MIL-STD-683F

5 May 1978

SUPERSEDING
MIL-STD-683E
26 August 1975

MILITARY STANDARD

CRYSTAL UNITS (QUARTZ) AND CRYSTAL HOLDERS (ENCLOSURES), SELECTION OF

FSC 5955

DEPARTMENT OF DEFENSE
Washington, D. C. 20360

Crystal Units (Quartz) and Crystal Holders (Enclosures), Selection of

MIL-STD-683F

1. This Military Standard is approved for use by all Departments and Agencies of the Department of Defense.

2. Beneficial comments (recommendations, additions, deletions) and any pertinent data which may be of use in improving this document should be addressed to: Commanding Officer, U.S. Army Electronics Command, ATTN: DRSEL-RD-TS, Fort Monmouth, N. J. 07703, by using the self-addressed Standardization Document Improvement Proposal (DD Form 1426) appearing at the end of this document or by letter.

CONTENTS

TABLES

1. SCOPE

1.1 Scope. This standard covers quartz crystal units and crystal holders (enclosures) designated as standard for use in new design of military equipment. Requirements for crystal units and crystal holders (enclosures) listed in this standard are covered in MIL-C-3098 and MIL-H-10056, respectively. See 6.2 for International Standardization Agreements.

1.2 Application. This standard is designed to serve the following purposes:

a. To provide the equipment designer with a list of crystal units and crystal holders (enclosures) considered by the military departments to be standard for military applications.

b. To control and minimize the variety of crystal-unit types used in military equipment in order to facilitate effective logistic support of equipment in the field, and to maximize economic support of production of the crystal units listed in this standard.

2. REFERENCED DOCUMENTS

2.1 Issues of documents. The following documents of the issue in effect on date of invitation for bids or request for proposal, form a part of this standard to the extent specified herein.

SPECIFICATIONS

MILITARY

MIL-C-3098 - Crystal Units, Quartz, General Specification for.
MIL-H-10056 - Holders (Enclosures), Crystal, General Specification for.

(Copies of specifications, standards, drawings, and publications required by contractors in connection with specific procurement functions should be obtained from the procuring activity or as directed by the contracting officer.)

3. DEFINITIONS

3.1 The terms, abbreviations, and symbols used in this standard are as defined in MIL-C-3098.

4. GENERAL REQUIREMENTS

4.1 Not applicable.

5. DETAILED REQUIREMENTS

5.1 Classification of listed crystal-unit types.

5.1.1 Standard crystal units. The crystal units listed in table I are designated as standard for use in new design of military equipment.

5.1.2 Crystal-unit type listing. Crystal units, arranged by type, are listed in table II. (Table II also indicated NATO Preferred or Guidance types.)

5.1.3 Application and use of crystal units. The specified maximum and minimum parameters of the crystal units are limiting factors beyond which the reliability of the crystal unit will be impaired from the viewpoint of life and satisfactory performance. The equipment designer has the responsibility of ascertaining that the crystal unit will be operated under conditions that are within the limits specified for the particular unit type required.

5.1.4 Conflict of requirements. In the event of conflict between technical requirements described in this standard and the applicable specification, the latter shall govern. However, any conflict, real or assumed, does not relieve the contractor of the responsibility to comply with 5.2 and 5.3

5.2 Crystal units not listed in this standard.

5.2.1 Procurement specification requirements (to be required upon approval of the Government for the use of a crystal unit not listed in this standard or covered by a specification sheet under MIL-C-3098). Copies of the complete procurement (engineering) specification, and all changes or revisions, shall be forwarded to the procuring activity. All specifications, revisions, and associated data shall clearly indicate the use of the special crystal type by contract number, equipment nomenclature, number of the special units used per equipment, the number of equipments to be delivered under the contract or order, and the identification of the approval letter of the crystal unit. This requirement shall not be waived.

5.3 Requirements for nonexistent crystal units. Should an equipment development have need for crystal units that cannot be satisfied by any known existing specification, the Government shall be so informed.

5.4 Standard crystal holders (enclosures). The following crystal holders (enclosures) are standard for use in the design of new quartz crystal units:

Holder (enclosure) type	Holder (enclosure) specification 1/
HC-6/U*	MIL-H-10056/2
HC-13/U*	MIL-H-10056/4
HC-18/U*	MIL-H-10056/9
HC-25/U*	MIL-H-10056/11
HC-26/U*	MIL-H-10056/13
HC-27/U*	MIL-H-10056/14
HC-28/U	MIL-H-10056/15
HC-29/U*	MIL-H-10056/16
HC-30/U**	MIL-H-10056/12
HC-32/U	MIL-H-10056/18
HC-33/U	MIL-H-10056/20
HC-34/U	MIL-H-10056/22
HC-35/U**	MIL-H-10056/21
HC-36/U	MIL-H-10056/23
HC-37/U**	MIL-H-10056/24
HC-38/U	MIL-H-10056/25
HC-39/U	MIL-H-10056/26
HC-40/U**	MIL-H-10056/27
HC-41/U	MIL-H-10056/28
HC-42/U	MIL-H-10056/29
HC-43/U	MIL-H-10056/30
HC-44/U	MIL-H-10056/31
HC-45/U	MIL-H-10056/32
HC-46/U	MIL-H-10056/33
HC-47/U	MIL-H-10056/34

1/ Holder (enclosure) specifications show standard holder (enclosure) design.

*NATO Preferred Item.
**NATO Guidance Item.

TABLE I. Standard crystal units (listed in order of low limit of frequency range).

Frequency range	Crystal-unit type	Mode of oscillation	Frequency tolerance, ppm	Operating temperature range, °C	Holder	MIL-C-3098/	Load capacitance, pF 1/	Rated drive level, mW
16 to 100 kHz	CR-38A/U	Fundamental	120	-40 to +70	HC-13/U	18	20.0 ±0.5	0.1
	CR-50A/U	Fundamental	120	-40 to +70	HC-13/U	28	∞	0.1
90 to 250 kHz	CR-37A/U	Fundamental	200	-40 to +70	HC-13/U	17	20.0 ±0.5	2.0 ±0.4
	CR-42A/U	Fundamental	30 2/	+70 to +80	HC-13/U	21	32.0 ±0.5	2.0 ±0.4
190 to 500 kHz	CR-47A/U	Fundamental	20 3/	+70 to +80	HC-6/U	26	20.0 ±0.5	2.0 ±0.4
200 to 555 kHz	CR-25B/U	Fundamental	100	-40 to +85	HC-6/U	7	∞	2.0 ±0.4
	CR-26A/U	Fundamental	20 3/	+70 to +80	HC-6/U	8	∞	2.0 ±0.4
	CR-63B/U	Fundamental	100 4/	-40 to +70	HC-6/U	41	20.0 ±0.5	2.0 ±0.4
455 kHz	CR-45/U	Fundamental	200	-40 to +70	HC-6/U	24	∞	2.0 ±0.4
0.8 to 20 MHz	CR-18A/U	Fundamental	50	-55 to +105	HC-6/U	3	32.0 ±0.5	10.0 ±2.0 5/ 5.0 ±1.0 6/
	CR-19A/U	Fundamental	50	-55 to +105	HC-6/U	4	∞	10.0 ±2.0 5/ 5.0 ±1.0 6/
	CR-27A/U	Fundamental	20 3/	+70 to +80	HC-6/U	9	32.0 ±0.5	5.0 ±1.0 5/ 2.5 ±0.5 6/
	CR-28A/U	Fundamental	20 3/ *	+70 to +80	HC-6/U	10	∞	5.0 ±1.0 5/ 2.5 ±0.5 6/
	CR-35A/U	Fundamental	20 3/ **	+80 to +90	HC-6/U	15	∞	5.0 ±1.0 5/ 2.5 ±0.5 6/
	CR-36A/U	Fundamental	20 3/ **	+80 to +90	HC-6/U	16	32.0 ±0.5	5.0 ±1.0 5/ 2.5 ±0.5 6/
	CR-62/U	Fundamental	10 3/ *	+70 to +80	HC-6/U	40	32.0 ±0.2	5.0 ±1.0 5/ 2.5 ±0.5 6/
	CR-85/U	Fundamental	20	-40 to +90	HC-6/U	56	∞	10.0 ±2.0 5/ 5.0 ±1.0 6/
			30	-55 to -40, +90 to +105				
	CR-157/U	Fundamental	50	-55 to +105	HC-33/U	137	∞	10.0 ±2.0 5/ 5.0 ±1.0 6/
2 to 10 MHz	CR-120/U	Fundamental	5	85 ±5	HC-27/U	97	100 ±0.5	.002
	CR-121/U	Fundamental	5		HC-27/U	98	50.0 ±0.5	.2
2.2 to 20 MHz	CR-78A/U	Fundamental	50	-55 to +105	HC-25/U	62	30.0 ±0.5	5.0 ±1.0
2.9 to 20 MHz	CR-64/U	Fundamental	50	-55 to +105	HC-18/U	42	30.0 ±0.5	5.0 ±1.0
	CR-79/U	Fundamental	50	-55 to +105	HC-25/U	63	∞	5.0 ±1.0
2.9 to 25 MHz	CR-69A/U	Fundamental	20	-40 to +90	HC-18/U	47	30.0 ±0.5	5.0 ±1.0
			30	-55 to -40, +90 to +105				
3 to 5 MHz	CR-90/U	Fundamental	4	-55 to +90	HC-27/U	96	30 ±0.5	.01
3 to 20 MHz	CR-66/U	Fundamental	20	-40 to +90	HC-6/U	44	30.0 ±0.5	10.0 ±2.0 5/ 5.0 ±1.0 6/
			30	-55 to -40, +90 to +105				
	CR-68/U	Fundamental	20 3/	+70 to +80	HC-6/U	46	32.0 ±0.5	5.0 ±1.0
5 to 20 MHz	CR-60A/U	Fundamental	50	-55 to +105	HC-18/U	38	∞	5.0 ±1.0
	CR-112/U	Fundamental	25	-55 to +105	HC-18/U	88	∞	5.0 ±1.0
10 to 61 MHz	CR-52A/U	Third overtone	50	-55 to +105	HC-6/U	30	∞	4.0 ±0.8 7/ 2.0 ±0.4 8/
	CR-65/U	Third overtone	10 9/ *	+70 to +80	HC-6/U	43	∞	2.0 ±0.4 7/ 1.0 ±0.2 8/
16 to 61 MHz	CR-76A/U	Third overtone	20	-40 to +90	HC-18/U	53	∞	2.0 ±0.4
			30	-55 to -40, +90 to +105				
17 to 61 MHz	CR-61/U	Third overtone	20 3/ **	+80 to +90	HC-18/U	39	∞	2.0 ±0.4 7/ 1.0 ±0.2 8/
	CR-73/U	Third overtone	30	-55 to +105	HC-29/U	54	∞	2.0 ±0.4 10/
	CR-84/U	Third overtone	20 3/ *	+80 to +90	HC-25/U	61	∞	2.0 ±0.4 7/ 1.0 ±0.2 8/
17 to 62 MHz	CR-55A/U	Third overtone	50	-55 to +105	HC-18/U	33	∞	2.0 ±0.4
	CR-67A/U	Third overtone	25	-55 to +105	HC-18/U	45	∞	2.0 ±0.4
	CR-77/U	Third overtone	20	-40 to +90	HC-25/U	55	∞	2.0 ±0.4
			30	-55 to -40, +90 to +105				
17 to 65 MHz	CR-81/U	Third overtone	50	-55 to +105	HC-25/U	58	∞	2.0 ±0.4

See footnotes at end of table.

TABLE I. Standard crystal units (listed in order of low limit of frequency range) - Continued.

Frequency range	Crystal-unit type	Mode of oscillation	Frequency tolerance, ppm	Operating temperature range, °C	Holder	MIL-C-3098/	Load capacitance, pF 1/	Rated drive level, mW
45 to 125 MHz	CR-74/U	Fifth overtone	10 9/	+80 to +90	HC-26/U	51	∞	1.0 ±0.2
	CR-54A/U	Fifth overtone	50	-55 to +105	HC-6/U	32	∞	2.0 ±0.4
	CR-56A/U	Fifth overtone	50	-55 to +105	HC-18/U	34	∞	2.0 ±0.4
	CR-59A/U	Fifth overtone	20 3/ **	+80 to +90	HC-18/U	37	∞	1.0 ±0.2
	CR-75/U	Fifth overtone	10 9/ *	+70 to +80	HC-6/U	52	∞	1.0 ±0.2
			20	-40 to +90				
50 to 125 MHz	CR-80/U	Fifth overtone	30	-55 to -40 +90 to +105	HC-18/U	57	∞	2.0 ±0.4
	CR-82/U	Fifth overtone	50	-55 to +105	HC-25/U	59	∞	2.0 ±0.4
			20	-40 to +90				
	CR-83/U	Fifth overtone	30	-55 to -40 +90 to +105	HC-25/U	60	∞	2.0 ±0.4
	CR-102/U	Fifth overtone	25	-55 to +105	HC-35/U	104	∞	2.0 ±0.4

1/ When a load capacitance is given, the crystal unit is designed to resonate at rated frequency with an external capacitor of the value specified. Crystal units which have infinite load capacitance are designed to operate at series resonance.
2/ Stability within overall frequency tolerance: ±20 ppm.
3/ Stability within overall frequency tolerance: ±5 ppm.
4/ Frequency tolerance over secondary operating temperature range (-55 to -40°C and +70 to +90°C): ±150 ppm.
5/ For frequencies up to and including 10 MHz.
6/ For frequencies above 10 MHz.
7/ For frequencies up to and including 25 MHz.
8/ For frequencies above 25 MHz.
9/ Stability within overall frequency tolerance: ±2.5 ppm.
10/ For frequencies of 17 to 30 MHz.
* Frequency tolerance at room temperature: ±70 ppm.
** Frequency tolerance at room temperature: ±80 ppm.

TABLE II. Reference listing by type designation.

Type CR_/U	MIL-C-3098/	Remarks	Type CR_/U	MIL-C-3098/	Remarks
1D	76	Special	87	65	USAF
5A	77	Special	88A	66	Special
6A	78	Special	89	67	EL
8A	111	Special	90**	96	Standard - table I
15B	1	Used for maintenance only	91	68	Special
16B	2	Used for maintenance only	92	69	CANCELLED
18A	3	Standard - table I	94	81	EL
19A*	4	Standard - table I	95	70	USAF
23	--	Obsolete - replaced by CR-52A/U and CR-54A/U	96	71	USAF
			97	72	USAF
24	6	Used for maintenance only	98	73	USAF
25B*	7	Standard - table I	99A	74	USAF
26A*	8	Standard - table I	100	75	USAF
27A	9	Standard - table I	101	103	EL
28A*	10	Standard - table I	102	104	Standard - table I
29A	11	Used for maintenance only	103	105	Special
30A	12	Used for maintenance only	104	79	USAF
32A	--	Obsolete - replaced by CR-65/U and CR-75/U	105	80	USAF
			106	82	USAF
33A	14	Special	107	83	USAF
35A*	15	Standard - table I	108	84	USAF
36A	16	Standard - table I	109	85	USAF
37A*	17	Standard - table I	110A	86	USAF
38A**	18	Standard - table I	111	87	USAF
39	19	Used for maintenance only	112	88	Standard - table I
40	20	Used for maintenance only	113	89	USAF
42A	21	Standard - table I	114	90	USAF
43	22	Used for maintenance only	115	91	Canceled
45	24	Standard - table I	116	92	USAF
46B	25	Special	117	93	USAF
47A*	26	Standard - table I	118	94	USAF
50A**	28	Standard - table I	119*	95	Special
51A	29	Special	120**	97	Standard - table I
52A*	30	Standard - table I	121**	98	Standard - table I
53A	31	Special	122	99	USAF
54A*	32	Standard - table I	123	100	USAF
55A*	33	Standard - table I	124	101	USAF
56A**	34	Standard - table I	125	102	USAF
57	35	Special	126	107	EL
58A	36	Used for maintenance only	127	106	USAF
59A*	37	Standard - table I	128	108	USAF
60A*	38	Standard - table I	129	110	USAF
61*	39	Standard - table I	130	109	Special
62	40	Standard - table I	131*	120	EL
63B*	41	Standard - table I	132*	121	EL
64*	42	Standard - table I	133	112	USAF
65*	43	Standard - table I	134	113	USAF
66**	44	Standard - table I	135	114	USAF
67A**	45	Standard - table I	136	115	USAF
68**	46	Standard - table I	137	116	USAF
69A*	47	Standard - table I	138	117	USAF
71*	49	Special	139	118	USAF
72	50	USAF	140	119	USAF
73**	54	Standard - table I	141	122	USAF
74**	51	Standard - table I	142	123	USAF
75*	52	Standard - table I	143	124	Canceled
76A**	53	Standard - table I	144	125	USAF
77*	55	Standard - table I	145	126	USAF
78A*	62	Standard - table I	146	127	USAF
79**	63	Standard - table I	147	128	USAF
80 **	57	Standard - table I	148	129	USAF
81*	58	Standard - table I	149	130	Special
82*	59	Standard - table I	150	131	EL
83 **	60	Standard - table I	151	132	USAF
84 **	61	Standard - table I	152	133	Special
85 **	56	Standard - table I	153	134	EL
86	64	USAF	154	138	USAF

*NATO Preferred Item.
**NATO Guidance Item.

TABLE II. Reference listing by type designation - Continued.

Type CR _/U	MIL-C-3098/	Remarks
155	135	STANDARD
156	136	STANDARD
157	137	Standard - table I
158	139	STANDARD
159	140	STANDARD
160	141	EL
161	142	SPECIAL

5.5 Crystal Unit Reference Chart. Table III is a reference chart stating basic characteristics of crystal types covered by MIL-C-3098.

TABLE III. Crystal units quick reference chart.

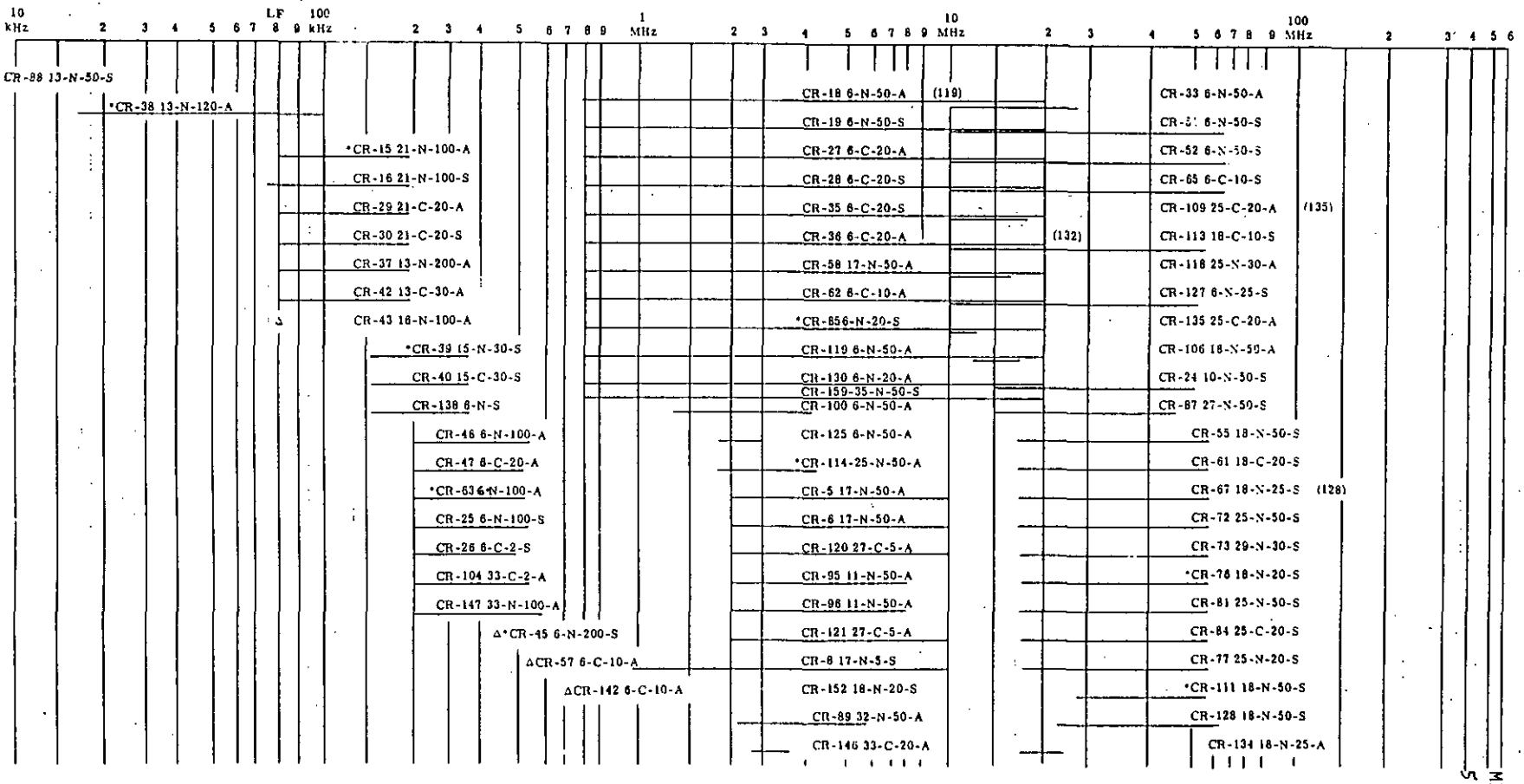
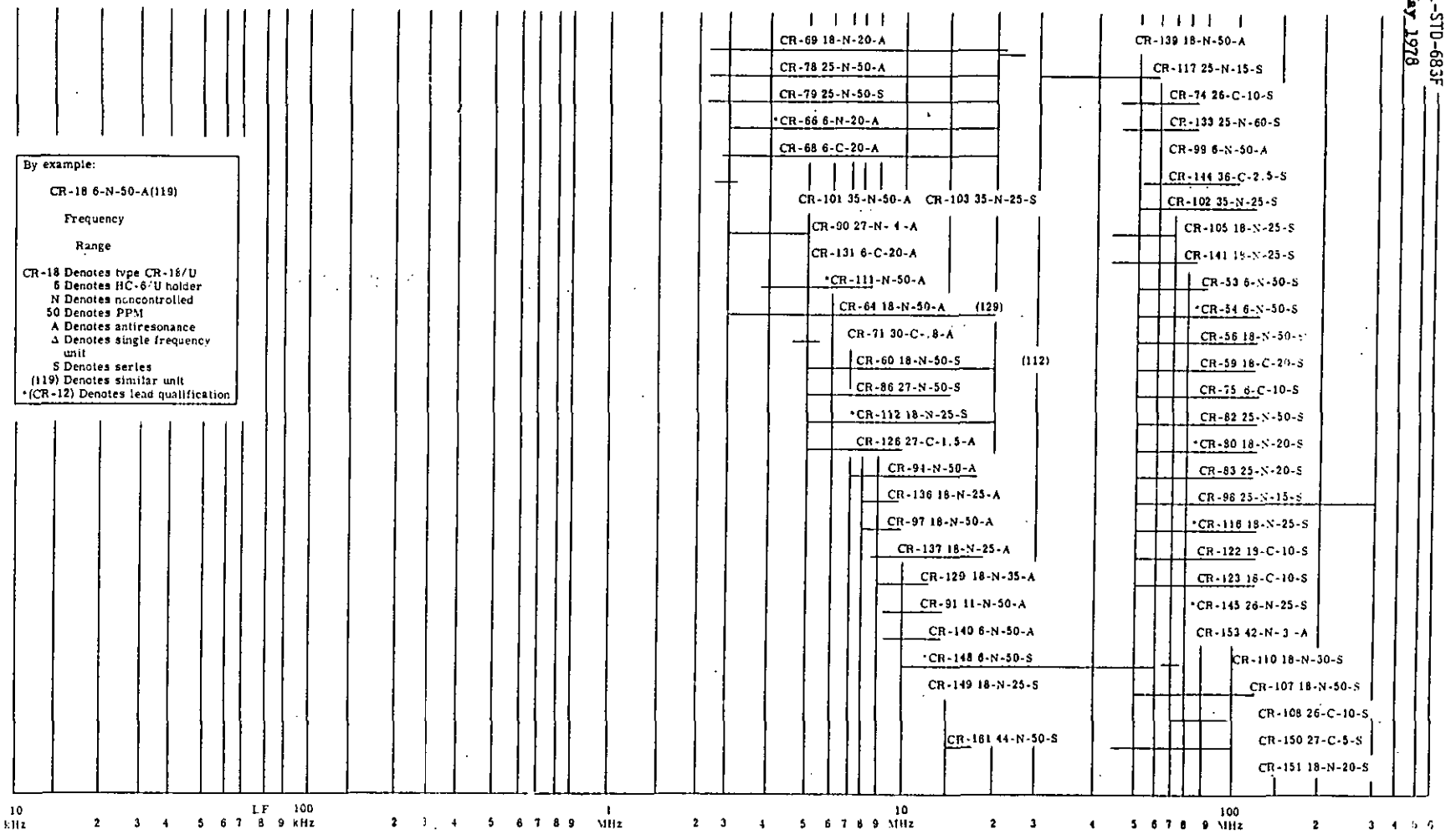


TABLE III. Crystal units quick reference chart - Continued.



Holder No. HC-()U	6(36)	10	11	13	14	15	16	17	18(43)	21	25(42)	26	27	28	29	30	32	33	35
Thickness (Approx)	.345	.560	.406	.345	.345	.345	1.312	.345	.106	1.187	.183	.183	.352	.352	.183	.75	.225	.345	.380
Height (Exc. Term)	.765	.555	1.282	1.516	.574	2.312	2.062	.765	.515	2.025	.530	.530	.775	1.526	.530	1.5	.635	.765	.250
Leads (L)									L			L				L		L	L
Glass (G)						G						G	G	G	G	G			
Cylindrical (R)		R				R	R									R			R

6. NOTES

6.1 Improvements. Crystal units having technological improvements are under experimental development. When development work of this nature has been successfully completed and the sources become available, the improved crystal units will then be recommended for inclusion as standard for new design.

6.2 International standardization agreement. Certain provisions of this standard are the subject of international standardization agreement, NEPR No. 39. When amendment, revision, or cancellation of this standard is proposed, the departmental custodians will inform their respective Departmental Standardization Offices so that appropriate action may be taken in respect to the international agreement concerned. The United States, by internation agreement (NEPR), has agreed to the use of types of crystal units designated by NATO Nomenclature, i.e., NXTl/A on new equipment design.

Custodians:
Army - EL
Navy - EC
Air Force - 85

Review activities:
Army - MI, AR, SM
Navy - SH
Air Force - 11
DLA - ES

User activities:
Navy - AS, MC, SH, OS
Air Force - 17, 19

Preparing activity:
Army - EL

Agent:
DLA - ES

(Project 5955-0518)

STANDARDIZATION DOCUMENT IMPROVEMENT PROPOSAL

OMB Approval
No. 22-R255

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NAME OF ORGANIZATION AND ADDRESS

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