ORIGINAL

CGTM # 77

M I D A S - 3

MONITOR AND SCOPE
PROGRAM DESCRIPTIONS

R.E. Brody

September 1969

CONTENTS

PREFACE

This is the first attempt at SLAC to monitor the progress of an experiment using the IBM/360 M91 computer. Previous experiments have used the 1800 computer to perform the dual function of collecting and partially analysing the data. However, in this and future cases the data rate will be too high for small computers, such as the IBM 1800, to perform any analysis. Their full capacity will be absorbed in collecting the data, with little core space or time available for checking it. One solution to this problem is to use the M91-1800 link to transfer data periodically to the M91 where a complete and rapid analysis of the sample can be performed.

In order to satisfy this requirement a program was designed for the IBM/360 M91 which would fulfill the following functions: Obtain a significant sample of the data being collected on the IBM 1800 computer on-line to a wire spark chamber experiment; perform a complete and immediate analysis of that sample on the M91; give the experimenter an instant display of the results of that analysis and provide him with a means of fast interaction through the use of a 2250 scope display situated in the experimental area.

The program which was finally designed for the M91 was called the Midas-3 system, as its functions were similar to those performed by the Midas program for the IBM 1800 computer for an earlier experiment.

Midas-3 consists of four separate tasks operating independently but able to communicate between each other and the 1800 computer in a 150K region of core of the M91. These four tasks were named the Monitor, the Scope, the Analysis, and the Command task.

Monitor is the control program; it has the highest priority, and it controls the data being passed acr ss the 1800 link; it initiates and terminates the other three programs; it transfers information between the other programs and is in fact a sub-system program. The Scope program will display whatever is requested by the other three programs which may be,in turn,a response to a request typed in at the scope console by the user. The Scope task will have a high priority. in the M91 so that response delay will be small, and will probably appear immediate to the user. The Analysis task will be the standard M91 program used to analyze the data tapes collected by the 1800-computer. The analysis of the sample data will be complete and results will be put on disc packs before being printed. The Analysis task will operate at a low priority so as not to disrupt the normal batch running of the M91. All the left-over CPU cycles available in the M91 will be used by the Analysis task which will then perform as a background job. The Command task is the receiver of all commands entered into the system, w hether from cards (when running off-line) from the scope or from the 1800, and is responsible for interpreting and responding to them.

Midas-3 is primarily designed to sample data being collected at the end station by an 1800 computer, perform a complete analysis of it in the M91, and display histograms and other information, on request, on the 2250 scope display situated in the end station. The Midas-3 system will be permanently in core during the experimental run. It will control the M91-1800 link and will request buffers of data from the 1800 periodically. This data will be fed to the M91 nalysis program, which will do a complete analysis on that data and when finished will request more data from the 1800. The amount of data transferred and

analyzed in Midas-3 will depend on the work load of the M91 and will probably vary hourly. In addition to the Analysis program, the Scope package will be available to control the 2250 scope in the end station. This scope will be used in roughly the same manner as it was for the 1800-Midas program. The keyboard will be unlocked and histograms and other information may be displayed on request.

The following points were important design considerations.

1. All programs are written in assembler language. Due to the fact that this program was to be in core permanently while the experiment was running, and also some time prior to that, only 150K was allowed for all four programs. It was thought to be almost impossible to do this if either Fortran or PL1 was used. Further, at least part of the Monitor had to be written in assembler language as some system macros for attaching and detaching tasks were required in any case.
2. The Monitor, Scope, and Command tasks are at a high priority. This will ensure a rapid response to the scope user.
3. The Analysis task is at a fairly low priority so that is can soak up the remaining M91 cycles without disturbing the batch programs too much. The amount of analysis being done will probably depend on the work load of the M91 and will vary hourly. However it is hoped that a certain minimum will be obtained at all times of the day.
4. The M91 controls the link completely. Since data is only being sampled there is no necessity for the 1800 to interrupt the M91 unless requested to do so. As a result of this, unsolicited

interrupts from the 1800 are currently not accepted. At some future date these will be accepted, since the code has been written to allow for them.

5. Independent programs were needed as far as possible so that several people could work on them simultaneously without too much confusion.

6. A very elastic design was necessary as no very clear idea of how the program should work was available when writing began.

This document contains descriptions of the Monitor and Scope tasks only. Each of these tasks is described separately as their operation is quite independent. The description is divided into four parts: the Introduction, Concepts, Structure, and Details. Each section is increasingly more detailed so that the final section is only for the use of those people or person who may wish to make modifications.

The code itself is fairly well documented and this paper is intended not only to give a general idea of the program but also to supplement the comments in the code.

MONITOR PROGRAM DESCRIPTION

LAYOUT FOR MONITOR PROGRAM DESCRIPTION

INTRODUCTION

This Monitor was written as the main system task in the Midas-3 system. It is designed to function with three subtasks, currently called the Scope, the Analysis and the Command tasks, and to operate the 1800 Link. It was designed so that if any of the sub-tasks were altered or removed, the main body of the Monitor program could still function. This would allow the program to be easily modified for use in other environments.

The original design of the IBM 1800 Link included the possibility of receiving and servicing unsolicited interrupts from the IBM 1800 computer. This facility was later removed in order to simplify the testing of the program and the link. However, when the link is known to be working reliably, this facility should be restored. The EXCPAM access method was used in the M91 code for communication across the link.

This write-up describes the functions of the Monitor in the Midas-3 system. For description of the Scope program see the second part of this document. The Analysis and Command programs will be documented separately but a very brief description of their functions can be found in the preface.

The last part of the Monitor write-up containing the detailed descriptions and flow charts is primarily for the use of anyone who may have to alter or ever (heaven forbid!) debug it. It is not intended to be light reading but is included here for the sake of completeness.

CONCEPTS

Background for Design

Since this is the first attempt at SLAC to write a set of programs as Midas-3 to link a small and large computer together, several unknown factors had to be taken into consideration. Whether or not the program would be required to work in another environment, i.e. with different subtasks, or even a different number of subtasks, how much M91 core would be available for the final run, whether or not the link would be reliable, whether or not this system would be used off-line to analyse the final experimental results, were all factors which were unknown. Consequently, some kind of a balance had to be maintained between making the program very general, which has the disadvantage of increasing both the size of the program and the time required to write it, and keeping the program small enough to perform certain specific functions. The latter has the disadvantage of making it difficult if not sometimes impossible to alter.

Design Considerations

The Monitor was not designed by itself but as an integral part of the Midas-3 system. It is therefore impossible to consider the design of the Monitor without examining the whole Midas-3 system. Several separate functions had to be put together so that they could operate effectively . For example a scope package was needed to operate the 2250 Scope, a program to control the 1800 link and the Analysis program were primary requirements. To put these functions in one program would have had several disadvantages, mainly that they would all be operating at the same priority, but also that more than one person would have been working on the program making it more inconvenient. Making each function a separate job would satisfy the priority requirements but would have necessitated some system changes to allow communication between jobs. It was decided that no system changes should be made unless there was no alternative. Finally it was decided that a set of subtasks in one region with communication tables set up between the tasks satisfied most of the primary requirements. These tasks were then outlined as the Monitor, the Scope, the Analysis and the Command tasks. The Monitor, Scope, and Command tasks were to have high priority, while the Analysis, which was to use most of this program's cycles,was to have a low priority. This would enable the Scope user and the 1800 Link a fast

response while not disturbing the regular operation of the M91. Fig. (1) shows the physical layout of the system with respect to the experimental area while Fig. (2) shows the distribution of core in the M91, 150K region.

To summarise then, the basic design considerations of the Midas-3 system are listed below.

1. All programs must be written in assembler language, for the sake of speed and space as only 150K of M91 core was available.
2. Each function should be as separate as possible with clear interfaces to allow several people to work on them with a minimum of confusion.
3. Monitor, Command, and Scope tasks must have a high priority for rapid response to the user and the 1800 compiler.
4. Analysis module must have a low priority so as to be permanently in core soaking up the remaining CPU cycles without disturbing the normal running of the M91. This was to be for the duration of the experimental run.
5. Separate functions (i.e. tasks) had to be able to operate independently but still be able to communicate.
6. If possible no system changes were to be made.

Functions of the Monitor

As noted earlier the Monitor is the mother task in the region, and as such performs certain major functions with respect to the other tasks in the region. The following is a list of these functions.

1. The Monitor performs all communication between its subtasks. This is necessary if the Monitor was to perform any error recovery at all; for example, the Analysis program might wish to send a message to be displayed on the scope while in the meantime the Scope program has abended. Only the Monitor is aware of the termination of the Scope program and any attempts to re-initiate it.
2. The Monitor performs all I/O to the 1800 link,and totally controls the link.
3. The Monitor does the data buffer handling for the Analysis program, i.e. when the link is open the Monitor will attempt to get two buffers for the data from the 1800; it will from then on attempt to keep those buffers full so that there is a minimum wait time for the Analysis program. It will also free one of those buffers at a later date if the space is needed for something else.

GENERAL LAYOUT

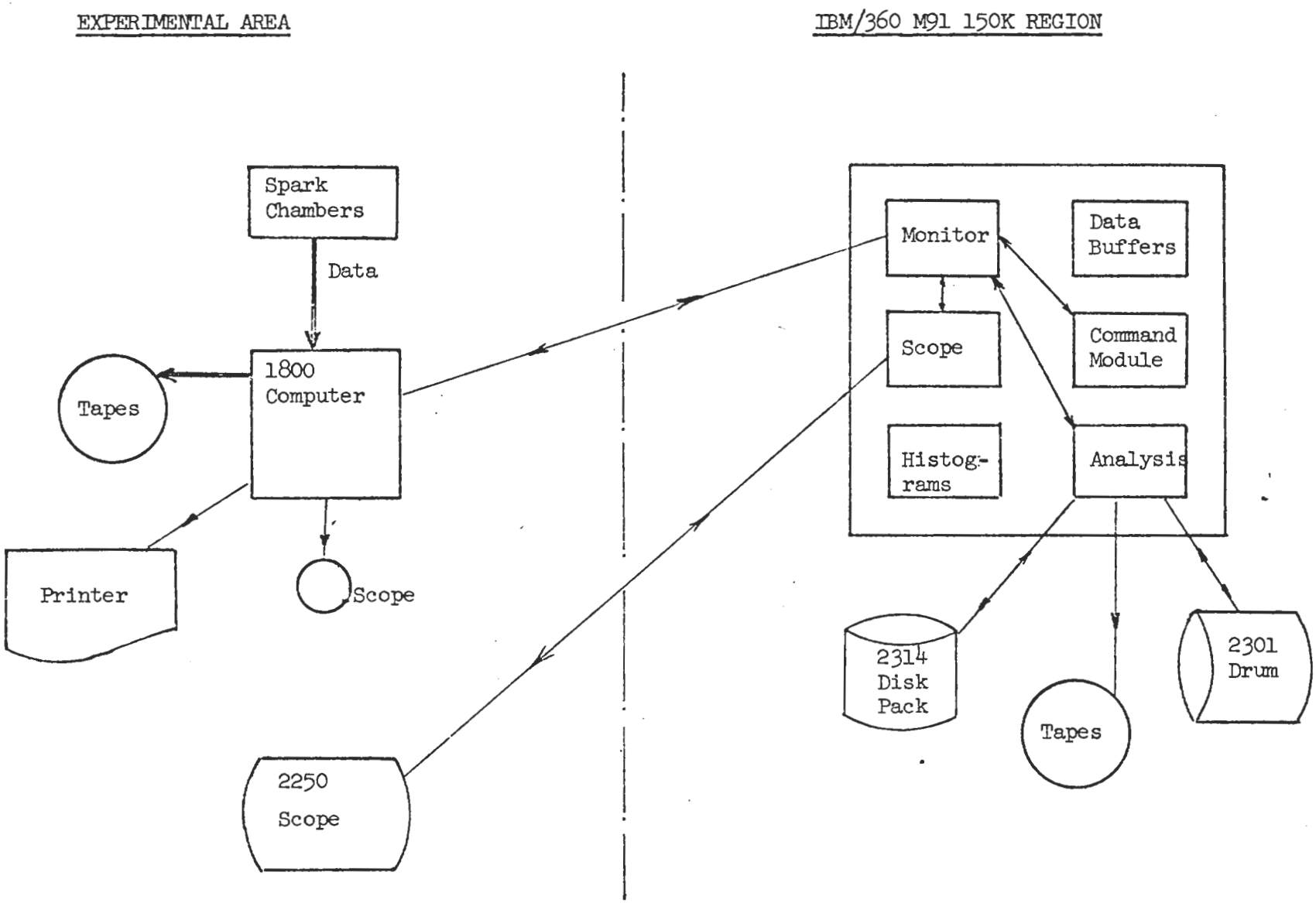
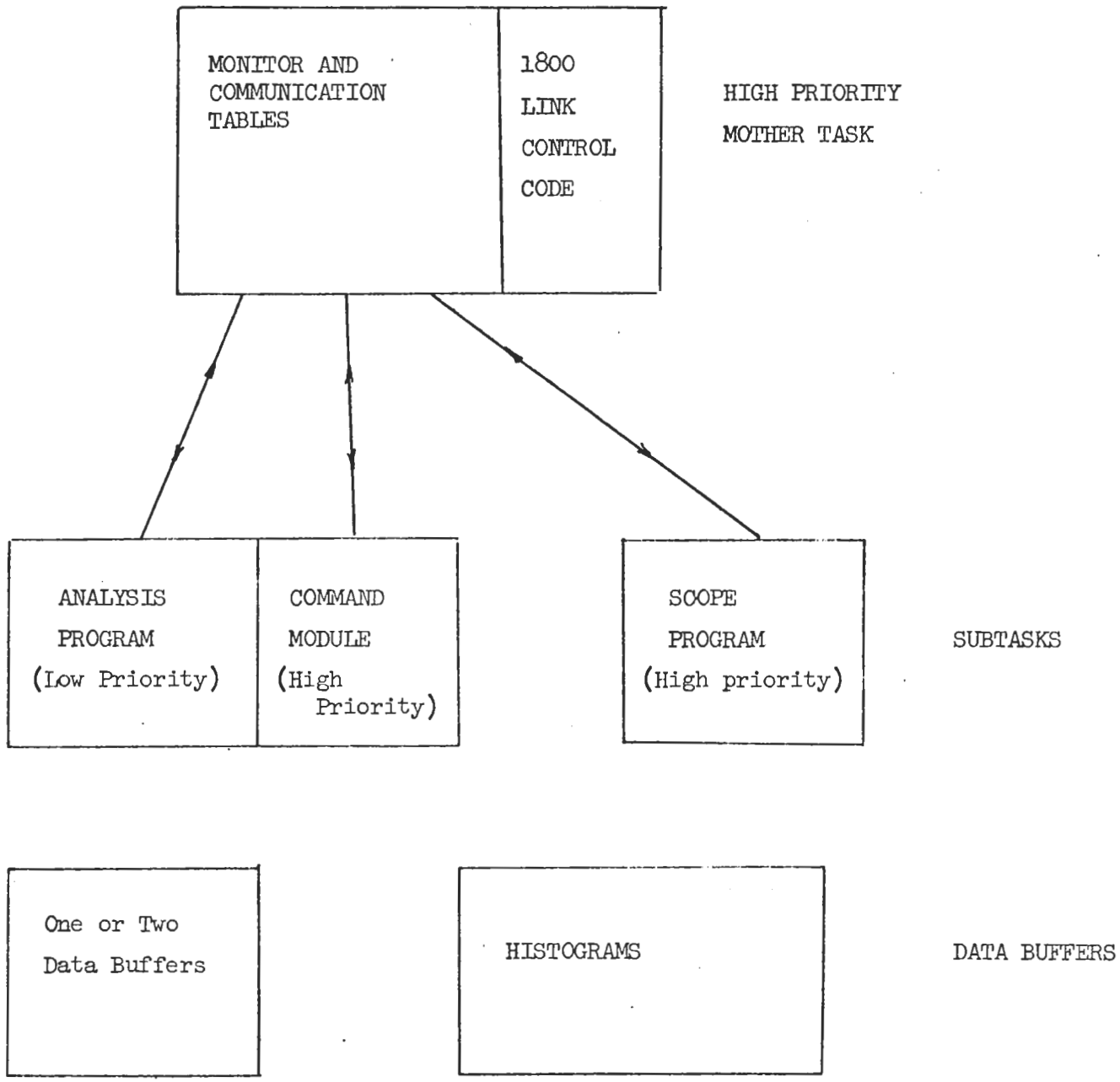


FIG 1.

M91 150K PARTITION



MONITOR:- Controls the partition.
ANALYSIS:- Performs the analysis of the experimental data.
SCOPE:- Used to display histograms and other onformation.
COMMAND:- Receiver of all commands entering the system.

FIG 2.

4. Since unsolicited interrupts from the 1800 are not accepted at present, the Monitor has the task of making periodic requests for commands and comments etc. to the 1800. When obtained it passes these on to the respective programs to deal with them.

5. The Monitor also attaches and detaches subtasks at the request of the Command module. This is necessary when changing from on-line to off-line and vice versa.

6. The Monitor does all error handling and attempts if possible to recover if one of the subtasks terminates.

Future Expansion

At the present time (beginnign Sept. 1969) the Monitor is working satisfactorily in an off-line environment. That is, the Monitor, Scope, Analysis, and Command tasks have been operating together with all the functions performing except that data for the analysis program has been read from tapes only. During the experimental run, data for the analysis program will be obtained through the Link from the 1800 computer. Since the link is not yet operating, although the Monitor code which controls the link has been tested with the use of a 2260 display, it is to be expected that most of the modifications which will take place will be in this area of the code. These modifications are really unpredictable as they will depend on the operation of the link and the procedures decided when either programs or hanrdware in each of the computers fail.

STRUCTURE

General Layout

The design of the Monitor is basically very simple (see fig. (3)). The entry point for the program is called MONIT, and the first subroutine entered is the initialisation routine. On entry the initialisation routine saves the registers, links the save areas and sets some flags. It then issues two IDENTIFY macros, one for the Scope task entry point and one for the Command task entry point. This then means that both the Scope and Command programs have to be part of the same load module as the Monitor. If at any time it is desired to make the Scope and Command tasks separate load modules which are loaded from a joblib library when they are attached, then these two IDENTIFY macros must be removed. The initialisation routine then attaches the Command task and finally exits into the Monitor Main Loop.

The Main Loop is the backbone of the Monitor task. It remains in this loop until the Command task, and later the other subtasks signal that they have a request. Initially only the Command task is attached. Other tasks are attached and the 1800 Link opened by the Monitor at the request of the Command task. Starting at the beginning of the loop the Monitor searches through three tables to see if any of its subtasks have any requests. If any subtask has a request it branches to a subroutine to check whether it is a valid request, and if it is, control is passed to a lower level routine. This lower level routine corresponds to the code number passed in the request and services that request only. When the request is serviced, control is returned to the Main Loop along the identical path and the request flag is turned off. If for any reason the request is unable to be serviced at that time, then a flag is set to indicate the fact, control is returned to the Main Loop along the same path as if the request had been completely serviced, but the request flag is left on. On a later pass round the Main Loop another attempt will be made to finish that request. After servicing a request, control is returned to the Main Loop at exactly the same point it left. After checking and servicing any requests which the subtasks might have, the Monitor tests whether the 1800 Link is open. If it is, it will then check if there is an unsolicited request from the 1800. Currently this is a dummy routine as no unsolicited requests from the 1800 computer are accepted. Again if the link is open the Monitor will check

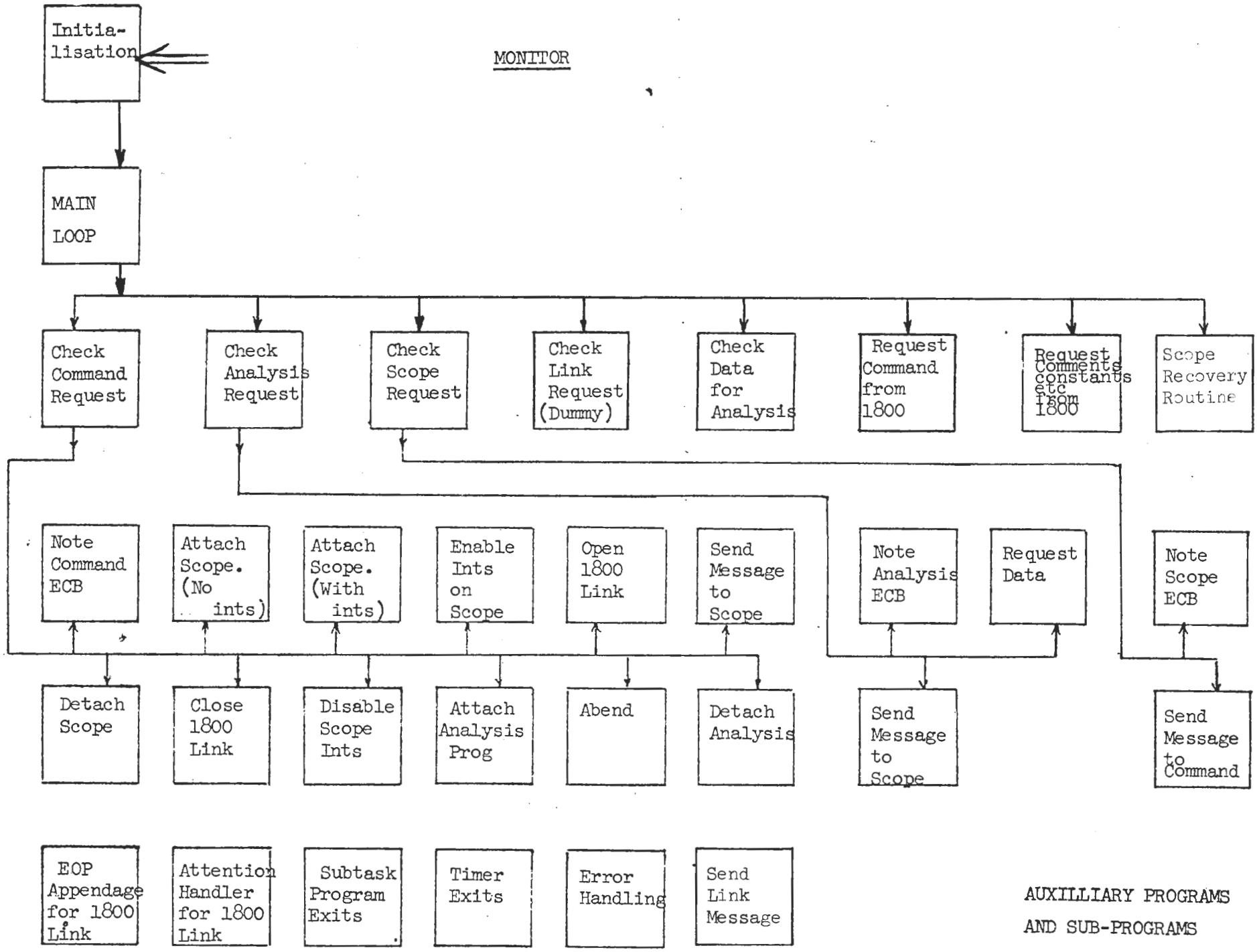

MONITOR
Initia-lisation
MAIN LOOP
Check Command Request
Check Analysis Request
Check Scope Request
Check Link Request (Dummy)
Check Data for Analysis
Request Command from 1800
Request Comments constants etc from 1800
Scope Recovery Routine
Note Command ECB
Attach Scope. (No ints)
Attach Scope. (With ints)
Enable Ints on Scope
Open 1800 Link
Send Message to Scope
Note Analysis ECB
Request Data
Note Scope ECB
Detach Scope
Close 1800 Link
Disable Scope Ints
Attach Analysis Prog
Abend
Detach Analysis
Send Message to Scope
Send Message to Command
EOP Appendage for 1800 Link
Attention Handler for 1800 Link
Subtask Program Exits
Timer Exits
Error Handling
Send Link Message
AUXILLIARY PROGRAMS AND SUB-PROGRAMS

FIG 3.

the Analysis programs 1800 data buffers. If either or both of these buffers are empty, the Monitor sends a message to the 1800 computer to request data for these buffers. The Monitor will now attempt to send a message to the 1800 to request commands for the Command task. It will be able to do this if the Analysis data buffers are both full and the Command task has serviced its previous command. Finally the Monitor will attempt to send a message to the 1800 computer to request comments, DMV's, etc. for the Analysis program. This will be done only if the link is not being used and the Analysis program has serviced the earlier request. The Monitor will now set a timer and attempt to go into the wait state. This timer is only a precautionary measure so that the Monitor never accidentally enters a permanent wait state.

The Monitor will come out of the wait state when one of the following things happens; either the timer terminates, one of the subtasks has a request and therefore posts the Monitor, or there has been some activity on the 1800 link and the Appendage or Attention Handler posts the Monitor. The first thing the Monitor does when it becomes active again is to clear the ECB it has been waiting on. This ensures that if a request becomes active after it has been checked and found inactive, the Monitor will not at the end of this cycle enter the wait state, but will find its ECB already posted and after clearing its own ECB it will return to the beginning of the Main Loop to start its cycle once again.

All tables and constants used by the Monitor are in the Monitor work Area control section called WORKAREA; see the Communication section for further details.

1800 Link Control

The 1800 computer link is currently controlled entirely by the Monitor in the M91. No communication takes place across the link which has not been initiated by the Monitor. This means that the 1800 computer cannot send commands to the Command task in the M91 but has to wait until they are requested by the Monitor. This was done to simplify the communication across this link during the initial period of running. Tables and some code are available to handle unsolicited messages from the 1800 but will have to be examined and probably debugged before being used.

The Monitor manages the operation of the 1800 link by use of a table called the Link Activity Table which is in the Monitor's work area. See fig. (4) for details of this table. This table will indicate the state

```
                 ***************************************
    SOLREAD      *  SOLFLGS*    SECBADDR               *
(SOLICITED       ***************************************
 READ            * SLENGTH                              *
 BUFFER)         ***************************************
                 * SBUFADDR                               *
                 ***************************************
                 * SDATLNAD                               *
                 ***************************************
    NSOLREAD     *NSOLFLGS *    NECBADDR                *
(UNSOLICITED     ***************************************
 READ            * NLENGTH                              *
 BUFFER)         ***************************************
                 * NBUFADDR                               *
                 ***************************************
                 * NDATLNAD                               *
                 ***************************************
    WRITE        * WRTFLGS *   WECBADDR                 *
(WRITE           ***************************************
 BUFFER)         * WLENGTH                              *
                 ***************************************
                 * WBUFADDR                               *
                 ***************************************
                 * NOT USED                               *
                 ***************************************
```

LINK ACTIVITY TABLE

FIG 4.

SOLREAD SOLICITED READ TABLE SHOWS IF DATA IS EXPECTED AND IF THE READ ISSUED FOR IT
NSOLREAD UNSOLICITED MESSAGE BEING RECEIVED
WRITE   A WRITE HAS BEEN ISSUED

ECBADDR THE ECB TO BE POSTED AT COMPLETION OF DATA TRANSFER OR ZERO
LENGTH   THE LENGTH OF THE DATA BEING TRANSFERED
BUFADDR THE ADDRESS OF THE BUFFER INTO WHICH OR FROM WHICH THE DATA IS BEING MOVED
SDATLNAD ADDRESS WHERE ACTUAL DATA LENGTH PASSED IS TO BE STORED (OTHERWISE ZERO)
NDATLNAD ADDRESS WHERE ACTUAL DATA LENGTH PASSED IS TO BE STORED

SOLFLGS BIT
  0 1 INDICATES A READ HAS BEEN ISSUED
  1 1 INDICATES AN ATTENTION IS EXPECTED, AND DATA IS TO BE READ
  2 1 INDICATES A FLAG TO BE SET ,THE LAST BIT OF THE BYTE GIVEN BY THE ADDRESS IN ECBADDR IS SET TO 1 WHEN THE READ TERMINATES
  3-7 UNUSED

NSOLFLGS BIT
  0 1 INDICATES A READ HAS BEEN ISSUED
  2 1 INDICATES A FLAG TO BE SET ,THE LAST BIT OF THE BYTE GIVEN BY THE ADDRESS IN ECBADDR IS SET TO 1 WHEN THE READ TERMINATES
  1,3-7 UNUSED

WRTFLGS BIT
  0 1 INDICATES A WRITE HAS BEEN ISSUED
  2 1 INDICATES A FLAG TO BE SET ,THE LAST BIT OF THE BYTE GIVEN BY THE ADDRESS IN ECBADDR IS SET TO 1 WHEN THE WRITE TERMINATES
  1,3-7 UNUSED

of the link at any instant in time. Only two types of activity can take place across the link, i.e., either Reads or Writes. A read can be issued when a message is expected or when an attention occurs unexpectedly; these are solicited and unsolicited Reads respectively. Then there are three types of activity which may take place across the link, Unsolicited Reads, Solicited Reads, and Writes. The table is therefore divided into three sections; the solicited read buffer, the unsolicited read buffer, and the write buffer, although only one buffer may be active at any one time. Currently the unsolicited read buffer must always be empty. The write buffer indicates whether a write has been issued from the Monitor to the 1800 computer. No other writes may be issued until this write has been terminated and this buffer cleared; in fact, writes may not be issued unless all the link activity buffers are empty. The write buffer will indicate the status of that write command. When a write is issued and a reply is expected, a flag in the solicited read buffer will indicate that a reply from the 1800 is expected. When an attention is obtained from the 1800 Link the Attention handler can check from the solicited read buffer that a message is requested, where it is to be placed, and its maximum length. With this information the attention handler can issue the Read to obtain the reply. The Appendage routine which gains control at the end of any transfer of data uses the Link activity table to determine whether it is the end of a read or write and whether an ECB of flag needs to be posted to indicate that the information has been transferred.

There is a general routine (SNDLNKMS, Send Link Message) which is used to set up the Link Activity Table and issue the write whenever messages are to be sent to the 1800 computer. Please see that subroutine write up for details of the parameters.

Timing

The Monitor has one timer which is used to cause it to become active at periodic intervals. Currently that timer is set at ten seconds but might have to be made smaller if the commands and comments, DMV's, etc. have to be requested more frequently.

The Monitor has been designed so that it does not wait for any event; it only goes into the wait state if there is nothing further to be done. For example, if there is a request to send a message down the link, the Monitor issues the write and, without waiting for the end of data transfer, will continue checking and servicing requests until there are none left. The monitor should never be in a position where it cannot service one request because it is waiting for another. Bottlenecks, such as in the 1800 link, may occur but probably the data and messages being transferred across it will not be so great as to cause any slowdown either in the Monitor or any of its subtasks.

Any requests to the Monitor when accompanied by posting the Monitor ECB gets serviced immediately, if the Monitor is in the wait state, or immediately after completing its current requests if it is already busy. Any request to the Monitor by one of its subtasks which is not accompanied by posting the Monitor ECB may have to wait until the Monitor becomes active when the timer expires. This may be anything up to ten seconds which is the current Monitor timer interval.

Communication between Tasks

One of the main functions of the Monitor is to perform the communication between its subtasks. It does this by setting up two tables for each task in its own work area and passing the addresses of these tables to each task as it is attached. Communication between the Monitor and each task is then effected through these tables.

The communication between the Monitor and the Analysis task will be described in detail here, but communication between the Monitor and all other of its subtasks takes place in this manner.

In addition to the two tables mentioned above, two ECB's are necessary to maintain the flow of information between the two tasks. These are: the ECB on which the Monitor waits when it is inactive and there are no requests to service, and the ECB on which the Analysis program waits when it also is inactive. The address of the former is passed to the Analysis program when it is attached, and the address of the latter is communicated to the Monitor during the Analysis program's initialisation step. In this manner each program can command the attention of the other by posting these ECB's respectively.

The first of the two tables whose address is passed to the Analysis program is the Monitor Analysis Request Table MNANLREQ (this would be the Monitor Scope Request Table MNSCPREQ in the case of the Monitor/Scope Communication tables). This table is used by the Analysis program to signal a request to the Monitor. Only one request can be made to the Monitor by the Analysis task at a time. No queueing of requests can take place; the Analysis may not issue another request until the Monitor has finished servicing the previous one. See fig (6) for details of this table. The Monitor will post an ECB or set a flag to signal the request has been serviced if the Analysis indicates that is needed when it sets up the request.

The second table is the Analysis Request Table, ANREQTBL (this would be the Scope Request Table, SCREQTBL, in the case of the Scope task). This table is used by the Monitor to signal requests from other subtasks or itself to the Analysis task. Each other subtask may send one request at a time to the Analysis task. No second request may be sent from a particular task until the Analysis has accepted the first one, i.e., no queueing of requests takes place. See fig (7). Requests on this table can be set up in two forms.The first is as a message with the first byte of flags and the last three bytes containing the message address, the second form would have a code number in the last three bytes and the first byte of flags would have a bit set to indicate this fact. See fig 8. for the Scope request table.

The order of events if the Analysis task wanted to send a message to the Scope program to be displayed on the 2250 screen would be as follows: The Analysis task would set up its MNANLREQ table with AMSGCODE equal to 3, this would indicate to the Monitor that this was a request for a message to be sent to the Scope. AMSGADDR would be set up to contain the address of the message to be displayed. APSTRTAD and SBITRTAD would be set to zero assuming that the Analysis program did not want an ECB posted or a flag set when the request was complete. Finally the Analysis program would set the first bit of AFLAGS to 1 to indicate the request is active and post the Monitor ECB to obtain a fast response. If the Monitor was in the wait state it would now become active and on its cycle in the main loop would discover the Analysis programs request. It would then examine the code number in AMSGCODE and would branch to a subroutine (SCANLMSG) corresponding to that code number. This routine would then look at the Scope Request Table SCREQTBL to determine if the Scope had serviced any earlier Analysis request. If it had not done so, i.e. that buffer was full, the routine SCANLMSG would return to the Main Loop without doing anything. At some later time the Monitor would again notice the Analysis request and would again enter SCANLMSG to service it. This would continue until the Scope had cleared the earlier Analysis request. Once the Scope is ready to accept a new Analysis message, the Monitor places the message address AMSGADDR in the last three bytes of the SCANLREQ buffer and sets the first bit of that buffer to 1 to indicate to the Scope program that there is an active request from the Analysis program [The SCANLREQ buffer is the equivalent to the Scope program as the ANSCPREQ buffer is to the Analysis program, see fig (8)]. The Monitor finally posts the Scope task's ECB. If the Scope task were at this point in the wait state it would immediately become active and eventually discover the Analysis request. The message would be displayed on the screen and the Scope would clear the SCANLREQ buffer to indicate that it had serviced that request from the Analysis program. The Scope program then posts the Monitor ECB. The Monitor notes that the Scope has displayed the Analysis program's message and in turn clears the MNANLREQ table to indicate that the Analysis request has been terminated and the Analysis may now send other requests to the Monitor.

This is a typical example of communication between tasks. All the details of the request have not been explained; however the general order of events is as described.

A list of code numbers used for communication between the Monitor and its subtasks are listed below. The table in which each of these codes could be set up is also indicated.

a. Requests to the Monitor from the Scope task. (set up in MNSCPREQ)

Code	Function
1	Scope ECB to be posted when a request for the Scope is active
2	Send message to the Command task.

b. Requests to the Monitor from the Analysis task. (set up inMNANLREQ)

Code	Function
1	Analysis ECB to be posted when a request for the Analysis is active
2	Request data from the 1800 computer
3	Send a message to be displayed on the scope

c. Requests to the Monitor from the Command task. (set up in MNSCMREQ)

Code	Function
1	Command ECB to be posted when a request for the Command task is active.
2	Attach Scope without interrupts.
3	Attach Scope with interrupts enabled.
4	Enable the interrupts on the scope.
5	Open 1800 Link
6	Send message from the Command tasks to the Scope
7	Detach the Scope task.
8	Close the 1800 Link.
9	Disable the interrupts on the Scope.
10	Attach the Analysis task.
11	Abend the job.
12	Detach the Analysis task.
13	Change the priority of the Analysis task.

d. Requests to the Analysis from the Monitor (set up in ANMONREQ)

These requests can take two forms, either an address can be set up in the last three bytes, or a code number alone may replace the address. The following is the only request from the Monitor to the Analysis task and is set up as a code number in the request buffer.

Code	Function
1	Scope task has abended, last request, if any, was lost.

e. Requests to the Command task from the Monitor (set up in CMMONREQ)
These requests can take two forms, either an address can be set up in the last three bytes, or a code number alone may replace the address. The following is the only request from the Monitor to the Command task and is set up as a code number in the request buffer.

Code	Function
1	Scope task has abended, last request, if any, was lost.

Messages sent to the Scope task are of the format shown in fig. 12. The code number in the message indicates to the Scope task what is requested. A list of these code numbers which arerecognisable to the Scope from the other tasks in the region are shown below. Note that these code number can also beset up directly into the Scope request buffer when no additional information needs to be passed. For example code number 3 which is used to request the interrupts to be enabled can be set up in a message as shown in fig 12. or alternatively it can be placed directly in the Scope request table provided the appropriate flag in the first byte of that request is on.

a. Message codes to the Scope from the Command task.

Code	Function
1	Display the message on the scope.
2	Display a message, allow a message to be returned to the Command task.
3	Allow interrupts to be enabled.
4	Command module now accepting new commands.
5	Disable the interrupts and do not allow them to be enabled.
6	New page for area of screen.
7	Display histgram.

b. Message codes to the Scope from the Analysis task.

Code	Function
1	Display the message on the Scope

Requests from the 1800 computer to the Analysis and the Command tasks (in ANLNKREQ and CMLNKREQ respectively) are always set up in the form of an address which points to the message from the 1800 computer. A 'no-data' message consisting of four bytes of zeros is recognised by the Monitor when the 1800 has no information to send.

Requests to the 1800 from the Monitor are in the from show below. This is similar to the form of messages sent to the Scope, see fig. 12, except that the location byte contains flags.

2	1	1	bytes
LENGTH	CODE	FLGS	
MESSAGE (if any)			

LENGTH Length of message plus header in bytes

CODE Code Number of message, (see below).

FLGS Not yet used.

Currently there are only four messages, each of four bytes, sent to the 1800 computer. These messages have the code numbers shown below.

CODE	REQUEST
1	Send data for the Analysis task
2	Send commands for the command task, if any are available.
3	Send comments etc for the Analysis tasks, if any are available.
4	Link is now open. No reply is expected to this message.

MONITOR REQUEST TABLE

All requests to the Monitor from the subtasks or the 1800 link are placed in this table.

```
          ****************************************
MNSCPREQ  *  SFLAGS              * SMSGCCDE      *
          ****************************************
          *  SMSGADDR    AND SRTNCODE             *
          ****************************************
          *  SPSTRTAD     (POST ECB ADDRESS)      *
          ****************************************
          *  SBITRTAD     (BIT SET ADDRESS)       *
          ****************************************
MNANLREQ  *  AFLAGS              * AMSGCCDE      *
          ****************************************
          *  AMSGADDR    AND ARTNCODE             *
          ****************************************
          *  APSTRTAD     (POST ECB ADDRESS)      *
          ****************************************
          *  SBITRTAD     (BIT SET ADDRESS)       *
          ****************************************
MNLNKREQ  * LFLAGS               *  LMSGCCDE     *
          ****************************************
          * LMSGADDR      OR       LRTNCODE      *
          ****************************************
          * LPSTRTAD     (POST ECB ADDRESS)      *
          ****************************************
          * LBITRTAD     (SET BIT ADDRESS)       *
          ****************************************
MNSCMREQ  * CFLAGS               * CMSGCCDE      *
          ****************************************
          * CMSGADDR       OR     CRTNCODE       *
          ****************************************
          * CPSTRTAD      (POST ECB ADDRESS)     *
          ****************************************
          * CBITRTAD      (SET BIT ADDRESS       *
          ****************************************
```

FIG 5a.

MONITOR REQUEST TABLE

Explanation of the flags and names

MSGCODE A CODE IS PLACED HERE TO INDICATE WHICH SUB ROUTINE IS TO BE BRANCHED TO,IN ORDER TO SATISFY THIS REQUEST

MSGADDR THE ADDRESS OF ANY MESSAGE OR DATA CONECTED WITH THIS REQUEST,OTHERWISE ZERO

RTNCODE RETURN CODE AFTER THE REQUEST HAS BEEN SATISFIED

PSTRTAD ADDRESS OF AN ECB TO BE POSTED WHEN THIS REQUEST SATSFD

BITRTAD ADDRESS OF A BYTE THE FIRST BIT OF WHICH IS SET TO 1 , WHEN THIS REQUEST FINISHED (OR ZERO)

SFLAGS BIT

0	1 SIGNIFIES REQUEST IS ACTIVE,0 MEANS NO REQUEST
1-7	USED BY THE PROGRAM WHOSE CODE NUMBER IS IN MSGCODE,THIS MUST BE ZERO WHEN INITIALISED
8	1 SIGNIFIES AN ECB TO BE POSTED ON RETURN. IF PSTRTAD IS ZERO WHEN THIS BIT IS ON THEN AN ERROR CONDITION RESULTS
9	1 SIGNIFIES A BIT TO BE FLAGED WHEN REQUEST COMPLETED. IF BITRTAD IS ZERO WHEN THIS FLAG IS ON AN ERROR CONDITION WILL RESULT
10-15	NOT USED

AFLAGS BIT

0	1 INDICATES A REQUEST IS ACTIVE,0 MEANS NO REQST
1-7	USED BY THE PROGRAM WHOSE CODE NUMBER IS IN MSGCODE,THIS MUST BE ZERO WHEN INITIALISED
8	1 MEANS AN ECB TO BE POSTED WHEN REQUEST SATISFD IF PSTRTAD ZERO WHEN THIS BIT ON, ERROR RESULTS
9	1 MEANS BIT TO BE FLAGGED ON RETURN. FIRST BIT OF ABITRTAD IS SET TO 1.IF ABITRTAD ZERO WHEN THIS BIT ON THEN ERROR CONDITION RESULTS
10-15	NOT USED

LFLAGS BIT

0	1 INDICATES A REQUEST IS ACTIVE. ZERO MEANS NO REQUEST
1-7	USED BY THE PROGRAM WHOSE CODE NUMBER IS IN MSGCODE,THIS MUST BE ZERO WHEN INITIALISED
8-15	NOT USED

CFLAGS BIT

0	1 SIGNIFIES REQUEST IS ACTIVE,0 MEANS NO REQUEST
1-7	USED BY THE PROGRAM WHOSE CODE NUMBER IS IN MSGCODE,THIS MUST BE ZERO WHEN INITIALISED
8	1 SIGNIFIES AN ECB TO BE POSTED ON RETURN. PSTRTAD MUST NOT BE ZERO WHEN THIS BIT IS ON
9	1 MEANS BIT TO BE FLAGGED ON RETURN.FIRST BIT OF THIS ADDRESS IS SET TO 1
10-15	NOT USED

FIG 5b.

MONITOR ANALYSIS REQUEST TABLE (MNANLREQ)

Requests from the Analysis program to the Monitor are placed in this table.

```
*                 ***********************************                  *
*      MNANLREQ   *  AFLAGS            * AMSGCODE          *            *
*                 ***********************************                  *
*                 *  AMSGADDR    AND ARTNCODE             *            *
*                 ***********************************                  *
*                 *  APSTRTAD     (POST ECB ADDRESS)      *            *
*                 ***********************************                  *
*                 *  SBITRTAD     (BIT SET ADDRESS)       *            *
*                 ***********************************                  *

*        AFLAGS BIT                                                     *
*                 0     1 INDICATES A REQUEST IS ACTIVE,0 MEANS NO REQST*
*                1-7    USED BY THE PROGRAM WHOSE CODE NUMBER IS IN     *
*                       MSGCODE,THIS MUST BE ZERO WHEN INITIALISED      *
*                 8     1 MEANS AN ECB TO BE POSTED WHEN REQUEST SATISED*
*                       IF PSTRTAD ZERO WHEN THIS BIT ON, ERROR RESULTS *
*                 9     1 MEANS BIT TO BE FLAGGED ON RETURN. FIRST BIT  *
*                       OF ABITRTAD IS SET TO 1.IF ABITRTAD ZERO WHEN   *
*                       THIS BIT ON THEN ERROR CONDITION RESULTS        *
*               10-15   NOT USED                                        *

*                                                                       *
*      MSGCODE   A CODE IS PLACED HERE TO INDICATE WHICH SUB ROUTINE IS *
*                TO BE BRANCHED TO,IN ORDER TO SATISFY THIS REQUEST     *
*      MSGADDR   THE ADDRESS OF ANY MESSAGE OR DATA CONECTED WITH THIS  *
*                REQUEST,OTHERWISE ZERO                                 *
*      RTNCODE   RETURN CODE AFTER THE REQUEST HAS BEEN SATISFIED       *
*      PSTRTAD   ADDRESS OF AN ECB TO BE POSTED WHEN THIS REQUEST SATSED*
*      BITRTAD   ADDRESS OF A BYTE THE FIRST BIT OF WHICH IS SET TO 1 , *
*                WHEN THIS REQUEST FINISHED (OR ZERO)                   *
```

FIG 6

ANALYSIS REQUEST TABLE (ANREQTBL)

Requests for the analysis program from any of the other programs in the region or from the Monitor are placed in this table.

```
*                                                                          *
*                                                                          *
*            ANREQTBL 4F      REQUESTS FOR THE ANALYSIS PROGRAM ARE       *
*            ********         PLACED IN THIS TABLE                        *
*            ****************************************                      *
*   ANLNKREQ *ANLNKFLG * ADDRESS OF LINK  MESSAGE     *                    *
*            ****************************************                      *
*   ANSCPREQ *ANSCPFLG * ADDRESS OF SCOPE MESSAGE     *                    *
*            ****************************************                      *
*   ANMONREQ *ANMONFLG * ADDRESS OF MONITOR MESSAGE   *                    *
*            ****************************************                      *
*   ANSCMREQ *ANSCMFLG *ADDRESS OF SCOP COMMAND MSG   *                    *
*            ****************************************                      *
*      BYTES 0          1          2          3                            *
*                                                                          *
```

ANLNKFLG BIT

0	A 1 indicates a request active, zero indicates no active request.
1	1 indicates a code number in the last half of the word 0 indicates there is a message address in the last three bytes of the word
2-7	Not used

SCANLFLG BIT

0	A 1 indicates a request active, zero indicates no request active
1	1 indicates a code number in the last half of this word 0 indicates a message address in last three bytes.
2-7	Not used

SCMONFLG BIT

0	A 1 indicates a request active, zero indicates no request
1	1 indicates a code number in the last half of the word 0 indicates that the last three bytes contain a message address.
2-7	Not used

SCSCMFLG Same as above.

FIG 7

SCOPE REQUEST TABLE

All requests for the Scope task are placed here by the Monitor.

```
         SCREQTBL  4F   SCOPE REQUESTS ARE PLACED HERE
         ********
         ****************************************
SCLNKREQ *SCLNKFLG *ADDRESS OF LINK MESSAGE      *
         ****************************************
SCANLREQ *SCANLFLG *ADDRESS OF ANALYSIS MESSAGE  *
         ****************************************
SCMONREQ *SCMONFLG *ADDRESS OF MONITOR MESSAGE   *
         ****************************************
SCSCMREQ *SCSCMFLG *ADDRESS OF SCOP COMMAND MSG  *
         ****************************************
   BYTES 0          1          2          3

SCLNKFLG  BIT
           0      01 INDICATES A REQUEST ACTIVE
                  00 INDICATES  NO REQUEST
           1      1 INDICATES A CODE IN THE LAST HALF OF WORD
                  0 INDICATES AN ADDRESS OF MESSAGE IN THIS WORD
          2-7     NOT USED
SCANLFLG  BIT
           0      01 INDICATES A REQUEST ACTIVE
                  00 INDICATES NO REQUEST
           1      1 INDICATES A CODE IN THE LAST HALF OF WORD
                  0 INDICATES AN ADDRESS OF MESSAGE IN THIS WORD
          2-7     NOT USED

SCMONFLG  BIT
           0      01 INDICATES A REQUEST ACTIVE
                  00 INDICATES NO REQUEST
           1      1 INDICATES A CODE IN THE LAST HALF OF WORD
                  0 INDICATES AN ADDRESS OF MESSAGE IN THIS WORD
          2-7     NOT USED
SCSCMFLG  BIT
           0      1 INDICATES A REQUEST ACTIVE, 0 MEANS NO REQUEST
           1      1 INDICATES A CODE IN THE LAST HALF OF WORD
                  0 INDICATES AN ADDRESS OF MESSAGE IN THIS WORD
          2-7     NOT USED
```

FIG 8.

Abnormal Termination

If the O.S. system 360 discovers an error in the Monitor task or the Monitor discovers an error in itself, the Monitor task will be abnormally terminated. When this happens all subtasks are also abnormally terminated and both the 1800 Link and the 2250 Scope are closed. In effect a disaster has occurred, at least as far as Midas-3 is concerned. It is therefore an essential part of the Monitor design that it should be extremely reliable. However, errors do occur in even the most carefully debugged programs. For this reason this section is included as an attempt to aid the unfortunate programmer in his or her search for the offending piece of code.

If the system discovers that the Monitor has an error then the termination code will be a system number and the dump has to be solved with the aid of "Messages and Completion Codes" and faith. [see your friendly Customer Engineer if the error persists].

If the Monitor discovers the problem itself then there is more hope. The following table contains a list of Monitor Termination Codes and the control sections in which they occur.

CODE	CSECT	Description of CSECT
3333	MONIT	Main Monitor Program
1111	ATTNHAND	1800 Link Attention Handler
2222	APENDAGE	1800 Link EOP Appendage
4444	ANLSEXIT	Analysis Task Exit Routine
5555	SCMMEXIT	Command Task Exit Routine.

User code 3333 will occur if an error is detected anywhere in the main Monitor code. Code 1111 occurs only in the attention handler for the 1800 Link. Code 2222 occurs only in the 1800 Link EOP Appendage exit. Code 4444 occurs in the Analysis exit routine. This routine obtains control when the Analysis task terminates abnormally. Currently there is no attempt to re-attach the task; the Monitor just abends. Code 5555 occurs in the Command task exit routine. This routine obtains control when the Command task terminates abnormally; the Monitor makes no attempt to recover but merely abends with the code shown.

For all of the above termination codes the exact address where the error was discovered is saved in the Monitor Work Area location called

ERORCODE before the ABEND was issued. This can easily be doscovered in the dump as it is preceeded by the characters "MONITOR ABEND ERROR ADDRESS". The address given in ERORCODE is the address of the code immediately following the point where the error was discovered. By using the linkage editor map to determine what part of the code this is,the source of the problem will become clear by reference to the comments in the code at that point.

In case of either the Analysis or Command tasks abnormally terminating, the Monitor makes no attempt to recover but terminates with a dump. The problem must then be solved by examining the subtask itself and solving the problem which caused it to terminate.

In case of the Scope task terminating, the Scope Exit Routine sets a flag to indicate the Scope task has abended and returns without abending the Monitor. When the Monitor enters the Main Loop it will test that flag and discover that the Scope has abended. Control will then pass to the Scope Recovery Routine which will attempt to clear all the necessary buffers, re-attach the Scope task and inform the other tasks in the region.

INITIALISATION

ENTRY POINT	MONIT
CSECT	MONIT
INPUT PARAMETERS	none
OUTPUT PARAMETERS	none
RETURN CODE	none
LOWER LEVEL ROUTINES	none
EXIT	MAINLOOP

FUNCTIONS

This routine will initialise some flags, issue the IDENTIFY instructions, if necessary for the subtasks, and attach the Command task. Control then passes to the Main Loop.

MAIN LOOP

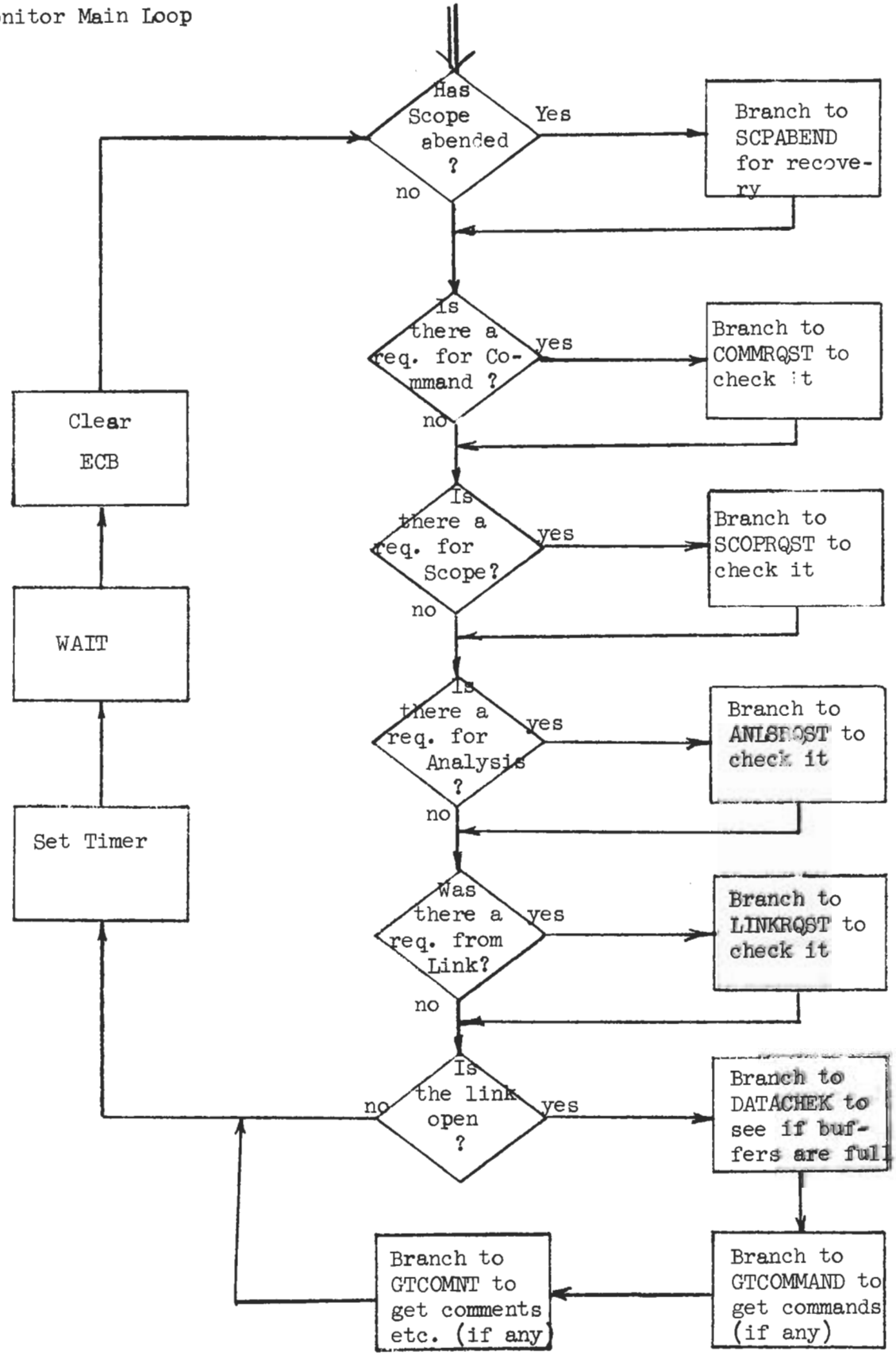
ENTRY POINT	MOMAINLP
CSECT	MONIT
INPUT PARAMETERS	none
OUTPUT PARAMETERS	none
RETURN CODE	none
LOWER LEVEL ROUTINES	SCPABEND COMMRQST SCOPRQST ANLSRQST LINKRQST DATACHEK
EXIT	none

FUNCTIONS

This routine cycles a loop checking for requests and if there are none it becomes inactive after setting a timer. The first thing this routine does on becoming active is to clear its own ECB before entering the loop again. The order of events inside the loop is as follows: first check if the Scope task has abended; if yes, branch to the Scope recovery program; next check if there is a Command request, Scope request, Analysis request or unsolicited link request in turn. If there is, then it branches to the respective routine to check that request; then to a lower level routine to service it, finally returning by the same path to the Main Loop. Before setting the timer, a test is made to determine if the 1800 Link is open, and if it is, whether the data buffers are full, and whether Command, comments, DMV's, etc. should be requested from the 1800 computer. Finally a timer (ten seconds current value) is set and the Monitor enters a wait state.

MOMAINLP

Monitor Main Loop



CHECK TASK REQUEST

ENTRY POINT	COMMRQST, SCOPRQST, ANLSRQST
CSECT	MONIT
INPUT PARAMETERS	none
OUTPUT PARAMETERS	none
RETURN CODE	none

LOWER LEVEL ROUTINES

Command	Scope	Analysis
CMECBAD	SCPECBAD	ANLECBAD
SCATCHNN	SCTOCMSG	LKDATAR
SCATCHEN		
ENBLINTS		
OPENLINK		
SCPCMMSG		
SCDETACH (dummy)		
CLOSLINK (dummy)		
DISABLNT (dummy)		
ATACHANL		
COMABEND		
DTACHANL		

EXIT — To Main Loop

FUNCTIONS

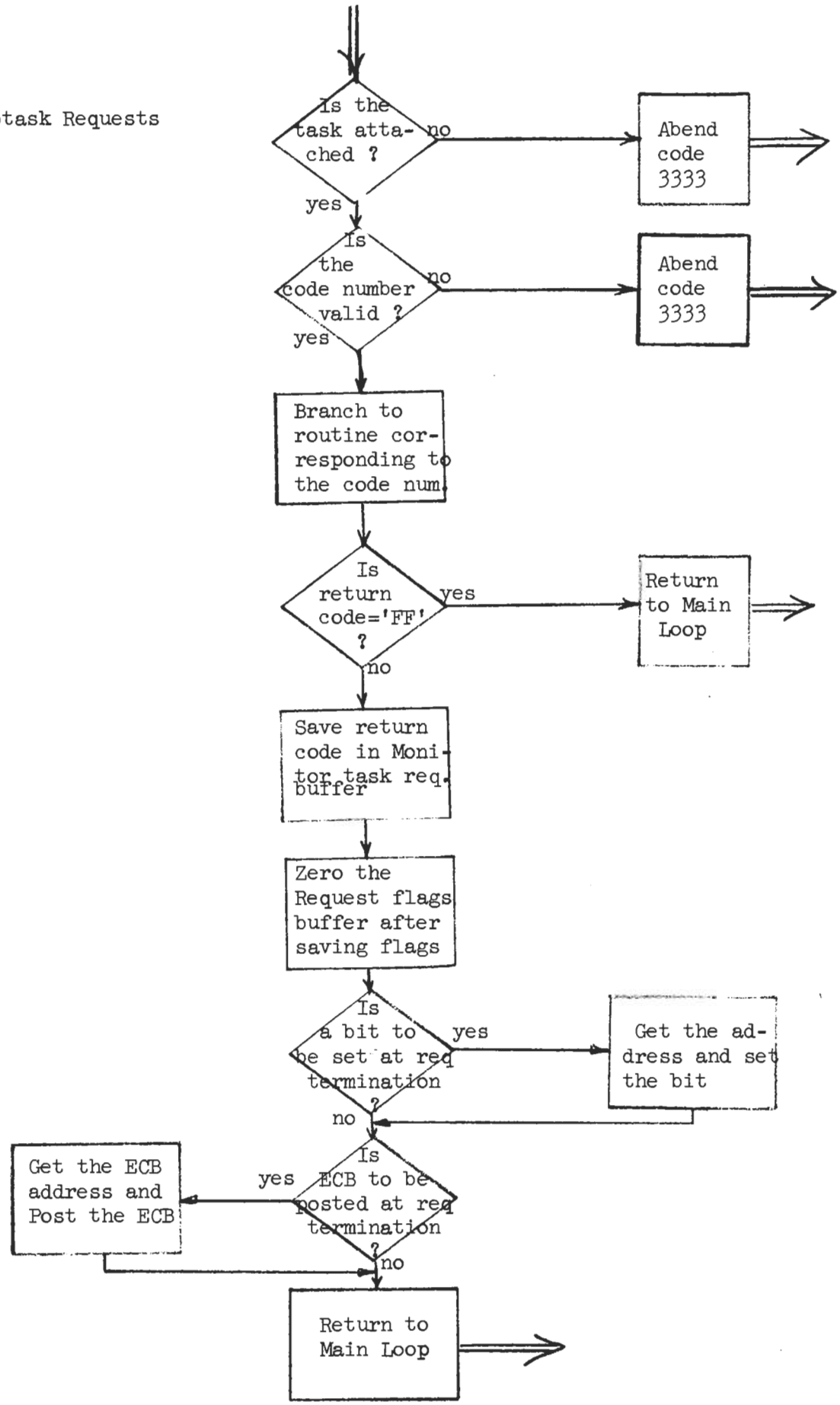
The function of these routines is to check that a request has a valid code number and branch to the routine corresponding to that code number. On return this routine checks whether the request was completed, and if it was not (i.e. return code was hex FF=TRYLATER) this routine simply returns to the Main Loop. If the request was completed (i.e. any return code except hex FF) then the Request buffer is cleared, and if any flag is to be set or ECB posted to signal the request terminated, it is done at this stage, The routine finally returns to the Main Loop.

COMMRQST

SCOPRQST

ANLSRQST

Check Subtask Requests



DATA CHECK ROUTINE

ENTRY POINT	DATACHEK
CSECT	MONIT
INPUT PARAMETERS	none
OUTPUT PARAMETERS	none
RETURN CODE	none
LOWER LEVEL ROUTINES	SNDLNKMS
EXIT	To Main Loop

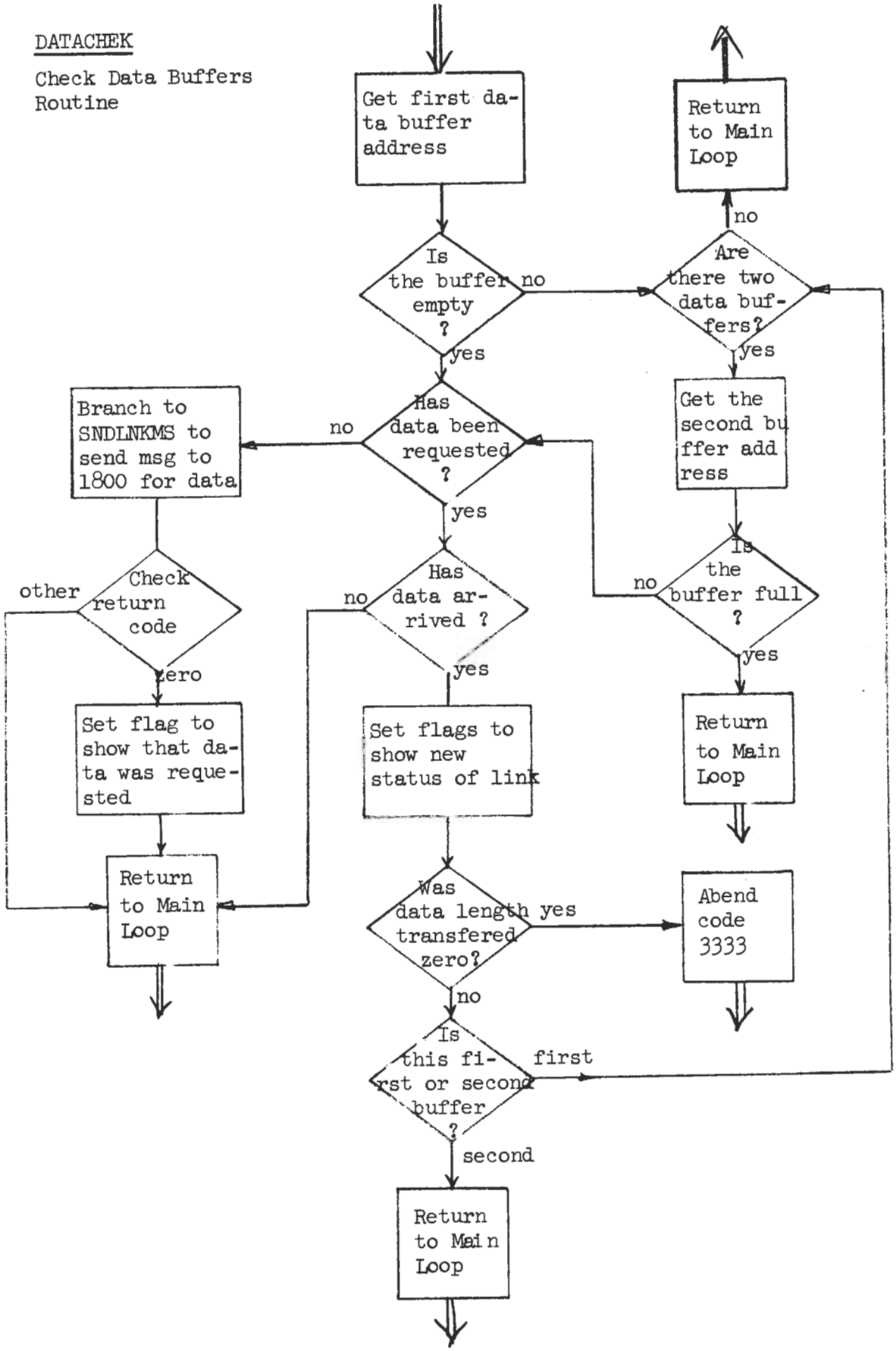
FUNCTIONS

This routine checks the first data buffer to see if it is empty. Provided that a message has not already been sent, a request is made to the 1800 for more data and control is returned to the Main Loop. If the message has already been sent, then a check is made to see whether it has arrived. If it has not, then control is again returned to the Main Loop, but if it has arrived then the buffer flag is switched on to show the buffer is full.

When the first buffer is full, either if it if found full originally or the data has arrived and the buffer is just marked as full, a check is made on the second buffer if there is one. The same procedure for requesting data for the second buffer, if necessary, as for the first is then followed.

DATACHEK

Check Data Buffers Routine



GET COMMAND ROUTINE

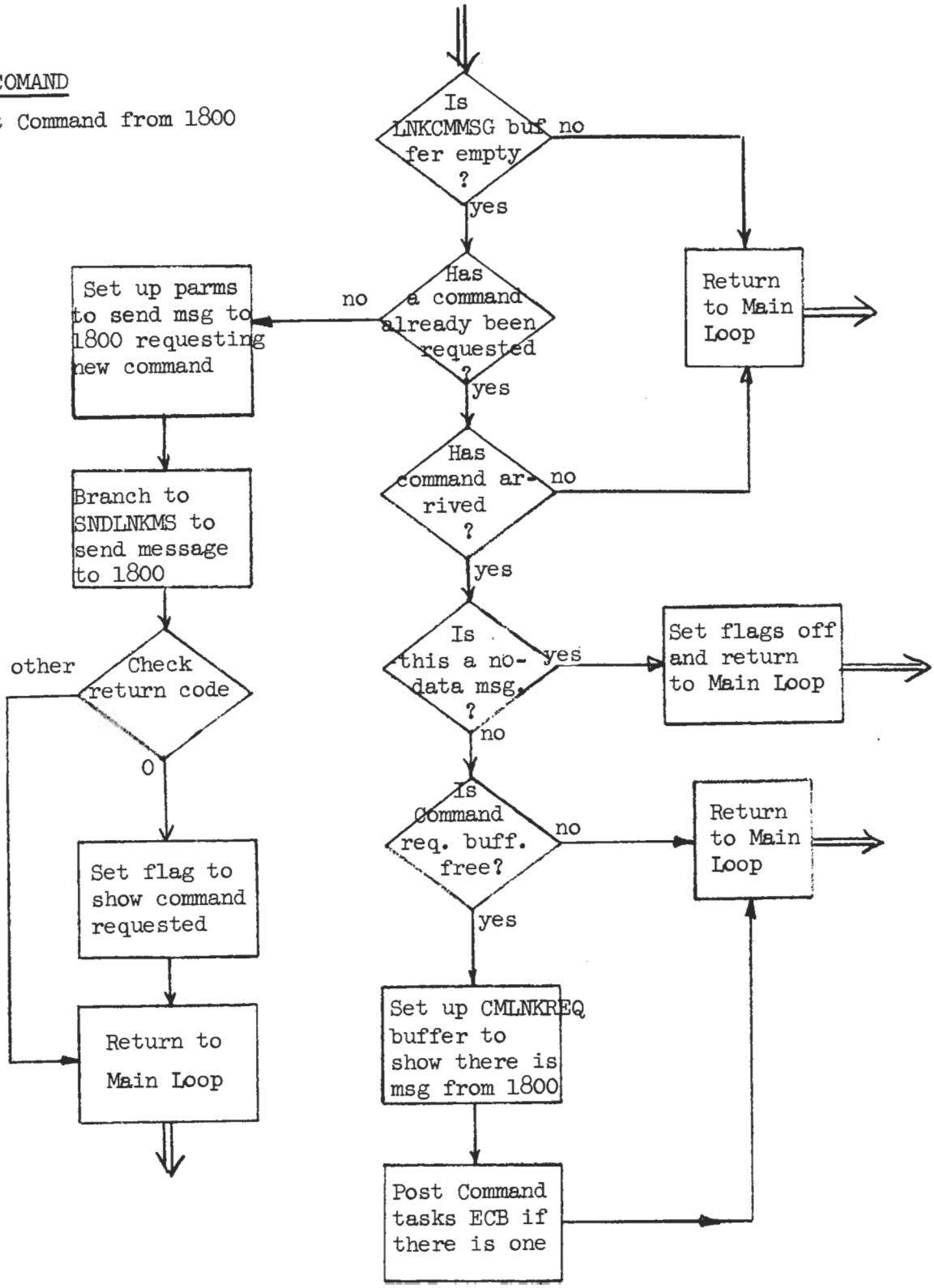
ENTRY POINT	GTCOMAND
CSECT	MONIT
INPUT PARAMETERS	none
OUTPUT PARAMETERS	none
RETURN CODE	none
LOWER LEVEL ROUTINES	SNDLNKMS
EXIT	To Main Loop

FUNCTIONS

The purpose of this routine is to request and ensure the smooth flow of commands from the 1800 computer to the Command task in the M91. Commands from the 1800 computer when they arrive are placed in a buffer called LNKCMMSG. This is a 256 byte buffer consisting of a four byte header and 252 bytes for the Command itself. When commands arrive from the 1800, an attempt is made to inform the Command task that there is a command in that buffer. If the Command task has not serviced the earlier command then the routine returns to the Main Loop and attempts to send the new command at a later time.

GTCOMAND

Get Command from 1800



SCOPE RECOVERY PROGRAM

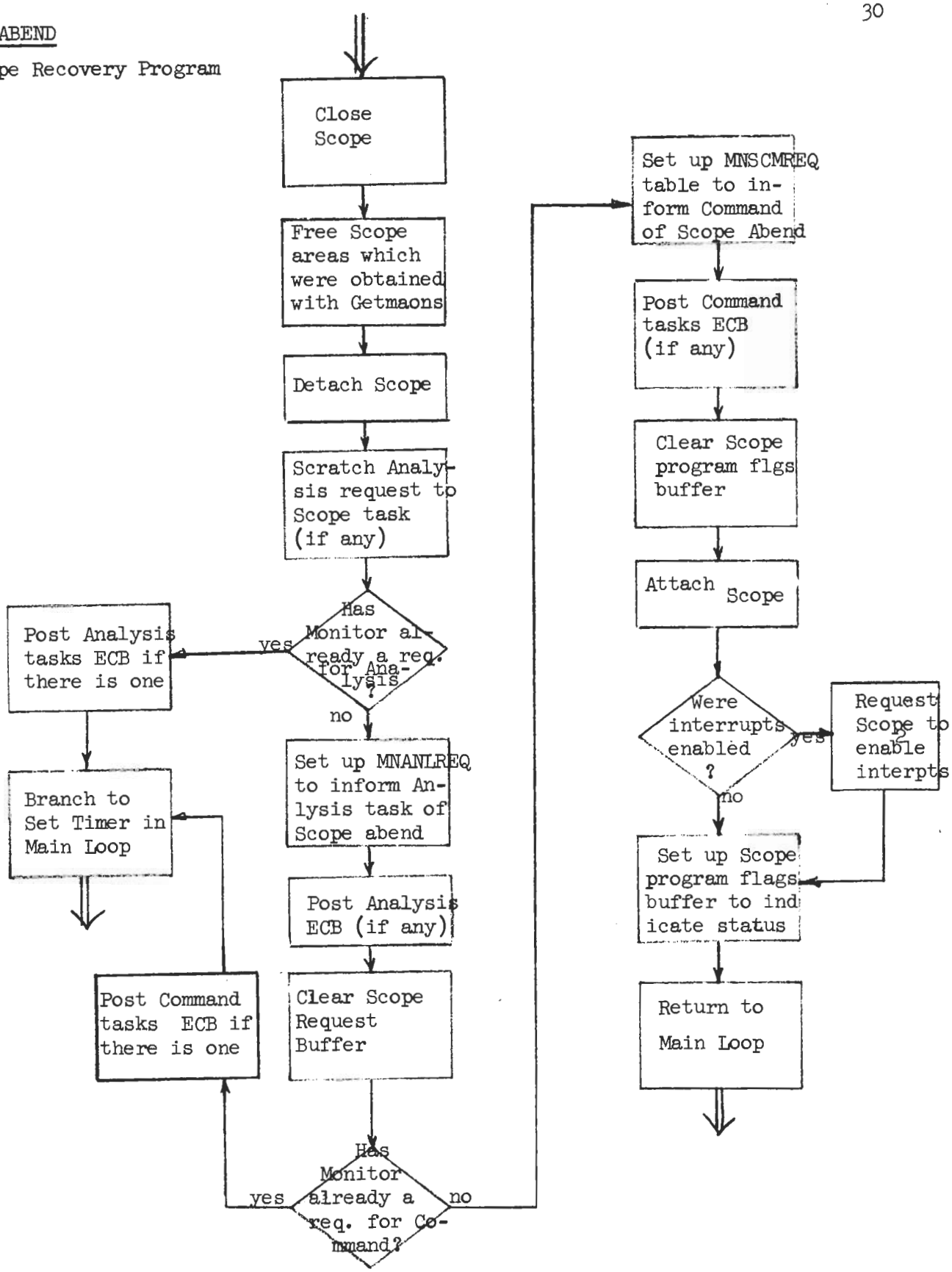
ENTRY POINT	SCPABEND
CSECT	MONIT
INPUT PARAMETERS	none
OUTPUT PARAMETERS	none
RETURN CODE	none
LOWER LEVEL ROUTINES	none
EXIT	To Main LoOp

FUNCTIONS

This program makes an attempt to re-attach the Scope task after it has abnormally terminated. The first thing it does is to close the scope, freemain those areas which have been GETMAINED by the Scope task, and detach the Scope task. The address of the DCB and the areas to freemain were passed back to the Monitor by the Scope when it was last attached. Both the Analysis task and the Command task must then be informed that the Scope has abnormally terminated before the Monitor can do anything else. Finally the Scope's request buffers are cleared, the scope is attached again, and the interrupts enabled, if that was their state before the Scope task abended. This routine then exits to the Monitor Main Loop.

SCPABEND

Scope Recovery Program



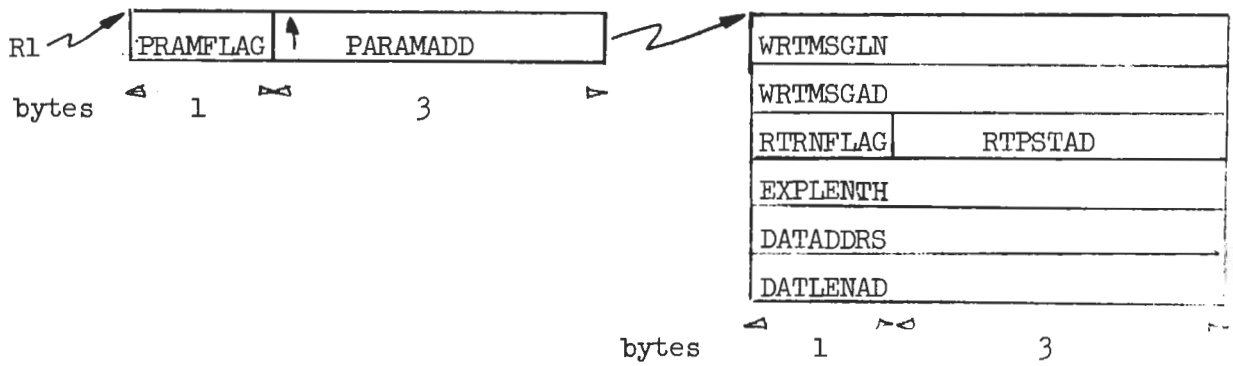
SEND LINK MESSAGE

ENTRY POINT — SNDLNKMS

CSECT — MONIT

INPUT PARAMETERS — R1 points to a parameter address

R14 contains the return address



PRAMFLAG	BIT	
	0	1 indicates a reply is expected and therefore parameter list is six words 0 indicates no reply therefore only two parms
	1-7	not used
PARAMADD		address of the parameters passed
WRTMSGLN		length of msg to be sent
WRTMSGAD		address of msg to be sent
RTRNFLAG	BIT	
	0,1	not used
	2	1 means rtpstad the address of a flag to be set. The last bit of the byte given by rtpstad will be set to one when reply is obtained 0 means an ecg at rtpstad will be posted
	3,7	not used

RTPSTAD	address to be flagged or posted when reply is obtained
EXPLENTH	length of data expected
DATADDRS	address of data buffer
DATLENAD	address where actual length of data received to be saved or zero if it is not required

OUTPUT PARAMETERS none

RETURN CODE R15 will contain one of the following return codes

0	message was sent and reply (if any) is expected
4	link busy

LOWER LEVEL ROUTINES none

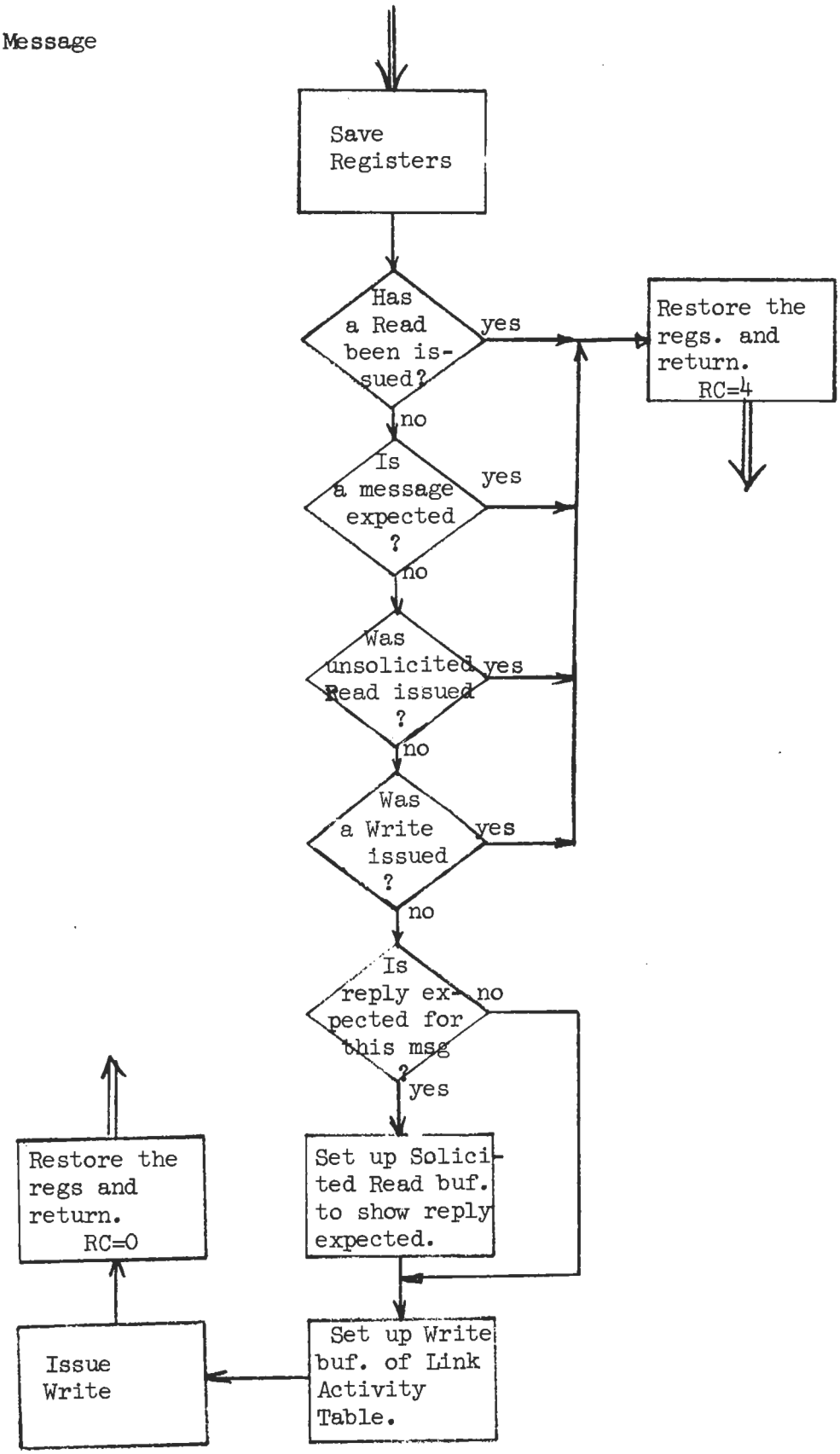
EXIT On register 14

FUNCTIONS

This routine checks whether the link is busy; if it is, it returns with code 4 in register 15. If the link is not busy, then a check is made on the input parameters to determine if a reply is expected. If it is, the Solicited Read buffer is prepared to indicate that fact. The Write buffer is then set up and the Write macro is issued. The routine then exits with a return code of zero.

SNDLNKMS

Send Link Message



ATTENTION HANDLER

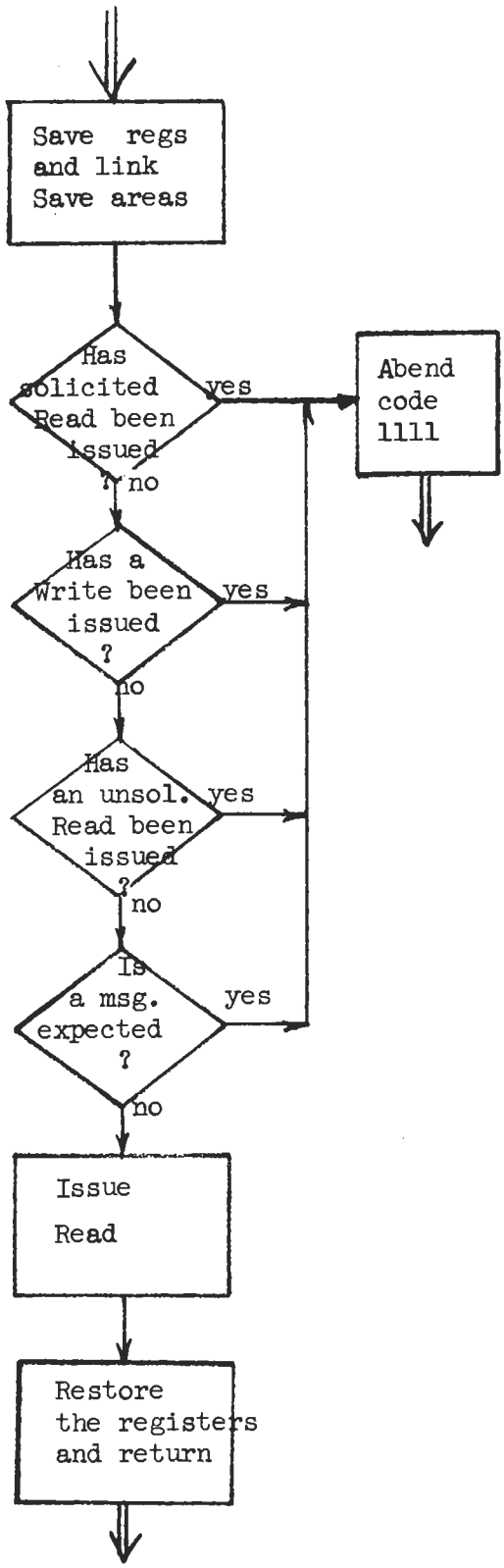
ENTRY POINT	ATTNHAND
CSECT	ATTNHAND
INPUT PARAMETERS	none
OUTPUT PARAMETERS	none
RETURN CODE	none
LOWER LEVEL ROUTINES	none
EXIT	On Register 14

FUNCTIONS

This routine checks whether the Link Activity Table indicates any READ or WRITE macros to have been issued without having terminated. It also checks that this attention occurred when a message from the 1800 is expected. If the table is in order and the message is expected, a READ is issued and this routine exits on Register 14.

ATTNHAND

Link Attention Handler



EOP APPENDAGE

ENTRY POINT	APENDAGE
CSECT	APENDAGE
INPUT PARAMETERS	none
OUTPUT PARAMETERS	none
RETURN CODE	none
LOWER LEVEL ROUTINES	none
EXIT	On Register 14

FUNCTION

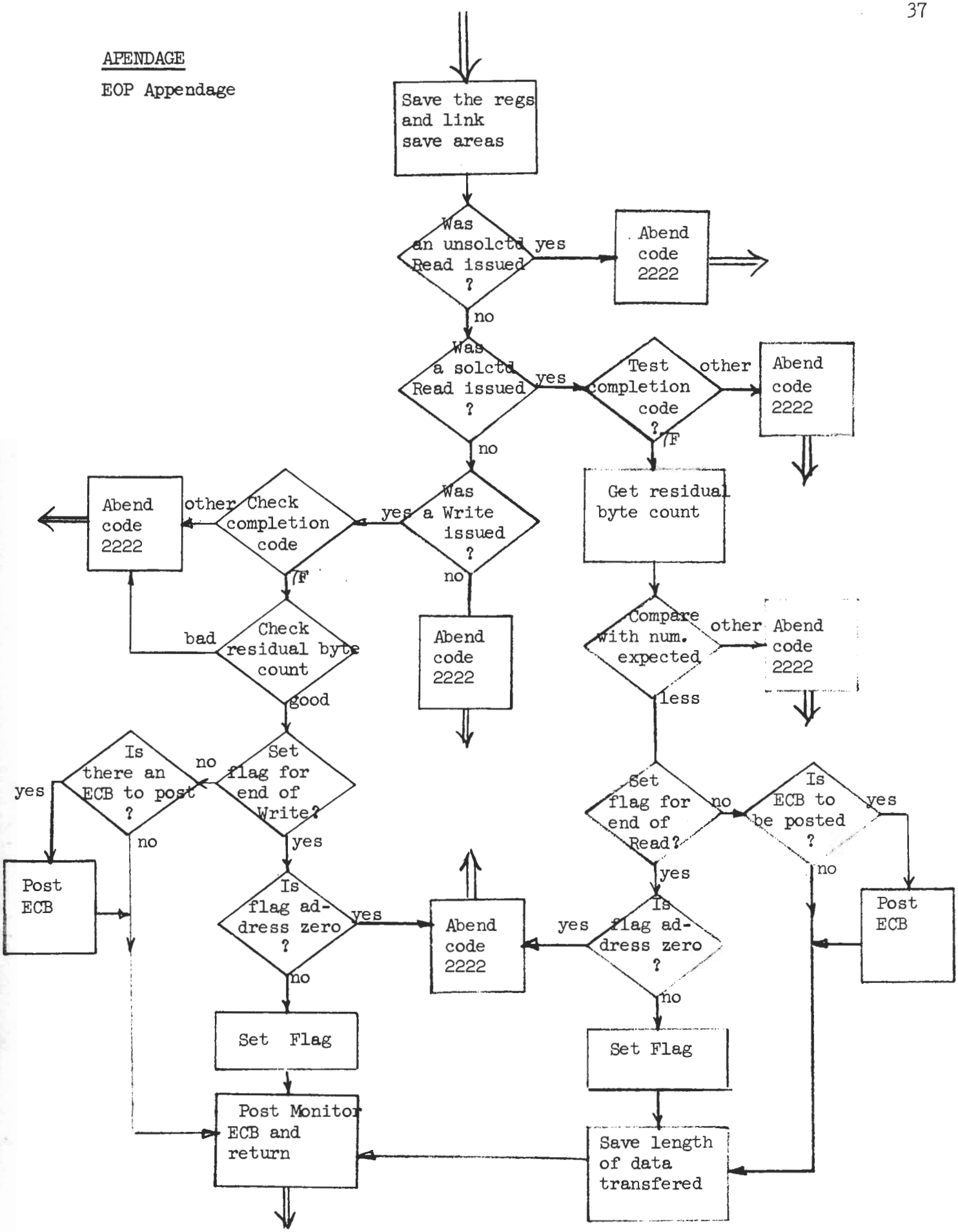
The E.O.P. Appendage Routine checks the completion of passing data across the link. The flags in the Link Activity Table indicate the type of activity in the link and inform the E.O.P. Appendage what to do about it.

A test is first made to determine whether a read or a write was issued. If a read was issued, i.e., this is the end of data transfer to the M91 from the 1800, the completion code is checked; if it is not 7F the Monitor abends. The residual byte count is checked to see that the data transferred is not more than the maximum expected. This routine then checks the Link Activity Table to determine if a flag is to be set or an ECB posted to signal the completion of the data transfer and performs whichever is necessary. Finally the Monitor Main ECB is posted and this routine exits.

The procedure is exactly the same at termination of a "Write" except that the length of data transferred must be exactly equal to that length issued with the write.

APENDAGE

EOP Appendage



EXIT FOR MAIN LOOP TIMER

ENTRY POINT	MTIMERXT
CSECT	MTIMERXT
INPUT PARAMETERS	none
OUTPUT PARAMETERS	none
RETURN CODE	none
LOWER LEVEL ROUTINES	none
EXIT	On Register 14

FUNCTION

Post Monitor main ECB.

ANALYSIS EXIT ROUTINE

ENTRY POINT	ANLSEXIT
CSECT	ANLSEXIT
INPUT PARAMETERS	none
OUTPUT PARAMETERS	none
RETURN CODE	none
LOWER LEVEL ROUTINES	none
EXIT	On Register 14.

FUNCTION

Abend Job with User Code 4444. This routine gets executed when the Analysis task terminates.

SCOPE EXIT ROUTINE

ENTRY POINT	SCOPEXIT
CSECT	SCOPEXIT
INPUT PARAMETERS	none
OUTPUT PARAMETERS	none
RETURN CODE	none
LOWER LEVEL ROUTINES	none
EXIT	On Register 14

FUNCTIONS

This routine gets executed when the Scope task terminates. It sets a flag in the Scope Program Table to indicate that the Scope has terminated. (That flag gets checked in the Monitor Main Loop) The program then exits.

COMMAND EXIT ROUTINE

ENTRY POINT	SCMMEXIT
CSECT	SCMMEXIT
INPUT PARAMETERS	none
OUTPUT PARAMETERS	none
RETURN CODE	none
LOWER LEVEL ROUTINES	none
EXIT	On Register 14

FUNCTIONS

Abend job with user code 5555. This routine gets executed when the Command task terminates.

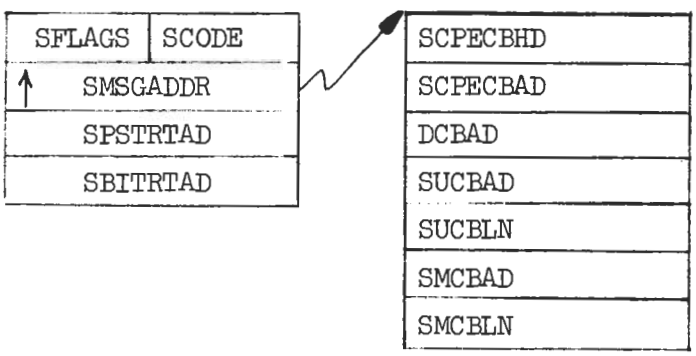
NOTE SCOPE REQUEST ECB

ENTRY POINT — SCPECBAD

CSECT — MONIT

INPUT PARAMETERS — The message address in the Monitor Scope request table points to a parameter list.

MNSCPREQ



SFLAGS	Request flags see fig (5b)
SCODE	Must be value 1
SMSGADDR	Address of parameter list
SCPECBHD	Header of parameter list
bytes	
0-1	length of list including header in bytes
2-3	not used.
SCPECBAD	The address of the Scope ECB
DCBAD	The address of the Scope DCB
SUCBAD	Address of SUCB table
SUCBLN	The address of the SUCB table
SMCBAD	Address of the SMCB table
SMCBLN	Length of the SMCB table

OUTPUT PARAMETERS — none

RETURN CODE — A return code is placed in Register 1

0 The parameters were saved.

EXIT On register 14.

FUNCTIONS

This routine saves the ECB address (second parameter)in the Scope Program Flags table. If the header indicates that the length of the message is greater than 8, then the remaining five parameters are saved in the Scope Program flags table. The routine then exits. This ECB address which is passed to the Monitor is the ECB on which the Scope task waits when it has nothing to do. When the Monitor has a request for the Scope task this ECB gets posted causing the Scope task to become active immediately and service that request.

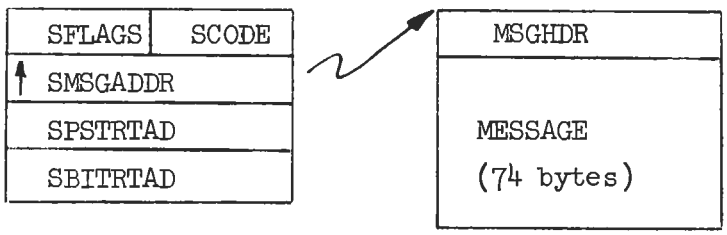
PASS SCOPE MESSAGE TO COMMAND TASK

ENTRY POINT — SCTOCMSG

CSECT — MONIT

INPUT PARAMETERS — The message address in the Monitor Scope request table points to the message to be passed to the command task.

MNSCPREQ



SFLAGS	Request flags see fig (5b)
SCODE	Must be value 2
SMSGADDR	Message address
MSG HDR bytes 0-1	Length of message including header (value 78)
2-3	not used
MESSAGE	User message

OUTPUT PARAMETERS — The Command Request buffer (CMSCPREQ) is set up to show this request from the Scope.

CMSCPREQ

FLAGS	flags see fig (7) for Analysis request table equivalent (ANSCPREQ)
Bit 0	set to 1 to indicate a request.
1-7	not used
A(MSGHDR)	Address of MSGHDR

RETURN CODE	In Register 1
	0 Message was sent
	FF Message could not yet be sent
EXIT	On Register 14

FUNCTIONS

The function of this routine is to inform the Command task that there is a message from the Scope task. It does this by setting up the Command Scope request buffer as shown above. It then posts the Command modules ECB to inform it that there is a request, and exits.

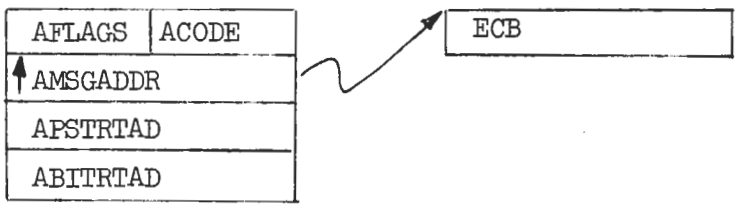
NOTE ANALYSIS REQUEST ECB

ENTRY POINT — ANLECBAD

CSECT — MONIT

INPUT PARAMETERS — The message address in the Monitor Scope request table points to the Analysis tasks ECB

MNANLREQ



AFLAGS	Request flags see fig (7)
ACODE	Must contain a value of 1
SMSGADDR	Contains address of Analysis Task's ECB

OUTPUT PARAMETERS — none

RETURN CODE — In Register 1

0 The request was completed.

EXIT — On Register 14

FUNCTIONS

This routine stores the address of the Analysis program's ECB in ANLPSTAD which is in the Program Flags Buffer for the Analysis program. It then exits with a return code of zero.

This ECB is the ECB on which the analysis program will wait when it has nothing to do. When the Monitor has a request for the Analysis program, this ECB will be posted causing the Analysis program to become active.

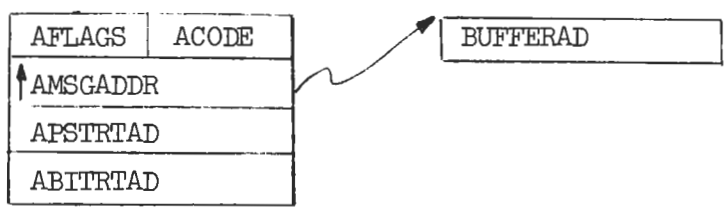
ANALYSIS DATA REQUEST

ENTRY POINT LKDATAR

CSECT MONIT

INPUT PARAMETERS This routine is entered as a result of the code number in the MNANLREQ table and uses some information from this table

MNANLREQ



AFLAGS	see fig (5b)
ACODE	Must have a value of 2
AMSGADDR	This must contain the address of a location where the address of the full buffer is to be placed
BUFFERAD	The address of the full buffer will be placed here

OUTPUT PARAMETERS The address of the full buffer is placed in BUFFERAD as shown above

RETURN CODE In Register 1

0 The request was completed

FF There are not yet any full buffers

EXIT On Register 14

FUNCTIONS

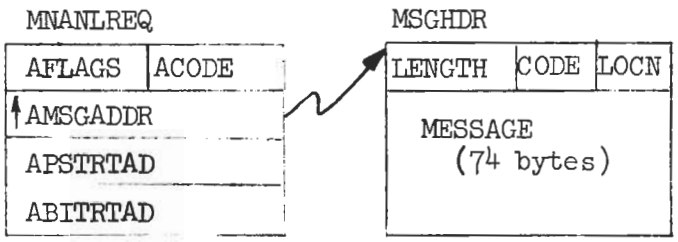
This routine searches the data buffers to see if there are any' full ones. If there is a full one it places the address in BUFFERAD and returns with a RC of zero. If there are no full buffers, the routine returns with a code of FF to try later.

SEND ANALYSIS MESSAGE TO SCOPE

ENTRY POINT — SCANLMSG

CSECT — MONIT

INPUT PARAMETERS — This routine uses the information in the Monitor Analysis request buffer (MNANLREQ).



AFLAGS BIT (2 bytes)

0 — 1 indicates an active request, 0 means no request used by SCANLMSG and valid only when bit 0 is on

Bit 1 — 1 indicates a msg sent to scope but not yet displayed. When scope has cleared request buffer, message has been displayed.

2-7 — not used

8 — 1 signifies an ECB to be posted on return. If PSTRTAD is zero when this bit is on then an error condition results

9 — 1 signifies a bit to be flagged when request completed. If BITRTAD is zero when this flag is on an error condition will result.

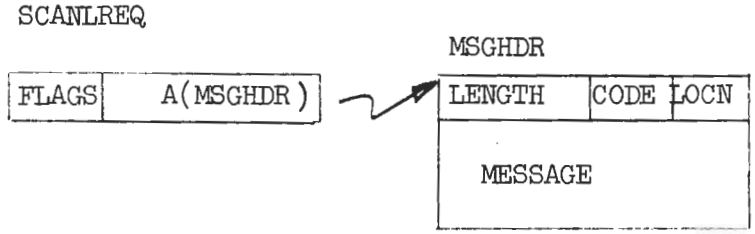
10-15 — not used

ACODE	Must have a value of 3
AMSGADDR	Points to the message
MSGHDR	Message header
LENGTH	Length of message plus header in bytes, currently must have a value of 78
CODE	Value of 1 recognised by the Scope program as a request to display the message
LOCN	Values of 1 through 4 indicate to the Scope where the message is to be displayed. Currently a value of 1 only accepted.in the Analysis message request
MESSAGE	The message to be displayed

OUTPUT PARAMETERS

The Scope Analysis request buffer (SCANLREQ) is set up to show the Scope task that there is a request from the Analysis task

SCANLREQ



FLAGS

bit 0	set to 1 to indicate an active request
1-7	not used

RETURN CODE

In Register 1

0 Indicates that the message was displayed and request finished

FF Indicates that either SCANLREQ was already full or that the request was set up as shown and has not been displayed

EXIT On Register 14

FUNCTIONS

This routine attempts to set up the SCANLREQ buffer as shown above. If the buffer is already busy it returns with code FF to try later. If the buffer is not busy it sets up the SCANLREQ buffer, and sets a flag in AFLAGS to indicate that the message was sent. The routine then exits with a return code of FF. At a later time this routine will again be entered and if SCANLREQ has been cleared, i.e. the message has been displayed, this routine exits with return code of zero indicating that the request has been finished and MNANLREQ can be cleared.

NOTE COMMAND REQUEST ECB

ENTRY POINT — CMMECBAD

CSECT — MONIT

INPUT PARAMETERS — The Monitor Command Request table contains the information this routine uses.

MNSCMREQ

CFLAGS	CCODE
CMSGADDR	
CPSTRTAD	
CBITRTAD	

CFLAGS	See fig (5b)
CCODE	Must have value 1 for this routine to be executed
CMSGADDR	Must contain the address of the Command task's ECB.

OUTPUT PARAMETERS — none

RETURN CODE — In Register 1

0 The ECB address has been saved.

EXIT — On Register 14

FUNCTION

This routine saves the address of the Command task's ECB in the Command task's program flags buffer. If there is a value there already it is overwritten. The routine then exits with a return code of zero.

ATTACH SCOPE WITHOUT INTERRUPTS

ENTRY POINT — SCATCHNN

CSECT — MONIT

INPUT PARAMETERS — The code number in MNSCMREQ causes this routine to be executed; not other parameters in that request buffer are needed but it is described here for the sake of completeness.

MNSCMREQ

CFLAGS	CCODE
CMSGADDR	
CPSTRTAD	
CBITRTAD	

CFLAGS — See fig (5b)
CCODE — Must have a value of 2
CMSGADDR — Not used.

OUTPUT PARAMETERS — none

RETURN CODE — On return R1 will contain one of the following codes:

0 - scope was attached
1 - scope is already attached with interrupts not enabled
2 - scope is already attached with interrupts enabled.

EXIT — On Register 14

FUNCTIONS

This routine checks whether the Scope task is already attached. If it isn't, it attaches it and sets up the flags in the Scope program flags to indicate this fact. The routine then returns with a return code of zero. If the Scope task is already attached then a return code of either 1 or 2 is placed in Register 1 and the routine exits.

ATTACH SCOPE WITH INTERRUPTS ENABLED

ENTRY POINT SCATCHEN

CSECT MONIT

INPUT PARAMETERS The code number in MNSCM causes this routine to be executed; no other parameters in that request buffer are needed by that routine but it is described here for the sake of completeness.

MNSCMREQ

CFLAGS	CCODE
CMSGADDR	
CPSTRTAD	
CBITRTAD	

CFLAGS See fig (5b)
CCODE Must have a value of 3
CMSGADDR Not used.

OUTPUT PARAMETERS The Scope request buffer is set up with a request for the interrupts to be enabled and the cursor inserted after the Scope task has been attached. The SCSCMREQ buffer is set up as shown.

SCSCMREQ

FLAGS	CODE
1	3

bytes

	FLAGS	
bit	0	Set to 1 to indicate an active request
	1	Set to 1 to indicate last three bytes contain a code number, not a message address
	2-7	Not used
	CODE	Set to value 3 to indicate to the Scope task that the interrupts are to be enabled

RETURN CODE

On return R1 contains one of the following codes

0 - Scope attached and interrupts enabled

1 - Scope is already attached, interrupts already enabled

2 - Scope is already attached, interrupts were enabled

All F's - Scope already attached not yet able to enable interrupts

EXIT

On Register 14

FUNCTIONS

The purpose of this routine is to ensure that the Scope is attached and the interrupts are enabled. It checks the Scope program flags to determine the status of the Scope. If the Scope is not attached, this routine attaches it and sets up the request buffer for the Scope as shown above. This means that as soon as the Scope task becomes active it will note the request to enable the interrupts. When the request has been set up for the Scope task, the Scope program flags are adjusted and this routine exits with a return code of zero.

If the Scope is already attached then, if necessary, the Scope is requested to enable the interrupts and the routine returns with one of the return codes shown above.

ENABLE SCOPE INTERRUPTS

ENTRY POINT ENBLINTS

CSECT MONIT

INPUT PARAMETERS The code number in MNSCMREQ (value 4) causes this routine to be entered; no other parameters in that request buffer are needed and CMSGADDR is not used.

OUTPUT PARAMETERS The Scope request buffer is set up with a request for the interrupts to be enabled and the cursor inserted. The Scope request buffer SCSCMREQ is set up as shown

SCSCMREQ

FLAGS	CODE

FLAGS

bit	0	Set to 1 to indicate an active request
	1	Set to 1 to indicate that the last three bytes contain a code number, not a message address
	2-7	not used.
	CODE	Set to value 3 to request the Scope task to enable the interrupts.

RETURN CODE On return R1 will contain one of the following values:

0 - Interrupts were enabled

1 - Interrupts were already enabled

All F's not yet able to enable as Scope is processing earlier rqst.

FUNCTION

This routine has to set up a request to the Scope task to enable the interrupts, if the interrupts were not already enabled. If the Scope request buffer is still full from an earlier request then a return code of FF is returned so that an attempt is made at a later time.

OPEN 1800 LINK

ENTRY POINT — OPENLINK

CSECT — MONIT

INPUT PARAMETERS — The Monitor Command request buffer which causes this routine to be executed is not used by this routine but is described below for the sake of completeness.

MNSCMREQ

CFLAGS	CCODE
CMSGADDR	
CPSTRTAD	
CBITRTAD	

CFLAGS — See fig (5b)

CCODE — Must have value 5 for this routine to be executed.

CMSGADDR — Not used.

OUTPUT PARAMETERS — none

RETURN CODE — In Register 1

0 The Link was opened.

EXIT — On Register 14

FUNCTIONS

If the link is already open, this routine causes an abend. A conditional getmain is issued to obtain space for the data buffer for the Analysis program. If this is successful a second Getmain is issued for a second data buffer. The word DATABUFN in the Monitor work area

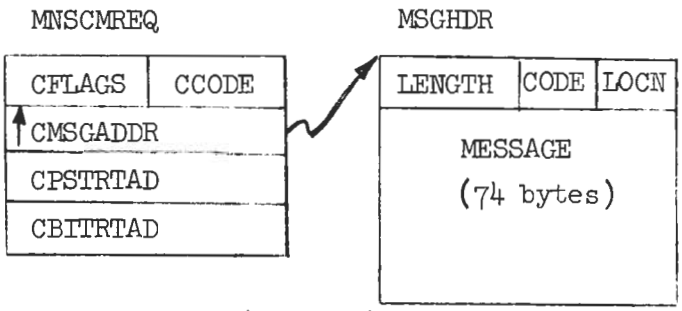
is set up to contain the number of data buffers while FSTBUFAD and SCNBUFAD will contain the addresses. Finally the link is opened and the routine exits.

SEND MESSAGE FROM COMMAND TASK TO SCOPE

ENTRY POINT SCPCMMSG

CSECT MONIT

INPUT PARAMETERS The Monitor Command request buffer contains information which this routine needs.



CFLAGS BIT (2 bytes)

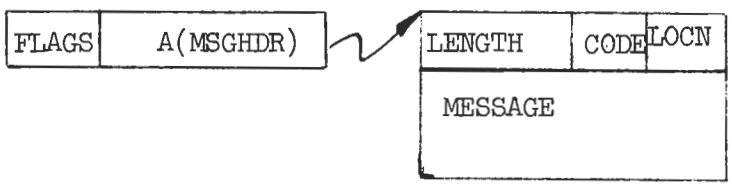
- 0 1 indicates an active request, 0 means no request
- 1-7 Used by SCPCMMSG and valid only when bit 0 is on
  - Bit 1 1 indicates a msg sent to scope but not yet displayed. When scope has cleared request buffer-message has been displayed
  - 2-7 not used
- 8 1 signifies an ECB to be posted on return. If PSTRTAD is zero when this bit is on then an error condition results
- 9 1 signifies a bit to be flagged when request completed. If BITRTAD is zero when this flag is on an error condition will result
- 10-15 not used

CCODE	Must have a value of 6 for this routine to be executed
CMSGADDR	Contains the address of the message to be passed to the Scope
MSGHDR	Message header for the message
LENGTH	Length of the message plus header in bytes; currently this must be 78
CODE	The code number which determines what the Scope does with this message. See Scope code for details
LOCN	Value 1 through 4 determines which area of the Scope the message is to be displayed, if any
MESSAGE	The message to be displayed, if any

OUTPUT PARAMETERS

The Scope request buffer is set up to indicate that there is a request from the Command task

SCSCMREQ



FLAGS

bit	0	Must be 1 to indicate a request active
	1	Must be 0 to indicate last three bytes of this word contain an address not a code number
	2-7	Not used
	A(MSGHDR)	The address of the Message header is set up in these three bytes.

RETURN CODE

On return Register 1 contains one of the following codes

0 - Message was passed to the Scope

1 - Scope program is not attached

All F's - Scope had not processed earlier request

EXIT

On Register 14

FUNCTION

This routine checks if SCSCMREQ buffer is empty. If it is not, it returns with a code of FF to try again later. If the buffer is empty then it sets up the request for the Scope task as shown above and returns with completion code FF. At a later time when the SCSCMREQ buffer is again empty, which signifies the message has been accepted, this routine returns with a completion code of zero signifying that the Command tasks request has been terminated.

ATTACH ANALYSIS TASK

ENTRY POINT — ATACHANL

CSECT — MONIT

INPUT PARAMETERS — The Monitor Command request buffer is set up as shown below although it is not used by this routine

MNSCMREQ

CFLAGS CCODE
CMSGADDR
CPSTRTAD
CBITRTAD

CFLAGS	See fig (5b)
CCODE	Must have a value 10 for this routine to be executed
CMSGADDR	Not used

OUTPUT PARAMETERS — none

RETURN CODE — On return R1 will contain one of the following codes

0 - The Analysis program was attached
1 - The Analysis program was already attached

EXIT — On Register 14

FUNCTION

This routine first checks if the Analysis is already attached. If it is it returns with return code of 1 in register 1. If not, then

an attach macro for that Analysis task is issued and the program flags for the Analysis task altered accordingly. This routine then checks if there are any data buffers. If there are, then these are flagged to show that they are empty and the routine exits with a return code of zero.

ABEND JOB

ENTRY POINT — COMABEND

CSECT — MONIT

INPUT PARAMETERS — The Monitor Command request buffer is set up as shown before although not used by this routine.

MNSCMREQ

CFLAGS	CCODE
CMSGADDR	
CPSTRTAD	
CBITRTAD	

CFLAGS — See fig (5b)

CCODE — Must have value 11 for this routine to be executed

CMSGADDR — Not used.

OUTPUT PARAMETERS — none

RETURN CODE — none

EXIT — none

FUNCTION

This routine issues an abend with a user termination code of 5555 causing the job to terminate.

DUMMY ROUTINES

SCDETACH	Detach the Scope Task
CLOSLINK	Close 1800 Link
DISABLNT	Disable the Interrupts on the Scope
DTACHANL	Detach the Analysis Task

The routines named above are available and included in the code; however they have not been debugged so no description of them will be given.

SCOPE PROGRAM DESCRIPTION

LAYOUT FOR SCOPE PROGRAM DESCRIPTION

INTRODUCTION

This Scope program was designed to operate as a subtask of the Monitor in the Midas 3 environment. Midas 3 is a set of programs designed to be resident in a 150K region of core in the IBM M91 computer throughout the duration of a spark chamber experiment. The purpose of Midas 3 is briefly defined as follows:

To obtain a significant sample of the data being collected on-line from a wire spark chamber experiment on the IBM 1800 computer; perform a complete and immediate analysis of that sample on the M91; to give the experimenter an instant display of the results of that analysis and provide him with a means of fast interaction through the use of a 2250 scope display situated in the experimental area.

This document will assume that the Scope program is part of the Midas 3 system, and will attempt to explain its functions in that light, even though given the same interface that is established with the Monitor it could function equally well as a subtask of any other program. For details concerning the Midas 3 system and the relationship of the Monitor to its subtasks please refer to the documentation of the Monitor.

When the plans were made to write the Scope routine it appeared that it would be required to be working in a very short space of time. A decision was therefore made to use the Fortran version of the 2250 Scope Package written at SLAC by R. Beach. These are a set of assembler language subroutines originally designed to allow the Fortran programmer to write programs for the 2250 Scope display. It now appears that this was an excellent decision as these routines which have greatly facilitated the writing of the Scope program have turned out to be extremely reliable.

GENERAL CONCEPTS

Background for Design

This task was designed to operate in Midas 3 as a subtask in a region containing at least four tasks. These tasks are the Monitor, the Analysis, the Command module, and the Scope, plus any subtasks which each of these may add.

The Monitor is the mother task of the region and it attaches the other three tasks. It serves as the communication centre for the subtasks, controls the link to the 1800 computer and attempts to recover if any subtask abends. The Analysis program is a version of the standard program used for analysing data from the spark chamber experiments, and can function offline or online to the 1800. The Command module is the receiver of all commands entering the system whether from cards, the 1800, or the scope. Its function is to interpret these commands and respond to them.

Design Considerations

Most of the factors which have to be taken into consideration when writing any scope program were also applicable in this case. Several others were added due to the special design of Midas 3 and the other subtasks in the region.

A fast response to the user was a primary requirement and was obtained by having the Scope routine at a high priority, while it performs minimum functions, i.e., no calculations, so as not to degrade the computer performance in general.

Reliability was also essential as the Midas 3 system would be resident in the M91 for several hours at a time. Reloading the program because of failure of the Scope task would be inconvenient not only because of the disruption of the analysis program but also because the 1800 has to switch mode when the M91 changes from online to offline operation.

The basic design of the scope program was made relatively simple. This and the ability of the monitor to clean up and restart the scope task if it does terminate abnormally should ensure the Scope program has the required degree of stability.

A 150K partition was all that was available for the Midas 3 system. As a result all the programs were written in assembler language. One subroutine (SAAAB1) of the RC Beach's scope package was also re-written in assembler language.

Each subroutine of the Scope was written as separate control sections. It was hoped that this would make expansion and changes to the program easier to effect.

Communication between the Scope and other tasks was made possible through the Monitor. All requests to the scope are in a standard form as shown in the section on communication, and can only take place through the Monitor.

Functions of the Scope Program

Since the Scope is only one task in the region, its functions have been limited to the manipulation of messages and displays being recorded on the screen, and the management of the interrupts and cursor which allow the user to enter his requests into the system. These functions can be listed as shown below:

1. Display all messages from the other tasks in the region in the appropriate area of the screen.
2. Respond to users requests by sending them to the correct task to deal with them.
3. Control the scope interrupts and set up the cursor so that the user can enter his requests.
4. Scale histograms and other displays so that they will fit on the screen.

Future Modifications

No program that is being used is ever terminated and plans for future modifications, even if long-range, are never final. However, a list of obvious changes is available for this program; some of them are mere efficiency improvements while others are valid program modifications.

A) Currently there are no requests to the Scope from the Monitor directly so that a Monitor request checking routine has not been written. This routine would be almost identical to the command request checking routine and therefore a simple addition.

B) Due to the fact that unsolicited requests from the 1800 to the Monitor are regarded as an error, there is no request checking routine for link requests. This will have to be added when unsolicited requests from the 1800 are programmed.

C) Currently two subtasks have been added to enable three timers to operate for the scope. These must be eliminated and a general coding routine written so that M91 system is not degraded.

D) A scaling routine to enable straight line graphs to be displayed must be added.

E) A scaling routine for 2-dimensional histograms has also been requested.

F) If a user types in a request for the command module while the command module is still processing an earlier command, a message to that effect apperas on the screen. When that command has been finished, a message "Commands will now be accepted" appears and the user may type in a message; however, the earlier message is now lost. Some buffering should be provided.

G) The last five user messages are displayed on the screen. This should be altered to display only four.

H) The message HISTOGRAM TOO LARGE FOR SCALING should be replaced by THE HISTOGRAM CANNOT BE SCALED.

STRUCTURE

General Layout of Subroutines

Fig. 9 gives a general flowchart of the scope task. Detailed descriptions and flowcharts of each of the subroutines are given in the last section of this document.

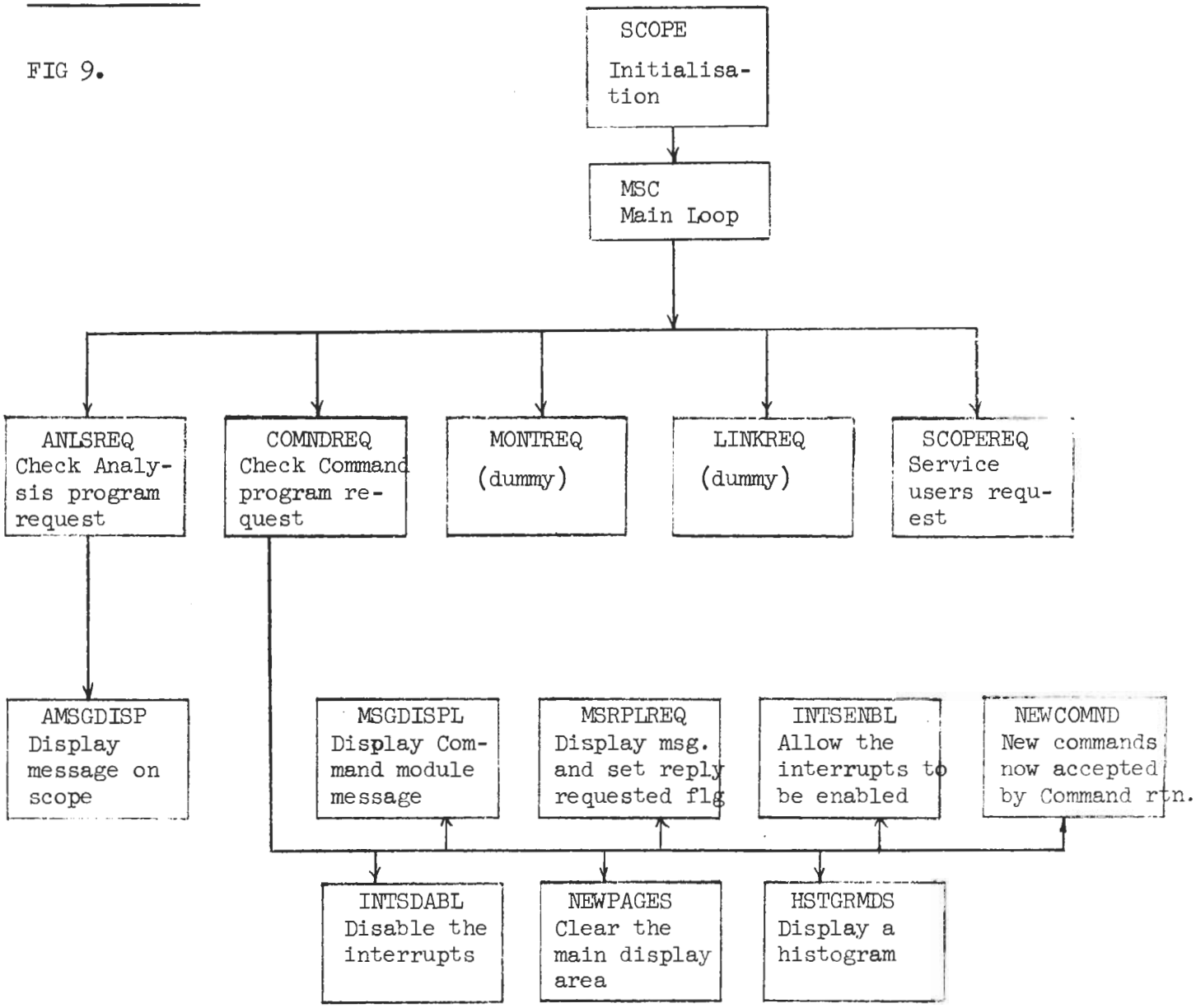
When the Scope is first attached it passes through an initialisation routine. This routine saves the input parameters, which are mainly addresses of communication tables, and zeroes out pointers in core to enable the scope to be opened. This is necessary so that the same copy of the Scope program in core may be re-attached in case of abnormal termination of the Scope routine.

The Scope then enters a main loop. This loop is the backbone of the entire scope program. All other subroutines (except for the attention handler and timing routines) are called directly or indirectly from this loop. On entering the loop, the program checks to see if there is a request from one of the other subtasks in the region; if not, it checks to see if the interupts are enabled, and if they are, whether or not a user has typed in a request. If there is no user request the Scope routine enters the wait state. If there is any active request either from one of the other subtasks in the region or from a user, control goes from the main loop into the respective subroutine to check the validity of that request and eventually into a lower level routine to service that request. Control is returned along the same path back to the main loop at the point where it was left, and processing in the main loop continues.

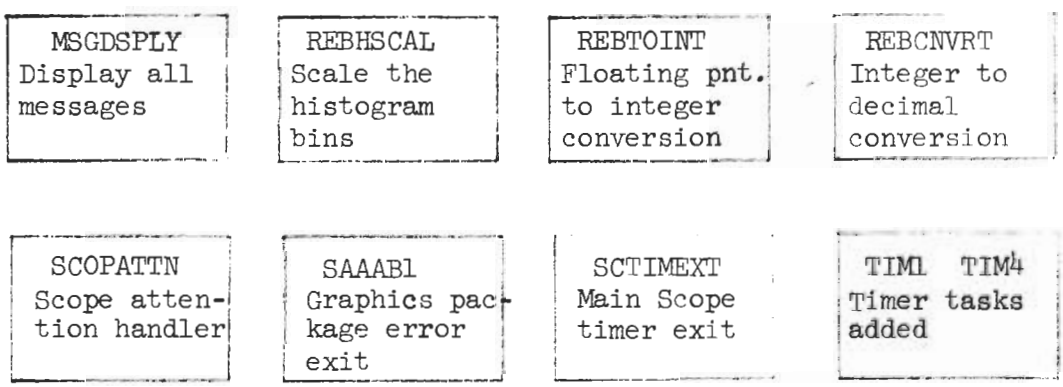
When the main loop enters the wait state, there are three ways it can become active again. The first way is through the Monitor; the Monitor has the address of the ECB on which the Scope is waiting so that when the Monitor has a request for the Scope it will post that ECB and thus make the Scope active again. The second way the Scope can become active is when a user types in a request and enters an attention at the scope console. This attention causes the asynchronous execution of the Attention Handling Routine. This means that this routine gets control whether or not the main scope program is in the wait state. The Attention Handling routine will read the user's message, disable the interrupts, set a flag to show that there is

SCOPE PROGRAM

FIG 9.



AUXILLIARY ROUTINES



a user request and finally post the main Scope ECB. This means that if the Scope was in the wait state, it immediately becomes active. The last way of forcing the Scope to become active is through the use of a timer. Before the scope goes into the wait state it sets a timer, so that at the end of the interval the Scope becomes active again under any circumstances. This was an extra precaution to ensure that the Scope never forgets a request and does not for any reason go into a permanent wait state. When the Scope becomes active its first function is to clear its own ECB. This ensures that if a request has been made after it has been checked as inactive and before the scope goes into the wait state, it will get serviced and not be forgotten. In this case when the Scope attempts to go into the wait state, it will find it has already been posted and will then execute the main loop once more.

User Response

The Scope program is attached by the Monitor at the request of the Command task. It is attached at a high priority to enable fast response. Interrupts are enabled and the cursor inserted also at the request of the Command task. Once the cursor appears on the screen the user may type in requests.

When a user has typed in his request, the end key interrupt is disabled, and the cursor removed. The Scope scans the request and decides where to send it. If it is for the Command module and the Command module is not already servicing an earlier command, the request will be sent. If the Command module is already servicing a request the new command will be lost. When the command module has finished servicing a request a message appears on the screen to the effect that new commands will be accepted. If it is not for the Command module the Scope program will recognise it and perform the necessary function. Currently only one request of this type will be serviced; this is a Z which causes the Scope to terminate. Others may be added.

After the decision has been made on whether or not a command can be sent and any necessary action taken, the end key interrupt is then enabled and the cursor inserted. The user may then start typing in requests again. The delay between hitting the end key and the cursor re-appearing is not noticeable to the user.

2250 SCOPE DISPLAY

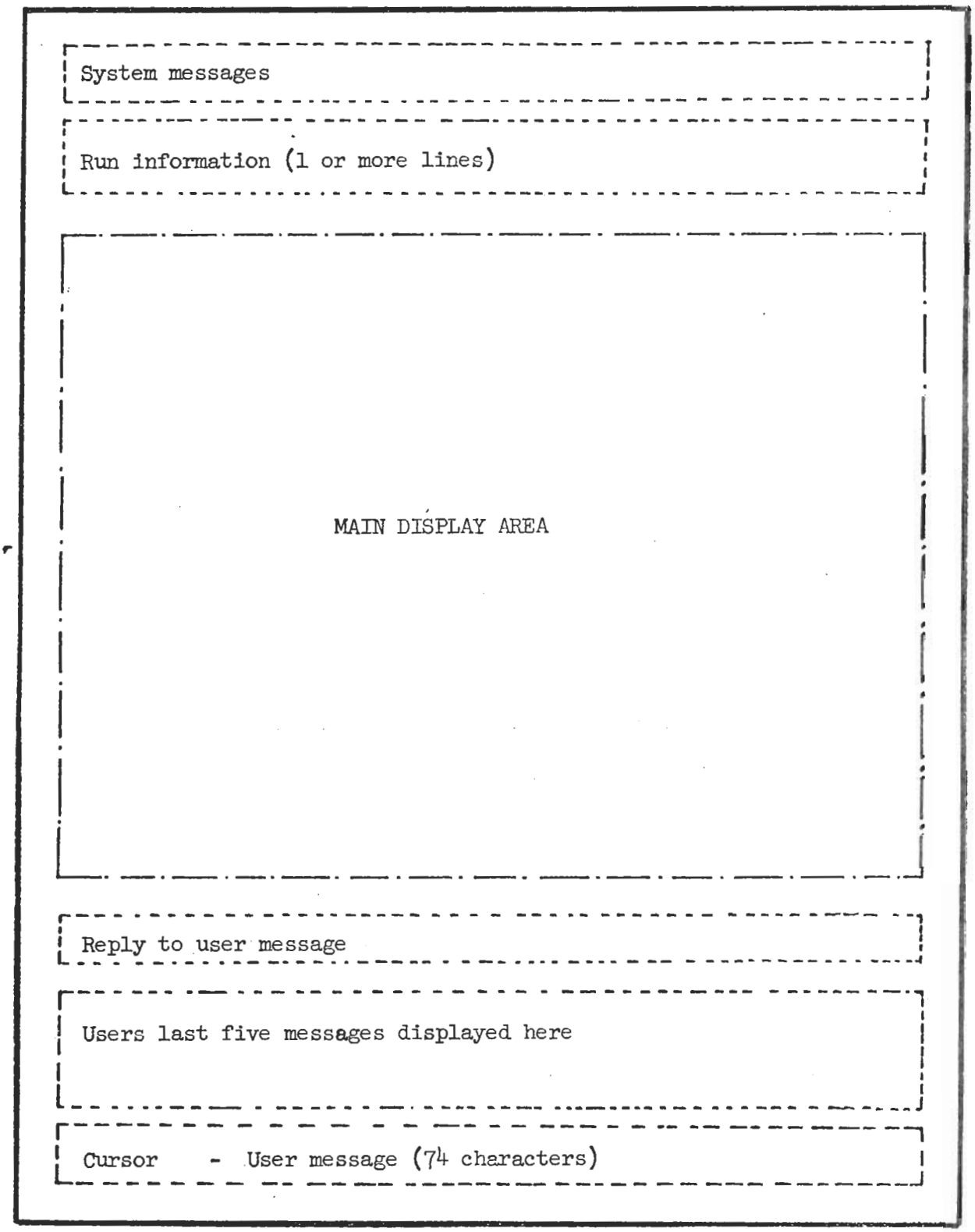


FIG 10.

Screen Organisation

See fig. (10) for a diagram of the organisation of the screen. The screen is divided into six areas. The four upper areas are for program displays. The lower two areas are used for user messages.

Starting at the top of the screen the first area is for system messages from either the Monitor or the other tasks. These messages, from either the Monitor or the other tasks usually indicate status information.

The second area is for run information which may or may not be used for displaying periodically updated information on the run.

The third area is the main display area. Displays are made here as a result of users' requests.

The fourth area is a message response to user commands. It usually contains a duplicate or perhaps modified version of what the user has typed in.

The fifth area is a memory bank of the user's last five requests, and the last area contains the cursor and is where the user types in his request. Messages can be displayed on the four upper areas. These areas are internally referred to by location code. The system message area at the top of the screen has location code 1, the run information area has location code 2, the message response area has location code 3, while the main display area has location code 4. (These are referred to as LOCN in the diagrams)

Timing Considerations

As far as the user is concerned, the current version of the scope program, running at priority 10 in the M91, has no appreciable delay time between his request and the response. However, when the analysis is running at a low priority and obtaining data from the link, noticeable delays will be occasioned when the response has to wait for parts of the analysis to complete execution. During this time the keyboard will be enabled and the user may type in requests; but as explained in the User Response section, no commands will be sent to the Command module.

Internally there are three separate timers operating, one belonging to the scope task and two separate subtasks. Although the latter two will eventually disappear, their functions will remain.

The function of the main Scope timer is mainly precautionary. Care has been taken to enable the keyboard at all times so the user is never locked out; the timer performs the same function internally. Although whenever there is a request from the user or the Monitor, the Scope is posted and the scope always looks at a request; it may not be able to service it immediately (e.g., It cannot erase a display if user is holding the previous page); consequently it will return to that request when an interrupt is obtained from the lightpen or one of the other timers. The main scope timer is to ensure that under any circumstances no request is "forgotten". The two other timers reflect the appearance of the HOLD REPL (hold, replace) signs which appear for the paging of data and display of system messages.

Requests are serviced from each subtask in the order that they are given. Since only one at a time may be passed to the Scope, for example, if the Command module is waiting to display a new page of data because the user is still examining an earlier page, he cannot in the meantime send any other message to be displayed.

Communication and Parameter Passing

Communication between the various subtasks in Midas 3 was one of the primary requirements of the system. This communication takes place through the Monitor whose main function is to ensure the smooth flow of information between these tasks and the 1800.

When the scope is initially attached it is passed three parameters -- see fig. (11). These are: 1. The Monitor Scope Request table address; 2. The Scope Request table address, and 3. The Monitor main ECB address. It is through these tables that inter-task communication takes place.

The first table MNSCPREQ, see fig. (11), is used to pass requests from the Scope to the Monitor. With the aid of an identifying code number the Monitor will know whether the Scope requires the message passed to one of the other subtasks or whether it is a direct request to the Monitor.

The second table is used to pass requests from the other tasks in the region to the Scope task. The Scope scans this table for requests whenever it becomes active. Currently there is only one buffer per task so that messages can only be sent one at a time from each task.

The last address passed is the address of the Monitors ECB. Whenever the Scope has a request for the Monitor it posts this ECB which causes the Monitor immediately to become active and to service the request.

Messages passed to the Scope for display on the screen must be of the format shown in fig. (12).

Each of the communication tables used by the Scope and the manner in which they can be set up are described in detail in the Monitor write-up, as this is one of the main functions of the Monitor.

Scope Requests to the Monitor

There are currently only two requests that the Monitor will recognize and these are identified by code number. They are:

CODE	FUNCTION
1	Address of Scope main ECB. The Monitor is requested to post this ECB each time it flags a request active for the Scope.
2	Pass the address of the user message to the Command module.

The Scope program will currently recognize no requests originating from the Monitor itself, none from the 1800 link, one from the analysis program and seven from the Command module. These again are identified by code number. They are:

Requests from the Analysis:

CODE	FUNCTION
1	Display message on screen from the Command module;

Requests from the Command module:

CODE	FUNCTION
1	Display a message
2	Clear main display area
3	Display message with reply
4	Command module now accepting commands
5	Disable interrupts
6	Clear main display area
7	Display Histogram

Initialising Parameters passed to the Scope when Attached

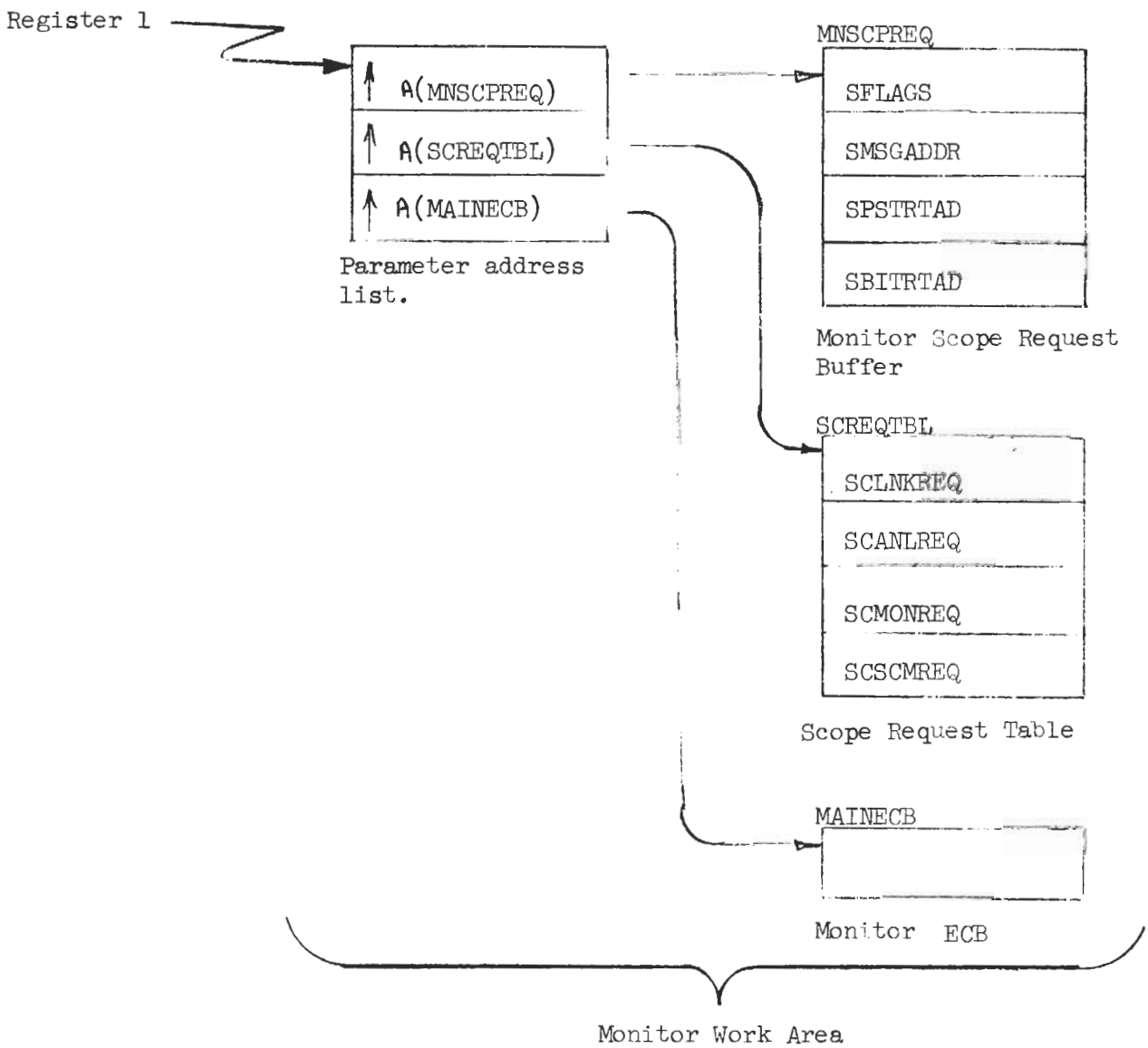
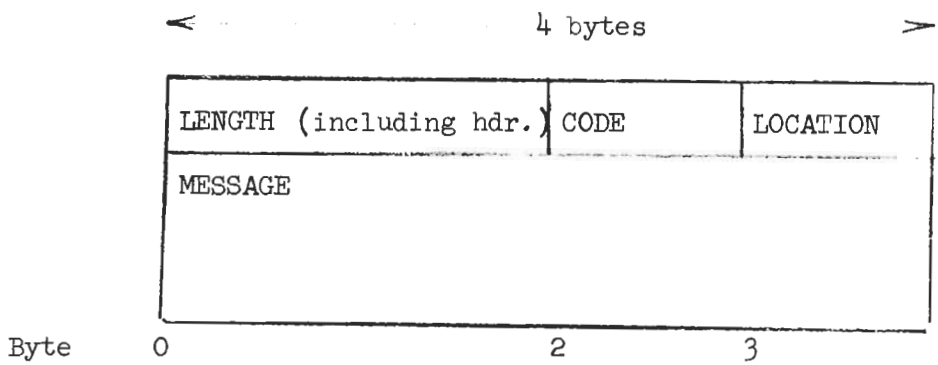


FIG 11.

MESSAGE FORMAT



LENGTH	Length of the message including the four byte header.
CODE	The code number which determines which subroutine in the Scope program will service the request.
LOCATION	The code number which will determine where on the screen the message is to be displayed
MESSAGE	The message to be displayed (if any).

NOTE: All messages to the Scope program from the other subtasks in the region must be of this format. This includes messages which are requests for action, such as enabling the interrupts, which do not require any text to be displayed.

FIG 12.

Abnormal Termination

The Scope program is currently set up to abend if it encounters errors in its own functions which may or may not be a result of incorrect parameters passed. User abend termination codes are numbered from 1000 upwards and the locations where each of these error codes occur are listed below.

CODE	CSECT	CSECT FUNCTION
1212	SCOPE	Initialisation
1515	MSGDSPLY	Display message
3131	MSRPLREQ	Display message with reply
8888	SCOPATTN	Scope Attention Handler
8888	REBHSCAL	Scale Histogram
9898	SCOPE	Error in recognising user message
3030	SAAAB1	Graphics package error handler

All except the last user code listed above store the exact location where the error was detected in SCERORCD in the main Scope work area (control section name SCOPWORK).

By examining the address in SCERORCD the exact location where the error was detected can be found.

SAAAB1 is the error exit program for the graphics package routines. In this routine there is a double word called SUBRTNAM which contains the name of the graphics subroutine call which caused the error to be found. Immediately following this there is a one word location called SCPKGCOD which contains the error code number. Investigation of the contents of these storage locations together with the explanation of the code number (found in RC Beach's User Note 20) will readily explain the problem.

All subroutines of the Scope program have standard OS save area linkages so that in case the task terminates with a system error code then the error can be traced in the usual manner.

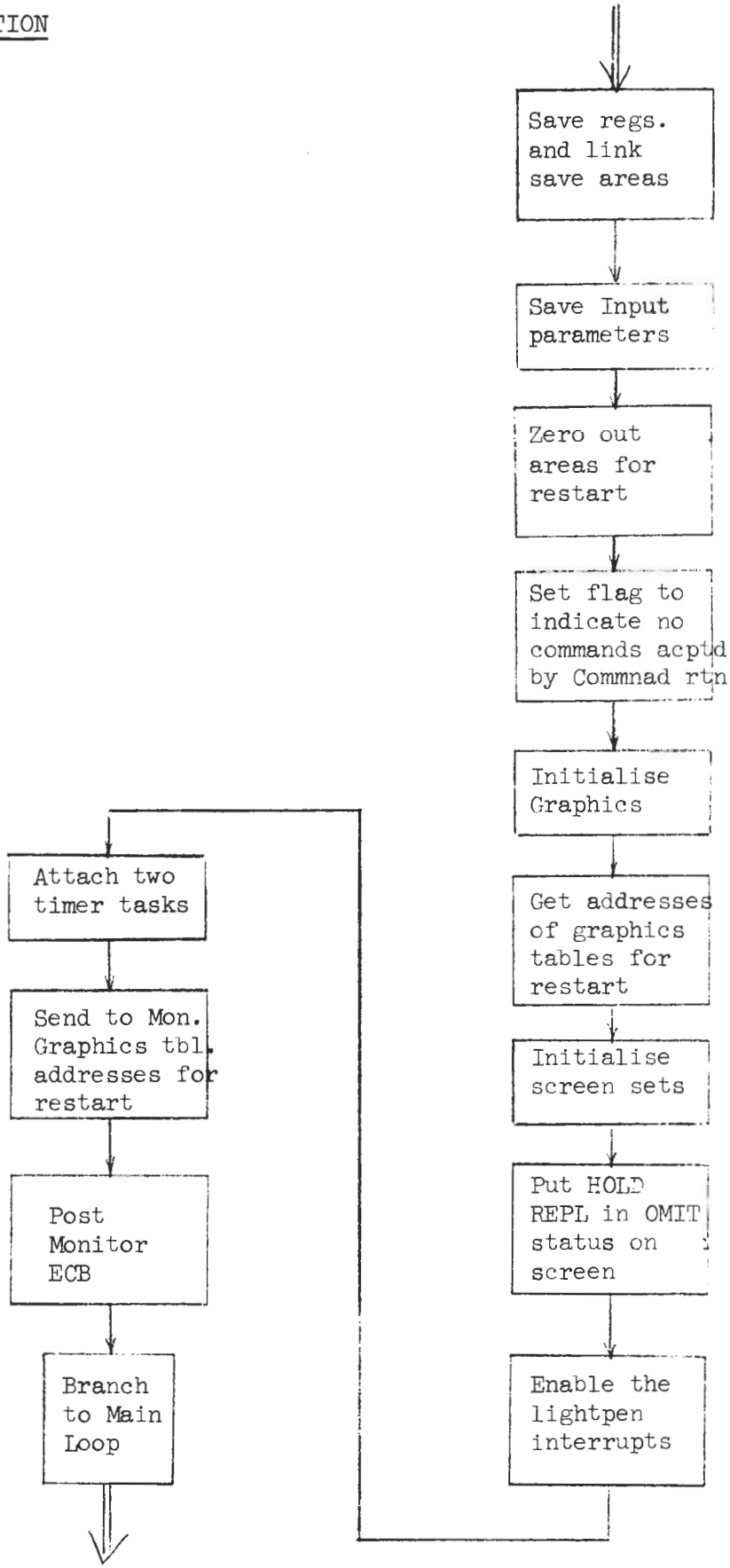
INITIALISATION

CSECT	SCOPE
INPUT PARAMETERS	R1 points to an address list containing these values ADMNSCP Address of MNSCPREQ table ADSCPRQ Address of SCREQTBL ADMNECB Address of monitor ECB
OUTPUT PARAMETERS	Not applicable as control is never returned from this routine
RETURN CODE	Not applicable.
LOWER LEVEL ROUTINES	SIPAK1 SIDEV1 SISET1 STEXT1 SSATN1
EXIT	Main loop

FUNCTIONS

This routine initialises some graphics package core locations to zero, in case this is a restart of the program. It initialises the scope, sets up the initial display on the screen, enables the lightpen interrupts, and attaches the timer subtasks. It finally sends the address of the Scope main ECB and some termination addresses to the Monitor for restart procedures and finally exits to the Main Loop.

INITIALISATION



MAIN LOOP

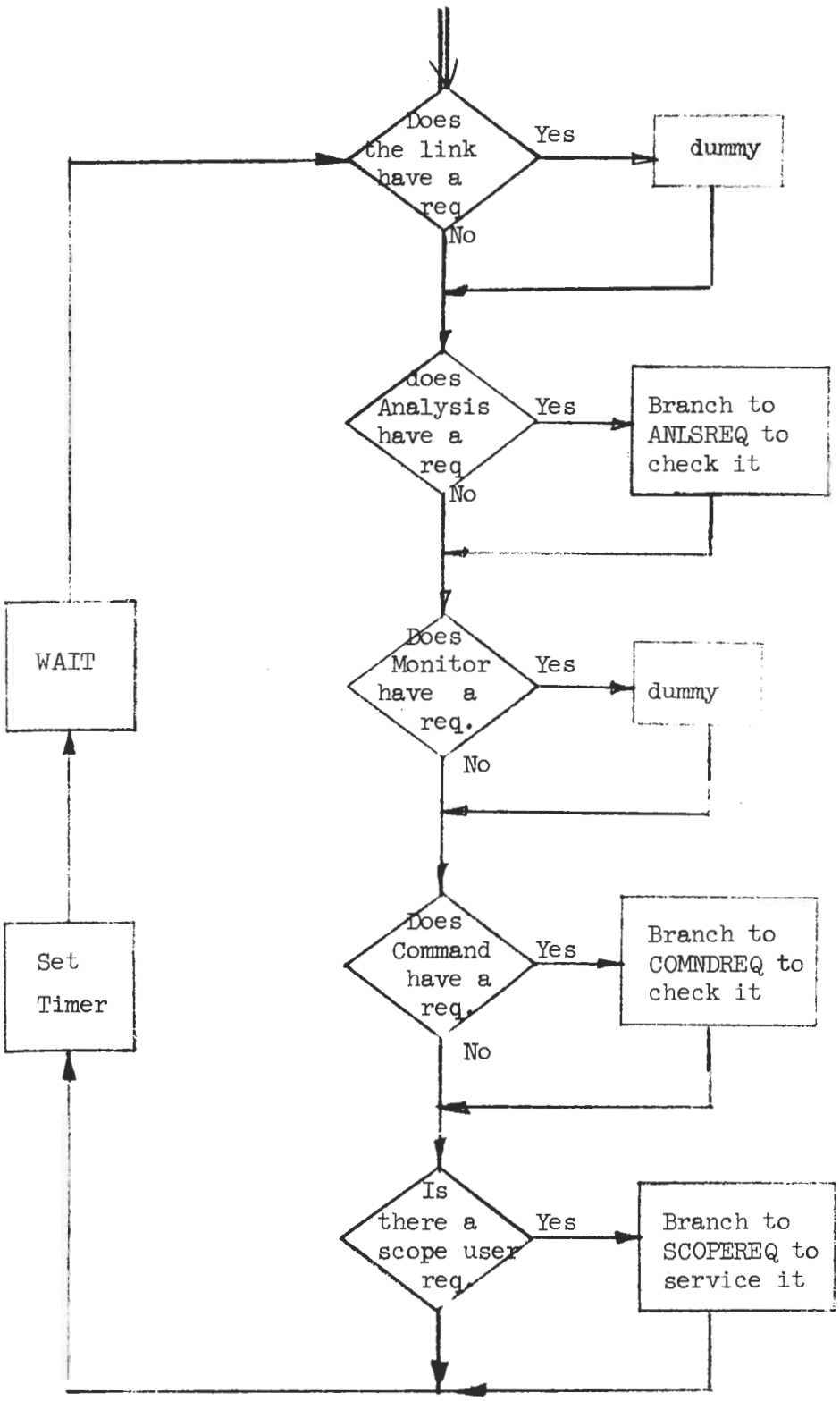
CSECT	SCOPE
INPUT PARAMETERS	none
OUTPUT PARAMETERS	none
RETURN CODE	none
LOWER LEVEL ROUTINES	LINKREQ (dummy) ANLSREQ MONTREQ (dummy) COMNDREQ SCOPEREQ
EXIT	none

FUNCTIONS

This routine checks if there is an active request from the link, analysis program, the Monitor, the Command routine,or the Scope user. If there is, it branches to one of the routines listed above to check the request servicing each in turn. If no request is active, a timer is set and the Main Loop then enters the wait state. Immediately on becoming active the ECB on which this routine waits is cleared and control is returned to the beginning of the loop.

MSC MAIN LOOP

Main Scope Loop



CHECK COMMAND REQUEST

CSECT	SCOPE	- ENTRY AT COMNDREQ
INPUT PARAMETERS	none	
OUTPUT PARAMETERS	none	
RETURN CODE	none	
LOWER LEVEL ROUTINES	MSGDISPL MSRPLREQ INTENABL NEWCOMND SCPCMDUM NEWPAGES HSTGRMDS	
EXIT	Main Loop	

FUNCTIONS

This routine checks whether the request in SCSCMRQP of the Scope Request Table (SCREQTBL) is given in the form of a code number, or whether it points to a message which contains the code number in the header (see figs (8) and(12) for format of these requests). Once the code number is obtained, a check is made to ensure that it is a valid code number. This routine then branches to a routine listed in the COMCODES table (in the work area) which corresponds to code number given. On return from that routine the return code is checked. If the return code (in R15) is hex FF, control is immediately returned to the Main Loop. This means that the routine has been unable to terminate the request and will try again later. If the return code is zero, the SCSCMRQP is zeroed, indicating that the request has been serviced and control is returned to the Main Loop.

CHECK ANALYSIS REQUEST

CSECT	SCOPE - ENTRY AT ANLSREQ
INPUT PARAMETERS	none
OUTPUT PARAMETERS	none
RETURN CODE	none
LOWER LEVEL ROUTINES	AMSGDISP
EXIT	Main Loop

FUNCTIONS

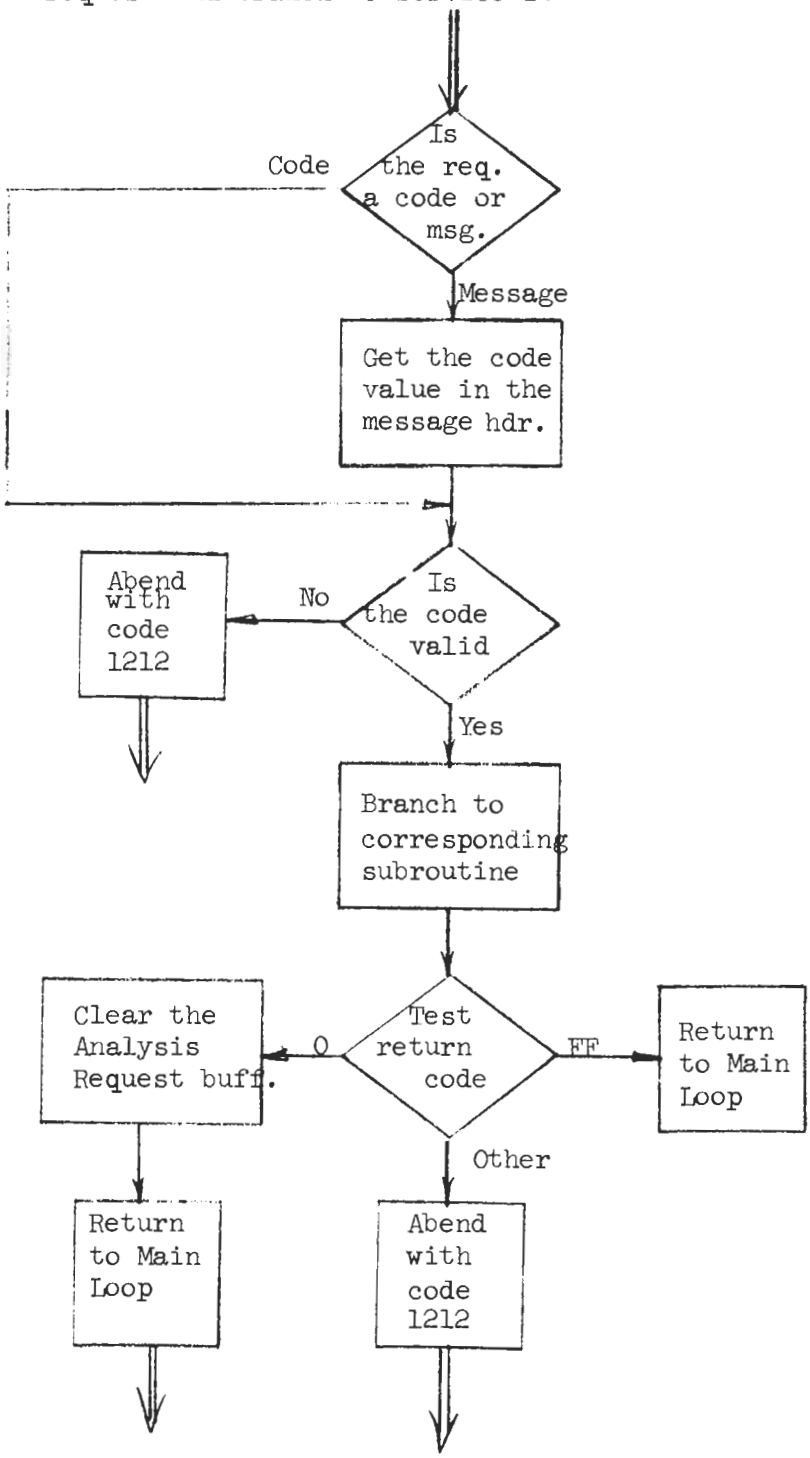
This routine checks whether the request in SCANLRQP of the Scope Request Table (SCREQTBL) is given in the form of a code number or whether it points to a message which contains the code number (see figs (8) and (12) for format of these requests). Once the code number is obtained a check is made to ensure that it is a valid code. This routine then branches to a routine listed in SANCODES tables (in the Scope work area) which corresponds to the code number given. On return from that routine the return code is checked. If the return code (in R15) is hex FF, control is immediately returned to the Main Loop. This means that the routine has been unable to terminate the request and will try again later. If the return code is zero then SCANLRQP is zeroed, indicating that the request has been serviced and control is returned to the Main Loop.

ANLSREQ

Check analysis request and branch to service it

COMNDREQ

Check Command request and branch to service it



SCOPE USER REQUEST

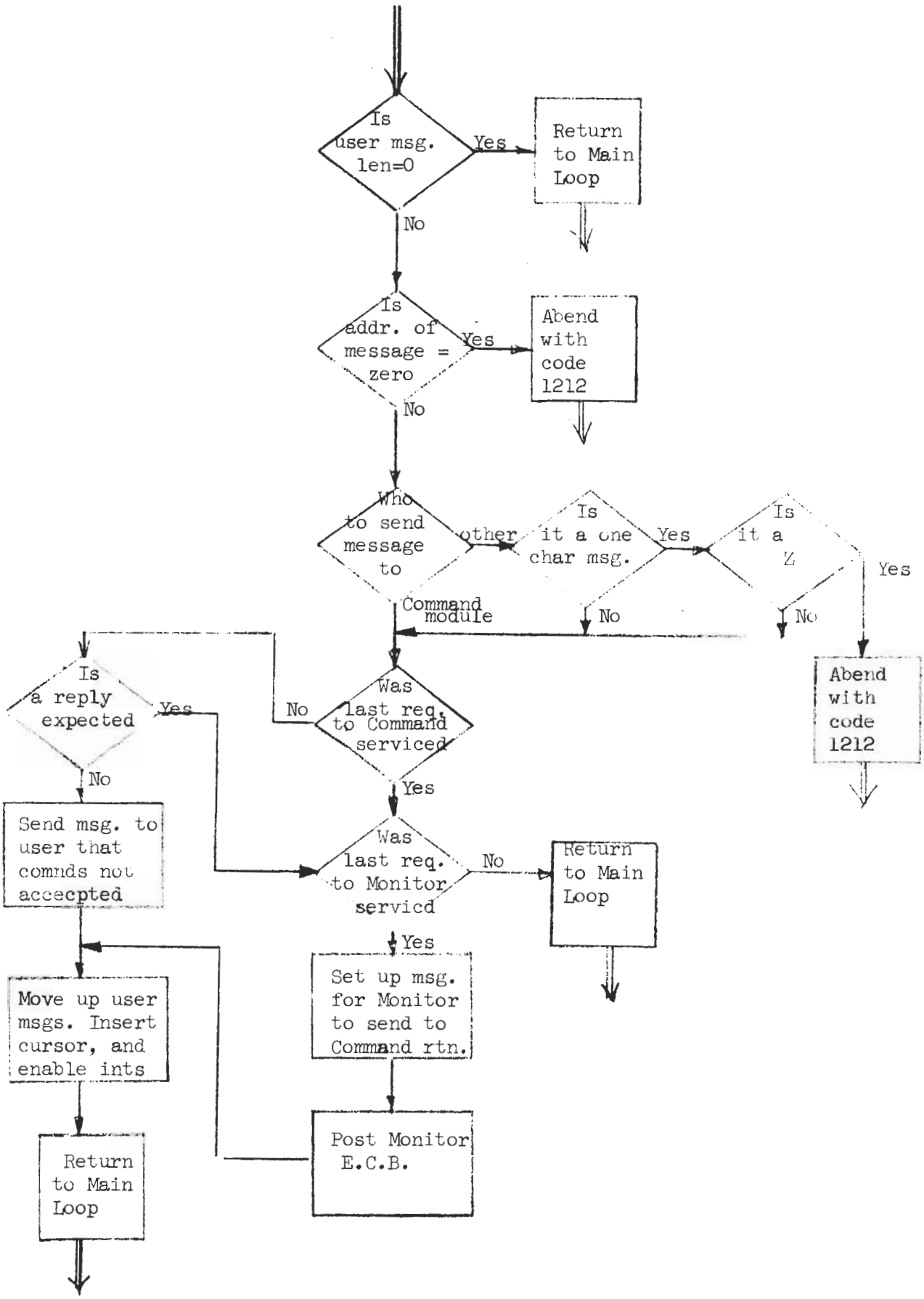
CSECT	SCOPE - ENTRY AT SCOPEREQ
INPUT PARAMETERS	none
OUTPUT PARAMETERS	
RETURN CODE	none
LOWER LEVEL ROUTINES	SCTXT1 STEXT1 SICUR1 SSATN1 SREAD1
EXIT	Main Loop

FUNCTIONS

The length of the user message is found in NCHAREAD and is checked for a zero length. If zero, the interrupts are re-enabled and an exit is made to the main loop. If the message length is not zero, then SCOPSTAT is checked for the address of the message. A check is then made on the message itself and if it is not recognisable to the scope, it is sent to the command module. In order to send the message to the Command module, checks have to be made that the Command module is accepting commands and that the buffer to send the requests to the Monitor is empty. If one or neither of these conditions is fulfilled, a return is made to the Main Loop; otherwise the message is sent to the Command module by setting up a request to the Monitor. Finally SCOPSTAT, which contains the user address and flag, is set to zero, the scope screen is re-adjusted to add the last user message to the buffer of five most recent messages, the interrupts are enabled and the Monitor ECB is posted. A return is then made to the Main Loop.

SCOPEREQ

Service Scope Users Request

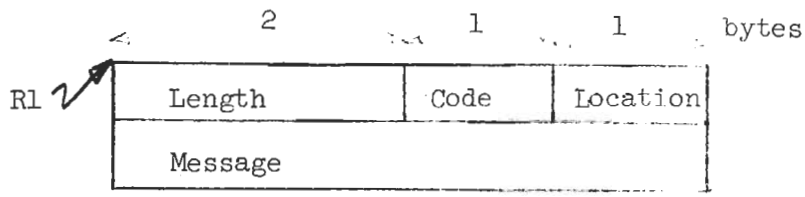


(DISPLAY) ANALYSIS MESSAGE

CSECT — AMSGDISP

INPUT PARAMETERS — R14 contains the return address.

R1 points to the message header.



LENGTH	length of message plus header (currently = 78)
CODE	should be value 1
LOCATION	should be value 1 to display message on system message display
MESSAGE	message to be displayed

OUTPUT PARAMETERS

One of the following codes is returned in Register 15:

0	The message was displayed successfully, or the message could not be displayed at all.
FF	The message could not yet be displayed.

LOWER LEVEL ROUTINES — MSGDSPLY

EXIT — On register 14

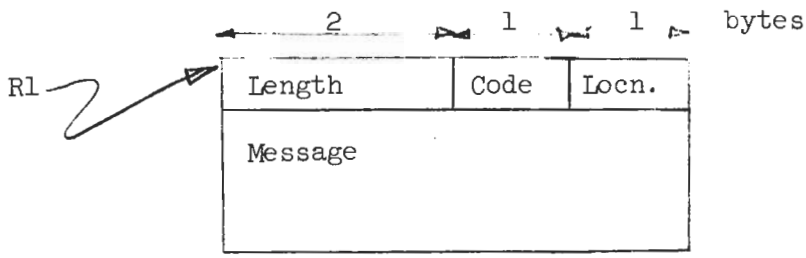
FUNCTIONS

The analysis program can currently only send messages to the system message area so this routine first checks the location code. If it is not correct, no message is displayed and control is returned with return code of zero. If the location code is one, then control is passed to MSGDSPLY, the main message display routine. On return, register 15 is untouched and this routine exits on register 14.

DISPLAY MESSAGE FROM COMMAND TASK

CSECT — MSGDISPL

INPUT PARAMETERS — R1 must point to the message header.



LENGTH	Value 78, must be header plus message length
CODE	Value 1 indicates message to be displayed
LOCATION	Code number 1 through 4 indicates area of screen to contain message
MESSAGE	74 byte message to be displayed.

OUTPUT PARAMETERS — none

RETURN CODE — R15 will contain one of the following return codes:

0	The message was displayed
FF	The message could not yet be displayed

LOWER LEVEL ROUTINES — MSGDSPLY

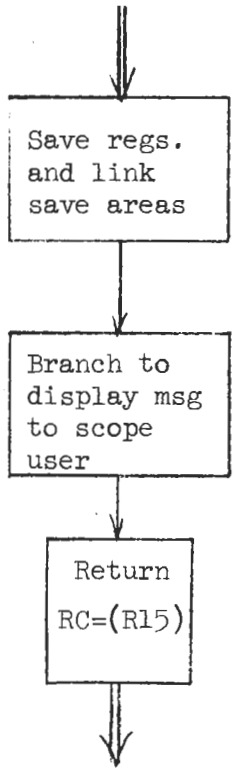
EXIT — On register 14

FUNCTIONS

Control is immediately passed to MSGDSPLY which is the central message handler for the scope. On return, R15 contains one of the return codes; this is left undisturbed and control is returned to the address in register 14.

MSGDISPL

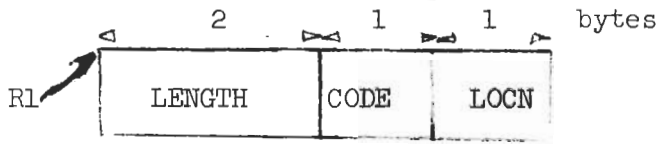
Display message from Command task



CLEAR AREA OF SCOPE

CSECT NEWPAGES

INPUT PARAMETERS R1 must point to the message header



LENGTH Length of header (must be value = 4)

CODE To indicate the new pages, this must be 6

LOCATION Area to be cleared

containing the request

R14 must contain the return address

OUTPUT PARAMETERS none

RETURN CODE R15 contains one of the following return codes:

0 The area was deleted

FF The request could not yet be performed

LOWER LEVEL ROUTINES SDELT1

SISET1

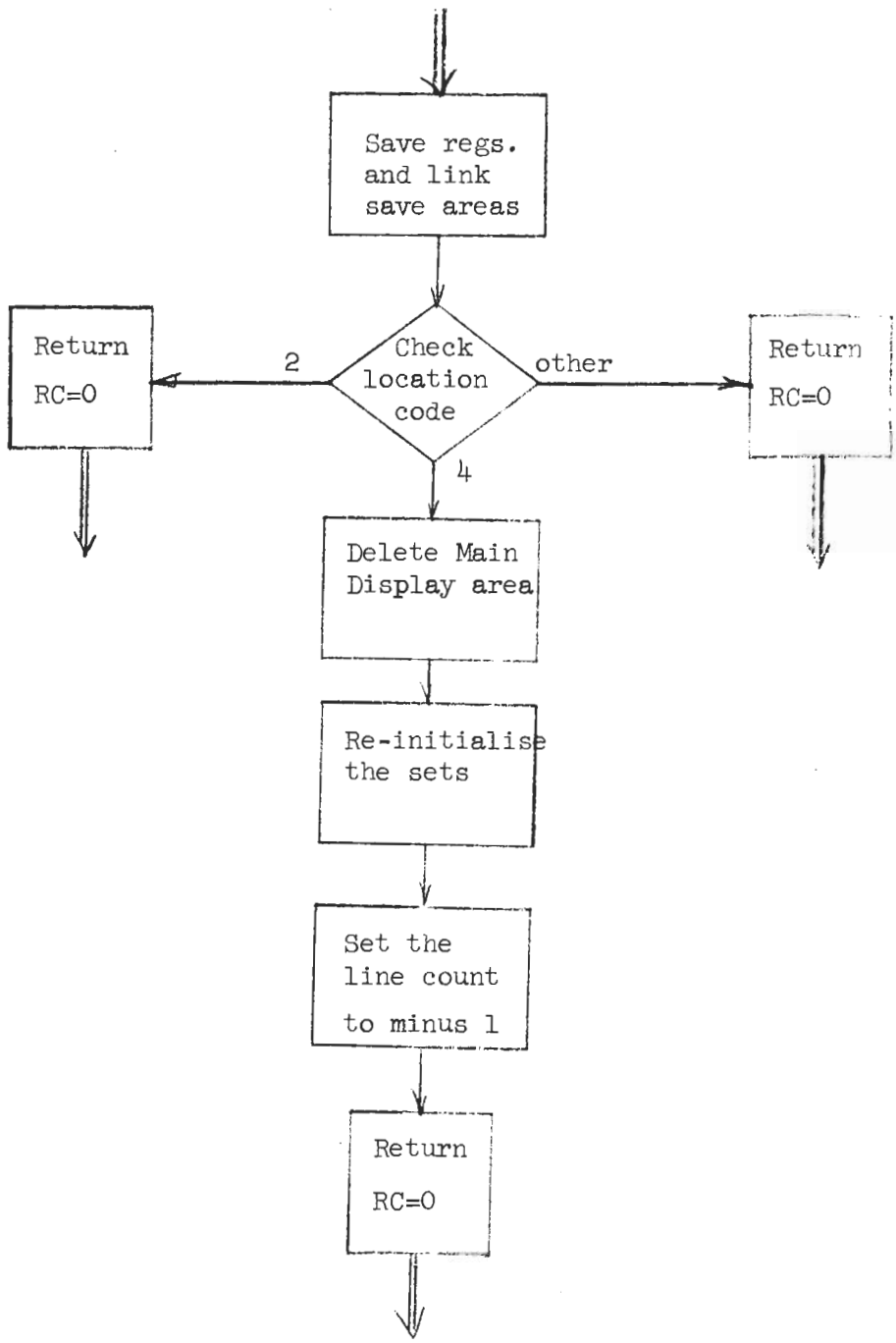
EXIT On register 14

FUNCTIONS

The location code is checked to see which area of the screen is to be cleared. Currently only the central area with location code 4 may be cleared. Other codes are treated as NOP's. When the code number is determined as 4, the screen is cleared and the set numbers re-initialised. The linecount for displaying is set to minus one and the routine exits on register 14.

NEWPAGES

Clear Main Display Area



DISPLAY MESSAGE WITH REPLY

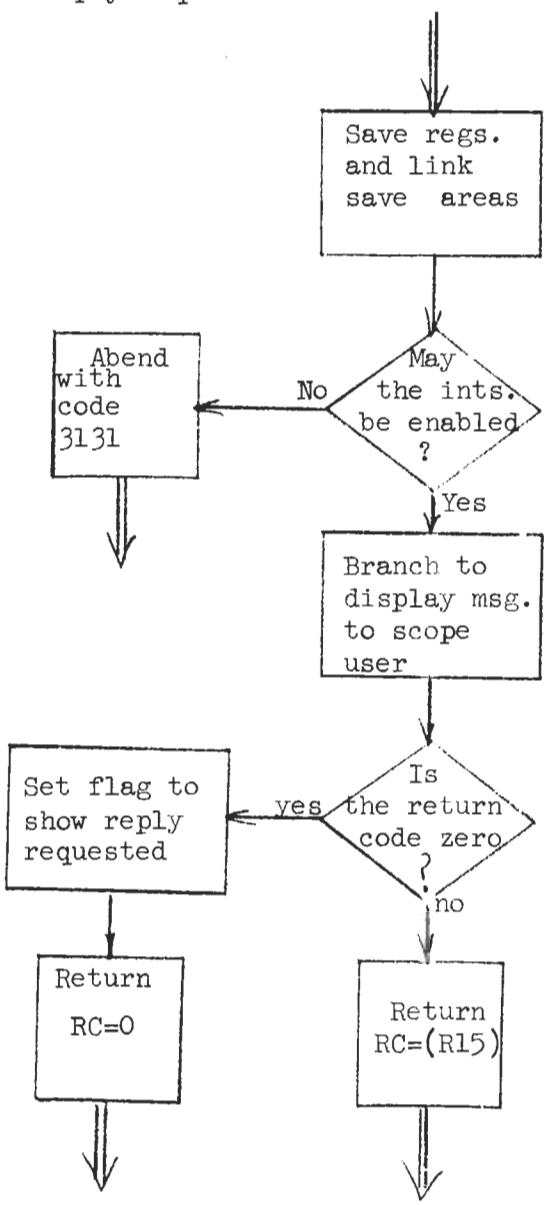
CSECT	MSRPLREQ
INPUT PARAMETERS	R1 must contain the address of the message header Register 1 points to a message header exactly the same as for Command Message Display except that the code should now have a value of 2. R14 must contain the return address.
OUTPUT PARAMETERS	none
RETURN CODE	On return, R15 will contain one of the following codes: 0 The message was displayed FF The message could not be displayed
LOWER LEVEL ROUTINES	MSGDSPLY
EXIT	Main Loop

FUNCTIONS

The functions of this routine are identical with the Command Message Display routine (MSGDISPL) except that a flag is set to allow the user to send a reply to the command module.

MSRPLREQ

Display message with Reply Requested

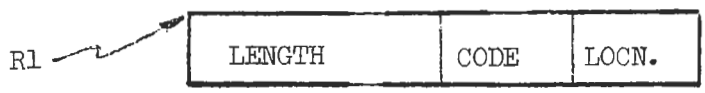


ALLOW INTERRUPTS TO BE ENABLED

CSECT — INTENABL

INPUT PARAMETERS — R14 must contain the return address

Although this routine does not check it, Register 1 points to the message which requests this service



LENGTH	Header length, value must equal 4
CODE	Value must equal 3
LOCATION	Not checked

OUTPUT PARAMETERS — none

RETURN CODE — 0 Interrupts were enabled (in R15)

LOWER LEVEL ROUTINES — STEXT1
SICUR1
MSGDSPLY

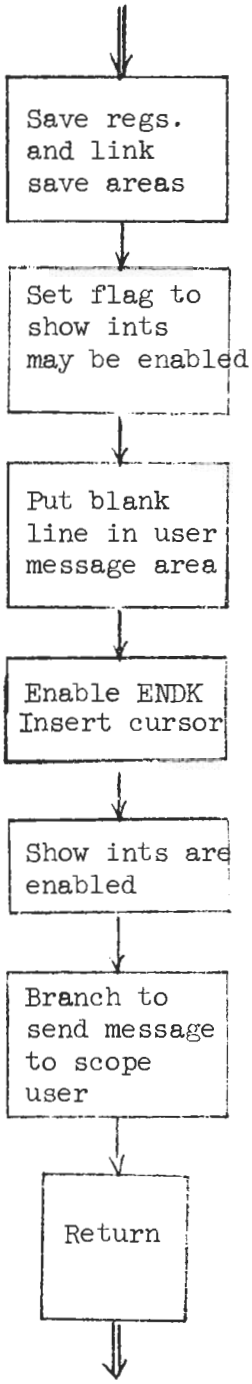
EXIT — On Register 14

FUNCTION

A blank line of text is inserted at the bottom of the screen and the cursor is inserted at the beginning of it. The ENDK interrupt is enabled and the flags set up to indicate that the interrupts may be enabled and also that they are currently enabled. A message is sent to the system display area to this effect. The routine then exits through register 14.

INTENABL

Interrupts may be Enabled



COMMANDS ACCEPTED

CSECT — NEWCOMND

INPUT PARAMETERS — R14 must contain return address

R1 points to the message which requests this service, although this routine does not need to check it.

LENGTH	Header length; value of 4
CODE	Must contain code value of 4
LOCATION	Not checked

OUTPUT PARAMETERS — none

RETURN CODE

0	The message sent and the flag set	(in R15)
FF	The message could not yet be sent.	(in R15)

LOWER LEVEL ROUTINES — MSGDSPLY

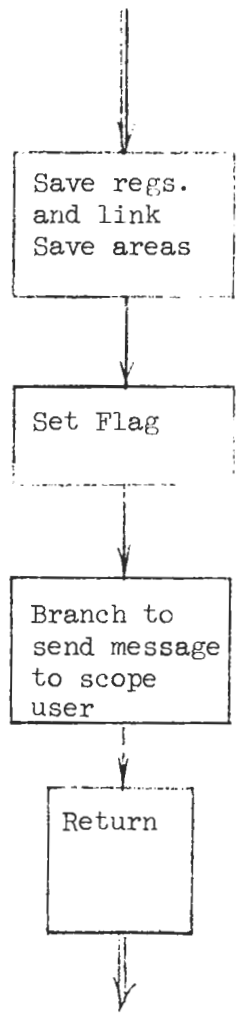
EXIT — On Register 14

FUNCTION

This routine first sets a flag to indicate that the command module will accept new commands. It then branches to MSGDSPLY to put a message on the screen indicating this fact. The control then returns to the address in Register 14. This now allows the user to send new commands to the Command module.

NEWCOMND

New Commands Accepted by the Command Routine



DISPLAY HISTOGRAM

CSECT — HSTGRMDS

INPUT PARAMETERS — R1 points to the message requesting the histogram to be displayed. The second word of the message contains the first histogram parameter.

R1 →

2	1	1	bytes
LENGTH	CODE	LOCN.	
NUMBINS			
HSTGRMAD			
BYTSPRBIN			
STARTX			
ENDX			
YMSGAD			
XMSGAD			

LENGTH	Length in bytes of the message header plus the parameters.
CODE	Value of 7 indicates a histogram to be displayed
LOCATION	Currently ignored, histograms are always displayed in the main display area
NUMBINS	Number of histogram bins
HSTGRMAD	The address of the histogram
BYTSPRBIN	Number of bytes per histogram bin
STARTX	Starting value of the X coordinate in floating point
ENDX	Ending value of the X coordinate in floating point
YMSGAD	The address of the Y coordinate message
XMSGAD	The address of the X coordinate message

OUTPUT PARAMETERS — none

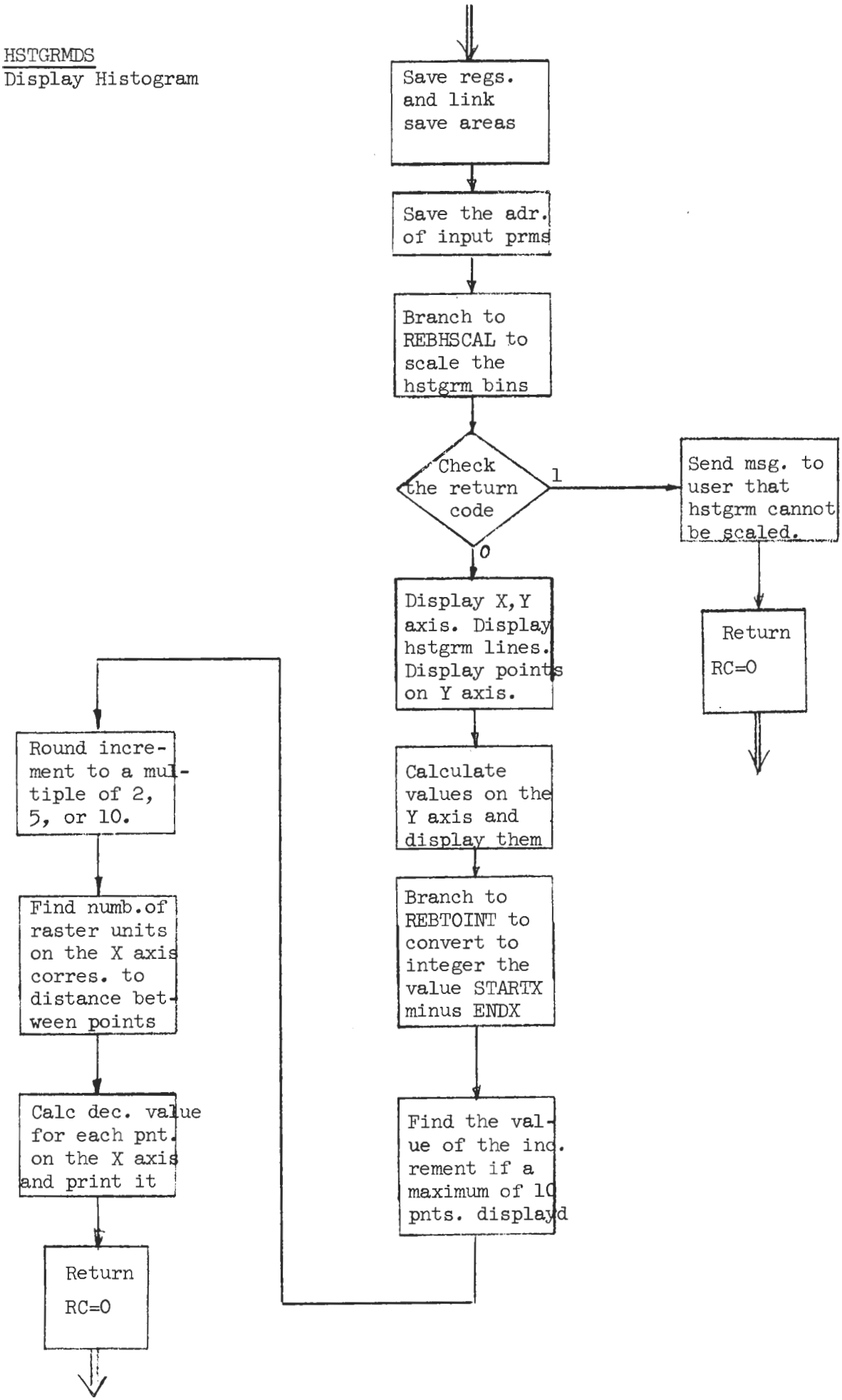
RETURN CODE	0	Histogram was displayed,or a message to indicate that it could not be scaled was shown on the screen. (in R15)
LOWER LEVEL ROUTINES	REBHSCAL STEXT1	
EXIT	On Register 14.	

FUNCTIONS

The function of this routine is to scale the histogram and display it. On entry the address of the histogram parameters is saved in HSTPRMAD. The routine then branches to REBHSCAL, a subroutine which will scale the histogram bins to a size which will fit on the screen. If the histogram cannot be scaled, a message is put on the screen, and the routine exits to the address in Register 14. If the histogram has been successfully scaled, then the lines are displayed together with the points on the Y axis (which were calculated by REBHSCAL). Values are calculated for each of the points on the Y axis and displayed.

The displacement of the points on the X axis are now calculated allowing a maximum of ten points between the first and the last histogram bin, and a round number for the value of the displacement. The actual values of the points are then calculated and displayed. A total of seven digits, a maximum of four before the point and a maximum of three after the point, can be displayed for each point on the X axis. If the number corresponding to a certain point reaches too close or beyond where the number for the next point on the axis should appear, then the number for the next point is omitted. Finally, the messages for the X coordinates and Y coordinates are displayed and this routine returns control to the address in register 14.

HSTGRMDS
Display Histogram



DISABLE INTERRUPTS

CSECT — INTSDABL

INPUT PARAMETERS — R14 must contain the return address
Although this routine does not check it, Register 1 points to the message which requests this service

LENGTH 4 bytes only
CODE must have value of 5
LOCATION Not checked.

OUTPUT PARAMETERS — none

RETURN CODE — 0 The interrupts were disabled

LOWER LEVEL ROUTINES — SDATN1
SDELT1
SRCUR1
MSGDSPLY

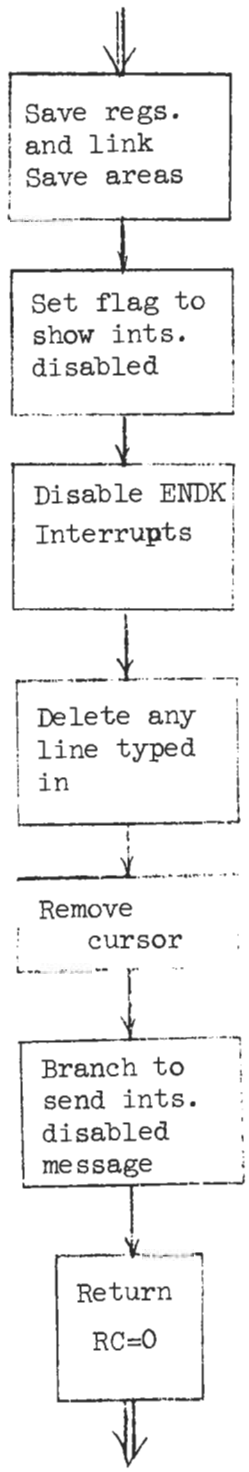
EXIT — On Register 14

FUNCTIONS

The interrupts are disabled, the line currently being typed in by the user is deleted, the cursor is removed, and a message is displayed on the screen that the interrupts have been disabled.

INTSDABL

Disable the Interrupts



GENERAL MESSAGE DISPLAY

CSECT — MSGDSPLY

INPUT PARAMETERS — R1 must contain the address of the message header

R14 must contain the return address.

OUTPUT PARAMETERS

RETURN CODE in R15 — 0 The message was displayed

FF The message could not yet be displayed

LOWER LEVEL ROUTINES — SCHNG1

SALRM1

STEXT1

NEWPAGES

EXIT — On Register 14.

FUNCTION

This display routine gets called whenever any messages are to be displayed on the screen. It does not get called when lines of text are displayed as part of a histogram.

The first function of this routine is to check the length of the message. Only 74 byte messages are currently accepted for display. If a message of another length is encountered, the message is not displayed, but the return code is set to zero and the message forgotten. After checking the length, this routine then checks the location code. If the location code is 1,2,3, or 4, the routine branches to following points called SYSTEMSG, RUNINFOR, RESPONSE, and DSPLTITL respectively. These correspond to the four areas of the screen. RUNINFOR and RESPONSE cause the message to be shown immediately, a return code of zero obtained, and control returns to the calling program.

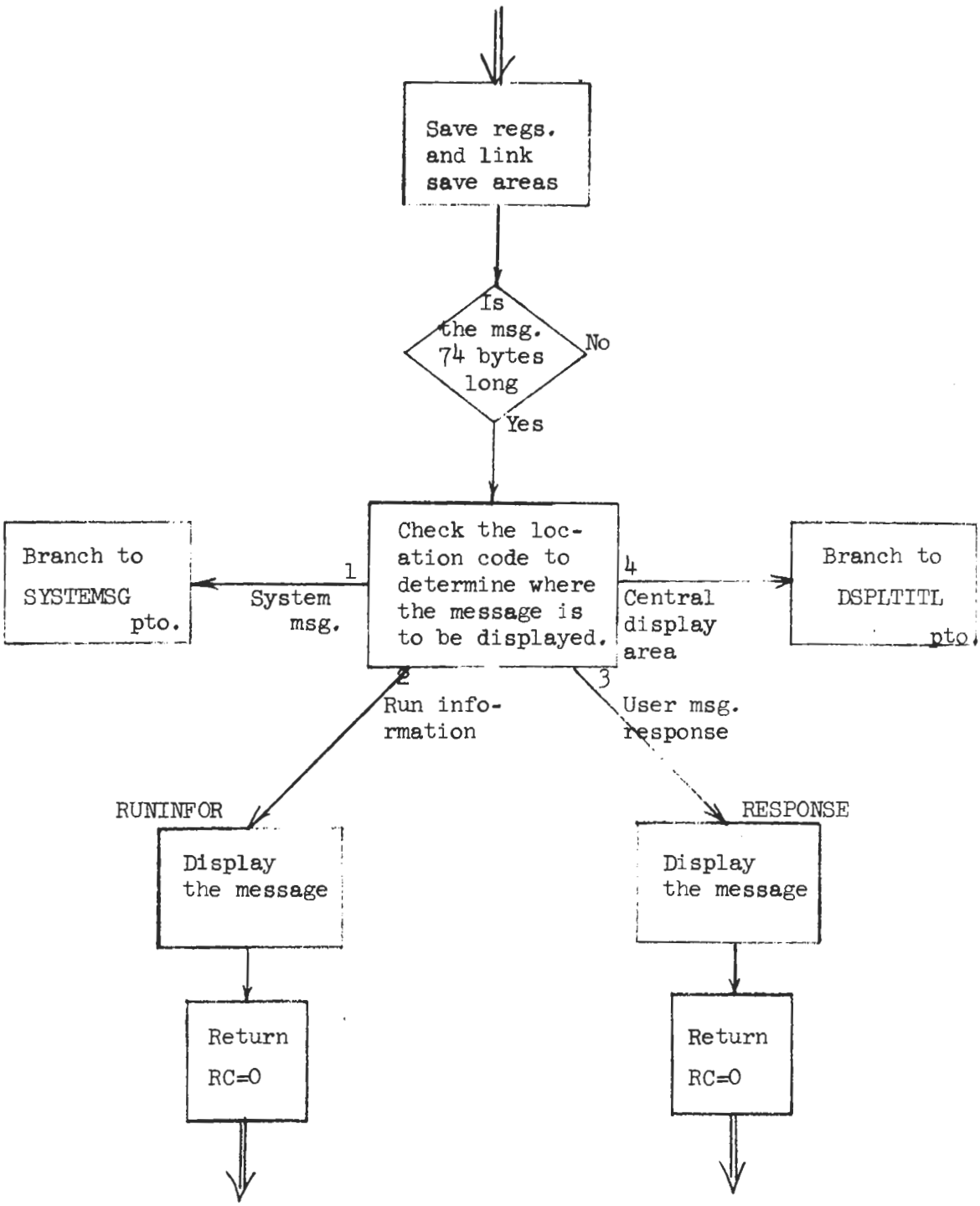
SYSTEMSG causes the following series of events to take place. A "HOLD" message appears on the righthand side of the system message area. This informs the scope user that unless the "HOLD" is interrupted by the lightpen, the current message will be replaced by the new one within five seconds (this is the first timer request as shown in the flow chart). If the user interrupts "HOLD" with the lightpen within those five seconds, then REPL appears adjacent to HOLD. This informs the user that he may replace the current message by interrupting REPL any time within the next five minutes (this is the second timer as shown in the flow chart). If he interrupts HOLD at any time during this second period then he gets a second timer of five minutes started again. If the five minute timer expires without either HOLD or REPL being interrupted then REPL disappears from the screen and the user has again a five second period to interrupt HOLD before the message is replaced. Please see the flow chart for details.

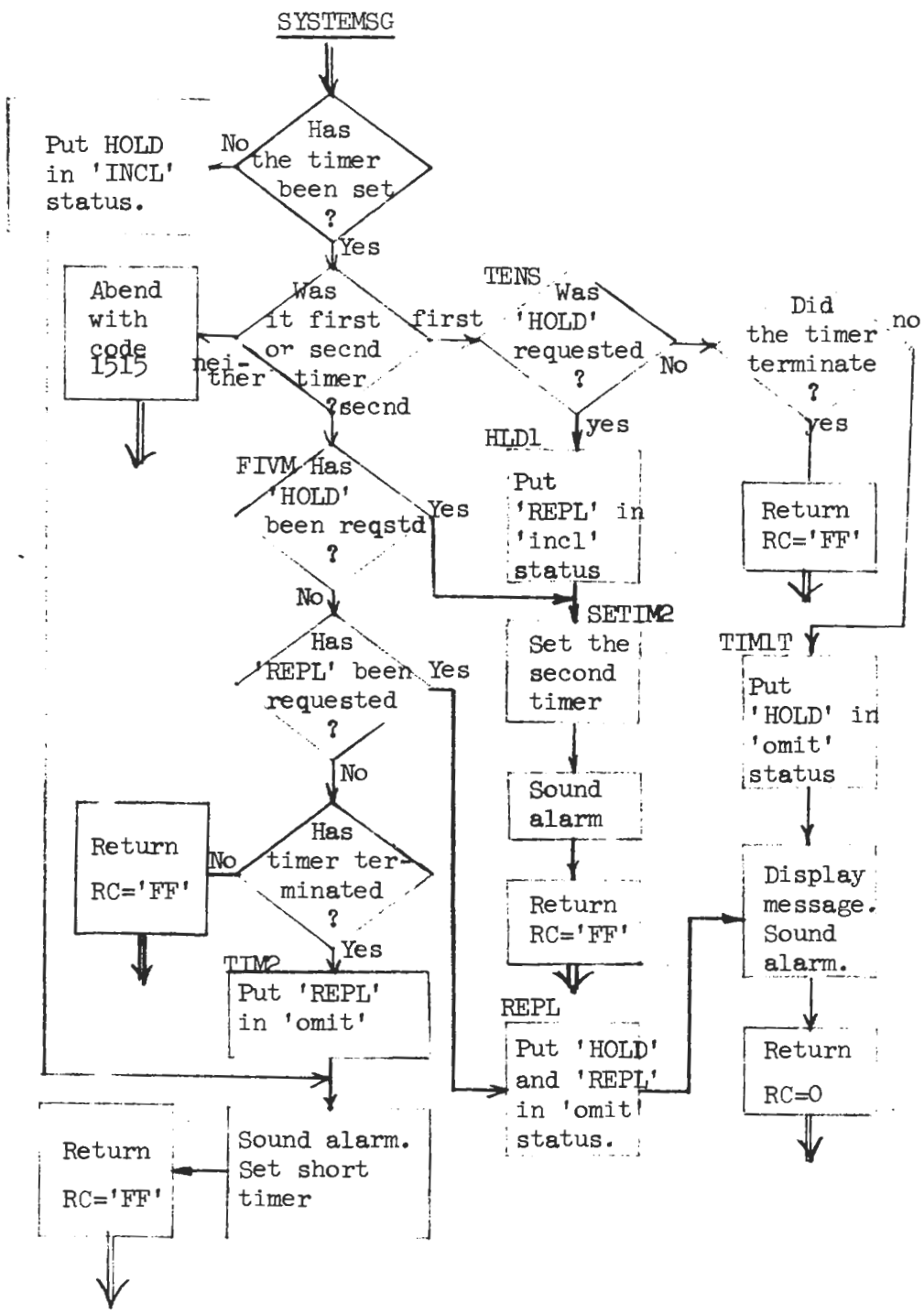
When the message is replaced, the return code is set to zero and control returns to the calling program.

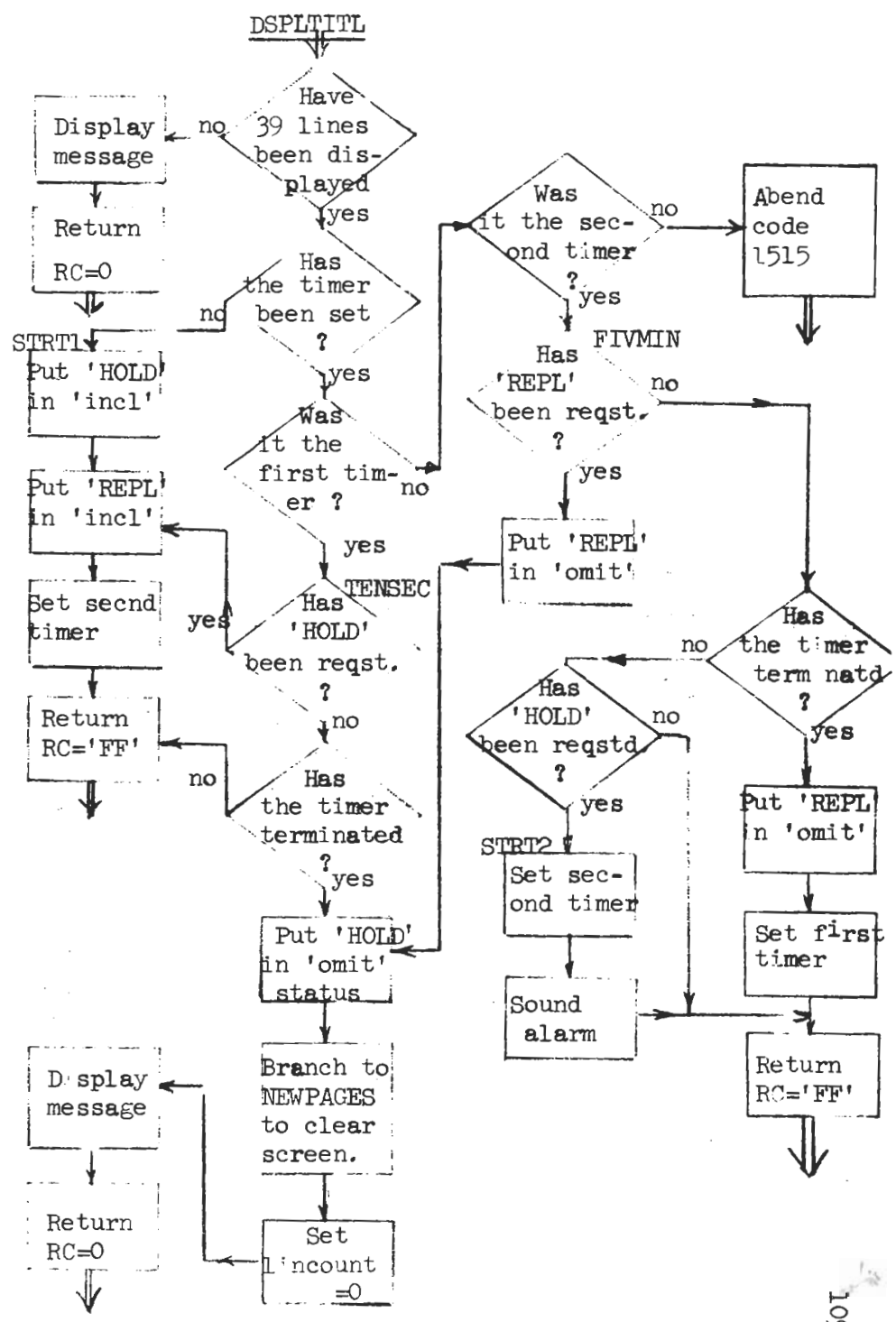
DSPLTITL causes the same series of actions to take place as for SYSTEMSG except that the order is slightly changed. Both HOLD and REPL appear on the upper righthand side of the main display area. The current display remains on the screen for five minutes unless either HOLD or REPL is interrupted by the lightpen. If REPL is interrupted, then the current display is immediately replaced by the new one and this routine exits with return code of zero. If HOLD is interrupted, then the timer is again set to last for five minutes. If the timer expires after five minutes with neither HOLD or REPL interrupted, then REPL disappears from the screen and the user has five seconds to interrupt HOLD for another five minute period. If the five second timer expires without this happening, then the current display is deleted, the new display appears on the screen, and this routine then exits.

MSGDSPLY

Central Message Display Routine




SYSTEMSG
Has the timer been set ?
No
Put HOLD in 'INCL' status.
Yes
Was it first or secnd timer ?
first
neither
secnd
Abend with code 1515
TENS
Was 'HOLD' requested ?
No
yes
HLD1
Put 'REPL' in 'incl' status
FIVM
Has 'HOLD' been reqstd ?
Yes
No
Has 'REPL' been requested ?
Yes
No
Has timer terminated ?
No
Yes
Return RC='FF'
TIM2
Put 'REPL' in 'omit'
Sound alarm. Set short timer
Return RC='FF'
SETIM2
Set the second timer
Sound alarm
Return RC='FF'
REPL
Put 'HOLD' and 'REPL' in 'omit' status.
Did the timer terminate ?
no
yes
Return RC='FF'
TIM1T
Put 'HOLD' in 'omit' status
Display message. Sound alarm.
Return RC=0


DSPLTITL
Have 39 lines been displayed
no
yes
Display message
Return RC=0
Has the timer been set ?
no
yes
STRT1
Put 'HOLD' in 'incl'
Put 'REPL' in 'incl'
Set secnd timer
Return RC='FF'
Was it the first timer ?
no
yes
TENSEC
Has 'HOLD' been reqst. ?
yes
no
Has the timer terminated ?
no
yes
Put 'HOLD' in 'omit' status
Branch to NEWPAGES to clear screen.
Set lincount =0
Display message
Return RC=0
Was it the second timer ?
no
yes
Abend code 1515
FIVMIN
Has 'REPL' been reqst. ?
no
yes
Put 'REPL' in 'omit'
Has 'HOLD' been reqstd. ?
no
yes
STRT2
Set second timer
Sound alarm
Has the timer term natd ?
no
yes
Put 'REPL' in 'omit'
Set first timer
Return RC='FF'

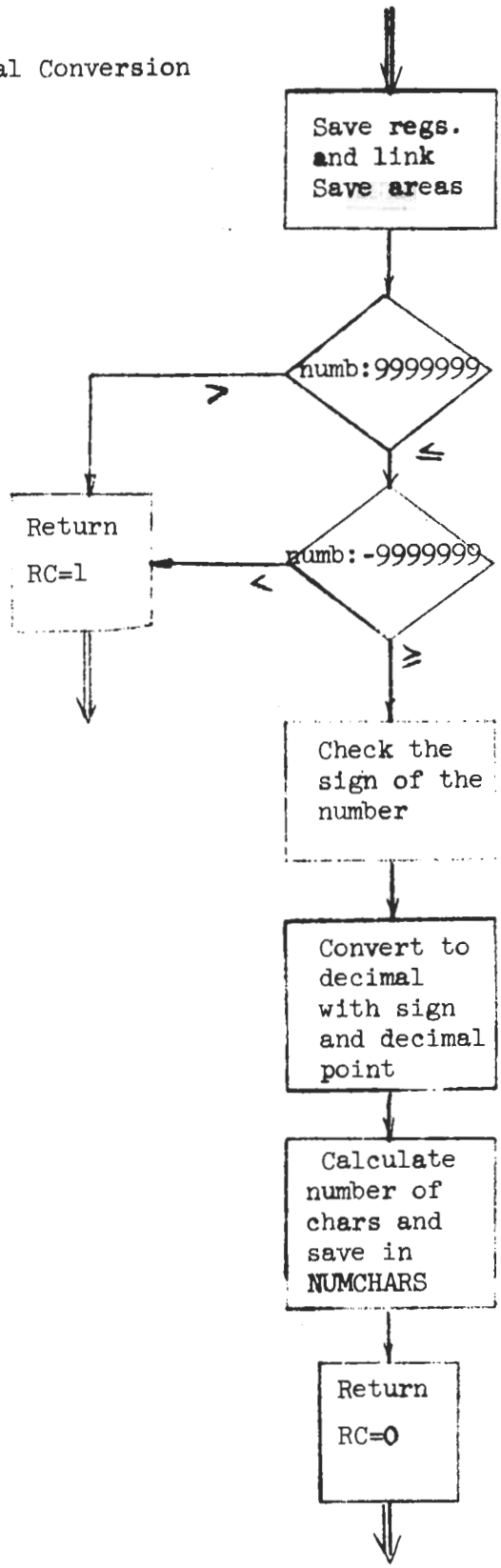
INTEGER TO DECIMAL CONVERSION

CSECT	REBCNVRT
INPUT PARAMETERS	R1 contains the number to be converted R14 contains the return address
OUTPUT PARAMETERS	ADXCHRS has the address of the first character (sign) of the unpacked signed decimal number NUMCHARS contains the number of characters in that decimal number.
RETURN CODE in R15	0 The conversion was performed 1 The conversion could not be performed.
LOWER LEVEL ROUTINES	none
EXIT	On Register 14

FUNCTIONS

A check is first made to see if the number to be converted lies between + and - 9999999. If it does not, then the conversion cannot be performed. The conversion is now made to a signed unpacked number with the decimal point inserted three places from the right (i.e., equivalent to dividing by 10^3).

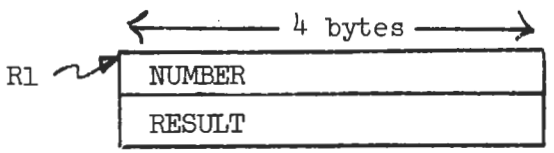
REBCNVRT
Integer to Decimal Conversion



FLOATING POINT TO INTEGER CONVERSION

CSECT — REBTOINT

INPUT PARAMETERS — R1 points to a parameter list.



NUMBER — Signed floating point number to be converted

RESULT — Integer value of number is placed here after conversion.

R14 contains the return address

OUTPUT PARAMETERS — See input parameters

RETURN CODE (in R15)

0 — The number was converted

1 — The number given could not be converted

LOWER LEVEL ROUTINES — none

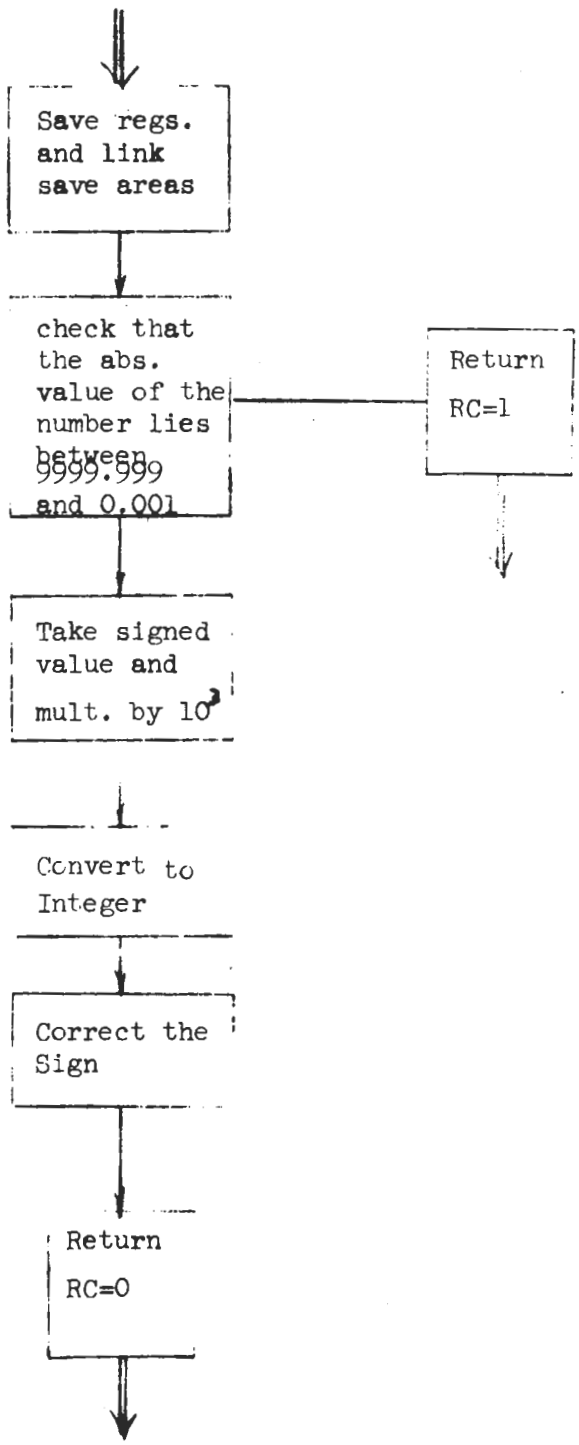
EXIT — On Register 14

FUNCTION

This routine checks that the absolute value of the short floating point number lies between 0.001 and 9999.999. If it lies outside this range, control is returned with a return code of one. This routine then multiplies the number by 10^3 to remove the fraction and finally converts it to integer.

REBTOINT

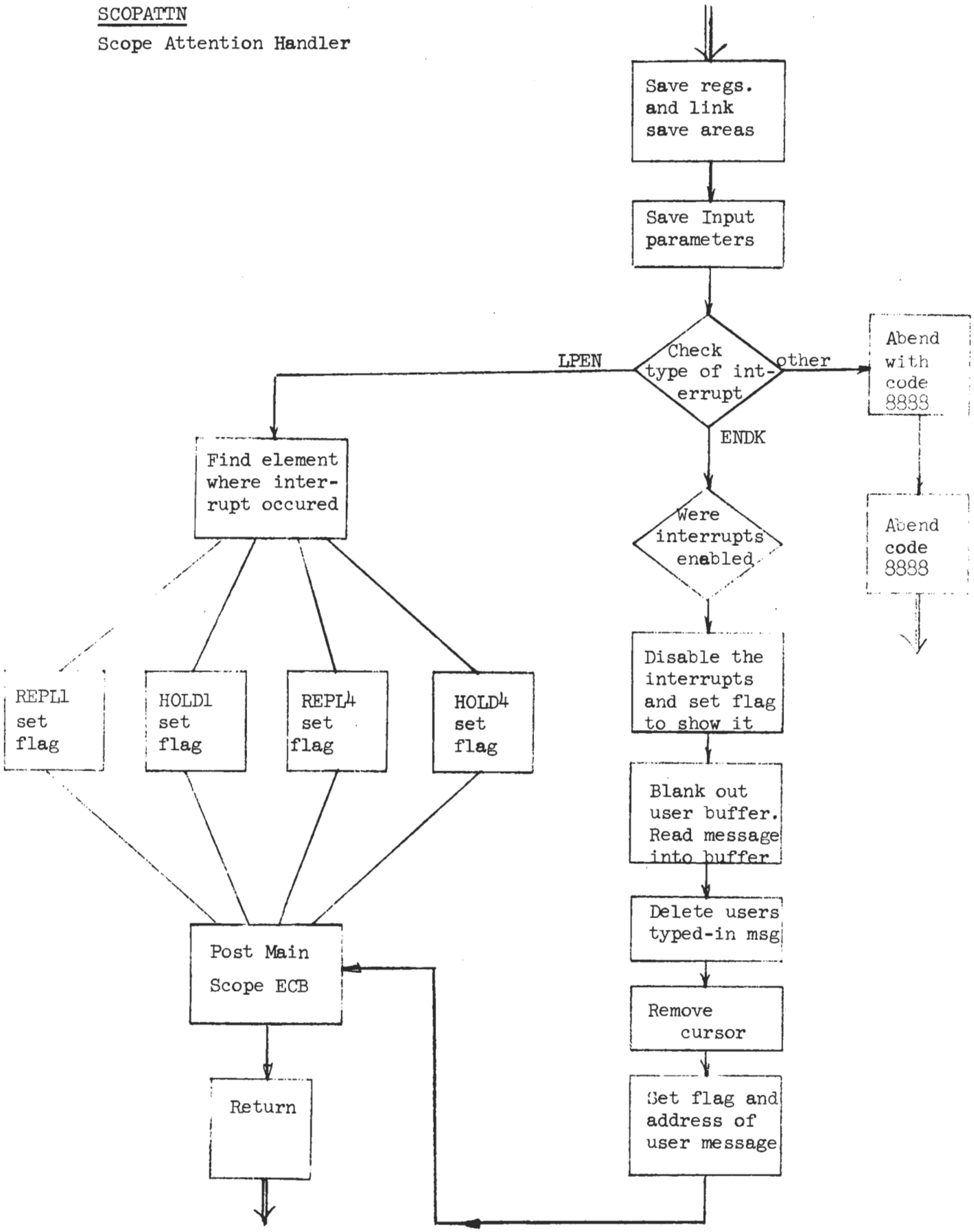
Floating Point to Integer Conversion



posting the main scope ECB. If the lightpen caused the interrupt then a test is made to determine which element was interrupted and a flag is set accordingly. The routine then exits after posting the main scope ECB.

SCOPATTN

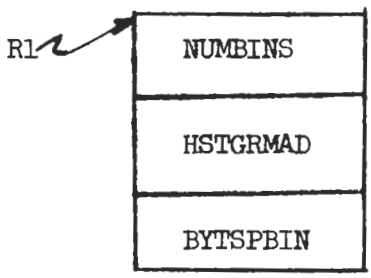
Scope Attention Handler



HISTOGRAM SCALING ROUTINE

CSECT REBHSCAL

INPUT PARAMETERS R1 points to a parameter list.



NUMBINS	The number of bins to be scaled
HSTGRMAD	Address of the first bin.
BYTSPBIN	Number of bytes per bin (either 2 or four)

R14 contains the return address.

OUTPUT PARAMETERS

The output parameters are placed in the work area control section and are as follows:

XBEGAXIS	THE ARRAY OF BEGINING X COORDS FOR XAXIS AND YAXIS
YBEGAXIS	THE ARRAY OF BEGINING Y COORDS FOR XAXIS AND YAXIS
XENDAXIS	THE ARRAY OF ENDING X COORDS FOR XASIX AND YAXIS
YENDAXIS	THE ARRAY OF ENDING Y COORDS FOR XAXIS AND YAXIS
XOFXPNTS	THE ARRAY OF X COORDS FOR POINTS ON X AXIS
YOFXPNTS	THE ARRAY OF Y COORDS FOR POINTS ON X AXIS
XBEGCOOD	ARRAY OF BGNING X COORDS FOR HISTOGRAM LINES
YBEGCOOD	ARRAY OF BGNING Y COORDS FOR HISTOGRAM LINES
XENDCOOD	ARRAY OF ENDING X COORDS FOR HISTOGRAM LINES
YENDCOOD	ARRAY OF ENDING Y COORDS FOR HISTOGRAM LINES
NUMYPNTS	NUMBER OF POINTS ON YBAXIS
NFULLBXS	NUMBER OF HSTGRM LINES

RETURN CODE

0	HISTOGRAM SCALED CORRECTLY
1	HISTOGRAM COULD NOT BE SCALED

LOWER LEVEL ROUTINES none

EXIT On Register 14

FUNCTION

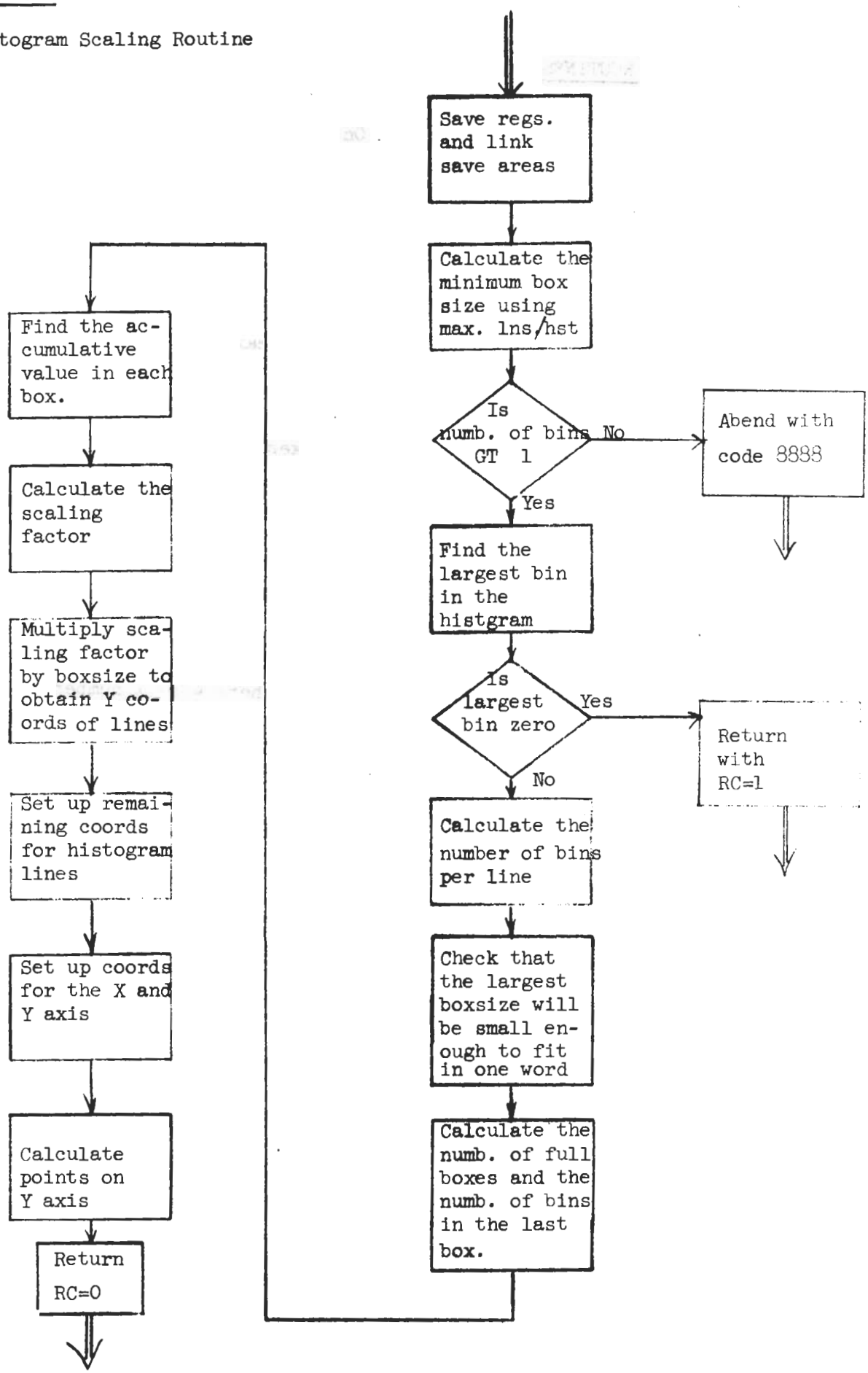
This routine scales the histogram bins so that they will fit onto the 2250 screen. A maximum of fifty vertical histogram lines can currently be displayed on the screen. This number can be changed by increasing the assembled value of MAXLNHST (maximum lines per histogram) and the space allocated to XBEGCOOD, XENDCOOD, YBEGCOOD, and YENDCOOD, all of which are in the Scope work area. The histogram is scaled by lumping the bins together in boxes, each box corresponding to one line of the histogram and containing the sum of one or more bins. There is a maximum raster separation of the lines on the screen so that if the histogram consists of only two lines, they will not be spread over the screen but will be close to the Y axis but having only the maximum raster separation between them.

It is calculated that the histogram cannot be scaled if there is only one bin. Failure also would occur if there were x number of bins per box and the integer value of the largest bin multiplied by x could not fit into one four-byte word.

This routine also calculates the displacement of the scaling points on the Y axis, and the X and Y axis themselves.

REBHSCAL

Histogram Scaling Routine



SCOPE TIMER EXIT

CSECT	SCTIMEXT
INPUT PARAMETERS	none
OUTPUT PARAMETERS	none
RETURN CODE	none
LOWER LEVEL ROUTINE	none
EXIT	On Register 14.

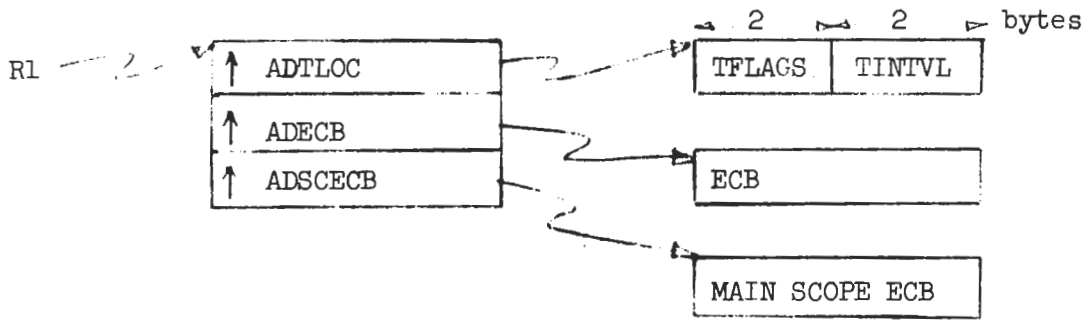
FUNCTION

Post Main Scope ECB so that the routine does not go into a permanent wait state.

TIMER TASKS TIM1 and TIM4.

CSECT — TIM1 and TIM4.

INPUT PARAMETERS — R1 points to a parameter address list.



TFLAGS

BIT	
0	1 Indicates a Timer was requested
1	1 Indicates a Timer macro issued
2	1 " the Timer terminated
3	1 " an interrupt on HOLD
4	1 " " " " REPL
5-15	not used

TINTVL — The interval for which the timer was issued.

ECB — This is the ECB this task must wait on.

OUTPUT PARAMETERS — none

RETURN CODE — none

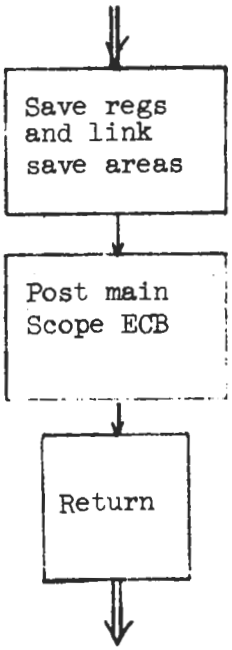
LOWER LEVEL ROUTINE — none

EXIT — none

FUNCTION

The function of these tasks is simply to issue a timer for the main scope task, When the timer terminates, the flag in TFLAGS is set and the main Scope ECB is posted. This task then goes into the wait state on the ECB whose address was passed to it when the task was attached.

TIMER ROUTINES

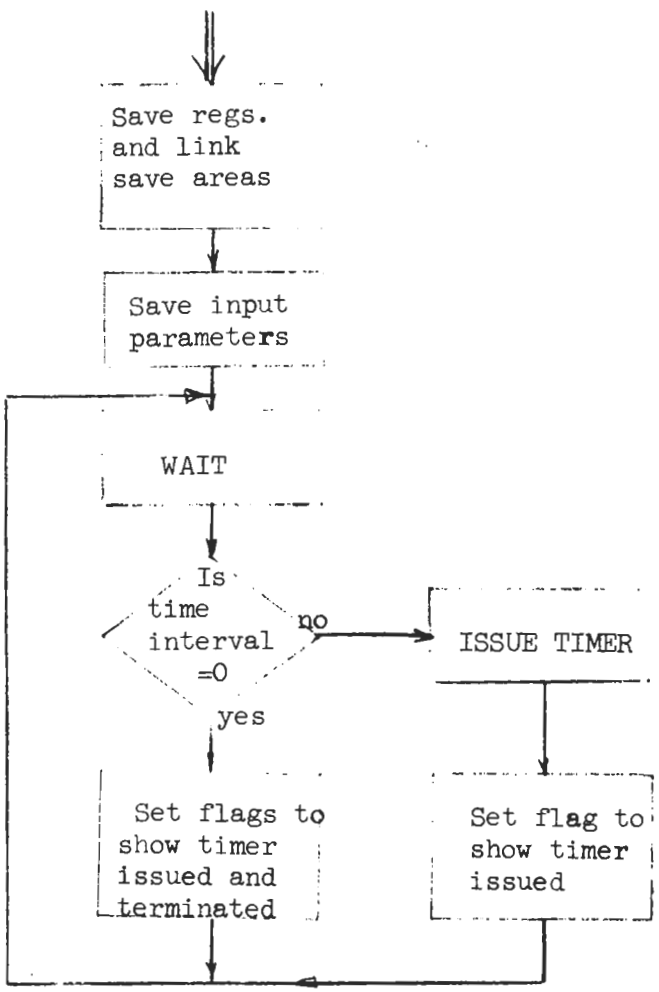


SCTIMEXT

Main Scope Timer Exit

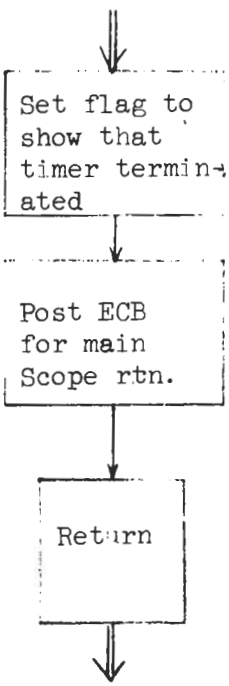
TIM1 and TIM2

Timer Tasks



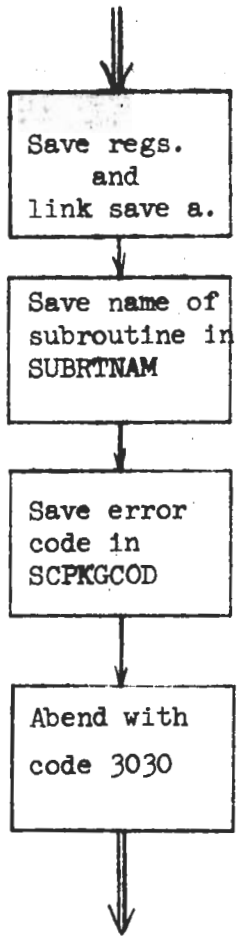
TIM1X and TIM2X

Timer Task Exit Routines



SAAAB1

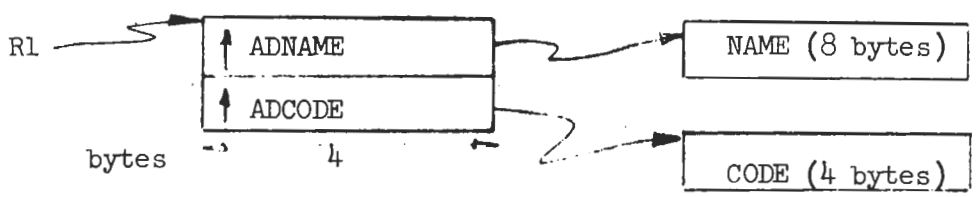
Graphics Package
Error Exit



GRAPHIC ROUTINES ERROR EXIT

CSECT — SAAAB1

INPUT PARAMETERS — R1 points to a parameter address list



NAME name of the graphics package subroutine where the error was detected.

CODE code number which determines the type of error. See Bob Beach's user note 20.

OUTPUT PARAMETERS — SUBRTNAM (8 bytes) contains NAME (see Input Parameters)

SCPKGCODE contains CODE (see Input Parameters)

RETURN CODE — none

LOWER LEVEL ROUTINE — none

EXIT — On register 14

FUNCTION

The name and code in the input list are moved to SUBRTNAM and SCPKGCODE which are in this control section. The task is then made to abend 3030, with a dump.

When the dump is examined SUBRTNAM and SCPKGCOD will contain the name of the routine where the error was found. Bob Beach's User Note 20 must then be referenced to obtain the cause for the error.