Crystal types 98-																					Country	Remarks
																				0160	Austria	
																					Belgium	
																					Canada	
																				0160	Denmark	
			0158	0156	0158	0156							0157								England	
																					Finland	
																			A	0160	France	
																					Italy	
																					Netherland	
																					Norway	
																				0160	Sweden	
																				0160	Switzerland	
																					USA	
																					Wm Germany	
																					Yugoslavia	
			TX CQM5344	RX CQM5344	TX CQM5342	RX CQM5342							CQM5414						CQM 5554	CQM5552	A = 19J706581P2	

RX 95 - 105MHz TX 66 - 88MHz		RX 138-141MHz TX 105-108MHz		370-420 MHz	
Crystal freq. MHz.		Crystal freq. MHz		Crystal freq. MHz	
Transmitter.	Receiver.	Transmitter	Receiver	Transmitter	Receiver
$F_x = \frac{F_s}{4}$	$F_x = \frac{F_s \div 10,7}{2}$	$F_x = \frac{F_s}{2}$	$F_x = \frac{F_s - 10,7}{3}$	$F_x = \frac{F_s}{6}$	$F_x = \frac{F_s - 21,4}{6}$

Crystal type and calculation

CQM5000

Parts list no. X 25943

Processing	JG-5410		

Date of issue 1981-3-19

Storno

Crystal types 98-																				Country	Remarks
					*58	*56						-	57					-	*56	Austria	
			*58	*56								57	-					*56	-	Belgium	
					*58	*56						-	57						57	Canada	
					*58	*56						-	57					-	*56	Denmark	
	*58	*56										-	57					-	-	England	
					*58	*						-	57					-	*56	Finland	
	*58	*56			*58	*56						-	57					-	56	France	
					*58	*56						-	57					-	*56	Italy	
			*58	*56	*58	*56						57	-					*56	*56	Netherland	
					*58	*56						-	57					-	*56	Norway	
					*58	*56						-	57					-	*56	Sweden	
					*58	*56						-	57					-	*56	Switzerland	
					59	57						-	57						57	USA	
			*58	*56									-					57	-	W. Germany	
					*58	*56						57	57					-	57	Yugoslavia	
	TX	RX	TX	RX	TX	RX						CQM 5669 (m)	CQM 5662 (m)					CQM 5114 (M)	CQM 5113 (M)	CQM 5112 (M)	
	CQM5334		CQM5333		CQM5332																

* When type 98-56 or 98-58 is used, D 152 must be clipped out.

** 420-440 MHz: $Fx = \frac{Fs + 21.4}{9}$

440.025-449.975 MHz: $Fx = \frac{Fs + 21.4}{9}$ or $\frac{Fs - 21.4}{9}$

same sign to be applied for all channels in a set.

450-470MHz: $Fx = \frac{Fs - 21.4}{9}$

66 - 88MHz		420 - 470 MHz		146-174 MHz	
Crystal freq. MHz		Crystal freq. MHz		Crystal freq. MHz	
Transmitter	Receiver	Transmitter	Receiver	Transmitter	Receiver
$Fx = \frac{Fs}{4}$	$F_x = \frac{Fs + 10,7}{2}$	** $Fx = \frac{Fs}{9}$		$Fx = \frac{Fs}{3}$	$Fx = \frac{Fs-10,7}{3}$

Crystal type and calculation

CQM 5000

Parts list no X 25943 Page 1 of 2

Processing	JG 5240		

Date of issue

24-10-79

Storno

Specification component:

S-96-0156A
80-04-24

Crystal Unit, Quartz, Storno Type 96-0156

1. Description:

Metal-plated vibrator mounted in a metal holaer; designed to operate at series resonance on the third mechanical overtone mode of oscillation, under non-controlled temperature conditions.

2. Reference specifications:

MIL-C-3098F, DEF-5271-A and IEC publ. 444 where applicable.

3. Holder: HC-42/U (MIL-H-10056/29) coldweld or resistance-weld.

4. Operating temp. range: Non-controlled $-25^{\circ}C$ to $+70^{\circ}C$.

5. Frequency range: 36 - 58 MHz

6. Method of testing: passive, crystal unit holder grounded, no compensation.

7. Tolerance on specified frequency: $-0/+20\times10^{-6}$ at $25^{\circ}C \pm 2^{\circ}C$.

8. Temperature characteristics:

Througout the operating temp.range $-25^{\circ}C$ to $+70^{\circ}C$ the deviation from the frequency measured at $25^{\circ}C$ shall be not greater than $\pm 10\times10^{-6}$.

9. Drive level: 1 mW ±20% (actual and test value).

10. Inductance: $L = (15.418 - 0.2133 \times f) \times 10^{-3}$ H ±25%

where f is the frequency in MHz. See graph on page 2.

11. Resonance resistance (R_r): 25 Ω max.

12. Spurious responses:

No spurious response with levels exceeding - 10 dB within 30 kHz and no spurious exceeding - 4 dB within 100 kHz of the main response. Spurious levels to be tested using IEC pi-network (passive).

13. Ageing: max. $\pm 2 \times 10^{-6}$. Test method: to MIL-C-3098F, para 4.8.16. To be tested using IEC pi-network (passive).

14. Test set: IEC pi-network.

15. Marking: Frequency in MHz (7digits), type designation (98-0156), date of manufacture, and name of manufacturer (initials).

16. Ordering data:

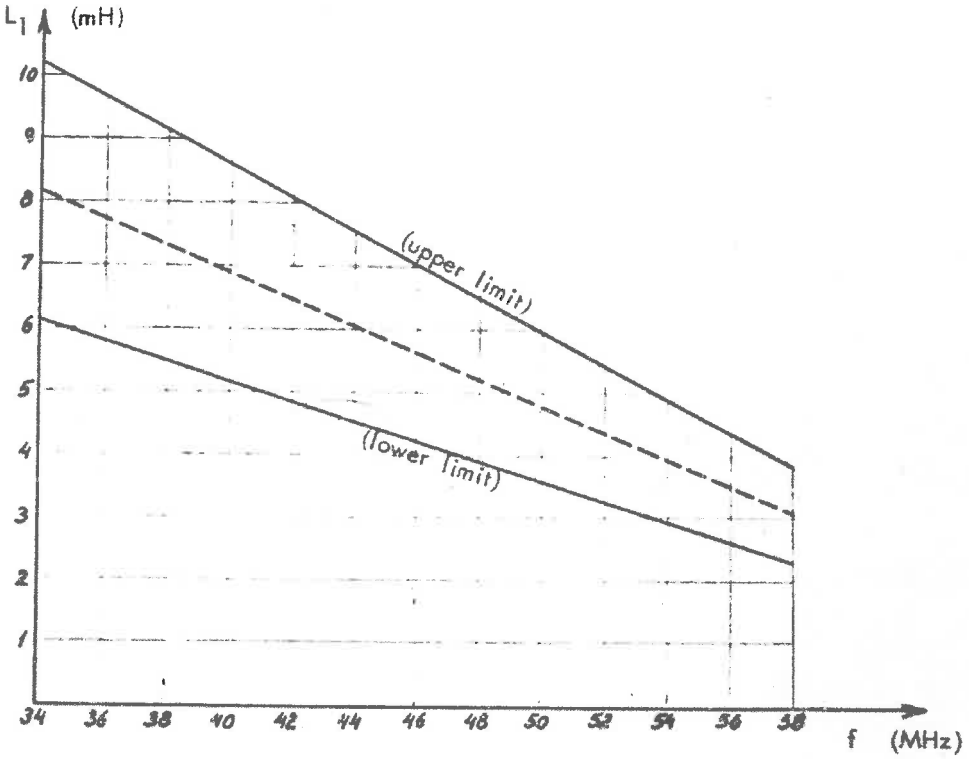
a. Number of this specification.
b. Frequency in MHz, 7 digits.

17. Type approval:

Supply to any Storno division is subject to type approval from Storno A/S Denmark.

REVISED
79-06-15
80-04-24

Motional Arm Inductance L_1 versus frequency:



Test Method (phase - offset)

1. Measure the resonance resistance R_r (as accurately as possible)
2. Measure the resonance frequency f_r (at phase zero)
3. Measure the frequency $f_{+\phi}$ (at phase - offset $+\phi$, e.g. $+40^\circ$)
4. Measure the frequency $f_{-\phi}$ (at phase - offset $-\phi$, e.g. -40°)
5. Calculate the motional arms inductance as follows:

$$L_1 \text{ (mH)} = \frac{(R_r + 25) \tan \phi}{2\pi \cdot (f_{-\phi} - f_{+\phi})} \cdot 10^3$$

REVISED

Specification (component)

S-96-0157A
80-04-24

Crystal Unit, Quartz, Storno Type 96-0157

1. Description:

   Metal-plated vibrator mounted in a metal holder; designed to operate at series resonance on the third mechanical overtone mode of oscillation, under non-controlled temperature conditions.

2. Reference specifications:

   MIL-C-3098F, DEF-5271-A and IEC publ. 444 where applicable.

3. Holder: HC-42/U (MIL-H-10056/29) coldweld or resistance-weld.

4. Operating temp. range: Non-controlled $-20^{\circ}C$ to $+70^{\circ}C$.

5. Frequency range: 36 - 58 MHz.

6. Method of testing: passive, crystal unit holder grounded, no compensation.

7. Tolerance on specified frequency: $-0/+20 \times 10^{-6}$ at $25^{\circ}C \pm 2^{\circ}C$.

8. Temperature characteristics:

   Througout the operating temp.range $-20^{\circ}C$ to $+70^{\circ}C$ the deviation from the frequency measured at $25^{\circ}C$ shall be not greater than $\pm 5 \times 10^{-6}$.

9. Drive level: 1 mW ± 20% (actual and test value).

10. Inductance: $L = (15.418 - 0.2133 \times f) \times 10^{-3}$ H ± 25%

    where f is the frequency in MHz. See graph on page 2.

11. Resonance Resistance (R_r): 25 Ω max.

12. Spurious responses:

    No spurious response with levels exceeding - 10 dB within 30 kHz and no spurious exceeding -4 dB within 100 kHz of the main response. Spurious levels to be tested using IEC pi-network (passive).

13. Ageing: max. $\pm 2 \times 10^{-6}$. Test method: to MIL-C-3098F, para 4.8.16. To be tested using IEC pi-network (passive).

14. Test set: IEC pi-network.

15. Marking: Frequency in MHz (7digits), type designation (98-0157), date of manufacture, and name of manufacturer (initials).

16. Ordering data:

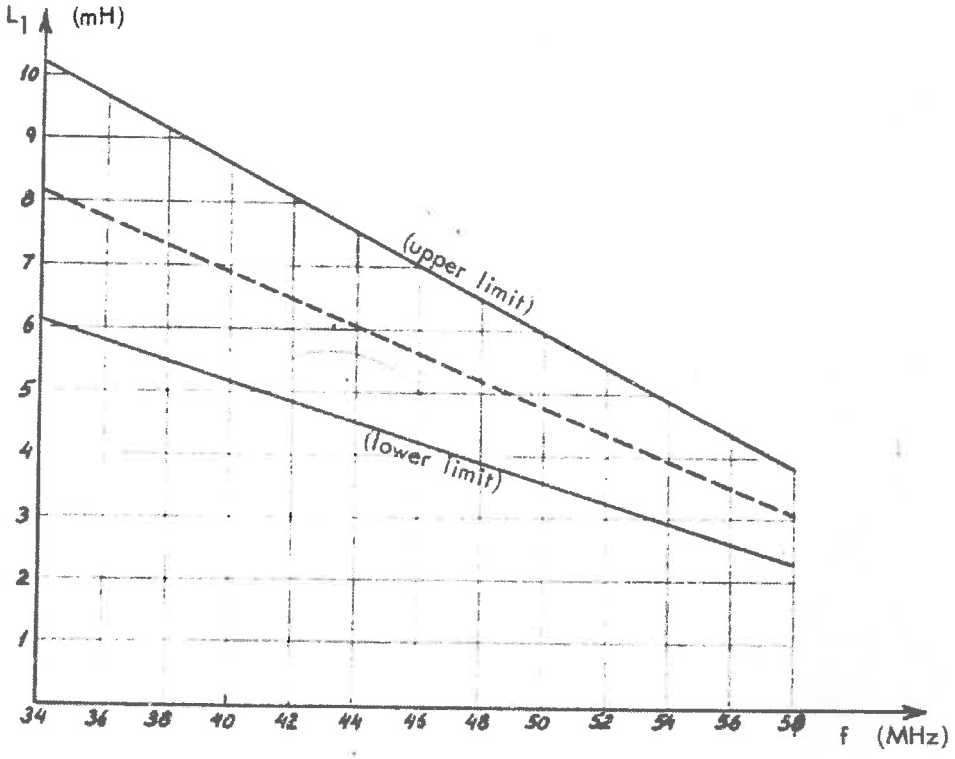
    a. Number of this specification.
    b. Frequency in MHz, 7 digits.

17. Type approval:

    Supply to any Storno division is subject to type approval from Storno A/S Denmark.

REVISED
79-06-15
80-04-24

Motional Arm Inductance L_1 versus frequency:



Test Method (phase - offset)

1. Measure the resonance resistance R_r (as accurately as possible)
2. Measure the resonance frequency f_r (at phase zero)
3. Measure the frequency $f_{+\phi}$ (at phase - offset $+\phi$, e.g. $+40^\circ$)
4. Measure the frequency $f_{-\phi}$ (at phase - offset $-\phi$, e.g. -40°)
5. Calculate the motional arms inductance as follows:

$$L_1 \text{ (mH)} = \frac{(R_r + 25) \tan \phi}{2\pi \cdot (f_{-\phi} - f_{+\phi})} \cdot 10^3$$

REVISED
79-06-15
80-04-24

Specification
(component)

S-98-0158A
80-04-24

Crystal unit, quartz, Storno type 98-0158

1. Description

Metal-plated vibrator mounted in a metal holder; designed to operate at series resonance on the fundamental mode of oscillation, under noncontrolled temperature conditions.

2. Reference specification:

IEC Publication 444 and MIL-C-3098F when applicable.

3. Holder:

HC42/U (Mil-H-10056/29) Coldweld or resistance-weld.

4. Operating temp. range: Noncontrolled $-25^{\circ}C$ to $+70^{\circ}C$.

5. Frequency range: 15 - 22MHz.

6. Method of testing: passive, crystal unit holder grounded.

7. Tolerance on specified frequency: $\pm 10 \times 10^{-6}$ measured at $25^{\circ}C \pm 2^{\circ}C$.

8. Temperature characteristics: Throughout the temperature range $-25^{\circ}C$ to $70^{\circ}C$, the deviation from the frequency measured at $25^{\circ}C$ shall be not greater than $\pm 10 \times 10^{-6}$.

9. Aging: Max. $\pm 2 \times 10^{-6}$. Test method to MIL-C-3098F para 4.8.16

10. Drive level: 1mW ± 20%. (actual and test value)

11. Motional arm capacitance: 20 ± 2 fF

12. Shunt capacitance: 5.5pF max.

13. Equivalent resistance: 15Ω max. Spurious response: $\frac{\text{Spurious resistance}}{\text{ESR}} > \frac{2}{1}$

14. Test set: TT - network.

15. Marking: The crystal-unit holder shall be marked as follows:

1. Frequency in MHz: 7 digits, see example below. x)
2. Type designation: 98-0158
3. Initials of manufacturer.
4. Date of manufacture.

16. Ordering data:

a. Number of this specification.

b. Frequency in MHz., 7 digits.

---

x) Example of marking: 17.99999MHz

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79-06-20
80-04-24

Specification
(component)

S-98-0159A
80-04-24

Crystal unit, quartz, Storno type 98-0159

1. Description

Metal-plated vibrator mounted in a metal holder; designed to operate at series resonance on the fundamental mode of oscillation, under noncontrolled temperature conditions.

2. Reference specification:

IEC Publication 444 and MIL-C-3098F when applicable.

3. Holder:

HC42/U (Mil-H-10056/29) Coldweld or resistance-weld.

4. Operating temp. range: Noncontrolled $-20^{\circ}C$ to $+70^{\circ}C$.

5. Frequency range: 15 - 22MHz.

6. Method of testing: passive, crystal unit holder grounded.

7. Tolerance on specified frequency: $\pm 10 \times 10^{-6}$ measured at $25^{\circ}C \pm 2^{\circ}C$.

8. Temperature characteristics: Throughout the temperature range $-20^{\circ}C$ to $70^{\circ}C$, the deviation from the frequency measured at $25^{\circ}C$ shall be not greater than $\pm 5 \times 10^{-6}$.

9. Aging: Max. $\pm 2 \times 10^{-6}$. Test method to MIL-C-3098F para 4.8.16

10. Drive level: 1mW ± 20%. (actual and test value)

11. Motional arm capacitance: 20 ± 2 fF

12. Shunt capacitance: 5.5pF max.,

13. Equivalent resistance: 15Ω max. Spurious response: $\frac{\text{Spurious resistance}}{\text{ESR}} > \frac{2}{1}$

14. Test set: TT - network.

15. Marking: The crystal-unit holder shall be marked as follows:

    1. Frequency in MHz: 7 digits, see example below. x)
    2. Type designation: 98-0159
    3. Initials of manufacturer.
    4. Date of manufacture.

16. Ordering data:

    a. Number of this specification.
    b. Frequency in MHz., 7 digits.

---

x) Example of marking: 17,99999MHz

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79-06-20
80-04-24

HSC.

Specification component

S-98-0160
80-04-24

Crystal Unit, Quartz, Storno Type 98-0160

1. Description:

Metal-plated vibrator mounted in a metal holder; designed to operate at series resonance on the third mechanical overtone mode of oscillation, under non-controlled temperature conditions.

2. Reference specifications:

MIL-C-3098F, DEF-5271-A and IEC publ. 444 where applicable.

3. Holder: HC-42/U (MIL-H-10056/29) coldweld or resistance-weld.

4. Operating temp. range: Non-controlled -20°C to +70°C.

5. Frequency range: 56 - 70 MHz.

6. Method of testing: passive, crystal unit holder grounded.

7. Tolerance on specified frequency: $-0/+20 \times 10^{-6}$ at 25°C ±2°C.

8. Temperature characteristics:

Througout the operating temp.range -20°C to +70°C the deviation from the frequency measured at 25°C shall be not greater than $\pm 5 \times 10^{-6}$.

9. Drive level: 1 mW ± 20% (actual and test value).

10. Motional arm capacitance (C_1): 1,5fF ± 25%

11. Equivalent resistance: 25 Ω max.

12. Spurious responses:

No spurious response with levels exceeding - 10 dB within 30 kHz and no spurious exceeding -4 dB within 100kHz of the main response. Spurious levels to be tested using IEC pi-network (passive).

13. Ageing: max. $\pm 2 \times 10^{-6}$. Test method: to MIL-C-3098F, para 4.8.16. To be tested using IEC pi-network (passive).

14. Test set: IEC pi-network.

15. Marking: Frequency in MHz (7digits), type designation (98-0160), date of manufacture, and name of manufacturer (initials).

16. Ordering data:

a. Number of this specification.
b. Frequency in MHz, 7 digits.

17. Type approval:

Supply to any Storno division is subject to type approval from Storno A/S Denmark.

REVISED
79-06-20
80-04-24

Specification
(component)

S-98-5010
79-02-08

Crystal Unit, Quartz, 10.245MHz

1. Description

Metal-plated vibrator mounted in a metal holder; designed to operate at antiresonance into a load capacitance of 30pF, on the fundamental frequency of the plate, and under non-controlled temperature conditions.

2. Reference specifications.

MIL-C-3098F, DEF-5271-A and IEC publ. 444 where applicable.

3. Holder: HC-25/U (MIL-H-1005656/11), solder sealed or
HC-42/U (MIL-H-10056/29) cold weld or resistance weld.

4. Operating temp. range: Non controlled -30°C to + 80°C.

5. Frequency: 10.245 MHz

6. Method of testing: passive.

7. Tolerance on specified frequency: $\pm 15 \times 10^{-6}$ measured 25°C ± 2°C.

8. Temperature characteristics: Throughout the operating temperature range (-30°C to + 80°C), the deviation from the frequency measured at 25°C shall be not greater than $\pm 20 \times 10^{-6}$. Must be tested with a load capacitance of 30pF (NPO).

9. Load capacitance: 30pF.

10. Drive level. 0.5mW ± 20%.

11. Capacitance, shunt: max 7pF

12. Activity.

R_{eff} (30pF) : max. 50 Ω

13. Test set: IEC pi-network.

14. Marking: The crystal-unit holder shall be marked with:
Frequency in MHz (5 digits), Pt. No. 98.5010, date of manufacture, and name of manufacturer.

15. Where not otherwise specified the crystal-unit is identical to MIL-type CR-64/U (MIL-C-3098F).

16. Type Approval

Supply to any Storno division is subject to type approval from Storno A/S, Denmark.

Specification
(component)

S-98-5011
79-02-08

Crystal Unit, Quartz, 11.155 MHz

1. Description

   Metal-plated vibrator mounted in a metal holder; designed to operate at antiresonance into a load capacitance of 30pF, on the fundamental frequency of the plate, and under non-controlled temperature conditions.

2. Reference specifications.

   MIL-C-3098F, DEF-5271-A and IEC publ. 444 where applicable.

3. Holder: HC-25/U (MIL-H-1005656/11), solder sealed or
   HC-42/U (MIL-H-10056/29) cold weld or resistance weld.

4. Operating temp. range: Non controlled $-30^{\circ}C$ to $+80^{\circ}C$.

5. Frequency: 11.155 MHz

6. Method of testing: passive.

7. Tolerance on specified frequency: $\pm 15 \times 10^{-6}$ measured $25^{\circ}C \pm 2^{\circ}C$.

8. Temperature characteristics: Throughout the operating temperature range ($-30^{\circ}C$ to $+80^{\circ}C$), the deviation from the frequency measured at $25^{\circ}C$ shall be not greater than $\pm 20 \times 10^{-6}$. Must be tested with a load capacitance of 30pF (NPO).

9. Load capacitance: 30pF.

10. Drive level. 0.5mW ± 20%.

11. Capacitance, shunt: max 7pF

12. Activity.

    R_{eff} (30pF) : max. 50 Ω

13. Test set: IEC pi-network.

14. Marking: The crystal-unit holder shall be marked with:
    Frequency in MHz (5 digits), Pt. No. 98.5011, date of manufacture, and name of manufacturer.

15. Where not otherwise specified the crystal-unit is identical to MIL-type CR-64/U (MIL-C-3098F).

16. Type Approval

    Supply to any Storno division is subject to type approval from Storno A/S, Denmark.

Specification
(component)

S-98-5032
79-01-22

Crystal Unit, Quartz, 20.945MHz

1. Description

Metal-plated vibrator mounted in a metal holder; designed to operate at antiresonance into a load capacitance of 30pF, on the fundamental frequency of the plate, and under non-controlled temperature conditions.

2. Reference specifications.

MIL-C-3098F, DEF-5271-A and IEC publ. 444 where applicable.

3. Holder: HC-25/U (MIL-H-1005656/11), solder sealed or HC-42/U (MIL-H-10056/29) cold weld or resistance weld.

4. Operating temp. range: Non controlled -30°C to + 80°C.

5. Frequency: 20.945MHz

6. Method of testing: passive.

7. Tolerance on specified frequency: $\pm 15 \times 10^{-6}$ measured 25°C ± 2°C.

8. Temperature characteristics: Throughout the operating temperature range (-30°C to + 80°C), the deviation from the frequency measured at 25°C shall be not greater than $\pm 20 \times 10^{-6}$. Must be tested with a load capacitance of 30pF (NPO).

9. Load capacitance: 30pF.

10. Drive level. 0.5mW ± 20%.

11. Capacitance, shunt: max 7pF

12. Activity.

R_{eff} (30pF) : max. 30Ω

13. Test set: IEC pi-network.

14. Marking: The crystal-unit holder shall be marked with: Frequency in MHz (5 digits), Pt. No. 98.5032, date of manufacture, and name of manufacturer.

15. Where not otherwise specified the crystal-unit is identical to MIL-type CR-64/U (MIL-C-3098F).

---

16. Type Approval

Supply to any Storno division is subject to type approval from Storno A/S, Denmark.

Specification
(component)

S-98-5033
79-01-22

Crystal Unit, Quartz, 21.855 MHz

1. Description

Metal-plated vibrator mounted in a metal holder; designed to operate at antiresonance into a load capacitance of 30pF, on the fundamental frequency of the plate, and under non-controlled temperature conditions.

2. Reference specifications.

MIL-C-3098F, DEF-5271-A and IEC publ. 444 where applicable.

3. Holder: HC-25/U (MIL-H-1005656/11), solder sealed or HC-42/U (MIL-H-10056/29) cold weld or resistance weld.

4. Operating temp. range: Non controlled -30°C to + 80°C.

5. Frequency: 21.855 MHz

6. Method of testing: passive.

7. Tolerance on specified frequency: $\pm 15 \times 10^{-6}$ measured 25°C ± 2°C.

8. Temperature characteristics: Throughout the operating temperature range (-30°C to + 80°C), the deviation from the frequency measured at 25°C shall be not greater than $\pm 20 \times 10^{-6}$. Must be tested with a load capacitance of 30pF (NPO).

9. Load capacitance: 30pF.

10. Drive level. 0.5mW ± 20%.

11. Capacitance, shunt: max 7pF

12. Activity.

R_{eff} (30pF) ; max. 30Ω

13. Test set: IEC pi-network.

14. Marking: The crystal-unit holder shall be marked with: Frequency in MHz (5 digits), Pt. No. 98.5033, date of manufacture, and name of manufacturer.

15. Where not otherwise specified the crystal-unit is identical to MIL-type CR-64/U (MIL-C-3098F).

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16. Type Approval

Supply to any Storno division is subject to type approval from Storno A/S, Denmark.

Specification
(component)

S-98-5034
79-02-08

Crystal Unit, Quartz, 10.245 MHz

1. Description

   Metal-plated vibrator mounted in a metal holder; designed to operate at antiresonance into a load capacitance of 30pF, on the fundamental frequency of the plate, and under non-controlled temperature conditions.

2. Reference specifications.

   MIL-C-3098F, DEF-5271-A and IEC publ. 444 where applicable.

3. Holder: HC-18/U (MIL-H-1005656/9), solder sealed or
   HC-43/U (MIL-H-10056/30) cold weld or resistance weld.
   Lead Length: min. 12.7 mm

4. Operating temp. range: Non controlled $-30^{\circ}C$ to $+80^{\circ}C$.

5. Frequency: 10.245 MHz

6. Method of testing: passive.

7. Tolerance on specified frequency: $\pm 15 \times 10^{-6}$ measured $25^{\circ}C \pm 2^{\circ}C$.

8. Temperature characteristics: Throughout the operating temperature range ($-30^{\circ}C$ to $+80^{\circ}C$), the deviation from the frequency measured at $25^{\circ}C$ shall be not greater than $\pm 20 \times 10^{-6}$. Must be tested with a load capacitance of 30pF (NPO).

9. Load capacitance: 30pF.

10. Drive level. 0.5mW ± 20%.

11. Capacitance, shunt: max 7pF

12. Activity.

    R_{eff} (30pF) : max. 50 Ω

13. Test set: IEC pi-network.

14. Marking: The crystal-unit holder shall be marked with:
    Frequency in MHz (5 digits), Pt. No. 98.5034, date of manufacture, and name of manufacturer.

15. Where not otherwise specified the crystal-unit is identical to MIL-type CR-64/U (MIL-C-3098F).

16. Type Approval

    Supply to any Storno division is subject to type approval from Storno A/S, Denmark.

Specification
(component)

S-98-5035
79-02-08

Crystal Unit, Quartz, 11.155 MHz

1. Description

Metal-plated vibrator mounted in a metal holder; designed to operate at antiresonance into a load capacitance of 30pF, on the fundamental frequency of the plate, and under non-controlled temperature conditions.

2. Reference specifications.

MIL-C-3098F, DEF-5271-A and IEC publ. 444 where applicable.

3. Holder: HC-18/U (MIL-H-1005656/9), solder sealed or
HC-43/U (MIL-H-10056/30) cold weld or resistance weld.
Lead Length: min. 12.7 mm

4. Operating temp. range: Non controlled $-30^{\circ}C$ to $+80^{\circ}C$.

5. Frequency: 11.155 MHz

6. Method of testing: passive.

7. Tolerance on specified frequency: $\pm 15 \times 10^{-6}$ measured $25^{\circ}C \pm 2^{\circ}C$.

8. Temperature characteristics: Throughout the operating temperature range ($-30^{\circ}C$ to $+80^{\circ}C$), the deviation from the frequency measured at $25^{\circ}C$ shall be not greater than $\pm 20 \times 10^{-6}$. Must be tested with a load capacitance of 30pF (NPO).

9. Load capacitance: 30pF.

10. Drive level. 0.5mW ± 20%.

11. Capacitance, shunt: max 7pF

12. Activity.

R_{eff} (30pF) : max. 50 Ω

13. Test set: IEC pi-network.

14. Marking: The crystal-unit holder shall be marked with:
Frequency in MHz (5 digits), Pt. No. 98.5035, date of manufacture, and name of manufacturer.

15. Where not otherwise specified the crystal-unit is identical to MIL-type CR-64/U (MIL-C-3098F).

16. Type Approval

Supply to any Storno division is subject to type approval from Storno A/S, Denmark.

CQM5000s

Channeling Instruction

XTAL TYPES ARE STATED ON SHEETS #26, 27 & 29

1. Channeling Information

1.1 Required Information

Given:
- channel spacing
- lowest receiving frequency
- highest receiving frequency
- lowest transmitting frequency
- highest transmitting frequency
- frequency of other wanted receiving channels
- frequency of other wanted transmitting channels

1.2 Recommended x-tal lists

Use recommended x-tal list for band of interest, included on pages 9 to 17, of this instruction and find the x-tal frequency which could give the coverage for lowest and highest frequencies wanted.

Reference xtal list is given at page 29, crystal types for different countries listed at pages 26 and 27.

1.3 "V" number calculation formulas

Select appropriate formula for receiver and transmitter frequencies at page 3. Insert known information on formulas to obtain "V" number for wanted frequencies and prepare a list for wanted frequency versus calculated "V" number. See page 5 for a list which could be used with FC 5001 or page 6A with CL 5001.
Check for possible self-quieting from list at par. 1.4.5.
Translate "V" numbers to hexadecimal code using conversion table included at page 7. Fill the hex code to the list which should be basis for PROM burning instrument. See important notice for FC 5001 at paragraph 1.5.
Additional hex code to binary conversion table at page 8 can be used to check burned PROM.

EXAMPLE.

An example is given to clarify the procedure for FC5001 or CL 5001 using the sample list at page 6 respective 6B.

Given:

Channel spacing		25 kHz
Lowest receiver frequency		156.300 MHz
Highest receiver frequency		156.850 MHz
Lowest transmitter frequency		156.300 MHz
Highest transmitter frequency		156.850 MHz
Frequency of other wanted RX channels		
156.400	156.600	156.800
156.450	156.650	
156.500	156.700	
156.550	156.700	
Frequency of other wanted TX channels		
156.400	156.600	156.800
156.450	156.650	
156.500	156.700	
156.550	156.750	

Abbreviations:

Wanted receiving freq., MHz	= A		
Wanted transmitting freq., MHz	= B		
Recommended RX x-tal, MHz	= C		
Recommended TX x-tal, MHz	= D		

Wanted channel spacing		Reference freq. MHz 80/160MHz	Reference freq. MHz 370/450MHz
10 or 20 kHz	--->	0.010	0.0066666
12.5 or 25 kHz	--->	0.0125	0.0083333
15 or 30 kHz	--->	0.015	

		RECEIVER	TRANSMITTER
FS5330 80 MHz		$\frac{(A + 10.7) - (C \times 2)}{\text{Reference frequency}} = V$	$\frac{B - (D \times 4)}{\text{Reference frequency}} = V$
FS5110 160 MHz		$\frac{(A - 10.7) - (C \times 3)}{\text{Reference frequency}} = V$	$\frac{B - (D \times 3)}{\text{Reference frequency}} = V$
FS5660 450MHz	420 450	$\frac{\frac{(A + 21.4)}{3} - (C \times 3)}{\text{Reference frequency}} = V$	$\frac{(\frac{B}{3}) - (D \times 3)}{\text{Reference frequency}} = V$
	440 470	$\frac{\frac{(A - 21.4)}{3} - (C \times 3)}{\text{Reference frequency}} = V$	
FS5550 370 MHz		$\frac{\frac{(A - 21.4)}{3} - (C \times 2)}{\text{Reference frequency}} = V$	$\frac{(\frac{B}{3}) - (D \times 2)}{\text{Reference frequency}} = V$
FS5410 Midband		$\frac{(A - 10.7) - (C \times 3)}{\text{Reference frequency}} = V$	$\frac{B - (D \times 2)}{\text{Reference frequency}} = V$

Formulas

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Rev.	Change	By	Date
2	AN 191	MTU	80Aug 29
1	AN 0146	MTU	80July 03

THIRD ANGLE PROJECTION | FIRST ANGLE PROJECTION | SI-METRIC | PRINTS TO

APPV	MTU
DATE	30/4
TITLE	INSTRUCTION, CHANNELING
MADE BY	MTu
ISSUED	1980.04.25
FIRST MADE FOR	CQM5000 S
F.C.F.O.	

GENERAL ELECTRIC Storno

Find the relevant section from recommended x-tal list included at the sheets 9 to 17 of this instruction.

From sheet 9, recommended RX x-tal: 47.1 MHz
covering 155.2 - 158.3875 MHz.

From sheet 11, recommended TX x-tal: 50.766666 MHz
covering 155.5 - 158.6875 MHz.

From sheet 3, select reference frequency = 0.0125 for 25 kHz channel spacing and use formulas for FS5110 because channels are in 160 MHz band.

Calculate RX and TX "V" numbers. If calculations are correct, "V" numbers should be between 256 and 511.
Start filling this information to the list given at page 5 or page 6A. Place the frequencies to wanted knob position or displayed channel number and write the corresponding "V" numbers to the same line.
Check for possible self quieting from list at par. 1.4.5.
From table I at sheet 29 choose standard or alternate reference xtal depending on possibility of self quieting.
Note:
For x-tal specifications see 19J706269 page 15,16 or 19J706331 page 5,6, and relevent x-tal specifications 98-0156, 98-0157, 98-0158, 98-0159, 98-0160 and 19J706361.

By using "V" number to hex code conversion list at page 7 convert "V" number to hex code and write to appropriate column.

FC 5001: See notice at par. 1.5. page 35.
PROM: 32 x 8 bit, 19J706247P1.

CL 5001: Only addresses 035_H to $0FC_H$ in the PROM are used for channel-coding.
If CL 5001 is used for channel control only (without TQ 5007/TQ 5008) PROM address 002_H should be programmed to 02_H.

All unused (illegal) channels should be programmed to FF_H.
PROM: 512 x 8 bit 19A700117P1.

PROM address	Remarks		Hex code
000 001	SYSTEM		/
002	Channel control only		02
003 : 034	SYSTEM		/
035 036 037 : 096 097 098	RX Ch. No.	00 01 02 : 97 98 99	According to the list page 6A
099 09A 09B : 0FA 0FB 0FC	TX Ch. No.	00 01 02 : 97 98 99	
0FD : 1FF	Not used.		/

For complete information see system instruction for tone-switching II.

Allocation of data in PROM.

19J706353		
CONT ON SHEET 6	SH NO 5	

List for channeling FS5000, FC5001

Knob pos.	Wanted RX Frequency	PROM Address	Calculated "V"	Hex Code
1		00		
2		01		
3		02		
4		03		
5		04		
6		05		
7		06		
8		07		
9		08		
10		09		
11		0A		
12		0B		

Knob pos.	Wanted TX Frequency	PROM Address	Calculated "V"	Hex Code
1		10		
2		11		
3		12		
4		13		
5		14		
6		15		
7		16		
8		17		
9		18		
10		19		
11		1A		
12		1B		

Recommended RX x-tal: ______
Recommended TX x-tal: ______
Reference x-tal: ______

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2	AN0333 TSA 21 Jan 02	1	AN0146 MTU 30 July 85

REVISIONS

THIRD ANGLE PROJECTION | FIRST ANGLE PROJECTION | SI-METRIC | PRINTS TO

APPV	DATE	TITLE	FIRST MADE FOR CQM5000 S
MTU	30/4	INSTRUCTION, CHANNELING	F.C.F.O.
		MADE BY MTu	
		ISSUED 1980.04.25 — GENERAL ELECTRIC Storno	19J706353 CONT ON SHEET 6 SH NO. 5

Sample list for channeling FS5112, FC5001.

Knob pos.	Wanted RX Frequency	PROM Address	Calculated "V"	Hex Code
1	156.300	00	344	58
2	156.400	01	352	60
3	156.450	02	356	64
4	156.500	03	360	68
5	156.550	04	364	6C
6	156.600	05	368	70
7	156.650	06	372	74
8	156.700	07	376	78
9	156.750	08	380	7C
10	156.800	09	384	80
11	156.850	0A	388	84
12	156.850	0B	388	84

Knob pos.	Wanted TX Frequency	PROM Address	Calculated "V"	Hex Code
1	156.300	10	320	40
2	156.400	11	328	48
3	156.450	12	332	4C
4	156.500	13	336	50
5	156.550	14	340	54
6	156.600	15	344	58
7	156.650	16	348	5C
8	156.700	17	352	60
9	156.750	18	356	64
10	156.800	19	360	68
11	156.850	1A	364	6C
12	156.850	1B	364	6C

See important notice at par. 1.5

Recomended RX x-tal: 47.100000
Recomended TX x-tal: 50.766666
Reference x-tal: 12.800000

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2	AN0333 TSA 81 Jan 02
1	AN 0146 MTu 80 July 03

THIRD ANGLE PROJECTION | FIRST ANGLE PROJECTION | SI-METRIC | PRINTS TO

APPV	DATE	TITLE	FIRST MADE FOR
MTJ	30/4	INSTRUCTION, CHANNELING	CQM5000 S[illegible]
			F.C.F.O.
		MADE BY MTu	19J706353
		ISSUED 1980.04.25	CONT ON SHEET 6A SH NO 6

GENERAL ELECTRIC Storno

List for channeling FS 5000, CL 5001.

Displ. Ch.no.	RX				TX			
	Frequency	PROM address	Calculated "V"	Hex Code	Frequency	PROM address	Calculated "V"	Hex code

Note: All unused (illegal) channels shall be programmed with Hex code : FF.

Recommended RX x-tal: _____ Reference x-tal: _____

Recommended TX x-tal: _____

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THIRD ANGLE PROJECTION | FIRST ANGLE PROJECTION | SI-METRIC | PRINTS TO

APPV	DATE	TITLE	FIRST MADE FOR CQM 5000 S
		INSTRUCTION, CHANNELING.	F.C.F.O.
		MADE BY TSA ISSUED 1981 JAN 14	GENERAL ELECTRIC Storno
			19J706353 CONT ON SHEET 6B SH NO. 6A

Sample list for channeling FS 5000, CL 5001.

Displ. Ch.no.	RX Frequency	RX PROM address	RX Calculated "V"	RX Hex code	TX Frequency	TX PROM address	TX Calculated "V"	TX Hex code
00	-	035	-	FF	-	099	-	FF
01	156.300	036	344	58	156.300	09A	320	40
02	156.400	037	352	60	156.400	09B	328	48
03	-	038	-	FF	-	09C	-	FF
04	-	039	-	FF	-	09D	-	FF
05	156.450	03A	356	64	156.450	09E	332	4C
06	-	03B	-	FF	-	09F	-	FF
07	156.500	03C	360	68	156.500	0A0	336	50
08	156.550	03D	364	6C	156.550	0A1	340	54
09	-	03E	-	FF	-	0A2	-	FF
10	-	03F	-	FF	-			
11	-	040	-	FF				
12	-	041	-			0F0	-	FF
13	-	042			-	0F1	-	FF
14	-			FF	-	0F2	-	FF
			-	FF	-	0F3	-	FF
		090	-	FF	-	0F4	-	FF
92	156.600	091	368	70	156.600	0F5	344	58
93	156.650	092	372	74	156.650	0F6	348	5C
94	156.700	093	376	78	156.700	0F7	352	60
95	156.750	094	380	7C	156.750	0F8	356	64
96	-	095	-	FF	-	0F9	-	FF
97	156.800	096	384	80	156.800	0FA	360	68
98	156.850	097	388	84	156.300	0FB	320	40
99	156.850	098	388	84	156.850	0FC	364	6C

Note: All unused (illegal) channels shall be programmed with Hex code : FF

Recommended RX x-tal: 47.10000 Reference x-tal: 12.80000

Recommended TX x-tal: 50.76666

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THIRD ANGLE PROJECTION | FIRST ANGLE PROJECTION | SI-METRIC | PRINTS TO

APPV	DATE	TITLE	FIRST MADE FOR
		INSTRUCTION, CHANNELING.	CQM 5000 S
			F.C.F.O.
		MADE BY TSA ISSUED 1981 JAN 14	GENERAL ELECTRIC Storno
			19J706353 CONT ON SHEET 7 SH NO 6B

	0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F
0	256	257	258	259	260	261	262	263	264	265	266	267	268	269	270	271
1	272	273	274	275	276	277	278	279	280	281	282	283	284	285	286	287
2	288	289	290	291	292	293	294	295	296	297	298	299	300	301	302	303
3	304	305	306	307	308	309	310	311	312	313	314	315	316	317	318	319
4	320	321	322	323	324	325	326	327	328	329	330	331	332	333	334	335
5	336	337	338	339	340	341	342	343	344	345	346	347	348	349	350	351
6	352	353	354	355	356	357	358	359	360	361	362	363	364	365	366	367
7	368	369	370	371	372	373	374	375	376	377	378	379	380	381	382	383
8	384	385	386	387	388	389	390	391	392	393	394	395	396	397	398	399
9	400	401	402	403	404	405	406	407	408	409	410	411	412	413	414	415
A	416	417	418	419	420	421	422	423	424	425	426	427	428	429	430	431
B	432	433	434	435	436	437	438	439	440	441	442	443	444	445	446	447
C	448	449	450	451	452	453	454	455	456	457	458	459	460	461	462	463
D	464	465	466	467	468	469	470	471	472	473	474	475	476	477	478	479
E	480	481	482	483	484	485	486	487	488	489	490	491	492	493	494	495
F	496	497	498	499	500	501	502	503	504	505	506	507	508	509	510	511

LSD of hex code.

MSD of hex code

"V" Numbers.

"V" Number to hex code convention table.

Example "V" = 345 equals to hex code 59.
"V" = 469 equals to hex code D5.

		1	NO CHANGE 30 July 03

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APPV	DATE	TITLE	FIRST MADE FOR CQM5000 S
MTU	30/4	INSTRUCTION, CHANNELING	F.C.F.O.
		MADE BY MTU	GENERAL ELECTRIC Stornо
		ISSUED 1980.04.25	19J706353 CONT ON SHEET 8 SH NO 7

J 732 PIN	0 1 2 3	4 5 6 7	8 9 A B	C D E F
LSD of hex code				
2	0-0-	0-0-	0-0-	0-0-
3	00--	00--	00--	00--
4	0000	----	0000	----
5	0000	0000	----	----

J 732 PIN	0 1 2 3	4 5 6 7	8 9 A B	C D E F
MSD of hex code				
6	0-0-	0-0-	0-0-	0-0-
7	00--	00--	00--	00--
8	0000	----	0000	----
9	0000	0000	----	----

Hex code to binary conversion table. (With FC 5001 only)

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THIRD ANGLE PROJECTION | FIRST ANGLE PROJECTION | SI-METRIC | PRINTS TO

APPV	DATE	TITLE	FIRST MADE FOR
MTU	30/4	INSTRUCTION, CHANNELING	CQM5000 S
		MADE BY MTu	F.C.F.O.
		ISSUED 1980.04.25	GENERAL ELECTRIC Stone
			19J706353 CONT ON SHEET 9 SH NO. 8

FS 5110 RECEIVER RECOMMENDED XTAL LIST

19J706353
CONT ON SHEET 10 SH NO. 9

Coverage		Recommended xtal	
20 KHz	12,5/25 KHz	Xtal freq MHz	Xtal freq x 3, MHz
	145.2 148.3875	43.766666	131.3
145.56 148.11	146.2 149.3875	44.1	132.3
146.56 14911	147.2 1503875	44.433333	133.3
147.56 150.11	148.2 151.3875	44.766666	134.3
148.56 151.11	149.2 152.3875	45.1	135.3
149.56 152.11	150.2 153.3875	45.433333	136.3
150.56 153.11	151.2 154.3875	45.766666	137.3
151.56 154.11	152.2 155.3875	46.1	138.3
152.56 155.11	153.2 156.3875	46.433333	139.3
153.56 156.11	154.2 157.3875	46.766666	140.3
154.56 157.11	155.2 158.3875	47.1	141.3
155.56 158.11	156.2 159.3875	47.433333	142.3
156.56 159.11	157.2 160.3875	47.766666	143.3
157.56 160.11	158.2 161.3875	48.1	144.3
158.56 161.11	159.2 162.3875	48.433333	145.3

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		1	NO CHANGE 80 July 03

REVISIONS

THIRD ANGLE PROJECTION | FIRST ANGLE PROJECTION | SI-METRIC | PRINTS TO

APPV	DATE	TITLE	FIRST MADE FOR CQM5000 S
MTU	30/4	INSTRUCTION, CHANNELING	F.C.F.O.
		MADE BY MTu ISSUED 1980.04.25	GENERAL ELECTRIC Storno
			19J706353 CONT ON SHEET 10 SH NO. 9

FS 5110 RECEIVER RECOMMENDED XTAL LIST

19J706353
CONT ON SHEET 11 SH NO. 10

Coverage		Recommended xtal	
20 KHz	12,5/25 KHz	Xtal freq MHz	Xtal freq x 3, MHz
159.56 162.11	160.2 163.3875	48.766666	146.3
160.56 163.11	161.2 164.3875	49.1	147.3
161.56 164.11	162.2 165.3875	49.433333	148.3
162.56 165.11	163.2 166.3875	49.766666	149.3
163.56 166.11	164.2 167.3875	50.1	150.3
164.56 167.11	165.2 168.3875	50.433333	151.3
165.56 168.11	166.2 169.3875	50.766666	152.3
166.56 169.11	167.2 170.3875	51.1	153.3
167.56 170.11	168.2 171.3875	51.433333	154.3
168.56 171.11	169.2 172.3875	51.766666	155.3
169.56 172.11	170.2 173.3875	52.1	156.3
170.56 173.11	171.2 174.3875	52.433333	157.2
171.56 174.11	172.2 175.3875	52.766666	158.3
172.56 175.11	173.2 176.3875	53.1	159.3
173.56 176.11		53.433333	160.3

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		1	NO CHANGE 80 July 03

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THIRD ANGLE PROJECTION | FIRST ANGLE PROJECTION | SI-METRIC | PRINTS TO

APPV	DATE	TITLE	FIRST MADE FOR
MTJ	30/4	INSTRUCTION, CHANNELING	CQM5000 S
			F.C.F.O.
		MADE BY MTJ	GENERAL ELECTRIC Storno
		ISSUED 1980.04.25	19J706353 CONT ON SHEET 11 SH NO. 10

FS 5110 TX RECOMMENDED XTAL LIST

19J706353 12 11
CONT ON SHEET SH NO.

Coverage		Recommended xtal	
20 KHz	12,5/25 KHz	Xtal freq MHz	Xtal freq x 3, MHz
144.86 147.41	145.5 148.6875	47.433333	142.3
145.86 148.41	146.5 149.6875	47.766666	143.3
146.86 149.41	147.5 150.6875	48.1	144.3
147.86 150.41	148.5 151.6875	48.433333	145.3
148.86 151.41	149.5 152.6875	48.766666	146.3
149.86 152.41	150.5 153.6875	49.1	147.3
150.86 153.41	151.5 154.6875	49.433333	148.3
151.86 154.41	152.5 155.6875	49.766666	149.3
152.86 155.41	153.5 156.6875	50.1	150.3
153.86 156.41	154.5 157.6875	50.433333	151.3
154.86 157.41	155.5 158.6875	50.766666	152.3
155.86 158.41	156.5 159.6875	51.1	153.3
156.86 159.41	157.5 1606875	51.433333	154.3
157.86 160.41	158.5 161.6875	51.766666	155.3
158.86 161.41	159.5 162.6875	52.1	156.3

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		1	NO CHANGE 80 July 03

REVISIONS

THIRD ANGLE PROJECTION | FIRST ANGLE PROJECTION | SI-METRIC | PRINTS TO

APPV	DATE	TITLE	FIRST MADE FOR CQM5000 S
MTJ	30/4	INSTRUCTION, CHANNELING	F.C.F.O.
		MADE BY MTu	GENERAL ELECTRIC Storno
		ISSUED 1980.04.25	19J706353 CONT ON SHEET 12 SH NO. 11

FS 5110 TX RECOMMENDED XTAL LIST

19J706353
CONT ON SHEET 13 SH NO 12

Coverage		Recommended xtal	
20 KHz	12,5/25 KHz	Xtal freq MHz	Xtal freq x 3, MHz
159.86 162.41	160.5 163.6875	52.433333	157.3
160.86 163.41	161.5 164.6875	52.766666	158.3
161.86 164.41	162.5 165.6875	53.1	159.3
162.86 165.41	163.5 166.6875	53.433333	160.3
163.86 166.41	164.5 167.6875	53.766666	161.3
164.86 167.41	165.5 168.6875	54.1	162.3
165.86 168.41	166.5 169.6875	54.433333	163.3
166.86 169.41	167.5 170.6875	54.766666	164.3
167.86 170.41	168.5 171.6875	55.1	165.3
168.86 171.41	169.5 172.6875	55.433333	166.3
169.86 172.41	170.5 173.6875	55.766666	167.3
170.86 173.41	171.5 174.6875	56.1	168.3
171.86 174.41	172.5 175.6875	56.433333	169.3
172.86 175.41	173.5 176.6875	56.766666	170.3
173.86 176.41	174.5 177.6875	57.1	171.3

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		1	NO CHANGE 80 July 03

REVISIONS

THIRD ANGLE PROJECTION | FIRST ANGLE PROJECTION | SI-METRIC | PRINTS TO

APPV	DATE	TITLE	FIRST MADE FOR CQM5000 S
MTU	30/4	INSTRUCTION, CHANNELING	F.C.F.O.
		MADE BY MTu	GENERAL ELECTRIC Storno
		ISSUED 1980.04.25	19J706353 CONT ON SHEET 13 SH NO. 12

FS 5110 TX RECOMMENDED XTAL LIST

19J706353
CONT ON SHEET 14 SH NO. 13

Coverage		Recommended xtal	
20 KHz	12,5/25 KHz	Xtal freq Mhz	Xtal freq x 3, MHz
174.86 177.41	175.5 178.6875	57.433333	172.3
175.86 178.41	176.5 179.6875	57.766666	173.3

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		1	NO CHANGE 80 July 03

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THIRD ANGLE PROJECTION | FIRST ANGLE PROJECTION | SI-METRIC | PRINTS TO

APPV	DATE	TITLE	FIRST MADE FOR CQM5000 S
MTU	30/4	INSTRUCTIONS, CHANNELING	F.C.F.O.
		MADE BY MTu	GENERAL ELECTRIC Storno — 19J706353
		ISSUED 1980.04.25	CONT ON SHEET 14 SH NO. 13

FS 5330 RECIEVER RECOMMENDED XTAL LIST

19J706353
CONT ON SHEET 15 SH NO 14

Coverage		Recommended xtal	
20 KHz	12,5/25 KHz	Xtal freq. MHz	Xtal freq. x 2, MHz
64.56 67.11	65.2 68.3875	36.35	72.7
65.56 68.11	66.2 69.3875	36.85	73.7
66.56 69.11	67.2 70.3875	37.35	74.7
67.56 70.11	68.2 71.3875	37.85	75.7
68.56 71.11	69.2 72.3875	38.35	76.7
69.56 72.11	70.2 73.3875	38.85	77.7
70.56 73.11	71.2 74.3875	39.35	78.7
71.56 74.11	72.2 75.3875	39.85	79.7
72.56 75.11	73.2 76.3875	40.35	80.7
73.56 76.11	74.2 77.3875	40.85	81.7
74.56 77.11	75.2 78.3875	41.35	82.7
75.56 78.11	76.2 79.3875	41.85	83.7
76.56 79.11	77.2 80.3875	42.35	84.7
77.56 80.11	78.2 81.3875	42.85	85.7
78.56 81.11	79.2 82.3875	43.35	86.7

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		1	NO CHANGE 80 July 03

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THIRD ANGLE PROJECTION | FIRST ANGLE PROJECTION | SI-METRIC | PRINTS TO

APPV	DATE	TITLE	FIRST MADE FOR
MTJ	30/4	INSTRUCTION, CHANNELING	CQM500C S
		MADE BY MTJ	F.C.F.O.
		ISSUED 1980.04.25	GENERAL ELECTRIC Storno
			19J706353
			CONT ON SHEET 15 SH NO 14

FS 5330 RECEIVER RECOMMENDED XTAL LIST

19J706353
CONT ON SHEET 16 SH NO 15

Coverage		Recommended xtal	
20 KHz	12,5/25 KHz	Xtal reeq. MHz	Xtal freq. x 2 MHz
79.56 82.11	80.2 83.3875	43.85	87.7
80.56 83.11	81.2 84.3875	44.35	88.7
81.56 84.11	82.2 85.3875	44.85	89.7
82.56 85.11	83.2 86.3875	45.35	90.7
83.56 86.11	84.2 87.3875	45.85	91.7
84.56 87.11	85.2 88.3875	46.35	92.7
85.56 88.11	86.2 89.3875	46.85	93.7
86.56 89.11	87.2 90.3875	47.35	94.7
87.56 90.11	88.2 91.3875	47.85	95.7

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		1	NO CHANGE 80 July 03	

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THIRD ANGLE PROJECTION | FIRST ANGLE PROJECTION | SI-METRIC | PRINTS TO

APPV	DATE	TITLE	FIRST MADE FOR CQM5000 S
MTO	30/4	INSTRUCTION, CHANNELING	F.C.F.O.
		MADE BY MTO	GENERAL ELECTRIC Storno
		ISSUED 1980.0 .25	19J706353 CONT ON SHEET 16 SH NO 15

FS 5330 TRANSMITTER RECOMMENDED XTAL LIST

Coverage		Recommended x-tal:	
20 KHz	12,5/25 KHz	Xtal freq, MHz	Xtal freq. x4 MHz
64.56 67.11	65.2 68.3875	15.5	62.
65.56 68.11	66.2 69.3875	15.75	63.
66.56 69.11	67.2 70.3875	16.	64.
67.56 70.11	68.2 71.3875	16.25	65.
68.56 71.11	69.2 72.3875	16.5	66.
69.56 72.11	70.2 73.3875	16.75	67.
70.56 73.11	71.2 74.3875	17.	68.
71.56 74.11	72.2 75.3875	17.25	69.
72.56 75.11	73.2 76.3875	17.5	70.
73.56 76.11	74.2 77.3875	17.75	71.
74.56 77.11	75.2 78.3875	18.	72.
75.56 78.11	76.2 79.3875	18.25	73.
76.56 79.11	77.2 80.3875	18.5	74.
77.56 80.11	78.2 81.3875	18.75	75.
78.56 81.11	79.2 82.3875	19.	76.

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		1	NO CHANGE 80 July 03

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THIRD ANGLE PROJECTION | FIRST ANGLE PROJECTION | SI-METRIC | PRINTS TO

APPV	DATE	TITLE	FIRST MADE FOR CQM5000 S
MTJ	30/4	INSTRUCTION, CHANNELING	F.C.F.O.
		MADE BY MTJ	GENERAL ELECTRIC Storno
		ISSUED 1980.04.25	19J706353 CONT ON SHEET 17 SH NO. 16

FS 5330 TRANSMITTER RECOMMENDED XTAL LIST

19J706353
CONT ON SHEET 18 SH NO 17

Coverage		Recommended x-tal:	
20 KHz	12,5/25 KHz	Xtal freq. MHz	X-tal freq. x4 MHz
79.56 82.11	80.2 83.3875	19.25	77.
80.56 83.11	81.2 84.3875	19.5	78.
81.56 84.11	82.2 85.3875	19.75	79.
82.56 85.11	83.2 86.3875	20.	80
83.56 86.11	84.2 87.3875	20.25	81.
84.56 87.11	85.2 88.3875	20.5	82
85.56 88.11	86.2 89.3875	20.75	83.
86.56 89.11	87.2 90.3875	21.	84.
87.56 90.11	88.2 91.3875	21.25	85

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THIRD ANGLE PROJECTION | FIRST ANGLE PROJECTION | SI-METRIC | PRINTS TO

APPV	DATE	TITLE	FIRST MADE FOR
MTJ	30/4	INSTRUCTION, CHANNELING	CQM5000 S
			F.C.F.O.
		MADE BY MTu	19J706353
		ISSUED 1980.04.25	CONT ON SHEET 18 SH NO 17

GENERAL ELECTRIC
Storno

FS 5550 receiver recommended x-tal list.

Coverage		Recommended x-tal	
20 kHz	25 kHz	x-tal freq. MHz	x-tal freq. X2 MHz
367.62 372.72	368.9 375.275	56.85	113.7
370.12 375.22	371.4 377.775	57.266666	114.533333
372.62 377.72	373.9 380.275	57.683333	115.366666
375.12 380.22	376.4 382.775	58.1	116.2
377.62 382.72	378.9 385.275	58.516666	117.033333
380.12 385.22	381.4 387.775	58.933333	117.866666
382.62 387.72	383.9 390.275	59.35	118.7
385.12 390.22	386.4 392.775	59.766666	119.533333
387.62 392.72	388.9 395.275	60.183333	120.366666
390.12 395.22	391.4 397.775	60.6	121.2
392.62 397.72	393.9 400.275	61.016666	122.033333
395.12 400.22	396.4 402.775	61.433333	122.866666
397.62 402.72	398.9 405.275	61.85	123.7
400.12 405.22	401.4 407.775	62.266666	124.533333
402.62 407.72	403.9 410.275	62.683333	125.366666

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THIRD ANGLE PROJECTION | FIRST ANGLE PROJECTION | SI-METRIC | PRINTS TO

APPV	DATE	TITLE	FIRST MADE FOR
MTJ	5/7 80	INSTRUCTION, CHANNELING	CQM 5000S
		MADE BY MTu	F.C.F.O.
		ISSUED 1981 JAN 14	GENERAL ELECTRIC Sterne
			19J706353
			CONT ON SHEET 19 SH NO. 18

FS 5550 receiver recommended x-tal list.

Coverage		Recommended x-tal	
20 kHz	25 kHz	x-tal freq. MHz	x-tal freq. X2 MHz
405.12 410.22	406.4 412.775	63.1	126.2
407.62 412.72	408.9 415.275	63.516666	127.033333
410.12 415.22	411.4 417.775	63.933333	127.866666
412.62 417.72	413.9 420.275	64.35	128.7
415.12 420.22	416.4 422.775	64.766666	129.533333
417.62 422.72	418.9 425.275	65.183333	130.366666
420.12 425.22	421.4 427.775	65.6	131.2

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THIRD ANGLE PROJECTION | FIRST ANGLE PROJECTION | SI-METRIC | PRINTS TO

APPV	DATE	TITLE	FIRST MADE FOR
MTU	3/7 80	INSTRUCTION, CHANNELING.	CQM 5000 S
			F.C.F.O.
		MADE BY MTU	GENERAL ELECTRIC Storno
		ISSUED 1981 JAN 14	19J706353
			CONT ON SHEET 20 SH NO 19

FS 5550 transmitter recommended x-tal list

Coverage		Recommended x-tal	
20 kHz	25 kHz	x-tal freq. MHz	x-tal freq. X2 MHz
368.72 373.82	370. 376.375	60.6	121.2
371.22 376.32	372.5 378.875	61.016666	122.033333
373.72 378.82	375. 381.375	61.433333	122.866666
376.22 381.32	377.5 383.875	61.85	123.7
378.72 383.82	380. 386.375	62.266666	124.533333
381.22 386.32	382.5 388.875	62.683333	125.366666
383.72 388.82	385. 391.375	63.1	126.2
386.22 391.32	387.5 393.875	63.516666	127.033333
388.72 393.82	390. 396.375	63.933333	127.866666
391.22 396.32	392.5 398.875	64.35	128.7
393.72 398.82	395. 401.375	64.766666	129.533333
396.22 401.32	397.5 403.875	65.183333	130.366666
398.72 403.82	400. 406.375	65.6	131.2
401.22 406.32	402.5 408.875	66.016666	132.033333
403.72 408.82	405. 411.375	66.433333	132.866666

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THIRD ANGLE PROJECTION | FIRST ANGLE PROJECTION | SI-METRIC

PRINTS TO

APPV	DATE	TITLE	FIRST MADE FOR
MTU	3/7 80	INSTRUCTION, CHANNELING	CQM 5000 S
		MADE BY MTU	F.C.F.O.
		ISSUED 1981 JAN 14	GENERAL ELECTRIC Stornо
			19J706353
			CONT ON SHEET 21 SH NO 20

FS 5550 transmitter recommended x-tal list

Coverage		Recommended x-tal	
20 kHz	25 kHz	x-tal freq. MHz	x-tal freq. X2 MHz
406.22 411.32	407.5 413.875	66.85	133.7
408.72 413.82	410. 416.375	67.266666	134.533333
411.22 416.32	412.5 418.875	67.683333	135.366666
413.72 418.82	415. 421.375	68.1	136.2
416.22 421.32	417.5 423.875	68.516666	137.033333
418.72 423.82	420. 426.375	68.933333	137.866666
421.22 426.32		69.35	138.7

FS 5660 receiver recommended x-tal list.

Coverage		Recommended x-tal	
20 kHz	25 kHz	x-tal freq. MHz	x-tal freq. X3 MHz.
417.32 422.42	418.6 424.9755	48.177777	144.533333
419.82 424.92	421.1 427.4755	48.455555	145.366666
422.32 427.42	423.6 429.9755	48.733333	146.2
424.82 429.92	426.1 432.4755	49.011111	147.033333
427.32 432.42	428.6 434.9755	49.288888	147.866666
429.82 434.92	431.1 437.4755	49.566666	148.7
432.32 437.42	433.6 439.9755	49.844444	149.533333
434.82 439.92	436.1 442.4755	50.122222	150.366666
437.32 442.42	438.6 444.9755	50.399999	151.2
439.82 444.92	441.1 447.4755	50.677777	152.033333
442.32 447.42	443.6 449.9755	50.955555	152.866666
444.82 449.92	446.1 452.4755	51.233333	153.7

Overlap.

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APPV	DATE	TITLE	FIRST MADE FOR CQM 5000 S
MTU	3/7 80	INSTRUCTION, CHANNELING	F.C.F.O.
		MADE BY MTU ISSUED 1981 JAN 14	GENERAL ELECTRIC Stamo 19J706353 CONT ON SHEET 23 SH NO 22

FS 5660 receiver recommended x-tal list

Coverage		Recommended x-tal	
20 kHz	25 kHz	x-tal freq. MHz	x-tal freq. X3 MHz
440.12 445.22	441.4 447.7755	45.955555	137.866666
442.62 447.72	443.9 450.2755	46.233333	138.7
445.12 450.22	446.4 452.7755	46.511111	139.533333
447.62 452.72	448.9 455.2755	46.788888	140.366666
450.12 455.22	451.4 457.7755	47.066666	141.2
452.62 457.72	453.9 460.2755	47.344444	142.033333
455.12 460.22	456.4 462.7755	47.622222	142.866666
457.62 462.72	458.9 465.2755	47.899999	143.7
460.12 465.22	461.4 467.7755	48.177777	144.533333
462.62 467.72	463.9 470.2755	48.455555	145.366666
465.12 470.22	466.4 472.7755	48.733333	146.2
467.62 472.72	468.9 475.2755	49.011111	147.033333

Overlap

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THIRD ANGLE PROJECTION | FIRST ANGLE PROJECTION | SI-METRIC | PRINTS TO

APPV	DATE	TITLE	FIRST MADE FOR CQM 5000 S
MTU	3/7 80	INSTRUCTION, CHANNELING	F.C.F.O.
		MADE BY MTU	19J706353
		ISSUED 1981 JAN 14	CONT ON SHEET 24 SH NO. 23

GENERAL ELECTRIC
Sterno

FS 5660 transmitter recommended x-tal list.

19J706353

CONT ON SHEET 25 SH NO. 24

Coverage		Recommended x-tal	
20 kHz	25 kHz	x-tal freq. MHz	x-tal freq. X3 MHz
418.72 423.82	420. 426.375	45.955555	137.866666
421.22 426.32	422.5 428.875	46.233333	138.7
423.72 428.82	425. 431.375	46.511111	139.533333
426.22 431.32	427.5 433.875	46.788888	140.366666
428.72 433.82	430. 436.375	47.066666	141.2
431.22 436.32	432.5 438.875	47.344444	142.033333
433.72 438.82	435. 441.375	47.622222	142.866666
436.22 441.32	437.5 443.875	47.899999	143.7
438.72 443.82	440 446.375	48.177777	144.533333
441.22 446.32	442.5 448.875	48.455555	145.366666
443.72 448.82	445. 451.375	48.733333	146.2
446.22 451.32	447.5 453.875	49.011111	147.033333
448.72 453.82	450. 456.375	49.288888	147.866666
451.22 456.32	452.5 458.875	49.566666	148.7
453.72 458.82	455. 461.375	49.844444	149.533333

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THIRD ANGLE PROJECTION | FIRST ANGLE PROJECTION | SI-METRIC

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APPV	DATE	TITLE	FIRST MADE FOR CQM5000 S
MTU	3/7 80	INSTRUCTION., CHANNELING	F.C.F.O.
		MADE BY MTU 1 4	GENERAL ELECTRIC Storno
		ISSUED 1991 JAN 15	19J706353 CONT ON SHEET 25 SH NO. 24

FS 5660 transmitter recommended x-tal list.

Coverage		Recommended x-tal	
20 kHz	25 kHz	x-tal freq. MHz	x-tal freq. X3 MHz
456.22 461.32	457.5 463.875	50.122222	150.366666
458.72 463.82	460. 466.375	50.399999	151.2
461.22 466.32	462.5 468.875	50.677777	152.033333
468.72 468.82	465. 471.375	50.955555	152.866666
466.22 471.32	467.5 473.875	51.233333	153.7

Crystal types 98-01xx

Country	CQM 5112	CQM 5113	CQM 5114	CQM 5662	CQM 5663	CQM5332 RX	CQM5332 TX	CQM5333 RX	CQM5333 TX	CQM5334 RX	CQM5334 TX
Austria	*56	-	-	57	-	*56	*58				
Belgium	-	*56	-	-	57			*56	*58		
Canada	57			57	-	*56	*58				
Denmark	*56	-	-	57	-	*56	*58				
England	-	-	57	57	-					*56	*58
Finland	*56	-	-	57	-	*56	*58				
France	*56	-	57	57	-	*56	*58			*56	*58
Italy	*56	-	-	57	-	*56	*58				
Netherland	*56	*56	-	-	57	*56	*58	*56	*58		
Norway	*56	-	-	57	-	*56	*58				
Sweden	*56	-	-	57	-	*56	*58				
Switzerland	*56	-	-	57	-	*56	*58				
USA	57			57	-	57	59				
W. Germany	-	57	-	-				*56	*58		
Yugoslavia	57	-	-	57	57	*56	*58				
	146-174 MHz			420 - 470 MHz		66 - 88MHz					

* When type 98-0156 or 98-0158 is used D 152 must be removed.

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APPV	DATE	TITLE	FIRST MADE FOR
MTU	3/7 80	INSTRUCTION, CHANNELING	CQM 5000 S
		MADE BY MTu	F.C.F.O
		ISSUED 1980 July 11	

GENERAL ELECTRIC
Storno

Crystal type: 98-01xx

Country	CQM5552 (370-420 MHz)	CQM5414 (RX 138-141 MHz, TX 105-108MHz)	CQM5342 RX/TX (RX 95 - 105MHz, TX 66 - 88MHz)	CQM5344 RX/TX (RX 95 - 105MHz, TX 66 - 88MHz)
Austria	160			
Belgium				
Canada				
Denmark	60			
England		57	*54 *58	*56 *58
Finland				
France	60			
Italy				
Netherland				
Norway				
Sweden	60			
Switzerland	60			
USA				
Wm Germany				
Yugoslavia				

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THIRD ANGLE PROJECTION | FIRST ANGLE PROJECTION | SI-METRIC | PRINTS TO

APPV	DATE	TITLE	FIRST MADE FOR CQM 5000 S
MTU	03/07 80	INSTRUCTION, CHANNELING	F.C.F.O
		MADE BY MTu; ISSUE 1980 july 11	GENERAL ELECTRIC Storno

19J706353
CONT ON SHEET 28 SH NO 27

1.4 Control for "Self quieting"

1.4.1 "Self quieting" are results of unwanted high order mixing of receiver internal oscillators which generate products in first IF or in receiver frequency. Direct harmonics of internal oscillators also might fall into IF or receiving frequency. To avoid this possibility consult the paragraph 1.4.5 for every customer frequency.

1.4.2 When no wanted receiving signal is present at the antenna terminal, "self quieting" might have a signal strength strong enough to open the squelch and keep the receiver quiet.

1.4.3 When a wanted receiving signal is present at the antenna terminal, "self quieting" causes co-channel type interference or reduces useful sensitivity of receiver.

1.4.4 Mechanism of "self quieting". Abbreviations:

a) Sources

- Receiver mixer x-tal freq. MHz = C
- Squaring amplifier freq. MHz = E
- Reference freq.(0.01, 0.0125 or 0.015 MHz) = F
- Second injection freq. MHz = G
- VCO freq. = H

b) Interference falls into:

- wanted receiver freq. MHz = A
- first IF freq. MHz = IF

c) Multiplication numbers:

- variable counter divide ratio = V
- order of first source = M
- order of second source = N

Mechanisms:

1 - (V x F) = IF/2 or IF/4
2 - (F x 1024) x N = A
3 - (G x M) = A
4 - (E x M) = A
5 - (C x M) ± (H x N) = IF or A
6 - (H x M) ± (F x N) = IF or A
7 - (H x M) ± (E x N) = IF or A
8 - (C x M) ± ((F x 1024) x N) = IF or A
9 - (E x M) ± ((F x 1024) x N) = IF or A

Alternatives:

1- use another synthesizer RX mixer osc. x-tal to avoid "V" number 428.

2- use high side injection x-tal at 2nd injection oscillator. 11.155 MHz instead of 10.245 or 21.855 MHz instead of 20.945.

3- use slightly offset reference x-tal, **See table below.**

4- weak quieting no change is necessary.

		Used for CQM 5XXX S	
Part no. 19J706361	Frequency	Standard	Alternate
P 1	12.800000MHz	5332, 5112, 5412, 5334, 5114	
P 2	10.240000MHz	5333, 5113,	
P 3	8.533333MHz	5662, 5552,	
P 4	6.826666MHz	5663, 5553,	
P 5	4.266666MHz	5664, 5554,	
P 6	12.800500MHz		5114
P 7	12.801000MHz		5112, 5334
P 8	12.802000MHz		5332
P 9	10.240650MHz		5113
P10	10.241300MHz		5333
P11	5.120000MHz	5333, 5113, 5 kHz raster	

Reference x-tals.

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APPV	DATE	TITLE	FIRST MADE FOR
MTU	30/4	INSTRUCTION, CHANNELING	CQM5000 S
			F.C.F.O.
		MADE BY MTu	19J706353
		ISSUED 1980.04.25	CONT ON SHEET 30 SH NO 29

GENERAL ELECTRIC Stornо

1.4.5 The known "self quieting" frequencies are listed below. In case of customer frequency coincides with these frequencies use the alternative

This list is applicable to recommended x-tal lists at sheet 9 to 17.

CQM 5112 or CQM 5114

Channel spacing: 12,5 or 25 KHz, 160 MHz Band

Rec. Xtal	"V"	Mech.	Alternative
43.76	428	1	1
44.10	336	-	4
44.10	428	1	1
44.43	256		4
44.43	428	1	1
44.76	428	1	1
45.10	428	1	1
45.43	428	1	1
45.76	428	1	1
45.76	454	3	2
46.10	374	3	2
46.43	294	3	2
45.76	428	1	1
46.76	428	1	1
47.10	428	1	1
47.43	428	1	1
47.76	428	1	1
48.10	428	1	1
48.43	428	1	1
48.76	428	1	1
49.10	428	1	1
49.10	472	3	2
49.10	474	3	2
49.43	393	3	2
49.43	394	3	2
49.43	428	1	1
49.76	313	3	2
49.76	314	3	2
49.76	428	1	1
50.10	428	1	1
50.10	432		4
50.43	428	1	1
50.76	272	2	3
50.76	428	1	1
51.10	428	1	1
51.43	428	1	1
51.76	320		4

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APPV	DATE	TITLE	FIRST MADE FOR
MTJ	30/4	INSTRUCTION, CHANNELING	CQM5000 S
			F.C.F.O.
		MADE BY MTu	19J706353
		ISSUED 1980.04.25	CONT ON SHEET 31 SH NO. 30

GENERAL ELECTRIC
Storno

Rec. Xtal	"V"	Mech.	Alternative
51.76	428	1	1
52.10	344	-	4
52.10	428	1	1
52.43	428	1	1
52.76	304	-	4

CQM 5113

Channel spacing 20 KHz, 160 MHz band

44.10	311	-	4
46.10	467	3	2
46.43	367	3	2
46.76	260	-	4
46.76	267	3	2
49.43	492	3	2
49.76	392	3	2
50.10	292	3	2
50.43	290		
53.10	390	-	4

CQM 5332

Channel spacing 25 KHz, 80 MHz band

(All Xtals)	428	1	1
38.35	457	3	2
38.85	377	3	2
39.35	297	3	2
40.85	464	2	3
41.35	384	2	3
41.85	304	2	3
43.35	474	3	2
43.85	397	3	2
44.35	314	3	2

CQM 5333
Channel spacing 20 KHz,80 MHz band

Rec Xtal	"V"	Mech.	Alternative
38.85	468	2	3
38.85	471	3	2
39.35	368	2	3
39.35	371	3	2
39.85	268	2	3
39.85	271	3	2
43.85	492	2	3
43.85	496	3	2
44.35	392	2	3
44.35	396	3	2
44.85	292	2	3
44.85	296	3	2

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THIRD ANGLE PROJECTION | FIRST ANGLE PROJECTION | SI-METRIC | PRINTS TO

APPV	DATE	TITLE	FIRST MADE FOR CQM 5000 S
MTU	30/4	INSTRUCTION, CHANNELING	F.C.F.O.
		MADE BY MTu	GENERAL ELECTRIC Stone
		ISSUED 1981 JAN 14	19J706353 CONT ON SHEET 33 SH NO. 32

CQM 5552.

Channel spacing 25 kHz, 370 MHz band.

Rec. Xtal	"V"	Mech.	Alternative.
56.850	321	-	4
56.850	366	-	4
60.183	404	3	2
60.600	304	3	2
63.100	384	-	4
63.516	469	-	4
63.933	369	-	4
63.933	415	-	4
63.933	424	-	4
64.350	269	-	4
64.350	278	-	4
64.350	324	-	4
64.350	428	1	4
64.766	428	1	4
65.183	428	1	4
65.600	428	1	4

CQM 5553.

Channel spacing 20 kHz, 370 MHz band.

56.850	458	-	4
60.183	505	-	4
60.600	380	-	4
60.600	426	-	4
61.016	301	-	4
61.850	375	-	4
63.933	473	-	4
64.350	348	-	4
64.350	394	-	4
64.350	405	-	4
64.766	269	-	4
64.766	280	-	4

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APPV	DATE	TITLE	FIRST MADE FOR CQM5000 S
MTu	30/7	INSTRUCTION, CHANNELING.	F.C.F.O.
		MADE BY MTu 1 4	GENERAL ELECTRIC Storno
		ISSUED 1981 JAN	19J706353 CONT ON SHEET 34 SH NO. 33

CQM 5662.

Channeling spacing 25 kHz, 450 MHz band.

Rec. Xtal.	"V"	Mech.	Alternative.
All Xtal	428	1	1
48.177	265	3	2
48.177	274	-	4
48.733	416	-	4
48.733	459	-	4
49.844	466	3	2
50.122	366	3	2
50.399	266	3	2
50.399	397	-	4
47.622	465	3	2
47.899	328	3	2

CQM 5663.

Channel spacing 20 kHz, 450 MHz band.

48.177	278	-	4
48.177	286	3	2
48.177	331	-	4
49.566	290	-	4
50.122	458	-	4
50.122	503	-	4
50.399	333	3	2
50.399	378	3	2
45.955	284	-	4
46.511	374	3	2
46.788	375	-	4
47.899	399	-	4
47.899	411	-	4
47.899	456	3	2
48.177	274	-	4
48.177	286	-	4
48.177	331	-	4
48.177	420	3	2
48.733	390	-	4
48.733	394	-	2
49.011	265	-	4

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REVISIONS

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APPV	DATE	TITLE	FIRST MADE FOR CQM 5000 S
μ20	30/7	INSTRUCTION, CHANNELING	F.C.F.O.
		MADE BY MTu	19J706353
		ISSUED 1981 JAN 14	CONT ON SHEET 35 SH NO. 34

GENERAL ELECTRIC
Storno

1.5 Setting of channel knob stop (with FC 5001 only)

Channel knob stop cannot be placed for more than 8 channels (ch. 1 to ch. 8). If ch. 9, ch. 10, ch. 11 and ch. 12 are to be used, do not insert stop pins. See sheet 24.

Important:

In case of more than 8 channels, but less than 12 channels are to be used, to avoid transmission in unauthorized channel; burn the unused channel location in the PROM with the highest channel code.

1.6 Modifications to RF5000 Board

- For 10 ppm units, cut diode D152.
- For all units, cut R157 and R309.
- For 80 MHz and Mid Band units, cut C159 and C160.

Modification to FS 5000 board.

When CL 5001 is installed the straps H3 - H4 and H5 - H6 must be cut.

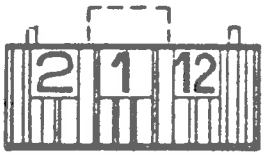
1.7 Remote Control of Channels (Automatic testing).

When FC5001 - FS5000 combination is used channels can be controlled externally via J 911. For remote control set S 901 to pos. 1.

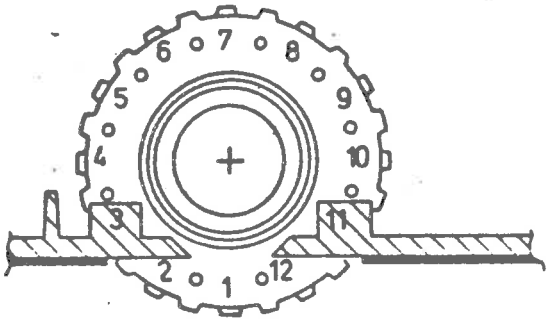
Channel	J 911 Pin:			
	8	7	6	5
1	0	0	0	0
2	0	0	0	1
3	0	0	1	0
4	0	0	1	1
5	0	1	0	0
6	0	1	0	1
7	0	1	1	0
8	0	1	1	1
9	1	0	0	0
10	1	0	0	1
11	1	0	1	0
12	1	0	1	1

0 = TTL low
1 = TTL high, internal pull down

Setting of channel knob stop.(with FS 5001 only)



S 901

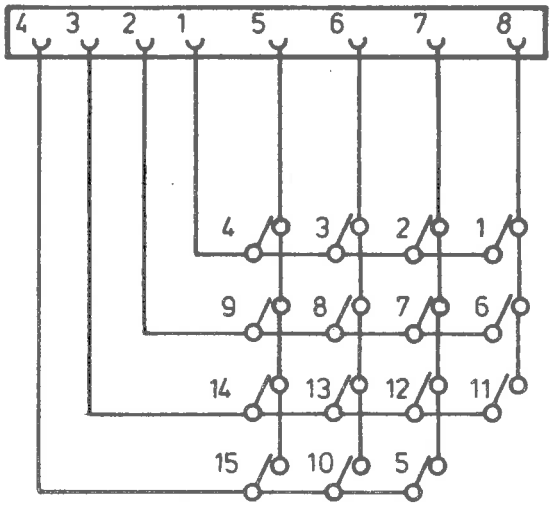


LOWEST CH.	INSERT PIN BETWEEN	HIGHEST CH.	INSERT PIN BETWEEN
1	10 AND 11	1	3 AND 4
2	11 AND 12	2	4 AND 5
3	12 AND 1	3	5 AND 6
4	1 AND 2	4	6 AND 7
5	2 AND 3	5	7 AND 8
6	3 AND 4	6	8 AND 9
7	4 AND 5	7	9 AND 10
8	5 AND 6	8	10 AND 11
9	6 AND 7	9	11 AND 12
10	7 AND 8	10	12 AND 1
11	8 AND 9	11	1 AND 2
12	9 AND 10	12	2 AND 3

NOTE : If 8 channels are used insert only one PIN.
If more than 8 channels are used stop is not possible and no PINs are inserted.
See important notice at paragraph 1.5.

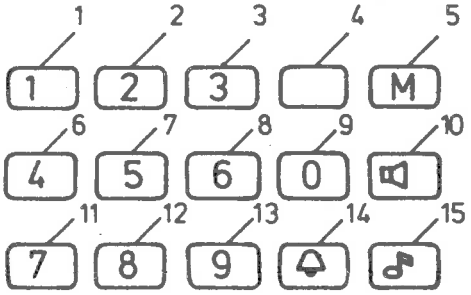
When CL 5001 - FS 5000 combination is used all functions normally available from the keyboard i.e. tonecodes, RF-channels, Tone key, LS in/out, mode etc. can be controlled automaticly from a special internal connector P804 placed on CL 5001.
For this purpose a special interface is necessary.

Interface for automatic test:



External relay operating floating contacts or equal.

The external switches are operating in parallel with the normal keyboard.
Relation between keyboard and interface is given below.



All other inteface is equal to standard CQM 5000 except that external channel control from rear-connector J911, should be omitted.

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APPV	DATE	TITLE	FIRST MADE FOR CQM 5000 S
		INSTRUCTION, CHANNELING	F C.F.O.
		MADE BY TSA	GENERAL ELECTRIC Storno
		ISSUED 1981 JAN 14	19J706353 CONT ON SHEET F SH NO 37