NOKIA
TELECOMMUNICATIONS

RD40
S11G

Regionet
Traxys

DC47023

Servicemanual

RD40

S11G

REGIONET
TRAXYS

DC47023

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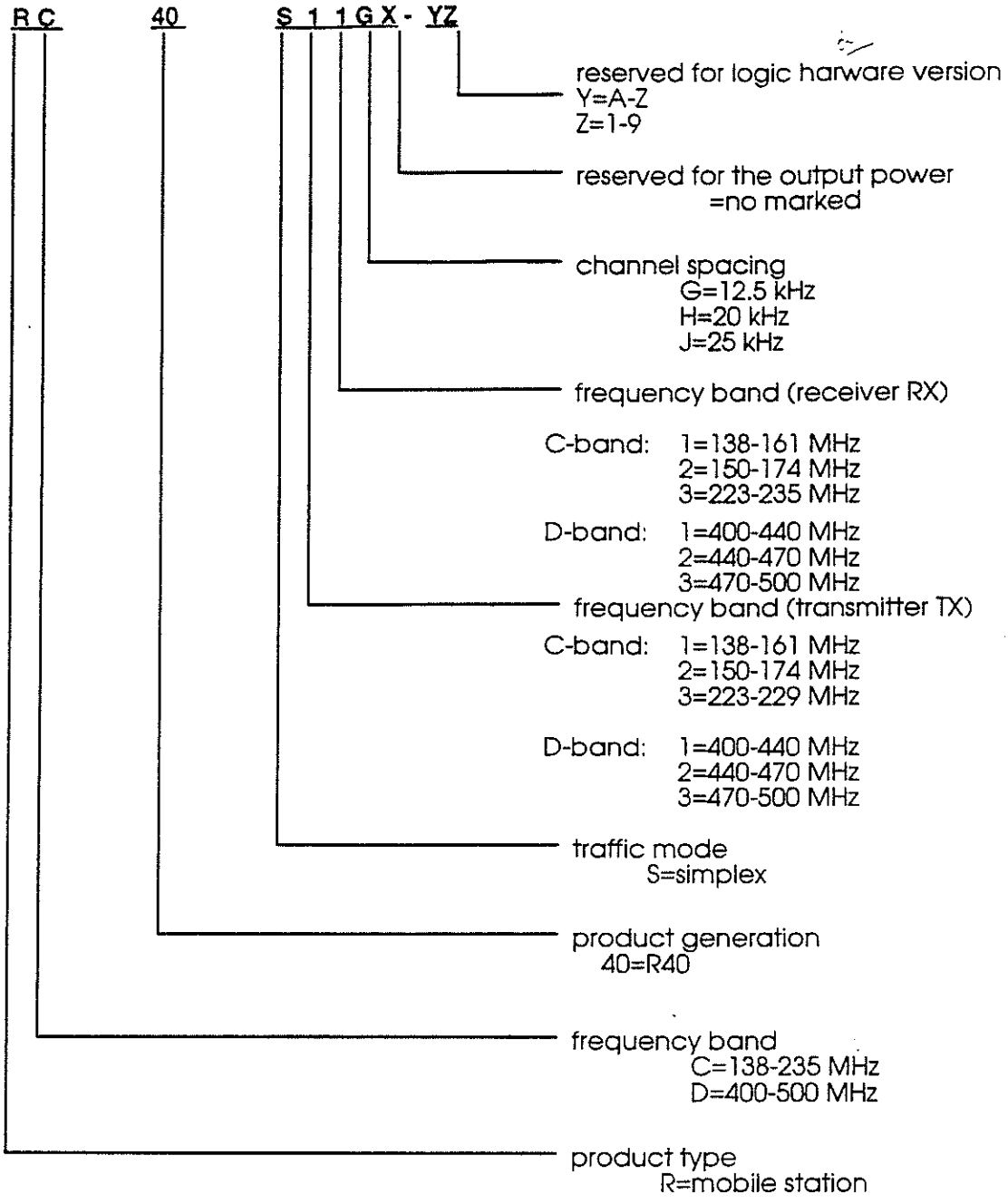
INTRODUCTION

This NOKIA Service Manual is a comprehensive guide to the operation, programming, maintenance and field repair of the NOKIA R40 trunked mobile radio.

The NOKIA R40 trunked mobile radio is specially designed for use in private and public trunked radio networks. It operates in single and two frequency simplex modes. The available frequency bands are 160 and 450MHz and channel spacing is 12.5kHz or 25kHz.

From time to time during its lifetime the NOKIA R40 will be changed and improved. To cover such changes, amendments and service notes will be issued in the form of replacement and/or additional pages.

THE PRODUCT CODE GUIDE OF NOKIA R 40 MOBILE STATIONS



Document	Prepared	Checked	Approved	Version	
CODEKEY R40	MPe 19.09.94	21.09.94. HK	21.09.94	/ 1.1	6X-8032

ITEM..: 6L 7542 R 40 PRODUCT STRUCTURE Version: 46

ID-code	Partno	Description	Value	Type	Cover	Psqty	Rec.
R1160A1		RC 40 S11G-A1 RADIO UNIT	TX138-150;RX138-161MHz;12	A01		1.00	4001
306503A1		L100A1 LOGIC UNIT	AUDIO & PROCESSOR PART	4.0		1.00	1400
0306510		R161G RF UNIT	ALL RF PARTS	0.2		1.00	1401
0306599		ASSEMBLY PARTS RC 40	CHASSIS	E		1.00	1401
*						0.00	
R1160A3		RC 40 S11G-A3 RADIO UNIT	TX138-150;RX138-161MHz;12	A01		1.00	4001
306503A3		L100A3 LOGIC UNIT	AUDIO & PROCESSOR PART	4.0		1.00	1400
0306510		R161G RF UNIT	ALL RF PARTS	0.2		1.00	1401
0306599		ASSEMBLY PARTS RC 40	CHASSIS	E		1.00	1401
*						0.00	
R1160B1		RC 40 S11G-B1 RADIO UNIT	TX138-150;RX138-161MHz;12	A01		1.00	4001
306503B1		L100B1 LOGIC UNIT	PROCESSOR & AUDIO PART	4.0		1.00	1400
0306510		R161G RF UNIT	ALL RF PARTS	0.2		1.00	1401
0306599		ASSEMBLY PARTS RC 40	CHASSIS	E		1.00	1401
*						0.00	
R1162A1		RC 40 S11J-A1 RADIO UNIT	TX138-150;RX138-161MHz;25	A01		1.00	4001
306503A1		L100A1 LOGIC UNIT	AUDIO & PROCESSOR PART	4.0		1.00	1400
0306528		R161J RF UNIT	ALL RF PARTS	0.2		1.00	1401
0306599		ASSEMBLY PARTS RC 40	CHASSIS	E		0.00	1401
*						0.00	
R1163A1		RC 40 S22G-A1 RADIO UNIT	TX150-174;RX150-174MHz;12	A01		1.00	4001
306503A1		L100A1 LOGIC UNIT	AUDIO & PROCESSOR PART	4.0		1.00	1400
0306535		R162G RF UNIT	ALL RF PARTS	0.2		1.00	1401
0306599		ASSEMBLY PARTS RC 40	CHASSIS	E		1.00	1401
*						0.00	
R1163A2		RC 40 S22G-A2 RADIO UNIT	TX150-174;RX150-174MHz;12	A01		1.00	4001
306503A2		L100A2 LOGIC UNIT	AUDIO & PROCESSOR PART	4.0		1.00	1400
0306535		R162G RF UNIT	ALL RF PARTS	0.2		1.00	1401
0306599		ASSEMBLY PARTS RC 40	CHASSIS	E		1.00	1401
*						0.00	
R1163A3		RC 40 S22G-A3 RADIO UNIT	TX150-174;RX150-174MHz;12	A01		1.00	4001

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ID-code	Partno	Description	Value	Type	Cover	Psqty	Rec.
306503A3		L100A3 LOGIC UNIT	AUDIO & PROCESSOR PART	4.0		1.00	1400
0306535		R162G RF UNIT	ALL RF PARTS	0.2		1.00	1401
0306599		ASSEMBLY PARTS RC 40	CHASSIS	E		1.00	1401
*						0.00	
R1163A4		RC 40 S22G-A4 RADIO UNIT	TX150-174;RX150-174MHz;12	A01		1.00	4001
306503A4		L100A4 LOGIC UNIT	AUDIO & PROCESSOR PART	4.0		1.00	1400
0306535		R162G RF UNIT	ALL RF PARTS	0.2		1.00	1401
0306599		ASSEMBLY PARTS RC 40	CHASSIS	E		1.00	1401
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*						0.00	
R1165A1		RC 40 S22J-A1 RADIO UNIT	TX150-174;RX150-174MHz;25	A01		1.00	4001
306503A1		L100A1 LOGIC UNIT	AUDIO & PROCESSOR PART	4.0		1.00	1400
0306542		R162J RF UNIT	ALL RF PARTS	0.2		1.00	1401
0306599		ASSEMBLY PARTS RC 40	CHASSIS	E		1.00	1401
*						0.00	
R1171A1		RC 40 S21J-A1 RADIO UNIT	TX150-174;RX138-161MHz;25	A01		1.00	4001
306503A1		L100A1 LOGIC UNIT	AUDIO & PROCESSOR PART	4.0		1.00	1400
0307056		R164J RF UNIT	ALL RF PARTS	0.2		1.00	1401
0306599		ASSEMBLY PARTS RC 40	CHASSIS	E		1.00	1401
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R1172A3		RC 40 S33G-A3 RADIO UNIT	TX223-229,RX223-235 MHZ 1	A01		1.00	4001
306503A3		L100A3 LOGIC UNIT	AUDIO & PROCESSOR PART	4.0		1.00	1400
0309261		R220G RF UNIT	ALL RF PARTS	0.2		1.00	1401
0306599		ASSEMBLY PARTS RC 40	CHASSIS	E		1.00	1401
*						0.00	
R1172A4		RC 40 S33G3-A4 RADIO UNIT	TX223-229;RX223-235MHz;12	A01		1.00	4001
306503A4		L100A4 LOGIC UNIT	AUDIO & PROCESSOR PART	4.0		1.00	1400
0309261		R220G RF UNIT	ALL RF PARTS	0.2		1.00	1401
0306599		ASSEMBLY PARTS RC 40	CHASSIS	E		1.00	1401
*						0.00	
R1180A1		RD 40 S11G-A1 RADIO UNIT	TX400-440;RX400-440MHz;12	A01		1.00	4004

ITEM..: 6L 7542 R 40 PRODUCT STRUCTURE Version: 46

ID-code	Partno	Description	Value	Type	Cover	Psqty	Rec.
306503A1		L100A1 LOGIC UNIT	AUDIO & PROCESSOR PART	4.0		1.00	1400
0306559		R451G RF UNIT	ALL RF PARTS	1.0		1.00	1404
0308155		ASSEMBLY PARTS RD 40	CHASSIS	E		1.00	1404
*						0.00	
R1180A3		RD 40 S11G-A3 RADIO UNIT	TX400-440;RX400-440MHz;12	A01		1.00	4004
306503A3		L100A3 LOGIC UNIT	AUDIO & PROCESSOR PART	4.0		1.00	1400
0306559		R451G RF UNIT	ALL RF PARTS	1.0		1.00	1404
0308155		ASSEMBLY PARTS RD 40	CHASSIS	E		1.00	1404
*						0.00	
R1180A4		RD 40 S11G-A4 RADIO UNIT	TX400-440;RX400-440MHz;12	A01		1.00	4004
306503A4		L100A4 LOGIC UNIT	AUDIO & PROCESSOR PART	4.0		1.00	1400
0306559		R451G RF UNIT	ALL RF PARTS	1.0		1.00	1404
0308155		ASSEMBLY PARTS RD 40	CHASSIS	E		1.00	1404
*						0.00	
R1182A1		RD 40 S11J-A1 RADIO UNIT	TX400-440;RX400-440MHz;25	A01		1.00	4004
306503A1		L100A1 LOGIC UNIT	AUDIO & PROCESSOR PART	4.0		1.00	1400
0306567		R451J RF UNIT	ALL RF PARTS	1.0		1.00	1404
0308155		ASSEMBLY PARTS RD 40	CHASSIS	E		1.00	1404
*						0.00	
R1183A1		RD 40 S22G-A1 RADIO UNIT	TX440-470;RX440-470MHz;12	A01		1.00	4004
306503A1		L100A1 LOGIC UNIT	AUDIO & PROCESSOR PART	4.0		1.00	1400
0306574		R452G RF UNIT	ALL RF PARTS	1.0		1.00	1404
0308155		ASSEMBLY PARTS RD 40	CHASSIS	E		1.00	1404
*						0.00	
R1183A3		RD 40 S22G-A3 RADIO UNIT	TX440-470;RX440-470MHz;12	A01		1.00	4004
306503A3		L100A3 LOGIC UNIT	AUDIO & PROCESSOR PART	4.0		1.00	1400
0306574		R452G RF UNIT	ALL RF PARTS	1.0		1.00	1404
0308155		ASSEMBLY PARTS RD 40	CHASSIS	E		1.00	1404
*						0.00	
R1185A1		RD 40 S22J-A1 RADIO UNIT	TX440-470;RX440-470MHz;25	A01		1.00	4004
306503A1		L100A1 LOGIC UNIT	AUDIO & PROCESSOR PART	4.0		1.00	1400

ITEM..: 6L 7542 R 40 PRODUCT STRUCTURE Version: 46

ID-code	Partno	Description	Value	Type	Cover	Psqty	Rec.
0306581		R452J RF UNIT	ALL RF PARTS	1.0		1.00	1404
0308155		ASSEMBLY PARTS RD 40	CHASSIS	E		1.00	1404
*						0.00	
R1185A3		RD 40 S22J-A3 RADIO UNIT	TX440-470;RX440-470MHz:25	A01		1.00	4004
306503A3		L100A3 LOGIC UNIT	AUDIO & PROCESSOR PART	4.0		1.00	1400
0306581		R452J RF UNIT	ALL RF PARTS	1.0		1.00	1404
0308155		ASSEMBLY PARTS RD 40	CHASSIS	E		1.00	1404
*						0.00	
R1186A1		RD 40 S12G-A1 RADIO UNIT	TX400-440;RX440-470MHz;12	A01		1.00	4004
306503A1		L100A1 LOGIC UNIT	AUDIO & PROCESSOR PART	4.0		1.00	1400
0307761		R453G RF UNIT	ALL RF PARTS	1.0		1.00	1404
0308155		ASSEMBLY PARTS RD 40	CHASSIS	E		1.00	1404
*						0.00	
R1186A3		RD 40 S12G-A3 RADIO-UNIT	TX400-440;RX440-470MHz;12	A01		1.00	4004
306503A3		L100A3 LOGIC UNIT	AUDIO & PROCESSOR PART	4.0		1.00	1400
0307761		R453G RF UNIT	ALL RF PARTS	1.0		1.00	1404
0308155		ASSEMBLY PARTS RD 40	CHASSIS	E		1.00	1404
*						0.00	
R1189A1		RD 40 S21G-A1 RADIO UNIT	TX440-470;RX400-440MHz;12	A01		1.00	4004
306503A1		L100A1 LOGIC UNIT	AUDIO & PROCESSOR PART	4.0		1.00	1400
0308691		R454G RF UNIT	ALL RF PARTS	1.0		1.00	1404
0308155		ASSEMBLY PARTS RD 40	CHASSIS	E		1.00	1404
*						0.00	
R1189A3		RD 40 S21G-A3 RADIO UNIT	TX440-470;RX400-440MHz;12	A01		1.00	4004
306503A3		L100A3 LOGIC UNIT	AUDIO & PROCESSOR PART	4.0		1.00	1400
0308691		R454G RF UNIT	ALL RF PARTS	1.0		1.00	1404
0308155		ASSEMBLY PARTS RD 40	CHASSIS	E		1.00	1404
*						0.00	
R1192A3		RD 40 S33G-A3 RADIO UNIT	TX470-500MHz;RX470-500MHz	A01		1.00	4004
306503A3		L100A3 LOGIC UNIT	AUDIO & PROCESSOR PART	4.0		1.00	1400
0309310		R500G RF-UNIT	INCLUDE ALL RF-PARTS	1.0		1.00	1404

ITEM..: 6L 7542 R 40 PRODUCT STRUCTURE Version: 46

ID-code	Partno	Description	Value	Type	Cover	Psqty	Rec.
0308155		ASSEMBLY PARTS RD 40	CHASSIS	E		1.00	1404
*						0.00	
R1192A4		RD 40 S33G-A4 RADIO UNIT	TX470-500;RX470-500MHz;12	A01		1.00	4004
306503A4		L100A4 LOGIC UNIT	AUDIO & PROCESSOR PART	4.0		1.00	1400
0309310		R500G RF-UNIT	INCLUDE ALL RF-PARTS	1.0		1.00	1404
0308155		ASSEMBLY PARTS RD 40	CHASSIS	E		1.00	1404
*						0.00	
4671238		CH 43 AJUSTABLE CU-HOLDER				1.00	9403
*						0.00	
4671258		CU 42M CONTROL UNIT	ALPHANUM. DISPLAY & KEYBO			1.00	9400
0308388		L110M LOGIC UNIT		1.1		1.00	1940
0308405		ASSEMBLY PARTS CU 42M		A		1.00	1940
*						0.00	
4671259		CU 42M PROG CONTROL UNIT	FOR PARAMETRIZATION			1.00	9400
0308395		L110MP LOGIC UNIT		1.1		1.00	1940
0308412		ASSEMBLY PART CU 42M PROG		A		1.00	1940
*						0.00	
4671240		CU 43 CONTROL UNIT	ALPHANUM. DISPLAY & KEYBO			1.00	9400
0308557		L115 LOGIC UNIT		1.2		1.00	1940
0308571		ASSEMBLY PARTS CU 43		A		1.00	1940
*						0.00	
4671239		CU 43 PROG CONTROL UNIT	FOR PARAMETRIZATION			1.00	9400
0308564		L115P LOGIC UNIT		1.2		1.00	1940
0308589		ASSEMBLY PARTS CU 43 PROG		A		1.00	1940
*						0.00	
4671245		CU 45 MICROPH. CONTR UNIT		DMC 594		1.00	9403
4671836		AT 45 ACCESSORIES CU 45				1.00	9403
*						0.00	
4671243		CH 42 CONTROL UNIT HOLDER				1.00	9400
0306655		ASSEMBLY PARTS CH 42				1.00	1940
*						0.00	

ITEM..: 6L 7542 R 40 PRODUCT STRUCTURE Version: 46

ID-code	Partno	Description	Value	Type	Cover	Psqty	Rec.
4671199		CC 40 BLIND SOCKET		A		1.00	506
4671198		CC 41 BLIND SOCKET, CU 45		A		1.00	506
*						0.00	
4671210		VT 58 BALL JOINT				1.00	9503
0303799		ASSEMBLY PARTS VT 58		1		1.00	9400
*						0.00	
4671247		CB 40 CONNECTION BOX				1.00	9400
0306704		L130 LOGIC UNIT		2.0		1.00	1940
0306711		ASSEMBLY PARTS CB 40				1.00	1940
*						0.00	
4671237		CB 40 D DATA CONNECT. BOX				1.00	9400
0308733		L130D LOGIC UNIT		B(2.0)		1.00	1940
0306711		ASSEMBLY PARTS CB 40				1.00	1940
*						0.00	
4671254		HM 40 HAND MICROPHONE		EMC 552-016		1.00	9403
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4671413		HM 40 L HAND MICROPHONE				1.00	9403
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4671255		SP 40 LOUDSPEAKER		S091E01N3901		1.00	9403
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4670935		RTC	REAL TIME CLOCK (OPTIO)			1.00	9400
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4671256		HS 40 HAND SET				1.00	9400
0308701		EA4 EAR AMPLIFIER		1.0		1.00	1940
0308719		HS 40 ASSEMBLY PARTS				1.00	1940
*						0.00	
4671257		HF 40 HANDS FREE SET				1.00	9403
0307384		PTT SWITCH				1.00	9403
5140146		MICROPHONE	64dB 900R 3.5m PLUG 3.5mm	M336E01E0010		1.00	204
*						0.00	
4671501		DM 40 DESKTOP MICROPHONE		MERRY		1.00	9403

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ID-code	Partno	Description	Value	Type	Cover	Psqty	Rec.
4671504		DM 41 DESKTOP MICROPHONE		FOSTER M147E21-435N3	9	1.00	9403
*						0.00	
4671604		VK 58 A ANTENNA CABLE				1.00	9500
0303929		ASSEMBLY PARTS VK 58 A				1.00	1950
*						0.00	
4671620		SC 40 SYSTEM CABLE		TEL-SC40		1.00	9403
0306743		ASSEMBLY PARTS SC 40				1.00	9403
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4671622		SC 42 SYSTEM CABLE		TEL-SC42		1.00	9403
0306768		ASSEMBLY PARTS SC 42				1.00	9403
*						0.00	
4671623		SC 43 SYSTEM CABLE		TEL-SC43		1.00	9403
0306775		ASSEMBLY PARTS SC 43				1.00	9403
*						0.00	
4671643		SC 44 S SYSTEM CABLE		TEL-SC44 S		1.00	9403
4671631		SYSTEM CABLE SC 44		TEL-SC44		1.00	9403
4671632		CC 44 CONNECTION ADAPTER	FOR SC 44			1.00	9403
*						0.00	
4671628		SC 45 SYSTEM CABLE		TEL-SC45		1.00	9403
*						0.00	
4671629		SC 46 SYSTEM CABLE		TEL-SC46		1.00	9403
*						0.00	
4671625		UC 40 SUPPLY WIRES		TEL-UC40		1.00	9403
0306736		ASSEMBLY PARTS UC 40				1.00	9403
*						0.00	
4671627		UC 42 SUPPLY WIRE SET				1.00	9403
0307754		ASSEMBLY PARTS UC 42				1.00	9403
*						0.00	
4671686		TK 40 TEST BOX				1.00	9400
0306895		ASSEMBLY PARTS TK 40				1.00	1940
0307507		L140 LOGIC UNIT		1.0		1.00	1940

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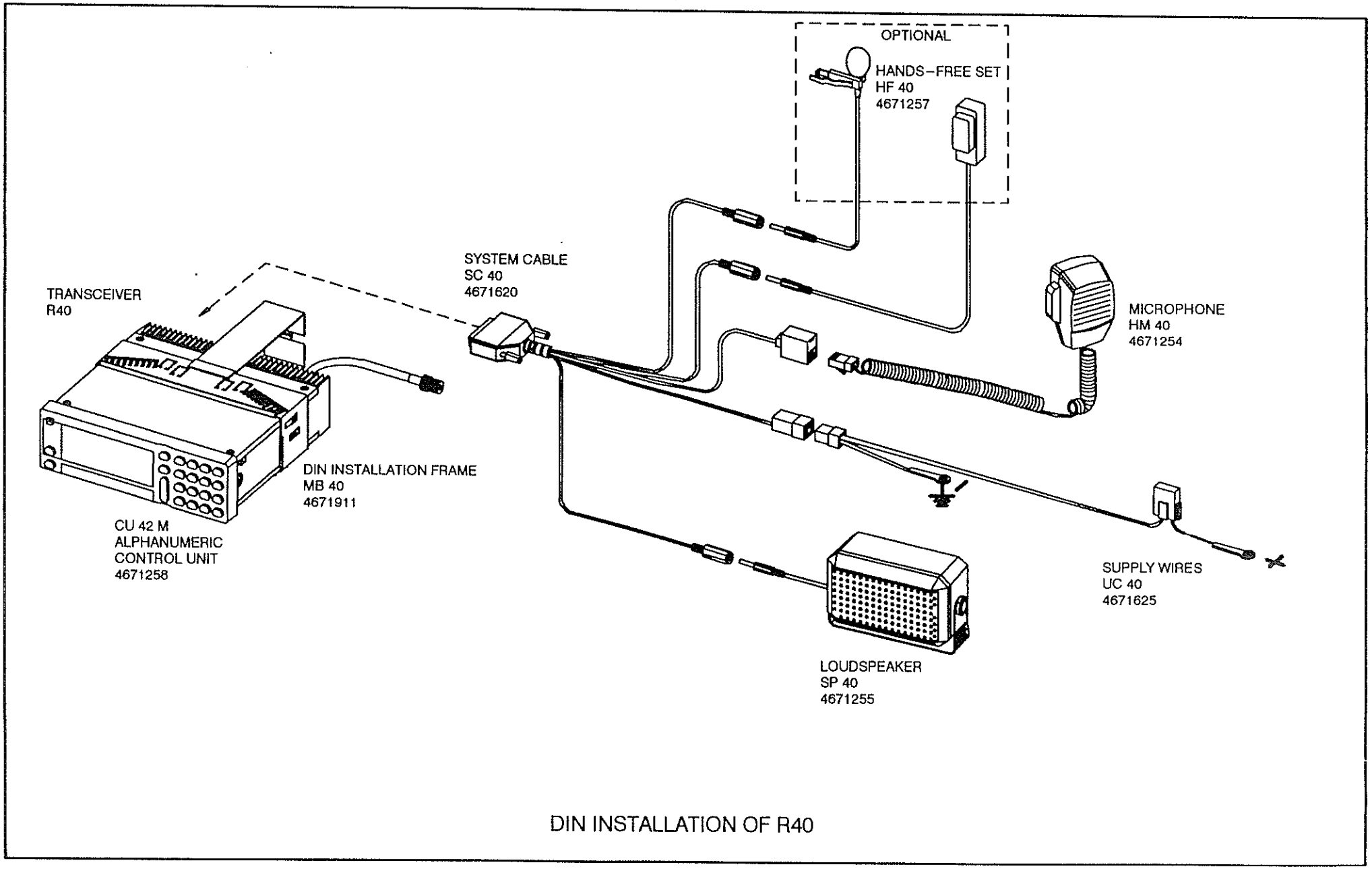
ID-code	Partno	Description	Value	Type	Cover	Psqty	Rec.
0307514		TC 40 TEST BOX CABLES				1.00	9403
*						0.00	
4671834		M 58 MOUNTING ACCESSORIES				1.00	9500
0303911		ASSEMBLY PARTS AT 58				1.00	1950
*						0.00	
4671664		HL 200 DONGLE	200 EYE STANDARD			1.00	9403
*						0.00	
4671710		AMAN R40 AC2	PROGRAM FOR PARAMETRIZATI			1.00	9406
4671711		AMAN R40 MPT DEALER	PROGRAM FOR PARAMETRIZATI			1.00	9406
4671712		AMAN R40 MPT SERVICE	PROGRAM FOR PARAMETRIZATI			1.00	9406
4671713		AMAN R40 TRAXYS DEALER	PROGRAM FOR PARAMETRIZATI			1.00	9406
4671714		AMAN R40 TRAXYS SERVICE	PROGRAM FOR PARAMETRIZATI			1.00	9406
*						0.00	
4671911		MB 40 DIN MOUNT. BRACKET				1.00	9403
0306809		ASSEMBLY PARTS MB 40				1.00	9403
0306817		MOUNTING ACCESSORIES MB40				1.00	9403
*						0.00	
4671912		MB 41 MOUNTING BRACKET	DASH & BOOT			1.00	9403
0306824		ASSEMBLY PARTS MB 41				1.00	9403
*						0.00	
4671914		MB 43	OFFICE MOUNTING BRACKET			1.00	9403
*						0.00	

Structure parts.....: 241 pci



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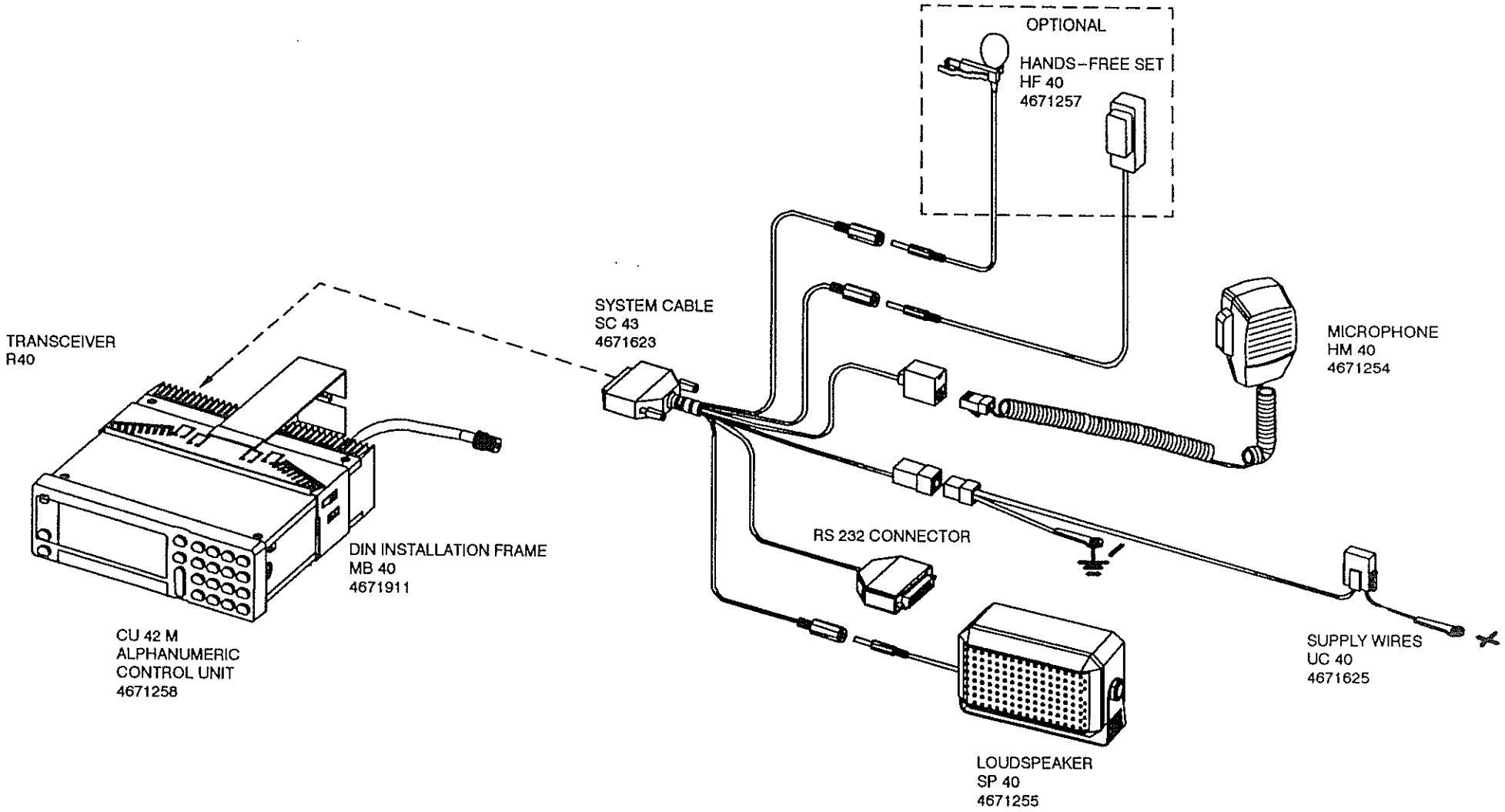

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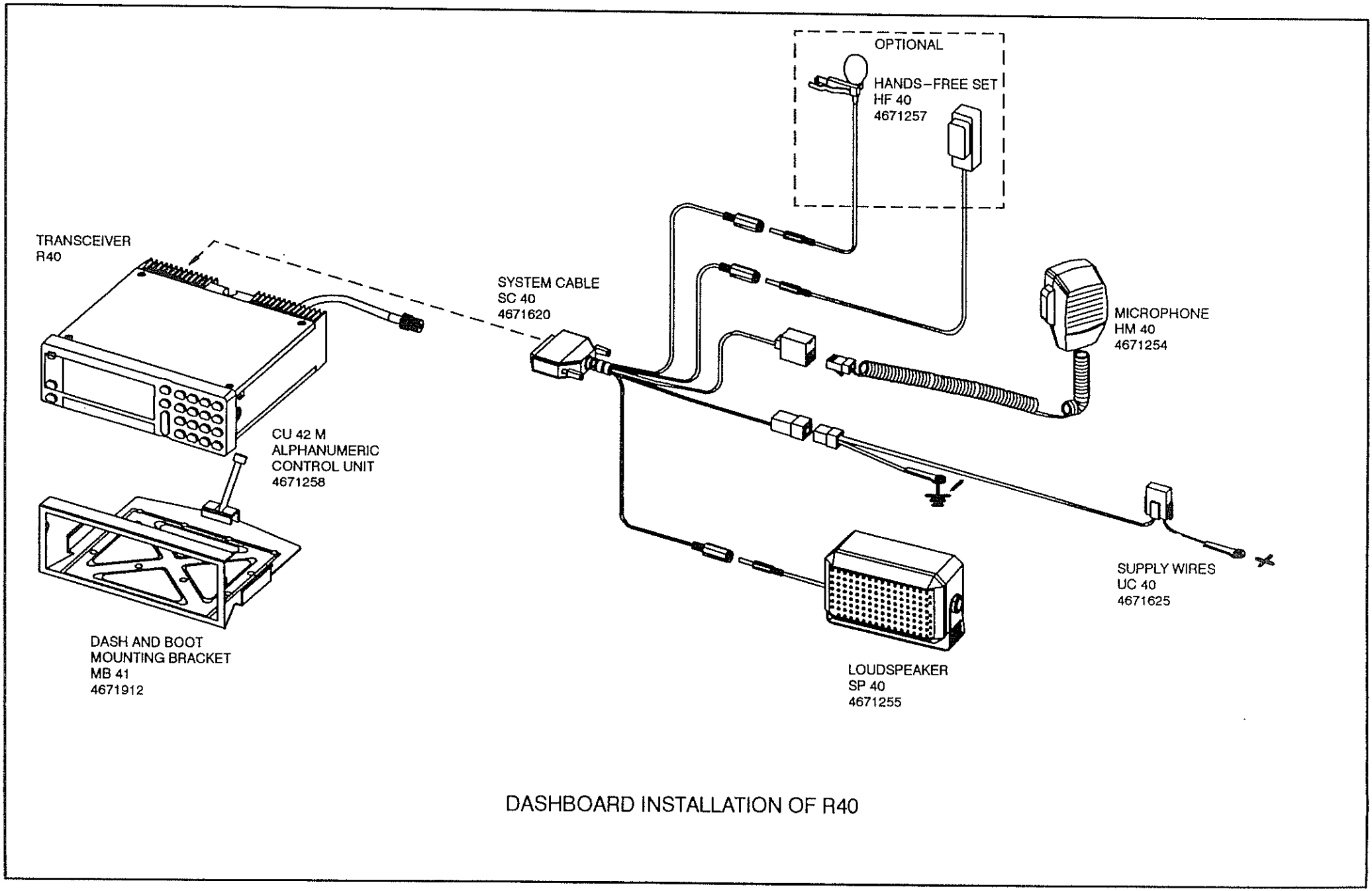

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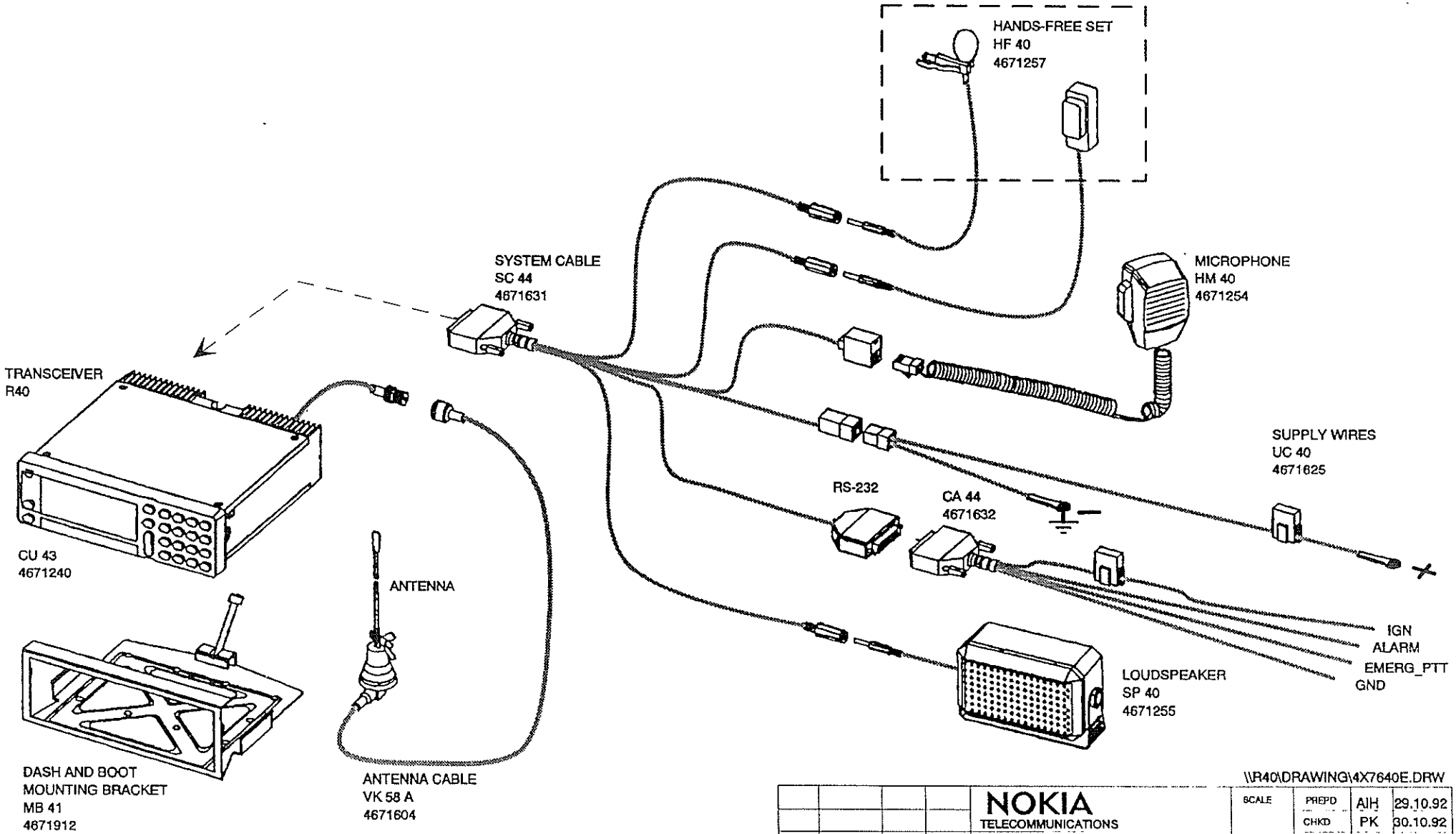

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					ARCHVD
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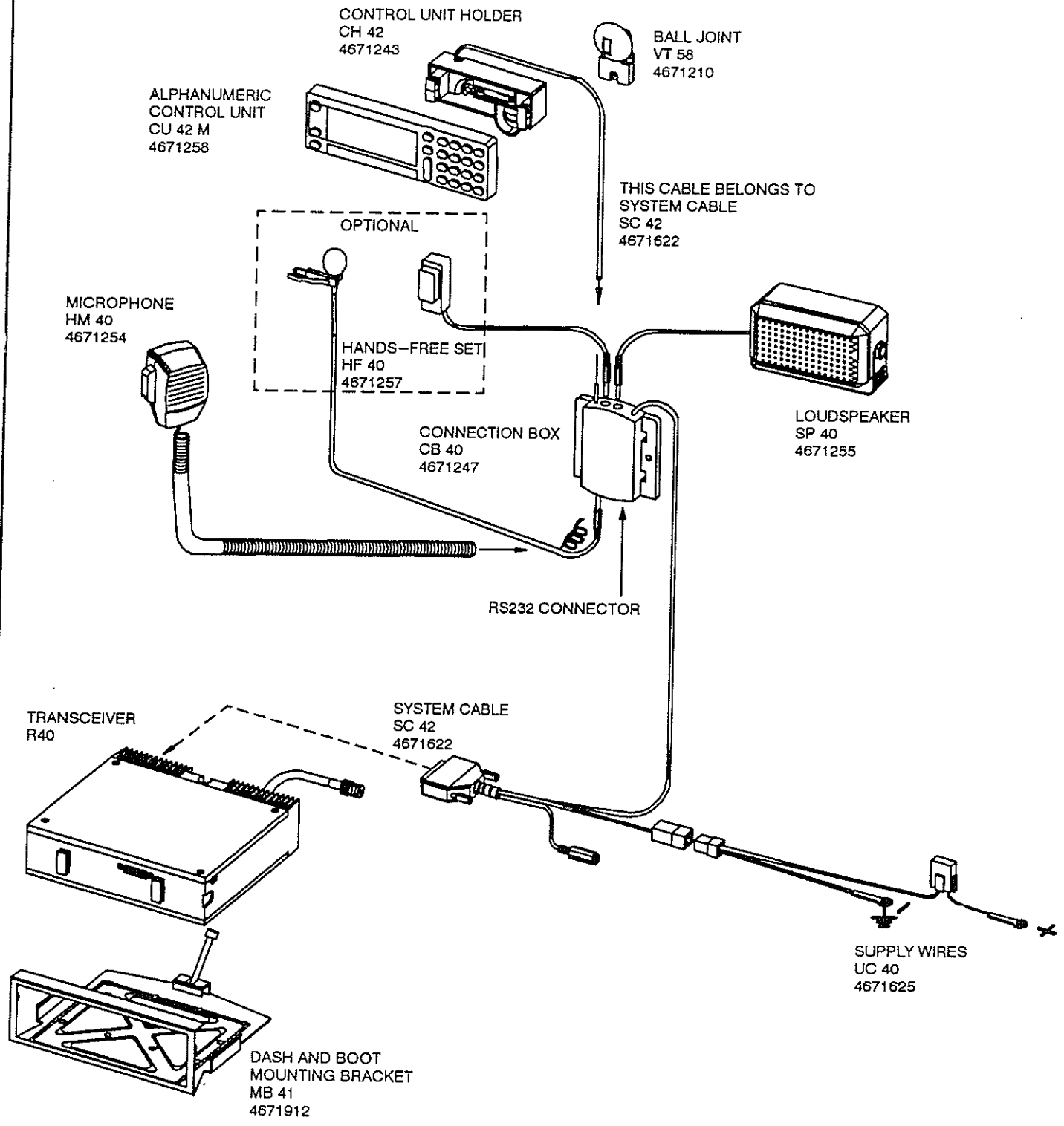
REV.	DATE	PREPD	APPRD		



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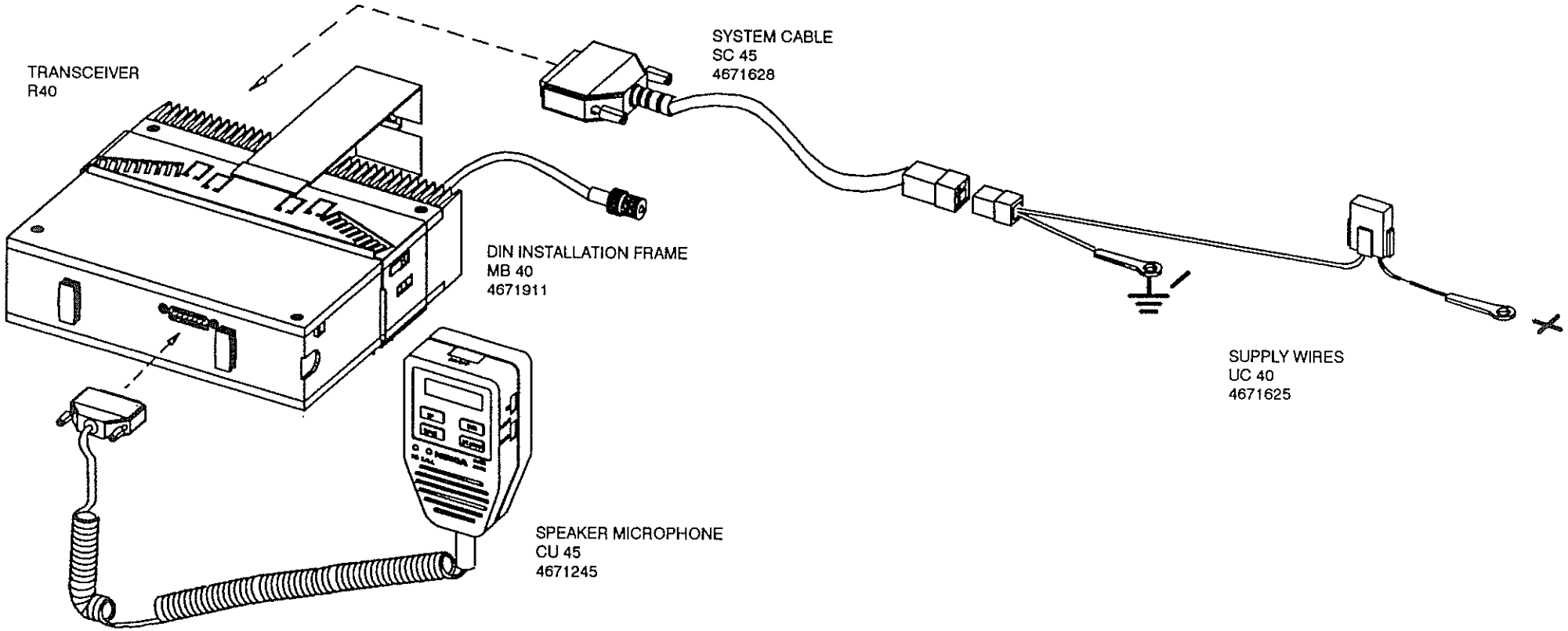

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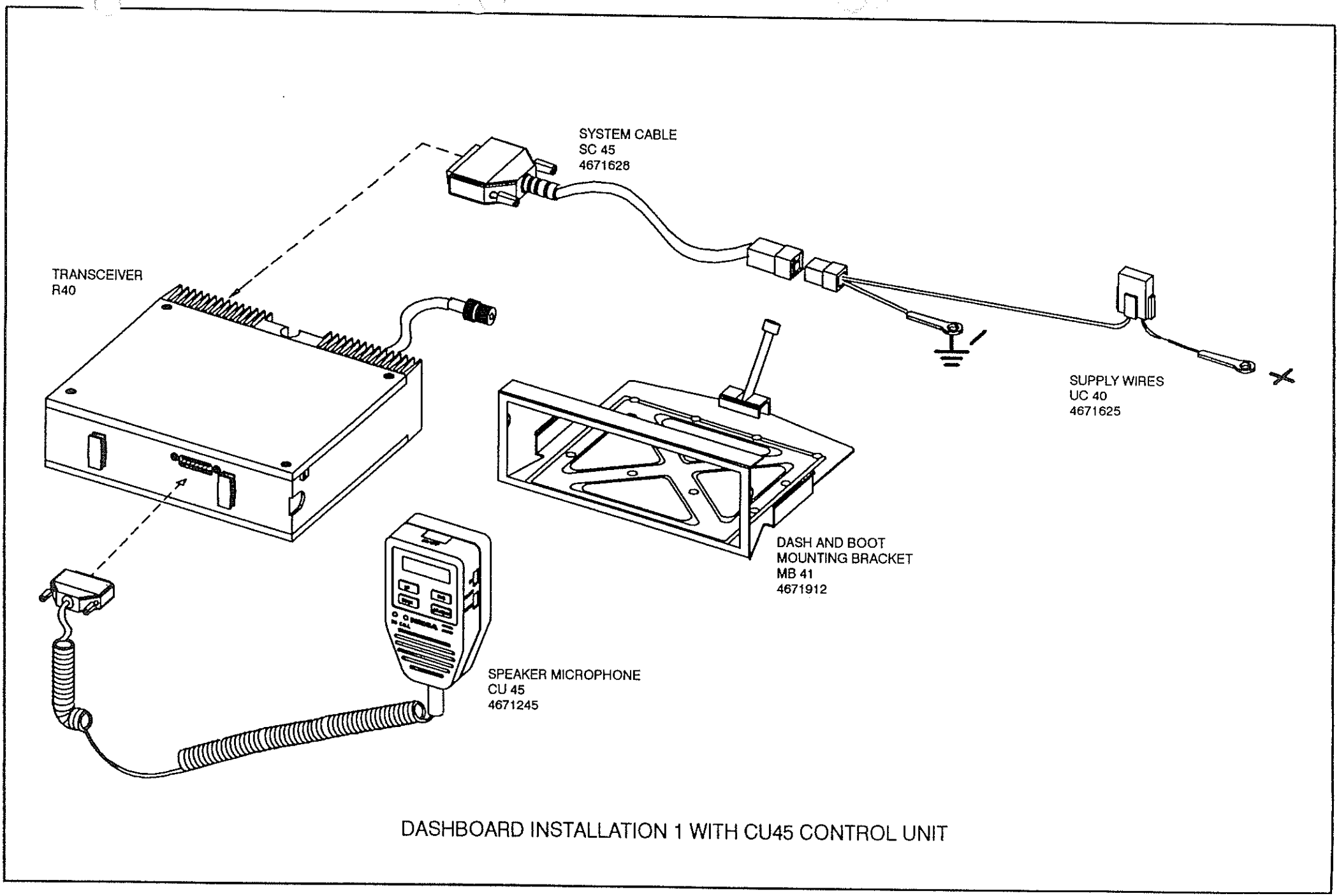
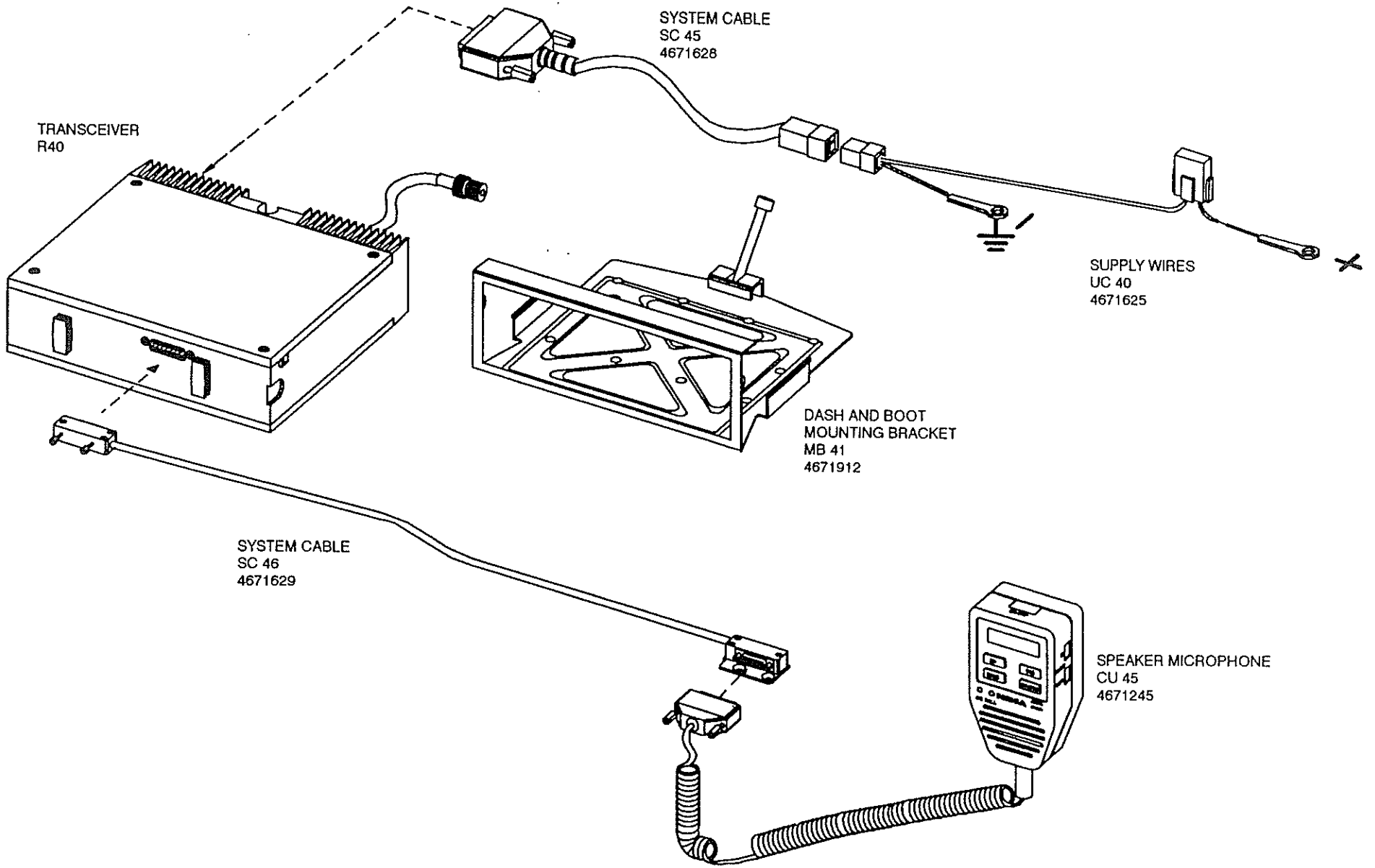
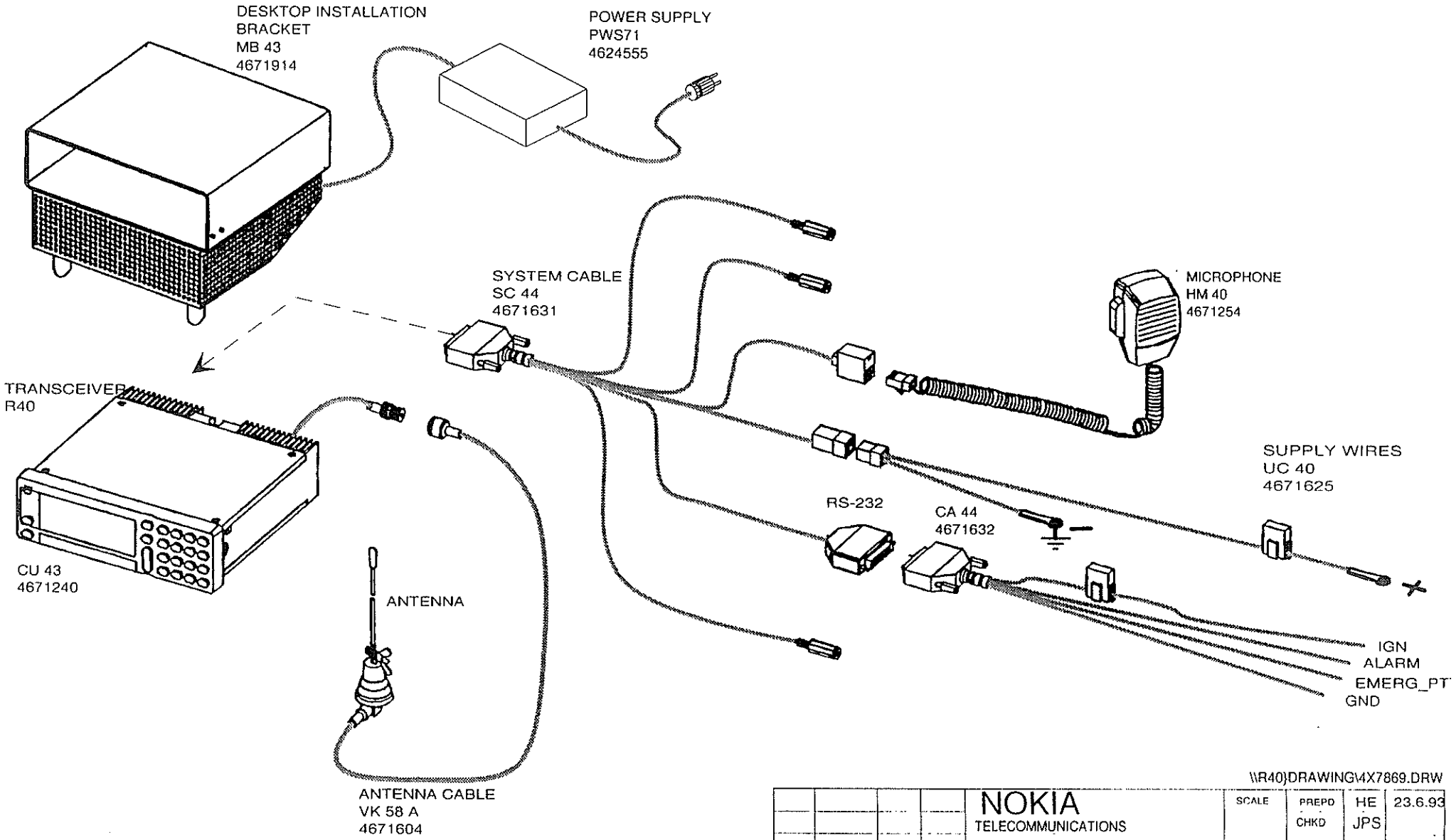


DASHBOARD INSTALLATION 1 WITH CU45 CONTROL UNIT



DASHBOARD INSTALLATION 2 WITH CU45 CONTROL UNIT



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			16.5.94
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REV.	DATE	PREPD	APPRD

NOKIA
TELECOMMUNICATIONS

R40

DESKTOP INSTALLATION SET

SCALE	PREPD	HE	23.6.93
	CHKD	JPS	
	APPRD	HH	24.6.93
	ARCHVD		

4X 7869.2

RD40S11G, TECHNICAL SPECIFICATIONS

The mobile radio RD40S11G, fulfils ETS 300 086 , CEPT T/R 24−01and MPT 1327 JRC radiotechnical specifications between the temperature range −25 ... +55°C. Unless otherwise stated all parameters apply at an ambient temperature of 20°C at a nominal supply voltage of 13.2V.

GENERAL SPECIFICATIONS

Installation	Vehicle only
Operation mode	1− and 2−frequency simplex
Frequency band	400 − 440MHz
Max. distance between channels	15MHz
Channel spacing	12.5kHz model
Frequency stability	0.0003%
Signalling	1200Bd FFSK (or CCIR)
Supply voltage	10.8 ... 15.6V nominal 13.2V (negative pole to chassis)
Current consumption	
stby	< 0.35A
receiving (2W audio)	< 0.80A
transmitting (1W)	< 2.00A
transmitting (10W)	< 5.00A
Antenna connector	50 Ω TNC , female

RECEIVER

Frequency band	400 − 440MHz
Sensitivity	< −116dBm 20dB SINAD psof.
Max. distance between channels	15MHz
Signal level detection	Adjustable between −120dBm ... −60dBm
Level detection attack time	< 10ms
CO−channel rejection	< 0 − 12dB
Adjacent channel selectivity	> 60dB
Spurious response rejection	> 70dB

Intermodulation rejections	> 65dB
Blocking	> 84dB
Amplitude characteristics of the receiver limiter	< 3dB
Audio output power	nom. 2W/4Ω symmetrical
Audio frequency response	+1 ... −3dB (300 ... 2550Hz)
Harmonic distortion	< 10%
Noise and Hum	< 40dB psof.
Audio muting	> 60dB
Intermediate frequencies	45MHz and 455kHz
Injection from synthesizer	455 ... 475MHz +12dBm

TRANSMITTER

Frequency band	400 ... 440MHz
Output power	Adjustable 1 ... 10W
Max. distance between channels	15MHz
Frequency stability	0.0003%
Adjacent channel power	< $60dB_c$
Spurious emissions	< −36dBm
Maximum deviation	2.5kHz
Modulation sensitivity	Better than 94dB S.P.L.
Audio frequency response	+1 ... −3dB (300 ... 2550Hz)
Harmonic distortion	< 10%
Residual modulation	< 40dB psof.
Audio muting	> 40dB

RD40S22G, J TECHNICAL SPECIFICATIONS

The mobile radio RD40S22G,J fulfils ETS 300 086 , CEPT T/R 24−01and MPT 1327 JRC radiotechnical specifications between the temperature range −25 ... +55°C. Unless otherwise stated all parameters apply at an ambient temperature of 20°C at a nominal supply voltage of 13.2V.

GENERAL SPECIFICATIONS

Installation	Vehicle only
Operation mode	1− and 2−frequency simplex
Frequency band	440 − 470MHz
Max. distance between channels	15MHz
Channel spacing	12.5kHz model G 25,0kHz model J
Frequency stability	0.0003%
Signalling	1200Bd FFSK (or CCIR)
Supply voltage	10.8 ... 15.6V nominal 13.2V (negative pole to chassis)
Current consumption	
stby	< 0.35A
receiving (2W audio)	< 0.80A
transmitting (1W)	< 2.00A
transmitting (10W)	< 5.00A
Antenna connector	50 Ω TNC , female

RECEIVER

Frequency band	440 − 470MHz
Sensitivity	< −116dBm 20dB SINAD psof.
Max. distance between channels	15MHz
Signal level detection	Adjustable between −120dBm ... −60dBm
Level detection attack time	< 10ms
CO−channel rejection	< 0 − 12dB {12,5kHz} < 0 − 8dB {25,0kHz}

Adjacent channel selectivity	> 60dB {12,5kHz} > 70dB {25,0kHz}
Spurious response rejection	> 70dB
Intermodulation rejections	> 65dB
Blocking	> 84dB
Amplitude characteristics of the receiver limiter	< 3dB
Audio output power	nom. 2W/4Ω symmetrical
Audio frequency response	+1 ... −3dB (300 ... 2550Hz) {12,5kHz} (300 ... 3000Hz) {25,0kHz}
Harmonic distortion	< 10%
Noise and Hum	< 40dB psof.
Audio muting	> 60dB
Intermediate frequencies	45MHz and 455kHz
Injection from synthesizer	485 ... 515MHz +12dBm

TRANSMITTER

Frequency band	440 ... 470MHz
Output power	Adjustable 1 ... 10W
Max. distance between channels	15MHz
Frequency stability	0.0003%
Adjacent channel power	< 60dB$_c$ {12,5kHz} < 70dB$_c$ {25,0kHz}
Spurious emissions	< −36dBm
Maximum deviation	2.5kHz {12,5kHz} 5.0kHz {25,0kHz}
Modulation sensitivity	Better than 94dB S.P.L.
Audio frequency response	+1 ... −3dB (300 ... 2550Hz) {12,5kHz} (300 ... 3000Hz) {25,0kHz}
Harmonic distortion	< 10%
Residual modulation	< 40dB psof.
Audio muting	> 40dB

LIST OF ABBREVIATIONS

AD_VS ..... SUPPLY VOLTAGE SUPERVISION
AF ..... AUDIO FREQUENCY
AFMUTE ..... AUDIO FREQUENCY MUTE
AFVOL(4:7) ..... AUDIO FREQUENCY VOLUME (four lines)
ALARM ..... EXTERNAL ALARM
ALARMC ..... EXTERNAL ALARM CONTROL
AMP ..... AMPLIFIER
ANT ..... ANTENNA
CCIR ..... CCIR SIGNAL
CCIR_LSP ..... CCIR SIGNAL TO LOUDSPEAKER
CH SPA_SEL ..... CHANNEL SPACE SELECTION
CLK ..... SYNTHESIZER DATA CLOCK
CLK_C ..... SERIAL BUS CLOCK
CLK_RS232 ..... RS-232 CLOCK
CRM ..... CAR RADIO MUTE
CRMC ..... CAR RADIO MUTE CONTROL
CTS ..... CLEAR TO SEND
DCD ..... DATA CARRIER DETECT
DCV ..... DIRECTIONAL COUPLER VOLTAGE
DEV(0:3) ..... DEVIATION CORRECTION (four lines)
DF ..... DATA FREQUENCY
DIN_C ..... CCIR-CIRCUIT DATA IN
DOUT_C ..... SERIAL BUS DATA
DSR ..... DATA SET READY
DTRIN ..... DATA TERMINAL READY INPUT
DTMF ..... DUAL TONE MULTI FREQUENCY
DTMF_CCIR ..... DTMF/CCIR SIGNAL LINES
DTMF_CCIR_IN ... CCIR-SIGNAL INPUT TO DECODER
DTMF_CCIR_LSP .. DTMF/CCIR SIGNALS TO LOUDSPEAKER
DTMFOUT_FX803 . DTMF-SIGNALS FROM FX803
DTR ..... DATA TERMINAL READY
EMERG_PTT ..... EMERGENCY PTT
ERP ..... EARPHONE
f ..... FREQUENCY (8.064 MHz)
FFSKIN ..... FFSK INPUT TO MODEM
FFSKOUT ..... FFSK OUTPUT FROM MODEM

FL–BP ..... BANDPASS FILTER
FL–HP ..... HIGHPASS FILTER
FL–LP ..... LOWPASS FILTER
FRT ..... FREE RUNNING TIMER
GS ..... ENABLE INPUT
HF_MIC_IN ..... HANDS FREE MICROPHONE IN
HF_MIC_OUT ..... HANDS FREE MICROPHONE OUT
IF–CIRCUIT ..... INTERMEDIATE FREQUENCY CIRCUIT
IGN ..... IGNITION ACKNOWLEDGE
IGN_IN ..... IGNITION ACKNOWLEDGE INPUT
IO_CS(2:0) ..... SIFT REGISTERS CHIP SELECTS
I^2C_INT ..... I^2C–INTERRUPT
I^2C(1:0) ..... I^2C BUS
LP ..... LOWPASS FILTER
LSPI ..... SYMMETRICAL LOUDSPEAKER LINE +POLE
LSP2 ..... SYMMETRICAL LOUDSPEAKER LINE –POLE
MOD ..... MODULATION LINE
OFF ..... POWER OFF
ON_OFF ..... POWER ON/OFF ACKNOWLEDGE
PC ..... TRANSMITTER POWER CONTROL
PTT ..... PUSH TO TALK
PTT_ACK ..... PUSH TO TALK ACKNOWLEDGE
PTT_HF ..... PUSH TO TALK HANDS FREE
PWR_ON_OFF .... POWER ON/OFF CONTROL LINE
RAM_IO ..... NV_RAM PAGE SELECTION
RF ..... RADIO FREQUENCY
R_F_C ..... RX FREQUENCY CONTROL
RI ..... RING INDICATOR
RSSI ..... RADIO SIGNAL STRENGTH INDICATOR
RTC ..... RX FREQUENCY CONTROL
RTS ..... REQUEST TO SEND
RTSIN ..... REQUEST TO SEND INPUT
RX_ANT ..... RECEIVING ANTENNA
RXD ..... RECEIVED DATA
RX_Q ..... RECEIVE QUICK DATA
RX_Q_C ..... RX_Q CONTROL LINE
SBUS(1:0) ..... SERIAL BUS
SCK ..... SERIAL CLOCK
SCL ..... I^2C SERIAL CLOCK

SD ..... SYNTHESIZER DATA
SDA ..... I^2C DATA
SIGN ..... CONFIDENCE TONES
SIGN_C ..... CONFIDENCE TONES CONTROL LINE
SIGNCLK ..... CCIR/CONFIDENCE TONES CLOCK LINE
SQ ..... SQUELCH
SQ_DC ..... SQUELCH DC ACKNOWLEDGE
SR ..... RECEIVERS LOCAL OSCILLATOR CONNECTION FROM SYNTHESIZER
SRE ..... SYNTHESIZER RX–ENABLE
ST ..... TRANSMITTERS LOCAL OSCILLATOR CONNECTION FROM SYNTHESIZER
STE ..... SYNTHESIZER TX–ENABLE
SWITCH1(4:7) ..... CONTROL LINE TO ANALOG SWITCH (four lines)
SWITCH2(0:7) ..... CONTROL LINE TO ANALOG SWITCH (eight lines)
TMCI ..... 8–BIT TIMER INPUT
TMCI2 ..... FRT2 INPUT
TMCI3 ..... FRT3 INPUT
TMO ..... 8–BIT TIMER OUTPUT
T_P_C ..... TX POWER CONTROL
TX OFF ..... TRANSMITTER OFF
TX ON ..... TRANSMITTER ON
TXD ..... TRANSMITTED DATA
TXT ..... TX–TEMPERATURE SUPERVISION
TX_Q ..... TRANSMIT QUICK DATA
TX_Q_C ..... TX_Q CONTROL LINE
VF ..... FILTERED SUPPLY VOLTAGE
VFT ..... FILTERED SUPPLY VOLTAGE TO TRANSMITTER
VM ..... POWER ON UNIT VOLTAGE
VM2 ..... MEMORY VOLTAGE
VOL(0:7) ..... VOLUME CONTROL
VS ..... SWITCHED VOLTAGE
VST ..... SWITCHED VOLTAGE TO TRANSMITTER
VSR ..... SWITCHED VOLTAGE TO RECEIVER
+5V ..... REGULATED VOLTAGE TO LOGIC
+5VF ..... REGULATED AND FILTERED VOLTAGE TO AUDIO
+8V ..... REGULATED VOLTAGE TO AUDIO

CONNECTIONS BETWEEN THE UNITS

CONNECTOR CONFIGURATION

SP (PP3) between the Prosessor unit and synthesizer

pin 1.	MOD	Modulation to VCO–unit
pin 2.	SRE	Receiver synthesizer enable
pin 3.	+18V	VCO supply voltage
pin 4.	VF_S	Synthesizer supply voltage
pin 5.	STE	Transmitter synthesizer enable
pin 6.	CLK	Clock
pin 7.	DATA	Serial data
pin 8.	TX_OFF	Transmitter control when syntheziser not in lock

TP (PP2) between the Prosessor unit and transmitter

pin 1.	NC	not connected
pin 2.	TPC	Power control from Prosessor board
pin 3.	VFT_8V	Regulated 8V,when transmitter is on
pin 4.	FPC	Feedback power control to processor.
pin 5.	VFT_S	Filtered DC voltage when Tx ON
pin 6.	VFT	Main supply voltage 10.8 ... 15.6V
pin 7.	VFT	Main supply voltage 10.8 ... 15.6V
pin 8.	VFT	Main supply voltage 10.8 ... 15.6V

RP (PP4) between the Prosessor unit and receiver

pin 1.	NC	not connected
pin 2.	NC	not connected
pin 3.	TX ON	+TX to receiver (when transmitter is ON)
pin 4.	VFT_S	Filtered DC voltage when Tx ON
pin 5.	RTC	RF–filter tuning voltage
pin 6.	RSSI	Received signal strengh indicator
pin 7.	SQ	Squelcher signal to processor (20kHz noice)
pin 8.	AF	Audio output to prosessor unit

CU (control unit) between the audio logic and control unit

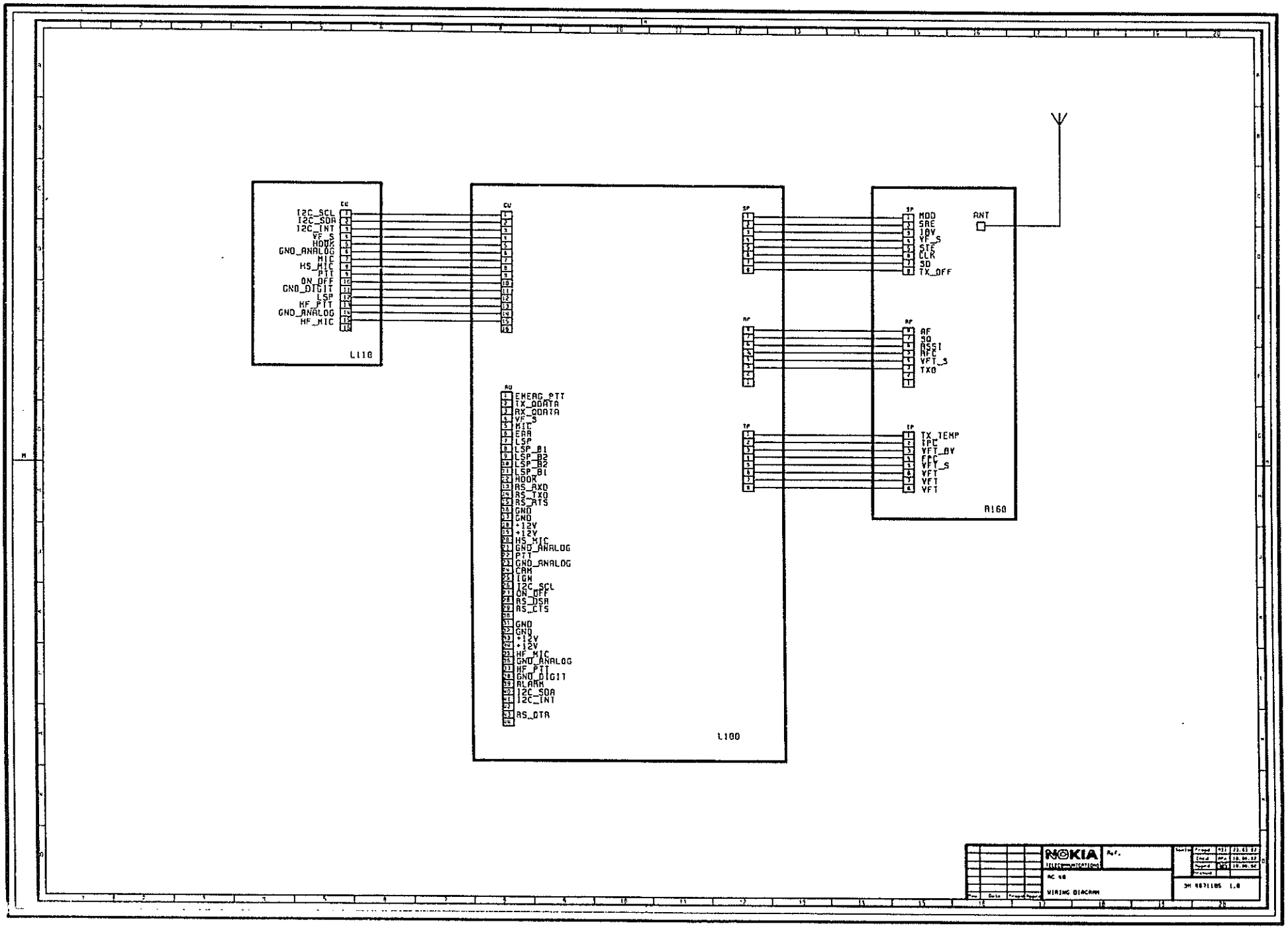
pin 1	I^2C_SCL	: serial clock (I^2C–bus)
pin 2	I^2C_SDA	: serial data (I^2C–bus)
pin 3	I^2C–INT	: interrupt (I^2C–bus)
pin 4	VF_S	: supply voltage (after switch)
pin 5	HOOK	: hook
pin 6	GND_ANALOG	: analog ground
pin 7	MIC	: amplified microphone signal
pin 8	HS_MIC	: microphone signal to the control unit
pin 9	PTT	: push to talk –line (tangent)
pin 10	ON_OFF	: power on/off –line
pin 11	GND_DIGIT	: digital ground
pin 12	LSP	: loudspeaker
pin 13	HF_PTT	: hands free PTT
pin 14	GND_ANALOG	: analog ground
pin 15	HF_MIC	: hands free microphone to the control unit
pin 16	NC	: no connection

RU (radio unit) PP7 between the audio logic and peripheral devices

pin 1	EMERG_PTT	: emergency tangent
pin 2	TX_QDATA	: transmitted quick data
pin 3	RX_QDATA	: received quick data
pin 4	VF_S	: supply voltage (after switch)
pin 5	MIC	: amplified microphone signal
pin 6	EAR	: earphone
pin 7	LSP	: DC isolated loudspeaker
pin 8	LSP_B1	: bridge connected loudspeaker (+)
pin 9	LSP_B2	: " " " (–)
pin 10	LSP_B2	: " " " (–)
pin 11	LSP_B1	: " " " (+)
pin 12	HOOK	: hook
pin 13	RS_RXD	: received data (RS232)
pin 14	RS_TXD	: transmitted data (RS232)
pin 15	RS_RTS	: request to send (RS232)

pin 16	GND	: supply voltage ground
pin 17	GND	: " " "
pin 18	+12V	: supply voltage (nom. 13.6 V)
pin 19	+12V	: " "
pin 20	HS_MIC	: handset microphone input
pin 21	GND_ANALOG	: analog ground
pin 22	PTT	: PTT
pin 23	GND_DIGIT	: digital ground
pin 24	CRM	: car radio mute
pin 25	IGN	: ignition sensor
pin 26	I^2C_SCL	: serial clock of the I^2C–bus
pin 27	ON_OFF	: power on/off information
pin 28	RS_DSR	: data set ready (RS232)
pin 29	RS_CTS	: clear to send (RS232)
pin 30	GND_ANALOG	: analog ground
pin 31	GND	: supply voltage ground
pin 32	GND	: " " "
pin 33	+12V	: supply voltage (nom. 13.6 V)
pin 34	+12V	: " "
pin 35	HF_MIC	: hands free microphone input
pin 36	GND_ANALOG	: analog ground
pin 37	HF_PTT	: PTT for an hands free microphone
pin 38	GND_DIGIT	: digital ground
pin 39	ALARM	: control of external alarm
pin 40	I^2C_SDA	: serial data of the I^2C–bus
pin 41	I^2C_INT	: interrupt of the I^2C–bus
pin 42	GND_DIGITAL	: digital ground
pin 43	RS_DTR	: data terminal ready (RS232)
pin 44	GND_ANALOG	: analog ground

CU_FILTERS and RU_FILTERS are blocks which include T–filters for the connectors CU and RU.


CC
I2C_SCL
I2C_SDA
I2C_INT
VF_S
HOOK
GND_ANALOG
MIC
HS_MIC
PTT
ON_OFF
GND_DIGIT
LSP
HF_PTT
GND_ANALOG
HF_MIC
L110
CV
AV
EMERG_PTT
TX_ODATA
RX_ODATA
VF_S
MIC
EAR
LSP
LSP_B1
LSP_B2
LSP_B2
LSP_B1
HOOK
RS_RXD
RS_TXD
RS_RTS
GND
GND
+12V
+12V
HS_MIC
GND_ANALOG
PTT
GND_ANALOG
CAM
IGN
I2C_SCL
ON_OFF
RS_DSR
RS_CTS
GND
GND
+12V
+12V
HF_MIC
GND_ANALOG
HF_PTT
GND_DIGIT
ALARM
I2C_SDA
I2C_INT
RS_DTR
L100
SP
MOD
SRE
10V
VF_S
SIE
CLK
SD
TX_OFF
AF
SQ
RSSI
APC
VFT_S
TXD
TX_TEMP
TPC
VFT_8V
FPC
VFT_S
VFT
VFT
VFT
ANT
R160
NOKIA
RC 48
WIRING DIAGRAM
3H 9871105 1.0

NOKIA R40 MOBILE RADIO

INSTRUCTION MANUAL

NOKIA

CONTENTS

DEAR USER OF THE NOKIA R40 MOBILE RADIO

The Nokia R40 – a mobile radio with plenty of functions for system networks – is now at your disposal. Please read this instruction manual carefully in order to learn to utilize all the properties of the phone.

The manual contains all the functions of the Nokia R40 in system networks. Some of them are network-related and they are marked with ★ in the text.

We wish you successful connections

NOKIA TELECOMMUNICATIONS

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FINLAND
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Prepared	Checked	Approved	Code
JL/16.9.94	JL/16.9.94	HHa/16.9.94	DC48009

IMPORTANT INFORMATION

- High frequency radio waves (VHF, UHF) generally propagate in straight lines and do not bend around obstacles. Terrain and buildings as well as interference from other sources may block the connection especially at the edge of the coverage area. These characteristics of radio communication must be taken into account when planning and using a radiotelephone network for emergency messages.

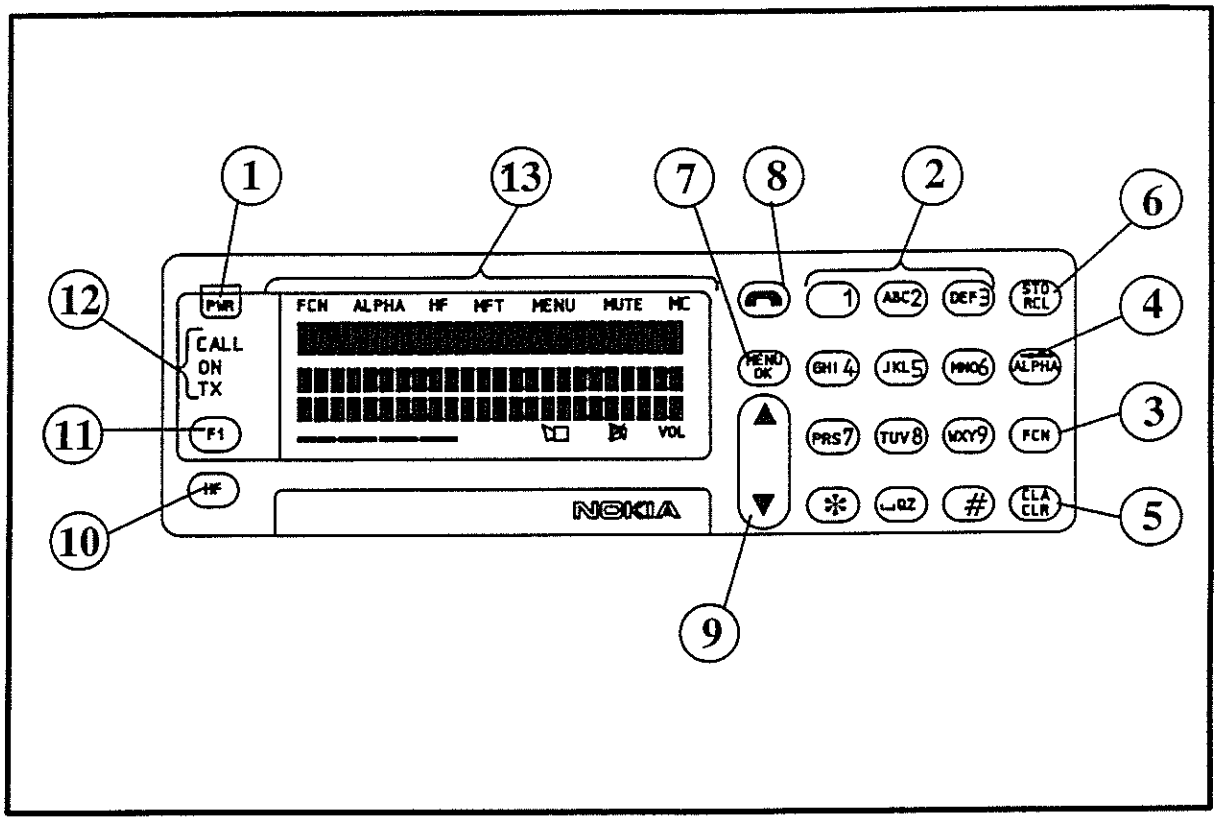
- Learn the correct and safe way of using the radiotelephone in a vehicle. It is recommended that you stop the vehicle, if it is possible to do so without creating a traffic disturbance, before using the radiotelephone.

- Turn off your radiotelephone near electrical detonators or in an explosive atmosphere. Observe the sign "Turn off two-way radios".

- While transmitting do not stand closer than 0,5 metres to the antenna in order to ensure unobstructed propagation of the radio waves and for safety reasons.
- Use of the radiotelephone should be avoided close to sensitive electronic monitoring systems such as medical instrumentation systems and pacemakers.
- The possibility exists that the use of a mobile radio in a vehicle may result in the altered operation of electronic systems (e.g. fuel injection and braking systems).

  If this occurs: **Turn off** the mobile radio **immediately**, and contact your service organization for advice.
- Fans, power accessories, window demisters or radios may alter the operation of the mobile radio. Consult the accessory manufacturer for details regarding the elimination of radio interference from such accessories.

ALPHANUMERIC CONTROL UNIT



1. Power switch

The mobile radio is switched on and off with the power switch. When switching the power on, the ON lamp lights up and all the characters on the display will appear for an instant.

2. Alphanumeric buttons

The buttons 0...9 are used, among other things, to dial a receiving subscriber's number. The # button is used to terminate a queue of numbers or characters that have been pressed. The * button is used to invoke special features such as an emergency call transmission and for status information calls.

Number buttons are also used for dialling characters A...Z. The alpha mode must be selected first by pressing ALPHA–button.
After that the alpha characters can be selected by number buttons as follows. Press key 2 once, the character 2 is shown in the display. If the key 2 is pressed again within 1 second, the character is changed to A and then to B and then to C and then to 2 again. If there is more than a 1 second pause between keying then a new character is shown in the display.

3. FCN button

This button is used to select an alternative function of certain keys. The alternative functions are printed with blue letters to the top of the buttons. For example, FCN + STO is used to program the abbreviated dialling memory.

4. ALPHA button

The ALPHA–button activates the ALPHA–mode. ALPHA–mode is active 5 seconds after the last key is pressed.

5. CLA/CLR button

The CLR button clears the display one character at a time.

By pressing FCN + CLA/CLR you select the alternative function CLA; CLA clears the entire display. In the menu mode you can exit from the menu by pressing FCN + CLA/CLR. If you are browsing the abbreviated number memory the first FCN + CLA/CLR will abort the browsing and the second will clear the display.

6. STO/RCL button

The RCL button is used to read the abbreviated dialling memory.

The alternative function (FCN+STO) is used to program the abbreviated dialling memory.

7. MENU/OK button

The OK button sends the Call back – acknowledgement to incoming call and sends status messages to the mailbox. In menu mode OK works as an acknowledgement of function.

The alternative function (FCN+MENU) gives you the menu of services.

8. Handset button ()

This button initiates and terminates the call.

9. ▲▼ button

This button is used to regulate the speaker volume when VOL indicator is on. To increase the volume press ▲ and to decrease the volume press ▼.

This button is also used when you are browsing the menu or the abbreviated dialling memory.

10. HF button (optional)

11. F1 button

This button performs a call to a pre–programmed number (memory location 47 in abbreviated number memory). The number can be for example:

- a public emergency number
- a public telephone network number
- any number in the Actionet system
- executive call inside the system (*9*No.)

12. Indicator lights

ON

The ON indicator flashes when the mobile radio is on but it is not registered into the system. The ON indicator will cease flashing and become steady, when the equipment is ready to transmit and receive calls.

CALL

The CALL indicator lamp will be on when the mobile radio receives an individual call or when you originate a call. The indicator will flash when the radio has received a group call.

The indicator lamp will remain on as a sign of a received call which you have not answered. It will turn off when you press any button. The CALL indicator lamp will stay lit during the call.

TX

The TX indicator will be on when the Press To Talk (PTT) switch is pressed (the transmitter is on).

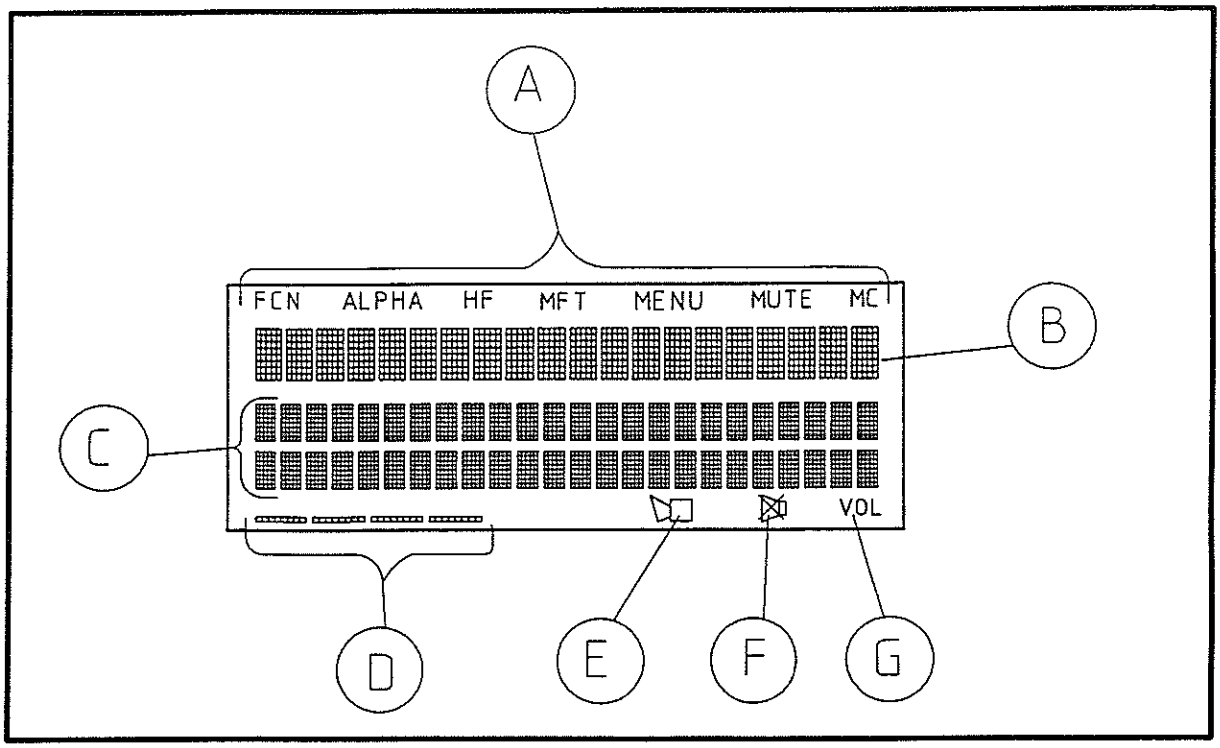
Keypad and display backlight control

If the display backlight control is set under supervision (see the menu "**Display settings**"), the display and keypad will be lit as stated in table below.

	Light ON after last function	
	Empty display	Characters on the display
Display backlight	5 seconds	1 minute
Keypad backlight	1 minute	2 minutes

Display viewing angle (up/down) and backlight level (high/low) can be also controlled with the menu ("**Display settings**").

13. DISPLAY



A. Indicator line

FCN	Indicates the FCN button is pressed
ALPHA	Indicates the keypad is in alpha mode
HF	Indicates the Hands Free –function is activated
MFT	Indicates the keypad is ready to transmit DTMF tones
MENU	Indicates the keypad is in menu mode
MUTE	Indicates the received group call should be answered manually
MC	Not in use

B. Upper display (Number display)

The upper display (number display) shows the dialled digits (max 20 digits) and the number of the A–subscriber if the call is coming from another terminal equipment on the same system.

C. Lower display (Info display)

The lower display (info display) contains two 24 digit lines. It displays various messages about the mobile radio's operation; for example call type information, short code memory texts and menu texts.

D. Field strength indication

Maximum four bars.

Four bars = very good channel
Three bars = good channel
Two bars = usable channel
One bar = poor channel

E. External alarm activated

F. Loudspeaker is off

G. Volume adjustment

When the VOL indicator is on, the ▲▼ button adjusts volume. There are eight volume levels and latest selected will be stored in the memory.

SIGNAL TONES

High pitched signal tones are indicated by a thin line, low pitched tones by a thick line.

1 Signal Tone for Pressing a Button " – "

– is heard when you press a button
– indicates that the function of the button is activated

2 Call Set-Up in Progress Tone " ▬— ▬— "

– is heard when the call has been transmitted (A-subscriber)

3 Signal Tone for an Incoming Call

An individual call and a group call have different signal tones.

Individual call " – "
Group call " – – – – – – – – – – – – – – – "

The signal tone will end when the call is answered or the time monitoring clears it down. The status and data call has a signal tone of its own: " ——— "

4 Number Unobtainable Warning Signal

" – – ——— – – ——— – – ——— "

– is heard when the exchange acknowledges that the call request has been turned down
– is heard when you select a wrong command

– ends when you press any number key

5 Transaction Confirmed "▬ ▬ ▬"

– is heard when e.g. a conference call request has been acknowledged by the exchange or a status message has been transmitted

6 Call Failed

" - "

– is heard when e.g. the call is failed because of the overload of the system

7 Queuing Tone

" ▬ ▬ ▬▬▬ ▬ ▬ ▬▬▬ "

– the A-subscriber will hear the queuing tone when he is waiting for the B-subscriber to be available

– both the A- and the B-subscriber will hear the queuing tone when the B-subscriber has answered but you have to wait for a free channel

8 Go to Channel " ___ "

– both the called and the calling phone give a short signal tone when they receive the GTC command from the system

9 Called Party Ringing Tone

" ▬▬▬▬▬ ▬▬▬▬▬ "

– can be heard from the A-subscriber's mobile radio when the B-subscriber's mobile radio is sending the ringing tone

10 Warning Signal

The warning signal " _____ " can be heard when:

– the handset volume controller is being pressed though the level is at the minimum or maximum value

– all characters on the display have been deleted with the CLR button

– the ▬ is pressed without dialling the subscriber number

– a button is pressed while the button buffer is full

– you are trying to scan the received call memory though it is empty

11 Call Clear Signal Tone "▬▬▬ ▬ "

– a long + short signal tone to indicate that the call is cleared down

ALERT TONE CHECK

The alert tones can be checked by using the menu (see menu functions Volume settings).

ERROR MESSAGES

The Error–sign, number and fault texts on the display give information about the state of equipment if the self–test diagnostics show problems.

Example:

Error 1
Catalogue error
_ _ _ _

Faults in the abbreviated number memory. A number is lost or some characters have been changed.

Meanings of Error messages:

No.	Text	Meaning
Error 1	Catalogue error	One of the abbreviated dialling numbers is lost from the memory or some character has been changed.
Error 2	Status text error	One of the pre–programmed status texts is lost from the memory.
Error 3	Data message error	One of the pre–programmed short data messages is lost.
Error 4	User settings lost	System information is lost. (Check the settings.)
Error 5	Service needed	Radio adjustment parameters are lost.
Error 6	Service necessary	Own subscriber number is lost.
Error 8	Illegal group number	Additional group number is illegal.
Error 9	Service needed	System parameters are lost.
Error 10	Service necessary	Channel table is lost.
Error 11	Service necessary	Default values of radio adjustment parameters are lost.

The error messages are cleared from the display by keying *#.

Errors 6, 10 and 11 make the mobile radio unusable and it has to be serviced immediately.

In errors 5 and 9 the mobile radio will work unreliably and the error message will be displayed each time after starting the mobile radio until you take it for servicing.

HOW TO MAKE A CALL

Switch the power on. All symbols will be displayed for a while and the equipment activates the self-test. The ON indicator lamp will start flashing.

The ON indicator will become steady when the mobile radio is within the coverage area of the base station and ready to operate. The ON indicator lamp will flash when the radio is not registered in the system and no calls can be made.

Select the desired subscriber number.

Press [#] or [ ] or Press To Talk switch (PTT).
If the B-subscriber is busy, the call will be automatically placed in a queue.

HOW TO ANSWER THE CALL

The CALL indicator lamp will turn on and the respective text will appear on the display.

The A-subscriber's number will appear on the B-subscriber's display if the call is coming from another user in the same system.

Press [#] or [ ] or PTT switch.

The upper display will be cleared when you answer the call.

If you have not answered an incoming call, the CALL indicator lamp will stay lit. If the call is from the same system, the A-subscriber's telephone number will remain on your display. You can call this number by pressing the # button or the button or PTT switch. You can clear the numeric display by selecting * # or FCN CLR.

HOW TO CLEAR DOWN A CALL

Press [ ] or select [*][#].

(NB. If there are characters on the display, the first * # will clear the display and the other one will clear down the call).

A time limit for the call can be set in the mobile radio or the system exchange. When the time expires, the call will be cleared down automatically. You will hear a warning tone 10 seconds before the clear down.

NUMBERING

Add 0 in front of the number when you are calling from the R40 to PSTN

When you call from vehicle to vehicle within your own group, you have to select the 2 or 3 last digits of the R40 number.

Some system networks have unique system service number. When calling from PSTN to the R40, first select the Actionet service number and then the R40 number. If you are calling from another service area, first select the trunk code number, then the Actionet service number and finally the R40 number.

CALL TYPES

Call Between Mobile Radios Within the Same Mobile Exchange Area

[No.] [#] or [ ] or PTT switch

Call Between Mobile Radios Within Your Own Fleet

[The 2 or 3 last digits] [#] or [ ] or PTT switch

★ Call to public network (PSTN)

[0][No.] [#] or [ ] or PTT switch

★ Call from PSTN to the Mobile Radio

[Actionet service no.][R40 No.]

Dial the trunk code number where the R40 is situated. As a signal for an incoming call "Individual call from: Public network" will be displayed.

★ Call to PABX

[1][E][XXXX] [#] or [ ] or PTT switch.

Where E is 3, 4, 5 or 6 and XXXX is called PABX subscriber number (4 to 8 digits).

★ Priority Call

[*][8][*][No.] [#] or [ ] or PTT switch

The priority call is placed ahead of ordinary calls in queuing. If the subscriber has no rights for a priority call, the call will be transmitted as a normal call.

Emergency Call

Call to the public emergency number [999] [#] or [ ] or PTT switch

or [000] or [112]

★ Executive Call

[*][9][*][No.] [#] or [ ] or PTT switch

Use this call if you want to originate an emergency call to another number than the public emergency number.

If necessary, an emergency call will clear down an on-going call in order to release an engaged channel or subscriber. The subscriber will hear a warning tone 10 seconds before the call is cleared down.

Group Call

Group Call to Your Own Fleet

[The 2 or 3 last group digits] [#] or [ ] or PTT switch

Group Call to Another Fleet

[Group no.] [#] or [ ] or PTT switch

★ Group Call from PSTN

[Actionet service no.][Group no.]

Functions in Group Call

The A-subscriber of the group call can clear down the call by selecting * # or . The B-subscriber can disconnect from the call by selecting * # or ., but the group call won't clear down.

If you want to join an on-going group call of your own group in your area, select

[50][RCL][#]

By an incoming group call, the audio path will normally be opened immediately and the loudspeaker will be switched on. If you do not want the audio path to open immediately the call has arrived, but just after the call has been answered, select

[*][51][#] the display shows **MUTE**

The function is cancelled by selecting

[#][51][#]

★ Broadcast Group Call

[*][11][*][No.] [#] or [☎] or PTT switch

The broadcast group call is an announcement call where the B-subscribers cannot transmit.

ABBREVIATED NUMBERS

There are 50 memory locations at your disposal. You can store 21 digits in each memory location.

The memory locations are available as follows:

1–43	your own abbreviated numbers
44–45	additional group numbers
46	default subscriber number for status message
47	number which will be activated by F1 button
48	default number, see page 17
49	number of the pager
50	last received group number
51	emergency call number, which will be activated by a separate emergency switch
0	the last number used

Storage to the First Available Memory Slot

[No.][FCN][STO][OK]

After pressing the STO button the cursor moves to Name row, the ALPHA indicator will appear and you can type the name before accepting the entry by pressing OK. You can move from row to other with ▼▲ button and inside the row with FCN ▼▲. You can move the cursor to the beginning of the row by pressing FCN ALPHA (←). You can remove character from cursor position by the CLR key.

If all memory slots 1–43 are occupied, the display will show "**Memory is full**". The number can be stored into a certain memory slot, the previous content of which will be deleted. See the next item.

If you wish to exit without storage press FCN CLA.

Storage to a Certain Memory Slot

No.	FCN	STO	Memory slot no.	OK

After pressing the STO button the ALPHA indicator will appear and you can type the name before you go with ▼ button to the bottom row. Clear the default memory slot by using CLR button, type the slot number and accept the storage by pressing OK.

If the memory location in question already contains a number, text "**Replace**" and the memory location number will appear on the number display and the info display will show the text **Old: No.** and **New: No.** Now the new number can be stored by pressing the OK button and the old number will be deleted.

Storage can be aborted by pressing FCN CLA. A 60-second delay during the selection will also abort the function.

Storage by name

Name	FCN	STO	No.	OK

Activate the ALPHA–mode by pressing ALPHA button first and type the name (max 17 characters). After pressing the STO button you can type the number and memory slot. If all memory slots are occupied or you want to store to the slot which already contains a number act as told in the earlier items.

The storage can be interrupted by pressing FCN CLA.

Storage via menu

Storage can be made in the menu. Activate the menu by pressing FCN MENU and the MENU indicator will appear in the indicator line.

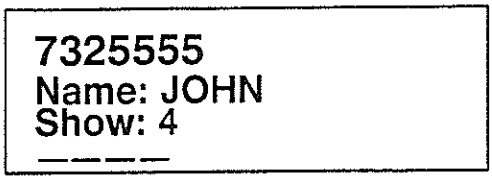
Select "**Memory recall and store functions (0)**" with OK button and then sublevel "**Write short code memory**" again with OK button. The text "**Give number and press OK**" appears on the display. Type the number and accept it with OK button. After that you have to give a memory slot number and a name (optional) and accept them with OK button.

Reading the Abbreviated Number Memory

Memory slot no. or name	RCL

The number stored in the memory location will appear on the number display and the info display will show **Name: XXXX** and **Show: n**, where n is the memory slot number. When the memory slot is read, you can browse the memory with ▼▲ button.

Example:



The telephone number will remain on the numeric display for future use. The call can be transmitted by pressing # or or PTT switch.

If the selected memory slot is empty, the texts "**Memory slot is empty**" and "**Press arrows to browse**" will appear on the display.

To read the memory according to name activate the ALPHA–mode first. Type the desired name or first letters of the name and press OK. If the selected name doesn't exist texts "**Not found**" and "**Press arrows to browse**" will appear on the display.

You can start reading also with the menu: "**Memory recall and store functions**" and then the function "**Read short code memory**".

You can edit current memory location by pressing FCN STO. Editing and storage is done as in the section "Storage to the First Available Memory Slot".

Deleting a Number from the Abbreviated Number Memory

FCN	STO	Memory slot no.	OK

When the number display is empty, press FCN STO and the text CLEAR will appear on the info display. Select the memory location number and press the OK button. The memory slot will be cleared and the display will return to the basic mode.

The clearing of a memory slot can be interrupted by pressing FCN CLA. The clearing of a memory location is under similar 60s time-monitoring to the storage, so select the functions in under one minute.

Editing

You can edit texts or numbers which are stored in the memory. Read the number from the memory by pressing memory slot number and RCL. Editing is started by keying FCN STO when text which you will edit is on the display. The VOL indicator will disappear in the edit mode.

The cursor shows the row which is going to be edited. You can move from row to row with ▼▲ button and inside the row with FCN ▼▲ digit by digit. You can move the cursor to the beginning of the row by pressing FCN ALPHA (←) and remove character from cursor position with the CLR key.

When you have carried out desired changes press OK and the text "**Replace**" and the memory location number will appear on the number display and the info display will show the text **Old: No.** and **New: No**. Now the new number can be stored by pressing the OK button and the old number will be deleted.

Editing can be interrupted by pressing FCN CLA.

Browsing the Abbreviated Number Memory

Press the [RCL] button. Now scanning can be carried out with ▼▲ button.

Scanning will start from the first memory slot. It can also be started from a desired memory location by calling it on the display by selecting

Memory slot no.	RCL

Default Number

The default number means a number which you most frequently phone and the selection of which is the easiest. The number is stored in memory location 48 by selecting

No.	FCN	STO	48	OK

You can phone the default number by selecting

[0] [#] or [ ] or PTT switch.

Additional Group Number

You can program a so-called additional group number by means of which you can call and set up new group calls within your own group.

If you want to program the additional group number to belong another group, the whole number has to be programmed into the memory.

You can program two additional group numbers, which will be stored in memory locations 44 and 45. The programming, reading and clearing is done as in other abbreviated number memory locations. See the items above. If the additional group number belongs to some other fleet, the whole number should be stored (e.g. 325590)

If the programmed additional group number isn't valid, error 8 is shown. If the user has no rights to program the additional group numbers, then this function can't be used ("rights" to program can be inhibited in the service mode).

The Last Used Number

You can easily select the last used number by pressing or selecting 0 RCL, when the display is empty. After that you can make a call to that number by pressing # or or PTT switch.

STATUS CALL

The terminal equipment can transmit 30 (1..30) status messages as digital codes. The mobile radios can transmit and receive status calls. The received messages will be stored in the memory, where they can be read. The memory will store the 5 first received status messages.

Transmitting a Status Message

*	0	Status no.	*	No.

or or PTT switch.

A status call transmission takes place with code *0nn, where nn = status number (1 ... 30). If you have defined a text for the status number it will appear on the display when you have keyed another *.
Messages 0 and 31 are also allowed although they have specific, fixed meanings. After another * dial the subscriber number to who you are sending the message.

Example:

```
*011*7325555
Status: 11
HELLO
____
```

Status message 11 (=HELLO) to subscriber number 7325555 by pressing # or or PTT switch.

If no subscriber number is dialled (e.g. *011#), the call is sent to the number programmed into the radio unit's memory (abbreviated dialling memory slot 46).

Receiving a Status Message

The A–subscriber's number of the status call is seen on the number display. The received status code (**Sts** nn) and the name of sender (if it is stored in the abbreviated memory) is seen on the info display. Status codes can be sent to different MX areas as well. The received status messages are stored in the memory.

Example:

```
7325555
Sts 11:
from: JOHN
____
```

Received status message 11 from subscriber number 7325555 which is stored in the abbreviated number memory as name John.

Status as text form

The received status code will be shown in text form if corresponding texts are pre–programmed into the mobile radio.

Example:

Received status message from subscriber number 7325555. Text "HELLO" is pre–programmed for the status message 11.

Status text writing in memory

The texts corresponding the status numbers can be written to memory in menu mode. Select menu mode by pressing FCN MENU and MENU indicator will appear in the indicator line. You can browse the menu with ▼▲ button. Select the first submenu "**Memory recall and store functions (0)**" with OK button and from there the function "**Write status text**" again with OK button. Text "**Give status number and press OK**" will appear on the info display. After you have given the number, the ALPHA mode turns on and the text "**Give status text and press OK**" will appear on the info display. Type the text and store it by pressing OK button.

There are 30 text slots available, 17 characters can be stored in each by the user. Two status messages are fixed:

- 0: Call request
- 31: Cancel call request

CALL BACK REQUEST

You can transmit a call back request by selecting

*	0	*	No.	#

The call back request is cancelled by selecting

#	0	*	No.	#

When you have received a call back request, the A-subscriber's number will be shown on the number display and the text "**Call request from: 732555**" on the info display. You can call back by pressing # or ☎ or PTT switch.

★ MAIL BOX

When you are transmitting a call back request or a status message and the B-subscriber is busy or his phone is not switched on, you can transmit your message to the mail box in the exchange, where the B-subscriber can later read it.

On the A–subscriber's display will appear:

```
*015*7325555
Send to mailbox?
OK => Yes, CLR => No
____
```

If you want to send the message to mail box press OK and if not press CLR button.

After 15 second delay the display will be cleared if no button is pressed.

The messages can be sent straight to the mail box by just keying OK after the subscriber number and initiating the call.

The mail box will store the 5 latest messages. They can be read by selecting

*	RCL

BROWSING THE RECEIVED CALLS AND STATUS MESSAGES

Your mobile radio will store the 5 latest received calls, which you haven't answered, and the 5 first status messages. Browsing mode is activated after a received call, which you haven't answered, or status message. You can activate the browsing mode also with pressing * OK or with the menu "**Memory recall and store functions**", submenu "**Received call and status buffer**".

Both memories can be browsed by ▼▲ button. Messages can be deleted by pressing CLR and you can exit from the browsing mode with *# or FCN CLA keying.

First you browse the status message memory. The A–subscriber's number of the status call is seen on the number display. The received status code (**Sts** nn) and the name of sender (if it is stored in the abbreviated memory) is seen on the info display

The memories will be cleared when the power is turned off.

★ DATA CALL

Data messages can be sent from the mobile radio or by external data equipments. A message can include max. 100 characters (digits or letters). Data messages are activated by

*	2	*	ALPHA	NNNNNNNN	ALPHA	*	XXXX	#

or

*	2	*	Z	RCL	XXXX	#

Where XXXX is called subscriber number, NNNNNNNN is max 100 characters and Z is data slot number 1 ... 5.

Data call through the MENU

Data calls can be sent also through the MENU. Select menu mode by pressing FCN MENU and MENU indicator will appear on the indicator line. Browse the menu with ▼▲ button and select "**Data message sending (2)**" with OK button. By pressing OK once again ALPHA mode turns on and you can write the desired message. Accept the message with OK button (ALPHA mode turns off) and give a B–subscriber number. Accept the number with OK and send the message by pressing # or 📞 or PTT switch

Data writing into memory

There are 5 text slots available, 100 characters can be stored in each by the user.

Writing into the memory

*	2	*	NNN	STO	X	STO

Where NNN = stored text
X = data slot number 1 ... 5

Reading Stored Data

Press OK button while the display is empty and the **VOL** indicator is on. The first data message stored in the memory will appear on the display, and ALPHA mode turns on. If there isn't any stored data messages text "No pre–programmed data" will appear on the display.

You can browse stored data messages by pressing ▼▲ button after you have read the first slot as told above. A 60–seconds delay during key presses will abort the function. Reading can also abort by pressing FCN CLA.

You can also read the data slot by keying

*	2	*	X	RCL

Where X = data slot number 1...5

Transmitting a Pre–programmed Data Message

The pre–programmed data message can be sent to the default data number (memory slot 46 in the abbreviated number memory) by pressing # or 📞 or PTT switch when the desired message is on the display.

Read stored data from the memory by pressing OK button and browse the desired data message to the display with ▼▲ button. You can add text from the keypad or edit it by using editor. When the data message is complete you can send it to default data number (e.g. dispatcher) by pressing # or 📞 or PTT switch. If there is no default number in the memory slot 46 the number unobtainable tone is heard and after that you can type a number.

The pre–programmed data is sent also by pressing

*	2	*	Z	RCL	XXXX	#

Where XXXX is called subscriber number

After keying *,2,*,X,RCL you have *2*NNNNNNNN* on the display. NNNNNNNNN means the stored text.

The pre–programmed data from data slot number 1 is sent by keying

*	2	*	XXXXX

Where XXXXX is called subscriber number

Short and extended data call reception

When the data is received, there is the text "Data n" and the subscriber number of the sender on the number display. The received data message is on the info display. The received data can be scrolled by pressing FCN ▼▲.

The short and extended data messages can be received by an external data equipment, as well.

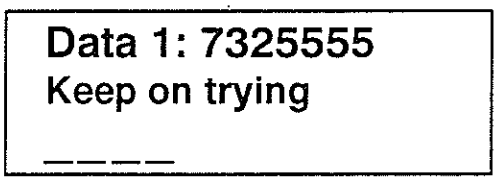
Browsing received short and extended data calls

The mobile radio stores received data messages in memory. There is space for 500 characters in memory, you can store at least five data messages (100 characters to a message) and maximum 20 messages (25 characters to a message).

The data message buffer can be browsed through menu or, if there is a data message in the display you can browse the buffer by pressing ▼▲ button. Browsing can be started also by pressing **OK.

Select menu mode by pressing FCN MENU and MENU indicator will appear on the indicator line. You can browse the menu with ▼▲ button. Select the first submenu "**Memory recall and store functions (0)**" with OK button and from there the function "**Received data call buffer**" again with OK button.

Example:



The first received data message will appear on the display. Also the subscriber number of the sender is displayed.

If a data message is longer than can be shown on info display (48 digits) you will get rest of the message by pressing FCN ▼▲.

You will get the next message on the display by pressing ▼▲ button. A data message (and its sender) can be deleted from the data buffer by keying CLR when the message is on the display. The memories are emptied when the power is turned off.

If the data buffer is empty when you try to read it, the text "**Data buffer is empty**" appears on the display.

If the buffer is full, the text "**Data buffer full**" appears on the upper display and the called mobile radio sends negative acknowledgement to the calling radio.

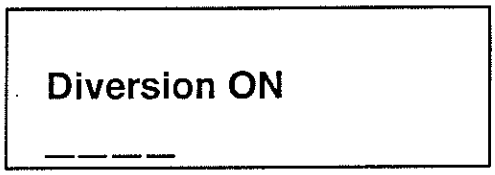
★ CALL DIVERSION

You can make a call diversion to an Actionet subscriber number, PABX number and public network number. Diversion can't be made to a group number or different MX.

*	41n	*	Diversion no.	#

n = 1	speech calls are diverted (including call back requests and cancelling of the call back re-quest)
n = 2	data calls are diverted (modem calls and status mes– sages)
n not defined	all calls are diverted

When the call diversion is activated the info display will show:



The informative text will be:

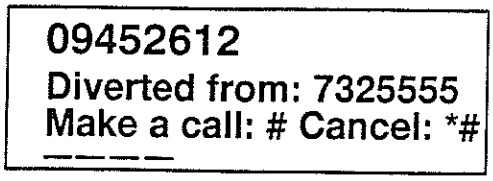
"**Diversion ON**" if all calls are diverted
"**Speech diversion ON**" if only speech calls are diverted
"**Data diversion ON**" if only data calls are diverted

The function will be cancelled by selecting

#	41n	#

or by using menu.

If you have called a subscriber number which has been diverted to another number, on your display will appear



If you want to make a call to the diverted number you can initiate the call also with ☎ or PTT switch.

Automatic call diversion

It is possible to make a call automatically to the diverted number with menu. Select menu mode by pressing FCN MENU and MENU indicator will appear on the indicator line. You can browse the menu with ▼▲ button.

Select "**Call settings** (7)" with OK button and there with the function "**Automatic/ manual call to diverted number**" you can select either automatic or manual call to diverted number by pressing OK button.

Cancel diversions to your mobile radio

You can cancel all diversions that have been made to your mobile radio by pressing

#	45n	#

n = 1	speech call diversion cancelled (including call back requests and cancelling of the call back request)
n = 2	data call diversion cancelled (modem calls and status messages)
n not present	all diversions cancelled

★ DIVERTING A CALL TO A PAGER

You can set the mobile radio to divert a received call to a pager. You should program the number of the pager into abbreviated number memory location 49.

NOTE! If you want to use a pager you have to define a channel which the pager will use. The definition of pager channel is done in service mode.

Diversion of the call is activated by selecting * 53 # and cancelled by selecting # 53 #. You can activate the diversion also in the menu (Call settings).

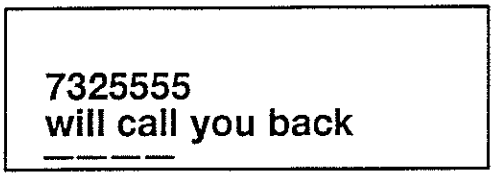
As an indicator for the activation text **PAGER ON** will be lit on the display. The radio diverts the call to the pager if you do not answer the call in 15 seconds.

CALL BACK

If you are unobtainable and you want to inform the A-subscriber that you will call back in a minute, press during the incoming call

OK

Example:



The text shown beside will appear on the A–subscriber' display

This function is possible only when you receive an individual call from the same system .

If you want the function to operate automatically, program it by selecting

*	48n	#

n = 1	speech calls receive the message
n = 2	data calls receive the message
n not defined	all calls receive the message

When call back has been programmed the info display will show

The informative text will be:

"**Call back ON**" if all calls are acknowledged
"**Speech call back ON**" if only speech calls are acknowledged
"**Data diversion ON**" if only data calls are acknowledged

The function can be cancelled by selecting

#	48	#

★ CONFERENCE CALL

No. # or or PTT switch

You can include a new subscriber in the call by selecting the number of the new subscriber during the call.

Conference call is possible during individual call. A subscriber from PSTN can be included into the call.

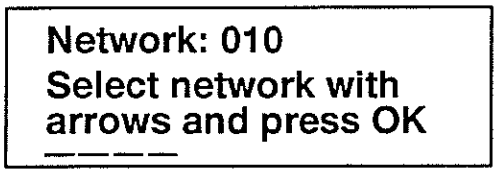
★ NETWORK SELECTION

Network parameters are programmed in the service mode. The selection of the network can be made manually by using the control unit. This enables a visit to another network.

Network selection can be done by keying

FCN 5 or from the menu (Additional functions/ Select network).

Example:



Current network is 010. You can select a new network with arrow key and accept it by pressing OK.

The network number is shown on the info display if you have set it to be visible in the menu (Display settings).

★ DTMF TONE SENDING

DTMF tones can be sent to the PSTN after a PSTN call is activated. Sending is activated by keying

FCN 3 or by using the menu (Special call functions).

MFT indicator will turn on and indicate that the keypad is ready to transmit DTMF tones.

If the number display is empty when you activate the DTMF sending mode, you can send DTMF tones one by one. In this mode a tone is transmitted when the button is pressed. The transmitter and TX indicator will turn on when the button is pressed. The OK button will return the mobile phone to the call mode.

Alternately you can select the desired characters previously and then activate the DTMF sending. The transmitter will turn on and the selected characters are sent (length of each tone is 500ms). When all the characters are sent the mobile phone will return to call mode.

All numbers, * and # are possible to send and A,B,C and D are activated by keys RCL, ALPHA, FCN, CLR correspondingly, when you press them.

QUICK CALLS

In service mode 1...9 numbers can be programmed in memory which can be used to initiate a quick call.

You can make a quick call by selecting

Memory location no.	#	or		or PTT switch.

★ SIMPLEX TRAFFIC

Mobile radios can communicate directly with each other without a base station on simplex channels. The definition of simplex channels is configured in service mode. A mobile radio has to be set manually to the simplex operation mode. In this mode system functions are not available.

Simplex traffic operation is activated by selecting

*	55	*	CCC	#	, CCC = channel number.

Return to system functions is done by pressing:

#	55	#

Simplex traffic can be activated also from the menu (Special call functions).

CALL DURATION

It is possible to check the duration of the last call you made (current if the call is in progress). The duration can be read by the sequence

FCN 4 .

The duration is shown for a short while in minutes and seconds: 12:35 (means 12 minutes 35 seconds).

You can check also the duration of all calls made with the mobile radio. Select call duration information from the menu (Clock settings/ Show last call and total duration) and both the duration of last call and all calls will appear on the display. The duration of all the calls is shown in hours, minutes and seconds; 12:20:40 (means 12 hours, 20 minutes and 40 seconds).

The call duration can be shown during a call by setting "Show call duration during conversation" ON from the menu (Display settings).

AUTOMATIC POWER OFF

It is possible to use an external input for automatic power off function.

In the service mode the "automatic power off" function can be set on and in the menu ("Additional functions") you can determine the time constant.

Example:

Select: 010 min.
Automatic power off ←
used/not used

Current delay is 10 minutes. You can type a new time with number keys.

When the power is turned off in a vehicle the mobile radio will be turned off also after this delay. If there is a call going on, the delay starts when the call is ended.

THE MENU

Using the Menu

The mobile radio has a menu which allows you to activate different operations, change settings and make different types of calls.

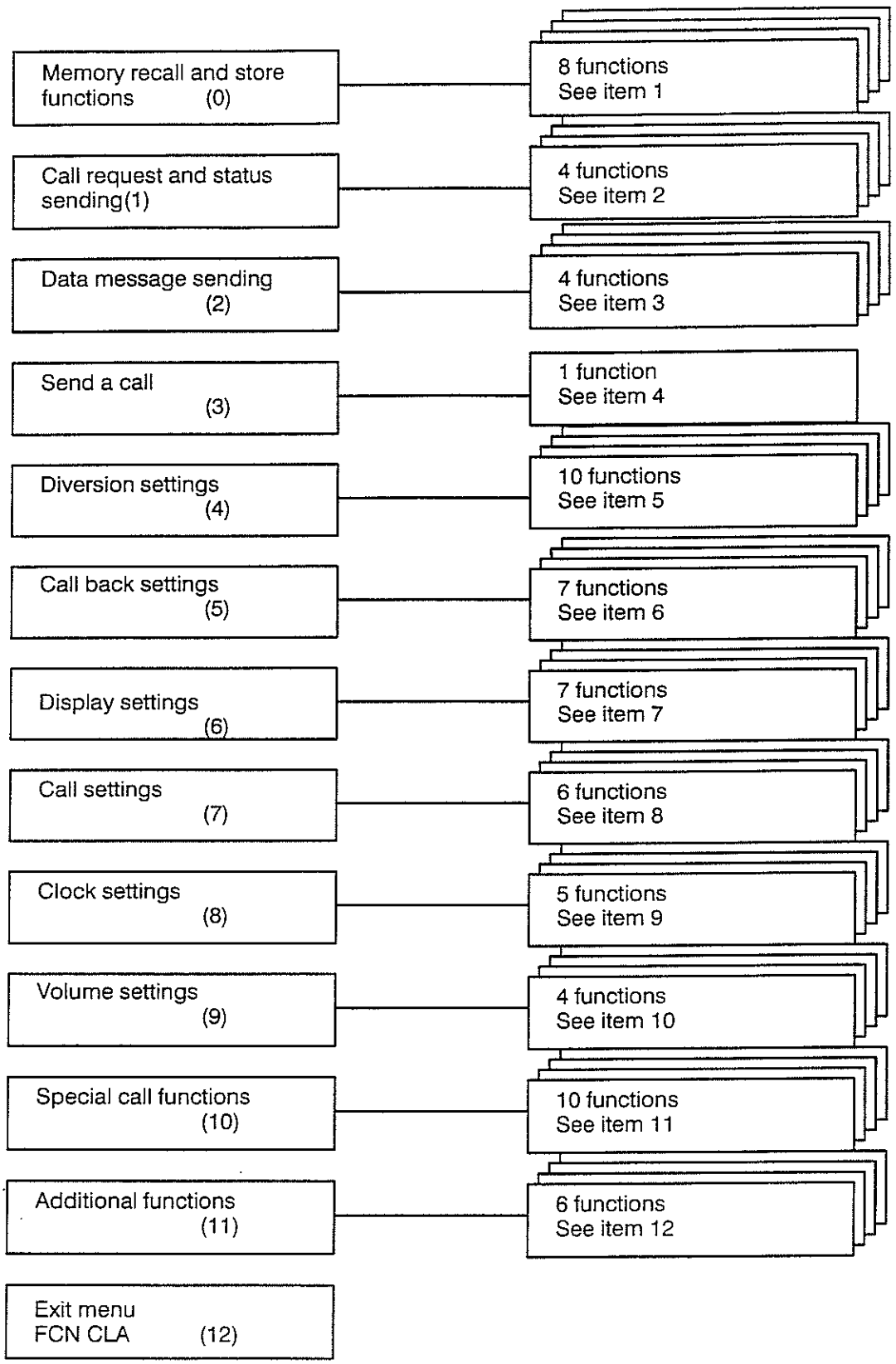
You can activate the menu by pressing FCN MENU and MENU indicator will appear on the display. At the same time VOL indicator will disappear indicating that you can browse the menu with ▼▲ button.

The desired function is selected by pressing OK button, which will give you the next menu level. If you are in the lowest level the OK button will execute the current function.

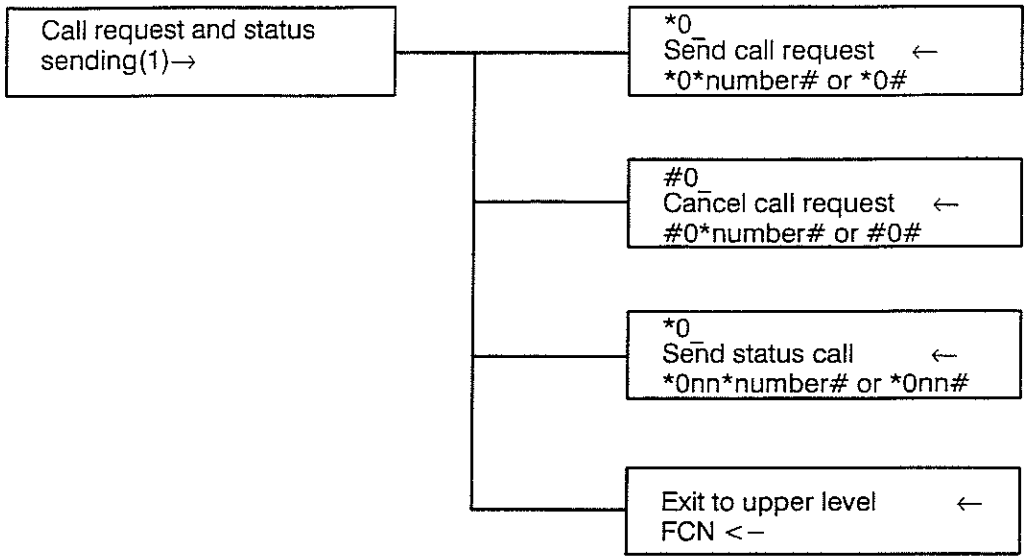
In functions which will activate a call (e.g. status, data or priority call) the first digits of the keying sequence will appear on the number display and the help text for the function will appear on the info display. Type the rest of the digits and press OK (exit from menu) or initiate a call by pressing # or  or PTT switch.

When setting functions (e.g. display settings) you can see the current value in number display and you can change the value by pressing OK button. With ▼▲ button you can move to the next item in the same menu level.

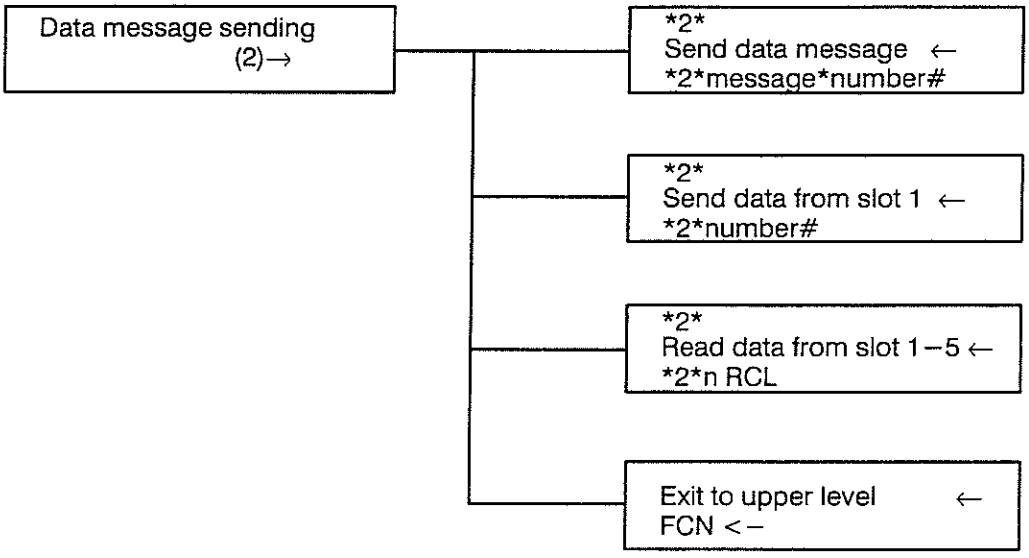
You can exit from the menu by keying FCN CLA or by selecting "Exit menu" from the main level of the menu. "Exit to upper level" is the way to change the menu level upwards.


Main level of menu
Sublevels
Memory recall and store functions (0)
8 functions See item 1
Call request and status sending(1)
4 functions See item 2
Data message sending (2)
4 functions See item 3
Send a call (3)
1 function See item 4
Diversion settings (4)
10 functions See item 5
Call back settings (5)
7 functions See item 6
Display settings (6)
7 functions See item 7
Call settings (7)
6 functions See item 8
Clock settings (8)
5 functions See item 9
Volume settings (9)
4 functions See item 10
Special call functions (10)
10 functions See item 11
Additional functions (11)
6 functions See item 12
Exit menu FCN CLA (12)

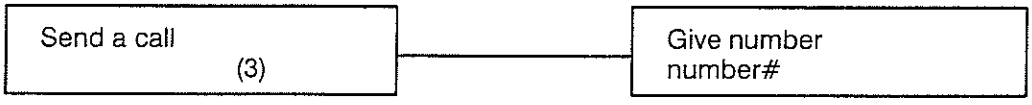
2. Call request and status sending



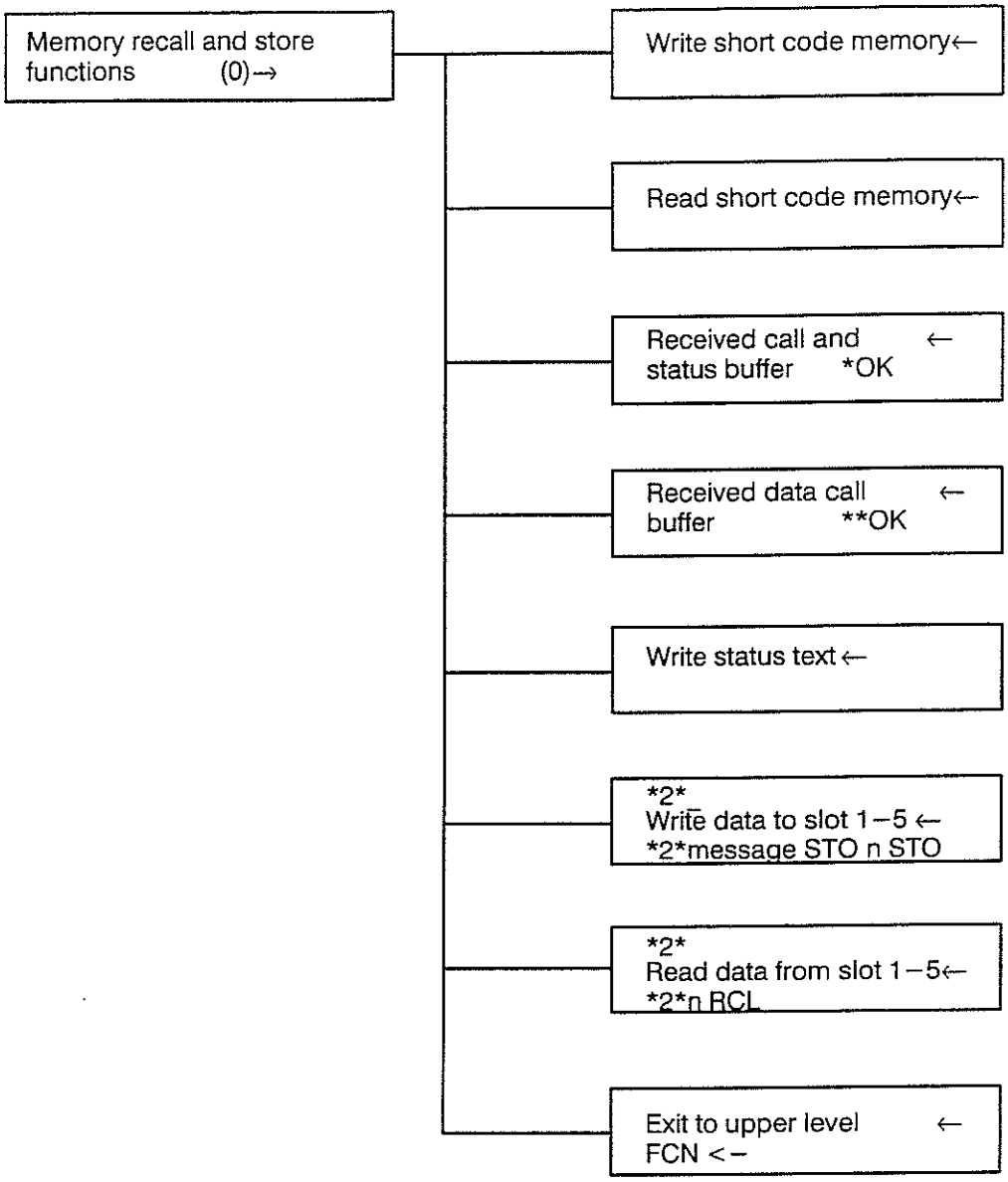
3. Data message sending



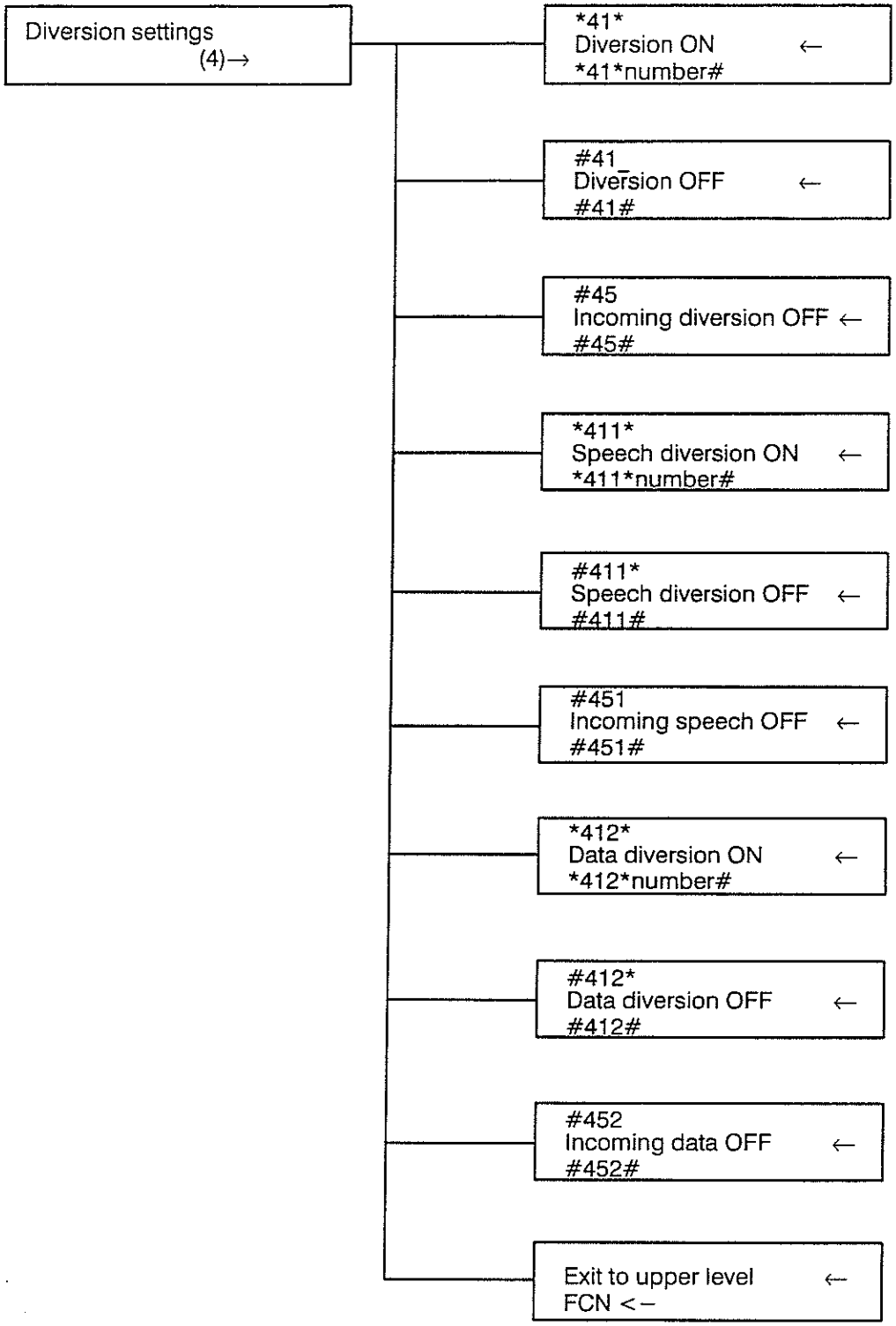
4. Send a call



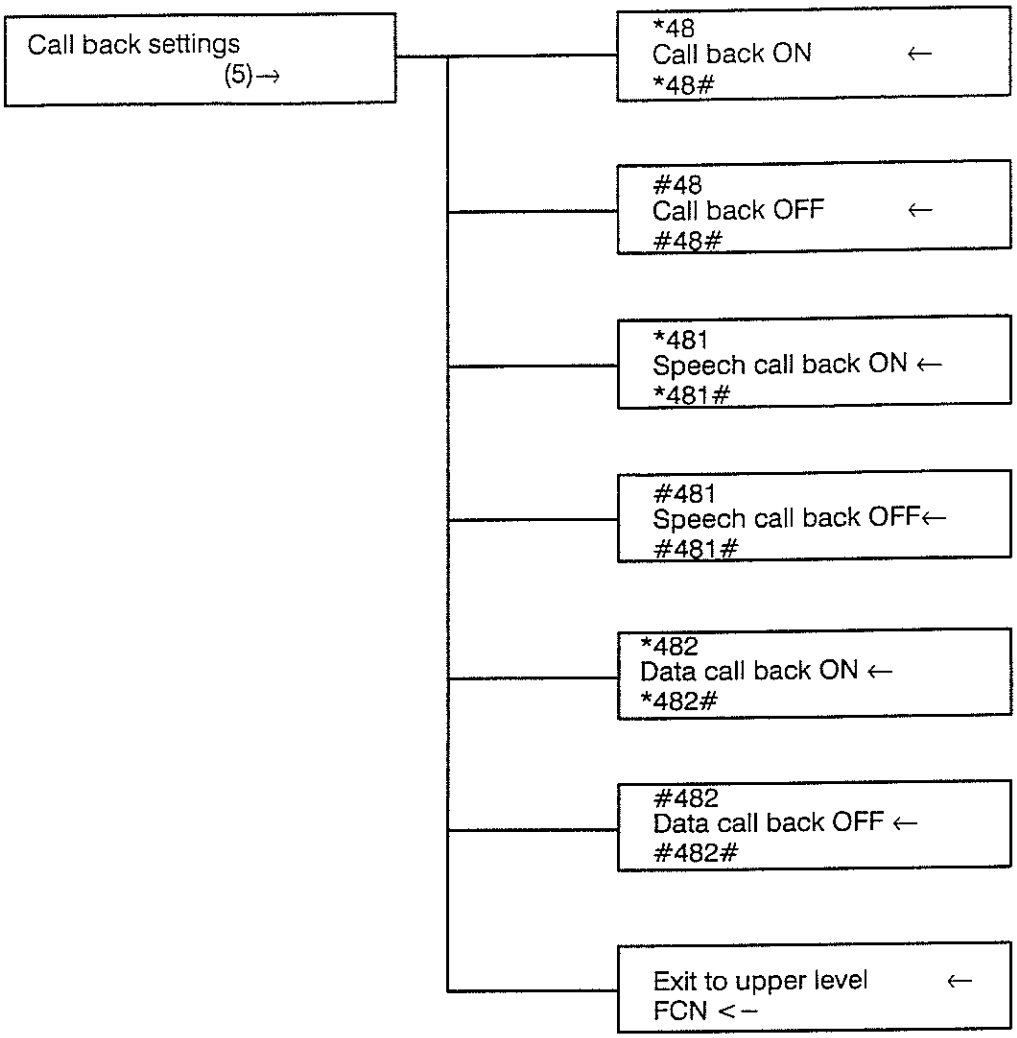
1. Memory recall and store functions



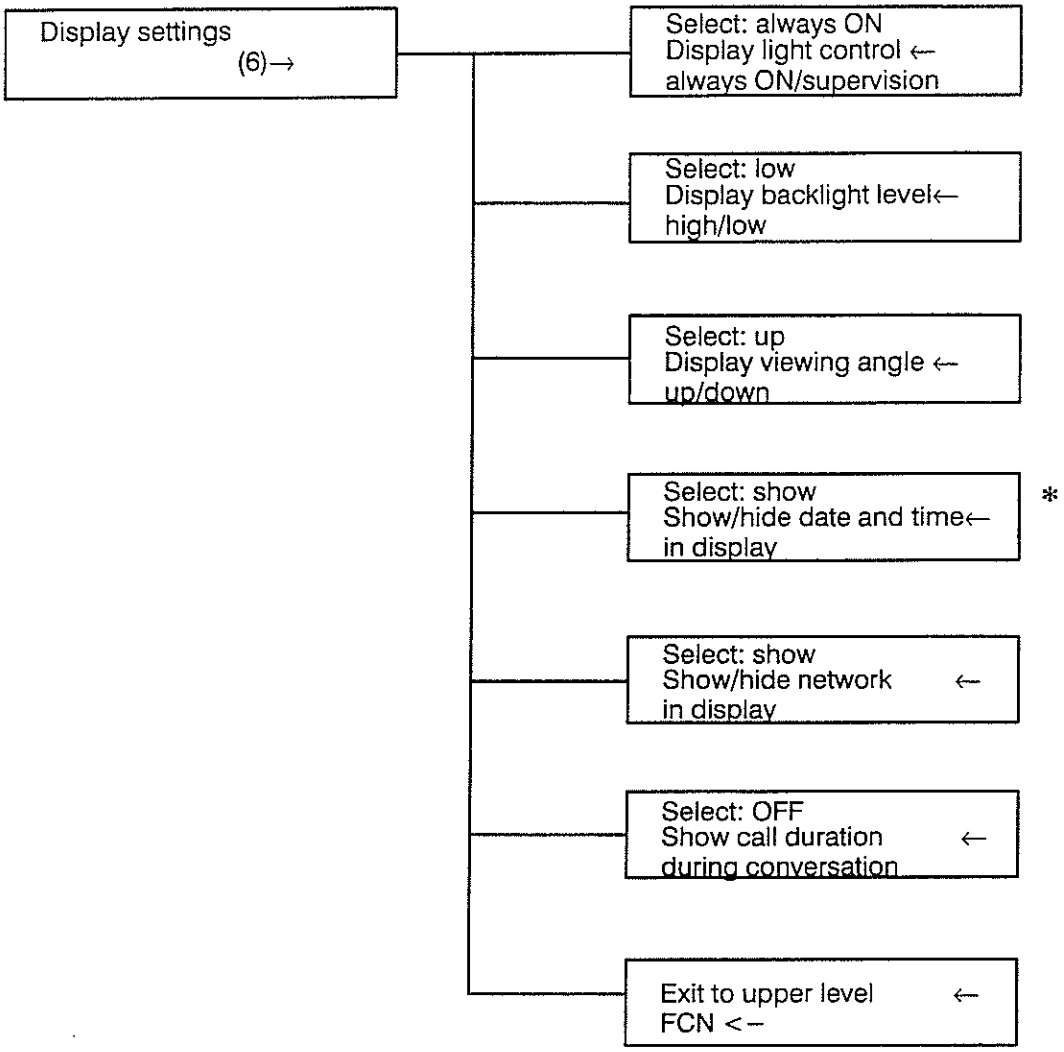
5. Diversion settings



6. Call back settings

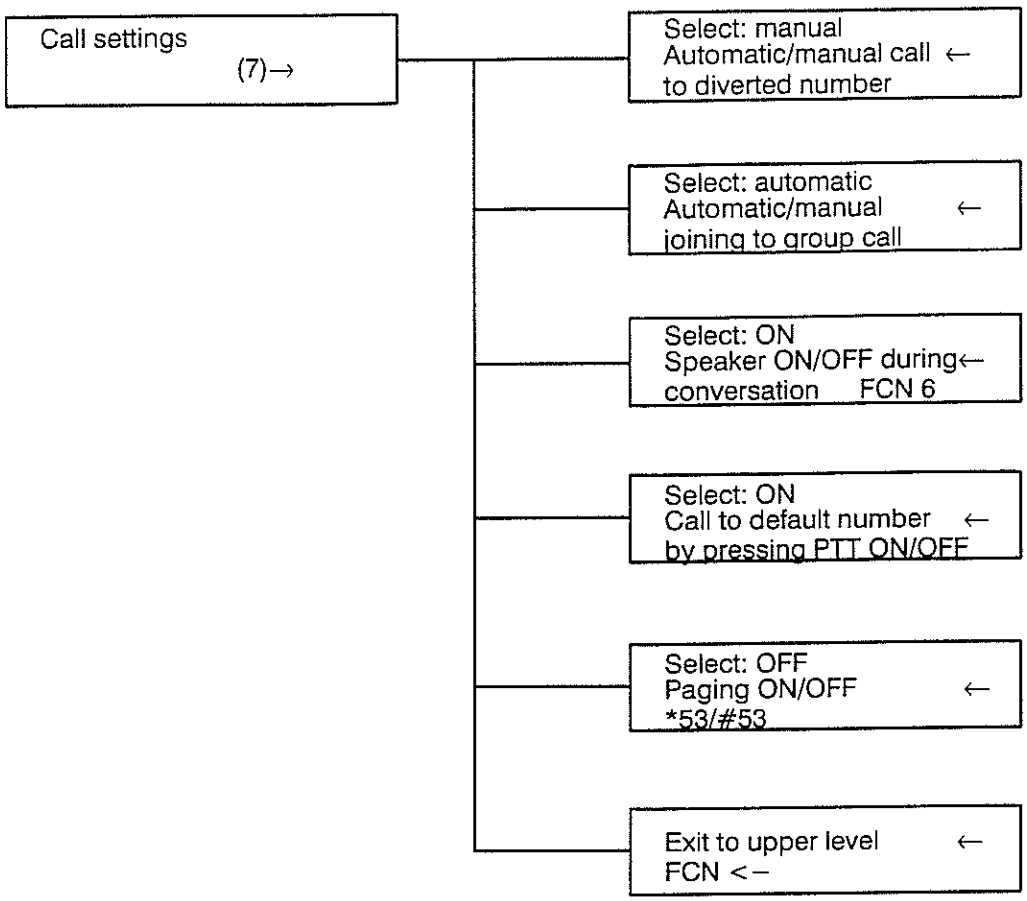


7. Display settings

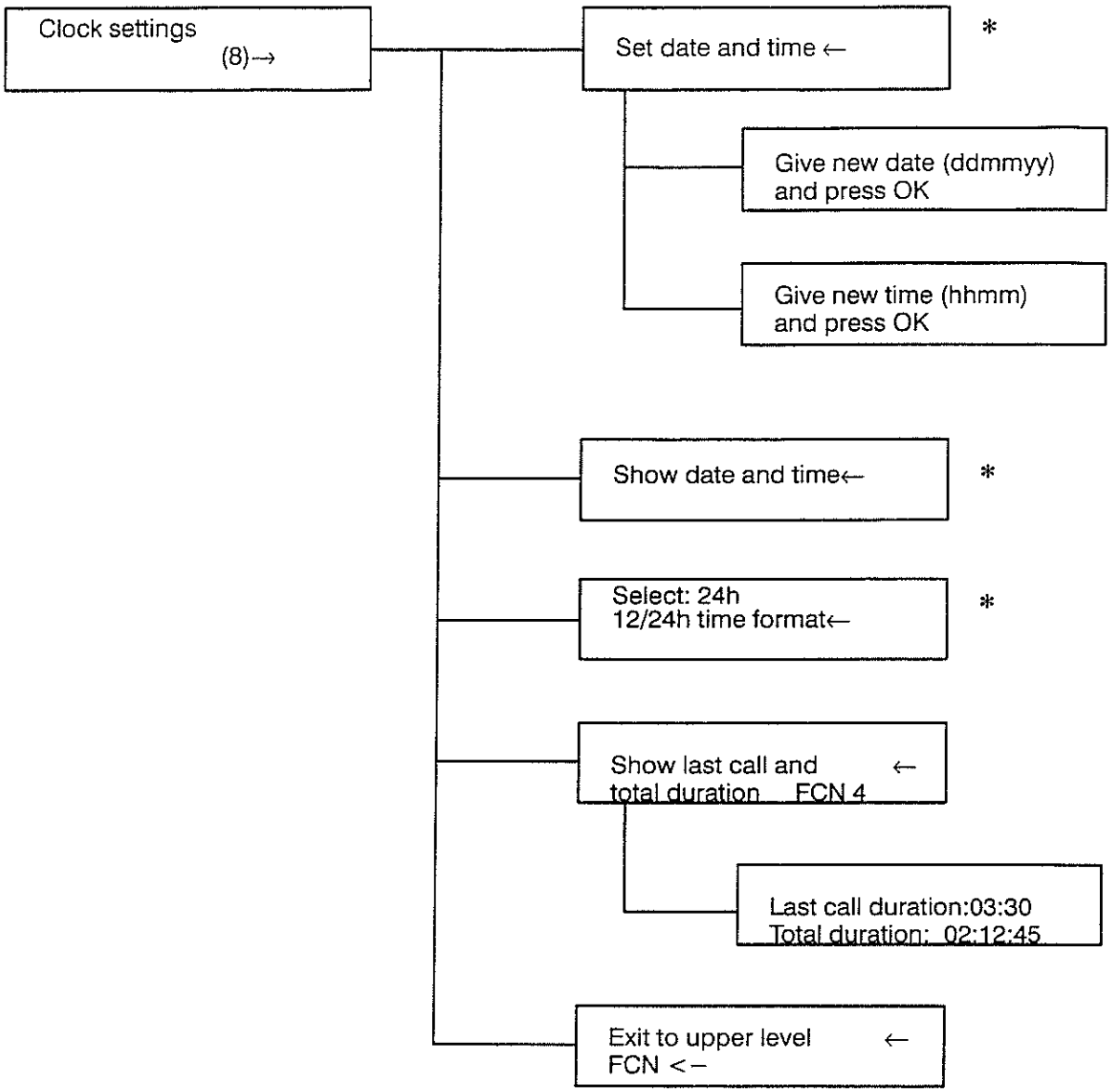


* is displayed only if optional clock cirquit is mounted

8. Call settings

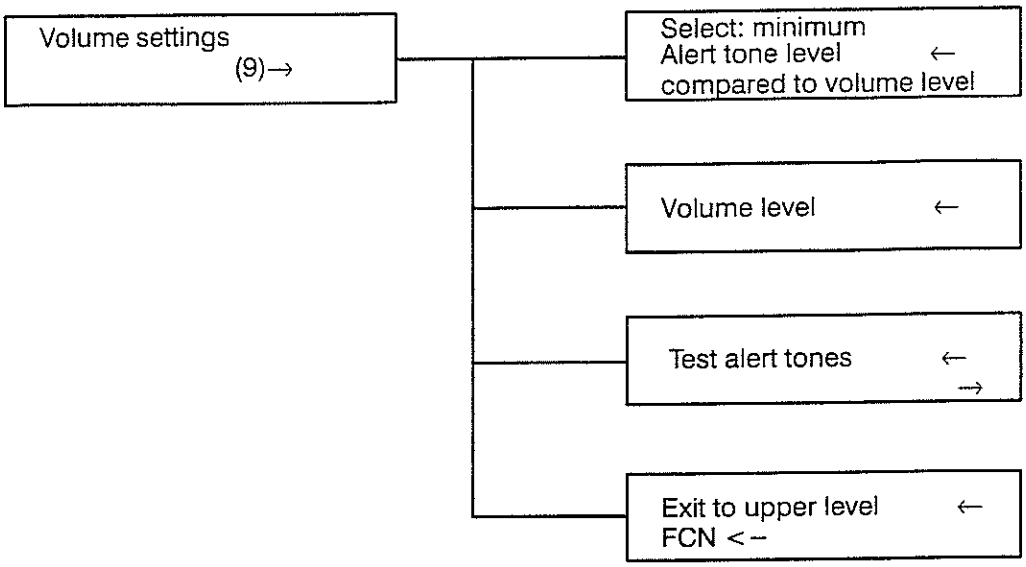


9. Clock settings

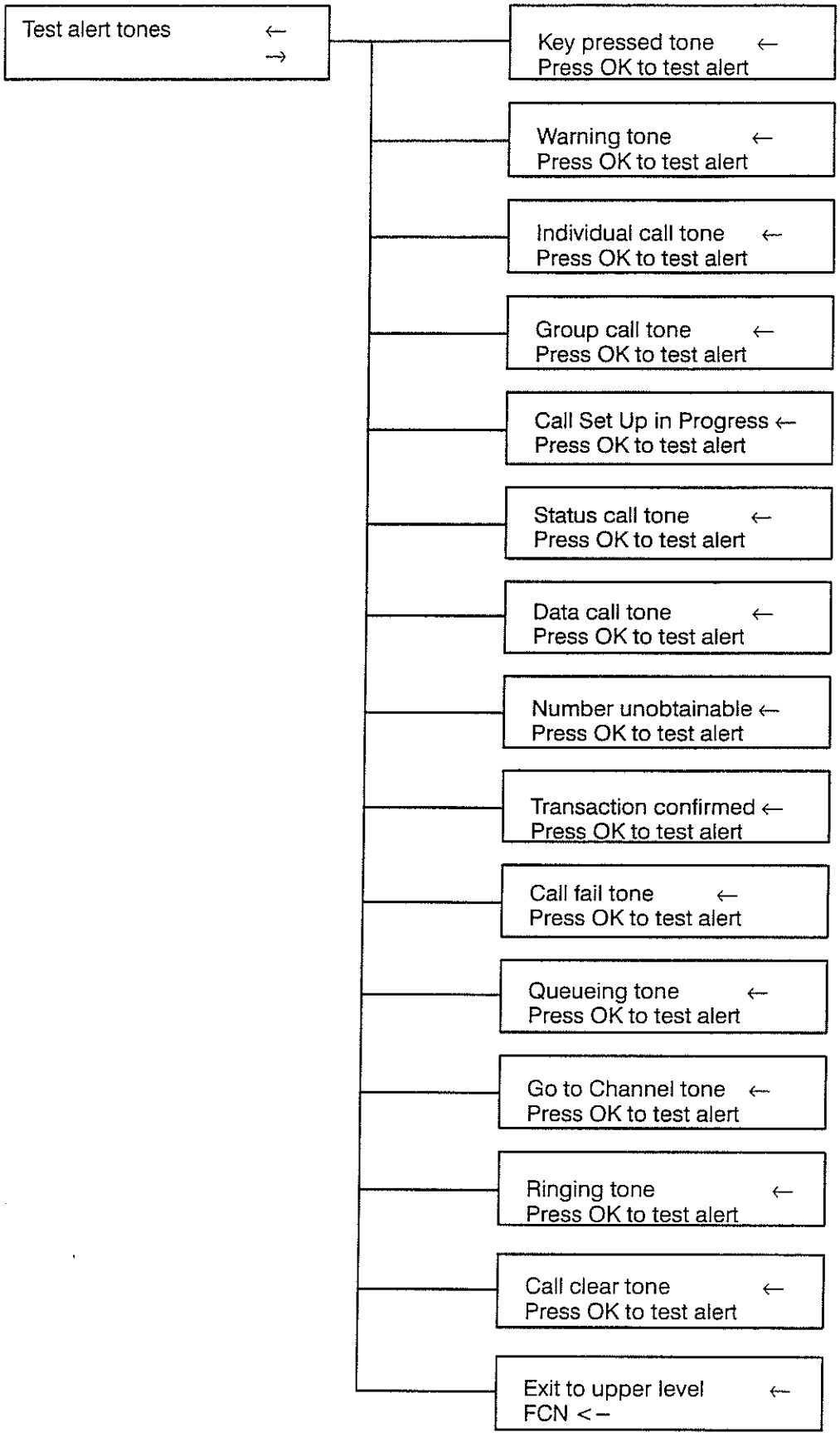


* is displayed only if optional clock cirquit is mounted

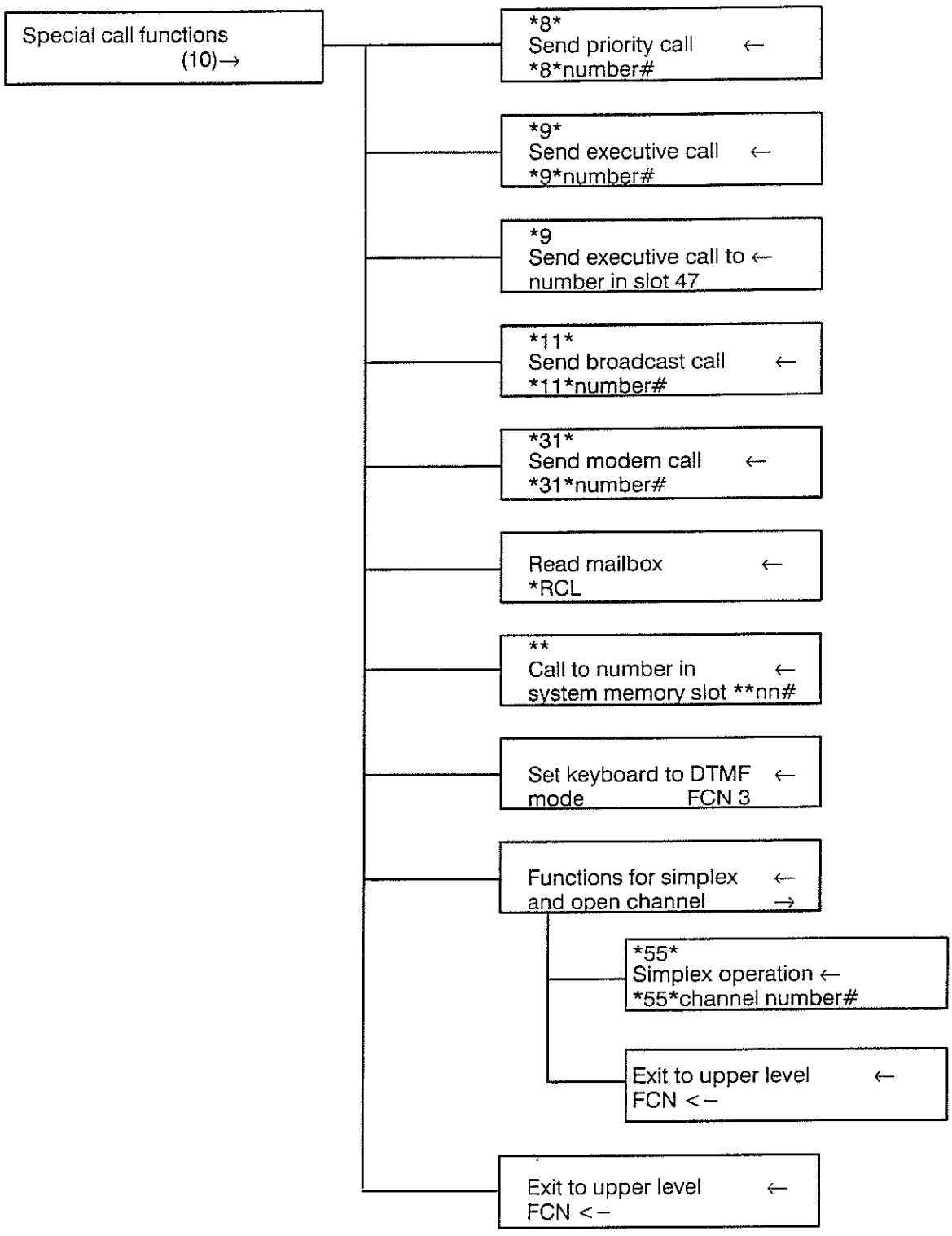
10. Volume settings



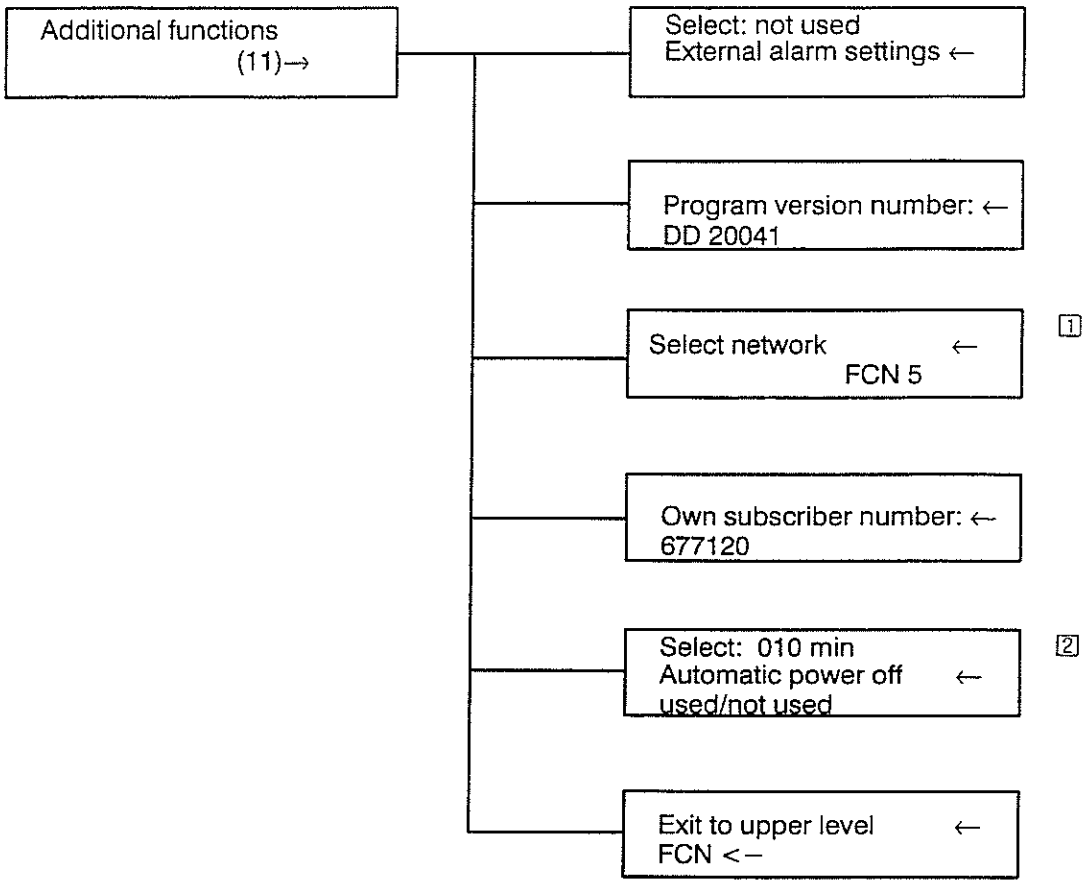
10.1 Test alert tones



11. Special call functions



12. Additional functions



1 is seen if several operators are defined.

2 is seen if Automatic power off function is activated.

All Nokia products are subject to continuous research and development; we therefore reserve the right to make changes and improvements in this manual without prior notes.

NOKIA R40 MOBILE RADIO WITH SPEAKER MICROPHONE CU45

INSTRUCTION MANUAL

DEAR USER OF THE NOKIA R40 MOBILE RADIO

The Nokia R40 – a mobile radio with plenty of functions for system networks – has just been placed at your disposal. Please read this instruction manual carefully in order to learn to utilize all the properties of the phone.

Some functions are network related and they are marked with ★ in the text.

We wish you successful connections

NOKIA TELECOMMUNICATIONS

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Prepared	Checked	Approved	Code
JL/15.10.93	AKo/11.11.93	AKo/11.11.93	DC48040

IMPORTANT INFORMATION

- High frequency radio waves (VHF, UHF) generally propagate in straight lines and do not bend around obstacles. Terrain and buildings as well as interference from other sources may block the connection especially at the edge of the coverage area. These characteristics of radio communication must be taken into account when planning and using a radiotelephone network for emergency messages.

- Learn the correct and safe way of using the radiotelephone in a vehicle. It is recommended that you stop the vehicle, if it is possible to do so without creating a traffic disturbance, before using the radiotelephone.

- Turn off your radiotelephone near electrical detonators or in an explosive atmosphere. Observe the sign "Turn off two-way radios".

- While transmitting do not stand closer than 0,5 metres to the antenna in order to ensure unobstructed propagation of the radio waves and for safety reasons.

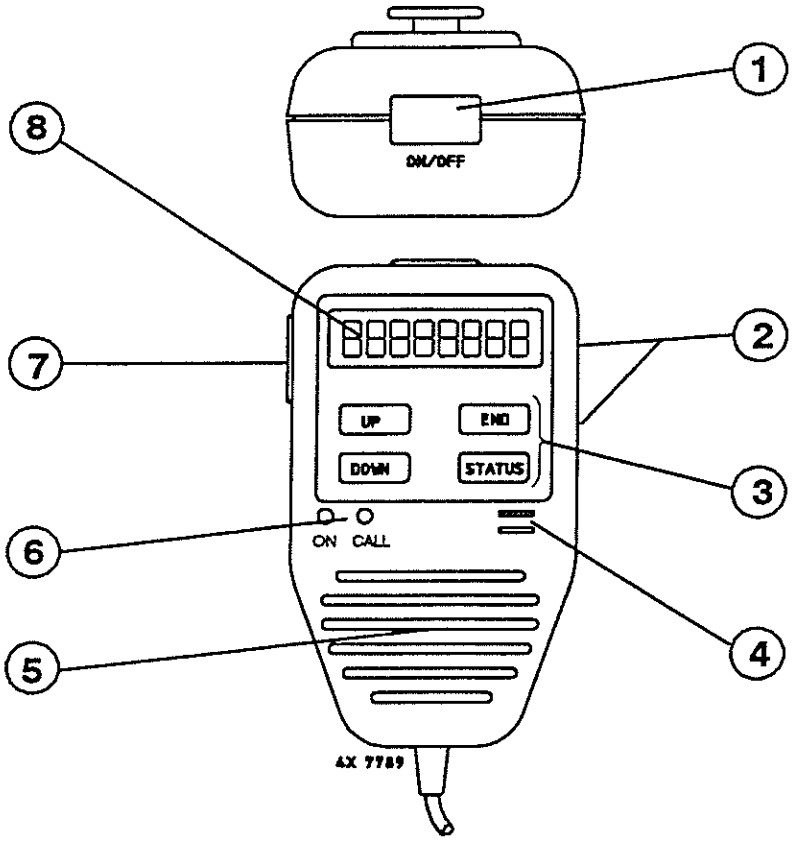
- Use of the radiotelephone should be avoided close to sensitive electronic monitoring systems such as medical instrumentation systems and pacemakers.

- The possibility exists that the use of a mobile radio in a vehicle may result in the altered operation of electronic systems (e.g. fuel injection and braking systems).

  If this occurs: **Turn off** the mobile radio **immediately**, and contact your service organization for advice.

- Fans, power accessories, window demisters or radios may alter the operation of the mobile radio. Consult the accessory manufacturer for details regarding the elimination of radio interference from such accessories.

CU 45



1. Power switch

The mobile radio is switched on and off with the power switch.

2. Volume control buttons (up/down)

These buttons control the speaker volume of CU45. Volume level (seven different levels) is adjusted step by step by pressing up/down buttons. A warning tone signal is heard if you are trying to decrease/increase the volume level though the level is at the minimum/maximum value

3. Buttons

- UP/DOWN buttons are used to browse abbreviated number memory, list of functions and status numbers
- STATUS button is used to activate status state and accept the selected choice
- END button is used in returning to base level and ending a call

4. Microphone

5. Loudspeaker

6. Indicator LEDs

Power ON led

- flashes when the mobile radio is on but it is not registered into the system
- lights steady when the radio is registered and ready to operate

CALL led

- flashes when group call is coming or when there is a new status message or unanswered call in the buffer
- lights steady when an individual call is coming or there is a call going on

7. Press–To–Talk switch (PTT)

The PTT switch activates the transmitter for speech. Press the switch when speaking and release it when listening.

8. Display

The display shows the state information and number of the A–subscriber (max 8 digits) when a call is received, if the incoming call is from another terminal equipment in the same system.

If the displayed number is longer than 8 digits it is shown in two parts which blink alternately. The = character indicates that the number continues in next displayed part. For example number 094526599 is shown :

09=	blinking alternately with	=4526599

The decimal points on the display show current field strength.

. . . .	= very good channel
. . .	= good channel
. .	= usable channel
.	= poor channel

SIGNAL TONES

High pitched signal tones are indicated by a thin line, low pitched tones by a thick line.

1 Signal Tone for Pressing a Button " – "

– is heard when you press a button

– indicates that the function of the button is activated

2 Call Set-Up in Progress Tone "

– is heard when the call has been transmitted (A-subscriber)

3 Signal Tone for an Incoming Call

An individual call and a group call have different signal tones.

Individual call " – "

Group call " – "

The signal tone will end when the call is answered or the time monitoring clears it down. The status and data call has a signal tone of its own: " ——— "

4 Number Unobtainable Warning Signal

" – – ——— – – ——— – – ——— "

– is heard when the exchange acknowledges that the call request has not been accepted

– is heard when you select a wrong command

– ends when you press any button

5 Transaction Confirmed "– – –"

– is heard when e.g. a conference call request has been acknowledged by the exchange or a status message has been transmitted

6 Call Failed

" – "

– is heard when e.g. the call is failed because of the overload of the system

7 Queuing Tone

"

"

– the A-subscriber will hear the queuing tone when he is waiting for the B-subscriber to be free

– both the A- and the B-subscriber will hear the queuing tone when the B-subscriber has answered but you have to wait for a free channel

8 Go to Channel " ___ "

– both the called and the calling phone give a short signal tone when they receive the GTC command from the system

9 Called Party Ringing Tone

" ▬▬▬▬▬ ▬▬▬▬▬ "

– can be heard from the A-subscriber's mobile radio when the B-subscriber's mobile radio is giving the ringing tone

10 Warning Signal

The warning signal " _____ " can be heard when:

– you are trying to go to the buffer reading mode though the buffer is empty

– the call time-out will clear the call after 10 seconds

– the volume controller is being pressed though the level is at minimum or maximum value

11 Call Clear Signal Tone " ▬▬▬▬ ▬ "

– a long + short signal tone to indicate that the call is cleared down

ERROR MESSAGES

When power is switched on to the mobile radio all display segments will be displayed for a while and the equipment activates the self–test. The "Err" text and number on the display give information about the state of the equipment if the self–test discovers some problems.

Meanings of Error messages:

No.	Meaning
Err 1 or	Some abbreviated dialling number(s) are lost from the memory some characters have been changed.
Err 4	System information is lost.
Err 5	Some radio adjustment parameters are lost.
Err 6	Own subscriber number is lost.
Err 8	Additional group number is illegal.
Err 9	Some system parameters are lost.
Err 10	Channel table is lost.
Err 11	Some local field parameters are lost

Errors 6, 10 and 11 make the mobile radio unusable; the Err text and number stay on the display and other functions are impossible. The mobile radio has to be taken for service immediately.

In other error cases the mobile radio will work with those properties that are possible. Err text and number stay on the display until some button is pressed.

ABBREVIATED NUMBERS

There are 43 memory locations at your disposal. You can store 21 digits in each memory location. The numbers can be stored to the mobile radio with the alphanumeric control unit or with parametrization software in service. The memory should contain all phone numbers and modifiers that you are going to use. There are some special memory locations which have predetermined functions like memory location 1 (No number).

The memory locations are available as follows:

0	the last number used
1	no number, empty memory location where browsing starts, DON'T STORE NUMBER IN THIS LOCATION
2 – 43	user numbers
44 – 45	additional group numbers
46	number to which calls are diverted if diversion is active
47	emergency call number, which will be activated by a separate emergency switch
48	default number
49	pager number
50	the last group number used
51	emergency number

The user can browse the memory by pressing UP and DOWN keys. UP key gives the next higher location and if you already have the highest memory location on the display next UP key pressing will give the contents of the lowest memory location. The DOWN key works in the same way but in the other direction (downwards).

Memory locations 44, 45, 46, 47, 48 and 49 can not been browsed because these numbers have special meanings.

Default number

The default number means a number which you most frequently call and the selection of which is easiest. The number is stored in the memory location 48 and can be activated in the base state just by pressing PTT–switch when the display is empty. The function must have been set on in service before usage is possible.

The last used number (redialling)

You can easily select the last used number again by pressing DOWN button once when you are in base state and the display is empty.

Emergency call

SoS text is on the display when you are in memory location 51 through which you can send a emergency call by pressing PTT. To reach location 51 press DOWN button until **SoS** text appears on the display (once or twice from base state).

OPERATION

Switch the power on. All symbols and your subscriber number will be displayed for a while and the equipment activates the self-test. The ON indicator lamp will start flashing.

The ON indicator lamp will flash when the radio is not registered in the system and thus no calls can be originated. The ON indicator will become steady when the mobile radio is within the coverage area of the base station and ready to operate. The display shows the operator number, for example F_o_1. The operator number will disappear from the display when you press any button.

HOW TO MAKE A CALL

When the mobile radio is switched on the base state of the radio is active. In the base state you can browse the preprogrammed abbreviated number memory with UP and DOWN buttons to select the desired subscriber number.

Press PTT switch to initiate the call.
If the B-subscriber is busy, the call will be automatically placed in a queue.

HOW TO ANSWER THE PHONE

The CALL indicator lamp will turn on and the signal tone for incoming call is heard.

The A-subscriber's number will appear on the B-subscriber's display if the call is coming from another user in the same system.

Press PTT switch and start the conversation.

The 5 latest received calls which you have not answered will be stored in the memory, where those can be read like told in section "HOW TO READ RECEIVED STATUS MESSAGES". Indication from the unanswered call is blinking CALL led.

HOW TO CLEAR DOWN A CALL

Press END button.

A time limit for the call can be set into the mobile radio or the system exchange. When the time expires, the call will be cleared down automatically. You will hear a warning tone 10 seconds before the clear down.

HOW TO SEND A STATUS MESSAGE

You can send a status code to a number which you have selected in the base state or from status/call buffer (as an answer to incoming call). Browse the pre-programmed abbreviated number memory with UP and DOWN buttons to select the desired subscriber number.

Press STATUS button when the desired number is on the display and the selected number and first status code will appear on the display.
For example:

57_ H

Select now the status code (0...31) with UP and DOWN buttons. When the desired status code is selected press PTT switch to send the message.

If the B–subscriber's status buffer is full, thus no more status messages can't be stored , A–subscriber hears "Call Failed"–tone and status sending is disabled.

Status codes 0 and 31 have fixed meanings:

- 0 = call request, shown as **H** on the display
- 31 = cancel call request, shown as □ on the display

HOW TO READ RECEIVED STATUS MESSAGES

Your mobile radio will store the 5 first status messages.

When a status message is received call led starts blinking until some button is pressed. Press STATUS button when the display is empty to move to the buffer reading mode and the latest received status code and A–subscriber's number will appear on the display. Received status messages and calls which you have not answered can be browsed with UP and DOWN buttons.

On the display there is an E as an indication of buffer reading state and received status message and the number of the A–subscriber. If the received message (A–subscriber's number and status message) is longer than 8 digits it is shown in two parts which are blinking alternately.

For example: Status 12 received from number 57 in the same fleet.

E 57_ 12

You can call to a number from which you have received an unanswered call by pressing PTT switch when the number is on the display. When you take a call, the number will be deleted from the memory.

All messages are deleted from the buffer when the power has been switched OFF or one by one with following keying sequence:

- select buffer reading mode as told above
- press STATUS button once again (= activate status sending to A–subscriber)
- delete received status message with END button

HOW TO SEND A CALL BACK MESSAGE

If you are unobtainable and you want to inform the A–subscriber that you will call back in a minute, press during the incoming call END button. The A–subscriber will get the Transaction Confirmed tone ("▬ ▬ ▬") as an information about call back.

This function is possible only when you receive an individual call from the same system .

You can store in the abbreviated number memory keying sequences through which you can set the function operate automatically. Selection of the function is done as normal call. Programming of automatic call back:

* 48n #

n = 1	speech calls receive the message
n = 2	data calls receive the message
n not defined	all calls receive the message

The function can be cancelled by selecting

48

SPECIAL FUNCTIONS

Special functions can be activated by pressing END button in the base state while the display is empty. In the functions menu you can:

- set diversion ON/OFF (1= ON, 0 = OFF) to predefined number
- select operator (1...6 choices, predefined in service)

On the display F character indicates that special functions can be activated/deactivated. Next character indicates function (d=diversion, o=operator) and last character the selectable state of current function. By pressing STATUS button you can change the function on/off or select a new network operator. If you have changed the operator the mobile radio will make the self test.

Call diversion

You can divert the incoming calls to the number which is stored in the abbreviated number memory location 46. To set diversion on dial END when the display is empty, and on the display appears F_d_0. By pressing STATUS you change the current state of diversion (ON/OFF).

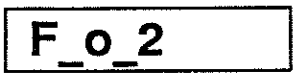
Example. Diversion is currently OFF and can be set ON by pressing STATUS button.

When the diversion is set on the mobile radio returns to the base state. As an indication of the diversion you will see:

Operator selection

Operator parameters are programmed in the service mode. The selection of the operator is made manually by pressing END when the display is empty, and then you can browse the desired operator to the display with UP/DOWN buttons and accept it by pressing STATUS.

Example 2. Operator can be changed to operator 2 by pressing STATUS button



★DIVERTING A CALL TO A PAGER

You can set the mobile radio to divert a received call to a pager. You should program the number of the pager into abbreviated number memory location 49.

You can store in the abbreviated number memory keying sequences through which you can set the function ON and OFF. Selection of the function is done as normal call. Diversion of the call to the pager is set ON by selecting * 53 # and canceled by selecting # 53 #.

NOTE! If you want to use a pager you have to define a channel which the pager will use. The definition of pager channel is done in service mode.

The radio diverts the call to the pager if you do not answer in 15 seconds.

★CONFERENCE CALL

You can include a new subscriber in the call by selecting the number of the subscriber during the call. Select the new subscriber number from the memory with UP/DOWN buttons and initiate the call by pressing STATUS button.

Conference call is possible during individual call.

NOKIA R40

DETACHING THE CONTROL UNIT

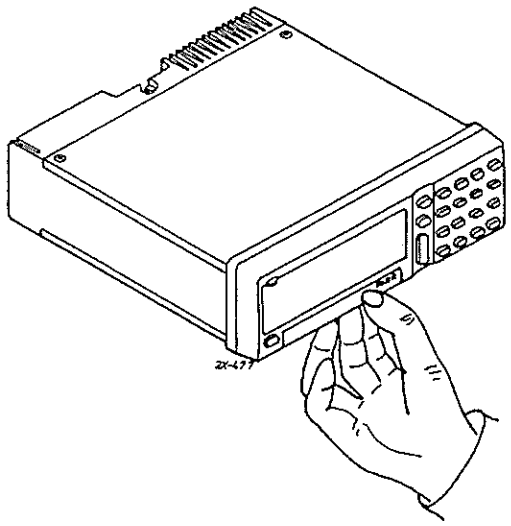


Figure 1.

1. Remove the front panel of the control unit (Fig.1)

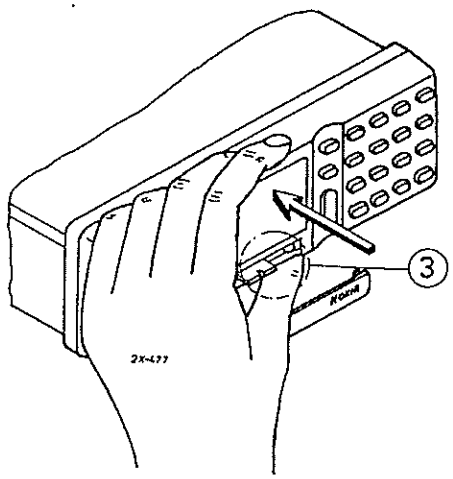
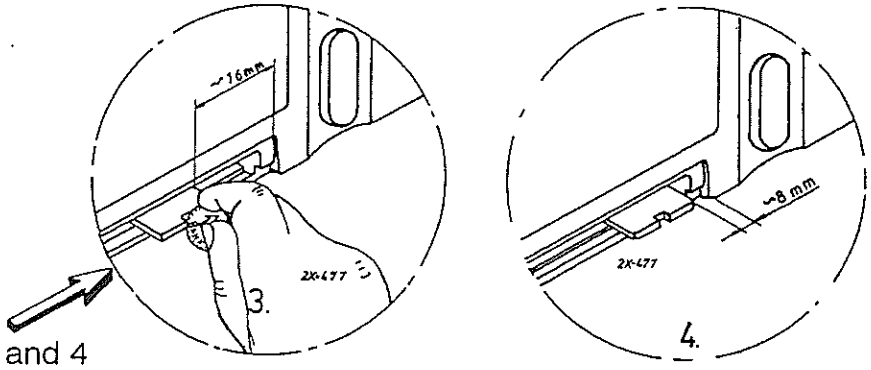


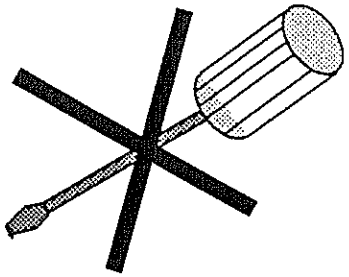
Figure 2.

2. Push the lever to right by using a coin to unlock.(Fig.2,3,4)



Figures 3 and 4

Notice! Avoid using any sharp tools when moving the lever, as it can damage the cables inside the radio.



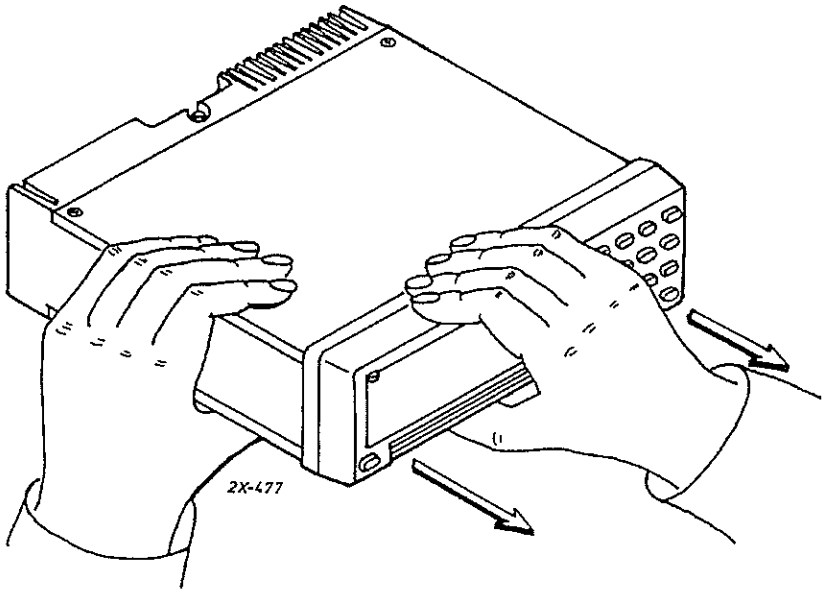


Figure 5.

3. Remove the control unit from the radio (Fig 5)

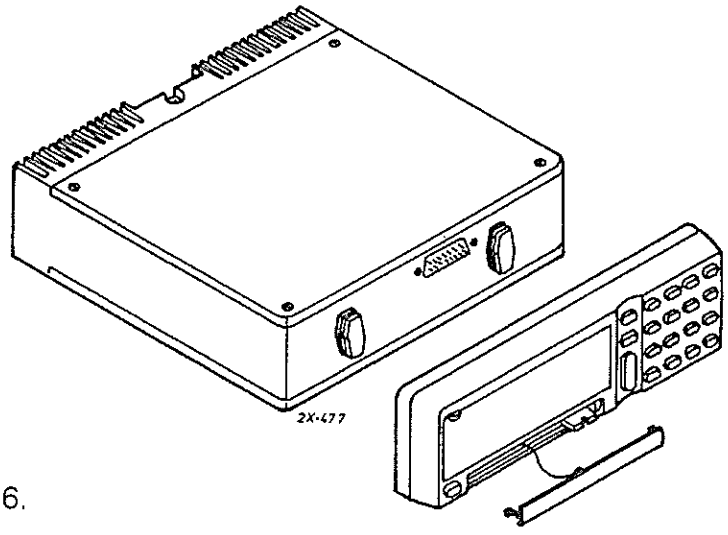


Figure 6.

NOKIA R40

FASTENING THE CONTROL UNIT

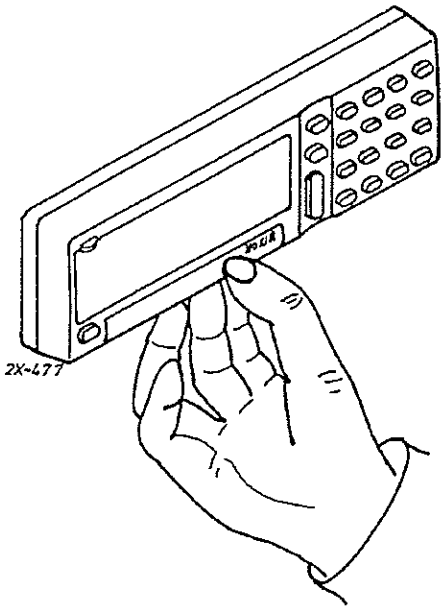


Figure 1.

1. Remove the front panel of the control unit (Fig.1)

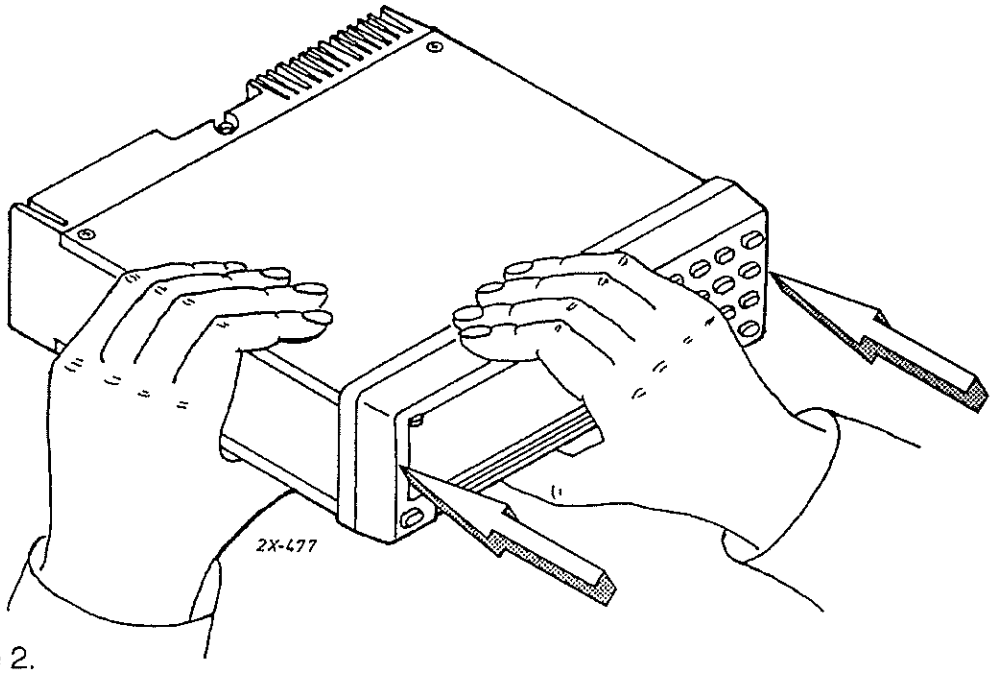


Figure 2.

2. Gently push the control unit onto the radio (Fig. 2)

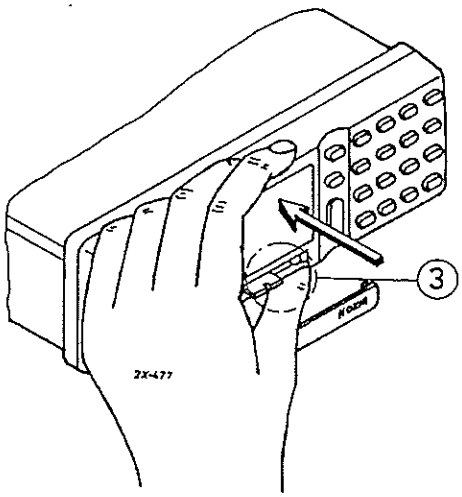
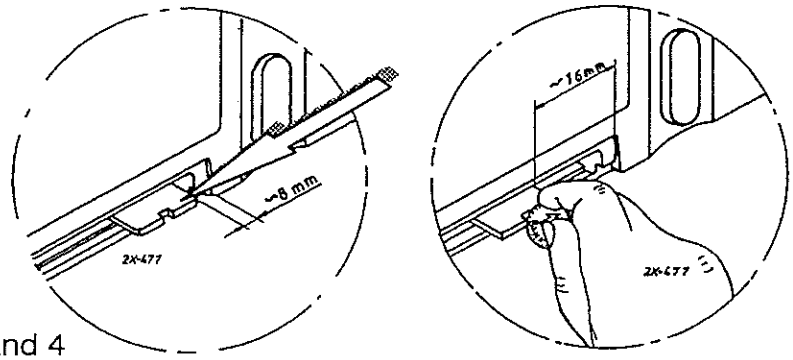


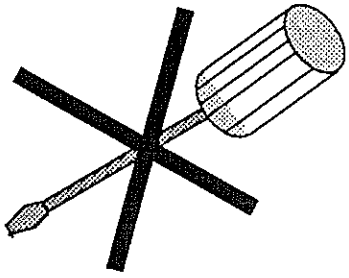
Figure 2.

3. Push the lever to left by using a coin to lock the control unit to the radio. (Fig.2,3,4)



Figures 3 and 4

Notice! Avoid using any sharp tools when moving the lever, it can damage the cables inside the radio.



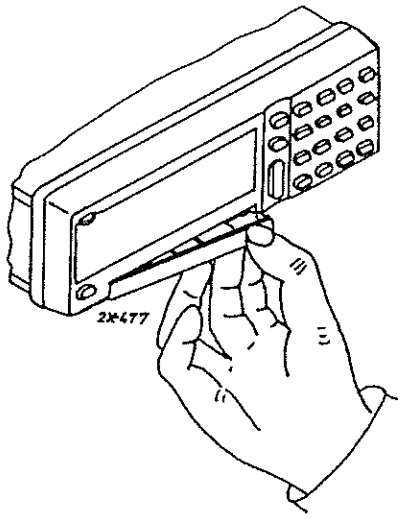


Figure 5.

4. Put the front panel back on the radio (Fig. 5)

SERVICE–MODE INSTRUCTIONS FOR NOKIA R40

REGIONET *(MPT)* & ESI

and

Traxys (DPTT)

GENERAL

The LOCAL state is intended to facilitate testing and adjustment of the mobile unit's station section in both production and in the field.

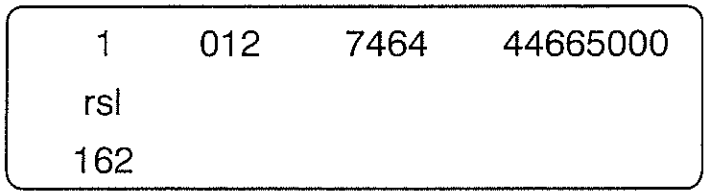
Functions can be activated in a special LOCAL state which can be entered by a service control unit . Each service control unit includes an individual EEPROM where the Identification code (ID–code) is stored. The ID–code is read via I^2C–bus when starting the LOCAL–state. Local state is selected when switching on the radio by pressing the PWR–key until text SELBST TEST is displayed. Functions can be activated manually by means of the control unit or directly with an automatic unit. You exit from the local state by turning off the device.

When the LOCAL state is activated the device is in the following state:

- –audiofrequency connected (handset line)
- –loudspeaker muted
- –volume at lowest level 0 (speaker line)
- –receiver on default middle channel
- –transmitter starts up with the PTT switch
- –transmitter power is low and the set value is used to control the power if the NV memory's content can be read; otherwise the control value is the default value stored in ROM
- –Watch dog switched off

Control unit displays

If the device is in the rest state (none of the tests has been activated) the device's top row will display the indication of the channel spacing, the receiver channel that is in force; logical channel number , physical channel number and frequency.
For example:



in top row: 1 = channel spacing 12.5 kHz
012 = logical channel number
7464 = physical channel number
44665000 = frequency 446.650MHz
in bottom row: rsl / 162 field strength indication

When you press the PTT switch the top row contains the transmitter channel information in force and an indication of the channel spacing, the same way as for receiving. If any of the channel information is not defined to NV–memory, the corresponding field on the display is empty.

The bottom and middle rows are reserved for indicating the entries made with the keys and information of the tests.

When a test is activated, a test number is shown on the middle row, right edge.
For each test, the special displays associated with the test are explained.

Available functions in the local state

- the radio unit can be directly set for either the lower, middle or upper channel
- the RX channel and TX channel can be selected separately
- it is possible to set the transmitter power outputs, i.e. 3 different power levels can be selected and if necessary the control values of the outputs can be changed.
- the transmitter power can be adjusted to the correct value in such a way that the output power is measured with a power meter whilst at the same time the LOCAL program provides a means of step–regulating the power in the desired direction. When the power has been adjusted the set control value can be saved.
- the squelcher opening and closing limits can be checked by changing the limit values.
- The squelcher limit values are saved in such a way that the squelcher opening or closing signal is adjusted for the generator and the relevant field strength values of the receiver are saved.
- the squelch can be set for normal operation.
- the channel spacing can be set
- the control values for the transmitter's deviation can be set and stored.
- the receiver's frequency band can be set and the set values can be saved.
- the synthesizer's operating range can be selected
- the volume can be adjusted
- the speaker line can be switched on and off.
- use of the microphone can be disabled and enabled
- Choice between HS– and HF–microphone
- CCIR transmission /reception
- modem (FFSK) transmission/reception
- DTMF–tone transmission
- the voltage levels measurements; field strength, battery voltage can be displayed.
- testing of the A/D and D/A converters

- setting of the output–ports data
- reading of the Input port's data
- MBUS transmission/reception
- Programming system parameters

Activating the tests:

In the rest state the device receives the start–up commands for different tests from the service control unit. The automatic unit can also start the same tests, in which case the automatic unit is connected in place of the control unit and it generates the corresponding keypad characters.

The desired test is activated by selecting a two–digit test number and pressing OK.

If the command sequence is incorrect, the device does nothing.

If the wrong information is keyed in, the entry can be cleared by pressing CLR.

The entire display can be cleared by pressing ##.

Tests which are endless loops are terminated by pressing *.

LOCAL TESTS:

Functional grouping:

10...19	Radio unit's setting functions
20...29	Tuning of transmitter
30...39	Tuning of receiver
40...49	Audio unit tests
50...59	Signalling tests
60...69	Logic unit tests
70...79	Programming of system parameters
90...99	Saving tuning values

The tests marked with ☆ are optional

NO.: FUNCTION

10 Receiver and transmitter to lower channel (channel x)

When performing a test the lower channel can be set by keying in test number 10 and a logical channel number or physical channel number or frequency. The frequency must be divisible on the current channel spacing.,

e.g.:	10027 OK	(logical channel 27)
	100001 OK	(channel 1)
	1044683750 OK	(f = 446.8375MHz)

The channel is stored to NV memory

If the channel number is not keyed in, use the channel number in memory, e.g.: 10 OK.

11 Receiver and transmitter to middle channel (channel x).

When performing a test the middle channel can be set by keying in on the same way like test 10.
If the channel number is not keyed in, use the channel number in memory, e.g.: 11 OK.

12 Receiver and transmitter to upper channel (channel x)

When performing a test the upper channel can be set by keying in on the same way like test 10.
If the channel number is not keyed in, use the channel number in memory, e.g.: 12 OK.

13 Selection of receiver channel

The selection is made by keying in the test number followed by a logical channel number or physical channel number or frequency.

e.g.:	13027 OK	(logical channel 27)
	130001 OK	(channel 1)
	1344683750 OK	(f = 446.8375MHz)

14 Selection of transmitter channel

The selection is made as in the previous test, but the test number is 14.
e.g.: 141114 OK (channel 1114).

15 Setting channel spacing and setting of synthesizer operating range

151 OK	12.5 kHz
153 OK	25.0 kHz
154 OK	C–band (160MHz) and (230MHz)
155 OK	D–band (450MHz) and (500MHz)

E.g.: 151 OK (channel spacing 12.5 kHz)
The channel spacing and synthesizer operating range are also saved to NV memory.

16 Simplex / Semiduplex selection

16 X1 X2 X3 X4 X5 X6
where

X1 – 2 = single–frequency simplex
1 = semiduplex

X2 – 1 = TX's frequency is a duplex interval above RX
0 = TX's frequency is a duplex interval below RX

X3 ... X6 duplex interval in MHz

E.g.: 16100595 OK The duplex interval is 5.95 MHz
TX's frequency is a duplex interval below the RX. Semiduplex operation.

17 Selection of default tuning values

If the NV–memory has lost the tuning values, the device will read automatically needed data from EPROM to NV–memory. By this test you can be select data which will be read on that exceptional situation.

170	Don't read the defaults automatically
171	C–band defaults will be read
172	D–band defaults will be read
173	The extra table of the defaults will be read

18 Selection of mobile unit's frequency band

This test is used to set the mobile unit to operate in either the C or D band.
Frequency band C: (160MHz)
18122080 OK for Tx
18229280 OK for Rx

Frequency band C: (220– MHz)
18135200 OK for Tx
18228000 OK for Rx

Frequency band D: (400– MHz)
18164000 OK for Tx
18271200 OK for Rx

Frequency band D: (470– MHz)
18175200 OK for Tx
18282400 OK for Rx

The frequency band indication is also saved to NV memory

190002 Reading of default values of the radio's tuning parameters (adjustment of the receiver's front end and the transmitter's power settings. from the EPROM to NV–memory.

20 Setting transmitter power output

The transmitter can be set for three different power ranges.
Selection possibilities:

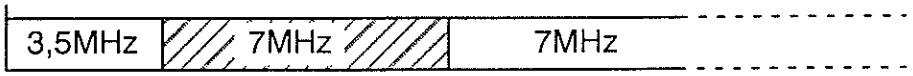
200 OK Transmitter OFF
201 OK 1st power range , LOW
202 OK 2nd power range , SIMPLEX
203 OK 3rd power range , HIGH
The set value is used as the control value. The control value can be changed by stepping with the ▲ or ▼ key.

The next frequency tuning band (7MHz) is selected by pressing RCL–key.
If you wish to save the control values to NV–memory and exit from the test, press STO–key.

You can also exit from the test without saving the new values:
–by pressing *, transmitter will be switched off
–by pressing #, transmitter will stay on

During the test the transmitter is turned on !!!!
It can be switched off by test 200 or by pressing the PTT and then releasing it.

138MHz *(S33G lowest is 220MHz)*
400MHz *(S33G lowest is 470MHz)*



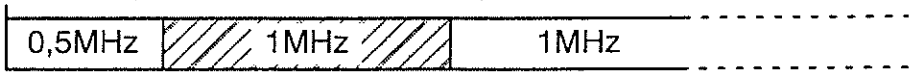
21 Correction of transmitter deviation

The control value that is in force appears in the lower row. Change the control value by keying in a ▲ or ▼ . The correction is in force on the frequency band (1MHz) which is used at the time. The entire frequency band is divided into 70 deviation correction bands.
During the test the transmitter is turned on !!!!

The next frequency tuning band is selected by pressing RCL–key.
If you wish to save the control values to NV–memory, press STO–key.

The test is exited by pressing *–key. The transmitter will be switched off.

138MHz *(S33G lowest is 220MHz)*
400MHz *(S33G lowest is 470MHz)*



30 Restoration of squelcher operation to normal mode.

31 Setting of squelcher's opening delay.

The value of the delay that is in force appears in the top row. You can change the value by keying in a ▲ or ▼. Delay possibilities: 0 ms, 10 ms and 50 ms.
The test is exited by pressing *–key.
This test doesn't affect on the radio in the system mode.
Factory test only!

32 Setting the squelcher's closing delay.

The delay value in force appears in the top row. You change the value by keying in a ▲ or ▼ sign. Delay possibilities: 0 ms, 50 ms and 100 ms

The test is exited by pressing *–key.
This test doesn't affect on the radio in the system mode.
Factory test only!

33 Setting the squelcher's opening level

Opening of the squelcher is tuned by making use of the generator. The squelcher's opening level is regulated for the generator and the field strength value corresponding to the opening level, (–114dBm). The right value can be saved to RAM by pressing the OK key. During the test the opening level appears in the right edge of the bottom row and the level to be measured appears at the left edge of the bottom row. The limit value thus obtained can be stored to NV memory by pressing STO–key.

1	012	7464	44665000
162	170	188	

where 162 <=> field strengt value
170 <=> generator value
188 <=> old value in memory

34 Setting the squelcher closing level.

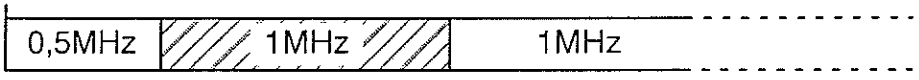
The squelcher closing is set by making use of the generator. (–118dBm). The principle of operation is the same as for the opening level.

35 Squelch ON

36 Adjustment of receiver's frequency band

Set the receiver to the lowest tuning band in use by test 13.

The control value in force appears in the bottom row as well as the field stregth value.
By pressing OK–key the radio will search the best possible value based on the default value. The default value will then be correct. You can change the control value with the ▲ and ▼ keys. The correction is in force on the frequency tuning band on which you are operating at the given time. The entire frequency band is divided into 1MHz tuning bands. The next frequency tuning band is selected by pressing RCL–key.
138MHz *(S33G lowest is 220MHz)*
400MHz *(S33G lowest is 470MHz)*



The correction values can be saved to NV memory by pressing STO–key.
The test is exited by pressing *–key.

40 Volume control

The volume is adjusted with the ▲ and ▼ keys.

The test is exited by pressing *–key.

41 Switches on the speaker line.

42 Switches off the speaker line.

43 Enables use of the microphone.

Microphone selection is done by keying in:
43 OK enables use of microphone
430 OK enables use of microphone from logic unit, not from control unit
431 OK selection of handset microphone or handmicrophone
432 OK selection of handsfree microphone

44 Disables use of the microphone.

47 Setting of the real time clock

When the test is activated, the display shows text "RTC set WDDMMYY", where W=weekday (1...7), DD=day (01...31), MM=month (01...12), YY=year (00...99). To save the date enter OK.

Then the display shows text "RTC set HHMMSS", where HH=hours (00...24), MM=minutes (00...59), SS=seconds (00...59).To save the time enter OK.

Exit the test by pressing *–key.

For example:
Date; 4th May 1992 ; Time 08.15.00
1040592 OK
081500 OK
*

☆ 50 CCIR transmission

When going into the test mode, transmission of CCIR tone 1540Hz will begin. Other tones can be selected with the ▲ and ▼ keys. Before the test the transmitter must be turned on by tests 201...203. Terminate the test by pressing the * key.
The current frequency is displayed in the bottom row.

Frequency/ Hz:
1981, 1124, 1197, 1275, 1358, 1446, 1540, 1640, 1747, 1860, 2400, 930, 2247, 991, 2110

51 Transmission of signal tones

The signal tones that can be selected are 300,500,800,1000,2000 and 3000 Hz. When going into the test mode, transmission of the 1000Hz signal tone will begin. Other tones can be selected with the ▲ and ▼ keys. The current frequency is displayed in the bottom row:

☆ 52 CCIR reception

This continually outputs a received CCIR tone to the display. If a CCIR tone does not come at all, text NO CCIR will be displayed. The received frequency will be displayed.
Terminate the test by pressing *.
During the test the transmitter must be turned on !!!!!

54 Modem transmission

When going into the test mode the test transmits the bit string 01010101 and by incrementing with the ▲ and ▼ keys you can also select the bit patterns 00000000 and 11111111. Quit the test by pressing *.
Before the test the transmitter must be switched on by tests 201...203.

Control channel synchronization is sent only when the test is started.
The bit strings 000 and 111 with synchronization are selected by tests:

540 OK (sync + 00000)
542 OK (sync + 11111)

55 Test for modem bit error ratio

When going into the test mode, REC1 is output to the display and the device is ready to receive 10000 bits of FFSK. The first time the data that has been read goes to memory. When you press OK, REC2 is output to

the display, at which point the device is ready to receive 10000 bits of data again.
Following this the test compares the data last transmitted with that in memory and displays the number of erroneous bits.
By pressing OK you can again return to the "REC2" phase. If the modem does not obtain a synchronization during the reception phase, TIME will be output to the display (wait 30 s.)
End the test by pressing *.

☆ 58 DTMF–transmission

When going into the test mode, transmission of DTMF tone 1 will begin. Other tones can be selected with the ▲ and ▼ keys. The digits appearing in the bottom row correspond to the current tone.
The transmitter can be switched on by tests 201...203, before test 58 is activated or during the test transmitter can be controlled by the PTT switch.
End the test by pressing *.

61 Measurement of input voltage. (For factory test only!)

This displays the value of the input voltage in the bottom row. This value is read directly from the A/D–converter and it does not have any any calibration value.
End the test by pressing *.

62 Testing of D/A converters

The desired data can be written to D/A converters. The converter is selected by 62X OK, where X=number of the D/A converter.
The data (YYY) is given in following format:
YYY OK
E.g.: 622 OK
Dat 063 OK (000....063)
control word 063 to converter 2

End the test by pressing *.

63 Testing of A/D converter

This can read the desired channel of the A/D converter. The conversion result appears in the bottom row.
E.g.: 631 OK
Reads channel 1

The channels in use: 0 = RSSI
1 = SQ
4 = VF

End the test by pressing *.

64 Setting the output ports

Specify in the form 64X OK where
X = number of the port
X can be 0 = OUT 0
1 = OUT 1
3 = RS 0
4 = RS 1
5 = RS 2
6 = Port 1
7 = Port 7
9 = Port 9

YYY data 0 ... 255
E.g.: 64 OK
Port 1 OK
Data 255 OK

Writes the word 255 to I/O –circuit OUT 1

A new port can be selected by entering X OK and new data entering YYY OK. New data must be given after a new port.

End the test by pressing *.

65 Reading Input–ports

After the test is activated by 65 OK, the port number is given by entering
X OK, where X is: 0 = OUT 0
1 = OUT 1
6 = Port 1
7 = Port 7
8 = Port 8/AD
9 = Port 9

The result is displayed on the bottom row.

E.g.: 65 OK
In 1 OK

Reads the I/O –port 1 and shows the data YYY

A new port can be given in form X OK

End the test by pressing *.

☆ 66 Safety code

The safety code will be displayed on the middle and bottom rows in the following form:

man mod serial
XXX YYY SSSSSS

where XXX=manufacturer's code
YYY=model
SSSSSS=serial number

77 Reading the service ID–codes

When the test is activated, the display shows text "Local –mode log" and the lower shows the factory ID and date of manufacturing.
The service control unit ID–codes and dates can be scrolled by ▲ / ▼ buttons. After the factory ID comes the last service ID and date.

92 Tuning and updating of RF levels L2, L1 and L0 to the NV memory.

Set the level at the generator and the run the current test.

921 OK	L0	(–108dBm)* (*can vary, see tuninig instr.)
922 OK	L1	(–98dBm)*
923 OK	L2	(–88dBm)*

93 Tuning of the voltage level shutdown_volt to the NV memory.
Set the level at the voltage supply and the run the current test.

93 OK shutdown_volt (10.2V)
OK to save values, * for exit without saving

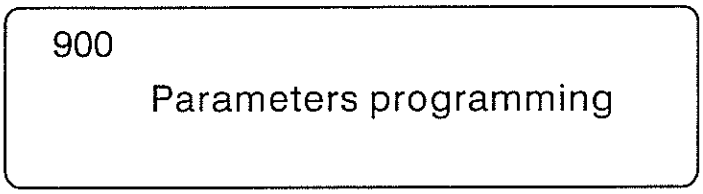
95 Saving the tuning parameters to NV–memory

95 OK

This test is used after reading the defaults by the test 19.

70 Programming system parameters

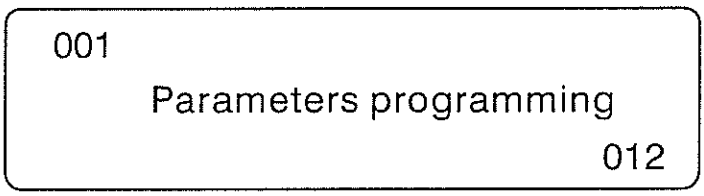
Most of the system parameters depend on the area the mobile operates in; we shall call this area the operating area (OA). The mobile can work in many different OA's, but for the mobile to work in a particular OA the OA dependent parameters must be set to the prescribed values for that particular OA. For example, the same mobile can work in Holland and in Germany, but it will have a different subscriber number for each country. To use the mobile it is necessary to preset the OA dependent parameters. Up to six different OA parameter selections may be preprogrammed hence there are six operating states, but it is necessary to program only one operating state for use. This one state is generally the main one used so it is called the first operating state; the other states are called the second through sixth states.



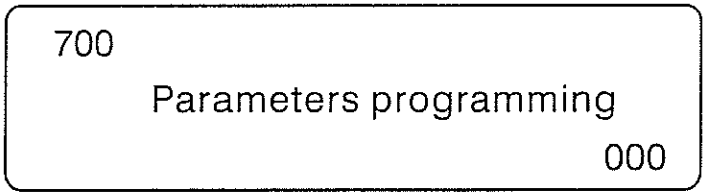
To enter, read, or alter system parameters for the operating state, you must first key in the four–digit password and then press the STO key:(FCN + RCL)

70 + OK + PASSWORD + STO

After you have entered the correct password you are in the programming mode for the system parameters.

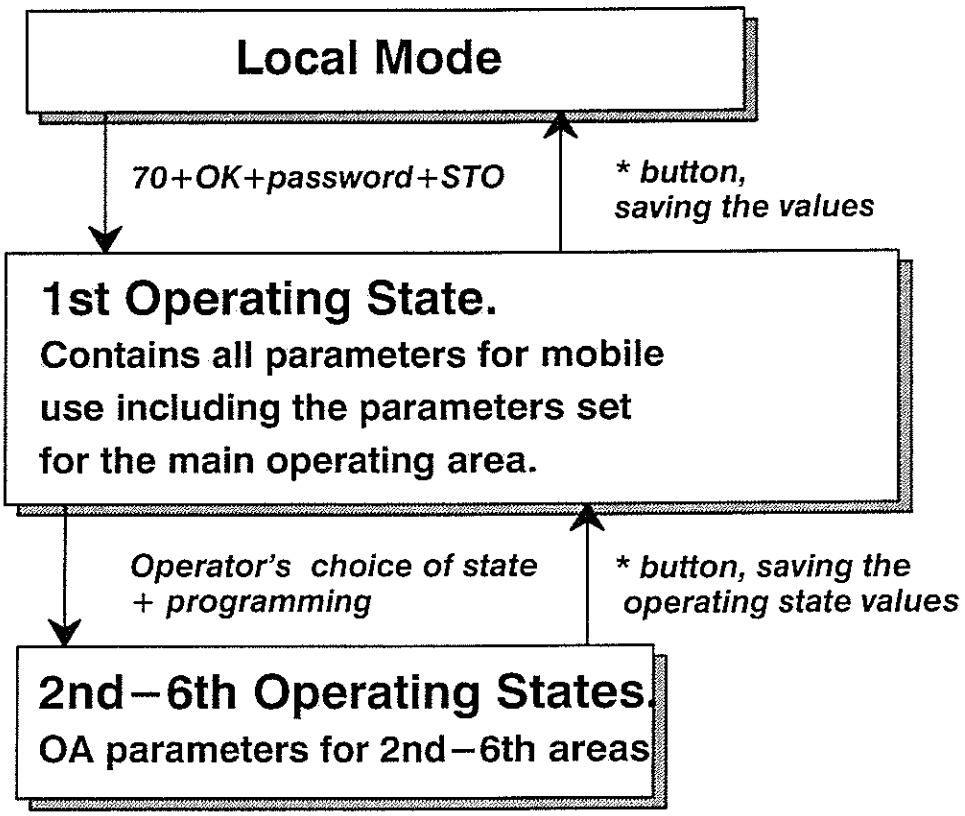


Programming to memory is done by keying in the series of numbers to be saved and pressing STO; the new parameter value appears on the top row of the display. If you do not wish to change the contents of a parameter value, press OK to advance to the next test number (the test number contains the value of the corresponding operating parameter). The three–digit test number appears continuously at the left edge of the display while you are in the programming mode. Another way to advance to the next test is to press the ▲ key.



Note that the program does not verify the correctness of the parameters; the user must perform operations carefully to avoid entering wrong parameters. You cannot exit from the programming mode by pressing the * key if programming of the channels has not been completed (e.g. the receiving channel has been programmed but not the transmitting channel and the control data).
Never attempt to exit from the programming mode by turning off the electricity! If the channel table or the call code is changed, the check sum of the given field is not computed until you exit from the parameter programming mode. To exit the parameter programming mode press the * key. Note that it takes a few seconds to compute the check sum!

The following flowchart summarizes the parameter programming procedure:



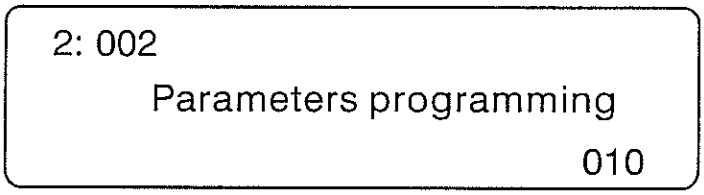
The parameters which depend on the operating area:

MPT:	*050...054*	*800*	*DPTT:*	*050...054*	*800*
	057	*810...815*		*057*	*810...815*
	100...149	*820...833*		*100...149*	*820...827*
	200...219	*860*		*200...219*	*860*
	709...736	*950...957*		*709...737*	*950...957*
	743...747			*743...747*	
	759			*759*	

Programming the Operating States

001...006 Operating State selection

Test 001 will select the first operating state; this state is the default state when you first enter the parameter programming mode. The programming of general parameters (those parameters independent of the operating area) must be done in the first operating state. If a state other than the first state is chosen, the display will show in the left a number of current operator. (2 :) This means that changes can't be done to parameters which are not dependent on the operating area (general parameters).



To select an operating state, key in the desired state number (001...006) then press OK.

Pressing the * key puts you back in the Local Mode.

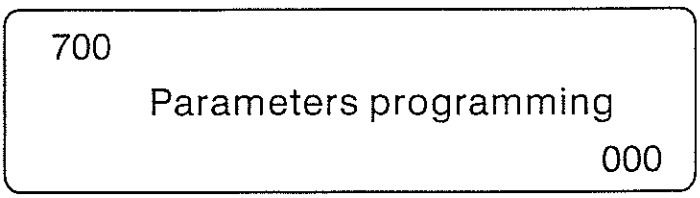
Note: the mobile utilizes the first bit of SYS–code but other systems start from the second bit.

NOTICE !

The operators 2–6 can be removed from the table by entering ## in the desired operator test 002 ... 006. This procedure can be done only manually, not with Aman–program.

Programming the 1st Operating State: general parameters and parameters dependent on the first operating area

In this mode you can program all system parameters. Exit the mode by pressing the * key. Programming tests are called up by entering the three–digit test number and pressing OK. The old parameter value then appears at the right edge of the top display row.



Never attempt to exit from the programming mode by turning off the electricity! If the channel table or the call code is changed, the check sum of the given field is not computed until you exit from the parameter programming mode. Exit the mode by pressing the * key. It takes a few seconds to compute the check sum!

It is also important to notice that when you have chosen an operating state, the changes you make only affect the parameters in that particular operating state.

The following programming tests are available:

Test 700 Input 1: (IGN)

000 = not in use
002 = automatic power–off. When (002) is selected, the mobile radio will power–off after the time set by system mode or test 313 has elapsed. The mobile radio will remain off until the car is started.

701 Input 2: (EMERGE)

000 = not in use
001 = when set to 001 you activate the individual–, group–, emergency–, modem–, statuscall or SDM/EDM–datamessage, which is programmed in the abbreviated dialling 51. The type of call is selected by the modifier of the call. eg. *9*..
When sending SDM, EDM–datacalls, *2* B–subs.no. is programmed. The datamessage sent, by default, is the text in memory location 1.

702 Telephone disable data. Each bit has its own meaning:

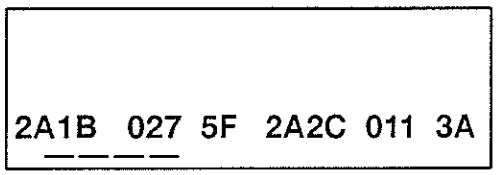
0	**–disable write of abbreviated dialling, only calls to abbreviated numbers are allowed (status sending is not limited)**	(001)
1	**–registration when power switched off is in use**	(002)
2	**–alert tone selection (AC=0,** MPT=4= ESI)	(004)
3	**–call to a public telephone network limited**	(008)
4	**–group calls limited**	(016)
5	**–15s. delay in call transfer to the pager (0=no delay)**	(032)
6	**–executive call limited**	(064)
7	**–programming of additional group call number limited.**	(128)

an example: 0 and 3 are selected –> 001 + 008 = 009

703 Test parameters (bits 1–5, factory test only)

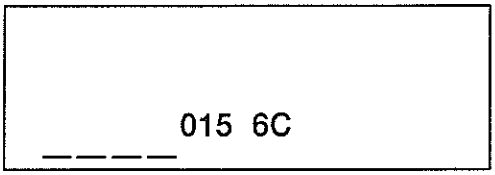
6 –test display in use (for service personnel only!!!) (064)
(available from Cr. 14.13–0 and Cr. 15.04.–0)
Notice ! If the operator name displayed in the lower row, test mode is off. Operator name display can be swithed off from the MENU–commands.

Idle state, radio using the control channel



where: 2A1B = SYS–code of the current control channel in HEX–mode.
027 = channel number of the current control channel in DEC.
5F = field strength of the current control channel in HEX.
2A2C= SYS–code of the best adjacent site in HEX.
011 = channel number of the best adjacent site in DEC.
3A = field strength of the best adjacent site in HEX.

Call state, radio using the traffic channel



where: 015 = channel number of the current traffic channel in DEC.
6C = field strength of the current traffic channel in HEX.

704 Channel set time. For example, 020 –> 20 ms.

705 Total time monitoring of an individual call. For example, 030 means 300 seconds. 000 –> no time monitoring.

706 Total time monitoring of a group call. For example, 030 means 300 seconds. 000 –> no time monitoring.

707 Total time monitoring of an PSTN call. For example, 030 means 300 seconds. 000 –> no time monitoring.

708 Total time monitoring of an emergency call. For example, 030 means 300 seconds. 000 –> no time monitoring.

709 *(MPT)* The maximum number of MX short dial numbers. (15)
(DPTT) FPP, which is used to determine the number of large and small fleets used in the numbering.

710 *(MPT)* not in use
(DPTT) Length of the dialling when calling a subscriber belonging to a different fleet. The length of the dialling can be either 5, 6 or 7 digits.

711 TS, time monitoring. The time determines how long the SYS code will be waited for on the control channel before looking for a new control channel.

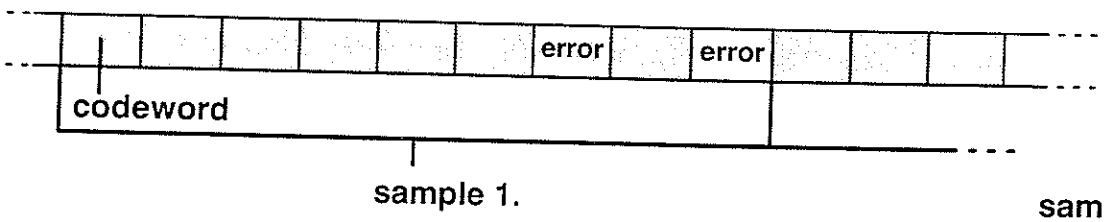
712 NV, (on DCC and NDCC call channels). The number of the same CCSCs before SYS is approved for verification. CCSC = Control Channel System Codeword

713 NV, (on a time–shared control channel). The number of the same CCSCs before SYS is approved for verification.

Tests 714...719 are used only by on DCC and NDCC control channels
DCC = Dedicated Control Channel ,
NDCC = Non Dedicated Control Channel

Control channel error checking is done only when field strength is less than level L2 (–X dBm).

Control channel signalling



sample 1. **sample 2.**

714 NC1, the number of code words in the sample for error checking before CC confirmation.

715 NC2, the number of code words in the sample for error checking after CC confirmation.

716 NX1, maximum number of errors in one sample before CC confirmation.

717 NX2, maximum number of errors in one sample after CC confirmation.

718 NZ1, number of samples on the CC before CC confirmation.

719 NZ2, number of samples om the CC after CC confirmation.

Tests 720...725 are used only by on time shared control channels

720 NC1, the number of code words in the sample for error checking before CC confirmation.

721 NC2, the number of code words in the sample for error checking after CC confirmation.

722 NX1, maximum number of errors in one sample before CC confirmation.

723 NX2, maximum number of errors in one sample after CC confirmation.

724 NZ1, number of samples on the CC before CC confirmation.

725 NZ2, number of samples om the CC after CC confirmation.

726 Limiting the use of comprehensive hunt
000 = no limits, 001 = limited

727 Radio unit control category; RUC ie. use of LAB–field. If the LAB is three digits, then it will be used like MPT 1343.
A–category = 004, B–cat. = 005, C–cat. = 006, D–cat. = 007

code	100	101	110	111

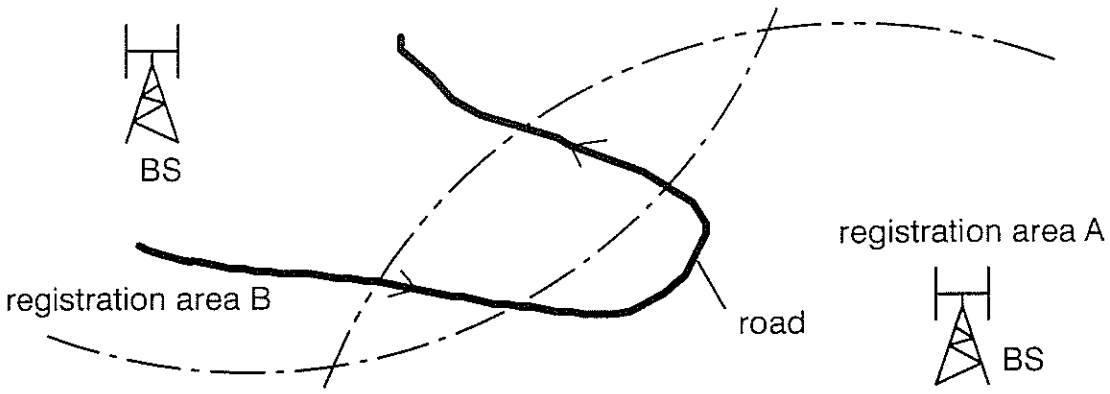
if the LAB code is 001 = no limits , if 010 only A and B can registrate
if 011 only C and D can registrate.

728 Groupcalls can be limited to other fleets. 000 = no limits, 001 = limited

729 *(DPTT)* MEP. Defines how many large fleet is divided into tiny fleets
10 – FPP = max. MEP

730 TC, time monitoring for the transmission of random access messages. For example, 006 = 60 seconds. (SERV–indicator is on even the BS is lost)

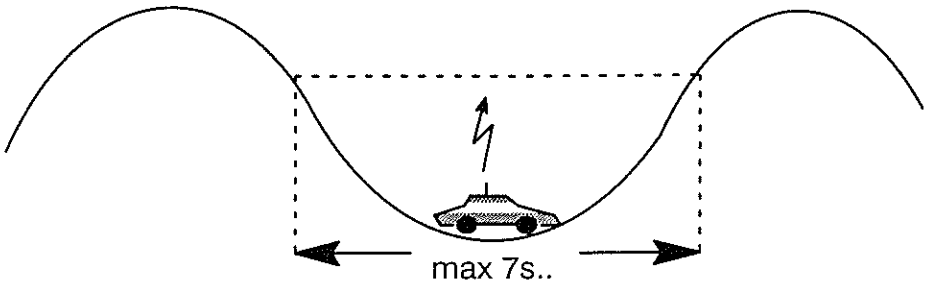
731 TD, time monitoring of the secondary registration area. For example, 002 = 10 minutes.



732 TJ, time monitoring, for example, when transmitting registration information. For example, 002 = 20 seconds.

733 TW, time monitoring when transmitting a call. For example, 006 = 60 seconds.

734 TN, carrier wave time monitoring on a traffic channel. For example, 007 = 7 seconds.



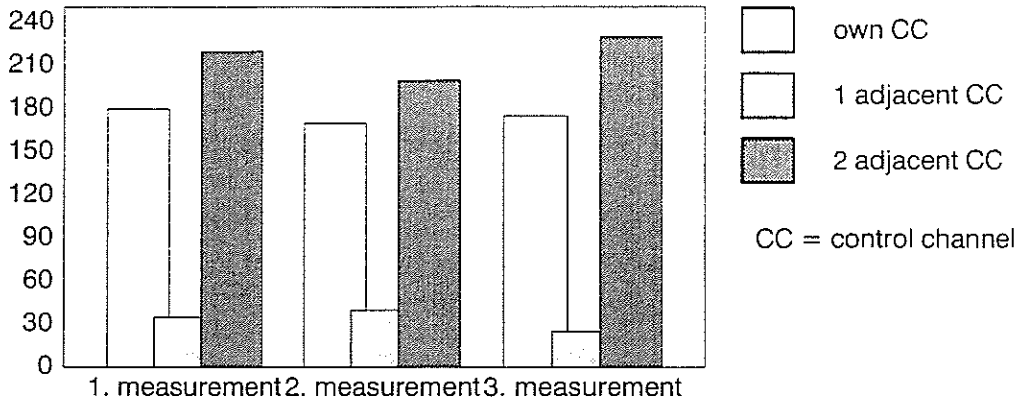
735 TA, time limit of ringing time as B–subscriber. For example, 006 = 60 seconds.

736 NT, wait time of the acknowledgement of an include request on a traffic channel. The increment is 103 bits. Accordingly, if 002 is programmed, this means that the wait time is 206 bits.

737 *(DPTT)* B–subscriber constraints. If the constraint is set to 001, the mobile unit can be used to call not only one's own fleet but also the fleets that have been programmed in tests 820...827.

738 TGG, time monitoring. The longest time period between two segments, when receiving MST–group data message. Time is given in seconds. For example, 010 = 10 seconds.

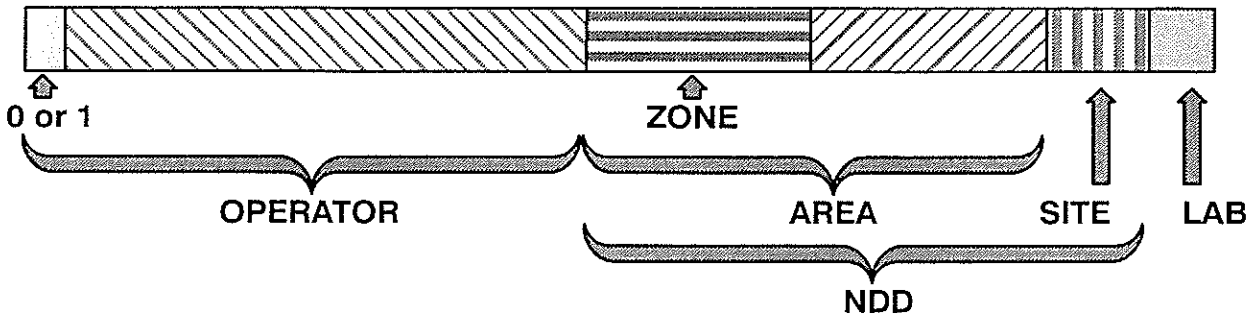
741 Superiority difference of a control channel in order to leave a previous control channel.



742

Limit value which must be exceeded in order to leave one's own control channel on the basis of field strength. Accordingly, if you program 0, then you can leave your own control channel immediately when test 741 indentifies a control channel that is better by the amount of the programmed figure.

The tests 743 ... 747 are for identifying the SYS–code (15–digits)



743 LAB field length in 0–SYS or 1–SYS (The number of bits)

744 SITE field length in 0–SYS or 1–SYS

745 AREA field length in (LA) 0–SYS or 1–SYS

746 ZONE field length in (LZ) 0–SYS or 1–SYS

747 OPERATOR field length in 0–SYS or 1–SYS.
Notice! The operatorcode includes also the first bit of the SYS–code.
Info ! Operator field meaning here is: OPID= If SYS code starts with '0'
NET = If SYS code starts with '1'

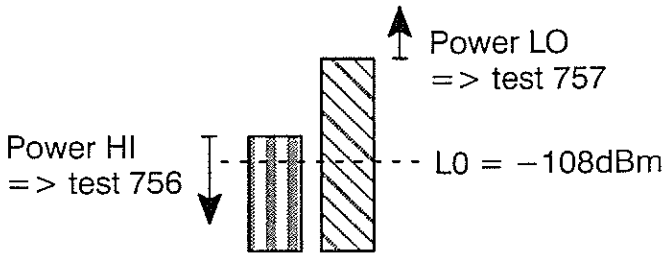
748...751 not in use

753 *(MPT)* System level number. Regionet= 003 , MPT 1343= 004 = ESI

754 A time (s) how long different control channels are measured in each field strength level. (used only with time shared control channels)

755 If the field strength is XXX units better than field strength level LO (–108dBm) on it's HOMESITE, the mobile registers to homesite. Homesite is a site which the mobile uses prefer than other sites. The SYS–code of HS. must be programmed by the test 920.
Notice! The values in the display are not absolute (without dimension).

756 If the field strength is less than ZZZ + field strength level L0 (–108dBm) the mobile uses normal (high) power level. On the traffic channel only.



757 If the field strength is YYY units better than field strength level L0 (–108dBm) the mobile uses low power level. On the traffic channel.

759 Transmitter on, time out (s). 000 = no limit, 001 = 10s.

760 not in use (factory test only) 255

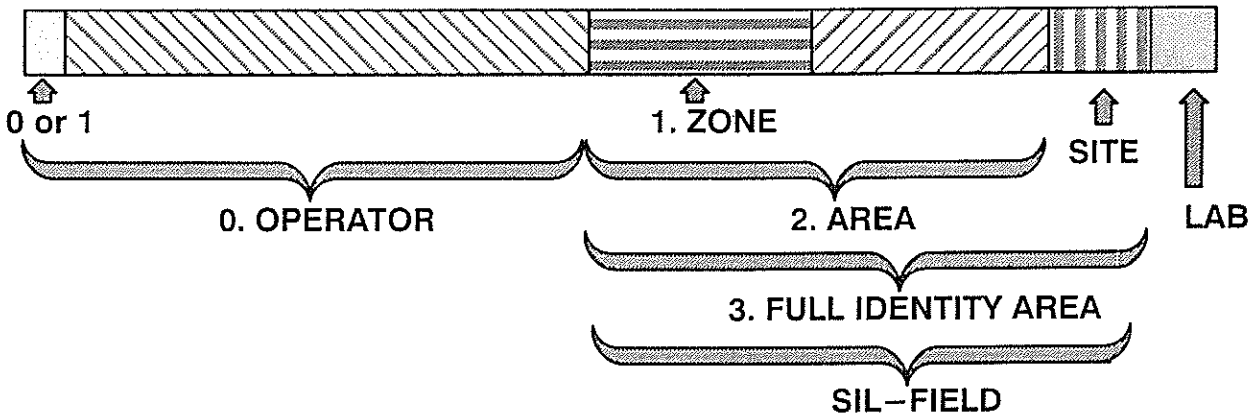
761 TG, time monitoring. The longest time period between two segments, when receiving EDM–data message. Time is given in seconds. For example, 010 = 10 seconds.

762 MAP27 N1 The max. lenght of the datafield.

763 MAP27 N2 The max.times of resending the data message

764 MAP27 T3 Credit report timeout.

768 SIL–field lenght: 3–9 bits
SIL –field is part of the SYS–code when checking the source of MAINT– and CLEAR–messages



800 *(MPT)* Programming of the mobile's subscriber number.
The subscriber number may be 6– or 7–digits long: appears in the lower row in the form yyyxxxx, where yyy is the prefix and xxxx is the ident. The ident number is always 4–digits long, but the prefix may be 2– or 3–digits long. To program the subscriber number enter the appropriate 6– or 7–digit prefix / ident –number.

(DPTT) Programming of the mobile's subscriber number.
The own subscriber number appears in the bottom row. The length of the own subscriber number is either 5, 6 or 7 digits (see test 710) but the most significant digit is not displayed because it is always 7.

810 Programming of the 1st group call number. Programming of the group call number is similar to programming of the subscriber number; refer to test 800. If you wish to delete a group call number, key in ##.

811 Programming of the 2nd group call number. See test 810.

812 Programming the 3rd group call number. See test 810

813 Programming of the 4th group call number. See test 810.

814 Programming of the 5th group call number. See test 810.

815 Programming of the 6th group call number. See test 810.

820...829 *(MPT) (not in ESI–system)* 5–dial string table. By each test can be programmed some other fleet numbering information to make dialling shorter. Routing code, prefix, base ident and the largest number of that specific fleet shall be programmed.

1. At first will be programmed the routing code. Old value is displayed. Default value is 000. 000 means also that it is not in use.

2. Then prefix will be programmed 000...127

3. Then base ident 0000...8100

4. Then largest number of the fleet. Small fleet 020... 089 or large fleet 200...899

820...827 *(DPTT)* **Fleets which can be called with a mobile unit. If the B–subscriber constraints have been set with test 737, the user can only place calls to these fleets. The length of the series of numbers is the same as the length of one's own call code.**
You delete a fleet by keying in ## after the test has been selected. These numbers must be programmed in such a way that only so–called base idents are programmed. If this is not done, the program calculates the nearest base ident down, saves this and moves the given figure to the top row.
Notice ! If additional group call number is from the other fleet, the used fleet number must be programmed to this (these) test(s)

830 *(MPT)* **The base ident number of your own fleet. (0000...8100)**

831 *(MPT)* **The largest number of your own fleet. It can vary from 020 to 089 or from 200 to 899.**

832 *(MPT)* **The base ident number of your own group. (0000...8100)**

833 *(MPT)* **The largest number of your own group. It can vary from 090 to 099 or from 900 to 999.**

840 Reading the security code. The manufacturer's code, which is in the range 000...255 is read first. Next you can read the model number, which is in the range 00...15. Then the serial number from 000000 to 262144 can be read

851...859 Programming of short dialling numbers 1...9
The number length can be max. 21 characters. It can include modificators, like numbers 0...9, *, #, _, (OK)
When programming these numbers, the next test can be selected by ▲ –key.

900 Programming a password. The old password appears in the top row. You can program a new four–digit password (0000 – 9999) by pressing the STO key.

920 Programming of the home site. Homesite is a site which the mobile uses prefer than other sites. By this test is programmed it's SYS–code. In decimal–mode, from 00000....32764

950 – 965

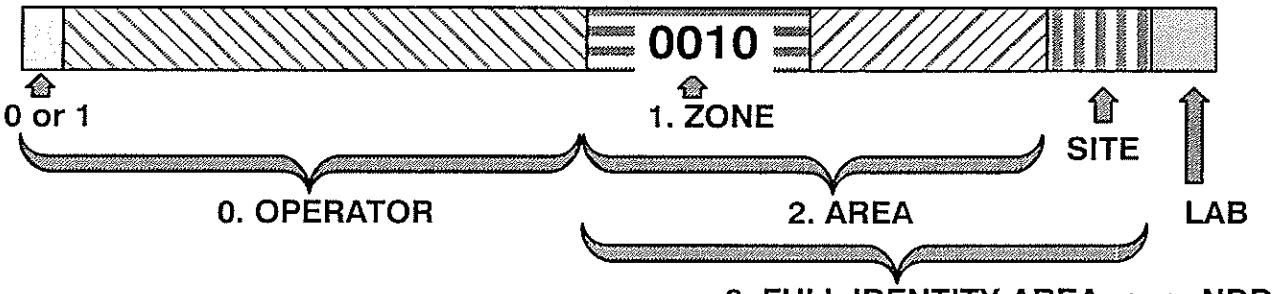
Programming of the acquisition authorisation –data.(AAD) This data defines the areas where mobile can be used. There can be four different area limits: the mobile can make calls on the whole operator area, or only on the ZONE–area, or only on the Calling AREA. Also the operatorcode must be programmed on the same time.

1. The mobile works on the whole operator area.
   The upper display shows 0 + operatorcode
   (This is as default if opearatorcode is programmed)

2. The mobile works only on the ZONE–area.
   1 ZONE value STO
   Zone value can varie between 0000...8191

3. The mobile works only on the sertain calling area.
   2 Calling area value STO
   Calling areas values can varie between 0000...8191

4. The mobile works only on the full identity area. <=> NDD
   3 Full identity area value STO
   Full identity area values can varie between 0000...8191



On the info–display you can see the old values – if there isn't any data, the display is clear. By OK–key you can go forward if you haven't program anything.
Notice! The operatorcode includes also the first bit of the SYS–code.

980 Programming of one's own CCIR call code. Lenght of the code can varie between 3 –6 digits.

030...034 How to program simplex channels

The test number is taken directly as a logical channel number. Recall the difference between a logical channel number and a physical channel number. A physical channel number refers to the entire channel range the mobile can use; a logical channel number refers to the narrower channel range the user chooses to use.
After the test number give the number of the receiving channel, 0000...9999 STO. Next give the number of the transmitting channel, 0000 – 9999 STO. Finally give the channel–specific control data 000– 255 STO.
The number of the channel is thus always 4 digits long.

The corresponding frequency to channel number depends on the zero–channel programmed by test 18. If the zero–channels are changed, the radio must be tuned again.

RC: RX,TX channels 0000 – 5760 138.0 MHz – 174.0 MHz
step on four channels; 0000, 0004, 0008,...
RD: RX,TX channels 0000 – 11200 400.0 MHz – 470.0 MHz
step on four channels; 0000, 0004, 0008,...

The channel number is calculated with both 12.5 and 25 kHz channel widths using a 6.25 kHz divider (the channel spacing is thus at 6.25 kHz intervals.)

For example: If the channel interval is 12.5 kHz and you want 446.5125 MHz as the RX channel and 440.0125 MHz as the TX channel, key in the following sequence:

030 OK 7442 STO 6402 STO

Deletion of an individual channel from the table is done by selecting the given test number (=channel number) and keying in ##.

040 Programming of the pager channel. (Look at tests 030–034)

Tests 050–053 are used to establish the channel table by defining the physical channel numbers corresponding to the logical channel numbers.

050 Use this test to enter the physical channel number corresponding to receiver logical channel 000. The tester needs to determine the physical channel number from the assigned frequency given to logical channel 000.
(ESI = 0199)

051 The physical channel no. corresponding to transmitter channel 000
(ESI = 1559)

052 The highest system channel (from 0000 to 1023)
(ESI = 57)

053 The lowest system channel (from 0000 to 1023) *(ESI = 22)*

054 programming of the "Home zone"

056 not in use

057 The duplex / semiduplex selection.
000 – semiduplex

100...149 The channels belong to normal hunt. In these test you will program locigal channelnumbers from 0001 to 1023. They should be in the form y xxxxx, y = time shared control channel information; 1 = time shared, 0 = not time shared

200...219 The channels which don't belong to comprehensive hunt. By these test you can remove 20 channels from comprehensive hunt. Programming will be in the form xxxx, when xxxx = channel number

308 Channel spacing (same as test 15)
Must be 001 = 12,5 kHz

The tests which can be programmed only by PC or by MENU– commands in the system mode.

310 Selectable call facilities

001	not in use
002	automatic call set–up from a diversion acknowledgement
004	PTT activates the number programmed in the abbreviated dialling 48.

311 Selection of external alarm function

0...31	A status call will activate an external alarm, which length is 1s.
200	A individual call will activate an external alarm, which length is 1s.
250	A individual call will activate an external alarm, which stays on until the call is answered.

If another number has been programmed here, external alarm function doesn't work.

312 Display settings

001	clock / date
002	operator info
004	keypad– and display backroud– light time monitoring switched OFF
008	12h time (default is 24h)
016	The intensity of display lights
032	View angle adjustment, from up / down

an example: 001,002 and 008 are selected –> 001 + 002 + 008 = 011

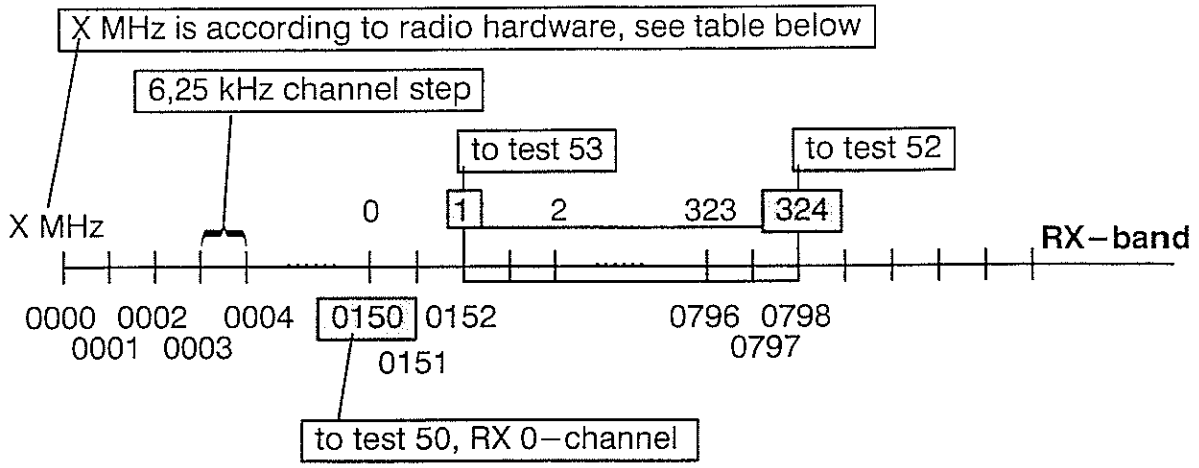
313 Power off time
When the car ignition is switched off there can be a time period which after the power is switched off from the mobile radio. The time is given by minutes, 001 = 1min. etc.
Notice ! test 700 must be then swithed to 001.

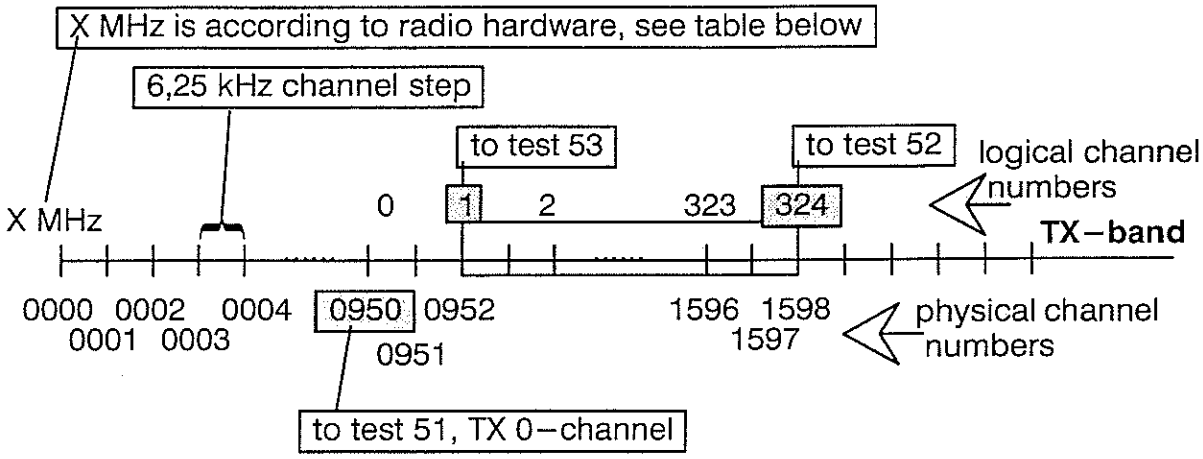
314 Automatic power off, a switch
000 = not in use
001 = in use

610 Total call time measurement (Can be read only by AMAN)

860 Programming of operator name.
The name can be programmed **only by using the PC–parameter programming software AMAN**. With this test you can delete a operator name by selecting the test number and keying in ##.

R40 CHANNEL TABLE





All the system channels which are defined by test 52 & 53 belongs to the comprehensive hunt. Normal hunt channels must be defined separately by tests 100...149.

Type	frequency X
RC40S???	138 MHz
RC40S33G	220 MHz
RD40S???	400 MHz
RD40S33G	470 MHz

TUNING INSTRUCTIONS RD40S11G, J

REQUIRED MEASURING DEVICES:

- multimeter
- signal generator
- SINAD meter
- RF power meter
- audio power meter
- distortion meter
- power supply

GENERAL

The mobile unit is,of course, factory tuned, but if corrections are made for a unit the adjustments should be checked to ascertain any effects the correction may have had.

All tuning and adjustment measures are performed in the maintenance state.

The mobile unit can be placed in the maintenance state by using the special control unit. Tuning operations should be performed in the order in which they are given in these instructions. Endless tests can be stopped by *–key.

PRETUNING THE RADIO

1. Connect the service Control unit (CU 43 PROG) to the radio.

2. Press the PWR–key and keep it down approx. 10s until you see "self test" text on the display.

3. Select the UHF frequency band by keying 155 OK on the control unit.

4. Select 12.5kHz as the channel spacing by keying 151 OK.

5. Select the lowest "reference" frequency for the transmitter synthesizer by keying 18164000.

6. Select the lowest "reference" frequency for the receiver synthesizer by keying 18271200.

7. Select semiduplex mode and duplex spacing 10MHz by keying 16101000 OK. (Selects also transmitter lower than receiver.)

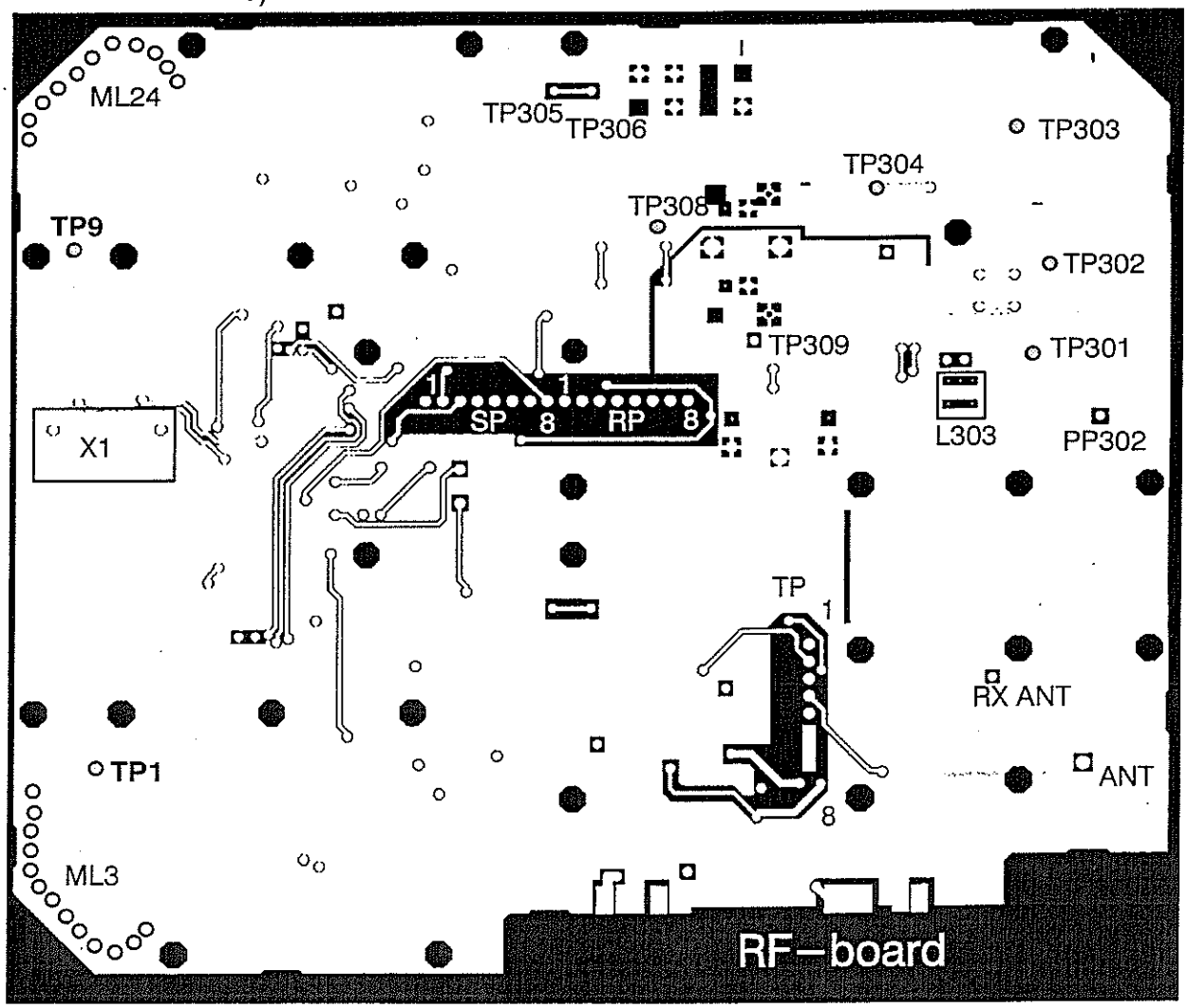
TUNING THE SYNTHESIZER AND VCO UNITS

1. Set the receiver synthesizer to the lowest frequency (465.0000MHz) by keying 10 42000000 OK.

2. Check the DC voltage at the test point TP9 (Rx) (with a high impedance multimeter). The voltage should be 2.2V... 4.0V.
(If necessary increase the voltage by drilling holes to strip line ML24. or to decrease the voltage fill the extra holes. This is done allready in the factory, there should not be any reason to tune ML24)

3. Switch ON the transmitter by TX_ON button

4. Check the DC voltage at the test point TP1 (Tx) (with a high impedance multimeter). The voltage should be 3.V +−1.0V.
(If the voltage is too low you must drill a hole by hole open in the VCO stripline ML3 beginning at the end nearby receiver's mixer.This is done allready in the factory, there should not be any reason to tune ML3)



5. Switch OFF the transmitter by TX_ON button

6. Set the receiver synthesizer to the highest frequency (475.0000MHz) by keying 1243000000 OK

7. Check the DC voltage at the test point TP9 (Rx) (with a high impedance multimeter). The voltage should be 12V at maximum.

8. Switch TX ON

9. Check the DC voltage at the test point TP1 (Tx) (with a high impedance multimeter). The voltage should be 12V at maximum.

10. Switch TX OFF

11. Set the transmitter to the lowest frequency (410.0000MHz) by keying 1441000000 OK.

12. Set the deviation correction value to 04 by keying 21 OK on the control unit and then using up and down arrows. Store the setting by keying FCN STO.

13. Check the highest used Rx–and Tx–frequency of the network where the mobile should operate. If one of the frequencies is higher than 430.0000MHz , make following tests:

- Calculate the difference between highest used channel in the network and 450.0000MHz.
- Add that difference to both 410.0000MHz and 420.0000MHz.
- Use these new frequencies as the lowest and highest channels and do tests 8...10 or 11...14 or both of them again

14. Adjust the dev. trimmers in the middle position

15. Connect an audio frequency 1000Hz signal to the tester TK 40 MIC–connector (MIC–button in MIC_RU position) and adjust the generator to the level when the deviation is 1,5kHz (12,5kHz) or 3,0kHz (25kHz). Set this level as a reference level (0dB–level). Signal must be pre–emphased

16. Change the modulating frequency to 300Hz and adjust the low–frequency responce by trimmer R434 to –1,0dB

17. Key in 44 OK on the control unit (Muting the MIC.)

18. Set the transmitter to the lowest frequency used in the network by keying 1441000000 OK

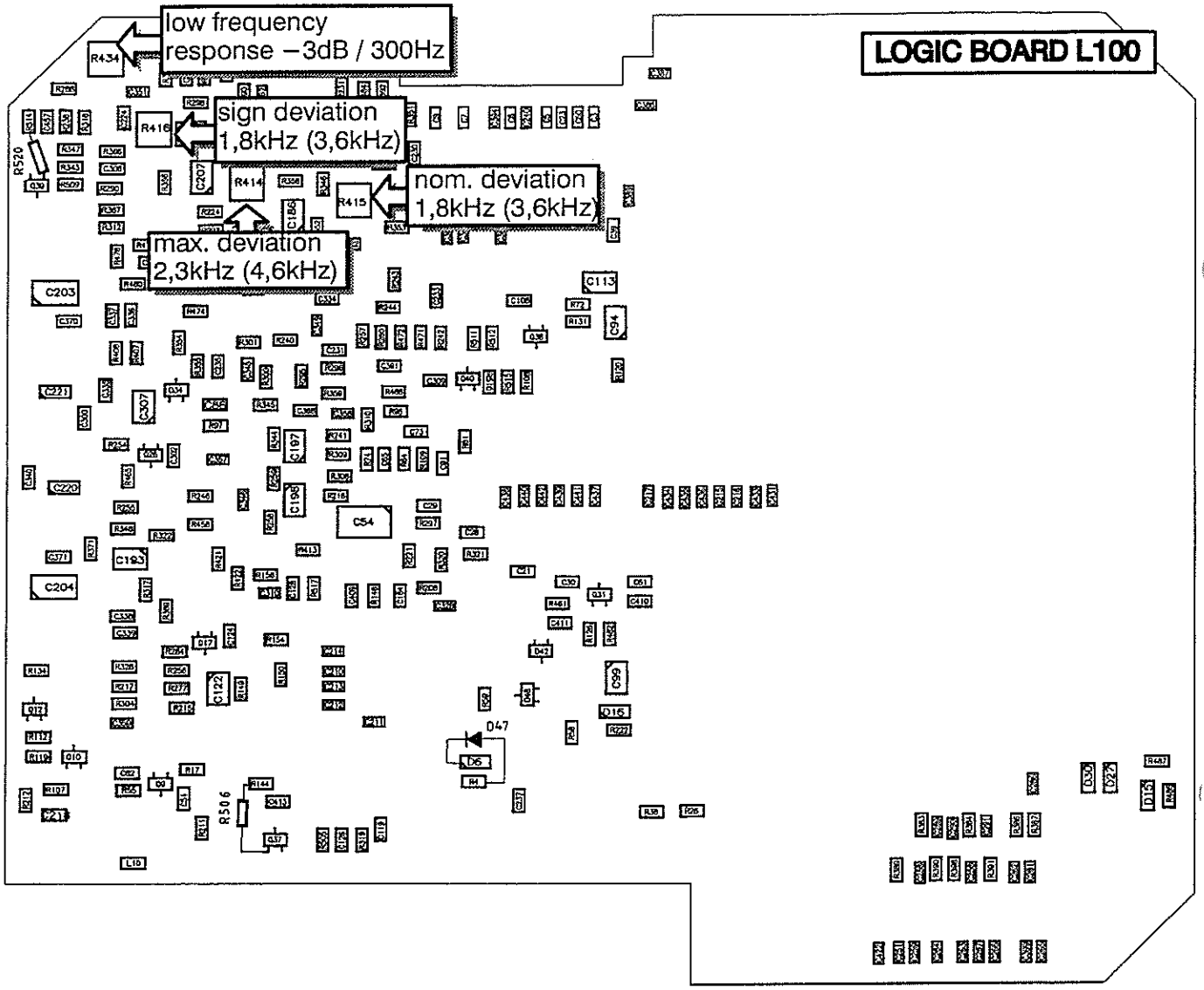
19. Set the transmitter on by keying 201 OK and then key #. Then key 54 OK to transmit FFSK.

20. On processor unit R416 adjust the deviation to 1,8kHz (12,5kHz) or 3,0kHz (25kHz).. End the test by * –key.

21. Key in 43 OK on the control unit. (MIC line on).

22. Connect an audio frequency 1000Hz signal to the MIC–connector of the tester and adjust the audio level of the generator to 1500mV RMS.

23. On processor unit R414 adjust the maximum deviation to 2,3kHz (12,5kHz) or 4,6kHz (25kHz).



24. Change the audio level to 150mV RMS.

25. On processor unit R415 adjust the deviation to 1,8kHz (12,5kHz) or 3,0kHz (25kHz).

26. Change the audio level back to 1500mV RMS.

27. Select deviation correction by keying in 21 OK on the control unit.

28. Correct the deviation to 2.3kHz (12,5kHz) or 4,6kHz (25kHz) with the up and down arrows.

29. Select the next tuning band by pressing RCL–key. (step is 1 MHz forward) Do the tuning in all the tuning bands which are used in the customer network frequencies.

30. Save the tuning values by entering FCN STO.
End the test by * –key.

TUNING THE TRANSMITTER

1. Set the transmitter to the lowest channel by keying in 1441000000 OK

2. Turn the transmitter on by keying 201 OK. (low power).

3. Set the power level to 1.0W with the up and down arrows on the control unit.

4. Select the next tuning frequency band if needed by pressing RCL–key. Repeat points 2 and 3 in all tuning bands in use.

5. Store the settings by keying FCN STO.

6. Turn the transmitter on again by keying 203 OK. (high power).

7. Set the power to 15W with the up and down arrows

8. Select the next tuning frequency band if needed by pressing RCL–key. Repeat points 2 and 3 in all tuning bands in use.

9. Store the settings by keying FCN STO.

- **Power levels:**

	Semiduplex
LO	1,W
HI	10W (6W)

If a simplex facility is used, corresponding value must be tuned in test 202.

TUNING THE RECEIVER

1. Set the receiver to lower channel by keying 10 OK on the control unit.

2. Connect the RF generator to the radio's antenna connector and adjust to the frequency corresponding the lower channel and to the level –60dBm. Modulate the frequency with a normal modulation (mod. 1kHz and dev.1,5kHz (12,5kHz) or 3,0kHz (25kHz)).

3. Connect the multimeter (AC range) to EAR/LSP–connector. (The EAR/LSP–button must be in LSP–mode)

4. Open the LSP–line by keying in 41 OK (42 OK closes LSP) and adjust the audio frequency voltage to maximum with detector coil L303 on the receiver.

5.Key in 40 OK on the control unit and using up key select the maximum output value.

6.Check the audio output power from the symmetrical loudspeaker output LSP_B. (It should be at least 2W/4Ω). P= U^2 *rms* / R
(Inside the tester TK 40 there is a 3,9Ω load connected when the loudspeaker is not connected.)

7.Connect a SINAD meter or a audio analysizer to the EAR/LSP–connector and decrease the audio power level.

8.Next step is to tune the maximum sensitivity of the receiver.
You have two different methods to do it. You can do it manually by keying 36 OK and using up and down arrows to tune maximum RSL–reading on the control unit's display and press OK. The second method is to do tuning automatically by keying 36 and OK twice quickly so that processor unit finds the maximum RSL–reading automatically.

9.Select the next tuning band by pressing RCL–key and change the RF–generator frequency 1 MHz forward to correspond the new RX–channel.

10.Repeat points 8 and 9 in the tuning bands which are in use.

11.Store the setting by keying FCN STO.

12.Check the receiver's sensitivity. (It should be better than –113dBm). (20 dB SINAD psof.)

SETTING OF THE SQUELCHER

Opening of the squelcher is tuned by making use of the generator. The squelcher's opening level is regulated for the generator and the field strength value corresponding to the opening level,

1	012	7464	44665000
162	170	188	

where 162 <=> field strengt value
170 <=> generator value
188 <=> old value in memory

Setting the squelcher opening level.

1. Control the receiver to center channel by keying in 11OK.

2. Connect a generator to the antenna connector and set generator frequency to correspond center channel frequency _____ MHz and level to −114 dBm

3. Start test 33 by keying 33OK
   During the test the opening level appears in the right edge of the bottom row and the level to be measured appears at the left edge of the bottom row.

4. If you want to change the value, press OK−key.

5. Store the value by keying FCN STO

6. Exit the test by * −key.

Setting the squelcher closing level.

1. Change the generator level to −118dBm

2. Start test 34 by keying 34OK
   During the test the opening level appears in the right edge of the bottom row and the level to be measured appears at the left edge of the bottom row.

3. If you want to change the value, press OK−key.

4. Store the value by keying FCN STO

5. Exit the test by * −key.

TUNING OF THE RF LEVELS

1.Control the receiver to center channel by keying in 11OK.

2.Connect a generator to the antenna connector and set generator frequency to _____ MHz and level to L0 [1]

3.Start test 921 by keying 921OK
During the test the opening level appears in the right edge of the bottom row and the level to be measured appears at the left edge of the bottom row.

4.Store the value by keying OK and exit from the test by * key.

5.Change the generator level to L1 [2]

6.Start test 922 by keying 922OK

7.Store the value by keying OK and exit from the test by * key.

8.Change the generator level to L2 [3]

9.Start test 923 by keying 923OK

10.Store the value by keying OK and exit from the test by * key.

1	921 OK	L0	(−113dBm)
2	922 OK	L1	(−98dBm)
3	923 OK	L2	(−88dBm)

TUNING OF THE VOLTAGE LEVELS

1.Connect the adjustable voltage supply to the test box

2.Start shutdown_volt test 93 by keying 93OK

3.Set the voltage to shutdown_volt level 10.2V
Check the voltage by a multimeter (DC) power supply connectors back side of the tester TK40

4.Store the value by keying OK
If you press * key. then exit without saving

5.Switch off the power and disconnect the connections.

TUNING INSTRUCTIONS RD40S22G, J

REQUIRED MEASURING DEVICES:

- multimeter
- signal generator
- SINAD meter
- RF power meter
- audio power meter
- distortion meter
- power supply

GENERAL

The mobile unit is,of course, factory tuned, but if corrections are made for a unit the adjustmentsshould be checked to ascertain any effects the correction may have had.

All tuning and adjustment measures are performed in the maintenance state.

The mobile unit can be placed in the maintenance state by using the special control unit.Tuning operations should be performed in the order in which they are given in these instructions. Endless tests can be stopped by *–key.

PRETUNING THE RADIO

1. Connect the service Control unit (CU 42M PROG or CU 43 PROG) to the radio.

2. Press the PWR–key and keep it down approx. 10s until you see "self test" text on the display.

3. Select the UHF frequency band by keying 155 OK on the control unit.

4. Select 12.5kHz as the channel spacing by keying 151 OK or 25 kHz by keying 153 OK.

5. Select the lowest "reference" frequency for the transmitter synthesizer by keying 18164000.

6. Select the lowest "reference" frequency for the receiver synthesizer by keying 18271200.

7. Select semiduplex mode and duplex spacing 10MHz by keying 16101000 OK. (Selects also transmitter lower than receiver.)

TUNING THE SYNTHESIZER AND VCO UNITS

1. Set the receiver synthesizer to the lowest frequency (444.0500MHz) by keying 10 44405000OK.

2. Switch TX ON to TX OFF position in the TK40

3. Check the DC voltage at the test point TP9 (with a high impedance multimeter). The voltage should be 2.2V... 4.0V. If necessary increase the voltage by drilling holes to strip line ML24. or to decrease the voltage fill the extra holes. (this is carried out in the factory, normally stripline tuning is not necessary)

4. Switch TX ON

5. Check the DC voltage at the test point TP1 (with a high impedance multimeter). The voltage should be 3.V +−1.0V. If the voltage is too low you must drill a hole by hole open in the VCO stripline ML3 beginning at the end nearby receiver's mixer. (this is carried out in the factory, normally stripline tuning is not necessary)

6. Set the receiver synthesizer to the highest frequency (458.4000MHz) by keying 1245840000 OK

7. Check the DC voltage at the test point TP9 (with a high impedance multimeter). The voltage should be 12V at maximum.

8. Switch TX ON

9. Check the DC voltage at the test point TP9 (with a high impedance multimeter). The voltage should be 12V at maximum.

10. Set the transmitter to the lowest frequency (449.0500MHz) by keying 10 OK.

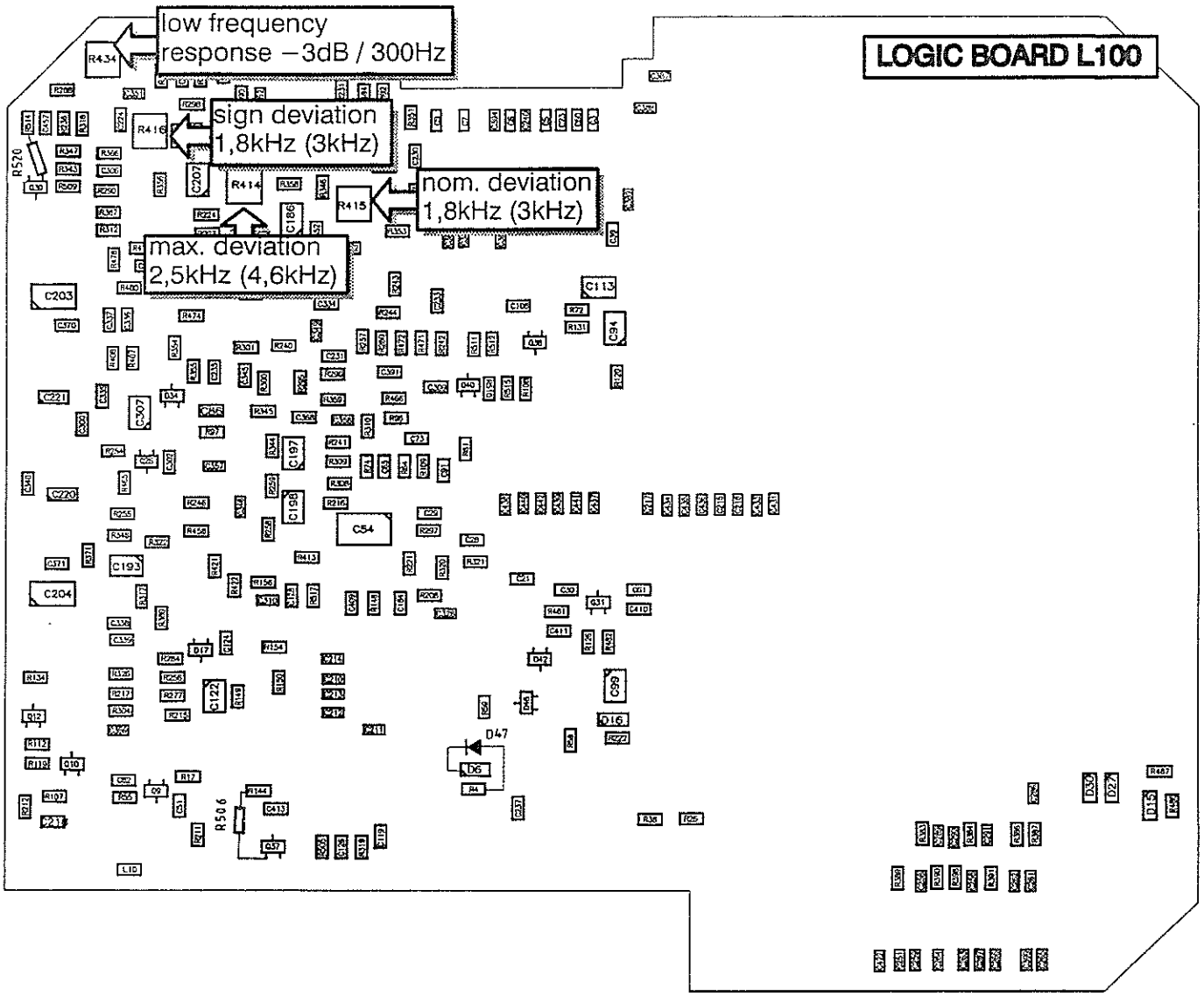
11. Set the deviation correction value to 04 by keying 21 OK on the control unit and then using up and down arrows. Store the setting by keying FCN STO.

12. Connect an audio frequency 1000Hz signal to the tester TK 40 MIC−connector (MIC−button in MIC position) and adjust the generator to the level when the deviation is 1,5kHz (12,5kHz) or 3,0kHz (25kHz). Set this level as a reference level (0dB−level). Signal must be pre−emphased

13. Change the modulating frequency to 300Hz and adjust the low−frequency responce by trimmer R434 to −1,0dB

14. Key in 44 OK on the control unit (Muting the MIC.)

15.Set the transmitter to the lowest frequency used in the network by keying 10 OK



16.Set the transmitter on by keying 201 OK and then key #. Then key 54 OK to transmit FFSK.

17.On processor unit R416 adjust the deviation to 1,8kHz (12,5kHz) or 3,0kHz (25kHz).. End the test by * −key.

18.Key in 43 OK on the control unit. (MIC line on).

19.Connect an audio frequency 1000Hz signal to the MIC−connector of the tester and adjust the audio level of the generator to 1500mV RMS.

20.On processor unit R414 adjust the maximum deviation to 2,5kHz (12,5kHz) or 4,6kHz (25kHz).

21.Change the audio level to 150mV RMS.

22.On processor unit R415 adjust the deviation to 1,8kHz (12,5kHz) or 3,0kHz (25kHz).

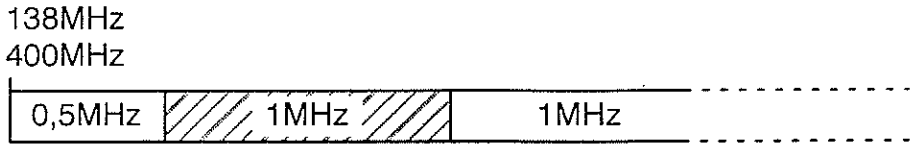
23.Change the audio level back to 1500mV RMS.

24.Select deviation correction by keying in 21 OK on the control unit.

25.Correct the deviation to 2.5kHz (12,5kHz) or 4,6kHz (25kHz) with the up and down arrows.

26.Select the next tuning band by pressing RCL–key. (step is 1 MHz forward) Do the tuning in all the tuning bands which are used in the customer network frequencies.

The test is exited by pressing *–key. The transmitter will be switched off.



27.Save the tuning values by entering FCN STO.
End the test by * –key.

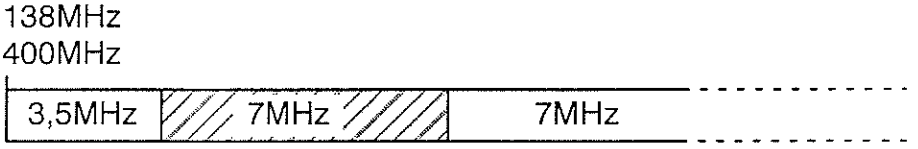
TUNING THE TRANSMITTER

1.Set the transmitter to the lowest channel by keying in 10 OK

2.Turn the transmitter on by keying 201 OK. (low power).

3.Set the power level to 1.0W with the up and down arrows on the control unit.

4.Select the next tuning frequency band if needed by pressing RCL–key. Repeat points 2 and 3 in all tuning bands in use.



5.Store the settings by keying FCN STO.

6.Turn the transmitter on again by keying 203 OK. (high power).

7.Set the power to 15W with the up and down arrows

8.Select the next tuning frequency band if needed by pressing RCL–key. Repeat points 2 and 3 in all tuning bands in use.

9.Store the settings by keying FCN STO.

10.Turn the transmitter on again by keying 202 OK. (simplex channel).

11.Set the power to __W with the up and down arrows

12.Select the next tuning frequency band if needed by pressing RCL–key. Repeat points 2 and 3 in all tuning bands in use.

- **Power levels:**

	Semiduplex
LO	1,W
HI	10W
simplex	_W

TUNING THE RECEIVER

1.Set the receiver to lower channel by keying 10 OK on the control unit.

2.Connect the RF generator to the radio's antenna connector and adjust to the frequency corresponding the lower channel and to the level –60dBm. Modulate the frequency with a normal modulation (mod. 1kHz and dev.1,5kHz (12,5kHz) or 3,0kHz (25kHz)).

3.Connect the multimeter (AC range) to EAR/LSP–connector. (The EAR/LSP–button must be in LSP–mode)

4.Open the LSP–line by keying in 41 OK (42 OK closes LSP) and adjust the audio frequency voltage to maximum with detector coil L303 on the receiver.

5.Key in 40 OK on the control unit and using up key select the maximum output value.

6.Check the audio output power from the symmetrical loudspeaker output LSP_B. (It should be at least 2W/4Ω). $P = U^2 rms / R$
(Inside the tester TK 40 there is a 3,9Ω load connected when the loudspeaker is not connected.)

7.Connect a SINAD meter or a audio analysizer to the EAR/LSP–connector and decrease the audio power level.

8.Next step is to tune the maximum sensitivity of the receiver.
You have two different methods to do it. You can do it manually by keying 36 OK and using up and down arrows to tune maximum RSL–reading on the control unit's display and press OK. The second method is to do tuning automatically by keying 36 and OK twice quickly so that processor unit finds the maximum RSL–reading automatically.

9.Select the next tuning band by pressing RCL–key and change the RF–generator frequency 1 MHz forward to correspond the new RX–channel.

10.Repeat points 8 and 9 in the tuning bands which are in use.

11.Store the setting by keying FCN STO.

12.Check the receiver's sensitivity. (It should be better than −116dBm). (20 dB SINAD psof.)

SETTING OF THE SQUELCHER

Opening of the squelcher is tuned by making use of the generator. The squelcher's opening level is regulated for the generator and the field strength value corresponding to the opening level,

1	012	7464	44665000
162	170	188	

where 162 <=> field strengt value
170 <=> generator value
188 <=> old value in memory

Setting the squelcher opening level.

1.Control the receiver to center channel by keying in 11OK.

2.Connect a generator to the antenna connector and set generator frequency to correspond center channel frequency _____ MHz and level to −114 dBm

3.Start test 33 by keying 33OK
During the test the opening level appears in the right edge of the bottom row and the level to be measured appears at the left edge of the bottom row.

4.If you want to change the value, press OK−key.

5.Store the value by keying FCN STO

6.Exit the test by * −key.

Setting the squelcher closing level.

1.Change the generator level to −118dBm

2.Start test 34 by keying 34OK
During the test the opening level appears in the right edge of the bottom row and the level to be measured appears at the left edge of the bottom row.

3.If you want to change the value, press OK–key.

4.Store the value by keying FCN STO

5.Exit the test by * –key.

TUNING OF THE RF LEVELS

1.Control the receiver to center channel by keying in 11OK.

2.Connect a generator to the antenna connector and set generator frequency to _____ MHz and level to L0 [1]

3.Start test 921 by keying 921OK
During the test the opening level appears in the right edge of the bottom row and the level to be measured appears at the left edge of the bottom row.

4.Store the value by keying OK and exit from the test by * key.

5.Change the generator level to L1 [2]

6.Start test 922 by keying 922OK

7.Store the value by keying OK and exit from the test by * key.

8.Change the generator level to L2 [3]

9.Start test 923 by keying 923OK

10.Store the value by keying OK and exit from the test by * key.

1	921 OK	L0	(–108dBm)	(BG –110dBm)
2	922 OK	L1	(–98dBm)	(BG –104dBm)
3	923 OK	L2	(–88dBm)	(BG –93dBm)

TUNING OF THE VOLTAGE LEVELS

1.Connect the adjustable voltage supply to the test box

2.Start shutdown_volt test 93 by keying 93OK

3.Set the voltage to shutdown_volt level 10.2V
Check the voltage by a multimeter (DC) power supply connectors back side of the tester TK40

4.Store the value by keying OK
If you press * key. then exit without saving

5.Switch off the power and disconnect the connections.

INSTALLATION MANUAL OF THE NOKIA R40

Issued	Date	Modification	
8.6.92 Ver 0.94	19.01.1996 01.04.1996	1.1 CU43–update by JS 1.2 CE–update by MHo	
Prepared	Checked	Approved	Date
JS	JS	TYn	08.06.1992

GENERAL

Start the installation by selecting mounting locations for all separate units and the antenna. This must be done in co–operation with the customer. The customer has the right not to accept a recommended antenna location. The installer should, however, explain the effect of an unsuitable installation. The necessary cable runs should also be planned with care. The time spent on proper planning of the job will be repaid by making the actual installation job much quicker and by reducing the risk of incorrect installation. Correct antenna location is particularly important. Best results are achieved by mounting the antenna on the roof.

Ease and safety of use must be taken into account when selecting the location of the control unit.

Vehicles fitted with electronic devices

An additional precaution is necessary in relation to vehicles fitted with Electronic Ignition, Fuel Injection, Anti–skid Brakes or any other electronic device where temporary loss of service could be hazardous.

In theory, any of the above systems could be affected by the presence of an RF field of sufficient intensity, which when detected may cause the device to malfunction. The source of RF may be a mobile radio installed in the vehicle itself or a transmitter operating in another vehicle alongside. If interaction occurs, loss of control could result for the duration of the mobile transmission.

System– and antenna cable should be run on the opposite side of the vehicle to the other electronic cables of the car.

In the interests of safety, the user must be asked to test the vehicle when the installation is complete.

Specialised vehicles

The installation on certain specialised vehicles, such as fuel tankers and fire–fighting vehicles, may be subject to additional safety regulations which must be closely observed.
Prior to commencing an installation on such a vehicle, be sure that any relevant safety regulations are fully understood.

Petrol powered vehicles

Ensure that there are no petrol leaks before commencing an installation involving the use of electronic tools as these can produce sparks.
Ensure no damage to petrol tank or fuel lines occurs when drilling holes.

Gas powered vehicles

Before installation:
Establish that there are no gas leaks. Don't use a flame. Butane and propane are heavier than air, so if there is a leak the gas may lay on the floor of the boot. The gas is detectable by its characteristic smell. The point of escaping gas may show signs of frosting.

The vehicle owner should arrange for the leak to be repaired before installation is commenced.

Ensure no damage to petrol tank or fuel lines occurs when drilling holes.

System– and antenna cable should be run on the opposite side of the vehicle to the gas fuel pipe

USER AND INSTALLATION NOTICE !

1. R40 Dashboard installation

In the case where grounding of the transceiver unit is not created via the metal structures of the installation environment (i.e. plastic dashboard), an additional grounding cable of $\varnothing$ $6mm^2$ and maximum lenght of 50 cm must be used between the transceiver unit and metal chassis of the vehicle. In the absence of proper grounding, an ESD–pulse may cause the radio unit to turn off.

2. R40 Desktop installation

Some extremely severe spurious effects in AC–mains network may reset the radio unit, and user settings may then be lost.

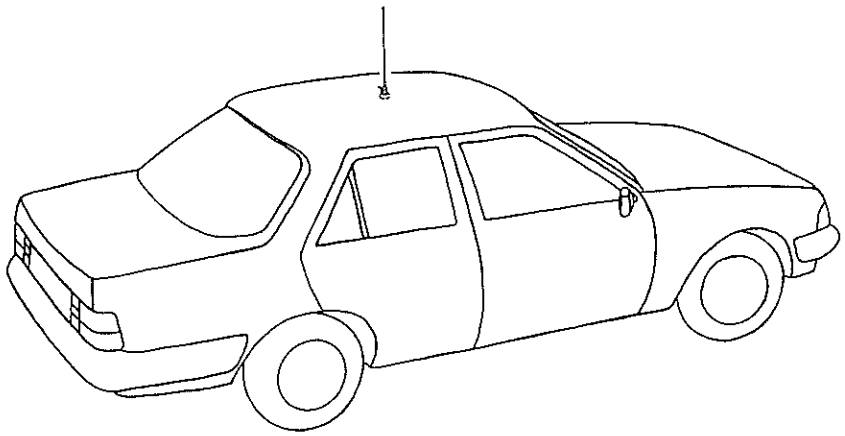
ANTENNA INSTALLATION

Antenna at the center of roof

The best quality of communication is achieved by installing the radiotelephone antenna at the center of the car roof. This is true with all radiotelephones, irrespective of brand or type.

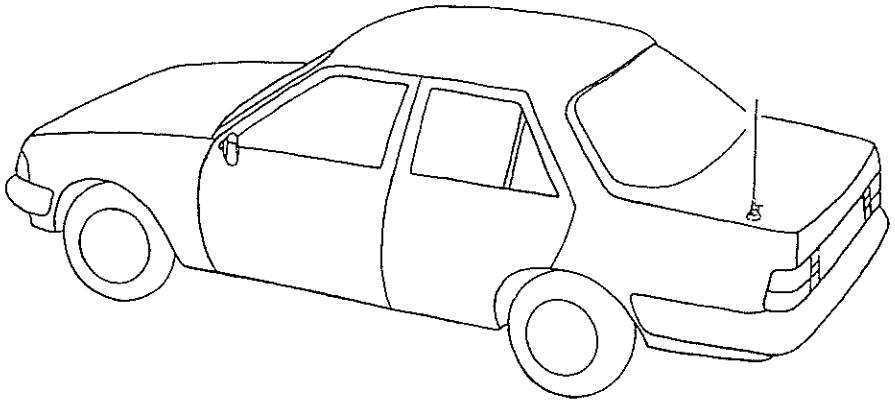
The highest radiation power and sensitivity of reception and the most uniform radiation pattern is obtained with the antenna at the center of the roof: the communication quality will then be independent of the vehicles direction with respect to the base station and the greatest effective height is obtained. This makes possible the best quality of communication particularly in hilly terrain or to when distant from the base station.

When installing the antenna at the edge of the roof there may be very little ground plane. However it is worth installing the antenna on the roof, even if the radius of the ground plane is as small as 15 centimeters. The center line of the vehicle is the best place even if there were more ground plane available at the body edges. Height variations less than 5 centimeters in the ground plane don't have any decisive effect on the radiation pattern of the antenna.



Other antenna locations

The wing is an alternative place for the antenna but is not as effective as the center of the roof. The radiation pattern will be uneven and the communication quality of the mobile telephone will be more dependent on the orientation of the car with respect to the base station. When the antenna is installed on the rear wing, it should not be mounted in the corner between the boot and the rear window. For best results, it should be located halfway out on the wing and it should be vertical.



The boot lid is the worst place for the antenna. Although the installation is quick and easy severe problems will occur with interference. With a new car, grounding of the boot lid is usually good via hinges and the lock but very soon these connections will loosen and significant interference will occur. Prevention of this interference has been shown to be difficult although earthing braids and springs are available. If the engine is situated at the rear of the car, the antenna must not be installed on the lid due to ignition interference.

For temporary installation the best choice is a magnet–mounted antenna on the roof.

When installing the radiotelephone antenna on a roof where there are other antennas the location must first be checked with a magnet antenna in order to avoid mutual effect or interference with the other antennas.

If the vehicle has a microprocessor for e.g. brake control, the antenna and cables should be installed as far as possible from the processor to avoid malfunctions caused by the RF field.

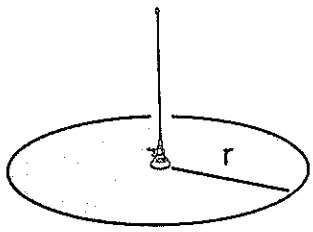
Car–radio antenna

Broadcast FM transmissions are often horizontally polarized. For that reason the BC–radio whip antenna is often installed at the body edge, near the side windows, where the polarization angle turns suitable for the whip antenna. Vertical polarization is usually used in radiotelephone networks. Consequently, the installation of a BC– radio whip cannot be used as a model for the installation of the radiotelephone antenna. Radiotelephone antennas should never be installed on vertical planes.

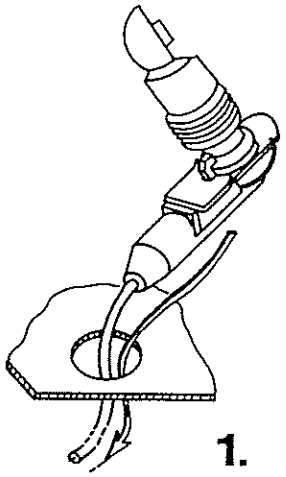
In some cases two antennas on the roof may cause mutual interference. In order to avoid problematic installations check different possibilities in advance with a magnet–mounted antenna.

Antenna installations on non–metallic surfaces

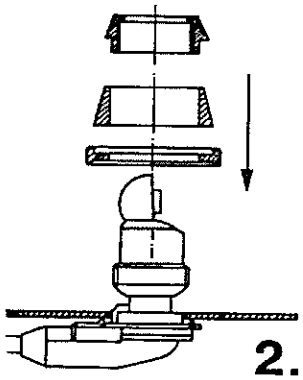
In any antenna installation, it should be kept in mind that the antenna needs an earth plane to operate properly. Thus the antenna cannot be mounted on a glass-fibre roof such as those used on some vehicles or boats. If the antenna must be mounted on a glassfibre roof, an earth plane made of metal sheet must be provided. The diameter of the earth plane should be at least 0.4 m, and the antenna should be mounted in the center. Another solution is to use a special antenna that does not need an earth plane.



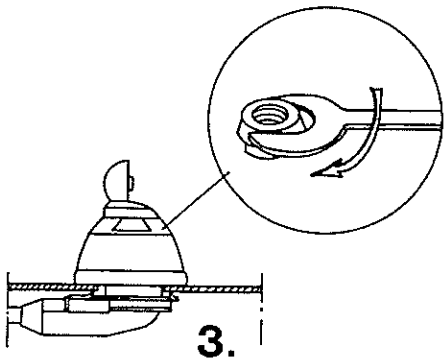
Installation

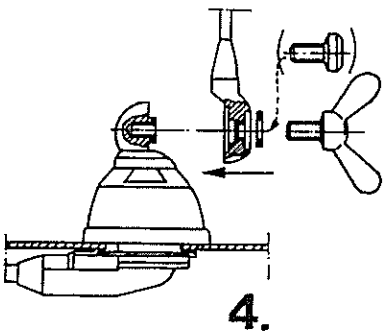


A proper antenna installation is very important to the operation of a radiotelephone. Select the best place and carry out the installation with care. A metal plate or box should be inserted below the drill hole in order to collect metal chips and to protect the upholstery against damage. The remaining drill dust and metal chips must be removed with a vacuum cleaner because they would color the ceiling upholstery after getting rusty.



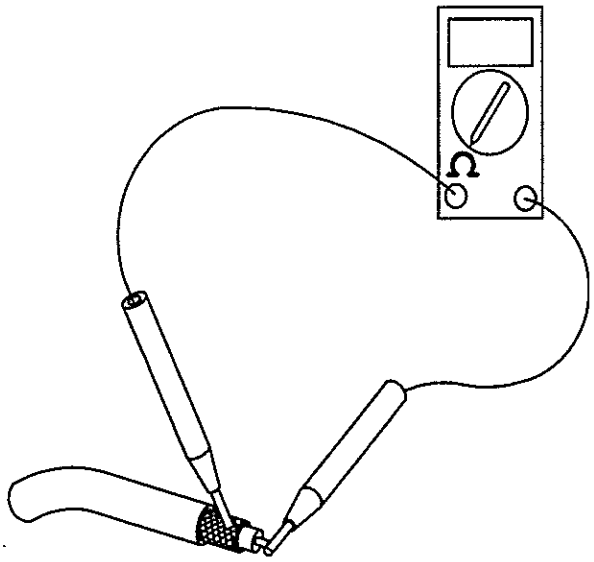
The antenna base must be properly earthed. The base contains grounding spikes that break through the paint from below when the mounting nut is tightened. The base should be slightly rotated back and forth before final tightening in order to provide reliable grounding. In some cases the grounding must be secured by grinding off the paint to expose the bare metal surface under the base mounting nut. The bare metal surface should then be protected against rust by applying rust preventer. The base mounting nut must be tightened very securely to preclude any movement in use.



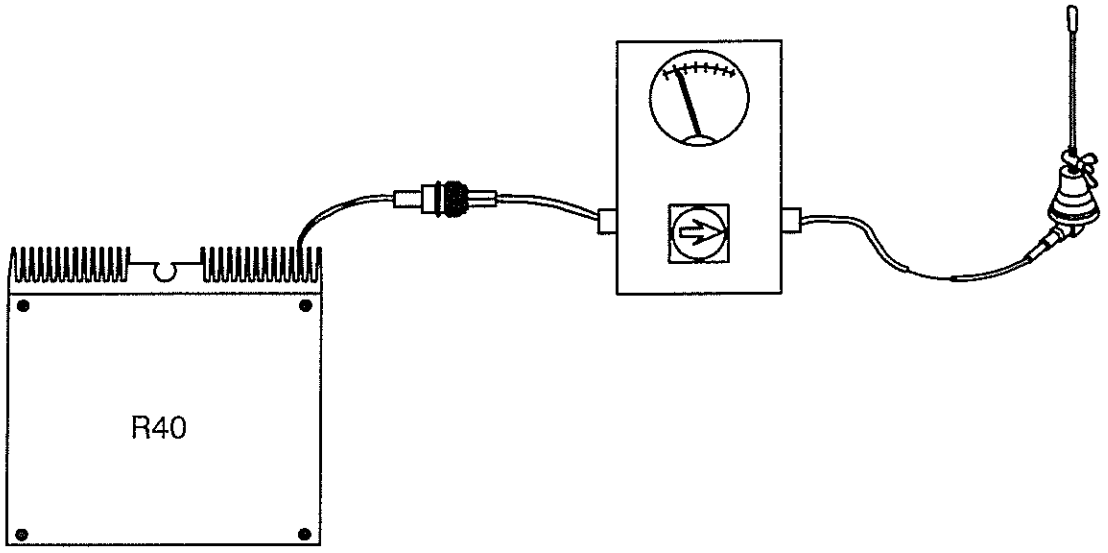


ANTENNA TUNING

The antenna should be tuned using a reflectometer (standing–wave meter). Tuning is performed outdoors, not too close to buildings or other disturbing structures.



Before tuning the antenna, use a multimeter to check that the antenna cable is not shorted and that the braid is connected to the car body. The bonnet, boot lid and all doors must be closed during tuning.



Antenna tuning connection

Measurement of power

Replace the control unit with a service control unit by which you can activate the service mode.

Connect the power meter between the radio and antenna cable.

Switch ON by pressing the PWR–key.

Select a free channel for transmitter by entering test 14 X, where X = frequency
(See. Service mode instructions)

Turn on the transmitter by entering 203 OK

Check that the outgoing power is according to specifications

Check that the incoming power is minimum.

Press * to switch OFF the transmitter.

If the power levels are incorrect, check that:
–power tuning levels are OK in the radio

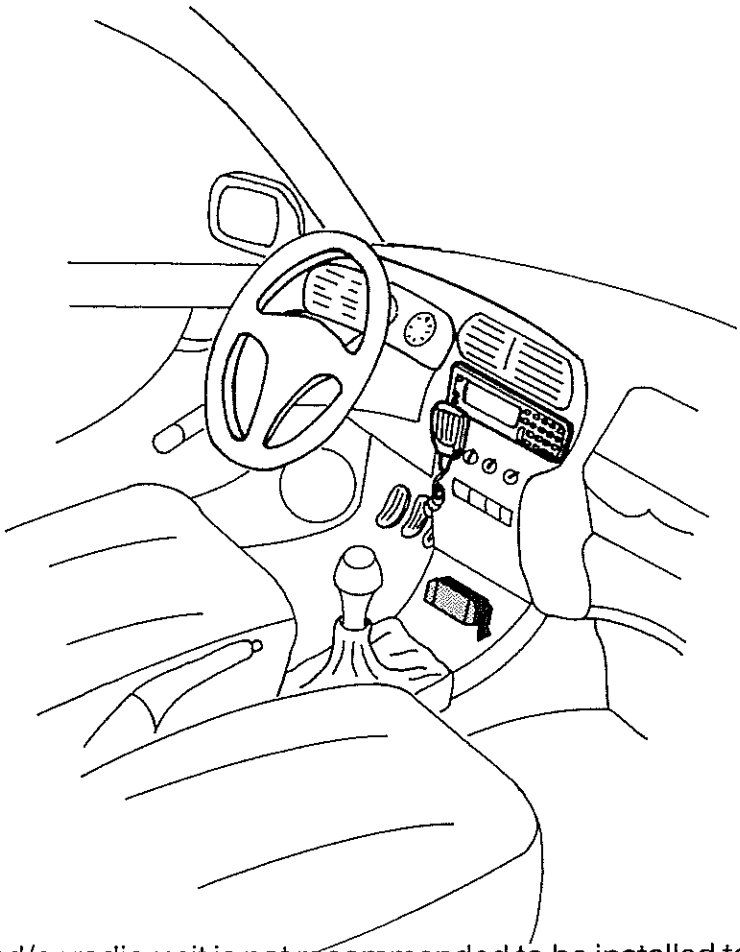
If there is too much incoming power, check that:
–the antenna is tuned, ie. it's lenght is correct. Tune the antenna according to antenna manufacture's instructions.
–the antenna cable is not shorted or the braid is not connected properly to car body.
–the antenna or the connectors are not faulty.

Repair the faults and test the outgoing/incoming power levels.

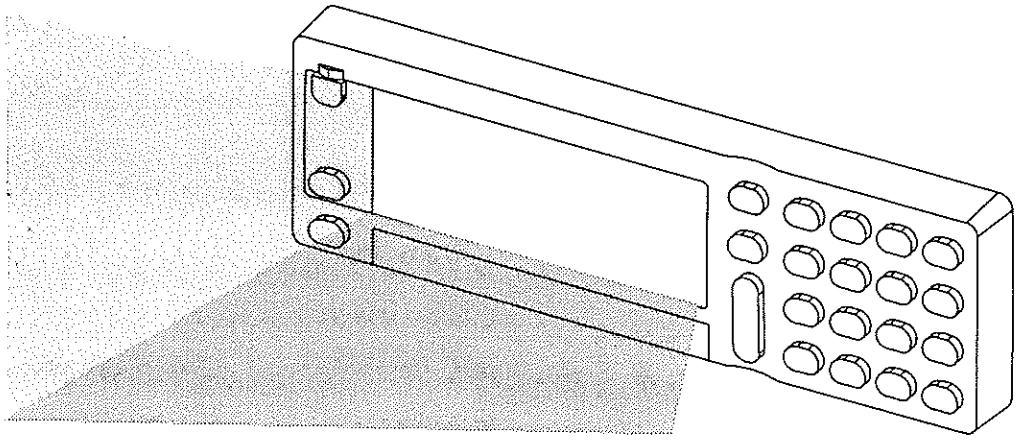
Disconnect the connections.

CONTROL UNIT INSTALLATION

The control unit must be within easy reach of operators and the display must be clearly visible. For traffic safety, any part of the radio installation should not obstruct the drivers view.



The control unit and/or radio unit is not recommended to be installed to direct sun light or close to a heater, temperature should never be more than +70°C. Be also sure that the installation set doesn't restrict legroom or cause a hazard in case of accident.



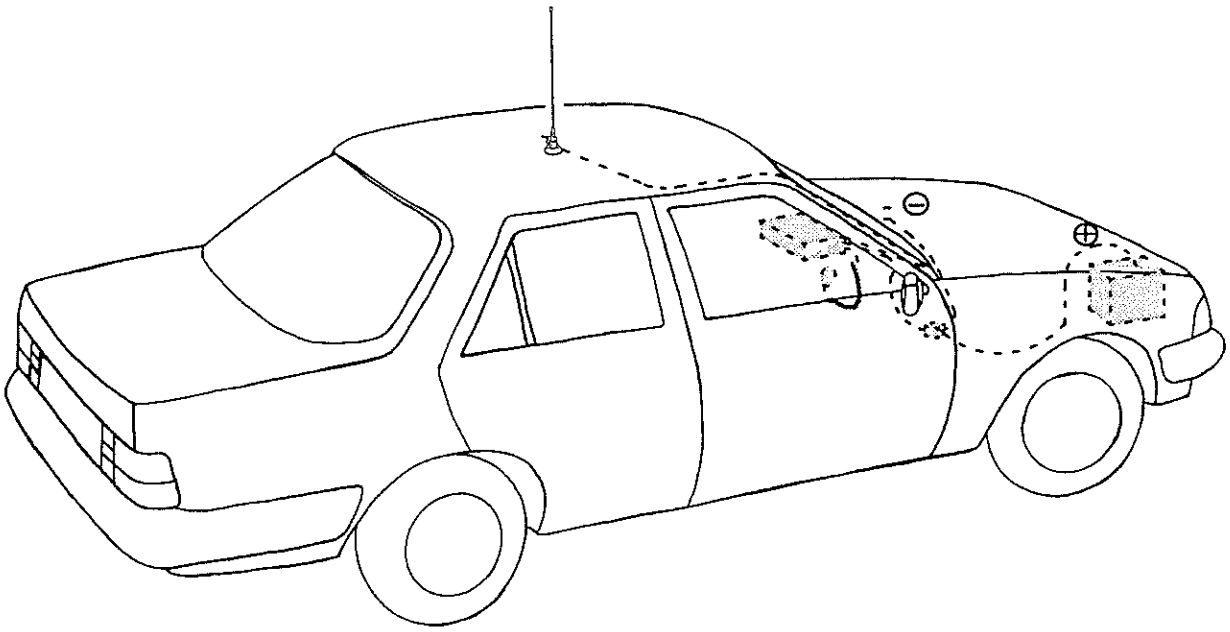
Proper view angle

MOUNTING OF THE RADIO UNIT

The radio must be placed so that the cables and connectors will not be damaged by luggage. The radio unit must also be easy to detach from the mounting bracket.

The cable from the mobile telephone to the antenna should be as short as possible, in order to minimize cable losses. All cables must be properly clamped down. Ensure that the cables cannot be squeezed by lids or other moving parts. The mounting bracket can be mounted in cramped places like compartments that are below the actual boot in some cars. However, such places may be too dusty or can sometimes contain condensation.

It is advisable to fix the transceiver to the internal structures of the car. Rust–preventing coating must be applied if holes are drilled into the bottom or fenders.



INSTALLATION OF CABLES

Cable paths should be chosen in such a way as to allow the cables to be laid under mats and mouldings for protection against mechanical damage. Installation must be made without dismantling cable connectors. Beware of sharp metal edges and hot engine parts that may damage the cable insulation. Cables must not be mounted on moving parts of the engine or car body, e.g. in hinged lorry cabins.

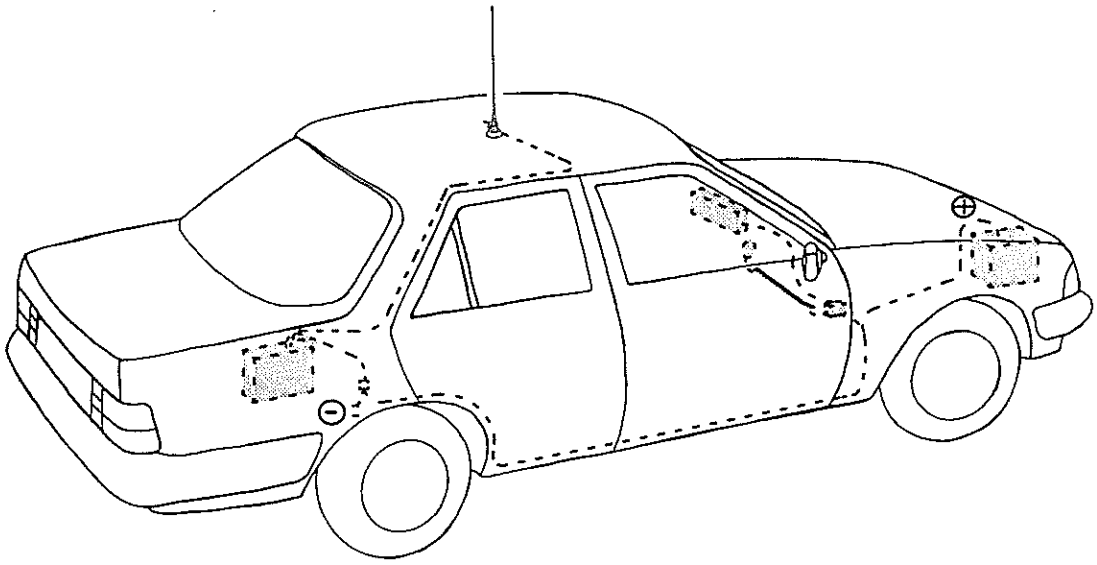
Cables should always be laid well away from high–voltage ignition leads and other cable harnesses in order to prevent noise from being induced into the radiotelephone cables.

Power cable

The positive power cable should be connected directly to the car battery terminal, and no other appliances must be connected to this cable. A fuse must be installed in the positive battery lead as close to the battery as possible. The power cables must be cut to suitable length. The negative cable is connected to car chassis close to the supply filter. The length of the negative cable should not exceed 0.3 meters.

Note that if the negative cable is connected to the negative terminal of the car battery and accidentally both the cars and transceivers negative cables have come loose from the terminal but are still connected to each other then starting up the car would cause high current to go through the radio because the grounding point would now be on the antenna base.

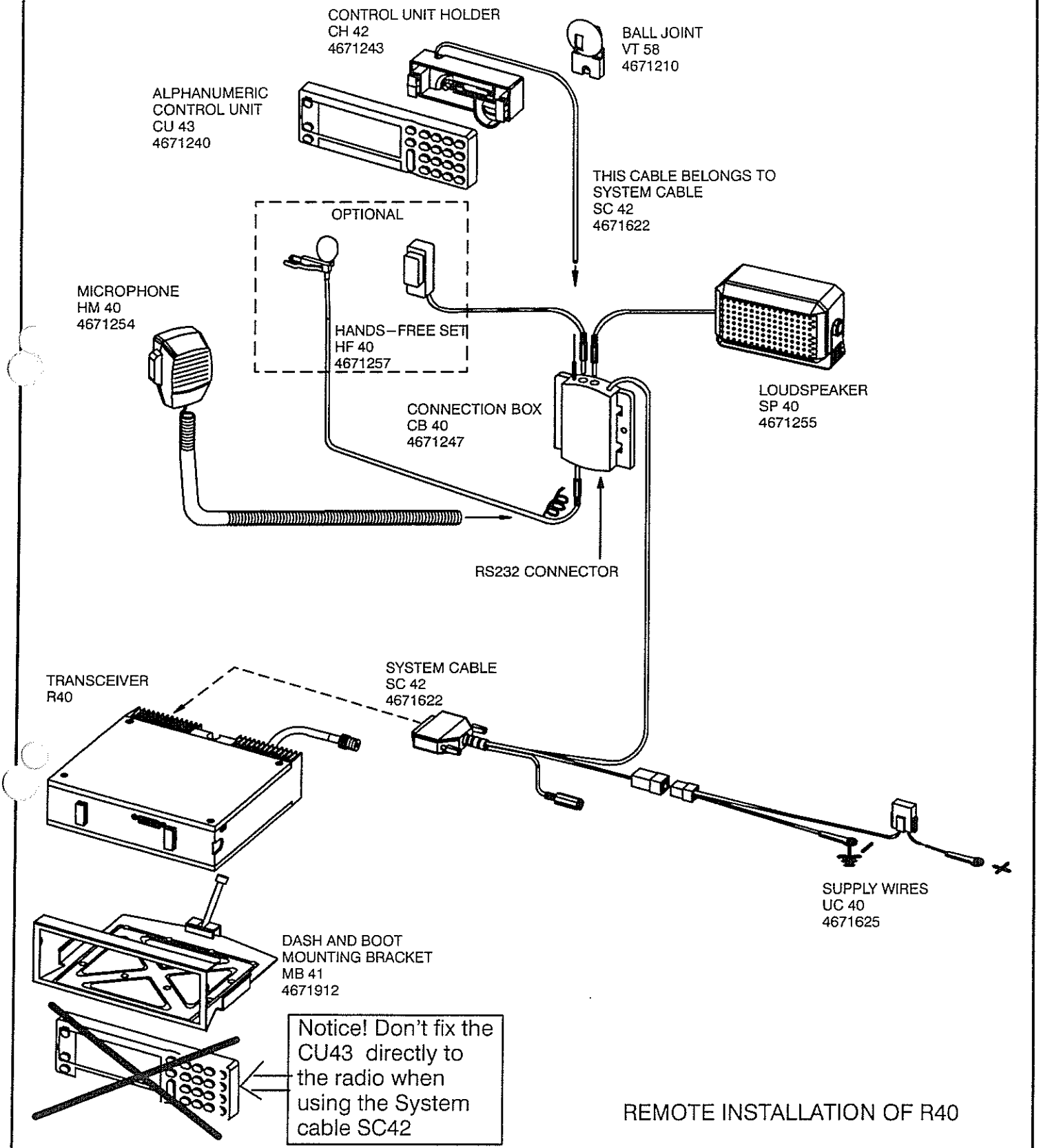
If the vehicle has a 24 V electric system, a 24/12 V voltage dropping regulator must be used. Never connect the mobile telephone across one of two series–connected 12–volt batteries.



Grounding

Good grounding is the basic requirement to achieve a good installation and to prevent noise disturbance. Here are some points that must be observed:

- grounding should be done separately and not to the cars existing screw connections.
- grounding place must be firm (e.g. lap joint of metal plates) so that the screw connection is reliable in the long term.
- grounding place must be cleaned carefully of paint and it should be given rust prevention with Vaseline or some suitable chemical.
- grounding cable must be as short as possible to reduce noise coupling and placed as close to the supply filter as possible.
- bad system grounding can be detected by reduced noise level when car antenna is removed or the car starts up.



REMOTE INSTALLATION OF R40

NOKIA R40 INSTALLATION USING DIN INSTALLATION FRAME

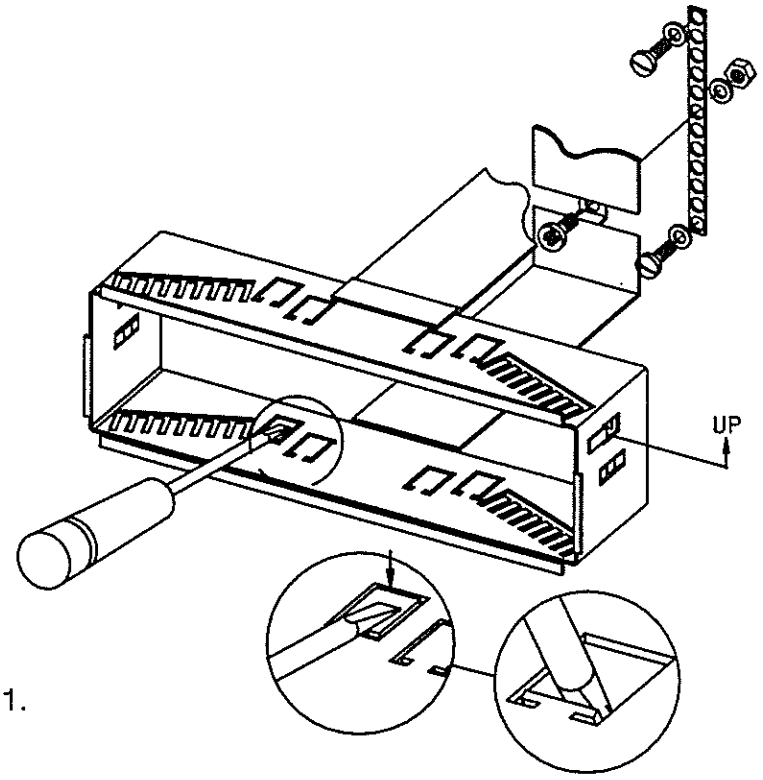


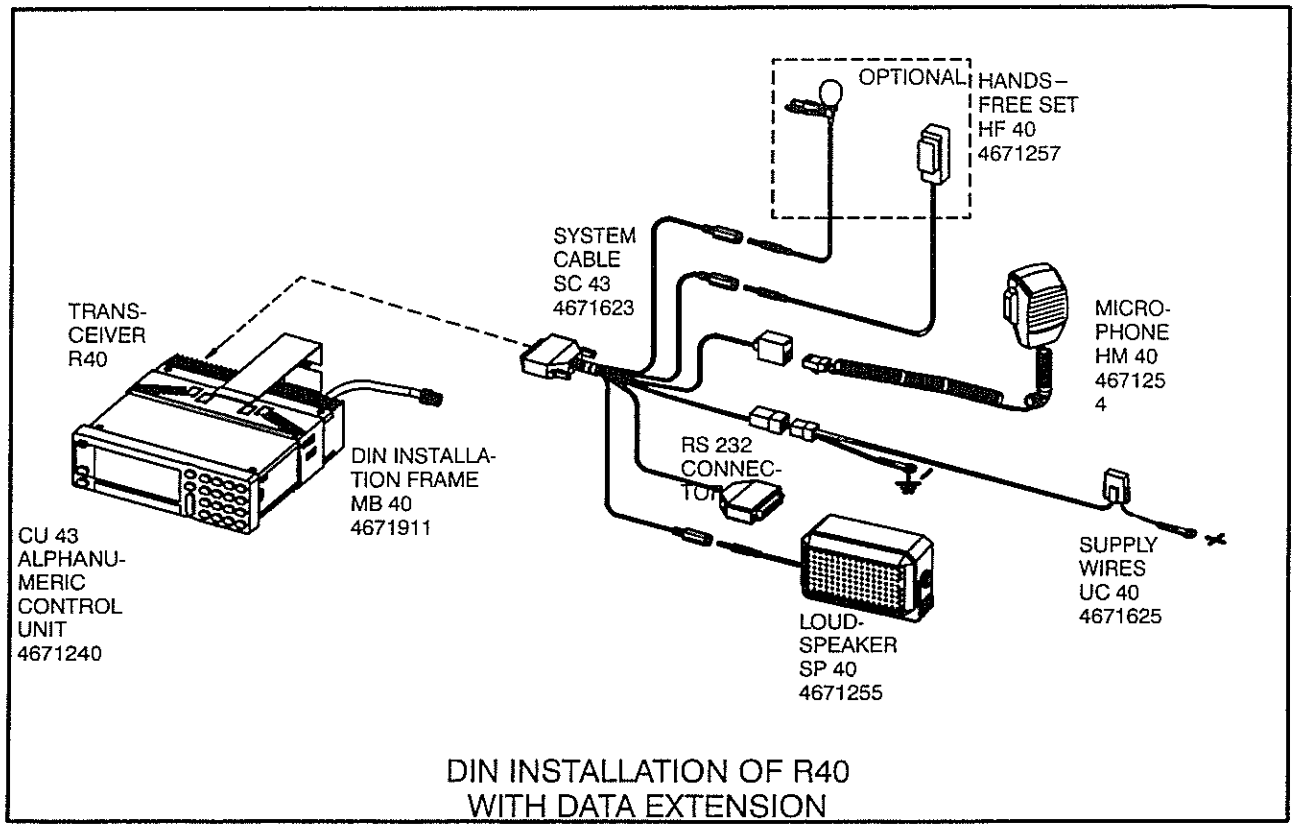
Figure 1.

Remove the cover plate of the DIN–installation hole of your car.

Put the DIN–installation frame into the hole. Be sure that the fixing springs of the frame are at the top..

Fix the frame at the back, if possible to the body of car.

Bend the tabs of the frame to lock it to the dashboard.



DIN INSTALLATION OF R40
WITH DATA EXTENSION

Run the cabling and install the loudspeaker and microphone to good and ergonomic locations on the dashboard of the vehicle. (There are three similar 3,5mm jack sockets, ensure that they are assigned correctly. They are marked with names)

Connect the system cable and the antenna cable to the radio and push it into the installation frame.

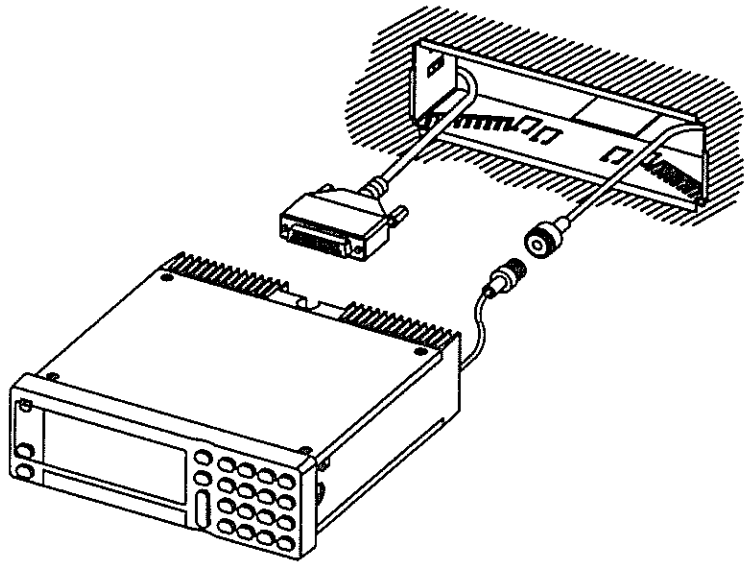


Figure 3.

DETACHING THE RADIO FROM THE DIN–INSTALLATION FRAME

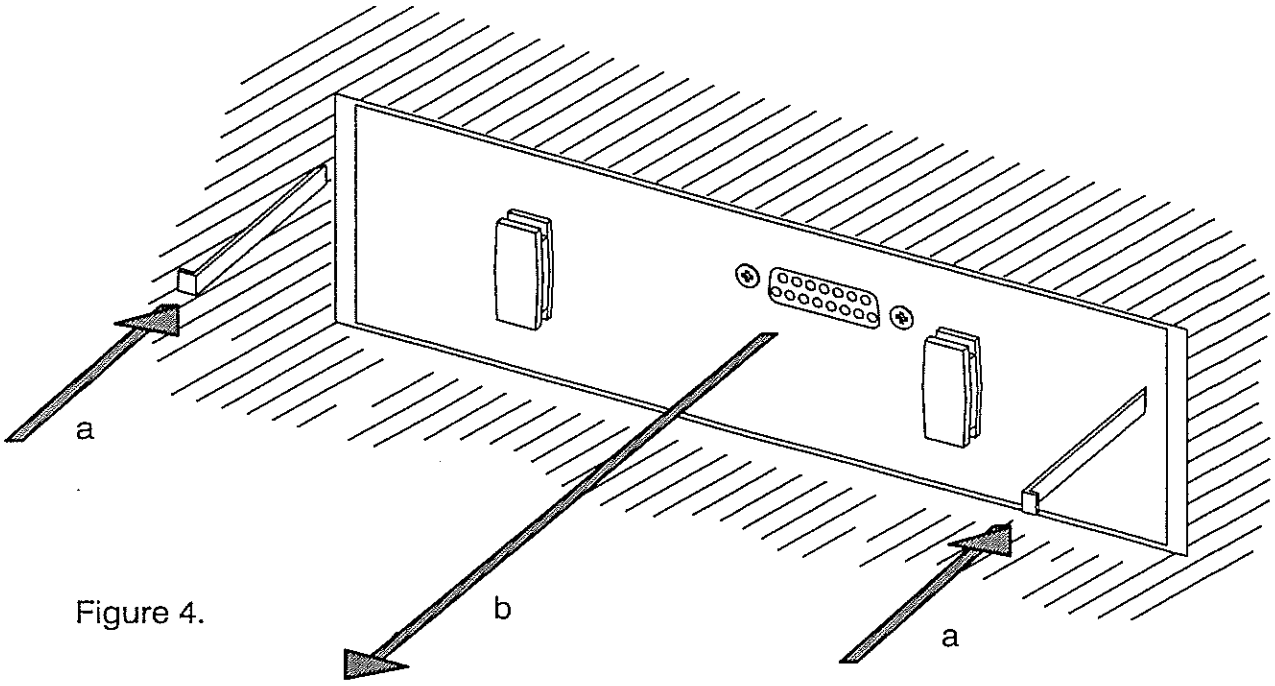


Figure 4.

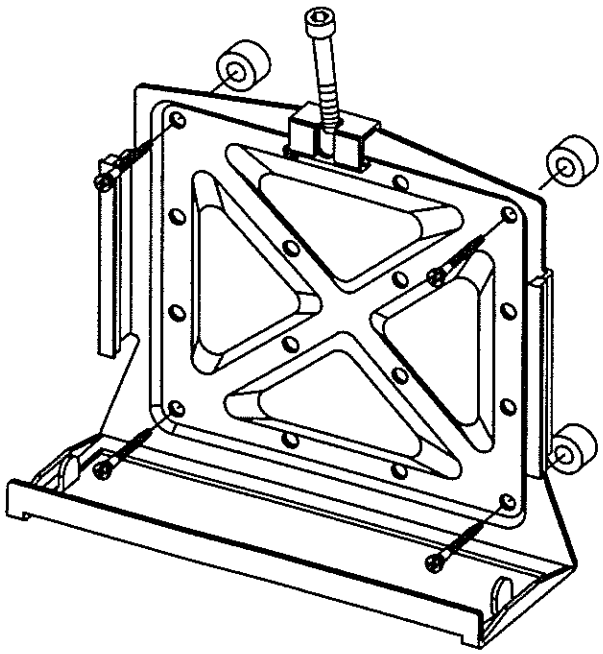
Detach the control unit from the radio

Push the unlocking pins down the sides of the radio to release locking springs. (a)

Pull the radio from the installation frame and remove the connections.

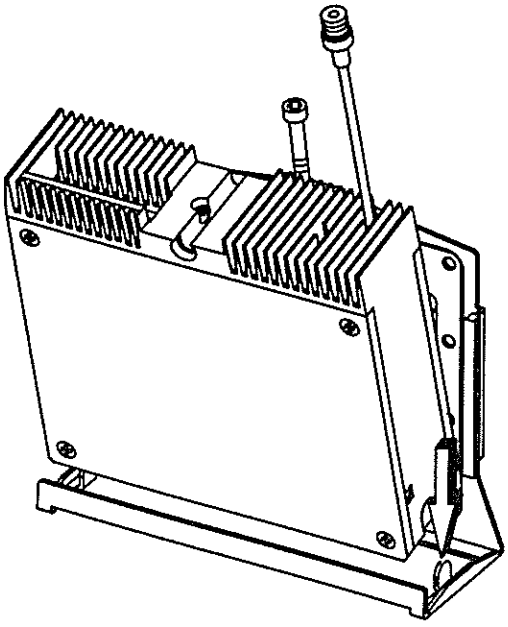
Notice ! Make sure that the locking springs of the frame haven't been bent when detaching the radio. If they are bent, please twist the locking springs so that the locking is secure.

NOKIA R40 INSTALLATION USING DASH AND BOOT MOUNTING BRACKET MB41

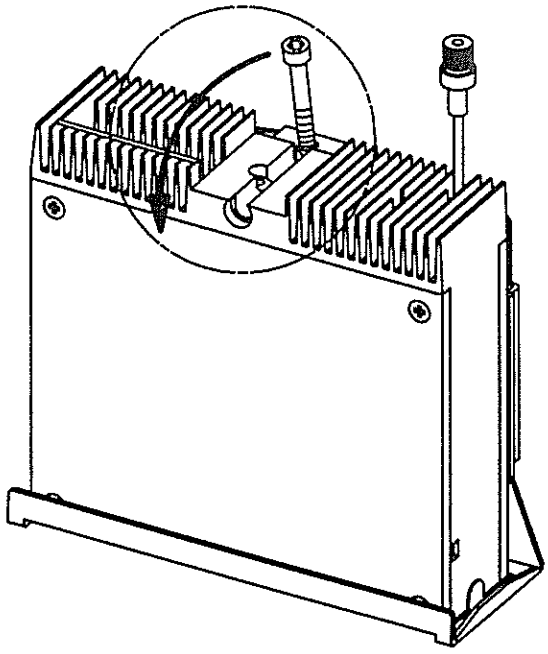


Install the mounting bracket in a safe place where the radio can be detached easily.

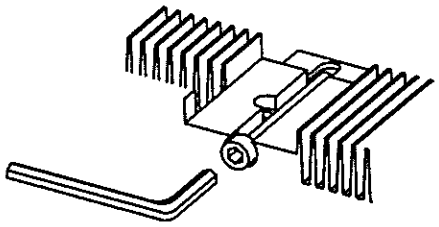
Before drilling any holes in the vehicle, check that there is free space behind the wall



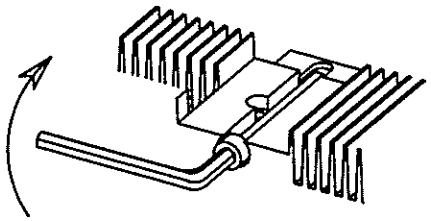
Put the radio on the mounting bracket



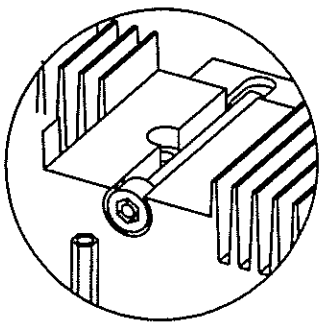
Lower the locking screw into position.



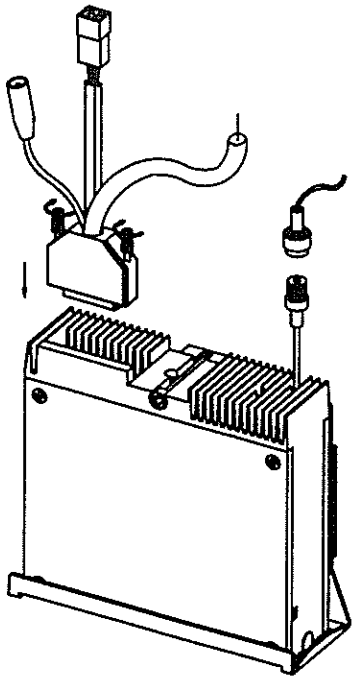
Tighten the socket–head screw



A special socket–head screw is optional for anti–theft use.



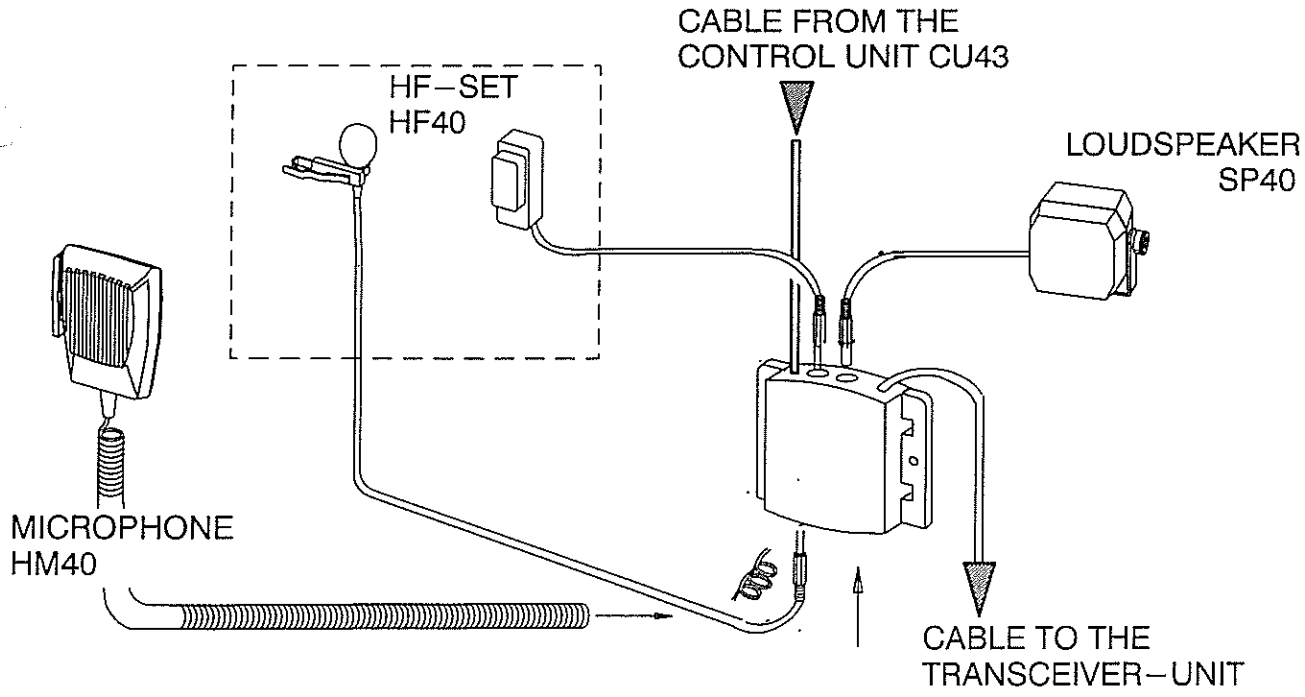
Connect the cables to the radio.

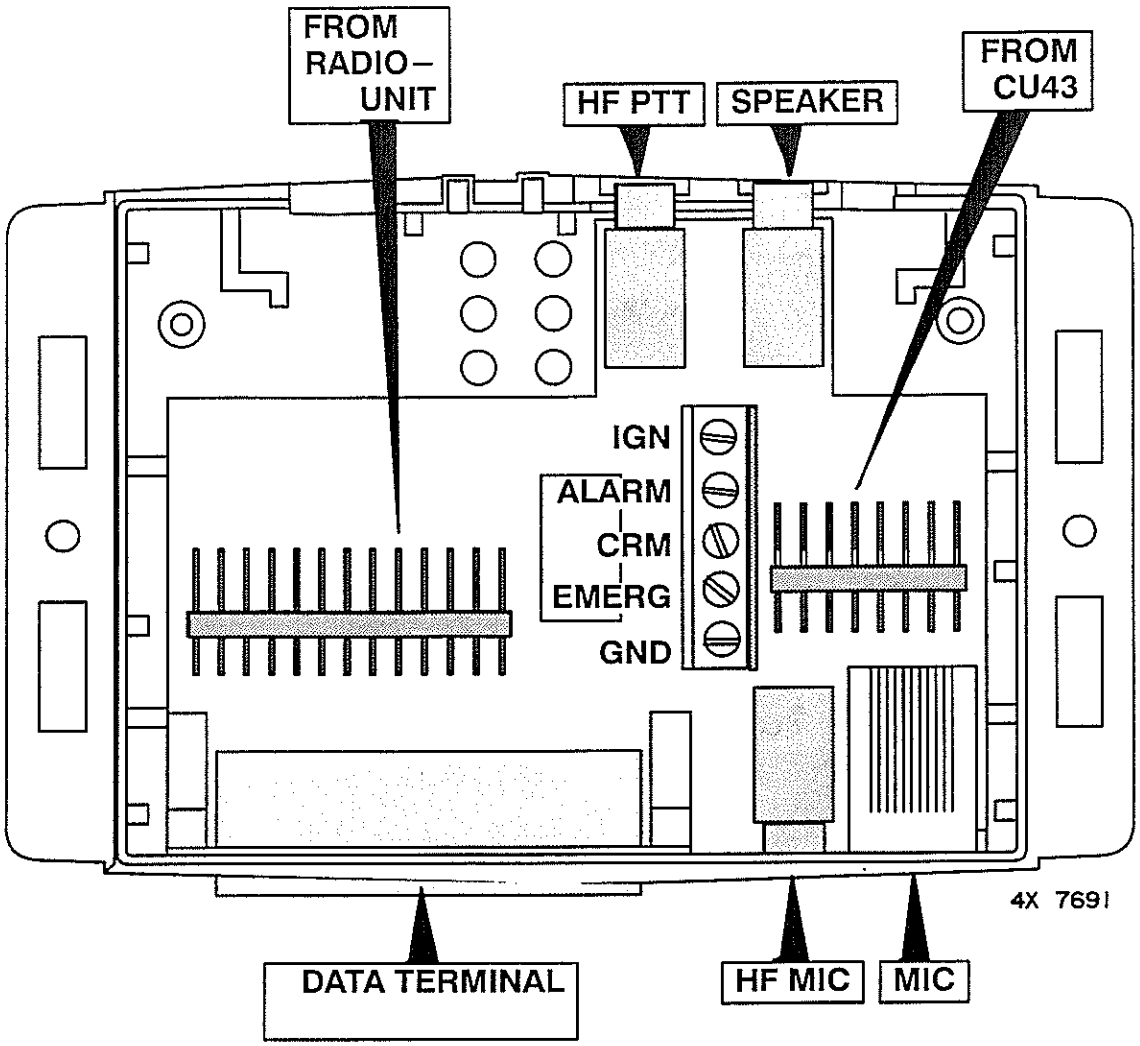


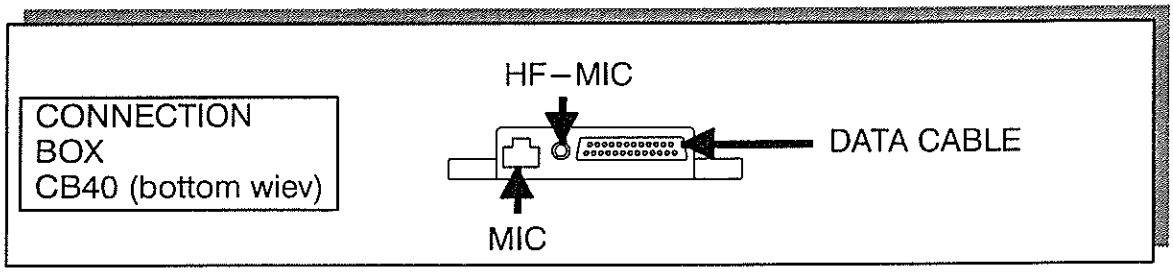
FIXING THE CONNECTION BOX CB40

CONNECTION BOX CB40 IS USED WITH REMOTE INSTALLATION

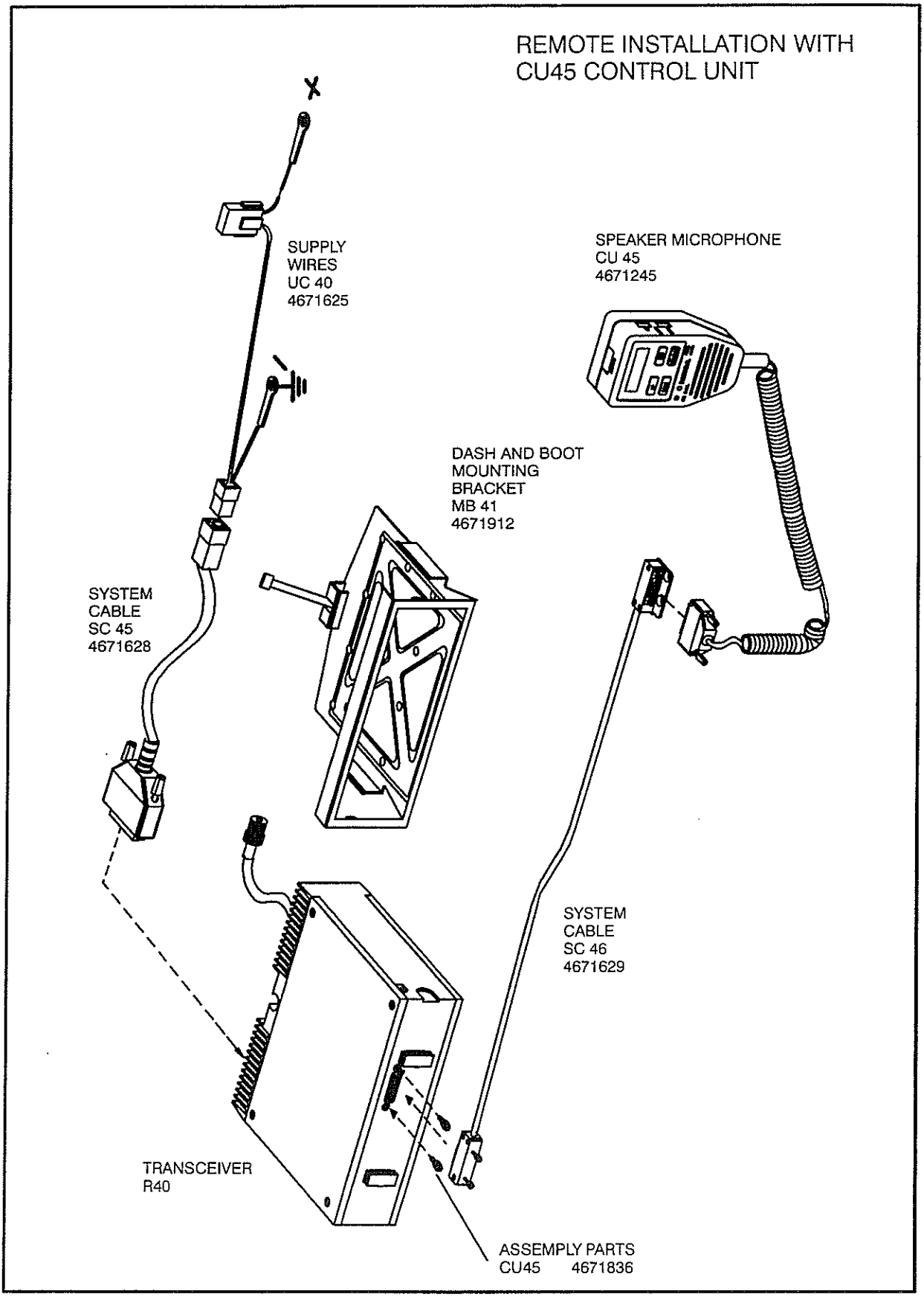
Connect the cables to CB40 as in the following pictures is shown.



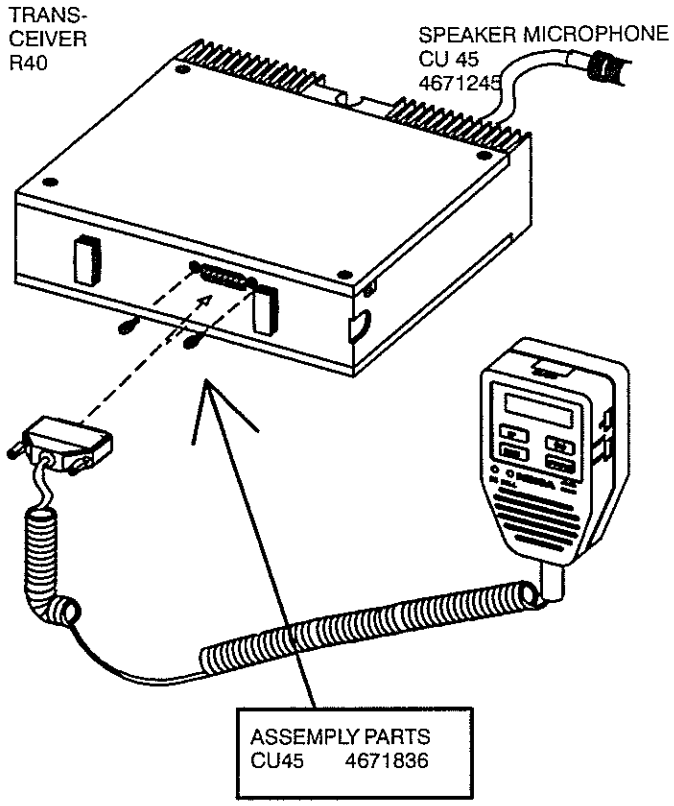

FROM RADIO– UNIT
HF PTT
SPEAKER
FROM CU43
IGN
ALARM
CRM
EMERG
GND
4X 7691
DATA TERMINAL
HF MIC
MIC


CONNECTION BOX CB40 (bottom wiev)
HF–MIC
DATA CABLE
MIC

THE INSTALLATION WITH CU45



DASHBOARD INSTALLATION
WITH CU45 CONTROL UNIT



When installing CU45 directly to the R40 radio – replace the connector screws with adaptor srews 4671836

RF COMPATIBILITY CHECKS

The following checks should be carried out if the vehicle is equipped with electronic anti–skid, ignition or engine management systems.

With the vehicle stationary and the engine running at fast idle, key the transmitter. Check that the brake lights do not illuminate and that the engine continues to run normally.

Operate the brake pedal, key the transmitter and check that the brake lights do not extinguish.

Drive the vehicle slowly at about 20 km/h and check that the brakes are working normally way and that the engine doesn't surge or cut out.

CAUTION !

In the event of an apparent malfunction in the braking and/or ignition systems during driving, the radio installation must be rendered inoperative and the vehicle manufacturer should be contacted before any further use is made of the installation.

Unqualified persons should not attempt to modify these units in any way

Safety first

– The use of mobile radio while driving may be in breach of traffic regulations in some countries. Check with your local Traffic Authority for further details.

– DON'T operate the mobile radio in an explosive atmosphere. Obey the "Turn Off Two Way Radios" signs where these are posted.

– To avoid radio frequency injury **don't touch the antenna** whilst the transmitter is on.

– The possibility exists that the use of a mobile radio in a vehicle may result in the altered operation of electronic systems (eg. fuel injection and braking systems).

If this occurs: **Turn off** the mobile radio **immediately**, and contact your service organization for advice.

– Fans, power accessories, window demisters or radios may alter the operation of the mobile radio. Consult the accessory manufacturer for details regarding the elimination of radio interference from such accessories.

CALL TESTS AND INTERFERENCE SUPPRESSION

When the installation and antenna tuning are completed, test calls must be made to ensure proper performance of the equipment. Test calls are first of all necessary to verify that the mobile telephone itself works properly.

There are two kinds of interference: outside interference and interference from the vehicle. Little can be done about outside interference during installation, but much more can be done with interference created by the vehicle.

The most common type of interference generated by the electrical system of the car is spark noise from the ignition system. This high–frequency noise couples into the radio-telephone via antenna.

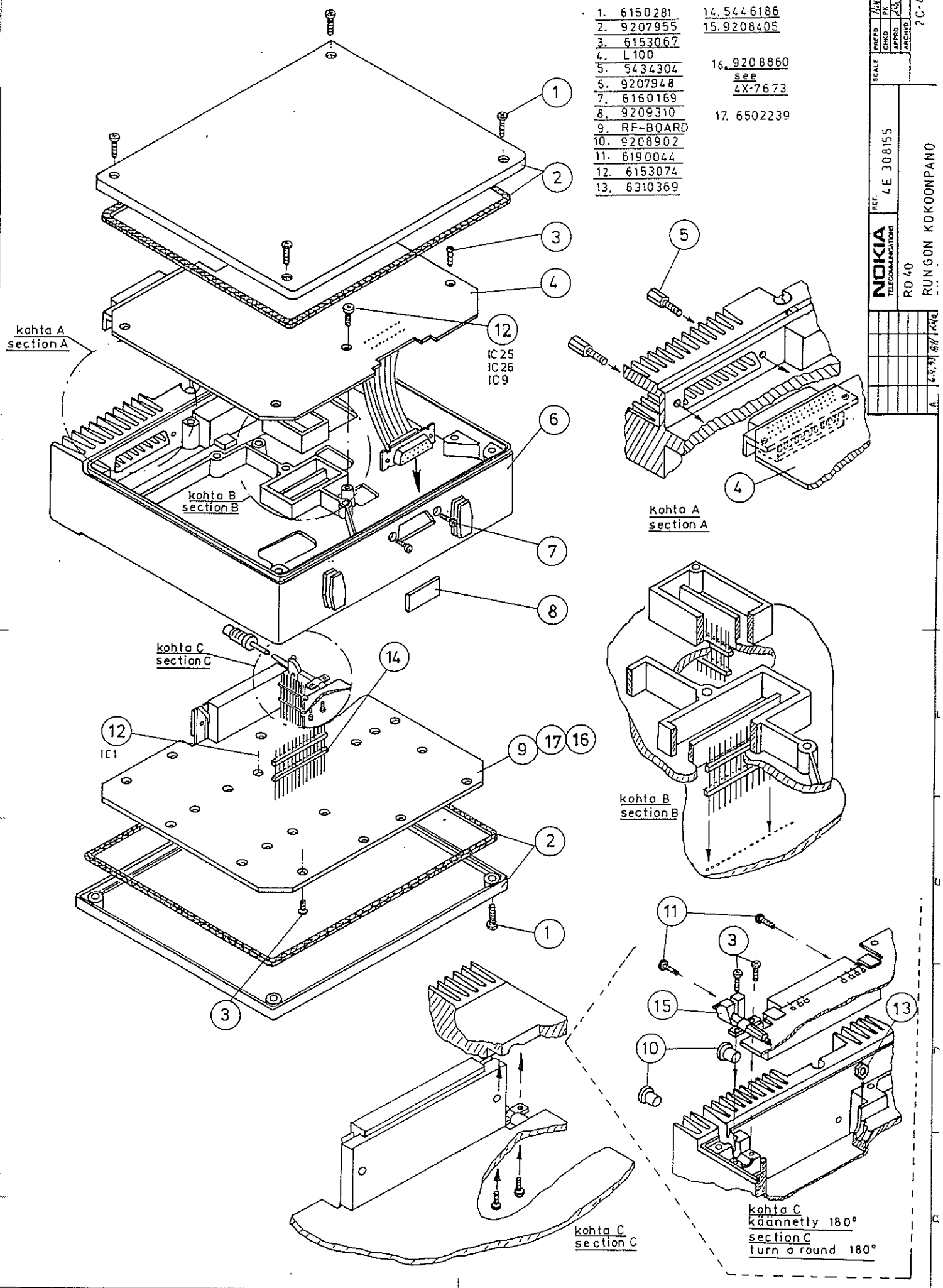
Ignition noise can be attenuated by using resistor cables to spark plugs. Suppression resistors can be used at the spark plugs and at the cable between coil and distributor. The resistor must be mounted near the distributor. 5 kΩ wire resistor is recommended. All connectors and cables of the ignition system must be clean and unbroken.

So called electronic ignition systems are used in many cars. Before any steps are taken to suppress ignition noise in such systems, the service of the ignition system dealer should be contacted, in order to avoid reducing the performance of the ignition system or even damaging it.

In some cases, spark noise can be suppressed by earthing the bonnet with a sufficiently thick, short copper braid.

Noise entering through the battery cable is low–frequency type from the alternator or various electric motors and can be heard as a whining noise in loudspeaker and ear-phone.

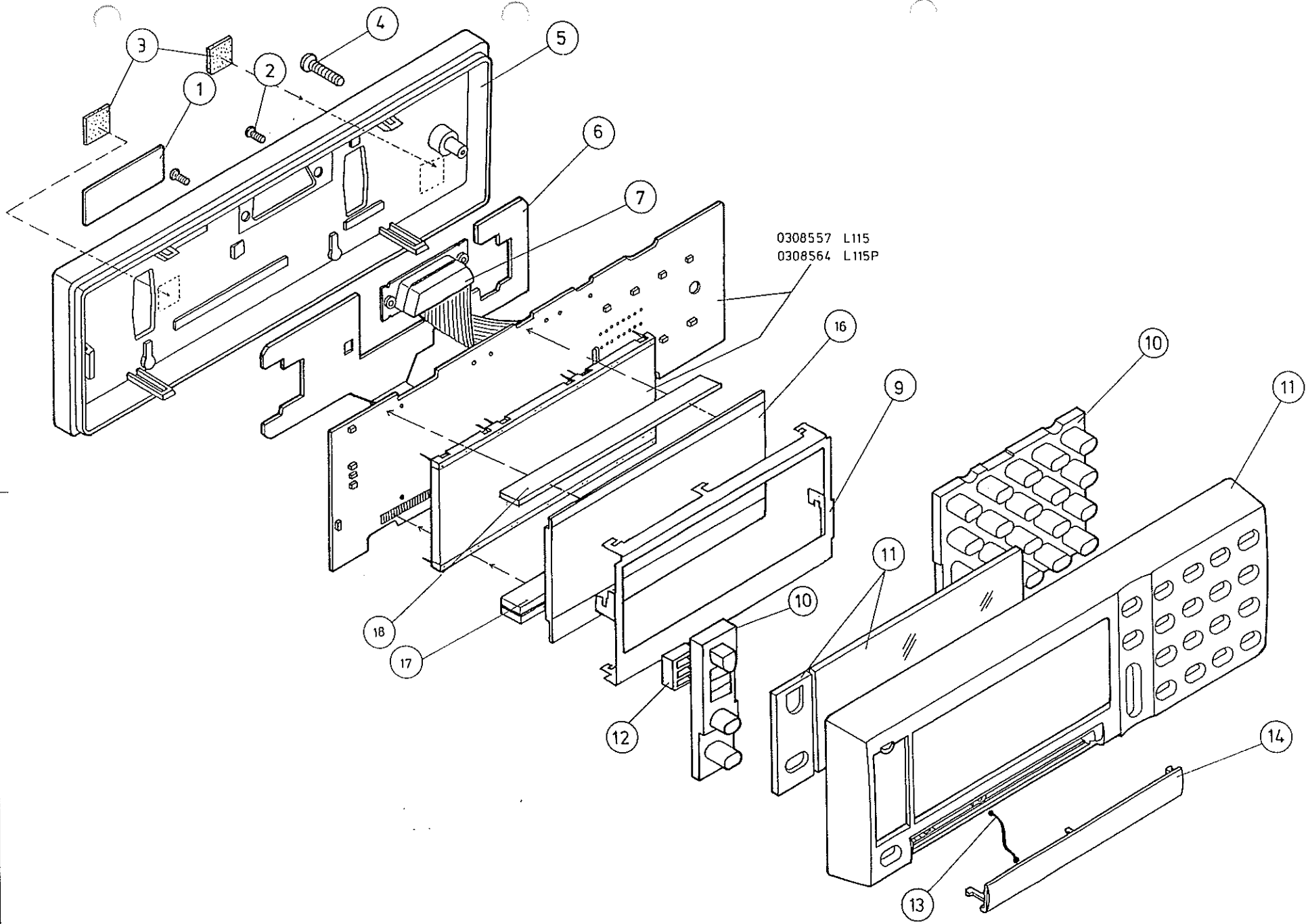
Alternator noise is often strong and broad–band type. Due to this fact alternator noise is difficult to prevent. Usually this noise is filtered from the supply voltage by a choke. Noise from electrical motors can suppressed by adding a capacitor between their ground and supply voltage.


1. 6150281
2. 9207955
3. 6153067
4. L100
5. 5434304
6. 9207948
7. 6160169
8. 9209310
9. RF-BOARD
10. 9208902
11. 6190044
12. 6153074
13. 6310369
14. 5446186
15. 9208405
16. 9208860 see 4X-7673
17. 6502239
kohta A section A
kohta B section B
kohta C section C
IC25 IC26 IC9
IC1
kohta C käännetty 180° section C turn a round 180°
NOKIA TELECOMMUNICATIONS
RD 40
RUNGON KOKOONPANO
REF. 4E 308155
2C-488

ITEM..: 0308155 RD 40 ASSEMBLY PARTS

Sqno	ID-code	Partno	Description	Value	Type	Cover	Psqty	Rec.
25	5434304	5	D-LOCKING SCREW	UN 4-40-2 A/4-4028 FEMALE	D20418-2		2.00	604
15	5446186	14	PIN HEADER	1X8-POLE -MALE	90547-0008		3.00	604
30	6150281	1	CROSS REC. SCREW	M 3X8 SFS 2976 PZ 5.8	M 3X6 5.8PZ FEZNKE		8.00	607
60	6153067	3	CROSS.REC.SCREW		MRX TT 3X6 FEZN		38.00	607
55	6153074	12	CROSS REC. SCREW	M 3X8 (TAPTITE DIN 7500 C	MRX TT 3X8 FEZN		4.00	607
35	6160169	7	CROSS REC. SCREW	M3X8 SFS 2977 PZ 5.8	M 3X8 5.8PZ FEZNKE		2.00	607
65	6190044	11	ALLEN SCREW	M 3X8 DIN 912 8.8	M 3X8 8.8 FEZNKE		2.00	607
70	6310369	13	HEX NUT	M 3 SFS 2067 5	M3 FEZNKE		2.00	607
20	6500548	EI KERÄTÄ	RF MESH STRIP	D1.6mm 170X175mm			2.00	506
85	6502239	17	RF-MESH SRIP	B-58	9105/TC/0.12EPDM		0.04	204
40	9207948	6	CHASSIS				1.00	506
45	9207955	2	COVER				2.00	506
50	9208405	15	GASKET				1.00	506
51	9208860	16					1.00	506
75	9208902	10	COVER PLUG				2.00	506
90	9209310	8	TYPE PLATE 12,7X33 mm	BLANCO PRINTER	TYYPPIKILPI 12,7X33	mm PRINTT.	2.00	506
10	DOKU	2C 308155,4X 7673	ASSOCIATED DRAWINGS				0.00	666
5	HISTORIA	A.30.03.93,PK	HISTORY				0.00	666

Structure parts.....: 18 pci



				NOKIA TELECOMMUNICATIONS	REF
				CU 43, 43 PROG	
				KÄYTTÖLAIT. KOKOONP.	
				CONTROL UNIT ASSEMBLY	
A	29993	PK			
REV.	DATE	PREPD	APPRD		

SCALE	PREPD	10.2.93
	CHKD	
	APPRD	
	ARCHVD	

20-400

2C 308571

Nokia Telecommunications BILL OF MATERIAL 21.10.93 Time: 09:16

Order	2	
Product's quantity	0,00	According structure
Option		
Items	1	Normal and work items
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Price	0	No price
Product group	0	With product group
Language	EN	English
Limits	1	Limit
Product 0308571	.0308571	

ITEM..: 0308571 ASSEMBLY PARTS CU 43

ID-code	Partno	Description	Value	Type	Cover	Psqty	Rec.
4851212	16	LCD DISPLAY	LCD FTN ALFANUM 1x20+2x24	E8259	98X44.5	1.00	204
5407116	17	ELASTIC CONNECTOR	L93W2.0H4.6mm Si	SRC-0755-05		1.00	204
5407250	18	ELASTIC CONNECTOR	0.1P L93W3.8H4.6mm Si	SRC-0755-02		1.00	204
6160169	2	CROSS REC. SCREW	M3X8 DIN 965 PZ 5.8 Fe/Zn	M3X8-5.8-PZ FEZNKE		2.00	207
6292014	4	PT-SCREW	CU58AF 2.5X16 PZ Fe/Zn	KB25X16 WN1442		1.00	407
9207874	5	B-COVER	CU 42			1.00	506
9207899	14	NAME PLATE	CU 42	9207881		1.00	506
9207909	6	LOCKING	CU 42			1.00	506
9208317	12	LED BOX	CU 42			1.00	506
9208412	13	STRING	CU 42			1.00	506
9209021	3	TAPE		B-KANNEN TARRA		2.00	506
9209180	11	A-COVER	PRINTED	9209142+9209134+9209	166	1.00	506
9209303	9	DISPLAY FRAME	CU 43			1.00	506
9209310	1	TYPE PLATE 12,7X33 mm	BLANCO PRINTER	TYYPPIKILPI 12,7X33	mm PRINTT.	1.00	506
9209670	10	KEYBOARD CU43		9207823		1.00	506
DOKU	2C 308571, 4R 7658	ASSOCIATED DRAWINGS				0.00	
HISTORIA	VERSIO A 30.09.93 PK	HISTORY				0.00	

Structure parts.....: 17 pci

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Option		
Items	1	Normal and work items
Spare parts	0	All parts
Sequencenumbers	1	No sequencenumbers
Price	0	No price
Product group	0	With product group
Language	EN	English
Limits	1	Limit
Product 0308589	.0308589	

ITEM..: 0308589 ASSEMBLY PARTS CU 43 PROG

ID-code	Partno	Description	Value	Type	Cover	Psqty	Rec.
4851212	16	LCD DISPLAY	LCD FTN ALFANUM 1x20+2x24	E8259	98X44.5	1.00	204
5407116	17	ELASTIC CONNECTOR	L93W2.0H4.6mm Si	SRC-0755-05		1.00	204
5407250	18	ELASTIC CONNECTOR	0.1P L93W3.8H4.6mm Si	SRC-0755-02		1.00	204
6160169	2	CROSS REC. SCREW	M3X8 DIN 965 PZ 5.8 Fe/Zn	M3X8-5.8-PZ FEZNKE		2.00	207
6292014	4	PT-SCREW	CU58AF 2.5X16 PZ Fe/Zn	KB25X16 WN1442		1.00	407
9207909	6	LOCKING	CU 42			1.00	506
9208317	12	LED BOX	CU 42			1.00	506
9208412	13	STRING	CU 42			1.00	506
9208606	11					1.00	506
9208613	5			9209142+9209234+9209	166+..9180	1.00	506
9208620	14					1.00	506
9209021	3	TAPE				1.00	506
9209310	1	TYPE PLATE 12,7X33 mm	BLANCO PRINTER	B-KANNEN TARRA TYYPPIKILPI 12,7X33 9207823	mm PRINTT.	2.00	506
9209670	10	KEYBOARD CU43				1.00	506
DOKU	2C 308571, 4R 7658	ASSOCIATED DRAWINGS				1.00	506
HISTORIA	VERSIO A 30.09.93 PK	HISTORY				0.00	
						0.00	

Structure parts.....: 16 pci

LOGIC SECTION

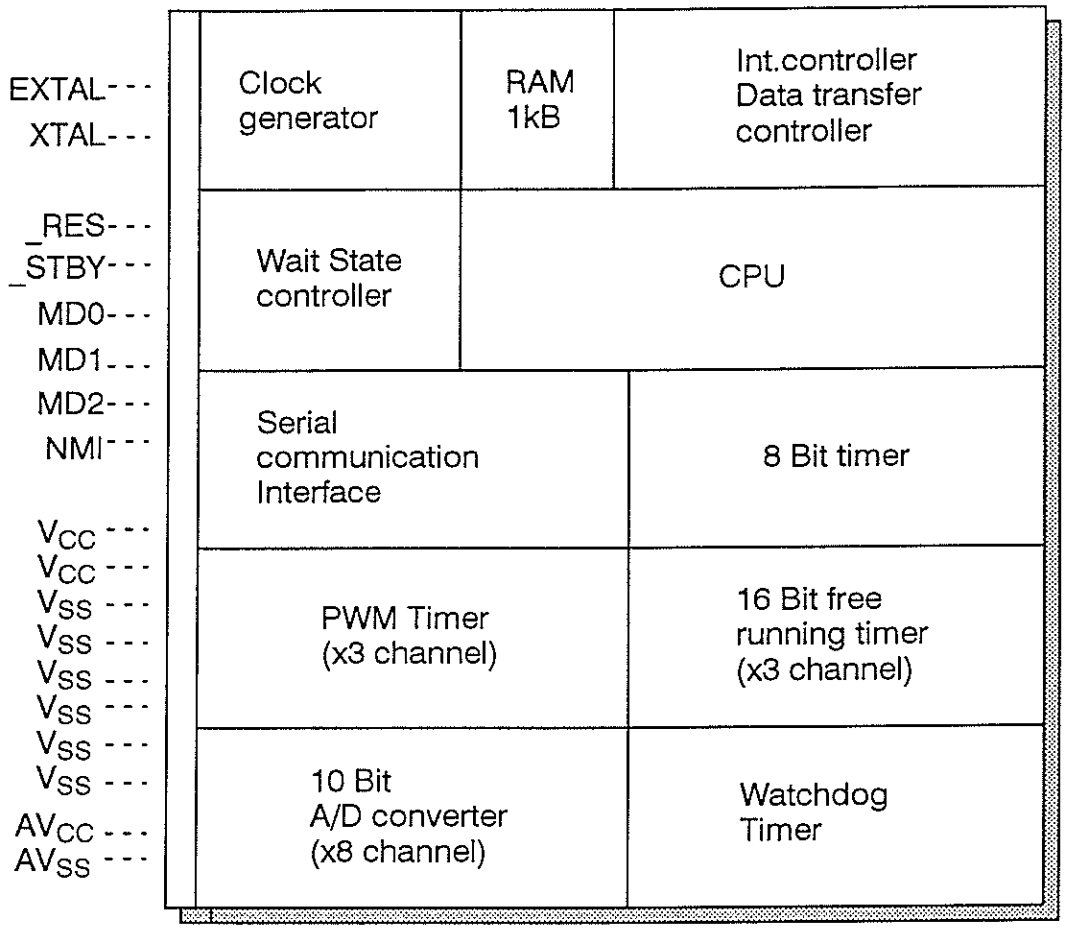
FUNCTIONAL DESCRIPTION

CONTENTS

1. PROCESSOR UNIT

The processor unit is the Hitachi H8–series microcontroller (MC). The MC controls all the functions of the audio– and radio units.

The MC includes functions as follows:



MC includes 9 I/O ports, which are software controlled. The ports are used as follows.

Port 1

0	f 8.064MHz output
1	IRQ1 acknowledge
2	SBUS CLK
3	SBUS DATA
4	CCIR DATA_IN
5	_IRQ0
6	_IRQ1
7	TM0 8–bit timer out

Port2

0	_AS Address strobe
1	R/_W Read/Write
2	_DS Data strobe
3	_RD Read
4	_WR Write

Port 3 DATA D0–D7 Ports 4–6 ADDRESS A0–A19

Port 8 A/D Converter AN0,AN1,AN4,AN5

AN2,AN3,AN6 ja AN7 are used as logical inputs

Port 7

0	TMCI 8–bit
1	SD synthesizer data
2	SRE synthesizer rx–enable
3	FTI3 capture input (PTT)
4	CLK synthesizer clk
5	TMCI2 Timer2 input
6	STE synthesizer tx–enable
7	FRT1

Port 9

0	FRT2
1	FRT3
2	NVRAM selection
3	I^2C CLK
4	I^2C DATA
5	TxD Serial Transm.
6	RxD Serial Receiver
7	SCK Serial Clock

The MC is switched to mode 3 (expanded maximum mode).

The microcontroller's clock frequency is 8.064 MHz.

2. RESET LOGIC

The RESET logic forms the RESET pulse and places the unit in the initial state.

RESET state acts in 2 cases:

- radiotelephone is turned on
- supply voltage is turned off or it decreases below the permitted value

When the power is turned on, a timeconstant forms a delay, which creates an approx. 30 ms RESET pulse.

Also, undervoltage supervision causes the RESET state, when IC14 pin 1 decreases below the thkeshold value (supply voltage VS has fallen).

The RESET state is disabled when RAM circuit is activated.This prevents loss of the data contained in the memory when the RESET state begins. RESET signal is also connected to the address decoder IC51, which disables activation of RAM when RESET is active.

2.1 WATCHDOG CONNECTION

Counter IC57 forms the watchdog connection. The counter calculates pulses, when MR–line is low. If the processor doesn't reset the counter in 4s. time by settting MR–line high, the counter output will go high position. The capacitor C367 will be charged via diode D44 and then the processor will get a RESET–pulse.

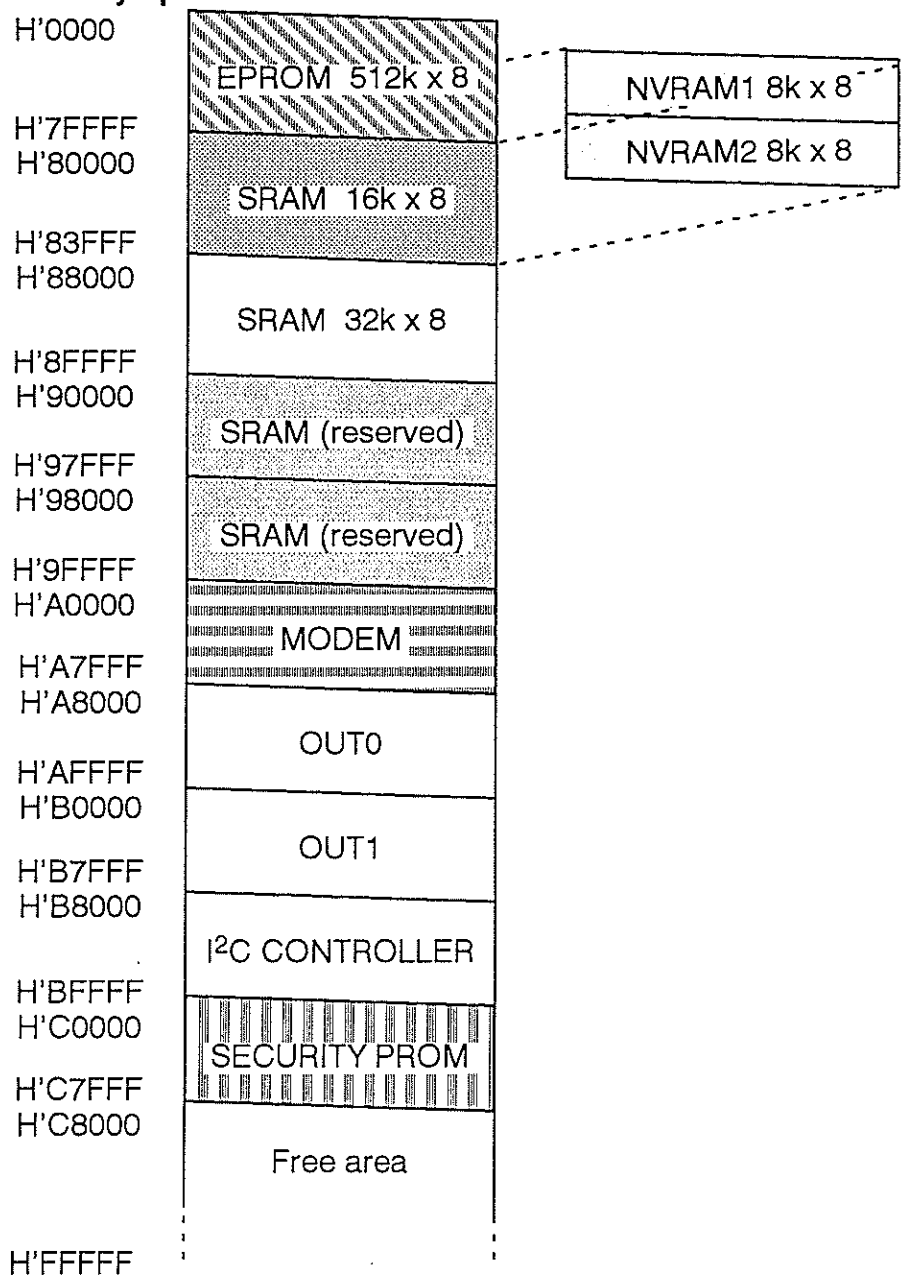
3. CLOCK GENERATOR

The MC generates an 8.064 MHz frequency, which is divided by the counter IC12.

- to 4.032 MHz, which is forwarded to MODEM IC38, SIGNALING PROCESSOR IC46 and I²C BUS CONTROLLER IC56
- to 2.106 MHz, to generate CCIR frequencies with 8 bit timer in MC
- to 504 kHz, to generate time supervising signal 3114 Hz for ARTS system with 8 bit timer, if used.
- 7875 Hz, which is timing FRT2

4. ADDRESS DECODING

Memory space is divided as follows:



MC's memory space is 1 MB and 512 k is reserved for EPROM. The other 512 k has been divided with use of the address decoder IC 51 into 32 k areas.

5. MICROCIRCUITS

5.1 EPROM

Program memory IC 53 can be either 1 MB, 2 MB or 4 MB memory circuit depending on the required memory space.

5.2 RAM/NVRAM

As data memories IC 54 and IC 55 there are two 32 kB SRAM circuits.

The data memory is split into RAM and NVRAM.

5.3 OUT 0

OUT 0 port IC 49 is an 8–bit binary output port from the MC. The following control signals are obtained from the port:

D0 : D/A CS D/A converter chip select
D1 : RTC CS real time clock chip select
D2 : CCIR CS audio processor chip select
D3 : RAM PAGE NVRAM page selection
D4 : nc
D5 : nc
D6 : nc
D7 : nc

5.4 OUT 1

OUT 1 port IC 50 is the same type as above. The following control signals are obtained from the port:

D0 : TXON Transmitter ON/OFF control
D1 : SR0 CS Shift register chip select
D2 : SR1 CS Shift register chip select
D3 : SR2 CS Shift register chip select
D4 : CTS Clear to Send RS–232
D5 : DSR Data Set Ready RS–232
D6 : nc
D7 : nc

5.5 FFSK MODEM

FFSK modem IC38 receives and transmits a 1200/1800 Hz phase–continuous FFSK signal. It is full duplex at 1200 baud rate and includes 8–bit parallel MC interface.
The modem's clock frequency is 4.032 MHz.

5.6 SECURITY CODE PROM

The SECURITY CODE PROM circuit IC35 is a 256x4 bibolar prom in which there is a security code to protect against unauthorised use of mobile.

5.7 I²C BUS CONTROLLER

I²C BUS CONTROLLER IC56 controls all data transfer between the logic unit and the control unit. The bus controller is connected directly to the data bus and it changes the parallel data transmission to serial data transmission.

Transmission speed is 37 kHz and it is bidirectional.

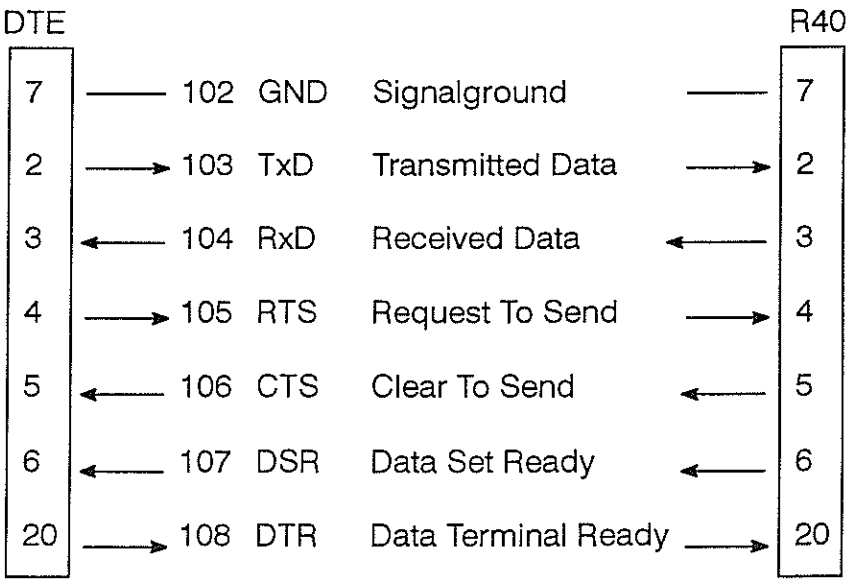
5.8 CLOCK/CALENDAR

The timekeeper chip IC46 contains a real time clock/calendar. It communicates with a MC via a serial interface.

The crystal frequency for the rtc is 32.768 kHz.

5.9 V.24 DATA INTERFACE

V.24 data interface uses the MC's serial communication interface and handshake lines. The interface lines are shown below:



IC47 and IC48 are RS–232 line drivers that combine three drivers and receivers which fulfill the electrical specification of CCITT V.28 while operating from a single +5 V power supply.

5.10 SIGNALLING PROCESSOR

The audio SIGNALLING PROCESSOR IC46 (option) provides an inband tone signalling facility for PMR radio systems.

It includes CCIR–transmitting/receiving and DTMF transfer functions.

It communicates with MC via a serial interface.

Processors clock frequency is 4.032 MHz.

5.11 D/A CONVERTER

D/A CONVERTER IC44 is 4x6–bit converter with serial interface to provide communication with MC.

Via the converter the MC controls receiver's frequency and power of transmitter.

6. ON/OFF UNIT

The supply voltage to the radio can be switched on by two ways.

- Either by car's ignition key or control unit's power switch.
- Power off is generated by pushing the power switch again.

7. INTERRUPT UNIT

The MC can use three external interrupt lines, NMI (edge sensed), IRQ0 (level sensed) and IRQ1 (edge sensed), and six internal interrupt lines.

Interrupt's which are connected to IRQ0 are:

– keyboard (I^2C)

Interrupt's which are connected to IRQ1 are:

– modem

– signalling processor

The PTT interrupt is connected to the FRT3 input capture line.

The I^2C–driver interrupt is connected to the FRT2 input capture line.

8. RF–UNIT INTERFACES

8.1 SYNTHESIZER INTERFACE

Connector SP:

1 MOD	modulated AF signal
2 SRE	synthesizer receiver enable
3 +18V	
4 VF_S	+12 V
5 STE	synthesizer transmitter enable
6 CLK	synthesizer transmitter clock
7 SD	synthesizer data
8 TX_OFF	synthesizer locked acknowledge

8.2 TRANSMITTER INTERFACE

Connector TP:

1 TX_TEMP	transmitter temperature control
2 FPC	forward power control
3 8V	
4 DC	DC voltage from transmitter
5 VFT_S	switched 12V to transmitter
6 VFT	
7 VFT	filtered 12V to transmitter
8 VFT	

8.3 RECEIVER INTERFACE

Connector RP:

1 nc	
2 nc	
3 0V tx	0 V when tx_on
4 VFT_S	12 V when tx_on
5 RFC	receiver frequency control
6 RSSI	radio signal strength information
7 SQ	squelch signal
8 AF	audio frequency

9. TIMER'S

FRT1	for operating system (used internally)
FRT2	for software (used internally)
FRT3	not used
TMO	confidence tones for operator and ARTS–timesupervising signal

AUDIO LOGIC –UNIT

FUNCTIONAL DESCRIPTION

CONTENTS

GENERAL

The audio unit consists of the low frequency stages of the transmitter and the receiver. Transmitter's low frequency stages consist of pre–emphasis, an automatic gain control (AGC), a limiter and a low pass filter for the microphone signal and a correction attenuator for deviation. The transmitter's low frequency stages include also adjustment of deviation. The audio block includes CCIR signaling, signal tones for the user's interface and adjustment for the FFSK signaling deviation. The low frequency stages of the receiver consist of an amplifier, whose gain depends on the channel spacing, a low pass filter, an audio delay line, a de–emphasis, a limiter, a volume control and a power bridge amplifier. The audio block is controlled via shift registers by the processor unit.

The audio unit includes also power supply parts. Power supply filters are on the audio sheet. A power supply switch, voltage regulators and a memory back–up battery are in the RF_IO sheet. The logic parts, the audio parts and the RF_IO parts are on the same board.

CONNECTORS

External connectors CU (D15S) and RU (D44S):

CU (control unit)

1 I^2C_SCL : serial clock (I^2C–bus)
2 I^2C_SDA : serial data (I^2C–bus)
3 I^2C–INT : interrupt (I^2C–bus)
4 VF_S : supply voltage (after switching)
5 HOOK : hook switch
6 GND_ANALOG : analog ground
7 MIC : amplified microphone signal
8 HS_MIC : microphone signal to the control unit
9 PTT : push to talk –line (PTT)
10 ON_OFF : power on/off –line
11 GND_DIGIT : digital ground
12 LSP : loudspeaker
13 HF_PTT : hands free PTT
14 GND_ANALOG : analog ground
15 HF_MIC : hands free microphone to the control unit
16 NC : no connection

RU (radio unit)

1 EMERG_PTT : emergency PTT
2 TX_QDATA : transmitted quick data
3 RX_QDATA : received quick data
4 VF_S : supply voltage (after switch)
5 MIC : amplified microphone signal
6 EAR : earphone
7 LSP : DC isolated loudspeaker
8 LSP_B1 : bridge connected loudspeaker (+)
9 LSP_B2 : " " " (–)
10 LSP_B2 : " " " (–)
11 LSP_B1 : " " " (+)

12 HOOK : hook switch
13 RS_RXD : received data (RS232)
14 RS_TXD : transmitted data (RS232)
15 RS_RTS : request to send (RS232)
16 GND : supply voltage ground
17 GND : " " "
18 +12V : supply voltage (nom. 13.6 V)
19 +12V : " "
20 HS_MIC : handset microphone input
21 GND_ANALOG : analog ground
22 PTT : PTT
23 GND_DIGIT : digital ground
24 CRM : car radio mute
25 IGN : ignition sensor
26 I2C_SCL : serial clock of the for I^2C–bus
27 ON_OFF : power on/off information
28 RS_DSR : data set ready (RS232)
29 RS_CTS : clear to send (RS232)
30 –
31 GND : supply voltage ground
32 GND : " " "
33 +12V : supply voltage (nom. 13.6 V)
34 +12V : " "
35 HF_MIC : hands free microphone input
36 GND_ANALOG : analog ground
37 HF_PTT : PTT for hands free microphone
38 GND_DIGIT : digital ground
39 ALARM : control of external alarm
40 I2C_SDA : serial data for I^2C–bus
41 I2C_INT : interrupt for I^2C–bus
42 –
43 RS_DTR : data terminal ready (RS232)
44 –

CU_FILTERS and RU_FILTERS are blocks which include T–filters for the connectors CU and RU.

Internal connectors FE1 and FE2

FE1 (future equipment)

1 Tx_FE_IN : microphone signal in
2 Tx_FE_OUT : audio signal out
3 GND_ANALOG : analog ground
4 +8V : regulated 8V
5 GND_DIGIT : digital ground
6 I^2C_INT : interrupt for I^2C–bus
7 I^2C_SCL : serial clock "
8 I^2C_SDA : serial data "

FE2 (future equipment)

1 Rx_FE_IN : received signal in
2 Rx_FE_OUT : signal out
3 GND_ANALOG : analog ground

AUDIO UNIT CONTROL SIGNALS

Control signals to different analog switches and adjustments of the audio unit are obtained from shift registers IC39, IC40 and IC41. The shift register is selected with a parallel bus IO_CS(2:0). SBUS(1:0) is a data bus, where bit 0 is clock and bit 1 is a data input. The shift registers and different control signals are as follows:

IC39 (netname SWITCH2(0:7))

bit	control	
0	MICMUTE	microphone muting
1	AFMUTE	Rx audio path muting
2	OFF	power off
3	CHA_SPA_SEL	select gain for channel spacing
4	CRMC	car radio muting
5	ALARMC	external alarm
6	Tx_QDATA_C	send quick data
7	Rx_QDATA_C	receive quick data

IC40 (netname AFCONT(0:7))

bit	control	
0–2	not used	
3	PWRAMP	control of power amplifiers
4–6		volume control of the Rx audio signal
7		chipselect for Rx volume adjustment

IC41 (netnames DEV(0:3) and SWITCH1(4:7))

bit	control	
0–3		control of deviation attenuation
4	PEAKDEV_C	control of peak deviation
5	FII_C	Fii–signal to the Tx path
6	–	no connection
7	SIGN_LSP	confidence tones to the LSP

LOW FREQUENCY STAGES OF THE TRANSMITTER

The amplified microphone signal (MIC) is brought to the capacitor C230. Pre–emphasis is made with capacitor C230 and the resistor R303.

Operational amplifiers IC18, IC19 and transistors Q22, Q24 and Q21 form an automatic gain control (AGC). The AGC adjusts the signal level to the proper value. The nominal deviation is adjusted with trimmer R415. The AGC works also as a band pass filter. IC22/2 forms an comparator, which controls peak deviation attenuator IC22/1 via Q36.

The diode D33 forms a deviation limiter by cutting the signal peaks. The maximum deviation is adjusted with trimmer R414. The signal can be muted with transistor Q25.

The operational amplifier IC20/2 forms a summing amplifier, where different transmitter signals are connected to the 6:th order low pass filter. The filter is formed with IC20/1, IC21/1 and IC21/2. The optional pre–emphasis of the FFSK signals is made by changing the capacitor C308 to 1nF and the resistor R275 to 33.2kΩ. Deviation of the FFSK signals is adjusted with trimmer R416. The FFSK signals are fed from the processor block via the FFSKOUT line. This adjustment effects deviation of all transmitted signals. The capacitor C342, resistor R470 and trimmer R434 form a high pass filter, which attenuates lower frequencies.

The analog switches IC27 form a correction attenuator for deviation. It corrects deviation to the same value in all channels.

All transmitter signals are fed to the modulator through the MOD line.

The DTMF signals and the CCIR signals are formed by IC46 which is on the processor unit. The signals are fed to the audio unit via DTMF_FX803 line. IC46 is a optional part.

SIGN is the clock line which determines the frequencies of confidence tones and the Fii signal. The Fii signal can be fed to the summing amplifier and there after to the modulator via analog switch IC30. The confidence tones as well as the Fii and the CCIR and DTMF signals can be fed to the earphone and loudspeaker bath.

LOW FREQUENCY STAGES OF THE RECEIVER

The detected audio signal (AF) is brought to the operational amplifier IC23/2, which amplifies the signal. Amplification depends on the channel spacing used. The next operational amplifier IC23/1 acts as a low pass filter. The received FFSK signal is separated to the modem from the output of IC23/1. The optional de–emphasis of the FFSK signals is made by changing the resistor R257 to 4.75kΩ and the resistor R260 to 10 nF capacitor. The FFSK signals are fed to the modem via the FFSKIN line.

IC36 is an audio delay circuit and IC37 is a clock circuit for IC36. The audio signal is delayed 30 ms, so that the audio path can be muted before the FFSK or the CCIR signals have arrived at the audio mute switch IC28. The next operational amplifier IC24/1 acts also as a low pass filter. It filters noice, which is caused by the delay circuit.

The operational amplifier IC24/2 forms de–emphasis for the CCIR and speech signals. The CCIR signals are separated to the decoder from the output of this IC. CCIR signals are fed to the decoder via the CCIR_IN line.

The earphone signal is taken from the output of the analog switch IC28.

The loudspeaker signal volume control is carried out with an analog multiplexer IC34. The audio signal is taken from different inputs, which determine how much the signal is attenuated. The signal can also be muted.

IC25 and IC26 are power amplifiers. They form a bridge amplifier. The loudspeaker can be connected between LSP_B1 and LSP_B2 lines or between LSP and ground. When the latter connection is used, the output power is 1/4 of the first. The bridge amplifier can be muted with the P–MOSFET Q27 and the transistor Q26.

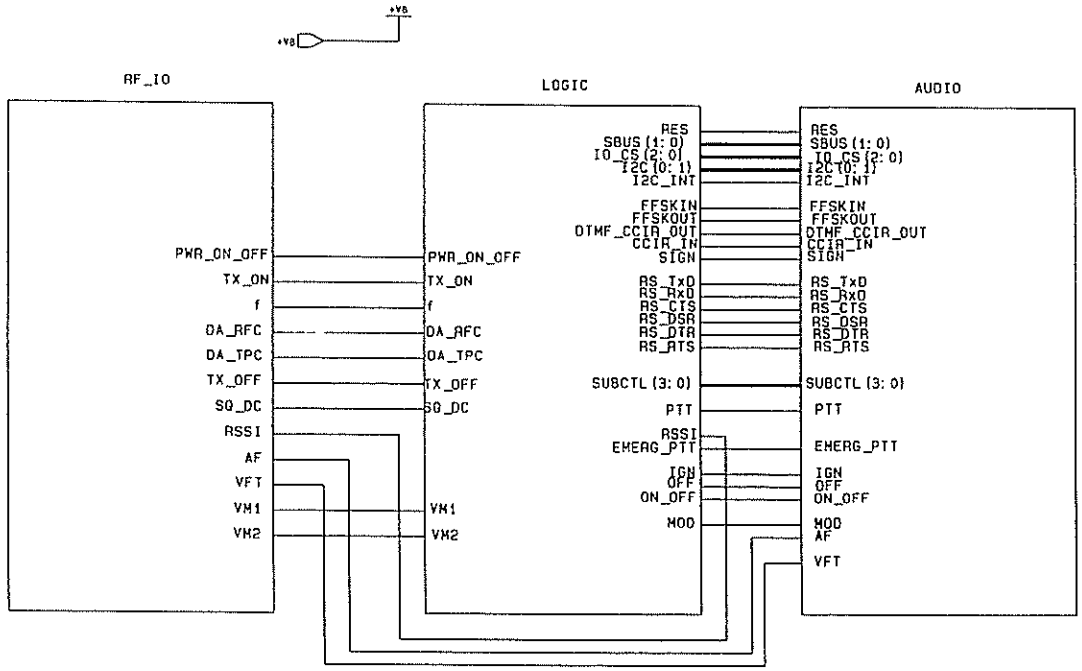
POWER SUPPLY

Power supply's schema is in the audio sheet and in the rf_io sheet. The following voltages are obtained from the power supply:

VF	Filtered voltage before the supply voltage switch Q3 (10.8 – 15.6 V DC, 13.2 V DC nominal voltage).
VFT	Filtered supply voltage for the transmitter.
VF_S	Filtered voltage after the supply switch.
+8V	Regulated supply voltage for the audio section.
+5V	Regulated voltage for the processor section.
+5VF	Regulated and filtered voltage for the audio section.
VM1	Supply voltage for ON/OFF logic.
VM2	Supply voltage for RAM memory.

When the R40 is off, VM2 is regulatedwith zener diode D6 and when the R40 is on, VM2 is generated from the regulated +5V. If external power supply is not connected to the system cable, VM2 is supplied from battery G1.

The ON/OFF logic controls the P–MOSFET Q3 via the transistor Q6. The P–MOSFET work s as a supply voltage switch.



Rev.	Date	Prepd	Appr
4.0	21.6.95	KIIOS/TL	
3.0	4.4.95		
1.8	31.1.95	KIIOS/TL	

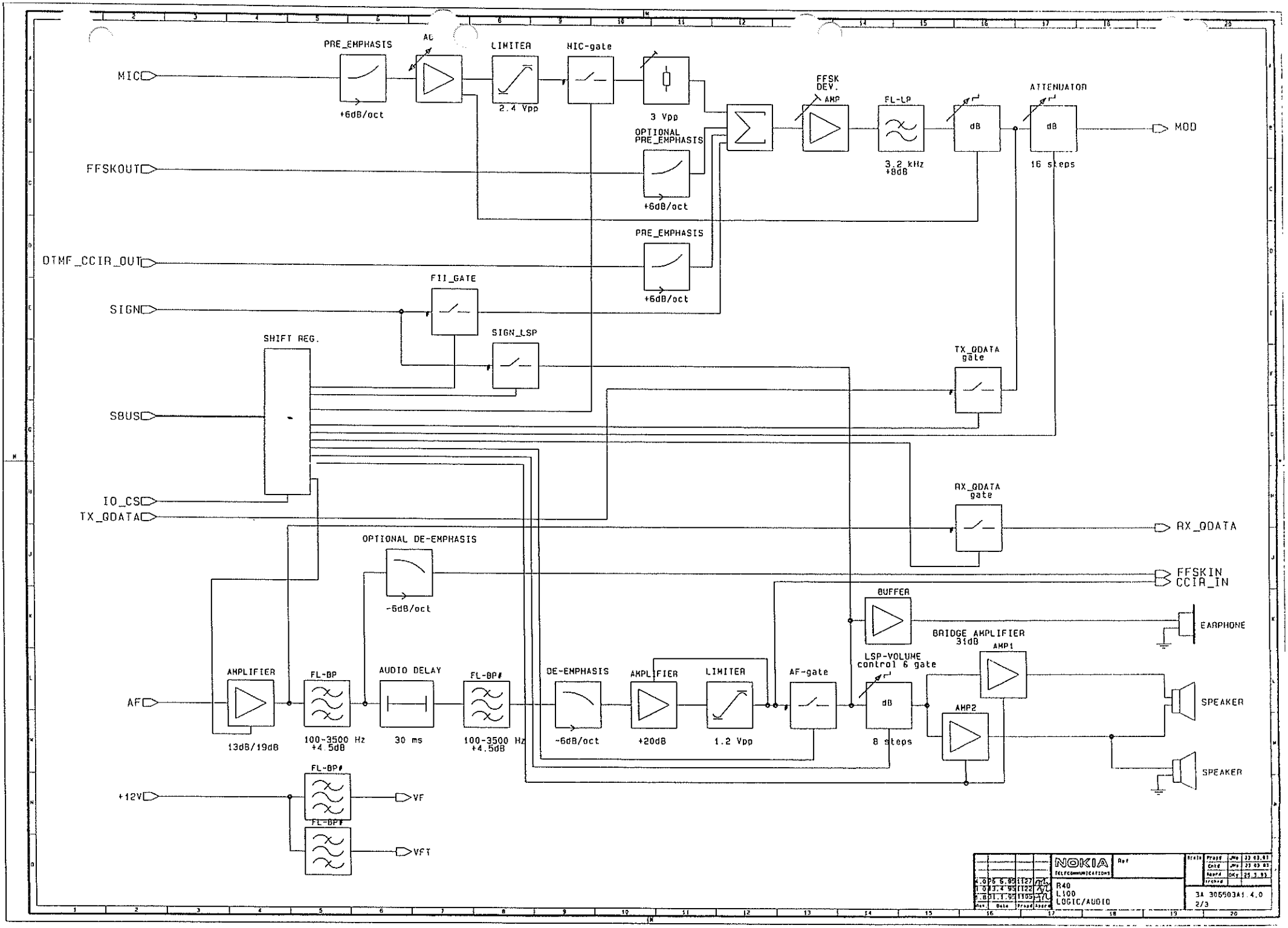
NOKIA TELECOMMUNICATIONS

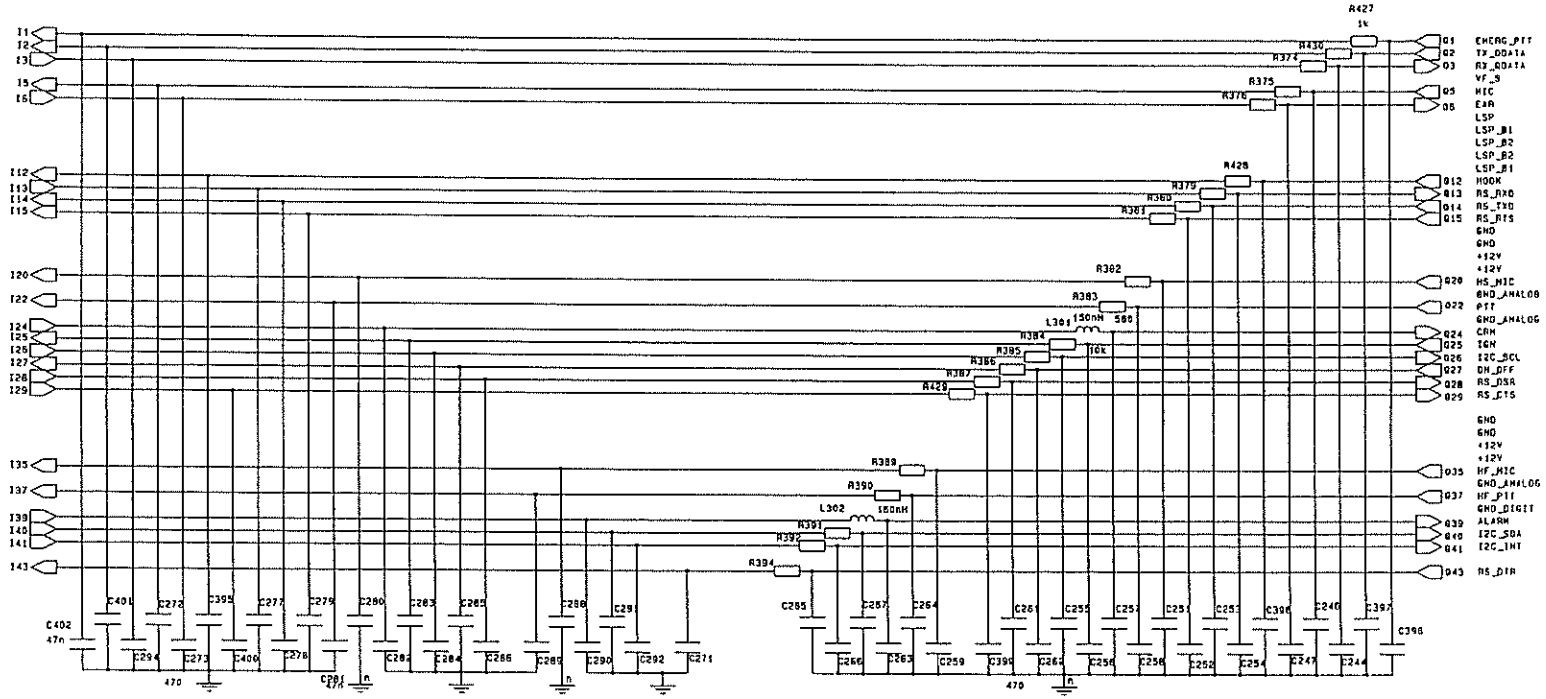
Ref

RAM
L100

Drawn	Jmp	22.02.93
Chkd	Jmp	22.02.93
Appvd	DKS	25.03.93
Archvd		

3H 30650341 4.0


MIC
PRE_EMPHASIS
+6dB/oct
AG
LIMITER
2.4 Vpp
MIC-gate
3 Vpp
OPTIONAL PRE_EMPHASIS
+6dB/oct
FFSKOUT
FFSK DEV.
AMP
FL-LP
3.2 kHz +8dB
dB
ATTENUATOR
dB
16 steps
MOD
PRE_EMPHASIS
+6dB/oct
DTMF_CCIR_OUT
FII_GATE
SIGN
SIGN_LSP
SHIFT REG.
TX_QDATA gate
SBUS
IO_CS
TX_QDATA
RX_QDATA gate
RX_QDATA
OPTIONAL DE-EMPHASIS
-6dB/oct
FFSKIN
CCIA_IN
BUFFER
EARPHONE
BRIDGE AMPLIFIER 31dB
AMP1
LSP-VOLUME control & gate
AMP2
SPEAKER
SPEAKER
AF
AMPLIFIER
13dB/19dB
FL-BP
100-3500 Hz +4.5dB
AUDIO DELAY
30 ms
FL-BP#
100-3500 Hz +4.5dB
DE-EMPHASIS
-6dB/oct
AMPLIFIER
+20dB
LIMITER
1.2 Vpp
AF-gate
dB
8 steps
+12V
FL-BP#
VF
FL-BP#
VFT
NOKIA
TELECOMMUNICATIONS
R40
L100
LOGIC/AUDIO
3A 305503A1.4.0
2/3



ALL CAPACITORS ARE 470 pF, EXCEPT C283, C281 AND C402 ARE 47 nF

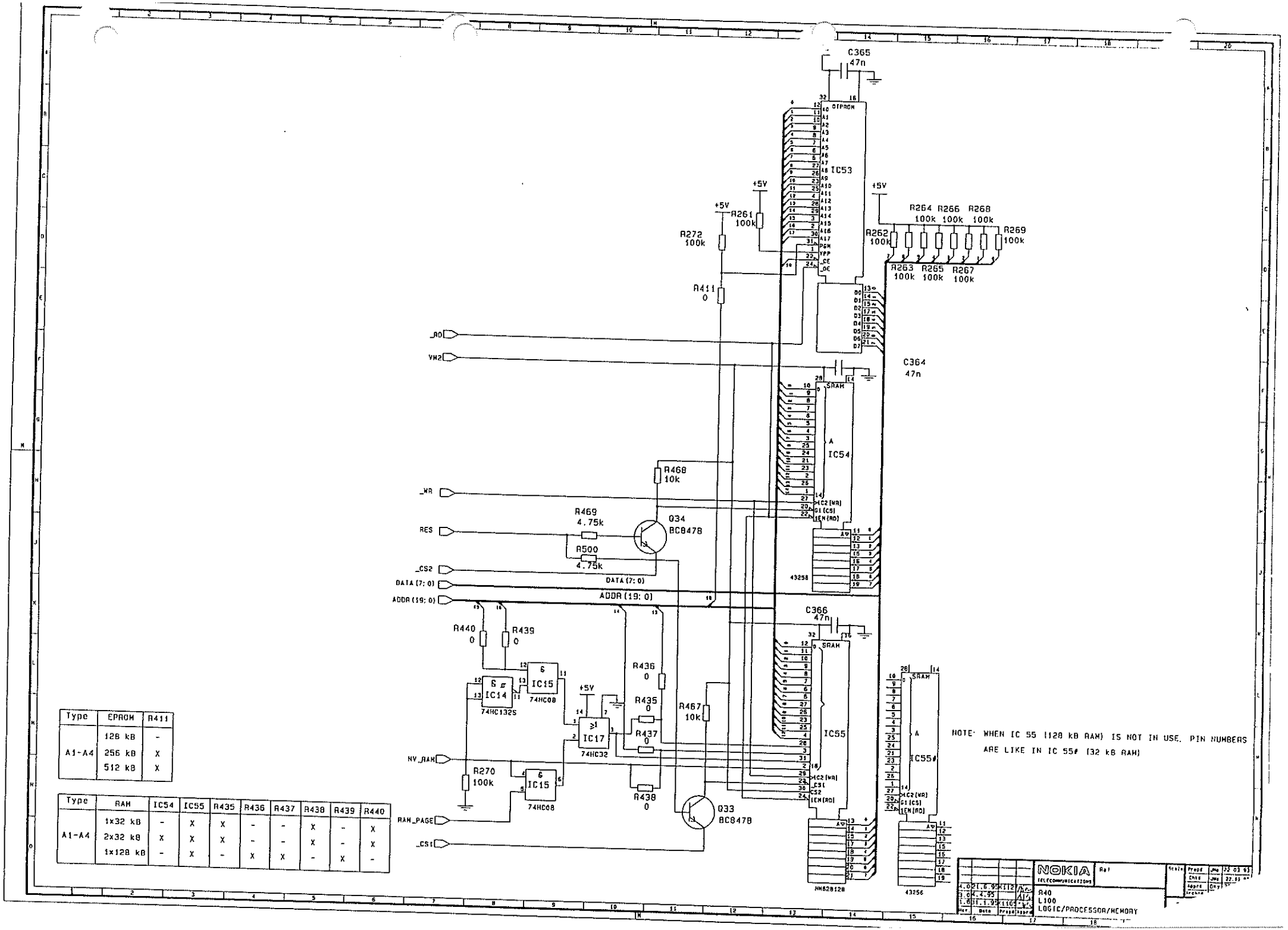
ALL RESISTORS ARE 100 OHM, EXCEPT R384 10 k, R383 560 ohm AND R427 1 k.

					NOKIA TELECOMMUNICATIONS	Ref	
1.0	21.6.95	M1122	/ik		R40		
1.0	1.6.95		/ik		L100		
1.0	31.3.95	M1105	/ik		LOGIC/AUDIO/RU_FILTERS		
Rev	Date		Prep'd	Appr'd			

Scale	Prep'd	Mp 22.02.93
	Chkd	JPO 22 02 93
	Appr'd	OKy 22. 3 93
	Archive	

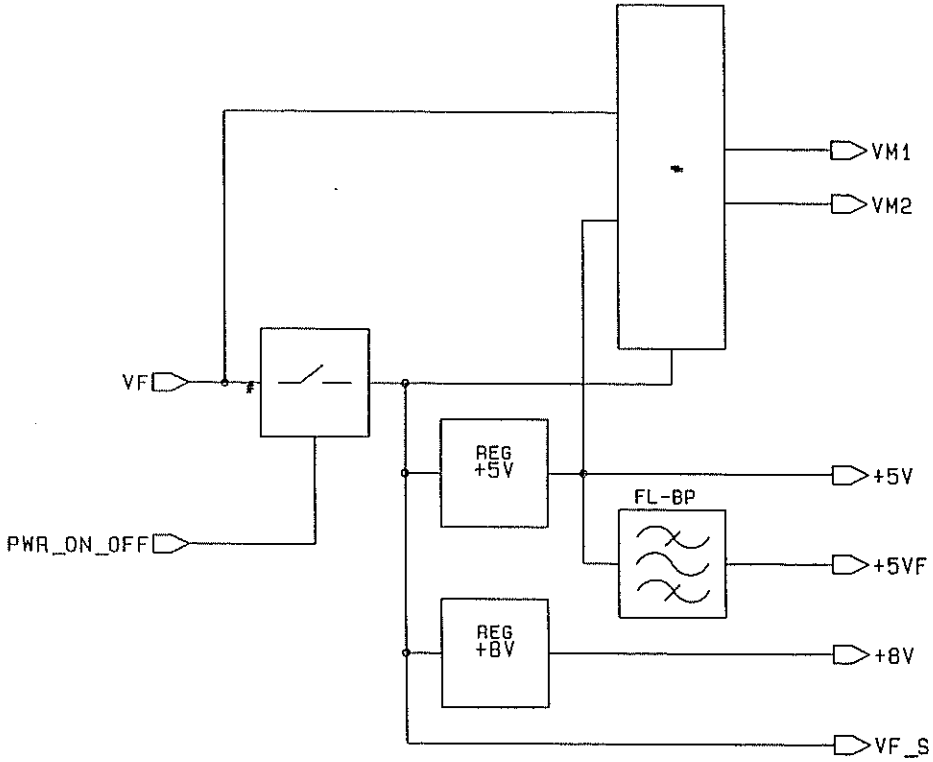
38 306503A1.4.0

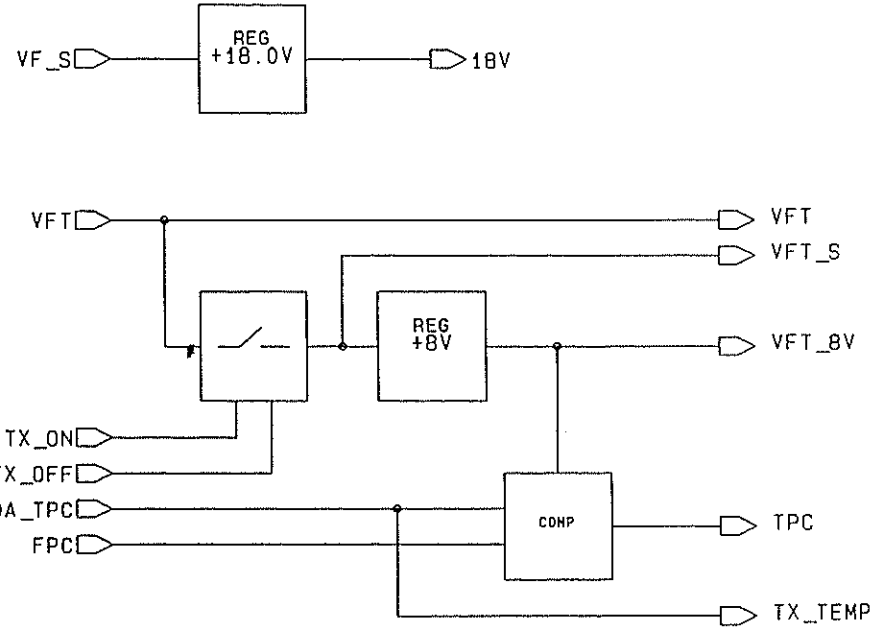
5/6

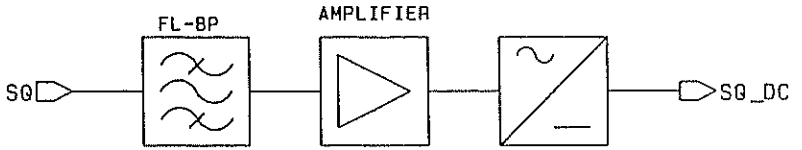


Type	EPROM	R411
A1-A4	128 kB	-
	256 kB	X
	512 kB	X

Type	RAM	IC54	IC55	R435	R436	R437	R438	R439	R440
A1-A4	1x32 kB	-	X	X	-	-	X	-	X
	2x32 kB	X	X	X	-	-	X	-	X
	1x128 kB	-	X	-	X	X	-	X	-







Rev.	Date	Prepd	Apprd
4.0	26.6.95	1127	
3.0	13.4.95	1122	
1.0	31.1.95	1105	

NOKIA TELECOMMUNICATIONS

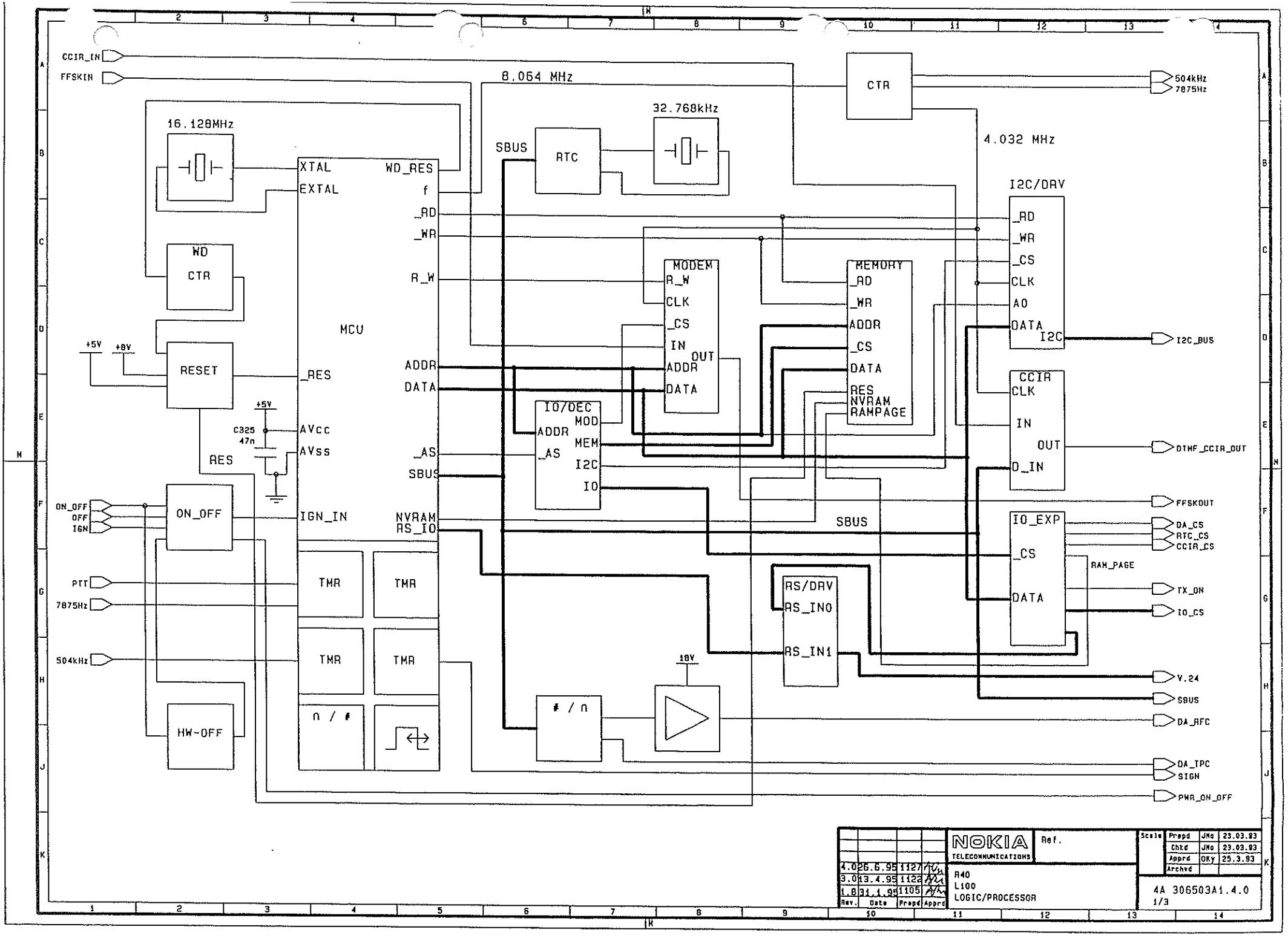
Ref.

R40
L100
LOGIC/RF_IO

Scale

Prepd	JNo	23.03.93
Chkd	JNo	23.03.93
Apprd	OKy	25.3.93
Archvd		

4A 306503A1.4.0
3/3



Rev.	Date	Prepd	Apprd
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3.0	13.4.95	1122	
1.B	31.1.95	1105	

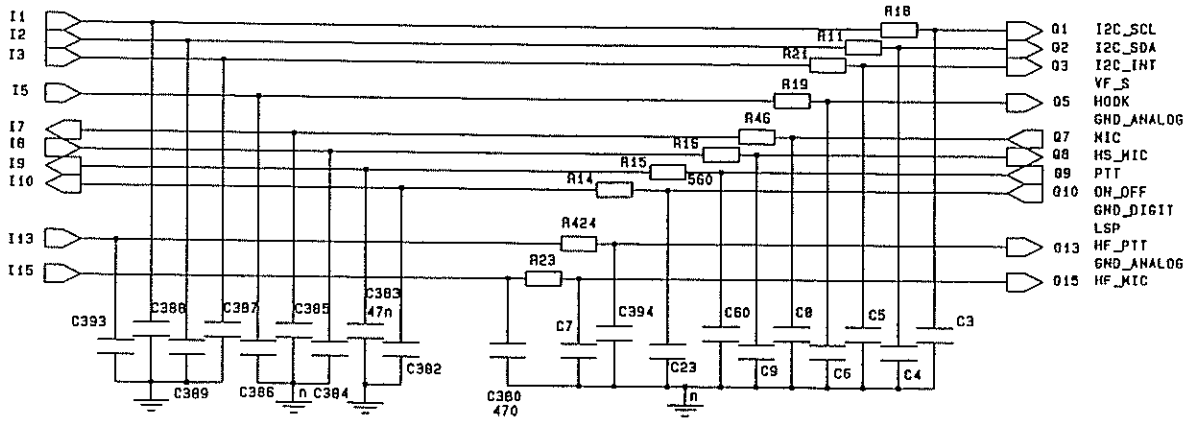
NOKIA TELECOMMUNICATIONS

Ref.

Scale			
	Prepd	JMa	23.03.93
	Chkd	JMa	23.03.93
	Apprd	OKy	25.3.93
	Archvd		

R40
L100
LOGIC/PROCESSOR

4A 306503A1.4.0
1/3



ALL CAPACITORS ARE 470 pF, EXCEPT C383 47 nF

ALL RESISTORS ARE 100 ohm, EXCEPT R15 560 ohm.

Rev.	Date	Prepd	Apprd
4.0	21.6.95	K1127	
3.0	4.4.95		
1.0	31.1.95	K1105	

NOKIA TELECOMMUNICATIONS

Ref.

R40
L100
LOGIC/AUDIO/CU_FILTERS

Scale			
	Prepd	JNo	22.03.93
	Chkd	JNo	22.03.93
	Apprd	OKy	23.3.93
	Archvd		

4B 306503A1.4.0
4/6

Type	IC 38
L100 A1, A3, A4	FX429LS
L100 A2	FX529LS

Type	IC35	IC46	IC16	IC43
A1	-	-	-	-
A2	-	-	-	-
A3	X	X	-	-
A4	X	-	-	-

Note: Pin numbers on uC are for PLCC 84 package, if uC is in QFP 80 package see table 4M 306503.

NOTE * : R522 NOT IN USE

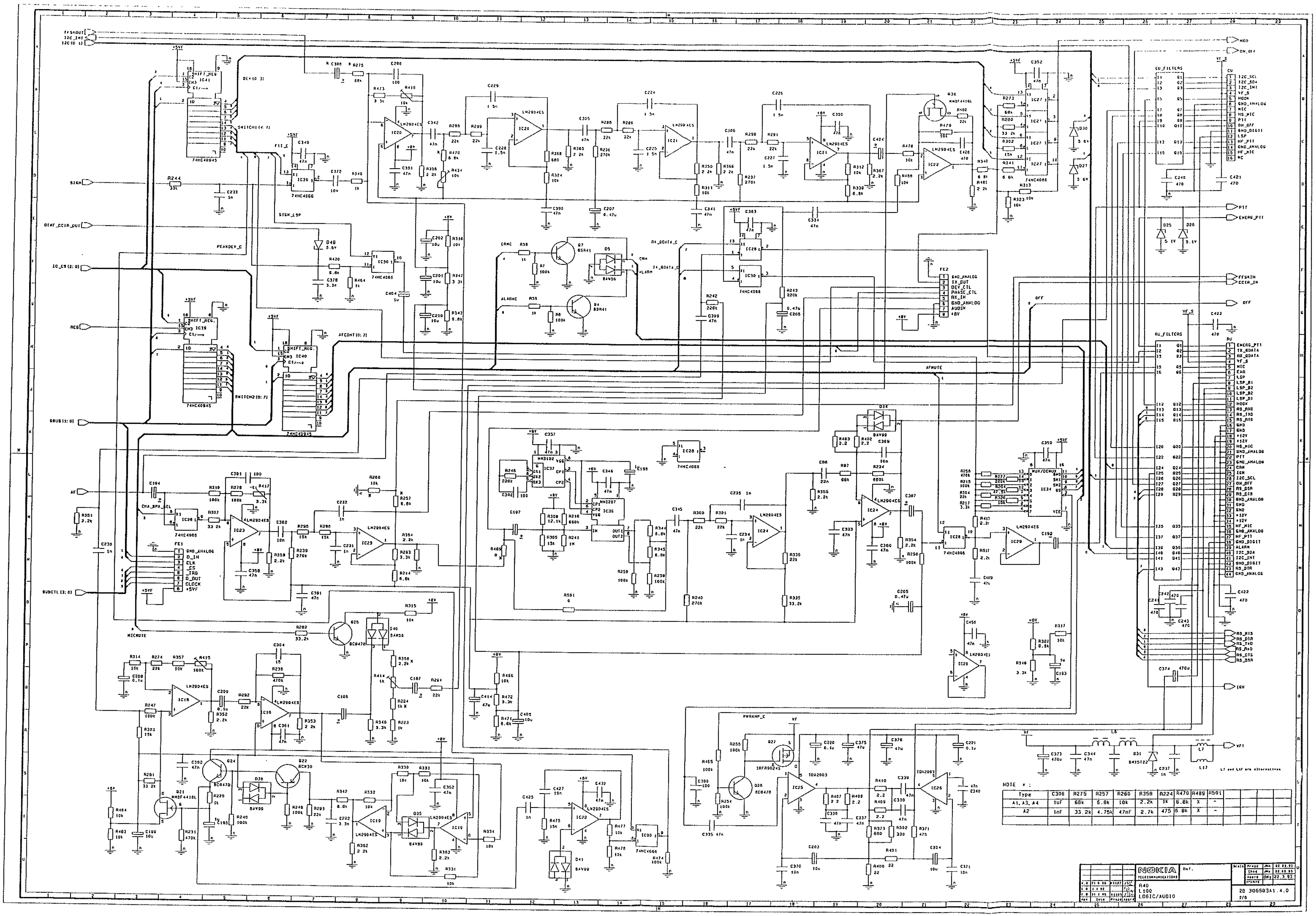
NOTE ** : IC43, X3, C317, C447, C448 ARE USED ONLY IN OPTION RIC 4670935

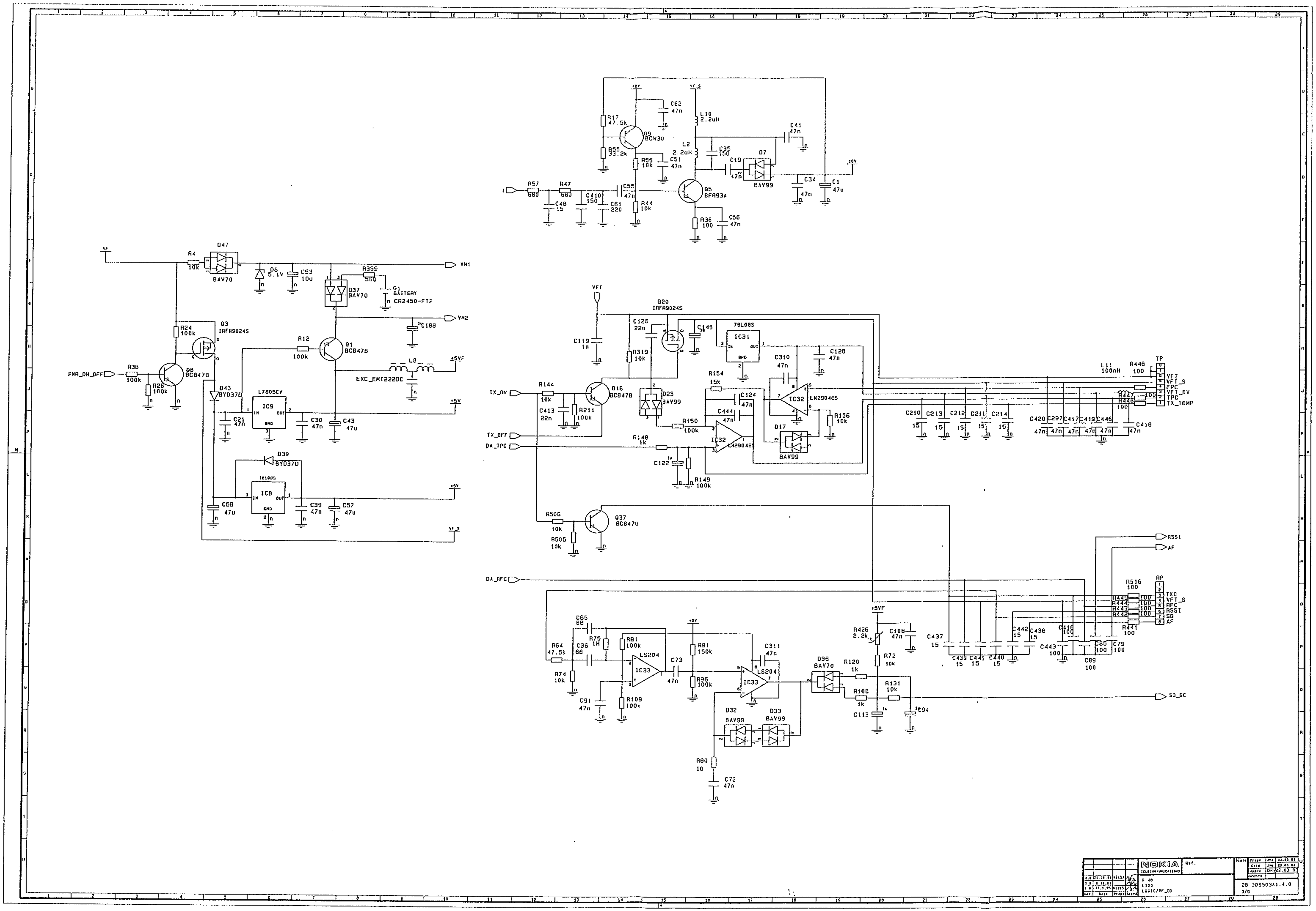
				NOKIA TELECOMMUNICATIONS	Ref
4	0	21.6.95	KIIZ	R 40	
3	0	4.7.95	SZL	L100	
1	0	31.1.95	KIIZ	LOGIC/PROCESSOR	
Nro	Date	Prepared			

Scale	Drawn	JMA	22.03.93
	Chkd	JMA	22.03.93
	Appvd	OKV	25.03.93

2B 306503A1.4.0

1/6


NOTE # :
Type	C308	R275	R257	R260	R358	R224	R470	R489	R501
A1, A3, A4	1uF	68k	6.8k	10k	2.2k	1k	6.8k	X	-
A2	1nF	33.2k	4.75k	47nF	2.7k	475	6.8k	X	-
NOKIA
TELECOMMUNICATIONS
Ref.
R40
L100
LOGIC/AUDIO
2B 306S03A1.4.0
2/6
Scale
Prepd
Chkd
Apprd
OKy 22.3 93
Date


VF
R4
10k
D47
BAV70
D6
5.1V
C53
10u
R369
560
D37
BAV70
G1
BATTERY
CR2450-FT2
VH1
VH2
C188
R24
100k
Q3
IRFR9024S
R12
100k
Q1
BC847B
L8
EXC_EMT222DC
+5VF
PWR_ON_OFF
R36
100k
R26
100k
Q6
BC847B
D43
BYD37D
L7805CV
IC9
C21
47n
C30
47n
C43
47u
+5V
D39
BYD37D
78L08S
IC8
C58
47u
C39
47n
C57
47u
+8V
VF_S
R17
47.5k
Q9
BCW30
R55
33.2k
R56
10k
C62
47n
C51
47n
L10
2.2uH
L2
2.2uH
C35
150
C41
47n
C19
47n
D7
BAV99
C34
47n
C1
47u
R57
680
R47
680
C48
15
C410
150
C61
220
C55
47n
R44
10k
Q5
BFR93A
R36
100
C56
47n
VFT
Q20
IRFR9024S
C126
22n
C146
78L08S
IC31
C119
1n
R319
10k
C310
47n
C128
47n
TX_ON
R144
10k
C413
22n
R211
100k
Q18
BC847B
D23
BAV99
R154
15k
C124
47n
C444
47n
IC32
LM2904ES
R156
10k
R150
100k
D17
BAV99
TX_OFF
DA_TPC
R148
1k
C122
R149
100k
R506
10k
R505
10k
Q37
BC847B
L11
100nH
R446
100
TP
VFT
VFT_S
FPC
VFT_8V
TPC
TX_TEMP
R447
R448
100
C210
C213
C212
C211
C214
15
C420
C297
C417
C419
C446
C418
47n
RSSI
AF
DA_RFC
R516
100
RP
TXO
VFT_S
AFC
RSSI
SQ
AF
R445
R444
R443
R442
R441
100
C65
68
C36
68
R75
1M
R64
47.5k
R74
10k
R81
100k
LS204
IC33
C91
47n
R109
100k
C73
47n
R91
150k
R96
100k
C311
47n
D32
BAV99
D33
BAV99
R80
10
C72
47n
D38
BAV70
R120
1k
R108
1k
R426
2.2k
C106
47n
R72
10k
R131
10k
C113
C94
SQ_DC
C437
15
C439
15
C441
15
C440
15
C442
15
C438
15
C416
100
C443
100
C85
100
C79
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C89
100
NOKIA
TELECOMMUNICATIONS
Ref.
R 40
L100
LOGIC/RF_IO
28 306503A1.4.0
3/6

REV.	DATE	PREPD	APPRD
4.0	5.9.95	1127	LRa
3.0	4.4.95	1122	
2.0	3.2.95		
1.8	31.1.95	1105	

NOKIA

TELECOMMUNICATIONS

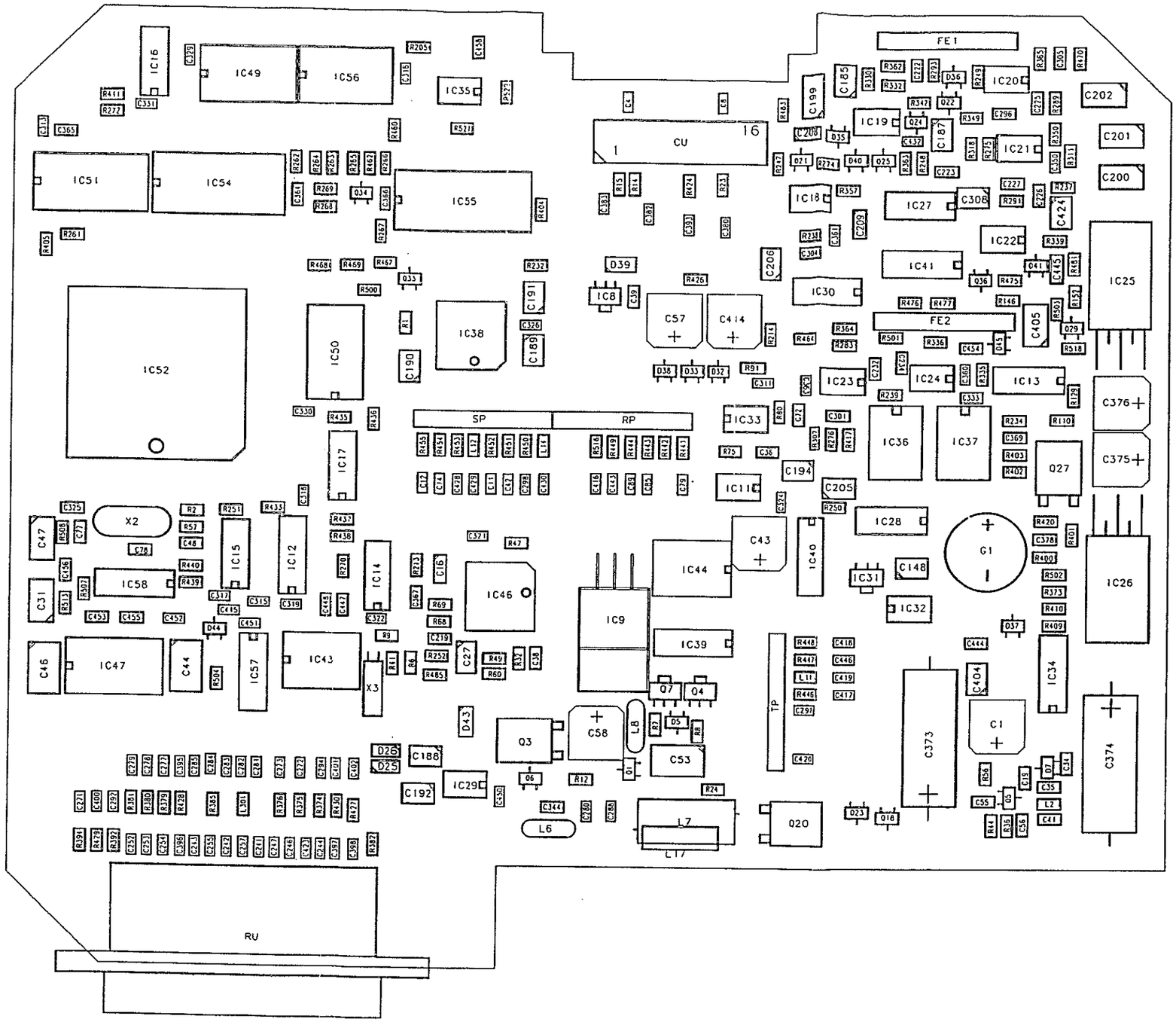
REF. 5F 9881586 4

R40

L100

SCALE			
	PREPD	MTK	28.06.95 MTK
	CHKD	MH	28.06.95 MTK
	APPRD	LRa	28.06.95 LRa
	ARCHVD		

3C 306503A1.4.0 1/4



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1.8	31.1.95	1105					
REV.	DATE	PREPD	APPRD				

PREPD	MTK	28.06.95	MTK
CHKD	MTK	28.06.95	MTK
APPRD	LRa	28.06.95	
ARCHVD			

3C 306503A1.4.0 4/4

ITEM..: 306503A3 L100A3 LOGIC UNIT AUDIO & PROCESSOR PART Version: 4.0

ID-code	Partno	Description	Value	Type	Cover	Psqty	Rec.
HISTORIA	6.6.94 APn CFA-proj. MUUTOKSET 8.6.94 APn,VERSIO 2 MUUT.NRO 1105 23.2.1995 HKa 21.03.95 PK; PL-KIERROS 3:N MUUTOKSET 20.04.95 PK; POISTETTU KELLO OPTION KOMPONENTIT(4670945) MUUTOS NRO 1127 JJe 4.9.95 21.11.95 PK; ins 9210242 5.1.96 JJ, MUKIN MUUTOKSET 1127 (V4)	HISTORY				0.00	
DOKU	4A 306503A1.4.0 1/3,2A 306503A1.4.0 2/3,3A 306503A1.4.0 3/3 2B 306503A1.4.0 1/6,2B 306503A1.4.0 2/6,2B 306503A1.4.0 3/6 4B 306503A1.4.0 4/6,3B 306503A1.4.0 5/6,3B 306503A1.4.0 6/6 3C 306503A1.4.0 1/2,3C 306503A1.4.0 2/2	ASSOCIATED DRAWINGS				0.00	
0307401		CONNECTION CABLE				1.00	504
2310404	C281,283,297,310,311,313,315, 316,318,319,321,322,324,326 328-331,346,349-352,357-363, 383,402,415,417-420,428-430 432,446,450-452	CERAMIC CHIP CAPACITOR	47 nF 10% 50V X7R CHIP	NESS 231A5	0805	41.00	213
4309470	IC12	DIGITAL IC	COUNT 12BIT BIN CMOS	74HC4040	SO16S	1.00	211
5436184	TP,SP,RP	CONNECTOR	8F-POLE PCB	90147-2108		3.00	204

ITEM..: 306503A3 L100A3 LOGIC UNIT AUDIO & PROCESSOR PART Version: 4.0

ID-code	Partno	Description	Value	Type	Cover	Psqty	Rec.
1411243	R402,403,407-410	CHIP RESISTOR	2.2R 5% 0.125 W	MOSS 2 140/5	1206	6.00	213
1411324	R80	CHIP RESISTOR	10R 5% 0.125 W	MOSS 2 140/5	1206	1.00	213
1411363	R400,401	CHIP RESISTOR	22R 5% 0.125 W	MOSS 2 140/5	1206	2.00	213
1411606	R502	CHIP RESISTOR	330R 5% 0.125 W	MOSS 2 140/5	1206	1.00	213
1411645	R15,369,383	CHIP RESISTOR	560R 5% 0.125 W	MOSS 2 140/5	1206	3.00	213
1411652	R47,57,222,368,373	CHIP RESISTOR	680R 5% 0.125 W	MOSS 2 140/5	1206	5.00	213
1411726	R134,350-356,358,359,362-367, 413,481,517	CHIP RESISTOR	2.2k 5% 0.125 W	MOSS 2 140/5	1206	19.00	213
1411740	R217,283,473,346-348,472,	CHIP RESISTOR	3.3k 5% 0.125 W	MOSS 2 140/5	1206	7.00	213
1411789	R214,257,322,339-345,471,420, 470	CHIP RESISTOR	6.8k 5% 0.125 W	MOSS 2 140/5	1206	13.00	213
1411807	R4,44,56,72,74,129,131,144, 156,251,260,311-317,319-321, 323,324,326,330-334,357,384, 466-468,476-479,483,484,487, 488 505,506,515	CHIP RESISTOR	10k 5% 0.125 W	MOSS 2 140/5	1206	45.00	213
1411821	R154,295,296,302,303,309,475	CHIP RESISTOR	15k 5% 0.125 W	MOSS 2 140/5	1206	7.00	213
1411846	R9,112,119,252,274,288-294, 297-301,304,336,480	CHIP RESISTOR	22k 5% 0.125 W	MOSS 2 140/5	1206	20.00	213
1411860	R244	CHIP RESISTOR	33k 5% 0.125 W	MOSS 2 140/5	1206	1.00	213
1411902	R32,97,273,275	CHIP RESISTOR	68k 5% 0.125 W	MOSS 2 140/5	1206	4.00	213
1411927	R1,2,6-8,12,24,26,38,81,96, 107,109,110,126,149,150,205, 211,212,215,247-250,254,255, 258,259,261-270,272,276,310 433,460-462, ,465,474,486, 504,508-513,520,521	CHIP RESISTOR	100k 5% 0.125 W	MOSS 2 140/5	1206	58.00	213
1411941	R49,91	CHIP RESISTOR	150k 5% 0.125 W	MOSS 2 140/5	1206	2.00	213
1411966	R60,242,243,246,277,514	CHIP RESISTOR	220k 5% 0.125 W	MOSS 2 140/5	1206	6.00	213
1411973	R236,237,239,240	CHIP RESISTOR	270k 5% 0.125 W	MOSS 2 140/5	1206	4.00	213

ITEM..: 306503A3 L100A3 LOGIC UNIT AUDIO & PROCESSOR PART Version: 4.0

ID-code	Partno	Description	Value	Type	Cover	Psqty	Rec.
1412007	R152,231,238,256	CHIP RESISTOR	470k 5% 0.125 W	MOSS 2 140/5	1206	4.00	213
1412021	R216,234,503	CHIP RESISTOR	680k 5% 0.125 W	MOSS 2 140/5	1206	3.00	213
1412046	R68,69,75,232,241,485,507,518	CHIP RESISTOR	1.0M 5% 0.125 W	MOSS 2 140/5	1206	8.00	213
1415600	R58,59,108,120,148,208,220, 221,223,224,349,450-452,454, 464 R427	MELF RESISTOR	1.0k 1% 0.125 W	NESS 142A4	0204	17.00	213
1415657	R11,14,16,18,19,21,23,36,46, 374-376,379-382,385-387, 389-392,394,424,428-430, 441-444,446-449,453,455,482, 516	MELF RESISTOR	100R 1% 0.125 W	NESS 142A4	0204	40.00	213
1415784	R146,469,500	MELF RESISTOR	4k75 1% 0.125 W	NESS 142A4	0204	3.00	213
1415960	R55,280-282,307,335	MELF RESISTOR	33k2 1% 0.125 W	NESS 142A4	0204	6.00	213
1416033	R17,41,64,213,284	MELF RESISTOR	47k5 1% 0.125 W	NESS 142A4	0204	5.00	213
1416280	R371	MELF RESISTOR	475R 1% 0.125 W	NESS 142A4	0204	1.00	213
1416530	R308	MELF RESISTOR	12k1 1% 0.125 W	NESS 142A4	0204	1.00	213
1422149	R404,405,411,435,438,440,489	CHIP RESISTOR	0R0 0.125 W	NESS 142/1	1206	7.00	213
1725072	R414	CHIP TRIMMER	1.0k 20% 0.25 W	RVG 4H01A-102VM		1.00	213
1725510	R416,434	CHIP TRIMMER	10k 20% 0.25 W	RVG 4H01A-103VM		2.00	213
1728512	R415	CHIP TRIMMER	100k 20% 0.25 W	RVG 4H01A-104VM		1.00	213
1827346	R426	CHIP TERMISTOR	NTC 2.2k 10%	NC20100222KBA	1206	1.00	213
1827703	R417	CHIP THERMISTOR	NTC 3.3k 10% 0.25 W	NC20100332KBA	1206	1.00	213
2309394	C372,368-371,427	CERAMIC CHIP CAPACITOR	10 nF 10% 50V X7R CHIP	MOSS 2 230/15	1206	6.00	213
2309436	C86,126,367,413	CERAMIC CHIP CAPACITOR	22 nF 10% 50V X7R CHIP	MOSS 2 230/15	1206	3.00	213
2309475	C19,21,28-30,34,39,41,51,55, 56,62,72,73,91,106,124,128, 184,218,219,305,306,309,325, 333-342,344,345,364-366, 390-392,409,411,444,456,458	CERAMIC CHIP CAPACITOR	47 nF 10% 50V X7R CHIP	MOSS 2 230/15	1206	48.00	213
2309940	C48,77,78,304	CERAMIC CHIP CAPACITOR	15 pF 5% 50V NP0 CHIP	MOSS 2 230/11	1206	4.00	213

ITEM..: 306503A3 L100A3 LOGIC UNIT AUDIO & PROCESSOR PART Version: 4.0

ID-code	Partno	Description	Value	Type	Cover	Psqty	Rec.
2309965	C38	CERAMIC CHIP CAPACITOR	22 pF 5% 50V NP0 CHIP	MOSS 2 230/11	1206	1.00	213
2310022	C36,65	CERAMIC CHIP CAPACITOR	68 pF 5 % 50V NP0 CHIP	MOSS 2 230/11	1206	2.00	213
2310047	C296,300-302,455	CERAMIC CHIP CAPACITOR	100pF 5 % 50V NP0 CHIP	MOSS 2 230/11	1206	5.00	213
2310061	C35,410	CERAMIC CHIP CAPACITOR	150pF 5 % 50V NP0 CHIP	MOSS 2 230/11	1206	2.00	213
2310086	C61	CERAMIC CHIP CAPACITOR	220pF 5 % 50V NP0 CHIP	MOSS 2 230/11	1206	1.00	213
2310128	C426	CERAMIC CHIP CAPACITOR	470pF 5 % 50V NP0 CHIP	MOSS 2 230/11	1206	1.00	213
2310167	C119,230-235,237,425,454	CERAMIC CHIP CAPACITOR	1.0nF 5 % 50V NP0 CHIP	MOSS 2 230/11	1206	10.00	213
2310181	C224-229	CERAMIC CHIP CAPACITOR	1.5nF 5 % 50V NP0 CHIP	MOSS 2 230/11	1206	6.00	213
2310223	C222,378,453	CERAMIC CHIP CAPACITOR	3.3nF 5 % 50V NP0 CHIP	MOSS 2 230/11	1206	3.00	213
2312054	C210-217,431,433-442	CERAMIC CHIP CAPACITOR	15 pF 5 % 50V X7R CHIP	NESS 231A1	0805	19.00	213
2310424	C11,12,14,42,79,85,89,298,416 443	CERAMIC CHIP CAPACITOR	100pF 5 % 50V NP0 CHIP	MOSS 2 230/11	0805	10.00	213
2310505	C3-9,23,60,240-244,246,247, 251-259,261-267,271-273, 277-280,282,284-286,288-292, 294,380,382,384-389,393-401, 421-423	CERAMIC CHIP CAPACITOR	470pF 5 % 50V NP0 CHIP	MOSS 2 230/11	0805	69.00	213
2519568	C1,43,57,58,375,376,414	AL.ELEC. CHIP CAPACITOR	47uF/25V 20%		D8XH6mm	7.00	213
2506154	C373,374	ALUM.ELECTROLYTIC CAPACIT	470 uF 20% 25V	D10L20	8 M	2.00	203
2604022	C16,208,209,220,221,445	TANTALUM CHIP CAPACITOR	100 nF 20% 35V CHIP	MOSS 2 260/2	3216	6.00	213
2610006	C99,205-207	TANTALUM CHIP CAPACITOR	470 nF 20% 35V CHIP	NESS 261A1	3528	4.00	213
2604110	C44,46,53,54	TANTALUM CHIP CAPACITOR	10 uF 20% 25V CHIP	MOSS 2 260/2	7343	4.00	213
2610010	C27,94,113,122,148,185-194, 197,198,307,308,404,424,457	TANTALUM CHIP CAPACITOR	1.0 uF 20% 35V CHIP	NESS 261A1	3528	22.00	213
2604431	C31,47,199-204,405	TANTALUM CHIP CAPACITOR	10 uF 20% 16V CHIP	NESS 261A1	6032	9.00	213
3640776	L17	INDUCTOR CHIP	1.5uH 5% <0.001R 5A		8.5x3.0	1.00	213
3607857	L6,8	T-FILTER	2.2nF 20% 16V 5A	EXC-EMT222DC		2.00	203
3608534	L2,10	INDUCTOR CHIP	2.2uH 5% 1.5R Q25/7.9 FR>	MOSS 2 360/2	1206	2.00	213
3641915	L11,12,14	INDUCTOR CHIP	100nH 10% 0.2R Q45/100 FR		1206	3.00	213
3640231	L301,302	INDUCTOR CHIP	150nH 10% 0.3R Q45/100 FR		1206	2.00	213
4100260	D5,40	DIODE PAIR	70V 0.1A 6ns COM.ANOD	BAW56	SOT23	2.00	212

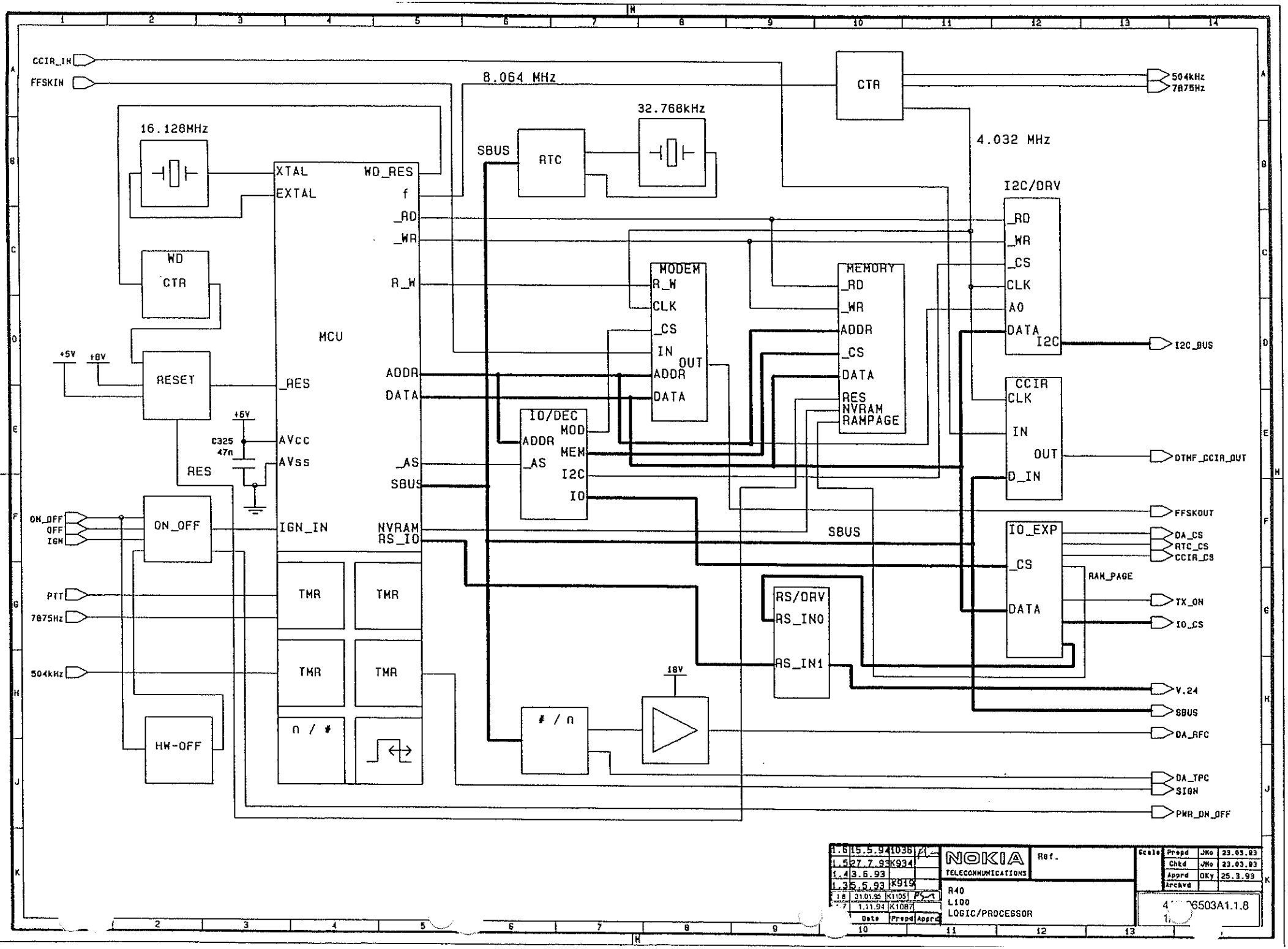
ITEM..: 306503A3 L100A3 LOGIC UNIT AUDIO & PROCESSOR PART Version: 4.0

ID-code	Partno	Description	Value	Type	Cover	Psqty	Rec.
4100278	D37,38,42,45,46,47	DIODE PAIR	70V 0.1A 6ns COM.CAT	BAV70	SOT23	6.00	212
4100285	D7,17,23,32-36,41,44	DIODE PAIR	70V 0.2A 6ns IN SERIES	BAV99	SOT23	10.00	212
4100783	D6,15,25,26	ZENER DIODE	5.1V 5% 0.5W	BZV55C5V1	SOD80	4.00	212
4114744	D31	TVS DIODE	20.9V/24.2V 30.6V/49A 150	1.5SMC20	DO214AB	1.00	212
4105167	D39,43	DIODE	200V 1.5A 250ns VF1.1V/1A	BYD37D	SOD80	2.00	212
4108100	D27,30,48	ZENER DIODE	5.6V 5% 0.4W	BZV55C5V6	SOD80	3.00	212
4116178	D16	ZENER DIODE	4.7V 5% 0.5W	BZV55C4V7	SOD80	1.00	212
4200709	Q5	TRANSISTOR	N 5GHz 12V 35mA 0.25W/56H	BFR93A/ON4238	SOT23	1.00	212
4200909	Q9,12,22,40	TRANSISTOR	P 150MHz 30V 0.1A 0.35W >	BCW30	SOT23	4.00	212
4202456	Q3,20,27	MOSFET	P 0.3R 50V 8A VP-4V	IRFR9020TR	TO252AA	3.00	212
4210055	Q1,6,10,18,24-26,29,31,33,34,37-39	TRANSISTOR	N 300MHz 45V 0.1A 0.25W >	BCW72	SOT23	14.00	212
4210312	Q4,7	TRANSISTOR	N 100MHz 60V 1A 1W >100	BSR41	SOT89	2.00	212
4214006	Q21,36	JFET	N VGS-6.0V 15mA 0.35W	MMBF4416L	SOT23	2.00	212
4303084	IC33	ANALOG IC	OP.AMP 2X LOW NOISE	LS204D	SO8S	1.00	211
4343240	IC18-24,29,32	ANALOG IC	OP.AMP 2X 3-32VDC LOW POW	LM2904ES	SO8S	9.00	211
4301713	IC54,55	MEMORY IC	SRAM 32kX8 120-150ns CMOS	HM62256LFP-12	SO28X	2.00	211
4305500	IC9	ANALOG IC	REG +5V 1A 0/150C	7805	TO220	1.00	201
4341185	IC34	DIGITAL IC	MUX/DEMUX 8CH ANALOG HCMO	74HC4051T	SO16S	1.00	211
4309488	IC27,28,30	DIGITAL IC	ANALOG SWITCH 4XBILATERAL	74HC4066T	SO14S	3.00	211
4309632	IC15	DIGITAL IC	AND 4X2 INP HCMOS	74HC08T	SO14S	1.00	211
4309907	IC13,14	DIGITAL IC	NAND 4X2 INP SCHM.TRIGG.H	74HC132T	SO14S	2.00	211
4310886	IC37	PROCESSOR IC	CLOCK GENERATOR CMOS	MN3102	PDIL8S	1.00	201
4314054	IC49,50	DIGITAL IC	D FF 8X 3-ST HCMOS	74HC374	SO20W	2.00	211
4320804	IC25,26	ANALOG IC	AMP AF 10W 18V 2.0RL	TDA2003H	TO220	2.00	201
4340078	IC11	ANALOG IC	OP.AMP 2X JFET +-18V LOW	TL062ID	SO8S	1.00	211
4340290	IC38	TELECOM IC	CODEC FFSK MODEM 1200BAUD	FX429LS	PLCC24	1.00	211
4346404	IC46	TELECOM IC	CODEC CCIR C-BUS	FX803LS	PLCC24	1.00	211
4340488	IC57,58	DIGITAL IC	COUNT 14BIT BIN CMOS	HEF4060BT	SO16S	2.00	211
4342835	IC39-41	ANALOG IC	SHIFT REG 8-STG HCMOS	74HC4094	SO16S	3.00	211
4343196	IC47	INTERFACE IC	BUS TRANSC 3X +5VCC	MC145407DW	SO20W	1.00	211

ITEM..: 306503A3 L100A3 LOGIC UNIT AUDIO & PROCESSOR PART Version: 4.0

ID-code	Partno	Description	Value	Type	Cover	Psqty	Rec.
4345716	IC52	PROCESSOR IC	MCU 16/8BIT ROMLESS 8MHz	HD6415328F	QFP80A	1.00	211
4346633	IC51	DIGITAL IC	DECODER 4TO16 LINE HCMOS	74HC154	SO24W	1.00	211
4348114	IC53	MEMORY IC	OTPROM 256X8 150ns CMOS	27C020-15S		1.00	411
4348740	IC35	MEMORY IC	EEPROM 256X8 CMOS	24C02S	SO8S	1.00	211
4347422	IC56	PROCESSOR IC	BUS CONTROLLER I2C	PCD8584T	SO20W	1.00	211
4347723	IC17	DIGITAL IC	OR 4X2 INP HCMOS	74HC32	SO14S	1.00	211
4349864	IC31,IC8	ANALOG IC	REG +8V 0.15A 0.5W	TA78L08F	SOT89	2.00	211
4349884	IC44	INTERFACE IC	DAC 4X6BIT SERIAL-INP	MC144111DW	SO16W	1.00	211
4352346	IC36	DELAY LINE	AUDIO DELAY 2.5-51.2ms	MN3207	PDIL8S	1.00	201
4508562	X2	PROCESSOR CRYSTAL	16.128 MHz 50 PPM PROS.CR	16.128MHz TC3.5D	11.5X5X4.5	1.00	202
4700799	G1	BATTERY	3V 0.5Ah Li	CR 2450-FT2		1.00	204
5409034		IC-SOCKET	32-POLE PLCC LOW PROFILE	0-0821977-1		1.00	214
5467556	RU	D-CONNECTOR	44M-POLE ANGLE PCB HIGH D	HV 44S1J		1.00	204
6500056		COMPONENT BASE	10cm 40 HOLES	PKR 40		0.05	204
9210242		PROM FRAME				1.00	506
9881586		PCB 1.6M		4		1.00	518

Structure parts.....: 115 pcs



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Date	Prepd	Apprd	

NOKIA TELECOMMUNICATIONS

Ref.

R40
L100
LOGIC/PROCESSOR

Scale			
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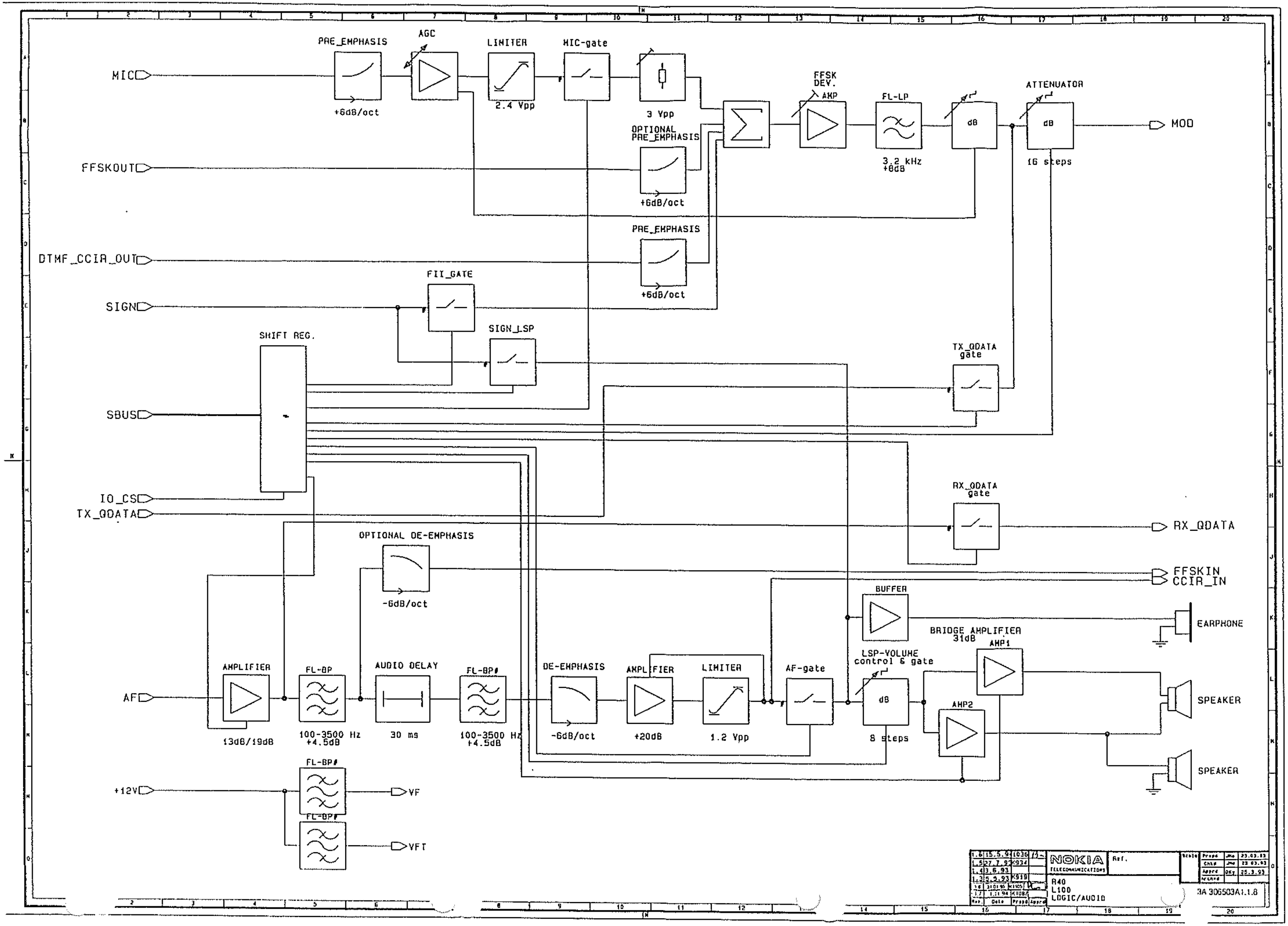
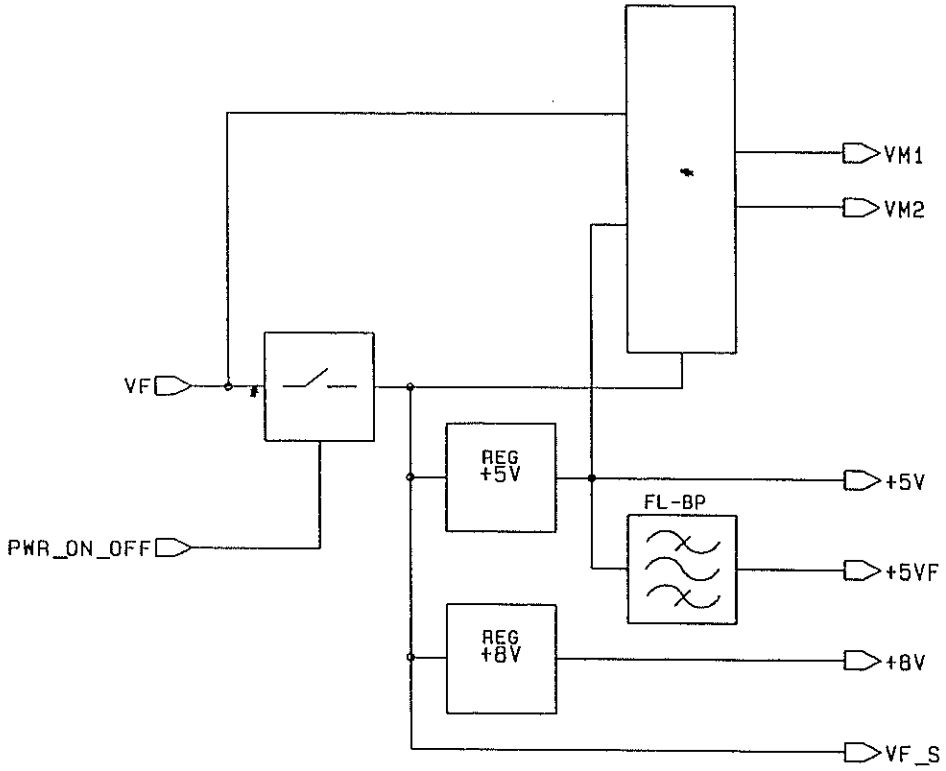
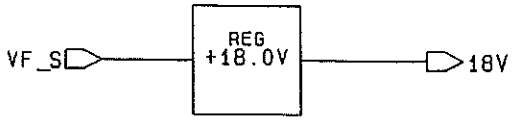
	Chkd	JMo	23.03.93
	Apprd	OKy	25.3.99
	Archvd		

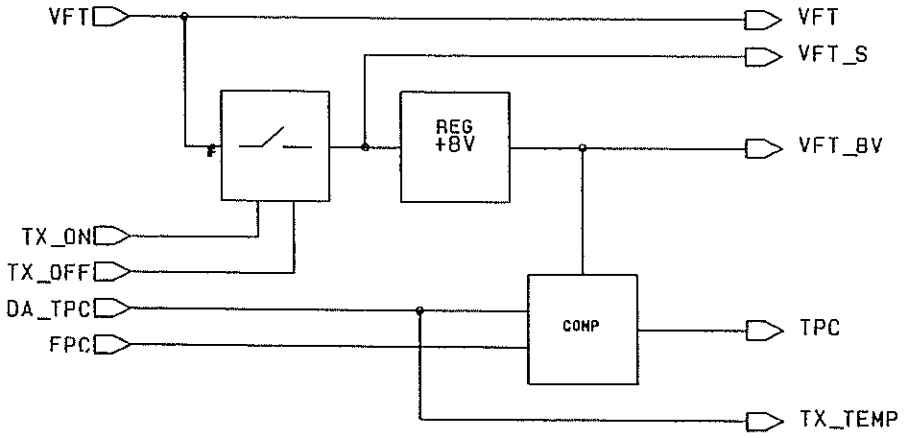
6503A1.1.8

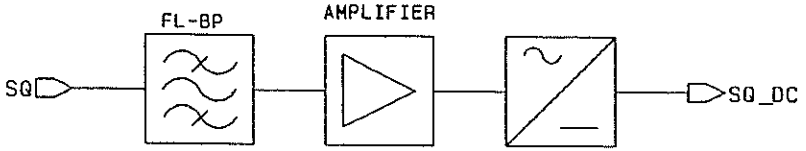


MIC
PRE_EMPHASIS
+6dB/oct
AGC
LIMITER
2.4 Vpp
MIC-gate
3 Vpp
FFSK DEV.
AMP
FL-LP
3.2 kHz
+6dB
ATTENUATOR
dB
16 steps
MOD
FFSKOUT
OPTIONAL PRE_EMPHASIS
+6dB/oct
DTMF_CCIR_OUT
PRE_EMPHASIS
+6dB/oct
SIGN
FII_GATE
SIGN_LSP
SHIFT REG.
TX_QDATA gate
SBUS
IO_CS
TX_QDATA
RX_QDATA gate
RX_QDATA
OPTIONAL DE-EMPHASIS
-6dB/oct
FFSKIN
CCIR_IN
BUFFER
EARPHONE
BRIDGE AMPLIFIER 31dB
AMP1
LSP-VOLUME control & gate
AF
AMPLIFIER
13dB/19dB
FL-BP
100-3500 Hz
+4.5dB
AUDIO DELAY
30 ms
FL-BP#
100-3500 Hz
+4.5dB
DE-EMPHASIS
-6dB/oct
AMPLIFIER
+20dB
LIMITER
1.2 Vpp
AF-gate
dB
8 steps
AMP2
SPEAKER
SPEAKER
+12V
FL-BP#
VF
FL-BP#
VFT
NOKIA
TELECOMMUNICATIONS
R40
L100
LOGIC/AUDIO
3A 306503A1.1.8

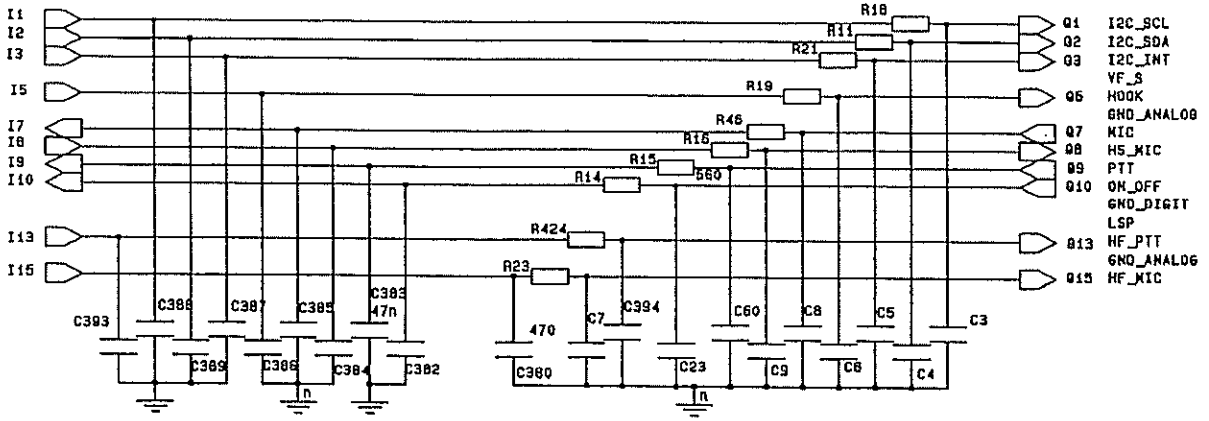








1.6	15.5.94	1036		NOKIA TELECOMMUNICATIONS	Ref.	Scale	
1.5	27.7.93	K934				Prepd	JMa 23.03.93
1.4	3.6.93					Chkd	JMa 23.03.93
1.3	5.5.93	K919				Apprd	OKy 25.3.93
1.8	31.01.95	K1105				Archvd	
1.7	1.11.94	K1087					
	Date	Prepd	Apprd	R40 L100 LOGIC/RF_IO		4 [illegible]6503A1.1.8	
						3	



ALL CAPACITORS ARE 470 pF, EXCEPT C383 47 nF

ALL RESISTORS ARE 100 ohm, EXCEPT R15 560 ohm.

1.6	15.5.93	K1036	
1.5	27.7.93	K934	
1.4	3.6.93		
1.3	5.5.93	K919	
1.2	31.01.95	K1105	
1.1	1.11.94	K1087	
	Date	Prepd	Apprd

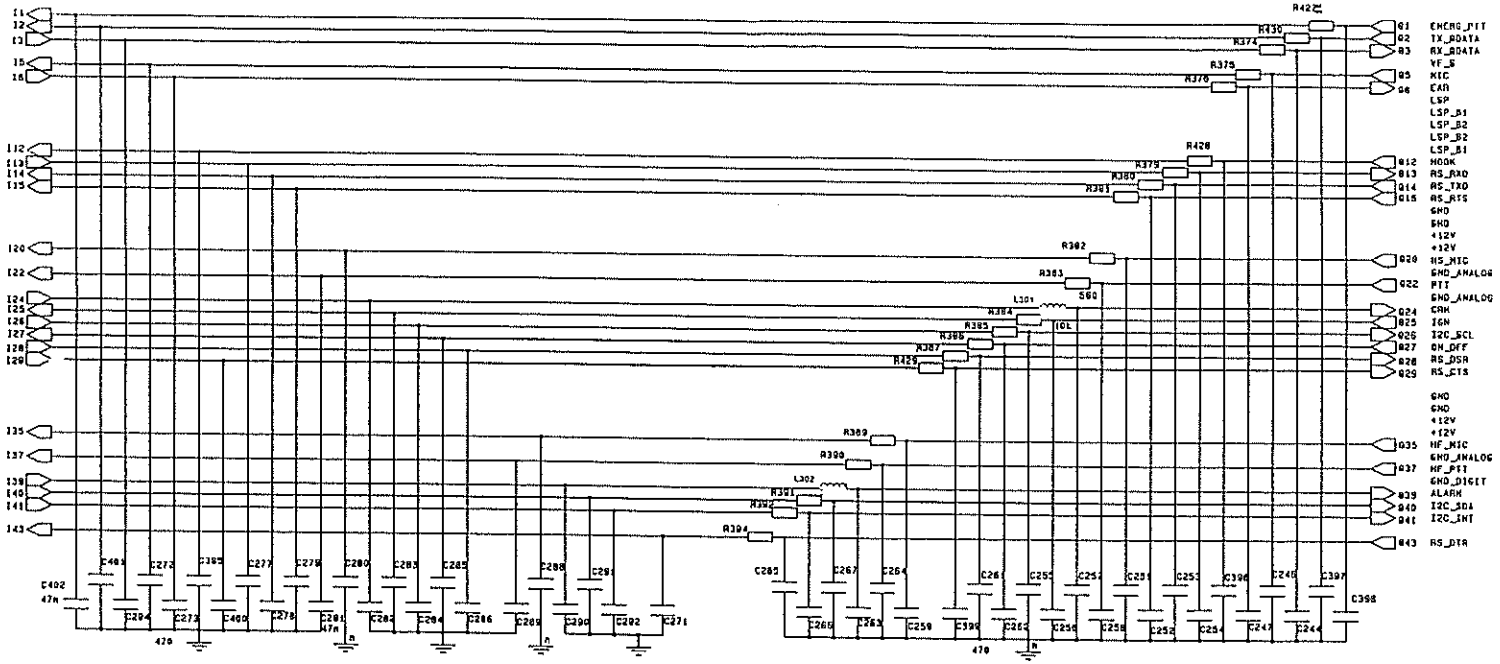
NOKIA TELECOMMUNICATIONS

Ref.

R40
L100
LOGIC/AUDIO/CU_FILTERS

Scale			
	Prepd	JNo	22.03.93
	Chkd	JNo	22.03.93
	Apprd	DKy	23.3.93
	Archvd		

4B 306503A1.1.8
4/



ALL CAPACITORS ARE 470 pF, EXCEPT C283, C281 AND C402 ARE 47 nF.

ALL RESISTORS ARE 100 OHM, EXCEPT R384 10 k, R383 560 ohm AND R427 1 k.

1.6	15.5.93	10:36	
1.5	27.4.93	K934	
1.4	9.4.93		
1.3	5.5.93	K919	
1.2	31.01.96	K1051	
1.1	3.11.94	K1047	
Rev	Date	Prepd	Appvd

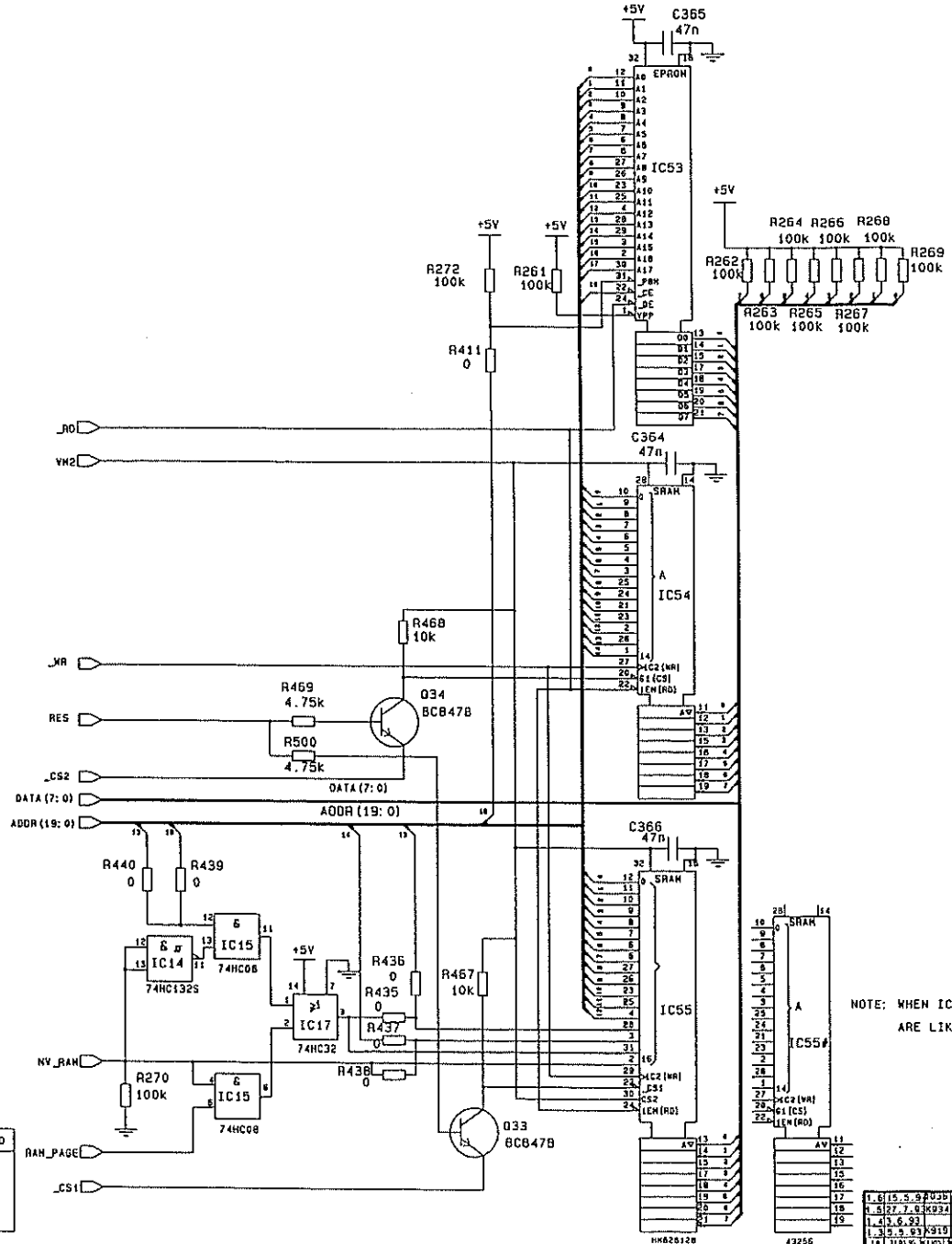
NOKIA TELECOMMUNICATIONS

Ref

R4a
L10a
LOGIC/AUDIO/RX_FILTERS

Prepd	JMa	22.03.93
Chkd	MK	22.03.93
Appvd	OKr	22.3.93
Scale		

3B 306503A1.1.0
5/6



NOTE: WHEN IC 55 (128 kB RAM) IS NOT IN USE, PIN NUMBERS ARE LIKE IN IC 55# (32 kB RAM)

Type	EPROM	R411
A1, A2	128 kB	-
	256 kB	X
	512 kB	X

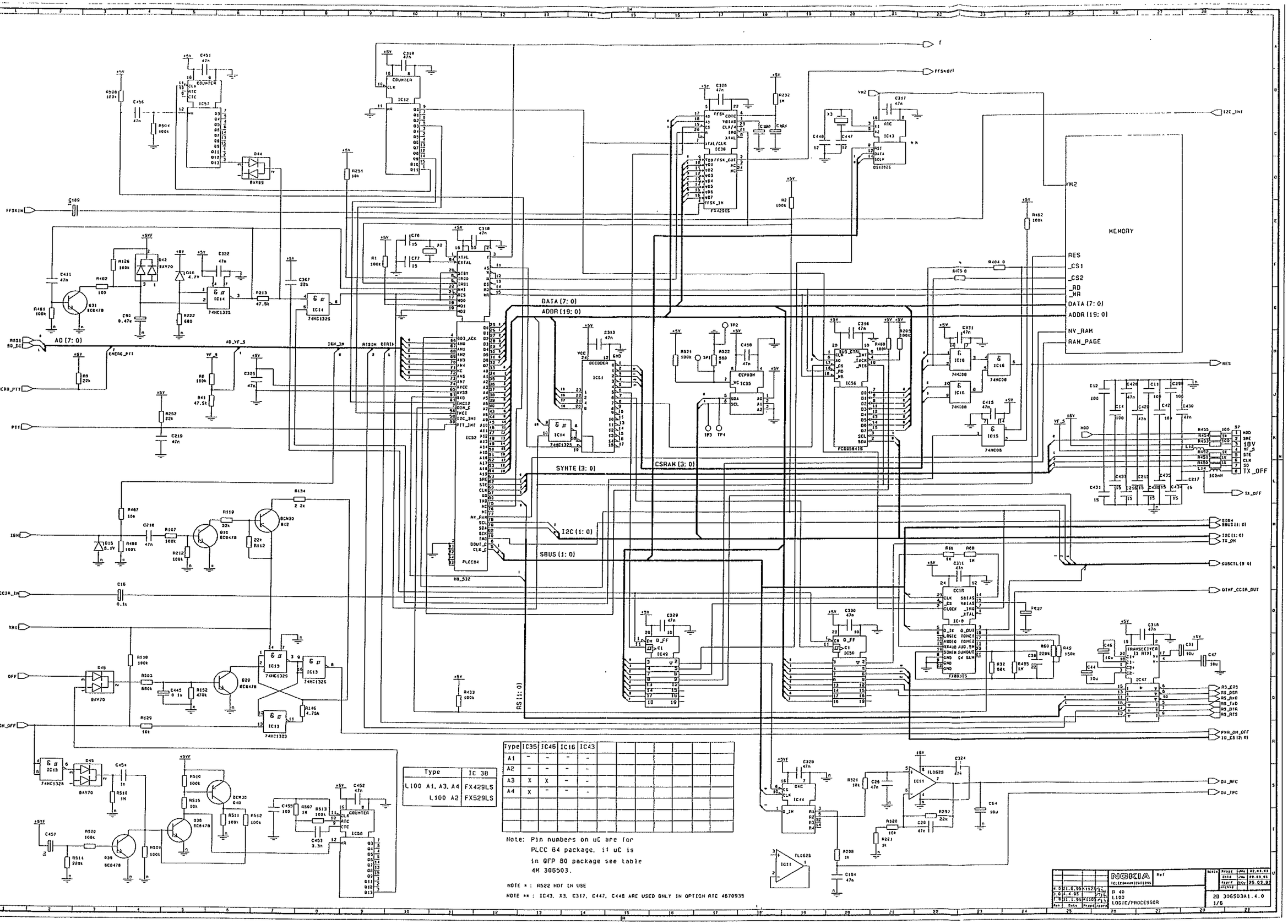
Type	RAM	IC54	IC55	R435	R436	R437	R438	R439	R440
A1, A2	1x32 kB	-	X	X	-	-	X	-	X
	2x32 kB	X	X	X	-	-	X	-	X
	1x128 kB	-	X	-	X	X	-	X	-

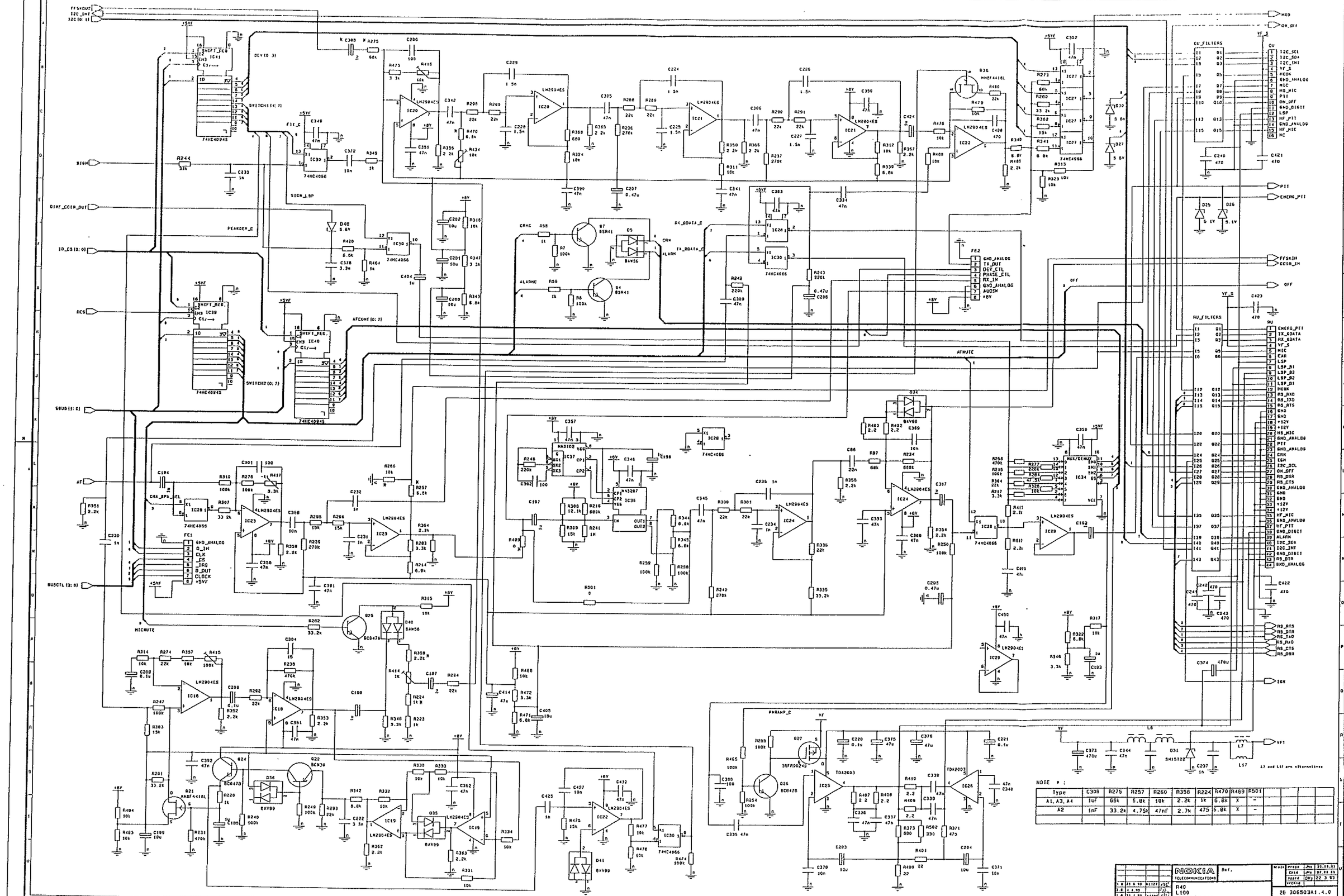
1.6	15.5.93	035	W.	NOKIA TELECOMMUNICATIONS	Orl.
1.5	27.7.93	K934			
1.4	3.6.93				
1.3	5.5.93	K919			
1.2	31.01.93	K1103			
1.1	3.11.92	K1084			
Rev	Date	Proj	Sign		

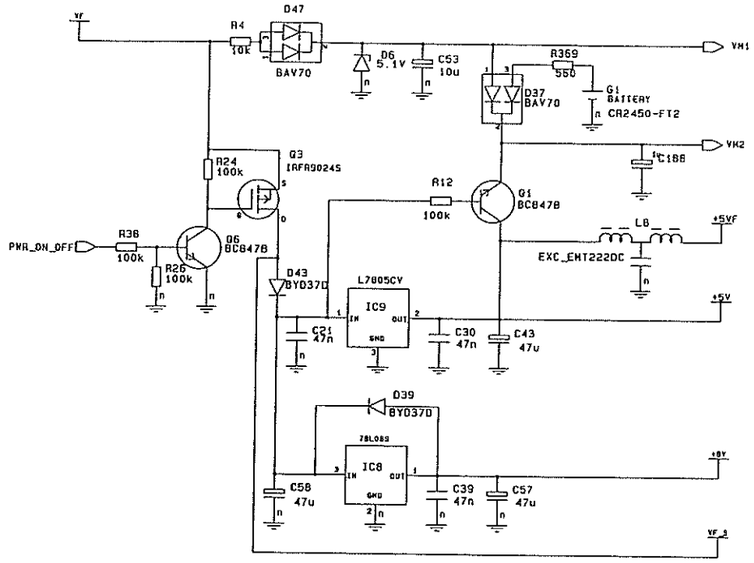
Scale	Proje	Jnd	2.03.93
	Chkd	Jno	22.03.93
	Appvd	DEV	25.3.93
	Approv		

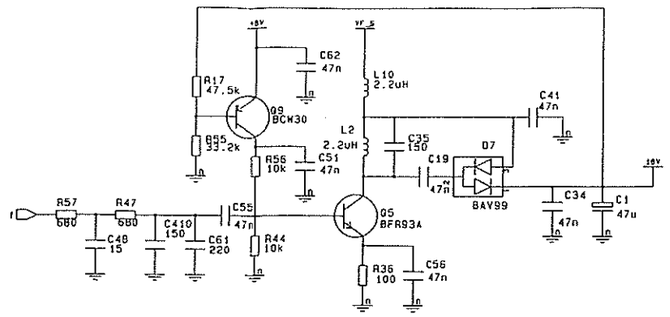
R40
L100
LOGIC/PROCESSOR/MEMORY

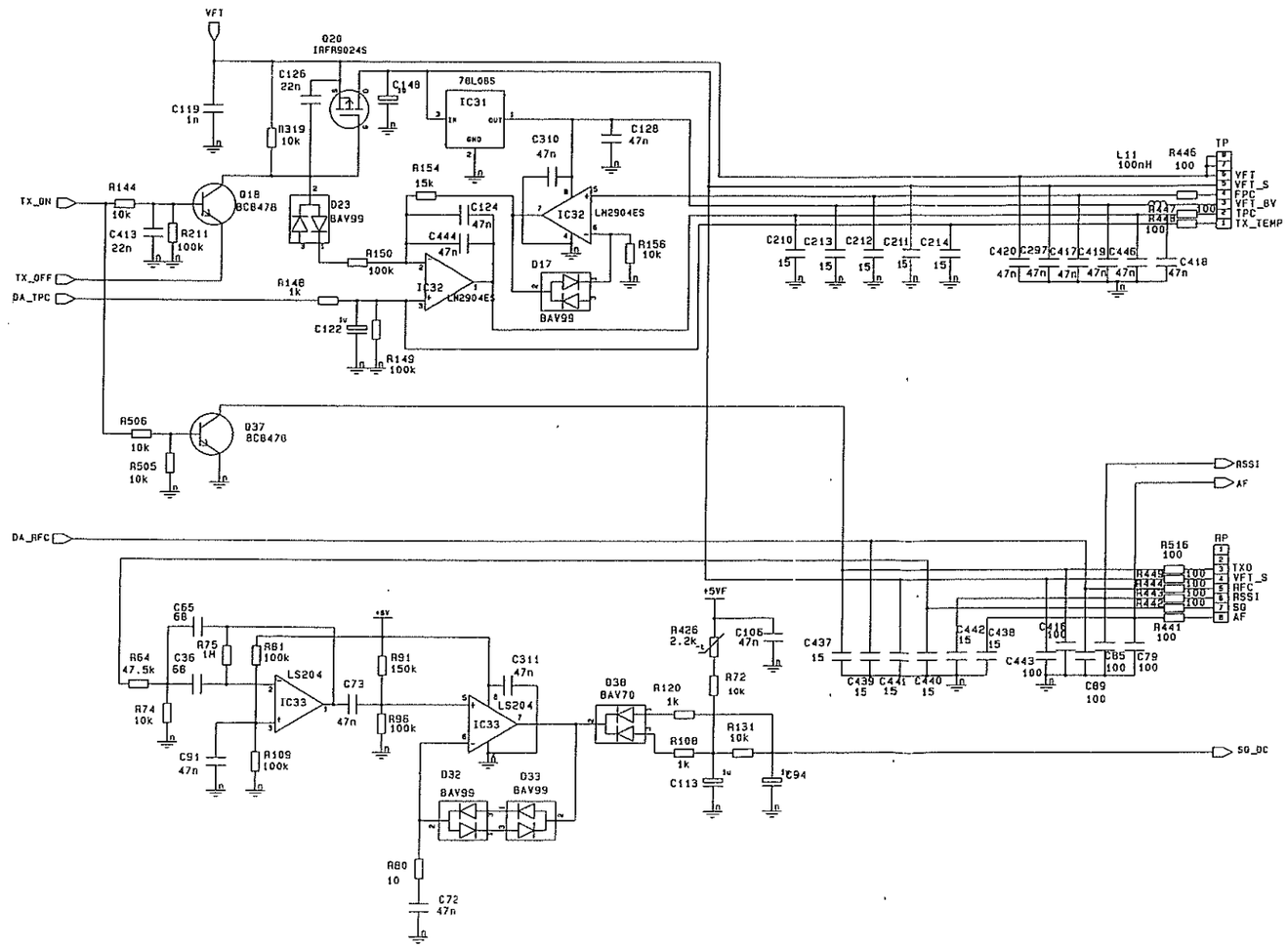
3B 30G503A1 1.8
6/6


DATA (7: 0)
ADDR (19: 0)
SYNTE (3: 0)
CSRAM (3: 0)
I2C (1: 0)
SBUS (1: 0)
AS (1: 0)
AD (7: 0)
MEMORY
RES
_CS1
_CS2
_RD
_WR
NV_RAM
RAM_PAGE
I2C_INT
FFSKOUT
FFSKIN
IGN
OFF
ON_OFF
CCIR_IN
TX_OFF
SIGN
SBUS(1: 0)
I2C(1: 0)
TX_ON
SUBCTL (3: 0)
DTMF_CCIR_OUT
PWR_ON_OFF
IO_CS (2: 0)
DA_RFC
DA_IFC
Type | IC 38
L100 A1, A3, A4 | FX429LS
L100 A2 | FX529LS
Type | IC35 | IC46 | IC16 | IC43
A1 | - | - | - | -
A2 | - | - | - | -
A3 | X | X | - | -
A4 | X | - | - | -
Note: Pin numbers on uC are for PLCC 84 package. If uC is in QFP 80 package see table 4H 306503.
NOTE *: R522 NOT IN USE
NOTE **: IC43, X3, C317, C447, C448 ARE USED ONLY IN OPTION RTC 4670935
NOKIA
TELECOMMUNICATIONS
Ref
R 40
L100
LOGIC/PROCESSOR
2B 306503A1.4.0
1/6

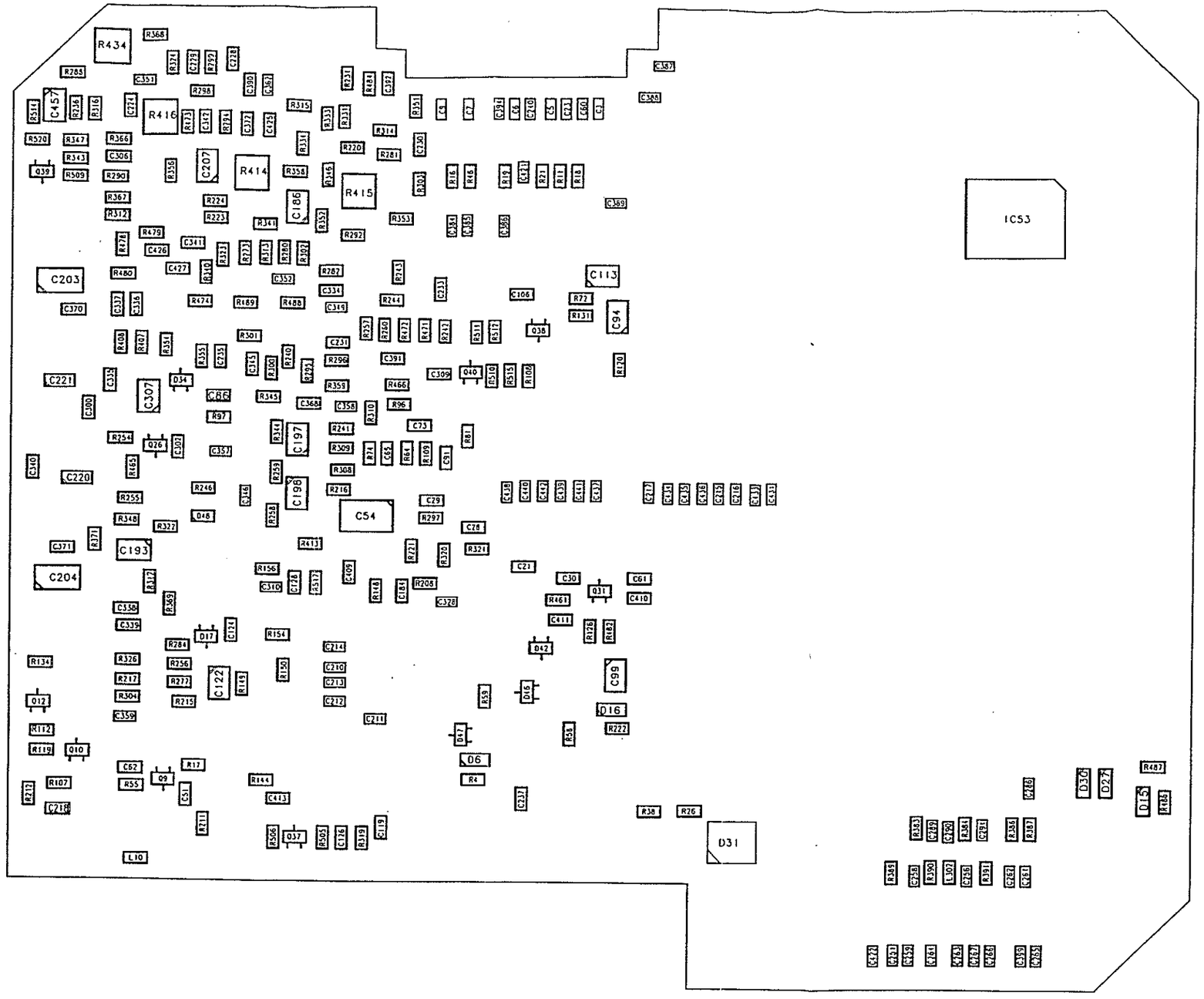

NOKIA
TELECOMMUNICATIONS
Ref.
R40
L100
LOGIC/AUDIO
2B 3065903A1.4.0
2/6
NOTE * :
Type | C308 | R275 | R257 | R260 | R358 | R224 | R470 | R489 | R501
A1, A3, A4 | 1uF | 68k | 6.8k | 10k | 2.2k | 1k | 6.8k | X | -
A2 | 1nF | 33.2k | 4.75k | 47nF | 2.7k | 475 | 6.8k | X | -



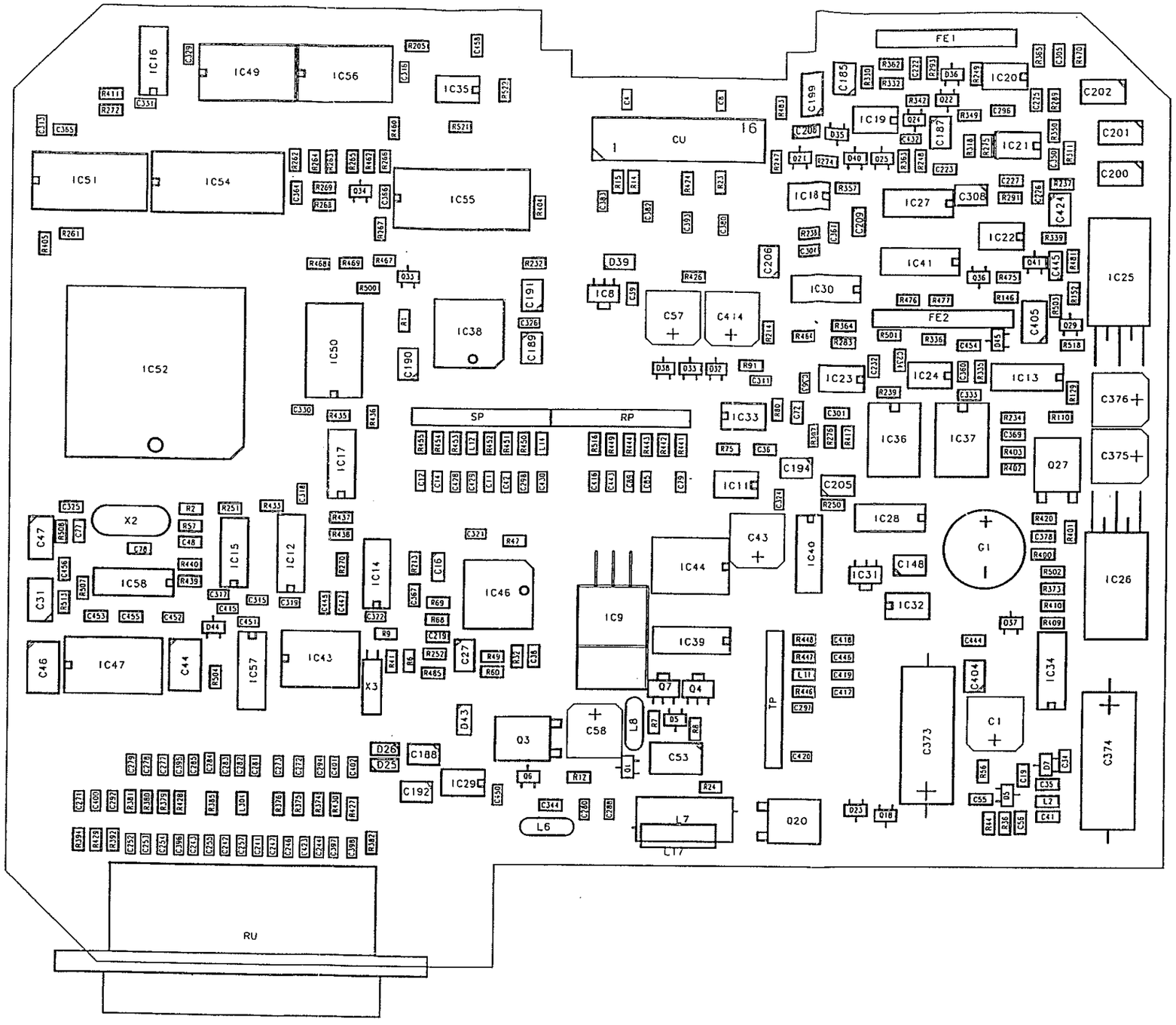




1.0	23.03.95	KS127	NOKIA TELECOMMUNICATIONS	Ref.	Date: Proof JMS 23.03.93; Chkd JMS 23.03.93; Appvd OKy 02.03.93
1.0	31.1.95	KS105	R 40 L100 LOGIC/RF_IO		20 306503A1.4.0 3/6
Rev	Date	Proof	Appvd		



				NOKIA	REF.	SCALE	PREPD	MTK 28.06.95 MTK
				TELECOMMUNICATIONS	5F 9881586 4		CHKD	MH 28.06.95 MTK
4.0	5.9.95	1127	MTK				APPRD	LRa 28.06.95 LRa
3.0	4.4.95	1122		R40			ARCHVD	
2.0	3.2.95			L100		3C 306503A1.4.0 1/4		
1.8	31.1.95	1105						
REV.	DATE	PREPD	APPRD					



REV.	DATE	PREPD	APPRD
4.0	5.9.95	1127	
3.0	4.4.95	1122	
2.0	3.2.95		
1.8	31.1.95	1105	

NOKIA
TELECOMMUNICATIONS

REF.
5F 9881586 4

R40
L100

SCALE			
	PREPD	MTK	28.06.95
	CHKD	MTK	28.06.95
	APPRD	LRa	28.06.95
	ARCHVD		

3C 306503A1.4.0 4/4

Nokia Telecommunications Oy BILL OF MATERIAL 17.05.95 Time: 10:13

Order	3	
Product's quantity	1,00	One product
Option		
Items	2	Normal items
Spare parts	0	All parts
Sequencenumbers	1	No sequencenumbers
Price	0	No price
Product group	0	With product group
Language	EN	English
Limits	1	Limit
Product 306503A3	.306503A3	

ITEM..: 306503A3 L100A3 LOGIC UNIT AUDIO & PROCESSOR PART Version: 1.8

ID-code	Partno	Description	Value	Type	Cover	Psqty	Rec.
HISTORIA	VERSIO 1.0,PK 22.03.93 MUUTETTU EPROM 4M->2M, 4327016->4327376 06.05.93 MHä 1.1 25.3.93 K914 1.2 4.5.93 K915 1.3 5.5.93 K919 SIISTITTY 20.5.93 MR D16 MUUTETTU 4,7V 14.6.-93 HKA,V1.4 MUUTOS NRO 934 28.7.93 HKA, V1.5 muutettu 5401006->5400073 MHä 20.12.1993 K1036 19.05.94 MR V1.6 MUUT.NRO 1087 28.9.1994 HKa MUUT.NRO 1105 23.2.1995 HKa KORJATTU 2309436 +1 KPL 27.3.95 MLK	HISTORY				0.00	
DOKU	4A 306503A1.1.7 1/3,2A 306503A1.1.7 2/3,3A 306503A1.1.7 3/3 2B 306503A1.1.7 1/6,2B 306503A1.1.7 2/6,2B 306503A1.1.7 3/6 4B 306503A1.1.7 4/6,3B 306503A1.1.7 5/6,3B 306503A1.1.7 6/6 3C 306503A1.1.7 1/2,3C 306503A1.1.7 2/2	ASSOCIATED DRAWINGS				0.00	
0307401		CONNECTION CABLE				1.00	504
2310404	C281,283,297,310,311,313, 315-319,321,322,324,326,	CERAMIC CHIP CAPACITOR	47 nF 10% 50V X7R CHIP	NESS 231A5	0805	46.00	213

ITEM..: 306503A3 L100A3 LOGIC UNIT AUDIO & PROCESSOR PART Version: 1.8

ID-code	Partno	Description	Value	Type	Cover	Psqty	Rec.
	328-331,346,349-352,357-363, 383,402,415,417-420,428-430 432,446,450-452						
4347472	IC43	PROCESSOR IC	REAL TIME CLOCK/RAM	DS1202SN	SO16W	1.00	211
4309470	IC12	DIGITAL IC	COUNT 12BIT BIN CMOS	74HC4040	SO16S	1.00	211
5436184	TP,SP,RP	CONNECTOR	8F-POLE PCB	90147-2108		3.00	204
1406179	R506	METAL FILM RESISTOR	10k 1% 0.125 W	MOSS 2 140/1		1.00	203
1408289	R520	METAL FILM RESISTOR	100k 1% 0.125 W	MOSS 2 140/1		1.00	203
1409660	R518	METAL FILM RESISTOR	1.0M 5% 0.125 W	MOSS 2 140/1		1.00	203
1411243	R402,403,407-410	CHIP RESISTOR	2.2R 5% 0.125 W	MOSS 2 140/5	1206	6.00	213
1411324	R80	CHIP RESISTOR	10R 5% 0.125 W	MOSS 2 140/5	1206	1.00	213
1411363	R400,401	CHIP RESISTOR	22R 5% 0.125 W	MOSS 2 140/5	1206	2.00	213
1411606	R502	CHIP RESISTOR	330R 5% 0.125 W	MOSS 2 140/5	1206	1.00	213
1411645	R15,369,383	CHIP RESISTOR	560R 5% 0.125 W	MOSS 2 140/5	1206	3.00	213
1411652	R47,57,222,368,373	CHIP RESISTOR	680R 5% 0.125 W	MOSS 2 140/5	1206	5.00	213
1411726	R134,350-356,358,359,362-367, 413,481,517	CHIP RESISTOR	2.2k 5% 0.125 W	MOSS 2 140/5	1206	19.00	213
1411740	R217,283, ,346-348,472,473	CHIP RESISTOR	3.3k 5% 0.125 W	MOSS 2 140/5	1206	7.00	213
1411789	R214,257,322,339-345,470,471, 420	CHIP RESISTOR	6.8k 5% 0.125 W	MOSS 2 140/5	1206	13.00	213
1411807	R4,44,56,72,74,129,131,144, 156,251,260,311-317,319-321, 323,324,326,330-334,357,384, 466-468,476-480,483,484,487 505,515	CHIP RESISTOR	10k 5% 0.125 W	MOSS 2 140/5	1206	43.00	213
1411821	R154,295,296,302,303,309,475	CHIP RESISTOR	15k 5% 0.125 W	MOSS 2 140/5	1206	7.00	213
1411846	R9,112,119,252,274,288-294, 297-301,304,336	CHIP RESISTOR	22k 5% 0.125 W	MOSS 2 140/5	1206	20.00	213
1411860	R244	CHIP RESISTOR	33k 5% 0.125 W	MOSS 2 140/5	1206	1.00	213
1411902	R32,97,273,275	CHIP RESISTOR	68k 5% 0.125 W	MOSS 2 140/5	1206	4.00	213
1411927	R1,2,6-8,12,24,26,38,81,96, 107,109,110,126,149,150,205,	CHIP RESISTOR	100k 5% 0.125 W	MOSS 2 140/5	1206	56.00	213

ITEM..: 306503A3 L100A3 LOGIC UNIT AUDIO & PROCESSOR PART Version: 1.8

ID-code	Partno	Description	Value	Type	Cover	Psqty	Rec.
	211,212,215,247-250,254,255, 258,259,261-270,272,276,310, 433,460-462, ,465,474,486, 504,508-513						
1411941	R49,91	CHIP RESISTOR	150k 5% 0.125 W	MOSS 2 140/5	1206	2.00	213
1411966	R60,242,243,246,277,514	CHIP RESISTOR	220k 5% 0.125 W	MOSS 2 140/5	1206	6.00	213
1411973	R236,237,239,240	CHIP RESISTOR	270k 5% 0.125 W	MOSS 2 140/5	1206	4.00	213
1412007	R152,238,256	CHIP RESISTOR	470k 5% 0.125 W	MOSS 2 140/5	1206	4.00	213
1412021	R216,234,503	CHIP RESISTOR	680k 5% 0.125 W	MOSS 2 140/5	1206	3.00	213
1412046	R68,69,75,231,232,241,485,507	CHIP RESISTOR	1.0M 5% 0.125 W	MOSS 2 140/5	1206	7.00	213
1415600	R58,59,108,120,148,208,221, 223,224,349,427,450-452,454, 464	MELF RESISTOR	1.0k 1% 0.125 W	NESS 142A4	0204	17.00	213
1415657	R11,14,16,18,19,21,23,36,46, 220,374-376,379-382,385-387, 389-392,394, ,424, 428-430,441-444,446-449,453, 455,482,516	MELF RESISTOR	100R 1% 0.125 W	NESS 142A4	0204	40.00	213
1415784	R79,146,469,500	MELF RESISTOR	4k75 1% 0.125 W	NESS 142A4	0204	4.00	213
1415833	R458	MELF RESISTOR	221R 1% 0.125 W	NESS 142A4	0204	1.00	213
1415960	R55,280-282,307,335	MELF RESISTOR	33k2 1% 0.125 W	NESS 142A4	0204	6.00	213
1416033	R17,41,64,213,284	MELF RESISTOR	47k5 1% 0.125 W	NESS 142A4	0204	5.00	213
1416280	R371	MELF RESISTOR	475R 1% 0.125 W	NESS 142A4	0204	1.00	213
1416530	R308,	MELF RESISTOR	12k1 1% 0.125 W	NESS 142A4	0204	1.00	213
1422149	R404,405,411,435,438,440,421, 422	CHIP RESISTOR	0R0 0.125 W	NESS 142/1	1206	8.00	213
1725072	R414	CHIP TRIMMER	1.0k 20% 0.25 W	RVG 4H01A-102VM		1.00	213
1725510	R416,434	CHIP TRIMMER	10k 20% 0.25 W	RVG 4H01A-103VM		2.00	213
1728512	R415	CHIP TRIMMER	100k 20% 0.25 W	RVG 4H01A-104VM		1.00	213
1827346	R426	CHIP TERMISTOR	NTC 2.2k 10%	NC20100222KBA	1206	1.00	213
1827703	R417	CHIP THERMISTOR	NTC 3.3k 10% 0.25 W	NC20100332KBA	1206	1.00	213

ITEM..: 306503A3 L100A3 LOGIC UNIT AUDIO & PROCESSOR PART Version: 1.8

ID-code	Partno	Description	Value	Type	Cover	Psqty	Rec.
2309394	C372,368-371,427	CERAMIC CHIP CAPACITOR	10 nF 10% 50V X7R CHIP	MOSS 2 230/15	1206	6.00	213
2309436	C86,126,367,413	CERAMIC CHIP CAPACITOR	22 nF 10% 50V X7R CHIP	MOSS 2 230/15	1206	4.00	213
2309475	C19,21,28-30,34,39,41,51,55, 56,62,72,73,91,106,124,128, 184,218,219,305,306,309,325, 333-342,344,345,364-366, 390-392,409,411,444,456	CERAMIC CHIP CAPACITOR	47 nF 10% 50V X7R CHIP	MOSS 2 230/15	1206	47.00	213
2309933	C447,448	CERAMIC CHIP CAPACITOR	12 pF 5% 50V NP0 CHIP	MOSS 2 230/11	1206	2.00	213
2309940	C48,77,78,304	CERAMIC CHIP CAPACITOR	15 pF 5% 50V NP0 CHIP	MOSS 2 230/11	1206	4.00	213
2309965	C38	CERAMIC CHIP CAPACITOR	22 pF 5% 50V NP0 CHIP	MOSS 2 230/11	1206	1.00	213
2310022	C36,65	CERAMIC CHIP CAPACITOR	68 pF 5 % 50V NP0 CHIP	MOSS 2 230/11	1206	2.00	213
2310047	C296,300-302,455	CERAMIC CHIP CAPACITOR	100pF 5 % 50V NP0 CHIP	MOSS 2 230/11	1206	5.00	213
2310061	C35,410	CERAMIC CHIP CAPACITOR	150pF 5 % 50V NP0 CHIP	MOSS 2 230/11	1206	2.00	213
2310086	C61	CERAMIC CHIP CAPACITOR	220pF 5 % 50V NP0 CHIP	MOSS 2 230/11	1206	1.00	213
2310128	C426	CERAMIC CHIP CAPACITOR	470pF 5 % 50V NP0 CHIP	MOSS 2 230/11	1206	1.00	213
2310167	C119,230-235,237,425,454	CERAMIC CHIP CAPACITOR	1.0nF 5 % 50V NP0 CHIP	MOSS 2 230/11	1206	10.00	213
2310181	C224-229	CERAMIC CHIP CAPACITOR	1.5nF 5 % 50V NP0 CHIP	MOSS 2 230/11	1206	6.00	213
2310223	C222,378,453	CERAMIC CHIP CAPACITOR	3.3nF 5 % 50V NP0 CHIP	MOSS 2 230/11	1206	3.00	213
2312054	C210-217,431,433-442	CERAMIC CHIP CAPACITOR	15 pF 5 % 50V X7R CHIP	NESS 231A1	0805	19.00	213
2310424	C11,12,14,42,79,85,89,298,416 443	CERAMIC CHIP CAPACITOR	100pF 5 % 50V NP0 CHIP	MOSS 2 230/11	0805	10.00	213
2310505	C3-9,23,60,240-244,246,247, 251-259,261-267,271-273, 277-280,282,284-286,288-292, 294,380,382,384-389,393-401, 421-423	CERAMIC CHIP CAPACITOR	470pF 5 % 50V NP0 CHIP	MOSS 2 230/11	0805	69.00	213
2505180	C1,43,57,58,375,376,414	ALUM.ELECTROLYTIC CAPACIT	47 uF 20% 25V	MOSS 2 250/2	RM 1	7.00	203
2506154	C373,374	ALUM.ELECTROLYTIC CAPACIT	470 uF 20% 25V	D10L20	8 M	2.00	203
2601159	C53	TANTALUM CAPACITOR	10 uF 20% 16V	MOSS 2 260/1	1 M	1.00	203
2604022	C16,208,209,220,221,445	TANTALUM CHIP CAPACITOR	100 nF 20% 35V CHIP	MOSS 2 260/2	3216	6.00	213
2610006	C99,205-207	TANTALUM CHIP CAPACITOR	470 nF 20% 35V CHIP	NESS 261A1	3528	4.00	213

ITEM..: 306503A3 L100A3 LOGIC UNIT AUDIO & PROCESSOR PART Version: 1.8

ID-code	Partno	Description	Value	Type	Cover	Psqty	Rec.
2604110	C44,46,54	TANTALUM CHIP CAPACITOR	10 uF 20% 25V CHIP	MOSS 2 260/2	7343	3.00	213
2610010	C27,94,113,122,148,185-194, 197,198,307,308,404,424	TANTALUM CHIP CAPACITOR	1.0 uF 20% 35V CHIP	NESS 261A1	3528	21.00	213
2604209	C457	TANTALUM CHIP CAPACITOR	1.0 uF 20% 16V CHIP	MOSS 2 260/2	3216	1.00	213
2604431	C31,47,199-204,405	TANTALUM CHIP CAPACITOR	10 uF 20% 16V CHIP	NESS 261A1	6032	9.00	213
3606825	L7	CHOKE	9uH 2.5 TURNS 600R/50MHz	WBC2.5-4B1-R		1.00	403
3607857	L6,8	T-FILTER	2.2nF 20% 16V 5A	EXC-EMT222DC		2.00	203
3608534	L2,10	INDUCTOR CHIP	2.2uH 5% 1.5R Q25/7.9 FR>	MOSS 2 360/2	1206	2.00	213
3640231	L301,L302	INDUCTOR CHIP	150nH 10% 0.3R Q45/100 FR		1206	2.00	213
3641915	L11,12,14	INDUCTOR CHIP	100nH 10% 0.2R Q45/100 FR		1206	3.00	213
4100260	D5,40	DIODE PAIR	70V 0.1A 6ns COM.ANOD	BAW56	SOT23	2.00	212
4100278	D37,38,42,45,46	DIODE PAIR	70V 0.1A 6ns COM.CAT	BAV70	SOT23	5.00	212
4100285	D7,17,23,32-36,41,44	DIODE PAIR	70V 0.2A 6ns IN SERIES	BAV99	SOT23	10.00	212
4100783	D6,15,25,26	ZENER DIODE	5.1V 5% 0.5W	BZV55C5V1	SOD80	4.00	212
4101948	D47	DIODE	50V 200mA 4ns	1N4153	DO35	1.00	202
4103511	D31	DIODE	18V 50A 20% 1.5kW/1ms	ICTE18	L9.5W5.2	1.00	202
4105167	D39,43	DIODE	200V 1.5A 250ns VF1.1V/1A	BYD37D	SOD80	2.00	212
4108100	D27,30	ZENER DIODE	5.6V 5% 0.4W	BZV55C5V6	SOD80	2.00	212
4116178	D16	ZENER DIODE	4.7V 5% 0.5W	BZV55C4V7	SOD80	1.00	212
4200709	Q5	TRANSISTOR	N 5GHz 12V 35mA 0.25W/56H	BFR93A/ON4238	SOT23	1.00	212
4200909	Q9,12,22,28,40	TRANSISTOR	P 150MHz 30V 0.1A 0.35W >	BCW30	SOT23	5.00	212
4202456	Q3,20,27	MOSFET	P 0.3R 50V 8A VP-4V	IRFR9020TR	TO252AA	3.00	212
4210055	Q1,6,10,18,24-26,29,31,33,34, 37-39	TRANSISTOR	N 300MHz 45V 0.1A 0.25W >	BCW72	SOT23	14.00	212
4210312	Q4,7	TRANSISTOR	N 100MHz 60V 1A 1W >100	BSR41	SOT89	2.00	212
4214006	Q21,36	JFET	N VGS-6.0V 15mA 0.35W	MMBF4416L	SOT23	2.00	212
4303084	IC33	ANALOG IC	OP.AMP 2X LOW NOISE	LS204D	SO8S	1.00	211
4343240	IC18-24,29,32	ANALOG IC	OP.AMP 2X 3-32VDC LOW POW	LM2904ES	SO8S	9.00	211
4301713	IC54,55	MEMORY IC	SRAM 32kX8 120-150ns CMOS	HM62256LFP-12	SO28X	2.00	211
4304427	IC8	ANALOG IC	USE 4304426 SGS	L7808CV	TO220	1.00	201
4305500	IC9	ANALOG IC	REG +5V 1A 0/150C	7805	TO220	1.00	201

ITEM..: 306503A3 L100A3 LOGIC UNIT AUDIO & PROCESSOR PART Version: 1.8

ID-code	Partno	Description	Value	Type	Cover	Psqty	Rec.
4341185	IC34	DIGITAL IC	MUX/DEMUX 8CH ANALOG HCMO	74HC4051T	SO16S	1.00	211
4309488	IC27,28,30	DIGITAL IC	ANALOG SWITCH 4XBILATERAL	74HC4066T	SO14S	3.00	211
4309632	IC15	DIGITAL IC	AND 4X2 INP HCMOS	74HC08T	SO14S	1.00	211
4309907	IC13,14	DIGITAL IC	NAND 4X2 INP SCHM.TRIGG.H	74HC132T	SO14S	2.00	211
4310886	IC37	PROCESSOR IC	CLOCK GENERATOR CMOS	MN3102	PDIL8S	1.00	201
4314054	IC49,50	DIGITAL IC	D FF 8X 3-ST HCMOS	74HC374	SO20W	2.00	211
4320804	IC25,26	ANALOG IC	AMP AF 10W 18V 2.0RL	TDA2003H	TO220	2.00	201
4340078	IC11	ANALOG IC	OP.AMP 2X JFET +-18V LOW	TL062ID	SO8S	1.00	211
4340290	IC38	TELECOM IC	CODEC FFSK MODEM 1200BAUD	FX429LS	PLCC24	1.00	211
4340488	IC57,58	DIGITAL IC	COUNT 14BIT BIN CMOS	HEF4060BT	SO16S	2.00	211
4342835	IC39-41	ANALOG IC	SHIFT REG 8-STG HCMOS	74HC4094	SO16S	3.00	211
4343196	IC47	INTERFACE IC	BUS TRANSC 3X +5VCC	MC145407DW	SO20W	1.00	211
4345716	IC52	PROCESSOR IC	MCU 16/8BIT ROMLESS 8MHz	HD6415328F	QFP80A	1.00	211
4346404	IC46	TELECOM IC	CODEC CCIR C-BUS	FX803LS	PLCC24	1.00	211
4346633	IC51	DIGITAL IC	DECODER 4TO16 LINE HCMOS	74HC154	SO24W	1.00	211
4327376	IC53	MEMORY IC	EPROM 256kX8 150ns CMOS	27C020-150	DIL32	1.00	201
4347168	IC35	MEMORY IC	PROM 256X4 50ns 3ST TTL	N82S129A	PLCC20	1.00	211
4347422	IC56	PROCESSOR IC	BUS CONTROLLER I2C	PCD8584T	SO20W	1.00	211
4347723	IC17	DIGITAL IC	OR 4X2 INP HCMOS	74HC32	SO14S	1.00	211
4349864	IC31	ANALOG IC	REG +8V 0.15A 0.5W	TA78L08F	SOT89	1.00	211
4349884	IC44	INTERFACE IC	DAC 4X6BIT SERIAL-INP	MC144111DW	SO16W	1.00	211
4352346	IC36	DELAY LINE	AUDIO DELAY 2.5-51.2ms	MN3207	PDIL8S	1.00	201
4504494	X3	CRYSTAL	32.768 kHz TC +-20 PPM-10	DT 26S 32.768KHz		1.00	202
4508562	X2	PROCESSOR CRYSTAL	16.128 MHz 50 PPM PROS.CR	16128KHZ	11.5X5X4.5	1.00	202
4700799	G1	BATTERY	3V 0.5Ah Li	CR 2450-FT2		1.00	204
5400073		IC-SOCKET	32-POLE DIL SOLDER 0.2Au	0-0345729-3		1.00	204
5467556	RU	D-CONNECTOR	44M-POLE ANGLE PCB HIGH D	HV 44S1J		1.00	204
6500056		COMPONENT BASE	10cm 40 HOLES	PKR 40		0.05	204
9881586		PCB 1.6M		L100 jep suoraan kup arille		1.00	518

Structure parts.....: 125 pcs

RF UNIT RXXXG, J

RF –part versions

Version type	low. frequency	channel spacing	high. frequency
R451G	400 MHz	12,5kHz	440MHz
R451J	400 MHz	25kHz	440MHz
R452G	430 MHz	12,5kHz	470MHz
R452J	430 MHz	25kHz	470MHz
R453G	400 MHz	12,5kHz	470MHz
R454G	400 MHz	12,5kHz	470MHz
R500G	470 MHz	12,5kHz	500MHz

Notice, in model R453G RX band is 440–470MHz and TX is 400–430MHz
in model R454G RX band is 400–430MHz and TX is 470–500MHz

RECEIVER OPERATION

Receiver block contains the following functional sub–blocks:

- High frequency stage
- First intermediate stage
- Second intermediate stage
- Detector

HIGH FREQUENCY STAGE

The antenna signal obtained from the low–pass filter and the antenna switch is brought via the ANT–connector to the high frequency amplifier transistor Q301.

Before the transistor stage there is the protection circuit D302 and D303 for the high voltages peak– protection. Also before the first RF amplifier there is the high–pass filter formed by ML301,C305 and ML302.

The high–pass filter is used to create an adequate attenuation for the first IF–frequency (45MHz) and also the normal broadcasting frequencies (88 ... 108 MHz).

At the normal receiving frequencies the attenuation of the filter is approx. 0.2 dB. The first high frequency amplifier gain is about 16dB and noise figure about 1.5 dB.

The amplifier is stabilized using the resistor R307 and condensators C308 and C307.

Collector current is set about 11 mA.

From the high frequency amplifier the signal is connected to the front end filter,which frequency band is tuned by changing the voltage across capacitance diodes D304,D305,D306 and D307.

Voltage is varying approximately 4 ... 13 V depending on the used frequency.

The filter is used to create an adequate attenuation for the image frequency and the other spurious frequencies.

ML306 and C309 is notch filter for the image frequency,which is 90 MHz above the receiving frequency.

FIRST INTERMEDIATE FREQUENCY STAGE

A high frequency amplified antenna signal is fed to the balanced mixer X302 pin 1.

Injection signal from the synthesizer is fed to the mixer pin 8. Before the mixer there is 5dB attenuator serving as the matching circuit.

The first IF–signal,which is 45 MHz is taken from the balanced mixer pin 3/4.

Synthesizer signal is 45 MHz above received signal (445 MHz ... 545 MHz) and it's level is approximately 12 dBm.

The first IF amplifier is transistor Q303. Transistor stage is stabilized with resistor R315 and condensator C323.

The amplifier gain is set approximately 18 dB and collector current is approx. 17 mA.

At the front and the end of the amplifier there is attenuators and the gain of the whole amplifier stage is about 10 dB.

From the amplifier the signal is fed to the first crystal filter XF301. The nominal impedance of the filter is 200 ohm and 3 dB bandwidth is 15 kHz and it is mainly rejecting the image frequency of the second intermediate frequency, which is 910 kHz above the receiving frequency.

The 45 MHz intermediate frequency signal from the filter is brought via the matching components C326,C327 and L301 to the IF–stage IC301.

THE SECOND INTERMEDIATE FREQUENCY STAGE

The IF–stage IC301 contains the second mixer and the amplifier.

The oscillator frequency is determined by the crystal X301 which frequency is 44.545 MHz. As a result of the mixing, the 455 kHz second intermediate frequency is obtained from the pin 20 of IC301, from which it is connected to the ceramic filter XF302.

The receiver's selectivity is mainly determined by this filter XF302.

From the filter the signal is connected to the pin 19 of the IC301.

After the ceramic filter XF302 the signal is amplified approximately 100dB with two limiting amplifier, from where the RSSI–voltage which is proportional to the antenna signal is fed to pin 6 of the connector RP.

DETECTOR

The signal obtained from the limiting amplifier is detected with the internal quadrature detector IC301.

The level of the detected signal is tuned for it's maximum value with the coil L303.

The audio frequency signal is obtained from IC301 the pin 8, from where the signal is connected to the pin 8 of the connector RP.

TEST POINT DATA

PP302 : 0.5 – 0.7 V DC during transmitting
TP301 : 0.5 – 0.7 V DC during transmitting
TP302 : 6.8 – 7.0 V DC on receive mode
TP303 : not used
TP304 : 4–11 V DC on receive mode (400...440 MHz)
TP305 : +10 – +14 dBm RF–signal from synthesizer
TP306 : +10 – +14 dBm RF–signal from synthesizer
TP307 : not used
TP308 : 4.2 – 4.4 V DC on receive mode
TP309 : not used
RP/3 : 0.69 x VFT_S during transmitting
RP/4 : 0 V on receive mode
RP/5 : RTC 0V on receive mode
RP/6 : RSSI 0...5.8 V
RP/7 : SQ 1–3,5V
RP/8 : AF 70 mVrms ±10 % (dev. 1,5kHz) ((12,5kHz channel spc))
260 mVrms ±10 % (dev. 3,0kHz) ((25kHz channel spc))

TRANSMITTER OPERATION

Transmitter block contains the following functional subblocks:

- first RF amplifier
- second RF amplifier
- RF amplifier module
- Directional coupler
- Low pass filter
- Antenna switching

The task of the power amplifier is to amplify the signal obtained from the transmitter's VCO to the power level which is adjustable from 1 W to 10 W.

The transmitter unit contains a two–stage RF amplifier, a power module,a directional coupler and a low pass filter with an antenna switching between the receiver and transmitter.

THE FIRST RF AMPLIFIER STAGE

The input signal from the synthesizer is brought via the ST connection,which is marked on the printed circuit board.

The purpose oh the amplifier is to amplify the +3 dBm signal obtained from the synthesizer to the selected output level.

The Input matching of the FET amplifier Q201 is formed by means of the micro striplines ML211,ML201 and ML202.

The Capacitor C201 acts as a DC isolator.

At the maximum output power,which is about 10 W,the gain on this stage is approximately 15 dB.

Gain is adjustable by changing the Gate 2 voltage.

The output of the first amplifier stage is matched to the second amplifier with the high pass filter L201,C205,R209,L202,C206 and ML202.

THE SECOND RF AMPLIFIER STAGE

From Q201's drain the signal is brought via the impedance matching circuit to the base of transistor Q202,which act's as a second RF amplifier. Q202's base is biased with a regulated DC voltage using R210 and D201.

Q202 amplifies the RF frequency signal approximately 10dB and the signal from it's collector is sent ahead for further amplification to pin 1 IC201, which is input of the first internal amplifier stage of the power output module.

The module amplifier stages receive their filtered collector voltages from Processor unit via the connector PP1.

RF AMPLIFIER MODULE

The RF amplifier module IC201 operates on the end frequency as well as the first and the second amplifier too.

IC201 is a three–stage power module,whose first stage is in class B, owning to it's quiescent current,it's operating voltage must be cut off during the receive operation.

The second and third stages operate in class C, which means that the current in them does not travel except transmitter is on and the RF module get it's driving RF power.

The gain in the module stages are approximately 20 dB

DIRECTIONAL COUPLER

Strip line ML206 functions as a directional coupler and by means of diode D202 a voltage that is proportional to the output power.

The DC voltage that is proportional to the output power is carried out to the Processor unit via the connector TP pin 4.

LOW PASS FILTER

The block contains the following sub–blocks:

– Antenna changeover

– lowpass filter

The task of the antenna filter is to accomplish antenna change over between the transmission and reception states.

During the transmission the unit operates as a filter for the transmitters harmonic frequency components.

RECEPTION

During reception,diode D203 (in the transmitter schematic diagram) and diode 302 (in the receiver schematic diagram) are disabled and the signal to be received is connected from the ANT connector to the SR–connection via the lowpass filter as well as the antenna changeover component.

TRANSMISSION

When the transmitter is started up,the logics (Processor unit) to the transmitter control TX ON pin to the active state.

The transmitter provides a bias voltage to diodes D203 and D302via the connector TP pin 5.

The diode D203 and D302 connect transmitter power via the low pass filter to the ANT connector.

TEST POINT DATA

TP/1	NC
TP/2	4.0 V 0.5 V 10 W output
TP/3	8.0 V 0.3 V TX ON reg.
TP/4	0.9 V 0.1 V 10 W output
TP/5	13.0 V
TP/6	10.8 ... 15.6 V supply voltage
TP/7	10.8 ... 15.6 V supply voltage
TP/8	10.8 ... 15.6 V supply voltage
TP207	0,9 V 0,1 V 10 W output
TP8	0.8 V 0,2 V 10 W output

SYNTHESIZER OPERATION

GENERAL

The synthesizer's task is to form an injection or first local oscillator signal to the receiver as well as a transmission signal,which is modulated with speech or data,to the transmitter.

In the RD 40 RF unit,a 45MHz intermediate frequency is used together with a high–level injection,such that the injection is an increment of one intermediate frequency above the reception frequency.

The synthesizer is formed from three separate blocks,

- synthesizer logic
- transmitter–VCO
- receiver–VCO

The synthesizer contains separate transmitter and receiver synthesizers. The synthesizer's operation is based on a digital phase–locked loop and the so–called two–base division principle.

The voltage–controlled oscillators (VCO's) are based on a modified Colpitts oscillator whose frequency is voltage–controlled by means of the capacitance diodes.

Modulation of the transmitter signal is based on deflection of the VCO's control voltage with a low frequency modulating signal.

OPERATING VOLTAGES

The synthesizer receives its operating voltage from Processor unit via the connector SP/4.The operating voltage is brought to the voltage regulators,which are 8.0V and 5.0V devices.

The 5V voltage functions as the supply voltage to the reference oscillator and synthesizer circuits.

8V voltage functions as the supply voltage to the receiver–VCO and the transmitter–VCO.

The step–up regulator's 18V voltage operates as a supply voltage to the loop filters as well as to the comparison frequency's filters.

SYNTHESIZER CIRCUITS AND TWO–BASE DIVISION METHOD

Operation of the TX and RX synthesizers is the same and therefore the operation of both shall be dealt with here.

Programmable dividers N and A in the synthesizer circuit operate as decrementing counters.

Inside the synthesizer circuit there is a programmable predivider, whose division number can be set to be either P or P+1.

Certain divisors are set for dividers N and A in such a way that A is smaller than N. The predivider's divisor is set to be P+1. On each pulse coming from the VCO, the predivider counts down by one. When it has counted to zero,it gives the A and N dividers one pulse,whereupon they in turn decrement by one.

When the predivider has given a number of pulses A,The A divider has counted to zero. This means that a number (P+1)*A of VCO's pulses has been counted.

When the A−divider has been reset,it changes the modulus control line's state and the predivider's divisor becomes the number P.

Now the N−divider continues decrementing on every pulse coming from the predivider until it is also reset to zero. Thus following resetting of the A−divider a number (N−A)*Pof VCO's pulses has been counted.

When N− has been reset,it gives the phase comparator one pulse and again changes the predivider's divisor to P+1,at which point the division operation begins from the beginning.

A total of (P+1)*A+(N−A)*P of VCO pulses,i.e. A+N*P during one round of division. In this case,the frequency going to the phase comparator is fVCO/(A+N*P). Since it should be the same as the comparison frequency fREF that is connected to the other input of the phase comparator,the frequency that is obtained for the

VCO is:

fVCO = (A+N*P) fREF

When counting the division factorit should be noted, that it is taken a second harmonic from the VCO to the synthesizer circuit.

Which means that the smallest channel spacing is 6.25 kHz.

On the basis of the above,the following formulas are obtained:

N = int(fVCO/(fREF*P) int = indiger part

A = fVCO/fREF − N*P

In the synthesizer used MB1501

N = 16 ... 2047 (dec.)

A = 0 ... 127 (dec.)

P = 64/65 or 128/129 (programmable)

The divisor of reference divider R is set on the basis of the channel spacing in such a way that the frequency of the reference oscillator divided by R is fREF.

Divisors R,N and A must first be converted to binary code before they can be brought to the dividers.

5V REGULATOR

IC2 is 5 V regulator,which provides operating voltages to the circuits X1, IC3 and IC5.

8 V REGULATOR

IC1 functions as an 8 V regulator and provides operating voltages to RXVCO and TXVCO.

18 V STEP–UP CIRCUIT

18 V step–up circuit's (located in the Processor unit)

18 V voltage provides operating voltages to IC4 and IC6 which act's as the loop filters.

REFERENCE OSCILLATOR

X1 is a temperature–compensated crystal oscillator from which a 12.5 kHz comparison frequency is obtained for the phase detector by dividing the oscillator's 12.8 MHz frequency with the divider in the PLL circuit.

PLL CIRCUITS

Both synthesizer circuits IC3 and IC5 are identical and implemented on the two–base divider principle.

From IC3 pin 7 a 5 V locking signal is obtained which is buffered by Q1 and brought via the SP pin 8 connector to the Processor unit.

If the transmitter VCO is locked, the locking signal is 0 V and the transmitter start up is enabled.

LOOP FILTERS

The two important task of the loop filter are to form from the phase comparator's output pulses an interference–free DC voltage to control the VCO and also to filter the noise which is generated in the loop and which impairs the purity of the VCO's signal.

The phase comparator's outputs are connected to the active low pass filter IC4 (IC6) in order to form a pure regulating voltage and so as to increase the VCO's regulating voltage range.

Thereafter the regulating voltage is brought via RC loops to the VCO.

RECEIVER–VCO

The RXVCO–block contains following sub–blocks:

- VCO
- three RF amplifiers
- lowpass filter
- second harmonic feedback filter Q12

The VCO circuit that is implemented is a modified Colpitts oscillator, whose active component is Q8, with strip ML30, ML24, C112, C142 C133, C67, D7 acting as the resonator.

Frequency band is selected by changing the length of ML24 and changing the component value of C112 and C75.

The small capacitor C77 is used to take a small part of the oscillator's power,which is amplified with Q9,Q15,Q11.

Q9's gain is approximately 18 dB.

Between Q9 and Q15 there is 5 dB attenuator.

The receiver's injection signal,which power is +12 dBm,is brought from connection SR to the receiver block.

The part of the power is obtained from the final buffer amplifier Q11 to the second harmonic feedback filter Q12 as to serve as feedback to the predivider.

TRANSMITTER–VCO

The block contains the following sub–blocks:

- VCO
- three RF amplifiers
- second harmonic feedback filter Q6

The VCO circuit is implemented as a modified Colpitts oscillator in which the Q2 acts as the active component and ML3, ML29, C21,C17, C111, D3 and C110 as the resonator.

Regulation of the VCO is accomplished by altering the length of C110's earth strip and band changing is handled with a capacitor that is connected in parallel with C110.

The modulation is brought via a voltage divider to the anode of D3, with the frequency regulation voltage at the cathode.

Transistors Q3, Q4 and Q5 acts as isolating amplifiers in order to achieve adequate separation between the transmitter and VCO.

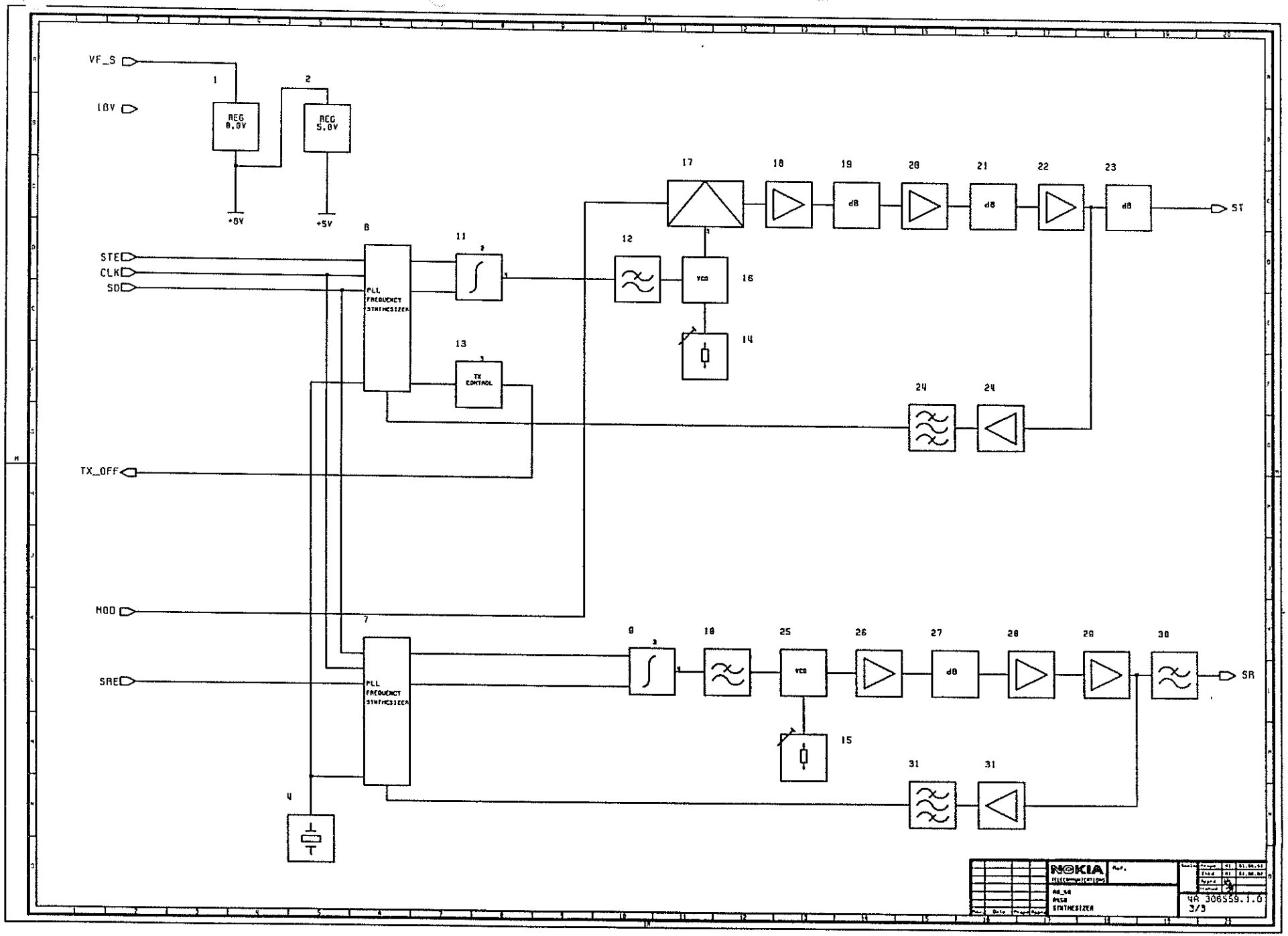
Feedback to the predivider is obtained from the Q5's collector via the second harmonic feedback filter Q6.

SIMPLEX OPERATION

In one channel simplex operation, TX and RX are using the same frequency, tx –synthesizer is shifted up 10 channels (125kHz) during reception. This prevents the possible interference from the TX–VCO to go to the receiver.

Due to this the channel setting time in simplex operation is longer than in the semiduplex operation.

During transmitting the receiver audio path is muted.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REG 5,0V
+8V
+5V
17
18
19
20
21
22
23
dB
ST
STE
CLK
SD
8
11
PLL FREQUENCY SYNTHESIZER
12
VCO
16
14
13
TX CONTROL
24
24
TX_OFF
MOD
7
9
10
25
26
27
28
29
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VCO
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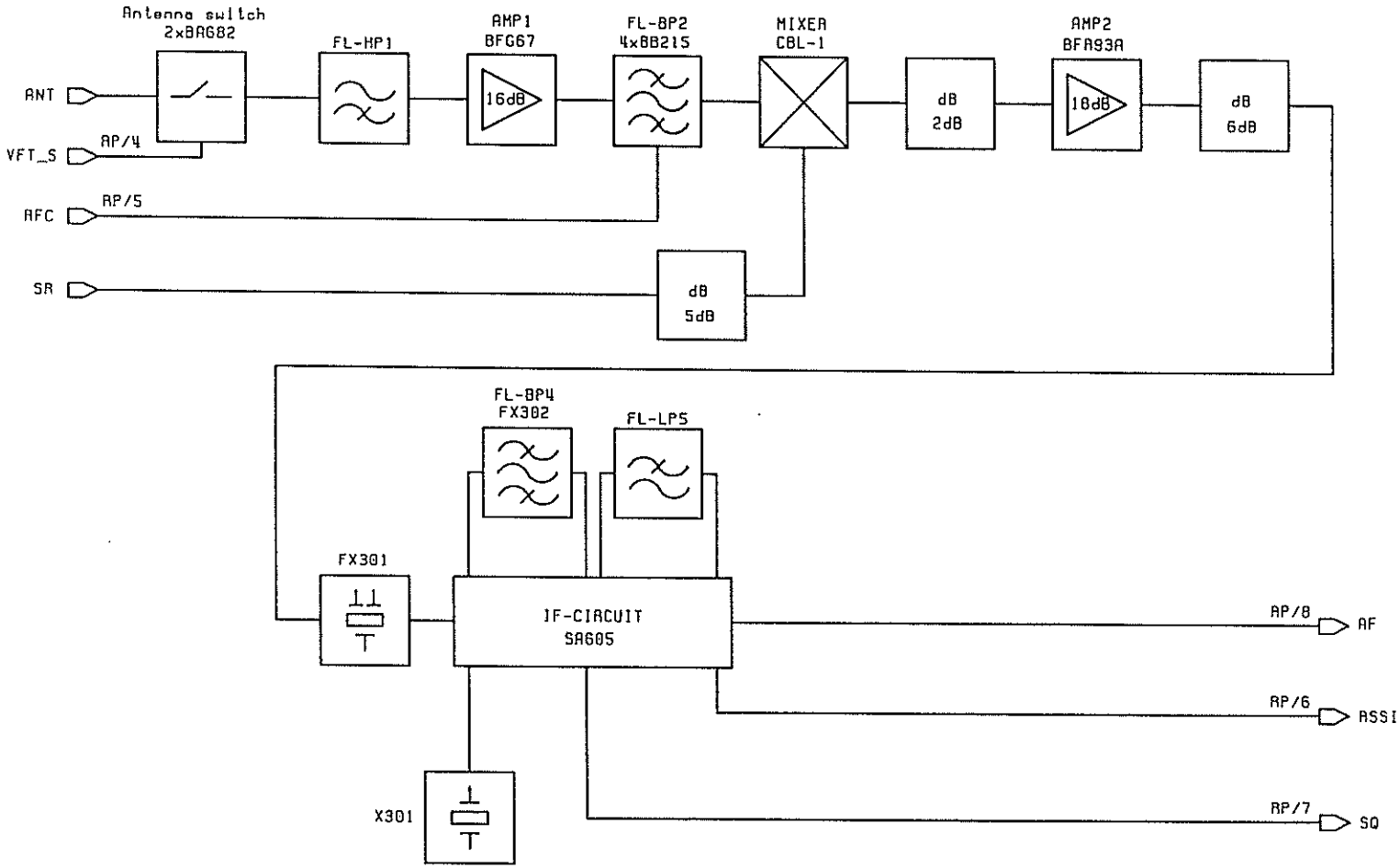

Rev.	Date	Prepd	Apprd	NOKIA TELECOMMUNICATIONS	Ref.
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				Scale	
				Prepd	AH1 12.03.92
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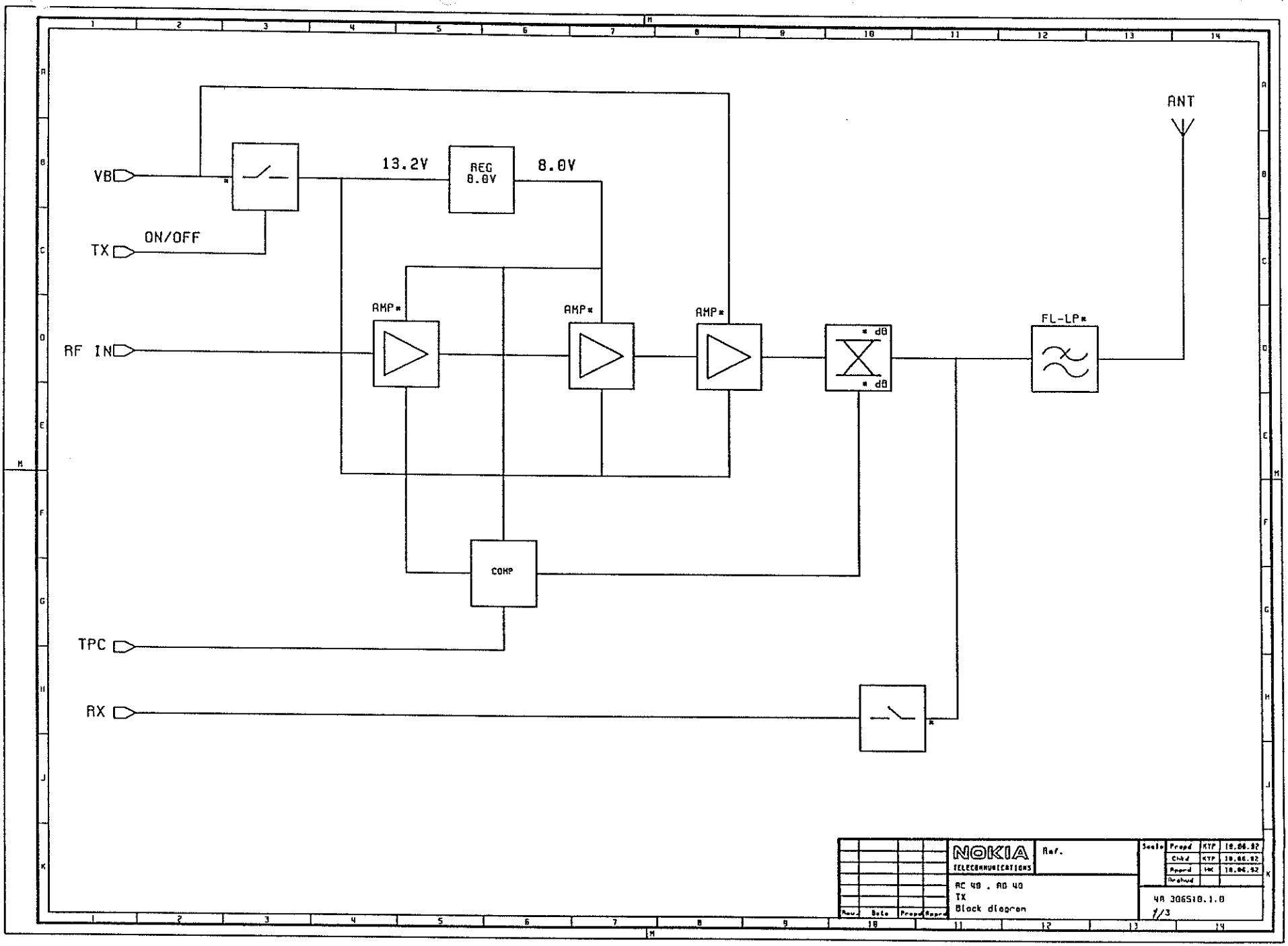
				Apprd	11.08.92
				Approved	
				4A 306558.1.0 2/3	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REG
8.0V
8.0V
TX
ON/OFF
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AMP*
AMP*
* dB
* dB
FL-LP*
RF IN
COMP
TPC
RX
NOKIA
TELECOMMUNICATIONS
Ref.
AC 40 , AD 40
TX
Block diagram
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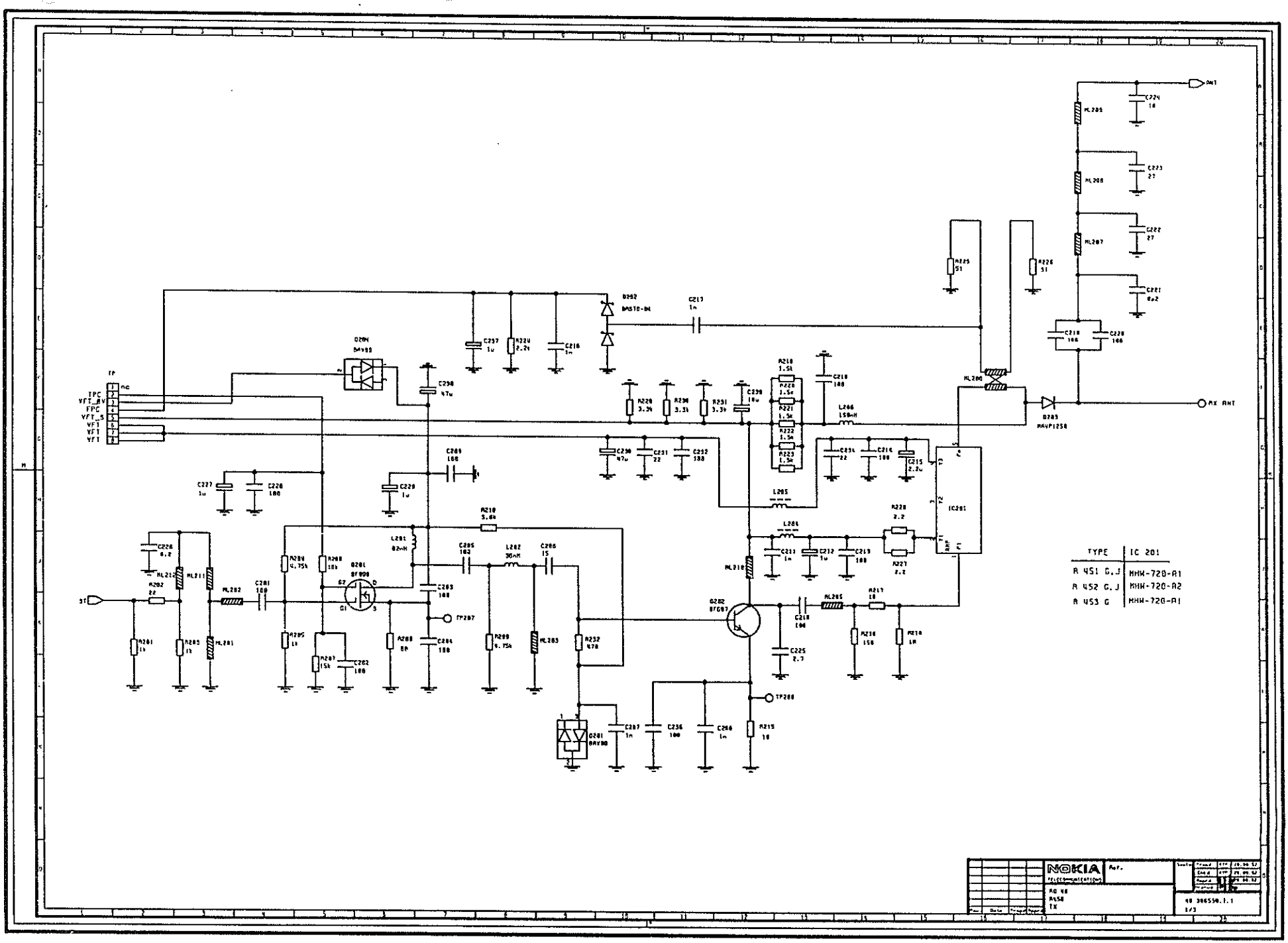
1/3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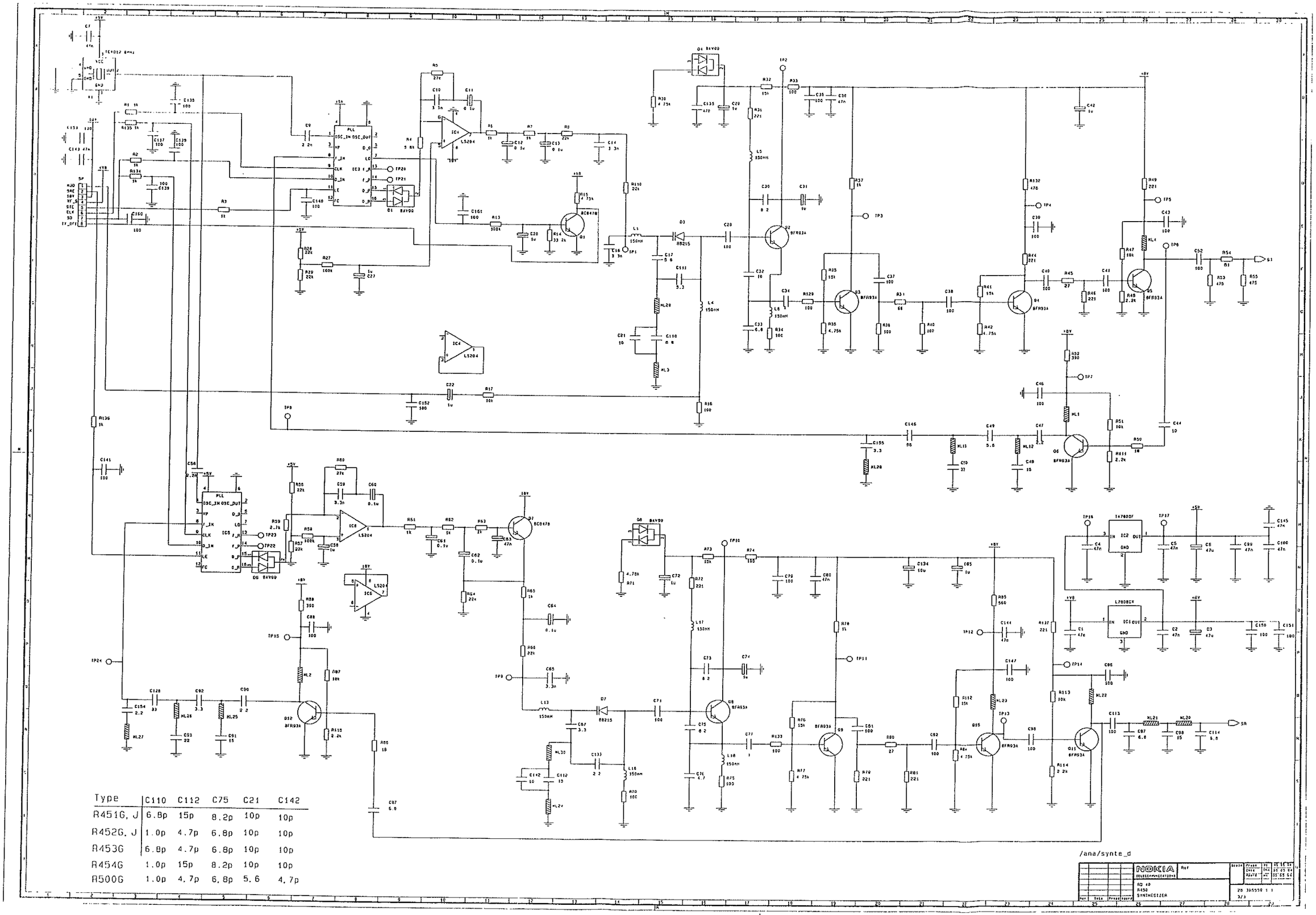
R 451 G,J | MMW-720-A1
R 452 G,J | MMW-720-A2
R 453 G | MMW-720-A1
NOKIA
RX
TX



Type	C110	C112	C75	C21	C142
R451G, J	6.8p	15p	8.2p	10p	10p
R452G, J	1.0p	4.7p	6.8p	10p	10p
R453G	6.8p	4.7p	6.8p	10p	10p
R454G	1.0p	15p	8.2p	10p	10p
R500G	1.0p	4.7p	6.8p	5.6	4.7p

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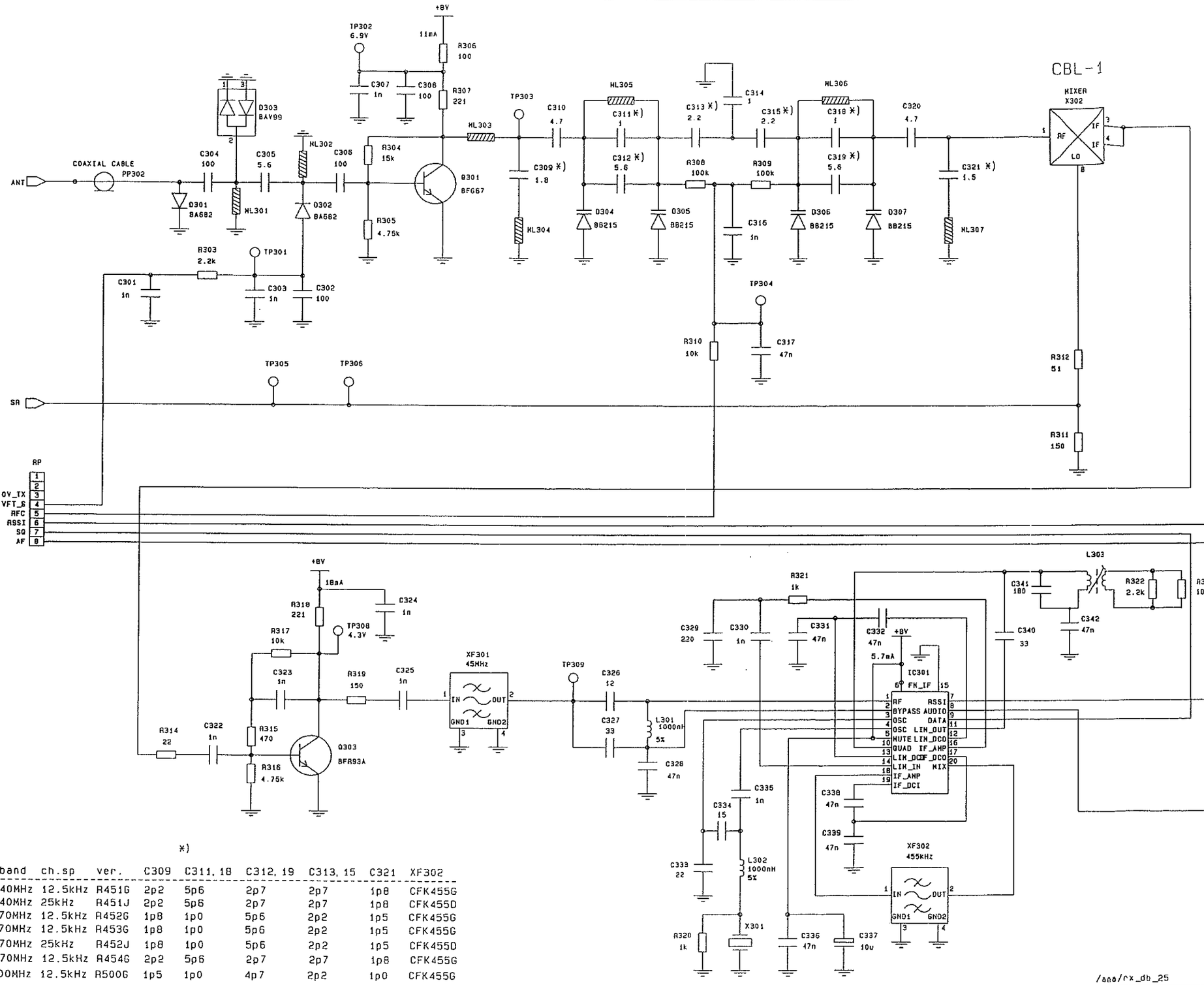
NOKIA

RD 40
R450
SYNTHESIZER

3/3



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Freq.band	ch.sp	ver.	C309	C311, 18	C312, 19	C313, 15	C321	XF302
400-440MHz	12.5kHz	R451G	2p2	5p6	2p7	2p7	1p8	CFK455G
400-440MHz	25kHz	R451J	2p2	5p6	2p7	2p7	1p8	CFK455D
430-470MHz	12.5kHz	R452G	1p8	1p0	5p6	2p2	1p5	CFK455G
430-470MHz	12.5kHz	R453G	1p8	1p0	5p6	2p2	1p5	CFK455G
430-470MHz	25kHz	R452J	1p8	1p0	5p6	2p2	1p5	CFK455D
400-470MHz	12.5kHz	R454G	2p2	5p6	2p7	2p7	1p8	CFK455G
470-500MHz	12.5kHz	R500G	1p5	1p0	4p7	2p2	1p0	CFK455G

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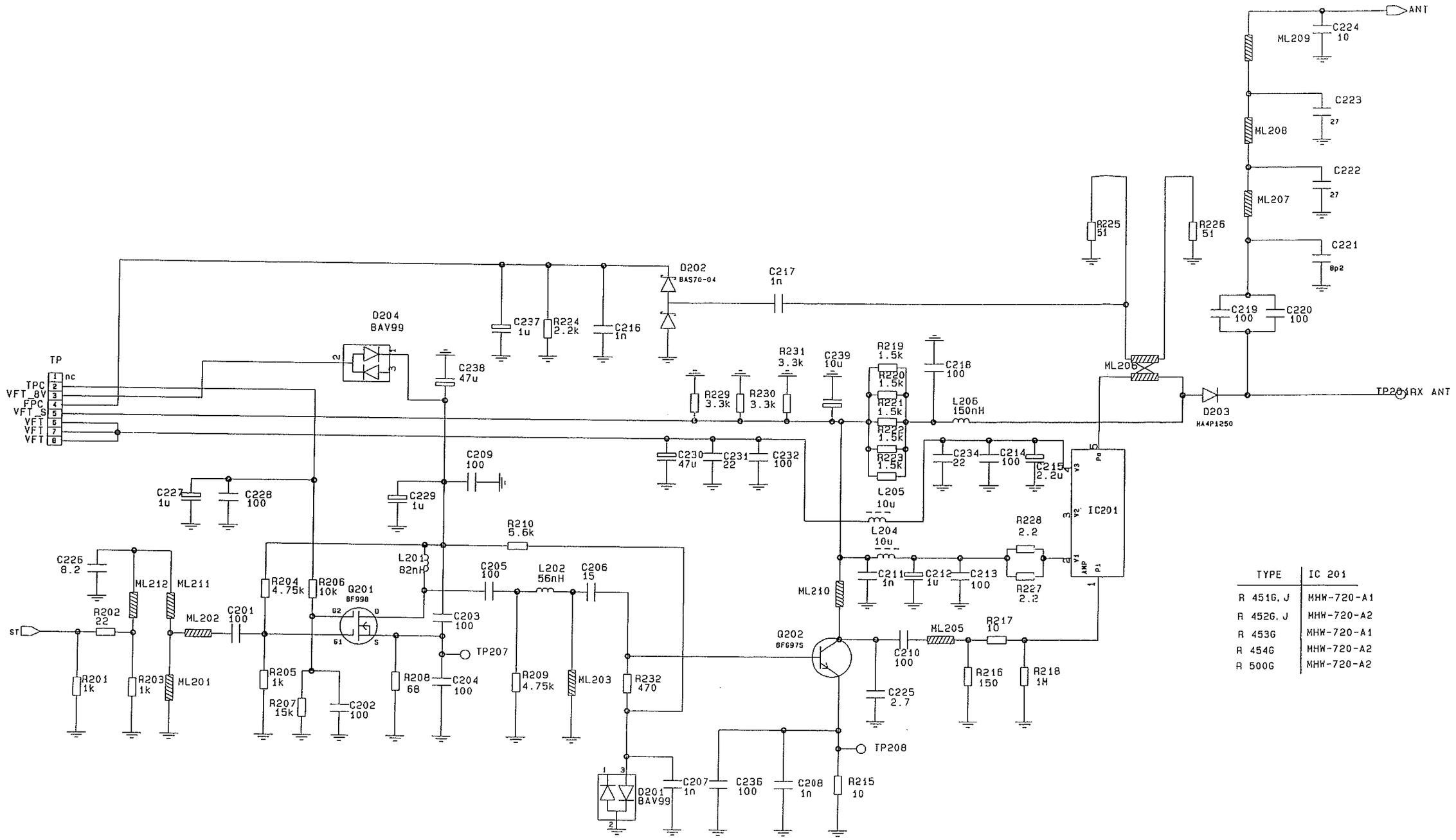
NOKIA TELECOMMUNICATIONS

Ref.

Scale	Prepd	PK	05.05.94
	Chkd	IKn	05.05.94
	Apprd	HK	05.05.94
	Archvd		

RD 40
R450
RX

38 306599.1.1
2/3



TYPE	IC 201
R 451G, J	MHW-720-A1
R 452G, J	MHW-720-A2
R 453G	MHW-720-A1
R 454G	MHW-720-A2
R 500G	MHW-720-A2

/user/ana/tx_db

NOKIA TELECOMMUNICATIONS

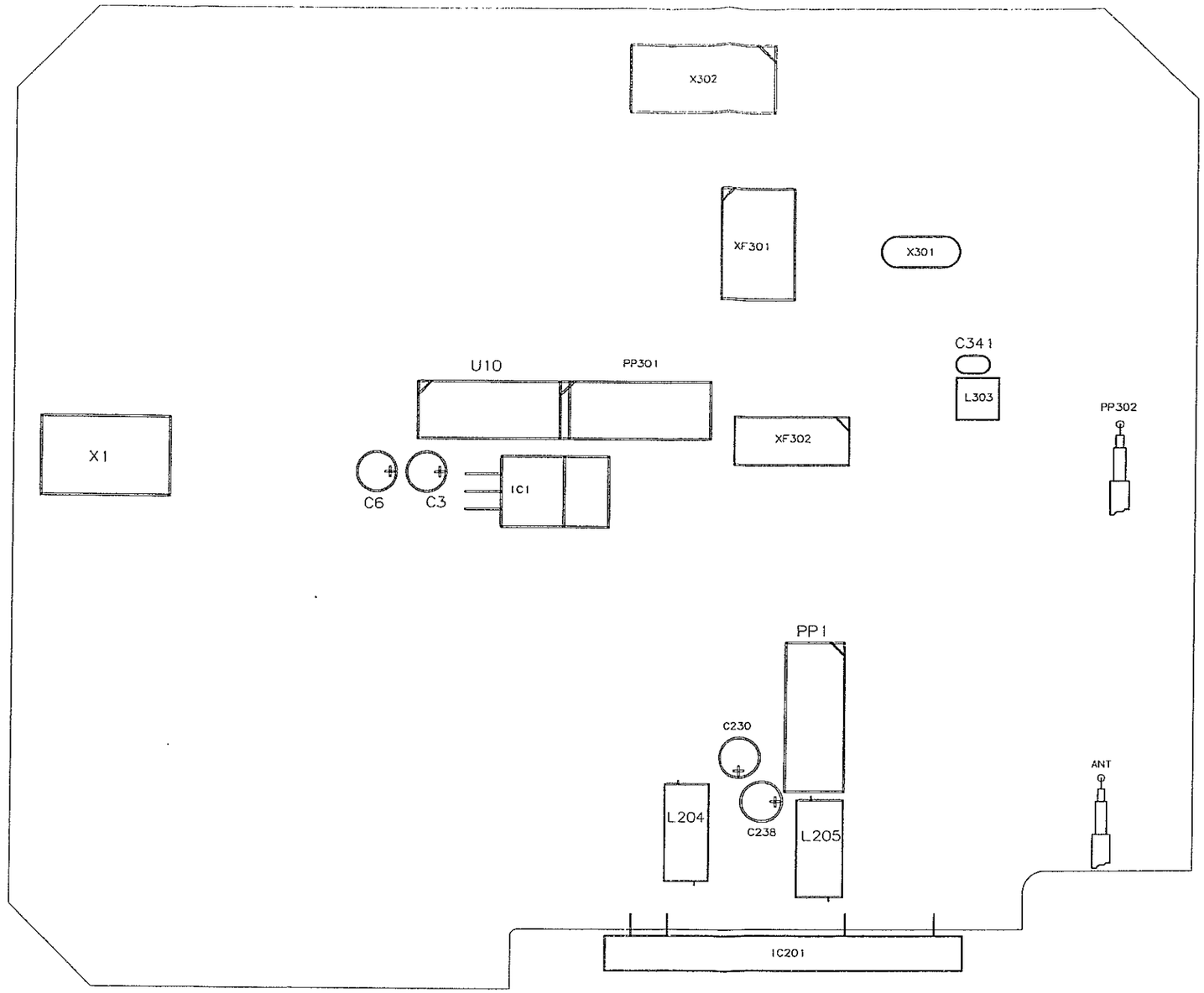
Ref.

Scale	Prepd	PK	05.05.94
	Chkd	IKn	05.05.94
	Apprd	MK	05.05.94
	Archvd		

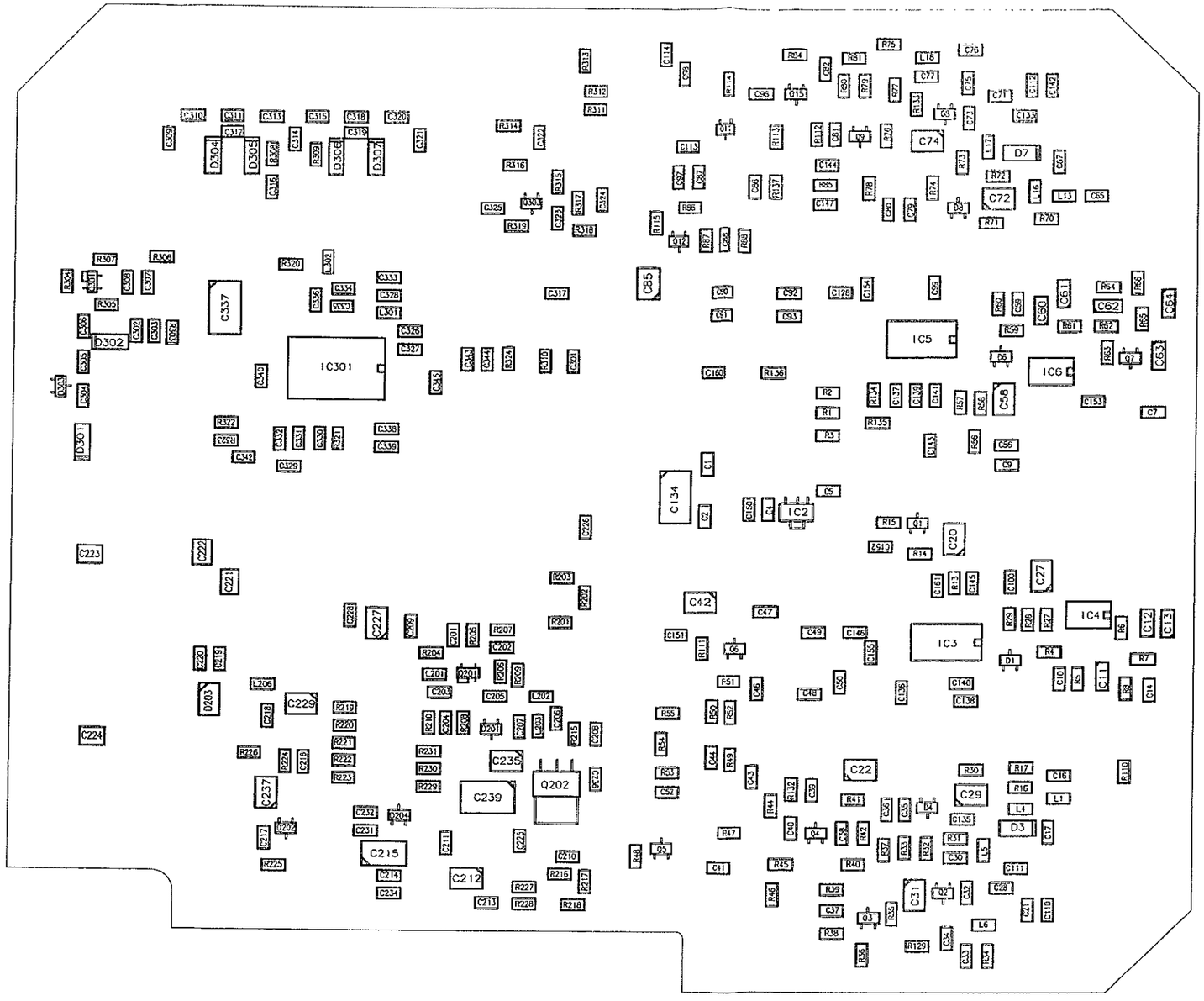
RD 40
R450
TX

4B 306559.1.1
1/3

Rev.	Date	Prepd	Apprd



NO	DATE	CHAN NO	APPRD	NOKIA CELLULAR SYSTEMS	REF 9881579 0S	SCALE	PREPD	MH	02.08.93
							CHKD	MH	02.08.93
							APPRD	LRa	02.08.93
							ARCHVD		
				RD40 R450		3C 306559.0S			



NO	DATE	CHAN. NO	APPRD	NOKIA CELLULAR SYSTEMS	REF. 9881579 OS	SCALE			
							PREPD	MH	02.08.93
							CHKD	MH	02.08.93
							APPRD	LRa	02.08.93
							ARCHVD		
				RD40 R450			3C 306559.OS		

ITEM..: 0306559 R451G RF UNIT ALL RF PARTS Version: 1.0

ID-code	Partno	Description	Value	Type	Cover	Psqty	Rec.
HISTORIA	27.08.92 PK 31.08.92 PK, 07.09.92 PK 03.11.92 PK C334 30.11.92 PK, HÄIRIÖPELTI JA RF-NAUHA SIIRRETTY KOONTAOSIIN 19.05.93 MR, SIISTITTY	HISTORY				0.00	
DOKU	4B 306559 1/3 3B 306559 2/3, 2B 306559 3/3	ASSOCIATED DRAWINGS				0.00	
1426026	R227,228	MELF RESISTOR	2.2R 2% 0.125 W	NESS 142A4	0204	2.00	213
2305274	C341	CERAMIC CAPACITOR	180 pF 2% N1500 100V	MOSS 2 230/11	RM 1	1.00	203
3640180	L202	INDUCTOR CHIP	56nH 10% 0.2R Q45/100 FR>		1206	1.00	213
3640231	L1,4-6,13,16-18,206	INDUCTOR CHIP	150nH 10% 0.3R Q45/100 FR		1206	9.00	213
3609490	L303	COIL	660uH Q100/455kHz	5PLN-3888A		1.00	203
3640383	L301,302	INDUCTOR CHIP	1000nH 5% 2.8R Q28/35 FR>		1206	2.00	213
4505380	X301	CRYSTAL	VT-CRYSTAL 44.545 MHz	UM2 44.545MHz	HC49/U	1.00	202
5436850	SP,TP,RP	CONNECTOR	8F-POLE PCB	4455-08BK		3.00	204
5405436	5	BUSHING	D3.6L10mm CuZn DIN46228	ART.NO.51428		1.00	204
5420018	3 (A+B+C)	TNC-CONNECTOR	TNC50 CABLE CRIMP RG223/U	21 TNC-50-3-9C/133		1.00	204
5405060	4	BUSHING	D6.0X12.0mm CuZn DIN46228	ART.NO.51436		1.00	204
7139928	PP302	COAXIAL CABLE	50R D1.3mm PTFE	K 01202-06		0.10	204
1411324	R215,217	CHIP RESISTOR	10R 5% 0.125 W	MOSS 2 140/5	1206	2.00	213
1411356	R50,86	CHIP RESISTOR	18R 5% 0.125 W	MOSS 2 140/5	1206	2.00	213
1411363	R202,314	CHIP RESISTOR	22R 5% 0.125 W	MOSS 2 140/5	1206	2.00	213
1411370	R45,80	CHIP RESISTOR	27R 5% 0.125 W	MOSS 2 140/5	1206	2.00	213
1411451	R39,208	CHIP RESISTOR	68R 5% 0.125 W	MOSS 2 140/5	1206	2.00	213
1411613	R52,88	CHIP RESISTOR	390R 5% 0.125 W	MOSS 2 140/5	1206	2.00	213
1411645	R85	CHIP RESISTOR	560R 5% 0.125 W	MOSS 2 140/5	1206	1.00	213
1411726	R48,111,114,115,224,303,322	CHIP RESISTOR	2.2k 5% 0.125 W	MOSS 2 140/5	1206	7.00	213
1411733	R59	CHIP RESISTOR	2.7k 5% 0.125 W	MOSS 2 140/5	1206	1.00	213
1411740	R229-231	CHIP RESISTOR	3.3k 5% 0.125 W	MOSS 2 140/5	1206	3.00	213

ITEM..: 0306559 R451G RF UNIT ALL RF PARTS Version: 1.0

ID-code	Partno	Description	Value	Type	Cover	Psqty	Rec.
1411772	R4,210	CHIP RESISTOR	5.6k 5% 0.125 W	MOSS 2 140/5	1206	2.00	213
1411807	R17,47,51,87,113,206,310,317, 323	CHIP RESISTOR	10k 5% 0.125 W	MOSS 2 140/5	1206	9.00	213
1411821	R32,35,41,73,76,112,207,304	CHIP RESISTOR	15k 5% 0.125 W	MOSS 2 140/5	1206	8.00	213
1411846	R8,28,29,56,57,64,66,110	CHIP RESISTOR	22k 5% 0.125 W	MOSS 2 140/5	1206	8.00	213
1411853	R5,60	CHIP RESISTOR	27k 5% 0.125 W	MOSS 2 140/5	1206	2.00	213
1411927	R13,27,58,308,309,324	CHIP RESISTOR	100k 5% 0.125 W	MOSS 2 140/5	1206	6.00	213
1412046	R218	CHIP RESISTOR	1.0M 5% 0.125 W	MOSS 2 140/5	1206	1.00	213
1415600	R1-3,6,7,37,61-63,65,78, 134-136,201,203,205,320,321	MELF RESISTOR	1.0k 1% 0.125 W	NESS 142A4	0204	19.00	213
1415649	R216,311,319	MELF RESISTOR	150R 1% 0.125 W	NESS 142A4	0204	3.00	213
1415657	R16,33,34,38,40,70,74,75,129, 133,306	MELF RESISTOR	100R 1% 0.125 W	NESS 142A4	0204	11.00	213
1415738	R219-223	MELF RESISTOR	1.5k 1% 0.125 W	NESS 142A4	0204	5.00	213
1415784	R15,30,36,42,71,77,84,204,209 305,316	MELF RESISTOR	4k75 1% 0.125 W	NESS 142A4	0204	11.00	213
1415833	R31,44,46,49,72,79,81,137,307 318	MELF RESISTOR	221R 1% 0.125 W	NESS 142A4	0204	10.00	213
1415960	R14	MELF RESISTOR	33k2 1% 0.125 W	NESS 142A4	0204	1.00	213
1416280	R53,55,132,232,315	MELF RESISTOR	475R 1% 0.125 W	NESS 142A4	0204	5.00	213
1416943	R54,225,226,312	MELF RESISTOR	51R 1% 0.125 W	NESS 142A4	0204	4.00	213
2309394	C344	CERAMIC CHIP CAPACITOR	10 nF 10% 50V X7R CHIP	MOSS 2 230/15	1206	1.00	213
2309475	C1,2,4,5,7,36,80,99,100, 143-145,317,328,331,332,336, 338,339,342	CERAMIC CHIP CAPACITOR	47 nF 10% 50V X7R CHIP	MOSS 2 230/15	1206	20.00	213
2309669	C34,77,314	CERAMIC CHIP CAPACITOR	1.0pF/0.25 50V NP0 CHIP	MOSS 2 230/11	1206	3.00	213
2309700	C321	CERAMIC CHIP CAPACITOR	1.8pF/0.25 50V NP0 CHIP	MOSS 2 230/11	1206	1.00	213
2309718	C67,92,111,155	CERAMIC CHIP CAPACITOR	3.3pF/0.25 50V NP0 CHIP	MOSS 2 230/11	1206	4.00	213
2309725	C17,49,305,311,318	CERAMIC CHIP CAPACITOR	5.6pF/0.25 50V NP0 CHIP	MOSS 2 230/11	1206	5.00	213
2309732	C30,73,75,226	CERAMIC CHIP CAPACITOR	8.2pF/0.25 50V NP0 CHIP	MOSS 2 230/11	1206	4.00	213
2309749	C47,90,133,154,309	CERAMIC CHIP CAPACITOR	2.2pF/0.25 50V NP0 CHIP	MOSS 2 230/11	1206	5.00	213

ITEM..: 0306559 R451G RF UNIT ALL RF PARTS Version: 1.0

ID-code	Partno	Description	Value	Type	Cover	Psqty	Rec.
2309757	C225,312,313,315,319	CERAMIC CHIP CAPACITOR	2.7pF/0.25 50V NP0 CHIP	MOSS 2 230/11	1206	5.00	213
2309771	C76,310,320	CERAMIC CHIP CAPACITOR	4.7pF/0.25 50V NP0 CHIP	MOSS 2 230/11	1206	3.00	213
2309789	C33,87,97,110,114	CERAMIC CHIP CAPACITOR	6.8pF/0.25 50V NP0 CHIP	MOSS 2 230/11	1206	5.00	213
2309926	C21,32,44,142	CERAMIC CHIP CAPACITOR	10 pF 5% 50V NP0 CHIP	MOSS 2 230/11	1206	4.00	213
2309933	C326	CERAMIC CHIP CAPACITOR	12 pF 5% 50V NP0 CHIP	MOSS 2 230/11	1206	1.00	213
2309940	C48,91,98,112,206	CERAMIC CHIP CAPACITOR	15 pF 5% 50V NP0 CHIP	MOSS 2 230/11	1206	5.00	213
2309965	C93,231,234,333,334	CERAMIC CHIP CAPACITOR	22 pF 5% 50V NP0 CHIP	MOSS 2 230/11	1206	5.00	213
2309989	C50,128,327,340	CERAMIC CHIP CAPACITOR	33 pF 5% 50V NP0 CHIP	MOSS 2 230/11	1206	4.00	213
2310015	C146	CERAMIC CHIP CAPACITOR	56 pF 5 % 50V NP0 CHIP	MOSS 2 230/11	1206	1.00	213
2310047	C28,35,37-41,43,46,52,71,79, 81,82,86,88,96,113,136-141, 147,150-153,160,161,201-205, 209,210,213,214,218-220,228, 232,236,302,304,306,308,345	CERAMIC CHIP CAPACITOR	100pF 5 % 50V NP0 CHIP	MOSS 2 230/11	1206	51.00	213
2310086	C329	CERAMIC CHIP CAPACITOR	220pF 5 % 50V NP0 CHIP	MOSS 2 230/11	1206	1.00	213
2310128	C135	CERAMIC CHIP CAPACITOR	470pF 5 % 50V NP0 CHIP	MOSS 2 230/11	1206	1.00	213
2310167	C207,208,211,216,217,301,303, 307,316,322-325,330,335	CERAMIC CHIP CAPACITOR	1.0nF 5 % 50V NP0 CHIP	MOSS 2 230/11	1206	15.00	213
2310209	C9,56	CERAMIC CHIP CAPACITOR	2.2nF 5 % 50V NP0 CHIP	MOSS 2 230/11	1206	2.00	213
2310223	C10,14,16,59,65	CERAMIC CHIP CAPACITOR	3.3nF 5 % 50V NP0 CHIP	MOSS 2 230/11	1206	5.00	213
2311114	C221	CERAMIC CHIP CAPACITOR	8.2pF/0.25 400V HQ CHIP		1210	1.00	213
2311121	C224	CERAMIC CHIP CAPACITOR	10 pF 5 % 400V HQ CHIP		1210	1.00	213
2311178	C222,223	CERAMIC CHIP CAPACITOR	27 pF 5 % 400V HQ CHIP		1210	2.00	213
2505180	C3,6,230,238	ALUM.ELECTROLYTIC CAPACIT	47 uF 20% 25V	MOSS 2 250/2	RM 1	4.00	203
2604022	C11-13,60-62,64	TANTALUM CHIP CAPACITOR	100 nF 20% 35V CHIP	MOSS 2 260/2	3216	7.00	213
2604093	C215	TANTALUM CHIP CAPACITOR	2.2 uF 20% 35V CHIP	MOSS 2 260/2	6032	1.00	213
2604110	C134,239,337	TANTALUM CHIP CAPACITOR	10 uF 20% 25V CHIP	MOSS 2 260/2	7343	3.00	213
2610010	C20,22,27,29,31,42,58,72,74, 85,212,227,229,237	TANTALUM CHIP CAPACITOR	1.0 uF 20% 35V CHIP	NESS 261A1	3528	14.00	213
2612701	C63	TANTALUM CHIP CAPACITOR	47 nF 20% 35V CHIP	NESS 261A1	3216	1.00	213
3606825	L204,205	CHOKE	9uH 2.5 TURNS 600R/50MHz	WBC2.5-4B1-R		2.00	403

ITEM..: 0306559 R451G RF UNIT ALL RF PARTS Version: 1.0

ID-code	Partno	Description	Value	Type	Cover	Psqty	Rec.
3608132	L201	INDUCTOR CHIP	82nH 10% 0.2R Q45/100 FR>	MOSS 2 360/2	1206	1.00	213
4100285	D1,4,6,8,201,204,303	DIODE PAIR	70V 0.2A 6ns IN SERIES	BAV99	SOT23	7.00	212
4100567	D202	SCHOTTKY DIODE	70V 50mA 0.41V/200nA 0.14	BAS70-04	SOT23	1.00	212
4106135	D3,7,304-307	VARICAP DIODE	30V 17pF/1V 2pF/28V	BB215	SOD68	6.00	202
4114556	D203	PIN DIODE	50V 50mA 4us 0.5R 0.9pF	MA4P1250	1210	1.00	212
4114842	D301,302	PIN DIODE	35V 100mA 0.5R 1.2pF/3V	BA682	SOD80	2.00	212
4200709	Q2-6,8,9,11,12,15,303	TRANSISTOR	N 5GHz 12V 35mA 0.25W/56H	BFR93A/ON4238	SOT23	11.00	212
4203049	Q201	MOSFET	N 12V 30mA VP2.5V	BF998	SOT143	1.00	212
4205413	Q202	TRANSISTOR	N 5.5GHz 15V 0.1A 1W/1GHz	BFG97	SOT223	1.00	212
4210055	Q1,7	TRANSISTOR	N 300MHz 45V 0.1A 0.25W >	BCW72	SOT23	2.00	212
4211967	Q301	TRANSISTOR	N 2GHz 20V 50mA 0.3W >60	BFG67	SOT143	1.00	212
4303084	IC4,6	ANALOG IC	OP.AMP 2X LOW NOISE	LS204D	SO8S	2.00	211
4304427	IC1	ANALOG IC	USE 4304426 SGS	L7808CV	TO220	1.00	201
4343158	IC3,5	DIGITAL IC	PLL FREQ.SYNTH/PRESCAL. 1	MB1501LPF	SO16L	2.00	211
4345182	IC2	ANALOG IC	REG +5V 0.15A	TA78L05F	SOT89	1.00	211
4349396	IC301	ANALOG IC	FM IF SYSTEM 4.5-8V	SA605D	SO20W	1.00	211
4303363	IC201	TRANSMITTER MODULE	400-440MHz 12.5V 20W	MHW720A1X	700-04	1.00	205
4354048	X302	ANALOG IC	MIXER DOUBLE BAL 1-1000MH	CBL1	L20W10H7.6	1.00	201
4503801	XF302	CERAMIC FILTER	455 kHz+-4 KHz	CFK 455G	L16W7.4H10	1.00	202
4505637	X1	CRYSTAL OSCILLATOR	12.8 MHz TCXO +-2.5 PPM	TCO 909F 12.8MHz	19X12X9	1.00	202
4504698	XF301	CRYSTAL FILTER	45.0 MHz+-7.5 kHz	RF 15BT 45.000	18X10X12	1.00	202
7130270	2	COAXIAL CABLE	50+-2R 2.95/5.3mm 2.5kV P	MOSS 2 713/1		0.15	204
9207930		FIXING DEVICE FOR MODULE				2.00	506
9207962		STRAIN RELIEF				1.00	506
9881579		PCB 1.6D		R 450 jep suoraan ku parille		1.00	518

Structure parts.....: 98 pci

ITEM..: 0309310 R500G RF-UNIT INCLUDE ALL RF-PARTS Version: 1.0

ID-code	Partno	Description	Value	Type	Cover	Psqty	Rec.
HISTORIA	23.03.94,KOPIOITU R452G MUUTOKSIA TULEE/ HK	HISTORY				0.00	
DOKU	4B 306559 1/3 3B 306559 2/3, 2B 306559 3/3	ASSOCIATED DRAWINGS				0.00	
1426026	R227,228	MELF RESISTOR	2.2R 2% 0.125 W	NESS 142A4	0204	2.00	213
2305274	C341	CERAMIC CAPACITOR	180 pF 2% N1500 100V	MOSS 2 230/11	RM 1	1.00	203
3640180	L202	INDUCTOR CHIP	56nH 10% 0.2R Q45/100 FR>		1206	1.00	213
3640231	L1,4-6,13,16-18,206	INDUCTOR CHIP	150nH 10% 0.3R Q45/100 FR		1206	9.00	213
3609490	L303	COIL	660uH Q100/455kHz	5PLN-3888A		1.00	203
3640383	L301,302	INDUCTOR CHIP	1000nH 5% 2.8R Q28/35 FR>		1206	2.00	213
4505380	X301	CRYSTAL	VT-CRYSTAL 44.545 MHz	UM2 44.545MHz	HC49/U	1.00	202
5436850	SP,TP,RP	CONNECTOR	8F-POLE PCB	4455-08BK		3.00	204
5405436	5	BUSHING	D3.6L10mm CuZn DIN46228	ART.NO.51428		1.00	204
5420018	3 (A+B+C)	TNC-CONNECTOR	TNC50 CABLE CRIMP RG223/U	21 TNC-50-3-9C/133		1.00	204
5405060	4	BUSHING	D6.0X12.0mm CuZn DIN46228	ART.NO.51436		1.00	204
7139928	PP302	COAXIAL CABLE	50R D1.3mm PTFE	K 01202-06		0.10	204
1411324	R215,217	CHIP RESISTOR	10R 5% 0.125 W	MOSS 2 140/5	1206	2.00	213
1411356	R50,86	CHIP RESISTOR	18R 5% 0.125 W	MOSS 2 140/5	1206	2.00	213
1411363	R202,314	CHIP RESISTOR	22R 5% 0.125 W	MOSS 2 140/5	1206	2.00	213
1411370	R45,80	CHIP RESISTOR	27R 5% 0.125 W	MOSS 2 140/5	1206	2.00	213
1411451	R39,208	CHIP RESISTOR	68R 5% 0.125 W	MOSS 2 140/5	1206	2.00	213
1411613	R52,88	CHIP RESISTOR	390R 5% 0.125 W	MOSS 2 140/5	1206	2.00	213
1411645	R85	CHIP RESISTOR	560R 5% 0.125 W	MOSS 2 140/5	1206	1.00	213
1411726	R48,111,114,115,224,303,322	CHIP RESISTOR	2.2k 5% 0.125 W	MOSS 2 140/5	1206	7.00	213
1411733	R59	CHIP RESISTOR	2.7k 5% 0.125 W	MOSS 2 140/5	1206	1.00	213
1411740	R229-231	CHIP RESISTOR	3.3k 5% 0.125 W	MOSS 2 140/5	1206	3.00	213
1411772	R4,210	CHIP RESISTOR	5.6k 5% 0.125 W	MOSS 2 140/5	1206	2.00	213
1411807	R17,47,51,87,113,206,310,317, 323	CHIP RESISTOR	10k 5% 0.125 W	MOSS 2 140/5	1206	9.00	213
1411821	R32,35,41,73,76,112,207,304	CHIP RESISTOR	15k 5% 0.125 W	MOSS 2 140/5	1206	8.00	213
1411846	R8,28,29,56,57,64,66,110	CHIP RESISTOR	22k 5% 0.125 W	MOSS 2 140/5	1206	8.00	213

ITEM..: 0309310 R500G RF-UNIT INCLUDE ALL RF-PARTS Version: 1.0

ID-code	Partno	Description	Value	Type	Cover	Psqty	Rec.
1411853	R5,60	CHIP RESISTOR	27k 5% 0.125 W	MOSS 2 140/5	1206	2.00	213
1411927	R13,27,58,308,309,324	CHIP RESISTOR	100k 5% 0.125 W	MOSS 2 140/5	1206	6.00	213
1412046	R218	CHIP RESISTOR	1.0M 5% 0.125 W	MOSS 2 140/5	1206	1.00	213
1415600	R1-3,6,7,37,61-63,65,78, 134-136,201,203,205,320,321	MELF RESISTOR	1.0k 1% 0.125 W	NESS 142A4	0204	19.00	213
1415649	R216,311,319	MELF RESISTOR	150R 1% 0.125 W	NESS 142A4	0204	3.00	213
1415657	R16,33,34,38,40,70,74,75,129, 133,306	MELF RESISTOR	100R 1% 0.125 W	NESS 142A4	0204	11.00	213
1415738	R219-223	MELF RESISTOR	1.5k 1% 0.125 W	NESS 142A4	0204	5.00	213
1415784	R15,30,36,42,71,77,84,204,209 305,316	MELF RESISTOR	4k75 1% 0.125 W	NESS 142A4	0204	11.00	213
1415833	R31,44,46,49,72,79,81,137,307 318	MELF RESISTOR	221R 1% 0.125 W	NESS 142A4	0204	10.00	213
1415960	R14	MELF RESISTOR	33k2 1% 0.125 W	NESS 142A4	0204	1.00	213
1416280	R53,55,132,232,315	MELF RESISTOR	475R 1% 0.125 W	NESS 142A4	0204	5.00	213
1416943	R54,225,226,312	MELF RESISTOR	51R 1% 0.125 W	NESS 142A4	0204	4.00	213
2309394	C344	CERAMIC CHIP CAPACITOR	10 nF 10% 50V X7R CHIP	MOSS 2 230/15	1206	1.00	213
2309475	C1,2,4,5,7,36,80,99,100, 143-145,317,328,331,332,336, 338,339,342	CERAMIC CHIP CAPACITOR	47 nF 10% 50V X7R CHIP	MOSS 2 230/15	1206	20.00	213
2309669	C34,77,110,311,314,318,321	CERAMIC CHIP CAPACITOR	1.0pF/0.25 50V NP0 CHIP	MOSS 2 230/11	1206	7.00	213
2309690	C309	CERAMIC CHIP CAPACITOR	1.5pF/0.25 50V NP0 CHIP	MOSS 2 230/11	1206	1.00	213
2309718	C67,92,111,155	CERAMIC CHIP CAPACITOR	3.3pF/0.25 50V NP0 CHIP	MOSS 2 230/11	1206	4.00	213
2309725	C17,49,305,21	CERAMIC CHIP CAPACITOR	5.6pF/0.25 50V NP0 CHIP	MOSS 2 230/11	1206	4.00	213
2309732	C30,73,226	CERAMIC CHIP CAPACITOR	8.2pF/0.25 50V NP0 CHIP	MOSS 2 230/11	1206	3.00	213
2309749	C47,90,133,154,313,315	CERAMIC CHIP CAPACITOR	2.2pF/0.25 50V NP0 CHIP	MOSS 2 230/11	1206	6.00	213
2309757	C225	CERAMIC CHIP CAPACITOR	2.7pF/0.25 50V NP0 CHIP	MOSS 2 230/11	1206	1.00	213
2309771	C76,112,310,320,312,319,142	CERAMIC CHIP CAPACITOR	4.7pF/0.25 50V NP0 CHIP	MOSS 2 230/11	1206	7.00	213
2309789	C33,75,87,97,114	CERAMIC CHIP CAPACITOR	6.8pF/0.25 50V NP0 CHIP	MOSS 2 230/11	1206	5.00	213
2309926	C32,44	CERAMIC CHIP CAPACITOR	10 pF 5% 50V NP0 CHIP	MOSS 2 230/11	1206	2.00	213
2309933	C326	CERAMIC CHIP CAPACITOR	12 pF 5% 50V NP0 CHIP	MOSS 2 230/11	1206	1.00	213

ITEM..: 0309310 R500G RF-UNIT INCLUDE ALL RF-PARTS Version: 1.0

ID-code	Partno	Description	Value	Type	Cover	Psqty	Rec.
2309940	C48,91,98,206	CERAMIC CHIP CAPACITOR	15 pF 5% 50V NP0 CHIP	MOSS 2 230/11	1206	4.00	213
2309965	C93,231,234,333,334	CERAMIC CHIP CAPACITOR	22 pF 5% 50V NP0 CHIP	MOSS 2 230/11	1206	5.00	213
2309989	C50,128,327,340	CERAMIC CHIP CAPACITOR	33 pF 5% 50V NP0 CHIP	MOSS 2 230/11	1206	4.00	213
2310015	C146	CERAMIC CHIP CAPACITOR	56 pF 5 % 50V NP0 CHIP	MOSS 2 230/11	1206	1.00	213
2310047	C28,35,37-41,43,46,52,71,79, 81,82,86,88,96,113,136-141, 147,150-153,160,161,201-205, 209,210,213,214,218-220,228, 232,236,302,304,306,308,345	CERAMIC CHIP CAPACITOR	100pF 5 % 50V NP0 CHIP	MOSS 2 230/11	1206	51.00	213
2310086	C329	CERAMIC CHIP CAPACITOR	220pF 5 % 50V NP0 CHIP	MOSS 2 230/11	1206	1.00	213
2310128	C135	CERAMIC CHIP CAPACITOR	470pF 5 % 50V NP0 CHIP	MOSS 2 230/11	1206	1.00	213
2310167	C207,208,211,216,217,301,303, 307,316,322-325,330,335	CERAMIC CHIP CAPACITOR	1.0nF 5 % 50V NP0 CHIP	MOSS 2 230/11	1206	15.00	213
2310209	C9,56	CERAMIC CHIP CAPACITOR	2.2nF 5 % 50V NP0 CHIP	MOSS 2 230/11	1206	2.00	213
2310223	C10,14,16,59,65	CERAMIC CHIP CAPACITOR	3.3nF 5 % 50V NP0 CHIP	MOSS 2 230/11	1206	5.00	213
2311114	C221	CERAMIC CHIP CAPACITOR	8.2pF/0.25 400V HQ CHIP		1210	1.00	213
2311121	C224	CERAMIC CHIP CAPACITOR	10 pF 5 % 400V HQ CHIP		1210	1.00	213
2311178	C222,223	CERAMIC CHIP CAPACITOR	27 pF 5 % 400V HQ CHIP		1210	2.00	213
2505180	C3,6,230,238	ALUM.ELECTROLYTIC CAPACIT	47 uF 20% 25V	MOSS 2 250/2	RM 1	4.00	203
2604022	C11-13,60-62,64	TANTALUM CHIP CAPACITOR	100 nF 20% 35V CHIP	MOSS 2 260/2	3216	7.00	213
2604093	C215	TANTALUM CHIP CAPACITOR	2.2 uF 20% 35V CHIP	MOSS 2 260/2	6032	1.00	213
2604110	C134,239,337	TANTALUM CHIP CAPACITOR	10 uF 20% 25V CHIP	MOSS 2 260/2	7343	3.00	213
2610010	C20,22,27,29,31,42,58,72,74, 85,212,227,229,235,237	TANTALUM CHIP CAPACITOR	1.0 uF 20% 35V CHIP	NESS 261A1	3528	15.00	213
2612701	C63	TANTALUM CHIP CAPACITOR	47 nF 20% 35V CHIP	NESS 261A1	3216	1.00	213
3606825	L204,205	CHOKE	9uH 2.5 TURNS 600R/50MHz	WBC2.5-4B1-R		2.00	403
3608132	L201	INDUCTOR CHIP	82nH 10% 0.2R Q45/100 FR>	MOSS 2 360/2	1206	1.00	213
4100285	D1,4,6,8,201,204,303	DIODE PAIR	70V 0.2A 6ns IN SERIES	BAV99	SOT23	7.00	212
4100567	D202	SCHOTTKY DIODE	70V 50mA 0.41V/200nA 0.14	BAS70-04	SOT23	1.00	212
4106135	D3,7,304-307	VARICAP DIODE	30V 17pF/1V 2pF/28V	BB215	SOD68	6.00	202
4114556	D203	PIN DIODE	50V 50mA 4us 0.5R 0.9pF	MA4P1250	1210	1.00	212

ITEM..: 0309310 R500G RF-UNIT INCLUDE ALL RF-PARTS Version: 1.0

ID-code	Partno	Description	Value	Type	Cover	Psqty	Rec.
4114842	D301,302	PIN DIODE	35V 100mA 0.5R 1.2pF/3V	BA682	SOD80	2.00	212
4200709	Q2-6,8,9,11,12,15,303	TRANSISTOR	N 5GHz 12V 35mA 0.25W/56H	BFR93A/ON4238	SOT23	11.00	212
4203049	Q201	MOSFET	N 12V 30mA VP2.5V	BF998	SOT143	1.00	212
4205413	Q202	TRANSISTOR	N 5.5GHz 15V 0.1A 1W/1GHz	BFG97	SOT223	1.00	212
4210055	Q1,7	TRANSISTOR	N 300MHz 45V 0.1A 0.25W >	BCW72	SOT23	2.00	212
4211967	Q301	TRANSISTOR	N 2GHz 20V 50mA 0.3W >60	BFG67	SOT143	1.00	212
4303084	IC4,6	ANALOG IC	OP.AMP 2X LOW NOISE	LS204D	SO8S	2.00	211
4304427	IC1	ANALOG IC	USE 4304426 SGS	L7808CV	TO220	1.00	201
4343158	IC3,5	DIGITAL IC	PLL FREQ.SYNTH/PRESCAL. 1	MB1501LPF	SO16L	2.00	211
4345182	IC2	ANALOG IC	REG +5V 0.15A	TA78L05F	SOT89	1.00	211
4349396	IC301	ANALOG IC	FM IF SYSTEM 4.5-8V	SA605D	SO20W	1.00	211
4304031	IC201	TRANSMITTER MODULE	RF HYBRIDE MODULE 400-470	MHW720A2	700-04	1.00	205
4354048	X302	ANALOG IC	MIXER DOUBLE BAL 1-1000MH	CBL1	L20W10H7.6	1.00	201
4503801	XF302	CERAMIC FILTER	455 kHz+-4 KHz	CFK 455G	L16W7.4H10	1.00	202
4505637	X1	CRYSTAL OSCILLATOR	12.8 MHz TCXO +-2.5 PPM	TCO 909F 12.8MHz	19X12X9	1.00	202
4504698	XF301	CRYSTAL FILTER	45.0 MHz+-7.5 kHz	RF 15BT 45.000	18X10X12	1.00	202
7130270	2	COAXIAL CABLE	50+-2R 2.95/5.3mm 2.5kV P	MOSS 2 713/1		0.15	204
9207930		FIXING DEVICE FOR MODULE				2.00	506
9207962		STRAIN RELIEF				1.00	506
9881579		PCB 1.6D		R 450 jep suoraan ku parille		1.00	518

Structure parts.....: 98 pci

Order	1	
Product's quantity	0,00	According structure
Option		
Items	2	Normal items
Spare parts	0	All parts
Sequencenumbers	1	No sequencenumbers
Price	0	No price
Product group	0	With product group
Language	EN	English
Limits	1	Limit
Product 0306581	.0306581	

ITEM..: 0306581 R452J RF UNIT ALL RF PARTS Version: 1.0

ID-code	Partno	Description	Value	Type	Cover	Psqty	Rec.
HISTORIA	31.08.92 PK, 07.09.92 PK 03.11.92 PK C334 30.11.92 PK, HÄIRIÖPELTI JA RF-NAUHA SIIRRETTY KOONTAOSIIN 19.05.93 MR, SIISTITTY	HISTORY				0.00	
DOKU	4B 306559 1/3, 3B 306599 2/3, 2B 306599 3/3	ASSOCIATED DRAWINGS				0.00	
1426026	R227,228	MELF RESISTOR	2.2R 2% 0.125 W	NESS 142A4	0204	2.00	213
2305274	C341	CERAMIC CAPACITOR	180 pF 2% N1500 100V	MOSS 2 230/11	RM 1	1.00	203
3640180	L202	INDUCTOR CHIP	56nH 10% 0.2R Q45/100 FR>		1206	1.00	213
3640231	L1,4-6,13,16-18,206	INDUCTOR CHIP	150nH 10% 0.3R Q45/100 FR		1206	9.00	213
3609490	L303	COIL	660uH Q100/455kHz	5PLN-3888A		1.00	203
3640383	L301,302	INDUCTOR CHIP	1000nH 5% 2.8R Q28/35 FR>		1206	2.00	213
4505380	X301	CRYSTAL	VT-CRYSTAL 44.545 MHz	UM2 44.545MHz	HC49/U	1.00	202
5436850	SP,TP,RP	CONNECTOR	8F-POLE PCB	4455-08BK		3.00	204
5405436	5	BUSHING	D3.6L10mm CuZn DIN46228	ART.NO.51428		1.00	204
5420018	3 (A+B+C)	TNC-CONNECTOR	TNC50 CABLE CRIMP RG223/U	21 TNC-50-3-9C/133		1.00	204
5405060	4	BUSHING	D6.0X12.0mm CuZn DIN46228	ART.NO.51436		1.00	204
7139928	PP302	COAXIAL CABLE	50R D1.3mm PTFE	K 01202-06		0.10	204
1411324	R215,217	CHIP RESISTOR	10R 5% 0.125 W	MOSS 2 140/5	1206	2.00	213
1411356	R50,86	CHIP RESISTOR	18R 5% 0.125 W	MOSS 2 140/5	1206	2.00	213
1411363	R202,314	CHIP RESISTOR	22R 5% 0.125 W	MOSS 2 140/5	1206	2.00	213
1411370	R45,80	CHIP RESISTOR	27R 5% 0.125 W	MOSS 2 140/5	1206	2.00	213
1411451	R39,208	CHIP RESISTOR	68R 5% 0.125 W	MOSS 2 140/5	1206	2.00	213
1411613	R52,88	CHIP RESISTOR	390R 5% 0.125 W	MOSS 2 140/5	1206	2.00	213
1411645	R85	CHIP RESISTOR	560R 5% 0.125 W	MOSS 2 140/5	1206	1.00	213
1411726	R48,111,114,115,224,303,322	CHIP RESISTOR	2.2k 5% 0.125 W	MOSS 2 140/5	1206	7.00	213
1411733	R59	CHIP RESISTOR	2.7k 5% 0.125 W	MOSS 2 140/5	1206	1.00	213
1411740	R229-231	CHIP RESISTOR	3.3k 5% 0.125 W	MOSS 2 140/5	1206	3.00	213
1411772	R4,210	CHIP RESISTOR	5.6k 5% 0.125 W	MOSS 2 140/5	1206	2.00	213

ITEM..: 0306581 R452J RF UNIT ALL RF PARTS Version: 1.0

ID-code	Partno	Description	Value	Type	Cover	Psqty	Rec.
1411807	R17,47,51,87,113,206,310,317, 323	CHIP RESISTOR	10k 5% 0.125 W	MOSS 2 140/5	1206	9.00	213
1411821	R32,35,41,73,76,112,207,304	CHIP RESISTOR	15k 5% 0.125 W	MOSS 2 140/5	1206	8.00	213
1411846	R8,28,29,56,57,64,66,110	CHIP RESISTOR	22k 5% 0.125 W	MOSS 2 140/5	1206	8.00	213
1411853	R5,60	CHIP RESISTOR	27k 5% 0.125 W	MOSS 2 140/5	1206	2.00	213
1411927	R13,27,58,308,309,324	CHIP RESISTOR	100k 5% 0.125 W	MOSS 2 140/5	1206	6.00	213
1412046	R218	CHIP RESISTOR	1.0M 5% 0.125 W	MOSS 2 140/5	1206	1.00	213
1415600	R1-3,6,7,37,61-63,65,78, 134-136,201,203,205,320,321	MELF RESISTOR	1.0k 1% 0.125 W	NESS 142A4	0204	19.00	213
1415649	R216,311,319	MELF RESISTOR	150R 1% 0.125 W	NESS 142A4	0204	3.00	213
1415657	R16,33,34,38,40,70,74,75,129, 133,306	MELF RESISTOR	100R 1% 0.125 W	NESS 142A4	0204	11.00	213
1415738	R219-223	MELF RESISTOR	1.5k 1% 0.125 W	NESS 142A4	0204	5.00	213
1415784	R15,30,36,42,71,77,84,204,209 305,316	MELF RESISTOR	4k75 1% 0.125 W	NESS 142A4	0204	11.00	213
1415833	R31,44,46,49,72,79,81,137,307 318	MELF RESISTOR	221R 1% 0.125 W	NESS 142A4	0204	10.00	213
1415960	R14	MELF RESISTOR	33k2 1% 0.125 W	NESS 142A4	0204	1.00	213
1416280	R53,55,132,232,315	MELF RESISTOR	475R 1% 0.125 W	NESS 142A4	0204	5.00	213
1416943	R54,225,226,312	MELF RESISTOR	51R 1% 0.125 W	NESS 142A4	0204	4.00	213
2309394	C344	CERAMIC CHIP CAPACITOR	10 nF 10% 50V X7R CHIP	MOSS 2 230/15	1206	1.00	213
2309475	C1,2,4,5,7,36,80,99,100, 143-145,317,328,331,332,336, 338,339,342	CERAMIC CHIP CAPACITOR	47 nF 10% 50V X7R CHIP	MOSS 2 230/15	1206	20.00	213
2309669	C34,77,110,311,314,318	CERAMIC CHIP CAPACITOR	1.0pF/0.25 50V NP0 CHIP	MOSS 2 230/11	1206	6.00	213
2309690	C321	CERAMIC CHIP CAPACITOR	1.5pF/0.25 50V NP0 CHIP	MOSS 2 230/11	1206	1.00	213
2309700	C309	CERAMIC CHIP CAPACITOR	1.8pF/0.25 50V NP0 CHIP	MOSS 2 230/11	1206	1.00	213
2309718	C67,92,111,155	CERAMIC CHIP CAPACITOR	3.3pF/0.25 50V NP0 CHIP	MOSS 2 230/11	1206	4.00	213
2309725	C17,49,305,312,319	CERAMIC CHIP CAPACITOR	5.6pF/0.25 50V NP0 CHIP	MOSS 2 230/11	1206	5.00	213
2309732	C30,73,226	CERAMIC CHIP CAPACITOR	8.2pF/0.25 50V NP0 CHIP	MOSS 2 230/11	1206	3.00	213
2309749	C47,90,133,154,313,315	CERAMIC CHIP CAPACITOR	2.2pF/0.25 50V NP0 CHIP	MOSS 2 230/11	1206	6.00	213

ITEM..: 0306581 R452J RF UNIT ALL RF PARTS Version: 1.0

ID-code	Partno	Description	Value	Type	Cover	Psqty	Rec.
2309757	C225	CERAMIC CHIP CAPACITOR	2.7pF/0.25 50V NP0 CHIP	MOSS 2 230/11	1206	1.00	213
2309771	C76,112,310,320	CERAMIC CHIP CAPACITOR	4.7pF/0.25 50V NP0 CHIP	MOSS 2 230/11	1206	4.00	213
2309789	C33,75,87,97,114	CERAMIC CHIP CAPACITOR	6.8pF/0.25 50V NP0 CHIP	MOSS 2 230/11	1206	5.00	213
2309926	C21,32,44,142	CERAMIC CHIP CAPACITOR	10 pF 5% 50V NP0 CHIP	MOSS 2 230/11	1206	4.00	213
2309933	C326	CERAMIC CHIP CAPACITOR	12 pF 5% 50V NP0 CHIP	MOSS 2 230/11	1206	1.00	213
2309940	C48,91,98,206	CERAMIC CHIP CAPACITOR	15 pF 5% 50V NP0 CHIP	MOSS 2 230/11	1206	4.00	213
2309965	C93,231,234,333,334	CERAMIC CHIP CAPACITOR	22 pF 5% 50V NP0 CHIP	MOSS 2 230/11	1206	5.00	213
2309989	C50,128,327,340	CERAMIC CHIP CAPACITOR	33 pF 5% 50V NP0 CHIP	MOSS 2 230/11	1206	4.00	213
2310015	C146	CERAMIC CHIP CAPACITOR	56 pF 5 % 50V NP0 CHIP	MOSS 2 230/11	1206	1.00	213
2310047	C28,35,37-41,43,46,52,71,79, 81,82,86,88,96,113,136-141, 147,150-153,160,161,201-205, 209,210,213,214,218-220,228, 232,236,302,304,306,308,345	CERAMIC CHIP CAPACITOR	100pF 5 % 50V NP0 CHIP	MOSS 2 230/11	1206	51.00	213
2310086	C329	CERAMIC CHIP CAPACITOR	220pF 5 % 50V NP0 CHIP	MOSS 2 230/11	1206	1.00	213
2310128	C135	CERAMIC CHIP CAPACITOR	470pF 5 % 50V NP0 CHIP	MOSS 2 230/11	1206	1.00	213
2310167	C207,208,211,216,217,301,303, 307,316,322-325,330,335	CERAMIC CHIP CAPACITOR	1.0nF 5 % 50V NP0 CHIP	MOSS 2 230/11	1206	15.00	213
2310209	C9,56	CERAMIC CHIP CAPACITOR	2.2nF 5 % 50V NP0 CHIP	MOSS 2 230/11	1206	2.00	213
2310223	C10,14,16,59,65	CERAMIC CHIP CAPACITOR	3.3nF 5 % 50V NP0 CHIP	MOSS 2 230/11	1206	5.00	213
2311114	C221	CERAMIC CHIP CAPACITOR	8.2pF/0.25 400V HQ CHIP		1210	1.00	213
2311121	C224	CERAMIC CHIP CAPACITOR	10 pF 5 % 400V HQ CHIP		1210	1.00	213
2311178	C222,223	CERAMIC CHIP CAPACITOR	27 pF 5 % 400V HQ CHIP		1210	2.00	213
2505180	C3,6,230,238	ALUM.ELECTROLYTIC CAPACIT	47 uF 20% 25V	MOSS 2 250/2	RM 1	4.00	203
2604022	C11-13,60-62,64	TANTALUM CHIP CAPACITOR	100 nF 20% 35V CHIP	MOSS 2 260/2	3216	7.00	213
2604093	C215	TANTALUM CHIP CAPACITOR	2.2 uF 20% 35V CHIP	MOSS 2 260/2	6032	1.00	213
2604110	C134,239,337	TANTALUM CHIP CAPACITOR	10 uF 20% 25V CHIP	MOSS 2 260/2	7343	3.00	213
2610010	C20,22,27,29,31,42,58,72,74, 85,212,227,229,235,237	TANTALUM CHIP CAPACITOR	1.0 uF 20% 35V CHIP	NESS 261A1	3528	15.00	213
2612701	C63	TANTALUM CHIP CAPACITOR	47 nF 20% 35V CHIP	NESS 261A1	3216	1.00	213
3606825	L204,205	CHOKE	9uH 2.5 TURNS 600R/50MHz	WBC2.5-4B1-R		2.00	403

ITEM..: 0306581 R452J RF UNIT ALL RF PARTS Version: 1.0

ID-code	Partno	Description	Value	Type	Cover	Psqty	Rec.
3608132	L201	INDUCTOR CHIP	82nH 10% 0.2R Q45/100 FR>	MOSS 2 360/2	1206	1.00	213
4100285	D1,4,6,8,201,204,303	DIODE PAIR	70V 0.2A 6ns IN SERIES	BAV99	SOT23	7.00	212
4100567	D202	SCHOTTKY DIODE	70V 50mA 0.41V/200nA 0.14	BAS70-04	SOT23	1.00	212
4106135	D3,7,304-307	VARICAP DIODE	30V 17pF/1V 2pF/28V	BB215	SOD68	6.00	202
4114556	D203	PIN DIODE	50V 50mA 4us 0.5R 0.9pF	MA4P1250	1210	1.00	212
4114842	D301,302	PIN DIODE	35V 100mA 0.5R 1.2pF/3V	BA682	SOD80	2.00	212
4200709	Q2-6,8,9,11,12,15,303	TRANSISTOR	N 5GHz 12V 35mA 0.25W/56H	BFR93A/ON4238	SOT23	11.00	212
4203049	Q201	MOSFET	N 12V 30mA VP2.5V	BF998	SOT143	1.00	212
4205413	Q202	TRANSISTOR	N 5.5GHz 15V 0.1A 1W/1GHz	BFG97	SOT223	1.00	212
4210055	Q1,7	TRANSISTOR	N 300MHz 45V 0.1A 0.25W >	BCW72	SOT23	2.00	212
4211967	Q301	TRANSISTOR	N 2GHz 20V 50mA 0.3W >60	BFG67	SOT143	1.00	212
4303084	IC4,6	ANALOG IC	OP.AMP 2X LOW NOISE	LS204D	SO8S	2.00	211
4304427	IC1	ANALOG IC	USE 4304426 SGS	L7808CV	TO220	1.00	201
4343158	IC3,5	DIGITAL IC	PLL FREQ.SYNTH/PRESCAL. 1	MB1501LPF	SO16L	2.00	211
4345182	IC2	ANALOG IC	REG +5V 0.15A	TA78L05F	SOT89	1.00	211
4349396	IC301	ANALOG IC	FM IF SYSTEM 4.5-8V	SA605D	SO20W	1.00	211
4304031	IC201	TRANSMITTER MODULE	RF HYBRIDE MODULE 400-470	MHW720A2	700-04	1.00	205
4354048	X302	ANALOG IC	MIXER DOUBLE BAL 1-1000MH	CBL1	L20W10H7.6	1.00	201
4558559	XF302	CERAMIC FILTER	455KHz +-7 kHz	CFK 455D	16X7.4X10	1.00	202
4505637	X1	CRYSTAL OSCILLATOR	12.8 MHz TCXO +-2.5 PPM	TCO 909F	19X12X9	1.00	202
4504698	XF301	CRYSTAL FILTER	45.0 MHz+-7.5 kHz	RF 15BT 45.000	18X10X12	1.00	202
7130270	2	COAXIAL CABLE	50+-2R 2.95/5.3mm 2.5kV P	MOSS 2 713/1		0.15	204
9207930		FIXING DEVICE FOR MODULE				2.00	506
9207962		STRAIN RELIEF				1.00	506
9881579		PCB 1.6D		R 450 jep suoraan ku parille		1.00	518

Structure parts.....: 99 pci

CONTROL UNIT FUNCTIONAL DESCRIPTION

CONTENTS

1. GENERAL

Control unit CU43 is consist of the display unit, display drivers, microphone amplifier, microphone mute, voice switch, keyboard, indicator leds, maintenance key (option)).

2. CONNECTIONS

External connector PL10 (D15) :

1 I²C_SCL . . . . . : serial clock (I²C–bus)
2 I²C_SDA . . . . . : serial data (I²C–bus)
3 I²C–INT . . . . . : interrupt (I²C–bus)
4 VS_F . . . . . : filtered supply voltage
5 HOOK . . . . . : hook info of the handset
6 GND_ANALOG . . . . . : analog ground
7 MIC . . . . . : amplified microphone signal
8 HS_MIC . . . . . : unamplified microphone signal in
9 PTT . . . . . : push to talk (PTT)
10 ON_OFF . . . . . : power on/off
11 GND_DIGIT . . . . . : digital ground
12 LSP . . . . . : loudspeaker
13 HF_PTT . . . . . : hands free PTT
14 GND_ANALOG . . . . . : analog ground
15 HF_MIC . . . . . : unamplified hands free microphone signal in

3. DISPLAY

Super twisted nematic liquid crystal display has three text rows and two icon rows. The upper row has 20 characters and second and third row have 24 characters each. Each character consists of a 5 * 7 pixel matrix. The first icon row is above the character rows and the second icon row is below the character rows.

There are 23 pixel rows and 120 pixel columns. Multiplexing rate is 1:24. Display drivers are one PCF8579 (IC 220) and three PCF8578 (IC230, IC240, IC250). They are organized such that IC220 drives all pixel rows and 16 pixel columns. IC230, IC240, IC250 are driving the other 104 pixel columns.

The display information is sent via I^2C–bus to the drivers memory. Drivers are then updating display about 35Hz frequency. This frame frequency is set with a resistor R220.

The display biasing is made up with resistors R230 .. R235. The display needs six bias levels to achieve best possible contrast (Vdd, V5, V4, V3, V2, Vlcd). Temperature compensation is –10 mV/K. At room temperature Vdd – Vlcd = Vop should be 6.0 Volts. Temperature sensor is PTC R237.

The display back lights are made by 30 surface mounted leds. Half of them are are in the top row, half in the bottom row. Light is taken throught a light conductor, which gives the same amount light to the whole display.

The lightning has two intensity levels, high and low which are selected by IC200 port P6. In high temperatures the lightning is limited by NTC–resistor R604 and transistor Q511. Lights are switched on/off by IC200, port P7

4. KEYBOARD

The keyboard consists of two silicone mats. There are 20 keys in the bigger mat and three keys in the smaller mat.

There are two I/O–expanders (IC190 and IC200) which are organized in the matrix form (5 * 5). While pressing a key it generates an interrupt and the pressed key can be read via I^2C–bus. The HOOK–line can be read from IC190 port P5 and POWER–line from port P6.

Keyboard back lights are made by green 10 leds.

5. INDICATORS

The TX–led is red (D210), CALL–led is yellow (D211) and ON–led is green (D212). These lights indicates the radio status.

These indicators are driven by the IO–expander IC120. The TX–led is driven by port P2, ON–led port P3 and CALL–led port P4. Writing a logical one to port it turns the led on and writing a logical zero it turns the led off.

6. AUDIO

The microphone amplifier amplifies handset microphone or hands free microphone signals with operational amplifiers (IC140 and IC160) so that output signal (MIC) level is 180 mVrms when using standard voice level: 1kHz and 94dB voice signal. Handset microphone signal can be adjusted with R140 and hands free microphone signal can be adjusted with R137.

The bandwidth is approximately 170 Hz – 6.7 kHz.

When a logical one is put into (IC120) port P6, the handset microphone signal is selected. When a logical zero is put into P6, the hands free microphone signal is selected. When a zero is written to (IC120) port P7, the microphone mute is selected.

7. MAINTENANCE KEY (Service–mode key, option, only with L115P)

EEPROM IC260 contains a maintenance key. It is impossible to use the maintenance programs if there is not an appropriate maintenance code. IC260 is installed in only those control units which are used by authorized service personnel.

8. POWER SUPPLY

The control unit gets 8 V from IC100 and 5 V from IC90. The negative LCD bias voltage to the LCD is generated by DC–DC converter IC218. Reference voltage VREF is generated from 8 V with resistors R101 and R102. Some circuits use the VS–voltage directly.

9. THE SUMMARY OF I/O–EXPANDER CONTROL SIGNALS

I/O–expanders convert I^2C–data to parallel and parallel data to I^2C–format. The ports of these expanders are quasi–bidirectional.

IC120 : ALL PORTS ACTS AS OUTPUTS, NOT AS INTERRUPTS!

- P7 : microphone mute (1 = yes, 0 = no)
- P6 : microphone select (1 = handset microphone, 0 = hands free microphone)
- P5 : hands free operation (1 = active, 0 = not active)
- P4 : CALL–led (1 = on, 0 = off)
- P3 : ON–led (1 = on, 0 = off)
- P2 : TX–led (1 = on, 0 = off)
- P1, P0 : not connected

IC190 : PORTS P7 .. P5 ARE INPUTS ALL THE TIME. PORTS P4 .. P0 ARE BIDIRECTIONAL. INTERRUPTING CIRCUIT!

- P7 : not connected
- P6 : ON–OFF–I^2C (0 = power on)
- P5 : HOOK (0 = handset microphone on hook, 1 = not on hook)
- P4 .. P0 : keyboard columns

IC200 : PORT P6 IS ALWAYS INPUT. PORTS P5 AND P7 ARE ALWAYS OUTPUTS. PORTS P4 .. P0 ARE BIDIRECTIONAL. NOT AN INTERRUPTING CIRCUIT!

- P7 : display back lights (1 = on, 0 = off)
- P6 : intensity of the back lights (1= high, 0= low)
- P5 : keyboard back lights (1 = on, 0 = off)
- P4 .. P0 : keyboard rows

Notice! Port P6 has a douple meaning, it selects also the type of the hanset CU43 / CU45

10. SUMMARY OF I²C–ADDRESSES

Display drivers:

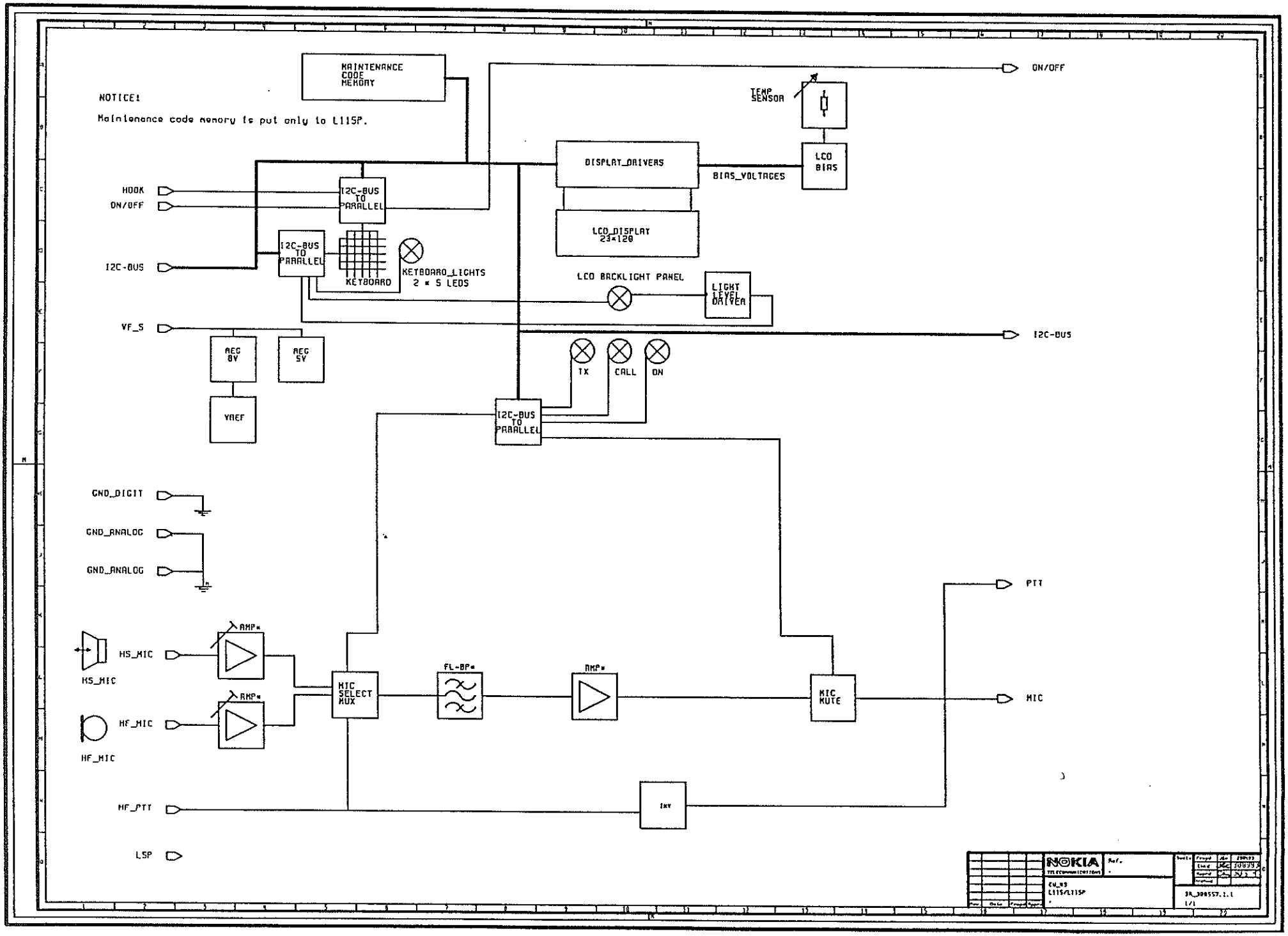
IC220 :		78H, HW subaddress 00H
IC230 :	,	HW subaddress 01H
IC240 :	,	HW subaddress 02H
IC240 :	,	HW subaddress 03H

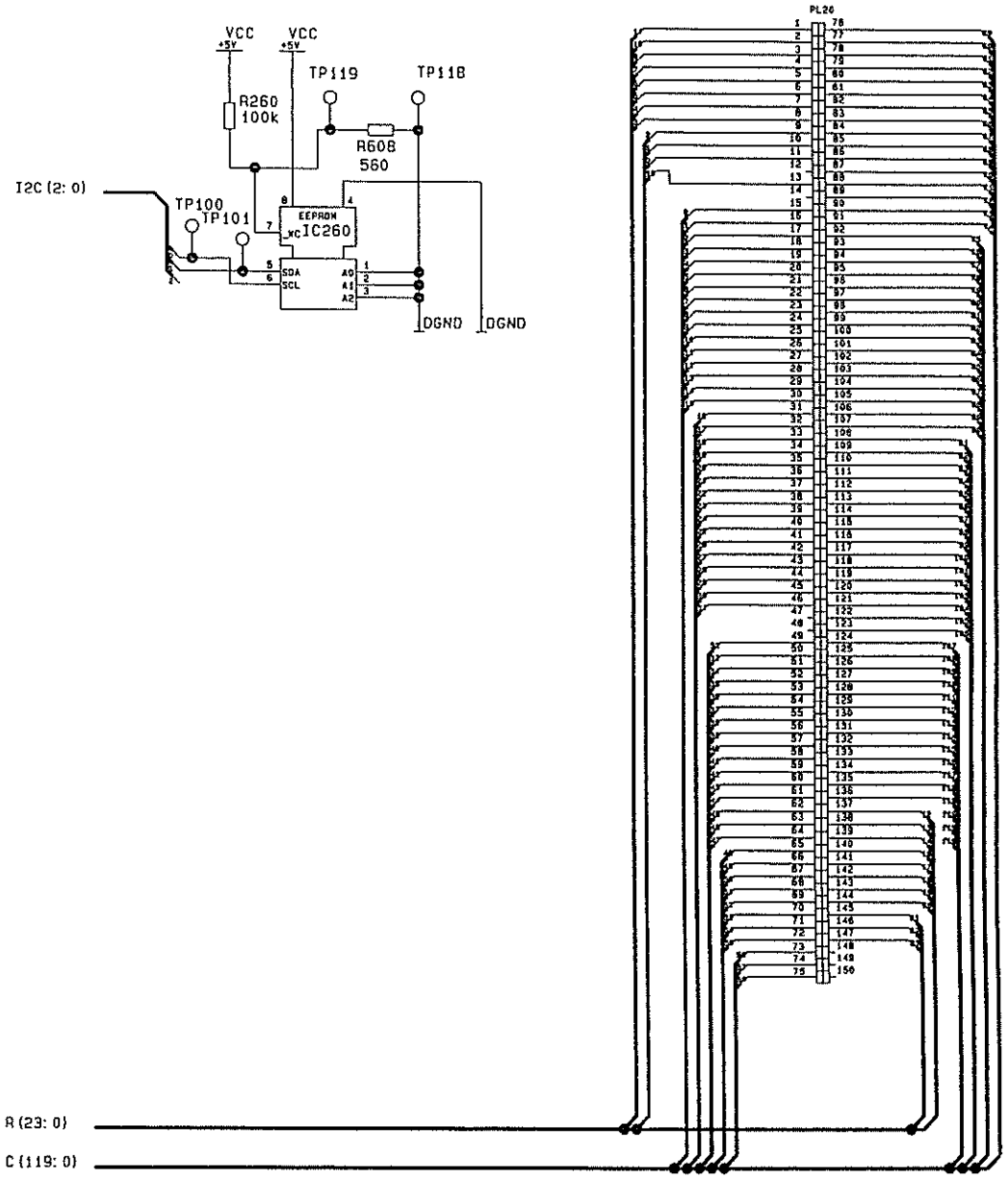
I/O–expanders:

IC120 :	40H
IC190 :	42H
IC200 :	44H

EEPROM:

IC260 :	A0H

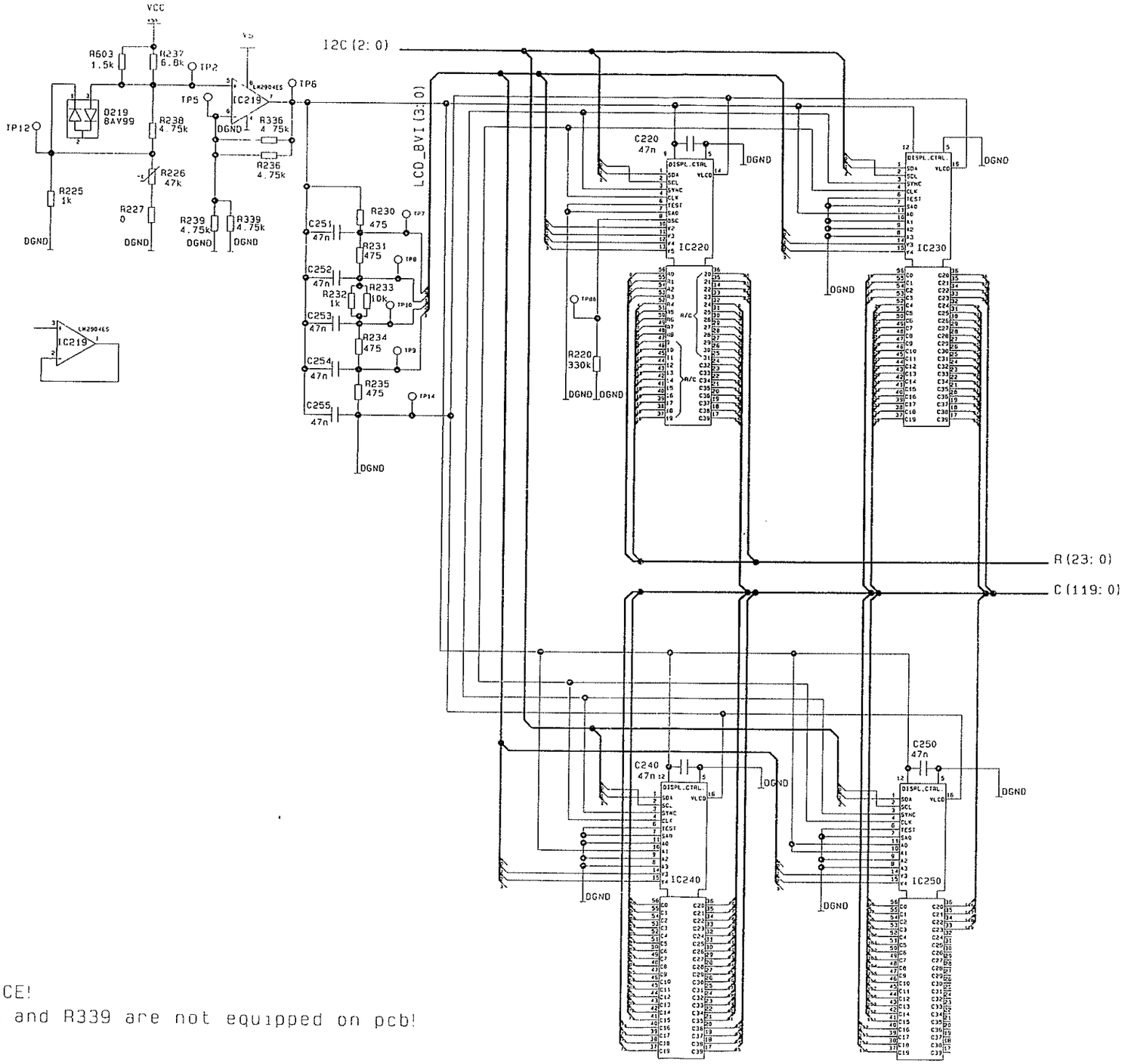

MAINTENANCE CODE MEMORY
NOTICE!
Maintenance code memory is put only to L11SP.
ON/OFF
TEMP SENSOR
DISPLAY_DRIVERS
LCD BIAS
BIAS_VOLTAGES
LCD_DISPLAY 23*120
HOOK
ON/OFF
I2C-BUS TO PARALLEL
I2C-BUS
I2C-BUS TO PARALLEL
KEYBOARD
KEYBOARD_LIGHTS 2 * 5 LEDS
LCD BACKLIGHT PANEL
LIGHT LEVEL DRIVER
VF_S
I2C-BUS
REG 8V
REG 5V
VREF
TX
CALL
ON
I2C-BUS TO PARALLEL
GND_DIGIT
GND_ANALOG
GND_ANALOG
PTT
AMP*
HS_MIC
HS_MIC
AMP*
HF_MIC
HF_MIC
MIC SELECT MUX
FL-BP*
AMP*
MIC MUTE
MIC
HF_PTT
INV
LSP
NOKIA
CN_N3
L11S/L11SP



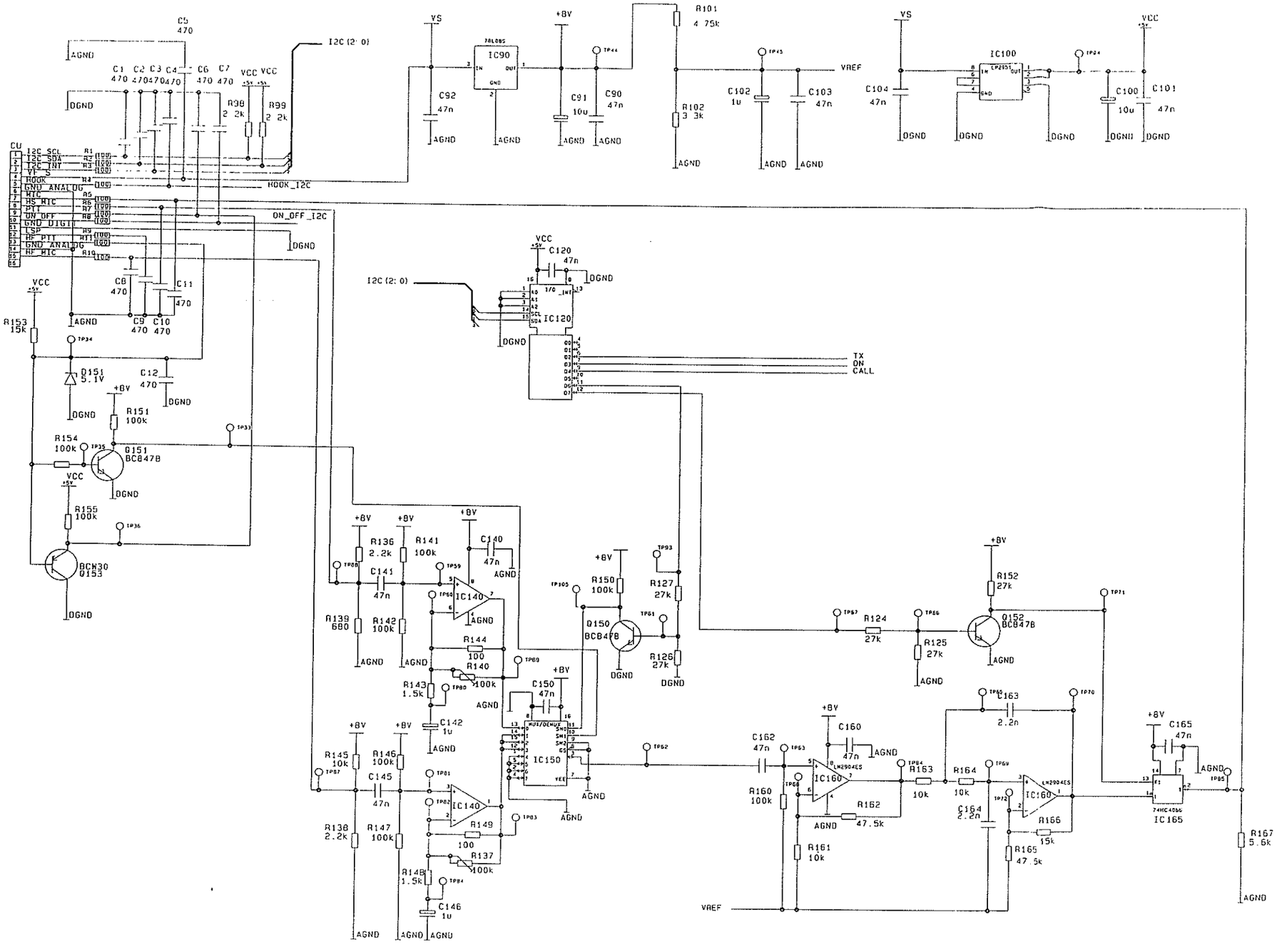
NOTICE!

IC260, R260, R608 are equipped only to L115P!

			NOKIA TELECOMMUNICATIONS	Ref. 5F0881803	
			CU_43 L116/L115P LCD-connector		35_308557.1.1 4/4
Rev.	Date	Prepd	Appvd		

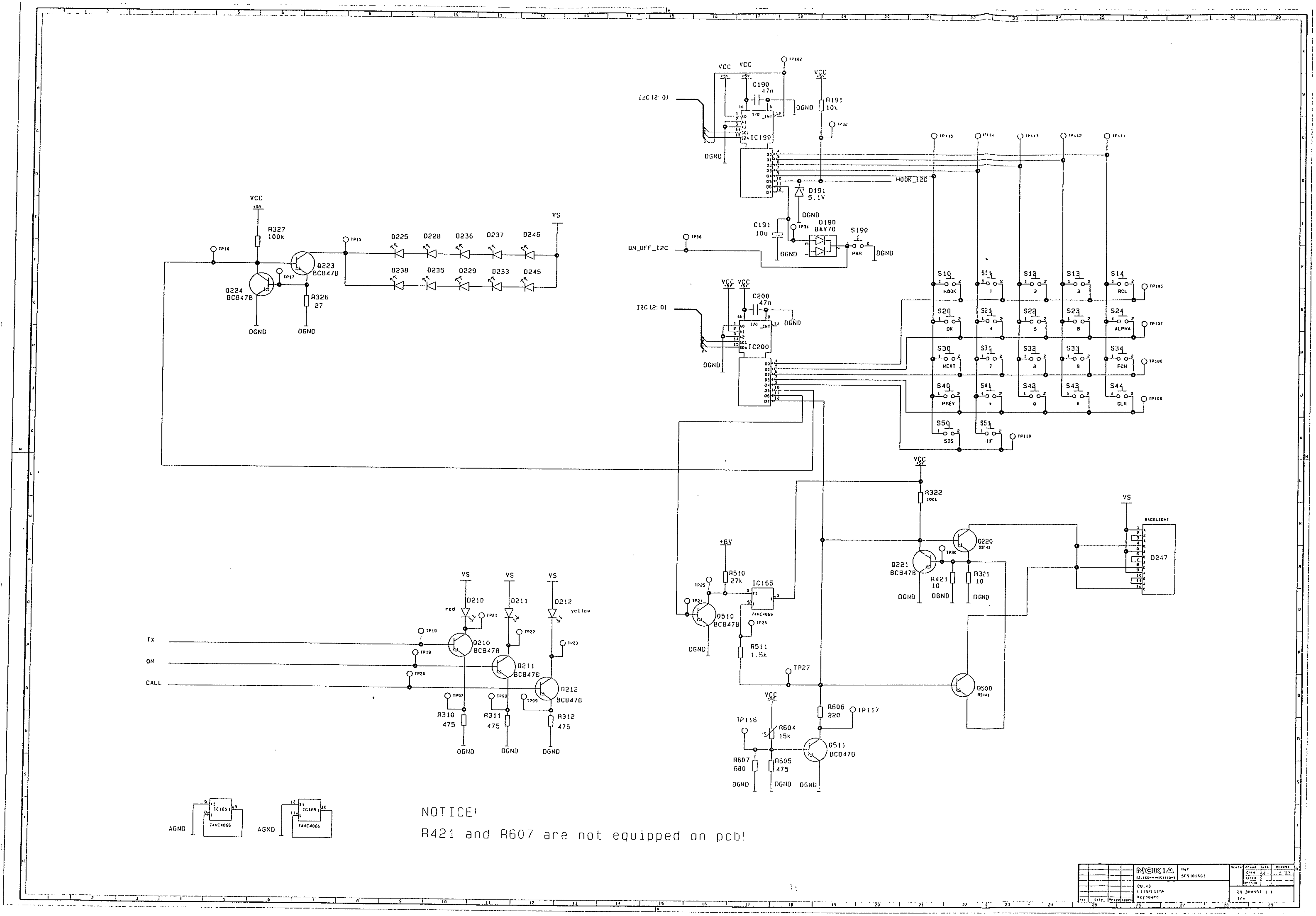


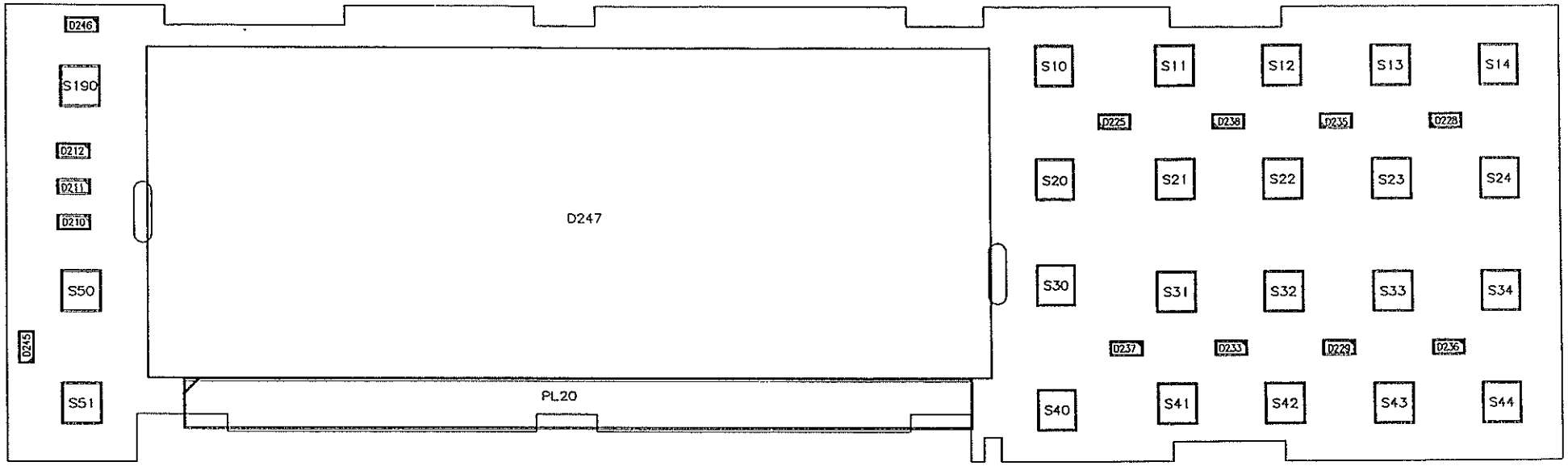
NOTICE!
R236 and R339 are not equipped on pcb!



NOTICE!

C1, C2, R139, R144, R149 are not equipped on pcb!


I2C(2:0)
VCC
+5V
C190
47n
IC190
R191
10k
DGND
TP102
TP32
HOOK_I2C
D191
5.1V
C191
10u
TP31
D190
BAV70
S190
PWR
ON_OFF_I2C
TP96
C200
47n
IC200
TP115
TP114
TP113
TP112
TP111
S10
HOOK
S11
1
S12
2
S13
3
S14
RCL
TP106
S20
OK
S21
4
S22
5
S23
6
S24
ALPHA
TP107
S30
NEXT
S31
7
S32
8
S33
9
S34
FCN
TP108
S40
PREV
S41
*
S42
0
S43
#
S44
CLR
TP109
S50
SOS
S51
HF
TP110
R327
100k
TP16
Q223
BC847B
Q224
BC847B
TP17
R326
27
TP15
VS
D225
D228
D236
D237
D246
D238
D235
D229
D233
D245
R322
100k
Q220
BSR41
Q221
BC847B
TP30
R421
10
R321
10
BACKLIGHT
D247
+8V
R510
27k
IC165
74HC4066
TP25
TP24
Q510
BC847B
TP26
R511
1.5k
TP27
Q500
BSR41
R606
220
TP117
TP116
R604
15k
Q511
BC847B
R607
680
R605
475
AGND
TX
ON
CALL
TP18
TP19
TP20
D210
red
TP21
D211
D212
yellow
TP22
TP23
Q210
BC847B
Q211
BC847B
Q212
BC847B
TP97
TP98
TP99
R310
475
R311
475
R312
475
NOTICE!
R421 and R607 are not equipped on pcb!
NOKIA
TELECOMMUNICATIONS
CU_43
L115/L115H
Keyboard
3/4



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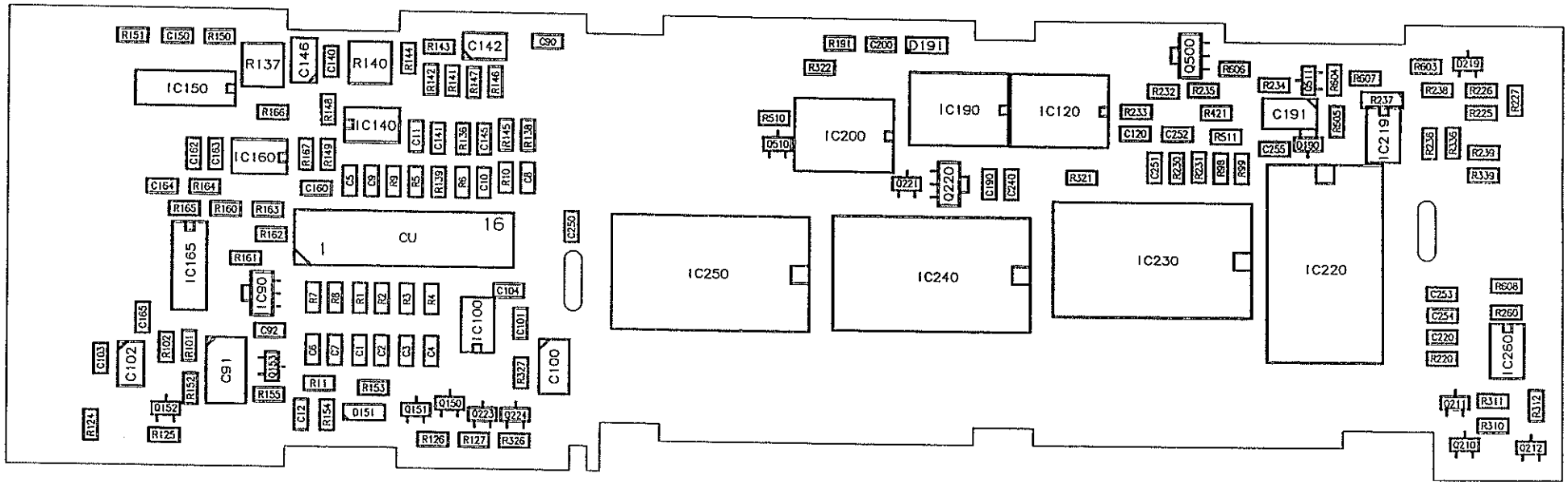
							CHKD	MH	15.04.93 MH
							APPRD	LRa	15.04.93 LRa
							ARCHVD		
				CU43 L115		3C 308557 1.1 2/2			
1.1	24.9.93	PK	OK						
REV.	DATE	PREPD	APPRD						



				NOKIA TELECOMMUNICATIONS	REF. 5F 9881593 1	SCALE 2:1	PREPD	MH 15.04.93
							CHKD	MH 15.04.93
							APPRD	LRa 15.04.93
							ARCHVD	
1.1	24.3.93	PK		CU43 L115		3C 308557.1.1 1/2		
REV.	DATE	PREPD	APPRD					

Order	2	
Product's quantity	0,00	According structure
Option		
Items	1	Normal and work items
Spare parts	0	All parts
Sequencenumbers	1	No sequencenumbers
Price	0	No price
Product group	0	With product group
Language	EN	English
Limits	1	Limit

Product 0308557 .0308564

ITEM..: 0308557 L115 LOGIC UNIT

ID-code	Partno	Description	Value	Type	Cover	Psqty	Rec.
0307419		CONNECTION CABLE		1600.0017		1.00	504
1411324	R321	CHIP RESISTOR	10R 5% 0.125 W	MOSS 2 140/5	1206	1.00	213
1411370	R326	CHIP RESISTOR	27R 5% 0.125 W	MOSS 2 140/5	1206	1.00	213
1411571	R606	CHIP RESISTOR	220R 5% 0.125 W	MOSS 2 140/5	1206	1.00	213
1411645	R608	CHIP RESISTOR	560R 5% 0.125 W	MOSS 2 140/5	1206	1.00	213
1411726	R98,99,136,138	CHIP RESISTOR	2.2k 5% 0.125 W	MOSS 2 140/5	1206	4.00	213
1411740	R102	CHIP RESISTOR	3.3k 5% 0.125 W	MOSS 2 140/5	1206	1.00	213
1411772	R167	CHIP RESISTOR	5.6k 5% 0.125 W	MOSS 2 140/5	1206	1.00	213
1411789	R237	CHIP RESISTOR	6.8k 5% 0.125 W	MOSS 2 140/5	1206	1.00	213
1411807	R145,161,163,164,191,233	CHIP RESISTOR	10k 5% 0.125 W	MOSS 2 140/5	1206	6.00	213
1411821	R153,166	CHIP RESISTOR	15k 5% 0.125 W	MOSS 2 140/5	1206	2.00	213
1411853	R124-127,152,510	CHIP RESISTOR	27k 5% 0.125 W	MOSS 2 140/5	1206	6.00	213
1411927	R141,142,146,147,150,151,154, 155,160,322,327	CHIP RESISTOR	100k 5% 0.125 W	MOSS 2 140/5	1206	11.00	213
1411980	R220	CHIP RESISTOR	330k 5% 0.125 W	MOSS 2 140/5	1206	1.00	213
1415600	R225,232	MELF RESISTOR	1.0k 1% 0.125 W	NESS 142A4	0204	2.00	213
1415657	R1-11	MELF RESISTOR	100R 1% 0.125 W	NESS 142A4	0204	11.00	213
1415738	R143,148,511,603	MELF RESISTOR	1.5k 1% 0.125 W	NESS 142A4	0204	4.00	213
1415784	R101,236,238,239	MELF RESISTOR	4k75 1% 0.125 W	NESS 142A4	0204	4.00	213
1416033	R162,165	MELF RESISTOR	47k5 1% 0.125 W	NESS 142A4	0204	2.00	213
1416280	R230,231,234,235,310-312,605	MELF RESISTOR	475R 1% 0.125 W	NESS 142A4	0204	8.00	213
1422149	R227	CHIP RESISTOR	0R0 0.125 W	NESS 142/1	1206	1.00	213
1728512	R137,140	CHIP TRIMMER	100k 20% 0.25 W	RVG 4H01A-104VM		2.00	213
1800619	R604	THERMISTOR NTC	CIA 37 15k 10% FSH1	NC20K00153KBA		1.00	203
1827954	R226	CHIP THERMISTOR	NTC 47k 5% 0.3 W	B57621-C473-J62	1206	1.00	213
2309475	C90,92,101,103,104,120,140, 141,145,150,160,162, 165,190,200,220,240,250-255	CERAMIC CHIP CAPACITOR	47 nF 10% 50V X7R CHIP	MOSS 2 230/15	1206	23.00	213
2310128	C3-12	CERAMIC CHIP CAPACITOR	470pF 5 % 50V NP0 CHIP	MOSS 2 230/11	1206	10.00	213
2310209	C163,164	CERAMIC CHIP CAPACITOR	2.2nF 5 % 50V NP0 CHIP	MOSS 2 230/11	1206	2.00	213
2604110	C91	TANTALUM CHIP CAPACITOR	10 uF 20% 25V CHIP	MOSS 2 260/2	7343	1.00	213

ITEM..: 0308557 L115 LOGIC UNIT

ID-code	Partno	Description	Value	Type	Cover	Psqty	Rec.
2604128	C102,142,146	TANTALUM CHIP CAPACITOR	1.0 uF 20% 35V CHIP	EI UUSIIN TUOTT	3528	3.00	313
2604262	C100,191	TANTALUM CHIP CAPACITOR	10 uF 20% 16V CHIP	EI UUSIIN TUOTT	6032	2.00	313
4100278	D190	DIODE PAIR	70V 0.1A 6ns COMM.CATH.	BAV 70	SOT 23	1.00	212
4100285	D219	DIODE PAIR	70V 0.2A 6ns IN SERIES	BAV 99	SOT 23	1.00	212
4100783	D151,191	ZENER DIODE	5.1V 5% 0.5W	BZV55C5V1	SOD 80	2.00	212
4200909	Q153	TRANSISTOR	P 150MHz 30V 0.1A 0.35W >	BCW 30	SOT 23	1.00	212
4210055	Q150-152,210-212,221,223,224, 510,511	TRANSISTOR	N 300MHz 45V 0.1A 0.25W >	BCW 72	SOT 23	11.00	212
4210312	Q220,500	TRANSISTOR	N 100MHz 60V 1A 1W	BSR 41	SOT 89	2.00	212
4301062	IC100	ANALOG IC	REG 1.24-29V 0.1A 0.5%	LM 2951ACM	SO 8S	1.00	211
4309382	IC120,190,200	PROSESSOR IC	I/O PORT 8BIT FOR I2C-BUS	PCF 8574T	SO 16W	3.00	211
4309488	IC165	DIGITAL IC	ANALOG SWITCH 4XBILATERAL	74HC4066T	SO 14S	1.00	211
4309689	IC140	ANALOG IC	OP.AMP 2X JFET LOW NOISE	TL 072ID	SO 8S	1.00	211
4341185	IC150	DIGITAL IC	MUX/DEMUX 8-CH ANALOG HCM	PC 74HC4051T	SO 16S	1.00	211
4343240	IC160,219	ANALOG IC	OP.AMP 2X 3-32VDC LOW POW	LM 2904	SO 8S	2.00	211
4343950	IC230,240,250	PROCESSOR IC	GRAPH. DISPLAY CONTROL LC	PCF 8579T	VSO 56	3.00	211
4343982	IC220	PROCESSOR IC	GRAPH. DISPLAY CONTROL LC	PCF 8578T	VSO 56	1.00	211
4349864	IC90	ANALOG IC	REG +8V 0.15A 0.5W	TA 78L08F	SOT 89	1.00	211
4850220	D247	LED MODULE	LED BACKLIGHT 25cd/M2/20m	L1219	97X38X2	1.00	202
4860062	D211,225,228,229,233,235-238, 245,246	LED	YEL/GRN >10mcd/20mA 2.2V	CL-150YG-CD-T	1206	11.00	212
4860070	D212	LED	YEL 5-12mcd 20mA 2.2V	CL-150Y-CD-T	1206	1.00	212
4865354	D210	LED	RED >1.0mcd/20mA 2.2V	CL-150R-CD-T	1206	1.00	212
9881593	9881593.1	PC-BOARD L115				1.00	508
DOKU	2B 308557.1.0 1/4,2B 308557.1.0 2/4,2B 308557.1.0 3/4 3B 308557.1.0 4/4,3C 308557.1.0 1/2,3C 308557.1.0 2/2	ASSOCIATED DRAWINGS				0.00	
HISTORIA	PROTO P1 25.02.93 PK PROTO P2 20.02.93 PK	HISTORY				0.00	

ITEM..: 0308557 L115 LOGIC UNIT

ID-code	Partno	Description	Value	Type	Cover	Psqty	Rec.
	SIISTITTY 20.05.93 MR PILOT 1.0 24.05.93 PK V1.1, 24.09.93 PK						
TYÖ-1						0.30	

Structure parts.....: 53 pci

ITEM..: 0308564 L115P LOGIC UNIT

ID-code	Partno	Description	Value	Type	Cover	Psqty	Rec.
0307419		CONNECTION CABLE		1600.0017		1.00	504
1411324	R321	CHIP RESISTOR	10R 5% 0.125 W	MOSS 2 140/5	1206	1.00	213
1411370	R326	CHIP RESISTOR	27R 5% 0.125 W	MOSS 2 140/5	1206	1.00	213
1411571	R606	CHIP RESISTOR	220R 5% 0.125 W	MOSS 2 140/5	1206	1.00	213
1411645	R608	CHIP RESISTOR	560R 5% 0.125 W	MOSS 2 140/5	1206	1.00	213
1411726	R98,99,136,138	CHIP RESISTOR	2.2k 5% 0.125 W	MOSS 2 140/5	1206	4.00	213
1411740	R102	CHIP RESISTOR	3.3k 5% 0.125 W	MOSS 2 140/5	1206	1.00	213
1411772	R167	CHIP RESISTOR	5.6k 5% 0.125 W	MOSS 2 140/5	1206	1.00	213
1411789	R237	CHIP RESISTOR	6.8k 5% 0.125 W	MOSS 2 140/5	1206	1.00	213
1411807	R145,161,163,164,191,233	CHIP RESISTOR	10k 5% 0.125 W	MOSS 2 140/5	1206	6.00	213
1411821	R153,166	CHIP RESISTOR	15k 5% 0.125 W	MOSS 2 140/5	1206	2.00	213
1411853	R124-127,152,510	CHIP RESISTOR	27k 5% 0.125 W	MOSS 2 140/5	1206	6.00	213
1411927	R141,142,146,147,150,151,154, 155,160,260,322,327	CHIP RESISTOR	100k 5% 0.125 W	MOSS 2 140/5	1206	12.00	213
1411980	R220	CHIP RESISTOR	330k 5% 0.125 W	MOSS 2 140/5	1206	1.00	213
1415600	R225,232	MELF RESISTOR	1.0k 1% 0.125 W	NESS 142A4	0204	2.00	213
1415657	R1-11	MELF RESISTOR	100R 1% 0.125 W	NESS 142A4	0204	11.00	213
1415738	R143,148,511,603	MELF RESISTOR	1.5k 1% 0.125 W	NESS 142A4	0204	4.00	213
1415784	R101,236,238,339	MELF RESISTOR	4k75 1% 0.125 W	NESS 142A4	0204	4.00	213
1416033	R162,165	MELF RESISTOR	47k5 1% 0.125 W	NESS 142A4	0204	2.00	213
1416280	R230,231,234,235,310-312,605	MELF RESISTOR	475R 1% 0.125 W	NESS 142A4	0204	8.00	213
1422149	R227	CHIP RESISTOR	0R0 0.125 W	NESS 142/1	1206	1.00	213
1728512	R137,140	CHIP TRIMMER	100k 20% 0.25 W	RVG 4H01A-104VM		2.00	213
1800619	R604	THERMISTOR NTC	CIA 37 15k 10% FSH1	NC20K00153KBA		1.00	203
1827954	R226	CHIP THERMISTOR	NTC 47k 5% 0.3 W	B57621-C473-J62	1206	1.00	213
2309475	C90,92,101,103,104,120,140, 141,145,150,160,162, 165,190,200,220,240,250-255	CERAMIC CHIP CAPACITOR	47 nF 10% 50V X7R CHIP	MOSS 2 230/15	1206	23.00	213
2310128	C3-12	CERAMIC CHIP CAPACITOR	470pF 5 % 50V NPO CHIP	MOSS 2 230/11	1206	10.00	213
2310209	C163,164	CERAMIC CHIP CAPACITOR	2.2nF 5 % 50V NPO CHIP	MOSS 2 230/11	1206	2.00	213
2604110	C91	TANTALUM CHIP CAPACITOR	10 uF 20% 25V CHIP	MOSS 2 260/2	7343	1.00	213

ITEM..: 0308564 L115P LOGIC UNIT

ID-code	Partno	Description	Value	Type	Cover	Psqty	Rec.
2604128	C102,142,146	TANTALUM CHIP CAPACITOR	1.0 uF 20% 35V CHIP	EI UUSIIN TUOTT	3528	3.00	313
2604262	C100,191	TANTALUM CHIP CAPACITOR	10 uF 20% 16V CHIP	EI UUSIIN TUOTT	6032	2.00	313
4100278	D190	DIODE PAIR	70V 0.1A 6ns COMM.CATH.	BAV 70	SOT 23	1.00	212
4100285	D219	DIODE PAIR	70V 0.2A 6ns IN SERIES	BAV 99	SOT 23	1.00	212
4100783	D151,191	ZENER DIODE	5.1V 5% 0.5W	BZV55C5V1	SOD 80	2.00	212
4200909	Q153	TRANSISTOR	P 150MHz 30V 0.1A 0.35W >	BCW 30	SOT 23	1.00	212
4210055	Q150-152,210-212,221,223,224,510,511	TRANSISTOR	N 300MHz 45V 0.1A 0.25W >	BCW 72	SOT 23	11.00	212
4210312	Q220,500	TRANSISTOR	N 100MHz 60V 1A 1W	BSR 41	SOT 89	2.00	212
4301062	IC100	ANALOG IC	REG 1.24-29V 0.1A 0.5%	LM 2951ACM	SO 8S	1.00	211
4309382	IC120,190,200	PROSESSOR IC	I/O PORT 8BIT FOR I2C-BUS	PCF 8574T	SO 16W	3.00	211
4309488	IC165	DIGITAL IC	ANALOG SWITCH 4XBILATERAL	74HC4066T	SO 14S	1.00	211
4309689	IC140	ANALOG IC	OP.AMP 2X JFET LOW NOISE	TL 072ID	SO 8S	1.00	211
4341185	IC150	DIGITAL IC	MUX/DEMUX 8-CH ANALOG HCM	PC 74HC4051T	SO 16S	1.00	211
4343240	IC160,219	ANALOG IC	OP.AMP 2X 3-32VDC LOW POW	LM 2904	SO 8S	2.00	211
4343950	IC230,240,250	PROCESSOR IC	GRAPH. DISPLAY CONTROL LC	PCF 8579T	VSO 56	3.00	211
4343982	IC220	PROCESSOR IC	GRAPH. DISPLAY CONTROL LC	PCF 8578T	VSO 56	1.00	211
4348740	IC260	MEMORY IC	EEPROM 256X8 CMOS	24C02S	SO 8S	1.00	211
4349864	IC90	ANALOG IC	REG +8V 0.15A 0.5W	TA 78L08F	SOT 89	1.00	211
4850220	D247	LED MODULE	LED BACKLIGHT 25cd/M2/20m	L1219	97X38X2	1.00	202
4860062	D211,225,228,229,233,235-238,245,246	LED	YEL/GRN >10mcd/20mA 2.2V	CL-150YG-CD-T	1206	11.00	212
4860070	D212	LED	YEL 5-12mcd 20mA 2.2V	CL-150Y-CD-T	1206	1.00	212
4865354	D210	LED	RED >1.0mcd/20mA 2.2V	CL-150R-CD-T	1206	1.00	212
9881593	9881593.1	PC-BOARD L115				1.00	508
DOKU	2B 308557.1.0 1/4,2B 308557.1.0 2/4,2B 308557.1.0 3/4 3B 308557.1.0 4/4,3C 308557.1.0 1/2,3C 308557.1.0 2/2	ASSOCIATED DRAWINGS				0.00	

ITEM..: 0308564 L115P LOGIC UNIT

ID-code	Partno	Description	Value	Type	Cover	Psqty	Rec.
HISTORIA	V1.1 24.09.93 PK	HISTORY				0.00	
TYÖ-1						0.00	

Structure parts.....: 54 pci

JUNE 8. 1993

I2C (2: 0)

I2C (2: 0)

Connector1

I2C_SCL
I2C_SDA
I2C_INT
VF_S
GND_ANALOG
MIC
PTT
ON_OFF
GND_DIGIT
LSP
GND_ANALOG

VF_S
TA7805F
IC10
IN
OUT
GND
C10 47n
C11 10u 25V
C12 47n
+5V

PTT
8 OHMS, 2/3W
R1 1k
Q1 BC847B
C2 0,1u 25V
D1 9.1v
8.5V
C3 10u 25V
R2 2.2k
C4 10u 25V
D2 5.6V
R3 2.2k
R51 100k
C51 47n
C1 1n
WM-34CZ

OP_AMP
TL072
IC50
R56 10k
R52 1.5k
R57 330k
R53 1.5k
R54 2.2k
R55 1.5k
C54 15n
C52 1u 25V
C53 1u 25V

+5V +5V
C30 47n
I/O_INT
IC30
C31 10u 25V
D31 BAV70

ON/OFF
UP
DOWN
END
STATUS
VOLUME
UP
DOWN

R61 100k
Q61 BC847B

IC60
PHILIPS 74HC4066T
PHILIPS HEF4066BT
NATIONAL CD4066BCH
TOSHIBA TC4066BT

R23 2.2k
R24 2.2k
+5V +5V +5V +5V
I/O_INT
IC20
CONTROL UNIT IDENTIFICATION

R40 2.2k
NTC
R41 2.2k
R44 2.2k
C40 47n
Vdd
C42 680
R46 1M
R42 100
R43 100
0577
DISP. CONTR
SDA
SCL
A0/DSC
A1
IC40
PCF8577CT
Rubber2
Rubber1
LCD
LCD

D20 D21 D22 D23
DISPLAY LIGHTS, YELLOW GREEN
Q20 BC847B
R20 330 SIZE 1206
D24
POWER, YELLOW GREEN
Q21 BC847B
R21 1k SIZE 1206
D25
CALL, YELLOW
Q22 BC847B
R22 470 SIZE 1206

NOKIA TELECOMMUNICATIONS
Ref. KHxHxxxxxxxx
CU_45_4671245
Unit_name
Sheet_name
Scale
Prepd APn 08.06.1993
Chkd APr 08.06.1993
Apprd
Archvd
P1.0
1/1
Rev. Date Prepd Apprd

FUNCTIONAL DESCRIPTION OF THE CONNECTION BOX CB 40

List of contents:

I. GENERAL DESCRIPTION

The connection box is used in the remote installation to connect the control unit, microphone, loudspeaker, HF–set and external I/O–lines to the radio–unit. There is also a D25–connector, where is RS232–interface and space to connect other devices.

With Connection Box CB40 must be used system cable SC42.

II. TECHNICAL DATA

Operating voltage		10.8... 15.6V
Current consumption		
standby typical.	3.6mA	
max.	7mA	
–CRM and ALARM activated typical		15.6mA
max.	20mA	

A. OUTPUT LEVELS:

–Symmetrical loudspeaker	2.6W/8Ω	(1)
	/nom.dev./13.2V	
	6.0W/8Ω	(1)
	/max.dev./13.2V	
–Unsymmetrical loudspeaker in HS		
	0.4W/16Ω	(1)
	/nom.dev./13.2V	
	0.9W/16Ω	(1)
	/max.dev./13.2V	
–Ear in HS–connector	160mVrms/2.2kΩ	
–CRM grounding,	max.current 200mA	
–ALARM grounding,	max.current 200mA	
–VF_S	10.8 – 15.6V/500mA	

B. INPUT LEVELS:

–IGN	10.8V–35V	
–HF_PTT	line is grounded ➧TxON	
–EMERG_PTT	line is grounded ➧TxON	
–HF_MIC	–67dB/1V/0.1Pa	(2)
(Foster M336E01)		
–HS_MIC	–66dB/1V/0.1Pa	(2)
(Merry EMC–552)		
–PTT	line is grounded when, TxON	
–HOOK	line is grounded when, handset is in the holder	

(1) loudspeaker power level when the radio–unit output is 6W/4Ω 13.2V from RU–connector measured with nom. deviation

(2) mic –input levels can be adjusted to each microphone type in the control unit.

III. CONNECTORS

A. RU_26 (to system cable):

1.	TX–QDATA	quick data, TX
2.	GND_ANALOG	analog ground
3.	VF_S	voltage to accessories
4.	GND_ANALOG	analog ground
5.	LSP_B1	bridge connected loudspeaker line +pole 1
6.	LSP_B2	bridge connected loudspeaker line – pole 2
7.	I^2C_SDA	I^2C–bus data
8.	I^2C_INT	I^2C–bus interrupt line
9.	GND_DIGIT	digital ground
10.	RS_DSR	RS–232 data terminal ready
11.	RS_RXD	RS–232 received data
12.	GND_ANALOG	analog ground
13.	GND_ANALOG	analog ground
14.	RX_QDATA	quick data, RX
15.	MIC	amplified mic–signal to radio
16.	EAR	earphone line
17.	PTT	Press To Talk
18.	GND_DIGIT	digital ground
19.	IGN	car ignition data
20.	I^2C_SCL	I^2C–bus clock
21.	ON_OFF	on/off–info
22.	RS_TXD	RS–232 transmitting data
23.	RS_DTR	RS–232 data terminal ready
24.	RS_CTS	RS–232 transmit ready
25.	RS_RTS	RS–232 transmit request
26.		Not connected

B. CU (to the control unit):

1.	I^2C_SCL	I^2C–bus clock
2.	I^2C_SDA	I^2C–bus data
3.	I^2C_INT	I^2C–bus interrupt line
4.	VF_S	voltage to accessories
5.	HOOK	handset state– lifted/into holder
6.	GND_ANALOG	analog ground
7.	MIC	amplified mic–signal to radio
8.	HS_MIC	handset mic to the control unit
9.	PTT	Press To Talk
10.	ON_OFF	on/off–info
11.	GND_DIGIT	digital ground
12.	LSP	unsymmetrical loudspeaker
13.	HF_PTT	HF–Press To Talk
14.	GND_ANALOG	analog ground
15.	HF_MIC	HF–mic–signal to the control unit
16.		Not connected

C. HS (to the handset):

1.	LSP	unsymmetrical loudspeaker line
2.	VF_S	voltage to handset
3.	EAR	handset earphone
4.	PTT	Press To Talk
5.	GND_ANALOG	analog ground
6.	HOOK	handset state– lifted/into holder
7.	GND_ANALOG	analog ground (mic–line protection)
8.	HS_MIC	handset mic to the control unit

D. RS (RS−232 + and other accessories):

1.	GND_DIGIT	digital ground
2.	RS_TXD	RS−232 transmitting data
3.	RS_RXD	RS−232 receiving data
4.	RS_RTS	RS−232 transmit request
5.	RS_CTS	RS−232 ready to transmit
6.	RS_DSR	RS−232 data terminal ready
7.	GND_DIGIT	digital ground
8.		not connected
9.	VF_S	voltage to accessories
10.	PTT	Press To Talk
11.	MIC	amplified mic−signal to radio
12.	GND_ANALOG	analog ground
13.	I^2C_SCL	I^2C−bus clock
14.	I^2C_SDA	I^2C−bus data
15.		not connected
16.	I^2C_INT	I^2C−bus interrupt line
17.		not connected
18.	GND_ANALOG	analog ground
19.	EAR	handset earphone
20.	RS_DTR	RS−232 data terminal ready
21.		not connected
22.		not connected
23.		not connected
24.	RX_QDATA	quick data, RX
25.	TX−QDATA	quick data, TX

E. LSP (to the loudspeaker):

LSP_B1	+pole 1 of bridge connected loudspeaker line
LSP_B2	− pole 2 of bridge connected loudspeaker line

F. EXT (external control lines):

1.	IGN	car ignition data
2.	ALARM	external alarm control line
3.	CRM	car radio muting
4.	EMERG_PTT	emergency switch
5.	GND_DIGIT	digital ground

IV. FUNCTIONAL DESCRIPTION

RS–232–bus and quick data –lines are connected directly from RU_26–connector to RS–connector.

I^2C–bus is connected from RU–connector to control unit (CU) and RS–connector.

The symmetrical loudspeaker line is connected from the RU_26–connector to LSP. The unsymmetrical loudspeaker line to control unit (CU) and to handset (HS) is formed of the LSP_B1–line by C8.

The handset (HS) has it's own grounding in the pin 5, taken from the radio–unit. That's because the unsymmetrical loudspeaker line current will not disturb other facilities.

HF_MIC–signal and HS_MIC–signal are connected to the control unit, where they will be amplified. The amplified signals will come back by MIC–line where they will be connected via RU_26–connector to the radio–unit. Resistors R11 and R16 will align the microphone sensitivity level to be the same as when installed together. The microphone input sensitivity levels are adjusted in the control unit.

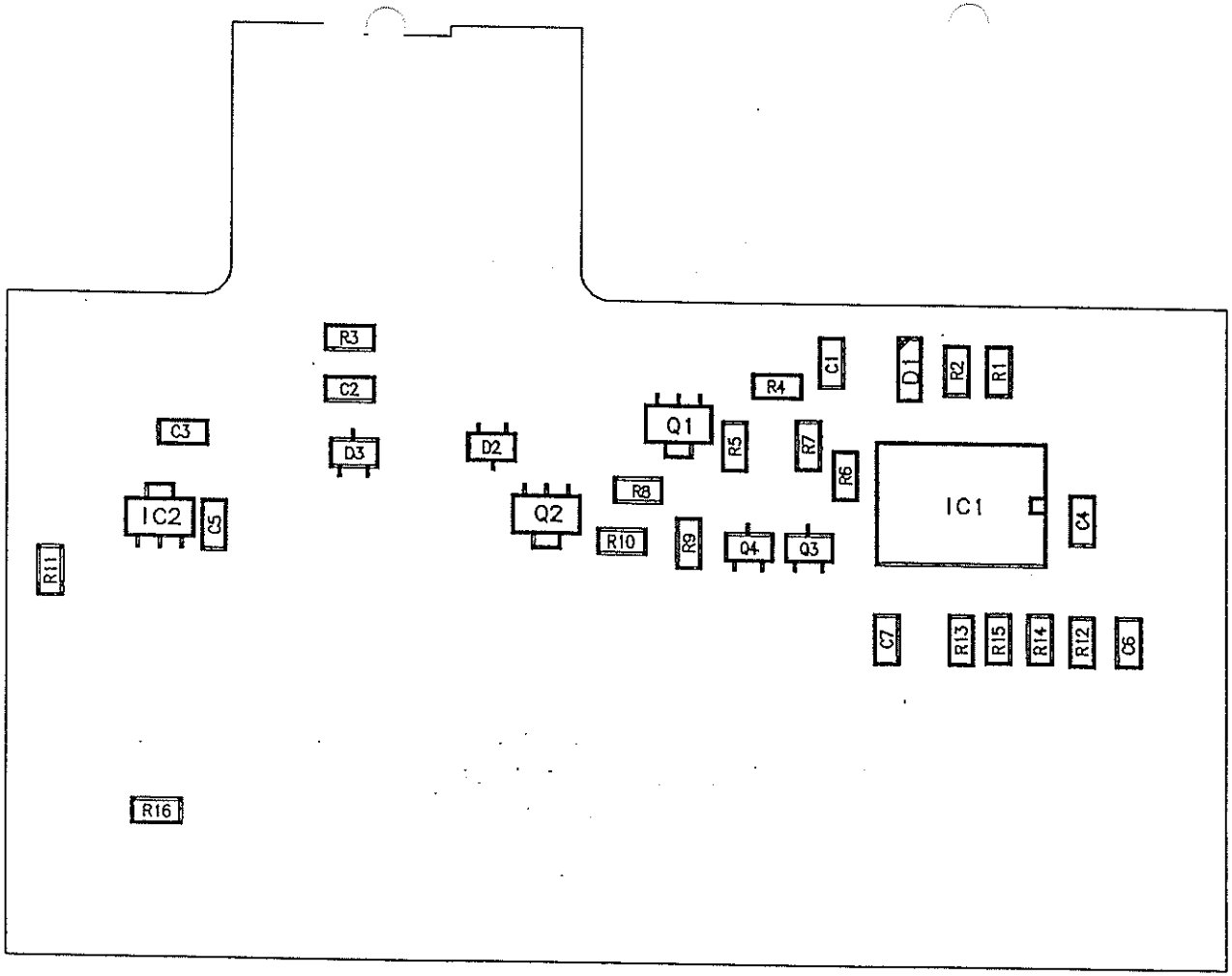
Ignition information IGN is connected from EXT–connector through filter components R3, C2 and D3 to RU_26–connector.

The external alarm line– ALARM, car–radio muting– CRM and emergency switch– EMERG_PTT are connected to I^2C–bus by IC1. The address of IC1 is 074.

The ALARM and CRM –lines are driven active by controlling IC1 outputs D0 and D1 to zero. Q3 and Q4 opens and Q1, Q2 will get the needed base current, so that outputs can be loaded by 200mA. D2 protects transistors of negative voltages.

EMERG_PTT is activated by grounding EXT–connector pin–4, when IC1 gives an interrupt from pin INT and then the state of D2 is read to the processor.

IC2 makes +5V voltage to the module.



REV.	DATE	PREPD	APPRD

NOKIA
TELECOMMUNICATIONS

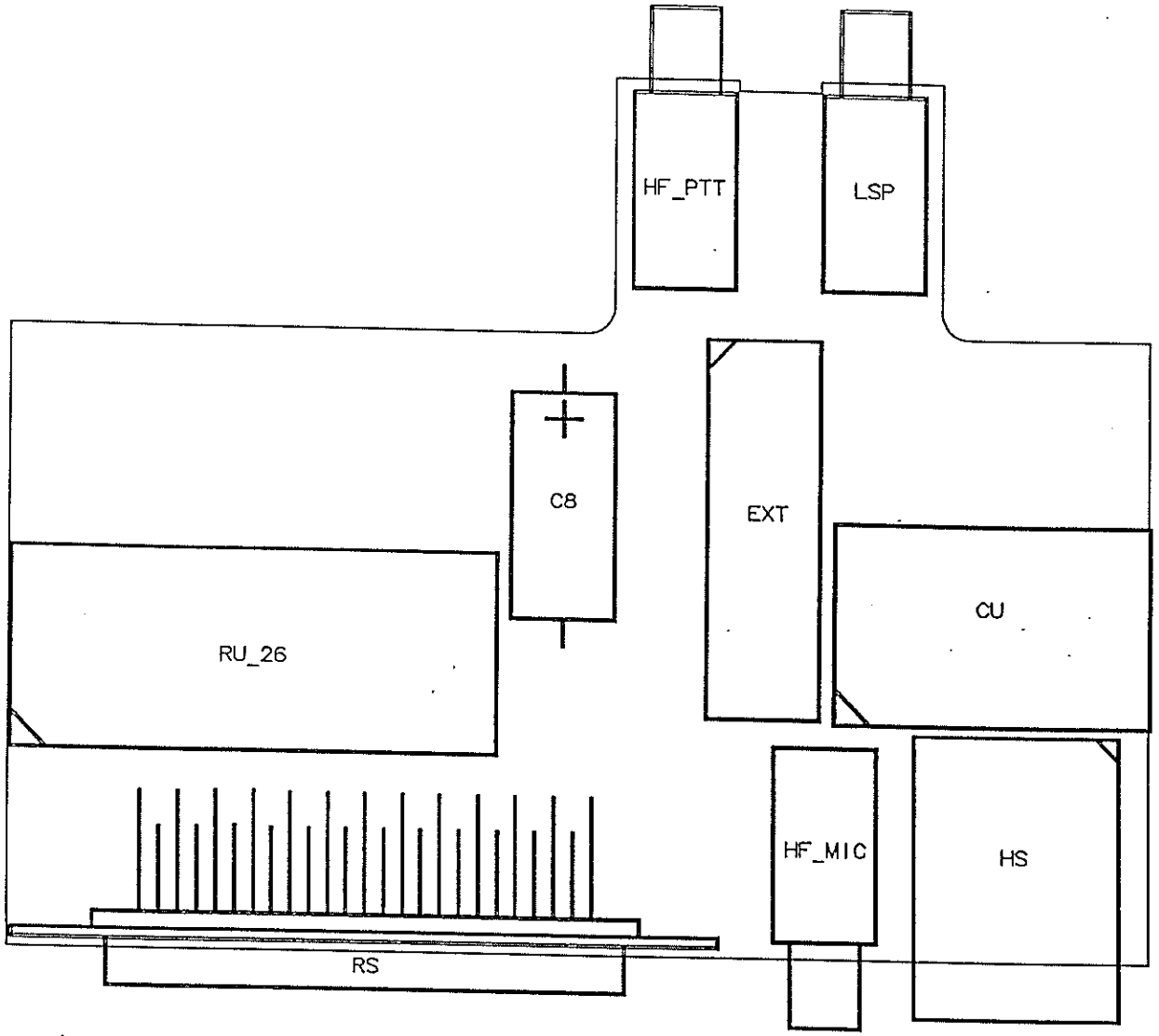
REF.
9881659 a

CB40
L130

SCALE
2:1

PREPD	MH	30.05.92
CHKD		
APPRD	LRa	30.05.92
ARCHVD		

3C 0306704 a



REV.	DATE	PREPD	APPRD

NOKIA
TELECOMMUNICATIONS

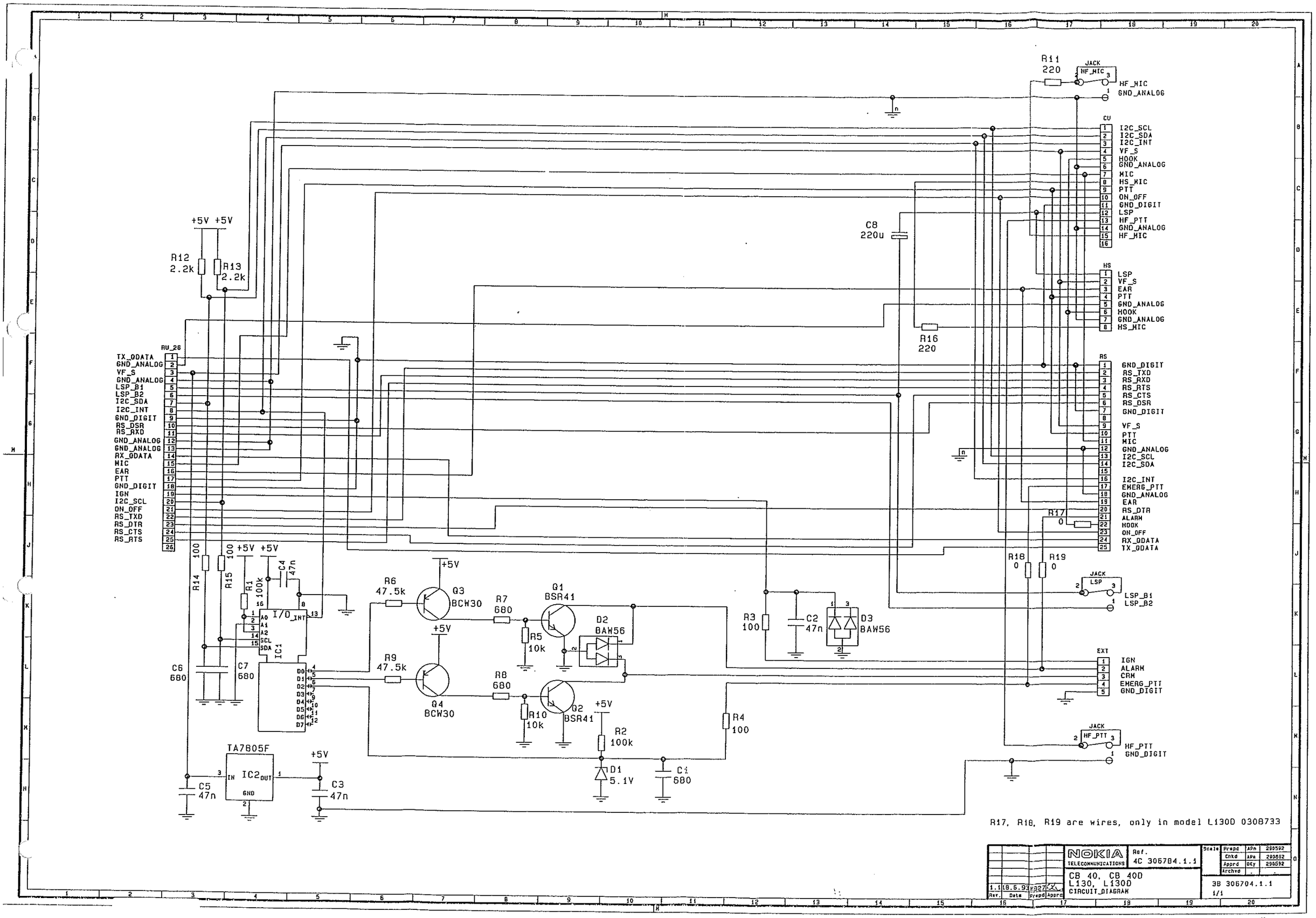
REF.
9881659 a

CB40
L130

SCALE			
2:1	PREPD	MH	30.05.92
	CHKD		
	APPRD	LRa	30.05.92
	ARCHVD		

3C 0306704 a

Order		2	
Product's quantity		0,00	According structure
Option			
Items		2	Normal items
Spare parts		0	All parts
Sequencenumbers		0	With sequencenumbers
Price		0	No price
Product group		0	With product group
Language		EN	English
Limits		1	Limit
Product	0306704	.0306704	


R11
220
JACK
HF_MIC
HF_MIC
GND_ANALOG
CU
I2C_SCL
I2C_SDA
I2C_INT
VF_S
HOOK
GND_ANALOG
MIC
HS_MIC
PTT
ON_OFF
GND_DIGIT
LSP
HF_PTT
GND_ANALOG
HF_MIC
HS
LSP
VF_S
EAR
PTT
GND_ANALOG
HOOK
GND_ANALOG
HS_MIC
RS
GND_DIGIT
RS_TXD
RS_RXD
RS_RTS
RS_CTS
RS_DSR
GND_DIGIT
VF_S
PTT
MIC
GND_ANALOG
I2C_SCL
I2C_SDA
I2C_INT
EMERG_PTT
GND_ANALOG
EAR
RS_DTR
ALARM
HOOK
ON_OFF
RX_ODATA
TX_ODATA
R17
0
R18
0
R19
0
JACK
LSP
LSP_B1
LSP_B2
EXT
IGN
ALARM
CRM
EMERG_PTT
GND_DIGIT
JACK
HF_PTT
HF_PTT
GND_DIGIT
C8
220u
R16
220
+5V +5V
R12
2.2k
R13
2.2k
RU_26
TX_ODATA
GND_ANALOG
VF_S
GND_ANALOG
LSP_B1
LSP_B2
I2C_SDA
I2C_INT
GND_DIGIT
RS_DSR
RS_RXD
GND_ANALOG
GND_ANALOG
RX_ODATA
MIC
EAR
PTT
GND_DIGIT
IGN
I2C_SCL
ON_OFF
RS_TXD
RS_DTR
RS_CTS
RS_RTS
R14
100
R15
100
+5V +5V
R1
100k
C4
47n
I/O_INT
IC1
A0
A1
A2
SCL
SDA
D0
D1
D2
D3
D4
D5
D6
D7
C6
680
C7
680
R6
47.5k
Q3
BCW30
+5V
R7
680
Q1
BSR41
D2
BAW56
R5
10k
R9
47.5k
Q4
BCW30
+5V
R8
680
R10
10k
Q2
BSR41
+5V
R2
100k
D1
5.1V
C1
680
R4
100
R3
100
C2
47n
D3
BAW56
TA7805F
IC2
IN
OUT
GND
C5
47n
+5V
C3
47n
R17, R18, R19 are wires, only in model L130D 0308733
NOKIA
TELECOMMUNICATIONS
Ref.
4C 3067B4.1.1
CB 40, CB 40D
L130, L130D
CIRCUIT DIAGRAM
3B 306704.1.1
1/1
Scale
Prepd APe 290592
Chkd APe 290592
Apprd OKy 290592
Archvd
1.1 18.6.93 KB27
Rev. Date Prepd Apprd

ITEM..: 0306704 L130 LOGIC UNIT

Sqno	ID-code	Partno	Description	Value	Type	Cover	Psqty	Rec.
15	1411571	R11,16	CHIP RESISTOR	220R 5% 0.125 W	MOSS 2 140/5	1206	2.00	213
20	1411652	R7,8	CHIP RESISTOR	680R 5% 0.125 W	MOSS 2 140/5	1206	2.00	213
25	1411726	R12,13	CHIP RESISTOR	2.2k 5% 0.125 W	MOSS 2 140/5	1206	2.00	213
30	1411807	R5,10	CHIP RESISTOR	10k 5% 0.125 W	MOSS 2 140/5	1206	2.00	213
35	1411927	R1,2	CHIP RESISTOR	100k 5% 0.125 W	MOSS 2 140/5	1206	2.00	213
40	1415657	R3,4,14,15	MELF RESISTOR	100R 1% 0.125 W	NESS 142A4	0204	4.00	213
45	1416033	R6,9	MELF RESISTOR	47k5 1% 0.125 W	NESS 142A4	0204	2.00	213
50	2309475	C2-5	CERAMIC CHIP CAPACITOR	47 nF 10% 50V X7R CHIP	MOSS 2 230/15	1206	4.00	213
55	2310142	C1,6,7	CERAMIC CHIP CAPACITOR	680pF 5 % 50V NPO CHIP	MOSS 2 230/11	1206	3.00	213
60	2506806	C8	ALUM.ELECTROLYTIC CAPACIT	220 uF 20% 16V	D8L16 AX		1.00	603
65	4100260	D2,3	DIODE PAIR	70 V 100 mA COMMON	BAW 56	SOT 23	2.00	612
70	4100783	D1	ZENER DIODE	5.1 V 0.5 W	BZV55C5V1	SOD 80	1.00	612
75	4200909	Q3,4	TRANSISTOR	PNP 0.1 A/ 20 V SOT-23	BCW 30	SOT 23	2.00	612
80	4210312	Q1,2	TRANSISTOR	BSR41		SOT 89	2.00	612
85	4309382	IC1	PROSESSOR IC	8-BIT REMOTE I/O	PCF 8574T	SO 16L	1.00	611
90	4345182	IC2	ANALOG IC	REGULATOR 5 V 150 mA	TA 78L05F	SOT 89	1.00	611
95	5403668	HS	MODULAR CONNECTON	8-POLE ANGLE PCB			1.00	604
100	5433744	RS	D-CONNECTOR	25-POLE FEM ANGLE PCB			1.00	604
105	5437124	HF-PTT,HF-MIC,LSP	AUDIO CONNECTOR	3.5 mm PCB JACK	SCJ-0352-1		3.00	604
110	5445138	RU_26	PIN HEADER	2X13-POLE ANGLE PCB	1-825457-3		1.00	604
115	5445610	CU	PIN HEADER	2X8 POLE MALE ANGLE AMP	825457-8		1.00	604
120	5448154	EXT	TERMINAL BLOCK	5-POLE 1.5 mm SCREW/PCB	WKB01-05-AWP		1.00	604
125	7118442				MOSS 2 711/3		0.02	604
130	9881659		PCB 1.6D		L130 jep suoraan kup arille		1.00	518
10	DOKU	3B 306704.1.1,3C 306704.1.1 1/2,3C 306704.1.1 2/2	ASSOCIATED DRAWINGS				0.00	666
5	HISTORIA	27.08.92 PK 19.05.93 MR SIISTIMISTÄ 30.06.93 PK V1.1 K927	HISTORY				0.00	666

Structure parts.....: 26 pci

Nokia Telecommunications BILL OF MATERIAL 01.07.93 Time: 09:53

Order	2	
Product's quantity	0,00	According structure
Option		
Items	2	Normal items
Spare parts	0	All parts
Sequencenumbers	0	With sequencenumbers
Price	0	No price
Product group	0	With product group
Language	EN	English
Limits	1	Limit
Product 0306711	.0306711	

ITEM..: 0306711 ASSEMBLY PART CB 40

Sqno	ID-code	Partno	Description	Value	Type	Cover	Psqty	Rec.
15	5434304		D-LOCKING SCREW	UN 4-40-2 A/4-4028 FEMALE	D20418-2		2.00	604
40	6150482		CROSS REC. SCREW	M 3X16 SFS 2976 PZ 5.8	M 3X16 5.8PZ FEZNKE		2.00	607
45	6270229		TAPPING SCREW	BZ 2.9X16 DIN 7981 PZ	BZ2.9X16 PZ FEZNKE		2.00	607
20	6292014		PT-SCREW	CU58AF	KB25X16 WN1442 MUSTA		3.00	607
50	6310369		HEX NUT	M 3 SFS 2067 5	M3 FEZNKE		2.00	607
55	6350202		STAR WASHER	A 3.2/6 S=0.4 DIN 6798	A3.2 FEZNKE		2.00	607
60	6501162				40X1,3X1,3		1.00	999
65	7700576		PLASTIC BAG	150 X 200mm	32112		1.00	
70	7700596		PLASTIC BAG	75 X 100mm 0.05mm POLYETH	32104		1.00	
25	9207979				9207979 + 9208846		1.00	506
30	9207987						1.00	506
35	9209310		TYPE PLATE 12,7X33 mm	BLANCO PRINTER	TYYPPIKILPI 12,7X33	mm PRINTT.	1.00	506
10	DOKU	4X 7654	ASSOCIATED DRAWINGS				0.00	666
5	HISTORIA	27.08.92 PK	HISTORY				0.00	666
		14.10.92 PK LISÄTTY						
		MUOVIPUSSIT						
		18.02.93 PK VAIHDETTU						
		TYYPPIKILPI						

Structure parts.....: 14 pci

FUNCTIONAL DESCRIPTION OF THE HANDSET HS40

I. GENERAL DESCRIPTION

Handset HS40 belongs to NOKIA R40–product family and it can be used as an alternative choice to the hand microphone HM40.
HS40 can be connected to connection box CB40 or to the system cables SC40 or SC43.

II. FUNCTIONAL DESCRIPTION

Handset HS40 consist of the handset part and it's holder.
In the handset are located condenser–type microphone, dynamic earphone, PTT–switch and HOOK–switch.

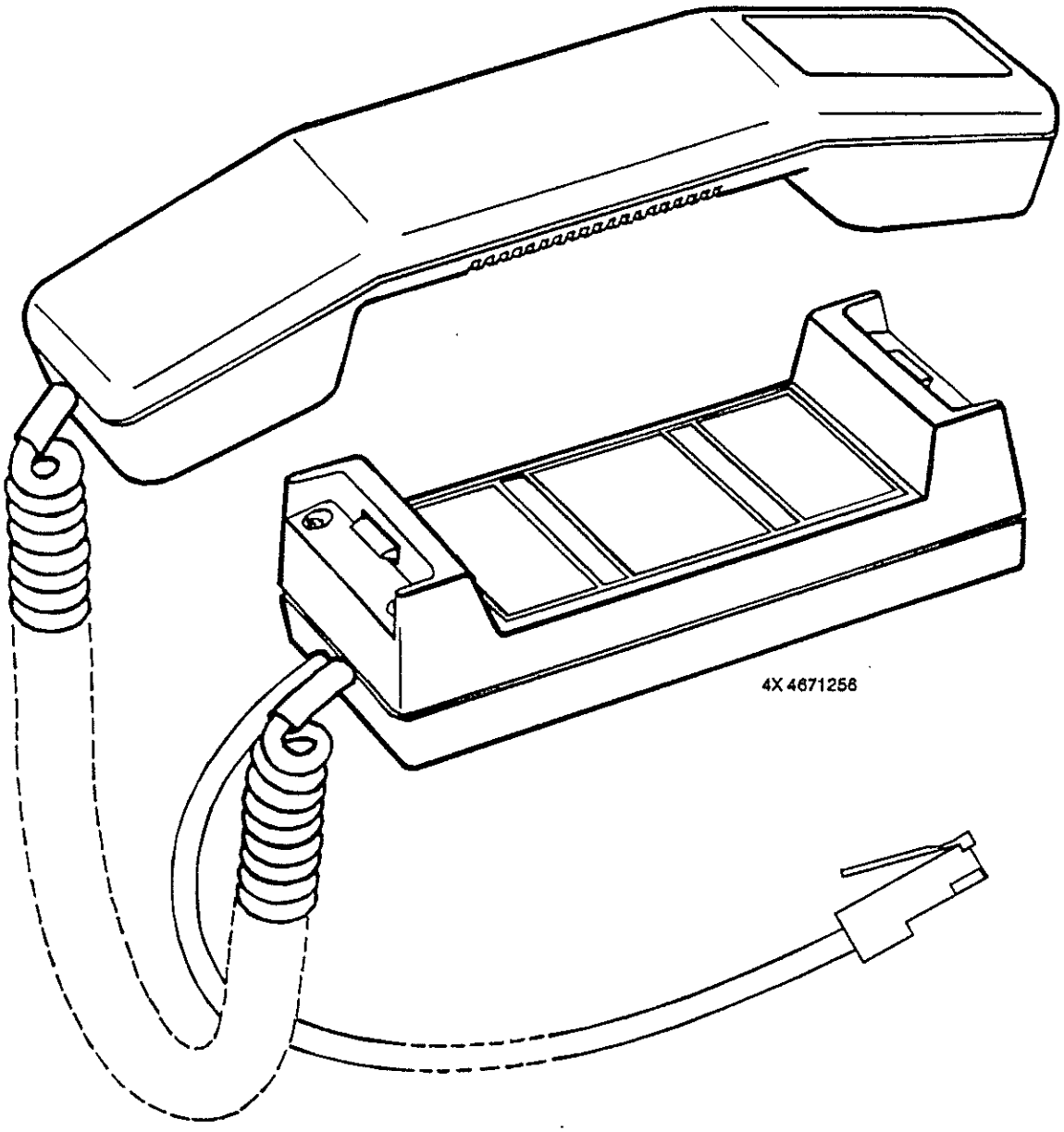
In the holder is located the earphone amplifier. The amplifier is made by operational amp. TL072 which gain is adjusted to 5,5–times.
The earphone has a 550mV– level with nominal deviation when the input power to earphone is 1,6W.

The microphone sensitivity is –62+/–3dB (0dB=1V/0,1Pa 1kHz)
The nominal voltage to the mic. is 4,5V max. 10V

The PTT–switch grounds the PTT–line when pressed.
HOOK–line is grounded when the handset is in the holder.

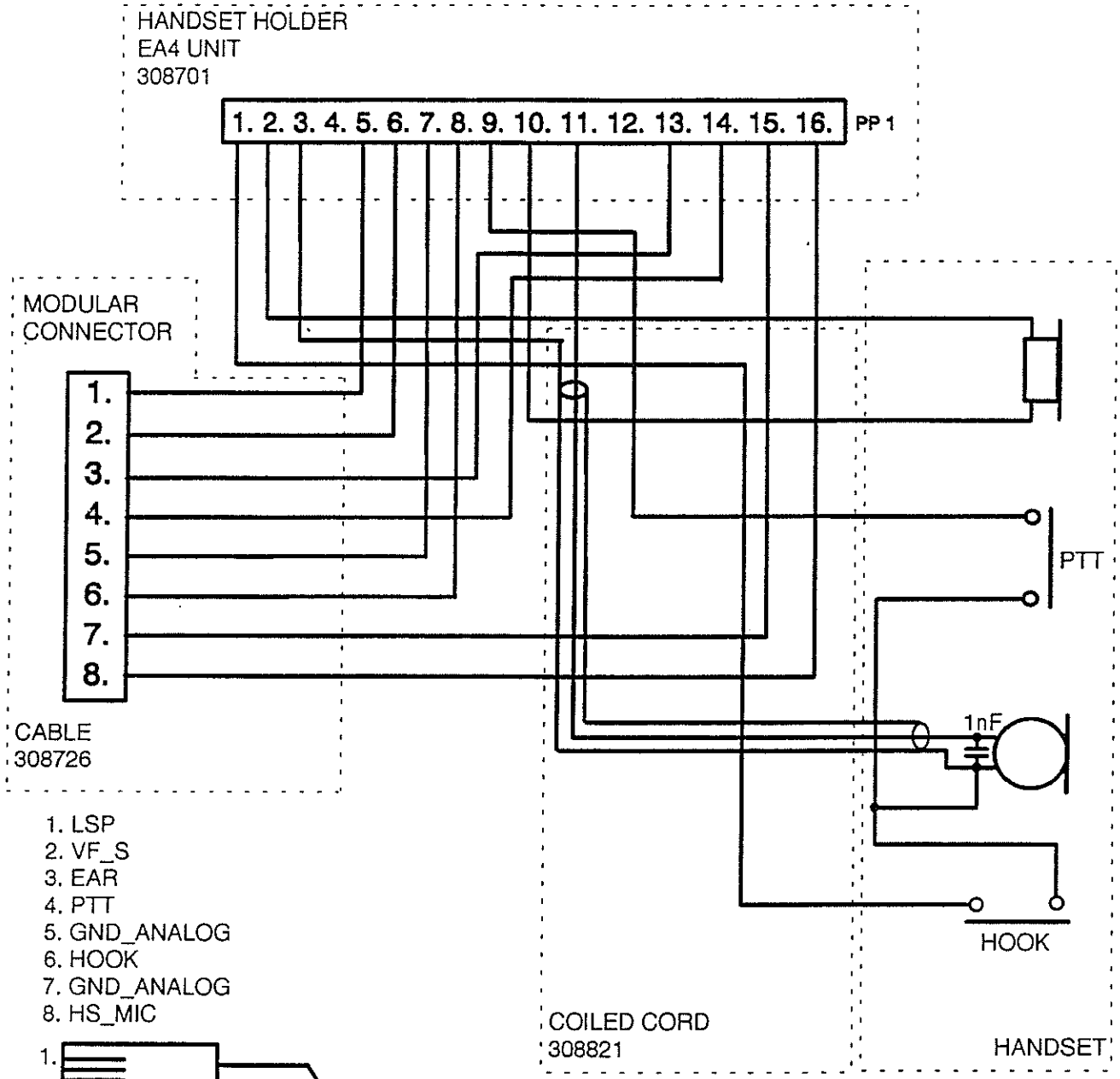
III. TECHNICAL DATA

Operating voltage	10.8... 15.6V
Current consumption max.	5mA
Nominal input level of the EAR–line	180mV
MIC–line level with 94dB voice signal	9,5mV$_{RMS}$ (to 2,2kΩ)
Audio frequency response, mic.	20 ... 16 000Hz
earphone	200 ... 4 000Hz
Operational temperature range	–25°C ... +55°C

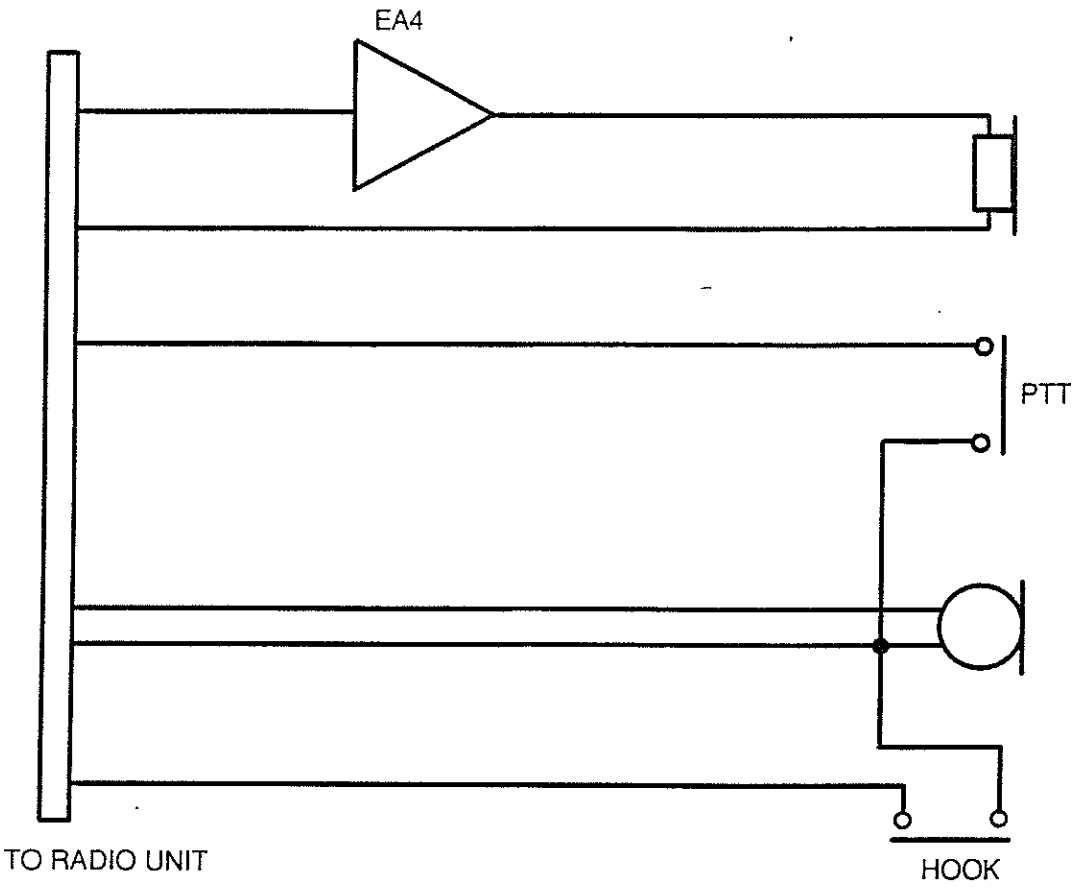


F:\R40\HS40\4671256.DRW

				NOKIA TELECOMMUNICATIONS	SCALE	PREPD	HE	8.10.93
						CHKD	AP	13.10.93
				HS 40		APPRD	OK	13.10.93
						ARCHVD		
REV.	DATE	PREPD	APPRD	Handset	4X 4671256.1			



REV.	DATE	PREPD	APPRD	NOKIA TELECOMMUNICATIONS	SCALE	PREPD	APn	6.9.1993
						CHKD	APn	6.9.93
						APPRD	OK	6.9.93
						ARCHVD		
				Wiring diagram HS40 4671256		4H 4671256.1.O		



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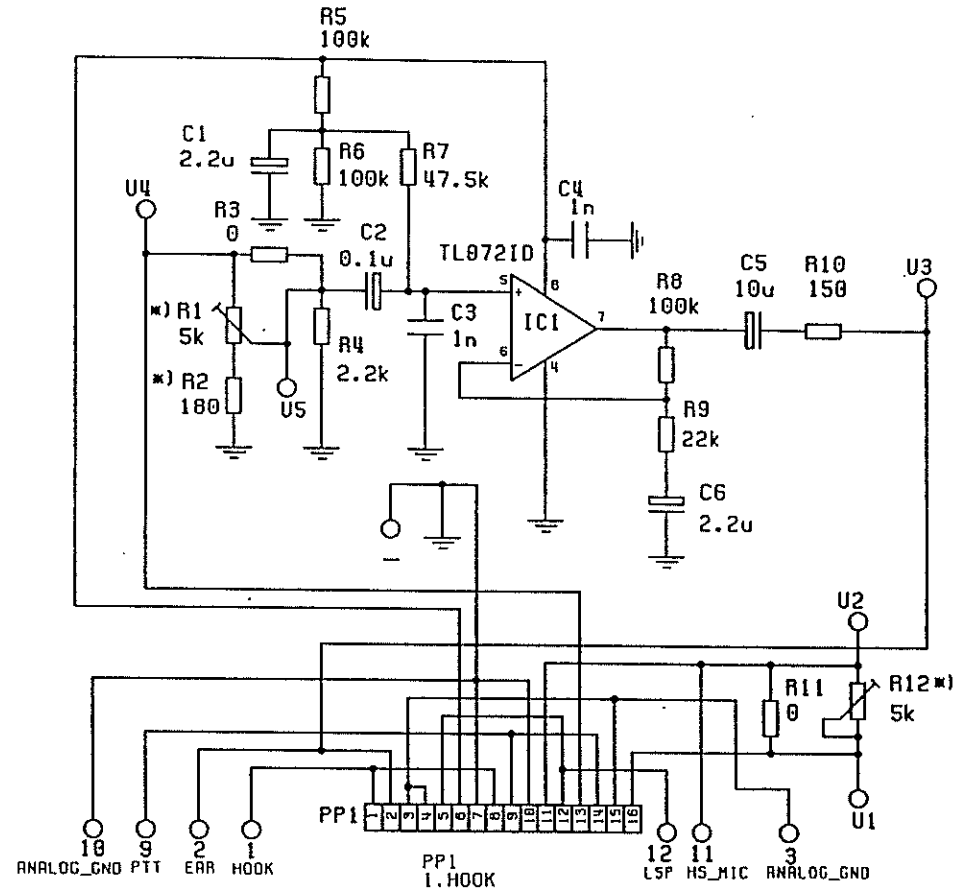
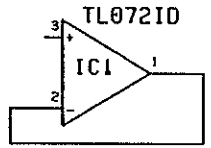
						CHKD	APn	6.9.-13
						APPRD		6.9.-93
						ARCHVD		
REV.	DATE	PREPD	APPRD	Block diagram HS40 4671256	4A 4671256.1.0			



PP1
1. HOOK
2. EAR
3. ANALOG_GND
4. ANALOG_GND
5. LSP
6. VF_S
7. ANALOG_GND
8. HOOK
9. PTT
10. ANALOG_GND
11. HS_MIC
12. LSP
13. EAR
14. PTT
15. ANALOG_GND
16. HS_MIC



*) R1,R2,R12 not in use

NOKIA TELECOMMUNICATIONS

Ref. MMxMxxxxxxxx

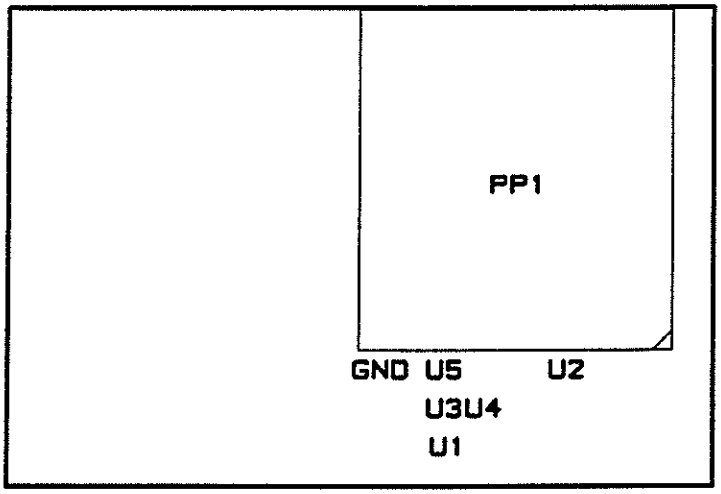
HS48
EAU
CIRCUIT_DIAGRAM

Scale

Prepd	APn	25.08.93
Chkd		6.9.-93
Apprd		6.9.-93
Archvd		

38_388781.1.0
1/1

Rev. Date Prepd Apprd



REV.	DATE	PREPD	APPRD

NOKIA
TELECOMMUNICATIONS

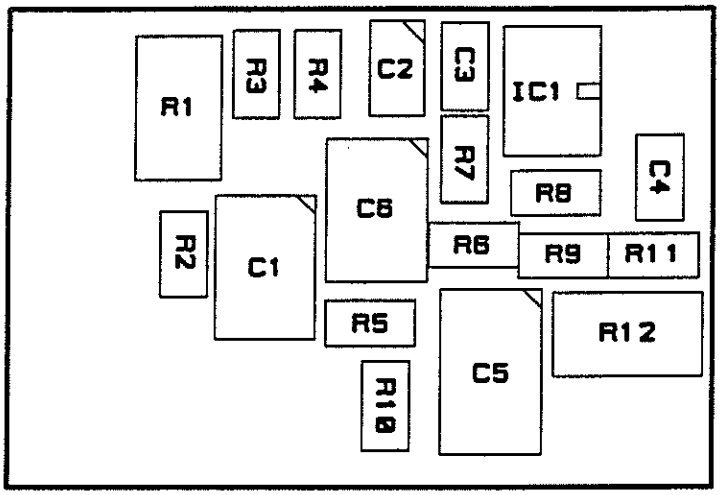
REF.

HS 40
EA4

SCALE 2:1

PREPD	PK	6.9.93
CHKD		13.10.9
APPRD		13.10.93
ARCHVD		

4C 308701.1.0 1/



REV.	DATE	PREPD	APPRD

NOKIA
TELECOMMUNICATIONS

REF.

HS 40
EA4

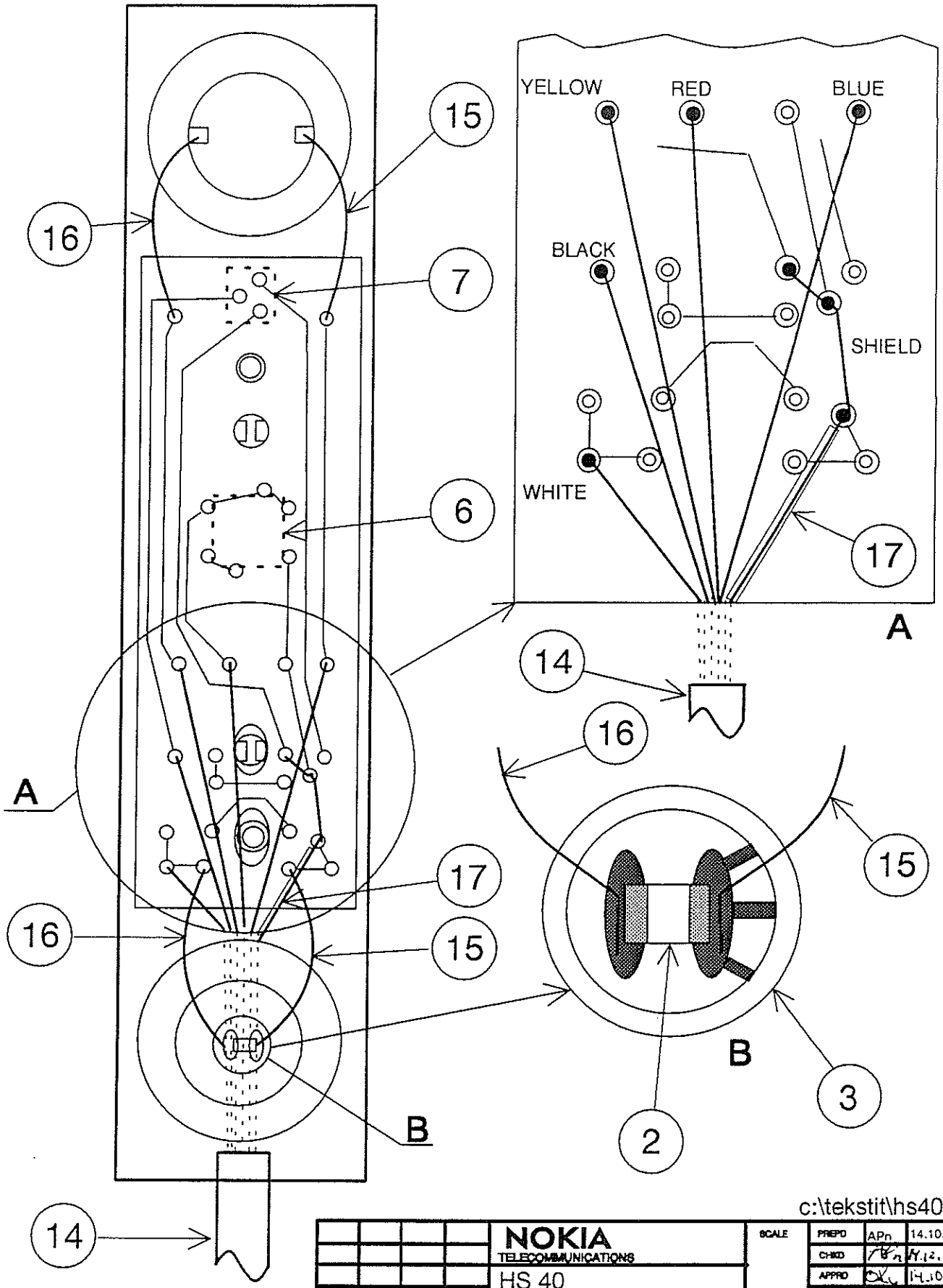
SCALE			
2:1	PREPD	PK	6.9.93
	CHKD	APh	13.10.9
	APPRD	OKL	13.10.9
	ARCHVD		

4C 308701.1.0 2/

ITEM..: 0308701 EA4 EAR AMPLIFIER

Sqno	ID-code	Partno	Description	Value	Type	Cover	Psqty	Rec.
15	1411726	R4	CHIP RESISTOR	2.2k 5% 0.125 W	MOSS 2 140/5	1206	1.00	213
20	1411846	R9	CHIP RESISTOR	22k 5% 0.125 W	MOSS 2 140/5	1206	1.00	213
25	1411927	R5,6,8	CHIP RESISTOR	100k 5% 0.125 W	MOSS 2 140/5	1206	3.00	213
30	1415649	R10	MELF RESISTOR	150R 1% 0.125 W	NESS 142A4	0204	1.00	213
35	1416033	R7	MELF RESISTOR	47k5 1% 0.125 W	NESS 142A4	0204	1.00	213
40	1422149	R3,11	CHIP RESISTOR	0R0 0.125 W	NESS 142/1	1206	2.00	213
45	2310167	C3,4	CERAMIC CHIP CAPACITOR	1.0nF 5 % 50V NPO CHIP	MOSS 2 230/11	1206	2.00	213
50	2604022	C2	TANTALUM CHIP CAPACITOR	100 nF 20% 35V CHIP	MOSS 2 260/2	3216	1.00	213
55	2604093	C1,6	TANTALUM CHIP CAPACITOR	2.2 uF 20% 35V CHIP	MOSS 2 260/2	6032	1.00	213
60	2604110	C5	TANTALUM CHIP CAPACITOR	10 uF 20% 25V CHIP	MOSS 2 260/2	7343	1.00	213
70	4309689	IC1	ANALOG IC	OP.AMP 2X JFET LOW NOISE	TL 072ID	SO 8S	1.00	211
75	5445610	PP1	PIN HEADER	2X8M-POLE ANGLE PCB	825457-8		1.00	204
80	9881924	5F 9881924.1	PC BOARD 1.6D	46X32 EA4	EA4		1.00	518
10	DOKU	4B 308701.1.0, 4C 308701.1.0 1/2 JA 2/2, 4H 4671256.1.0 4A 4671256.1.0	ASSOCIATED DRAWINGS				0.00	
5	HISTORIA	V1.0 7.9.93 PK	HISTORY				0.00	

Structure parts.....: 15 pci



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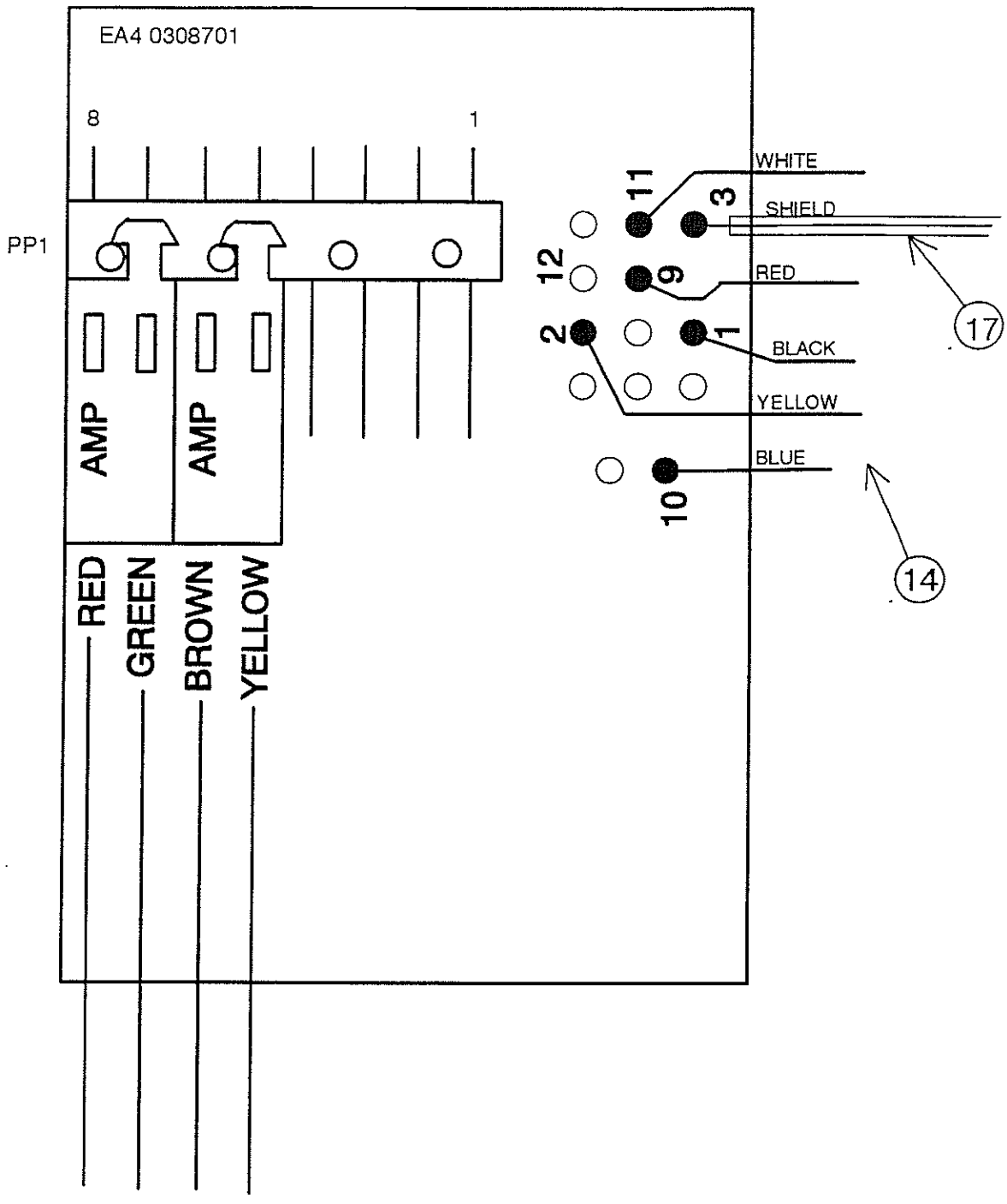
REV.	DATE	PREPD	APPRD

NOKIA
TELECOMMUNICATIONS

HS 40
Handset wiring

SCALE			
	PREPD	APn	14.10.-93
	CHKD		
	APPRD		
	ARCHVD		

4H 308719 1.0.



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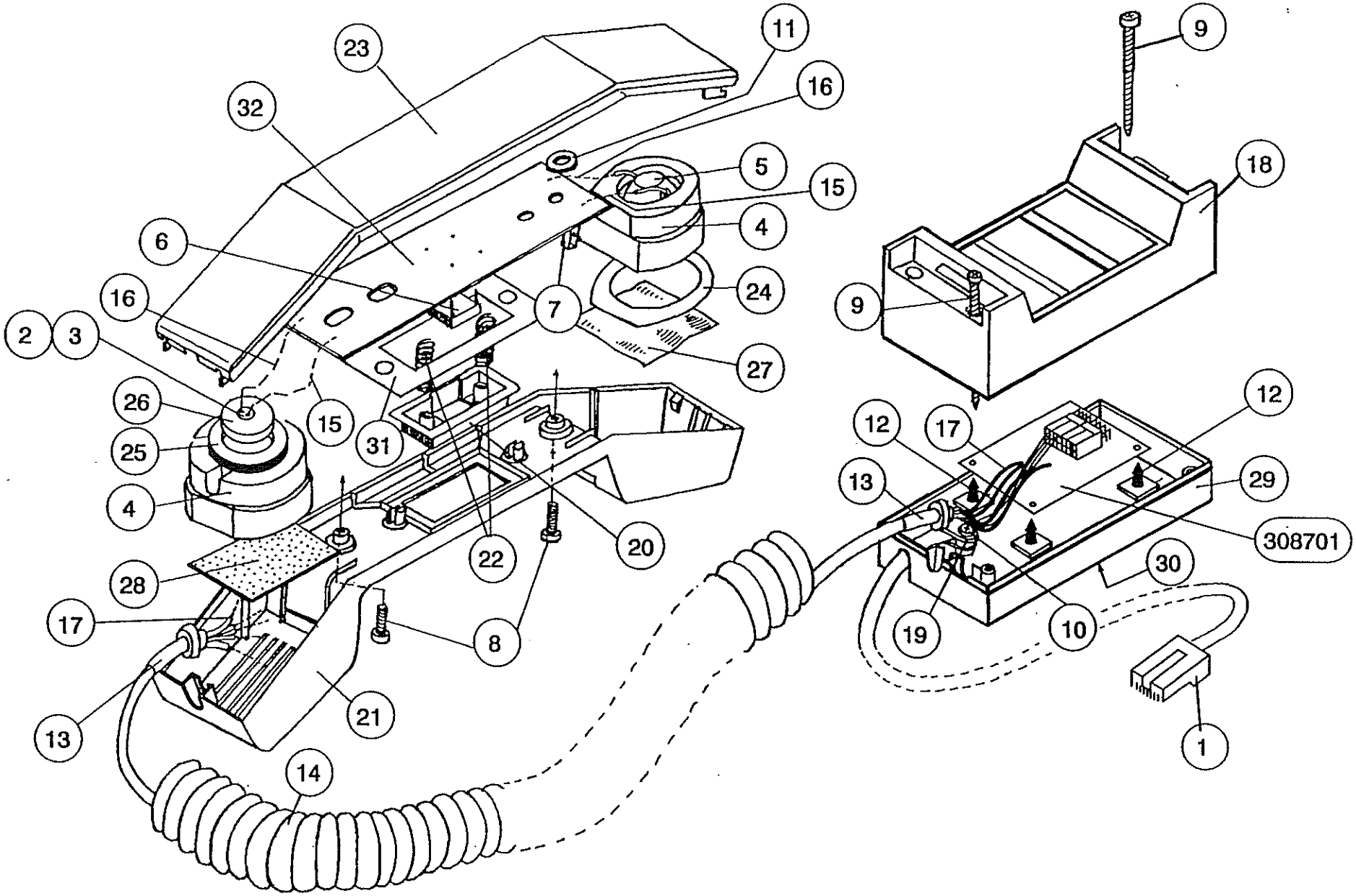
				NOKIA TELECOMMUNICATIONS	SCALE	PREPD	APn 14.10.-93
				HS 40		CHKD	
				EA4 wiring		APPRD	
						ARCHVD	
REV.	DATE	PREPD	APPRD		4H 308701 E1.0		



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				NOKIA TELECOMMUNICATIONS	SCALE	PREPD	HE 1.10.93
						CHKD	1.10.-93
						APPRD	CK 1.10.-93
				HS 40		ARCHVD	
REV.	DATE	PREPD	APPRD	Handset assembly			3C 308719.1

ITEM..: 0308719 HS 40 ASSEMBLY PARTS

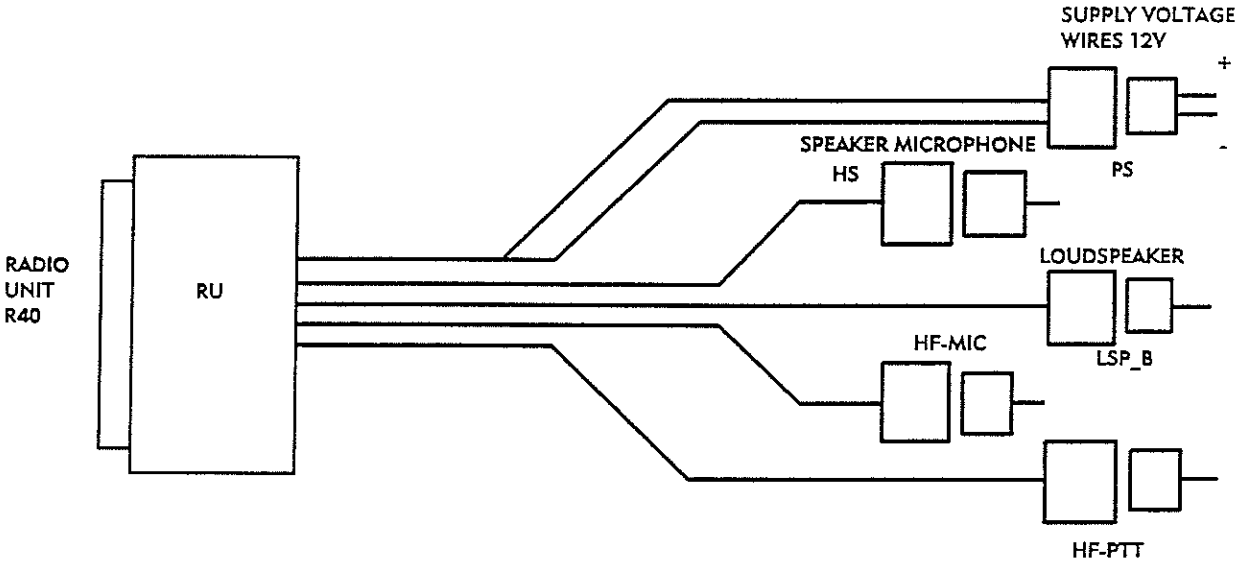
Sqno	ID-code	Partno	Description	Value	Type	Cover	Psqty	Rec.
15	0308726	1	CABLE FOR HS 40		KAAPELI HS 40:LLE		1.00	1940
20	2310167	2	CERAMIC CHIP CAPACITOR	1.0nF 5 % 50V NPO CHIP	MOSS 2 230/11	1206	1.00	213
30	5140315	3	MICROPHONE	ELECTRET -62+-3dB Z2.2k 2	WM-034-AY 185	D9.7H6.7	1.00	204
25	5140756	4	MOUNTING RING		LP 1224A KORKEA		2.00	204
35	5143465	5	RECEIVER CAPSULE		DH 28A		1.00	204
40	5200059	6	PUSH BUTTON SWITCH	1-LOCK S 12V/50mA W/O KEY	SKHCAB 261A		1.00	204
45	5203170	7	MICRO SWITCH		1010.4102 Ag		1.00	204
50	6150387	8	SCREW		M3X12-5.8-PZ FEZNMU		2.00	207
55	6243225	9	PLATE SCREW		B2.9X22-PZ FEZNMU		2.00	407
60	6270179	10	TAPPING SCREW	B BZ2.9X9.5 DIN7981 PZ Fe	BZ2.9X9.5-PZ FEZNKE		2.00	407
65	6305040	11	WASHER				1.00	207
70	6400282	12	BOARD SUPPORT	SPACE 14.1mm HOLE 4.0MM/S	KKGLS-04M		3.00	407
75	6402080	13	GROMMET SLEEVE		15-407		2.00	207
80	7100276	14	SPIRAL CABLE		TKIX 4X0.10+0.10		1.00	504
85	7113204	15	WIRE	1X0.15mm2 KJ 0.15 BLK	MOSS 2 711/2		0.10	204
90	7113363	16	WIRE	1X0.15mm2 KJ 0.15 WHT	MOSS 2 711/2		0.10	204
95	7330889	17	PLASTIC TUBING	2.0/2.8X0.4mm SILICOR GRY	SK 8128 S2/0.4		0.18	204
100	8219015	18	COVER		EE-1901 + LUK.JOUSI		1.00	506
105	9125477	19	STRAIN RELIEF		700006 (UJ124S)		1.00	506
155	9129351	20	PTT-KNOP		EE 1680-5-4 8216805		1.00	506
110	9129552	21	LOWER PART		EE 1541-5-2 8215415		1.00	506
115	9129569	22	SPRING		NR 268-4 CU 8802685		2.00	506
120	9129714	23	UPPER PART		EE-1539-5-2 8215395		1.00	506
135	9130075	24	RUBBER GASKET		20740281		1.00	506
125	9130082	25	RUBBER RING		2073195		1.00	999
130	9130099	26	RUBBER RING		2072795		1.00	999
140	9130109	27	PLASTIC FILM		4D KIRKAS		1.00	506
145	9130117	28	PLASTIC FOAM		4D		1.00	506
150	9133848	29	BOTTOM		EE-1902 +JOUSET		1.00	506
165	9205299	31	PTT-KNOB RUBBER				1.00	506
160	9209310	30	TYPE PLATE 12,7X33 mm	BLANCO PRINTER	TYYPPIKILPI 12,7X33	mm PRINTT.	1.00	506

ITEM..: 0308719 HS 40 ASSEMBLY PARTS

Sqno	ID-code	Partno	Description	Value	Type	Cover	Psqty	Rec.
170	9828045	32	PC-BOARD		EE-1804 A (8918045)		1.00	508
10	DOKU		ASSOCIATED DRAWINGS				0.00	
5	HISTORIA	27.05.93 PK 14.09.93 APn,lis.6400282 ja 9203728, poist.7113243ja7113324 21.09.93 APn lisätty osanumerot 22.09.93 APn, johdinten piiuudet muutettu	HISTORY				0.00	

Structure parts.....: 34 pci

SYSTEM CABLE SC 40
4671620



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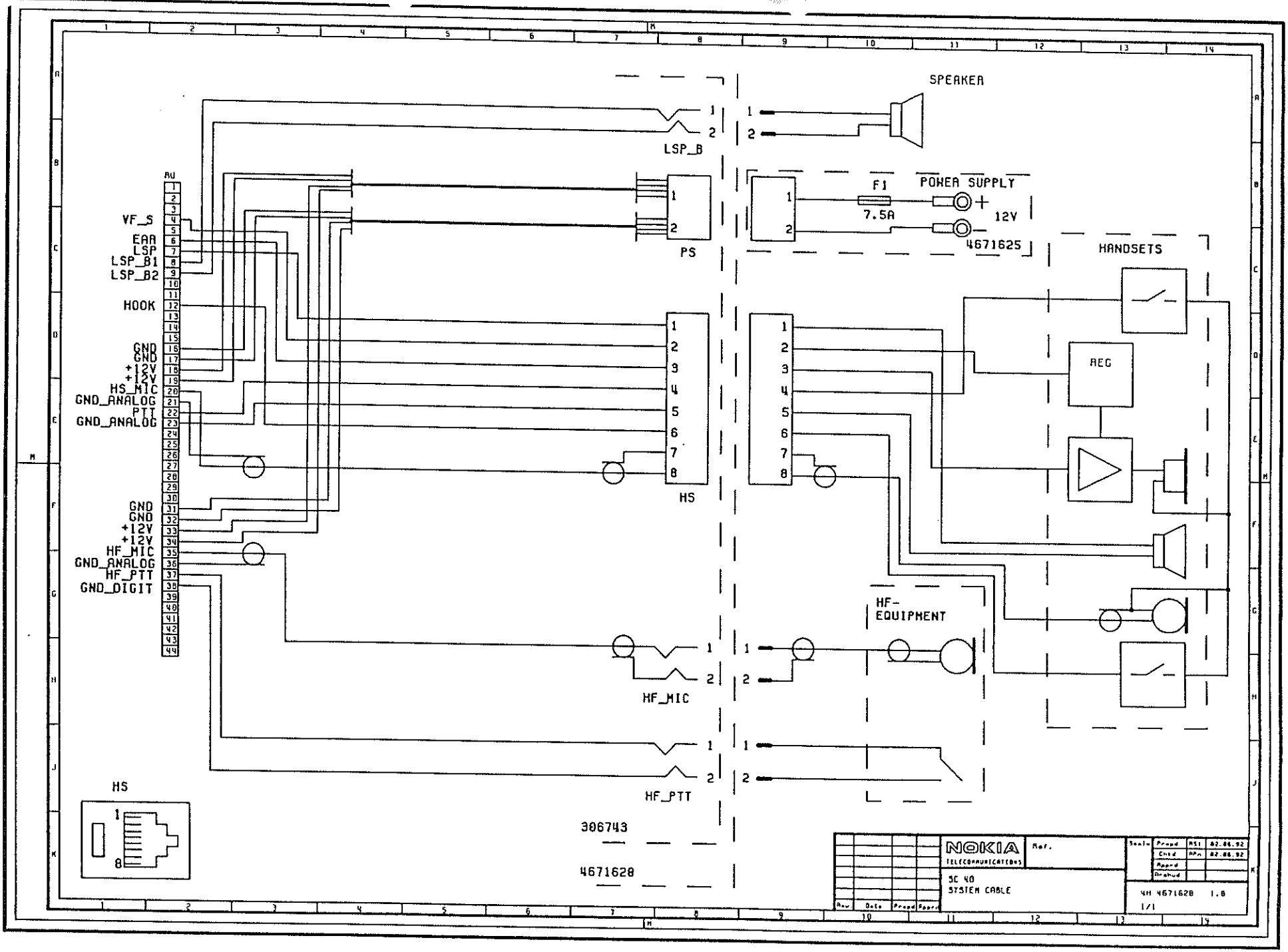
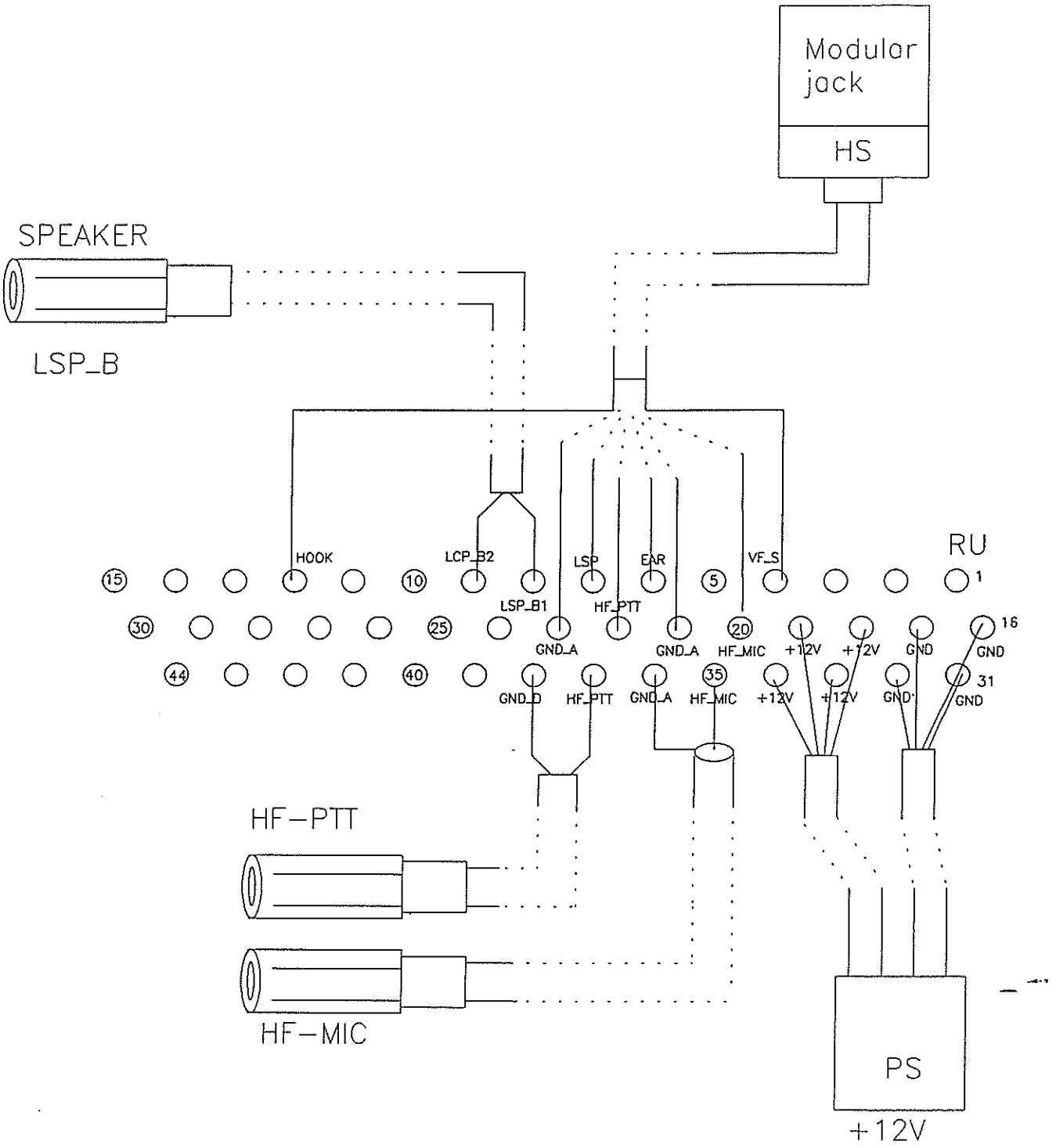

SPEAKER
LSP_B
POWER SUPPLY
F1
7.5A
12V
4671625
HANDSETS
AEG
PS
HS
HF_MIC
HF_PTT
HF-
EQUIPMENT
VF_S
EAR
LSP
LSP_B1
LSP_B2
HOOK
GND
GND
+12V
+12V
HS_MIC
GND_ANALOG
PTT
GND_ANALOG
GND
GND
+12V
+12V
HF_MIC
GND_ANALOG
HF_PTT
GND_DIGIT
AU
HS
306743
4671628
NOKIA
TELECOMMUNICATIONS
SC 40
SYSTEM CABLE
4M 4671628 1.0
1/1

NOKIA
TELECOMMUNICATIONS

SC40 PIN ORDER

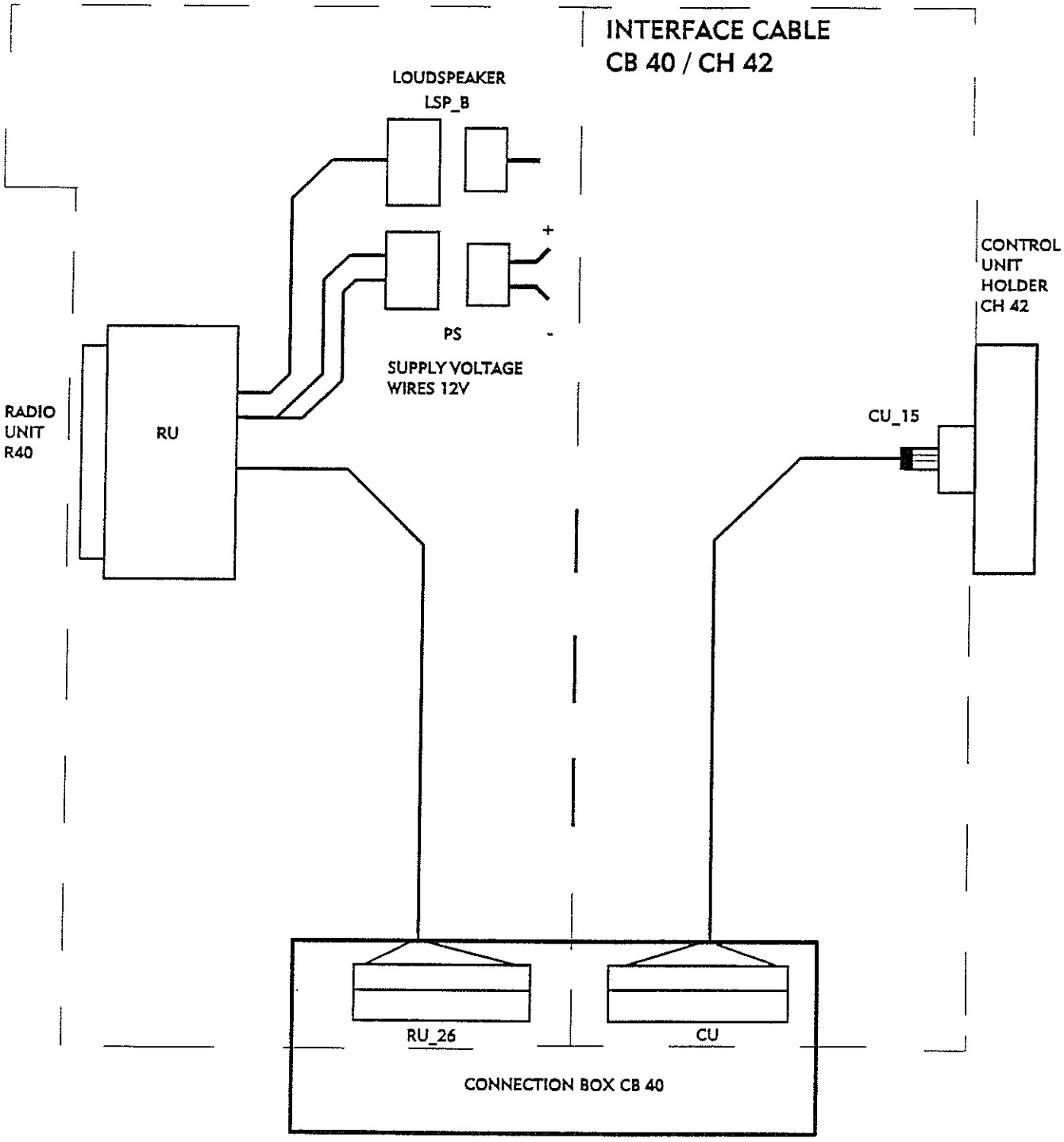


Issue	Approved	Date	Modification	
Prepd. 02.06.92 PK	Checked APn 02.06.92		Approved OKy 20.05.92	Code 4X 4671620.1.0

NOKIA TELECOMMUNICATIONS
NCS / PMR-TERMINALS

SYSTEM CABLE SC 42
4671622

INTERFACE CABLE
CB 40 / CH 42



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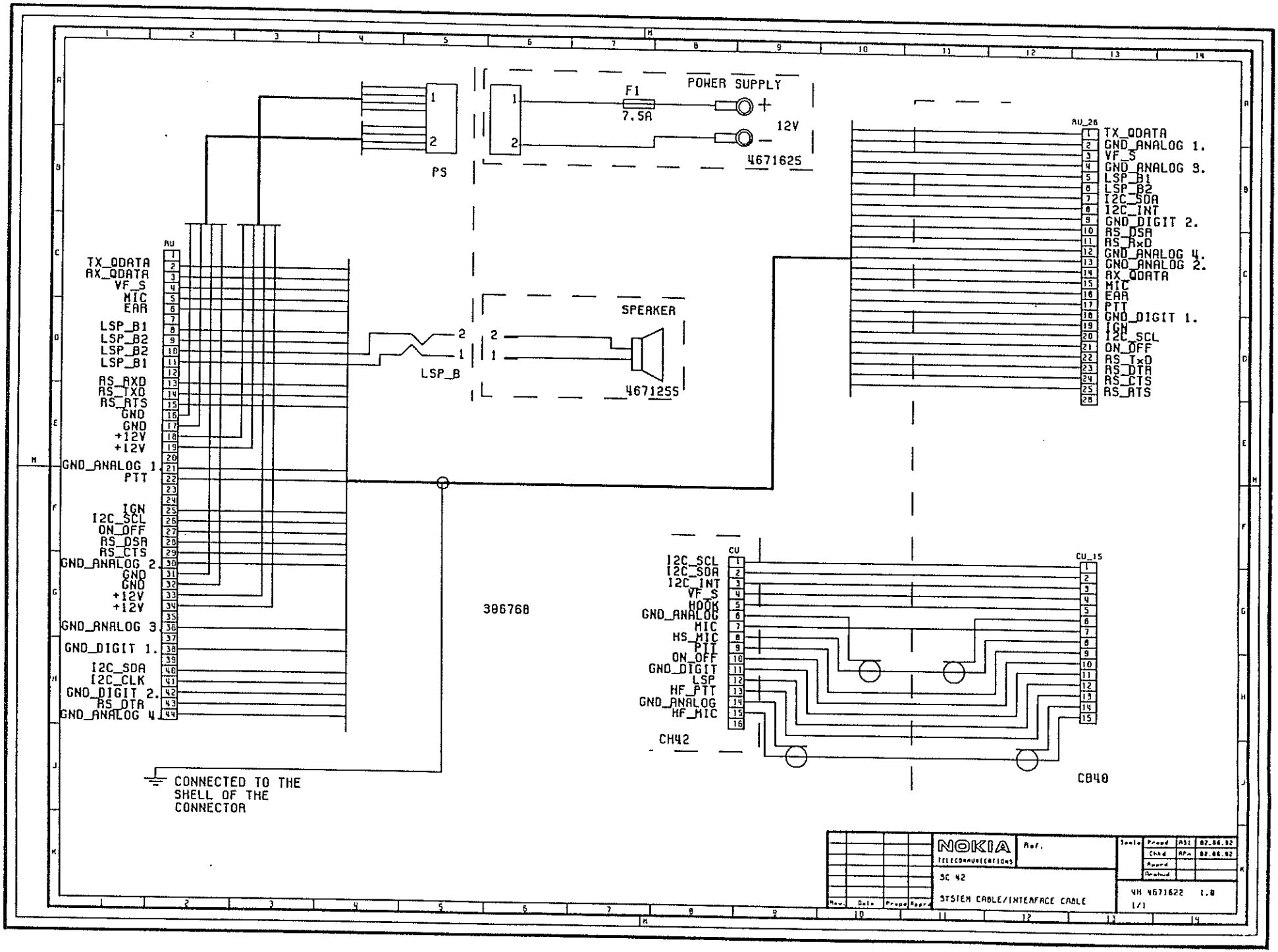
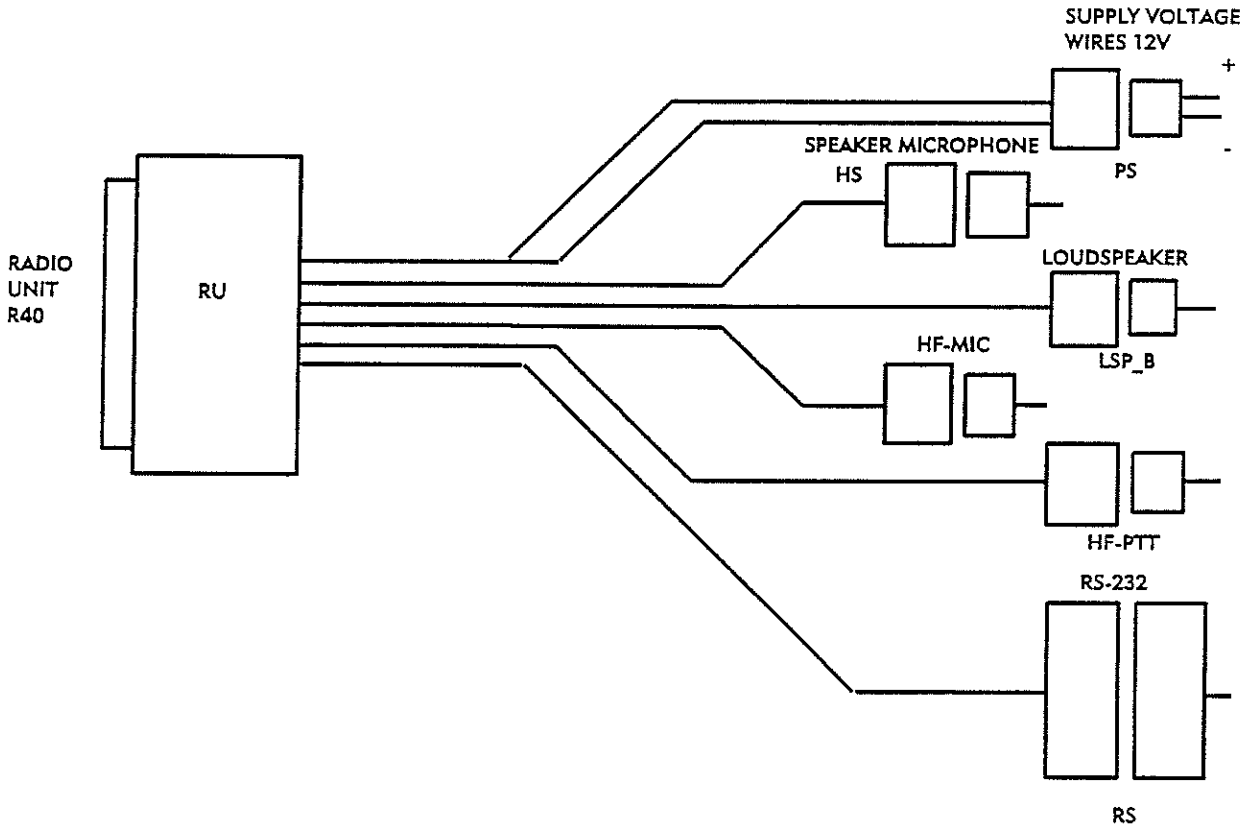

POWER SUPPLY
F1
7.5A
12V
4671625
PS
SPEAKER
LSP_B
4671255
AU
TX_QDATA
RX_QDATA
VF_S
MIC
EAR
LSP_B1
LSP_B2
LSP_B2
LSP_B1
RS_RXD
RS_TXD
RS_RTS
GND
GND
+12V
+12V
GND_ANALOG 1.
PTT
IGN
I2C_SCL
ON_OFF
RS_DSR
RS_CTS
GND_ANALOG 2.
GND
GND
+12V
+12V
GND_ANALOG 3.
GND_DIGIT 1.
I2C_SDA
I2C_CLK
GND_DIGIT 2.
RS_DTR
GND_ANALOG 4.
AU_26
TX_QDATA
GND_ANALOG 1.
VF_S
GND_ANALOG 3.
LSP_B1
LSP_B2
I2C_SDA
I2C_INT
GND_DIGIT 2.
RS_DSR
RS_RXD
GND_ANALOG 4.
GND_ANALOG 2.
RX_QDATA
MIC
EAR
PTT
GND_DIGIT 1.
IGN
I2C_SCL
ON_OFF
RS_TXD
RS_DTR
RS_CTS
RS_RTS
386768
CU
I2C_SCL
I2C_SDA
I2C_INT
VF_S
HOOK
GND_ANALOG
MIC
HS_MIC
PTT
ON_OFF
GND_DIGIT
LSP
HF_PTT
GND_ANALOG
HF_MIC
CH42
CU_15
CB40
CONNECTED TO THE
SHELL OF THE
CONNECTOR
NOKIA
TELECOMMUNICATIONS
SC 42
SYSTEM CABLE/INTERFACE CABLE
4H 4671622 1.0
1/1

SYSTEM CABLE SC 43
4671623



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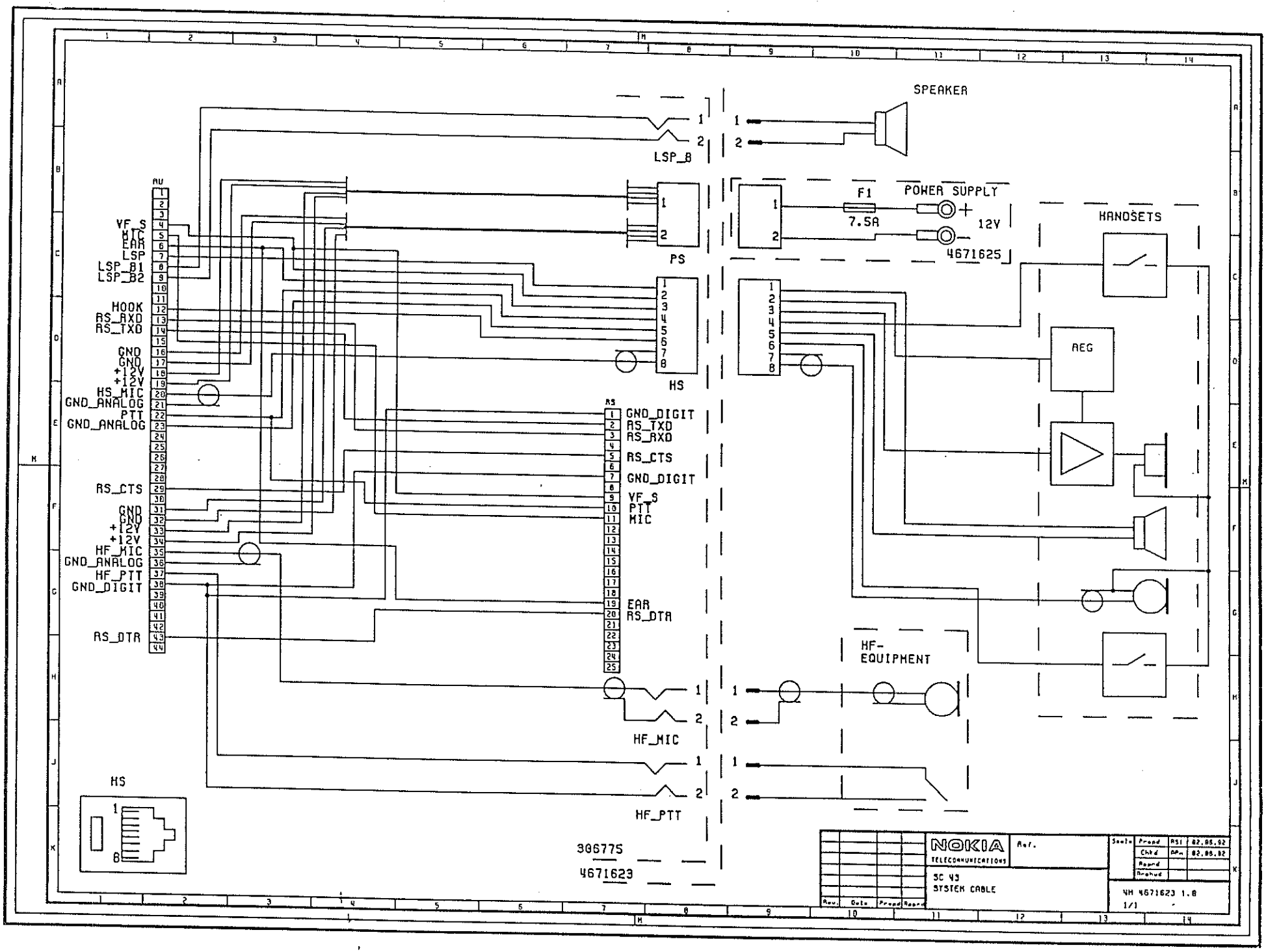
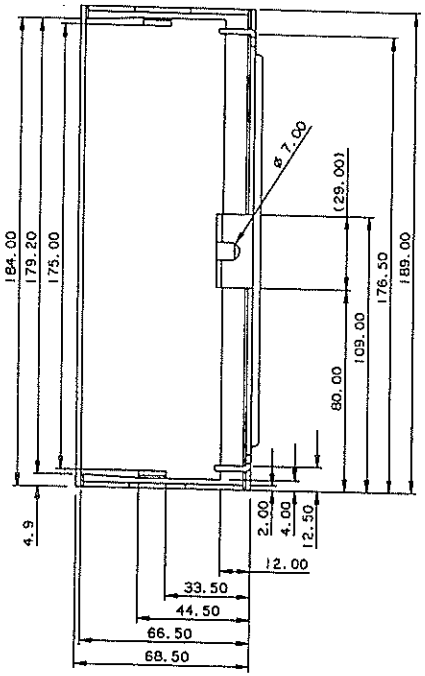
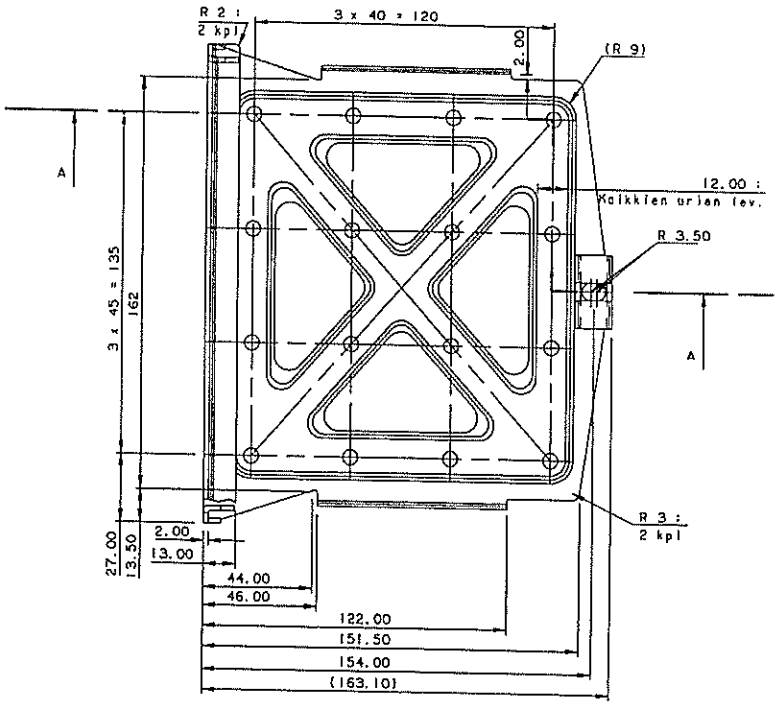
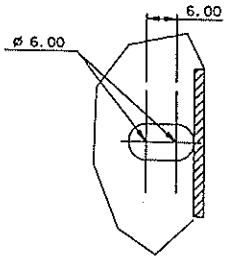
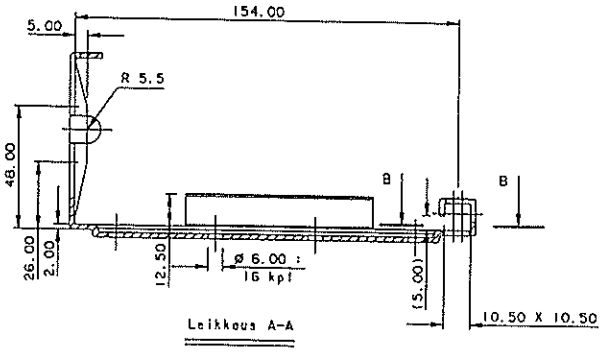

SPEAKER
LSP_B
F1
7.5A
POWER SUPPLY
12V
4671625
HANDSETS
PS
HS
REG
HF-
EQUIPMENT
HF_MIC
HF_PTT
AU
VF_S
MIC
EAR
LSP
LSP_B1
LSP_B2
HOOK
RS_RXD
RS_TXD
GND
GND
+12V
+12V
HS_MIC
GND_ANALOG
PTT
GND_ANALOG
RS_CTS
GND
GND
+12V
+12V
HF_MIC
GND_ANALOG
HF_PTT
GND_DIGIT
RS_DTR
RS
GND_DIGIT
RS_TXD
RS_RXD
RS_CTS
GND_DIGIT
VF_S
PTT
MIC
EAR
RS_DTR
HS
306775
4671623
NOKIA
TELECOMMUNICATIONS
SC 43
SYSTEM CABLE
4M 4671623 1.8
1/1







Leikkaus B-B



Leikkaus A-A

Fe 37 B s = 2 mm

NOKIA

MB 41

Dash and boot mounting bracket

SCALE 1:1

ID 9208476