

## List of Australian amateur and experimental radio stations

## AUCKLAND

Call signal	Licensee	Address
ZL1AA	C. N. Edwards	7 Arnold St. Grey Lynn, Auckland.
ZL1AB	S. G. Waite	84 Mariborough Street, Dominion Road, Auckland.
ZL1AC	C. L. Button	Devonport, Auckland, 20 Tainui Road.
ZL1AD	Leys Institute	St. Marys Road, Ponsonby, Auckland.
ZL1AE	R. V. Roberts	59 Hepburn Street, Ponsonby, Auckland.
ZL1AG	F. Roberts	24 Kimberley Road, Epsom, Auckland.
ZL1AH	Messrs. Hartie and Gray	7 Alten Road, Auckland.
ZL1AJ	N. C. Shepherd	1 Norths Road, Whangarei, Auckland.
ZL1AK	W. H. Claxton	Parawai, Thames, Auckland.
ZL1AL	R. G. Bartrum	5 Russell Street, Devonport, Auckland.
ZL1AM	J. C. Isherwood	17 Clyde Street, Whangarei, Auckland.
ZL1AN	H. B. M. Arthur	24 Lawrence Street, Herne Bay, Auckland.
ZL1AO	R. G. White	9 Veronica Avenue, Mount Albert, Auckland.
ZL1AP	N. J. Winch	Broady Street, Te Awamutu, Auckland.
ZL1AQ	White Island Products (Ltd.)	Sulphur Point, Tauranga, Auckland.
ZL1AR	L. M. Mellars	18 Station Road, Remuera, Auckland.
ZL1AS	W. A. Penton	69 Grange Road, Mount Eden, Auckland.
ZL1AT	G. S. Swain	Mahoe Street, Te Awamutu, Auckland.
ZL1AV	F. C. Reardon	154A Hobson Street, Auckland.
ZL1AW	R. R. Lyons	Mangatawhiri Valley, Auckland.
ZL1AX	R. J. Orbell	10 Beaconsfield Street, Devonport, Auckland.
ZL1AY	N. S. Barnaby	51 Grange Road, Mount Eden, Auckland.
ZL1AZ	J. R. Sherson	14 Stanley Street, Claudelands, Hamilton.
ZL1BA	R. J. Taylor	2 Fremont Street, Parnell, Auckland.
ZL1BB	R. Beazley	19 Alexandra Avenue, Mount Albert, Auckland.
ZL1BC	W. E. F. Mickelborough	204 Great North Road, Grey Lynn, Auckland.
ZL1BD	W. H. Wadham	16 Dunkerron Avenue, Epsom, Auckland.
ZL1BE	E. K. McKay	Selwyn Road, Kohimarama, Auckland.
ZL1BF	A. L. Partelow	52 Brighton Road, Parnell, Auckland.
ZL1BG	Dr. B. G. Thompson	Sanatorium Grounds, Rotorua.
ZL1BH	A. H. Hudson	15 Mount Hobson Road, Remuera, Auckland.
ZL1BI	J. R. Turnbull	47 Beresford Street, Bayswater, Auckland.
ZL1BJ	R. M. Jackson	National Bank of New Zealand (Ltd.), Queen Street, Onehunga, Auckland.
ZL1BK	A. G. Reid	5 Marine Terrace, Bayswater, Auckland.
ZL1BL	J. S. Lynch	Ngaruawahia, Auckland.
ZL1BN	D. W. M. Tapp	Commonwealth Hotel, Rotorua.
ZL1BO	G. D. Gerken	Cape Maria Van Dieman, Auckland.
ZL1BP	J. D. Surman	3 Ashton Road, Mount Eden, Auckland.
ZL1FA	White Island Products (Ltd.)	White Island, Auckland.
ZL1FB	G. T. Guide	Hospital Hill, Opotiki, Auckland.
ZL1FC	N. G. Gulde	Hospital Hill, Opotiki, Auckland.
ZL1FD	F. R. Booth	28 Rosstrevor Street, Hamilton.
ZL1FE	A. F. Wood	P. W. Station, Waibou, Auckland.
ZL1FF	L. W. White	3 Veronica Avenue, Mount Albert, Auckland.
ZL1FG	J. Lonsdale	11 Anne Street, Devonport, Auckland.
ZL1FH	J. Steele	Linwood Earnock Avenue, Takapuna, Auckland.
ZL1FI	C. S. Goodwill	Jocelyn Street, Te Puke, Auckland.
ZL1FJ	W. J. Sexton	14 Ethel Street, Edendale, Auckland.
ZL1FK	S. M. Y. Hamlin	Mount Wellington Highway, Ellerslie, Auckland.
ZL1FM	J. E. B. Warn	Gorrie Avenue, Epsom, Auckland.
ZL1FO	E. R. Cooper	8 London Street, Ponsonby, Auckland.
ZL1FP	G. S. Anchor	8 Queen's Avenue, Frankton Junction, Auckland.
ZL1FR	L. W. Harris	103 Princess Street, Onehunga, Auckland.
ZL1FS	L. H. Dickson	3 Glory Avenue, Epsom, Auckland.
ZL1FT	N. N. Waiding	84 Hepburn Street, Ponsonby, Auckland.
ZL1FU	G. D. White	Bridge Street, Opotiki, Auckland.
ZL1FV	A. Evans	Wairoa Road, Papakura, Auckland.
ZL1FW	E. Whitely	1 Halston Road, Dominion Road, Auckland.
ZL1FX	J. H. L. Trenwith	19 Bellwood Avenue, Mount Eden, Auckland.
ZL1FY	N. C. Curtis	Whataro Northern Wairoa, Auckland.
ZL1FZ	Auckland Grammar School, (G. McB. Salt, Science Master).	Mountain Road, Mount Eden, Auckland.
ZL1XI	Auckland University College.	Princess Street, Auckland.

## List of Australian amateur and experimental radio stations—Continued

## WELLINGTON

Call signal	Licensee	Address
ZL2AA	A. S. Brown.....	14 Grant Street, Dannevirke.
ZL2AB	D. Wilkinson.....	Waerenga Road, Otaki.
ZL2AC	I. H. O'Meara.....	Bushmere Road, Gisborne.
ZL2AD	P. R. Stevens.....	258 Gladstone Road, Gisborne.
ZL2AE	R. J. Patty.....	55 Salisbury Road, Gisborne.
ZL2AF	W. J. Sinclair.....	Hirini Street, Gisborne.
ZL2AG	S. W. S. Strong.....	12A Parau Street, Gisborne.
ZL2AH	R. V. Roberts.....	39 Scarborough Terrace, Wellington.
ZL2AJ	V. H. Parminter.....	41 Drummond Street, Wellington.
ZL2AK	A. McD. Cooper.....	Care of M. V. "Paupa" Shell Co., Wellington.
ZL2AL	S. E. Brown.....	32 Owens Street, Wellington.
ZL2AM	W. F. Buist.....	Corner Collins and High Streets, Hawera.
ZL2AN	M. L. Weston.....	47 Barraud Street, Dannevirke.
ZL2AO	G. A. J. Burnette.....	Maip Road, Lower Hutt.
ZL2AP	J. L. Armstrong.....	Maungataniwha, Wairoa.
ZL2AQ	M. W. Coutts.....	Goldfinch Street, Taihape.
ZL2AR	A. B. McB. Rennie.....	67 Campbell Street, Wanganui.
ZL2AS	H. R. Boyle.....	370 Main Road, Karori, Wellington.
ZL2AV	R. G. Chatfield.....	42 Raroa Road, Kelburn, Wellington.
ZL2AW	C. R. Clarke.....	91 Apu Crescent, Lyall Bay, Wellington.
ZL2AX	J. V. Kyle.....	30 Waldegrave Street, Palmerston North.
ZL2AY	F. D. Bitossi.....	49 Durham Street, Wellington.
ZL2BA	F. T. Cropp.....	17 Mason Street, Lower Hutt, Wellington.
ZL2BB	J. A. Lynn.....	414 Lyndon Road, Hastings.
ZL2BC	S. H. Perry.....	89 Tiber Street, Wellington.
ZL2BE	J. C. Mills.....	311 Queen Street, Hastings.
ZL2BF	P. H. Matthews.....	The Ridgway, Mornington, Wellington.
ZL2BG	J. G. Tinney.....	74 Kainui Road, Hataitai, Wellington.
ZL2BH	W. M. Hall.....	46 Tarakaka Street, Naglo, Wellington.
ZL2BI	C. G. Liddell.....	Lyall Bay, Wellington.
ZL2BJ	A. V. Jury.....	Papawai, Greytown.
ZL2BN	S. J. Hislop.....	4 Park Road, Napier.
ZL2BO	H. C. Dixon.....	36 Devon Street, Wellington.
ZL2BP	W. N. Maeklin.....	75 Waipapa Road, Hataitai, Wellington.
ZL2BR	K. A. Lambert.....	Belmont, Tayforth, Wanganui.
ZL2BT	R. A. Tanner.....	Karere Road, Longburn.
ZL2BU	J. F. Donald.....	27 Marion Street, Wellington.
ZL2BV	F. J. K. Lane.....	31 Manawatu Street, Palmerston North.
ZL2BX	R. G. Black.....	21 Karepa Street, Brooklyn, Wellington.
ZL2BY	C. T. Berry.....	20 Rata Street, Wanganui.
ZL2BZ	O. W. Gillion.....	17 Wilson Street, Hawera.
ZL2DA	L. H. Halcrow.....	2 Thane Road, Wellington.
ZL2DB	C. W. Morrison.....	27 Momo Street, Seatoun, Wellington.
ZL2DC	A. T. Mitchell.....	15 Naughton Terrace, Kilbirnie, Wellington.
ZL2DD	J. P. Boyer.....	Aubrey Street, New Plymouth.
ZL2DF	R. A. Patchett.....	Motor ship "Otokia," Wellington.
ZL2DG	C. R. H. Taylor.....	326 The Terrace, Wellington.
ZL2DI	P. R. McMahon.....	14 Marne Street, Palmerston North.
ZL2DJ	E. A. Petersen.....	Farnham Street, Mornington, Wellington.
ZL2DL	R. A. J. Carr.....	195 Sutherland Road, Lyall Bay, Wellington.
ZL2GA	J. Johnson.....	Fortunatus Street, Brooklyn, Wellington.
ZL2GC	A. Howarth.....	12 High Street, Dannevirke.
ZL2GD	B. R. Adair.....	120 Sheehan Street, Gisborne.
ZL2GE	G. E. Tyler.....	61 Vigor Brown Street, Napier.
ZL2GF	J. O. Taylor.....	248 The Terrace, Wellington.
ZL2GG	C. H. Brown.....	70 Wallace Street, Wellington.
ZL2GH	J. V. Berry.....	74 Harrison Street, Wanganui.
ZL2GI	E. L. MacGregor.....	Windsor Hill, Waipawa.
ZL2GJ	K. L. Elliott.....	92 West Street, Feilding.
ZL2GK	S. R. Perkin.....	42 Puru Crescent, Lyall Bay, Wellington.
ZL2GL	M. T. Gabriel.....	80 Gray Street, Palmerston North.
ZL2GO	H. G. G. Fownes.....	110 Riddiford Street, Wellington South.
ZL2GQ	F. I. R. Hunt.....	221 Clifford Street, Gisborne.
ZL2GR	W. S. Green.....	13 Washington Avenue, Brooklyn.
ZL2GS	H. E. H. Green.....	Clifford Road, Johnsonville.
ZL2GT	R. K. Duncan.....	6 Mount Street, Wellington.
ZL2GU	J. C. East.....	270 The Terrace, Wellington.
ZL2GV	A. R. C. Claridge.....	13 Rawhiti Street, Dannevirke.
ZL2GW	S. G. Taylor.....	Beach Road, Levin.
ZL2GX	P. A. Tipping.....	80 Hataitai Road, Wellington.
ZL2GY	L. H. Wass.....	11 King Street, Petone.
ZL2GZ	E. A. McConnell.....	551 Childers Road, Gisborne.
ZL2XA	E. A. Shrimpton.....	38 Rongotai Terrace, Wellington.
ZL2XP	W. M. Dawson.....	2 Rata Road, Wellington.
ZL2XS	Standard Telephones & Cables (Australasia) Ltd.	24-26 Ballance Street, Wellington.

## List of Australian amateur and experimental radio stations—Continued

## CANTERBURY

Call signal	Licensee	Address
ZL3AA	W. S. Purton.....	Waitua.
ZL3AB	L. C. Evans.....	26 Malcolm Avenue, Christchurch.
ZL3AC	Radio Society of Christchurch.	St. Asaph Street, Christchurch.
ZL3AE	R. K. Venables.....	163 Moorhouse Avenue, Christchurch.
ZL3AH	H. B. Courtris.....	25 Harper Street, Timaru.
ZL3AI	J. E. Strachan.....	High School, Rangiora, Christchurch.
ZL3AJ	R. G. F. Blake.....	Station Road, Southbrook.
ZL3AN	S. S. Edwards.....	26 Patten Street, Avonside, Christchurch.
ZL3AR	D. W. Buchanan.....	74 Wills Street, Ashburton, Christchurch.
ZL3AS	N. W. Laugeson.....	44 Hills Road, St. Albans, Christchurch.
ZL3AT	L. J. Marquet.....	20 Chichester Street, Woolston, Christchurch.
ZL3AU	H. O. Hills.....	97 White Street, Rangiora, Christchurch.
ZL3AW	R. W. Mintrom.....	Fire Brigade Station, Woolston, Christchurch.
ZL3AZ	R. J. Gibbs.....	180 Bolleston Street, Christchurch.
ZL3BA	E. B. Buckhurst, jr.....	98 Office Road, Merivale, Christchurch.
ZL3BC	J. Harrison.....	Scargill, Christchurch.
ZL3BD	J. C. East.....	326 Papanui Road, Christchurch.
ZL3BE	G. J. Lancaster.....	Boys' High School, Christchurch.
ZL3BF	E. Prince.....	78 Cobham Road, Spreydon, Christchurch.
ZL3BG	L. W. Hurrell.....	134 Fisher Street, Beckenham, Christchurch.
ZL3BH	J. F. Gabites.....	445 Marsland Road, Marshlands, Christchurch.
ZL3CB	C. R. H. Taylor.....	7 Rutland Street, St. Albans, Christchurch.
ZL3CD	G. H. S. Clarkson.....	Springfield, Christchurch.
ZL3CE	B. G. Henderson.....	100 Rugby Street, Christchurch.
ZL3CF	A. E. H. Simpson.....	99 Abberley Road, St. Albans, Christchurch.
ZL3CG	H. F. V. Brown.....	10 Merivale Lane, Christchurch.
ZL3CI	R. M. Kay.....	17 Nelson Terrace, Timaru.
ZL3CJ	A. E. S. Hanau.....	32 Beverley Road, Timaru.
ZL3CM	W. T. Toon.....	73 Cannon Street, St. Albans, Christchurch.
ZL3CN	I. A. B. More.....	48 Hackthorne Road, Christchurch.
ZL3CO	G. Seton-Kellaway.....	Waikari, Canterbury.
ZL3CP	G. W. Parton.....	69 Hackthorne Road, Christchurch.
ZL3CR	C. R. Harvey.....	30 Peterborough Street, Christchurch.
ZL3CT	J. R. Tabley.....	113 Milton Street, Spreydon, Christchurch.
ZL3CU	G. E. McCurdy.....	66 Wills Street, Ashburton, Christchurch.
ZL3CV	R. W. Sanderson.....	223 Camaron Street, Ashburton.
ZL3CX	J. D. Stewart.....	112 Alford Forest Road, Ashburton, Christchurch.
ZL3CY	W. T. Smith.....	26 Derby Street, St. Albans, Christchurch.

## OTAGO

ZL4AA	F. D. Bell.....	Shag Valley Station, Waikare.
ZL4AC	R. E. Robinson.....	3 Chatham Avenue, Dunedin.
ZL4AD	A. E. Jordon.....	41 Venus Street, Invercargill.
ZL4AE	G. E. Brown.....	32 Ardwick Street, Gore.
ZL4AL	A. H. M. Grubb.....	Gore or elsewhere.
ZL4AM	W. M. Crockett.....	Tiverton Street, Palmerston.
ZL4AO	H. N. Shrimpton.....	Coneu Hill Road, Dunedin.
ZL4AP	L. R. Stroud.....	6 Heriot Row, Dunedin.
ZL4AR	W. G. Wilkinson.....	21 Melrose St., Dunedin.
ZL4AT	J. Stone.....	34 Grove Street, Dunedin.
ZL4AV	J. L. Milnes.....	39 Lees Street, Dunedin.
ZL4AX	F. P. Earland.....	33 Waverley Street, Dunedin.
ZL4AZ	T. K. S. Sidey.....	11 Constophine Road, Caversham, Dunedin.
ZL4BA	J. G. Smith.....	7 Crosby Street, Dunedin.
ZL4BB	J. E. Brooks.....	12 Prince Albert Road, Dunedin.
ZL4BC	L. C. Bates.....	306 George Street, Dunedin and elsewhere.
ZL4BD	A. Swann.....	Botting Street, Opopo, Dunedin.
ZL4BE	N. H. Shepherd.....	81 Warden Street, Dunedin.
ZL4BG	W. C. Baird.....	6 Young Street, Dunedin.
ZL4BH	S. W. Boon.....	26 Avon Street, Oamaru.
ZL4BI	S. R. Hitchcock.....	14 Rewa Street, Dunedin.
ZL4BL	D. G. Kennedy.....	Derwent Street, Oamaru.
ZL4BM	V. G. Whiteman.....	Puysegur Point Lighthouse, Otago.
ZL4BN	H. G. Bremner.....	Port Chalmers Hotel, Port Chalmers.
ZL4BO	W. V. Macauley.....	122 Harbour Terrace, Dunedin.
ZL4BP	W. G. Collett.....	30 Calder Avenue, N.E. Valley, Dunedin.

## NEW FUNDAMENTAL FREQUENCY STANDARD

The Bureau of Standards has recently installed equipment which materially advances the accuracy of the frequency standard. The new equipment comprises essentially a group of four piezo oscillators, each having the frequency 100 kilocycles. Three are alternative standards, the fourth is a reference point against which to check the others. Beats between each of the first three and the fourth are automatically counted by three telephone message registers. An automatic camera takes a picture of the counters each 1,000 seconds, from which

record the number of beats per 1,000 seconds of each standard against the reference point can be obtained. In 1,000 seconds, each oscillator makes 100,000,000 oscillations, so that variations in frequency within the group can be measured to 1 part in 100,000,000.

To obtain the absolute frequency, the output of one oscillator is fed into a submultiple generator from which currents of 10 kilocycles and 1 kilocycle may be drawn, these frequencies being as accurate as the original oscillations. The 1-kilocycle frequency drives a synchronous motor clock, which is geared to keep exact mean solar time when the input frequency is exactly 1,000 cycles.

The rate of the clock is obtained by checks with Arlington time signals. The percentage gain or loss then is numerically equal to the deviation of the oscillator from 100 kilocycles; that is, if the clock gained 1 second per day, it would be fast 1 part in 86,400, so the frequency of the piezo oscillator is 100,001.16 cycles per second.

The crystals are of 30° cut, and vibrate on a thickness frequency. They are doughnut-shaped, that shape being chosen as giving a low temperature coefficient. The temperature and atmospheric pressure in which the crystals operate are carefully regulated, as are the filament and plate voltages. Stand-by batteries take care of power failures.

Measurements show that the average short time variations of each of the crystals are less than 1 part in 10,000,000. The standard maintains an absolute value of frequency which is known to 1 part in 10,000,000.

#### A TUNED-REED COURSE INDICATOR FOR THE 4 AND 12 COURSE AIRCRAFT RADIO RANGE

A paper by the above title by F. W. Dunmore was published in the April issue of the Bureau of Standards Journal of Research. This gives data on the reed indicator unit which was developed for use with the 12-course radio range system described in papers in the March issue. There are three reeds in this visual indicator, each reed being tuned to one of the modulation frequencies sent out by the radio range, namely, 65, 86.7, and 108.3 cycles. A simple shutter with windows, in front of the vibrating reeds, exposes any two at a time. Further details are given in the paper, which will also be available separately as Bureau of Standards Research Paper No. 160, obtainable by purchase from the Superintendent of Documents, Government Printing Office, Washington, D. C.

#### AERONAUTIC RADIOBEACON IMPROVEMENTS

Recent work by the Bureau of Standards has made improvements in the characteristics of the vibrating reed course indicator resulting in a 20 per cent increase in sensitivity and at the same time reducing the required constancy to which the modulation frequencies at the beacon station must be held. A variation of  $\pm 0.75$  per cent in these frequencies is now permissible. These improvements have been obtained through the use for the reed material of a high-permeability nickel-steel alloy, called "A" metal, rather than elinvar which was previously employed.

A small filter unit was designed permitting the simultaneous connection of the reed indicator and the head telephones in the receiving set output without materially affecting the performance of the reed indicator. This unit operates to reduce to a negligible degree the low-frequency hum heard in the ear phones when visual-type beacon signals are received. It therefore permits the pilot to wear the head-telephones while the reeds are in operation, if desired, so that when the visual range beacon is interrupted for transmitting a radiotelephone broadcast the pilot will hear the broadcast begin.

A receiving-set installation was made to permit night flights on the College Park beacon. On one night flight, made from College Park, Md., to Philadelphia, Pa., and return, no course variations were observed. The distance from College Park to Philadelphia, is 115 miles. In a number of previous tests made on the ground at Media, Pa., 105 miles from College Park, some perceptible night course variations had been obtained. At a distance of 200 miles from College Park, on the ground at Boonton, N. J., large variations have been observed, which might seriously limit the usefulness of the beacon at night at this distance. The result of the night test flight to Philadelphia appeared to show that variations in the air are less than ground tests indicate. A series of night flights are planned to secure more data on dependable distance ranges at night.