Micro System

MCM8/21/22/25/30/37

Service Manual

MP3-CD PLAYBACK MP3

COMPACT disc DIGITAL AUDIO

TABLE OF CONTENTS

CLASS 1
LASER PRODUCT

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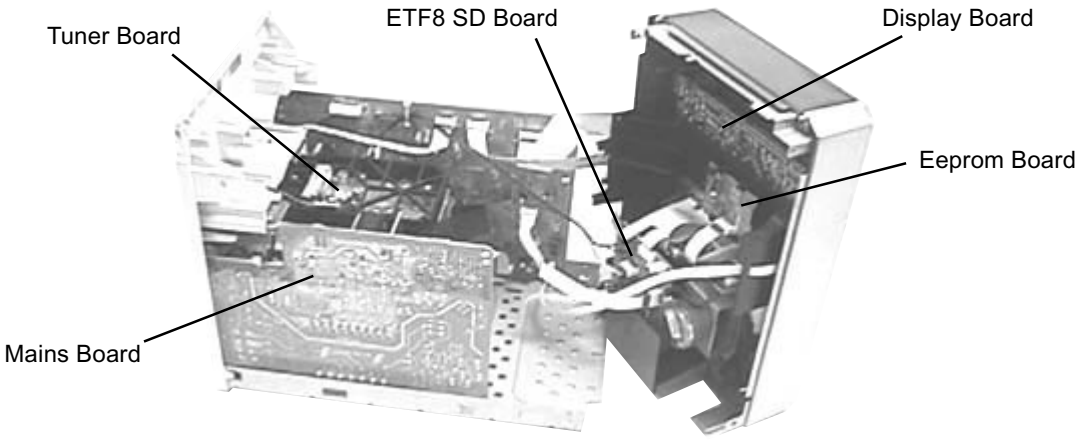
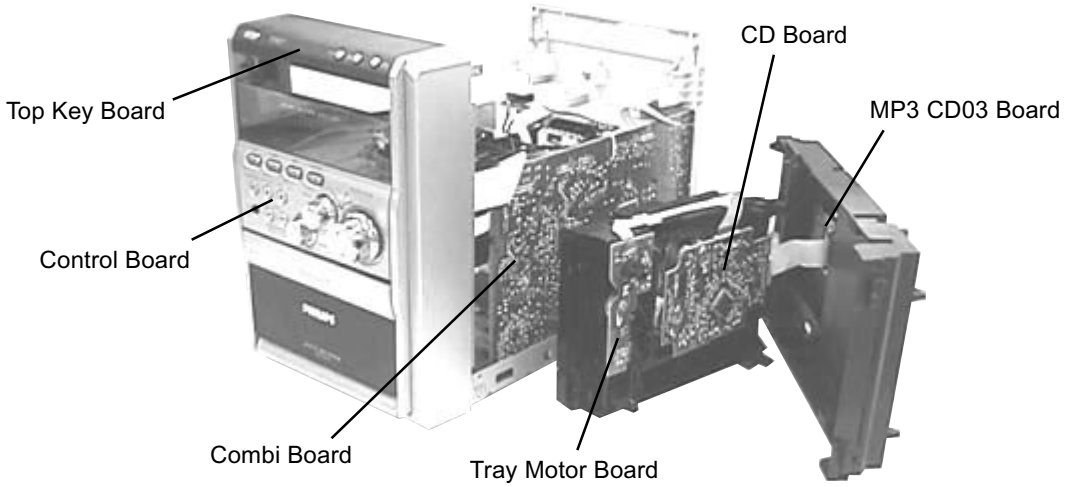
GB 3139 785 30622

Version 1.2

PHILIPS

LOCATION OF PC BOARDS





VERSION VARIATIONS:

Type /Versions: / Features & Board in used:	MCM8									
	/21	/22	/25	/30	/37					
Aux in / CDR in	x	x	x	x	x					
Line Out										
Video Out										
Surround Out										
Subwoofer Out										
Digital Out										
Digital in										
Matrix Surround										
RDS/NEWS		x	x							
Dolby Pro Logic (DPL)										
Incredible Surround	x	x	x	x	x					
Karaoke Features										
Voltage Selector	x									
ECO Power Standby (Clock Display Off)	x	x	x	x	x					
ECO6 Tuner Board - Systems Non-Cenelec	x			x	x					
ECO6 Tuner Board - Systems Cenelec		x	x							

SPECIFICATIONS

GENERAL:

Mains voltage : 110-127V/220-240V Switchable for /21/21M
120V for /37
220V for /33
220-230V for /22/25
230-240V for /30

Mains frequency : 50/60Hz

Power consumption : 60W at 1/8 P_{rated}
65W at 1/8 P_{rated} /21/21M
< 15W at Standby (Demo mode off)
< 0.5W at ECO Standby
< 1.0W at ECO Standby /21/21M

Clock accuracy : < 4 seconds per day

Dimension centre unit : 175 x 252 x 350mm

TUNER:

FM

Tuning range : 87.5-108MHz

Grid : 50kHz
100kHz for /37

IF frequency : 10.7MHz ± 25kHz

Aerial input : 75 ohm coaxial
300 ohm click fit for /37

Sensitivity at 26dB S/N : < 7uV

Selectivity at 600kHz bandwidth : > 25dB

Image rejection : > 25dB [> 75dB]

Distortion at RF=1mV, dev. 75kHz : < 3%

-3dB Limiting point : < 8uV

Crosstalk at RF=1mV, dev. 40kHz : > 18dB

MW

Tuning range : 531-1602kHz
530-1700kHz for /21/21M/37

Grid : 9kHz
10kHz for /21/21M/37

IF frequency : 450kHz ± 1kHz

Aerial input : Frame aerial

Sensitivity at 26dB S/N : < 4.4mV/M

Selectivity at 18kHz bandwidth : > 18dB

IF rejection : > 45dB

Image rejection : > 28dB

Distortion at RF=50mV, M=80% : < 5%

AMPLIFIER:

Output power (6 ohm, 1kHz, 10% THD)

L & R : 2 x 75W RMS

Frequency response within -3dB : 50Hz-16kHz

Bass : 60Hz ± 3 Steps

Treble : 12kHz ± 3 Steps

Incredible Surround : On / Off

Input sensitivity

Aux in (at 1kHz) : 500mV at 600 ohm

CDR in (at 1kHz) : 1000mV at 600 ohm

Output sensitivity

Headphone output at 32 ohm : 15mW ± 2dB (Max. vol.)

CD Headphone output at 32 ohm : 5mW ± 2dB (Max. vol.)

CASSETTE RECORDER:

Number of track : 2 tracks (stereo)

Tape speed : 4.76 cm/sec ± 2%

Wow and flutter : < 0.4% DIN

Fast-wind/Rewind time C60 : 130 sec

Bias system : 78kHz ± 10kHz

Rec/Pb frequency response within 8dB : 80Hz - 10kHz

Signal to Noise Ratio (Type I) : > 48dBA

Signal to Noise Ratio (Type II) : > 52dBA

COMPACT DISC:

Measurement done directly at the connector on the board.

Output Resistance : < 100 ohm

Output Voltage (0dB, 1kHz) : 0.5Vrms ± 1dB (unloaded)

Channel Unbalance : < ±1dB

Channel Separation (1kHz) : > 60dB

Frequency Response (±3dB) : 20Hz-20kHz

Signal to Noise Ratio : > 76dBA

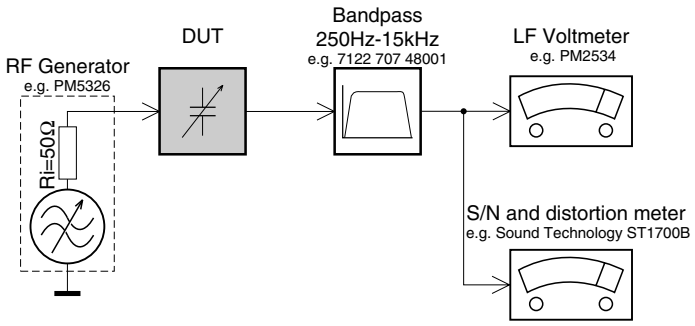
MP3-CD Bit Rate : 32-256 kbps

Sampling Frequencies : 32, 44.1, 48 kHz

[....] Values indicated are for "ECO6 Cenelec Board" only.

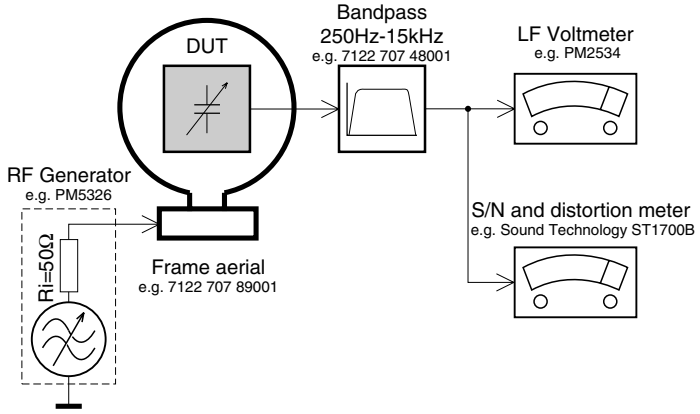
MEASUREMENT SETUP

Tuner FM



Use a bandpass filter to eliminate hum (50Hz, 100Hz) and disturbance from the pilottone (19kHz, 38kHz).

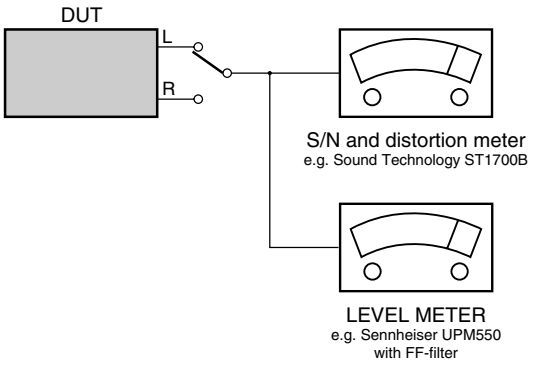
Tuner AM (MW,LW)



To avoid atmospheric interference all AM-measurements have to be carried out in a Faraday´s cage.
Use a bandpass filter (or at least a high pass filter with 250Hz) to eliminate hum (50Hz, 100Hz).

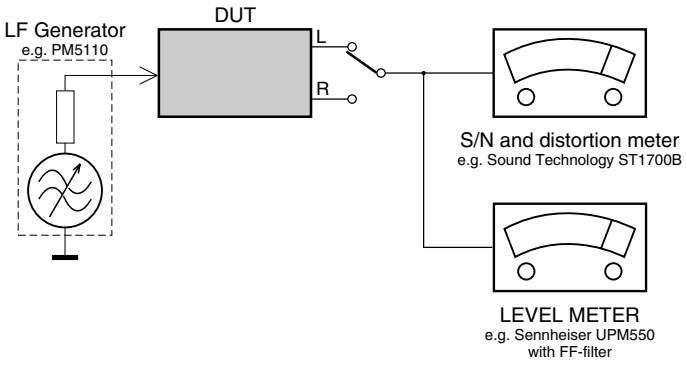
CD

Use Audio Signal Disc SBC429 4822 397 30184
(replaces test disc 3)



Recorder

Use Universal Test Cassette **CrO2** SBC419 4822 397 30069
or Universal Test Cassette **Fe** SBC420 4822 397 30071



SERVICE AIDS

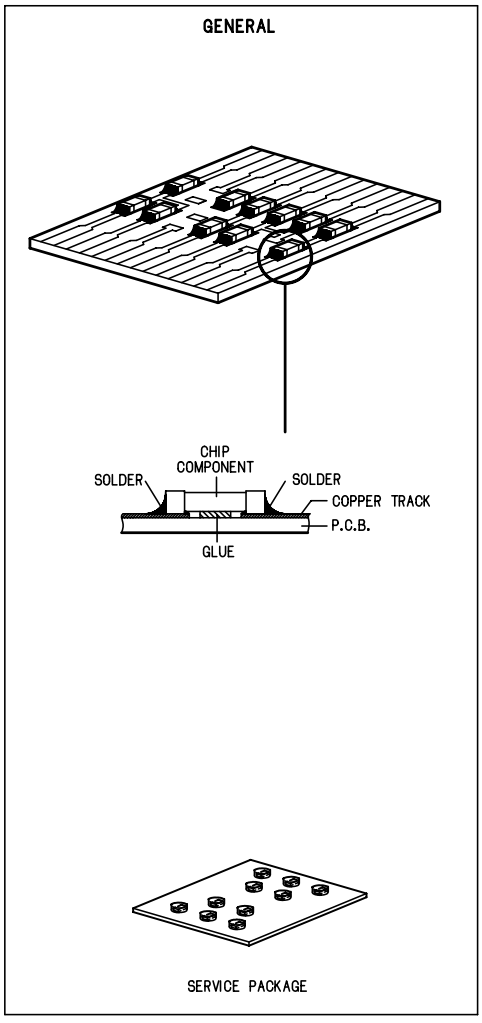
Service Tools:

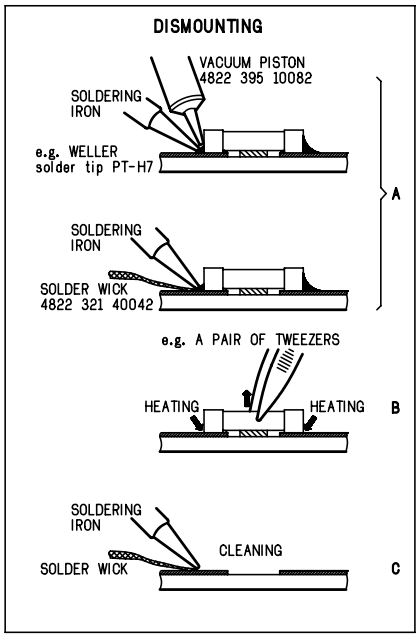
Universal Torx driver holder 4822 395 91019
Torx bit T10 150mm 4822 395 50456
Torx driver set T6 - T20 ..... 4822 395 50145
Torx driver T10 extended 4822 395 50423

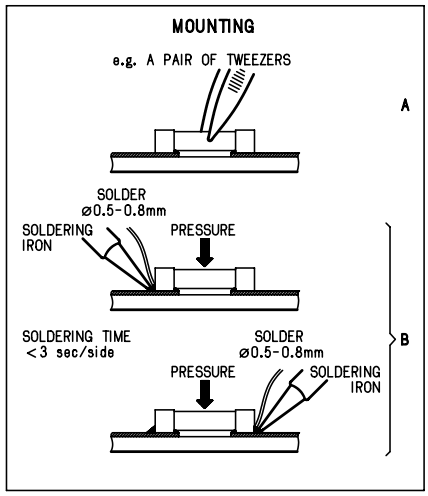
Compact Disc:

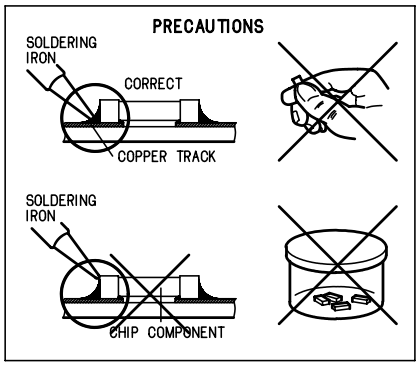
SBC426/426A Test disc 5 + 5A 4822 397 30096
SBC442 Audio Burn-in Test disc 1kHz 4822 397 30155
SBC429 Audio Signals disc 4822 397 30184
Dolby Pro-logic Test Disc 4822 395 10216

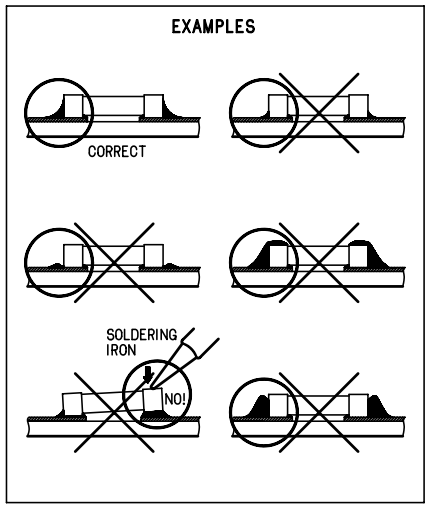
HANDLING CHIP COMPONENTS











ESD

(GB) WARNING

All ICs and many other semi-conductors are susceptible to electrostatic discharges (ESD). Careless handling during repair can reduce life drastically.
When repairing, make sure that you are connected with the same potential as the mass of the set via a wrist wrap with resistance. Keep components and tools also at this potential.

(F) ATTENTION

Tous les IC et beaucoup d'autres semi-conducteurs sont sensibles aux décharges statiques (ESD).
Leur longévité pourrait être considérablement écourtée par le fait qu'aucune précaution n'est prise à leur manipulation.
Lors de réparations, s'assurer de bien être relié au même potentiel que la masse de l'appareil et enfiler le bracelet serti d'une résistance de sécurité.
Veiller à ce que les composants ainsi que les outils que l'on utilise soient également à ce potentiel.

(D) WARNUNG

Alle ICs und viele andere Halbleiter sind empfindlich gegenüber elektrostatischen Entladungen (ESD).
Unsorgfältige Behandlung im Reparaturfall kan die Lebensdauer drastisch reduzieren.
Veranlassen Sie, dass Sie im Reparaturfall über ein Pulsarmband mit Widerstand verbunden sind mit dem gleichen Potential wie die Masse des Gerätes.
Bauteile und Hilfsmittel auch auf dieses gleiche Potential halten.

(NL) WAARSCHUWING

Alle IC's en vele andere halfgeleiders zijn gevoelig voor electrostatische ontladingen (ESD).
Onzorgvuldig behandelen tijdens reparatie kan de levensduur drastisch doen verminderen.
Zorg ervoor dat u tijdens reparatie via een polsband met weerstand verbonden bent met hetzelfde potentiaal als de massa van het apparaat.
Houd componenten en hulpmiddelen ook op ditzelfde potentiaal.

(I) AVVERTIMENTO

Tutti IC e parecchi semi-conduttori sono sensibili alle scariche statiche (ESD).
La loro longevità potrebbe essere fortemente ridatta in caso di non osservazione della più grande cauzione alla loro manipolazione.
Durante le riparazioni occorre quindi essere collegato allo stesso potenziale che quello della massa dell'apparecchio tramite un braccialetto a resistenza.
Assicurarsi che i componenti e anche gli utensili con quali si lavora siano anche a questo potenziale.

(GB) ESD PROTECTION EQUIPMENT:

Complete Kit ESD3 (small tablemat, wristband, connection box, extention cable and earth cable) 4822 310 10671
Wristband tester 4822 344 13999

(GB)
Safety regulations require that the set be restored to its original condition and that parts which are identical with those specified, be used

Safety components are marked by the symbol ⚠.

(NL)
Veiligheidsbepalingen vereisen, dat het apparaat bij reparatie in zijn oorspronkelijke toestand wordt teruggebracht en dat onderdelen, identiek aan de gespecificeerde, worden toegepast.

De Veiligheidsonderdelen zijn aangeduid met het symbool ⚠

(F)
Les normes de sécurité exigent que l'appareil soit remis à l'état d'origine et que soient utiliséés les piéces de rechange identiques à celles spécifiées.

Less composants de sécurité sont marqués ⚠

(D)
Bei jeder Reparatur sind die geltenden Sicherheitsvorschriften zu beachten. Der Original zustand des Geräts darf nicht verändert werden; für Reparaturen sind Original-Ersatzteile zu verwenden.

Sicherheitsbauteile sind durch das Symbol ⚠ markiert.

(I)
Le norme di sicurezza esigono che l'apparecchio venga rimesso nelle condizioni originali e che siano utilizzati i pezzi di ricambio identici a quelli specificati.

Componenty di sicurezza sono marcati con ⚠

(GB)
After servicing and before returning set to customer perform a leakage current measurement test from all exposed metal parts to earth ground to assure no shock hazard exist. The leakage current must not exceed 0.5mA.

CLASS 1
LASER PRODUCT

(GB) Warning !

Invisible laser radiation when open.
Avoid direct exposure to beam.

(S) Varning !

Osynlig laserstrålning när apparaten är öppnad och spärren är urkopplad. Betrakta ej strålen.

(SF) Varoitus !

Avatussa laitteessa ja suojalukituksen ohitettaessa olet alttiina näkymättömälle laserisäteilylle. Älä katso säteeseen!

(DK) Advarse !

Usynlig laserstråling ved åbning når sikkerhedsafbrydere er ude af funktion. Undgå udsaettelse for stråling.

(F)
"Pour votre sécurité, ces documents doivent être utilisés par des spécialistes agréés, seuls habilités à réparer votre appareil en panne".

DISMANTLING INSTRUCTIONS

Dismantling of the Cover Cassette and Universal Loader

1) Remove the Cover Cassette (pos 150) in the direction as shown in Figure 1.
2) Loosen 4 screws to remove the Cover Top (pos 240) by sliding it out towards the rear before lifting up.
   - 2 screws on the rear
   - 1 screw each on the left & right side
3) Loosen 2 screws each to remove the Panel Left (pos 180) and Panel Right (pos 181). The Panels are removed by sliding it towards the rear and outwards.
   - 1 screw on the rear
   - 1 screw on the side
   - see Service position A
4) Use a screw driver to give a push in the direction as shown in Figure 2 and Figure 2A to unlock the Loader Tray before sliding it out.
5) Slide out the Loader Tray and remove the Cover CD (pos 110 + pos 111) in the direction as shown in Figure 3.
6) Loosen 4 screws A (see Figure 4) to remove the Bracket Module Mounting (pos 156) and Universal Loader (pos 1103).
   - 2 screws each on the left & right side

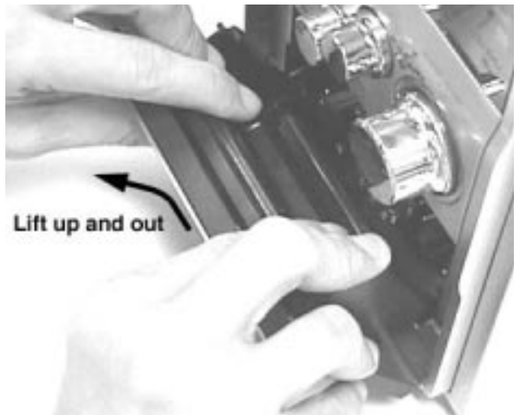


Figure 1

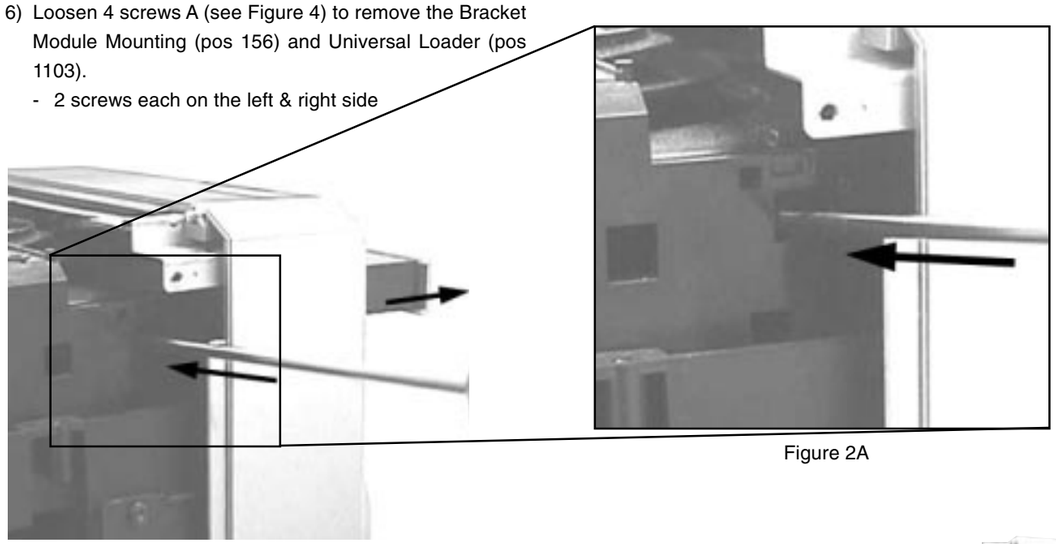


Figure 2A

Figure 2

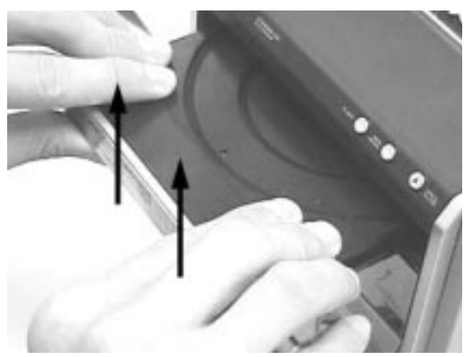


Figure 3

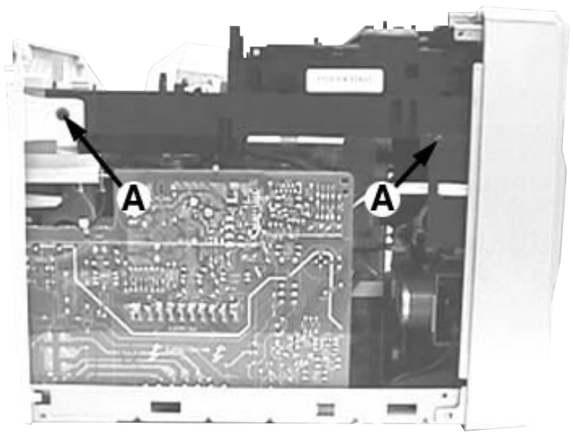


Figure 4

Detaching the Universal Loader from the Bracket Module Mounting

1) Slide out the Loader Tray fully and remove 4 screws B (see Figure 5) to detach the Universal Loader (pos 1103) from the Bracket Module Mounting (pos 156).
   - see Service position B

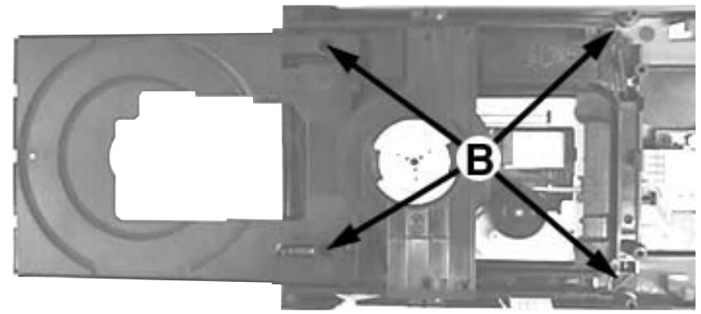


Figure 5

Detaching the Front Panel assembly from the Bottom/Rear assembly

1) Remove 2 screws C (see Figure 6) from the bottom of the Cabinet Front (pos 101).

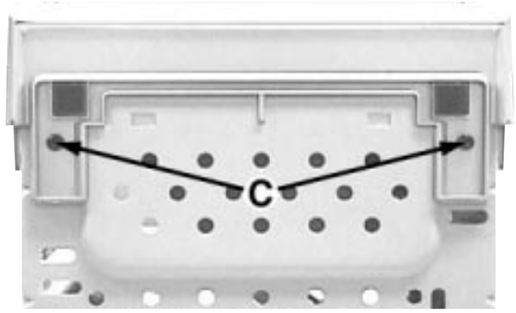


Figure 6

2) Release the fixation of the Combi Board (pos1102-1001) to Bracket Combi (pos 155) by releasing the 2 catches C1 (see Figure 7) and pulling the Combi Board outwards as shown in Figure 7A.
3) Uncatch 2 catches C2 (see Figure 7) on the left & right sides of the Cabinet Front (pos 101) and slides the Front Panel assembly out towards the front.
   - see Service position C

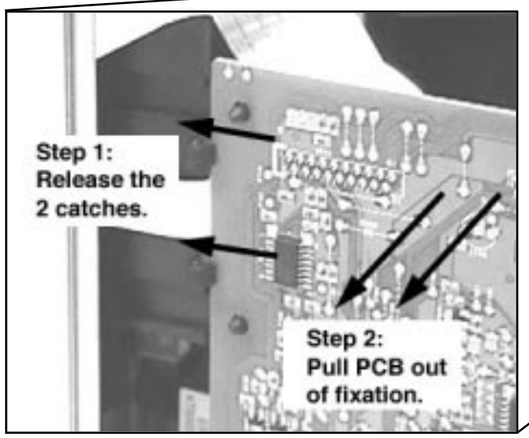


Figure 7A

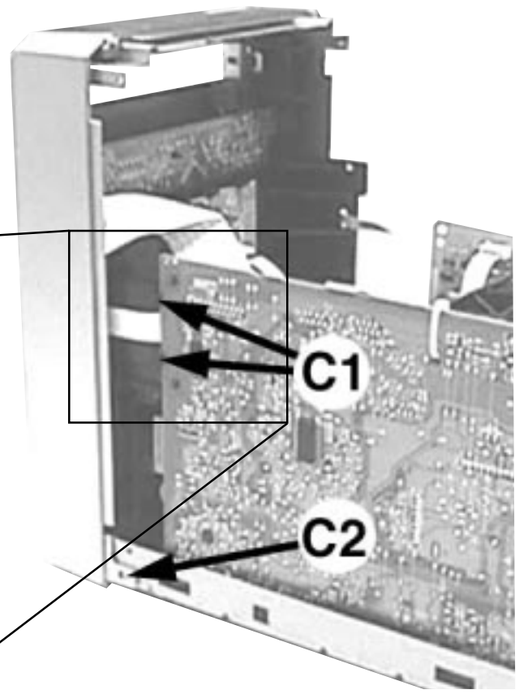


Figure 7

DISMANTLING INSTRUCTIONS

Dismantling of the Front Panel assembly

1) The Knob Volume (pos 141) can be remove by pulling it out in the direction as shown in Figure 8.
2) The Knob Bass/Knob Treble (pos 140) can be remove by pulling it out in the direction as shown in Figure 9.
3) Loosen 4 screws D (see Figure 12) to remove the Shield Tape Deck and Module Tape Deck (pos 1107).
4) Loosen 2 screws E (see Figure 11) to remove the Bracket Top Support (pos 113).
5) Loosen 1 screw F and 4 catches C3 (see Figure 11) to remove the Eeprom Board (pos 1105D).
6) Loosen 4 screws G (see Figure 11) to remove the Bracket Combi (pos 155).
7) Uncatch 4 catches C4 (see Figure 13) to remove the Display Board (pos 1105A)
8) Loosen 4 screws H (see Figure 13) to remove the Top Key Board (pos 1105C).
9) Loosen 5 screws J (see Figure 14) and 2 nuts W (see Figure 10) to remove the Control Board (pos 1105B).

Figure 8

Figure 9

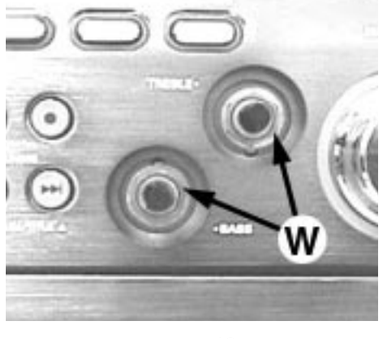


Figure 10

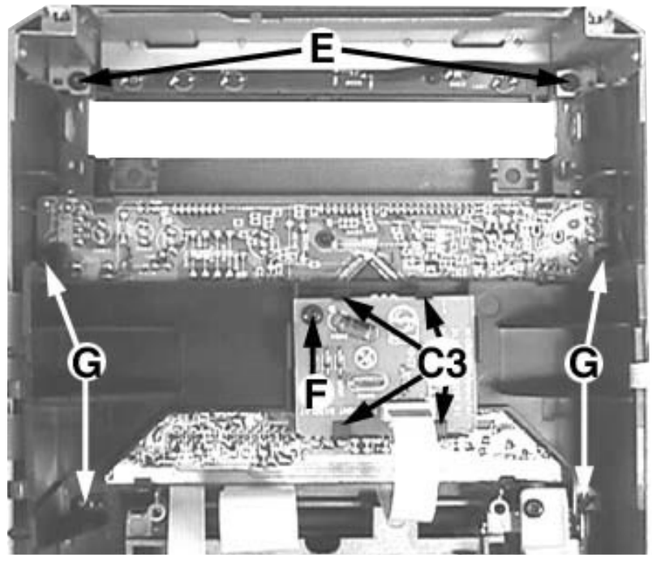


Figure 11

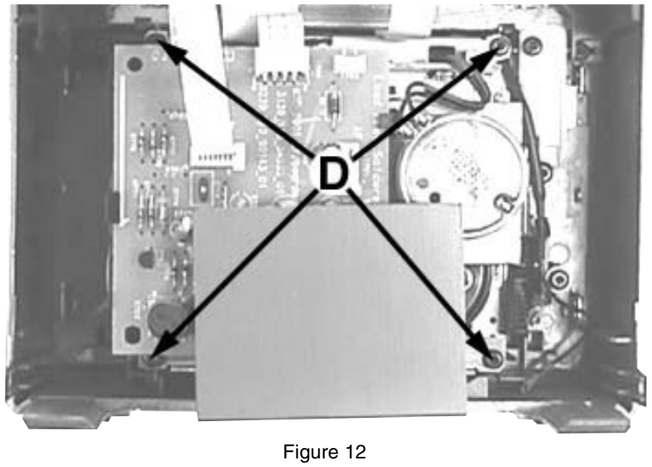


Figure 12

Dismantling of the Front Panel assembly

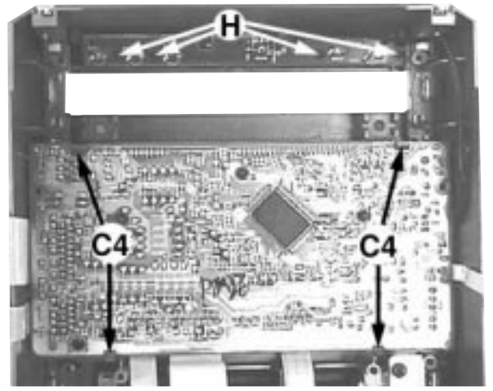


Figure 13

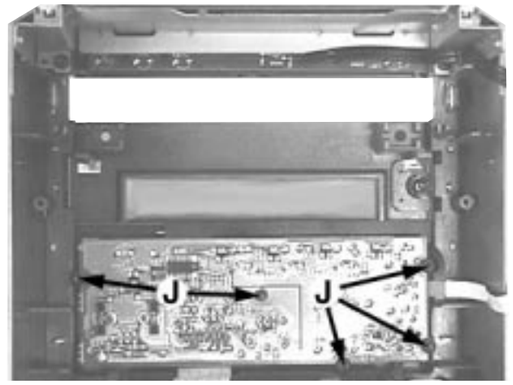


Figure 14

Dismantling of the Rear Panel assembly

1) Loosen 3 screws K and 2 catches C5 (see Figure 15) to remove the Tuner Board assembly.
2) Loosen 3 screws L (see Figure 15) to free the Combi Board (pos 1102-1001).
3) Loosen 1 screw M (see Figure 15) to free the Mains Socket Board (pos 1102-1002B).
4) Loosen 1 scew N and 2 catches C6 (see Figure 15) to free the Panel Rear (pos 230) by sliding it out towards the rear.

Note : Tuner Board assembly and Mains Socket Board can also be remove together with the Panel Rear.

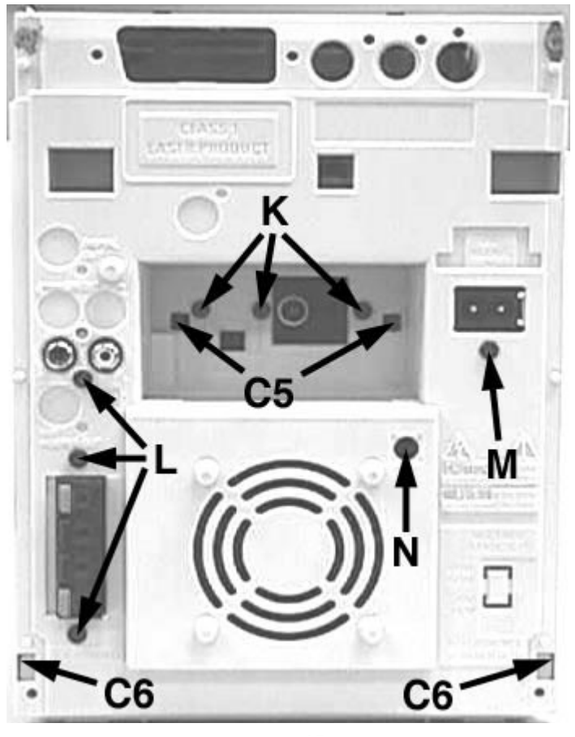


Figure 15

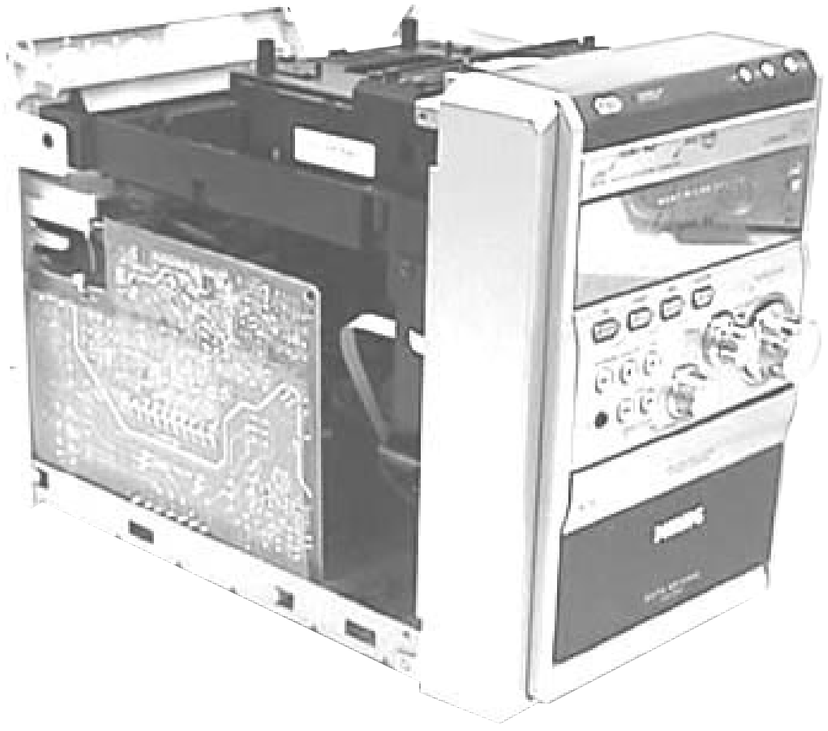
DISMANTLING INSTRUCTIONS

Repair Hints & Service Positions

1) During repair it is possible to disconnect the Tuner Board and/or CD Module completely unless the fault is suspected to be in that area. This will not affect the performance of the rest of the set.

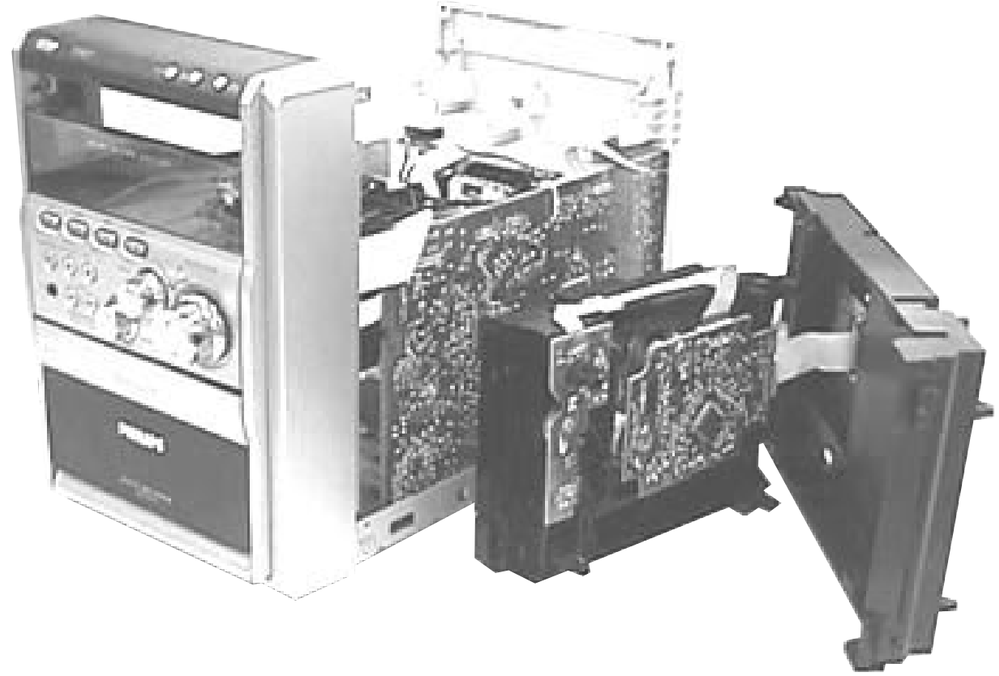
Note: The flex cables are very fragile, care should be taken not to damage them during repair. After repair, be very sure that the flex cables are inserted properly into the flex sockets before encasing, otherwise faults may occurs.

Service position A

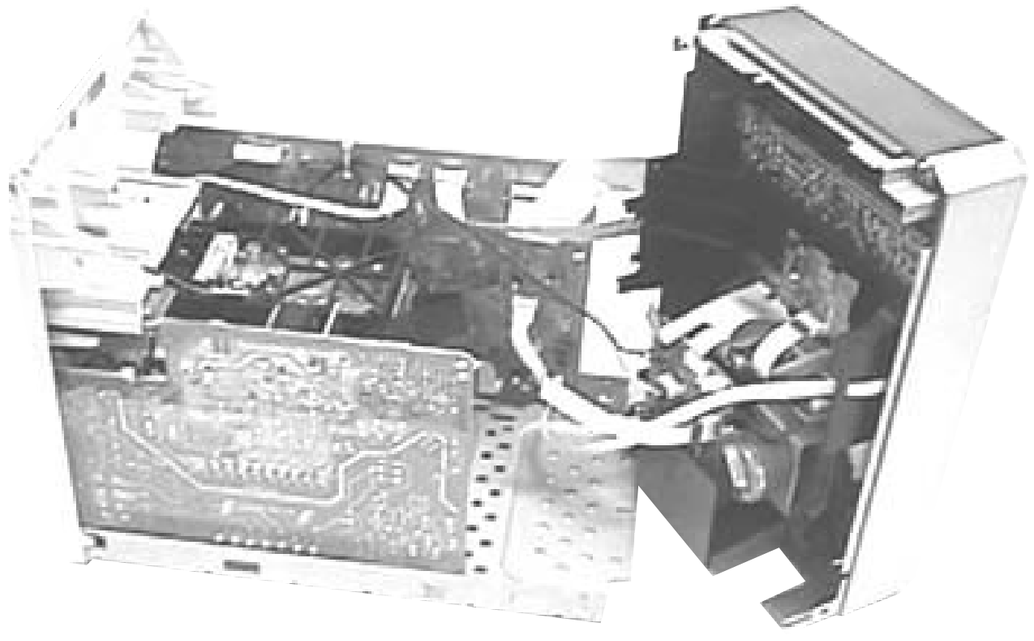


2-3

Service position B

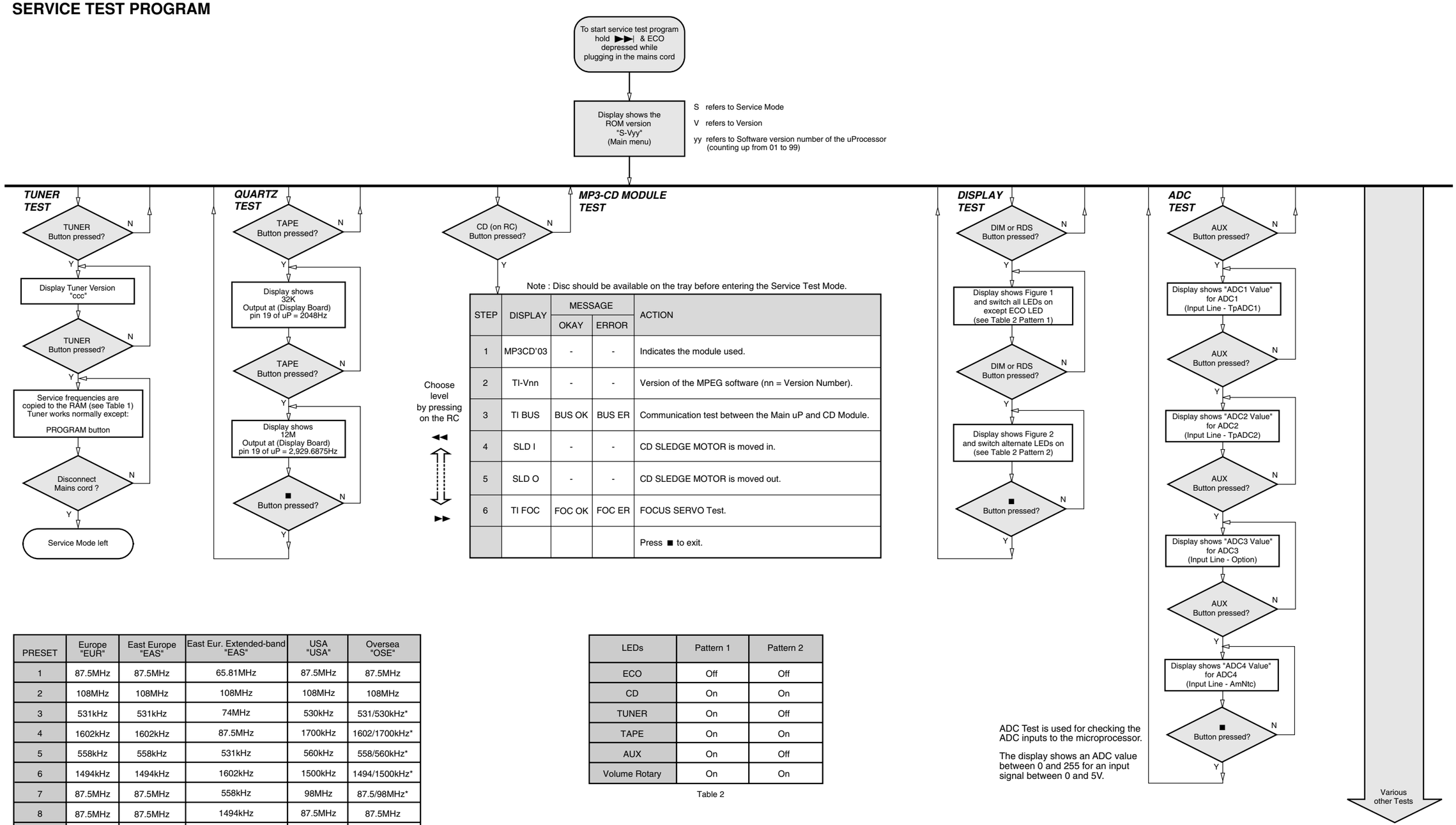


Service position C



3-1

SERVICE TEST PROGRAM



Note : Disc should be available on the tray before entering the Service Test Mode.

STEP	DISPLAY	MESSAGE OKAY	MESSAGE ERROR	ACTION
1	MP3CD'03	-	-	Indicates the module used.
2	TI-Vnn	-	-	Version of the MPEG software (nn = Version Number).
3	TI BUS	BUS OK	BUS ER	Communication test between the Main uP and CD Module.
4	SLD I	-	-	CD SLEDGE MOTOR is moved in.
5	SLD O	-	-	CD SLEDGE MOTOR is moved out.
6	TI FOC	FOC OK	FOC ER	FOCUS SERVO Test.
				Press ■ to exit.

ADC Test is used for checking the ADC inputs to the microprocessor.

The display shows an ADC value between 0 and 255 for an input signal between 0 and 5V.

PRESET	Europe "EUR"	East Europe "EAS"	East Eur. Extended-band "EAS"	USA "USA"	Oversea "OSE"
1	87.5MHz	87.5MHz	65.81MHz	87.5MHz	87.5MHz
2	108MHz	108MHz	108MHz	108MHz	108MHz
3	531kHz	531kHz	74MHz	530kHz	531/530kHz*
4	1602kHz	1602kHz	87.5MHz	1700kHz	1602/1700kHz*
5	558kHz	558kHz	531kHz	560kHz	558/560kHz*
6	1494kHz	1494kHz	1602kHz	1500kHz	1494/1500kHz*
7	87.5MHz	87.5MHz	558kHz	98MHz	87.5/98MHz*
8	87.5MHz	87.5MHz	1494kHz	87.5MHz	87.5MHz
9	87.5MHz	87.5MHz	98MHz	87.5MHz	87.5MHz
10	87.5MHz	87.5MHz	70.01MHz	87.5MHz	87.5MHz
11	98MHz	98MHz	65.81MHz	87.5MHz	98/87.5MHz*

Table 1

Note: * Depending on the selected grid frequency (9 or 10kHz).
By holding the ECO and TUNER buttons depressed while switching on the Mains supply, one of the undermentioned features will be activated:
- the tuning grid frequency is toggled between 9kHz and 10kHz for the Oversea (/21) version.
- the extended FM1 (65.81MHz - 74MHz) is toggled on and off for East Eur. (/34) version.

LEDs	Pattern 1	Pattern 2
ECO	Off	Off
CD	On	On
TUNER	On	Off
TAPE	On	On
AUX	On	Off
Volume Rotary	On	On

Table 2

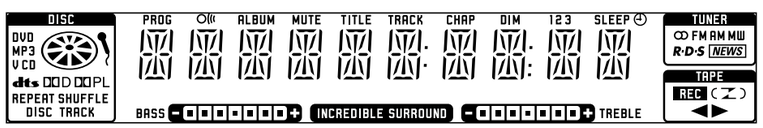


Figure 1

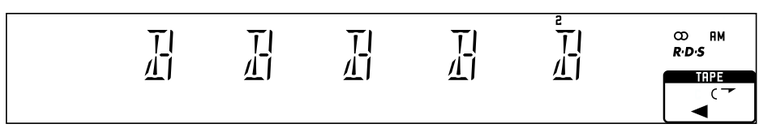
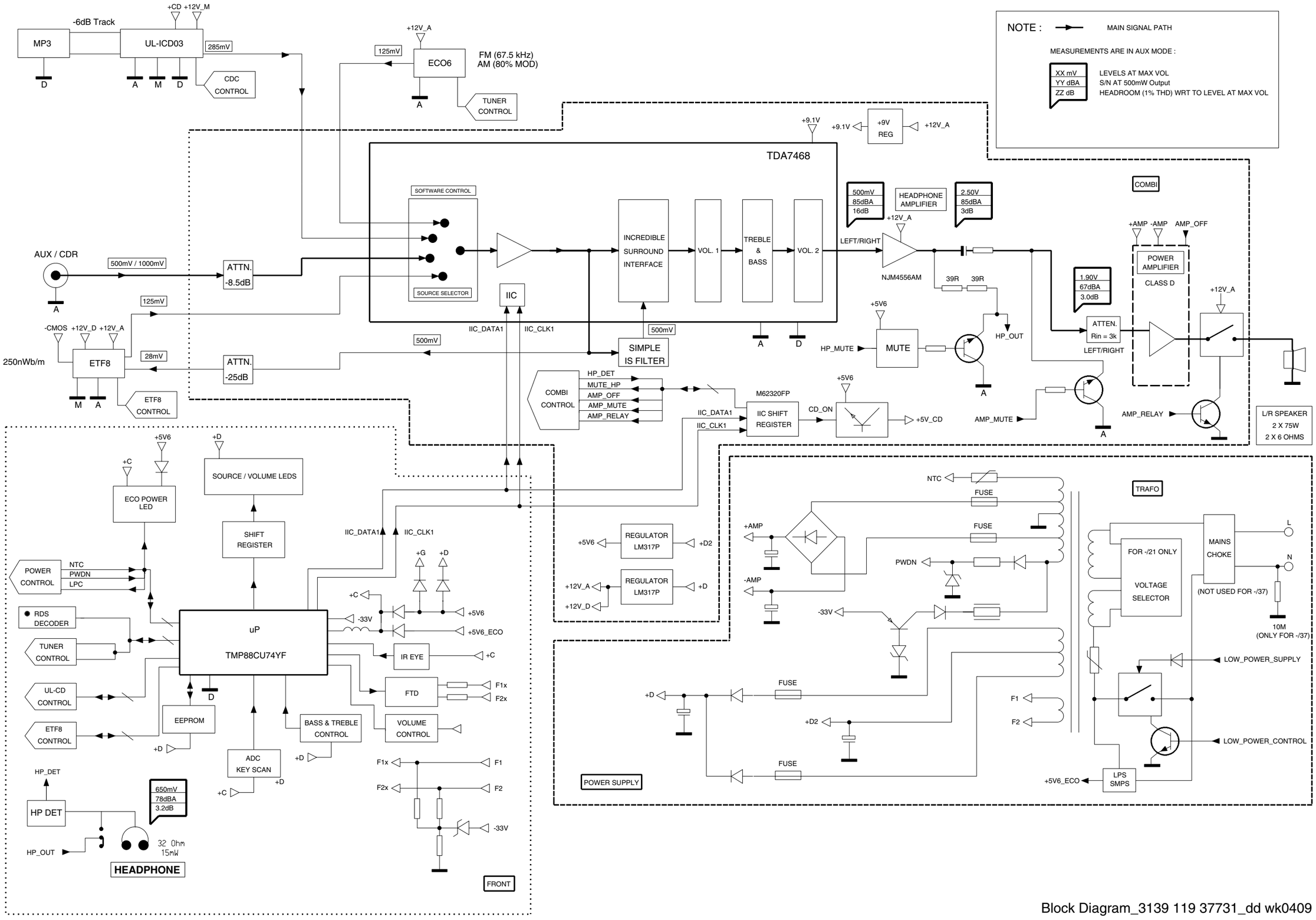


Figure 2

TEST	Activated with	ACTION
EEPROM TEST	▶▶| ■ to Exit	Test patterns will be sent to the EEPROM. "PASS" is displayed if the uProcessor read back the test patterns correctly, otherwise "FAIL" will be displayed.
EEPROM FORMAT TEST	|◀◀	Load default data. Display shows "NEW" for 1 second. ***Caution! All presets from the customer will be lost!!***
DEMO TOGGLE	►II	Pressing this button will toggle between DEMO ON and DEMO OFF. The DEMO status will scroll once across the Display.
ROTARY ENCODER TEST	Volume, Treble or Bass Knob	Display shows value for 2 seconds. Values increases or decreases until Volume Maximum (0dB) or Volume Minimum (VOL MUTE) is reached.
LEAVE SERVICE TEST PROGRAM	Disconnect mains cord	

4-1

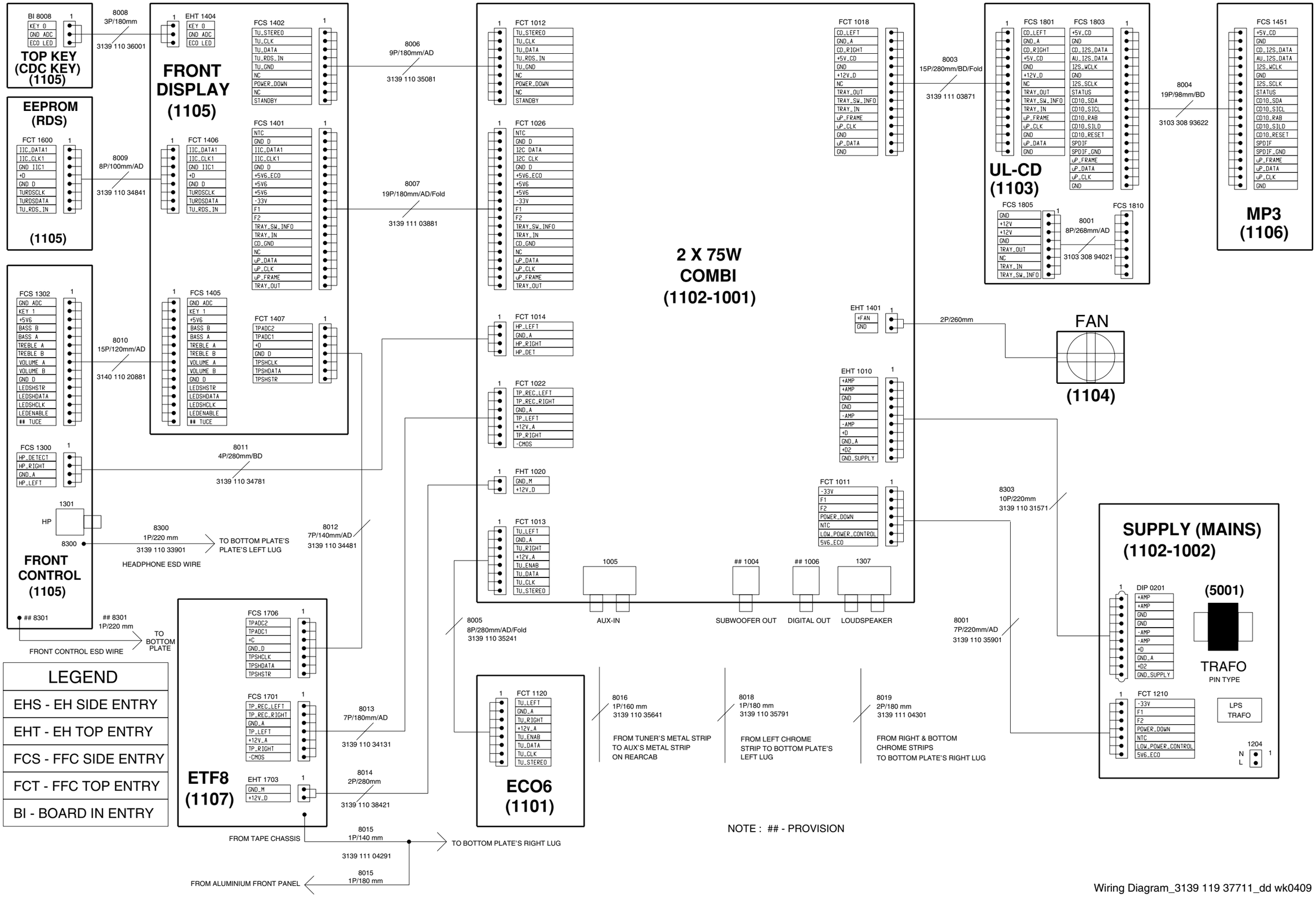
SET BLOCK DIAGRAM



Block Diagram_3139 119 37731_dd wk0409

5-1

SET WIRING DIAGRAM



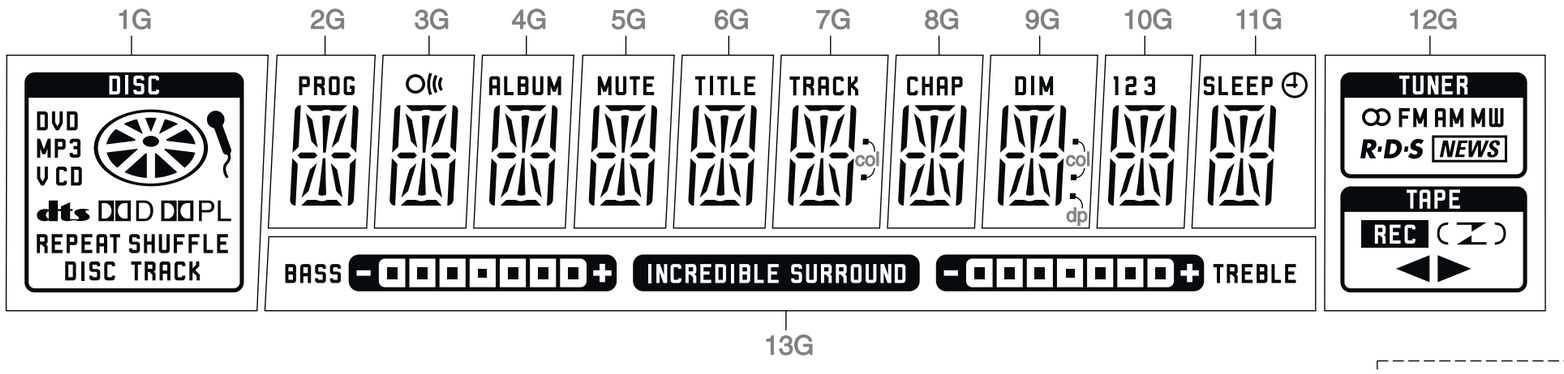
6-1

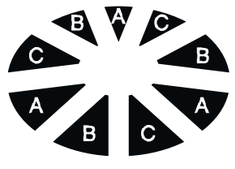
FRONT BOARD

TABLE OF CONTENTS

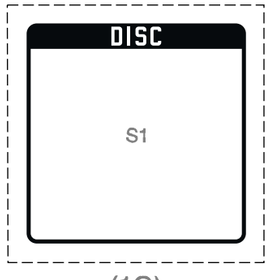
6-2

FTD DISPLAY PIN CONNECTION

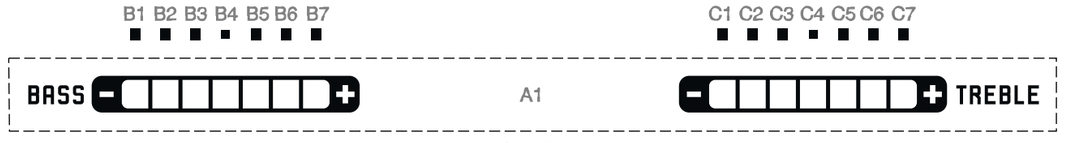




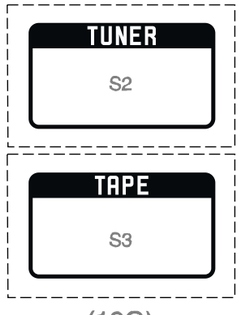
(1G)



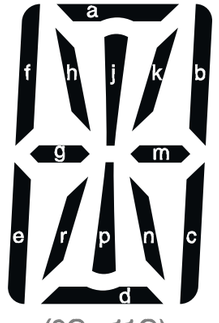
(1G)



(13G)



(12G)



(2G - 11G)

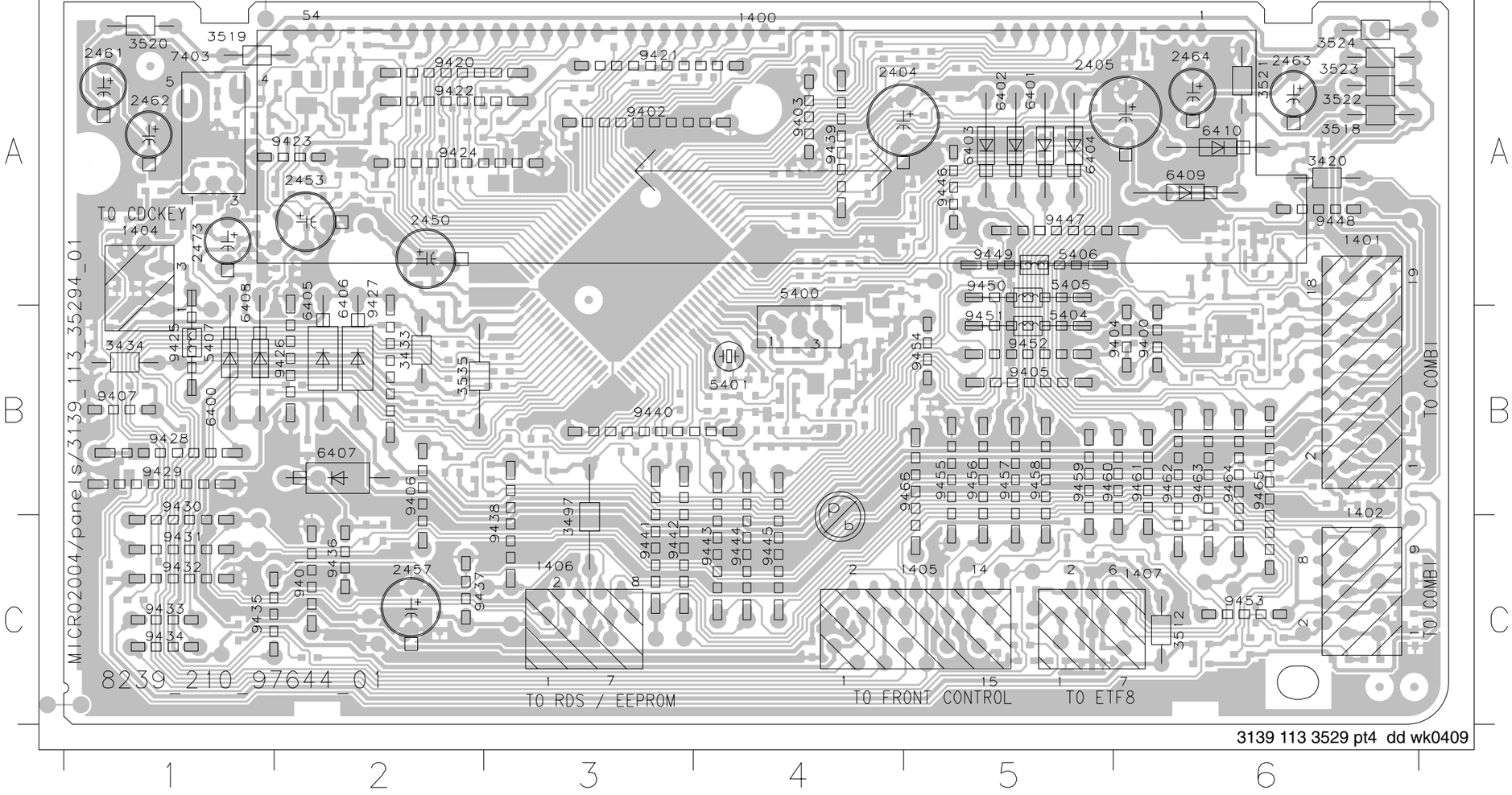
	1G	2G	3G	4G	5G	6G	7G	8G	9G	10G	11G	12G	13G
P1	S1	-	-	-	-	-	col	-	col	1	-	S2	INCREDIBLE SURROUND
P2	DVD	-	-	-	-	-	-	-	dp	2	SLEEP	∞	A1
P3	MP3	PROG	((o))	ALBUM	MUTE	TITLE	TRACK	CHAP	DIM	3	🕘	FM	B1
P4	V	a	a	a	a	a	a	a	a	a	a	AM	B2
P5	CD	h	h	h	h	h	h	h	h	h	h	MW	B3
P6	dts	j , p	j , p	j , p	j , p	j , p	j , p	j , p	j , p	j , p	j , p	R·D·S	B4
P7	DD D	k	k	k	k	k	k	k	k	k	k	NEWS	B5
P8	DD PL	b	b	b	b	b	b	b	b	b	b	S3	B6
P9	REPEAT	f	f	f	f	f	f	f	f	f	f	REC	B7
P10	SHUFFLE	m	m	m	m	m	m	m	m	m	m	☾	C1
P11	DISC	g	g	g	g	g	g	g	g	g	g	☽	C2
P12	TRACK	c	c	c	c	c	c	c	c	c	c	→	C3
P13		e	e	e	e	e	e	e	e	e	e	←	C4
P14		r	r	r	r	r	r	r	r	r	r	◀	C5
P15	B	n	n	n	n	n	n	n	n	n	n	▶	C6
P16	A	d	d	d	d	d	d	d	d	d	d	-	C7
P17	C	-	-	-	-	-	-	-	-	-	-	-	-

6-3

DISPLAY BOARD - COMPONENT LAYOUT

1400 A4	2405 A5	2473 A1	3520 A1	5404 B5	6404 A5	9400 B6	9420 A2	9428 B1	9436 C2	9444 C4	9452 B5	9460 B5
1401 A6	2450 A2	3420 A6	3521 A6	5405 A5	6405 A2	9401 C2	9421 A3	9429 B1	9437 C2	9445 C4	9453 C6	9461 B6
1402 B6	2453 A2	3433 B2	3522 A6	5406 A5	6406 A2	9402 A3	9422 A2	9430 B1	9438 C3	9446 A5	9454 B5	9462 B6
1404 A1	2457 C2	3434 B1	3523 A6	5407 B1	6407 B2	9403 A4	9423 A2	9431 C1	9439 A4	9447 A5	9455 B5	9463 B6
1405 C5	2461 A1	3497 C3	3524 A6	6400 B1	6408 A1	9404 B6	9424 A2	9432 C1	9440 B3	9448 A6	9456 B5	9464 B6
1406 C3	2462 A1	3512 C6	3535 B2	6401 A5	6409 A6	9405 B5	9425 B1	9433 C1	9441 C3	9449 A5	9457 B5	9465 B6
1407 C6	2463 A6	3518 A6	5400 A4	6402 A5	6410 A6	9406 B2	9426 B2	9434 C1	9442 C3	9450 A5	9458 B5	9466 B5
2404 A4	2464 A6	3519 A1	5401 B4	6403 A5	7403 A1	9407 B1	9427 A2	9435 C1	9443 C4	9451 B5	9459 B5	

This assembly drawing shows a summary of all possible versions. For components used in a specific version see schematic diagram and respective parts list.



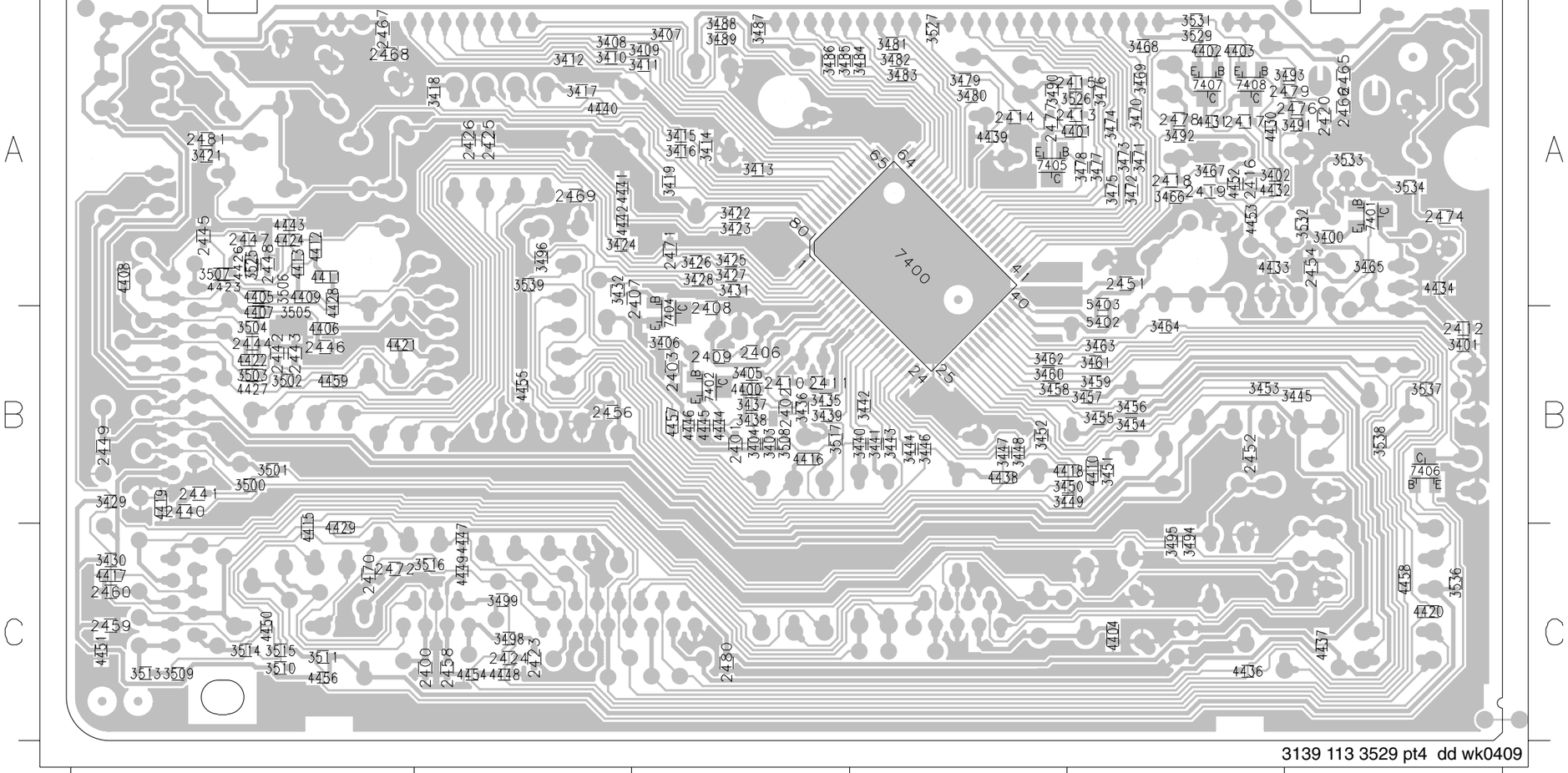
3139 113 3529 pt4 dd wk0409

6-4

DISPLAY BOARD - CHIP LAYOUT

2400 C2	2423 C2	2459 C1	3402 A5	3422 A3	3443 B4	3462 B4	3481 A4	3501 B1	3529 A5	4410 B5	4431 A5	4451 C1
2401 B3	2424 C2	2460 C1	3403 B3	3423 A3	3444 B4	3463 B5	3482 A4	3502 B1	3531 A5	4411 A1	4432 A5	4452 A5
2402 B3	2425 A2	2465 A6	3404 B3	3424 A2	3445 B6	3464 B5	3483 A4	3503 B1	3532 A6	4412 A1	4433 A5	4453 A5
2403 B3	2426 A2	2466 A6	3405 B3	3425 A3	3446 B4	3465 A6	3484 A4	3504 B1	3533 A6	4413 A1	4434 A6	4454 C2
2406 B3	2440 B1	2467 A1	3406 B3	3426 A3	3447 B4	3466 A5	3485 A3	3505 B1	3534 A6	4415 C1	4436 C5	4455 B2
2407 A3	2441 B1	2468 A1	3407 A3	3427 A3	3448 B4	3467 A5	3486 A3	3506 A1	3536 C6	4416 B3	4437 C6	4456 C1
2408 B3	2442 B1	2469 A2	3408 A2	3428 A3	3449 B5	3468 A5	3487 A3	3507 A1	3537 B6	4417 C1	4438 B4	4457 B3
2409 B3	2443 B1	2470 C1	3409 A3	3429 B1	3450 B5	3469 A5	3488 A3	3508 B3	3538 B6	4418 B5	4439 A4	4458 C6
2410 B3	2444 B1	2471 A3	3410 A2	3430 C1	3451 B5	3470 A5	3489 A3	3509 C1	3539 A2	4419 B1	4440 A2	4459 B1
2411 B3	2445 A1	2472 C1	3411 A3	3431 A3	3452 B4	3471 A5	3490 A4	3510 C1	4400 B3	4420 C6	4441 A2	5402 B5
2412 B6	2446 B1	2474 A6	3412 A2	3432 A2	3453 B5	3472 A5	3491 A6	3511 C1	4401 A5	4421 B1	4442 A2	5403 A5
2413 A5	2447 A1	2476 A6	3413 A3	3435 B3	3454 B5	3473 A5	3492 A5	3513 C1	4402 A5	4422 B1	4443 A1	7400 A4
2414 A4	2448 A1	2477 A4	3414 A3	3436 B3	3455 B5	3474 A5	3493 A6	3514 C1	4403 A5	4423 A1	4444 B3	7401 A6
2415 A5	2449 B1	2478 A5	3415 A3	3437 B3	3456 B5	3475 A5	3494 C5	3515 C1	4404 C5	4424 A1	4445 B3	7402 B3
2416 A5	2451 A5	2479 A6	3416 A3	3438 B3	3457 B5	3476 A5	3495 C5	3516 C2	4405 A1	4426 A1	4446 B3	7404 B3
2417 A5	2452 B5	2480 C3	3417 A2	3439 B3	3458 B4	3477 A5	3496 A2	3517 B3	4406 B1	4427 B1	4447 C2	7405 A4
2418 A5	2454 A6	2481 A1	3418 A2	3440 B4	3459 B5	3478 A5	3498 C2	3525 A1	4407 B1	4428 A1	4448 C2	7406 B6
2419 A5	2456 B2	3400 A6	3419 A3	3441 B4	3460 B4	3479 A4	3499 C2	3526 A5	4408 A1	4429 C1	4449 C2	7407 A5
2420 A6	2458 C2	3401 B6	3421 A1	3442 B4	3461 B5	3480 A4	3500 B1	3527 A4	4409 A1	4430 A5	4450 C1	7408 A5

This assembly drawing shows a summary of all possible versions. For components used in a specific version see schematic diagram and respective parts list.



6-5

DISPLAY BOARD - CIRCUIT DIAGRAM PART 1

Note : Some values may varies, see respective parts list for correct value.

Note : DC Voltages During Active Play.
Values in Square Bracket are DC Voltages at ECO-Standby.
Values in Bracket are DC Voltages at Standby (Clock Mode).

Legend : ■ Refer to Variant Table.
For Provision Only .

1400 HNA-13SM42

ECO LED

TO CDC KEY

TO FRONT CONTROL

DVD

TO RDS / EEPROM

TO ETF8

RESET

IR EIRE

POWER-DOWN

FOR PROVISION ONLY

TMP88CU74F
7400

CPU

RAM

ROM

Program Counter

8-Bit A/D Converter

8239_210_97644_01 (Display Circuit 1)...for 3529 pt4 dd wk0409

1400 A13 3473 C7
1404 C1 3474 C7
1405 E1 3475 C7
1406 E13 3476 C7
1407 G13 3477 C7
2400 H12 3478 C6
2401 H1 3479 C6
2402 H2 3480 C6
2403 I1 3481 C6
2404 F4 3482 C6
2405 F4 3483 C6
2406 G6 3484 C6
2407 H5 3485 C5
2408 H6 3486 C5
2409 H6 3487 C5
2410 G6 3488 C5
2411 G6 3489 C5
2412 C2 3490 C10
2413 C10 3491 C13
2414 C10 3492 C12
2415 C9 3493 C13
2416 C11 3494 E12
2417 C11 3495 E12
2418 C12 3496 H5
2419 C13 3497 H10
2420 C13 3498 G12
2423 H11 3499 G12
2424 H12 3526 C10
2425 H12 3527 C10
2426 H12 3529 C12
2458 H11 3531 C13
2473 H4 3532 H4
2474 I4 3533 H4
2476 C12 3534 I4
2477 C10 3535 D9
2478 C11 3536 A3
2479 C13 3537 D10
2480 D9 3538 D10
3400 A1 3539 H9
3401 B1 4400 I9
3402 C11 4401 C10
3403 H1 4402 C11
3404 H1 4403 C13
3405 H2 4404 H4
3406 I1 4410 F9
3407 C4 4415 B3
3408 C4 4416 B4
3409 C4 4418 B4
3410 D4 4420 E10
3411 D3 4429 B3
3412 D4 4438 G10
3413 D4 4457 G5
3414 E4 4458 E10
3415 E3 5400 G6
3416 E4 5401 G6
3417 E3 5407 C2
3418 F4 6400 A1
3419 F4 6401 E3
3421 F3 6402 E4
3422 G4 6403 E3
3423 G4 6404 F4
3424 G4 6410 F3
3425 G4 7400 G8
3426 G4 7401 B1
3427 G4 7402 H1
3428 G5 7403 H3
3429 H3 7404 H6
3430 H3 7405 C10
3431 H5 7406 A3
3432 H5 7407 C12
3433 H7 7408 C13
3434 I7 9401 H4
3435 H8 9402 B8
3436 I8 9403 B8
3437 H9 9406 G10
3438 I9 9407 D10
3439 H9 9425 C2
3440 H8
3441 H9
3442 G8
3443 G9
3444 G8
3445 G8
3446 G9
3447 G9
3448 G8
3449 F9
3450 F9
3451 F10
3452 F9
3453 F9
3454 F9
3455 F9
3456 F9
3457 E9
3458 E9
3459 E9
3460 E9
3461 E9
3462 E9
3463 E9
3464 D9
3465 C2
3466 C8
3467 C8
3468 C8
3469 C8
3470 C8
3471 C7
3472 C7

6-6

DISPLAY BOARD - CIRCUIT DIAGRAM PART 2

DVD	MP3
	NTC
	GND_IIC1
	IIC_DATA1
	IIC_CLK1
	GND_D
	+5V6_ECO
	+5V6
	+5V6
	-33V
	F1
	F2
IIC_CLK3	SW_INFO
IIC_DATA3	TRAY_IN
GND_IIC3	CD_GND
DVD_POWER_ON	NC
NC	uP_DATA
DVD_I NT	uP_CLK
DVD_TURDS_CLK	uP_FRAME
DVD_TURDS_DATA	TRAY_OUT

NOTE : DVD_TURDS_CLK & DVD_TURDS_DATA ARE FOR MCD9/22 VERSION

TO COMBI

1401 — FE-ST-VK-N

NTC

I2C1 I2C1 IIC1 IIC1

3502 -> 220R for MCD9

3500 220R

3501 220R

3502 470R

9405 Tray_SW_Info

IIC_DATA1

IIC_CLK1

D

0V [5.6V]

+5V6_ECO

+5V6 5.6V

-33V -33V

F1

F2

4427 3503 220R # ESD PROVISION

Tray_In__DVD_Power_On

4422 2443 10p 2442 10p 9400 D 9404 4421 2444 100n 4406

PWDN

Standby

4408 4459 5404 2u2 9451 uP_DATA__IIC_DATA3

3504 470R 4407

3505 470R 4428 4409 5405 2u2 9450 uP_CLK__IIC_CLK3

3506 470R 4405 5406 2u2 9449 uP_FRAME__DVD_TURdsClk

3507 470R 4411 4423 4412

Tray_Out__DVD_TURdsDATA

3525 470R 4424 4426

2445 10p 2446 10p 2447 10p 2448 10p

FOR ESD PROVISION ONLY

4413 DVD_INT__TUCE

+C +D

3508 33K 3509 10K 3510 10K 3511 10K 3512 10K

TUSTEREO__DVD_VolB

TUCLK__DVD_VolA

TUDATA__DVD_RC6

TUCE

TU_RDS_In

DVD_INT__TUCE

3420 1K0

2481 47p 3517 47K 2469 47p 2470 47p 2471 47p 2472 47p 4417

D # FOR ESD PROVISION ONLY

TO COMBI

1402 — FE-ST-VK-N

3513 1K0 3514 1K0 3515 1K0 # 3516 1K0 # 9453 2460 100p

DVD	MP3
DVD_VOLB	TU_STEREO
DVD_VOL A	TU_CLK
DVD_RC6	TU_DATA
TU_RDS_IN	TU_RDS_IN
TU_GND	TU_GND
NC	NC
POWER_DOWN	POWER_DOWN
NC	NC
STANDBY	STANDBY

+5V6_ECO — 6405 1N4003 — 5402 4u7 — 5403 4u7 — 2449 100n — 2450 47u 16V — 2451 100n — +H +5V

+5V6 — 6407 1N4003 — 2457 47u 16V — 2459 100n — +D +5V

+5V6 — 6406 1N4003 — 2452 100n — 2453 47u 16V — 2454 100n — 2456 100n — +C +5V

+5V6 — 6408 1N4148 — +G

D

F2 — 3519 2R2 — 3520 2R2 — F2x

3518 220R

2461 4u7 50V — 2462 4u7 50V — 2465 220p — 2466 220p — FTD1

(MCM5) 4.7Vac
(MCM7) 4.7Vac
(MCM8) 4.0Vac
(MCD9) 4.7Vac

(MCM5) 4.4Vac
(MCM7) 4.4Vac
(MCM8) 3.9Vac
(MCD9) 4.4Vac

F1 — 3523 2R2 — 3524 2R2 — F1x

3522 220R — 3521 22K — FTD2

2463 4u7 50V — 2464 4u7 50V — 2467 220p — 2468 220p — FTD2

6409 -33V BZX79-B6V8

Note : Some values may varies, see respective parts list for correct value.

Note : DC Voltages During Active Play.
Values in Square Bracket are DC Voltages at ECO-Standby.

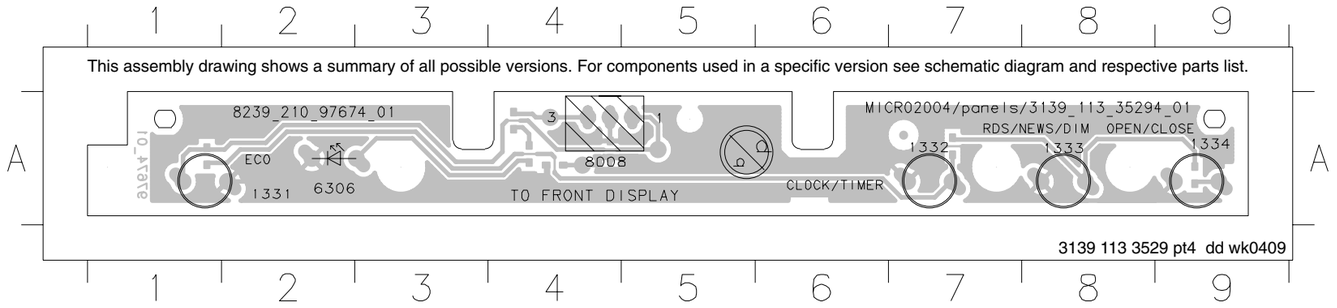
Legend : ■ Refer to Variant Table.
For Provision Only .

DISPLAY BOARD - VARIANT TABLE

	MCM7/22 MCM7/25	MCM7/37	MCM8/22 MCM8/25	MCM8/21
2444	100N	100N	100N	100N
3434	180R	180R	470R	470R
3436	1M	1M	2M2	2M2
3437	680K	680K	-	-
3438	1M	1M	-	-
3496	-	10K	-	10K
3497	-	10K	-	10K
3503	-	-	-	-
3508	39K	39K	-	-
3519	2R2	2R2	1R	1R
3520	2R2	2R2	1R	1R
3523	2R2	2R2	1R	1R
3524	2R2	2R2	1R	1R
4400	-	-	X	X
4406	X	X	X	X
4409	X	X	X	X
4411	X	X	X	X
4413	-	-	-	-
4420	X	X	X	X
4421	X	X	X	X
4422	-	-	-	-
4424	X	X	X	X
4427	X	X	X	X
4438	X	-	X	-
4457	X	-	X	-
4458	X	X	X	X
4459	-	-	-	-
5404	2U2	2U2	2U2	2U2
5405	2U2	2U2	2U2	2U2
5406	2U2	2U2	2U2	2U2
9400	-	-	-	-
9404	-	-	-	-
9405	X	X	X	X
9449	-	-	-	-
9450	-	-	-	-
9451	-	-	-	-

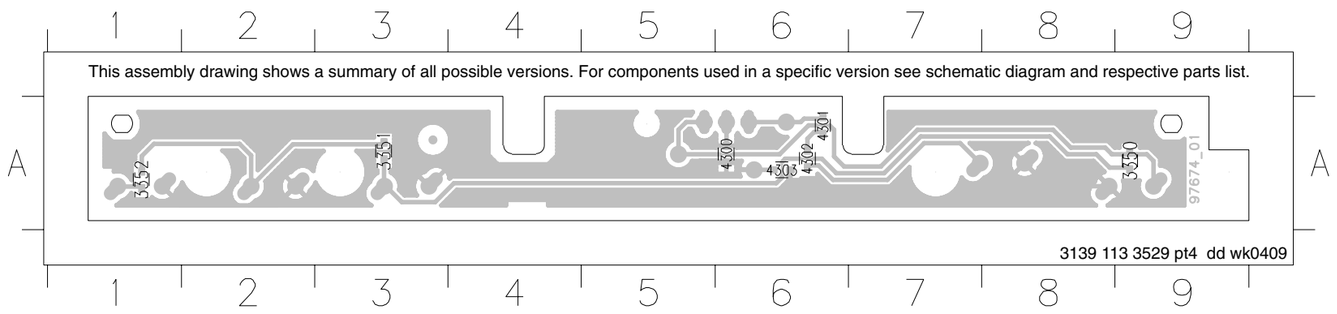
X - Item in use.

TOP KEY BOARD - COMPONENT LAYOUT



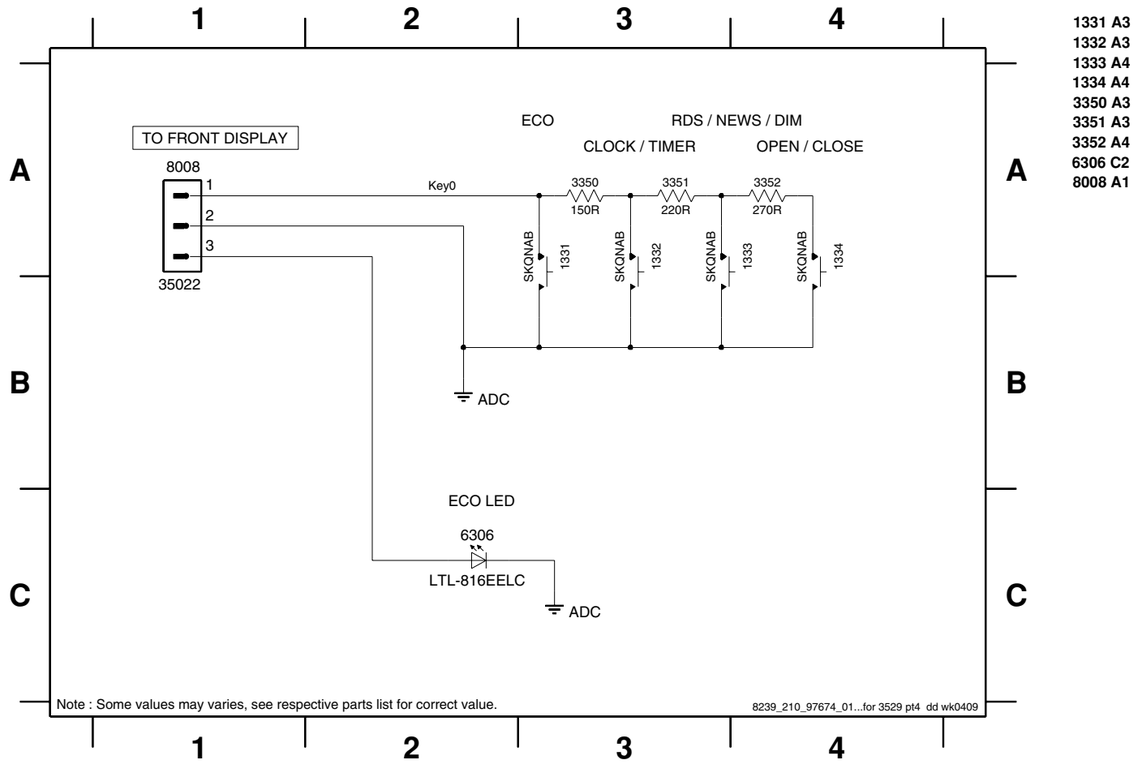
1331 A2
1332 A7
1333 A8
1334 A9
6306 A2
8008 A4

TOP KEY BOARD - CHIP LAYOUT



3350 A9
3351 A3
3352 A1
4300 A6
4301 A6
4302 A6
4303 A6

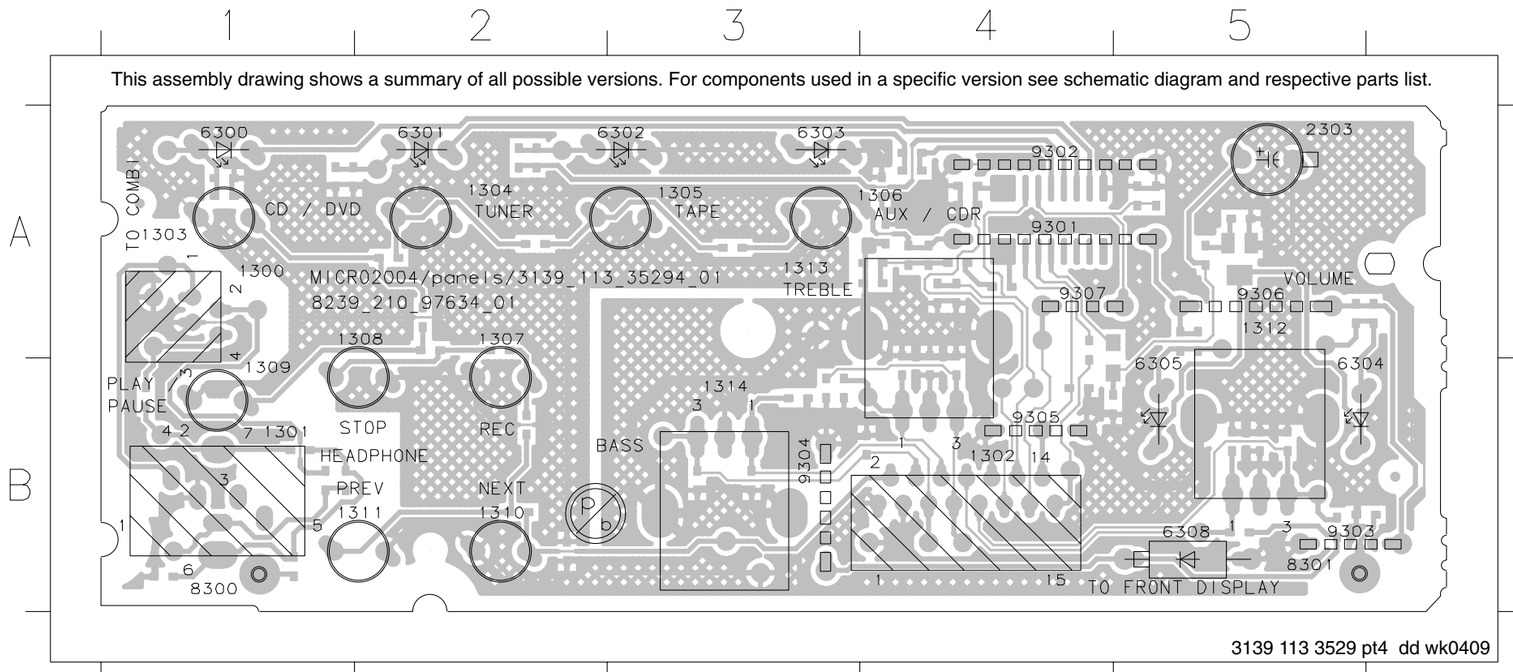
TOP KEY BOARD - CIRCUIT DIAGRAM



1331 A3
1332 A3
1333 A4
1334 A4
3350 A3
3351 A3
3352 A4
6306 C2
8008 A1

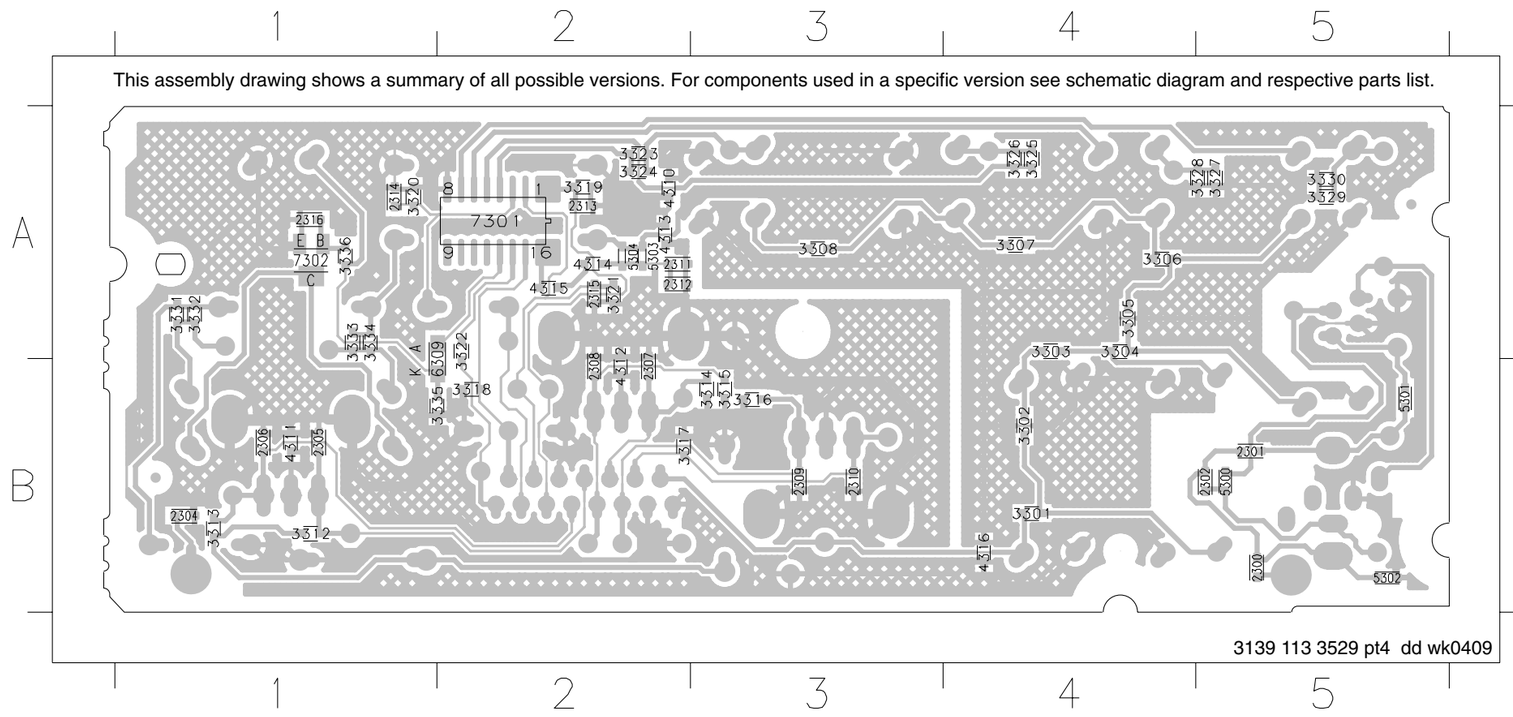
6-8

CONTROL BOARD - COMPONENT LAYOUT



1300 A1
1301 B1
1302 B4
1303 A1
1304 A2
1305 A3
1306 A4
1307 A2
1308 A2
1309 B1
1310 B2
1311 B2
1312 A5
1313 A3
1314 B3
2303 A5
6300 A1
6301 A2
6302 A3
6303 A3
6304 B5
6305 B5
6308 B5
8300 B1
8301 B5
9301 A4
9302 A4
9303 B5
9304 B3
9305 B4
9306 A5
9307 A4

CONTROL BOARD - CHIP LAYOUT

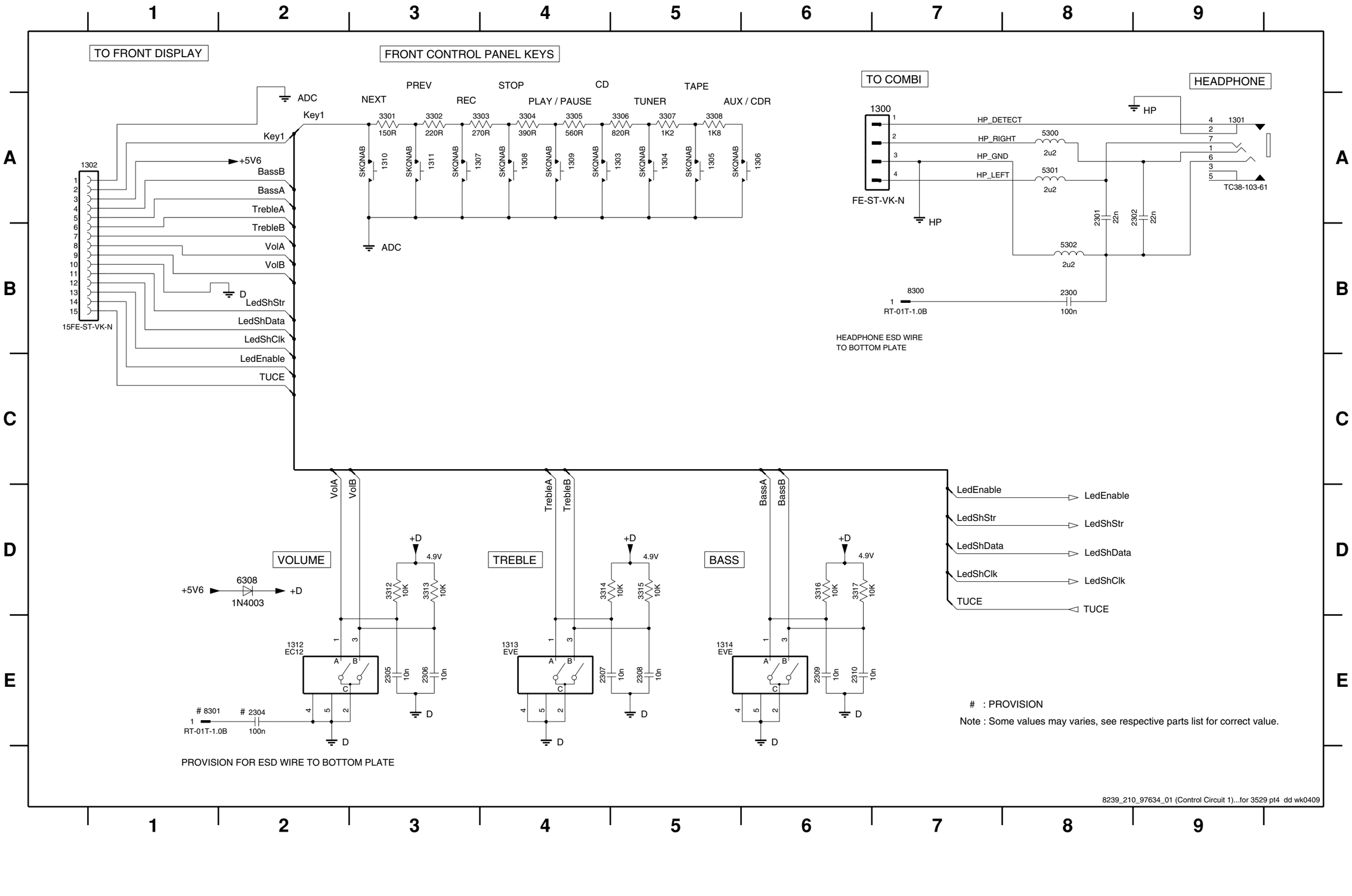


2300 B5
2301 B5
2302 B5
2304 B1
2305 B1
2306 B1
2307 B2
2308 B2
2309 B3
2310 B3
2311 A2
2312 A2
2313 A2
2314 A1
2315 A2
2316 A1
3301 B4
3302 B4
3303 A4
3304 A4
3305 A4
3306 A4
3307 A4
3308 A3
3312 B1
3313 B1
3314 B3
3315 B3
3316 B3
3317 B2
3318 B2
3319 A2
3320 A1
3321 A2
3322 A2
3323 A2
3324 A2
3325 A4
3326 A4
3327 A5
3328 A5
3329 A5
3330 A5
3331 A1
3332 A1
3333 A1
3334 A1
3335 B1
3336 A1
4310 A2
4311 B1
4312 B2
4313 A2
4314 A2
4315 A2
4316 B4
5300 B5
5301 B5
5302 B5
5303 A2
5304 A2
6309 A1
7301 A2
7302 A1

6-9

CONTROL BOARD - CIRCUIT DIAGRAM PART 1

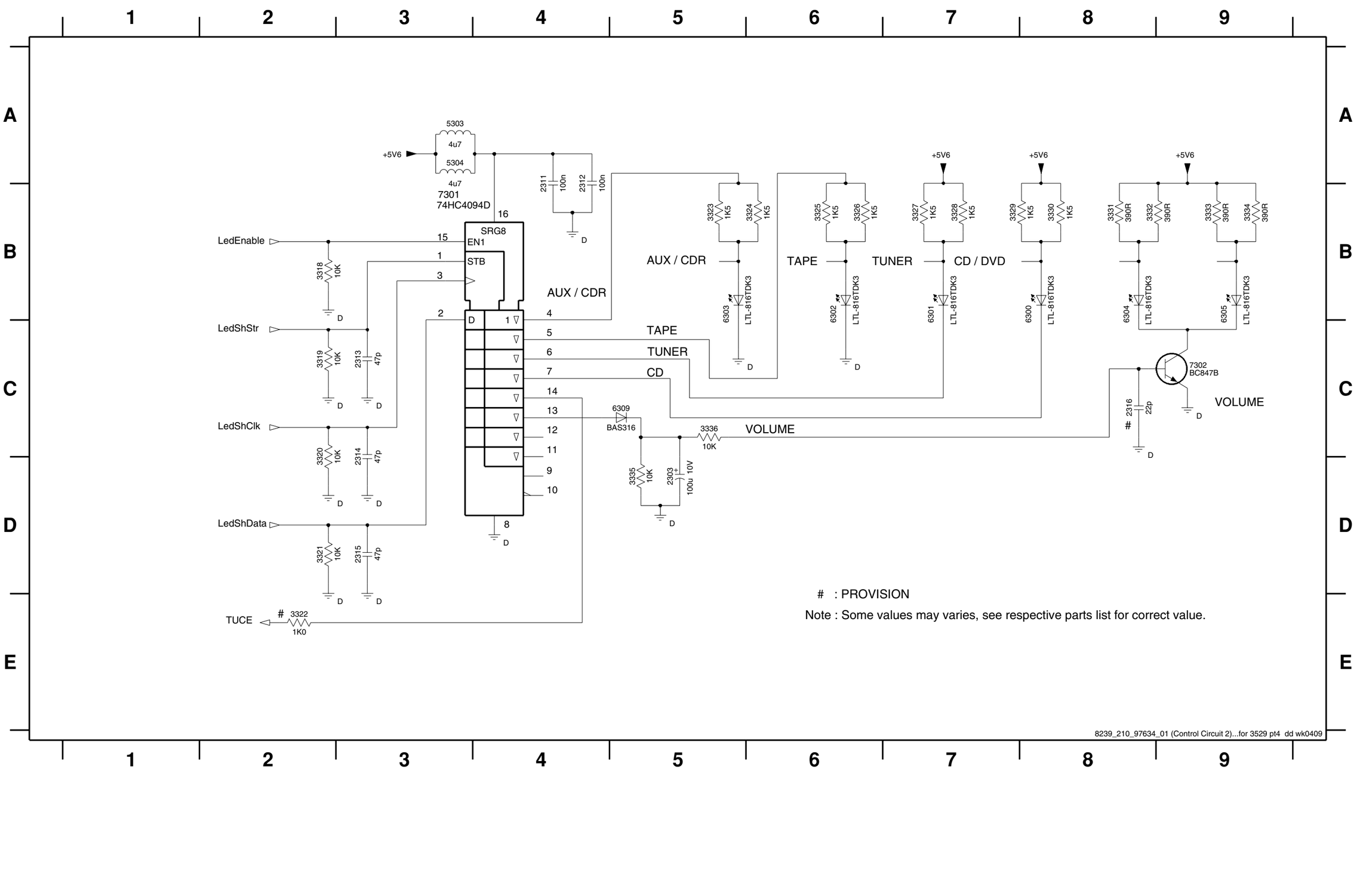
1300 A7 1302 A1 1304 A5 1306 A6 1308 A4 1310 A3 1312 E2 1314 E5 2301 A8 2304 E2 2306 E3 2308 E5 2310 E6 3302 A3 3304 A4 3306 A5 3308 A5 3313 D3 3315 D5 3317 D6 5301 A8 6308 D2 8301 E2
1301 A9 1303 A5 1305 A5 1307 A3 1309 A4 1311 A3 1313 E4 2300 B8 2302 A9 2305 E3 2307 E4 2309 E6 3301 A3 3303 A4 3305 A4 3307 A5 3312 D3 3314 D4 3316 D6 5300 A8 5302 B8 8300 B7



6-10

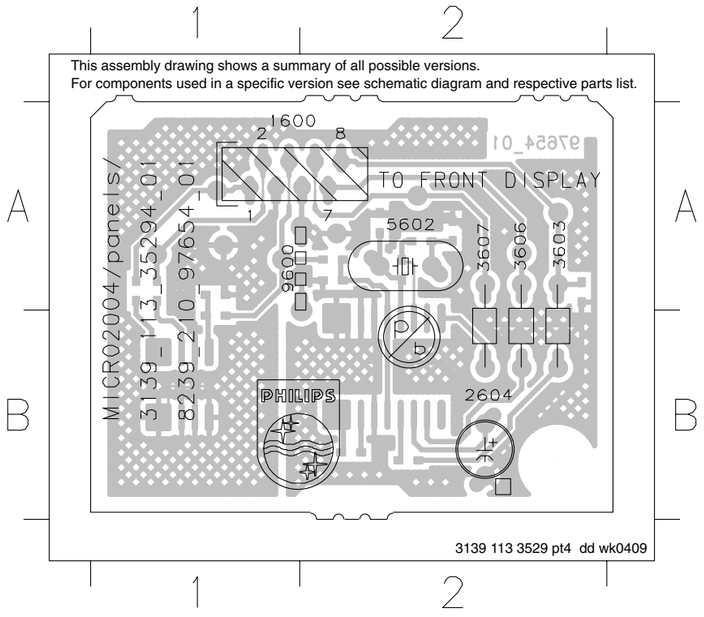
CONTROL BOARD - CIRCUIT DIAGRAM PART 2

2303 D5 2312 A4 2314 C3 2316 C8 3319 C2 3321 D2 3323 B5 3325 B6 3327 B7 3329 B7 3331 B8 3333 B9 3335 D5 5303 A3 6300 B8 6302 B6 6304 B8 6309 C5 7302 C9
2311 A4 2313 C3 2315 D3 3318 B2 3320 C2 3322 E2 3324 B6 3326 B6 3328 B7 3330 B8 3332 B8 3334 B9 3336 C5 5304 A3 6301 B7 6303 B5 6305 B9 7301 B3



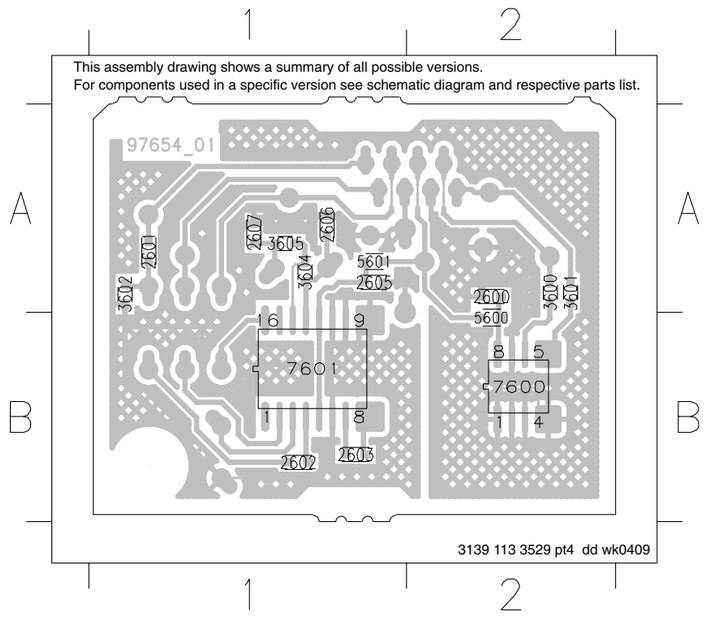
EEPROM BOARD - COMPONENT LAYOUT

1600 A1 3603 A2 3607 A2 9600 A1
2604 B2 3606 A2 5602 A2



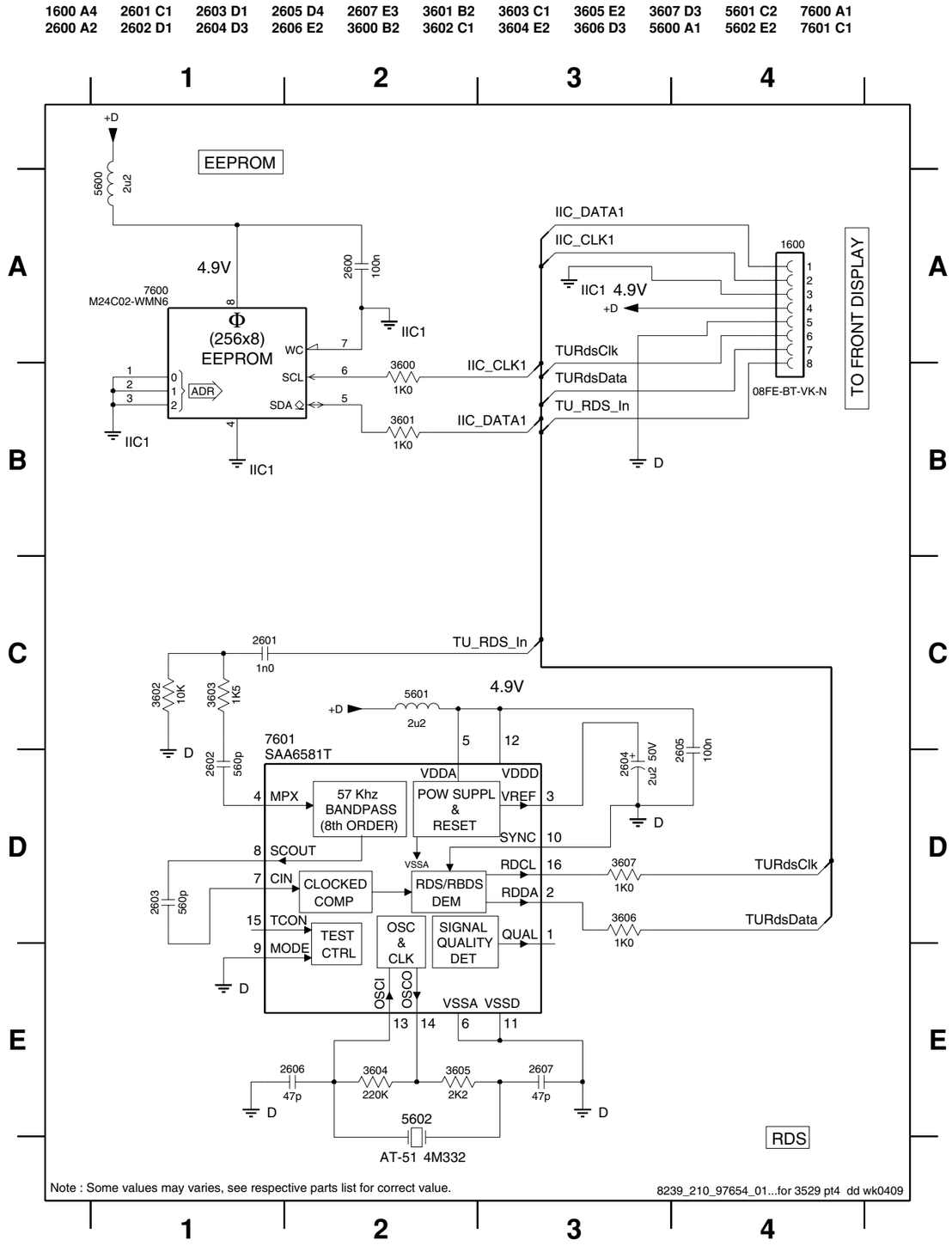
EEPROM BOARD - CHIP LAYOUT

2600 A2 2605 A1 3601 A2 5600 B2
2601 A1 2606 A1 3602 A1 5601 A1
2602 B1 2607 A1 3604 A1 7600 B2
2603 B1 3600 A2 3605 A1 7601 B1



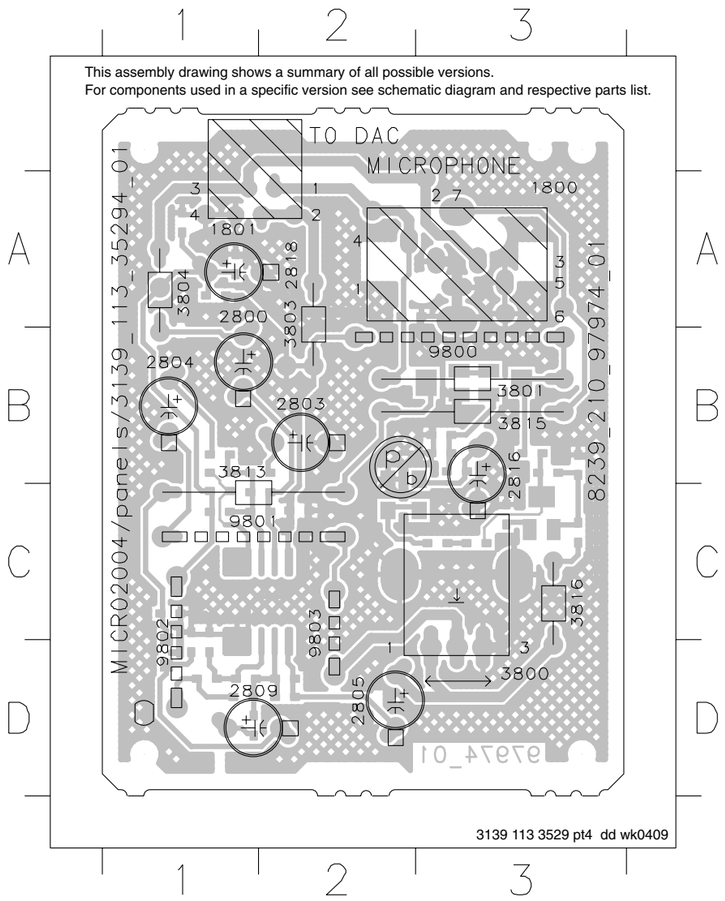
EEPROM BOARD - CIRCUIT DIAGRAM

1600 A4 2601 C1 2603 D1 2605 D4 2607 E3 3601 B2 3603 C1 3605 E2 3607 D3 5601 C2 7600 A1
2600 A2 2602 D1 2604 D3 2606 E2 3600 B2 3602 C1 3604 E2 3606 D3 5600 A1 5602 E2 7601 C1



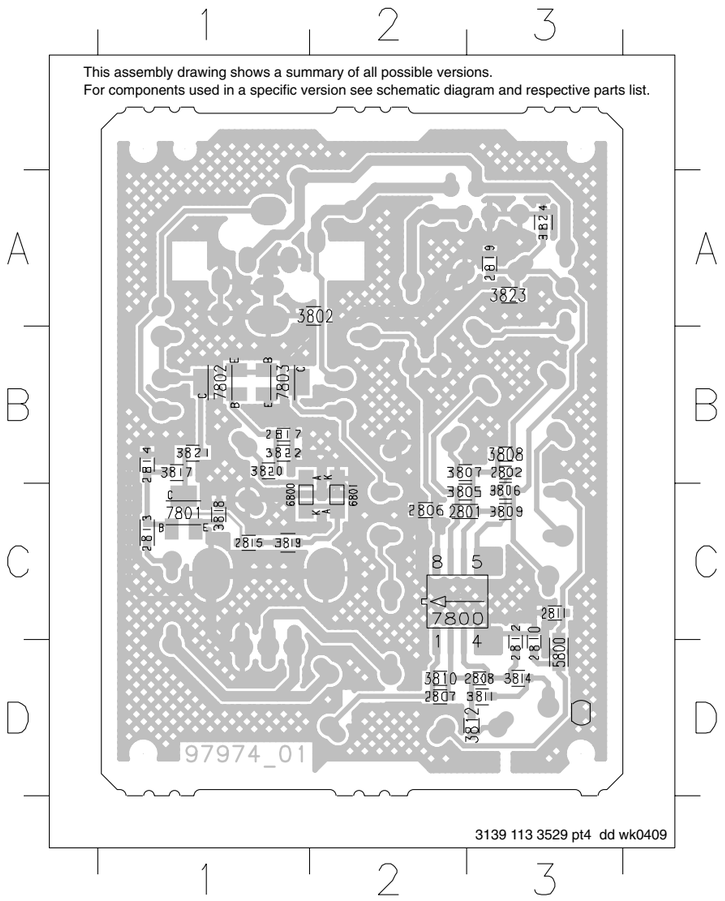
KARAOKE BOARD - COMPONENT LAYOUT (For MCD9 only)

1800 A3	2805 D2	3801 B3	3816 C3
1801 A1	2809 D1	3803 A2	9800 B3
2800 A1	2816 B3	3804 A1	9801 C1
2803 B2	2818 A2	3813 B1	9802 D1
2804 B1	3800 D3	3815 B3	9803 C2



KARAOKE BOARD - CHIP LAYOUT (For MCD9 only)

2801 C2	2815 C1	3811 D3	3824 A3
2802 B3	2817 B1	3812 D3	5800 D3
2806 C2	2819 A3	3814 D3	6800 C1
2807 D2	3802 A2	3817 B1	6801 C2
2808 D3	3805 C2	3818 C1	7800 C2
2810 D3	3806 C3	3819 C1	7801 C1
2811 C3	3807 B2	3820 B1	7802 B1
2812 D3	3808 B3	3821 B1	7803 B1
2813 C1	3809 C3	3822 B1	
2814 B1	3810 D2	3823 A3	



6-13

KARAOKE BOARD - CIRCUIT DIAGRAM (For MCD9 only)

1800 B1	2801 C7	2804 B6	2807 C4	2810 B3	2813 D5	2816 E3	2819 E6	3802 A3	3805 C7	3808 B6	3811 B4	3814 A2	3817 D4	3820 D3	3823 E7	6800 D3	7800-B B7	7803 D2
1801 B9	2802 B6	2805 B5	2808 B4	2811 B2	2814 E4	2817 E2	3800 B5	3803 B9	3806 B6	3809 C6	3812 B3	3815 B1	3818 E4	3821 D3	3824 E7	6801 E4	7801 D4	
2800 B7	2803 C6	2806 A5	2809 B3	2812 B2	2815 D4	2818 E7	3801 A3	3804 B8	3807 C6	3810 C4	3813 B2	3816 D5	3819 D4	3822 E3	5800 B3	7800-A B4	7802 D2	

ONLY USED FOR MCD9 VERSION

Microphone

MIC IN

TC38-103-61

MIC-ALC

TO DAC

FE-ST-VK-N

Note : Some values may varies, see respective parts list for correct value.

6-14

ELECTRICAL PARTS LIST - FRONT BOARD

ELECTRICAL PARTS LIST - FRONT BOARD

MISCELLANEOUS

1300	4822 265 11183	Flex Connector 4P	2410	4822 122 33761	22pF 5% 50V		3324	4822 051 30152	1k5 5% 0,062W		3440	4822 051 30102	1k 5% 0,062W	
1301	2422 026 05563	Headphone Socket	2411	4822 122 33761	22pF 5% 50V		3325	4822 051 30152	1k5 5% 0,062W		3441	4822 051 30102	1k 5% 0,062W	
1302	4822 265 10979	Flex Connector 15P	2412	2020 552 94427	100pF 5% 50V		3326	4822 051 30152	1k5 5% 0,062W		3442	4822 051 30101	100R 5% 0,062W	
1303	4822 276 13775	Tact Switch	2413	2020 552 94427	100pF 5% 50V		3327	4822 051 30152	1k5 5% 0,062W		3443	4822 051 30101	100R 5% 0,062W	
1304	4822 276 13775	Tact Switch	2414	2020 552 94427	100pF 5% 50V		3328	4822 051 30152	1k5 5% 0,062W		3444	4822 051 30102	1k 5% 0,062W	
1305	4822 276 13775	Tact Switch	2417	2020 552 94427	100pF 5% 50V		3329	4822 051 30152	1k5 5% 0,062W		3445	4822 051 30102	1k 5% 0,062W	
1306	4822 276 13775	Tact Switch	2418	2020 552 94427	100pF 5% 50V		3330	4822 051 30152	1k5 5% 0,062W		3446	4822 051 30471	470R 5% 0,062W	
1307	4822 276 13775	Tact Switch	2419	2020 552 94427	100pF 5% 50V		3331	4822 051 30391	390R 5% 0,062W		3447	4822 051 30471	470R 5% 0,062W	
1308	4822 276 13775	Tact Switch	2420	2020 552 94427	100pF 5% 50V		3332	4822 051 30391	390R 5% 0,062W		3448	4822 051 30471	470R 5% 0,062W	
1309	4822 276 13775	Tact Switch	2444	2238 586 59812	100nF +80/-20% 50V		3333	4822 051 30391	390R 5% 0,062W		3452	4822 051 30471	470R 5% 0,062W	
1310	4822 276 13775	Tact Switch	2450	4822 124 81286	47uF 20% 16V		3334	4822 051 30391	390R 5% 0,062W		3453	4822 051 30102	1k 5% 0,062W	
1311	4822 276 13775	Tact Switch	2451	2238 586 59812	100nF +80/-20% 50V		3335	4822 051 30103	10k 5% 0,062W		3454	4822 051 30102	1k 5% 0,062W	
1312	2422 129 16708	Rotary Encoder 24P	2453	4822 124 81286	47uF 20% 16V		3336	4822 051 30103	10k 5% 0,062W		3455	4822 051 30102	1k 5% 0,062W	
1313	2422 129 00039	Rotary Encoder 24P	2457	4822 124 81286	47uF 20% 16V		3350	4822 051 30151	150R 5% 0,062W		3456	4822 051 30102	1k 5% 0,062W	
1314	2422 129 00039	Rotary Encoder 24P	2460	2020 552 94427	100pF 5% 50V		3351	4822 051 30221	220R 5% 0,062W		3457	4822 051 30102	1k 5% 0,062W	
1331	4822 276 13775	Tact Switch	2461	4822 124 12032	4,7uF 20% 50V		3352	4822 051 30271	270R 5% 0,062W		3458	4822 051 30102	1k 5% 0,062W	
1332	4822 276 13775	Tact Switch	2462	4822 124 12032	4,7uF 20% 50V		3400	4822 117 12968	820R 5% 0,62W		3459	4822 051 30102	1k 5% 0,062W	
1333	4822 276 13775	Tact Switch	2463	4822 124 12032	4,7uF 20% 50V		3401	4822 117 12925	47k 1% 0,063W		3460	4822 051 30102	1k 5% 0,062W	
1334	4822 276 13775	Tact Switch	2464	4822 124 12032	4,7uF 20% 50V		3403	4822 117 13632	100k 1% 0,62W		3461	4822 051 30102	1k 5% 0,062W	
1400	3139 110 53601	FTD HNA-13SM42	2473	4822 124 12032	4,7uF 20% 50V		3404	4822 051 30684	680k 5% 0,062W		3462	4822 051 30102	1k 5% 0,062W	
1401	4822 265 11545	Flex Connector 19P	2474	4822 126 14238	2,2nF 50V		3405	4822 051 30102	1k 5% 0,062W		3463	4822 051 30471	470R 5% 0,062W	
1402	4822 265 11531	Flex Connector 9P	2480	2020 552 94427	100pF 5% 50V		3406	4822 117 12891	220k 1%		3464	4822 051 30471	470R 5% 0,062W	
1405	4822 265 10979	Flex Connector 15P	2600	2238 586 59812	100nF +80/-20% 50V		3407	4822 051 30102	1k 5% 0,062W		3465	4822 051 30272	2k7 5% 0,062W	
1406	4822 265 11535	Flex Connector 8P	2601	5322 126 11578	1nF 10% 50V	/22/25	3408	4822 051 30102	1k 5% 0,062W		3466	4822 051 30102	1k 5% 0,062W	
1407	4822 267 10956	Flex Connector 7P	2602	4822 126 14249	560pF 10% 50V	/22/25	3409	4822 051 30102	1k 5% 0,062W		3467	4822 051 30102	1k 5% 0,062W	
1600	4822 265 11515	Flex Connector 8P	2603	4822 126 14249	560pF 10% 50V	/22/25	3410	4822 051 30102	1k 5% 0,062W		3468	4822 051 30102	1k 5% 0,062W	
			2604	4822 124 22652	2,2uF 20% 50V	/22/25	3411	4822 051 30102	1k 5% 0,062W		3469	4822 051 30102	1k 5% 0,062W	

CAPACITORS

2300	2238 586 59812	100nF +80/-20% 50V	2605	2238 586 59812	100nF +80/-20% 50V	/22/25	3412	4822 051 30102	1k 5% 0,062W		3470	4822 051 30102	1k 5% 0,062W	
2301	2238 916 15641	22nF 10% 25V	2606	4822 126 11785	47pF 5% 50V	/22/25	3413	4822 051 30103	10k 5% 0,062W		3471	4822 051 30102	1k 5% 0,062W	
2302	2238 916 15641	22nF 10% 25V	2607	4822 126 11785	47pF 5% 50V	/22/25	3414	4822 051 30103	10k 5% 0,062W		3472	4822 051 30102	1k 5% 0,062W	
2303	9965 000 14169	100uF 10V 20%					3415	4822 051 30102	1k 5% 0,062W		3473	4822 051 30102	1k 5% 0,062W	
2305	5322 126 11583	10nF 10% 50V					3416	4822 051 30102	1k 5% 0,062W		3474	4822 051 30102	1k 5% 0,062W	
2306	5322 126 11583	10nF 10% 50V					3417	4822 051 30102	1k 5% 0,062W		3475	4822 051 30102	1k 5% 0,062W	
2307	5322 126 11583	10nF 10% 50V					3418	4822 051 30102	1k 5% 0,062W		3476	4822 051 30102	1k 5% 0,062W	
2308	5322 126 11583	10nF 10% 50V					3419	4822 051 30102	1k 5% 0,062W		3477	4822 051 30102	1k 5% 0,062W	
2309	5322 126 11583	10nF 10% 50V					3420	4822 050 21003	10k 1% 0,6W		3478	4822 051 30102	1k 5% 0,062W	
2310	5322 126 11583	10nF 10% 50V					3421	4822 051 30103	10k 5% 0,062W		3479	4822 051 30102	1k 5% 0,062W	
2311	2238 586 59812	100nF +80/-20% 50V					3422	4822 051 30102	1k 5% 0,062W		3480	4822 051 30102	1k 5% 0,062W	
2312	2238 586 59812	100nF +80/-20% 50V					3423	4822 051 30102	1k 5% 0,062W		3481	4822 051 30102	1k 5% 0,062W	
2313	4822 126 11785	47pF 5% 50V					3424	4822 051 30102	1k 5% 0,062W		3482	4822 051 30102	1k 5% 0,062W	
2314	4822 126 11785	47pF 5% 50V					3425	4822 051 30102	1k 5% 0,062W		3483	4822 051 30102	1k 5% 0,062W	
2315	4822 126 11785	47pF 5% 50V					3426	4822 051 30102	1k 5% 0,062W		3484	4822 051 30102	1k 5% 0,062W	
2401	3198 017 44740	470nF 10V					3427	4822 051 30102	1k 5% 0,062W		3485	4822 051 30102	1k 5% 0,062W	
2402	5322 126 11583	10nF 10% 50V					3428	4822 051 30102	1k 5% 0,062W		3486	4822 051 30102	1k 5% 0,062W	
2403	5322 126 11583	10nF 10% 50V					3431	4822 051 30102	1k 5% 0,062W		3487	4822 051 30102	1k 5% 0,062W	
2404	3198 028 52290	22uF 20% 50V					3432	4822 051 30472	4k7 5% 0,062W		3488	4822 051 30102	1k 5% 0,062W	
2405	3198 028 52290	22uF 20% 50V					3433	4822 116 52263	2k7 5% 0,5W		3489	4822 051 30102	1k 5% 0,062W	
2407	2222 867 15339	33pF 5% 50V					3434	4822 116 83883	470R 5% 0,5W		3490	4822 117 12864	82k 5% 0,6W	
2408	4822 122 33761	22pF 5% 50V					3435	4822 051 30102	1k 5% 0,062W	/22/25	3491	4822 051 30103	10k 5% 0,062W	
2409	4822 126 14223	2,2pF 50V					3436	3198 021 32250	RST SM 0603 2M2 5%		3492	4822 117 12864	82k 5% 0,6W	
							3439	4822 051 30102	1k 5% 0,062W		3493	4822 117 12864	82k 5% 0,6W	

RESISTORS

3301	4822 051 30151	150R 5% 0,062W												
3302	4822 051 30221	220R 5% 0,062W												
3303	4822 051 30271	270R 5% 0,062W												
3304	4822 051 30391	390R 5% 0,062W												
3305	4822 051 30561	560R 5% 0,062W												
3306	4822 117 12968	820R 5% 0,62W												
3307	4822 117 11817	1k2 1% 1/16W												
3308	4822 117 12903	1k8 1% 0,063W												
3312	4822 051 30103	10k 5% 0,062W												
3313	4822 051 30103	10k 5% 0,062W												
3314	4822 051 30103	10k 5% 0,062W												
3315	4822 051 30103	10k 5% 0,062W												
3316	4822 051 30103	10k 5% 0,062W												
3317	4822 051 30103	10k 5% 0,062W												
3318	4822 051 30103	10k 5% 0,062W												
3319	4822 051 30103	10k 5% 0,062W												
3320	4822 051 30103	10k 5% 0,062W												
3321	4822 051 30103	10k 5% 0,062W												
3323	4822 051 30152	1k5 5% 0,062W												

6-15

ELECTRICAL PARTS LIST - FRONT BOARD

ELECTRICAL PARTS LIST - FRONT BOARD

RESISTORS

3494	4822 051 30682	6k8 5% 0,062W	
3495	4822 051 30682	6k8 5% 0,062W	
3496	4822 051 30103	10k 5% 0,062W	/21
3497	4822 050 21003	10k 1% 0,6W	/21
3498	4822 051 30101	100R 5% 0,062W	
3499	4822 051 30101	100R 5% 0,062W	
3500	4822 051 30221	220R 5% 0,062W	
3501	4822 051 30221	220R 5% 0,062W	
3502	4822 051 30471	470R 5% 0,062W	
3509	4822 051 30103	10k 5% 0,062W	
3510	4822 051 30103	10k 5% 0,062W	
3511	4822 051 30103	10k 5% 0,062W	
3513	4822 051 30102	1k 5% 0,062W	
3514	4822 051 30102	1k 5% 0,062W	
3515	4822 051 30102	1k 5% 0,062W	
3518	4822 116 83872	220R 5% 0,5W	
3519	4822 116 80176	1R 5% 0,5W	
3520	4822 116 80176	1R 5% 0,5W	
3521	4822 116 52257	22k 5% 0,5W	
3522	4822 116 83872	220R 5% 0,5W	
3523	4822 116 80176	1R 5% 0,5W	
3524	4822 116 80176	1R 5% 0,5W	
3527	4822 051 30101	100R 5% 0,062W	
3529	4822 051 30101	100R 5% 0,062W	
3531	4822 051 30101	100R 5% 0,062W	
3532	4822 051 30101	100R 5% 0,062W	
3533	4822 051 30103	10k 5% 0,062W	
3534	4822 051 30102	1k 5% 0,062W	
3535	4822 116 52263	2k7 5% 0,5W	
3600	4822 051 30102	1k 5% 0,062W	
3601	4822 051 30102	1k 5% 0,062W	
3602	4822 051 30103	10k 5% 0,062W	/22/25
3603	4822 116 52243	1k5 5% 0,5W	/22/25
3604	4822 117 12891	220k 1%	/22/25
3605	4822 051 30222	2k2 5% 0,062W	/22/25
3606	4822 050 11002	1k 1% 0,4W	/22/25
3607	4822 050 11002	1k 1% 0,4W	/22/25
4300	4822 051 30008	0R Jumper 0603	
4301	4822 051 30008	0R Jumper 0603	
4302	4822 051 30008	0R Jumper 0603	
4303	4822 051 30008	0R Jumper 0603	
4310	4822 051 30008	0R Jumper 0603	
4311	4822 051 30008	0R Jumper 0603	
4312	4822 051 30008	0R Jumper 0603	
4313	4822 051 30008	0R Jumper 0603	
4314	4822 051 30008	0R Jumper 0603	
4315	4822 051 30008	0R Jumper 0603	
4316	4822 051 30008	0R Jumper 0603	
4400	4822 051 30008	0R Jumper 0603	
4404	4822 051 30008	0R Jumper 0603	
4405	4822 051 30008	0R Jumper 0603	
4406	4822 051 30008	0R Jumper 0603	
4407	4822 051 30008	0R Jumper 0603	
4409	4822 051 30008	0R Jumper 0603	
4411	4822 051 30008	0R Jumper 0603	
4420	4822 051 30008	0R Jumper 0603	
4421	4822 051 30008	0R Jumper 0603	
4423	4822 051 30008	0R Jumper 0603	
4424	4822 051 30008	0R Jumper 0603	
4426	4822 051 30008	0R Jumper 0603	
4427	4822 051 30008	0R Jumper 0603	
4430	4822 051 30008	0R Jumper 0603	
4431	4822 051 30008	0R Jumper 0603	
4432	4822 051 30008	0R Jumper 0603	
4433	4822 051 30008	0R Jumper 0603	
4434	4822 051 30008	0R Jumper 0603	
4436	4822 051 30008	0R Jumper 0603	
4437	4822 051 30008	0R Jumper 0603	
4438	4822 051 30008	0R Jumper 0603	/22/25
4439	4822 051 30008	0R Jumper 0603	
4440	4822 051 30008	0R Jumper 0603	
4441	4822 051 30008	0R Jumper 0603	
4442	4822 051 30008	0R Jumper 0603	
4443	4822 051 30008	0R Jumper 0603	
4444	4822 051 30008	0R Jumper 0603	
4445	4822 051 30008	0R Jumper 0603	
4446	4822 051 30008	0R Jumper 0603	
4447	4822 051 30008	0R Jumper 0603	
4448	4822 051 30008	0R Jumper 0603	
4449	4822 051 30008	0R Jumper 0603	
4450	4822 051 30008	0R Jumper 0603	
4451	4822 051 30008	0R Jumper 0603	
4452	4822 051 30008	0R Jumper 0603	
4453	4822 051 30008	0R Jumper 0603	
4454	4822 051 30008	0R Jumper 0603	
4455	4822 051 30008	0R Jumper 0603	
4456	4822 051 30008	0R Jumper 0603	
4457	4822 051 30008	0R Jumper 0603	/22/25
4458	4822 051 30008	0R Jumper 0603	

COILS & FILTERS

5300	3198 018 52280	FXDIND SM 0603 2U2 10%	
5301	3198 018 52280	FXDIND SM 0603 2U2 10%	
5302	3198 018 52280	FXDIND SM 0603 2U2 10%	
5303	3198 018 54780	FXDIND SM 0603 4U7 10%	
5304	3198 018 54780	FXDIND SM 0603 4U7 10%	
5400	5322 242 73686	RES CER 12MHz	
5401	2422 543 01069	RES XTL 32,768kHz	
5402	3198 018 54780	FXDIND SM 0603 4U7 10%	
5403	3198 018 54780	FXDIND SM 0603 4U7 10%	
5404	4822 157 62552	Coil 2,2uH 5%	
5405	4822 157 62552	Coil 2,2uH 5%	
5406	4822 157 62552	Coil 2,2uH 5%	
5407	4822 157 62552	Coil 2,2uH 5%	
5600	3198 018 52280	FXDIND SM 0603 2U2 10%	
5601	3198 018 52280	FXDIND SM 0603 2U2 10%	/22/25
5602	4822 242 11033	RES XTL 4,332MHz	/22/25

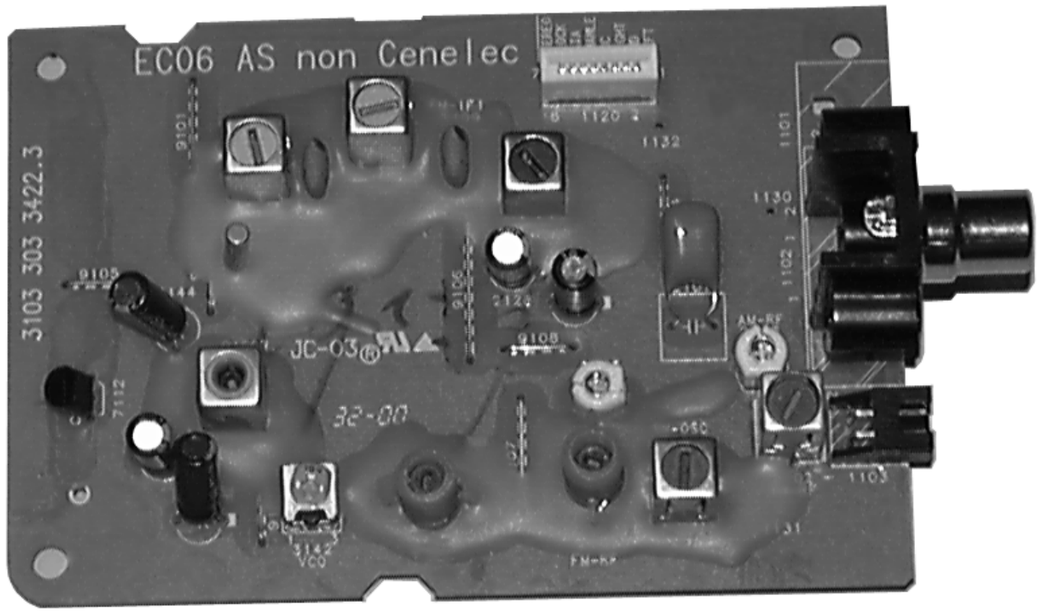
DIODES

6300	9322 190 55676	LED VS LTL-816TDK3	
6301	9322 190 55676	LED VS LTL-816TDK3	
6302	9322 190 55676	LED VS LTL-816TDK3	
6303	9322 190 55676	LED VS LTL-816TDK3	
6304	9322 190 55676	LED VS LTL-816TDK3	
6305	9322 190 55676	LED VS LTL-816TDK3	
6306	9322 179 76676	LED VS LTL-816EELC	
6308	4822 130 31878	1N4003G	
6309	4822 130 11397	BAS316	
6400	4822 130 30621	1N4148	
6401	4822 130 30621	1N4148	
6402	4822 130 30621	1N4148	
6403	4822 130 30621	1N4148	
6404	4822 130 30621	1N4148	
6405	4822 130 31878	1N4003G	
6406	4822 130 31878	1N4003G	
6407	4822 130 31878	1N4003G	
6408	4822 130 30621	1N4148	
6409	4822 130 34278	BZX79-B6V8	
6410	4822 130 30621	1N4148	

TRANSISTORS & INTEGRATED CIRCUITS

7301	4822 209 15449	IC SM 74HC4094D	
7302	5322 130 60159	BC847B	
7400	3139 110 53741	TMP88CU74YF - 'MCM7/8S53741'	
7401	4822 130 60373	BC857B	
7402	5322 130 60159	BC847B	
7403	9322 185 95667	IR Receiver TSOP4836ZC1	
7404	5322 130 60159	BC847B	
7405	5322 130 60159	BC847B	
7407	5322 130 60159	BC847B	
7408	5322 130 60159	BC847B	
7600	9322 145 26668	IC SM M24C02-WMN6	
7601	9352 686 05118	IC SM SAA6581T	/22/25

Note : Only the parts mentioned in this list are normal service spare parts.



ECO6 Tuner Board

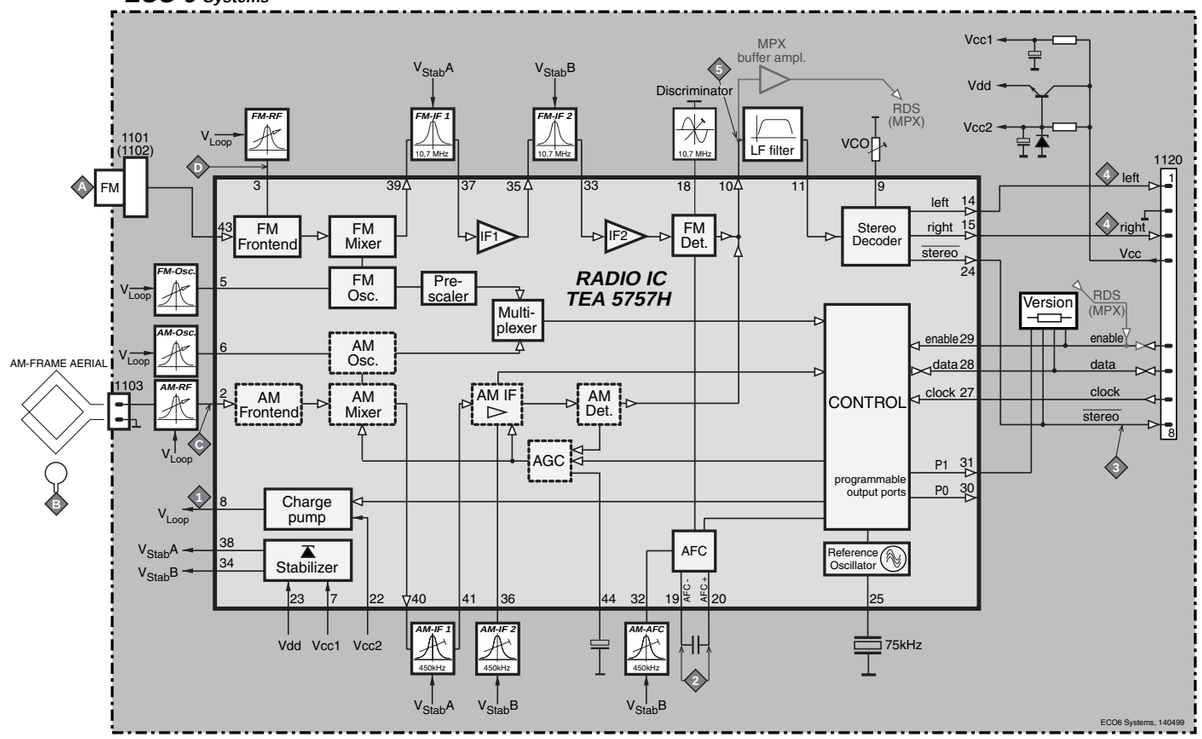
version: ***SYSTEMS non-CENELEC***

TABLE OF CONTENTS

7A-1

BLOCK DIAGRAM

TUNER BOARD
ECO 6 Systems



7A-2

TUNER BOARD ECO6 / SYSTEMS NON CENELEC

VERSION PROGRAMMING COMPONENTS

VERSION	6120	3156	3157	3170	7111
/00 /02 FM/MW/LW	X				
/00 /02 FM/MW		X	X		X
/01 FM/MW		X	X		X
/14 FM-OIRT/MW		X	X		X
/17 FM/AM	X				
/06 FM-Japan/AM				X	X

X component mounted

VERSION DETECTION

LEGEND

(p)...for provision only
USA ... for USA version only
E-EU ... for East European version only
J ... for Japanese version only

...V FM mode stereo
...V MW mode
(V) EVM ...V LW mode
voltages measured while set is tuned to a strong transmitter

Signal path
FM
AM
MPX (Audio Frequency)
AF - left/right

ECO6 Sys-non Cenelec, 000911

These assembly drawings show a summary of all possible versions.
For components used in a specific version see schematic diagram respectively partslist.

7A-3

TUNER ADJUSTMENT TABLE (ECO6 FM/MW- and FM/MW/LW - versions with AM-frame aerial)

Waverange	Input frequency	Input	Tuned to	Adjust	Output	Scope/Voltmeter
VARICAP ALIGNMENT						
FM 87.5 - 108MHz (65.81 - 74, 87.5 - 108MHz)			108MHz	5130	◇1	8V ±0.2V
			87.5MHz (65.81MHz)	check		4.3V ±0.5V (1.2V ±0.5V)
MW FM/AM-version, 10kHz grid 530 - 1700kHz			1700kHz	5123		8V ±0.2V
			530kHz	check		1.1V ±0.4V
FM/MW-version, 9kHz grid 531 - 1602kHz			1602kHz	5123		6.9V ±0.2V
			531kHz	check		1.1V ±0.4V
LW 153 - 279kHz			279kHz	5122		8V ±0.2V
			153kHz	check		1.1V ±0.4V
MW FM/MW/LW- version, 9kHz grid 531 - 1602kHz			1602kHz	5123		8V ±0.2V
			531kHz	check		1.1V ±0.4V
FM IF						
FM	10.7MHz, 45mV continuous wave	◇D	IC 7101 21 shortcircuit to block AFC 2141	5119	◇2	0 ± 3 mV DC
FM RF						
FM 87.5 - 108MHz (65.81 - 74, 87.5 - 108MHz)	108MHz	◇A mod=1kHz Δf=±22.5kHz	108MHz	2155	◇4	MAX
	87.5MHz (65.81MHz)		87.5MHz (65.81MHz)	5131		
VCO						
FM	98MHz, 1mV continuous wave	◇A	98MHz	3142	◇3	152kHz ±1kHz [1]
AM IF						
MW	450kHz connect pin 6 of IC 7101 (AM Osc.) with 3.3kΩ to Vcc	◇C Δf=±10kHz V_{RF} = 0.5mV (as low as possible)	IC 7101 36 100nF 220R	5111	◇5	max. f_o symmetric
			see remark [2] IC 7101 40 100nF 220R	5112		
AM AFC **MW**		◇C continuous wave V_{RF} = 2mV		5114	◇2	0 ± 2 mV DC
AM RF [3]						
MW [4] FM/MW/LW- and FM/MW-version (9kHz grid) 531 - 1602kHz	1494kHz	◇B Δf = ±30kHz V_{RF} as low as possible	1494kHz	2106	◇5	max. f_o symmetric
	558kHz		558kHz	5102		
LW	198kHz		198kHz	5103		
MW FM/AM-version, 10kHz grid 530 - 1700kHz	1500kHz		1500kHz	2106		
	560kHz		560kHz	5102		

ECO6, Sys + PA with frame aerial, 070799

Use Service Testprogram. By selecting the TUNER TEST test frequencies will be stored as preset frequencies automatically.

[1] If sensitivity of frequency counter is too low adjust to max. channel separation (input signal: stereo left 90% + 9%, adjust output on right channel to minimum)

[2] RC network serves for damping the IF-filter while adjusting the other one.

[3] For AM RF adjustments the original frame antenna has to be used !

[4] MW has to be aligned before LW.

↕ Repeat

Electrical Partslist *ECO6* *SYSTEMS NON-CENELEC*

7A-4

MISCELLANEOUS

1101	2422 015 19376	SOCKET 2P CLICKFIT	USA only
1102	4822 267 10283	SOCKET COAX, IEC 75Ω	not USA
1103	4822 265 31184	JST CONNECTOR 2 POLE	
1120	4822 265 11515	FFC SOCKET, 8P	

CAPACITORS

2101 ©	4822 126 13692	47pF	1%	63V	
2102 ©	4822 126 13838	100nF	10%	50V	not USA
2103 ©	5322 122 31647	1nF	10%	63V	
2104 ©	5322 122 32531	100pF	5%	50V	
2105 ©	4822 126 13838	100nF	10%	50V	USA only
2106	2020 800 00191	3-11pF TRIMCAP.,N450			
2107	4822 121 51319	1µF	20%	50V	
2120 ©	4822 126 13689	18pF	1%	63V	
2124 ©	5322 122 32654	22nF	10%	63V	
2125 ©	2020 552 96199	560pF	1%	50V	
2126 ©	5322 122 31863	330pF	5%	50V	
2127 ©	4822 126 14076	220nF	20%	25V	
2128	4822 124 40248	10µF	20%	63V	
2129	4822 124 41584	100µF	20%	10V	
2130 ©	5322 122 32654	22nF	10%	63V	
2131 ©	4822 126 13482	470nF	20%	16V	
2132 ©	4822 126 13482	470nF	20%	16V	
2133	4822 124 21913	1µF	20%	63V	
2134 ©	4822 126 13188	15nF	5%	63V	not USA
2134 ©	5322 122 32654	22nF	10%	63V	USA only
2135 ©	4822 126 13188	15nF	5%	63V	not USA
2135 ©	5322 122 32654	22nF	10%	63V	USA only
2136 ©	4822 126 14076	220nF	20%	25V	
2137 ©	4822 126 14076	220nF	20%	25V	
2138	4822 124 22652	2,2µF	20%	50V	
2139 ©	4822 126 14236	15pF	5%	50V	
2140 ©	4822 126 13695	82pF	1%	63V	
2141 ©	4822 126 13838	100nF	10%	50V	
2143 ©	4822 126 14076	220nF	20%	25V	
2144	4822 124 21913	1µF	20%	63V	
2145 ©	4822 122 33575	220pF	5%	50V	
2146 ©	4822 122 33575	220pF	5%	50V	
2147 ©	4822 122 33575	220pF	5%	50V	
2148 ©	4822 122 33127	2,2nF	10%	63V	
2149 ©	5322 122 32659	33pF	5%	50V	RDS only
2150 ©	4822 126 13838	100nF	10%	50V	
2152 ©	4822 126 12105	33nF	5%	63V	not for East Europe
2152 ©	5322 116 80853	560pF	5%	63V	for East Europe only
2153 ©	4822 126 13486	15pF	2%	63V	not for East Europe
2153 ©	4822 122 33926	12pF	2%	50V	for East Europe only
2155	2020 800 00191	3-11pF TRIMCAP.,N450			
2159 ©	5322 122 32659	33pF	5%	50V	
2164 ©	4822 126 13482	470nF	20%	16V	
2165 ©	4822 126 13838	100nF	10%	50V	
2166 ©	5322 122 31647	1nF	10%	63V	
2167 ©	4822 122 33926	12pF	5%	50V	
2169 ©	4822 122 33127	2,2nF	10%	63V	RDS only

RESISTORS

3101 ©	4822 051 20333	33kΩ	5%	0,1W	
3102 ©	4822 117 10837	100kΩ	1%	0,1W	
3103 ©	4822 051 20822	8,2kΩ	5%	0,1W	
3104 ©	4822 117 13577	330Ω	1%	0,1W	
3105 ©	4822 117 11503	220Ω	5%	0,1W	
3132 ©	4822 051 20479	47Ω	5%	0,1W	
3134 ©	4822 051 20223	22kΩ	5%	0,1W	
3141 ©	4822 117 11148	56kΩ	1%	0,1W	
3142	4822 100 12159	TRIMPOT. 100kΩ			

RESISTORS

3143 ©	4822 051 20223	22kΩ	5%	0,1W	RDS only
3144 ©	4822 051 10102	1kΩ	2%	0,25W	RDS only
3145©	4822 117 11449	2,2kΩ	1%	0,1W	
3146 ©	4822 051 20229	22Ω	5%	0,1W	
3152 ©	4822 051 20471	470Ω	5%	0,1W	
3153 ©	4822 051 20471	470Ω	5%	0,1W	
3154 ©	4822 117 13577	330Ω	1%	0,1W	
3155 ©	4822 117 11503	220Ω	5%	0,1W	
3156 ©	4822 117 10837	100kΩ	1%	0,1W	
3157 ©	4822 117 10837	100kΩ	1%	0,1W	
3158 ©	4822 051 20471	470Ω	5%	0,1W	
3159 ©	4822 051 20471	470Ω	5%	0,1W	
3160 ©	4822 051 20471	470Ω	5%	0,1W	
3161 ©	4822 051 20223	22kΩ	5%	0,1W	
3167 ©	4822 051 20121	120Ω	5%	0,1W	
3168 ©	4822 051 20121	120Ω	5%	0,1W	
3169 ©	4822 051 20154	150kΩ	5%	0,1W	
3170 ©	4822 117 10837	100kΩ	1%	0,1W	
3172 ©	4822 051 20562	5,6kΩ	5%	0,1W	
3176 ©	4822 051 20333	33kΩ	5%	0,1W	RDS only
3181 ©	4822 051 10102	1kΩ	2%	0,25W	
4103 ©	4822 051 20008	CHIP JUMPER 0805			
4106 ©	4822 051 20008	CHIP JUMPER 0805			
4107 ©	4822 051 20008	CHIP JUMPER 0805			
4108 ©	4822 051 20008	CHIP JUMPER 0805			

COILS

5102	4822 157 71634	RF-COIL MW
5109	4822 242 70665	FM-IF FILTER 10,7MHz
5110	4822 242 70665	FM-IF FILTER 10,7MHz
5111	2422 549 44023	AM-IF FILTER 450kHz
5112	4822 157 70302	AM-IF FILTER 450kHz
5114	4822 157 70302	AM-IF FILTER 450kHz
5119	4822 157 11443	DISCRIMINATOR COIL
5121	4822 242 10261	QUARTZ 75kHz
5123	2422 549 44108	RF-COIL, AM-OSCILLATOR
5130	4822 157 11843	RF COIL 1,5 TURNS
5131	4822 157 11843	RF COIL 1,5 TURNS

DIODES

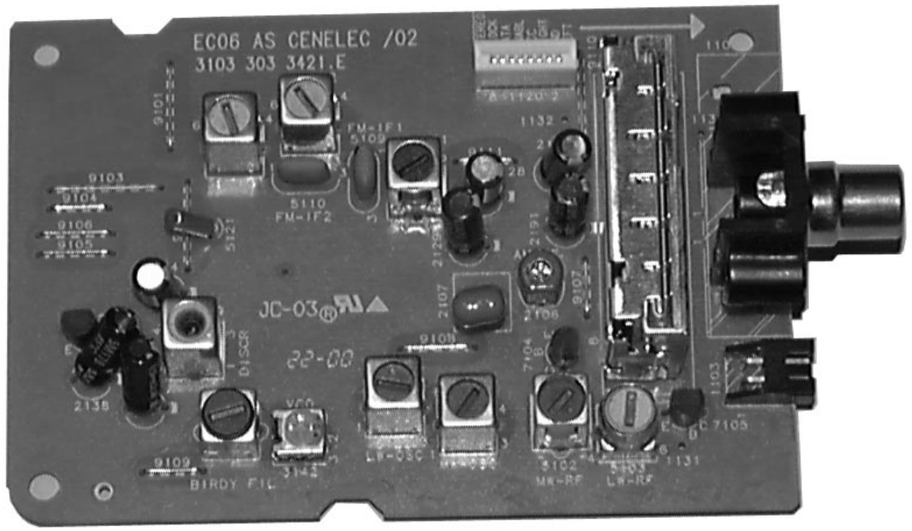
6103 ©	5322 130 34337	BAV99	
6105 ©	4822 130 83075	HN1V02H	
6106 ©	4822 130 83757	BAS216	
6107 ©	9340 386 90115	BZX284-C11	
6120 ©	4822 130 83757	BAS216	
6130 ©	4822 130 82833	1SV228	
6131 ©	4822 130 82833	1SV228	

TRANSISTORS

7102	4822 130 42131	BF550	
7103 ©	5322 130 42756	BC857C	RDS only
7111 ©	5322 130 42755	BC847C	
7112	4822 130 44503	BC547C	

INTEGRATED CIRCUITS

7101 ©	9351 740 80557	TEA5757H/V1, RADIO IC



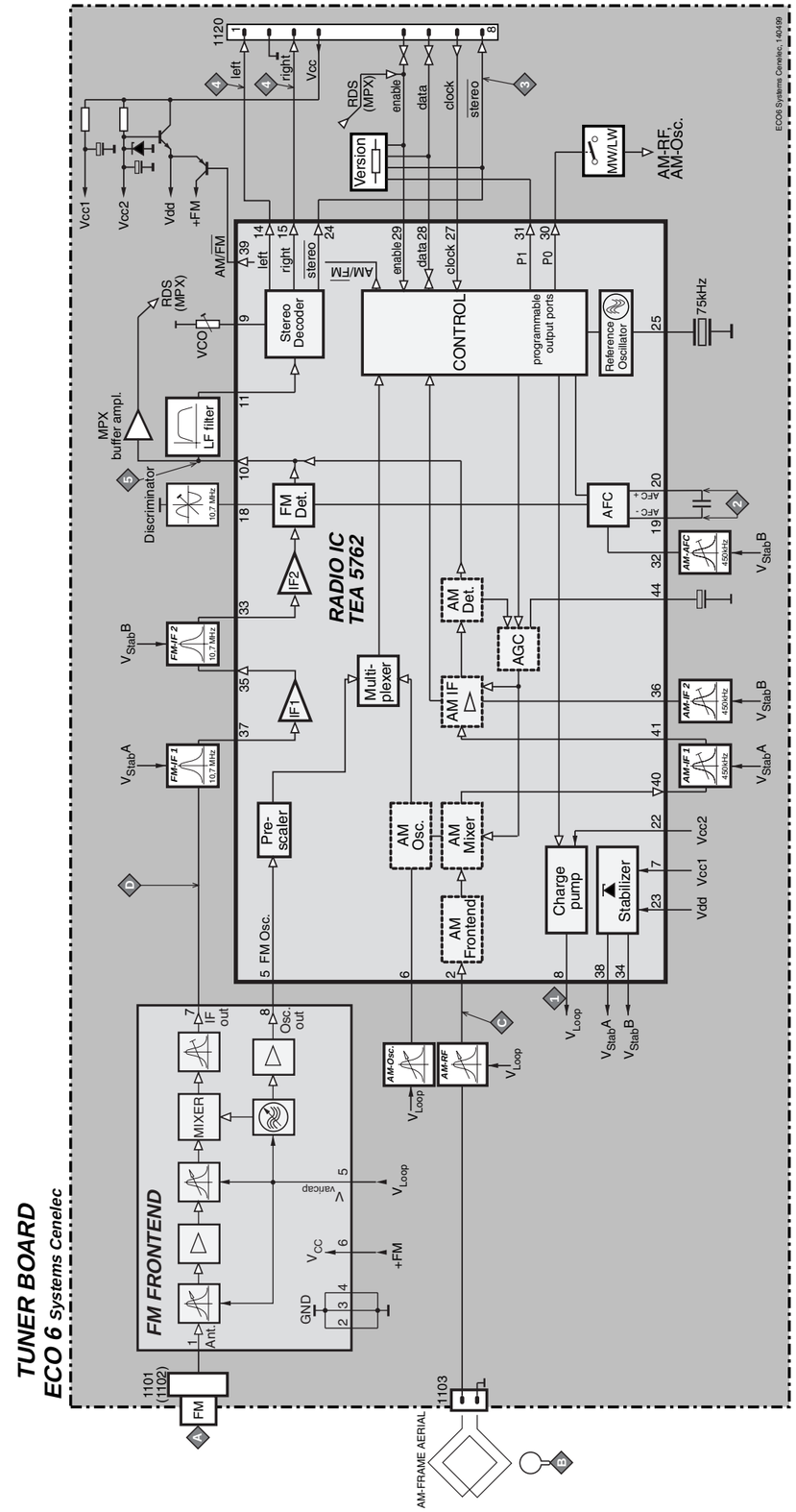
ECO6 Tuner Board

version: ***SYSTEMS CENELEC***

TABLE OF CONTENTS

7B-1

BLOCK DIAGRAM



7B-2

TUNER BOARD ECO6 / SYSTEMS-CENELEC

VERSION PROGRAMMING COMPONENTS

VERSION	6120	3156	3157	3170	7111
/00 /02 FM/MW/LW	☒				
/00 /02 FM/MW		☒	☒		☒
/01 FM/MW		☒	☒		☒
/14 FM-OIRT/MW		☒	☒		☒
/17 FM/AM	☒				

☒ component mounted

VERSION DETECTION

PROGRAMMABLE OUTPUT PORTS

AM-IF1

5111 450kHz

AM-IF2

5112 450kHz

AM-AFC

5114 450kHz

FM-IF1

5109

FM-IF2

5110

FM FRONTEND

1110 FE450

7101 TEA5762

CONTROL

STEREO DECODER

VCO

3142

BIRDY FILTER

AM-OSCILLATOR

MPX BUFFER AMPLIFIER

DISCRIMINATOR

AM FRAME AERIAL

MW/LW-RF

LW only

RDS only

× marked components not for LW version

LEGEND

* ... only assembled in FM/AM-version
(p)...for provision only
USA ... for USA version only
LW ... for LW version only

SMD jumper 41xx 0R

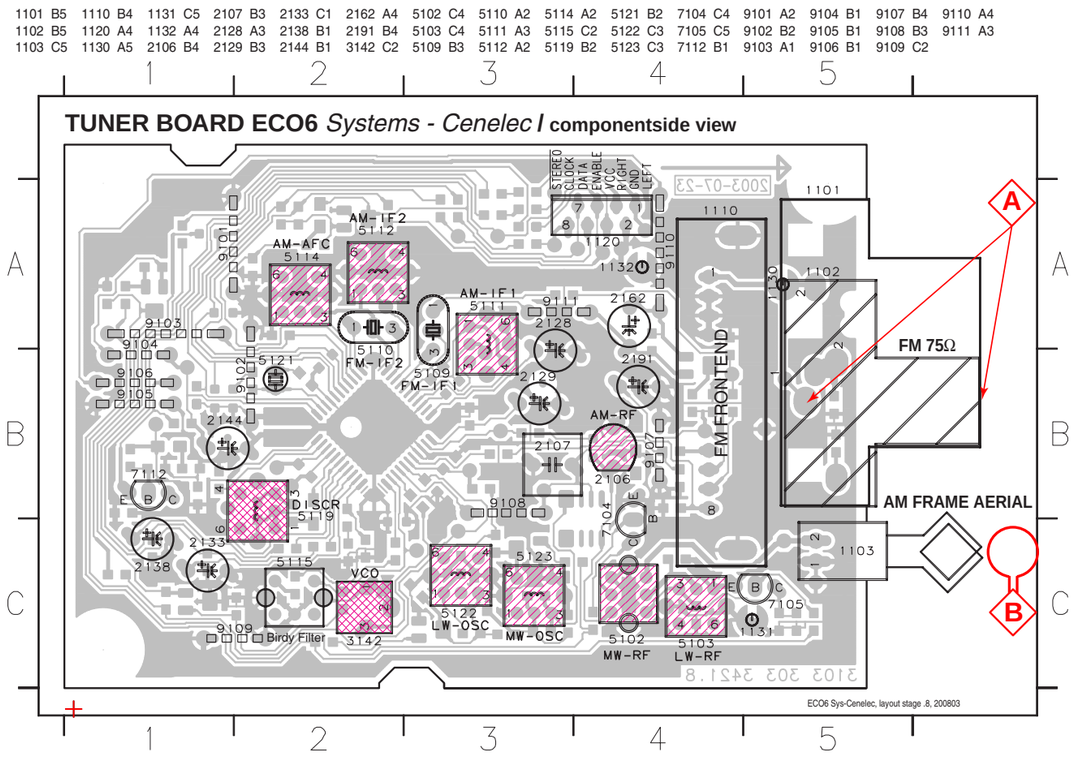
...V FM mode stereo
...V MW mode
...V LW mode
EVM
voltages measured while set is tuned to a strong transmitter

Signal path
FM
AM
MPX (Audio Frequency)
AF - left/right

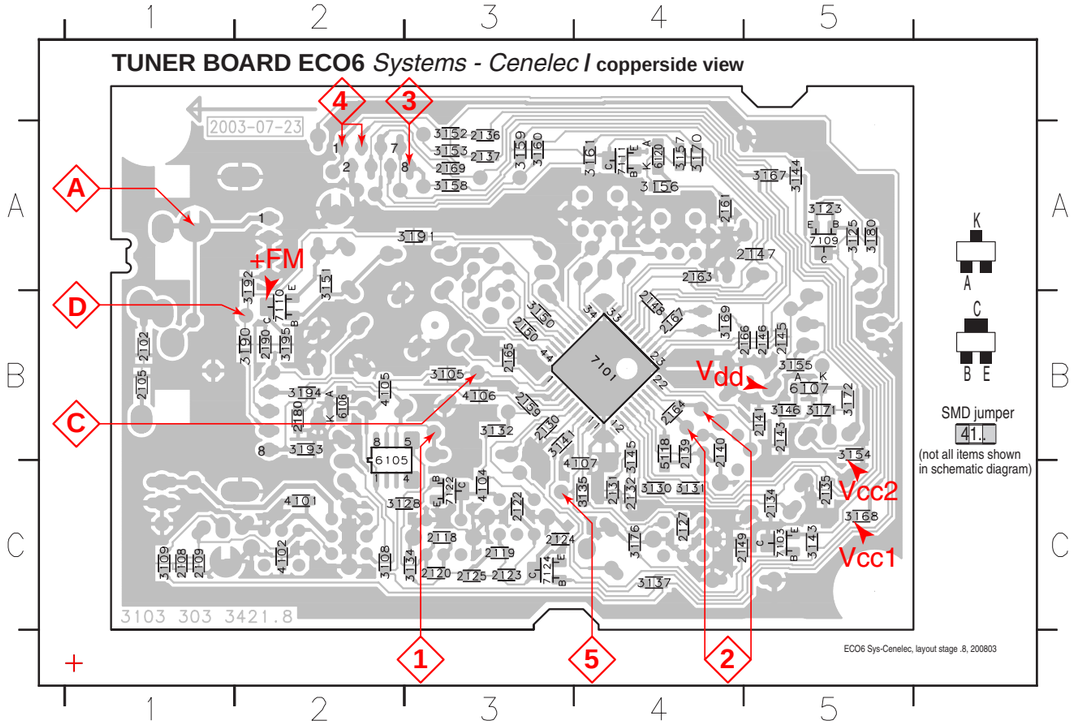
ECO6 Sys-Cenelec, 010517

1101	A2	5121	E11
1102	B1	5122	H5
1103	E2	5123	G5
1110	B2	6105-1	E4
1120	E14	6105-2	G6
1130	A2	6106	D4
1131	C2	6107	G13
1132	F13	6120	C13
2102	B1	7101	C8
2105	A2	7103	H8
2106	E3	7104	D2
2107	E4	7105	F4
2108	G3	7109	H3
2109	G3	7110	H12
2118	H6	7111	C13
2119	H6	7112	G12
2120	I6	7122	H4
2122	H6	7124	H7
2123	H6	7103	B2
2124	H6	7104	B6
2125	H6	7105	E2
2127	E7	7106	E2
2128	B8	7107	C3
2129	C7	7109	D5
2130	F11	7110	D5
2131	F8	7111	E5
2132	F8	7112	F7
2133	F8	7113	A9
2134	I8	7114	B11
2135	I9	7116	F10
2136	H14	7117	F13
2137	H13	7118	G11
2138	F9	7120	F13
2139	G9	7121	F13
2140	G9	7122	E13
2141	F10	7123	E13
2143	G12	7124	G14
2144	G11	7125	F14
2145	E11	7126	F13
2146	E12	7127	F13
2147	E12	7140	F11
2148	E12	7141	F10
2149	H7	7142	F10
2150	A10		
2159	D5		
2161	C11		
2162	H12		
2163	D11		
2164	G10		
2165	C7		
2166	E11		
2167	E11		
2169	G8		
2180	C4		
2190	C3		
2191	C3		
3105	D5		
3108	D2		
3109	G4		
3123	H3		
3125	H2		
3128	H3		
3130	I9		
3131	I9		
3132	G4		
3134	H6		
3135	E7		
3137	H7		
3141	E7		
3142	E6		
3143	G7		
3144	G8		
3145	F8		
3146	G13		
3150	H12		
3151	H12		
3152	G14		
3153	G13		
3154	F13		
3155	G12		
3156	C12		
3157	D12		
3158	E13		
3159	D13		
3160	D13		
3161	D13		
3167	F12		
3168	F11		
3169	E11		
3170	D12		
3171	G12		
3172	G12		
3176	H7		
3180	I3		
3190	B6		
3191	B7		
3192	B6		
3193	B4		
3194	C4		
3195	C3		
4101	E2		
4102	F3		
4104	H5		
5102	E3		
5103	F2		
5109	B9		
5110	B10		
5111	A9		
5112	A11		
5114	B11		
5115	E7		
5118	G9		
5119	G9		

1101 B5 1110 B4 1131 C5 2107 B3 2133 C1 2162 A4 5102 C4 5110 A2 5114 A2 5121 B2 7104 C4 9101 A2 9104 B1 9107 B4 9110 A4
1102 B5 1120 A4 1132 A4 2128 A3 2138 B1 2191 B4 5103 C4 5111 A3 5115 C2 5122 C3 7105 C5 9102 B2 9105 B1 9108 B3 9111 A3
1103 C5 1130 A5 2106 B4 2129 B3 2144 B1 3142 C2 5109 B3 5112 A2 5119 B2 5123 C3 7112 B1 9103 A1 9106 B1 9109 C2



2102 B1 2120 C3 2130 B3 2137 A3 2146 B5 2161 A4 2169 A3 3123 A5 3134 C3 3145 C4 3154 B5 3160 A3 3171 B5 3192 A2 4104 C3 6106 B2 7110 B2
2105 B1 2122 C3 2131 C4 2139 B4 2147 A5 2163 A4 2180 B2 3125 A5 3135 C4 3146 B5 3155 B5 3161 A4 3172 B5 3193 B2 4105 B2 6107 B5 7111 A4
2108 C1 2123 C3 2132 C4 2140 B4 2148 B4 2164 B4 2190 B2 3128 C2 3137 C4 3150 B3 3156 A4 3167 A5 3176 C4 3194 B2 4106 B3 6120 A4 7122 C3
2109 C1 2124 C3 2134 C5 2141 B5 2149 C4 2165 B3 3105 B3 3130 C4 3141 B3 3151 A2 3157 A4 3168 C5 3180 A5 3195 B2 4107 C4 7101 B4 7124 C3
2118 C3 2125 C5 2135 C5 2143 B5 2150 B3 2166 B5 3108 C2 3131 C4 3143 C5 3152 A3 3158 A3 3169 B4 3190 B2 4101 C2 5118 C4 7103 C5
2119 C3 2127 C4 2136 A3 2145 B5 2159 B3 2167 B4 3109 C1 3132 B3 3144 A5 3153 A3 3159 A3 3170 A4 3191 A3 4102 C2 6105 B2 7109 A5



These assembly drawings show a summary of all possible versions.
For components used in a specific version see schematic diagram respectively partslist.

7B-3

TUNER ADJUSTMENT TABLE (**ECO6 Cenelec** FM/MW - and FM/MW/LW - versions with AM-frame aerial)

Waverange	Input frequency	Input	Tuned to	Adjust	Output	Scope/Voltmeter
VARICAP ALIGNMENT						
FM 87.5 - 108MHz (50kHz grid)			108MHz	check	◇1	8V ±1.2V
			87.5MHz	check		1.6V ±0.5V
MW 531 - 1602kHz (9kHz grid)			1602kHz	5123		8V ±0.2V 3-band 6.9V ±0.2V 2-band
			531kHz	check		1.1V ±0.4V
LW 153 - 279kHz (3kHz grid)			279kHz	5122		8V ±0.2V
			153kHz	check		1.1V ±0.4V
FM - IF						
FM	10.7MHz, 45mV continuous wave	◇D	IC 7101 21 shortcircuit to block AFC 2141	5119	◇2	0mV ±3mV
FM - VCO						
FM	98MHz, 1mV continuous wave	◇A	98MHz	3142	◇3	152kHz ±1kHz [1]
FM RF (channel separation)	Note: The FM-frontend unit has already been adjusted by the factory and needs therefore no further adjustments for service purposes.					
FM	98MHz, 1mV 90% Left + 9% pilot mod=1kHz	◇A	98MHz	IF coil inside FM frontend 1110	◇4	right channel min.
AM IF						
MW	450kHz connect pin 6 of IC 7101 (AM Osc.) with 3.3kΩ to Vcc	◇C Δf = ±10kHz V_{RF} = 0.5mV (as low as possible)	IC 7101 36 100nF 220R	5111	◇5	max. f_o symmetric
			IC 7101 40 100nF 220R see remark [2]	5112		
AM AFC **MW**		◇C continuous wave V_{RF} = 2mV		5114	◇2	0mV ±2mV
AM RF [3]						
MW	1494kHz	◇B Δf = ±30kHz V_{RF} as low as possible	1494kHz	2106	◇5	max. f_o symmetric
	558kHz		558kHz	5102		
LW	198kHz		198kHz	5103		

ECO6 Sys Cenelec, 190599

Use Service Testprogram. By selecting the TUNER TEST test frequencies will be stored as preset frequencies automatically.

[1] If sensitivity of frequency counter is too low adjust to max. channel separation (input signal: stereo left 90% + 9%, adjust output on right channel to minimum)

[2] RC network serves for damping the IF-filter while adjusting the other one.

[3] For AM RF adjustments the original frame antenna has to be used!
MW has to be aligned before LW.

↕ Repeat

Electrical Partslist *ECO6* SYSTEMS-CENELEC

7B-4

MISCELLANEOUS

1101	2422 015 19376	SOCKET CLICKFIT 2P	USA only
1102	4822 267 10283	SOCKET COAX, IEC 75Ω	not USA
1103	4822 265 31184	JST CONNECTOR, 2 POLE	
1110	2422 542 90071	FM FRONTEND	
1120	4822 265 11515	FFC SOCKET, 8P	

CAPACITORS

2102 ©	4822 126 13838	100nF	10%	50V	not USA
2105 ©	4822 126 13838	100nF	10%	50V	USA only
2106	2020 800 00204	TRIMCAP. 4,2 - 20pF, N750			LW only
2106	2020 800 00191	TRIMCAP. 3 - 11pF, N450			FM/AM only
2107	4822 121 51319	1µF	20%	50V	
2108 ©	5322 122 32531	100pF	5%	50V	LW only
2109 ©	5322 122 32448	10pF	5%	50V	LW only
2120 ©	4822 126 13689	18pF	1%	63V	FM/AM only
2120 ©	5322 122 32658	22pF	5%	50V	LW only
2122 ©	4822 122 33891	3,3nF	10%	63V	LW only
2123 ©	2020 552 93494	390pF	1%	50V	LW only
2124 ©	4822 122 33177	10nF	20%	50V	FM/AM only
2125 ©	2020 552 96199	560pF	1%	50V	
2127 ©	4822 126 14076	220nF	20%	25V	
2128	4822 124 40248	10µF	20%	63V	
2129	4822 124 41584	100µF	20%	10V	
2130 ©	5322 122 32654	22nF	10%	63V	
2131 ©	4822 126 13482	470nF	20%	16V	
2132 ©	4822 126 13482	470nF	20%	16V	
2133	4822 124 21913	1µF	20%	63V	
2134 ©	3198 017 31530	15nF	10%	50V	not USA
2134 ©	5322 122 32654	22nF	10%	63V	USA only
2135 ©	3198 017 31530	15nF	10%	50V	not USA
2135 ©	3198 017 32230	22nF	10%	25V	USA only
2136 ©	4822 126 14076	220nF	20%	25V	
2137 ©	4822 126 14076	220nF	20%	25V	
2138	4822 124 22652	2,2µF	20%	50V	
2139 ©	4822 126 14236	15pF	5%	50V	
2140 ©	4822 126 13695	82pF	1%	63V	
2141 ©	4822 126 13838	100nF	10%	50V	
2143 ©	4822 126 14076	220nF	20%	25V	
2144	4822 124 21913	1µF	20%	63V	
2145 ©	4822 122 33575	220pF	5%	50V	
2146 ©	4822 122 33575	220pF	5%	50V	
2147 ©	4822 122 33575	220pF	5%	50V	
2148 ©	4822 122 33127	2,2nF	10%	63V	
2149 ©	5322 122 32659	33pF	5%	50V	RDS only
2150 ©	4822 126 13838	100nF	10%	50V	
2159 ©	5322 122 31151	22µF	20%	50V	
2163 ©	4822 126 13838	100nF	10%	50V	LW only
2164 ©	4822 126 13482	470nF	20%	16V	
2165 ©	4822 126 13838	100nF	10%	50V	
2166 ©	5322 122 31647	1nF	10%	63V	
2167 ©	4822 122 33926	12pF	5%	50V	
2169 ©	4822 122 33127	2,2nF	10%	63V	RDS only
2180 ©	3198 017 31030	10nF	10%	50V	
2190 ©	4822 126 13838	100nF	10%	50V	
2191	4822 124 40178	100µF	20%	10V	

RESISTORS

3105 ©	4822 117 11503	220Ω	5%	0,1W	
3108 ©	4822 117 11449	2,2kΩ	1%	0,1W	LW only
3109 ©	4822 051 20472	4,7kΩ	5%	0,1W	LW only
3123 ©	4822 051 20472	4,7kΩ	5%	0,1W	LW only
3125 ©	4822 117 10833	10kΩ	1%	0,1W	LW only
3128 ©	4822 117 11449	2,2kΩ	1%	0,1W	LW only
3130 ©	3198 021 38210	820Ω	5%	0,06W	
3131 ©	3198 021 38210	820Ω	5%	0,06W	
3132 ©	4822 051 20479	47Ω	5%	0,1W	
3134 ©	4822 051 20223	22kΩ	5%	0,1W	
3135 ©	3198 021 31020	1kΩ	5%	0,06W	
3137 ©	4822 051 20223	22kΩ	5%	0,1W	LW only
3141 ©	4822 117 11148	56kΩ	1%	0,1W	
3142	4822 100 12159	TRIMPOT. 100kΩ			
3143 ©	4822 051 20223	22kΩ	5%	0,1W	RDS only
3144 ©	4822 051 10102	1kΩ	2%	0,25W	RDS only
3145 ©	4822 117 11449	2,2kΩ	1%	0,1W	
3146 ©	4822 051 20229	22Ω	5%	0,1W	
3150 ©	4822 117 10833	10kΩ	1%	0,1W	
3151 ©	4822 051 20683	68kΩ	5%	0,1W	
3152 ©	4822 051 20471	470Ω	5%	0,1W	
3153 ©	4822 051 20471	470Ω	5%	0,1W	
3154 ©	4822 117 13577	330Ω	1%	0,1W	
3155 ©	4822 117 10353	150Ω	5%	0,1W	
3156 ©	4822 117 10837	100kΩ	1%	0,1W	
3157 ©	4822 117 10837	100kΩ	1%	0,1W	
3158 ©	4822 051 20471	470Ω	5%	0,1W	
3159 ©	4822 051 20471	470Ω	5%	0,1W	
3160 ©	4822 051 20471	470Ω	5%	0,1W	
3161 ©	4822 051 20223	22kΩ	5%	0,1W	
3167 ©	4822 051 20121	120Ω	5%	0,1W	
3168 ©	4822 051 20121	120Ω	5%	0,1W	
3169 ©	4822 051 20154	150kΩ	5%	0,1W	
3170 ©	4822 117 10837	100kΩ	1%	0,1W	
3171 ©	4822 117 10834	47kΩ	1%	0,1W	
3172 ©	4822 051 20562	5,6kΩ	5%	0,1W	
3176 ©	4822 051 20333	33kΩ	5%	0,1W	RDS only
3180 ©	4822 117 10833	10kΩ	1%	0,1W	LW only
3190 ©	4822 051 20121	120Ω	5%	0,1W	
3191 ©	4822 051 20121	120Ω	5%	0,1W	
3192 ©	4822 117 13577	330Ω	1%	0,1W	
3193 ©	4822 117 13577	330Ω	1%	0,1W	
3194 ©	4822 117 11449	2,2kΩ	1%	0,1W	
3195 ©	4822 051 20101	100Ω	5%	0,1W	
4101 ©	4822 051 20008	CHIP JUMPER 0805			FM/AM only
4102 ©	4822 051 20008	CHIP JUMPER 0805			FM/AM only
4104 ©	4822 051 20008	CHIP JUMPER 0805			FM/AM only
4105 ©	4822 051 20008	CHIP JUMPER 0805			
4106 ©	4822 051 20008	CHIP JUMPER 0805			
4107 ©	4822 051 20008	CHIP JUMPER 0805			

COILS

5102	4822 157 71634	RF-COIL MW	
5103	2422 549 44107	RF-COIL LW	LW only
5109	4822 157 71639	FM-IF FILTER 10,7MHz	
5110	4822 242 70665	FM-IF FILTER 10,7MHz	
5111	2422 549 44023	AM-IF FILTER 450kHz	
5112	4822 157 70302	AM-IF FILTER 450kHz	
5114	4822 157 70302	AM-IF FILTER 450kHz	
5115	4822 157 71636	ANTI BIRDY FILTER	
5118 ©	2422 535 95881	100nH	
5119	4822 157 11443	DISCRIMINATOR COIL	
5121	4822 242 10261	QUARTZ 75kHz	
5122	2422 549 44108	RF-COIL, LW-OSCILLATOR	LW only
5123	2422 549 44108	RF-COIL, MW-OSCILLATOR	

DIODES

6105 ©	4822 130 83075	HN1V02H	
6106 ©	4822 130 83757	BAS216	
6107 ©	9340 386 90115	BZX284-C11	
6120 ©	4822 130 83757	BAS216	

TRANSISTORS

7103 ©	5322 130 42756	BC857C	RDS only
7104	9322 003 64676	TBC337-40	LW only
7105	9322 003 64676	TBC337-40	LW only
7109 ©	4822 130 60373	BC856B	LW only
7110 ©	4822 130 60373	BC856B	
7111 ©	5322 130 42755	BC847C	
7112	4822 130 44503	BC547C	
7122 ©	5322 130 42755	BC847C	LW only
7124 ©	5322 130 42755	BC847C	LW only

INTEGRATED CIRCUITS

7101	4822 209 90315	TEA5762H/V1, RADIO IC

ETF8 TAPE MODULE

TABLE OF CONTENTS

9-1

CONNECTORS ASSIGNMENTS:

CONNECTOR 1701		INTERCONNECTION TO AF BOARD
1	REC-L	Record input left
2	REC-R	Record input right
3	GND A	AF Ground
4	TAPE-L	Playback output left
5	+12V	D.C. supply (+12V) for AF electronics
6	TAPE-R	Playback output right
7	-CMOS	Negative d.c. supply (-9V) for controlling JFET J111

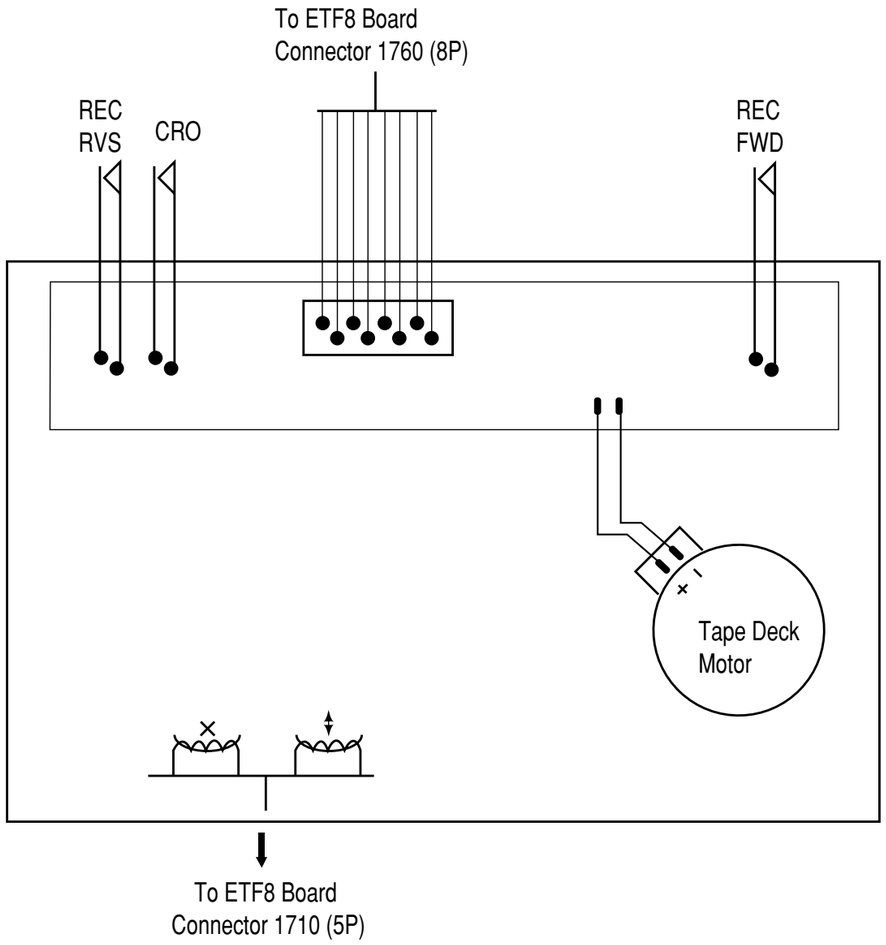
CONNECTOR 1703		INTERCONNECTION TO AF BOARD
1	GND M	Motor Ground
2	+MOTOR	D.C. supply (+12V) for tape deck motor & solenoid

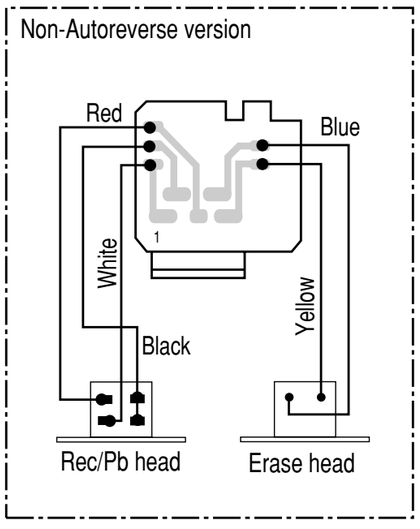
CONNECTOR 1706		INTERCONNECTION TO FRONT BOARD
1	CR_IN	Deck sensing Chrome Tape
2	AD1	Deck sensing switches output voltage / Deck EOT
3	+5V	DC supply (+5V) for deck status ADC network (ref to microprocessor's supply)
4	GND _P	Control & Oscillator Ground
5	CLK	HEF4094BT shift register Clock line
6	DATA	HEF4094BT shift register Data line
7	STROBE	HEF4094BT shift register Strobe line

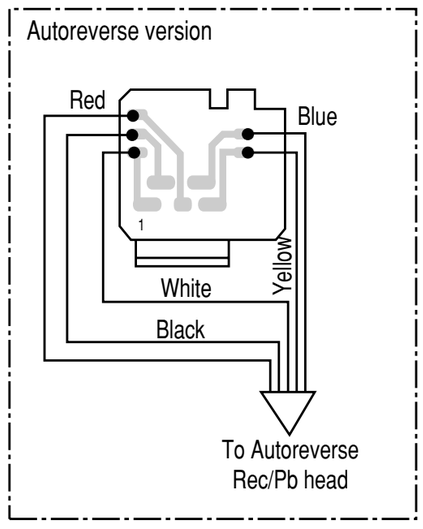
CONNECTOR 1710		TAPE HEAD CONNECTIONS
1	GND A	Erase Head ground
2	ERASE HEAD	Erase Head
3	R/P HD Rch	R/P Head right channel positive
4	Common	Pb Head return ground shield
5	R/P HD Lch	R/P Head left channel positive

CONNECTOR 1760		DECK CONTROL INTERFACE
1	Vcc 12V	Deck / Motor supply
2	PHOTO	Photo sensor output (tape movement indication)
3	GND_M	Deck / Motor ground
4	MODE	Mode switch (head engagement)
5	Sol_supply	Solenoid supply
6	CR_IN	Chrome tape detection switch
7	REC FWD	Record tab protection status switch (forward)
8	REC REW	Record tab protection status switch (reverse)

TAPE DECK WIRING

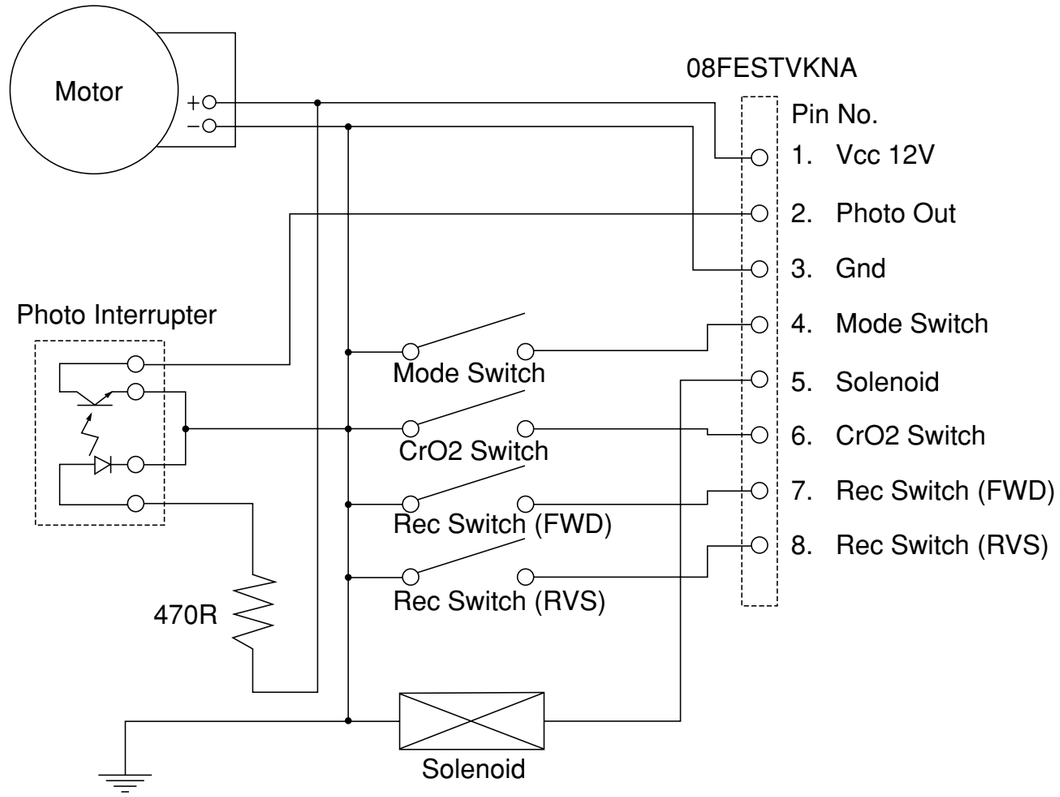






9-2

TAPE MECHANISM ELECTRONICS



9-3

TAPE ADJUSTMENT & CHECK TABLE

	TEST CASSETTE	RECORDER MODE	MEASURE ON	READ ON	ADJUST with	ADJUST to
MOTOR SPEED	SBC420 3150Hz	PLAY	1 or 2 LEFT RIGHT	frequency counter	check	3150Hz +/- 2%
WOW & FLUTTER	SBC420 3150Hz	PLAY		W&F-meter	check	< 0.4 % DIN
ADJUST AZIMUTH	SBC420 10kHz	PLAY FWD		mV-meter	left hand screw	max. output level & left=right
		PLAY REV ^			right hand screw	
PLAYBACK FREQ. RESPONSE	SBC420	PLAY		mV-meter	check	limits see fig. 1 *
CHECK RECORD/PLAYBACK FREQUENCY AND DISTORTION						
Inject 8.85mV signals 100Hz, 250Hz, 1kHz, 10kHz, 12.5kHz via 3 or 4	SBC419A or SBC420	RECORD				
	RECORDED CASSETTE	PLAY	1 or 2 LEFT RIGHT	mV-meter	check	limits see fig. 2 *
Inject 1kHz 28mV via 3 or 4	SBC419A or SBC420	RECORD				
	RECORDED CASSETTE	PLAY	1 or 2 LEFT RIGHT	THD-meter	check	< 3% *

SBC419A : 4822 397 30069
SBC420 : 4822 397 30071

^ For Auto-reverse version only
* If high frequencies are not within limits, decrease bias and re-measure.
If distortion is too high, increase bias and re-meaure

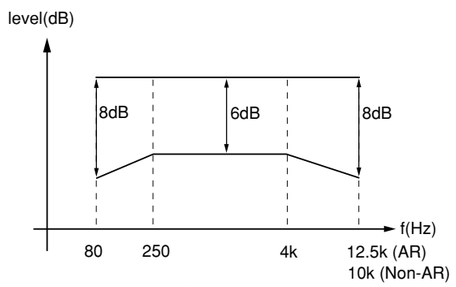


figure. 1

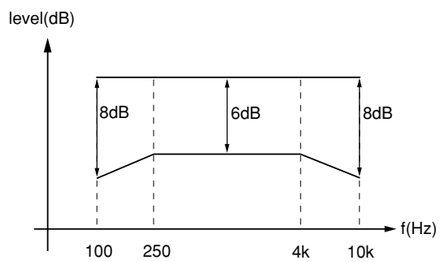
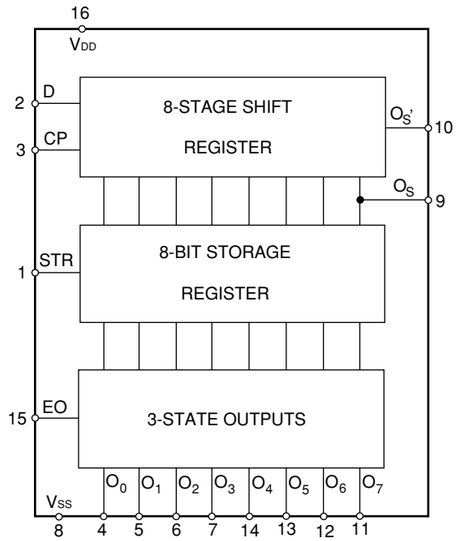


figure. 2

HEF4094BT FUNCTIONAL BLOCK DIAGRAM



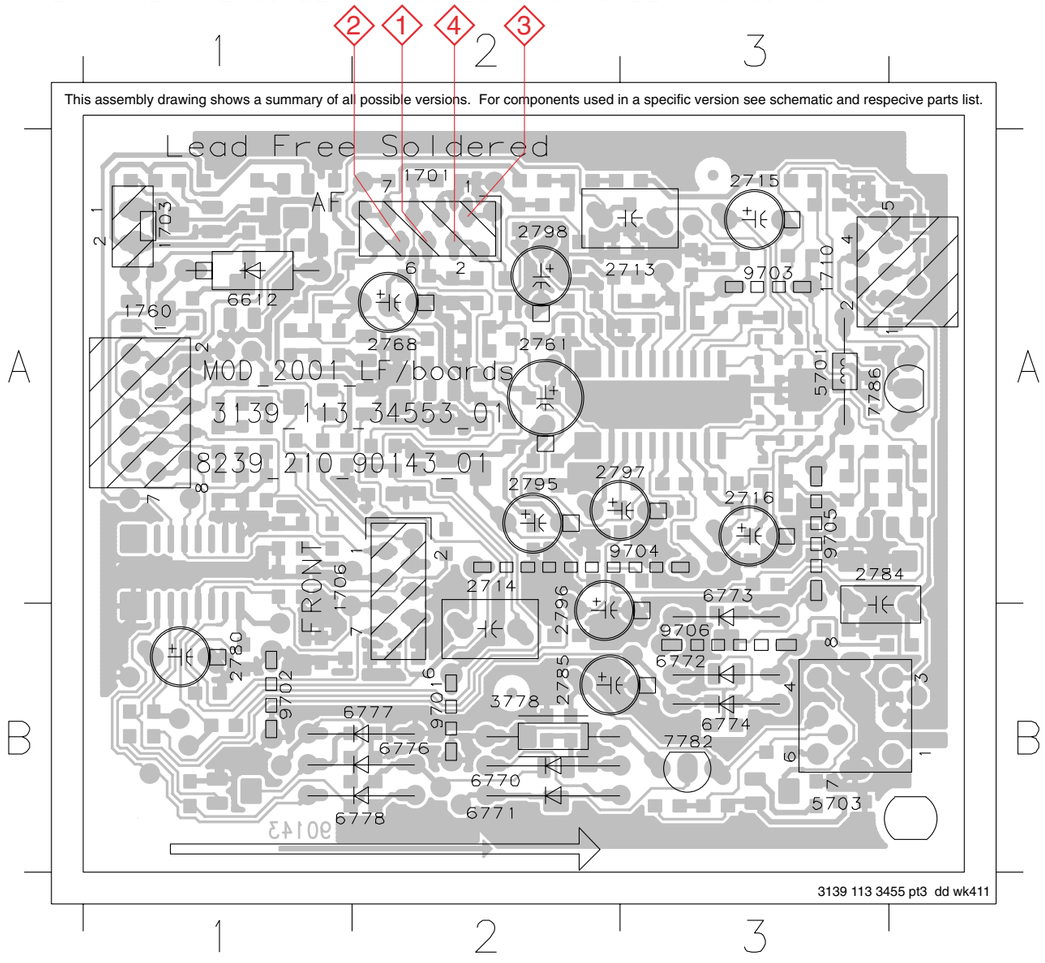
AF Control Logic State Table

State of Module	Control lines from HEF4094BT							
	O_0	O_1	O_2	O_3	O_4	O_5	O_6	O_7
	CR_SEL	REC	BIAS_OFF	CR_BIAS		SOL	MUTE_OFF	MOT
Stop	0	0	1	X	Not in used	Deck Mechanism Timing	0	0
Playback (Ferro)	0	0	1	0			1	1
Playback (Chrome)	1	0	1	1			1	1
Record (Ferro)	0	1	0	0			0	1
Record (Chrome)	1	1	0	1			0	1
FWD	0	0	1	X			0	1
REW	0	0	1	X			0	1

Note: 0 = Logic Low
1 = Logic High
X = Not applicable

COMPONENT LAYOUT

1701 A2
1703 A1
1706 A1
1710 A3
1760 A1
2713 A3
2714 A2
2715 A3
2716 A3
2761 A2
2768 A2
2780 B1
2784 A3
2785 B2
2795 A2
2796 B2
2797 A2
2798 A2
3778 B2
5701 A3
5703 B3
6612 A1
6770 B2
6771 B2
6772 B3
6773 A3
6774 B3
6776 B2
6778 B2
7782 B3
7786 A3
9701 B2
9702 B1
9703 A3
9704 A3
9705 A3
9706 B3



CHIP LAYOUT

2621 B3
2622 B3
2623 A3
2625 A3
2701 A1
2702 A1
2703 A2
2704 A2
2709 A1
2710 A1
2711 A1
2712 A2
2717 A1
2718 A1
2719 A1
2720 A1
2721 A1
2722 A1
2723 A1
2724 A1
2725 A3
2727 A1
2728 A1
2729 A1
2730 A1
2731 A1
2732 A1
2743 B1
2747 A2
2769 A2
2770 A3
2781 B1
2782 B1
2786 B1
2787 B1
2788 A2
2789 A1
2790 A1
2791 A1
2793 A1
2794 A1
2799 A2
3607 A3
3608 A3
3609 A3
3610 A3
3611 A3
3612 A3
3614 A3
3624 A3
3626 A3
3628 A3
3630 A3
3678 A3
3680 A3
3686 A3
3709 A1
3710 A1
3711 A1
3712 A1
3717 A1
3718 A1
3719 A1
3720 A1
3721 A1
3722 A1
3723 A1
3724 A1
3733 A2
3734 A1
3735 A2
3736 A2
3737 A2
3738 A3
3739 A3
3740 A3
3743 A2
3744 A3
3745 A3
3746 A3
3749 A1
3750 A1
3762 B2
3764 A2
3768 A2
3769 B2
3770 B2
3771 B2
3772 B3
3774 B2
3775 B1
3776 B1
3777 B1
3779 B1
3780 B1
3781 A1
3786 B3
3789 B2
3790 A2
3791 A1
3792 B3
3793 A2
3794 A1
3795 A1
3796 A2
3797 A3
3800 B3
4701 A2
4702 A3
4705 A2
4707 B2
4708 A2
4709 A3
4710 A3
4711 A3
4712 A3
4718 A2
4719 A2
4720 A2
4721 B2
4723 A2
4725 A2
4726 A2
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4733 A2
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4746 A1
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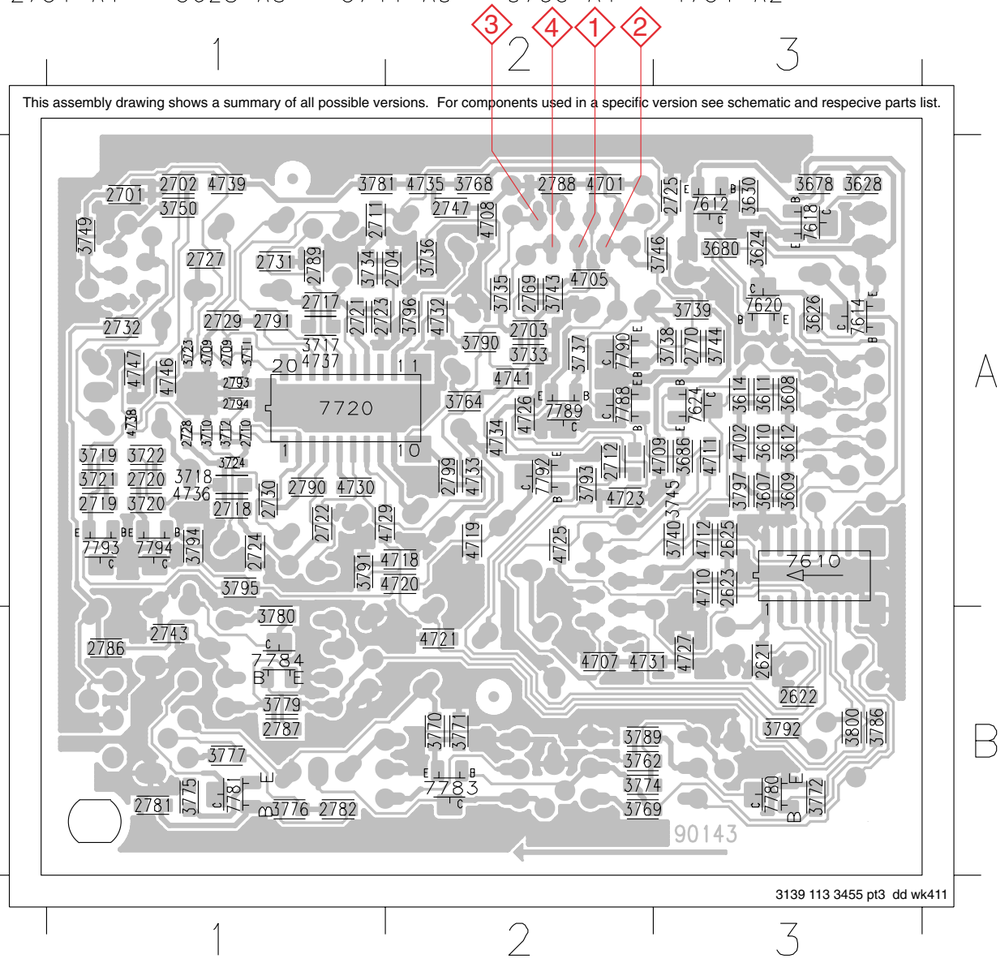
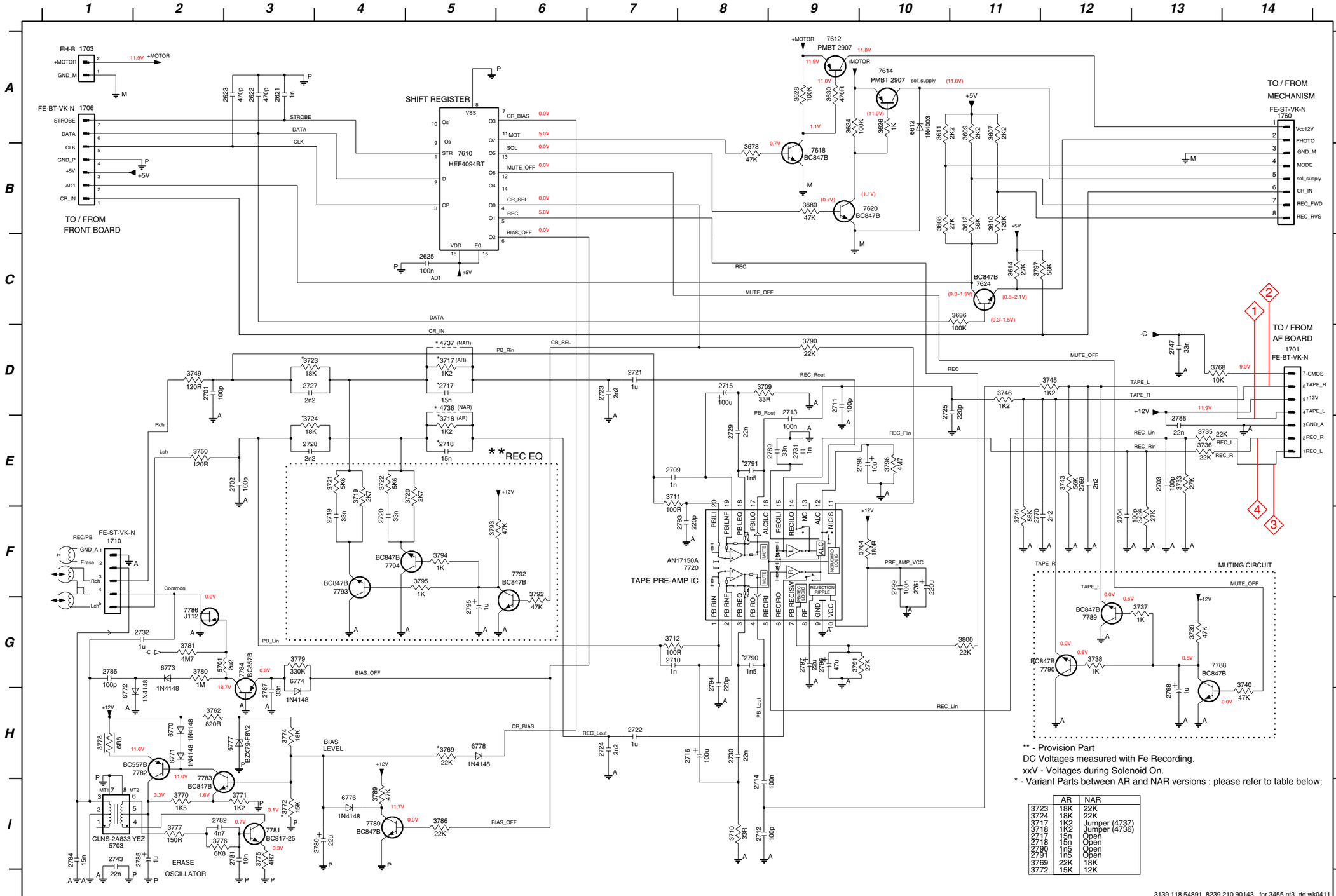
7610 A3
7612 A3
7614 A3
7618 A3
7620 A3
7624 A3
7720 A1
7780 B3
7781 B1
7783 B2
7784 B1
7786 B2
7789 B1
7790 B1
7792 A2
7793 A1
7794 A1



9-5

CIRCUIT DIAGRAM



** - Provision Part
DC Voltages measured with Fe Recording.
xxV - Voltages during Solenoid On.
* - Variant Parts between AR and NAR versions : please refer to table below;

	AR	NAR
3723	18K	22K
3724	18K	22K
3717	1K2	Jumper (4737)
3718	1K2	Jumper (4736)
2717	15n	Open
2718	15n	Open
2790	1n5	Open
2791	1n5	Open
3769	22K	18K
3772	15K	12K

3139 118 54891_8239 210 90143...for 3455 pt3_dd wk0411

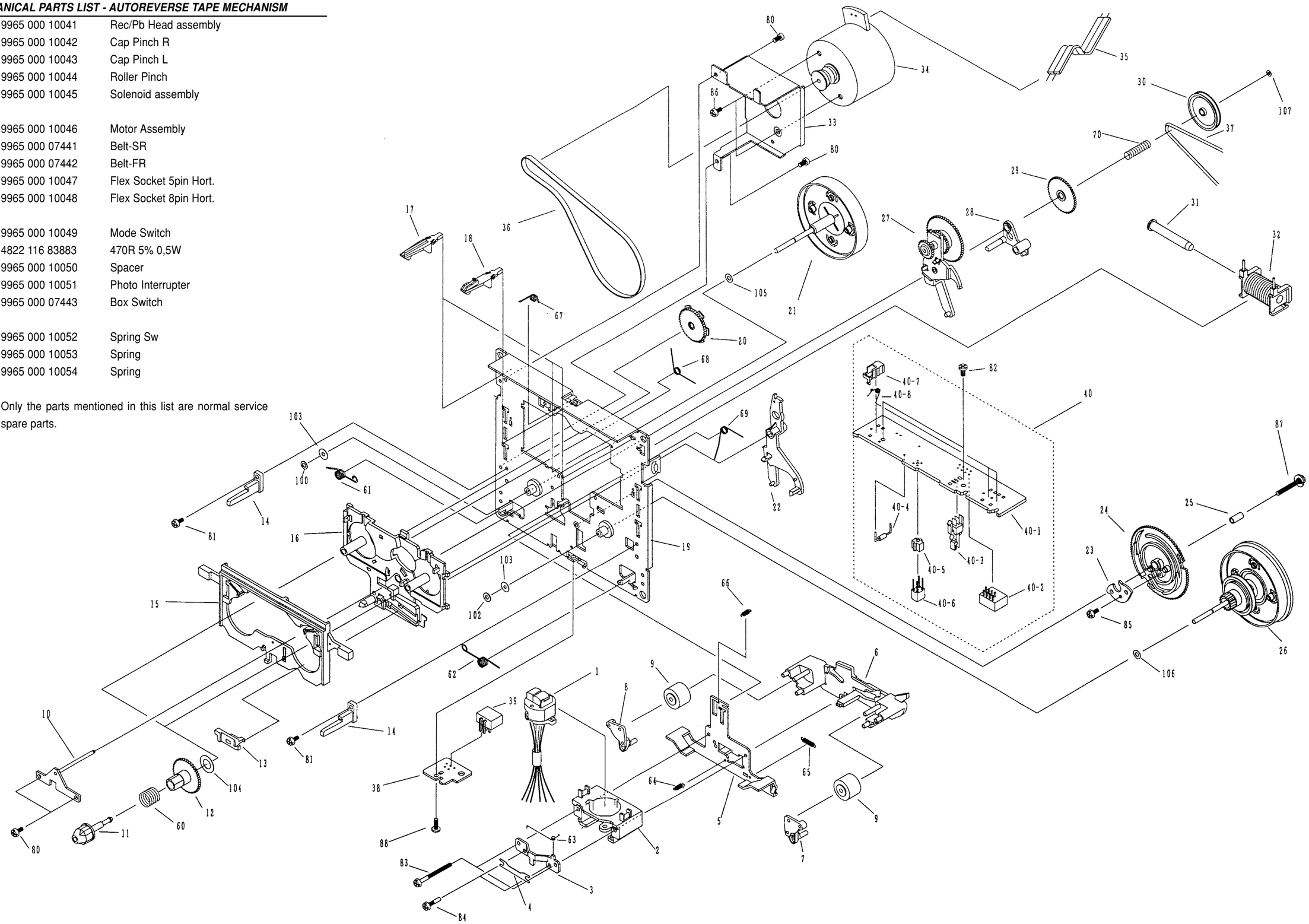
AUTOREVERSE (AR) TAPE MECHANISM

MECHANICAL PARTS LIST - AUTOREVERSE TAPE MECHANISM

1	9965 000 10041	Rec/Pb Head assembly
7	9965 000 10042	Cap Pinch R
8	9965 000 10043	Cap Pinch L
9	9965 000 10044	Roller Pinch
32	9965 000 10045	Solenoid assembly
34	9965 000 10046	Motor Assembly
36	9965 000 07441	Belt-SR
37	9965 000 07442	Belt-FR
39	9965 000 10047	Flex Socket 5pin Hort.
40-2	9965 000 10048	Flex Socket 8pin Hort.
40-3	9965 000 10049	Mode Switch
40-4	4822 116 83883	470R 5% 0,5W
40-5	9965 000 10050	Spacer
40-6	9965 000 10051	Photo Interrupter
40-7	9965 000 07443	Box Switch
40-8	9965 000 10052	Spring Sw
61	9965 000 10053	Spring
62	9965 000 10054	Spring

Note: Only the parts mentioned in this list are normal service spare parts.

9-6



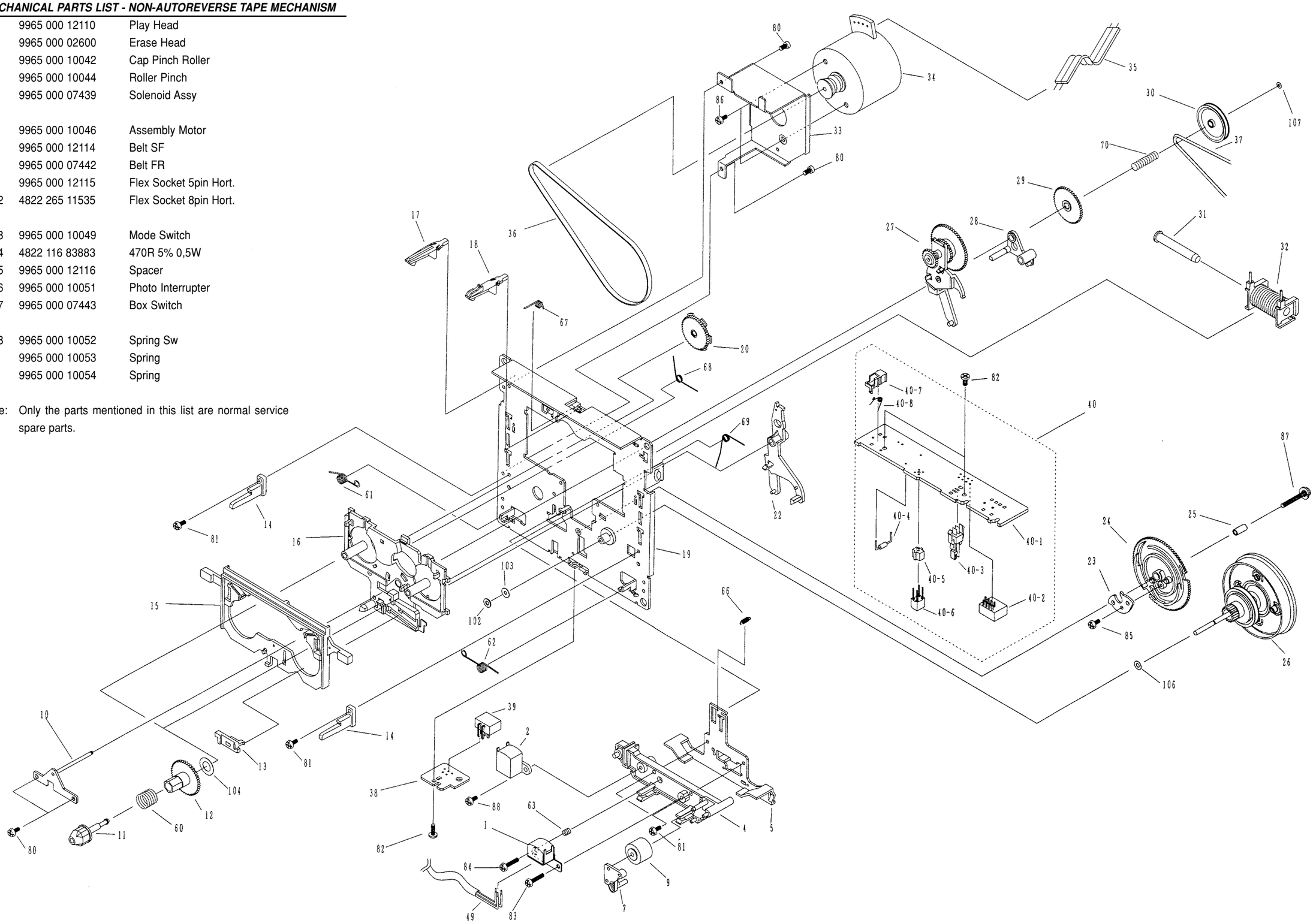
NON-AUTOREVERSE (NAR) TAPE MECHANISM

MECHANICAL PARTS LIST - NON-AUTOREVERSE TAPE MECHANISM

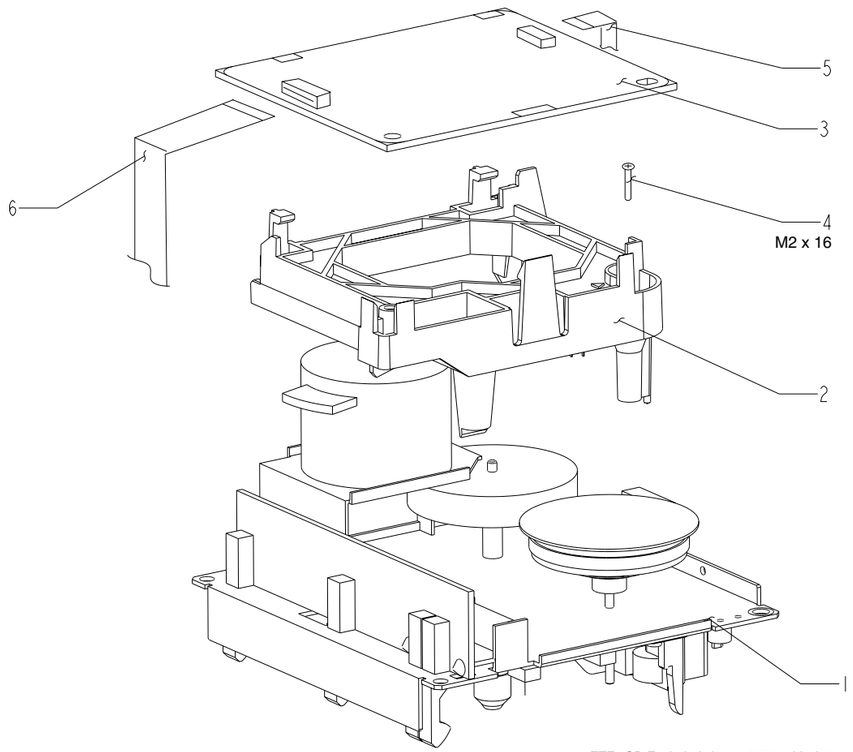
1	9965 000 12110	Play Head
2	9965 000 02600	Erase Head
7	9965 000 10042	Cap Pinch Roller
9	9965 000 10044	Roller Pinch
32	9965 000 07439	Solenoid Assy
34	9965 000 10046	Assembly Motor
36	9965 000 12114	Belt SF
37	9965 000 07442	Belt FR
39	9965 000 12115	Flex Socket 5pin Hort.
40-2	4822 265 11535	Flex Socket 8pin Hort.
40-3	9965 000 10049	Mode Switch
40-4	4822 116 83883	470R 5% 0,5W
40-5	9965 000 12116	Spacer
40-6	9965 000 10051	Photo Interrupter
40-7	9965 000 07443	Box Switch
40-8	9965 000 10052	Spring Sw
61	9965 000 10053	Spring
62	9965 000 10054	Spring

Note: Only the parts mentioned in this list are normal service spare parts.

9-7



TAPE MODULE EXPLODED VIEW



ETF8 SD Exploded view ....78730 dd wk204

MECHANICAL PARTS LIST - TAPE MODULE

1	3139 118 78740	AR Tape Mech. CRL4438
1	3139 118 79220	Non-AR Tape Mech. CFL4217
5	3139 110 35580	Flex Cable 5pin 40mm AD
6	3139 110 35590	Flex Cable 8pin 48mm AD

Note: Only the parts mentioned in this list are normal service spare parts.

9-8

ELECTRICAL PARTS LIST - ETF8 BOARD

MISCELLANEOUS

1701	4822 267 10953	Flex Socket 7pin Vert.	
1706	4822 267 10953	Flex Socket 7pin Vert.	
1710	4822 267 10958	Flex Socket 5pin Hort.	
1760	4822 265 11535	Flex Socket 8pin Hort.	

CAPACITORS

2621	5322 126 11578	1nF 10% 50V	
2621	5322 122 31647	1nF 10% 63V	
2622	4822 126 13881	470pF 5% 50V	
2622	5322 122 32268	470pF 5% 50V	
2623	4822 126 13881	470pF 5% 50V	
2623	5322 122 32268	470pF 5% 50V	
2625	4822 126 14305	100nF 10% 16V	
2625	2238 586 59812	100nF +80/-20% 50V	
2701	4822 122 31765	100pF 2% 63V	
2701	5322 122 32531	100pF 5% 50V	
2702	4822 122 31765	100pF 2% 63V	
2702	5322 122 32531	100pF 5% 50V	
2703	4822 122 31765	100pF 2% 63V	
2703	5322 122 32531	100pF 5% 50V	
2704	4822 122 31765	100pF 2% 63V	
2704	5322 122 32531	100pF 5% 50V	
2709	5322 126 11578	1nF 10% 50V	
2710	5322 126 11578	1nF 10% 50V	
2711	4822 122 31765	100pF 2% 63V	
2711	5322 122 32531	100pF 5% 50V	
2712	4822 122 31765	100pF 2% 63V	
2712	5322 122 32531	100pF 5% 50V	
2713	5322 121 42386	100nF 5% 63V	
2714	5322 121 42386	100nF 5% 63V	
2715	4822 124 41584	100uF 20% 10V	
2716	4822 124 41584	100uF 20% 10V	
2717	3198 017 31530	15nF 50V	AR
2717	4822 126 13188	15nF 5% 63V	AR
2718	3198 017 31530	15nF 50V	AR
2718	4822 126 13188	15nF 5% 63V	AR
2721	3198 017 41050	1uF 10V	
2721	4822 126 14043	1uF +80/-20% 16V	
2722	3198 017 41050	1uF 10V	
2722	4822 126 14043	1uF +80/-20% 16V	
2723	4822 126 14238	2,2nF 50V	
2724	4822 126 14238	2,2nF 50V	
2725	4822 126 13883	220pF 5% 50V	
2727	4822 126 14238	2,2nF 50V	
2728	4822 126 14238	2,2nF 50V	
2729	4822 126 14494	22nF 10% 25V	
2729	2238 916 15641	22nF 10% 25V	
2730	4822 126 14494	22nF 10% 25V	
2730	2238 916 15641	22nF 10% 25V	
2731	5322 126 11578	1nF 10% 50V	
2731	5322 122 31647	1nF 10% 63V	
2732	3198 017 41050	1uF 10V	
2732	4822 126 14043	1uF +80/-20% 16V	
2743	4822 126 14494	22nF 10% 25V	
2743	2238 916 15641	22nF 10% 25V	
2747	4822 126 14549	33nF 16V	
2761	4822 124 40196	220uF 20% 16V	
2768	4822 124 40756	1uF 20% 100V	
2769	4822 126 14238	2,2nF 50V	
2770	4822 126 14238	2,2nF 50V	
2780	4822 124 81151	22uF 50V	
2781	5322 126 11583	10nF 10% 50V	
2781	4822 122 33177	10nF 20% 50V	
2782	4822 126 13193	4,7nF 10% 63V	
2784	4822 121 51305	15nF 10% 50V	
2785	4822 124 21913	1uF 20% 63V	
2786	4822 122 31765	100pF 2% 63V	
2786	5322 122 32531	100pF 5% 50V	
2787	4822 126 14549	33nF 16V	
2788	4822 126 14494	22nF 10% 25V	
2788	2238 916 15641	22nF 10% 25V	
2789	4822 126 14549	33nF 16V	
2790	4822 126 14247	1,5nF 50V	AR
2791	4822 126 14247	1,5nF 50V	AR
2793	4822 126 13883	220pF 5% 50V	
2794	4822 126 13883	220pF 5% 50V	
2796	4822 124 40433	47uF 20% 25V	
2797	4822 124 81151	22uF 50V	
2798	4822 124 21732	10uF 20% 25V	
2799	4822 126 14305	100nF 10% 16V	
2799	2238 586 59812	100nF +80/-20% 50V	

RESISTORS

3607	4822 051 30222	2k2 5% 0,062W	
3607	4822 117 11449	2k2 5% 0,1W	
3608	4822 051 30273	27k 5% 0,062W	
3609	4822 051 30222	2k2 5% 0,062W	
3609	4822 117 11449	2k2 5% 0,1W	
3610	4822 051 20124	120k 5% 0,1W	
3611	4822 051 30222	2k2 5% 0,062W	
3611	4822 117 11449	2k2 5% 0,1W	
3612	4822 051 30563	56k 5% 0,062W	
3614	4822 051 30273	27k 5% 0,062W	
3624	4822 117 13632	100k 1% 0,062W	
3624	4822 117 10837	100k 1% 0,1W	
3626	4822 051 30102	1k 5% 0,062W	
3628	4822 117 13632	100k 1% 0,062W	
3628	4822 117 10837	100k 1% 0,1W	
3630	4822 051 30471	470R 5% 0,062W	
3678	4822 117 12925	47k 1% 0,063W	
3680	4822 117 12925	47k 1% 0,063W	
3686	4822 117 13632	100k 1% 0,062W	
3686	4822 117 10837	100k 1% 0,1W	
3709	4822 051 30339	33R 5% 0,062W	

9-9

ELECTRICAL PARTS LIST - ETF8 BOARD

ELECTRICAL PARTS LIST - ETF8 BOARD

RESISTORS

3710	4822 051 30339	33R 5% 0,062W	
3711	4822 051 30101	100R 5% 0,062W	
3712	4822 051 30101	100R 5% 0,062W	
3717	4822 117 11817	1k2 1% 1/16W	AR
3717	4822 051 20122	1k2 5% 0,1W	AR
3718	4822 117 11817	1k2 1% 1/16W	AR
3718	4822 051 20122	1k2 5% 0,1W	AR
3723	4822 051 30183	18k 5% 0,062W	AR
3723	4822 051 30223	22k 5% 0,062W	Non-AR
3724	4822 051 30183	18k 5% 0,062W	AR
3724	4822 051 30223	22k 5% 0,062W	Non-AR
3733	4822 051 30273	27k 5% 0,062W	
3734	4822 051 30273	27k 5% 0,062W	
3735	4822 051 30223	22k 5% 0,062W	
3735	4822 051 20223	22k 5% 0,1W	
3736	4822 051 30223	22k 5% 0,062W	
3736	4822 051 20223	22k 5% 0,1W	
3737	4822 051 30102	1k 5% 0,062W	
3737	4822 051 10102	1k 2% 0,25W	
3738	4822 051 30102	1k 5% 0,062W	
3738	4822 051 10102	1k 2% 0,25W	
3739	4822 117 12925	47k 1% 0,063W	
3740	4822 117 12925	47k 1% 0,063W	
3743	4822 051 30563	56k 5% 0,062W	
3744	4822 051 30563	56k 5% 0,062W	
3745	4822 117 11817	1k2 1% 1/16W	
3745	4822 051 20122	1k2 5% 0,1W	
3746	4822 117 11817	1k2 1% 1/16W	
3746	4822 051 20122	1k2 5% 0,1W	
3749	4822 051 30121	120R 5% 0,062W	
3749	4822 051 20121	120R 5% 0,1W	
3750	4822 051 30121	120R 5% 0,062W	
3750	4822 051 20121	120R 5% 0,1W	
3762	4822 117 12968	820R 5% 0,62W	
3764	4822 051 30181	180R 5% 0,062W	
3764	4822 117 11448	180R 1% 0,1W	
3768	4822 051 30103	10k 5% 0,062W	
3768	4822 117 10833	10k 1% 0,1W	
3769	4822 051 30223	22k 5% 0,062W	AR
3769	4822 051 30183	18k 5% 0,062W	Non-AR
3770	4822 051 30152	1k5 5% 0,062W	
3771	4822 117 11817	1k2 1% 1/16W	
3771	4822 051 20122	1k2 5% 0,1W	
3772	4822 051 30153	15k 5% 0,062W	AR
3772	4822 051 30123	12k 5% 0,062W	Non-AR
3774	4822 051 30183	18k 5% 0,062W	
3775	4822 117 13608	4,7R 5% 0,063W	
3776	4822 051 30682	6k8 5% 0,062W	
3777	4822 051 30151	150R 5% 0,062W	
3777	4822 117 10353	150R 1% 0,1W	
3778	4822 052 10688	6R8 5% 0,33W	
3779	4822 051 30334	330k 5% 0,062W	
3780	4822 051 30105	1M 5% 0,062W	
3780	4822 051 20105	1M 5% 0,1W	
3781	4822 051 30475	4M7 5% 0,062W	
3786	4822 051 30223	22k 5% 0,062W	
3786	4822 051 20223	22k 5% 0,1W	
3789	4822 117 12925	47k 1% 0,063W	
3790	4822 051 30223	22k 5% 0,062W	
3790	4822 051 20223	22k 5% 0,1W	
3791	4822 051 30273	27k 5% 0,062W	
3796	4822 051 30475	4M7 5% 0,062W	
3797	4822 051 30563	56k 5% 0,062W	
3800	4822 051 30223	22k 5% 0,062W	
3800	4822 051 20223	22k 5% 0,1W	
4701	4822 051 30008	0R Jumper 0603	
4702	4822 051 30008	0R Jumper 0603	
4705	4822 051 30008	0R Jumper 0603	
4707	4822 051 30008	0R Jumper 0603	
4708	4822 051 30008	0R Jumper 0603	
4709	4822 051 30008	0R Jumper 0603	
4710	4822 051 30008	0R Jumper 0603	
4711	4822 051 30008	0R Jumper 0603	
4712	4822 051 30008	0R Jumper 0603	
4718	4822 051 30008	0R Jumper 0603	
4719	4822 051 30008	0R Jumper 0603	
4720	4822 051 30008	0R Jumper 0603	
4721	4822 051 30008	0R Jumper 0603	
4723	4822 051 30008	0R Jumper 0603	
4725	4822 051 30008	0R Jumper 0603	
4726	4822 051 30008	0R Jumper 0603	
4727	4822 051 30008	0R Jumper 0603	
4729	4822 051 30008	0R Jumper 0603	
4730	4822 051 30008	0R Jumper 0603	
4731	4822 051 30008	0R Jumper 0603	
4732	4822 051 30008	0R Jumper 0603	
4733	4822 051 30008	0R Jumper 0603	
4734	4822 051 30008	0R Jumper 0603	
4735	4822 051 30008	0R Jumper 0603	
4736	4822 051 30008	0R Jumper 0603	Non-AR
4737	4822 051 30008	0R Jumper 0603	Non-AR
4738	4822 051 30008	0R Jumper 0603	
4739	4822 051 30008	0R Jumper 0603	
4741	4822 051 30008	0R Jumper 0603	
4746	4822 051 30008	0R Jumper 0603	
4747	4822 051 30008	0R Jumper 0603	

COILS & FILTERS

5701	4822 157 62552	Coil 2,2uH 5%
5703	4822 156 20946	Osc Coil 100kHz

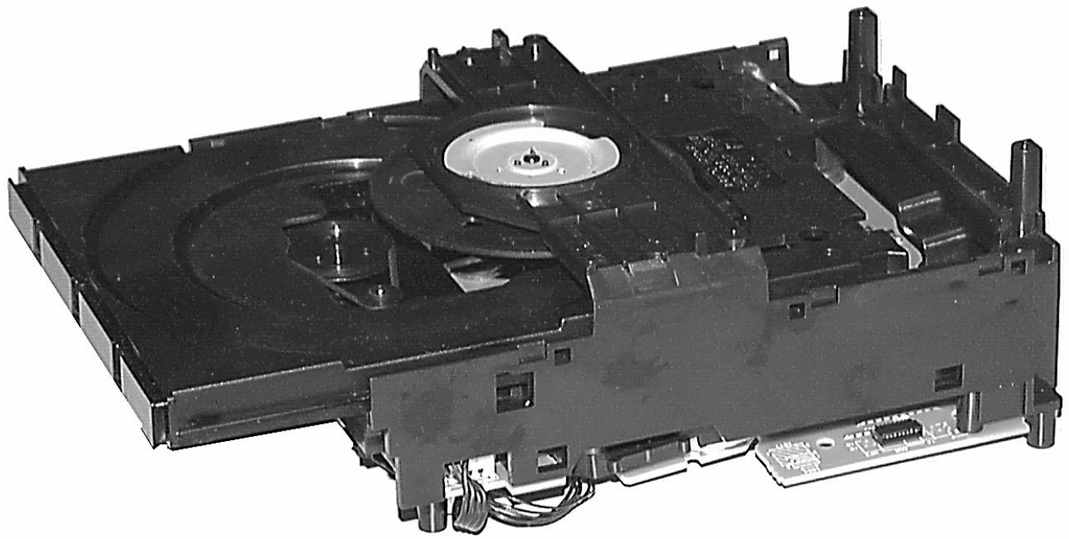
DIODES

6612	4822 130 31878	1N4003G
6770	4822 130 30621	1N4148
6771	4822 130 30621	1N4148
6772	4822 130 30621	1N4148
6773	4822 130 30621	1N4148
6774	4822 130 30621	1N4148
6776	4822 130 30621	1N4148
6777	4822 130 34382	BZX79-B8V2
6778	4822 130 30621	1N4148

TRANSISTORS & INTEGRATED CIRCUIT

7610	5322 209 11306	HEF4094BT
7612	4822 130 11201	PMBT2907
7614	4822 130 11201	PMBT2907
7618	5322 130 60159	BC847B
7620	5322 130 60159	BC847B
7624	5322 130 60159	BC847B
7720	9322 167 09668	AN17150ATA
7780	5322 130 60159	BC847B
7781	4822 130 42804	BC817-25
7782	4822 130 44568	BC557B
7783	5322 130 60159	BC847B
7784	4822 130 60373	BC857B
7786	9340 052 70126	FET SIG J112
7788	5322 130 60159	BC847B
7789	5322 130 60159	BC847B
7790	5322 130 60159	BC847B

Note: Only the parts mentioned in this list are normal service spare parts.



Universal Loader

(Single Disc Tray Loader)

MP3 version, ICD03 PHONIC Layout stage .3

This document describes 2 versions, the version with the Mitsumi CD drive ***MCD2*** and the version with the Sanyo CD drive ***DA12***.
The CD drive used in a specific application is stated on the type plate, located on one of the side walls of the changer module.

TABLE OF CONTENTS

Service hints

In case of symptom „skipping tracks“ perform following actions:

1. VERIFY THE COMPLAINT

PLAYABILITY CHECK

use CD-RW Printed Audio Disk 7104 099 96611
TR 3 (Fingerprint)
TR 8 (600µ black dot) **maximum at 01:00**

- playback of these two tracks without audible disturbance
  playing time for: Fingerprint ≥10seconds
  Black dot from 00:50 to 01:10
- jump forward/backward (search) within a reasonable time

2. CLEAN THE LENS

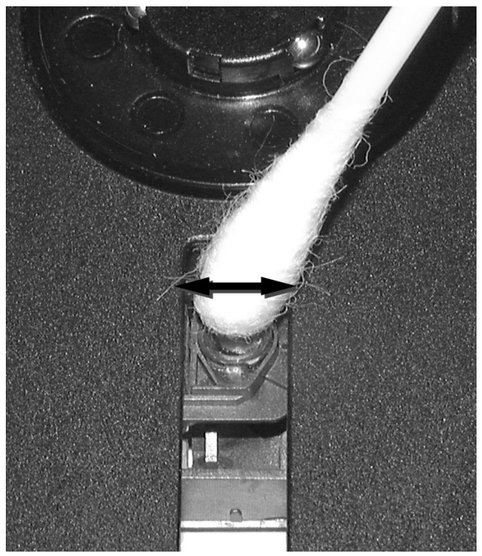
CD DRIVE – LENS CLEANING

Before touching the lens it is advised to clean the surface of the lens by blowing clean air over it in order to avoid that little particles make scratches on the lens.

Because the material of the lens is synthetic and coated with a special anti-reflectivity layer, cleaning must be done with a non-aggressive cleaning fluid. It is advised to use “Cleaning Solvent B4”, available with codenumber 4822 389 10026.

The actuator is a very precise mechanical component and may not be damaged in order to guarantee its full function. It is advised to clean the lens gently (don’t press too hard) with a soft and clean cotton bud moistened with the special lens cleaner.

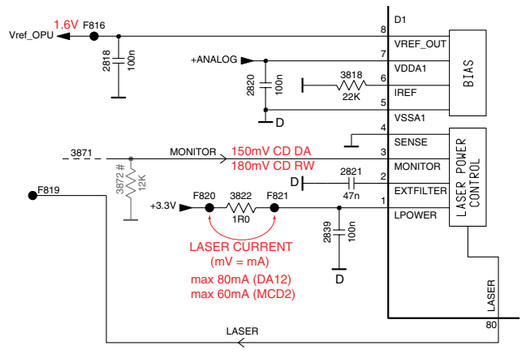
The direction of cleaning must be in the way as indicated in the picture below.



3. MEASURE THE LASER CURRENT

CD DRIVE – LASER CURRENT MEASUREMENT

The laser current can be measured as a voltage drop on resistor 3822. Typical value 50mV (MCD2 disc drive) respectively 55mV (DA12 disc drive).



If the value is higher than 60mV (MCD2 disc drive) respectively 80mV (DA12 disc drive) or the current increases just after switching the laser on - the laserdiode is most probably defective. In that case the CD drive has to be replaced.

4. GENERAL HINTS

Since the HF pre-amplifier is integrated into the new ”CD18“ signal processor the well-known eye pattern signal is not available as external signal and cannot be measured anymore. Also measuring the offset voltages is not necessary because the new signal processor contains an automatic offset compensation.

However the circuitry offers some new aspects for checking the system:

- the Monitor voltage shows if the sensitivity is set correctly (attention: ESD sensitive line!):
  CD DA: 150mV
  CD RW: 180mV

- the Focus search algorithm is divided into 4 steps:
  1st step: CD DA sensitivity
  2nd step: CD DA enforced sensitivity
  3rd step: CD RW sensitivity
  4th step: CD RW enforced sensitivity

The used sensitivity can be found out by either measuring the Monitor voltage or counting the up/down movements of the OPU until focus is found.
e.g. when a normal CD DA is played back Monitor voltage should measure 150mV respectively Focus should be found within the first up/down movement of the OPU.

In case a higher sensitivity setting can be observed than defined, there are following possible reasons:
- disc scratched or dirty
- poor reflectivity of the disc - disc not conform standard
- lens of the OPU dirty
- laser power too low

Service hints

CAUTION

CHARGED CAPACITORS ON THE SERVO BOARD MAY DAMAGE THE CD DRIVE ELECTRONICS WHEN CONNECTING A NEW CD MECHANISM. THAT´S WHY, BESIDES THE SAFETY MEASURES LIKE
• SWITCH OFF POWER SUPPLY
• ESD PROTECTION
ADDITIONAL ACTIONS MUST BE TAKEN BY THE REPAIR TECHNICIAN.

The following steps have to be done when replacing the CD mechanism:
1. Disconnect flexfoil cable from the old CD drive
2. Put a paperclip onto the flexfoil cable to short-circuit the contacts (fig.1)
3. Remove the old CD drive
4. Remove paperclip from the flexfoil cable and connect it to the new CD drive
5. Position the new CD drive on its studs
6. Remove solder joint from the Laser unit (see below)

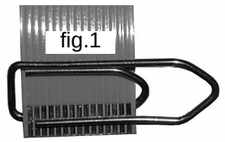
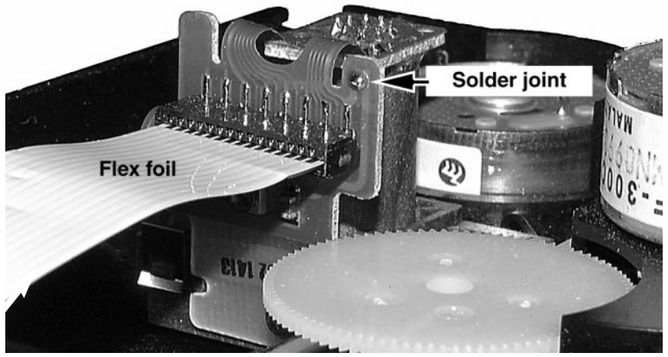


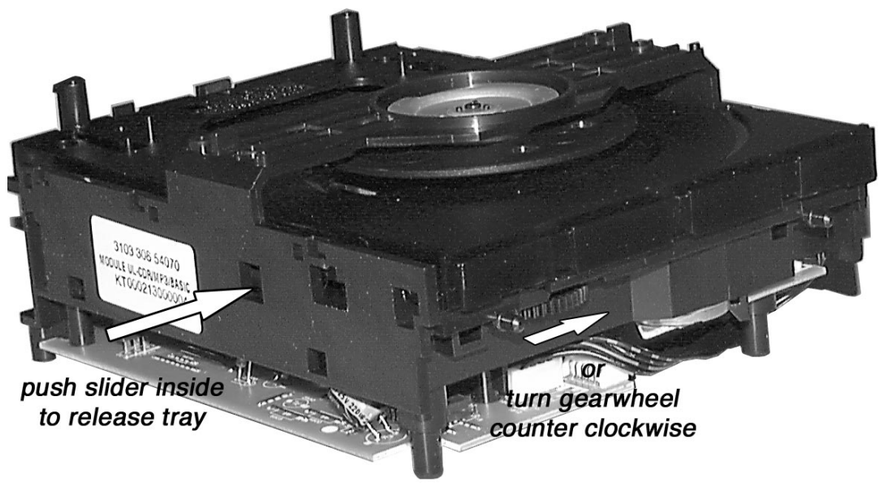
fig.1

Attention: The laser diode of this CD drive is protected against ESD by a solder joint which short-circuits the laser diode to ground.
For proper functionality of the CD drive this solder joint must be removed **after** connecting the drive to the set.



Emergency open

In case of a Supply fault, the drawer can be opened manually.
1. Remove the top cover of the set to get access to the CD Module.
2. Proceed as shown in picture below.



10-2

Service hints

Dismantling of Drawer

1. Open the drawer and release 2 catches as shown in fig. 2
2. Pull drawer out.

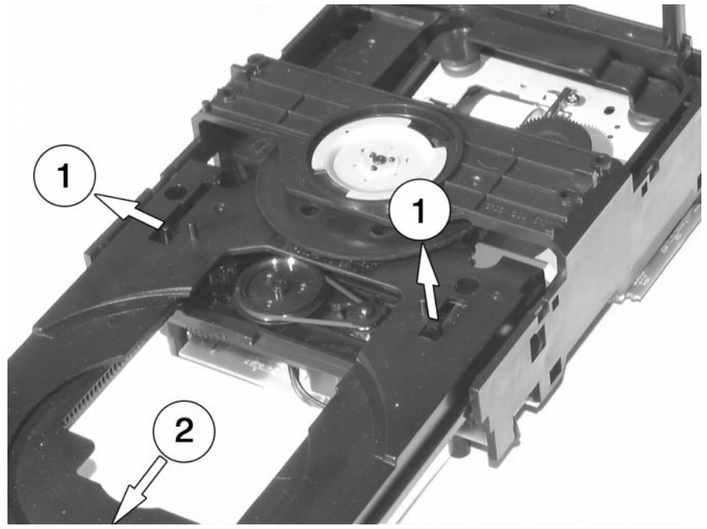
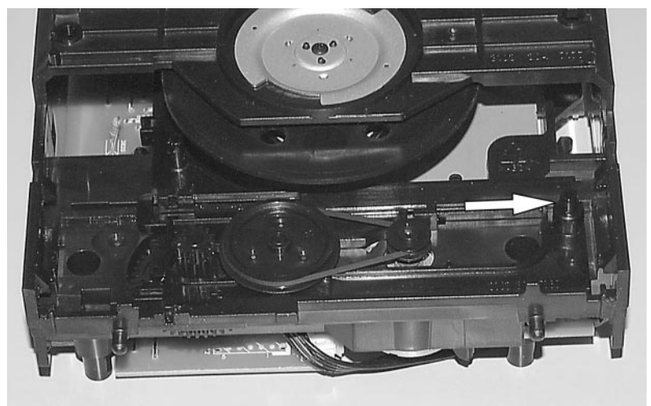


fig.2

Assembling of Drawer

1. Check if slider is on the right side → see picture below.
2. If necessary - move slider to the right end position first.
3. Insert the Drawer.



10-3

Abbreviations

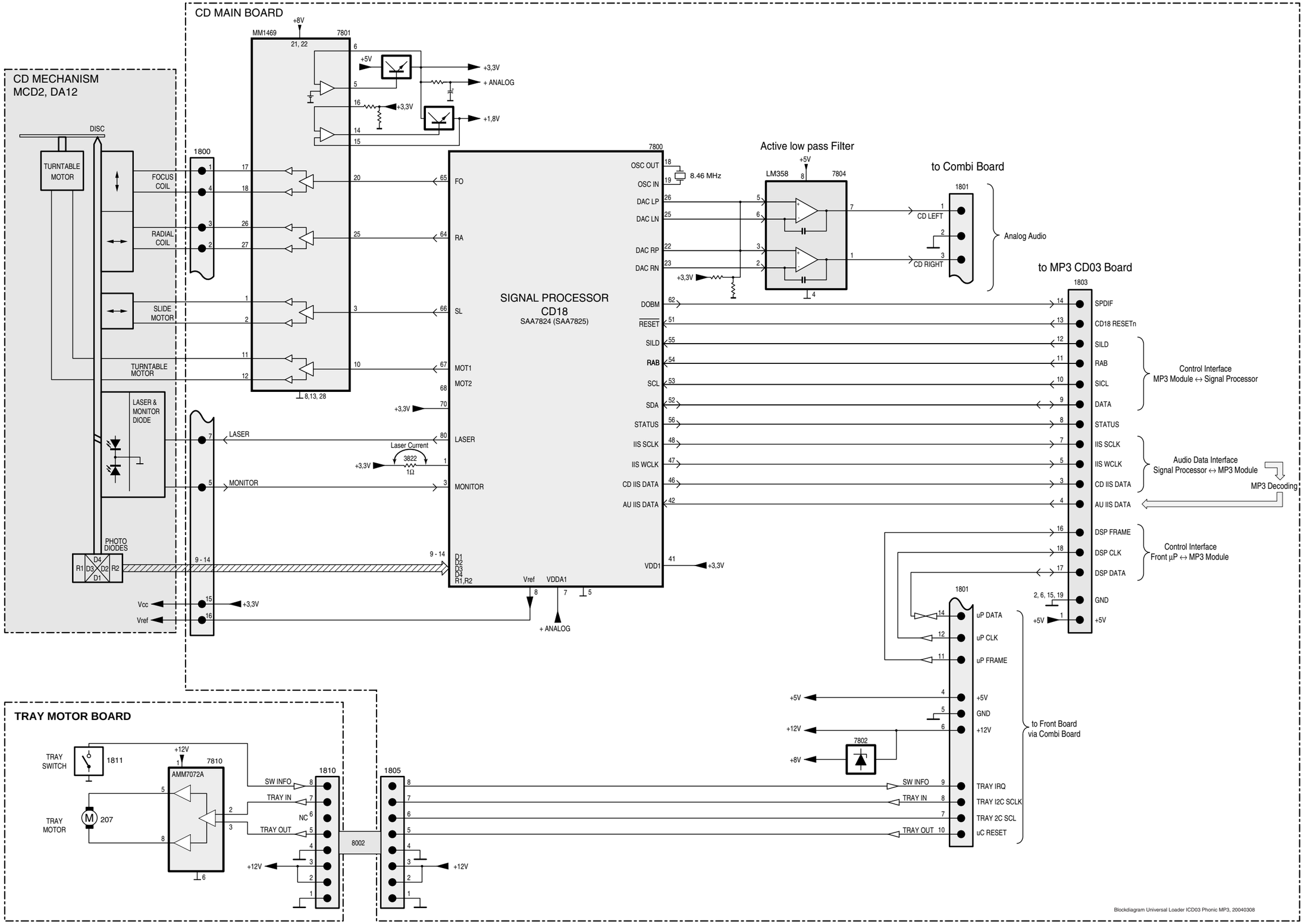
SIGNAL PROCESSOR (CD18) SAA7825

SYMBOL	PIN	I/O	DESCRIPTION
LFPOWER	1	I	laser power supply
EXFILTER	2	O	10 nF capacitor for laser start-up control
MONITOR	3	I	laser monitor diode
SENSE	4	I	OPU ground reference point for MONITOR measurement
V_{SSA1}	5	SUP	analog ground 1
I_{REF}	6	O	reference current output (22 kΩ resistor connected to analog ground)
V_{DDA1}	7	SUP	analog supply voltage 1
V_{REFO}	8	I/O	servo reference voltage
D1	9	I	diode voltage/current input (central diode signal input)
D2	10	I	diode voltage/current input (central diode signal input)
D3	11	I	diode voltage/current input (central diode signal input)
D4	12	I	diode voltage/current input (central diode signal input)
R1	13	I	diode voltage/current input (satellite diode signal input)
R2	14	I	diode voltage/current input (satellite diode signal input)
CSLICE	15	I/O	22 nF capacitor for adaptive HF data slicer
V_{DDA2}	16	SUP	analog supply voltage 2
V_{SSA2}	17	SUP	analog ground 2
OSCOUT	18	O	crystal/resonator output
OSCIN	19	I	crystal/resonator input
V_{SSA3}	20	SUP	analog ground 3
DACGND	21	I	audio DAC ground
DACRP	22	O	audio DAC right channel differential positive output
DACRN	23	O	audio DAC right channel differential negative output
$DACV_{ref}$	24	I/O	audio DAC decoupling point (10 μF or 100 nF to ground
DACLN	25	O	audio DAC left channel differential negative output
DACLP	26	O	audio DAC left channel differential positive output
$DACV_{pos}$	27	I	audio DAC positive supply voltage
$BUFV_{pos}$	28	I	audio buffer positive supply voltage
BUFINR	29	I	audio buffer right input
BUFOUTR	30	O	audio buffer right output
BUFOUTL	31	O	audio buffer left output
BUFINL	32	I	audio buffer left input
BUFGND	33	I	audio buffer ground
LKILL	34	O	KILL output for left channel (configurable as open-drain)
RKILL	35	O	KILL output for right channel (configurable as open-drain)
CDTRDY	36	O	CD text output to microcontroller ready flag
CDTDATA	37	O	CD text output data to microcontroller
CDTCLK	38	I	CD text microcontroller clock input
CFLAG	39	O	correction flag output (open-drain)
V_{SSD1}	40	SUP	digital ground 1

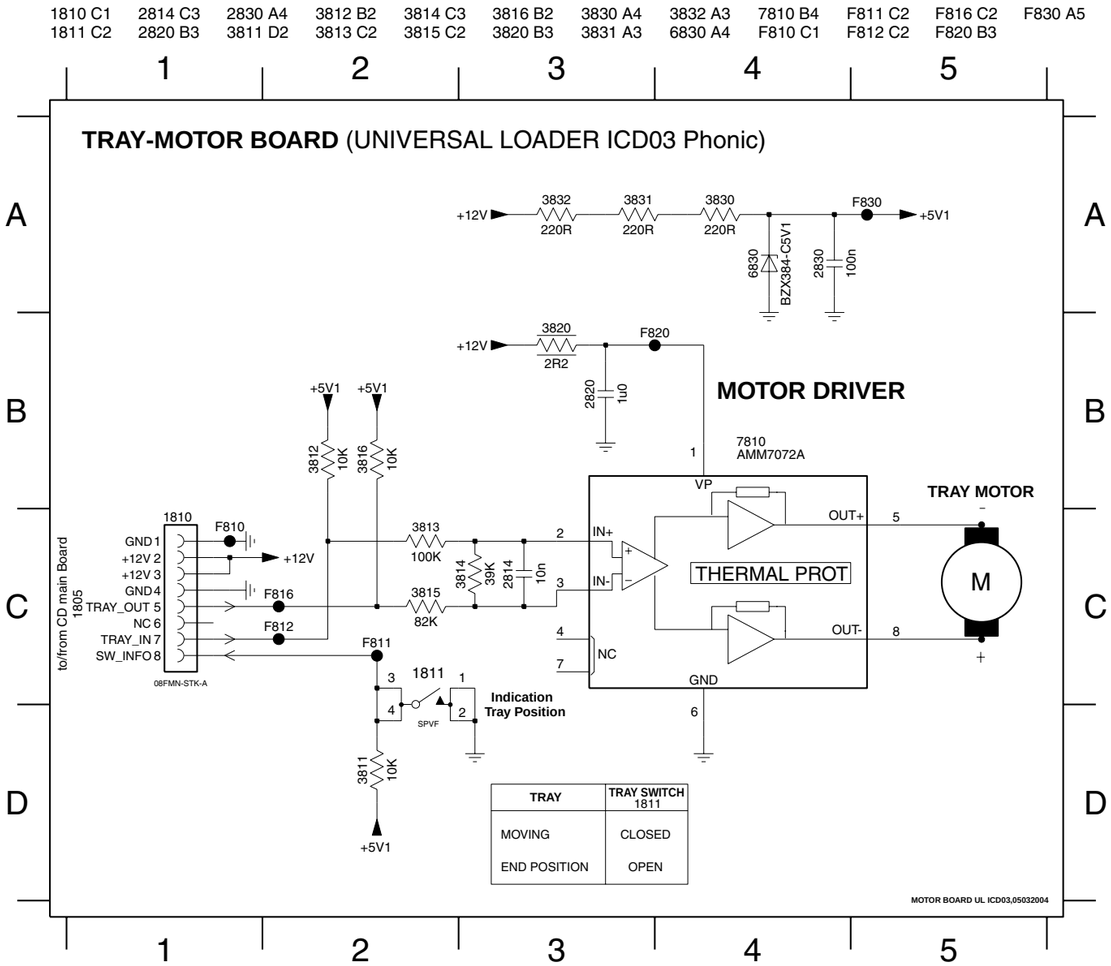
SYMBOL	PIN	I/O	DESCRIPTION
V_{DDD1}	41	SUP	digital supply voltage 1
SDI	42	I	serial data input (loopback)
WCLI	43	I	word clock input (loopback)
SCLI	44	I	serial bit clock input (loopback)
EF	45	O	C2 error flag output
DATA	46	O	serial data output
WCLK	47	O	word clock output
SCLK	48	O	serial clock output
CLK16	49	O	16 MHz clock output
CLK4/12	50	O	configurable 4 MHz or 12 MHz clock output
$\overline{RESET}$	51	I	power-on reset input (active LOW)
SDA	52	I/O	microcontroller interface data input/output (open-drain)
SCL	53	I	microcontroller interface clock input
RAB	54	I	microcontroller interface R/W and load control input (4-wire)
SILD	55	I	microcontroller interface R/W and load control input (4-wire)
STATUS	56	O	servo interrupt request line/decoder status register/DC offset value readback output
RCK	57	I	subcode clock input
SUB	58	O	P to W subcode output
SFSY	59	O	subcode frame sync output
SBSY	60	O	subcode block sync output
V_{SSD2}	61	SUP	digital ground 2
DOBM	62	O	bi-phase mark output (externally buffered)
V_{DDD2}	63	SUP	digital supply voltage 2
RA	64	O	radial actuator output
FO	65	O	focus actuator output
SL	66	O	sledge actuator output
MOTO1	67	O	motor output 1 output
MOTO2	68	O	motor output 2 output
V_{SSD3}	69	SUP	digital ground 3
V_{DDD3}	70	SUP	digital supply voltage 3
V1	71	I	versatile pin 1 input
V2	72	I	versatile pin 2 input
V3	73	O	versatile pin 3 output
V4	74	O	versatile pin 4 output
V5	75	O	versatile pin 5 output
TEST1	76	I	test pin 1 input
TEST2	77	I	test pin 2 input
TEST3	78	I	test pin 3 input
TEST4	79	I	test pin 4 input
LASER	80	O	laser drive output

10-4

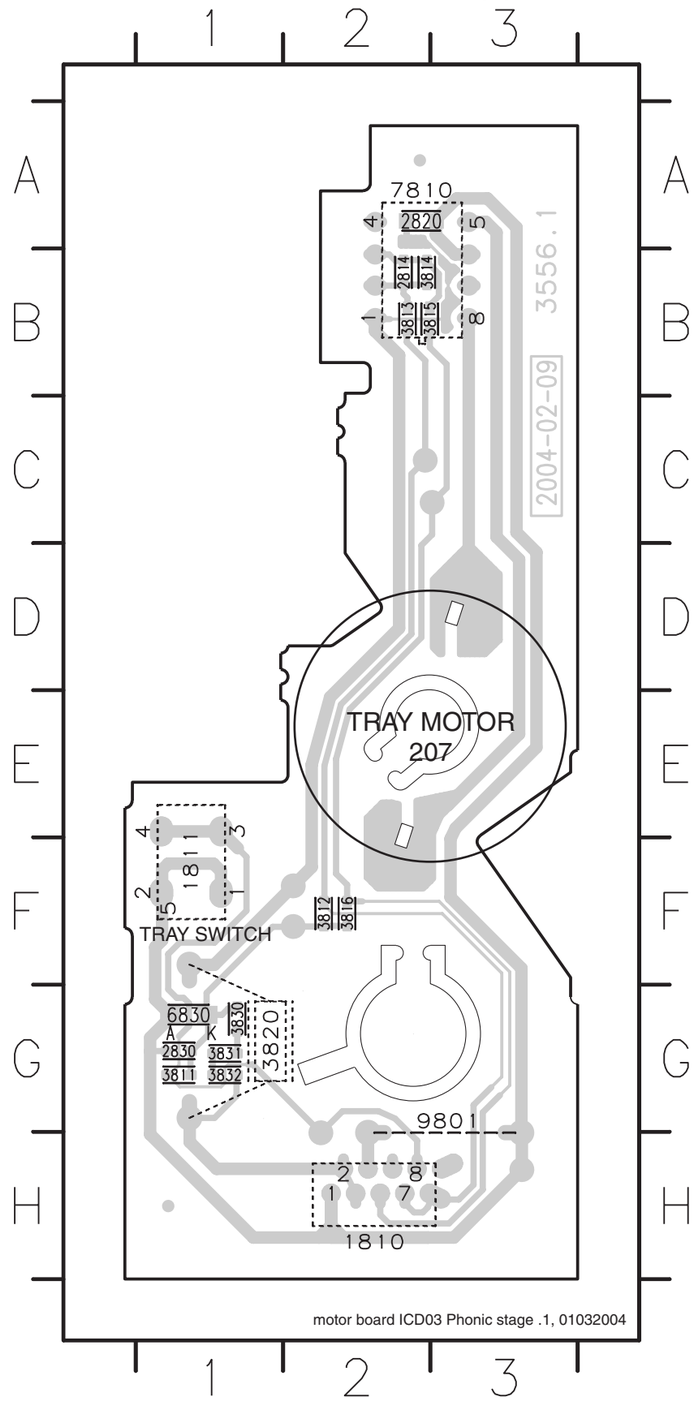
BLOCK DIAGRAM
Universal Loader / ICD03 PhonIC MP3



10-5



TRAY MOTOR BOARD / copper side view



10-6

CD MAIN BOARD
ICD03 / MP3 version

AUDIO OUT

DACLEFT to 1801
DACRIGHT to 1801
7804-2 LM358D
7804-1 LM358D
VCC_OPAMP 4.8V
Vref_OPAMP 1.3V
+5V
+3.3V
+ANALOG 3.2V
GNDA

7800 SAA7825H
SIGNAL PROCESSOR CD18 - PhonIC

DAC BITSTREAM
HEADPHONE BUFFERS
KILL
CD-TEXT INTERFACE
TIMING
DC OFFSET COMPENSATION
VOLTAGE & CURRENT BUFFER HF & LF CAPTURE
HF
DATASLICER
BIAS
SERVO
LASER POWER CONTROL
PROCESSOR AUDIO
SRAM
DEMOD EFM DIGITAL PLL
FLAGS CORRECTOR ERROR
PROCESSOR SUBCODE
TEST
VERSATILE PINS INTERFACE
MOTOR CONTROL
OUTPUT STAGES
EBU INTERFACE
SERIAL DATA LOOPBACK INTERFACE
SERIAL DATA INTERFACE
MICRO CONTROLLER INTERFACE

VSSA3 OSCIN OSCOUT VSSA2 VDDA2 CSLICE R2 R1 D4 D3 D2 D1 VREF_OUT VDDA1 IREF VSSA1 SENSE MONITOR EXTFILTER LPOWER
DAC_GND DAC_HP DAC_RN DAC_VREF DAC_LN DAC_LP DAC_VPOS DAC_VPOS BUF_IN_R BUF_OUT_R BUF_OUT_L BUF_IN_L BUF_GND LKILL RKILL CDT_RDY CDT_DATA CDT_CLK CR_AG VSSD1
LASER TEST4 TEST3 TEST2 TEST1 V5 V4 V3 V2 V1 VDDD3 VSSD3 MOTO2 MOTO1 SL FO RA VDDD2 DOBM VSSD2
VDDD1 SDI WCLI SCLI EF DATA WCLK SCLK CLK16 CLK4_12 RESET SDA SCL RAB SILD STATUS RCK SUB SFSY SBSY

MONITOR 150mV CD DA / 180mV CD RW
LASER CURRENT (mV = mA) max 80mA (DA12) max 60mA (MCD2)
LASER
FOCUS
TRACK
SLIDE
DISC

DRIVE DETECTION
DA12 10K
MCD2 10K

MOTOR DRIVER
7801 MM1469PH
Level shift
Driver Mute
D.BUF
Vcc
Vref
+8V

CD Drive
Sanyo DA12
Mitsumi MCD2
16PNM-STK-A
VREF VCC GND LD MON F+ T+ T- F-
ESD sensitive line!

T = 1 s during Focus search

CD18_RESETn from 1803/13

7802 L7808 IN OUT COM

to MP3CD03 MODULE
from 1801 Control Interface FRONT - MP3CD03
DSP_CLK DSP_DATA DSP_FRAME SPDIF_GND SPDIF CD18_RESETn SILD RAB SICL SDA STATUS IIS_SCLK GND IIS_WCLK AU_IIS_DATA CD_IIS_DATA +5V
CONTROL INTERFACE MP3 MODULE - CD18
AUDIO DATA INTERFACE CD18 MP3 MODULE
1803 FMN

to Combi Board
from 7804
DACLEFT DACRIGHT
CD_LEFT GND_A CD_RIGHT +5V GND +12V Tray_I2C_SDA Tray_I2C_SCL Tray_IRQ uC_RESET uP_FRAME uP_CLK uP_DATA
1801 15FE-BT-VK-N
1805 FMN
(SW_INFO) (TRAY_IN) (NC) (TRAY_OUT)
FFC 1->>n
to 5DTC CONTROL BOARD (to UNIV.LOADER-MOTOR BOARD)
to 1803 Control Interface FRONT - MP3CD03
to 7801/7
SPDIF_GND SPDIF

V.... DC voltages and waveforms measured in PLAY mode
...for provision only

UL ICD03 Phonic MP3, 08032004

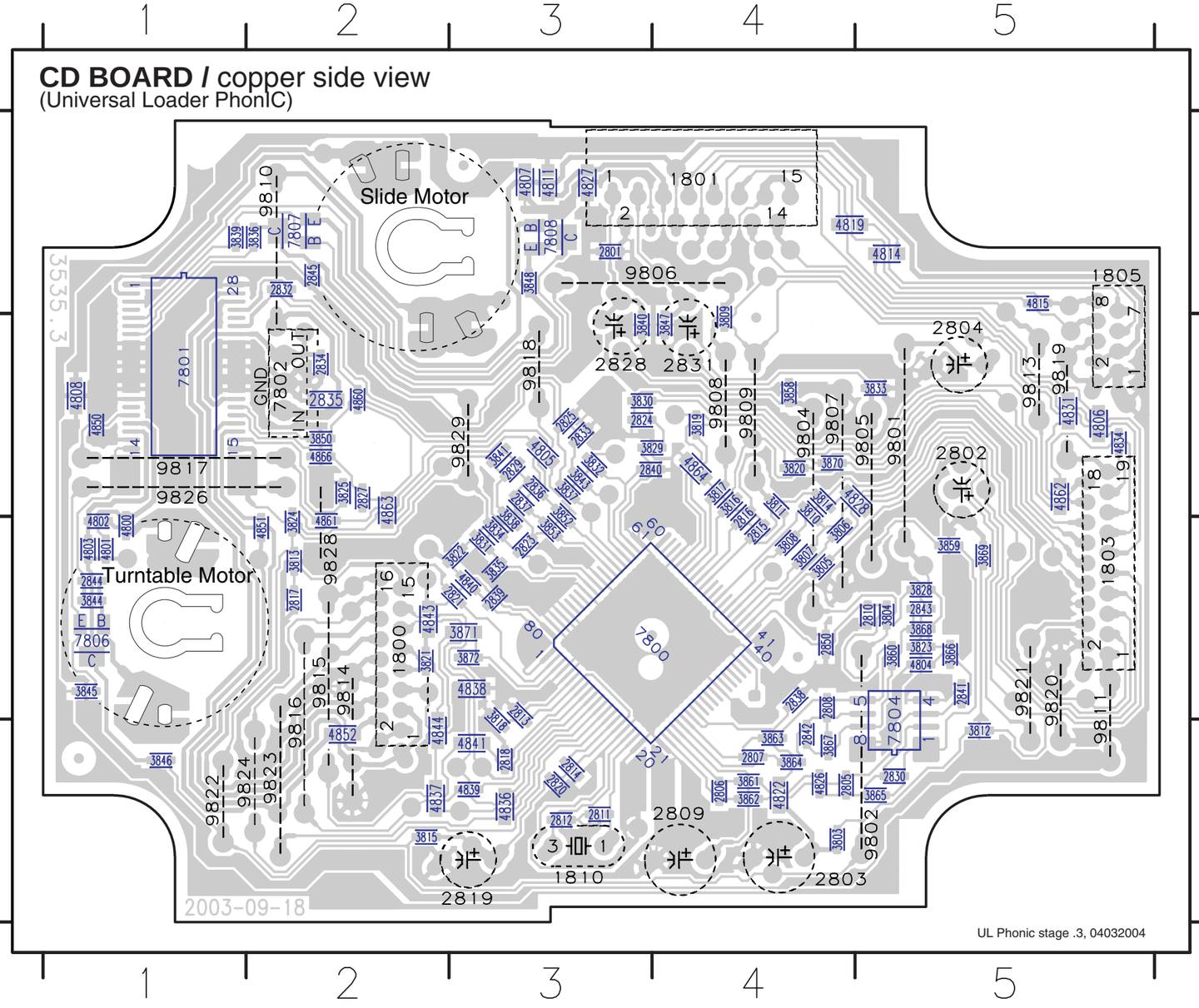
1800 D2 1801 G14 1803 B14 1805 H11 1810 B6 2801 A9 2802 B2 2803 A9 2804 B3 2805 A6 2806 A8 2807 A8 2808 A4 2809 A8 2810 B11 2811 B6 2812 B6 2813 C5 2814 C7 2815 D11 2816 D12 2817 D3 2818 D5 2819 C5 2820 D6 2821 E7 2823 G9 2824 F11 2825 F7 2827 F7 2828 G12 2829 G8 2830 A5 2831 G12 2832 H6 2833 H7 2834 I6 2835 I5 2836 I3 2837 I4 2838 A9 2839 E7 2840 G10 2841 B5 2842 A3 2843 A3 2844 G5 2845 H6 2850 A9 3803 A8 3804 B11 3805 B11 3806 C12 3807 C11 3808 C11 3809 H3 3810 C11 3811 C12 3812 D12 3813 D3 3814 D12 3815 B5 3816 D11 3817 D11 3818 D7 3819 D11 3820 D11 3821 E5 3822 E6 3823 B2 3824 F4 3825 F4 3828 B2 3829 F10 3830 F11 3831 F8 3832 G10 3833 B4 3834 G9 3835 F8 3836 H5 3837 F7 3838 G9 3839 H4 3840 G12 3841 G8 3843 G7 3844 G5 3845 G6 3846 G5 3847 G12 3848 H5 3850 F3 3852 I3 3853 I4 3858 A2 3859 A5 3860 A3 3861 A6 3862 A6 3863 A4 3864 A4 3865 A5 3866 B6 3867 A3 3868 A4 3869 B2 3870 E12 3871 E5 3872 E5 4800 H4 4801 H4 4802 H4 4803 H4 7800 B11

7801 G2 7802 I5 7804-1 A5 7804-2 A3 7806 G5 7807 H5 7808 H5 7801 B3 F803 B12 F804 C7 F805 C12 F806 C12 F807 D13 F808 C4 F809 C12 F810 C4 F811 C4 F812 D4 F813 D4 F814 D4 F815 B6 F816 D5 F818 E2 F819 E5 F820 E6 F821 E6 F822 E3 F823 E2 F824 E2 F825 F4 F826 F4 F827 F3 F828 F9 F829 D12 F830 D12 F831 F10 F832 F10 F833 G8 F834 G13 F835 G13 F836 G13 F837 G13 F838 H13 F839 H13 F840 H2 F841 H2 F842 H13 F843 H13 F844 H4 F845 H13 F846 H4 F847 H13 F848 H13 F849 I13 F850 I13 F851 I14 F852 C13 F853 C13 F854 D12 F855 D12 F856 D12 F857 G6

10-7

WIRED COMPONENTS

1800 C2
1801 A4
1803 C5
1805 B5
1810 D3
2802 B5
2803 D4
2804 B5
2809 D4
2819 D3
2828 B3
2831 B4
7802 B2
9801 B5
9802 D5
9804 B4
9805 B5
9806 A3
9807 B4
9808 B4
9809 B4
9810 A2
9811 C5
9813 B5
9814 D2
9815 C2
9816 D2
9817 B1
9818 B3
9819 B5
9820 C5
9821 C5
9822 D1
9823 D2
9824 D2
9826 B1
9828 C2
9829 B3

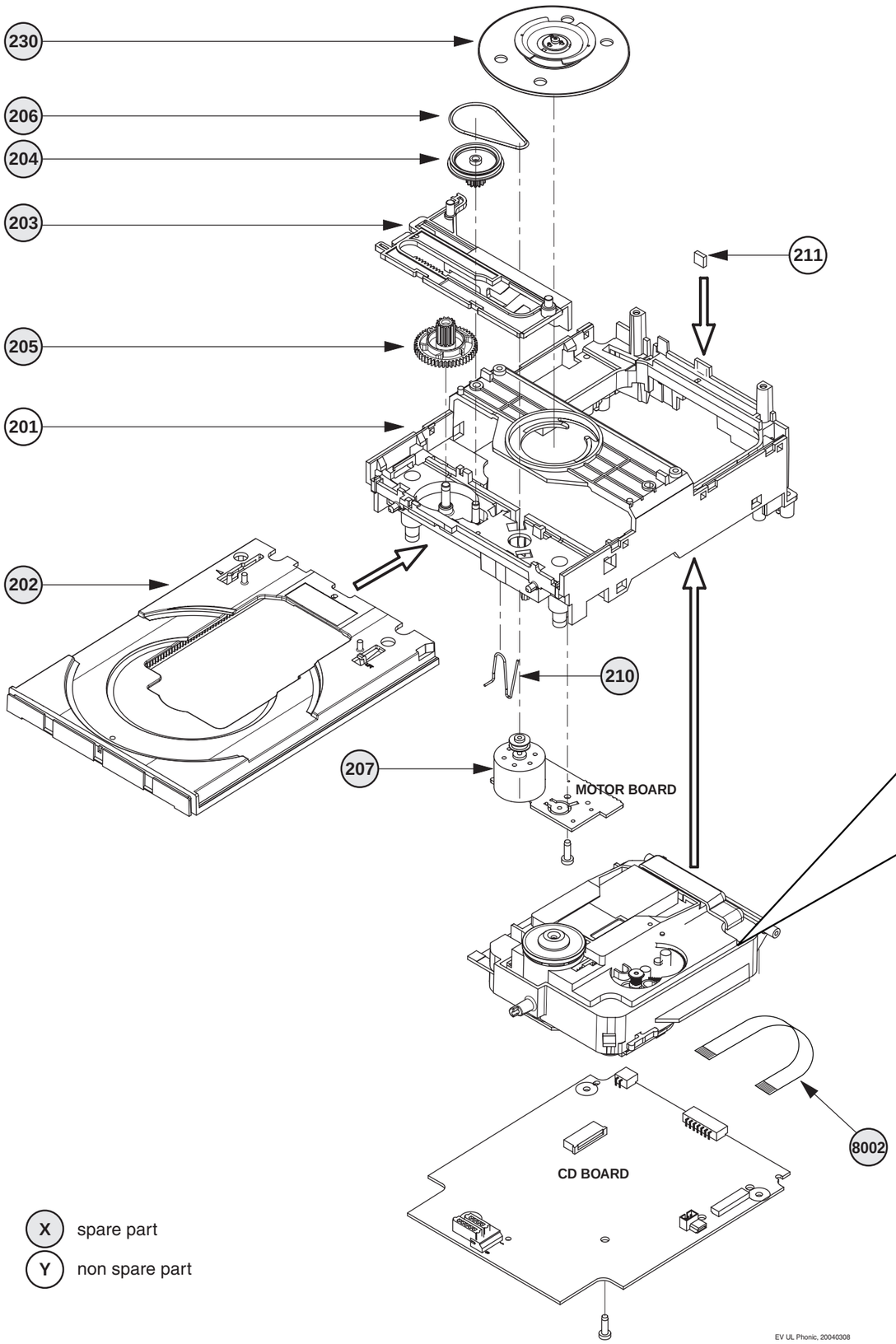


SURFACE MOUNTED COMPONENTS

2801 A3
2805 D4
2806 D4
2807 D4
2808 C4
2810 C5
2811 D3
2812 D3
2813 C3
2814 D3
2815 C4
2816 C4
2817 C2
2818 D3
2820 D3
2821 C3
2823 C3
2824 B3
2825 B3
2827 B2
2829 B3
2830 D5
2832 A2
2833 B3
2834 B2
2835 B2
2836 B3
2837 B3
2838 C4
2839 C3
2840 B3
2841 C5
2842 D4
2843 C5
2844 C1
2845 A2
2850 C4
3803 D4
3804 C5
3805 C4
3806 C4
3807 C4
3808 C4
3809 B4
3810 B4
3811 B4
3812 D5
3813 C2
3814 B4
3815 D2
3816 B4
3817 B4
3818 D3
3819 B4
3820 B4
3821 C2
3822 C3
3823 C5
3824 C2
3825 B2
3828 C5
3829 B3
3830 B3
3831 C3
3832 B3
3833 B5
3834 C3
3835 C3
3836 A2
3837 B3
3838 C3
3839 A1
3840 B3
3841 B3
3843 B3
3844 C1
3845 C1
3846 D1
3847 B4
3848 A3
3850 B2
3852 B3
3853 C3
3858 B4
3859 C5
3860 C5
3861 D4
3862 D4
3863 D4
3864 D4
3865 D5
3866 C5
3867 D4
3868 C5
3869 C5
3870 B4
3871 C3
3872 C3
4800 C1
4801 C1
4802 C1
4803 C1
4804 C5
4805 B3
4806 B5
4807 A3
4808 B1
4811 A3
4814 A5
4815 A5
4819 A4
4822 D4
4826 D4
4827 A3
4828 B5
4831 B5
4834 B5
4836 D3
4837 D2
4838 C3
4839 D3
4840 C3
4841 D3
4843 C2
4844 D2
4850 B1
4851 C2
4852 D2
4860 B2
4861 C2
4862 B5
4863 B2
4864 B4
4866 B2
7800 C3
7801 B1
7804 D5
7806 C1
7807 A2
7808 A3

10-8

Exploded view *UNIVERSAL LOADER*



X spare part

Y non spare part

MECHANICAL PARTS

202	3103 304 71780	DRAWER
203	3103 304 71800	SLIDER
204	3103 304 71820	PULLEY GEARWHEEL
205	3103 304 71830	GEARWHEEL
206	3103 304 71910	DRIVING BELT
207	3103 308 54160	MOTOR ASSY
210	3103 301 06660	SPRING SUPPORT
220	3103 304 71790	SUPPORT CD
222	4822 529 10387	RUBBER DAMPER CD DRIVE, FRONT
223	4822 529 10387	RUBBER DAMPER CD DRIVE, FRONT
230	3103 308 11940	CLAMPER ASSY DA11
240	3103 309 05380	CD DRIVE, MCD2
240	3103 309 05390	CD DRIVE DA12T3
8001	3103 308 93611	FLEXFOIL CABLE, 16P, 88mm BD
8002	3103 308 94021	FLEXFOIL CABLE, 8P, 268mm AD

MOTOR BOARD

MISCELLANEOUS

1810	2422 025 16371	FFC-CONNECTOR, 8P, SIDE ENTRY
1811	2422 129 16655	LEAF SWITCH, 1P

CAPACITORS

2814	©	5322 126 11583	10nF	10%	63V
2820	©	4822 126 14043	1µF	20%	16V
2830	©	2238 586 59812	100nF	10%	50V

RESISTORS

3811	©	4822 051 30103	10kΩ	5%	0,06W
3812	©	4822 051 30103	10kΩ	5%	0,06W
3813	©	4822 117 13632	100kΩ	1%	0,06W
3814	©	4822 051 30393	39kΩ	5%	0,06W
3815	©	4822 117 12864	82kΩ	5%	0,06W
3816	©	4822 051 30103	10kΩ	5%	0,06W
3820		4822 052 10228	2,2Ω	5%	0,33W
3830	©	4822 051 30221	220Ω	5%	0,06W
3831	©	4822 051 30221	220Ω	5%	0,06W
3832	©	4822 051 30221	220Ω	5%	0,06W

DIODES

6830	©	9340 548 52115	BZX284-C5V1

INTEGRATED CIRCUITS

7810	9322 196 36682	AMM7072A, MOTOR DRIVER

MP3 CD03 BOARD

Only complete board available

3103 308 67611	MP3 CD03 BOARD TXT5V

CD BOARD

MISCELLANEOUS

1800	4822 267 11028	FFC-CONNECTOR, 16P, SIDE ENTRY
1801	4822 265 10979	FFC-CONNECTOR, 15P, SIDE ENTRY
1803	2422 025 16836	FFC-CONNECTOR, 19P, SIDE ENTRY
1805	2422 025 16371	FFC-CONNECTOR, 8P, SIDE ENTRY

CAPACITORS

2801	©	3198 017 34730	47nF	10%	16V
2802		4822 124 41584	100µF	20%	10V
2803		4822 124 12052	220µF	20%	6,3V
2804		4822 124 11912	220µF	20%	6,3V
2805	©	2020 552 94427	100pF	5%	50V
2806	©	2238 916 11552	1,5nF	5%	25V
2807	©	2238 916 11552	1,5nF	5%	25V
2808	©	2020 552 94427	100pF	5%	50V
2809		4822 124 12052	220µF	20%	6,3V
2810	©	2238 586 59812	100nF	10%	50V
2813	©	2238 586 59812	100nF	10%	50V
2814	©	2238 916 15641	22nF	10%	25V
2815	©	5322 126 11578	1nF	10%	63V
2817	©	2238 586 59812	100nF	10%	50V
2818	©	2238 586 59812	100nF	10%	50V
2820	©	2238 586 59812	100nF	10%	50V
2821	©	3198 024 44730	47nF	5%	50V
2823	©	2238 586 59812	100nF	10%	50V
2825	©	5322 126 11583	10nF	10%	63V
2828		4822 124 40248	10µF	20%	63V
2829	©	3198 017 41050	1µF	20%	10V
2830	©	4822 126 13883	220pF	5%	50V
2831		4822 124 40248	10µF	20%	63V
2833	©	5322 126 11582	6,8nF	10%	63V
2834	©	3198 017 44740	470nF	20%	10V
2835	©	4822 126 13482	470nF	20%	16V
2836	©	3198 017 44740	470nF	20%	10V
2837	©	4822 126 13879	220nF	20%	16V
2838	©	2238 586 59812	100nF	10%	50V
2839	©	2238 586 59812	100nF	10%	50V
2840	©	2238 586 59812	100nF	10%	50V
2841	©	4822 126 13883	220pF	5%	50V
2842	©	4822 126 13883	220pF	5%	50V
2843	©	4822 126 13883	220pF	5%	50V
2844	©	5322 126 11583	10nF	10%	63V
2845	©	2238 586 59812	100nF	10%	50V

RESISTORS

3803	©	4822 051 30109	10Ω	5%	0,06W
3804	©	4822 051 30109	10Ω	5%	0,06W
3805	©	4822 051 30471	470Ω	5%	0,06W
3806	©	4822 051 30471	470Ω	5%	0,06W
3807	©	4822 051 30471	470Ω	5%	0,06W
3808	©	4822 051 30471	470Ω	5%	0,06W
3809	©	4822 051 30102	1kΩ	5%	0,06W
3810	©	4822 051 30471	470Ω	5%	0,06W
3811	©	4822 051 30471	470Ω	5%	0,06W
3812	©	4822 051 30472	4,7kΩ	5%	0,06W
3813	©	4822 051 30339	33Ω	5%	0,06W
3814	©	4822 051 30471	470Ω	5%	0,06W
3815	©	4822 117 13608	4,7Ω	5%	0,06W
3816	©	4822 051 30471	470Ω	5%	0,06W
3817	©	4822 051 30471	470Ω	5%	0,06W
3818	©	4822 051 30223	22kΩ	5%	0,06W
3819	©	4822 051 30471	470Ω	5%	0,06W
3820	©	4822 051 30471	470Ω	5%	0,06W
3821	©	4822 117 13608	4,7Ω	5%	0,06W
3822	©	4822 117 12917	1Ω	5%	0,06W

10-9

ELECTRICAL PARTSLIST Universal Loader / ICD03 PhonIC MP3 Version

RESISTORS

3823	©	4822 051 30102	1kΩ	5%	0,06W
3824	©	5322 117 13028	12kΩ	1%	0.06W
3825	©	5322 117 13033	15kΩ	1%	0.06W
3828	©	4822 051 30152	1,5kΩ	5%	0,06W
3831	©	4822 051 30103	10kΩ	5%	0,06W for DA12 drive only
3832	©	4822 117 12971	15Ω	5%	0,06W
3833	©	4822 051 30152	1,5kΩ	5%	0,06W
3834	©	4822 051 30101	100Ω	5%	0,06W
3835	©	4822 051 30103	10kΩ	5%	0,06W for MCD2 drive only
3836	©	4822 117 13608	4,7Ω	5%	0,06W
3837	©	4822 051 30152	1,5kΩ	5%	0,06W
3838	©	4822 051 30102	1kΩ	5%	0,06W
3839	©	4822 051 30221	220Ω	5%	0,06W
3840	©	4822 051 30223	22kΩ	5%	0,06W
3841	©	4822 051 30102	1kΩ	5%	0,06W
3843	©	4822 051 30222	2,2kΩ	5%	0,06W
3844	©	4822 051 30103	10kΩ	5%	0,06W
3845	©	4822 051 30471	470Ω	5%	0,06W
3846	©	4822 051 30479	47Ω	5%	0,06W
3847	©	4822 051 30223	22kΩ	5%	0,06W
3848	©	4822 117 13613	2,2Ω	5%	0,06W
3850	©	4822 051 30183	18kΩ	5%	0,06W
3852	©	4822 051 30472	4,7kΩ	5%	0,06W
3853	©	4822 051 30472	4,7kΩ	5%	0,06W for MCD2 drive only
3853	©	4822 051 30682	6,8kΩ	5%	0,06W for DA12 drive only
3858	©	4822 051 30152	1,5kΩ	5%	0,06W
3859	©	4822 051 30101	100Ω	5%	0,06W
3860	©	4822 051 30101	100Ω	5%	0,06W
3861	©	4822 051 30223	22kΩ	5%	0,06W
3862	©	4822 051 30223	22kΩ	5%	0,06W
3863	©	4822 051 30223	22kΩ	5%	0,06W
3864	©	4822 051 30223	22kΩ	5%	0,06W
3865	©	4822 051 30123	12kΩ	5%	0,06W
3866	©	4822 051 30123	12kΩ	5%	0,06W
3867	©	4822 051 30123	12kΩ	5%	0,06W
3868	©	4822 051 30123	12kΩ	5%	0,06W
3869	©	4822 051 30101	100Ω	5%	0,06W
3870	©	4822 117 12925	47kΩ	1%	0,06W
3871	©	4822 051 20008	CHIP JUMPER 0805		
4800	©	4822 051 30008	CHIP JUMPER 0603		for MCD2 drive only
4801	©	4822 051 30008	CHIP JUMPER 0603		for DA12 drive only
4802	©	4822 051 30008	CHIP JUMPER 0603		for DA12 drive only
4803	©	4822 051 30008	CHIP JUMPER 0603		for MCD2 drive only
4804	©	4822 051 30008	CHIP JUMPER 0603		
4805	©	4822 051 20008	CHIP JUMPER 0805		
4806	©	4822 051 20008	CHIP JUMPER 0805		
4807	©	4822 051 20008	CHIP JUMPER 0805		
4808	©	4822 051 20008	CHIP JUMPER 0805		
4811	©	4822 051 20008	CHIP JUMPER 0805		
4814	©	4822 051 20008	CHIP JUMPER 0805		
4815	©	4822 051 30008	CHIP JUMPER 0603		
4819	©	4822 051 20008	CHIP JUMPER 0805		
4822	©	4822 051 20008	CHIP JUMPER 0805		
4826	©	4822 051 30008	CHIP JUMPER 0603		
4827	©	4822 051 20008	CHIP JUMPER 0805		
4828	©	4822 051 20008	CHIP JUMPER 0805		
4831	©	4822 051 20008	CHIP JUMPER 0805		
4834	©	4822 051 30008	CHIP JUMPER 0603		
4836	©	4822 051 20008	CHIP JUMPER 0805		
4837	©	4822 051 20008	CHIP JUMPER 0805		
4838	©	4822 051 20008	CHIP JUMPER 0805		
4839	©	4822 051 30008	CHIP JUMPER 0603		
4840	©	4822 051 30008	CHIP JUMPER 0603		
4841	©	4822 051 20008	CHIP JUMPER 0805		

RESISTORS

4843	©	4822 051 20008	CHIP JUMPER 0805		
4844	©	4822 051 20008	CHIP JUMPER 0805		
4850	©	4822 051 30008	CHIP JUMPER 0603		
4851	©	4822 051 30008	CHIP JUMPER 0603		
4852	©	4822 051 20008	CHIP JUMPER 0805		
4860	©	4822 051 30008	CHIP JUMPER 0603		
4861	©	4822 051 30008	CHIP JUMPER 0603		
4862	©	4822 051 20008	CHIP JUMPER 0805		
4863	©	4822 051 20008	CHIP JUMPER 0805		
4864	©	4822 051 20008	CHIP JUMPER 0805		
4866	©	4822 051 30008	CHIP JUMPER 0603		

COILS

1810	2422 540 98519	RESONATOR 8,467MHz

TRANSISTORS

7806	©	5322 130 60159	BC846B
7807	©	4822 130 60373	BC856B
7808	©	4822 130 60373	BC856B

INTEGRATED CIRCUITS

7800	©	9352 731 95557	SAA7825H, SIGNAL PROC. PHONIC
7801	©	9322 181 79668	MM1469PH, MOTOR DRIVER
7802		4822 209 72554	MC7808CT, 8V Regulator
7804	©	5322 209 82941	LM358D, DUAL OP-AMP.

10-10

MP3 BOARD FOR ORIENTATION ONLY

MP3 CD 2003 Board (flash version)

DSP

For Flash version: TMS320DA150PGE160
For ROM version: TMS320D1608xPGE

7451

JTAG Interface

Text version only

only for FLASH version

Flash EPROM

M29W800DB-70NG

7450

EEPROM

M24C32

7458

Voltage stabilisation

7455 LM317D

for 5V front uP

CONTROL INTERFACE Front µP

DATA INTERFACE CD10/CD18

CONTROL INTERFACE CD10/CD18

EXTERNAL DIGITAL SOURCE

to/from CD MODULE

3487, 3438 only for 5V push pull
3481, 3452 = 1k for 5V push pull

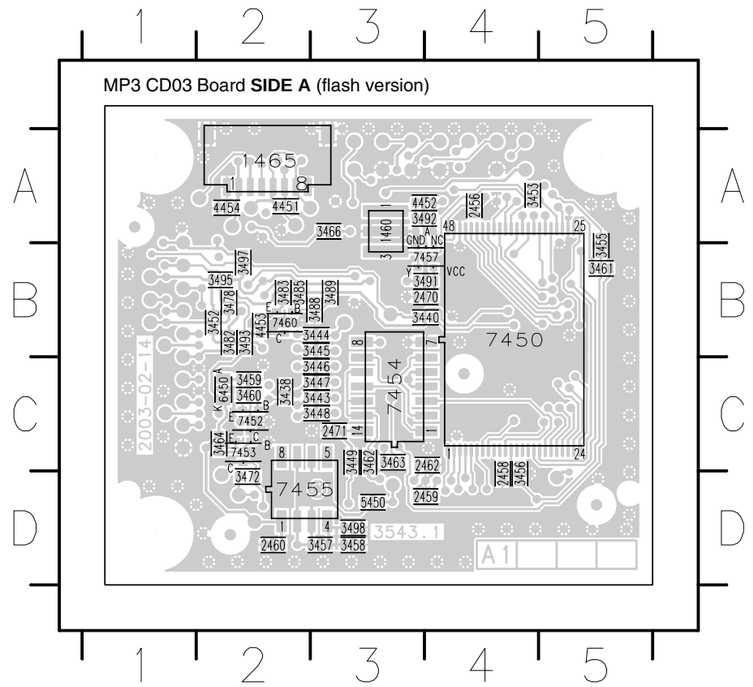
\# .... only for FLASH version
⋆ .... only for ROM version

MP3 CD 2003 flash version, 040304

1451 F14
1455 B14
1460 F9
1465 A14
2450 A1
2451 B5
2452 B2
2453 B4
2454 B7
2455 B2
2456 C12
2457 D9
2458 C10
2459 D2
2460 E13
2461 D12
2462 D2
2463 D8
2464 G12
2465 G2
2466 G8
2467 H6
2468 H4
2469 H5
2470 D9
2471 E11
2472 D1
3438 I3
3440 A5
3443 H4
3444 H6
3445 H5
3446 H4
3447 H4
3448 H3
3449 E11
3450 A4
3451 B7
3452 H3
3453 A12
3454 B1
3455 C9
3456 C10
3457 D13
3458 D14
3459 E13
3460 F13
3461 E12
3462 E2
3463 E1
3464 F13
3465 A2
3466 H8
3467 F8
3468 F8
3469 E13
3470 F1
3471 E13
3472 G9
3473 G2
3474 G8
3475 G2
3476 H2
3477 H7
3478 B6
3479 H8
3480 H2
3481 H3
3482 H5
3483 H6
3484 H5
3485 I11
3487 I3
3488 I12
3489 I12
3490 H8
3491 D9
3492 E9
3493 H12
3494 H8
3495 H11
3496 H8
3497 I13
3498 D14
3499 A2
4450 C13
4451 B13
4452 F9
4453 I11
4454 A13
4455 G8
4456 G8
4459 F2
4460 F2
5450 A3
6450 E13
6451 E12
7450 A10
7451 D5
7452 F13
7453 F12
7454-A G11
7454-B F11
7454-C F11
7454-D G11
7455 D13
7456 E12
7457 E9
7458 A1
7460 I12
F401 B3
F402 E13
F403 E8
F404 E8
F405 E8
F406 E8
F407 E8
F408 F8
F409 E8
F410 F8
F411 E13
F412 E13
F413 G13
F414 H13
F415 G13
F416 H13
F417 H13
F418 H13
F419 H13
F420 H13
F421 H13
F422 H3
F423 H13
F424 H13
F425 I13
F426 I13
F427 E8
F428 E8
F429 E8
F430 E8
F431 E8
F432 F8
F434 E8
F436 E8
F440 A2
F441 A13
F442 A13
F443 A13
F444 A13
F445 A13
F446 B13

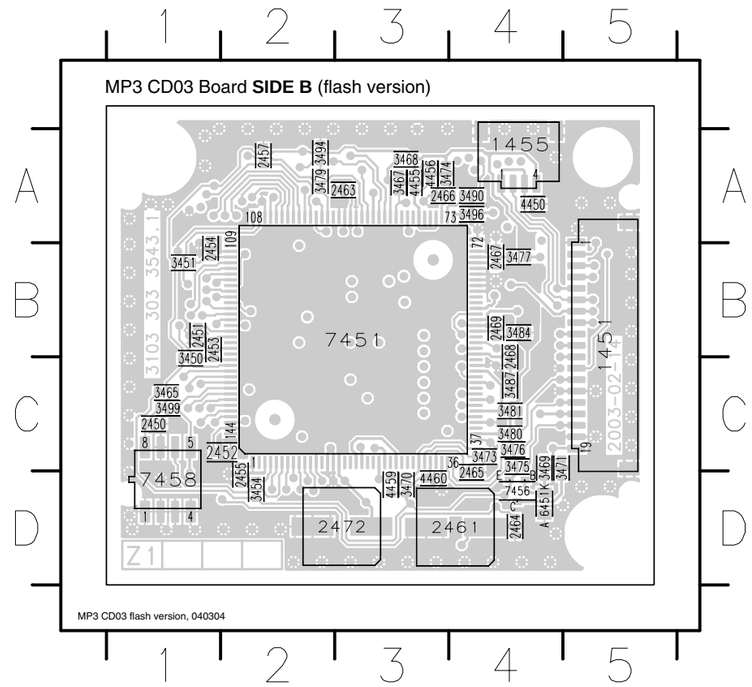
MP3 BOARD FOR ORIENTATION ONLY

MP3 CD03 Board **SIDE A** (flash version)



1460 A3 4452 A3
1465 A2 4453 B2
2456 A4 4454 A2
2458 D4 5450 D3
2459 D4 6450 C2
2460 D2 7450 B4
2462 C4 7452 C2
2470 B4 7453 C2
2471 C3 7454 C3
3438 C2 7455 D2
3440 B4 7457 B4
3443 C3 7460 B2
3444 B3
3445 B3
3446 C3
3447 C3
3448 C3
3452 B2
3453 A4
3455 B5
3456 D4
3457 D3
3458 D3
3459 C2
3460 C2
3461 B5
3462 C3
3463 C3
3464 C2
3466 A3
3472 D2
3478 B2
3482 B2
3483 B2
3485 B2
3488 B3
3489 B3
3491 B4
3492 A3
3493 B2
3495 B2
3497 B2
3498 D3
4451 A2

MP3 CD03 Board **SIDE B** (flash version)

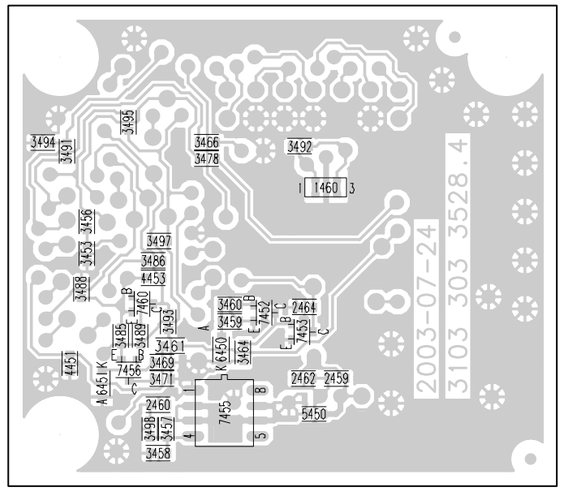


MP3 CD03 flash version, 040304

1451 B5 4459 D3
1455 A4 4460 D3
2450 C1 6451 D4
2451 B1 7451 B3
2452 C2 7456 D4
2453 B1 7458 D1
2454 B1
2455 D2
2457 A2
2461 D4
2463 A3
2464 D4
2465 D4
2466 A3
2467 B4
2468 B4
2469 B4
2472 D3
3450 C1
3451 B1
3454 D2
3465 C1
3467 A3
3468 A3
3469 C4
3470 D3
3471 C4
3473 C4
3474 A3
3475 C4
3476 C4
3477 B4
3479 A2
3480 C4
3481 C4
3484 B4
3487 C4
3490 A4
3494 A2
3496 A4
3499 C1
4450 A4
4455 A3
4456 A3

1460 B3 3456 B1 3464 C3 3486 C2 3494 A1 5450 D3 7456 C2
2459 D4 3457 D2 3466 A2 3488 C2 3495 A2 6450 C3 7460 C2
2460 D2 3458 D2 3469 C2 3489 C2 3497 B2 6451 D2
2462 D3 3459 C3 3471 D2 3491 B1 3498 D2 7452 C3
2464 C3 3460 C3 3478 B2 3492 B3 4451 C1 7453 C3
3453 B1 3461 C2 3485 C2 3493 C2 4453 C2 7455 D3

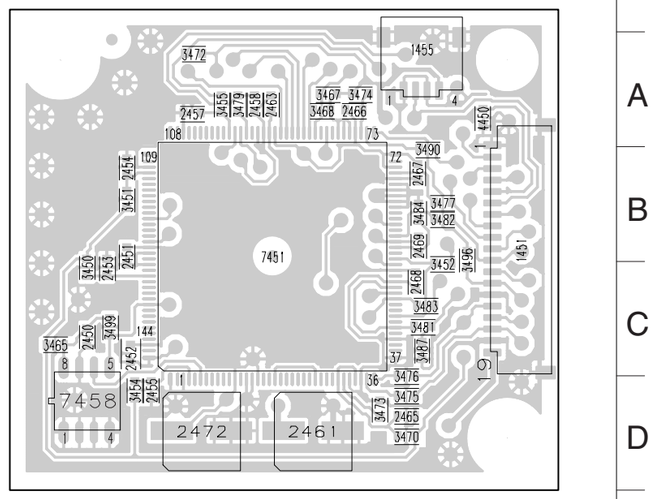
MP3 CD2002/CD03 Board **SIDE A** (mask version)



This assembly drawing shows a summary of all possible versions.
For components used in a specific version see schematic diagram
respectively partslist.

1451 B5 2454 B2 2465 D4 3450 C1 3467 A3 3475 D4 3483 C4 4450 A5
1455 A4 2455 D2 2466 A4 3451 B2 3468 A3 3476 D4 3484 B4 7451 B3
2450 C1 2457 A2 2467 B4 3452 C4 3470 D4 3477 B4 3487 C4 7458 D1
2451 B2 2458 A3 2468 C4 3454 D2 3472 A2 3479 A2 3490 B4
2452 C2 2461 D3 2469 B4 3455 A2 3473 D4 3481 C4 3496 B4
2453 C1 2463 A3 2472 D2 3465 C1 3474 A4 3482 B4 3499 C1

MP3 CD2002/CD03 Board **SIDE B** (mask version)

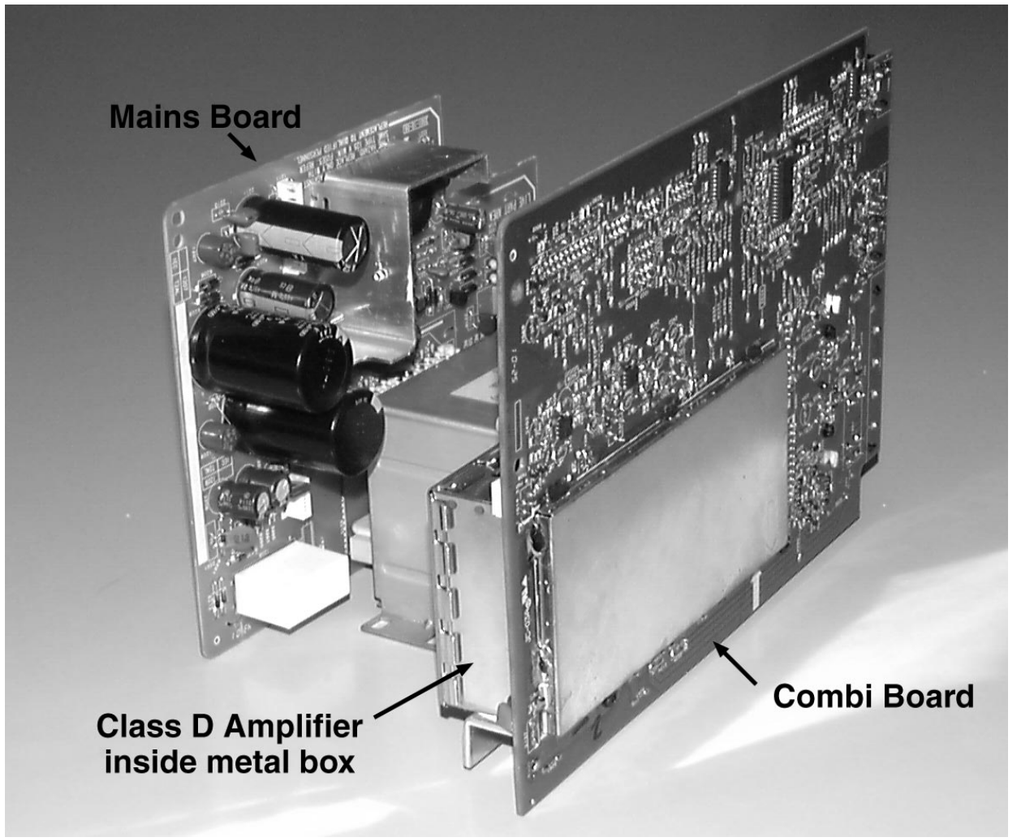


This assembly drawing shows a summary of all possible versions.
For components used in a specific version see schematic diagram
respectively partslist.

MP3 CD2002 stage .4, 050304

10-12

PERSONAL NOTES:



Power 2003 Module

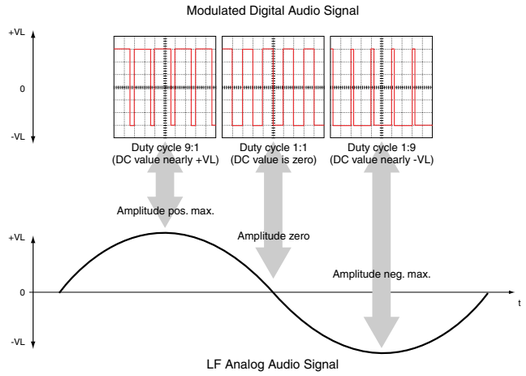
(75 - 150W Class D)

stage M.6/C.4 update 1

TABLE OF CONTENTS

Class-D Circuit Description (BASED ON POWER 2003 MODULE 75-150W CLASS D)

Basically Class-D works by transforming the LF audio input to a square wave signal with a fixed frequency and a variable duty cycle. See simplified drawing below.



The amplitude of the square wave signal is equal to the supply voltage of the amplifier. With the audio signal the square wave signal is pulse-width modulated.

Compared to a conventional power amplfier the benefits of the Class D amplifier are:
- higher effiency
- lower power dissipation
- smaller cooling fin
- smaller mains transformer

Disadvantage of this concept is:
- 500kHz square wave signal with high current requires a shielding box to suppress radiation.

Required Circuitries:

- **500kHz square wave oscillator**.
  The oscillator frequency is created by 7312-3; it is a dual-frequency oscillator with ceramic resonators 5300 and 5302, which resonate at 500kHz and 425kHz respectively. The resonators are switched by transistors 7309 and 7316, controlled by the "OZ_SW" line from the port expander 7406.
  The reason for 2 frequencies is to avoid tuner disturbances in the AM-band.
  The oscillator signal is shaped to square wave with 7312-2, afterwards buffered and fed to the amplifier modulators (ROZ to the right channel, LOZ to the left). One channel gets inverted clock to balance supply loading.

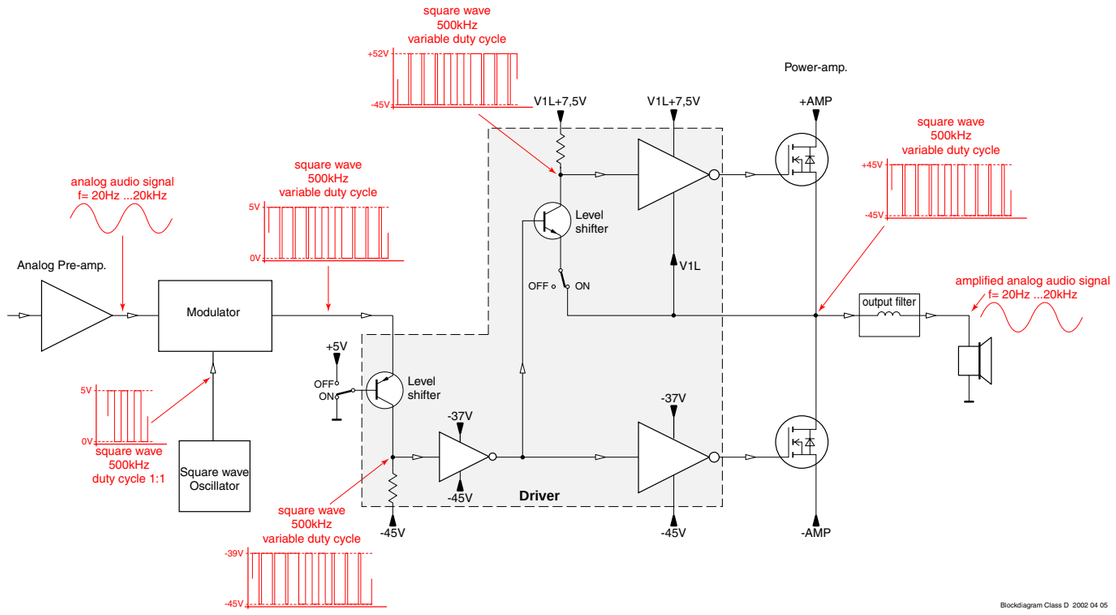
- **Modulator**
  The modulator forms the pulse width modulated signal. For each channel a seperate modulation is required.

- **Power FETs**
  The FETs require drivers which supply the gates. One for the high-side-FET and one for the low-side-FET. Because of the different supply voltages also an additional level shifter is necessary per driver.

- **Output filter**
  The output filter is necessary to block the 500kHz square wave signal from the speaker.
  Refers to the left channel in schematic diagrams.
  It consists of a series-mode coil 5101 and a capacity of approx. 550nF (2116, 2134), which forms a Chebycheff filter with 40kHz cut-off frequency at 6Ω load. For EMC reasons both, the speaker output and the return ground are fed through a common mode coil (5102). The filter is further improved by splitting the output capacity into 2116 before and 2134 after the common mode coil.

All above mentioned circuitries are located inside the metal shielding box.

Blockdiagram Class D



Class-D Circuit Description (Based on Power 2003 Module 75-150W Class D)

Functional Description:

Refers to the left channel in schematic diagrams.
The first stage of the modulator is an error integrator which compares the input to the (24 dB amplified) output signal of the power stage. The difference is leading to a current, which loads the integrator 7122-A. The second stage (7122-B) adds the 500kHz rectangular oscillator signal, creates high gain and low distortion and is again integrating. The output signal leads to a triangle wave form (see oscillogram Ⓔ). The DC value of this triangle signal is floating, dependent on the amplitude of the analog input signal. The next stage is a comparator, which compares the integrated voltage with the internal switching levels - thus creating a voltage controlled duty cycle. 7122 C and D improve the shape of the pulses. For details see oscillograms Ⓐ-Ⓕ.
At pin 8 of IC7122 there is a square wave with the same frequency and duty cycle as the desired output.

The next task is to feed this information to the output FETs. Both FETs are n-channel types, so they are modulated by feeding the gate in respect to the source connection. Inverters 74LV14 are used as drivers. The driver for the low-side FET (7121) is supplied by the negative supply -VL2 and a voltage +VL (generated by 7115 and 6113), which is 7.5V higher than -VL2. The digital signal is level-shifted by 7128 to the low side driver stage. 3142, 6111 and 2126 together form a delay circuit for rising edges by approx. 100ns for the low side FET. 3154, 6109 and 2137 delay the rising edge by 50ns for the high side FET. This to compensate the switch-off delay of the FETs and ensures that both FETs are not conducting at the same time.
The high-side FET (7109) is controlled by the inverted signal taken from pin 2 of 7118, which is level-shifted by transistor 7119. The driver for the high-side FET is supplied by a floating voltage between the amplifier output -V1L and +V1L, created by the charge pump 6110, 2114 regulated by 7114 and 6114 to a 7.5V higher level. The pump is additionally supplied (via 3151) by +45V to ensure supply at start-up (no signal). The last stage in the gate driver consists of three gates in parallel for increased output current for the capacitive load of the FET. For additional increase of the switching speed push/pull transistors 7132/7111 are added.

Protection Circuits:

The amplifier is protected against low load impedance (including short circuit). Current is sensed by shunts 3101, 3130 in both supplies. Overcurrent at the positive supply is then sensed by 7104, the negative supply overcurrent triggers 7117, which then also triggers 7104. The collector current in turn triggers the monoflop 7122-5 and -6, giving a "High" pulse at pin 10. This shuts off level-shifter 7128 and blocks transistor 7129 and 7131, which draws current into the emitter resistor 3134 of level-shifter 7119. It is now also shut off. So, both FETs are shut off within approx. 0,2 sec. The monoflop can be reset by:
- switching mains off and on again
- pressing Standby button and afterwards any source button
- plugging headphone in for a short moment

When a headphone is used the amplifier is shut off. This is done by pulling pin 13 of 7122 via signal line "AMP_OFF" and transistor 7130 to high level. The line "AMP_OFF" is controlled by the port expander 7406 which detects the headphone via signal line "HP_DET".

The loudspeakers are protected against DC voltages resulting e.g. from defective FETs. Voltages higher than ±2V are detected by 7110 respectively 7112. The transistors conduct and pull the "DC_PROT" line down, blocking transistor 7243 which in turn disables speaker relay 1201.

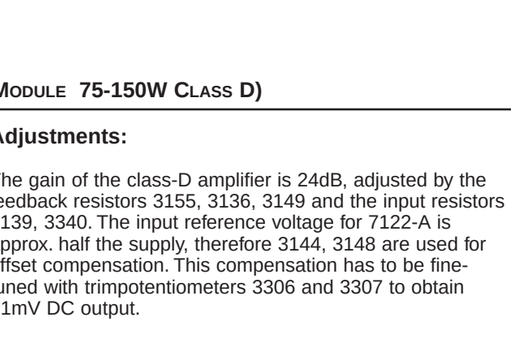
Adjustments:

The gain of the class-D amplifier is 24dB, adjusted by the feedback resistors 3155, 3136, 3149 and the input resistors 3139, 3340. The input reference voltage for 7122-A is approx. half the supply, therefore 3144, 3148 are used for offset compensation. This compensation has to be fine-tuned with trimpotentiometers 3306 and 3307 to obtain <1mV DC output.

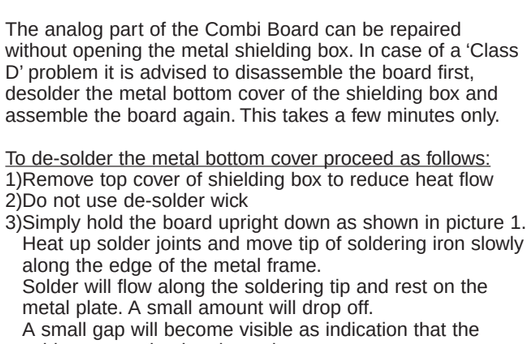
Service Hints:

The analog part of the Combi Board can be repaired without opening the metal shielding box. In case of a 'Class D' problem it is advised to disassemble the board first, desolder the metal bottom cover of the shielding box and assemble the board again. This takes a few minutes only.

<u>To de-solder the metal bottom cover proceed as follows:</u>
1)Remove top cover of shielding box to reduce heat flow
2)Do not use de-solder wick
3)Simply hold the board upright down as shown in picture 1.
Heat up solder joints and move tip of soldering iron slowly along the edge of the metal frame.
Solder will flow along the soldering tip and rest on the metal plate. A small amount will drop off.
A small gap will become visible as indication that the solder connection is released.
When all solder joints are released the cover can be removed by help of a screwdriver. Begin at the corner indicated by an arrow → see picture 2.



pict. 1



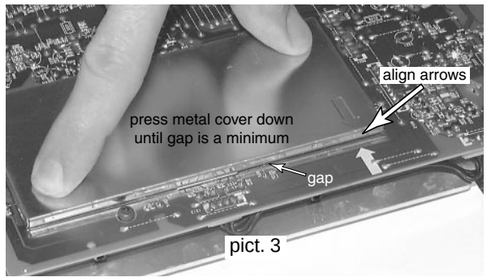
pict. 2

<u>To re-mount the metal bottom cover proceed as follows:</u>
1)The solder connections are not distributed evenly. Therefore the cover has to be mounted in that way that the arrow indicator on the cover is positioned in line with the arrow printed on the printed board → see picture 3.

Service Hints

2)Press the metal cover smoothly down until the gap between cover and printed board becomes a minimum. This is important for proper shielding.
3)Heat up the residual solder on the metal cover. The solder will flow back to the solder areas. If necessary apply additional new solder.
4)Take care that all solder joints are re-soldered again.

Attention: Poor soldering of the metal shielding box results in disturbance of the tuner.



pict. 3

In most cases the FETs 7109 and/or 7121 for the left channel, respectively 7218 and/or 7231 for the right channel will be defective. This can easily be checked with an ordinary Ohm-meter.
Left Channel:
In case **7109** is defect replace following parts:
7109, 7111, 7132, 7105, 7119, 7104, 3101, 3103 and 2106

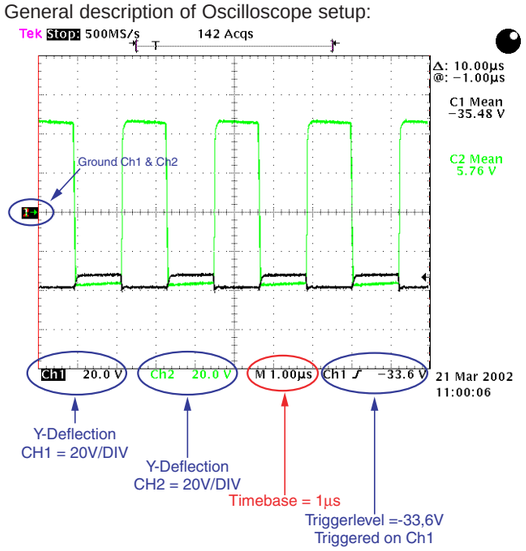
In case **7121** is defect replace following parts:
7121, 7113, 7133, 7118, 7117, 3129, 3130 and 2118

Right Channel:
In case **7218** is defect replace following parts:
7218, 7221, 7244, 7209, 7228, 7208, 3205, 3209 and 2206

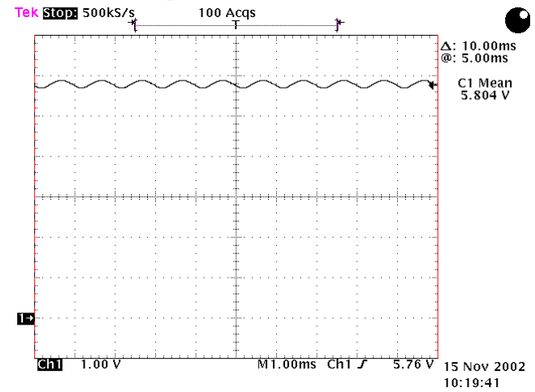
In case **7231** is defect replace following parts:
7231, 7210, 7245, 7235, 7227, 3241, 3243 and 2220

Attention: Do not forget to adjust the DC-offset after replacing the FET!
If none of the FETs is defective the fault is most probably located in the modulator. To check the operation - follow the given signals.

General description of Oscilloscope setup:

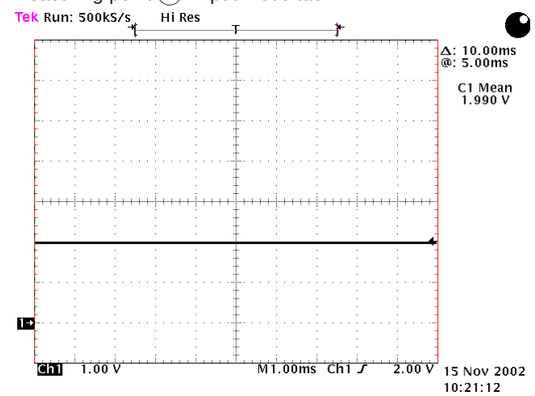


The following signals are measured on condition:
AUX in = 500mV/1kHz, Volume = -28dB
Load = 2 x 6Ω
Measuring point Ⓐ can be found on circuit diagram 3.
All other measuring points are shown on circiut diagram 4 respectively 5.
Measuring point Ⓐ: Output pre-amplifier

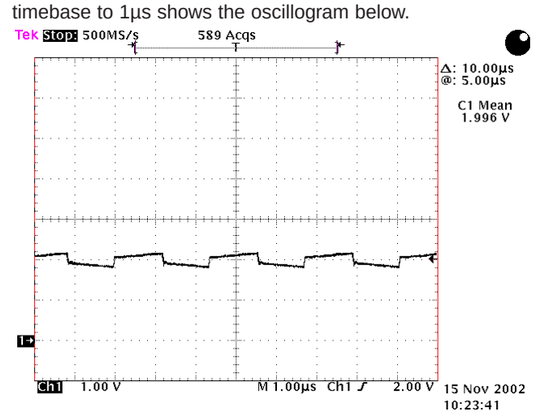


Normal analog signal measured (1kHz- Timebase 1µs). If this signal can´t be measured - the fault is outside the shielding box.

Measuring point Ⓑ: Input Modulator

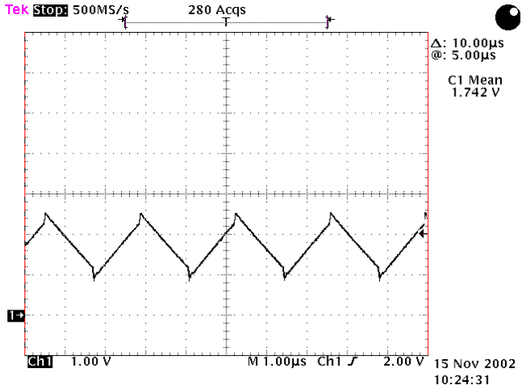


The 1kHz signal is not visible anymore. Reducing the timebase to 1µs shows the oscillogram below.



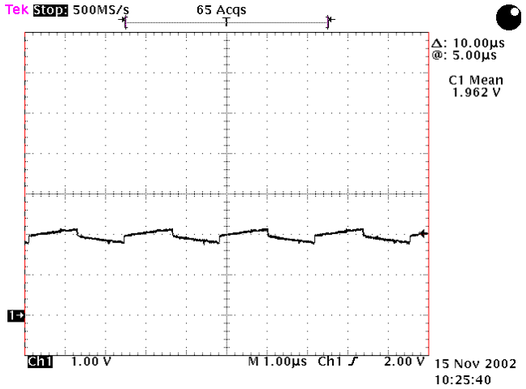
Service Hints

Measuring point Ⓒ:



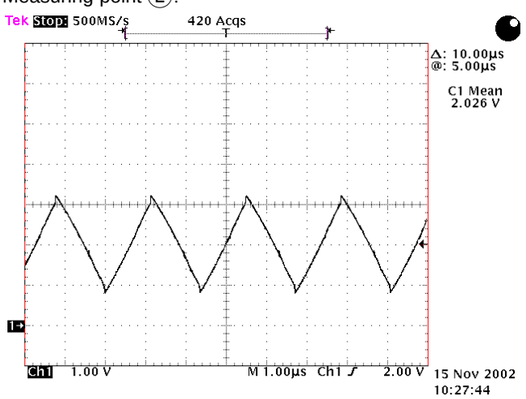
The first stage of the modulator is an integrator. An integrated rectangle results in a triangle.

Measuring point Ⓓ:



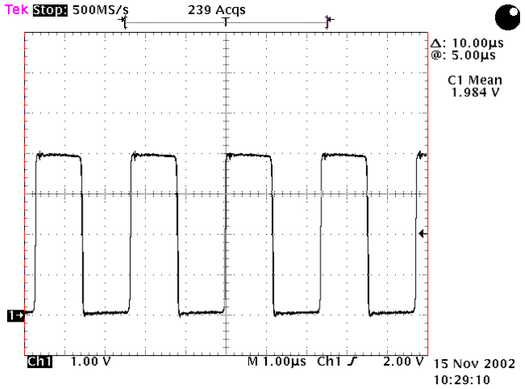
The oscillator signal (squarewave) is fed to the second integrator (7122-B).

Measuring point Ⓔ:



The integrated rectangle results in a triangle. 7122-C works as a comparator. 7122-D improves the shape of the pulses.

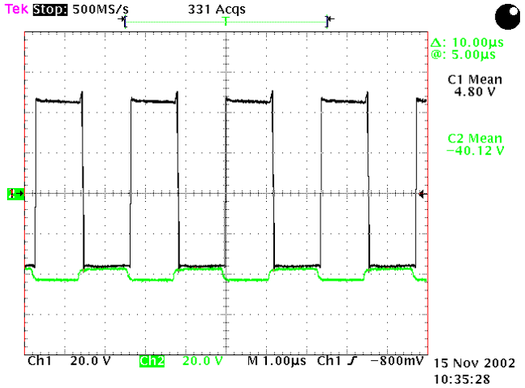
Measuring point Ⓕ: Output modulator



In this pulse width modulated square wave the analog Audio signal is included. Measurements with an analog scope will show a jitter on the falling edge.

The modulator frequency is still fixed to 500kHz. Similar to a frequency modulation - in this case the amplitude of the analog audio signal varies the pulse width, the frequency defines the speed.

Measuring point Ⓖ:

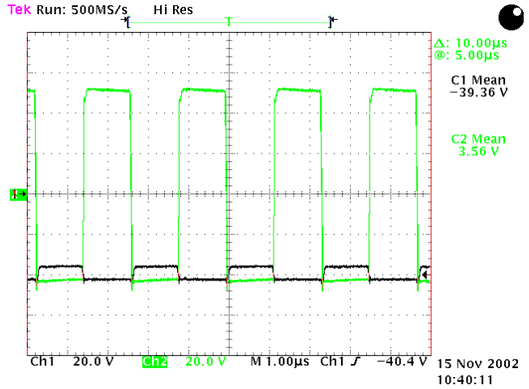


The low-side driver signal <G1> (Ch2) is the modulator output level-shifted by transistor 7128. The high-side driver signal <G2> (Ch1) is the inverted low-side driver signal level-shifted by transistor 7119.

11-3

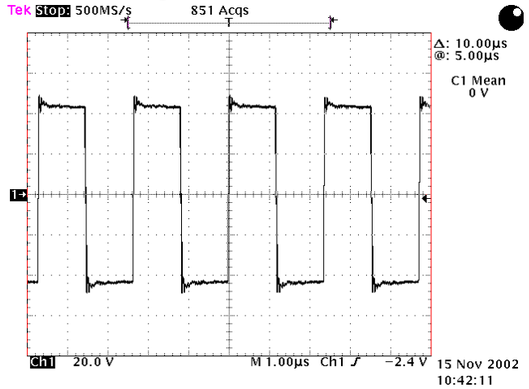
Service Hints

Measuring point Ⓗ: gate-signal of the FETs



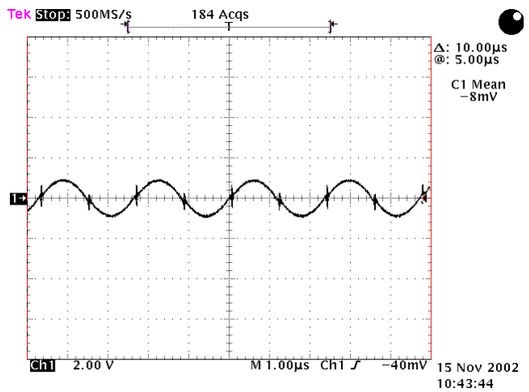
Ch1 = H1, CH2 = H2

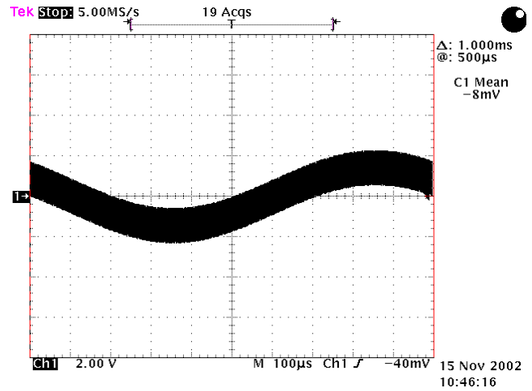
Measuring point Ⓘ:

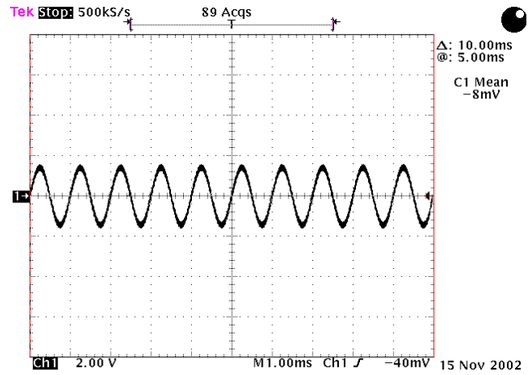


Digital output signal.

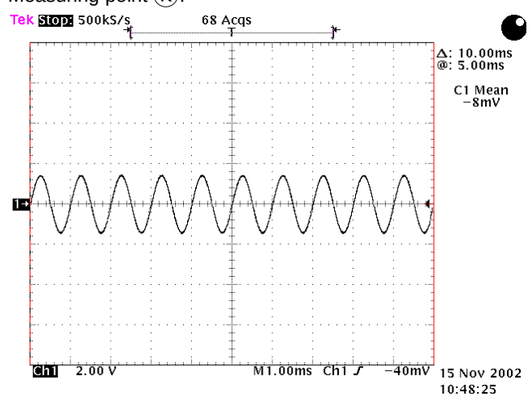
Measuring point Ⓙ:
The following three signals are measured after output filter 5101 with different timebases.







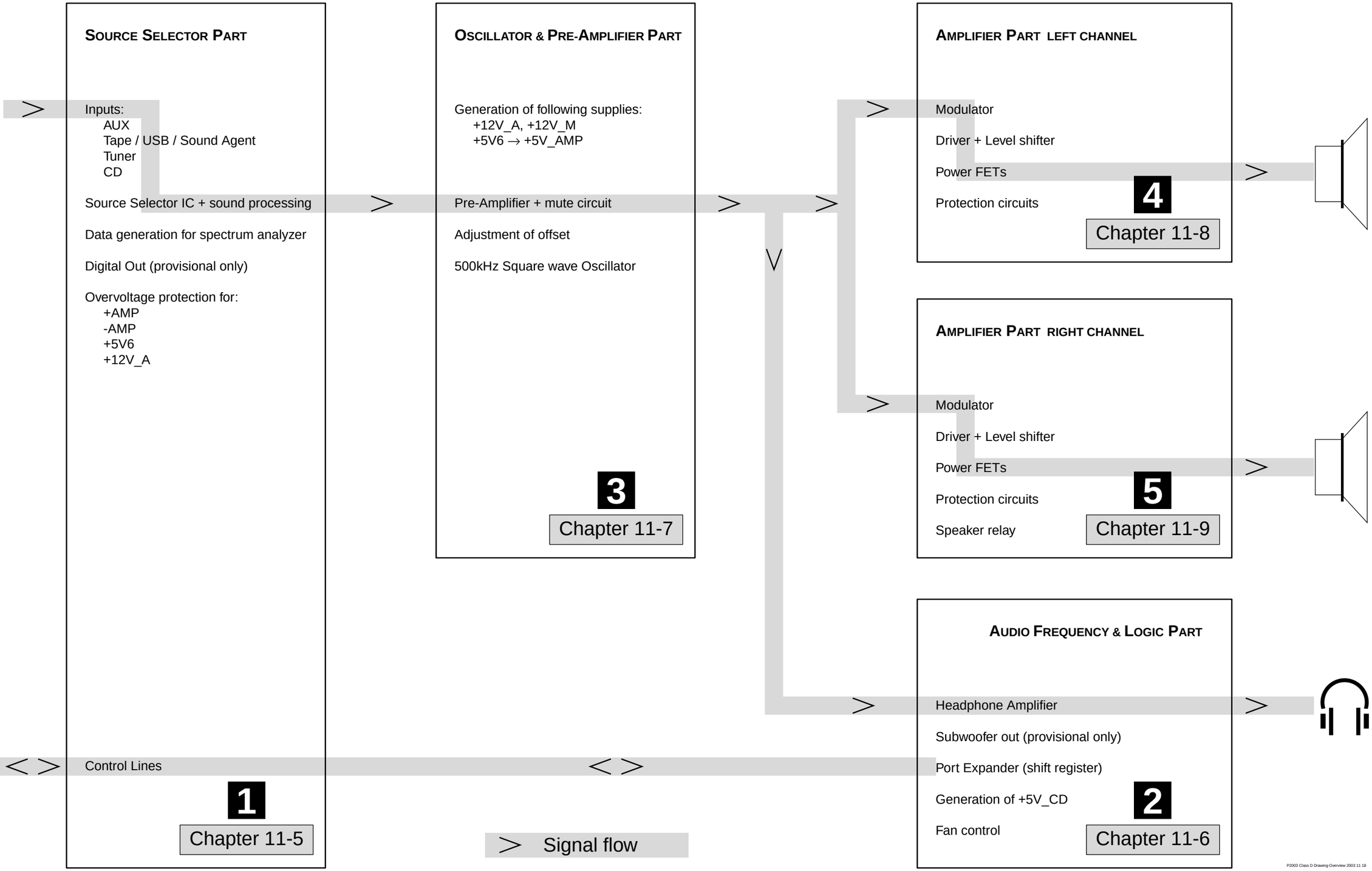
Measuring point Ⓚ:



After common mode coil 5102 - the audio signal is restored.

11-4

Power 2003 75 - 150W Class D
Combi Board Circuit Diagram Overview



11-5

1 COMBI BOARD
SOURCE SELECTOR

* VARIANT-TABLE

POS.NR	67781 150W	67841 75W SA	67941 75W TAPE
3510	6k8	6k8	22k
3511	6k8	6k8	22k
3536	22k	22k	1k
3571	22k	22k	1k

SA stands fror **S**ound **A**gent

EVM (V) ...V DC voltages measured in Tuner mode

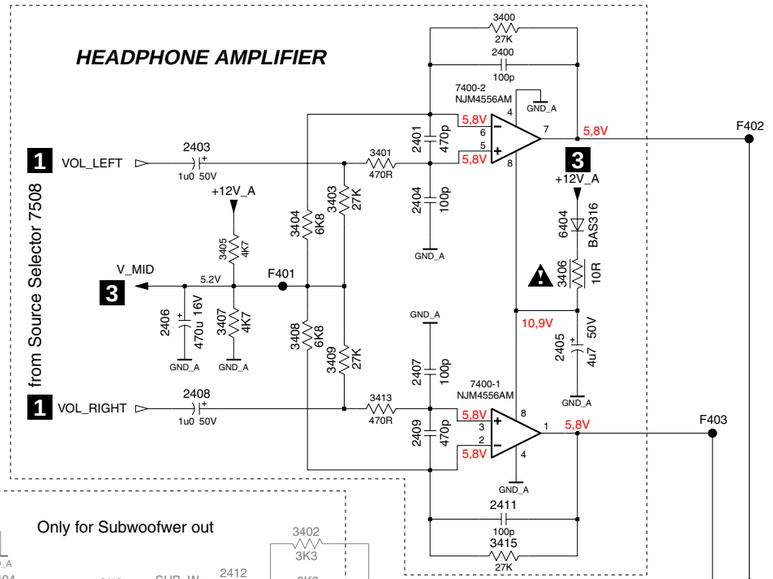
ECO Standby mode

Combi board P2003 150W class D, 09.04.04

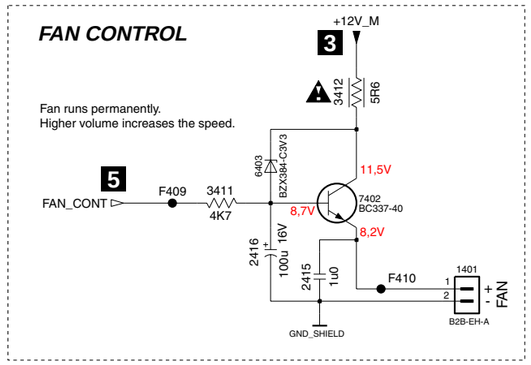
11-6

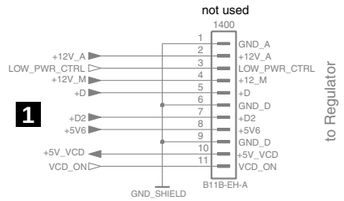
2 COMBI BOARD
AUDIO FREQUENCY & LOGIC

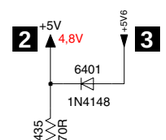
HEADPHONE AMPLIFIER

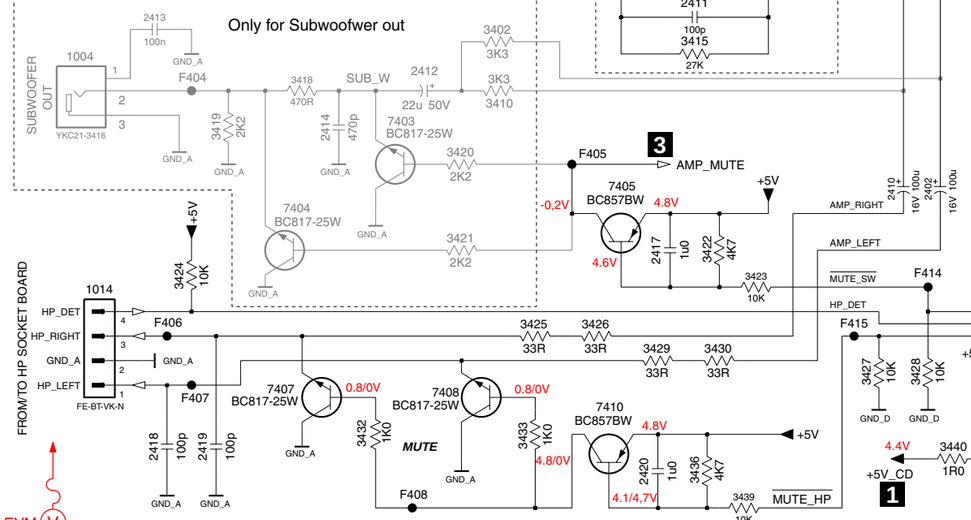


FAN CONTROL







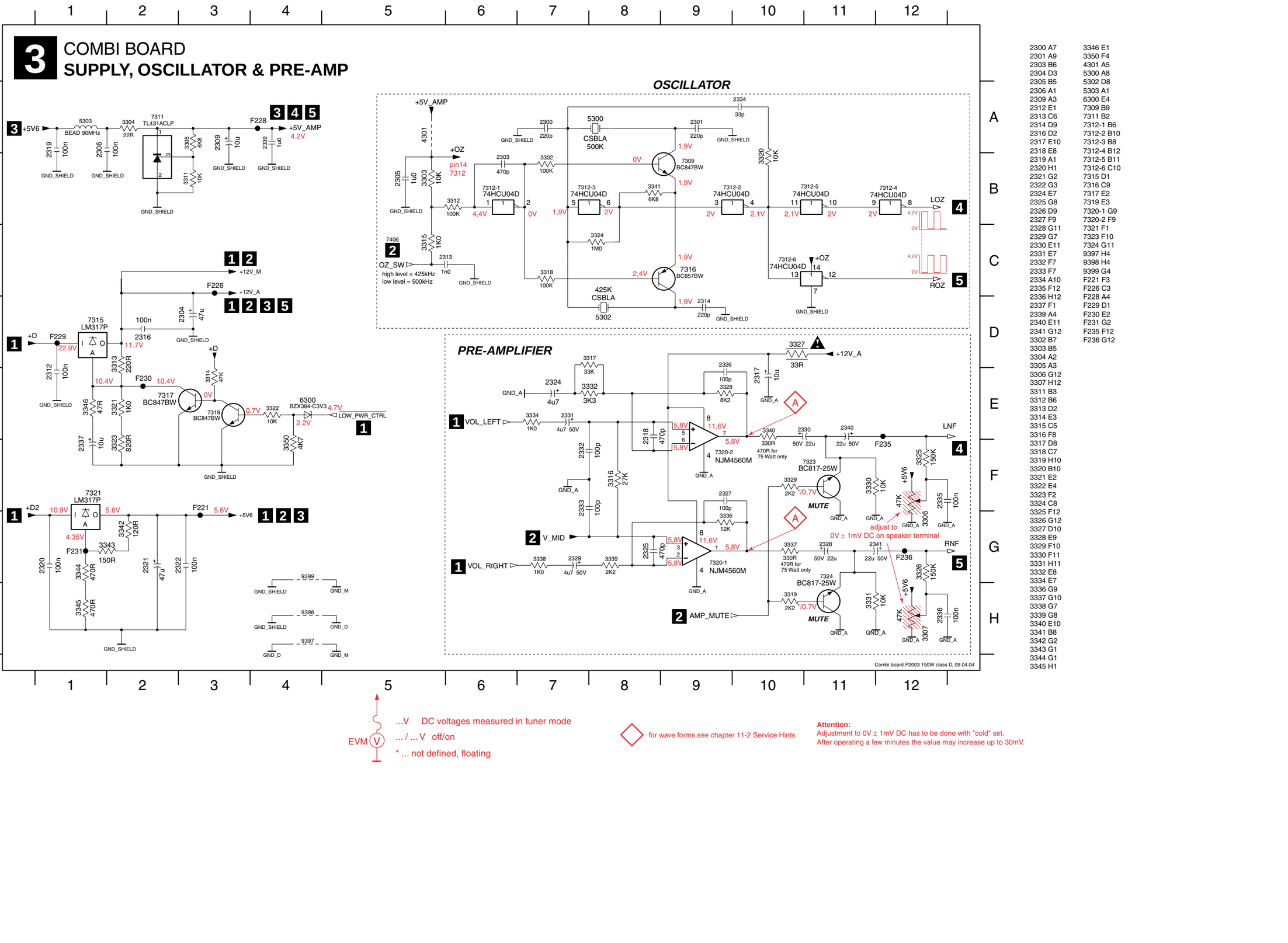


Combi board P2003 150W class D, 03.12.03

1004 D1	7409 F7
1014 E1	7410 F4
1400 C8	7411 F6
1401 C9	9269 F7
2400 A4	9499 F6
2401 A4	F401 B3
2402 D6	F402 A6
2403 A2	F403 C5
2404 B4	F404 D1
2405 B5	F405 D4
2406 B2	F406 E1
2407 C4	F407 F1
2408 C2	F408 F3
2409 C4	F409 B8
2410 D5	F410 C9
2411 C4	F411 E6
2412 D3	F412 E8
2413 C1	F413 E8
2414 D2	F414 E6
2415 C9	F415 E5
2416 B8	F416 F8
2417 E4	F417 E8
2418 F1	F418 E9
2419 F1	F419 E9
2420 F4	F420 E9
2421 E9	
3400 A4	
3401 A3	
3402 D3	
3403 B3	
3404 B3	
3405 B3	
3406 B5	
3407 B3	
3408 B3	
3409 C3	
3410 D3	
3411 B8	
3412 A9	
3413 C3	
3415 D4	
3418 D2	
3419 D1	
3420 D3	
3421 E3	
3422 E4	
3423 E5	
3424 E1	
3425 E3	
3426 E4	
3427 F5	
3428 F5	
3429 E4	
3430 E4	
3431 E7	
3432 F2	
3433 F3	
3434 F8	
3435 D9	
3436 F4	
3437 F6	
3438 F7	
3439 F4	
3440 F6	
6401 D9	
6403 B8	
6404 B5	
7400-1 C4	
7400-2 A4	
7402 B9	
7403 D3	
7404 E2	
7405 D4	
7406 E9	
7407 F2	
7408 F3	

11-7

3 COMBI BOARD
SUPPLY, OSCILLATOR & PRE-AMP



2300 A7
2301 A9
2303 B6
2304 D3
2305 B5
2306 A1
2309 A3
2312 E1
2313 C6
2314 D9
2316 D2
2317 E10
2318 E8
2319 A1
2320 H1
2321 G2
2322 G3
2324 E7
2325 G8
2326 D9
2327 F9
2328 G11
2329 G7
2330 E11
2331 E7
2332 F7
2333 F7
2334 A10
2335 F12
2336 H12
2337 F1
2339 A4
2340 E11
2341 G12
3302 B7
3303 B5
3304 A2
3305 A3
3306 G12
3307 H12
3311 B3
3312 B6
3313 D2
3314 E3
3315 C5
3316 F8
3317 D8
3318 C7
3319 H10
3320 B10
3321 E2
3322 E4
3323 F2
3324 C8
3325 F12
3326 G12
3327 D10
3328 E9
3329 F10
3330 F11
3331 H11
3332 E8
3334 E7
3336 G9
3337 G10
3338 G7
3339 G8
3340 E10
3341 B8
3342 G2
3343 G1
3344 G1
3345 H1
3346 E1
3350 F4
4301 A5
5300 A8
5302 D8
5303 A1
6300 E4
7309 B9
7311 B2
7312-1 B6
7312-2 B10
7312-3 B8
7312-4 B12
7312-5 B11
7312-6 C10
7315 D1
7316 C9
7317 E2
7319 E3
7320-1 G9
7320-2 F9
7321 F1
7323 F10
7324 G11
9397 H4
9398 H4
9399 G4
F221 F3
F226 C3
F228 A4
F229 D1
F230 E2
F231 G2
F235 F12
F236 G12

...V DC voltages measured in tuner mode
... / ... V off/on
* ... not defined, floating

for wave forms see chapter 11-2 Service Hints

Attention:
Adjustment to 0V ± 1mV DC has to be done with "cold" set.
After operating a few minutes the value may increase up to 30mV.

11-8

4 COMBI BOARD
AMPLIFIER / LEFT CHANNEL

*** VARIANT-TABLE**

POS.NR	67781 150W	67841/67941 75W SA / 75W TAPE
2102	220u	
2138		330u
2119	4n7	1n5
2124	220u	
2139		330u
2135	470p	1n
3101	0R033	0R047
3109	100R	4R7
3111	10R	1R0
3119	10K	15K
3120	4K7	4K7
3121	4K7	4K7
3130	0R033	0R047
3135	100R	4R7
3139	470R	560R
3140	1K2	1K5
3152	1K8	1K5
3153	1K8	1K5
3156	10R	1R0
5101		30u
5105	20u	
7109	PHX18NQ11T	STP14NF12FP
7121	PHX18NQ11T	STP14NF12FP
7132	BC817-25W	
7133	BC817-25W	

SA stands for **S**ound **A**gent

2100 A11, 2101 A11, 2102 A10, 2103 A10, 2104 D1 | 2106 B12, 2108 D3, 2110 D8, 2111 G10, 2112 D11 | 2113 E8, 2114 D10, 2115 E14, 2116 F12, 2117 F14 | 2118 G12, 2119 G3, 2120 F2, 2121 H9, 2122 C11 | 2124 H10, 2125 G1, 2126 H7, 2128 H11, 2130 G11 | 2132 G9, 2134 F14, 2135 G4, 2136 H10, 2137 D7 | 2138 A11, 2139 H11, 3100 D2, 3101 B11, 3102 E6 | 3103 B11, 3106 C12, 3107 G7, 3108 C4, 3109 C10 | 3110 E4, 3111 C9, 3114 E3, 3115 F6, 3117 D7 | 3119 D9, 3120 G10, 3121 G10, 3122 G9, 3125 H4 | 3126 D1, 3127 H6, 3129 G11, 3130 G11, 3133 G7 | 3134 G6, 3135 F10, 3136 E8, 3137 F13, 3138 F13 | 3139 G1, 3140 G4, 3142 G8, 3143 G5, 3144 G2 | 3145 D11, 3146 G7, 3147 D5, 3148 G2, 3149 F3 | 3151 C10, 3152 C9, 3153 C9, 3154 E8, 3155 E8 | 3156 F10, 5100 A11, 5101 E12, 5102 F13, 5103 H11 | 5105 E12, 6106 D9, 6108 G9, 6109 E8, 6110 C10 | 6111 H8, 6113 H9, 6114 E9, 7104 B13, 7105 C7 | 7109 C11, 7111 C10, 7113 F10, 7114 D9, 7115 G9 | 7117 G12, 7118 F7, 7119 G6, 7121 F11, 7122-1 G3 | 7122-2 G4, 7122-3 G4, 7122-4 G5, 7122-5 E4, 7122-6 E3 | 7128 F6, 7129 D6, 7130 D2, 7131 H6, 7132 B11 | 7133 F11, 9199 D1, F102 G9, F112 G12, F114 D14

Power Stage 1

+AMP_L, +43V, 2101 100n GND_SHIELD, 5100 BEAD 90MHz, 2100 100n GND_SHIELD, 2103 100n, *2102 220u, *2138 330u 50V, GND_SHIELD

*3101 0R033, 2106 1n0, Short Circuit Protection, +43V, 7104 BC856B, +4,2V, SC_L to E1

+50V, -40V, *3111 10R, GND_SHIELD, 7132 *BC817-25W, 3103 1K0, *3109 100R, H2, *7109 STP14NF12FP, 7111 BC807-25W

Driver Stage + Levelshifter

7105 74LV14D, 1A VCC, 1Y 2, 2A 2Y 4, 3A 3Y 6, 4A 4Y 8, 5A 5Y 10, 6A 6Y 12, GND 7

3117 1K8, 2137 33p, +46V, -39V, G2, 6109 BAS316, 3154 1K0

Supply High-Side Driver

6110 BAV99 COL, 7114 BC817-25W, 3152 *1K8, 3153 *1K8, 3151 100K, +V1L, 3119 *10K, 2110 1uO, 6106 BZX384-C6V8, -V1L 1.2V, 6114 BAV99 COL, 2113 1uO, 1.2V, 7,8V, 2114 10u, 29,3V

Power Stage 1 (continued)

I, +42V, -42V, 2122 220p, 3145 22R, 2112 220p, GND_SHIELD, 3106 22K

Output Filters

J, K, *5105 20u, *5101 30u, 2116 330p, 3138 10K, 3137 10K, 5102 HF2024, 2134 220p, 2115 1n0, 2117 1n0, GND_SHIELD, to_LS_L, to_LS_L_neg

Amplifier ON-OFF Switch

2 7406, AMP_OFF, 9199, 3100 10K, 0.7V, 7130 BC847BW, 0V, 3126 10K, 2104 10n, GND_D, GND_SHIELD, 2108 10n

from 7104 SC_L, 7122-6 74HCU04D E, 7122-5 74HCU04D F, 3114 4K7, 3110 100K, 4.2V

3 +5V_AMP, 4.2V, 3108 4K7, AMP_D 5

3147 10K, 7129 BC856B, 0,5V, -41,7V, 3102 4K7

Modulator

+5V_AMP, 2120 1uO, 4K7 3149, 3148 18K, 3144 150K, GND_SHIELD

3 LNF, *3139 470R, 2125 4n7, GND_SHIELD, GND_A

7122-1 74HCU04D A, 7122-2 74HCU04D B, 7122-3 74HCU04D C, 7122-4 74HCU04D D, 2.1V, 1.9V, *3140 1K2, *2119 4n7, *2135 470p

B, C, D, E, F, 3125 1K0, LOZ, 3 OSCILLATOR

3115 1K0, 0V, 0,4V, 7128 BC856B, 3143 1K0

Supply Low-Side Driver

G1, -36V, -43V, 7118 74LV14D, 3133 5K6, 3146 1K5, 3142 1K2, 6111 BAS316, 3107 1K5, 100p 2126

7119 MMBTA42, 3134 330R, -41,8V, -41,7V, 7131 BC846B, -42,4V, 3127 10K

F102, +VL, 7115 BC817-25W, 3122 15K, *3121 4K7, *3120 4K7, 2132 1uO, 6108 BZX384-C6V8, 2111 1uO, -40,7V, -VL, 7,8V, 33,3V, 2121 1uO, 6113 BAV99 COL, 1.2V, -43V, -VL2

-35V, -40V, *3156 10R, GND_SHIELD, 3135 *100R, H1, *7121 STP14NF12FP, 7113 BC807-25W, 7,8V, 44,7V

Short Circuit Protection, 7117 MMBTA42, -42,8V, 3129 1K0, F112, -42,9V, *3130 0R033, 2118 1n0

2130 100n GND_SHIELD, 5103 BEAD 90MHz, 2128 100n GND_SHIELD, 2136 100n, *2124 220u, *2139 330u 50V, GND_SHIELD, -43V, -AMP 1

EVM (V) ...V DC voltages measured in Tuner mode

for wave forms see chapter 11-2 Service Hints

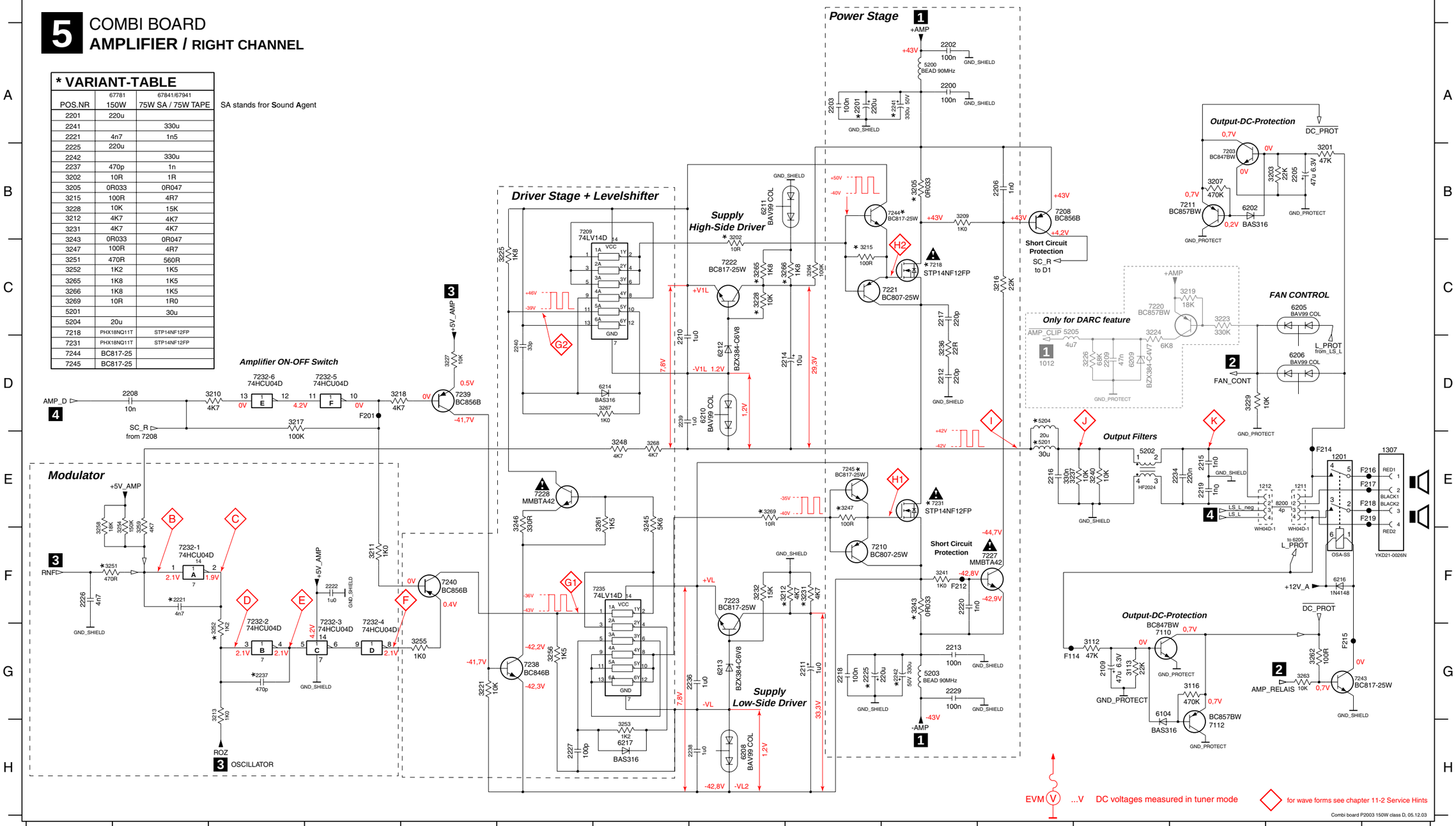
11-9

5 COMBI BOARD
AMPLIFIER / RIGHT CHANNEL

*** VARIANT-TABLE**

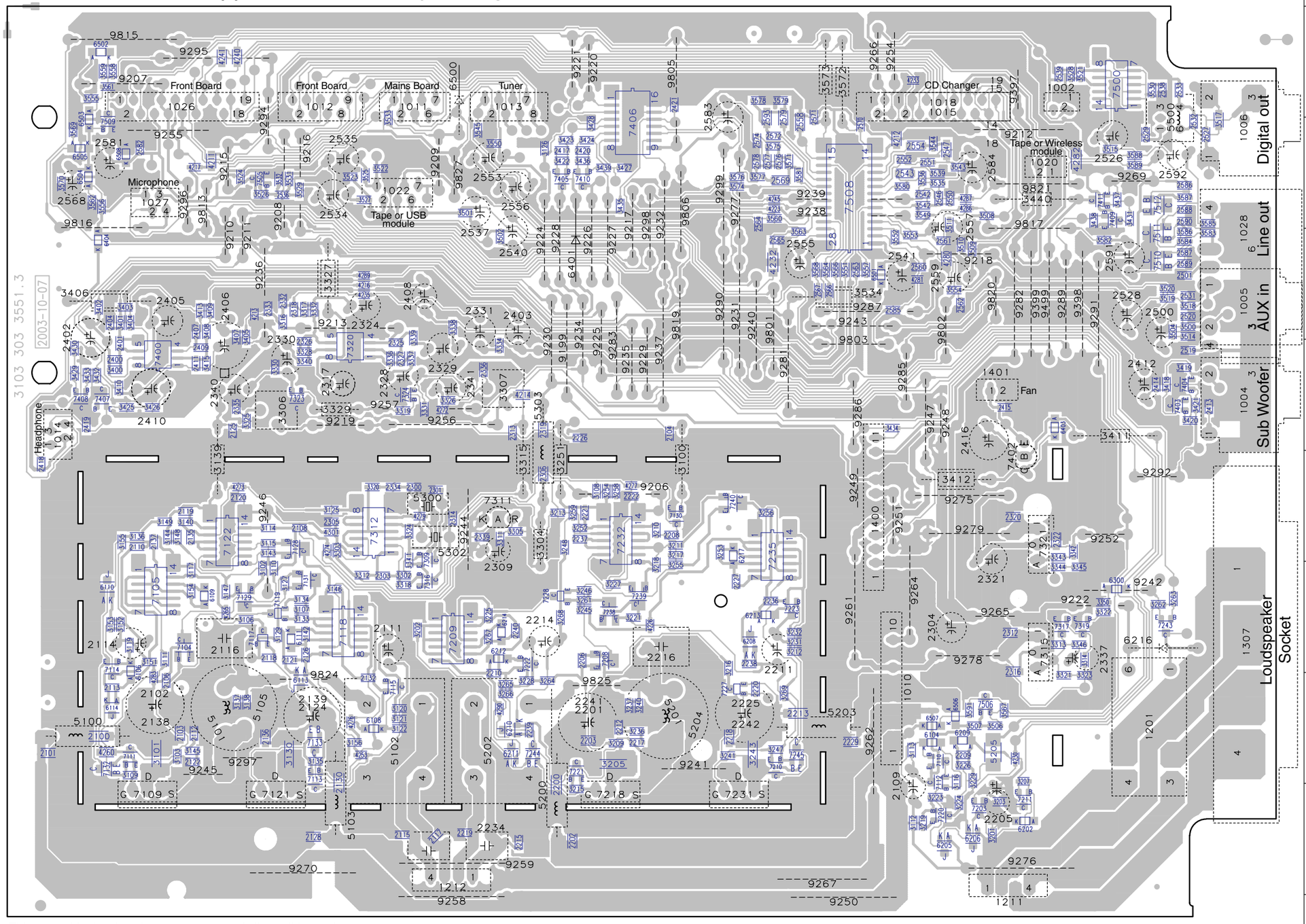
POS.NR	67781 150W	67841/67941 75W SA / 75W TAPE
2201	220u	
2241		330u
2221	4n7	1n5
2225	220u	
2242		330u
2237	470p	1n
3202	10R	1R
3205	0R033	0R047
3215	100R	4R7
3228	10K	15K
3212	4K7	4K7
3231	4K7	4K7
3243	0R033	0R047
3247	100R	4R7
3251	470R	560R
3252	1K2	1K5
3265	1K8	1K5
3266	1K8	1K5
3269	10R	1R0
5201		30u
5204	20u	
7218	PHX18NQ11T	STP14NF12FP
7231	PHX18NQ11T	STP14NF12FP
7244	BC817-25	
7245	BC817-25	

SA stands for Sound Agent



11-10

COMBI BOARD / copperside view Layout stage .3

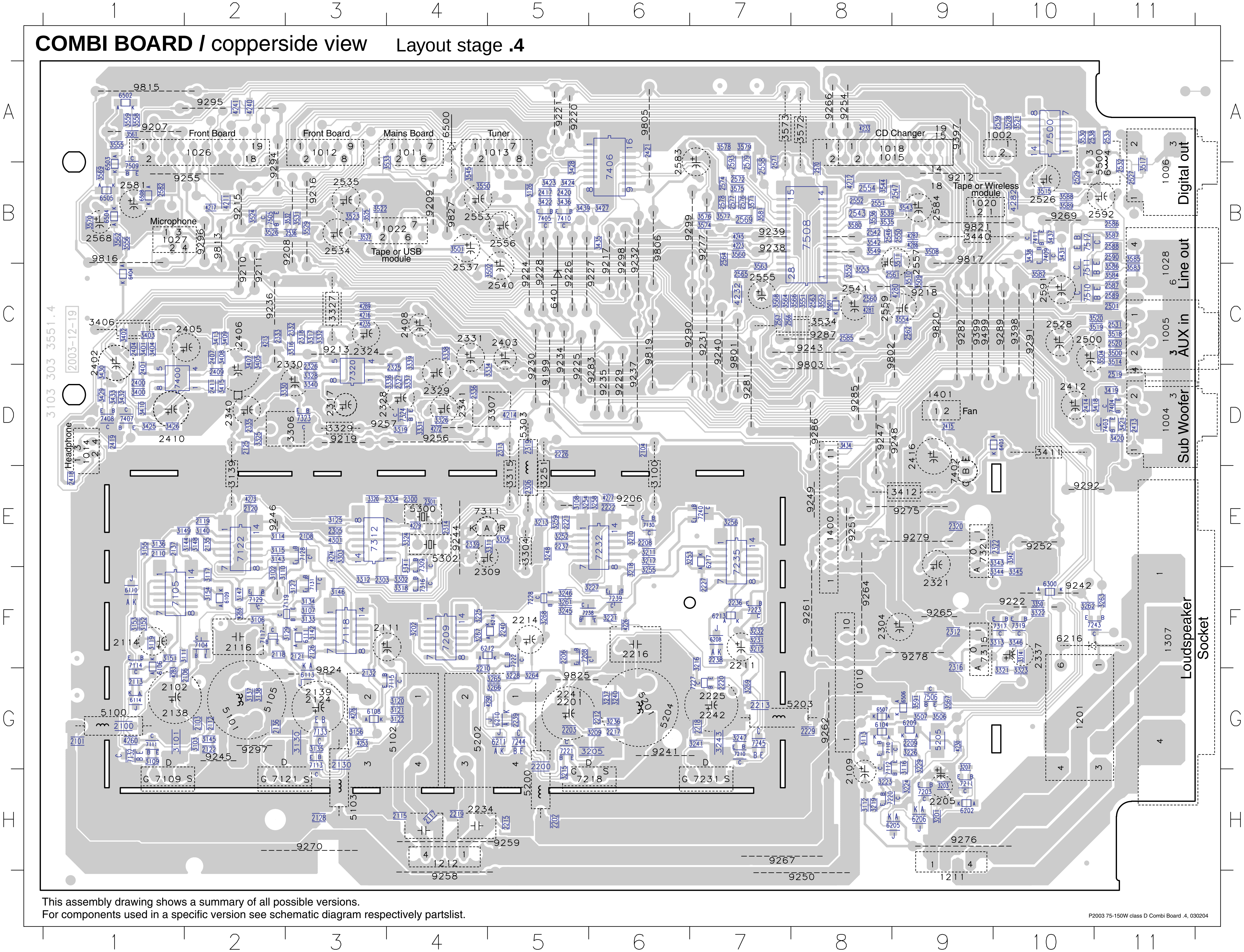


This assembly drawing shows a summary of all possible versions.
For components used in a specific version see schematic diagram respectively partslist.

P2003 75-150W class D Combi Board .3, 251103

1002 A9	1013 A5	1027 B1	1401 D9	2134 H4	2216 F6	2317 D3	2337 F10	2408 C4	2534 B3	2556 B5	2591 C10	3307 D5	3440 B9	5103 H3	5300 E4	7109 H1	7402 E9	9211 C2	9219 D3	9227 C6	9235 D6	9242 F10	9249 E8	9257 D3	9266 A8	9278 F9	9287 C8	9296 B2	9499 C9	9815 A1	9825 G5
1004 D11	1014 D1	1028 C11	2102 G1	2138 G1	2225 G7	2321 F9	2340 D2	2410 D1	2535 B3	2557 B9	2592 B11	3315 E5	3534 C8	5105 G2	5302 E4	7121 H2	9199 D5	9212 B9	9220 A5	9228 C5	9236 C2	9243 C8	9250 H8	9258 H4	9267 H7	9279 E9	9289 C10	9297 G2	9801 C7	9816 B1	9827 B4
1005 C11	1015 A8	1201 G10	2109 H8	2139 G3	2234 H4	2324 C3	2341 D4	2412 D10	2537 B4	2559 C8	3100 E6	3327 C3	3572 A8	5200 H5	5303 D5	7218 H6	9206 E6	9213 C3	9221 A5	9229 D6	9237 D6	9244 E4	9251 E8	9259 H4	9269 B10	9281 D7	9290 C6	9298 B6	9802 C8	9817 B9	
1006 B11	1018 A9	1211 H9	2111 F3	2201 G5	2241 G5	2328 D3	2402 C1	2416 D9	2540 C5	2568 B1	3139 E2	3329 D3	3573 A7	5201 G6	5500 B11	7231 H7	9207 A1	9215 B2	9222 F10	9230 D5	9238 B8	9245 G2	9252 E10	9261 F8	9270 H3	9282 C9	9291 C10	9299 B6	9803 D8	9819 C6	
1010 G8	1020 B9	1212 H4	2114 F1	2205 H9	2242 G7	2329 D4	2403 C5	2500 C10	2541 C8	2581 B1	3251 E5	3406 C1	5100 G1	5202 G5	6216 F10	7311 E4	9208 B3	9216 B3	9224 C5	9231 C7	9239 B8	9246 E2	9254 A8	9262 G8	9275 E9	9283 D6	9292 E10	9397 A9	9805 A6	9820 C9	
1011 A4	1022 B4	1307 F11	2116 F2	2211 F7	2304 F8	2330 D2	2405 C2	2526 B10	2553 B4	2583 A6	3304 E5	3411 D10	5101 G2	5203 G8	6401 C5	7315 F9	9209 B4	9217 B6	9225 D5	9232 B6	9240 C7	9247 D8	9255 B2	9264 F8	9276 H9	9285 D8	9294 B2	9398 C10	9806 B6	9821 B9	
1012 A3	1026 A2	1400 E8	2124 G3	2214 F5	2309 E4	2331 C4	2406 C2	2528 C10	2555 C7	2584 B9	3306 D3	3412 E9	5102 G4	5204 G6	6500 A4	7321 E9	9210 C2	9218 C9	9226 C5	9234 C5	9241 G6	9248 D9	9256 D4	9265 F9	9277 B7	9286 D8	9295 A2	9399 C9	9813 B2	9824 F3	

COMBI BOARD / copperside view   Layout stage **.4**



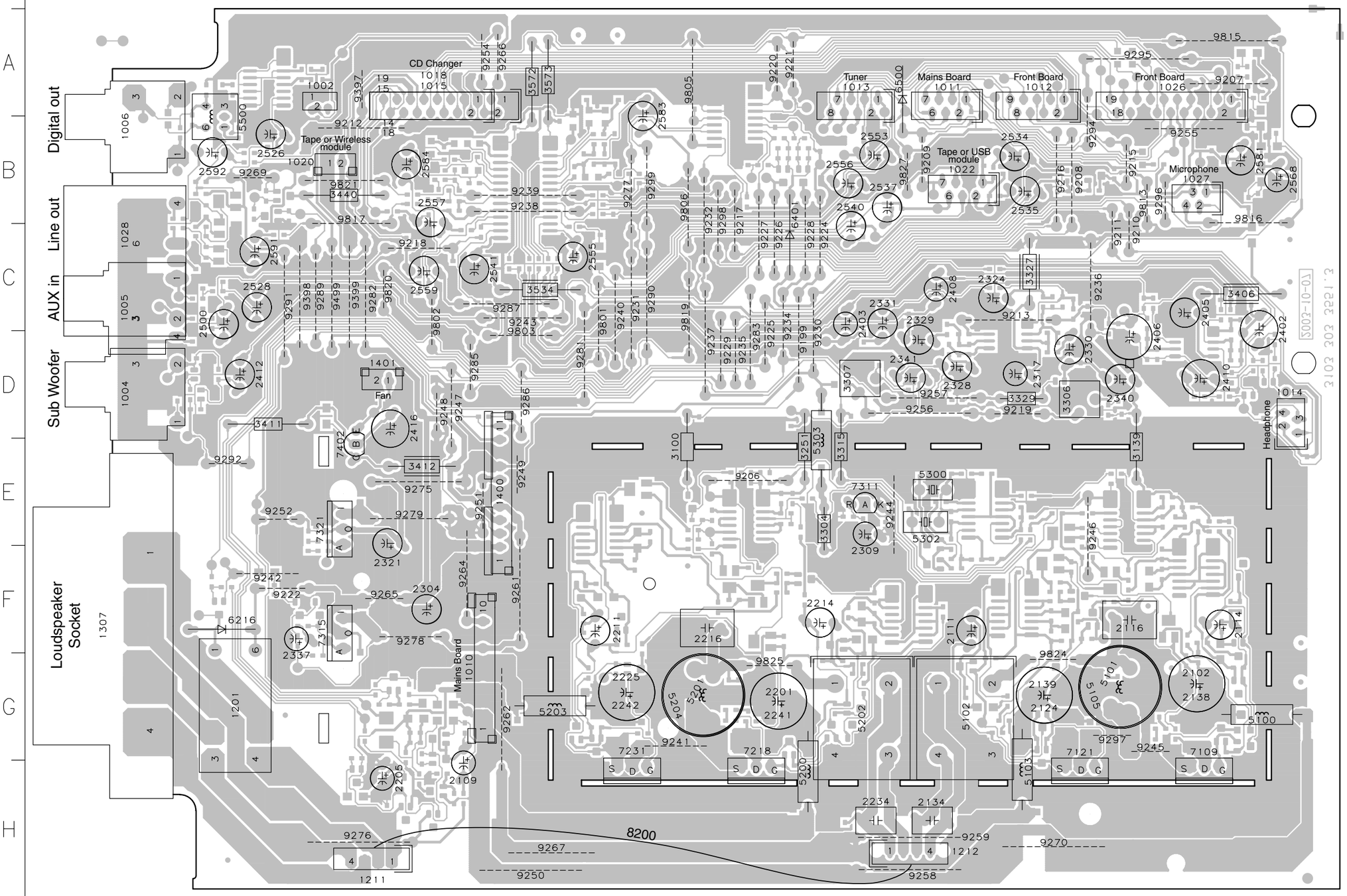
This assembly drawing shows a summary of all possible versions.
For components used in a specific version see schematic diagram respectively partslist.

P2003 75-150W class D Combi Board .4, 030204

2100 G1	2587 C11	3337 D4	4216 C3
2101 G1	2588 B11	3338 C4	4217 B2
2103 G2	2589 C11	3339 C4	4223 B7
2104 D6	2590 B11	3340 D3	4226 F6
2106 G2	2593 B7	3341 F4	4230 G9
2108 E3	3101 G1	3342 E10	4232 C7
2110 E1	3102 F2	3343 E10	4233 A8
2112 G2	3103 G2	3344 F10	4235 C3
2113 G1	3106 F2	3345 F10	4240 A2
2115 H4	3107 F3	3346 F10	4241 A2
2117 H4	3108 E5	3350 F10	4245 B7
2118 F2	3109 G1	3400 D1	4253 G3
2119 E2	3110 F2	3401 C1	4260 G1
2120 E2	3111 F1	3402 C1	4265 F2
2121 F3	3112 H8	3403 C1	4272 D4
2122 G2	3113 G8	3404 C1	4273 E2
2125 D2	3114 E2	3405 C2	4274 E3
2126 F3	3115 E2	3407 C2	4276 G3
2128 H3	3116 G9	3408 C2	4277 E6
2130 G3	3117 F2	3409 C2	4279 E4
2132 G3	3119 F1	3410 D1	4280 C9
2135 E2	3120 G4	3413 C2	4281 C8
2136 G2	3121 G4	3415 D2	4282 B10
2137 E1	3122 G4	3418 D11	4283 G1
2200 H5	3125 E3	3419 D11	4286 B9
2202 H5	3126 B5	3420 D11	4287 B9
2203 G5	3127 F3	3421 D11	4289 C3
2206 F5	3129 F3	3422 B5	4290 G5
2208 E6	3130 G3	3423 B5	4301 E3
2209 G9	3133 F3	3424 B5	5205 G9
2210 G4	3134 F3	3425 D1	6104 G8
2212 G6	3135 G3	3426 D1	6106 F1
2213 G7	3136 E1	3427 B6	6108 G3
2215 H5	3137 G2	3428 B5	6109 F2
2217 G6	3138 G2	3429 D1	6110 F1
2218 G7	3140 E2	3430 D1	6111 F3
2219 H4	3142 F3	3431 B10	6113 G3
2220 G7	3143 E2	3432 D1	6114 G1
2221 E5	3144 E2	3433 D1	6202 H9
2222 E6	3145 G2	3434 D8	6205 H8
2226 D5	3146 F3	3435 B6	6206 H9
2227 F7	3147 F2	3436 B5	6208 F7
2229 G8	3148 E2	3437 B10	6209 G9
2236 F7	3149 E1	3438 B10	6210 G5
2237 E5	3151 F1	3439 B5	6211 G5
2238 F7	3152 F1	3500 C11	6212 F4
2239 G5	3153 F1	3501 B4	6213 F7
2240 F5	3154 F2	3502 C5	6214 F4
2300 E4	3155 E1	3504 C11	6217 E7
2301 E4	3156 G3	3506 G9	6300 F10
2303 F3	3201 H9	3507 G9	6403 D10
2305 E3	3202 F4	3508 B9	6404 C1
2306 E5	3203 H9	3509 C9	6501 C8
2312 F9	3205 G6	3510 C9	6502 A1
2313 D5	3207 G9	3511 B9	6503 A1
2314 E4	3209 G6	3514 C11	6504 B1
2316 F9	3210 E6	3515 B10	6505 B1
2318 C3	3211 E6	3517 B11	6506 G9
2319 D5	3212 F7	3518 C11	6507 G8
2320 E9	3213 E5	3519 C11	6508 B1
2322 E10	3215 H5	3520 C11	7104 F2
2325 D4	3216 F7	3521 A10	7105 F1
2326 D3	3217 E6	3522 B3	7110 G8
2327 D4	3218 F6	3523 B3	7111 G1
2332 C3	3219 H8	3524 B2	7112 G8
2333 C2	3221 F6	3525 B3	7113 G3
2334 E4	3223 H8	3526 B2	7114 F1
2335 D2	3224 H9	3527 B3	7115 G4
2336 D4	3225 F4	3528 A10	7117 F2
2339 E4	3226 G9	3529 B3	7118 F3
2400 D1	3227 F6	3530 A10	7119 F3
2401 D1	3228 G5	3531 B3	7122 E2
2404 C1	3229 G9	3532 B3	7128 E3
2407 C2	3231 F7	3533 B4	7129 F2
2409 D2	3232 F7	3535 B8	7130 E6
2411 D2	3236 G6	3536 B8	7131 F3
2413 D11	3237 G6	3539 B8	7132 G1
2414 D10	3240 G6	3542 B8	7133 G3
2415 D9	3241 G7	3543 B9	7203 H9
2417 B5	3243 G7	3544 B8	7208 F5
2418 E1	3245 F5	3545 B4	7209 F4
2419 D1	3246 F5	3549 B8	7210 G7
2420 B5	3247 G7	3550 B4	7211 H9
2421 A6	3248 E5	3551 C8	7220 H8
2501 C11	3252 E5	3552 C8	7221 G5
2519 D11	3253 E6	3553 C8	7222 F5
2520 C11	3254 E5	3554 C9	7223 F7
2527 B11	3255 F6	3555 A1	7227 G7
2529 B10	3256 E7	3556 B1	7228 F5
2531 C11	3258 E6	3557 C8	7232 E6
2532 B11	3259 E5	3558 A1	7235 E7
2533 A11	3261 F5	3559 A1	7238 F5
2536 B3	3262 F10	3560 B7	7239 F6
2538 A10	3263 F11	3561 A1	7240 E7
2539 A10	3264 G5	3562 B1	7243 F10
2542 B8	3265 G5	3563 C7	7244 G5
2543 B8	3266 G5	3564 C7	7245 G7
2546 B8	3267 F4	3566 C8	7309 E4
2547 B9	3268 F5	3567 G9	7312 E3
2550 B9	3269 G7	3568 C7	7316 F4
2551 B8	3302 F4	3569 B1	7317 F10
2552 B8	3303 E3	3570 B1	7319 F10
2554 B8	3305 E5	3571 B7	7320 D3
2558 B7	3311 E5	3574 B7	7323 D3
2560 C8	3312 F3	3575 B7	7324 D4
2561 C9	3313 F10	3576 B7	7400 D1
2562 C9	3314 F10	3577 B7	7403 D11
2563 C8	3316 C3	3578 A7	7404 D11
2564 B7	3317 C3	3579 A7	7405 B5
2565 C7	3318 F4	3580 B8	7406 B6
2566 C7	3319 D4	3581 B7	7407 D1
2567 C7	3320 E3	3582 C10	7408 D1
2569 B7	3321 G10	3583 C11	7409 B10
2570 B8	3322 F10	3584 C11	7410 B5
2571 A7	3323 G10	3585 B11	7411 B10
2572 B7	3324 E4	3586 C11	7500 A10
2574 B7	3325 D2	3587 B11	7505 B2
2576 B7	3326 D4	3588 B10	7506 G9
2577 B7	3328 D3	3589 B10	7508 B8
2578 B7	3330 D2	3591 G9	7509 B1
2579 B7	3331 D4	4211 B2	7510 C10
2582 B1	3332 C3	4212 B8	7511 C10
2585 C8	3334 D5	4213 C2	7512 B10
2586 B11	3336 D4	4214 D5	

11-12

COMBI BOARD / componentside view Layout stage .3



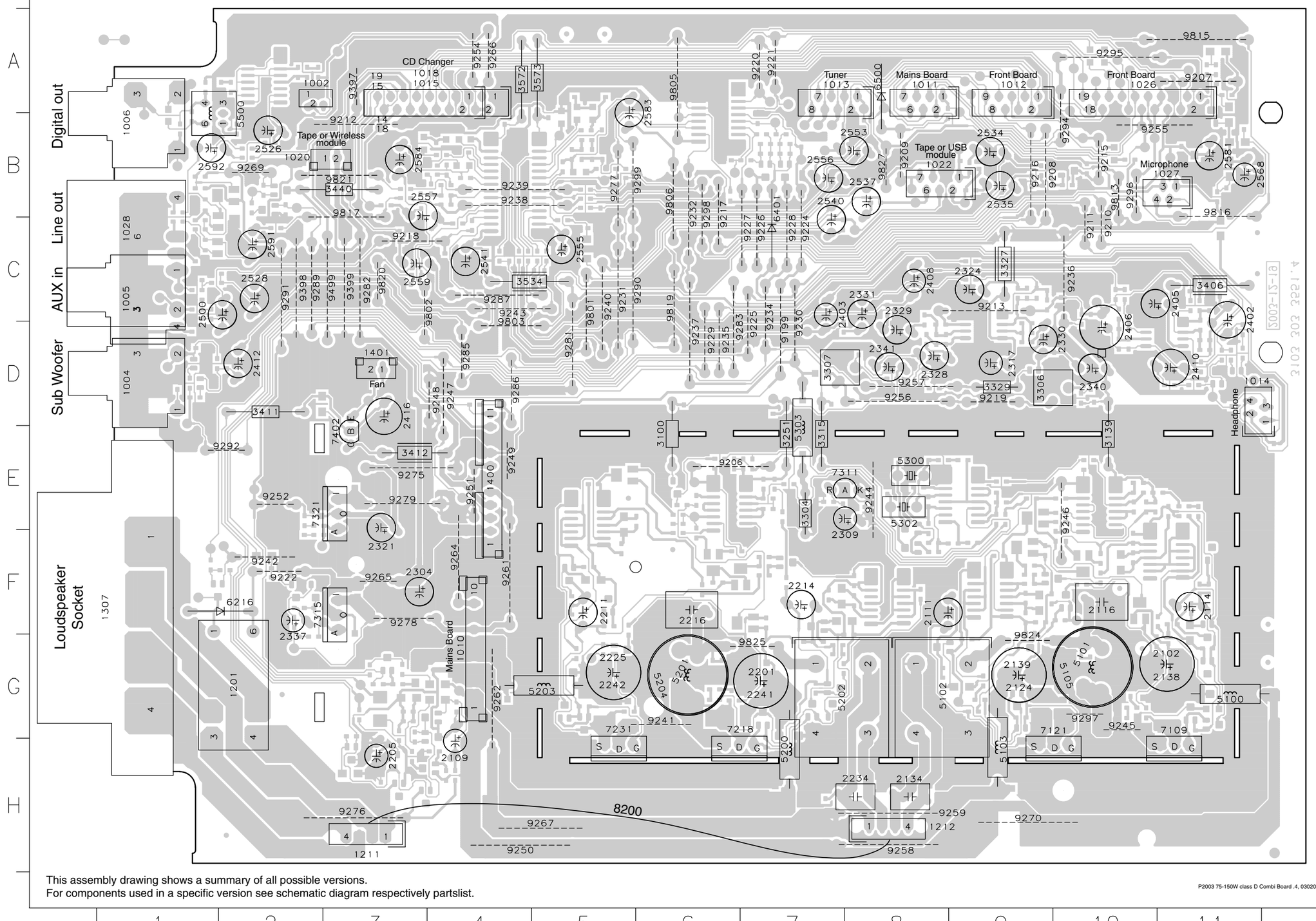
This assembly drawing shows a summary of all possible versions.
For components used in a specific version see schematic diagram respectively partslist.

P2003 75-150W class D Combi Board .3, 251103

1002	A2	6500	A8
1004	D1	7109	G11
1005	C1	7121	G10
1006	B1	7218	G6
1010	G4	7231	G5
1011	A8	7311	E8
1012	A9	7315	F2
1013	A7	7321	E2
1014	D11	7402	E3
1015	A3	8200	H5
1018	A3	9199	D7
1020	B3	9206	E6
1022	B8	9207	A11
1026	A10	9208	B9
1027	B11	9209	B8
1028	C1	9210	C10
1201	G2	9211	C10
1211	H3	9212	B3
1212	H8	9213	C9
1307	F1	9215	B10
1400	E4	9216	B9
1401	D3	9217	B6
2102	G11	9218	C3
2109	H4	9219	D9
2111	F8	9220	A7
2114	F11	9221	A7
2116	F10	9222	F2
2124	G9	9224	C7
2134	H8	9225	D7
2138	G11	9226	C7
2139	G9	9227	C7
2201	G7	9228	C7
2205	H3	9229	D6
2211	F5	9230	D7
2214	F7	9231	C5
2216	F6	9232	B6
2225	G5	9234	C7
2234	H8	9235	D6
2241	G7	9236	C10
2242	G5	9237	D6
2304	F3	9238	B4
2309	F8	9239	B4
2317	D9	9240	C5
2321	F3	9241	G6
2324	C9	9242	F2
2328	D8	9243	C4
2329	C8	9244	E8
2330	D10	9245	G10
2331	C8	9246	E10
2337	G2	9247	D4
2340	D10	9248	D4
2341	D8	9249	E4
2402	C11	9250	H4
2403	C7	9251	E4
2405	C11	9252	E2
2406	D10	9254	A4
2408	C8	9255	B10
2410	D11	9256	D8
2412	D2	9257	D8
2416	D3	9258	H8
2500	C1	9259	H8
2526	B2	9261	F4
2528	C2	9262	G4
2534	B9	9264	F4
2535	B9	9265	F3
2537	B8	9266	A4
2540	C8	9267	H5
2541	C4	9269	B2
2553	B8	9270	H9
2555	C5	9275	E3
2556	B7	9276	H3
2557	B3	9277	B5
2559	C3	9278	F3
2568	B11	9279	E3
2581	B11	9281	D5
2583	A6	9282	C3
2584	B3	9283	D6
2591	C2	9285	D4
2592	B1	9286	D4
3100	E6	9287	C4
3139	E10	9289	C2
3251	E7	9290	C6
3304	E7	9291	C2
3306	D9	9292	E2
3307	D7	9294	B10
3315	E7	9295	A10
3327	C9	9296	B10
3329	D9	9297	G10
3406	C11	9298	B6
3411	D2	9299	B6
3412	E3	9397	A3
3440	B3	9398	C2
3534	C4	9399	C3
3572	A4	9499	C3
3573	A5	9801	C5
5100	G11	9802	C4
5101	G10	9803	D4
5102	G8	9805	A6
5103	H9	9806	B6
5105	G10	9813	B10
5200	H7	9815	A11
5201	G6	9816	B11
5202	G7	9817	B3
5203	G5	9819	C6
5204	G6	9820	C3
5300	E8	9821	B3
5302	E8	9824	G9
5303	E7	9825	G7
5500	B2	9827	B8
6216	F2		
6401	B7		

11-13

COMBI BOARD / componentside view Layout stage .4



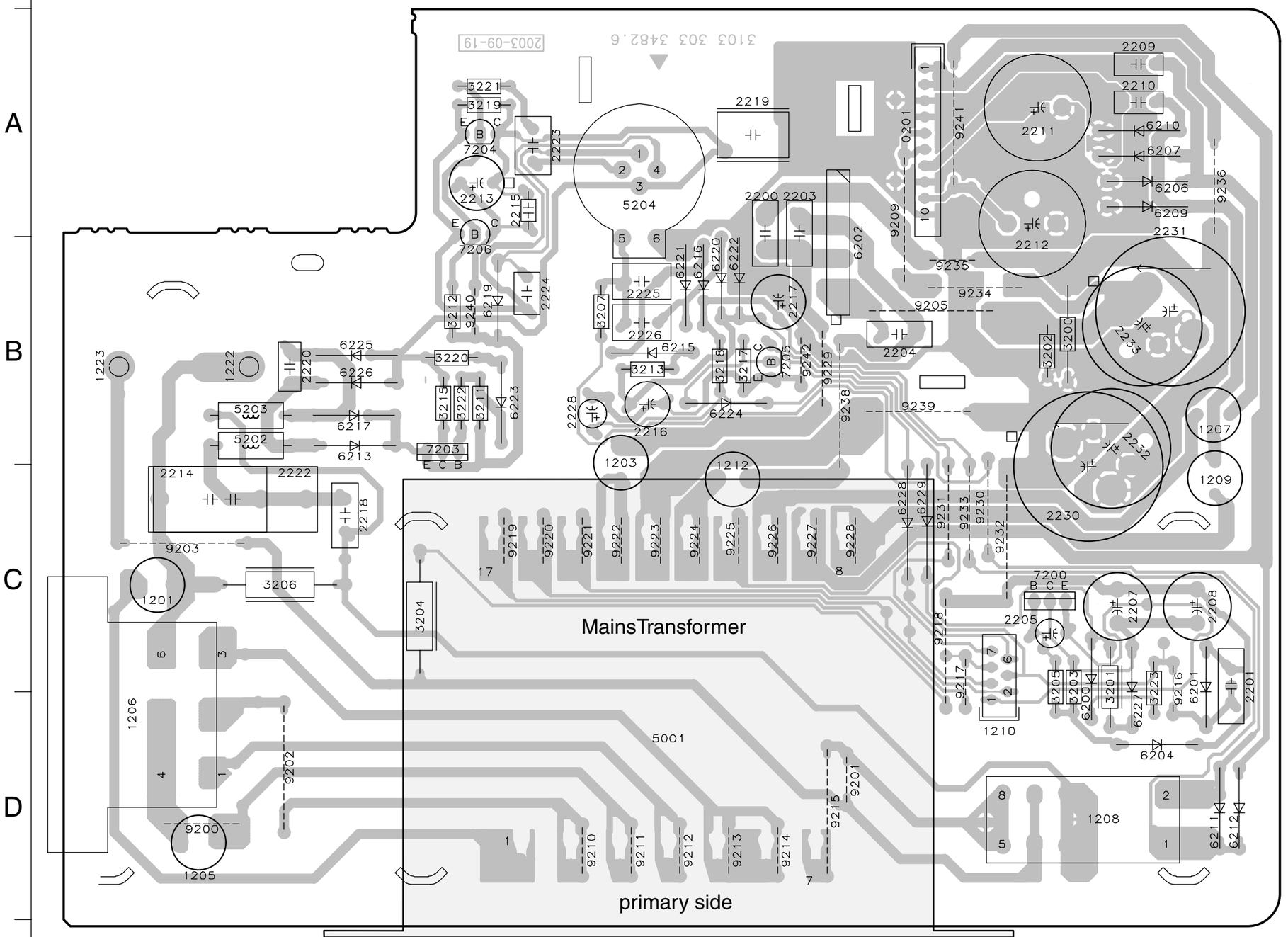
This assembly drawing shows a summary of all possible versions.
For components used in a specific version see schematic diagram respectively partslist.

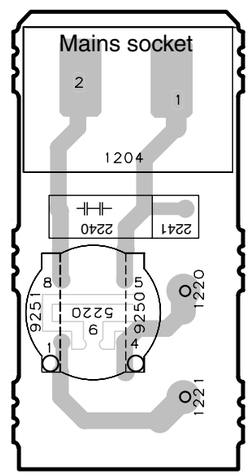
P2003 75-150W class D Combi Board .4, 030204

1002	A2	6500	A8
1004	D1	7109	G11
1005	C1	7121	G10
1006	B1	7218	G6
1010	G4	7231	G5
1011	A8	7311	E8
1012	A9	7315	F2
1013	A7	7321	E2
1014	D11	7402	E3
1015	A3	8200	H5
1018	A3	9199	D7
1020	B3	9206	E6
1022	B8	9207	A11
1026	A10	9208	B9
1027	B11	9209	B8
1028	C1	9210	C10
1201	G2	9211	C10
1211	H3	9212	B3
1212	H8	9213	C9
1307	F1	9215	B10
1400	E4	9216	B9
1401	D3	9217	B6
2102	G11	9218	C3
2109	H4	9219	D9
2111	F8	9220	A7
2114	F11	9221	A7
2116	F10	9222	F2
2124	G9	9224	C7
2134	H8	9225	D7
2138	G11	9226	C7
2139	G9	9227	C7
2201	G7	9228	C7
2205	H3	9229	D6
2211	F5	9230	D7
2214	F7	9231	C5
2216	F6	9232	B6
2225	G5	9234	C7
2234	H8	9235	D6
2241	G7	9236	C10
2242	G5	9237	D6
2304	F3	9238	B4
2309	F8	9239	B4
2317	D9	9240	C5
2321	F3	9241	G6
2324	C9	9242	F2
2328	D8	9243	C4
2329	C8	9244	E8
2330	D10	9245	G10
2331	C8	9246	E10
2337	G2	9247	D4
2340	D10	9248	D4
2341	D8	9249	E4
2402	C11	9250	H4
2403	C7	9251	E4
2405	C11	9252	E2
2406	D10	9254	A4
2408	C8	9255	B10
2410	D11	9256	D8
2412	D2	9257	D8
2416	D3	9258	H8
2500	C1	9259	H8
2526	B2	9261	F4
2528	C2	9262	G4
2534	B9	9264	F4
2535	B9	9265	F3
2537	B8	9266	A4
2540	C8	9267	H5
2541	C4	9269	B2
2553	B8	9270	H9
2555	C5	9275	E3
2556	B7	9276	H3
2557	B3	9277	B5
2559	C3	9278	F3
2568	B11	9279	E3
2581	B11	9281	D5
2583	A6	9282	C3
2584	B3	9283	D6
2591	C2	9285	D4
2592	B1	9286	D4
3100	E6	9287	C4
3139	E10	9289	C2
3251	E7	9290	C6
3304	E7	9291	C2
3306	D9	9292	E2
3307	D7	9294	B10
3315	E7	9295	A10
3327	C9	9296	B10
3329	D9	9297	G10
3406	C11	9298	B6
3411	D2	9299	B6
3412	E3	9397	A3
3440	B3	9398	C2
3534	C4	9399	C3
3572	A4	9499	C3
3573	A5	9801	C5
5100	G11	9802	C4
5101	G10	9803	D4
5102	G8	9805	A6
5103	H9	9806	B6
5105	G10	9813	B10
5200	H7	9815	A11
5201	G6	9816	B11
5202	G7	9817	B3
5203	G5	9819	C6
5204	G6	9820	C3
5300	E8	9821	B3
5302	E8	9824	G9
5303	E7	9825	G7
5500	B2	9827	B8
6216	F2		
6401	B7		

11-14

Mains Board I copperside view





This assembly drawing shows a summary of all possible versions.
For components used in a specific version see schematic diagram respectively partslist.

Power2002 70W Class D - Mains Board stage.6 2003 10 02

0201 A4
1201 C1
1203 B3
1205 D1
1206 D1
1207 B5
1208 D5
1209 C5
1210 C5
1212 C4
1222 B1
1223 B1
2200 A4
2201 D5
2203 A4
2204 B4
2205 C5
2207 C5
2208 C5
2209 A5
2210 A5
2211 A5
2212 A4
2213 A2
2214 B1
2215 A3
2216 B3
2217 B4
2218 C2
2219 A4
2220 B1
2222 C1
2223 A3
2224 B3
2225 B3
2226 B3
2228 B3
2230 C5
2231 B5
2232 B5
2233 B5
3200 B5
3201 D5
3202 B5
3203 D5
3204 C2
3205 C5
3206 C1
3207 B3
3211 B2
3212 B2
3213 B3
3215 B2
3217 B4
3218 B3
3219 A3
3220 B2
3221 A2
3222 B2
3223 C5
5001 C3
5202 B1
5203 B1
5204 A3
6200 D5
6201 D5
6202 B4
6204 D5
6206 A5
6207 A5
6209 A5
6210 A5
6211 D5
6212 D5
6213 B2
6215 B3
6216 B3
6217 B2
6219 B2
6220 A3
6221 B3
6222 A3
6223 B2
6224 B3
6225 B2
6226 B2
6227 C5
6228 C4
6229 C4
7200 C5
7203 C2
7204 A2
7205 B4
7206 A2
9200 D1
9201 D4
9202 D1
9203 C1
9205 B4
9209 A4
9210 D3
9211 D3
9212 D3
9213 D3
9214 D4
9215 D4
9216 C5
9217 C4
9218 C4
9219 C2
9220 C3
9221 C3
9222 C3
9223 C3
9224 C3
9225 C4
9226 C4
9227 C4
9228 C4
9229 B4
9230 C5
9231 C4
9232 C5
9233 C5
9234 B5
9235 B4
9236 A5
9238 B4
9239 B4
9240 B2
9241 A4
9242 B4

11-15

0201 D10 1201 A3 1203 A5 1205 A3 1206 A3
1207 B5 1208 C3 1209 C5 1210 C10 1212 B5
1222 A2 1223 A2 2200 A6 2201 C8 2203 A6
2204 A6 2205 A10 2207 B8 2208 B9 2209 C6
2210 C7 2211 C7 2212 B7 2213 D4 2214 D1
2215 D5 2216 E8 2217 E9 2218 E1 2219 E7
2220 E1 2222 D1 2223 D6 2224 E6 2225 C8
2226 D7 2228 C1 2230 A7 2231 B7 2232 A7
2233 A7 2240 A1 3200 A8 3201 B8 3202 A8
3203 B9 3204 A2 3205 B9 3206 B2 3207 C8
3211 D4 3212 D5 3213 D8 3215 E3 3217 C2
3218 B1 3219 E6 3220 E4 3221 D6 3222 E3
3223 B8 5001 A4 5202 E1 5203 E1 5204 D7
6200 B8 6201 C9 6202 A6 6204 B9 6206 C6
6207 C7 6209 C6 6210 C7 6211 C3 6212 C3
6213 D2 6215 D8 6216 D9 6217 D2 6219 D6
6220 D8 6221 E8 6222 E8 6223 E3 6224 C1
6225 E2 6226 E2 6227 E8 6228 C1 7200 A9
7203 D3 7204 E5 7205 B2 9200 A3 9201 B3
9250 A1 9251 A1

MAINS BOARD / PWR304 150W CLASS D

1204 2 100n 1 * 9251 5220 2240 2241 97TS * 9250 1221 1222 1220 1223
3204 10M /37 ONLY
1206 SDKP /21 ONLY
1201 T1A6 IEC T4A UL T1A25 NON ECO
NOT /21 9200 1205 T1A6 /21 ONLY T1A25 NON ECO
MAINS_2 3206 10M MAINS_1
5001 2000TS-092 NTC DISPLAY F1 F2 T.F
1203 T5A 19372 1212 T5A 19372 1207 T2A 19372 1209 T2A 19372
GBU8D 6202 2200 100n 2203 100n 2204 100n
2230 4m7 2232 3300u 3200 33K 43V +AMP
2231 4m7 2233 3300u 3202 33K -43V -AMP
2209 100n 6206 1N5392 6207 1N5392 6209 1N5392 6210 1N5392 2210 100n 2211 3m3 22.9V +D
2212 6m8 10.9V +D2
3201 4R7 6227 1N4003
6200 1N4148 3223 4K7 3207 4K7 6229 1N4148 5,2V PWR_DWN
2207 100u 2208 100u
7200 BD438 -49V -34V -33.5V -Vkk
3203 3K9 3205 680R 6204 BZX79-C33 2205 0u47
4n7 2201 6201 BZX79-F8V2
9201 9251 9250
3218 10K 7205 BC337-40 BZX79-B2V7 6224 0V 0.7V
2228 22u 6228 1N4148 2K2 3217 4.3V LOW_PWR_CTRL 0V
+D2 6212 1N4148 OZ 1208 10.2V MAINS_2
12V_RELAIS 6211 1N4148
1210 5V6_ECO LOW_PWR_CTRL to C1 NTC PWR_DWN F2 F1 -Vkk
5V6_ECO 5,6V LOW_PWR_CTRL 4,3V NTC 4V PWR_DWN 5,2V F2 -25,8V F1 -25,8V -Vkk -33,5V
FROM / TO COMBI BOARD 1011 1

MAINS_1 2214 220n 2222 470n 5202 1mH * 2220 47n 5203 1mH MAINS_2
32,7 * 2218 22n
1N4003 6213 1N4003 6217 6225 1N4003 6226 1N4003
7203 BD438 3222 680R 3211 330R 6223 BZX79-C39 3220 330R 3215 100R
38V
2213 100u 3212 4M7 3221 330R 2223 100n
7206 BC547B * 2215 100n BC557B 7204 21V
2224 10n 3219 100K
STANDBY 5204 3A1631N 2225 100n 2226 100n 2219 2n2
12V_RELAIS 1N4148 6215 1N4148 6216 14V
1N4148 6219 1N4148 6220 1N4148 6221
3213 470R 5V6_ECO 5.6V
2216 10u BZX79-C5V6 6222 2217 220u
EVM V
xxV DC voltages measured in Tuner mode, mains supply 230V
xxV ECO STANDBY MODE
xxV measured with a * not grounded multimeter *
* not used
0201 +AMP +43V +AMP +43V -AMP -43V -AMP -43V +D 22.9V +D2 10.9V
TO COMBI BOARD 1010 1

Power2003 150W ClassD Mains Board Circuit Diagram 2003 12 03

ELECTRICAL PARTSLIST *POWER 2003 75&150W Class-D* ***MAINS BOARD***

MISCELLANEOUS

1201 ⚠	4822 071 51602	FUSE 1,6A	/21/22 only
1201 ⚠	4822 253 10126	FUSE T4A	/37 only
1203 ⚠	4822 071 55002	FUSE T5A	/21/22 only
1204 ⚠	2422 030 00328	MAINS SOCKET /37	
1204 ⚠	4822 265 31015	MAINS SOCKET, IEC	
1205 ⚠	4822 071 51602	FUSE 1,6A	/21 only
1206 ⚠	2422 129 16478	VOLTAGE SELECTOR	/21 only
1207 ⚠	9965 000 07788	FUSE RAD T2A	
1208 ⚠	2422 132 07519	RELAY 1P 12V 16A	
1209 ⚠	9965 000 07788	FUSE RAD T2A	
1210	4822 267 10953	FFC-CONNECTOR, 7P, TOP ENTRY	
1212 ⚠	4822 071 55002	FUSE T5A	
5001 ⚠	3103 308 30870	Mains Transformer /37	for 75W only
5001 ⚠	3103 308 30880	Mains Transformer /22	for 75W only
5001 ⚠	3103 308 30890	Mains Transformer /21, /21M	for 75W only
5001 ⚠	3103 308 31011	Mains Transformer /37	for 150W only
5001 ⚠	3103 308 31001	Mains Transformer /22	for 150W only
5001 ⚠	3103 308 30991	Mains Transformer /21, /21M	for 150W only
5204 ⚠	2422 549 45157	STANDBY TRANSFORMER	

CAPACITORS

2200	4822 121 43696	100nF	10%	100V	
2201	4822 122 31125	4,7nF	10%	63V	
2203	4822 121 43696	100nF	10%	100V	
2204	4822 121 43696	100nF	10%	100V	
2205	5322 124 41948	0,47µF	20%	50V	
2208	2020 012 93547	100µF	20%	63V	
2209	5322 121 42386	100nF	5%	63V	
2210	5322 121 42386	100nF	5%	63V	
2211	4822 124 42367	3300µF	20%	35V	
2212	4822 124 12328	6800µF	20%	16V	
2213	4822 124 40255	100µF	20%	50V	
2214 ⚠	4822 121 10512	220nF	20%	275V	/22 only
2216	4822 124 21732	10µF	20%	25V	
2217	4822 124 80144	220µF	20%	25V	
2219 ⚠	4822 126 14088	2,2nF	20%	250V	
2222 ⚠	4822 126 13589	470nF	10%	275V	/21/37 only
2223	5322 121 42386	100nF	5%	63V	
2224	4822 122 30043	10nF	80%	63V	
2225	5322 121 42386	100nF	5%	63V	
2226	5322 121 42386	100nF	5%	63V	
2228 ©	4822 124 11946	22µF	20%	16V	
2232	2022 020 00644	3300µF	20%	50V	
2233	2022 020 00644	3300µF	20%	50V	
2240	2022 330 00014	100nF	20%	275V	

RESISTORS

3200	4822 050 23303	33kΩ	1%	0,6W	
3201 ⚠	4822 052 10478	4,7Ω	5%	0,5W	NFR
3202	4822 050 23303	33kΩ	1%	0,6W	
3203	4822 116 52276	3,9kΩ	5%	0,5W	
3204 ⚠	4822 053 21106	10MΩ	5%	0,5W	/37 only
3205	4822 116 52228	680Ω	5%	0,5W	
3206 ⚠	4822 053 21106	10MΩ	5%	0,5W	
3207	4822 116 52283	4,7kΩ	5%	0,5W	
3211	4822 116 52219	330Ω	5%	0,5W	
3212	4822 111 30893	4,7MΩ	5%	0,2W	
3213	4822 116 83883	470Ω	5%	0,16W	
3215	4822 116 52175	100Ω	5%	0,5W	
3217	4822 116 52256	2,2kΩ	5%	0,16W	
3218	4822 050 21003	10kΩ	2%	0,25W	
3219	4822 116 52234	100kΩ	5%	0,5W	
3220	4822 116 52219	330Ω	5%	0,5W	
3221	4822 116 52219	330Ω	5%	0,5W	
3222	4822 116 52228	680Ω	5%	0,5W	
3223	4822 116 52283	4,7kΩ	5%	0,5W	

COILS

5202	4822 157 53473	1000µH
5203	4822 157 53473	1000µH
5220 ⚠	4822 157 11832	400µH, Mains filter

DIODES

6200	4822 130 30621	1N4148
6201	4822 130 34382	BZX79-B8V2
6202	4822 130 11139	GBU8D
6204	4822 130 34142	BZX79-B33
6206	4822 130 31878	1N4003G
6207	4822 130 31878	1N4003G
6209	4822 130 31878	1N4003G
6210	4822 130 31878	1N4003G
6211	4822 130 30621	1N4148
6212	4822 130 30621	1N4148
6213	4822 130 31878	1N4003G
6215	4822 130 30621	1N4148
6216	4822 130 30621	1N4148
6217	4822 130 31878	1N4003G
6219	4822 130 30621	1N4148
6220	4822 130 31983	BAT85
6221	4822 130 31983	BAT85
6223	4822 130 34145	BZX79-B39
6224	5322 130 34563	BZX79-C2V7
6225	4822 130 31878	1N4003G
6226	4822 130 31878	1N4003G
6227	4822 130 31878	1N4003G
6228	4822 130 30621	1N4148
6229	4822 130 30621	1N4148

TRANSISTORS

7200	4822 130 40995	BD438
7203	4822 130 40995	BD438
7204	4822 130 44568	BC557B
7205	4822 130 40855	BC337-40
7206	4822 130 40959	BC547B

11-16

ELECTRICAL PARTSLIST *POWER 2003 75&150W Class-D* ***COMBI BOARD***

MISCELLANEOUS

0021	4822 492 11735	SPRING TRANSISTOR	
1005	2422 026 05418	SOCKET, CINCH, 2p	
1011	4822 267 10953	FFC-CONNECTOR, 7P, TOP ENTRY	
1012	2422 025 14518	FFC-CONNECTOR, 9P, TOP ENTRY	
1013	4822 265 11515	FFC-CONNECTOR, 8P, TOP ENTRY	
1014	4822 267 10733	FFC CONNECTOR, 4P, TOP ENTRY	
1015	4822 265 10981	FFC-CONNECTOR, 15P, TOP ENTRY	
1022	4822 267 10953	FFC-CONNECTOR, 7P, TOP ENTRY	
1026	4822 265 11553	FFC-CONNECTOR, 19P, TOP ENTRY	
1201	2422 132 07517	RELAY 2P 12V	
1307	2422 015 19893	SOCKET, CLICKFIT, 4P	

CAPACITORS

2100 ©	4822 122 33496	100nF	10%	63V	
2101 ©	2222 580 15649	100nF	10%	50V	
2102	2022 031 00196	220µF	20%	50V	for 150W only
2103 ©	2222 580 15649	100nF	10%	50V	
2104 ©	5322 126 11583	10nF	10%	63V	
2106 ©	5322 126 11578	1nF	10%	63V	
2108 ©	5322 126 11583	10nF	10%	63V	
2109	4822 124 80483	47µF	20%	6,3V	
2110 ©	3198 017 41050	1µF	20%	10V	
2111	4822 124 21913	1µF	20%	63V	
2112 ©	4822 126 13883	220pF	5%	50V	
2113 ©	3198 017 41050	1µF	20%	10V	
2114	4822 124 40248	10µF	20%	63V	
2115 ©	5322 126 11578	1nF	10%	63V	
2116	5322 121 42661	330nF	5%	63V	
2117 ©	5322 126 11578	1nF	10%	63V	
2118 ©	5322 126 11578	1nF	10%	63V	
2119 ©	4822 126 13193	4,7nF	10%	63V	for 150W only
2119 ©	4822 126 14247	1,5nF	10%	50V	for 75W only
2120 ©	3198 017 41050	1µF	20%	10V	
2121 ©	3198 017 41050	1µF	20%	10V	
2122 ©	4822 126 13883	220pF	5%	50V	
2124	2022 031 00196	220µF	20%	50V	for 150W only
2125 ©	4822 126 13193	4,7nF	10%	63V	
2126 ©	2020 552 94427	100pF	5%	50V	
2128 ©	2222 580 15649	100nF	10%	50V	
2130 ©	4822 122 33496	100nF	10%	63V	
2132 ©	3198 017 41050	1µF	20%	10V	
2134	4822 121 42408	220nF	5%	63V	
2135 ©	3198 016 31020	1nF	5%	25V	for 75W only
2135 ©	4822 126 13881	470pF	5%	50V	for 150W only
2136 ©	2222 580 15649	100nF	10%	50V	
2137 ©	2222 867 15339	33pF	5%	50V	
2138	2020 012 93762	330µF	20%	50V	for 75W only
2139	2020 012 93762	330µF	20%	50V	for 75W only
2200 ©	4822 122 33496	100nF	10%	63V	
2201	2022 031 00196	220µF	20%	50V	for 150W only
2202 ©	2222 580 15649	100nF	10%	50V	
2203 ©	2222 580 15649	100nF	10%	50V	
2205	4822 124 80483	47µF	20%	6,3V	
2206 ©	5322 126 11578	1nF	10%	63V	
2208 ©	5322 126 11583	10nF	10%	63V	
2210 ©	3198 017 41050	1µF	20%	10V	
2211	4822 124 21913	1µF	20%	63V	
2212 ©	4822 126 13883	220pF	5%	50V	
2213 ©	4822 122 33496	100nF	10%	63V	
2214	4822 124 40248	10µF	20%	63V	
2215 ©	5322 126 11578	1nF	10%	63V	
2216	5322 121 42661	330nF	5%	63V	
2217 ©	4822 126 13883	220pF	5%	50V	
2218 ©	2222 580 15649	100nF	10%	50V	
2219 ©	5322 126 11578	1nF	10%	63V	
2220 ©	5322 126 11578	1nF	10%	63V	
2221 ©	4822 126 13193	4,7nF	10%	63V	for 150W only
2221 ©	4822 126 14247	1,5nF	10%	50V	for 75W only
2222 ©	3198 017 41050	1µF	20%	10V	
2225	2022 031 00196	220µF	20%	50V	for 150W only
2226 ©	4822 126 13193	4,7nF	10%	63V	
2227 ©	2020 552 94427	100pF	5%	50V	
2229 ©	2222 580 15649	100nF	10%	50V	
2234	4822 121 42408	220nF	5%	63V	
2236 ©	3198 017 41050	1µF	20%	10V	
2237 ©	3198 016 31020	1nF	5%	25V	for 75W only
2237 ©	4822 126 13881	470pF	5%	50V	for 150W only
2238 ©	3198 017 41050	1µF	20%	10V	
2239 ©	3198 017 41050	1µF	20%	10V	
2240 ©	2222 867 15339	33pF	5%	50V	
2241	2020 012 93762	330µF	20%	50V	for 75W only
2242	2020 012 93762	330µF	20%	50V	for 75W only
2300 ©	4822 126 13883	220pF	5%	50V	
2301 ©	4822 126 13883	220pF	5%	50V	
2303 ©	4822 126 13881	470pF	5%	50V	
2304	4822 124 80231	47µF	20%	16V	
2305 ©	3198 017 41050	1µF	20%	10V	
2306 ©	4822 126 14585	100nF	10%	50V	
2309	4822 124 21732	10µF	20%	25V	
2312 ©	2222 580 15649	100nF	10%	50V	
2313 ©	5322 126 11578	1nF	10%	63V	
2314 ©	4822 126 13883	220pF	5%	50V	
2316 ©	4822 126 14585	100nF	10%	50V	
2317	4822 124 21732	10µF	20%	25V	
2318 ©	4822 126 13881	470pF	5%	50V	
2319 ©	4822 126 14585	100nF	10%	50V	
2320 ©	4822 126 14585	100nF	10%	50V	
2321	4822 124 80231	47µF	20%	16V	
2322 ©	4822 126 14585	100nF	10%	50V	
2324	4822 124 40769	4,7µF	20%	100V	
2325 ©	4822 126 13881	470pF	5%	50V	
2326 ©	2020 552 94427	100pF	5%	50V	
2327 ©	2020 552 94427	100pF	5%	50V	
2328	4822 124 81151	22µF	20%	50V	
2329	4822 124 40769	4,7µF	20%	100V	
2330	4822 124 81151	22µF	20%	50V	
2331	4822 124 40769	4,7µF	20%	100V	
2332 ©	2020 552 94427	100pF	5%	50V	
2333 ©	2020 552 94427	100pF	5%	50V	
2334 ©	2222 867 15339	33pF	5%	50V	
2335 ©	2238 586 59812	100nF	10%	50V	
2336 ©	2238 586 59812	100nF	10%	50V	
2337	4822 124 21732	10µF	20%	25V	
2339 ©	3198 017 41050	1µF	20%	10V	
2340	4822 124 81151	22µF	20%	50V	
2341	4822 124 81151	22µF	20%	50V	
2400 ©	2020 552 94427	100pF	5%	50V	
2401 ©	4822 126 13881	470pF	5%	50V	
2402	4822 124 23052	100µF	20%	16V	
2403	4822 124 22651	1µF	20%	50V	
2404 ©	2020 552 94427	100pF	5%	50V	
2405	4822 124 40769	4,7µF	20%	100V	
2406	4822 124 80791	470µF	20%	16V	
2407 ©	2020 552 94427	100pF	5%	50V	
2408	4822 124 22651	1µF	20%	50V	
2409 ©	4822 126 13881	470pF	5%	50V	
2410	4822 124 23052	100µF	20%	16V	
2411 ©	2020 552 94427	100pF	5%	50V	
2415 ©	3198 017 41050	1µF	20%	10V	

11-17

ELECTRICAL PARTSLIST *POWER 2003 75&150W Class-D* ***COMBI BOARD***

ELECTRICAL PARTSLIST *POWER 2003 75&150W Class-D* ***COMBI BOARD***

CAPACITORS

2416	4822 124 23052	100µF	20%	16V		
2417 ©	3198 017 41050	1µF	20%	10V		
2418 ©	2020 552 94427	100pF	5%	50V		
2419 ©	2020 552 94427	100pF	5%	50V		
2420 ©	3198 017 41050	1µF	20%	10V		
2421 ©	2238 586 59812	100nF	10%	50V		
2500	2022 020 00734	1µF	20%	50V		
2519 ©	2238 586 59812	100nF	10%	50V		
2520 ©	4822 126 13881	470pF	5%	50V		
2528	2022 020 00734	1µF	20%	50V		
2531 ©	4822 126 13881	470pF	5%	50V		
2534	4822 124 40769	4,7µF	20%	100V		
2535	4822 124 40769	4,7µF	20%	100V		
2536 ©	2238 586 59812	100nF	10%	50V		
2537	2022 020 00734	1µF	20%	50V		
2540	2022 020 00734	1µF	20%	50V		
2541	4822 124 81151	22µF	20%	50V		
2542 ©	5322 126 11578	1nF	10%	63V		
2543 ©	4822 126 14583	470nF	10%	16V		
2546©	4822 126 14549	33nF	10%	16V		
2547 ©	2222 780 15656	330nF	10%	16V		
2550 ©	5322 126 11579	3,3nF	10%	63V		
2551 ©	4822 126 13879	220nF	20%	16V		
2552 ©	4822 126 13193	4,7nF	10%	63V		
2553	4822 124 21913	1µF	20%	63V		
2554 ©	4822 126 14583	470nF	10%	16V		
2555	4822 124 80231	47µF	20%	16V		
2556	4822 124 21913	1µF	20%	63V		
2557	2022 020 00734	1µF	20%	50V		
2558 ©	4822 126 14583	470nF	10%	16V		
2559	2022 020 00734	1µF	20%	50V		
2560 ©	4822 126 13881	470pF	5%	50V		
2561 ©	4822 126 13881	470pF	5%	50V		
2562 ©	4822 126 13881	470pF	5%	50V		
2563 ©	4822 126 13881	470pF	5%	50V		
2564 ©	4822 126 13881	470pF	5%	50V		
2565 ©	4822 126 13881	470pF	5%	50V		
2566 ©	4822 126 13881	470pF	5%	50V		
2567 ©	4822 126 13881	470pF	5%	50V		
2568	4822 124 80483	47µF	20%	6,3V		
2569 ©	4822 126 14583	470nF	10%	16V		
2570 ©	2020 552 94427	100pF	5%	50V		
2571 ©	2020 552 94427	100pF	5%	50V		
2572 ©	4822 126 13879	220nF	20%	16V		
2574 ©	4822 126 13193	4,7nF	10%	63V		
2576 ©	5322 126 11578	1nF	10%	63V		
2577 ©	4822 126 14549	33nF	10%	16V		
2578 ©	5322 126 11579	3,3nF	10%	63V		
2579 ©	2020 552 96684	470nF	10%	25V		
2581	4822 124 21913	1µF	20%	63V		
2582 ©	2238 586 59812	100nF	10%	50V		
2585 ©	2238 586 59812	100nF	10%	50V		
2593 ©	2222 780 15656	330nF	10%	16V		

RESISTORS

3100	4822 050 21003	10kΩ	2%	0,25W		
3101 ©	2122 118 06085	0,033Ω	5%	1W	for 150W only	
3101 ©	2122 118 06235	0,047Ω	5%	1W	for 75W only	
3102 ©	4822 051 30472	4,7kΩ	5%	0,06W		
3103 ©	4822 051 30102	1kΩ	5%	0,06W		
3106 ©	4822 051 30223	22kΩ	5%	0,06W		
3107 ©	4822 051 30152	1,5kΩ	5%	0,06W		
3108 ©	4822 051 30472	4,7kΩ	5%	0,06W		
3109 ©	4822 051 30101	100Ω	5%	0,06W	for 150W only	

RESISTORS

3109 ©	4822 117 13608	4,7Ω	5%	0,06W	for 75W only	
3110 ©	4822 117 13632	100kΩ	1%	0,06W		
3111 ©	4822 051 30109	10Ω	5%	0,06W	for 150W only	
3111 ©	4822 117 12917	1Ω	5%	0,06W	for 75W only	
3112 ©	4822 117 12925	47kΩ	1%	0,06W		
3113 ©	4822 051 30223	22kΩ	5%	0,06W		
3114 ©	4822 051 30472	4,7kΩ	5%	0,06W		
3115 ©	4822 051 30102	1kΩ	5%	0,06W		
3116 ©	4822 051 30474	470kΩ	5%	0,06W		
3117 ©	4822 117 12903	1,8kΩ	1%	0,06W		
3119 ©	4822 051 30103	10kΩ	5%	0,06W	for 150W only	
3119 ©	4822 051 30153	15kΩ	5%	0,06W	for 75W only	
3120 ©	4822 051 30472	4,7kΩ	5%	0,06W		
3121 ©	4822 051 30472	4,7kΩ	5%	0,06W		
3122 ©	4822 051 30153	15kΩ	5%	0,06W		
3125 ©	4822 051 30102	1kΩ	5%	0,06W		
3126 ©	4822 051 30103	10kΩ	5%	0,06W		
3127 ©	4822 051 30103	10kΩ	5%	0,06W		
3129 ©	4822 051 30102	1kΩ	5%	0,06W		
3130 ©	2122 118 06085	0,033Ω	5%	1W	for 150W only	
3130 ©	2122 118 06235	0,047Ω	5%	1W	for 75W only	
3133 ©	4822 051 30562	5,6kΩ	5%	0,06W		
3134 ©	4822 051 30331	330Ω	5%	0,06W		
3135 ©	4822 051 30101	100Ω	5%	0,06W	for 150W only	
3135 ©	4822 117 13608	4,7Ω	5%	0,06W	for 75W only	
3136 ©	4822 051 30472	4,7kΩ	5%	0,06W		
3137 ©	4822 051 30103	10kΩ	5%	0,06W		
3138 ©	4822 051 30103	10kΩ	5%	0,06W		
3139	4822 116 52226	560Ω	5%	0,5W	for 75W only	
3139	4822 116 83883	470Ω	5%	0,16W	for 150W only	
3140 ©	4822 051 30152	1,5kΩ	5%	0,06W	for 75W only	
3140 ©	4822 117 11817	1,2kΩ	1%	0,06W	for 150W only	
3142 ©	4822 117 11817	1,2kΩ	1%	0,06W		
3143 ©	4822 051 30102	1kΩ	5%	0,06W		
3144 ©	4822 051 30154	150kΩ	5%	0,06W		
3145 ©	4822 117 12139	22Ω	5%	0,06W		
3146 ©	4822 051 30152	1,5kΩ	5%	0,06W		
3147 ©	4822 051 30103	10kΩ	5%	0,06W		
3148 ©	4822 051 30183	18kΩ	5%	0,06W		
3149 ©	4822 051 30472	4,7kΩ	5%	0,06W		
3151 ©	4822 117 13632	100kΩ	1%	0,06W		
3152 ©	4822 051 30152	1,5kΩ	5%	0,06W	for 75W only	
3152 ©	4822 117 12903	1,8kΩ	1%	0,06W	for 150W only	
3153 ©	4822 051 30152	1,5kΩ	5%	0,06W	for 75W only	
3153 ©	4822 117 12903	1,8kΩ	1%	0,06W	for 150W only	
3154 ©	4822 051 30102	1kΩ	5%	0,06W		
3155 ©	4822 051 30472	4,7kΩ	5%	0,06W		
3156 ©	4822 051 30109	10Ω	5%	0,06W	for 150W only	
3156 ©	4822 117 12917	1Ω	5%	0,06W	for 75W only	
3201 ©	4822 117 12925	47kΩ	1%	0,06W		
3202 ©	4822 051 30109	10Ω	5%	0,06W	for 150W only	
3202 ©	4822 117 12917	1Ω	5%	0,06W	for 75W only	
3203 ©	4822 051 30223	22kΩ	5%	0,06W		
3205 ©	2122 118 06085	0,033Ω	5%	1W	for 150W only	
3205 ©	2122 118 06235	0,047Ω	5%	1W	for 75W only	
3207 ©	4822 051 30474	470kΩ	5%	0,06W		
3209 ©	4822 051 30102	1kΩ	5%	0,06W		
3210 ©	4822 051 30472	4,7kΩ	5%	0,06W		
3211 ©	4822 051 30102	1kΩ	5%	0,06W		
3212 ©	4822 051 30472	4,7kΩ	5%	0,06W		
3213 ©	4822 051 30102	1kΩ	5%	0,06W		
3215 ©	4822 051 30101	100Ω	5%	0,06W	for 150W only	
3215 ©	4822 117 13608	4,7Ω	5%	0,06W	for 75W only	
3216 ©	4822 051 30223	22kΩ	5%	0,06W		

RESISTORS

3217 ©	4822 117 13632	100kΩ	1%	0,06W		
3218 ©	4822 051 30472	4,7kΩ	5%	0,06W		
3221 ©	4822 051 30103	10kΩ	5%	0,06W		
3225 ©	4822 117 12903	1,8kΩ	1%	0,06W		
3227 ©	4822 051 30103	10kΩ	5%	0,06W		
3228 ©	4822 051 30103	10kΩ	5%	0,06W	for 150W only	
3228 ©	4822 051 30153	15kΩ	5%	0,06W	for 75W only	
3229 ©	4822 051 30103	10kΩ	5%	0,06W		
3231 ©	4822 051 30472	4,7kΩ	5%	0,06W		
3232 ©	4822 051 30153	15kΩ	5%	0,06W		
3236 ©	4822 117 12139	22Ω	5%	0,06W		
3237 ©	4822 051 30103	10kΩ	5%	0,06W		
3240 ©	4822 051 30103	10kΩ	5%	0,06W		
3241 ©	4822 051 30102	1kΩ	5%	0,06W		
3243 ©	2122 118 06085	0,033Ω	5%	1W	for 150W only	
3243 ©	2122 118 06235	0,047Ω	5%	1W	for 75W only	
3245 ©	4822 051 30562	5,6kΩ	5%	0,06W		
3246 ©	4822 051 30331	330Ω	5%	0,06W		
3247 ©	4822 051 30101	100Ω	5%	0,06W	for 150W only	
3247 ©	4822 117 13608	4,7Ω	5%	0,06W	for 75W only	
3248 ©	4822 051 30472	4,7kΩ	5%	0,06W		
3251	4822 116 52226	560Ω	5%	0,5W	for 75W only	
3251	4822 116 83883	470Ω	5%	0,16W	for 150W only	
3252 ©	4822 051 30152	1,5kΩ	5%	0,06W	for 75W only	
3252 ©	4822 117 11817	1,2kΩ	1%	0,06W	for 150W only	
3253 ©	4822 117 11817	1,2kΩ	1%	0,06W		
3254 ©	4822 051 30154	150kΩ	5%	0,06W		
3255 ©	4822 051 30102	1kΩ	5%	0,06W		
3256 ©	4822 051 30152	1,5kΩ	5%	0,06W		
3258 ©	4822 051 30183	18kΩ	5%	0,06W		
3259 ©	4822 051 30472	4,7kΩ	5%	0,06W		
3261 ©	4822 051 30152	1,5kΩ	5%	0,06W		
3262 ©	4822 051 30101	100Ω	5%	0,06W		
3263 ©	4822 051 30103	10kΩ	5%	0,06W		
3264 ©	4822 117 13632	100kΩ	1%	0,06W		
3265 ©	4822 051 30152	1,5kΩ	5%	0,06W	for 75W only	
3265 ©	4822 117 12903	1,8kΩ	1%	0,06W	for 150W only	
3266 ©	4822 051 30152	1,5kΩ	5%	0,06W	for 75W only	
3266 ©	4822 117 12903	1,8kΩ	1%	0,06W	for 150W only	
3267 ©	4822 051 30102	1kΩ	5%	0,06W		
3268 ©	4822 051 30472	4,7kΩ	5%	0,06W		
3269 ©	4822 051 30109	10Ω	5%	0,06W	for 150W only	
3269 ©	4822 117 12917	1Ω	5%	0,06W	for 75W only	
3302 ©	4822 117 13632	100kΩ	1%	0,06W		
3303 ©	4822 051 30103	10kΩ	5%	0,06W		
3304	4822 116 52186	22Ω	5%	0,5W		
3305 ©	4822 051 30682	6,8kΩ	5%	0,06W		
3306	2120 368 90125	47kΩ	TRIMPOT.			
3307	2120 368 90125	47kΩ	TRIMPOT.			
3311 ©	4822 051 30103	10kΩ	5%	0,06W		
3312 ©	4822 117 13632	100kΩ	1%	0,06W		
3313 ©	4822 051 30221	220Ω	5%	0,06W		
3314 ©	4822 117 12925	47kΩ	1%	0,06W		
3315	4822 050 11002	1kΩ	5%	0,2W		
3316 ©	4822 051 30273	27kΩ	5%	0,06W		
3317 ©	4822 051 30333	33kΩ	5%	0,06W		
3318 ©	4822 117 13632	100kΩ	1%	0,06W		
3319 ©	4822 051 30222	2,2kΩ	5%	0,06W		
3320 ©	4822 051 30103	10kΩ	5%	0,06W		
3321 ©	4822 051 30102	1kΩ	5%	0,06W		
3322 ©	4822 051 30103	10kΩ	5%	0,06W		
3323 ©	4822 117 12968	820Ω	5%	0,06W		
3324 ©	4822 051 30105	1MΩ	5%	0,06W		
3325 ©	4822 051 30154	150kΩ	5%	0,06W		

RESISTORS

3326 ©	4822 051 30154	150kΩ	5%	0,06W		
3327 ▲	4822 052 10339	33Ω	5%	0,33W	NFR	
3328 ©	5322 117 13056	8,2kΩ	1%	0,06W		
3329	4822 116 52256	2,2kΩ	5%	0,16W		
3330 ©	4822 051 30103	10kΩ	5%	0,06W		
3331 ©	4822 051 30103	10kΩ	5%	0,06W		
3332 ©	4822 051 30332	3,3kΩ	5%	0,06W		
3334 ©	4822 051 30102	1kΩ	5%	0,06W		
3336 ©	4822 051 30123	12kΩ	5%	0,06W		
3337 ©	4822 051 30331	330Ω	5%	0,06W		
3337 ©	4822 051 30471	470Ω	5%	0,06W	for 75W only	
3338 ©	4822 051 30102	1kΩ	5%	0,06W		
3339 ©	4822 051 30222	2,2kΩ	5%	0,06W		
3340 ©	4822 051 30331	330Ω	5%	0,06W		
3340 ©	4822 051 30471	470Ω	5%	0,06W	for 75W only	
3341 ©	4822 051 30682	6,8kΩ	5%	0,06W		
3342 ©	4822 051 30121	120Ω	5%	0,06W		
3343 ©	4822 051 30151	150Ω	5%	0,06W		
3344 ©	4822 051 30471	470Ω	5%	0,06W		
3345 ©	4822 051 30471	470Ω	5%	0,06W		
3346 ©	4822 051 30479	47Ω	5%	0,06W		
3350 ©	4822 051 30472	4,7kΩ	5%	0,06W		
3400 ©	4822 051 30273	27kΩ	5%	0,06W		
3401 ©	4822 051 30471	470Ω	5%	0,06W		
3403 ©	4822 051 30273	27kΩ	5%	0,06W		
3404 ©	4822 051 30682	6,8kΩ	5%	0,06W		
3405 ©	4822 051 30472	4,7kΩ	5%	0,06W		
3406 ▲	4822 052 10109	10Ω	5%	0,33W	NFR	
3407 ©	4822 051 30472	4,7kΩ	5%	0,06W		
3408 ©	4822 051 30682	6,8kΩ	5%	0,06W		
3411	4822 116 52283	4,7kΩ	5%	0,5W		
3412 ▲	4822 052 10568	5,6Ω	5%	0,33W	NFR	
3413 ©	4822 051 30471	470Ω	5%	0,06W		
3415 ©	4822 051 30273	27kΩ	5%	0,06W		
3422 ©	4822 051 30472	4,7kΩ	5%	0,06W		
3423 ©	4822 051 30103	10kΩ	5%	0,06W		
3424 ©	4822 051 30103	10kΩ	5%	0,06W		
3425 ©	4822 051 30339	33Ω	5%	0,06W		
3426 ©	4822 051 30339	33Ω	5%	0,06W		
3427 ©	4822 051 30103	10kΩ	5%	0,06W		
3428 ©	4822 051 30103	10kΩ	5%	0,06W		
3429 ©	4822 051 30339	33Ω	5%	0,06W		
3430 ©	4822 051 30339	33Ω	5%	0,06W		
3431 ©	4822 051 30102	1kΩ	5%	0,06W		
3432 ©	4822 051 30102	1kΩ	5%	0,06W		
3433 ©	4822 051 30102	1kΩ	5%	0,06W		
3434 ©	4822 051 30222	2,2kΩ	5%	0,06W		
3435 ©	4822 051 30271	270Ω	5%	0,06W		
3436 ©	4822 051 30472	4,7kΩ	5%	0,06W		
3437 ©	4822 051 30562	5,6kΩ	5%	0,06W		
3438 ©	4822 051 30103	10kΩ	5%	0,06W		
3439 ©	4822 051 30103	10kΩ	5%	0,06W		
3440	4822 116 80176	1Ω	5%	0,5W		
3500 ©	4822 051 30152	1,5kΩ	5%	0,06W		
3501 ©	4822 051 30472	4,7kΩ	5%	0,06W		
3501 ©	4822 117 12917	1Ω	5%	0,06W		
3502 ©	4822 051 30472	4,7kΩ	5%	0,06W		
3502 ©	4822 117 12917	1Ω	5%	0,06W		
3504 ©	4822 051 30103	10kΩ	5%	0,06W		
3506 ©	4822 051 30471	470Ω	5%	0,06W		
3507 ©	4822 051 30562	5,6kΩ	5%	0,06W	for 75W only	
3507 ©	5322 117 13056	8,2kΩ	1%	0,06W		
3508 ©	4822 051 30222	2,2kΩ	5%	0,06W		

ELECTRICAL PARTSLIST *POWER 2003 75&150W Class-D* ***COMBI BOARD***

RESISTORS

3509 ©	4822 051 30222	2,2kΩ	5%	0,06W		
3510 ©	4822 051 30682	6,8kΩ	5%	0,06W	for 150W and 75W SA	
3510 ©	4822 051 30223	22kΩ	5%	0,06W	for 75W TAPE only	
3511 ©	4822 051 30682	6,8kΩ	5%	0,06W	for 150W and 75W SA	
3511 ©	4822 051 30223	22kΩ	5%	0,06W	for 75W TAPE only	
3514 ©	4822 051 30153	15kΩ	5%	0,06W		
3518 ©	4822 051 30152	1,5kΩ	5%	0,06W		
3519 ©	4822 051 30103	10kΩ	5%	0,06W		
3520 ©	4822 051 30153	15kΩ	5%	0,06W		
3522 ©	4822 051 30152	1,5kΩ	5%	0,06W		
3523 ©	4822 051 30152	1,5kΩ	5%	0,06W		
3524 ©	4822 117 11817	1,2kΩ	1%	0,06W		
3525 ©	4822 051 30102	1kΩ	5%	0,06W		
3525 ©	4822 051 30273	27kΩ	5%	0,06W		
3526 ©	4822 051 30334	330kΩ	5%	0,06W		
3527 ©	4822 051 30102	1kΩ	5%	0,06W		
3527 ©	4822 051 30273	27kΩ	5%	0,06W		
3529 ©	482 2 051 30154	150kΩ	5%	0,06W		
3531 ©	4822 051 30154	150kΩ	5%	0,06W		
3532 ©	4822 117 12864	82kΩ	5%	0,06W		
3533 ©	4822 051 30562	5,6kΩ	5%	0,06W		
3534 ▲	4822 052 10109	10Ω	5%	0,33W		NFR
3535 ©	4822 051 30562	5,6kΩ	5%	0,06W		
3536 ©	4822 051 30223	22kΩ	5%	0,06W	for 150W and 75W SA	
3536 ©	4822 051 30102	1kΩ	5%	0,06W	for 75W TAPE only	
3539 ©	4822 051 30153	15kΩ	5%	0,06W		
3542 ©	4822 051 30123	12kΩ	5%	0,06W		
3543 ©	5322 117 13056	8,2kΩ	1%	0,06W		
3544 ©	4822 051 30562	5,6kΩ	5%	0,06W		
3545 ©	4822 051 30393	39kΩ	5%	0,06W		
3549 ©	4822 051 30101	100Ω	5%	0,06W		
3550 ©	4822 051 30393	39kΩ	5%	0,06W		
3551 ©	4822 051 30101	100Ω	5%	0,06W		
3552 ©	4822 051 30101	100Ω	5%	0,06W		
3553 ©	4822 051 30101	100Ω	5%	0,06W		
3554 ©	4822 051 30101	100Ω	5%	0,06W		
3555 ©	4822 051 30562	5,6kΩ	5%	0,06W		
3556 ©	4822 051 30153	15kΩ	5%	0,06W		
3557 ©	4822 051 30101	100Ω	5%	0,06W		
3558 ©	4822 117 12903	1,8kΩ	1%	0,06W		
3559 ©	4822 117 12903	1,8kΩ	1%	0,06W		
3560 ©	4822 051 30101	100Ω	5%	0,06W		
3561 ©	4822 051 30102	1kΩ	5%	0,06W		
3562 ©	4822 051 30102	1kΩ	5%	0,06W		
3563 ©	4822 051 30101	100Ω	5%	0,06W		
3564 ©	4822 051 30101	100Ω	5%	0,06W		
3566 ©	4822 051 30101	100Ω	5%	0,06W		
3567 ©	4822 051 30101	100Ω	5%	0,06W		
3568 ©	4822 051 30101	100Ω	5%	0,06W		
3569 ©	4822 051 30102	1kΩ	5%	0,06W		
3570 ©	4822 117 13632	100kΩ	1%	0,06W		
3571 ©	4822 051 30223	22kΩ	5%	0,06W	for 150W and 75W SA	
3571 ©	4822 051 30102	1kΩ	5%	0,06W	for 75W TAPE only	
3572	4822 116 83883	470Ω	5%	0,16W		
3573	4822 116 83883	470Ω	5%	0,16W		
3574 ©	4822 051 30101	100Ω	5%	0,06W		
3575 ©	4822 051 30562	5,6kΩ	5%	0,06W		
3576 ©	4822 051 30123	12kΩ	5%	0,06W		
3577 ©	4822 051 30153	15kΩ	5%	0,06W		
3578 ©	5322 117 13056	8,2kΩ	1%	0,06W		
3579 ©	4822 051 30562	5,6kΩ	5%	0,06W		
3580 ©	4822 051 30101	100Ω	5%	0,06W		
3581 ©	4822 051 30101	100Ω	5%	0,06W		

RESISTORS

3591 ©	4822 051 30102	1kΩ	5%	0,06W	for 75W only	
3591 ©	4822 051 30332	3,3kΩ	5%	0,06W	for 150W only	
4211 ©	4822 051 20008	CHIP JUMPER 0805				
4212 ©	4822 051 20008	CHIP JUMPER 0805				
4213 ©	4822 051 30008	CHIP JUMPER 0603				
4214 ©	4822 051 20008	CHIP JUMPER 0805				
4216 ©	4822 051 30008	CHIP JUMPER 0603				
4217 ©	4822 051 30008	CHIP JUMPER 0603				
4223 ©	4822 051 30008	CHIP JUMPER 0603				
4226 ©	4822 051 30008	CHIP JUMPER 0603				
4230 ©	4822 051 30008	CHIP JUMPER 0603				
4232 ©	4822 051 20008	CHIP JUMPER 0805				
4233 ©	4822 051 30008	CHIP JUMPER 0603				
4235 ©	4822 051 30008	CHIP JUMPER 0603				
4240 ©	4822 051 20008	CHIP JUMPER 0805				
4241 ©	4822 051 20008	CHIP JUMPER 0805				
4245 ©	4822 051 30008	CHIP JUMPER 0603				
4253 ©	4822 051 30008	CHIP JUMPER 0603				
4260 ©	4822 051 20008	CHIP JUMPER 0805				
4265 ©	4822 051 30008	CHIP JUMPER 0603				
4272 ©	4822 051 30008	CHIP JUMPER 0603				
4273 ©	4822 051 30008	CHIP JUMPER 0603				
4274 ©	4822 051 30008	CHIP JUMPER 0603				
4276 ©	4822 051 30008	CHIP JUMPER 0603				
4277 ©	4822 051 30008	CHIP JUMPER 0603				
4279 ©	4822 051 30008	CHIP JUMPER 0603				
4280 ©	4822 051 20008	CHIP JUMPER 0805				
4281 ©	4822 051 30008	CHIP JUMPER 0603				
4282 ©	4822 051 20008	CHIP JUMPER 0805				
4283 ©	4822 051 30008	CHIP JUMPER 0603				
4286 ©	4822 051 30008	CHIP JUMPER 0603				
4287 ©	4822 051 30008	CHIP JUMPER 0603				
4289 ©	4822 051 30008	CHIP JUMPER 0603				
4290 ©	4822 051 30008	CHIP JUMPER 0603				
4301 ©	4822 051 30008	CHIP JUMPER 0603				

COILS

5100	4822 157 11411	FERRITE BEAD	
5101	2422 536 00612	30µH	for 75W only
5102	2422 549 44944	Mains Filter 330µH 3A	
5103	4822 157 11411	FERRITE BEAD	
5105	2422 536 00686	20µH	for 150W only
5200	4822 157 11411	FERRITE BEAD	
5201	2422 536 00612	30µH	for 75W only
5202	2422 549 44944	Mains Filter 330µH 3A	
5203	4822 157 11411	FERRITE BEAD	
5204	2422 536 00686	20µH	for 150W only
5300	2422 540 98542	Resonator 500kHz	
5302	2422 540 98561	Resonator 425kHz	
5303	4822 157 11411	FERRITE BEAD	

DIODES

6104 ©	4822 130 11397	BAS316	
6106 ©	4822 130 11416	PDZ6.8B	
6108 ©	4822 130 11416	PDZ6.8B	
6109 ©	4822 130 11397	BAS316	
6110 ©	4822 130 10328	BAV99W	
6111 ©	4822 130 11397	BAS316	
6113 ©	4822 130 10328	BAV99W	
6114 ©	4822 130 10328	BAV99W	
6202 ©	4822 130 11397	BAS316	
6205 ©	4822 130 10328	BAV99W	
6206 ©	4822 130 10328	BAV99W	
6208 ©	4822 130 10328	BAV99W	

11-18

ELECTRICAL PARTSLIST *POWER 2003 75&150W Class-D* ***COMBI BOARD***

DIODES

6210 ©	4822 130 10328	BAV99W	
6211 ©	4822 130 10328	BAV99W	
6212 ©	4822 130 11416	PDZ6.8B	
6213 ©	4822 130 11416	PDZ6.8B	
6214 ©	4822 130 11397	BAS316	
6216	4822 130 30621	1N4148	
6217 ©	4822 130 11397	BAS316	
6300 ©	4822 130 10838	UDZ3.3B	
6401	4822 130 30621	1N4148	
6403 ©	4822 130 10838	UDZ3.3B	
6404 ©	4822 130 11397	BAS316	
6500	4822 130 61219	BZX79-C10	
6501 ©	9322 102 64685	UDZ-2,7B	
6502 ©	4822 130 11397	BAS316	
6503 ©	4822 130 11397	BAS316	
6504 ©	4822 130 11397	BAS316	
6505 ©	4822 130 11397	BAS316	
6506 ©	9322 150 18685	BZX384-C47	
6507 ©	9322 150 18685	BZX384-C47	
6508 ©	3198 020 55680	BZX384-C5V6	

TRANSISTORS

7104 ©	4822 130 60373	BC856B	
7109 ▲	9322 173 29687	STP14NF12FP, FET POWER	for 75W only
7109 ▲	9340 578 15127	PHX18NQ11T, FET POWER	for 150W only
7110 ©	3198 010 42310	BC847BW	
7111 ©	3198 010 44350	BC807-25W	
7112 ©	3198 010 42320	BC857BW	
7113 ©	3198 010 44350	BC807-25W	
7114 ©	9340 219 30115	BC817-25W	
7115 ©	9340 219 30115	BC817-25W	
7117 © ▲	9337 760 90215	PMBTA42	
7119 © ▲	9337 760 90215	PMBTA42	
7121 ▲	9322 173 29687	STP14NF12FP, FET POWER	for 75W only
7121 ▲	9340 578 15127	PHX18NQ11T, FET POWER	for 150W only
7128 ©	4822 130 60373	BC856B	
7129 ©	4822 130 60373	BC856B	
7130 ©	3198 010 42310	BC847BW	
7131 ©	5322 130 60159	BC846B	
7132 ©	9340 219 30115	BC817-25W	for 150W only
7133 ©	9340 219 30115	BC817-25W	for 150W only
7203 ©	3198 010 42310	BC847BW	
7208 ©	4822 130 60373	BC856B	
7210 ©	3198 010 44350	BC807-25W	
7211 ©	3198 010 42320	BC857BW	
7218 ▲	9322 173 29687	STP14NF12FP, FET POWER	for 75W only
7218 ▲	9340 578 15127	PHX18NQ11T, FET POWER	for 150W only
7221 ©	3198 010 44350	BC807-25W	
7222 ©	9340 219 30115	BC817-25W	
7223 ©	9340 219 30115	BC817-25W	
7227 © ▲	9337 760 90215	PMBTA42	
7228 © ▲	9337 760 90215	PMBTA42	
7231 ▲	9322 173 29687	STP14NF12FP, FET POWER	for 75W only
7231 ▲	9340 578 15127	PHX18NQ11T, FET POWER	for 150W only
7238 ©	5322 130 60159	BC846B	
7239 ©	4822 130 60373	BC856B	
7240 ©	4822 130 60373	BC856B	
7243 ©	9340 219 30115	BC817-25W	
7244 ©	9340 219 30115	BC817-25W	for 150W only
7245 ©	9340 219 30115	BC817-25W	for 150W only
7309 ©	3198 010 42310	BC847BW	
7316 ©	3198 010 42320	BC857BW	
7317 ©	3198 010 42310	BC847BW	
7319 ©	3198 010 42310	BC847BW	

TRANSISTORS

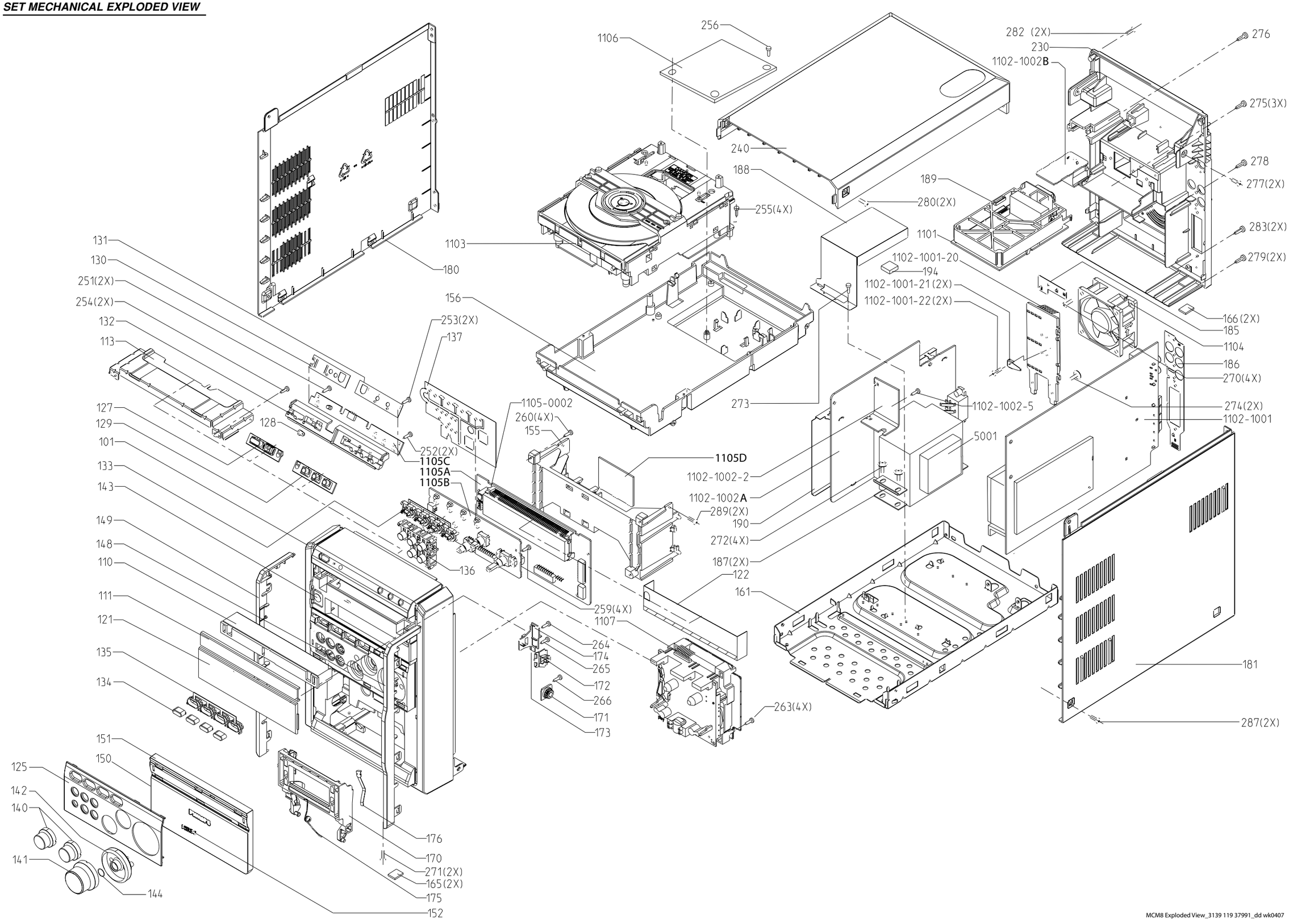
7323 ©	9340 219 30115	BC817-25W	
7324 ©	9340 219 30115	BC817-25W	
7402	4822 130 40855	BC337-40	
7405 ©	3198 010 42320	BC857BW	
7407 ©	9340 219 30115	BC817-25W	
7408 ©	9340 219 30115	BC817-25W	
7409 ©	9340 219 30115	BC817-25W	
7410 ©	3198 010 42320	BC857BW	
7411 ©	3198 010 44350	BC807-25W	
7505 ©	3198 010 42310	BC847BW	
7506 ©	3198 010 42320	BC857BW	
7509 ©	3198 010 42310	BC847BW	

INTEGRATED CIRCUITS

7105 ©	9350 694 90118	74LV14D	
7118 ©	9350 694 90118	74LV14D	
7122 ©	5322 209 11517	PC74HCU04T, HEX INVERTER IC	
7209 ©	9350 694 90118	74LV14D	
7232 ©	5322 209 11517	PC74HCU04T, HEX INVERTER IC	
7235 ©	9350 694 90118	74LV14D	
7311	4822 209 14933	TL431IZ, PROGRAMMABLE VOLT.REF	
7312 ©	5322 209 11517	PC74HCU04T, HEX INVERTER IC	
7315	4822 209 81351	LM317MPTB	
7320 ©	4822 209 83357	NJM4560M	
7321	4822 209 81351	LM317MPTB	
7400 ©	4822 209 31378	NJM4556M, 2-FOLD OP-AMP.	
7406 ©	4822 209 17345	M62320FP, I2C SHIFT REGISTER	
7508 ©	9322 150 74668	TDA7468D, SOURCE SEL. & SOUND	

12-1

SET MECHANICAL EXPLODED VIEW



MCM8 Exploded View_3139 119 37991_dd wk0407

MECHANICAL & ACCESSORIES PARTS LIST - MAIN UNIT

0101	3139 254 00601	Cabinet Front /21	
0101	3139 254 00401	Cabinet Front /22/25	
(1) 0110	3139 254 00441	Cover CD Technical UL Loader	
(1) 0111	3139 111 62041	Cover CD Alu Plated	
0121	3139 254 00811	Window Display /21	
0121	3139 254 00661	Window Display /22/25	
(4) 0125	3139 111 62031	Panel Control Alu Plated	
0127	3139 254 00091	Button Set Power Chrome	
(4) 0128	3139 114 79981	Lightguide Power Standby	
0129	3139 254 00631	Button Set RDS/News	
0132	3139 114 79921	Bracket Button RDS	
(4) 0133	3139 254 00071	Button Set Source	
(4) 0134	3139 114 79911	Cap Source Chrome	
(4) 0135	3139 114 79971	Lightguide Source	
(4) 0136	3139 254 00611	Button Set Function	
0140	3139 254 00051	Knob Bass/Treble Chrome	
0141	3139 254 00061	Knob Volume Chrome	
(4) 0142	3139 254 00001	Lightguide Volume	
(4) 0143	3139 114 79991	Lightguide IR	
0144	4822 492 51374	Ring	
(4) 0148	3139 254 00041	Frame Right	
(4) 0149	3139 254 00031	Frame Left	
(2) 0150	3139 254 00411	Cover Cassette	
(2) 0151	3139 111 62021	Panel Cassette Alu Plated	
(2) 0152	4822 459 10887	Badge Philips Assy	
0155	3139 114 79941	Bracket Combi	
0156	3139 114 79901	Bracket Module Mounting	
(4) 0165	3139 113 27140	Foot Rubber 4mm	
0166	3139 113 27140	Foot Rubber 4mm	
(4) 0170	3139 114 73930	Door Cassette ETF SD Left	
(4) 0171	4822 529 10322	Damper Assembly	
(4) 0172	3139 114 68640	Push Catch Left	
(4) 0173	4822 492 11344	Spring Compression	
(4) 0174	4822 402 11245	Bracket Left	
(4) 0175	3139 111 01390	Spring Torsion Left	
(4) 0176	4822 492 42787	Spring Cassette	
0180	3139 114 76040	Panel Left	
0181	3139 114 76050	Panel Right	
0230	3139 254 00211	Panel Rear	
0240	3139 254 00581	Cover Top	

0326	3139 119 02411	L/R Loudspeaker Box
0331	2422 076 00546	Cable FM Aerial
0331	4822 320 11094	300 ohm FM Antenna /37
0332	2422 549 45067	Antenna AM Loop
0333	3139 238 06511	Remote Control
0336	2422 070 98151	⚠ Mains Cord /21/22
0336	9965 000 07586	⚠ Mains Cord /25
0336	2422 070 98248	⚠ Mains Cord /30
0336	2422 070 98246	⚠ Mains Cord /37
0337	3139 128 73010	⚠ Mains Plug Adapter /21
1104	2822 031 01494	Fan 12VDC 0.8W 3100RPM
1106	3103 308 67611	PBAS 8 MP3CD03 TXT 5V
5001	3103 308 30890	⚠ Mains Transformer /21
5001	3103 308 30880	⚠ Mains Transformer /22/25/30
5001	3103 308 30870	⚠ Mains Transformer /37
8001	3139 110 35900	FFC Foil 07P/220/07P AD
8003	3139 111 03871	FFC Foil 15P/280/15P BD Fold
8004	3103 308 93622	CWAS FFC 98 19P BD
8005	3139 110 35240	FFC Foil 08P/280/08P AD Fold
8006	3139 110 35080	FFC Foil 09P/180/09P AD
8007	3139 111 03881	FFC Foil 19P/180/19P AD Fold
8009	3139 110 34840	FFC Foil 08P/100/08P AD
8010	3140 110 20881	FFC Foil 15P/120/15P AD
8011	3139 110 34780	FFC Foil 04P/280/04P BD
8012	3139 110 34480	FFC Foil 07P/140/07P AD
8013	4822 320 12752	FFC Foil 07P/180/07P AD

(1) P001	3141 079 00311	Cover CD Tray Pre-assy
(2) P002	3141 079 00291	Cover Cassette Pre-assy
(4) P004	3141 079 00361	Cab Front Pre-assy /22/25
(4) P004	3141 079 00371	Cab Front Pre-assy /21/30
(4) P004	3141 079 02271	Cab Front Pre-assy /37

Note : Only these parts mentioned in the list are normal service parts.

12-2

SCREW LISTS - MAIN UNIT

251	D2 x 8
252	D2 x 8
253	D2 x 8
254	D3 x 8
255	D3 x 20
256	D3 x 8
259	M3 x 12
260	D3 x 10
263	D3 x 12
264	D3 x 12
265	M3 x 12
266	M3 x 12
270	D3 x 35
271	M3 x 6
272	M3 x 10
273	M3 x 6
274	M3 x 10
275	D3 x 10
276	D3 x 10
277	D3 x 10
278	D3 x 10
279	M3 x 10
280	M3 x 10
282	D3 x 12
283	D3 x 10
287	M3 x 10
289	D3 x 10

Left/Right Loudspeaker Box Breakdown

9965 000 23634	Cloth Frame Assembly
9965 000 23635	Catch (Grommet Light Grey)

REVISION LIST

Version 1.0 (3139 785 30620)

* Initial Release MCM8/21/22

Version 1.1 (3139 785 30621)

* Introduction of MCM8/25
* Page 6-7 : Front Board - Display part Variant Table adapted
* Page 6-14 to 6-15 : Front Board - Electrical parts list adapted
* Page 12-2 : Mechanical & Accessories parts list adapted
* Chapter 11 : Power 2003 Module (75-150W Class D) - Update 1
  - Missing safety signs added (Refer to schematic diagrams 1, 3 and partslist)

Version 1.2 (3139 785 30622)

* Introduction of MCM8/30 & MCM8/37
* Page 12-2 : Mechanical & Accessories parts list adapted