

SERVICE MANUAL

S T E R E O
TUNER

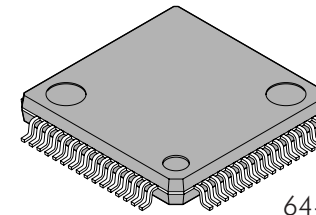
TU-610

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MB95F108AHW 8-bit Proprietary Microcontrollers



64-pin plastic LQFP (FPT-64P-M03)

■ DESCRIPTION

The MB95100AH series is general-purpose, single-chip microcontrollers. In addition to a compact instruction set, the microcontrollers contain a variety of peripheral functions.

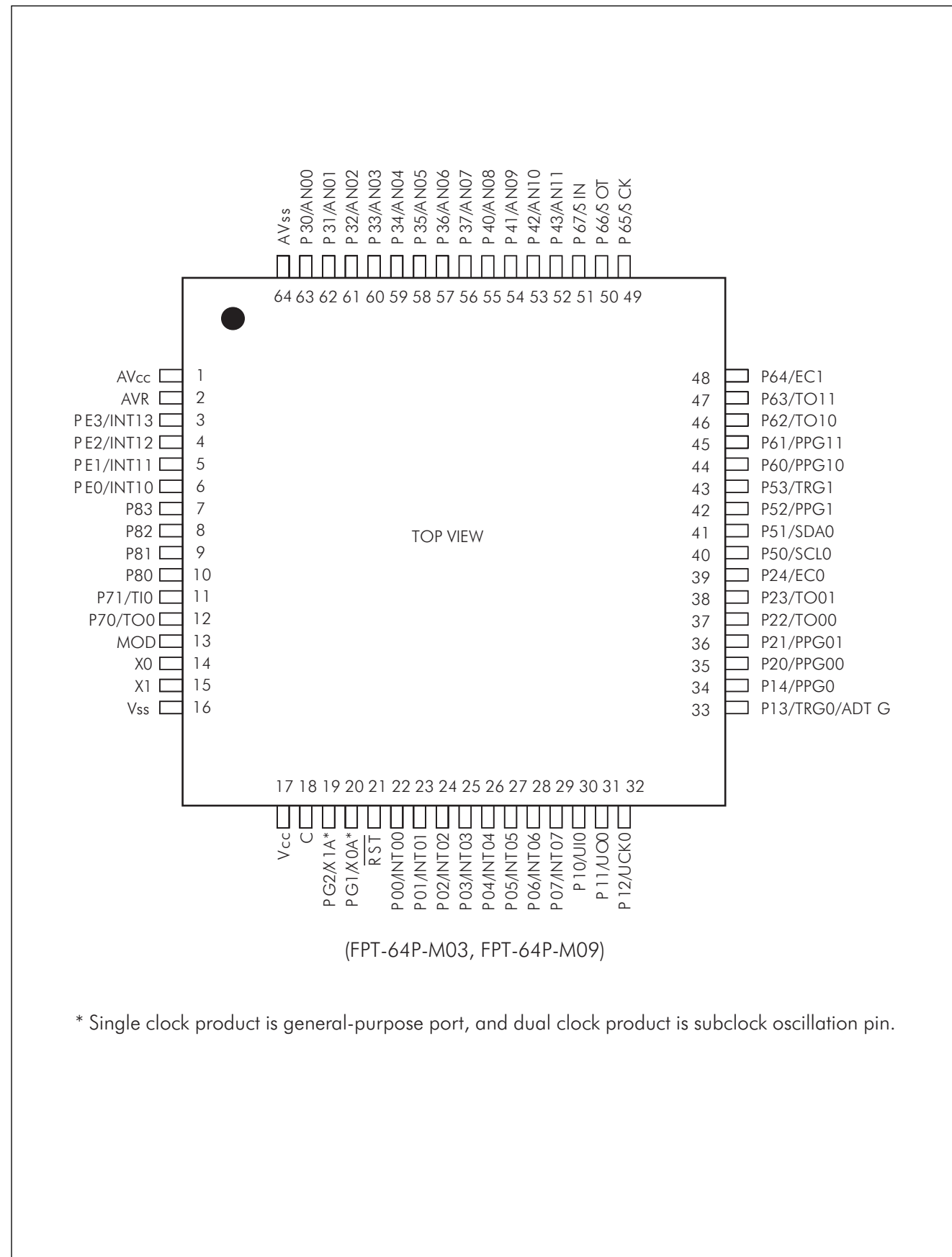
■ FEATURE

- F²MC-8FX CPU core
 - Instruction set optimized for controllers
 - Multiplication and division instructions
 - 16-bit arithmetic operations
 - Bit test branch instruction
 - Bit manipulation instructions etc.
- Clock
 - Main clock
 - Main PLL clock
 - Subclock (for dual clock product)
 - Sub PLL clock (for dual clock product)
- Timer
 - 8/16-bit compound timer x2 channels
 - 16-bit reload timer
 - 8/16-bit PPG x2 channels
 - 16-bit PPG x2 channels
 - Timebase timer
 - Watch prescaler (for dual clock product)
- LIN-UART
 - Full duplex double buffer
 - Clock asynchronous or clock synchronous serial transfer capable
- UART/SIO
 - Clock asynchronous or clock synchronous serial transfer capable
- I²C*
 - Built-in wake-up function
- External interrupt
 - Interrupt by edge detection (rising, falling, or both edges can be selected)
 - Can be used to recover from low-power consumption (standby) modes.
- 8/10-bit A/D converter
 - 8-bit or 10-bit resolution can be selected
- Low-power consumption (standby) mode
 - Stop mode
 - Sleep mode
 - Watch mode (for dual clock product)
 - Timebase timer mode
- I/O port: Max 54
 - General-purpose I/O ports (Nch open drain) : 6 ports
 - General-purpose I/O ports (CMOS) : 48 ports

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■ PIN ASSIGNMENT



* Single clock product is general-purpose port, and dual clock product is subclock oscillation pin.

■ PIN DESCRIPTION

Pin no.	Pin name	Circuit type	Description
FPT-64P-M03 FPT-64P-M09			
1	AVcc	-	A/D power supply pin
2	AVR	-	A/D reference input pin
3	PE3/INT13	P	General-purpose I/O port. The pins are shared with the external interrupt input.
4	PE2/INT12		
5	PE1/INT11		
6	PE0/INT10		
7	P83	O	General-purpose I/O port
8	P82		
9	P81		
10	P80	H	General-purpose I/O port. The pin is shared with 16-bit reload timer ch0 output.
11	P71/TI0		
12	P70/TO0	A	General-purpose I/O port. The pin is shared with 16-bit reload timer ch0 input.
13	MOD		
14	X0	A	Subclock oscillation pin
15	X1		
16	Vss	-	Power supply pin (GND)
17	Vcc	-	Power supply pin
18	C	H	Capacitor connection pin
19	PG2/X1A	H/A	Single clock product is general-purpose port. Dual clock product is main clock oscillation pin (32 kHz).
20	PG1/X0A		
21	RST	B'	Reset pin
22	P00/INT00	C	General-purpose I/O port. The pins are shared with external interrupt input. Large current port.
23	P01/INT01		
24	P02/INT02		
25	P03/INT03		
26	P04/INT04		
27	P05/INT05		
28	P06/INT06		
29	P07/INT07	G	General-purpose I/O port. The pin is shared with UART/SIO ch0 data input.
30	P10/UI0		

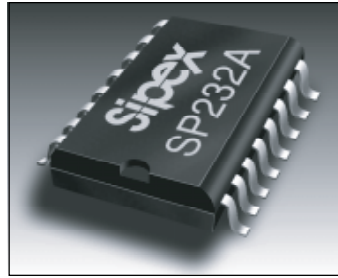
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Pin no.	Pin name	Circuit type	Description
FPT-64P-M03 FPT-64P-M09			
31	P11/UO0	H	General-purpose I/O port. The pin is shared with UART/SIO ch0 data output.
32	P12/UCK0		General-purpose I/O port. The pin is shared with UART/SIO ch0 clock I/O.
33	P13/TRG0/ ADTG		General-purpose I/O port. The pin is shared with 16-bit PP G ch0 trigger input (TRG0) and A/D trigger input (ADTG).
34	P14/PPG0		General-purpose I/O port. The pin is shared with 16-bit PPG ch0 output.
35	P20/PPG00	H	General-purpose I/O port. The pins are shared with 8/16-bit PPG ch0 output.
36	P21/PPG01		
37	P22/TO00		General-purpose I/O port. The pins are shared with 8/16-bit compound timer ch0 output.
38	P23/TO01		
39	P24/EC0		General-purpose I/O port. The pin is shared with 8/16-bit compound timer ch0 clock input.
40	P50/SCL0	I	General-purpose I/O port. The pin is shared with I ² C ch0 clock I/O.
41	P51/SDA0		General-purpose I/O port. The pin is shared with I ² C ch0 data I/O.
42	P52/PPG1	H	General-purpose I/O port. The pin is shared with 16-bit PPG ch1 output.
43	P53/TRG1		General-purpose I/O port. The pin is shared with 16-bit PPG ch1 trigger input.
44	P60/PPG10	K	General-purpose I/O port. The pins are shared with 8/16-bit PPG ch1 output.
45	P61/PPG11		
46	P62/TO10		General-purpose I/O port. The pins are shared with 8/16-bit compound timer ch1 output.
47	P63/TO11		
48	P64/EC1		General-purpose I/O port. The pin is shared with 8/16-bit compound timer ch1 clock input.
49	P65/SCK		General-purpose I/O port. The pin is shared with LIN-UART clock I/O.
50	P66/SOT		General-purpose I/O port. The pin is shared with LIN-UART data output.
51	P67/SIN	L	General-purpose I/O port. The pin is shared with LIN-UART data input.
52	P43/AN11	J	General-purpose I/O port. The pins are shared with A/D analog input.
53	P42/AN10		
54	P41/AN09		
55	P40/AN08		

Pin no.	Pin name	Circuit type	Description
FPT-64P-M03 FPT-64P-M09			
56	P37/AN07	J	General-purpose I/O port. The pins are shared with A/D analog input.
57	P36/AN06		
58	P35/AN05		
59	P34/AN04		
60	P33/AN03		
61	P32/AN02		
62	P31/AN01		
63	P30/AN00		
64	AVss	-	A/D power supply pin (GND)

SP232ACT

Enhanced RS-232 Line Drivers/Receivers



DESCRIPTION

The Sipex SP231A, SP232A and SP233A are enhanced versions of the Sipex SP231, SP232 and SP233 RS-232 line drivers/receivers.

They are pin-for-pin replacements for these earlier versions and will operate in their sockets.

Performance enhancements include 10V/ μ s slew rate,

120k bits per second guaranteed transmission rate,

and increased drive current for longer and more flexible cable configurations.

Ease of use enhancements include smaller, 0.1 μ F charge pump capacitors, enhanced ESD protection, low power dissipation and overall ruggedized construction for commercial environments.

The series is available in plastic and ceramic DIP and SOIC packages operating over the commercial, industrial and military temperature ranges.

FEATURE

The Sipex SP231A, SP232A and SP233A are enhanced versions of the Sipex SP231, SP232 and SP233 RS-232 line drivers/receivers. They are pin for-pin replacements for these earlier versions, will operate in their sockets with capacitors ranging from 0.1 to 100 μ F, either polarized or non-polarized, and feature several improvements in both performance and ease of use. Performance enhancements include 10V/ μ s slew rate, 120k bits per second guaranteed transmission rate, and increased drive current for longer and more flexible cable configurations. Ease of use enhancements include smaller, 0.1 μ F charge pump capacitors, enhanced ESD protection, low power dissipation and overall ruggedized construction for commercial environments.

The SP232A, SP233A, SP310A and SP312A include charge pump voltage converters which allow them to operate from a single +5V supply. These converters convert the +5V input power to the \pm 10V needed to generate the RS-232 output levels. Both meet all EIA RS-232D and CCITT V.28 specifications.

The SP231A has provisions for external V+ supplies. With this power supplied externally, the current drain due to charge pump operation is considerably reduced, typically to 400 μ A.

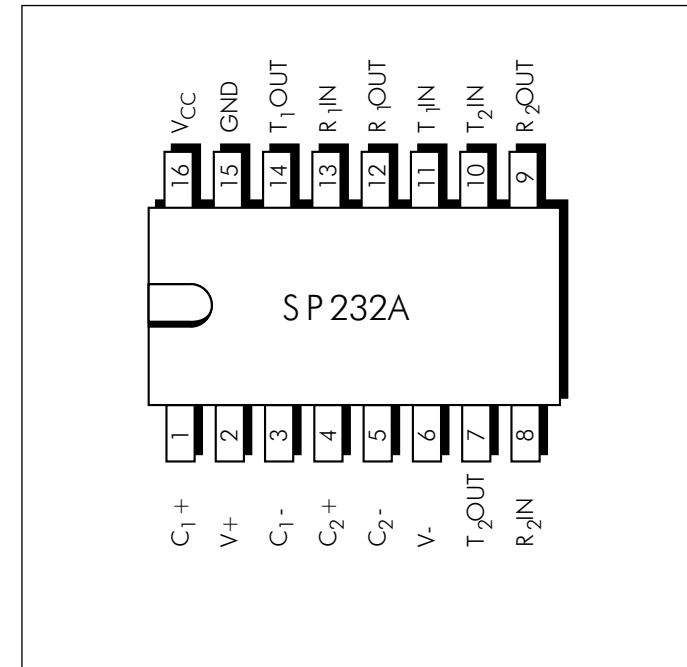
The SP310A provides identical features as the SP232A. The SP310A has a single control line which simultaneously shuts down the internal DC/DC converter and puts all transmitter and receiver outputs into a high impedance state. The SP312A is identical to the SP310A with separate tri-state and shutdown control lines.

The SP231A is available in 14-pin plastic DIP, CERDIP and 16-pin SOIC packages for operation over commercial, industrial and military temperature ranges.

The SP232A is available in 16-pin plastic DIP, SOIC and CERDIP packages, operating over the commercial, industrial and military temperature ranges. The SP233A is available in a 20-pin plastic DIP and 20-pin SOIC package for operation over the commercial and industrial temperature ranges.

The SP310A and SP312A are available in 18-pin plastic, CERDIP and SOIC packages for operation over the commercial and industrial temperature ranges. Please consult the factory for DIP and surface-mount packaged parts supplied on tape-on-reel, as well as parts screened to MIL-M-38510.

PIN ASSIGNMENT



24LC02B

2K I²C™ Serial EEPROM

DESCRIPTION

The Microchip Technology Inc. 24AA02/24LC02B (24XX02*) is a 2 Kbit Electrically Erasable PROM. The device is organized as one block of 256x8-bit memory with a 2-wire serial interface. Low-voltage design permits operation down to 1.8V, with standby and active currents of only 1μA and 1 mA, respectively. The 24XX02 also has a page write capability for up to 8 bytes of data. The 24XX02 is available in the standard 8-pin PDIP, surface mount SOIC, TSSOP and MSOP packages and is also available in the 5-lead SOT-23 package.

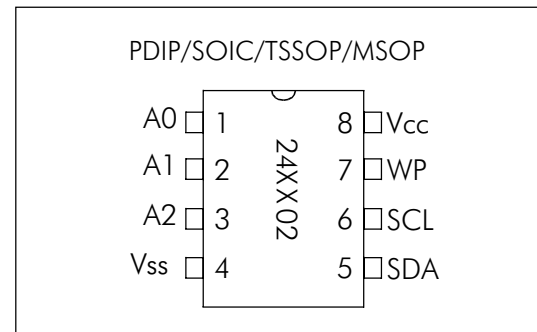
FEATURE

- Single supply with operation down to 1.8V
- Low-power CMOS technology
 - 1 mA active current typical
 - 1μA standby current typical (I-temp)
- Organized as 1 block of 256 bytes (1 x 256 x 8)
- 2-wire serial interface bus, I²C™ compatible
- Schmitt Trigger inputs for noise suppression
- Output slope control to eliminate ground bounce
- 100 kHz (24AA02) and 400 kHz (24LC02B) compatibility
- Self-timed write cycle (including auto-erase)
- Page write buffer for up to 8 bytes
- 2 ms typical write cycle time for page write
- Hardware write-protect for entire memory
- Can be operated as a serial ROM
- Factory programming (QTP) available
- ESD protection > 4,000V
- 1,000,000 erase/write cycles
- Data retention > 200 years
- 8-lead PDIP, SOIC, TSSOP and MSOP packages
- 5-lead SOT-23 package
- Pb-free finish available
- Available for extended temperature ranges:
 - Industrial (I): -40°C to +85°C
 - Automotive (E): -40°C to +125°C

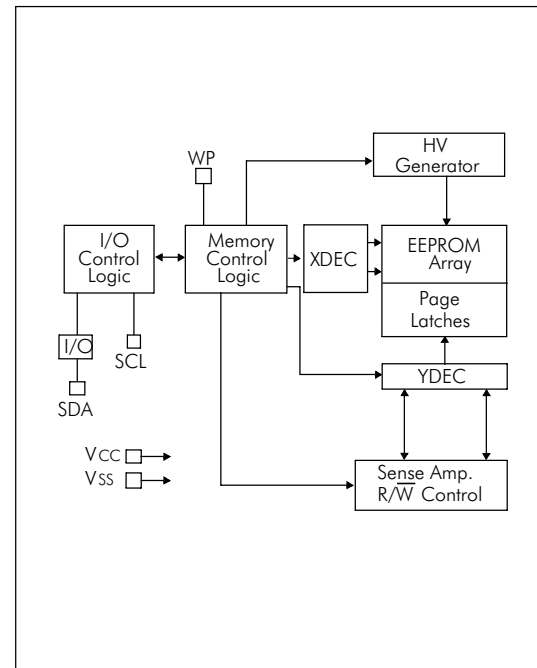
PIN DESCRIPTION

Name	PDIP	SOIC	TSSOP	MSOP	SOT23	Description
A0	1	1	1	1	-	Not Connected
A1	2	2	2	2	-	Not Connected
A2	3	3	3	3	-	Not Connected
Vss	4	4	4	4	2	Ground
SDA	5	5	5	5	3	Serial Address/Data I/O
SCL	6	6	6	6	1	Serial Clock
WP	7	7	7	7	5	Write-Protect Input
Vcc	8	8	8	8	4	+1.8V to 5.5V Power Supply

PACKAGE TYPE (SOIC)



BLOCK DIAGRAM



SPECIFICATIONS

	TU-610
FM (22.5kHz MOD. 1kHz)	
Tuning range	87.5~108.0MHz
Sensitivity	2uV(Less than 10uV)
T.H.D. (Mono)	0.2% (Less than 0.5%)
S/N (mono)	60dB (Better than 50dB)
Output level (75kHz MOD.)	0 dB±3 dB
AM (30% MOD. 400Hz)	
Tuning range	Europe: 522~1629kHz, U.S.A: 520~1710kHz
Sensitivity	8uV(Less than 58uV)
T.H.D.	1% (Less than 2%)
S/N	50dB (Better than 40dB)
Output level	-10 dB±3 dB
Operation Temperature	-10°C ~ +40°C
Power Source	100~120VAC or 220~240VAC; 50/60Hz (Supplied AC mains transformer depends on country requirements)
Power Consumption	10W
Weight	5.2kg/11.5lb
Dimensions	482(W)x88(H)x380(D)mm/19(W)x3.5(H)x14.9(D)in

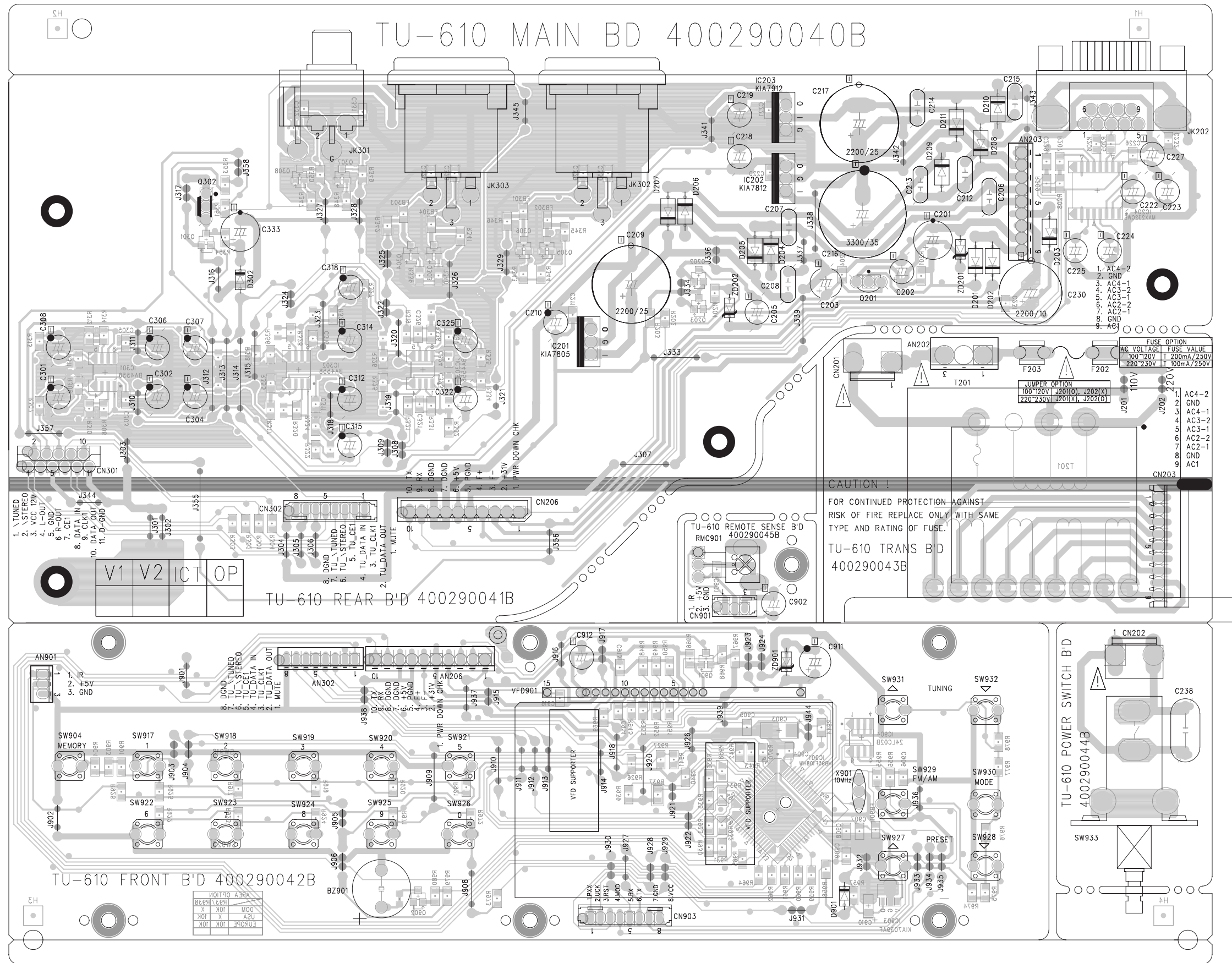
* Specifications and design subject to change without notice for improvements.

ELECTRICAL PARTLIST

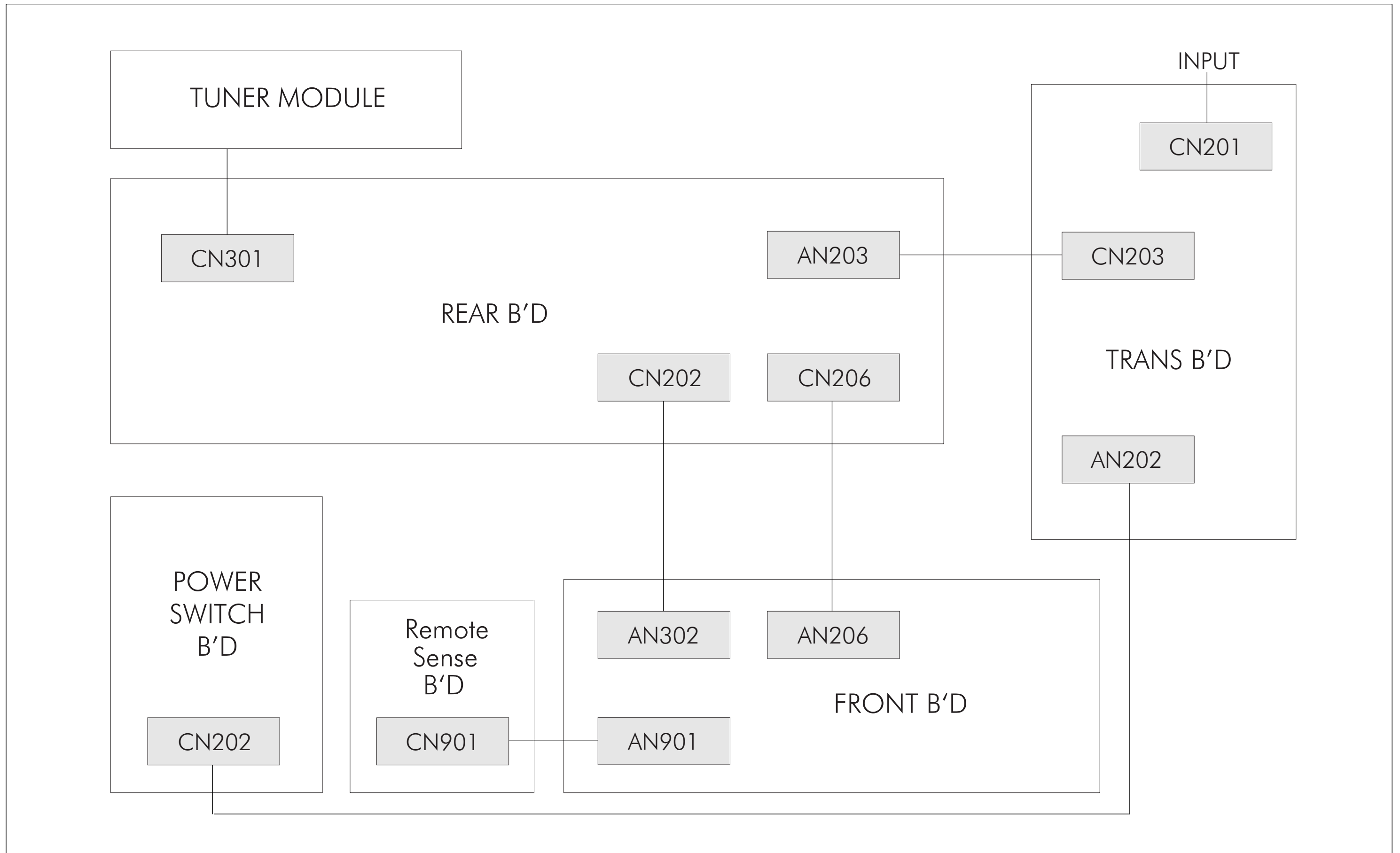
Ref.	Part No.	Description	Value
TU-610 MAIN B'D			
TU-610 REAR B'D			
D201-211	2058100996	D/1N4006,1N4006(4007)	1N4006(4007)
D302	2058400993	D/1SS133,1SS133	1SS133
ZD202	2058500051	ZD/UZ5.1B,5.1B	5.1B
ZD201	2058502133	ZD/UZ33BM,33BM	33BM
IC201	2118011305	7805/KIA/API-U,7805	7805
IC202	2118011805	7812/KIA/API-U,7812	7812
IC203	2128611306	7912/KA,7912	7912
C230	3408222221	EC2200U10/SG,2200/10	Oct-00
C209 C217	3408222241	EC2200U25/SG,2200/25	2200/25
C216	3419233261	EC3300U35/SG,3300/35	3300/35
AN2030	4353977710	09P/AN,ASSY-09P	ASSY-09P
JK302-303	4408194210	XLR/F/5031-030/V,XLR/F	XLR/F
CN301	4428589111	11P/FFC-SCB11/1.25,FFCSCB-11P	FFCSCB-11P
CN302	4428594508	08P/53014/2,53014-08P	53014-08P
CN206	4428595010	10P/LW-5267/2.5,LW5267-10P	LW5267-10P
JK202	4430000500	DS09PM/4438189610,D-SUB09P	D-SUB09P
JK301	4438095310	RCA/JK44RN/02H/4438085410,RCA02P	RCA02P
Q201	2008606104-T	NPN/KTC3198-Y,KTC3198-Y	KTC3198-Y
Q302	2008606111-T	PNP/KRA107M,KRA107M	KRA107M
C202 C218-219	3409210071-T	EC10U50/SGT,10/50	10/50
C301 C308	3409210071-T	EC10U50M/SGT,10/50	10/50
C201	3409210171-T	EC100U50/SGT,100/50	100/50
C205 C222-225	3409210971-T	EC1U50/SGT,1/50	1/50
C227			
C304 C307 C315	3409222071-T	EC22U50M/SGT,22/50	22/50
C318 C322 C325			
C333	3409222141-T	EC220U25/SGT,220/25	220/25
C210 C302 C306	3409247041-T	EC47U25M/SGT,47/25	47/25
C312 C314			
C203	3409247071-T	EC47U50/SGT,47/50	47/50
C206-208	3609153120-T	MA0.015U100T,0.015/100(M)	0.015/100(M)
C212-215			
Q202 Q301	S20160405003	NPN/KRC107S/SMT3,KRC107S	KRC107S
Q203	S20160499001	NPN/KTC3875S-Y/SOT23,KTC3875S-Y	KTC3875S-Y
Q303-308	S20560405003	NPN/KTD1304/SOT23,KTD1304	KTD1304
IC301-303	S21101084001	BA4558F/SOP08P2,BA4558F	BA4558F
IC204	S21275160001	MAX232/SOP16P,MAX232CWE	MAX232CWE
FB301-304	S26001212029	BEAD/HB1M121JT/2012,HB-1M2012-121JT	HB-1M2012-121JT
R322 R329 R332	S30100007231	R0J/2012,0	0
R337			
R201-202 R307	S30101027231	R1KJ/2012,1K	1K
R313 R320			
R325-326 R328			
R354			
R204 R208 R308	S30101037231	R10KJ/2012,10K	10K
R314 R324 R327			
R331 R334-336			
R209 R353	S30101047231	R100KJ/2012,100K	100K
R310 R312	S30101237231	R12KJ/2012,12K	12K
R341-342	S30101527231	R1.5KJ/2012,1.5K	1.5K
R345-346			
R349-350			
R319 R321	S30102037231	R20KJ/2012,20K	20K
R339-340	S30102227231	R2.2KJ/2012,2.2K	2.2K
R343-344			
R347-348			
R351	S30102247231	R220KJ/2012,220K	220K
R205-207	S30104707231	R47J/2012,47	47
R301-304			
R203	S30104727231	R4.7KJ/2012,4.7K	4.7K
R309 R311	S30104737231	R47KJ/2012,47K	47K
R317-318	S30105127231	R5.1KJ/2012,5.1K	5.1K
R355-356			
C211 C220-221	S35101045331	CE0.1U50Z/2012,0.1U	0.1U
C226 C229 C231			
C303 C305 C311			
C316 C323-324			
C232 C327-332	S35601012440	CE100P50/2012,100P	100P
C321 C326	S35601802440	CE18P50/2012,18P	18P
C204	S35614732540	CE0.047U50K/2012,0.047U	0.047U
TU-610 FRONT B'D			
D901	2058400993	D/1SS133,1SS133	1SS133
ZD901	2058502024	ZD/UZ2.4BM,2.4BM	2.4BM
VFD901	2328130992	LC/9-ST-37GINK,9-ST-37GINK	9-ST-37GINK
X901	3938000880	10MHZ/CSTLS,10MHz	10MHz
AN206	4353977610	10P/AN,ASSY-10P	ASSY-10P
AN901	4353977810	03P/AN/2,ASSY-03P	ASSY-03P

Ref.	Part No.	Description	Value
AN302	4353978010	08P/AN/2,ASSY-08P	ASSY-08P
CN903	4428594508	08P/53014/2,53014-08P	53014-08P
SW904	4628985710	TC/THVV501BAA,THVV501BAA	THVV501BAA
SW917-932			
BZ901	5540000050	BUZZER/CAP-1205SL,CAP-1205SL	CAP-1205SL
C912	3409222033-T	EC22U16/SET,22/16	22/16
C911	3409247033-T	EC47U16M/SE/T,47/16	47/16
Q902	S20110499001	PNP/KTA1504S-Y/SOT23,KTA1504S-Y	KTA1504S-Y
Q901	S20160499001	NPN/KTC3875S-Y/SOT23,KTC3875S-Y	KTC3875S-Y
IC903	S21103030502	KIA7039AF/SOT89,KIA7039AF	KIA7039AF
IC901	S21211642902	MB95F108AHW/LQFP64P,MB95F108AW	MB95F108AW
IC904	S21233089902	24LC02B/SOP08P,24LC02B	24LC02B
FB901	S26001212029	BEAD/HB1M121JT/2012,HB-1M2012-121JT	HB-1M2012-121JT
R956	S30100107231	R1J/2012,1	1
R916 R928	S30101017231	R100J/2012,100	100
R901 R917 R945	S30101027231	R1KJ/2012,1K	1K
R958 R972			
R925-927 R937	S30101037231	R10KJ/2012,10K	10K
R939 R948-950			
R957 R966-967			
R971			
R923 R977	S30101537231	R15KJ/2012,15K	15K
R903 R919 R968	S30102227231	R2.2KJ/2012,2.2K	2.2K
R973			
R924 R978	S30102737231	R27KJ/2012,27K	27K
R904 R920 R974	S30103327231	R3.3KJ/2012,3.3K	3.3K
R979-980			
R969	S30103337231	R33KJ/2012,33K	33K
R931-936	S30104707231	R47J/2012,47	47
R941-944			
R951-953			
R959-962			
R964-965 R970			
R921 R930 R940	S30104727231	R4.7KJ/2012,4.7K	4.7K
R955 R975			
R922 R976	S30108227231	R8.2KJ/2012,8.2K	8.2K
C910	S34211050720	TT1U35/A,1/35	1/35
C903	S34211070350	TT100U10/C,100/10	100/10
C909	S35101024331	CE1000P50/2012,1000P	1000P
C904-905	S35101045331	CE0.1U50Z/2012,0.1U	0.1U
C907-908			
C913-914 C916			
C906	S35611032540	CE0.01U50K/2012,0.01U	0.01U
TU-610 TRANS B'D			
T201	2828052600	PT/SH7379A,TU-610(KS)	TU-610(KS)
AN202	4353977910	02P/B3P-VH/7.92,ASSY-02P	ASSY-02P
CN201	4355933803	02P/B3P-VH/7.92,B3PVH-02P	B3PVH-02P
CN203	4428594909	09P/LA-5268/2.5,LA5268-09P	LA5268-09P
F202-203	4458999110	FUSE/CLIP/20MM,FUSE	FUSE
TU-610 POWER SWITCH B'D			
C238	3549472407	CE4700P250M/AC,4700P250	4700P250
CN202	4355933803	02P/B3P-VH/7.92,B3PVH-02P	B3PVH-02P
SW933	4648199900	PU/SDDL1PASL051,SDDL1PASL051	SDDL1PASL051
TU-610 REMOTE SENSE B'D			
RMC901	2438200950	B7.9KHZ/RPM7138,37.9KHz	B7.9KHz
CN901	4428594503	03P/53014/2,53014-03P	53014-03P
C902	3409210071-T	EC10U50/SGT,10/50	10/50
C901	S35101024331	CE1000P50/2012,1000P	1000P

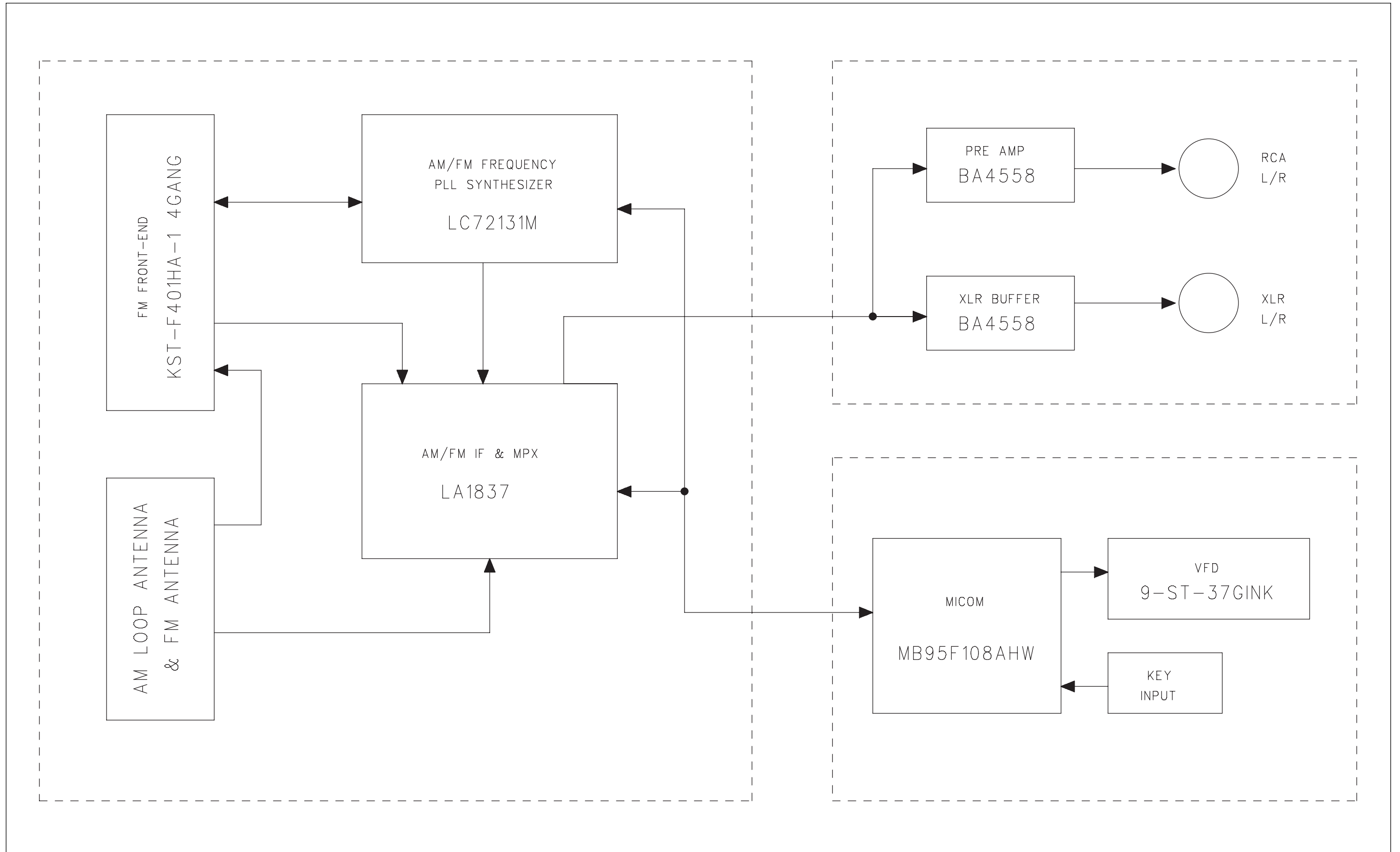
TOP AND BOTTOM VIEW OF P.C.BOARD



WIRING DIAGRAM



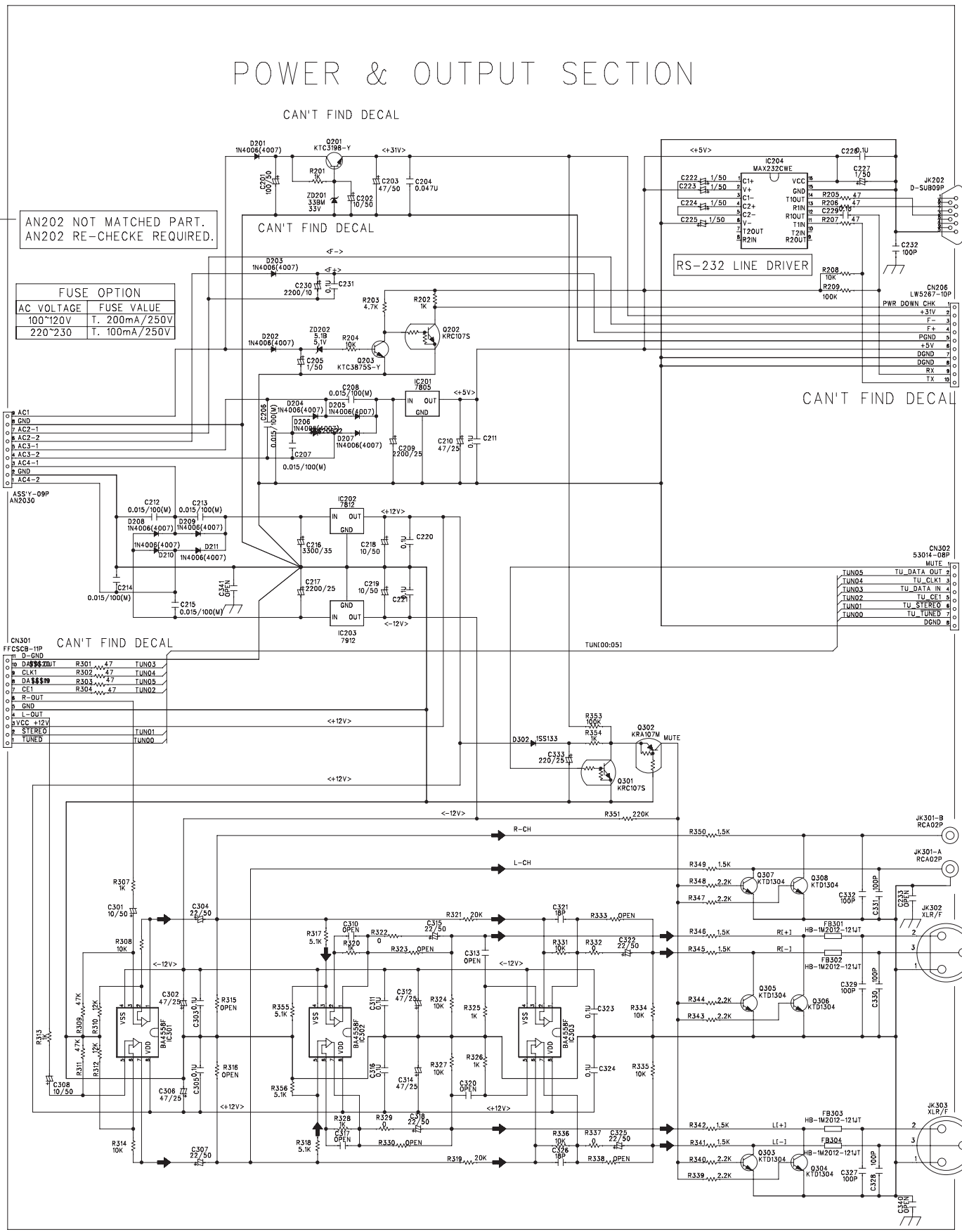
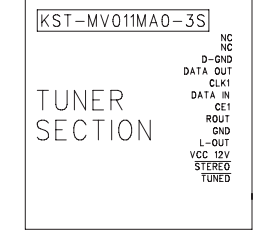
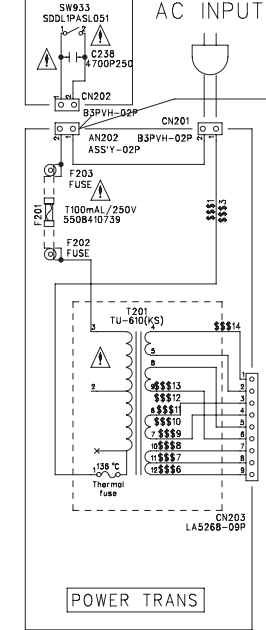
BLOCK DIAGRAM



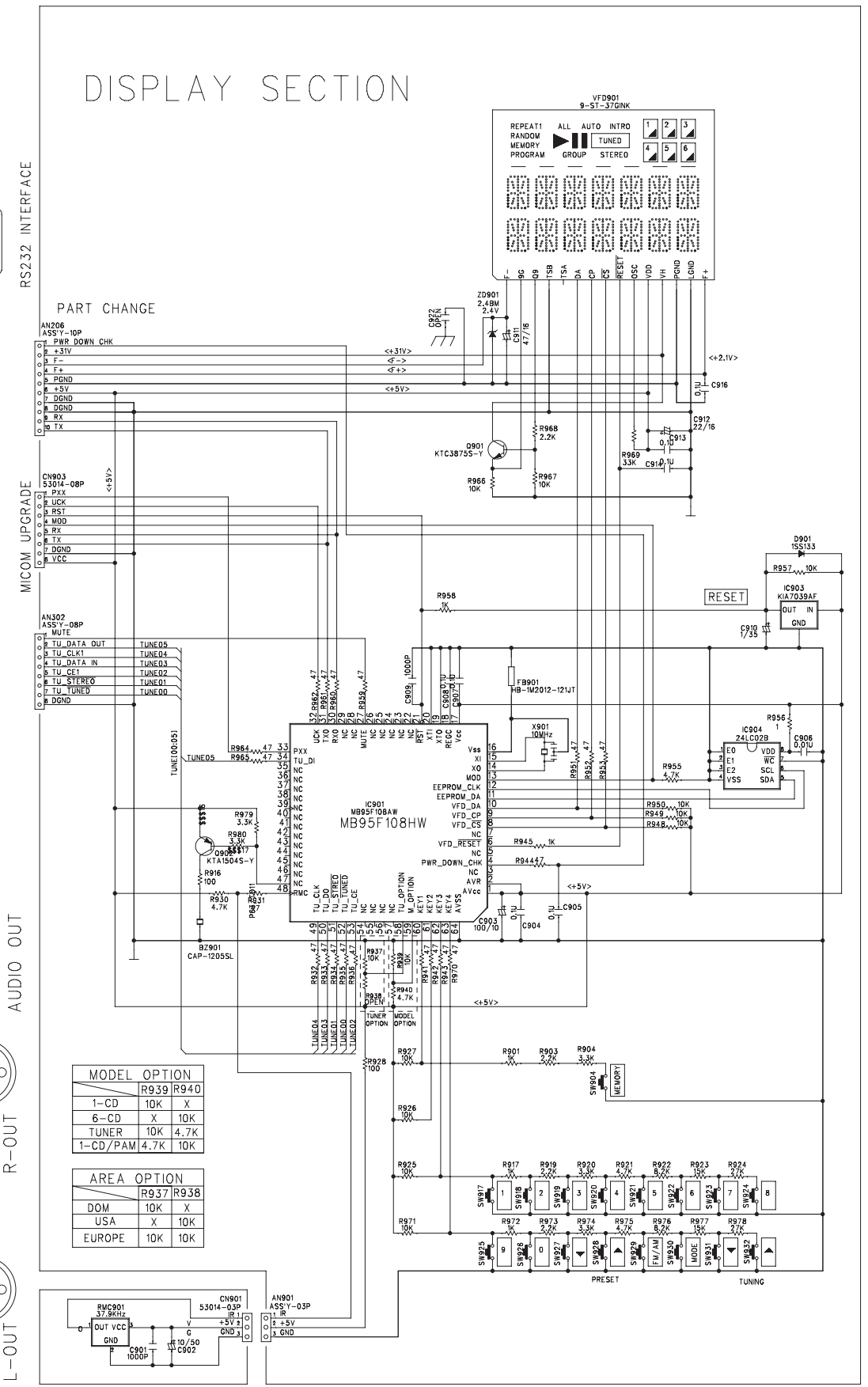
SCHEMATIC DIAGRAM

POWER & OUTPUT SECTION

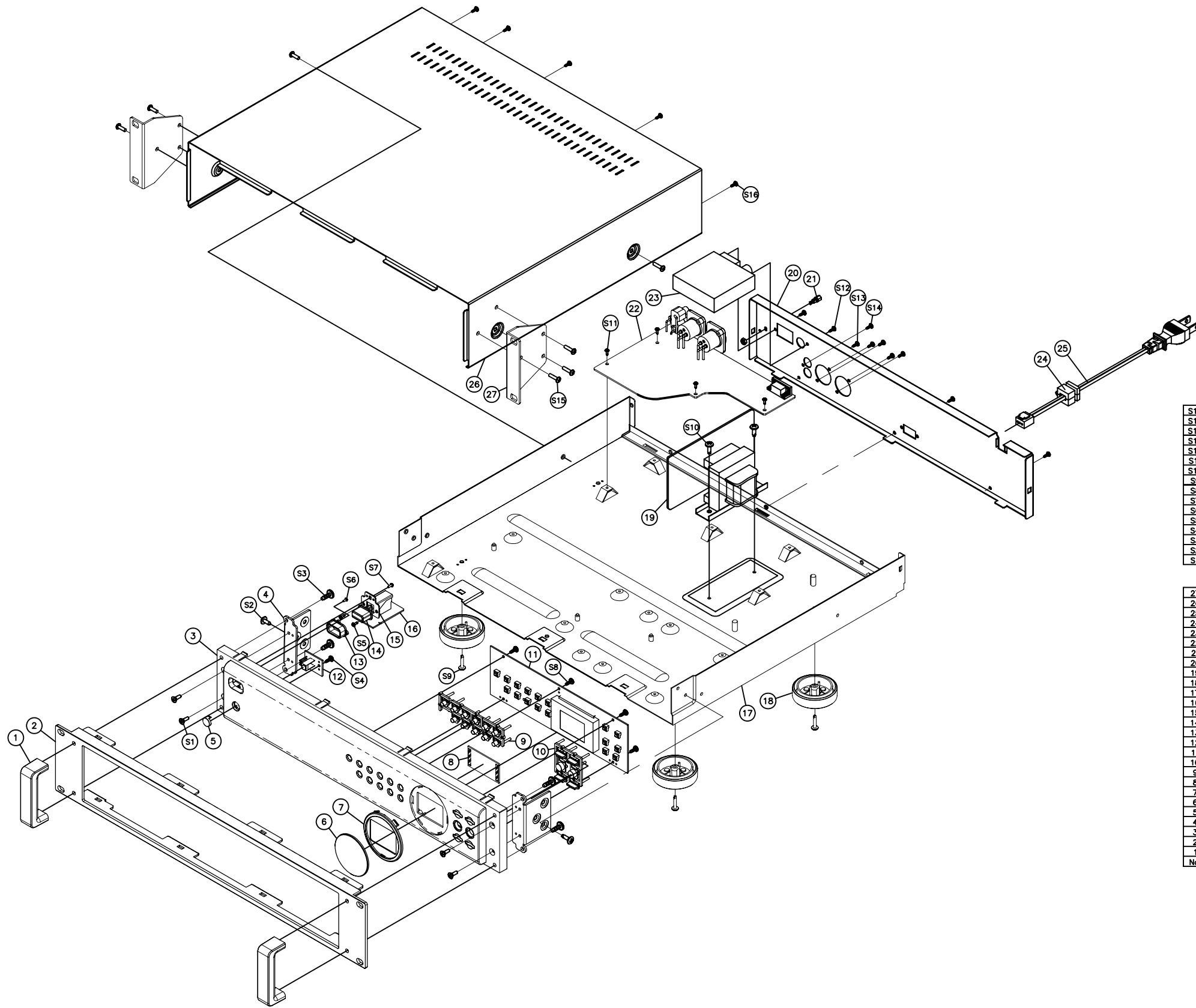
POWER S/W



DISPLAY SECTION



EXPLODED VIEW OF CABINET & CHASSIS / MECANICAL PARTLIST



S16	SCREW 2BTC 3x8B	8109230083R	5	
S15	SCREW BM 4x15B	8009140153R	8	
S14	SCREW 2BTC 3x8B	8109230083R	5	
S13	SCREW 2BTC 3x8B	8109230083R	3	
S12	SCREW 2BTC 3x8B	8109230083R	2	
S11	SCREW 2BTC 3x6B	8109230063R	4	
S10	SCREW 3BTC 4x6B	8109340063R	2	
S9	SCREW 2BTC 3x6B	8109230063R	4	
S8	SCREW 2BTC 3x6B	8109230063R	6	
S7	SCREW 2BTC 3x6B	8109230063R	1	
S6	SCREW 2WPTC 2x5B	8159220053R	1	
S5	SCREW BM 3x6B	8009130063R	2	
S4	SCREW 2BTC 3x8B	8109230083R	1	
S3	SCREW BM 4x15B	8009140153R	4	
S2	SCREW FM 4x10B	8029140103R	2	
S1	SCREW FM 3x8B	8029130083R	4	

27	RACK BKT	048503961516	2	
26	TOP COVER	046121670216	1	
25	AC CORD	4308998610	1	
24	CORD STOPPER (DACH-1)	6518997910	1	
23	TUNER PACK	3928209860	1	
22	REAR PCB	400290041A	1	
21	SYSTEM GND	4438092810	1	
20	BACK CHASSIS	046102975611	1	
19	TRANS PCB	400290043A	1	
18	FOOT	6033102510	4	
17	MAIN CHASSIS	6102970340	1	
16	POWER SW PCB	400290044A	1	
15	BKT POWER	6505937510	1	
14	PUSH KNOB POWER	048545981011	1	
13	DECO KNOB POWER	048545980916	1	
12	REMOTE SENSE PCB	400290045A	1	
11	FRONT PCB	400290042A	1	
10	KNOB FUNC C	048543972716	1	
9	KNOB FUNC A	048543972926	1	
8	WINDOW FILTER	04857500070B	1	
7	DECO WINDOW	048543972416	1	
6	WINDOW	048575985211	1	
5	WINDOW REMO	8575985110	1	
4	HANDLE BKT	6503961410	2	
3	SUB PANEL	048521987411	1	
2	FRONT PANEL	048602956116	1	
1	HANDLE	048603988816	2	
No.	PART NAME	PART NUMBER	Q'TY	REMARK