

DEPARTMENT OF COMMERCE

BUREAU OF STANDARDS

WASHINGTON

ELH:ANK

February 11, 1929.

I-6

Owners and Operators of Radio Broadcasting Stations.

Subject: Testing of Piezo Oscillators.

Gentlemen:

1. The enclosed letter circular is intended to give information to owners and operators of broadcasting stations regarding adjustment of quartz plates and the testing of piezo oscillators by the Bureau of Standards.

2. The Bureau will calibrate for any broadcasting station a piezo oscillator regularly used to check the station's frequency. Frequency meters and frequency indicators will not be accepted for test for use as station standards. In order to assist broadcasting stations to obtain standards for the frequency allocation which went into effect November 11, 1928, the Bureau of Standards during the past six months has calibrated piezo oscillators free of charge for such stations as had previously had a piezo oscillator calibrated by the Bureau. Other stations paid the regular calibration fees. Beginning March 1, 1929, the Bureau will charge its regular fees for all calibration of frequency standards for broadcasting stations. The fees are given in the attached fee schedule 163.

Respectfully,

George K. Burgess

George K. Burgess, Director.

Enclosure:

LC 258

Fee Schedule 163.

(February 11, 1929)

TESTING OF PIEZO OSCILLATORS FOR BROADCASTING STATIONS.

The Bureau's radio tests are necessarily limited to special tests for the Government, tests of instruments which are in turn used as standards for testing considerable numbers of other instruments, tests of importance to the Bureau as a matter of research, tests of piezo oscillators for broadcasting stations, and a few other tests for which special reasons arise. Fees for tests are given in Test Fee Schedule 163 which is attached.

Before the Bureau of Standards can undertake any test a written request must be received which contains the following information:

- (a) Licensed frequency of the station.
- (b) Type of piezo oscillator and quartz plate.
- (c) Location and call letters of the station.
- (d) Name of the owner of the radio station where the piezo oscillator is to be used.

A piezo oscillator will not be tested unless the quartz plate is mounted in a suitable holder and operates readily. Tests are limited to complete piezo oscillators. A complete piezo oscillator here refers to the mounted quartz plate and vacuum tube circuits. Tubes and batteries need not be shipped with the piezo oscillator provided information is given the Bureau as to the type of tube and voltages to be used during test. Tests will not be made on a piezo oscillator the construction of which is such that it cannot be expected to maintain its frequency value.

Where a quartz plate is used to control the frequency of a broadcasting station automatically, it is not feasible to calibrate this plate at the Bureau of Standards since the entire piezo oscillator must be submitted. In such cases the station should provide a separate piezo oscillator which is regularly used for checking purposes. This may be sent to the Bureau for test. This procedure calls for an entirely independent quartz plate and piezo oscillator for checking, separate from the quartz plate and circuits incorporated in the transmitting set. When a quartz plate is used for automatic piezo control of a transmitting set it is futile to remove it from the set for frequency measurement, as the frequency may be several hundredths per cent different from the frequency obtained



when the quartz plate is operating in the transmitting set. Hence, any quartz plate and piezo oscillator is accepted for test with the understanding that it is intended for use as an independent standard for checking the frequency of the transmitting set.

Ordinarily, work will be started on tests as soon as the apparatus is received. For the usual tests from two to five days are required for completion.

Test fee schedule 163 includes two items, e and f, covering the frequency adjustment of a quartz plate which is not more than one per cent below the desired frequency. A quartz plate having a frequency which is too high can not be accepted for adjustment. Experience with quartz plates having a frequency below that desired has been such as to demonstrate that broadcasting stations purchasing such plates and sending them to the Bureau for final adjustment by grinding, are often making needless trouble, expense, and loss of time for themselves and the Bureau. The preparation of a quartz plate as a frequency standard for a broadcasting station is a highly technical manufacturing process or series of operations. Even when special apparatus and the utmost skill are employed, satisfactory results are not always obtained. A certain per cent of any manufactured product is usually found to be defective and is discarded and experience shows that the percentage of defective quartz plates is high.

When the Bureau offers to undertake to grind a quartz plate to a given frequency, it is undertaking to complete a manufacturing process in which no guarantee of the satisfactory outcome can be made. The manufacturer may or may not have been able to exercise the skill required to produce a satisfactory finished product. The fact that a quartz plate operates at one frequency is no indication that it will be satisfactory at a slightly different frequency. It is possible that during the grinding process one of the following results may be obtained which will render the quartz plate unsatisfactory as a frequency standard: (1) failure to oscillate; (2) presence of one or more frequencies near the desired frequency; (3) sudden change in frequency often passing the desired frequency.

Persons submitting a piezo oscillator with a quartz plate requiring grinding may be required to replace the plate one or more times in order to obtain a satisfactory standard. The Bureau charges for all tests upon plates which may prove to be defective, the fee being from half to full charge depending upon the amount of work done. Satisfactory quartz plates can be purchased from manufacturers having suitable equipment, accurate standards, and trained personnel.

As a guide to obtaining a reliable piezo oscillator and quartz plate, the prospective purchaser might request the following information from the manufacturer before purchase: (1) Has the standard which you use in calibrating quartz plates been calibrated by the Bureau of Standards? (2) What accuracy of frequency will you guarantee? (3) For how long? (4) Will you guarantee that the quartz plate will operate readily and not have other frequencies near the assigned frequency?

When piezo oscillators are to be operated at temperatures higher than room temperature, as specified in test items b, d, and f, they should be provided with suitable heat-insulated cabinets and thermostats which will maintain a temperature constant within 1.0°C or better over a period of several hours. A thermometer with 1.0° or finer graduations should be provided, and provision made for mounting it so that the bulb is near the quartz plate and protected from the heater. When such a piezo oscillator is sent to the Bureau for test, the complete heated cabinet, thermostat, thermometer, etc., must be sent with it.

Attached:

Fee Schedule 163.

DEPARTMENT OF COMMERCE
Bureau of Standards

Test Fee Schedule 163. - STANDARDS OF RADIO FREQUENCY.

Effective March 1, 1928, superseding all previous schedules for the items covered.

The Bureau's radio tests are necessarily limited to special tests for the Government, tests of instruments which are in turn used as standards for testing considerable numbers of other instruments, tests of importance to the Bureau as a matter of research, and a few other tests for which special reasons arise.

A quartz plate will not be tested unless it operates readily, is mounted in a suitable holder, and is accompanied by the piezo oscillator circuits in which it is used.

Some quartz plates submitted are unsatisfactory for certification by reason of failure to operate, having one or more frequencies close to the desired frequency or having a frequency outside the 1 per cent limit set by the Bureau. In case this is ascertained before the complete procedure of adjusting the plate is carried through, schedule 163z applies; half of the regular fee is usually charged. In case the unsatisfactory condition does not appear until the adjustment procedure is completed, the entire regular fee is charged. These fees will be charged independently of whether another plate is submitted later.

Item	Description	Fee
163a	Determination of one fundamental frequency of a piezo oscillator or resonator or quartz plate, at room temperature.....	\$15.00
163b	Determination of one fundamental frequency of a piezo oscillator or resonator or quartz plate, provided with a suitable thermostat, at a specified temperature above that of the laboratory.....	25.00
163c	Adjustment at room temperature to specified frequency, of a quartz plate mounted in a holder provided with a simple mechanical adjustment for varying the frequency.....	20.00

Item	Description	Fee
163d	Adjustment at a specified temperature above that of the laboratory to specified frequency of a quartz plate provided with a suitable thermostat and mounted in a holder provided with a simple mechanical adjustment for varying the frequency.....	\$40.00
163e	Adjustment at room temperature to specified frequency, of a quartz plate cut to approximate frequency (not more than 1 per cent below the specified frequency).....	30.00
163f	Adjustment at a specified temperature above that of the laboratory to specified frequency, of a quartz plate provided with a suitable thermostat and cut to approximate frequency (not more than 1 per cent below the specified frequency).....	75.00
163g	Determination of frequency of frequency meter (wavemeter), (minimum charge, each coil, \$10.00), per point.....	2.00
163z	For special tests not covered by the above schedule, fees will be charged dependent upon the nature of the test.	

