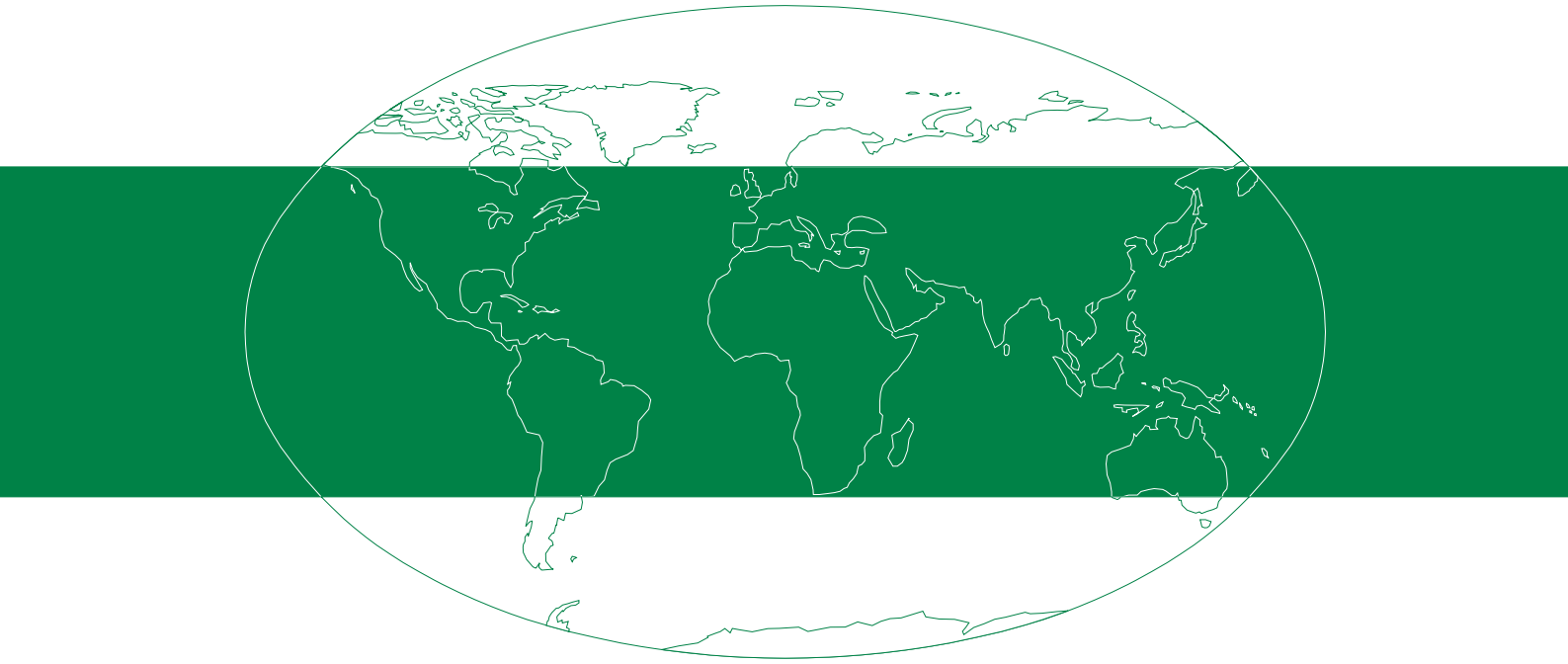
SAILOR



SERVICE AND IDENTITY PROGRAMMING
FOR
VHF RT2047

ONLY FOR AGENTS AND SERVICE PERSONNEL

S.P. RADIO A/S · AALBORG · DENMARK

SAILOR

SAILOR ® • Porsvej 2 • PO Box 7071 • DK-9200 Aalborg SV • Denmark
Phone: +45 9634 6100 • Fax: +45 9634 6101 • Telex: 69789 ECI DK
E-mail: sailor@sailor.dk • Web: www.sailor.dk

S. P. RADIO A/S · SAILOR MARINERADIO
PORSVEJ 2 . DK-9200 AALBORG SV . DENMARK . TELEPHONE 98 18 09 99 . TELEX 69 789 . TELEFAX 98 18 67 17 . REG. NO. 203327

ADDENDUM (1/9-92) TO SAILOR MANUAL:
INSTRUCTIONS FOR IDENTITY and SERVICE PROGRAMMING OF SAILOR VHF RT2047.

In connection with the release of the DSC-version of RT2047 we would like to draw attention to some changes concerning the identity and service programming. For more detailed information we refer to the latest version of 'INSTRUCTION BOOK FOR SAILOR VHF RT2047'.

1 SERVICE MODE:

A switch for entering service mode has been introduced. When a strap is placed over P4 on the keyboard unit (7) the set will enter service mode.

2 THE DSC CONTROL REGISTER:

This register is located at hexadecimal address $76 in service program 5 and contains the following bits. The register should typically be binary 00010010 or hexadecimal 12 when a DSC unit is connected and zero without a DSC.

Bit 7	Bit 6	Bit 5	Bit 4	Bits 3-0
Optional DSC channel	Spare	ATIS enable	DSC enable	The selective duplex address.

The selective duplex address:
Contains the RT2047's SP VHF-BUS address. Should be set to binary 0010 if the RT2047 is operating as the primary duplex unit and to binary 0100 if it is the secondary duplex unit.

DSC enable:
Enables the DSC-functions in RT2047 when set, should always be set when operated with SAILOR's VHF DSC unit.

ATIS enable:
ATIS (Automatic Transmitter Identification System) messages will be sent when this bit is set and the RT2047 is run with the SAILOR VHF DSC RM2042. ATIS is used in the rhine radio-telephone service area.

Optional DSC channel:
Is used for testing SAILOR VHF DSC RM2042 with RT2047. When this bit is set the DSC channel is set to channel 74 so distress calls and digital calls can be tested without disturbing traffic on channel 70.

CONTENTS

4. FAULT FINDING
4.1. KEYBOARD AND/OR DISPLAY DOES NOT WORK
4.2. THE SET ALWAYS STARTS WITH CHANNEL 16
4.3. THE SET ALWAYS STARTS WITH "EO" IN THE DISPLAY

5. FAULT FINDING WITH THE RESET PIN
TEST PROGRAMMES

ADD THIS TO SECTION 4.5., ADJUSTMENT PROCEDURE, IN THE INSTRUCTION BOOK FOR RT2047:

5.5.1.

10. REMOVE THE EEPROMS, BUT REMEMBER THEIR POSITION
11. SHORT CIRCUIT FROM IC609 PIN 1 TO GROUND
12. ADJUST THE Vpp-VOLTAGE, MEASURED ON IC609 PIN 4 TO 24.5 +- 0.5V WITH R617A

PROCEDURE FOR CHANGING THE SET INTO SERVICE MODE

Fig. 1.1

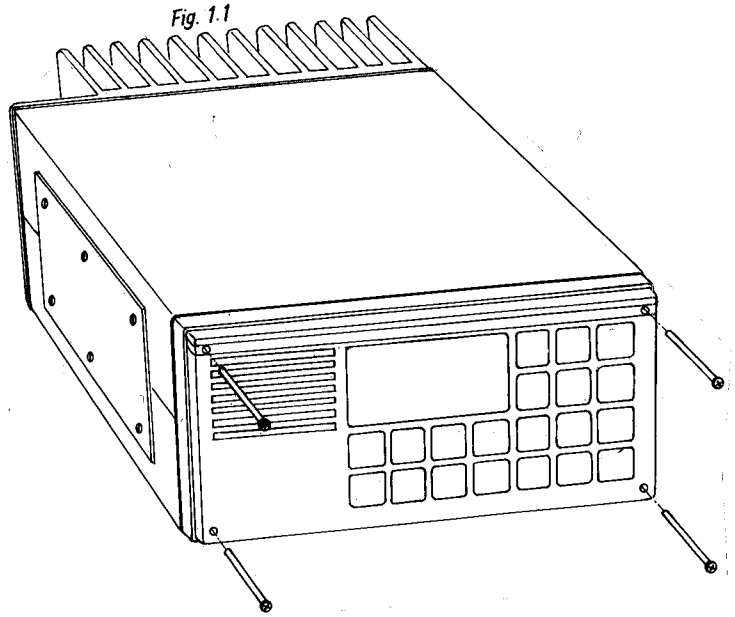


Fig. 1.2

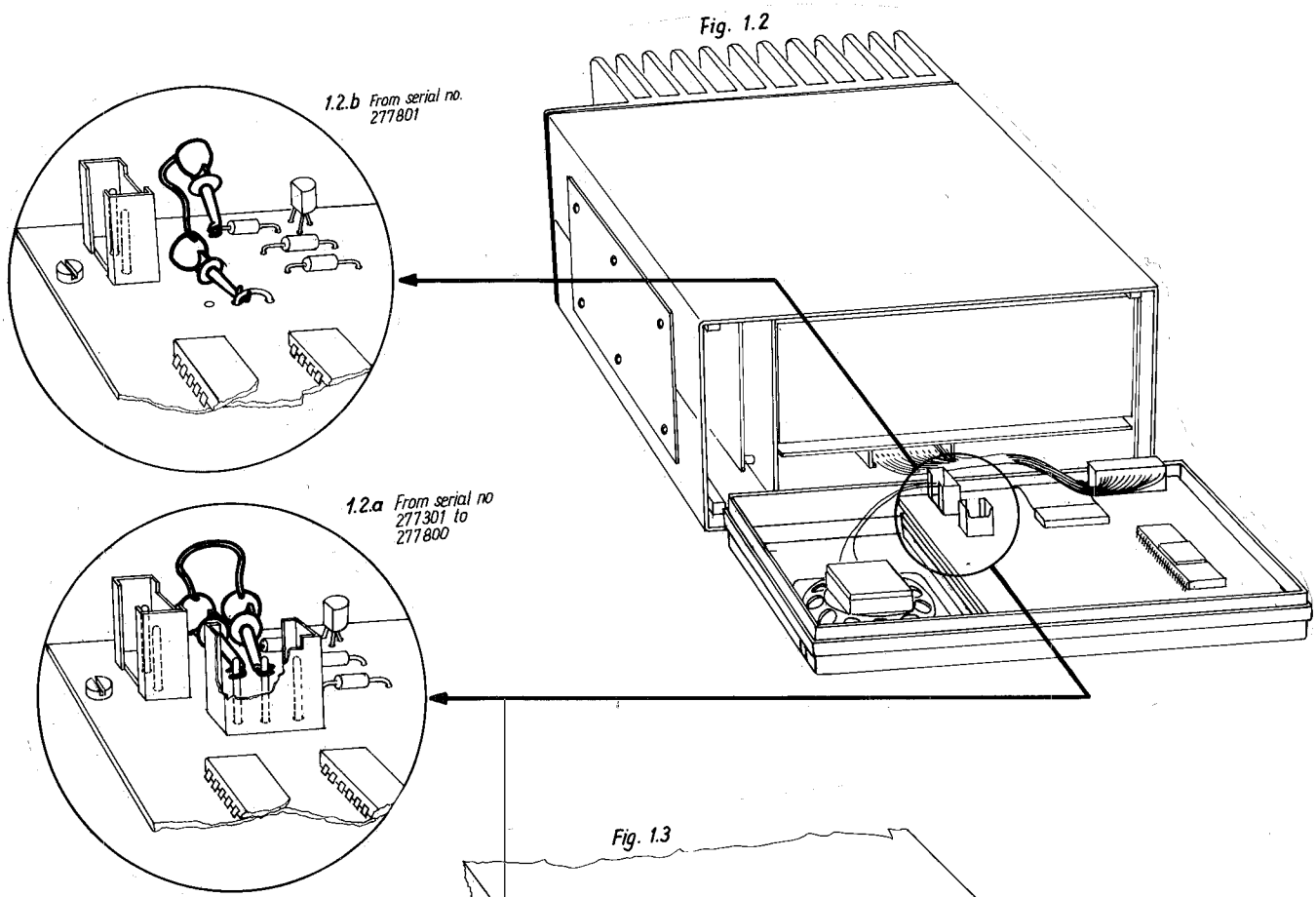
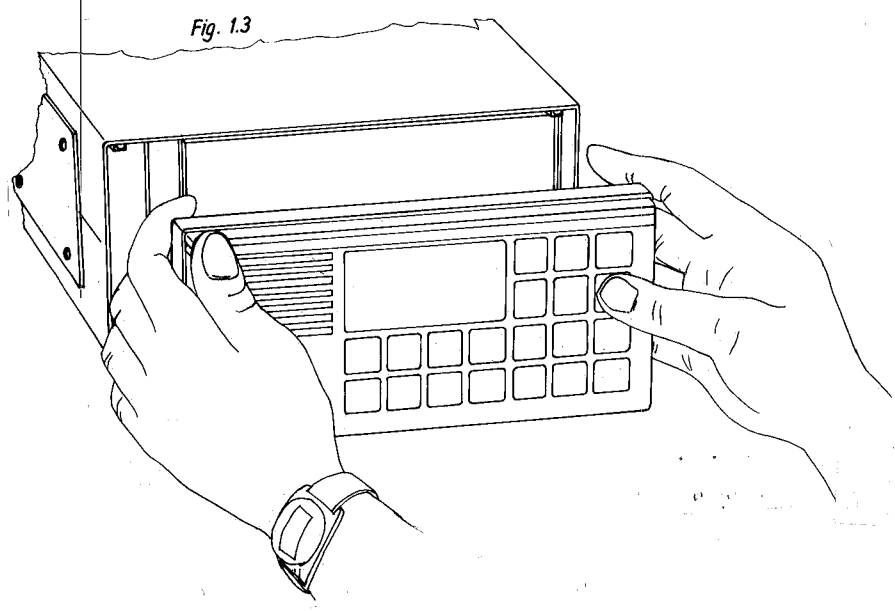


Fig. 1.3



1. SERVICE MODE

1.0. GENERAL

In service mode it is possible to programme the EEPROMS and to use several test programmes, which are useful for fault finding.

The EEPROMS contain information about private channels, selcall number, identity codes etc. Also the last setting of volume, squelch and channel number are stored in the EEPROM every time the set is switched off, but these addresses cannot be accessed.

For normal operation with up to 20 private channels, only one PROM is necessary, namely PROM no. 0 (IC609). If more than 20 private channels or a new function code for the international channels are to be used, a second PROM no. 1 (IC610) is to be inserted. If an 8 pin PROM (2K) is used, a second PROM is not necessary.

WARNING: Read this information carefully, because several of the P-codes affect the contents of the PROMS, and thereby also the function of the set.

1.1. OPERATION PROCEDURE FOR SERVICE MODE

a) Unscrew the 4 screws on the frontplate (fig.1.1.) and place the keyboard in front of the set (fig. 1.2.).

b) To enable the service mode, a jumper has to be connected on the keyboard unit from the 3-poled socket (pin in the middle) to ground (fig. 1.2b).

c) Switch on the set.

d) The display will be erased and the set is ready in service mode.

e) While programming, the keyboard can be held with left hand (fig.1.3.).

f) Select the service programme by means of a P-code.

g) Select a new programme just by entering a new P-code.

h) Return to normal function by removing the jumper again.

1.2. P-CODE OVERVIEW

P No.	Function:		
0	EEPROM No. 0 adr. 00-13		
1	EEPROM No. 0 adr. 14-27		
2	EEPROM No. 0 adr. 28-3B		
3	EEPROM No. 0 adr. 3C-4F		
4	EEPROM No. 0 adr. 50-63		
5	EEPROM No. 0 adr. 64-77		
6	EEPROM No. 1 adr. 00-13		
7	EEPROM No. 1 adr. 14-27		
8	EEPROM No. 1 adr. 28-3B		
9	EEPROM No. 1 adr. 3C-4F		
10	EEPROM No. 1 adr. 50-63		
11	EEPROM No. 1 adr. 64-77		
12	Continuous read-out to the synthesizer		
13	Test of latch for squelch and volume (IC604)		
14	Step response of RX-synthesis		
15	Step response of TX-synthesis		
16	Every port on IC619 are turned into input pins		
17	Write/read test of EEPROM No. 0		
18	Copy EEPROM 1 to 0		
19	Selcall test tone		
20	EEPROM No. 0 with standard factory set-up		
21	EEPROM No. 1 with standard function set-up		
22	Test timer IC619		**
23	Test RAM IC619		
24	Test ROM IC619		
50	Test of display		
51	Test of serial interface		
52	Test ACIA DSC-Interface		
53	Read adr. 0-FF in IC709	DSC	**
54	T-BUS output		
55	T-BUS output, Double Sequence		
56	Test Timer IC709		
57	Test RAM IC709		
58	Test ROM IC709		

** Only valid from C1038E (version 6) and C1039D (version 5).

2. PROGRAMMING OF THE EEPROMS

2.0. OPERATION PROCEDURE FOR PROGRAMMING OF THE EEPROMS

a) Select the service programme to be used, e.g. P3.

The read-out will show the address, the actual code and the PROM number (see fig. 2.1.).

b) To change the code in an address, e.g. from FF to F4, press

When you press ENT the code will be changed, and the read-out will show the next address.

c) To step through all the addresses in a service programme, press:

d) To store the corrected content, press:

e) To examine the stored content enter the same service programme again.

2.0.1. KEYBOARD AND DISPLAY CONFIGURATION

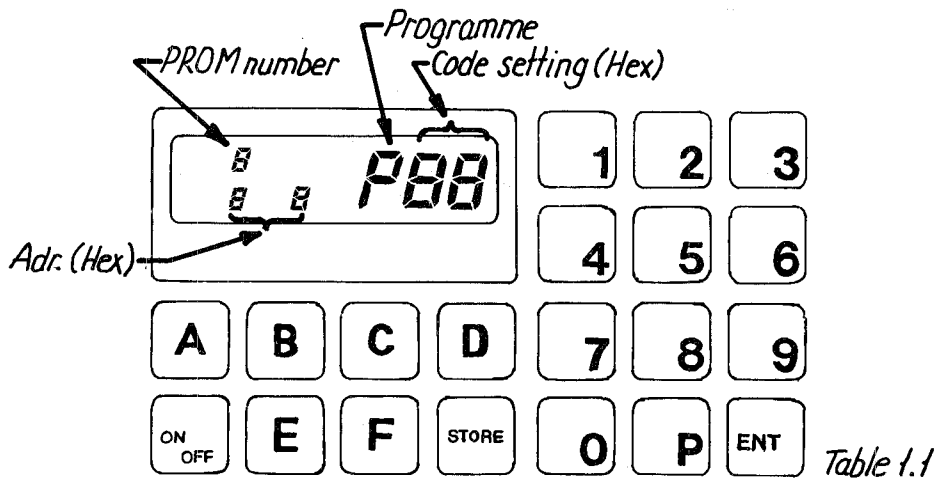


Table 1.1

2.0.2. HEXADECIMAL PROGRAMMING

In service mode all addresses and codes to be programmed are in hexadecimal notation.

2.0.2.1. CONVERSION FROM BINARY TO HEXADECIMAL NOTATION

Binary bit number: 7 6 5 4 (Group M) 3 2 1 0 (Group L)

Split up the 8 bits into 2 groups of 4 bits each as shown. Then convert each group according to the following table.

Dec.	Hex.	Bin.
0	0	0000
1	1	0001
2	2	0010
3	3	0011
4	4	0100
5	5	0101
6	6	0110
7	7	0111
8	8	1000
9	9	1001
10	A	1010
11	B	1011
12	C	1100
13	D	1101
14	E	1110
15	F	1111

Fig. 2.2. Binary to hex.

E.g. bit no. 7 6 5 4 = 1 1 0 0 → C; 3 2 1 0 = 1 0 0 1 → 9

Hexadecimal code: C 9

2.0.2.2. CONVERSION FROM DECIMAL TO HEXADECIMAL NOTATION

Dec.	Hex.
0	00
16	10
32	20
48	30
64	40
80	50
96	60
112	70
128	80
144	90
160	A0
176	B0
192	C0
208	D0
224	E0
240	F0

Fig. 2.3. Decimal to hex(MSB).

Dec.	Hex.
0	0
1	1
2	2
3	3
4	4
5	5
6	6
7	7
8	8
9	9
10	A
11	B
12	C
13	D
14	E
15	F

Fig. 2.4. Decimal to hex (LSB)

Decimal to hex: Find the nearest lower value in fig. 2.3. and the corresponding hex value. Then subtract the decimal value in the table from the actual value, and find the hex value in fig. 2.4. corresponding to the result. Finally add the two hex figures.

E.g. Convert 171.
The nearest lower is 160 = A0
171 - 160 = 11 = B
Result AB
==

Hex to decimal:

E.g. Convert 1A.
Find the decimal value from fig. 2.3. corresponding to 10 = 16
Find the decimal value from fig. 2.4. corresponding to A = 10
Result 26
==

2.1. PROGRAMMING OF PRIVATE CHANNELS

a) Switch the set into service mode as described in section 1.1.

b) Find N(hex) in fig. 2.6.

c) Find the address for the frequency code for private channels in fig. 2.7. or fig. 2.8.

d) Find the service programme to be used.

e) Programme N(hex) at the address. See section 2.0.

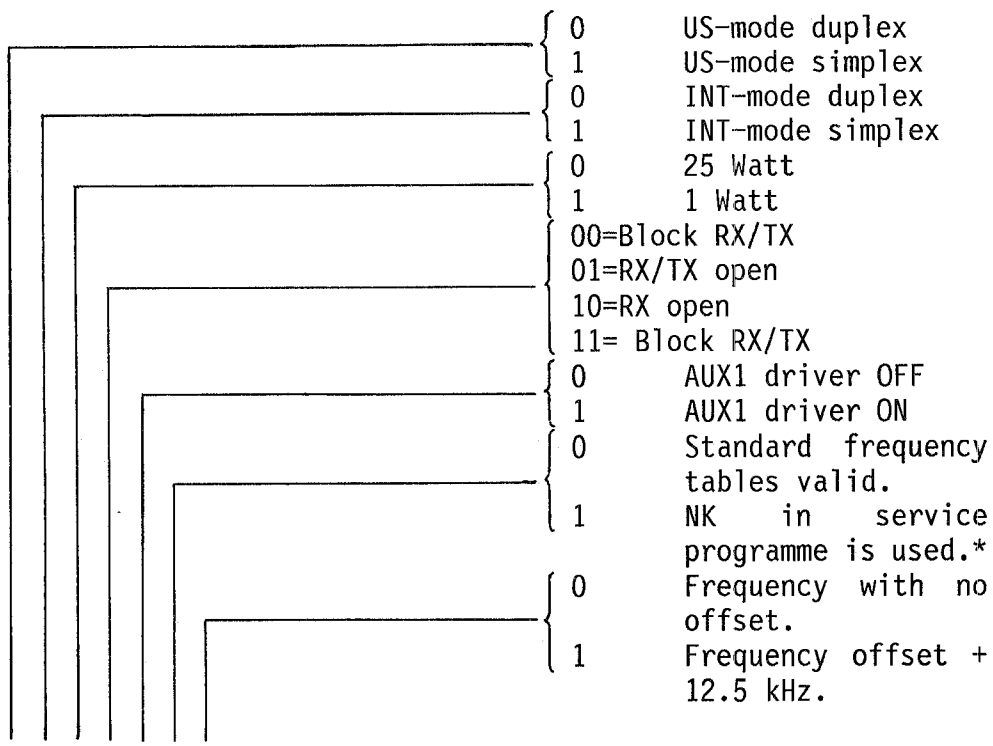
f) Set up the function code by means of fig. 2.5. and convert it to hex by means of fig. 2.2.

g) Find the address for the function code in fig. 2.7. or fig. 2.8.

h) Programme the function code.

HINT: Write down the coding in fig. 2.7. or fig. 2.8.

Fig. 2.5. Function Code.



* See fig. 2.9. addr. 64-48

For special purposes dividing figures can be calculated from the following formulas:

$$F = 156.0 + CH \times 0.050$$

$$N = \left(\frac{F - 16.8}{0.0125} - NK \right) : 2$$

CH = Channel number ($CH_{1-28} = (CH_{1-28})$ $\quad CH_{60-88} = (CH_{60-88} - 59.5)$
F = Transmitting frequency in MHz
NK = Constant for the dividing figure
N = Channel coding in decimal

The internal programme NK(TX) is 11136 (2B80 in hex) for transmitting. There is also a constant for simplex receiving NK(RX), which is 10768 (2A10 in hex). This must always be 368 less than NK(TX) to maintain a duplex distance of 4.6 MHz.

Fig. 2.6. Dividing Figures.

F(TX)	F(RX)	N(hex)	F(TX)	F(RX)	N(hex)
152.800	157.400	80	152.825	157.425	81
152.850	157.450	82	152.875	157.475	83
152.900	157.500	84	152.925	157.525	85
152.950	157.550	86	152.975	157.575	87
153.000	157.600	88	153.025	157.625	89
153.050	157.650	8A	153.075	157.675	8B
153.100	157.700	8C	153.125	157.725	8D
153.150	157.750	8E	153.175	157.775	8F
153.200	157.800	90	153.225	157.825	91
153.250	157.850	92	153.275	157.875	93
153.300	157.900	94	153.325	157.925	95
153.350	157.950	96	153.375	157.975	97
153.400	158.000	98	153.425	158.025	99
153.450	158.050	9A	153.475	158.075	9B
153.500	158.100	9C	153.525	158.125	9D
153.550	158.150	9E	153.575	158.175	9F
153.600	158.200	A0	153.625	158.225	A1
153.650	158.250	A2	153.675	158.275	A3
153.700	158.300	A4	153.725	158.325	A5
153.700	158.350	A6	153.725	158.375	A7
153.800	158.400	A8	153.825	158.425	A9
153.850	158.450	AA	153.875	158.475	AB
153.900	158.500	AC	153.925	158.525	AD
153.950	158.550	AE	153.975	158.575	AF
154.000	158.600	B0	154.025	158.625	B1
154.050	158.650	B2	154.075	158.675	B3
154.100	158.700	B4	154.125	158.725	B5
154.150	158.750	B6	154.175	158.775	B7

F(TX)	F(RX)	N(hex)	F(TX)	F(RX)	N(hex)
154.200	158.800	B8	154.225	158.825	B9
154.250	158.850	BA	154.275	158.875	BB
154.300	158.900	BC	154.325	158.925	BD
154.350	158.950	BE	154.375	158.975	BF
154.400	159.000	C0	154.425	159.025	C1
154.450	159.050	C2	154.475	159.075	C3
154.500	159.100	C4	154.525	159.125	C5
154.550	159.150	C6	154.575	159.175	C7
154.600	159.200	C8	154.625	159.225	C9
154.650	159.250	CA	154.675	159.275	CB
154.700	159.300	CC	154.725	159.325	CD
154.750	159.350	CE	154.775	159.375	CF
154.800	159.400	D0	154.825	159.425	D1
154.850	159.450	D2	154.875	159.475	D3
154.900	159.500	D4	154.925	159.525	D5
154.950	159.550	D6	154.975	159.575	D7
155.000	159.600	D8	155.025	159.625	D9
155.050	159.650	DA	155.075	159.675	DB
155.100	159.700	DC	155.125	159.725	DD
155.150	159.750	DE	155.175	159.775	DF
155.200	159.800	E0	155.225	159.825	E1
155.250	159.850	E2	155.275	159.875	E3
155.300	159.900	E4	155.325	159.925	E5
155.350	159.950	E6	155.375	159.975	E7
155.400	160.000	E8	155.425	160.025	E9
155.450	160.050	EA	155.475	160.075	EB
155.500	160.100	EC	155.525	160.125	ED
155.550	160.150	EE	155.575	160.175	EF
155.600	160.200	F0	155.625	160.225	F1
155.650	160.250	F2	155.675	160.275	F3
155.700	160.300	F4	155.725	160.325	F5
155.750	160.350	F6	155.775	160.375	F7
155.800	160.400	F8	155.825	160.425	F9
155.850	160.450	FA	155.875	160.475	FB
155.900	160.500	FC	155.925	160.525	FD
155.950	160.550	FE	155.975	160.575	FF
156.000	160.600	00	156.025	160.625	01
156.050	160.650	02	156.075	160.675	03
156.100	160.700	04	156.125	160.725	05
156.150	160.750	06	156.175	160.775	07
156.200	160.800	08	156.225	160.825	09
156.250	160.850	0A	156.275	160.875	0B
156.300	160.900	0C	156.325	160.925	0D
156.350	160.950	0E	156.375	160.975	0F
156.400	161.000	10	156.425	161.025	11
156.450	161.050	12	156.475	161.075	13
156.500	161.100	14	156.525	161.125	15
156.550	161.150	16	156.575	161.175	17
156.600	161.200	18	156.625	161.225	19

F(TX)	F(RX)	N(hex)	F(TX)	F(RX)	N(hex)
156.650	161.250	1A	156.675	161.275	1B
156.700	161.300	1C	156.725	161.325	1D
156.750	161.350	1E	156.775	161.375	1F
156.800	161.400	20	156.825	161.425	21
156.850	161.450	22	156.875	161.475	23
156.900	161.500	24	156.925	161.525	25
156.950	161.550	26	156.975	161.575	27
157.000	161.600	28	057.025	161.625	29
157.050	161.650	2A	157.075	161.675	2B
157.100	161.700	2C	157.125	161.725	2d
157.150	161.750	2E	157.175	161.775	2f
157.200	161.800	30	157.225	161.825	31
157.250	161.850	32	157.275	161.875	33
157.300	161.900	34	157.325	161.925	35
157.350	161.950	36	157.375	161.975	37
157.400	162.000	38	157.425	162.025	39
157.450	162.050	3A	157.475	162.075	3B
157.500	162.100	3C	157.525	162.125	3D
157.550	162.150	3E	157.575	162.175	3F
157.600	162.200	40	157.625	162.225	41
157.650	162.250	42	157.675	162.275	43
157.700	162.300	44	157.725	162.325	45
157.750	162.350	46	157.775	162.375	47
157.800	162.400	48	157.825	162.425	49
157.850	162.450	4A	157.875	162.475	4B
157.900	162.500	4C	157.925	162.525	4D
157.950	162.550	4E	157.975	162.575	4F
158.000	162.600	50	158.025	162.625	51
158.050	162.650	52	158.075	162.675	53
158.100	162.700	54	158.125	162.725	55
158.150	162.750	56	158.175	162.775	57
158.200	162.800	58	158.225	162.825	59
158.250	162.850	5A	158.275	162.875	5B
158.300	162.900	5C	158.325	162.925	5D
158.350	162.950	5E	158.375	162.975	5F
158.400	163.000	60	158.425	163.025	61
158.450	163.050	62	158.475	163.075	63
158.500	163.100	64	158.525	163.125	65
158.550	163.150	66	158.575	163.175	67
158.600	163.200	68	158.625	163.225	69
158.650	163.250	6A	158.675	163.275	6B
158.700	163.300	6C	158.725	163.325	6D
158.750	163.350	6E	158.775	163.375	6F
158.800	163.400	70	158.825	163.425	71
158.850	163.450	72	158.875	163.475	73
158.900	163.500	74	158.925	163.525	75
158.950	163.550	76	158.975	163.575	77
159.000	163.600	78	159.025	163.625	79
159.050	163.650	7A	159.075	163.675	7B

F(TX)	F(RX)	N(hex)	F(TX)	F(RX)	N(hex)
159.100	163.700	7C	159.125	163.725	7D
159.150	163.750	7E	159.175	163.775	7F

2.1.1. ADDRESSES OF PRIVATE CHANNELS FROM PO TO P19

Fig. 2.7. Address table for private channels in PROM no. 0:

Select service programme P3:

Private Channel	Addrs.	N(hex)	Addrs.	Function
P 0	3C		3D	
P 1	3E		3F	
P 2	40		41	
P 3	42		42	
P 4	44		45	
P 5	46		47	
P 6	48		49	
P 7	4A		4B	
P 8	4C		4D	
P 9	4E		4F	

Select service programme P4:

Private Channel	Addrs.	N(hex)	Addrs.	Function
P 10	50		51	
P 11	52		53	
P 12	54		55	
P 13	56		57	
P 14	58		59	
P 15	5A		5B	
P 16	5C		5D	
P 17	5E		5F	
P 18	60		61	
P 19	62		63	

2.1.2. ADDRESSES OF PRIVATE CHANNELS FROM P20 TO P67

When private channels from P20 to P67 are to be used, an extra EEPROM IC610 is to be inserted. This PROM is referred to as PROM no. 1.

Note that private channels from P20 to P67 cannot be used if a new function code to the international maritime channels is to be programmed, because these codes use the same locations. These private channels cannot be scanned.

Fig. 2.8. Address table for private channels in PROM no. 1:

Select service programme P6

Private Channels	Addrs.	N(hex)	Addrs.	Function
P 20	00		01	
P 21	02		03	
P 22	04		05	
P 23	06		07	
P 24	08		09	
P 25	0A		0B	
P 26	0C		0D	
P 27	0E		0F	
P 28	10		11	
P 29	12		13	

Select service programme P7:

Private Channel	Addrs.	N(hex)	Addrs.	Function
P 30	14		15	
P 31	16		17	
P 32	18		19	
P 33	1A		1B	
P 34	1C		1D	
P 35	1E		1F	
P 36	20		21	
P 37	22		23	
P 38	24		25	
P 39	26		27	

Select service programme P8:

Private Channel	Addrs.	N(hex)	Addrs.	Function
P 40	28		29	
P 41	2A		2B	
P 42	2C		2D	
P 43	2E		2F	
P 44	30		31	
P 45	32		33	
P 46	34		35	
P 47	36		37	
P 48	38		39	
P 49	3A		3B	

Select service programme P9:

Private Channel	Addrs.	N(hex)	Addrs.	Function
P 50	3C		3D	
P 51	3E		3F	
P 52	40		41	
P 53	42		43	
P 54	44		45	
P 55	46		47	
P 56	48		49	
P 57	4A		4B	
P 58	4C		4D	
P 59	4E		4F	

Select service programme P10:

Private Channel	Addrs.	N(hex)	Addrs.	Function
P 60	50		51	
P 61	52		53	
P 62	54		55	
P 63	56		57	
P 64	58		59	
P 65	5A		5B	
P 66	5C		5D	
P 67	5E		5F	

2.2. PROGRAMMING OF USER SELECTED FUNCTIONS AND NATIONALITY

Fig. 2.9. Service programme P5, locations and contents

Addrs.	Contents:
64	NK(RX) MSB
65	NK(RX) LSB
66	NK(TX) MSB
67	NK(TX) LSB
68	Selcall figure no. 1
69	Selcall figure no. 2
6A	Selcall figure no. 3
6B	Selcall figure no. 4
6C	Selcall figure no. 5
6D	Min. volume level
6E	Selcall volume
6F	Max. transmit time **
70	IDNT 0
71	IDNT 1
72	IDNT 2
73	IDNT 3
74	Preference channel to DW & Scanner
75	Quick channel
76	T-BUS - address **
77	(Checksum no. 0)
	The locations described in paranthesis are used by the uC.

** Max. transmit time.

Transmit time can be programmed from 1-15 minutes in bits 0-3.

Release time can be programmed from 1-15 seconds in bits 4-7.

The function is disabled with 00 programmed.

Transmit time is the max. time it is able to transmit before it automatically stops.

Release time is the time, which has to pass before transmission is possible after an automatic stop.

Release time must not be less than 1 sec. when this timer is enabled.

** Only valid from C1038E (version 6) and C1039D (version 5).

2.2.1. SELCALL NUMBER

Programme one figure in each location starting with the most significant figure as figure no. 1. Do not bother about the extra zero in the display. If there is two identical figures in succession, the latter is to be programmed as an "A".

E.g. The numer 67730 is to be programmed as 67A30.

Note: Remember to enable the selcall afterwards, see fig. 2.10.

2.2.2. MINIMUM VOLUME LEVEL

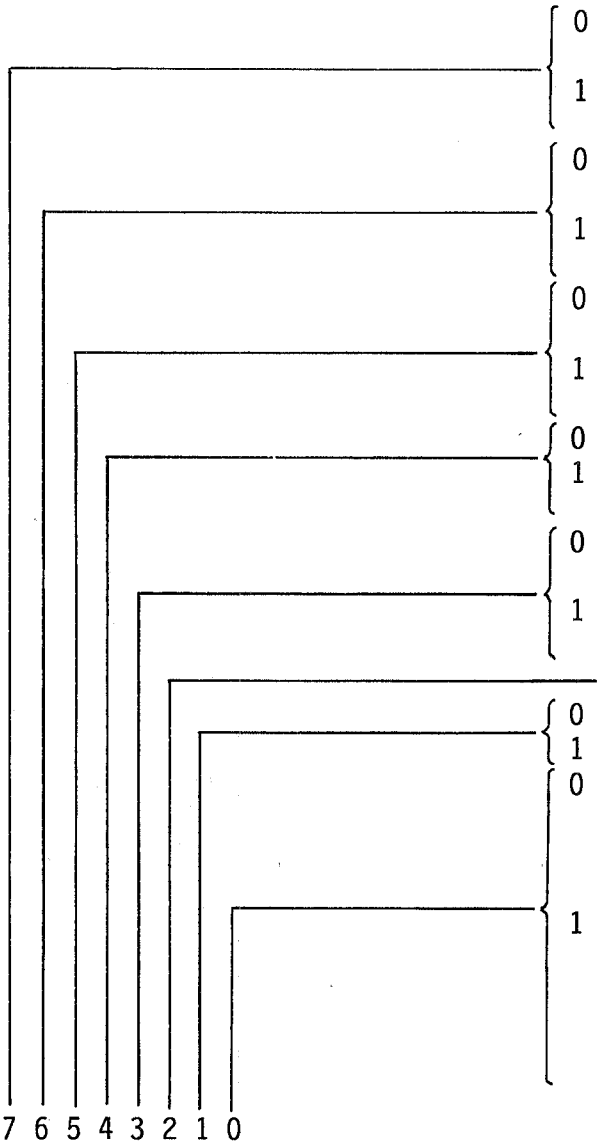
The minimum volume level can be set to any stop from 0 to F. This means that the volume cannot be lower than the level indicated in this address. This is to be used when the authorities do not allow the volume level to go to zero.

2.2.3. SELCALL ALARM VOLUME

The alarm volume can be pre-set to any stop from 0 to F. The setting corresponds to the normal read-out in the display, but has to be programmed in hex.

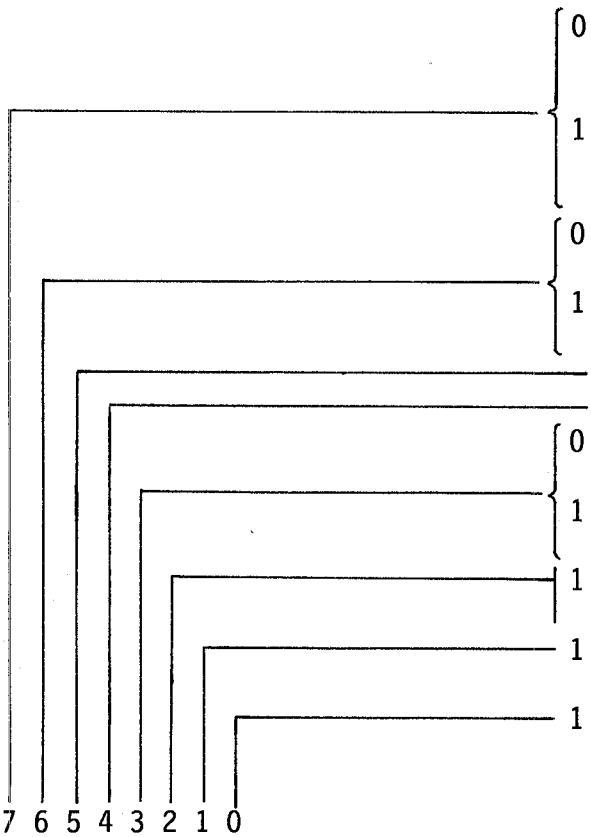
2.2.4. IDENTITY CODES

Fig. 2.10. Identity code no. 0.



** Only valid from C1083E (version 6) and C1039D (version 5).

Fig. 2.11. Identity code no. 1.



Please note that if the relay is to be ON on one of the channels 10, 13 or 16, and the channel is also pref. ch., then it is bit no. 3 that has to be set to "1".

** Only valid from C1038E (version 6) and C1039D (version 5).

Fig. 2.12. Identity code no. 2

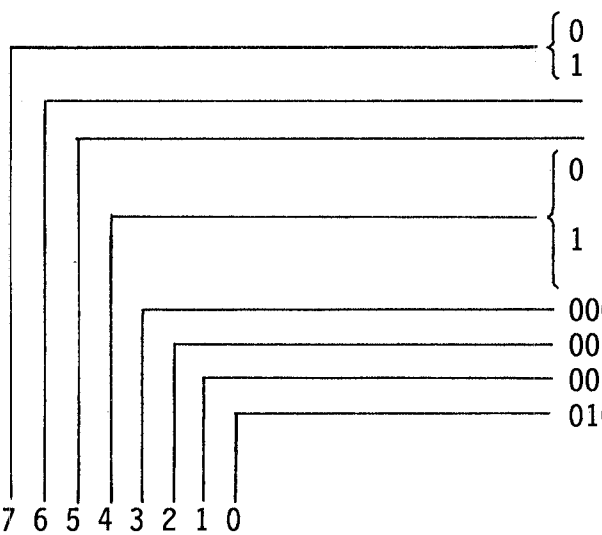
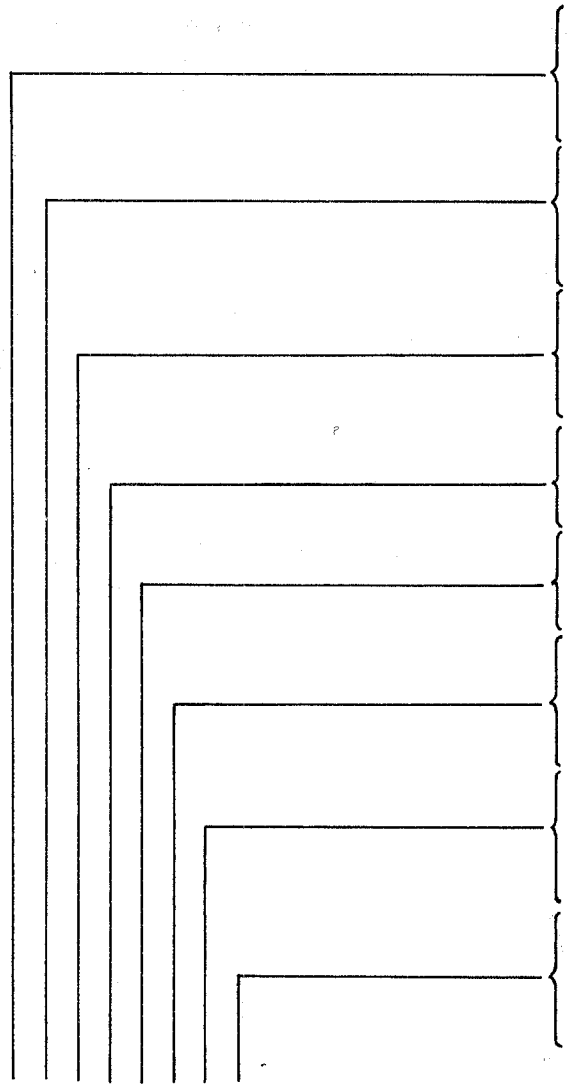


Fig. 2.13 Identity code no. 3.



	0	Pref. ch. incl. in scanning.
	1	No pref. ch. in scanning.
	0	
	1	Only Scan 0 to enabled (Add & Delete enabled).
	0	All scan facilities disabled.
	1	Scan facilities enabled.
	0	Dual watch disabled.
	1	Dual watch enabled.
	0	
	1	Triple watch enabled.
	0	Scan listen time from 1-10 secs.
	1	Scan listen time from 1-99 secs.
	0	
	1	Only Scan 0 enabled (Add & Delete disabled).
	0	DW incl. in scanning.
	1	No DW incl. in scanning.

Bit no. = 7 6 5 4 3 2 1 0

0.0.0...0...0.0.....	Only step of channels with long press on ENT.
0.0.1...0...0.0.....	Normal scanner enabled.
0.0.1...1...1.0.....	Tripple watch. Two channels + 16.
0.0.1...0...1.0.....	Only Scan 0 enabled (Add & Delete disabled).
0.1.1...0...0.0.....	Only Scan 0 enabled (Add and Delete enabled).

2.2.5. PREFERENCE CHANNEL FOR DW AND SCANNER

The preference can be changed to any channel, if this is more important than channel 16. Channel numbers from 0-29 are to be programmed direct in hex. For channel numbers from 60-89, 30 is to be subtracted before converting to hex. Private channels from P0-P19 are to be programmed as a number from 60-89.

2.2.6. QUICK SELECT CHANNEL

This is the channel selected when the push button, normally marked with a red 16, is activated. If another channel is programmed, the push button should be marked accordingly. Channel numbers from 0-29 are be programmed direct in hex. For channel numbers from 60-89, 30 is to be subtracted before converting to hex. Private channels from P0-P29 are to be programmed as a number from 60-89.

2.3. PROGRAMMING OF A NEW FUNCTION CODE FOR THE INTERNATIONAL CHANNELS

If a new function code for the international channel numers is needed it can be programmed in PROM no. 1, and enabled by a bit in identity code no. 0 (please see fig. 2.10.). If this is done, private channels from P20-P67 cannot be used.

In fig. 2.14 - 2.16. the internal programmed data is given at the location where the new function code is to be programmed. For the channels to be changed, find the new function code by means of fig. 2.6., and then programme the entire table into the PROM.

Fig. 2.14. Function code in ext. PROM. Use service programme P6.

Addrs.	Data	Channel number
00	00	CH00
01	88	CH01
02	08	CH02
03	08	CH03
04	08	CH04
05	88	CH05
06	C8	CH06
07	88	CH07
08	C8	CH08
09	C8	CH09
0A	C8	CH10
0B	C8	CH11
0C	C8	Ch12
0D	C8	CH13
0E	C8	CH14
0F	C8	CH15
10	C8	CH16
11	C8	CH17
12	88	CH18
13	88	CH19

Fig. 2.15. Function code in ext. PROM. Use service programme P7.

Addrs.	Data	Channel number
14	08	CH20
15	88	CH21
16	88	CH22
17	88	CH23
18	08	CH24
19	08	CH25
1A	08	CH26
1B	08	CH27
1C	08	CH28
1D	08	CH29
1E	08	CH60
1F	08	CH61
20	08	CH62
21	88	Ch63
22	08	CH64
23	88	CH65
24	88	CH66
25	C8	CH67
26	C8	CH68
27	C8	CH69

Fig. 2.16. Function code in ext. PROM. Use service programme P8.

Addrs.	Data	Channel number
28	C8	CH70
29	C8	CH71
2A	C8	CH72
2B	C8	Ch73
2C	C8	CH74
2D	00	CH75
2E	00	CH76
2F	C8	CH77
30	88	CH78
31	88	CH79
32	88	CH80
33	88	CH81
34	88	CH82
35	88	CH83
36	08	CH84
37	08	CH85
38	08	CH86
39	08	CH87
3A	88	CH88
3B	00	CH89

K-OPTION

If pin no. 28 on IC709 is pulled to ground, a radio programme to inland mode will switch into INT-mode.

If a function code in the PFOM is used, the radio will use the function code from the addresses given in fig. B.1. - B.3. The function code must be programmed by the user.

Fig. B.1. Function code in ex. PROM. Use service programme P9.

Addrs.	Data	Channel number
3C	00	CH00
3D	88	CH01
3E	08	CH02
3F	08	CH03
40	08	CH04
41	88	CH05
42	C8	CH06
43	88	CH07
44	C8	CH08
45	C8	CH09
46	C8	CH10
47	C8	CH11
48	C8	Ch12
49	C8	CH13
4A	C8	CH14
4B	C8	CH15
4C	C8	CH16
4D	C8	CH17
4E	88	CH18
4F	88	CH19

Fig. B.2. Function code in ext. PROM. Use service programme P10.

Addrs.	Data	Channel number
50	08	CH20
51	88	CH21
52	88	CH22
53	88	CH23
54	08	CH24
55	08	CH25
56	08	CH26
57	08	CH27
58	08	CH28
59	08	CH29
5A	08	CH60
5B	08	CH61
5C	08	CH62
5D	88	Ch63
5E	08	CH64
5F	88	CH65
60	88	CH66
61	C8	CH67
62	C8	CH68
63	C8	CH69

Fig. B.3. Function code in ext. PROM. Use service programme P11.

Addrs.	Data	Channel number
64	C8	CH70
65	C8	CH71
66	C8	CH72
67	C8	Ch73
68	C8	CH74
69	00	CH75
6A	00	CH76
6B	C8	CH77
6C	88	CH78
6D	88	CH79
6E	88	CH80
6F	88	CH81
70	88	CH82
71	88	CH83
72	08	CH84
73	08	CH85
74	08	CH86
75	08	CH87
76	88	CH88
77	00	CH89

Fig. 2.17. Standard programming of PROM no. 0.

Addrs.	Contents	Description
0	FF	Scan 0 . 01234567
1	FF	Scan 0 . 89 etc.
2	FF	Scan 0 .
3	FF	Scan 0 .
4	FF	Scan 0 .
5	FF	Scan 0 .
6	FF	Scan 0 .
7	FF	Scan 0 .
8	FF	Scan 0 .
9	FF	Scan 0 .
A	00	Scan 1 .
B	00	Scan 1 .
C	00	Scan 1 .
D	00	Scan 1 .
E	00	Scan 1 .
F	00	Scan 1 .
10	00	Scan 1 .
11	00	Scan 1 .
12	00	Scan 1 .
13	00	Scan 1 .
14	00	Scan 2 .
15	00	Scan 2 .
16	00	Scan 2 .
17	00	Scan 2 .
18	00	Scan 2 .
19	00	Scan 2 .
1A	00	Scan 2 .
1B	00	Scan 2 .
1C	00	Scan 2 .
1D	00	Scan 2 .
1E	00	Scan 3 .
1F	00	Scan 3 .
20	00	Scan 3 .
21	00	Scan 3 .
22	00	Scan 3 .
23	00	Scan 3 .
24	00	Scan 3 .
25	00	Scan 3 .
26	00	Scan 3 .
27	00	Scan 3 .
28	00	Scan 4 .
29	00	Scan 4 .

Addrs.	Contents	Description
2A	00	Scan 4 .
2B	00	Scan 4 .
2C	00	Scan 4 .
2D	00	Scan 4 .
2E	00	Scan 4 .
2F	00	Scan 4 .
30	00	Scan 4 .
31	00	Scan 4 .
32	00	Scan 5 .
33	00	Scan 5 .
34	00	Scan 5 .
35	00	Scan 5 .
36	00	Scan 5 .
37	00	Scan 5 .
38	00	Scan 5 .
39	00	Scan 5 .
3A	00	Scan 5 .
3B	00	Scan 5 .
3C	00	PO N
3D	00	PO FUNC
3E	00	P1 N
3F	00	P1 FUNC
40	00	P2
41	00	P2
42	00	P3
43	00	P3
44	00	P4
45	00	P4
46	00	P5
47	00	P5
48	00	P6
49	00	P6
4A	00	P7
4B	00	P7
4C	00	P8
4D	00	P8
4E	00	P9
4F	00	P9
50	00	P10
51	00	P10
52	00	P11
53	00	P11
54	00	P12
55	00	P12
56	00	P13
57	00	P13
58	00	P14
59	00	P14
5A	00	P15

Addrs.	Contents	Description
5B	00	P15
5C	00	P16
5D	00	P16
5E	00	P17
5F	00	P17
60	00	P18
61	00	P18
62	00	P19
63	00	P19
64	FF	NK(RX) MSB
65	FF	NK(RX) LSB
66	FF	NK(RX) MSB
67	FF	NK(RX) LSB
68	07	Selcall figure no. 1
69	02	Selcall figure no. 2
6A	03	Selcall figure no. 3
6B	08	Selcall figure no. 4
6C	09	Selcall figure no. 5
6D	00	Min. volume level
6E	0A	Selcall volume
6F	00	Max. transmit time **
70	08	IDNT 0
71	08	IDNT 1
72	00	IDNT 2
73	34	IDNT 3
74	10	Preference channel to DW & Scanner
75	10	Quick channel
76	00	T-BUS - address **
77	00	(Checksum no. 0)

** Only with C1038E (version 6) and C1039D (version 5) or higher.

3. TEST PROGRAMMES FOR RT2047

The test programmes are activated as described in section 1.1. Operation Procedure for Service Mode. The read-out for the test programmes will either be as described under the appropriate section or two bars.

To select another programme, just key-in a new P-code. Notice that the set can only be switched off with a long push when it is in service mode.

3.1. CHECK OF CONNECTIONS TO RX-SYNTHESIZER

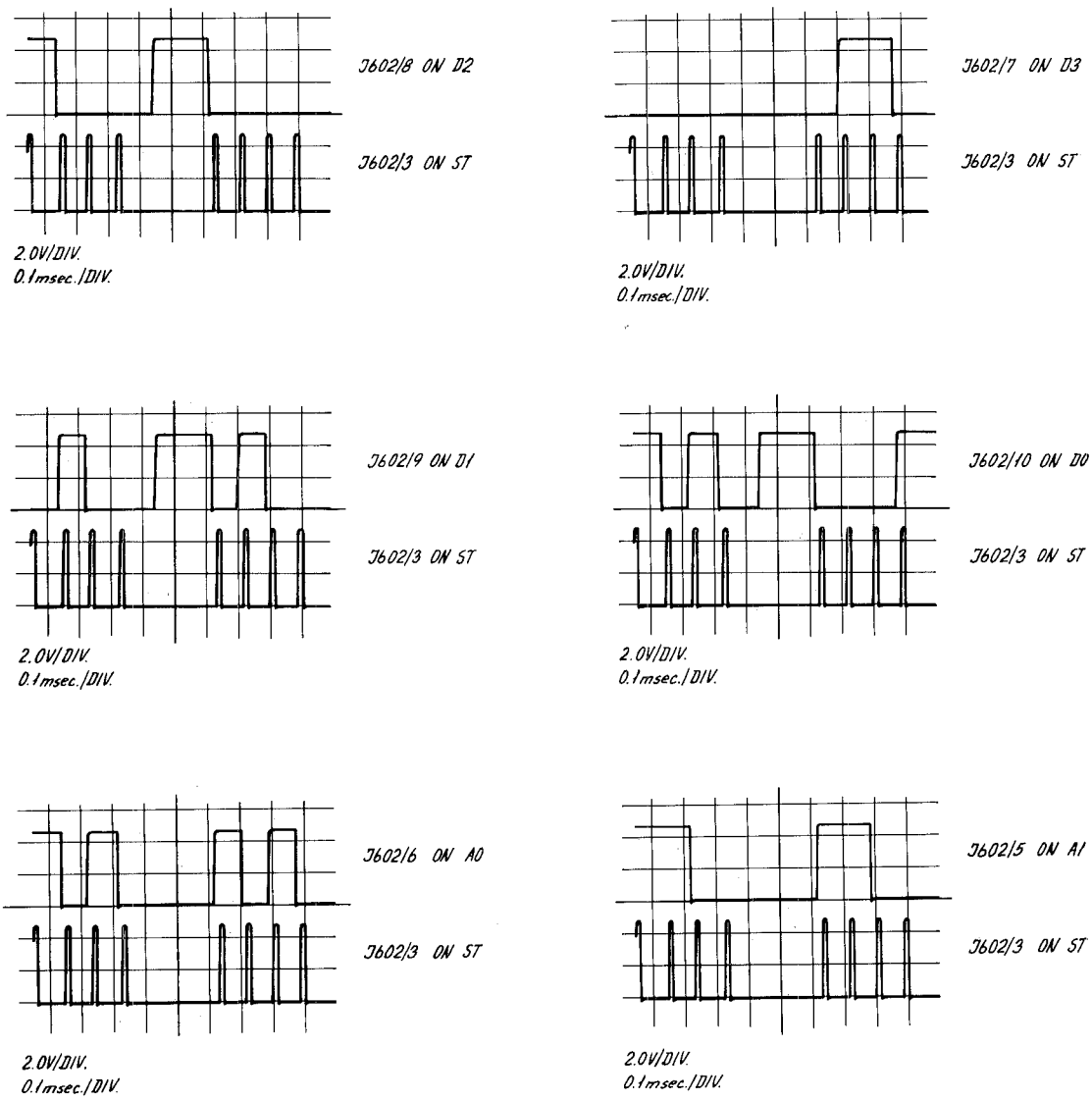
With this programme the connections between the uC and the RX-synthesizer can be checked.

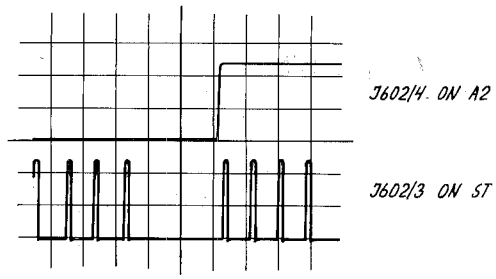
a) Select Service Programme P12. The uC IC619 initiates and loads the RX-synthesizer with channel 16 continuously.

b) Check fig. 3.1. by means of an oscilloscope. Use the strobe ST on J603/3 as trigger.

c) If all the voltages are good and the receiving or transmitting frequencies are still wrong, then there is a fault in the synthesizer circuit.

Fig. 3.1. Connections to the synthesizer.





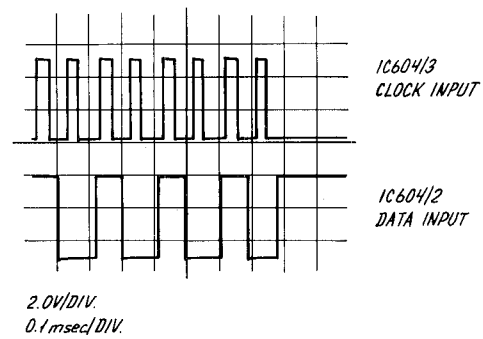
3.2. CHECK OF LATCHES TO SQUELCH AND VOLUME

The purpose is to verify the connections between the latch and the uC, as well as the function of the latch.

a) Select Service Programme P13. The uC IC619 writes continuously the hex codes 55 and AA into the latch IC604, so that the outputs of the latch should be toggling.

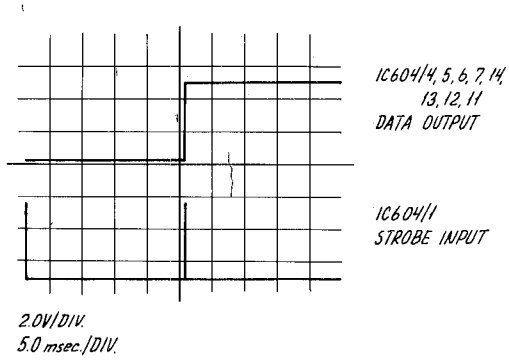
b) Check fig. 3.2. by means of an oscilloscope. Use the data input on IC604 pin 2 as trigger.

Fig. 3.2. Clock and data to latch.



c) Check fig. 3.3. by means of an oscilloscope. Use the strobe input on IC604 pin 1 as trigger.

Fig. 3.3. Latch outputs.



3.3. STEP RESPONSE OF RX-SYNTHESIZER

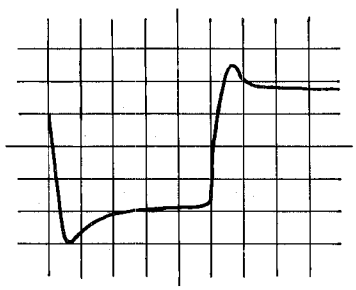
If this test is OK, then there is no fault in the RX-SYNTHESIZER.

a) Select service programme P14.

b) Connect an oscilloscope between L205 and L207.

c) Check fig. 3.4.

Fig. 3.4. Step response in RX-SYNTHESIZER.



3.4. STEP RESPONSE OF TX-SYNTHESIZER

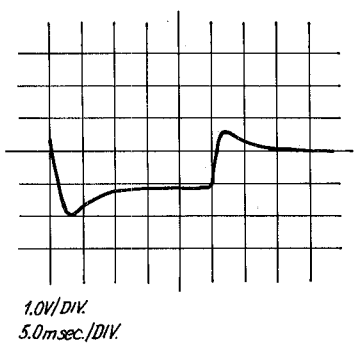
If this test is OK, then there is no fault in the TX-SYNTHESIZER.

a) Select service programme P15.

b) Connect an oscilloscope between L311 and R344.

c) Check fig. 3.5.

Fig. 3.5. Step response in TX-SYNTHESIZER.



3.5. TURN ALL PORTS ON IC619 TO INPUT MODE

Every pin goes into its high impedance state, so they can be checked for short-circuits. This programme has the same effect as pulling the re-set pin to ground.

a) Short-circuit the contact in the ON/OFF relay.

b) Select service programme P16.

c) When finished, switch off the set by means of a long push.

3.6. WRITE/READ TEST OF PROM NO. 0 (IC609)

Important: The contents of the EEPROM will be destroyed.

a) Select service programme P17. The EEPROM goes through a write/read test.

b) Wait for one of the following answers in the display:
"A0" for no fault. "E0" for a fault.
(as long as the test goes on there are two bars in the display).

1) If no fault is encountered, the EEPROM will be filled with FF in all locations.

2) If there is a fault, the uC will continue to test the location where the fault was found. This gives the possibility to check the clock, data and AD/DA wires.

3.6.1. RECOMMENDED USE OF P17

a) Use service programme P13 for checking the clock and data lines to both IC609 and 610. This is possible as these lines are shared with the latch IC604.

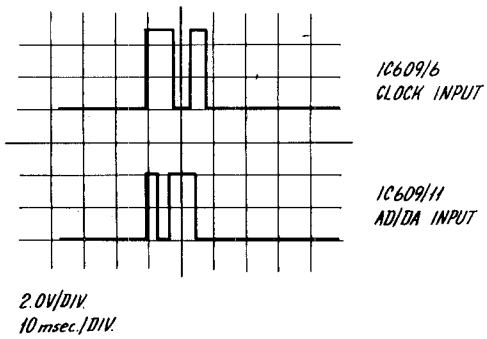
b) Check that the AD/DA line is high (higher than 2.4V).

c) Remove the EEPROMS.

d) Select service programme P17.

e) Check fig. 3.6. by means of an oscilloscope. Use the AD/DA input on IC609 pin 11 as trigger. In doing this you also check the AD/DA line.

Fig. 3.6. AD/DA and clock.



f) Adjust the Vpp voltage, as described in adjustment procedure.

g) Use service programme P18 to make a copy of the old EEPROM no. 0. If this is not possible, insert a new device as PROM no. 0 and programme it as described in sec. 2, and go to j).

h) Insert the old EEPROM in socket no. 0 and select service programme P17.

i) If a fault is still encountered, then it is a bad device and it must be replaced with the copy. If there is no fault, copy back the contents.

j) Check that the contents is OK.

3.7. COPY OF PROM NO. 1 (IC610) TO PROM NO. 0 (IC609)

This programme copies the contents of PROM no. 1 into PROM no. 0. After the copy has been made, the uC compares the contents of the two PROMS.

a) Insert the PROM which you want to copy in socket no. 1, and the other one in socket no. 0.

b) Select service programme P18.

c) Wait for one of the following ansers in the display:
"AO" for a successful copy.
"EO" if there is a fault.
(as long as the copying goes on there are two bars in the display).

3.8. SELCALL TEST TONE

By means of this programme it is possible to adjust the selcall filter.

NOTE: It is not necessary to change your programmed selcall number.

a) Select service programme P19. Tone no. 7 will be generated in the loudspeaker (set the volume to step 10).

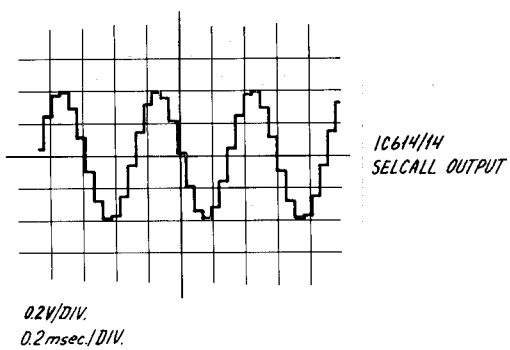
b) Connect a wire from the loudspeaker terminal to the point between C620 and R652.

c) Connect an oscilloscope to pin 14 of IC614.

d) Check fig. 3.7.

e) Adjust potentiometer R663 to max. output on the oscilloscope.

Fig. 3.7. Output of selcall filter.



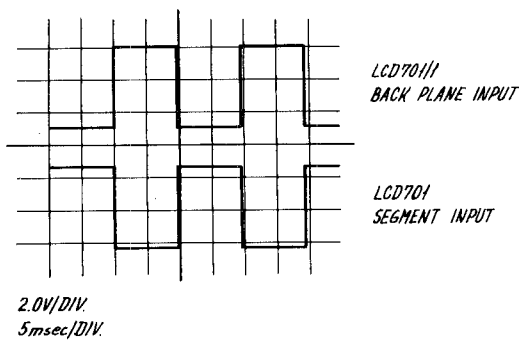
3.9. TEST OF DISPLAY

The display will show all the figures and letters.

a) Select service programme P50.

b) Check fig. 3.8. by means of an oscilloscope. Use the backplane input on LCD701 pin no. 1 for trigging of the oscilloscope.

Fig. 3.8. Display inputs.



3.10. TEST OF THE COMMUNICATION BETWEEN MICROPROCESSORS IC619 AND IC709

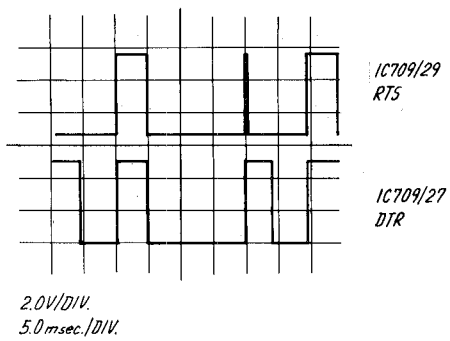
IC709 sends a character to IC619, which transmits the same character back to IC709. IC709 compares the transmitted character with the received character, and if they are identical the read-out will show "A1". If "A1" does not appear in the display, then follow the check list below. Follow the signals from one uC to the other. If the signals arrive correctly, and the uC does not respond correctly to the signal given by the next point, then the fault is in this uC (please see section 3.12. - 3.13.).

a) Check that the operating conditions for both uCs are established.

b) Select service programme P51.

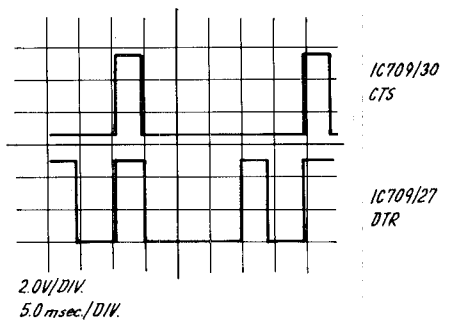
c) Check the DTR and RTS-lines. Use IC709 pin 27 output for trigging of the oscilloscope (if RTS is identical to DTR then there may be a fault on the CTS-line).

Fig. 3.9. RTS and DTR lines



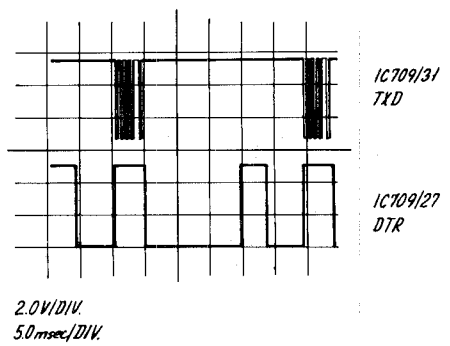
d) Check the CTS-line. Use IC709 pin 27 output for trigging of the oscilloscope.

Fig. 3.10. CTS-line.



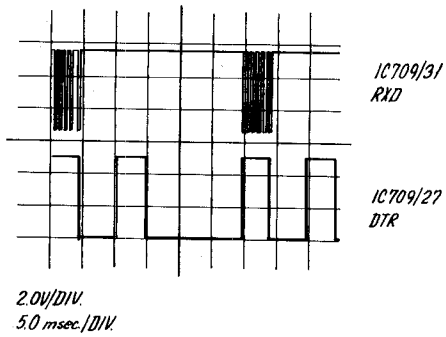
e) Check the TXD-line. Use IC709 pin 27 output for trigging of the oscilloscope.

Fig. 3.11. TXD-line.



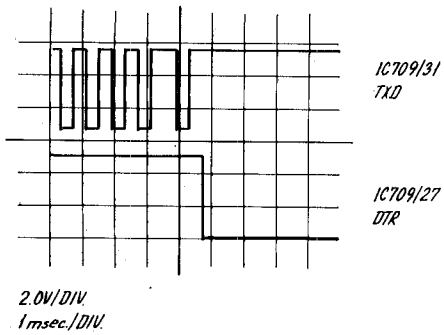
f) Check the RXD-line. Use IC709 pin 27 output for trigging of the oscilloscope.

Fig. 3.12. RXD-line.



g) Check the character. Use IC709 pin 27 output for trigging of the oscilloscope.

Fig. 3.13.



3.11. TEST OF KEYBOARD

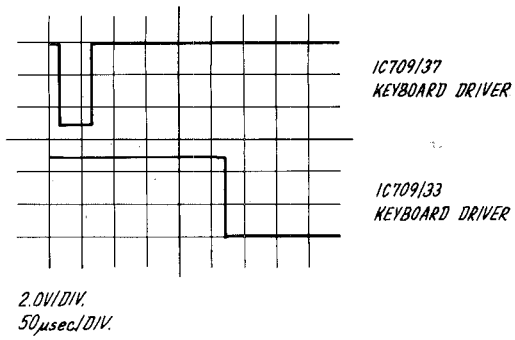
This test requires no service programme.

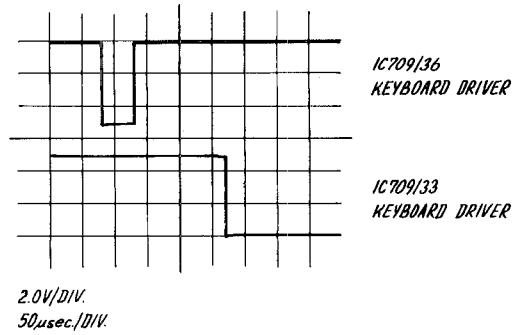
a) Check fig. 3.14. by means of an oscilloscope. Use IC709 pin 33 output for trigging of the oscilloscope.

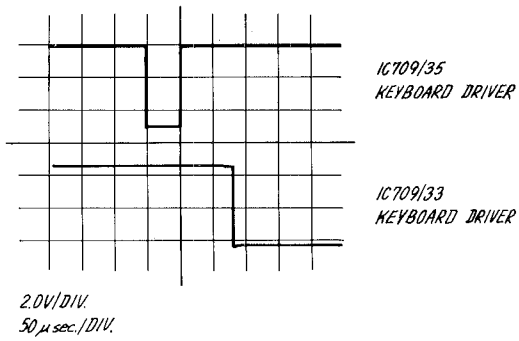
b) All the inputs on IC709 pins 9, 10, 11, 12 must be high.

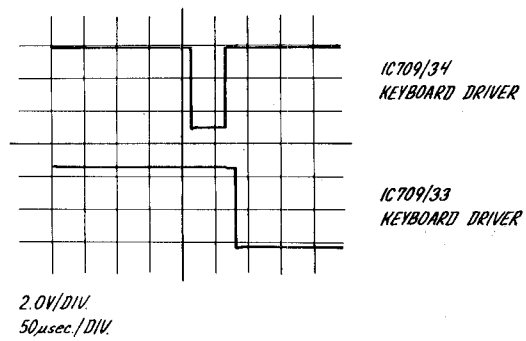
c) If a push button is activated, both the PA-line and the PC-line connected to this push button must be low until the push button is released again.

Fig. 3.14. Keyboard inputs.









3.12. NORMAL OPERATING CONDITIONS FOR IC619

Pin 1: Vss: 0V.

Pin 2: RESET: Higher than 4.75V.

Pin 3: INT: 5V.

Pin 4: Vcc: 5V.

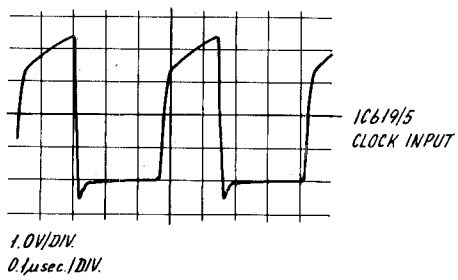
Pin 5: EXTAL: Frequency = 2.1 MHz +/- 20 Hz.
See fig. 3.15.

Pin 6: XTAL: 0V.

Pin 7: NUM: 0V. (If the uC is a MOTOROLA UV-device, then it must be 5V).

Pin 8: TIMER: 5V.

Fig. 3.15. IC619 clock.



3.13. NORMAL OPERATING CONDITIONS FOR IC709

Pin 1: Vss: 0V.

Pin 2: RESET: Higher than 4.75V.

Pin 3: INT: 0V.

Pin 4: Vcc: 5V.

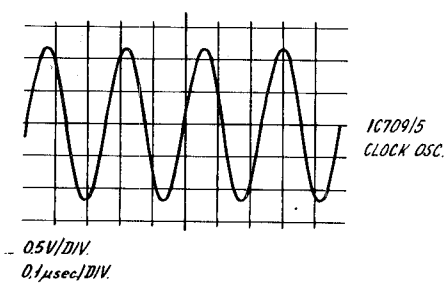
Pin 5: EXTAL: Frequency = 4.0 Mhz +/- 0.1 MHz.
See fig. 3.16.

Pin 6: XTAL: Frequency = 4.0 MHz +/- 0.1 MHz.
As fig. 3.16., but the level is lower.

Pin 7: NUM: 0V. (If the uC is a MOTOROLA UV-device, then it must be 5V).

Pin 8: TIMER: 5V.

Fig. 3.16. IC709 clock.



4. FAULT FINDING

4.1. KEYBOARD AND/OR DISPLAY DOES NOT WORK

1. Check normal operating conditions for IC709. Please see section 3.13.
2. Check keyboard. Please see section 3.11.
3. Check display. Please see section 3.9.
4. Check communication line to IC619. Please see section 3.10.

4.2. THE SET ALWAYS STARTS WITH CHANNEL 16

1. Check EEPROM no. 0. Please see section 3.6.

4.3. THE SET ALWAYS STARTS WITH "E0" IN THE DISPLAY

1. Check EEPROM no. 0. Please see section 3.6.

If a new EEPROM has been mounted, service programme P5 has to be used to set up the IDNT-codes etc., or the contents of a master device has to be copied into it. Please see section 2.

5. FAULT FINDING WITH THE RE-SET PIN

If the re-set pin is short-circuited to ground, the uC stops and all ports will be turned into input mode. (High impedance level). When the short-circuit is opened again the uC will start again. If this is done with IC619, then remember to short-circuit the ON/OFF RELAY contact, or else the set will switch off. While the re-set pin is grounded it is possible to force the pins connected to an input terminal high and low by means of a resistor that is connected to ground or 5V. This technique is of value when you are to determine whether the line is short-circuited to another terminal.

TEST PROGRAMMES

The following test programmes are only for versions from C1038E (version 6) and from C1039D (version 5).

Programme EEPROM no. 0 with standard factory set-up

a) Select service programme P20.

b) During programming 2 bars will be shown.

c) When finished the display will show A0 for no faults.

Programme EEPROM no. 1 with standard function code

a) Select service programme P21.

b) During programming 2 bars will be shown.

c) When finished the display will show A0 for no faults.

Test timer IC619

a) Select service programme P22.

b) Wait for one of the following answers:
A3 for OK.
E3 for fault.

Test RAM IC619

a) Select service programme P23.

b) During testing 2 bars will be shown.

c) When finished the display will be blanc and another test programme can be chosen. If any faults the computer will "hang" and the set can only be switched off by a long push on ON/OFF or by removing the power supply.

Test ROM IC619

a) Select service programme P24.

b) When you have finished and the test was OK, the version number will be displayed, C1038E (version 6).

Test programmes P52 - P55 serve the DSC options.

Test timer IC709

a) Select service programme P56.

b) Wait for one of the following answers:
A3 for OK.
E3 for fault.

Test RAM IC709

a) Select service programme P57.

b) When finished the display will be blank and another test programme can be chosen. If any faults the computer will "hang" and the set can only be switched of by a long push on ON/OFF or by removing the power supply.

Test ROM IC709

a) Select service programme P58.

b) When finished and the test was OK, the version number will be displayed, C1039 (version 5).