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IMSAI Board History:
CPA Programmers Front Panel rev.4 Engineering Change Orders (ECO's)

Overview- *The IMSAI CPA revision 4 Programmer's Front Panel was introduced in December of 1975 as a component of the IMSAI 8080 Microcomputer. It was also sold as a separate item in kit or assembled form for those individuals wishing to utilize its diagnostic capabilities for troubleshooting, monitoring, and modifying data in S-100 bus computers lacking such a convenience. It could be run in an extender board in any S-100 socket position.*

Four IMSAI Manufacturing Corporation Engineering Change Orders were released during the product life of the CPA rev.4. They are listed in their order of release. Note that the IMSAI CPA rev. 4 schematic includes these modifications. See the addenda following regarding several schematic errors and some useful "unofficial" modifications that allow greater compatibility with other manufacturer's boards.

ECO 76-0061 (Early 1976) Modification to prevent generation of MEMWRITE signal during OUTPUT instruction:

1. On the COMPONENT SIDE of the CPA circuit board, CUT the trace from U25 (7400) pin 3 to U24 (8T97) pin 4
2. On the SOLDER SIDE of the board, CONNECT U16 (74LS04) pin 6 to U25 (7400) pin 5
3. On the SOLDER SIDE of the board, CONNECT U25 (7400) pin 3 to U25 pin 4
4. On the SOLDER SIDE of the board, CONNECT U25 (7400) pin 6 to U25 pins 9 and 10
5. On the SOLDER SIDE of the board, CONNECT U25 (7400) pin 8 to U24 (8T97) pin 4

ECO 77-0035 (March 5, 1977) Modification to always allow the Front Panel to come up in a STOP mode at POWER UP time:

1. On the COMPONENT SIDE of the CPA circuit board, CUT U22 (74107) pin 11 free from the board near the surface and gently lift it free from the connecting trace
2. On the SOLDER SIDE of the board, CONNECT U18 (74107) pin 13 to U16 (7402) pins 11 and 12
3. On the COMPONENT SIDE of the board, carefully solder a small piece of wire (30 gauge wire-wrap wire works best) from the free lead of U22 (74107) pin 11, through a feed-through hole (via) to U 16 pin 13

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ECO 77-0039 (April 22, 1977) Modification to allow use with IMSAI Dynamic RAM boards (This change makes the S-100 bus RUN line (71) agree with the bus definition):

1. On the COMPONENT SIDE of the CPA circuit board, CUT the trace extending down from U24 (8T97) pin 9

2. On the SOLDER SIDE of the board, CUT the trace from U24 (8T97) pin 10 and feed-through (via) "A" (see diagram on CPA SOLDER side drawing)

3. On the SOLDER SIDE of the board, CUT the trace from feed-through (via) "B" near S-100 bus pin 53

4. On the SOLDER SIDE of the board, REMOVE the entire feed-through (via) pad connected to S-100 bus pin 71

5. On the SOLDER SIDE of the board, CONNECT U22 (74107) pin 5 to U24 (8T97) pin 10

6. On the SOLDER SIDE of the board, CONNECT S-100 bus pin 71 to U24 pin 9. On the SOLDER SIDE of the board, CONNECT feed-through (via) "A" to feed-through (via) "B"

ECO 77-0098 (September 1, 1977) Modification to prevent spurious triggering of "one-shots during RUN mode, causing unpredictable program execution:

1. On the COMPONENT SIDE of the CPA circuit board, CUT the trace from U23 pin 11(74123) to R60

2. On the SOLDER SIDE of the board, CUT the trace from U17 (74123) pin 2 and its feed-through (via)

3. On the SOLDER SIDE of the board, CUT the trace from U20 (74123) pin 11 and U19 (74107) pin 8

4. On the SOLDER SIDE of the board, CONNECT U20 pin 11 and U22 (74107) pin 6

5. On the SOLDER SIDE of the board, CONNECT U 19 (74107) pin 8 and the LOAD side of R60

6. On the SOLDER SIDE of the board, CONNECT U17 (73123) pin 2 to U17 (74123) pin 3

Compatibility Modifications (after-market)

*(Note: asterisk character * following a function indicates active low or "false", per IEE 696 standard notation)*

Modification to run with IMSAI MPU-B *(MPU-B uses XRDY2 (S-100 bus pin 12) instead of XRDY (S-100 bus pin 3)*

1. On COMPONENT SIDE, ADD jumper between S-100 bus pins 3 and 12

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7-23-2004

Modification to cut EXTERNAL CLEAR* (S-100 bus pin 54) free from the S-100 bus. Note that this bus pin becomes "SLAVE CLEAR* in the IEE 696 specification:

> On SOLDER SIDE, CUT trace leading from bus pin 54 to via

Modification to eliminate hardware memory protect (S-100 bus pin 20) from bus. Note that this bus pin becomes "GROUND" in the IEEE 696 specifications:

> On COMPONENT SIDE, CUT trace leading from bus pin 20 to via. Note that this modification requires removing the switch bracket to gain access to the bus pin. As an alternative, it may possible to insulate bus pin 20 with a piece of tape or similar insulating means

Modification to derive FETCH status (SM1) from S-100 bus pin 44 instead of S-100 bus pin 39 (DO5, a status bit unique to timing and flags derived from the original Intel 8080 microprocessor):

> On COMPONENT SIDE, CUT trace leading from S-100 bus pin 39 to U11 pin 9. Connect a jumper between S-100 bus pin 44 (SM1) and U11 pin 9. The recommended technique is to cut the original trace just above the bus pin, then jumper from the remaining trace leading to U11 pin 9, to bus pin 44. Note that this modification requires removing the switch bracket to gain access to the bus pin

Miscellaneous:

The ¼" spacers used between the front panel assembly and the chassis mounting bracket can be a pain to keep on when removing and replacing the front panel group. Simply "crush" the spacers slightly with pliers to distort their diameter and they will stay with the mounting screws. Avoid excessive crush.

A small dab of RTV (silicone rubber), available at your local hardware store) works great for tacking modification wires in place. If you're inclined to want to smear the RTV around with your fingers, wet them with some dishwashing detergent first to avoid messy fingers after the job is done.

Do NOT use alcohol or glass cleaner-type substances to clean the acrylic front plate or switch handles. Use a mild solution of dishwashing detergent and a soft cloth (never paper towels, because they'll scratch the plastic) instead. Afterwards, a good plastic cleaner formulated for acrylic can be used (but be sure to wash the surface FIRST!)

The original IMSAI CPA rev.4 schematic has several errors as follows:

1. (Lower Left corner): S-100 bus pin 37 leading to U11 pin 9 is mis-labeled. It should be S-100 bus pin **39**
2. (Center Upper Left): U15 pin 1 (SOUT) is shown going up to U25 pin 5. Change the drawing to show U25 pin 5 connected to U15 pin 2 (SOUT*)