

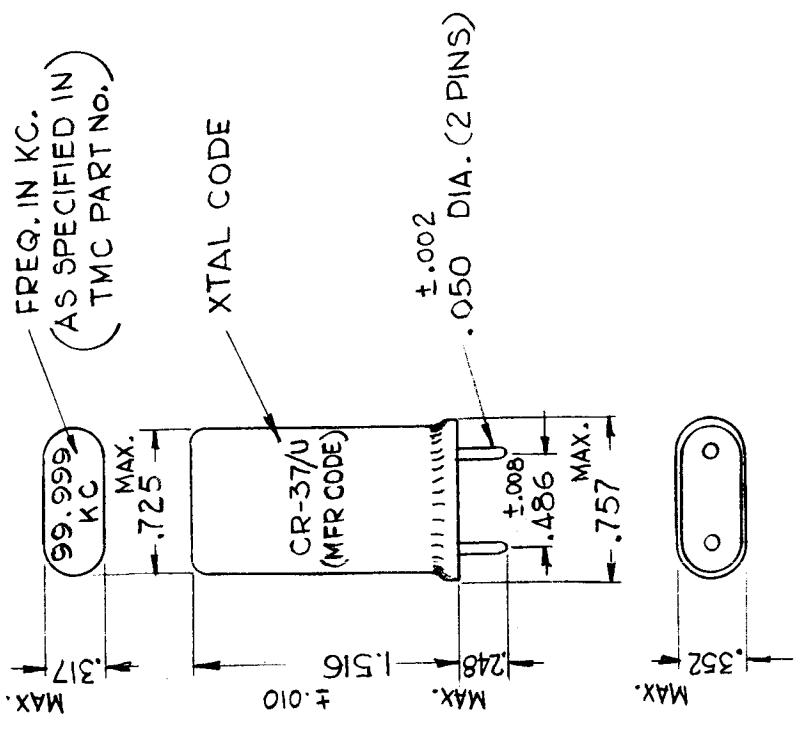
-SPECIFICATIONS -
 HOLDER: HC-13/U (PER MIL-H-10056/4)
 FREQ. RANGE= 90 TO 250KC/SEC, INCL.
 (FOR SPECIFIC FREQ., SEE TMC PART NO.)
 O/A FREQ. TOL= ±0.02%
 LOAD CAPACITANCE = 20.0 ±0.5 uuf
 MODE OF OSC. = FUNDAMENTAL
 OPERATING TEMP. RANGE: -40°±3° TO +70-0°C.
 RESONANCE TYPE: PARALLEL

-NOTE -
 ALL OTHER SPECIFICATIONS & REQUIREMENTS SHALL BE IN ACCORDANCE WITH MIL-C-3098/17

TMC PART NO. SHALL BE IN THE FOLLOWING FORM

CR-37/U
 TMC & MIL
 TYPE DESIGNATION SPECIFIC
 FREQ. IN KC

USED ON
 MODEL GPR-92
 ASSY. NO. 10-4-63
 DATE



REQ. PER UNIT		M. GELLMAN DESCRIPTION		SYMBOL	
GPR-92		UNIT TO BE IN ACCORDANCE WITH MIL-C-3098/17		CR-37/U	
PART NO.		THE TECHNICAL MATERIEL CORP.		MAMARONECK.	
STOCK SIZE		CRYSTAL UNIT, QUARTZ			
MATERIAL		G.D.L		10/4/63	
TYPE & TEMPER		DRAWN		CHECKED	
HEAT TREAT. SPEC.		ELEC. DES. APP.		MECH. DES. APP.	
FINISH & SPEC. NO.		CR-37/U			
SYMBOL		MATERIAL		SCALE	
		CRYSTAL UNIT, QUARTZ		DO NOT SCALE	
DESCRIPTION		DATE		CHECKER	
UNLESS OTHERWISE SPECIFIED					
DIMENSIONS ARE IN INCHES AND INCLUDE					
CHEMICALLY APPLIED OR PLATED FINISHES					
TOLERANCES		FRACTIONS		CODE	
.X ±.05		± 1/64		ANGLES	
.XX ±.01		± 0° 30'		± 0° 30'	
.XXX ±.005					

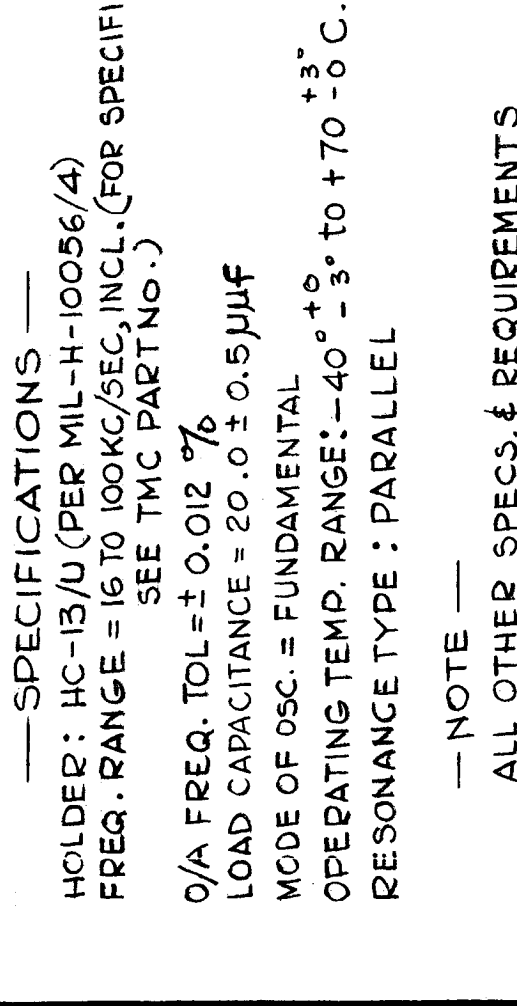
THE CONTENTS OF THIS DRAWING ARE THE EXCLUSIVE PROPERTY OF THE TECHNICAL MATERIEL CORP. ITS UNAUTHORIZED USE FOR REPRODUCTION IN WHOLE OR IN PART IS STRICTLY FORBIDDEN.

REQ. PER UNIT
 MODEL
 USED ON
 ASSY. NO.
 DATE
 11-2-62

CR-38A/U
 A

— SPECIFICATIONS —
 HOLDER: HC-13/U (PER MIL-H-10056/4)
 FREQ. RANGE = 16 TO 100 KC/SEC, INCL. (FOR SPECIFIC FREQ., SEE TMC PART NO.)
 O/A FREQ. TOL = $\pm 0.012\%$
 LOAD CAPACITANCE = $20.0 \pm 0.5 \mu\text{F}$
 MODE OF OSC. = FUNDAMENTAL
 OPERATING TEMP. RANGE: $-40^{\circ} - 3^{\circ}$ to $+70 - 0^{\circ} \text{C.}$
 RESONANCE TYPE : PARALLEL

— NOTE —
 ALL OTHER SPECS. & REQUIREMENTS SHALL BE IN ACC/WITH MIL-C-3098/18



TMC PART NO. SHALL BE IN THE FOLLOWING FORM
CR-38A/U — 100.000
 TMC & MIL SPECIFIC
 TYPE DESIGNATION FREQ. IN KC

SYM	DESCRIPTION	DATE	CH. NO.	DRAFTS	CHECKER	ENG. APP.
A	DIM. 1.516 ± 0.10 WAS 1.386 MAX.	4-11-63	8761	<input checked="" type="checkbox"/>	WY	<i>[Signature]</i>

REQ. ITEM	PART NO.	STURMER DESCRIPTION	SYMBOL
		THE TECHNICAL MATERIEL CORP. MAMARONECK. NEW YORK	
		CRYSTAL UNIT, QUARTZ	

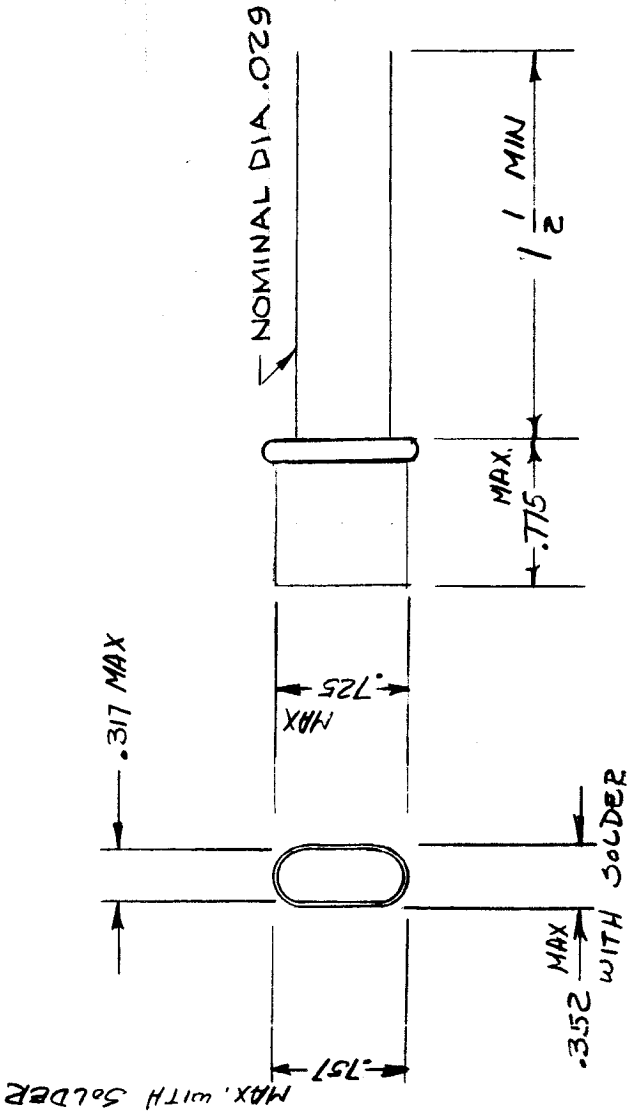
TYPE & TEMPER	HEAT TREAT. SPEC.	DRAWN	CHECKED	FINAL APPROVAL
		<i>[Signature]</i>	<i>[Signature]</i>	<i>[Signature]</i>

FINISH & SPEC. NO.	MATERIAL	SCALE	CODE

UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES AND INCLUDE CHEMICALLY APPLIED OR PLATED FINISHES
 DECIMALS
 X ± .05
 .XX ± .01
 .XXX ± .005
 FRACTIONS
 ± 1/64
 ANGLES
 ± 0° 30'

IF IT IS FOUND DESIRABLE TO CHANGE ANY TOLERANCE OR OTHER DETAIL SPECIFIED ON THIS DRAWING NOTIFY THE PURCHASER PROMPTLY.

MAXIMUM ALLOWABLE TOLERANCES HAVE BEEN DETERMINED AND DEVIATIONS WILL BE CAUSE FOR REJECTION. REMOVE ALL BURRS AND SHARP EDGES



SPECIFICATIONS

MODE OF OPER: FUNDAMENTAL
 RESONANCE: SERIES, 455.000 KC $\pm 0.02\%$
 OPER. TEMP. RANGE: -40° TO $+70^\circ$ C
 RATED DRIVE LEVEL: $2 \pm 0.4 \text{ MIN}$
 L1: 10.1Hys (NOMINAL)
 C1: 0.0122 Pf (NOMINAL)
 C0: 5.3Pf (7.0Pf MAX)
 R5: 900 Ω MAX.
 Q: 32,300 $\pm 5\%$

NOTE:

- 1- THERE SHALL BE NO SPURIOUS RESPONSES WITHIN $\pm 7.0 \text{ KC}$ OF THE OPER. FREQ.
- 2- CASE TYPE HC-6/U WITH $1\frac{1}{2}''$ MIN WIRE LEADS.

CR 102 C

USED ON

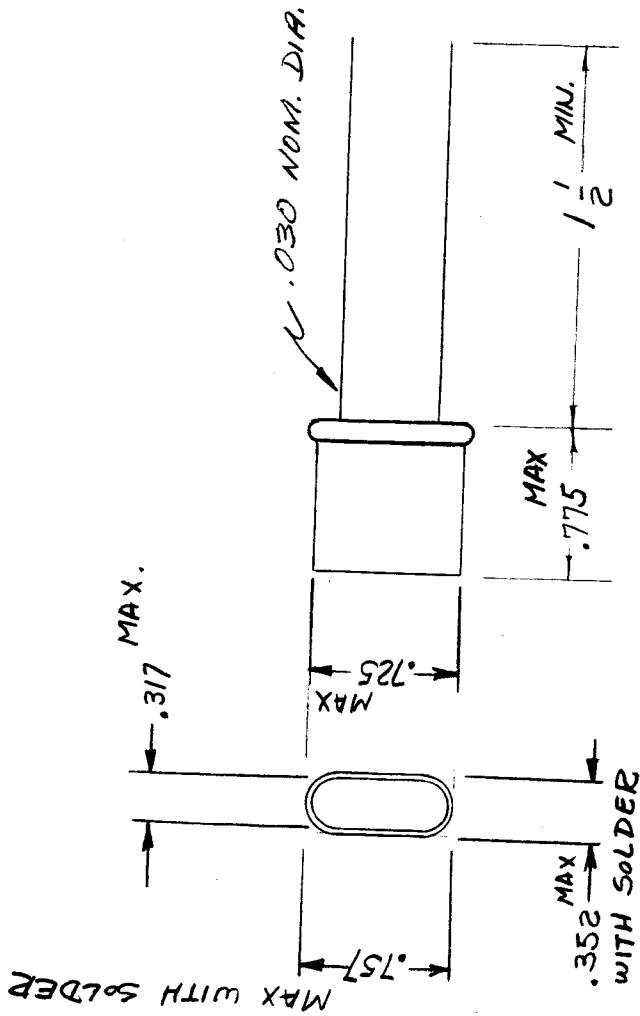
REQ. PER UNIT	MODEL	PROJECT NO.	ASSY. NO.	DATE
1	GPR	297		3-28-55
1	FFRD-1,2,3	E-458-P		4/16/56

REQ. ITEM	PART NO.	DESCRIPTION	SYMBOL
		THE TECHNICAL MATERIEL CORP. MAMARONECK, NEW YORK	
		CRYSTAL, 455 K.C.	
		CVD 3-28-55	
		DRAWN	ELEC. DES. APP. MECH. DES. APP.
		TYPE & TEMPER	
		HEAT TREAT. SPEC.	
		FINISH & SPEC. NO.	

ISSUE ITEM	CHANGED FROM	DATE	CN. NO.	DRAFTS CHECKER	ENG. APP.
C 1	COMPLETELY REVISED	3-22-65	13707	Shaw	[Signature]
B 1	UPDATED DWG	10/3/63	10076	AD	[Signature]
A 1	ON FREQUENCY SPECIFIC OPER. TEMP. RANGE: -55° TO $+90^\circ$ C	7-3-61	5174	GOL	[Signature]
SCALE: 5/101-22 (2003) 5/101-22 (2003)					
TOLERANCES					
DEC. DIM. \pm					
FRAC. DIM. \pm					
ANGULAR DIM. \pm					
DRILL, PUNCH, COMMERCIAL STOCK SIZES AND MANUFACTURERS TOLERANCES ARE NOT INCLUDED.					

REQ. PER UNIT	1
MODEL	GPR
USED ON	CR 103 C
ASSY. NO.	10-27-55
DATE	

- SPECIFICATIONS**
- 1-MODE OF OPER: FUNDAMENTAL
 - 2-RESONANCE: SERIES, 3.500 MC ± .005%
 - 3-OPER. TEMP. RANGE: -55° T + 105°C,
 - 4-MAX. DRIVE LEVEL: 10MW
 - 5-CO: 7.0 P.F. MAX.
 - 6-Rs: 52 Ω MAX.
 - 7-AGING: NOT RATED
 - 8-SHOCK & VIBRATION:
 - A: FREQ ±.0005%
 - B: Rs ±10%



REF: MIL-C-3098/4A
 NOTE: CR-19A/U CRYSTAL WITH 1/2" WIRE LEADS

REQ. ITEM	PART NO.	DESCRIPTION	SYMBOL
C 1		THE TECHNICAL MATERIEL CORP. MAMARONECK, NEW YORK	
B 1		CRYSTAL 3.5 MC.	
A 1			
ISSUE ITEM	CHANGED FROM	DATE	CH. NO. DRAFTS CHECKER ENG. APP.
		7-6-61	5183 G.D.L. RU
		10/17/65	10211 RU
		9-28-65	13707 RU
			RU
SCALE: 5401-250 MAXIMUM ALLOWABLE TOLERANCES HAVE BEEN DETERMINED AND ANY DEVIATIONS WILL BE CAUSE FOR REJECTION. REMOVE ALL BURRS AND SHARP EDGES			
TOLERANCES			
DEC. DIM. ±			
FRAC. DIM. ±			
ANGULAR DIM. ±			
FINISH & SPEC. NO.	G.T.O		
TYPE & TEMPER	HEAT TREAT. SPEC.	DRAWN	CHECKED
		19/27/65	HH
		AA	WDR
			FINAL APPR VAL
			CR 103 C

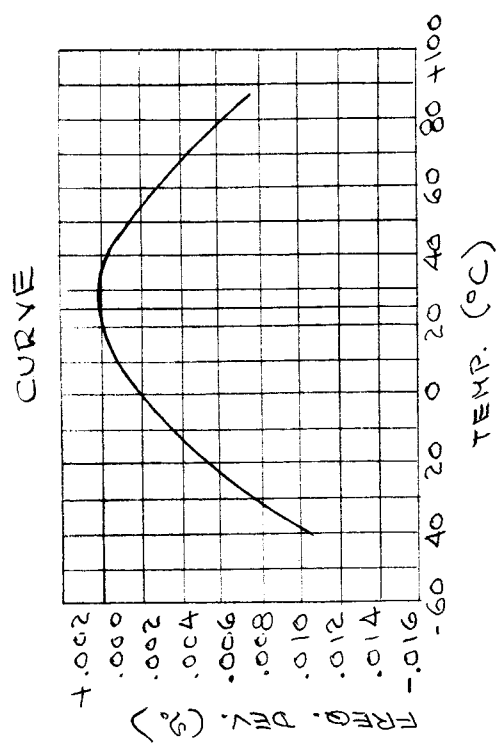
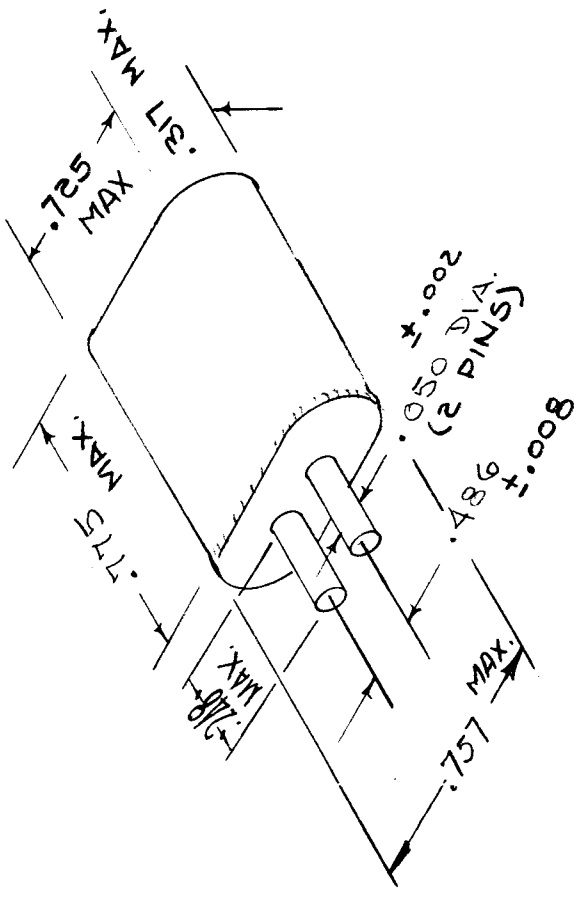
REQ. PER UNIT	MODEL	USED ON ASSY. NO.	DATE
		CR-10A	B

MILITARY HOLDER TYPE HC-6/U
 " CRYSTAL " CR-4/U
 " SPEC. MIL-C-12813A (MODIFIED)
 FREQ. RANGE 500 - 1200 KC
 MODE OF OPER. FUNDAMENTAL
 TEMP. RANGE -40 TO +70°C
 FREQ. TOL. ± .03%
 RESONANCE. SERIES
 DRIVE LEVEL : 3.9V
 MAX. RESISTANCE: 11,000 Ω
 MARKING: TO BE IN ACCORDANCE WITH MIL-C-3098.

REF:
 S401-251
 S401-129

STANDARD DRAWING

REQ. ITEM	PART NO.	DESCRIPTION	SYMBOL
		THE TECHNICAL MATERIEL CORP. MAMARONECK. NEW YORK	
	STOCK SIZE	CR-4/U CRYSTAL UNIT (MODIFIED FOR HC-6/U HOLDER)	
	MATERIAL	QDD 4/26/56	A.J.J.
	TYPE & TEMPER	HEAT TREAT. SPEC.	FINAL APPROVAL
	FINISH & SPEC. NO.		CR-10A
			MECH. DES. APP. PLK 4/27/56
			ELEC. DES. APP.



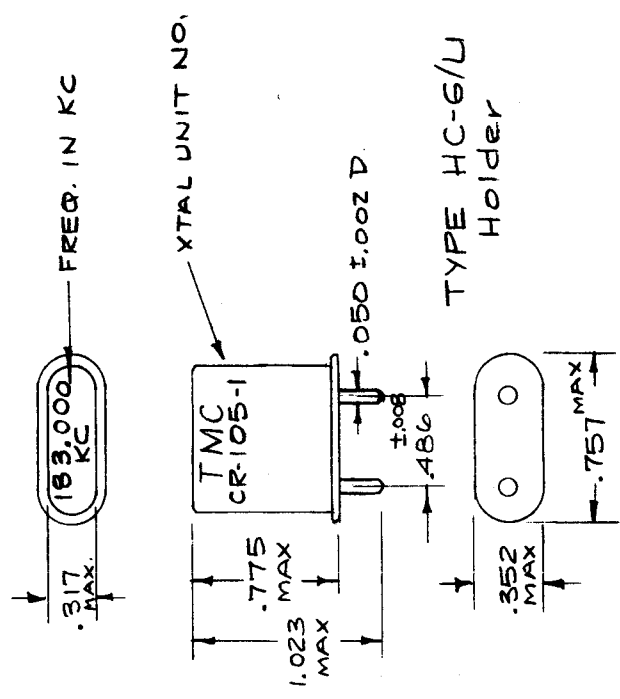
ISSUE ITEM	CHANGED FROM	DATE	CH. NO.	DRAFTS	CHECKER (ENG. APP.)
B 1	SPECS, REF & PICT. DIMS REVISED	3-22-65	13707		RD
A 1	ELEC. SPEC - RESONANCE SERIES Added	7-6-61	5184	BDL	RD

TOLERANCES
 DEC. DIM. ±
 FRAC. DIM. ±
 ANGULAR DIM. ±

SCALE:
 MAXIMUM ALLOWABLE TOLERANCES HAVE BEEN DETERMINED AND ANY DEVIATIONS WILL BE CAUSE FOR REJECTION.
 REMOVE ALL BURRS AND SHARP EDGES

STANDARD DRAWING

TMC NO.	FREQ. TOL. %	OPERATING TEMP. RANGE	RESONANCE TYPE	LOAD CAP. <i>μfd.</i>	USED ON
					ASSY. NO. DATE
CR-105-1	±.01	-40° to +70° C	PARALLEL	32 ± 0.5	FREQ. CR-105 C
CR105-2	±.01	-40° to +70° C	PARALLEL	32 ± 0.5	183.000 KC 217.000 KC



SHALL BE MARKED IN ACCOR. WITH MIL-C-3098

REQ. ITEM	PART NO.	DESCRIPTION	SYMBOL
C 1	CR105-2 ADDED	THE TECHNICAL MATERIEL CORP. MAMARONECK. NEW YORK	
B 1	SEE EMN #10855	CRYSTAL UNIT, QUARTZ, SPECIAL (HC-6/U HOLDER)	
A 1	DIM. 486 ±.008 WAS .468 ±.008		
ISSUE ITEM	CHANGED FROM	DATE	CH. NO.
		10-27-64	12770
		2/18/64	10855
		11-13-62	7663
		DATE	CH. NO.
		DRAFTS	CHECKER
		ENG. APP.	
TOLERANCES			
DEC. DIM. ±			
FRAC. DIM. ±			
ANGULAR DIM. ±			
TYPE & TEMPER		HEAT TREAT. SPEC.	DRAWN
FINISH & SPEC. NO.			ELEC. DES. APP. MECH. DES. APP.
164/11/58		CHECKED	164/11/58
		FINAL APPROVAL	164/11/58
			CR-105 C

REQ. PER UNIT	1	MODEL	MSR-5	USED ON	CR 107 A
ASSY. NO.		DATE	10-26-60		

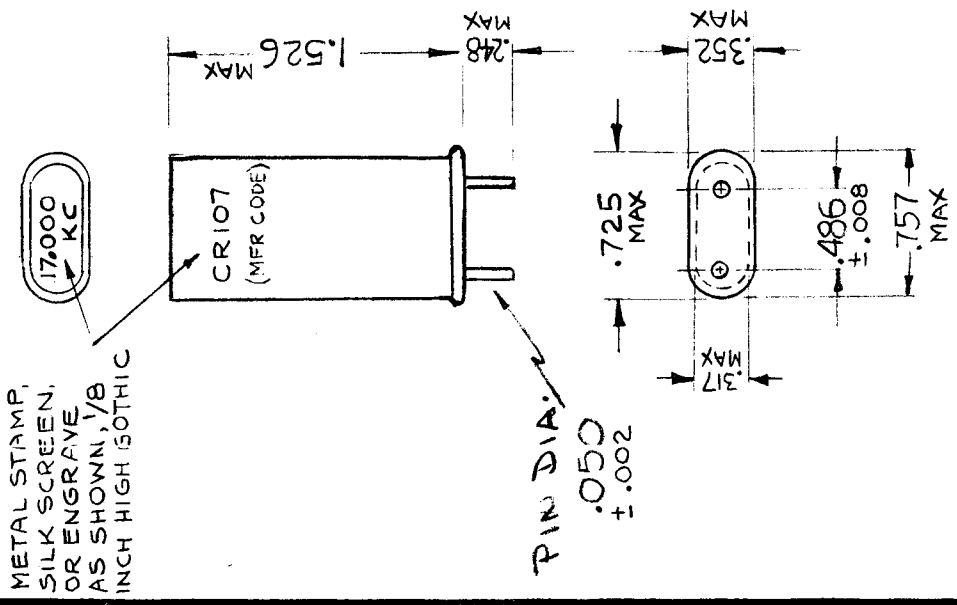
SPECIFICATIONS

FREQUENCY - 17,000KC
 MODE OF OPERATION - FUNDAMENTAL
 RESONANT CIRCUIT - PARALLEL
 EXTERNAL LOAD CAPACITANCE - $32 \pm 1.0 \mu\text{fd}$

FREQUENCY TOLERANCE - $\pm 0.005\%$
 OPERATING TEMPERATURE - $+75 \pm 5^\circ\text{C}$
 RATED DRIVE LEVEL - 0.1mw
 MAXIMUM DRIVE LEVEL - 1.0mw

Rs - 100,000 OHMS MAXIMUM
 Co - $20 \mu\text{fd} \pm 20\%$
 Ci - $0.033 \pm 20\%$
 HOLDER - HC-13/u
 CUT - NT

DIMENSIONS - SEE PICTORIAL
 MARKINGS - SEE PICTORIAL
 APPLICABLE SPECIFICATIONS - MIL-C-3098/18 AND
 MIL-H-10056/14



REQ. ITEM	PART NO.	DESCRIPTION	SYMBOL
		THE TECHNICAL MATERIEL CORP. MAMARONECK, NEW YORK	
		CRYSTAL UNIT, QUARTZ	
		MATERIAL	
		TYPE & TEMPER	
		HEAT TREAT. SPEC.	
		FINISH & SPEC. NO.	
		ELEC. DES. APP	
		MECH. DES. APP	
		CR 107 A	

ISSUE ITEM	CHANGED FROM	DATE	CH. NO.	DRAFTS	CHECKER	ENG. APP.
A 1	COMPL. REVISED	7.6.64	11710	JB	<i>[Signature]</i>	<i>[Signature]</i>

SCALE: 5401-287 (AA3N5F32N)

MAXIMUM ALLOWABLE TOLERANCES HAVE BEEN DETERMINED AND ANY DEVIATIONS WILL BE CAUSE FOR REJECTION.
 REMOVE ALL BURRS AND SHARP EDGES

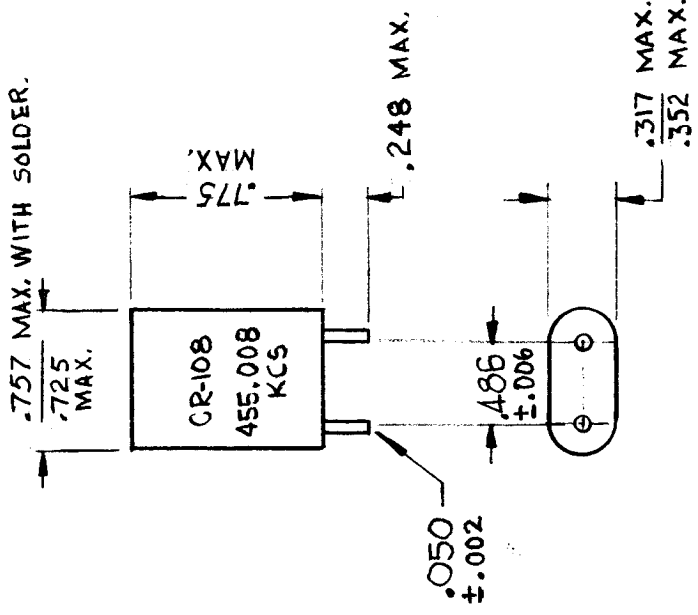
TOLERANCES

DEC. DIM. \pm
 FRAC. DIM. \pm
 ANGULAR DIM. \pm

REQ. PER UNIT	MODEL	USED ON
	GPR-92	FL-10Z
		DATE
		9-20-61
		CR-108 A

SPECIFICATIONS

SERIES RESONANT FREQ. 455.008KC $\pm 0.010\%$
 PARALLEL RESONANT FREQ. 456.152 KC
 MAX. EFFECTIVE RESISTANCE AT SERIES RESONANCE-2200 Ω
 PARALLEL RESONANCE CAPACITY LOAD. 20 μ mf
 DELTA FREQ. 144 CPS $\pm 10\%$
 $C_0 = 2.0$ pf ± 1.0 pf
 $C_1 = 130 \pm 10$
 RATED DRIVE LEVEL 0.1 MW
 HOLDER TYPE - HC-6/U
 OPERATING TEMP. RANGE -35°C $\pm 10^\circ$ C
 TYPE - 5° X CUT
 OPERABLE TEMP. RANGE - 0°C TO 55°C
 FREQ. DEVIATION OVER OPERATING TEMP. RANGE - $\pm 0.012\%$
 HARMONIC OF QUARTZ VIBRATION - FUNDAMENTAL
 MUST CONFORM MECHANICALLY WITH MIL-C3098

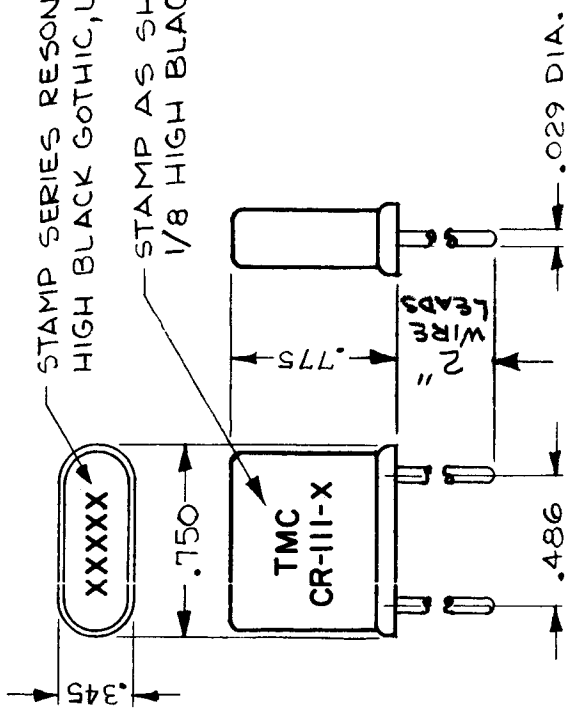


REQ. ITEM	PART NO.	GELLMAN DESCRIPTION	SYMBOL
		THE TECHNICAL MATERIEL CORP. MAMARONECK, NEW YORK	
		CRYSTAL UNIT, QUARTZ	
		455 KC	
		R 14220	
		12-14-61	
		13120	
		97	
		DATE	
		CH. NO.	
		DRAFTS	
		CHECKER	
		ENG. APP.	
		SCALE: S401-221 #0061604-4	
		MAXIMUM ALLOWABLE TOLERANCES HAVE BEEN DETERMINED AND ANY DEVIATIONS WILL BE CAUSE FOR REJECTION. REMOVE ALL BURRS AND SHARP EDGES	
ISSUE ITEM	CHANGED FROM	TOLERANCES	
A 1	COMPLETELY REVISED		
DEC. DIM. \pm			
FRAC. DIM. \pm			
ANGULAR DIM. \pm			
		TYPE & TEMPER	
		HEAT TREAT. SPEC.	
		DRAWN	
		CHECKED	
		FINAL APPROVAL	
		M. H. H. H.	
		CR-108 A	
		ELEC. DES. APP. MECH. DES. APP.	

TMC PART NO.	CR-111-1	CR-111-2	SERIES RESONANT FREQ.	454.400 KC	455.600 KC	REQ. PER UNIT	MODEL	USED ON	CR-111
							KIT-166	ABS'Y. NO.	
								DATE	
								11/13/63	

-SPECIFICATIONS-
 SERIES RESONANT FREQ.: SEE CHART
 RATED DRIVE LEVEL: 1 MW.
 OPERATING TEMP. RANGE: -40 to +70°C.
 FREQUENCY TOLERANCE: ±0.01%
 CASE: MILITARY TYPE HC-6/U WITH LEADS INSTEAD OF PINS.
 ΔF: 90 CPS MINIMUM
 Cφ: 5.6 uufd MAXIMUM
 Rs: 1000Ω MAXIMUM
 Ct: .01 ±.002uufd
 MODE OF OPERATION: FUNDAMENTAL

NOTE:
 1. ALL SPURIOUS RESPONSES WITHIN ±8 KC OF FS SHALL BE ATTENUATED GREATER THAN 45 db.
 2. FS MEASURED WITH A SHUNT CAPACITANCE OF 20 uufd.
 3. MARKINGS SHALL BE IN ACCORDANCE WITH MIL-C-3098



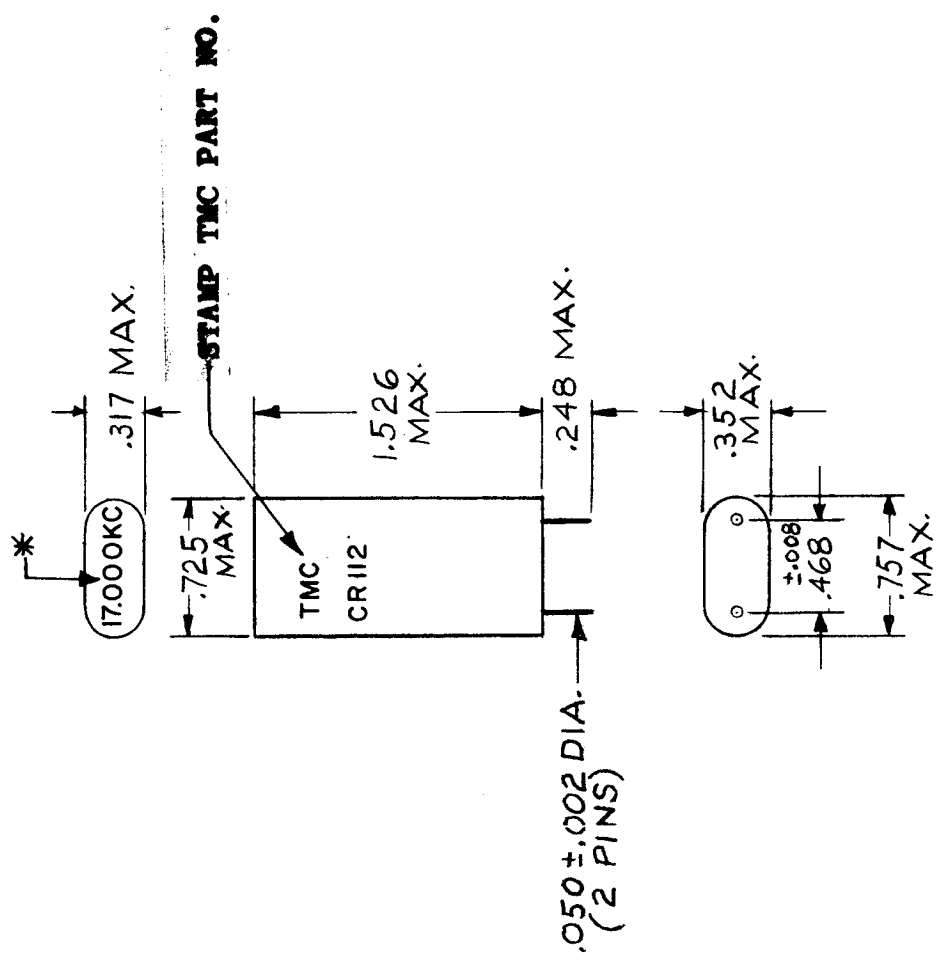
REQ. ITEM	PART NO.	DESCRIPTION	SYMBOL
	#	STOCK SIZE	
	#	MATERIAL	
	#	TYPE & TEMPER	
	#	HEAT TREAT. SPEC.	
	#	FINISH & SPEC. NO.	
		THE TECHNICAL MATERIEL CORP. MAMARONECK, NEW YORK	
		CRYSTAL UNIT, QUARTZ	
		DATE	
		CH. NO.	
		DRAFTS	
		CHECKER	
		ENG. APP.	
		SCALE	DO NOT SCALE
		CODE	C
		DESCRIPTION	
		UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES AND INCLUDE CHEMICALLY APPLIED OR PLATED FINISHES	
		FRACTIONS	± 1/64
		TOLERANCES	ANGLES, ± 0°-30'
		DECIMALS	X ± .05
			XX ± .01
			.XXX ± .005
		DATE	11/21/63
		CHECKED	[Signature]
		DRAWN	[Signature]
		ELEC. DES. APP.	[Signature]
		MECH. DES. APP.	[Signature]
		FINAL APPROVAL	[Signature]
		CR-111	φ

REQ. PER UNIT	1	MODEL	SBE-2	USED ON	CR-112	DATE	3-24-64
		ASSY. NO.	A-1516				

SPECIFICATIONS

FREQUENCY: 17.000KC
 FREQUENCY TOTAL AT 70°C + .005%
 FREQUENCY DEVIATION FROM: 65°C - 75°C : + .001%.
 RESONANCE: SERIES
 DRIVE LEVEL: 0.1 MW
 SERIES RESISTANCE: 120K OHMS MAX.
 HOLDER TYPE: HC-13/U

* MARKING: MARKING SHALL BE IN ACCORDANCE WITH MIL-C-3098. UNITS SHALL BE MANUFACTURED IN ACCORDANCE WITH MIL-C-3098.



REQ. ITEM	PART NO.	DESCRIPTION	SYMBOL
		THE TECHNICAL MATERIEL CORP. MAMARONECK. NEW YORK	
		CRYSTAL UNIT QUARTZ (17KC, 70°C)	
		A.M. @ 3-25-64	4-2-64
		DRAWN	FINAL APPROVAL
		HEAT TREAT. SPEC.	
		FINISH & SPEC. NO.	CR-112
		TYPE & TEMPER	
		CHECKED	
		ELEC. DES. APP. MECH. DES. APP.	
		5401-96 (JKNH17T-45)	
		DATE	
		CH. NO.	
		DRAFTS	
		CHECKER	
		ENG. APP.	
		SCALE	
		UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES AND INCLUDE CHEMICALLY APPLIED OR PLATED FINISHES	
		FRACTIONS ± 1/64 ANGLES ± 0° 30'	
		TOLERANCES	
		DECIMALS	
		X ± .05	
		.XX ± .01	
		.XXX ± .005	

STANDARD DRAWING

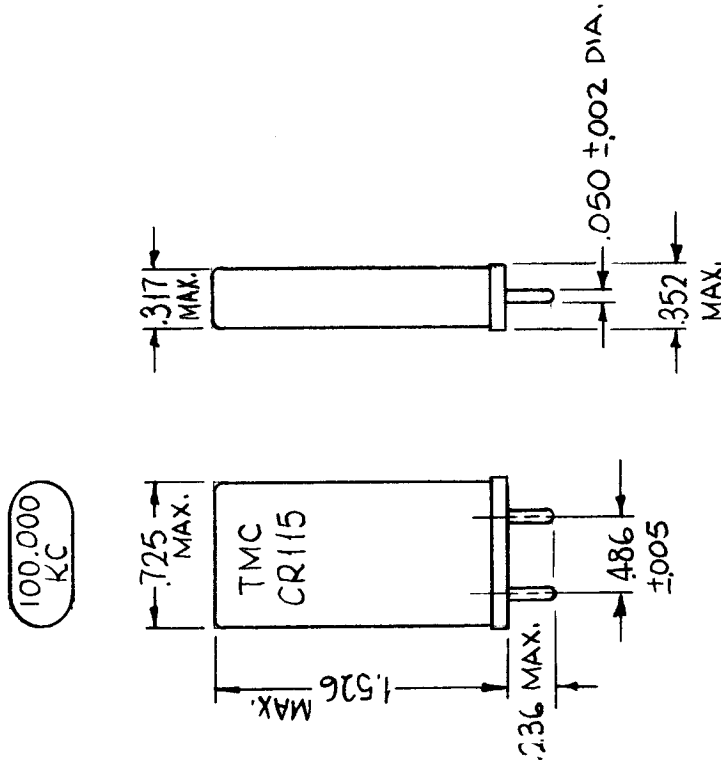
REQ. PER UNIT	MODEL	USED ON ASSY. NO.	DATE	CR 115
			9-30-65	

1. OPERATING CHARACTERISTICS:

- 1.1 Operating temperature range: 0° to + 50°C.
- 1.2 Nominal frequency: 100.000KC ± .0025 o/o 25°C.
- 1.3 Frequency deviation from nominal over operating temperature range: Shall not exceed 8 cycles.
- 1.4 Operating conditions: Series resonance.
- 1.5 Pin - to - pin capacity: 14.0 PF nominal, pin - to - pin capacity shall not vary more than 5 o/o from unit to unit.
- 1.6 Maximum effective resistance over operating temperature range: 1500Ω
- 1.7 Drive level: 0.4 mw max.

2. PERFORMANCE CHARACTERISTICS:

- 2.1 The following tests shall be conducted in accordance with the latest version of MIL-C-3098.
 - 2.1.1 Immersion
 - 2.1.2 Insulation resistance.
 - 2.1.3 Leakage.
 - 2.1.4 Moisture resistance.
- 3. MECHANICAL REQUIREMENTS:
 - 3.1 Holder: HC-13/U.
 - 3.2 Markings: Per MIL C-3098.



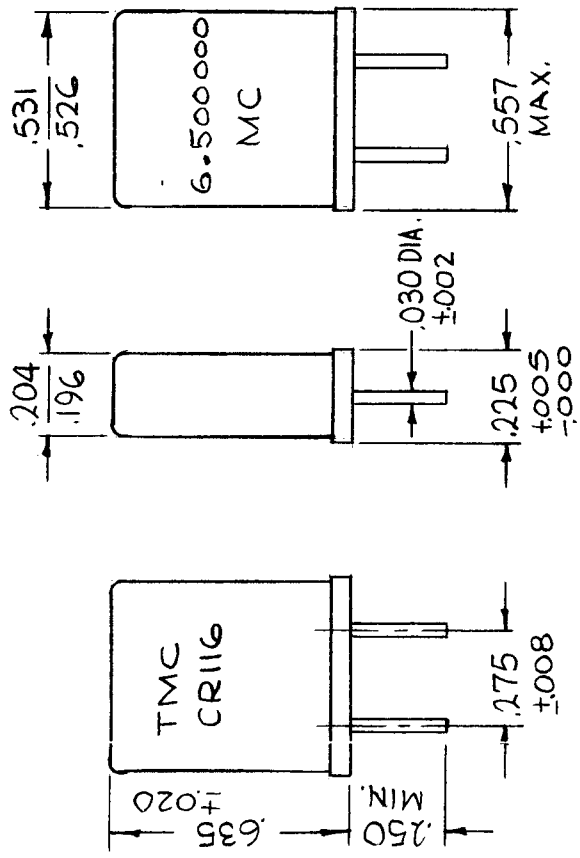
REQ. ITEM	PART NO.	DESCRIPTION	SYMBOL
		THE TECHNICAL MATERIEL CORP. MAMARONECK. NEW YORK	
		CRYSTAL UNIT, QUARTZ 100 KC	
		J. MINARD <i>J. Minard</i>	
		DRAWN	CHECKED
		TYPE & TEMPER HEAT TREAT. SPEC.	FINAL APPROVAL
		MATERIAL	
		FINISH & SPEC. NO.	
		SCALE 1:1	
		DATE 9/30/65	
		CH. NO.	
		DRAFTS	
		CHECKER	
		ENG. APP.	
		CODE C	
		S401-308	
		DESCRIPTION ORIGINAL RELEASE	
		UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES AND INCLUDE CHEMICALLY APPLIED OR PLATED FINISHES	
		TOLERANCES	
		FRACTIONS	
		DECIMALS	
		.X ± .05	
		.XX ± .01	
		.XXX ± .005	
		± 1/64 ANGLES, ± 0° 30'	

STANDARD DRAWING

REQ. PER UNIT	MODEL	USED ON ASS'Y. NO.	DATE
			9-30-65
			CR116

4. TEST REQUIREMENTS:

4.1 Units shall be measured in military test set TS-330/75M or equivalent with the 15 pt ± .5 pf placed in series with the crystal unit.



OPERATING CHARACTERISTICS:

- 1.1 Operating temperature range: 0° to +50°C.
- 1.2 Frequency: 6.500000 MC.
- 1.3 Frequency deviation over operating temperature range: Shall not exceed ±.003% of nominal.
- 1.4 Operating condition: Series resonance.
- 1.5 Series load capacity: 15 ± 0.5 PF.
- 1.6 Pin-to-pin capacity: 2.6 PF nominal. Pin-to-pin capacity shall not vary more than 5% from unit to unit.
- 1.7 Maximum effective resistance over operating temperature range: 50 ohms.
- 1.8 Motional parameters: Series elements of the crystal unit shall not vary more than 5% from unit to unit.
- 1.9 Drive level: 2.5 mw max.

PERFORMANCE CHARACTERISTICS:

2.1 The following tests shall be conducted in accordance with the latest version of MIL-C-3098.

- 2.1.1 Immersion
- 2.1.2 Insulation resistance
- 2.1.3 Leakage
- 2.1.4 Moisture resistance

MECHANICAL REQUIREMENTS:

- 3.1 Holder: HC-12/U.
- 3.2 Pins: See Figure .
- 3.3 Markings: (As per MIL-C-3098, as shown).

REQ. ITEM	PART NO.	DESCRIPTION	SYMBOL
		THE TECHNICAL MATERIEL CORP. MAMARONECK. NEW YORK	
		CRYSTAL UNIT, QUARTZ	
		6.5 MC	
		DRAWN: <i>[Signature]</i> 10/10/65	
		CHECKED: <i>[Signature]</i>	
		FINAL APPROVAL: <i>[Signature]</i>	
		TYPE & TEMPER HEAT TREAT. SPEC.	
		FINISH & SPEC. NO.	
		MECH. DES. APP. 10/10/65	
		MECH. DES. APP. CR116	

SYM: ORIGINAL RELEASE 9/30/65

DATE: 9/30/65	CH. NO. 2:1	DRAFTS	CHECKER	ENG. APP.
UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES AND INCLUDE CHEMICALLY APPLIED OR PLATED FINISHES				
TOLERANCES				
DECIMALS	FRACTIONS	ANGLES		
±.05	± 1/64	± 0° 30'		
±.01				
±.001				
±.0005				

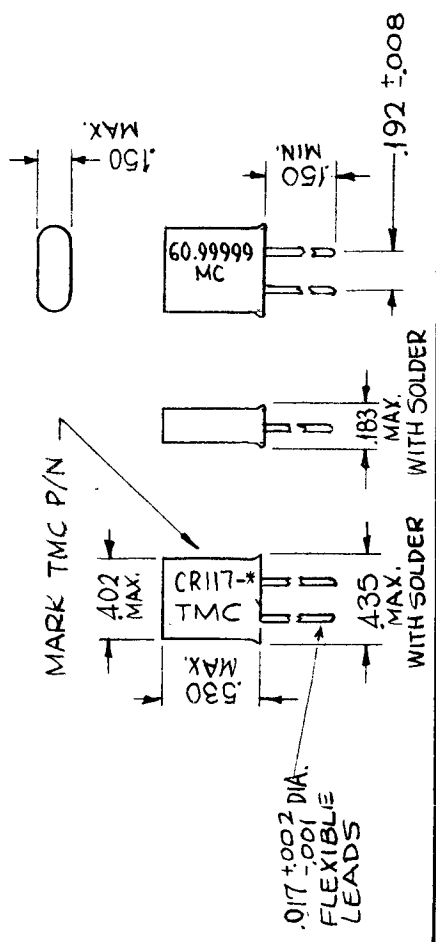
TMC P/N	FREQ.	SERIES RES. LOAD CAP. PF
CR117-1	9,000,000 MC	20 ± .5 PF
CR117-2	9,900,000 MC	20 ± .5 PF

REQ. PER UNIT	MODEL	USED ON ASS'Y. NO.	DATE
	VLRB-1		10-20-64
			CR117

SPECIFICATIONS

FREQUENCY RANGE: 2.9MC TO 20 MC INCL.
 OPERATING TEMP: 0° TO + 50°C
 FREQ. DEVIATION OVER OPERATING TEMP. RANGE ± .003% OF NOMINAL.
 RESONANCE: SERIES RESONANCE WITH SERIES LOAD CAPACITANCE. (SEE CHART)
 PIN CAPACITANCE: 7 PF MAX.
 DRIVE LEVEL: 5.0MW ± 1.0
 EQUIVALENT RESISTANCE:

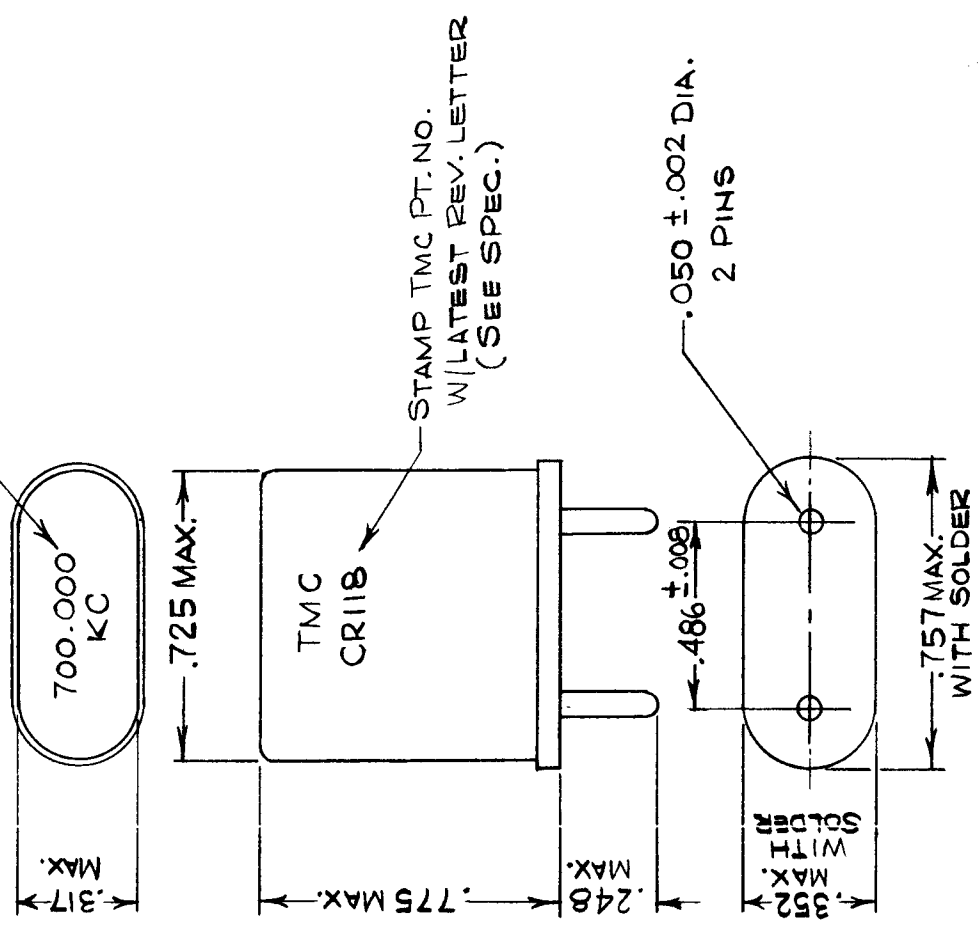
- 2.9 TO 3.75 MC 175Ω MAX.
 - 4 TO 4.75 MC 120Ω MAX.
 - 4.75+ TO 6 MC 75 Ω MAX.
 - 6+ TO 7 MC 50 Ω MAX.
 - 7+ TO 10 MC 30 Ω MAX.
 - 10+ TO 20 MC 25 Ω MAX.
- HOLDER: HC-18
 MARKING: MARKING SHALL BE IN ACCORDANCE WITH MIL-C-3098 AND AMEND.
 UNIT SHALL BE BUILT IN ACCORDANCE WITH MIL-C-3098/47 CR 69/U EXCEPT FOR OPERATING TEMP., FREQ. TOL. RESONANCE AND LOAD CAP.



STANDARD DRAWING

REQ. ITEM	PART NO.	DESCRIPTION	SYMBOL
		THE TECHNICAL MATERIEL CORP. MAMARONECK. NEW YORK	
		CRYSTAL, QUARTZ	
TYPE & TEMPER	HEAT TREAT. SPEC.	DRAWN	CHECKED
		SRG	@ 10-20-64
FINISH & SPEC. NO.		ELEC. DES. APP.	MECH. DES. APP.
		92102014	CR117
SYM	DESCRIPTION	DATE	SCALE
Ø	ORIGINAL RELEASE FOR PRODUCTION	10-27-64	
X	EXP. RELEASE	10-20-64	
UNLESS OTHERWISE SPECIFIED	DIMENSIONS ARE IN INCHES AND INCLUDE CHEMICALLY APPLIED OR PLATED FINISHES		
DECIMALS	FRACTIONS		
.X ± .05	± 1/64		
.XX ± .01	ANGLES		
.XXX ± .005	± 0° 30'		
TOLERANCES	CODE	S401-129	
		C	

STAMP FREQ. ON TOP OF UNIT



REQ. PER UNIT	MODEL	USED ON
	VLRE-1	ASSY. NO.
		DATE
		G-15-65

CR118

SPECIFICATIONS

OPERATING CHARACTERISTICS:

OPERATING TEMP. RANGE: -10° TO +50°C.
 FREQUENCY: 700.000 KC TO 840.000 KC
 FREQ. DEVIATION OVER OPERATING TEMP. RANGE:
 SHALL NOT EXCEED ±.005 % OF NOMINAL.
 OPERATING CONDITION: PARALLEL RESONANCE.
 SERIES LOAD CAPACITY: 32 ± 0.5 PF.
 PIN TO PIN CAPACITY: 7 PF MAX.
 MAX. EFFECTIVE RESISTANCE OVER OPERATING
 TEMP. RANGE: 800 OHMS.
 DRIVE LEVEL: 10.0 ± 2.0 MW.

PERFORMANCE CHARACTERISTICS:

THE FOLLOWING TESTS SHALL BE CONDUCTED IN
 ACCORDANCE WITH THE LATEST VERSION
 OF MIL-C-3098:

1. IMMERSION
2. INSULATION RESISTANCE
3. LEAKAGE
4. MOISTURE RESISTANCE

MECHANICAL REQUIREMENTS:

HOLDER: HC-G/U
 MARKING: MARK WITH TMC PART NO. AND PER MIL-C-3098.
TEST REQUIREMENTS:
 UNITS SHALL BE MEASURED IN MILITARY TEST SET TS-710
 OR EQUIVALENT WITH 32 PF ± 0.5 PF LOAD CAPACITY.

TMC PART NO. TO BE IN FOLLOWING FORM:

CR118 - 700.000 KC

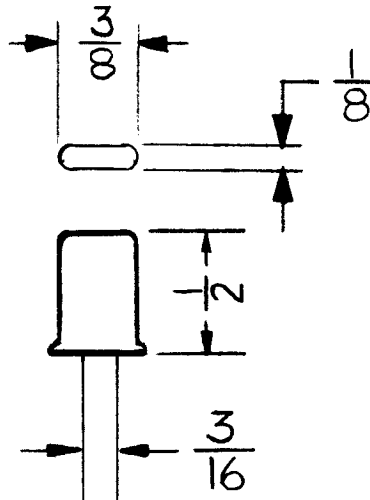
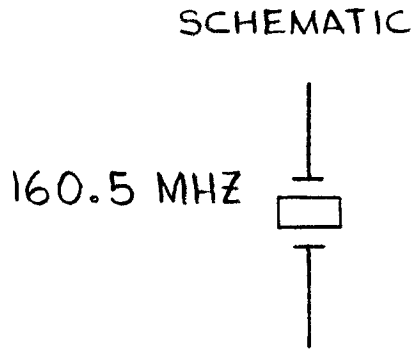
BASIC P/N FREQ. IN KC TO CONSIST OF ALL DIGITS

REQ. ITEM	PART NO.	POSE	DESCRIPTION	SYMBOL
			THE TECHNICAL MATERIEL CORP. MAMARONECK. NEW YORK	
			CRYSTAL UNIT, QUARTZ	
			.7 TO .84 MC	
			H. AUSTIN	1/15/65
			DRAWN	CHECKED
			HEAT TREAT. SPEC.	FINAL APPROVAL
			FINISH & SPEC. NO.	CR118
			ELEC. DES. APP.	
			MECH. DES. APP.	

STAMPED WITH TMC PART NO.

SYM	DESCRIPTION	DATE	CH. NO.	DRAFTS	CHECKER	ENG. APP.
Ø	ORIGINAL RELEASE FOR PRODUCTION	6-16-65	AA	JC		
	UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES AND INCLUDE CHEMICALLY APPLIED OR PLATED FINISHES					
	DECIMALS					
	.X ± .05					
	.XX ± .01					
	.XXX ± .005					
	FRACTIONS					
	± 1/64					
	ANGLES					
	± 0° 30'					
	TOLERANCES					
	CODE					
	C					

APPLICATION			REVISIONS							
QTY	MODEL USED ON	ASS'Y NO.	LTR	DESCRIPTION	DATE	E.M.N.NO	DRAFT	CHKD	APPD	
1	A5625		X	EXP. RELEASE	4-2-75			F.I.		
			Ø	ORIGINAL RELEASE	1-19-77			F.I.	*	



SPECIFICATIONS:

S401-523 type 902 53.500 160.5 MHZ
(HC-18/U)

3rd OT non-oven
± .002% @ room temp.
.002% from -30° to 60°C
14 pf load cap.
max. 40 ohms resistance

UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES AND INCLUDE CHEMICALLY APPLIED OR PLATED FINISHES	REQ'D	ITEM	PART NUMBER	DESCRIPTION	SYM.		
DECIMALS .X ± .05 .XX ± .01 .XXX ± .005 FRACTIONS 1/64 ANGLES 0° - 30°	LIST OF MATERIAL						
MATERIAL	FINAL APPROVAL	<i>[Signature]</i>	DATE	THE TECHNICAL MATERIEL CORP. MAMARONECK, NEW YORK CRYSTAL, QUARTZ, OSC.			
FINISH	MECH. DES.	<i>[Signature]</i>	DATE				
	ELECT. DES.		DATE				
	CHECKED		DATE				
	DRAWN	<i>[Signature]</i>	DATE	4-2-75			
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				A	82679	CR120	Ø
				SCALE	1:1	SHEET	OF

STANDARD DRAWING

IF IT IS FOUND DESIRABLE TO CHANGE ANY TOLERANCE OR OTHER DETAIL SPECIFIED ON THIS DRAWING NOTIFY THE PURCHASER PROMPTLY.

MAXIMUM ALLOWABLE TOLERANCES HAVE BEEN DETERMINED AND DEVIATIONS WILL BE CAUSE FOR REJECTION. REMOVE ALL BURRS AND SHARP EDGES

CR10001

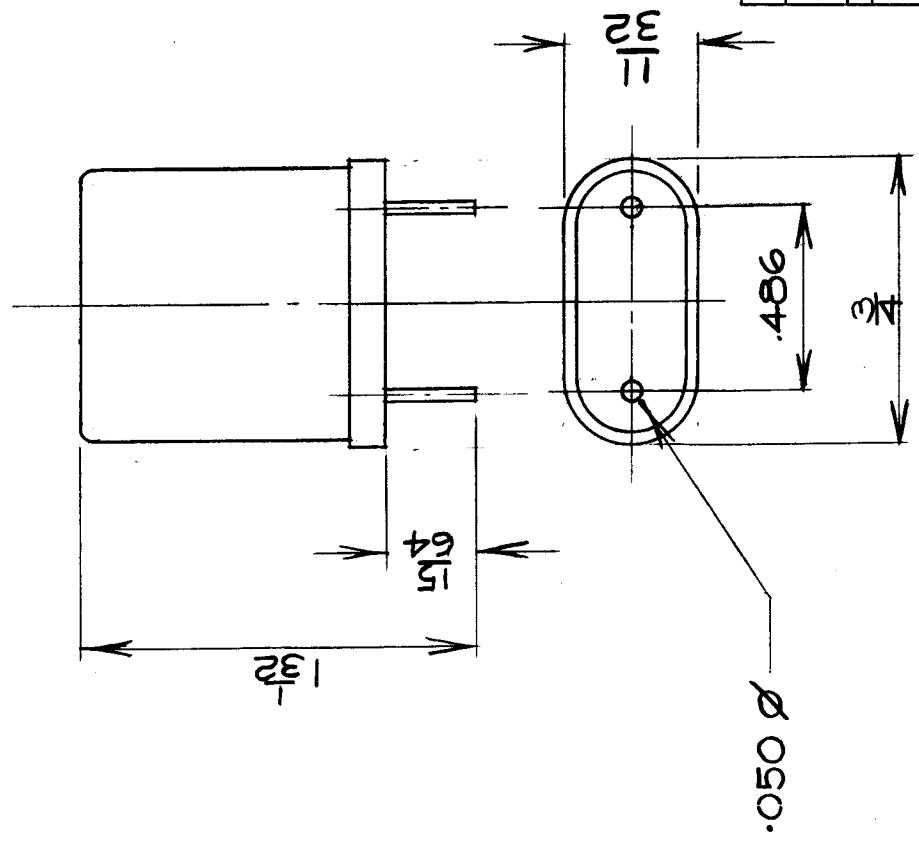
USED ON

MODEL PROJECT NO. ASS'Y. NO. DATE

TIS II CE5005

AUG 18 1959

REF: C.R. SNELGROVE CO. LTD.
TYPE S-17 (MIL HC-6/U) HOLDER
FREQ. - 197.450 KC/S.



REQ. ITEM	PART NO.	DESCRIPTION	SYMBOL
		TMC (Canada) LIMITED OTTAWA	
		CRYSTAL	
		197.450 KC/S	
STOCK SIZE			
MATERIAL			
WEIGHT PER PC.			
TYPE & TEMPER		DCM	
HEAT TREAT. SPEC.			
FINISH & SPEC. NO.			CR10001
DRAWN		ELEC. DES. APP.	MECH. DES. APP.
CHECKED		FINAL APPROVAL	

ISSUE ITEM	CHANGED FROM	DATE	CN. NO.	DRAFTS CHECKER	ENG. APP.
TOLERANCES					
DEC. DIM. \pm	DRILL, PUNCH, COMMERCIAL STOCK SIZES AND MANUFACTURERS TOLERANCES ARE NOT INCLUDED.				
FRAC. DIM. \pm					
ANGULAR DIM. \pm					
SCALE 2:1					

IF IT IS FOUND DESIRABLE TO CHANGE ANY TOLERANCE OR OTHER DETAIL SPECIFIED ON THIS DRAWING NOTIFY THE PURCHASER PROMPTLY.

MAXIMUM ALLOWABLE TOLERANCES HAVE BEEN DETERMINED AND DEVIATIONS WILL BE CAUSE FOR REJECTION. REMOVE ALL BURRS AND SHARP EDGES

STANDARD DRAWING

CR10002

USED ON

DATE

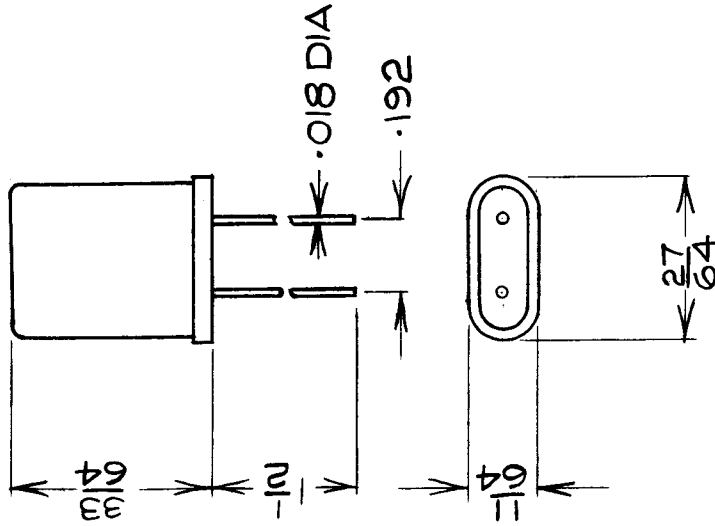
MAY 28
1959

ASS'Y. NO.

PROJECT NO.

MODEL

AMC6-5 CE 646



REF: C. R. SNELGROVE CO. LTD
TYPE S-1 - . FREQ-10 MC/S
SUBMINIATURE, PLATED, WIRE MOUNTED,
HERMETICALLY SEALED HOLDER

REQ. ITEM	PART NO.	DESCRIPTION	SYMBOL
		TMC (Canada) LIMITED OTTAWA	ONTARIO
		CRYSTAL	
		10 MC	
		DCM	
		DRAWN	ELEC. DES. APP. MECH. DES. APP.
		CHECKED	FINAL APPROVAL
		HEAT TREAT. SPEC.	
		FINISH & SPEC. NO.	CR10002

ISSUE ITEM	CHANGED FROM	DATE	CN. NO.	DRAFTS CHECKER	ENG. APP.
TOLERANCES					
SCALE 2:1					
DRILL, PUNCH, COMMERCIAL STOCK SIZES AND MANUFACTURERS TOLERANCES ARE NOT INCLUDED.					
DEC. DIM. ±	—				
FRAC. DIM. ±	1/64				
ANGULAR DIM. ±	—				

STANDARD DRAWING

IF IT IS FOUND DESIRABLE TO CHANGE ANY TOLERANCE OR OTHER DETAIL SPECIFIED ON THIS DRAWING NOTIFY THE PURCHASER PROMPTLY.

CR-10003

USED ON

MODEL

PROJECT NO.

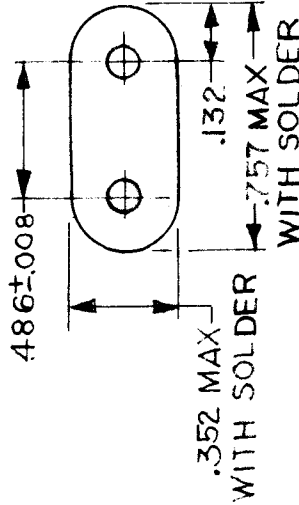
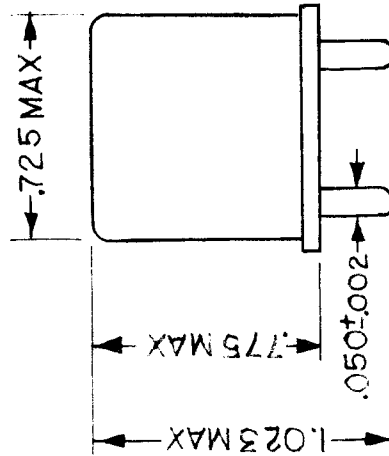
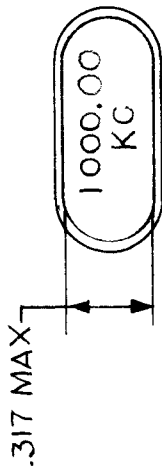
ASS'Y. NO.

DATE

LMC-10

MAY 13/60

MAXIMUM ALLOWABLE TOLERANCES HAVE BEEN DETERMINED AND DEVIATIONS WILL BE CAUSE FOR REJECTION. REMOVE ALL BURRS AND SHARP EDGES



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Property of:

THE TECHNICAL MATERIEL CORPORATION
MAMARONECK, NEW YORK

REQ.	ITEM	PART NO.	DESCRIPTION	SYMBOL
			TMC (Canada) LIMITED OTTAWA ONTARIO	
			CRYSTAL, QUARTZ	
			1 MC, HC-6/U HOLDER	
			MK	
			DRAWN	<i>RW</i>
			CHECKED	<i>1000</i>
			HEAT TREAT. SPEC.	
			FINISH & SPEC. NO.	CR-10003

ISSUE	ITEM	CHANGED FROM	DATE	CN. NO.	DRAFTS	CHECKER	ENG. APP.
ALL OTHERS							
TOLERANCES DEC. DIM. ± .005 FRAC. DIM. ± — ANGULAR DIM. ± —							
SCALE S - 10034 - 2 DIMENSIONS IN INCHES UNLESS OTHERWISE SPECIFIED DRILL, PUNCH, COMMERCIAL STOCK SIZES AND MANUFACTURERS TOLERANCES ARE NOT INCLUDED.							

STANDARD DRAWING

CR 10004

IF IT IS FOUND DESIRABLE TO CHANGE ANY TOLERANCE OR OTHER DETAIL SPECIFIED ON THIS DRAWING NOTIFY THE PURCHASER PROMPTLY.

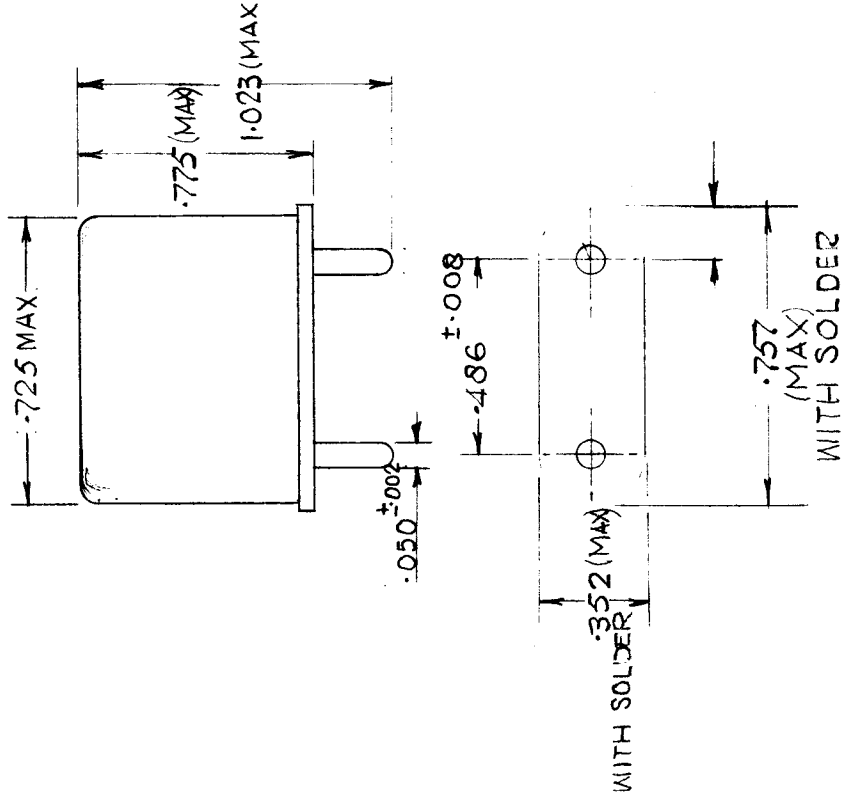
MAXIMUM ALLOWABLE TOLERANCES HAVE BEEN DETERMINED AND DEVIATIONS WILL BE CAUSE FOR REJECTION. REMOVE ALL BURRS AND SHARP EDGES

USED ON

MODEL	PROJECT NO.	ASS'Y. NO.	DATE
GPR-90			11 JULY '60

.158 RAD (MAX)

452.45
KC



NOTE.

CRYSTAL MANUFACTURERS N° S-46 U MOUNTED IN CASE, TYPE HC-6/U MANUFACTURED TO ORDER FOR TMC. (WHEN ORDERING QUOTE P/O 13707).

* USED ON: GPR-90 MOD. CAN. - 1B.

REQ.	ITEM	PART NO.	DESCRIPTION	SYMBOL
			TMC (Canada) LIMITED OTTAWA ONTARIO	
			CRYSTAL, QUARTZ	
			1MC, HC-6/U HOLDER*	
			WHDAVISON	R W Thomas
			DRAWN	ELEC. DES. APP.
			CHECKED	MECH. DES. APP.
			HEAT TREAT. SPEC.	FINAL APPROVAL
			FINISH & SPEC. NO.	CR/0004

ISSUE	ITEM	CHANGED FROM	DATE	CN. NO.	DRAFTS	CHECKER	ENG. APP.

TOLERANCES	
DEC. DIM. ±	.005
FRAC. DIM. ±	
ANGULAR DIM. ±	

SCALE S-10045-2
DIMENSIONS IN INCHES
UNLESS OTHERWISE SPECIFIED
DRILL, PUNCH, COMMERCIAL STOCK
SIZES AND MANUFACTURERS
TOLERANCES ARE NOT INCLUDED.

CR10008

ISSUE	ITEM	CHANGED FROM	DATE	CN. NO.	DRAFTS	CHECKER	ENG. APP.	REQ.	ITEM	PART NO.	DESCRIPTION	SYMBOL
Ø		REL TO PROD	21-6-67		RD		<i>[Signature]</i>					

FREQ RANGE: 200 KHZ TO 125 MHZ

CR10008 - XXXXX

TMC NO FREQ REQ'D IN HZ

MFGK : S10045 - 2
MFGK STYLE: S17W

STANDARD DRAWING

MODEL	PROJECT NO.	ASSY. NO.	DATE
			21 JUNE 67

TOLERANCES		IF IT IS FOUND DESIRABLE TO CHANGE ANY TOLERANCE OR OTHER DETAIL SPECIFIED ON THIS DRAWING NOTIFY THE PURCHASER PROMPTLY.	
ALL OTHERS	DEC. DIM. ±	SCALE 1" = 1"	DIMENSIONS IN INCHES UNLESS OTHERWISE SPECIFIED
	FRAC. DIM. ±	DRILL, PUNCH, COMMERCIAL STOCK SIZES AND MANUFACTURERS TOLERANCES ARE NOT INCLUDED.	
	ANGULAR DIM. ±		

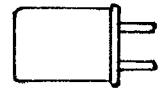
STOCK SIZE	WEIGHT PER PC.
MATERIAL	TYPE & TEMPER
HEAT TREAT. SPEC.	
FINISH & SPEC. NO.	

TMC (Canada) LIMITED OTTAWA ONTARIO	CRYSTAL, QUARTZ
WIRE TERMINATION	
RD	
DRAWN	ELEC. DES. APP. <i>[Signature]</i>
CHECKED	TECH. DES. APP. <i>[Signature]</i>
	FINAL APPROVAL
	CR10008

ISSUE	ITEM	CHANGED FROM	DATE	CN. NO.	DRAFTS	CHECKER	ENG. APP.	REQ.	ITEM	PART NO.	DESCRIPTION	SYMBOL
Ø		ENG. RELEASE	16 MAY 73		JMM		SDW					

CRYSTAL SPECIFICATIONS: -

FREQUENCY RANGE: 3.7 TO 24 MHZ
 HOLDER STYLE: HC 36/u COLD WELD
 MODE OF OPERATION: FUNDAMENTAL
 LOAD CAPACITY: 22 PF
 FREQUENCY TOLERANCE: ± 0.0015 %
 OPERATING TEMPERATURE: + 75°C ± 1.5°C
 DRIVE LEVEL: 1 MILLIWATT
 RESISTANCE: AS FOR MIL TYPE CR 27A/U



APPROX. CRYSTAL SIZE

NOTE: ~
 1. CRYSTAL COULD BE PURCHASED FROM
 C.R. SNELGROVE CO. LTD.:

TTRT-F		141/71	A11094	16 MAY 73	TMC (Canada) LIMITED OTTAWA ONTARIO	
MODEL	PROJECT NO.	ASSY. NO.	DATE	CRYSTAL QUARTZ		
USED ON				3.7 - 24 MHZ		
MAXIMUM ALLOWABLE TOLERANCES HAVE BEEN DETERMINED AND DEVIATIONS WILL BE CAUSE FOR REJECTION. REMOVE ALL BURRS AND SHARP EDGES		IF IT IS FOUND DESIRABLE TO CHANGE ANY TOLERANCE OR OTHER DETAIL SPECIFIED ON THIS DRAWING NOTIFY THE PURCHASER PROMPTLY.			DRAWN	
TOLERANCES		SCALE			CHECKED	
DEC. DIM. ± .X = .05	DIMENSIONS IN INCHES UNLESS OTHERWISE SPECIFIED			ELEC. DES. APP.		
FRAC. DIM. ± 1/64 .XX = .01	DRILL: PUNCH, COMMERCIAL STOCK SIZES AND MANUFACTURERS TOLERANCES ARE NOT INCLUDED.			MECH. DES. APP.		
ANGULAR DIM. ± 0'30' .XXX = .008				FINAL APPROVAL		
				S.D.W.		
				S.WITTEH		
				CR10009		