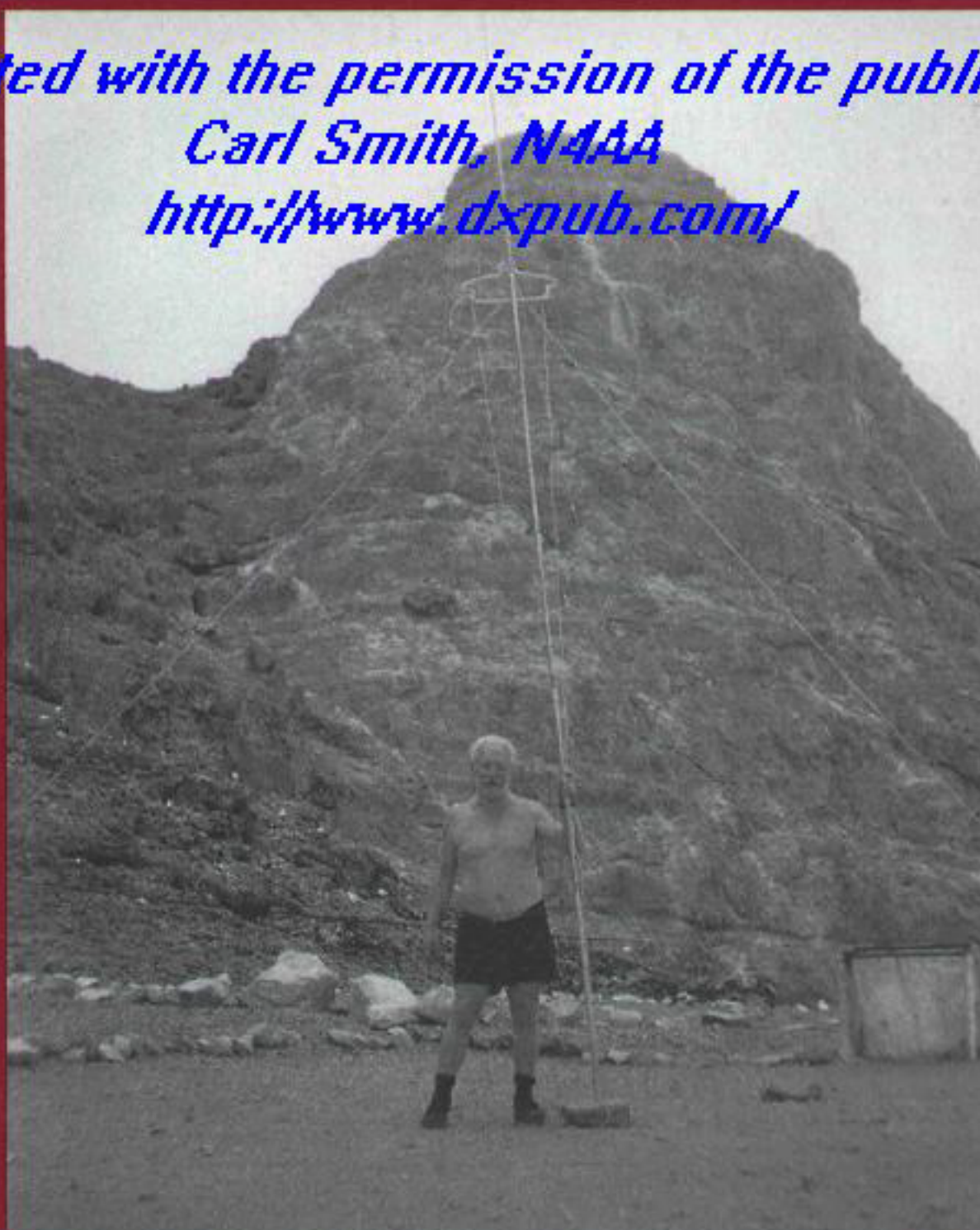


The DX Magazine

The Bimonthly Magazine for DXers

In this issue:
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IRC's - Do you understand them?
A review of DXAID
A DXers "Dream Machine"
A 1950 QRP DXpedition
and more

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HK3JJH/HKØ - Malpelo Island 2001

AN ALMOST TWENTY YEAR COLLINS RADIO DREAM COME TRUE

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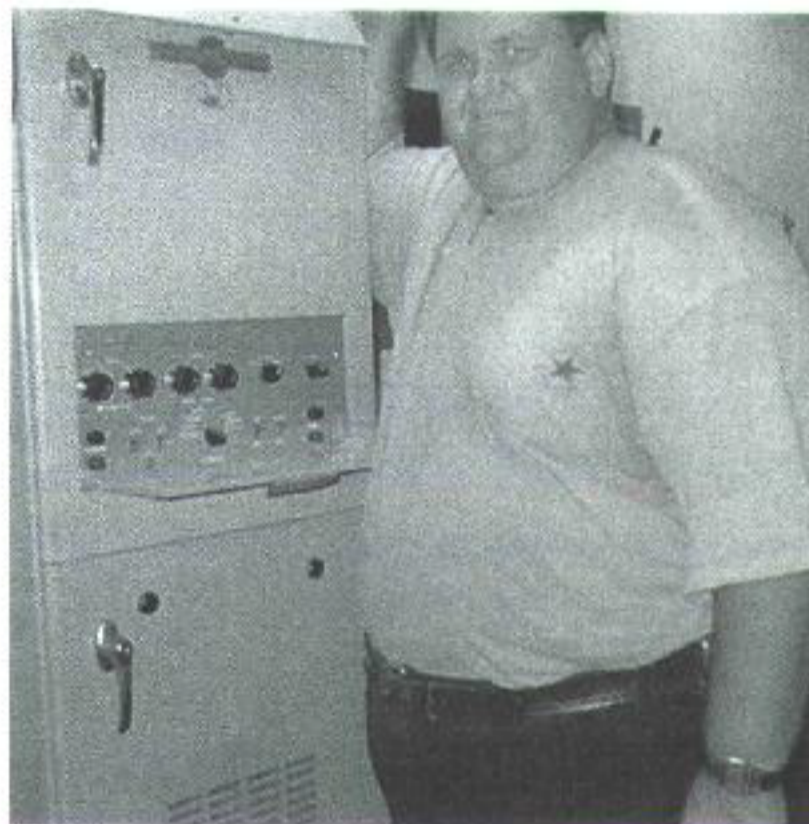
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When I was but a young amateur, just getting my feet wet in the DX game I happened upon a piece of like new Collins radio equipment that I had never seen before, and which captured my imagination. It had a huge version of the familiar red winged emblem, the gray paint color, and styling of the S-line that most all amateurs are familiar with. However this was a huge unit standing six feet tall and was unlike anything I had seen before.

Fresh out of school, my first big job with ITT Avionics, lasted for a year. I then went to work for a small defense contractor as their assistant Chief Engineer. In the summer of 1982, after only a couple of months on the job, I discovered my "dream".

At this point I had only been a licensed amateur for about three years. I had read and reread many catalogs, QST, 73 and Ham Radio Horizon magazines that came my way for years. I had visited a number of the tri-state used amateur radio stores that had many of the big old black Collins A-line and S-line stations as well as other large radio equipment on the shelves and the floors. In my year at ITT I had contact with lots of communications equipment, especially high end Collins and Hammarlund receivers, but I had never seen this particular unit before. As a member of Navy MARS (callsign NNNØWWL) I had visited the stations of fellow MARS members and had seen almost every piece of Collins equipment made, or so I thought. A few of them had the Collins 30S-1 amplifier, as did the Army MARS station at Fort Monmouth. This unit looked a lot like a 30S-1, but was much bigger and more complicated looking. Whatever it was, be it an amplifier or a transmitter, it stood taller than I did, looked new and it had "Collins" on it. These characteristics alone commanded a lot of respect from this young radio amateur fortunate enough to gaze upon it.

My first thought was A.M. broadcast or shortwave broadcast transmitter. But, it was so much larger and



The author with his "Dream Machine"

more complicated looking than any amplifier I had ever seen. It had two doors with locking handles dividing three quarters of the height of the unit, with two fold-down panels, one in the top door and the other under a set of panel meters above the top door. The fold-down panels revealed a multitude of controls that offered a level of complication beyond what I had seen in radio equipment to that date. The unit had three large Simpson meters; a multimeter, a plate current meter and it even had a 5kw RF wattmeter built into the unit. WOW! It was capable of output power levels that required a meter with a 5kw range, I was very impressed, and intrigued to say the least. Being only 24 years old and wet behind the ears, here I was in the presence of something that was unknown to me. I wanted to know more. The top fold-down panel under the meters had a label that read Collins Radio Company model 204F-1 Transmitter with a serial number just



A 5 KW Wattmeter on the front panel !!!!

over 100. There were output Tune and Load controls, a screw driver set overload control and a forward/reflected power selector switch. So it was a transmitter and not an amplifier, at least that was what the label stated. The second fold-down panel contained a number of tuning controls and switches for driver tuning and multimeter selection, as well as local vs. remote control, and a plastic covered tuning chart for frequencies from 2 to 30Mhz. As I am the curious type, I grasped the bottom door handle and found it was not locked. The door opened and inside were a number of transformers, oil filled capacitors, a huge blower, multiple relays and contactors, including two large tubes that I assumed to be either regulators or rectifiers as it looked like the bottom section was all power supply and cooling components. I opened the top door and found the RF compartment. I could see 6146 tubes, the predecessors to the 6146B/2001 tubes in my TS-520SE and two huge chimneys. The tubes seemed to be ceramic tubes such as the 4CX250B we used in AC power supplies that I was familiar with, but bigger. I lifted a chimney to see what we had. There, imprinted in red was "Eimac 4CX1000A". There were huge tunable capacitors and tunable coils, a lot more than were needed in an amplifier I thought. I could see a long piece of RG-58 cable hanging off the unit with a BNC connector. It was routed into the top of the unit and seemed to plug into the "J1" connector, visible when the top door was open. A heavy A.C. line cord with locking plug was there, but no other cables were attached to it. The RG-58 cable could not possibly be the output cable, not even to a dummy load I thought. It must be a transmitter as I could not see any SO-239 or N connectors for input and output. The RG-58 cable must be for an audio connection for some type of studio microphone console was my thought. So what was this mystery

marvel of Collins engineering that stood in front of me, which over time, or due to lack of need, the company had forgotten about, or so I hoped?

As fast as they could, my legs swiftly took me in search of my boss, the Chief Electronic Engineer, Kay G. Sears. He would know what it was, he knew everything that went on around there. He had been there since 1948 starting out as a junior engineer fresh out of the Army. However, he was not to be found, he was off site at a day-long conference.

Looking around, I saw test equipment on carts near the unit, a signal generator and switchable attenuator, a frequency counter, a Lavoire Laboratories spectrum analyzer and a Lavoire Laboratories WWV receiver. I did not see a transmitter or transceiver so it looked like it was indeed an old AM transmitter from some by gone day. But I still held out hope. I started to formulate a plan that even if it were a broadcast transmitter, if the documentation was available on the unit, perhaps it could be modified for amateur use.

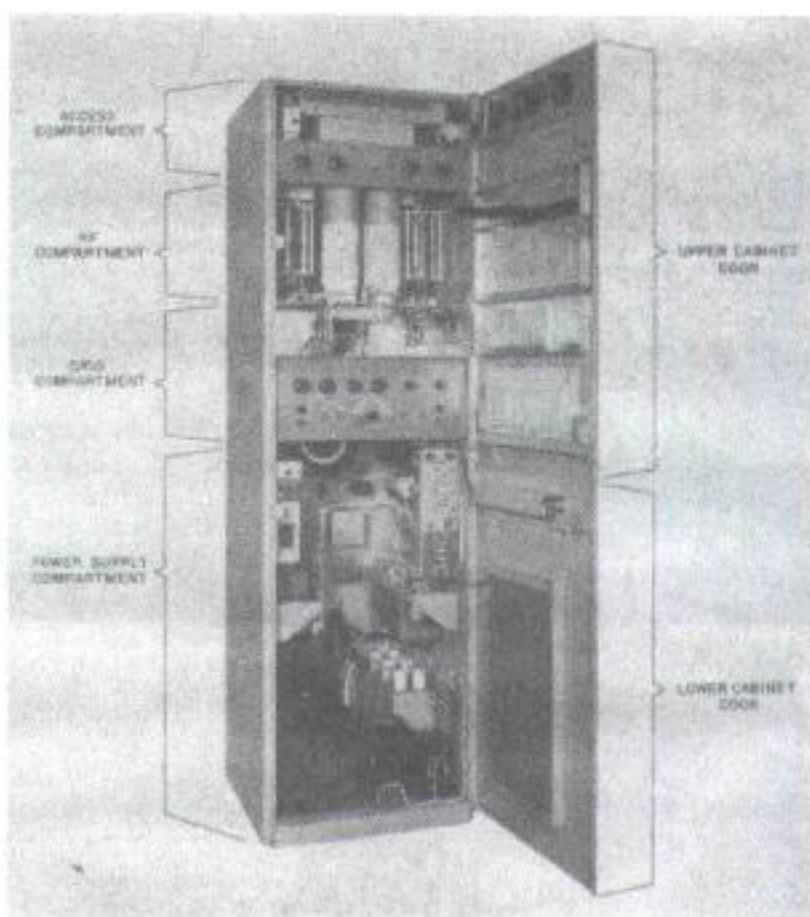
That evening I discussed my find of the 204F-1 with my amateur friends, especially my MARS buddies. I described what I had found in detail and the consensus was that I had come across an old obsolete AM broadcast transmitter, but I was not yet convinced.

I arrived at work very early the next day and impatiently awaited the arrival of my boss to ask my questions. When he arrived, and after some fast questioning while he poured his first cup of morning coffee, he informed me that the unit was an old military surplus HF amplifier, not a transmitter. He said the company had acquired it many years ago and that it was designed to be driven by a low power exciter for fixed operation in a 24/7 teletype operating scenario mainly. He said it was bought as new, unused military surplus in the 1970's. It was used to test antenna components, sub assemblies and fully assembled manpack antenna for dielectric breakdown that the company manufactured under subcontract now and then. I learned that the tests were performed starting at about 2Mhz and higher with kilowatt plus power levels under experimental FCC license authorization on specific carrier frequencies. The tests required a heavy duty transmitter for the extended key down periods involved and needed to be frequency agile, thus the choice of the Collins amplifier and an exciter. However, the frequency stability exceeded the exciter of the day so a signal generator was used. The RG-58 cable was for the exciter input and on top of the unit was the RF output connector, a huge connector that dwarfs an SO-239 I later found out. I also learned that my boss was the only one who knew how to operate the unit and that he was the only

employee that knew Morse Code. That was of course until I came along. As an FCC license requirement the station had to identify in morse code (using a 2 by 3 KA2Xxx and later KC2Xxx callsign) during on the air testing. They did so using a J-38 hand key rather than automated means, which meant a key operator with morse code ability was required. Now that I knew it was indeed an amplifier my thoughts immediately turned into visions of the unit in my ham shack. It became very obvious to me that such an amplifier would be a very frequency agile and powerful addition to my MARS station. Yes, I was a brash young man with visions that far exceeded what most thought was realistic, or to put it another way, I am a firm believer in overkill.

From the manual and other sources, in official language the unit is a 204F-1 (the military nomenclature being AM-2374/URT) Radio Transmitter manufactured by the Collins Radio Company, Cedar Rapids, Iowa. It is a two channel, 3 stage RF Linear Power Amplifier, covering 2-30Mhz continuously. It was designed in the late 1950's and manufactured through the early 1970's for commercial, government and military applications and was sold world wide. Requiring only 0.1 to 0.2 watts of drive to produce 2.5Kw continuous output (5.0Kw input) if used as designed, the amplifier will actually produce much more than the rated continuous output when used in ICAS type of service from its pair of 4CX1000A tubes. The military designation, AM-2374/URT, is for Amplifier, RF, Transmitter, 2-30 MHz, 2.5 KW (PEP), 50 ohm output impedance, part of AN/URT-18. It is 70 inches high by 20 inches wide by 22 1/4 inches deep and can run off 220-440 vac, 60 Hz single phase. By the way the AN/URT-18 is Radio Transmitter Set, HF, CW & SSB, 2.5Kw, major component being the AM-2374/URT. Basically, it is the combination of an exciter and the amplifier. The first stage of the 204F-1 is a 6CL6 Pentode operating in Class A, followed by a pair of 6146 tubes operating in Class AB1, the third stage is a pair of Eimac 4CX1000A tetrode tubes as a Class AB1 voltage amplifier covering 2-30 Mhz. It has two completely separate input and output tuning networks for an instantaneous QSY from one band to another and an unbelievable number of interlocks and safeguards including monitoring the antenna system for an open circuit.

So basically, what I had found was the big brother to the venerable Collins 30S-1 amplifier. However instead of a single 4CX1000A driven by a 100 watt class transceiver we had a unit with three RF power stages to accept low power drive and a pair of 4CX1000A tubes as the final stage. In addition, unlike



the 30S-1, the 204F-1 was basically a high power transmitter with local or remote control ability, not a T/R amplifier. But the addition of the 2PDT coaxial relay that I found in a box with the unit changes all that. Furthermore, I later learned the 30S-1 and 204F-1 actually shared a number of the same components, complete with the exact same part numbers. What I have never been able to determine for sure, and I have done a fair amount of research on this subject, is was the 30S-1 derived from the 204F-1 or was it the other way around? I have learned that there was an entire family of 204— amplifiers that were built by Collins during this time period, some single channel, some with auto tuners and many of which made the 204F-1 look puny by comparison.

As I later learned, my boss had been an amateur prior to World War II while growing up in Iowa, not far from Collins Radio. As an Army Captain during the war, he ran a communications station in Alaska using high speed CW. He had attempted, to no avail, to teach some of the bench technicians at the company to send morse code and operate the system so that he did not have to perform the antenna tests personally. He told me that during my interview with him, when he learned I was a licensed amateur he immediately planned, as one of my future duties, that I would step into this position when the next antenna production run took place. At that point I eagerly agreed with him that he had an excellent idea, even though it meant the unit was not for sale. Kay gave me formal instruction on how to

properly operate the Collins amplifier using the signal generator and step attenuators to develop the required drive levels for the specified antenna RF power test levels required for passing the acceptance test specifications. To him, this was just part of the job, to me it was a sheer pleasure. To operate the unit and monitor the RF output on both the built-in wattmeter and the external Bird 43 wattmeter, almost pinned with a 5,000 watt slug in the Bird, while tuning up into a dummy load, was exhilarating to say the least. I had never been in control of so much RF energy before.

A few years later, 1985 to be precise, I received word that no more antenna orders would be forthcoming. At that point, expecting that I would soon be able to buy my dream amplifier, I asked and received permission to interface my new Kenwood TS-930S to the Collins to test it for compatibility in my station. As I had already approached the company about purchasing the unit when it was no longer required, it seemed to be the right time to move forward. With permission granted I wired the DPDT coaxial relay that came with the unit, and had never been used, into the internal amplifier relay of the TS-930 to switch the 28vdc coil voltage provided by a Lambda bench supply. I wired the TS-930 transverter output through a step attenuator on the amplifier input side of the relay. I adjusted the carrier control and attenuator to measure the needed RF output on an RF volt meter into a dummy load for the drive required for 1kw output from the unit. I attached the drive signal from the attenuator going to the dummy load to the J1 drive input connector on the 204F-1 and proceeded to transmit with over 1Kw into the huge Bird 51.5 ohm dummy load with my hand on my Nye Viking Master key just long enough to read the Bird meter. It was magic. I was now driving my dream amplifier for the first time with my personal ham transceiver. I increased the drive level to achieve RF power output levels that the SB-220, that I would later purchase from a fellow MARS member, would have required four 3-500Z tubes or more to achieve. Later that evening after business hours, with the unit adjusted for legal amateur power levels and a test range antenna tuned to resonance at 4041khz, I ran my 0000Z Navy MARS Region net on USB. Needless to say the net control station that evening received numerous compliments as to his signal being better than normal. I am sure that the NVIS antenna with its low loss hard line, supporting mast/transmission line sections and RG-17/U transmission line between it and the amplifier made a big difference over my normal inverted V antenna and 100 watts. At any rate the proof of concept had been achieved and I now wanted the 204F-1 for my own,



Lower tuning panel of the 204F-1

more than ever.

However, it was not to be. The company held out hope that future add on contracts would come along and thus would not consider selling the unit to the deserving junior engineer in their employ. I started looking for a 204F-1 on the used market and did find some, but priced way beyond my average amateur budget, so I settled for an SB-220. Over the next several years, I periodically renewed my interest with the company. My boss also went to bat for me all to no avail, with the single exception that when it was no longer needed I would get first consideration. In 1989 I left their employ, but I continued to keep in touch over the years and continued to express my interest now and then in the Collins amplifier. I upgraded to General, then Advanced and finally Extra along the way and periodically made good use of my SB-220. However I was always thinking, or rather dreaming, about how nice it would be to some day have the Collins 204F-1 as part of my station. I considered it to be mine, just not in my possession, yet. I dreamed of the day it would be at my command during a DX contest, especially on 160 meters or busting a pileup that even my SB-220 could not help me with.

Last year, I lost my father to a sudden heart attack and it appeared that I was going to relocate my family to Florida, as that was where my Mother wanted to move. My brother was already a resident as were my wife's parents and other extended family. Since I was unemployed at the time it seemed like a good plan. Not wanting to leave without a last ditch attempt at making my Collins dream come true, and not having asked about it for 2 years, I inquired about the possibility of purchasing the 204F-1 one last time. To my surprise and pleasure they agreed with the words "Steve it's yours for the taking". Well, to say the least I was

pleased. I planned to have the moving company pick it up on the way to my storage unit and then to my house for the final move to Florida.

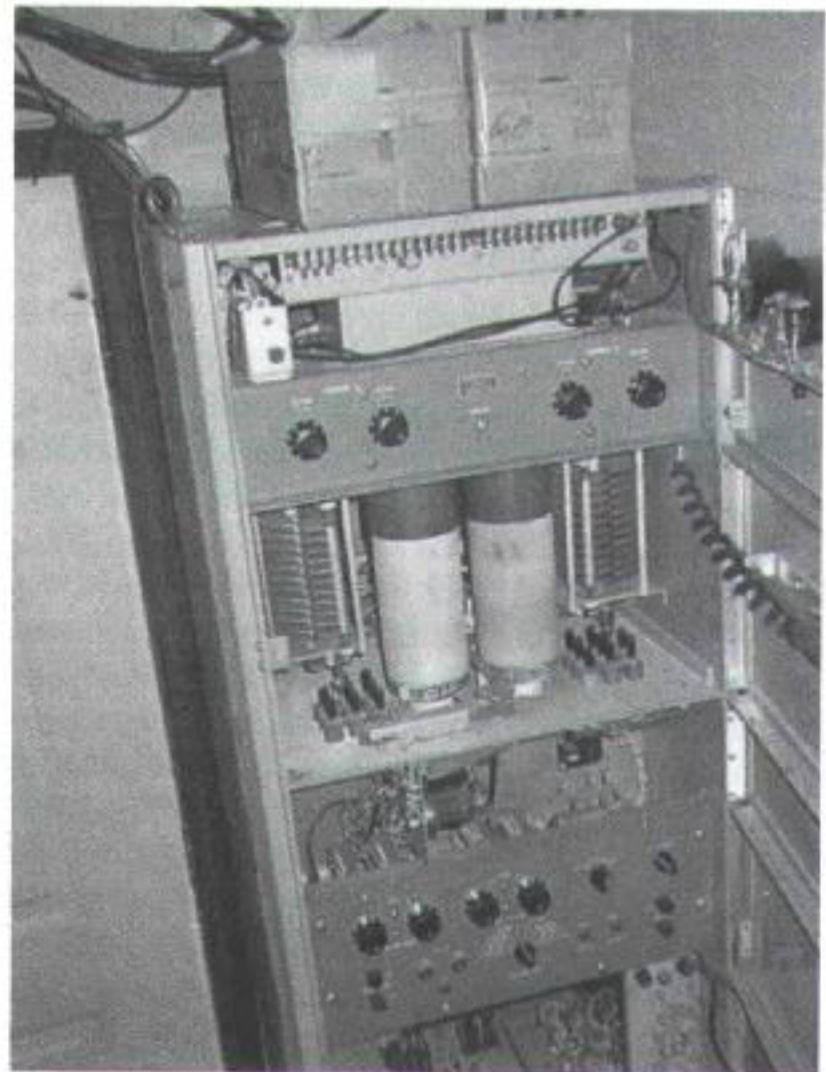
However, as life always seems to do, my plans were changed. The Collins was now mine to take whenever I wanted, but my house was not selling fast enough and the sale of my mother's house was coming to a close. I took a job in New Jersey and took my house off the market. I don't think I ever really wanted to move to Florida anyway. Life was good and I was happy. But then came the prospect of moving the Collins into my tongue and groove log home built on a crawl space. Unlike the concrete slab I had years earlier when I first wanted to purchase the unit, and the ranch home near my brother in Florida which also had a concrete slab, I now had a problem. How would I make my dream amplifier part of my current tightly packed station, already overflowing with radio equipment and keep it from falling through the floor?

The plans came together fast. My good friend Bill, KC2CNB took to the task to help me plan the most economical (I had been unemployed for 6 months), and sound ways to both reinforce my house and safely transport the amplifier to its new home. We started with a visit to the company warehouse and found the unit had been left uncovered and a window pane less than ten feet away has been broken. Upon opening the doors to my dismay I found lots of dust and dead bugs, cob webs and the metal surfaces, including switch contacts not under pressure were now very tarnished. Otherwise it still looked new like. The unit had not been powered up in over 15 years. Although we could have done so on site, we opted not to fire it up just yet. I wanted to clean and ring out everything first. The dolly that the unit had been on for probably the last 30 years had seen better days. It still seemed to be sturdy, but the unit was not fastened to the dolly, something I never paid much attention to in previous times. We surveyed what would be required to move the unit to the loading dock, which had also seen much better days, then from the loading dock onto a rental truck with an electric tail gate lift to transport it to my house. We decided that a heavy duty ratchet moving strap around the dolly and the unit would be needed along with a four man crew. Since it rolled nice and easy on the dolly, getting it onto the truck from the loading dock looked simple enough, rather like moving an upright freezer unit. More on this later.

At home, I picked the only logical location for the unit, in the corner of the room on the other side of the main egress doorway into my station, just under the inlet for all my cables. It was a small area with a open

archway into the next room that was a difficult to place to put anything worthwhile anyway. But it was just perfect for the amplifier. It was also right over the main weight bearing beam for the floor which ran the length of the house. Over the next month Bill and I, with Bill actually doing the crawling in the two (2) feet of clearance under the house, we added concrete footings and blocks and new pressure treated beams. We actually jacked up and lowered the house at the main beam onto the added supports. We found that we would have to remove the railings on my porch as well as the awning over the door to bring the unit into the house. The doorway only offered a ½ inch clearance for entry into the house with the door jam to contend with as the biggest problem.

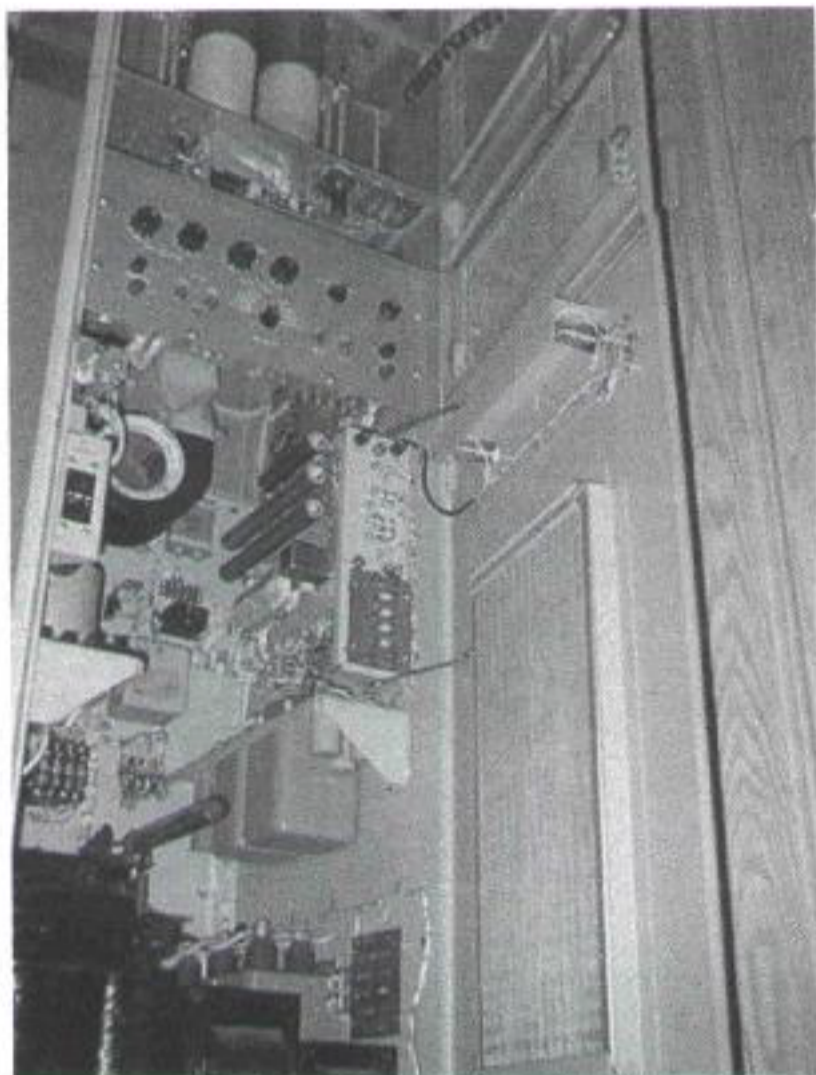
By the time the house was ready, business travel and training related travel for my new job set in, as did the winter weather and the window of opportunity to move the unit passed. The spring and summer of 2001 offered no opportunities as scheduling enough people on a week day to gain access to the unit was tough. Cost estimates from professional movers and the loving care I foresaw ruled that option out. Finally in September 2001 I had a new 12 by 16 foot shed built and now had the additional space needed to rid myself of the storage unit I took on



*View of the top - PA - section of the cabinet.
Note the "chimney's" for the two tubes.*

when my father passed away. I was able to schedule Bill for the weekday move; it ended up being just the two of us with my wife in tow for moral support.

The day of the big move came. The entire day and night before, well into the morning, it rained. During the day we experienced scattered showers, not exactly the best weather for the task at hand. We had rented a 24-foot Penske truck with electric lift gate rated at 1700 pounds. When we arrived at the warehouse we prepared the unit for moving by strapping it solidly to the dolly



A view from the "bottom" of the large cabinet.

with a heavy duty ratcheting moving strap with the hooks into the eye bolts on top of the unit. With the truck in position, on the best section of the loading dock, we started to move toward the lowered lift gate when all of a sudden the unit started to tip over. Being 5 foot 11 inches and over 250 pounds I was able to hold on to it. Bill got on all fours discovering one of the dolly wheels had only one of the four lag bolts left in it and it was bent. The wood dolly was rotten and the bolts had bent and torn out as we moved over the broken and partially collapsed loading dock. It took 90 minutes of scrounging new bolts and installing them by hand with little ground clearance to perform the work, into new locations without the benefit of being able to drill holes before we were able to continue. Moving the unit onto the lift gate was

easy with the aid of Bill's come along. However, the movement of the lift gate with the added weight (lift gate rating of 1700 pounds) of the 580 pound Collins and 400 pounds of man was interesting. It was jerky and keeping the unit from falling off was not easy. Next came moving the unit ever so gingerly to the back of the truck and strapping it in tight for the 35 mile drive to my home. We *had* been on schedule until the broken wheel incident, and now the humid 85-degree weather with scattered showers was taking its toll on us. We didn't make it back to my house until 5:00 p.m., almost three hours late. We needed to unload half the truck in order to have a path for the unit to roll out. By 7:00 p.m. we were positioned to move the unit onto the porch. The problem we encountered here was getting the truck lined up just right so that the tailgate could lower into position. Again we had the problem with the tail gate's jerky movement and stopping it while keeping the big unit from falling off. We used Bill's come-along again which made moving the unit off the lift gate and onto the porch extremely smooth and easy. Now came the task of getting the unit through the door jam with the 1/2 inch of clearance and over the big bump of the door jam. My young, 24 year old, strapping neighbor Peter, who is the picture of the perfect male, came along to help. He crouched down and lifted the unit over the door jam from inside the house and then Bill did the same with the back set of wheels from the outside of the house. Had it not been for Peter this would not have gone as well. Lastly we rolled the big cabinet into the station, closed the door and moved it into the corner and its new home.

This story is not yet over, it may actually only just be beginning. Since last year, when I first placed information about the unit on my web site, I have communicated with a number of amateurs who have a 204F-1. Some have had a 204F-1 or similar model on the air for years and others are in the process of restoring one. From lessons learned from these contacts, and from good engineering sense, taking its age into account, I have now developed a long list of "to-do's" before I place the 204F-1 on the air after such a long time in storage. The unit needs to be thoroughly cleaned and tested in accordance with the installation and alignment manual. I also need to purchase both a replacement DPDT coaxial relay along with the UG-999A/U RG-17/U to N-connector adapter (which I found a source of at a \$100 a pop) as the original ones are missing. I am also planning to add the ability to by-pass the first two amplifier stages to be able to drive the 4CX1000A tubes direct from a 100-watt exciter with the addition of a non-inductive 100-watt load



The massive power supply takes up the bottom half of the cabinet.

resistor from the grids to ground. I may also add a G3SEK tetrode screen voltage protection board. I need to have a 220-volt AC line installed as I run my current SB-220 and AL-811 off dedicated 120vac mains. I have already purchased a pair of used Dentron MT-3000A antenna tuners for use with the 204F-1 instead of using my flimsy MFJ-989C units just to be on the safe side.

At some point in the near future my Collins dream full legal limit DX contest amplifier will go on-line. It will likely be a full 20 years from the first time I saw it until I next transmit with the 204F-1. The present estimate for the cleanup effort, coupled with my work schedule and other time demands, will likely be another 6 months to a year. So it may not be until the spring or fall 2002 DX contest season before the 204F-1 makes her maiden debut on the amateur bands at N2CKH. I am in no hurry however. At present I very happy just to finally have the unit in my possession. When it goes on-line I will be extremely happy. With persistence and a little luck our dreams do come true. Could DXCC Honor Roll be next? Maybe so.

For more information, detailed photos and schematics of the 204F-1 visit my web site.



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