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[illegible] SPEC

TO: RSX-11D Distribution

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SUBJ: SYSTEM TRAPS

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Unless specified otherwise, the terms "RSX" and "RSX-11" imply "RSX-11D".

RSX-11D is an event driven system that uses Event Flags and Declaratives of Significant Events for communication and synchronization. In addition, it is desirable to allow certain conditions to cause a "trap" to an appropriate service routine. These traps are provided by the Operating System (not the hardware) and are called "System Traps".

Some System Trap conditions are purely informational (viz., I/O completion), and when a service routine is not provided, a trap does not occur and execution is not interrupted. However, other System Trap conditions are the result of a fault (viz., Stack overflow), and require sevice. In these cases, if a service routine is not included in a Task, the Task's execution is aborted.

This facility provides a means of conserving CPU usage, e.g., Rather than attempting to prevent a fault (Stack or table overflow), extra code is executed only if the fault actually occurs; or, when computation and I/O overlap, it is not necessary to continuously examine an Event Flag to

test for I/O completion.

It is important to realize that while increased system efficency can be obtained (in some cases) by using System Traps, the user must be somewhat more sophisticated than the "average FORTRAN programmer", however, knowledge or utilization of System Traps is not required to effectively use the system, and it is likely that most FORTRAN programs would not use this facility.

When a particular System Trap is to be used by a Task, a service routine for the System Trap condition must be a part of the Task, and the Task must "connect" the service routine to the system, using the SET SYSTEM TRAP VECTOR Directive. The same Directive may be used to "disconnect" a System Trap.

When a System Trap occurs, the Trap service routine (or routines) run at the software priority of their associated Tasks, and will interrupt (or effectively interrupt) this Task. Upon entry, the PC & PS of the associated Task are at the top of the Task's stack.

Trap Service routines run with the Task's registers and with the Task's privilege restrictions. Hence, a service routine normally saves and restores any registers used. (In some cases, the function of a service routine might be to modify the context of its associated Task, e.g., alter its PC.)

A Directive is used to exit from a System Trap service routine. This Directive is issued with the PC & PS of the associated Task on the stack (normally the entry condition), and will effect an RTI instruction execution unless the associated Task's execution is suspended (via SUSPEND or WAITFOR).

Most System Traps are synchronous and can be serviced with controlled re-entrancy, however, some (I/O completion, and elapsed Mark Time Interval) System Traps are asynchronous and must be coded re-entrantly.

To connect a System Trap service routine to the system, a System Trap identification number and a service routine entry address are specified as parameters of the SET SYSTEM TRAP VECTOR Directive. An entry address of zero implies "no trap service routine".

The following is a list of RSX-11D System Traps preceded by an identification number used with the SET SYSTEM TRAP VECTOR Directive.

01 -- I/O completion.
02 -- Elapsed MARK TIME interval.

03 -- Execution of a NON-RSX EMT instruction.
04 -- Execution of a TRAP instruction.
05 -- Execution, of an BPT instruction.
06 -- Execution of an IOT instruction.
07 -- Trace (T-Bit) trap.
08 -- Segment Fault (mem violation, incl stack o'flow).
09 -- Floating point (hardware) exception interrupt.
10 -- (reserved).
11 -- (reserved).
12 -- (reserved).
13 -- (reserved).
14 -- (reserved).
15 -- Power failure recovery.
16 -- I/O Rundown.