'0F'	'51'
	76	RD G1	'0E'	'4E'
	77	RD G3	'0E'	'51'
	78	RD G3	'0E'	'51'
BB8X	81	RD G1	'0E'	'4E'
	82	FM G3	'0F'	'5A'
	83	RD G1	'0E'	'4E'
	84	RD G3	'0E'	'51'
	85	FM G3	'0F'	'51'
	86	RD G3	'0E'	'4E'
	87	RD G3	'0E'	'51'
	88	RD G3	'0E'	'51'
BB9X	91	RD G1	'0E'	'4E'
	92	FM G2	'0F'	'60'
BBAX	A1	RD G1	'0E'	'4E'
	A2	FM G2	'0F'	'62'
	A3	FM G2	'0F'	'68'
	A4	RD G1	'0E'	'4E'
	A5	RD G2	'0E'	'62'
	A6	RD G2	'0E'	'68'

Track overrun for 3330 Compatibility mode = 13,300 bytes

Comments

All operations use Head 01 (HAR = '02').

MICRODIAGNOSTIC ERROR CODE DICTIONARY

Error Code	Error Description	CE Panel Lamp Display Byte	CE Panel Lamp Display Description	MAP Section	MAP Entry	MICFL
BC00	Lost synchronization between the master and the slave. (Restart test.)					
BC01	Invalid test number entered (only test 1 is valid – restart test).					
BC02	Online status not present.	2	Drive Status Byte Expected XXXX 1XXX	DEV-I 410	C	

Note: *BC errors are valid only if the UR hardware EC 446707 is installed. Do not use microdiagnostic routine BC until EC 446707 is installed.*

BC test 1 error stops have the following range:
BC00 to BC20.

Error Code	Error Description	Byte	CE Panel Lamp Display Description	MAP Section	MAP Entry	MICFL
BC 11	Master could not reset one or more Slave Assignment Register bits. **Note:** *This error is valid only if the UR hardware EC 446707 is installed (See Note).*	2	Failing position of the Assignment Register. (Ones indicate failure.)	CTL-I-886	A	770
BC 12	Slave could not reset one or more master Assignment Register bits.	2	Failing position of the Assignment Register. (Ones indicate failure.)	CTL-I 886	B	770
BC 13	Neither interface can reset Assignment Register bits on the other interface.	2	Failing position of the Assignment register. (Ones indicate failure.)	CTL-I 886	C	770
BC 15	Master received Index Alert during Selection (Tag '83') after the Slave issued a tag to force string switch to neutral.		Not Used	CTL-I 888	A	770
BC 16	Slave received Index Alert during Selection (Tag '83') after the master issued a tag to force string switch to neutral.			CTL-I-888	B	770
BC 17	Both interfaces received Index Alert during Selection (Tag '83').			CTL-I-888	C	770
BC 19	Master failed to get full selection after slave tried to force string switch to neutral.			CTL-I-888	A	770
BC 1A	Slave failed to get full selection after master tried to force string switch to neutral.			CTL-I-888	B	770
BC 1B	Neither interface could get full selection.			CTL-I-888	C	770
BC 1D	No response from master.			CTL-I-888	A	770
BC 1E	No response from slave.			CTL-I-888	B	770
BC 1F	No response from either interface.			CTL-I-888	C	770
BC 20	Slave did not get a partial selection from Tag '83' when the master had a long Connection Set. Partial Selection = Bus In bit 3.		Not Used	CTL-I-850	B	770

Error Code	Error Description	CE Panel Lamp Display Byte	CE Panel Lamp Display Description	MAP Section	MAP Entry	MICFL
BD01 to BD07	Errors common to all routines.			**MICRO 100**		
BD11	Following a Rezero or long Seek, Seek Complete was not received, Drive Check was not received, and Busy is now inactive.	2 3 4	Bus In under Read Status Tag '84' Bus '00' Expected xx0x xx01 See Note See Note	**ACC 301**	**B**	810
BD12	Failed to receive Busy following a Seek Start.	2 3 4	Bus In under Read Status Tag '84' Bus '00' Expected xxxx xx1x See Note See Note	**ACC 210**	**C**	810
BD13	Failed to receive Access Status following a Seek Start.	2 3 4	Bus In under Sense Status 4 Tag '8F' Bus '13' Expected 0000 1100 See Note See Note	**ACC 510**	**A**	810
BD14	Failed to receive the proper Access Status after 'nn' micro-seconds following a Seek Start.	2 3 4	Bus In under Sense Status 4 Tag '8F' Bus '13' Expected 0000 1110 See Note See Note	**ACC 660**	**A**	810
BD15	Received Read/Write Check, Drive Check, and Servo Off-Track errors.	2 3 4	Not Used See Note See Note	**ACC 660**	**A**	810
BD16	Received Read/Write Check, Drive Check, and not Servo Off-Track errors.	2 3 4	Not Used See Note See Note	**ACC 660**	**A**	810
	Note:	3 & 4	*Delay value currently in Use Counter. Value is in microseconds.* *The seek length is constant. Default = 07 or CE parameter 2 = xx (01 through 255).*			

Error Code	Error Description	CE Panel Lamp Display Byte	CE Panel Lamp Display Description	MAP Section	MAP Entry	MICFL
BF10	Interface test card malfunctioned.					
BF12	Open inbound line.		Refer to Figure 1 for Error Message Bytes 2 and 3.	CTL-I 30	A	860
BF13	Faulty outbound line.		Refer to Figure 2 for Error Message Bytes 2 and 3.	CTL-I 40	A	860
BF14	Open Bus cable.			CTL-I 50	A	860
BF15	Open Tag cable.			CTL-I 50	A	860
BF16	Reversed Tag/Bus cables.			CTL-I 50	B	860

Figure 1. Inbound Lines

Both Error Message Bytes 2 and 3 are used to display the failing lines. Bit on indicates failing line.

Bit	Line Name
0	Bus In 0
1	Bus In 1
2	Bus In 2
3	Bus In 3
4	Bus In 4
5	Bus In 5
6	Bus In 6
7	Bus In 7
8	Error Alert
9	Select Active
10	Sync In
11	CE Alert
12	Normal End
13	Check End
14	Tag Valid
15	Index

Figure 2. Outbound Lines

Both Error Message Bytes 2 and 3 are used to display the failing lines. Bit on indicates failing line.

Bit	Line Name
0	Bus Out 0
1	Bus Out 1
2	Bus Out 2
3	Bus Out 3
4	Bus Out 4
5	Bus Out 5
6	Bus Out 6
7	Bus Out 7
8	Tag Bus 6
9	Select Hold
10	Tag Bus 0
11	Tag Bus P
12	Tag Bus 4
13	Tag Bus 5 – or Recycle
14	Tag Gate
15	Tag Bus 7

Error Code	Error Description	CE Panel Lamp Display Byte	CE Panel Lamp Display Description	MAP Section	MAP Entry	MICFL
BF20	Open outbound line.		Refer to Figure 2 for Error Message Bytes 2 and 3.	CTL-I 60	A	860
BF21	Open inbound line.		Refer to Figure 1 for Error Message Bytes 2 and 3.	CTL-I 30	B	860
BF24	Faulty inbound line.		Refer to Figure 1 for Error Message Bytes 2 and 3.	CTL-I 70	A	860
BF28	Shorted lines.		Refer to Figure 1 for Error Message Bytes 2 and 3.	CTL-I 80	A	860
BF31	Open Sync Out or faulty Response line.			CTL-I 90	A	860
BF32	Open Response or faulty Sync Out line.			CTL-I 90	B	860
BF33	Open Recycle line.			CTL-I 20	A	860