



Raymarine Limited

RAY 240 VHF Radio

Circuit Diagrams

FCC ID PJ5RAY240

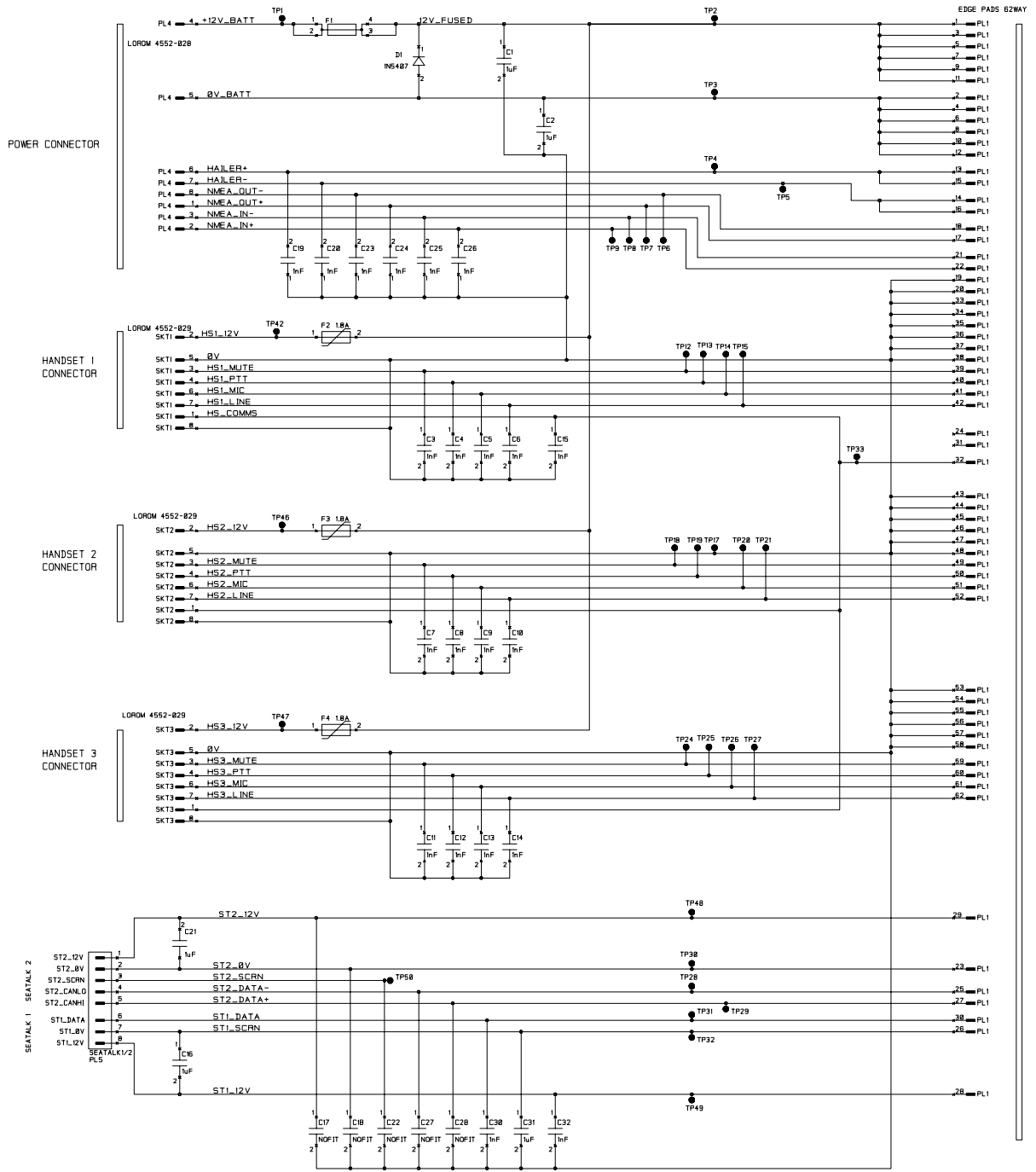
IC: 4069B-RAY240

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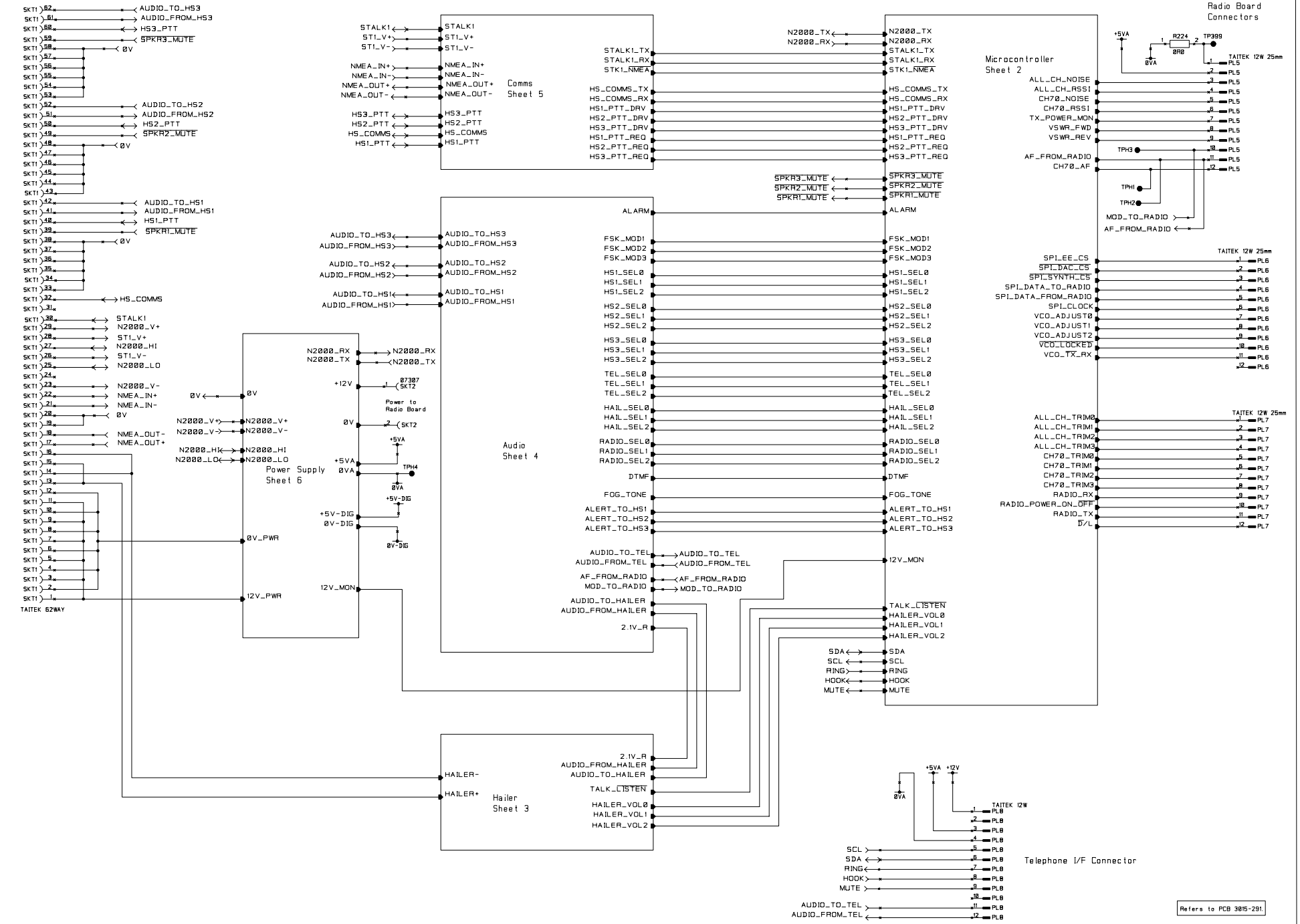
Used on.

Odd numbered pads on component side
Even numbered pads on solder side

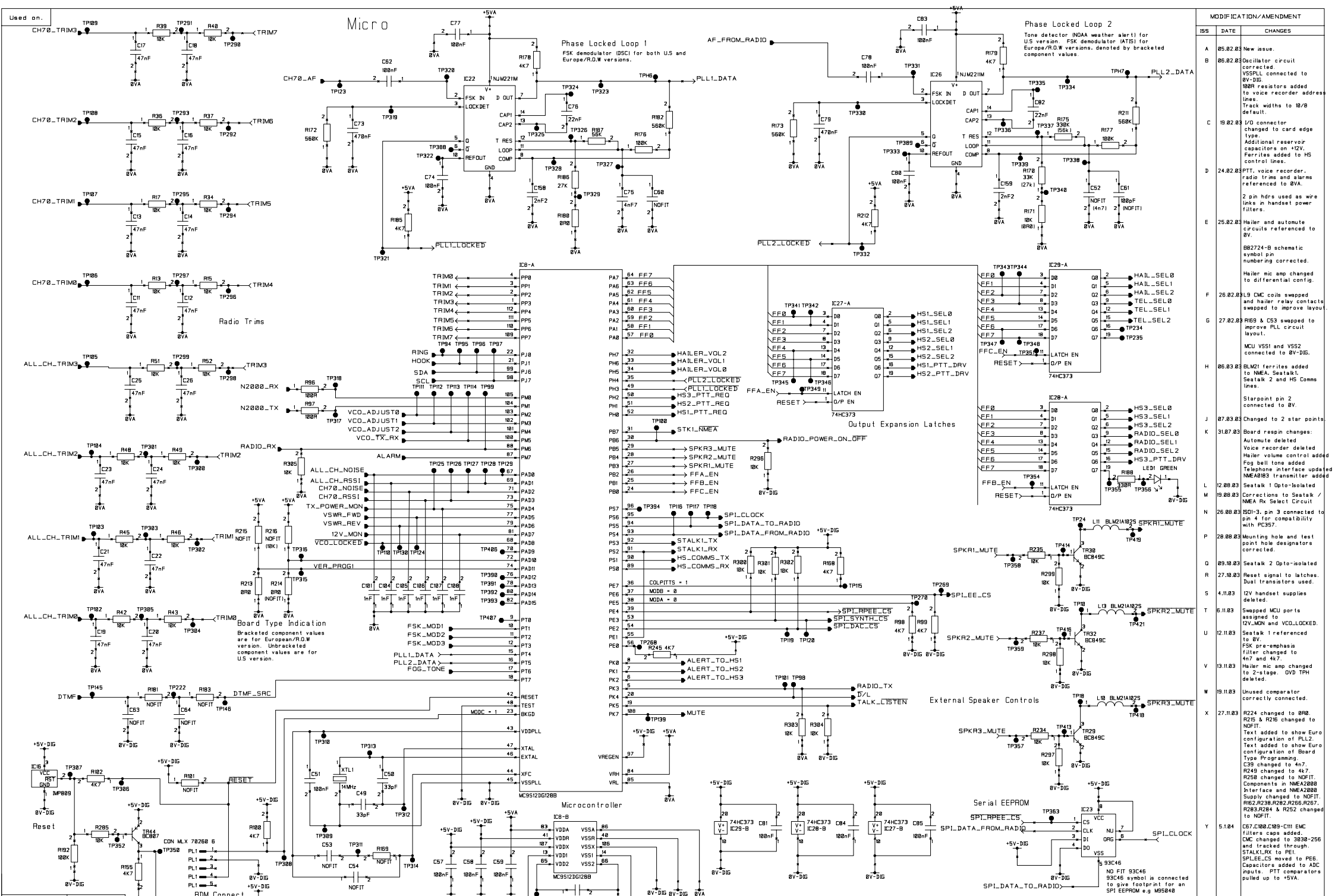


MODIFICATION/AMENDMENT		
ISS	DATE	CHANGES
A	25.02.03	New issue.
B	06.08.03	PCB Respin. Polyswitches added. Change to Lorum connectors.
C	18.08.03	Edge connector pin-out changed to match Issue B Processor Board
D	17.11.03	Combined ST1/ST2 connector. Decoupling capacitors on all signal lines to 0V.
E	19.11.03	F2, F3, F4 changed to surface mount 9608MFSMB5.
F	20.11.03	C17 and C22 changed to 1uF 9326L1. C17 changed to 0603 nofit. C21 changed to 1uF. C22 changed to 1206 nofit.

I/O Connector



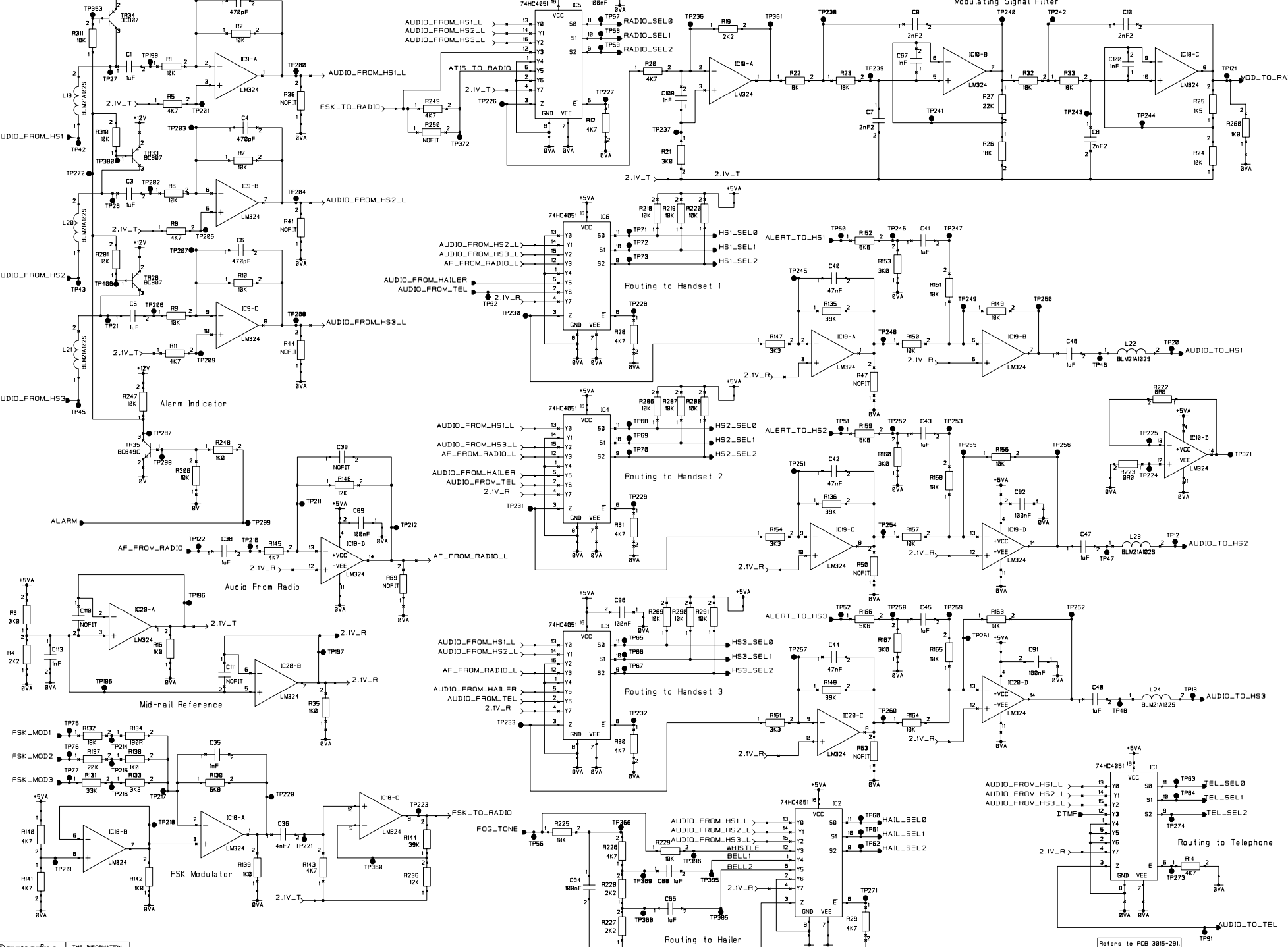
MODIFICATION/AMENDMENT	
ISS	CHANGES
A	05.02.03 New issue.
B	06.02.03 Oscillator circuit corrected. V55PLL connected to 0V-DIG. 100R resistors added to voice recorder address lines. Track widths to 10/8 default.
C	19.02.03 I/O connector changed to card edge type. Additional resistor capacitors on +12V. Ferrites added to HS control lines.
D	24.02.03 PTT, voice recorder, radio trims and alarms referenced to 0V. 2 pin headers used as wire links in handset power filters.
E	25.02.03 Hailer and automate circuits referenced to 0V. B82724-B schematic symbol pin numbering corrected. Hailer mic amp changed to functional config.
F	26.02.03 L9 CMC coils swapped and hailer relay contacts swapped to improve layout.
G	27.02.03 R8B & C53 swapped to improve PLL circuit layout.
H	06.03.03 BLM21 ferrites added to NMEA, Stalktalk 2 and HS Comms lines. Starpoint pin 2 connected to 0V.
J	07.03.03 Changed to 2 star points.
K	31.07.03 Board respin changes: Automute deleted. Voice recorder deleted. Hailer volume control added. Fog bell tone added. Telephone interface updated. NMEA082B transmitter added.
L	12.08.03 Sealtalk 1 Opto-Isolated
M	19.08.03 Corrections to Sealtalk / NMEA Rx Select Circuit
N	26.08.03 ISO-3, pin 3 connected to pin 4 for compatibility with PC35P.
P	28.08.03 Mounting hole and test point hole designators corrected.
Q	09.10.03 Sealtalk 2 Opto-isolated
R	27.10.03 Reset signal to latches. Dual transistors used.
S	4.11.03 12V handset supplies deleted.
T	6.11.03 Swapped MCU ports assigned to Sealtalk 1 12V_MON and VCO_LOCKED.
U	12.11.03 Sealtalk 1 referenced to 0V. FSK pre-emphasis filter changed to 4n7 and 4k7.
V	13.11.03 Hailer mic amp changed to 2-stage. DVD TPH deleted.
W	19.11.03 Unused comparator correctly connected.
X	27.11.03 R224 changed to 0R0. R215 & R216 changed to NOFIT. Text added to show Euro configuration of PLL2. Text added to show Euro configuration of Board Type Programming. C39 changed to 4n7. R249 changed to 4k7. R258 changed to NOFIT. Components in NMEA2000 interface and NMEA2000 Supply changed to NOFIT. R162, R238, R282, R266, R267, R283, R284 & R252 changed to NOFIT.
Y	5.1.04 C67, C100, C109 - CH1 EMC filters caps added. CMC changed to 3038-256 and tracked through. STALK1_RX to PE1. SPL_EE_CS moved to PE6. Capacitors added to ADC inputs. PTT comparators pulled up to +5VA.



MODIFICATION/AMENDMENT		
ISS	DATE	CHANGES
A	05.02.03	New issue.
B	06.02.03	Oscillator circuit corrected. VSSPLL connected to 0V-DIG. 100R resistors added to voice recorder address lines. Track widths to 10/8 (default).
C	19.02.03	I/O connector changed to card edge type. Additional reservoir capacitors on +12V. Ferrites added to HS control lines.
D	24.02.03	PT1, voice recorder, radio trim pins and alarms referenced to 0V. 2 pin hdre used as wire links in handset power filters.
E	25.02.03	Hailer and automate circuits referenced to 0V. BB2724-B schematic symbol pin numbering corrected.
F	26.02.03	Hailer mic amp changed to differential config. L9 CMC coils swapped and hailer pins and contacts swapped to improve layout.
G	27.02.03	R169 & C53 swapped to improve PLL circuit layout.
H	06.03.03	MCU VSS1 and VSS2 connected to 0V-DIG. BLM21 ferrites added to NMEA, Seatalk, Seatalk 2 and HS Comms lines.
J	07.03.03	Starpoint pin 2 connected to 0V.
K	07.03.03	Changed to 2 star points. Board respin changes: Automute deleted. Voice recorder deleted. Hailer volume control added. Fog bell tone added. Telephone interface updated. NMEA0183 transmitter added.
L	12.08.03	Seatalk 1 Opto-Isolated.
M	19.08.03	Corrections to Seatalk / NMEA Rx Select Circuit.
N	26.08.03	ISO-3, pin 3 connected to pin 4 for compatibility with PC357.
P	28.08.03	Mounting hole and test point hole designators corrected.
Q	09.10.03	Seatalk 2 Opto-isolated.
R	27.10.03	Reset signal to latches. Dual transistors added.
S	4.11.03	12V handset supplies deleted.
T	6.11.03	Swapped MCU ports assigned to 12V_MON and VCO_LOCKED.
U	12.11.03	Seatalk 1 referenced to 0V. FSK pre-emphasis filter changed to 4k7 and 4k7.
V	13.11.03	Hailer mic amp changed to 2-stage. OVD TPH deleted.
W	19.11.03	Unused comparator correctedly connected.
X	27.11.03	R224 changed to 0R0. R215 & R216 changed to NOFIT. Text added to show Euro configuration of PLL2. Text added to show Euro configuration of Board Type Programming. C39 changed to 4k7. R249 changed to 4k7. R258 changed to NOFIT. Components in NMEA2000 interface and NMEA2000 Supply changed to NOFIT. R152, R236, R262, R266, R267, R283, R284 & R252 changed to NOFIT.
Y	5.1.04	C67, C100, C109 - C111 EMC filters caps added. CMC changed to 3628-256 and tracked through. STALK1_RX to PE1. SPI_LATCH_CS moved to RES. Capacitors added to ADC inputs. PTT comparators pulled up to +5VA.

Used on:

Audio and Switching



MODIFICATION/AMENDMENT		
ISS	DATE	CHANGES
A	05.02.03	New issue.
B	06.02.03	Oscillator circuit corrected. VSSPLL connected to 0V-DIG. 100R resistors added to voice recorder address lines. Track widths to 10/8 default.
C	19.02.03	I/O connector changed to card edge type. Additional reservoir capacitors on +12V. Ferrites added to HS control lines.
D	24.02.03	PTT, voice recorder, radio trims and alarms referenced to 0V.
E	25.02.03	2 pin hdrs used as wire links in handset power filters. Hailer and automute circuits referenced to 0V.
F	26.02.03	BB2724-B schematic symbol pin numbering corrected. Hailer mic amp changed to differential config.
G	27.02.03	L9C coils swapped and hailer relay contacts swapped to improve layout.
H	06.03.03	MCU VSS1 and VSS2 connected to 0V-DIG. BLM21 ferrites added to NMEA, Seatalk, Seatalk 2 and HS Comm lines.
J	07.03.03	Starpoint pin 2 connected to 0V.
K	31.07.03	Changed to 2 star points. Board respn changes: Automute deleted. Voice recorder deleted. Hailer volume control added. Fog bell tone added. Telephone interface updated. NMEA0183 transmitter added.
L	12.08.03	Seatalk 1 Opto-Isolated.
M	19.08.03	Connections to Seatalk / NMEA Rx Select Circuit.
N	26.08.03	ISO-3, pin 3 connected to pin 4 for compatibility with PC357.
P	28.08.03	Mounting hole and test point now designators corrected.
Q	09.10.03	Seatalk 2 Opto-isolated.
R	27.10.03	Reset signal to latches. Dual transistors used.
S	4.11.03	12V handset supplies deleted.
T	6.11.03	Swapped MCU ports assigned to 12V-MCN and VCD-LOCKED.
U	12.11.03	Seatalk 1 referenced to 0V. FSK pre-emphasis filter changed to 4n7 and 4k7.
V	13.11.03	Hailer mic amp changed to 2-stage. OVD THP deleted.
W	19.11.03	Unused comparator correctly connected.
X	27.11.03	R224 changed to 0R0. R215 & R216 changed to NDFIT. Text added to show Euro configuration of Board Type Programming. C38 changed to 4n7. R249 changed to 4k7. R250 changed to NDFIT. Components in NMEA2000 Interface and NMEA2000 Supply changed to NDFIT. R162, R238, R262, R266, R267, R283, R284 & R252 changed to NDFIT.
Y	5.1.04	C67, C100, C103 - CH1 EMC filters case added. CMC changed to 3830-256 and tracked through. STAKL_RX to PE1. SPL_EE_CS moved to PE6. Capacitors added to ADC inputs. PTT comparators pulled up to +5V.

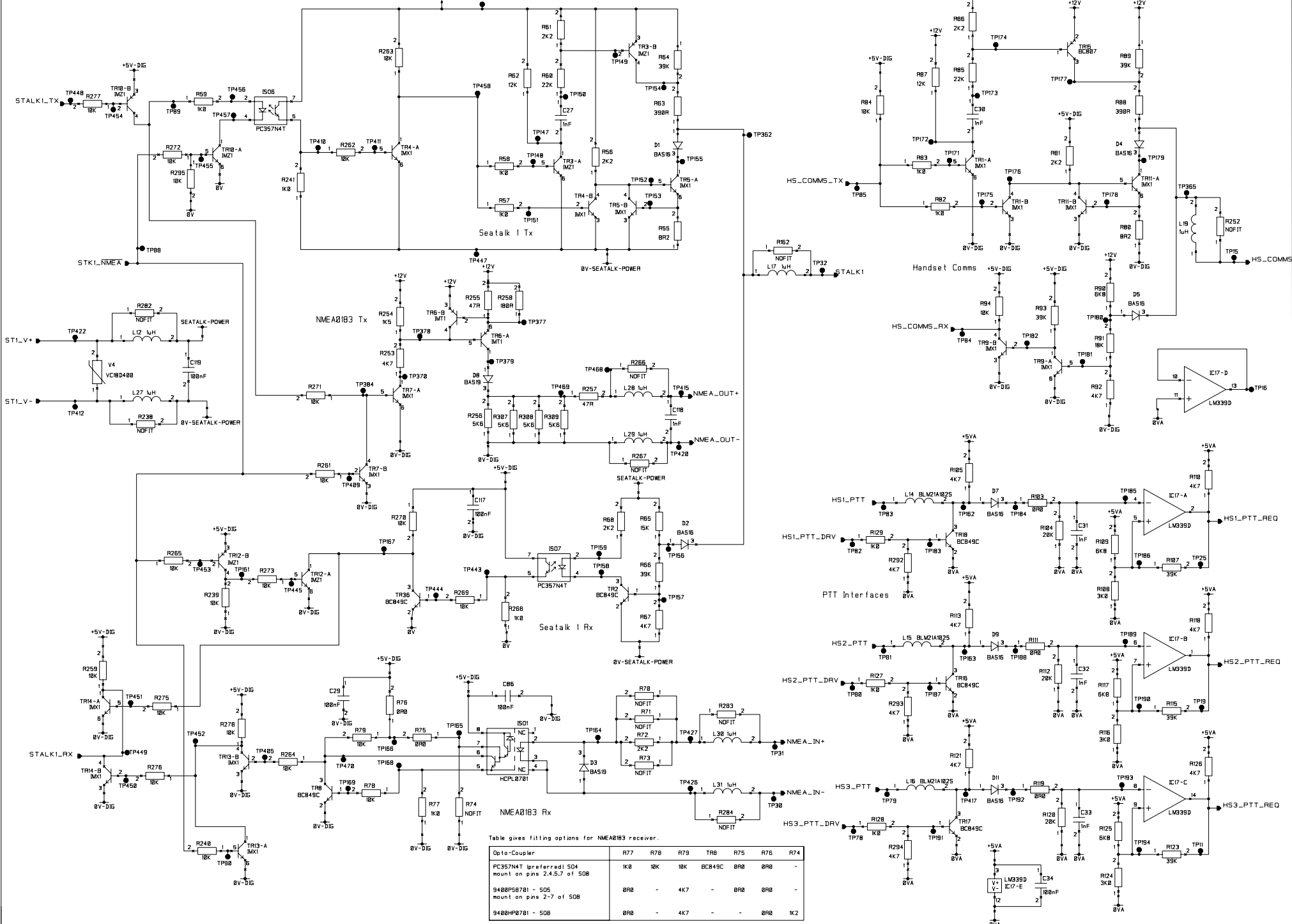


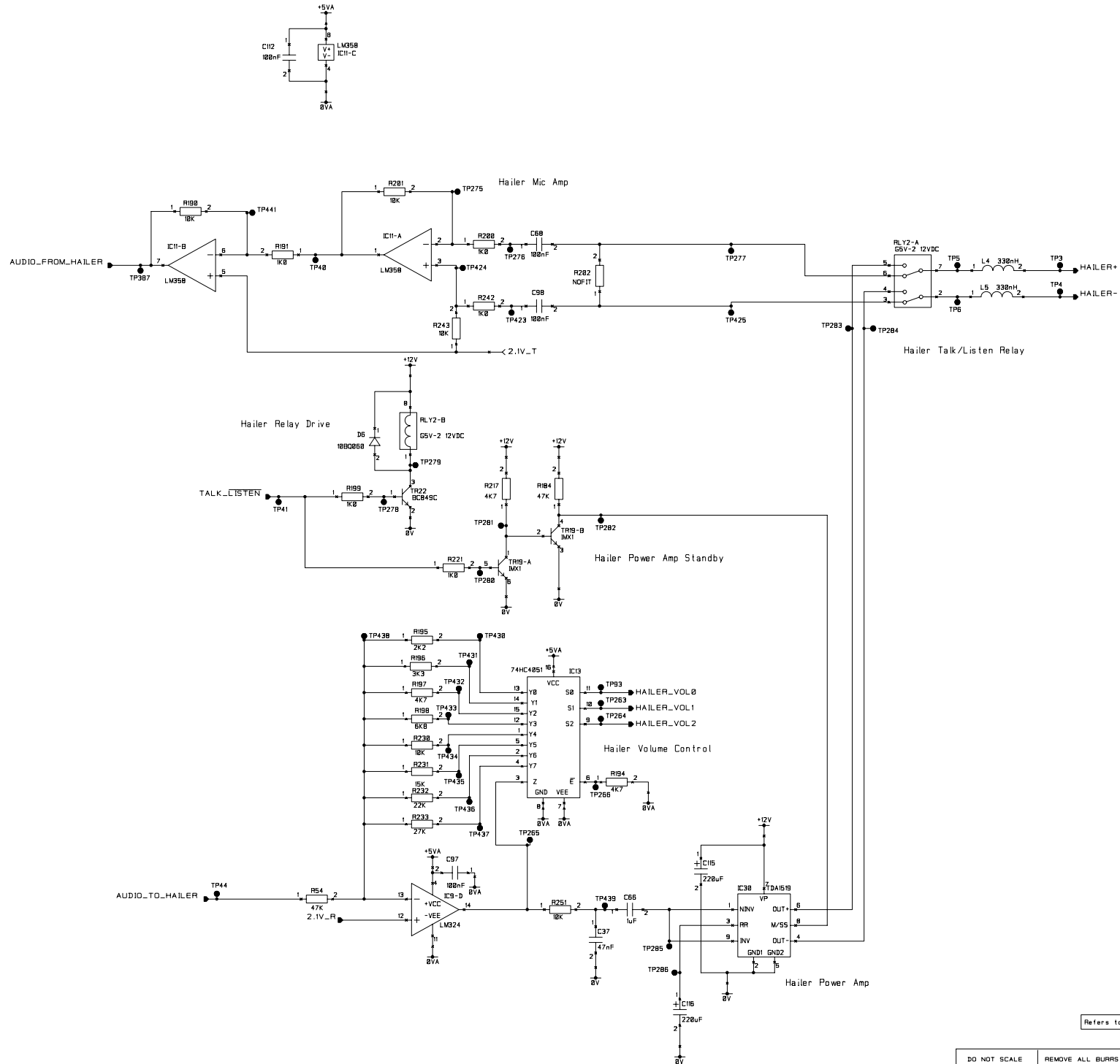
Table gives fitting options for NMEA0183 receiver.

Opto-Coupler	R77	R78	R79	R88	R75	R76	R74
PC357N4T (preferred) S04 mount on pins 2,4,5,7 of SOB	10K	10K	10K	BCR49C	0R0	0R0	-
9408PS8701 - S05 mount on pins 2-7 of SOB	0R0	-	4K7	-	0R0	0R0	-
9408HP8701 - SOB	0R0	-	4K7	-	-	0R0	1K2

MODIFICATION/AMENDMENT		
ISS	DATE	CHANGES
A	05.02.03	
B	06.02.03	New issue. Oscillator circuit corrected. VSSPLL connected to 0V-DIG. 100R resistors added to voice recorder address lines. Track widths to 10/8 fault.
C	19.02.03	I/O connector changed to card edge type. Additional reservoir capacitors on +12V ferrites added to HS control lines. PTT voice recorder, radio trms and alarms referenced to 0VA.
D	24.02.03	2 pin hdrs used as wire links in handset power filters.
E	25.02.03	Hailer and automate circuits referenced to 0V. BB2724-B schematic symbol pin numbering corrected.
F	28.02.03	Hailer mic amp changed to differential config.
G	27.02.03	L9 CMC coils swapped and hailer relay contacts swapped to improve layout. R69 & C53 swapped to improve PLL circuit layout.
H	06.03.03	NCU V551 and V552 connected to 0V-DIG. BLM21 ferrites added to NMEA, Seatalk, Seatalk 2 and HS Comms lines.
J	07.03.03	Starpoint pin 2 connected to 0V.
K	31.07.03	Changed to 2 star points. Board resin changes: Automute deleted Voice recorder deleted Hailer volume control added Pbg bell tone added Telephone interface updated NMEA0183 transmitter added
L	12.08.03	Seatalk 1 Opto-Isolated
M	19.08.03	Corrections to Seatalk / NMEA Rx Select Circuit
N	26.08.03	ISO1-3, pin 3 connected to pin 4 for compatibility with PC357.
P	28.08.03	Mounting hole and test point now designators corrected.
Q	09.10.03	Seatalk 2 Opto-Isolated
R	27.10.03	Reset signal to latches. Dual transistors used.
S	4.11.03	+12V handset supplies deleted.
T	6.11.03	Swapped MCU ports assigned to 12V, MCV and VCO_LOCKED.
U	12.11.03	Seatalk 1 referenced to 0V. FSK pre-emphasis filter changed to 4K7 and 4K7.
V	13.11.03	Hailer mic amp changed to 2-stage. OVD TPH deleted.
W	19.11.03	Unused comparator correctly connected.
X	27.11.03	R224 changed to 0R0. R215 & R216 changed to NDFIT. Text added to show Euro configuration of PLL2. Text added to show Euro configuration of Board Type Programming. C39 changed to 4n7. R240 changed to 4K7. R250 changed to NDFIT. Components in NMEA2000 interface and NMEA2000 supply changed to NDFIT. R62,R236,R282,R286,R267, R263,R264 & R252 changed to NDFIT.
Y	5.1.04	C67,C108,C109-C111 EMC filters caps added. CMC changed to 3030-250 and tracked through STALK1_RX to PE1. SPL_EE_CS moved to PE6. Capacitors added to ADC inputs. PTT comparator pulled up to +5VA.

Refers to PCB 3015-291.

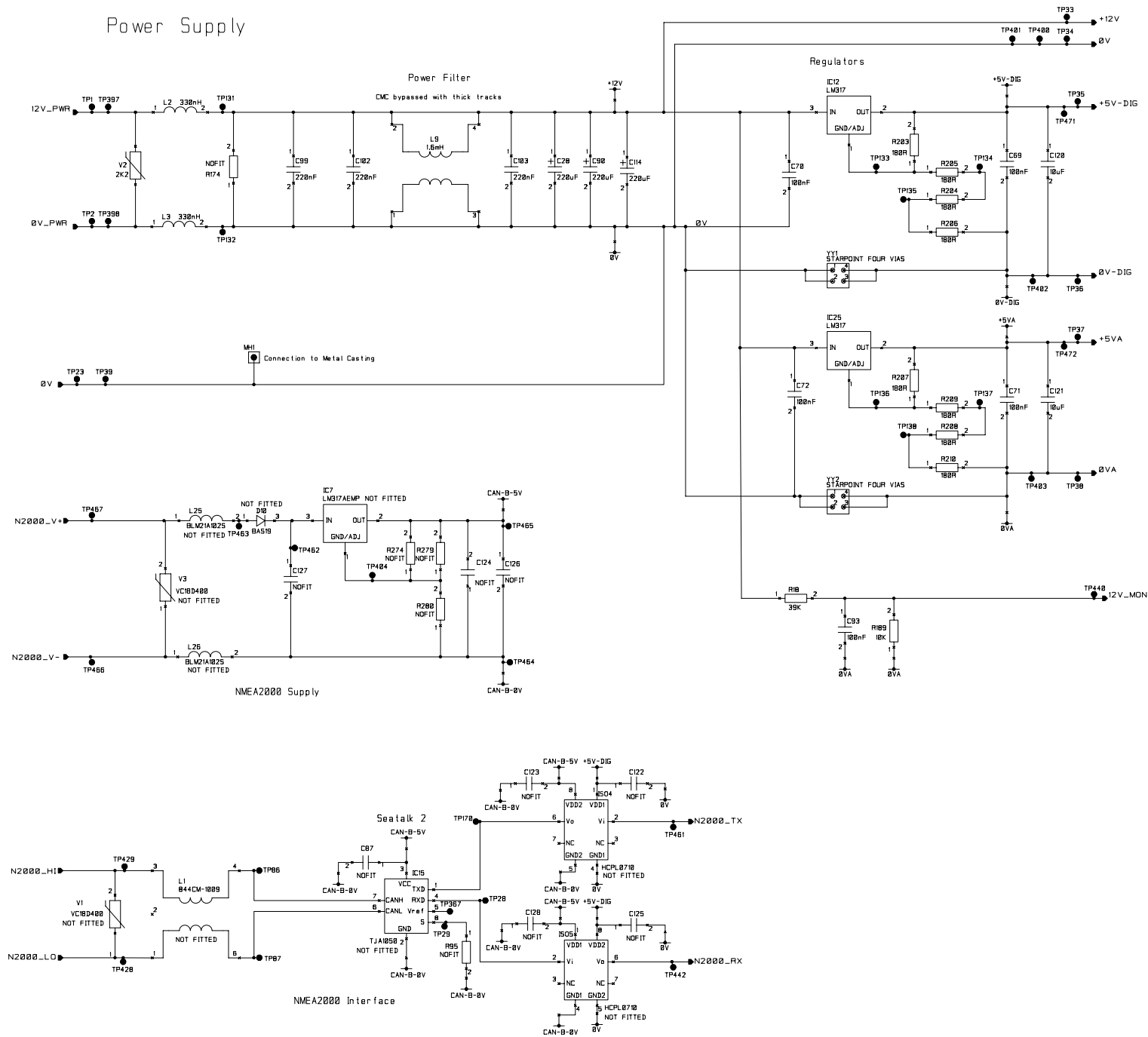
Hailer



Refers to PCB 351-291.

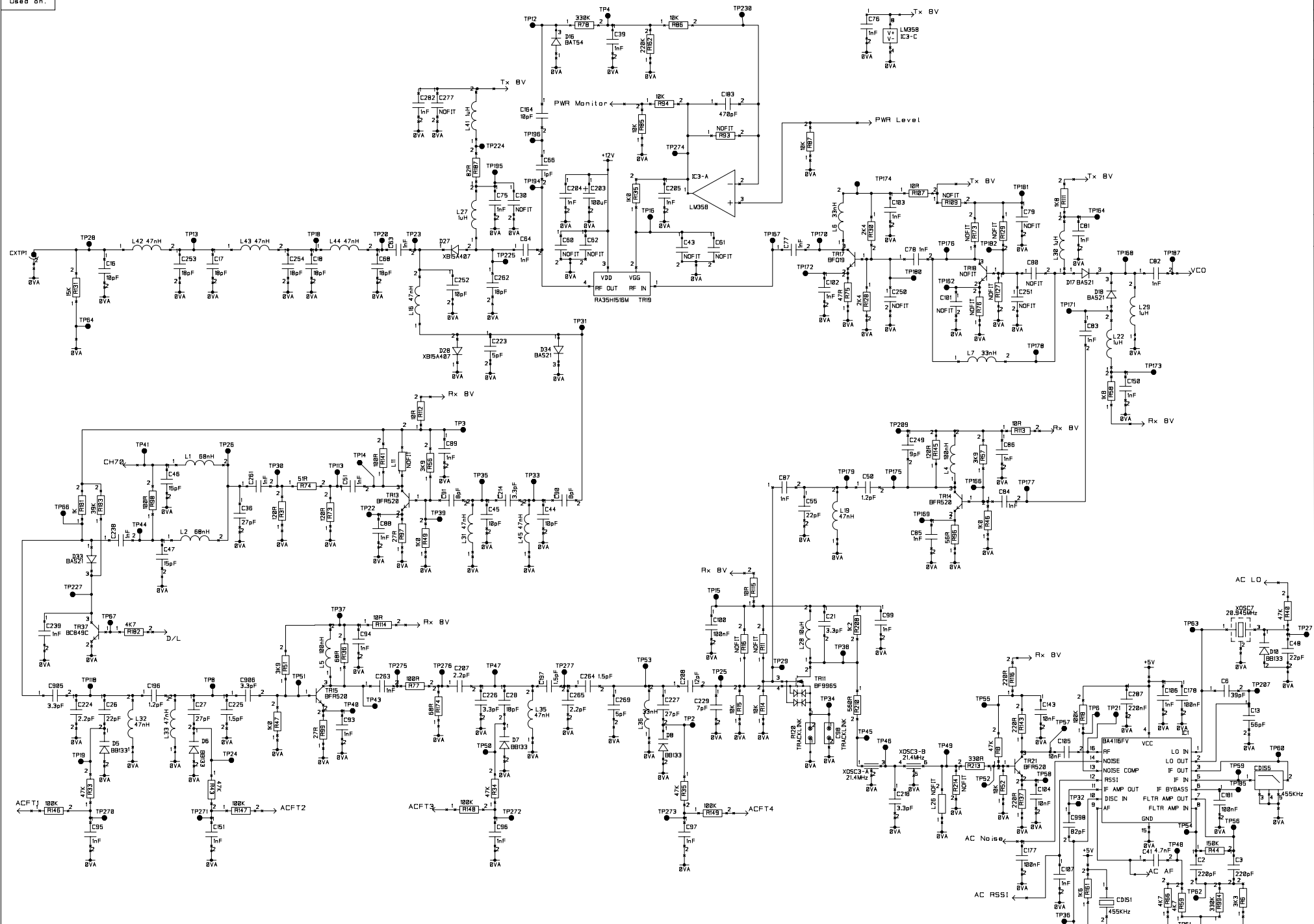
MODIFICATION/AMENDMENT		
ISS	DATE	CHANGES
A	05.02.03	New issue.
B	06.02.03	Oscillator circuit corrected. VSSPLL connected to 0V-DIG. 100R resistors added to voice recorder address lines. Track widths to 10/8 default.
C	19.02.03	I/O connector changed to card edge type. Additional reservoir capacitors on +12V. Ferrites added to HS control lines.
D	24.02.03	PTT, voice recorder, radio trims and alarms referenced to 0VA. 2 pin hdrs used as wire links in handset power filters.
E	25.02.03	Hailer and automate circuits referenced to 0V. BB2724-B schematic symbol pin numbering corrected. Hailer mic amp changed to differential config.
F	26.02.03	L9 CMC coils swapped and Hailer relay contacts swapped to improve layout.
G	27.02.03	R189 & C83 swapped to improve PLL circuit layout. MCU VSS1 and VSS2 connected to 0V-DIG.
H	06.03.03	BLM21 ferrites added to NMEA, Seatalk1, Seatalk 2 and HS Comms lines. Starpoint pin 2 connected to 0V.
J	07.03.03	Changed to 2 star points
K	31.07.03	Board respin changes: Automute deleted Voice recorder deleted Fog bell tone added Telephone interface updated NMEA0183 transmitter added
L	12.08.03	Seatalk 1 Opto-Isolated
M	19.08.03	Corrections to Seatalk / NMEA Rx Select Circuit
N	26.08.03	ISO-3, pin 3 connected to pin 4 for compatibility with PC357.
P	28.08.03	Mounting hole and test point hole designators corrected.
D	09.10.03	Seatalk 2 Opto-isolated
R	27.10.03	Reset signal to latches. Dual transistors used.
S	4.11.03	12V handset supplies deleted.
T	6.11.03	Swapped MCU ports assigned to HAILER_12V_MON and VCO_LOCKED.
U	12.11.03	Seatalk 1 referenced to 0V. 5K pre-emphasis filter changed to 4n7 and 4k7.
V	13.11.03	Hailer mic amp changed to 2-stage. OVD TPH deleted.
W	19.11.03	Unused comparator correctly connected.
X	27.11.03	R224 changed to 0R0. R215 & R216 changed to NOFIT.
Y	5.1.04	Text added to show Euro configuration of PL12. Text added to show Euro configuration of Board Type Programming. C39 changed to 4n7. R249 changed to 4k7. R258 changed to NOFIT. Components in NMEA2000 Interface and NMEA2000 Supply changed to NOFIT. R162, R236, R282, R266, R267, R283, R284 & R252 changed to NOFIT.
		C67, C88, C89 - C111 EMC filters caps added. CMC changed to 3038-256 and tracked through. STALK1_OV to FEL. SPL_EE_CS moved to PE6. Capacitors added to ADC inputs. PTT comparators pulled up to +5VA.

Power Supply



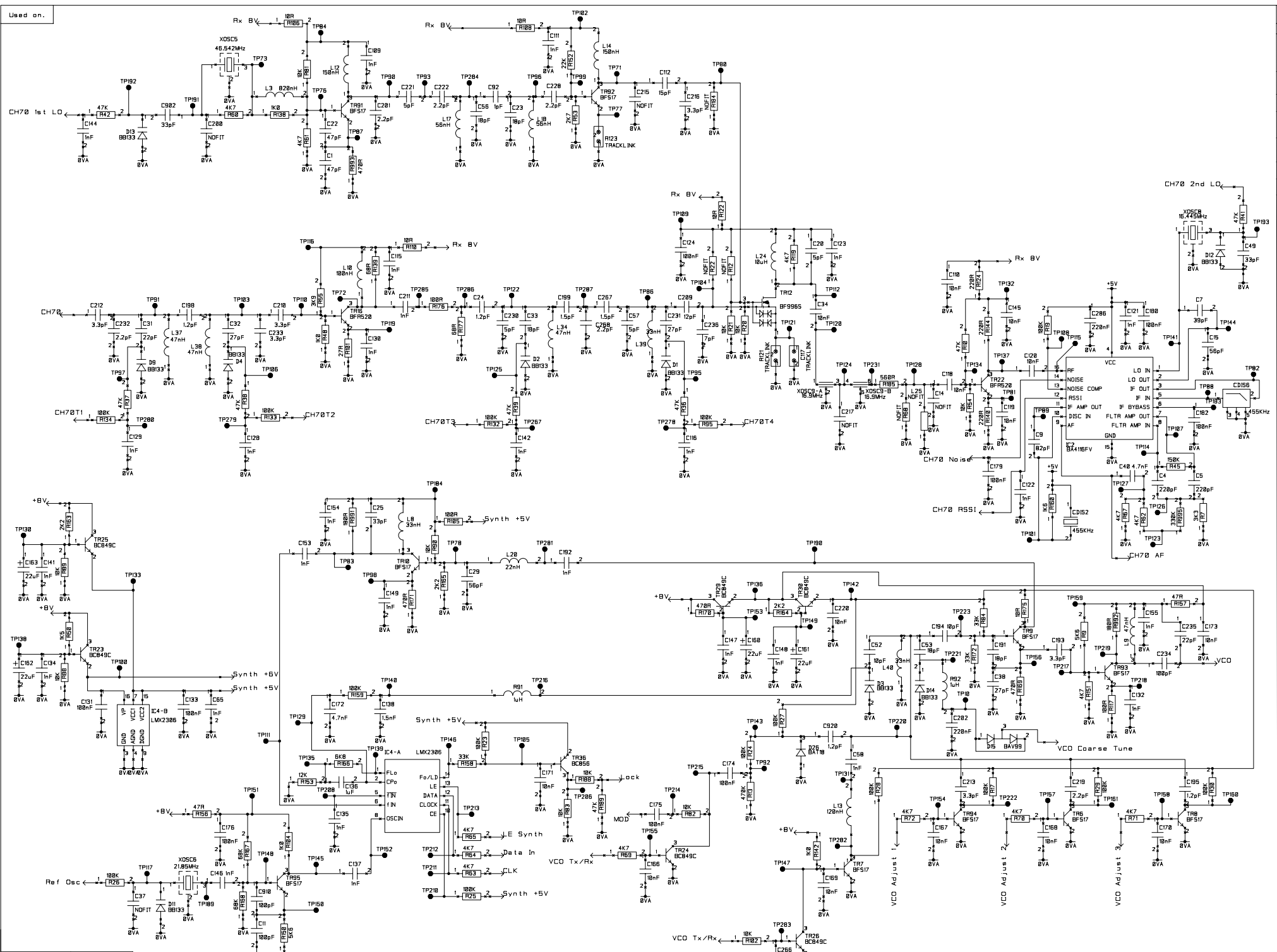
Refers to PCB 3015-291.

MODIFICATION/AMENDMENT		
ISS	DATE	CHANGES
A	25.02.03	New issue.
B	26.02.03	Oscillator circuit corrected. V5SPUL connected to 0V-DIG. 00R resistors added to voice recorder address lines. Track widths to 10/8 default.
C	19.02.03	I/O connector changed to card edge type. Additional reservoir capacitors on +12V. Ferrites added to HS control lines.
D	24.02.03	PTT voice recorder, twisp trim and alarms referenced to 0V. 2 pin hrs used as wire links in handset power filters.
E	25.02.03	Haier and automate circuits referenced to 0V. BB2724-B schematic symbol pin numbering corrected. Haier mic amp changed to differential config.
F	26.02.03	LM259 CMC coils swapped and Haier relay contacts swapped to improve layout.
G	27.02.03	R169 & C53 swapped to improve PLL circuit layout. MCU V5S1 and V5S2 connected to 0V-DIG.
H	26.03.03	BLM2 ferrites added to NMEA, Seatalk, Seatalk 2 and HS Comms lines. Starpoint pin 2 connected to 0V.
J	27.03.03	Changed to 2 star points.
K	31.07.03	Board respin changes: Automate deleted. Voice recorder deleted. Haier volume control added. Fog bell tone added. Telephone interface updated. NMEA0183 transmitter added.
L	12.08.03	Seatalk 1 Opto-isolated.
M	19.08.03	Corrections to Seatalk / NMEA Rx Select Circuit.
N	26.08.03	ISO1-3, pin 3 connected to pin 4 for compatibility with PC357.
P	28.08.03	Mounting hole and test point hole designators corrected.
Q	09.10.03	Seatalk 2 Opto-isolated.
R	27.10.03	Reset signal to latches. Dual transistors used.
S	4.11.03	12V handset supplies deleted.
T	6.11.03	Swapped MCU ports assigned to 12V_MDN and VCD_LOCKED.
U	12.11.03	Seatalk 1 referenced to 0V. FSK pre-emphasis filter changed to 4n7 and 4k7.
V	13.11.03	Haier mic amp changed to 2-stage. DVD TPH deleted.
W	19.11.03	Unused comparator correctly connected.
X	27.11.03	R224 changed to 0R0. R216 & R216 changed to NOFIT. Text added to show Euro configuration of Board Type Programming. C59 changed to 4n7. R249 changed to 4k7. R258 changed to NOFIT. Components in NMEA2000 Interface and NMEA2000 Supply changed to NOFIT. R62, R238, R262, R266, R267, R283, R284 & R252 changed to NOFIT.
Y	5.1.04	C67, C100, C109 - C111 EMC filters caps added. CMC changed to 3030-256 and tracked through. SPLK_LRX to PE1. SPLK_LCS moved to PE6. Capacitors added to ADC inputs. PTT comparators pulled up to +5VA.



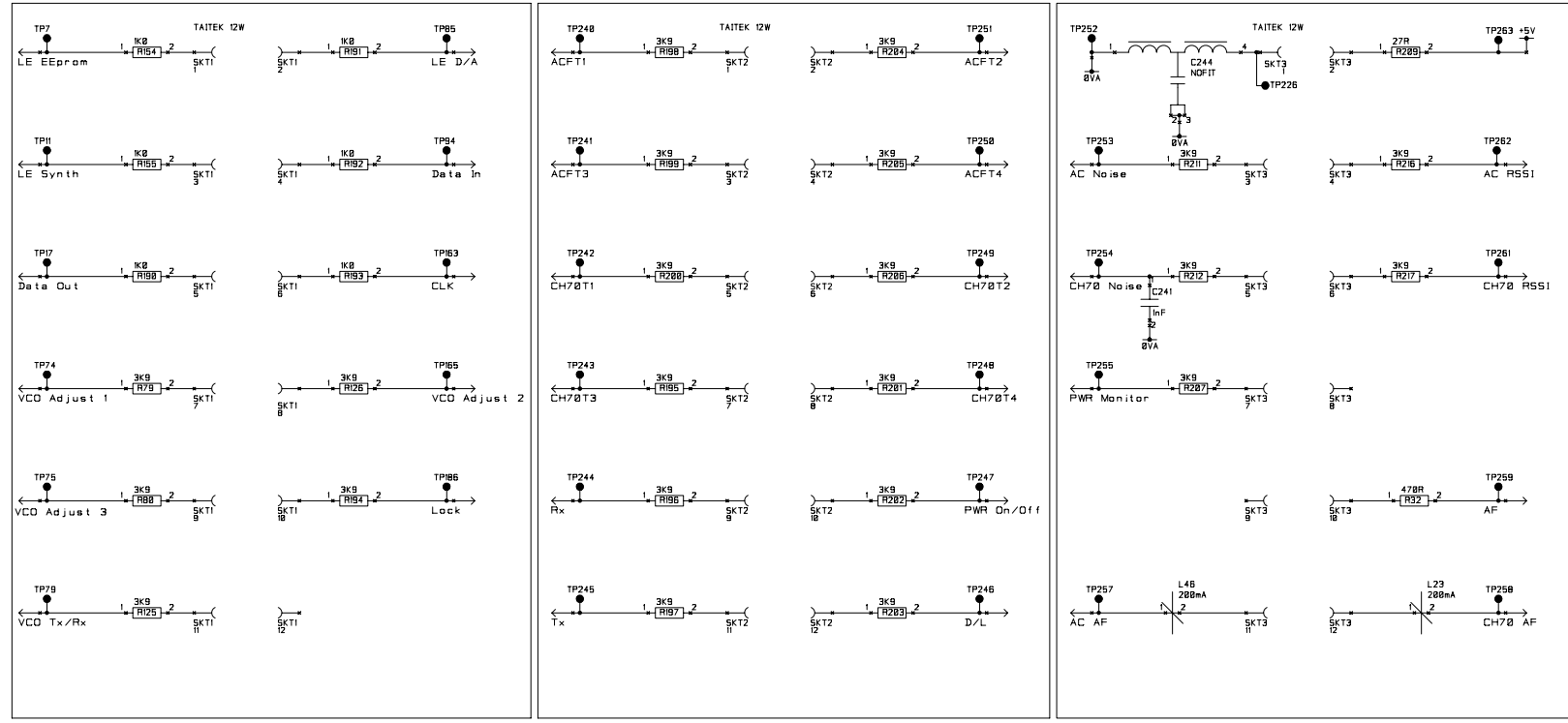
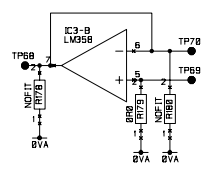
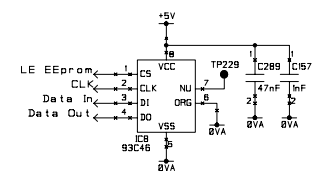
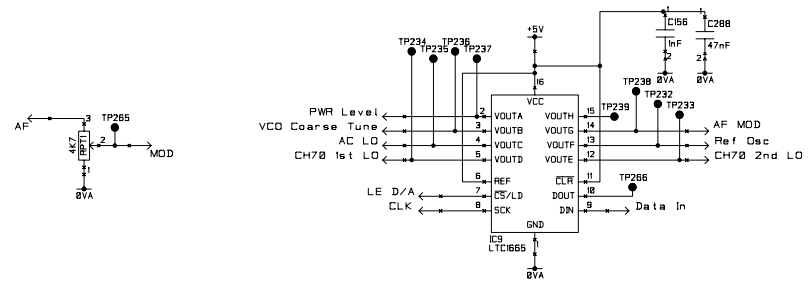
THIS CIRCUIT DIAGRAM REFERS TO PCB 3015-277

MODIFICATION/AMENDMENT		
ISS	DATE	CHANGES
A	19.11.03	Previous schematic number was 4552806 Issue Z.
B	24.11.03	See file - '3015-277 REV D Changes'
C	24.11.03 SWJ	See file - '3015-277 REV E Changes' Upssued to bring in line with Sheet 3.
D	26.11.03	Short the connections of L21, and re-numbering of the test points
E	12.01.04	See file - '3015-277 REV E Changes' changes 7-42
F	13.01.04 SWJ	Delete C69-74,255-268,278-276,278-281,283-285 Change CHASSIS connections to GVA, C21 7pF to 5p, C19 1K5 to R208 1K2, C35 10nF to R210 568R, C108 10nF to R213 330R, C12 4K7 to R214 No Fit.
G	19.01.04 SWJ	Change D16 BAS21 to BAT54, C66 1pF to 10pF, R78 220K to 330K, R162 568K to 220K.

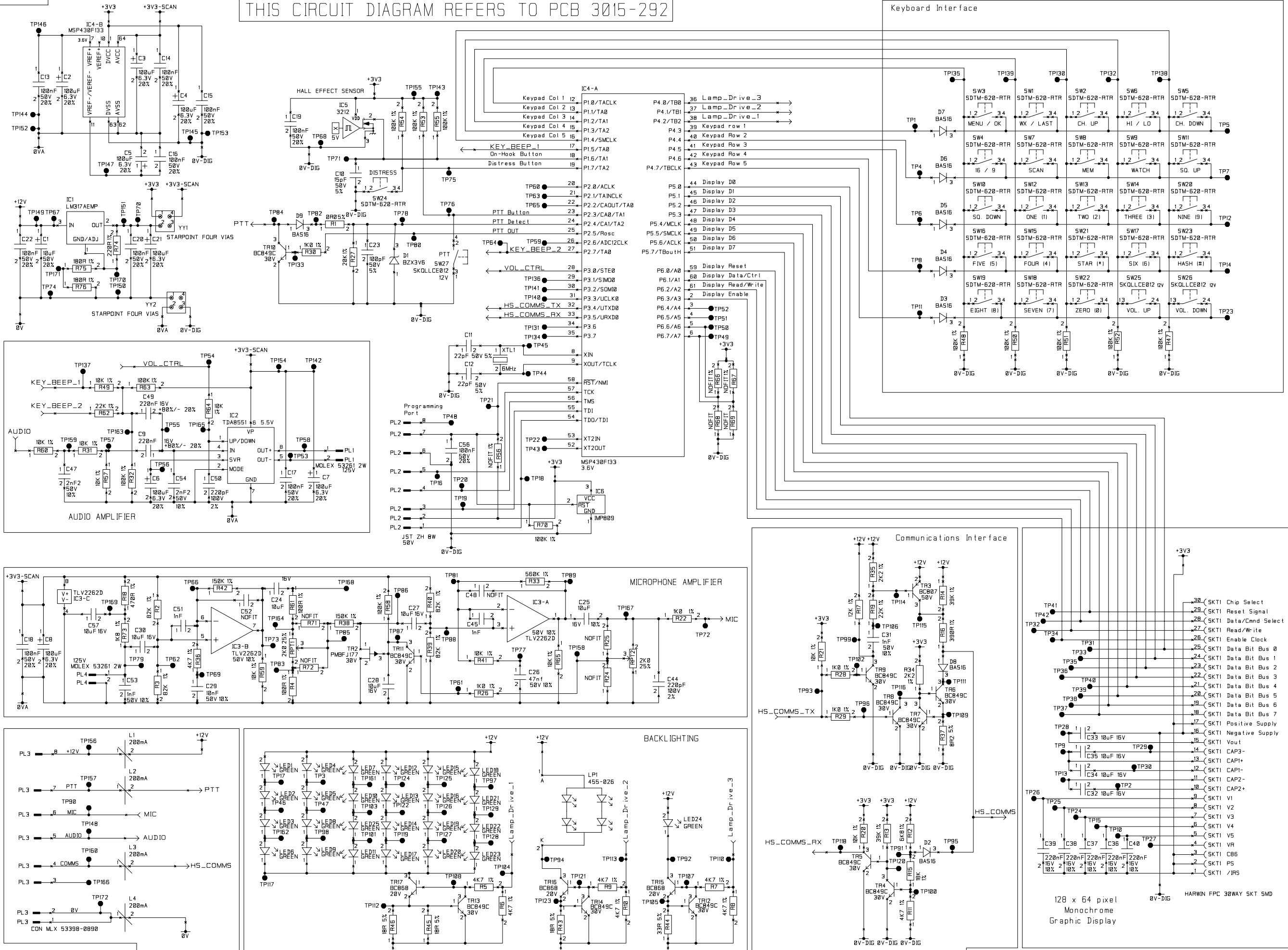


MODIFICATION/AMENDMENT		
ISS	DATE	CHANGES
A	19.11.03	Previous schematic number was 4552806 Issue 2.
B	24.11.03	See file - '3015-277 REV D Changes' changes 1-6
C	24.11.03	See file - '3015-277 REV E Changes' changes 1-6
D	26.11.03	Upseued to bring in line with Sheet 3.
E	12.01.04	See file - '3015-277 REV E Changes' changes 7-42
F	13.01.04	Changed R26 100K to 10K. C37 NO FIT to 1uF.
G	19.01.04	Changed R26 10K to 100K. C37 1uF to NO FIT.

ISS	DATE	CHANGES
A	19.11.03	Previous schematic number was 4552086 Issue 2.
B	24.11.03	See file - '3015-277 REV E Changes' changes 1-6
C	24.11.03 SWJ	Added Shield Mounting Hole SH145. Connected C244 pin 1 & 4 together.
D	26.11.03	Short the connections of L21 and re-numbering of the test points
E	12.01.04	See file - '3015-277 REV E Changes' changes 7-42
F	13.01.04 SWJ	Added L23, L46. Change MH1-6 from CHASSIS to 0VA. C244 to NOFIT. Deleted L21, C198, 237, 240, wire link across C244, TP264. Move R32
G	16.01.04 SWJ	Change L15, L23, L46, to their Raymarine numbers.

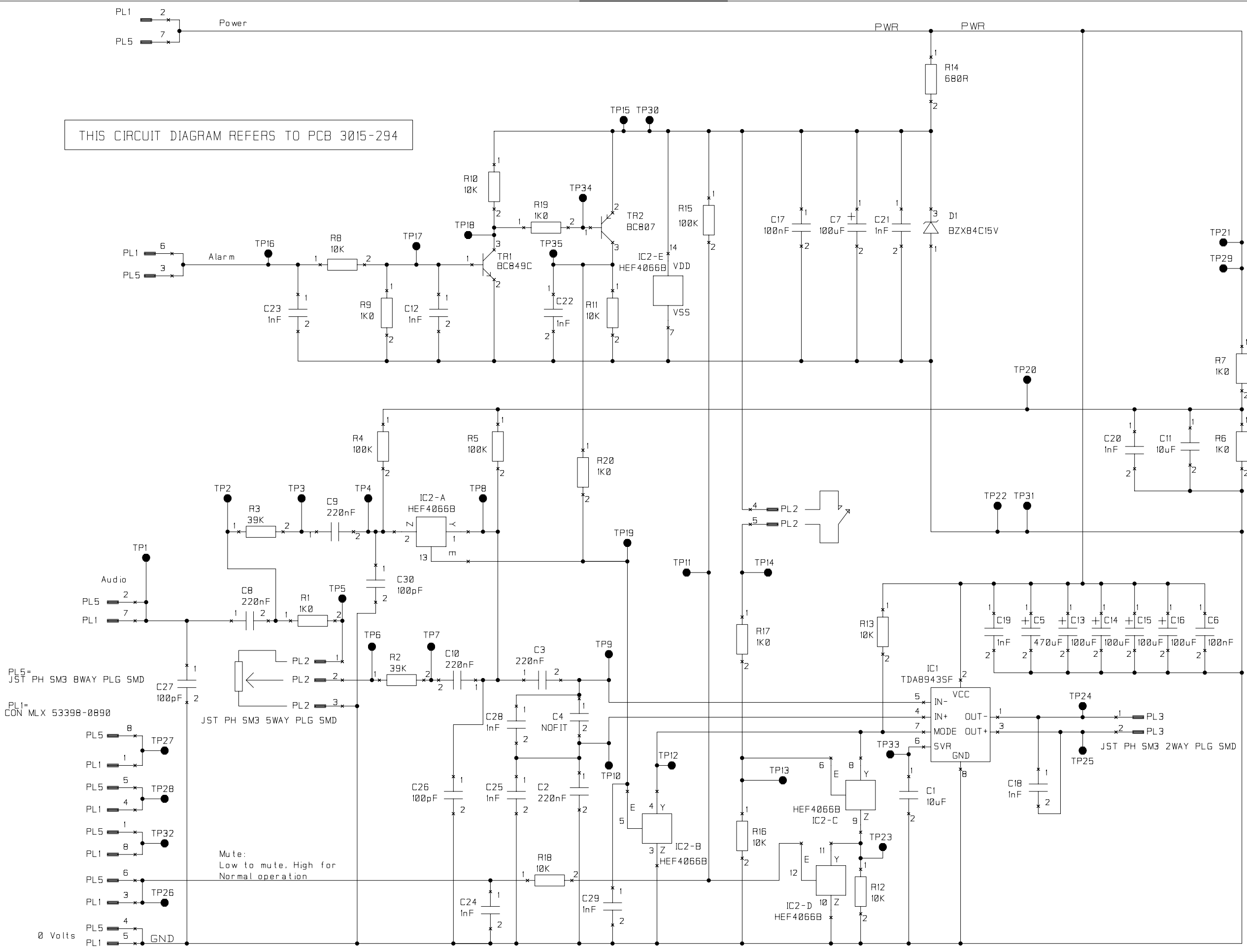


THIS CIRCUIT DIAGRAM REFERS TO PCB 3015-292



MODIFICATION/AMENDMENT		
ISS	DATE	CHANGES
A	05.02.03	FIRST ISSUE
B	26.02.03	Addition of EMC components.
C	14.05.03	Change values of R44-46 R51, R57, C21 Re-name key-layout Extra Backlighting LEDs IC5 added
D	21.05.03	Change PL2 and PL3
E	27.05.03	Change values of R2, R3, R5, R6, R41, R42, R43 C5, C25, C26 Add C48 SKT1 pin 30 is now 0V Added Key Beep
F	18.06.03	Addition of EMC components on VOL_CTRL line
G	24.06.03	PL2, PL3 part changed
H	01.07.03	C51, C52 ADDED
J	20.10.03	Further changes to Mic Preamp et. al.
K	23.10.03	Component Value Changes. Added IC6, R59, R61, R65-69.
L	13.11.03	Added R70 IC3 now LMV358 SW26-27 pin no. allocated
M	28.11.03	Added R71, R72. Changed part numbers of C9, C26, C49 Changed R2, R3, R39, R40 from 220k to 82k
N	15.12.03	R31 was 33k, now 10k R55, R56, R57 was 10k, now NOFIT
P	16.01.04	C45, C51, C53 changed to Inf from 33k C46 removed. C47 changed to 2n2F from 220p. C54 changed to 2n2F from 100p. R22 and R23 removed. Feedthroughs C41-43 removed and replaced by L1-L3 ferrite bead. Added L4 ferrite bead. IC1 changed to LM317 from LM317P R18 changed to 470k from 22k Added R73-76 and C57
Q	22.01.04	R1 now 0R, was 10k R27 now 20k, was 10k R12 now 68k, was 15k R15 now 10k, was 33k
R	23.01.04	TP172 Added
S	09.02.04	SW4 SW4 pins 36 & 38.
T	12 FEB 04	IC3 changed to 9408TLV262 for EMC reasons

THIS CIRCUIT DIAGRAM REFERS TO PCB 3015-294

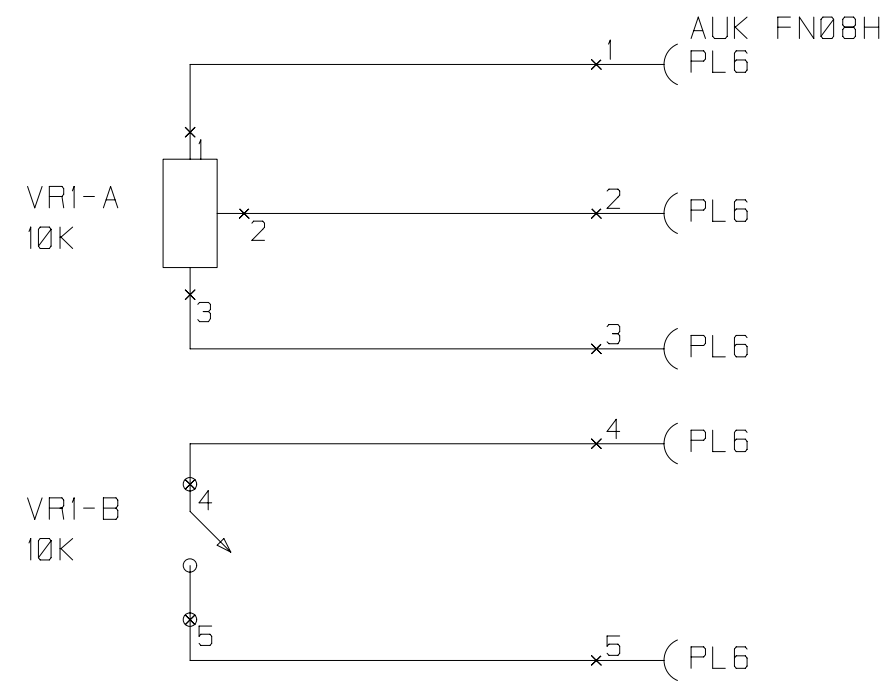


PL5 = JST PH SM3 8WAY PLG SMD
 PL1 = CON MLX 53398-0890
 JST PH SM3 5WAY PLG SMD
 JST PH SM3 2WAY PLG SMD
 Mute: Low to mute, High for Normal operation
 0 Volts

MODIFICATION/AMMENDMENT

ISS	DATE	CHANGES
A	21.07.03	First Issue
B	29.08.03	PL5 pinout changed testpad attributes changed
C	03.09.03	Remove MH's Change PL5 for 9600JST8
D	04.09.03	C4 becomes 2n2F 0V and screen separated at connector
E	05.09.03	Add TP33 to IC1 pin 6
F	11.09.03	Component Additions Following Peer Review
G	18.Sep.03	Addition of Extra RF protection Capacitors
H	03.Nov.03	Change D1 to 15V, increase R14 to 680R. Change values of R1 and R2 Change values of C26, C27, C30
J	26 JAN 04	Change Value of C2, C3, C8, C9, C10 from 100n to 220n to improve frequency response.

ISS	DATE	COMMENTS
A	28.08.03	First Issue
B	26 Sep 03	Change Direction of Pot Operation



THIS CIRCUIT DIAGRAM REFERS TO PCB 3015-293



THE INFORMATION CONTAINED HEREIN SHALL NOT BE REPRODUCED WITHOUT THE PRIOR WRITTEN PERMISSION OF RAYMARINE LTD

DO NOT SCALE	REMOVE ALL BURRS AND SHARP EDGES UNLESS OTHERWISE STATED	DRAWN J.R.L.	CHKD	DATE 26.09.03
PROJ D552	TITLE . VOLUME CONTROL	SCALE 1:1	DRWG No :-	4552-036