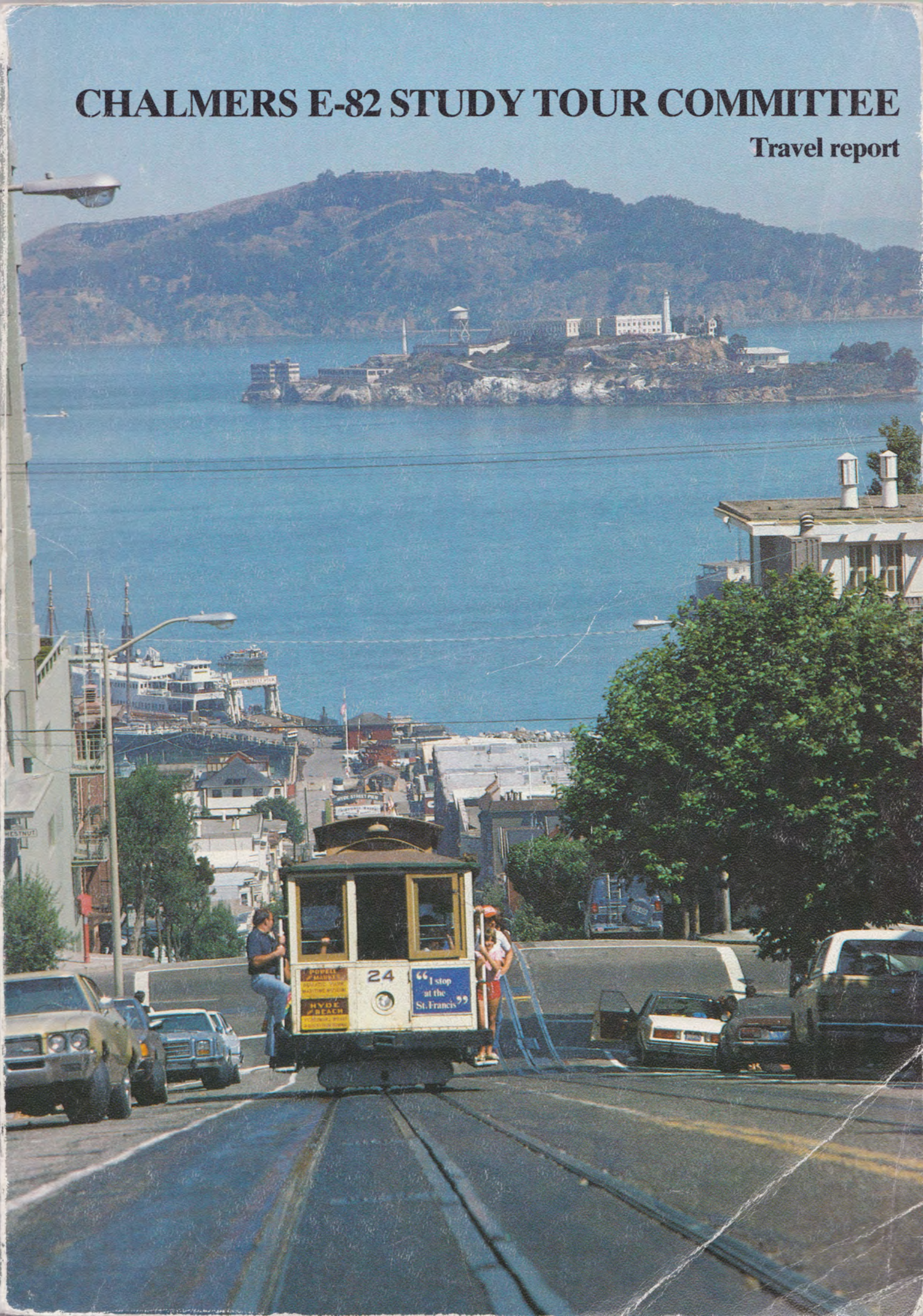
CHALMERS E-82 STUDY TOUR COMMITTEE

Travel report



1982

Chalmers Study Tour Committee

School of Electrical Engineering

The BOARD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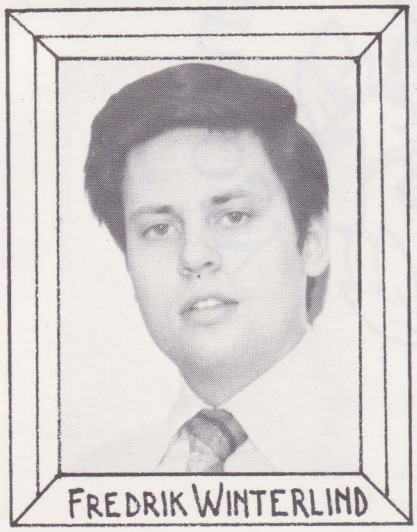
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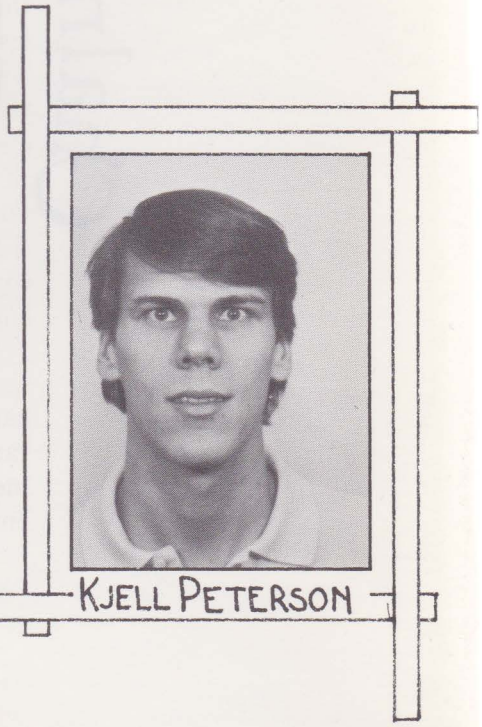
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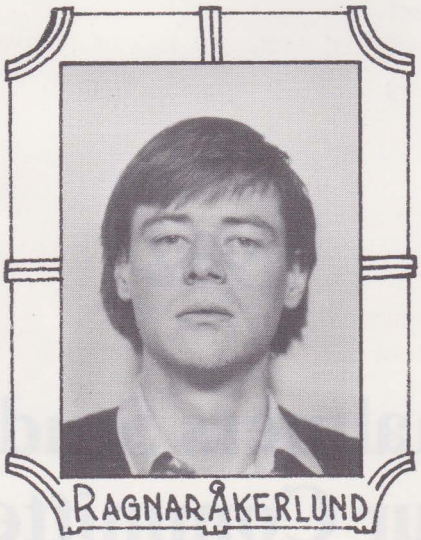
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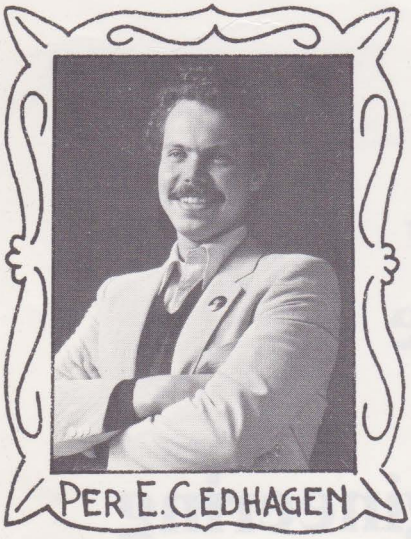

PER E. CEDHAGEN


PER-FREDRIK HALLINGBERG

Cover: Cablecar in San Francisco
Photo by: Caj Månsson

Grafica, Västerås 1982

Preface

Suddenly, after more than one year of hard work in our small headquarters at Chalmers University of Technology in Gothenburg, it was time for us to leave. We were 31 students from the School of Electrical Engineering who were leaving Sweden for a summer in the United States. There we were to try our wings and apply our theoretical knowledge to tasks in different American electronics and computer companies. For most of us, we think, it was the first time that we visited another country except as tourists. Because of this there was a light nervousness when we all got together one early morning in June at Landvetter International Airport.

On the following pages you will find the respective member's own stories but, as a summary, we can say that we all have had one of the most fantastic and wonderful summers of our lives, meeting new and interesting people in a stimulating environment.

Before closing, there are lots of people that we are indebted to and without their support none of all this would have been possible.

We would like to thank:
Our American employers
The American-Scandinavian Foundation
The Swedish companies that supported us
Sverige-Amerika Stiftelsen
Arbetsmarknadsstyrelsen
The School of Electrical Engineering
and finally all the other people at and outside Chalmers.

Lars Renneby
Per E. Cedhagen
P-F Hallingberg
Ragnar Åkerlund
Fredrik Winterlind
Kjell Peterson

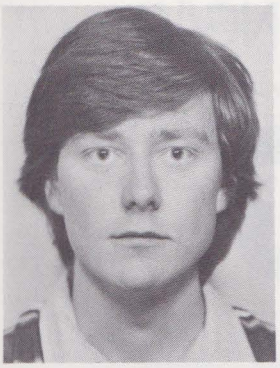
PS. Good luck to the guys in Chalmers E-83.

Contents

Our American Employers

Yellow Springs Instruments Co. Inc.
Spectrum Tech. Inc.
Encoder products
Inland Motor
Xynetics
Spacecraft Components Corp.
C&M Corp
Power Pac Inc.
ITT Gilfillan
United Scientific Corp. (CATEL/TOMCO)
IBM
IBM Thomas J. Watson Research Lab.
Ocean Applied Research
T&B Corp.
Belfort Instrument Co.
Osborne Assoc.
Pensilco
Memorex Corp.
Energy & Control Consultants ECC
Space Vector Corp.
Linden-Alimak Inc.
Communications Satellite Corp.
Karkar electronics

Working at Spacecraft



Michael Anderse'n
Spacecraft Components Corp.
Hawthorne California

Do you want this job? That's what I was asked one day last spring when the job at Spacecraft Components Corporation became available. I didn't hesitate long before I accepted and after two very nice days in New York I flew to Los Angeles where I was going to work.

Spacecraft Components Corporation is a company that employs about fifty people. They buy connectors from other companies and break them down to small parts. When an order is received, parts needed are assembled and sold. One of the reasons of this procedure is that Spacecraft can deliver much faster than the manufacturers.

On my first day I was introduced to many friendly cooperative people and began working on assembling connectors. My task was to check all the parts needed, that each component had the correct number stamped on it and then assemble the parts. I did this for the first week and was then assigned another project. For quite a few years the company had saved different kinds of contacts that were all mixed and my job was to separate all the different kinds. I did this for a couple of weeks and then I started working as a stock clerk. My job was to identify some of the components from breakdown to find out what company had manufactured them and put them away in stock according to the number code. Sometimes the number was stamped on the part which made it rather easy, other times I had to find it out some other way. I found it challenging and interesting to work with this and the weeks went by fast.

My residence during my two month stay in Los Angeles was at Northrop University which is a school for aircraft engineering. This place was chosen because of its convenient location. The College is situated about ten miles from where I was working and Monday through Friday I either took the bus or rode a bike to work. Riding a bike to work only took about half an hour which is not considered a long traveling time in such a large city as Los Angeles.

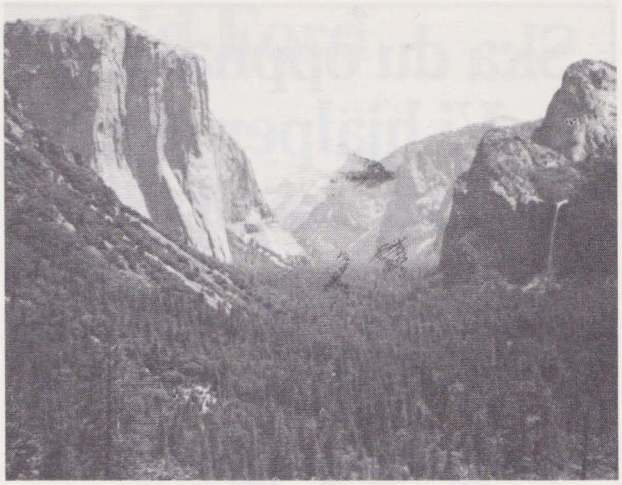
Climbin the Half Dome in Yosemite.

While employed at Spacecraft Components Corporation I met many employees who were very helpful when I needed assistance. They also made my time after work fun and interesting. During my eight weeks in L.A. I saw a lot of beautiful places and I had a very enjoyable time.

The last four weeks of the summer I spent in San Diego which is probably one of the most beautiful cities in the world. I stayed with my relatives and one of the weeks was spent in a cottage right by the beach.

I feel fortunate that I got the opportunity to work in the United States, an experience I'll never forget.

Michael Andersén
Richertsgatan 2C-3307
412 81 Göteborg

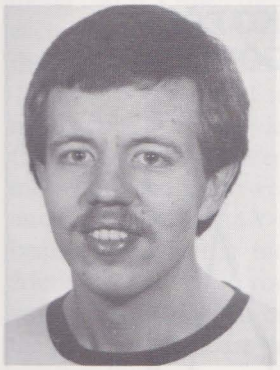


The beautiful Yosemite Valley

Outside the amusementpark Magic Mountain

"The crookedest street". Lombard street, San Francisco.

Cross-country in a good old Ford



Ingmar Andersson
Xynetics/Electroglas
Santa Clara California

After having waited two days in that (too) big of a city New York, I took off on the 5:th of June a Destination: A hopefully sunny California. Well, the sun did not make me disappointed, because when I left California on the 8:th of August it had rained once in nine weeks!

I landed at San Francisco International Airport. After some small problems I found Kathy McDonald and her husband. Kathy is the personel assistant of Electroglas. The first two nights I stayed in their house.

The 7:th of June 1982 was of course a big date in my life. It was my first day at Electroglas. I arrived with Kathy in the morning and after some paperwork I was introduced to quite a few new friendly faces.

Don Sims, my supervisor, showed me the whole company; from the assembly line to a complete machine.

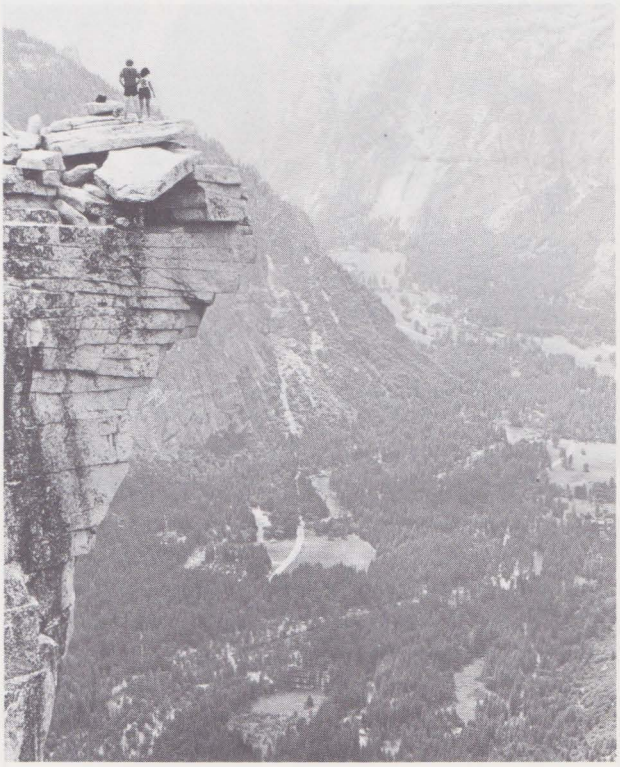
After meeting all the new people and hearing all the new English terminology I was a little bit confused by breakfasttime. However, it seemed to be an interesting job — which it really did turn out to be. Later that day I met Vince, one of the four guys I was going to share a house with during my eight weeks at work.

Electroglas, a unit of General Signal, is one of the world's leading manufacturers of waferprobers. The prober I worked with most of the time, model 1034X, is sold all over the world to big semiconductor industries such as Intel, Texas Instrument, National Semiconductor, IBM, Memorex, Westinghouse, Bell and a lot of smaller industries.

My primary duty was to test the waferprober 1034X. The machine was divided into two parts: the power-supply and the prober. The first thing I learned to check was the power-supply because that was the easiest part.

I had a test procedure to follow which consisted of many different things. For example I checked the wiring attached to the transformers and capacitators, the insulation between the AC- and DC-ground, set the different DC-voltages and did a continuity check. To help me I had an oscilloscope, a frequency counter, a volt-ohm-meter, a buglight and of course all the people at the test department. They answered all my questions and tried to explain how the PC-boards and the prober worked — especially during the first few weeks.

Tony, Gil, Randy and Ray at work troubleshooting on the 1034X wafer prober.



Wiew from Half-dome, Yosemite National Park.

During the testing I could find all different kinds of problems. Sometimes it could be a miss-wiring and then the girls from the assembley line helped me. But most of the time it was a bad IC. That's when the real trobleshooting began. Imagine-trying to find one (or more) bad ICs when there are eight different PC-boards, each one with approximately 40 ICs! You must use the oscilloscope at the correct places.

The prober is used to examine wafers. Through a microscope you can view each die on the wafer. the forcer that put the wafer in the exact positon is a linear motor divided into two parts: one for the X-positon and the other for the Y-position. The forcer has an air bearing so when it moves across the plattern it is frictionless. Even if you use the prober for ten years you can still have an exact position of the forcer on the plattern! Compare that with a "normal" mechanical construciton!

I lived with four other guys in a house 15 minuters from work. All of us were about the same age so we did a lot of things together. For example — the night we had 40 people over to watch the televised fight for the Heavyweight Boxing Championship between Holmes and Cooney — and when we attended a friend's wedding in the park. Another time we rode the whole 60 minutes journey to the Pacific Ocean in the back of a pick-up truck. We played softball in the parks and watched baseball in San Francisco. Many thanks to Vince, Jerry, Mike, Nate and their friends.

I worked ten hours, four days a week, so I had Fridays off. Some weekends I spent with my friends from Chalmers and exploring Los Angeles, San Francisco, rodeo in Salinas and Yosemite.

The last day at work a day I'll never forget. During our two-o'clock break some of my friends at work took me out to a parkinglot and gave me a really nice framed diploma which stated that I had "...successfully completed the 1034X prober ....." The best of all was that there were at least 45 signatures and good-luck-wishes. Thank you everybody. — Was it your idea Gil?

Almost 5000 feet (1500 meter) elevation-difference down to the Colorado-river, Grand Canyon.

The first thing on my list of things to do besides work was to buy a BIG American car. I found a big Ford LTD -73 with a 460 (7,5 liter) engine, which I bought in the middle of June. There were many things to play with in the car; an airconditioner, tilted steering wheel, electric central lock, electric window and an electric adjustable chair.

Good old Ford!

If you go cross-country by car be sure that you don't miss:

1. San Francisco
2. Highway 1 between S.F and L.A
3. Mainstreet in Las Vegas
4. Hiking down to the Colorado river in the Grand Canyon.
5. Bourbon Street, New Orleans
6. Snorkling in Key West

"...everybody go surfing, surfing U.S.A".

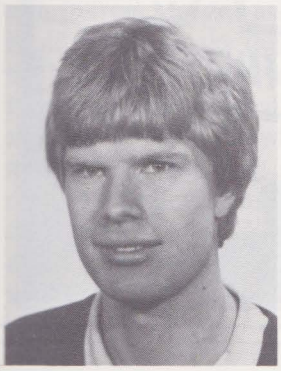
After 6.600 miles in 24 days the car is hopefully still running in Hartford, Connecticut.

Finally lots of THANKS to all the wonderful people I met at work; Don, Gil, Ray, Randy, Bruce, Tony, Kathy, Tom, Rhonda, Mark, Mike and "Boo", Patrick, Chris, Netty, Bihn and everybody else.

I will be back some day.

Ingmar Andersson

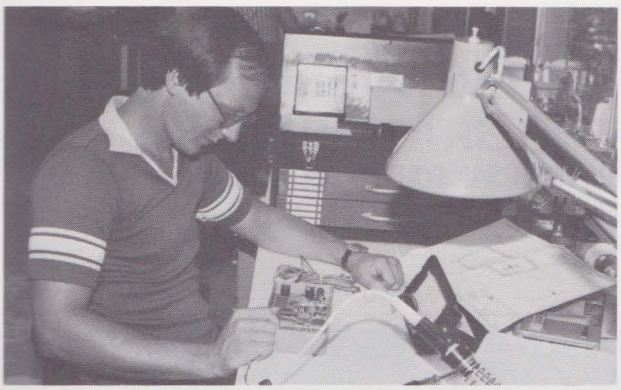
Working in Ohio



Per Andreasson
Yellow Springs Instruments Co., Inc.
Yellow Springs Ohio

Together with Ragnar Åkerlund I spent the summer of 1982 in the state of Ohio, or, more exactly at Yellow Springs Instrument Co., Inc. (YSI), Yellow Springs. The company is known as one of the best producers of thermistors in the world: for example, NASA has bought thermistors for the space Shuttle from YSI. The company is not only manufacturing thermistors, but also industrial and biomedical instrumentation such as oxygen meters, conductivity meters, blood glucose analyzers and cholesterol analyzers.

When Ragnar and I arrived in Yellow Springs, we didn't know anything about how to solve the practical problems, like where to live, how to find a car and many other things. We hadn't been many hours at the company, when suddenly all our problems were solved. The solution was my nearest boss, Jay Abbey.



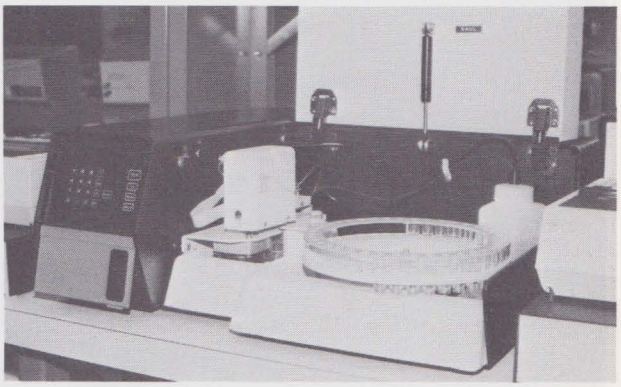
Our host, Jay Abbey, at work.

He lived alone in a house with two extra bedrooms, and we were welcome to live in his house during the summer. This was a perfect solution; we shared everything in his house, the cooking, cutting the grass, the stereo, the laundry and many other things.

When the housing problems were solved, it was time for me to start working. I was to work at the biomedical research and development department. There were nine persons working at this department. Although they were only nine, they worked on many different projects such as model 24: an automatic glucose blood analyzer, model 23L: a manual lactate blood analyzer, model 23E: an instrument for alchol measurements and model 2349: a digital display with linearization of the probe curve. I worked a little on some of these projects: for example, I changed some components on PC-boards and I made some small programs for curve,approximation and linearization. But during the summer I also worked on two bigger projects, proof of claims for model 24 and an interface program between two computers.

Model 24 is an automatic glucose blood analyzer and it is also YSI's first step into the microcomputer age. Model 24 is really to use: the operator answers a few questions from the machine and when the machine is started, it is doing all the laboratory assistants work, including printing the results on a data sheet. The proof of claims for model 24 was a long project that had started long before I arrived in Yellow Springs, and it was still running when i left. My part in the project was to enter data for the proof of claim computer program. During this work I had to make changes in the program too: for example, I added confidence level calculations to the program.

The other 'big project' was an interface program between two computers. It should make it possible to copy data from computer 1, a PDP-11, to computer 2, a Starplex II. The idea was that the Starplex would take care of all hand-shaking routines, and the PDP would only send characters.



One of three Model 24 used for proof of claims.

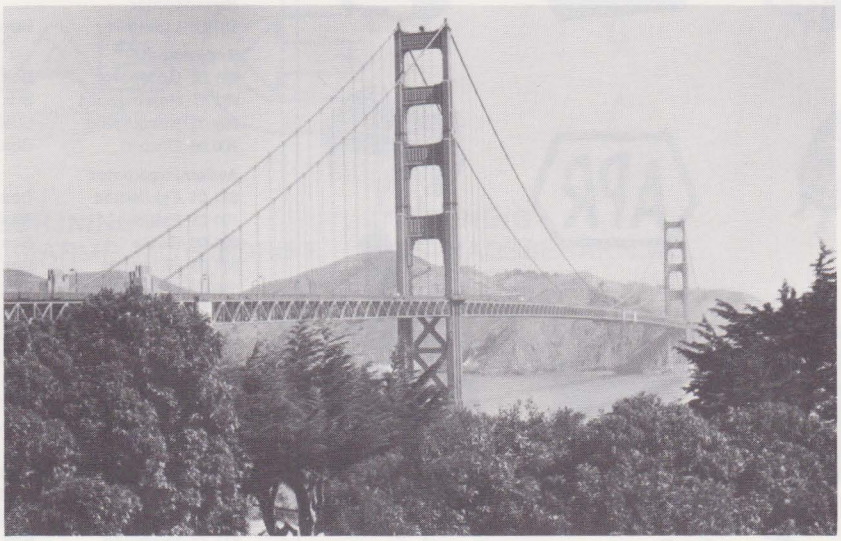
The big part of this project was, of course, to write the hand-shaking program for the Starplex. This was to be done in Fortran, a language I learnd more than two years ago and had never used since. After some initialization problems, which were solved with a lot of help from Mat and assembler programming, I finally could start to make the program. On my last day at the company, I had a program that seemed to work. It worked as we wanted it to when used a terminal to simulate the PDP. But when we tried to use the Starplex and the PDP together, some kind of timing problem occurred and everything failed. Since it was my last day at YSI I had no chance to try to solve this problem and I don't know whether anyone ever got this program working.

Finally I would like to say 'Thank You' to everybody I met during this fantastic summer at YSI. Especially I want to thank Paul, Carol Gordon Leigh and, of course, our 'landlord', Jay.

Pär Andreasson

San Francisco!

Up the hills in
the cablecar



Maybe the most famous
bridge in the world

San Francisco: Fish Market at Fishermans wharf

Anita's Travel Report

Anita Björck
Karkar Electronics
San Francisco California

Karkar Electronics

Karkar Electronics is the name of the company which so generously gave me a trainee job this summer. Mr Edward Karkar founded the business in 1956 and the main products then were electric filters. They are now also making muliplex-systems and are as the rest of the industry going more and more from analogue to digital communication products. They sell equipment both for commercial and military use. There about 450 employees working two shifts and all the development and assembly is done within the company. Karkar Electronics is growing. It is twice as big today as it was two years ago and the commercial products will sell for 18 million dollars this year.

Waiting for the bus.

Working as a trainee

They took very good care of me and I made many new friends. My boss, Dr Kovalevski was so anxious to make things interesting and made me feel very comfortable. I was happy to work with the digital engineer by name Louis and the technician Muhammed. Most of the time I assisted them in their work to design and develop a digital regulator for a single sideband amplifier from which I learnt a lot. I also wrote programs in BASIC on a desk calculator, HP 85 and studied its possibilities. I changed some programs written on another computer to fit the HP 85.

Where to live

During my first month in San Francisco I was lucky

Skyscrapers (?) in Chicago.

to borrow an apartment in a Victorian house from the beginning of this century. These charming houses which cling to the hills of San Francisco and are so typical for the city. The apartment belonged to friends who were on vacation in Sweden and were kind to let me use it in the meantime.

Luck seemed to stay with me and for the rest of my training period I got a sublet studio right in downtown SF. It was a small place, but I loved it. It is not easy to get apartments for short periods so I was very happy to get these nice places to stay in.

I left my heart in San Francisco

It is not as bad as it sounds, but I do love this city. San Francisco is a wonderful place. The fog often cames in through the Golden Gate in the afternoon, and nights can be pretty cold even in the summer, but on sunny days you can see the white city shining. The

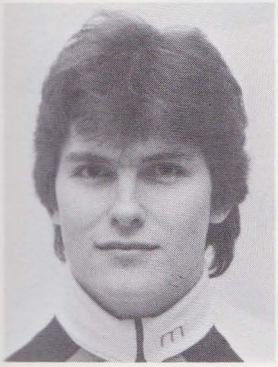
Anita discussing a problem with Dr Kovalevski.

sailors have always good wind on the San Francisco Bay, but it can be tough with sudden shops and changes. The wind also makes the air better than in most other big cities and the climate cooler than in the rest of California. There is so much to see and do in and around this fashinating city that you can never get enough of it. I spent eight weeks in SF before I left to see other parts of the US and visit relatives and friends.

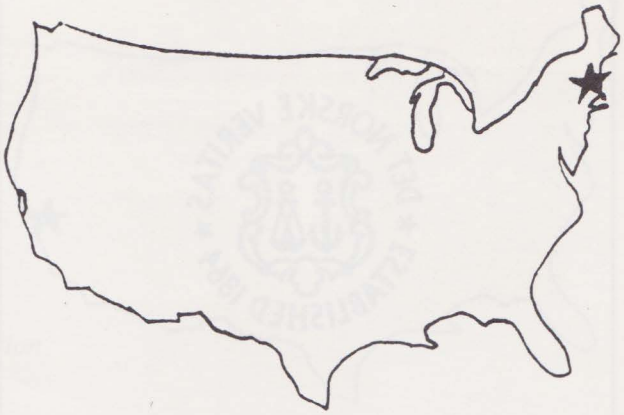
To sum it all up I must say my summer has been just wonderful.

Anita Björck

Summer of my life



Anders Björkman
Linden-Alimak Inc.
Bridgeport Connecticut



My first time in the United States of America, and it wasn't as a tourist. I was actually going to work "over there". I could hardly believe that it was true until I was seated on Finnair's DC 10 with all my friends from Chalmers.

I was going to spend my summer with the Light Equipment Division at LINDEN ALIMAK Inc. in Bridgeport, Conn. and my main task there would be to design and build a test system for the submersible pumps that they manufacture. Another project for me was to design a control box for the same pumps. The test system was to measure the flow speed and the pressure (head of water) that the pumps produce to check that they are OK.

The first thing that I had to do was to make a lot of phone calls to gather technical and pricing information on flow meters, pressure meters, electrically actuated valves, digital readouts, stainless steel tanks and stainless steel piping. In the beginning I had some difficulties getting aquainted with the US gallons per minute instead of liters per second and the feet and inches instead of meters. I had to make conversions all the time to get a feeling of how much everything actually was. Anyway, it soon was clear that we had to have two different pipe sizes since the range in flow that we wanted to measure was so wide, from 25 to 1600 USGPM. At this time the system started to take shape in my mind and I made a lot of sketches of what it might look in the end. Then we started to order all the things we needed, which were: two flowmeters, one for 3 inch piping and one for 6 inch piping, working on the vortex principle (water meeting an edge creates voltices at a frequence proportional to the flow speed) with a 4-20 mA dc output, the rangeability of the 3 inch was 25 to 403 USGPM and of the 6 inch 164 to 1600 USGPM, one pressure transducer with a 4-20 mA dc output and a rangeability of 0-350 feet of water, two electrically actuated valvews, one 3 inch and one 6 inch, two stainless steel tanks with a diameter of 7 feet and an average depth of 3.5 feet. We also ordered the piping, the flages and the gaskets that we needed.

While waiting for all this to be delivered I was working on the design of the control panel for the system. I also designed the control box for the pumps. The panel consisted of three digital readouts that took a 4-20 mA dc signal and showed the accurate flow speed and pressure, four pushbuttons to actuate the valves and a couple of selector switches. On the control box I did the wiring diagram, bought the components and put together a prototype. When I had finished the prototype, it made me very happy to find out that it worked just the way I wanted it to.

When all the things we had ordered for the test system arrived, we hired two welders to do the welding on the tanks and piping while I mounted and wired up the control panel. When this was done my eight weeks of trainee work were over, so I never got the opportunity to see the final result of my work. The tanks and piping were to be painted and put in place in the workshop, the flowmeter, the valves and the pressure meter to be mounted and connected, to complete the entire system. (They promised to send me photos of it all when it was finished, which I really hope they do).

I really enjoyed my time at LINDEN ALIMAK Inc. this summer very much because of all the nice people I met there. They were all very good to me. Of course, I also had some spare time while I was there. Most of the evenings I spent with the wonderful family which I stayed with, going to the pool, having great dinners and watching TV.

I also spent one weekend in New York city, one weekend in Newport on Rhode Island and one weekend in Washington DC. After my trainee period I went to California for almost two weeks, visiting some friends and relatives there and I had a wonderful vacation under blue skies and a burning sun.

It sure has been a great summer and I think that the work I did was a terrific complement to my theoretical studies at Chalmers.

Finally, I would like to thank everyone who has helped to make this possible.

THANK YOU!

Anders

Osborne the IBM of the future:

Benny Boman
Osborne Computer Corporation
Hayward California

My ten weeks at Osborne Computer Corporation (OCC), really flew by. OCC, a new dynamic company, is making waves in the computer world with its product, a truly portable computer, the Osborne 1. It is a portable computer with a built-in keyboard, monitor and two floppy disks. One astonishing fact is that when you buy this computer, the following software is **included** in the price: Supercalc, a spredsheet program by Sorcim; Wordstar, a wordprocessing program; Mbasic, Cbasic and the CP/M operating system.

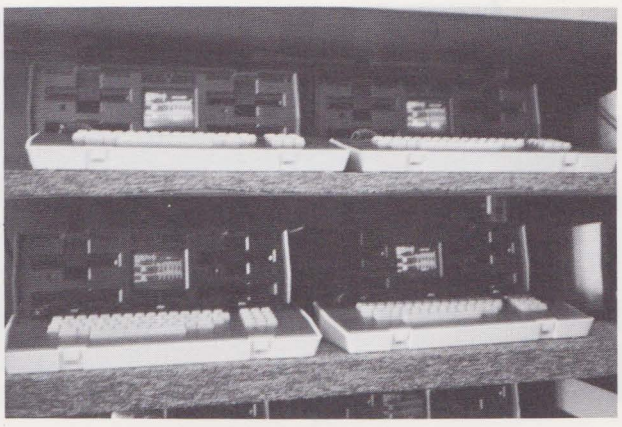
The company is rapidly growing and it will soon, if it does not already, produce as many computers per month as the APPLE corporation does. That's really remarkable for a company less than two year old.

What did I do at OCC?

Well, the first two weeks I sat down the "Osborne 1" and learned how to operate the computer, learned Supercalc, Wordstar, the CP/M operating system etc. The rest of the time I spent on a project, trying to implement a real-time hardware clock on the "Osborne 1". The project involved both software and hardware. The software part consisted mainly of two programs, a basic program written in Microsoft basic and a assembly routine written in assembly language (Z-80 mnemonics). I also did a modification of an existing autostart program. The autostart program is the program that automatically loads the CP/M system and a program into the memory when you are doing a cold boot of the system. I changed the autostart program to load, together with CP/M, both Mbasic and my basic program. I used "DDT", a dynamic debugging tool, which is provided on the CP/M utility disk on every Osborne 1, to make changes in the program. Due to the fact that the "Osborne 1", a Z-80 based machine, uses the 6800- family of support chips instead of the 8080-family, memory-mapped I/O must be performed. Furthermore, the memory of an Osborne 1 is divided into three memory banks, so bank-switching techniques must be performed. For instance, when you write or read to aport, you must switch between banks, because the memory-mapped I/O space resides in the second bank of memory, while the TPA resides in bank one. These facts made the usual peek and poke statements in basic a little more complicated. First, you have to make a "call" to an assembly routine that does the switching between banks before sending or receiving data from a port.

My basic program and the assembly routine worked fine, but when I connected my signals from the computer to the hardware clock (see figure 1), which was wire-wrapped on a breadboard, I didn't receive the chip select I expected at the right time. When I looked at the signals with an oscilloscope, I found that the timing diagrams were wrong. The read signal rd went low before the chip select cs did.

Unfourtunately, due to the lack of time, this is still left to be corrected. With the right timings this clock will be able to tell the time and with the programmable interrupt -signals provided, it can control events both when the computer is turned on and off.



Osborne 1, a truly portable computer.

If has been a pleasure working for OCC, a company full of enthusiastic employees. You can really sense the enthusiasm in the air. On the assembly line many of the workers are wearing an Osborne T-shirt, and on the back of this T-shirt it says: "ADAM, SAYS I CAN". Adam Osborne, the President of OCC, has really inspired the people at OCC, making them do their best to make the "Osborne 1" a product which has both built-in quality and low price. I think no I know that OCC will produce new products as good

The big apple.

The Golden Gate from another angle.

as the Osborne 1 in the future. It's the logical thing with people like Adam Osborne as President, Ed Richter as Vice President of Engineering, George Waldron Senior Engineer, Wayne, Lee, Tom, Greg, Don, Ron, Bob ..... Well I can't list them all. I like to thank you all at OCC for making my weeks at OCC most memorable.

After my training period I travelled for two weeks with two of my friends, Claes Harvenberg and Lennart Cider. Of all the things we did I just like to mention a few things I will always remember. First, the view from Tresidder Peak (10500 feet), in Yosemite National Park, and the bear that came to our camp in the night. Secondly, the good times we had in Boston when we visited friends of mine who live in a small town close to Boston.

To everybody I know in the USA I finally like to say: You haven't seen the last of me, I will return.

Yours
Benny Boman

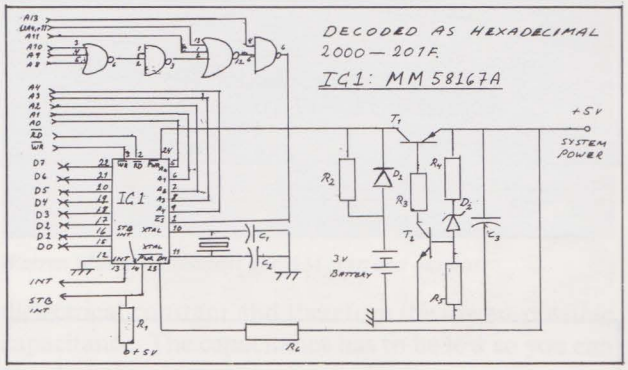


Figure 1: Real time clock.

Wired up in Connecticut

Henrik Bonder
C&M Connecticut
Wauregan Connecticut

It is 4 pm, june 3, 1982 and we have finally arrived at John F. Kennedy Airport in New York, United States of America!

After some problems, for example a severe rainstorm (8 inches of rain) we finally arrived at Voluntown, Conneticut. I am saying we, because we were two fellows, Jan Önnegren and myself, who were going to work for C&M Corp. in Wauregan, Conneticut.

We didn't know anyting about the work, except that C&M Corp. manufactures cables in different shapes and forms. We didn't know where we were going to stay either. But everything turned out to be excellent.

When we stepped out from the train in Westerly, Rhode Island, six hours delayed due to the rainstorm, the first thing we did was to call Warren Mueller at his home in Voluntown so he could pick us up at the railway station.

Half an hour later, a Cadillac Fleetwood stopped outside the station and a man with a familiar face, and a woman stepped out from the car. It was Warren, the company's president, and Elaine. You can't believe how nice it was to see them!

After a rainy sunday it was finally the first day of work. Warren showed us around in the plant and then he left us with Tom Harris, the personnel manager, who showed us some videotapes about the cables and how to measure them. This was a nice thing, because I didn't know very much about insulation and conductors before I enterd this work, except for what we have learned at school.

The next day we were informed about the projects we were going to work on during the two months. Jan and I were split into two different projects, one concerning a Hewlett-Packard Cable (for the HPIB-system), which was Jan's project, and the other one, my project, was an IBM-cable.

The IBM-cable is used as an I/O-cable between the CPU and the memory and other I/O-units. This cable is divided into minor cables, each one an air coaxial cable (fig. 1 and fig. 2). This air coaxial cable consists of an insulation tube and a thread (or filler) wrapped on the conductor so that the rest of the insulation is air. Because of that air, this insluation has the lowest

Warren Mueller. President of C&M corp and our host.

dielectrical constant and therefore the lowest possible capacitance. The capacitance has to be low so you can speed up the computer.

Well, the IBM-project was to solve some problems with the electrical properties of the cable. The problems can be summarized as follows:

a) Too high DC-resistance in the conductor
b) Too high initial capacitance
c) Too large change in capacitance after stability test

The first proble was easily solved. The tension during the thread wrapping was too high, so the conductor was therefore streched.

I thought that the second problem needed some theoretical calculations first, so it was just to try to remember what P.G. Hovenskiöld had taught us once. The air didn't cause me any problem, but the thread caused me to choose an approximate solution. The formula I ended up with was:

$$C = \frac{2\pi\varepsilon_0 l}{\frac{1}{\varepsilon_r}\ln\frac{c}{b} + \ln\frac{b}{a}\left(1 + \frac{\varepsilon_r - 1}{\pi}\,\frac{b-a}{b+a}\right)^{-1}} \quad (pF)$$

where l = the length of the cable
ε_0 = the dielectrical constant in vacuum
ε_r = the dielectrical constant of the insulation material
a, b and c follow by fig. 3

Mark Andrews. The vice president and my guide through the summer.

Measuring physical data.

IBM requires a wall thickness of the insulation tube of 18 miles (1 mil = 0.001 inch). Therefore, the only solution to decrease the capacitance was to increase the outer diameter of the insulation tube, that is the c-figure in the formula above.

The hardest item to solve was the capacitance stability problem. IBM requires that the cable should be exposed to a stability test which consists of the following items:

a) Baking in an oven at 75°C for four hours.
b) Roomtemperature for four hours.
c) Coldbox at -40°C for four hours.
d) Roomtemperature for at least four hours.
e) Back to item a). This procedure will be done three times.

The most important problem here was that the capacitance wanted to "pop up" after the first time in the ovens and afterwards remained rather stabile. IBM requires that the change in capacitance should be less than 2%.

To solve this problem, we thought that if we baked the cable in an oven during a period of time, this stability problem should be solved. First we tried to bake the cable once and the result was encouraging: the change in capacitance was much less than before, but still the "pop up" was there. By looking at the records from the stability tests I had done before, on the not baked cables, I drew the conclusion that if you baked the cable twice, almost copying the stability test, you should have a more stabile cable. I therefore did bake the cable in a couple of different ways to see if it worked out to be as I hoped it would. But the "pop up" was still there. The last baking procedure I suggested was to bake the tube before shielding and afterwards once more after that they had put on the outer jacket. The lack of time made it impossible for me to see the results of this. But now at printing time I will know.

At the end I want to thank you, Warren and Elaine and everybody else, for treating us so well during our stay in the U.S.A. You gave us the summer of our lives. I will be back very soon.

Henrik

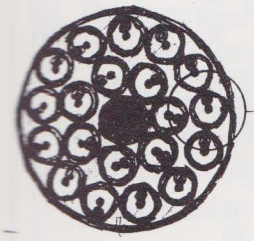


Fig. 1

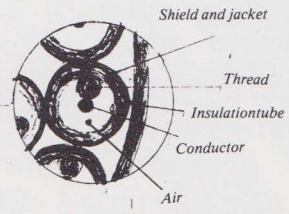


Fig. 2

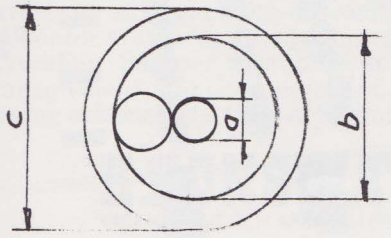
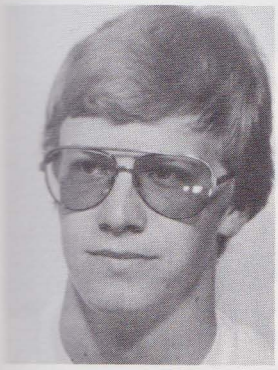


Fig.3

Eureka!

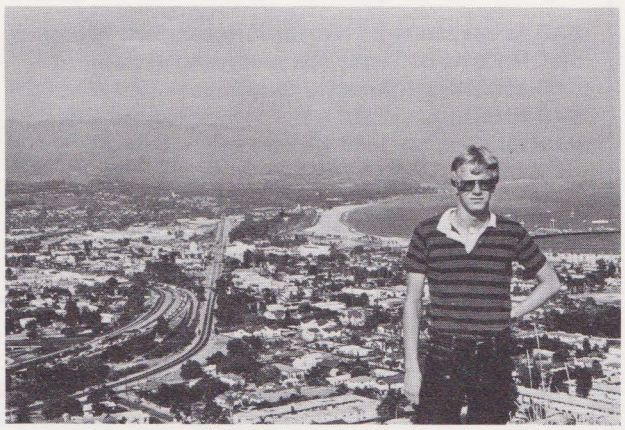


Micael Caiman
Spectrum Technology Inc.
Goleta California

Eureka! That's what I felt when I arrived at Santa Barbara that Saturday evening in the beginning of June. Eureka is the motto for the state of California and it means 'I have found it'. And so I did, I found it two hours drive north of Los Angeles, resting on a narrow shelf between the Santa Ynez Mountains and the Pacific Ocean. I was going to spend eight weeks of my life there and I enjoyed it from the very first minute.

Santa Barbara (75 000 inhabitants) traces it's history back to the earliest days of Spanish settlement in upper California. Spanish Franciscans built, in 1786, one of the 21 California missions there. It's called 'the Queen of the missions' and is considered to be the most beautiful of them all. The Spanish influence has also affected the architecture. In downtown you can find many whitewashed, tileroofed buildings and numerous Spanish street names. The climate is nearly perfect; it rains extremely little and the temperature is very comfortable all the year around. I suppose that you, dear reader, can understand that Santa Barbara is a very attractive area to live in. There are many well known people who own real estate in Santa Barbara County, for example, movie stars like Jane Fonda, Bo Derek and Ronald Reagan.

Spectrum Technology Incorporated is a rather small company (80 employees) and is located in Goleta just north of Santa Barbara. Mats Westholm, another member of the group, and I had got the opportunity to work there. When we entered the plant that first Monday morning we were welcomed by the engineering manager Marv Veeser and my supervisor Glen Bishof. They showed us the plant and told us some technical facts about the products. Spectrum Technology manufactures a complete line of oscillators and timing systems including oven-controlled crystal oscillators, temperature compensated crystal oscillators (TCXO) and crystal oscillators/IC logic clocks. Most of them are special custom-designed devices and systems, for example, oscillators for the Space Shuttle. Spectrum Technology specializes in proven reliability design devices featuring subminiature size, extremely low profiles, low power consumption and high stability output frequencies or pulse rates from one pulse per hour to beyond the 100 MHz region.



Beatiful Santa Barbara.

I was placed in the engineering department and my main task was to work with the TCXO's. The problem with the quartz crystal is that it changes it's resonant frequency with temperature. To compensate this error we used a resistor-thermistor,varicap-network. To find the right values of the components we used an automatic test system. it consisted of several computer-controlled ovens in which the units were run over temperature, a synthesizer which generated the required frequency and a phase-looked loop where the measured frequency from the unit was compared to the synthesizer

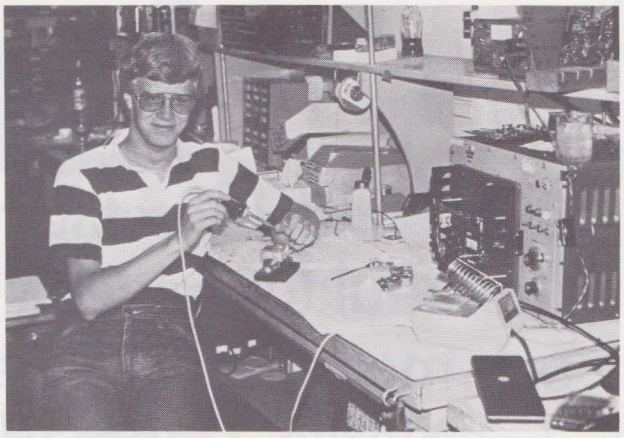
An evening at THE restaurant in Santa Barbara.

frequency. With the aid of these measured data, a computer program calculated the optimal values of the components.

But Spectrum was not only electronics. I had my birthday the second day we worked there. At lunchbreak some of the employees escorted me to a room where they showed me a huge birthdaycake saying: Happy Birthday Micael! Thank you, Maria, for that great surprise. One Saturday we had a company picnic. A really nice and warm day and plenty of good food. We also introduced two Swedish specialities: Jansons Temptation and Punch.

During our stay in Santa Barbara we had the great pleasure of staying with the secretary of the local ASF chapter, Miss June Hendrickson. June is one of the most hospitable, enthusiastic, kind and humoristic persons I've ever met. I can't find superlatives enough to describe her. Thank you once more for what you did for us; I will never forget it.

In our free time we tried to see as much as possible of southern California. We had some really great experiences like hiking in the snow in Sequoia National Park on 4 July. We also tried to surf some weekends. Difficult but fun. (Thank you, David). Another great event was to see the Beach Boys (who else) in concert in Los Angeles. In August Mats and I travelled around and saw, like most of the other students, Las Vegas, Grand Canyon..... I'm sure you know the rest. We



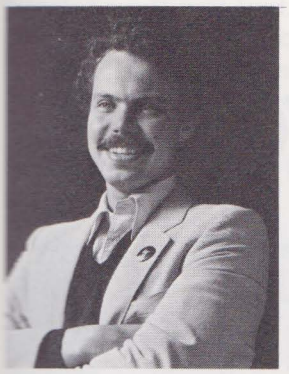
Rock around the clock.

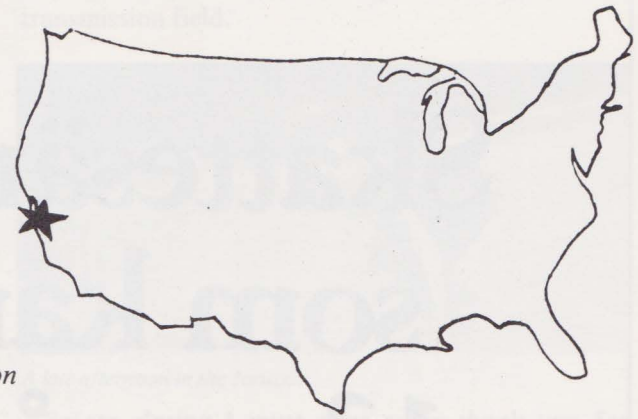
also went down to Guadalajara in Mexico and visited Mikael Ranc, a good Mexican friend of ours. He is also studying at Chalmers and was home in Mexico during the summer. It was really an interesting week and a big contrast to what we saw in the US.

Finally, I would like to thank Trans World Airlines who gave me the opportunity to see the gorgeous airport of Saint Louis four (4) times in one month.

Micael Caiman

High Frequencies





Per Cedhagen
Catel/Tomco
United Scientific Corporation
Santa Clara California

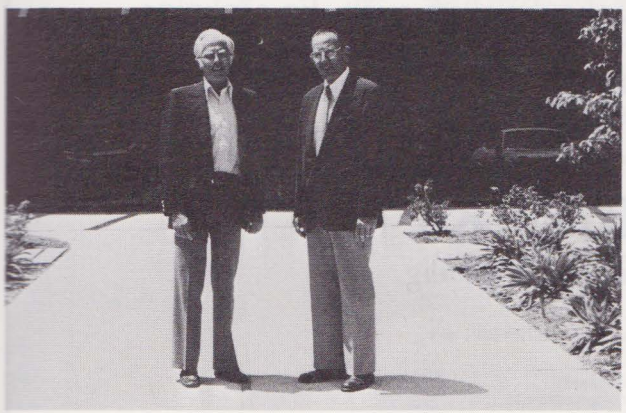
I have had the great opportunity of working for United Scientific Corporation / Catel / Tomco at their Santa Clara facilities. After more than one year of hard work on the board of the Chalmers E-82 Study Tour Committee it was with a great relief I received my visa and working permit. Finally, I realised, that the dream was about to come true.

Catel / Tomco is a division of United Scientific Corporation. Catel introduced in 1974 for the cable-television industry a new technology which meant that an FM-modulated signal could be transmitted through a coaxialcable. By using FM instead of a vestigal sideband AM-signal, you gain a signal with virtually complete noise immunity. The systems Catel provides are not only for the expanding cable-TV industry but for all purposes where a high-quality broadband transmission is needed. In comparison to a microware-link economically, at a shorter distance, cabletrans-mission is preferable. Since a multiplexing technique is used, many channels can use the same cable. Examples where Catel products are represented is in unmanned stations in the Bay Area Rapid Transit (BART). They also provide equipment for high-speed data-transmission and facsimile.

At first I worked with Seth Anderson at Catel's corporate division. There I learned the importance of documentation when you run an industry like Catel with an assembly-line production of a wide range of equipment. If you don't have a proper documenta-tion, it will soon be very hard to plan the production and you might even end up in a situation where you don't know what you are producing at the moment. Documentation is also necessary for planning the flow of material through the company. It takes an experienced and professionel management to deal with this problem, especially when a company is growing, like Catel, 30-40% annually.

A summer to remember:

After my time at Catel I started working for Tom Olson at Tomco. I was engaged in a project where I,

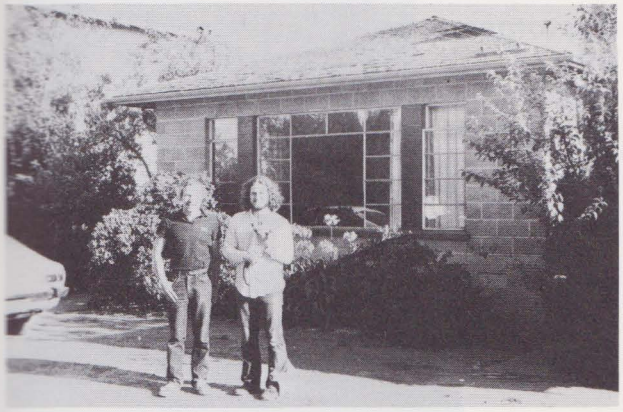


Seth Andersson at CATEL corporate division and Frank Genochio, President of CATEL.

My summerlove; OLGA!

for manufacture, put together a special pilot carrier processing system for an educational cable network. Part of the job was to finally design a unit which compared the level of the incoming pilot signal with a fixed level and if it was to low generate a new pilot signal at a sufficient level. This project involved a great deal of applied electronics.

Tomco's business idea differs from Catel's in the sense that they will meet any customers special needs in HF-transmission where standard equipment is not sufficient. The combination of having Tomco and Catel under the same roof is an excellent idea of how to meet all different kinds of problems in the cable transmission field.



Little house I used to live in.

A late afternoon in the Jacuzzi.

Before closing I must once again thank you for giving me this wonderful oppurtunity to work in an American Electronics industry. I have enjoyed myself very much during my stay at USC. I have met new and interesting people of which some have become my close friends, and all I can say is that I'll come back fer sure, fer sure...

Per E. Cedhagen

Rocky Mountain National Park

Rocki´n the Rockies

What the Heck is a Power Supply?

Mats Dahlquist
Power Pac Inc.
South Norwalk Connecticut

Power Pac Inc. is a company in South Norwalk, Connecticut, with 120 employees working with power supplies. This summer I had the great opportunity to be one of them. A summer, which increased my knowledge in electronics and the English language and gave me a small idea of how the American society functions. The people at Power Pac were very nice and helpful and tried hard to give me a good time. I must say that they succeeded.

Power Pac, founded in 1971, is a privately owned company devoted solely to the design and manufacture of power supplies. The power supply applications. vary from Medical Electronics, CRT Terminal, Disk Drive, Process Controls, Microprocessor, Main Frame Computers to Industrial Control.

I started working in the test department to get familiar with the units and moved after a couple of days to the service dept., a place where I learned a lot about trouble shooting, which sometimes can be really frustrating for a person who has only studied theory. The next place for me was the engineering department, where I grappled with building prototypes, including calculations of e.g. overload limits and sense networks.

A 20-minute drive south if Power Pac is Old Greenwich, a small and beautiful town, where I rented a room. Fortunately, Old Greenwich is close to the shore and only an hour from New York City. I bet it is easy to guess how I spent my weekends.

Walter Anderes solving problems together with two concentrated engineers.

After 8 nice and interesting weeks, it was with mixed feelings I said good bye to all my friends at Power Pac and in Old Greenwich and headed west for California and my 4 weeks vacation.

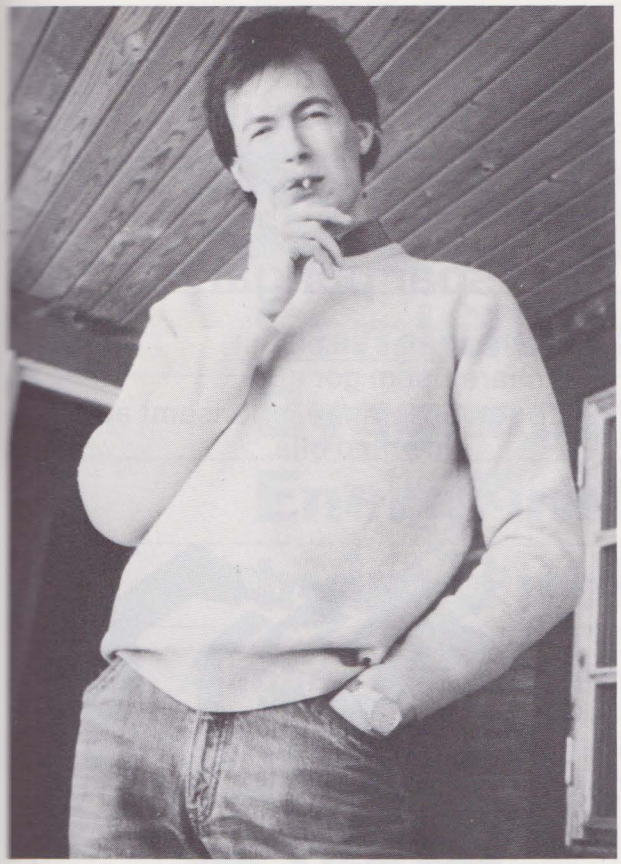
I am now sitting at my desk back in Gothenburg, looking at my fading suntan and trying to write down my impressions and experiences. It was a great time and I miss you guys at Power Pac and your crazy stories about what only happens to you.

New York city is fantastic and California the same, but that is another story.

Finally, I would like to thank you all and especially Walter Anderes, who gave me a ride every day and taught me a lot.

Charles and Mark, capturing wild Bill Brookmeger, a famous outlaw, in the engineering dept. at power pac.

Chief Engineer Walter Anderes, President Charles Mittel and his wife Janie, after a hard days work.

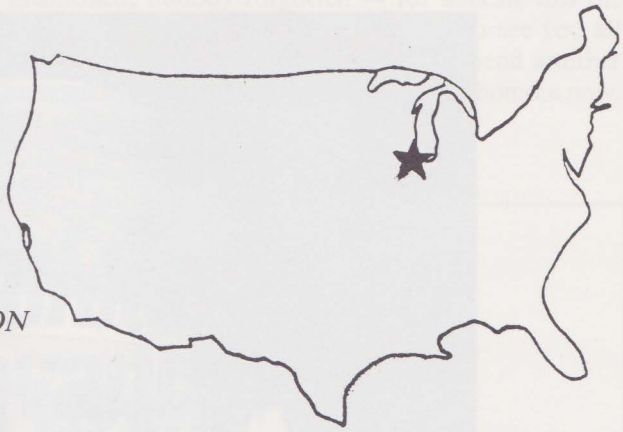


See ya!

Mats Dahlquist

The best summer of my life

Annika Elvnert
TARGET CORPORATION
Lake Bluff, Illinois



Location

Chicago, Illinois, has many suburbs on Lake Michigan. I spent seven educational and wonderful weeks in especially two of them. Lake Forest is the largest of Chicago's suburbs with 15 000 inhabitants. There are mostly beautiful private homes, which indicates that there are rich people living in that area. I stayed with relatives in Lake Forest. I worked at TARGET CORPORATION, which is situated at quite a new industrial park at Lake Bluff, a couple of miles north of Lake Forest.

A brief History

Target Corporation is one of the thousands of thousands of small companies, which exist in the US. It was formed by Mr Thomas J Lloyd in 1964 and was situated at Glenview, Illinois. After having moved to bigger facilities once, Target's decision was to build its own plant due to success and a larger number of employees. In 1964 Target had just a couple of workers well educated in electronics, but nowadays there are about 100 employees at the Lake Bluff plant.

Production

Today, the tuners and the switches are the two most important products. **The tuners** are used by the US Navy in a transmitting set, which is the major communication equipment on most American ships. The tuner has 19 frequency bands to cover the range 2 to 30 MHz. It produces an output of 1 000 W of average radio frequency power.

The swithes are officially called Rotary Solenoid Operated Switchboard Selector Switches. These switches are used in radar signal distribution switchboards. The switches switch signals from eleven different radar sets to any or all of ten individual radar indicators. The switches will also handle reply signals from as many as nine IFF (Identification Friends or Foe) interrogator sets. They are used by the US Navy.

My Job

I worked as an inspector at the Incoming Inspection Department where I made many mechanical and electronic measurements. I knew already how to measure mechanically with the vernier caliper, the micrometer, the optical comparator etc. and how to interpret a drawing. My supervisor, instructor and the other inspectors were happy teaching me for instance how to make electrical resistance measurements, make transistorrand voltage breakdown measurements with the transistor curve tracer and interpret federal military specifications and specifications from many American manufacturing companies. I enjoyd working at Target Corporation very much.

Testing transistor gain and breakdown with the transistor curve tracer.

Spare Time

Except for just "inhaling" American customs during my spare time I made some trips in Illinois and Wisconsin in the VW Rabbit I borrowed, went to parties where I met many interesting people, saw many stage

plays and movies, worked on the crew of "Guys and Dolls" and went to Great America (an amusement park) where I rode the biggest roller coaster in the world.

Travelling

After having quit working, I toured the US and saw many of the traditional tourist traps, but I also went to Montana and Mexico. Everything was fantastic!

Concludingly..

.. I would like to thank EVERYBODY — nobody mentioned, nobody forgotten — for making this the best summer of my life so far. I hope to see you all soon again — I do have the chance to spend another summer in the US like this, since I'm a sophomore now.

Love, Annika.

Working with computers in the Rockies

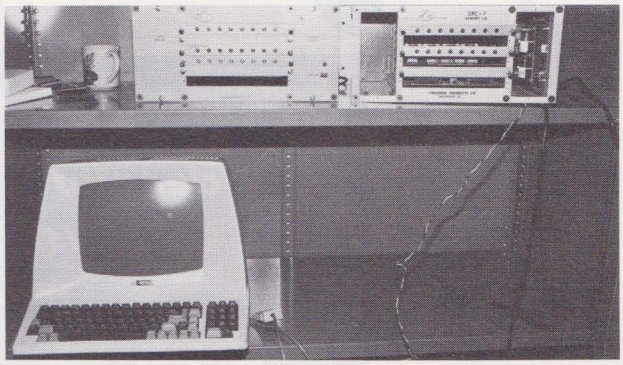
Jan-Eric Ermeland
Encoder Products Company
Sandpoint Idaho

After working for the Chalmers E-82 Study Tour Committee most of the fall and the spring, it was nice to be on the airplane from Gothenburg to New York. After having followed all the arrows and visited all the authorities at JFK airport it was nice to come out and inhale the air of the world metropolis. A few days with some friends in New York went pretty quick. Then it was time to start the trip to the company; it took me a long time to get there because I visited some relatives on my way. When I had arrived in Seattle it was time for an 11-hour bus trip which would take me to Sandpoint, Idaho, where I was to work for 8 weeks this summer.

Sandpoint is a little town about 4500 residents located on the beautiful Lake Pend Oreille, which is surrounded by high mountains. When I arrived in Sandpoint I was met by two boys who would be my roommates for the summer. They were renting a 4-bedroom house, which gave us plenty of room.

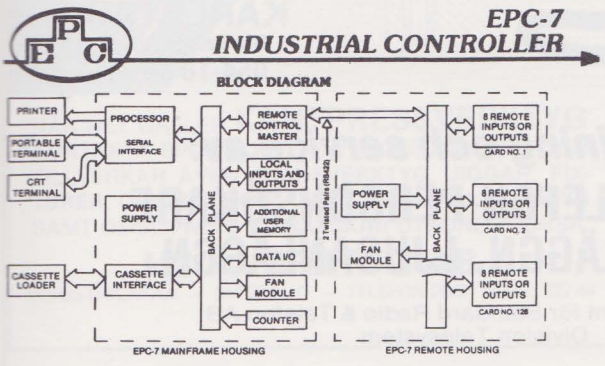
The name of the company I was working for is Encoder Products Company; it has about 80 employees and manufactures industrial controllers.

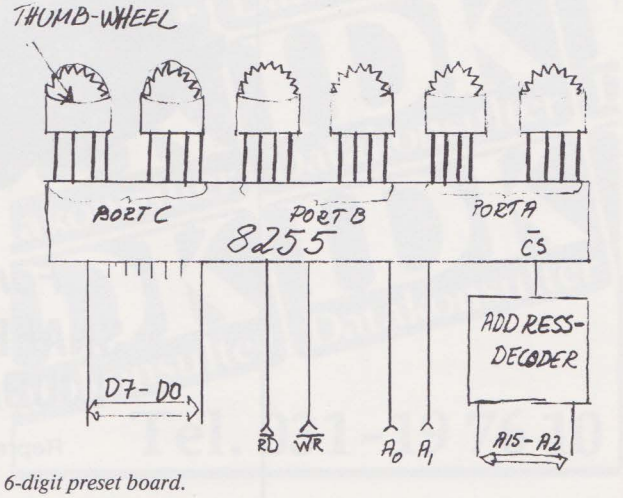
First, I was introduced to the manager of the engineering department, Mr. Gene Schraut, who explained the policies of the company; after that I met James MacLachlan, who was the engineer I was going to work for most of the time. After a short talk with the president, Mr. Bill Watt, James explained how their industrial controller EPC-7 was built up, which was the product I was going to work with. EPC-7 is a



EPC-7

microprocessor-based programmable controller which is programmed with a tiny Basic language. It is built up of modules, which gives it great flexibility. The microprocessor used is National Semiconductors 8-bits processor INS 8073. The first design I did was a 6-digit preset board, where the information comes from 6 thumb wheels. To implement this I used, for example, Intel's programmable peripheral interface 8255A. I followed this project from an outline to a finshed product over bread-boarding, drawing the schematic, drafting and later troubleshooting of the circuit-board. Then next project was to make a remote A/D converter. This caused me some problems since the remote control





6-digit preset board.

Trouble shooting.

master was not working properly. This problem was solved with a small redesign of the control circuit.

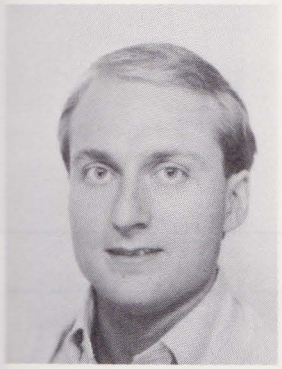
I also designed one local and one remote 12-digit display-board using 7, segement LED.s, and one remote 6-digit preset board. I also did troubleshooting on their new remote input board and output board. These didn't cause me too much trouble, but when I was troubleshooting the remote control master I really got proof of the fact that Murphy's law (anything that can go wrong will go wrong) existed.

The last day we had a company picnic with among other things a softball tournament. Then I traveled around in the US which was not to different from all the traveling the others did.

I wish to thank everybody who made my stay in USA pleasant, and those who gave me the opportunity to go to USA and work for one summer.

Jan Eric Ermeland

A Symmetrical Component Distance Relay



Magnus Ewerbring

Abstract

This paper describes the concept of a Symmetrical Component Distance Relay (SCDR), as well as the considerations that have been taken care of, in order to implement the routine on a Motorola 68000 microprocessor.

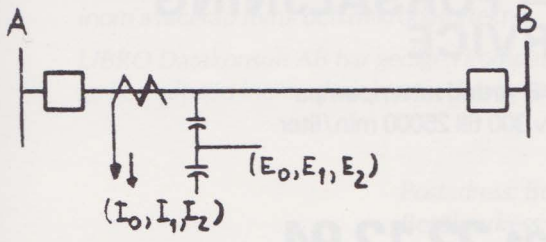
This work has been carried out by a student from Chalmers University of Technology (CTH), Sweden, at Cornell University, USA, för the fulfillment of a Master of Science degree, at CTH.

Introduction

Symmetrical components have proved to be very useful concept, in order to analyse the status of a power transmission system. Although the theory is quite old (it was introduced about 60 years ago), it is just recently that it has been used for power system protection applications. The development of 16-bit microcomputers has given a new impetus to this activity. A system was designed by the American Electric Power Service Corporation (AEP) in 1979 using a microcomputer from Plessey. My task was to adapt and implement the algorithm on an MC 68000, taking advantage of the architecture, in order to achive an execution time of less than 1.39 ms.

SCDR

The most significant feature of the SCDR is that it uses only a single performance equation (equation 1 below) to determine the distance to a fault from a transmission line terminal, regardless of the type of fault. There are a total of 10 different faults that may occur on a grounded three-phase power system. It is interesting to note that a three-phase distance relaying system normally uses six impedance computing units to cover all ten fault types. Conceptually, the use of a single equation to determine the distance to a fault is equivalent to using a single impedance unit which responds correctly to all faults.



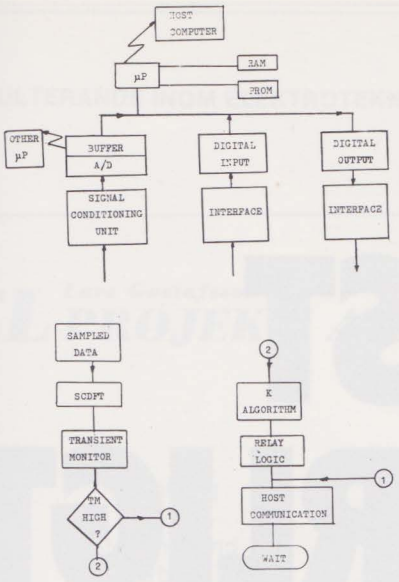
A brief rewiev of the SCDR theory is given here for reference. Let (E0, E1, E2,) and (I0, I1, I2) be the symmetrical components of voltages and currents at a terminal of the transmission line AB (see figure 1). Let (Z0, Z1) be the zero and positive sequence impedances of the transmission line. It is then possible to define the different ratios between the voltage and the impedance together with the current for each respective sequence. In terms of these ratios, a distance measure k is defined as follows:

$$K = \frac{k1 + k2k2' + k0k0'}{1 + k0' + k2' + k1} \qquad (1)$$

It can be shown that the distance measure k given by equation (1) correctly represents the per unit distance (expressed in terms of total line length) to any balanced or unbalanced fault on the transmission line.

The routine that determines the apropriate k, depending on the type of fault, is known as the k algorithm. A number of various test have to be performed in order to determine what type of fault has occurred. To be able to perform a k calculation within the maximum execution time, it is important to modify all algorithms, so they take advantage of the architecture of the MC 68000. A number of instructions supported by the processor have been omitted, since they require a considerable amount of time to execute.

The symmetrical voltages and currents are all obtained from the Symmetrical Component Descrete Fourier Transform (SCDFT), which was not a part of this work. All these data are generated recursively, using a half cycle window. It is very important to use only the contribution from the fundamental frequency part when the symmetrical components are formed. There-



fore, all signals are analog filtered before reaching the A/D converter (see figure 2). However, when the data window of the SCDFT filter spans the onset of a transient, it contains two partial ample sets belonging to pre- and post-transient system states. It is important to recognize this condition, so that no relaying decisions can be made during this period. A convenient method of achiving this control is through the use of a transient monitor function.

The transient monitor is a measure of the difference of a pure sinusoidial wave and the input wave in one data window. This can be obtained by applying the inverse descrete Fourier transform to the symmetrical components and comparing them with the input data. This is generated recursively.

The hardware and the softwre configurations are shown in figure 2. The microprocessor system is a Megadata M 68000 (8 MHz). It should be noted that the samplins rate is 12•60 = 720 Hz (1/1.39 ms —1).

Conclusions

The SCDFT, the Transient monitor and the K algorithm were implemented and tested on real field data. They proved to generate a very accurate answer. The maximum execution time was 725 us. It is most satisfying to note that the routine was able to execute within the avaible time. Future versions will have plenty of time for the relay logic and eventual host communication, especially since faster versions of the MC 68000 are to be released in the near future.

Acknowledgement

It is a pleasure to acknowledge Professor James S. Thorp, for his brilliant supervising of the project, and also Professor Arun G. Phadke and Professor Cristopher Pottle, for their help and guidence in partial matters. Thanks to Assistant Professor Stig-Göran Larsson, CTH, for his preparatory supervising. Finally special thanks to Peter Wijeratne for all his work on the SCDFT routine, and of course, to the graduate students of room 303, Phillips Hall, whose full support on the project and also during my free time, helped me to have a most memorable time at Cornell University and Ithaca.

Magnus Ewerbring

L A — city of dreams

Helena Gellerman
ITT Gilfillan
Van Nuys California

I just can't believe it. Not another full drawer. Where do all the things come from? Four hours later all my doubts became reality. I found myself sitting on my suitcase, staring at the gap where I could see shirts, skirts and socks sticking out. Despite all the hamburgers and icecream cones that had forced me to choose a larger size when buying clothes, there was no chance I could shut the suitcase. I opened it for the eighth time, suddenly realizing that I had to put my faith in the U S Mail I picked up a mug with the name ITT Gilfillan and not until now did it struck me that I was to leave Los Angeles where I had spent the most wonderful, interesting and hectic time of my life.

In the middle of March, when the paper where ITT Gilfillan offered one person a trainee-job for the summer had been handed over to me, I got both curious and excited. What kind of tasks would be given to me? What would it be like living with an American family for two months? Would California and Los Angeles in particular live up to my expectations? Two months were enough to convince me that I had to buy a new overseas ticket in a few years and that all the work I had done to qualify for a job in the U S was a cheap price for all my experiences.

Gilfillan, established back in 1898 as a smelting company, realized in the 1920's the importance of electronics, changed its production and became one of the nation's five major radio manufacturers. During World War Two, Gilfillan was selected to work with Massachusetts Institute of Technology on the development and production of a ground-controlled approach radar landing system which was the most sophisticated radar system to be produced during the war. The experience gained throughout this cooperation, combined with a thorough research has made Gilfillan able to develop highly advanced radars for both military and commercial use. In 1971, Gilfillan was made a division of ITT and is nowadays one of the leading radar companies in the world. During my two months I came to see almost the whole company and something that amazed me was all the detail work done for each radar produced at the plant.

Last year, ITT Gilfillan received an order from Sweden, where the Swedes wanted a low coverage radar developed. One part of the project consisted of writing a compiler in Pascal for a new computer. In the beginning of June, the job had progressed to the point where the program was to be tested and documented. I was lucky enough to have taken a course in Pascal at Chalmers just before I left, because I was given the task to write comments to a part of the program. I suggested that I write the comments in Swedish, but somehow my supervisor didn't seem to approve of my idea! The documentation took four weeks and the rest of the time I was testing if the compiler was working properly and generating the right error messages. Through the job, I learned how a compiler works and how programs are developed step by step from the buyer's specification.

The best memory though was all the people that offered me their friendship. They gave me many different viewpoints of the USA and had a wonderful sense of humor. Especially when they tried to convince me that softball and baseball are fun games and that my accent was slightly better than that of the Swedish chef in "The Muppet Show". As I can't write everyone's name, I hope that you all feel that this:

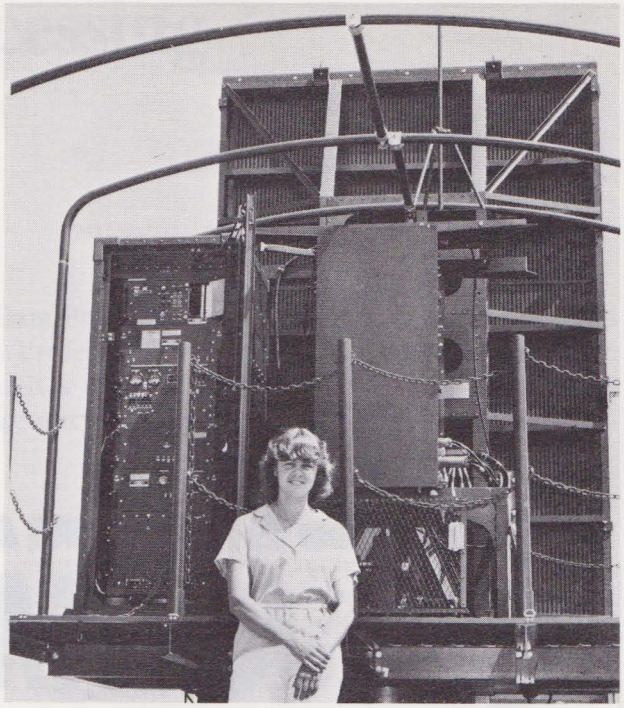
"Thank you for all that you taught, showed and gave me" is especially for you. There is one person and his family that I would like to thank in particular

I work on the low coverage radar, proced for the vikings.

as they opened their home to me. Marsha and Steve Weiss treated me as a family member and I really got to know the American way of life from the inside. I'll always remember you as the persons who gave me the best part of my summer in the U S.

I put the mug beside the suitcase and kept picking out things that I wouldn't need during my trip around the USA, until I finally was able to close and look the suitcase. The cute little pile on the floor weighed 17 pounds. After hitting the heavy traffic on the way to the airport and having "as much as" 15 minutes check-in time, I was on my way to meet some friends in San Francisco. Shortly after take-off, overlooking Los Angeles, I promised myself to try to be back within five years.

The following month went by just as fast as the preceding two. Yosemite was impressive with its water-falls but Grand Canyoun was outstanding. We were lucky enough to get a place to sleep for the night down by the Colorado River. During the hike, the silence and all the different views were breathtaking. In other words, it was a sharp contrast to Las Vegas with its fascinating, made-up world which we had visited two days earlier. I got my share of the Swedish summer when visiting a friend of mine in Minneapolis for a week. After experiencing how it is to go horseback riding in the Rocky Mountains when it is raining cats and dogs, I arrived in Washington on the 17th. The center of the city really lived up to my expectations. Two days of running in and out of famous buildings made me longing for adventure, so I went down to meet the sharks on the coral-reefs outside Key West. I never got the opportunity to get one of my highest nightmares fulfilled, but instead some barracudas gave the underwater paradise the excitement needed. The moment I got off the plane in Boston, I liked the place.



The radars were tested outside ITT Gilfillan.

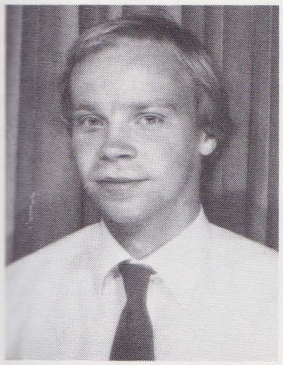
The salty air, the European way of planning the city, and the students. It was the second place that really reminded me of Sweden.

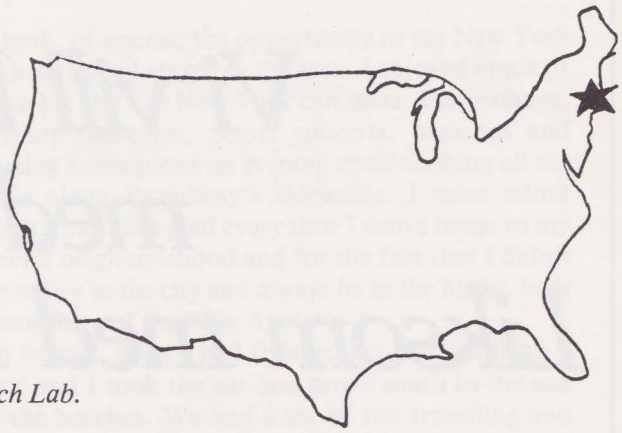
After three days of studying "The Big Apple" and buying presents, I ended my trip the way I started it. Hitting the heavy traffic on the way to the airport and dashing to the check-in counter. Finally seated inside the plane, we all started asking our friends what they'd been up to during the summer, but as the flight left the ground almost everybody got quiet. Maybe I wasn't alone in thinking:

"Thanks for the very best summer in my life".

KRETSTJÄNST

On the stem of the big apple





P-F Hallingberg
IBM Thomas J. Watson Research Lab.
Yorktown Heights New York

When I was 4 years old I spent a year with my family in Chicago. Ever since then I have taken every opportunity to get back to the USA. Therefore, I decided to join the Chalmers Study Tour Committee which possibly would expose me to a part of American living thet was completely unkown to me — the life of the working american.

On a sunny day in May I was sitting in Mr. Lars Arosenius' office in the Swedish IBM realizing that I would spend my summer in the USA working for IBM at the Thomas J. Watson Research Laboratory in Yorktown Heights, New York.

After a few hectic weeks with arranging, preparing and packing, I boarded Finnairs DC-10 with the destination of New York. There I immediately took another flight and ended up with my friends in Chicago very late the same night. The objective of this Chicago trip was, besides seeing my friends, to pick up the car that was going to be my faithful friend for the second summer in a row. Late Sunday, the day before my first day of work, I arrived at Juniper Ledge, the house that would be my home for the next 8 weeks.

Mrs Marianne Marks, the owner of the house, welcomed me with a big smile. Juniper Ledge is a very charming big old house with everyting you could need for 8 weeks of very comfortable living. Besides the five duchhounds and the two cats there were, to use Mariannes own word, about 8 ''inmates'' in the house during my stay. I had imagined a summer with Americans around but here we were, one Swede, one Canadian, one German, two Japanese, one French, one Indian and one English-American guy. Of course we took the oppurtunity to learn a little about different countries, customs and food. Many a night we all sat around the large dining table eating delicious native country dinners cooked by each of us in turn. These dinners provided good cheers, many laughs and helped us to see ourselves as friends not just workingpartners.

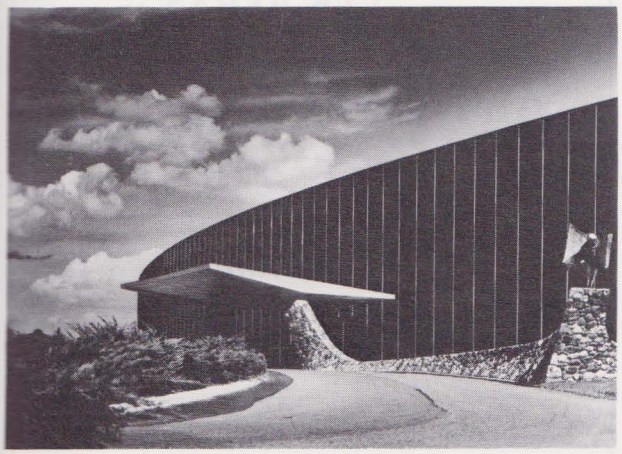
The IBM Thomas J. Watson Research Laboratory is the largest laboratory and is also the headquarters the research division's three laboratories. The other locations are San José Research laboratory 80 kilometers south of San Francisco and the Zürich Research Lab in Switzerland. The research division's objective is mainly to carry out fundamential scientific reasearch and to explore productrelated technologies. They also try to foster basic scientific understanding.

The laboratory is beautifully located on the green valleys just off the Hudson River only 50 kilometers north of Manhattan. Despite its proximity to the city, the city, the area around the lab is fairly rural and quite heavily forested. The main building, designed by the famous architect Eero Sarinen, forms a 400 meters long curve three stories high overlooking all the green of the valley. Beautiful!

At work the first morning, I was introduced to Mr. Gene Troskey who was going to be my adviser during my stay there. His project was called TEX and since in dealed with microprocessor, microcomputer interacting, it well suited my own interests. In short terms, TEX stands for Telephone Enhancement Box and is meant to be a computer peripheral (a telephone under control of a host computer). TEX is a microprocessor controlled and is capable of executing orders from the host computer as for example dialing. It also sends messages to the host when, for example, an incoming call is in progress or when it has detected a busy signal after dialing. The system consists of a logic section with the microprocessor, I/O-ports, RAMs, EPROMS and the hardware interface for the host. The analog

section deals with the telephone lines and has several switches, amplifiers, tonedetectors and tonegenerators.

I came to project when a lot of effort had to be put in to accomplish the last 10 percent of the work. In order to learn the construction, I built one box myself. Then I had to dig into approximately 7 kbyte of Assemlercode to debug the program. For this work I used Intels Intellec system, Universal Promprogrammer and Incircuit Emulator. I also worked with the analog section to improve its function detecting inprogress tones.



I feel that I gained very valuable work experiance during my stay at IBM and that I will come back to school more motivated for future studies.

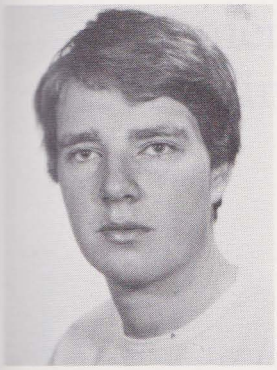
I took, of course, the opportunity to see New York City a lot since I stayed in the area. I enjoyed much of what a big city like New York can offer. For instance, there are museums, plays, concerts, highrises and someting as simple as an evening stroll wathing all the people along Broadway's sidewalks. I must admit though, that I felt glad every time I drove home to my peaceful neighbourhood and for the fact that I didn't have to live in the city and always be in the hectic, busy athmosphere of the "Big Apple".

In August, after I had finished my work at IBM, a friend and I took the car and drove south to the sun and the beaches. We had a lot of fun travelling and since we are good representatives of our schools electrical engineering department, we didn't miss such highlights as Walt Disney World, Thomas A. Edisons home or, of course, a visit to the little village of Gasque at the coast of Alabama.

My summer in the USA was a great adventure. I would like to thank everybody that made it possible.

Per-Fredrik

I came, I saw, I shall return



Peter Hamberg
Pensilco
Bradford Philadelphia

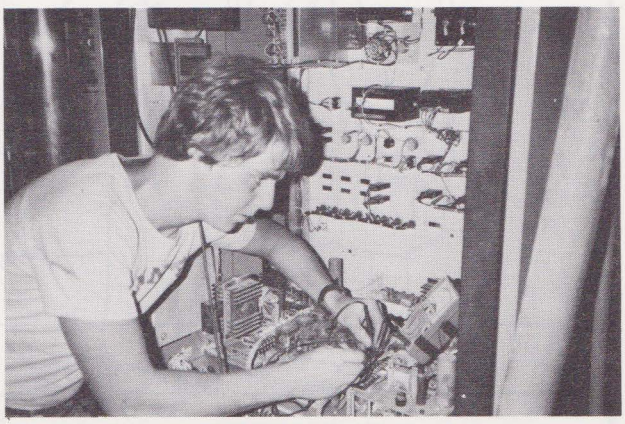
In September 81 our work to get over to the USA started. We were about 50 students that were interested in getting "over there" and we knew it would be hard to get a job, so I was not sure before I had the papers from the company, that confirmed my trainee period. Now when the difficult part of getting a job was over the only thing that stood between the USA and me were a lot of paperwork. Finally it was June 3rd and everything was set to go. After a couple of days in New York it was time for Bo Janfalk and me to fly to Bradford, PA, where we were going to work this summer.

Bradford is a small town whith about 10 000 inhabitans and it is situated in the nortwest of Pennsylvania close to New York state. Bradford is the first place in USA where they found oil and it used to be the town with most millionairs per inhabitants.

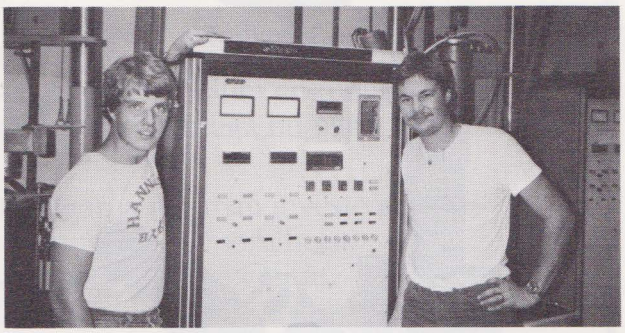
To get to Bradford was not so easy. The plane from JFK was delayed due to traffic problems so we missed the connection flight from Pittsburgh to Bradford that day. A day late we showed up at Pensilco, the company we where going to work at.

Pensilco is a company that makes n- and p-doped silicon wafers for the semi-conductor industry. To get the right structure on the silicon crystal was a very interesting process. They melt the silicon in furnaces and when the temerature is right, a seed with the right structure is put down, on which the crystal start to grow. By varying the speed they pulled the seed with, the diameter of the crystal could be determined. If the process is not thoroughly controlled it is easy to lose the crystal and then you have to start all over again. When the crystal has the right length it is taken out of the furnace and after it is cooled down they cut it into thin slices and polish them.

During the whole process from pure silicon until the polished wafer there were severel tests to make sure that the slices could fulfill the customers requests. The first week Bo and I studied the silicon growing process to get familiar with it. The second week our real work started. Our main task was to rebuild and rewire the control equipment to the furnaces. We also did a lot calibration, troubleshooting on electronic equipment and even a little bit of electrical installation.



Testing on one of the controlers.



Two proud Trainees and the result of their work.

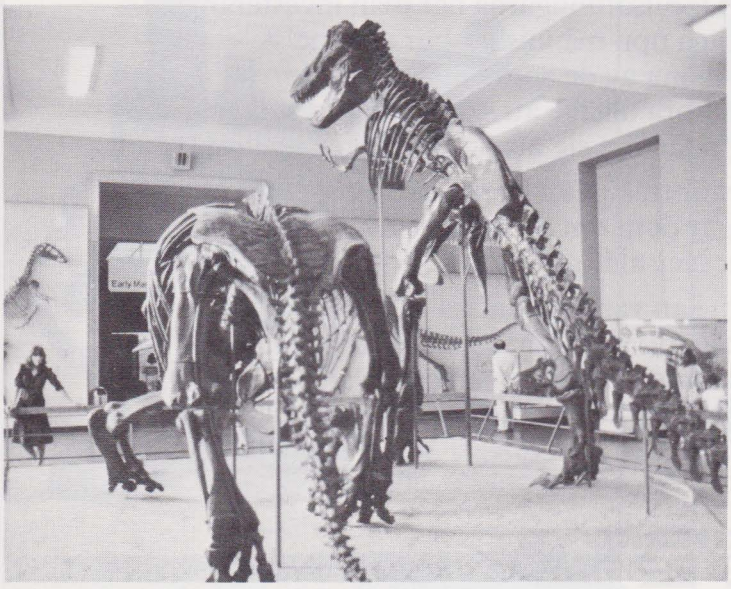
We lived on a campus at UPB, which means University of Pittsburgh at Bradford. There were about 70 students that lived on the campus during the summer and we made real good friends with some of them. All the people we met were realy nice and I would like to thank them all for making my stay in Bradford such a wonderful experience. The eight weeks we stayed at Pensilco went by in no time at all.

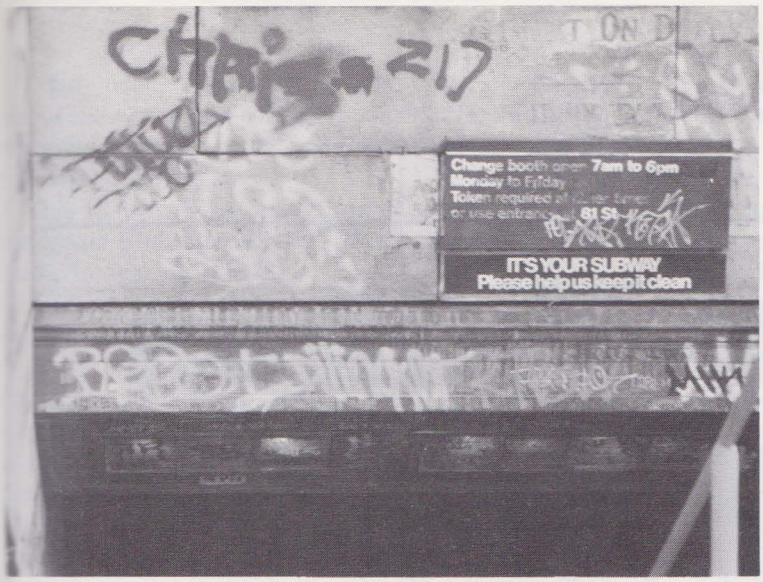
When our work was finished, we had a month to travel around. The continent is really big, so I only got to see some pieces of it, but I like what I saw. If I get an opportunity to go back I definetely will take it.

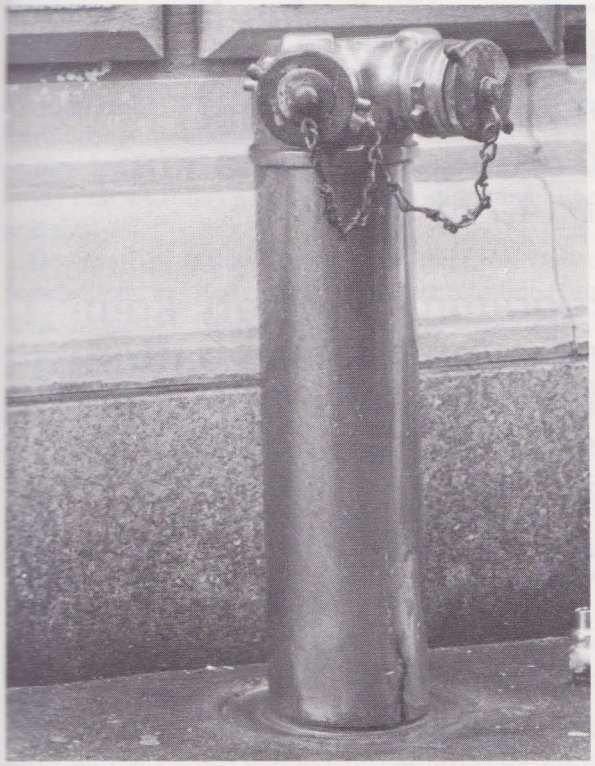
Finaly I want to give all students at Chalmers who get the same chance the advice: GO FOR IT.

Peter Hamberg

New York, New York.....

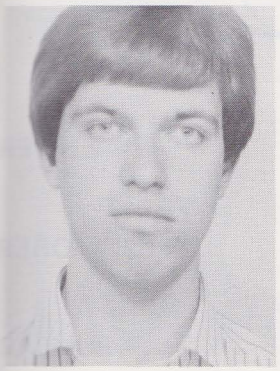



Change booth open 7am to 6pm
Monday to Friday
Token required at other times
or use entrance at
81 St
IT'S YOUR SUBWAY
Please help us keep it clean




DONT
WALK

Memories from Memorex



Claes Harvenberg
Memorex Corporation
Santa Clara California

I spent my summer in Santa Clara, California. Santa Clara is situated about forty miles south of San Francisco, just south of San Francisco bay. This area is well-known as Silicon Valley.

The climate in Santa Clara differs a lot from the climate in San Francisco. In San Francisco it is often quite cold, and it is often foggy and rainy. Just a few miles inland the temperatur gets higher and it is not very likely to rain. The one day in June when it rained for half an hour, almost everybody at work went out to look at the strange event.

I worked at Memorex, which is a very big company. One of their best-known products was their cassettetape, but they recently sold that part to another company. Their main products now are computer tape, floppy disks, rigid disks, disk drives and computer terminals.

Memorex recently joined the Burroughs Corporation, one of the largest computer manufacturers in the world. This strengthened the financial position of both companies and since Memorex got all Burroughs' computer storage products, it made Memorex an even stronger competitor in its field.

I worked with quality control at their rigid disks production. They produce mainly 14'' disks, but the demand for 5-1/4'' disks for the fast growing micro computer industry exceeds their production capacity, and they are therefore going to move resources to production of the 5-1/4'' disk.

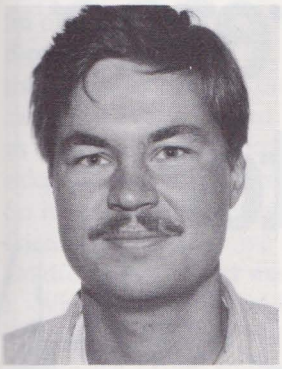
Quality control consists of checking a couple of key parameters of the disks and adjusting the production according to the results and the statistical evaluations. It also includes calibrating test equipment.

My work included many different tasks in this area, such as testing electronic circuits in test equipment to make sure they gave the right readings and measured with the right accuracy. This gave me practical experience with both digital and analog electronics.

I performed tests of disks in order to make standard-disks, which are used in the production to control the running production. I also made a computer program. The program stored supplier performance data on floppy disks and could present these data in a couple of different reports.

Working in California was a very positive experience.

A very special summer



Bo Janfalk
Pensilco
Bradford Philadelphia

When I first heard of the USA Study Tour Committee in the beginning of 1981 I thought of it as a splendid idea, and I decided to join the committee of 1982, and that was probably one of the best decisions of my life. After a lot of work trying to raise the money to make the trip to USA possible the day of departure finally arrived. We were about 90 students from Chalmers University of Technology that boarded the plane in Gothenburg on June 3:rd and took off for New York. After a short stay in New York we, that is Peter Hamberg and me, started our trip to Bradford and the Pensilco corp., but unfortunabley the weather didn't seem to like us. Some terrible thunderstorms delayed our flights so we didn't arrive in Bradford until monday evening instead of sunday evening as we had planned. At the airport we were met by Dennis Skaggs, ass. plant engineer at Pensilco, who was going to be our boss for the next 8 weeks. He and his friends took us out to the University of Pittsburgh at Bradford where we were going to stay during the summer.

A few facts about Pensilco: It is a rather small company with about one hundred employees, and they are growing silicon crystals with all kinds of different dopings and then cutting them into wafers which they deliver to the semiconductor industry all over the US.

The first week at the plant we spent most of our time trying to understand the silicon growing process, and the problems involved in it. Next week it was time for us to start on our big task, rebuilding some of the old crystal growing furnaces. We were introduced to Kent Wesmiller, with whom we were going to work most of our time at Pensilco, and he explained what we had to do. And that was taking the furnaces apart, cleaning all the parts that we were going to reuse, putting all the new and old parts back in again, wiring it and make it look nice. At first this seemed to be a really hard task but with Kent's help and a lot of work we finally worked it out. This took most of our time during the first four weeks.

For those of you who are not familiar with the silicon growing process I will try to explain the basic facts of it. The technique used is called the Czochralski method and it is the most used method all over the world. These are the basic facts of how it works. Silicon is melted down in a quartz (SIO2) crucible using graphite heaters. When the temperature of the silicon melt reaches 1600 degress celsius a seed of silicon is dipped into the melt. Now starts the growing process and how that works I am trying to explain with a picture.

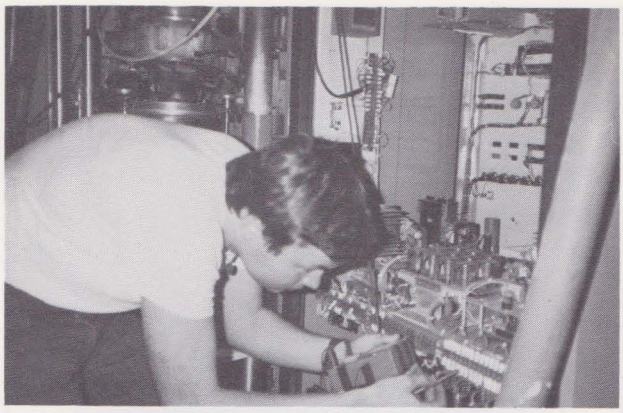
Crucible and seed lift speed as well as rotation speed and temperature are the most important parameters of the process and they are all controlled by the control furnaces that we were rebuildning.

After we had finished our work on the furnaces I spent one week trouble shooting the individual motor control units. I also spent a few days calibrating a thickness gauge for the wafers. The last few weeks with Pensilco I was working with some saws that the company had just bought. These saws cut the silicon crystals into thin slices called wafers and they were fully automatic and the problem with some of them was that they didn't feed the crystal forward after the first wafer was cut or the cut throug both the crystal and the crystal holder and things like that. This kept me busy for the rest of may stay at Pensilco. Well that all about the work and now I would like to tell you a little about what we did in the evenings, during the weekends and on our roundtrip.

Trying to calibrate a thickness gauge.

We soon found out that Bradford was a rather small town, it had about tenthousand inhabitants and it was situated in the northern part of Pennsylvania just on the border to New York state. The surroundings were very beautiful with big forest, low mountains and a lot of lakes and streams. The people we met were very nice and we made a lot of good friends among both the people working at the plant and the students at the campus where we stayed. They took us out and showed us both the town and its night life as well as the contryside, and they made this summer an unforgettable one. So it was with sad eyes that we took farewell of our friends at the party we held the night before we left Bradford and headed west for our roundtrip in the US.

When I left Bradford I flew to San Fransisco to meet some of my friends. We stayed a couple of days there before we drove south on highway no:1 along the beautiful coastline of California. After about ten days in southern California we left for Las Vegas where we stayed one night spending some money on the slot machines. From there we went to Grand Canyon which was even more terrific than I ever expected. There I split up with my friends who were going back to San Fransisco and went to Denver CO. to meet someother friends of mine whom I was going to travel with for the rest of my stay in the USA. From Denver we went south through New Mexico, Arizona, Texas and Louisiana and ended up in New Orleans. We stayed there for a few days, listened to live jazz music at the famous Preservation Hall and looked at the french quarters. Then we headed east to Florida where we had som lazy days in the sun down in Key West, the most southern place in the US. From Key West we travelled north along the eastcoast up to New Jersey where we visited a friend of ours. And so after four weeks of travelling we went back to New York city where the plane was waiting to take us back to Sweden and Gothenburg.



Trouble shooting at the crystal growing Purnace.

At last I would like to say that I am very satisfied with my summer in the USA and I would like to thank all of you in Bradford, Bill for driving us to work every morning and sharing a lot of our good times, Kent for everything you taught us and for great company both at work and in our spare time, Dennisk, Chris, Al, Laurie, Tammy and Sue for making this summer a real pleasant one and especially Bob Mytton who made it a reality by offering us the work at Pensilco, once again THANK YOU.

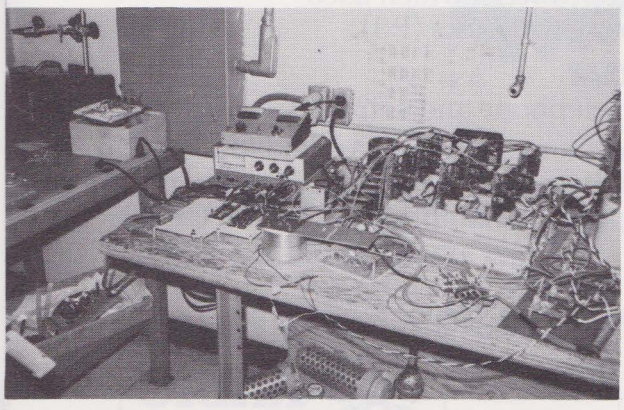
Bo Janfalk

Radford, where is that?

Dag Lundgren
Inland Motor
Radford Virginia

Up in the beautiful Appalachian mountains in Virginia there is a small town called Radford. It is situated on the New River, about one hour drive west of Roanoke. This is an area with old history since the early settlers colonized it in the 17:th century. It is also the place where I have been working for eight weeks this summer at Inland Motor. The company is a division of the Kollmorgen Corporation and has about 400 employees. They are making various kinds of electrical DC-motors both linear and ordinary ones. Their motors are used in many applications such as parts of servosystems where high accuracy and torque are required. For example, in some military equipment and maybe in one of the future Space Shuttles.

During my time there, I was working on different projects for the control systems of their brushless DC-motors. My job was to design and build parts of a control system and afterwards test and troubleshoot them until they were working as expected. In the control system both analog and digital signals are used and to work with them in the same circuit was a new experience for me and I found it very interesting. The design work included writing programs for PROMs (Programable Read Only Memory) and also programming the chips. Even more exiting was when I put most of my circuits together with some other parts and had a control system that I used for running a brushless DC-motor.



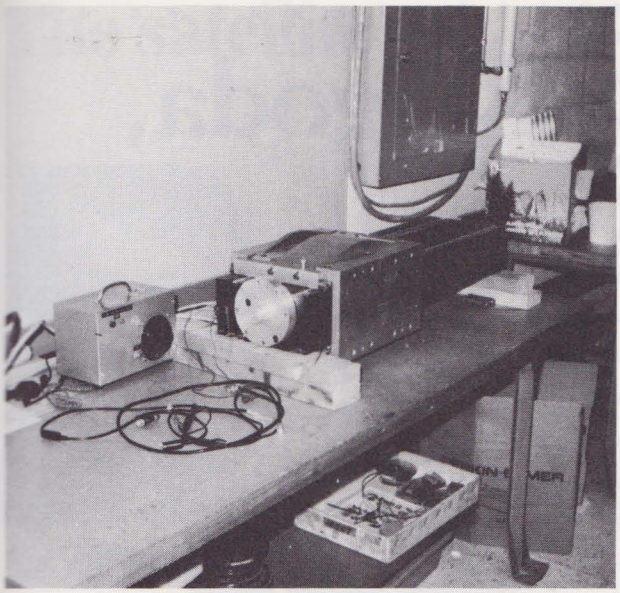
My workbench.

In my work I also used one of the company's CAD (Computer Aided Design)-programs. I was helped by the fact that I had used a similar program in Sweden, since I was the first user of that particular program at Inland. The program I used made theoretical analysis of electrical circuits and such programs make design work much easier.

Brian and Harold.

Inland Motor has a co-op program, which I wish Swedish companies also had. The co-op program involving Inland and some universities, makes it possible for students to combine work and studies in a nice way. For example, there are students that are working for two threemonth periods and studying the rest of the year during college. This is a good experience for the students but it also provides the company with engineers trained in both practical and theoretical enineering.

My eight weeks at Inland Motor went by much too fast and at the end of July I left Radford and flew to San Francisco. In this cold but nice city I met some other Swedes and together we traveled around in California, Nevada, Arizona and Utah for about three weeks. During this time we visited beautiful places like Santa Barbara, San Diego, Yosemite and Zion National Parks and we also saw the impressing tufas in Mono Lake. After that we spent a couple of days in the Rocky Mountains in Colorado before we flew down to Miami. From there we drove out to Key West



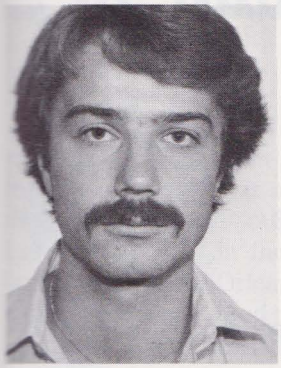
A large linear motor.

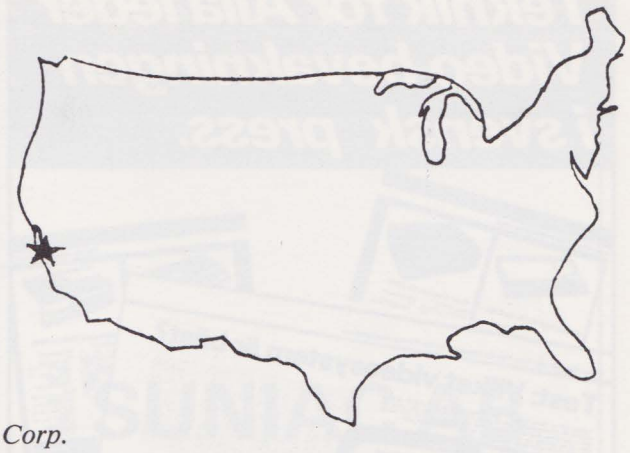
where the thing that made the strongest impression was the gorgeous coral reefs with their coulorful fish. After some days in hot and humid southern Florida it was time to go back to cold and rainy Sweden again.

I would like to thank everyone at Inland and all others who helped make this summer one of my very best ever.

Dag Lundgren

The satellite





Lars Magnusson
Communications Satellite Corp.
Washington DC

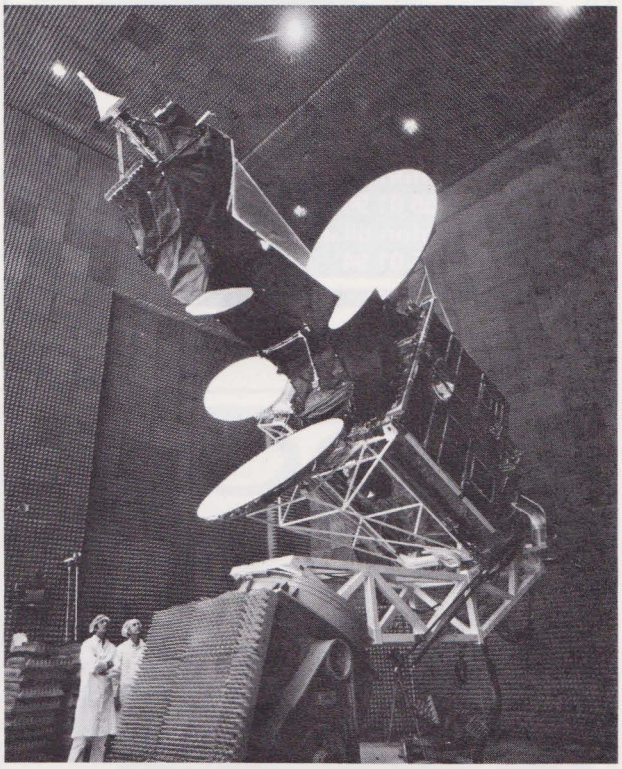
On the third of June it was finally time to leave Sweden and its somewhat unreliable summers and go to the U.S., California and the sun. After much too short a visit in New York, I arrived in San José together with Caj and Per. We were picked up at the airport by Hokan (Håkan) Holm and taken to Palo Alto. Hokan is an old Chalmers student who was born in the same town as me in Sweden, Sävsjö, in the dark forests of Småland. He has been working in the U.S. for many years and he arranged so that I could come and work with Comsat. We all stayed at the Holm's house for the first couple of days until we were able to get other places to live.

Caj and I moved just across the street to live with Pablo, a guy from Argentina. He was a very nice guy and because of him I came to meet a lot of interesting people from all over the world. He also arranged a couple of really nice parties. We lived in what is called a condominium with a tennis court, swimming pool, sauna and hot tub. Unfortunately, I don't play tennis but I used the swimming pool and the hot tub instead.

Palo Alto is one of the cities in the bay area south of San Francisco. It is also the site of famous Stanford University. There are cities all around the San Francisco Bay with Silicon Valley in the south. It is all rather flat and most of the houses are one story high. In this area, and I believe everywhere in the U.S., you really need a car, I did't have one but I managed rather well anyway since it only took ten minutes to cycle to work.

The Communications Satellite Corporation where I worked, is the American part of Intelsat, an international organization for telephone and television "exchange" by satellite all over the world. Comsat's task in Palo Alto is to supervise the building and testing of the satellites. In this case it was the Intelsat-V, which is built by Ford Aerospace and Communications in Palo Alto. The I-V is the fifth generation of Intelsat satellites: it has a capacity of 12000 two-way telephone circuits and two television channels.

Since a satellite is a very expensive device and it is impossible to repair it once it is up in space, it must be made sure that it will work properly. For this reason



The Intelsat-V satellite in the antenna range.

there is an enormous amount of testing done, first on the unit level and then at the different stages of assembly. The testing is done in order to simulate the actual conditions during launch (acoustic and vibration testing) and inorbit life (thermal vacuum chamber, a giant sphere where you can vary pressure and temperature in order to simulate the different stages of the spacecraftyear, and the antenna range where the communications module is tested according to antenna patterns, frequency responses and so on).

My task at Comsat was to help out where help was needed. Of course all this testing involves a lot of data logging so this is what I did most of the time. At the same time I tried to learn as much as possible about the satellite and satellite communication in general. I

found it very interesting since a satellite and the building of it covers most of the different electronic fields like control systems, high frequency technology, electrical measurements (most of the testing is carried out automatically by computers so there was some programming too).

After eight weeks of work I had four weeks of vacation, during which I drove across the continent together with Ingemar and Jan. Among many other things we surfed in southern California, gambled in Las Vegas, hiked in the Grand Canyon, listened to jazz music in New Orleans and snorkled in Key West, so we had a pretty good time.

Finally, I want to thank Hokan and all the people at Comsat for making this wonderful trip possible for me, I really enjoyd it.

Lars Magnusson

Getting into shape

Caj Månsson
Energy & Control Consultants
San Jose California

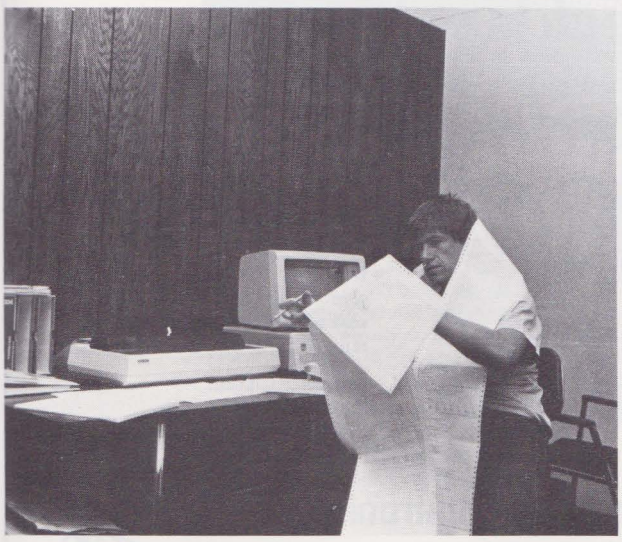
I spent a great summer with ECC, a bunch of nice guys who are consulting utility companies in energy matters. It is a rather small office so I got to know everybody and we had a very friendly atmosphere.

The first thing I had to do after arriving to San Jose airport was to find a place to stay and I was lycky. With the help of Håkan Holm, a swedish engineer working in the area, I found Pablo who had a spare room in his apartment. How I managed to survive those South American parties he gave, I don't know.

Second I had to find some means of transportation: California-Motorcycle, to me those two words have always been connected to each other, so I bought a motorcycle.

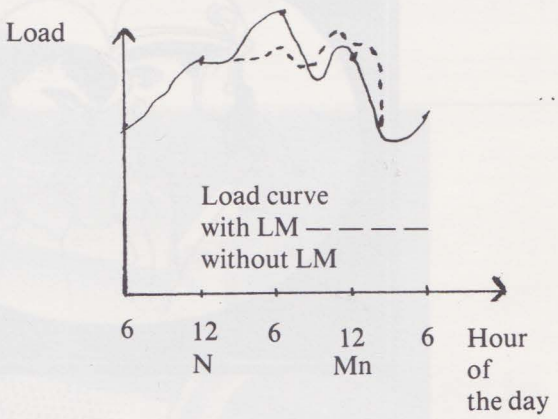
Now I was ready for work. As mentioned earlier ECC is consulting in Energy Conrol Systems. They deal with:

SCADA — Supervisory Control and Data Systems Accusision
EMS — Energy Management System
AGS — Automatic Generation Control
DA — Distribution Automutation
LM — Load Management



Fighting the computer.

I worked mostly with LM. Load Management is a way to change the load shape, by shutting the customers water heaters off for a certain amount of hours, at a certain time of the day or shutting the air conditioners off for approximately 10 minutes every hour during the peak period of the day. This can be done either with a timer or by remote control (radio or power line transmitted).



To get into the subject a little, I was first assigned to go through the vendor files and write a report on remote meter reading and remote control of swithes. The reason why the utility companies want to read the electric meters from one main station can vary, it can be to save labor or to make load surveys. Doing this I got the general idea of load management.

My next assignment was to write a computer program to determine the type of load control and the hour to apply it to make the best savings for the utility company. This was a big task and it took me several weeks to finish it. I wrote it in Basic for their personal computer. In the meantime I also helped out with drawing graphs for reports that ECC was doing.

My final larger task was to write an accounting time program. This program gathers information from weekly time cards, and accumulates the time spent on engineering projects categorized by engineer and by project. To finish this last projekt I stayed an extra week which I did not mind since I like the Bay Area.

Famous bridge in famous city.

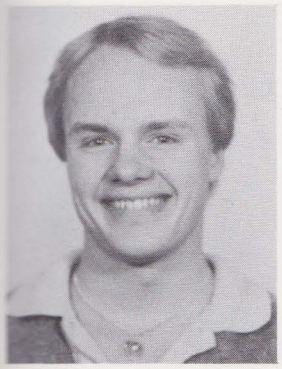
Touring the city.

The last weekend we had a company picnic to which Jack brought all the local wines, so it all turned into a wine tasting party and from what I remember we has some good wines.

During the weekends I had time to look around the beatiful Bay Area and also make trips to other parts of California. After I had finished working I had the possibility to try and compare the tacos all over the U.S together with Per Cedhagen and Bo Janfalk. Among many places I saw was Key West and the corall reefs, where I went scuba diving with Helena. It was like stepping into an aquarium.

Thanks to all of you who made this fantastic summer possible, especially the ECC for putting up with me, the swedish companies who bought advertisments and Odd Fellow in Örebro who gave me a grant.

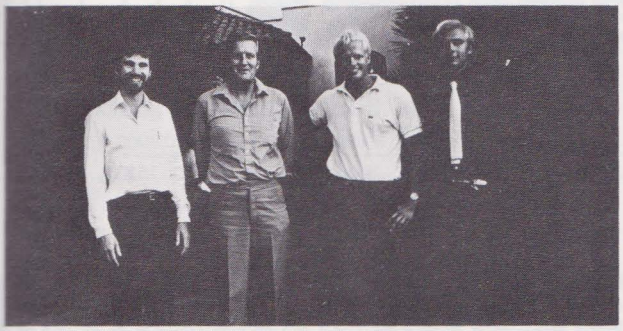
During ...



Björn Nilsson
Space Vector Corp.
Northridge California

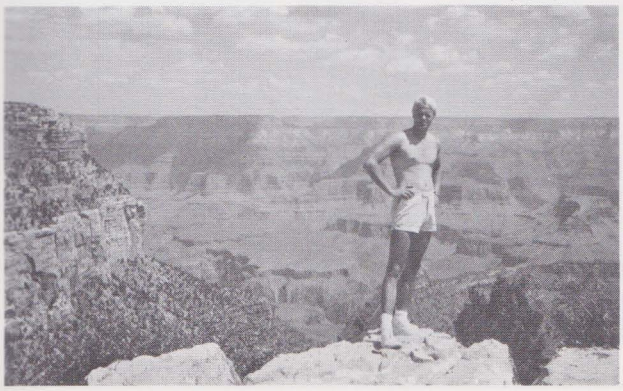
... this summer I got the opportunity to work at Space Vector Corp in Los Angeles CA.

Space Vector Corp is a pretty small company with about 90 employees. It didnt take long time to realize that this company has a great capacity concerning rockets and aerospace. My friend Ulf and I got very

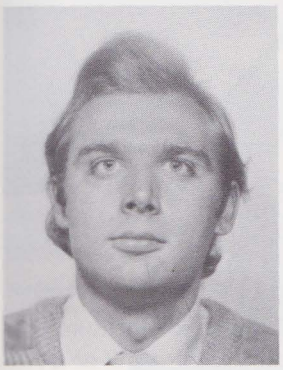


interesting tasks from the beginning. We worked in the areas of rocket vehicle and trajectory analysis, orbital mechanics and range safety. We also did additional work in the area of fragment ballistics and aerodynamics. We got our own office with a sign on the door that said: +The Swedish Flight Analysis Group+ probably made by our nice supevisor, Tony. One of the main projects for us and the company during the summer was the Conestoge I rocket which is supposed to be launched from Texas the 9th of Sept 82. In July we went with the company to White Sands missile range in New Mexico to launch another rocket called Aries. During the same week we got the Friday off and went from New Mexico to Grand Canyon. We also got an 'American dad' during our stay in L.A. he, one of the employees, let us stay in his house and we were allowed to rent his car. To live in Los Angeles without a car is almost impossible. We drove the car both to San Diego and the beautiful highway no1 to San Francisco. My visit in the US gave me a lot: experience, friends, english vocabulary, and sunshine.

Björn Nilsson
Edinboro PA



The Swedish flight analysis group



Ulf Palmnäs
Space Vector Corp.
Northridge California

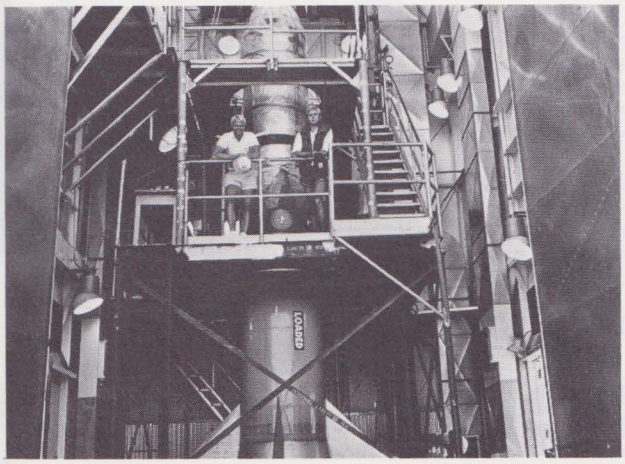
SPACE VECTOR CORPORATION (SVC), which I had the great pleasure of working for, is a small corporation with BIG views. Although it has only a hundred employees, it has built **22** sounding rockets of which all, but two, have been successfully launched from, the United States or Sweden. During these two flights the first-stage motor overheated. The motor is one part not built by SVC.

The present big views SVC has is buildning a series of **L**ow — **O**rbit — **V**ehicles (LOV). That is a rocket for launching payloads into earth orbit, in contrast to sounding rockets who have a quick up an down journey. To my great pleasure, the first SVC test-LOV was successfully launched in September 1982. It was on this first LOV, the Conestoga 1, and on the future bigger LOVs that Björn Nilsson (please see his text) and I worked during our two months at the company.

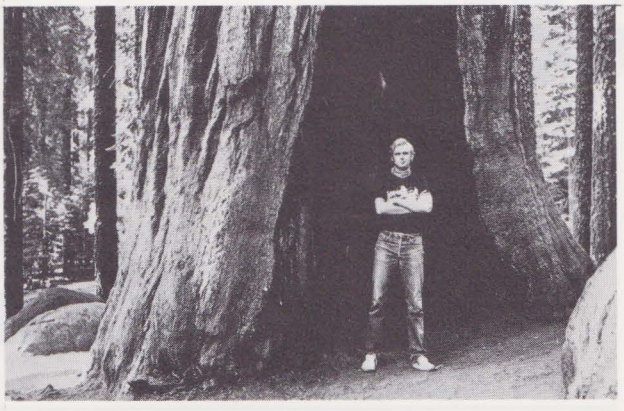
The way things worked around SVC was that one of our supervisors, Tony Materna or Clay Bushnell, knew what had to be done and thought about it. his ideas were then "brainstormed" at a big meeting during which we got our tasks. The tasks were often put as "what happens if .....", or "how far will the furthest part go if we course, weant that we had to start with ideal physics and physics equations, reform them, make realistic approximations, collect all the input, write or use an existing program, receive output and then after numerous additional compute runs I or Björn presented the results. Since much of our work was connected with a safety-range report, our findings were often points or circles on maps or curves on a diagram. But all added up, they made up the area requirements needed to launch this first LOV.

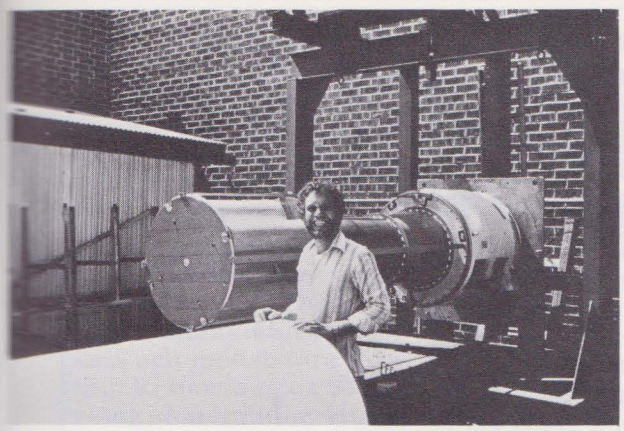
Working hard!?

Our work related to larger LOVs was mainly combining accessable motors into stages and for this new rocket calculate its performance, with different payloads, different trajectories and different launch sites. During our calculations we came across a couple of interesting combinations on which the corporation will continue to do extended calculations. To give us a broader understanding of rocket hardware, we assembled, in 100° F, a rocket from above the first stage and did some bending



Two Swedish rocket engineers.





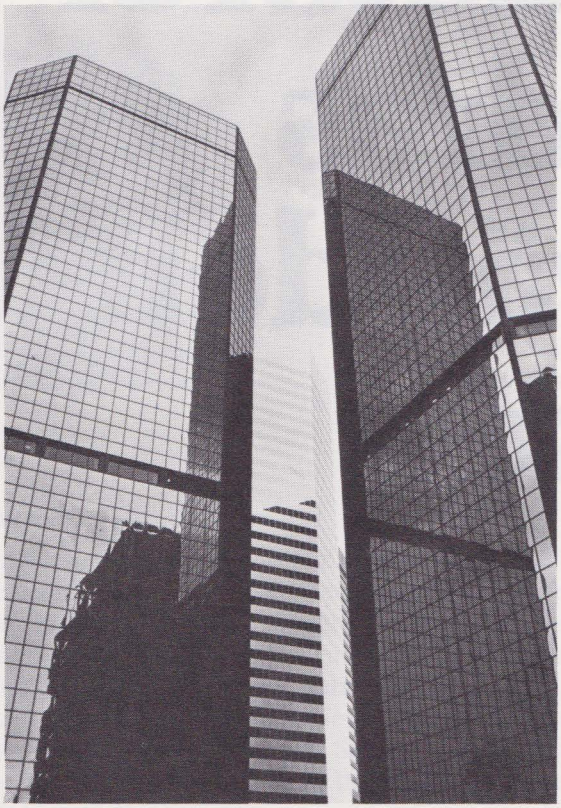
Ralph by the payload.

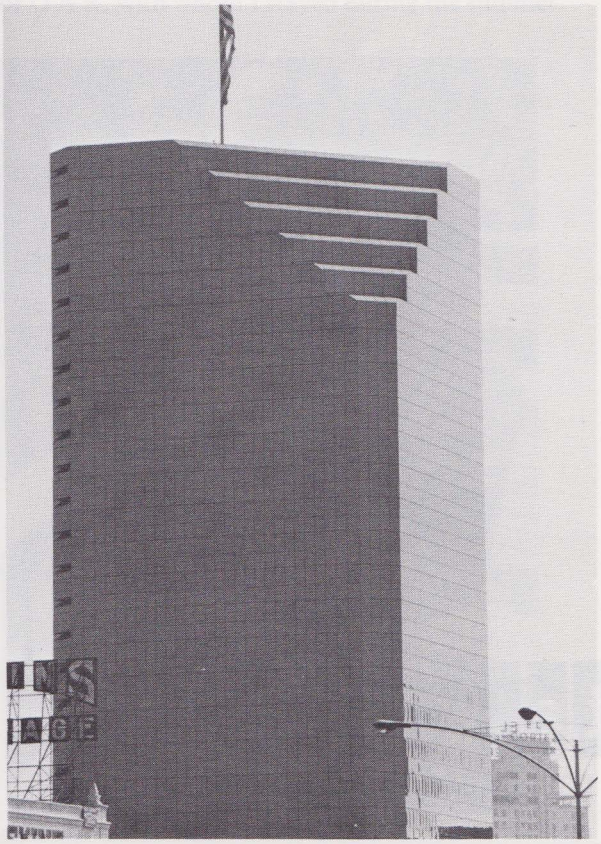
and natural frequency tests on it. We also flew from L. A. to White Sands, New Mexico, to see an assembly, test, countdown and launch of one of SVC's rockets. This hardware training is something I grately appreciated and it really gave me a greater understanding of the rocket industry.

To summarize my stay at Space Vector, it was most interesting, pleasant and educational. I belive that nowhere else could I've been greated with such willingness to help and teach about rockets an nowhere else could I have gotten such a broad perspective of rocket engineering. Thank You, Space Vector, for a Great Summer.

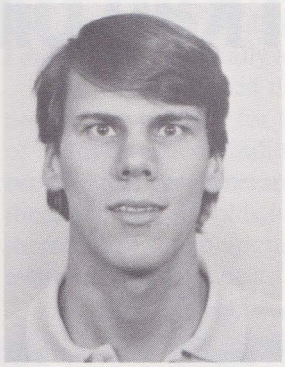
ULF PALMNÄS Teknisk fysik
Space Vector Corporation, CA

American Architecture

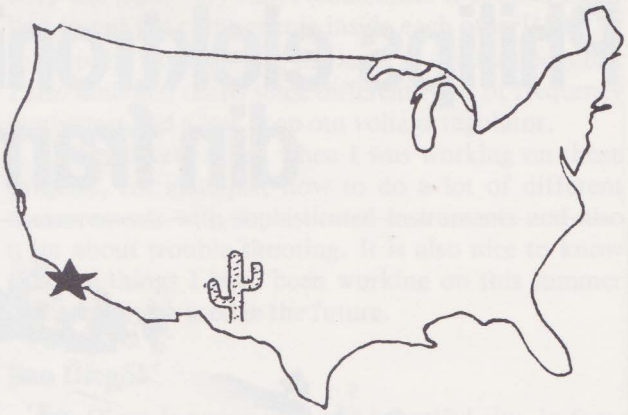




Short Leads



Kjell Peterson
Ocean Applied Research
San Diego California



Takeoff!

After nearly one year of hard work of the board of the committee, I was finally there. I could almost feel the vibrations of magic that went through the airplane when we landed at John F Kennedy Airport in New York on June 3. I was a nice feeling!!!!!!!!

After a couple of days in New York, I continued my trip to my final destination, San Diego, California, and Ocean Applied Research, the company where I was to work this summer.

I was met at Lindbergh Field (of course named after the famous Charles Lindbergh) by one of O A R's employees, Mary Helm. She also fed me good food the two first weeks (you could see how good it was on the scale) and took me to Ernie Rowland, another employee of O A R, with whom I stayed during the summer.

Star of India.

My host, Ernie Rowland.

The company!

I had got the opportunity to work at a very nice company, It is a small company that employs about 80 people. They have had students from the committee for two years before me, so they know a lot about how it is to be a student in a foreign country which was good for me. It is a very friendly and relaxed company and the people I met seemed to enjoy most of their time there.

OAR was founded in 1968, then they manufactured an oceanographic tracking device. In 1978 they became a division of General Indicator Corporation, a division of CompuDyne.

Now they manufactures automatic radio direction finders, radio beacons and flashing light beacons. Their products are used for tracking transmitters, sources of radio interference and in rescue operations and are used by a wide range of users from fishermen to military and government people. It is a growing company and much of their production is for export. They won the 1981 World Trade Association of San Diego Exporter of the year Award for their products and marketing methods. The same year they also got the President's "E" Award for excellence in export.

My Work!

I worked in the engineering research and developing laboratory under the supervision of Alex Burwasser, who is OAR's Senior Radio Design Engineer. My first task was to perform a Fourier analysis of a complex audio waveform to determine it's spectral content. I did this first manually and then on a computer.

After that I worked the rest of my time with some new prototype parts for the company's new generation of radio direction finding equipment. The difference between this new generation and the present one is that there are more sophisticated technical solutions and therefore fewer components (cheaper) and also better technical performance.

Last day at work eating icecream.

I started by building and testing two AGC IF amplifiers, one for 10.7 MHz and one for 75 MHz where AGC stands for Automatic Gain Control. To obtain AGC, we used varactors, which changed their capacitance with the voltage, by changing the capacitance we also changed the resonance frequency and thereby we changed the gain at a certain frequency.

There were some problems at those high frequencies, especially with the component placement. I had to keep the leads very short (sometimes it seemed like I had to put the components inside each other!!!!!!!!!) to keep the inductance in the leads as small as possible. I also built and tested some different types of frequency converters and a low drop out voltage regulator.

I learned very much when I was working on those projects, for example, how to do a lot of different measurements with sophisticated instruments and also a lot about trouble shooting. It is also nice to know that the things I have been working on this summer will actually be used in the future.

San Diego!

San Diego is a very nice and beautiful city, in fact, it is so nice that it has got the name AMERICA'S FINEST CITY!!!!!!!!!!!!!!!!!! It is not too big a city (which I liked), with the suburbs there are a little bit more than 1 million people living there.

The climate is perfect. They have summer from May to October, a short winter (if one could call a San Diego winter a winter) and a short spring. All the people I met there were very nice and friendly.

And of course the beaches are wonderful.

If that is not enough they also have America's best baseball team, SAN DIEGO PADRES!!!!!!!!!!!!!!!!

Mission Beach, San Diego.

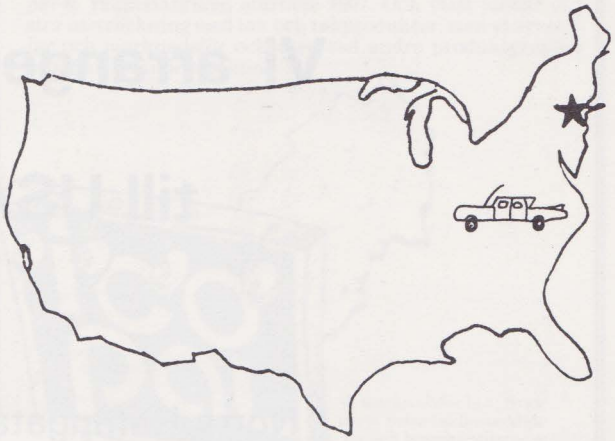
At Last!

Finally I would like to say that I am very happy that I got this opportunity to go to the United States and work for one summer. It has been a great summer and worth all the work I had to do to get here.

I would like to thank:
OAR — For giving me the job
Alex — For everything you taught me
Don — For answering my questions
The people at the lunch table — For the talk during the breaks
Mary and Neal — For everything you showed me
And at last, THANK YOU ERNIE, for letting me stay at your home this summer; you did a lot for me and I do hope you can get your fish "golden brown" now.

Kjell

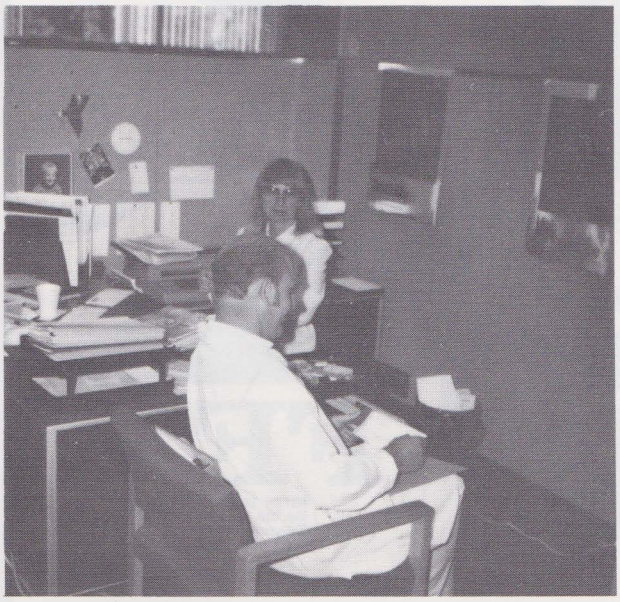
New York



Lars Renneby
Thomas Betts Corporation
Raritan New Jersey

New York, the "Big Apple", welcomed us with a rainy sky and a skyline much bigger than you can imagine. The first days in this, the biggest city of them all, scared me a little. I had a hard time overcoming the impression that the following day the world was coming to an end in this crazy city. After a couple of weeks when I had established myself and learned what to look at and what to overlook, I started to appreciate the "Apple". New York City probably has more to offer than any other city in the world. If you doubt it take a look for yourself.

The first contact with my employer, the Thomas and Betts Corporation, was when I called the Secretary of the division (Optoelectronics) where I would be working, and talked with her in my "very best" English. She was kind enough to send a limousine to pick me up because she didn't know if "decent" transporation was available. When I arrived at the hotel where I was going to stay until we could find something permanent, I found an invitation for dinner with the Managing Director of the Optoelectronics Division; and another divisional manager picked me up later and took me out for some brief information about the Company and what I was supposed to do.

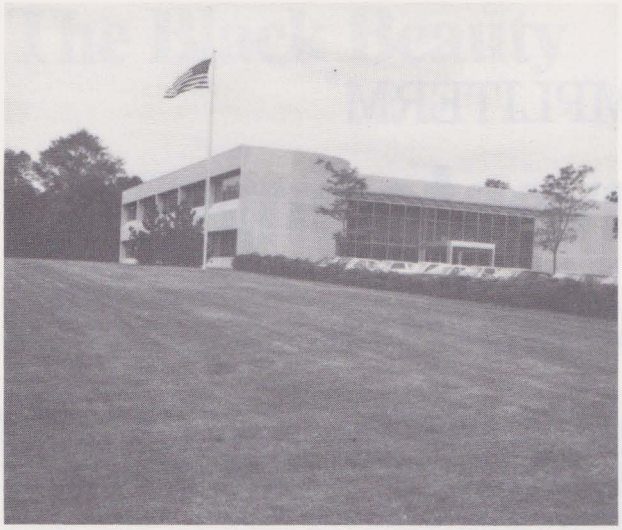


Work in progress.

Thomas & Betts as a company!

The Company was founded by Robert McKean Thomas and Hobard D. Betts in 1895. T&B has grown to a Company today of 3,000 employees and a turnover of approximately 270 million. The Company has a couple of manufacturing plants inside the U.S.- and sales offices in Western Europe and Japan. The international sales represented around one third of the total sales, which is quite a lot for a medium-sized Company. T&B has been in the electronic connection business since 1960, and besides the well-known TY-RAP and other multiple use products, the connector part of the Company earns their money today. For the computer market, T&B developed a flat cable and connector system called Blue Macs which can carry up to 64 cables in one connector. Last year the Company developed an under-carpet wiring system called VERSA-TRAK which is a system only a couple of millimeters thick that saves the office both power and signal transmission. VERSA-TRAK is one of the products that the Company believes is going to have a good future. The Group is located in the corporate headquarters in Ratitan, New Jersey in a fairly new facility.

I have worked with the Optoelectronics Research & Development Department dealing with a new fiber optic connector. The idea is to develop a sophisticated optical connection system without use of any epoxy, only a cleaving tool which the Group already had developed. The new fiber optic connector system is characterized by low insertion loss high repeatability and rapid, simple field installability with the already existing cleaving tool. I have been involved in different types of measurement series where we checked the behavior of the connector under different circumstances such as temperature, forces on the fibre/connector, variation in fibre diameter, and much more. I have also been dealing a lot with the Tektronix 4052 which we have used to program our heat chamber to do different types of temperature cycles during the time we were not present. In Optoelectronics I have had



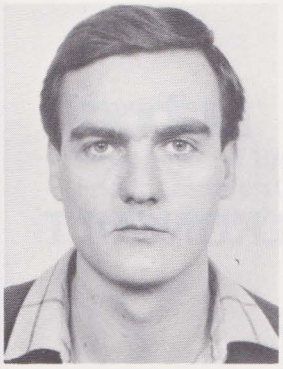
Company headquarter.

the great opportunity to work with people that are experts in the field of fiber optics, and if I can remember all they have taught me, it's going to be much easier for me later to work in the engineering field. I really appreciate all my co-workers in the Company who let me take part of their knowledge, and I'm going to try to use it wisely and for the best purpose.

Last, but not least, I would especially like to thank the E-82 Study Tour Committee and its Board for a terrific time. Without the teamwork that we had this summer would have been impossible to realize.

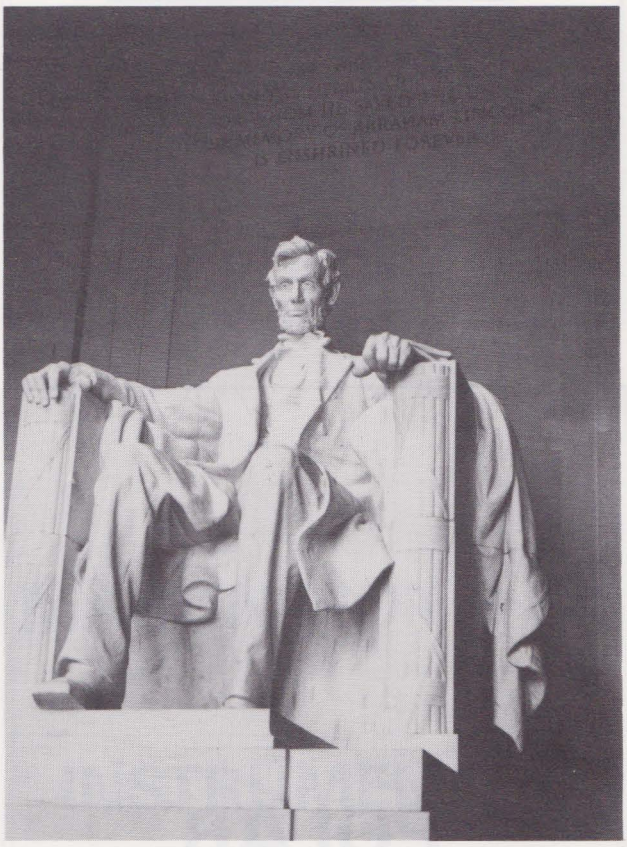
Lars Renneby

The Black Beauty

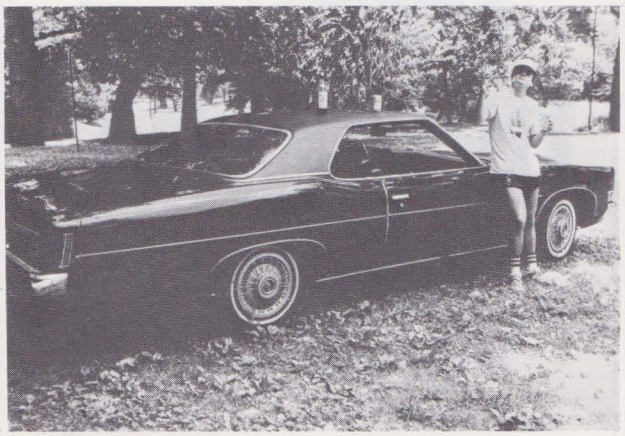


Per Wennman
Belfort Instrument Co.
Baltimore Maryland

After a long flight with a transfer at Schipol Airport we finally arrived at J.F Kennedy Airport. We were eighty students from the Schools of Elecrical and Mechanical Engineering at Chalmers. After we had picked up our luggage and passed trough customs, we met some of the people from the American Sandinavian Foundation. They had arranged two buses to take us into Manhattan. Unfortunately, the buses had by mistake already gone with another group of people. After a couple of telephone calls to the bus company and some hours of waiting, the buses arrived. Apparently the bus drivers had decided to have a race to N.Y city; they were driving like madmen and gave us an unforgettable trip. We spent three days in N.Y, mostly walking around in the streets watching the busy people. Fredrik Osterstrom and I also went to see The Statue Of Liberty from where you have a good view over the famous Manhattan skyline. Then it was time for Fredrik and me to take a flight to Baltimore where we were to work for eight weeks as trainees at Belfort Instrument Company. Mr. Reily, the president of Belfort, took us to the apartment at the Loyola College dormitory where we would live the next eight weeks.



Belfort Instrument Co. (a subsidary of Trans Technology) has manufactured meteorological instrumets for more than 100 years but is still a rather small company having about 60 employees. Most of the employees work in the workshop, either with producing parts for the instruments or assembling them. There is also an electrical section were the two engineers, Melvin and Norbert, as well as the technicians work. It was in this section Fredrik and I worked. The first month's major task was to calibrate and perform different tests on the Digital Altimeter Setting Indicator (DASI) units. The DASI system is a micro-processor-based precision altimeter. The variations in the atmospheric pressure is sensed by a high precision pressure senor and converted into a DC voltage between 0-5 volts corresponding to 775-1100 mbar. This voltage along with the station elevation information is translated into a frequency signal and sent to the microprocessor, which

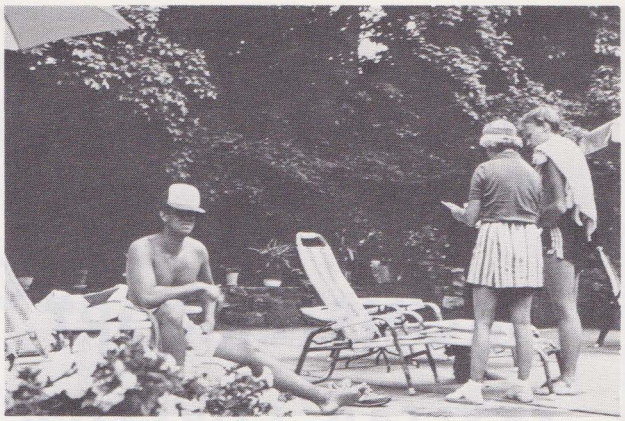


Me and the Black Beauty.

calculates the atmospheric pressure at sea level. This pressure is displayed on a five-digit display and sent in FSK to remote displays if there are any in the system. A typical application for the DASI is that an Air Traffic Control Tower has the sensor translator unit, which sends the calculated sea level pressure to remote displays situated at different locations at the airport. The air traffic controller transmits this information to the pilot, who sets his flight altimeter which then will indicate what height the aircraft is flying at. We also did some troubleshooting on the microprocessor boards for the DASI and other electrical circuits. The second month we mainly designed and built a circuit for sensing a varying resistance and translating the actual resistance to a corresponding DC current. We decided to use a differential bridge amplifier to convert the resistance change to a voltage output. This voltage was amplified in two amplifier stages and then fed into the voltage controlled current source. We had to build the circuit with very low drift op-amps, to meet the specifications. Then we tested the circuit and after some modifications it behaved as we wanted it to do.

There was not only work; since we worked four days a week ten hours a day had long weekends. The first weekend we spent looking for a good car to buy. after a two-day search we found an interesting ad in the local paper. It was love at the first sight when we saw 'The Black Beauty', Pontiac Catalina 1971 with a 400 cubic inch (6,5l) V8 motor. She was a huge car that had everything: automatic transmission, power steering, power brakes, air conditioning and a lot of ofter things. We bought it on the spot and it gave us many nice troublefree miles. The first place we visited was Ocean City, a city for people (mostly young people) who want to go on a spree during the nights and spend the days on the beach. The Midsummer weekend

Fredrik and Brian having breakfast.



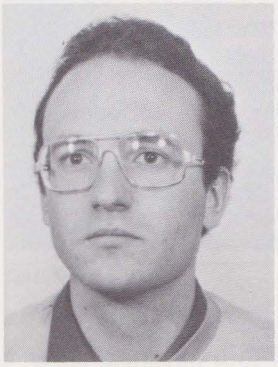
Fredrik, PF and PF:s landlady at her place.

Fredrik and I together with five other Chalmers students gathered in Newport, Rhode Island. There we celebrated midsummer eve with an excellent dinner. During the days we improved our tans on the beach. One night we went to the harbor to look at the tall ships which participate in the Tall Ship Race. The old ships were really impressive. In Washington there were a lot of things to see: the Capitol, the Washington Memorial, the Lincoln Memorial, the White House and a lot of museums. I think we spent at least six hours at the Space Museum where they have the Lunar Lander, a lot of Apollo capsules and the spare Spacelab among a number of other interesting things. The most beautiful ting we saw was the Niagara Falls. The so-called Horse-shoe Fall on the Canadian side was so powerful. We took a trip with the Maid Of Mist a boat that takes you very near the falls. It was a fantastic experience to hear the roar of the falls and feel the power of nature. I just wonder what the first human who saw the falls was thinking? While we were so far north we took the opportunity to visit Canada and Toronto with it's CN Tower, the highest freestanding building in the world.

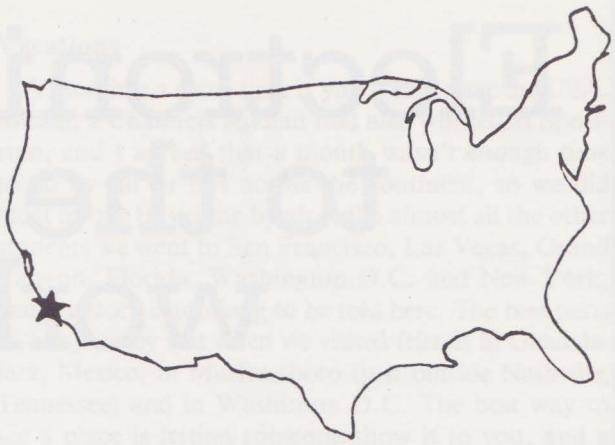
I would like to thank all the kind and nice people at Belfort for taking good care of us and special to Mr. John Reily and his family, who gave us the opportunity to work at Belfort. Last but not least I want to give the talented technician Brian Rehill and his family my best regards. I hope I'll see you in Sweden soon, Brian and that The Black Beauty is running as smooth as she did for us.

Per Wennman

Selecting capacitors



Mats Westholm
Spectrum Technology Inc.
Goleta California



— Micael, get up, it's almost seven o'clock!

— Don't yell at me, I was awake before you. I turned the alarm clock off, that entitles me to twenty minutes extra sleep as a bonus, don't you remember?

We had such a good time in Santa Barbara that we never had time to sleep. Some mornings we were tired, but we always arrived to work at the same time (i.e. three minutes late).

The Company

Spectrum Technology Incorporated is a company with approximately 70 emploees. It manufactures crystal oscillators and it is situated in Goleta, not far from Santa Barbara where we lived. Oscillators from Spectrum are bought by companies all over the world. There are for example oscillators from Spectrum flying in the Swedish fighter-airplanes Viggen and in the booster rockets of the space shuttle Columbia.

TCXOs (Temperature Compensated C-tal Oscillators)

A basic crystal oscillator, a quartz crystal and a feedback loop, has the disadvantage that it changes its frequency with temperature due to natural properties of the crystal. If you are not satisfied with this behavior, you should buy a TCXO instead. The TCXOs manufactured at Spectrum use a varicap (a voltage controlled capacitor, which in reality is a diode) to keep the frequency almost constant over a wide temperature range. When the natural properties of the crystal make the frequency too high, you want the varicap to tune it down and vice versa. the tuning is made by a network of resistors and thermistors that puts different voltages over the varicap at different temperatures.

Since all quartz crystals are a little bit different, you have to design the compensating network individually for every oscillator. A great help in doing this is a computer-controlled system that runs the oscillators at several different temperatures and records the varicap-voltages required to keep the oscillators at the nominal frequency. When the system has access to this information, it computes and individual network

Outside Spectrum's main entrance.

to compensate the oscillator at all temperatures. This process (measuring, gathering of data and computing) is called the "Phi-Run".

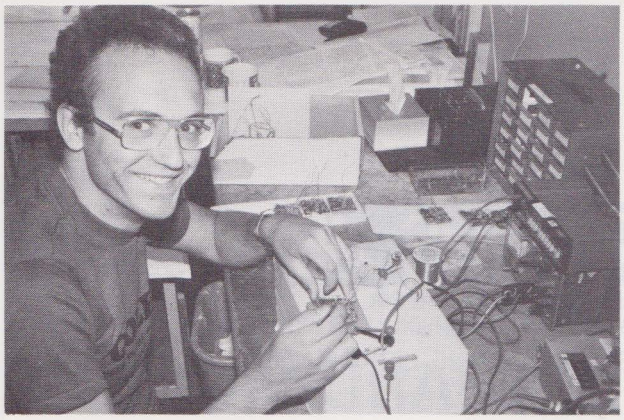
My Work

Most of the time I prepared oscillators for the "Phi-Run". I checked that they worked properly and soldered a selected capacitor into its place to make them run at approximately the right frequency. I also mounted the oscillators on test cards so that the computer system could get the data from them. Sometimes the oscillators didn't work the way they were supposed to. Then I had to troubleshoot them; that was sometimes difficult but always more interesting than when it worked at the first try.

At work we also met Brett and David, two nice guys that we had some fun with during evenings and weekends. With the help of David we tried to surf; at my best I managed to stand up for about two seconds! I enjoyed trying and I suspect that I would enjoy it even more if I had the chance to learn it.

Santa Barbara

Santa Barbara is a very nice city with the Pacific Ocean on one side and montains on the other. Palm trees grow everywhere, and the beaches are beautiful. The scenery around Santa Barbara is very varied, just within some hours of driving you can find extremes like the snow in the Sierra Nevada and the heat in the Mojave Desert.



Testing oscillators.

What made our time in Santa Barbara so enjoyable was that we stayed with June Hendrickson, a fantastic person, June helped us with everything, but never too much. When something had to be arranged, she told us the best way to do it, but she always let us do it ourselves; we learned a lot that way. June also introduced us to many of her nice friends.

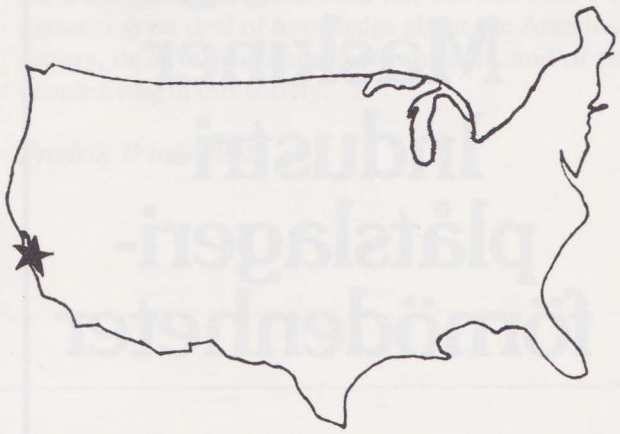
Vacations

A month is a short time if you want to see the USA. Micael, a Chalmers student that also worked at Spectrum, and I agreed that a month wasn't enough time to go by car or bus across the continent, so we did most of our travelling by air. Like almost all the other students we went to San Francisco, Las Vegas, Grand Canyon, Florida, Washington D.C. and New York, and the story is too long to be told here. The best parts of our journey was when we visited friends in Guadalajara, Mexico, in Murfreesboro (just outside Nashville, Tennessee) and in Washinton D.C. The best way to see a place is letting someone show it to you, and a person who lives there is the best one to do it.

A summer in the United States of America is a useful experience, but most of all it's fun!

37° 27' N lat, 122° 9' 30" W long

Fredrik Winterlind
IBM Corporation
Palo Alto California



If you take a close look at your world map at this position you will find Palo Alto. This is one of the many small cities within the so called Bay Area, which means that it is one of San Francisco's suburbs and is situated on the San Francisco Peninsula.

Its history dates back to the accidental discovery of the area by Spanish explorers in 1769. The Spaniards camped by San Franciscuito Creek under a redwood tree which they called 'El Palo Alto', which means 'the tall stick'. This tree still stands at the city's northern entrance.

Palo Alto is the home town of the Hewlett-Packard company, Stanford University and Varian Associates. It has more than 190 industries, employing 35-37000 persons locally. The population is somewhere around 55000 persons.

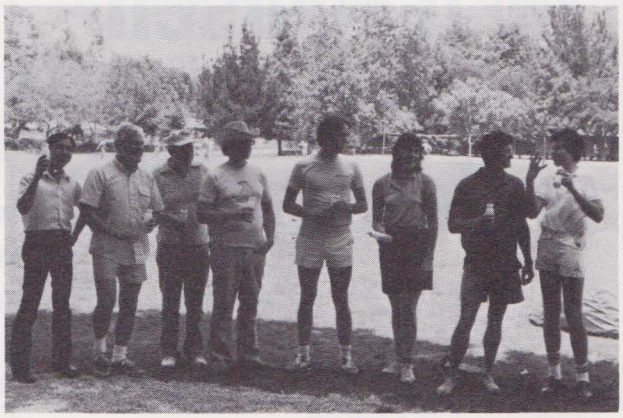
One of the many companies having plants in this city is the IBM Corporation. And one of the groups within this IBM plant, namely IAD, is the place where I was offered to work during the summer of 1982. IAD stands for Industry Application Development. The group came to Palo Alto seven years ago. It presently employs 27 persons and it has the purpose of developing systems for graphic and text applications for large office use. The operations carried out by the department are stand-alone operations, which means that everything concerning the specific product is handled within the department. That means not only developing the product, but also testing it and writing the publications necessary to promote it. This is not a typical structure for an IBM office.

Over the years systems like Printext, TREND and ATMS have been released by IAD. Printext is a formatter product which drives a photocomposer and which is specifically oriented to the page-makeup requirements of the newspaper industry. TREND is a graphics package which produces time-sequence data for the IBM 3279 colour terminal.

ATMS stands for Advanced Text Management System. This is a system for document handling and it was first released in 1974. When I arrived, the third version of ATMS — logically called ATMS III — had just been developed and all the testing of this system was about to begin. Testing was the area within which I was going to work so I had to learn how to go about this first and as ATMS has its own language, like all other systems in this world, I also had to learn how to communicate with it.

When you test a system you first study the system manual closely and for each statement in the manual you design a testprogram — called 'testcase' — which should verify that the statement speaks 'the truth, the whole truth and nothing but the truth'.

The system is then exposed to the thorough and unmerciful execution of the testcase. The result is equally unmercifully scrutinized by the test team in search of any possible bugs.



Since this is an IBM product of course very few bugs could be found, but whenever a bug was detected it was eliminated and the testcase was executed once more.

Almost all American companies have during the last decade experienced how 'Made in Japan' has turned from symbolizing junk to symbolizing inexpensive quality as good as, or even better than American products. This has maybe been most obvious to the car manufacturers. The American computer industry is still supposed to be a step or two ahead of the Japanese. But only a tremendous effort on behalf of the American computer companies to present the products that are

smallest, fastest and least expensive can make it stay that way. One way of doing this is to present products that have no defects when delivered to the customer. This makes bughunting a very important part of the development of any system.

It is my hope that I in the testing of ATMS III have contributed something to the work of releasing a good product on the market. I know that I have gained valuable experience this summer in learning how a complex system works and all the work that has to be put into a product before it can be released. I've also found out a bit about how one of the biggest companies in the world is structured and what it is like to work for a company like IBM. And last but not least I've gained a great deal of knowledge about the American society, its advantages and disadvantages, and of the people living in this society.

Fredrik Winterlind

8 to 5

Ulrica Wållgren
Memorex Corporation
Santa Clara California

When I got a telephone-call from the Study Tour Committee, I could not really belive that I one and half months later would start working at MEMOREX. But here I am, working 8 to 5 and enjoying it!

When Claes and I arrived at San Francisco airport. Mr Robles, the manager of Human Resources at MEMOREX, and his wife were waiting for us. They invited us to their home for the weekend.

On Monday the work started at the Rigid Media Division. I was working with 5 1/4'' discs, produced at that moment in small quantities on a pilot line.

Disc — production

For producing a disc you need to follow special steps;

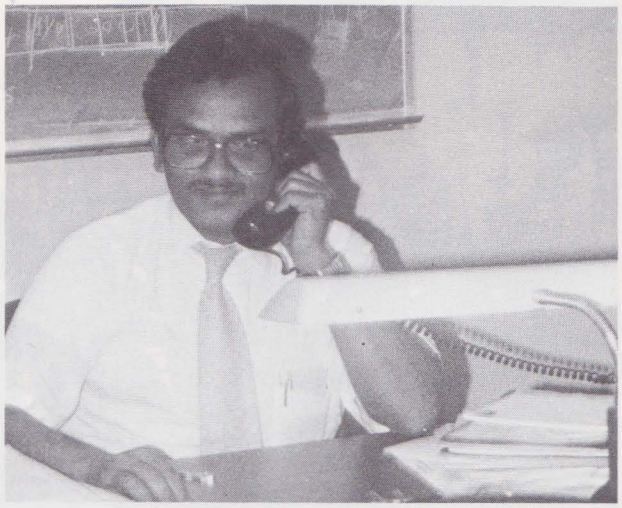
- Wash the aluminium-substrate
- Coating: Spray the iron-oxide on the substrate
- Polish the disc until you got the right thickness of the coating
- Dipcoating: Cover the disc with a special kind of grease, for getting a smooth surface
- Burnishing: A special head flying over the surface, controlling that we have not got any surface irregularities
- Testing with a testdrive (certifier) that the disc has a good magnetic quality.

Computer — help

To control changing of disc-quality, disc,tester or heads, you save all your data for analysing. I wrote a Pascal-program, which plots a yieldcurce. The program sums all the different magnetic errors on each side of the disc, compare total errors upper-side with total errors lower-side and choose the biggest sum. The yieldcurve will show the precentage of discs, which meet a given error criterion.

Standard — discs

The disc certifier has to be calibrated periodically to compensate for variations in heads and drifting of testing threshold. This will be done with a standard disc. The parameters for the standard-disc are stored in the certifier's memory. The testdrive is programmed to multiply the result with the right constant to get the expected figures. Calibration will be done each 20th disc. While I was there, we produced a ''goldstandard''. We were testing a large amount of different heads and discs for finding the meandisc, which we chose to our ''gold-standard''. Some of the other discs were to be used as ''silver-standard''.



My boss Viz.

Disc — packs

You have two kind of disc-packs, removable and non-removable. The removable system has the disadvantage that it has a greater aptness to ''crash'' or lose data. This is because access to the discs make them vulnerable to dirt. Non-removable discs could offer better performance, but a power failure would make their data unavailable.

Different kinds of discs

They have found cobalt a better magnetic material than ironoxide. You produce plated discs (thinfilms-discs) by accelerating a gas of ions and e g argon into a target consisting of cobalt. The bombarding ions« cause the ejection of cobalt atoms. The thin metal films

are intolerant of defects and are less durable than the ironoxide-discs. On the other hand the need for greater storage densities for data will make those discs more attractive. At MEMOREX they are working with the development of those discs, but they have not started to produce them yet.

They are also making some research on laser technologny. The data is written when a laser beam burns holes in the coating of a disc. A hole will correspond to a zero and the absence of a hole to a one. A low power laser is used to read the data on the discs. Memories of this kind are nonerasable, which limits the use for this type of data storage.

Floppy-discs are also quite popular. This is a thin sheet of Mylarplastic, on which the ironoxide is coated. MEMOREX produces 5 1/4'' and 8''. Usually the head is kept from touching the medium by airbearing effect, but on floppy-discs the head makes contact with the surface. This make floppy-discs sensitiv for dirt and that it is necessary to spin slowly.

Standing up for MEMOREX.

MEMOREX, a funny place.

New heads

In effort to improve the head performance, MEMO—REX has introduced the thinfilmshead. Instead of using a coil of wire as an inductive circuit, they use a thinfilm conductor deposited as a spiral.

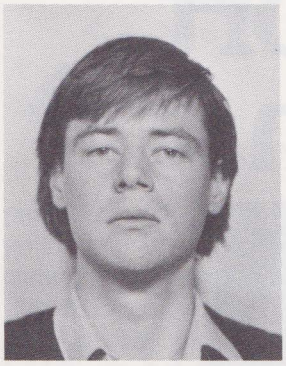
The two months, I was working at MEMOREX, passad by real quickly. Time flies, when you have fun and I really had a good time. I met a lot of nice people at MEMOREX, everyone trying to teach me as much as possible. Especially, I would like to mention my boss Viz and all the people at our department. I would also like to thank the Saars for letting me stay with their family like a daughter.

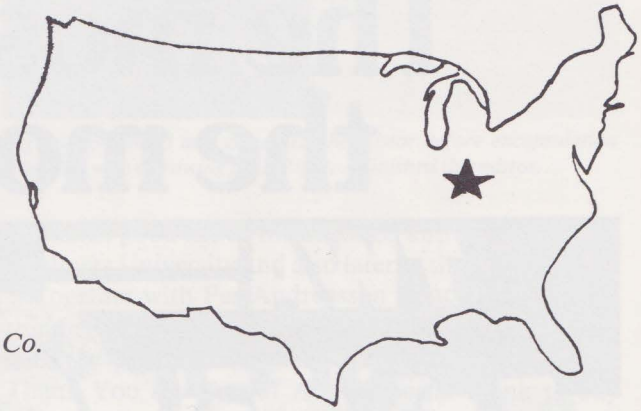
After one month of traveling around in the States, it was time to go back to Sweden. Not even memories like a boiling car in Death Valley, scorpions down in Grand Canyon or mosquitos in Everglades Florida, will make me change my mind...

This has been a perfect summer!

Ullrica Wållgren

A Summer in Yellow Springs





Ragnar Åkerlund
Yellow Springs Instrument Co.
Yellow Springs Ohio

Yellow Springs and the Company

Leaving the corn and bean fields behind you, driving into Yellow Springs, you will find a small town with about 5000 inhabitants. The hot and extremely humid climat in this area makes you feel like you are in a greenhouse. The friendly and outwardgoing population, a mix of people with different racial and cultural backgrounds, has a high median level of education (13.5 years). This together with the fact that the town posesses an old college, which has been a center for liberal art and sciences for more than 100 years, gives the town a unique atmosphere.

Yellow Springs has several industries and research laboratories. One is Yellow Springs Instrument Company. YSI was founded in 1948 and its most important product was, for the first couple of years, an interchangeable thermistor temperature probe. But YSI gradually expanded and began produce instruments used in measuring temperature, humidity, oxygen, conductivity and light. During the last ten years the company has been successful in developing medical and industrial analyzers, which by an electrochemical procedure measure small quantities of matter dissolved in liquids. Today YSI, with its 390 employees, is one of the leading manufactures of laboratory instruments used in the medical, biological and industrial research fields and markets its products in more than 50 countries.

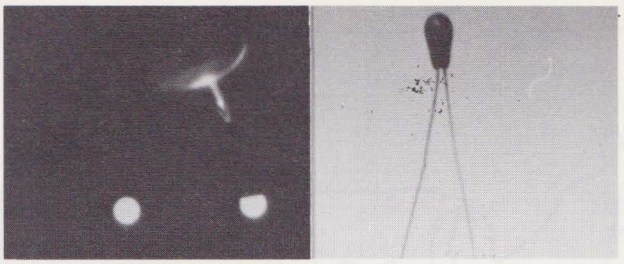
The Manufacturing of Thermistors

Now something about YSI's thermistors. They are manufactured from special powdered metal oxides which are compressed into small discs and then sintered. The mixture of metals, sintering temperature and atmosphere determine the thermistor slope and characteristics. By grinding the disc, its volyme is reduced which causes the resistance level to increase. By this *grinding process* all thermistors of a given type and value can be manufactured with nearly identical resistance levels. Then leads are attached and each thermistor is individually tested at several different temperatures. Finally the thermistor is encapsulated with a protecting coat of epoxy and color coded for resistance value identification. the result is a precision interchangeable temperature sensing device with a good accuracy in the -80 to +150°C range. Its great sensitivity allows the use of simple, rugged readout instrumentation, as well as the use of long leads without significant loss of accuracy.

My Tasks

I worked in a group, consisting of seven persons, doing research in and development of measuring instruments. Among other things the group has a small

Thermistor manufacturing cycle.



Left: Ungrounded and grounded thermistor before encapsulation (together with a drawing pin). Right: A finished thermistor.

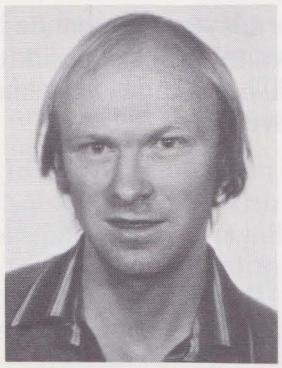
production of special thermistors and to this the manual grinding process belongs. This process requires a comparator, which tells the operator who is grinding the thermistor when desired resistance level has been reached. The instrument works by a dual current bridge, comparing the resistance of the grounded thermistor with a reference resistance. Differences in value are amplified and then displayed with a great accuracy.

My tasks were error search and development of this comparator. Consisting of both practical and theoretical moments, it was a very interesting work. I am sure I will make good use of the acquired knowledge back at Chalmers University and also later in the future.

Together with Per Andreasson I had a stupendous summer in Yellow Springs. We got very good contact with the people at YSI and enjoyed their kindness. Thank You all of you! And a special thank to Jay Abbey, who let us stay in his house. And introduced us to golf, theatre, musicpubs, relatives, baseball, drive-in movie theatre, the American way of life and much, much more.

Ragnar Åkerlund

Capacitances!



Jan Önnegren
C&M Corporation
Wauregan Connecticut

In August 1981, I had to decide if I was interested in going to the states or not. Of course I was interested and I can tell you it was a summer that I never will forget.

After some misunderstanding and problems with a hurricane I ended up in a town called Voluntown, which is situatied in the east of Conecticut. There I had the opportunity of working for a cable and wire company named C&M Corporation.

I will start by explaining how a datacable could be manufactured. When making a cable you need a conductor and some sort of insulation material. The conductor within a wire is mostly made of copper or copper-covered steel. Copper is the most used material because of it's high electrical and thermal conductivity, high melting point and high resistance to corrosion. Coppercovered steel is used for having the resistance of copper and the strength of steel. The most common insulating material is PVC. Other materials used at C&M are semirigid PVC, nylon, polypropylene and rulan. On these plastic material you have a lot of requirements such as physical, thermal and electrical. The electrical requirements are the dielectric constant, dissipation factor and stability. So you choose insulating materials according to your requirements!

Donald Gingras looking for damage on a datacable.

Now I will try to explain all the steps in the manufacturing of a datacable.

1. The first operation is always the extrusion, that is to say you put the plastic compound into an extruder, which melts it down and puts it on to the conductor with a specified wall thickness, concentricity and colour.
2. Then the wire goes to colour coding. there are several alternatives that you can choose between when identifying wires. Some of the most common ways are helical stripes, ringmarks, bandmarks, dots, printed numbers and words.
3. After colour coding, the wire goes to the twisting operation. There the wire is twisted together with another wire, with a specified numbers of turns per meter.
4. Now it is time for cabling. You put all your twisted together in a core. You often put an aluminium mylar tape around the core.
5. To reduce the electrical noise due to other sources you usually put a shield around the cable. How good the electrical shield is depends on the percentage of coverage that you apply to the shield.
6. Now the cable is almost finished. You only have to put a jacket on the cable and later on print the name and number on the cable.
7. Each is checked at the cable quality control station before it is sold. I was surprised by the fact that there are so many operations before you can sell a cable.

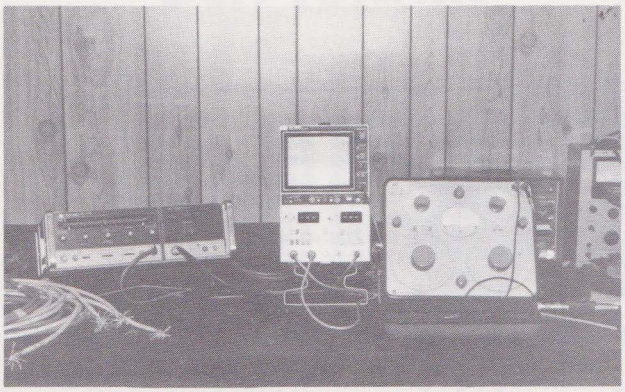
My summer project.

When I began working I got a summer project that I had to work with during my eight weeks at C&M Corporation. My project was to find out which sources that affected the capacitance fluctuation during all the manufacturing operations I have mentioned before, on one special datacable.

This cable is rather new and it concists of four

twisted pairs of wires in the core and a shield around the core. Outside this innershield you have the outer-layers that concist of eight twisted pairs of wires and an outershield. So I had 24 wires and 24 different capacitances within everycable.

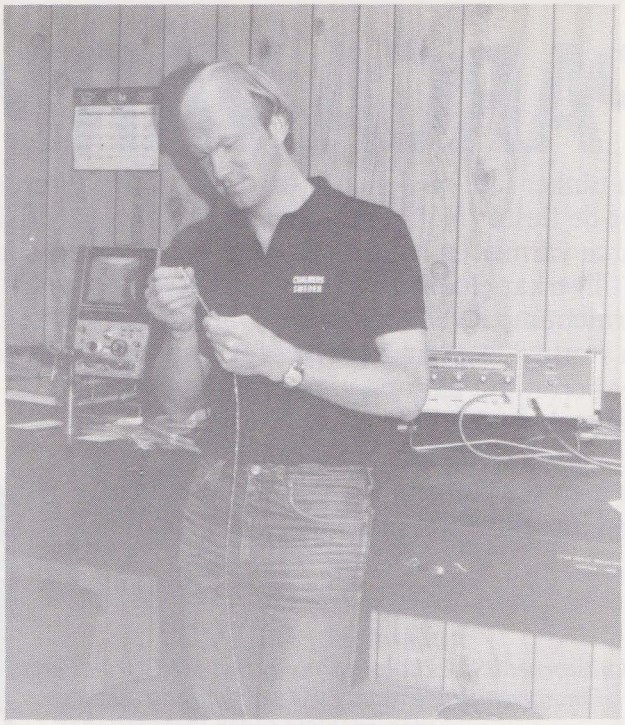
I begin by learning as much as possible about the cable and the capacitance application to wire and cable. I even tried to learn all the test procedures that we did on the cable, so that I later on could do all the tests by myself.



Some test equipment for cable and wire.

This special type of cable has been manufactured fore more than six months, during this time C&M has checked the capacitance in every reel, so I had more than 20 000 capacitance values! How would I get anything out of 20 000 values? What do you want to know? How would I analyse the variance, correlation and the average? As you can see there were a lot of things that I had to think about before I started calculating.

I made a program on C&Ms computer with very good plotting facilites, that gave us a chance to look at graphs instead of looking at values.



What could be wrong??

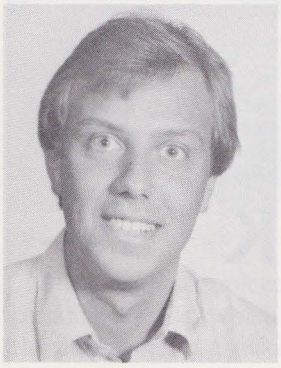
The variation in capacitance within a cable is mostly caused by too much tension or heat during the manufacturing operations. Other factors that affect the capacitance are the compound and the diameter of the conductor. To end this project I wrote a report.

I think this way of working with a projekt during a summer is very good.

Finally I want thank Warren and Elaine for everyting and I really mean everything!! I also want to thank everyone at C&M Corporation and Connecticut for making this summer so great.

Jan Önnegren

There are two kinds of people in the world,

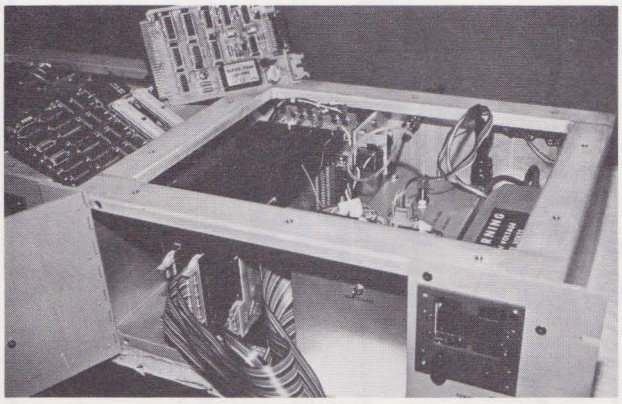


Fredrik Österström
Belfort Instrument Co.
Baltimore Maryland

those who go to the United States to do their trainee work and those who don't. I did, but the decision was taken only the day before we left since my left knee had just been operated on because of a broken cruciate ligament, and I still had my left leg in a cast. But thanks to Dr. Per Renström at Sahlgren Hospital who made arrangements for me in U.S.A, I got permissions to go, which I never will regret.

The trip over went smoothly. All the guys where talking about the jobs they had got, but none really knew so very much about what was waiting.

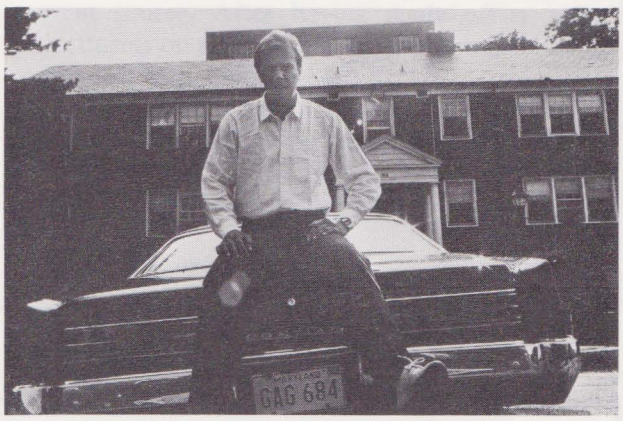
After a few days in the Big Apple, where we met all kinds of people, were almost run over a couple of times in our struggles to get a taxi after having seen the Statue of Liberty, I went in a small propeller plane together with my friend Per Wennman. After a bumpy flight we reached Baltimore which was our final destination.



DASI base unit.

We were met by Mr. J B Reilly, the president of the company, at the airport and driven to the 5-room apartment they had rented for our stay. I was really nice and situated on the Loyola College campus.

The first thing to do when you settle down in the big country is to get yourself some wheels. And so we did. It was a black, fully equipped, '71 Pontiac Catalina and the dream had come true. To given the 400 cu.in. engine full dampers was something that has to be heard. We spend all the money we earned on gas,



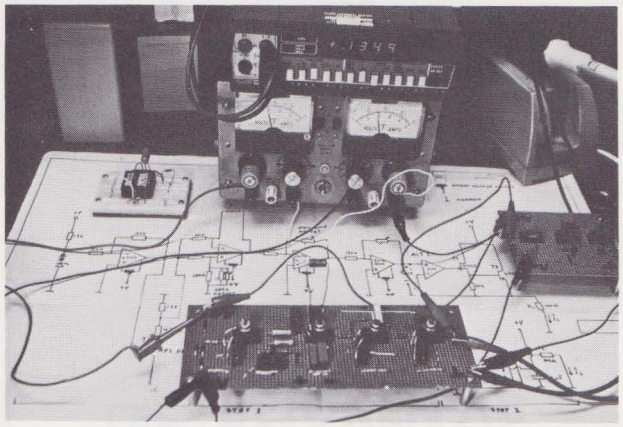
Author on "the Black Beauty".

almost. The airconditioner itself took a lot, but was good to have in hot and humid Baltimore.

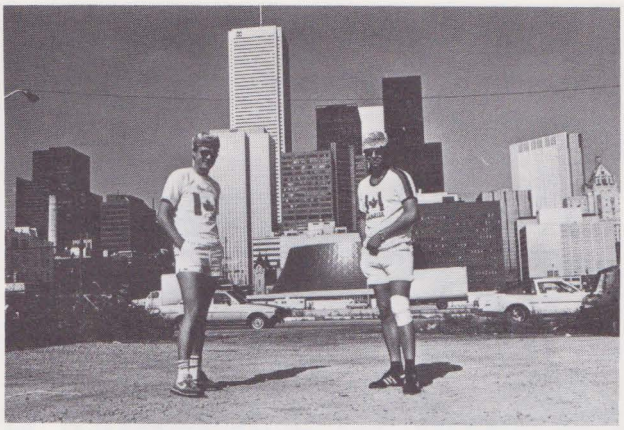
We did a lot of traveling on weekends since we had Fridays off. I will never forget the CN-tower in Toronto, the Niagara Falls, New port (Rhode Island) and the midsummer cruise with friends from Chalmers, Washington and the museums, Ocean City and the sunny beaches, John Mayall and the Bluesbreakers, The Baltimore crabs at the Rehills family with Droppar and much, much more.

Between the weekends and the driving we worked at Belfort Instruments Co, now a subsidary of Trans Technology. It's a very old company, having about 60 employes, and famous for it's manufacturing of meteorological instruments. All the people we met at Belfort were kind and nice to work with, especially the two engineers, Melvin and Norbert, and the technichans, Brian, John and Charlie, with whom we exchanged a lot of experience.

Our first assignment was to help the company in their work on a contract from the Federal Aviation Administration (FAA) concearning a Digital Altimeter Setting Instrument (DASI) system; 40 base units, 50 sensor units and 400 displays were about to be delivered. The system is used at airports to give the pilot information to set the flight altimeter, which will then indicate the correct height on the aircraft.



Dew-point meter circuit.



Canadians?

The DASI base unit contained a sensor with a sensitive ceramic capsule, which sent a electrical signal due to the atmospheric pressure, to a processor along with the station elevation information. The atmospheric pressure at sea level was calculated and displayed with an accuracy of 5 thousands of an inch mercury.

We did a lot of testing and calibration and also learned a lot about troubleshooting on the microprocessorbased displays, which sometimes didn't work properly. Faults were found and redesigns of the circuits were made.

Our final project was to design and construct a dew-point meter circuit where a variance in resistance from 83.99 to 123.95 ohms was to result in a variance on the output from 4.00 to 20.00 mA. At our disposal was the op-amp LM 11C which has superior qualities compared to, i.e, 741. This was essential due to the high stability requirements that we had to comply with.

We put the resistance variance in a bridge amplifier and after two invertersteps fed the voltage into a current source. After having made offset voltage adjustments on all op-amps and a few improvements, we made it work before we left.

Special thanks to the committee who worked extremely hard, to Mr. Reilly who made the dream come true, to Brian Rehill and his family for great hospitality and to all the Americans who gave us unforgettable memories.

I'll be back some day.

Fredrik!

Job Hunting

There we were, in San Jose, one early Sunday morning at the end of March. Everything had proceeded very fast. The Board of Chalmers E-82 Study Tour Committee had decided that we had the economic resources for sending two representatives from the committee to the United States to try to engage more American electronics and computer companies in our exchange program. The formal resolution was taken by the entire committee only five days before we left Sweden. The reason for this trip was obvious: we had more members in our group that we had training positions in the United States.

When it came to selecting an area for a two-week job hunting trip there was only one natural choice: Silicon Valley. It represents the very heart of the electronics industry in the world, with several hundred companies in a small geographical area in and around San José, California. To assist us in our endeavor, we had an AVIS-car, some maps and an alphabetical directory of electronics manufacturers.

We started out by just driving around looking at this actually beautiful industrial area. All the buildings have their own smart design and they are all surrounded by beautifully landscaped areas. On Monday morning we began our work by calling up a lot of companies on the phone. We did get some positive responses but primarily we practiced out argumentation. That afternoon we made our first company visits and then had an opportunity to present our exchange program more thoroughly to people with responsibility for such matters. The second day was pretty much like the first, trying to arrange meetings by telephone in the morning and then around delivering travel reports and other written material in the afternoon. In most cases we presented this material to someone. But that day we made a great discovery that totally changed our tactics. After visiting one company we said: — Why don't we just walk across the street to that company, knock on the door and tell them that we are from Sweden and that we would like to present a trainee exhange program to someone at their company?

Said and done; and tired of always hearing 'no' on the phone we thought that at least we could take a look at the girl at the front desk before getting a 'no' answer. We explained our errand and the girl looked at her phone list, made some calls and told us that we were about to meet Mr. NN from Personnel. About one hour later we left after discussions with three different

P-F Hallingberg the treasurer, is here trying to rescue the car during one of many rainy days in California.

people in top positions. This became the pattern we followed during our visit. It was much more effective compared with making unnecessary phone calls.

Our original plan included a one-day trip to San Diego since we had prepared some companies there by sending them letters with some information in advance. When we passed through Los Angeles during the weekend on our way to San Diego we realised that you don't spend a few days there looking for suitable companies. It would have taken weeks to cover only a small part of that huge city landscape. So we decided to spend only one day in San Diego, where we concentrated our efforts in Sorrento Valley, a little north from San Diego.

Per Cedhagen, the Trainee Appointment Manager, in discussion with a possible employer.

After that we returned to Silicon Valley, an area well known to us by then, which still had lots of companies for us to visit. When the last week had nearly passed, it was time to sum up our work. We had been in contact with about 80 companies either by telephone or by personal visits. We had also talked to ten former Chalmers students working in the area, asking them if they could be of any assistance. About 99% of the people we met were very friendly and positive and

The last desperate attempt to perswade an american company to take part in the exchange program.

really did their best for our cause. But we had one big problem to face and that was the economic situation in the United States during this period. Many companies had watch their spendings, and we were mostly talking to people with narrow economic margins. Therefore, I must say that the trip was not the success that everybody had hoped it would be, but the final result was that at least a few more members got training positions in the United States. I also hope that this year's committee, the Chalmers E-83 Study Tour Committee, will reap some benefits from our attempt to place a few more Chalmers trainees in the United States during the summers.

Per E. Cedhagen
Trainee Appointment Manager
Chalmers E-82 Study Tour Committee

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