

DIFFUSION / LP-CVD GROUP CONTROLLER  
HOST COMMUNICATION INTERFACE SPECIFICATIONS

T O K Y O   E L E C T R O N   L t d .

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1. 2	Di ffusion/CVD Group Controller			mi cro VAX
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## History of Revision

Ver.	Date	Contents	Page
1.0	25-SEP-1990	Initial release	
1.1	28-SEP-1993	Revised Add PNO S1F6 Add MFC, pressure variable S2F27 Add S2F69/F70 in scenario	10, 11 14, 15 33, 35
1.2	31-OCT-1995	Revised Add APC data S1F6	11

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## 1. INTRODUCTION

This specification describes the communicational interface between Group Controller and Host Computer.

Group Controller has SECS-I and SECS-II protocol to communicate with Host Computer.

SECS device id which must be controled by Host Computer are corresponding only to Tube Controller. Transfers are controled implicitly by SECS messages having Tube Controller device id.

Hereinafter G/C denotes Group Controller, T/C denotes Tube Controller and HOST denotes Host Computer.

G/C controls some areas consisting of T/Cs and Transfers group.  
 G/C AREA STATUS screen displays status of all T/C including a same area in one displaying page.  
 To see the AREA STATUS screen of other area, G/C operator have to push a key to switch the area displaying on G/C terminal.

Only one SECS communication line (physical line) is established between HOST and G/C. SECS device id is defined corresponding to each T/C. And these SECS id is transfered on one communication line between HOST.

Explaining from HOST point of view, it does not have to know any information about areas. HOST can access to T/C, via G/C, by controlling the SECS device id on communication messages.

Number of T/C including one area is limited to 16.  
 Number of areas which can be registered on one G/C is limited to 8.

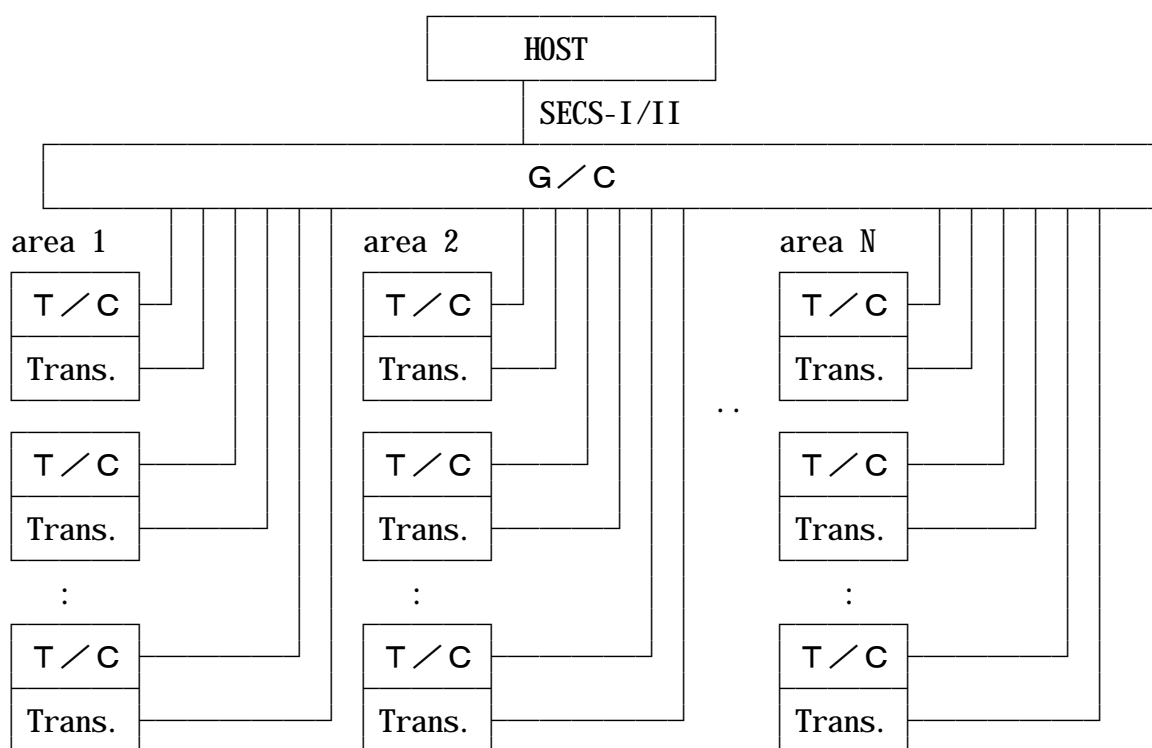


Figure 1-1 Communicational routing

## 2. OUTLINE OF INTERFACE

G/C communicates to HOST using SECS-I protocol and SECS-II message sub-sets.

### 2.1 DATA LINK BASIC SPECIFICATIONS

Table 2.1-1 shows the electrical, physical and character interface specifications as data link parameters.

Table 2.1-1 DATA LINK PARAMETERS

Electrical interface	according to EIA RS-232-C														
Connector	ISO 2110-1980(D-sub) 25pin[FEMALE]														
Signal connections	<table><tr><td>Pin</td><td>Description</td></tr><tr><td>1</td><td>Shield</td></tr><tr><td>2</td><td>Tx Data (G/C outputs)</td></tr><tr><td>3</td><td>Rx Data (G/C inputs)</td></tr><tr><td>7</td><td>Signal ground</td></tr><tr><td>9</td><td>Optical cable connector power.</td></tr></table>		Pin	Description	1	Shield	2	Tx Data (G/C outputs)	3	Rx Data (G/C inputs)	7	Signal ground	9	Optical cable connector power.	(+12V d. c.)
Pin	Description														
1	Shield														
2	Tx Data (G/C outputs)														
3	Rx Data (G/C inputs)														
7	Signal ground														
9	Optical cable connector power.														
Data rate	300 to 9600 bps. (we recommend 9600)														
Character structure	start bit = 1bit data bit = 8bit (LSB~MSB) stop bit = 1bit parity bit = none														

## 2.2 DATA LINK PROTOCOL PARAMETERS

Table 2.2-1 shows range and setting of data link protocol parameters of G/C.

Table 2.2-1 DATA LINK PROTOCOL PARAMETERS

Parameters	Range	Recommendation
T 1	0.1 ~ 10.0 (sec)	0.5 (sec)
T 2	0.2 ~ 25.0 (sec)	10 (sec)
T 3	1 ~ 120 (sec)	45 (sec)
T 4	1 ~ 120 (sec)	45 (sec)
R T Y	1 ~ 31	3
M / S	Master or Slave	Master
Device id	0000(hex) ~ 7FFF(hex)	See Note 1

Note 1) An unique id number is required for device on same physical communication line. One device id is corresponding to one T/C. Transfer is accessed by using T/C device id which the transfer is connected.

## 2.3 COMMUNICATION PROTOCOL

G/C communicates to HOST in SECS-I/II protocols.  
Following items are specially mentioned.

Multi block transmission is available for both directions.

Multi open transaction for both direction can be supported.  
Interleaving message handling can be also supported.

Duplicate block detection and neglection function is available.

Treating of multi open transaction (including interleaving message handling) and of duplicate block detection follow G/C parameter setting. These parameters can be set not to proceed these functions. And the setting of these two parameters are independent for each other.

### 3. MESSAGES

#### 3.1 MESSAGES

##### MESSAGES FOR HOST ORIGIN TRANSACTION

SxF0	Abort Transaction
S1F1	Are You There Request
S1F2	Online Data
S1F5	Formatted Status Request
S1F6	Formatted Status Data
S2F21	Remote Command Send
S2F22	Remote Command Acknowledge
S2F27	Initiate Processing Request
S2F28	Initiate Processing Acknowledge
S2F67	Dummy Exchange Request
S2F68	Dummy Exchange Acknowledge



## MESSAGES FOR G/C ORIGIN TRANSACTION

SxF0	Abort Transaction
S1F1	Are You There Request
S1F2	Online Data
S2F17	Date and Time request
S2F18	Date and Time Data
S5F1	Alarm Report Send
S5F2	Alarm Report Acknowledge
S6F9	Formatted Variable Send
S6F10	Formatted Variable Acknowledge
S6F11	Event Report Send
S6F12	Event Report Acknowledge
S9F1	Unrecognized Device Id
S9F3	Unrecognized Stream Type
S9F5	Unrecognized Function Type
S9F7	Illegal Data
S9F9	Transaction Timer Timeout

## 3.2 MESSAGE DETAILS FOR HOST ORIGIN TRANSACTION

### 3.2.1 ABORT TRANSACTION (SxF0)

SxF0      Abort Transaction

S, H→G

Description:

May occur in reply to a primary message or in a multi-block message. Terminates further work on this transaction.

Structure:

Header only. The header is constructed from the stored header for the transaction in progress by changing the function code to 0 and the E-bit to a 1.

### 3.2.2 ARE YOU THERE REQUEST (S1F1/S1F2)

S1F1 Are You There Request

S, H→G, R

Description:

Establishes if all of G/C, the T/C pointed by device id and the transfer for this T/C are on line state. A function 0 response to this function means the communication is inoperative at least one of these three equipment.

Structure:

Header only.

S1F2 Online Data

S, H←G

Description:

Data signifying that G/C, T/C and transfer are on line. Mdel name and revision for T/C are responded.

Structure:

L, 2

- 1.<MDLN> T/C model name. A, 6 "MD3100" or "MD3200"
- 2.<SOFTREV> T/C software revision. A, 6 "REV?.?"

### 3.2.3 FORMATTED STATUS REQUEST (S1F5/S1F6)

S1F5      Formatted Status Request

S, H→G, R

Description:

A request for G/C to report the status according to a predefined fixed format.

Structure:

<SFCD> Status form code B, 1  
0: T/C and transfer status summary  
>0: not supported

S1F6      Formatted Status Data

M, H←G

Description:

G/C reports the value of status variables according to the SFCD.  
A function 0 response means that one of G/C, T/C specified by device id and transfer for the T/C is off line.

Structure:

L, 3  
1. L, 9  
1. <TCSTAT> T/C status A, 8 "STANDBY "  
"READY "  
"RUN "  
"END "  
"HOLD "  
"ABORT "  
"ABORTEND"  
2. <PPID> recipe ID A, 6  
3. L, 2  
1. <TTLREMT> total remaining process time A, 8 "hhhhmmss"  
2. <STPREMT> step remaining time A, 6 "hhmmss"  
4. L, 7  
1. L, 5  
1. <ZONENAME1> temperature zone name (zone-1) A, 6  
:  
5. <ZONENAME5> (zone-5)  
2. L, 5  
1. <TEMPSET1> temperature Setting (zone-1) A, 6  
:  
5. <TEMPSET5> (zone-5)  
3. L, 5  
1. <TEMPCTL1> temperature Control TC(zone-1) A, 6  
:  
5. <TEMPCTL5> (zone-5)  
4. L, 5  
1. <TEMPPDL1> temperature Paddle TC(zone-1) A, 6  
:  
5. <TEMPPDL5> (zone-5)  
5. L, 5  
1. <HEATPW1> heater power (zone-1) A, 5  
:  
5. <HEATPW5> (zone-5)  
6. <TMPCTLMDD> temperature control mode A, 1  
"1" = External Thermocouple

"2" = Internal Thermocouple  
 "3" = Ratio mix  
 "6" = External Thermocouple (Temp. null ON)  
 "7" = Internal Thermocouple (Temp. null ON)  
 "8" = Ratio mix (Temp. null ON)

7. <PRFTBL> profile table name A, 1

"1" = PFA  
 "2" = PFB  
 "3" = PFC  
 "4" = PFD  
 "5" = PFE

5. L, 3

1. L, 15

1. <MFCNAME01> MFC gas name #1 A, 6

:

15. <MFCNAME15> #15

2. L, 15

1. <MFCSET01> MFC setting #1 A, 5

:

15. <MFCSET15> #15

3. L, 15

1. <MFCACT01> MFC actual #1 A, 5

:

15. <MFCACT15> #15

6. L, 4 ; L, 0 when T/C is MODEL3100 (diffusion)

1. L, 1

1. <PRSSET> pressure setting A, 5

2. L, 1

1. <APCSET> APC setting A, 3

3. L, 4

1. <PRSACT1> pressure actual #1 A, 5

:

4. <PRSACT4> #4

4. L, 1

1. <APCACT> APC actual A, 3

7. L, m ; m is number of standby factors (0 ... 16)

1. <STBFAC1> standby factor A, 8

:

m <STBFACm>

8. L, n ; n is number of T/C alarms occurring (0 ... 200)

1. <ALMD1> alarm ID name A, 6

:

n. <ALMDn>

9. <PNO> PNO value of the executing step A, 2 (00 ... 99)  
Valid only while <TCSTAT> is "RUN".

2. L, 5

1. <LOADER> loader status I, 1

0 = IDLE  
1 = BUSY for lot loading/unloading  
2 = not used  
3 = BUSY for dummy exchanging

2. L, 2

1. <TRANSMOD> transfer mode I, 1

1 = Remote (AGV use)  
2 = Remote (AGV no use)  
3 = Local

2. <TRANSTAT> transfer status I, 1

1 = Ready

- 2 = Busy
- 3 = Maintenance
- 3.<BATCHID> batch ID A,10
- 4.L,i ; i is number of lots containing this batch
  - 1.<LOTID1> lot ID A,16
  - ⋮
  - i.<LOTIDi>
- 5.L,j ; j is number of transfer alarms occurring (0 or 1)
  - 1.<ALTX> alarm text A,40
- 3.L,3
  - 1.<DUMUSE> dummy wafer usage status I,1
    - 0 = normal
    - 1 = overused
  - 2.<TUBUSE> tube usage status I,1
    - 0 = normal
    - 1 = overused
  - 3.<BOATUSE> boat usage status I,1
    - 0 = normal
    - 1 = overused

### 3.2.4 REMOTE COMMAND SEND (S2F21/S2F22)

S2F21 Remote Command Send

S, H→G, R

**Description:**

Similar to pressing buttons on T/C panel or to operate console of transfer. It causes following equipment activity.

In a normal operation, T/C remote command is not necessary. But transfer command is necessary. See message flow diagram in section 4.

**Structure:**

<RCMD> Remote command code U, 1

BIT7 = 0 : T/C commands.

01(Hex) = start (T/C start button)

02(Hex) = hold ON (T/C hold button ON)

03(Hex) = hold OFF (T/C hold button OFF)

04(Hex) = end reset (T/C end-reset button)

05(Hex) = recipe cancel (resume T/C READY to STANDBY)

06(Hex) = alarm reset (only stop T/C alarm buzzer)  
(HOST can not reset alarm itself, because of safety)

07(Hex) = emergency abort (T/C EMG button)

BIT7 = 1 : transfer commands.

88(Hex) = Unload process carriers

89(Hex) = Unload dummy carriers

90(Hex) = Batch Load Cancel

S2F22 Remote Command Acknowledge

S, H←G

**Description:**

Acknowledge or error reply for S2F21.

S2F0 will be sent when one of G/C, T/C or transfer was offline state. S2F0 will be also sent when a communication error was detected between G/C and T/C or G/C and transfer.

Structure: <CMDA> Acknowledge code U, 1

0 = OK (command has been accepted)

1 = command does not exist

2 = can not perform now

### 3.2.5 INITIATE PROCESSING REQUEST (S2F27/S2F28)

#### S2F27 Initiate Processing Request

S, H→G, R

##### Description:

Host requests equipment to initiate processing of the identified lots at the specified location in the machine using the specified process program.

Transfer will be ready to accept process lots after the successful reply for this command.

If time variables, temperature variables, MFC variables, or pressure variables were specified, the default value being kept in G/C recipe table is overwritten by these values.

Spaces (20Hex) as a value of variable in S2F27 means to use current default value.

Recipe ID must be registered and frozen on G/C to the T/C.

At the loading of carriers, one monitor wafer carrier must be added at the tail of the processing lots always, even though monitor recipe ID means that the transfer does not use any monitor wafers.

A function 0 response means that one of G/C, T/C specified by device id and transfer for the T/C is off line.

See message flow diagram on section 4.

##### Structure:

L, 3

1. <LOC> machine material location B, 1 (always zero)

2. L, 6

1. <PPID> recipe ID A, 6

2. L, 3

1. <TIM/ARA> time variable A A, 6 "hhmmss"

2. <TIM/ARB> time variable B A, 6 "hhmmss"

3. <TIM/ARC> time variable C A, 6 "hhmmss"

3. L, 5

1. <TEMPVAR1> temperature variable A (zone-1) A, 6

:

5. <TEMPVAR5> temperature variable A (zone-5) A, 6

4. L, 15

1. <MFCVAR1> MFC variable A (MFC #1) A, 5

:

15. <MFCVAR15> MFC variable A (MFC #15) A, 5

5. L, 1

1. <PRESVAR> pressure variable A A, 5

6. <MONITOR> monitor recipe ID A, 1 "0" to "9"

3. L, n ; n is the number of lots in this batch, 1 to 6

1. <MID1> lot id #1 A, 16

:

n. <MIDn> lot id #n A, 16



S2F28 Initiate Processing Acknowledge

S, H←G

Description:

Response by equipment to S2F27. Returned status indicates whether or not the request was honored by the equipment.

Structure: <CMDA> Acknowledge code U, 1

0 = command has been accepted

1 = command does not exist

2 = can not perform now

### 3.2.6 DUMMY EXCHANGE REQUEST (S2F67/S2F68)

#### S2F67 Dummy Exchange Request

S, H→G, R

##### Description:

Request to exchange dummy wafer to the transfer.

A function 0 response means that one of G/C, T/C specified by device id and transfer for the T/C is off line.

See message flow diagram on section 4.

Structure: <EXMODE> exchange mode B, 1  
1 = unload only.  
2 = load or exchange (depends on current state)

##### Note:

<EXEMODE> = 2 causes dummy exchange if boat already has dummy wafers. It causes loading if boat does not have any dummy wafer yet.

#### S2F68 Dummy Exchange Acknowledge

S, H←G

##### Description:

Acknowledge for S2F67.

It contains the information how many new monitor wafer carriers and how many empty carriers must be prepared for dummy exchanging.

##### Structure:

L, 2

1. <DEACK> dummy wafer exchange acknowledge code U, 1  
0 = command is accepted  
1 = command does not exist  
2 = can not perform now

2. L, 2

1. <EMPCRY> number of empty carriers required U, 1 (0 - 2)  
valid only when <DEACK> = 0

2. <FULCRY> number of filled carriers required U, 1 (0 - 2)  
valid only when <DEACK> = 0

### 3.3 MESSAGE DETAILS FOR G/C ORIGIN TRANSACTION

#### 3.3.1 ABORT TRANSACTION (SxF0)

SxF0      Abort Transaction

S, H←G

Description:

May occur in reply to a primary message or in a multi-block message. Terminates further work on this transaction.

Structure:

Header only. The header is constructed from the stored header for the transaction in progress by changing the function code to 0 and the E-bit to a 1.

### 3.3.2 ARE YOU THERE REQUEST (S1F1/S1F2)

S1F1 Are You There Request

S, H←G, R

Description:

Confirmation of communication logical and physical line connection between G/C and HOST.

Structure:

Header only.

S1F2 Online Data

S, H→G

Description:

Host answer that HOST computer is ready to communicate.

Structure:

L, 0

### 3.3.3 DATE AND TIME REQUEST (S2F17/S2F18)

S2F17 Date and Time Request

S, H←G, R

Description:

G/C synchronizes its time base with HOST.

G/C make this synchronization whenever it turns into ONLINE.

Structure:

Header only.

S2F18 Date and Time Data

S, H→G

Description:

Actual time data of HOST.

Structure: <TIME> Time data A, 12 "yy~~mm~~ddhhmmss"

### 3.3.4 ALARM REPORT SEND (S5F1/S5F2)

S5F1 Alarm Report Send

S, H←G, R

#### Description:

This message reports a change in or presence of an alarm condition. One message will be issued when the alarm is set and one message will be issued when the alarm is cleared. Irrecoverable errors may not have a corresponding clear message. Also clear message will not be sent if G/C turns into OFFLINE state before the clearance of the alarm. From the opposite side of view, no alarm set message but a clear message is sent to HOST if G/C turned to ONLINE after the occurrence of the alarm.

#### Structure:

L, 3

1. <ALCD> alarm code B, 1  
 BIT7 = 1 means alarm set  
 BIT7 = 0 means alarm cleared  
 BIT0~BIT6 is alarm category code  
     6 = equipment status warning  
     64 = alarm report for transfer  
     65 = process start failure
2. <ALID> alarm ID U, 1 See Table 3.3-1
3. <ALTX> alarm text A, n (n=0 - 40)

Table 3.3-1 ALARM LIST

ALCD	ALID	ALTX	Description
86/06H	1-200	defined on T/C	T/C alarm report
C0/40H	1-255	defined on transfer	Transfer alarm report
C1/41H	1	CAN NOT USE THIS RECIPE	Process start failure
	2	RECIPE DOWNLOAD INQUIRE NOT GRANTED	
	3	RECIPE DOWNLOAD FAILURE	
	4	RECIPE CHECK NOT PASSED ON T/C	
	5	PROCESS VARIABLES DOWNLOAD FAILURE	
	6	COMMAND NOT ACCEPTED BY TRANSFER	

#### Note:

Alarms of process start failure will be cleared by operator function on G/C terminal, "Forced Progress" or "Forced End" in "Auxiliary".

S5F2 Alarm Report Acknowledge

S, H→G

#### Description:

Acknowledge.

Structure: <ACKC5> Acknowledge code B, 1  
 0 = accepted

### 3.3.5 FORMATTED VARIABLE SEND (S6F9/S6F10)

S6F9      Formatted Variable Send

M, H←G, R

Description:

Process completion data.

Reported when T/C finished its process or an operator selected a "Forced End" operation at G/C terminal.

Structure:

L, 4

1. <PFCD> predefined form code B, 1 (always zero)
2. <DATAID> data ID I, 1 (=1 ; process data)
3. <CEID> collection event ID I, 1 (=2)
4. L, 4
  1. L, 2
    1. <DSID1> data set ID B, 1 (=1 ; process summary)
  2. L, 4
    1. <BATCHID> batch ID A, 10
    2. <PPID> recipe ID A, 6
    3. <STARTTIME> start time A, 12 "yyymmddhhmmss"
    4. <ENDTIME> end time A, 12 "yyymmddhhmmss"
  2. L, 2
    1. <DSID2> data set ID B, 1 (=2 ; lot information)
  2. L, i ; i is the number of lots containing the batch (1-6)
    1. <LOTID1> lot ID #1 A, 16
    - :
    - i. <LOTIDi> lot ID #i A, 16
  3. L, 2
    1. <DSID3> data set ID B, 1 (=3 ; time variables)
  2. L, 3
    1. <VTIMEA> time variable-A A, 6 "hhmmss" or " "
    2. <VTIMEB> time variable-B A, 6 "hhmmss" or " "
    3. <VTIMEC> time variable-C A, 6 "hhmmss" or " "
  4. L, 2
    1. <DSID4> data set ID B, 1 (=4 ; temperature variables)
  2. L, 5
    1. <VTMP1A> temp. variable A zone-1 A, 6 "9999.9" or " "
    - :
    5. <VTMP5A> temp. variable A zone-5 A, 6

S6F10      Discrete Variable Acknowledge

S, H→G

Description:

Acknowledge for S6F9.

Even though this acknowledge code was not zero, G/C will not retry to send this S6F9 any more.

Structure: <ACKC6> Acknowledge code B, 1

0 = accepted

≠0 = error

### 3.3.6 EVENT REPORT (S6F11/S6F12)

S6F11 Event Report

S, H←G, R

Description:

G/C sends the events according to the T/C status, transfer status changes.

Structure:

L, 3

1.<DATAID> event report data ID I,1 (=2 ; event report)

2.<CEID> collection event ID I,1 (=2)

3.L, n ; n is number of event to be reported. See note.

1. L, 2

1.<RPTID> report ID I,1

1 = line connection status

2 = T/C status report

3 = transfer status report

4 = dummy wafer usage status

5 = process tube usage status

6 = wafer boat usage status

2. L, 1

1.<STATUS> status value A,8 See table 3.3-2

:

n. L, 2

:

Note:

n (number of event) is usually one. The only exception of it is at the first report when G/C turns into ONLINE with HOST. In this case, n is six, it means all event state at that time are reported when G/C turns into ONLINE.

S6F12 Event Report Acknowledge

S, H→G

Description:

Acknowledge for S6F11.

Even though this acknowledge code was not zero, G/C will not retry to send this S6F11 any more.

Structure: <ACKC6> Acknowledge code B, 1

0 = accepted

≠0 = error



Table 3.3-2 EVENT LIST

RPTID	STATUS	Description
1	"ONLINE " "OFFLINE "	G/C, T/C, transfer becomes ONLINE G/C, T/C, transfer becomes OFFLINE
2	"STANDBY " "READY " "RUN " "END " "HOLD " "ABORT " "ABORTEND"	T/C becomes STANDBY state T/C becomes READY state T/C becomes RUN state T/C becomes END state T/C becomes HOLD state T/C becomes ABORT state T/C becomes ABORT END state
3	"P-LOAD-W" "P-LOAD-C" "P-UNLD-R" "P-UNLD-C" "D-LOAD-W" "D-LOAD-C" "D-UNLD-R" "D-UNLD-C"	transfer is Waiting LOADING of Process lots transfer Completes LOADING of Process lots transfer becomes Ready to UNLoad Process lots transfer Completes UNLoading Process lots transfer is Waiting LOADING of Dummy carrier transfer Completes LOADING of Dummy carrier transfer becomes Ready to UNLoad Dummy carrier transfer Completes UNLoading Dummy carrier
4	"D-NORMAL" "D-OVRUSE"	Dummy wafer using count is stil lower than limit Dummy wafer using count is over its limit
5	"T-NORMAL" "T-OVRUSE"	process Tube using count is stil lower than limit process Tube using count is over its limit
6	"B-NORMAL" "B-OVRUSE"	wafer Boat using count is stil lower than limit wafer Boat using count is over its limit

### 3.3.7 UNRECOGNIZED DEVICE ID (S9F1)

S9F1	Unrecognized Device Id	S, H←G
------	------------------------	--------

**Description:**

The device ID in the message block header did not correspond to any known device ID.

Structure: <MHEAD> received message block header B, 10

### 3.3.10 UNRECOGNIZED STREAM TYPE (S9F3)

S9F3	Unrecognized Stream Type	S, H←G
------	--------------------------	--------

**Description:**

G/C does not recognize the stream type in the message block header. This message is issued only when W-bit in the received message was different from predefined one. S9F5 message will be issued when received stream number is not predefined.

Structure: <MHEAD> received message block header B, 10

### 3.3.11 UNRECOGNIZED FUNCTION TYPE (S9F5)

S9F5	Unrecognized Function Type	S, H←G
------	----------------------------	--------

**Description:**

This message indicates that the function in the message ID is not recognized by G/C. It also includes that the stream in the message ID is not recognized.

Structure: <MHEAD> received message block header B, 10

### 3.3.12 ILLEGAL DATA (S9F7)

S9F7      Illegal Data      S, H←G

**Description:**

This message indicates that the stream and function were recognized but the associated data format could not be interpreted. When block number in message block header was illegal, this message is issued, too.

Structure: <MHEAD> received message block header B, 10

### 3.3.13 TRANSACTION TIMER TIMEOUT (S9F9)

S9F9 Transaction Timer Timeout S, H←G

**Description:**

This message indicates that a transaction (receive) timer has timed out and that the corresponding transaction has been aborted. It is up to the host to respond to this error in an

appropriate manner to keep the system operational.  
G/C send this message after T3 or T4(inter-block) timeout.

Structure: <SHEAD> message header which is supposed to receive.

## 4. MESSAGE FLOW DIAGRAMS

### 4.1 TURNING TO ONLINE

#### 4.1.1 G/C TURNS TO ONLINE STATE

G/C has already connected ONLINE with some T/Cs and some transfers. An operator operates G/C function "Switch HOST line" in "Auxiliary".

For example, there were ten T/Cs and ten transfers, named from 1 to 10. And T/C 1, 2, 3, 4, 5 were connected ONLINE with G/C. Transfer 2, 4, 6, 8 were connected ONLINE with G/C. When operator switches G/C to HOST ONLINE mode, two communication line for T/C 2 and 4 will be established between HOST and G/C. S1F1, S1F2 transaction is done using one of T/C 2 and 4 device ID, S6F11 is sent twice for T/C 2 and for T/C 4.

If there were no pair of T/C and transfer both of them had been connected ONLINE with G/C, G/C operator function "Switch HOST line" is not available.

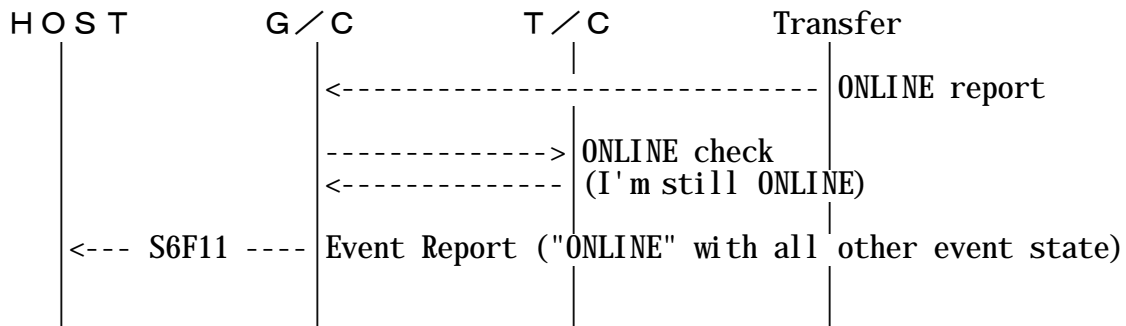
HOST	G/C	T/C	Transfer
<--- S1F1 ----- ----- S1F2 ---->	Are You There (Using device ID one of T/Cs which is ONLINE with G/C and also the transfer linked with it is ONLINE with G/C)		
<--- S6F11 ----- . . .	Event Report ("ONLINE" with all other status report) (This report will be sent for all T/Cs which are connected ONLINE with G/C and are having the transfer connected ONLINE with G/C)		
<--- S2F17 ----- ----- S2F18 ---->	Date and Time request (The same device ID as S1F1 is used.)		

#### 4.1.2 T/C OR TRANSFER TURNS TO ONLINE

G/C has already been ONLINE with HOST.

One transfer becomes ONLINE with G/C, and T/C linked with it has already connected ONLINE with G/C.

The similar sequence goes on if T/C turned to ONLINE while transfer was ONLINE already.



## 4.2 ARE YOU THERE FROM HOST

G/C was already ONLINE with HOST.

It means at least one pair of T/C and transfer is ONLINE with G/C and G/C itself is ONLINE with HOST.

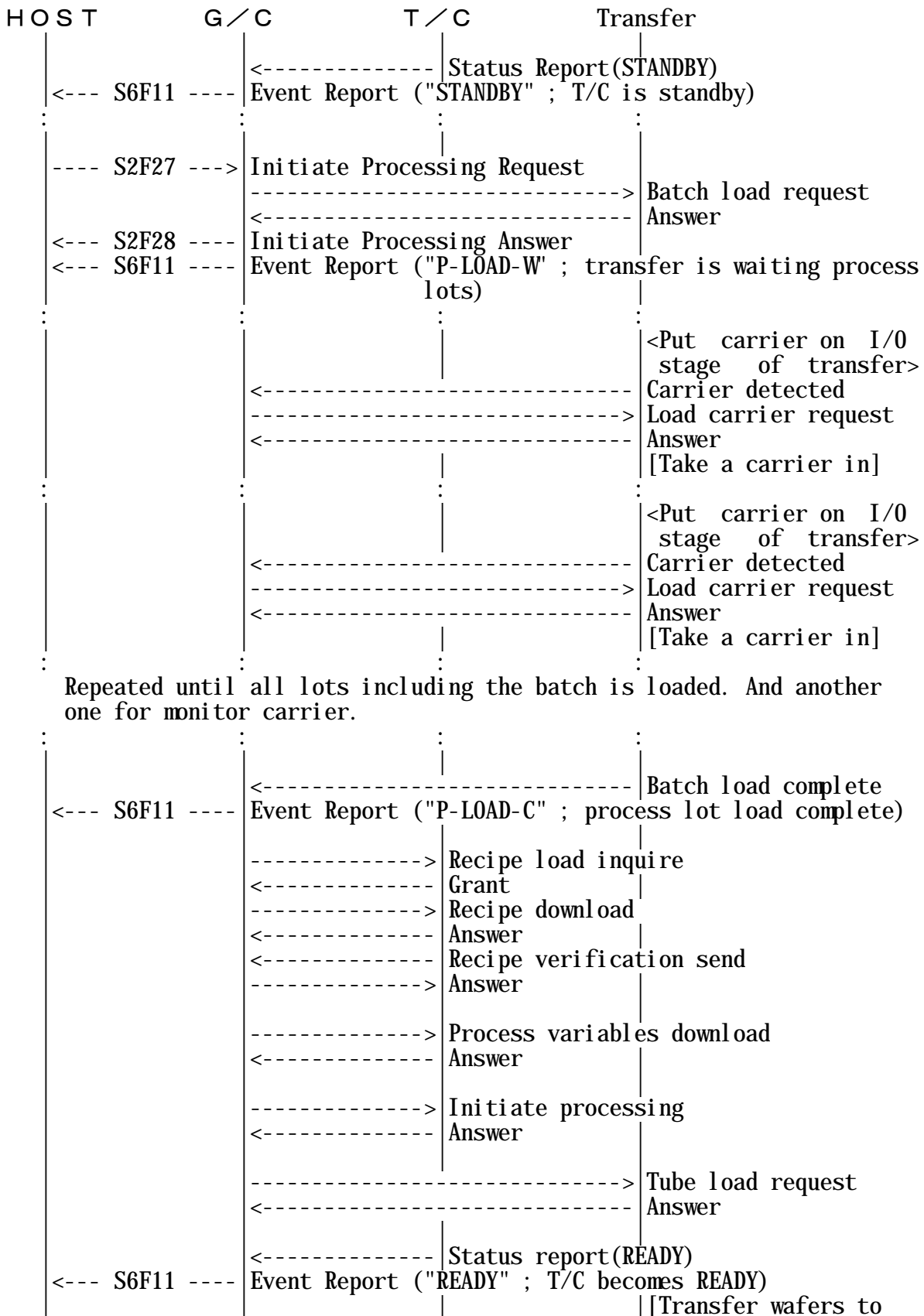
HOST	G/C	T/C	Transfer
----- S1F1 ----->	Are You There		
<----- S1F2 -----	(With device ID one of ONLINE connected T/Cs)		
<----- S2F17 -----	Date and Time Request		
----- S2F18 ---->	(The same device ID as S1F1 is used.)		

If HOST sent S1F1 in this case with device ID of not connected T/C, G/C returns S1F0 in stead of S1F2.

HOST	G/C	T/C	Transfer
----- S1F1 ----->	Are You There		
<----- S1F0 -----	(With unconnected T/C device ID)		

### 4.3 MESSAGE FLOWS OF PROCESSING LOTS

Operator or AGV action is commented with < >.  
 Tube or transfer action is commented with [ ].

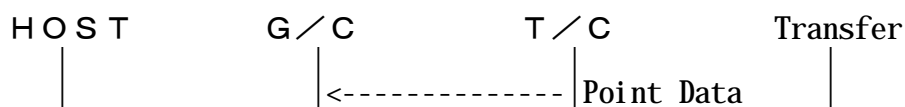


			the boat]
	<-----	Status report (RUN)	
<--- S6F11 ---	Event Report ("RUN" ; T/C becomes RUN)		
			[process at tube]
:	:	:	:
Data collection is done during processing according to the recipe specification of POINT DATA and STATIONARY DATA (SAMPLING defined in recipe)			
Message flows are described later.			
:	:	:	:
	<-----	Process end data	
<--- S6F9 ---	Formatted Variable Send		
--- S6F10 --->			
	<-----	Status Report (END)	
<--- S6F11 ---	Event Report ("END" ; T/C becomes END)		
			[END RESET is done by transfer automatically]
	<-----	Status Report (STANDBY)	
<--- S6F11 ---	Event Report ("STANDBY" ; T/C becomes STANDBY)		
			[Transfer wafers from boat to cassette]
	<-----	Batch unload enable	
<--- S6F11 ---	Event Report ("P-UNLD-R" ; ready to unload lots)		
--- S2F21 --->	Remote Command Send (Unload process carriers)		
	<-----	Batch unload request	
		Answer	
<--- S2F22 ---			
	<-----	<Unload carriers>	
		Batch unload complete	
<--- S6F11 ---	Event Report ("P-UNLD-C" ; Production unload complete)		

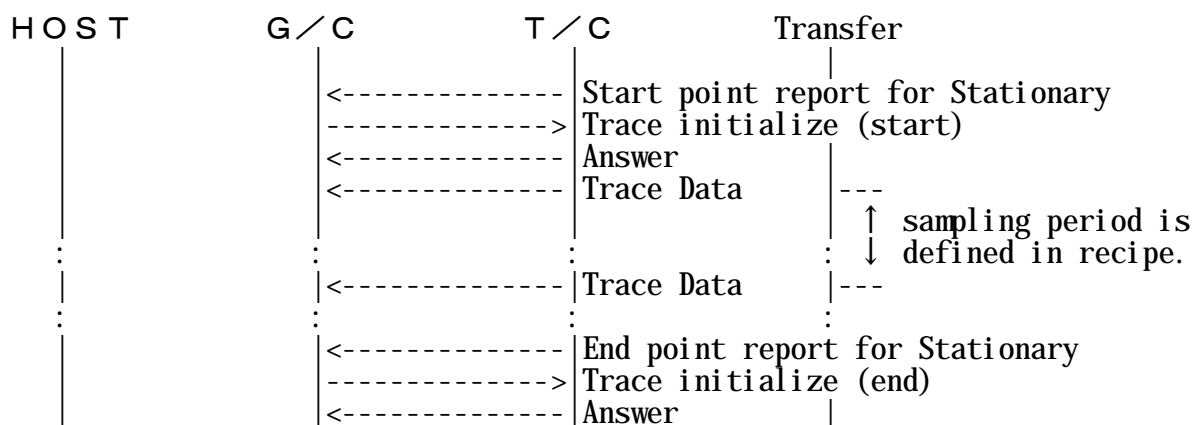


Data collection message flow during processing is described as next two types. One of them is point data collection, another is stationary data collection.

#### Point Data collection



#### Stationary Data collection



#### 4.4 PROCESS START NOT GRANTED

Operator or AGV action is commented with < >.  
Tube or transfer action is commented with [ ].

HOST	G/C	T/C	Transfer
1	1	1	1
2	2	2	2
3	3	3	3
4	4	4	4
5	5	5	5
6	6	6	6
7	7	7	7
8	8	8	8
9	9	9	9
10	10	10	10
11	11	11	11
12	12	12	12
13	13	13	13
14	14	14	14
15	15	15	15
16	16	16	16
17	17	17	17
18	18	18	18
19	19	19	19
20	20	20	20
21	21	21	21
22	22	22	22
23	23	23	23
24	24	24	24
25	25	25	25
26	26	26	26
27	27	27	27
28	28	28	28
29	29	29	29
30	30	30	30
31	31	31	31
32	32	32	32
33	33	33	33
34	34	34	34
35	35	35	35
36	36	36	36
37	37	37	37
38	38	38	38
39	39	39	39
40	40	40	40
41	41	41	41
42	42	42	42
43	43	43	43
44	44	44	44
45	45	45	45
46	46	46	46
47	47	47	47
48	48	48	48
49	49	49	49
50	50	50	50
51	51	51	51
52	52	52	52
53	53	53	53
54	54	54	54
55	55	55	55
56	56	56	56
57	57	57	57
58	58	58	58
59	59	59	59
60	60	60	60
61	61	61	61
62	62	62	62
63	63	63	63
64	64	64	64
65	65	65	65
66	66	66	66
67	67	67	67
68	68	68	68
69	69	69	69
70	70	70	70
71	71	71	71
72	72	72	72
73	73	73	73
74	74	74	74
75	75	75	75
76	76	76	76
77	77	77	77
78	78	78	78
79	79	79	79
80	80	80	80
81	81	81	81
82	82	82	82
83	83	83	83
84	84	84	84
85	85	85	85
86	86	86	86
87	87	87	87
88	88	88	88
89	89	89	89
90	90	90	90
91	91	91	91
92	92	92	92
93	93	93	93
94	94	94	94
95	95	95	95
96	96	96	96
97	97	97	97
98	98	98	98
99	99	99	99
100	100	100	100

until here (P-LOAD-C), the scenario is as same as 4.3

```

|<--- S6F11 ---|<-----|Batch load complete
|               |Event Report ("P-LOAD-C" ; process lot load complete)
|               |----->Recipe load inquire
|               |<-----Grant
|               |----->Recipe download (Failed)

```

Group controller turn into the process start sequence error state as "Recipe Send Error".

<Operator operates G/C terminal "Forced Progress" function.  
He gave a command "Retry" for the error.>

G/C starts from the recipe download again.

```

-----> Recipe load inquire
<----- Grant
-----> Recipe download
<----- Answer(OK)
<----- Recipe verification send
-----> Answer
-----> Process variables download
<----- Answer
-----> Initiate processing
<----- Answer
-----> Tube load request
<-----

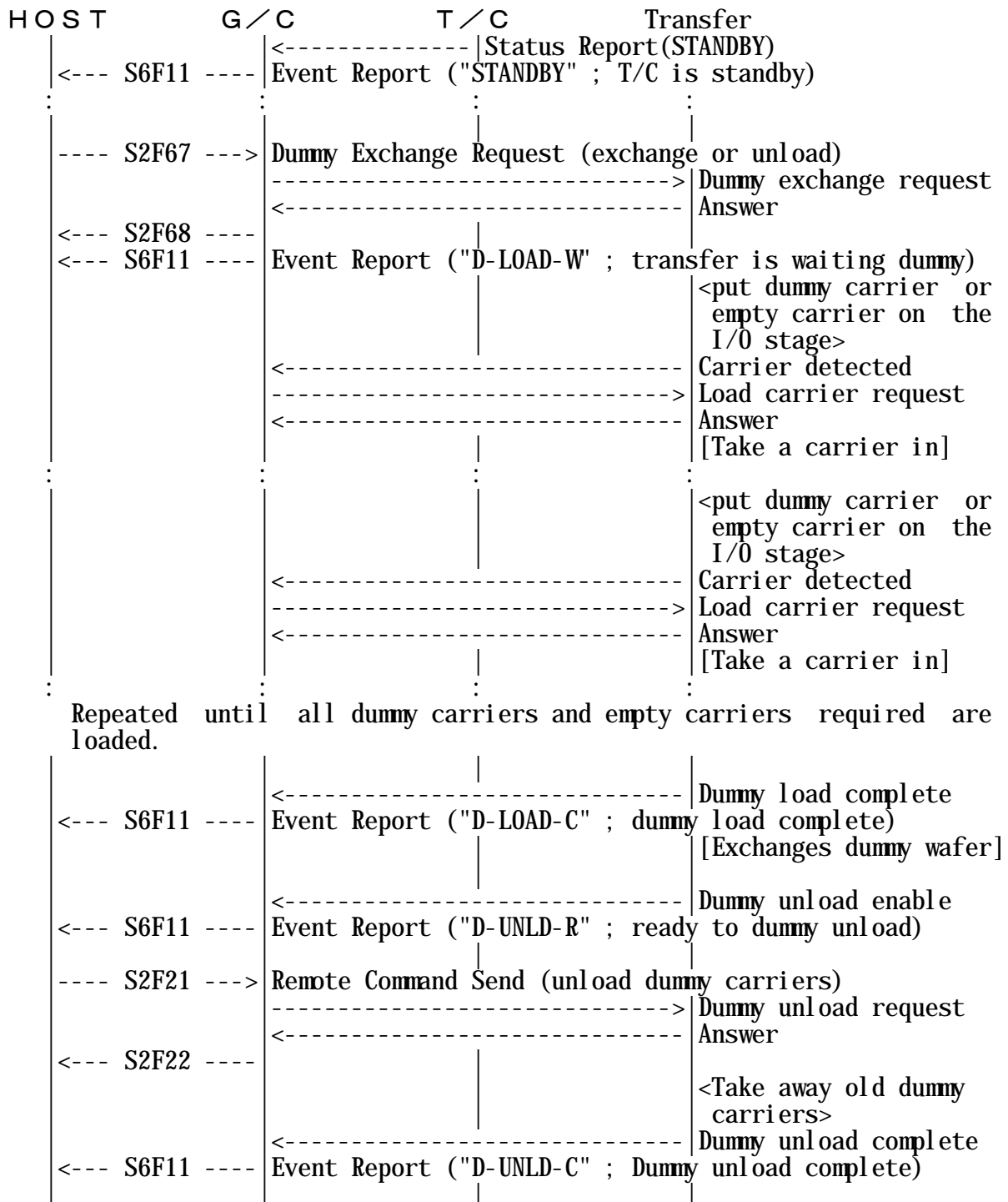
```

from here, the scenario continues as same as 4.3

## 4.5 DUMMY WAFER EXCHANGE

Dummy wafer exchange is available while transfer has no process lots.  
This flow shows when "exchange" is specified in Dummy Exchange Request (S2F67)

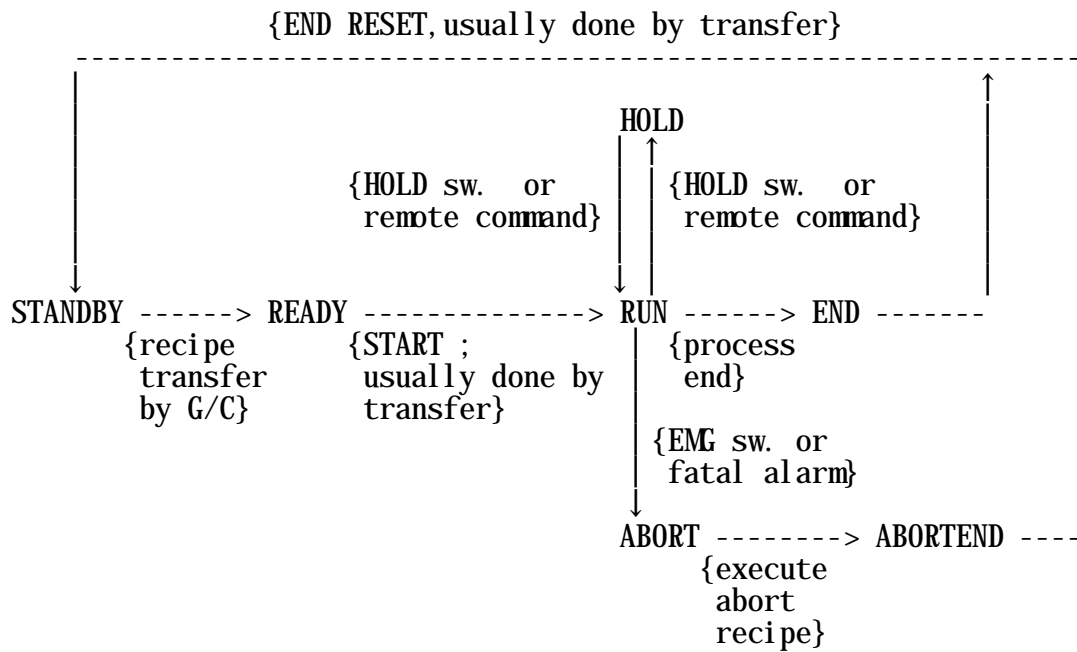
If "unload" was specified in S2F67, message flow is as same as the case of exchange. The only difference is the carriers to be loaded include only empty carriers.



## APPENDIX-A STATUS TRANSITION

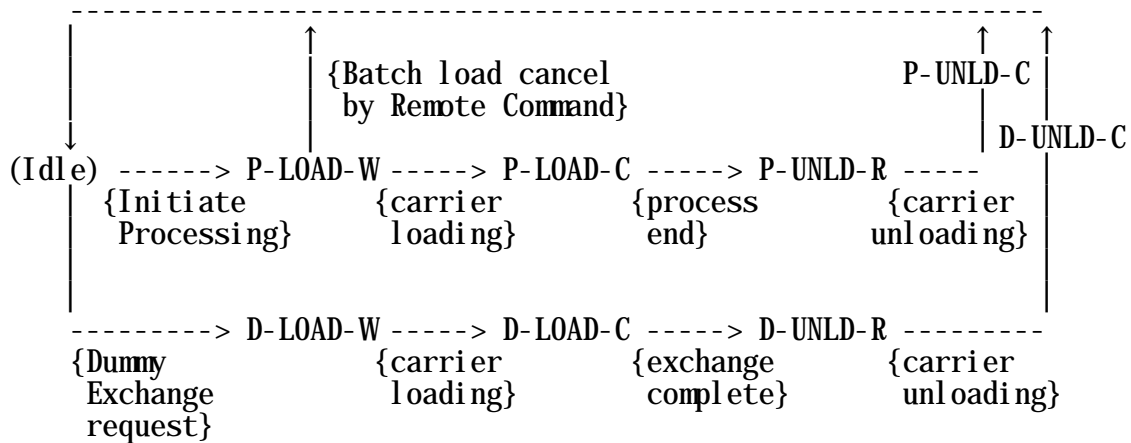
The status reported in S6F11 (Event Report) for T/C, transits like following diagram

Trigger of the transit is expressed in { }.



The status reported in S6F11 (Event Report) for transfer, transits like following diagram

Trigger of the transit is expressed in { }.



## APPENDIX-B GLOSSARY OF ABBREVIATION

This section, the abbreviations used in SECS message description are expressed .

Message direction is described in this documentation like followings.

Example 1

S, H→G, R : Single block message, from host to G/C, expecting reply message from G/C.

Example 1

M, H←G : Multi block message, from G/C to host, not expecting reply message from host.

List/Item format is described in this documentation according next table.

List/Item format expression	Abbreviation	value
LIST with 1 byte length byte.....	L1 or L	(01x)
LIST with 2 bytes length byte.....	L2	(02x)
LIST with 3 bytes length byte.....	L3	(03x)
ASCII with 1 byte length byte.....	A1 or A	(41x)
ASCII with 2 bytes length byte.....	A2	(42x)
ASCII with 3 bytes length byte.....	A3	(43x)
BINARY with 1 byte length byte.....	1B1 , B1 , 1B or B	(21x)
BINARY with 2 bytes length byte.....	1B2 or B2	(22x)
BINARY with 3 bytes length byte.....	1B3 or B3	(23x)
BOOLEAN with 1 byte length byte.....	101 , 01 , 10 or 0	(25x)
BOOLEAN with 2 bytes length byte.....	102 or 02	(26x)
BOOLEAN with 3 bytes length byte.....	103 or 03	(27x)
1 byte INTEGER with 1 byte length byte.....	1I1 , I1 , 1I or I	(65x)
1 byte INTEGER with 2 bytes length byte.....	1I2 or I2	(66x)
1 byte INTEGER with 3 bytes length byte.....	1I3 or I3	(67x)
2 byte INTEGER with 1 byte length byte.....	2I1 or 2I	(69x)
2 byte INTEGER with 2 bytes length byte.....	2I2	(6Ax)
2 byte INTEGER with 3 bytes length byte.....	2I3	(6Bx)
4 byte INTEGER with 1 byte length byte.....	4I1 or 4I	(71x)
4 byte INTEGER with 2 bytes length byte.....	4I2	(72x)
4 byte INTEGER with 3 bytes length byte.....	4I3	(73x)
8 byte INTEGER with 1 byte length byte.....	8I1 or 8I	(61x)
8 byte INTEGER with 2 bytes length byte.....	8I2	(62x)
8 byte INTEGER with 3 bytes length byte.....	8I3	(63x)
4 byte REAL(IEEE floating) with 1 byte length byte...	4F1 or 4F	(91x)
4 byte REAL(IEEE floating) with 2 bytes length byte...	4F2	(92x)
4 byte REAL(IEEE floating) with 3 bytes length byte...	4F3	(93x)
8 byte REAL(IEEE floating) with 1 byte length byte...	8F1 or 8F	(81x)
8 byte REAL(IEEE floating) with 2 bytes length byte...	8F2	(82x)
8 byte REAL(IEEE floating) with 3 bytes length byte...	8F3	(83x)
1 byte UNSIGNED_INTEGER with 1 byte length byte.....	1U1 , U1 , 1U or U	(A5x)
1 byte UNSIGNED_INTEGER with 2 bytes length byte.....	1U2 or U2	(A6x)
1 byte UNSIGNED_INTEGER with 3 bytes length byte.....	1U3 or U3	(A7x)
2 byte UNSIGNED_INTEGER with 1 byte length byte.....	2U1 or 2U	(A9x)
2 byte UNSIGNED_INTEGER with 2 bytes length byte.....	2U2	(AAx)
2 byte UNSIGNED_INTEGER with 3 bytes length byte.....	2U3	(ABx)
4 byte UNSIGNED_INTEGER with 1 byte length byte.....	4U1 or 4U	(B1x)
4 byte UNSIGNED_INTEGER with 2 bytes length byte.....	4U2	(B2x)
4 byte UNSIGNED_INTEGER with 3 bytes length byte.....	4U3	(B3x)
8 byte UNSIGNED_INTEGER with 1 byte length byte.....	8U1 or 8U	(A1x)

8 byte UNSIGNED_INTEGER with 2 bytes length byte.....8U2	(A2x)
8 byte UNSIGNED_INTEGER with 3 bytes length byte.....8U3	(A3x)

# I N D E X

ITEM	PAGE - LINE
<ACKC5> Acknowledge code B, 1	20 - 55
<ACKC6> Acknowledge code B, 1	21 - 51
Acknowledge code B, 1	22 - 42
<ALCD> alarm code B, 1	20 - 18
<ALID> alarm ID U, 1 See Table 3.3-1	20 - 25
<ALMDi> alarm ID name A, 6	11 - 41
<ALTX> alarm text A, n (n=0 - 40)	20 - 26
<APCACT> APC actual A, 3	11 - 35
<APCSET> APC setting A, 3	11 - 29
<BATCHID> batch ID A, 10	21 - 19
batch ID A, 10	12 - 3
<BOATUSE> boat usage status I, 1	12 - 17
<CEID> collection event ID I, 1 (=2)	21 - 14
collection event ID I, 1 (=2)	22 - 12
<CMDA> Acknowledge code U, 1	15 - 7
Acknowledge code U, 1	13 - 42
<DATAID> data ID I, 1 (=1 ; process data)	21 - 13
event report data ID I, 1 (=2 ; event report)	22 - 11
<DEACK> dummy wafer exchange acknowledge code U, 1	16 - 33
<DSID1> data set ID B, 1 (=1 ; process summary)	21 - 17
<DSID2> data set ID B, 1 (=2 ; lot information)	21 - 24
<DSID3> data set ID B, 1 (=3 ; time variables)	21 - 30
<DSID4> data set ID B, 1 (=4 ; temperature variables)	21 - 36
<DUMUSE> dummy wafer usage status I, 1	12 - 11
<EMPCRY> number of empty carriers required U, 1 (0 - 2)	16 - 38
<ENDTIME> end time A, 12 "yymmddhhmmss"	21 - 22
<EXMODE> exchange mode B, 1	16 - 13
<FULCRY> number of filled carriers required U, 1 (0 - 2)	16 - 40
<HEATPW> heater power (zone-i) A, 5	10 - 54
<LOADER> loader status I, 1	11 - 47
<LOC> machine material location B, 1 (always zero)	14 - 32
<LOTIDi> lot ID A, 16	12 - 5
lot ID #i A, 16	21 - 26
<MDLN> T/C model name. A, 6	9 - 22
<MFCACti> MFC actual #i A, 5	11 - 22
<MFCNAMEi> MFC gas name #i A, 6	11 - 14
<MFCSETi> MFC setting #i A, 5	11 - 18
<MFCVARI> MFC variable A (MFC #i) A, 5	14 - 44
<MHEAD> received message block header B, 10	24 - 9
received message block header B, 10	24 - 23
received message block header B, 10	24 - 35
received message block header B, 10	24 - 48
<MIDi> lot id #i A, 12	14 - 51



<MONITOR> monitor recipe ID A, 1 "0" to "9"	14 - 49
<PFCD> predefined form code B, 1 (always zero)	21 - 12
<PNO> PNO value of the executing step A, 2	11 - 44
<PPID> recipe ID A, 6	10 - 32
recipe ID A, 6	14 - 34
recipe ID A, 6	21 - 20
<PRFTBL> profile table name A, 1	11 - 6
<PRSACTi> pressure actual #i A, 5	11 - 31
<PRSSET> pressure setting A, 5	11 - 27
<PRSVAR> pressure variable A A, 5	14 - 48
<RCMD> Remote command code U, 1	13 - 14
<RPTID> report ID I, 1	22 - 15
<SFCD> Status form code B, 1 =0	10 - 10
<SOFTREV> T/C software rev. A, 6	9 - 23
<STARTTIME> start time A, 12 "yymmddhhmmss"	21 - 21
<STATUS> status value A, 8	22 - 23
<STBFACi> standby factor A, 8	11 - 37
<STPREMI> step remaining time A, 6 "hhmmss"	10 - 35
<TCSTAT> T/C status A, 8	10 - 25
<TEMPCTLi> temperature Control TC(zone-i) A, 6	10 - 46
<TEMPPDL1> temperature Paddle TC(zone-1) A, 6	10 - 50
<TEMPSETi> temperature Setting (zone-i) A, 6	10 - 42
<TEMPVARI> temperature variable A (zone-i) A, 6	14 - 40
<TIMWARA> time variable A A, 6 "hhmmss"	14 - 36
<TIMWARB> time variable B A, 6 "hhmmss"	14 - 37
<TIMWARC> time variable C A, 6 "hhmmss"	14 - 38
<TMPCTLMDD> temperature control mode A, 1	10 - 57
<TRANSMDD> transfer mode I, 1	11 - 53
<TRANSTAT> transfer status I, 1	11 - 57
<TTLREMI> total remaining process time A, 8 "hhhhmmss"	10 - 34
<TUBUSE> tube usage status I, 1	12 - 14
<VTIMEA> time variable-A A, 6 "hhmmss" or " "	21 - 32
<VTIMEB> time variable-B A, 6 "hhmmss" or " "	21 - 33
<VTIMEC> time variable-C A, 6 "hhmmss" or " "	21 - 34
<VTMPiA> temp. variable A zone-i A, 6	21 - 38
<ZONENAMEi> temperature zone name (zone-i) A, 6	10 - 38
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Are You There Request S, H←G, R	18 - 3
S1F2 On Line Data S, H→G	18 - 13
On Line Data S, H←G	9 - 14
S1F5 Formatted Status Request S, H→G, R	10 - 3

S1F6 Formatted Status Data S, H←G	10 - 15
S2F17 Date and Time Request S, H←G, R	19 - 3
S2F18 Date and Time Data S, H→G	19 - 13
S2F21 Remote Command Send S, H→G, R	13 - 3
S2F22 Remote Command Acknowledge S, H←G	13 - 33
S2F27 Initiate Processing Request S, H→G, R	14 - 3
S2F28 Initiate Processing Acknowledge S, H←G	15 - 1
S2F67 Dummy Exchange Request S, H→G, R	16 - 3
S2F68 Dummy Exchange Acknowledge S, H←G	16 - 23
S5F1 Alarm Report Send S, H←G, R	20 - 3
S5F2 Alarm Report Acknowledge S, H→G	20 - 50
S6F10 Discrete Variable Acknowledge S, H→G	21 - 44
S6F11 Event Report S, H←G	22 - 3
S6F12 Event Report Acknowledge S, H→G	22 - 35
S6F9 Formatted Variable Send M, H←G, R	21 - 3
S9F1 Unrecognized Device Id	S, H←G 24 - 3
S9F3 Unrecognized Stream Type S, H←G	24 - 14
S9F5 Unrecognized Function Type S, H←G	24 - 28
S9F7 Illegal Data S, H←G	24 - 40
S9F9 Transaction Timer Timeout S, H←G	24 - 53
Signal connections	3 - 17
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SxF0 Abort Transaction S, H→G	8 - 5
Abort Transaction S, H←G	17 - 5
T1	4 - 10
T2	4 - 12
T3	4 - 14
T4	4 - 16
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