

3 125

3 115

NATIVE I/O
REFERENCE
CARD

**Command, Status and Sense Information
for natively attached I/O's.**

For details refer to Functional Characteristics:

GA 33 - 1506 for 3125,

GA 33 - 1510 for 3115.

Supplement to /370 Reference Summary Card GX 20-1850.

NOTE: Additional copies of this card can be
obtained from CE Information Department 7902
P.O. Box 800 880, 7000 Stuttgart 80, Germany.

3125

3115

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REFERENCE
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For details refer to Functional Characteristics:

- GA 33 - 1506 for 3125,
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CONSOLE PRINTER

Hex	Command Code								Command
	CCW Bits								
	0	1	2	3	4	5	6	7	
01	0	0	0	0	0	0	0	1	Write inhibit carrier return
09	0	0	0	0	1	0	0	1	Write auto carrier return
0A	0	0	0	0	1	0	1	0	Read inquiry
03	0	0	0	0	0	0	1	1	Control no-op
0B	0	0	0	0	1	0	1	1	Control alarm
04	0	0	0	0	0	1	0	0	Sense

Unit Status

Bit	Designation
32	Attention
33	Status modifier
34	Control unit end
35	Busy
36	Channel end
37	Device end
38	Unit check
39	Unit exception

Channel Status

Bit	Designation
40	Program-controlled interruption
41	Incorrect length
42	Program check
43	Protection check
44	Channel data check (not used)
45	Channel control check (not used)
46	Interface control check (not used)
47	Chaining control check (not used)

Sense Byte 0

Bit	Designation
0	Command reject
1	Intervention required
2	(Not used)
3	Equipment check
4	(Not used)
5	(Not used)
6	(Not used)
7	(Not used)

VIDEO DISPLAY

Hex	Command Code								Command
	CCW Bits								
	0	1	2	3	4	5	6	7	
01	0	0	0	0	0	0	0	1	Write
05	0	0	0	0	0	1	0	1	Erase/write
0F	0	0	0	0	1	1	1	1	Erase all unprotected
06	0	0	0	0	0	1	1	0	Read modified
04	0	0	0	0	0	1	0	0	Sense
03	0	0	0	0	0	0	1	1	Control no-op

Unit Status

Bit	Designation
32	Attention
33	Status modifier
34	Control unit end
35	Busy
36	Channel end
37	Device end
38	Unit check
39	Unit exception

Channel Status

Bit	Designation
40	Program-controlled interruption
41	Incorrect length
42	Program check
43	Protection check
44	Channel data check
45	Channel control check
46	Interface control check
47	Chaining check (not used)

Sense Byte 0

Bit	Designation
0	Command reject
1	Intervention required
2	(Not used)
3	(Not used)
4	(Not used)
5	(Not used)
6	(Not used)
7	Operation check

1403 PRINTER

Hex	Command Code CCW Bits							Command	
	0	1	2	3	4	5	6		7
01	0	0	0	0	0	0	0	1	Write and no space after printing
09	0	0	0	0	1	0	0	1	Write and space 1 line after printing
11	0	0	0	1	0	0	0	1	Write and space 2 lines after printing
19	0	0	0	1	1	0	0	1	Write and space 3 lines after printing
89	1	0	0	0	1	0	0	1	Write and skip to channel 1 after printing
91	1	0	0	1	0	0	0	1	Write and skip to channel 2 after printing
99	1	0	0	1	1	0	0	1	Write and skip to channel 3 after printing
A1	1	0	1	0	0	0	0	1	Write and skip to channel 4 after printing
A9	1	0	1	0	1	0	0	1	Write and skip to channel 5 after printing
B1	1	0	1	1	0	0	0	1	Write and skip to channel 6 after printing
B9	1	0	1	1	1	0	0	1	Write and skip to channel 7 after printing
C1	1	1	0	0	0	0	0	1	Write and skip to channel 8 after printing
C9	1	1	0	0	1	0	0	1	Write and skip to channel 9 after printing
D1	1	1	0	1	0	0	0	1	Write and skip to channel 10 after printing
D9	1	1	0	1	1	0	0	1	Write and skip to channel 11 after printing
E1	1	1	1	0	0	0	0	1	Write and skip to channel 12 after printing
0B	0	0	0	0	1	0	1	1	Space 1 line immediately
13	0	0	0	1	0	0	1	1	Space 2 lines immediately
1B	0	0	0	1	1	0	1	1	Space 3 lines immediately
8B	1	0	0	0	1	0	1	1	Skip to channel 1 immediately
93	1	0	0	1	0	0	1	1	Skip to channel 2 immediately
9B	1	0	0	1	1	0	1	1	Skip to channel 3 immediately
A3	1	0	1	0	0	0	1	1	Skip to channel 4 immediately
AB	1	0	1	0	1	0	1	1	Skip to channel 5 immediately
B3	1	0	1	1	0	0	1	1	Skip to channel 6 immediately
BB	1	0	1	1	1	0	1	1	Skip to channel 7 immediately
C3	1	1	0	0	0	0	1	1	Skip to channel 8 immediately
CB	1	1	0	0	1	0	1	1	Skip to channel 9 immediately
D3	1	1	0	1	0	0	1	1	Skip to channel 10 immediately
DB	1	1	0	1	1	0	1	1	Skip to channel 11 immediately
E3	1	1	1	0	0	0	1	1	Skip to channel 12 immediately

Notes:

- If a skip immediately command orders the carriage to advance the form to a channel at which the form is located at the time the command is given, carriage movement depends on the preceding command as follows:
 - If the preceding command was a command that caused carriage movement (such as a write and space, write and skip, space immediately or skip immediately) then the present skip immediately is accepted but the carriage does *not* move.
 - If the preceding command did not include a carriage operation (such as write without space, or load UCS buffer command), the form is advanced from the present channel until that channel is detected the next time.
- If a skip command specifies a channel which is not punched in the carriage control tape, a carriage runaway occurs.

UCS Commands

Hex	Command Code CCW Bits							Command	
	0	1	2	3	4	5	6		7
EB	1	1	1	0	1	0	1	1	Gate load operation
F3	1	1	1	1	0	0	1	1	Load UCS buffer and fold
FB	1	1	1	1	1	0	1	1	Load UCS buffer and no fold
7B	0	1	1	1	1	0	1	1	Allow data check
73	0	1	1	1	0	0	1	1	Block data check

Unit Status

Bit Designation

- 32 Attention (not used)
- 33 Status modifier (not used)
- 34 Control unit end (not used)
- 35 Busy
- 36 Channel end
- 37 Device end
- 38 Unit check
- 39 Unit exception

Channel Status

Bit Designation

- 40 Program-controlled interruption
- 41 Incorrect length
- 42 Program check
- 43 Protection check
- 44 Channel data check
- 45 Channel control check
- 46 Interface control check (not used)
- 47 Chaining check (not used)

Sense Byte 0

Bit	Designation
0	Command reject
1	Intervention required
2	Bus out check (not used)
3	Equipment check
4	Data check
5	Chain buffer parity check
6	(Not used)
7	Channel 9

Sense Byte 1

Sense byte 1 is not used, and contains all zeros.

Sense Byte 2

Bit	Designation
0	Chain interlock
1	Forms check
2	Coil protect check
3	Subscan ring check
4	Chain buffer address register check
5	(Not used)
6	Any hammer on check
7	(Not used)

Sense Byte 3

Sense byte 3 is not used, and contains all zeros.

Sense Byte 4

Bit	Designation
0	Hammer reset failure check
1	No fire check
2	Misfire check
3	Print data buffer parity check
4	Check bit buffer parity check
5	Chain buffer parity check
6	Buffer address register parity check
7	Clock check

Sense Byte 5

Bit	Designation
0	Open hammer coil check
1 to 7	(Not used)

3203 PRINTER

3203 Write Commands

Hex	Command Code							Command	
	CCW Bits								
	0	1	2	3	4	5	6	7	
01	0	0	0	0	0	0	0	1	Write without spacing
09	0	0	0	0	1	0	0	1	Write and space 1 after printing
11	0	0	0	1	0	0	0	1	Write and space 2 after printing
19	0	0	0	1	1	0	0	1	Write and space 3 after printing
89	1	0	0	0	1	0	0	1	Write and skip to channel 1 after printing
91	1	0	0	1	0	0	0	1	Write and skip to channel 2 after printing
99	1	0	0	1	1	0	0	1	Write and skip to channel 3 after printing
A1	1	0	1	0	0	0	0	1	Write and skip to channel 4 after printing
A9	1	0	1	0	1	0	0	1	Write and skip to channel 5 after printing
B1	1	0	1	1	0	0	0	1	Write and skip to channel 6 after printing
B9	1	0	1	1	1	0	0	1	Write and skip to channel 7 after printing
C1	1	1	0	0	0	0	0	1	Write and skip to channel 8 after printing
C9	1	1	0	0	1	0	0	1	Write and skip to channel 9 after printing
D1	1	1	0	1	0	0	0	1	Write and skip to channel 10 after printing
D9	1	1	0	1	1	0	0	1	Write and skip to channel 11 after printing
E1	1	1	1	0	0	0	0	1	Write and skip to channel 12 after printing

Notes:

1. If a write and skip command specifies a channel for which no code exists in the buffer, the carriage does not move and the command ends with unit check set and the no channel found bit (bit 6) set in sense byte 0.
2. If a write and skip command orders the carriage to go to the channel at which it is currently located, the form moves until that channel is detected the next time.

3203 - Carriage Control Space and Skip Commands

Command Code		Command
CCW Bits		
Hex	0 1 2 3 4 5 6 7	
0B	0 0 0 0 1 0 1 1	Space 1
13	0 0 0 1 0 0 1 1	Space 2
1B	0 0 0 1 1 0 1 1	Space 3
8B	1 0 0 0 1 0 1 1	Skip to channel 1
93	1 0 0 1 0 0 1 1	Skip to channel 2
9B	1 0 0 1 1 0 1 1	Skip to channel 3
A3	1 0 1 0 0 0 1 1	Skip to channel 4
AB	1 0 1 0 1 0 1 1	Skip to channel 5
B3	1 0 1 1 0 0 1 1	Skip to channel 6
BB	1 0 1 1 1 0 1 1	Skip to channel 7
C3	1 1 0 0 0 0 1 1	Skip to channel 8
CB	1 1 0 0 1 0 1 1	Skip to channel 9
D3	1 1 0 1 0 0 1 1	Skip to channel 10
DB	1 1 0 1 1 0 1 1	Skip to channel 11
E3	1 1 1 0 0 0 1 1	Skip to channel 12

Notes:

1. If a skip command specifies a channel for which no code exists in the buffer, the carriage does not move and the command ends with unit check set in the CSW and the no channel found bit (bit 6) set in sense byte 0.
2. If a skip command orders the carriage to go to the channel at which it is already located, and the preceding command moved the carriage, the carriage does not move and channel end and device end are presented. If the preceding command was a write without space, the carriage moves until the specified channel is detected next time.

TO DISABLE THE 3203 STACKER:
 JUMPER IN 3203 CABINET
 01A1B5-G4 TO 01A1B5-G5.

3202 - Carriage Control Buffer Byte Codes

Hex	Buffer Byte Code Bits							Meaning	
	0	1	2	3	4	5	6		7
00	0	0	0	0	0	0	0	0	No channel (no punch)
01	0	0	0	0	0	0	0	1	Channel 1
02	0	0	0	0	0	0	1	0	Channel 2
03	0	0	0	0	0	0	1	1	Channel 3
04	0	0	0	0	0	1	0	0	Channel 4
05	0	0	0	0	0	1	0	1	Channel 5
06	0	0	0	0	0	1	1	0	Channel 6
07	0	0	0	0	0	1	1	1	Channel 7
08	0	0	0	0	1	0	0	0	Channel 8
09	0	0	0	0	1	0	0	1	Channel 9
0A	0	0	0	0	1	0	1	0	Channel 10
0B	0	0	0	0	1	0	1	1	Channel 11
0C	0	0	0	0	1	1	0	0	Channel 12
0D..FFX	X	X	X	X	X	X	X	X	End-of-sheet

3203 UCS Commands

Command Code		Command
CCW Bits		
Hex	0 1 2 3 4 5 6 7	
F3	1 1 1 1 0 0 1 1	Load UCS Buffer with folding
FB	1 1 1 1 1 0 1 1	Load UCS without folding
73	0 1 1 1 0 0 1 1	Block data check
7B	0 1 1 1 1 0 1 1	Allow data check

Unit Status

Bit	Designation
32	Attention (not used)
33	Status modifier (not used)
34	Control unit end (not used)
35	Busy
36	Channel end
37	Device end
38	Unit check
39	Unit exception

Channel Status

Bit	Designation
40	Program-controlled interruption
41	Incorrect length
42	Program check
43	Protection check
44	Channel data check
45	Channel control check
46	Interface control check (not used)
47	Chaining check (not used)

Sense Byte 0

Bit	Designation
0	Command reject
1	Intervention required
2	Bus out check (not used)
3	Equipment check
4	Data check
5	Chain buffer parity check
6	No channel found
7	Channel 9

Sense Byte 1

Sense byte 1 is not used.

Sense Byte 2

Bit	Designation
0	Interlock (chain gate open)
1	Forms check (jam)
2	Coil protect check
3	Subscan ring check
4	Chain buffer address register check
5	Hammer unit shift check (applies to 3203 Model I only)
6	Any-hammer-on check
7	Device ready check

Sense Byte 3

Bit	Designation
0	(Not used)
1	(Not used)
2	(Not used)
3	Carriage inhibit check
4	(Not used)
5	(Not used)
6	Step check
7	Move check

Sense Byte 4

Bit	Designation
0	Hammer reset failure check
1	No fire check
2	Misfire check
3	Print data buffer parity check
4	Check bit buffer parity check
5	Chain buffer parity check
6	Buffer address register check
7	Clock check

Sense Byte 5

Bit	Designation
0	Open coil check
1	(Not used)
2	(Not used)
3	(Not used)
4	(Not used)
5	(Not used)
6	(Not used)
7	(Not used)

Hex	Command Code								Command
	CCW Bits								
	0	1	2	3	4	5	6	7	
02	0	0	0	0	0	0	1	0	Read and feed primary
22	0	0	1	0	0	0	1	0	Read column binary and feed primary
82	1	0	0	0	0	0	1	0	Read and feed secondary
A2	1	0	1	0	0	0	1	0	Read column binary and feed secondary
05	0	0	0	0	0	1	0	1	Punch primary
25	0	0	1	0	0	1	0	1	Punch column binary primary
85	1	0	0	0	0	1	0	1	Punch secondary
A5	1	0	1	0	0	1	0	1	Punch column binary secondary
01	0	0	0	0	0	0	0	1	Punch and feed primary
21	0	0	1	0	0	0	0	1	Punch column binary and feed primary
81	1	0	0	0	0	0	0	1	Punch and feed secondary
A1	1	0	1	0	0	0	0	1	Punch column binary and feed secondary
45	0	1	0	0	0	1	0	1	Write card
-7	0	H	H	H	0	1	1	1	Load print head buffer
-3	0	M	M	M	0	0	1	1	Primary stacker select
-3	1	M	M	M	0	0	1	1	Secondary stacker select
-B	X	M	M	M	1	0	1	1	Punch stacker select
04	0	0	0	0	0	1	0	0	Sense
03	0	0	0	0	0	0	1	1	Control no-op

Notes:

1. The 'H' positions represent the binary coded print head buffer number.
2. The 'M' positions represent the binary coded stacker number.
3. The 'X' position in the punch stacker select command may be 0 or 1; the position is ignored.

Unit Status

Bit	Designation
32	Attention (not used)
33	Status modifier (not used)
34	Control unit end (not used)
35	Busy
36	Channel end
37	Device end
38	Unit check
39	Unit exception

Channel Status

Bit	Designation
40	Program-controlled interruption
41	Incorrect length
42	Program check
43	Protection check
44	Channel data check
45	Channel control check
46	Interface control check (not used)
47	Chaining check (not used)

Sense Byte 0

Bit	Designation
0	Command reject
1	Intervention required
2	Bus-out check (not used)
3	Equipment check
4	Data check
5	Feed check/machine check
6	No card available
7	(Not used)

Sense Byte 1

Bit	Designation
0	Cover interlock
1	Jam bar check
2	Corner station check
3	Cell 8 to 9 feed check
4	Print station feed check
5	Punch station feed check
6	Read station feed check
7	Input station feed check

Sense Byte 2

Bit	Designation
0	Secondary select
1	Card in punch station
2	Preprint SC 7 exposed
3	Prepunch SC 5 exposed
4	Prepunch SC 4 exposed
5	Preread SC 3 exposed
6	Preread SC 2 exposed
7	Input station SC 1 exposed

Sense Byte 3

Bit	Designation	
0	primary card 0	} Primary prepunch station
1	binary value 4	
2	binary value 2	
3	binary value 1	
4	secondary card 1	} Secondary prepunch station
5	binary value 4	
6	binary value 2	
7	binary value 1	

Sense Byte 4

Bit	Meaning	Card Location
0	primary (0)/secondary (1)	} Punch or preprint station
1	binary value 4	
2	binary value 2	
3	binary value 1	
4	primary (0)/secondary (1)	} After print station
5	binary value 4	
6	binary value 2	
7	binary value 1	

Sense Byte 5

Bit	Meaning	Card Location
0	primary (0)/secondary (1)	} Corner station (to be stacked)
1	4	
2	2	
3	1	
4	primary (0)/secondary (1)	} Stacker pocket (was just stacked)
5	4	
6	2	
7	1	

Sense Byte 6

Bit	Designation
0	Multi data check
1	Binary value 64
2	Binary value 32
3	Binary value 16
4	Binary value 8
5	Binary value 4
6	Binary value 2
7	Binary value 1

5425 MFCU

Hex	Command Code							Command	
	CCW Bits								
	0	1	2	3	4	5	6		7
04	0	0	0	0	0	1	0	0	Sense
02	0	0	0	0	0	0	1	0	Read and feed primary
82	1	0	0	0	0	0	1	0	Read and feed secondary
22	0	0	1	0	0	0	1	0	Read IPL mode and feed primary
A2	1	0	1	0	0	0	1	0	Read IPL mode and feed secondary
01	0	0	0	0	0	0	0	1	Write punch and feed primary
81	1	0	0	0	0	0	0	1	Write punch and feed secondary
05	0	0	0	0	0	1	0	1	Write punch primary
85	1	0	0	0	0	1	0	1	Write punch secondary
41	0	1	0	0	0	0	0	1	Write print and feed primary
C1	1	1	0	0	0	0	0	1	Write print and feed secondary
45	0	1	0	0	0	1	0	1	Write print primary
C5	1	1	0	0	0	1	0	1	Write print secondary
-	0	M	M	M	0	F	1	1	Control primary
-	1	M	M	M	0	F	1	1	Control secondary
0F	0	0	0	0	1	1	1	1	Set ERP mode
0B	0	0	0	0	1	0	1	1	Reset ERP mode

Notes:

1. The 'F' bit of a 'control primary' or 'control secondary' command represents card feeding. If it is set, the 5425 can perform a feed cycle.
2. The 'M' bits of a 'control primary' or 'control secondary' command represent a binary coded stacker number.

Bit Setting

1	2	3	Meaning
0	0	0	: No-op if F=0, autoselect if F=1
0	0	1	: Stacker 1
0	1	0	: Stacker 2
0	1	1	: Stacker 3
1	0	0	: Stacker 4

All other codes are invalid.

Unit Status

Bit	Designation
32	Attention (not used)
33	Status modifier (not used)
34	Control unit end (not used)
35	Busy
36	Channel end
37	Device end
38	Unit check
39	Unit exception (not used)

Channel Status

Bit	Designation
40	Program-controlled interruption
41	Incorrect length
42	Program check
43	Protection check
44	Channel data check
45	Channel control check
46	Interface control check
47	Chaining check (not used)

Sense Byte 0

Bit	Designation
0	Command reject
1	Intervention required
2	Bus-out check
3	Equipment check
4	Data check
5	Overrun (not used)
6	No card available
7	(Not used)

Sense Byte 1

Bit	Designation
0	Read check
1	Punch check
2	(Not used)
3	Print data check
4	Print clutch check
5	Hopper check
6	Feed check
7	(Not used)

Sense Byte 2

Bit	Designation
0	(Not used)
1	(Not used)
2	Card in primary wait station
3	Card in secondary wait station
4	(Not used)
5	Hopper cycle not complete
6	Card in transport counterbit 2
7	Card in transportcounter bit 1

Sense Byte 3

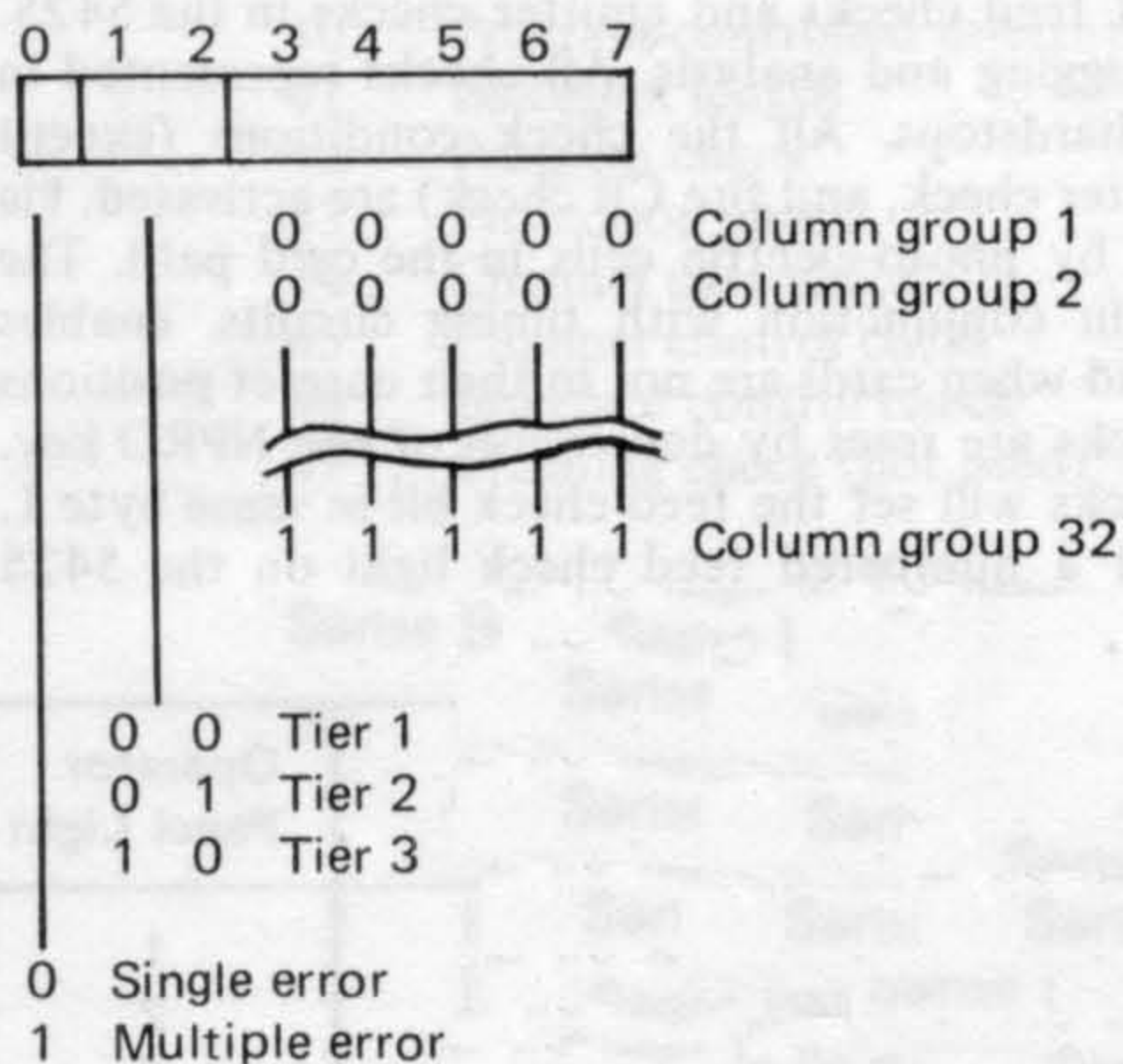
Sense byte 3 contains a hexadecimal number whose value can represent any one of 21 feed checks and emitter checks in the 5425. It is used for error logging and analysis. All checks represented in this byte are 5425 hardstops. All the check conditions (except stacker jam, gear emitter check, and fire CB check) are activated, via a fiber optic bundle, by photo-electric cells in the card path. The state of these cells, in conjunction with timing circuits, enables checks to be recognized when cards are not in their correct positions in the card path. Checks are reset by depression of the NPRO key. Any one of these checks will set the feed check bit in sense byte 1. The checks also light a numbered feed check light on the 5425 operator panel.

Hexadecimal Value of Sense Byte 3	Check Name	Operator Panel Light
01	Hopper eject check	1
02	Read inject check	2
03	Read station check	3
04	Read eject check	4
05	Early wait eject check	5
06	Wait eject check	6
07	Punch inject check	7
08	Punch registration check 1	8
09	Punch station check	9
0A	Punch registration check 2	10
0B	Punch transport check	11
0C	Punch eject check	12
0D	Corner station check	13
0E	Corner eject check	14
0F	Print inject check	15
10	Print station check	16
11	Print eject check	17
12	Stacker transport check	18
13	Stacker jam	19
14	Gear emitter check	20
15	Fire CB check	20

Sense Byte 4

Sense byte 4 defines the card column group and tier where the error was detected which caused the first read check or punch check of a card cycle. If more than one read check or more than one punch check occurs during a card cycle, a multiple check indicator in sense byte 4 will be set. The read check (bit 0) and punch check (bit 1) bits in sense byte 1 show whether sense byte 4 contains read check or punch check information. In the unusual case where a read check and a punch check occur during the same card cycle, bits 0 and 1 will both be set in sense byte 1, which means that the contents of sense byte 4 will be undefined.

Sense Byte 4



Sense Byte 5

Sense byte 5 specifies the row or rows for the tier and column identified in sense byte 4 in which a read check or punch check error occurred. Thus, sense bytes 4 and 5 together define the position of the error which caused the first read check or punch check during a card cycle down to one or more of the 24 read cells or punches or their associated circuits. The bits in sense byte 5 have the following meanings assigned:

Bit	Designation
0	D row miscompare
1	C row miscompare
2	B row miscompare
3	A row miscompare
4	8 row miscompare
5	4 row miscompare
6	2 row miscompare
7	1 row miscompare

Sense Bytes 6, 7, 8, 9 and 10

Sense bytes 6, 7, 8, 9, and 10 form a table for the five most recent command strings. When a new last command string appears in sense byte 6, the previous contents of sense byte 6 are shifted down to sense byte 7, the previous contents of sense byte 7 are shifted down to sense byte 8, and so on. (A command string starts with the first command following any command causing a feed and ends with the next command causing a feed.)

3504 CARD READER

Hex	Command Code							Command	
	CCW Bits								
	0	1	2	3	4	5	6	7	
-	S	S	C	0	F	0	1	0	Read, feed and stacker select
-	1	1	C	0	F	0	1	0	Read only
-	S	S	1	0	F	0	1	1	Feed and stacker select
11	0	0	0	1	0	0	0	1	Write RCE format
31	0	0	1	1	0	0	0	1	Write OMR format
03	0	0	0	0	0	0	1	1	Control no-op
04	0	0	0	0	0	1	0	0	Sense

Notes:

1. The 'S' positions represent the stacker select bits, and are only applicable if the 3504 has the selective stacker feature installed.
2. The 'C' position represents the data code bit. This bit is at zero for EBCDIC; set for card image.
3. The 'F' positions represent the format bits. The format bit is at zero when all card columns are to be read; set for reading in read column eliminate (RCE) or optical mark read (OMR) formats.

Unit Status

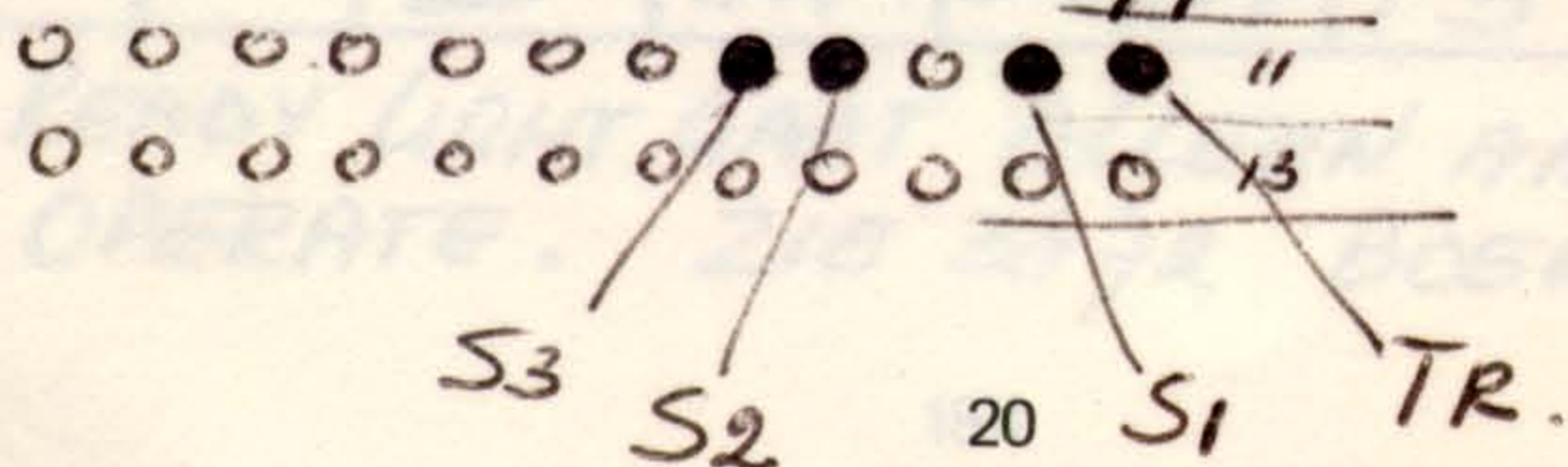
Bit	Designation
32	Attention (not used)
33	Status modifier (not used)
34	Control unit end (not used)
35	Busy
36	Channel end
37	Device end
38	Unit check
39	Unit exception

Channel Status

Bit	Designation
40	Program controlled interruption
41	Incorrect length
42	Program check
43	Protection check
44	Channel data check
45	Channel control check
46	Interface control check (not used)
47	Chaining check (not used)

CABLE TEST 21E CTM 4-2040-(M,I,E)ENTER

DIGITAL SCOPE CTM 99-0100



Sense Byte 0

Bit	Designation
0	Command reject
1	Intervention required
2	Bus out check (not used)
3	Equipment check
4	Data check
5	Overrun (not used)
6	Abnormal format reset
7	Permanent error key

Sense Byte 1

Bit	Designation
0	Permanent error
1	Automatic retry
2	Motion malfunction
3	Retry after intervention complete
4 to 7	(Not used)

3525 CARD PUNCH

Hex	Command Code							Command	
	0	1	2	3	4	5	6		7
-	S	S	C	0	0	0	0	1	Write, feed, and stacker select
03	0	0	0	0	0	0	1	1	Control no-op
04	0	0	0	0	0	1	0	0	Sense
If Card Read feature is installed:									
-	1	1	C	0	F	0	1	0	Read only
-	S	S	C	0	F	0	1	0	Read, feed, and stacker select
11	0	0	0	1	0	0	0	1	Write RCE format
-	S	S	1	0	F	0	1	1	Feed and stacker select
If Card Print feature is installed:									
-	L	L	L	L	L	1	0	1	Print line
-	S	S	1	0	F	0	1	1	Feed and stacker select

Legend:

- SS - Stacker select bits
- C - Data code bit (0 for EBCDIC, 1 for BCD)
- F - Format bit (1 for RCE format, 0 for reset)
- L - Print line designation

Unit Status

- | Bit | Designation |
|-----|-----------------------------|
| 32 | Attention (not used) |
| 33 | Status modifier (not used) |
| 34 | Control unit end (not used) |
| 35 | Busy |
| 36 | Channel end |
| 37 | Device end |
| 38 | Unit check |
| 39 | Unit exception |

Channel Status

- | Bit | Designation |
|-----|------------------------------------|
| 40 | Program controlled interruption |
| 41 | Incorrect length |
| 42 | Program check |
| 43 | Protection check |
| 44 | Channel data check |
| 45 | Channel control check |
| 46 | Interface control check (not used) |
| 47 | Chaining check (not used) |

Sense Byte 0

- | Bit | Designation |
|-----|--------------------------|
| 0 | Command reject |
| 1 | Intervention required |
| 2 | Bus out check (not used) |
| 3 | Equipment check |
| 4 | Data check |
| 5 | Overrun (not used) |
| 6 | Abnormal format reset |
| 7 | Permanent error key |

Sense Byte 1

- | Bit | Designation |
|--------|-----------------------------------|
| 0 | Permanent error |
| 1 | Automatic retry |
| 2 | Motion malfunction |
| 3 | Retry after intervention complete |
| 4 to 7 | (Not used) |

3330/3333 DISK STORAGE

Command Code				Operation	Type
Single Track		Multi-track			
Hex	CCW Bits	Hex	CCW Bits		
06	00000110	86	10000110	Read data	Read
0E	00001110	8E	10001110	Read key and data	
1E	00011110	9E	10011110	Read count, key and data	
16	00010110	96	10010110	Read record zero	
12	00010010	92	10010010	Read count	
1A	00011010	9A	10011010	Read home address	
02	00000010			Read initial program load	
22	00100010			Read sector	
05	00000101			Write data	Write
0D	00001101			Write key and data	
1D	00011101			Write count, key and data	
01	00000001			Write special count, key and data	
15	00010101			Write record zero	
19	00011001			Write home address	
11	00010001			Erase	
39	00111001	B9	10111001	Search home address	Search
31	00110001	B1	10110001	Search identifier equal	
51	01010001	D1	11010001	Search identifier high	
71	01110001	F1	11110001	Search identifier equal or high	
29	00101001	A9	10101001	Search key equal	
49	01001001	C9	11001001	Search key high	
69	01101001	E9	11101001	Search key equal or high	
04	00000100			Sense I/O	Sense
03	00000011			No-operation	Control
07	00000111			Seek	
0B	00001011			Seek cylinder	
1B	00011011			Seek head	
0F	00001111			Space count	
13	00010011			Recalibrate	
17	00010111			Restore	
1F	00011111			Set file mask	
23	00100011			Set sector	

Unit Status

Bit	Designation
32	Attention (not used)
33	Status modifier
34	Control unit end
35	Busy
36	Channel end
37	Device end
38	Unit check
39	Unit exception

Channel Status

Bit	Designation
40	Program-controlled interruption
41	Incorrect length
42	Program check
43	Protection check
44	Channel data check
45	Channel control check
46	Interface control check (not used)
47	Chaining check (not used)

Sense Byte 0

Bit	Designation
0	Command reject
1	Intervention required
2	Not used
3	Equipment check
4	Data check
5	Overrun
6	Not used
7	Not used

Sense Byte 1

Bit	Designation
0	Permanent error
1	Invalid track format
2	End of cylinder
3	(Not used)
4	No record found
5	File protected
6	Write inhibited
7	Operation incomplete

Sense Byte 2

Bit	Designation
0	(Not used)
1	Correctable
2	(Not used)
3	Environmental data present
4	(Not used)
5	(Not used)
6	(Not used)
7	(Not used)

Sense Byte 3

Sense byte 3 contains the restart command which is generated when the operation incomplete bit (sense byte 1, bit 7) is set. The restart command assists in identifying the operation which was in progress when the interruption, caused by the incomplete operation, occurred.

The restart command and the CSW provide information which can be used by the system recovery program to construct a new CCW, which is issued to the disk attachment to continue the operation at the point of interruption, after the unusual condition has been corrected.

When the operation incomplete bit is set, the restart command is set to 06 (hexadecimal) if a basic write operation was in progress. Sense byte 3 contains all zeros when the operation incomplete bit is off.

Sense Byte 4

Bits 0-1

Bits 0 and 1 provide control unit identification for the customer engineer.

Bits 2-7

Bits 2-7 identify the disk drive, as follows:

Bits 2-7	Identify
111000	Drive A
110001	Drive B
101010	Drive C
100011	Drive D

Sense Byte 5

Bit

0	128	
1	64	
2	32	
3	16	Cylinder number (low)
4	8	
5	4	
6	2	
7	1	

Sense Byte 6

Bit

0	zero	
1	512	Cylinder number (high)
2	zero	
3	16	
4	8	
5	4	Head
6	2	
7	1	

Note:

If an alternate track is detected during an overflow operation, the operation incomplete bit (sense byte 1, bit 7) is set, and the address of the defective track is set into sense byte 6 and incremented by one.

Sense Byte 7

Sense byte 7 has two functions. Firstly, it specifies the format of sense bytes 8 to 23. Secondly, it provides message tables which give additional information on errors.

Sense Bytes 8 to 23

Sense bytes 8 to 23 define the various kinds of checks that can affect the 3330/3333 disk subsystem. These bytes also provide usage/error statistics. The 16 bytes do not have unique assignments but their information content varies according to the format specified by bits 0 to 3 of sense byte 7. The seven formats available are listed in the description of "Sense Byte 7" in this section.

The error definitions given in sense bytes 8 to 23 may be of programming checks, system checks, equipment checks, or data checks, depending on the format. The usage/error statistics provide accumulated counts of significant events during subsystem operation, such as the number of bytes read and searched, and the number of access motions initiated by the channel.

The information provided by sense bytes 8 to 23 is mainly for the use of the customer engineer. For a full description, see the **Reference Manual for IBM 3830 Storage Control and IBM 3330 Disk Storage, GA26-1592**.

Bits Format of Sense Bytes 8 to 23

0123	
0000	Format 0: Programming or system check
0001	Format 1: Device and control unit equipment check
0010	Format 2: Disk attachment equipment check
0011	Format 3: (Not used)
0100	Format 4: Data checks not providing displacement information
0101	Format 5: Data checks providing displacement information
0110	Format 6: Usage/error statistics

3340 DISK STORAGE

Command Code				Operation	Type	
Single Track		Multi-track				
Hex	CCW Bits 01234567	Hex	CCW Bits 01234567			
06	00000110	86	10000110	Read data	Read	
0E	00001110	8E	10001110	Read key and data		
1E	00011110	9E	10011110	Read count, key and data		
16	00010110	96	10010110	Read record zero		
12	00010010	92	10010010	Read count		
1A	00011010	9A	10011010	Read home address		
02	00000010			Read initial program load		
22	00100010			Read sector		
05	00000101			Write data		Write
0D	00001101			Write key and data		
1D	00011101			Write count, key and data		
01	00000001			Write special count, key and data		
15	00010101			Write record zero		
19	00011001			Write home address		
11	00010001			Erase		
39	00111001	B9	10111001	Search home address equal	Search	
31	00110001	B1	10110001	Search identifier equal		
51	01010001	D1	11010001	Search identifier high		
71	01110001	F1	11110001	Search identifier equal or high		
29	00101001	A9	10101001	Search key equal		
49	01001001	C9	11001001	Search key high		
69	01101001	E9	11101001	Search key equal or high		
04	00000100			Sense I/O		Sense
A4	10010100			Read buffered log*		
03	00000011			No-operation	Control	
07	00000111			Seek		
0B	00001011			Seek cylinder		
1B	00011011			Seek head		
0F	00001111			Space count		
13	00010011			Recalibrate		
17	00010111			Restore		
1F	00011111			Set file mask		
23	00100011			Set sector		

Unit Status

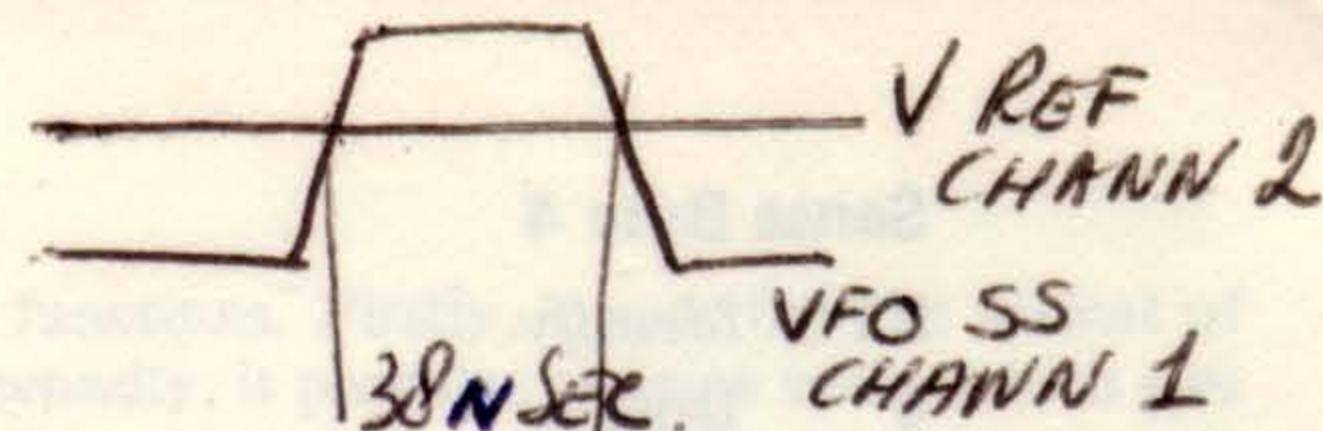
Bit	Designation
32	Attention (not used)
33	Status modifier
34	Control unit end
35	Busy
36	Channel end
37	Device end
38	Unit check
39	Unit exception

Channel Status

Bit	Designation
40	Program-controlled interruption
41	Incorrect length
42	Program check
43	Protection check
44	Channel data check
45	Channel control check
46	Interface control check (not used)
47	Chaining check (not used)

Sense Byte 0

Bit	Designation
0	Command reject
1	Intervention required
2	(Not used)
3	Equipment check
4	Data check
5	Overrun
6	Track condition check
7	Seek check



CHAN 1 → A2 T2 J05
CHAN 2 → A2 T2 B08

X 10 PROBES 0.5 V/DIV.
10 NANOSEC / MAGNIFIER X 10

Sense Byte 1

Bit	Designation
0	(Not used)
1	Invalid track format
2	End of cylinder
3	(Not used)
4	No record found
5	File protected
6	Write inhibited
7	Operation incomplete

BOTH CHANN. TO THE SAME GROUND
NO JOBS RUNNING.
PULSES ALSO WITH NO
READY DRIVES.

Sense Byte 2

Bit	Designation	Bit 6	Bit 7	Meaning
0	RPS feature present			
1	Correctable			
2	(Not used)			
3	Environmental data present			
4	(Not used)	0	0	(Not used)
5	(Not used)	0	1	32 megabytes
6	Data module size	1	0	70 megabytes
7	Data module size	1	1	(Reserved)

Sense Byte 3

Sense byte 3 contains the restart command which is generated when the operation incomplete bit (sense byte 1, bit 7) is set. The restart command assists in identifying the operation which was in progress when the interruption, caused by the incomplete operation, occurred.

The restart command and the CSW provide information which can be used by the system recovery program to construct a new CCW, which is issued to the disk attachment to continue the operation at the point of interruption.

When the operation incomplete bit is set, the restart command is set to 06 (hexadecimal) if a basic read operation was in progress, or to 05 (hexadecimal) if a basic write operation was in progress. Sense byte 3 contains all zeros when the operation incomplete bit is off.

Sense Byte 4

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

Sense Byte 5

Bit	
0	128
1	64
2	32
3	16 Cylinder Number (low)
4	8
5	4
6	2
7	1

Sense Byte 6

Bit	
0	1024 Cylinder
1	512 Cylinder Cylinder number (high)
2	256 Cylinder
3	0 (not used)
4	8
5	4 Head number
6	2
7	1

Sense Byte 7

Sense byte 7 has two functions. Firstly, it specifies the format of sense bytes 8 to 23. Secondly, it provides message tables which give additional information on errors.

Bits	Format of Sense Bytes 8 to 23
0 1 2 3	
0 0 0 0	Format 0: Programming or system check
0 0 0 1	Format 1: Device and control unit equipment check
0 0 1 0	Format 2: Disk attachment equipment check
0 0 1 1	Format 3: (Not used)
0 1 0 0	Format 4: Data checks not providing displacement information
0 1 0 1	Format 5: Data checks providing displacement information
0 1 1 0	Format 6: Usage/error statistics

Sense Bytes 8 to 23

Sense bytes 8 to 23 define the various kinds of checks that can affect the 3340 disk subsystem. These bytes also provide usage/error statistics. The 16 bytes do not have unique assignments but their information content varies according to the format specified by bits 0 to 3 of sense byte 7. The seven formats available are listed in the description of "Sense Byte 7" in this section.

The error definitions given in sense bytes 8 to 23 may be of programming checks, system checks, equipment checks, or data checks, depending on the format. The usage/error statistics provide accumulated counts of significant events during subsystem operation, such as the number of bytes read and searched, and the number of access motions initiated by the channel.

The information provided by sense bytes 8 to 23 is mainly for the use of the customer engineer. For a full description see the Introduction to IBM 3340 Disk Storage, GA26-1619.

BY MIP. TROUBLES REPLACE
U2 - 0236934 - COM. EXT
C2 - " 7634 - MSC INTF
P2 - " 6933 - GPR CARD
H2 - " 7660 - I3 CARD
R2 - " 7633 - SHIFT CARD
S2 - " 7188 - MASK CARD
Q2 - " 7646 - TIMER.

3410/3411 MAGNETIC TAPE

Hex	Command Code							Command	
	0	1	2	3	4	5	6		7
01	0	0	0	0	0	0	0	1	Write
02	0	0	0	0	0	0	1	0	Read forward
0C	0	0	0	0	1	1	0	0	Read backward
07	0	0	0	0	0	1	1	1	Rewind
0F	0	0	0	0	1	1	1	1	Rewind-unload
17	0	0	0	1	0	1	1	1	Erase gap
1F	0	0	0	1	1	1	1	1	Write tape mark
27	0	0	1	0	0	1	1	1	Backspace block
2F	0	0	1	0	1	1	1	1	Backspace file
37	0	0	1	1	0	1	1	1	Forwardspace block
3F	0	0	1	1	1	1	1	1	Forwardspace file
C3	1	1	0	0	0	0	1	1	Set 1600 bpi-PE mode
CB	1	1	0	0	1	0	1	1	Set 800 bpi-NRZI mode
97	1	0	0	1	0	1	1	1	Data security erase
1B	0	0	0	1	1	0	1	1	Request track in error
4B	0	1	0	0	1	0	1	1	Set diagnose
03	0	0	0	0	0	0	1	1	Control no-op
04	0	0	0	0	0	1	0	0	Sense

Unit Status

Bit	Designation
32	Attention (not used)
33	Status modifier (not used)
34	Control unit end
35	Busy
36	Channel end
37	Device end
38	Unit check
39	Unit exception

Channel Status

Bit	Designation
40	Program controlled interruption
41	Incorrect length
42	Program check
43	Protection check
44	Channel data check
45	Channel control check
46	Interface control check
47	Chaining check

Sense Byte 0

Bit	Designation
0	Command reject
1	Intervention required
2	Bus out check (not used)
3	Equipment check
4	Data check
5	Overrun
6	Word count zero (not used)
7	Data converter check (not used)

Sense Byte 1

Bit	Designation	Status A	Status B	Meaning
0	Noise			
1	Tape unit status A			
2	Tape unit status B			
3	7-track TU (not used)			
4	At load point	0	0	Non-existent drive
5	Write status	0	1	Not ready
6	File protected	1	0	Ready and not busy
7	Not capable	1	1	Ready and busy

Sense Byte 2

The bits in sense byte 2 contain information that is used only by the control unit itself, not the program. This is because the bits represent the track-in-error information. For PE read operations, each bit that is set represents a track that has a phase error or is dead. (A dead track is one that is damaged, or has never been written on.) For PE write operations, each bit that is set represents a track that has an envelope check (see "Sense Byte 3") or phase error. During NRZI read operations, the bits in sense byte 2 represent the cyclic redundancy check (CRC) information. During NRZI write operations, sense byte 2 is not used and contains the code 03 (hex).

Sense byte 2 is made available to the tape control unit when the 'request track in error' command is given.

Sense Byte 3

Bit	Designation
0	Vertical redundancy check
1	Multiple track error (PE or longitudinal redundancy (NRZI))
2	Skew
3	End data check (PE) or cyclic redundancy check (NRZI)
4	Envelope check (PE only)
5	1600 bpi
6	Backward
7	C-compare (not used)

Sense Byte 4

<i>Bit</i>	<i>Designation</i>
0	Tape unit positioning check
1	Tape unit reject
2	End of tape
3	(Not used)
4	(Not used)
5	Diagnostic track check
6	Tape unit check
7	Illegal command

Sense Byte 5

<i>Bit</i>	<i>Designation</i>
0	New subsystem
1	New subsystem
2	Write tape mark check
3	PE identification burst
4	PE compare (not used)
5	Tachometer check
6	False end mark
7	Reserved for RPQ

Bit 0 *Bit 1* *new subsystem*
Meaning

0	1	A 3410/3411 magnetic tape subsystem is attached
0	0	A 3410/3411 magnetic tape subsystem is <i>not</i> attached
1	0	
1	1	

Sense Byte 6

<i>Bit</i>	<i>Designation</i>
0	7-track unit (not used)
1	Short gap mode
2	Dual density
3	Alternate density
4 to 7	Tape unit model

Sense Byte 7

<i>Bit</i>	<i>Designation</i>
0	Lamp check
1	Left column check
2	Right column check
3	Ready reset
4	Data security erase
5	(Not used)
6	(Not used)
7	(Not used)

Sense Byte 8

<i>Bit</i>	<i>Designation</i>
0	(Not used)
1	Feedthrough
2	(Not used)
3	End velocity check
4	No read-back data
5	Start velocity check
6	(Not used)
7	(Not used)

