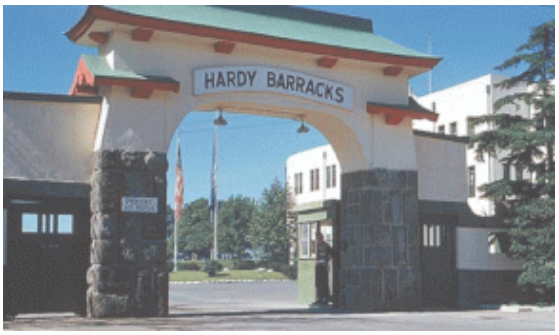
My Three Years with ADA...

No, not a gal, not a computer programming language, and nothing to do with Americans with Disabilities...ADA was a callsign of a U.S. Army radio station located in Tokyo, Japan...my assignment from 1953 to 1956. This is a little story with pictures of my involvement with ADA back then. All photos are my own except where noted.

ADA served the U.S. Far East Command (FEC) Headquarters as the primary communications station for U.S. Army communications across the Pacific to San Francisco, Seattle, Anchorage, Honolulu, Manila, Okinawa and across the Japan Sea to Seoul and Pusan in Korea and also to Saigon, French Indochina. We would later come to know the new name of Vietnam all too well. When I arrived in FEC in February 1953 the Korean War was in a half-way truce that was not formalized until July 1953. A state of truce still exists in 2003, the war not over.

My first assignment in FEC was to Hardy Barracks, specifically to C Company, 71st Signal Service Battalion, 8235th Army Unit, U. S. Army Central Command, Tokyo. Newcomers would roll through the main gate shown at right. The main building is shown below in the US Signal Corps photo used on postcards.



Hardy Barracks housed most of the offices of US Army Central Command Far East as well as A Company (photo), C Company (transmitters), and Battalion Headquarters Company (variety of communications including Telephone) of the 71st Signal Service Battalion. Hardy was located west of central Tokyo, slightly west from the Japanese Diet (their Congress). FEC Hq was northeast of Tokyo center. Transmitters for ADA were on a man-made island southeast of Tokyo at the edge of Tokyo Bay. Hardy residents enjoyed a nice post with a large consolidated mess, movie theater (tickets were a dime), library, snack bar, laundry, tailor shop, post office, chapel, and a branch of the Bank of America under one roof. A Post Exchange (PX) was outside in an adjacent building to the right above. A barber shop was next to the PX.

A typical Hardy billet room is at right where a gentleman from Iowa (Gerald Brame) is catching up on his correspondence. Wall lockers hold our uniforms and some civilian clothes (allowed off-duty). Helmet liner on top of outer steel helmet is stacked on the wall locker top (we wear the liner for ceremonial formations). The Kevlar “fritz” helmet would not appear until three decades later. Foot lockers on stands contain small things. Toilets and showers are in the floor below. It is stark and utilitarian but quite comfortable compared to other military billets.

A Geographical Orientation...

The 8235th's A Company is photographic and works out of a building in downtown Tokyo containing full lab facilities for still and motion picture work, black and white or color. The Battalion won two Unit Citations for their work on covering the prisoner exchanges during Operations Big Switch and Little Switch. They record visual history of the Army in this part of the world. The other Companies work with electrons and radio waves. The B Company Receiver site is located in the country northwest of Tokyo, sharing radio receiving facilities with the US Air Forces Far East. Since B Company facilities are so remote, personnel are billeted there next to the receiving site. C Company's Transmitter site on the edge of Tokyo Bay is within shuttle bus driving distance. Transmitters are deliberately located far away and near the water for technical radio reasons...ground conductivity and the rather large RF field from 36 transmitters ranging from 1 KW to 15 KW.

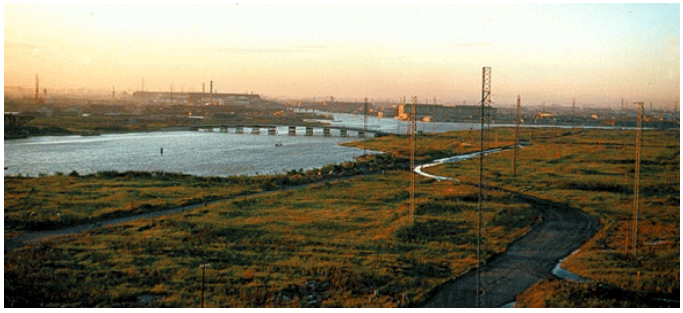
At the center of communications is "Control" at Chuo Kogyo, a converted civilian warehouse housing a central radio control point with an entire floor devoted to manual relaying of paper teleprinter ("Teletype") messages. All of the Central Command individual message centers send and receive from "CK" our short form for the Chuo Kogyo facility. CK is just at the northeast edge of Tokyo quite close to Camp Drake, a large replacement depot or "repple depple" in GI jargon. The majority of relayed teleprinter messages come and go from FEC HQ at Pershing Heights, an occupied area encompassing the old Japanese War Ministry about a mile northeast of Tokyo center. Pershing Heights is also the location of the United Nations Command that directed the Korean War effort.

To begin looking at ADA, we can take a shuttle out to Transmitters. The driver at left is waiting for us. A Japanese national, he is employed by the Army as a driver. Such employees wear a black uniform on duty. The busses are converted WW2 3/4-ton light trucks, truck bed removed and replaced by a small bus shell. Conversion was done at a joint US and Japanese plant in Yokohama.

This bus is for the Swing Shift. Transmitters has four operating teams working three shifts daily for 24-hour communications. The fourth team is on their day off. It's an unusual 12-day cycle of three days on each shift followed by three days off.

There is light traffic in late afternoon. The usual bus route avoids the center of Tokyo. Electric street cars in their green and yellow are all over the city. The iron bridge at right marks the entrance to a series of islands in the bay.

All sizes of shipyards are visible on the route through the waterways. A pair of Japanese Self Defense ships are being worked on at right. The Japanese have always been good shipwrights. Japanese shipyards elsewhere have made many of the world's supertankers.



The fourth and last bridge crossed is shown upper left. The outer guard post is at right. The Japanese national guards are mostly ex-military personnel retaining their military spit-and-polish and strict discipline. Their only arms are a riot baton, their function mainly to keep Japanese civilians away. The Far East Air Force (FEAF) 16th Communications Squadron shares Tsukushima Island with the 8235th Army Unit. FEAF personnel have to live on the island as well as operate their transmitters. The Army portion of Tsukushima is shown below in daylight.

The inner perimeter of the Army transmitter complex inside the dike wall, view from the water tower. The FEAF's 16th Communications Squadron complex in middle background. The entry road comes from the left to an inner gate post (white fencing on road). Two of the three Quonset huts to the right are for the Japanese guard force. The main building is T-shaped with the top of the T to the camera. The top of the T is about 150 feet long. The bottom of the T houses motor-generator sets that keep ADA on the air if the main power fails (too often).

Antennas, poles, and antenna feed lines are everywhere. The high double pole at left, made from two 70 foot telephone poles, carries the VHF and UHF radio relay antennas for telephone cable backup. All outgoing signals are normally carried over telephone cable. The radio relay equipment can handle the task if that cable is broken. Eventually this backup will have to move up in frequency to the low microwave range since the spectrum is already getting crowded at VHF and UHF bands in 1953. A smaller pole just to the left of the main building holds two more VHF antennas. Most of the poles seen above are for HF antenna feedlines. Ordinary telephone poles do that job, installed by Battalion Outside Plant Telephone personnel and their special drilling and hoisting trucks.

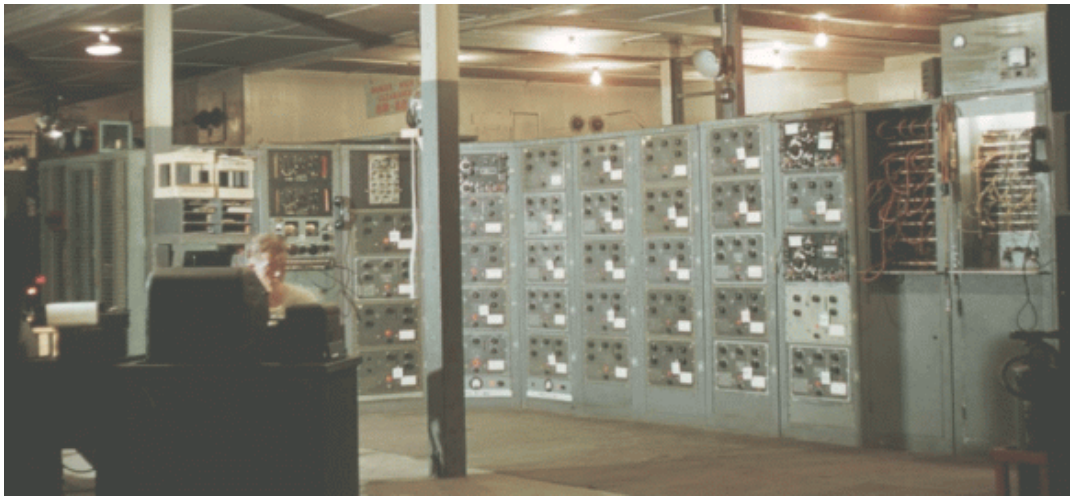
Most antennas are delta-match with a few rhombics. More rhombics will be added at the new site in Kashiwa.

At right, the inner gate and Japanese guard, the only guard who carries a weapon. The sign warns all that trespassers will be prosecuted by Japanese law. The guards all know the shuttle bus schedules and anyone or anything else calls for an alert to the "trick chief" (operating team supervisor) inside the main building. If it is a military visitor, one of the team inside must run out to the gate to check their ID. There are few visitors here.

Photo taken in summer. Note guard's uniform. The main transmitter building is straight ahead beyond the gate.

Inside the main building at the "top" of the T-shaped plan. HF Transmitters from 1 KW output to 15 KW output run along all walls. At the time of this photo there were about 36 transmitters installed.

The two blurry figures are seated at the control console which had two Model 15 Teletypes and our command telephones direct to the control center at Chuo Kogyo. The Teletypes are our command input and response written-record "logbook" for all transmitter operation. The emergency power generator room is to the left, over the square end of the rubber runner. The Officer In Charge (OIC) and his Executive have offices to the right and behind the camera. This shot is taken from the VHF and Carrier room doorway.



Exciter racks behind the control console, PFC Martin Lindemann at the Teletype. Most circuits were FSK RTTY. O-5 Exciters did the frequency control and keying for RTTY transmitters. Final frequency adjustment and mark-space "spread" was adjusted at the exciter. The Frequency Standard group at the Receiver site was part of each QSY, furnishing an audio tone for zero-beating a Mark and setting the Space at 850 Cycles from Mark. While there were two BC-221s in the rack, all frequency control was done with the aid of the General Radio equipment at Frequency Standards at Receivers. "Standards" would have the last word on our frequency, looped into our Teletype circuit to Control at CK. All frequencies were crystal controlled and identified by names rather than the frequency itself to avoid

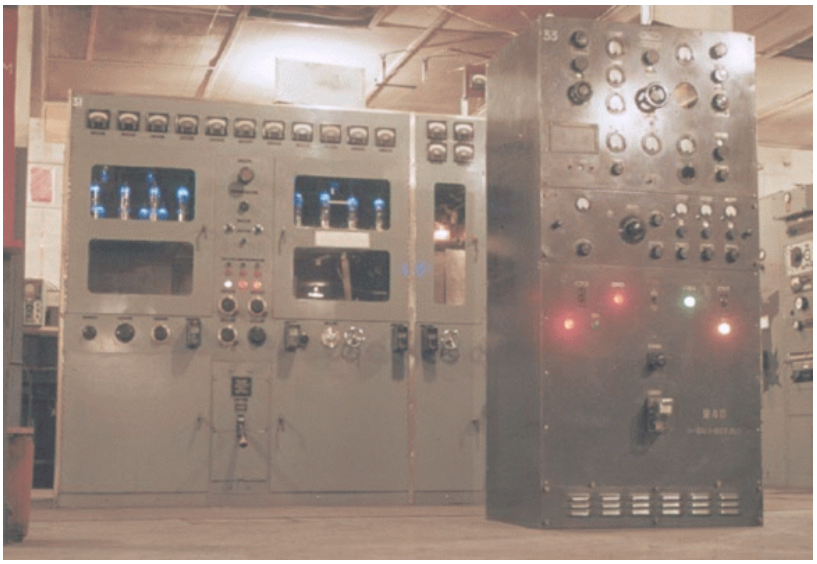
typographical errors. All of the frequencies for the Korean circuits were named for beer brands.

At right is the lamp-heated quartz crystal cabinet located on the other side of the exciter racks. Frequencies were already established by the Army Signal Office. Crystal blanks could be ground with the aid of the equipment to the right of the cabinet. Warming by lamps kept crystal temperature about the same as in the hot, vacuum tube exciters.

When a QSY order came over the order-wire Teletype (as at left), one person would change crystals behind the exciter rack. Another person would go to the transmitter itself to preset controls for tuning to a new frequency. A "Fox Test" sentence ('the quick brown fox jumped...') would already be put on the TTY (teletypewriter) line for that circuit by Control Center. Frequency Standards at the remote Receiver site would already set up on the new frequency (they were on the same Teletype order-wire loop). The person at the transmitter would adjust for proper tuning and the person at the exciter would zero-beat the Mark using audio on a devoted telephone line to Standards. With keying applied, Space was set via a "double heterodyne" comparing the Space tone audibly with an 850 Cycle audio standard.

Once Control was satisfied with final frequency measurement by Standards, they would remove the Fox keying signal and put the radio circuit back up. The SSB transmitters had more precise crystal control and would not need any Fox Test keying although it was sent to benefit the circuit's receivers at the other end. Standards would double-check the SSB pilot carrier frequency and report that on the order-wire. All of the military SSB circuits were 12 KHz bandwidth in the commercial format consisting of four 3 KHz audio channels. One audio channel was the SSB voice order-wire. A second audio channel was reserved for voice circuits through the message centers. The third and fourth audio channels carried 6 to 12 TTY circuits using AFSK. The AFSK tones were generated at Chuo Kogyo using "Carrier" equipment designed for that task. No CW circuits existed as primary radio circuits. The sole CW circuit was a third-priority use for the FEC Commander's aircraft from 1953 to 1955; that circuit's transmitter primary use was as RTTY. Some of the RTTY circuits had higher-speed 4-TTY-channel time-multiplexed single line into an exciter. For those the exciter's electromechanical polar relay was replaced with a special vacuum tube circuit. Multiplexing itself was done at Chuo Kogyo.

Heavy Duty Transmitters!



At right are two typical transmitters, a BC-339 at right foreground, 1 KW RF output, a Press Wireless PW-15 in background, 15 KW RF output, both running RTTY.

The BC-339 was a workhorse of the station. Designed before WW2 it was very conservative in ratings, contained its own power supply in the bottom section. Most of those at ADA were built during WW2 by the Lewyt Vacuum Cleaner company (according to the metal label attached, not surprising since a lot of companies produced whatever they could for that war effort). The middle section is a self-contained oscillator and driver drawer. The final amplifier was at the top and used two type 833 triodes in push-pull. The PW-15 seemed more power supply than transmitter. The power supply took up the left two-thirds, blue glow of mercury vapor rectifier tubes visible through windows. The final amplifier was to the right using air-cooled triodes (filament glow of one seen through the window on the right). The PW-15s were designed for commercial service before WW2. PW-15s at

ADA were eventually replaced by BC-339 and BC-340 pairing shown on the next page.

The BC-340 is actually a power amplifier that accepts the output of a BC-339 (in the middle to right of the access ladder) and boosts that RF output to 10 KW, continuous duty. The power supply for the BC-340 amplifier is the box at far left, behind the access ladder.

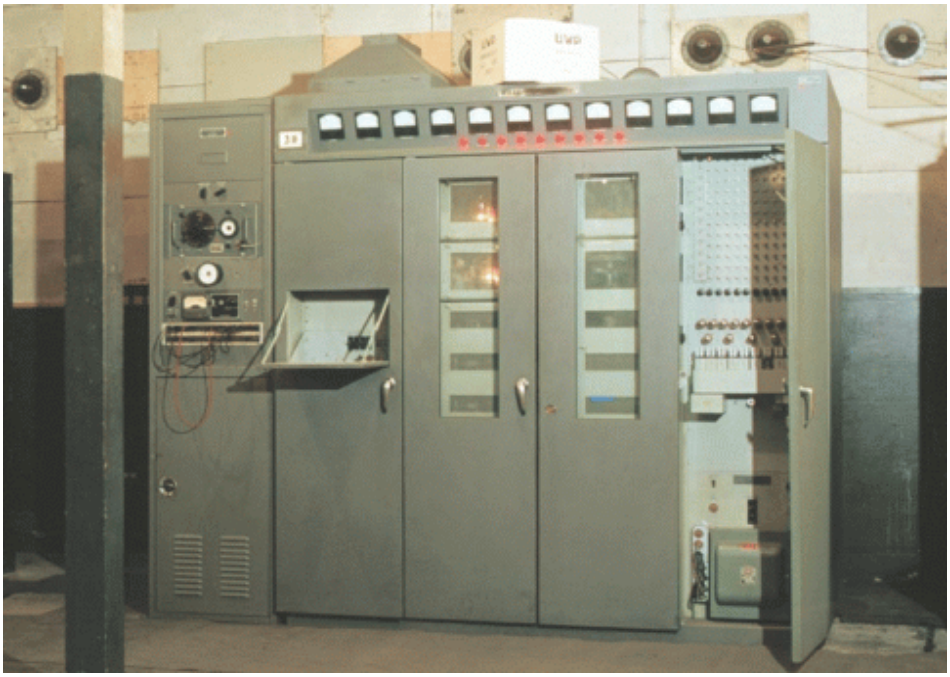
The final amplifier tubes are water cooled with the heat exchanger units outside. Heat exchangers are shown at right in the rare snow at wintertime.

The rod-like objects are insulators for the feedlines of other transmitters. One of the mundane tasks at Transmitters in winter was knocking down ice from feedlines and feedline poles. However, a little fun was also had in the winter with our "girlfriend" shown below, naturally named Ada. Alas, each officer-in-charge usually had us remove Ada as soon as she was made. The author is attempting to make out with Ada here but got a cold shoulder. The Quonset huts to the right of Ada and author are for the Japanese guards. They did give us help with Ada, supplying bits of coal for the "cosmetics."

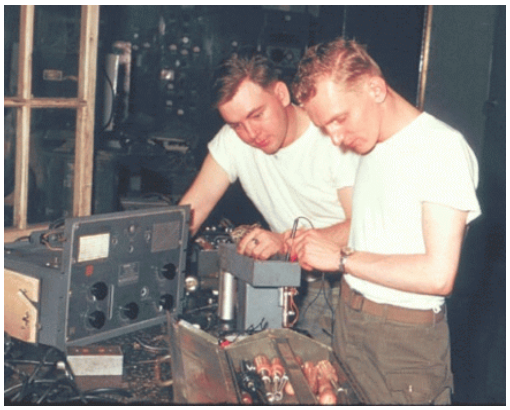
At right is one of the pre-WW2 Western Electric SSB transmitters. It was cranky to tune with very old-style components and wiring, but only one of the three at the Tsukushima site had to be repaired in a two-year period. At 1 KW PEP this one was on the circuit to AHA in Hawaii. All would later be replaced by the more modern 4 KW PEP Western Electric LD-T2, a post-WW2 design. Two BC-339s are in background to left.

Fire extinguishers are available all over but were never needed. The hanging sign warns of height clearance in English and Japanese. One Japanese national engineer was employed full time to handle more technical tasks...and also helped on obtaining more common electrical items used in the station.

All of the HF feedlines are balanced, open-wire. Pairs of bowl insulators served as feed-throughs on the walls. The large white triangle structures on top of each transmitter was a sign indicating the circuit's end station.

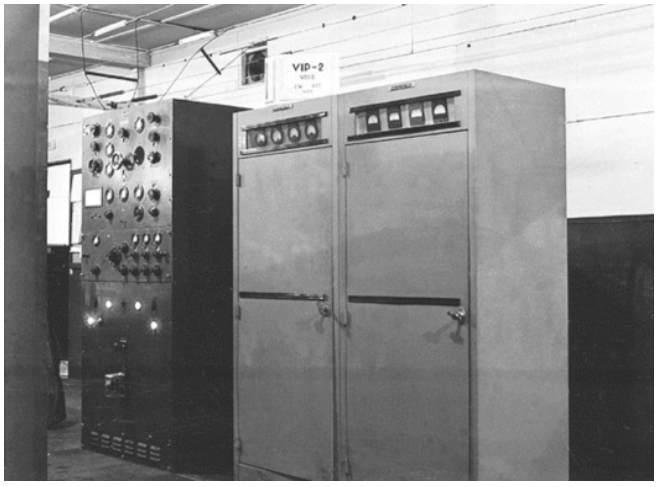


The LD-T2 at left was a joy to QSY. It was preset-tuned to ten frequencies. 12 servo motors did rotational tuning according to the setting of 120 potentiometers inside the right-hand cabinet top. This was almost a must since the design had individually-shielded amplifier stages and a complex air cooling system. RF power output was 4 KW PEP without strain. All amplifier stages except the final were Class A with the final running Class AB2. This LD-T2 is on the San Francisco radio circuit. A BC-339 and BC-340 pair, called "Frisco George" add four more teleprinter channels to the San Francisco path. Dark ceramic bowl insulators on the wall are feedlines' pass-through. Obviously there had been some changes on feedline positions since ADA Transmitters started operation in 1947...unused old access holes have been covered with plywood. The left-hand rack holds a small patch panel and measuring equipment for maintenance testing; the LD-T2 itself is the four racks topped by a dozen 6-inch meter indicators. This LD-T2 is the first of four to be used by ADA, the other three to be installed at the new Transmitters site at Kashiwa, north of Tokyo.



While the new Sideband transmitter works reliably day in and day out, some of the older equipment needs fixing. An O-5FR Exciter is having its trouble searched at right by Henry Peterson and Richard Slota. The long workbench is behind the PW-15s at one end of the tee arm of the main building. The old O-5 design was a box within a box style, the middle box out on the bench. The trouble with this one was a bad component in the inner box.

Note that both are in T-shirts, a concession to the hot interior of the main building in summer. The Officer In Charge (OIC) had allowed a temperature reading for "shirts off" and a thermometer is mounted on the left of the exciter racks with that marking. Shirts must be on when going outside to ID someone entering the inner gate.



At left one of the strange matings of old and (then) new. A BC-339 CW transmitter with a Wilcox high-level AM modulator and modulator power supply to serve as a moderately high power AM voice transmitter. This combination required some ingenuity in the interlock circuitry for cutting high voltage if either was opened. The interlock circuit voltages were different. This "VIP" circuit was the sole voice-only transmitter at ADA. ADA continued with RTTY and 12 KHz bandwidth SSB.

The open-wire feedlines are seen clearly here. For this combination there are two feedlines for two antennas. The BC-339 antenna switch selected the two out of three maximum.

Some Other Problems...

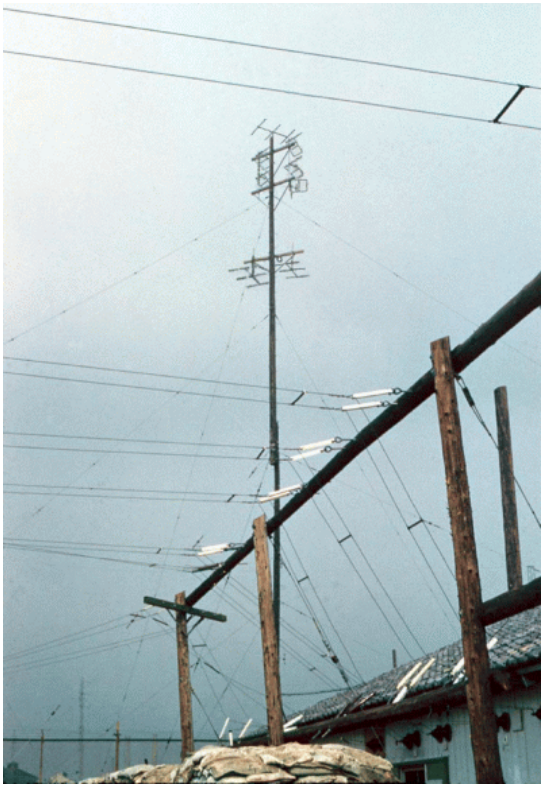
The Transmitters island of Tsukushima was very nearly at sea level. This caused seepage of sea water close to the island surface. At left SFC Joe Takahashi is operating a pump mounted on a trailer to remove water in a rock-filled capture sump around the inner perimeter ramp. Joe is the emergency power NCO and a likeable guy.

Part of the sandbag wall around the main building is in the background. Photo taken from the top of the ramp surrounding the inner perimeter.

Another trouble, albeit minor, is the continual sound of blower motors, of air moving to cool all the transmitters. It is nice to be able to take a few minutes off in a quieter place such as the"Ada's Place" snack bar. ADA retained half of the nearest quonset hut (of three) as a place to take a break. With a new coat of paint in the summer time it looked decent. In the right-hand photo Dick Slota is counting out Military Payment Certificates (MPCs), a part of the honor system of paying for coffee. All the paper money of US personnel in Japan was in MPC form. Coin is the same coin as in the US.

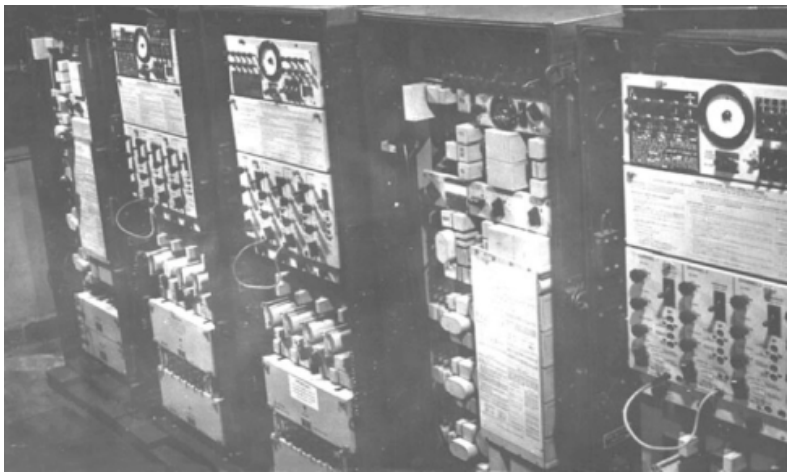
ADA has to keep signals coming in from Control in order to transmit anything. That is through telephone wire cables over land. These can get broken by one of the many construction crews rebuilding and modernizing Tokyo. Backup for the wire cable is the VHF radio relay equipment using AN/TRC-1 and AN/TRC-8 sets. The main VHF antenna pole is at right behind the HF antenna feedlines.

At the top of the antenna pole are a TRC-1 3-element Yagi, five TRC-8 square-corner reflectors, two TRC-1 Yagis on the bottom TRC-1 Yagis came with all three elements and boom section

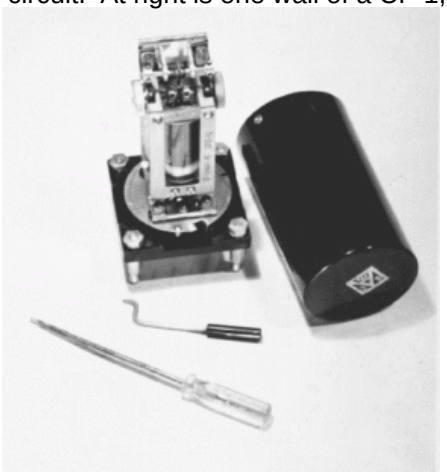


adjustable to marked Megacycles, no fussing about measuring lengths. Two more antennas are mounted on a shorter pole closer to the main building (out of sight in this photo).

Preceding page had an early 1953 VHF radio bench arrangement. In color at left is a group from 1954 with L to R, top to bottom, TRC-1 Transmitter and two TRC-8 receivers; four TRC-8 receivers; TRC-1 receiver (just out of sight at left), three TRC-1 transmitters. Two more TRC-1 receivers are on a bench wing to the left, out of the photo. All are FM with 12 KHz audio bandwidth. AN/TRC-1s have crystal control for both transmit and receive. AN/TRC-8 receivers are variable-tuning but quite stable. All run continuously for instant backing up of a faulty landline cable. Note: No TRC-8 transmitters were used; backup was primarily receive.

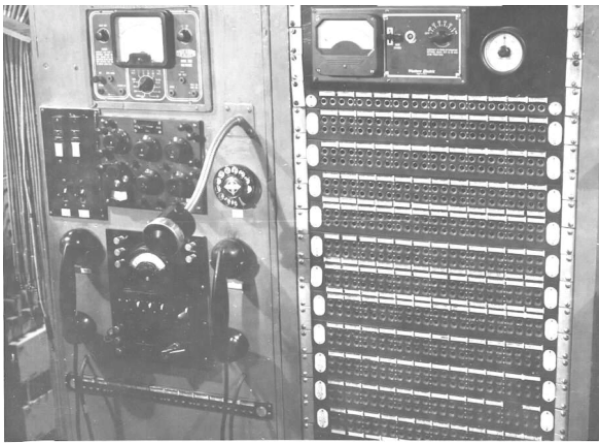


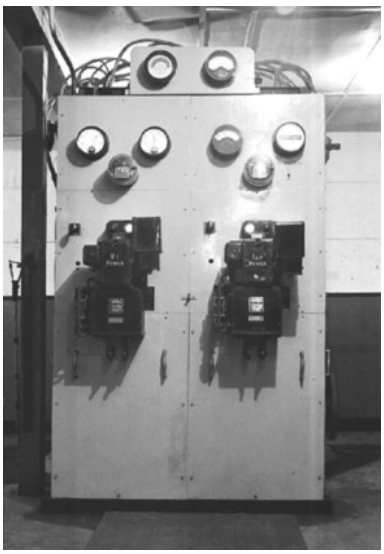
To handle all the voice bandwidth circuits, CF-1 "Carrier" bays were used, frequency-multiplexing four 3 KHz circuits to/from one 12 KHz bandwidth radio relay circuit. CF-2 Carrier bays separated four separate TTY loop circuits carried as tones on a 3 KHz voice bandwidth circuit. At right is one wall of a CF-1, two CF-2s, a CF-1, and, partially hidden, a CF-2 bay. All were made by Western Electric and their "cabinets" were also transit cases. Weight of one bay was about 400 pounds.



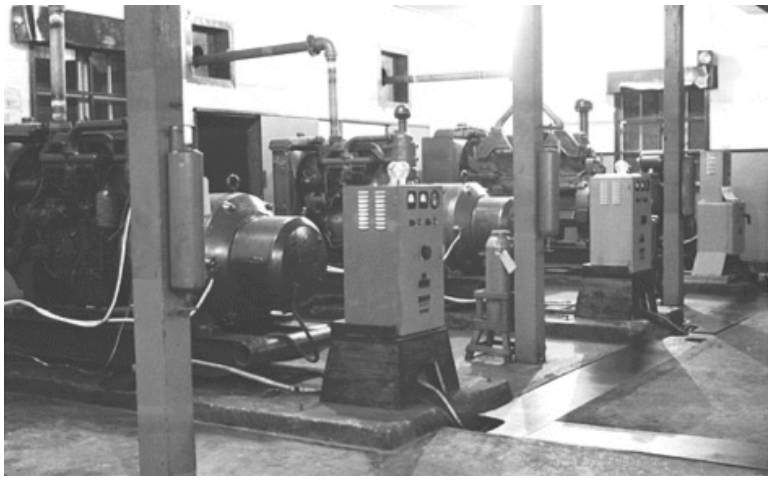
At left is a typical polar relay used in CF-2 Carrier bays and also in the single-TTY-channel exciters. Teleprinter loop current would energize the relay coil. Contacts could then switch the Carrier tones or the exciter frequency shifting circuit. All were plug-in with adjustments for the contacts (knurled wheel on each side of polar relay top). The special "S" rod and small screwdriver were all required for tools of adjustment. Each CF-2 bay had a special adjustment generator and sensor for contact alignment.

The patch panel at right made it possible to quickly reconnect every transmitter modulation line from telephone cable to VHF radio relay. Telephone practice had all patch panel jacks in vertical pairs. Internal contacts made the circuit through with no plug inserted, known as a "normal-through" arrangement. Patch cords are hanging on the rack at extreme left. Left hand rack contains telephone test equipment including a Wheatstone Bridge for measuring loop resistance. Below the photo is a "Thousand-Twenty" ringer to enable a ring over a telephone circuit carried over the VHF radio relay.





At left the main power box, Tokyo-supplied power on the left. Power demand at time of photo was 320 KW. The right side is for ADA's own emergency motor-generators, three of the six MG sets shown above right. During 1953 to 1955 it was not uncommon to have two power outages a month. One indicator for that was to check the vibrating-reed power frequency meter. When the normal 50 Cycle power frequency edged down to 48 Cycles, the Tokyo-supplied main power was soon to stop. That was dramatic at night, all lights extinguishing and the constant blower motor noise ceasing. The power man had to run and start up the motor-generators and synchronize them, other shift personnel had to check transmitter tuning as soon as emergency power was on-line. Of course, every HF radio circuit was interrupted causing problems at Control in Chuo Kogyo. Standards out at the Receiver site had to check all frequencies again. The Trick Chief would call Control on the phone when a power outage happened, usually receiving a laconic "Okay...let us know when you are back" while everyone else at transmitters was very busy.



A personal favorite Army vehicle, the 3/4-ton truck in light snow on the outer-perimeter road at Tsukushima. As wide as a modern Humvee, it is higher and could carry 8 in the truck on bench seats, 3 side by side in the cab

One pleasure off duty is the ability to wear civilian clothes on or off post. At left the Battalion's name has been changed on the Hardy Barracks direction sign but the duties remain the same.

There will be greater changes as shown following...

At right dusk after snow at the main Battalion entrance in Hardy Barracks' center. Tranquil.

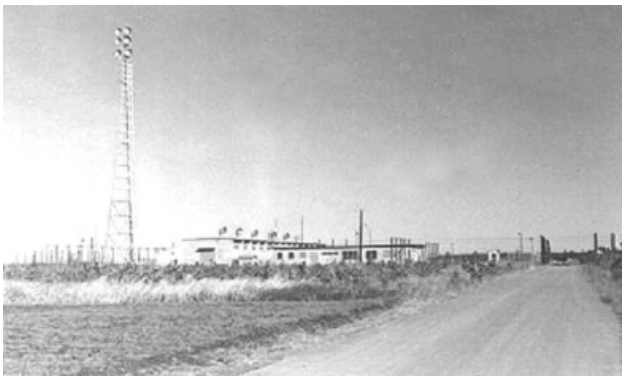
The New Transmitter Site

Several things happened during1954. Battalion Headquarters company moved to Camp Drake, C Company and the Transmitter site relocated to Kashiwa, northeast of Tokyo, using an old Mitsubishi airfield from WW2. I and some others attended a 2-week course on new General Electric microwave radio relay equipment at Camp Zama, the home of the 72nd Signal Service Battalion, a companion unit serving Army Forces Far East. One of the attendees from the 72nd was Irv McVey. Twenty-six years later Irv will be one of my immediate managers at Rocketdyne Division of Rockwell International..

The new ADA Transmitter building is concrete, in the middle of the airfield. A 200' tower holds the microwave "dish" antennas for four 24-voice-channel microwave terminals, two on-line and two always running as immediate backup. Two extra parabolic antennas are for manual switchover direct to Pershing Heights if the Chuo Kogyo facility is ever inoperative. Outside Plant Telephone men have already begun to install the rigid coaxial cable feeding the microwave dishes, barely visible above tower mid-way point in the photo at right. Barracks for C Company are new single-story wood structures shown below in front of the old Mitsubishi aircraft hangar that was kept and refurbished.

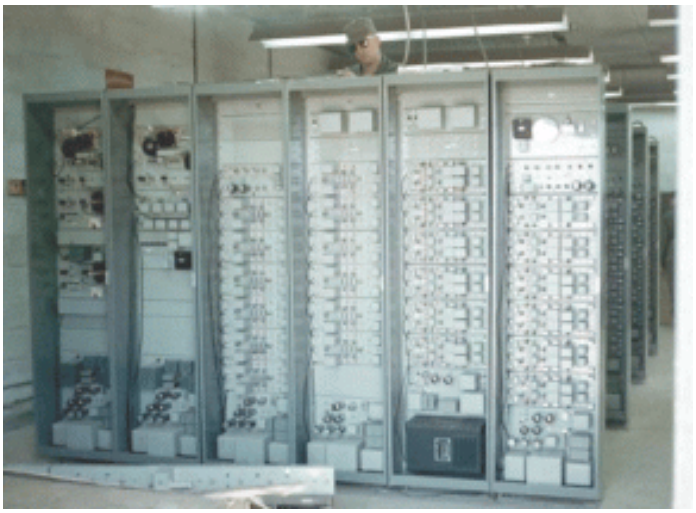
One side of the hangar contains the orderly room, stock room, day room, and mess hall. With three trucks and a fire engine along the other wall, there is still room for volleyball or basketball games and holding morning PT drills.

The Kashiwa site will have its own power with a capacity of 600 KW load from four very large motor-generators, two running and two as standby. The power building is at right behind the new antenna feedline support poles at one corner of the transmitter building. Feedline support pole cross-arms are over 15 feet high.



At left a long shot of the Transmitters buildings at Kashiwa in the middle of the old airfield. Dominating everything is the 200 foot microwave tower. There is a smaller building at the base of the tower to hold the microwave terminals, barely visible in this photo. The tower was originally planned to be at the leg of the tee of the main building but too many HF feedlines necessary prevented that. It was relocated to the top of the tee and a small block building added for the electronics. The road seen here is one of the airfield's runways now used as a service road.

At left, Outside Plant Telephone men preparing the 20-foot rigid coax sections for the microwave feedlines. The coax is 1 5/8" diameter rigid line that will be pressurized with dried air. At right the three are up on the tower attaching the sections. The top 4 parabolic reflector antennas, 10 feet in diameter, will be pointing to Chuo Kogyo. The bottom 2 will be towards Pershing Heights. Final pointing will be done after the coaxial line installation is complete.



At left a wireman is installing a 24 pair telephone cable to make the 24 voice channels to the microwave patch board. This photo shows the two RF racks on the left, two transmit racks, two receive racks. Mode is pulse position modulation, 0.5 microsecond wide pulses at an 8 1/3 KHz frame repetition rate, RF at 1800 MHz. All construction is “dishpan” style with chassis plate also the rack panel, tubes on one side, components on the other. Pulse modulators are in pairs in middle racks, pulse demodulators also in pairs in right-hand racks. Regulated power supplies in bottom of racks; black object in second rack from right is a 20 Cycle ring supply for channels carrying conventional telephone.

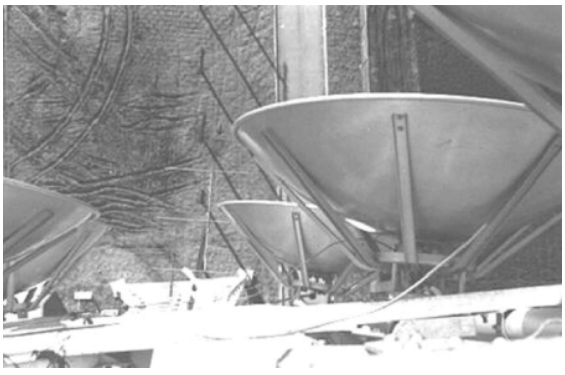
At bottom left the rack cabinet fronts and backs have been attached and the RF diplexer installed over the RF racks. The diplexer is two waveguide bandpass filters joined in the middle for the antenna connection. The diplexer is laying on the floor in the photo just above, waiting to be installed after telephone cable is connected. RF transmit and receive carrier frequencies are separate RF full duplex. Transmit peak power on the ground is 12 Watts, attenuated to only 2 Watts peak at the antenna (240 feet of coax). Note author’s tailored fatigues in self-timer bottom photo. At extreme left is the corner of a temporary wood table holding AN/TRC-1 transmitters and receivers and a Thousand-Twenty ringer for telephone communications during installation. Two TRC-1 Yagi antennas are already on the tower at mid-point and near the top. When installation is complete the microwave terminals will furnish all communications into and out of the Kashiwa site. Two terminals will be always

on-line for 46 channels of audio (2 channels as microwave voice order-wires). Two other terminals will be running spares, ready for instant patch-over. In case of total Chuo Kogyo failure ADA can communicate by microwave directly with Pershing Heights and FEC HQ through the bottom two antennas. Each terminal's RF section is fully duplicated with automatic switchover to spare RF in case of RF failure.

Corporal Jess Matlick at the microwave toll test board (Signal Corps photo at left). The jack field in foreground handles the 96 pairs of microwave channels (running and spares), CF-1 and CF-2 Carrier bay input and output, and several conventional telephone lines all over the site. In the background are the "Christmas tree" terminal blocks for cabling to allow jumper wire pairs to connect the cable pairs to the jack field pairs. The white circular objects are plastic covered rings that act as jumper pair guides. Patch cords are in the rack to the left of the toll test board. In case of microwave terminal failure, on-duty microwave men can manually reroute 24 channels to a running spare terminal.

At right the author playing at adjusting a demodulator on one terminal (Signal Corps photo). The standard oscilloscope is a Tektronix 511AD. In the author's lap is the huge General Electric manual for the terminal. The terminal will later be given an official nomenclature as AN/FRC-23 by the Chief Signal Office. The total vacuum tube complement is about 360. Mean time between failures (MTBF) is long and due to tube failure. Average of all 8235th microwave station terminal failures was about one every 8 months.

At left, looking down the microwave tower ladder from mid-point platform. Coax lines are on either side of the ladder. A cage of straps has been placed around the ladder, supposedly for some kind of safety. From the 70 foot mid-point and up requires climbing an internal ladder. Square building at the bottom for microwave terminals. At right a view from adjoining triangular tower side. Temporary 3-element Yagis for AN/TRC-1s are on telephone pole cross-arms at mid-tower and under the bottom 10 foot diameter microwave dishes. Andrew Corporation antennas have a hole near center for a 150 W spotlamp acting as a de-icer. Not needed at Kashiwa. Shadows on ground are from feedline support poles.



From tower top with aircraft warning light at extreme right looking towards barracks and aircraft hangar (middle back-ground from photo center to right. Farms dot the airfield between runways now used as roads. Antenna and feedline poles have sprouted everywhere.

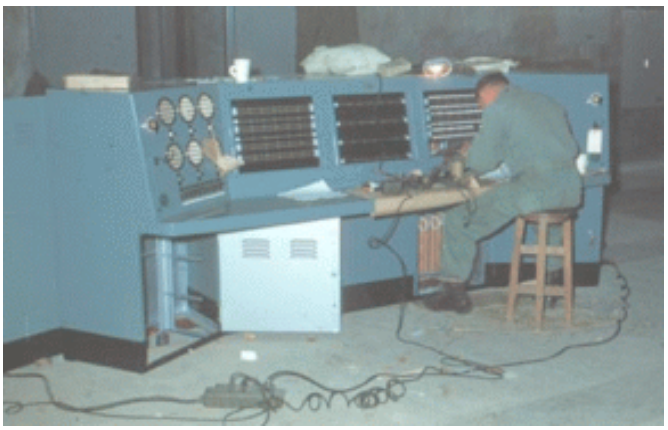
At right, looking to the right along the same runway as seen above, another cluster of farm houses and more antenna and feedline poles. The same warning light, one of two at the top. The RF field from transmitters was strong enough to blot out most Japanese radios

on farms. No EMI or RFI restrictions then...

Above left, two Signal Corps photos showing the “antenna farm” conversion of the airfield to a different use. The bottom of the tee of the main building is to the right in right above, part of the loading dock to the right of main entrance double doors. Objects on roof in left photo are air vents to get rid of about 200 KW of waste electrical heat. Left photo shows the temporary Yagis on microwave tower.

At left one of the four 300 KW motor-generators in the power building, SFC Joe Takahashi standing between it and the air compressor and tanks used to start one of the standby 16-cylinder marine diesels that turned the generator. Two motor-generators were always turning, two kept as standby units. Main electrical panel at extreme right. ADA at Kashiwa did not suffer from sudden electrical power failure. Noisy place...

Main transmitter room (top of the tee shape) to right at the beginning of the move from Tsukushima. Room length about 150 feet. Windows have two pairs each of clear glass bowl insulators for feedlines. A three-phase AC power buss of rectangular copper buss bars runs the



length of each wall at chest height. Final painting not completed when this photo was taken. New transmitter control console being installed, jack fields and audio

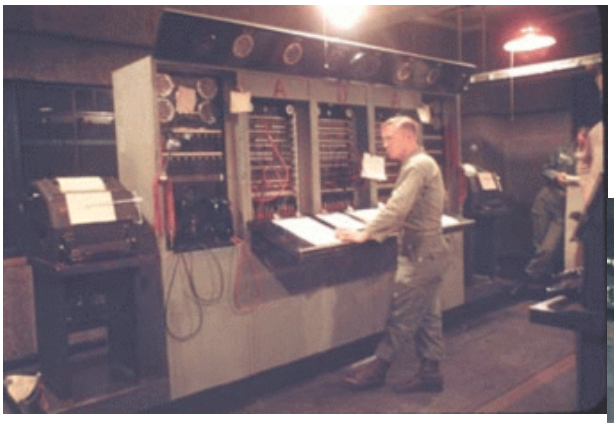
monitor speakers now centralized. Two Model 15 Teletypes will be at console ends as order-wire units.

At right maintenance NCOIC SFC Don Ross checks audio on one of the new Western Electric LD-T2 units. The windows with bowl insulator pairs are visible at top background. Signal Corps photo. Servo motor preset panel open at right showing 120 potentiometers at top and servo amplifiers at middle of rack.

Kashiwa Transmitters main room after final installation of all transmitters. Four more WE LD-T2s were added to the lone LD-T2 moved from Tsukushima. Photo by unknown other. Completed console at middle background. Rubber strip rugs are more for operator comfort and to avoid static electricity pickup, not for power electricity shock. The odd little structure in middle of floor is a “butt can” for smokers. It was not a crime to smoke on duty in the 1950s. Double doors at far end of room are about 12 feet high. At left of left photo are two Collins Radio 50 KW CW transmitters configured as 40 KW PEP Class B amplifiers for LD-T2s.

At right the Collins Power Amplifier, photo by unknown other. This power amplifier was also preset-tuned to carrier frequencies as with the Western Electric LD-T2. QSY of the combination was very easy. Meters on top were for antenna currents. With 600 Ohm open-wire feedlines and 40 KW PEP, the antenna feedline current was a bit above 8 Amps peak. A WE LD-T2 with a Collins 40 KW power amplifier into a 400 foot rhombic as in the San Francisco (AGA) circuit resulted in a very good signal strength at the other end.

Exercising Control...



This is “Control,” the Center of FEC Hq communications at Chuo Kogyo. Not a Message Center, Control oversees Transmitters, Receivers, and controls the flow of teleprinter messages to and from all the other stations in the Army’s Pacific network.
A wide shot of Control is at right, center console hidden by the

middle bank of teleprinters. Handsets for San Francisco, Honolulu, Seattle and Okinawa permit instant voice communications with them over the SSB voice channel order-wire. Behind the camera is a glass partition isolating Control from the clattering din of 220 teleprinters of Teletype Relay on the same floor.
At left the Teletype Relay part of the first floor taken from the Control doorway in the partition. Time exposure blurs out the relay operators tending each bank of machines.

One bank shown below. Each rack contains a paper tape printer-puncher (chadless tape) and a transmitter distributor accepting outgoing messages. Distributor automatically switches readers when first tape is finished. Operators manually load, take off tape reading the address preamble of each message. Triangular signs above each rack denote the TTY circuit far end.

Interruptions will happen in any TTY circuit. The banks of machines at left make copies of all outgoing messages so they can be re-sent immediately. All outgoing tape dumps into waste bins at the bottom of each TTY rack. In the foreground is a rack of some tapes ready to resend.

This whole floor is air conditioned to keep the paper tape in good shape. While that is a comfort to signalmen on that floor, they must work in a continual clatter of the teleprinters that never ceases.

By contrast, the “Carrier” room on the floor above Teletype Relay is almost as silent as the night...just rack after rack of electronics that electronically compresses many voice and teleprinter channels for transmission on a single

audio circuit or decompresses incoming signals to their separate audio or TTY circuits.

Carrier is an un-busy place...equipment is long-lasting and reliable, doing all the work. A couple of humans wait for errant electrons to break free so that they can direct them back to their assigned path.

The only apparent activity is the blinking lights on the four racks shown below in more detail - The “Mux” (time-division Multiplex) equipment is relatively new in military communications of the 1950s. A Mux can take up to four teleprinter signals, time-slice them, then send them out on a single circuit for transmission. It can take an incoming Mux-format signal and un-slice them into four separate teleprinter channels.

Designed in the early 1950s under a USN contract, it used 7-pin miniature thyratron tubes as memory elements. Each teleprinter channel needed one of the four identical pull-out chassis on the bottom (left-hand rack as the bottom channel already pulled out). Six neon bulbs (just above the meter in the channel pull-out) would indicate teleprinter activity, one for a start time and five for the data bits. The multiplexed signal could be transmitted as FSK the same as a single channel teleprinter.

If designed using year 2000 techniques and components, all four racks could be compressed into half the size of one of the pull-outs with room to spare. Lots of circuits means lots of wiring, both for cables entering Chuo Kogyo and for cables within. Changes of wiring were needed from time to time and such are done by moving jumper wire pairs on the “main frame” shown at left. Blocks of contacts were mounted on the frame (seen with a white coding strip on the front at left). Each block had 48 contact pairs top and bottom. All cables’ wire pairs were wrap-connected on the bottom contacts, regardless of the cable origin. Jumper wire pairs were wrap-connected to the top contacts. Use of the jumper wire allowed a very flexible connection system without physically moving any cables or rewiring cable terminal connections. The back side had many, many jumpers running back and forth. This type of cable circuit routing originated in civilian telephone companies of the 1920s.

Sometimes it was necessary to change a circuit or group of circuits <u>now</u> rather than wait for a wire man to move the jumper wires. This was accomplished by a “patch panel” that is the big brother of the old telephone switchboard. It consists of horizontal jack strips with pairs of jacks having internal contacts between top and bottom jack pairs. These internal spring contacts “made” (completed) a connection “normally” with no plugs inserted. That was called a “normal-through.” If a wire circuit needed changing, patch cords with plugs at each end were inserted, breaking the “normal through” connection.. All wire circuits went through a patch panel. Patch panel plug cords and jack strips made it easy to change a wire circuit routing and to perform tests on a particular wire circuit. Wire circuits and radio circuits were all considered together in the whole of ADA communications.

The intrepid warrior at below right is the author, ready to fight all electronic troubles with his trusty issue solder gun. This is in the center of Chuo Kogyo's microwave facility in 1955, next to the Carrier room (door at right background). The CK microwave room had 9 terminals, each handling 24 voice-grade audio channels. With 216 different audio circuits, the microwave section had to have its own patch panel and channel testing capability.

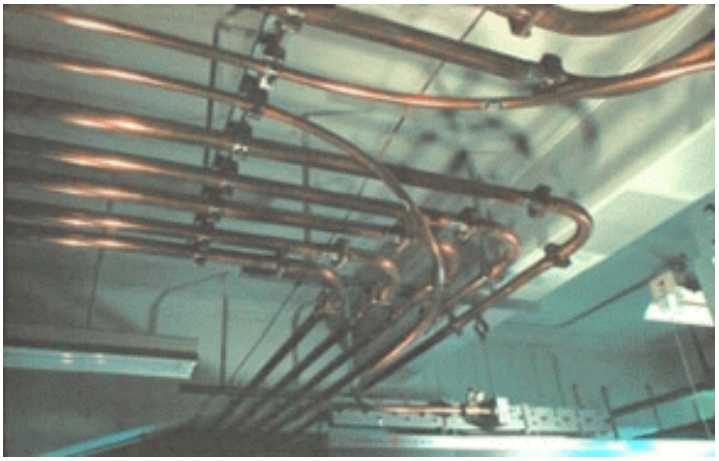
Two black and white Signal Corps photos below showing the CK microwave installation in progress. The GE equipment is without full cabinets during installation and initial testing. RF racks to the left, AF racks to the right. Dual RF transmitter panels are side by side at the top, dual receivers vertical in the left-most rack. Fault-sensing and switchover was automatic for either, along with fault indication.

Transmitter units used 5th overtone crystal oscillators with a 2C39 septupler to reach 1800 MHz, the final amplifier also being a 2C39 having 12 W peak pulse RF output. Receiver local oscillators also had 5th overtone crystal oscillators and the 2C39 inverted-lighthouse septupler. Receiver IF strips were similar to radar IF design, the horizontal box-like objects just below the meters in the left photo. Since RF operation was full duplex, transmit and receive frequencies were separate, coupling to a common antenna accomplished by a double waveguide bandpass filter diplexer that mounted above the left-most four racks. Part of the 1 5/8 inch rigid coax lines are installed here. A pulse frame consisted of four 0.5 microsecond sync pulses followed by 24 individual 0.5 microsecond wide channel pulses, frames having an 8 1/3 KHz repetition rate. Modulation was by pulse position within a channel slot. Transmit pulse frames were crystal controlled in rate asynchronous to receive pulse frames. Channel modulation was done in the center two racks, channel modulators in pairs. Channel demodulators were also in pairs, located in the right-most racks. The frame rate allowed 3 KHz wide audio channels with each channel demod having a low-pass filter that removed any higher frequencies. Signal to noise ratio for each channel was better than 45 db.

Below left the microwave tower at CK with antennas at final positioning. Four dishes to the right are to Kashiwa Transmitters. The two at left are for backup to Receivers (Receivers retained their landline cables as primary linkage). The three antennas in the middle are backups to FEC HQ at Pershing Heights. Landline cables to Pershing Heights was also prime. Two microwave terminals to Transmitters was the only link to them with two more terminals as on-line "hot" backups.

Complete room at right, author by scope cart, Specialist Eflinger at far end to show length of room. Wire cable raceway above right end of terminals. One antenna diplexer visible at upper left corner. An "up-to-date" feature is fluorescent lighting as compared to ordinary incandescent lighting elsewhere at CK.

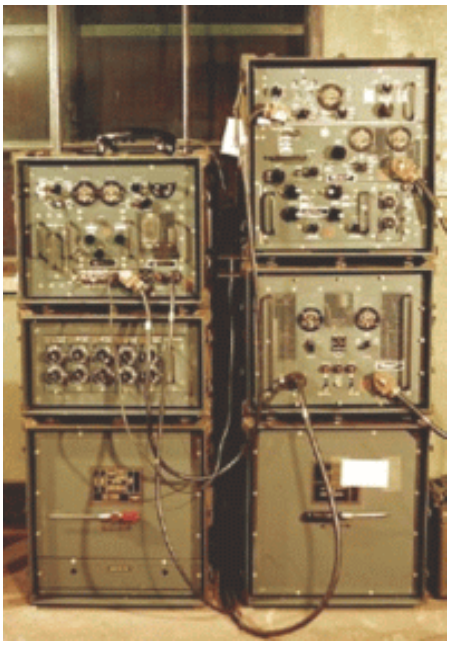
Nearly completed rigid, pressurized 1 5/8" copper coax lines at below left, straight and elbow sections made by Andrew Corporation who also made the parabolic reflector antennas. At time of this photo two runs were hand-bent to reach diplexers, probably due to a small shortage of coax. Pressurization by dry air accomplished by another Andrew unit not shown, 1/4 inch copper tubing supplying air into daisy-chained coax runs. Air pressure gauge is seen installed at feedpoint of one diplexer at lower right. Pressurization by dry air kept coaxial line losses under 8 db per terminal.



Below right the author at the CK microwave teleprinter order-wire. There was very little traffic on that Model 15 since the microwave equipment was reliable and long-lasting. Just the same, every section and subsection was tied together by both voice and teleprinter order-wire circuits. If changes were needed or emergency handling required, the teleprinters provided a written record at each end to minimize any mistakes. Photo in November 1955, olive drab winter uniform, "Ike" jacket removed. Poplin shirt had no insignia; summer uniform khaki shirts had insignia.

On the next page, a shot of the CK roof antenna farm at dusk. Yagi antennas for TRC-1 and TRC-8 VHF still exist as backup for a few other installations. The square structures obscuring the microwave tower are

antennas for a new Signal Corps radio relay system being evaluated for use elsewhere in FEC Central Command. The new Western Electric radio relay set is shown to the right in its transit cases. It operates over a 40 to 400 MHz range and includes cable repeater amplifier units powered from either end. The system is designated AN/TRC-24 and will prove its worth in Laos and Vietnam in the decade following.



Receivers and Other Things...

I visited Receivers but had no chance to take pictures there and regret that. The US Army and USAF receiver site was the largest in the world at the time. Receivers was equipped for both frequency and space diversity but their vast antenna field had little photogenic value, just lots of poles and wires scattered over dozens of farm plots. From the Receivers backup micro-wave tower, their antenna farm looked much like the antenna field at Kashiwa Transmitters.

In mid-1955 “receivers” was renamed Camp Owada and “transmitters” at Kashiwa renamed Camp Tomlinson. That meant new signs but little else. CK referred to them as just “receivers” or “transmitters.” Downsizing of the US Army in Japan began in 1958 in combining the FEC Sig Svc Bn with the Japan Sig Svc Bn (formerly the 72nd) with a combined headquarters at Camp Zama. The big Hardy Barracks building was turned back to the Japanese in September 1958, Central Command offices moved elsewhere. By 1964 all long-haul communications, including transmitters, receivers, tape relay, and microwave was transferred from Army to USAF with technical command out of Fuchu. The old USAF Funabashi transmitter station was closed and its equipment moved to Kashiwa (still called Camp Tomlinson) between 1965 and 1968. In 1979 the Kashiwa site was turned over to the Japanese Self Defense Forces. Camp Drake was closed entire in 1986. Only Hardy Barracks remains as a US installation in the Tokyo area, much reduced in size. As of 2003 the only central Honshu Army signal unit is the 78th Signal Battalion at Camp Zama under control of the 516th Signal Brigade headquartered at Fort Shafter, Hawaii, the HQ of USARPAC, US Army Pacific. Callsign ADA remains as the primary one for USARPAC today. Those at Camp Zama still wear the old Fuji patch on the left shoulder a half century later...

I was fortunate in being able to photographically record where I served. Most of the black and white photos were done with a Kodak Retina II 35mm rangefinder camera, film developed by self in a developing tank, loading via changing bag. Color photos were on Kodachrome, mostly using an Exacta VX SLR purchased mail-order through a duty-free vendor in Hong Kong. Color slides were processed through PX services. All photos in here were first scanned by an HP 2400 DPI scanner, then repaired and adjusted by Adobe PhotoDeluxe 2.0. Many slides had suffered emulsion reticulation and some dye changes. These were repaired as much as possible but a 47 year long storage made some slides unuseable. Six of about 600 of my photos were published in the November 10, 2002, Sunday edition of the Pacific Stars and Stripes military newspaper. This document was composed with WordPerfect 8.0 and Adobe Acrobat 4.0.

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formerly RA16408336, Sgt (E-5), MOS 281.6, US Army Signal Corps 1952-1960
20 September 2003