RSX-110 SPEC

TO: RSX-110 Distribution

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SUBJ: MULTI-TELETYPE HANDLER TASK

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1.0 INTRODUCTION

1.1 This functional specification will cover both interior design considerations and outward appearance of I/O handler Task to support multiple teletype devices under RSX-11D. The index is below.

A. HANDLER SYSTEM INTERFACE   [PARA

B. INTERRUPT SERVICE ROUTINE: CONVENTIONS   [PARA

2.0   HANDLER INTERFACE TO SYSTEM

2.1   HARDWARE INTERFACE

A.   Teletype devices standardly supported by
     Teletype Handler Task Interrupt service rout
     are:

   1. KSR33 - 10 char/sec

   2. KSR35 - 10 char/sec

   3. LA30 [DECWRITER] - 30 char/sec [serial
       parallel]

   4. VT05 - Variable rate

B.   All the above teletype devices (other than
     operator console) will be initially supported
     if interfaced to the PDP-11 via the KL-11

C.   It is currently envisioned that other,
     teletype-class devices may appear, and provis
     are made so that this should   with
     problems with the Handler. The   and
     however will not support a low speed
     Reader/Punch.

D.   At present, a maximum of 17 devices will be allow
     to be enabled for any PSX-11 running system,
     to restrictions on the allocated vector space
     the KL-11.

* Full duplex 8-bit asynchronous line
Support will extend to the KL-11A,
KL-11C, implying a maximum rate of 30
one Teletype Device.

2.2 USER TASK INTERFACE

A. The Teletype Handler like any other RSX-1
Handler, receives its queued requests from a
active task via either of the two QUEUE I/O Syst
Directives. The user task provides the directi
with a request.node to the logical unit numb
[LUN], desired, as well as with the varic
parameters neccessary for its execution. T
system determines which physical device the us
LUN has been assigned to and after adding sc
linkage and user identifier information, queues t
node to the appropriate handler's request list.

B. The table below gives descriptions of the varic
I/O functions performed for the user task ov t
Teletype Handler. These codes will be compati-
with similar commands on a wide variety of f
devices, thus promoting device independence. T
user may also specify an I/O status word, and/or
event flag to the Handler for any I/O functi
through the request node. The Handler will ca
the user event flag to be set [if specified] , wh
the I/O function is complete, and the user stat
word [if soacifed] to be set to an octal va
determining the outcome of the I/O [success, or t
type of failure incurred].

CODE #	COMMAND	DESCRIPTION OF HANDLER FUNCTION
0400	WRITE	Writes a line from a lI buffer within t requesting task.
0622	WRITE|TEXT FILE	Writes a text fi specified in the requ node, to user select teletype. This is t current Teletype Handl method of despoolin [See section 2.3.]
1000	READ	Reads a line into a lI buffer within t requesting task.
1002	READ|NO ECHO	Same as READ, except Input characters a echoed on the teletv device.

1400   ATTACH   Dedicates the telety
                        device specified to t
                        user task issuing t
                        "ATTACH." Only th
                        user's request nodes wi
                        be processed by t
                        handler for that devic
                        regardless of t
                        priority of other us
                        nodes.

2000   DETACH   Detaches the user
                        from the teletype devic
                        Negates an ATTACH.

C. The format of the text line buffer specifies in t
    user "READ" or "WRITE" function request nodes, wi
    be compatible with the text line formats defined
    the Files project. This format will be included
    detail here, when it becomes available.

D. The status word location, if desired, is defined
    the user task, within user core, from an address
    the user request node. Possible values of th
    word upon completion of a Teletype operation are:

        1. +1 = Successful completion
        2. +2 = Successful completion of Read, t
                  operator terminated line wi
                  ALTMODE, not CARRIAGE RETURN.
        3. +3 = Read completed because opera
                  typed maximum number of character
                  No terminator seen.
        4. +4 = ↑U typed by operator, li
                  terminated [if write operation]
        5. +5 = ↑S typed by operator [if wri
                  operation]
        -
        6. -5 = Illegal function code
        7. -13 = Illegal buffer address
        8. -14 = Illegal buffer count
        9. -207 = Teletype Device incapable
                  desired I/O function
        10. -213 = Illegal characters
        11. -220 = Timeout occurred [if r
                  operation]
        12. -999 = No node available for request qu

E. The general format of the request node that t
    user passes to the QUEUE I/O Directive is defi
    in the I/O Operations Specification. The detai
    bit definitions of words 5-12 of the node howev

are defined soley by the I/O Function.   For
functions available from the Teletype Handi
three basic detailed formats of words 5-12 exi
Format A is for I/O functions "WRITE", "READ",
"READ:NO ECHO". Format B is for functions "ATTA
and "DETACH". Format C is for "WRITE:TEXT FILE."

1. FORMAT A

WD#   MEANING

05   The 16 bit address of the start
              the text line buffer relative to
              user task
06   Special mode word [if set:]
              a. BITS 0-13=UNUSED
              B. BITS 14= pass all charact
                  [RUBOUT, +U etc.]
              C. BIT 15="nole byte count wan
                  [terminator will not end line

2. FORMAT B

NO SPECIALIZED I/O FUNCTION WORDS
NECESSARY

3. FORMAT C

THE FORMAT WILL BE IDENTICAL TO THE "C
FILE" REQUEST AS DEFINED BY THE FILES PROJE

2.3   SPOOLER INTERFACE

A.   Teletype spooling for RSX-11D will be performed
     a separate handler task, for all user I/O "WRIT
     functions assigned via LUN's, to a "SPOOLE
     device'. This "Spooler Handler" will optim
     throughout using its own disk manipulation'.

     Therefore it will enable the user task to funn
     its Teletype output directly to disk and ex!
     This will both free core, and dramatically decre
     runtime for Teletype I/O bound user tasks! two ve
     desirable features'.

B.   Also, like the Teletype Handler, the function
     interface of the Teletype Spooler with the us
     task will be similar to other RSX-11D I/O handler
     promoting user task device independence. To spoo
     simply change the user output LUN from telety
     device to "Spooler" device,

C.   The Teletype Handler itself will also provi
     facilities for a non-device independent form
     spooling, here, the user task "spools" its outp
     lines directly to a text file on the dis
     utilizing the I/O record handling capabilit!
     provided by the Files project. Upon to
     completion [either a terminating character, or
     user program exit or abort], a "WRITE: TEXT FIL
     request node will be queued for the Telet
     handler, the entire unbroken text file will th
     be output on the user specified Teletype, under
     user specified priority.

D.   By the judicious use of multiple text files
     break up long outputs, a user task should be a
     to "spool" at the level of effectiveness [if not
     sophistication] provided by the Teletype Spoo!
     Handler Task. It is this form of spool!
     capability that will be provided initially'.

3.0   INTERRUPT SERVICE ROUTINE:CONVENTIONS

3.1   Special Characters

A. The typing of ↑C shall cause the Teletype Interru
    Service Routine to trigger the MCR sequenc
    Nothing will be echoed. It will be left to the
    task to have set itself to key off this variab!
    and perform legality checking. [Is this
    console Teletype? What is its status?] There wi
    be no effect on any TTY input or output operatior

B. The typing of ↑X shall cause the Teletype Interr
    Service Routine to pass the time, date and
    device number, [via the Send System Directive]
    start up [via the Request System Directive] a u
    task specified at System Generation [SGEN] ti
    This task could be used to, for example, allow
    MCR to run on the teletype from which the ↑X
    typed.   The task may or may not be prese
    depending on the installation's need for such
    feature.   In any case ↑X can be typed from
    Teletype device, and there will be no effect on
    TTY input or output operation.

C. During write operations, the typing of ↑S sh
    cause a +5 to be returned in the status word.
    the typing of ↑U shall cause a +4 to be returned
    well as truncating the output in the middle of t
    line. The user task can use this information
    [for example] stop a long printout on that un
    In read mode, ↑U will clear the current
    buffer, and echo as CRLF.

D. The typing of ↑R shall cause the current
    buffer [if in read mode] to be retyped up to
    current input character. This allows a confu
    typist to examine exactly what he has typed
    the system.

E. The typing of ↑I shall cause a Horizontal Tab to
    echo'd, regardless of whether the Teletype Dev
    has a Horizontal Tab hardware capability.

F. The following characters always have spec
    meanings.

    1. ALTMODE [233, 375, 376] - ends line input.
        echo on output. Converted to 233. Will a
        further console input on the same output li

2.   CARRIAGE RETURN [215] - ends line input.

3.   TAB [HORIZONTAL, VERTICAL, FORM FEED] - If n
     provided by Teletype device, they will
     simulated.

4.   RUBOUT [377] - Deletes last character and ac-
     as "\", If any previous characters in u-
     buffer,

3.2 TABLES

A. The Teletype Interrupt Service Routine is that par
    of the handler task rooked directly Into tn
    Interrupt chain. It is assembled with the Teletyp
    Handler, but is run In Kernel Mode.

B. The Interrupt Service Routine will be structured t
    be "LINEWARE". In other words, it will make th
    Teletype appear as a line device to the Teletyp
    Handler.

C. For each Teletype Device specified in the PUD [th
    maximum of "N", where "N" <16 is the number c
    teletype devices the Handler was assembled t
    control], 3 control words and 4" line buff
    locations will be available in the Teletv
    Handler, set in the format:

    WD 00 = STATUS OF TELETYPE, IF SET:

        BIT 00 = CHAR OPERATION IN PROGRESS
        BIT 01 = LINE OPERATION IN PROGESS
        BIT 02 = JOB IN PROGRESS [ATTACHED]
        BIT 03 = NO ECHO REQUIRED
        BIT 04 = SET IN POSITION FOR OVERPRINT
        BIT 05 = CONTROL CHARACTER BEING PROCESSED
        BIT 06 = LINE IS OVER
        BIT 07 = UNUSED

        BIT 08 = "WRITE" IN PROGRESS
        BIT 09 = "WRITE FILE" IN PROGRESS
        BIT 10 = "READ" IN PROGRESS
        BIT 11 = UNUSED
        BIT 12 = UNUSED

        BIT 13 = UNUSED
        BIT 14 = PASS ALL CHARACTERS [MODE]
        BIT 15 = WHOLE BYTE COUNT WANTED [MODE]

    [NOTE: BITS 0-12 ARE SET INTERNAL TO THE HANDLE
    BITS 13-15 ARE PROVIDED BY THE USER I/O FUNCTI
    MODE WORD.]

    WD 01 = STATUS OF TTY HARDWARE [SET VIA SGEN].*
    SET:

        BIT 00 = DEVICE HAS NO KEYBOARD [READ DISABLE
        BIT 01 = DEVICE HAS NO PRINTER [WRITE DISABLE
        BIT 02 = NOT FULL   DUPLEX   [CHARACTER E
                 DISABLED]

BIT 03 = HORIZONTAL TAB ENABLED VIA HARDWARE
BIT 04 = VERTICAL TAB ENABLED VIA HARDWARE
BIT 05 = FORM FEED ENABLED VIA HARDWARE
BIT 06 = PARITY REQUIRED FOR DEVICE
BIT 07 = UNUSED

BITS 08-15 = MAX   NUMBER   OF   NULLS   NEED
             FOLLOWING CARRIAGE RETURN FOR T
             TELETYPE DEVICE, TO AVOID OVERPRINT.

WDS 02-05 = BUFFER POINTERS

WD 02 = CURRENT COUNT [NUMBER OF CHARACTERS TO
        BEFORE MAXIMUM BYTE COUNT EXCEEDED]

WD 03 = ADDRESS OF CURRENT CHARACTER BYTE BEI
        PROCESSED

WD 04 = POINTER TO USER MODE

WD 05 = PUD ENTRY POINTER FOR THIS DEVICE

WDS 06-08 = CHARACTER PROCESSING WORDS

WD 06
      BYTE 0 = CHARACTER CODE BEING PROCESSED
      BYTE 1 = RELATIVE PROCESSOR LOCATION

WD 07 = POINTER TO CURRENT CHARACTER BEING ECHO'D

WD 08
      BYTE 0 = NUMBER OF CHARACTERS SINCE LAST
      BYTE 1 = NUMBER OF CR SINCE LAST PAGE

WDS 9-48 = TEXT BUFFER FOR CURRENT LINE; [TH
           ALLOWS DOUBLE BUFFERING ON ALL TELETYPE L
           I/O FOR UP TO 80 CHARACTERS.]

* Some sample values are: KSR35=3,LA33=7473