Internal Report #39

IMP H/J GSE

Varian 520/i Software Summary

by
Curt Widdoes

May 7, 1972
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Tape In Record Master Routine #2 with patches Stages 1 and 2.
Tape Master Created 5-28-72. Mrs Assembly 1-11-72 70000-201F1000!

 Said #2 5-28-72 /14EE-17C2;164E!

Power Fail Restart #1 5-28-72 /FF0-0002;0020-00DD;1000!

Absolute Assembler #4 5-28-72 /0000-0EF6;1000!

Absolute Assembler #4 with MTA Modifications 5-28-72 /0000-0EF6;1680-1735;1000!

Linking Loader #2 5-28-72 /14EE-17C2;14EE!

(14EE) and BD (OF5A) Math Subs 5-28-72 /0EEE-0FF;1000!

(12EE) and BD (135A) Math Subs 5-28-72 /12EE-13FF;1000!

User with FF and MATH. VIRGIN. Patches Stages 1,2,3,4,5,6. Assem 1-20-72. Stored 5-28-72 /0000-0FF;1000!

ABC with BUFFER SETUP 3. STAGE 1 PATCHES. NEEDS ABC MASTER ROUTINE #2 OVERLAY. STORED 5-28-72 /0000-18BF;1000!

Calibration Program #1. Patches Stages 1,2,3,4,5. Paper Tape Created 7-12-71. Stored 5-28-72. Start ADA ODE1. /0000-0FF;11FO-13FF;ODE1!

CALAN. Patches Stages 1,2,3. Paper Tape Created 7-14-71. Stored 5-28-72. Start ADA ODE1. /0000-14BF;ODE1!


FTP2. VIRGIN. Assem 2-2-72. Patches Stages 1,2,3,4,5,6,7,8. Stored 5-28-72 /0000-13FF;1000!

FTP. VIRGIN. Assem 2-2-72. Patches Stages 1,2,3,4. Stored 5-28-72 /0000-13FF;1000! MUST USE STAGE 5 PATCH!

Paper Call Prgram. VIRGIN. Patches Stage 1. Assem 5-26-72. Stored 5-28-72 /0100-0400,1000-13FF;1000!
## Obsolete SRL Programs

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<td>FTP1</td>
<td>PI function test program</td>
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<tr>
<td>MR1</td>
<td>PI master routine</td>
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<td>CLEANUP</td>
<td>PI cleanup routine</td>
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<td>WINDY JR</td>
<td>PI dump routine</td>
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### Varian and Varian-Based Programs

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<td>ABS ASSEM #3</td>
</tr>
<tr>
<td>26</td>
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</tr>
<tr>
<td>27</td>
<td>MTA ASSEM</td>
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</tr>
<tr>
<td>29</td>
<td>LINKING LOADER #2</td>
</tr>
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ABC (Abbreviated Basic-Like Calculator)

ABC is a Basic-like interpretive language run under the ABC interpreter. A description of the language can be found in "Summary of ABC Language", Curt Widdoes, 11-15-71. A summary of the operation of the interpreter follows:

1. Starting address $032A
2. Latest assembly 10-1-71 1 part patches stage 1
3. The ABC interpreter wipes out MR2, therefore special procedures must be used in loading ABC.

To load ABC from paper tape, use absolute loader #2 and proceed normally.

To load ABC from mag tape, use MR2 to load 0000-18BF, then load the rest of ABC from paper tape using absolute loader #2. The portion of ABC which overlays MR2 is punched separately exactly for this purpose.

MR2 must be reloaded after using ABC. Use the absolute loader #2 to load MR2, or else use absolute loader #2 to load MR2 bootstrap and then bootstrap MR2 in from mag tape.
Master Routine #2 (MR2)

1. starting addresses:
   - main start (command loop) $1C00
   - tape initialization $19AA
   - bootstrap $1F90

2. latest assembly 1-9-72 and 1-11-72 2 parts
   - patches stages 1,2

3. loading MR2 from paper tape: use absolute loader #2

4. bootstrapping MR2 from mag tape:
   - place tape at load point
   - place deck on line
   - load MR2 bootstrap using absolute loader #2
   - start at address $1F90

5. commands:
   - LEXX. load and execute program XX (hex)
   - LRXX. load program XX (hex) and return to command mode
   - B. branch to Baid at address $164C
   - S. store a new program (see 6 below)
   - I. index a tape
   - R. rewind to load point

6. After the S command, a program ID is required in the following format:
   NAME AND COMMENTS/XXXX-XXXX,XXXX-XXXX,XXXX-XXXX,XXXX!
   Up to three address fields may be specified. Addresses may be any
   hex numbers, zero-filled and right justified in a four-character field.
Background Test Program #2 (BTP2)

1. starting addresses:
   - full start (rewind tape) $0100
   - restart (no rewind) $0102

2. latest assembly
   - 2-2-72 1 Part
   - patches stages 1,2,3,4,5,6

3. load BTP2 from mag tape or paper tape, MR2 must be resident.

4. commands:
   - FXXXX. rewind and go to file XXXX (decimal)
   - SXX. write header at current position and record
     XX (decimal) records of quiescent data
     (will not write at file 0) XX=00 → record
     until SS1 depressed
   - E. write trailer and E0F at current position
     (will not write at file 0)
   - B. go to Baid at address $164C
   - M. go to MR2 at address $1CO0
   - C. print command status & temperature
   - R. rewind to load point

5. header-trailer options:
   - + delete last item
   - control P go to command mode
   - control D start entire input over again
   - ! terminate input of current item
BTP2 (cont.)

6. sense switch options:

<table>
<thead>
<tr>
<th>SS1</th>
<th>SS2</th>
<th>SS3</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>x</td>
<td>x</td>
</tr>
<tr>
<td>0</td>
<td>1</td>
<td>x</td>
</tr>
<tr>
<td>0</td>
<td>0</td>
<td>x</td>
</tr>
<tr>
<td>0</td>
<td>x</td>
<td>0</td>
</tr>
<tr>
<td>0</td>
<td>x</td>
<td>1</td>
</tr>
</tbody>
</table>

- stop recording at end of record
- print rates each record
- don't print rates each record
- print new events
- print error events

Note: since rate info is saved until it is printed, the first set of rates printed after SS2 is depressed may be a set that was accumulated in a previous subcom state.

7. the DMP program may be used to dump BTP2 tapes

8. TTY printout event error codes:

<table>
<thead>
<tr>
<th>Code</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>no subcom change after 32 events</td>
</tr>
<tr>
<td>2</td>
<td>readout ended too early</td>
</tr>
<tr>
<td>3</td>
<td>parity error in at least one nibble</td>
</tr>
<tr>
<td>4</td>
<td>read after write error</td>
</tr>
<tr>
<td>5</td>
<td>hazard true</td>
</tr>
<tr>
<td>6</td>
<td>D5H·D5</td>
</tr>
<tr>
<td>8</td>
<td>subcom change too soon</td>
</tr>
</tbody>
</table>

Note: ignore the first 8 error in a file if it occurs in the first record.

9. During recording of data, the TTY keyboard and reader are enabled. If a control P is sensed, recording will be terminated in the end of the
BTP2 (cont.)
current record.

Note: to insure that the control P is received, press repetition control P over an event-line boundary. Printing of events will stop when control P is received.
Function Test Program #3 (FTP3)

1. starting addresses:
   - full start (rewind) $0100
   - restart (no rewind) $0102

2. lastest assembly 2-2-72 1 part
   patches stages 1,2,3

3. Load FTP3 from mag tape or paper tape. MR2 must be resident.

4. commands:
   - FXXXX: rewind and go to file XXXX (decimal)
   - S: input and record header record and return to command mode
   - E: input trailer record and record trailer and EOF, then return to command mode
   - B: go to Baid at address $164C
   - M: go to Master Routine at address $1CO0
   - C: print command status and temperature
   - R: rewind to load point
   - TX1X2: do test X1X2 (see 5 below)
   - Q: print quiescent data on TTY

5. test types: (X1 and X2 are independent)

<table>
<thead>
<tr>
<th>X1</th>
<th>X2</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>no paret test</td>
</tr>
<tr>
<td>1</td>
<td>short paret test</td>
</tr>
<tr>
<td>2</td>
<td>long paret test</td>
</tr>
<tr>
<td>0</td>
<td>no sector-bit test</td>
</tr>
<tr>
<td>1</td>
<td>sector-bit test</td>
</tr>
</tbody>
</table>

Note: TOO. ⇒ record quiescent data. FTP3 then asks for # of records.
FTP3 (cont.)

6. sense switch options during recording:

<table>
<thead>
<tr>
<th>SS1</th>
<th>SS2</th>
<th>SS3</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>x</td>
<td>x</td>
</tr>
<tr>
<td>0</td>
<td>x</td>
<td>x</td>
</tr>
</tbody>
</table>

7. sense switch options during printing

<table>
<thead>
<tr>
<th>SS1</th>
<th>SS2</th>
<th>SS3</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>x</td>
<td>x</td>
</tr>
<tr>
<td>0</td>
<td>1</td>
<td>x</td>
</tr>
<tr>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>0</td>
<td>0</td>
<td>1</td>
</tr>
</tbody>
</table>

8. error codes in TTY printout

- 1: no subcom change after 32 counts
- 2: readout ended early
- 3: parity error in at least one nibble
- 5: hazard true
- 6: D5H•D5
- 8: subcom change too soon

9. FTP3 will not write data or header or trailer records at file 0.
Function Test Program #2 (FTP2)

1. starting address:

   full start               $ODE1

2. latest assembly        7-26-71     1 part
   patches stages          1,2,3,4

3. Load FTP2 from magtape or paper tape. FTP2 is self contained.

4. commands:

   B. go to Baid at address $164C
   C. print command status
   D. print temperature
   G. allow entry of comments
   P. pulse and read out one event
   Q. print quiescent data
   TX1X2 perform test $X_1X_2$
   Xab. set up M1 and M2.

5. Full details are contained in "FTP2 Documentation", Curt Widdoes, 8-2-71
DMP (dump program)

DMP dumps formatted (BTP2 format) tapes and unformatted tapes.

1. starting addresses

- full start (rewind) $0100
- restart (no rewind) $0102

note: restart does not mess up the file or record counters in DMP

2. latest assembly

1-20-72
1 part

patches stages
1, 2, 3, 4, 5

3. operating procedure:

First do a full start to rewind the tape and reset DMP. DMP will remember its position on the tape until some manual intervention makes that memory invalid.

Answer the opening dialogue as in this sample:

FIRST FNRN: 1, 1.
LAST FNRN: 2, 4.
HEX OR NORMAL: N.
OPTIONS: 1, 0, 1.

Each item is described below:

FIRST FNRN: Input a file number and record number (decimal). This will be the first record dumped.

LAST FNRN: Input a file number and record number (decimal). This will be the last record dumped.

HEX OR NORMAL: H => unformatted hex dump (and questions end here)
N => formatted dump (and OPTIONS: must be answered)

OPTIONS: Input $X_1, X_2, X_3$ where $X_1, X_2, X_3$ are each either 0 or 1 and have significance as follows:

- $X_1$ 1/0 => print/do not print header and trailer
- $X_2$ 1/0 => print/do not print temp, PCBE
- $X_3$ 1/0 => print/do not print rates
DMP (cont.)

4. sense switches control printing of events in the formatted dump as follows:

<table>
<thead>
<tr>
<th>SS1</th>
<th>SS2</th>
<th>SS3</th>
<th>Events</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>x</td>
<td>x</td>
<td>no events printed</td>
</tr>
<tr>
<td>1</td>
<td>0</td>
<td>0</td>
<td>all events printed</td>
</tr>
<tr>
<td>1</td>
<td>1</td>
<td>x</td>
<td>all new events can be together</td>
</tr>
<tr>
<td>1</td>
<td>x</td>
<td>1</td>
<td>all error events</td>
</tr>
</tbody>
</table>

5. In both formatted and unformatted dumps, the following information is printed out at the beginning of each record (one exception below):

FNRN XXX XXXX REC LEN XXXX ERRORS:

The FNRN item is the actual FNRN as counted by the DMP program. Errors that may appear are:

- REREAD1 or REREAD2 for both formatted and unformatted
- LEN (length) formatted only
- CS (checksum) formatted only

The REREAD error indicates how many times the record was read and the hardware signalled that a parity error occurred. The record will be read no more than three times.

Note that the LEN, CS, or REREAD2 errors cause the record in error to be dumped in the unformatted (hex) mode even if the formatted mode was selected.

The only time when the FNRN header information is not printed at the beginning of each record is when the formatted dump mode has been selected, SS1 = 0, and the option entries X1 = 1, X2 = 0, X3 = 0, i.e., when only headers and trailers are being dumped.
6. tape positioning:

The DMP program remembers where the tape is and goes directly to the correct file and thence to the correct record without rewinding when the command dialogue is completed.

For example: if the tape is at file 50 and DMP is dumping records and we want to abort the current dump in order to start at file 60, then proceed as follows:

- press step
- press reset
- load address $0102 (restart address)
- press run
- input the appropriate information

The tape will not be rewound. DMP will proceed directly to file 60.

Note that if we want to go to file 1 from file 50 it would be faster to start at address $0100 so that the tape will be rewound quickly.

7. When DMP has dumped the last record of the last file of data on a tape, but has been commanded to print more files, it will either loop re-reading the EOF and printing EOF on the TTY, or it will read on toward the end of the tape. In either case, the operator is likely to become aggravated. This problem is too trivial to warrant fixing. The operator should know which file is the last file on the tape.
Calibration Program #1 (CTPl)

1. starting address $ODE1
2. latest assembly 3-25-71 3 parts
   patches stages 1,2,3A,4A,5A,6A,7A,8,9
3. Load CTPl from magtape or paper tape. It is self contained.
4. When CTPl starts it asks the following questions and expects answers as below:

   REMOTE  C
   DATE: 5-7-72 AND I CAN WRITE LOTS OF COMMENTS HERE. 
   OPTION: 1.
   DETECTORS: 01,02,03,07.
   CHANNELS: 0500,0700,0678,1234,  
             2000,2345,1234,1234,0987,6789,1234,5432,5678.

Each item is described below:

REMOTE  put fluke supply in remote, turn on paper tape punch, and type C
DATE: enter date and comments for CALAN
OPTION: 0 => 1000 pulse sample 1 => 10000 pulse sample
DETECTORS: enter each detector number in zero filled decimal
           + at beginning of a number field restarts detector input;
           illegal character inside a number field => ? is typed and
           field input is restarted
CHANNELS: enter each channel number in zero filled decimal; only 32
           channels allowed.
           + at beginning of a number field restarts channels input;
           illegal character inside a number field => ? is typed and
           field input in restarted.
CTP1 (cont.)

< at beginning of number field => delete the last existing field if there is at least one

Note: S. as the first characters of the detectors or channels input => use the standard detector or channel table.

See next page for a printout demonstrating the special options.
REMOTE C
DATE: THIS IS A SAMPLE
OPTION: 0
DETECTORS: 01, 02, 03, 04, 05, 06
CHANNELS: 0001, 0002, 0003, 0005
0006, 0007, 0008

REMOTE C
DATE: THIS IS A SAMPLE
OPTION: 1
DETECTORS: 01, 02, 03, 04, 05, 06
DETECTORS: 01, 02, 03, 04, 05
DETECTORS: 01, 02, 03
CHANNELS: 0001, 0002, 0003
CHANNELS: 0001, 0002, 0003

Note that a channel name - '0001' - is located in the detectors and channel range.
Calibration Analysis (CALAN)

This program performs analysis of a calibration paper tape produced by CTPl (calibration program #1) assembled 3-25-71. Operate as follows:

1. Load CALAN from magtape or paper tape (it is self contained)
2. Start at address $0DE1
3. Feed in calibration tape, starting at blank leader
4. Let program run until tape is through
5. Feed in next tape
6. Continue until done.

Note: Latest assembling 7-6-71  Patches stages 1, 2, 3
Check Out Peripheral Equipment (COPE)

This program checks out the Fluke power supply and GR counter. Operate as follows:

1. Load program COPE from magtape or paper tape. COPE is self contained.
2. Set up hardware. EIS need not be connected.
3. Start COPE at address $010F
4. Repeat the following sequence until each bit of the GR counter has been checked:
   a. set up a number in GR counter using 10 MHz pulses internal to GR counter
   b. press run
   c. compare number printed with GR counter number (they should be equal)
   Note: if SSL is depressed the counter will be enabled and reset immediately after the number is printed over the TTY.
5. Set up the Fluke DVM to monitor the Fluke supply voltage
6. Start COPE at address $014A.
7. Put Fluke in remote.
8. Perform the following procedure:
   press run
   verify output voltage 10 µV, 20 µV ... 90 µV, 0
   press run
   verify output voltage 10 µV, 20 µV ... 90 µV, 0
   press run
   verify output voltage 100 µV, 200 µV, ... 900 µV, 0
   press run
   verify output voltage 1 V, 2 V, ... 9 V, 0
COPE (cont.):

9. Test is completed

Note: Latest assembly 6-23-71 Patches stage 1
Gaid 51:

VIM: #92U0203-009A 5-28-70
OCHO-0FC2;0E2E
Absolute Loader #1:

VAX #92U0303-054A 5-28-70
LFAE-LFFF (Bootstrap format)

Absolute Loader #2:

Identical to Absolute Loader #1 with the following exceptions:
LFAE-1FC2 has been modified to simplify the operating procedure.

Operating procedure changes:
Q and C need not be set. After loading the Absolute Loader #2 with
the Bootstrap Loader, proceed as follows:

1) Set P as follows:
   a) P = 1FB3 to halt after loading.
   b) P = 1FB7 to continue after loading.

2) Run.
LFAE-LFFF (Bootstrap format)
Relocating Assembler #1:

VXI #92U0303-004C 4-8K 3-15-70
0000-0EED;0000

Relocating Assembler #2:

Identical to Relocating Assembler #1, with the following exceptions:

0009 107E 400 Bytes literal definitions
000B 1146 50 Literal symbolic definitions
000D 17FC 429 Symbols

Operating procedure is identical.

0000-0EED;0000
Power Fail-Restart #1:

VDX #92U0103-074B 4-02-70
0000-0002, 0020-00DD; 0000

Power Fail-Restart #2:

Identical to Power Fail-Restart #1 with the following exceptions:

Reassembled in sector #5, 1742-17FF.

Operating procedure is identical, except all halts are displaced from their
Power Fail-Restart #1 positions by 172216.

0000-0002, 1742-17FF; 1820
Absolute Assembler #1:
VDM #92U0303-002C 1-07-70
0000-OECC;0000

Absolute Assembler #2:
Identical to Absolute Assembler #1, with the following exceptions:
OEC6 17FC 439 Symbols
OEC2 1058 400 Bytes literal definitions
OEC4 1120 50 Literal symbolic definitions
Operating procedure is identical.
0000-OECC;0000

Absolute Assembler #3:
VDM #92U0303-002D 8-20-70
0000-OEF6;0000
This version corrects the BRM=37 problem

Absolute Assembler #4:
Identical to Absolute Assembler #3, with the following exceptions:
OEC2 17FC Do not destroy Master Routine
Operating procedure is identical.
0000-OEF6;0000
MIA is an abbreviation of Absolute Amendment #4. It is used for testing the computer's logic and output on magnetic tape.

Operating procedure:
1. Load Absolute Amendment #4.
2. Overlay with MIA patch assembled 1-29-72, MR2 must be resident.
3. Put blank tape on mag tape unit at load point.
4. Start on address $1605. Computer will halt at 0.
5. Set $51, $52, $53 known for pass 1.
7. Enter $61 into C register.
8. Press run.
9. Turn on page tape reader to read source tape.
10. When computer halts, start pass 2 as in normal assembly. Testing will be ignored on mag tape.
11. When computer halts, load address $16FA and press run in order to write TOF. Computer will halt at 0.
12. Punch object tape header manually.
13. Start pass 3 as in normal assembly. Press space to begin to read.

To load the mag tape on the PDP-10 proceed as follows:
1. Duplication from 9T to 7T on PDP-11 using KENDOP.
2. Reformat from 7T to 9T using RFPM-11.
3. Load reformatted tape on PDP-10.
Baid #1:

VDM 492u0203-008A 8K 5-28-70
1CB3-1FC2;1EB4C

Baid #2:

Identical to Baid #1 with the following exceptions:

Location is sector #5, 14B3-17C2.

Operating procedure changes:

BRU to 157C
BRM to 157A
14F3-17C2;164C
Linking Loader #1:

VID: #92U0303-052A 8K 4-17-70
1CEC-1FC2, 1CEF

Linking Loader #2:

Identical to Linking Loader #1 with the following exceptions:

Location is sector #5, 14EE-17C2.

Operating procedure changes:

To start P = 14EF, Q = 16EB.

14EE-17C2, 14EE