II.14. ERROR AND MESSAGE PROCESSING

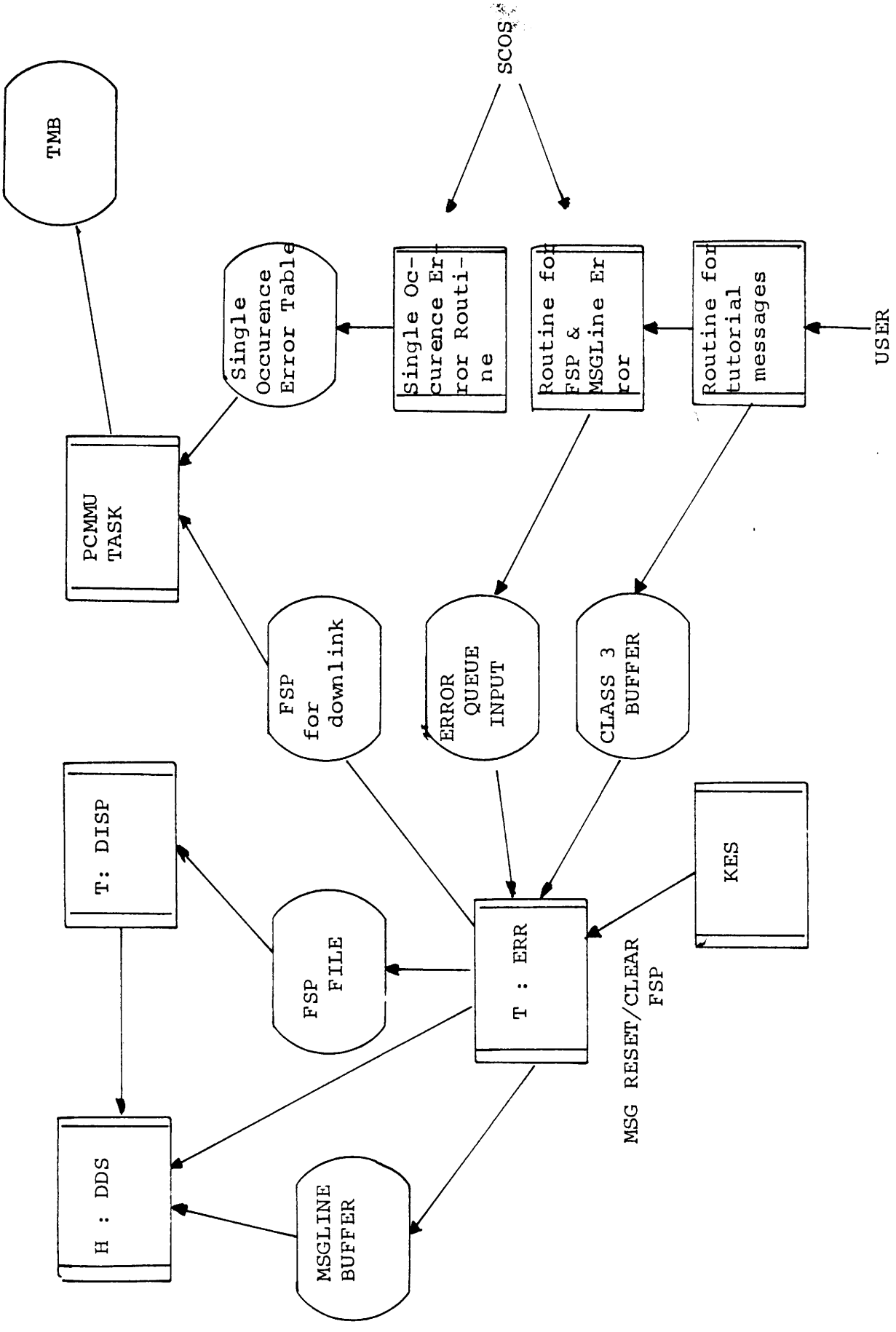
II.14.1. Function Description

II.14.1.1. Purpose and Overview

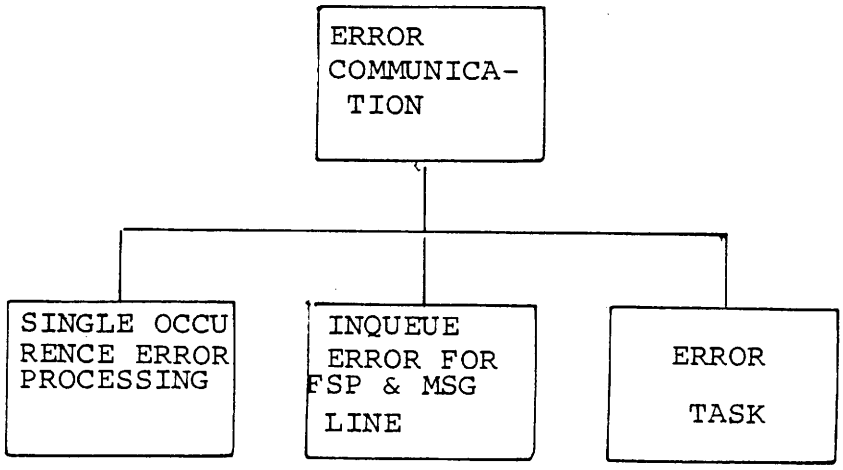
The purpose of this part is to manage the error communication for SCOS. It downlinks a ten deep arrays of SCOS detected single occurence errors. It builds the Fault Summary page on occurence of concerned errors, an image of the current FSP is downlinked every second ; it manages also the message line on each operational DDU.

The downlink of single occurence errors is done by an S base routine but for FSP or Message line error an S base routine only inqueues the errors for further processing by the error task.

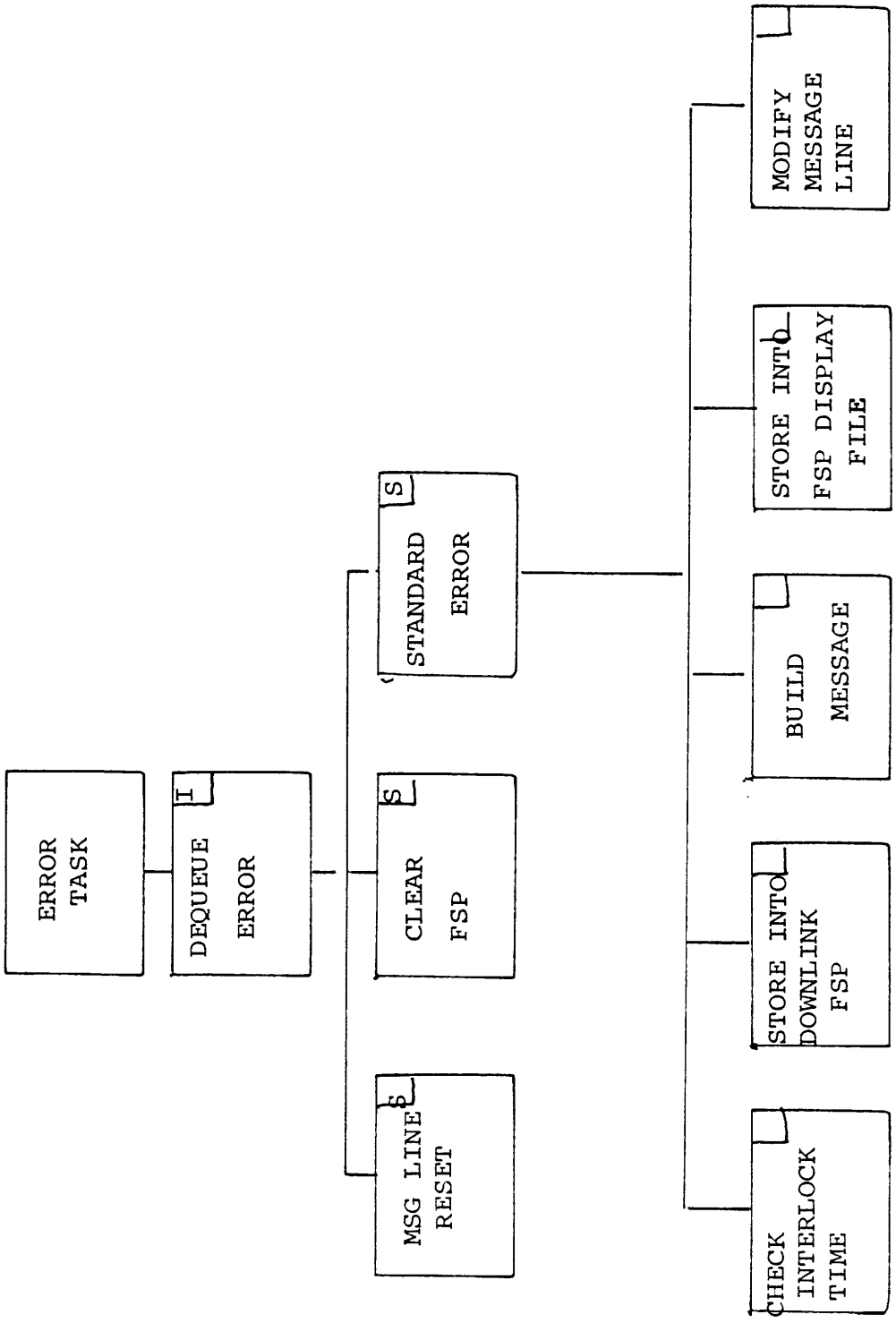
Error Communication Diagram



1.2. Function Set Structure Diagram



Function Set Structure Diagram for Error Task



II.14.1.3. Routine List

S : SØER Record, time tag and process a Single Occurence Error

S : FSP Time tag and inqueue an error for Fault Summary Page and / or Message Line

S : TUT Prepare a user class 3 message for message line

T : ERR Error task,it consists of the following routines

- EDEQU Dequeue an error from Input queue
- ECINT Check if interlock time is sufficient
- EMGRST Message Reset
- ECLFSP Clear FSP
- EBLDMG Build an error message for FSP and Message Line
- ECHOMG Choose and if needed build the Message Line
- EOUTMG Output Message Line
- EFSPDW Enter one message into FSP downlink
- EFSPDS Enter one message into FSP displayed

II.14.2. Data Space Description

II.14.2.1. Single Occurence Errors Data Space

II.14.2.2. Fault Summary Page Data Space

II.14.2.2.1. Downlink FSP

II.14.2.2.2. FSP display buffer

II.14.2.3. Message Line Data Space

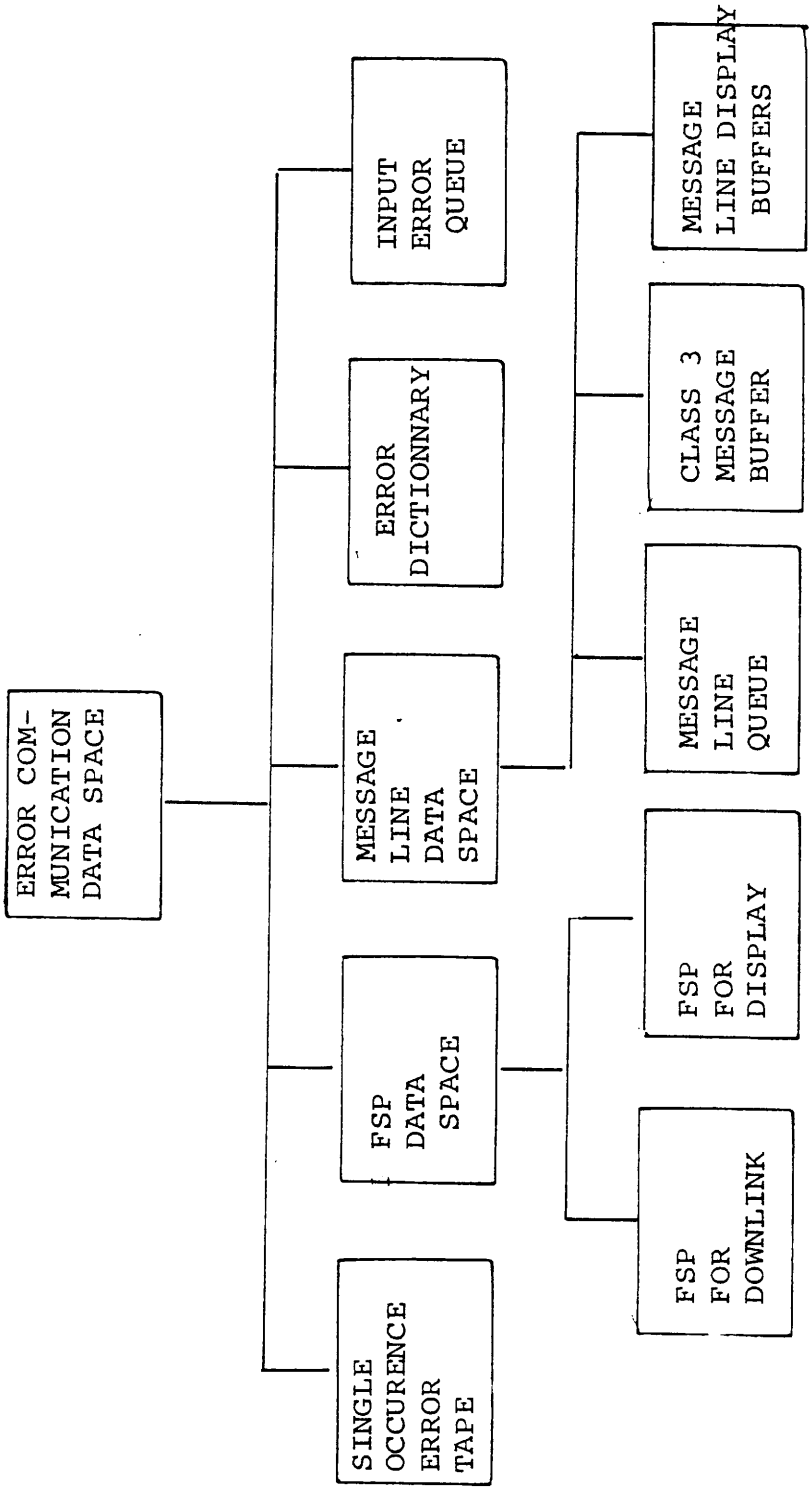
II.14.2.3.1. Message Line Queue table

II.14.2.3.2. Class 3 message buffer

II.14.2.3.3. Message line buffers

II.14.2.4. Error Dictionnary

II.14.2.5. Input Error Queue



2. Error Communication Data Space

II.14.2.1. Single Errors Table Data Space

II.14.2.1.1. Purpose

This table records the ten last single occurence errors this table is downlinked every second by the PCMMU task.

II.14.2.1.2. Data Description

Refers to diagram 12.2.1.2.

. Header Description :

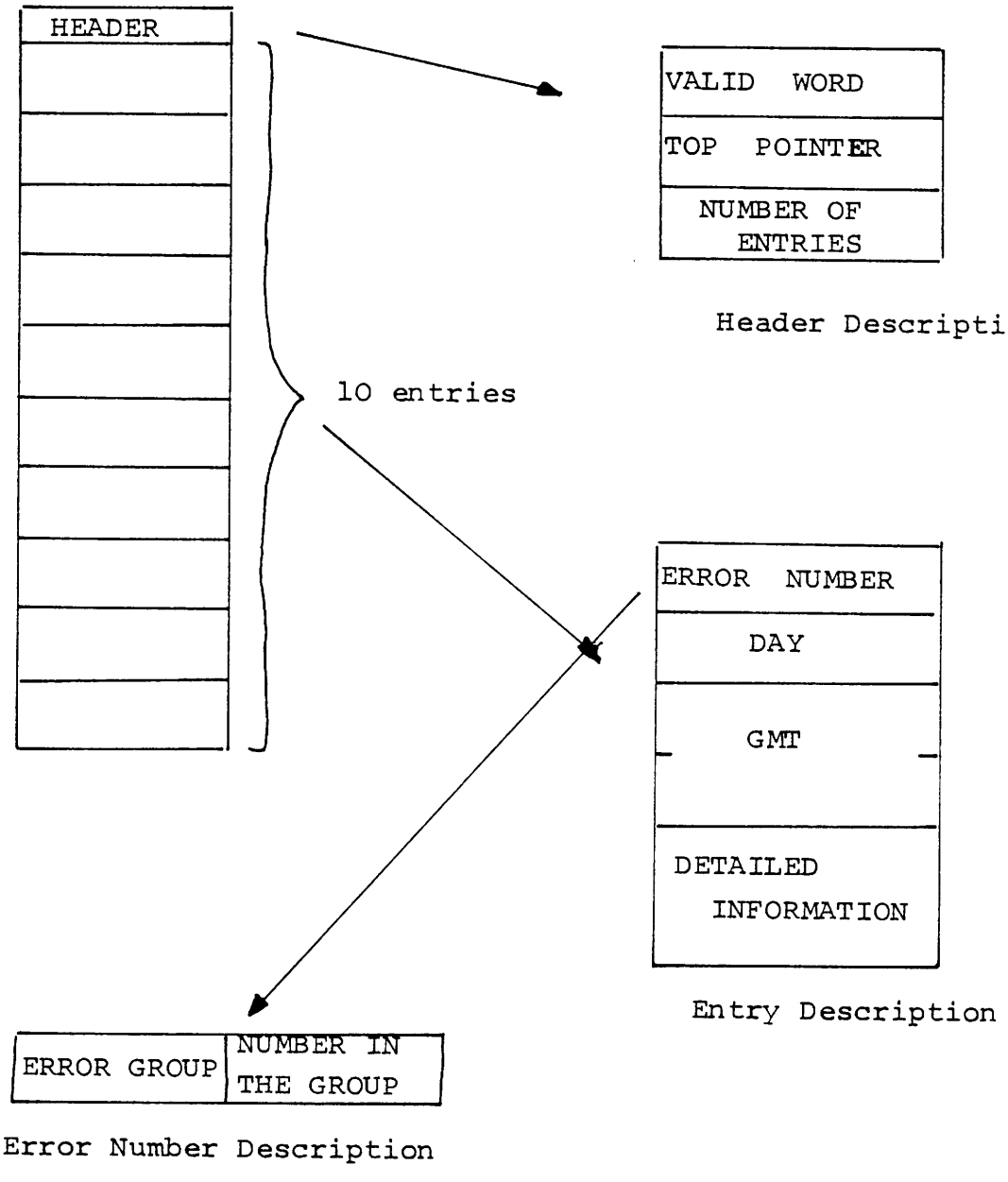
- VALID WORD (one word)
  This word is set to one each time a new entry is added, it is reset by the PCMMU task in order not to write on the TMB a table not changed from the previous one.
- TOP POINTER (one word)
  This pointer relative to the end of header, it points to the most recent entry in the SOT.
  All the entries are stored in a sequential way, except the bottom entry, the following of which is the first entry.
- NUMBER OF ENTRIES (one word) is the number of valid entries in the single occurence table.

. Entry Description

ERROR NUMBER

The error number is a one word length information, it consists of a byte Error Group and a byte number in the group.

DAY (one word)
is the day number in the year of error occurence.
GMT (two words)
is the time in milliseconds from the beginning of the day defined as a double integer.



2.1.2. Single occurence error table

DETAILED INFORMATION
This a complement to error number, it may precisely identify the reason or the originator of the error, its content and length are still TBD.

II.14.2.1.3. Access Method

This array is managed like a circular buffer, each time a new entry is added, it is stored before the previous top, except if the top was the first entry, then the new top is the bottom.

So the single occurence error table is always logically ordered by decreasing GMT.

II.14.2.2. Fault Summary Page Data Space

II.14.2.2.1. FSP for downlink

Purpose

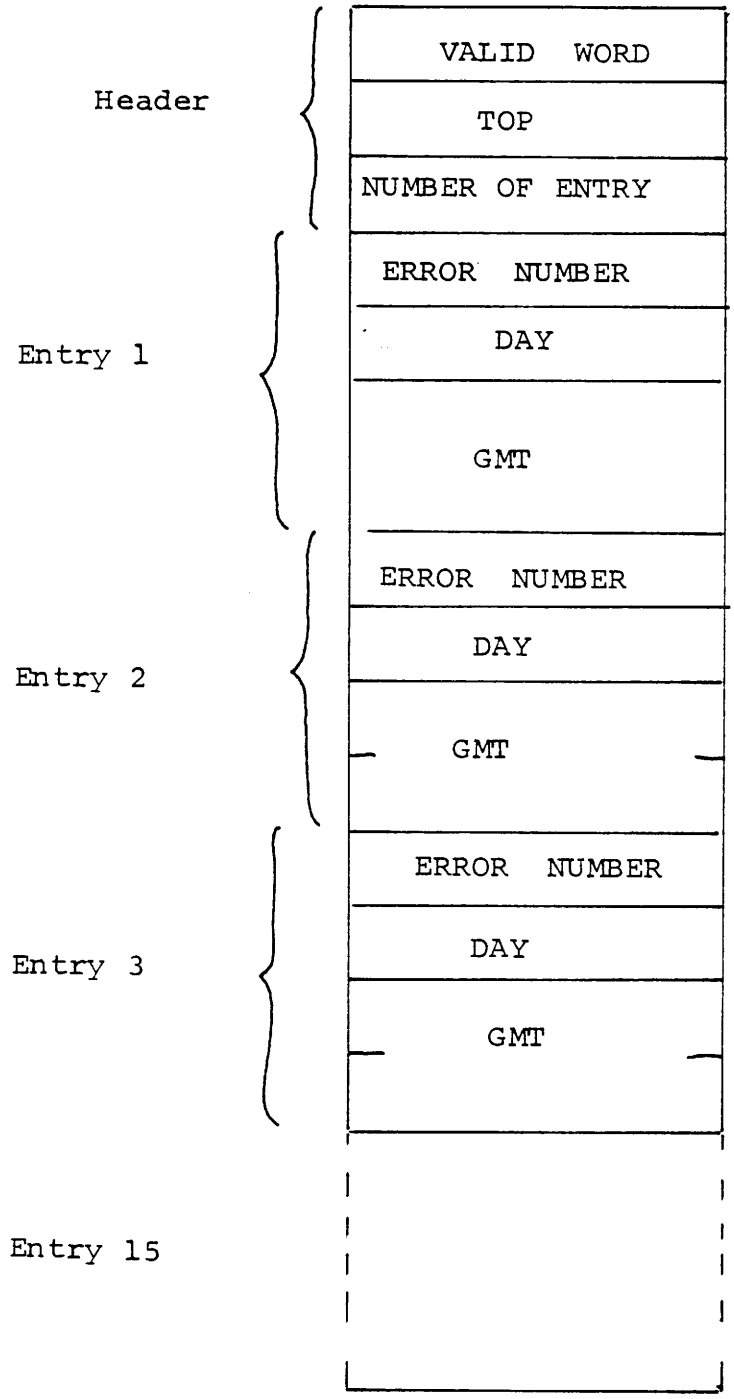
This table reflects exactly the displayed FSP that is it contains the last 15 errors detected, this table is downlinked every second by the PCMMU task. This table is managed by the error task, one entry is added at the beginning each time a new error is encountered, and the table is zeroed if a keyboard command requires it.

Data Description

Refers to diagram 12.2.2.1.

. Header Description

- VALID WORD (one word)
This word is set to zero during modification of the table, it is set to 1 after modification and is reset by the PCMMU task in order to avoid the PCMMU to downlink this table if it has not been modified or if the error task is modifying it.
- TOP (one word)
This word gives the address of the first entry, this address is a byte one relative to the header end.
- NUMBER OF ENTRY
This word contain the number of valid entry in the FSP in the range zero to fifteen.



2.2.1. Lay out of FSP for downlink·

. Entry Description

- ERROR NUMBER
This consists of two bytes, the left one is error group and identify the error message on FSP display the right one is a number inside the group.
- DAY (one word)
is the day number from the beginning of the year at which the error occurs.
- GMT (two words)
is the time in 10 ms with double integer representation from the beginning of the day.

Access Method

This table is managed like a circular buffer, each time a new entry is added, it is stored before the previous top, except if the top was the first entry, then the new top is the bottom ; so this table is always logically ordered by decreasing GMT.

II.14.2.2.2. FSP display buffer

Purpose

This buffer is built so that the display task has only to output it on a DDU without any modification when requested; it is the only Display which is always core resident. It has been structured so that add of a new line at the top does not imply to modify the whole buffer. We use the DDU's hardware facility to scan the different lines in a random range.

Data Description

Refers to diagram 12.2.2.2.

This buffer must be directly output to the DDU coupler so it begins with a start of message and position the DDU scanner to the first character of the first line of the message area in the Fault Summary page ; each line is followed by a carriage return except the last line which is followed by a jump to the end of this part of DDU buffer memory.

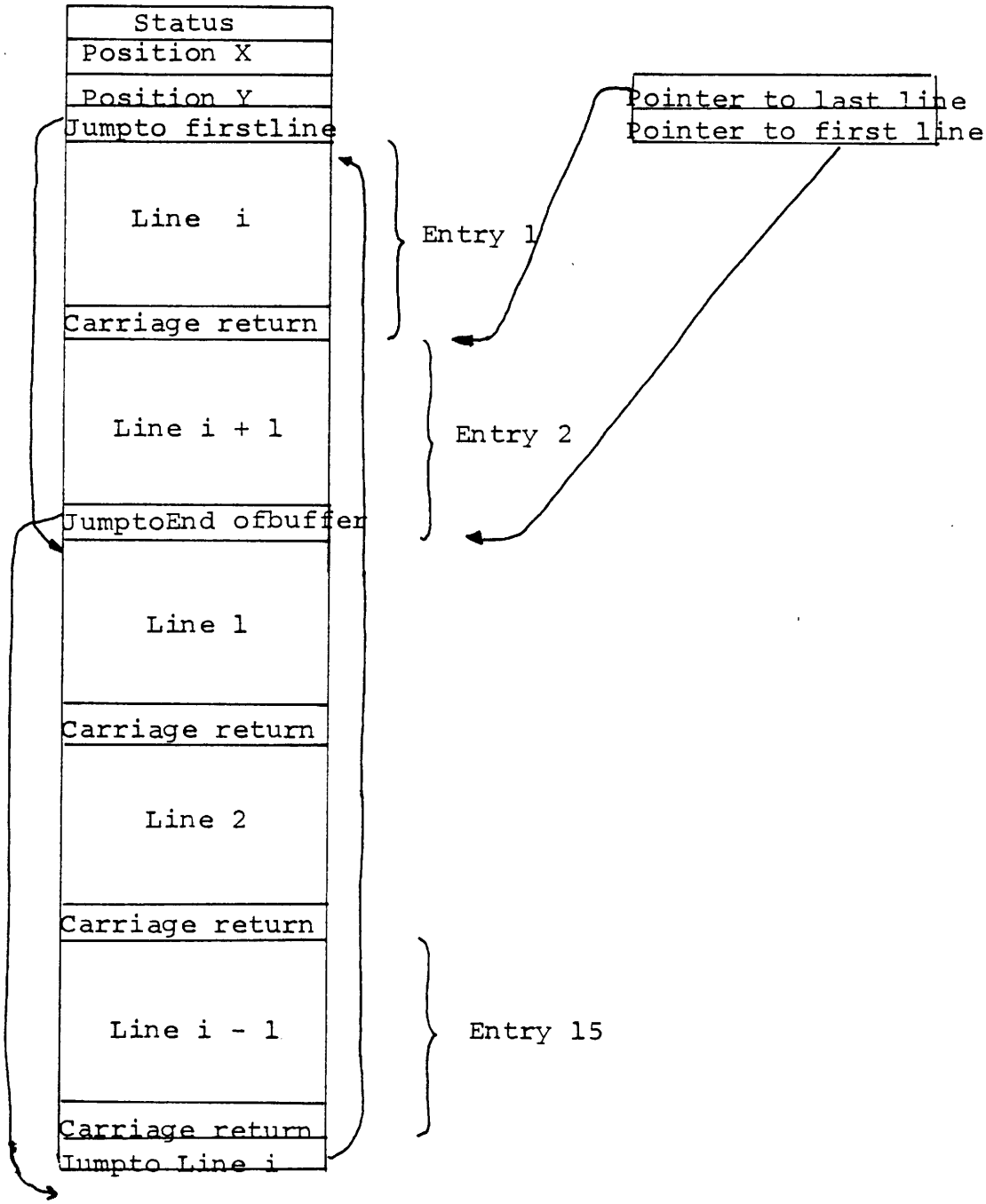
This buffer is initialized with all existing blank line.

A flag is shared between Display task and Error Task to avoid to output a buffer during modification.

Access Method

When a new line is added in the Fault Summary Page this line is the first, and the previous first became the second and so on.

When a new message need to be entered into the FSP, the line 15 is deleted, it is the DDU buffer area before the current top, or the bottom entry if the previous top was the first ; this line is replaced by the new message, the dump to the first line is then modified, and also the carriage return of the new last message is replaced by a dump to the end of buffer.



2.2.2. Lay out of dynamic display buffer memory of FSP

II.14.2.3. Message Line Data Space

II.14.2.3.1. Message Line Queue Table

Purpose

This table is used to choose the next message to be entered in the message line : the message line contains the oldest message in the lower class not reset by the MSG Reset key.

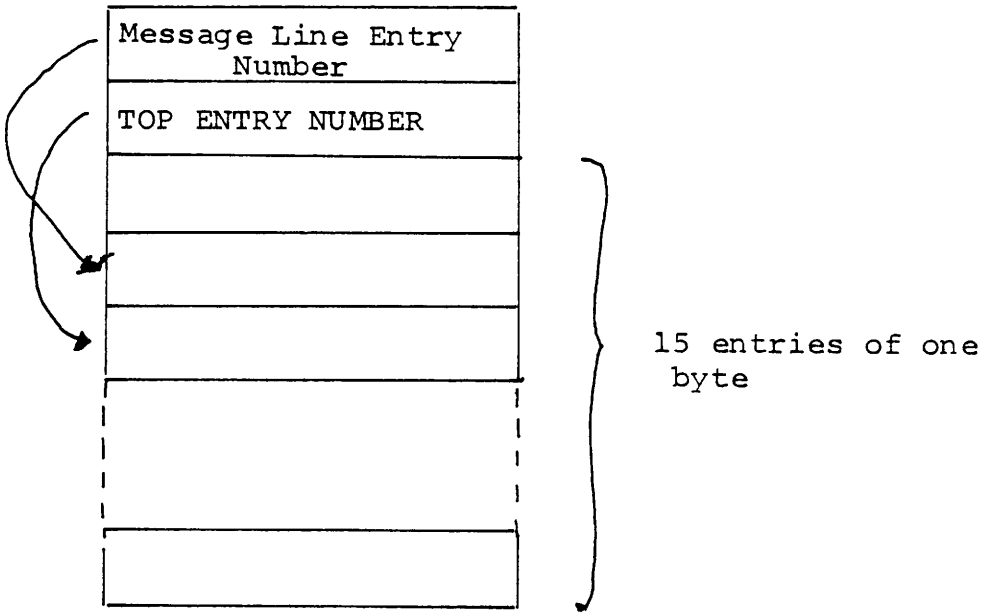
Data Description

This is a byte entries table described in diagram 12.2.3.1.

MESSAGE LINE ENTRY NUMBER (one byte)
is the entry number in this table of the message currently displayed on the message line.(zero it no message are displayed, -1 if the displayed message is a class 3 message).

TOP ENTRY NUMBER
is the entry number in this table of the most recent message.

ENTRY
each entry is one byte length, it contains the class number of the message or zero if this message has been reset.



2.3.1. Message Line Queue Table

Access Method

This table is organized as a ring table like downlink FSP table, it is updated each time a new entry is created in the FSP and each time a MSG has been keyed in to one keyboard.

When a MSG Reset has been received or when a new message is entered in the FSP this table is scanned to get the new message going to the SCOS message line.

II.14.2.3.1. Class 3 message buffer

Purpose

SCOS users has the facility to generate Class 3 message, these messages do not appear on the FSP, but only on the message line if no class 1/2 messages are currently displayed on this line.

This buffer contains the EBCDIC character string to be output on message line when message line will be free.

Data Description

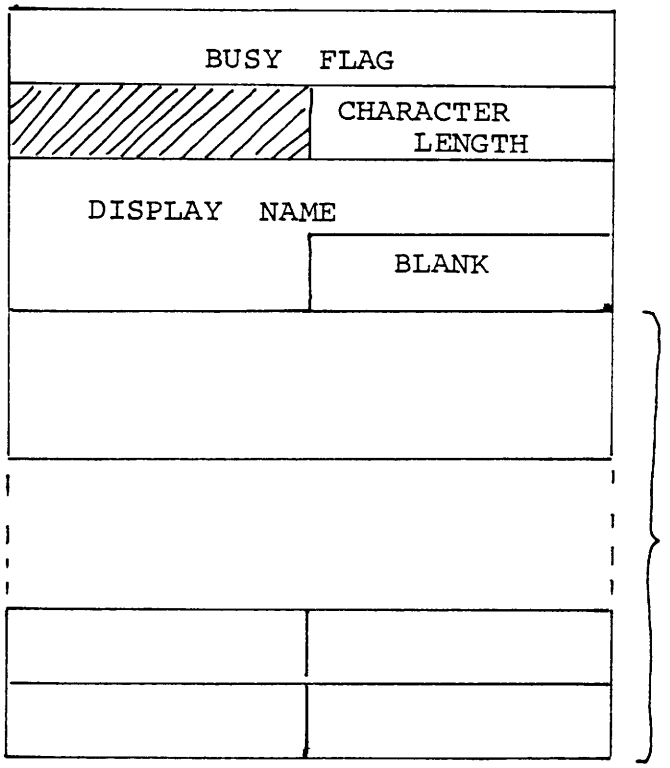
Refers to diagram 12.2.3.1.

BUSY FLAG this flag is set when a class 3 message has been entered and is not reset by MSG RESET Function Key.

The character string has the same structure as an HAL/S character string that is to say the second byte contains the number of character of the string, this length must be less than 23 including the 3 first character for display and a space between display abbreviation and message itself.

Access Method

This buffer is under the Z zone and is shared by the routine which output on the message line and the error task.



2.3.2. Class 3 Message Buffer

II.14.2.3.3. Message Line Display Buffer

Purpose

The message Line is directly output by the error task, and the error task need to build the message line that goes to all operationnal DDU.

The message line contains almost the same information as for a FSP line, the only exceptions are that the Caution and Warning Information and the day of occurence are not mentionned and on the opposite that is mentionned the number of error not reset by the MSG RESET function key.

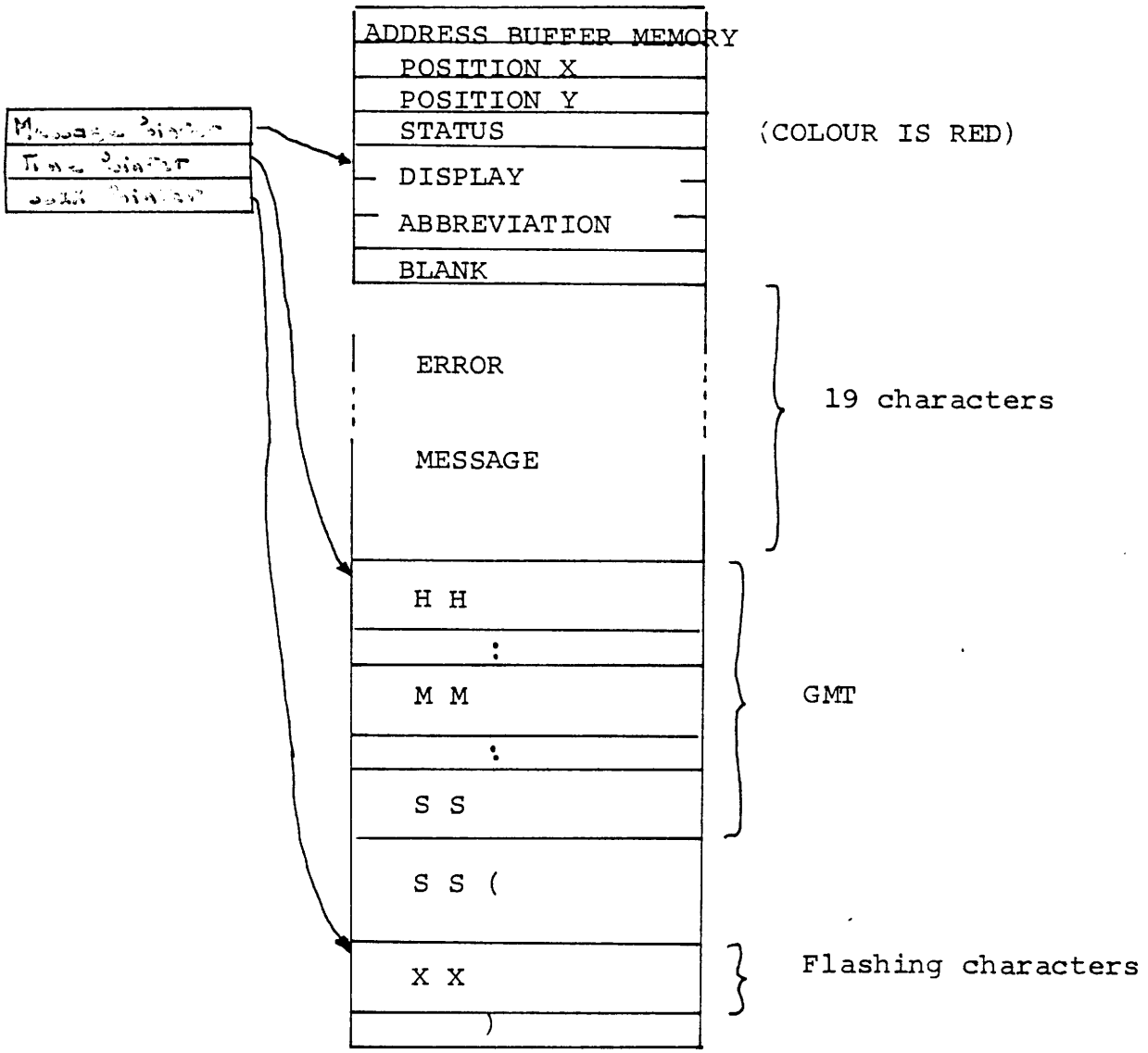
Data Description

Refers to diagram 12.2.3.3.

This buffer begins by information due to Hardware :
Start of message, address buffer memory, position X and Y and status, then the message itself in DDU Code (one character per word), its GMT of occurence and last the number of unreset messages.

Access Method

Three pointers are used to fill the three variable parts of this buffer that is to say display abbreviation and error message, time of occurence, number of unreset messages.



2.3.3. Message Line Display Buffer

II.14.2.4. Error Dictionnary

Purpose

These tables identify the error message to be output on FSP or Message line, they are generated by DBGM and consist of two parts : Error Message list and error dictionnary itself.

Data Description

Refers to diagram 2.4.

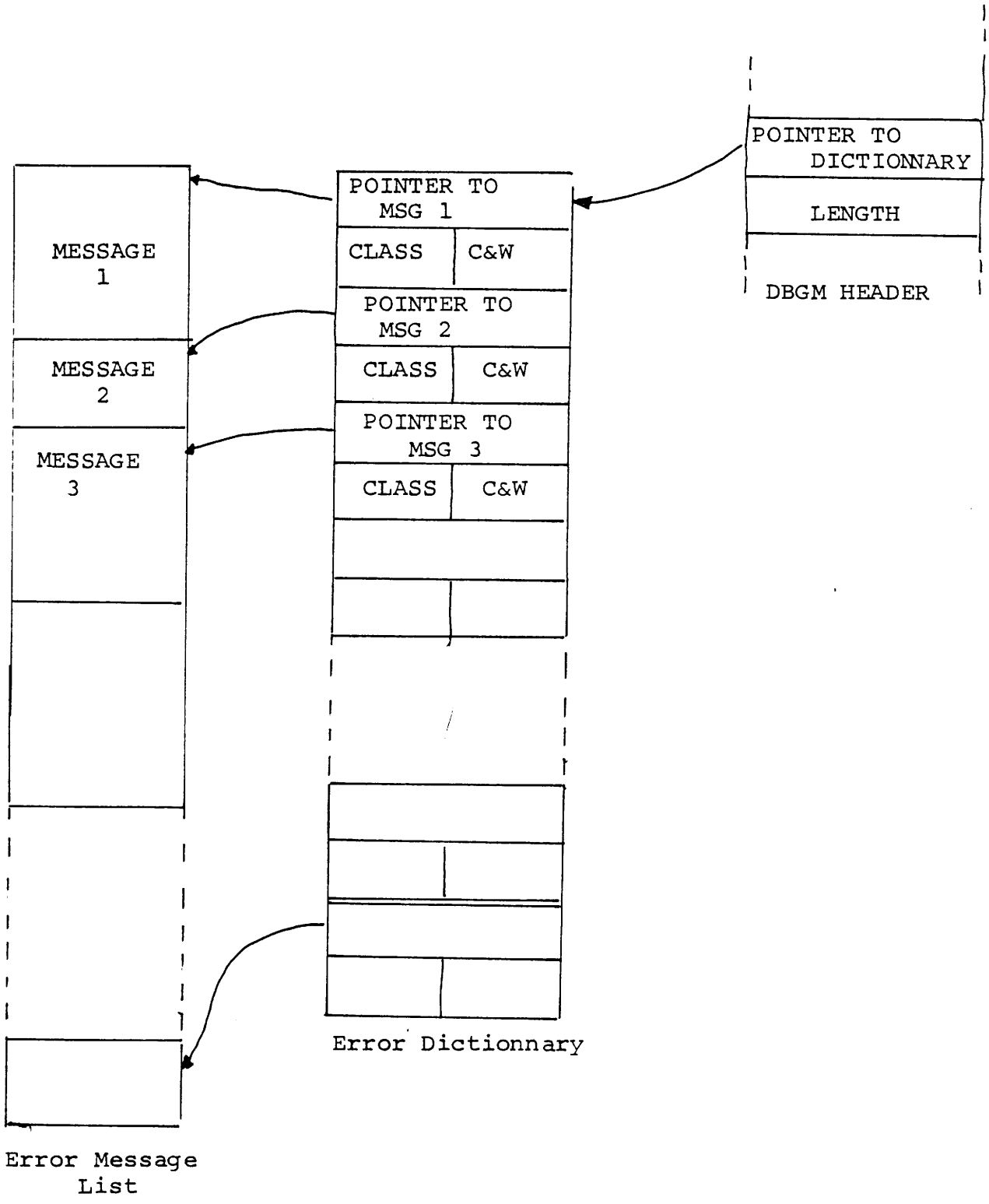
- ERROR MESSAGE LIST

This is the list of the error as HAL/S characters string, that is to say each entry contains in the second byte the number of characters, then the display abbreviation, one space and the display itself.

- ERROR DICTIONNARY

This is a list of error descriptor, it is ordered by group number, that is the first byte of error number is an index in the error dictionnary.

A descriptor contains first pointer to error message, after on one byte, ERROR CLASS is the class of the error typically 1 or 2, and then is a flag C&W which says if one of the following characters ↑↓ must be displayed on the FSP.



2.4. Error Dictionnary

II.14.2.5. Input Error Queue

Purpose

This is the interface between the S base routine used by any SCOS task emitting an error and the error task. The S base routine stores the error number and time of occurence into this queue and awakes the error task if the queue was previously empty.

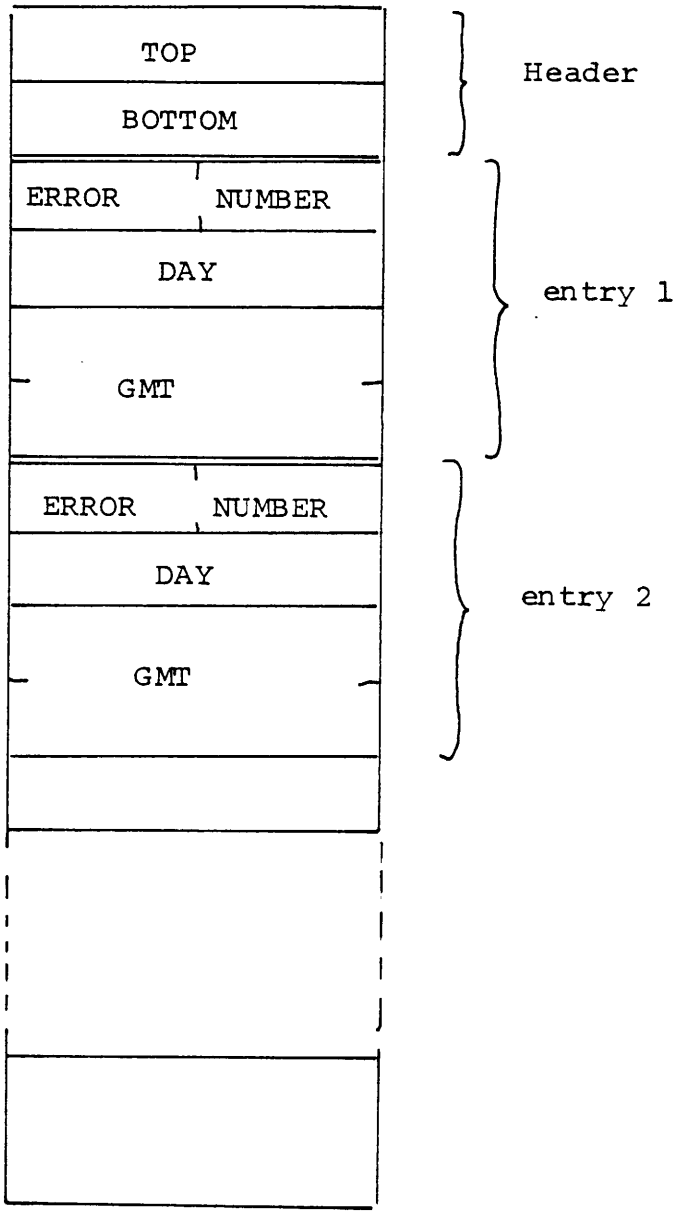
Data Description

Refers to diagram 2.5.

This queue is a FIFO queue and is organized like a ring ; TOP is the pointer relative to the header end of the oldest entry in the queue ;

BOTTOM is the pointer relative to the header end of the most recent entry in the queue. Each entry contains Error Number as a two bytes field : left is the Error group, right is the error number inside the group.

After it contains the time of occurence as a three words field, first word is day in the year, the two following words are GMT from the beginning of the days with a double integer format in 10 millisecond unit.



2.5. Input Error Queue

Access Method

This table is organized as a ring that is to say each entries are sequentially ordered by increasing GMT, except the last entry whose following entry is the first.

There are two types of access, one for inqueue an error and another one for dequeue an error.

Inqueue

This is only use by one S base routine, this phase is a critical one and must be protected either by a system ressource or by setting interrupt mask.
The processing to be done is : increase bottom pointer of entry length modulo buffer length and store the error number and time of occurence in the entry pointed by bottom.

Dequeue

This is done by the error task, it is also a critical part, this is done by getting the error entry from TOP pointer and after increasing TOP pointer of entry length modulo buffer length.

II.14.3. Single Occurence Error I : SØER

II.14.3.1. Purpose

This routine is an S base routine and can be called by any SCOS task to signal an error that only need to be downlinked.

II.14.3.2. Routine Description

This routine first compute the day and GMT of occurence and store then with ERROR NUMBER and detailed information into the Single Occurence Error Table and last set to one the VALID WORD to indicate to the PCMMU task that a modification has been done to the table and it must move the table in TMB and reset VALID WORD.

Because this routine can be called by any task and to insure that all entries in the table are ordered by time of occurence, it must be protected against multiple call at the same time by setting interrupt masks or Requesting a system ressource.

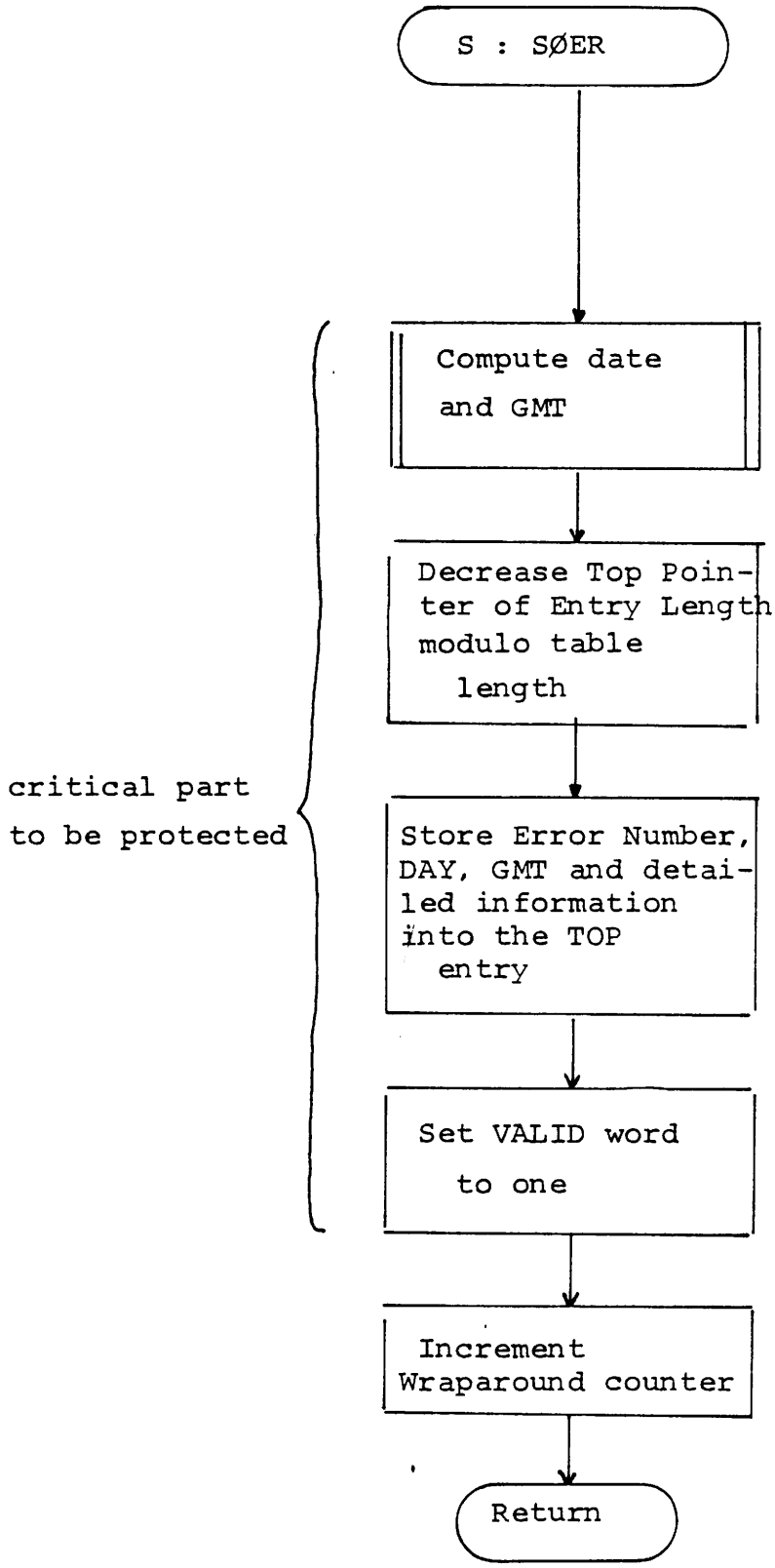
II.14.3.3. Input Description

- Error number (one word)

- Detailed information TBD

II.14.3.4. Output Description

- No output



3.5. Functionnal Flowchart of S : SØER

4. Inqueue Error for FSP and Message Line

4.1. Purpose and overview

The purpose of these routines is to provide an interface between any piece of software having detected an error or wanting to send a message to SCOS message line and the error task. The interface is done by the mean of a FIFO queue ; all the inqueues are done by an S base routine : I : FSP, and all the out queues are done by the error task.

The same queue is also used to communicate between the keyboard task and the error task ; the keyboard task send dummy error messages (of group zero) to ask for Message Reset or Clear FSP.

The error task needs also to be warned when a Class 3 message is required to be displayed on the message line, so the routine for tutorial messages S : TUT stores the character string of the message into the class 3 message buffer and inqueue a dummy message (group 255) in the input error queue.

II.14.3.4.2. Routine for tutorial messages S:TUT

II.14.3.4.2.1. Purpose

Any SCOS application task has the facility to display a tutorial or advisory message on to the message line if there is no error currently displayed on the SCOS message line.

II.14.3.4.2.2. S : TUT Description

This routine looks first if the Class 3 buffer is busy or not ; if it is busy this means that the last Class 3 message has not been reset then a busy buffer report is given to the user.

If the buffer is not busy the new message is stored into the buffer and a dummy error code is sent to the error task (group 255).

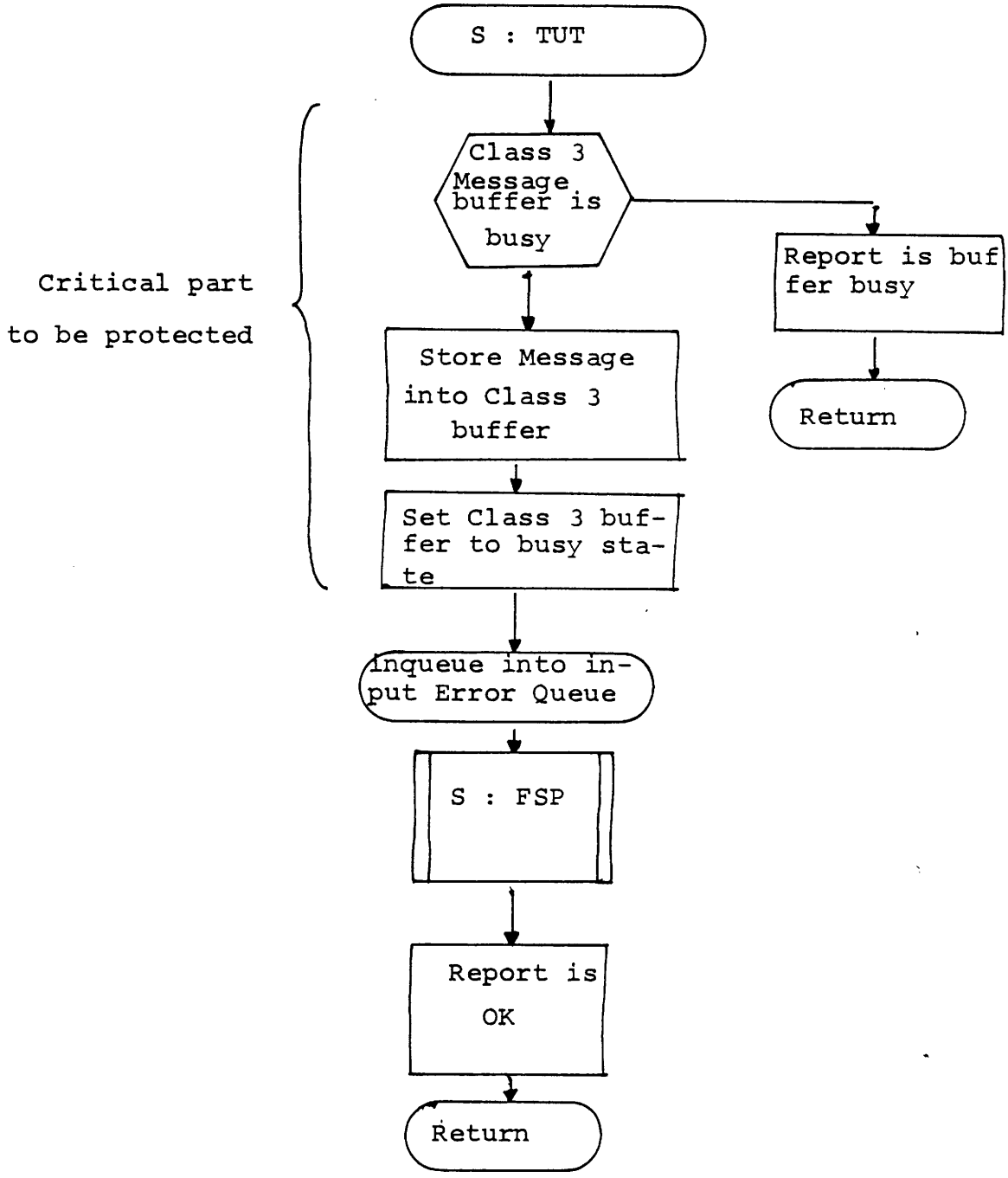
II.14.3.4.2.3. S : TUT Input Description

Message pointer is a pointer to a HAL/S like character string that is the right byte of the first word contains the length of the character string which begins at the second word.

The maximum length of the character string is 23 characters, including if needed the display abbreviation.

II.14.3.4.2.4. S : TUT Output Description

The output is only a boolean report, if true the class 3 message buffer has not been reset, and another call is needed ; if false it means the message is now stored in the Class 3 message buffer.



4.2.5. Functionnal Flowchart of S : TUT

II.14.3.4.3. Routine for Inqueue Error to FSP / message line I : FSP

II.14.3.4.3.1. Purpose

This routine is the interface between any SCOS task, and the error task, if inqueue the error number and time of occurence ; some dummy message can be also inqueued for communication from Keyboard task to error task (for Message Reset and Clear FSP) they are group zero messages, the tutorial messages which are built by S : TUT are also inqueued by S : FSP as group 255 messages.

II.14.3.4.3.2. S : FSP Description

The following algorithm is used :

- if queue is empty then set a flag to awaken the error task after processing.
- Compute Day and GMT if it is not dummy message.
- Increase pointer to tables and store one entry.
- If queue is full then delete the oldest entry.
- If the flag is set then awaken the error task.

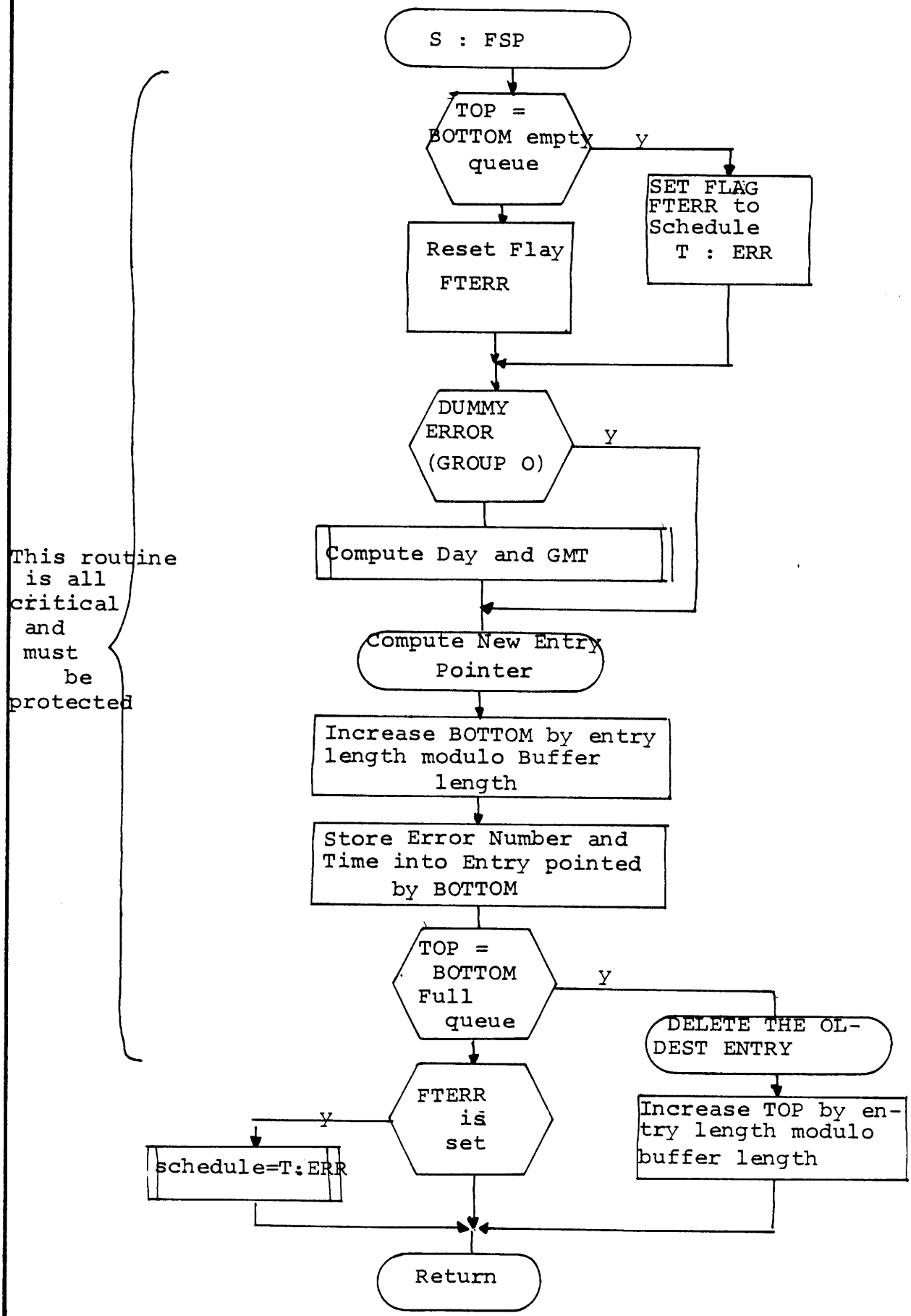
Remark : all this routine is a critical part and must be protected against reentrancy and simultaneous use by the error task.

II.14.3.4.3.3. Input Description

Input parameter is error number.

II.14.3.4.3.4. Output Description

No output.



4.3.5. Functionnal Flowchart of S : FSP

II.14.3.5. Error Task T : ERR

II.14.3.5.1. Purpose

This task is used to always keep ready to output the FSP display buffer, to build the message line to output it to all operationnal DDU, and to downlink an image of the FSP.

II.14.3.5.2. Task Description

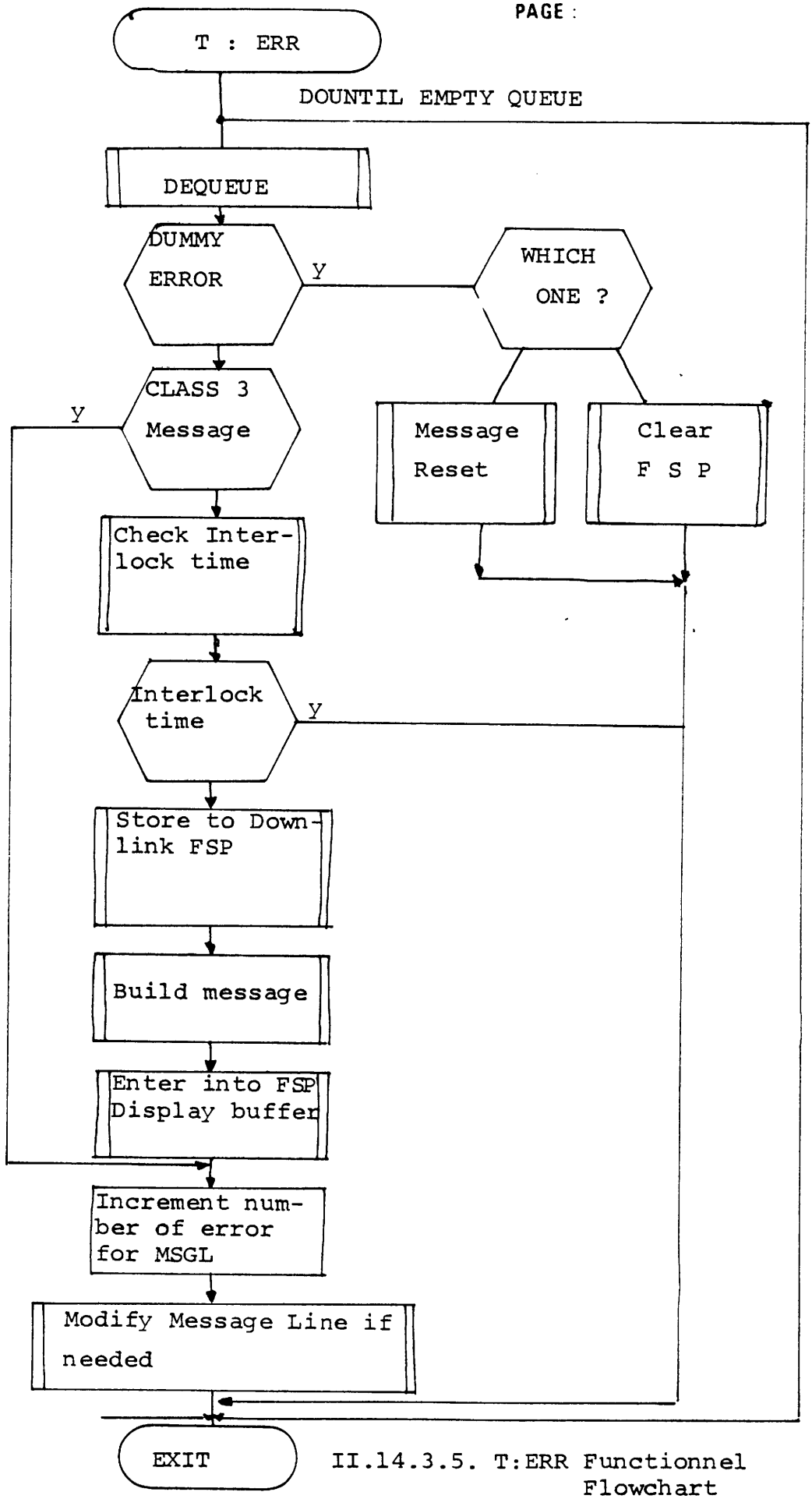
This task process all errors in the input error queue ;

If they are dummy errors that are input from keyboard task they are separately processed ; it is the case for message reset or clear FSP.

Then for errors going to FSP the error task checks if they are in the FSP and if interlock time is sufficient, other way the error is not processed.

After, the errors going to FSP are stored in the FSP downlink, the error message is built and stored into the FSP display file.

The number of not reset messages is then incremented, the message line is changed if needed and last output to all operationnal DDU.



II.14.3.5. T:ERR Functionnel Flowchart