KINEX CORPORATION: 1977-1984

I set up shop in our bedroom and went to work. Between doing some consulting tasks for AMI I proceeded to design a processor for a V27 modem that I intended to develop on my own. I also did some consulting for a few other companies, such as Milgo, Telenet, Penril and DCA. These did not turn into more than one-day affairs, either because I didn't know how to market my service appropriately, or because I told them all I knew in one day. The income was just enough to keep us going while I was working on my own design. As I got the design more or less complete I ordered parts and drew up wire lists for the bread board which Anne-Berit proceeded to wire up, sitting at our dining room table. At the same time I wrote up a development proposal with a fairly detailed technical description , time schedule and cost estimates.

In starting a business I was aware of my inadequacies as a business man and tried to hook up with somebody who could handle that side of the venture. My first putative partner was a guy named Jack Gulati, who had been a salesman for Paradyne. At the time, he had left Paradyne and was trying to build a business around a remote car starter that an acquaintance of his had developed. He was still interested in getting together with me also, but when I told him that Anne-Berit would be a key person in the business he dropped out. Obviously, in his culture it was not OK have your wife in this kind of role. The next partner I got together with was Bob Tyburski, who was introduced to me by Karen Syence. We worked together for a while, including making a presentation for a V27 development project to Chuck Johnson at General Data Comm. I thought we made a fairly good pitch, but Chuck didn't bite. He ended up hiring Dale Walsh, who was my development competitor at Paradyne, and did the thing in-house. Bob lived in Fairfax, Va and when we went to General Data Comm, which is in Danbury, CT, we drove there in Bob's car. When we got back to his house that evening he said to his wife "If somebody asks me what I did today, I'd have to tell them that I drove Karl to General Data Comm". Later, we came to an amicable parting of the ways when I decided that I could do better on my own after lining up the Nokia deal. There is no way of knowing if Tyburski would have been a good business man and leader, but it is virtually certain that he would have been better than me, and he would have allowed me to do a better job of engineering and product development. Probably my first big management mistake as founder of Kinex.

Part of my sales pitch for Kinex was a personal profile on me published in Data Communications magazine in connection with my transition from Paradyne to Kinex. This was the work of the editor, Harry Karp, who had come to view me as a technical-marketing guru in the data communications industry.

Another contact I made in looking for partners/investors was Hugo Riso from Oslo, Norway. I had been in touch with him when I was at Paradyne and discussed representation in Norway. This, however, came to naught when Joe Looney made a deal with Case in the UK and gave them exclusive rights to all of Europe. So when I was out on my own I contacted Hugo and told him what I was up to. He was interested and invested $5000 in the company and said he would be contacting European company on our behalf as soon as I had something for him to show them. At this point we also went ahead and

formed the company legally and called it Kinex Corporation, using a naming algorithm that I stole from Alexander M. Poniatoff, the founder of Ampex Corporation.

When I got my development proposal finished I sent a copy to Hugo, who took it to Nokia and was able to present it to Folke Ahlback, who was manager of the modem business unit of Nokia Electronics. Folke was interested in my proposal and I was invited to come to Helsinki to make a presentation in person. I went there in November of 1976 together with Hugo and made our presentation. After our visit to Nokia, Hugo and I went to the UK and made the same pitch to Plessey and one other electronics company.

The result of our presentations was that we got a yes from Nokia and no from the other two. At this point I started to get second thoughts about Tyburski, to whom I had given a good chunk of the company in return for his services, since I and Anne-Berit were doing all the work, and so far had taken all the risks, and now had even been able to line up a customer without his help. I told him about my misgivings and he gracefully bowed out, with the proviso, however, that he owned a piece of the company.

The contract with Nokia was for about $70 K for which I was supposed to develop all of the digital part of the modem and Nokia would do the analog filtering, the power supply and the box. They were smart enough to realize (even if I wasn't) that I had neither the skills nor the resources to handle these items so they took them. The 70 K was a reduction from the original price of $76 K which included Hugo's markup. Folke told me later that Hugo probably viewed this as me negotiating away his commission, although that was not my intent. Another example of my naiveté in business. The Nokia part of the project was started in Risto Sarkilahti's group, with Lauri Luomi and Gunnar Holm assigned to it. The analog filter design was done by Mikko Laiho who was an expert at designing LC filters.

With the contract from Nokia I was able to move out of the bedroom and set up shop with an official company address. This was a one-room office above Bill Hall Appliances on Starkey Road, about a mile from our house. The facilities included two banquet folding tables, one used as a desk and the other as a work table, plus a couple of chairs. A single line telephone provided the only communications link to the outside world. For "email" I had made an arrangement with a one-man import export business called Trident Corporation which had a teletype machine for communicating with his suppliers in Greece. For a nominal fee he let me send and receive telexes to/from Nokia and others, and alerted me to incoming mail by phone. His office was located downtown Clearwater, so each sending or receiving of a message involved about a 45-minute automobile trip. Spam was not a problem.

The lab equipment consisted of a BK Precision analog scope, a Motorola 6800 based "development system" with audio cassette tape for I/O, a Paratronics Logic Analyzer, two BK Precision wave form generators, a bench power supply and a 3002 line simulator. I put quotes around development system because the term greatly overstates the reality of the actual device. It basically consisted of the 6800 micro-processor with RAM memory for program and data storage, a primitive keyboard, plus a couple of I/O ports. One was

connected to a ribbon cable terminated in three PROM socket headers which were plugged into the PROM sockets on the modem bread board. The second one was connected to the cassette tape recorder. The development software consisted of a program to read and write the cassette tape and to format the data appropriately for output to the PROM sockets. I hired an assembly language programmer from AC Nielsen to write this program, which he did in a few evenings of work for a few hundred dollars. I also hired Tom Saliga to help with some filter designs, again for a fairly modest amount of money.

Work on the modem proceeded fairly expeditiously, considering the limited manpower and equipment resources applied to the task. I had sent schematics to Nokia so that they could build more robust development systems, and as they were completed I shipped software “releases” so they could get started working with the modem also. To help speed up progress and to get Nokia engineers acquainted with the software they sent Gunnar Holm to Florida to work with me. Gunnar was a brand new employee at Nokia, who hadn’t finished the thesis work he required to graduate, so this project became the basis for his thesis. He was also brand new in many other respects, including foreign travel, driving an automobile, etc. We rented a condo for him at Bardmor, which was located about a mile from the office, and bought him a bicycle. Quite often we invited him home for dinner since Anne Berit had kind of a motherly concern for this seemingly inexperienced innocent out in the big world by himself for the first time. Gunnar has ever since shown me a great deal of respect and appreciation, calling me his technical father, and I attribute this mostly to the generous way that Anne Berit helped him with his logistical issues and generally looked after his wellbeing while he was in Florida.

With the Nokia contract in hand my thoughts naturally turned to expansion of the business. One avenue of expansion was to get more customers for the V27 modem design, and in pursuit of this I made contact with SAT in France (actually it was Hugo Riso who got that ball rolling also). The possibility of a license agreement with SAT tended to undercut the value of Nokia’s investment so they were not completely happy with this. First of all, since they were doing a significant part of the development they felt that if deal should be struck it should be with Kinex and Nokia jointly, and secondly since we were still in the middle of the development project it was premature to discuss licensing deals with third parties. Nevertheless, we did have some preliminary talks, including a couple meetings at SAT in Paris which I attended together with Folke. There was also a meeting in Florida with the SAT project manager once when Folke was visiting. After our formal meeting the SAT PM took me aside to ask some questions about some electronic gadget he was interested in purchasing. As soon as we were out of earshot of Folke he made me the proposition that I basically screw Nokia and make a deal with SAT. I refused the offer and after this the negotiations with SAT came to a stand still and then fell through.

During this period, although I spent a fair amount of time on sales/marketing and business activities I was still the primary developer of the DSP hardware and software. In that role I needed to visit Helsinki from time to time to work out particular problems or exert extra-effort pushes to meet some schedule milestones. During two of these visits, which lasted a few weeks, I was put up in the apartments of two Nokia secretaries who happened to be away for those periods and were happy to make a few extra Finn-marks in rent. I

remember how small and modest these quarters were, but also how neat and well-kept. I felt like an oversized lumbering hulk in them that should only walk on tiptoe for fear of disturbing their feminine neatness and niceness. The idea with these arrangements was of course to save money so I also did some limited cooking to avoid spending money on restaurant meals. However, Folke was nice enough to take me out to dinner from time to time and some of the other guys, such as Egon Cronhjort, Jussi Jaamies and Gunnar, also had me home for dinner. The apartments were located downtown Helsinki while the Nokia facility was located about 20 km outside of Helsinki in Kilo. I commuted by train to and from work, which involved a 10-minute walk at each end. One of the visits took place in the Fall and I remember how late at night, after 10-12 hours of intense troubleshooting and debugging, the cold November rain running down my back woke me up from the debugging day dreams.

During each one of these visits to Nokia I also took the opportunity to visit my mother in Baggholma and later in Brando. Once she told me that one of her friends had remarked that Ingmar must miss his home terribly since he comes here so often. People were not used to America emigrants returning for visits several times per year. Although I always felt the obligation to visit her on these trips, the feeling did not generally extend to the level of actually inspiring me to put forth much effort into making the visits enjoyable and memorable. My attitude was a little bit that just having me visit for a few days should be enough for her, and for me it was enough that people saw what a good son I was that came to visit his old mother every chance he got. Once, however I went on a day-long excursion with her and her nursing-home friends, where we rode on buses and ferries and visited a number of churches. Another time, I do remember, I sat on the bed with her and we sang old songs like ‘Plocka vill jag skogsviol’ och ‘Uti var hage’. I think she liked that even in spite of my singing. I received a D in song in grade school and my mother thought that the teacher had been overly generous.

My visits to Brando and Baggholma sometimes took place wintertime which gave me the opportunity to re-experience the various unconventional methods of transportation that I was used to from my childhood, such as riding in the fore-salon of an icebreaker

In starting Kinex I had a couple of different motivations. I thought I knew enough to develop modems mostly on my own with very little help and thus gain the maximum share of the returns from the effort. Also, I wanted to have a situation or organization where engineers were more highly valued than in normal companies, where sales and management contributions are most generously rewarded. And I had a vision of me leading a group of smart, motivated engineers who would follow my technical lead and help me implement the ideas I would come up with, in collaboration with the team, of course. The first mistake I made in basing my future on these fantasies was that I overestimated my skills and capabilities and consequently failed to take action to improve them through classes and other forms of training. The second mistake, which was a consequence of the first, was that I grossly underestimated the resources and times required to do actual product development.

The reason for the overconfidence in my technical abilities was that I had been successful in grasping new and fairly complex technical issues reasonably quickly and been able to apply my understanding to productive effect. There was the Turing machine homework at Penn which at first glance seemed impenetrable, but which became clear to me in a kind of aha-experience when I sat down and concentrated on the details of the problem and the associated definitions. The result was that I was able to produce a Turing Machine design that impressed the professor. There was also the time that I had to design a complete CPU for the General Dynamics Buoy proposal and by good concentration and reflecting on some information I had seen from another system I was able to figure out how state machines could be used to describe the logic needed for program sequencers, instruction decoders, and the like. I had also experienced the satisfaction of being able to read a fairly dense specification for a complex communications system and pick up the key novel feature in it when a more senior engineer at Beckman failed to do so. Then, of course, there was my tour de force, developing the MP48 modem at Paradyne, where, as a virtual engineering novice who had spent most of his career in marketing activities, I beat a team of experienced engineers by conceiving a more efficient and elegant design and implementing it in less time. These experiences led me to believe that I could solve any technical problem that might arise if I just concentrated on them enough. What they didn't teach me however was how much I had been depending on other peoples work as well in doing the MP 48. To me the key things were designing the processor and writing and debugging the program, and I overlooked all the grubby details that others had painstakingly handled, and without which no product can be developed. So, overestimating my own contribution and underestimating that of others, led me to think that I could easily do the whole thing on my own. It is a great attitude for your self esteem, but as a basis for a business plan it stinks.

It didn't take too long into the life of Kinex Corporation before the "rigid rod of reality" started to deflate my fantasies. It wasn't a catastrophic collapse, just an embarrassing schedule slippage and need to go back and ask for more money. The most amazing thing, however, was how steadfastly I resisted learning anything from this experience. To this day I am forced to admit that fantasy project scheduling is a habit I have never gotten over. Why is this? Why can I never use my experience to tell me that things take time, and ignoring this fact because you wish it otherwise is the action of a fool, or worse. One clue is the difficulty in standing up to your bosses and defending a long schedule when you can't completely exclude the possibility that you could get lucky, and everything could happen without problems and snags. This is the case even when your bosses are only your own hopes and wishes. Maybe the second law of thermodynamics could be used to convince yourself that the probability of getting lucky in the real world is so close to zero as to be equal to it.

The other remarkable thing about my reaction to the early problems of Kinex was my failure to take remedial action. Although it was becoming clear to me that I had neither sufficient engineering skills nor the management skills I needed for the situation I had placed myself in, I did not attempt to take a single class or read any books to try to improve my skill set. The main reason for this is more understandable: it was simple fear and panic. I was so terrified of my immediate problems that I did not dare to take a even

week out to get some additional training, either in engineering or management, instead I fantasized that by trying harder I could come up with some solution. The fantasies always were based on me discovering some shortcut that would obviate the need for me to learn things the hard way like other people, as well as turn out to be better, more efficient, and less expensive. The clinging to this fantasy kept me from doing even an adequate job as either engineer or manager.

In accordance with the plan to generate revenue by doing development contracts I started to plan a 9600 bps modem project and pitched it to Nokia and Burroughs Corporation, whose FAX group under Bob Krallinger thought they needed a FAX modem. Both Nokia and Burroughs agreed to support the project, although Folke had some reservations about the complexities inherent in this kind of 3-way project and their potential for contractual disputes. In addition I made an agreement with John Familetti of Timeplex to develop a 208B version of the 4800 bps modem for them. With these activities in place Kinex was in need of more resources and had the wherewithal to pay for them. We hired John Sutton and Norm White to work on the 9600 bps project and Keith Brown to work on the 208B project. None of these gentlemen had any training or experience in modem design but they were the only people I could find. I told myself that it wasn't that hard, I could teach them the basics and they could learn the rest as they went along. To accommodate the new staff we needed more space so we rented a 2500 sq ft facility on Cross Bayou Drive. With more financial activity and with payroll responsibility we now needed a full-time person in accounting so Anne-Berit started working full-time as well.

The technical approach for the 9600 modem was based on using the SPP2811 DSP chip I had helped architect for American Micro Systems, supported by two Motorola 6800 processors to handle the control and bit shuffling, one for the transmitter and one for the receiver. Since the 2811 was not ready, and was not planned to be ready until the end of our project, I decided to do the development on a platform that used an SPP Emulator (SPPE) instead of the SPP itself. The SPPE was made up of a TRW multiplier chip, some RAM and ROM and some basic program control logic. I was taking a risk on the SPP, being as it was not yet available and I had no definite commitment from AMI as to its schedule, availability, and price. But I was good friends with Bill Nicholson, the AMI marketing VP and I felt confident that he would give me a good deal. However, AMI had made a big bet on a new technology called VMOS, which involved putting the transistors in V-grooves etched in the silicon, thereby increasing the density as well as the speed. This technology had been sold to AMI by a brash new PhD from Stanford by the name of T.J. Rogers, later famous as the founder and CEO of Cypress Semiconductor. Unfortunately, TJ had sold AMI a bill of goods: he could never get the VMOS technology to be economically producible, even after AMI had sunk tens of million dollars in the effort. So we wound up using the SPPE-based platform as the production version of the 9600 modem, which cost considerably more than if we had stuck with a design based on the bit-slice architecture of the 4800 modem. Also, the fact that three processors needed to have access to the same memory required some kind of priority contention logic to resolve access conflicts. The circuit that John Sutton came up with for this purpose was such a mish-mash of logic gates and flip-flops that I could never figure out how it was supposed to work, but I am quite sure that much simpler and more reliable circuit would have

resulted if I had had the management skill to sit down with John and coach him through a more straight forward design process. Instead I just sat there and worried about it and never even asked him to describe to me how it was supposed to work.

Around this time I also started the process of obtaining investors in the company. I had stayed in touch with Harvey Ross, whom I had been introduced to by Burt Smith of Western Union. I had met Burt while still at Paradyne. Harvey worked with a partner, a stock broker friend of his from Los Angeles. He offered to help me write a business plan and the broker with his connections in the investor community would shop it around and try to find some interested party. Harvey also put me in touch with Bill Marshall, an attorney in the Miami office of Baskin and Sears (John Sears was at that time Ronald Reagan's campaign manager). All this legal and financial fire power and connections so turned my head that I chose to ignore the quiet voice inside that reminded me that I had written the key portions of several business plans myself at Paradyne. When I told Folke that I was seeking outside investors and had prepared the business plan for the purpose he said that Nokia would also be interested in taking a look at it. Without much hemming and hawing Nokia and Folke decided that they would invest in Kinex. One of the conditions, however, was that they did not want any other investors in the picture, and we did have Hugo Riso and Bob Tyburski on the books as stock holders. So any deal with Nokia had to include buying them out. Also, Nokia did not like the deal with Timeplex, which in their view gave them way too many rights in our basic 4800 bps design. Folke had put some pressure on me to not release any information to Timeplex unless they came up with some significant amount of additional money. Timeplex for their part did not want to release any more funds until they could see a demonstration of a working 208B prototype. When Familetti came to my office to pick up the PCB films and some other drawings I found it impossible to state outright my position as instructed by Folke. Instead, without further explanation I held back some of the key drawings and told him he could not have them now. It was one of the most painful and embarrassing meetings in my business life and to Familetti it must have seemed like a strange way to do business. Shortly thereafter we received a letter from the Timeplex attorney informing me that they were canceling the contract due to non-performance and demanding their $50K down payment back. I presented this development as good news to Folke: we can get out of the Timeplex deal by just giving them their money back, and he agreed. What he should have concluded was that our ability to execute on development projects was somewhat suspect.

However, Nokia agreed to everything, buying out existing investors, paying off Timeplex, and compensating Harvey Ross and his partner. I was also able to get them to agree to my modification of their earn-out formula by inserting a $350K floor on the buyout price, come what may. This was basically the start of our path to financial independence. To complete the Nokia investment deal I went to Helsinki and met with Kari Kairamo who signed the deal for Nokia. Kairamo was then one of the top people in Finland with a high visibility position in the business world and significant political power as well.

After securing financing, the next step was to hire key staff and move into new quarters.

We leased a 6000 sq foot building on Bryan Dairy Road in Largo which was ample for a fairly large development and production facility. After just one interview for each position we hired John Hodge as V.P. of Operations and Ted Tsevdos as V.P. of Marketing. This abbreviated recruiting process was another disturbing sign of my inadequacies as a manager and leader. Hodge was a personally unappealing individual who, although smart and knowledgeable, was almost as bad at interpersonal communications as I but in the opposite direction. Ted Tsevdos was basically a has-been salesman and bullshitter who had managed to rise to significant positions in big companies (he had been in charge of setting up and running some factories in Taiwan for RCA, a fact which impressed me tremendously). Early on he exposed his shaky grasp of key business issues when he tried to explain the 'learning curve' concept to me, still I found it impossible to act on the conclusion that I drew from his confused explanation, and his poor judgment in trying to impress me with it. Or maybe his judgment wasn't so poor, for all the reaction I gave him he was left with the impression that he had correctly explained a concept that was new to me. The doubt about his capabilities that this conversation left me with I failed to share with Folke until I had to fire Ted, in response to pressure from Folke and lack of success in the market place. Of course, the real problem was our business plan and our inability to bring out competitive products on time. It is doubtful that even the most creative, energetic, and enterprising sales manager could have overcome those hurdles let alone someone with the liabilities of Ted Tsevdos.

After firing Tsevdos I hired Bill Huston, this time after two interviews, but without any really well grounded confidence that I was hiring the right man. Huston proceeded to hire himself a sizeable team, including an advertising and PR guy, named Tom Fouse, a technical marketing guy to handle our promotion and marketing materials, named Randy Huston (his brother), a secretary, and three salesmen, one of whom was a lay preacher who did sermons on the side. I was quite impressed with his verbal skills and felt that he should be able to talk his way into some good modem deals for us. Folke, however, was somewhat horrified at the exotic characters he found his business being represented by in the US. In the end it turned out that bringing in modem deals were not his strong suit, but he did do the wedding ceremony (which was held in our conference room) for one of our assemblers and she was very happy with the way that went off. So at least he demonstrated a certain competence in his ministerial capacity. Fouse came to us from E-Systems, a medium size defense electronics company, where he had been a post-sales customer liaison guy. A lot of E-systems' customers were Central and South American military types and Tom had traveled extensively in those countries entertaining various military and government officials, and gotten used to some lavish entertainment budgets. He was a natty dresser with a perfectly coiffed head of prematurely white hair setting off his nice tan. He must have been pleased with the overall effect because he kept a large photograph of his well groomed self on the office wall.

Randy Huston was a smart young guy who should have been able to make things happen for us marketing-wise but for whatever reason, I don't recall anything in particular that he accomplished. Certainly, one problem is that we were a new company trying to sell a me-too product in an established and maturing, and close to declining market. The other problem was that we did not have high-functioning development department, which of

course was my fault more than anyone else's. Randy did pick up on the excitement that was brewing in the personal computer world and knew about the great success Hayes had with PC modems. He did not try to push for us to go in that direction and personally I was not interested because I saw PC modems, which at the time were only 300 or maybe 1200 bps, as such a low-tech product that it did not match our capabilities. The real reason is probably I didn't have the nerve to make such a dramatic change in our whole strategy, plus I could use the excuse that it didn't fit with Nokia's product development requirements. One thing I did, which also did not fit that well with Nokia's priorities was to do a development contract with Intertel for 9600 fast-poll modem. Both Kinex and Nokia needed a 9600 fast-poll and so did Intertel, and we had a suitable DSP engine, i.e. the SPPE based platform, so we agreed to let them have non-exclusive rights to the product once we had finished developing it. The president of Intertel was a guy named Jerry Holsinger who was one of the founders of Codex and one of the big names in the industry. Having him come to us for modem development help was such turn-on for me that I forgot about all the reasons why this was dumb deal to do. This deal went the same way as Timeplex, when we couldn't get the product finished on time they pulled out of the deal but we got to keep the money they had already paid to be able to use the IP already received.

Around this time, Folke's bosses were getting tired of losing so much money on his US business and they assigned a guy named Timo Koski to come and help him. Timo was one of Kairamo's star employees whom he had hired from Siemens with the objective of helping him develop more effective technology strategies. Folke was not appreciative of the help but he probably had no choice in the matter. They both came out for an in-depth review where Bill Huston and his team put on their best show about the marketing effort and the value to Nokia of the US operation. Timo was not impressed, and shortly after the review came the decision that we should get a new president and the man Timo picked for the job was Werner Gruber, a man he knew from Siemens, who was running some LED subsidiary in the Valley.

Nokia-Kinex 1984-1990

In connection with this change in my situation I decided to exercise my option to sell my remaining share of kinex to Nokia at the agreed on price of $350,000. Also the name of the company was chsnged to Nokia-Kinex Corporation.

When Werner became president I became VP of engineering. With me directly in charge of day to day engineering we still had continual problems meeting schedules and getting products to work properly. Part of the problem was that some of our engineers were not skilled enough for the tasks they had, but the bigger problem was that they were not managed well. Both of those problems were of course due to my failures, I had selected them and I was managing them. It did not take Gruber too long to conclude that it wasn't working and he put Steve Isaac in charge of the two ongoing projects that were in trouble while I was given advanced development, which at that time meant the V32 modem, a radically new modem type using echo-canceling to set up a full-duplex channel on ordinary two-wire dial-up circuits.

This was two demotions in relatively short order, from president to VPE, and then from VPE to VP advanced development. It should now be obvious to all concerned that as a businessman and a manager I was a bust. Strangely though, the key people, primarily Folke, did not get tired of me and just fire my ass out of the company. He certainly had good reason to. One big reason they kept me around was undoubtedly Anne Berit. With her dedication to the job, her organizational capability, and her habit of producing accurate reports on time she gave the whole enterprise an air of competence that I think allowed people to think that there was a real business there which could do something.

The question for Karl was, what is he good at? He was smart in terms of figuring out technical puzzles, but not smart in learning from experience, which caused him to continually, repeatedly underestimate the time and resources required to do the job and therefore always finish late. Another factor was his laxness in project planning; if he had given that phase sufficient energy and attention he would have known better the size of the job and not been so subject to optimistic scheduling. Management and market pressure is always driving these developments and a project manager who hasn't done his homework is poorly placed to resist such pressure with factual information about the tasks to be performed and the time and resources required. Plus, it requires courage or self confidence or balls or whatever you want to call it to stand up to management and say unpopular things, and the reality of product development resources and schedules are usually unpopular. This may have been Karl's weakest area, he just couldn't make himself tell people what they didn't want hear. If he had only understood how big a problem this was for him and stayed out of anything that had to do with managing people or otherwise interacting with them in non-casual purposeful ways, he could have been a very happy and fulfilled technical guru, problem solver, individual developer, consultant or some such. The reason he went the other way was a lack of confidence in his ability to stay competitive and well-paid as a purely technical expert. It never occurred to him that he could take some courses to polish up his skills where needed, or it occurred to him but he didn't dare take the timeout to do that, he was so busy doing incompetently what he might have learned to do well after some good courses.

After Werner Gruber had tried and failed to turn Kinex profitable the talk turned to question of how to get out of it. After some discussions back and forth John Hodge made an agreement with Nokia to take over the business except for the engineering department and run it as strictly a manufacturing company as long as he could without a product development capability. The B&H Communications Company operated for a couple of years, until the "cow ran out of milk".

The engineering department stayed with Nokia and became the Florida development facility for Nokia Data Communications. It was moved to a new facility in Largo; Anne Berit and her team had the responsibility for handling the search and negotiation for this facility, which she handled in a competent manner that brought her to the attention of different parts of Nokia management. Seeing that the mobile phone business was in a better growth position than the modem business she transferred into that group as the controller and HR manager. As that side of the business grew she was given more and more

responsibilities as the management of Nokia Mobile Phones came to rely on her judgment as well as her work ethic and dedication.

The data communications group was divided into two parts, a modem development group and a multiplexer development group. I was in charge of modem development and Steve Isaac was in charge of multiplexer development. Steve's mission was strictly to be a development lab for Nokia, while my group was still to try to generate modem sales in the US, however, under the Nokia name rather than the Kinex or Nokia-Kinex name. To help us implement that strategy, Risto Sarkilahti was transferred to Florida as the president of Nokia Data-USA, and a man named Kari Lahtinen came over as the VP of Marketing. This was against my strenuous objections that an American should be hired instead, because a Finn would have such a long and steep learning curve to climb. Folke was dubious about our ability to select and attract a suitable American, probably keeping in mind hires we had made in the past, such as Ted Tsevdos, John Hodge, Bill Huston, and Joe Bowden.

One of my assignments was to line up living quarters for Risto and his family. Being a little less than frugal we found him a place on the beach in an area of Clearwater known as Carlrue next door to Jack Eckerd, the drug store magnate. It was a great place for them to enjoy their Florida sojourn and to show their appreciation they held some company parties there that were much appreciated and well attended.

As seems reasonably easy to understand in retrospect, the effort to sell Nokia modems in America did not bear fruit, immediate or otherwise. Kari hired a salesman (American) and started to take some trips around the country to call on customers and I generated ads and marketing materials. We also brought Folke over to make calls on key prospects, primarily telephone companies such as Bell South, Nynex, Alltel, GTE, and Quest. The idea was that Nokia was en experienced supplier of modems to various international telcos and we would use that expertise as our main selling point in the US. In spite of substantial effort and expenditures in advertising, promotion and selling, and in spite of a very competitive product, we were not able to close any deals. There just wasn't any reason for customers to go through the process of qualifying a new vendor at this stage of the market. Prices were declining, several well-established competent vendors were serving it, and people were starting to see the end of the modem era looming in the not very distant future. So, after almost two years of fruitless effort Nokia decided to throw in the towel.

Concurrent with the marketing effort two product development programs were started at Nokia-Largo, a low-cost V32 modem intended for the emerging PC market and an Ethernet multiplexer/router. We came close with V32 modem, almost signing a deal with Gandalf in Canada, but in some detailed project presentations at Gandalf it became obvious to them and us that we did not meet their requirements for an OEM supplier. I had run the project as a hardware plus firmware development using pretty much home-grown tools and seat of the pants quality control and testing. Gandalf was looking for professional software engineering practices and results and this we could not offer. It was another example where I had failed to adopt a new way to do things because I was afraid of it.

Alongside the V32 development we took on a couple joint projects with Silicon Valley partners to develop modem chip sets. One was with AMD to develop a V24 chipset and the other one was with VLSI Technology to develop a FAX chipset for Ricoh. In the AMD project Nokia provided the modem expertise in the persons of Gunnar Holm and Kaj Bjorkvall and AMD stood for the digital silicon and a small Finnish company named Fincitek for the analog silicon. It is unclear to me if a working chipset ever was produced but a marketable product did not result from the project. In the VLSI technology project Nokia again provided the modem technology and VLSI developed the digital chip. Ray Chen and Steve Walker were responsible for programming the VLSI chip with our modem algorithms. As part of the project we were invited to go to Ricoh in Tokyo to make a presentation of our approach. The analog part was supplied by a third party vendor. The project resulted in a good, reasonably competitive FAX modem chip set but Ricoh never used in actual production to my knowledge. Its main purpose seems to have been as a negotiation lever to get better pricing from Rockwell. Also, the project was driven by the Ricoh semiconductor division, and they did not seem to have complete buy-in from the FAX division.

Around this time I received a call from a guy I had known at AMI by the name Hiromitsu Yagi, a Japanese engineer who had worked on the SPP chip there. He told me about his new company, Clarkspur Design, which he had recently started. His business idea was to license a DSP chip he had developed to companies that had DSP applications they wanted to implement on their own silicon. To sell this he needed to demonstrate its capability and he thought that running a V29 modem on it was en effective way to do that. The reason he contacted me was to see if I was interested in helping out with the programming. I said I was so he sent me one of his development systems to work with. What Yagi-san had produced was an astonishing achievement for a one-man shop. He had designed and laid out the logic, done the lay-out, design checking and testing, produced the graphics files, had the wafers fabricated and tested, chips assembled, designed and had built a development board, checked it out, written a substantial package of development software, (assembler, loader, debugger), all in a totally professional style (no wire-wrap cludges, no code hacks, in short no sign that this was not the work of a substantial organization). The architecture of the chip was extremely simple and straightforward with the necessary facilities for effective signal processing (multiply and accumulate instruction, auto-pointer addressing) but no special cute tricks. I could have enjoyed a few cute tricks myself, but I had to agree that Yagi's simple approach suited the situation the best.

I was extremely motivated to take this on and set up the development system in one of our spare bedrooms, went out and bought an oscilloscope, a 3002 line simulator, a PC plus some other tools. To start with I decided to program a sin/cos generator and send it to Yagi just to see the first result. (Sin/cos generators are usually done by table look-up, but if you want high resolution, say a tenth of a degree, the table needs to be about 4000 words long which is too much for a small on-chip memory. So the solution is to do a coarse table and then interpolate between those values. To do this you take advantage of a trig identity and an approximation.

The identity is: sin(A+B) = sinAcosB + cosAsinB

The approximation is: sinB ≈ B for small values of B and cosB ≈ 1 for small values of B

sinA and cosA are from the table

So we have: sin(A+B) ≈ SinA + BcosA

The code and table used up less than 100 words and the execution time was on the order of 30 cycles.)

Yagi immediately put this to the test and discovered that it had a bug, which I was somewhat embarrassed to find out since this was one of my favorite algorithms that I had invented myself and combined some of the key elements that make DSP coding such an enjoyable activity.

I proceeded to write code in earnest, every morning before breakfast I would go into the bedroom and write some and every day after dinner I did the same. The tools were basic, but extremely simple and easy to learn, which also describes the chip itself, consequently I got up to speed very quickly and was able to send a complete V29 transmitter program to Yagi within a couple of weeks. The receiver took a little longer, since it was a much longer and more complicated program, but it was probably lees than three months before I send him a fairly complete V29 modem program, transmitter and receiver. Without me asking, Yagi offered to pay me $60,000 for the code which I happily accepted. As soon as it was in presentable shape, Yagi used the code to demonstrate the chip to Ricoh and was able to secure a deal with them in relatively short order.

The reason I felt free to keep up this activity in my spare time, which could be seen as a violation of my employment agreement with Nokia was that I saw this chip as the solution to Nokia's cost reduction problem. Here we could have or own silicon, after paying a relatively modest fee to Clarkspur, and achieve very competitive product costs. Consequently, the next time Folke came to town I invited him and Risto to our spare bedroom and showed him the V29 modem running. I told them what I had done and proposed that Nokia make the deal with Yagi and we start implementation of our next modem on the Clarkspur DSP. I don't remember if I pushed for any compensation for the work I had already done, but I probably made some suggestion along those lines. While Folke and his management were pondering this proposal I proceeded to work on a development agreement with Yagi and Cirrus Logic. Bill Nicholson had introduced me to the VP Engineering of Cirrus, a guy named Kenyon May, who had an interest in extending their product line into the modem area. My idea was that Cirrus would help pay for the development, Nokia would be responsible for the modem algorithm and coding, Clarkspur would provide the platform. Then Cirrus would produce the silicon and sell it a chip set, Nokia would buy it from Cirrus at favorable pricing and use it in its end user modem products. It was a complicated three-way deal of the sort that used to horrify Folke (and it is as good an example as any of my business naiveté that it didn't horrify me). It was quite

late in the modem business life cycle to be making elaborate new development plans, especially in the leased line segment of the market, so I was not hanging too much of my hopes for the future on the outcome of Nokia's review of my proposition.

End of Part 5

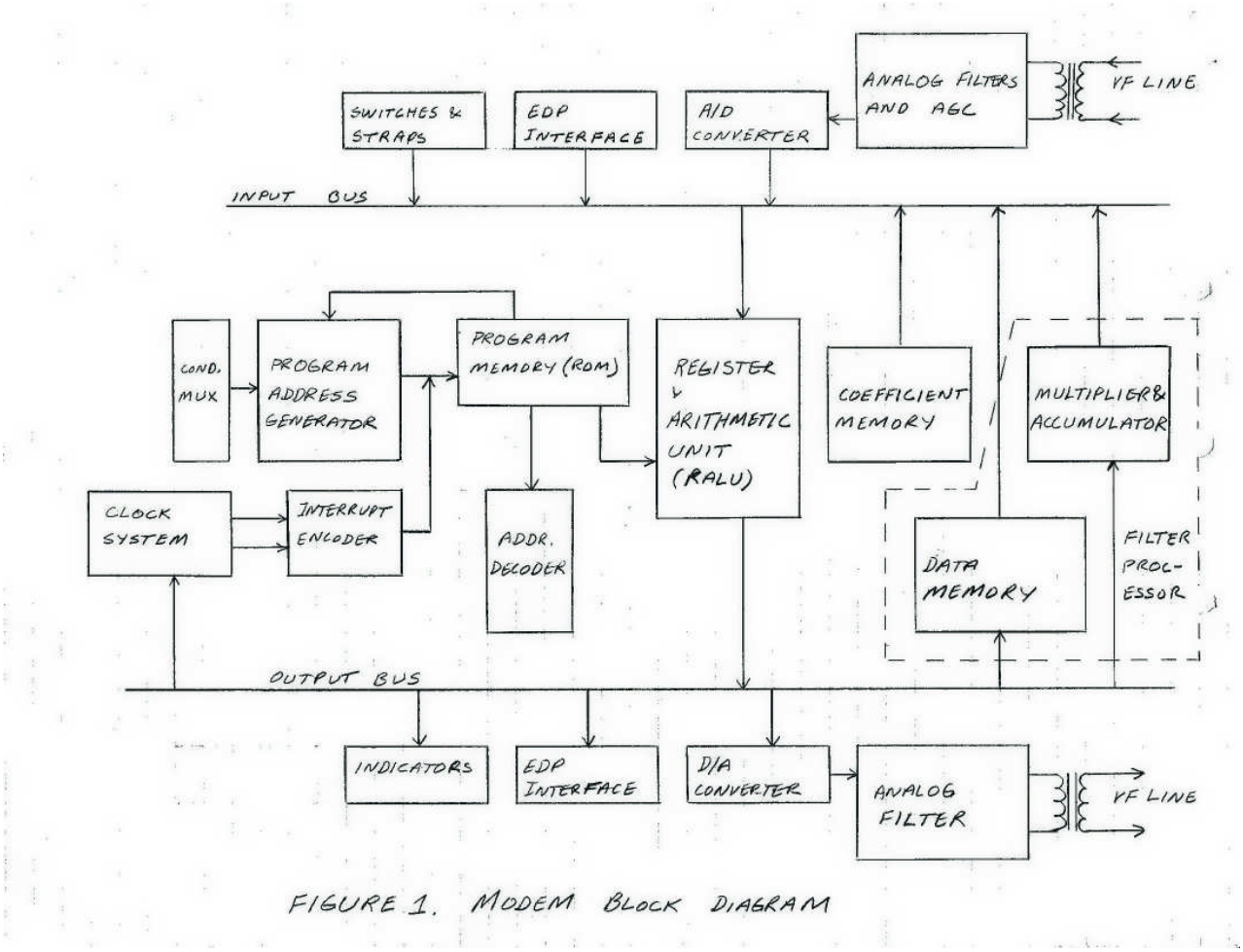

FIGURE 1. MODEM BLOCK DIAGRAM

From my home-made proposal to Nokia

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Future shock. *Karl I. Nordling believes microprocessors will change the course of the industry.*

Newsmaker

Karl I. Nordling

Come the revolution, this designer will be cashing in on the microprocessor boom

It's a long way from the peace of Largo, a pleasant Florida Gulf Coast community, to the booming semiconductor houses of Texas and California. But from his home there Karl I. Nordling can see a technological revolution approaching; and a golden opportunity, too.

Nordling was one of the founders of Paradyne Corp., and is still a pioneering data communications product designer. He believes that the growing production of microprocessors by semiconductor companies will have an enormous effect on the communications and data processing industries.

"Data communications systems will continue to change and grow," says Nordling. "And with people using programmable products throughout their systems, these systems will be able to grow easily in the future. They will be in the best position."

Nordling believes the microprocessor—already moving into data communications products in a limited way—holds the key to the future. Now in the process of starting a company called Kinex Corp., Nordling may be the right man in the right place at the right time: He is an electrical engineer with a heavy background in software, and in an industry that is taking off.

"The chief strategy of my business is to use standard off-the-shelf microprocessor products," says Nordling. "I will be developing applications software for these products to do different jobs. I'm not at all worried about developing hardware myself. The best way you can get value-added products these days is through software."

High level. What kind of software will Nordling use in his microprocessor-based products? He prefers to work with one of the high level languages, like Basic or Fortran. He can program in most of the popular languages and, partly because of his background in engineering and hardware, he tends to see software as just another way to perform the logic function in data communications systems.

As an example of what he believes the future holds, Nordling points to a modem he designed recently at Paradyne. He took two four-bit microprocessor slices, put them together and programmed the configuration to act as a modem. The system, says Nordling, also needed a high-speed multiplier, a program-address generator, read-only and random-access memory, and some 40 medium-scale integrated (MSI) logic chips. In a year or so, he believes the system's capability can be duplicated with an off-the-shelf microprocessor and a handful of chips.

"The secret is to use software to emulate existing hardware," says Nordling. "Take time-division multiplexers, for instance. Today they can really be emulated by microprocessors. You get some chips and you just program up a time-division multiplexer."

When asked in what functions microprocessors will be most heavily utilized, Nordling conjures up a smorgasbord of offerings. In data communications, he sees micros

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HUGO RISØ A/S

Teknisk Import

P. O. Box 8 Taasen, Oslo 8, Norway
Langmyrgrenda 1, Oslo 8

Cables : HUGOTEST. Telephone : 23 25 80
Bankers : Den norske Creditbank
Telex : 18 216 ultra n

OY NOKIA AB
Electronics
P.O.Box 780
SF-00101 Helsinki 10
Finland

September 30, 1977

Your ref.: Mr. Folke Ahlbäck
Utvecklingschef

Our ref.: HR:st

Dear Mr. Ahlbäck: Re. KINEX Modems

Thank you for your telephone call advising that you agree to Mr. Nordling's suggestions in his KINEX letter of September 19.

We have now received a telex from Mr. Nordling suggesting a visit to Helsinki for two or three days in week 44. We telexed this information to you yesterday, asking whether this would suit you.

Mr. Nordling also asked that you have available the equipment to show transparent view graphs 8x11".

We are looking forward to hearing from you and to the visit to Helsinki.

Best regards,

HUGO RISO A/S

Hugo Risø

CC: Mr. Karl I. Nordling, KINEX Corporation

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VIRGINIA
STATE CORPORATION COMMISSION
RICHMOND, VIRGINIA

EXHIBIT A

ARTICLES OF AMENDMENT
TO THE
ARTICLES OF INCORPORATION OF
KINEX CORPORATION

PTG

1. The name of the Corporation is KINEX CORPORATION.

2. The amendments adopted are as follows:

(a) Strike out Article III and substitute the following:

"ARTICLE III

Section 1. Authorized Capital. The authorized Capital Stock of the Corporation is One Hundred Twenty Thousand (120,000) shares, consisting of One Hundred Five Thousand (105,000) shares of Common Stock of the par value of $1.00 per share and Fifteen Thousand (15,000) shares of Preferred Stock of the par value of $1.00 per share.

Section 2. Rights, Preferences, etc. of Capital Stock. The relative rights, preferences and limitations and the restrictions and qualifications of the shares of each class of Capital Stock are as follows:

A. Common Stock.

(i) Dividends.

Subject to all of the rights of the Preferred Stock, dividends may be paid upon the Common Stock as and when declared by the Board of Directors out of any funds legally available therefor.

(ii) Liquidation.

In the event of any voluntary or involuntary liquidations, dissolution or winding up of the affairs of the Corporation, after payment shall have been made in full to the holders of the Preferred Stock, as provided in this Article III, the holders of the Common Stock shall be entitled to receive any and all assets remaining to be paid or distributed, and the holders of the Preferred Stock shall not be entitled to participate therein.

B. Preferred Stock.

(i) Dividends.

(a) The holders of the Preferred Stock shall be entitled to receive, when and as declared by the Board of Directors, out of any funds legally available therefor, cash dividends at the annual rate of Seven Dollars ($7.00) per share from the date such shares are issued, payable quarterly on the first days of January, April, July and October in each year. Such dividends shall accrue

BUSINESS PROPOSAL

The joint development venture that KINEX proposes to NOKIA OY is as follows:

1. KINEX and NOKIA share the cost of developing the modem to the engineering model stage (i.e. Printed circuit boards that meet all functional requirements of the modem). The NOKIA share of the development cost is $56,000, payable at $7,000 per month starting on the date of contract and continuing for 8 months, or until delivery of the prototypes, at which time any remaining balance is payable.

2. NOKIA has the right to manufacture and market the KINEX 4800 in the Nordic countries after purchasing a minimum of 100 core-modems from KINEX at a price of $1,500 each, and by payment of a royalty. The royalty shall be a percentage of the sales price of the modem, and based on the quantity of modems sold according to the following table:

1st 500 units:	5 %
next 500 units:	4 %
next 500 units:	3 %
all units thereafter:	2 %

3. KINEX will deliver the following items to NOKIA:

1. Two prototype core modems consisting of PC boards that meet all functional requirements.
2. One complete set of reproducible documentation including cicuit schematics, logic diagrams and PC layouts. Also included in the documentation will be an engineering specification for the modem, and a manufacturing test specification.

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OY NOKIA AB
ELECTRONICS

9 Nov. 1977

Mr. Karl Nordling
KINEX Corporation
9280 - 119th Avenue North
Largo, Florida 33543
U.S.A

OUR REF. 3110/588/FA/elk
YOUR REF.

Dear Karl,

It was a pleasure to have you and Hugo visit us in Helsinki. The discussions held by us afterwards have not changed our general views on the possibilities to get a mutual benefit from the co-operation with KINEX.

Enclosed you have the letter of intent I promised. There are a few slight modifications of the text we agreed upon at your visit here.

We want to point out that we think in the final agreement there should be a statement where you formally declare your intention not to use software or hardware solutions which are of a secret and proprietary nature and therefore could lead to infringement of Paradynes rights.

The draft for the agreement will get its final form at us and be mailed to you the week beginning at the 5 of December.

Finally I want to draw your attention to the fact that when you are making licence agreements with companys within Common Market you must grant them equal rights in all EEC-countries. Please correct me if I am wrong. This could have an impact on our plans to have exclusive rights in whole Scandinavia (Denmark is an EEC-member).

Please advice me whether I shall send Hugo copies of our correspondence.

Best regards,

Folke Ahlbäck

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D E V E L O P M E N T C O N T R A C T

Between Kinex Corporation (herein Kinex) and Oy Nokia Ab Electronics (herein **NOKIA)** to operate as from January 1, 1978.

OBJECTS

A. To develop jointly a microprocessor modem capable of 4.800 bps herein referred to as the Product.

B. To produce the Products, when developed, for sale for the joint benefit of the parties hereto according to an agreed division of countries, royalties and other benefits as specified in this contract.

THE TERMS OF THE AGREEMENT

1. Development of the Product

The parties shall jointly develop a prototype of the Product which is a 4.800 bps auto-equalized modem for use on national and international leased circuits or lines in the public switched network. It shall fully comply with CCITT recommendation V27-bis and V27-ter. Additionally it shall have several advanced optional features to be specified jointly.

2. Division of development contribution between the parties

The development work of the Product is divided into 5 parts A-E as follows:

A. Design of the cabin
B. Design of the power supply
C. Design of the digital part of core modem
D. Development of software for core modem
E. Design of the analog parts

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STOCK PURCHASE AGREEMENT

AGREEMENT made as of this 28th day of August, 1980, between KINEX CORPORATION ("Kinex"), a Virginia corporation having its principal office at 6793 Cross Bayou Drive, Largo, Florida 33543, and NOKIA INCORPORATED ("Nokia"), a Georgia corporation, having its principal office at Suite 108, 6303 Barfield Road N.E., Atlanta, Georgia 30328.

W I T N E S S E T H :

WHEREAS, Kinex has authorized capital consisting of One Hundred Thousand (100,000) shares of common stock, par value One Dollar ($1.00) each (the "Common Stock"); and

WHEREAS, Kinex has issued and outstanding twenty-nine thousand two hundred fifty (29,250) shares of Common Stock, of which twelve thousand eight hundred fifty (12,850) are owned by Karl Nordling, eight thousand one hundred fifty (8,150) are owned by Anne Berit Nordling, his wife, and eight thousand two hundred fifty (8,250) are owned by Wenche Riso; and

WHEREAS, Nokia intends to acquire the eight thousand two hundred fifty (8,250) shares of Common Stock now owned by Wenche Riso; and

WHEREAS, Kinex intends to increase its authorized shares of Common Stock by five thousand (5,000) shares, thereby increasing its aggregate authorized Common Stock to one hundred five thousand (105,000) shares; and

WHEREAS, Nokia has agreed to acquire from Kinex, and

Outside Kinex at Cross Bayou

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Controller and HR manager for Kinex

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Brochure for the first Kinex modem

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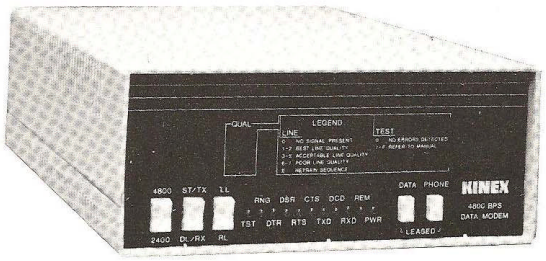


NOKIA-KINEX

"ENGINEERED EXCELLENCE"

48/208AB MODEM SERIES

HIGHLIGHTS:

- 208A and 208B compatible as selected by front panel switches
- Simultaneous leased/switched line interfaces
- 201C fallback operation
- Auto-speed recognition
- Auto answer/disconnect
- Compatible with all industry standard auto call equipment
- Echo protect feature for satellite connections
- "Call Message" feature for network administration
- Powerful line equalization capability
- Real-time digital line quality display
- Local and remotely controlled diagnostics
- Built-in bit error test set
- Strapping accessible via front panel
- Optional surge protection
- Rack Mount version available

GENERAL DESCRIPTION:

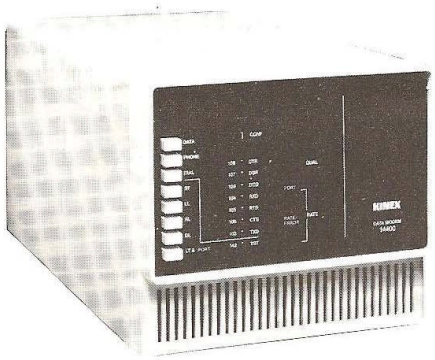
The Nokia-Kinex 48/208AB family of modems are intended for synchronous data transmission on the public switched telephone network (dial-up) or on private lines (3002). All models support transmission at 4800 bits per second and are compatible with the Bell 208AB standard. In addition, Models 2 and 3 support transmission at 2400 bits per second and are compatible with the Bell 201C standard. Operation at 2400 bps can be selected by strapping, a front panel switch, via pin 23 of the RS-232 connector or by autospeed detection (model 3 only). The autospeed capability allows any 48/208AB Model 3 to recognize and communicate with any Bell 201C compatible modem or any other Nokia-Kinex 48/208AB (all models).

On dial-up circuits, all models operate in a half-duplex transmission mode. On private leased lines, data can be transmitted in either a half-duplex or full-duplex mode. On both types of connections, either voice or data communicaton can be selected. A unique capability of Models 2 and 3 is the call "message" feature which allows a user at one modem to notify a person at the other modem that they wish to verbally communicate when in data mode by flashing a visual signal.

All models are equipped with jacks for simultaneous physical connection to both a dial-up circuit and a 4-wire unconditioned private line. Selection between the two is accomplished by means of front panel swtiches. This facilitates convenient backup operation when the modem is used on a private line.

All modems provide both automatic answer and automatic disconnect when used in dial-up service. They also are compatible with all industry standard auto-call units. Models 2 and 3 additionally provide an "echo protect" feature which allows operation with echo suppressors on satellite connections.

The Nokia-Kinex 48/208AB series is equipped with built-in monitoring and test features which allow non-technical personnel to determine line conditions and perform fault isolation. This includes a continuous display of line quality and RS-232 signal status. In addition, each unit has a built-in bit error rate test set which eliminates the need for external test equipment and is used with Analog, Digital, and Line Loopbacks. Remote controlled testing on 4-wire leased lines is also available in Models 2 and 3 via the remote digital loopback feature. This allows the operator at one station to determine the condition of the remote modem without assistance from a remote operator.



NOKIA-KINEX

"ENGINEERED EXCELLENCE"

14400/M DATA MODEM

HIGHLIGHTS

- 14,400 bps operation over 3002 unconditioned lines
- 12,000 and 9600 bps (V.29) fallback rates
- Built-in 4-port Time Division Multiplexer
- Wide variety of tail circuit applications
- Advanced automatic adaptive equalizer
- Complete fault isolation and performance monitoring capability
- Local and remotely controlled diagnostics
- Independent monitoring of RS-232 signals on each port
- Built-in bit error rate tester
- Dynamic Digital Line Quality Indicator
- Rate/Port selection via front panel controls
- Optional plug-in Eye Pattern Display module

GENERAL DESCRIPTION:

The Nokia-Kinex 14400/M data modem is designed to provide reliable transmission of synchronous data at 14,400 bits per second over most 3002 unconditioned voice-grade circuits. It offers exceptionally high throughput and superior operating economy while accommodating a wide variety of networking applications.

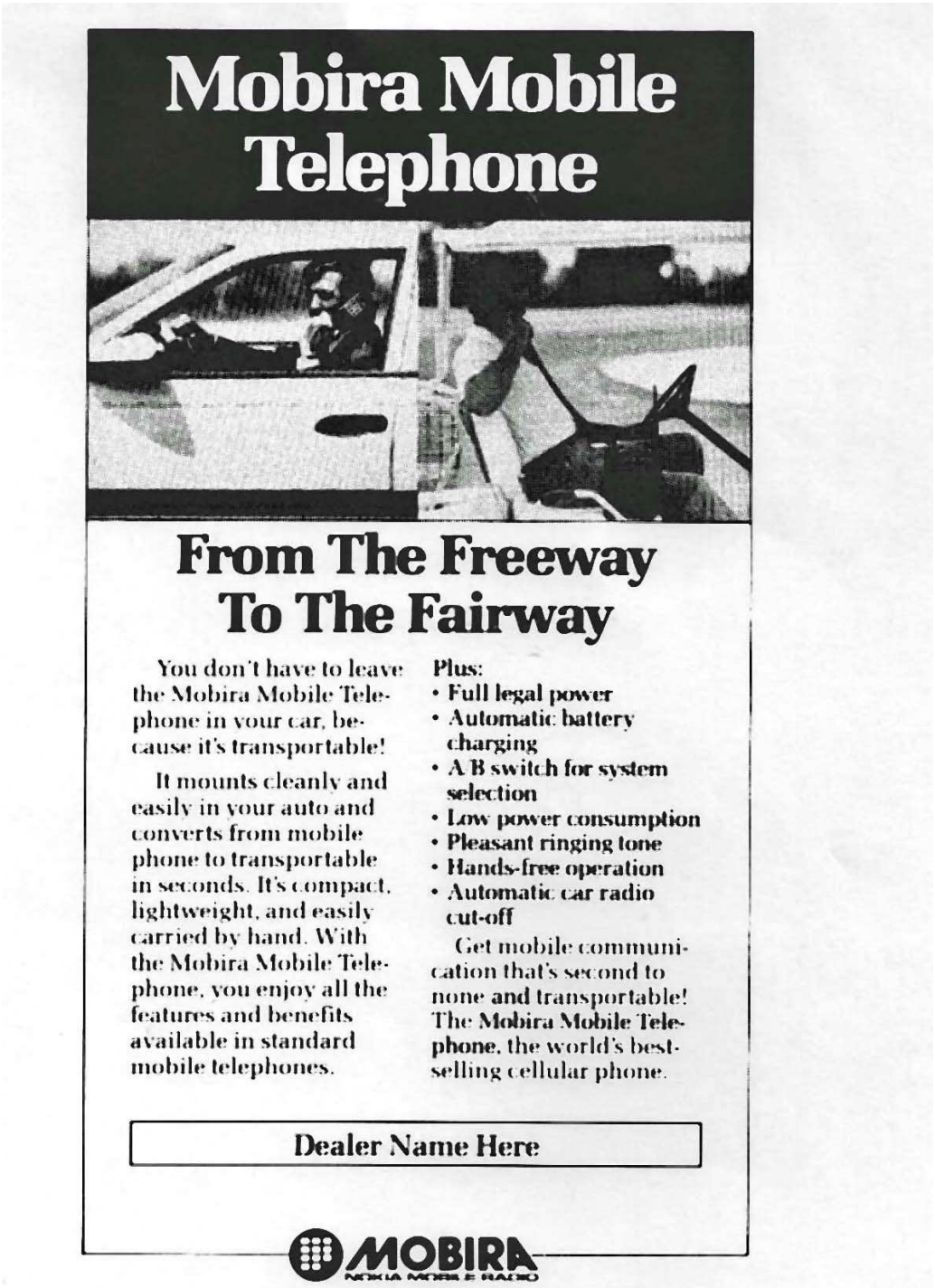
The primary 14,400 bps transmission rate can be reduced to 12,000 or 9,600 bps(V.29) in case an unacceptable error rate occurs or if the application requires a lower bit rate. Fallback speeds may be activated manually via a front panel switch or by using the terminal interface (RS-232) signal.

Various data rate combinations are available with the built-in four port multiplexer allowing up to four data channels to use the same high-speed transmission path. Channel speed selection and port assignments can be implemented either by the front panel "CONF" switch or by internal strapping accessed from the front panel.

Independent simulated controlled carrier operation, with selectable RTS/CTS delays and independent clocking, is provided for each port. This permits easy connection of remote multi-point tail circuits or switched lines to the central site via a multiplexed 14,400 bps link.

The Nokia-Kinex 14400/M, as well as the transmission link, can easily be diagnosed by means of the versatile internal test circuitry of the modem. All relevent local and remotely controlled loopbacks can be initiated by the touch of a front panel switch. The digital loopbacks can be activated independently on each port without disrupting the other ports which may be in use. This allows end-to-end testing of any sub-channel without interfering with the others. The 14400/M also has a built-in bit error test function, including a bit error counter, which allows the operator to effectively measure the BER performance of the line or individual port without additional test equipment.

The Nokia-Kinex 14400/M represents a significant advancement in high-speed technology providing you a cost effective means to optimize your data network. By integrating the 14400/M into your network, you can realize the immediate benefits of the best engineered 14,400 bps data modem in the world today.



The president of Kinex moonlighting as photo model Back

Folke outside our KABIN

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Outside the Oulu factory. From the left: Ray Chen, Heikki Laamanen, Gunnar Holm, Mikko Laiho, Lauri Luomi, Risto Sarkilahti, Sam Park

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Kinex building on Bryan Dairy Road

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Bill Huston, with the camera

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John Hodge at the company picnic

Back

Tom Fouse cooking and John Hodge waiting to eat, AB supervising

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Bill Huston, Werner Gruber, Steve Isaac, unidentified sales guy Back

Happy hour at Ricoh

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Beach party at Risto's

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With my mother in Brändö

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Areial view of Baggholma ca 1965

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Winter transportation in Finland

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