

1915 Onwards

It is unknown just when radio licensing started in Canada after the passing of the Radio Act of 1913, but they were certainly slow at getting off the ground with radio operator certification. The U.S. had created their Department of Communications in 1912 (later replaced by the F.C.C. in the 30's) and by 1913 had established Radio Inspectors in most major ports, conducting exams and issuing certificates. At that time, since the U.S. had no restriction as the nationality of persons being certified, many Canadians went south and obtained their operator's certificate.

In 1915, Great Britain passed legislation requiring all vessels over 3000 tons to be radio equipped. This legislation was soon copied by most nations and created a great demand for certified operators. Shortly after, Spratt Shaw Schools in both Vancouver and Victoria started radio operator training courses with Bruce Arundel as instructor in Vancouver and Chris Brown in Victoria.

This turn of events was unexpected by the Department. They had no Radio Inspectors and here were schools turning out people demanding examination for certification. Initially, Haughton had to give the code part of the examinations and then send the written papers to Ottawa for marking. Finally, in 1917, he found his answer in a naval rating, Bruce Restall.



Restall

Bruce Restall had served an apprenticeship as a machinist in Britain and then immigrated to Victoria where he found employment as a machinist in an electrical shop.

He soon qualified as an electrician as well.

In later years, he mentioned he had become an amateur before WWI broke out and when it did, he immediately joined the navy and was assigned to a submarine as a wireless operator. He showed me a certificate issued by the Minister of the Naval Service appointing him as a wireless operator first class and that this was his warrant. He was later moved into Esquimalt as an instructor training wireless operators and before long he was moonlighting by teaching wireless at Spratt Shaw's night school.

This must have caught Haughton's attention as he arranged for Restall to be transferred under his command and had him take over examinations and ship inspections. When he was not employed on ship inspections or examinations, he worked as a Radio Electrician for Hughes.

In 1917, the CGS Quadra collided in fog with a CPR steamer at the entrance to Nanaimo Harbour and had to be run aground to avoid sinking. She sat there for several months where at high tide only her funnel was above water. Finally she was sold, re-

floated and patched up to haul ore from Britannia Mines to the smelter in Tacoma. In the 20's, she was re-sold and used in the rum running trade. She was finally caught by the U. S. Coast Guard, towed into San Francisco and sold at public auction for \$1,625, then scrapped. An ignominious end for a vessel that had been a friend to the men of the radio service over many years.

Due to the isolation of Triangle Island, the ruling of hiring only married men relaxed. In late 1916, the bachelor operators at the Island jointly hired a rather plumpish Miss Brunton, a woman in her late 30' s, as their housekeeper.

To their chagrin, she soon had them organized.' They had to dress for dinner with clean shirts, ties and jackets and they had to clean their shoes. As compensation, she was an excellent cook and their dwelling was kept spotless. In November 1918, the fisheries vessel Galiano, doing double duty as a lighthouse tender after the loss of the CGS Quadra, called in to deliver supplies and to pick up two passengers, Miss Brunton and Sid Elliott. At the last moment a message arrived cancelling Elliott's transfer and he woefully climbed back up the 1000 steps to the station.

Suddenly a storm struck, the seamen dumped the rest of the supplies on the beach, pushed Miss Brunton into the work boat and headed out to the waiting Galiano. They were quickly hoisted on board and set sail for Ikeda station on the Queen Charlotte Islands. That was the last anyone ever saw of the Galiano. She apparently foundered and sank with her crew of 26 - and Miss Brunton. The only thing heard was an incomplete message "We are sinking" sent out by the operator Michael Neary and picked up at Triangle by his brother, Jack Neary.

In 1920, it was decided that the Ikeda station would close and that the Triangle station would relocate to a more sheltered site at Bull Harbour.

Due to the improvement in equipment, the need for a repeater station between Triangle and Digby Island was no longer necessary. Also, Ikeda's revenue for handling telegrams from the nearby mines was substantially reduced since the mines were closing. On its closure, the station building and its equipment were moved by barge and set up at Bull Harbour and then Triangle's operation was moved to the new site.

The lighthouse on Triangle was also dismantled since it proved to be too high above the ocean ,and mariners complained it was in the clouds most of the time. It was replaced by automatic acetylene lights mounted at lower levels. Only the equipment was removed and within a few years the buildings had blown down and disappeared.

In February of the same year, a 79 page consolidation of the Radio Telegraph Act of 1913 together with its various updated Radio Regulations was published by the Department of the Naval Service (available at a cost of 10 cents per copy).

Of particular interest was the various classes of operator certificates:

- (1) Extra First Class
- (2) First Class
- (3) Second Class
- (4) Third Class
- (5) Emergency
- (6) Experimental
- (7) Amateur Experimental

In 1920, Sid Jones, a WWI veteran with two years in the trenches in Flanders, graduated from the Sprott Shaw School in Vancouver and was examined by Bruce Restall. He passed the examination but was advised it would take three months before Ottawa issued his certificate. Jones and a couple of other new graduates then went down to Seattle for a bit of a celebration and while there dropped into the Department of Communications office in the L.C. building and met Inspector Wolfe. Upon inquiry about writing for a U.S. certificate, they were advised there was no problem and they sat down and started writing. Two days later, they not only had their certificates but Wolfe had lined up jobs for them on U.S. vessels.

Jones made an initial trip on the San Francisco run and then switched to the Alaska run as purser/operator, and to his surprise, was paid overtime (unheard of in Canada). Apparently he had lots of overtime since he had to check the cargo when it was loaded on board and again when it was off-loaded. The result was that when he returned to Canada three months later, he was able to bank \$600 American, a large sum of money at that time. He got his Canadian certificate and signed up with the Marconi Company and was assigned to a ship on the Orient run.

In 1923, Jones was about to get married so he swallowed the anchor and joined the West Coast Radio Service (he had a first class certificate by this time).

After a few days at Point Grey where Jack Bowerman was the Officer-in-Charge, he was assigned to Alert Bay under Tommy Raine. Three months later, he received a telephone call from Houghton instructing him to proceed to Digby Island to relieve its Officer-in-Charge, Sid Jackson, who was going on vacation.

Many of the department's early operators had never bothered writing their certificates and, in an effort to force them to obtain their certificates, an edict had been issued that certified operators would go ahead of uncertified operators on the seniority list.

So Jones arrived at Digby Island to find himself in charge of uncertified operators with 10 - 12 years service. This action created a furor but it did force some to apply

themselves to obtain their certificates. Some, however, never did write for their certificates, secure in the knowledge that as permanent civil servants, they had a sinecure for life and could not be fired. These operators never received promotions, and some of them were still operators in 1946.

When Jones took over at Digby Island, he found the station typewriter a mess so he requisitioned a new typewriter brush. Haughton wrote back suggesting he use an old toothbrush. Jones, always a humorist, then requisitioned a used toothbrush but Haughton had the last laugh - he supplied one!

In 1920, Walter Howard was appointed as the first Radio Inspector west of the Great Lakes and was located in Victoria, with Haughton. In 1924, he transferred to Ottawa but soon regretted his move and tried desperately to get back to Victoria.

In 1925, Jack Bowerman was appointed as the first Radio Inspector in Vancouver and set up his new office in the Dominion Bank building on Hastings Street.

A. L. (Andy) Gray and his brother Gifford Gray were also appointed Radio Inspectors with Andy replacing Howard in Victoria and Gifford going on to open the first office in Winnipeg.

In 1927, Harold Tee opened a new office in Edmonton, Sid Jones became assistant under Gifford Gray in Winnipeg and Jim Harker was named assistant to Bowerman in Vancouver.

In 1928, Walter Howard finally got his transfer back to Victoria but paid the price by dropping in seniority behind those appointed in 1925 and 1927. He became assistant to Andy Gray, a position probably kept open for him by Haughton.

F.C. (Charlie) Aitken went to Ottawa to replace Howard.



In WWI he was seconded to the RCAF, with the temporary rank of Squadron Leader, to help set up the Commonwealth Training Program for radio operators.

He remained in the Air Force after the war and ended up as its Director of Telecommunications.

About this time, the Department developed an internal examination, called the "*Barrier Exam*", which was a requirement for promotion to Senior Operator. It consisted of copying the international radio telegraph code at 25 wpm on a typewriter, similarly copying the American Morse telegraph code at 20 wpm, an extensive examination in message tolls and departmental accounting procedures and finally, an oral exam on the maintenance and operation of typical departmental equipment and power plants.

It is not possible to ascertain just when E. Hughes left the service but, by 1920, R.L. Stephenson was the Divisional Engineer. Stephenson had been an apprentice engineer assisting Marconi in some of his early work, had graduated from the Marconi School for Wireless Engineers at Frinton-on-Sea in Britain, and had worked as an engineer on the building of the chain of stations in eastern Canada.

In 1922, the Radio Service was transferred back to the Department of Marine and Fisheries. At that time there were 740 broadcast stations in Canada with an annual licence fee of \$50 and 740 radio amateurs whose annual licence fee was \$1.00.

In the 1923 call book, only 6 broadcast stations are listed in B.C. with 5 in Vancouver and one in Nelson. Surprisingly, none are listed in Victoria.

In the early 20' s, the old spark equipment was phased out and replaced with the more efficient tube equipment. Later in the decade, a chain of automatic radio beacon stations was established as an aid to marine navigation.

In his circular No. 286 dated May 19, 1922, Haughton announced an allowance of 50 cents per week had been granted for the cleaning of the station building.

In 1923, Pachena Point was no longer needed as a relay point between Victoria and Estevan Point and nearly suffered the same fate as the station at Ikeda. Fortunately, at the last minute, it was decided to make it a Direction Finding (D.F.) station to assist mariners navigating the Straits of Juan de Fuca.

In his circular letter No. 365 dated January 29, 1924, Haughton advised that in view of the fact that certain D.F. operators on the east coast had made avoidable errors recently in giving bearings by making mistakes in-simple division, addition and subtraction, the Deputy Minister had approved the following penal ties, to become effective February 1, 1924:

1. 1st offence Operator to lose 3 months seniority;
2. 2nd offence - Operator to lose 1 year seniority;
3. and for a 3rd offence - Operator's service to be dispensed with.

About this time, broadcast receiver licensing was implemented at an annual fee of \$2.50 per radio. Note 1

These licences could be obtained from any departmental office, post office, store selling radios or door to door vendors. It was a great relief to all when this form of licensing was discontinued in 1952, particularly to the Radio Inspectors who had to enforce this most unpopular form of licensing.

In the early 20' s, a new source of revenue developed when private commercial stations began to be established at such places as Logan Inlet, Anyox, Port Alice, Ocean Falls, Klemtu, etc. These stations had their own radio operators who also often served as bookkeepers, storekeepers, timekeepers, etc., and provided a radio telegraphy service on low frequency to the nearest coast station.

In the 30's, this private commercial service was greatly expanded with the availability of lower priced radiotelephone equipment which could be operated by anyone and soon developed into the major source of revenue for the West Coast Radio Service.

By the late 40' s, the stations at Bull Harbour, Alert Bay, Digby Island, Estevan Point and Cape Lazo each had dozens of such stations under their control. The Department had assigned the frequency of 2292 kHz to accommodate this service. By the late 50's, this service began to disappear with the development of a viable VHF service along the coast by the B.C. Telephone Co.

An additional service provided by the Digby Island station (VAJ), at Prince Rupert was the opening of a radio telegraph link to station WXH at Ketchikan, Alaska. This circuit handled all the telegraph traffic between Prince Rupert and Alaska.

Also, whenever the CN telegraph lines were disrupted by the frequent slides along the Skeena River, all telegraphic traffic in and out of Prince Rupert would be handled by Digby Island where things could get quite hectic.

The list of broadcasting stations for 1923 stations reported the following as located in British Columbia.

Call Sign	Owner	Location	Wavelength
CFYC*	Victor W.Odlum	Vancouver	360 meters
CHCA*	R.C.A.	Vancouver	360 meters
CHOC*	Westinghouse	Vancouver	360 meters
CJCE	Vancouver Sun	Vancouver	420 meters
CKCD	Vancouver Province	Vancouver	410 meters
CJCB	Janes G. Bennet	Nelson	400 meters

*Authorized to broadcast market and weather reports only and were each assigned specific periods when they could make their broadcasts. The other stations could broadcast music, interviews, news reports, etc.

By the mid 20's the Union Steamship Co., whose vessels traversed the coast making calls wherever a passenger or a bit of freight could be picked up or delivered, started to make daily broadcasts on 1630 kHz announcing the next day's points of call. People used to tune their broadcast receivers to the top end of the dial so they would know when to meet the ship to pick up their mail and/or supplies, or to see the Purser to place an order for some item they wanted brought up from Vancouver.

Later, fishermen and tow boat operators started making use of this frequency and by the late 30's it had become the standard marine radio-telephone frequency on this coast. It became so well established that, when 2182 kHz became the international distress frequency, it was a tough regulatory problem getting them to use the new frequency. It was finally phased-in during the late 50's.

With the changeover to tube type transmitters, the radio operators had to make better use of semi-automatic keys (called bugs) such as had been used for decades by their counterparts on the landline telegraph circuits. The high currents used in keying the old spark transmitters generally made the use of this type of key impractical. In some instances, operators would install a special high speed keying relay but these were not always very reliable. Haughton insisted that operators must demonstrate their proficiency to the Officer-in-Charge. These keys were a very personal thing and each carefully adjusted to meet its owner's particular needs. You would never touch another person's bug without his consent and if you altered its setting you were bound for eternal damnation.

In 1923, an additional station was established in downtown Vancouver using the call sign VAB (formerly used by Ikeda) and was located in the Merchants Exchange Building at 815 West Hastings Street.

Jim Harker was the Officer-in-Charge with Len Crowe as his assistant.

The service provided by this station could just as well have been handled by the nearby station at Point Grey. However, shipping agents and tow boat owners who wanted their own station to contact their vessels in Vancouver Harbour and in the Gulf of Georgia were prepared to foot the bill.

The station was later moved to the Marine Building and then closed during WWII.



Another World War I veteran was E.T. Redford who lost an arm in France.

After obtaining his operator's certificate in 1919, he applied for a position with the Radio Service but was turned down by Haughton who did not believe a one-armed man could do the job.

He was then hired by Marine and Fisheries as an operator on a Fisheries patrol vessel.

In 1922, when the Radio Service was transferred back to the Department of Marine and Fisheries, Haughton inherited Redford.

It is to be noted that his one arm never held him back. He was a proficient operator and an outstanding Officer-in-Charge.

In 1926, the Vancouver School Board established a radio operator training course in Room 19 of the old King Edward High School located on the corner of Oak Street and 10th Avenue, with

Walter Lambert as instructor. This was later moved downtown when the Vancouver Vocational School was established.

Walter Lambert was a real character and a strong disciplinarian. A strong esprit-de-corps developed among the Room 19 graduates which continues to this day. A few years ago they held a reunion attended by several hundred Room 19-ers who came from all over the world. Another reunion is being planned for 1989 or 1990.

In the early 20's, radio interference from power lines and street-cars was becoming an increasing problem for broadcast listeners.

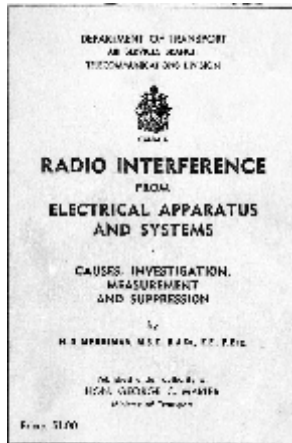
Initially, the Department turned a blind eye to complaints of this problem, they had neither the manpower nor the expertise to deal with it. Fortunately, the B. C. Electric Company was concerned with its public image and assigned two journeyman electricians, one in Vancouver and the other in Victoria, to investigate and resolve these complaints.

It is understood these gentlemen were sent south to Seattle where the Puget Sound Light and Power Company had already developed some expertise in the field and agreed to assist in the training of their colleagues from B. C. These gentlemen continued in this work until their retirement in the 60's. Our inspectors found them most knowledgeable and helpful.

With their retirement, B.C. Hydro discontinued this service and turned over all complaints to the Department.

In the mid 20's, the Department decided it could no longer ignore the pressure of interference complaints and H.O. Merriman was appointed to head up an interference investigation service.

He made a thorough study of the problems, authored several papers and books, and in the late 20's toured the inspection offices across the country to give some on-the-job training to the inspectors.

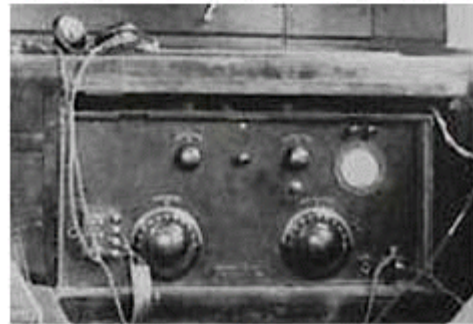


He soon realized, however, some full time interference specialists were needed in the field.

Accordingly, he recruited a number of radio technicians from across Canada, gave them some intensive training in Ottawa and assigned them to field offices.



Marine & Fisheries - 1927 - Marine et Pêcheries



They were also supplied with a specially fitted interference vehicle. Basil Irvine was assigned to Vancouver and arrived in late 1929 or early 1930, with his fully-equipped inspection van.

Irvine was originally from Vancouver and had served on the submarines with Bruce Restall in WWI. His arrival in Vancouver initially caused a bit of a stir since he was higher in grade than the working level inspectors.

As a teenager in the mid 30's, a chum and I had set up some old model "T" Ford spark coils and were busy learning the code on the air, oblivious to the interference we were causing broadcast receivers in the area.

One day, Irvine appeared at the door, gave the two of us a "good talking to" and then introduced us to the world of amateur radio. Who at that time would have guessed that I would take over his job when he retired...

Incidentally, when Irvine first arrived, it was considered too dangerous for him to operate the equipment while he was driving, so a chauffeur, George Smith, was hired to do his driving.

Under Irvine's tutoring, Smith soon became a good interference investigator. A few years later, when it was realized a chauffeur was really gilding the lily, Irvine managed to get Smith reclassified as a Radio Electrician and Smith became his assistant. Smith continued in this position until his retirement about 1958.

In the early 30's, a remote transmitter site was established on Williams Road, Lulu Island, for the Point Grey (VAI) and the Vancouver (VAB) transmitters. This new site was given the call sign VAL and had a staff of four operators to take care of equipment maintenance and breakdowns. Just before the outbreak of WWII, it was relocated to a new site on Garden City Road where there was more room for antenna arrays.

In 1930, The Fisheries part of the department was separated to form the new Department of Fisheries. The Department of Marine Radio Service continued to supply the radio operators on the fishing patrol vessels and to maintain their radio equipment.

After the successful voyage of the RCMP vessel St. Roch through the North West Passage, it was deemed time to establish a marine coast station on the Arctic Ocean.

As everything west of Port Arthur at that time came under Haughton, he was instructed to put the wheels in motion and establish "a station at Coppermine, N.W.T. To this end, Fred Sealey was sent north to build the station and to be its first Officer-in-Charge. When he returned to Victoria two years later, he was promoted to Radio Inspector.

Later Fred transferred to the aeradio service when it was first established and ended his career as Radio Technician at Pat Bay Airport. The station at Coppermine continued to be manned from Victoria until 1956.

In the early 30's, Walter Howard was on an interference investigation at Comox when a tube failed in his radio, so he borrowed one from the Officer-in-Charge at the nearby station of Cape Lazo.

On his return to Victoria he must have mentioned the incident to Haughton because the Officer-in-Charge received a letter of reprimand for giving away government property and was told the cost of its replacement would be deducted from his salary.

In the late 20's or early 30's, George Gilbert a senior radio electrician in the workshop, read the first paper in the Proceedings of the I.R.E. about the piezo electric effect of quartz crystals and the crystals' value in frequency control.

Gilbert, always an experimenter, rounded up some quartz, built a diamond saw and sliced up some crystal blanks and then proceeded to teach himself to grind crystals. Once he mastered the art, he then went around converting the station transmitters. It is claimed the transmitters were the first in Canada to have crystal control.

As Haughton grew older he became cantankerous and was disliked by his staff. In the mid 30' s, he went home with an attack of influenza and the story is told that some wit in the office phoned a funeral home, reported Haughton's death and instructed them to pick up his body. Imagine Haughton's rage when he answered the doorbell to find a funeral director complete with hearse there to pick him up. He never found out who the culprit was.

In 1937, the West Coast Radio Service was transferred to the newly created Department of Transport and C.P. Edwards became its first Deputy Minister. Within this new department were two radio branches, Marine Radio and Aeradio which were to remain separate entities until the mid 50's.

Haughton, and after him Bowerman, built up a pool of operators to provide vacation relief on the stations and government vessels. When these operators were not engaged in providing vacation relief, they were frequently used as acting radio inspectors - without the extra pay.

Radio Technicians who frequently traveled the coast, often to out of the way places, were occasionally called upon to undertake special inspections, resolve complex interference problems, give operator "barrier" exams and even get involved in the occasional prosecution. To this end, some of them carried letters of authority issued by the Superintendent.

This practice continued up to 1956 when Radio Regulations became a separate division and was divorced from the operations group.

In 1938, Sid Jackson opened a new office in Kamloops, B.C. and on his retirement two years later was replaced by Len Crowe. In late 1941, with increased demands by the

war, the Kamloops office was closed and Crowe returned to Vancouver. Sid Jackson's son, John, later became a Radio Inspector in Victoria.

In 1939, Sid Jones finally got his transfer back to the coast but, like Walter Howard, he had to pay a penalty by dropping levels to senior operator. However, he went to Pachena Point as Officer-in-Charge shortly after, then to Digby Island and finally to Point Grey, where he was its last Officer-in-Charge.

At the outbreak of WWII, it was necessary to move the Point Grey station inland to Westbrooke Crescent. Heavy gun emplacements were being constructed on the station site to form part of a fort for the defense of Vancouver.

With the outbreak of WWII, all lighthouses on the coast were instructed to monitor the 10 AM daily broadcast of the CBC. A special broadcast was made with either the code word "A FOR APPLE" or "B FOR BUTTER". The "A FOR APPLE" indicated the lights would be illuminated that night but if "B FOR BUTTER" were broadcast, they were to keep the lights switched off.

On June 20, 1942, at approximately 9:45 PM, a Japanese submarine surfaced off Estevan Point and started shelling the station. The shelling continued for about 40 minutes with the first shells landing on the beach about 100 yards in front of the lighthouse. Mr. Lally, the lighthouse keeper, immediately extinguished the light and the submarine raised its sights as successive shells went overhead into the woods.

Approximately 25 shells were fired and, except for a few shell fragments hitting the buildings, no damage was caused. The duty operator sent a message to Pacific Command, shut down the station, and the staff and families went into the woods for safekeeping.

E. T. Redford was Officer-in-Charge at the time. Among his staff were Brian S. Harrison (who later headed up the Regional Authorization group in Vancouver) and Bob Glass (who later was Chief of the air navigation aids flight checking section in Vancouver and took early retirement to be ordained into the ministry).

Several months after the shelling, a Japanese submarine was sunk off the coast of New Zealand. Its crew were rescued and told their captors they had shelled a lighthouse off the Canadian west coast.

After Japan's entry into the war, the military requested assistance in the interception of Japanese radio broadcasts. To this end, they funded the operation and supplied the necessary equipment, mostly National HRO receivers and typewriters.

This new service was set up on the second floor of the Point Grey station and Andy Gray came over from Victoria as Officer-in-Charge. The position was reclassified to Radio Technician 3. Some time was taken up in recruiting additional operators and in training them in the more complex Japanese

KANA code.

At its peak, 28 operators in three shifts were employed in this service, among them a number of female operators including Olive Carrol, Elizabeth King and Agnes Lake.

Carrol and King sailed as operators on freighters for several years after the war.

Harry Lathwell, later Regional Head of Authorization in this region, and Eric Shea, later Regional Superintendent of Radio Regulation in Winnipeg, were also interception operators.

With the end of the European war in 1945, the large interception staff used on the east coast to monitor the German submarine service were transferred to Vancouver.

To accommodate this influx, a second interception station was established at the old Williams Road transmitter site on Lulu Island. After being trained in the Japanese code, 68 more operators were engaged in this service. However, they had hardly reached their peak in proficiency when the Japanese surrendered and the service was disbanded. One of these operators who returned to the east was Bill Ryal, later Director of Radio Regulations in Ottawa.

Brian Harrison, who had been at Estevan Point when it was shelled, was a shift supervisor at Williams Road. Another of the shift supervisors was Art Healey, later Officer-in-Charge at Pachena Point and Alert Bay stations.



Bowerman

In recognition of the invaluable contribution made by the Interception Program of the West Coast Radio Service, its superintendent, Jack Bowerman, was awarded the Order of the British Empire.

JAPANESE CODE

A -- . --	CHI . . .	ME -...-
I .-	TSU .-.	MO -..-.
U .. -	TE .-.-	YA .-
E -.-.-	TO ..-..	(Y)I .-
O .-...	NA .-.	YU -..-.
N -.-.-	NI -.-.	(Y)E -.-.-
KA .-..	NU 	YO --
KI -.-..	NE --.-	RA ...
KU ... -	NO .. --	RI --.
KE -.-	HA -...-	RU -.-.-
KO ----	HI --..-	RE ---
SA -.-.-	FU --..	RO .-.-
SHI --.-.	HE .	WA -.-
SU ---.-	HO -..	(W) I .-.-
SE .----.	MA -.- -	(W)U .. -
SO ---.	MI .-.-.-	(W)E .-.-.
TA -.	MU -	(W)O .-.-

Interception operators wrote down the code characters in English letters as indicated above and this went to translators who joined the groups of letters to make up Japanese words and they translated them into English. Transmission of numbers from 0 to 9 inclusive are the same as in the international radiotelegraphy code.

note 1: In 1922, the fee was \$1.00, in 1932 it was \$2 and in 1938 \$2.50