NEW ZEALAND POST OFFICE

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Post Office Headquarters,
WELLINGTON.

29 March 1971

Regional Engineers.
District Engineers.

Radio Inspectors Equipment: Frequency Counter, Takeda Riken TR3788C

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Attached to this memorandum are copies of a draft Engineering Instruction for the operation and use of the Takeda Riken TR3788C frequency counter. These instructions should be followed while using the counter, and any suggested amendments to the methods described, or to the accessories supplied, should be submitted to this Office before 30 September 1971.

It should be noted that the counter accuracy stated in paragraph 4.2 is a figure based on the worst expected drift rate of the counter standard oscillator. After several counters have had calibration checks effected, see paragraph 6.2, the accuracy figure may be altered according to the average drift rate.

R W Beaker

Encl.

for Superintending Engineer (Radio)

FREQUENCY MEASURING EQUIPMENT

FREQUENCY COUNTER - TAKEDA RIKEN - TR3788C

1. CANCELLATIONS. Nil.

2. GENERAL.

2.1 This Instruction describes the use of Takeda Riken TR3788C frequency counters issued to Radio Inspectors for frequency measurement of radio apparatus operating on frequencies up to 500 MHz.

3. ACCESSORIES.

3.1 The following accessory items are provided with the counter.

(a) 230 volt power cord.

(b) Set of battery cords.

(c) 20dB attenuator.

(d) Co-axial cord, BNC to BNC.

(e) Co-axial cord, BNC to r.f. coupling loop.

(f) 12/24 volt inverter power supply.

(g) Counter instruction manual.

(h) Inverter instruction manual.

(i) Spare fuses.

Item (f) is housed in the protective lid for the counter. All other items are contained in a plastic satchel.

4. CONDITIONS OF USE

4.1 The instruction manual provided describes the method of setting up the instrument. These instructions should be followed along with additional requirements included in this Instruction.

4.2 Before a measurement is attempted with this Instrument, allow a warm up time of 15 minutes so that the required accuracy may be obtained. After this warm-up time, the basic measuring accuracy of the counter will be better than 2 parts in 10^{-6} for one year.

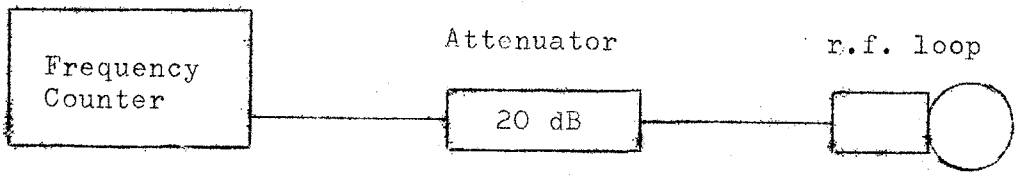
4.3 Because this instrument may be easily damaged with excessive signal (max 2 volts), the following procedure should be used to achieve a stable display of frequency.

4.3.1 Some transmitters, such as in TV translators, have r.f. monitoring points for connecting test receivers or frequency counters. Where possible, these points should be used. The counter should be connected to the test point with the 20dB attenuator in circuit, and the frequency measured. Should the level be insufficient to produce a stable display on the counter, remove the attenuator and connect as before.

4.3.2 When suitable, measure the frequency of 0 to 25 watt transmitters terminating the transmitter output into a Marconi TF1065A Output Test Set. Connect the frequency counter with the 20dB attenuator in circuit, to the BNC socket marked LO on the Output Test Set. When the transmitter is triggered, the frequency will be displayed.

With power below one watt, the 20dB attenuator may have to be removed from the input circuit, but only if a stable display can not be obtained with the attenuator in circuit.

4.3.3 Where measurement can not be made using methods 4.3.1 and 4.3.2, coupling of signal to the counter must be made with the r.f. loop provided. Initially, the counter should be set up as in fig 1. The 20dB attenuator must be in circuit to prevent excessive input signal.



4.3.4 Move the loop progressively closer to the aerial, or aerial feeder wire, until a stable display is obtained. Increase the coupling by moving the loop slightly closer to the aerial than the threshold point. Take care that an arc, or contact with the aerial, is not possible.

4.3.5 Should there be insufficient coupling to obtain a stable display on the counter with the arrangement as above, withdraw the loop from near the aerial, or aerial feeder wire. Remove the 20dB attenuator from the input and proceed with the method in 4.3.4.

4.3.6 When measuring the frequency of very low output transmitters, it may become necessary to wrap an insulated wire around the aerial or aerial feede wire to obtain sufficient coupling. This should never be attempted until methods 4.3.4 and 4.3.5 have proved unsatisfactory.

4.4 Whenever using the inverter power supply to power the counter, always ensure that the voltage switch on the inverter matches the supply voltage. This switch is provided to allow operation on 12 or 24 volts.

5. MEASUREMENT

5.1 The measurement of different types of emission requires different measuring conditions. The following methods should be used:-

(a) A3 - Measure with carrier only.

(b) A3H - Measure with carrier only.

(c) A3A - Measure with carrier only.

(d) A3J - Modulate the transmitter with a sinewave of known frequency. The carrier frequency will then be:

for USB: Measured freq. - Modulating freq.
for LSB: Measured freq. + Modulating freq.

(e) Frequency Modulated emissions - Measure either modulated or unmodulated.

In cases (a), (b) and (c), the power output of the transmitter will increase when modulation is applied. Should this happen when the counter is coupled, the increase in power could produce an excessive signal at the input circuits of the counter. It is important to ensure that the transmitter is not capable of being readily modulated while measurements are made.

5.2 Difficulty may be experienced in measuring the frequency of some pulse modulated carrier and interrupted carrier forms of emissions as may be found in tele-control transmitters and ship's lifeboat transmitters. In such instances, the measurement displayed may bear little relation to the operating frequency. Should trouble be experienced, little further can be done to obtain an obsolute frequency check and nothing further should be attempted with this counter.

6. MAINTENANCE

6.1 Under no circumstances is this instrument to have maintenance attempted by anyone other than staff of the Radio Laboratory, Radio Section, Wellington East Post Office Building. No other establishment has the necessary accurate equipment to maintain this instrument.

6.2 To ensure that the frequency standards in these counters remain accurate, each instrument will be recalled for calibration checks once a year. The counter should be sent to the Radio Laboratory, at the beginning of the first week of the month according to the roster below.

February:	Wanganui and Invercargill.
March:	Auckland and Dunedin.
April:	Hamilton and Timaru.
May:	Rotorua and Christchurch.
June:	Gisborne and Greymouth.
July:	Napier and Nelson.
August:	New Plymouth and Masterton.
September:	Whangarei and Palmerston North.
October:	Wellington.

6.3 In the event of failure of a counter, one spare instrument is available while repairs are being effected. This spare counter is not available to districts when their instrument is required for calibration checks.

6.4 Transport of the counter to the Radio Laboratory will be by NAC airfreight. The instrument should be well packed and be housed in a sturdy box so that the possibility of damage during transit is reduced to a minimum.

6.5 Under no circumstances should the r.f. pick-up loop be adjusted or should any new loop be made for use with the counter except as detailed in paragraph 4.3.6.

7. REFERENCE. E.I. Power General K 0001.

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