II.8. Monitoring Services

II.8.1. Overview

Limit Sensing and special processing are done by at most 5 monitoring tasks cyclically processing tables. These tasks are scheduled at their own frequency by the PIOL task. As Limit Sensing and special processing are done by different programs, the processing is done by a reentrant S base routine : I : MØNI, called by the monitor tasks.

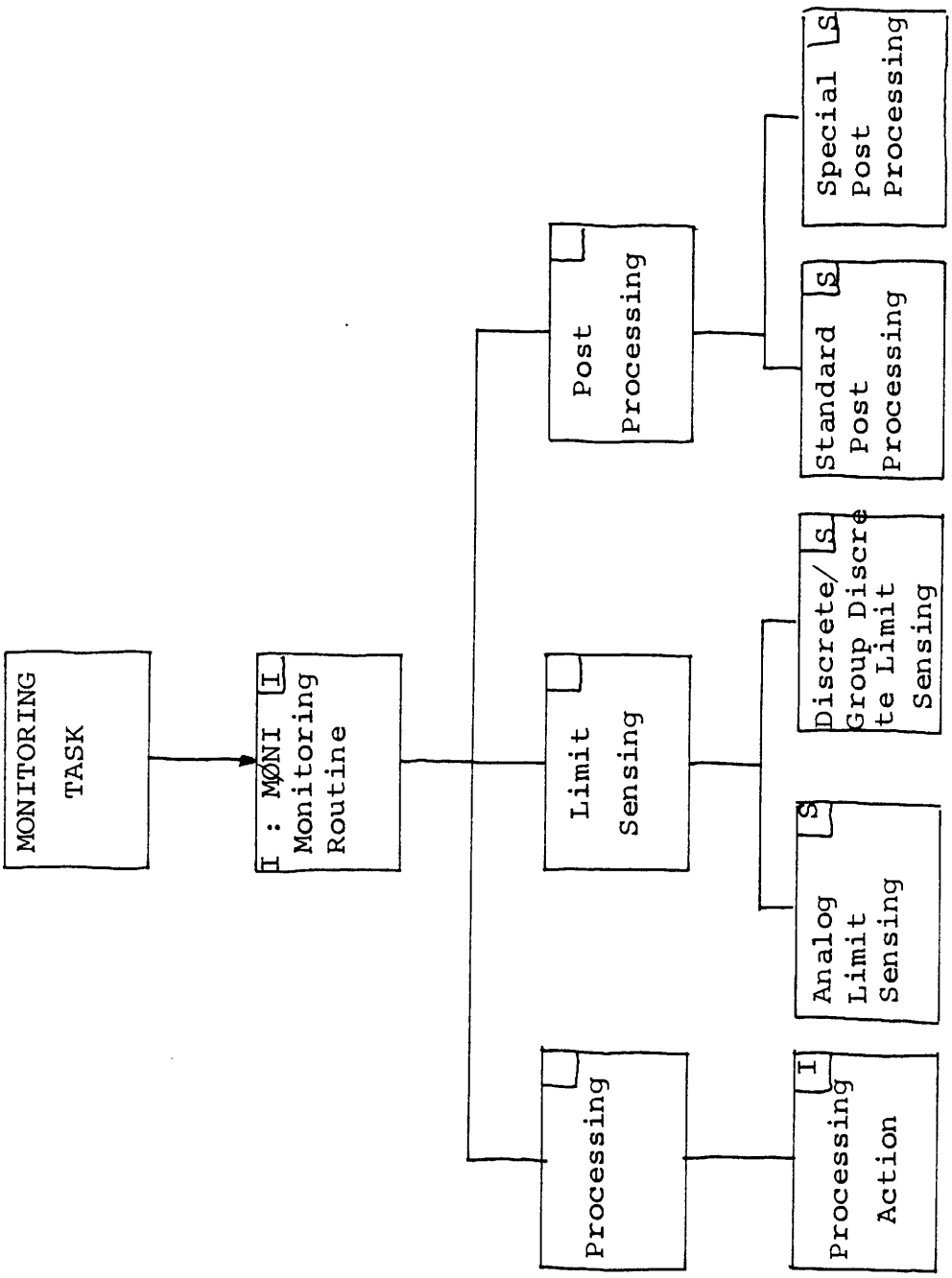
Because the scanning of these tables is always sequential, a variable length entry structure has been chosen. By the way the Limit sensing and special processing tables are divided into one table by scanning frequency. These 5 tables are generated by DBGM and each table is accessed by a pointer in the DBGM Header.

Some special processing are only related to display on FFD, but the kind of processing is almost the same, so these special processings are foreseen to be added into the limit monitor table.

The "monitoring" always consist of three steps.

- first, pre-processing : normally access the raw value from the PIØLT or for special cases, compute the value to be limit-sensed from some raw values and store this value in a S/W ID
  This processing is the only processing done for display.
- second : limit sense the result of preprocessing against predefined limits and produce a new status and some change of status flag this phase is called Limit Sensing.
- third step is activated only if a change

of status has occured and the processing in this case may be generate an error, put a DDU operationnal and so one ; this is called post processing.



1. Functionnal Set Structure Diagram

II.8.2. Data Space Description

Each frequency table is organized into a sequential table with variable length entries, each entry may contain a certain number of fields they are always in the following range (See diagram 2).

- Header field

This field exists in each entry, it contains the CID result of special processing and / or input to limit sensing and some flags that indicate the existing field and other miscellaneous information.

- Preprocessing Field

This field also exists in each entry, it may be subdivided into some processing actions, each one of this action consists of action number and a parameter list depending on the action. The result of the last processing action is stored into the header CID and is used as an input to limit sensing.

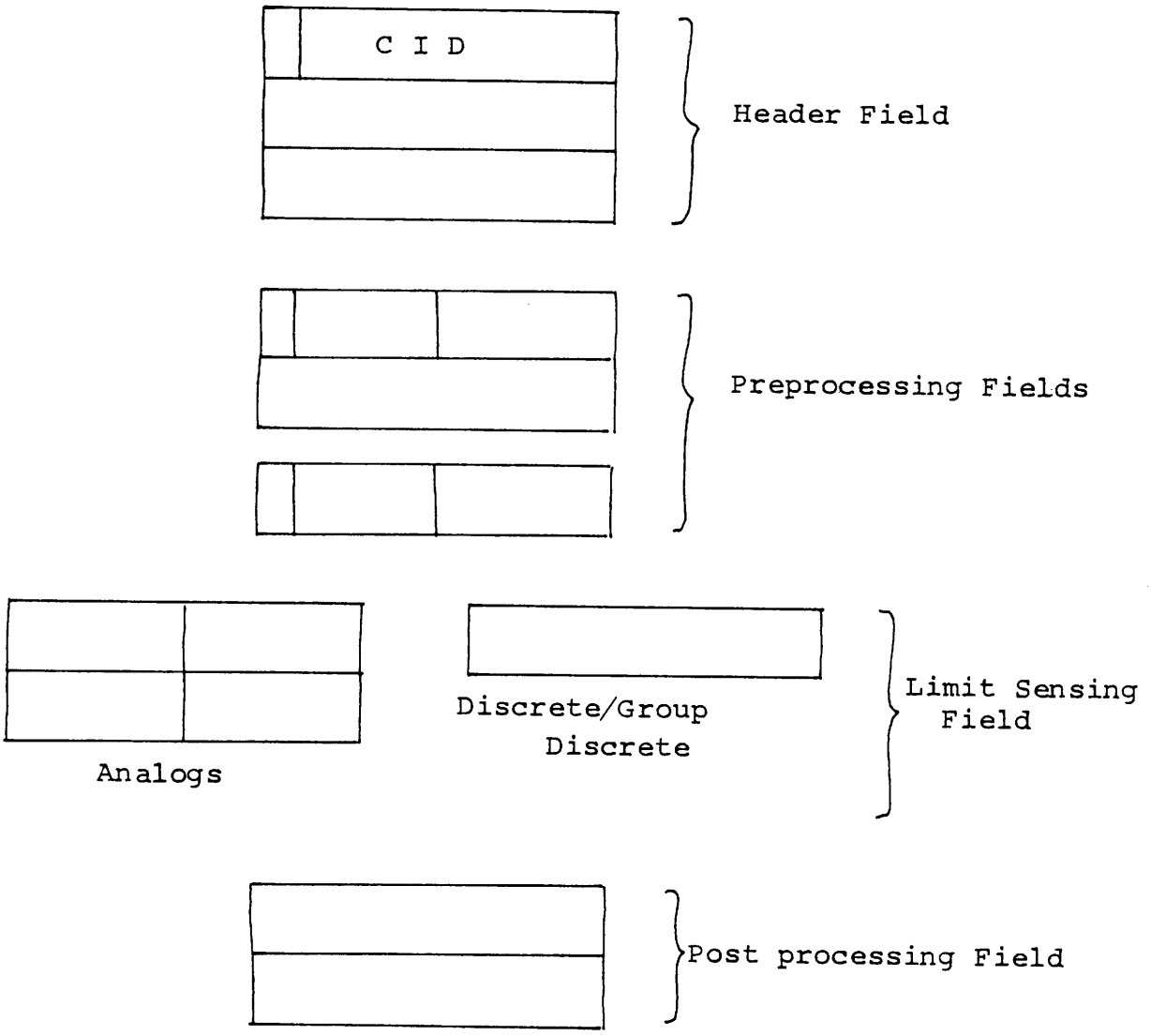
- Limit Sensing Field(may exist or not)

The structure of this field is dependent on the nature of the tested item, one structure exists for discrete or group discrete, this field gives the limit values and the counter of occurence.

- Post processing field

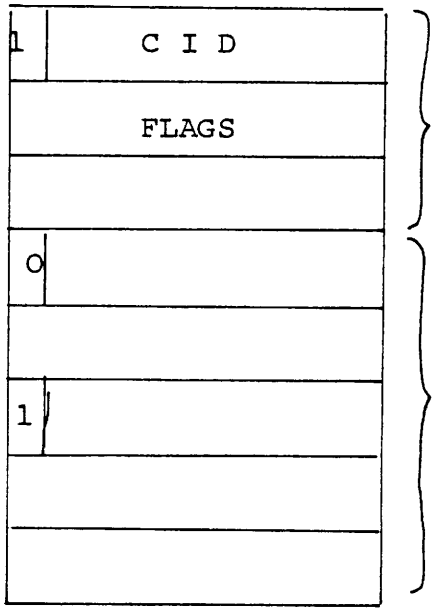
This field exist only if limit sensing field exists, it contains data to be taken into account if a change of status has occured ; it contains storage area for an event pointer error number if needed, data for the case of serial ready line and for DDS power.

Depending on the purpose of the entry some fields may exist or not, typical examples are described in diagram 2.0.

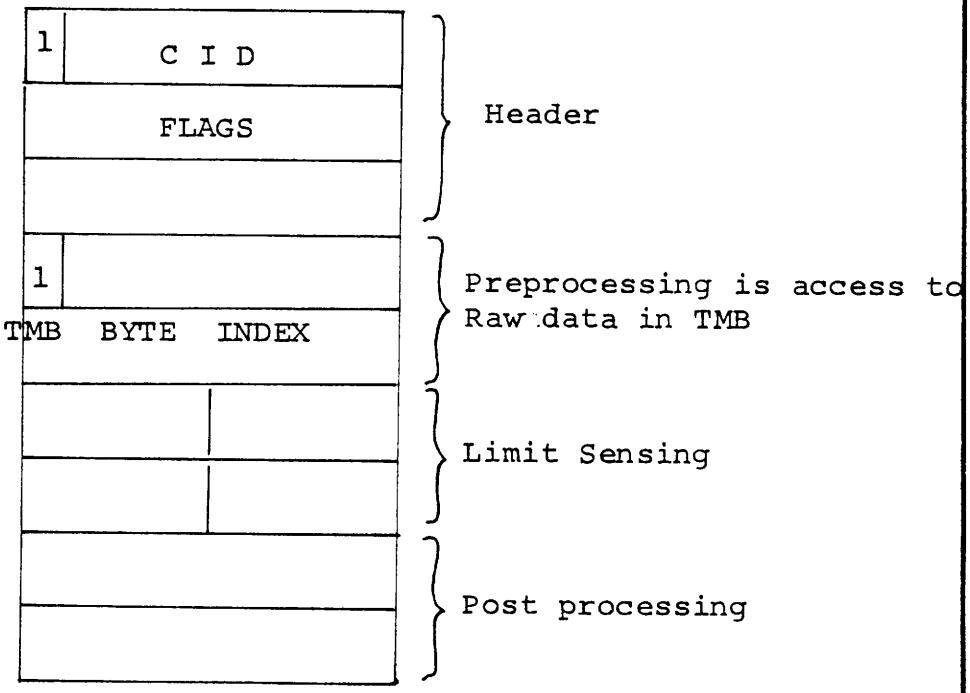


2. Lay out of an entry into monitoring tables

Special processing for Display purpose



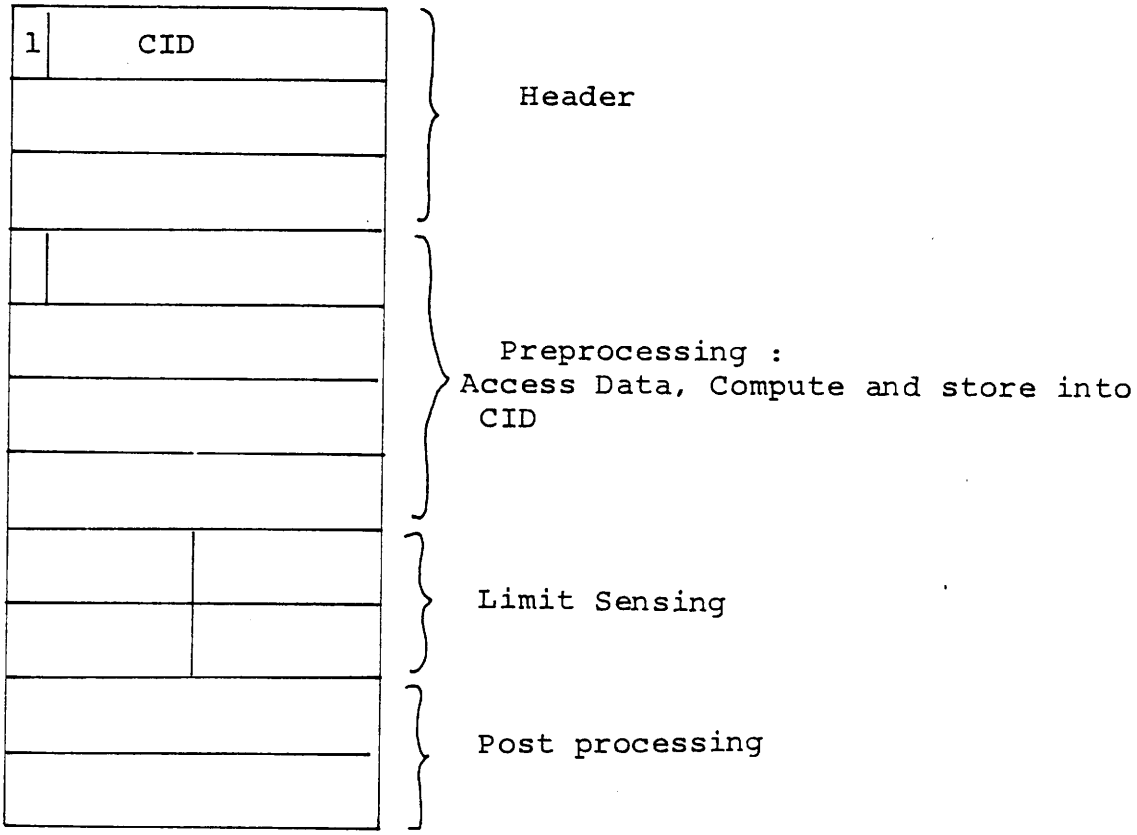
Limit Sensing Without special processing



.../...

2.0. Typical examples of entry lay out in monitoring tables

Limit Sensing of a computed value (example Rate of Smoke increase)



2.0. typical examples of entry lay out in monitoring tables

II.8.2.1. Header Description

Refers to diagram 2.1.

- CID identify the monitored point and the result of special processing if special processing actually exists and is not only access to raw data. As for any other CID in SCOS the left bit is set to one to indicate that it is a CID and not an ID.
- ENTRY LENGTH
is the byte length of the whole entry, it permits the monitoring routines to get the next entry address.
- OFFSET OF LIMIT SENSING
is the byte length of the header field and preprocessing field.
- FLAGS is a set of flags commonly used by all field processing.
The following is a list of their meanings with associated bit number in the word.

Constant flags.

0 Limit Sensing Exist

This flag is the reset when the entry is used for special processing only needed by display.

1 Analog/Discrete Limit Sensing

if this flag is set to one the value to Limit Sense is a raw analog value.

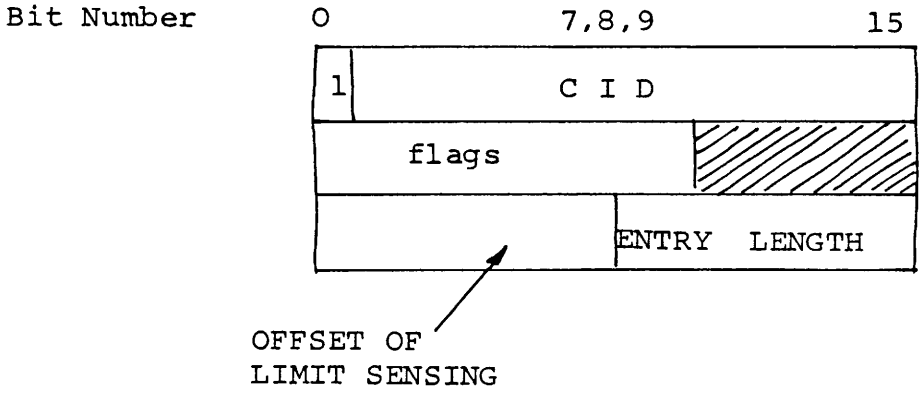
2 Post processing is not standard.

In case of a limit sensing entry exist, the post processing is standard

if only an error is generated in case of out limit condition.

3 End of table

This flag is set when one entry is the last one for a given frequency.



2.1. Lay out of Header Description

Dynamic Flags

4 Enable/Inhibit Special Processing

This flag is set for instance when the ID of the result is inactivated, it inhibits all processings of the entry.

5 Enable/Inhibit Limit Sensing

This flag is set when the user requests to Enable/Inhibit the monitoring.

6 Event processing Enable/Inhibit

This flag is set by the user when he wants one event to be assigned to OK/not OK status of any monitored point.

Status Flag

7 Out of Limit Status

This means that an error has been emitted and that the value has not come back into the limits, it is used to avoid too many calls to error processing and to reddish the line of concerned monitor data on FFD.

8 High out of Limit

Means that the last computed value was out of higher limit, it is used to print the " ' " on the FFD for the concerned item.

9 Low out of Limit.

II.8.2.2. Preprocessing Field

Refers to diagram 2.2.

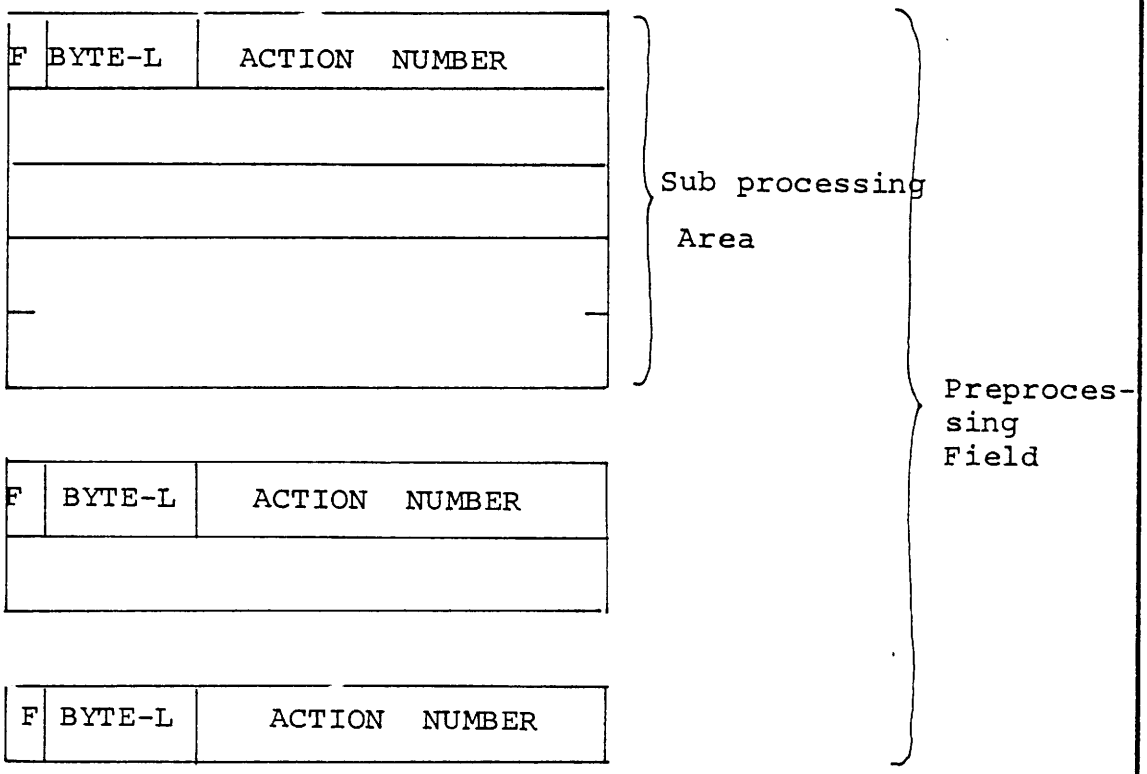
The preprocessing field consists of one to a certain number of subprocessing area. Each subprocessing area is characterized by ACTION NUMBER. This represents a subroutine number to execute, the type and number of parameters are associated with the routine number.

The following type of parameter may be used.

- Word Constant
- Double Word Floating point constant
- Pointer to Analog Values in TMB as byte index relative to the beginning of the TMB
- Discrete or Group Value TMB descriptor is a two words parameter, the first an even byte index pointing to the concerned word in the TMB, the second is a mask with only singificant bits of the word set.

* F flay is set for the last preprocessing action of the preprocessing field.
* BYTE-L is the byte length of the subprocessing field.

. It is foreseen, for the moment, to have only one pre-processing field.



2.2. Diagram of preprocessing field

II.8.2.3. Limit Sensing Field

Two structures of Limit Sensing are used one for analogs raw value and one for discrete, they are described in diagram 2.3.

For Analog Limit sensed values, the read or computed is compared to the limits (HIGH LIMIT, LOW LIMIT) and if out the current counter is incremented, if not the counter is zeroed.

All these variables are one byte length the maximum and current counter are unsigned value, on the opposite the limits are signed values in the range - 128, + 127 -

For Discrete/Group Discrete the check done by monitoring tasks are done only against expected state ; the expected state is not adjusted, that is the bit position inside the expected state word is the same than in the TMB word.

Limit Sensing field for analog

MAX COUNTER	CUR COUNTER
HIGH LIMIT	LOW LIMIT

Limit Sensing field for Discrete Group Discrete

EXPECTED STATE

2.3. diagram of Limit Sensing field

II.8.2.4. Post Processing Field

This field is always present when limit sensing exists and only in this case, it has the structure of standard or special post processing depending on a flag in the header ; the lay out is described in diagram 2.4.

EVENT POINTER is a dynamic value, it is filled on user request when some one wants an event is assigned to the OK/not OK status of a monitored point.

When one event is assigned to a monitored point, it is set each time the monitored values goes out of limit (maximum counter = current counter) it is reset each time the value comes back into the limits ; at the event assignment, it is also initialized to the status of the monitored point.

Action number may have different meaning typical examples are Serial Ready line, the PIOL must be warned if this line is on, DDU power, a special action has be done if the status is changed from OFF to ON.

Standard Post Processing

EVENT POINTER
ERROR NUMBER

Special Post Processing

EVENT POINTER	
ACTION NUMBER	PARAMETER

2.4. Lay out of post processing field

II.8.3. Routine Description

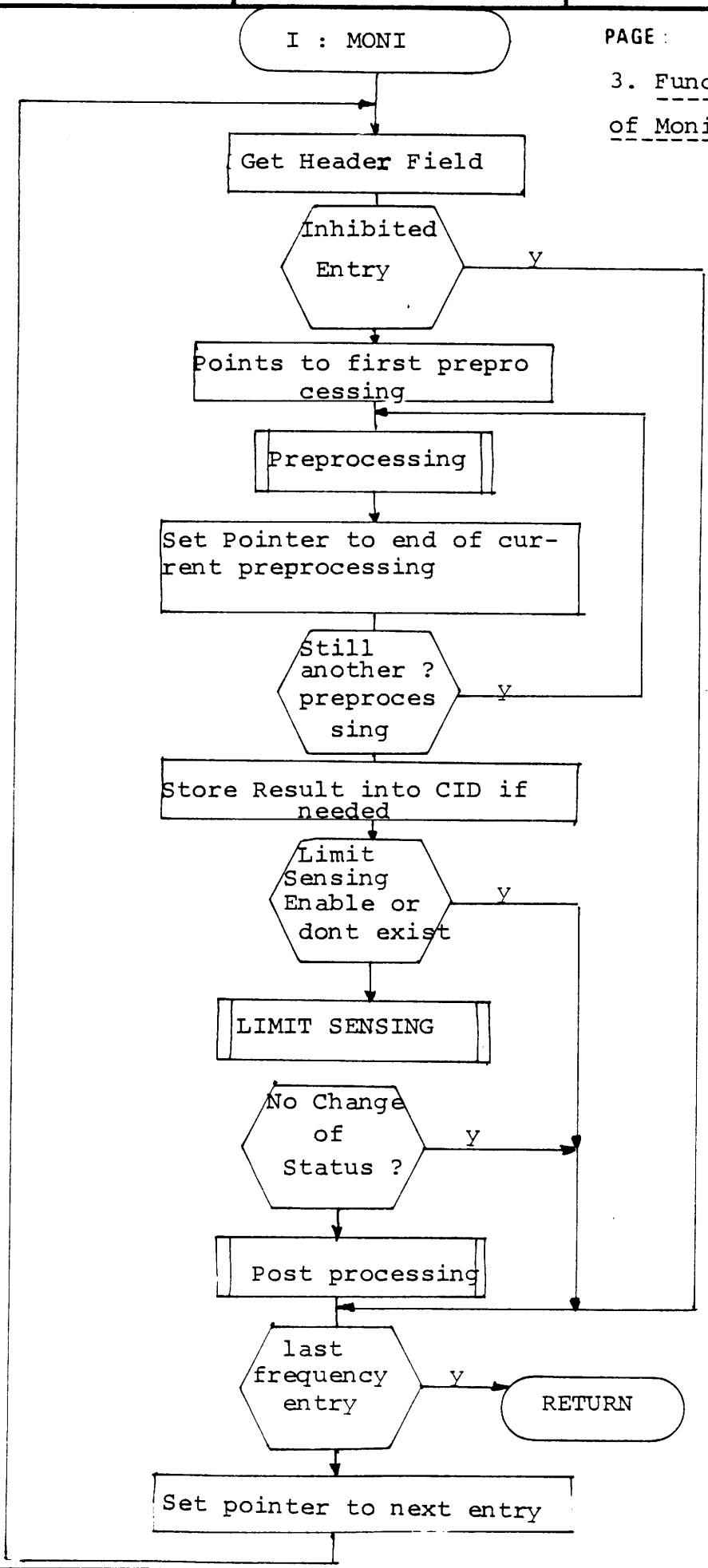
Monitoring and special processing are done by at most 5 tasks, one per frequency, but each task is only a call to a reentrant S base routine : I : MØNI with the address of the concerned monitoring table, this address is produced by DBGM in DBGM header.

I : MONI routine scans and processes each entry of the frequency table ; for each entry the following processing is done if this entry is enabled.

First preprocessing is done for every subprocessing field of the entry ; at the end of preprocessing the result is stored if needed into the CID and is kepts in the task area for limit sensing.

When for an entry limit sensing exist and is not inhibited this step is done and last when a change of status occurs the post processing corresponding to this entry is done.

3. Functionnal Flowchart of Monitoring Routine



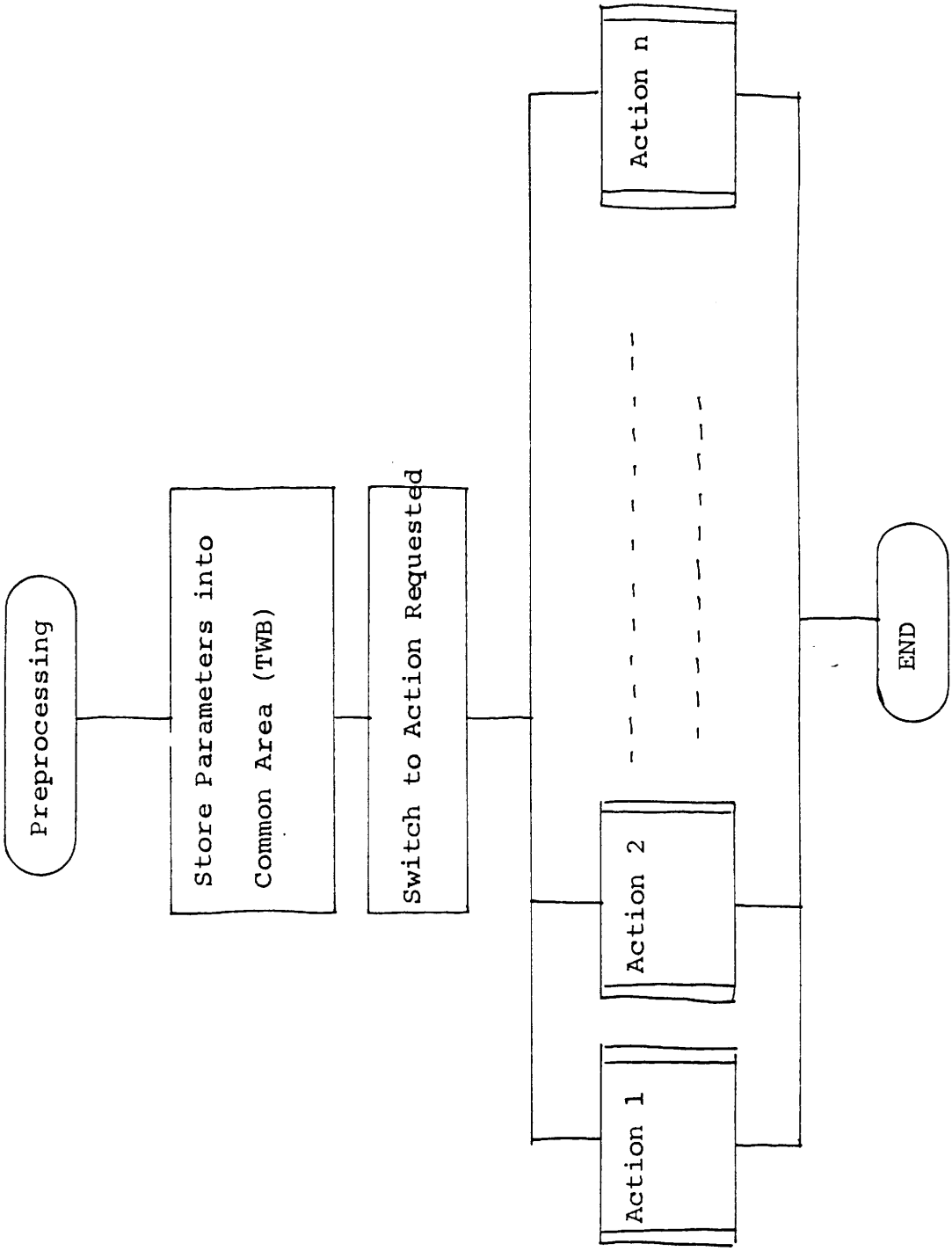
II.8.3.1. Preprocessing

The preprocessing is mainly a switch to the requested action, this action may be either a block of code or an S base routine.

Refers to diagram 3.1.

II.8.3.1.1. List of preprocessing action

T.B.S.



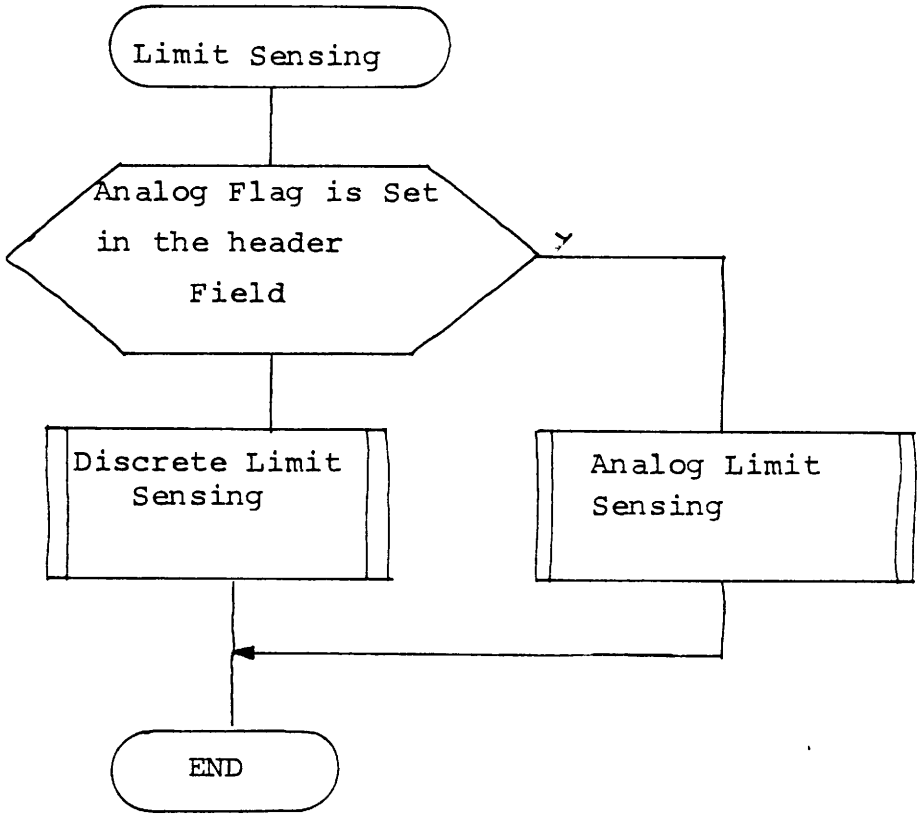
3.1. Preprocessing Functionnal Flowchart

II.8.3.2. Limit Sensing

Limit Sensing is : check a value against expected limit, and set flags into header of the entry to indicate the new status, it is also : set internal flags which are input to post processing. These internal flags are defined as follows :

- SOF Single Occurence Flag is set the first time an analog value goes out of limit.
- FSP flag for a discrete/group discrete it means the value is for the first time different of the expected state ; for an analog it means the maximum counter has just been reached.
- NOKOK flag means that a value has come back into the limits.

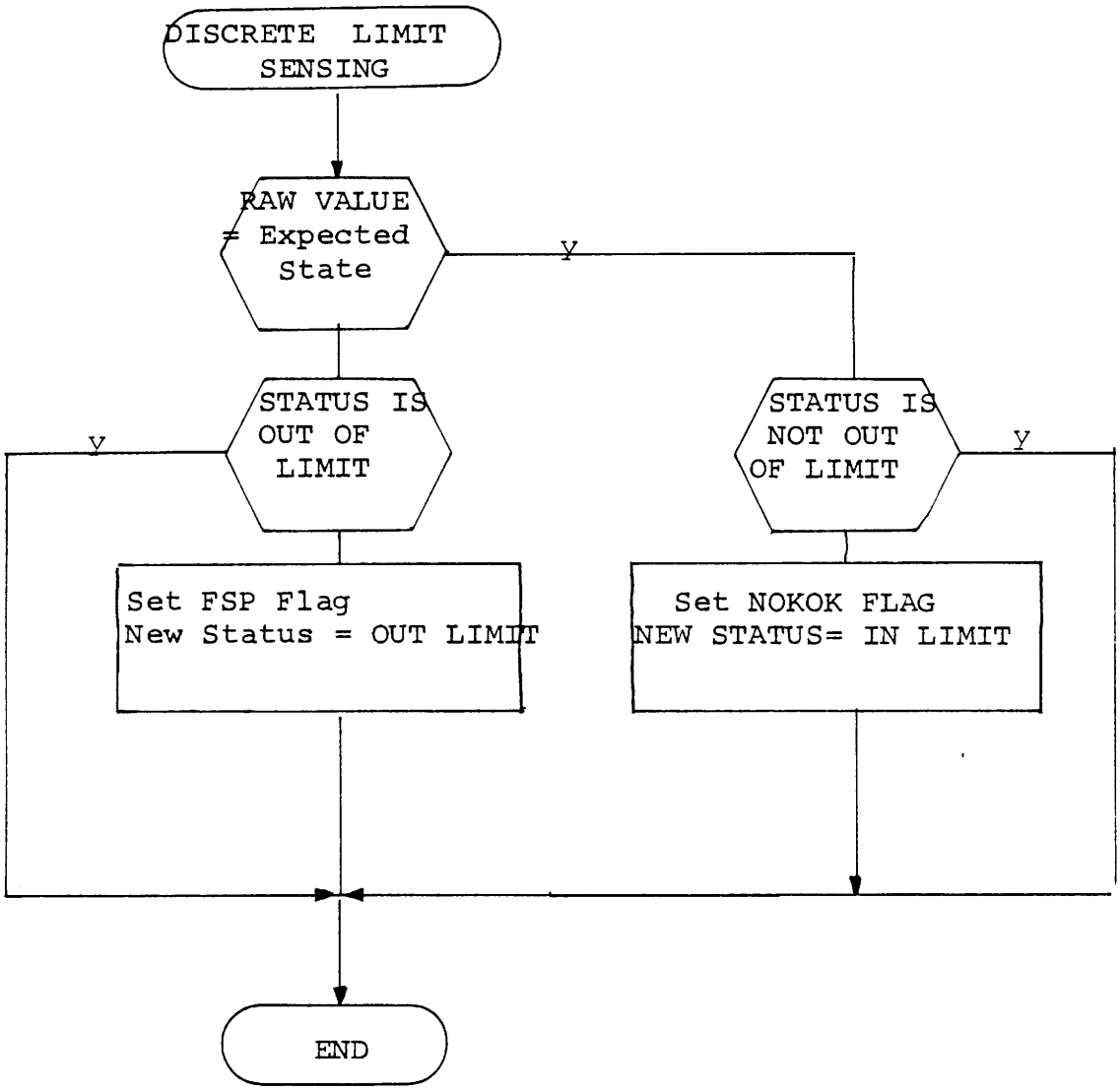
The limit sensing so is different for analog and for discrete and it is explained below.



3.2. Functionnal Flowchart for Limit Sensing

II.8.3.2.1. Limit Sensing for Discrete Group Discrete

Limit Sensing for discrete or group discrete is only check the value against an expected state, then modify the status of entry and set for post processing two flags : FSP when the value is for the first time out of limit and NOKOK when the value has just come back into the limits.



3.2.1. Flowchart of discrete Limit Sensing

II.8.3.2.2. Limit Sensing for analog Raw value

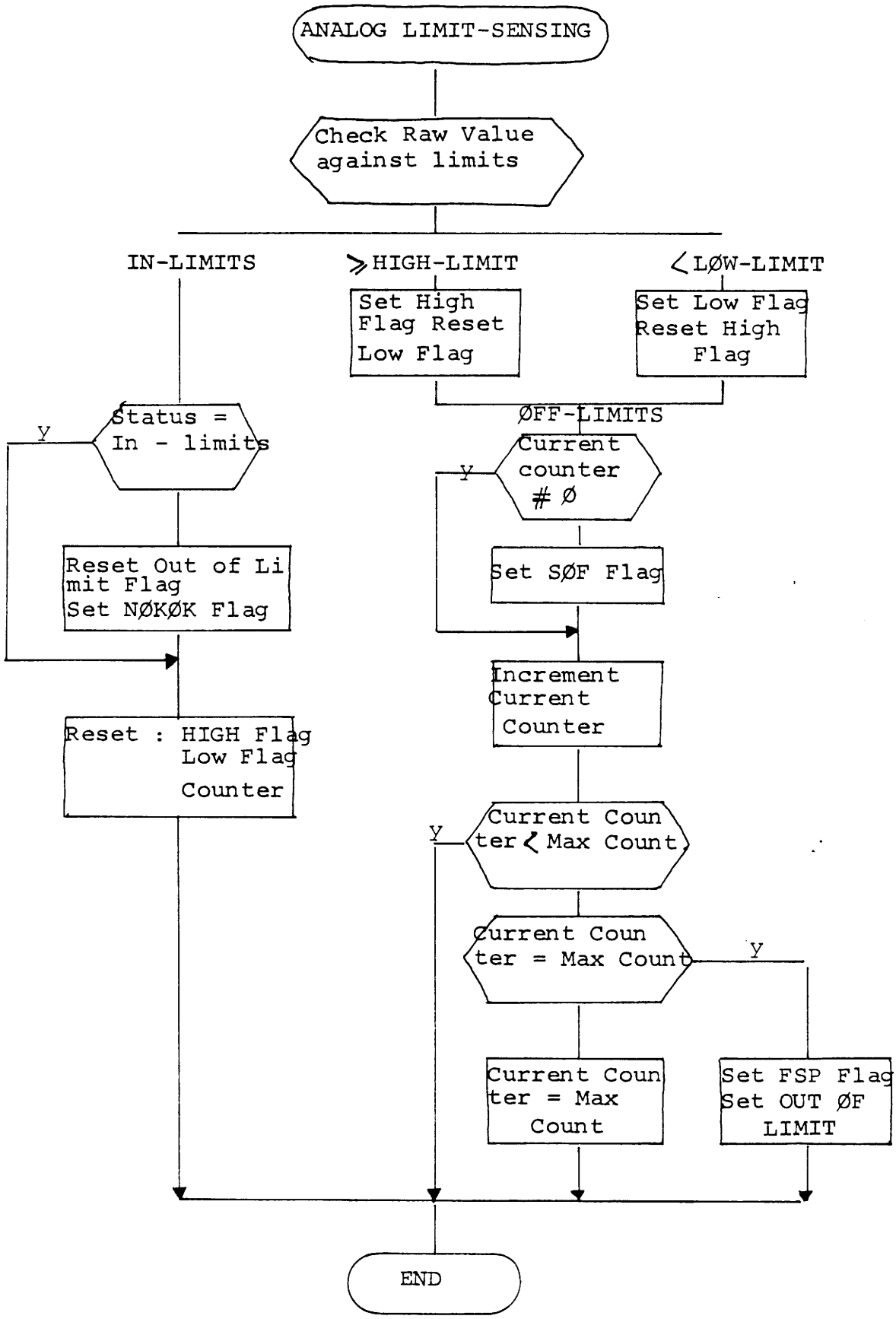
Limit Sensing for analog values consists of maintaining current status of the entry and some flags for the different post processing action.
The current status is composed of

High Limit flag the current value is greater than the high limit,
Low Limit flag the current value is less than the low limit
Out Limit flag the maximum counter is equal to current counter.

The flag for post processing are

SOF : Single Occurence flag the value is for the first time come out of the limits.
FSP : FSP flag the current counter has just reached the maximum counter.
NOKOK, flag, the value has just come back into the limits

See flowchart in diagram 3.2.2.



II.8.3.3. Post Processing

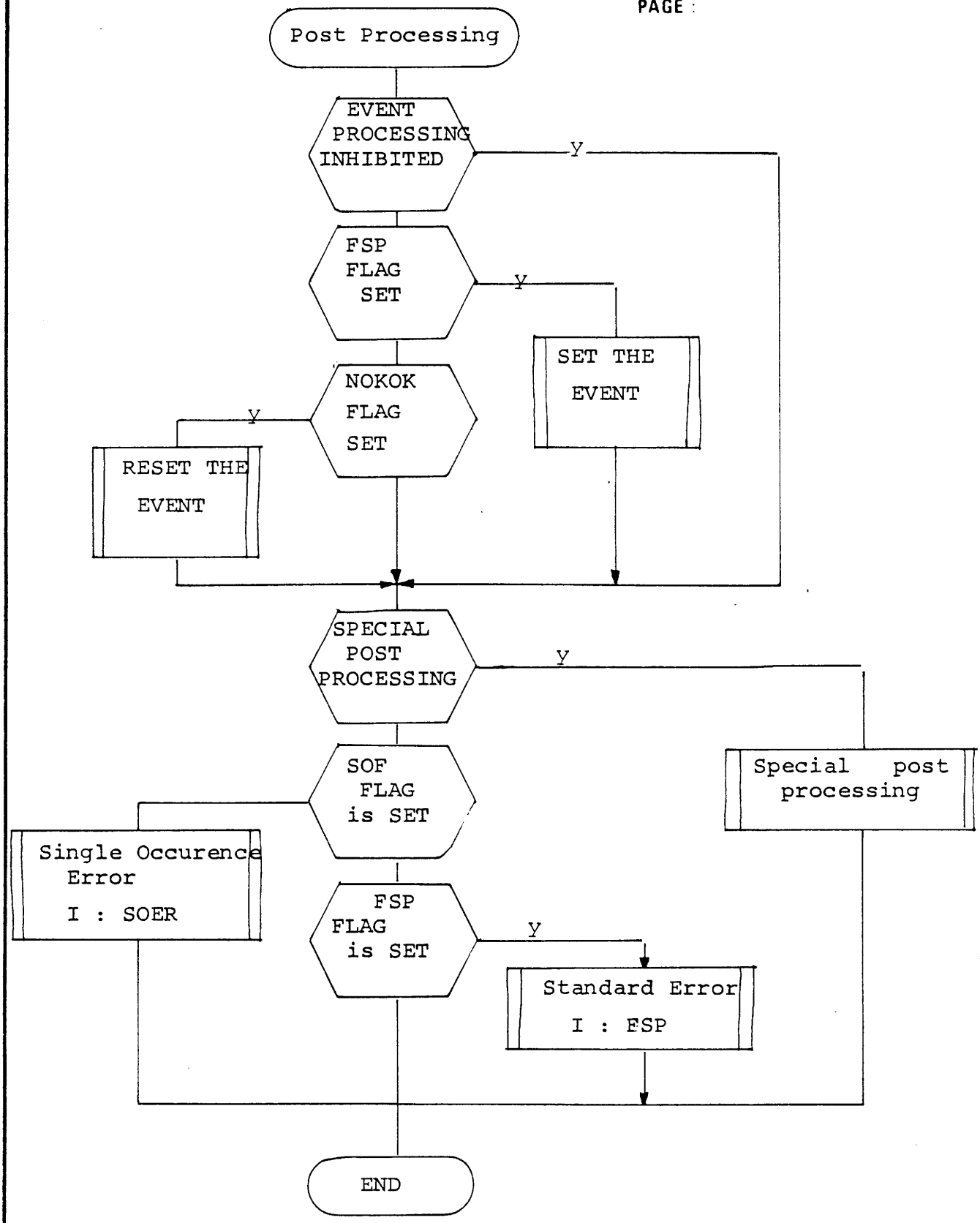
Post processing consists of two steps, first event processing, second depending on the entry error processing or special post processing ;

Event processing is done if an event pointer has been initialized in the entry, in this case the event is set when the value goes out of limits (FSP flag set) and reset when the value comes back into the limits (NOKOK flag set).

Error processing is send a single occurence error when the value goes for the first time out of limit (SOF flag set), and send a FSP error when the current counter has just reached the maximum counter (FSP flag set).

II.8.3.3.1. Special Post Processing

T.B.S.



3.3. Functionnal Flowchart of Post Processing

II.8.3.4. User Interface

- User interface is composed of at least three entry points :

  Read Monitor Data,
  Change Monitor Data,
  Assign an event to an entry point.

II.8.3.4.1. Read Monitor Data

The calls to this procedure allow a user to read the following data in the monitored entry :

Status :
- Out of limit status
- High out of limit
- Low out of limit
- Enable/Inhibit Monitoring

Limits :
- Low Limit
- High Limit
- Expected State
- Maximum counter

The exact interface is TBS.

II.8.3.4.2. Write Monitor Data

This routine allows a user to modify the following data into the monitored entry :

- Low Limit
- High Limit
- Expected State
- Maximum Counter
- Enable/Inhibit Monitoring

The description of the interface is TBS.

II.8.3.4.3. Assign an Event to a monired entry

This allow ofuser to assign an event to the status (out limit, in limit) of a monitored point, the event is set when the value goes out of limit and reset when the value comes back into the limits.

The interface description is TBS.