IBM 1620 Jr.
Project Status

Report #2 (6/30/2017) *Corrected*

This is the second status report on the IBM 1620 Jr. project. An overview of the project is detailed in *IBM 1620 Jr. Project Description, Version 1.1 (3/21/2017)*. The project is structured as several sub-projects, each with a set of volunteers working on it. Note that this is only a summary of the work done to date. Details are available in email & data files.

Meetings (Team)

Steve and Dave met in LA on April 23rd at 1pm to compare the candidate LEDs and make a final decision.

The first in-person meeting of most of the project team took place on May 15th at 2pm in Steve's home. Present were Steve Casner, Joe Fredrick, David Brock, Dag Spicer, and [via FaceTime] Dave Babcock. There was a lot of discussion and many open issues were either resolved or assigned to team members. The highlight of the meeting was Steve sharing with the team, the partially assembled and running front panel with Raspberry Pi and daughter boards.

Steve and Joe held several "work parties" at Steve's home to work on the front panel.

Steve, Joe, and Dave met again in person on June 18th at 1pm in Steve's home to inspect the functionally complete front panel, discuss current issues, and for Dave to take the panel with him to begin the simulator work.

General (Team)

David Brock investigated funding for the project. The museum would prefer if the team self-funded and submitted receipts for monies spent. The museum would then issue "gifts in kind" donation receipts for tax purposes. David will provide more information on how to do this.

It was decided to demonstrate the IBM 1620 Jr. at VCF West at CHM on August 5th and 6th. While it won't be completed by then, significant functionality will be operational. It'll be a great opportunity to share what has been done so far, get feedback from the vintage computer community, and generate interest & possible contributions to the project.

Front Panel (Steve Casner, Joe Fredrick)

The front panel sub-project consists of all physical and electrical work done on the spare IBM 1620 front panel, the Raspberry Pi 3 (RPi), and the interface circuitry connecting the two.

Great progress has been made on the front panel and it is now functionally complete. Work done this quarter includes:

- LEDs which best match the original incandescent lights [variable-intensity and on/off] were selected, ordered, and installed.

- Resistor packs were selected, ordered, and installed. We choose a value that allows 5-7x brightness compared to the real IBM 1620, so that the machine can be run in "realistic" [lower intensity] mode when used by a few people or in "bright" mode when being demonstrated for a large group.
- The final use and labelling of all indicator lights and switches was determined.
- A solution to the broken toggle switches was found using a surplus military switch with a short, threaded shaft. Custom lathe-milled, solid brass handles were made and powder-coated blue to visually match the original ones.
- The faulty "Instant Stop / SCE" and the [not faulty] "Stop / SIE" switches were replaced with similar dual-throw switches, so that hardware debouncing could be implemented with both of them. The intermittent switch may be the reason its plastic carrier was broken – "if it doesn't work, then press it harder".
- The front panel was disassembled, cleaned, and reassembled. In the process, a little of the white paint on the "Instant Stop / SCE" switch was accidentally removed and later touched up.
- The three daughter boards were fully assembled and installed, stacked on top of the Raspberry Pi. The whole assembly was mounted on a fabricated bracket on the back of the front panel.
- A few new wires were added to the original wiring harnesses due to previously unused lights and switches which are now being used. All wiring harnesses were installed and properly anchored to the panel.
- Plastic defusers were made and added to the lower on/off status lights for a more realistic look now that LEDs are being used.
- A circuit which allows the RPi to drive an original [variable intensity] incandescent light was designed and built. It, and an incandescent light, were temporarily added to the front panel to allow experiments with light brightness and duty cycles. Using this circuit, PWM values were determined for matching brightness levels and the display algorithm was modified to approximate the ramp up/down of the incandescent lights.
- The Raspberry Pi bought for the project suffered a hardware failure [no power to the USB or ethernet ports] and was replaced. [A known problem with some RPi's.]
- The front panel test program, which includes the display thread, was enhanced to provide more light and switch testing. An accidental short between two wires was discovered, by running the test program, and fixed.

There are a few, non-functional items remaining to complete the front panel:

- Label the added indicator lights and switches.
- Apply Loctite 271 to the threads of the brass toggle switch handles.
- Repair the lower front right corner of the wooden case.
- Add an internal latch to prevent the front panel from being opened when unattended.
- Add a lockable back with connectors for power, USB, etc.
- Add folding handles to the side of the case, so that it can be carried safely.
- Paint the case metallic gray to match the real IBM 1620 cabinet.

Console Device (Dave Babcock, Joe Fredrick, Dag Spicer)

The console device sub-project consists of all physical and electrical work done on the console I/O device, also known as the console typewriter.

After a lot of thought, investigation, and some discussion, the IBM [Lexmark] Wheelwriter 1000 was selected as the console device for the IBM 1620 Jr. This electronic typewriter is two generations of IBM typewriter newer than the original IBM Model B used with the IBM 1620. It is a solid, reliable device for which supplies and service are readily available. Its IBM "M" keyboard comes close to the tactile feel of an

electric typewriter. It has full-character impact printing which looks close to the IBM 1620 console typewriter's font. The IBM 1620's special characters (zero, FLAG, RECORD MARK, and GROUP MARK) can be approximated by over-printing.

The plan is to electrically intervene a Teensy Arduino microcontroller between the typewriter keyboard and motherboard. The microcontroller will appropriately filter the keyboard input, interface to the IBM 1620 Jr.'s RPi via a USB serial link, handle the over-printing of special characters, and meter the print speed to average 10 cps.

Two IBM Wheelwriter 1000's were purchased in June. Joe has one unit for developing the microcontroller hardware/software and Dave has the other to work out the software details. Both typewriters will be modified, so that a spare device is available if needed.

Card Read/Punch Device (Dave Babcock)

The card read/punch device sub-project consists of emulating the physical punched card device in the software simulator using USB memory sticks to represent individual card decks.

Several approaches to the card read/punch device were discussed at the May meeting. The team felt that this is one area of the IBM 1620 Jr. where modern technology could actually enhance the user's experience of running the historic machine. Specifically, a touch-sensitive display could be used to show a photo-realistic simulation of the real IBM 1622 in operation, including sound. This would be based on a recorded video of the IBM 1401's card read/punch device [which is physically very similar to the IBM 1620's card read/punch] in operation. The user could "press" the buttons on the device, load card decks [via USB memory sticks or selection from the software library], and see & hear the reading/punching of cards in real-time. The display could be housed in a miniature 1622-shaped cabinet with USB sockets for loading the "card decks".

Simulator (Dave Babcock, Steve Casner)

The simulator sub-project consists of developing a new IBM 1620 cycle-level simulator, coded in C, that interfaces with the front panel hardware. It will simulate an IBM 1620 Model 1 Level F card system with 60,000 digits of memory and the automatic divide, indirect addressing, floating point, and MF/TNF/TNS processor options.

Development of the simulator has just begun. The enhanced version of the display thread, used when testing the front panel, will be used in the final simulator.

Software Library (Lee Courtney, Dave Babcock)

The software library sub-project consists of converting all of the museum's IBM 1620 software collection to a format usable by the IBM 1620 Jr., assembling the associated documentation, and testing the programs on the IBM 1620 Jr.

Work on the software library has not begun.

Operations Guide (Dave Babcock)

The operations guide sub-project consists of writing a brief document on the operation of the IBM 1620 Jr.

Writing the operations guide is dependent upon the development of the simulator.

Website (Dave Babcock, Team)

The website sub-project consists of selecting, configuring, and populating a dedicated website on the IBM 1620 Jr. project which will document the entire project.

The original idea for the website was to use it as a communication platform while working on the project. Team members could post messages, data files, documents, and photos to the site. Threaded discussions would help to track the progress of the project, resolve issues, and document the "thought process" behind decisions. As it turns out, the team has been functioning well using simple emails, sending around files, and occasionally sharing files through the cloud.

At this point, a "team coordination" website would not be a benefit. Instead, what is needed is a website which documents and describes the work of the IBM 1620 Jr. project. All of the emails, documents, files, and photos of the project have been preserved and would be presented in a curated fashion on the site.

One of the incomplete items from the original IBM 1620 Restoration Project was a full website dedicated to the IBM 1620. The site would contain complete information about the machine, its development and use, reference manuals, photos, software, a simulator, and all documentation on the restoration project itself. A mock-up of the site was done and some material collected for it, but that's as far as it went.

The thinking now is to complete the full IBM 1620 website as originally planned and add a subsection which documents the IBM 1620 Jr. project.