

Story by John Van Gardner
More - <http://ed-thelen.org/comp-hist/storiesVanGardner.html>

Chinese Binary

As the usage of the 704 Systems grew everywhere the need for an offline card to tape system like the 714/759/727 combination used by the 705 System, became apparent. That peripheral system could not be used to read binary program decks and write them on tape. It could only read 80 column BCD (Binary Coded Decimal) cards and write them on tape one at a time. Checking circuits would detect more than three punches in one column as an error.

When the 704 read a tape the 7 bits from the tape character were sent to the tape control where the parity was checked and the 6 data bits sent parallel to the right hand (Low Numeric order) bits of the MQ register. The MQ would be shifted left 6 places. This process would repeat until all 6 groups of the word were in the MQ. The contents of the MQ would be stored in memory by a Copy instruction in the program. This arrangement allowed the 704 to handle 6 BCD 6 bit characters in a word.

A feature for the 714/759 was designed that would allow any combination of punches to be read. Each card column would contain two BCD characters. Rows 12 thru 3 of column 1 would contain the first character written on tape. Rows 4 thru 9 of column 1 would contain the second character written on tape. This alternating pattern would continue until the complete card had been written on tape. If the data in the card was a binary word the sign bit would be a 12 punch in column 1 and the low order numeric bit would be a 9 punch in column 3.

This feature allowed binary program deck to be read and place on tape. Originally the feature was called Chinese Binary because you had to turn the card sideways to read the data manually. Someone in IBM recognized the insinuation and dictated a name change to Column Binary. They were never able to stop people from referring to internal money transfers sideways from one IBM pocket to another as Chinese Dollars.

This feature was Field Installable but it took 300 man hours to do it. All the back panel wiring was soldered at each end and individual circuits had to be built and modified within the pluggable units one resistor, capacitor, diode, etc. at a time. If you made a mistake extensive damage could occur when power was applied.

I was in the middle of one of these changes at Lockheed working in a very cramped area next to file cabinets where they kept card decks. An operator came up behind me and got a card deck from one of the drawers and failed to close the drawer. When I squatted down to do some panel wiring I caught the corner of the drawer with my hip. It tore a large hole in my suit pants and shorts and gave me a large scratch. I went into the CE room and used the stapler from my desk to close up the large torn flap on my pants and put on an IBM smock we used in the shop. It was getting close to quitting time so I went back to the machine to get to a good stopping point. I wore the smock home and when I got there my wife wanted to know why I was dressed that way. I took the smock off and turned around and showed her.

A few days later I was still working on the change and trying to get to another good stopping point when I got a phone call from Jack Bellinger. He was over at the Lockheed surplus sales building and wanted me to bring my car over there and get him. His wife had brought him to work so she could have the car and Lockheed had called him and told him he had won the bid on 20 surplus dial indicators.

Jack had talked to me about the dial indicators before he submitted his bid. He knew that I had been a machinist before I was in the navy and he wanted to know what a new dial indicator cost. I had told him I had never seen one of less than \$60.00 back then. He bid \$100.00 for the lot and won the bid. That was \$5.00 each and they were all new. I had to clean up, walk out the tunnel to the parking lot and get my car. Then I had to go to the gate where I could get a pass to get my car into the plant area. I got to the surplus area and got Jack and the dial indicators. We went to the gate to turn in the car pass and then back to the parking lot. Second shift was coming in and it was full so I had to park at the end. We walked back to the computer room and I told Jack to call his wife and tell her I would bring him home. That was two hours lost time right in the middle of the Chinese Binary change. *(Months later after Jack had sold all but one of the dial indicators he wanted to know if I wanted to buy it. I told him I would give him the \$5.00 he paid for it to keep him from losing any money. He told me he would have to get \$5.25 for it because he had to make a profit. I gave him the \$5.25 but I should have sent him a bill for my time and gas. I finally used my dial indicator one time when I rebuilt the automatic transmission on my 1962 Pontiac to check the input shaft free play.)*

After the change was complete the machine appeared to run ok but after a few weeks a pattern began to unfold. The card reader would get Read Checks on binary cards and whoever took the call would adjust the clipping level voltage and it would run ok. Then someone would get a Read Check call and it would be running BCD cards. They would adjust the clipping level voltage and the reader would run ok. After looking back through the logbook I realized the two different card types required a different clipping level. I began looking into this when I could get time on the machine but had not really made any progress. This went on for a long time but the customer was not complaining because they thought the machine was breaking each time and we were fixing it quickly each time.

One day I got a request for assistance on a 714 at Marshall Space Flight Center in Huntsville, AL. When I got there the problem they were having was the same one I had been working on for months at Lockheed. This time it was serious because I had to fix it before I could go home. One thing I noticed at Huntsville was the hole pattern in the cards that were failing. If one of the card rows was almost punched out and had a column that was not punched in that row it was picking a bit in that column.

I found a keypunch and began punching some test cards. One of the failures I had seen was a card that had most of the 8 row was punched except column 12. I punched a card with all 8s except column 12 then duplicated about ten of these cards. Then I went back to the machine and tried the deck. It failed immediately and on every card. Now I had something that failed consistent enough that I could scope it. I made me a big deck of these cards.

The 714 read brushes connect to a winding around a magnetic core. When the brush goes through a hole in a card it touches the contact roll, which is connected to 48 volts DC. This voltage causes current to flow through thru the brush and core winding setting the core to a 1 bit. I decided to scope one of the read brushes to see what the signal going to a core looked like. That's when I got a surprise. Instead of seeing a 48 volt pulse from the contact roll it was only 27 volts. I put the scope on the common brush that fed the 48 volts to the contact roll and saw 48 volts until the row of holes in the card passed under the brushes then it dropped to 27 volts. I followed the wire that fed the common brush back to a terminal block and found a solid 48 volts there. All those holes in the card was causing so much current to all those cores it was dropping 21 volts across the wire from the terminal block to the common brush. The machine needed a bigger wire.

I asked the local CEs for a larger wire and the only one they could come up with on site looked like an automobile battery cable. We had to grind the sides of the lugs down to where they would fit between the webs of the terminal block. It didn't look to good but I wanted to see if that was going to fix the problem.

I installed the wire and hung the scope lead on the common brush terminal and ran my deck of card. None of them failed and the scope showed a solid 48 volts. I found I could vary the clipping level voltage over a much wider range than ever before. After setting the clipping level voltage to the center of its range I gave the machine back to the customer who began reading BCD assembly source cards. The machine worked fine. I was going to get to go home after all.

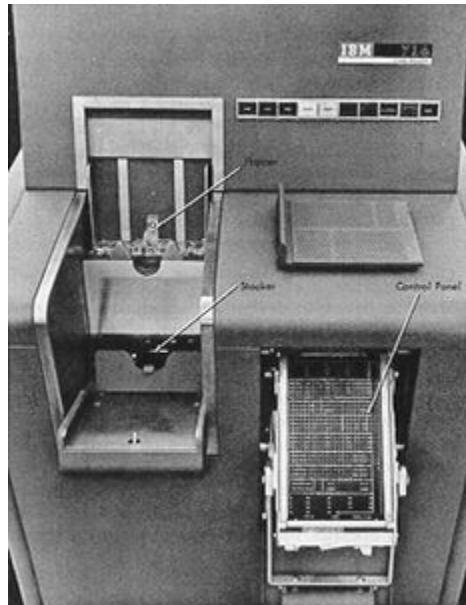
When I got back to Lockheed I got the 714 from the customer and connected a scope to the common brush. I ran some of my test cards and showed all the CEs there what was causing all the trouble we had been fighting. One good thing about working at Lockheed was they were a good source of any kind of wire you needed. They made all the cables for the airplanes they were building up on the second mezzanine. I went there and got some wire and terminal lugs like I wanted and installed it on our machine. We never had our old problem again.

I never knew why a bit was picked in the blank column when the 48 volts was pulled down to 27 volts. When anyone would ask I would just say, "I don't explain them, I just fix them".

I sent in a formal IBM Suggestion form with a description of the problem, the solution and a deck of the test cards. Weeks later I got a rejection letter saying they had not had any reports of the trouble. I wrote them back and dared them to run the deck of cards I had sent them on a machine at the plant. I didn't hear anymore for a long time. Then I received another rejection letter saying they could not justify a change. I saw I was fighting a losing battle so I forgot about it.

Later on in January 1961 when I went to Poughkeepsie for 7090 school one of the Manufacturing Managers invited some of us students to his office in the plant. He had some questions he wanted to ask us. He said part of his problem was the field was not feeding back information about problems we were having with the machine they made. This didn't set well with me so I told him about my experience with the 714 card reader. He picked up his phone and called the suggestion department to find out who in the 714 group reviewed my suggestion. They read him the suggestion and gave him the name of a man that was currently working for him. He sent for the man to come to the office. When he got there the Manager asked him about the test deck I had sent. The man said they could not use the deck. When the Manager asked him why, he said, "It was too tough a test on the machines, none of them would run it". The Manager was visibly angry and he and the man left the office for a few minutes. When the Manager returned he said he was going to see that my suggestion was reopened. I probably wouldn't get much money but at least I would get credit for my idea. The 714 was a dead issue as the 1401s were taking over all the peripheral work.

On May 1, 1961 I received a Suggestion Award of \$25.00.



IBM 714 Card Reader