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MILITARY
SPECIFICATION

MIL-C-10405A(SigC)
2 April 1954
Superseding
Specification MIL-C-10405
27 July 1950

CRYSTAL UNITS, QUARTZ, PRESSURE AND SPACER MOUNTED

1. SCOPE

1.1 This specification covers the following types of crystal units consisting of a quartz element, spacer mounted or pressure mounted between metal electrodes under spring pressure and housed in a sealed holder.

Crystal Unit in Radio Transmitter BC-610-( )
Crystal Unit in Radio Receiver BC-499-( )
Crystal Unit DC-34
Crystal Unit DC-35
Crystal Unit CR-6/U
Crystal Unit CR-8/U
Crystal Unit CR-10/U
Crystal Unit CR-13/U (455kc)
Crystal Unit CR-13/U (5250kc)

2. APPLICABLE SPECIFICATIONS STANDARDS, DRAWINGS, AND PUBLICATIONS

2.1 The following specifications, standards, and publications, of the issue in effect on date of invitation for bids, form a part of this specification.

SPECIFICATIONS

FEDERAL

NN-B-591	Boxes, Fiberboard, Wood-Cleated (For Domestic Shipment).
NN-B-601	Boxes, Wood-Cleated-Plywood, For Domestic Shipment.
NN-B-621	Boxes, Wood, Nailed and Lock-Corner.
NN-B-631	Boxes, Fiber, Corrugated (For Domestic Shipment).
QQ-M-151	Metals; General Specification for Inspection of.
QQ-S-571	Solder, Soft (Tin, Tin-Lead, and Lead-Silver).
LLL-B-631	Boxes, Fiber, Corrugated (For Domestic Shipment).

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JAN-P-105	Packaging and Packing for Overseas Shipment - Boxes, Wood, Cleated, Plywood.
JAN-P-106	Packaging and Packing for Overseas Shipment - Boxes; Wood, Nailed.

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JAN-P-108	Packaging and Packing for Overseas Shipment - Boxes, Fiberboard (V-Board and W-Board), Exterior and Interior.
JAN-P-120	Packaging and Packing for Overseas Shipment - Cartons, Folding, Paperboard.
JAN-P-133	Packaging and Packing for Overseas Shipment - Boxes, Set-Up, Paperboard.
MIL-L-10547	Liners, Case, Waterproof.
MIL-H-12783(SigC)	Holders, Crystal.

STANDARDS

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MIL-STD-105	Sampling, Procedures and Tables for Inspection by Attributes.
MIL-STD-129	Marking of Shipments.

The specification sheets listed on Supplement 1 to this specification also forms a part of this specification.

(Copies of specifications and standards required by contractors in connection with specific procurement functions should be obtained from or as directed by the contracting officer. Both the title and identifying number or symbol should be stipulated when requesting copies.)

3. REQUIREMENTS

3.1 Parts, materials, and processes; general.-

3.1.1 Selection.- Items (parts, materials, and processes) shall be such as to enable the equipment to meet its performance and other requirements, as described herein, and shall be selected in accordance with subparagraphs (a), (b), or (c), as applicable. (When none of the subparagraphs apply, specified equipment performance and other requirements govern exclusively).

(a) The item shall conform to a detailed description herein.

(b) The item shall be the manufacturer's type, or approved equal, referenced herein and shall incorporate any modifications specified in connection with the item.

(c) The item shall conform to a detailed document referenced herein for the particular purpose of specifying the item; to any changes in, or additional requirements prescribed by this specification in connection with the detailed document; and to any limitations prescribed herein as to the application of types, classes, grades, characteristics, compositions, etc, covered by the detailed document. Optional deviations from the detailed document, if described herein, may be exercised by the contractor.

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3.2 Preproduction samples.-

3.2.1 Quantities.- After award of contract, 30 preproduction samples of each type of crystal unit on order shall be furnished:

3.2.2 Compliance with specified requirements.-

3.2.2.1 Preproduction samples shall meet specified requirements, shall be made and assembled by tools and methods that will be used for quantity production and shall be accompanied by a statement to that effect. (See 3.2.2.3 for exception).

3.2.2.2 Approval of preproduction samples shall not be construed as a waiver of any specified requirement.

3.2.2.3 When deviation from 3.2.2.1 is unavoidable, the preproduction samples may be submitted for approval provided that the accompanying statement describes in detail each nonconforming feature, reason therefor, and manner in which it will be corrected in production of equipment on contract.

3.2.3 Test data.- The preproduction samples shall be accompanied by test data showing compliance with specified performance. The test data shall comprise an engineering report giving test procedure, observations and other data, calculations, test results, and essential details of the testing equipment (manufacturer's model, serial number, date of calibration, and the like).

3.2.4 Reference standards.- After preproduction samples have been approved and returned to the contractor's plant, they shall be kept intact in custody of the Government inspector until released by him. They shall be used as reference standards to resolve any differences of opinion regarding interpretation of requirements.

3.2.5 Preproduction inspection.- Preproduction samples may be subjected by the Government to the group A inspection specified in Table II. Unlisted nondestructive inspection on preproduction samples may be performed to determine compliance with specified requirements. Preproduction inspection will normally be performed in this order: (1) vibration, (2) bounce, (3) shock, bench-handling, (4) shock, ballistic or drop, and (5) immersion; other preproduction inspection may precede, follow, or be interspersed between the foregoing.

Table I - Preproduction inspection

Inspection	Requirement	Test Procedure
Visual and Mechanical Inspection		4.2.1
Frequency (measurement over temperature range)	3.8.2	4.2.2
Resonance Resistance (measurement over temperature range)	3.8.3	4.2.3
Drop	3.9	4.2.4.1
Vibration	3.10	4.2.4.2
Seal	3.11	4.2.5
Immersion	3.12	4.2.6
Internal Inspection		4.2.7
Cleaning	3.13	4.2.8
Corrosion	3.14	4.2.9

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3.3 Soldering.-

3.3.1 Solder.- Solder used for electrical connections shall be composition Sn60 conforming to Specification QQ-S-571.

3.3.2 Flux and cleaning agents.- No acid or acid salts shall be used in preparation for or during soldering; however, exception is permitted for preliminary tinning of electrical connections and for tinning or soldering of mechanical joints not used to complete electrical circuits, but in no case shall acid or acid salts be used where they can come in contact with insulation material. Where acid or acid salts are used, as permitted above, they shall be completely neutralized and removed immediately after use. Flux for soldering of electrical connections shall be rosin or rosin and alcohol.

3.3.3 Process.- There shall be no sharp points or rough surfaces resulting from insufficient heating. The solder shall feather out to a thin edge, indicating proper flowing and wetting action, and shall not be crystallized, overheated, or underheated. The minimum necessary amount of flux and solder shall be used for electrical connections. The soldering shall be so accomplished that no rosin remains on the joint or in the proximity of the joint. Any means employed to remove an unavoidable excess of flux shall not incur the risk of loose particles of flux, brush bristles, or other foreign material remaining in the equipment, flux being spread over a larger area, or resulting damage to the equipment. Insulation material that has been subjected to heating during the soldering operation shall be undamaged and parts fastened thereto shall not have become loosened.

3.4 Cleaning.- Metal parts, after fabrication shall be cleaned in accordance with good commercial practice, or as specified in an applicable document. Cleaning processes shall have no visible or latent deleterious effect on the crystal units. Corrosive material shall be removed completely before parts are assembled into the crystal units. After assembly, components shall be cleaned thoroughly and shall be free from particles of solder, flux, and other foreign material. If necessary, such cleaning shall also be performed before final assembly of components.

3.5 Crystal units.- Detail requirements or exceptions applicable to the individual types are specified on the individual specification sheets as listed in Supplement 1 to this specification.

3.5.1 Crystal holders.- Crystal holders for the different crystal units shall be as specified on the individual specification sheets.

3.5.1.1 Springs.- Springs shall be of the type and material specified in MIL-H-12783 and when assembled in the crystal unit shall exert a force within the limits specified on the specification sheet for the particular type of crystal unit.

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3.6 Etching.- The quartz element of all units shall be finished to final frequency by etching. All elements shall be etched a minimum amount as specified below. Any frequency adjustment required after the minimum etching shall be accomplished by etching. No hand lapping or other form of abrasive finishing shall be applied to the major surfaces of the quartz element after the "minimum etch" has been accomplished. If edging is necessary to restore activity at any time after the "minimum etch", it shall be accomplished with a bonded abrasive. Upon being subjected to the test of 4.2.10 the frequency of a freshly lapped element shall increase at least the amount determined by one of the applicable formulae listed below:

Formula for AT cut elements: $df = 0.6F2$
Formula for BT cut elements: $df = 0.4F2$
"df" is the required frequency increase expressed in kc/sec.
"F" is the frequency of the quartz element expressed in Mc/sec.

3.7 Marking.- Crystal units shall be marked in accordance with the drawing specified on the applicable specification sheet.

3.8 Operating characteristics.-

3.8.1 Temperature range.- The temperature range of the crystal units shall be as specified on the applicable specification sheet.

3.8.2 Frequency.- The nominal frequency range and the frequency tolerance of the crystal units shall be as specified on the applicable specification sheet (see 4.2.2).

3.8.3 Resonance resistance.- The maximum resonance resistance as specified on applicable specification sheets shall not be exceeded at any temperature within the specified temperature range when tested in accordance with 4.2.3.

3.9 Drop.- After the test specified in 4.2.4.1 there shall be no resultant mechanical damage to the unit, and the frequency and resonance resistance shall not have deviated outside the tolerances specified for the crystal unit on the applicable specification sheet.

3.10 Vibration.- After the test specified in 4.2.4.2 there shall be resultant mechanical damage to the unit, and the frequency and resonance resistance shall not have deviated outside the tolerances specified for the crystal unit on the applicable specification sheet.

3.11 Seal.- After the test of 4.2.5 there shall be no evidence of leaking of gas or air from the holder.

3.12 Immersion.- After the test of 4.2.6 there shall be no mechanical damage to the unit and the marking shall be legible. The d-c resistance between the pins of the unit shall not be less than 500 megohms, and the resonance resistance and frequency shall be within tolerances specified for the particular crystal unit.

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3.13 Cleaning.- Following the test of 4.2.8, the frequency of the unit shall not exceed the value measured before the test by more than the amount permitted on the applicable specification sheet.

3.14 Corrosion.- There shall be no excessive corrosion of the crystal units after their exposure to the test of 4.2.9.

3.15 Workmanship.- Components and parts shall be manufactured and assembled in a thoroughly workmanlike manner.

4. SAMPLING, INSPECTION AND TEST PROCEDURES

4.1 Inspection, general.- Government inspection shall consist of group A, group B, and group C inspection as specified in 4.1.1 through 4.1.3.2. Group B inspection may be performed on samples that have passed the group A inspection, or separate samples may be selected for group A and group B inspection, at the discretion of the Government inspector. Similarly, successive or separate sampling may be performed for the sub-group 1 and sub-group 2 tests.

4.1.1 Group A inspection.- Group A inspection shall be in accordance with Table II and Military Standard MIL-STD-105. All tests with a sub-group shall be performed on the same sample units in the order shown.

Table II - Government group A inspection

Inspection	Rqt Par.	Test Par.	AQL Major	AQL Minor
Subgroup 1 tests				
Visual and Mechanical Inspection (external)	3.5, 3.7	4.2.1	1.5% for the group	*
Drop	3.9	4.2.4.1		
Vibration	3.10	4.2.4.2		
Seal	3.11	4.2.5		
Subgroup 2 tests				
Frequency	3.8.2	4.2.2.1 4.2.2.2	1.5% for the group	*
Resonance Resistance	3.8.3	4.2.3.1 4.2.3.2		

* All defects are considered major.

4.1.2 Group B inspection.- Group B inspection shall be in accordance with Table III.

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4.1.2.1 Order of inspection within group B.- Group B inspection shall be performed in the order shown in Table III.

4.1.2.2 Sampling procedure.- Samples shall be selected in an unbiased manner by the Government inspector. Unless otherwise specified, inspection shall be started using level II of the specified drawing. If the number of defective sample units from a lot exceeds the acceptance number specified on the drawing, the lot shall be rejected. Disposition of rejected product (sample units and lots) shall be in accordance with Standard MIL-STD-105 and 4.1.4.

4.1.2.3 Procedure in case of failure.- When a lot is rejected, the contractor shall immediately investigate the cause of failure and shall report to the Government inspector the results thereof and proposed corrective action. If the contractor and Government inspector cannot agree on the corrective action to be taken, the matter shall be referred to the contracting officer for resolution.

Table III - Government group B inspection

Inspection	Rqt Par.	Test Par.	Sampling Dwg.	Plan AQL
Immersion	3.12	4.2.6)	460-13	8%
Internal Inspection	3.3	4.2.7)	For the Group	
	3.3.2	)		
	3.3.3	)		
	3.4, 3.5	)		
	3.5.1	)		
Cleaning	3.13	4.2.8)		

4.1.3 Group C inspection.- Group C inspection shall consist of the etching test 4.2.10.

4.1.3.1 Selection of samples.- One freshly lapped plate shall be selected at random each day for the group C test.

4.1.3.2 Non-compliance.- If a sample plate fails group C inspection, the contractor shall immediately investigate the cause of failure and shall report to the Government inspector the results thereof and details of corrective action taken on the process and affected portion of product. If the Government inspector does not consider that the corrective action will enable the equipment to meet specified requirements, or if the contractor cannot determine the cause of failure, the matter shall be referred to the contracting officer.

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4.1.4 Disposition of nonconforming product.- When defective sample units or rejected lots are resubmitted or affected portion of product is submitted for acceptance, such items shall be suitably tagged or identified by equivalent means to indicate the cause of failure and means employed to correct the fault. The record shall be presented to the Government when the product is submitted and shall become the property of the Government.

4.2 Methods of test.-

4.2.1 Visual and mechanical inspection.- The unit shall be subjected to external inspection to insure that the physical dimensions are within the specified tolerances, that the marking is correct, and that the workmanship is satisfactory.

4.2.2 Frequency.-

4.2.2.1 Method of measurement.- The frequency of the unit shall be measured in an operating crystal test oscillator which has been correlated to the reference standard crystal test set.

4.2.2.2 Measurement over the temperature range.- While the temperature of the crystal unit is varied at a rate not exceeding 2°C per minute, the measurement shall be made over the applicable temperature range either continuously or at intervals no greater than 2°C per minute.

4.2.3 Resonance resistance.-

4.2.3.1 Method of measurements.- The resonance resistance of the unit shall be measured in an operating crystal test oscillator which has been correlated to the reference standard crystal test set. The resonance resistance of units designed for operation at the series or parallel resonance of the unit in a given circuit shall be measured in terms of the equivalent electrical resistance of the unit at its resonant frequency.

4.2.3.2 Measurement over the temperature range.- The measurement shall be made over the applicable temperature range while the temperature of the unit is varied at a rate not exceeding 2°C per minute, either continuously or, at the contractor's option, at intervals no greater than 2°C.

4.2.4 Drop and vibration.- The frequency and resonance resistance shall be measured before and after subjecting the unit to the drop or to the vibration test using the methods specified in 4.2.2.1, 4.2.2.2, 4.2.3.1.

4.2.4.1 Drop.- The unit shall be permitted to fall 5 times at random orientation, from a height of 8 inches, onto a horizontal 2 inch oak plank. See 3.9.

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4.2.4.2 Vibration.- The units shall be rigidly mounted on the platform of a vibration machine. The units shall be mounted so that the vibration will be applied as follows:

(1) One-third of the units shall have the direction of motion parallel to the pin length.

(2) One-third of the units shall have the direction of motion perpendicular to the largest face.

(3) One-third of the units shall have the direction of motion perpendicular to the pin length and parallel to the largest face.

4.2.5 Seal.- Either one of the following tests shall be performed. See 3.11.

4.2.5.1 Test A.-

4.2.5.2 Test equipment.- Test of the seal shall be made in a WE Hermetic Seal Test Equipment KS-1010, N.A. Philips Hermetic Seal Test Equipment, Model Number 14, 2, equal, using the following procedures:

4.2.5.3 Using a test voltage of 1000 volts ± 25 volts, measure the ionic current through each test point with no crystals in the sockets. At a pressure of 1/2" to 3/4" of mercury the total current through any test point should be less than 2 microamperes. If it is more, the machine is invalid for this test because of excessive leakage usually caused by moisture in the wiring and components. Insert the crystal units in the test sockets including at least one leaker of the same type and frequency range to show proper operation of the equipment. This shall not count as a reject. Reduce pressure in chamber to between 1/2" and 3/4" of mercury, and hold for 10 minutes. At the end of this period, holding the same vacuum, apply the test potential of 1000 volts ± 25 volts to each unit in turn. Reject any unit showing a current greater than 2 microamperes.

4.2.5.4 Test B.- The unit shall be immersed in water heated to a temperature between 90°C and 95°C and held at this temperature for 5 minutes. During this period no gas or air leakage shall occur as indicated by bubbles excaping from within the holder.

4.2.6 Immersion.- The unit shall be immersed in water heated to a temperature between 90°C and 95°C and held at this temperature for approximately one hour. The units shall then be removed before the water has been permitted to cool. All surface water shall be wiped or forced air dried, and the unit shall be set aside at room temperature for 1/2 hour. At the end of that time, the DC resistance between the pins of the unit shall be measured, using a test voltage no greater than 100 volts, and the frequency and resonance resistance shall be measured using the methods specified in 4.2.2 and 4.2.3.1. (See 3.12).

4.2.7 Internal inspection.- The crystal unit shall be disassembled and the interior of the crystal holder shall be examined in detail for compliance with the applicable requirements of section 3 and the drawings.

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4.2.8 Cleaning.- The unit shall be disassembled. The quartz element and the electrodes shall be washed by scrubbing with a nylon toothbrush, using water and a neutral soap and then rinsed in boiling distilled water and dried by evaporation. The unit shall be reassembled, no attempt being made to maintain the original position except for inversion of the electrodes with reference to the quartz element. During the washing, drying and reassembling operations the major surfaces of the element shall not be touched by the operator's fingers. The frequency shall be measured before and after the test, using methods specified in 4.2.2.1 and 4.2.3.1. See 3.13.

4.2.9 Corrosion.- The crystal unit shall be subjected for 50 hours to the salt spray fog test specified in Specification QQ-M-151, and then examined for evidence of corrosion. See 3.14.

4.2.10 Etching.- The blank to be tested shall be subjected to the minimum etching process used by the manufacturer in his normal production procedure. The frequency of the blank shall be measured before and after being subjected to the "minimum etch" and the increase in frequency noted, using the methods specified in 4.2.2.1 and 3.6.

4.3 Standard test conditions.- Unless otherwise specified herein, measurements and tests shall be made at $25^{+10^\circ}_{-5^\circ}$ C, ambient atmospheric pressure, and ambient humidity.

4.3.1 Frequency and resonance resistance measurements.- When frequency and/or resonance resistance are measured both before and after a test, the second measurement shall be made with the crystal unit at thermal equilibrium in an ambient temperature within 2°C of the temperature in which the first measurement was made. The level of drive of the test set shall be kept at a practical minimum with evaluation of the test being made on change of frequency and/or resonance resistance.

4.3.2 Levels of drive.- Unless otherwise specified, the level of drive shall be established within 20 percent of the value specified for each crystal unit. The referenced standard test sets to be used, and drive adjustment procedures shall be as specified in the applicable Military specification sheet.

4.4. Test oscillators.- Test oscillators shall be designed to permit external connections to the crystal unit since it is not intended that test equipment be subjected to the operating temperature range specified for the crystal units.

4.4.1 Referenced standard test set.- The Referenced Standard Test Set as specified in the applicable Military specification sheet shall be used exclusively under the Government inspector's supervision and shall be the only standard to which the manufacturer's test sets shall be correlated. The reference test set shall not be used for routine tests.

4.4.2 Manufacturer's test sets.- The manufacturer's test sets shall be used for all Government inspection tests and shall be correlated with the Referenced Standard Test Set to the satisfaction of the Government inspector.

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5. PREPARATION FOR DELIVERY

5.1 Preservation and packaging.-

5.1.1 For domestic shipment (immediate use).- Crystal units, quartz, pressure and spacer mounted shall be preserved and packaged in accordance with commercial practice. (See 6.1).

5.1.2 For domestic shipment (involving storage) or for overseas shipment.- Crystal units shall be unit packaged individually or in sets, in accordance with 5.1.2.1, or 5.1.2.2 as specified (see 6.1).

5.1.2.1 Individual packages.- Crystal units shall be cushioned to prevent damage and individually packaged in a folding carton or set-up box conforming to Specification JAN-P-120 and JAN-P-133, respectively.

5.1.2.2 Set packages.- Crystal units shall be packaged in sets, each set to consist of one crystal unit of each designated frequency. Each set shall be packaged in a hinged-cover-and-clasp-style enameled or lacquered metal box satisfactory to the bureau of Service concerned, or in fiberboard boxes, set-up boxes, or cartons as specified (see 6.1). When set-up boxes or cartons are specified, each set not exceeding 5 pounds set shall be packaged in a full telescope type of box having a minimum caliper of 0.030 inch. Sets in excess of 5 pounds shall be packaged in suitable corrugated or solid fiberboard boxes having a minimum bursting strength (Mullen test) of 200 pounds. Metal boxes shall be provided with plastic or metal trays having individual cells for each crystal unit. Set-up, folding, or fiberboard boxes shall be provided with fiberboard, or chipboard cell partitions. Crystal units shall be individually wrapped or cushioned to prevent damage.

5.1.2.3 Intermediate packages.- Five unit packages prepared as specified in 5.1.2.1, or a multiple thereof, shall be further packaged in intermediate containers conforming to Specification JAN-P-120 or JAN-P-133. The gross weight of the intermediate container shall not exceed 5 pounds.

5.2 Packing.-

5.2.1 For domestic shipment (immediate use).- The crystal units, quartz, pressure and spacer mounted shall be so packed as to insure arrival at destination in satisfactory conditions, and in containers complying with Consolidated Freight Classification Rules, at lowest rate.

5.2.2. For domestic shipment involving extended storage.- Crystal units, quartz, pressure and spacer mounted shall be packed in wood cleated fiberboard, wood cleated plywood, nailed wood, corrugated fiberboard, wirebound boxes conforming to Specification NN-B-591, NN-B-601, NN-B-621, LLL-B-631 or NN-B-631. The gross weight shall not exceed 65 pounds for fiberboard boxes and 200 pounds for plywood or wood boxes. Closure shall be made in accordance with the applicable box specification.

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5.2.3 For export shipment.- The crystal units, packaged as specified in 5.1.2.1 through 5.1.2.3 bearing the same stock number, shall be packed in a wood cleated plywood or nailed wood box conforming to the requirements of Specifications JAN-P-105 or JAN-P-106 respectively. Fabricate the box to fit the contents snugly. Unless otherwise specified, shipping containers shall be lined with sealed waterproof case liner conforming to Specification MIL-L-10547. The approximate gross weight of any exterior shipping container shall not exceed 150 pounds. Close the shipping container as specified in the appendix of the applicable box specification.

5.2.3.1 Shipping containers shall be strapped in conformance with the requirements of the appendix of the applicable container specification only for direct shipment to ports.

5.3 Marking for shipment.- Interior packages and exterior shipping containers shall be marked in accordance with applicable provisions of MIL-STD-129.

6. NOTES

6.1 Ordering data.- Procurement documents should specify the following:

(a) Title, number, and date of this specification.

(b) Type required.

(c) Whether domestic or overseas shipment is required.

(d) Samples required (See 3.2).

(e) Marking and shipping of samples.

(f) Place of final inspection.

(g) Type of packaging (See 5.1.2 and 5.1.2.2).

6.2 Contractual requirements.- It is recommended that the following be included in the contract.

6.2.1 Additional inspection.- It should be understood that additional examination, measurement, and nondestructive testing of equipment may be performed by the Government when considered necessary to determine compliance with this specification and other applicable documents. Accordingly, the Government inspector may withdraw materials, parts, or components temporarily from production for such inspection performed either at a Government laboratory or the contractor's plant.

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6.2.2 Waiver of preproduction samples.- When items for which preproduction samples are required are currently in production on a Government order, the contractor may apply to the contracting officer for waiver of preproduction samples on the new order. Any request for waiver should be made by the prime contractor and should include a statement indicating that: the specified samples have been submitted and approved on the current contract; production of the item under the new order will be concurrent with, or follow without interruption, production on the current order and will be at the same plant; and current production is in strict compliance with specified requirements for the new equipment except for such deviations as may be authorized on the current order. These deviations should be described in the statement. Waiver of preproduction samples may be contingent on renegotiation of the contract to reflect the saving in cost to the contractor.

NOTICE: When Government drawings, specifications, or other data are used for any purpose other than in connection with a definitely related Government procurement operation, the United States Government thereby incurs no responsibility nor any obligation whatsoever; and the fact that the Government may have formulated, furnished, or in any way supplied the said drawings, specifications, or other data is not to be regarded by implication or otherwise as in any manner licensing the holder or any other person or corporation, or conveying any rights or permission to manufacture, use or sell any patented invention that may in any way be related thereto.

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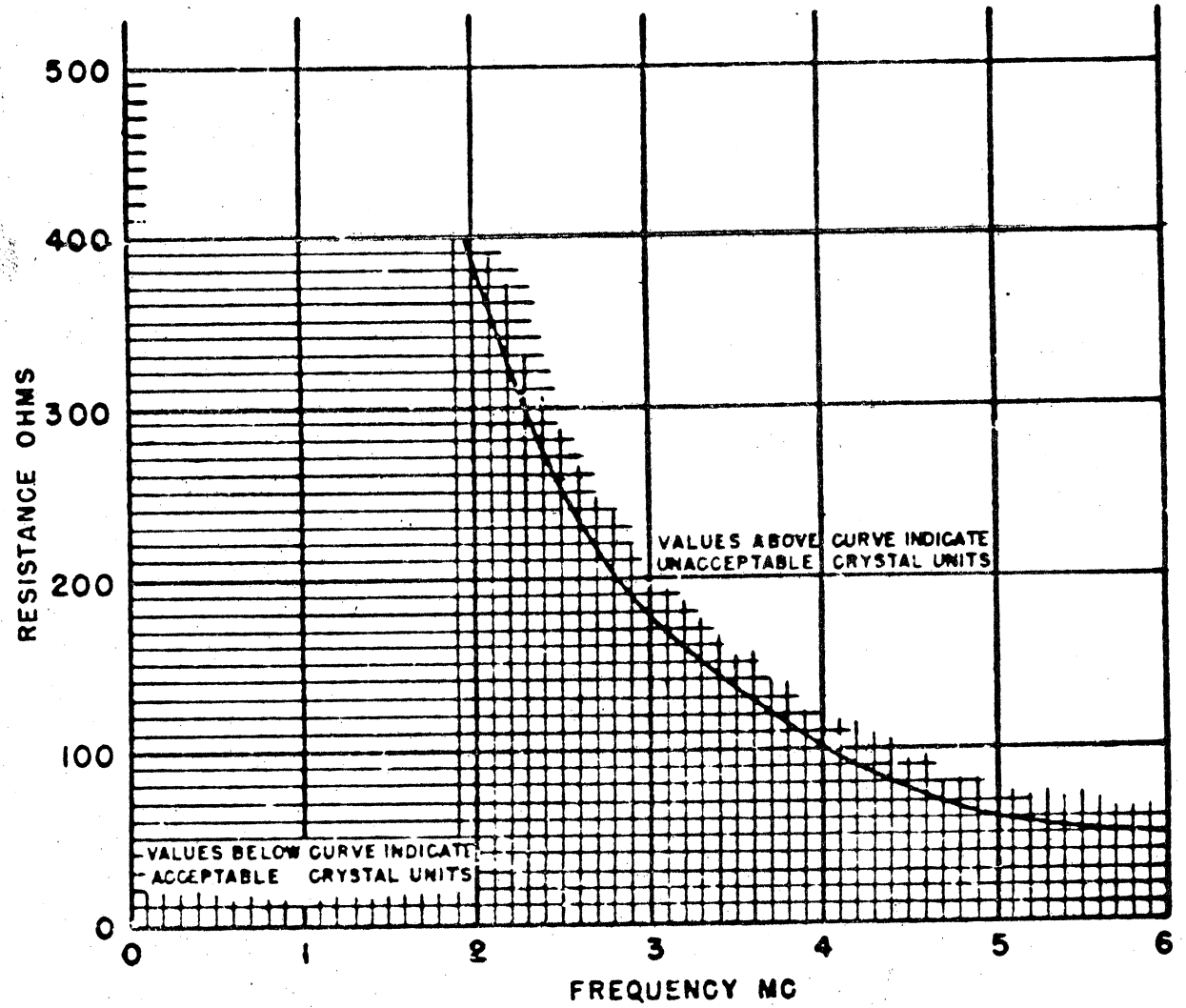

MAXIMUM EFFECTIVE RESISTANCE FOR CRYSTAL IN HOLDER FT-171 B FOR USE IN BC-610-E

CALIBRATION DATA FOR TS-330/TSM

RF CURRENT OF 30 ma AT 5 Mc WITH CALIBRATION RESISTANCE OF 100 OHMS

FIGURE 1

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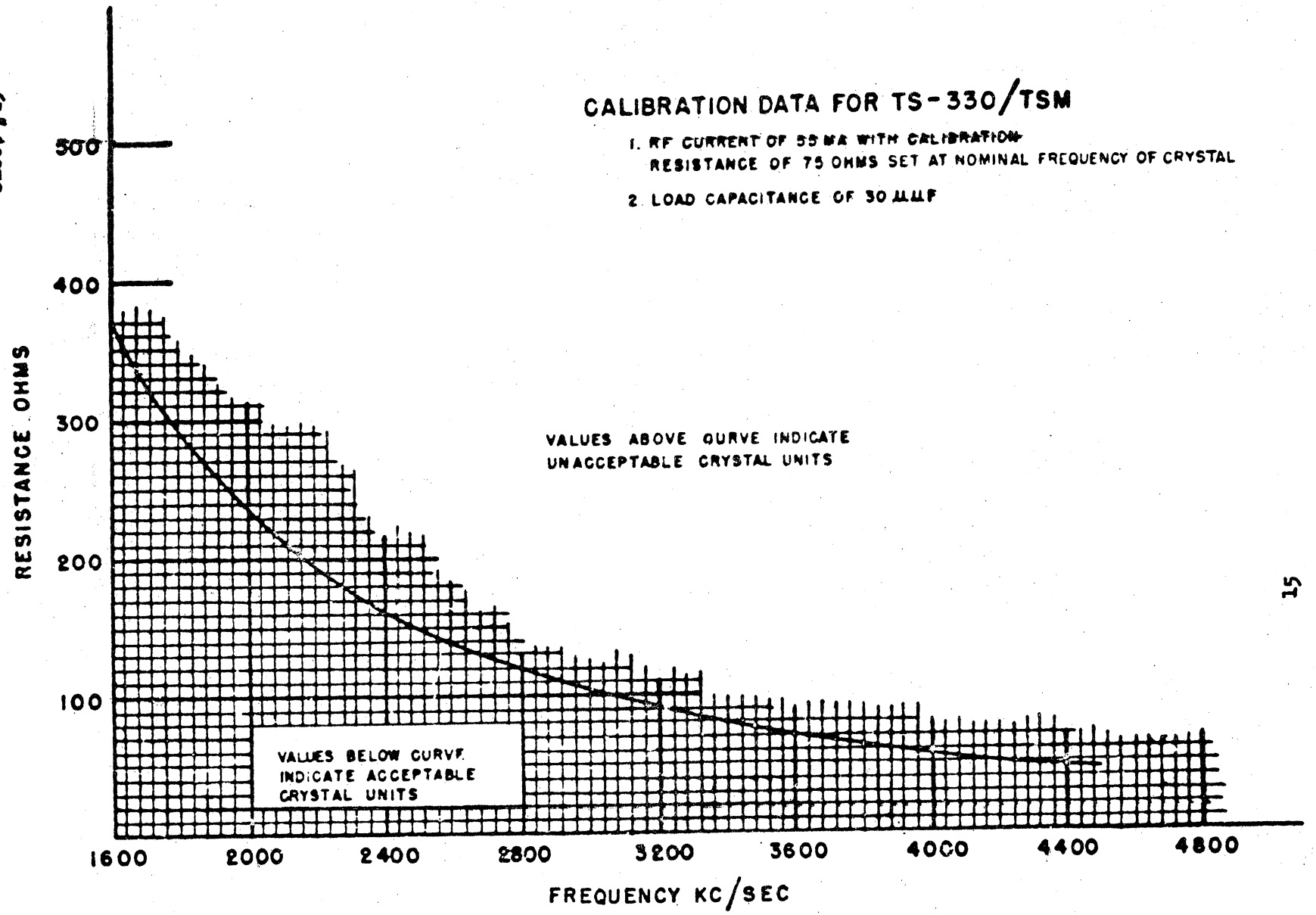

CRYSTAL UNITS DC-34 MAXIMUM EFFECTIVE RESISTANCE

FIGURE 2

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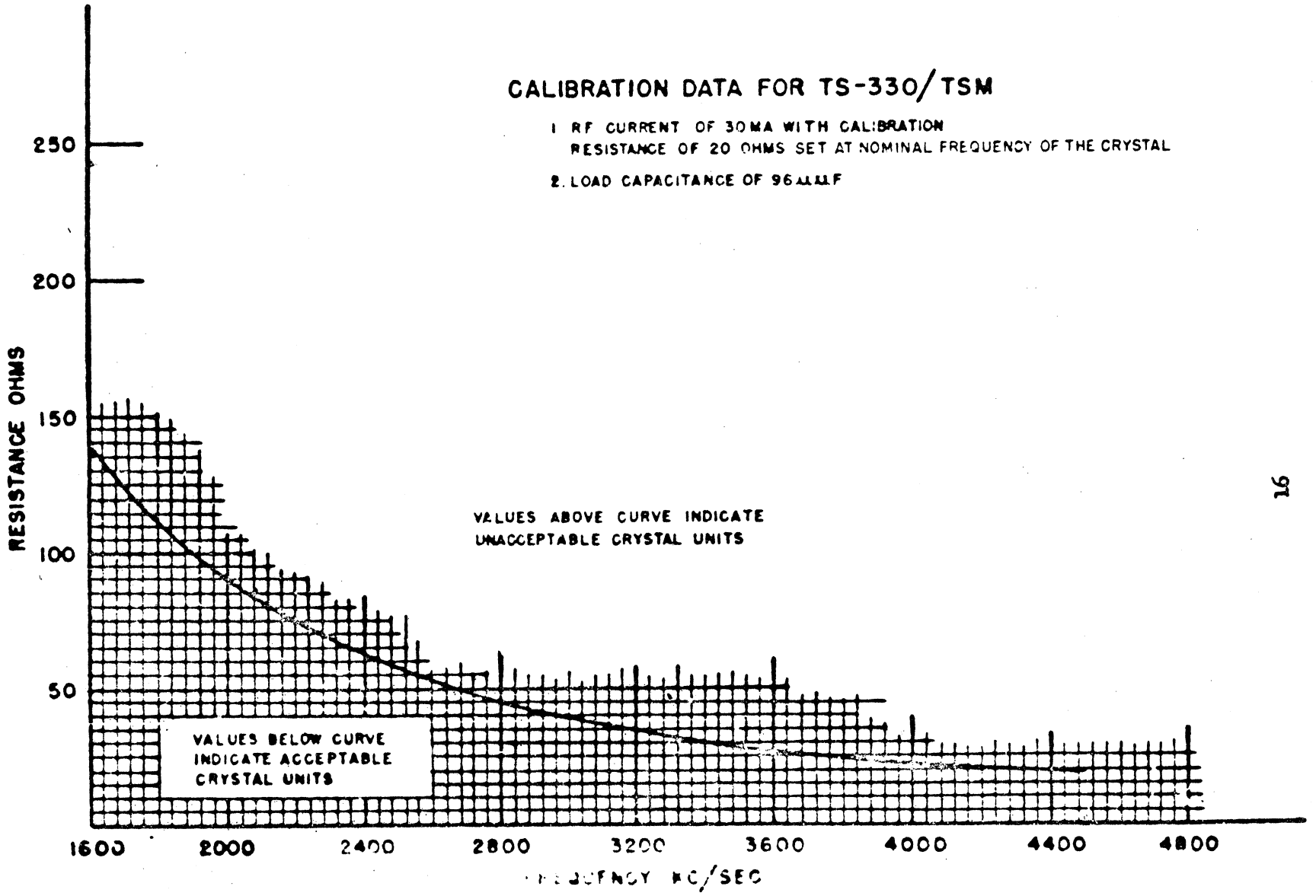

CRYSTAL UNITS DC-35 MAXIMUM EFFECTIVE RESISTANCE

FIGURE 3

DRIVE ADJUSTMENT DATA FOR TS-330/TSM

(SET TO INDICATED VALUES WITH TEST SET IN "CALIBRATE" POSITION)

FREQUENCY RANGE (MC)	CALIBRATION FREQUENCY (KC)	CALIBRATION RESISTANCE (OHMS)	CALIBRATION CRYSTAL CURRENT (MA)
2 - 2.25	2000	90	20
2.25 - 3.4	3000	130	20
3.4 - 10	5000	100	30

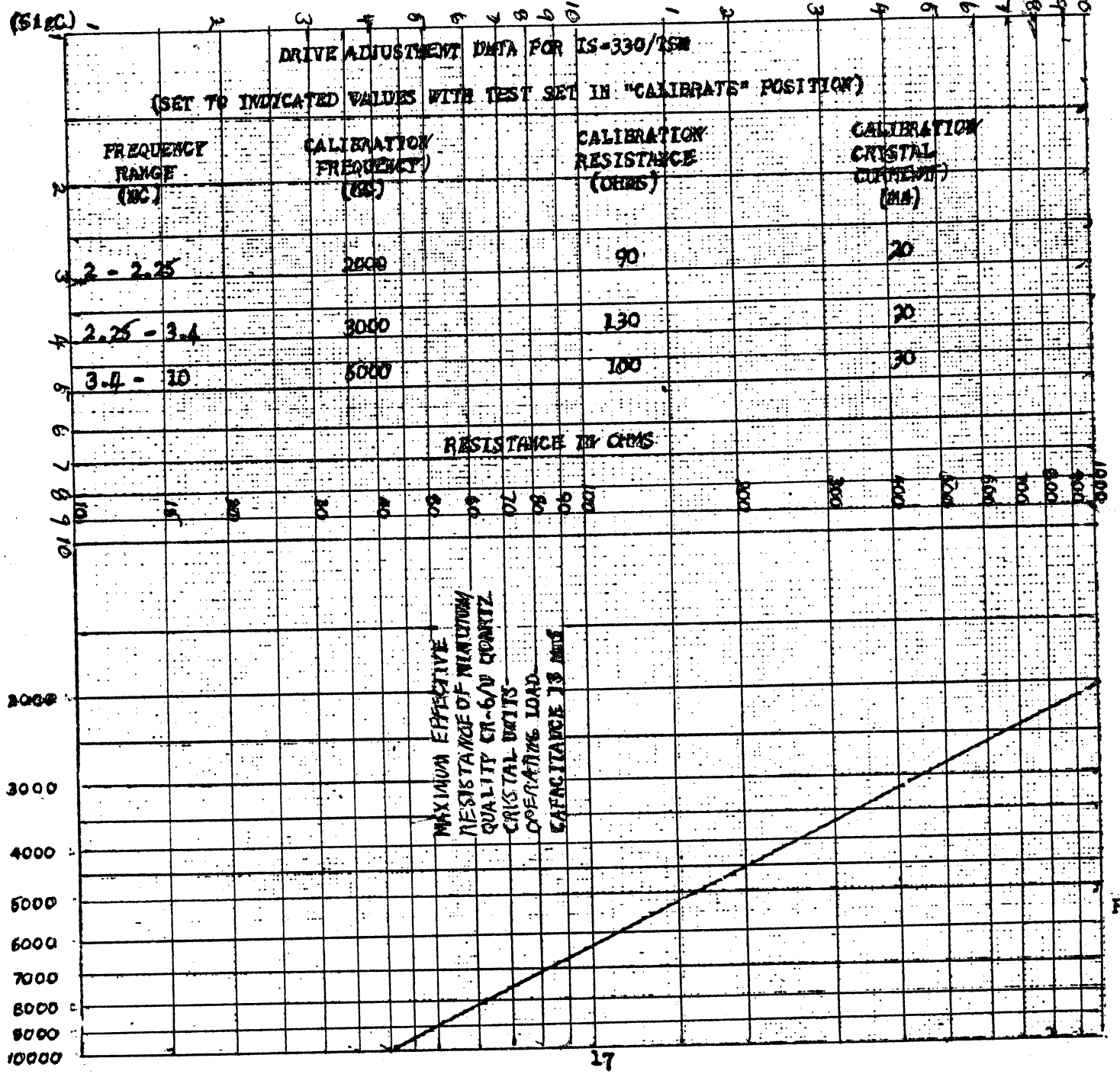

FIGURE 4.

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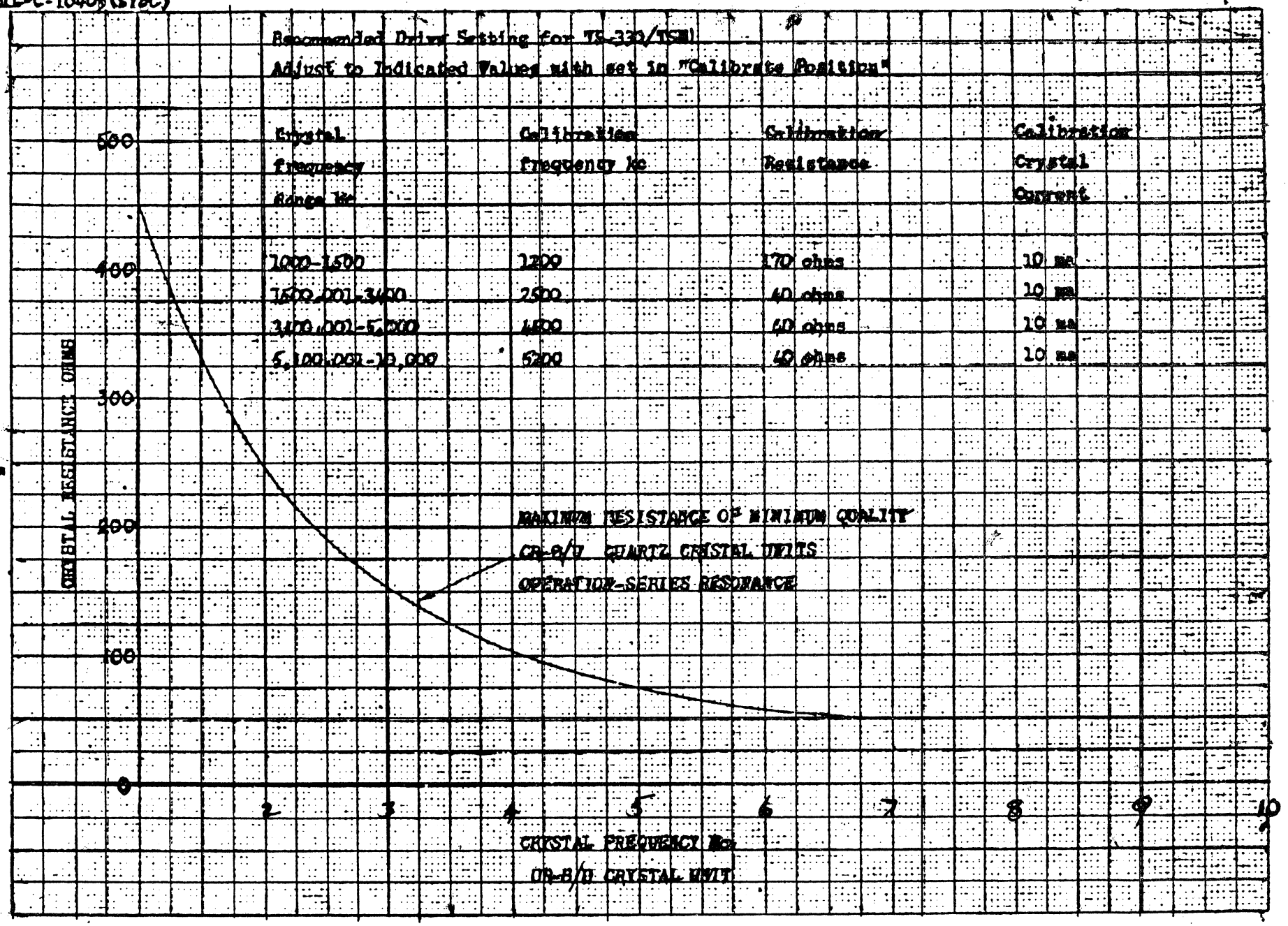

FIGURE No. 5
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