INTERNAL REPORT No. 33

"SRLSYS -- A Magnetic Tape Oriented
Executive Routine for the PDP-11/20"

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1.   Abstract

SRLSYS is a permanently resident monitor for the PDP-11. It includes
IOXMTA, which it uses for all I/O functions. The monitor, IOXMTA, I/O
buffers, and the Absolute Loader together occupy the top 4K words of
memory, and use a few words in low memory for system communication.
SRLSYS supports specially formatted magnetic tape libraries, and
provides a number of utility services which may be requested from the
keyboard or by the user program. SRLSYS is not compatible with DEC DOS.

1.1.   Conventions

All numeric quantities in this writeup are octal representations, unless
specified otherwise. Carriage-return is specified as <CR>. Lowercase
letters in command fields indicate user-supplied octal digits.

1.2.   Related Documentation

The user should be familiar with the program IOX, which is described
in the PDP-11 PAPER TAPE SOFTWARE PROGRAMMING HANDBOOK (DEC-11-GGPB-D),
and with IOXMTA, which is described in Space Radiation Laboratory Internal
Report No. 32.

2.   Commands

2.1.   Command Format

The monitor types a period (.) when it is ready to accept a command.
Commands consist of a single command character, followed by numeric

arguments as needed. A command string is always terminated by a carriage-return. Any character except an octal digit (ASCII codes 6Ø - 67) is interpreted as a field terminator. Commands described below will be shown with a period preceeding the command character. This period is typed by the monitor, not by the user. Quantities enclosed in square brackets are optional. The brackets are not typed. A semicolon may be used to indicate the end of a command string and the beginning of comments, except with the .A and .L commands, which must be terminated immediately by <CR>, unless the rrr field is present.

2.2.   Commands

.A<CR>   run the Absolute loader; the monitor will type .SWITCHES?
                    and wait for the switch register to be set. Type <CR>
                    when ready.

.An[:mmm][,rrr]   load from file mmm (default = 1) of unformatted tape n
                    in Absolute format, with a relocation bias rrr. This
                    command is used to load PAL-11M or LINK-11M output.

.Baaaaa   Branch to address aaaaa.

.Caaaaa-bbbbb   Clear memory between (including) aaaaa and bbbbb.

.Daaaaa-bbbbb   Dump core on TTY from address aaaaa to bbbbb.

.En   write an End-of-file on magtape unit n.

.Fn[:mmm]   space to File mmm (default = 1 implies rewind) on
                    magtape unit n. (Nn is faster than Fn:1, since F will
                    backspace rather than rewind).

.G   Go to address specified in last tape label record,
               or to the standard start address at location 5Ø, if
               the former is odd.

.Hn:mmm   Header of file mmm to TTY.

.In   Index magtape unit n; i.e., dump all the label records
               on the TTY.

.Kn:mmm   Kill programs in file mmm and beyond by writing an
               extra EOF at the end of file mmm-1. Note that mmm
               must be greater than 1, or the monitor (file 1) would
               be lost.

.Ln:mmm[,rrr] Load the formatted core image file mmm from tape unit
               n, with relocation bias rrr. This file must have been
               produced by the S command (see below). The file #
               must be greater than 1.

.Mn±mmm   Move tape n forward/backward mmm records (but not past
               EOF). A minus sign indicates space reverse; any other
               character indicates space forward.

.On   Open unit n (clear internal EOM).

.Pmmm   Punch mmm inches of blank tape on the low speed punch.

.Sn   Store a program on unit n. The monitor will pause to
               accept a label record of no more than 2ØØ (decimal)
               characters.

.Wn   reWind unit n.

.Zn   initialiZe tape n by dumping an unformatted core image of the monitor at the beginning of the tape. This is two records, followed by an EOF. Trap vectors are forced to HALTs, except for loc. 4-12 and 2Ø-22.

.←aaaaa,ddddd   (back-arrow) deposit data ddddd at address aaaaa.

.?aaaaa   (question mark) print contents of loc. aaaaa.

2.3.   Field Formats

2.3.1. Tape unit numbers are always specified as a single octal digit immediately following the command character.

2.3.2. File numbers are always specified as an octal number between 1 and 77777, and separated from the unit number by a colon. The default file number is always 1.

2.3.3. Where field separators are shown, they may be any character with ASCII value less than 6Ø. Characters with value greater than 67 are interpreted as zero fields. See 2.3.2. above for one exception. If a load relocation bias is present, it must be separated from the preceeding field by a comma.

2.4.   Program Tape Formats

The commands H, I, L, and S operate on special tapes which are initialized by the Z command. The first file consists of two records which form an absolute core image of the monitor, including IOXMTA but not the Absolute Loader. This is followed by program files each containing a label record and one or more records which are absolute core images containing the

program of interest. The last program file is followed by a double
EOF. The S command replaces the second EOF with the new program being
stored. The label record contains (in ASCII) the address limits of
each subsequent record in the file (see 2.5. below).

2.5.   Storing a Program

2.5.1. Assuming a write-enabled tape has been properly initialized by using
        the Z command, programs in core can be stored using the S command.
        After typing Sn<CR>, type any desired label information (containing
        no "/" or "!" or TAB characters) followed by a slash ("/"). Then
        type the address limits of each record to be dumped, followed by a
        semicolon. Finally, type the preferred start address for the program,
        followed by an exclamation point ("!") and a carriage-return. Any
        text following the exclamation point will be ignored. Examples:

        .S3
        DATA REDUCTION PROGRAM "FITXYZ" #304.
        STORED 4-JAN-72/0-77,1000-50377;50!

        .S0
        SYSTEM TEST #4/2000-17777;2002!

        .S7
        TWO BLOCKS/50-247,2000-17340;0!

        In the above address pairs, the first address of each pair will be
        rounded down if odd. The second address should normally be odd.

2.5.2. Any printable characters with ASCII values less than 57 (but not 41 = "!") may
        be used to separate the address fields, but those shown above (comma
        and hyphen) are recommended.

2.5.3.   If the specified starting address is odd, location 5Ø will be used
when the program is loaded. If it is zero, or null, use of the G
command after a load will cause the monitor to reenter command mode.

2.5.4.   After the exclamation is typed (followed by <CR>), the monitor will
type: .VERIFY: and wait for a response. Typing Y<CR> will cause
the command to be executed. Typing any other character will cause the
command to be aborted, and the monitor will return to command mode.

2.5.5.   If any of the address blocks specified include any addresses between 4ØØ
and 777 (inclusive), an error message will be printed and an additional
verification requested. Later attempts to load the resulting block will
probably cause system failure, since these addresses are used as stack
space by the monitor and I/O processor. If this second verification is
not answered with a Y, the tape will be repositioned and the double EOF
restored as it was before the command was given.

2.6.   Command Verification

Before executing any command which would modify a magnetic tape (i.e.
E, K, S, or Z), the monitor asks that the command be verified. See
paragraph 2.5.4. for a discussion of this. Verification is sometimes
required twice when an attempt is made to do something which threatens
the monitor.

2.7.   Number Fields

All argument fields are interpreted as unsigned octal integers (except
the M command, which may have either a positive or negative argument.)

A number field is considered to begin with the first character with ASCII value greater than 57, and end with the first character greater than 67 or less than 60. Leading characters <60 are ignored, and terminators greater than 67 freeze the scan, so no more fields are seen. E.G. the string

.D+-,-2XYZ,456

would be interpreted as

.D2,0

Empty fields are assumed to be zero. Carriage-return also freezes the scan, so omitted fields default to zero. Semicolons are effective comment delimiters.

2.8.   Description of Commands

2.8.1.   Several of the commands have already been explained. These are A, B, C, E, F, G, K, S, W, Z and ?. Additional details concerning the others are presented below.

2.8.2.   The Dump Command

The D command expects two addresses, separated by any terminator less than 60. Dumping begins at the first address specified (must be even) and continues until a line containing the second address has been dumped. If the second address is lower than the first, no dump results. The dump format consists of the address of the first word on the line, 6 words of data dumped in octal, and the ASCII equivalents of the 12 bytes dumped. If a byte does not correspond to a printable character, a period is

substituted. A typical line of output might look like;

Ø1Ø24Ø: ØØØØØ6 ØØØØØØ ØØØØØ6 ØØ5Ø15 Ø42524 Ø5213Ø [........TEXT]

The colon following the address, and the square brackets around the ASCII field are a permanent part of the dump format, and do not represent data being dumped.

2.8.3.   The Index Command

This command dumps the first record of each file of a tape, except file #1, on the teletype. Preceeding the dump is the file number associated with that record. This command should be used only with the formatted tapes produced by the Z and S commands.

2.8.2.1. The Header Command

This command is similar to the Index command, but it only types the label record of the specified file. The file number must be greater than 1.

2.8.4   The Load Command

Records are loaded as specified by the address pairs in the label record. Other portions of memory are not altered. The starting address is saved for subsequent use by the G command. If the starting address is odd, location 5Ø will be used. If the system stack is threatened, additional verification will be requested. See paragraph 2.5.5.

2.8.5. The Move Command

The character following the unit number is only checked to see if it
is a minus sign. Anything else is interpreted as plus. Thus the
following are equivalent:

```
M2+7
M267
M2 7
M2,7
M2+0007.
```

The move will be terminated if an EOF is detected.

2.8.6. The Punch Command

The numeric argument is the number of _inches_ of blank tape to be punched.
After typing <CR>, turn on the punch and type any single character (it
will not be echoed). When the punch stops, type a character (no echo)
to return to command mode.

2.8.7. The Deposit (←) Command

Only word data and even addresses are acceptable. Attempts to deposit
at non-existent addresses will cause errors.

3. Utility Routines

Some functions performed by the monitor can be requested by user programs
as subroutines. The general format of these calls is:

```
JSR     R5,@#44
.WORD   (code number for function desired)
.WORD   (additional arguments)
```

These are described below.

3.1.   Octal to ASCII Conversion

```
JSR    R5,@#44
.WORD  Ø
.WORD  (address of number to be converted)
.WORD  (address of first byte of desired ASCII string)
```

A six-digit ASCII string will be stored starting at the address specified

by the third argument.

3.2.   ASCII to Octal Conversion

```
JSR    R5,@#44
.WORD  1
.WORD  (address of string)
.WORD  (address of resulting number)
```

See paragraph 2.7 for a description of how the string is interpreted. At

return, the second argument will contain the address of the byte which

stopped the scan.

3.3.   Magnetic Tape Positioning

```
JSR    R5,@#44
.WORD  2
.WORD  (address of string)
.WORD  (error return address)
```

The second argument is a pointer to a string of the form

Mn:mmm   or   Mn

where the M is optional, the n must be a single octal digit, and mmm must

be an octal integer greater than zero. The subroutine will position tape

unit n to the beginning of file mmm, and the second argument will be

changed to point to the byte that stopped the scan. If a double EOF is

reached, or if n is not a legal unit number, control will be transferred

to the address specified in the third argument. If the former occurs, a

message will be typed indicating the current position of the tape.

3.4   Dumping Core

```
JSR   R5,@#44
.WORD  3
.WORD    (first address to be dumped)
.WORD    (last address to be dumped)
```

The dump format is described in paragraph 2.8.2.

3.5   Other functions are available by direct calls to IOXMTA.

4.   Error handling

4.1.   The simplest errors are command format errors. These include undefined
           commands, improper tape unit or file specification, odd addresses where
           even addresses are required, etc. The monitor types a question mark and
           waits for a new command.

4.2.   Failure to respond properly to a   .VERIFY: request (see para. 2.5.4.)
           is treated as in para. 4.1. The command is aborted. See para. 2.5.5
           for a special case.

4.3.   Attempting to space past a double EOF on magnetic tape causes an EOM
           condition, and the current file number (i.e. between the two file-marks)
           is typed on the teleprinter (cf. para. 3.3). Unless the EOM is first
           cleared by using the O command, the E and M commands will not be executed
           on that unit. The commands which take file number arguments (n:mmm)
           (i.e. A, F, H, K, L) will work only if the file number specified is less
           than the file number which set EOM. The commands I, S, W, and Z all imply
           O, so they work always.

4.4.   IOX fatal errors (which normally would halt in location 4Ø) cause a
           message to be typed of the form:

.IOX ERROR CODE 00000n AT LOC aaaaaa -- SP= aaaaaa
REENTER?

The error codes are:

CODE	MEANING
0	Location 4 trap: illegal addressing mode, non-existent memory referenced, bus error; or, on FBIN write on magtape, BUFSIZE was not greater than BC.
1	Illegal device-command combination, or illegal command, or file number less than 1 requested in FILE command.
2	Slot out of range.
3	Device out of range.
4	Slot not INITed.
5	Illegal data mode.

Typing a carriage-return will cause an attempt to reenter at the point of interrupt if CODE = 0. Typing D will cause a 4-line core dump of the area near the end of the stack. Any other response will cause the monitor to type a question mark and reenter command mode.

4.4.1. If there is not enough stack space available to process the above errors, the following message is typed:

.IOX ERROR; CAN'T PROCESS
.SP WAS aaaaaa

The user stack is destroyed, an IOX RESET is performed, and core is dumped from 370 to 513. The monitor then types a question mark and returns to command mode.

4.5   If a location 4 trap is caused by a stack overflow, the message is:

.STACK OVERFLOW

The actions stated in para. 4.4.1 are taken.

4.6   A location 10 trap results in the following message:

.RESERVED INSTRUCTION AT LOC aaaaaa -- SP= aaaaaa
.REENTER?

Reentry may be attempted by typing <CR>. Any other response will cause the monitor to go into command mode.

4.7   I/O errors generally result in a self-explanatory message, i.e.:

```
MTS=bbbbbbbbbbbbbbbb          (binary dump of magtape status)
.CHECKSUM ERROR
.BUFFER TOO SHORT
.DEOF ON UNIT n--FILE=mmmmmm
.FORMAT ERROR
.EOF BEFORE TRA
.RETRY?
```

4.7.1.   If a checksum error occurs on paper tape, manually reposition the tape prior to typing <CR> in response to the   .RETRY?   message. On magnetic tape, the tape will be repositioned automatically. If a magnetic tape ILC (illegal command -- usually tape offline or write-locked) or PAE (parity error or cyclic redundancy error, or BTE) occurs, only the   MTS=...   and   .RETRY?   messages will be typed. In case of ILC, the message

PRESS CONT WHEN READY.

is also typed. Fix the problem, press CONT on the console, and respond with a <CR> to the   .RETRY?   message.

4.7.2   The   .BUFFER TOO SHORT   message may follow a magtape RLE (record length error), and usually implies:

a) a format error on a labelled tape Load;

b) a record longer than 600 bytes on an Absolute format load;

c) a label record longer than 202_{10} bytes.

No retry is permitted.

4.7.3. The DEOF message has been described above (4.3.).

4.7.4. .FORMAT ERROR refers to label records for formatted tapes. On output, the typed label should be checked for error, or excessive length. On input, the tape probably is not a properly labelled tape.

4.7.5. .EOF BEFORE TRA refers to a formatted binary file being read by the A command.

4.7.6. The only recognized response to   .RETRY?   is a <CR>. This will cause the last I/O command to be re-executed. If that was a magtape operation, and the error was a PAE or checksum error, the tape will be backspaced one record first. See also para. 4.7.1. Any response to   .RETRY? other than <CR> will cause the monitor to enter command mode.

4.8.   Calls to MONITOR subroutines (cf. para. 3) which have illegal codes result in the message:

.ERROR: CALL=nnnnnn AT LOC=aaaaaa

where nnnnnn is the illegal code number, and aaaaaa is its address plus 2.

4.8.1.   Any non-fatal IOXMTA error which occurs during execution of the E, M, or W commands, or the write EOF portion of the K or Z commands, will produce the message:

.ERROR: CALL=nnnnnn AT LOC=SYSM07

where nnnnnn is the status/mode word used for the IOXMTA call. The meaning of the various error codes can be found in the IOXMTA writeup.

4.8.2.   Any undefined combination of IOXMTA error bits in the status byte of the buffer header used by the tape input routine will result in the message:

.ERROR: CALL=00000n AT LOC=INPUT9

where n may be 1, 5, 6, or 7. This represents the three low-order bits in the status byte.

5.   Storage assignments

5.1.   Locations 0-3 must always contain a JMP to the monitor start address, which is 67004 in the 16K version.

5.2.   Locations 4-7 and 10-13 should be set up for the monitor's error handlers. See the listing.

5.3.   Locations 40-43 should contain a JMP to the IOX fatal error handler. See the listing.

5.4   Locations 44-47 should contain a JMP to the monitor's subroutine call handler. See the listing.

5.5   Locations 50-57 and 110-117 should be set up by the user program with JMPs to user start/restart addresses. Locations 50-53 must be set up with a

JMP to the user start address. The other locations _may_ be set up for the user's convenience. Only location 5∅ is used by the monitor.

5.6.   The IOT vector (loc. 2∅-23) and all the I/O device vectors (locs. 6∅-77 and 224-227) must be set up for IOXMTA.

5.7.   Locations 4∅∅ to 777 are used by the monitor for stack space, and may also be used by the user program for this purpose. However, data in this area may be destroyed by the monitor whenever any of the following occur:

1) monitor coldstart;

2) monitor restart via loc. ∅ or CTRL-C;

3) stack overflow;

4) IOX fatal error when the stack is nearly full;

5) IOX fatal error ∅ if reentry is not requested.

5.8.   Locations xx∅∅∅∅ to xx6777 are reserved for IOXMTA, and future expansion of IOXMTA. Here, xx is ∅4 for a 12K machine, and ∅6 for a 16K machine (etc.)

5.9.   Locations xx7∅∅∅ to xx7∅∅3 contain a JMP to the monitor coldstart routine. This is used by the monitor bootstrap loader. Locations xx7∅∅4 to xy7477 (xy = xx + 1) contain the monitor, including the coldstart routine, I/O buffers, and space reserved for expansion.

5.1∅   Location xy75∅∅ is expected to contain the Absolute Loader. If it does not, the A command will not work for paper tape loads.

5.11.   The Z command sets unused trap vectors to the standard defaults:

.WORD   .+2,HALT

and sets loc. 50 with a JMP to the monitor. Locations 0-227 are
stored in the first record, and locations xx0000 to xy7477 in the second.

6.   Starting procedures

6.1.   If the paper tape Absolute Loader is not in core, load it using the
        Bootstrap Loader.

6.2.   If the monitor is not in core:

        1) If there is no initialized magnetic tape available, load IOXMTA, then SRLSYS
            from paper tape using the Absolute Loader. It will start itself.

        2) If there is an initialized magnetic tape available, mount it,
            position it at load point, select UNIT 1, and load the MONITOR
            BOOTSTRAP using the Absolute Loader. The bootstrap will start
            itself, read in the monitor, and jump to the monitor coldstart
            address.

6.3.   If the monitor is in core, but not running:

        1) If the processor is not running, set the switch register to zero,
            press LOAD ADDR, ENABLE, START.

        2) If a program is running, type CTRL-C. If nothing happens, HALT
            the processor and do step 6.3.1 above.

ADDENDUM to SRL Internal Report #33   20 April 72

SRLSYS VØØ3A   JWB

2.3.2.1.   The form   n:*   may be used with the A and L commands to indicate that
           the operation should begin at the current position of the tape (not
           necessarily the beginning of the current file.)

3.3.1.   The form   Mn:*   , meaning leave the tape where it is, is also
           acceptable. The string pointer points to the character following
           the asterisk at return.

4.7.7.   If the   RETRY?   message follows a parity error or checksum error,
           the reply "A" will cause the bad record to be accepted. Processing
           will then continue normally.

5.12.   Locations 24-27 should be set up for the monitor's power fail trap
           handler. See the listing.

7.   Power Fail / Restart

7.1.   Power down procedure:
           1) wait until current operation is finished
           2) type CTRL-C
           3) turn off tape units
           4) turn console power key off.

           Power up restart:
           1) turn console power key on
           2) press CONT ;   monitor should start.

Refers to
Version 3
Only

ADDENDUM #2 to SRL Internal Report #33   15 May 72

SRLSYS V003A   JWB

Due to a program bug, the SRLSYS K command may fail. To circumvent the problem,
make a dummy reference to the desired unit immediately before using the K
command, e.g.:

```
        .On
        .Kn:fff
```

or

```
        .Wn
        .Kn:fff
```

WARNING:

The K command will cause an EOF to be written on whichever unit was last specified
in a command other than K or F.

Permanent Fix:

Make the following change and reassemble: (See p. 17 of the listing)

OLD:

```
MS02.4:  MOV  MFILE,MFILE2
         MOVB R1,MS02.5
         IOT
         etc.
```

NEW:

```
MS02.4:  MOV  MFILE,MFILE2
         MOVB R1,MS02.5
         MOVB R1,UNIT
         IOT
         etc.
```

The Mn:* construction does not work properly. To circumvent the problem use

        Mn:d*

where d is any octal digit.

Permanent Fix:

Make the following changes and reassemble: (See p. 17 of the listing)

   Line #

```
944          BNE    MSØ2.4     ; NO--USE DEFAULT
             CMPB   (RØ)+,#'*  ; MU:* IS A NO-OP ⎞
             BEQ    MSØ2.7     ;                 ⎬ insert
             DEC    RØ         ; WENT TOO FAR    ⎠
945          MOV    RØ,MSØ2.4  ; SET UP CALL
...
95Ø          MOV    MSØ2.3,RØ  ; UPDATE THE POINTER
951          CMPB   (RØ)+,#'*  ; MU:* IS A NO-OP ⎫
952          BEQ    MSØ2.7     ;                 ⎬ delete
953          TST    MFILE2     ; VALID FILE SPEC?
...
```

Change line 963 from

    BEQ   MSØ2.6

       to

    BEQ MSØ2.7

Delete line 975:

MSØ2.6:   DEC   RØ   ; POINT TO DELIMITER

ADDENDUM #4 to SRL Internal Report #33   3 Nov 72

SRLSYS VØØ4A   JWB
Operating System Release 3

2.2.1.   New Commands

.Un   Unload unit n: rewind and go offline.

.←aaaaa,d$_1$,d$_2$,d$_3$...   deposit data d$_1$ at aaaaa, d$_2$ at aaaaa+2, etc.
                          Last data item must be followed immediately by
                          <CR> or semicolon.

.$any text...   insert text into coldstart message buffer.

.?$ display coldstart message.

3.6.   New Utility Routine: GET/PUT

```
          JSR   R5,@#44
          .WORD 4
          .WORD (address of first data byte)
          .WORD (address of Data Control Block (DCB))
```

This routine performs a magtape read or write operation with automatic
error recovery. The operation is controlled by a Data Control Block
as follows:

```
DCB:  .WORD (EOF address)
      .WORD (PAE address)
      .WORD (RLE address)
      .WORD (buffer size)
      .WORD (IOXMTA status/mode) (FBIN illegal)
      .WORD (byte count)
      .BYTE INOUT  (Ø for output, non-zero for input)
      .BYTE SLOT   (must be INITED before call)
```

Control is returned to the calling routine when the operation has been
successfully completed, or when an uncorrectable error has occurred.

ADDENDUM #4   SRLSYS   VØØ4A (cont.)

In the event of an error, control is transferred to the appropriate
address as specified in the DCB. If that address is zero, odd, or
non-existent, a message is printed of the form:

.INVALID ..EXIT ADDR(x)   DCB=aaaaaa

where aaaaaa is the address of the DCB, and x is

> E for end-of-file or end-of-tape
> P for unrecoverable parity error
> R for record length error

and control is transferred to the monitor.

When the operation is completed the IOXMTA status byte is copied into
the DCB, as well as the byte count if it is an input operation. The
mode byte is not changed. If the specified byte count is larger than
the buffer size, the latter is used instead.

3.6.1.   I/O Error Recovery

If an ILC error occurs, the command is reissued until it is successful.
Manual intervention is usually required to correct the problem.

If an EOF or EOT is encountered, a SEEK is performed to clear the
resulting EOM condition, and control is returned at the EOF address
specified in the DCB.

If a parity error (PAE), cyclic redundancy error (CRE), bad tape error (BTE),
or bus grant late (BGL) occurs, five (5) retries are attempted on input,

ADDENDUM #4   SRLSYS   VØØ4A (cont.)

and four (4) on output before the error is considered permanent. In addition, three (3) attempts are made to recover an output error by writing with extended interrecord gap (XIRG). If any error occurs while the tape is being positioned for a retry, it is also considered permanent.

No retry is performed in the event of a record length error (RLE).

3.6.2.   Formatted Binary mode is illegal, and will result in an IOX ERROR CODE 5.

4.7.8.   Some of the error messages indicated in paragraphs 4.6 and 4.7 have been abbreviated slightly.

5.1.1.   The start address is 664Ø4 in the 16 K version.

5.8.1.   Locations xxØØØØ to xx6377 are reserved for IOXMTA.

5.9.1   Location xx64ØØ is the new coldstart address. Monitor locations are xx64ØØ to xy7477.

8.   ADDENDUM #2 and ADDENDUM #3 are obsolete.