

SECTION III—CRYSTAL HOLDERS

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SECTION III—CRYSTAL HOLDERS

INTRODUCTION

3-1. Section III contains all available descriptions of crystal holders now being used in, or recommended for use in, USAF equipments. The crystal holders described are divided into two groups, as defined in subparagraphs a and b below. Included with the Group-I Crystal Holders and following the technical data chart and description sheets are a table and description sheets giving the types of sockets suitable for use with Group-I Crystal Holders. At the end of Section III is a digest of Military Standard terms, tests, and procedures applicable to crystal holders meeting military specifications.

a. Group I includes those Military Standard crystal holders that are recommended for use in equipments of new design. These are the crystal holders assigned Joint Army-Navy-Air Force type number HC-X/U, where X is either a one-digit

or a two-digit number. Except in the event of unusual or special requirements, the design engineer of crystal-controlled circuits for military equipment should consider only those crystal holders in Group I.

b. Group II includes the older types of crystal holders which are still widely used in current models of USAF radio equipments, but which are not recommended for use in military equipments of new design. These crystal holders are arranged in order of their USAF stock numbers, except for the addition of the prefix "2100-," which serves to identify the item as belonging to the USAF 16-F stock class. The information concerning the Group-II crystal holders is included primarily for the benefit of the crystal specialist or field engineer in the military. As a reference source of crystal holders, it may also prove helpful to design and research engineers.

GROUP I

RECOMMENDED MILITARY STANDARD CRYSTAL HOLDERS

The crystal holders included in Group I are those conforming to Military Specifications and which are recommended for use in armed-services equipments of new design. Also included are descriptions of representative sockets that can be used with the Group-I holders.

Section III

Crystal Holders—Group I

TECHNICAL DATA CHART FOR GROUP-I MILITARY STANDARD CRYSTAL HOLDERS

Type Number	Material	Base or Terminal Connection	Physical Dimensions (In.)			Crystal Units Part of
			High	Wide	Thick	
HC-5/U	plastic holder	3 pins, $\frac{5}{8}$ in. lg, $\frac{5}{32}$ in. dia	$2\frac{21}{32}$	$1\frac{19}{32}$	$1\frac{3}{16}$	CR-15/U, -16/U, -29/U, -30/U
HC-6/U	metallic holder	2 pins, $1\frac{13}{64}$ in. lg, 0.050 in. dia, 0.486 in. c to c	1	$2\frac{3}{32}$	$\frac{5}{16}$	CR-18/U, -19/U, -23/U, -25/U, -26/U, -27/U, -28/U, -32/U, -33/U, -35/U, -36/U, -44/U, -45/U, -46/U, -47/U, -48/U, -49/U, -51/U, -52/U, -53/U, -54/U
HC-10/U	metallic holder	2 sleeves, $\frac{3}{16}$ in. lg, $\frac{1}{16}$ in. dia	$1\frac{1}{16}$	$\frac{9}{16}$	$\frac{9}{16}$	CR-24/U
HC-13/U	metallic holder	2 pins, $1\frac{13}{64}$ in. lg, 0.050 in. dia, 0.486 in. c to c	$1\frac{33}{64}$	$2\frac{3}{32}$	$\frac{5}{16}$	CR-37/U, -38/U, -42/U, -50/U
HC-14/U	metallic holder	2 pins, $1\frac{13}{64}$ in. lg, 0.050 in. dia, 0.486 in. c to c	$1\frac{3}{16}$	$2\frac{3}{32}$	$\frac{5}{16}$	
HC-15/U	electron tube (glass envelope)	std octal	$2\frac{7}{8}$	$1\frac{9}{32}$	$1\frac{9}{32}$	CR-39/U, -40/U
HC-16/U	electron tube (metallic envelope)	std octal	$2\frac{7}{8}$	$1\frac{5}{16}$	$1\frac{5}{16}$	CR-43/U
HC-17/U	metallic holder	2 pins, $\frac{7}{16}$ in. lg, 0.093 in. dia, 0.486 in. c to c	$1\frac{3}{16}$	$\frac{23}{32}$	$\frac{5}{16}$	CR-58/U
HC-18/U	metallic holder	2 flexible leads, $1\frac{1}{2}$ in. lg	$\frac{33}{64}$ *	$\frac{3}{8}$	$\frac{5}{32}$	CR-55/U, -56/U, -59/U, -60/U, -61/U
HC-21/U	metallic holder	3 pins, $\frac{5}{8}$ in. lg, 0.156 in. dia	$2\frac{21}{32}$	$1\frac{19}{32}$	$1\frac{19}{32}$	CR-15/U, -16/U, -29/U, -30/U

* Not including flexible leads.

CRYSTAL HOLDER HC-5/U

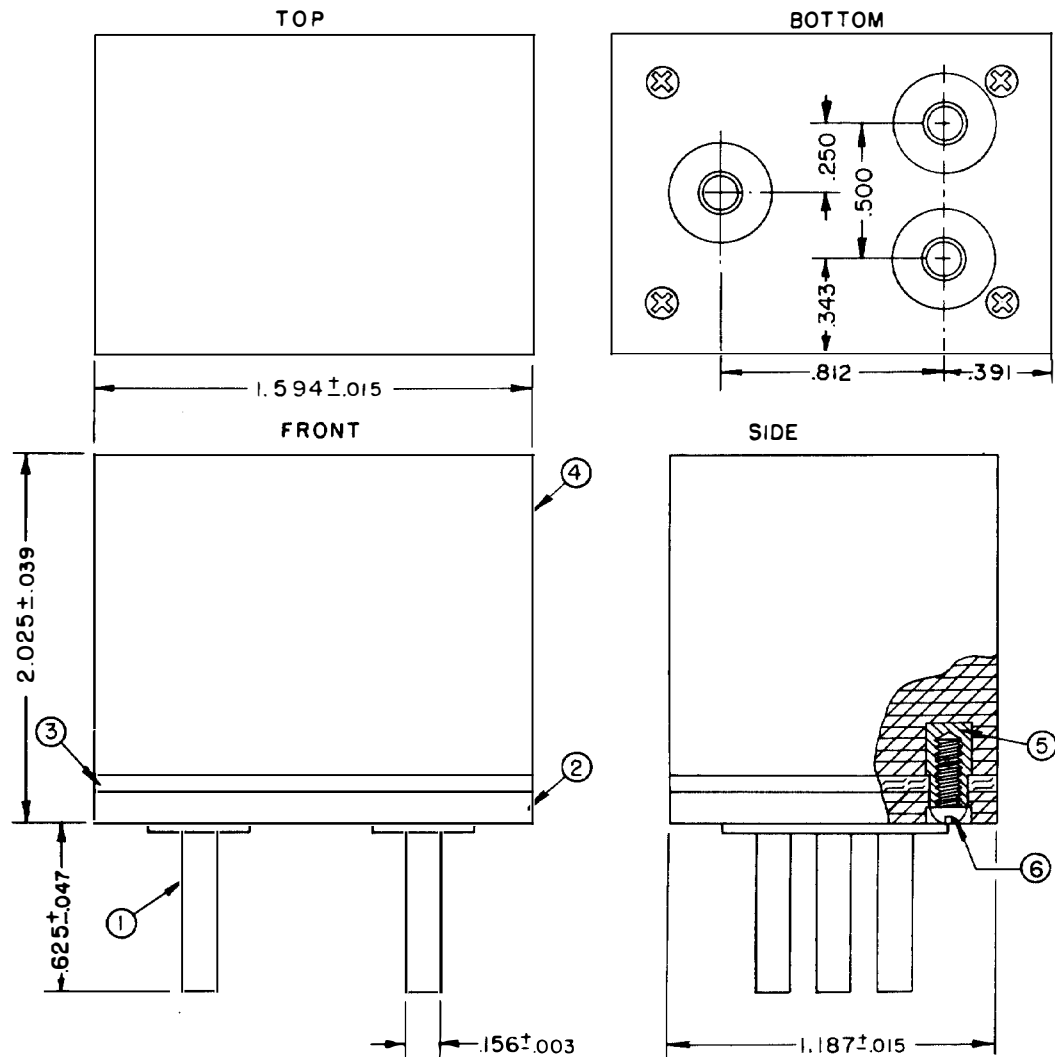


Figure 3-1. Crystal Holder HC-5/U

Section III

Crystal Holders—Group I

FUNCTIONAL DESCRIPTION

A three-pin plastic holder used to mount low-frequency quartz plates. It can be used at temperatures within the range of -40°C to $+75^{\circ}\text{C}$, but since the holder is designed for gasket sealing and has an inferior form factor compared with metal holders, it will operate best in equipments not intended to be subjected to below-freezing or extremely high temperatures, and in areas where the ambient humidity is not at a continuously high level.

EMPLOYMENT OF HOLDER

Crystal Units Employing Holder: CR-15/U, -16/U, -29/U, and -30/U

Sockets Used With Holder: See figure 3-14

MILITARY SPECIFICATIONS

Authority: MIL-H-10056B (16 Jan 53); MIL-H-1056/1 (16 Jan 53)

Dimensions: See figure 3-1. All dimensions in inches. Unless otherwise specified, tolerances are ± 0.005 in. on decimals.

Materials:

<i>Item No. (Fig. 3-1)</i>	<i>Description</i>	<i>Material</i>	<i>Qty</i>
1	Pin	Nickel-silver radio tube pin E.3675, as made by American Brass Co, or equal	3
2	Base	Plastic: Resinox No. 7934, Melmac No. 6105, BM-7156, Durez No. 12708, or equal	1
3	Gasket	Buna S, per Spec MIL-R-3065, 60-75 Shore A Durometer hardness	
4	Cover	Same as for item 2	1
5	Insert	Brass, per Spec QQ-B-611, comp B, $\frac{1}{2}$ hard	4
6	Phillips machine screw No. 2-56 NC-2 x $\frac{1}{2}$ in. lg	Brass	4

Special Requirements: None

LOGISTICAL DATA

USAF Stock No.: 2100-2xH51.1

Status: Standard*

Date of Status:

Commercial Sources: See Appendix III.

Related Specifications, Standards, and Publications: See Appendix IV.

*Note: The proposed revision of Military Specification MIL-H-10056B deletes the plastic holder HC-5/U and substitutes the metal holder HC-21/U.

CRYSTAL HOLDER HC-6/U

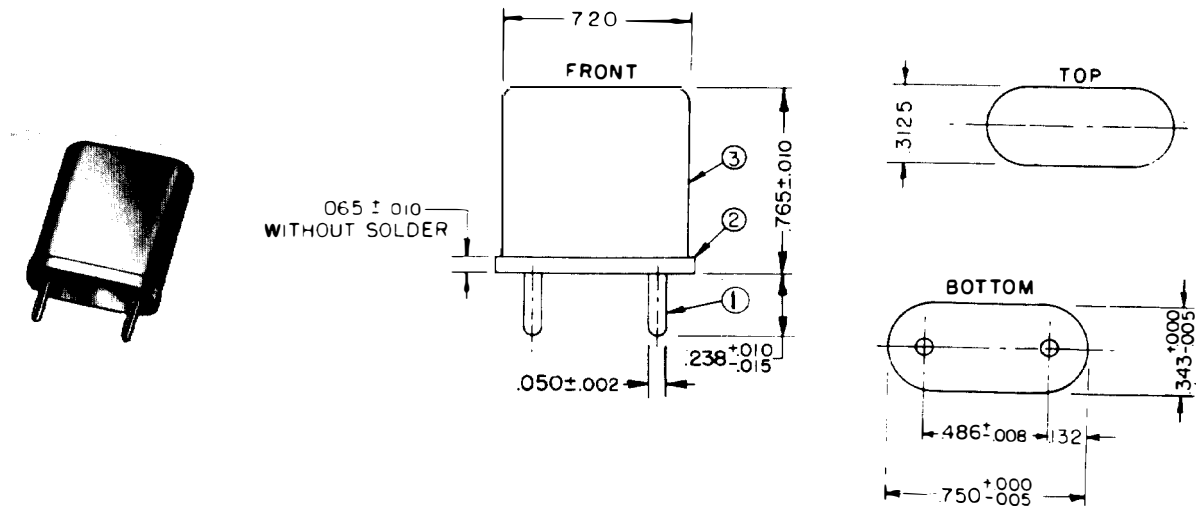


Figure 3-2. Crystal Holder HC-6/U

FUNCTIONAL DESCRIPTION

A lightweight, all-metal unit particularly suitable for use in either mobile or portable equipment and wherever crystal units may be subjected to severe conditions of moisture or mechanical shock. Several types of mounting are possible, but the most satisfactory, generally, is a plated crystal supported by two looped springs. This holder is designed for hermetic sealing and is dependable over a temperature range of -55°C to $+90^{\circ}\text{C}$ and higher.

EMPLOYMENT OF HOLDER

Crystal Units Employing Holder: CR-18/U, -19/U, -23/U, -25/U, -26/U, -27/U, -28/U, -32/U, -33/U, -35/U, -36/U, -44/U, -45/U, -46/U, -47/U, -48/U, -49/U, -51/U, -52/U, -53/U, -54/U, and -57/U

Sockets Used With Holder: See figures 3-15 and 3-16.

MILITARY SPECIFICATIONS

Authority: MIL-H-10056B (16 Jan 53); MIL-H-1056/2 (16 Jan 53)

Dimensions: See figure 3-2. All dimensions in inches. Unless otherwise specified, tolerances are ± 0.005 in. on decimals.

Materials:

Item No. (Fig. 3-2)	Description	Material	Qty
1	Pin	Kovar No. 920050, or equal	2
2	Base	Kovar No. 910010, or equal	1
3	Cover	Nickel silver, per Spec QQ-N-321, type III comp B	1

Special Requirements: (Refer to figure 3-2.)

- Item No. 2 shall be insulated from item No. 1 by glass. Glass shall be Corning Glass Seal No. 705-2, or equal.
- Item No. 2 shall be hot-tin-dipped or electro-tin-plated in accordance with type I finish of Spec 72-53.
- Before forming, item No. 2 shall be 0.010 ± 0.001 inch thick, and item No. 3 shall be 0.010 inch thick.
- Item No. 1 shall project at least 0.040 inch above the inside glass seal.

LOGISTICAL DATA

USAF Stock No.:

Status: Standard

Date of Status:

Commercial Sources: See Appendix III.

Related Specifications, Standards, and Publications: See Appendix IV.

CRYSTAL HOLDER HC-10/U

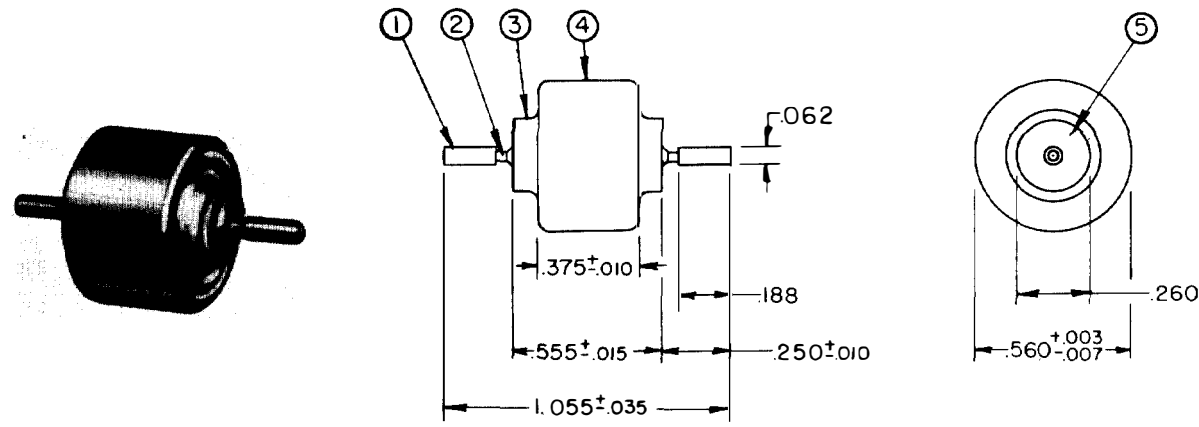


Figure 3-3. Crystal Holder HC-10/U

FUNCTIONAL DESCRIPTION

Compact, miniature, metal holder designed for pressure-mounting thickness-mode circular quartz elements and for hermetic sealing. The coaxial arrangement of the crystal leads introduces a minimum of holder capacitance across the crystal, and hence is particularly suitable for use with v-h-f crystals. Also, the rugged construction and firm support provided the crystal make this holder preferred in mobile or portable equipment that may be subjected to severe conditions of vibrations or shock. The holder is dependable over a temperature range of -55°C to $+90^{\circ}\text{C}$ and higher.

EMPLOYMENT OF HOLDER

Crystal Units Employing Holder: CR-24/U
Sockets Used With Holder: See figure 3-17.

MILITARY SPECIFICATIONS

Authority: MIL-H-10056B (16 Jan 53); MIL-H-1056/3 (16 Jan 53)
Dimensions: See figure 3-3. All dimensions in inches. Unless otherwise specified, tolerances are ± 0.005 in. on decimals.

Materials:

Item No. (Fig. 3-3)	Description	Material	Qty
1	Sleeve	Coil silver	2
2	Pin	Kovar No. 920050, or equal	2
3	End bell	Kovar No. 910010, or equal	2
4	Cover	Nickel silver per Spec QQ-N-321, type III, comp B	1
5	Seal	Corning Glass No. 705-2, or equal	2

Special Requirements: (Refer to figure 3-3.)

- Item No. 1 shall be soldered to item No. 2.
- Item No. 3 shall be hot-tin-dipped or electro-tin-plated in accordance with type I finish of Spec 72-53.

LOGISTICAL DATA

USAF Stock No.:
Status: Standard
Date of Status:
Commercial Sources: See Appendix III.
Related Specifications, Standards, and Publications: See Appendix IV.

CRYSTAL HOLDER HC-13/U

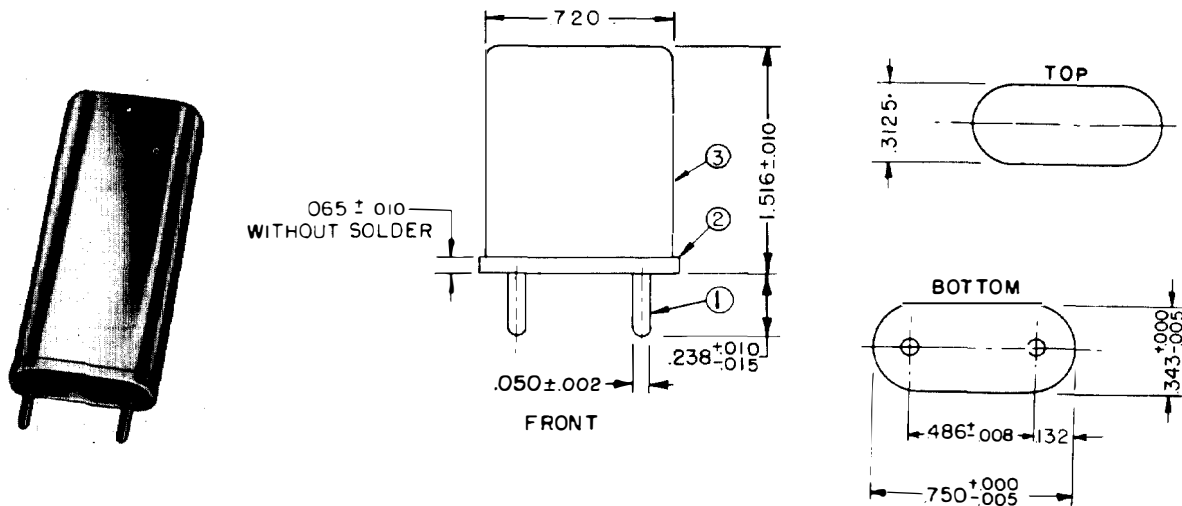


Figure 3-4. Crystal Holder HC-13/U

FUNCTIONAL DESCRIPTION

A lightweight, all-metal unit, similar to Crystal Holder HC-6/U but having a cover of greater length to accommodate a larger quartz plate for lower-frequency use.

EMPLOYMENT OF HOLDER

Crystal Units Employing Holder: CR-37/U, -38/U, -42/U, and -50/U

Sockets Used With Holder: See figures 3-15 and 3-16.

MILITARY SPECIFICATIONS

Authority: MIL-H-10056B (16 Jan 53); MIL-H-1056/4 (16 Jan 53)

Dimensions: See figure 3-4. All dimensions in inches. Unless otherwise specified, tolerances are ± 0.005 in. on decimals.

Materials:

Item No. (Fig. 3-4)	Description	Material	Qty
1	Pin	Kovar No. 920050, or equal	2
2	Base	Kovar No. 910010, or equal	1
3	Cover	Nickel silver, per Spec QQ-N-321, type III, comp B	1

Special Requirements: (Refer to figure 3-4.)

- Item No. 2 shall be insulated from item No. 1 by glass. Glass shall be Corning Glass Seal No. 705-2, or equal.
- Item No. 2 shall be hot-tin-dipped in accordance with type I finish of Specification 72-53.
- Before forming, item No. 2 shall be 0.010 ± 0.001 inch thick, and item No. 3 shall be 0.010 inch thick.
- Unless otherwise specified, item No. 1 shall project at least 0.040 inch above the inside glass seal.

LOGISTICAL DATA

USAF Stock No.:

Status:

Date of Status:

Commercial Sources: See Appendix III.

Related Specifications, Standards, and Publications: See Appendix IV.

CRYSTAL HOLDER HC-14/U

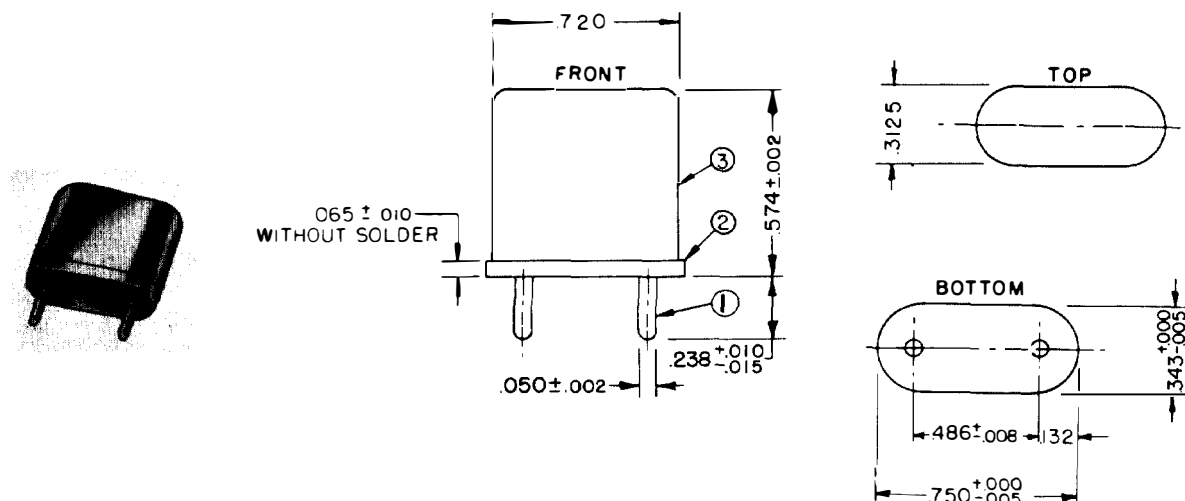


Figure 3-5. Crystal Holder HC-14/U

FUNCTIONAL DESCRIPTION

A miniature, lightweight, all-metal unit. Similar to Crystal Holder HC-6/U but with a shorter cover. It is used to mount quartz plates in the higher-frequency range, where space is at a premium.

EMPLOYMENT OF HOLDER

Crystal Units Employing Holder: CR-7/U

Sockets Used With Holder: See figures 3-15 and 3-16.

MILITARY SPECIFICATIONS

Authority: MIL-H-10056B (16 Jan 53) ; MIL-H-1056/5 (16 Jan 53)

Dimensions: See figure 3-5. All dimensions in inches. Unless otherwise specified, tolerances are ± 0.005 in. on decimals.

Materials:

Item No. (Fig. 3-5)	Description	Material	Qty
1	Pin	Kovar No. 920050, or equal	2
2	Base	Kovar No. 910010, or equal	1
3	Cover	Nickel silver, per Spec QQ-N-321, type III, comp B	

Special Requirements: (Refer to figure 3-5.)

- Item No. 2 shall be insulated from item No. 1 by glass. Glass shall be Corning Glass Seal No. 705-2, or equal.
- Item No. 2 shall be hot-tin-dipped or electro-tin-plated in accordance with type I finish of Spec 72-53.
- Before forming, item No. 2 shall be 0.010 ± 0.001 inch thick, and item No. 3 shall be 0.010 inch thick.
- Item No. 1 shall project at least 0.040 inch above the inside glass seal.

LOGISTICAL DATA

USAF Stock No.:

Status:

Date of Status:

Commercial Sources: See Appendix III.

Related Specifications, Standards, and Publications: See Appendix IV.

CRYSTAL HOLDER HC-15/U

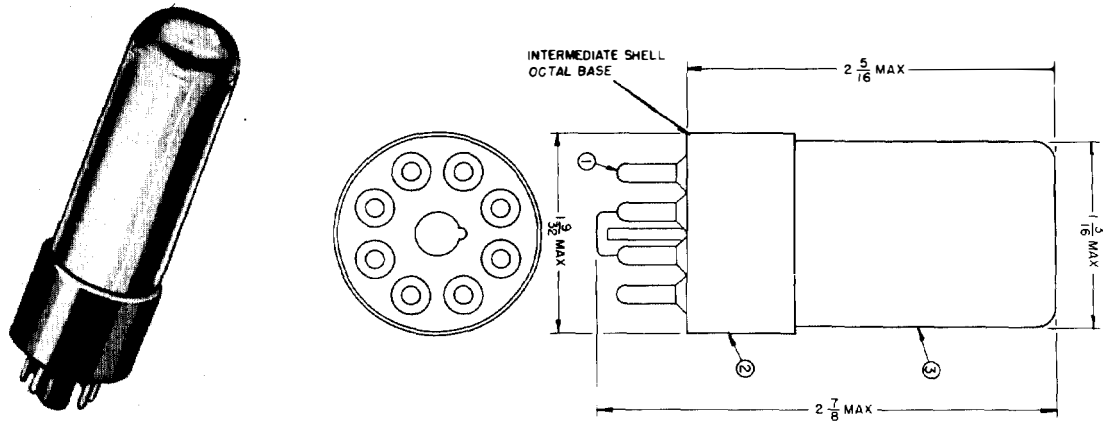


Figure 3-6. Crystal Holder HC-15/U

FUNCTIONAL DESCRIPTION

This glass-envelope crystal holder is similar in size and shape to a 6SC7GT electron tube. It is normally used to mount low-frequency, flexure-mode, quartz plates, where an evacuated container is needed to reduce damping. The holder uses standard vacuum-tube parts and fits in a standard octal socket. The glass envelope is to be preferred to the metal holder when a vacuum seal is required because the elimination of the metal, soldering, etc. minimizes the causes of crystal aging due to gas leakage, electrolysis, and contamination. The holder is dependable within the temperature range of -55°C to $+80^{\circ}\text{C}$.

EMPLOYMENT OF HOLDER

Crystal Units Employing Holder: CR-39/U and -40/U.

Sockets Used With Holder: Standard octal.

MILITARY SPECIFICATIONS

Authority: MIL-H-10056B (16 Jan 53) ; MIL-H-1056/6 (16 Jan 53)

Dimensions: See figure 3-6. All dimensions in inches. Unless otherwise specified, tolerances are ± 0.005 in. on decimals.

Materials:

Item No. (Fig. 3-6)	Description	Material	Qty
1	Pin	Commercial	8
2	Base	Low-loss phenolic	1
3	T9	Glass	1

Special Features: Except for dimensions, there are none specified.

LOGISTICAL DATA

USAF Stock No.:

Status:

Date of Status:

Commercial Sources: See Appendix III.

Related Specifications, Standards, and Publications: See Appendix IV.

CRYSTAL HOLDER HC-16/U

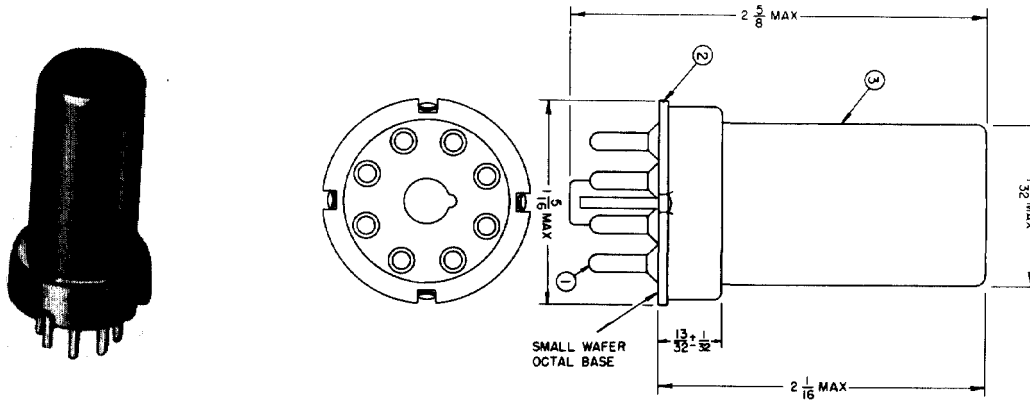


Figure 3-7. Crystal Holder HC-16/U

FUNCTIONAL DESCRIPTION

This crystal holder is similar in size and shape to a metal envelope 6SK7 electron tube. It is a rugged, moisture-proof holder in which quartz plates may either be pressure-, wire-, or fixed-air-gap-mounted. The holder is recommended for calibration, test, and similar purposes. Holder uses standard vacuum-tube parts and fits in a standard octal socket. Although it is used in the 70—100-kc range, the holder is useful for frequencies up to 850 kc. The shortness of the cover relative to the size of crystal blanks of 85 kc and below makes it somewhat difficult to fabricate a dependable crystal unit. The holder can be used at temperatures within the range of -55°C to $+90^{\circ}\text{C}$ and higher.

EMPLOYMENT OF HOLDER

Crystal Units Employing Holder: CR-43/U
Sockets Used With Holder: Standard octal

MILITARY SPECIFICATIONS

Authority: MIL-H-10056B (16 Jan 53); MIL-H-1056/7 (16 Jan 53)

Dimensions: See figure 3-7. All dimensions in inches. Unless otherwise specified, tolerances are ± 0.005 in. on decimals.

Materials:

Item No. (Fig. 3-7)	Description	Material	Qty
1	Pin	Commercial	8
2	Base	Commercial	1
3	MT8 envelope	Commercial	1

Special Requirements: None specified

LOGISTICAL DATA

USAF Stock No.:

Status:

Date of Status:

Commercial Sources: See Appendix III.

Related Specifications, Standards, and Publications: See Appendix IV.

CRYSTAL HOLDER HC-17/U

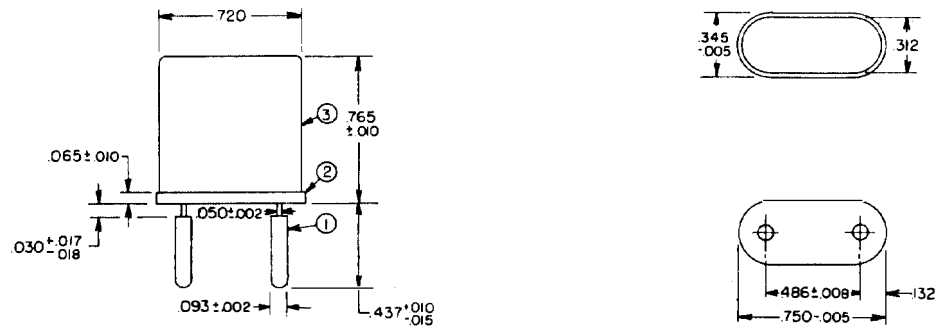


Figure 3-8. Crystal Holder HC-17/U

FUNCTIONAL DESCRIPTION

A lightweight, all-metal unit particularly suitable for use in either mobile or portable equipment and wherever crystal units may be subjected to severe conditions of moisture or mechanical shock. Several types of mounting are possible, but the most satisfactory, generally, is a plated crystal supported by two looped springs. This holder is designed for hermetic sealing and is dependable over a temperature range of -55°C to $+90^{\circ}\text{C}$ and higher. This holder is identical to Holder HC-6/U except for larger dimensions of pins.

EMPLOYMENT OF HOLDER

Crystal Units Employing Holder: CR-58/U

Sockets Used with Holder:

MILITARY SPECIFICATIONS

Authority: MIL-H-10056C (Proposed revision, 4 April 1956)

Dimensions: See figure 3-8. All dimensions in inches. Unless otherwise specified, tolerances are ± 0.005 in. on decimals.

Materials:

Item No. (Fig. 3-8)	Description	Material	Qty.
1	Pin	50% nickel, 50% iron alloy	2
2	Base	Steel, cold rolled strip condition No. 3, per Specification QQ-S-640	1
3	Cover	Copper, nickel zinc alloy, composition No. 5, annealed soft temper, per Specification QQ-C-585	1

Special Requirements: (Refer to figure 3-8.)

- Item No. 2 shall be insulated from item No. 1 by glass. Glass shall be Corning Glass Seal No. 705-2, or equal.
- Item No. 2 shall be hot-tin-dipped or electro-tin-plated in accordance with type I finish of Specification MIL-F-14072.
- Before forming, item No. 2 shall be 0.010 ± 0.001 inch thick and item No. 3 shall be 0.010 inch thick.
- Item No. 1 shall project at least 0.040 inch above the base.

LOGISTICAL DATA

USAF Stock No.:

Status:

Date of Status:

Commercial Sources: See Appendix III.

Related Specifications, Standards, and Publications: See Appendix IV.

CRYSTAL HOLDER HC-18/U

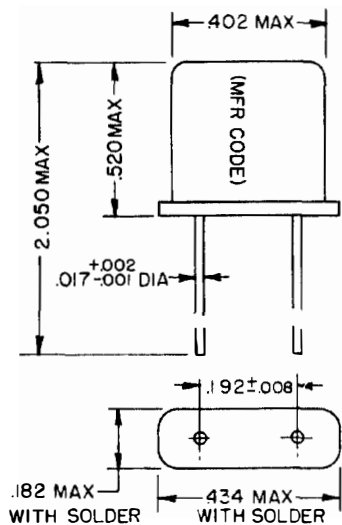
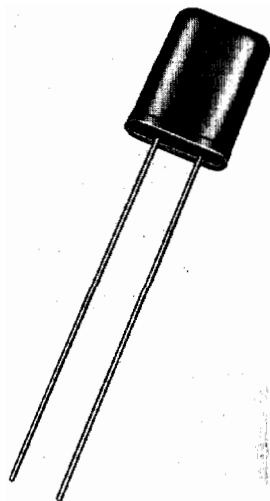


Figure 3-9. Crystal Holder HC-18/U

FUNCTIONAL DESCRIPTION

A lightweight, all-metal holder suitable for use in subminiature circuit applications. Long flexible leads are provided to permit wiring crystal holder directly into the circuit.

EMPLOYMENT OF HOLDER

Crystal Units Employing Holder: CR-55/U, -56/U, -59/U, -60/U, -61/U

Sockets Used with Holder: None

MILITARY SPECIFICATIONS

Authority: MIL-H-10056C (Proposed revision, 4 April 1956)

Dimensions: See figure 3-9. All dimensions are in inches. Unless otherwise specified, tolerances are ± 0.005 in. on decimals.

Materials:

Item No. (Fig. 3-9)	Description	Material	Qty.
1	Pin	Cobalt-nickel-iron alloy (Kovar A)	2
2	Base	Cobalt-nickel-iron alloy (Kovar A)	1
3	Cover	Copper, nickel, zinc alloy, composition No. 5, annealed soft temper, per Specifica- tion QQ-C-585	1

Special Requirements: (Refer to figure 3-9.)

- Item No. 2 shall be insulated from item No. 1 by glass. Glass shall be Corning Glass Seal No. 705-2, or equal.
- Item No. 2 shall be hot-tin-dipped or electro-tin-plated in accordance with type I finish of Specification MIL-F-14072.
- Before forming, item No. 2 shall be 0.010 ± 0.001 inch thick and item No. 3 shall be 0.010 ± 0.001 inch thick.
- Item No. 1 shall project at least 0.040 inch above the base.

LOGISTICAL DATA

USAF Stock No.:

Status:

Date of Status:

Commercial Sources: See Appendix III.

Related Specifications, Standards, and Publications: See Appendix IV.

CRYSTAL HOLDER HC-21/U

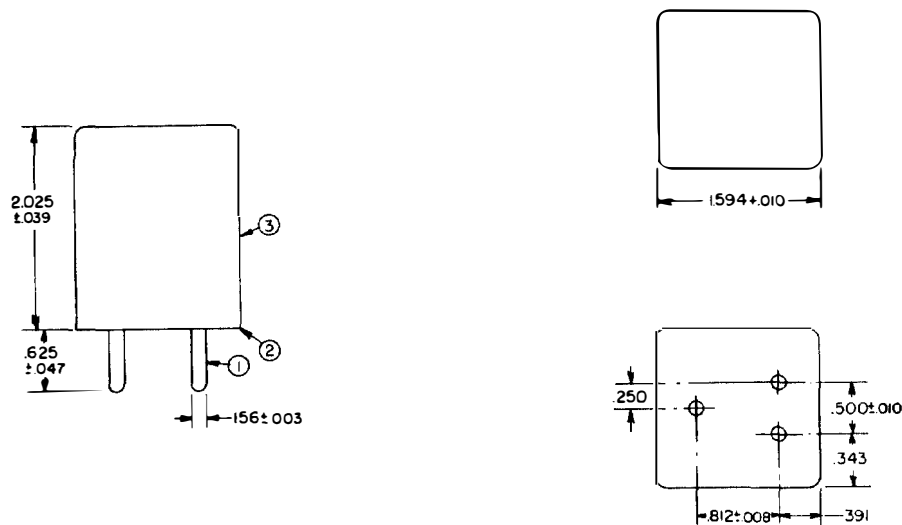


Figure 3-10. Crystal Holder HC-21/U

FUNCTIONAL DESCRIPTION

A three-pin, all-metal holder used to mount low-frequency quartz plates. Dimensions of this holder are identical to those of plastic holder HC-5/U, which it is intended to replace. Holder HC-21/U is designed for hermetic sealing and is dependable over a temperature range of -55°C to $+90^{\circ}\text{C}$ and higher.

EMPLOYMENT OF HOLDER

Crystal Units Employing Holder:

Sockets Used with Holder: See figure 3-14.

MILITARY SPECIFICATIONS

Authority: MIL-H-10056C (Proposed revision, 4 April 1956)

Dimensions: See figure 3-10. All dimensions in inches. Unless otherwise specified, tolerances are ± 0.005 in. on decimals.

Materials:

Item No. (Fig. 3-10)	Description	Material	Qty.
1	Pin	50% nickel, 50% iron	3
2	Base	Cold rolled steel, condition No. 2, dull finish, per Specification QQ-S-636	1
3	Cover	Terneplate type drawing quality, class special coated, grade unassorted, per Specification QQ-T-181	1

Special Requirements: (Refer to figure 3-10.)

- Item No. 2 shall be insulated from item No. 1 by glass. Glass shall be Corning Glass Seal No. 705-2, or equal.
- Item No. 2 shall be hot-tin-dipped or electro-tin-plated in accordance with type I finish of Specification MIL-F-14072.
- Before forming, item No. 2 shall be 0.010 ± 0.001 inch thick and item No. 3 shall be 0.010 ± 0.001 inch thick.
- Item No. 1 shall project at least 0.040 inch above the base.

LOGISTICAL DATA

USAF Stock No.:

Status:

Date of Status:

Commercial Sources: See Appendix III.

Related Specifications, Standards, and Publications: See Appendix IV.

CRYSTAL HOLDER HC- /U
(For addenda)

Figure 3-11. Crystal Holder HC- /U

FUNCTIONAL DESCRIPTION

Materials:

Item No. (Fig. 3-)	Descrip- tion	Material	Qty

EMPLOYMENT OF HOLDER

Special Requirements:

Crystal Units Employing Holder:

Sockets Used With Holder:

MILITARY SPECIFICATIONS

LOGISTICAL DATA

Authority: MIL-H-10056B (16 Jan 53) ; MIL-H-1056/

USAF Stock No.:

Status:

Date of Status:

Dimensions: See figure 3-11. All dimensions in inches. Unless otherwise specified, tolerances are ± 0.005 in. on decimals.

Commercial Sources: See Appendix III.

Related Specifications, Standards, and Publications: See Appendix IV.

CRYSTAL HOLDER HC-18/U
(For addenda)

Figure 3-12. Crystal Holder HC- /U

FUNCTIONAL DESCRIPTION

Materials:

Item No. (Fig. 3-)	Descrip- tion	Material	Qty

EMPLOYMENT OF HOLDER

Special Requirements:

Crystal Units Employing Holder:

Sockets Used With Holder:

MILITARY SPECIFICATIONS

LOGISTICAL DATA

Authority: MIL-H-10056B (16 Jan 53) ; MIL-H-1056/
Dimensions: See figure 3-12. All dimensions in inches. Unless otherwise specified, tolerances are ± 0.005 in. on decimals.

USAF Stock No.:
Status:
Date of Status:
Commercial Sources: See Appendix III.
Related Specifications, Standards, and Publications: See Appendix IV.

CRYSTAL HOLDER HC- /U
(For addenda)

Figure 3-13. Crystal Holder HC- /U

FUNCTIONAL DESCRIPTION

Materials:

<i>Item No. (Fig. 3-)</i>	<i>Description</i>	<i>Material</i>	<i>Qty</i>

EMPLOYMENT OF HOLDER

Special Requirements:

Crystal Units Employing Holder:

Sockets Used With Holder:

MILITARY SPECIFICATIONS

Authority: MIL-H-10056B (16 Jan 53) ; MIL-H-1056/

Dimensions: See figure 3-13. All dimensions in inches. Unless otherwise specified, tolerances are ± 0.005 in. on decimals.

LOGISTICAL DATA

USAF Stock No.:

Status:

Date of Status:

Commercial Sources: See Appendix III.

Related Specifications, Standards, and Publications: See Appendix IV.

Section III
Crystal Sockets

**TECHNICAL DATA CHART OF CRYSTAL SOCKETS SUITABLE FOR USE
WITH GROUP-I HOLDERS^b**

<i>Type Holder Accommo- dated</i>	<i>Manufacturer^a</i>	<i>Model No.</i>	<i>Figure No.</i>	<i>Material of Insulator</i>	<i>Material of Contacts</i>	<i>Additional Stray Cap. Shunted Across Xtal ($\mu\mu f$)</i>
HC-5/U	Cinch	2886	3-14 (A)	NEMA Spec Grade XP laminated phenolic (nat.)	Cinch P27	
	E. F. Johnson	122-223-1	3-14 (B)	Glass-bonded mica or NEMA Spec Grade XXX laminated phenolic	Brass w/steel spring, C _d pl	
		122-223-2		Glass-bonded mica	Phosphor bronze w/beryllium copper springs, silver pl	
HC-6/U, HC-13/U, and HC-14/U	Cinch	54A17358	3-15	Steatite, Grade L5, glazed	Beryllium copper, P31W-3 finish, solder term. hot-tin dipped	
	Elco	430	3-15	Ceramic, Grade 5, glazed	Brass, C _d pl	
		430 U		Ceramic, Grade 5, unglazed		
		430 PH		Ceramic, Grade 5, glazed	Phosphor bronze, C _d pl	
		430 U PH		Ceramic, Grade 5, unglazed		
		430 BC		Ceramic, Grade 5, glazed	Beryllium copper, silver pl	
		430 U BC		Ceramic, Grade 5, unglazed		
	E. F. Johnson	126-105-1	3-15	Steatite, Grade L4 or better, glazed	Beryllium copper, silver pl, solder term., hot-tin dipped	
		126-105-2			Phosphor bronze	
	Methode	SCJ 700-1	3-15	Steatite, Grade L5, glazed	Phosphor bronze, brass, or beryllium copper, as specified; C _d or silver pl; solder term. hot-tin dipped	
		SCJ 700-2		Same as SCJ 700-1 except not DC200 impregnated		
	Sylvania	G24-666	3-16	Low-loss phenolic	Phosphor bronze C _d pl, hot-tin dipped	
HC-10/U	Eby	8943	3-17	Ceramic	Spring-type body clip; brass, silver pl	
HC-15/U and HC-16/U	These holders are accommodated by standard octal sockets. For technical data and mounting provisions of octal sockets, see National Military Establishment Specification JAN-S-28A					

^a See Appendix III for complete name and address.

^b Crystal Holder HC-18/U is a subminiature unit fabricated with wire leads for soldered connections; hence no socket is required.

Section III
Crystal Sockets

Mounting Provisions	Dimensions (In.)										Remarks
	A	B	C	D	E	F	G	H	I	J	
Three 0.152-in. dia holes on $\frac{5}{8}$ x $1\frac{1}{4}$ in. mtg centers					See fig. 3-14 (A)						
Two mtg holes spaced $1\frac{27}{32}$ in. c to c					See fig. 3-14 (B)						
0.115—0.135 in. dia mtg hole	$\frac{53}{64}$	0.481—0.491	0.243	$\frac{3}{8}$	0.236—0.260	0.115—0.135	$\frac{3}{8}$	$\frac{3}{8}$	$\frac{1}{4}$	$\frac{1}{8}$	Withdrawal force of inserted xtal is $1\frac{1}{2}$ lb $\pm 40\%$ direct pull
0.125-in. dia mtg hole	$\frac{53}{64}$	0.486	0.243	$\frac{3}{8}$	$\frac{1}{4}$	0.125	$\frac{43}{64}$	$\frac{3}{8}$	$\frac{19}{64}$	$\frac{1}{8}$	
0.125-in. dia mtg hole	$\frac{53}{64}$	0.486		$\frac{3}{8}$			$\frac{43}{64}$	$\frac{3}{8}$	$\frac{19}{64}$		Withdrawal force of inserted xtal is $1\frac{1}{2}$ lb $\pm 40\%$ direct pull
0.130-in. dia mtg hole	$\frac{53}{64}$	0.486		$\frac{3}{8}$	$\frac{1}{4}$	0.130	$\frac{31}{64}$	$\frac{3}{8}$	$\frac{7}{64}$	$\frac{1}{8}$	Tropicalization treatment optional
Four 0.156-in. dia holes on $6\frac{1}{8}$ x $\frac{9}{16}$ -in. mtg centers					See fig. 3-16						Accommodates 48 holders
Two 0.125-in. dia holes on $\frac{1}{2}$ x $1\frac{1}{4}$ -in. mtg centers					See fig. 3-22						

GROUP II

CRYSTAL HOLDERS CURRENTLY IN MILITARY SERVICE BUT NOT RECOMMENDED FOR USE IN EQUIPMENTS OF NEW DESIGN

Group II includes the older types of crystal holders which are still widely used in current models of USAF radio equipments, but which are not recommended for use in military equipments of new design. These crystal holders are arranged in the order of their USAF stock numbers, which numbers are the same as the Signal Corps stock numbers except for the addition of the prefix "2100-," which serves to identify the item as belonging to the USAF 16-F stock class.

TECHNICAL DATA CHART FOR GROUP-II CRYSTAL HOLDERS

<i>USAF Stock Number 2100-</i>	<i>Nomenclature</i>	<i>Holder Spec</i>	<i>Material</i>	<i>Method of Mounting</i>
2xH1.1	Crystal Holder Wilcox Type 80D		Plastic	
2xH2.1	Crystal Holder FT-249		Plastic	
2xH2.2	Crystal Holder FT-249		Plastic	
2xH2.3	Crystal Holder FT-249		Plastic	
2xH2.4	Crystal Holder		Plastic case, metal cover	
2xH2.5	Crystal Holder (Collins Type 1G)		Plastic	
2xH3.1	Crystal Holder FT-164	171-148B	Ceramic	
2xH3.2	Crystal Holder FT-164	171-148B	Ceramic	
2xH4.1	Crystal Holder (Bendix 3947)		Plastic	
2xH5.1	Crystal Holder (Bliley MO-2)		Plastic	
2xH6.1	Crystal Holder FT-171-B	71-975	Plastic	
2xH6.2	Crystal Holder FT-171-B	71-975	Plastic	
2xH7.1	Crystal Holder FT-241-A	71-1696	Plastic	
2xH9.1	Crystal Holder (Collins Type 1C)		Plastic	
2xH10.1	Crystal Holder FT-243	71-1350	Plastic case, metal cover	
2xH14.1	Crystal Holder HC-12/U		Plastic	
2xH14.1-1	Crystal Holder CR-1A/AR		Plastic	
2xH14.2	Crystal Holder HC-11/U		Plastic	
2xH15.1	Crystal Holder	71-1165	Metal	
2xH17.1	Crystal Holder (Howard Engineering CM-1)		Plastic	
2xH18.1	Crystal Holder (WECO Type 5AA)		Plastic	

Base or Terminal Connections	Outside Dimensions (In.)			Electrodes	Remarks
	High	Wide	Thick		
Std 3-pin	1 $\frac{3}{4}$	1 $\frac{1}{2}$ $\frac{1}{16}$	1 $\frac{1}{16}$		
Std 3-pin	1 $\frac{9}{16}$	1 $\frac{1}{2}$ $\frac{1}{16}$	1 $\frac{25}{32}$	2 pr, both 1 x 1 in.	
Std 3-pin	1 $\frac{9}{16}$	1 $\frac{3}{16}$	1 $\frac{25}{32}$	2 pr; 1 pr 1 x 1 in.; 1 pr $\frac{3}{4}$ x $\frac{3}{4}$ in.	
Std 3-pin	1 $\frac{9}{16}$	1 $\frac{3}{16}$	1 $\frac{25}{32}$	2 pr, $\frac{3}{4}$ x $\frac{3}{4}$ in.	
3-pin, $\frac{5}{8}$ in. lg, 0.156 in. dia	2 $\frac{3}{8}$	1 $\frac{9}{16}$	1 $\frac{3}{32}$	1 pr, 1 x 1 in.	
3-pin, $\frac{1}{2}$ in. lg, $\frac{5}{16}$ in. dia	2 $\frac{1}{4}$	1 $\frac{3}{8}$	$\frac{7}{8}$		
	1 $\frac{1}{8}$	2 $\frac{1}{2}$ (dia)		1 pr, brass, nickel-plated	For LF quartz wafer
	1 $\frac{1}{8}$	2 $\frac{1}{4}$ (dia)		1 pr, brass, nickel-plated	For HF quartz wafer
6-pin on std octal base	1 $\frac{3}{16}$	1 $\frac{1}{2}$ (dia)			For 3 quartz plates
2-pin, $\frac{3}{4}$ in. c to c	1 $\frac{3}{16}$	1 $\frac{3}{8}$ (dia)			
2 banana pins, $\frac{3}{16}$ in. lg, $\frac{3}{4}$ in. c to c	1 $\frac{1}{2}$ $\frac{1}{16}$	1 $\frac{1}{2}$	$\frac{3}{4}$	1 pr, 1 x 1 in.	
2 banana pins, $\frac{3}{16}$ in. lg, $\frac{3}{4}$ in. c to c	1 $\frac{1}{2}$ $\frac{1}{16}$	1 $\frac{1}{2}$	$\frac{3}{4}$	1 pr, $\frac{3}{4}$ x $\frac{3}{4}$ in.	
2-pin, $\frac{7}{16}$ in. lg, $\frac{1}{2}$ in. c to c	1 $\frac{1}{16}$	1 $\frac{3}{32}$	$\frac{7}{16}$		
Std 5-pin, $\frac{9}{16}$ in.	1 $\frac{25}{32}$	1 $\frac{9}{16}$	1 $\frac{3}{16}$		
2-pin, 1 $\frac{1}{32}$ in. lg c to c	1 $\frac{1}{4}$	1 $\frac{1}{16}$	0.434		
2-pin, $\frac{5}{8}$ in. lg, $\frac{1}{2}$ c to c	1 $\frac{1}{4}$	1 $\frac{1}{4}$	$\frac{7}{16}$		
2-pin, $\frac{5}{8}$ in. lg, $\frac{1}{2}$ in. c to c	1 $\frac{1}{4}$	1 $\frac{1}{4}$	$\frac{7}{16}$		
2-pin, $\frac{5}{8}$ in. lg, $\frac{1}{2}$ in. c to c	1 $\frac{1}{4}$	1 $\frac{1}{4}$	$\frac{7}{16}$		
Std octal	2 $\frac{1}{2}$ $\frac{1}{32}$	1 $\frac{7}{32}$ (dia)			
2-pin, $\frac{1}{2}$ in. lg, $\frac{3}{4}$ in. c to c	$\frac{5}{8}$	1 $\frac{3}{8}$ (dia)			
Std 3-pin, 1 $\frac{11}{32}$ in. lg	1 $\frac{7}{8}$	1 $\frac{3}{8}$	1 $\frac{1}{8}$		

Section III
Crystal Holders—Group II
TECHNICAL DATA CHART FOR GROUP-II CRYSTAL HOLDERS—Continued

<i>USAF Stock Number 2100-</i>	<i>Nomenclature</i>	<i>Holder Spec</i>	<i>Material</i>	<i>Method of Mounting</i>
2xH24.1	Crystal Holder (Bliley MC-7)		Plastic body, metal front	
2xH25.1	Crystal Holder (Aircraft Accessories HN-10)		Plastic	
2xH26.1	Crystal Holder (Galvin FMT-X5)		Ceramic, with metal front and back	
2xH27.1	Crystal Holder (Bliley BC-3)		Plastic	
2xH28.1	Crystal Holder (Aircraft Accessories 601T)		Ceramic	
2xH29.1	Crystal Holder RCA AVA-10		Ceramic	Pressure-air gap
2xH30.1	Crystal Holder (HFR Type)		Plastic	
2xH31.1	Crystal Holder (CW Type)		Ceramic	
2xH32.1	Crystal Holder (Bliley LD-2)		Plastic	
2xH33.1	Crystal Holder (Henry DC34)		Plastic	
2xH34.1	Crystal Holder (Henry DC35)		Plastic	
2xH35.1	Crystal Holder (Premier 180GF and 180 GW)		Ceramic, with metal front and back	
2xH36.1	Crystal Holder (Bliley C and S)		Plastic	
2xH37.1	Crystal Holder (Fisher Rad TS25)		Plastic	
2xH38.1	Crystal Holder (Fisher Rad RS25)		Plastic	
2xH39.1	Crystal Holder (Aireon AA9E)		Metal	
2xH40.1	Crystal Holder (Aircraft Accessories AA9A)		Metal	
2xH41.1	Crystal Holder (Aircraft Accessories AA9G)		Metal	
2xH42.1	Crystal Holder (Peterson Radio PR)		Ceramic	
2xH43.1	Crystal Holder (RCA AVA-53-A)		Ceramic	Pressure-air gap
2xH44.1	Crystal Holder (Learadio 3858A)		Plastic	
2xH45.1	Crystal Holder (WECO DC-20)		Plastic	
2xH46.1	Crystal Holder (Standard Piezo CS5D)		Plastic	
2xH47.1	Crystal Holder (Bliley AR8W)		Plastic	
2xH48.1	Crystal Holder (Howard Type HMC4)		Ceramic	
2xH49.1	Crystal Holder (Collins LD)		Plastic	
2xH50.1	Crystal Holder (Bliley AR3)		Plastic	
	Crystal Holder HC-1/U		Plastic	
	Crystal Holder HC-2/U		Plastic	
	Crystal Holder HC-3/U		Plastic	
	Crystal Holder HC-4/U		Plastic	

Section III
Crystal Holders—Group II

<i>Base or Terminal Connections</i>	<i>Outside Dimensions (In.)</i>			<i>Electrodes</i>	<i>Remarks</i>
	<i>High</i>	<i>Wide</i>	<i>Thick</i>		
2-pin, $\frac{3}{4}$ in. c to c	$1\frac{1}{8}$	$1\frac{3}{8}$	$\frac{9}{16}$		
2 banana pins, 0.85 in. c to c	$2\frac{7}{8}$	$1\frac{1}{2}$	$\frac{7}{8}$		Plastic model of 601-T holder
2-pin, $\frac{7}{16}$ in. lg, $\frac{3}{4}$ in. c to c	$1\frac{7}{8}$	$1\frac{1}{2}$	$\frac{3}{4}$		
2-pin, $\frac{3}{4}$ in. c to c	$\frac{9}{16}$	$1\frac{3}{8}$ (dia)			
2 banana pins, 0.85 in. c to c	$2\frac{7}{8}$	$1\frac{1}{2}$	$\frac{7}{8}$		
2 banana pins, 0.85 in. c to c	$2\frac{1}{4}$	$1\frac{17}{32}$	$1\frac{5}{16}$		
2-pin, $\frac{3}{4}$ in. c to c	$\frac{1}{2}$	$1\frac{1}{8}$ (dia)			CW Type HFR Model G and R-100
2-pin, $\frac{3}{4}$ in. c to c	$\frac{5}{8}$	$1\frac{1}{2}$ (dia)			
2-pin, $\frac{3}{4}$ in. c to c					
2-pin, $\frac{3}{4}$ in. c to c	2	$1\frac{3}{8}$	$\frac{3}{8}$		
	2	$1\frac{3}{8}$	$\frac{3}{8}$		
3 alined pins	$2\frac{5}{8}$	$1\frac{1}{2}$	$\frac{7}{8}$		
2-pin, $\frac{3}{8}$ in. c to c	$\frac{7}{8}$	$1\frac{1}{2}$ (dia)			
2-pin		$1\frac{1}{2}$ (dia)			
2-pin		$1\frac{1}{2}$ (dia)			
Std 3-pin	$2\frac{1}{4}$	$1\frac{1}{8}$	$1\frac{1}{2}$		Same as MX9E
Std 3-pin	$2\frac{1}{4}$	$1\frac{1}{8}$	$1\frac{1}{2}$		Same as MX9A
Std 3-pin	$2\frac{11}{32}$	$1\frac{37}{64}$	$1\frac{9}{64}$		
2-pin	$\frac{3}{4}$	$1\frac{3}{8}$ (dia)			
2 banana pins, 0.85 in. c to c	$1\frac{3}{4}$	$1\frac{7}{16}$	$\frac{9}{16}$		
2 banana pins	$1\frac{5}{8}$	$1\frac{1}{8}$	$\frac{5}{8}$		
2-pin	$1\frac{1}{4}$	$1\frac{1}{8}$	$\frac{7}{16}$		
3-pin	$2\frac{1}{8}$	$1\frac{9}{16}$	$1\frac{1}{8}$		
3-pin	$1\frac{5}{8}$	$1\frac{5}{16}$	$1\frac{1}{8}$		Same as AR4W, except freq
5-pin	$1\frac{1}{2}$	$1\frac{1}{8}$	$1\frac{1}{16}$		Interchangeable with Collins 1C holder
Std 3-pin	$1\frac{1}{2}$	$1\frac{1}{8}$	$1\frac{3}{8}$		
Std 5-pin	$1\frac{7}{8}$	$1\frac{1}{2}$	$1\frac{1}{2}$		
2-pin	$2\frac{3}{4}$	$1\frac{11}{64}$	$\frac{9}{16}$		
2-pin	$2\frac{1}{4}$	$1\frac{3}{8}$	$\frac{1}{2}$		
2-pin	$2\frac{1}{16}$	$1\frac{3}{8}$	$\frac{1}{2}$		
2-pin	$1\frac{9}{32}$	$1\frac{3}{16}$	$\frac{7}{16}$		

Top View Labels:

- WINDOW FOR CALIBRATION CARD
- CRYSTAL HOLDER P.T. 64
- CRYSTAL
- FREQ. 500
- IMP. (S NAME)

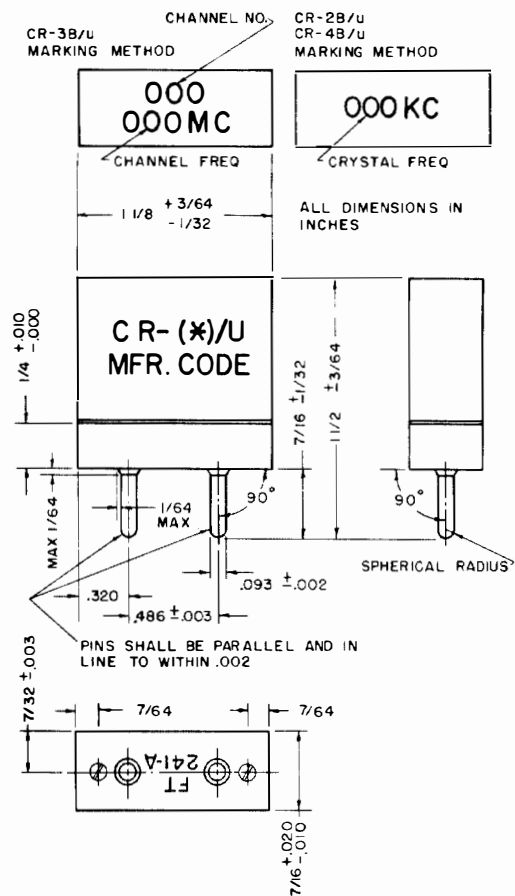
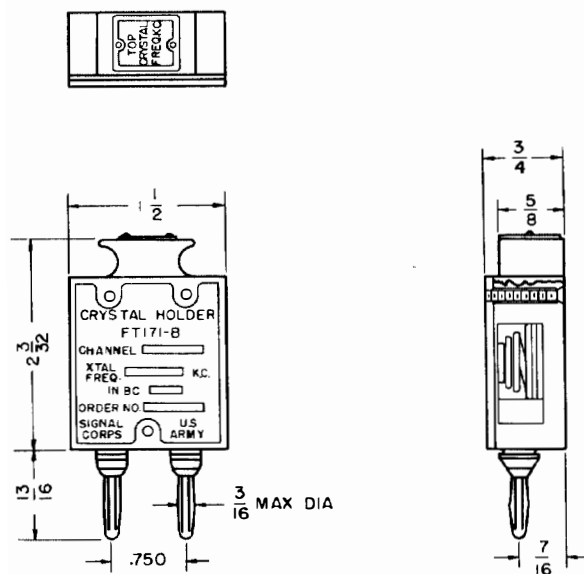
Side View Labels:

- UPPER ELECTRODE MONEL METAL
- VELLUMOID OR NEOPRENE WASHER OR EQUAL
- TERMINAL NICKEL PLATED BRASS
- DRILL AND TAP THROUGH TERMINAL
- ALL SCREWS NICKEL PLATED BRASS
- BOTTOM ELECTRODE MONEL METAL
- GUIDE RING MONEL METAL
- SOLDERED
- VELLUMOID OR NEOPRENE WASHER OR EQUAL
- CERAMIC BODY GLAZE ALL OVER EXCEPT AROUND SURFACES
- REMOVABLE NAMEPLATE
- THREADED BUSHING

Dimensions (inches):

- Overall width: $3 \frac{1}{4}$
- Overall height: $1 \frac{1}{2}$
- Terminal height: $\frac{5}{16}$
- Internal vertical spacing: $\frac{1}{8}$, $\frac{2}{4}$, $\frac{9}{16}$
- Horizontal spacing from center: $\frac{1}{8}$, $\frac{1}{2}$
- Bottom flange thickness: $\frac{1}{16}$
- Internal horizontal spacing: $\frac{1}{8}$, $\frac{1}{2}$

ALL DIMENSIONS IN INCHES



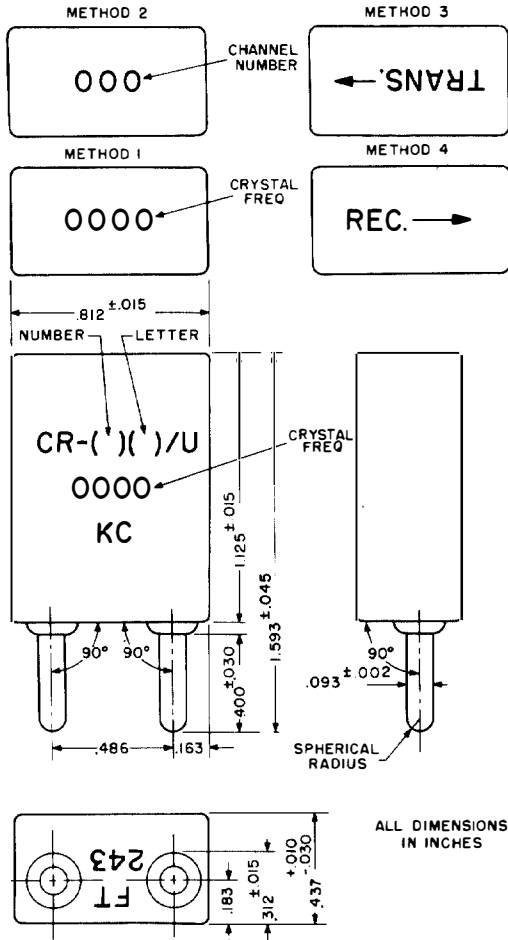


Figure 3-21. Crystal Holder FT-243. The markings indicated are applicable for Crystal Units CR-5B/U, CR-6B/U, CR-7B/U, CR-10B/U, and CR-12A/U. Method 1 is used where the operating frequencies of the using equipment are in terms of frequencies only; or where a single crystal is used to control both a transmitter and a receiver and the channel is expressed in terms of frequency. Method 2 is used where the operating frequencies of the using equipment are designated in terms of channel numbers and frequencies; or where a single crystal is used to control both a transmitter and a receiver and the operating frequency is expressed as a channel number as well as a frequency. Methods 3 and 4 are used respectively where two separate crystal units are employed in a single equipment, each performing a different function, such as one being used for transmitting and the other for receiving. Method 4 is used where the crystal unit is used to control the local oscillator of a receiver. On the back of the receiver crystal holder is marked "RECEIVE ON 0000 KC," where 0000 is the receiver frequency, which is always to be 455 kc below the crystal frequency. For an exploded view of the FT-243 holder, as a part of Crystal Unit CR-BB/U, see figure 1-70.

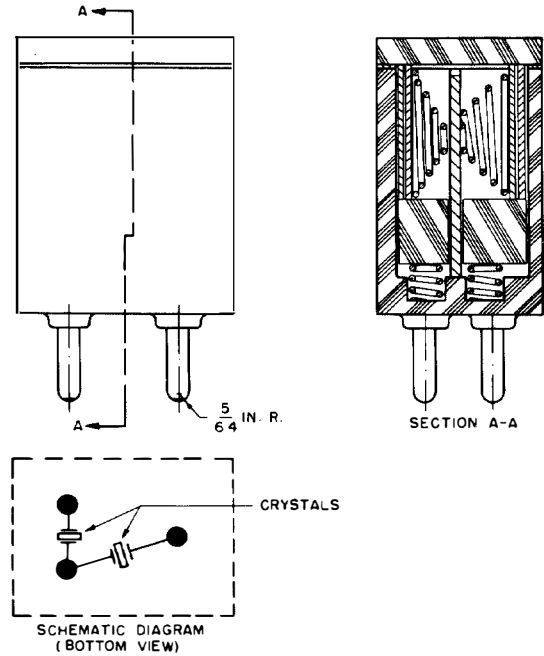


Figure 3-22. Crystal Holder FT-249

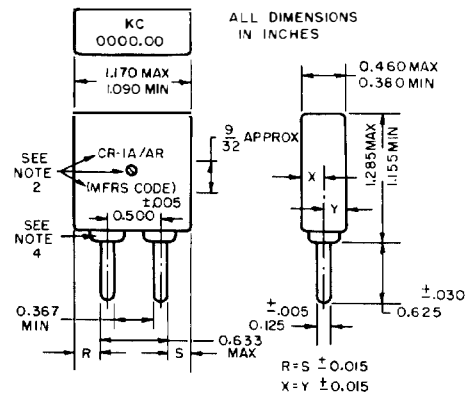


Figure 3-23. Crystal Holder for Crystal Unit CR-1A/AR

Section III
Crystal Holders—Group II

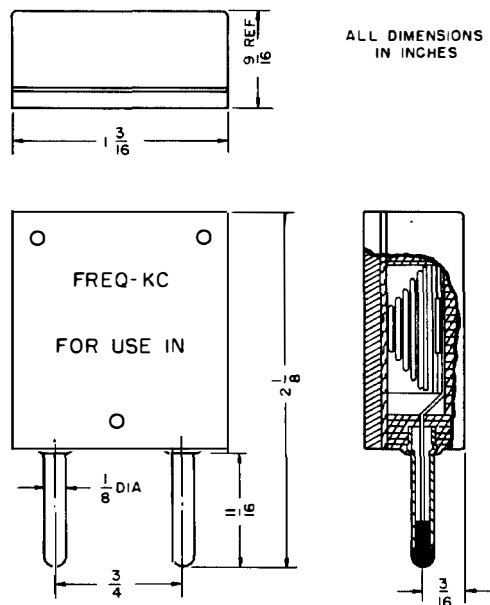


Figure 3-24. Crystal Holder HC-1/U

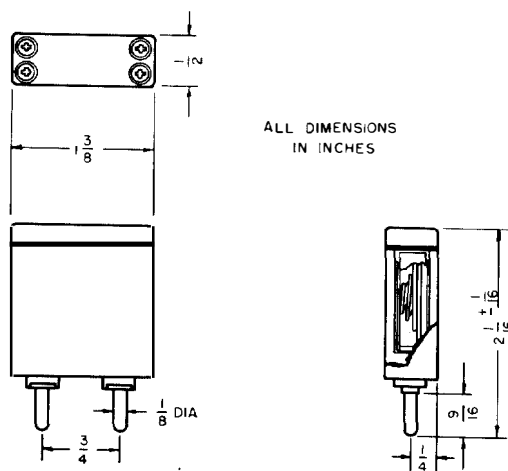


Figure 3-25. Crystal Holder HC-2/U and HC-3/U, except that the latter has pins of $\frac{5}{32}$ -in. diameter

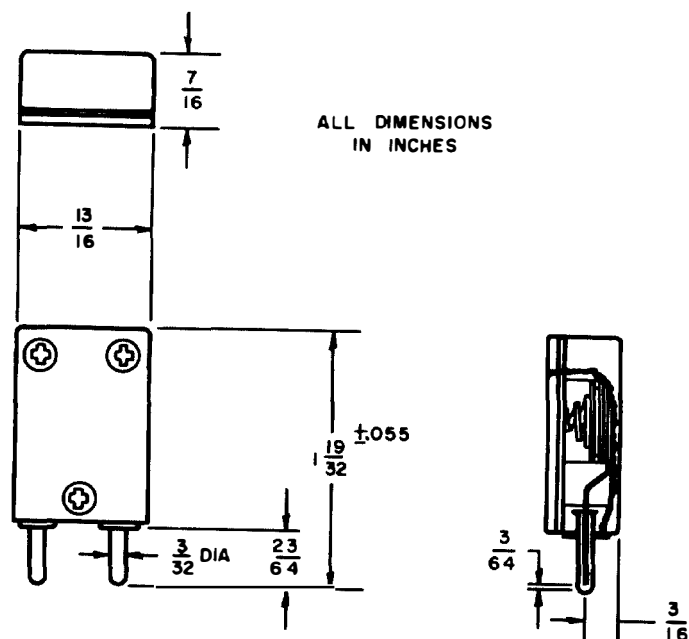


Figure 3-26. Crystal Holder HC-4/U

EXPLANATION OF MILITARY STANDARD TERMS USED IN DESCRIPTION OF CRYSTAL HOLDERS

Applicable Tests

3-2. Tests which have been specified for the particular crystal holder, and which have been performed by the Government or under the supervision of the Government to determine compliance of production and production specimens with the Military Specifications.

Authority

3-3. Serial numbers and dates of the military publications which prescribe the military specifications for the crystal holders being described. All holders described in Group I conform to Military Specification MIL-H-10056().

Condition A—Immersion Test (See paragraph 3-18a)

Condition B—Immersion Test (See paragraph 3-18b)

Corrosion Test (See paragraph 3-16)

Date of Status (See paragraph 2-4)

Delivery Requirements (See paragraphs 3-23 and 3-24)

Dimensions and Markings

3-4. Illustrated and largely self-explanatory. The marking of crystal holders, when required, is to be legible and permanent. See paragraph 2-26 for marking pertaining to crystal unit.

Fabrication Requirements (See paragraphs 3-8 and 3-14)

Functional Description

3-5. Provides summary of the general physical and operational features of the crystal holder.

Glass Seal Inspection (See paragraph 3-17)

Immersion Test (See paragraph 3-18)

Insulation Materials (See paragraph 3-10)

Insulation Resistance (See paragraph 3-18)

Leakage Test (See paragraph 3-19)

Marking (See paragraph 3-4)

Method A—Leakage Test (See paragraph 3-19a)

Method A—Thermal Shock Test (See paragraph 3-22a)

Method B—Leakage Test (See paragraph 3-19b)

Method B—Thermal Shock Test (See paragraph 3-22b)

Nomenclature of Crystal Holders

3-6. The Joint Army, Navy, Air Force nomenclature for designating a particular type of crystal holder is as follows:

CRYSTAL HOLDER NOMENCLATURE

Item Name	Type Number		
Crystal Holder	HC	X	U
	Component Indicator	Number	Equipment Indicator Letter for Type of Installation

In the type number, the component, a crystal holder is identified by the symbol, HC. The component symbol is followed by a hyphen and one or two digits (-X) which identify the crystal holder as having been designed in accordance with a particular set of specifications. The letter, U, separated from the number by a slant sign, is the equipment indicator symbol for "general utility installation," which means that the crystal is intended for use in two or more of the three general installation classes—airborne, shipboard, and ground.

Ordering Requirements (See paragraph 3-23)

Packaging Requirements (See paragraph 3-24)

Pin Alinement Test (See paragraph 3-20)

Requirements and Procedure of Tests

3-7. See Military Specification MIL-H-10056() for details of the required inspections, the grouping of tests, and the procedure for sampling.

FABRICATION REQUIREMENTS

Covers

3-8. Covers are designed to fit the bases in a manner that permits easy assembly and interchangeability of covers and bases of the same type supplied on any one contract or order.

Flux

3-9. Rosin or rosin and alcohol are normally used as flux. If other fluxes are used, conclusive evidence has been presented to the Government that the proposed substitution and technique of application result in a noncorrosive joint. No corrosive compounds are used for soldering or welding.

b. Method B: The glass envelope, but not the base assembly of the holder, is immersed in boiling water for 15 seconds and immediately thereafter immersed in ice water for 5 seconds, the volume of the water being sufficient to maintain constant temperature. The glass envelope must withstand this test without cracking or breaking.

Visual and Mechanical Inspection (See paragraph 3-30)

a. Method A: The base assembly is clamped to a suitable test jig and subjected to a gage pressure of 50 pounds per square inch while immersed in tap water for at least 30 seconds. The base assembly must show no evidence of leakage around the pins, at the seams, or through cracks or porous spots in any of the base material. The continuous formation of bubbles is evidence of leakage.

b. Method B: The crystal holder is clamped to a suitable test jig and the cavity subjected to similar conditions as in Method A. The holder must show no evidence of leakage around the pins, or through cracks or porous spots in the holder material. The continuous formation of bubbles is evidence of leakage.

Pin Alinement Test

3-20. The pins of the crystal holder are required to be so alined that they conform to the mechanical dimensions given in the individual Specification Sheet, when measured by means of a shadowgraph. Refer to paragraph 2-24 for alternate test-gage method.

Tensile Strength Test

3-21. The base assembly of the holder is supported in a way that clears the glass seal. A direct load of 30 pounds is applied along the axis of the pins away from the base for at least 30 seconds, after which, the glass seal must show no evidence of loosening from the pins or base.

Thermal Shock Test

3-22. The base assembly or glass envelope, as applicable, is tested as noted on the individual Specification Sheet in accordance with Method A or B as described below:

a. Method A: The base assembly is immersed for at least 10 seconds in liquid flux at a temperature not exceeding 25°C, then, abruptly hot-tin-dipped for at least 10 seconds in molten solder at a temperature between 302° to 312°C. The solder is immediately shaken off and the base assembly is plunged back into the liquid flux for at least 10 seconds. A minimum of three such cycles, continuously, is required. The thermal capacities of

the flux and solder baths must be sufficient to maintain the specified bath temperatures for the quantity of base assemblies being tested at any one time. When the thermal-shock cycles are completed, the insulation resistance must not be less than 5000 megohms when measured with an insulation tester as described in paragraph 3-18, and the glass seal must pass its standard inspection as described in paragraph 3-17.

b. Method B: The glass envelope, but not the base assembly of the holder, is immersed in boiling water for 15 seconds and immediately thereafter immersed in ice water for 5 seconds, the volume of the water being sufficient to maintain a constant temperature. The glass envelope must withstand this test without cracking or breaking.

DELIVERY REQUIREMENTS

Ordering

3-23. According to Military Specification MIL-H-10056B, procurement documents should specify the following:

a. Title, number, and date of the latest specification (the latest at the present time, being Military Specification: Holders, Crystal, MIL-H-10056B, dated 16 January 1953).

b. Type designation, and the title, number, and date of the applicable individual Specification Sheet (the latest one at the present time for HC-13/U, for example, is MIL-H-10056/4, dated 16 January 1953).

c. Whether springs are required, dimensions, and how they are to be mounted.

d. Length of pin above base. (See note 6 on applicable Specification Sheet for HC-13/U.)

e. The laboratory at which preproduction tests are to be performed. (See MIL-H-10056() for requirements of preproduction tests.)

f. Whether packing and marking are for domestic or overseas shipment.

g. That the contractor shall not substitute for a specified material or fabricated part unless he obtains approval from the bureau or service concerned. Evidence to substantiate his claim that such a substitute is suitable shall be submitted with his request. Similar notification and substantiating evidence shall be submitted at any later time if substitution becomes necessary or desirable. At the discretion of the bureau or service concerned, test samples may be required to prove the suitability of the proposed substitute.

Packaging

3-24. Electron-tube type crystal holders shall be packaged and packed in accordance with packaging group I of Specification MIL-P-75. All other

Section III

Military Specifications

types of crystal holders shall be unit-packages with method III of Specification MIL-P-116. Crystal holders are then placed in containers for either domestic shipment and storage or for overseas shipment described in subparagraphs a. and b. below. In addition to any special marking required by the contract or order, unit packages and exterior shipping containers shall be marked in accordance with Standard MIL-STD-129. These packaging, packing, and marking requirements apply only to direct shipment to the Government and are not intended to apply to contracts or orders between the manufacturer and prime contractors.

a. **Packing for Domestic Shipment and Storage:** Crystal holders packaged per specification shall be packed in wood-cleated plywood, nailed wood, or corrugated or solid fiber-board boxes conforming to Specification NN-B-601, NN-B-621, LLL-B-631, and LLL-B-636, respectively. Closures shall be made in accordance with the applicable box specification. The gross weight shall not exceed 45 pounds for fiberboard boxes and 150 pounds for plywood or wood boxes. Fiberboard having a minimum dry bursting strength (Mullen test) of less than 200 pounds shall not be used.

b. **Packing for Oversea Shipment:** Crystal holders packaged per specification shall be packed

in wood-cleated plywood, nailed wood, or fiberboard boxes conforming to Specification JAN-P-105, JAN-P-106, and JAN-P-108, respectively. Plywood shall be type B, condition 1, conforming to Specification JAN-P-139. Each shipping container shall have a case liner conforming to type II, grade A, class 2 of Specification MIL-L-10547. Box closures shall be as specified in the appendix of the applicable specification for fiberboard boxes, and 150 pounds for plywood or wood boxes.

Solder Requirements (*See paragraph 3-11*)

USAF Stock No.

3-29. Number for identifying item when requisitioning from U. S. Air Force supply depot. The USAF stock numbers of crystal holders are the same as the respective Signal Corps numbers except that the prefix, "2100-," is added, which serves to identify the item as belonging to USAF stock class 16-F.

Visual and Mechanical Inspection

3-30. Inspection of crystal holders to determine if material, design, construction, marking, and workmanship comply with applicable specifications. For greater detail, refer to Fabrication Requirements, paragraphs 3-8 to 3-14.

Workmanship Requirements (*See paragraph 3-20*)