MCR10210
Fix the ISOLTS hdump CU history printout on an L68 (pas.061 T&D deck)
Revision 1.0

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1 Problem Description

Ticket #444 describes an issue where, on an L68 processor, the ISOLTS executive's `hdump` request (dump the history registers) prints wrong control unit history register data, and after a test page has run it prints the L68 registers in the DPS8 format.

The executive is the deck `pas.061` in the T&D deck file ("multics pas executive rev. b.2 062287"). After reading the history registers, `hdump` prints the control unit (CU) history registers one row per entry. The row loop comes back to L45330 for each entry:

```
L45330 LDA    1887        DPS8 flag (set at L11355 from RSW 2)
       TZE    L45333      L68: print this row
       TRA    L45500      DPS8: the DPS8 printout (64 entries)
L45333 LDA    L46234      the row's flags word (current entry)
       ...
L45356 LDA    L46234      word 0 of the current entry
L45376 LDA    L46235      word 1
L45402 LDA    L46235      word 1
```

The loads at L45333, L45356, L45376 and L45402 should move forward two words per row, and be reset to the first entry (L45442, `LDA 46234`) at the end. But the end of the loop takes its address from L45330 and stores it into L45330, and the reset stores into L45330, instead of L45333:

```
045432      LDA    L45330      should be L45333
045433      ADA    2,DU
045434      STA    L45330      should be L45333
045435      STA    L45356
            ...
045443 L45443 LDA   L45442
045444      STA    L45330      should be L45333
```

It looks as if the three-word DPS8 test was put in front of the loop's first load and these three addresses were not moved. The effects on an L68:

- The first `hdump` after the executive is loaded: the DPS8 test reads words 1887, 1889, ..., 1917 (all zero, so every row takes the L68 path). L45333 never moves, so every row shows entry 0's flag bits, and the opcode and address columns of rows 2–16 come from the executive's own words 1889–1917, not from the history registers.
- Every later `hdump`: L45330 is now `LDA 46234`, so the DPS8 test reads the first word of CU entry 0. Once the history registers have recorded anything, that word is nonzero, and the L68 registers are printed by the DPS8 routine (L45500): 64 entries, of which only the first 16 were read. Under ISOLTS this printout also went to the ISOLTS error log with "`*** an error has occurred ***`" instead of to the terminal.

A DPS8/M is not affected: word 1887 is nonzero at the first test, and the executive goes to L45500 before the loop changes anything.

The bug was found while checking ticket #8 ("ISOLTS executes pas2 test harness incorrectly"), which no longer reproduces; the wrong L68 dumps seen there are this bug. The PM061 unit of the T&D tape (t4d_b.2) has the same code and the same bug.

2 Proposed Change

Replace the deck `pas.061` in `>system_library_tandd>tandd_deck_file` with one assembled by GMAP from a source that changes these three words:

Word	Was	Is
045432	045330235000 (LDA L45330)	045333235000 (LDA L45333)
045434	045330755000 (STA L45330)	045333755000 (STA L45333)
045444	045330755000 (STA L45330)	045333755000 (STA L45333)

The source is `>lib>td>source>deckfile>pas>pas.061.gmap` as installed by MCR10204 (which also fixed words 071247 and 045545), with the three words changed and the routine commented. Apart from the comments, the change to the source is:

```
-       LDA     L45330
+       LDA     L45333    PATCH: was LDA L45330
        ADA     2,DU
-       STA     L45330
+       STA     L45333    PATCH: was STA L45330
        STA     L45356
...
 L45443 LDA     L45442
-       STA     L45330
+       STA     L45333    PATCH: was STA L45330
```

The new source assembles to the same words as the installed one except these three (28414 words, same transfer address; checked with a local assembler that reproduces every deck of the deck file).

Here is the `compare_ascii` comparison of the current and proposed deck:

```
cpa >lib>td>s>deckfile>pas>pas.061.gmap ==

Inserted in B:
B13069   * L68 CU history printout, one row per entry; the row loop comes back
B13070   * here (TRA L45330 below) for each entry. L45330 is the DPS8 test (1887
B13071   * nonzero, set at L11355 from RSW 2): DPS8 rows are printed by L45500.
B13072   * L45333 (flags word), L45356 (word 0) and L45376/L45402 (word 1) load
B13073   * the current entry and are advanced 2 per row at the end of the loop.
B13074   *
B13075   * PATCH (2026-11-22, ticket #444): the end of the loop advanced L45330
B13076   * instead of L45333, and the reset at L45443 stored the first-entry load
B13077   * (L45442) over L45330. So L45333 always loaded entry 0, and the DPS8
B13078   * test became a load of a history word: the first hdump on an L68 tested
B13079   * words 1887, 1889, ... and repeated entry 0's flags on every row, and
B13080   * every later hdump tested the first word of CU entry 0 and, once the
B13081   * history registers held anything, printed the L68 registers with the
B13082   * DPS8 printout (64 entries, 48 never read). The loop now advances and
B13083   * resets L45333, and L45330 stays LDA 1887.
Preceding:
A13069   L45330 LDA    1887


A13072   L45333 LDA    L46234
Changed by B to:
B13087   L45333 LDA    L46234    first entry; advanced by the row loop


A13135           LDA    L45330
A13136           ADA    2,DU
A13137           STA    L45330
Changed by B to:
B13150           LDA    L45333    PATCH: was LDA L45330
B13151           ADA    2,DU
B13152           STA    L45333    PATCH: was STA L45330


A13145           STA    L45330
Changed by B to:
B13160           STA    L45333    PATCH: was STA L45330

Comparison finished: 4 differences, 25 lines.
```

Effect

- On an L68: every `hdump` prints the L68 format, 16 CU rows read from the history registers, at the terminal.
- On a DPS8/M: none.

3 Installation

The source goes in `>lib>td>source>deckfile>pas` (replacing `pas.061.gmap`; `>lib>td` is updated without an MCR). The deck file is a multisegment file, which neither `mbuild` nor `update_seg` installs, so this change has no build script and the deck is replaced by hand with `replace_tandd_deck` (MCR10204).

In a new process, with no ISOLTS, POLTS, MOLTS, COLTS or `deckfile_manager` session using the deck file (it is opened for update):

```
cwd WORKDIR
copy NEW>pas.061.gmap pas.061.gmap
ec >lib>td>exec_coms>gmapone pas.061.gmap
copy >system_library_tandd>tandd_deck_file new_deck_file
replace_tandd_deck new_deck_file pas.061 pas.061.objdk -check
replace_tandd_deck new_deck_file pas.061 pas.061.objdk -save old.pas.061
```

Run the tests below with `new_deck_file`, then:

```
rename >system_library_tandd>tandd_deck_file tandd_deck_file.old
copy new_deck_file >system_library_tandd>tandd_deck_file
```

and give the new file the old one's names and ACL (`copy_names`, `copy_acl`). Keep `tandd_deck_file.old` until the change is accepted. Then use `deckfile_manager`'s `list` request to make a new `deckfile.list`, and replace `>lib>td>source>deckfile>pas>pas.061.gmap` with the new source.

4 Testing

Before the deck file is replaced, the deck can be tried by putting it in ISOLTS's working directory as a segment named `pas.061`: ISOLTS uses such a segment before the deck file. Test on a system with a spare CPU (on the emulator, GHM-TEST or a test system).

1. `replace_tandd_deck -check`: no errors. An extract of the new file (`extract_tandd_deck_file`) differs from the old file's manifest only in the `pas.061` record.
2. ISOLTS on an L68 CPU (`test cpu X`): `hdump` at the first `*options?` prints the L68 format, 16 CU rows taken from the history registers. Then `tst887`, `seq`; at the next stop `hdump` again: L68 format at the terminal, no "`*** an error has occurred ***`", and a further `hdump` the same.
3. The same on a DPS8/M CPU: the DPS8 format as before (64 entries).
4. The whole ISOLTS sequence (`tst700`, `seq`) on both CPU types: the same stops as before the change.

Done on the dps8m emulator (MR12.9o, ISOLTS, 2026-11-22), with the three words changed in the running executive by ISOLTS's `alter` request instead of a new deck: on the L68 CPU all three dumps were in the L68 format, 16 rows from the history registers, printed at the terminal with no error (before the change: rows 2–16 from words 1889–1917, then the DPS8 printout in the error

log); on the DPS8/M CPU the dumps were unchanged. Steps 1–4 with the assembled deck remain to be done on Multics.

5 Files Changed

- `>system_library_tandd>tandd_deck_file`: record `pas.061` replaced.
- `>lib>td>source>deckfile>pas>pas.061.gmap` (no MCR needed there; the installed version is `pas.061.gmap.orig`, the difference `pas.061.diff`).

6 Version History

2026-11-22	1.0	Initial version of the MCR.