

Sage ENDEC Receiver

Operation

&

Service Manual

Important Notice

All versions of the Sage ENDEC Receiver described in this document have been discontinued for many years, are no longer available for purchase, including the chassis and the individual receiver modules. They are no longer serviced by Sage or Harris. The information provided in this document is provided "as is" without warranty of any kind, either expressed or implied. We do not make any warranties or representations as to its accuracy or completeness. We assume no liability or responsibility for any errors or omissions in the content of this document. Your use of the contents of this document is at your own risk.

Released November, 2012

SAGE ENDEC RECEIVER

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This manual covers the operation and features of the Sage ENDEC Receiver.

Product Overview

The Sage ENDEC Receiver is a high-performance, 19-inch, rack-mountable receiver system. It features simultaneous reception of up to six radio signals. The chassis accommodates three modules in any variation. The available modules are, FM/AM, VHF, UHF.

Each receiver module within the ENDEC Receiver Chassis has frequency selector switches mounted on the front of it. Access to the switches is from the front of the unit utilizing a unique slide-out front panel that allows frequency changes without removing the unit from the rack. Antenna, audio, and power connections are at the rear of the unit. Screw terminals are located at the rear of each module, and protrude from the rear of the chassis, allowing connection to the receiver's signals.

Installation

The ENDEC Receiver may be mounted in a standard 19 inch rack cabinet, utilizing the mounting ears on the side of the unit, or it may be operated in a desk-top configuration, with the mounting ears removed.

Rear Panel Functions:

Chassis Back-Side View



DC Power

A UL approved DC wall adapter is supplied with the ENDEC Receiver. Plug it into 110-125VAC wall power, and connect the DC jack into the jack on back of the ENDEC Receiver marked DC IN.

External Speaker

Receive audio will be heard out of the built-in speaker of the ENDEC Receiver. An external speaker may be plugged into the ENDEC Receiver's 1/4 inch audio jack, located on the rear of the unit and labeled EXTERNAL SPEAKER OUT. If an external speaker is used, it should be an 8 ohm type. The internal speaker will be disabled when the external speaker is in use.

ENDEC EAS Signals

Normally, the ENDEC Receiver is used for monitoring AM, FM, or NOAA broadcasts for Emergency Alert System (EAS). The output of the ENDEC Receiver is connected to an EAS Decoder with wires from the receiver's terminal block to the EAS ENDEC's terminals. Refer to the manual of the EAS ENDEC for more information on which terminals to connect.

The following signals are present at the rear panel for each receiver:

Audio Output: Audio positive output. 600 ohm unbalance output, adjustable from 200 mV to 2.5 V peak to peak.

Ground: Audio return.

Carrier Detect: Active low with the presence of carrier.

Audio Detect: Active low with the presence of modulated carrier. This signal will tend to turn on and off as the modulation level varies.

ANTENNA

An antenna must be connected to each receiver module. The antenna connections are located at the rear of the chassis and are labeled 1, 2, 3, 4, 5 and 6. You must determine which type of module is in each of the six positions. The standard factory configuration is FM=1, AM=2, VHF =3. Channels four through six are not used unless additional modules are required.

Connect a suitable antenna to each of the modules in your ENDEC Receiver. The AM and VHF modules require 50 ohm antennas, and the FM module requires a 75 ohm antenna. All antenna connections to the ENDEC Receiver are type BNC connectors.

Although the receiver modules in the ENDEC Receiver are well-shielded, high-quality commercial units, like all radio receivers they have a limit as to the amount of RF energy they can handle. It is best not to locate a receiver's antenna near sources of high RF energy, or the sensitivity of the receiver may be affected. If the ENDEC Receiver's antenna must be located at or near a broadcast transmitter's site, you may have to experiment with positioning the antenna such that it has minimum interference from the site. You may also want to install an RF trap in line with the antenna, to "notch-out" unwanted RF energy to the receiver. For the FM band, a suitable RF trap is manufactured by Winegard, Model #FT-7600. This filter is tunable over the FM broadcast band and offers up to 26 dB of attenuation. Contact Harris Broadcast for additional information on the filter.

The FM receiver contains a Local/Distance switch. In certain instances, the receiver may be overloaded by nearby strong signals. In these cases, the use of the Local/Distance switch may improve the performance. When placing the switch in the Local position, approximately 25 dB of attenuation will be obtained. The Local/Distance switch is mounted on the top right side of the AM/FM module. The Local position is to the left, and the Distance position is to the right. Access this switch by opening the front panel. In most cases, the Distance position will give better performance.

For best AM reception, you should electrically ground the chassis of the ENDEC Receiver to a good earth ground. A screw is provided on the rear of the ENDEC Receiver chassis for connecting the chassis to ground.

Recommended antennas: These are general recommendations for typical antennas found to work in normal environments. However, the operator must keep in mind that other antenna configurations may be necessary, depending on the sensitivity of the site. A distant monitoring assignment and the presence of strong local stations may affect the desired antenna configuration. Contact your Harris distributor for additional antenna recommendations.

AM: A long length of wire (approximately 30 feet is sufficient) coiled around a non-conductive cylinder is generally acceptable for AM reception. Insure that the antenna is not exposed to an area where lighting damage is possible.

FM: A simple 300 ohm dipole antenna, like one supplied with most home stereo units with a 75 - 300 ohm transformer, is suitable for most applications. A fixed or telescoping whip-type antenna is also sufficient.

VHF: A 50 ohm whip or telescoping antenna is acceptable for most environments.

UHF: A 50 ohm whip or telescoping antenna is acceptable for most environments.

Front Panel Functions:



Power LED: Illuminated when DC power is applied

Carrier Detect LED's: Six LED's indicate the presence of a carrier on each module in use. In the standard configuration, only diodes 1 through 3 are active.

Modulation LED's: Six LED's indicate the presence of audio modulation on each module. The LED will blink with the receive signal's audio modulation. Low audio levels will cause the LED's to blink only with the peaks in the signal. In the standard configuration, only diodes 1 through 3 are active.

Select: Selects audio to be monitored by the internal or external speaker. This does not affect the audio outputs at the rear panel.

Volume: Controls audio volume to either the internal speaker or the external speaker.

Operation

There may be from 1-6 receivers within the ENDEC Receiver chassis. The standard configuration is 3 receivers; an AM broadcast, an FM broadcast, and a VHF NOAA weather receiver. The standard configuration has the FM band as position #1, AM band as position #2 and VHF band as position #3. The connections on the rear panel as well as the audio select switch and LED's follow this numbering scheme.

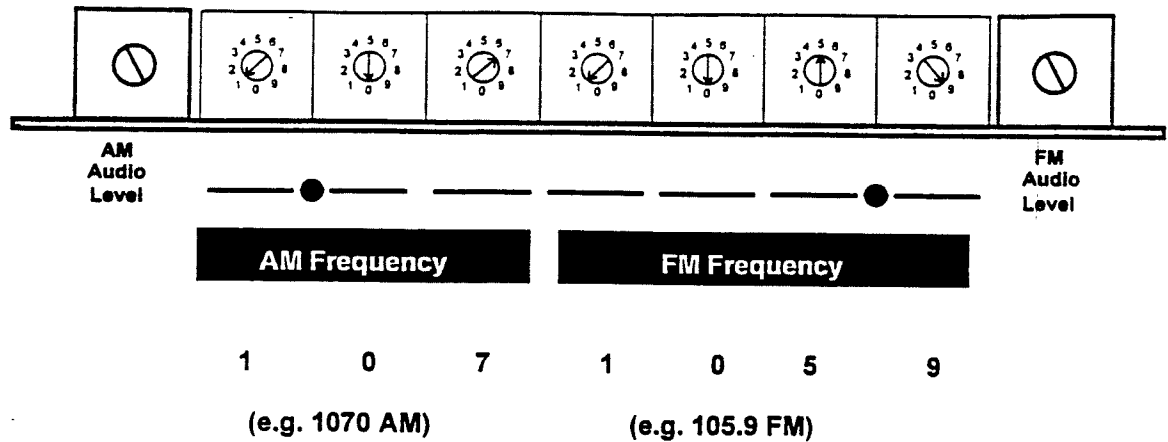
Before operating the unit, the receive frequency of the receivers in the ENDEC Receiver chassis must be set. The frequencies are set by first sliding the front panel of the chassis out from the unit, exposing the frequency select switches. The frequency select switches are adjusted with a small screwdriver, after the front panel has been slid out.

Setting the frequency of the AM/FM broadcast receiver.

The frequency adjustment dial is accessed by opening the front panel. To open the front panel, loosen the two thumb screws located on each end of the front panel, carefully slide the front panel forward, and allow it to swing down. The AM receiver frequency is dialed into the AM/FM module using the left three switches. The AM frequency is in 10kHz increments. For example, the frequencies 660kHz to 1600kHz are dialed in as 066 through 160 on the switches.

The FM receiver frequency is dialed into the AM/FM module using the right 4 switches. The FM frequency is in 100kHz increments. In other words, the frequencies 87.1MHz through 106.9MHz are dialed in as 0871 through 1069.

AM/FM Module Controls

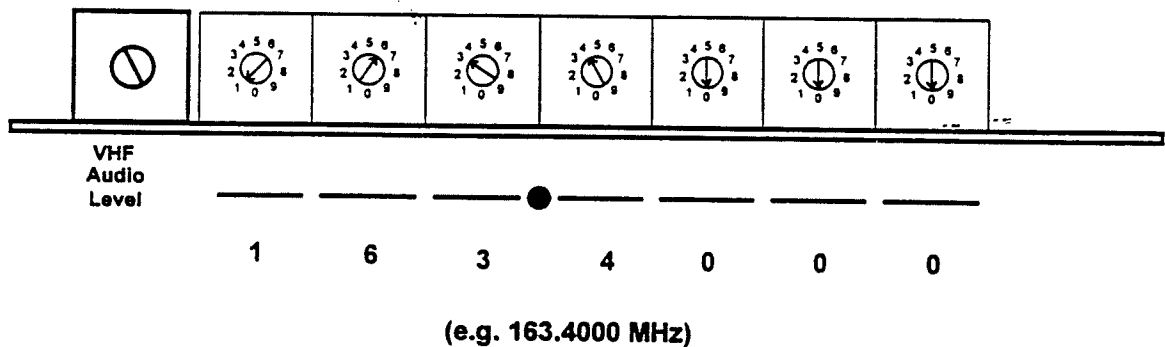


The audio line output level can be adjusted with the Audio Level controls on the front side of the receiver module. The factory setting for the audio output level is 2V peak-to-peak.

Setting the Frequency of the VHF and UHF Receiver

The VHF and UHF receiver's frequency is dialed into the module using the seven switches on the front of the module. The frequency is in 500 Hz increments.

Frequency Controls



SPECIFICATIONS

UHF RECEIVER:

Frequency Range.....	450MHz to 470MHz
Channel Step Size.....	10khz & 12.5khz
Channel Spacing.....	25khz
Adjacent Channel Rejection @ 25KHz spacing:.....	> 60db
Sensitivity.....	0.4uV for 12db S/N
Spurious Rejection.....	>60db
Image Rejection.....	>60db
FM Broadcast Band Rejection.....	>75db

AM Receiver

Frequency range	530 kHz- 1710 kHz
Channels step size	10 kHz
Audio frequency response.....	200 - 3400 kHz +/- 3 dB
Sensitivity	10 for most for a 20 dB S/N
THD	<3% with 33% @ 1mV modulation
Selectivity	>45 dB at +/- 20 kHz
Image rejection.....	>35 dB
IF rejection.....	>35 dB
AGC.....	>45 dB

FM Receiver

Frequency range	87.9 MHz - 107.9 MHz
Channels step size	100 kHz
Audio frequency response.....	50 Hz 12,000 Hz +/- 1 dB
Sensitivity	2 uV for a 26 dB S/N
THD	<2%
Selectivity (+/- 400 kHz)	>65 dB
IF rejection.....	>65 dB
Image rejection.....	>60 dB

VHF Receiver

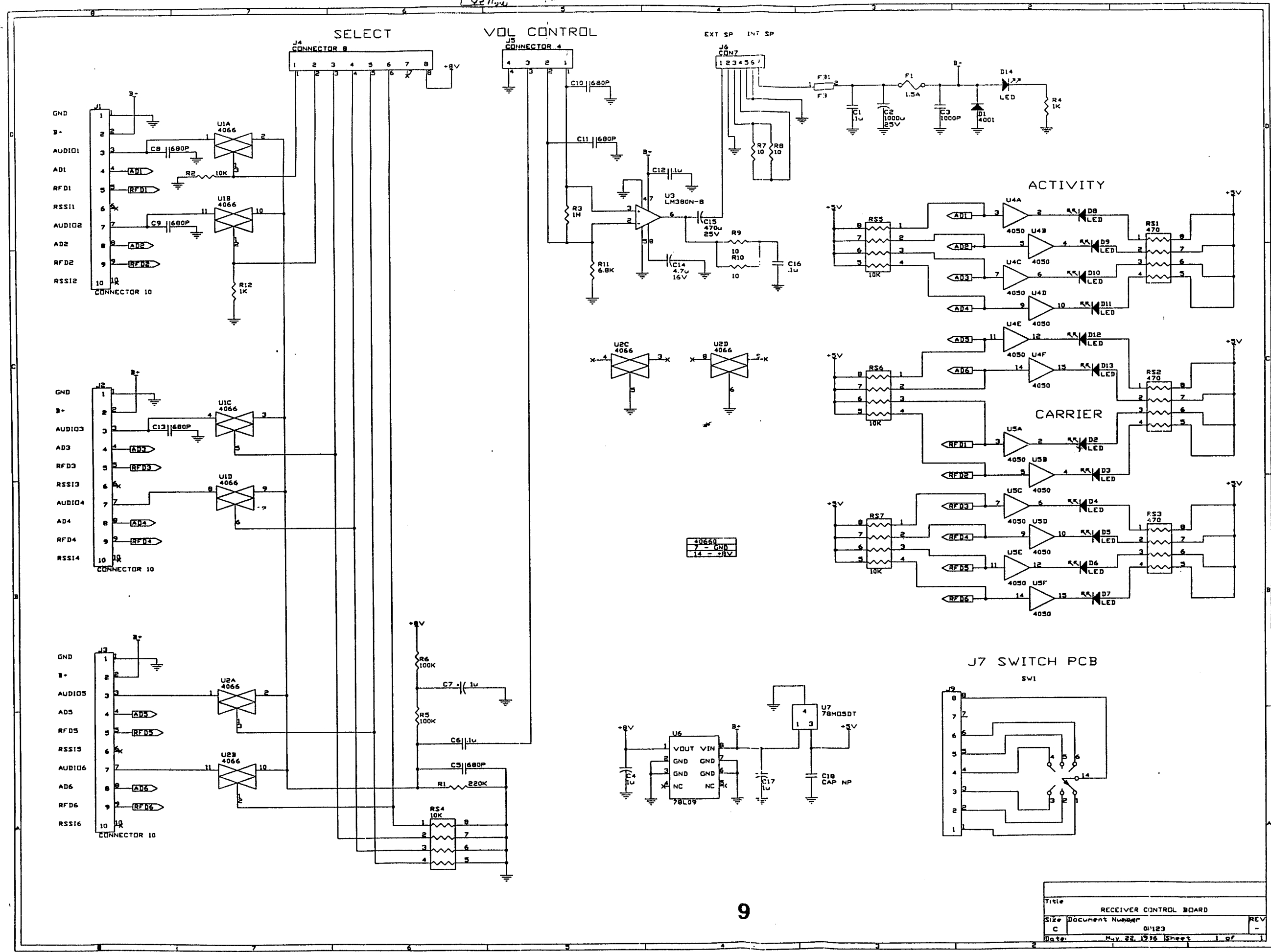
Frequency range	154 MHz - 164 MHz
PLL Step Size	10 kHz, 12.5 kHz, 15 kHz
Sensitivity35 uV for 12 dB SINAD
THD	<3%
Selectivity	>55 dB
IF Rejection	>65 dB
Image Rejection	>65 dB
Operating Temperature (all receivers)	0- 50° C
NOAA Weather Channels: 162.550 MHz, 162.400 MHz, 162.475 MHz, 162.425 MHz, 162.450 MHz, 162.500 MHz, 162.525 MHz	

SAGE ENDEC RECEIVER

SECTION 2: SCHEMATICS AND PARTS LISTS

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5-202
 Brown
 12/11/84



Title		
RECEIVER CONTROL BOARD		
Size	Document Number	REV
C	0123	-
Date	May 22, 1986	Sheet 1 of 1

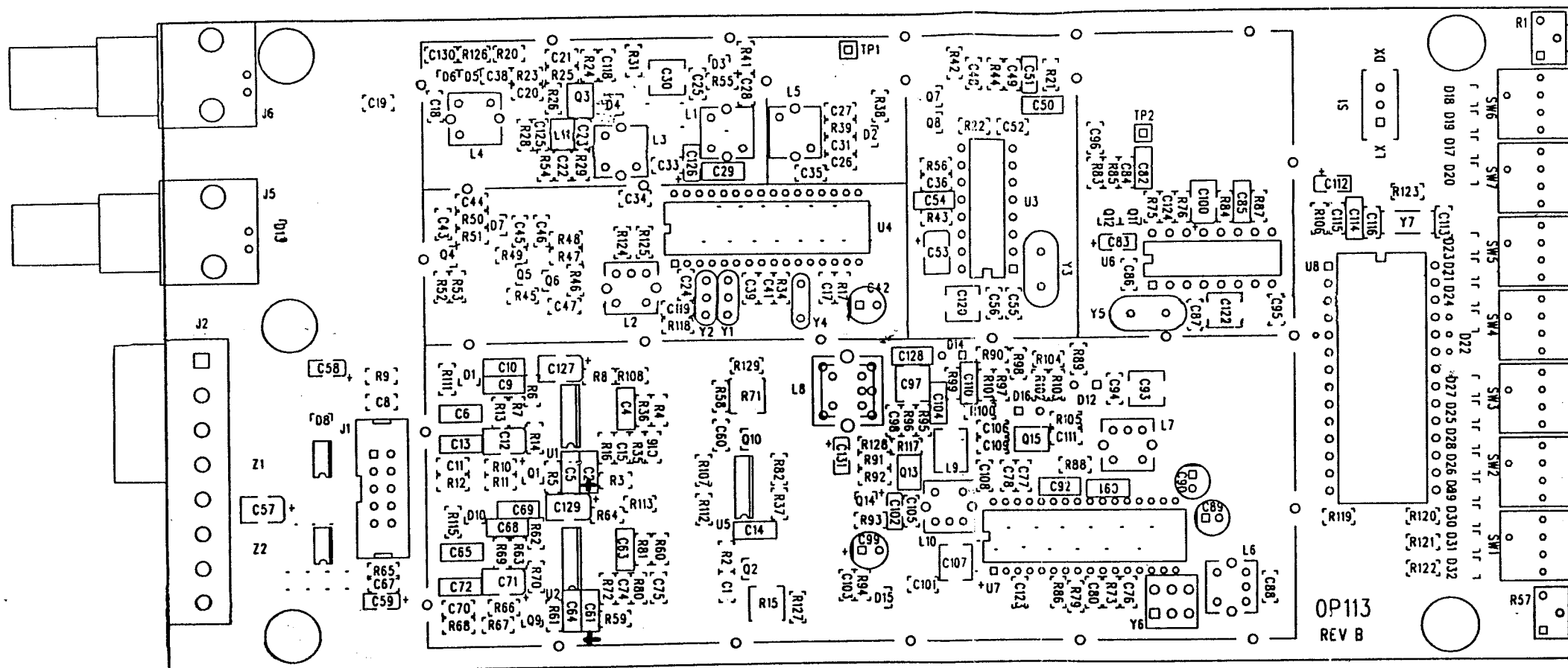
SAGE ENDEC RECEIVER FRONT PANEL, CHASSIS PARTS

Assembly Name : 5A123 Rev : B1

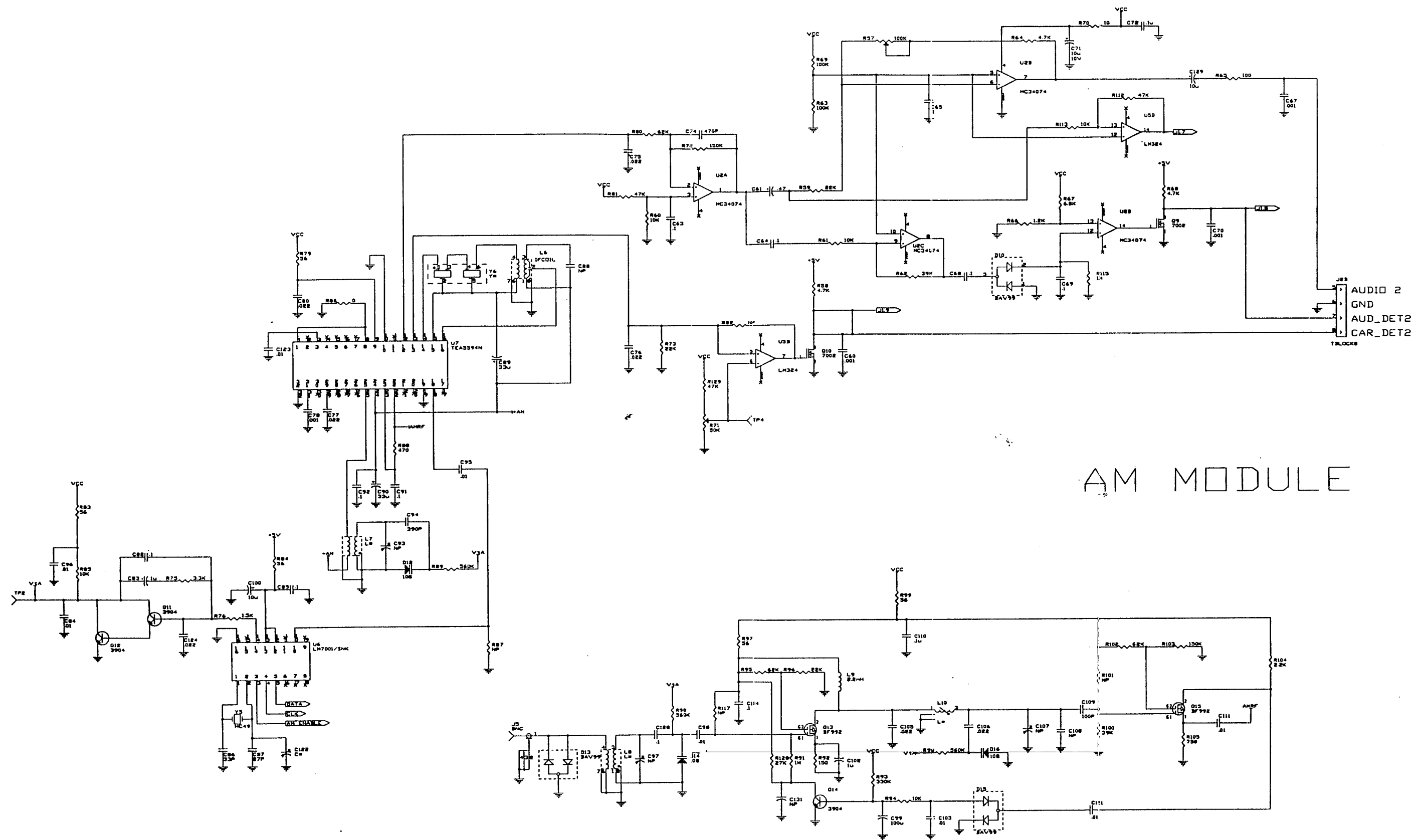
Page 1

PNum	QTY	Descrip	Ref
0P123	1.00	PCB, blank, BekTec front panel	A100
1C112-681	6.00	Cap,cer,5%,NPO,0805,50V,680pF	C5, C8, C9, C10, C11, C13
1C118-105	3.00	Cap,tant,20%,16V,A case,1uF	C4, C7, C17
1C118-475	1.00	Cap,tant,20%,16V,SMT,B case,4.	C14
1C143-102	1.00	Cap,cer,10%,X7R,0805,50V,1000p	C3
1C144-104	5.00	Cap,cer,10%,X7R,1206,50V,0.1uF	C1, C6, C12, C16, C18
1C247-1C471	1.00	Cap,electrolytic,16V,thru hole	C15
1C247-1E102	1.00	Cap,electrolytic,25V,thru hole	C2
1D145-DL4001	1.00	Diode,SMT,DL1 case,1A	D1
1D248-11	6.00	Diode,LED,thru hole,3mm,Yellow	D8, D9, D10, D11, D12, D13
1D248-12	7.00	Diode,LED,thru hole,3mm,Green	D2, D3, D4, D5, D6, D7, D14
1J222-10C	3.00	Connector,10 pin header,flat c	J1, J2, J3
1J249-8	1.00	Connector,male,MAS-CON,RT angl	J9
1J250-4	1.00	Connector,male,MAS-CON,straigh	J5
1J250-7	1.00	Connector,male,MAS-CON,straigh	J6
1J250-8	1.00	Connector,male,MAS-CON,straigh	J4
1L137-1S0	1.00	Inductor,choke,ferrite,SMT	FB1
1Q126-380N-8	1.00	IC,Audio Power Amp,8 pin Dip	U3
1Q127-78L09	1.00	IC,VREG,9V,SMT,SOP-8	U6
1Q127-78M05DT	1.00	IC,VREG,5V,SMT,600mA	U7
1Q128-4050	2.00	IC,CMOS,Hex Buffer,SMT,SO-14	U4, U5
1Q128-CD4066	2.00	IC,Digital CMOS,SMT,4066 Quad	U1, U2
1R104-100	4.00	Res,5%,SMT,0805,10 ohm	R7, R8, R9, R10
1R104-102	2.00	Res,5%,SMT,0805,1k	R4, R12
1R104-103	1.00	Res,5%,SMT,0805,10k	R2
1R104-104	2.00	Res,5%,SMT,0805,100k	R5, R6
1R104-105	1.00	Res,5%,SMT,0805,1M	R3
1R104-224	1.00	Res,5%,SMT,0805,220k	R1
1R104-682	1.00	Res,5%,SMT,0805,6.8k	R11
1R230-103	4.00	Resistor array,10k X 4,SMT	RS4, RS5, RS6, RS7
1R230-471	3.00	Resistor,array,470 X 4,SMT	RS1, RS2, RS3
1S228-DP	1.00	Switch,chassis mount,6 TH DP	SW1
1X232-1R5	1.00	Fuse,SMT,1.5A,w/holder	F1
5A123-MFG	1.00	MFG of Assembly, Selector swit	MFG

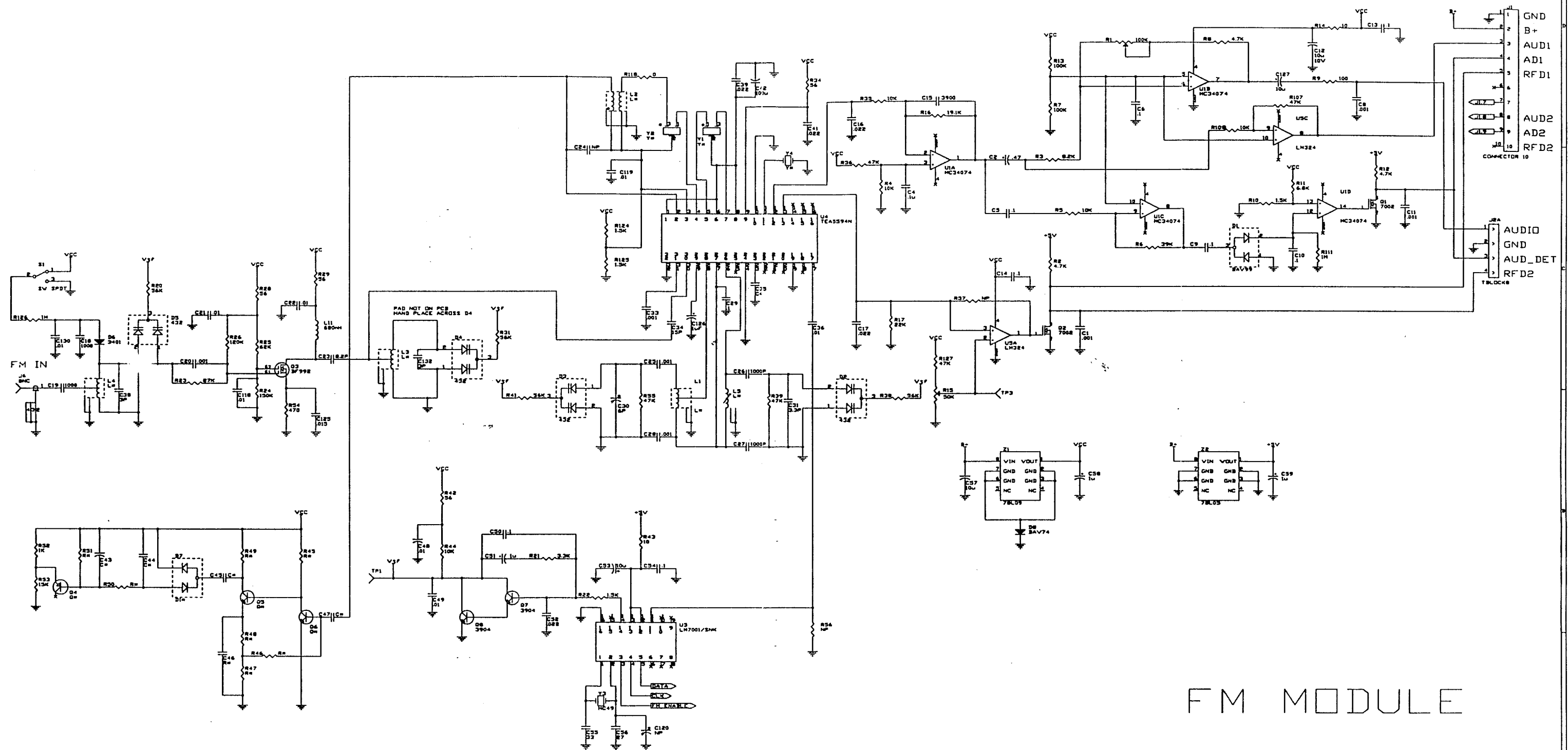
REVISIONS				
ZONE	LTR	DESCRIPTION	DATE	APPROVED
	A	REV NO. 2	4-3-96	
	B	REV NO. 3	5-22-96	



QTY	UNIT	MEAS	CAGE CODE	PART OR IDENTIFYING NO.	NOMENCLATURE OR DESCRIPTION	NOTES/MATERIAL SPECIFICATION	ITEM NO.
PARTS LIST							
DIMENSIONS & TOLERANCING PER AMS Y14.5M-1982				CONTRACT NO.			
UNLESS OTHERWISE SPECIFIED: DIMENSIONS ARE IN INCHES TOLERANCES: ANGLES ± 1° DECIMALS .01 ± .010 DECIMALS .002 ± .002 HOLE & BOLT EDGE MATCH ± .005 BEND RADIUS .01 ON .03 & .06 ± .03 ON .08 & GREATER SHEET METAL CORNER RADIUS .015 .25 .50 .75 1.00 1.50 2.00 2.50 3.00 4.00 5.00 6.00 8.00 10.00 12.00 15.00 20.00 25.00 30.00 40.00 50.00 60.00 75.00 100.00 125.00 150.00 200.00 250.00 300.00 400.00 500.00 600.00 750.00 1000.00				APPROVALS			
DRAWN: PDS, INC.				DATE: 2-14-96			
CHECKED: PDS, INC.				DATE: 2-14-96			
PROJECT ENG: PDS, INC.				DATE: 2-14-96			
DESIGN: PDS, INC.				DATE: 2-14-96			
RELEASE: PDS, INC.				DATE: 2-14-96			
APPLICATION BLOCK				TITLE: ASSEMBLY DRAWING AM/FM MODULE			
NEXT ASSY: USED ON:				SIZE: B			
APPLICATION BLOCK				DRAWING NO: OP113			
APPLICATION BLOCK				SCALE: NONE			
APPLICATION BLOCK				FILENAME: SNK6ASY.DWG			
APPLICATION BLOCK				SHEET: 1 OF 1			

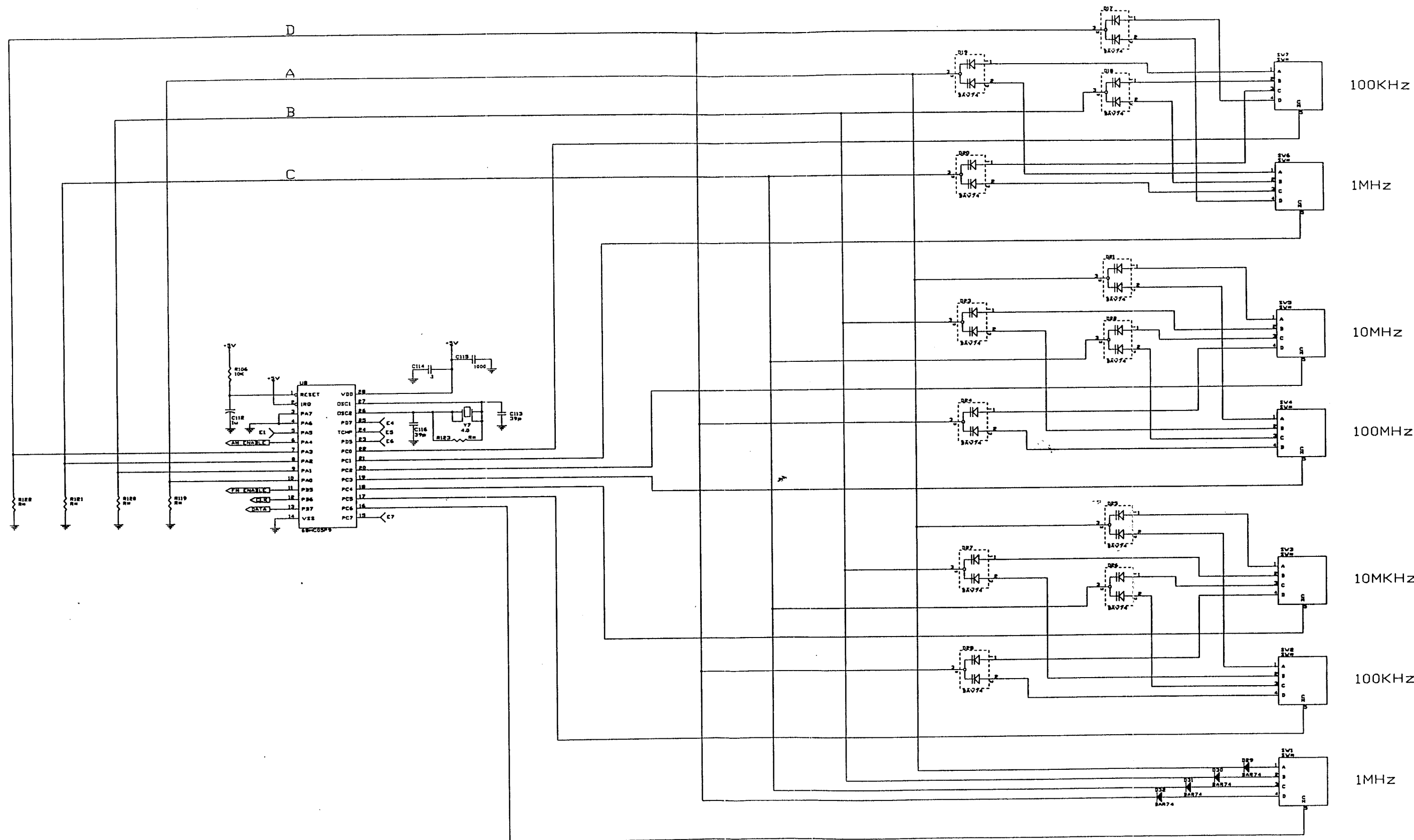


AM MODULE



NOTES:

1. * DENOTES MISSING PART VALUE.



FM

AM

SAGE ENDEC RECEIVER AM/FM MODULE PARTS, 1 OF 2

Assembly Name : 5A113 Rev : C1

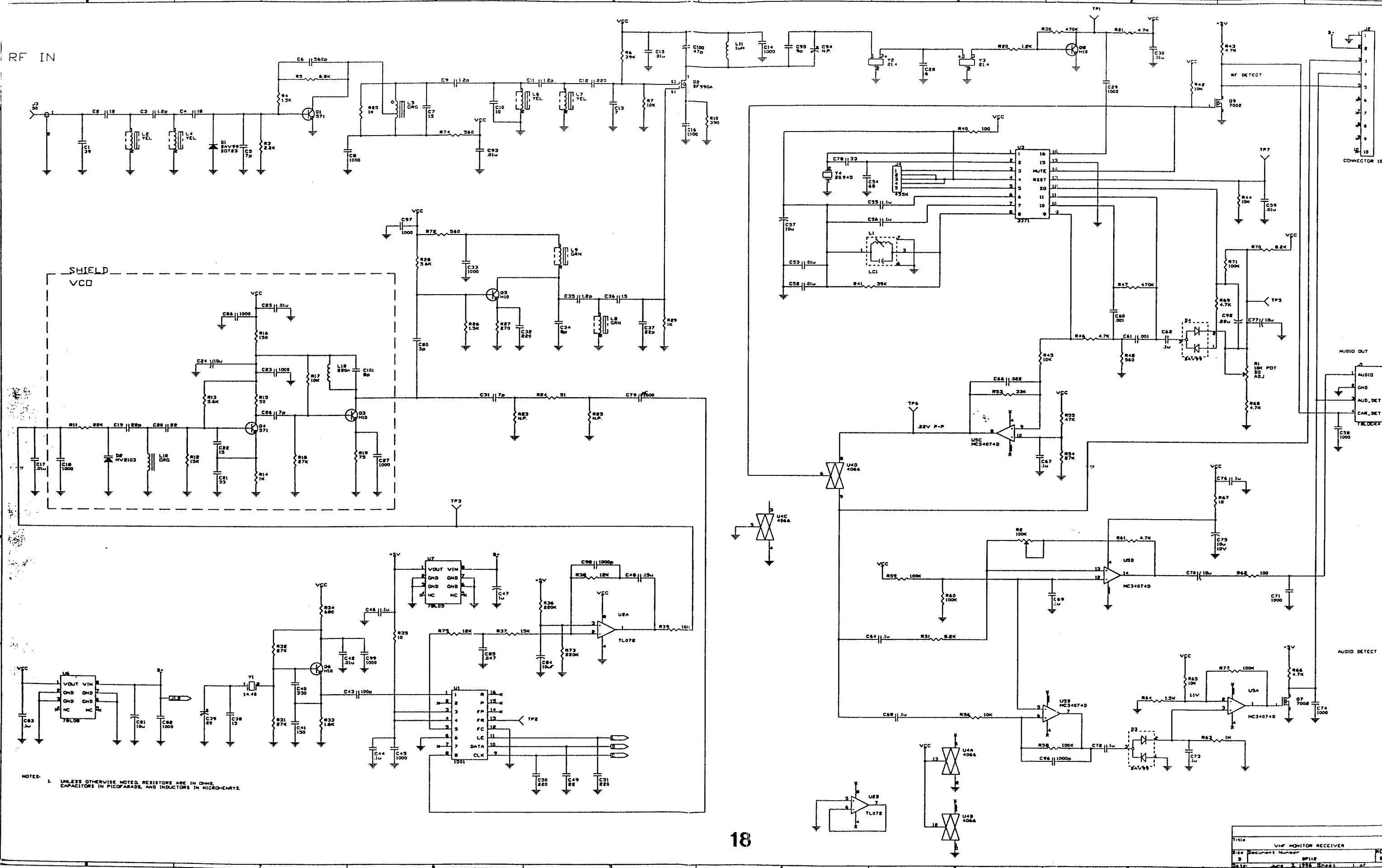
PNum	QTY	Descrip	Ref
0P113	1.00	PCB, blank, AM/FM Receiver Mod	A100
1C112-101	1.00	Cap,cer,5%,NPO,0805,50V,100pF	C109
1C112-150	1.00	Cap,cer,5%,NPO,0805,50V,15pF	C34
1C112-270	2.00	Cap,cer,5%,NPO,0805,50V,27pF	C56, C87
1C112-330	2.00	Cap,cer,5%,NPO,0805,50V,33pF	C55, C86
1C112-390	2.00	Cap,cer,5%,NPO,0805,50V,39pF	C113, C116
1C112-391	1.00	Cap,cer,5%,NPO,0805,50V,390pF	C94
1C112-3R0	2.00	Cap,cer,+/- .25pF,NPO,0805,50V,	C17, C38
1C112-471	1.00	Cap,cer,5%,NPO,0805,50V,470pF	C74
1C112-8R2	1.00	Cap,cer,+/- .25pF,NPO,0805,50V,	C23
1C118-105	7.00	Cap,tant,20%,16V,A case,1uF	C102, C112, C126, C51, C58, C59, C83
1C119-474	2.00	Cap,tant,20%,35V,A case,0.47uF	C2, C61
1C143-102	16.00	Cap,cer,10%,X7R,0805,50V,1000p	C1, C11, C115, C18, C19, C20, C25, C26, C27, C28, C33, C60, C67, C70, C78, C8
1C143-103	16.00	Cap,cer,10%,X7R,0805,50V,0.01u	C101, C103, C111, C118, C119, C123, C130, C21, C22, C36, C48, C49, C84, C95, C96, C98
1C143-153	1.00	Cap,cer,10%,X7R,0805,50V,0.015	C125
1C143-223	12.00	Cap,cer,10%,X7R,0805,50V,.022u	C105, C106, C124, C16, C17, C39, C41, C52, C75, C76, C77, C80
1C143-392	1.00	Cap,cer,10%,X7R,0805,50V,3900p	C15
1C144-104	24.00	Cap,cer,10%,X7R,1206,50V,0.1uF	C10, C104, C110, C114, C128, C13, C14, C29, C4, C5, C50, C54, C6, C63, C64, C65, C68, C69, C72, C82, C85, C9, C91, C92
1C244-M106	1.00	Cap,tant,16V,SMT,C case,10 uF	C57
1C247-1C330	2.00	Cap,electrolytic,16V,thru hole	C89, C90
1C247-1E101	2.00	Cap,electrolytic,25V,thru hole	C42, C99
1C273-106	6.00	Cap,tant,16V,10%,SMT,B case,10	C100, C12, C127, C129, C53, C71
1C277-3R0	1.00	Cap,cer,5%,NPO,1206,50V,3.0pF	C30
1D145-BV432	4.00	Diode,Dual varactor,SOT-23	D2, D3, D4, D5
1D149-BAV74	17.00	Diode,small sig,SOT-23,dual,CC	D17, D18, D19, D20, D21, D22, D23, D24, D25, D26, D27, D28, D29, D30, D31, D32, D8
1D149-BAV99	4.00	Diode,small sig,SOT-23,dual	D1, D10, D13, D15
1D149-BV3401	1.00	Diode,Silicon Pin Switching Di	D6
1D262-108	3.00	Diode,varactor,thru hole	D12, D14, D16
1F173-E10.7	2.00	Filter,10.7MHz,Low Loss,Cerami	Y1, Y2
1F173-Z468HL3	1.00	Filter,468kHz,6 element,thru h	Y6
1F233-A10.7	1.00	Filter,Discriminator 10.7 MHz,	Y4
1J222-10C	1.00	Connector,10 pin header,flat c	J1
1J238-28T	1.00	Socket,IC,28 pin DIP,Tin-Lead	A103
1J242-H08	1.00	Connector,Term Blk,8 pos,Heade	J2
1J243-1111	2.00	Connector,BNC,Female,R/A,PCB M	J5, J6
1L190-681	1.00	Inductor,SMT,1008,680nH,10%	L11
1L214-4	1.00	Inductor,7mm shielded,4T,Yello	L5
1L216-6	3.00	Inductor,7mm shielded,6T,Blue,	L1, L3, L4
1L231-11213N	1.00	Inductor,AM IF coil,Tunable,th	L6
1L231-1627X	1.00	Inductor,AM Oscillator coil,Tu	L7
1L231-A6515	1.00	Inductor,FM IF coil,Tunable,th	L2
1L260-1043-181	1.00	Coil,Tunable,180uH,5%,10EZ	L8

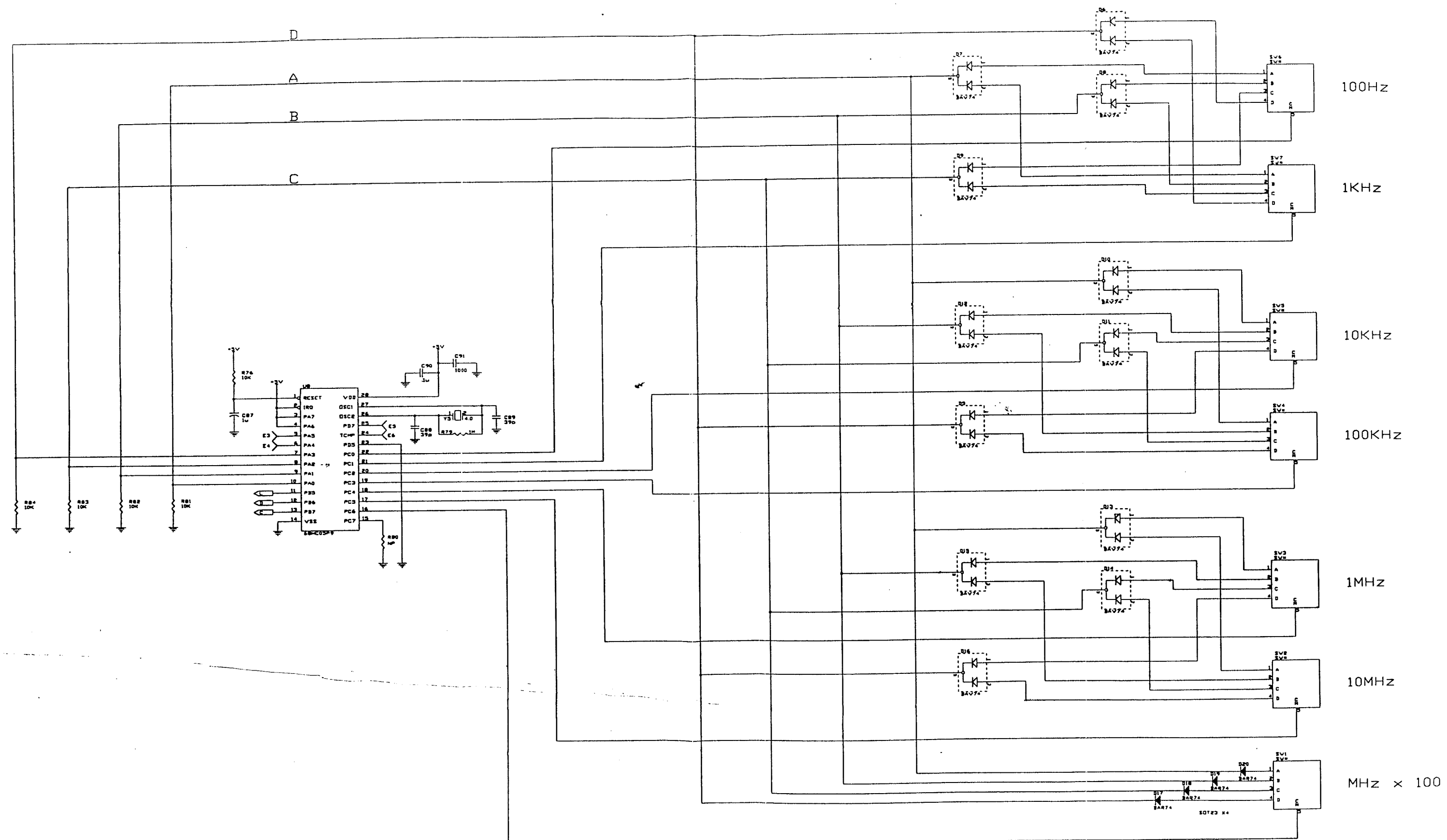
SAGE ENDEC RECEIVER AM/FM MODULE PARTS, 2 OF 2

Assembly Name : 5A113 Rev : C1

PNum	QTY	Descrip	Ref
IL260-1044-221	1.00	Coil,Tunable,220uH,5%,7P	L10
IL272-4N222	1.00	Inductor,SMT,Wirewound,Ferrite	L9
IQ126-34074	3.00	IC,OP-AMP,quad,SMT,SO-14,0 to	U1, U2, U5
IQ126-5594	2.00	IC,AM/FM Receiver,32 pin Dip	U4, U7
IQ127-78L05	1.00	IC,VREG,5V,SMT,SOP-8	Z2
IQ127-78L09	1.00	IC,VREG,9V,SMT,SOP-8	Z1
IQ130-7001	2.00	AM/FM PLL	U3, U6
IR104-000	2.00	Res,jumper,SMT,0805,0 ohm	R118, R86
IR104-100	3.00	Res,5%,SMT,0805,10 ohm	R14, R43, R70
IR104-101	2.00	Res,5%,SMT,0805,100 ohm	R65, R9
IR104-103	11.00	Res,5%,SMT,0805,10k	R106, R108, R113, R35, R4, R44, R5, R60, R61, R85, R94
IR104-104	4.00	Res,5%,SMT,0805,100k	R13, R63, R69, R7
IR104-105	5.00	Res,5%,SMT,0805,1M	R111, R115, R123, R126, R91
IR104-122	1.00	Res,5%,SMT,0805,1.2k	R66
IR104-124	1.00	Res,5%,SMT,0805,120k	R26
IR104-151	1.00	Res,5%,SMT,0805,150 ohm	R92
IR104-152	5.00	Res,5%,SMT,0805,1.5k	R10, R124, R125, R22, R76
IR104-154	3.00	Res,5%,SMT,0805,150k	R103, R24, R72
IR104-222	5.00	Res,5%,SMT,0805,2.2k	R104, R119, R120, R121, R122
IR104-223	4.00	Res,5%,SMT,0805,22k	R17, R59, R73, R96
IR104-273	2.00	Res,5%,SMT,0805,27k	R128, R23
IR104-332	2.00	Res,5%,SMT,0805,3.3k	R21, R75
IR104-334	1.00	Res,5%,SMT,0805,330k	R93
IR104-393	3.00	Res,5%,SMT,0805,39k	R100, R6, R62
IR104-471	2.00	Res,5%,SMT,0805,470 ohm	R54, R88
IR104-472	6.00	Res,5%,SMT,0805,4.7k	R12, R2, R58, R64, R68, R8
IR104-473	8.00	Res,5%,SMT,0805,47k	R107, R112, R127, R129, R36, R39, R55, R81
IR104-560	9.00	Res,5%,SMT,0805,56 ohm	R28, R29, R34, R42, R79, R83, R84, R97, R99
IR104-563	4.00	Res,5%,SMT,0805,56k	R20, R31, R38, R41
IR104-564	3.00	Res,5%,SMT,0805,560k	R89, R90, R98
IR104-623	4.00	Res,5%,SMT,0805,62k	R102, R25, R80, R95
IR104-682	2.00	Res,5%,SMT,0805,6.8k	R11, R67
IR104-751	1.00	Res,5%,SMT,0805,750 ohm	R105
IR104-822	1.00	Res,5%,SMT,0805,8.2k	R3
IR108-1912	1.00	Res,1%,SMT,0805,19.1k	R16
IR154-473	2.00	POT,SMT,3mm,47K	R15, R71
IR270-X104	2.00	POT,3/8 in. square,single turn	R1, R57
IS217-1903	1.00	Switch,PCB,SPDT	S1
IS240-10H	7.00	Switch,BCD,10 position,R/A PC	SW1, SW2, SW3, SW4, SW5, SW6, SW7
IT153-3904	5.00	Transistor,SMT,NPN,GP,SOT-23,1	Q11, Q12, Q14, Q7, Q8
IT159-7002CT	4.00	Transistors,MOSFET,SOT-23,Rdso	Q1, Q10, Q2, Q9
IT191-BF992	3.00	Transistor,dual gate MOSFET,rf	Q13, Q15, Q3
IY210-7.200	2.00	Crystal,7.2MHz,HC-49,50ppm	Y3, Y5
IY259-A4.00	1.00	Resonator,cer,SMT,4.000MHz	Y7
3M122-1	1.00	Shield,AM/FM Receiver,82-CBS-3	A101
3M309-1003	1.00	Spacer,Wash-awa,0.45ID X 0.100	A104
5A113-MFG	1.00	MFG of Assembly, AM/FM Monitor	MFG
NP	0.00	No placement	C107, C108, C120, C122, C131, C24, C31, C35, C43, C44, C45, C46, C47, C88, C93, C97, D7, Q4, Q5, Q6, R101, R117, R37, R45, R46, R47, R48, R49, R50

RF IN





SAGE ENDEC RECEIVER VHF MODULE PARTS. 1 OF 3

Assembly Name : 5A112 Rev : C1

PNum	QTY	Descrip	Ref
0P112	1.00	PCB, blank, VHF Monitor Receiv	A100
1C111-154	1.00	Cap,cer,5%,X7R,1206,50V,0.15uF	C48
1C112-100	1.00	Cap,cer,5%,NPO,0805,50V,10pF	C10
1C112-101	1.00	Cap,cer,5%,NPO,0805,50V,100pF	C43
1C112-120	2.00	Cap,cer,5%,NPO,0805,50V,12pF	C2, C37
1C112-150	3.00	Cap,cer,5%,NPO,0805,50V,15pF	C101, C22, C7
1C112-151	1.00	Cap,cer,5%,NPO,0805,50V,150pF	C41
1C112-180	1.00	Cap,cer,5%,NPO,0805,50V,18pF	C4
1C112-1R2	4.00	Cap,cer,+/- .25pF,NPO,0805,50V,	C11, C3, C35, C9
1C112-220	4.00	Cap,cer,5%,NPO,0805,50V,22pF	C19, C20, C31, C36
1C112-221	5.00	Cap,cer,5%,NPO,0805,50V,220,pF	C12, C32, C49, C50, C51
1C112-330	3.00	Cap,cer,5%,NPO,0805,50V,33pF	C21, C38, C78
1C112-331	1.00	Cap,cer,5%,NPO,0805,50V,330pF	C40
1C112-390	3.00	Cap,cer,5%,NPO,0805,50V,39pF	C1, C88, C89
1C112-3R0	1.00	Cap,cer,+/- .25pF,NPO,0805,50V,	C80
1C112-470	1.00	Cap,cer,5%,NPO,0805,50V,47pF	C100
1C112-561	1.00	Cap,cer,5%,NPO,0805,50V,560pF	C6
1C112-680	1.00	Cap,cer,5%,NPO,0805,50V,68pF	C54
1C112-6R0	1.00	Cap,cer,+/- .25pF,NPO,0805,50V,	C28
1C112-7R0	3.00	Cap,cer,+/- .25pF,NPO,0805,50V,	C13, C26, C5
1C112-8R0	1.00	Cap,cer,+/- .25pF,NPO,0805,50V,	C34
1C112-9R0	1.00	Cap,cer,+/- .25pF,NPO,0805,50V,	C95
1C118-105	2.00	Cap,tant,20%,16V,A case,1uF	C47, C87
1C118-224	1.00	Cap,tant,20%,16V,A case,0.22uF	C92
1C143-102	22.00	Cap,cer,10%,X7R,0805,50V,1000p	C14, C16, C18, C23, C27, C29, C33, C45, C58, C60, C61, C71, C74, C79, C8, C82, C86, C91, C96, C97, C98, C99
1C143-103	9.00	Cap,cer,10%,X7R,0805,50V,0.01u	C15, C17, C25, C30, C42, C52, C53, C59, C93
1C143-223	1.00	Cap,cer,10%,X7R,0805,50V,.022u	C66
1C144-104	14.00	Cap,cer,10%,X7R,1206,50V,0.1uF	C44, C46, C55, C56, C62, C64, C67, C68, C69, C72, C73, C76, C83, C90
1C144-473	1.00	Cap,cer,10%,X7R,1206,50V,0.047	C85
1C183-200	1.00	Cap,trimmer,Murata TZBX4 type,	C39
1C244-M106	1.00	Cap,tant,16V,SMT,C case,10 uF	C81
1C273-106	6.00	Cap,tant,16V,10%,SMT,B case,10	C24, C57, C70, C75, C77, C84
1D145-2103	1.00	Diode,varactor,SOT-23,11p	D2
1D149-BAV74	16.00	Diode,small sig,SOT-23,dual,CC	D10, D11, D12, D13, D14, D15, D16, D17, D18, D19, D20, D5, D6, D7, D8, D9
1D149-BAV99	3.00	Diode,small sig,SOT-23,dual	D1, D3, D4
1F173-W455E	1.00	Filter,455kHz,6 element,7.5kHz	Y6
1J222-10C	1.00	Connector,10 pin header,flat c	J2
1J238-28T	1.00	Socket,IC,28 pin DIP,Tin-Lead	A103
1J242-H04	1.00	Connector,Term Blk,4 pos,Heade	J1
1J243-1111	1.00	Connector,BNC,Female,R/A,PCB M	J3
1L186-8128	1.00	Inductor,quad coil,455kHz	L1
1L201-102	1.00	Inductor,SMT,1008,1uH,5%	L11
1L201-221	1.00	Inductor,SMT,1008,220nH,5%	L12
1L214-4	4.00	Inductor,7mm shielded,4T,Yello	L2, L4, L6, L7

Assembly Name : 5A112 Rev : C1

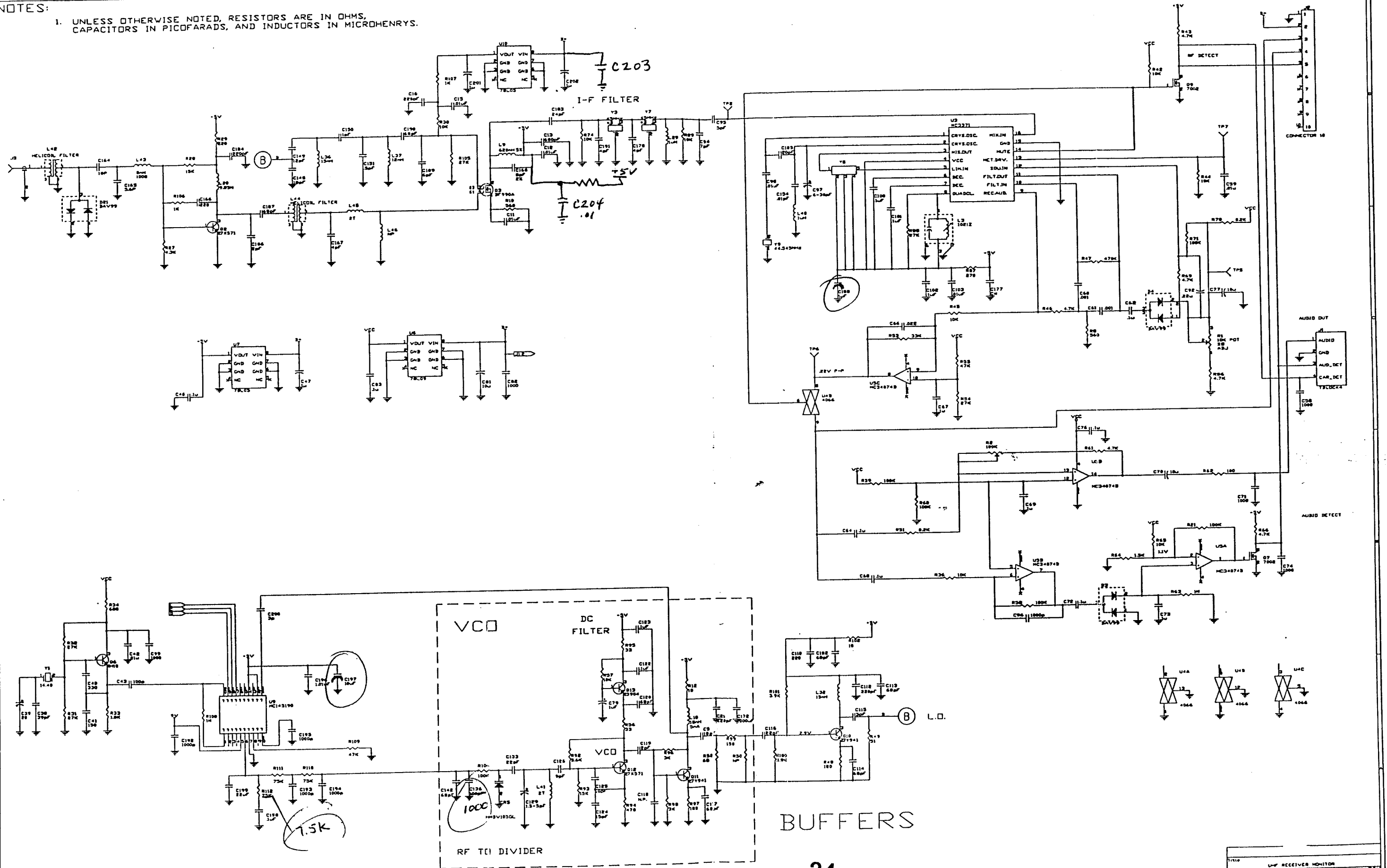
PNum	QTY	Descrip	Ref
1L214-5	2.00	Inductor,7mm shielded,5T,Green	L8, L9
1L214-C3	1.00	Inductor,7mm unshielded,3T,Ora	L10
1L220-3B	1.00	Inductor,7mm shielded,3T,tappe	L5
1L274-101K	1.00	Inductor,SMT,0805,100nH @ 150M	R23
1Q126-3371D	1.00	IC,Receiver,SO-16,MC3371	U3
1Q126-34074	1.00	IC,OP-AMP,quad,SMT,SO-14,0 to	U5
1Q126-TL072	1.00	IC,OP-AMP,dual,SMT,JFET input,	U2
1Q127-78L05	1.00	IC,VREG,5V,SMT,SOP-8	U7
1Q127-78L09	1.00	IC,VREG,9V,SMT,SOP-8	U6
1Q128-1501A	1.00	IC,PLL programmable divider	U1
1Q128-CD4066	1.00	IC,Digital CMOS,SMT,4066 Quad	U4
1R104-100	2.00	Res,5%,SMT,0805,10 ohm	R35, R67
1R104-101	2.00	Res,5%,SMT,0805,100 ohm	R40, R62
1R104-102	2.00	Res,5%,SMT,0805,1k	R14, R85
1R104-103	9.00	Res,5%,SMT,0805,10k	R17, R39, R42, R44, R45, R56, R65, R7, R76
1R104-104	5.00	Res,5%,SMT,0805,100k	R58, R59, R60, R71, R77
1R104-105	2.00	Res,5%,SMT,0805,1M	R63, R79
1R104-122	1.00	Res,5%,SMT,0805,1.2k	R20
1R104-123	2.00	Res,5%,SMT,0805,12k	R38, R75
1R104-151	1.00	Res,5%,SMT,0805,150 ohm	R16
1R104-152	3.00	Res,5%,SMT,0805,1.5k	R26, R4, R64
1R104-153	2.00	Res,5%,SMT,0805,15k	R12, R37
1R104-182	1.00	Res,5%,SMT,0805,1.8k	R33
1R104-222	6.00	Res,5%,SMT,0805,2.2k	R29, R3, R81, R82, R83, R84
1R104-223	1.00	Res,5%,SMT,0805,22k	R11
1R104-224	2.00	Res,5%,SMT,0805,220k	R36, R73
1R104-271	1.00	Res,5%,SMT,0805,270 ohm	R27
1R104-272	1.00	Res,5%,SMT,0805,2.7k	R18
1R104-273	3.00	Res,5%,SMT,0805,27k	R31, R32, R54
1R104-333	1.00	Res,5%,SMT,0805,33k	R53
1R104-391	1.00	Res,5%,SMT,0805,390 ohm	R10
1R104-393	2.00	Res,5%,SMT,0805,39k	R41, R6
1R104-472	7.00	Res,5%,SMT,0805,4.7k	R21, R43, R46, R61, R66, R68, R69
1R104-473	1.00	Res,5%,SMT,0805,47k	R55
1R104-474	2.00	Res,5%,SMT,0805,470k	R30, R47
1R104-510	2.00	Res,5%,SMT,0805,51 ohm	R15, R24
1R104-561	3.00	Res,5%,SMT,0805,560 ohm	R48, R72, R74
1R104-562	2.00	Res,5%,SMT,0805,5.6k	R13, R28
1R104-681	1.00	Res,5%,SMT,0805,680 ohm	R34
1R104-682	1.00	Res,5%,SMT,0805,6.8k	R5
1R104-750	1.00	Res,5%,SMT,0805,75 ohm	R19
1R104-822	2.00	Res,5%,SMT,0805,8.2k	R51, R70
1R154-103	1.00	POT,SMT,3mm,10K	R1
1R270-X104	1.00	POT,3/8 in. square,single turn	R2
1S240-10H	7.00	Switch,BCD,10 position,R/A PC	SW1, SW2, SW3, SW4, SW5, SW6, SW7
1T153-571	2.00	Transistor,SMT,NPN,ss rf,SOT-2	Q1, Q4
1T153-H10	4.00	Transistor,SMT,NPN,VHF/UHF,ss	Q3, Q5, Q6, Q8
1T159-7002CT	2.00	Transistors,MOSFET,SOT-23,Rdso	Q7, Q9
1T191-BF990A	1.00	Transistor,dual gate MOSFET,rf	Q2
1Y143-A	2.00	Crystal insulator for HC-49	A105
1Y174-21.4	1.00	Crystal filter,21.400MHz,20ppm	Y2

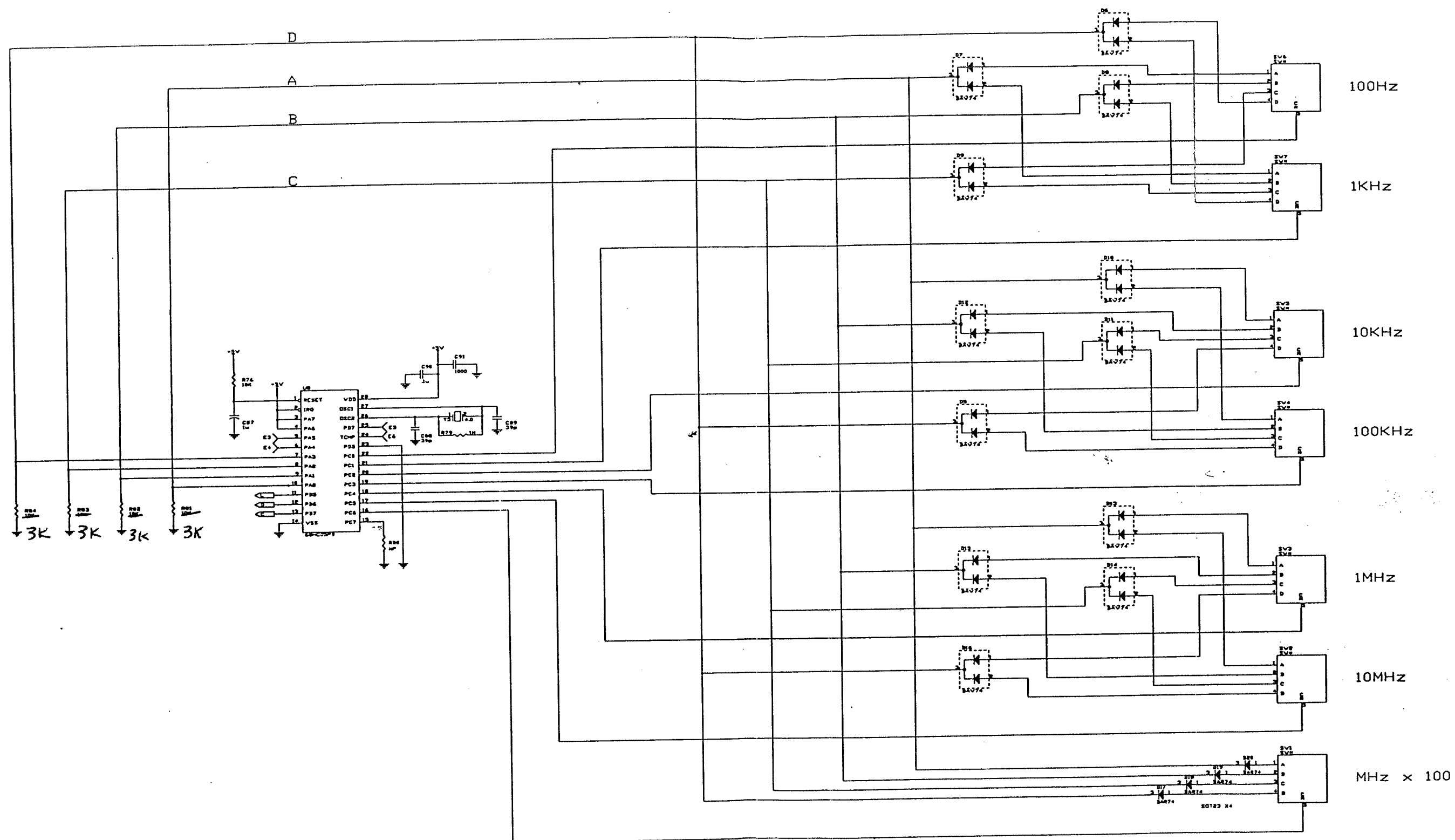
Assembly Name : 5A112 Rev : C1

PNum	QTY	Descrip	Ref
1Y210-20.945	1.00	Crystal,20.9450MHz,HC-49,25ppm	Y4
1Y210-7.200-A	1.00	Crystal,7.2MHz,HC-49,10ppm	Y1
1Y259-A4.00	1.00	Resonator,cer,SMT,4.000MHz	Y5
3M122-2	1.00	Shield,VHF Monitor Receiver,82	A102
3M264-030	2.00	Insulator,Crystal,3 hole,UM-1,	A104
5A112-MFG	1.00	MFG of Assembly, VHF Monitor	MFG
NP	0.00	No placement for this referenc	C94, R25, R80

NOTES:

1. UNLESS OTHERWISE NOTED, RESISTORS ARE IN OHMS, CAPACITORS IN PICOFARADS, AND INDUCTORS IN MICROHENRYS.





Assy. No : 5A151

Part NUM	REFERENCE	PART DESCRIPTION	QTY per Board
0P151	A100	PCB, blank, UHF Monitor Receiver	1
1C112-0R5	C151	Cap, cer, +/- .25pf, NPO, 0805, 50V, 0.5pF Panasonic ECU-V1H0R5JCN	1
1C112-100	C125	Cap, cer, 5%, NPO, 0805, 50V, 10pF Panasonic ECU-V1H100JCN	1
1C112-101	C43	Cap, cer, 5%, NPO, 0805, 50V, 100pF MMI CE101JN0T1	1
1C112-120	C149	Cap, cer, 5%, NPO, 0805, 50V, 12pF Panasonic ECU-V1H120JCN	1
1C112-150	C124	Cap, cer, 5%, NPO, 0805, 50V, 15pF Panasonic ECU-V1H150JCN	1
1C112-151	C41	Cap, cer, 5%, NPO, 0805, 50V, 150pF Panasonic ECU-V1H151JCG	1
1C112-180	C148 C164 C5	Cap, cer, 5%, NPO, 0805, 50V, 18pF Panasonic ECU-V1H180JCN	3
1C112-1R0	C150	Cap, cer, +/- .25pf, NPO, 0805, 50V, 1.0pF Johanson 500R15N1R0V6E	1
1C112-200	C185	Cap, cer, 5%, NPO, 0805, 50V, 20pF Panasonic ECU-V1H200JCN	1
1C112-220	C116 C133	Cap, cer, 5%, NPO, 0805, 50V, 22pF Panasonic ECU-V1H220JCN	2
1C112-221	C110 C112 C16 C166 C184 C21	Cap, cer, 5%, NPO, 0805, 50V, 220pF Panasonic ECU-V1H221JCN	6
1C112-240	C183	Cap, cer, 5%, NPO, 0805, 50V, 24pF Panasonic ECU-V1H240JCN	1
1C112-2R0	C119 C186	Cap, cer, +/- .25pf, NPO, 0805, 50V, 2.0pF Panasonic ECU-V1H020JCN	2
1C112-331	C40	Cap, cer, 5%, NPO, 0805, 50V, 330pF Panasonic ECU-V1H331JCG	1
1C112-390	C38 C88 C89	Cap, cer, 5%, NPO, 0805, 50V, 39pF Panasonic ECU-V1H390JCG	3
1C112-3R0	C115 C130 C200	Cap, cer, +/- .25pf, NPO, 0805, 50V, 3.0pF Panasonic ECU-V1H030CCN	3
1C112-4R0	C167 C178 C191	Cap, cer, +/- .25pf, NPO, 0805, 50V, 4pF Panasonic ECU-V1H040JCN	3
1C112-5R0	C95	Cap, cer, +/- .25pf, NPO, 0805, 50V, 5.0pF	1
1C112-5R6	C165	Cap, cer, +/- .25pf, NPO, 0805, 50V, 5.6pF Panasonic ECU-V1H5R6JCN	1
1C112-680	C113 C114 C117 C120 C142 C182 C187 C190	Cap, cer, 5%, NPO, 0805, 50V, 68pF Panasonic ECU-V1H680JCG	8

Assy. No : 5A151

Part NUM	REFERENCE	2 PART DESCRIPTION	QTY per Board
1C112-681	C13	Cap, cer, 5%, NPO, 0805, 50V, 680pF Panasonic ECU-V1H681JCX	1
1C112-8R0	C189	Cap, cer, +/- .25pf, NPO, 0805, 50V, 6.0pF Panasonic ECU-V1H060JCN	1
1C112-7R0	C94	Cap, cer, +/- .25pf, NPO, 0805, 50V, 7.0pF Panasonic ECU-V1H070JCN	1
1C112-9R0	C126	Cap, cer, +/- .25pf, NPO, 0805, 50V, 9pF Panasonic ECU-V1H090JCN	1
1C118-105	C160 C188 C201 C202 C47 C79 C87	Cap, tant, 10%, 16V, A case, 1uF Panasonic ESC-T1CY105R	7
1C118-106	C197 C70 C77 C81	Cap, tant, 20%, 16V, B case, 10uF Panasonic ESC-T1CX106R	4
1C118-224	C92	Cap, tant, 20%, 16V, A case, 0.22uF AVX TAJA224K035R	1
1C143-102	C136 C172 C192 C193 C194 C195 C58 C60 C61 C71 C74 C82 C91 C96 C99	Cap, cer, 10%, X7R, 0805, 50V, 1000pF Panasonic ECU-V1H102KBN	15
1C143-103	C103 C11 C12 C15 C154 C196 C42 C59 C98	Cap, cer, 10%, X7R, 0805, 50V, 0.01uF Panasonic ECU-V1H103KBG	9
1C143-223	C199 C66	Cap, cer, 10%, X7R, 0805, 50V, .022uF Panasonic ECU-V1H223KBN	2
1C144-104	C100 C101 C102 C122 C123 C198 C46 C62 C64 C67 C68 C69 C72 C73 C76 C83 C90	Cap, cer, 10%, X7R, 1206, 50V, 0.1uF Panasonic ECU-V1H104JBW	17
1C183-060	C129	Cap, trimmer, 2-6pF, NPO, SMT Murata TZBX4Z060BA110	1
1C183-200	C39	Cap, trimmer, Murata TZBX4 type, 20pF, A terminal Sprague GKG20066-07	1
1C183-300A	C97	Cap, trimmer, 6.5 to 30pF, N900, SMT Sprague GKG30066-07	1
1C306-8R0	C168	Cap, cer, 2%, NPO, 0805, 50V, 8pF	1
1D145-105	CR5	Diode, varactor, SOT-23, 2.8p, M4E Motorola MMBV105GLT1	1
1D149-BAV74	D10 D11 D12 D13 D14 D15 D16 D17 D18 D19 D20 D5 D6 D7 D8 D9	Diode, small sig, SOT-23, dual, CC Motorola BAV74LT1	16

Assy. No : 5A151

Part NUM	REFERENCE	3 PART DESCRIPTION	QTY per Board
1D149-BAV99	D21 D3 D4	Diode, small sig, SOT-23, dual National BAV99LT1	3
1F173-W455E	Y8	Filter, 455kHz, 6 element, 7.5kHz Murata CFWS455E	1
1J222-10C	J2	Connector, 10 pin header, flat cable, 0.05 dual row, low profile ADAM TECH BHR-10-VUA	1
1J238-28T	A102	Socket, IC, 28 pin DIP, Tin-Lead plate, 0.6 in spacing Augate 328-AG19DC	1
1J242-H04	J1	Connector, Terminal Block Header, thru hole, 5mm centers, 4 positions Augat 5EHDR-04	1
1J243-1111	J3	Connector, BNC, Female, R/A, PCB Mount RFI RFB-1111	1
1L-252	L42 L44	Filter, Helical TOKO 252MXPR-2615V	2
1L170-1606-9	L20	Inductor, 9.8nH +/- 5%, SMT, Micro Spring, 1606 Coilcraft 4.85nH 9900-9 1606-9	1
1L170-A02T	L41 L45	Inductor, 5.0nH, SMT, spring Coilcraft A02T	2
1L170-A03T	L43	Inductor, 8.0nH, SMT, spring Coilcraft A03T	1
1L100-8128 1021Z	L3	Inductor, quad coil, 455kHz Toko 7MC-8128Z	1
1L201-102	L29 L40	Inductor, SMT, 1008, 1uH, 5% Stetco 1008G102JTE	2
1L201-120	L37	Inductor, SMT, 1008, 12nH, 5%	1
1L201-150	L32 L36	Inductor, SMT, 1008, 15nH, 5%	2
1L201-180	L10	Inductor, SMT, 1008, 18nH, 5%	1
1L201-621	L9	Inductor, SMT, 1008, 620nH, 5%	1
1Q122-705P9	U8	IC, CPU, CMOS, 28 pin DIP Motorola MC68HC705P9	1
1Q126-3371D	U3	IC, Reciever, SO-16, MC3371 Motorola MC3371D	1
1Q126-34074	U5	IC, OP-AMP, quad, SMT, SO-14, 0 to 70 C Motorola MC34074D	1
1Q127-78L05	U10 U7	IC, VREG, 5V, SMT, SOP-8 Motorola MC78L05CD	2

Assy. No : 5A151

Part NUM	REFERENCE	PART DESCRIPTION	QTY per Board
1Q127-78L09	U6	IC, VREG, 9V, SMT, SOP-8 Motorola MC78L09ACD	1
1Q128-CD4066	U4	IC, Digital CMOS, SMT, 4066 Quad switch, 8V Motorola MC14066BD	1
1Q130-145190	U9	IC, PLL Freq. Synthesizers, 1.1 GHz, SOIC Motorola MC145190DT	1
1R104-100	R102 R12	Res, 5%, SMT, 0805, 10 ohm Panasonic ERJ-6GEYJ100	2
1R104-101	R62	Res, 5%, SMT, 0805, 100 ohm Panasonic ERJ-6GEYJ101	1
1R104-102	R106 R107	Res, 5%, SMT, 0805, 1k Panasonic ERJ-6GEYJ102	2
1R104-103	R30 R36 R42 R44 R45 R57 R65 R74 R76 R89	Res, 5%, SMT, 0805, 10k Panasonic ERJ-6GEYJ103	10
1R104-104	R104 R21 R58 R59 R60 R71	Res, 5%, SMT, 0805, 100k Panasonic ERJ-6GEYJ104	6
1R104-105	R108 R63 R79	Res, 5%, SMT, 0805, 1M Panasonic ERJ-6GEYJ105	3
1R104-151	R99	Res, 5%, SMT, 0805, 150 ohm Panasonic ERJ-6GEYJ151	1
1R104-152	R64	Res, 5%, SMT, 0805, 1.5k Panasonic ERJ-6GEYJ152	1
1R104-153	R28 R93	Res, 5%, SMT, 0805, 15k Panasonic ERJ-6GEYJ153	2
1R104-181	R48 R97	Res, 5%, SMT, 0805, 180 ohm Panasonic ERJ-6GEYJ181	2
1R104-182	R33	Res, 5%, SMT, 0805, 1.8k Panasonic ERJ-6GEYJ182	1
1R104-221	R29	Res, 5%, SMT, 0805, 220 ohm Panasonic ERJ-6GEYJ221	1
1R104-271	R87	Res, 5%, SMT, 0805, 270 ohm Panasonic ERJ-6GEYJ272	1
1R104-273	R105 R31 R32 R54 R88	Res, 5%, SMT, 0805, 27k Panasonic ERJ-6GEYJ273	5
1R104-302	R81 R82 R83 R84 R96 R98	Res, 5%, SMT, 0805, 3.0K	6
1R104-330	R56 R95	Res, 5%, SMT, 0805, 33 ohm Panasonic ERJ-6GEYJ330	2
1R104-333	R53	Res, 5%, SMT, 0805, 33k Panasonic ERJ-6GEYJ333	1

Assy. No : 5A151

Part NUM	REFERENCE	PART DESCRIPTION	QTY per Board
1R104-392	R100 R101	Res, 5%, SMT, 0805, 3.9k Panasonic ERJ-6GEYJ392	2
1R104-432	R27	Res, 5%, SMT, 0805, 4.3k	1
1R104-471	R94	Res, 5%, SMT, 0805, 470 ohm Panasonic ERJ-6GEYJ471	1
1R104-472	R43 R46 R61 R66 R69 R86	Res, 5%, SMT, 0805, 4.7k Panasonic ERJ-6GEYJ472	6
1R104-473	R109 R55	Res, 5%, SMT, 0805, 47k Panasonic ERJ-6GEYJ473	2
1R104-474	R47	Res, 5%, SMT, 0805, 470k Panasonic ERJ-6GEYJ474	1
1R104-510	R49	Res, 5%, SMT, 0805, 51 ohm Panasonic ERJ-6GEYJ510	1
1R104-561	R10 R8	Res, 5%, SMT, 0805, 560 ohm Panasonic ERJ-6GEYJ561	2
1R104-562	R92	Res, 5%, SMT, 0805, 5.6k Panasonic ERJ-6GEYJ562	1
1R104-680	R52	Res, 5%, SMT, 0805, 68 ohm Panasonic ERJ-6GEYJ680	1
1R104-681	R34	Res, 5%, SMT, 0805, 680 ohm Panasonic ERJ-6GEYJ681	1
1R104-753	R110 R111 R112	Res, 5%, SMT, 0805, 75k ohm Panasonic ERJ-6GEYJ753	3
1R104-822	R51 R70	Res, 5%, SMT, 0805, 8.2k Panasonic ERJ-6GEYJ822	2
1R154-103	R1	POT, SMT, 3mm, 10K Panasonic EVM-7JSX30B14	1
1R270-X104	R2	POT, 3/8 in square, single turn, thru hole, Cermet Trim, 100K BI Technologies 72XR100K	1
1S240-10H	SW1 SW2 SW3 SW4 SW5 SW6 SW7	Switch, BCD, 10 position, R/A PC Mount NKK DRFR10H	7
1T153-3904	Q13	Transistor, SMT, NPN, GP, SOT-23, 1AM Motorola MMBT3904	1
1T153-571	Q12 Q2	Transistor, SMT, NPN, ss rf, SOT-23, 7X Motorola MMBR571LT1	2
1T153-941	Q10 Q11	Transistor, SMT, NPN, ss rf, SOT-23, 7Y Motorola MMBR941	2
1T153-H10	Q6	Transistor, SMT, NPN, VHF/UHF, ss rf, SOT-23, 3EM Motorola MMBTH10	1

Assy. No : 5A151

Part NUM	REFERENCE	6 PART DESCRIPTION	QTY per Board
1T159-7002CT	Q7 Q9	Transistors, MOSFET, SOT-23, R _{ds(on)} =7.5 Zetex 2N7002CT	2
1T191-BF990A	Q3	Transistor, dual gate MOSFET, rf ss Phillips BP990A	1
1Y174-45.0-F	Y3 Y7	Crystal, Filter, 45.000MHz, UM-1 Temex TE7430	2
1Y179-14.400	Y1	Crystal, 14.4000MHz, UM-1, 5ppm Frequency Management 719-100-4	1
1Y179-44.545	Y9	Crystal, 44.5450MHz, UM-1, 20ppm	1
1Y259-A4.00	Y5	Resonator, cer, SMT, 4.000MHz Murata CSAC4.00MGC-TC	1
3M122-2	A101	Shield, VHF Monitor Receiver, 82-CBS-3.5 X 5.0 X 0.8 Leader Tech	1
NP	C118 C177 L46 R50 R80	No placement for this reference	3

Sage Receiver Limited Warranty & Service Information US Warranty Only

Warranty service for this unit will be administered by Harris Corporation in accordance with the following warranty statement.

Sage warrants to the original purchaser that this product and the components thereof, will be free from defects in workmanship and materials for a period of one year from the date of purchase.

Sage will, without charge, repair or replace, at its option, defective product or component parts upon prepaid delivery to the service department of Harris, Richmond, IN, accompanied by proof of purchase date in the form of a valid sales receipt.

This warranty does not apply in the event of misuse or abuse of the product or as a result of unauthorized alteration or repairs. This warranty is void if the serial number is altered, defaced, or removed.

Neither Sage or Harris shall be liable for any consequential damages, including without limitation damages resulting from loss of use. Some states do not allow limitation of incidental or consequential damages, so the above limitation or exclusion may not apply to you. This warranty gives you specific rights and you may also have other rights which vary from state to state.

The following information is provided in the unlikely event that your unit must be returned for service.

1. Be sure the unit is the cause of the problem. Check to make sure the unit has power supplied, all cables are connected correctly and the cables themselves are in working condition.
2. If you find the unit to be at fault, write down a description of the problem including how and when the problem occurs.
3. Call Harris at 765-962-8596 for a Return Authorization (RA) number.
4. Pack the unit in its original carton or a reasonable substitute. Put the packaged unit in another box for shipping. Print the RA number clearly under the address. NOTE: The Receiver is subject to damage if poorly packaged. Shipping damage may affect your warranty.
5. Include with your unit a return shipping address (we cannot ship to a P.O. Box), a copy of your purchase receipt, a daytime phone number, and the description of the problem
6. Ship the unit **FREIGHT PREPAID** to
Harris Broadcast Division
3712 National Road West
Richmond, Indiana 47374

Attention: Service Department - Sage Receiver RA#:

PLEASE NOTE: All returns must have a valid RA number.