INSTRUCTIONS FOR OPERATING
THE CLOUGH-BRENGLE TYPE O C OSCILLATOR

CONNECTION TO THE LINE: Plug into any 110 volt line either AC or DC regardless of frequency. Normal variations of line voltage will not affect operation. If working from DC line and the instrument does not oscillate reverse the line plug to correct polarity. The line cord is a resistor and will become warm in operation. It should not be closely coiled, but should be strung out for free radiation and under no circumstances should it be shortened. If the oscillator is permanently located in the shop it is best to set it where the radiated heat from the case can be readily dissipated since the thermal balance of the instrument is a factor in its stability.

With the case ungrounded it will be noted that the case has a small potential with respect to ground. This is due to the charge in the line filter condensers and its effect may be eliminated by grounding the instrument to a water pipe or to the conduit of the house wiring.

Before using the instrument for precise work, turn on the line switch at the extreme left on and allow the instrument to heat for 20 minutes to assure stability.

BAND SELECTOR: The upper left hand knob controls the band or range selector. This dial shows the band number corresponding to the curves on the graph and also the kilocycle and meter limits of the band. The six bands are covered by six coils which are rotated by a shaft and connected into the circuit as required.

TUNING DIAL: The upper right hand knob controls the tuning dial which is built on to a gear drive variable condenser. The small or upper dial is mounted directly on the main or rotor shaft and turns in direct ratio to the plates. The large or lower dial is mounted on the gear shaft and rotates four complete revolutions for one full swing of the condenser plates. The upper dial is divided into quadrants, one of which is blank and the others show several numbers, 1 1 1 - 2 2 2 and 3 3 3. When the blank quadrant is visible the condenser plates are in the first 1/4 of their rotation and when the "1's" are up the plates are in their second 1/4 of rotation, etc. The lower dial is divided into 100 divisions and lettered 0 to 100 so that the full four revolutions will bring the 0 to the indicator line four times or a total of 400 points. Therefore, on the first 1/4 of the swing of the condenser plates only the numbers on the large dial will be visible and the dial reading is between 0 and 99. On the second 1/4 the "1's" on the small dial show and the reading is between 100 and 199, etc., to a maximum reading of 400. These numbers correspond to the numbers marked DIAL across the top and bottom of the graph.

GRAPH OR CURVE: At the extreme left of the graph sheet is a table marked READY REFERENCE CHART which shows all of the commonly used frequencies, the band in which they are contained and the proper dial settings. This chart is made up at the time the instrument is calibrated and is accurate throughout. The next table to the right shows the full frequency range of each band in KC or MC as required and is divided into steps of such interval to make for easiest reading of the curves. To determine the dial settings for a required frequency locate the proper band from either the graph table or the selector dial then fix the point required, in the chart, now follow the graph line straight across the sheet to the right to the point where it intersects the curve marked with the band number and then straight up or down to the tuning dial setting. Reverse the procedure to find the frequency for any given dial setting. The numbers on the curves correspond to the band numbers as shown in the table and on the selector dial.

OUTPUT AND ATTENUATION: The shielded cord attached to the instrument is for low or attenuated output only. It is secured in the case to accomplish complete shielding and maximum attenuation. Do not try to disconnect it. The extra cord is for high output and A.F. audio frequency and is to be plugged into the respective tip jacks when in use. The shield of the low output cord is connected to ground and to the ground post of the receiver when the high output cord is in use, in which case the conductor of the low output cord is not used. Always disconnect this cord when using the low output, to avoid strays. The attenuator controls are only partially effective on the high output but operate in series on the low output so that signal strength can be continuously varied from approximately 1/2 microvolt to 2 volts. The designation numbers under the attenuator knobs permits virtual calibration of the output although some variation in output will be caused by variations of line voltage and frequency adjustment.

A F & EXT. MOD. If the output cord is plugged into the upper or tip jack it will deliver a pure 400 cycle audio note suitable for testing of all audio circuits. The dial settings of the instrument have no relation to this function. Usually best results will be obtained if a .25 MFD. condenser is used in series with the output cord, to one of the grid circuits of the audio system. This feature permits an overall check of the whole audio system.

Use a phone plug to connect audio oscillator or high impedance pickup into the external modulation jack. This automatically cuts off the modulation in the instrument, if it happens to be on when the plug is inserted. Connect inner conductor the output cord to the antenna post of the receiver and the sheath to the ground post and adjust attenuation or output to desired level. Tune either the oscillator to the receiver or the receiver to the oscillator until the signal is heard or noted on an output meter. This feeds the modulated signal through all circuits of the receiver and exactly simulates a broadcast signal. The principal advantage of such a test is to permit overall check of the receiver with a signal free of static and of known strength and clarity. If a music record is used only the usual listening test can be performed but it is very valuable particularly in noisey locations or where good clear broadcast signals are not available. If a high impedance pickup is used it may be necessary to connect a 5 or 10,000 ohm potentiometer across it to control the amplitude of the modulation. If a calibrated audio or beat frequency oscillator such as the CLOUGH-BRENGLE TYPE O B is used, accurate fidelity curves can be run. Such curves will graphically show the absolute tone fidelity of the receiver and are necessary in making comparison before and after servicing or of different receivers. The use of a variable modulation frequency fed through the receiver in this manner is the only proper method to use in locating parts of the receiver or cabinet that may be vibrating so as to set up rattles or howls. Once the sympathetic frequency is set on the audio oscillator, it can be held until the vibrating part is located. This is particularly necessary in the servicing of the now popular wide range receivers and amplifiers.

MODULATION: The modulation switch controls only the modulation of the oscillator frequency and when ON impresses a frequeny of 400 cycles on the oscillator fundamental. It is necessary to use the modulated signal when output of the receiver is checked with a speaker or output meter. The unmodulated signal will come through the speaker as low hiss if it can be heard at all. In peaking the I F system of AVC receivers many service men prefer to use the unmodulated frequency and note the peak on the tuning meter.

In the event there is no tuning meter a milliameter may be placed in the plate circuit of either of the A V C controlled I F tubes. The CLOUGH-BRENGLE type U E Unimeter has scales particularly suited either to this purpose or to use as an output meter. The I F stages may thus be peaked with absolute precision. The type of receiver howls particularly associated with vibration of oscillator circuit parts may best be investigated and located with the unmodulated signal. Such howls have the characteristic of appearing at fairly definite carrier frequencies and may not be apparent at other points on the dial. In this test use the speaker as output and resonate the oscillator with the receiver at the particular dial setting at which the howl ordinarily occurs, then find the loose part that is beating with the input note to generate an audible frequency. The rubber tip of a pencil makes a good exploring tool. Some receivers have a hum which is audible only when tuned into resonace with the broadcast station. Usually this is caused by inadequate filtering of the R F or I F plate circuit current and can properly be investigated only with the unmodulated signal from the oscillator.

I F ALIGNMENT: Connect the high output cord of the oscillator to the grid of the first detector, select the proper frequency from either the ready reference chart or the curve and set it on the oscillator dial. Then turn up the attenuation until a note is heard in the speaker or registered on the meter. Adjust the trimmers of the I F transformers slowly so as to always hit the exact peak. To test the sharpness of the lineup rotate the oscillator dial over a band of about 10 K C either side of peak. A properly aligned I F system should peak sharply at the proper frequency. Always work the oscillator at the lowest signal strength that will give good indication. Therefore, switch to the low output cord as soon as possible and retard attenuators regularly as alignment proceeds.

A V C ACTION: To check the A V C action resonate the receiver to the oscillator at any convenient frequency and slowly increase the oscillator output until the output meter shows distinct flattening of the receiver output curve. Such flattening of the receiver output curve should occur before the power output reaches the point where distortion begins.

R F ALIGNMENT: Connect the output cord of the oscillator to the antenna post of the receiver through a .00025 condenser to simulate an antenna. Always use the lowest output from the oscillator that will give good indication. To obtain best results it is necessary to follow the alignment instructions of the receiver manufacturers during this operation as there are many variations. Care should be taken to see that both oscillator and receiver are grounded. Fundamental frequencies are available from the oscillator up to 30 M C but the instrument is rich in harmonics which are absolutely reliable for still higher frequencies.

SELECTIVITY TEST: After the receiver is completely serviced connect the low output cord to the antenna post and resonate the two at some convenient point, then swing the oscillator in steps of 1 K C each side of the peak, noting the output meter readings. When this is plotted on squared paper it will give an accurate selectivity curve. Such curves are usually made at several settings on the receiver dial since no receiver has uniform selectivity across its full tuning range.

SENSITIVITY CURVES: After complete servicing of the receiver connect the low output cord to the antenna post, adjust attenuation to minimum point at which signal can be noted then swing across the tuning range of the receiver to check comparative sensitivity at different points on its dial. A little experience using the same equipment on

different receivers will establish emperical standards that will be reliable for most purposes.

GENERAL: The CLOUGH-BRENGLE Type O C Oscillator contains 2 - 37 and 1 - 36 tubes, which are not particularly critical. They are worked at a low level and should last a long time. However, in replacement it is advisable to select good tubes and if possible use the same make tubes as originally supplied with the instrument. This oscillator is ruggedly built and will stand all ordinary usage but should not be tampered with, dropped, carried by the cord, or, otherwise abused. Calibration is performed at the factory entirely at fundamentals from quartz crystals. Re-calibration should not be attempted without adequate equipment. It can be performed at the factory for a nominal charge. It is fully guaranteed and will be serviced free of charge any time within ninety days from purchase if returned to the factory, transportation prepaid, providing the defect is the responsibility of the manufacturer.

All of the data from which the original curved graph was made is on file at the factory so that duplicate curves can be supplied without returning the instrument, or blank graph sheets are available at a nominal price.

MANUFACTURED AND GUARANTEED BY:

THE CLOUGH-BRENGLE CO.

CHICAGO U.S.A.

Clough-Brengle *PROFESSIONAL* Service Instruments

ALL-WAVE CONTINUOUSLY VARIABLE

Signal Generator---50 k.c. to 30 m.c. (6,000 to 10 meters)

All Fundamentals without use of Harmonics

Exclusive Features Introduced by the new MODEL OC

● ACCURACY—6 bands each covered by a dial 25 inches long, divided into 400 divisions, each division 1/16 inch wide. Readings to 1/10% accuracy. Hand calibrated with crystal oscillators.

● STABILITY—Electron coupling. "Tropical" impregnation of all coils. Three separate tubes for three separate functions. Rugged mechanical construction.

● CONVENIENCE—Continuously variable in frequency, 50 kilocycles to 30 megacycles. Continuously variable in output, 1/2 microvolt to 2 volts. 400 cycle audio test note. External modulation from phonograph or beat frequency oscillator when desired. Line operated without batteries.

An entirely new design for servicing All-Wave and Short-Wave Receivers

Advances and changes in receiver design bring new problems for the serviceman. The methods and equipment for testing and adjusting older sets are not suitable for today's new all-wave sets and for many of the recent sets employing entirely different intermediate frequencies.

CLOUGH-BRENGLE engineers have developed in the new MODEL OC Test Oscillator a complete solution to the problem of testing and aligning all receivers, regardless of their reception bands or the intermediate frequency employed.

Introducing countless entirely new electrical and mechanical features, its performance may be summed up as follows: The MODEL OC provides every known intermediate, broadcast, and short-wave frequency on fundamental signals (no confusing harmonics) at whatever signal strength needed for perfect alignment of any stage, no matter how badly out of alignment or how great the amplification or high the sensitivity of the set.

All this at an overall accuracy of ½ of 1% at any point in all frequency bands! Use of an electron-coupled circuit and careful engineering assure absolute frequency stability. Errors of frequency setting are banished with the new MICRO-ACCURATE Dial that may be set to 1/10 of 1% accuracy.

The MODEL OC is compact, light weight, and built to take the hardest service. Operation is from any 110 volt A.C. or D.C. line, eliminating the expense and weight of batteries.

Like all other CLOUGH-BRENGLE Professional Service Equipment, the new MODEL OC Test Oscillator is sold on a satisfaction guarantee. If after ten days' trial you are not entirely satisfied, the purchase price will be gladly refunded.

CLOUGH-BRENGLE MODEL OC

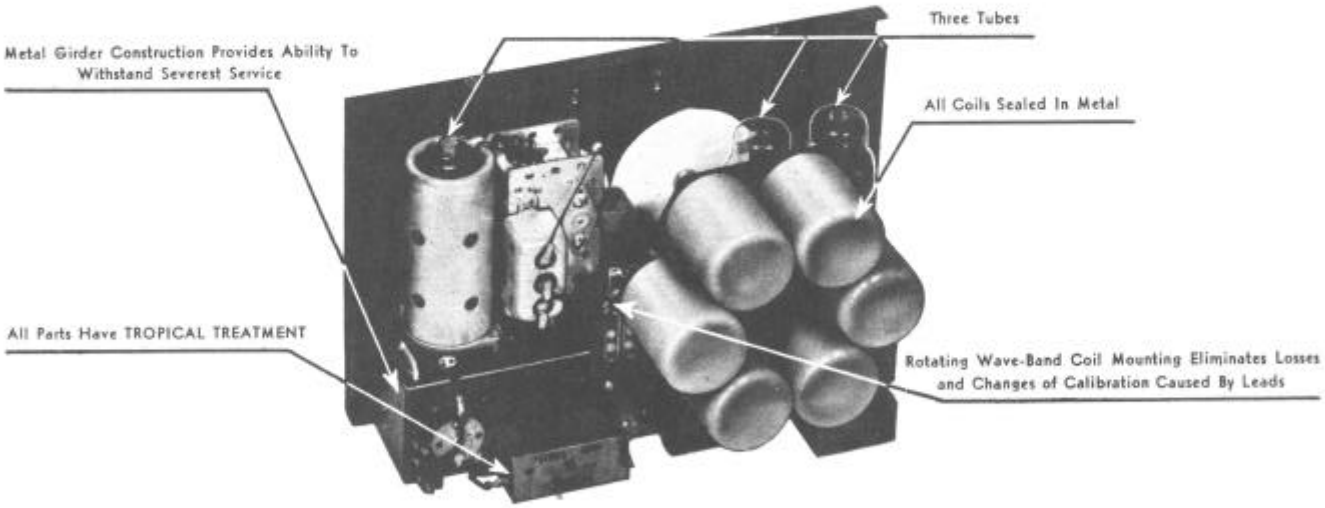
Test Oscillator List $49.85—Net $29.94

The CLOUGH-BRENGLE CO.

1134 West Austin Avenue - Chicago, U. S. A.

Clough-Brengle *PROFESSIONAL* Service Instruments

Precision Tuning Dial Spreads each Band over 25-inch Scale



FREQUENCY RANGE—From 50 kilocycles to 30 megacycles (6,000 to 10 meters) without skips, on fundamental frequencies, completely calibrated. This range is necessary for complete coverage of all intermediate, broadcast, and short-wave frequencies now in use and provides assurance against obsolescence not possessed by instruments failing to offer this complete coverage.

SIGNAL VOLTAGE OUTPUT—Continuously variable by means of two attenuation controls from a high of 2 volts to the extreme low of 1/2 microvolt. The perfect control of volume prevents overloading the receiver on high output and assures gradual dropoff to practically zero.

SIX FREQUENCY BANDS—are employed to cover this wide range. For each band a separate completely shielded coil is mounted on the rotating unit. The band selector control on the front panel rotates the desired coil to the contact position, doing away with the losses and strays produced by long leads and wave-band switches.

MICRO-ACCURATE DIAL—Allows output frequency to be set to 1/10 of 1% accuracy. The dial scale for each band is 25 inches long, divided into 400 divisions, each 1/16 inch apart. This ease of accurate frequency setting eliminates the frequent cause of errors in ordinary variable air condenser tuned oscillators which may be as great as several per cent, with a 180 degree dial.

STABILITY—is secured through the use of an electron-coupled oscillator circuit whose frequency output is not affected by wide fluctuation of tube voltages. Careful design of mechanical parts has eliminated frequency shift from temperature or humidity. Output frequency of each band is individually adjusted to zero beat against a crystal oscillator. This method was first employed in the CLOUGH-BRENGLE MODEL OA Oscillator, and not one of these instruments has ever come back to the factory over 50 cycles (.05 k.c.) off zero beat, even after the most severe service.

MODULATION—The MODEL OC introduces entirely new facilities for testing. It provides these three types of output: 400 cycle modulated radio frequency signal for all ordinary alignment work; an unmodulated r.f. signal; and a 400 cycle audio frequency signal for all audio amplifier and speaker tests. In addition, a jack is provided on the front panel for plugging in a phonograph pickup or calibrated audio oscillator when other than 400 cycle audio modulation is desired.

CIRCUIT—The MODEL OC employs the electron-coupled test oscillator circuit first introduced by CLOUGH-BRENGLE. Separate audio frequency modulator stage is employed to assure freedom from frequency drift and a pure 400 cycle note that does not shift with voltage change or tube replacement. Separate rectifier circuit provides power for these stages and is carefully filtered to prevent feedback through the power supply circuit. Employs one type 36 and two type 37 tubes.

A.C. OR D.C. LINE OPERATED—Connects to any 110 volt power line. Power cord resistor dissipates voltage drop for filaments externally of instrument to prevent heating and resultant frequency drift. Switch on front panel allows instrument to be shut off without disconnecting power cord.

COMPACT SIZE—Only 10¾ x 7½ x 5¾" deep. Net weight 8½ lbs. Housed in heavy metal case, crystallac finished, affording complete shielding and protection against damage.

EQUIPMENT—The MODEL OC is furnished complete as described above, with power cord, shielded output lead, one type 36 and two type 37 laboratory tested tubes, and instruction sheet.

CLOUGH-BRENGLE
Service and Laboratory Instruments

CLOUGH-BRENGLE engineers have developed a complete line of equipment for all laboratory and service testing needs. Write for information on any equipment need. The following are some of the new instruments on which bulletins are now ready:

Model OB Audio Oscillator—A remarkably low price precision laboratory instrument with new features making its use easier and application wider than any previous equipment of this type.

Model VM Vacuum Tube Voltmeter—Designed for laboratory use and more accurate service work. Low in price and simplified to allow easy set-up and operation.

Model UC Unimeter—Sets a new low price for a precision calibrated Volt-Ohm-Milliameter. Provides A.C., D.C. voltage and current, resistance, capacity, and receiver output ranges for all service testing.

Model OA Test Oscillator—The popular CLOUGH-BRENGLE fixed frequency type electron-coupled oscillator. Similar in design to the Model OC, but provides seven fixed frequency outputs instantly available by wave-change switch. Used and recommended by over 20 leading set manufacturers.

Clough-Brengle Company

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Chicago, U. S. A.

Export Office
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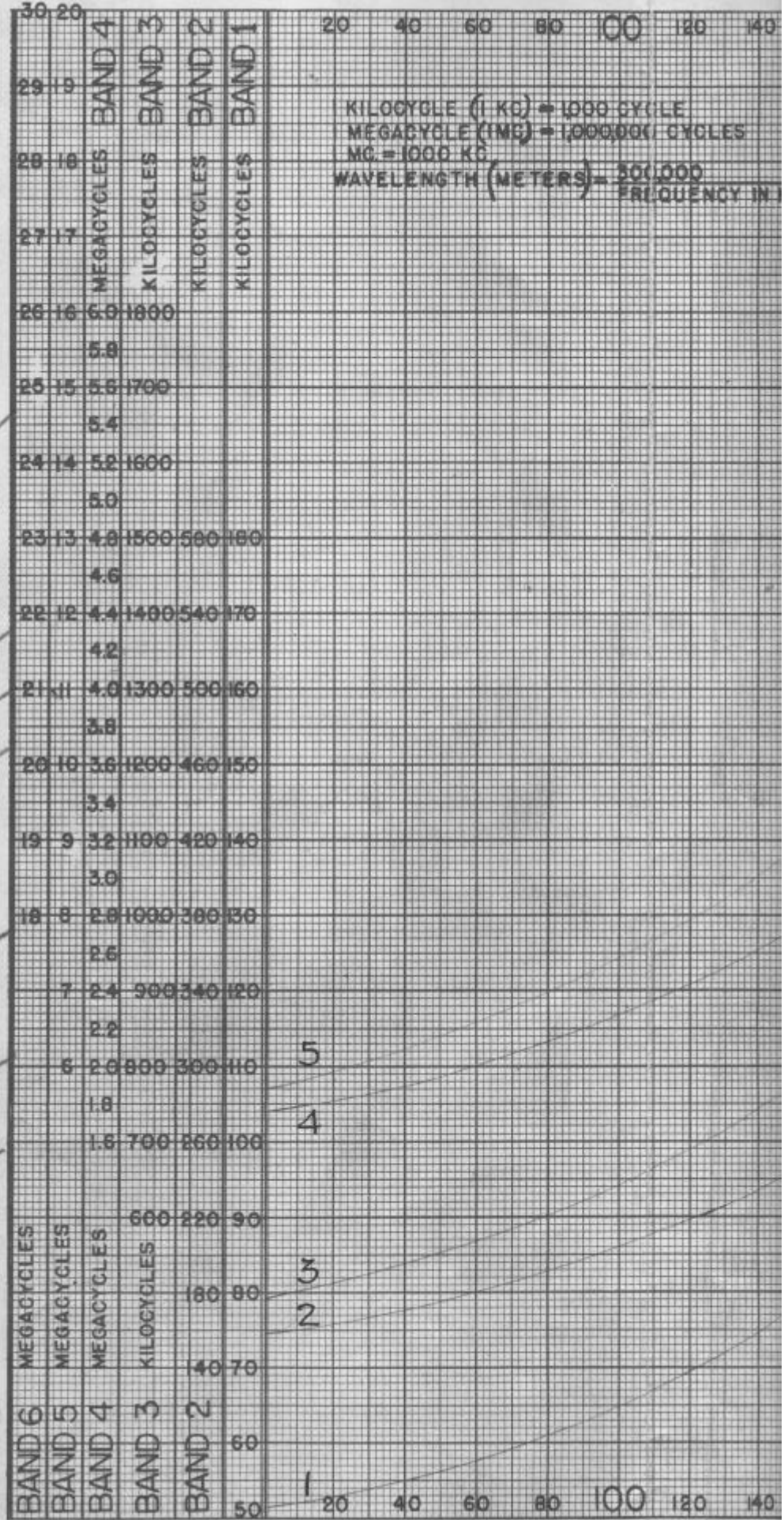
Cable Address: LIKEX

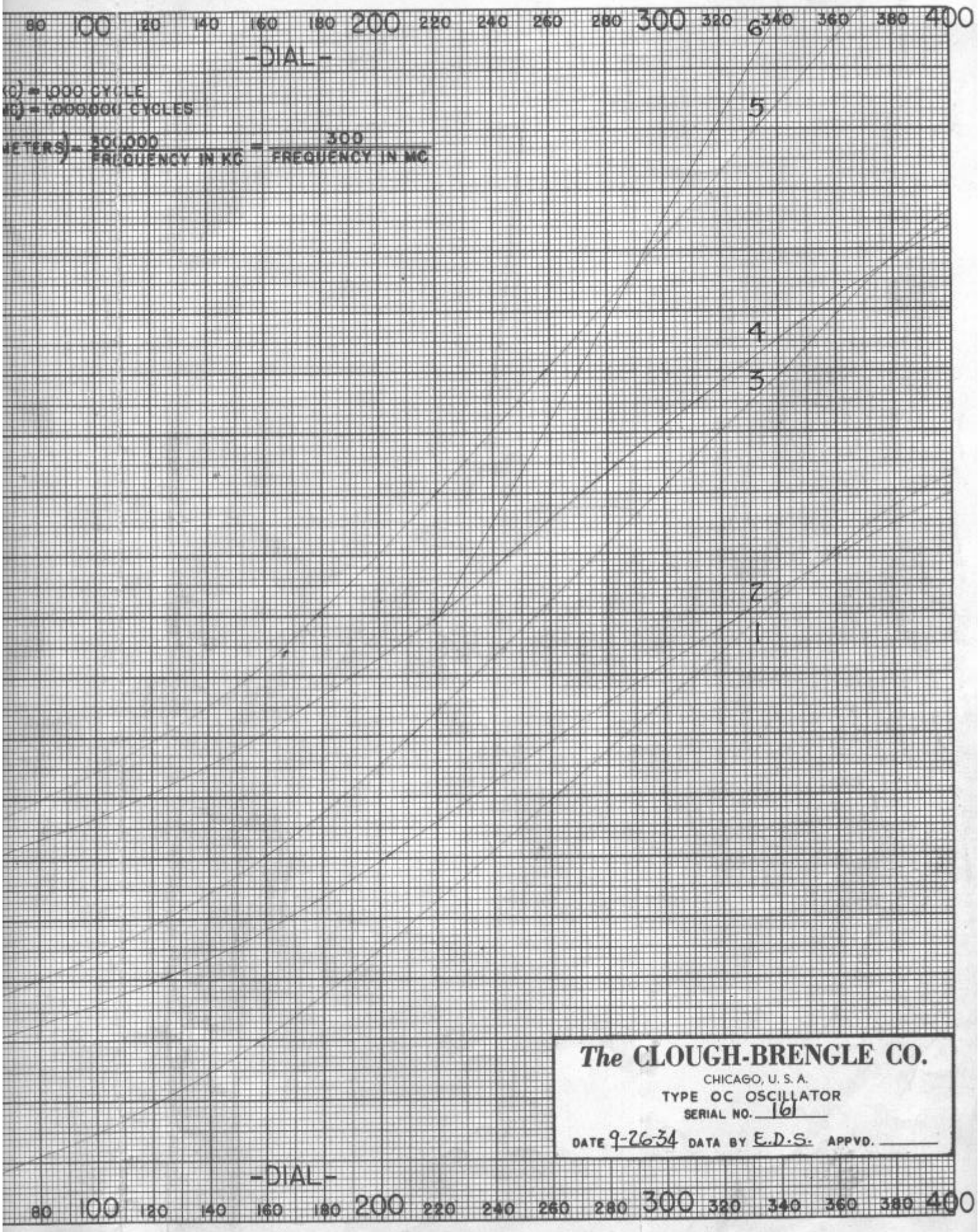
Form No. 14013

Printed in U. S. A.

READY REFERENCE CHART

F	BAND	DIAL	F	BAND	DIAL
55k.c.	1	42	472.5k.c.	2	339
92k.c.	1	192	477.5k.c.	2	342
100k.c.	1	217	480k.c.	2	344
107k.c.	1	230	482.5k.c.	2	346
110k.c.	1	237	485k.c.	2	349
115k.c.	1	249	490k.c.	2	353
120k.c.	1	261	500k.c.	2	361
125k.c.	1	274	517.5k.c.	2	378
130k.c.	1	286	525k.c.	2	386
132k.c.	1	291	535k.c.	3	37
140k.c.	1	311	550k.c.	3	48
145k.c.	1	323	570k.c.	3	61
150k.c.	1	335	600k.c.	3	78
160k.c.	1	359	650k.c.	3	104
165k.c.	1	372	700k.c.	3	125
172.5k.c.	2	45	800k.c.	3	159
175k.c.	2	51	950k.c.	3	199
177.5k.c.	2	54	1000k.c.	3	210
180k.c.	2	60	1200k.c.	3	255
181.5k.c.	2	62	1400k.c.	3	298
182.5k.c.	2	64	1425k.c.	3	303
200k.c.	2	93	1500k.c.	3	320
206k.c.	2	103	1525k.c.	3	325
230k.c.	2	136	1710k.c.	3	364
235k.c.	2	140	1730k.c.	3	368
240k.c.	2	147	2.0m.c.	4	58
250k.c.	2	157	2.4m.c.	4	116
252.5k.c.	2	160	2.5m.c.	4	128
260k.c.	2	167	3.9m.c.	4	240
262k.c.	2	169	4.0m.c.	4	245
262.5k.c.	2	170	5.0m.c.	4	312
264k.c.	2	171	6.0m.c.	4	387
265k.c.	2	172	8.0m.c.	5	123
350k.c.	2	240	10.0m.c.	5	178
370k.c.	2	255	15.0m.c.	5	277
427k.c.	2	300	18.0m.c.	5	333
445k.c.	2	315	20.0m.c.	5	369
450k.c.	2	320	24.0m.c.	6	270
455k.c.	2	324	30.0m.c.	6	341
456k.c.	2	325			
460k.c.	2	328			
465k.c.	2	332			
470k.c.	2	336			





The CLOUGH-BRENGLE CO.

CHICAGO, U. S. A.

TYPE OC OSCILLATOR

SERIAL NO. 161

DATE 9-26-34 DATA BY E.D.S. APPVD. _____