

My Beginning in Field Support

Dave Gunderson, Field Engineering Technician at Sperry UNIVAC

PROLOGUE

Mr. Gunderson was searching the internet for information about the MPC-16 that he had worked with on the ARTSIIIA upgrade project. He found the VIP Club website then responded to the Legacy call for stories via editor Lowell Benson. The result is his brief career summary <https://vipclubmn.org/People3.html#DaveG>, this 'Our Stories' for April '23, and a UYK-23 story as the May '23 'Our Stories' [<https://vipclubmn.org/OurStories.html#2023>].

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INTRODUCTION

My name is David Gunderson. I go by Dave as David seems so formal. As I told Lowell Benson in my initial email to him; I have stories to tell. In my all too brief time at UNIVAC most of it was spent away from the Eagan facility where my Air Traffic Control (ATC) management team was headquartered. {sic. <https://vipclubmn.org/aircontrol.html>}

My job at UNIVAC was my first after leaving the Marine Corps Third Air Wing where I had worked on Flight Simulators and Air Traffic Control. Ernie Horning and Dan Cheskey hired me in 1976 to work in the ARTSIIIA upgrade. I probably wasn't a perfect fit for the position of Field Engineering Technician as much of my technology background was in Analog Circuitry, mostly Vacuum Tube based. I did have a background in Air Traffic Control (ATC) and I had a current Security Clearance going for me. I didn't have a solid background in Digital Circuits nor any Programming experience. I was relieved that nobody asked to see my DD-214 Discharge Papers as it stated that my qualification for a civilian position was as a 'Television Repairman'.

As I was hired early on for the program, everyone assumed that I'd catch up. In this early time, some of us new hires found ourselves 'loaned out' to different departments to fill in. In my case, I ended up in the material testing laboratory. I learned to quality test components like connectors, the plating on wire wrap pins, and backplane wiring [<https://vipclubmn.org/Components.html>]. I actually liked the assignment, and they liked my enthusiasm for the work. Opportunities to learn were everywhere. My next temporary assignment was checking Request for Change forms (RFC's) for accuracy. Again, giving me another opportunity to learn something worthwhile.

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Finally, I was called up to work at the ARTSIIIA Test Bed at the MSP (Minneapolis-St. Paul) airport. I remember being shown around by Al Thomas. He led me up to an IOP (Input/Output Processor) and casually asked, "Do you think you can work on this?" I looked at the IOP's Maintenance Panel like a 'Deer staring at the headlights' and mumbled, "Yes." <https://vipclubmn.org/CP30bit.html#IOP> My time at the test bed could have been more productive as I lacked programming experience.

SINK OR SWIM

I learned several things about the IOP while at the Airport Test Bed. The main ingredient that was missing was the understanding of the instruction set and writing the 'Quick and Dirty' routine in machine language needed in the troubleshooting process. Lucky for me, the Eagan facility offered training in the basement classrooms after hours. I had one-on-one programming training from an instructor named Ivan Christensen that finally 'laid it all out' to my analog soaked mind. Just like that, a light came on and I 'got it'. Mr. Christensen, thank you.

MY LUCK CONTINUES

For some reason, I got reassigned to support Enroute ARTS (EARTS). I found myself at the EARTS Test Bed at the FAA Center in Farmington, MN. I reported to Bob Schwartz. Bob in turn, assigned Dick Werner and Jerry Ludwig to be my mentors. With my fledgling programming skills, Dick would assign me programming tasks. Initially, simple routines and working up to more complex tasks. Come to think about it, both Dick and Jerry taught me how to play Bridge and Pinochle on our lunch breaks.



Picture 1. Field Engineer John Philbert at the EARTS Test Bed in Farmington, MN.

I specifically remember one programming assignment. I was tasked to write a program to write a block of data to the Tape Drive. The data would be formatted in such a way as to be restored to memory by the Boot Loader in NDRO. It seemed simple enough. I knocked out the code and 'fat fingered' it into the maintenance panel. The routine seemed to work. The data was written to tape. The Boot Loader would read it in and result in the dreaded 'four stop' (indicating a failure). Reviewing the reason for failure in the NDRO listing showed a checksum error. I went over and over the logic in my routine and said to myself that it should work but didn't. I eventually found my stupid error. The software bug being on how my logic looked at the number Zero. To those of you that have programmed on a 'Ones Complement' Computer, you eventually learn the brutal lesson for two different numeric representations for the number Zero, one being positive and the other being negative. I wonder if figuring this out the hard way was a 'rite of passage' for UNIVAC programmers.

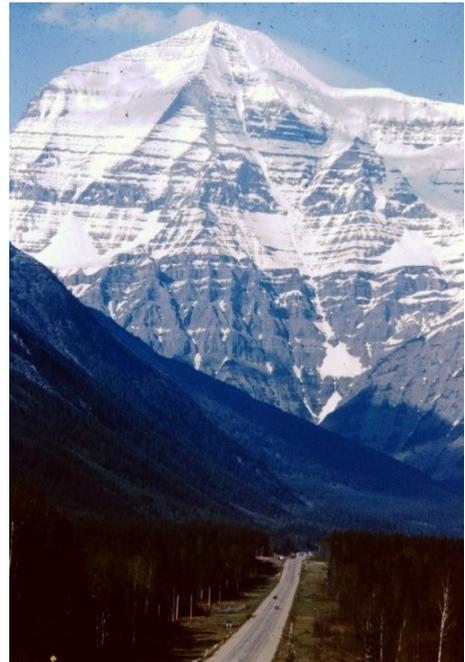
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What else did I learn from Dick and Jerry? Reading program listings and understanding what was going on. I also learned what canned diagnostics could do and could not do. I learned to walk problems back to the failing gate using a dual trace scope. Channel 'A' being the failing signal. Channel 'B' being the gating signal from the 'Timing Chain'. I also learned to write 'tight program loops' to aid in troubleshooting. Not all programming assignments were serious. Dick Werner once wrote a clever routine to the RFDU Panel that emulated a moving movie house marquee. I thought, "How neat." I ended up writing one myself as my programming skills were progressing. I often think of the genius talent on the team that helped me immensely in learning the art of troubleshooting.

My time spent at Farmington proved to be just what I needed in learning the trade. The time finally came to field the first EARTS installation at Anchorage. I volunteered to go as I always wanted to experience the 'Last Frontier'. Request granted. I was Alaska bound. I drove up to Alaska as Kevin Illa's wingman as we made the journey in his car. Our families remained in the Twin Cities. The trip was an interesting one. We got to sight see a good deal of the country on the way up to Alaska.

The Alcan Highway was the most interesting leg of our journey. For those of you that haven't traveled it, all I can say that it was the most grueling dirt road I had ever traveled on. Our first day of driving two hundred miles through blizzard conditions with packed snow going at thirty miles per hour tops. When we finally made it to Fort Nelson British Columbia we were relieved and thankful. Our first order of business was finding accommodations.

The motel we selected looked okay from the outside. In fact it looked luxurious compared to others in the town. We checked in and paid our money. We found our rooms to have a patina of cigarette smoke that permeated everything. Burn marks from laid down cigarettes were on the furniture, the fiberglass sink and tub enclosure. Even on the bed blankets. It was still snowing outside and at least the room had heat. We called down to the front desk and asked for ice (Note: Libations after a rough day). The attendant delivered it shortly in a Minnow Bucket. Kevin and I stared at each other in disbelief. After what we had endured earlier on the Alcan it didn't seem to matter. Welcome to Fort Nelson, Crown Jewel of the North.



Picture 2. Mt. Robson in British Columbia was a typical sight before we hit the Alcan Highway.

Later on we ventured out to see what the town had for entertainment. The big draw being the town's only movie theater. I can't recall the movie that was being played but remember the theater as being a repurposed WWII military maintenance Quonset hut. It too, had thick cigarette smoke that flickered in the projector light as the movie scenes changed. Most of the patrons would make running commentaries about the movie as it progressed. It was like being in a room with a group of Siskel(s) and Ebert(s). It was by far, the most surreal experience that I ever experienced at the movies. We didn't stay for the double feature.

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The rest of the trip wasn't exciting as the scenery became flat and devoid of trees. The only excitement was dodging the ever present potholes in the gravel road and looking out for large stones that were thrown off the tires of passing semi-trucks. We made it to Alaska and to the comfort of pavement on the road, glad to have survived the Alcan Highway in one piece.

ANCHORAGE AND THE INSTALLATION

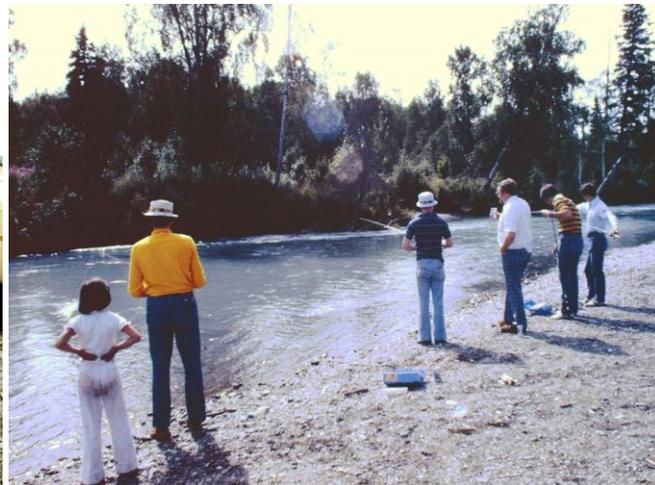
Some of the installation team made it up to Anchorage before any equipment had arrived. We had checked in with the FAA and had done all we could on site prep for the installation. Our contact at the FAA said that they would call us when the shipment came in and suggested that we should go fishing in the meantime as the Red Salmon were 'running' in the Kenai River. Who were we to disagree with the customer?



Picture 3. Kevin Illa, Dave Gunderson, and bob Schmitt trying their luck on the Kenai River. [Note: I must admit that it was one of the best days of fishing that I ever had in my life.]



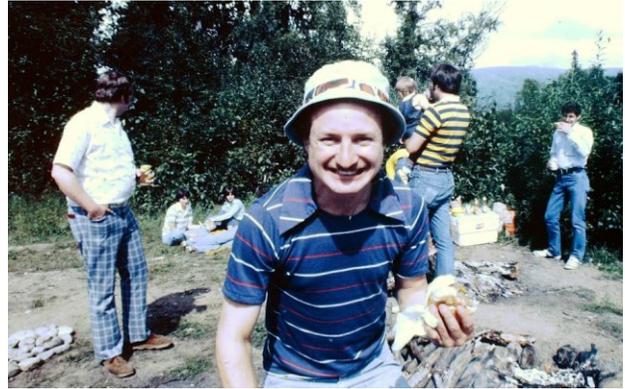
Picture 4. Dick Werner with his salmon catch.



Dick Werner & daughter, Jerry Ludwig, John Philbert, Kevin Illa and Bill Stelmach

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The equipment shipment came in the day after our fishing expedition to the Kenai River. We were ready to work. As for the installation, it went relatively smooth and with the usual hiccups. The team stayed for six months. The latter part after the installation being an evaluation and debug phase. Those six-months were a great time as our families would get together on weekends on outings.

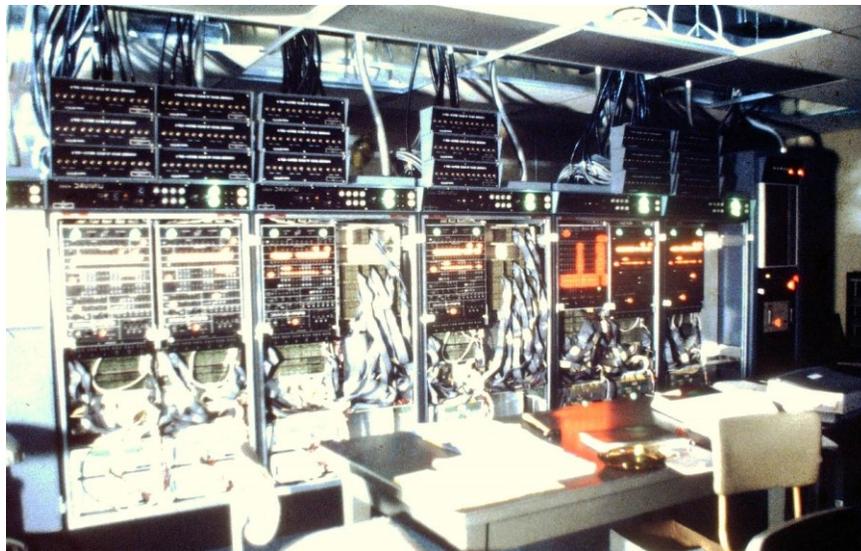


Picture 5. John Philbert, Jerry [the Joker] Ludwig, Kevin Illa, and Bill Stelmach. Wives in the background.

As with all things, the installation/debug phase ended. Most of the team assembled to proceed to the next EARTS site in Honolulu. John Philbert (field engineer) and me (field tech) would stay on for another six months tour to maintain the site and give in-depth hands-on training to the FAA's support technicians. I'm getting ahead of myself here. You haven't seen our EARTS installation, and I took some photos of it.

EARTS Computer Room Photos

As the photos are of an installation that was installed well over forty years ago and has been replaced for a new system. I thought that it was safe to post them in this write-up. As I haven't seen any photos of UNIVAC ARTSIIIA or EARTS sites posted anywhere, this will give you a rare glimpse into our past ATC efforts. I took some of the photos on a night shift and left the overhead lighting OFF for that dramatic effect. I'll post each photo and explain out all the pieces and mention what I still remember. As I wanted to make the pictures larger for more detail, this will result in several pages of this section.



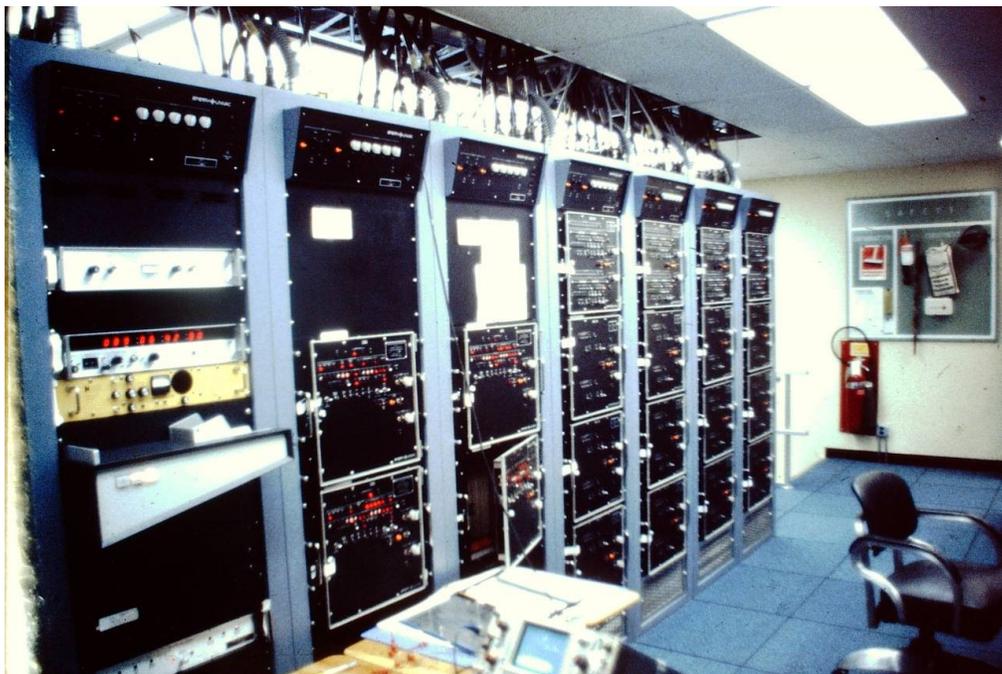
Picture 6. Left to right are three IOPs, CMA Module, IOP, CMA Module, RFDU Module, two IOPs and Tape drive with controller.

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The Core Memory Units were housed on the left-hand side cabinets (not fully shown) and behind the IOPs. This was the standard configuration of an EARTS installation as I remember it. By far, the most maintenance support went into this side of the room.

The IOPs accounted for the lion's share of the troubleshooting that I did on this site. The CMAs being a close second (Note: I'll talk more on this later). What caused problems in new equipment you may ask? The equipment ran flawlessly when it was ready to be shipped from St Paul. Why did we see failures happen during the installation? My guess would be incidents that happened in shipping.

Unrelated to this EARTS installation was a shipping incident that accounted for problems we saw in the ARTSIIIA upgrade at San Diego. Both the IOPs we installed had problems right 'out of the box'. All problems ending up in the backplanes of both IOPs. The root cause was a condition known as a 'cold flow' in the wiring. We traced the cause back to the shipper that had parked the shipment over the weekend in near zero temperatures in Salt Lake City. Driving his frozen load over bumpy roads did the rest. I can only guess that the long trip from Minnesota to Alaska proved to be hard on our shipment as well.



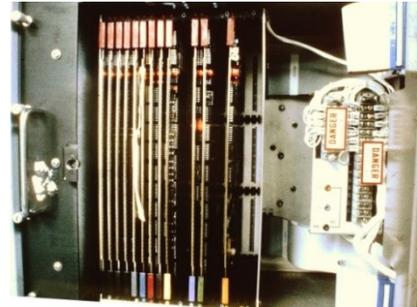
Picture 7. The system peripherals stood on the other side of the computer room.

The leftmost rack contained third party components not manufactured by UNIVAC. Components here were a card reader and the system 'time clock'. The golden unit was a Short-Wave Receiver that only received radio stations WWV or WWVH on 5, 10 and 15 MHz. The unit on top of the receiver would decode the IRIG Time code embedded on the receiver's audio signal. In the test bed in Farmington, this system worked flawlessly. In Anchorage, it was troublesome as Japan's equivalent time radio station JJY overpowered the WWV and WWVH transmissions. JJY didn't transmit IRIG so it was an unforeseen problem.

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The next two racks contained the Disk Drive Controllers and the IBAG (RADAR Sensor) Interfaces. The next four racks contained the Display Interface/Controllers. The peripherals in these six racks were built around the MPC-1616 Micro Controller. Everyone liked troubleshooting on this side of the room as the machine architecture and troubleshooting methods for the units were similar.

The only issues that I can remember were in the circuit cards themselves. The printed circuit cards had trace runs on nine different levels. We came across several cards that failed due to circuit level separation on the card. After these cards were weeded out and replaced, we saw few failures.



Unique to Enroute Centers were the Displays used. They were made by Raytheon and were called the PVD (Plan View Display). ARTSIIIA used a different display called the DED (Note: I forgot the actual name). The PVD had a unique feature as they could be laid flat in case of the computer system crashing. Little plastic figurines called 'Shrimp Boats' could be placed on the screen face and be manually pushed like a Chess piece across the screen by the Air Traffic Controller.



Another component not manufactured by UNIVAC was the Disk Drives. They were made by ISS and integrated into all our ATC systems. These were truly unique. Only one Drive could be accessed at a time. They were 'Daisy Chained' by a common cable. As you can see by the photo, they were numbered by a removable plug. In the 70's this was cutting edge stuff. From a personal perspective, they required more of a mechanical 'touch' in repairing and

aligning. We had one guy that excelled at working on this unit. His name was John Hendricks.



The last two components not made by UNIVAC in this photo, was the KSR-40 Teletype Terminal (Note: I'm not sure of the proper designation here). The unit was made by the Teletype Corporation and was one of its early designs of an electrical terminal. I remember that it wasn't processor controlled but used one-time programmable chips to emulate the desired operations. As I remember, these units never gave us any issues to speak of. The corresponding line printer was a 600 lines per minute unit made by Data Products. These too, were bullet proof.

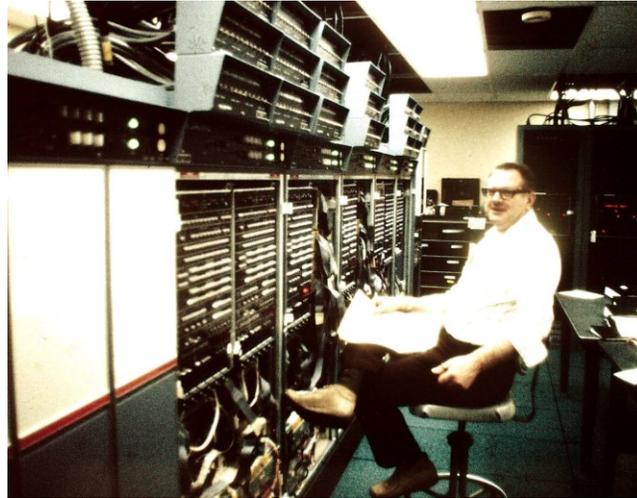


Picture 8. It was my pleasure to show you the Anchorage EARTS installation, *DAVE*.

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FAA Technician Training & Site Maintenance

As I mentioned earlier, John Philbert and I stayed at the site to train the FAA's support technicians and to maintain the system until the technicians could support it themselves. John worked days and I worked nights. This way we could train two technicians at a time on our respective shifts.



Picture 9. FAA Technician Frank Z receiving training on the night shift.

I found giving instruction rewarding as I soon discovered training to be a two-way street. I learned a great deal from them too.

Our tour of duty at Anchorage wasn't without issues. The first problem was John needed to go back to the 'lower 48' [Note: how Alaskans call the continental United States] due to some difficulties. That happened about sixty days into our tour. I remained on the site for the duration of both his and my terms. It worked out alright for me. I was promoted back into the day shift and worked hard to make sure that everyone got trained. The other issue of note was the dreaded CMA Module problems which everyone experienced in the ATC program. I've been reading on the website by others explaining the issues. I'll explain it here from a technician's point of view and what we saw in the field.

First, I've read on the website that the issues were more of a multi access traffic cop scenario. Many of the problems that I saw were Parity Errors being generated. The occurrence rate was random. We would have no problems for weeks then 'bang', the system would scatter and reboot. The problem was more profound when the system was loaded with more air traffic. I've heard that it was worse at the New York TRACON facility. Word went out from management that everyone should focus into writing a routine that could force the problem to manifest itself as the system memory diagnostics couldn't force the problem when recycled.

I've noticed that sometimes Field Engineers approached the same issue from different angles and shared what they found with others in the software they had written. I remember going through some of their listings and remarking that they were looking at things that I hadn't considered. As I remarked earlier in this rambling story, "I was in the company of geniuses". Truly gifted people.

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My own take on the problem was the randomness of the failures. If only all the IOPs could be coordinated during the testing? It then occurred to me one morning in bed at three AM that it could be coordinated. The other wild card was that the access to the memories through the CMA should be done immediately after the IOP coordination. The method for coordination came from an unlikely source (the RFDU Module) in the form of the Metronome Interrupt. The data pattern that I selected was a 'sliding ones and zero' [Note: Best pattern to use to induce memory errors].

The game plan settled on was having a single IOP write one pattern and all the other IOPs cabled to the same CMA write the complementing pattern. It was probably a half-baked notion but worth a shot. I had to test this on the night shift when the air traffic was minimal and the IOPs could be taken offline.

I ran my routine. About thirty seconds into the program execution, the system crashed due to a Parity Error. I ran the routine several times and came up with the same error in the same runtime length. I did a rewire in the backplane of the affected port on the CMA and reran the routine. The second time around the program took several minutes to extract a different Parity Error.

By the third detection and resulting CMA rewire, I documented my work, dumped the program to magnetic tape then mailed it off to my friend Dick Henninger at New York TRACON. He called me at Anchorage and had several questions. They ran the routine and had immediate results too. From TRACON it was distributed everywhere. This probably was my only notable contribution to the ATC effort in the big picture.

My first field assignment finally ended after seventeen months. I finally emigrated back to the 'lower 48', returning to civilization and the ARTSIIIA installation program. I installed a handful of sites in the ARTSIIIA upgrade, none of which matched my experiences at Anchorage.

EPILOGUE

I am retired now. I look back to the highlights of my career, such as it was. I had some great gigs and some that were less than ideal. Most of my experiences were in field support and mostly solo like my Anchorage EARTS tour turned out to be. If asked by anyone, I'll quickly relate that my growth was founded at Farmington and my confidence was founded in Alaska. I credit my experiences with Sperry UNIVAC that set me on the right technology life course.

My employer after UNIVAC was the Federal Government. I spent a little over a decade in the Department of Defense (DoD). I started out writing Test Programs for Automated Test Equipment ATE at the Sacramento Army Depot (SAAD). I ended up working in field support from the Depot as a Tech Rep traveling worldwide on different programs. I switched Agencies in 1992 to the Department of Interior (DoI) when the Base Realignment and Closure Commission (BRAC) started closing Military Installations. My new employer was Hoover Dam (Hydroelectric support) and later at the Bureau of Reclamation's Regional Office. I worked in Water Resources (Remote Data Collection). My time with the Federal Government totaling forty-two years in length.

Why did I write this story? I wanted to say "Thank You" to everyone that helped me. The skills and knowledge that I learned from others at UNIVAC guided me in other jobs. Thanks again, *Dave*.