DOC. NO. FT02000-R003-E0
11-10-97

FULLY AUTOMATIC PROBER

UF200/190

OPERATION MANUAL

OF

GP-IB COMMANDS

1st Edition

TOKYO SEIMITSU CO., LTD.
TOKYO, JAPAN

DOCUMENT LIST

- CONTENTS -

1 Prober System Software Version 1

2 Interface Specifications.....2

2.1 Interface Configuration.....2
2.2 Bus Lines.....2
2.3 Message.....2

3 Prober Operations and Commands.....3

3.1 Commands.....3
3.2 Status Reporting.....7
3.3 Setup of Operating Environment.....11
3.3.1 Setup before Initialization.....11
3.3.2 Setup after Initialization.....17
3.3.3 STB code setting.....23
3.4 Examples of Prober Control with GP-IB Commands.....24

4 Description on Commands.....28

4.1 A (String) : XY travel (absolute distance).....28
4.2 B : Request of prober ID.....29
4.3 C : Marking.....29
4.4 D : Z DOWN.....29
4.5 E : Error code request.....30
4.6 F : FAIL counting-up.....31
4.7 F (String) : F-axis fine adjustment.....31
4.8 G : Positioning start die.....32
4.9 H : Multi-site location No. request.....33
4.10 I : Index size setting.....33
4.11 J : Positioning next die / target die.....34
4.12 K : Stop.....37
4.13 L : Unload/load/align.....38
4.14 L 1 : Wafer loading without alignment.....40
4.15 L 8 : Pre-loading.....41
4.16 L 9 : Load from inspection tray (without alignment).....42
4.17 M : Marking.....43
4.18 N : Alignment retry.....46
4.19 N 1 : Alignment retry (alignment only).....47
4.20 N 2 : Retry of probe-pad alignment.....48
4.21 N 9 : Wafer/probe-pad alignment.....49
4.22 O : On-wafer information request.....50
4.23 P : PASS counting-up.....51
4.24 Q : XY coordinates request.....52
4.25 R : XY coordinates (absolute values) request.....52
4.26 S (String) : XY travel (by relative coordinates).....53

4.27 T : Test start....54
4.28 U : Unloading....54
4.29 U 0 : Unloading all wafers....55
4.30 U 9 : Unloading to inspection tray....56
4.31 V : Lot number request....56
4.32 W : Needle cleaning....57
4.33 WB: Perform brush cleaning....57
4.34 X : Wafer number request....58
4.35 Y : Gross value request....58
4.36 Z : Z UP....59
4.37 Z ± : Chuck height fine adjustment....60
4.38 a : Parameter setting....61
4.39 al: Assign-load setting....63
4.40 b : Wafer ID request....63
4.41 c: Pass/Fail counts request....64
4.42 d : Directory request....64
4.43 du: Up-load device data....66
4.44 dd: Down-loading device data....72
4.45 e : Error message request....75
4.46 em: Alarm buzzer ON....75
4.47 e s : Error clearance request....76
4.48 f : Chuck temperature request....76
4.49 fp: Fail-mark inspection result request....77
4.50 h : Chuck temperature setting....78
4.51 i : Parameter request....79
4.52 j2: Load the specified wafer....80
4.53 j c : Needle cleaning request....81
4.54 ji: Set up cassette for retest....81
4.55 jm: Perform Fail-mark inspection....82
4.56 jp: Perform probe-mark inspection....83
4.57 j s : Probe-mark inspection applying die....84
4.58 jv: End lot retesting immediately....85
4.59 j w : Make the cassette testing ready....86
4.60 j w1 (or 2) : Elevator 1 (or 2) wafer sensing....86
4.61 k c : Card contact count request....87
4.62 k u : Up-load of a device parameter group....88
4.63 k d : Down-load of a device parameter group....91
4.64 k h : Request of site location....92
4.65 l : Load device data from HD, FD, or Network Host....93
4.66 le: Lot end request....94
4.67 m s : Prober status request....95
4.68 n6: Probing area setting....95
4.69 n c : Preset the contact counter....96
4.70 nd: Request of probe tip data for a pad....97
4.71 ni: Request of probe-pad alignment results....98
4.72 np: Probe-mark inspection data request....99
4.73 o: On-wafer information request....99
4.74 p : Printout request....100

4.75 q : Request of start die coordinates....100
4.76 r : Request of Hot-chuck status....101
4.77 s : Save current device data....102
4.78 s t : Request of prober start....103
4.79 vZ: Contact resistance measurement....104
4.80 vE: End of vZ....104
4.81 w : Request of wafer status....105
4.82 x : Request of cassette status....105
4.83 y : Yield data request....106
4.84 z : Set the current Z as contact height....106

5 Error Messages....107

6 Remarks....108

1 Prober System Software Version

The TSK Standard GP-IB command set explained by this GP-IB Command Operation Manual FT02000-R003-E0 (the first edition) can work correctly under UF200/190 System Software Version 1.01 or later. In an environment of System Software Version 1.00, some commands may not operate in accordance to their descriptions. (This may happen under a customized System Software, too; in such a case, contact our field application engineers.)

2 Interface Specifications

2.1 Interface Configuration

(1)	Source handshake	SH	All functions applicable
(2)	Acceptor handshake	AH	All functions applicable
(3)	Talker	T	Basically talker Acting on the serial polling
(4)	Listener	L	Basically listener
(5)	Service request	SR	All function applicable
(6)	Remote/local	RL	Not applicable
(7)	Parallel polling	PP	Not applicable
(8)	Device clear	DC	Not applicable
(9)	Device trigger	DT	Not applicable
(10)	Controller	C	Not applicable

2.2 Bus Lines

All the following signals are in the negative logic at TTL level.

(1)	Data lines	DIO1 ••••••••••••• DIO8
(2)	Handshake lines	DAV, NRFD, NDAC
(3)	Management lines	ATN, REN, IFC, SRQ, EOI The REN line does not work. The SRQ line can be neglected.

2.3 Message

(1) Code ASCII code without parity (or JIS 8-bit code)

(2) Interface message (in Command mode)

<Primary address group>

(a) Address command group: Not available

(b) Universal command group: LLO, DCL and PPL commands can not work.

(c) Listener address group: Listener primary address

(d) Talker address group: Talker primary address

<Secondary address group>

Secondary addresses and secondary commands do not work.

(3) Delimiter CR•LF or CR

(4) ISO 7-bit code list

3 Prober Operations and Commands

3.1 Commands

The command formats described in this Section are almost common to those of Prober A-PM-80A; actually, the command formats proper to UF200/190 are added to those of A-PM-80A.

All the commands are requests from the controller (or Tester) to Prober. (Prober can receive a command when it is set to Listener.)

Response to each command that requests actions to Prober is made with a status byte (STB).

Response that should be made with accompanying data is returned in the form of the command plus data.

<Command List>

(Direction: Controller → Prober)

Command code		Purpose	Response	Remark
ASCII	Type			
@	----------	----------	----------	----------
A	A (string)	XY travel (absolute distance)	STB = 65, 67, or 74	*2
B	B	Request of prober ID	B (string)	*1
C	C (code)	Marking	STB = 66, 67, 69, 80, or 81	*1, *2
D	D	Z DOWN	STB = 68	*1
E	E	Error code request	E (string)	*1
F	F	Fail counting-up	STB = 79, 80, or 81	*2
	F (string)	F-axis fine adjustment	STB = 98 or 99	*2 For Shorting block
G	G	Position the start die	STB = 70 or 67	*2
H	H	Multi-site location No. request	H (string)	*1
I	I (string)	Index size setting	STB = 77	*1
J	J	Position the next die	STB = 66, 67 or 81	*2
	J (string)	Position a target die	STB = 66, 67 or 74	*2
K	K	Stop Prober operation	STB = 85	*1
L	L	Unload/load/align	STB = 70 or 76	
	L1	Load (without alignment)	STB = 76 or 118	
	L8	Pre-load	STB = 76 or 118	
	L9	Load from the inspection tray	STB = 118 or 76	
M	M (code)	Marking	STB = 66, 67, 69, 80, or 81	*1, *2
	M (string)	Marking (with category data)	STB = 66, 67, 69, 80, or 81	*1, *2
N	N	Alignment retry	STB = 70	
	N1	Alignment retry	STB = 76 or 113	
	N2	Retry of probe-pad alignment	STB = 76, 114 or 115	
	N9	Wafer/probe-pad alignment	STB = 119 or 76	
O	O	On-wafer information request	O (string)	*1
P	P	Pass counting-up	STB = 67, 78, 80, 81	*2
Q	Q	XY coordinates request	Q (string)	*1
R	R	XY absolute distance request	R (string)	*1
S	S (string)	XY travel (by coordinates)	STB = 66, 67, 74	*2
T	T	Test start		*1
U	U	Unload	STB = 71	*1
	U0	Unload all wafers	STB = 71	
	U9	Unload to the inspection tray	STB = 71	
V	V	Lot number request	V (string)	*1
	VR	Lot number setting	STB = 98; correct end STB = 99; incorrect end	*1
W	W	Needle cleaning	STB = 89	*1, *2 Exchangeable with b command
	WB	Perform Brush cleaning	STB = 89	

Command code		Purpose	Response	Remark
ASCII	Type			
X	X	Wafer number request	X (string)	*1
Y	Y	Gross value request	Y (string)	*1
Z	Z	Z UP	STB = 67	*1
	Z±	Z Up/Down for fine adjustment	STB = 92	*1
a	a (string)	Parameter setting	STB = 98; setting complete STB = 99; data error	*1
	al	Assign-load setting	STB = 98	
b	b	Wafer ID request	b (string)	*1 Exchangeable with W command
c	c	Pass/Fail counts request	c (string)	*1
d	d (string)	Directory (device name) request	d (string)	*1
	du	Up-load device data	du (string) STB = 76, 98, or 108	*1
	dd (string)	Down-loading device data	STB = 76, 98, or 99	*1
e	e	Error message request	e (string)	*1
	em	Alarm buzzer ON	STB = 101, or 76	*1 Auto lot end
	es	Error clearance request	STB = 119	*1
f	f	Chuck temperature request	f (string)	*1
	fp	Fail mark inspection result request	fp (string)	
h	h (string)	Chuck temperature setting	STB = 93; correct end STB = 99; incorrect end	*1
i	i (string)	Parameter request	i (string)	*1
j	j2 (code)	Load the specified wafer	STB = 70, 84, 99	*1
	jc	Needle cleaning request	STB = 89 or 76	
	ji	Set up cassette for retest	STB = 98 or 99	
	jm	Perform Fail-mark inspection	STB =110 or 111	
	jp	Perform probe-mark inspection	STB = 110; correct end STB = 111; incorrect end	*2
	js (string)	Probe-mark inspecting die select	STB = 66; correct end STB = 74; out of probing area	*2
	jv	End lot retesting immediately	STB =94 or 99	
	jw	Make the cassette testing ready	STB = 98; correct end STB = 99; incorrect end	*1
	jw1	Elevator 1 wafer sensing	STB = 98, 99, or 76	Auto lot end
	jw2	Elevator 2 wafer sensing	STB = 98, 99, or 76	Auto lot end
k	kc	Card contact count request	kc (string)	*1
	ku	Up-load a device parameter group	ku (string), data = 196 bytes	*1
	kd (string)	Down-load a device parameter group	STB = 98; correct end STB = 99; incorrect end	*1
	kh	Multi-site location No. request	kh (string)	*1

Command code		Purpose	Response	Remark
ASCII	Type			
l	l (string)	Load device data from HD, FD, or Network Host	STB = 98; correct end STB = 99; incorrect end	*1
	le	Lot end request	STB = 98; correct end STB = 99; incorrect end	*1 N
m	ms	Prober status request	ms (code)	*1
n	n6	Probing area setting	STB = 98	
	nc (string)	Preset the contact counter	STB = 98; correct end STB = 99; incorrect end	*1
	nd (string)	Request of probe tip data for a pad	nd (string)	
	ni	Request of probe-pad align. results	ni (string)	
	np	Probe-mark inspection data request	np (string)	
o	o	On-wafer information request	o (string)	
p	p	Perform CR/LF with printer	STB = 86	*1
	p (string)	Print out the string after CR/LF	STB = 86	*1
q	q	Request of the start die coordinates	q (string)	*1
r	r	Request of Hot-chuck status	r (string)	*1
s	s (string)	Save current device data to HD or FD	STB = 98; correct end STB = 99; incorrect end	*1
	st	Request of prober start	STB = 120; correct end STB = 121; incorrect end	*1
v	vZ (string)	Contact resistance measurement	STB = 98, 99	For Shorting block
	vE	End of vZ	STB = 98, 99	For Shorting block
w	w	Request of wafer status	w (string)	*1
x	x	Request of cassette status	x (string)	*1
y	y	Yield data request	y (string)	*1
z	z	Set the current Z as contact height	STB = 116	*1, *2

*1: Effective under the TTL + GP-IB external control.

*2: Usable only during the probing; when issued in the other conditions, “GP-IB Command Execution Condition Error” will occur.

3.2 Status Reporting

The status reporting for Prober to notice its condition to the controller (or Tester) takes the form of "Status byte" that is sent at Prober's issuing SRQ; the code setting of the status byte depends on the user specification. (The status byte does not mean the command response.)
Unnecessary status bytes can be killed by the user.
The following tables show details of the status bytes in the default code setting.

STB code	Naming	Relative command	Purpose	Remark
64 (40H)	GP-IB Initial Setting Done			Initialization complete
65 (41H)	Absolute Value Travel Done	A	XY travel (absolute distances)	Chuck DOWN at the end
66 (42H)	Coordinate Travel Done	js	Probe-mark insp. die select	
		J	Position next die	Chuck DOWN at the end
		J (str.)	Position target die	
		C	Marking	
		M	Marking	
		M (str.)	Marking (with category data)	
		S	XY travel (by coordinates)	
67 (43H)	Z UP (Test Start)	A	XY travel (absolute distances)	Chuck UP at the end
		C	Marking	
		G	Position the start die	
		J	Position the next die	
		J (str.)	Position target die	
		M	Marking	
		M (str.)	Marking (with category data)	
		P	Pass counting-up	
		S	XY travel (by coordinates)	
		Z	Z UP	
68 (44H)	Z DOWN	D	Z DOWN	
69 (45H)	Marking Done	C	Marking	Chuck height depends on Up/Down marking.
		M	Marking	
70 (46H)	Wafer Loading Done	G	Position the start die	Start die is positioned with Chuck in DOWN.
		L	Load/align	
		j2	Load the specified wafer	
		N	Alignment retry	
		N1	Alignment retry	

STB code	Naming	Relative command	Purpose	Remark
71 (47H)	Wafer Unloading Done	U	Unload	Prober waits for the next wafer loading.
		U0	Unload all wafers	
		U9	Unload to inspection tray	
72 (48H)				
73 (49H)				
74 (4AH)	Out of Probing Area	A	XY travel (absolute distances)	Travel beyond the probing area is prohibited. If so, X/Y/Z do not change.
		J (str.)	Position target die	
		S	XY travel (by coordinates)	
		js (str.)	Probe-mark inspect. die	
75 (4BH)	Prober Initial Setting Done			
76 (4CH)	Error			Occurrence of an error state
77 (4DH)	Index Setting Done	I	Index size setting	
78 (4EH)	Pass Counting Up Done	P	Pass counting-up	
79 (4FH)	Fail Counting Up Done	F	Fail counting-up	
80 (50H)	Wafer Count			Output at unloading a wafer
81 (51H)	Wafer End			• All dice test complete • All sample dice test end
82 (52H)	Cassette End			
83 (53H)				
84 (54H)	Alignment Rejection Error	j2 (code)		Output at unloading an align. unsuccessful wafer
85 (55H)	Stop Command Received	K	Prober stop	
86 (56H)	Print Data Receiving Done	p	Print out	
87 (57H)	Warning Error			Prober continues working.
88 (58H)	Test Start (Count Not Needed)			For testing at Fail check-back with Chuck in UP. The test result is not
89 (59H)	Needle Cleaning Done	W	Needle cleaning	
90 (5AH)	Probing Stop			• Intended prober stop • Stop due to yield NG or continuous Fails • Stop on the start die

STB code	Naming	Relative command	Purpose	Remark
91 (5BH)	Probing Start			Probing restart from the stop condition
92 (5CH)	Z Up/Down Done	Z±	Z Up/Down for fine adjustment	
93 (5DH)	Hot Chuck Cont. Command Received	h	Chuck temperature setting	
94 (5EH)	Lot Done	jv	End lot retest immediately	• Normal lot end • Front-load wafer end
95 (5FH)				
96 (60H)				
97 (61H)				
98 (62H)	Command Normally Done	jw, kd		Also, l(str.), le, nc, vZ, etc.
99 (63H)	Command Abnormally Done	jw, kd		Also, jv, l(str.), le, nc, vZ, etc.
100 (64H)	Test Done Received			Test Complete received from Tester
101 (65H)	(em command correct end)	em	Alarm buzzer ON	
102 (66H)				
103 (67H)	Map Data Down Loading Normally Done			
104 (68H)	Map Data Down Load Abnormally Done			
105 (69H)	Able to Adjust Needle Height			
106 (6AH)				
107 (6BH)	Binary data up-loading start	du	Device data up-load	
108 (6CH)	Binary data up-loading finish	du	Device data up-load	
109 (6DH)				j2 command receive OK
110 (6EH)	Needle Mark OK	jp	Probe-mark inspection	
		jm	Fail mark inspection	
111 (6FH)	Needle Mark NG	jp	Probe-mark inspection	
		jm	Fail mark inspection	
112 (70H)				
113 (71H)	Re-Alignment Done	N1	Alignment retry	
114 (72H)	Auto Needle Alignment Normally Done	N2	Probe-pad align. retry	

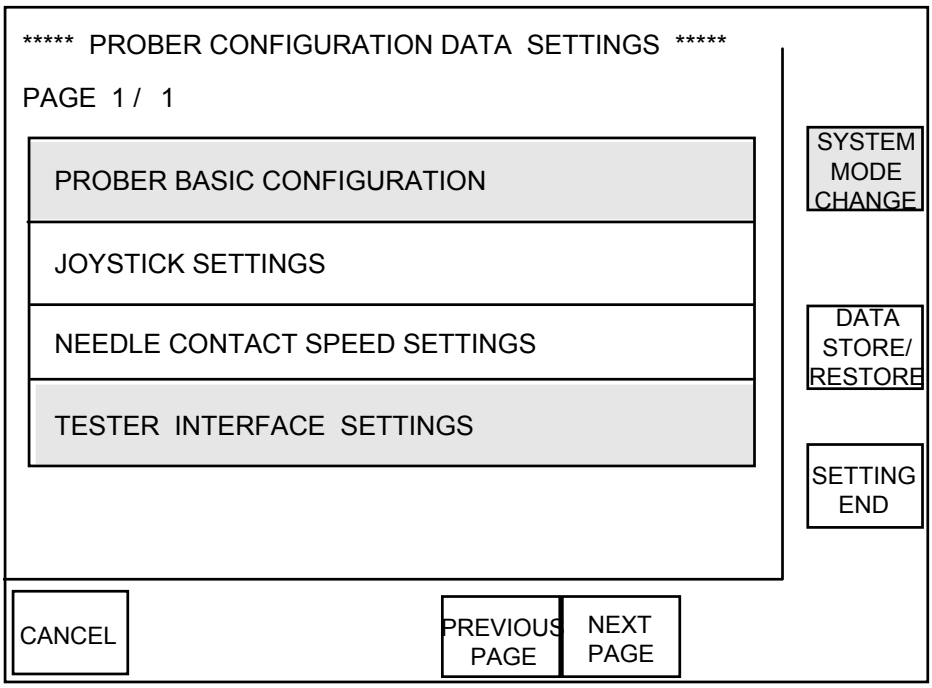
STB code	Naming	Relative command	Purpose	Remark
115 (73H)	Auto Needle Alignment Abnormally Done	N2	Probe-pad align. retry	
116 (74H)	Chuck Height Setting Done	z	Set current Z as contact height	
117 (75H)	(Continuous Fail error)			At the change from STB=76 by the setting
118 (76H)	Wafer Loading Done	L1	Load without alignment	
		L9	Load from inspection tray	
119 (77H)	Error Recovery Done (Wafer centering complete)	es	Error clearance request	
		N9	Alignment/retry of probe-pad alignment	
120 (78H)	Start Normally Done	st	Request of prober start	
121 (79H)	Start Abnormally Done	st	Request of prober start	
122 (7AH)	Probe-mark inspection finish	np	Probe-mark insp result request	
123 (7BH)	Fail-mark inspection finish	fp	Fail-mark insp. result request	
124 (7CH)				
125 (7DH)				
126 (7EH)				
127 (7FH)				

3.3 Setup of Operating Environment

In order to use the GP-IB interface for controlling Prober operation and obtaining necessary data from Prober, its operating environment must be set up with the relative parameters at first.

3.3.1 Setup before Initialization

On the initialization screen produced after power-up or system resetting, push <System Mode Change> button and enter an appropriate password to set the operation level to “Engineer” or “Manager”.
On the altered screen, pushing <Prober Configuration Change> button calls up [Prober Configuration Data Settings] menu as shown below.

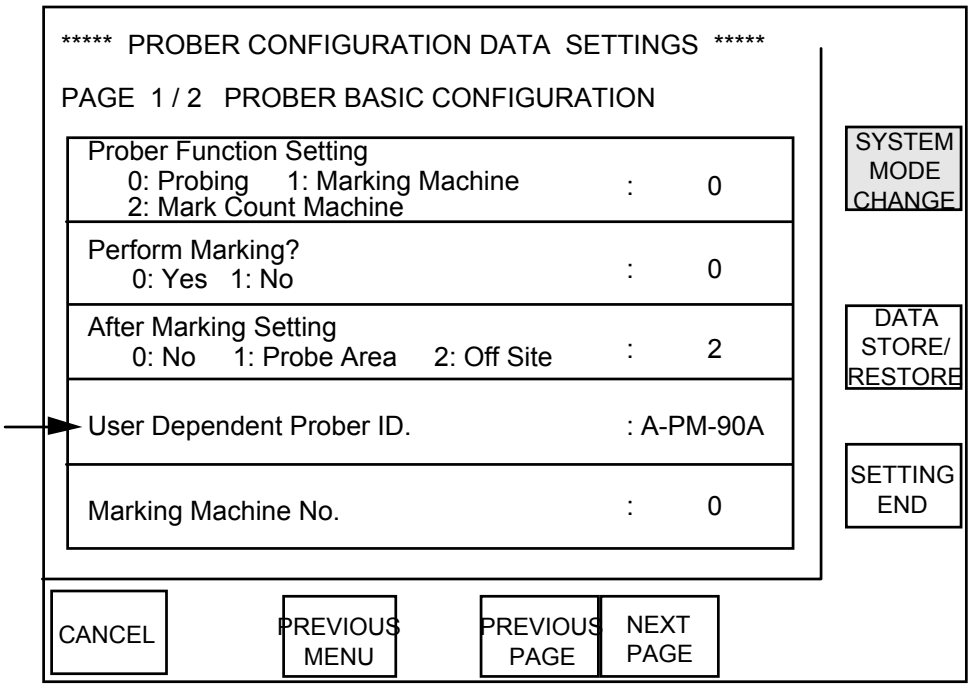


Contained relative parameters are:

(1) [Prober Basic Configuration] sub-menu
- User proper prober ID entry

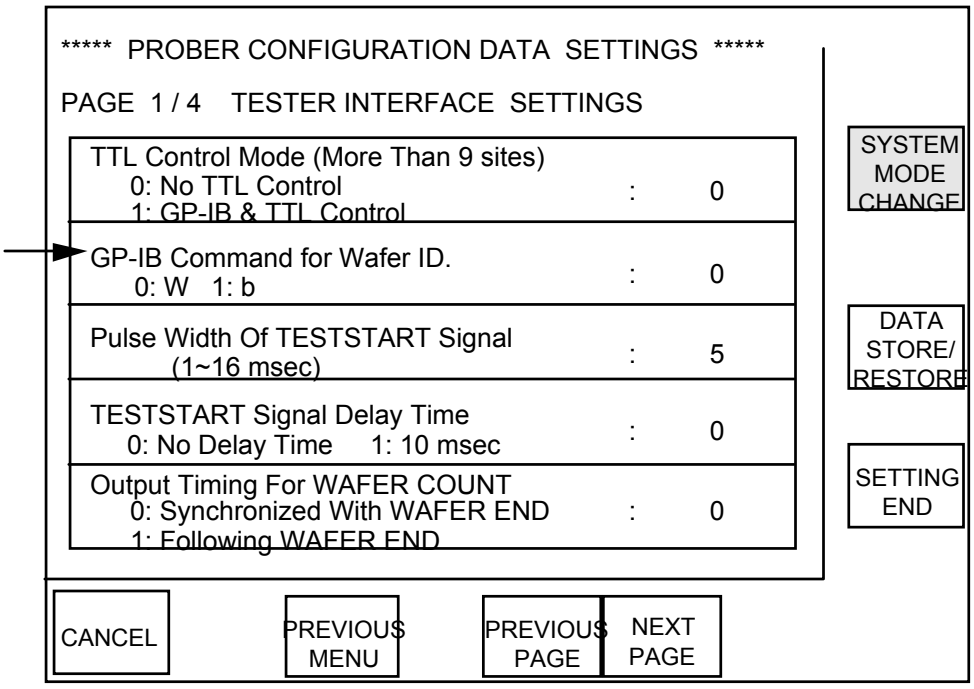
(2) [Tester Interface Settings] sub-menus
- GP-IB command for demanding the wafer ID
- Category data type, Line or Binary
- Line category format, 16 bits or 32 bits
- Automatic Chuck Up with the lot first die
- Prober device address with GP-IB
- Application of 16 multi-site format
- Application of plural category data for one die

(1) [Prober Basic Configuration] sub-menu

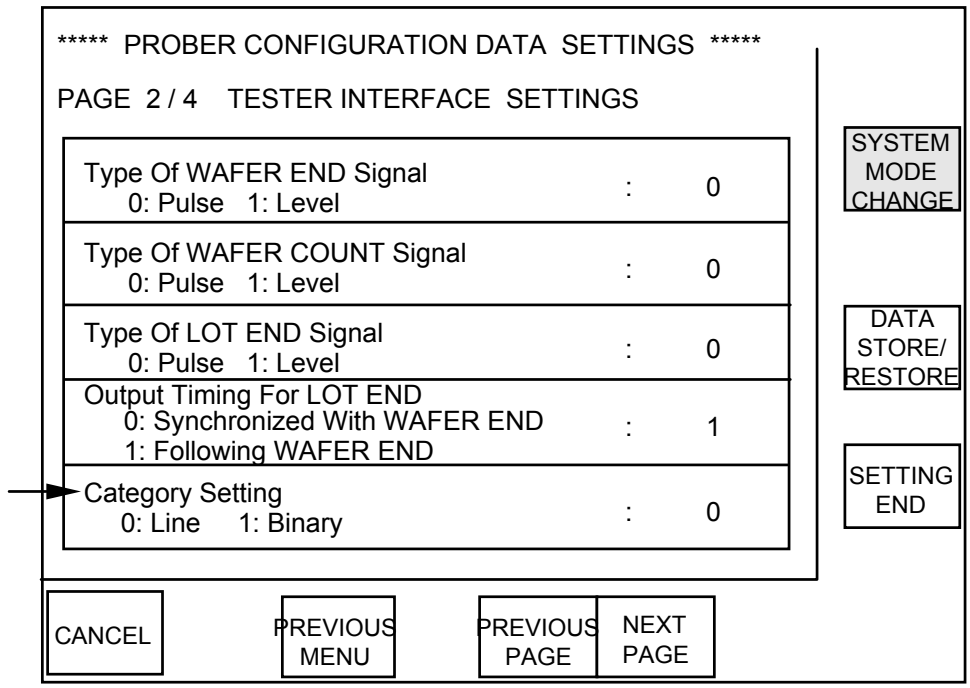


- User Dependent Prober ID
  : Up to 8 alphanumeric characters for Prober ID.
  Controller can read the entered ID with “B” command.

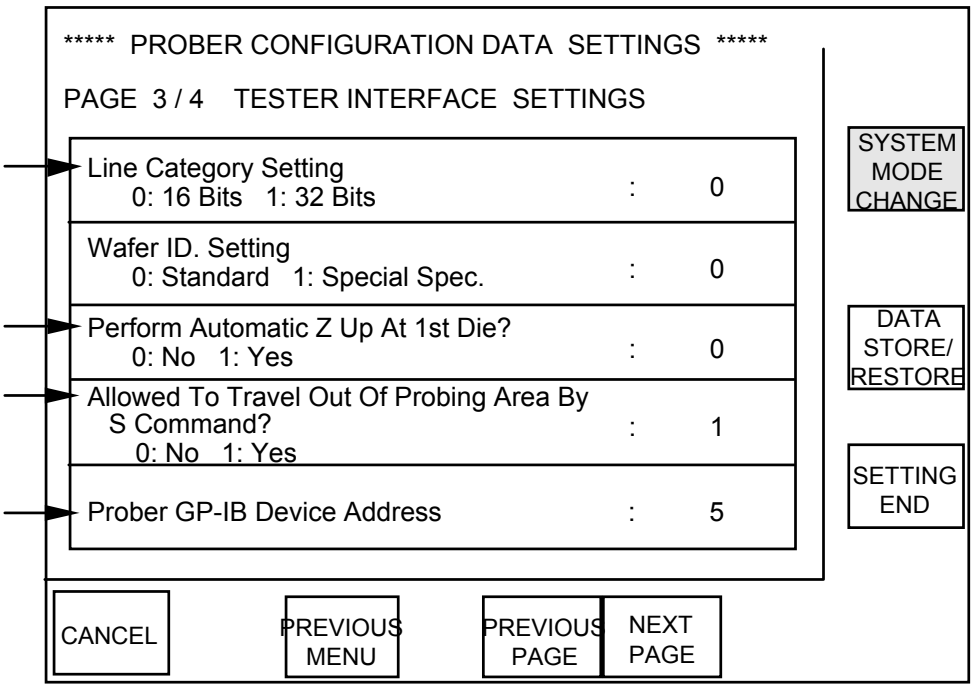
(2) [Tester Interface Settings] sub-menus



- GP-IB Command for Wafer ID
  : Choice of the command to demand wafer ID, “W” or “b”.
  The needle cleaning function is taken by the other command.



- Category setting
  : Selection of the category data type to be used in Marking command (“M” or “C”); ‘Line’ for each bit position of the category data fixed to a category (Bin), and ‘Binary’ for the binary category number.

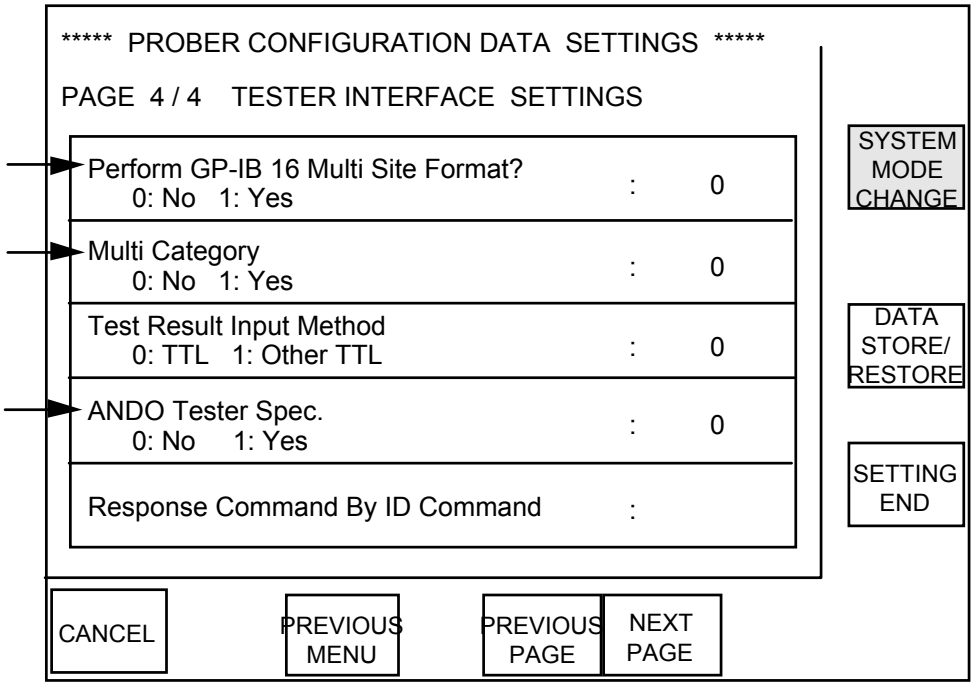


- Line Category Setting
  : With the 'Line' category data type, choice of 16 bits (lines) or 32 bits (lines) category data to be sent with Marking command "M" or "C".

- Perform Automatic Z Up at 1st Die?
  : Choice whether to automatically drive up or not Chuck to the probing height for the start die of each wafer after the wafer alignment and probe-pad alignment .

- Allowed To Travel Out Of Probing Area By S Command?
  : Whether to allow (prohibit) or not Chuck positioning out of the testing die area on wafer with "S" command.

- Prober GP-IB Device Address
  : Set the device address of Prober under the GP-IB system in the range of 0 ~ 30.



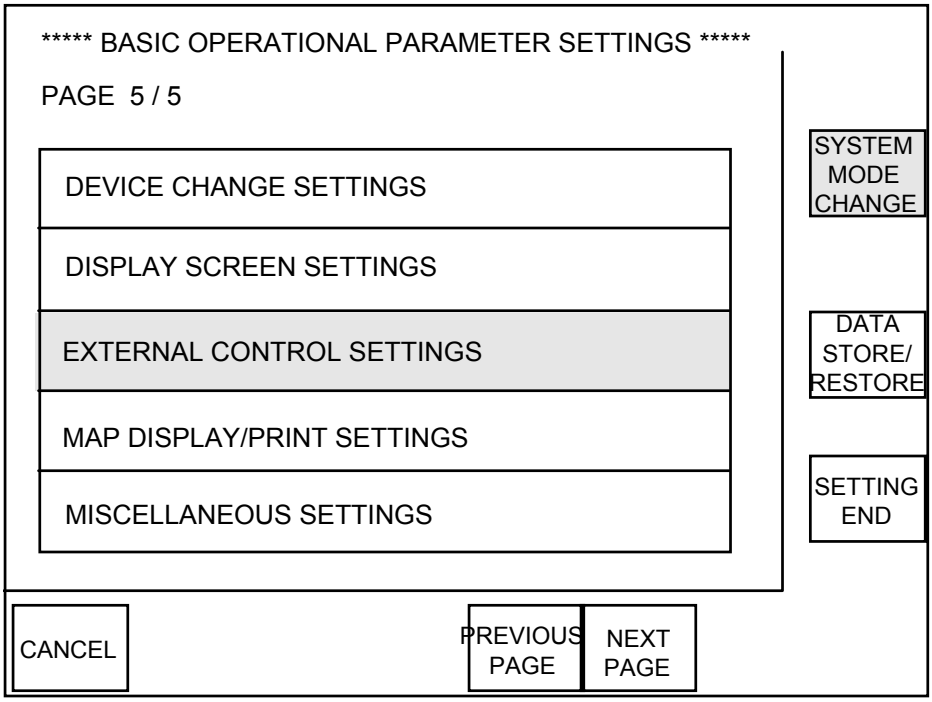
- Perform GP-IB 16 Multi Site Format?
  : Without applying the 16 multi-site format, the number of bytes carrying the individual site data in Marking command or On-wafer information response (to “O” command) will vary with the number of sites.
  At applying the 16 multi-site format, the same bytes for the 16 sites are used with 2 ~ 16 sites probing.

- Multi Category
  : At 16 or 32 line category data format, whether for a same die to have plural category (Bin) numbers or not.

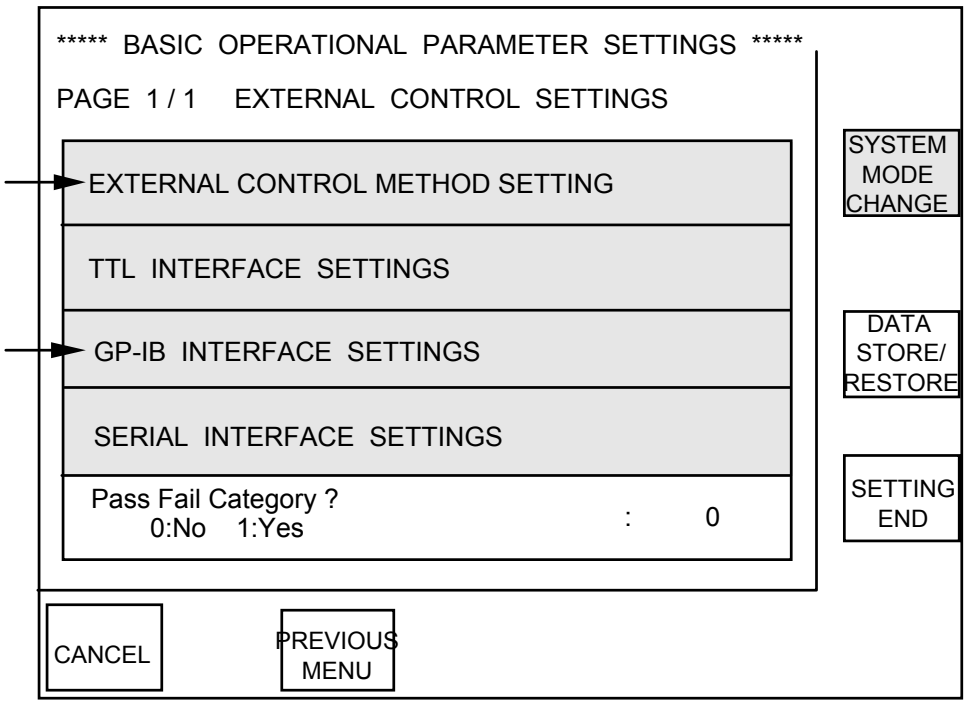
- ANDO Tester Spec.
  : Whether to control or not the GP-IB interface according to the performance of Ando Electric ‘s Testers.

3.3.2 Setup after Initialization

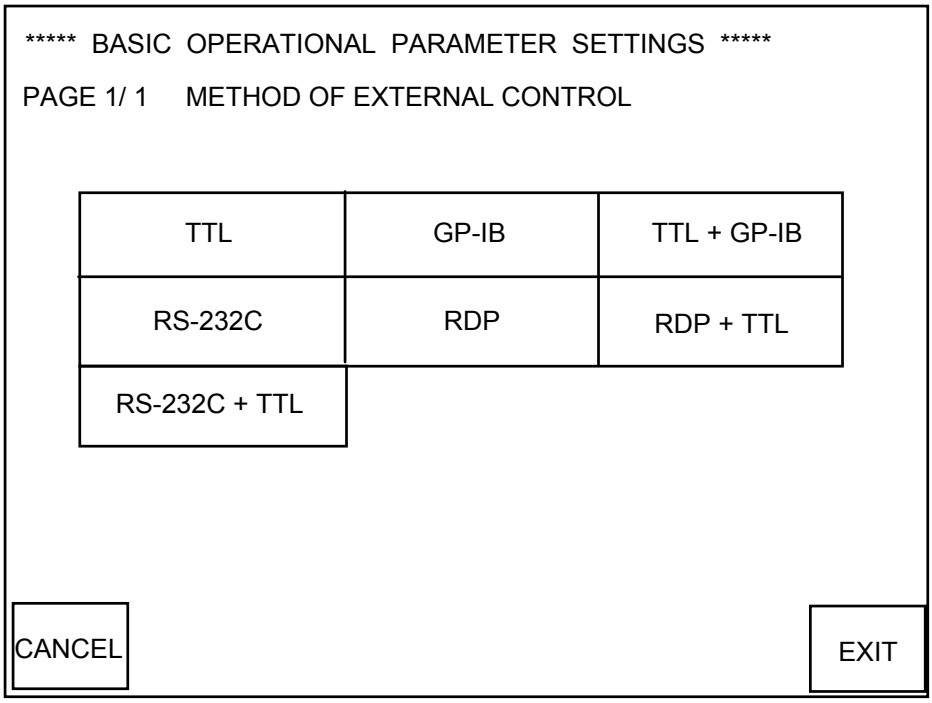
After Prober initialization, open [Basic Operational Parameter Settings] menu Page 5/5 as shown below.



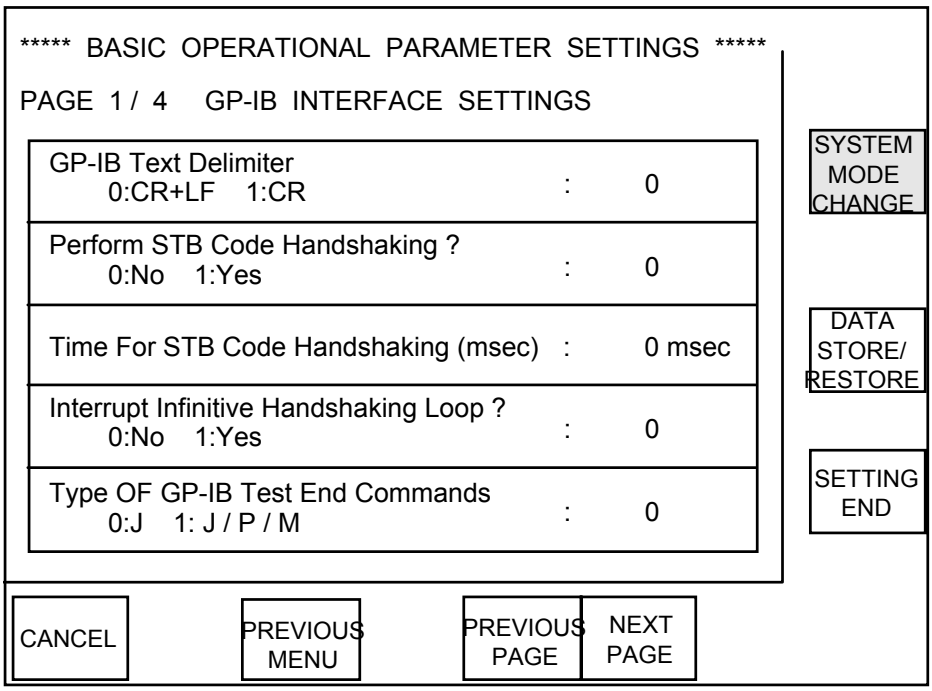
Then, touch <External Control Settings> line for the setup of the relative Basic Operational parameters.



- External Control Method Setting
  : The display changes to [Method of External Control] as below; choose “GP-IB” or “TTL + GP-IB” depending on the system configuration. After the selection, push <EXIT> button to return to the above menu.



- GP-IB Interface Settings
  : Opens the Basic Operational parameter menu for the GP-IB interface, as explained on the following pages.



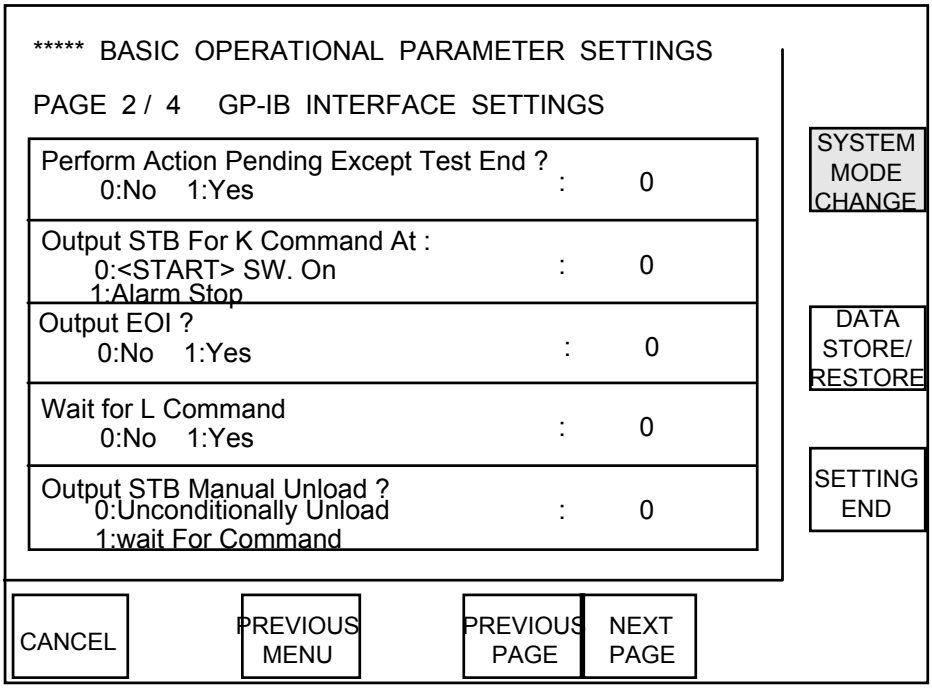
- GP-IB Text Delimiter
  : Select whether to use as the delimiter a CR + LF code or a CR code only.

- Perform STB Code Handshaking?
  : At '0', next process will begin even if the controller has not read STB from Prober.
  At '1', next process can not begin until the controller has read STB from Prober.

- Time For STB Handshaking
  : With "Perform STB Code Handshaking?" set to '1', Prober will wait by the period entered here for the controller to have read STB from Prober (0~3000 msec). The overtime will result in an error.

- Interrupt Infinitive Handshaking Loop?
  :

- Type of GP-IB Test End Commands
  : At '0', only "J" command has the ability to position the next die.
  At '1', "P", "M", and "C" commands in addition to "J" can position the next die.



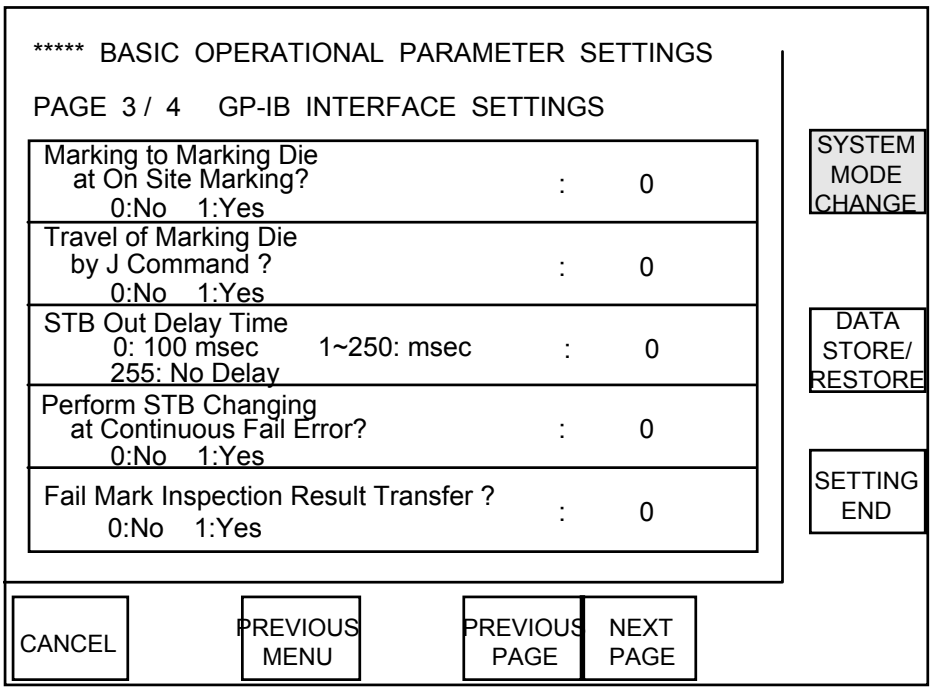
- Perform Action Pending Except Test End?
  : At '0', pushing <STOP> switch during a die testing will make Chuck driven down immediately for the probing stop.
  At '1', Chuck probing height will be maintained after pushing <STOP> switch during a die testing until the Test End command has come and then the probing will stop.

- Output STB For K Command At:
  : At '0', after the probing stop by "K" command, the corresponding STB is sent back at the push of <START> switch (to resume the probing).
  At '1', after the probing stop by "K" command, the corresponding STB is sent back after the alarm clear with the Joy Stick button pushed by the operator.

- Output EOI?
  : Whether to output EOI or not.

- Wait For L Command?
  : At '0: No', the next wafer loading will begin automatically without waiting for the receipt of "L" command.
  At '1: Yes', "L" command is awaited for the start of next wafer loading.

- Output STB Manual Unload?
  : At the manual unload of the current wafer with <Manual Unload> button on the screen, whether to send it immediately to the cassette or to wait for the receipt of "U" command after issuing STB = 71.



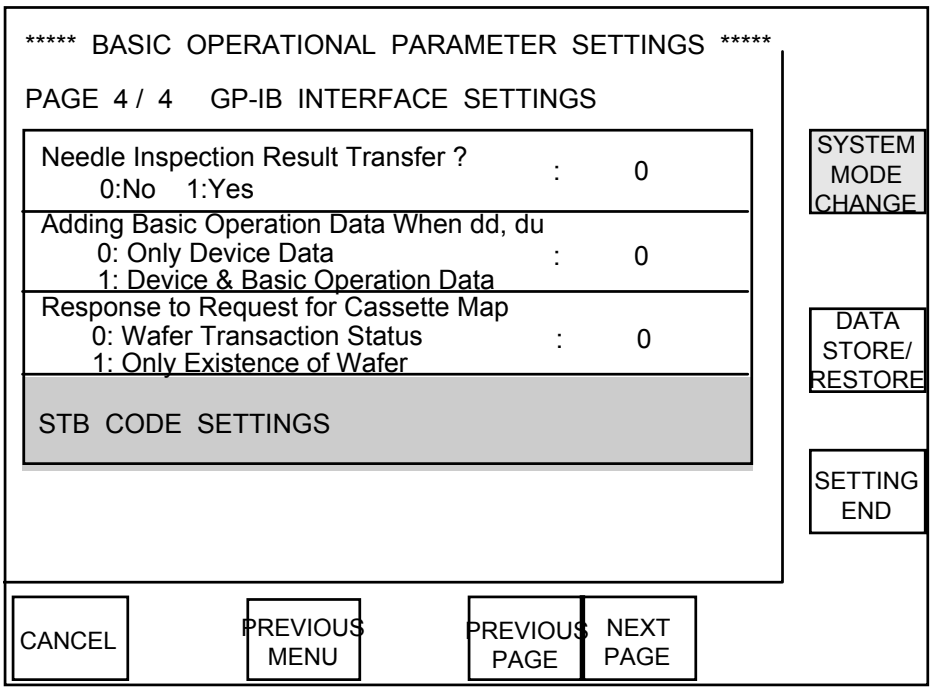
- Marking to Marking Die at On Site Marking?
  - : At '0: No', the in-place marking will neglect all the forced marking dice.
  - : At '1: Yes', when receiving "J" command the in-place marking will work on the next forced marking die and the following test die will be positioned. (Applicable to the single site probing only.)

- Travel of Marking Die by J Command?
  - : At '0: No', Prober with receipt of "J" command will neglect the next forced marking die and position the following test die.
  - : At '1: Yes', when receiving "J" command Prober will not skip the next forced marking die and drive the marker at receiving the marking command.

- STB Out Delay Time
  - : Choose a suitable STB output timing depending on the tester characteristics.

- Perform STB Changing at Continuous Fail Error?
  - : At '1: Yes', the STB code to be sent to the tester on occurrence of continuous Fails can be changed from '76' (the general purpose error occurrence code) to '117'. This is necessary when using an ADVANTEST tester. (After setting '1' here, proceed to [STB Code Settings] menu and change the user-defined code of STB control No. 117 from '0' to '117'.)

- Fail Mark Inspection Result Transfer?
  - : At '1: Yes', upon completion of the Fail mark inspection, Prober will output STB = 123 and wait for "fp" command from Tester demanding the inspection result data.



- Needle Inspection Result Transfer?
  : At '1: Yes', whenever the probe mark inspection on the die specified by "js" command has been performed for each of preset pads under the instruction of "jp" command, Prober will output STB = 122 and wait for "np" command from Tester demanding the inspection result data for the pad.

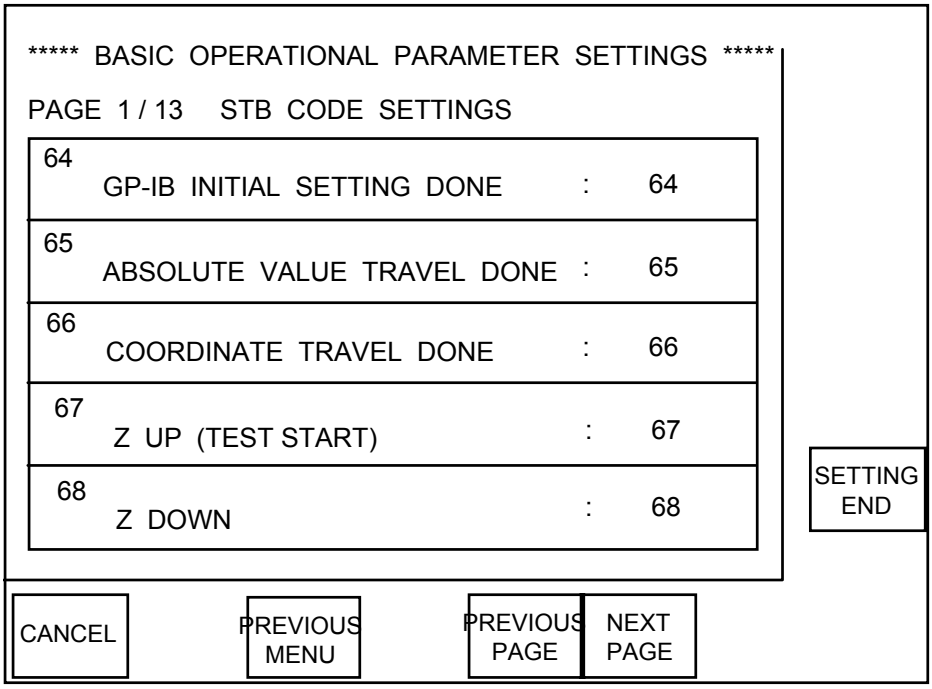
- Adding Basic Operation Data When dd, du
  : With the optional Binary data transfer function provided, Prober can up/down-load the device data including the proper image data with Tester under "du"/"dd" commands. At setting to '1' here, the set of Basic Operational parameters can be added to the up/down-loaded device data.

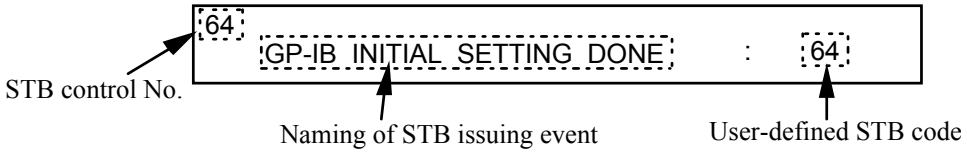
- Response to Request for Cassette Map
  : The performance setting of "w" command for the wafer status request, whether to send the full details of wafer processing states in the cassette slots or the wafer presence information only for each slot.

- STB Code Settings
  : Touching this line opens [STB Code Settings] menu, where the user can kill some STBs from Prober or change actual code numbers to be sent to the controller.

3.3.3 STB code setting

When changing the code of an event, touch the corresponding line on [STB Code Settings] menu as shown below.



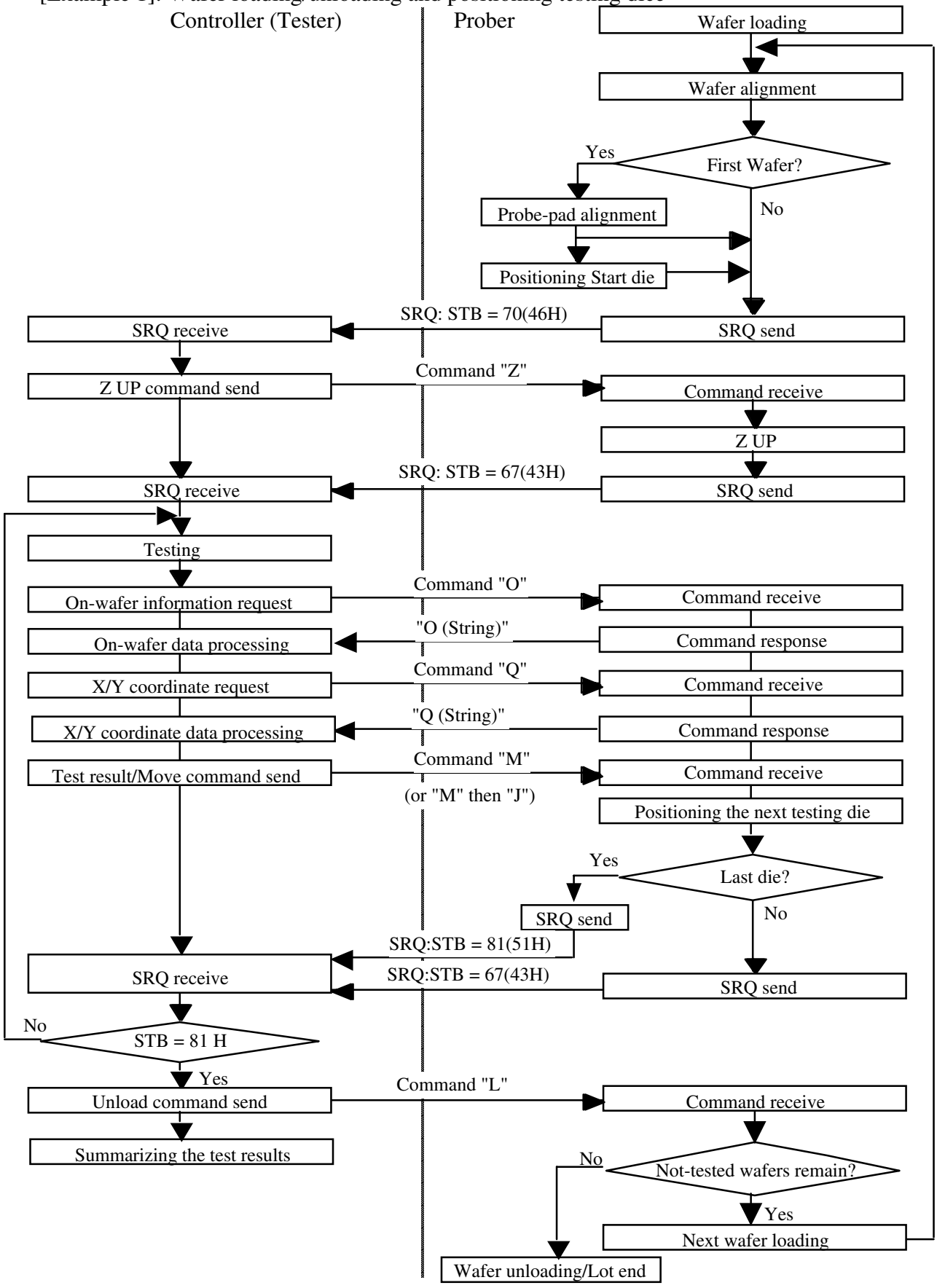


All the STB codes used in this document are STB control numbers. The user-defined STB codes to be output to the controller can take any number from 64 to 127.
When “0” is taken for an event, its STB is not sent from Prober.

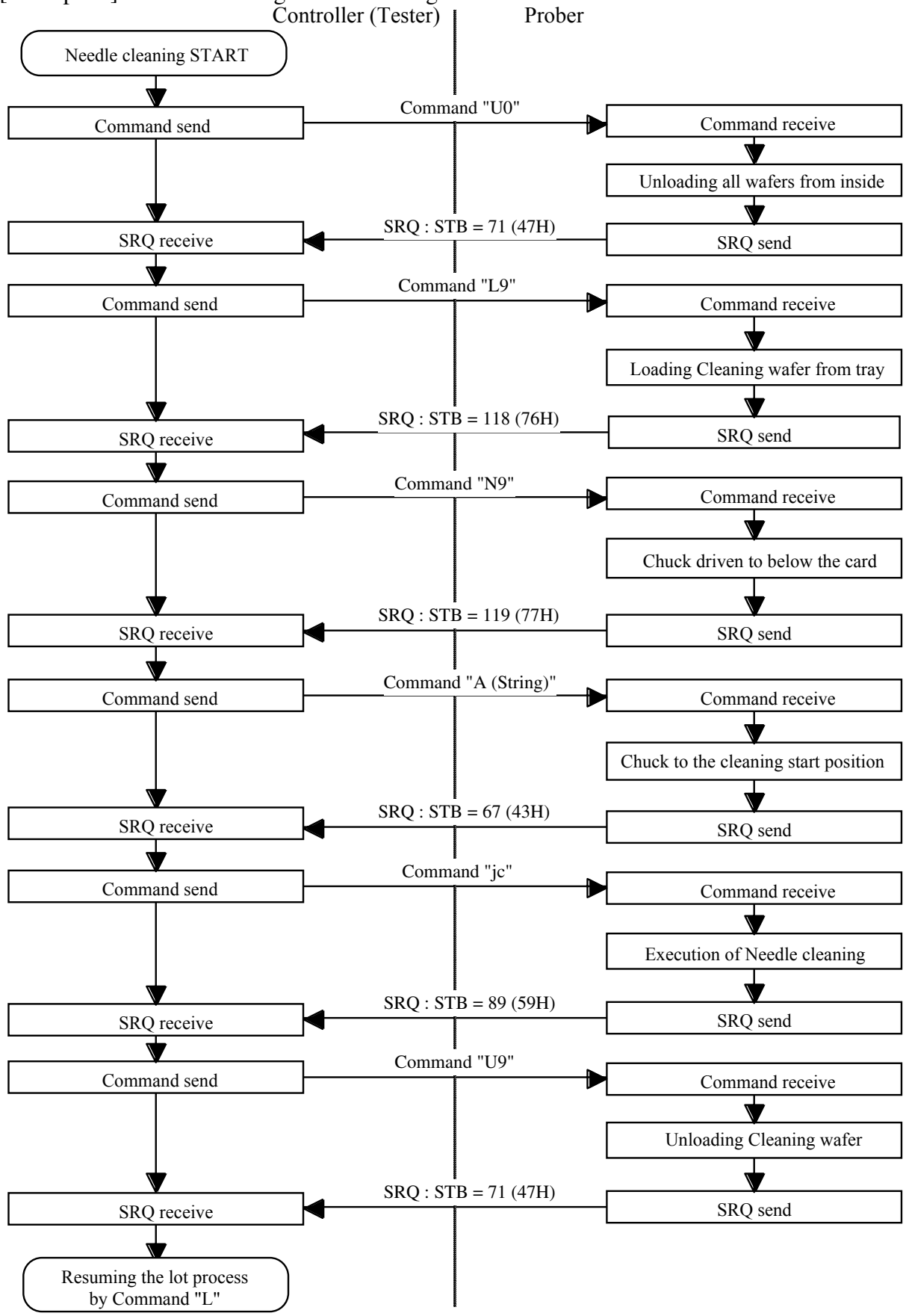
3.4 Examples of Prober Control with GP-IB Commands

For the reference, following pages show the interface flowcharts for the prober control with GP-IB commands.

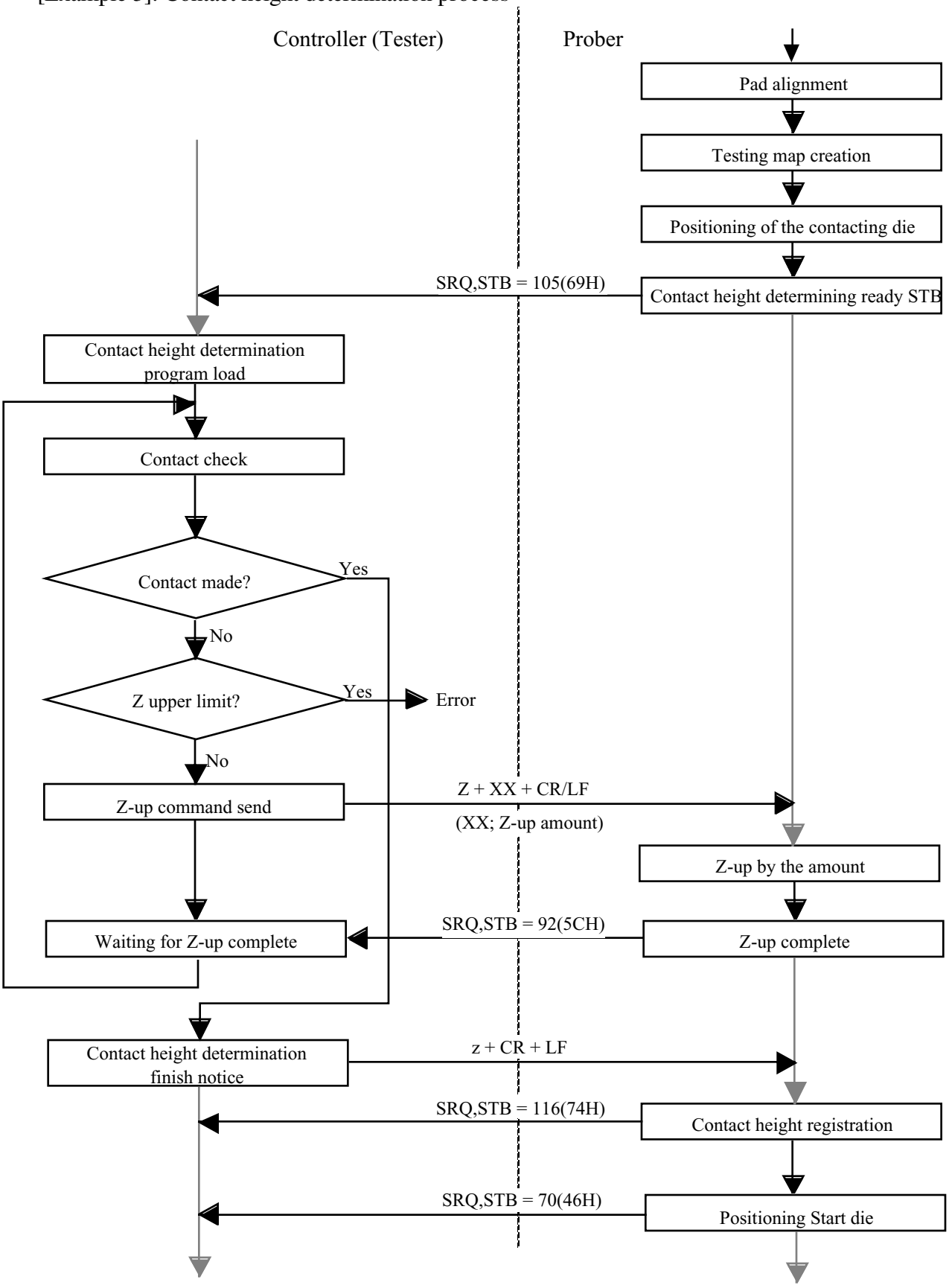
[Example 1]: Wafer loading/unloading and positioning testing dice



[Example 2]: Needle cleaning with a cleaning wafer



[Example 3]: Contact height determination process



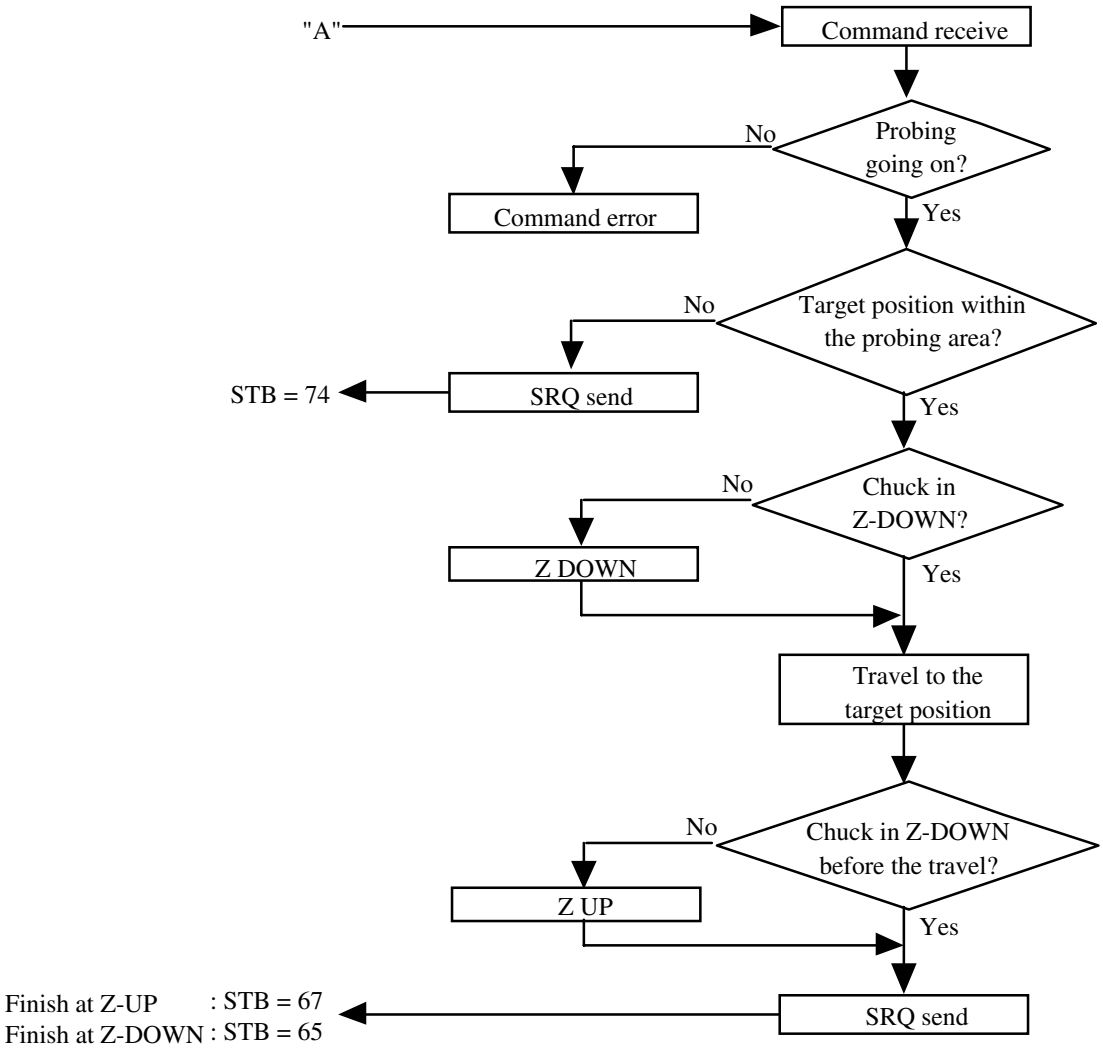
4 Description on Commands

4.1 A (String) : XY travel (absolute distance)

A	Y	±	10^5	10^4	10^3	10^2	10^1	10^0	X	±	10^5	10^4	10^3	10^2	10^1	10^0	CR	LF

(Unit: 10^0 μm or 10^{-4} inch)

At receiving this command, Chuck is set to Z-DOWN at first, it travels from the current position by the demanded X/Y amounts, and then Chuck height is returned to that before receiving this command.
X+ is leftward, and Y+ backward.



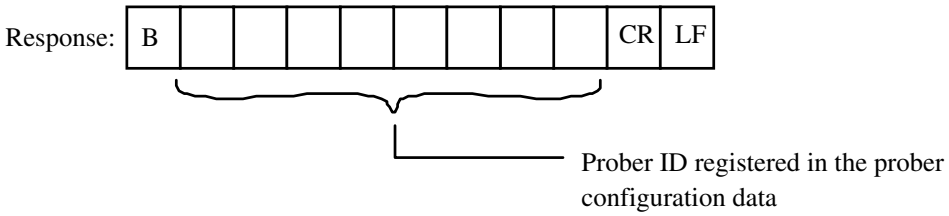
Remarks:

1) The “Probing going on” period is from the positioning of the start die till the wafer last die testing end.
2) A specified travel distance over 1/2 index (but less than one index) in X or Y direction changes the die coordinate value by ±1 after the travel.

4.2 B : Request of prober ID

B	CR	LF

When Prober has received this command and it is allowed as Talker, it outputs Prober ID registered in Prober configuration data.



Note: This command can be used in any time after the initialization.

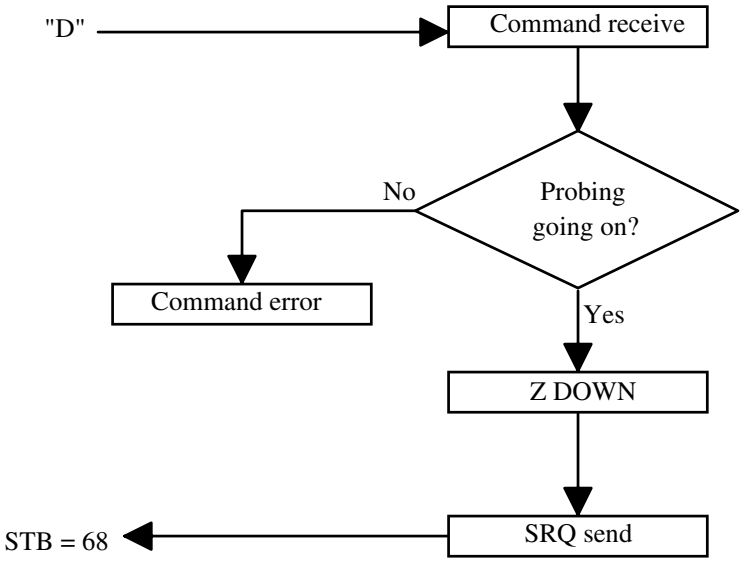
4.3 C : Marking

The format of this command is all the same to that of 4.17 M: Marking. See the sub-section.

4.4 D : Z DOWN

D	CR	LF

At receiving this command, Chuck is set to Z-DOWN.



4.5 E : Error code request

E	CR	LF

On occurrence of an error state, Prober issues SRQ and outputs STB = 76 (STB = 87 at a warning condition, or STB = 94 at All lot finish); the controller should do serial poll and receive the status bytes.
When Prober in an error state has received this command and it is allowed as Talker, it outputs the following error code.

Response:

E	x	n	n	n	n	CR	LF

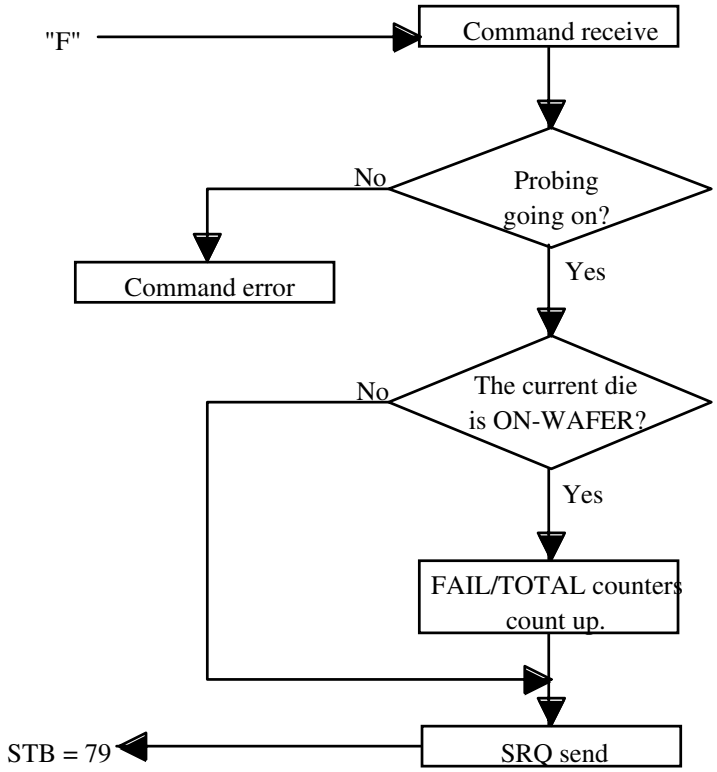
Error code
Error type "S" : System error
"E" : Error state
"O" : Operator call
"W" : Warning condition
"I" : Information

When Prober in no error state has received this command, it does not output error code.
The error code is erased at the clearance of error state.

4.6 F : FAIL counting-up

F	CR	LF

When Prober has received this command with the probes in the On-wafer condition, FAIL and TOTAL counters count it. This command takes effect only when the channel location is set to zero (for the single site probing).



4.7 F (String) : F-axis fine adjustment

F	±	X1	X0	CR	LF

X1X0: 0 ~ 99 μm

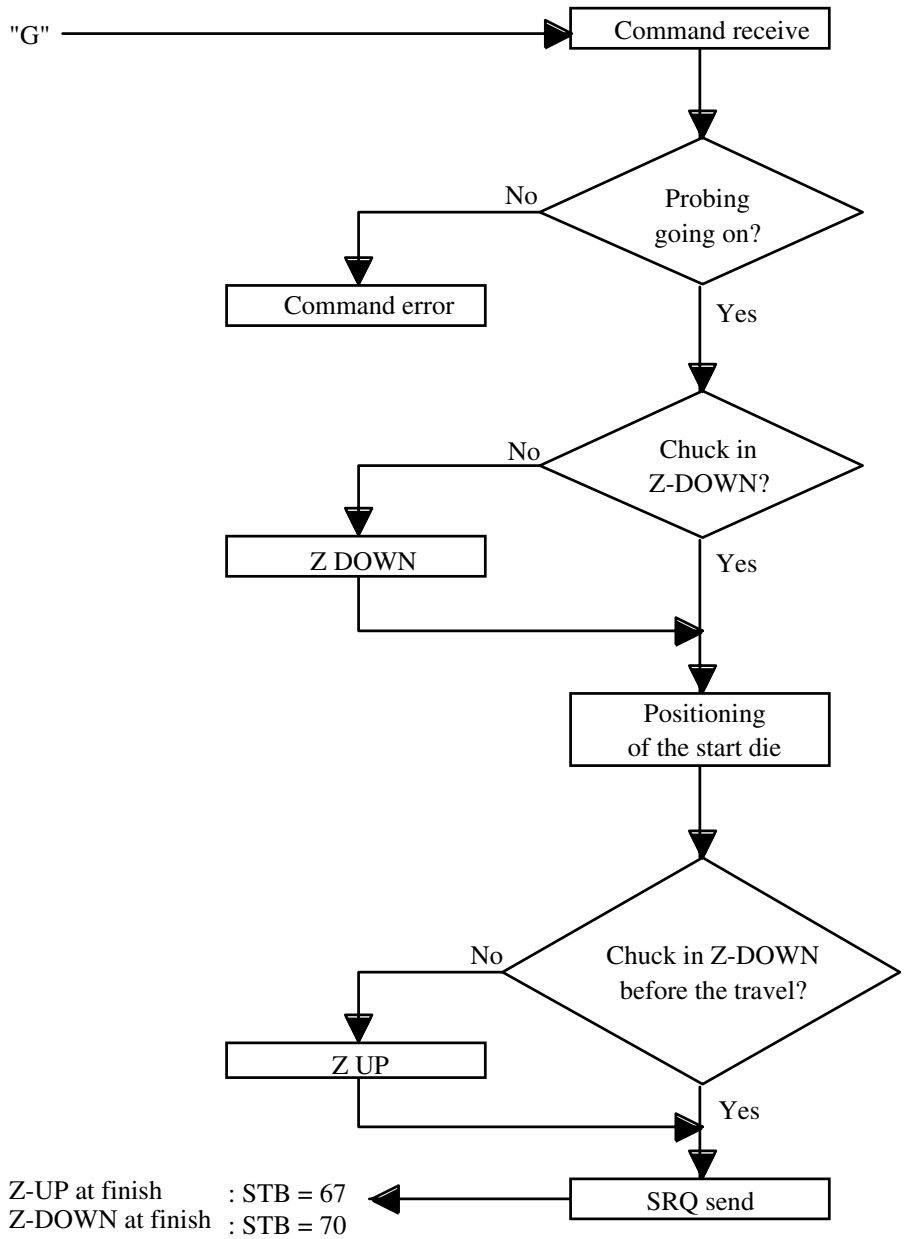
Prober will move up/down the F-axis (carrying the probe tip viewing camera, cleaning disc, and the optional Shorting block) by the height in the command. This command is effective when using the optional Shorting block.

Response: SRQ send STB = 98; correct finish
STB = 99; incorrect finish

4.8 G : Positioning start die

G	CR	LF

At receiving this command, Chuck is set to Z-DOWN, the start die is positioned , and then Chuck height is returned to that before receiving this command.
Since this command is used for the re-testing of the current wafer, PASS/FAIL counters are reset to zero, too.



4.9 H : Multi-site location No. request

H	CR	LF

When Prober has received this command and it is allowed as Talker, it outputs the channel location No. registered in the device data.

Response:

H	x	x	CR	LF

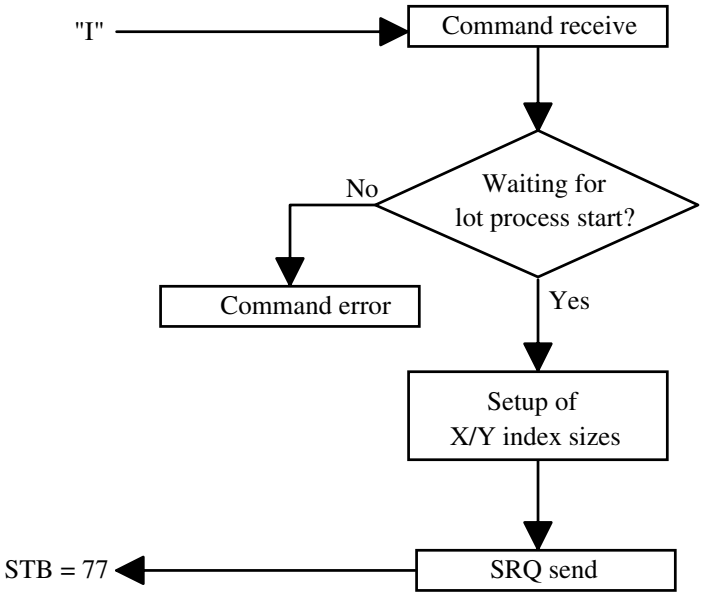
Channel location number

4.10 I : Index size setting

I	Y	10^4	10^3	10^2	10^1	10^0	X	10^4	10^3	10^2	10^1	10^0	CR	LF

(Unit: 10^0 µm or 10^{-4} inch)

At receiving this command, the index sizes of die are changed accordingly.



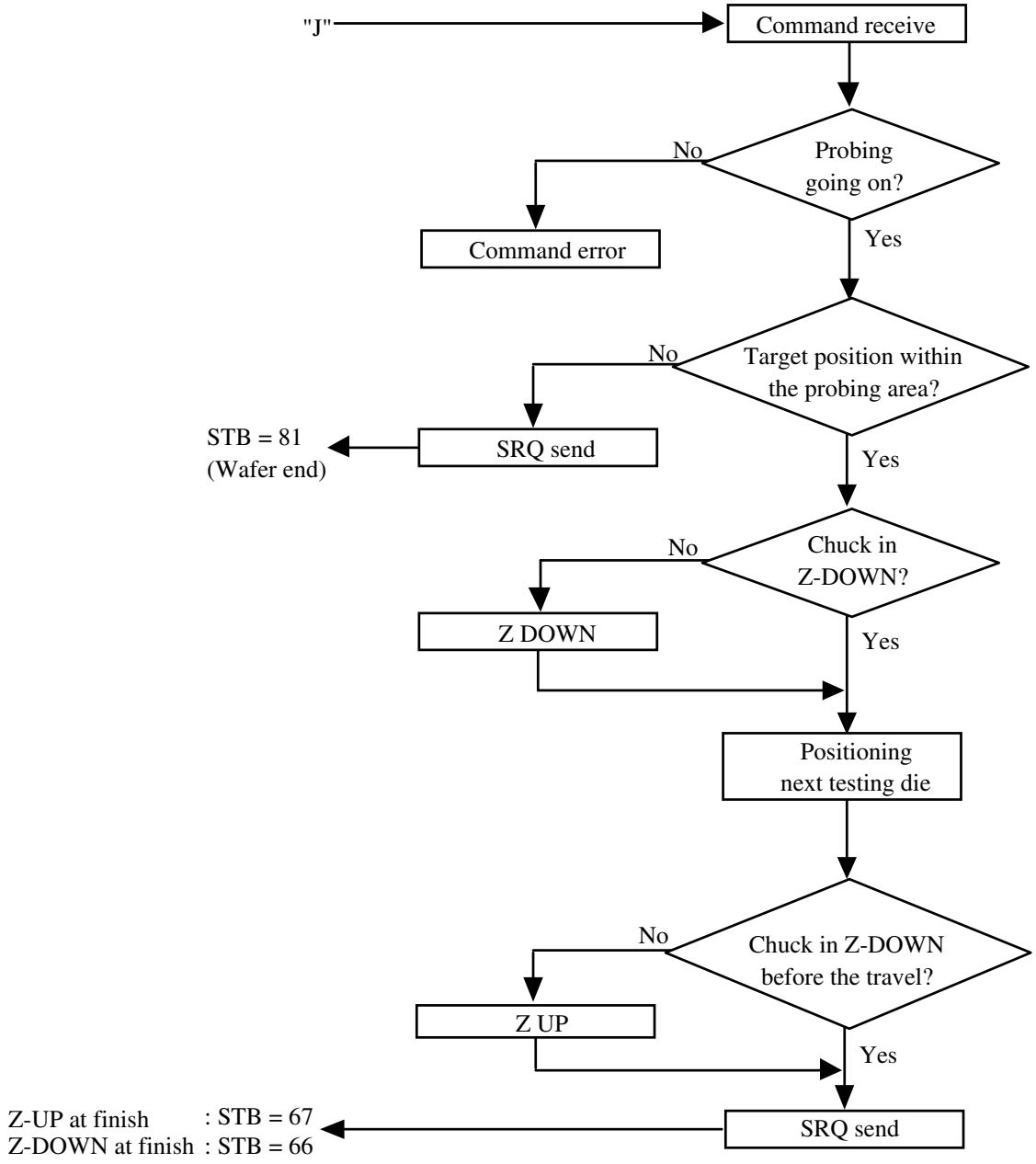
Note: After execution of this command, wafer alignment and probe-pad alignment become necessary.

4.11 J : Positioning next die / target die

(1) Positioning the next die

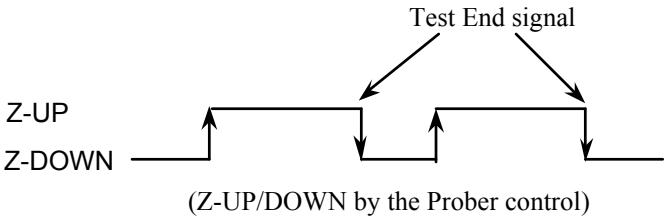
J	CR	LF

At receiving this command, Chuck is set to Z-DOWN, the next testing die is positioned, and then Chuck is returned to the height before receiving this command.

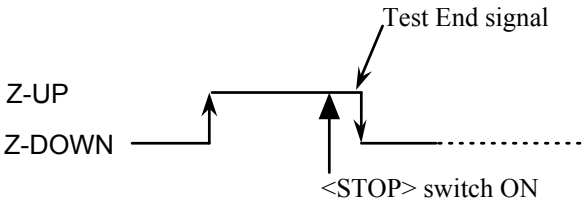


Remark: <STOP> switch operation under the GP-IB control

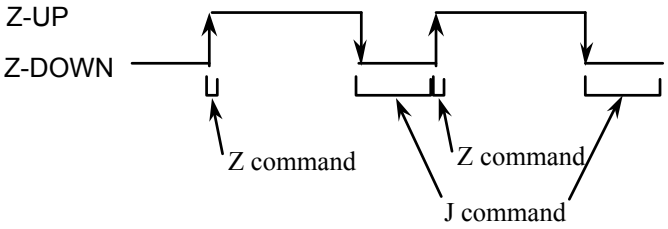
At the control under TTL Interface



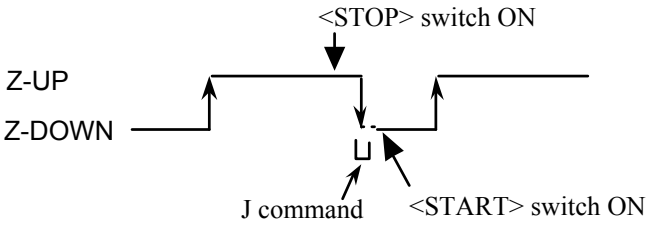
Under the TTL interface control, when <STOP> switch has been pushed in the testing of a die, after the completion of the die testing the next die is positioned and Prober stops with Chuck kept to Z-down. When <START> switch is pushed in this condition, Chuck is driven up and Prober outputs the Test Start signal.



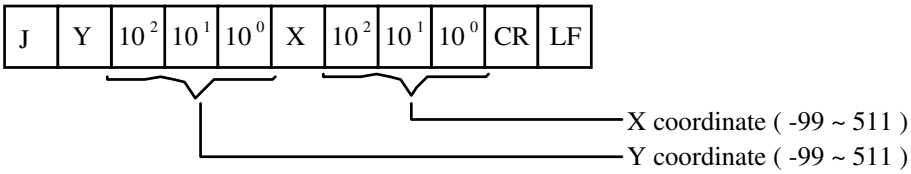
GP-IB control



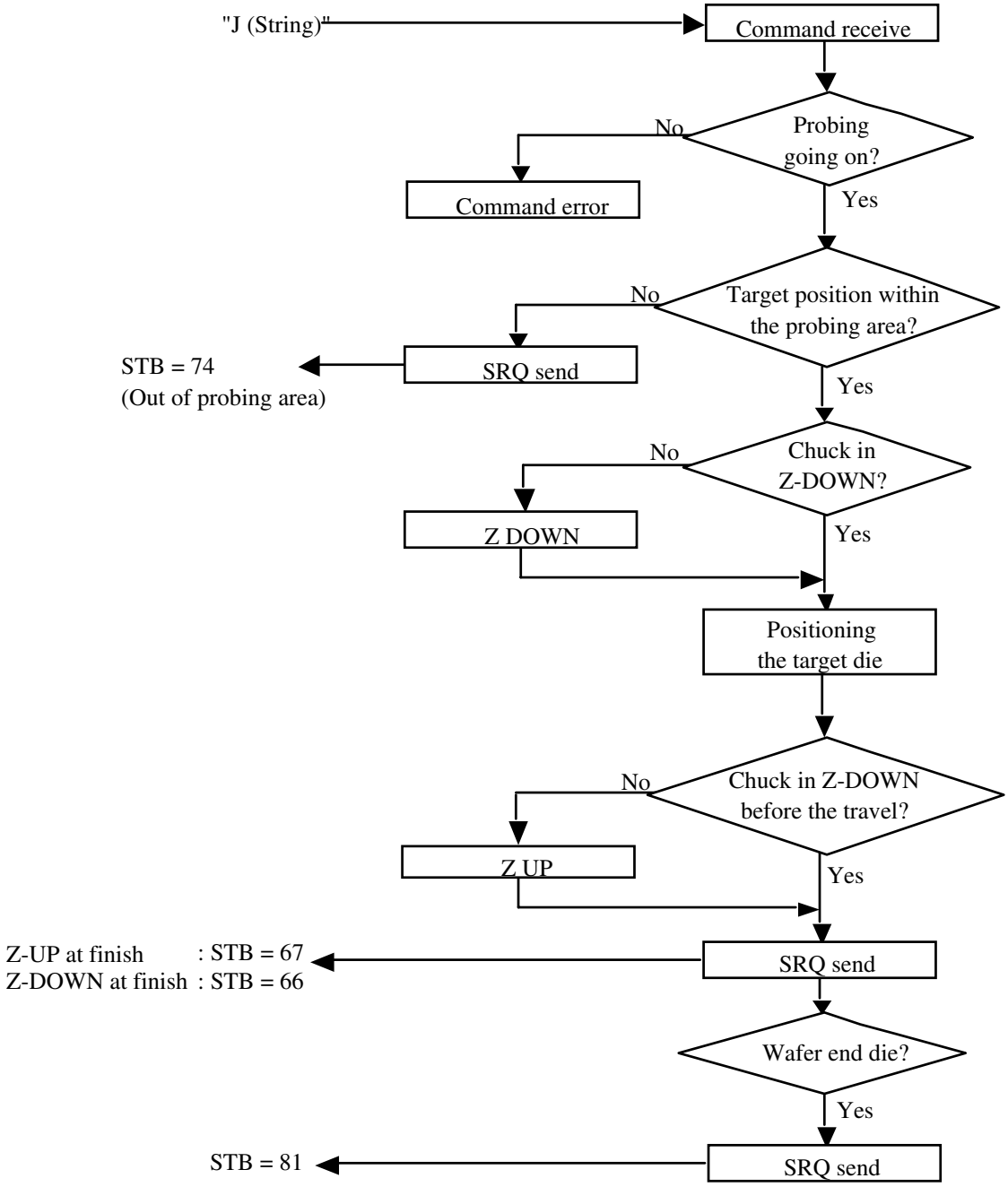
Under the GP-IB control, when <STOP> switch has been pushed in the testing of a die (before receiving "J" command), Chuck is driven down at receiving of "J" command, but the next testing die is not positioned and Prober stops as it is. At this time Prober sends STB = 90.
When <START> switch is turned on after a while, the next testing die is positioned and Prober then sends STB = 67 after Z-UP.



(2) Positioning a target die



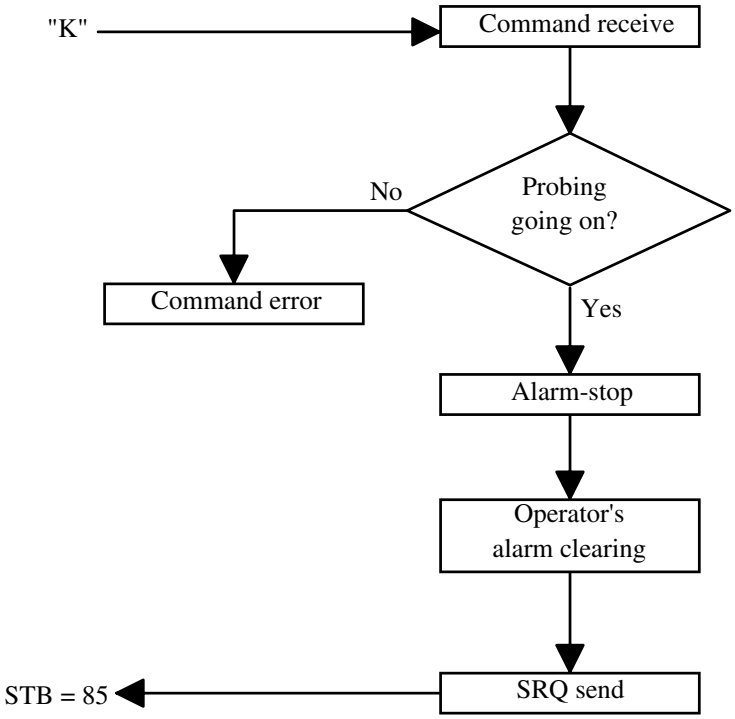
At receiving this command, Chuck is set to Z-DOWN, the die having the specified coordinates is positioned, and then Chuck is returned to the height before receiving this command.



4.12 K : Stop

K	CR	LF

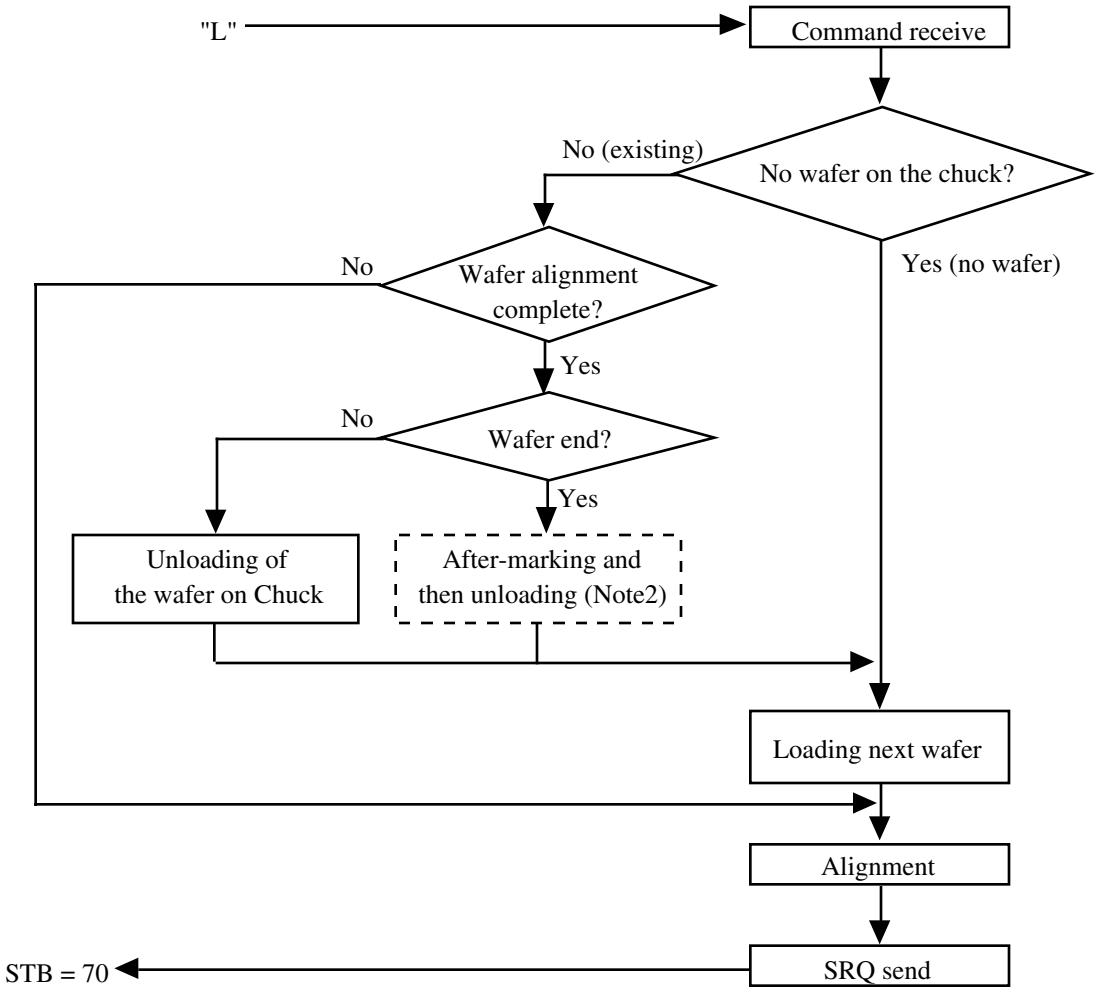
At receiving this command, Prober indicates the message "GP-IB STOP COMMAND" and alarm-stops.
After clearing the alarm by JOY STICK push button, Chuck can be moved with JOY STICK.
For resuming Prober operation, push <START> switch or send the GP-IB command from the controller.



4.13 L : Unload/load/align

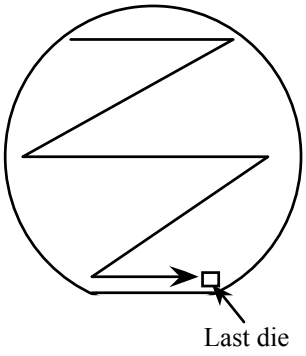
L	CR	LF

Usually this command is used at the Wafer End to unload the wafer and load/align the next wafer.
At receiving this command after a wafer is loaded and aligned, the wafer is unloaded and the next wafer is loaded and aligned.
When receiving this command at no wafer on Chuck, Chuck is driven DOWN, Prober loads the first available wafer for the wafer/probe-pad alignment, and it waits for the operator's action or next coming command.

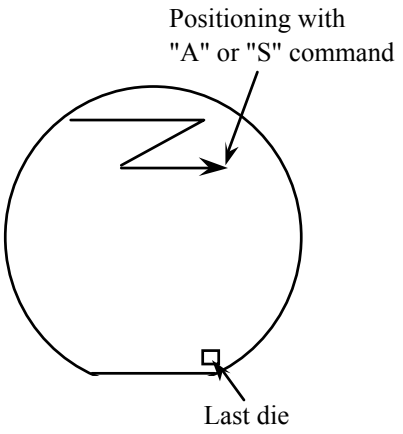


Note 1: This command can be used in any time after the initialization.
Note 2: When receiving this command at the Wafer End in the after-marking setting, Prober performs the after-marking according to the test result map and the unloads it.

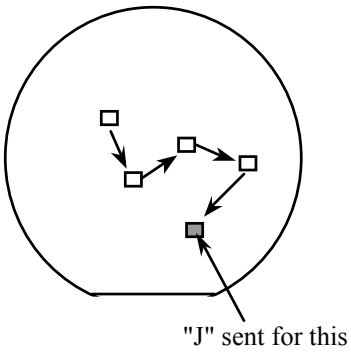
Remark: Using L command with the after-marking



In the usual probing:
At receiving J command on the last (Wafer End) die, Prober sends back STB = 81. With the instruction of unloading by L command, Prober works for the after-marking in reference to the test result map and then unloads the wafer.
(Under the setting to alarm-stop with the yield error at the Wafer End, Prober will alarm-stop at receiving L command for a low yield.)



In the probing of dice selected with “A” or “S” command:
When the tests of selected dice have finished and you want to mark the Fail dice, jump to the last die with A or S command or repeat sending J command to reach the last die. At receiving J command on the last die, Prober sends back STB = 81; respond with L command to unload the wafer. Prober will act for the after-marking according to the test result map and then unloads the wafer.
If L or U command has been used on a die other than the last die, the wafer is unloaded without the after-marking. (After the unloading, STB = 71 - Wafer unloading done is sent.)

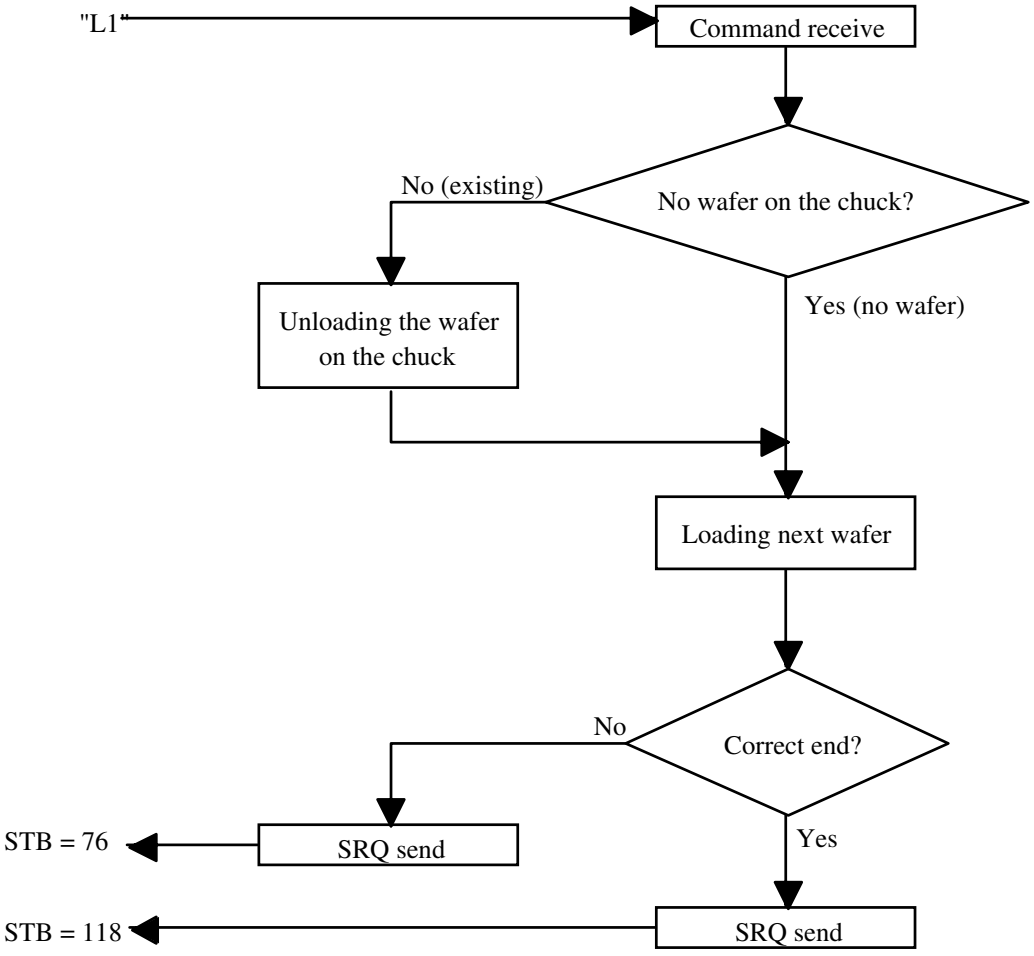


In the sampling by teaching; for selecting particular dice with “A” or “S” command and marking:
After positioning a wanted die with A or S command, send M command to make the die Fail. Then send J command; Prober sends back STB = 81. At this time, respond with L command to unload the wafer; Prober will after-mark the die and then unload the wafer.

4.14 L 1 : Wafer loading without alignment

L	1	CR	LF

At receiving this command, Chuck is set to Z-DOWN, and if wafer loading is not complete the next available wafer is loaded to Chuck.
When a wafer already exists on Chuck, the wafer is unloaded and the next wafer is loaded.



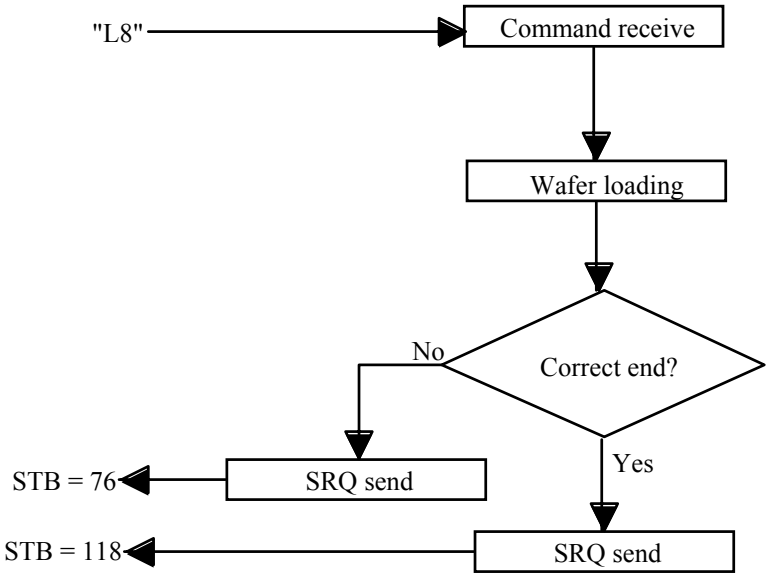
Notes:

1) This command can be used in any time after the initialization.
2) Wafer profile measurement and alignment are not performed.

4.15 L 8 : Pre-loading

L	8	CR	LF

At receiving this command, the wafer in the start slot of cassette is taken out, pre-aligned, and read of its wafer ID.

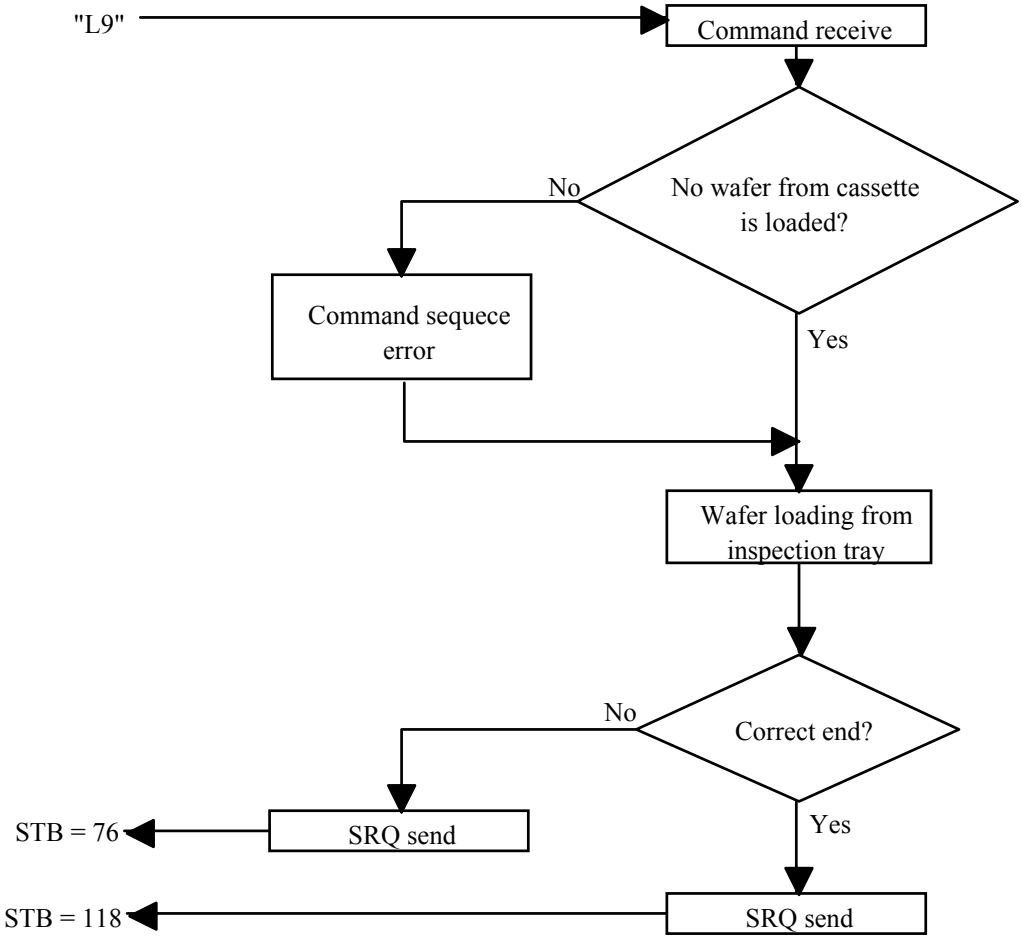


Note: This command can be used after the initialization or at the start of a lot process.

4.16 L 9 : Load from inspection tray (without alignment)

L	9	CR	LF

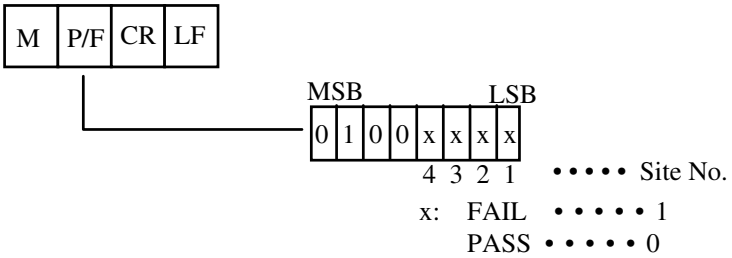
At receiving this command, the wafer in the inspection tray is loaded to Chuck.



Note: Wafer profile measurement and alignment do not take place.

4.17 M : Marking

(1) Without category data



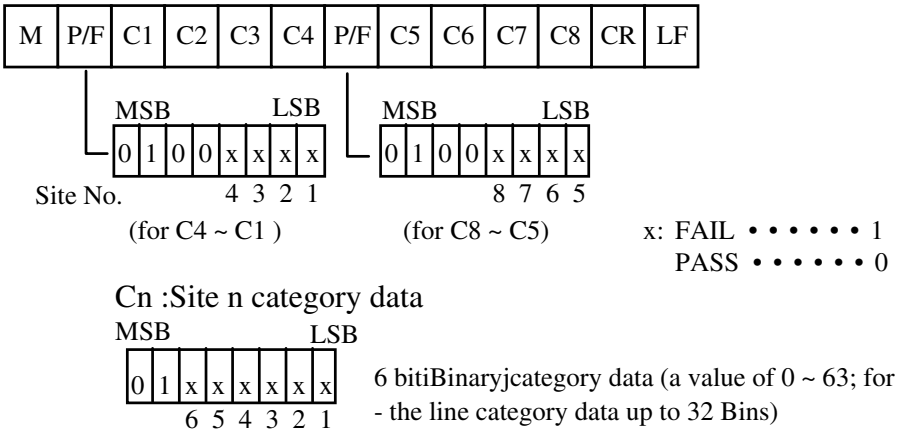
At receiving this command, the die which is On-wafer and judged as FAIL is marked, and the PASS/FAIL and TOTAL counters count up. (At 5 ~ 8 sites the P/F data takes 2 bytes, and 9 ~ 16 sites it takes 4 bytes, so on.)

Remark:

Whether the M command has the category data or not is identified with the command data length. At 4 sites, for example, the data length without category data is 1 byte, the one with the binary category data 5 bytes, the one with the 16 bit line category data 17 bytes, and the one witch the 32 bit line category data 33 bytes, etc.

(2) With binary category data

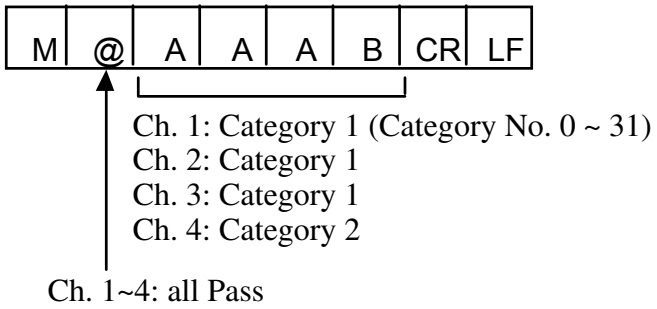
The command format for 8-site probing:



Cn :Site n category data

6 bitiBinaryjcategory data (a value of 0 ~ 63; for handling 64 Bins - the line category data up to 32 Bins)

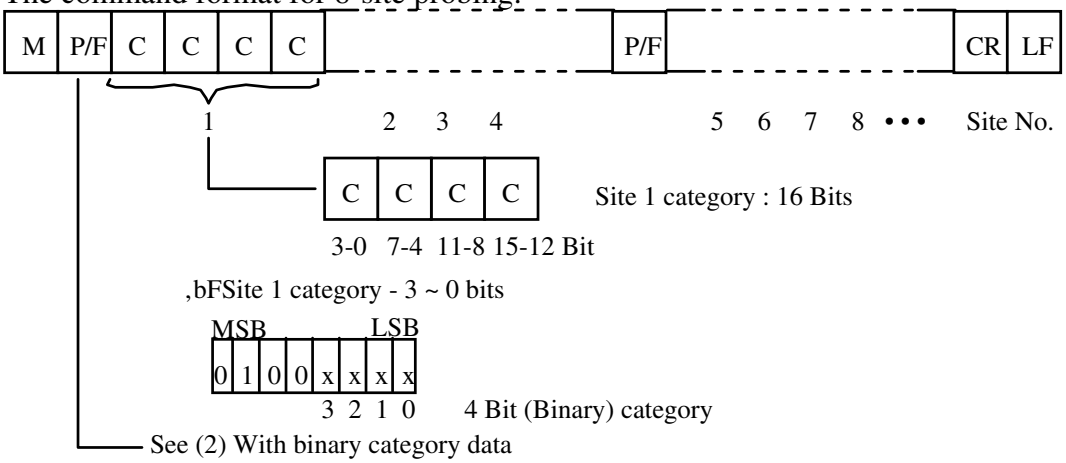
Example of ASCII code representation of M command for 4-site probing



HEX	ASCII	
40 =	@	Bin 0
41 =	A	Bin 1
42 =	B	Bin 2
|	|	
5F	_	Bin 31

(3) With 16 bit category data

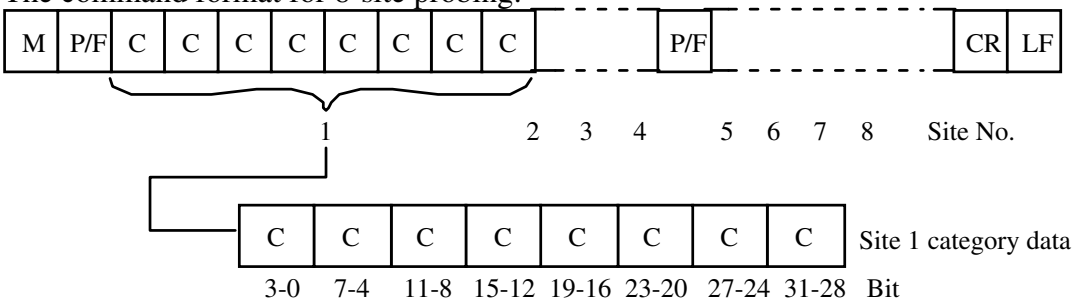
The command format for 8-site probing:



The category data of each site takes 4 bytes.
The category counter corresponding to a bit having the value "1" counts on.

(4) With 32 bit category data

The command format for 8-site probing:

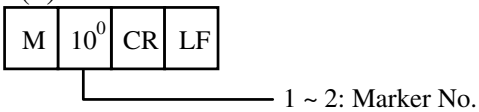


For the bit usage and P/F, see (2) With binary category data and (3) With 16 bit category data.
The category data of each site takes 8 bytes.
The category counter corresponding to a bit having the value "1" counts on.

Remark:

The command data length must meet the number of sites in the multi-site probing; however, if it is longer than that of the site number, the unnecessary part is simply neglected.

(5) Marker drive



When Prober has received this command during probing, Prober drives the selected marker.
Under this command, FAIL/TOTAL counters do not count on; for the counting F command must be sent. (This is used at 2-color marking in the single site probing.)

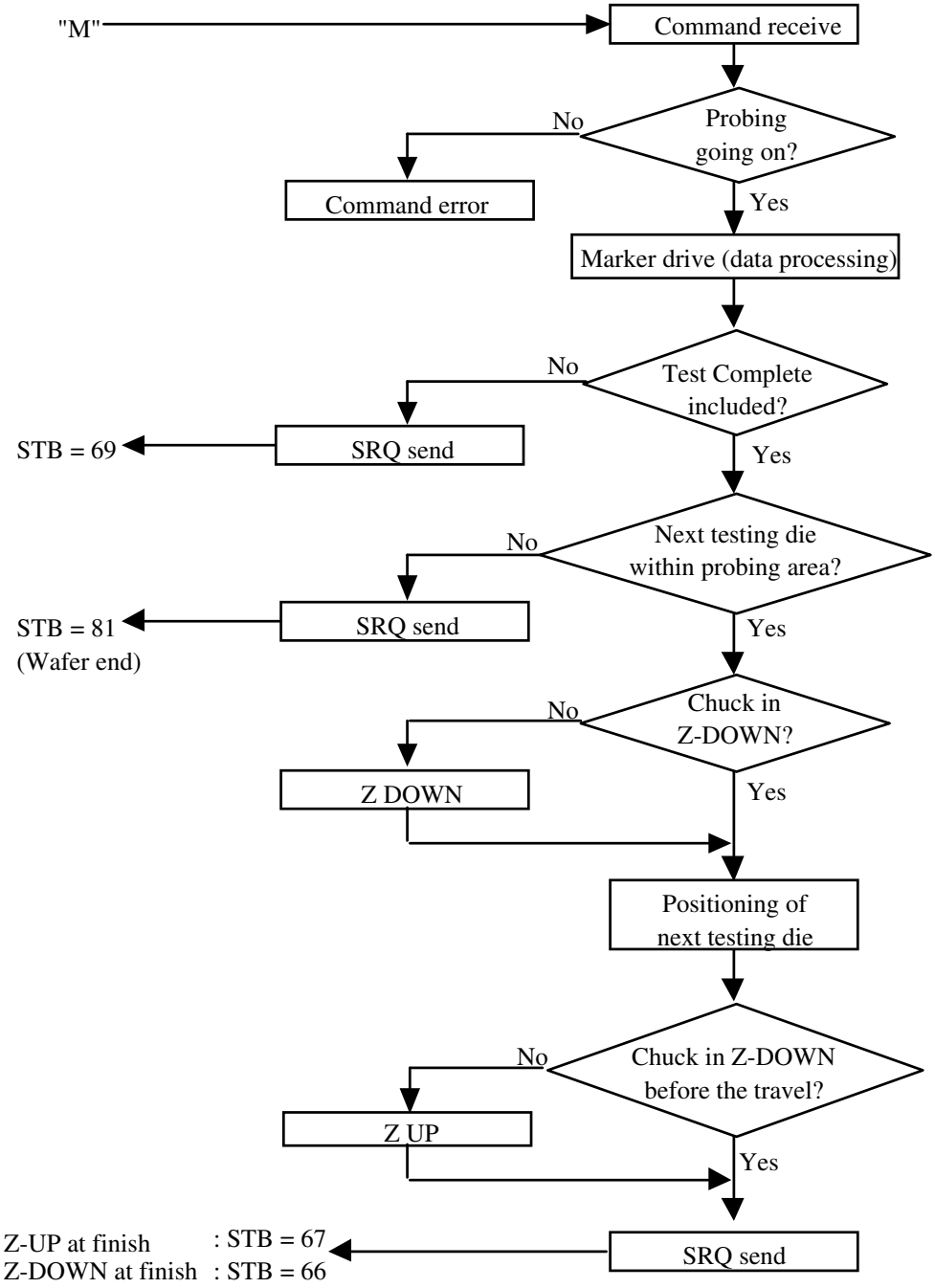
Response: SRQ send STB = 69

(6) Prober's actions and responses

With M command not having the Test End function, at receiving the command, Prober drives the marker and processes the category data for the in-place marking or simply processes the Pass/Fail and category data for the after-marking, and then Prober responds with STB = 69.

With M command given the Test End function, after sending STB = 69, Prober drives down Chuck, positions the next testing die, and recovers the previous Chuck height at receiving the command as replying with one of the following STBs:

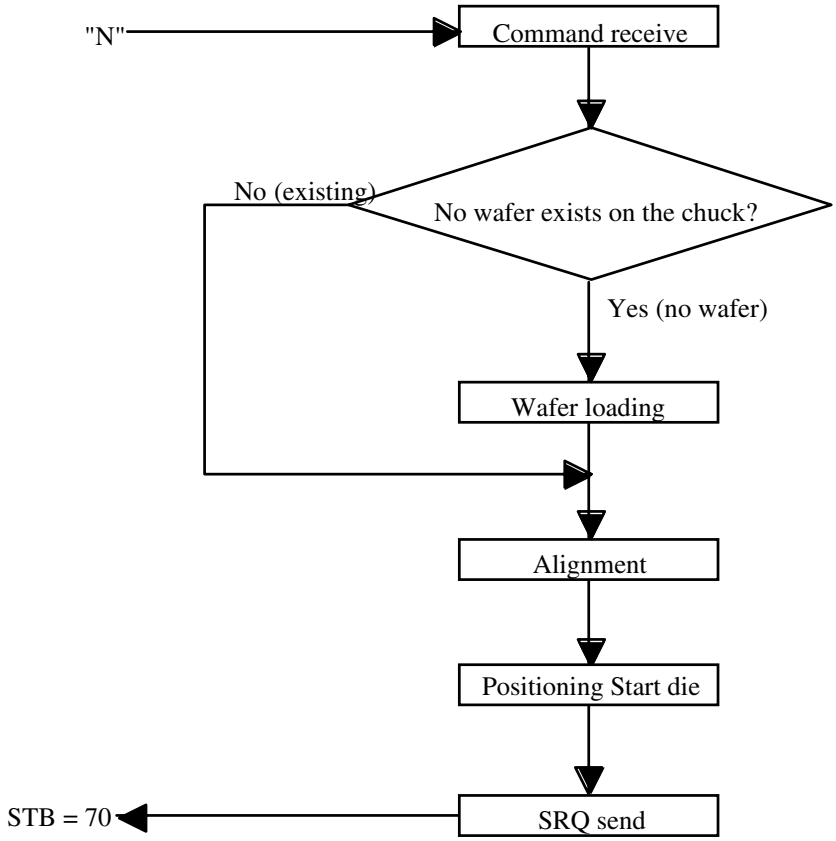
- •When receiving this command at Z-UP STB = 67
- •When receiving this command at Z-DOWN STB = 66
- •When the next testing die exits out of the probing area STB = 81 (Wafer End)



4.18 N : Alignment retry

N	CR	LF

At receiving this command, when no wafer exits on Chuck the load/align process takes place, and if a wafer already exists on Chuck automatic alignment takes place.



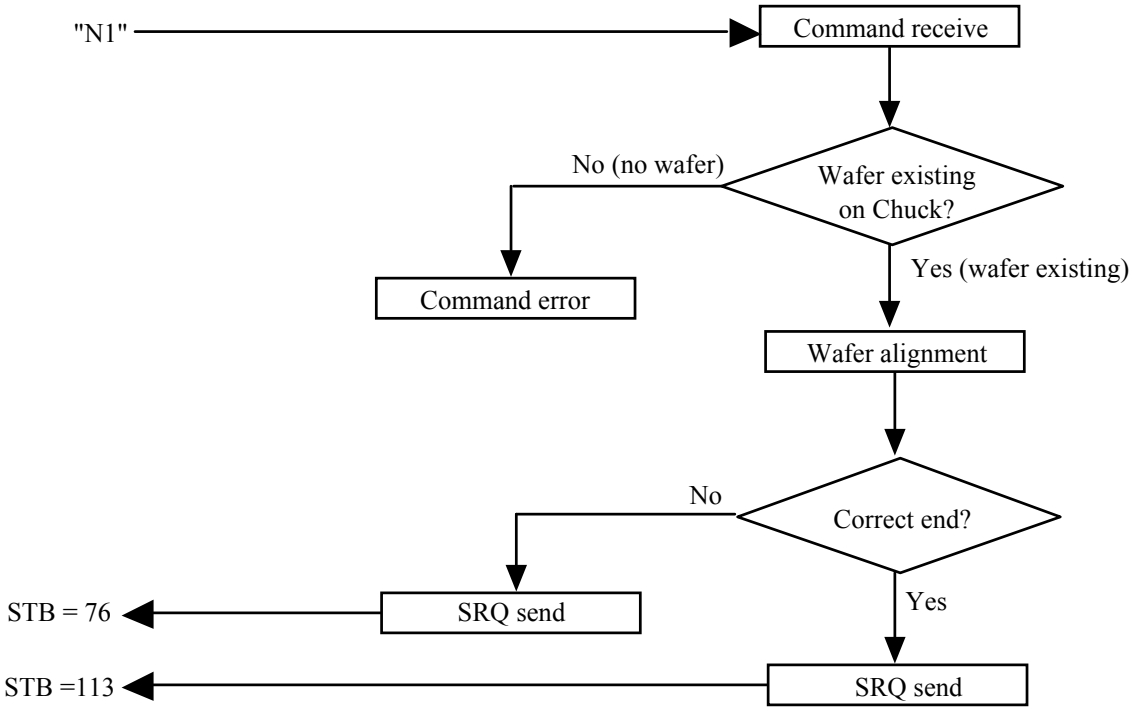
Remark:

When the target wafer is the initial wafer of a new device or the first wafer of a new lot after the device change, the automatic probe-pad alignment follows the wafer alignment and then the start die is positioned for the wafer. For one of the other wafers, after the wafer alignment alone the start die is positioned.

4.19 N 1 : Alignment retry (alignment only)

N	1	CR	LF

At receiving this command, the wafer existing on Chuck is subjected to the automatic alignment. After the alignment, Chuck stops below the alignment camera as responding with STB = 113.



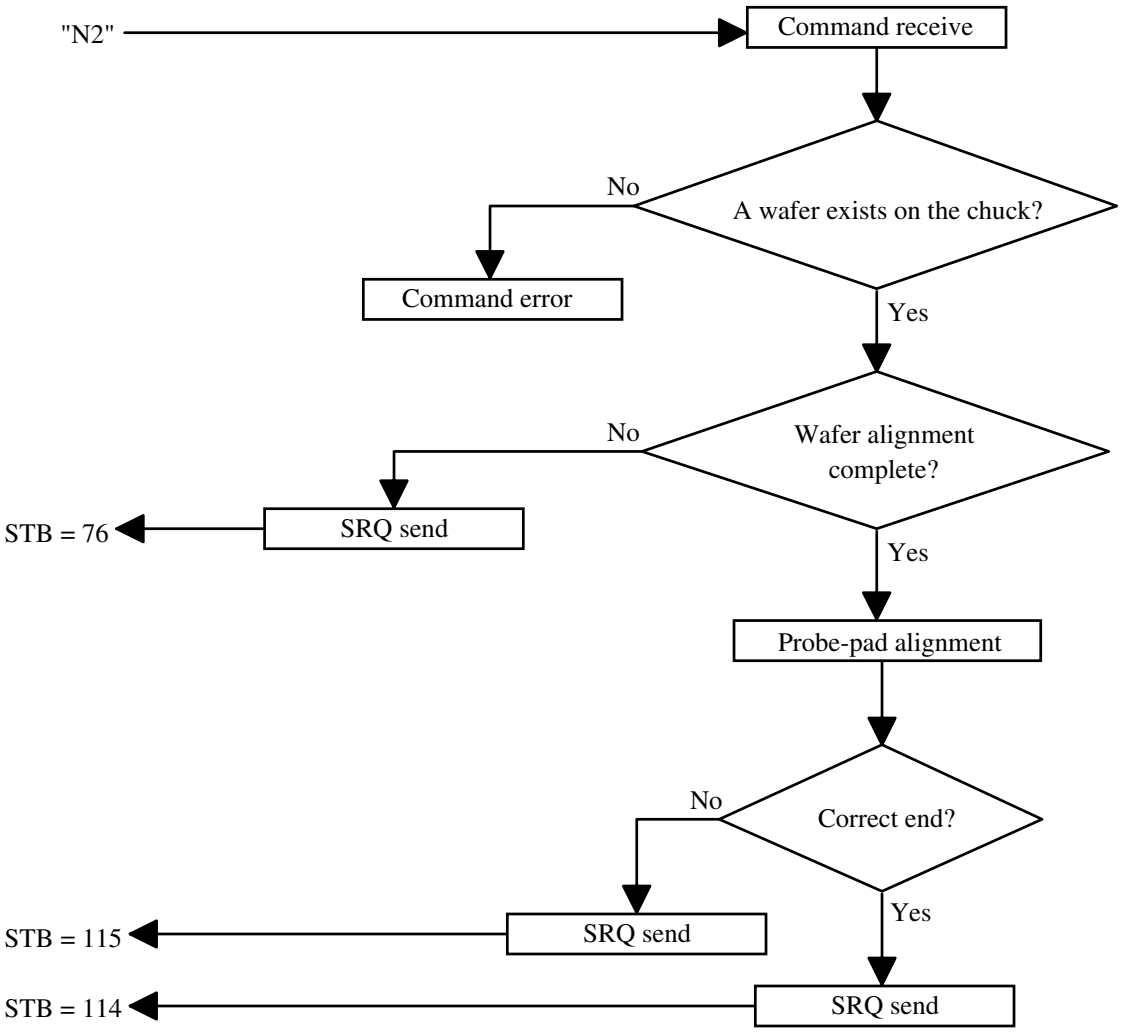
Remark:

This N1 command is for the alignment retry of the current wafer on Chuck without the probe-pad alignment. Use this in the combination of L1 command (loading a new wafer) → N1 command execution → N2 command (for the probe-pad alignment).

4.20 N 2 : Retry of probe-pad alignment

N	2	CR	LF

At receiving this command, the probe-pad alignment is done for the wafer existing on Chuck.
After completion of the probe-pad alignment, Chuck stops as it is; so send G command to position the start die for starting the probing.



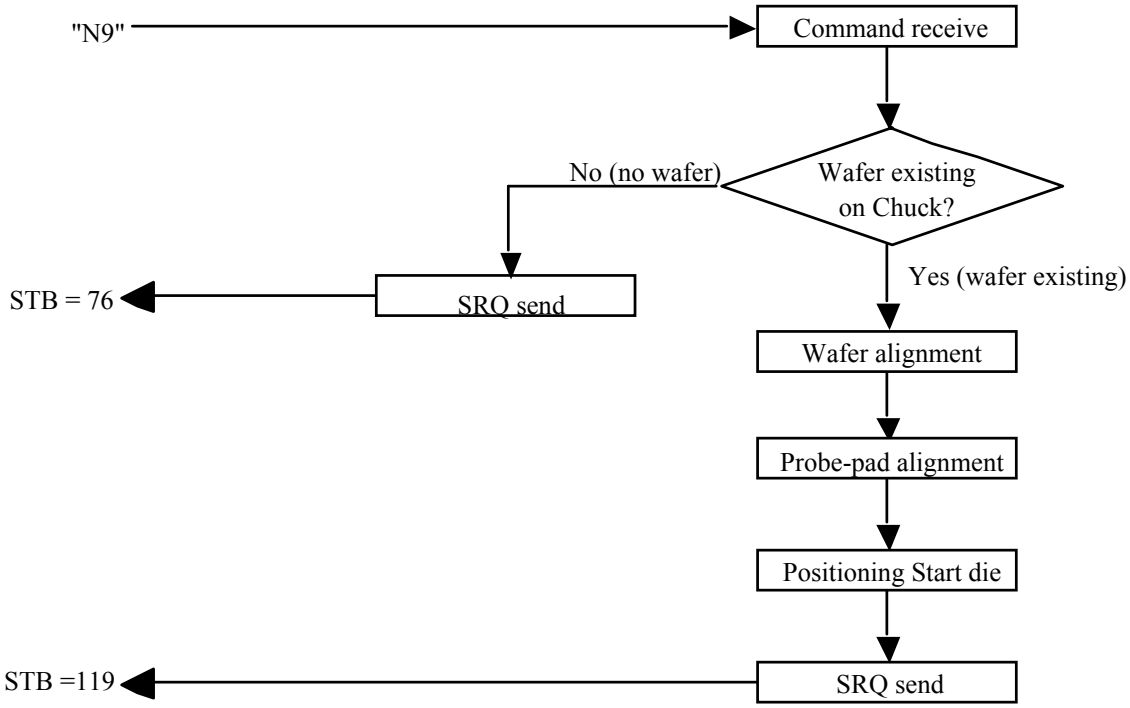
Remark:

Use this in the combination of L1 command (loading a new wafer) → N1 command (for the wafer alignment) → N2 command (for the probe-pad alignment).

4.21 N 9 : Wafer/probe-pad alignment

N	9	CR	LF

At receiving this command, Prober performs the wafer and probe-pad alignment on the wafer existing on Chuck and then positions the start die as responding with STB = 119.



Remark:

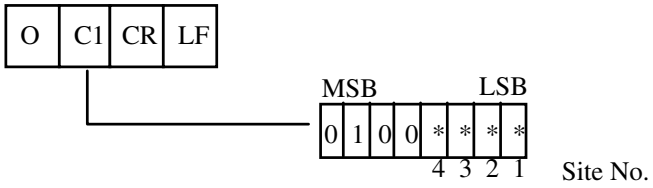
Use this in the combination of L9 command (loading a wafer from the inspection tray) → N9 command execution.

4.22 O : On-wafer information request

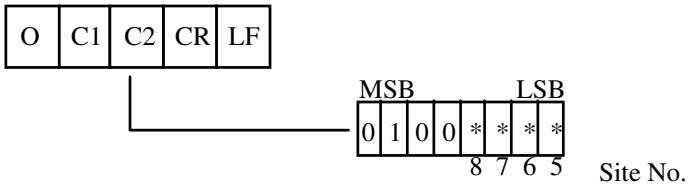
O	CR	LF

At receiving this command, Prober outputs the current On-wafer information.

Response: (1)



(2)



C1,C2: HEX character x :1= On-wafer, 0 = Off-wafer

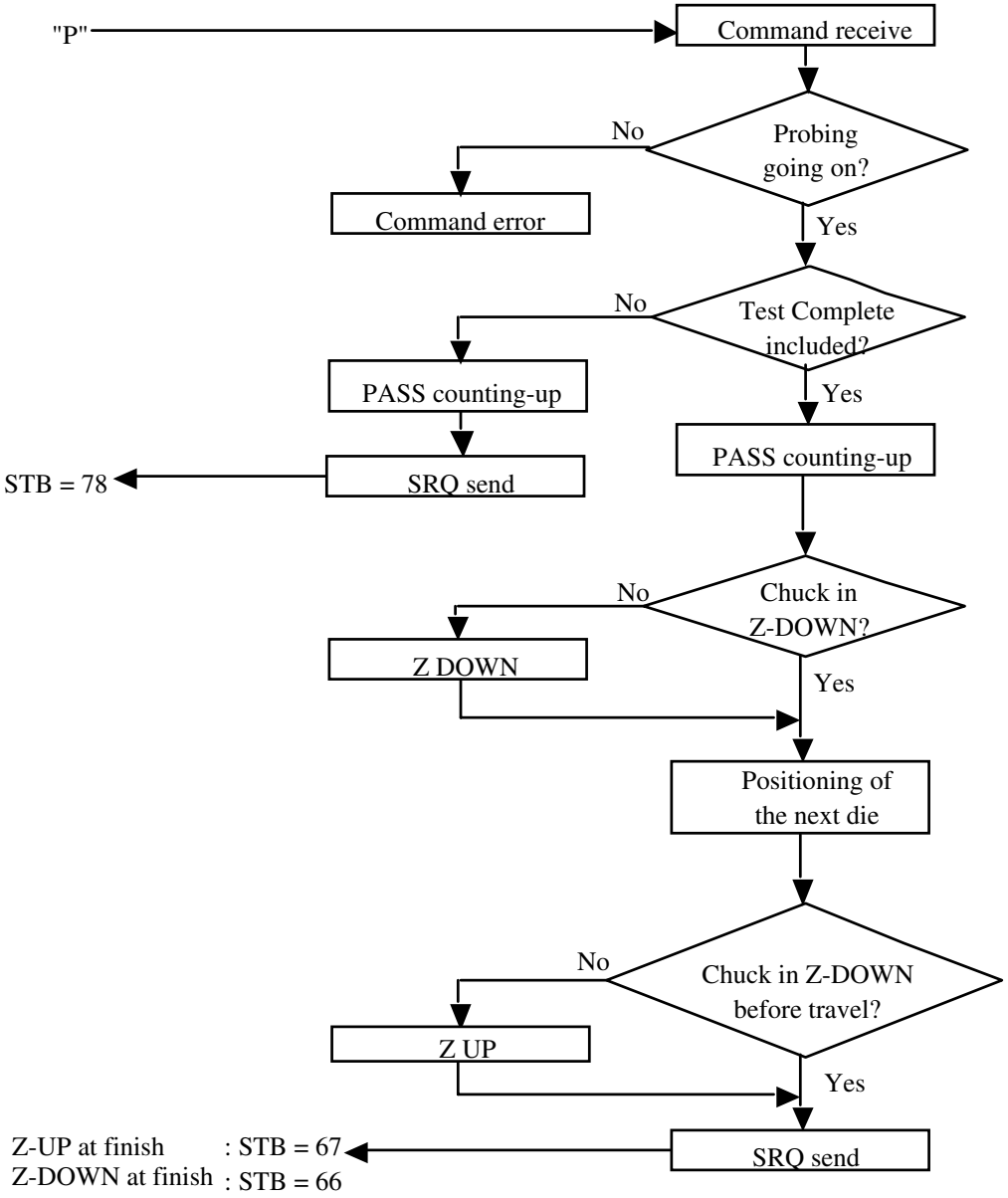
Notes:

1) Periphery marking dice, forced marking dice, and probing skip dice are not On-wafer.
2) Effective only during probing. Otherwise it will cause the command error.
3) For 9 ~ 64-site probing, this function is modified as option.

4.23 P : PASS counting-up

P	CR	LF

At receiving this command, if the current die is On-wafer the PASS and TOTAL counters count on. When this command includes the Test Complete function, Chuck is set to Z-DOWN, the next die is positioned, and Chuck height is returned to that before receiving this command. Use this command for the single site probing.



4.24 Q : XY coordinates request

Q	CR	LF

When Prober has received this command and it is allowed as Talker, it outputs the current coordinates.

Response:

Q	Y	10^2	10^1	10^0	X	10^2	10^1	10^0	CR	LF

X coordinate (–99 ~ 511)
Y coordinate (–99 ~ 511)

Note: This is valid only during probing; otherwise the response is indefinite.(The command error does not occur.)
Even if the actual coordinate value is less than –99 (like –100 or –101), the response is –99.

4.25 R : XY coordinates (absolute values) request

R	CR	LF

When Prober has received this command and it is allowed as Talker, the current absolute coordinate values in the probing area are output. The unit is 10^{-1} μm or 10^{-5} inch.

Response:

R	Y	10^5	10^4	10^3	10^2	10^1	10^0	10^{-1}	X	10^5	10^4	10^3	10^2	10^1	10^0	10^{-1}	CR	LF

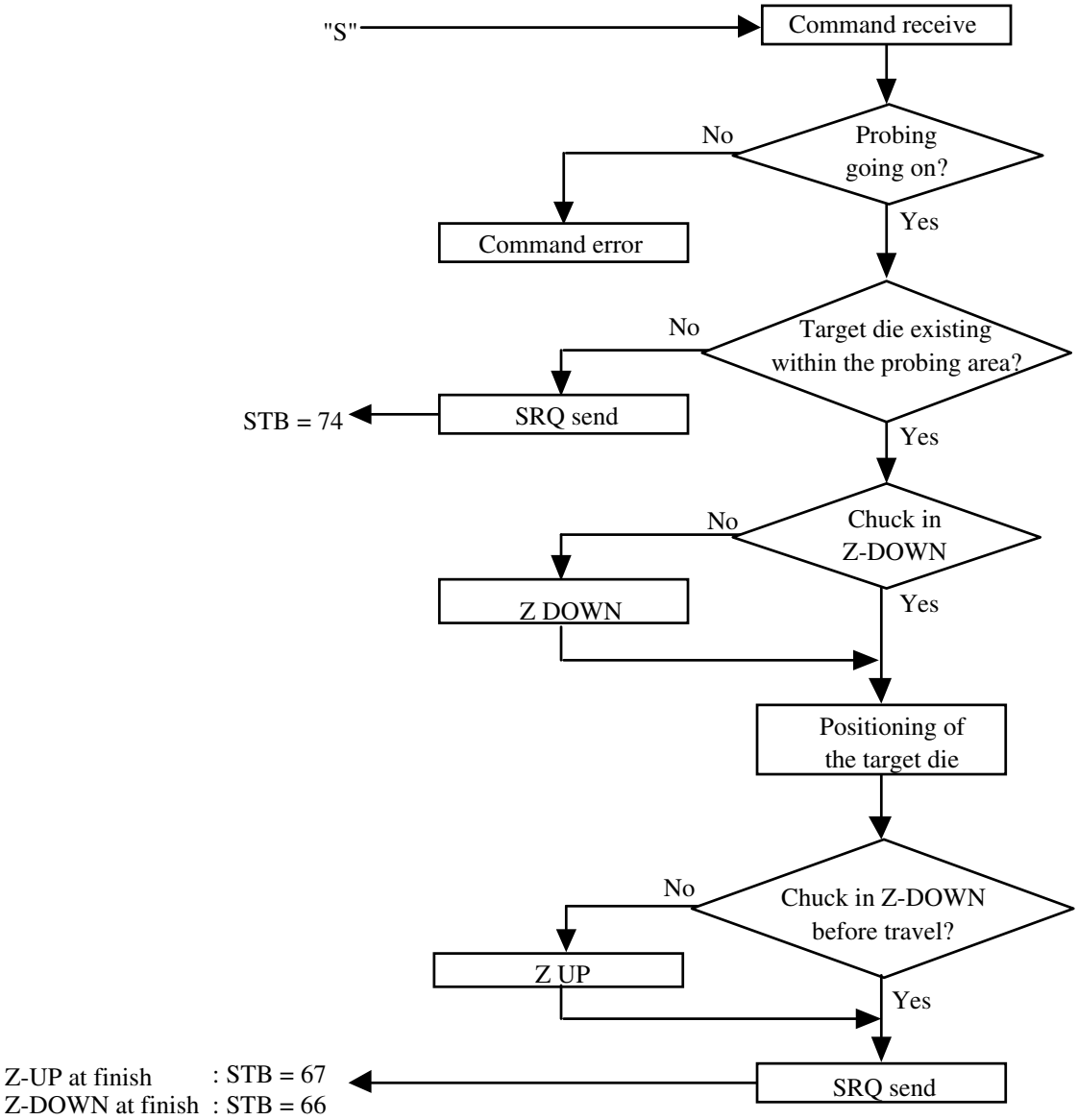
(in case of μm)

Note: This is valid only during probing; otherwise the command error results.

4.26 S (String) : XY travel (by relative coordinates)

S	Y	±	10^2	10^1	10^0	X	±	10^2	10^1	10^0	CR	LF

At receiving this command, Chuck is set to Z-DOWN, it travels from the current coordinates by the demanded numbers of indexes according to the coordinate directions preset in [Set-up Sequence Settings] of the Basic Operation Settings, and Chuck height is returned to that before receiving this command.



4.27 T : Test start

T	CR	LF

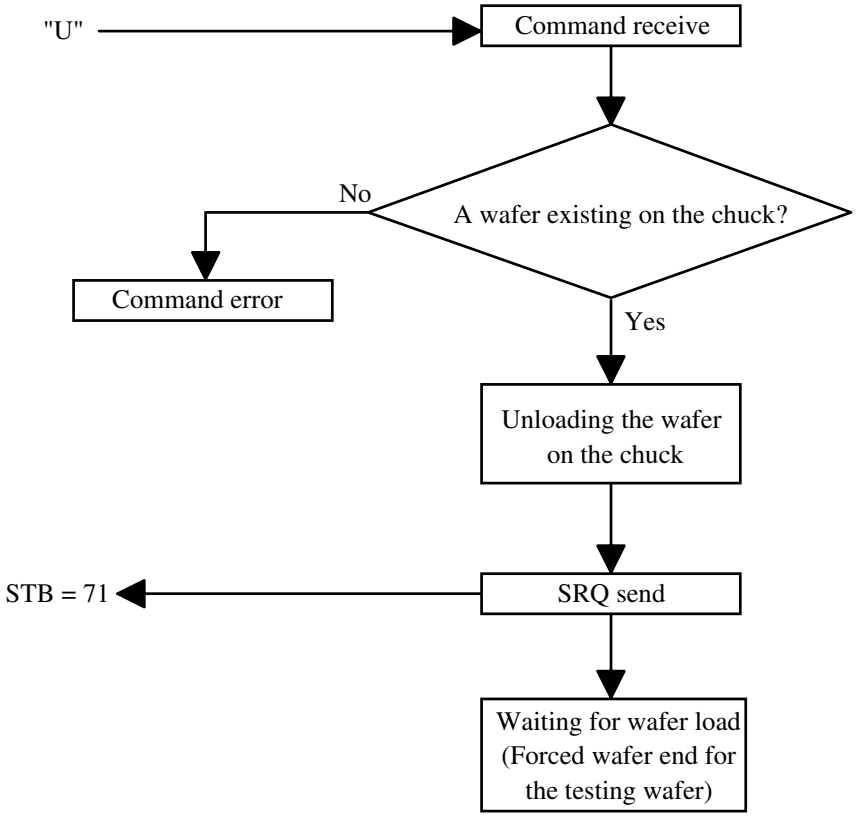
This command is recognized as the Test Start command for A-PM-6000A for the command compatibility.
No actions take place.

Response: none

4.28 U : Unloading

U	CR	LF

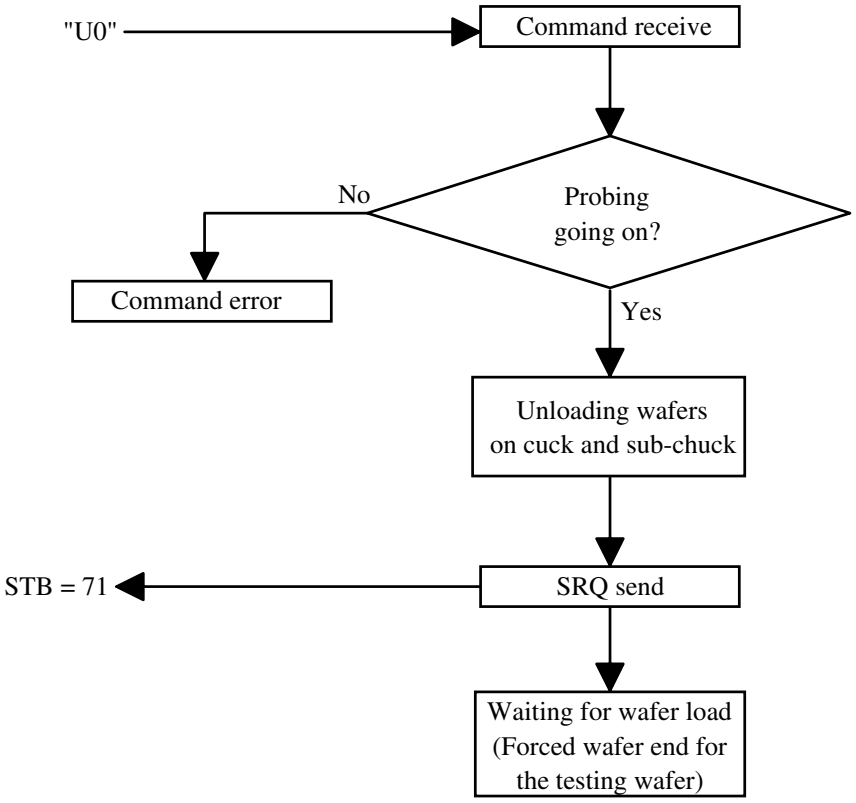
At receiving this command, the wafer existing on Chuck is unloaded.



4.29 U 0 : Unloading all wafers

U	0	CR	LF

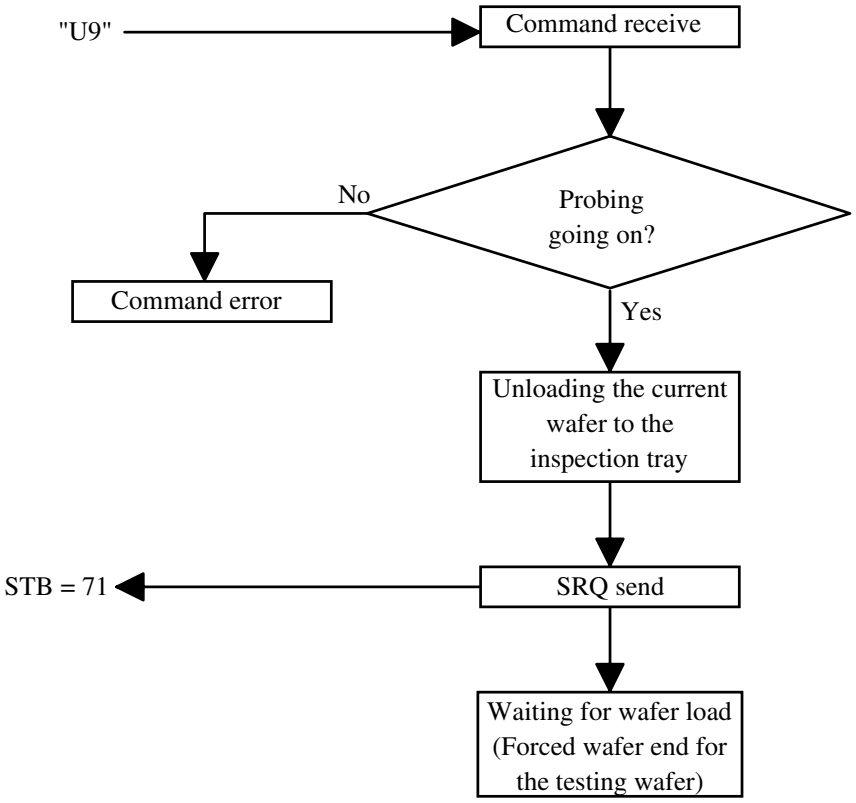
At receiving this command, Prober has the wafer existing on Chuck and the one on the sub-chuck returned to the cassette.
However, the wafer which existed on the sub-chuck can be loaded to Chuck with the later loading command.



4.30 U 9 : Unloading to inspection tray

U	9	CR	LF

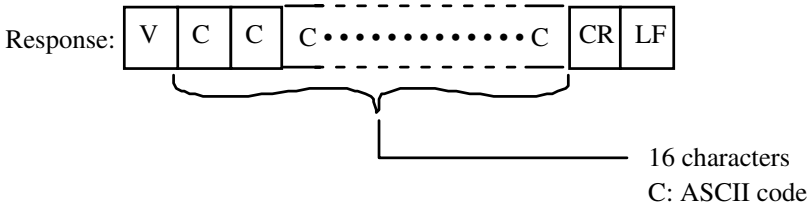
At receiving this command, the wafer existing on Chuck is sent to the inspection tray.



4.31 V : Lot number request

V	CR	LF

When Prober has received this command and it is allowed as Talker, it outputs the lot number.



Notes:

1) If the lot number is not set up, all the text characters in the response are spaces.
2) This command can be used after Prober initialization.

4.32 W : Needle cleaning

W	CR	LF

At receiving this command, Chuck is set to Z-DOWN, it goes to the cleaning position, and the needle cleaning takes place with the cleaning unit according to the cleaning parameters.
After completion of the cleaning, Chuck returns to the previous position with the height to that before receiving this command.
When the needle cleaning using a cleaning wafer is specified, this command can not work for the needle cleaning.

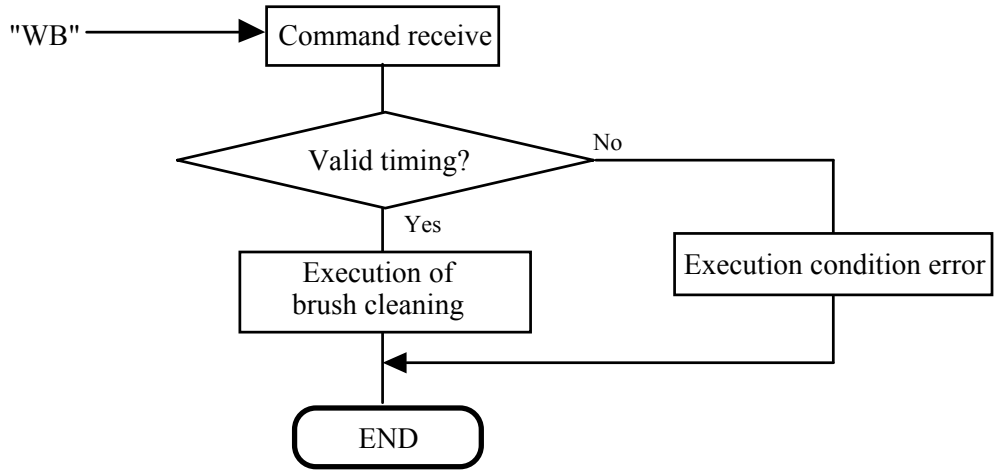
Response: SRQ send STB = 89

Note: This command can be used after the initialization.
Make sure on the exchange of functions with “b” command (for the wafer ID request).

4.33 WB: Perform brush cleaning

W	B	CR	LF

The brush cleaning is performed.



Response: SRQ send STB = 89; correct finish

Note: This command can be used only during probing.

4.34 X : Wafer number request

X	CR	LF

When Prober has received this command and it is allowed as Talker, it outputs the current wafer number and cassette number.

Response:

X	10^1	10^0	10^0	CR	LF

1 ~ 6: Cassette number

00 ~ 99 : Slot number

Notes:

1) For a wafer loaded from the inspection tray or front side, no wafer number is assigned and so the wafer number becomes "* *" and the cassette number is 5.
2) For a wafer loaded from the special tray, no wafer number is assigned and so the wafer number becomes "* *" and the cassette number is 6.
3) This command can be used after the initialization.

4.35 Y : Gross value request

Y	CR	LF

When Prober has received this command and it is allowed as Talker, it outputs the current gross value.

Response:

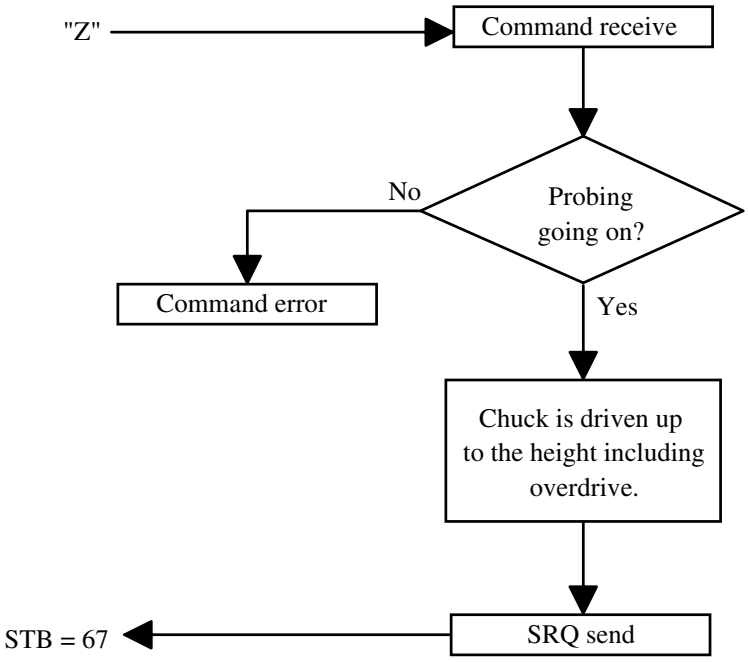
Y	10^4	10^3	10^2	10^1	10^0	CR	LF

Note: This command can be used after the initialization.

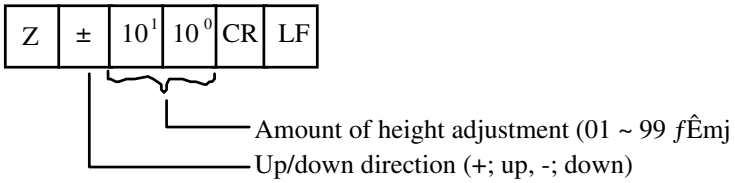
4.36 Z : Z UP

Z	CR	LF

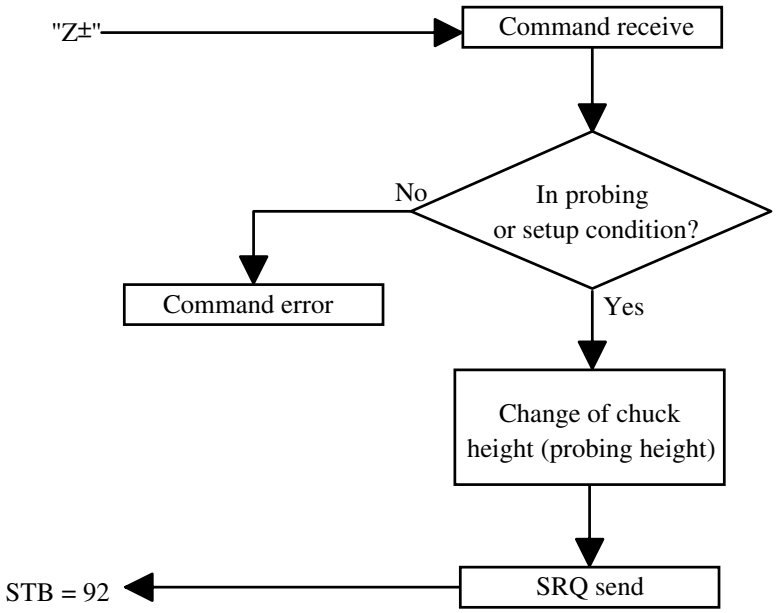
At receiving this command, Prober drives Chuck up to the Probing Height (PH).



4.37 Z ± : Chuck height fine adjustment

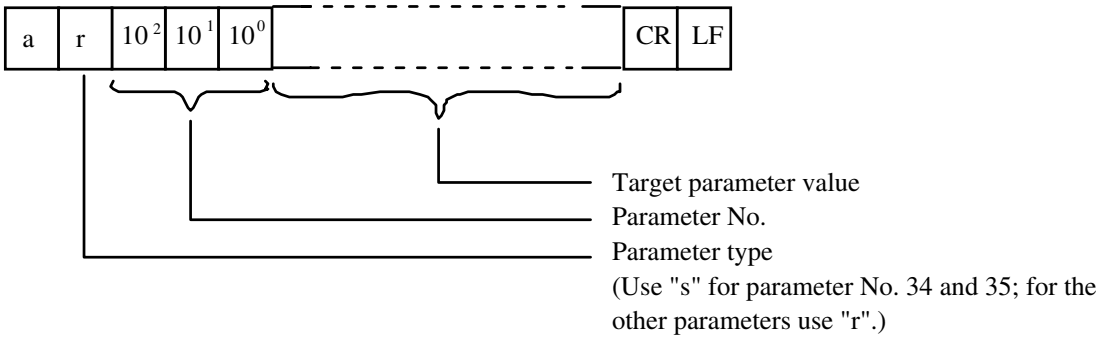


At receiving this command, Prober changes Chuck height by the demanded amount in the demanded direction.

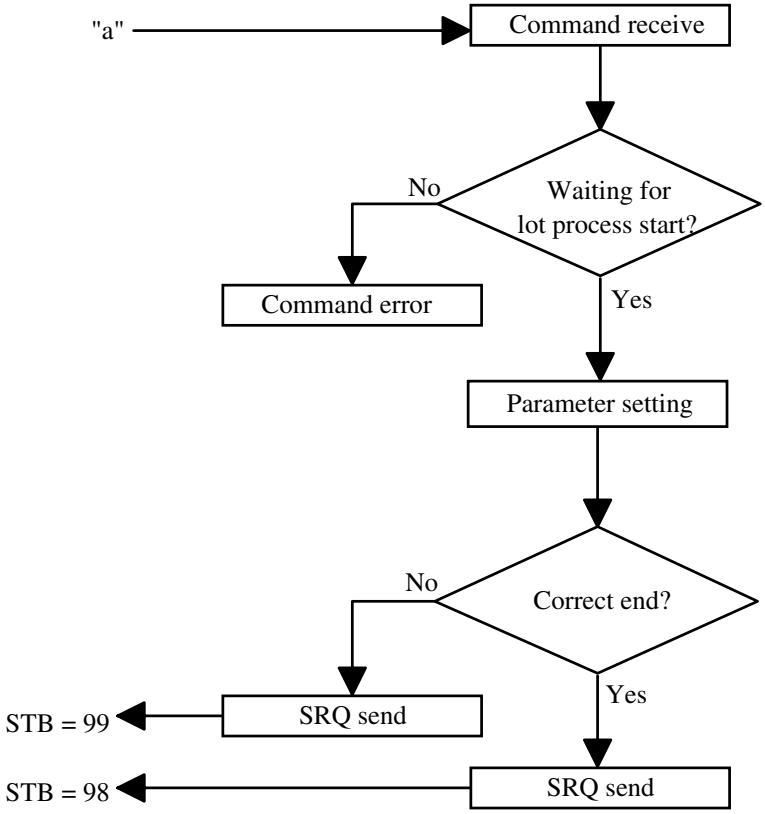


Note: If the final height is out of limit, the height change does not occur.
In such a case, no error is output.

4.38 a : Parameter setting



This command can change the value of the selected parameter.



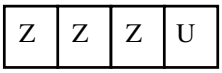
Note: If the result is incorrect, check the parameter value, parameter No. and Prober status whether probing is going on or not.

Parameter No.

0.WF Name

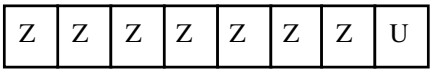
X: Alpha-numeric characters (max. 16 bytes)

1.WF Size



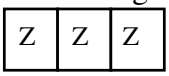
U : i (inch),m (mm)
Z Z Z : 3.0 ~ 8.0 (inch)
100 ~ 200 (mm)

2. Index - X
3. Index - Y



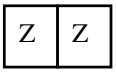
U : u (μm),m (mm)
i (inch),l (mil)
Z Z Z Z Z Z : 10.0 ~ 99999.9 (μm)
0.01000 ~ 99.9999 (mm)
0.1 ~ 99999.9 (mil)
0.0001 ~ 9.9999 (inch)

4.ORI - FLA (Orientation flat angle)



Z Z Z : 0 ~ 360 (deg.)

6.CH - 1 LOC

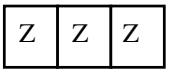


Z Z: Site location number

7. Probe Mode

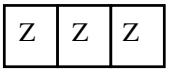
Z : 0 = NORMAL
1 = SAMPLE
2 = SAMPLE & NORMAL

11.TEMP



Z Z Z : 0, 50 ~ 130(Unit : ℃)

34. Reference Coordinate X
35. Reference Coordinate Y



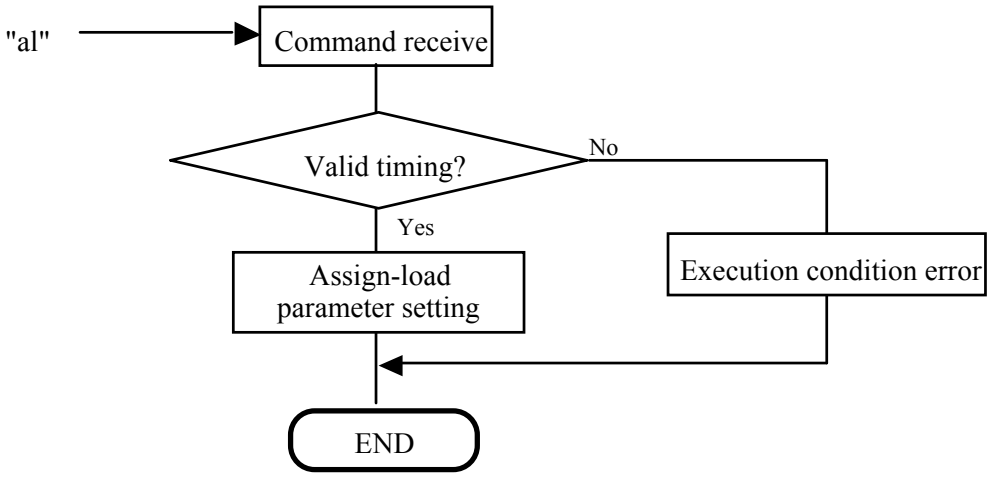
Z Z Z : –99 ~ 511

4.39 al: Assign-load setting

a	l	C	S	S	CR	LF

C: Cassette No. (1 digit numeral; 1, 2, 9)
S: Slot No. (2 digit numeral; 01 ~ 25, 99)

Note: This command simply sets a wafer for the assign-loading; the loading action itself can be initiated with L command.



Response: SRQ send STB = 98; correct finish

Note: This command can be used only in the state of waiting for the lot start.

4.40 b : Wafer ID request

b	CR	LF

When Prober has received this command and it is allowed as Talker, it outputs the ID of wafer which is under the probing.

Response:

b	A	B • • • • • • • • • • • • • • S	CR	LF

Notes:
1) The response data length is variable within 19 characters; spaces contained in the last part are erased. The spaces existing between effective characters are not erased, however.
2) This command can be used after the initialization.
3) Make sure on the exchange of functions with W command for the needle cleaning.

4.41 c: Pass/Fail counts request

c	CR	LF

When Prober has received this command and it is allowed as Talker, it outputs the counts of Pass/Fail counters. (For the single-site probing only.)

Response:

c	P	10^5	10^4	10^3	10^2	10^1	10^0	F	10^5	10^4	10^3	10^2	10^1	10^0	CR	LF

4.42 d : Directory request

d	C	CR	LF

a : FD
c : HD

When Prober has received this command and it is allowed as Talker, it outputs the directory of device data files stored in the demanded storage device.

Response:

d	10^1	10^0	10^1	10^0	10^2	10^1	10^0	Block or text	CR	LF

max. 240 bytes
Block or text lengthimax.240j
Number of total blocks (1`99j
Current block No. (1`99j

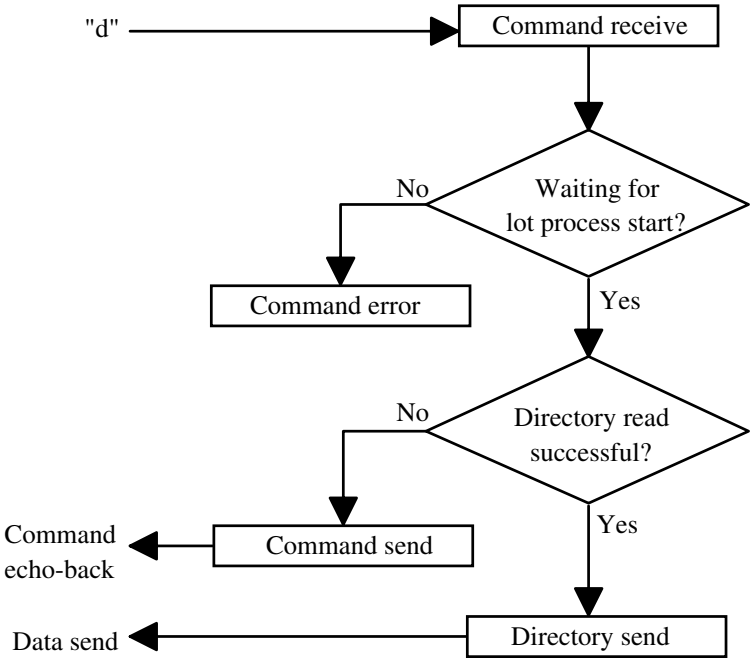
1 directory 16 characters
1 block 15 directories

Since the HD can contain max. 100 device data, the max. number of directories is 100, which can be sent by 7 blocks. In order to read the full directories, wait until the current block No. becomes same to the number of total blocks.
One FD can contain max. 5 type device data, so the full directories can be sent in one block.
If Prober can not read the directory for a reason such as "FD is not inserted" or "No device files available", it returns the echo-back of the command.

Response:

d	C	CR	LF

a : FD
c : HD


"d"
Command receive
Waiting for lot process start?
No
Command error
Yes
Directory read successful?
No
Command send
Command echo-back
Yes
Directory send
Data send

4.43 du: Up-load device data

After the setup of a new device on Prober, the device data together with the current Basic Operational parameters can be up-loaded to the Tester (Host). This up-loading process can begin when receiving "du" command in the timing that STB = 107 has been sent from Prober with a manual operation.
The whole sending data are divided into plural blocks; whenever the data transfer of each block has finished, STB = 98 is sent to notice that the next block is ready, so issue "du" command again in response. After the output of the last block, STB = 108 is sent to notice the transfer end of all the blocks.
Whether the Basic Operational parameters are up-loaded together or not depends on the setting of "Adding Basic Operation Data When dd, du" in [GP-IB Interface Settings].

• Command format

d	u	CR	LF

• Response

First block:

d	u	CB	AB	LB	Data (Header information)	EOI

CB: Current block No. (fixed to 01) 2 bytes (ASCII)
AB: Number of whole blocks (02 ~ 99) 2 bytes (ASCII)
LB: Block length (fixed to 00081) 5 bytes (ASCII)
Data: Header information 70 bytes (ASCII)

Second and subsequent blocks:

d	u	CB	AB	LB	Data	EOI

CB: Current block No. (02 ~ 99) 2 bytes (ASCII)
AB: Number of whole blocks (02 ~ 99) 2 bytes (ASCII)
LB: Block length (00011 ~ 51211) 5 bytes (ASCII)
Data: Device data/Basic Operational parameters Max. 50 k bytes (Binary)

After the response with each block data, Prober outputs the following STBs:
STB = 98: Next block ready to send
STB = 109: All blocks sending over
STB = 78: End by an error

Note: The termination code is "EOI" for the transfer of binary (executable) data.

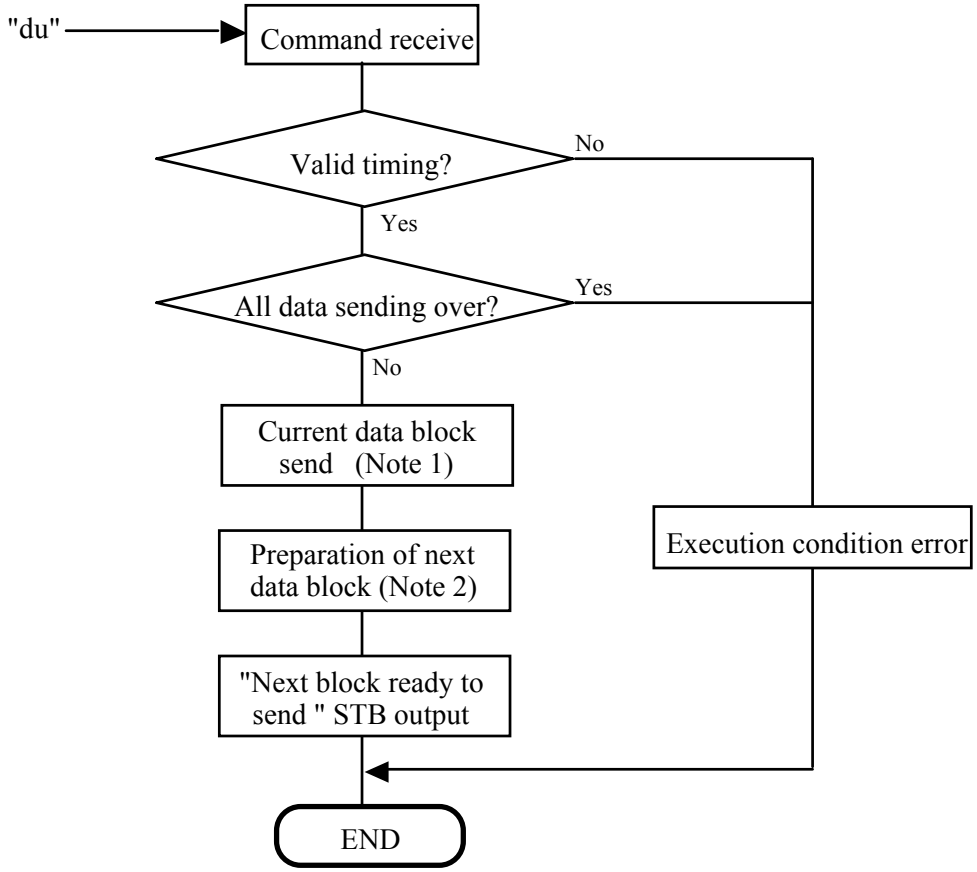
• Command valid timing

Valid only in the timing at the output of STB = 107, which is sent after the testing die map creation on the initial wafer of a new device and at the choice of "GP-IB Host" for the data saving media on [Device Data Store] screen; in the other timing the error will occur.
Until the completion of the whole block data transfer, repeat issuing "du" command in response to STB = 98 (Next block ready to send).

• Cautions

1) Throughout the execution of this command appears the message “Up-loading Device/Basic Operation data”, disabling any operation on Prober.
2) Until the completion of the whole blocks, the up-loading process can not be terminated midway.
3) It is not allowed to modify the transferred device data/Basic Operational parameters on the Host’s side.
4) The Basic Operational parameters, to be sent in the last block, has the machine proper ID (16 bytes) added at the top of the data.

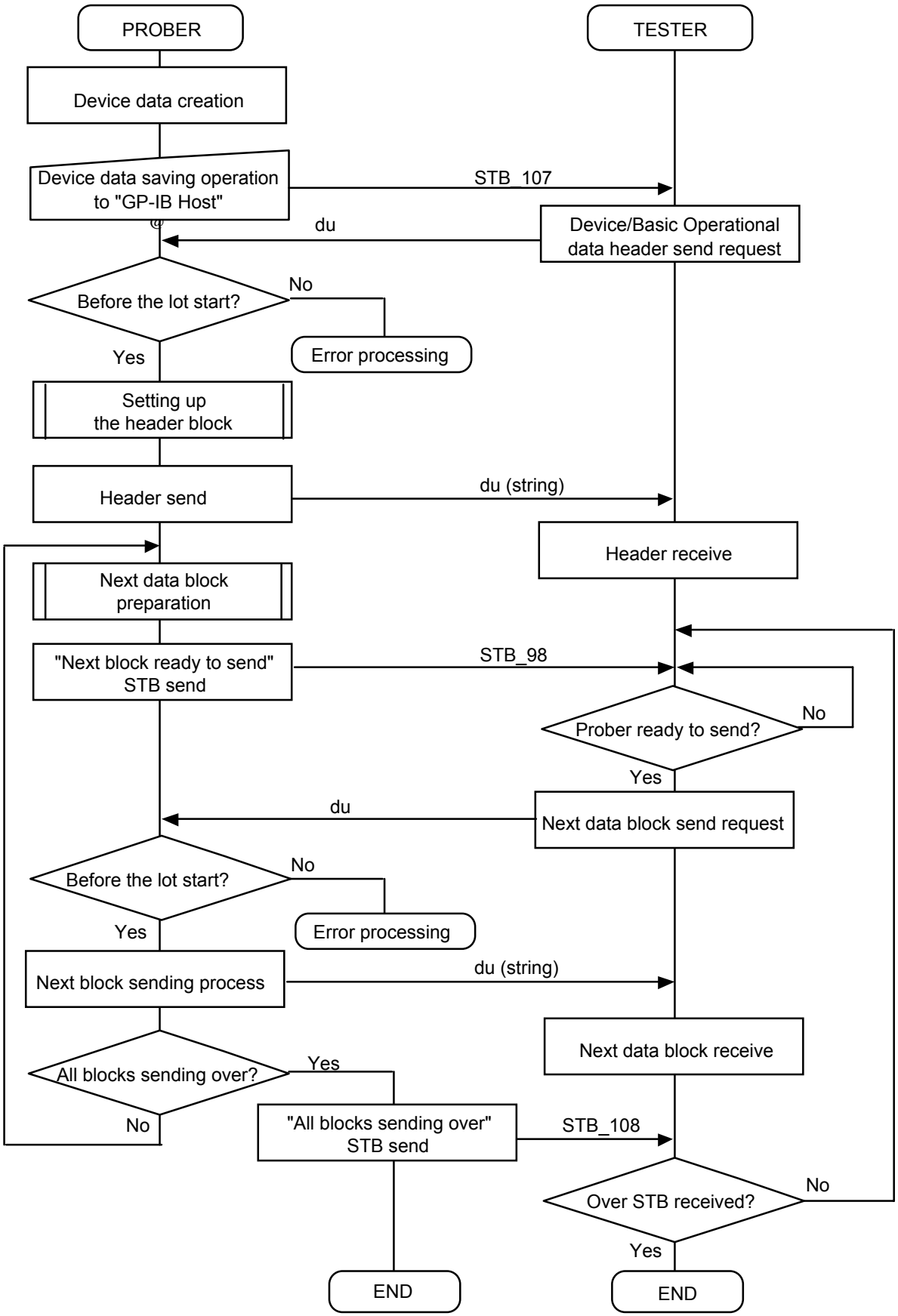
• Command processing



Note 1: The device data are sent by blocks from the second block in an internally fixed order. The Basic Operational parameters are sent in the last block.

Note 2: Since the second and subsequent blocks handle the max. 50 k byte data volume, each next block is prepared before receiving the next “du” command and STB = 98: Next block ready to send is output at the completion of the preparation.

• Device data/Basic Operational parameters up-loading flow chart before a new device lot process



• Transferring data format

Header block:

Item	Location	Length	Data type	Remark
Command identifier	+0	2	(ASCII) “du”	
Current block No.	+2	2	(ASCII) “01”	Fixed to “01”
Number of all blocks	+4	2	(ASCII) “03” ~ “99”	
Block length	+6	5	(ASCII) “00075” or ”00081”	
Device name	+11	16	(ASCII) “????????????????”	
Device data item list file size	+27	6	(ASCII) “?????? ”~”150000”	
Device parameter file size	+33	6	(ASCII) “??????”~”150000”	
Image data size	+39	6	(ASCII) “000000”~”150000”	
Die location data size	+45	6	(ASCII) “000000”~”150000”	
Sample die data size	+51	6	(ASCII) “000000”~”150000”	
Pad data size	+57	6	(ASCII) “000000”~”150000”	
Probe-mark inspecting pad data size	+63	6	(ASCII) “000000”~”150000”	
Probe-pad alignment pad data size	+69	6	(ASCII) “000000”~”150000”	
Basic Operational parameter file size	+75	6	(ASCII) “??????”~”150000”	

Note: The device data item list file and the succeeding data files are sent in the corresponding separate blocks. The device data item list file and the device parameter file are always sent, so the number of all blocks is 3 at the least.
The block length of the header block is 75 bytes without sending the Basic Operational parameter file, or 81 bytes with the Basic Operational parameter file accompanied.

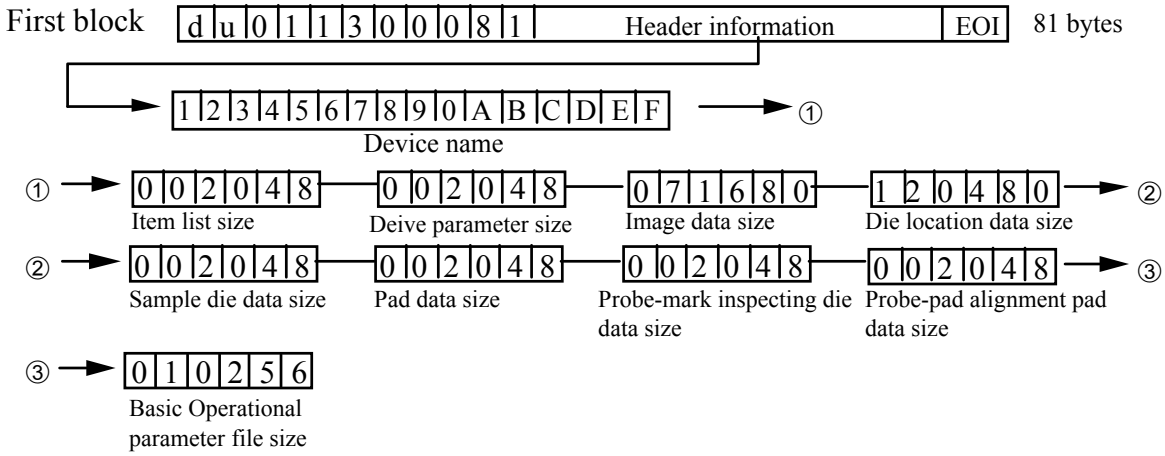
Data block:

Item	Location	Length	Data type	Remark
Command identifier	+0	2	(ASCII) “du”	
Current block No.	+2	2	(ASCII) “02” ~ “99”	
Number of all blocks	+4	2	(ASCII) “03” ~ “99”	
Current block length	+6	5	(ASCII) “00011” ~ “51211”	
Device data (Device data item list) (Device parameters) (Image data) (Die location data) (Sample die data) (Pad data) (Probe-mark inspecting pad data) (Probe-pad alignment pad data) Basic Operational parameters	+11	Variable (Max. 50 k bytes)	(Binary data)	Each data file uses a block, but if the data volume exceeds 50 k bytes, plural blocks are used. The machine proper ID is added on the top of the parameter data.

• Example of the block data transfer

The following is an example of the device data consisting of those data files as below associated with the Basic Operational parameters.

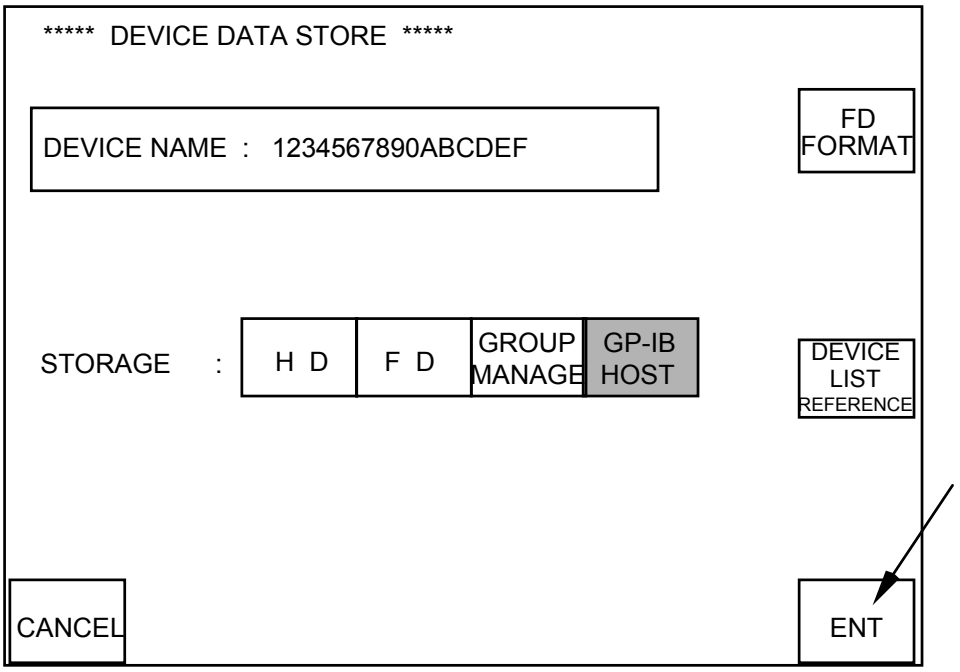
- ☐ Device name : '1234567890ABCDEF'
- ☐ Device data item list file : 2 k bytes
- ☐ Device parameter file : 2 k bytes
- ☐ Image data : 70 k bytes
- ☐ Die location data : 120 k bytes
- ☐ Sample die data : 2 k bytes
- ☐ Pad data : 2 k bytes
- ☐ Probe-mark inspecting pad data : 2 k bytes
- ☐ Probe-pad alignment pad data : 2 k bytes
- ☐ Basic Operational parameter file : 10 k bytes (+ machine proper ID - 16 bytes)



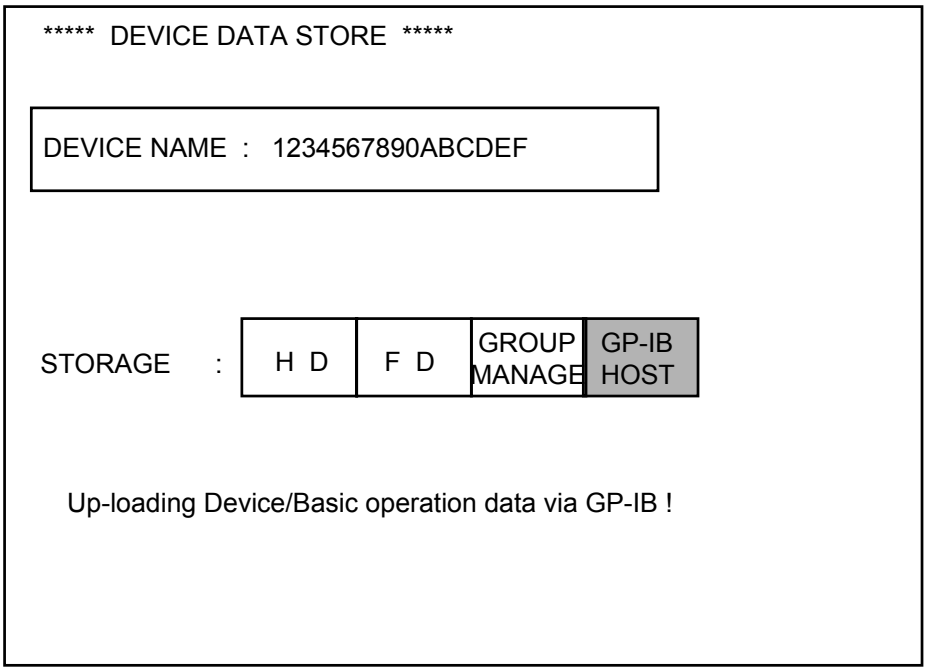
2nd block	d	u	0	2	1	3	0	2	0	4	8	Device data item list	EOI	2 k bytes
3rd block	d	u	0	3	1	3	0	2	0	4	8	Device parameter	EOI	2 k bytes
4th block	d	u	0	4	1	3	5	1	2	0	0	Image data	EOI	50 k bytes
5th block	d	u	0	5	1	3	2	0	5	1	2	Image data	EOI	20 k bytes
6th block	d	u	0	6	1	3	5	1	2	0	0	Die location data	EOI	50 k bytes
7th block	d	u	0	7	1	3	5	1	2	0	0	Die location data	EOI	50 k bytes
8th block	d	u	0	8	1	3	2	0	5	1	2	Die location data	EOI	20 k bytes
9th block	d	u	0	9	1	3	0	2	0	4	8	Sample die data	EOI	2 k bytes
10th block	d	u	1	0	1	3	0	2	0	4	8	Pad data	EOI	2 k bytes
11th block	d	u	1	1	1	3	0	2	0	4	8	Probe-mark insp. pad data	EOI	2 k bytes
12th block	d	u	1	2	1	3	0	2	0	4	8	Probe-pad align. pad data	EOI	2 k bytes
13th block	d	u	1	3	1	3	1	0	2	5	6	Basic Operational parameters	EOI	10 k bytes

• Manual operation for beginning the up-loading

When the device data setup has finished for a new device through the process of device parameter setting and the initial wafer loading/alignment/probe-pad alignment/testing die map creation, open [Device Parameter Settings] screen and push <Data Store> button; [Device Data Store] screen appears as below:



Choose <GP-IB Host> as the storage and push <ENT> button; Prober sends STB = 107 to Tester. When receiving “du” command in this timing, the up-loading begins.



During the up-loading, the above screen is maintained when any operation is impossible on Prober. After completion of the all data transfer, the lot process can be started.

4.44 dd: Down-loading device data

For down-loading a set of the device data and Basic Operational parameters previously up-loaded to Tester (Host) with “du” command before starting the lot process. The down-loading must be done by the block data transfer all the same in the block composition and order of the blocks.

• Command format

First block:

d	d	CB	AB	LB	Data (Header information)	EOI

CB: Current block No. (fixed to 01) 2 bytes (ASCII)
AB: Number of whole blocks (02 ~ 99) 2 bytes (ASCII)
LB: Block length (fixed to 00081) 5 bytes (ASCII)
Data: Header information 70 bytes (ASCII)

Second and subsequent blocks:

d	d	CB	AB	LB	Data	EOI

CB: Current block No. (02 ~ 99) 2 bytes (ASCII)
AB: Number of whole blocks (02 ~ 99) 2 bytes (ASCII)
LB: Block length (00011 ~ 51211) 5 bytes (ASCII)
Data: Device data/Basic Operational parameters Max. 50 k bytes (Binary)

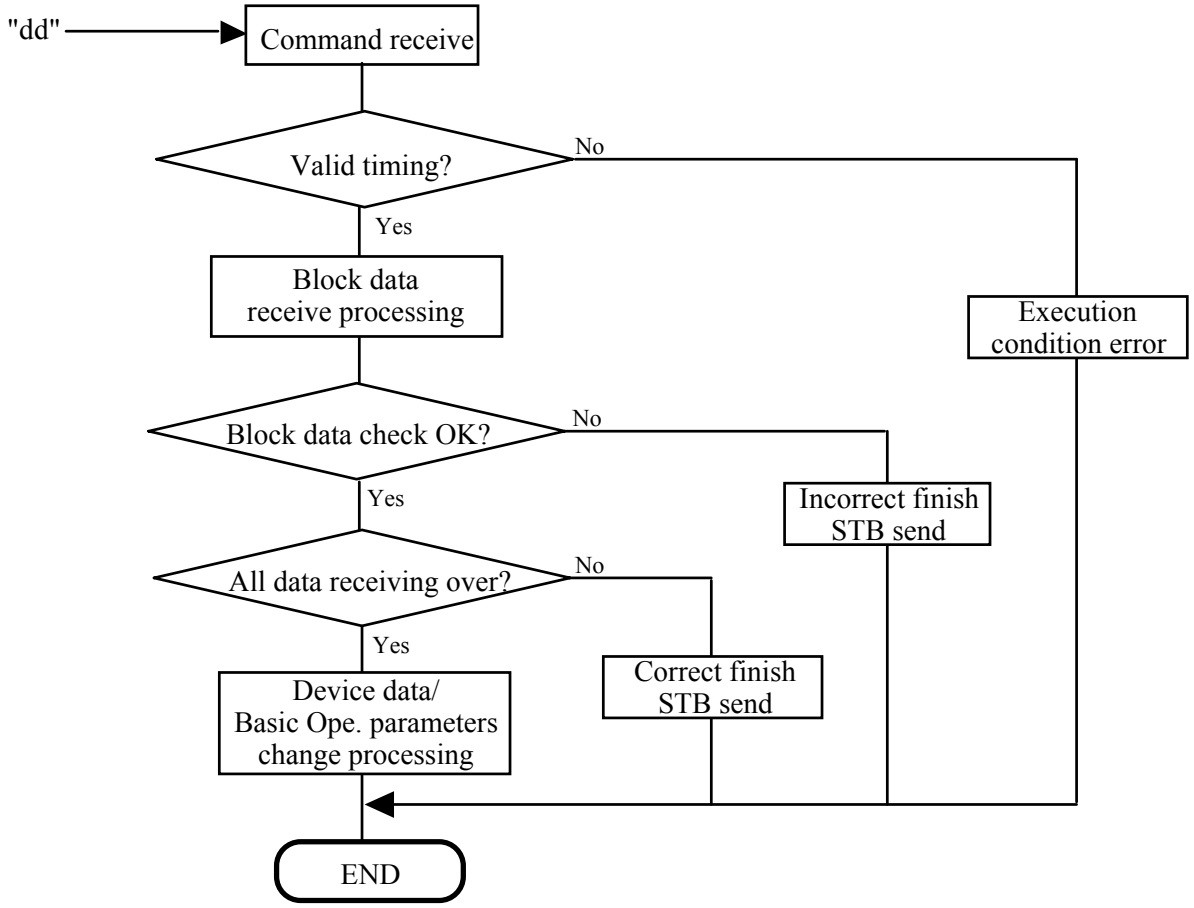
Note: The termination code is “EOI” for the transfer of binary (executable) data.

• Response
STB = 98: correct finish
STB = 99: incorrect finish
STB = 78: End by an error

• Command valid timing
Valid only before starting a lot process; however, invalid at the screen change of the display on Prober.
Repeat the block data transfer until the whole data blocks of a device are down-loaded.
Once the wafer loading has been started before completion of the whole data blocks transfer, all the received data become void.

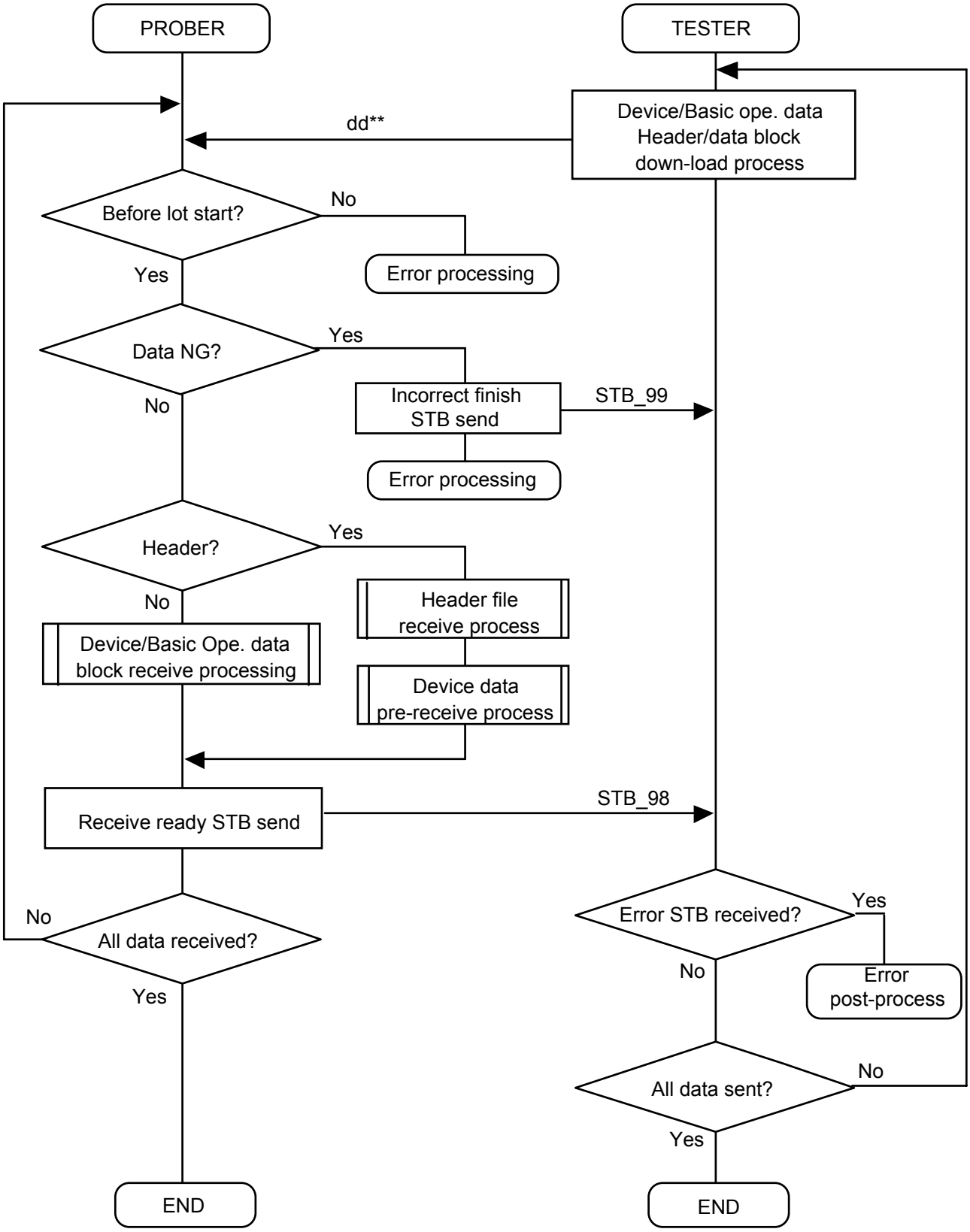
• Cautions
1) Send the individual blocks of the device data previously up-loaded with “du” command in the same order at the up-loading. The content of each block must not be modified on the Host side.
2) The message “Down-loading Device/Basic Operation data” shows throughout the process going on under the command, disabling any operation on Prober..

• Command processing



The block data check compares the block No. and block data length with the actual number and length. If the check result is NG, STB = 99 is output, when Prober does not indicate error message. Examine the block No. and block data length on the Tester side and resend the correct block data.

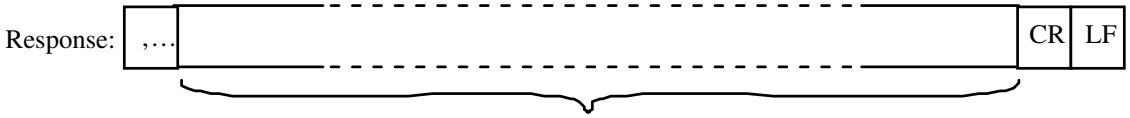
• Device data/Basic Operational parameters down-loading flow chart before starting a lot process



4.45 e : Error message request

e	CR	LF

On occurrence of an error state, Prober sends STB = 76 (STB = 87 at a warning condition, STB = 94 at All lots finish); the controller should make serial polling and receive the status bytes.
When Prober has received this command during an error state and it is allowed as Talker, it outputs the error message which is displayed on the screen.



If Prober has received this command in no error state, no error message is output.
The error message is cleared after clearance of the error state.

4.46 em: Alarm buzzer ON

e	m	Message	CR	LF

A message to be shown on Prober at receiving this command. (Max. 20 characters of ASCII codes; for less characters, fill the space codes to 20 digits.)

At receiving this command, Prober turns on the buzzer, flickers the yellow lamp, and shows the message on the display.

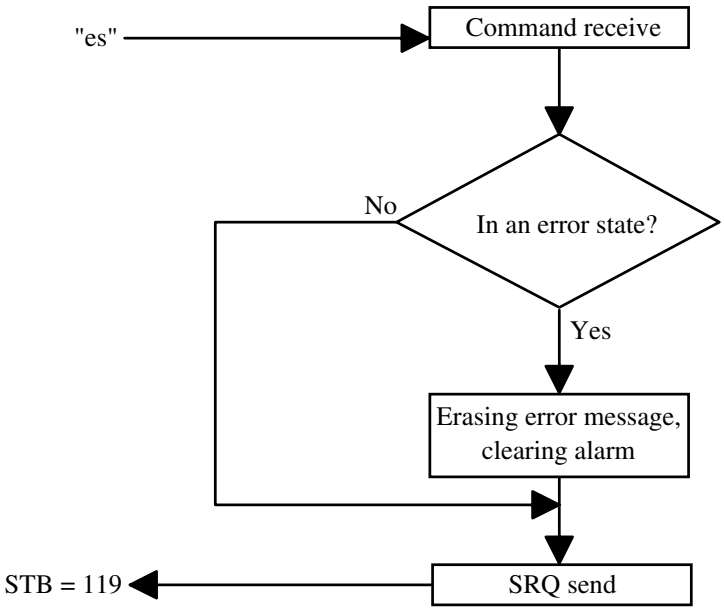
Response: SRQ send STB = 101; correct finish
STB = 76; execution condition error

• Command valid timing
Only at the cassette end with the Auto-lot end option selected. Do not used in the other timing.

4.47 e s : Error clearance request

e s	CR	LF

When Prober has received this command in an error state, it makes the error message erased and the alarm cleared.



4.48 f : Chuck temperature request

f	CR	LF

At receiving this command, Prober outputs the Chuck setting and current temperatures.

Response:	f	10^{2}	10^{1}	10^{0}	10^{-1}	10^{2}	10^{1}	10^{0}	10^{-1}	CR	LF
		Current temp.				Setting temp.					

ASCII code 4 bytes at the graduation of 0.1˚C (Example: 0855 = 85.5˚C)
If the Chuck temperature is not controlled, the response is the command echo-back;

Response:	f	CR	LF

Note: This command can be used after the initialization.

4.49 fp: Fail-mark inspection result request

f	p	CR	LF

At receiving this command, Prober sends the currently available Fail-mark inspection result.

Response:

a	b	c	d	e	f	g	CR	LF

a: Judgment after the inspection (1 byte)
- 0: Acceptable
- 1: Warning size
- 2: Too large
- 3: Too small
- 4: Position not good
- 5: Not found (all 0 at e, f, and g)
- 6: Not measurable (all 0 at e, f, and g)
- 7: Aspect ratio error

b: Inspected die coordinate X (4 bytes)
–511 ~ +511

c: Inspected die coordinate Y (4 bytes)
–511 ~ +511

d: Marker No. (1 byte)
1, or 2

e: Fail-mark diameter (4 bytes)
0000 ~ 9999 µm

f: Fail-mark size X (4 bytes)
0000 ~ 9999 µm

g: Fail-mark size Y (4 bytes)
0000 ~ 9999 µm

• Command valid timing

Valid only in the timing STB = 123 is output at the completion of Fail-mark inspection on one die. This command can be used with “Fail Mark Inspection Result Transfer?” set to ‘1: Yes’ in [GP-IB Interface Settings].

If “fp” command has not come in a period from the Host after sending STB = 123, the Timeout error will occur; after clearing the error state, send the command for resuming the operation.

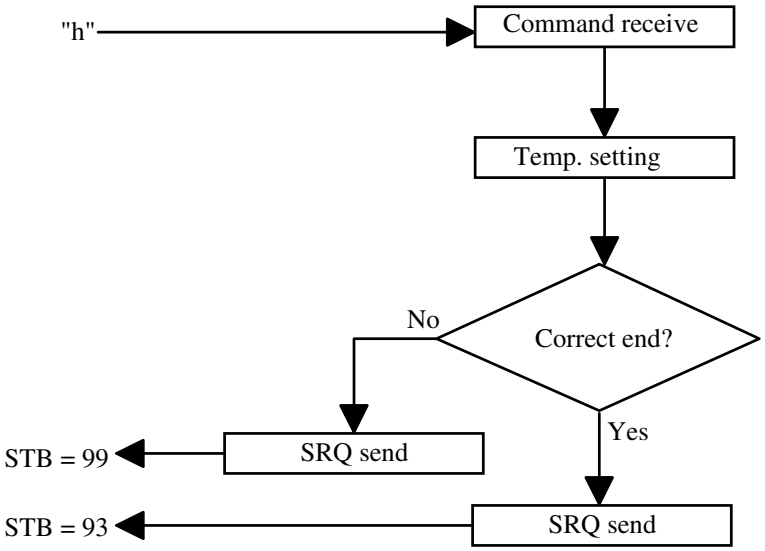
In case that another command has come till the end of the data sending after output of STB = 123, the execution condition error will occur.

4.50 h : Chuck temperature setting

h	10^2	10^1	10^0	10^{-1}	CR	LF

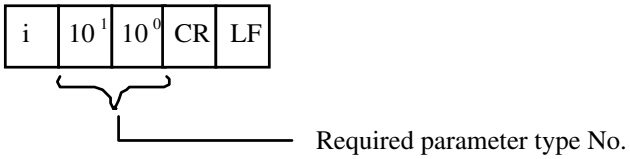
Setting temp.: ASCII 4 bytes of the unit 0.1°C
Temp. control for –55 ~ 200°C

At receiving this command, the Hot-chuck temperature is set up.

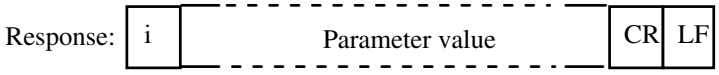


Note: This command can be used after the initialization.

4.51 i : Parameter request



At receiving this parameter and being allowed as Talker, Prober outputs the value of requested parameter.



Note: This command can be used after the initialization.

Parameter type No. and response

01 : Wafer size
Response with ASCII code 4 bytes in the following format;
3.01i ~8.01i : inch
100 m ~ 200 m : mm

20 : Card No.
ASCII code 5 bytes of alpha-numeric characters

22 : Wafer thickness
ASCII code 4 bytes of the unit 1 μm

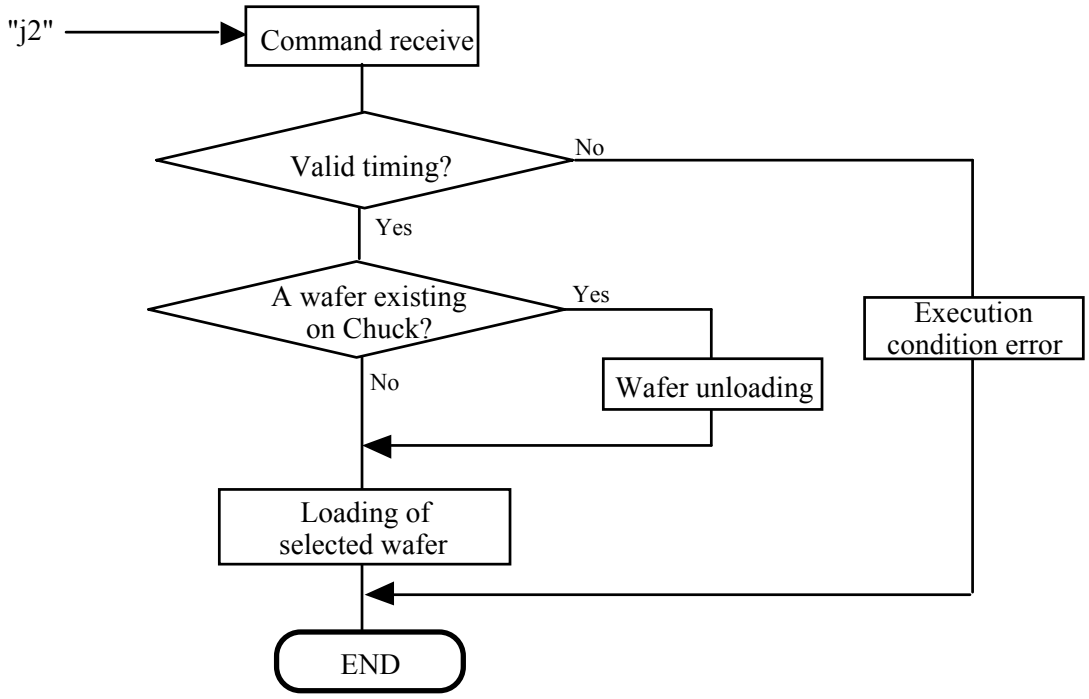
24 : Probe contact height
The height from the origin with ASCII code 5 bytes of the unit 1 μm

4.52 j2: Load the specified wafer

j	2	C	S	S	CR	LF

C: Cassette No. (Numeral 1 digit; 1, 2, 9)
SS: Slot No. (Numeral 2 digits; 01 ~ 25, 99)
When “CSS” is “999”, the wafer existing on Chuck is unloaded and the current lot process is ended.
If a slot not containing a wafer is appointed, the wafer existing on Chuck is unloaded and Prober sends STB for the incorrect finish.

The wafer in the designated cassette/slot is loaded and aligned. At this time, the next wafer is not pre-loaded.
If receiving this command with a wafer existing on Chuck, Prober unloads the wafer on Chuck at first and then loads the demanded wafer.



Response: SRQ send	STB = 70	Correct finish
	STB = 84	Alignment reject
	STB = 99	Incorrect finish

Note: Effective any time except for the wafer loading/unloading going on.

4.53 j c : Needle cleaning request

j	c	CR	LF

At receiving this command, Prober performs the needle cleaning at the current position with the overdrive, number of contacts and displacement per contact preset in the device data.

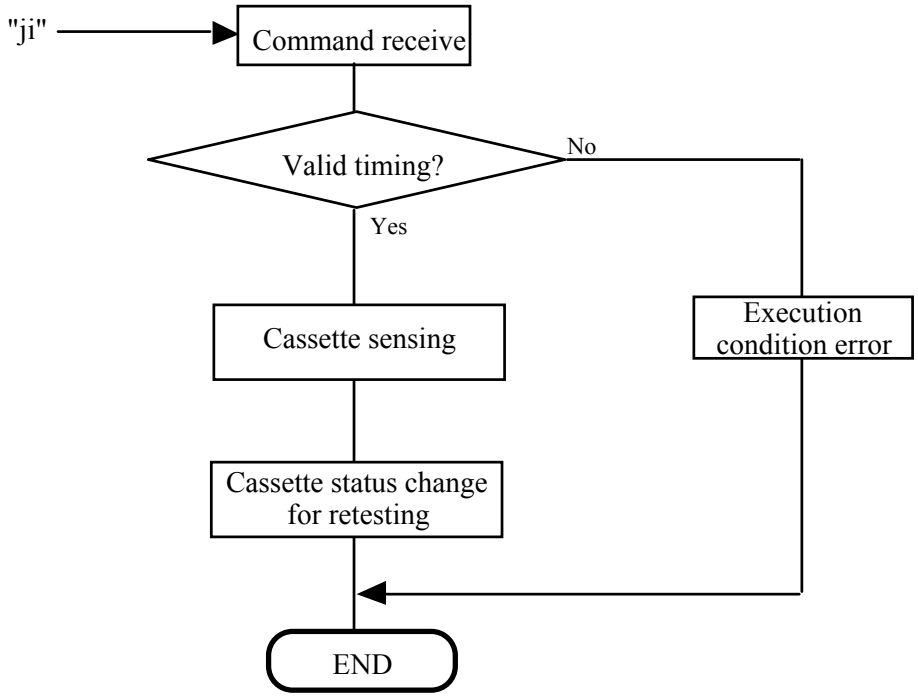
Response: SRQ send STB = 89 Correct end
STB = 76 Error occurrence

Note: Applicable only during probing; otherwise it will cause the command error.

4.54 ji: Set up cassette for retest

j	i	CR	LF

For making retest-ready the finished cassette for which the cassette end alarm has occurred or the alarm has been cleared.



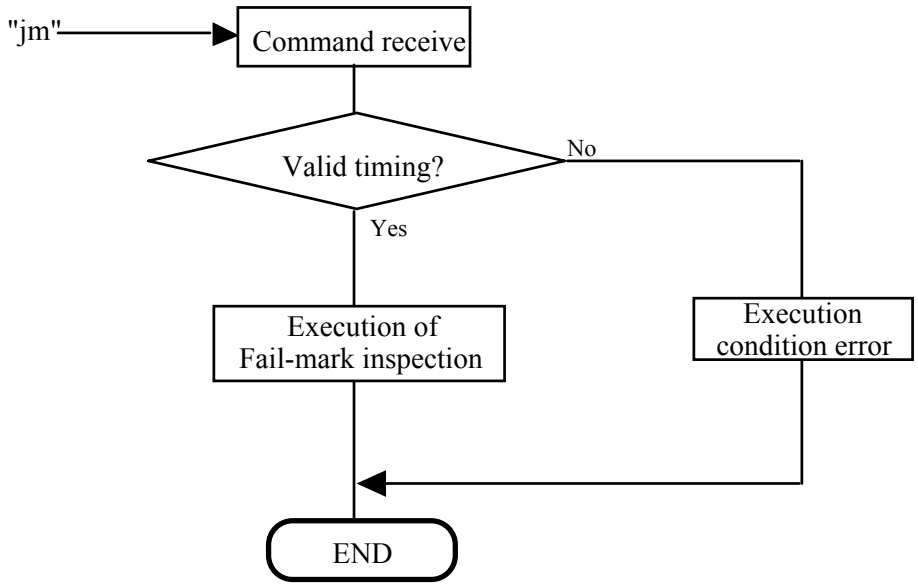
Response: SRQ send STB = 98 Correct finish
STB = 99 Incorrect finish

• Command valid timing
From the output of Lot End (Finish) with STB = 94 till the release of the cassette lock.

4.55 jm: Perform Fail-mark inspection

j	m	CR	LF

For demanding the Fail-mark inspection on the die positioned under the card.



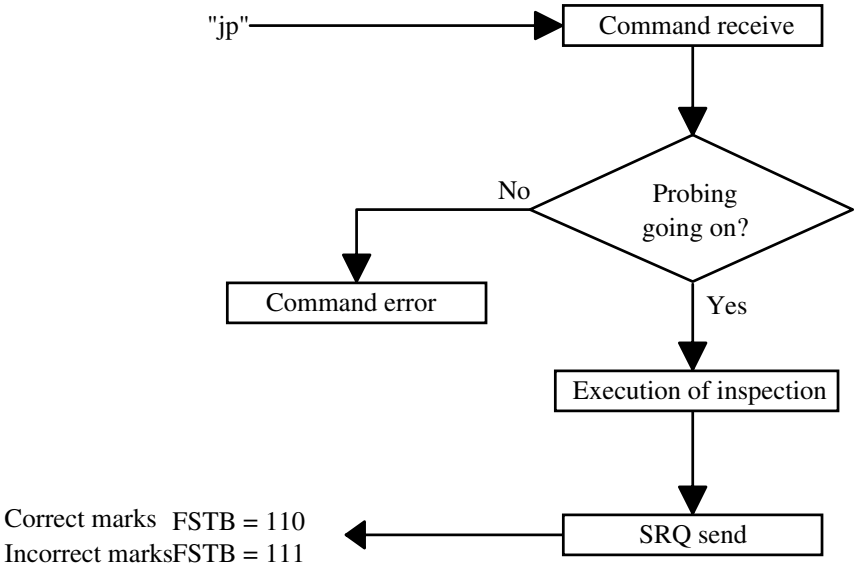
Response: SRQ send STB = 110 Correct finish
STB = 111 Incorrect finish

• Command valid timing
Valid only during probing. Effective with the in-place marking at the single-site probing.

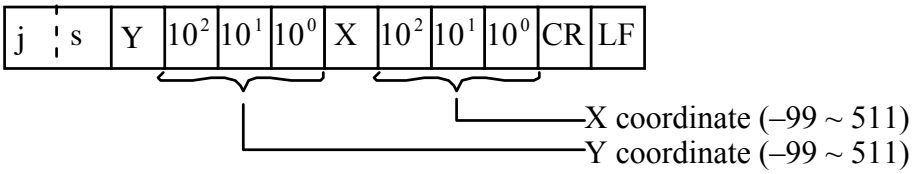
4.56 jp: Perform probe-mark inspection

j	p	CR	LF

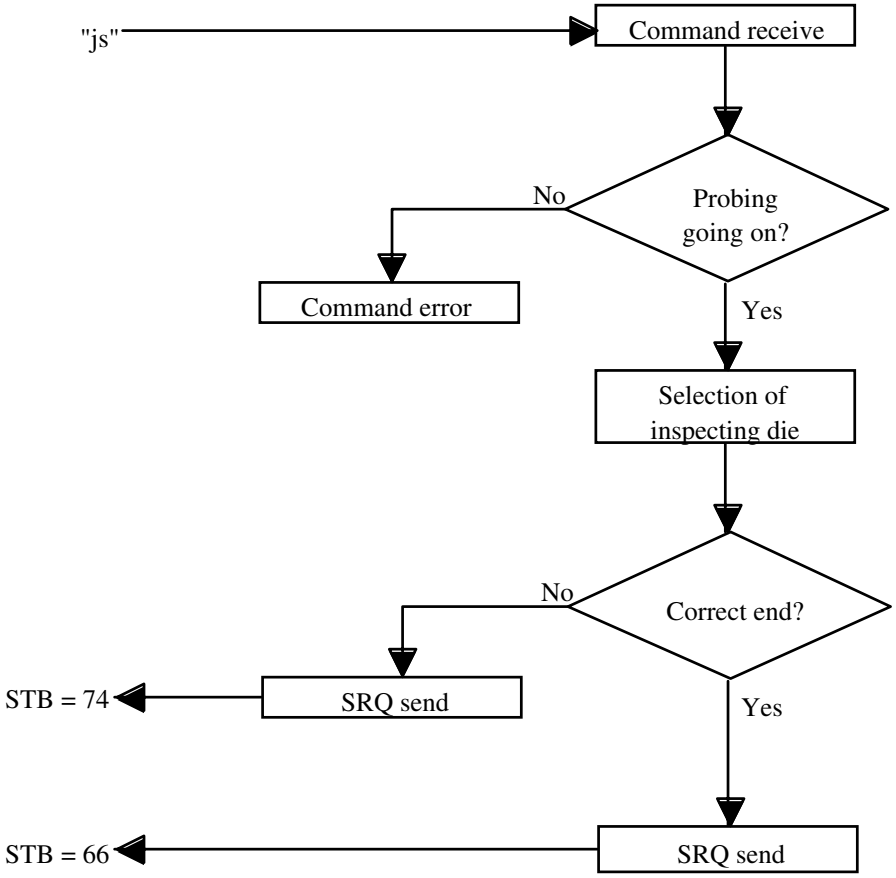
At receiving this command, Prober has the probe-mark inspection executed for the selected die.



4.57 j s : Probe-mark inspection applying die



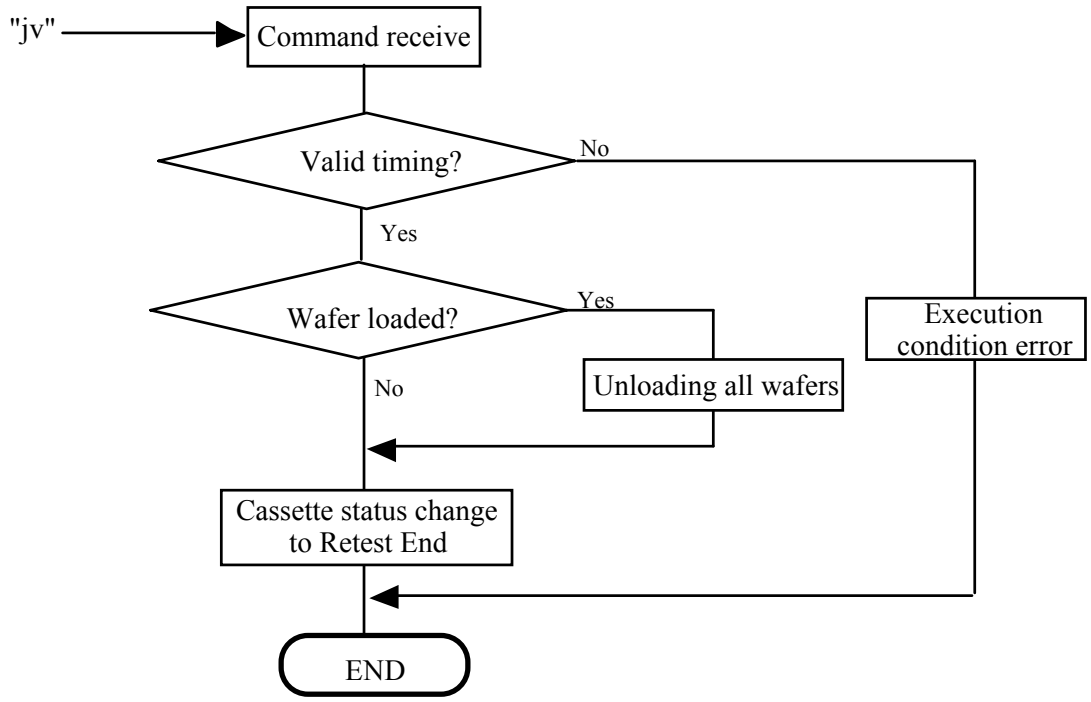
This command specifies the die for the probe-mark inspection with its coordinates.



4.58 jv: End lot retesting immediately

j	v	CR	LF

For terminating the retesting lot midway with all loaded/pre-loaded wafers returned to the cassette.



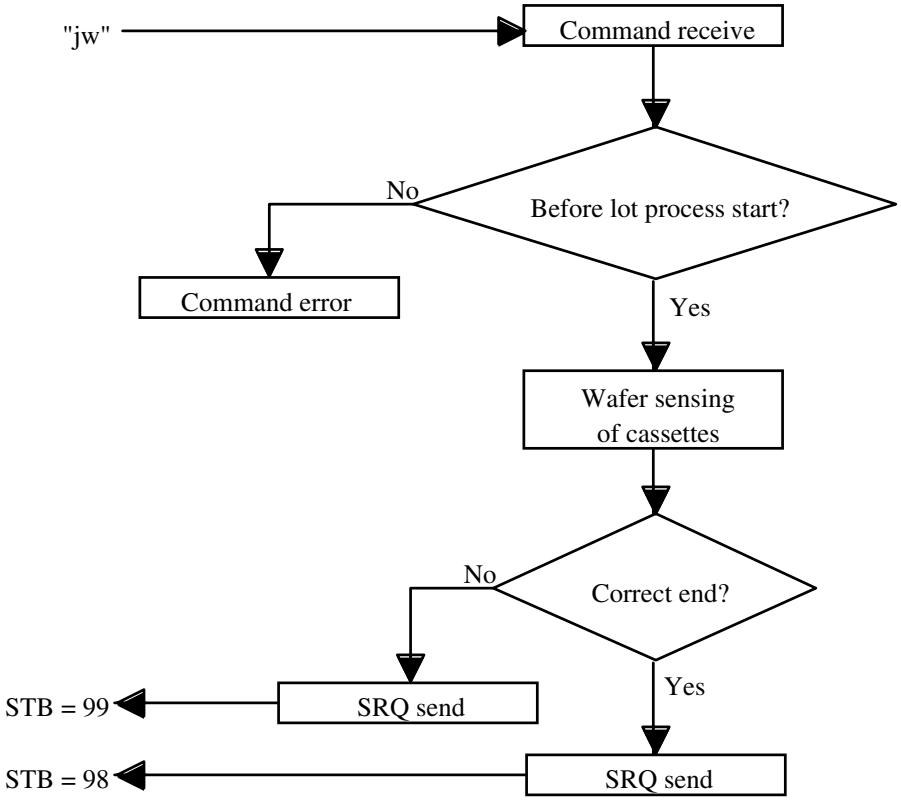
Response: SRQ send STB = 94 Correct finish
STB = 99 Incorrect finish

• Command valid timing
During the lot retesting only.

4.59 j w : Make the cassette testing ready

j	w	CR	LF

At receiving this command, Prober makes the loaded cassettes ready for testing.



4.60 j w1 (or 2) : Elevator 1 (or 2) wafer sensing

j	w	X	CR	LF

X = 1;front cassette, 2; rear cassette

At receiving this command, Prober starts the wafer sensing with the demanded cassette.
This command is valid only when the elevator carrying the cassette stays in the top.
If the wafer sensing has been already done by the manual switch operation or NEW CST switch lamp is blinking yet after the cassette end, Execution Condition error will occur.

Response: SRQ send	STB = 98	Correct finish
	STB = 99	Incorrect finish
	STB = 76	Execution condition error

Note: This command can be used with the Auto-lot end option.

4.61 k c : Card contact count request

k	c	CR	LF

At receiving this command and being allowed as Talker, Prober outputs the card contact count.

Response:

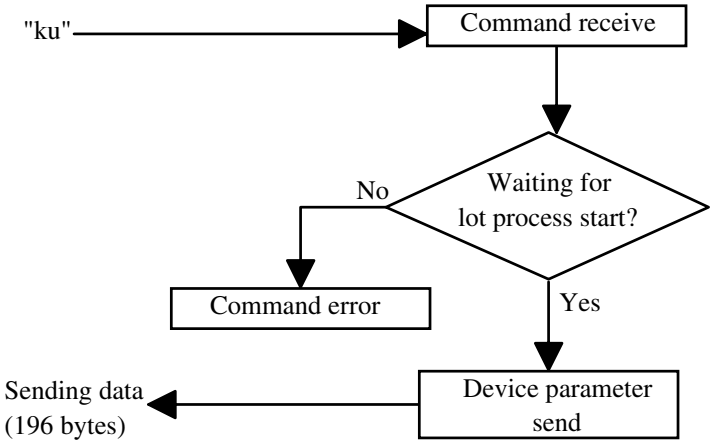
k	c	10^9	10^8	10^7	10^6	10^5	10^4	10^3	10^2	10^1	10^0	CR	LF

Note: This command can be used after the initialization.

4.62 k u : Up-load of a device parameter group

k	u	CR	LF

At receiving this command, Prober answers back the current device parameters to the controller.

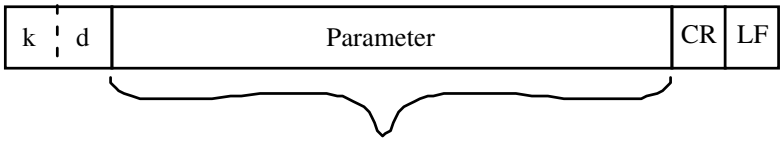


No.	Item	Description	BYTE
1	Wafer Name	: Fixed 12 characters	12
2	Wafer Size	: 4 - 4 inch, 5 - 5 inch, 6 - 6 inch, 8 - 8 inch, 9 - 4.5 inch	1
3	ORI.FLA.Angle	: Orientation flat angle, 0~360	3
4	X-Axis	: X index, 0~99999 (μm)	5
5	Y-Axis	: Y index, "	5
6	X-θ INT. Chip	: Not used (fixed to 0)	4
7	Y-θ INT. Chip	: Not used (fixed to 0)	4
8	X Start Position	: Not used (fixed to 0)	5
9	Y Start Position	: Not used (fixed to 0)	5
10	Alignment Axis	: Not used (fixed to X)	1
11	Chip Size Check	: Not used (fixed to N)	1
12	X Alignment Size	: Not used (fixed to 1)	1
13	Y Alignment Size	: Not used (fixed to 1)	1
14	Probe Size	: Probing area radius from the wafer center 0~9999 (100μm)	4
15	Target Sense	: "0"; not applied, "1"; to be applied	1
16	Target Position X1	: Not used (fixed to 0)	3
17	Target Position Y1	: Not used (fixed to 0)	3
18	Target Position X2	: Not used (fixed to 0)	3
19	Target Position Y2	: Not used (fixed to 0)	3
20	Standard Chip X	: Target position -X "±00"~"±99"	3
21	Standard Chip Y	: " -Y "	3
22	Target Pattern Check	: Not used (fixed to N)	1
23	Reference Chip-X	: Not used (fixed to 0)	3
24	Reference Chip-Y	: Not used (fixed to 0)	3
25	ORI.FLA. Select	: Not used (fixed to N)	1
26	Number of Flat	: Not used (fixed to 0)	1
27	ORI.FLA. Position	: Not used (fixed to 0)	1

No.	Item	Description	BYTE
28	Probe Area Select	: Setting method “Y": 5-point Data-in, "N": wafer margin	1
29	Edge Correct	: Die margin, 1~100 (%)	3
30	Sample Probe	: Sampling test "0"; not applied, "1"; to be applied	1
31	Sample Step-1 X	: Sampling test die (X1) "±0"~"±99"	3
32	Sample Step-1 Y	: “ (Y1) “	3
33	Sample Step-2 X	: “ (X2) “	3
34	Sample Step-2 Y	: “ (Y2) “	3
35	Sample Step-3 X	: “ (X3) “	3
36	Sample Step-3 Y	: “ (Y3) “	3
37	Sample Step-4 X	: “ (X4) “	3
38	Sample Step-4 Y	: “ (Y4) “	3
39	Sample Step-5 X	: “ (X5) “	3
40	Sample Step-5 Y	: “ (Y5) “	3
41	Sample Step-6 X	: “ (X6) “	3
42	Sample Step-6 Y	: “ (Y6) “	3
43	Sample Step-7 X	: “ (X7) “	3
44	Sample Step-7 Y	: “ (Y7) “	3
45	Sample Step-8 X	: “ (X8) “	3
46	Sample Step-8 Y	: “ (Y8) “	3
47	Pass Net	: Pass die count limit at the yield check, "0"~"65535"	5
48	ILLUM. Mode	: Not used (fixed to 0)	1
49	Start POSI.	: Not used (fixed to 0)	1
50	Micro POSI.	: Not used (fixed to 0)	1
51	Align Axis	: Alignment main axis, "X"; X axis, "Y"; Y axis	1
52	Auto Focus	: "0"; not applied, "1"; to be applied	1
53	X Align Size	: Die group size, X "1"~"9"	1
54	Y Align Size	: “ Y “	1
55	Monitor Chip -X	: Block sampling die group X "1"~"9"	1
56	Monitor Chip -Y	: Block sampling die group Y “	1
57	Monitor Chip Size-X	: Not used (fixed to 0)	4
58	Monitor Chip Size -Y	: Not used (fixed to 0)	4
59	Multi Chip	: Number of sites for the multi-site probing, "1","2","4","8"	1
60	Multi Location	: Channel location at the multi-site probing	2
61	Unload Stop	: Visual inspection, "Y"; to be done, "N"; not to be done	1
62	Stop Counter	: Visual inspection interval, "0"~"99"	2
63	Test Reject Cassette	: Continuous FAIL reject & yield reject wafer cassette "0":LOAD CST. "1"~"2":REJECT CST.	1
64	Align Reject Cassette	: Alignment NG wafer cassette "0":LOAD CST. "1"~"2":REJECT CST.	1
65	Continuous Process	: Continuous FAIL post-process	1
66	Continuous Process	: Continuous FAIL post-process "0"; STOP "1"; wafer unloading and next wafer loading	1
67	Continuous Preset	: Continuous FAIL limit "1"~"999"	3
68	Skip Chip Row	: Continuous FAIL skip "0"~"99”	2
69	Check Back Count	: Allowable check-back times "0"~"9"	1
70	Reject Wafer Count	: Allowable reject wafer amount with the continuous FAIL check-back "0"~"9"	1

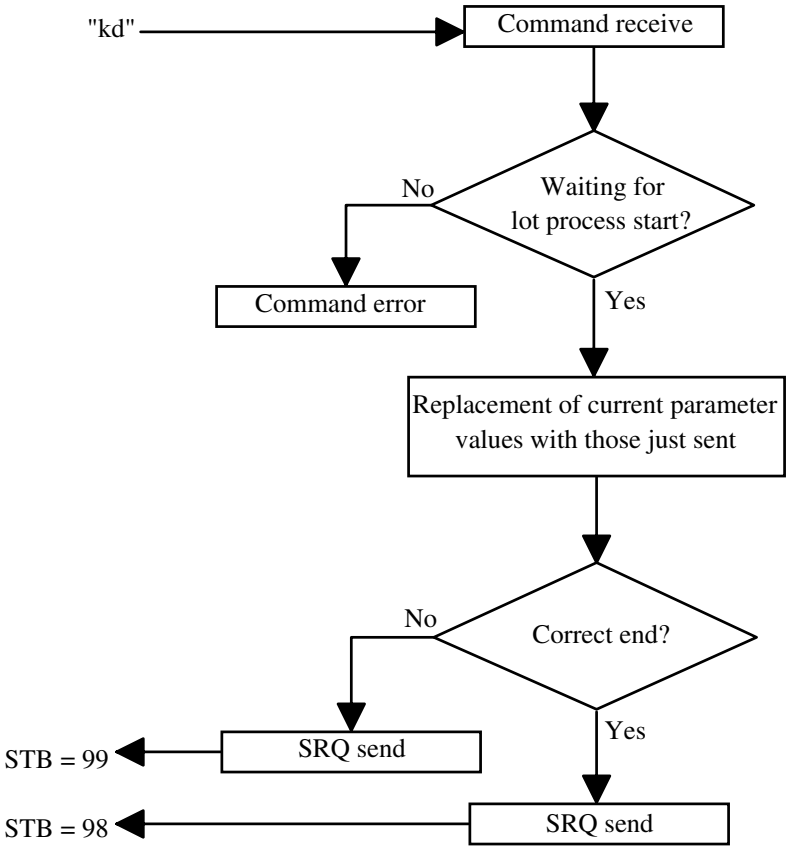
No.	Item	Description	BYTE
71	Polish After Check Back	: Needle cleaning with the continuous FAIL check-back "Y"; to be applied, "N"; not to be applied	1
72	Polish	: Needle cleaning, "Y"; to be applied, "N"; not to be applied	1
73	Z Count	:Contact times in one needle cleaning "0"~"99"	2
74	Chip Count	:Die interval of needle cleaning "0"~"9999"	4
75	Wafer Count	:Wafer interval of needle cleaning "0"~"99"	2
76	Over Drive	:Overdrive at the needle cleaning "0"~"999"(μm)	3
77	Total Count	:Needle cleaning limit "0"~"9999"	4
78	Hot Chuck	:Hot-chuck setting temperature "0"~"135"	3
79	Preset Address -X	:X coordinate preset value "0"~"99"	2
80	Preset Address -Y	:Y " "0"~"99"	2
		Total	196

4.63 k d : Down-load of a device parameter group



For the data format, see "ku" command

At receiving this command, Prober replaces the current device parameters with the sent values.



Note: Even if at the incorrect end, Prober does not fall in an error state. Retry the command operation or set up the device parameters manually.

4.64 k h : Request of site location

k	h	CR	LF

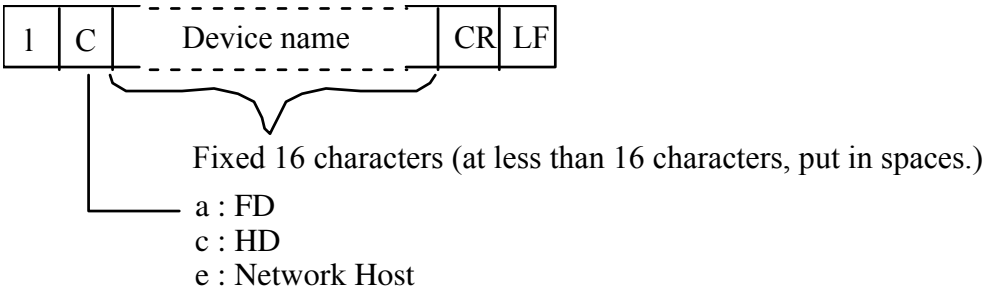
At receiving this command and being allowed as Talker, Prober sends the site location information on the probe card which is contained in the card type data.

Response:

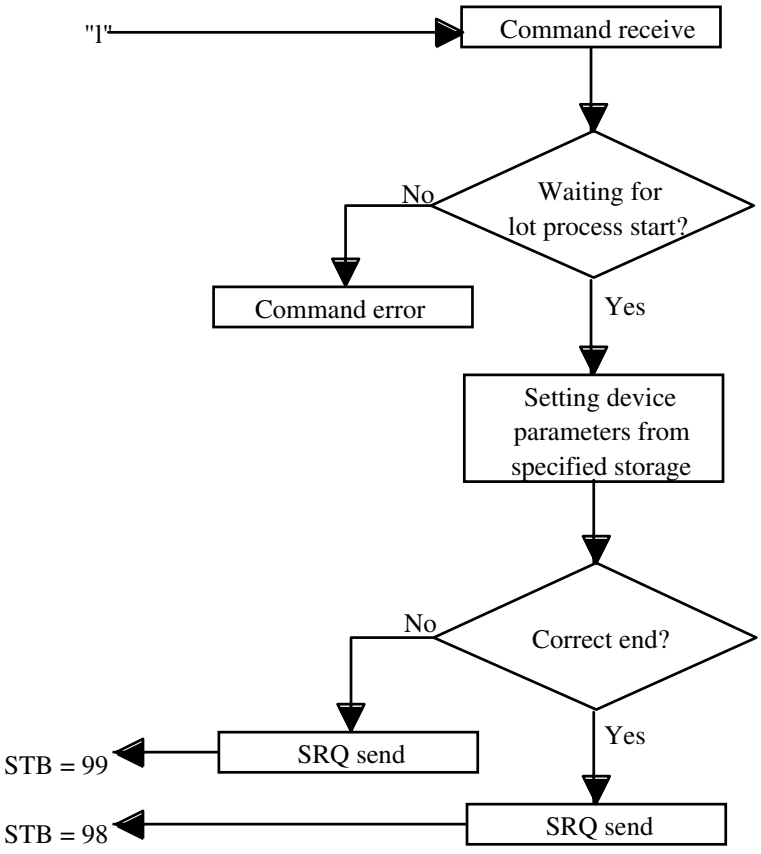
k	h	x	x	CR	LF

Site location value

4.65 I : Load device data from HD, FD, or Network Host



At receiving this command, Prober sets device parameters of the specified device name from the specified storage device. For a Prober in a network under the group-management Host, “le (Device name)” can make the Prober access the network Host and obtain the device parameters from the Host.

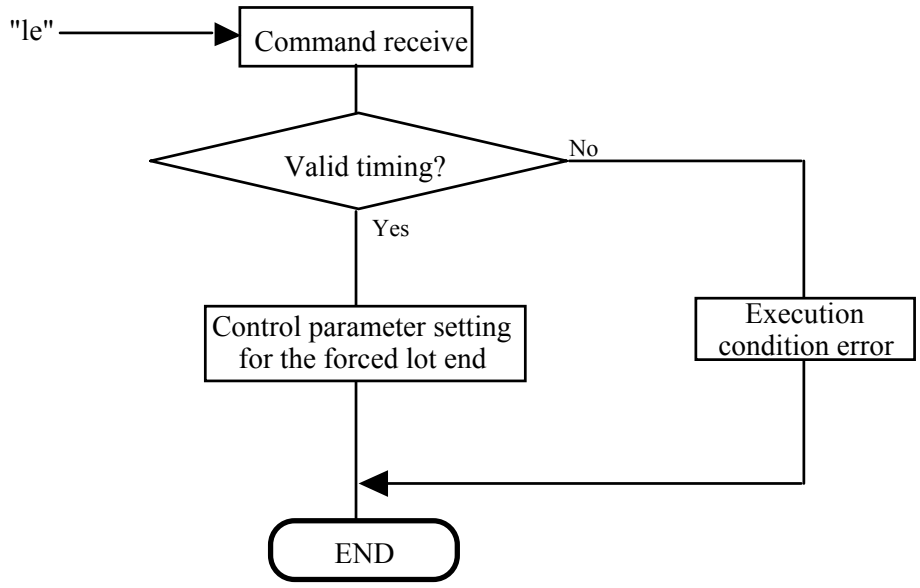


Note: Even if in the incorrect end, Prober does not fall in error. Retry the command process or set up device parameters manually.

4.66 le: Lot end request

l	e	CR	LF

For setting control parameters to terminate the lot process forcibly.



Response: SRQ send	STB = 98	Correct finish
	STB = 99	Incorrect finish

• Command valid timing
During the probing only.
This command works only for setting the control parameters so as to terminate the current lot process forcibly. Prober's actions for actually ending the lot are controlled by "L" or "U" command.

4.67 m s : Prober status request

m s	CR	LF

At receiving this command and being allowed as Talker, Prober reports its current status to the controller.

Response:

m s	C	C	CR	LF

Status
"W": Cassette process going on
" ": Cassette process not going on

Status
"I": Waiting for the lot start
"C": Card replacement going on
"R": Lot process going on
"E": Waiting for the operator's help in an error

Note: This command can be used after the initialization.

4.68 n6: Probing area setting

n	6	C	Setting data	CR	LF

C: Setting data type; ASCII 1 byte
a: Sampling test area setting

n	6	a	Upper limit	Lower limit	CR	LF

s: Skip die setting

n	6	s	X coordinate	Y coordinate	CR	LF

m: Marking die setting

n	6	m	X coordinate	Y coordinate	CR	LF

e: Sampling area setting end

n	6	e	CR	LF

Caution: The sampling test area setting must be followed with the sampling area setting end command.

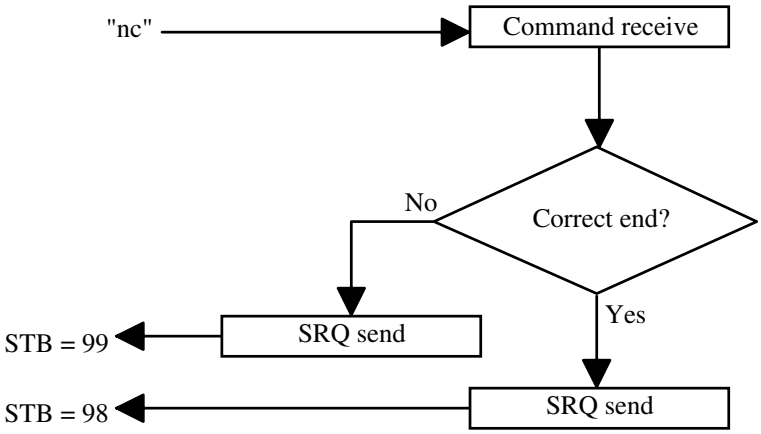
Once Prober has received this command, the sampling data can be down-loaded to work with the upper/lower limits.

Response: SRQ send STB = 98 Correct finish

4.69 n c : Preset the contact counter

n	c	10^9	10^8	10^7	10^6	10^5	10^4	10^3	10^2	10^1	10^0	CR	LF

At receiving this command, Prober presets the told value to the probe contact counter.



Note: This command can be used after the initialization.

4.70 nd: Request of probe tip data for a pad

n	d	Site No.	Pad No.	CR	LF

Site No. ASCII 3 bytes
Pad No. ASCII 4 bytes

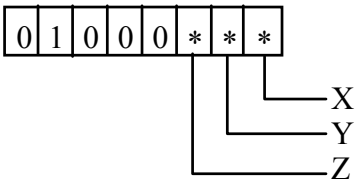
Replying to this command, Prober sends the measured probe tip data of a specified pad.

• Response

1) When the probe tip data are available:

n	d	①	②	③	④	⑤	⑥	⑦	⑧	CR	LF

① Site No. ASCII 3 bytes (fixed)
② Pad No. ASCII 4 bytes (fixed)
③ Pad center location X ASCII 6 bytes (fixed) including sign (+/–), µm
④ Pad center location Y ASCII 6 bytes (fixed) including sign (+/–), µm
⑤ Probe tip offset X ASCII 4 bytes (fixed) including sign (+/–), µm
⑥ Probe tip offset Y ASCII 4 bytes (fixed) including sign (+/–), µm
⑦ Probe tip focus height ASCII 4 bytes (fixed) including sign (+/–), µm
⑧ Over-limit item ASCII 1 byte (fixed)



Example 1) only X at the over-limit
'A' (41H)

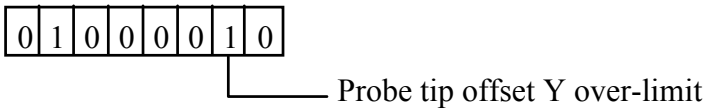
Example 2) X and Z at the over-limit
'E' (45H)

* Each value of sign uses the first byte for '+' or '–'.
* An indefinite offset value or focus tip is represented by all 9s.

Example of output data:

nd 001 0001 –00123 +00456 +012 +100 +999 B
① ② ③ ④ ⑤ ⑥ ⑦ ⑧

① Site No. 1
② Pad No. 1
③ Pad center location X –123 µm
④ Pad center location Y +456 µm
⑤ Probe tip offset X +12 µm
⑥ Probe tip offset Y +100 µm
⑦ Probe tip focus height indefinite
⑧ Over-limit item



2) When the probe tip data are not available:

n	d	CR	LF

• Command valid timing

Valid when the probe-pad alignment data are available; not valid during the alignment going on, however, when Prober sends back STB = 76 meaning “GP-IB Command Execution error”.
The recommended timing is after positioning of the start die which is noticed with STB = 70 on the new lot first wafer; on the second and subsequent wafers, the probe-pad alignment data are always available except in the retry of the alignment.

4.71 ni: Request of probe-pad alignment results

n	i	CR	LF

Replying to this command, Prober sends the probe-pad alignment data.

• Response

n	i	①	②	③	④	⑤	⑥	⑦	⑧	⑨	⑩	⑪	⑫	⑬	⑭	⑮	⑯	CR	LF

① Device name	ASCII 16 bytes (fixed)
② Index size X	ASCII 8 bytes (fixed), unit 0.1 μm
③ Index size Y	ASCII 8 bytes (fixed), unit 0.1 μm
④ Orientation flat angle	ASCII 3 bytes (fixed), unit degree
⑤ Probe tip offset limit (for the distance from the pad edge)	ASCII 2 bytes (fixed), μm
⑥ Probe tip offset limit (for the distance from the pad center)	ASCII 2 bytes (fixed), μm
⑦ Probe tip height variation limit	ASCII 2 bytes (fixed), μm
⑧ Card center X from the mounting position	ASCII 8 bytes (fixed), 0.1 μm
⑨ Card center Y from the mounting position	ASCII 8 bytes (fixed), 0.1 μm
⑩ Probe tip contacting Chuck height	ASCII 5 bytes (fixed), μm
⑪ Wafer thickness	ASCII 5 bytes (fixed), μm
⑫ Card angle	ASCII 8 bytes (fixed), 0.00001 degree
⑬ Number of measured data items	ASCII 4 bytes (fixed)
⑭ Max. site No.	ASCII 3 bytes (fixed)
⑮ Max. pad No.	ASCII 4 bytes (fixed)
⑯ Probe tip measurement date/time	
Year (the last 2 digits)	ASCII 2 bytes (fixed)
Month	ASCII 2 bytes (fixed)
Day	ASCII 2 bytes (fixed)
Hour	ASCII 2 bytes (fixed)
Minute	ASCII 2 bytes (fixed)
Second	ASCII 2 bytes (fixed)

* For a device name less than 16 characters, the space code is used for filling up.

• Command valid timing

Valid when the probe-pad alignment data are available; not valid during the alignment going on, however, when Prober sends back STB = 76 meaning “GP-IB Command Execution error”.
The recommended timing is after positioning of the start die which is noticed with STB = 70 on the new lot first wafer; on the second and subsequent wafers, the probe-pad alignment data are always available except in the retry of the alignment.

4.72 np: Probe-mark inspection data request

n	p	CR	LF

Replying to this command, Prober sends the probe-mark inspection data currently available.

• Response

a	b	b	b	CR	LF

a: Probe-mark judgment result
0: Correct
1: Too large
2: Position no good
3: Measurement failure
4: Too small
bbb: Pad No. (001 ~ 999)

• Command valid timing
Valid only in the timing STB = 122 has been sent after completion of one pad inspection.
If "np" command has not come from Tester within a period after the output of STB = 122, the timeout error will occur; the Prober operation can be resumed with the re-sending of "np" command after the alarm clearance.
In the case a different command has come from the output of STB = 122 till the end of the data transfer, the Execution Condition error will occur.
This command is usable with the parameter "Needle Inspection Result Transfer" set to '1: Yes' in [GP-IB Interface Settings].

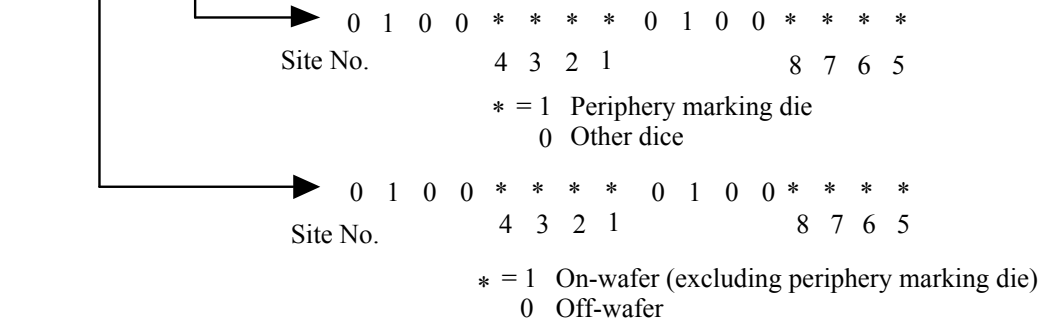
4.73 o: On-wafer information request

o	CR	LF

Replying to this command, Prober sends the On-wafer information including the periphery marking data.

Response:

o	C	C	C	C	CR	LF



For putting marks on the periphery marking dice in the in-place marking, confirm their locations with this command and instruct for the marking with "M" or "C" command.

4.74 p : Printout request

p	CR	LF

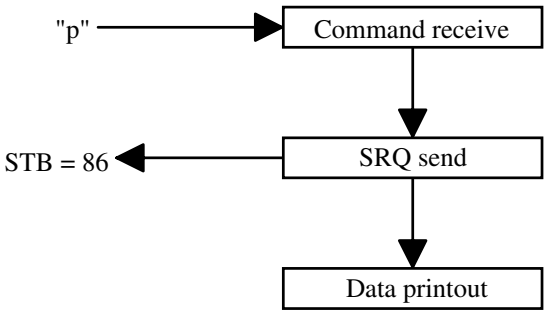
At receiving this command, Prober has the printer forward by one line and carriage return, which is the built-in printer or external printer according to Prober configuration data.

p		CR	LF

ASCII printout data (max. 80 characters)

At receiving the command in this format, Prober has the printer print out the sent data followed by one line feed and carriage return.

Note: This command can be used after the initialization.



4.75 q : Request of start die coordinates

q	CR	LF

At receiving this command, Prober outputs the start die coordinates.

Response:

q	Y	10^2	10^1	10^0	X	10^2	10^1	10^0	CR	LF

X coordinate (–99 ~ 511)
Y coordinate (–99 ~ 511)

Note: This command is effective only during probing; otherwise the response data are indefinite. (Command error does not occur.)
For a coordinate value less than –99, its sent coordinate becomes –99.

4.76 r : Request of Hot-chuck status

r	CR	LF

At receiving this command and being allowed as Talker, Prober reports the Hot-chuck status as follows.

Response:

r	Z	Z	CR	LF

7	6	5	4	3	2	1	0
0	1	0	0	0	0	0	X

1: Auto-tuning incomplete after the start of heating-up with Auto-tuning

7	6	5	4	3	2	1	0
0	1	0	0	0	0	0	0

1: Device provided
1: Heating-up start
1: High temp. limit over
1: Low temp. limit over

Examples of response:

•Hot-chuck not provided

r	@	@	CR	LF

•After start of heating-up with Auto-tuning, the Auto-tuning is not complete yet.

r	A	A	CR	LF

•Setting temp.>Measured temp.

r	K	@	CR	LF

•Setting temp.<Measured temp.

r	G	@	CR	LF

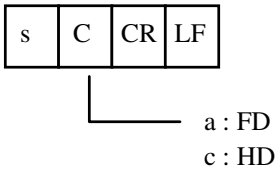
•Setting temp. = Measured temp. (Hot-chuck ready to use)

r	C	@	CR	LF

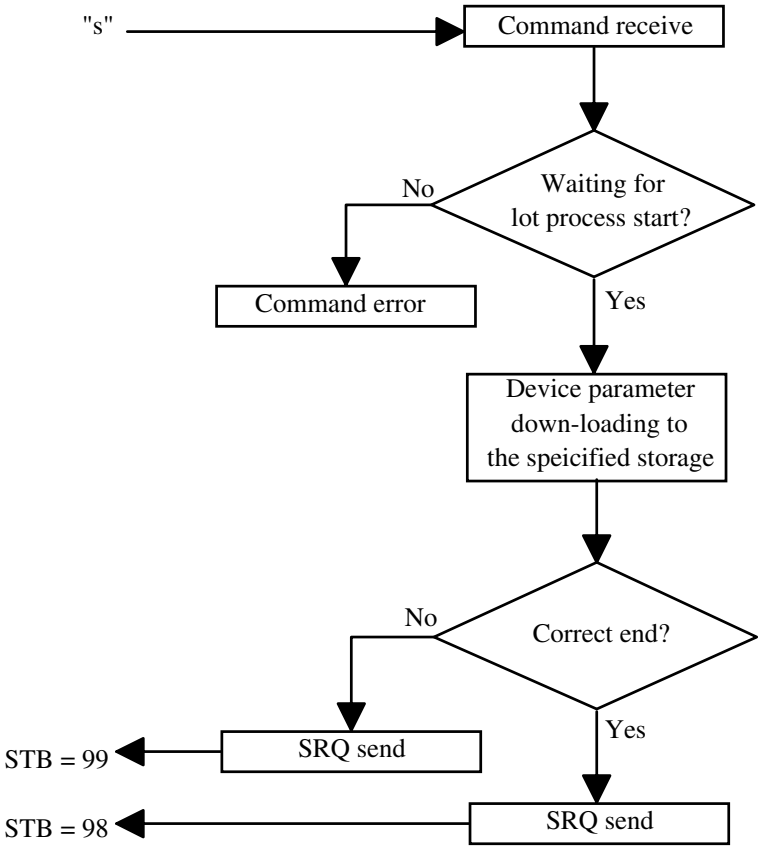
•Heating-up stop

r	A	@	CR	LF

4.77 s : Save current device data



At receiving this command, Prober saves the current device parameters to the media of the specified storage device.

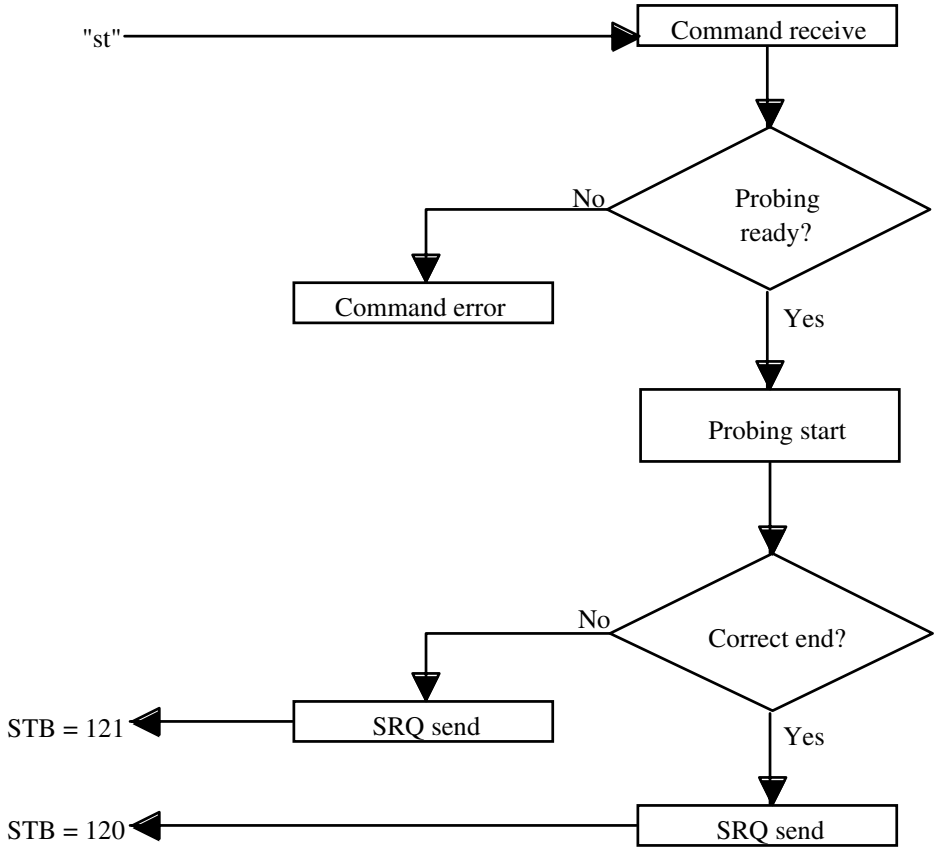


Note: The incorrect end means that the down-loading was impossible from a reason such as no media in the specified storage, the media write-protected, or insufficient remaining area of the media.
Prober does not fall in an error state.

4.78 s t : Request of prober start

s	t	CR	LF

At receiving this command, Prober acts as if its START switch has been pushed on.



4.79 vZ: Contact resistance measurement

v	Z	n	X1	X0	CR	LF

n: Contact mode 0; single contact
1; double contact
X1X2: over-drive amount, 0 ~ 99 μm

The Shorting block comes under the probe card and it is driven up to the contact height + over-drive amount by the F axis. The Shorting block position is regulated free from the previous position with the travel control data for the cleaning.

• Response: SRQ send STB = 98; correct finish
STB = 99; incorrect finish

4.80 vE: End of vZ

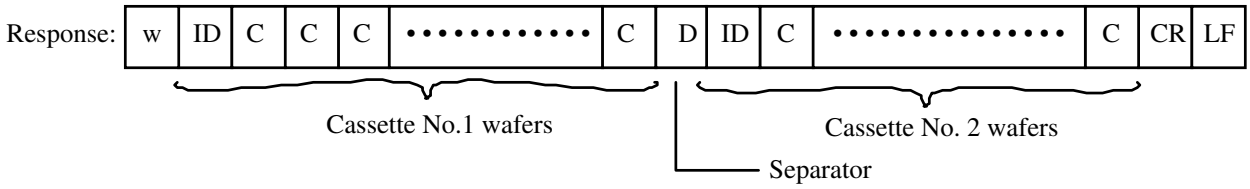
v	E	CR	LF

For ending the contact resistance measurement to drive Chuck to Z-Down toward the original die position.

• Response: SRQ send STB = 98; correct finish
STB = 99; incorrect finish

4.81 w : Request of wafer status

At receiving this command, Prober outputs the status of each wafer in the loaded cassettes.



•ID: Cassette status •
- 0 = No cassette
- 1 = Ready to test
- 2 = Testing under way
- 3 = Testing finished
- 4 = Rejected wafer cassette

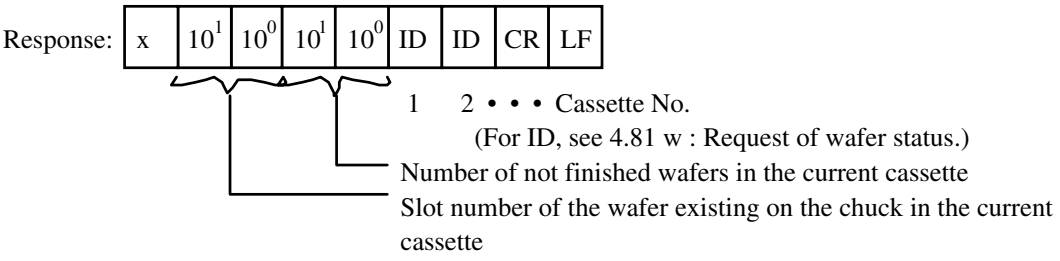
C: Wafer status
- 0 = No wafer
- 1 = Testing not done
- 2 = Testing finished
- 3 = Testing under way

Notes:
1) The wafer status area of the response data is fixed to 25 slots and total for two cassettes. When only one cassette is loaded, "No cassette" is marked for the second cassette.
2) The wafer existing on Chuck is "Testing under way"; if it is unloaded to the reject wafer cassette, its original slot is "No wafer" and its inserted slot of the rejected wafer cassette is "Testing finished".
3) This command can be used after the initialization.

4.82 x : Request of cassette status

x	CR	LF

At receiving this command, Prober outputs the status of the currently loaded cassettes.



Note: This command can be used after the initialization.

4.83 y : Yield data request

y	CR	LF

At receiving this command and being allowed as Talker, Prober outputs the yield value.

Response:

y	10^2	10^1	10^0	10^{-1}	CR	LF

Yield (%)

Note: When NET is specified instead of yield, the response becomes:

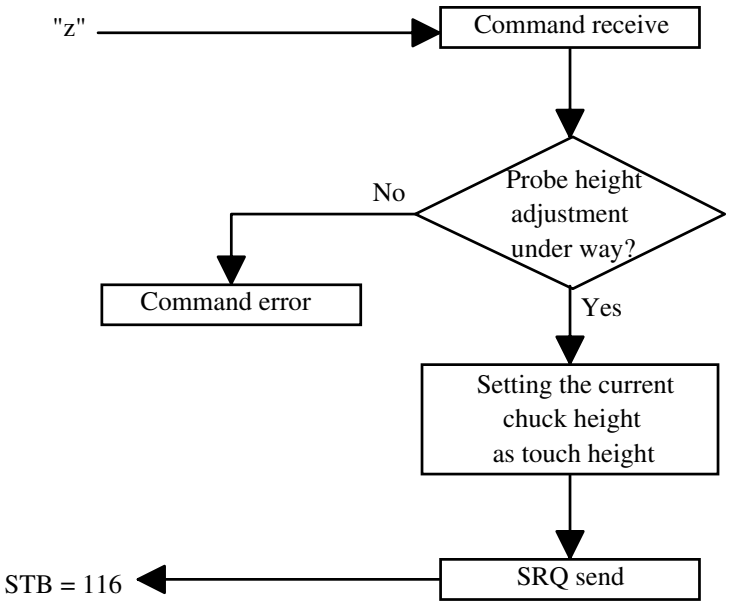
y	CR	LF

This command can be used after the initialization.

4.84 z : Set the current Z as contact height

z	CR	LF

At receiving this command, Prober sets the current chuck height as the contact height.



5 Error Messages

No.	Error message	Error state/actions
00650	GP-IB I/F RECEIVE ERROR !!	• The Prober side Driver software for the GP-IB interface control has worked wrong in the command receiving process. • Reset Prober.
00651	GP-IB I/F TRANSMIT ERROR !!	• The Prober side Driver software for the GP-IB interface control has worked wrong in the response data processing for a received command. • Reset Prober.
00660	GP-IB RECEIVE COMMAND FORMAT INVALID !!	• The format (using characters and number of digits) of a received command is not appropriate. • Check the control program on the Tester side.
00661	GP-IB COMMAND EXECUTION ERROR !!	• Due to the timing or Prober status, a received command can not be executed. Example: A die positioning command has come while no wafer exists on Chuck. • Check the control program on the Tester side.
00665	GP-IB STOP COMMAND RECEIVED !!	• Prober operation has stopped with K command received.
00667	GP-IB COMMUNICATION TIMEOUT ERROR !!	• The SRQ or STB read/response time on the Tester side has exceeded the preset period. • Check the GP-IB interface control function on the Tester side.
00669	GP-IB RESPONSE TIMEOUT ERROR !!	• The SRQ or STB read/response time on the Tester side has exceeded the preset period. • Check the GP-IB interface control function on the Tester side.

6 Remarks

① If Prober operation has stopped by some reason (such as alarm-stop, STOP switch pushing, or receiving K command) and the operator's help (such as alignment retry, probe-pad alignment retry, manual unloading) has changed the previous status, Prober will send the corresponding STB after completion of the operation step applied.

② Operator's manual stop
At the operator's manual stop of Prober, STB = 90 is output; at the manual restarting, STB = 91 is output. For a Tester not meeting these STBs, change their 'user-defined STB codes' to '0' for killing them.

③ Operation stop under the Prober internal functions and restart
In the probing (die testing), the Prober operation may have stopped under the control of a Prober internal function such as the continuous Fail check or probe-mark inspection, independently of the Tester control.
With the setting for alarm-stop on occurrence of the continuous Fails, for example, the alarm happens at receiving "M" or "C" command usually, and STB = 76 (Occurrence of an error state) and STB = 90 (Probing stop) are sent after Z-Down. When the operator has cleared the alarm and instructed the restart with <START> switch, STB = 69 is first sent as the response to "M" command. For moving to the next testing die, "J" command is necessary. At receiving "J" command, Prober positions the next testing die while keeping Z-Down and sends STB = 66. At the reach of STB = 66, let Tester issue "Z" command for driving up Chuck to the probing height.
A Tester whose GP-IB control program can not comply with such operation stop under the Prober internal functions and the restart procedure can not use the internal functions.