DVD-Video Recorder

DVD+RW Basic Engine

VAD8031

Service
Service
Service

Service Manual

CLASS 1
LASER PRODUCT

DVD+ReWritable

DIGITAL VIDEO

DIGITAL AUDIO

Contents **Page**

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PHILIPS

1. Technical Specifications and Connection Facilities

1.1 VAD8031 functionality:

- Loading of 8 cm and 12 cm discs by a motorized tray
- Disc type recognition and in case of a DVD+RW disc laser power calibration
- Servo control for disc rotation, sledge movements, tilt, focus and actuator position
- EFM+ encoding / decoding for DVD, and EFM decoding for CD
- Writes and read DVD+RW discs and reads DVD, CD and CD-R/RW discs
- Linking control, header insertion and sector number updating at record
- Interfacing to the MPEG back-end for control and for data
- The back-end has to provide MPEG data processing, data buffering, construction of logical format for Lead-in, Data area and Lead-out part of the DVD+RW disc

1.2 Connections

The following interfaces are provided for connecting the drive to the MPEG back-end Application:

- Power Connector: 4-pin supply interface
- IDE Connector: 40-pin command and data transfer interface

IDE Bus selection:

- Jumper Selection: 6-pin IDE Bus selector

Attention: Jumper has to be in position "Master"

1.3 Read and Write Speeds

Type of Disc (Function)	Disc Rotation Speed
Read Speed CD	CAV 7x
Read Speed DVD	CAV 4x
Write Speed DVD+RW	ZCAV 2.4x
Write Speed DVD+R	ZCAV 2.4x

2. Safety Instructions, Warnings and Notes

2.1 Safety Instructions

2.1.1 General Safety

Safety regulations require that during a repair:
- Connect the unit to the mains via an isolation transformer.
- Replace safety components, indicated by the symbol ⚠, only by components identical to the original ones. Any other component substitution (other than original type) may increase risk of fire or electrical shock hazard.

Safety regulations require that after a repair, you must return the unit in its original condition. Pay, in particular, attention to the following points:
- Route the wires/cables correctly, and fix them with the mounted cable clamps.
- Check the insulation of the mains lead for external damage.
- Check the electrical DC resistance between the mains plug and the secondary side:
  1. Unplug the mains cord, and connect a wire between the two pins of the mains plug.
  2. Set the mains switch to the 'on' position (keep the mains cord unplugged!).
  3. Measure the resistance value between the mains plug and the front panel, controls, and chassis bottom.
  4. Repair or correct unit when the resistance measurement is less than 1 MΩ.
  5. Verify this, before you return the unit to the customer/ user (ref. UL-standard no. 1492).
  6. Switch the unit 'off', and remove the wire between the two pins of the mains plug.

2.1.2 Laser Safety

This unit employs a laser. Only qualified service personnel may remove the cover, or attempt to service this device (due to possible eye injury).

Laser Device Unit

Type	:	Semiconductor laser GaAlAs
Wavelength	:	650 nm (DVD)
	:	780 nm (VCD/CD)
Output Power	:	20 mW (DVD+RW writing)
	:	0.8 mW (DVD reading)
	:	0.3 mW (VCD/CD reading)
Beam divergence	:	60 degree

Figure 2-1 Class 1 Laser Product

Note: Use of controls or adjustments or performance of procedure other than those specified herein, may result in hazardous radiation exposure. Avoid direct exposure to beam.

2.2 Warnings

2.2.1 General

- All ICs and many other semiconductors are susceptible to electrostatic discharges (ESD, symbol ⚠). Careless handling during repair can reduce life drastically. Make sure that, during repair, you are at the same potential as the mass of the set by a wristband with resistance. Keep components and tools at this same potential. Available ESD protection equipment:
  – Complete kit ESD3 (small tablemat, wristband, connection box, extension cable and earth cable) 4822 310 10671.
  – Wristband tester 4822 344 13999.
- Be careful during measurements in the live voltage section. The primary side of the power supply (pos. 1005), including the heatsink, carries live mains voltage when you connect the player to the mains (even when the player is 'off'!). It is possible to touch copper tracks and/or components in this unshielded primary area, when you service the player. Service personnel must take precautions to prevent touching this area or components in this area. A 'lightning stroke' and a stripe-marked printing on the printed wiring board, indicate the primary side of the power supply.
- Never replace modules, or components, while the unit is 'on'.

2.2.2 Laser

- The use of optical instruments with this product, will increase eye hazard.
- Only qualified service personnel may remove the cover or attempt to service this device, due to possible eye injury.
- Repair handling should take place as much as possible with a disc loaded inside the player.
- Text below is placed inside the unit, on the laser cover shield:

CAUTION VISIBLE AND INVISIBLE LASER RADIATION WHEN OPEN AVOID EXPOSURE TO BEAM
ADVARSEL SYNLIG OG USYNLIG LASERSTRÅLING VED ÅBNING UNDGÅ UDSÆTTELSE FOR STRÅLING
ADVARSEL SYNLIG OG USYNLIG LASERSTRÅLING NÅR DEKSEL ÅPNES UNNGÅ EKSPONERING FOR STRÅLEN
VARNING SYNLIG OCH OSYNLIG LASERSTRÅLNING NÄR DENNA DEL ÄR ÖPPNAD BETRAKTA EJ STRÅLEN
VARO! AVATT AESSA OLET ALTTIINA NÄKYMÄTTÖMÄLLE LASER SÄTEILYLLE. ÄLÄ KATSO SÄTEESEEN
VORSICHT SICHTBARE UND UNSICHTBARE LASERSTRAHLUNG WENN ABDECKUNG GEÖFFNET NICHT DEM STRAHL AUSSETSEN
DANGER VISIBLE AND INVISIBLE LASER RADIATION WHEN OPEN AVOID DIRECT EXPOSURE TO BEAM
ATTENTION RAYONNEMENT LASER VISIBLE ET INVISIBLE EN CAS D'OUVERTURE EXPOSITION DANGEREUSE AU FAISCEAU

Figure 2-2 Warning text

3. Directions For Use

Not applicable

4. Mechanical Instructions

Note that exploded views can be found in chapter 10

4.1 General

Follow the dismantling instructions in described order.
Do not place the unit with its PWB on a hard surface (e.g. table), as it could damage the components on it.
Always place something soft (a towel or foam cushion) under it.
Never touch the lens of the OPU.
Take sufficient ESD measures during handling.

4.2 Dismantling

You can divide the Basic Engine into the following parts:
1. Loader (frame and tray, clamp)
2. PWB (or 'mono board')
3. DVD-Module (OPU, turntable motor, and sledge-motor assy)
4. Encasing

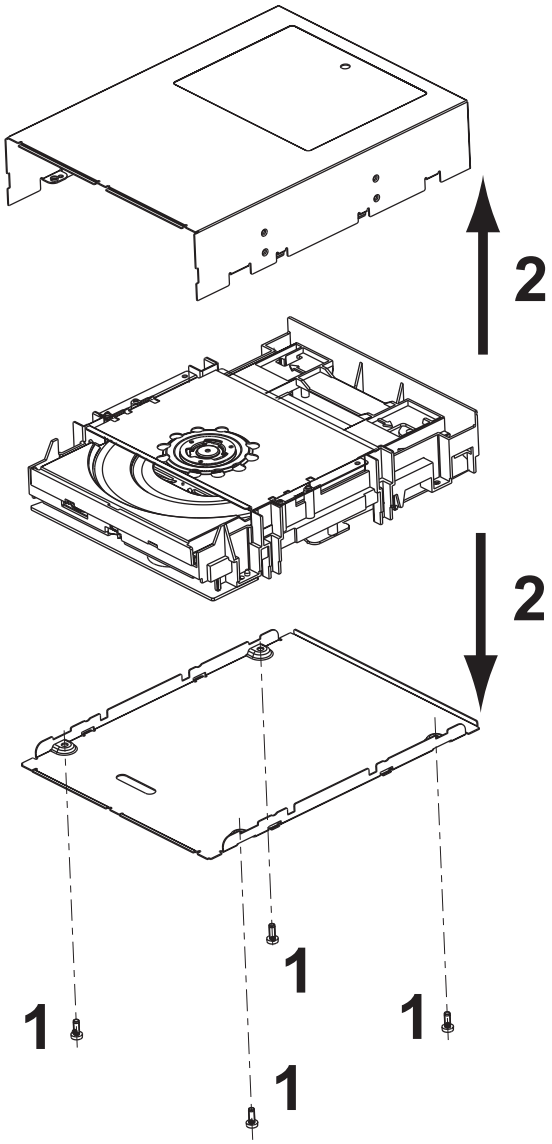


Figure 4-1 Basic Engine dismantling (part1)

4.3 Cabinet and Clamper Bridge

- Remove the encasing by releasing the four screws [1], see figure 4-1
- Make sure that you do not lose the 5 heat paths (gray rubber pieces that conduct the heat from the ICs to the case)!
- Remove the clamper bridge assy, by releasing the two screws [1], see figure 4-2

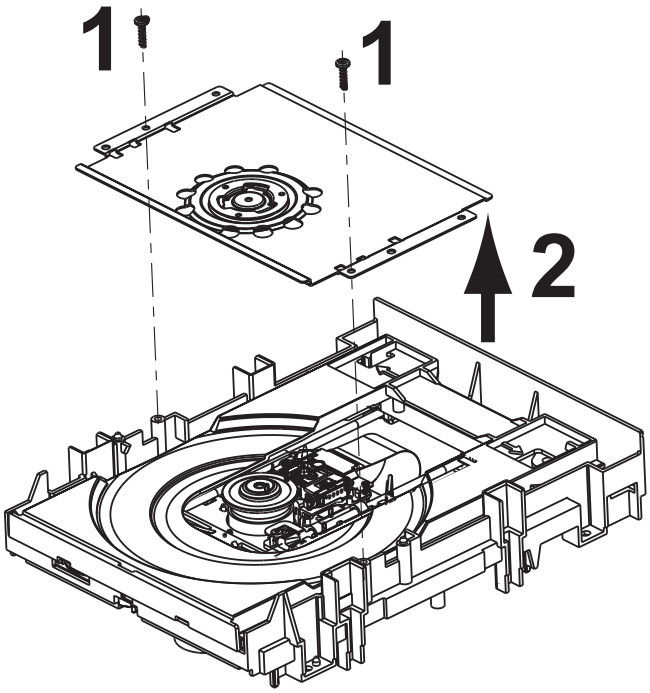


Figure 4-2 Remove Clamper Bridge

4.4 Tray

– Remove encasing as as described in 4.3
– Disengage the two holders that fix the tray [1], see figure 4-3, and pull out the tray [2]

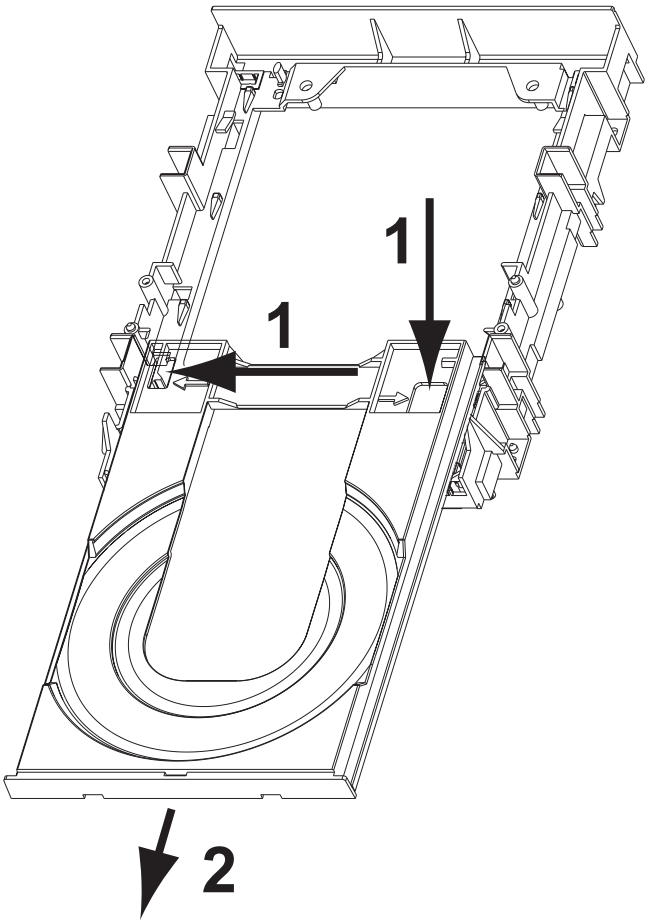


Figure 4-3 Remove Tray

4.5 Printed Board

Note: After Exchanging the PWB (or the DVD-M) the complete drive has to be adjusted! Refer to chapter 8 for adjustment instructions!

– Remove encasing and clamper bridge as described in 4.3
– Disconnect the four flex foils from the PWB connectors
– Remove the 2 screws that hold the PWB, see figure 4-4
– At assembly make sure that the 5 heat paths (gray rubber pieces) are placed on the ICs!

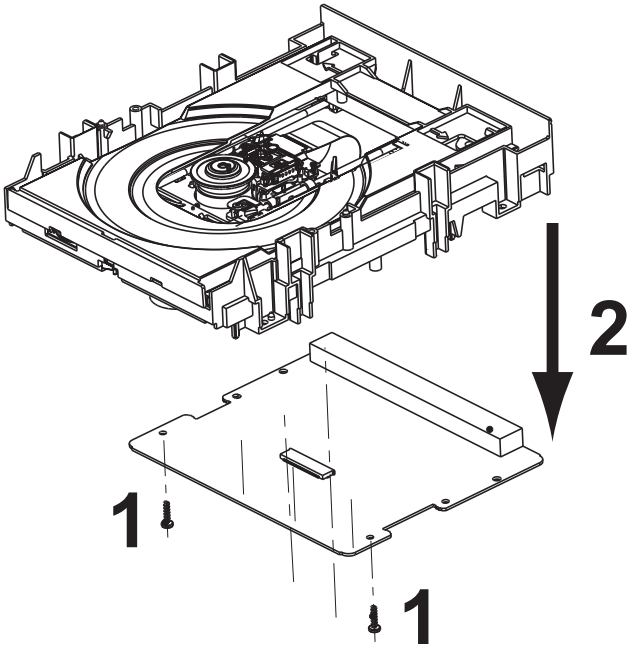


Figure 4-4 Remove PWB

4.6 DVD-M

Caution: Never try to align or repair the DVD-Module itself! Only the factory can do this properly. Service engineers are only allowed to exchange the sledge motor assy.
After Exchanging the DVD-M (or the PWB) the complete drive has to be adjusted! Refer to chapter 8 for adjustment instructions!

– Remove encasing, clamper bridge and PWB as described in 4-3 and 4-5
– Remove the four screws [1], see figure 4-5.
– Now you can remove the DVDM

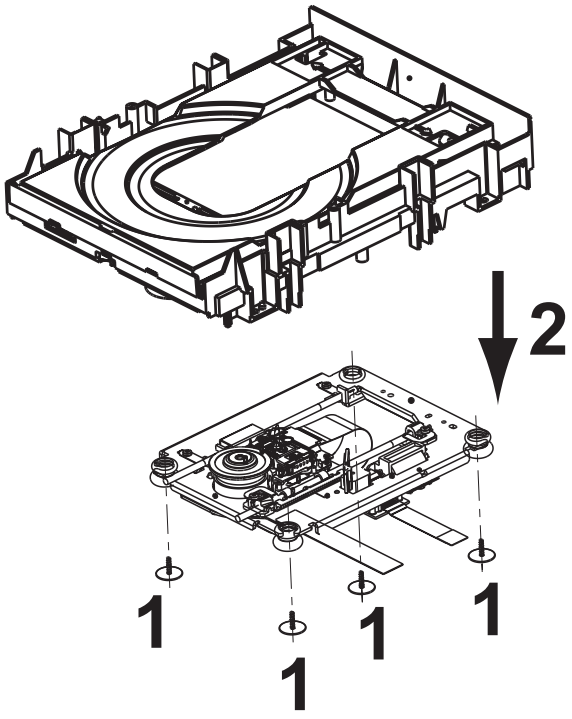


Figure 4-5 Remove DVDM

4.7 Sledge Motor Assembly

Caution: Never try to align or repair the DVD-Module itself! Only the factory can do this properly. Service engineers are only allowed to exchange the sledge motor assy.

– Place the DVD-Module, with the laser facing downwards on a soft surface.
– Remove the three screws that hold the sledge-motor assy and lift the assy upwards. You can replace it now.

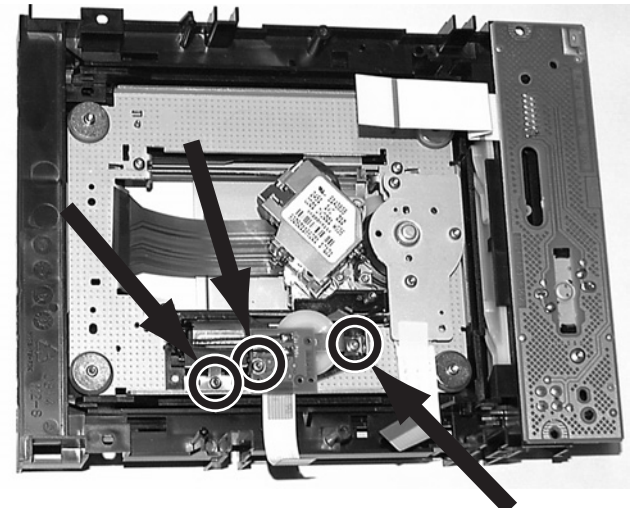


Figure 4-6 Remove Sledge Motor Assy

4.8 Re-assembly

To re-assemble the module, do all processes in reverse order. Take care of the following:

- **Sledge-motor assy:** Mesh the teeth of the sledge motor and sledge rack properly, during mounting of the sledge motor assy.
- **Heat Paths:** Put the 5 heat paths (gray rubber pieces) back to their position on the ICs, see figure 4-7.
- **Complete module:** Place all wires/cables in their original positions
- **Emergency opening slot:** Be sure that the slot for the emergency tray opener is covered by adhesive tape!
- **Jumper selection:** Jumper has to be in position "Master"!

Figure 4-7 Heat Paths

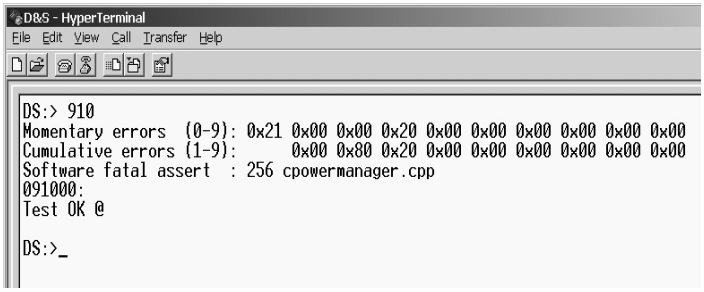
5. Diagnostic Software

5.1 General

Please refer to the service manual of the recorder for a description of the complete Diagnostics Software. In this manual only drive specific error codes are explained.

5.2 Error Codes

With DSW command 910 (Digital Board Chrysalis) the set software can retrieve an overview of all occurred engine errors.



5.2.1 Momentary Errors

Byte 0: latest error:

Overview of the BE error codes.

error code	error	meaning
0x00	no_error	No error has occurred
0x01	illegal_command_error	Command not allowed in this state or unknown command
0x02	illegal_parameter_error	Parameter(s) not valid for this command
0x03	command_timeout_error	The maximum execution time for the command has exceeded
0x04	sledge_home_error	The sledge could not be moved home
0x05	sledge_calibration_error	An error occurred during calibration of the sledge
0x06	sledge_unstable_error	The sledge detected unstable control
0x07	speed_timeout_error	Spindle motor could not reach its target speed within timeout
0x08	speed_window_error	Measured spinning speed is not within expected window
0x09	focus_timeout_error	Focus could not be achieved within the timeout
0x0A	focus_retries_error	The amount of focus retries expired
0x0B	focus_agc_error	The focus agc results are out of range
0x0C	radial_timeout_error	Servo didn't get on track within the timeout
0x0D	radial_retries_error	Servo didn't get on track after several retries
0x0E	radial_agc_error	The radial agc results are out of range
0x0F	radial_init_error	Unreliable signal scaling after the radial initialisation
0x10	hf_pll_error	HF-decoder pll could not lock to HF signal
0x11	wobble_pll_error	Wobble pll could not lock to wobble signal
0x12	subcode_timeout_error	Subcode information could not be read
0x13	subcode_notfound_error	Requested subcode item could not be found
0x14	header_timeout_error	Header information could not be read
0x15	adip_timeout_error	Adip information could not be read
0x16	adip_window_error	Adip address was not within expected window
0x17	adip_sync_error	No adip sync was detected
0x18	atip_timeout_error	Atip information could not be read
0x19	atip_notfound_error	Requested atip item could not be found
0x1A	atip_window_error	Atip address was not within expected window
0x1B	atip_sync_error	No atip sync was detected
0x1C	tray_error	Tray could not be closed or opened within the timeout
0x1D	seek_error	The requested seek couldn't be performed within the time-out
0x1E	no_hf_present_error	Attempt to read from a blank area
0x1F	record_error	An error occurred during the recording
0x20	illegal_stopaddress_error	The requested stopaddress with modify-stop-address is not valid
0x21	no_disc_error	No disc is detected
0x22	not_initialised_error	The system is not initialised (e.g. seek on unknown disc-type)
0x23	illegal_medium_error	BE detected an unsupported medium during disc recognition
0x24	cd_frequency_error	Measured HF frequency is not within CD frequency range
0x25	dvd_frequency_error	Measured HF frequency is not within DVD frequency range
0x26	reserved(non_existing_bca_error)	Attempt to read non-existing bca information
0x27	reserved(bca_read_error)	An error occurred during reading of bca information
0x28	selftest_error	An error occurred during the self-test of the BE
0x29	i2c_error	The I2C interface does not operate
0x2A	laser_pll_error	Laser control pll did not lock or lost lock on write clock
0x2B	laser_forward_sense_error	Forward sense value didn't change with changing laser power
0x2C	jitter_optimisation_error	An error occurred during optimisation of the jitter
0x2D	tilt_calibration_error	An error occurred during calibration of the tilt frame
0x2E	reserved	

0x2F	frontend_offset_calib_error	The offset in the frontend couldn't be calibrated
0x30	reserved	
0x31	wsg_calculation_error	An error occurred in the calculation of the write strategy
0x32	buffer_overrun_error	The buffer input stream overran the buffer output stream
0x33	return_value_invalid_error	The requested information is not available for this inquiry
0x34	illegal_recording_speed_error	The selected speed is not allowed for a recording on this medium
0x35	opc_media_parameter_error	The media parameters (info in ATIP/ADIP) are invalid or not read
0x36	opc_record_power_error	The final optimum power was not reached
0x37	opc_start_power_low_error	OPC start power too low (optimum power is higher)
0x38	opc_start_power_high_error	OPC start power too high (optimum power is lower)
0x39	opc_power_calculation_error	Error during OPC power calculation (samples are wrong)
0x3A	opc_test_zone_full_error	OPC can't be performed because test zone is full
0x3B	opc_bad_jitter_measurement_error	The jitter measurement during OPC samples readback failed
0x3C	opc_read_samples_error	An error occurred during OPC readback sampling
0x3D	ropc_alpha_overflow_error	The determined value for the optimum power is too high
0x3E	ropc_alpha_ref_current_error	The alpha measurement reference current is wrong (IAN)
0x3F	ropc_alpha_gain_error	The alpha measurement alpha gain is wrong
0x40	beta_over_under_flow_error	During the walking OPC a beta over-/under-flow was detected
0x41	not_enough_calib_points_error	Not enough valid calibration points available for re-calibration
0x42	not_enough_power_error	The calculated power during re-calibration exceeds max power
0x43	illegal_reading_speed_error	The selected speed is not allowed for the requested command
0x44	servo_fatal_error	The actuator dissipation became too high during a servo recovery

This error is overwritten by the next player / inquiry command.

Byte 1 - 9: cumulative errors of previous error occurences.
Every individual error has its own bit in the 9-byte structure as described in the drawing below:

Format of the BE error bytes

byte 1

b7	b6	b5	b4	b3	b2	b1	b0
reserved	FOCUS AGC ERROR	FOCUS RETRIES ERROR	FOCUS TIMEOUT ERROR	RADIAL AGC ERROR	RADIAL RETRIES ERROR	RADIAL TIMEOUT ERROR	RADIAL INIT ERROR

byte 2

TRAY ERROR	reserved	JITTER OPTIMIZATION ERROR	SLEDGE HOME ERROR	SLEDGE UNSTABLE ERROR	SLEDGE CALIBRATION ERROR	TILT SENSOR OFFSET CALIBRATION ERROR	TILT CALIBRATION ERROR

byte 3

RECORD ERROR	SEEK ERROR	NO DISC ERROR	NOT INITIALISED ERROR	ILLEGAL STOPADDRESS ERROR	ILLEGAL PARAMETER ERROR	ILLEGAL COMMAND ERROR	COMMAND TIMEOUT ERROR

byte 4

SERVO FATAL ERROR	reserved	reserved	HF PLL ERROR	NO HF PRESENT ERROR	HEADER TIMEOUT ERROR	SUBCODE NOTFOUND ERROR	SUBCODE TIMEOUT ERROR

byte5

WOBBLE PLL ERROR	ADIP SYNC ERROR	ADIP WINDOW ERROR	ADIP TIMEOUT ERROR	ATIP NOTFOUND ERROR	ATIP SYNC ERROR	ATIP WINDOW ERROR	ATIP TIMEOUT ERROR

byte6

WSG CALCULATION ERROR	DVD FREQUENCY ERROR	CD FREQUENCY ERROR	ILLEGAL RECORDING SPEED ERROR	SPEED WINDOW ERROR	SPEED TIMEOUT ERROR	NON EXISTING BCA ERROR	BCA READ ERROR

byte7

LASER FORWARD SENSE ERROR	NVRAM CHECKSUM UPDATE ERROR	FRONTEND OFFSET CALIBRATION ERROR	LASER PLL ERROR	ILLEGAL READING SPEED ERROR	ILLEGAL MEDIUM ERROR	SELFTEST ERROR	I^2C ERROR

byte8

OPC READ SAMPLES ERROR	OPC BAD JITTER MEASUREMENT ERROR	OPC TEST ZONE FULL ERROR	OPC POWER CALCULATION ERROR	OPC START POWER HIGH ERROR	OPC START POWER LOW ERROR	OPC RECORD POWER ERROR	OPC MEDIA PARAMETER ERROR

byte9

RETURN VALUE INVALID ERROR	BUFFER OVERRUN ERROR	BETA OVER/UNDER FLOW ERROR	NOT ENOUGH CALIB POINTS ERROR	NOT ENOUGH POWER ERROR	ROPC ALPHA GAIN ERROR	ROPC ALPHA REF CURRENT ERROR	ROPC ALPHA OVERFLOW ERROR

These errors are kept in memory until a power down of the drive (e.g. when recorder goes to standby) or reset of the drive.

5.2.2 Cumulative errors

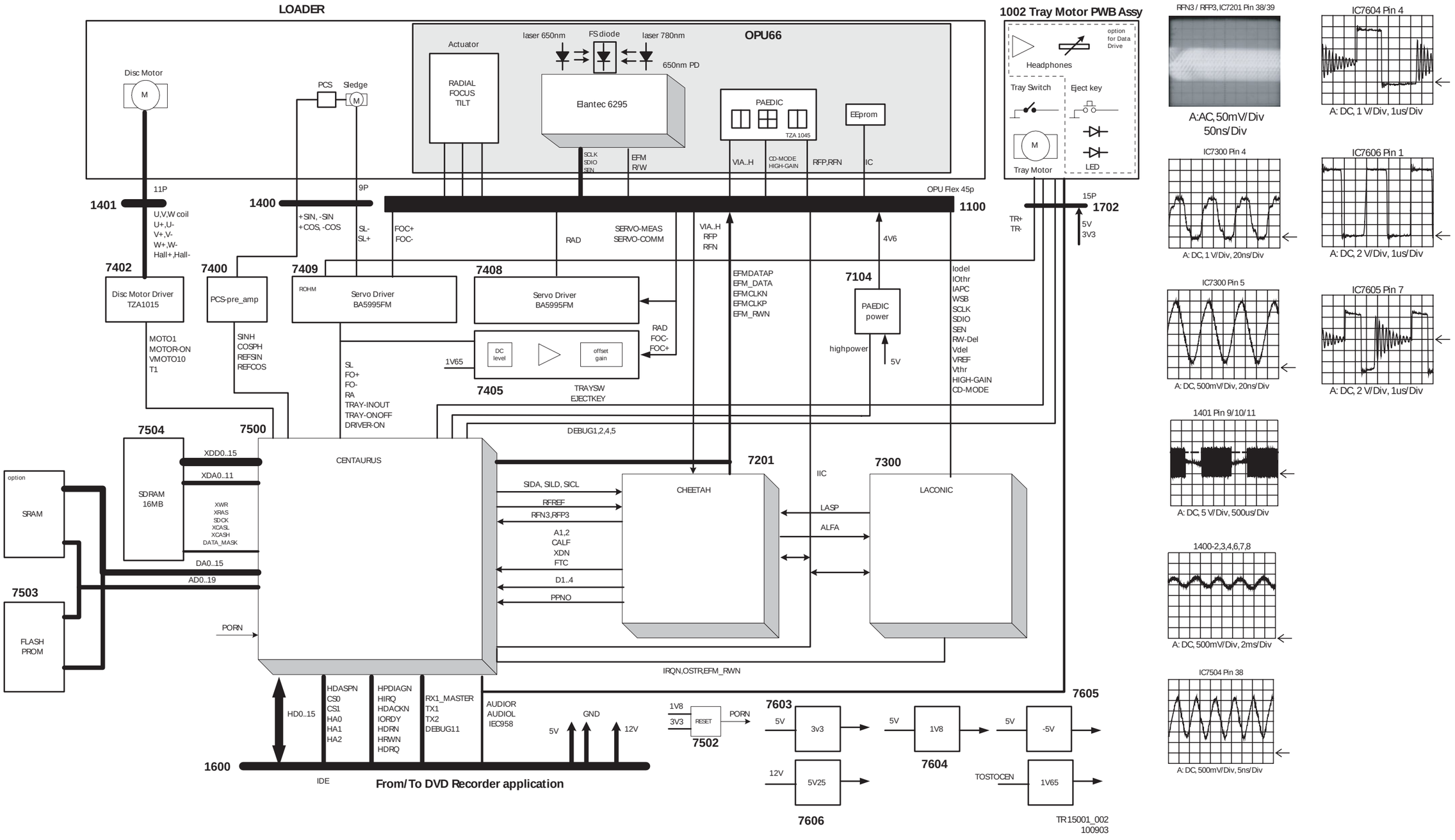
These errors are stored in EEPROM and are thus non-volatile showing the complete error history of the drive.
Byte 1 - 9: cumulative errors of previous player / inquiry error occurences. These bytes are the same as the nine bytes (1-9) of the Momentary errors

5.2.3 Software fatal assert

Gives row number and file name in the source code of the firmware of the data path of the AV

6. Block Diagram.

Block Diagram



RFN3 / RFP3, IC7201 Pin 38/39

A:AC, 50mV/Div
50ns/Div

IC7604 Pin 4

A: DC, 1 V/Div, 1us/Div

IC7300 Pin 4

A: DC, 1 V/Div, 20ns/Div

IC7606 Pin 1

A: DC, 2 V/Div, 1us/Div

IC7300 Pin 5

A: DC, 500mV/Div, 20ns/Div

IC7605 Pin 7

A: DC, 2 V/Div, 1us/Div

1401 Pin 9/10/11

A: DC, 5 V/Div, 500us/Div

1400-2,3,4,6,7,8

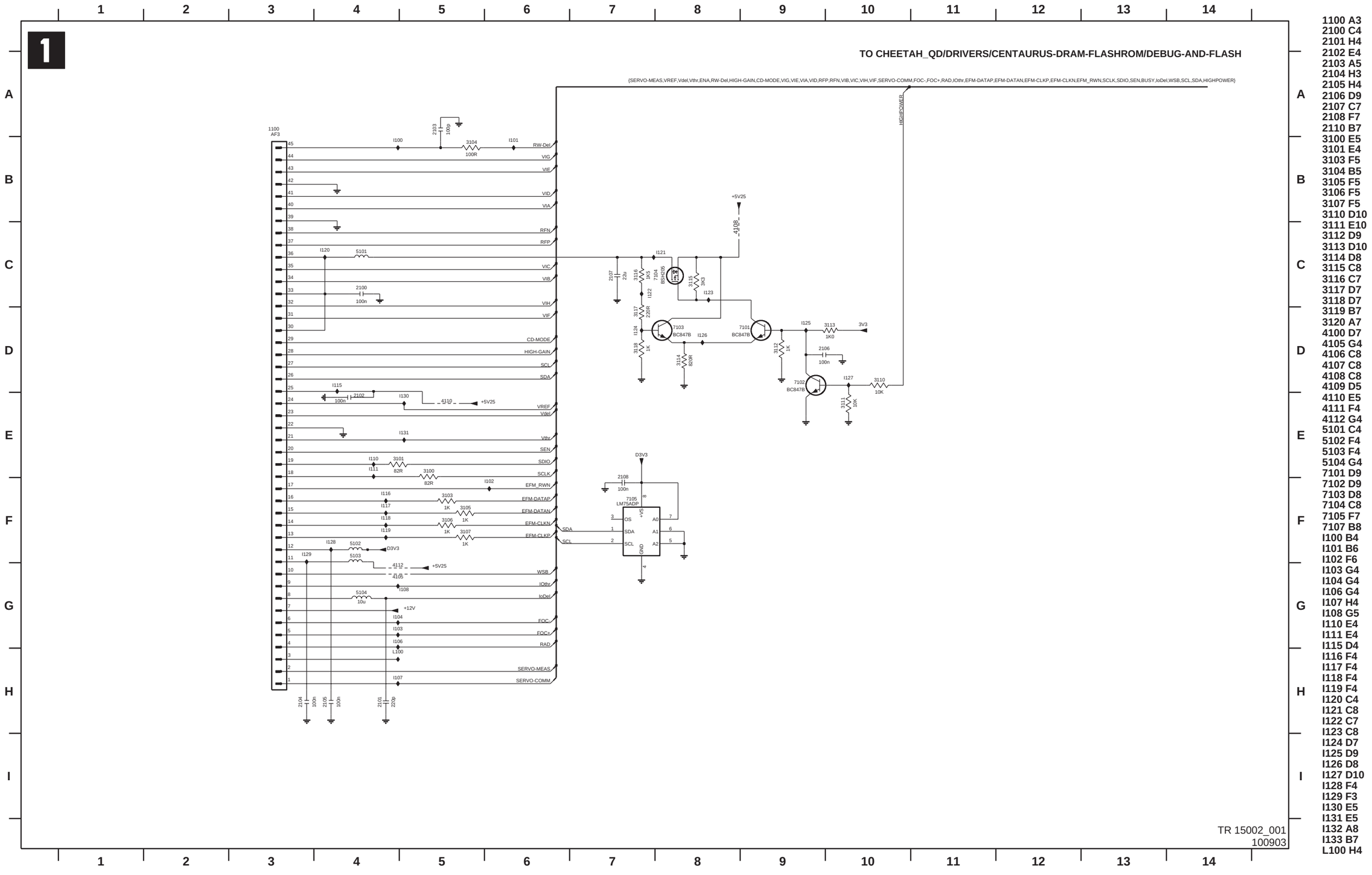
A: DC, 500mV/Div, 2ms/Div

IC7504 Pin 38

A: DC, 500mV/Div, 5ns/Div

7. Electrical Diagrams and Print-Layouts

Servo Board: OPU Interface



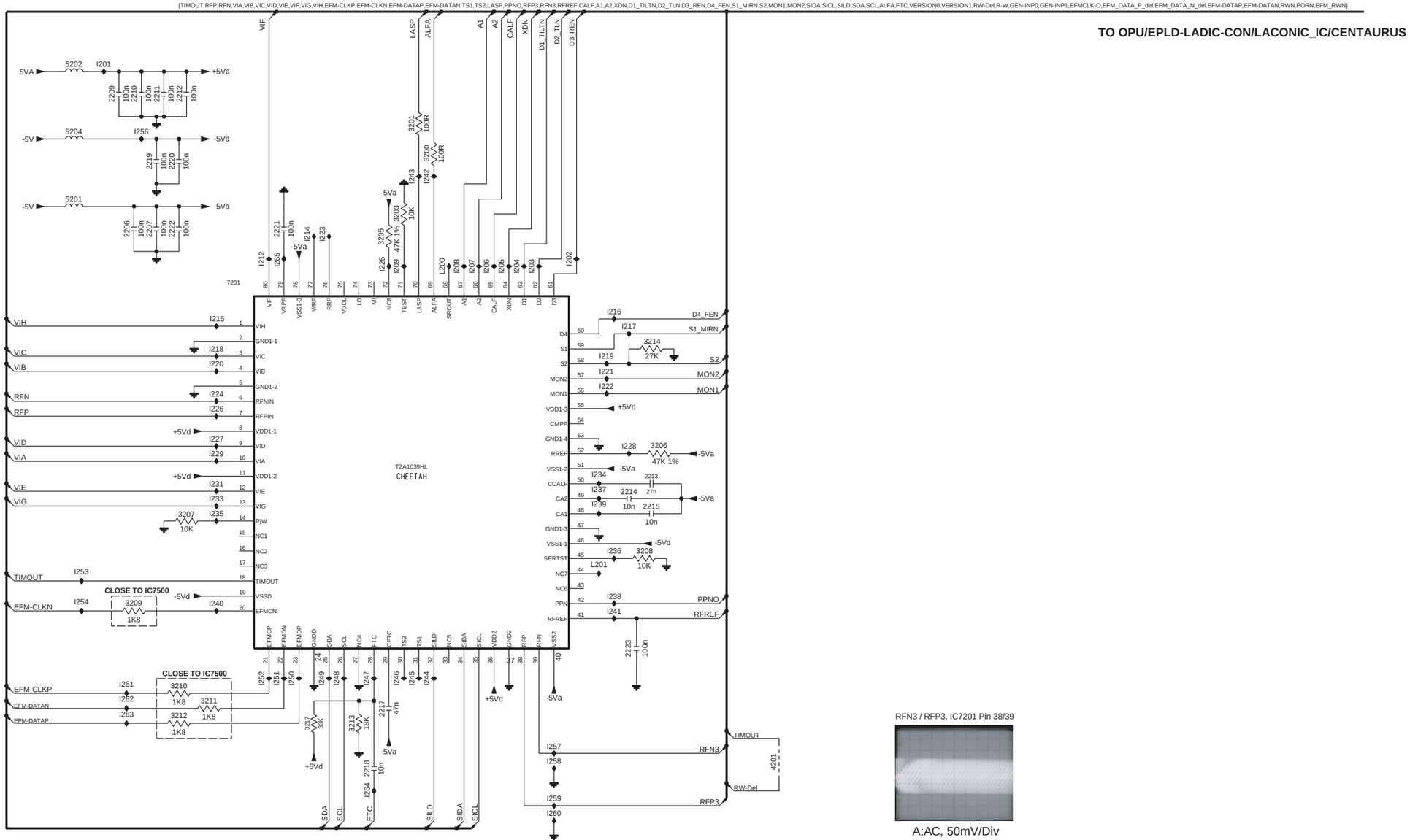
1100 A3
2100 C4
2101 H4
2102 E4
2103 A5
2104 H3
2105 H4
2106 D9
2107 C7
2108 F7
2110 B7
3100 E5
3101 E4
3103 F5
3104 B5
3105 F5
3106 F5
3107 F5
3110 D10
3111 E10
3112 D9
3113 D10
3114 D8
3115 C8
3116 C7
3117 D7
3118 D7
3119 B7
3120 A7
4100 D7
4105 G4
4106 C8
4107 C8
4108 C8
4109 D5
4110 E5
4111 F4
4112 G4
5101 C4
5102 F4
5103 F4
5104 G4
7101 D9
7102 D9
7103 D8
7104 C8
7105 F7
7107 B8
I100 B4
I101 B6
I102 F6
I103 G4
I104 G4
I106 G4
I107 H4
I108 G5
I110 E4
I111 E4
I115 D4
I116 F4
I117 F4
I118 F4
I119 F4
I120 C4
I121 C8
I122 C7
I123 C8
I124 D7
I125 D9
I126 D8
I127 D10
I128 F4
I129 F3
I130 E5
I131 E5
I132 A8
I133 B7
L100 H4

Servo Board: Cheetah

2

{TIMOUT,RFP,RFN,VIA,VIB,VIC,VID,VIE,VIF,VIG,VIH,EFM-CLKP,EFM-CLKN,EFM-DATAP,EFM-DATAN,TS1,TS2,LASP,PPNO,RFP3,RFN3,RFREF,CALF,A1,A2,XDN,D1_TILTN,D2_TLN,D3_REN,D4_FEN,S1_MIRN,S2,MON1,MON2,SIDA,SICL,SILD,SDA,SCL,ALFA,FTC,VERSION0,VERSION1,RW-Del,R-W,GEN-INP0,GEN-INP1,EFMCLK-O,EFM_DATA_P_del,EFM_DATA_N_del,EFM-DATAP,EFM-DATAN,RWN,PORN,EFM_RWN}

TO OPU/EPLD-LADIC-CON/LACONIC_IC/CENTAURUS



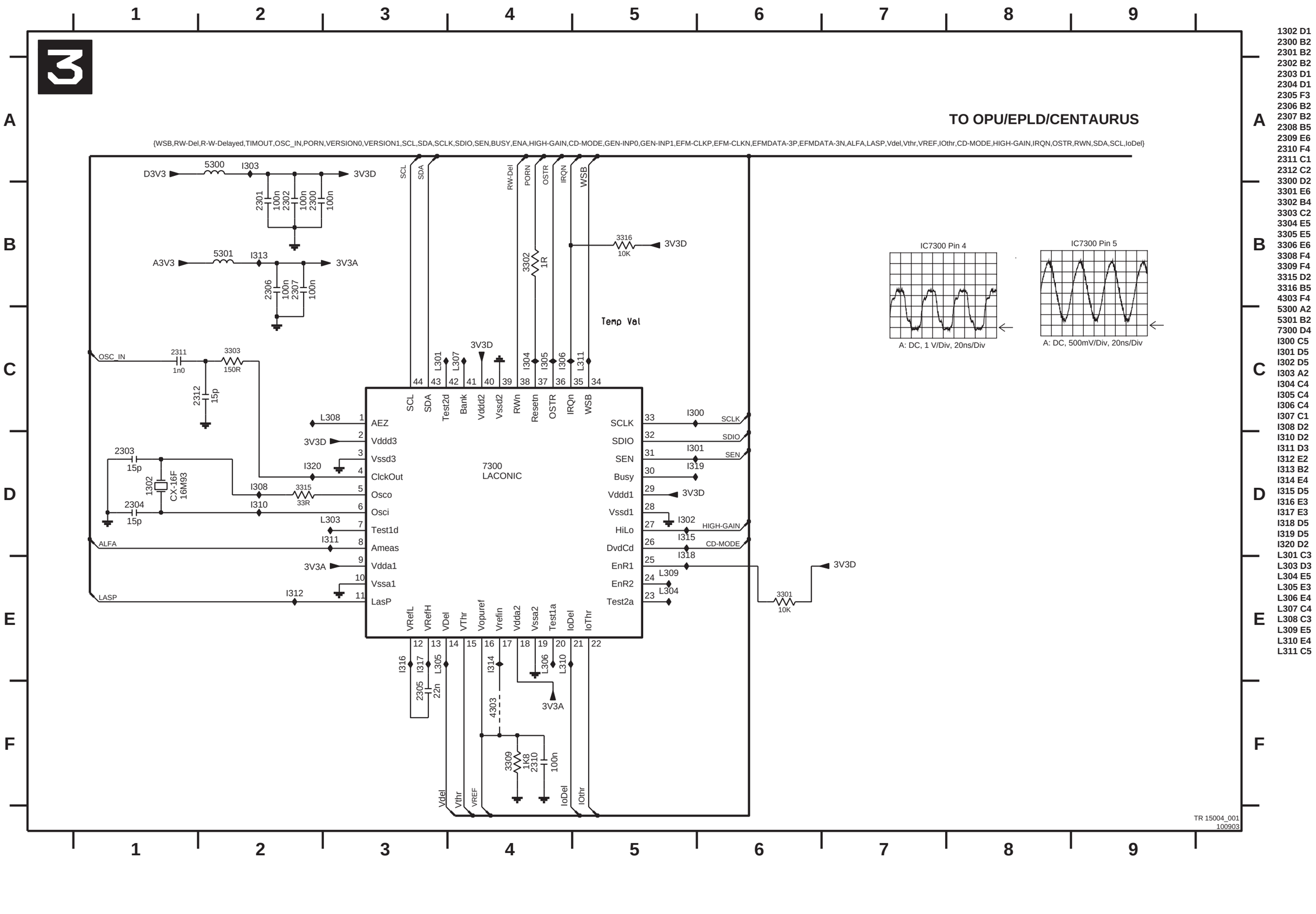
RFN3 / RFP3, IC7201 Pin 38/39

A:AC, 50mV/Div
50ns/Div

TR 15003_001
100903

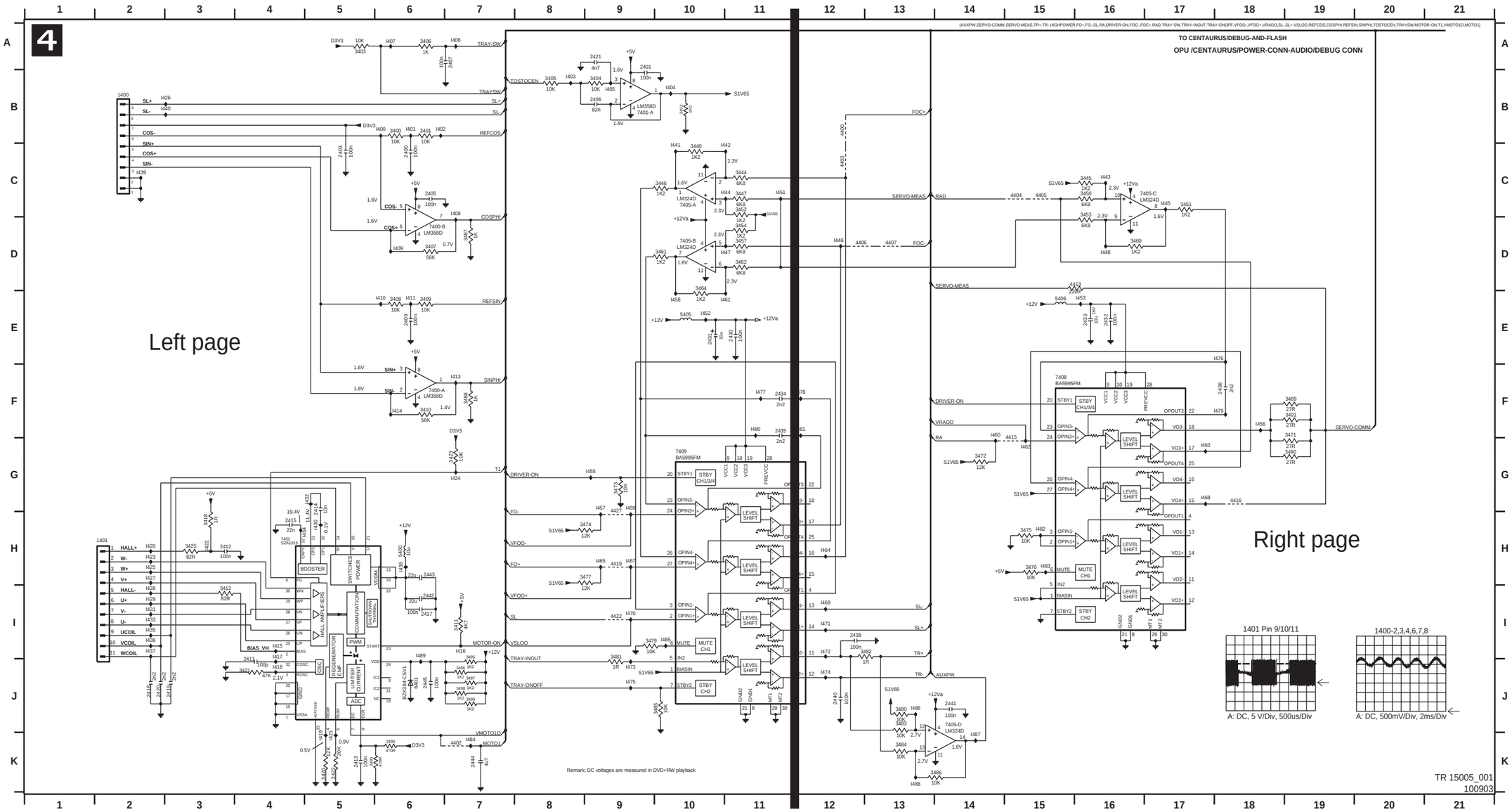
2204 B5
2205 B5
2206 C2
2207 C3
2209 B2
2210 B2
2211 B3
2212 B3
2213 F7
2214 F7
2215 F7
2217 H5
2218 H5
2219 C3
2220 C3
2221 C4
2222 C3
2223 G7
3200 C5
3201 B5
3202 C4
3203 C5
3204 C4
3205 C5
3206 E7
3207 F3
3208 F7
3209 G2
3210 H3
3211 H3
3212 H3
3213 H4
3214 D7
3215 D3
3216 D3
3217 H4
4200 H9
4201 H8
5201 C2
5202 B2
5204 B2
7201 D3
I201 B2
I202 D6
I203 D6
I204 D6
I205 D6
I206 D6
I207 D6
I208 D5
I209 D5
I212 D4
I214 C4
I215 D3
I216 D7
I217 D7
I218 D3
I219 D7
I220 E3
I221 E7
I222 E7
I223 C4
I224 E3
I225 D5
I226 E3
I227 E3
I228 E7
I229 E3
I231 F3
I233 F3
I234 F7
I235 F3
I236 F7
I237 F7
I238 G7
I239 F7
I240 G3
I241 G7
I242 C5
I243 C5
I244 H5
I245 H5
I246 H5
I247 H5
I248 H4
I249 H4
I250 H4
I251 H4
I252 H4
I253 G2
I254 G2
I256 B2
I257 H6
I258 H6
I259 I6
I260 I6
I261 H2
I262 H2
I263 H2
I264 I5
I265 D4
L200 D5
L201 F7

Servo Board: Laconic



1302 D1
2300 B2
2301 B2
2302 B2
2303 D1
2304 D1
2305 F3
2306 B2
2307 B2
2308 B5
2309 E6
2310 F4
2311 C1
2312 C2
3300 D2
3301 E6
3302 B4
3303 C2
3304 E5
3305 E5
3306 E6
3308 F4
3309 F4
3315 D2
3316 B5
4303 F4
5300 A2
5301 B2
7300 D4
I300 C5
I301 D5
I302 D5
I303 A2
I304 C4
I305 C4
I306 C4
I307 C1
I308 D2
I310 D2
I311 D3
I312 E2
I313 B2
I314 E4
I315 D5
I316 E3
I317 E3
I318 D5
I319 D5
I320 D2
L301 C3
L303 D3
L304 E5
L305 E3
L306 E4
L307 C4
L308 C3
L309 E5
L310 E4
L311 C5

Servo Board: Drivers (Overview)



Servo Board: Drivers (Left page)

4

Left page

1401 Pin 9/10/11

A: DC, 5 V/Div, 500us/Div

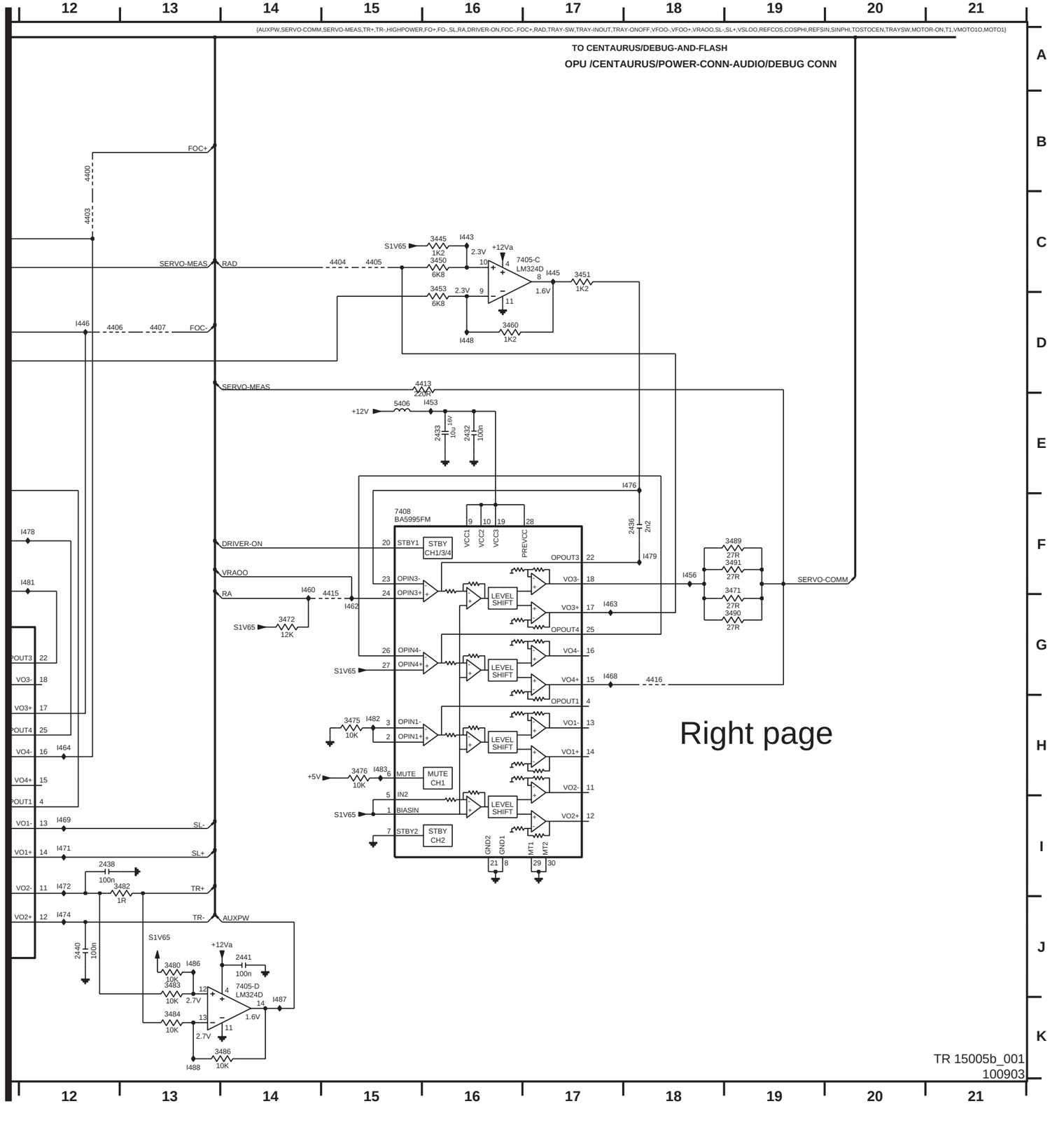
1400-2,3,4,6,7,8

A: DC, 500mV/Div, 2ms/Div

Remark: DC voltages are measured in DVD+RW playback

TR 15005a_001
160903

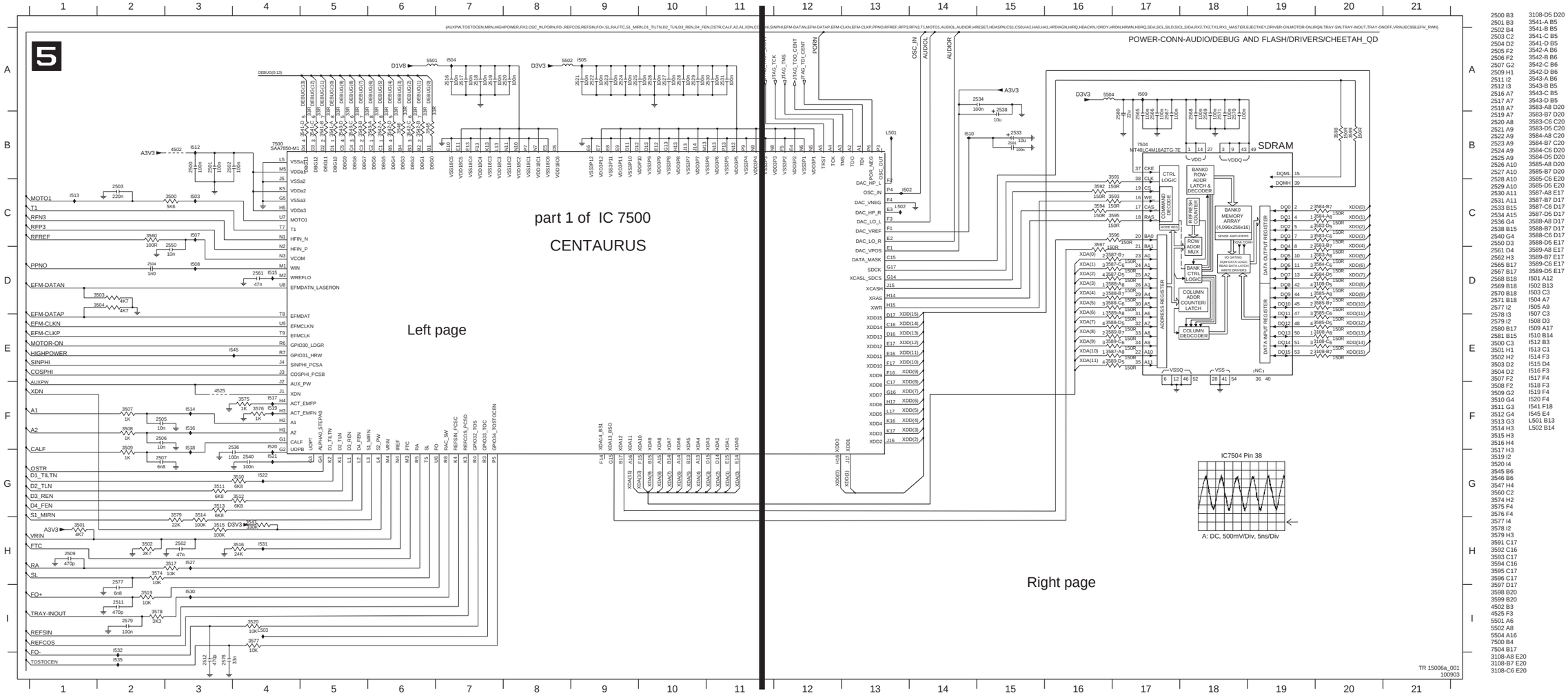
Servo Board: Drivers (Right page)



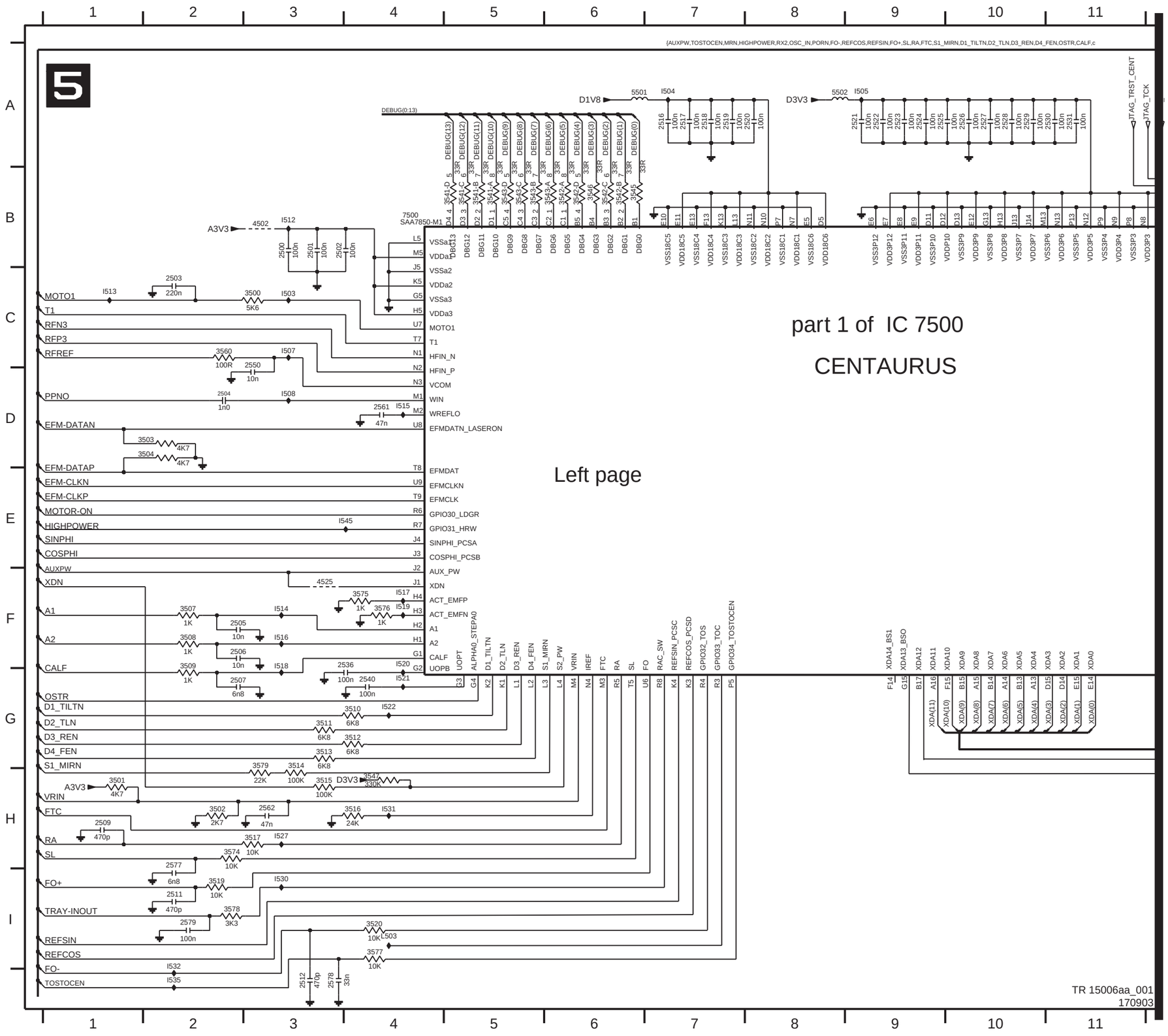
A

1400 B2	I401 B6
1401 H2	I402 B6
2400 C6	I403 B8
2401 A9	I404 B10
2403 C5	I405 B9
2405 C6	I406 A7
2406 B9	I407 A6
2407 A7	I408 C7
2409 E6	I409 D6
2411 J4	I410 E6
2412 H3	I411 E6
2413 K5	I413 F7
2414 G5	I414 F6
2415 H4	I415 I4
2416 I6	I416 I7
2417 I6	I417 I4
2418 J2	I418 J4
2419 J3	I419 K5
2420 J2	I420 H2
2421 A9	I421 K5
2430 E11	I422 H3
2431 E10	I423 H2
2432 E16	I424 G7
2433 E16	I425 H2
2434 F11	I426 B3
2435 F11	I427 H2
2436 F18	I428 I2
2438 I12	I429 I2
2440 J12	I430 H5
2441 J14	I431 I2
2442 I6	I432 G5
2443 H6	I433 I2
2444 K7	I434 H4
3400 B6	I435 I2
3401 B6	I436 I2
3403 A6	I437 I2
3404 B9	I438 H6
3405 B8	I439 C2
3406 A6	I440 B3
3407 D6	I441 C10
3408 E6	I442 C11
3409 E6	I443 C16
3410 F6	I444 C11
3411 I7	I445 C17
3412 I3	I446 D12
3418 H3	I447 D11
3420 K5	I448 D16
3421 J4	I451 C11
3422 K5	I452 E10
3423 G7	I453 E16
3425 H3	I455 G9
3440 C10	I456 F18
3444 C11	I457 G9
3445 C16	I458 E10
3446 C10	I459 G9
3447 C11	I460 F14
3450 C16	I461 E11
3451 C17	I462 G15
3452 C11	I463 G17
3453 C16	I464 H12
3454 D11	I465 H9
3457 D11	I467 H9
3460 D16	I468 G17
3461 D10	I469 I12
3462 D11	I470 I9
3464 D10	I471 I12
3471 F19	I472 I12
3472 G14	I473 J9
3473 G9	I474 J12
3474 H9	I475 J9
3475 H15	I476 E18
3476 H15	I477 F11
3477 H9	I478 F12
3478 I9	I479 F18
3479 I9	I480 F11
3480 J13	I481 F12
3481 I9	I482 H15
3482 I13	I483 H15
3483 J13	I484 K7
3484 K13	I485 I10
3485 J10	I486 J13
3486 K14	I487 K14
3487 D7	I488 K13
3488 F7	
3489 F19	
3490 G19	
3491 F19	
3492 B10	
3493 K5	
3494 K6	
4400 B12	
4402 K7	
4403 C12	
4404 C15	
4405 C15	
4406 D12	
4407 D13	
4410 D13	
4411 D13	
4413 D16	
4415 G15	
4416 G18	
4417 G19	
4419 H9	
4422 I9	
4427 H9	
5400 H6	
5405 E10	
5406 E15	
7400-A F6	
7400-B D6	
7401-A B9	
7402 H4	
7405-A C10	
7405-B D10	
7405-C C16	
7405-D J14	
7408 F15	
7409 G10	
I400 B6	

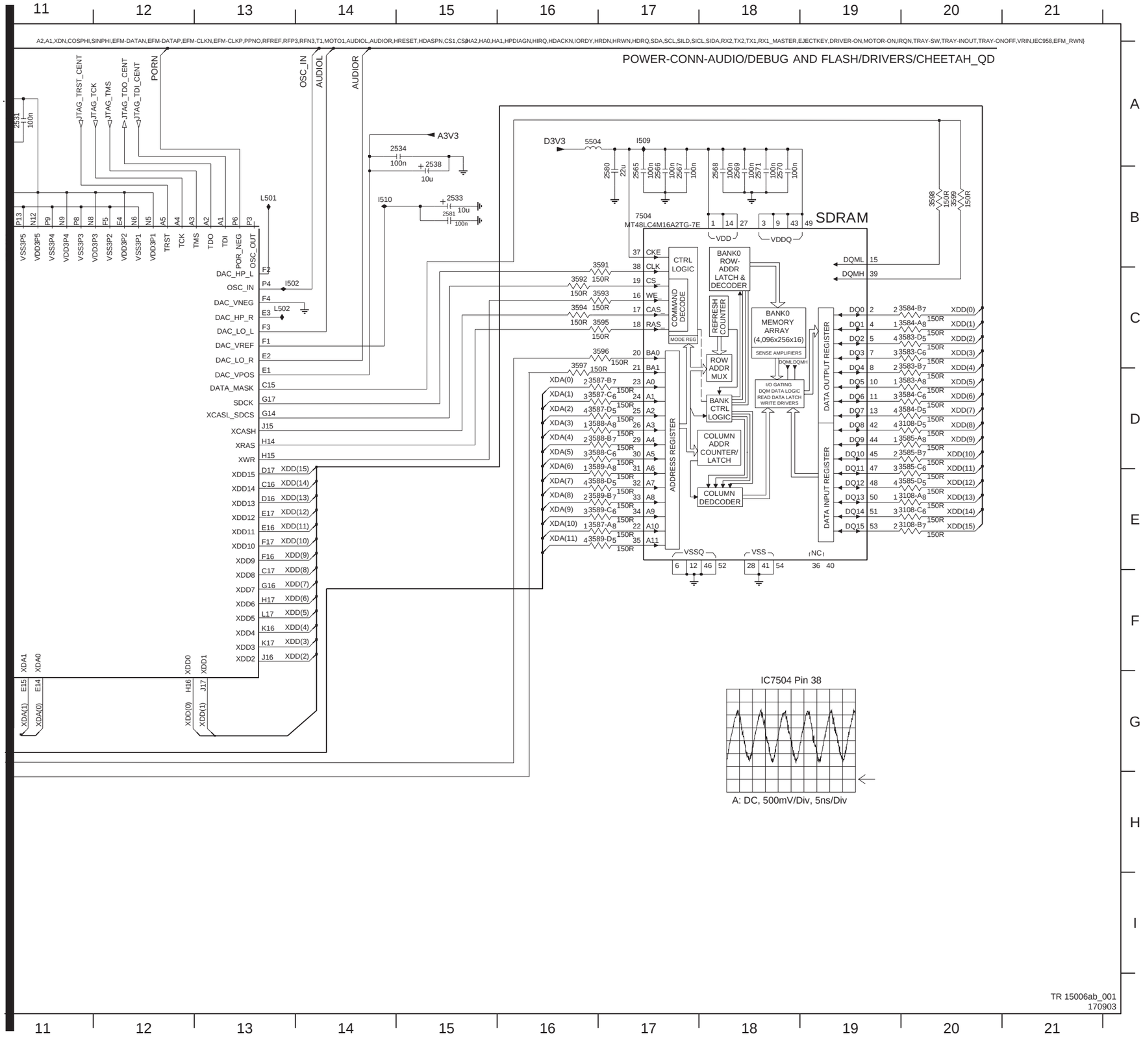
Servo Board: Centaurus Part 1 (Overview)



Servo Board: Centaurus Part 1 (Left page)

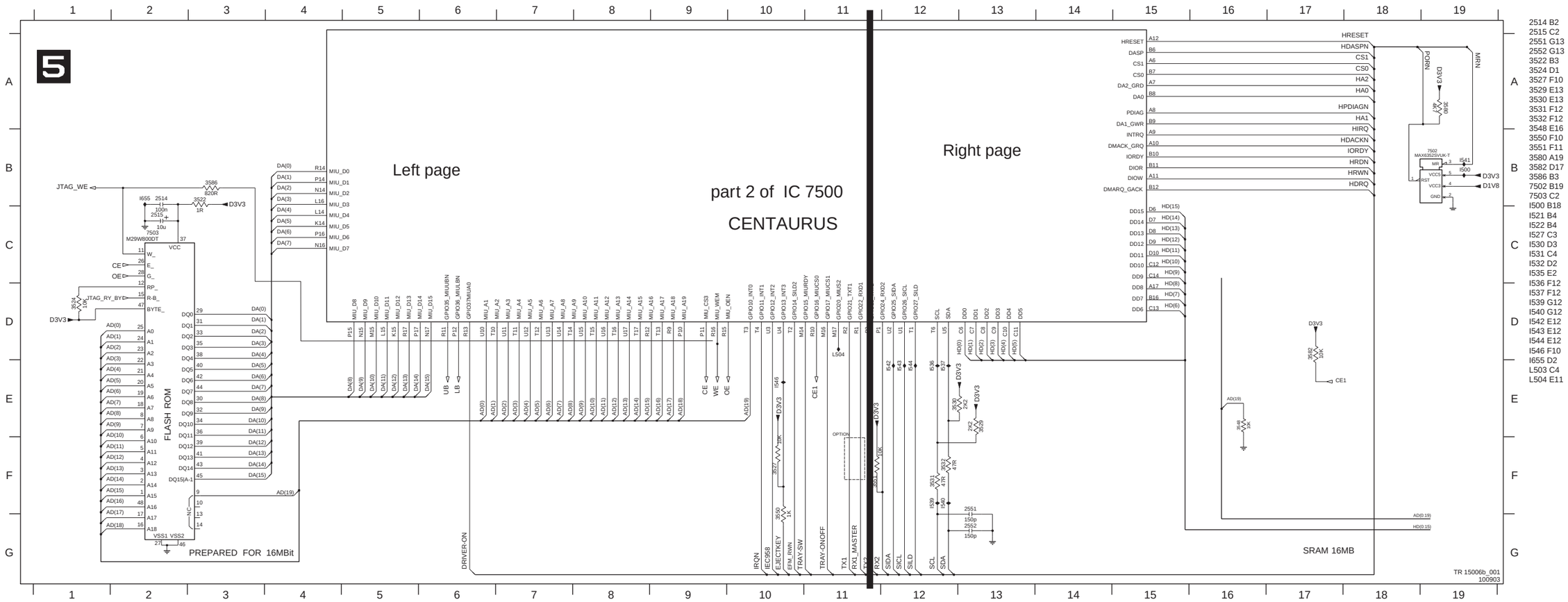


Servo Board: Centaurus Part 1 (Right page)

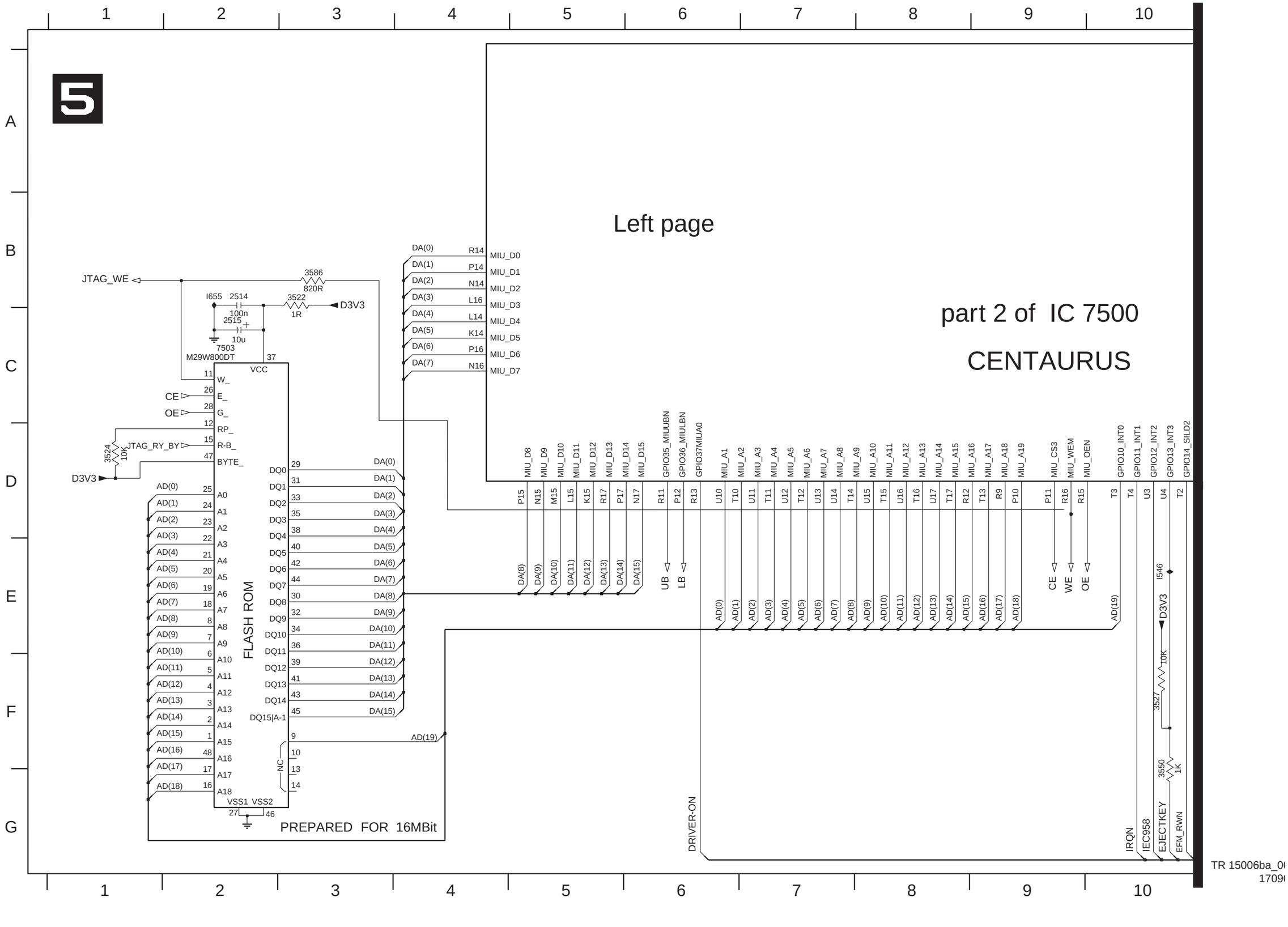


2500	B3	3108-D5 D20
2501	B3	3541-A B5
2502	B4	3541-B B5
2503	C2	3541-C B5
2504	D2	3541-D B5
2505	F2	3542-A B6
2506	F2	3542-B B6
2507	G2	3542-C B6
2509	H1	3542-D B6
2511	I2	3543-A B6
2512	I3	3543-B B5
2516	A7	3543-C B5
2517	A7	3543-D B5
2518	A7	3583-A8 D20
2519	A7	3583-B7 D20
2520	A8	3583-C6 C20
2521	A9	3583-D5 C20
2522	A9	3584-A8 C20
2523	A9	3584-B7 C20
2524	A9	3584-C6 D20
2525	A9	3584-D5 D20
2526	A10	3585-A8 D20
2527	A10	3585-B7 D20
2528	A10	3585-C6 E20
2529	A10	3585-D5 E20
2530	A11	3587-A8 E17
2531	A11	3587-B7 D17
2533	B15	3587-C6 D17
2534	A15	3587-D5 D17
2536	G4	3588-A8 D17
2538	B15	3588-B7 D17
2540	G4	3588-C6 D17
2550	D3	3588-D5 E17
2561	D4	3589-A8 E17
2562	H3	3589-B7 E17
2565	B17	3589-C6 E17
2567	B17	3589-D5 E17
2568	B18	I501 A12
2569	B18	I502 B13
2570	B18	I503 C3
2571	B18	I504 A7
2577	I2	I505 A9
2578	I3	I507 C3
2579	I2	I508 D3
2580	B17	I509 A17
2581	B15	I510 B14
3500	C3	I512 B3
3501	H1	I513 C1
3502	H2	I514 F3
3503	D2	I515 D4
3504	D2	I516 F3
3507	F2	I517 F4
3508	F2	I518 F3
3509	G2	I519 F4
3510	G4	I520 F4
3511	G3	I541 F18
3512	G4	I545 E4
3513	G3	L501 B13
3514	H3	L502 B14
3515	H3	
3516	H4	
3517	H3	
3519	I2	
3520	I4	
3545	B6	
3546	B6	
3547	H4	
3560	C2	
3574	H2	
3575	F4	
3576	F4	
3577	I4	
3578	I2	
3579	H3	
3591	C17	
3592	C16	
3593	C17	
3594	C16	
3595	C17	
3596	C17	
3597	D17	
3598	B20	
3599	B20	
4502	B3	
4525	F3	
5501	A6	
5502	A8	
5504	A16	
7500	B4	
7504	B17	
3108-A8	E20	
3108-B7	E20	
3108-C6	E20	

Servo Board: Centaurus Part 2 (Overview)



Servo Board: Centaurus Part 2 (Left page)



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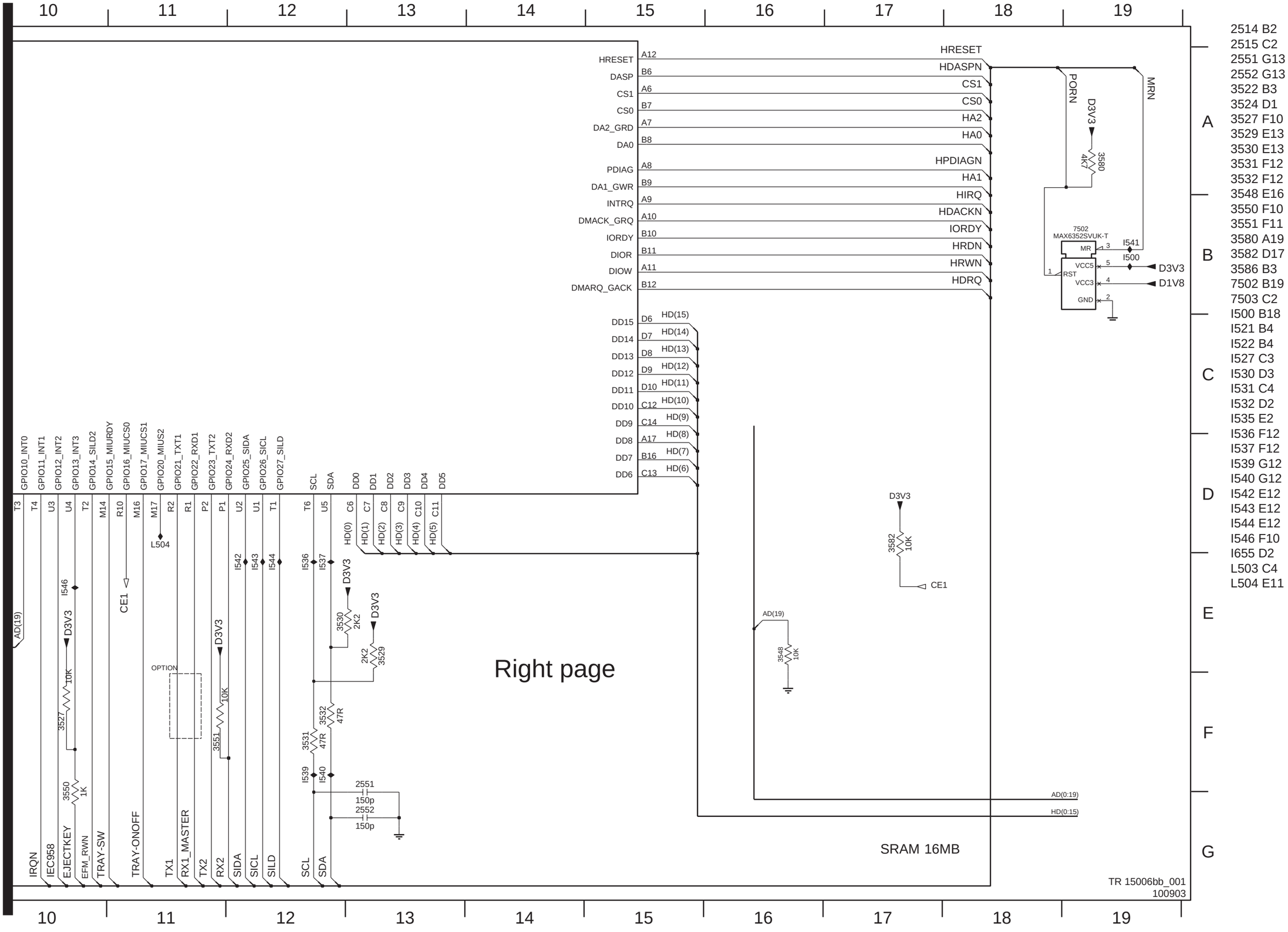
1709(

Servo Board: Centaurus Part 2 (Right page)



Servo Board: Power, Connectors

6 **CENTAURUS-DRAM-FLASHROM**

{AUDIOL,AUDIOR,RX1_MASTER,DEBUG(11),TX1,TX2,HDASPN,CS0,CS1,HA0,HA1,HA2,HPDIAGN,HIRQ,HDACKN,IORDY,HRDN,HRWN,HDRQ,IRESET,IEC958,AUDIO_FRONT_L,AUDIO_FRONT_R}

HD(0:15)

AUDIO_FRONT_R
AUDIOR
AUDIO_FRONT_L
AUDIOL
RX1_MASTER
TX2
TX1
DEBUG(11)
HDASPN
CS1
CS0
HA2
HA0
HPDIAGN
HA1
HIRQ
HDACKN
IORDY
HRDN
HRWN
HDRQ
HD(15)
HD(0)
HD(14)
HD(1)
HD(13)
HD(2)
HD(12)
HD(3)
HD(11)
HD(4)
HD(10)
HD(5)
HD(9)
HD(6)
HD(8)
HD(7)
HRESET
IEC958

3V3
A3V3
D3V3
+5V25
D1V8
+5V
5VA
-5V
+12V

7603 LD1117DT33
7604 TEA1207T
7605 ST735
7606 L5970D

ON BOTTOM SIDE PCB
DNIN
EMI-FILTER

IC7604 Pin 4
A: DC, 1 V/Div, 1us/Div
IC7606 Pin 1
A: DC, 2 V/Div, 1us/Div
IC7605 Pin 7
A: DC, 2 V/Div, 1us/Div

1600-1 B13
1600-2 H13
1600-3 A13
1600-4 I13
1600-5 A13
1600-6 I14
1600-7 I14
2600 A12
2601 A12
2602 A11
2603 A11
2604 B12
2605 H11
2607 I11
2608 I6
2609 I11
2610 B5
2611 B4
2612 B4
2614 I6
2615 H3
2616 F2
2617 F2
2618 G5
2621 A10
2622 A10
2623 I11
2624 I12
2625 I12
2626 I11
2650 E5
2651 H4
2652 E5
2653 I11
2654 I6
2655 B4
2656 E5
2657 E5
2658 F4
2659 H4
2660 E5
2661 I11
2662 C6
2663 C5
2664 C5
2665 C3
3600 A12
3601 B12
3602 A11
3603 A11
3604 A12
3605 A11
3606 B11
3607 B12
3608 B11
3609 B12
3610 B12
3611 B10
3612 B10
3613 B10
3614 B10
3615-A C12
3615-B C12
3615-C C12
3615-D C12
3619 D12
3620 C10
3621 D10
3622 D12
3623 D12
3624 D11
3625 D12
3626 E12
3627 E11
3628 E12
3629 E11
3630 E12
3631-A F11
3631-B F11
3631-C F11
3631-D F11
3635-A G11
3635-B G11
3635-C F11
3635-D F11
3639-A G11
3639-B G11
3639-C G11
3639-D G11
3643-A H11
3643-B H11
3643-C G11
3643-D H11
3647 H12
3648 H12
3650-1 H9
3650-2 H9
3650-3 H9
3650-4 H9
3651-1 H9
3651-2 H9
3651-3 H9
3651-4 H9
3652-1 H9
3652-2 H9
3652-3 H9
3652-4 H10
3653-1 H10
3653-2 H9
3653-3 H9
3653-4 H9
3660 F3
3661 G3
3662 E3
3665 I1
3684 E11
3686 H4
3689 C11
3690 C11
3691 F3
3692 D5
3693 D3
3694 C3
4601 B11
4604 I2
4605 B4
4610 A12
4611 A12
4612 E3
5602 B4
5603 B4
5604 F3
5607 I12
5609 G3
5613 D6
5614 G6
5615 H12
5616 C6
5617 C3
6603 G3
6604 I12
6605 I12
6606 E3
6607 D4
7603 B5
7604 G4
7605 E4
7606 C4
I538 I13
I600 A10
I601 A12
I602 A13
I603 A10
I604 A12
I605 A11
I606 A11
I607 B11
I608 B12
I609 B11
I610 C11
I611 C12
I612 C12
I613 C12
I614 C12
I615 C12
I616 C12
I617 D12
I618 D12
I619 D12
I620 E12
I621 E12
I622 E12
I623 F12
I624 F12
I625 F12
I626 F12
I627 F12
I628 F12
I629 B3
I630 E4
I631 F12
I632 G12
I633 B3
I634 B4
I636 G12
I637 G12
I638 G12
I640 E2
I641 G12
I642 G12
I643 G12
I644 H12
I645 H12
I646 H11
I647 G3
I648 G2
I649 H12
I650 I2
I651 F3
I652 F3
I653 H12
I654 I2
I656 H4
I657 B10
I658 I11
I659 I12
I660 I10
I661 I11
I662 D13
I663 B10
I664 E5
I665 E5
I666 E5
I667 G5
I668 D12
I669 E13
I670 E13
I671 B13
I672 H13
I673 A13
I674 B13
I675 A13
I676 I13
I677 E13
I678 D13
I679 D13
I680 H13
I681 I13
I682 I13
I683 B13
I684 A10
I685 A10
I686 E4
I687 C3
I688 C4
I689 C5
I690 C4
I691 C5
I692 D5

aTR 15008_001
100903a

Servo Board: Tray Motor Connections

7

OPU/CHEETAH_QD/DRIVERS/CENTAURUS/POWER-CONN

{RAD,SERVO-COMM,MOTO1,MRN,RX1_MASTER,TX1,A1,A2,CALF,VRIN,D1_TILTN,D2_TLN,D3_REN,D4_FEN,S1_MIRN,S2,FTC,MON1,MON2,RX2,TX2,PPNO,IRQN,PORN,T1,SCL,SDA,XDN,DRIVER-ON,FO-,FO+,VFOO-,VFOO+,RA,VRAOO,SL+,SL-,FOC+,FOC-,AUDIO_FRONT_L,AUDIO_FRONT_R,TR+,TR-,TRAYSW,EJECTKEY,SL,VSLOO,VMOTO1O}

DEBUG(0:13)

D3V3

3709 10K

DEBUG(4) I700
DEBUG(0) I701
DEBUG(1) I702
DEBUG(2) I703
DEBUG(3) I704
I705
DEBUG(6) I707
DEBUG(7) I709
DEBUG(8) I711
DEBUG(5) I713

I721 RX1_MASTER
I722 RX2

I723 MRN

1702 AF2

15 TRAYSW
14 AUDIO_FRONT_L
13 I725 EJECTKEY
12
11 4700 DEBUG(2)
10 AUDIO_FRONT_R
9 DEBUG(1)
8
7 DEBUG(5)
6 +5V
5
4 DEBUG(4)
3 TR-
2 D3V3 I736
1 TR+

L700 DEBUG(5)
L701 DEBUG(6)
L702 DEBUG(7)

I715 DEBUG(10)
L703 DEBUG(8)
I716 DEBUG(12)
I717 DEBUG(13)

I718 DEBUG(9)
I719 DEBUG(11)

JTAG_TRST_CENT I720 3717 33R I706
JTAG_TDO_CENT I714
JTAG_TDI_CENT I710
JTAG_TMS I712
JTAG_TCK I708
JTAG_WE I731
JTAG_RY_BY I732
I735

3718 10K

JTAG CONECTION

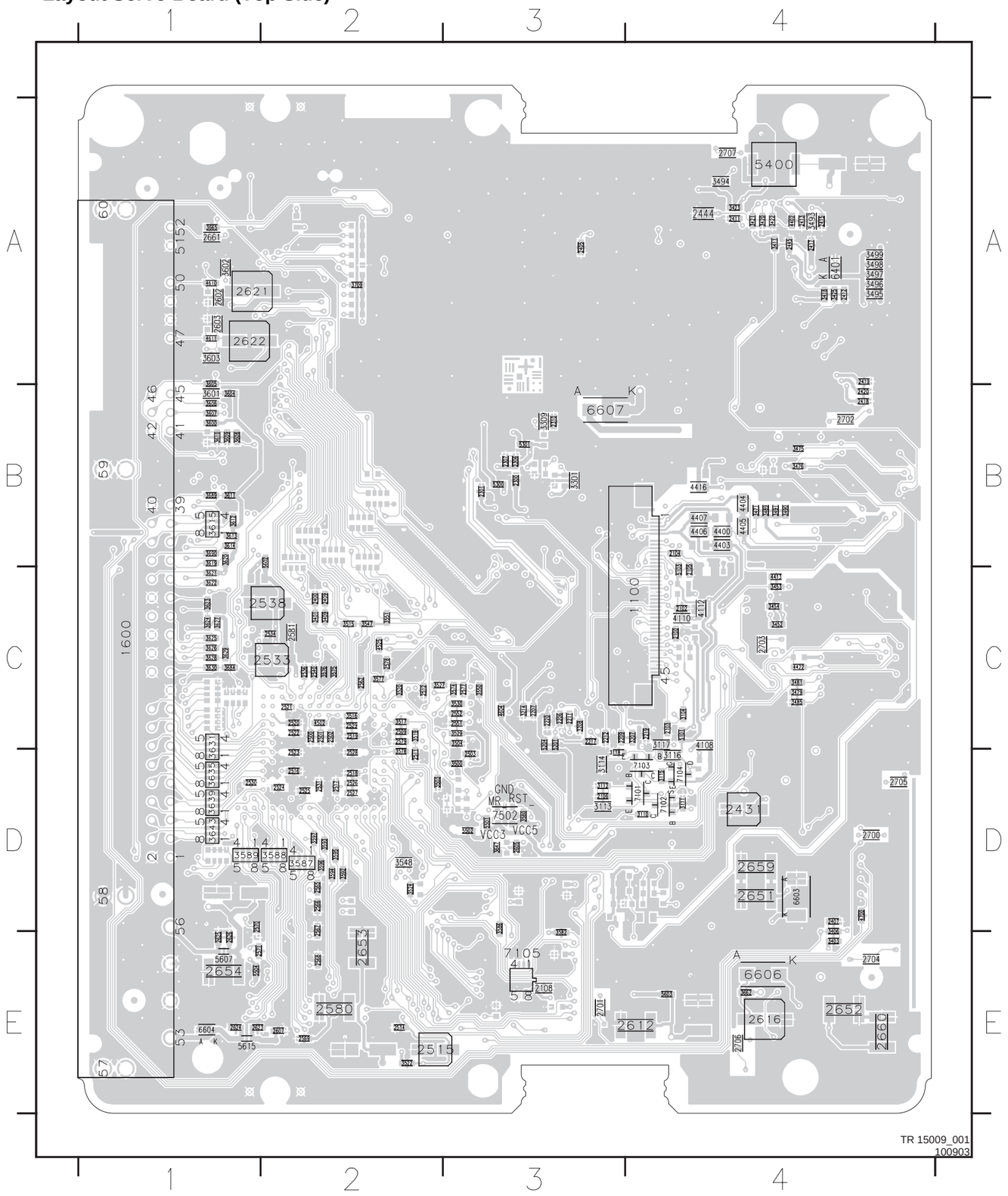
Connection Splitted GND plane

2700 10n 2702 10n 2704 10n 2706 10n
2701 10n 2703 10n 2705 10n 2707 10n

TR 15014_001
071003

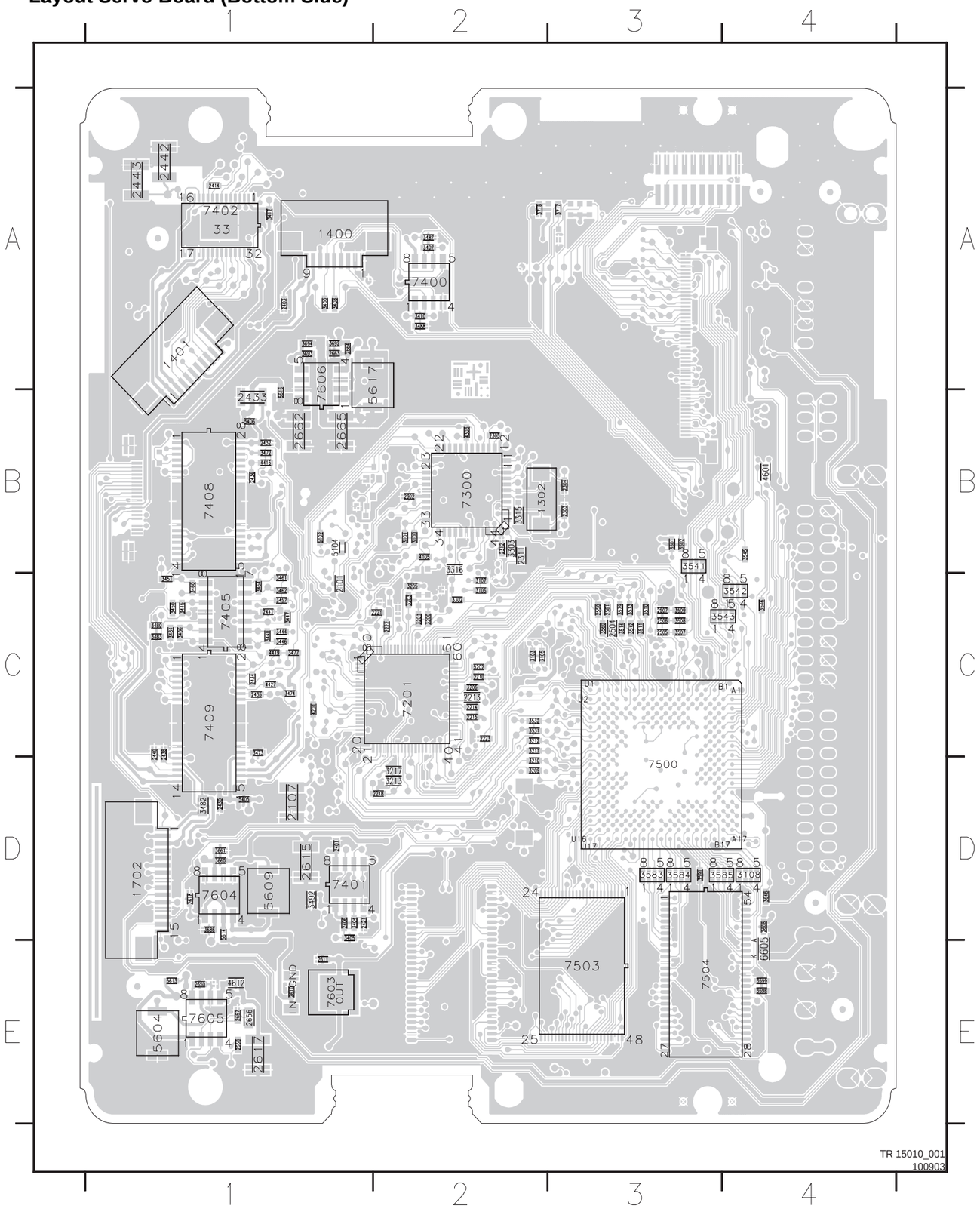
0001 I7
0002 I8
1700 B1
1702 F6
1703 C6
1705 E9
2700 I10
2701 I11
2702 I10
2703 I11
2704 I10
2705 I11
2706 I10
2707 I11
3702 H5
3703 H5
3704 H5
3705 H5
3706 I5
3707 I5
3708 C5
3709 C4
3710 C4
3711 C4
3712 C5
3713 B13
3714 B13
3715 B13
3716 B13
3717 C13
3718 D13
3719 D13
4700 F7
4701-A B2
4701-B B2
4701-C B2
4701-D C2
4702-A C2
4702-B C2
4702-C C2
4702-D D2
4703-A D2
4703-B D2
4703-C C2
4703-D C2
4704-A E2
4704-B E2
4704-C D2
4704-D E2
4705-A D2
4705-B F2
4705-C F2
4705-D E2
4706-A F2
4706-B F2
4706-C F2
4706-D D2
4707 F2
I700 C5
I701 D5
I702 D5
I703 D5
I704 D5
I705 D5
I706 C14
I707 D5
I708 C14
I709 D5
I710 C14
I711 E5
I712 C14
I713 E5
I714 C14
I715 H3
I716 H3
I717 H3
I718 I3
I719 I3
I720 C12
I721 E2
I722 E2
I723 F2
I725 F6
I731 C14
I732 C14
I735 D14
I736 H6
L700 G3
L701 G3
L702 H3
L703 H3

Layout Servo Board (Top Side)



1100	C4	2578	C2	3498	A4	3709	A2
1600	C1	2579	C2	3499	A4	3710	A2
2100	C4	2580	E2	3500	D3	3711	A2
2102	C4	2581	C2	3503	D2	3712	A2
2103	C4	2600	A1	3504	C3	4100	C4
2104	B4	2601	A1	3515	C2	4106	D4
2105	C4	2602	A1	3516	C2	4107	D4
2106	D3	2603	A1	3517	C2	4108	C4
2108	E3	2604	B1	3519	C2	4109	C4
2206	C3	2605	D3	3520	C2	4110	C4
2207	C3	2607	E2	3522	E2	4111	C4
2209	C3	2609	E2	3524	D2	4112	C4
2211	C3	2612	E4	3527	C2	4400	B4
2212	C3	2614	D1	3529	C3	4402	A4
2217	C3	2616	E4	3530	C3	4403	B4
2219	C4	2621	A1	3534	D3	4404	B4
2220	C3	2622	A1	3547	C2	4405	B4
2300	B3	2623	E1	3548	D2	4406	B4
2301	B3	2624	E1	3550	C3	4407	B4
2306	B3	2625	E1	3551	C2	4410	B4
2307	B3	2626	E1	3574	C3	4411	B4
2309	B3	2651	D4	3575	C2	4413	C4
2310	B3	2652	E4	3576	C2	4416	B4
2400	C2	2653	E2	3577	C2	4417	B4
2405	A3	2654	E1	3578	D2	4422	C4
2407	D4	2655	E4	3580	D3	4502	C2
2409	C2	2659	D4	3581	D3	4519	D2
2411	A4	2660	E4	3582	E3	4520	D3
2412	A4	2661	A1	3586	D3	4525	C2
2413	A4	2700	D4	3587	D2	4604	C3
2415	A4	2701	E3	3588	D2	4605	C1
2416	A4	2702	B4	3589	D1	4610	A1
2417	A4	2703	C4	3592	D2	4611	A1
2418	B4	2704	E4	3593	D2	4700	D4
2419	A4	2705	D4	3594	D2	4701	B2
2420	B4	2706	E4	3595	D2	4702	B2
2431	D4	2707	A4	3596	D2	4703	B2
2444	A4	3104	C4	3597	D2	4704	B2
2445	A4	3110	D4	3600	B1	4705	B2
2500	C2	3111	D4	3601	B1	4706	B2
2501	C2	3112	D3	3602	A1	4707	B2
2502	C2	3113	D3	3603	A1	5101	C4
2503	D3	3114	D3	3604	B1	5103	C4
2509	C2	3115	D4	3605	A1	5201	C3
2511	D2	3116	D4	3606	B1	5204	C3
2512	C2	3117	C4	3607	B1	5300	B3
2514	E2	3118	D3	3608	B1	5301	B3
2515	E2	3207	C4	3609	B1	5400	A4
2516	D2	3208	C3	3610	B1	5501	D3
2517	D2	3214	C3	3611	B1	5502	D3
2518	D2	3215	C4	3612	B1	5504	E1
2519	C2	3216	C4	3613	B1	5602	B2
2520	C2	3301	B3	3614	B1	5603	E4
2521	C2	3304	B3	3615	B1	5607	E1
2522	C2	3305	B3	3619	B1	5615	E1
2523	D2	3306	B3	3620	B1	6401	A4
2524	D2	3308	B3	3621	C1	6603	D4
2525	D2	3309	B3	3622	C1	6604	E1
2526	D2	3401	C2	3623	C1	6606	E4
2527	D2	3403	E4	3624	C1	6607	B3
2528	D2	3406	E4	3625	C1	7101	D4
2529	C2	3409	C2	3626	C1	7102	D4
2530	D1	3411	A4	3627	C1	7103	D4
2531	D2	3418	A4	3628	C1	7104	D4
2533	C2	3420	A4	3629	C1	7105	E3
2534	C2	3421	A4	3630	C1	7502	D3
2536	C2	3422	A4	3631	C1		
2538	C2	3423	A4	3635	D1		
2540	C2	3425	A4	3639	D1		
2551	C3	3452	C4	3643	D1		
2552	C3	3453	C4	3647	D3		
2562	C2	3454	C4	3650	D1		
2563	D3	3471	B4	3651	C1		
2564	D3	3475	B4	3652	C1		
2565	D2	3476	B4	3653	C1		
2566	D2	3478	C4	3662	E4		
2567	D2	3479	C4	3665	A1		
2568	E2	3481	C4	3684	C1		
2569	E2	3485	C4	3689	B1		
2570	D1	3489	B4	3690	B1		
2571	E1	3490	B4	3702	A2		
2572	D3	3491	B4	3703	A2		
2573	E3	3493	A4	3704	A2		
2574	E3	3494	A4	3705	A2		
2575	E3	3495	A4	3706	A2		
2576	D3	3496	A4	3707	A2		
2577	C3	3497	A4	3708	A2		

Layout Servo Board (Bottom Side)



1302	B2	3303	B2	5406	B1		
1400	A1	3315	B2	5604	E1		
1401	A1	3316	B2	5609	D1		
1500	D2	3400	A1	5613	E1		
1700	A3	3404	D1	5614	D1		
1702	D1	3405	D1	5616	B1		
1703	A3	3407	A2	5617	A1		
1705	B1	3408	A1	6605	E4		
2101	C1	3410	A2	7107	B1		
2107	D1	3412	A1	7201	C2		
2110	B1	3440	C1	7300	B2		
2204	C2	3444	C1	7400	A2		
2205	C2	3445	C1	7401	D1		
2210	C2	3446	C1	7402	A1		
2213	C2	3447	C1	7405	C1		
2214	C2	3450	C1	7408	B1		
2215	C2	3451	C1	7409	C1		
2218	D2	3457	C1	7500	D3		
2221	C2	3460	C1	7503	E3		
2222	C2	3461	C1	7504	E3		
2223	C2	3462	C1	7505	E2		
2302	B2	3464	C1	7603	E1		
2303	B3	3472	B1	7604	D1		
2304	B3	3473	C1	7605	E1		
2305	B2	3474	C1	7606	A1		
2308	C2	3477	C1				
2311	B2	3480	C1				
2312	B2	3482	D1				
2401	D1	3483	C1				
2403	A1	3484	C1				
2406	D1	3486	C1				
2414	A1	3487	A2				
2421	D1	3488	A2				
2430	D1	3492	D1				
2432	B1	3501	B3				
2433	B1	3502	B3				
2434	C1	3507	C3				
2435	C1	3508	C3				
2436	B1	3509	C3				
2438	C1	3510	C3				
2440	C1	3511	C3				
2441	C1	3512	C3				
2442	A1	3513	C3				
2443	A1	3514	C3				
2504	C3	3528	C3				
2505	C3	3531	C2				
2506	C3	3532	C2				
2507	C3	3541	B3				
2550	C3	3542	C4				
2561	C3	3543	C4				
2608	D4	3545	B4				
2610	E1	3546	C4				
2611	E1	3560	C3				
2615	D1	3579	C3				
2617	E1	3583	D3				
2618	D1	3584	D3				
2650	E1	3585	D3				
2656	E1	3591	D3				
2657	E1	3598	E4				
2658	E1	3599	E4				
2662	B1	3648	D4				
2663	A1	3660	D1				
2664	A1	3661	D1				
2665	B1	3686	D1				
3100	B2	3691	E1				
3101	B2	3692	A1				
3103	C2	3693	A1				
3105	C2	3694	A1				
3106	C2	3713	A3				
3107	C2	3714	A3				
3108	D4	3715	A3				
3119	B1	3716	A3				
3120	B2	3717	A3				
3200	C2	3718	A2				
3201	C2	3719	A3				
3202	C2	4105	B2				
3203	C2	4200	B2				
3204	C2	4201	C1				
3205	C2	4303	B2				
3206	C2	4415	B1				
3209	D2	4419	C1				
3210	D2	4427	C1				
3211	C2	4601	B4				
3212	C2	4612	E1				
3213	D2	5102	B1				
3217	D2	5104	B1				
3300	B2	5202	C2				
3302	C2	5405	D1				

8. Alignments

In case of a change of DVD-M or PWB a readjustment is necessary to align the OPU and PWB to each other.

8.1 Necessary Tools

- Personal computer with Windows 2000™ or Windows XP™
- USB to ATAPI adapter, (standard computer equippment) see figure 8-1.
- "Applicator software" (v2.85.00).

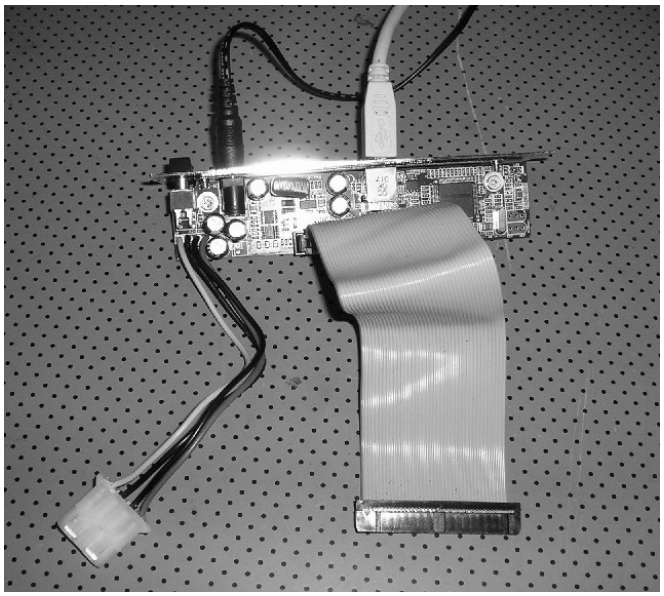


Figure 8-1 , USB to ATAPI adapter

8.2 Adjustment Procedure

- Connect the basic engine to the USB to ATAPI adapter
- Power on the adapter
- Connect the USB connector of the adapter to the PC.

  Note that the USB bus supports "Hot Plugging". That means the computer can already be switched on. Alternatively you can connect the basic engine directly to the IDE bus of a computer. In this case the adapter is not necessary but the PC has to be switched off and must be started up in order to detect the new drive on the IDE bus.

- Call up the applicator software, see figure 8-2
- Set the timeout to 50 seconds, see figure 8-3
- Run the "Adjust Laser Control" command, see figure 8-4.
- The "Status" indicator in the left section of the window has to become green after successful adjustment.

After repairing the drive it should be tested at least with the following discs:

1. LVP 12.01 (710409991731) test layer change on track 28 ->31
2. DVD+R disc. Use Disc type Ricoh 4X DVD+R

- Record 1 minute
- press stop
- Open / close
- Play back recorded track

3. CD-RW low reflection audio disc. (7104 099 96581)

Figure 8-2 , Applicator Software

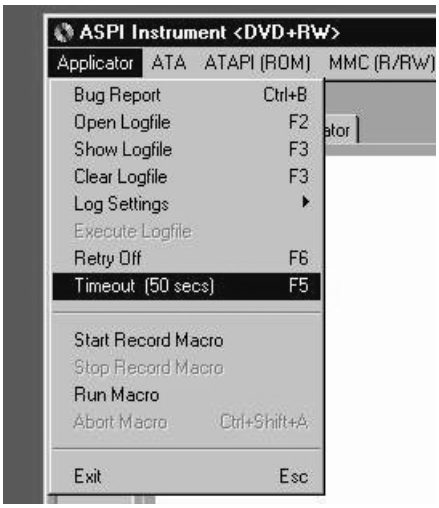


Figure 8-3 , Set Timeout

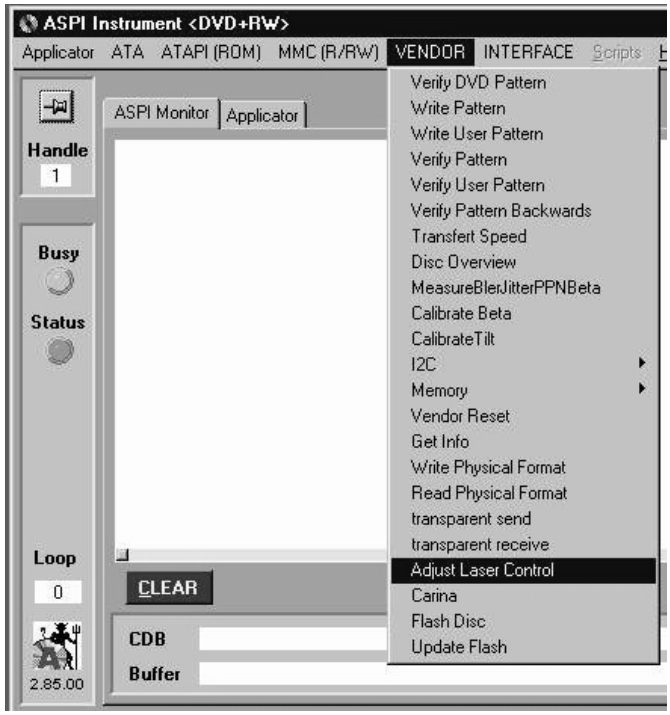


Figure 8-4 , Run Adjust Laser Control

9. Circuit Descriptions, Abbreviation List, and Datasheets

9.1 General

The VAD8031 module, also known as “AV3”, is a Video Recorder Drive with an IDE interface intended for use in a consumer DVD+RW/+R video recorder.
The video recorder engine performs all basic servo tasks. It reads data from and writes data to the disc and controls all functions like tray control, start/stop the disc, tracking, jumping and communicating to the host.

Mechanically, the module consists of a motorized tray loader that contains the dual laser optical pickup unit and a PCBA that contains all the electronics needed to control the drive and interfacing to the MPEG encoder/decoder back-end application.
There is a temperature sensor included in the drive that prevents malfunction or destruction of the drive in case the temperature inside the drive gets too high.

9.2 Overall Block Diagram

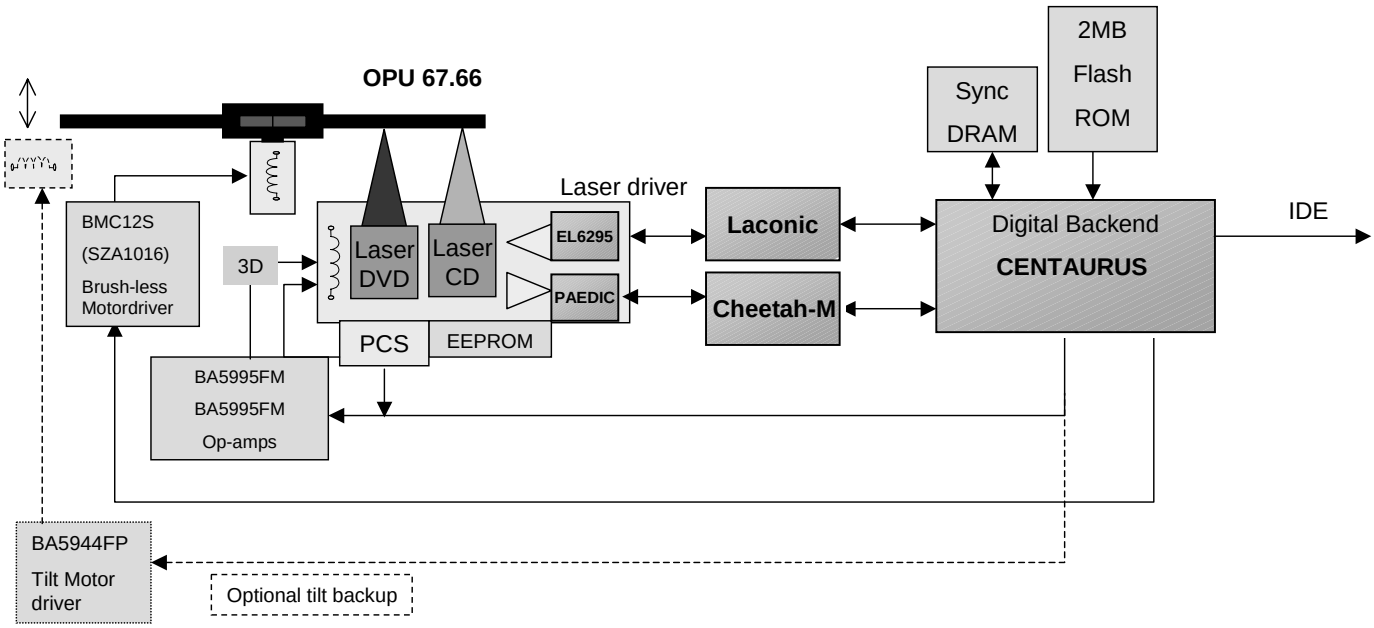


Figure 9-1 Block diagram

This section describes briefly the functional behaviour of the engine. It performs all basic servo functions:

- It reads data from the disc,
- It writes data to the disc,
- It controls all other functions like tray control, start/stop the disc, tracking, jumping, and communication to the host.

9.3 Centaurus

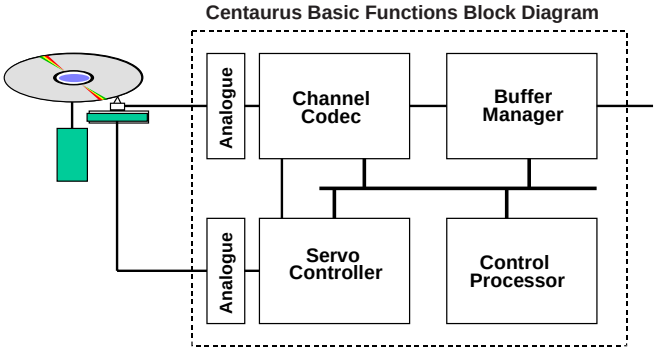


Figure 9-2

The Centaurus, IC7500 is a highly integrated IC that controls all the functions of the drive. It interfaces via the IDE to the MPEG back-end and incorporates the following functions:

- CD/DVD channel decoder/encoder
- CD/DVD data block decoder/encoder
- Buffer Manager
- Digital Servo processor using digital signal processor.
- Drive System microprocessor based on MIPS core.

The MIPS microcontroller uses Flash ROM for the firmware and SRAM to execute the program. SDRAM is provided for the encoding/decoding function block of centaurus. 2 MBytes of data buffer size is available inside the IC for data storage.

9.4 Cheetah

The Cheetah, IC7201 is an analogue pre-processing for the diode signals coming from the OPU. It contains an amplifier with programmable gain that amplifies the RF signal to adapt the output for the different reflectivity of the various discs. The tracking signals are filtered and normalized. In addition the IC contains a timing circuit for the sample and hold circuits and for switching the various blocks between read and write.
Supporting functions such as laser control and offset control are incorporated. Communication to and from the IC is based on a fast two-wire serial bus that works according to the I2C interface protocol.

9.5 Laconic

The main function of the LACONIC, IC7300 is to control the laser power. The IC forms a closed control loop in combination with the Elantec located on the OPU. It compensates aging and temperature of the laser. Furthermore it forms a fingerprint correction loop. It also acts as bridge between IIC and serial bus of the Elantec laser driver on the OPU.

9.6 Optical Pick-up Unit

The OPU66 is a dual laser Optical Pick-up Unit for DVD+RW/+R. It consists of a 3-D actuator for focusing, redial tracking and tilt correction.

- 650nm laser for DVD
- 780nm laser for CD

On the interconnecting flex several electrical components are mounted.

- Elantec — programmable laser diode power driver
- Paedic — integrated photo detector with programmable gain pre-amplifier
- Eeprom — containing a number of values representing adjustments belonging to the OPU.

The laser control and diode signal processor ICs together with an EEPROM are mounted on the OPU flex.
The laser control IC generates the DVD laser read and writing signals needed for reading DVD discs and writing DVD+RW / +R discs (write strategies of DVD+RW / +R discs).
The diode signal processor is an analogue pre-processor adapted for the CD and CD-R / RW read function.
The EEPROM contains information about writing current, writing strategies and other parameters belonging to the OPU.

9.7 Motor and Servo drivers

A Servo Driver is implemented to control the sledge. Several motor driver ICs are incorporated to control the Tray, Disc and Turntable motors,

Driver ICs are incorporated for control of the:

- Actuator
- Disc Motor
- Sledge Motor
- Tray Motor

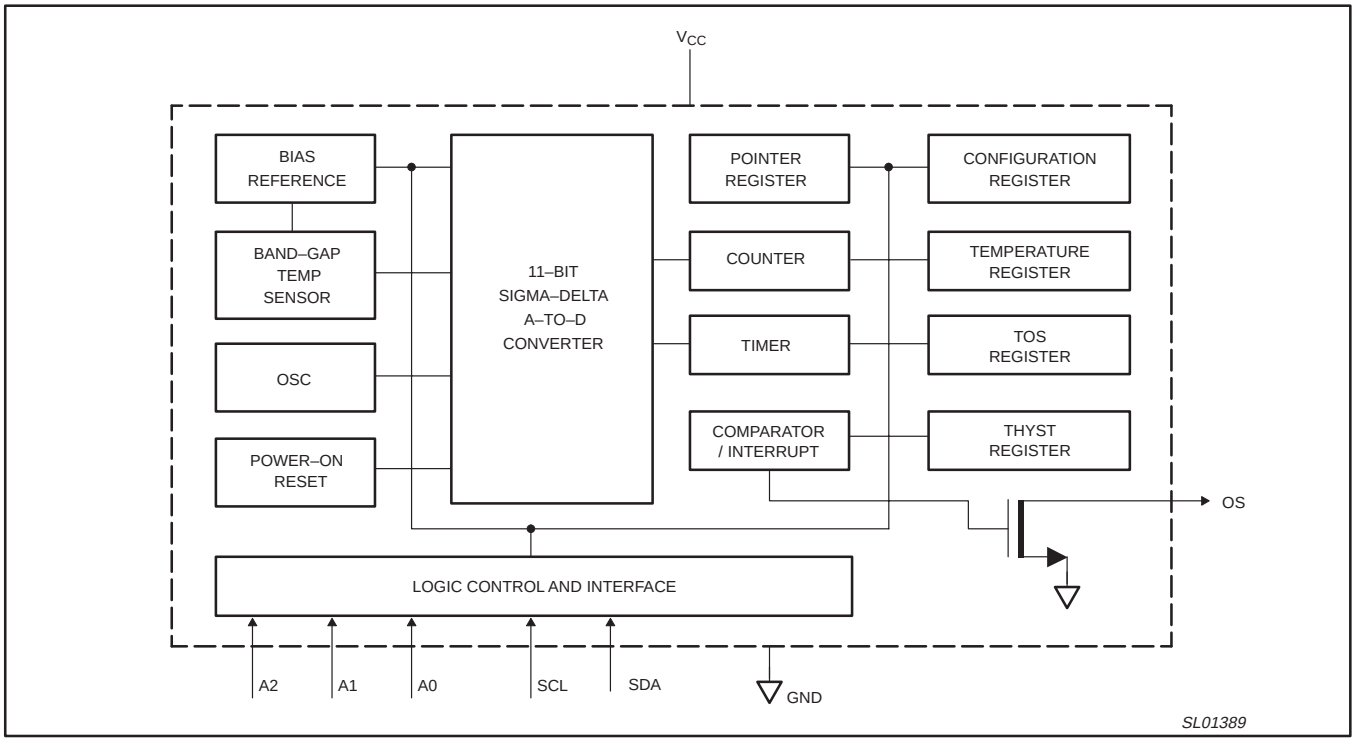
9.8 ICs Servo Board

IC7105, LM75A: Servo Board, Temperature Sensor

Pin description

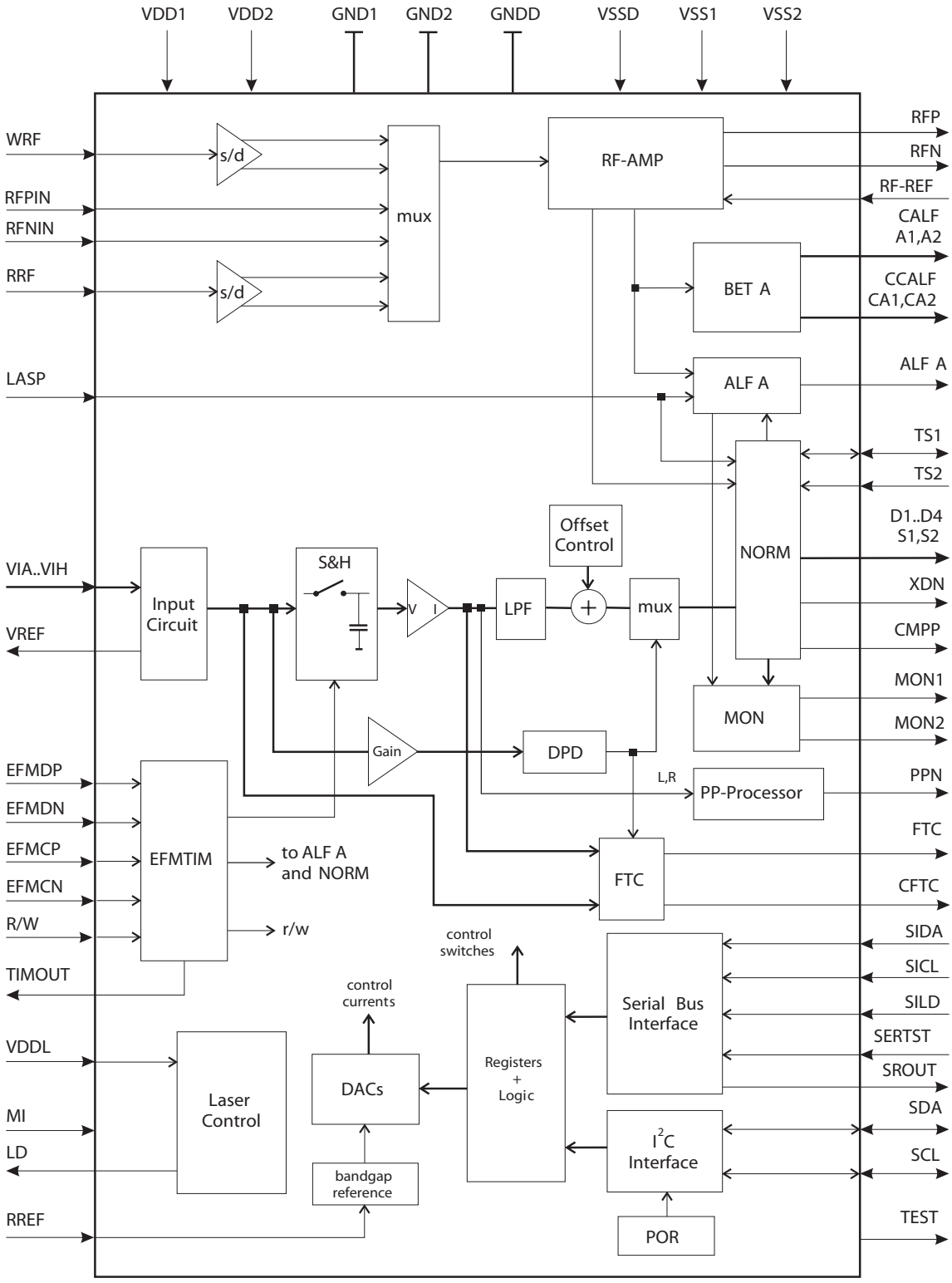
PIN	SYMBOL	DESCRIPTION
1	SDA	Digital I/O. I^2C serial bi-directional data line. Open Drain.
2	SCL	Digital input. I^2C serial clock input.
3	OS	Overtemp Shutdown output. Open Drain.
4	GND	Ground. To be connected to the system ground.
5	A2	Digital input. User-defined address bit2.
6	A1	Digital input. User-defined address bit1.
7	A0	Digital input. User-defined address bit0.
8	V_{CC}	Power supply.

SIMPLIFIED BLOCK DIAGRAM



IC7201, TZA1039HL: Servo Board, Analogue Preprocessor

BLOCK DIAGRAM



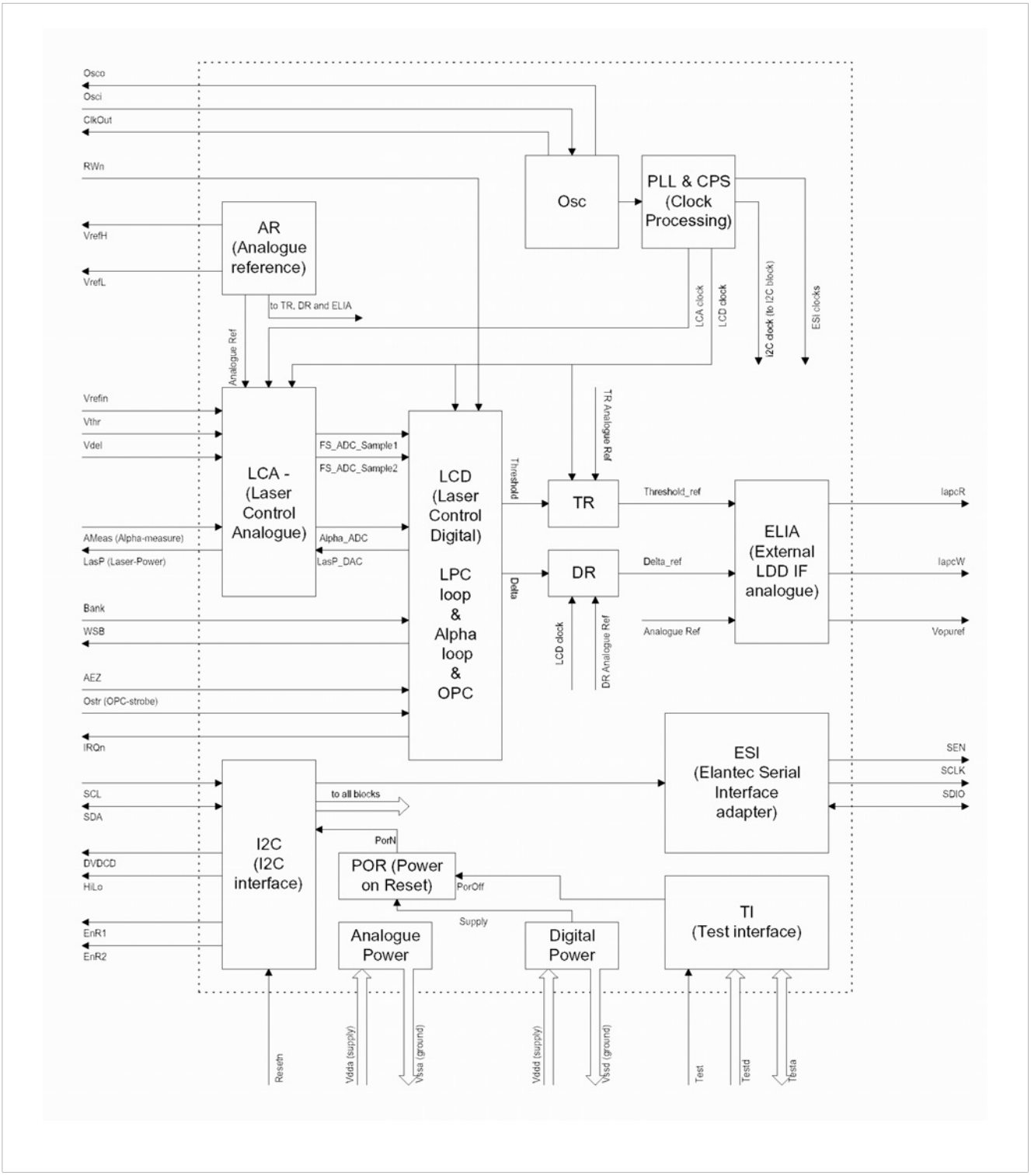
PINNING

SYMBOL	PIN	DESCRIPTION
VIH	1	Satelite segment H input
GND1	2	Ground
VIC	3	Central segment C input
VIB	4	Central segment B input
GND1	5	Ground
RFNIN	6	Inverse differential RF input
RFPIN	7	Differential RF input
VDD1	8	Positive supply
VID	9	Central segment D input
VIA	10	Central segment A input
VDD1	11	Positive supply
VIE	12	Satelite segment E input
VIG	13	Satelite segment G input
R/W	14	External Read/Write signal input
N.C.	15	Not connected
N.C.	16	Not connected
N.C.	17	Not connected
TIMOUT	18	EFMTIM test output
VSSD	19	Negative supply
EFMCN	20	Inverse EFM clock input
EFMCP	21	EFM clock input
EFMDN	22	Inverse EFM data input
EFMDP	23	EFM data input
GNDD	24	Ground
SDA	25	Data input/output I2C
SCL	26	Clock input I2C
N.C.	27	Not connected
FTC	28	FTC output
CFTC	29	FTC high pass lter capacitor
TS2	30	Tilt sensor input current
TS1	31	Tilt sensor input current
SILD	32	Strobe line of serial bus interface
N.C.	33	Not connected
SIDA	34	Data line of serial bus interface
SICL	35	Clock line of serial bus interface
VDD2	36	Positive supply voltage
GND2	37	Supply ground
RFP	38	RF output voltage, positive
RFN	39	RF output voltage, negative
VSS2	40	Negative supply voltage
RFREF	41	Reference voltage for differential RF output common mode level
PPNO	42	Output PP voltage

SYMBOL	PIN	DESCRIPTION
N.C.	43	Not connected
N.C.	44	Not connected
SERTST	45	Enable test mode (Tie to GND for normal operation)
VSSD	46	Negative supply voltage
GNDD	47	Supply ground
CA1	48	Beta circuit external capacitor
CA2	49	Beta circuit external capacitor
CCALF	50	Beta circuit external capacitor
VSS1	51	Negative supply voltage
RREF	52	Reference resistor to VSS
GND1	53	Supply ground
CMPP	54	MPP external capacitor
VDD1	55	Positive supply
MON1	56	Monitor output voltage
MON2	57	Monitor output voltage
S2	58	Servo output current
S1	59	Servo output current
D4	60	Servo output current
D3	61	Servo output current
D2	62	Servo output current
D1	63	Servo output current
XDN	64	X-position output voltage
CALF	65	RF average level signal
A2	66	RF bottom level signal
A1	67	RF top level signal
SROUT	68	shift register output for register test mode
ALFA	69	alfa output current
LASP	70	laser power setpoint signal
TEST	71	Test output
N.C.	72	Not connected
MI	73	Monitor input for laser
LD	74	Drive current for laser
VDDL	75	Laser supply voltage
RRF	76	Single-ended RF read input
WRF	77	Single-ended RF writeinput
VSS1	78	Negative supply
VREF	79	PDIC reference voltage output
VIF	80	Satelite segment F input

IC7300, TZA1042: Servo Baord, Laser Power Controller

Block diagram



Pin description

Symbol	Pin	Type	Drive /Thr.	Description
AEZ	1	I hy pd	T	Alpha Error Zero/Alpha Set Zero
V_{DDD3}	2	P	-	Digital Pad Supply
V_{SSD3}	3	P	-	Digital Pad Supply
CLOCKOUT	4	T	M	Buffered Oscillator Output
OSCO	5	AO	A	Output of inverting Amplifier that forms oscillator
OSCI	6	AI	A	Input of inverting Amplifier that forms oscillator
TEST1D	7	I pd	T	Test pin
AMEAS	8	AI	A	Alpha Measure – value of measured disk writing quality
V_{DDA1}	9	P	-	Analogue Supply
V_{SSA1}	10	P	-	Analogue Supply
LASP	11	AO	A	Laser Power – indicates power level
VREFL	12	AO	A	Bandgap Voltage Reference ground connection
VREFH	13	AO	A	Bandgap Voltage Reference output
VDEL	14	AI	A	Voltage input for Delta “laser power”
VTHR	15	AI	A	Voltage input for Threshold “laser power”
VOPUREF	16	AO	A	Reference Voltage for OPU
VREFIN	17	AI	A	Input Reference Voltage for Vthr and Vdel
V_{DDA2}	18	P	-	Analogue Supply
V_{SSA2}	19	P	-	Analogue Supply
TEST1A	20	AB	A	Test pin
IAPCW	21	AO	A	Current Output of Delta Reference
IAPCR	22	AO	A	Current Output of Threshold Reference
TEST2A	23	AB	A	Test pin
ENR2	24	T	M	Programmable Output Flag
ENR1	25	B pd	M/T	Device Initialisation/Programmable Output Flag (must be driven to VDD during reset)
DVDCD	26	T	M	Programmable Output Flag for indicating DVD/CD mode
HILO	27	T	M	Programmable Output Flag for indicating High/Low reflectivity
V_{SSD1}	28	P	-	Digital Pad Supply
V_{DDD1}	29	P	-	Digital Pad Supply
BUSY	30	B	M/T	Busy Enable input from Elantec / Board test IO
SEN	31	B	M/T	Serial Enable output to Elantec / Board test IO
SDIO	32	B	M/T	Serial data input output from/to Elantec / Board test IO
SCLK	33	B	M/T	Busy Enable input from Elantec / Board test IO
WSB	34	B	M/T	Write Strategy Bank – output controls OPU write switching / Board test IO

Pin description…*continued*

Symbol	Pin	Type	Drive /Thr.	Description
IRQN	35	OD	M	Interrupt Request Not – active low interrupt request
OSTR	36	I hy pd	T	OPC Strobe – request step in alpha setpoint / Board test input
RESETN	37	I hy pd	T	Reset Not – active low reset input
RWN	38	B	M/T	Read/Write not – indicates power setpoints/Board test IO
V_{SSD2}	39	P	-	Digital Core Supply
V_{DDD2}	40	P	-	Digital Core Supply
BANK	41	I hy pd	T	CAV setpoint switching input signal / Board test IO
TEST2D	42	I pd	T	Test pin
SDA	43	BOD	M/T	I^2C Serial Data
SCL	44	I	T	I^2C Serial Clock

[1] All supply pins must be connected to the same external power supply voltage

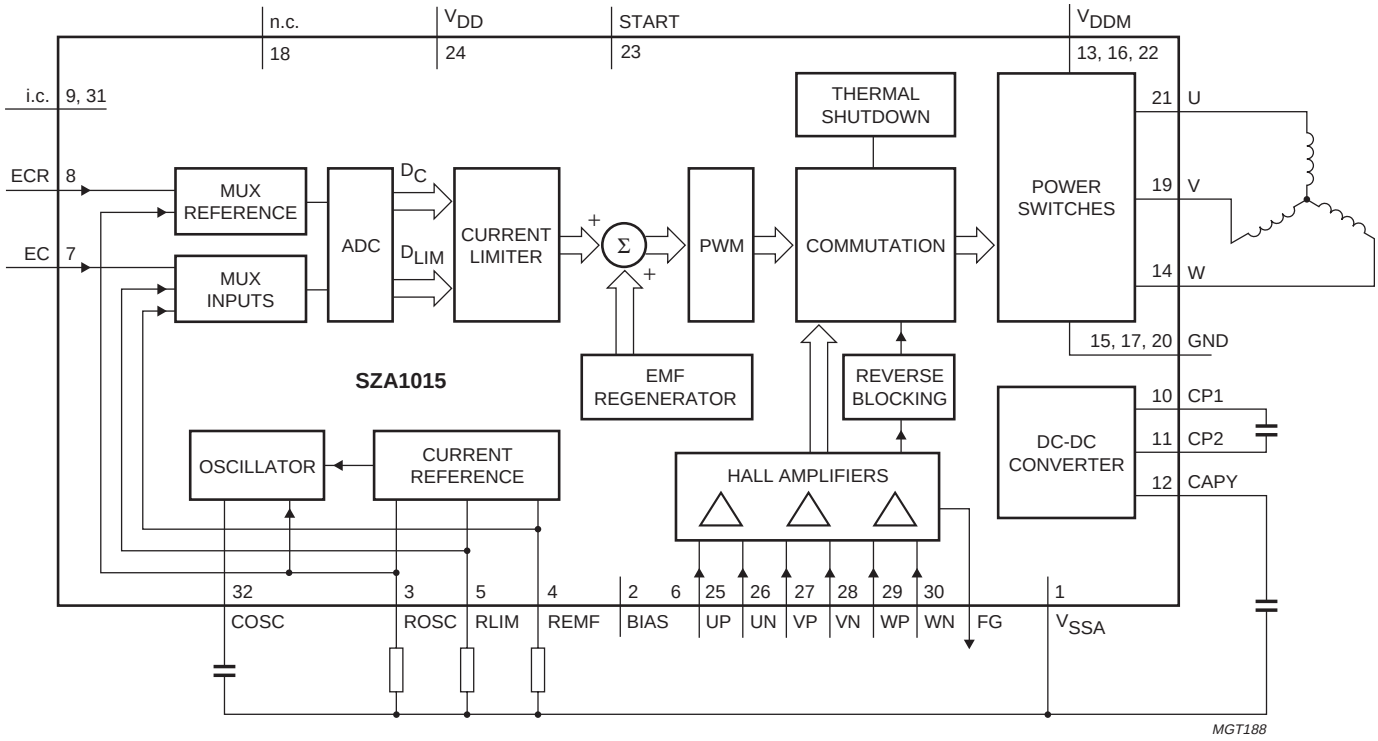
[2] All inputs are 5V tolerant – i.e. they will drive the supply voltage (3.0-3.6V), but will work correctly when interface to a 5V drive device

[3] The pin type definition is given below:

PinType Definition Table

Type	Definition
I	input
O	output
OD	open drain
B	bi-directional
BOD	bi-directional open drain
T	tri-state output
AI	analog input
AO	analog output
AB	analog bi-directional
P	power connection
hy	hysteresis on input
pd	hysteresis on output

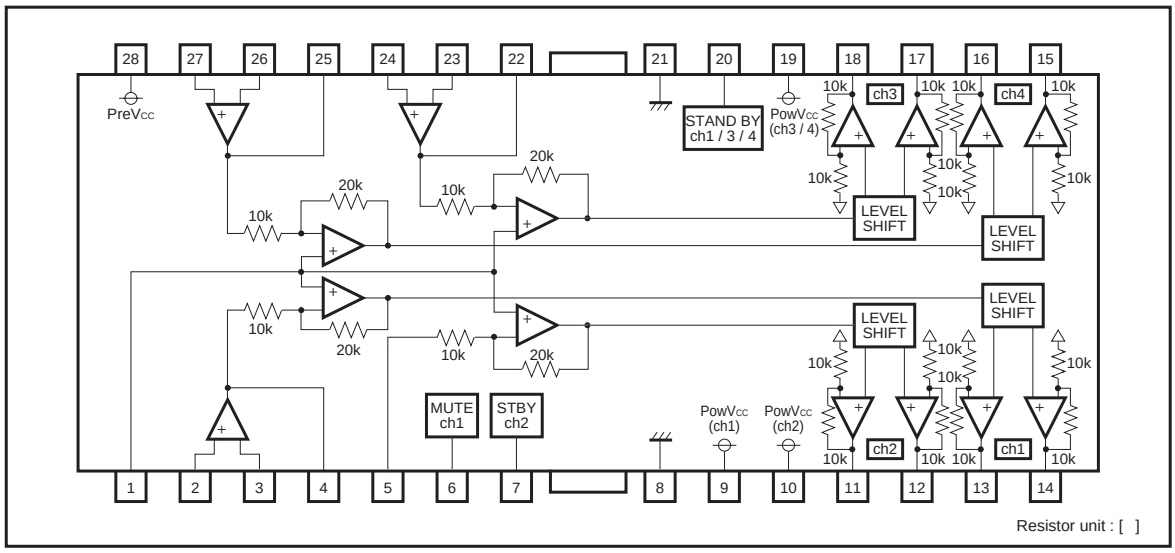
IC7402, SZA1015: Servo Board, Brushless Motor Controller



PINNING

SYMBOL	PIN	DESCRIPTION
V_{SSA}	1	motor control ground supply
BIAS	2	Hall element bias
ROSC	3	external resistor for internal oscillator
REMF	4	external resistor for EMF regeneration
RLIM	5	external resistor for current limiting
FG	6	frequency generator output
EC	7	output current control pin
ECR	8	output current control reference voltage pin
i.c.	9	internally connected (leave open-circuit)
CP1	10	booster capacitor connection 1
CP2	11	booster capacitor connection 2
CAPY	12	booster output
V_{DDM}	13	motor supply voltage
W	14	motor terminal W
GND	15	ground supply
V_{DDM}	16	motor supply voltage
GND	17	ground supply
n.c.	18	not connected
V	19	motor terminal V
GND	20	ground supply
U	21	motor terminal U
V_{DDM}	22	motor supply voltage
START	23	start/stop control pin
V_{DD}	24	system supply voltage
UP	25	positive Hall input U
UN	26	negative Hall input U
VP	27	positive Hall input V
VN	28	negative Hall input V
WP	29	positive Hall input W
WN	30	negative Hall input W
i.c.	31	internally connected (leave open-circuit)
COSC	32	external capacitor for internal oscillator

IC7408,7409 BA5995: Servo Board, 4-channel BTL driver
IC actuator and motor drive



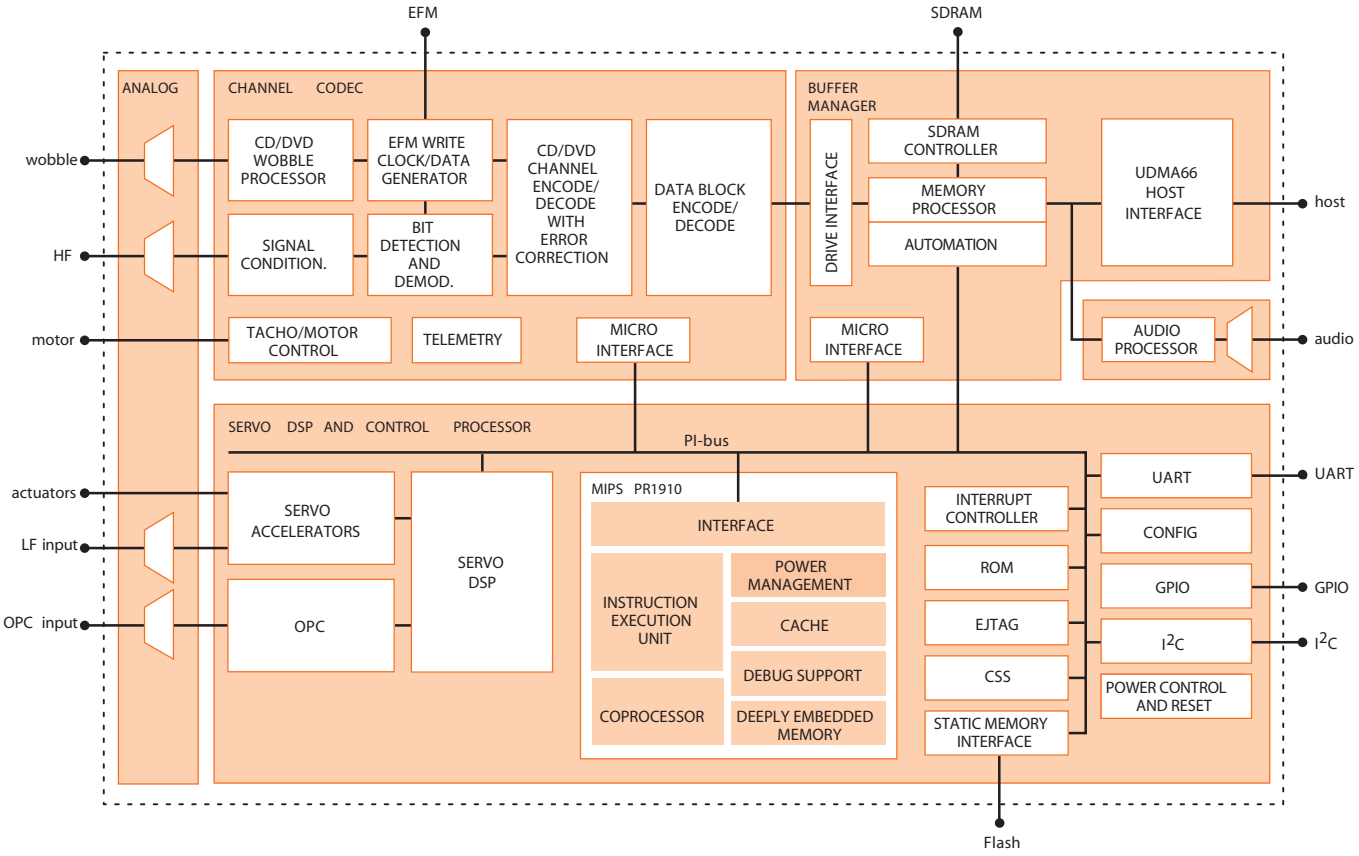
Pin No.	Pin name	Function
1	BIAS IN	Input for bias-amplifier
2	OPIN1 (+)	Non inverting input for CH1 OP-AMP
3	OPIN1 ( )	Inverting input for CH1 OP-AMP
4	OPOUT1	Output for CH1 OP-AMP
5	IN2	Input for CH2
6	MUTE	Input for CH1 mute control
7	STBY2	Input for CH2 stand by control
8	GND	Substrate ground
9	PowVcc1	Vcc for CH1 power block
10	PowVcc2	Vcc for CH2 power block
11	V_{O2} ( )	Inverted output of CH2
12	V_{O2} (+)	Non inverted output of CH2
13	V_{O1} ( )	Inverted output of CH1
14	V_{O1} (+)	Non inverted output of CH1

Note) Symbol of + and (output of drivers) means polarity to input pin.
(For example if voltage of pin4 high, pin14 is high.)

Pin No.	Pin name	Function
15	V_{O4} (+)	Non inverted output of CH4
16	V_{O4} ( )	Inverted output of CH4
17	V_{O3} (+)	Non inverted output of CH3
18	V_{O3} ( )	Inverted output of CH3
19	PowVcc3	Vcc for CH3/4 power block
20	STBY1	Input for CH1/3/4 stand by control
21	GND	Substrate ground
22	OPOUT3	Output for CH3 OP-AMP
23	OPIN3 ( )	Inverting input for CH3 OP-AMP
24	OPIN3 (+)	Non inverting input for CH3 OP-AMP
25	OPOUT4	Output for CH4 OP-AMP
26	OPIN4 ( )	Inverting input for CH4 OP-AMP
27	OPIN4 (+)	Non inverting input for CH4 OP-AMP
28	PreVcc	Vcc for pre block

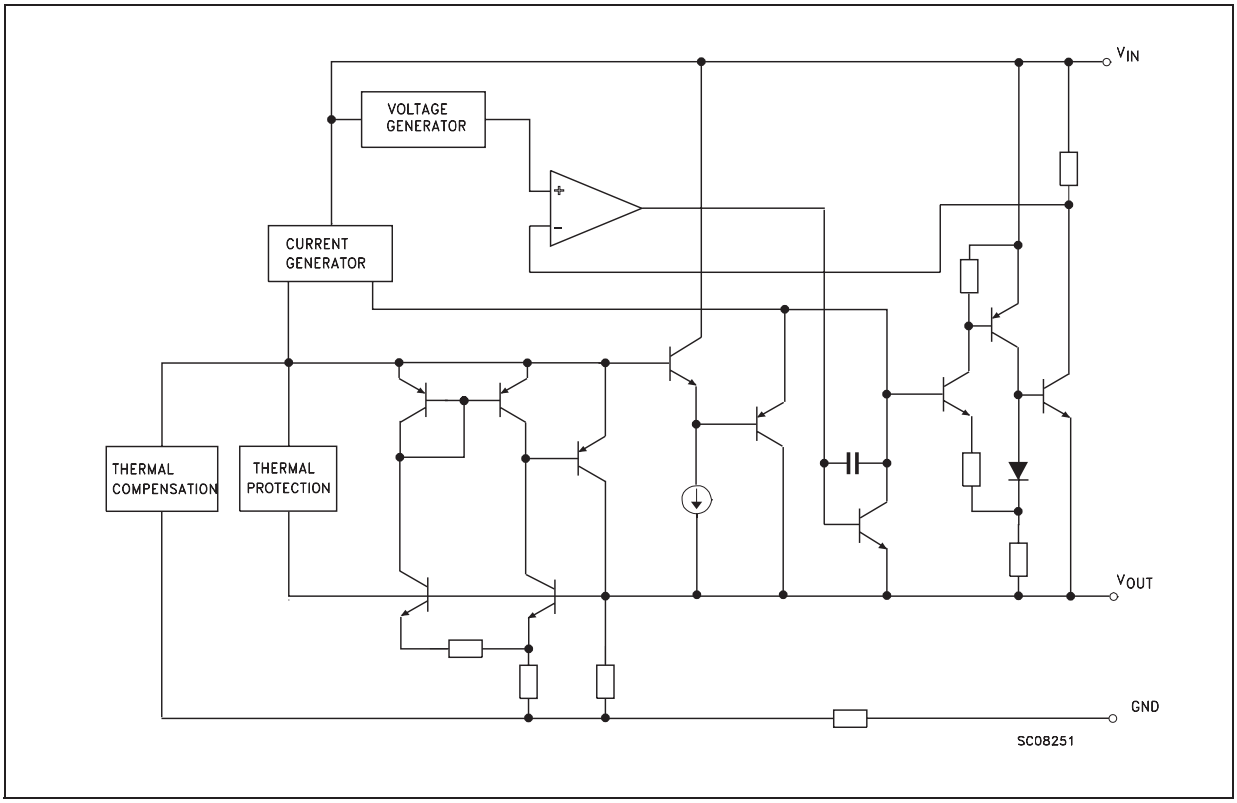
IC7500, PNX7850: Servo Board, Channel Codec/Buffer Manager/Servo Processor and Controller

Nexperia PNX7850 conceptual block diagram



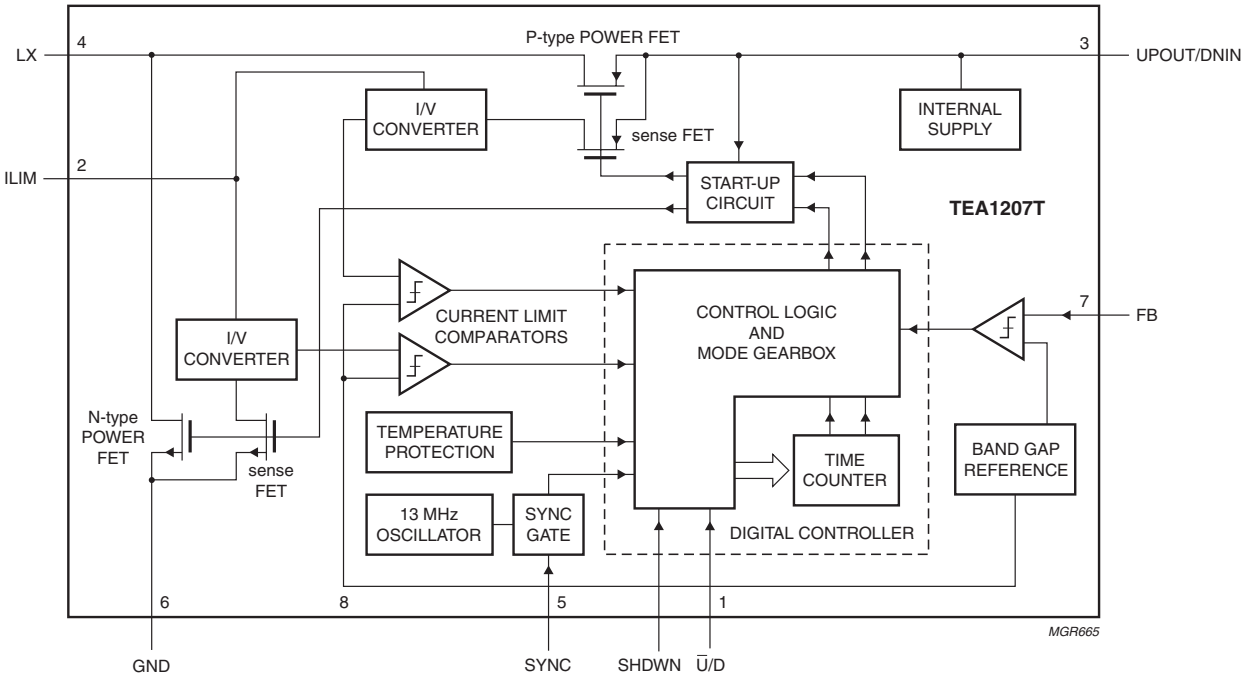
IC7603, LD1117: Servo Board, Voltage Regulator

BLOCK DIAGRAM



IC7604, TEA1207: Servo Board, DC/DC Converter

Block diagrama

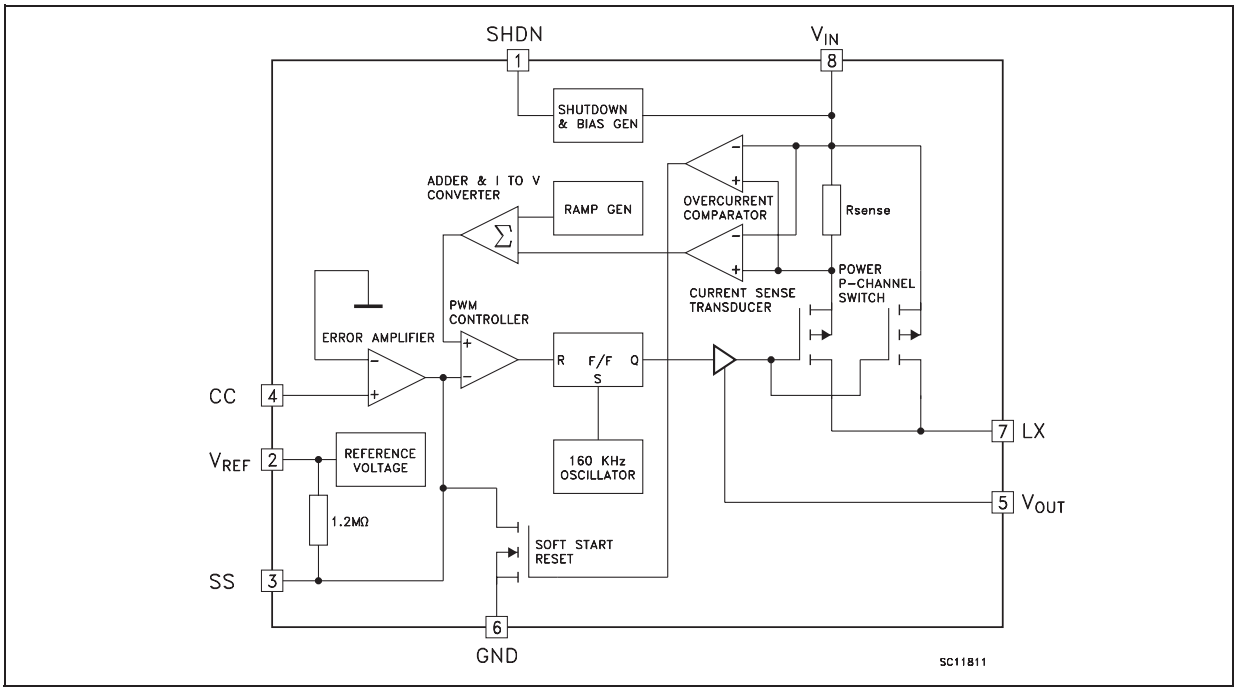


PINNING

SYMBOL	PIN	DESCRIPTION
$\overline{U}$/D	1	up-or-down mode selection input; active LOW for up mode
ILIM	2	current limiting resistor connection
UPOUT/DNIN	3	output voltage in up mode; input voltage in down mode
LX	4	inductor connection
SYNC	5	synchronization clock input
GND	6	ground
FB	7	feedback input
SHDWN	8	shut-down input

IC7605, ST735: Servo Board, -5V Inverting PWM Regulator

SCHEMATIC DIAGRAM



PIN DESCRIPTION

Pin N°	Symbol	Name and Function
1	SHDN	SHUT-DOWN Control (V_{CC}=ON GND=Shutdown
2	V_{REF}	Reference Output Voltage
3	SS	Soft Start
4	CC	Compensation Input
5	V_{OUT}	Negative Output Voltage
6	GND	Ground
7	LX	Switch Output
8	V_{IN}	Positive Supply - Voltage Input

IC7606, L5970: Servo Board, Step Down Switching Regulator

PINS FUNCTION

N.	Name	Description
1	OUT	Regulator Output.
2	SYNC	Master/slave synchronization.
3	INH	A logical signal (active high) disables the device. If INH not used the pin must be grounded. When it is open an internal pull-up disable the device.
4	COMP	E/A output for frequency compensation.
5	FB	Feedback input. Connecting directly to this pin results in an output voltage of 1.23V. An external resistive divider is required for higher output voltages.
6	V_{REF}	3.3V V_{REF}. No cap is requested for stability.
7	GND	Ground.
8	V_{CC}	Unregulated DC input voltage.

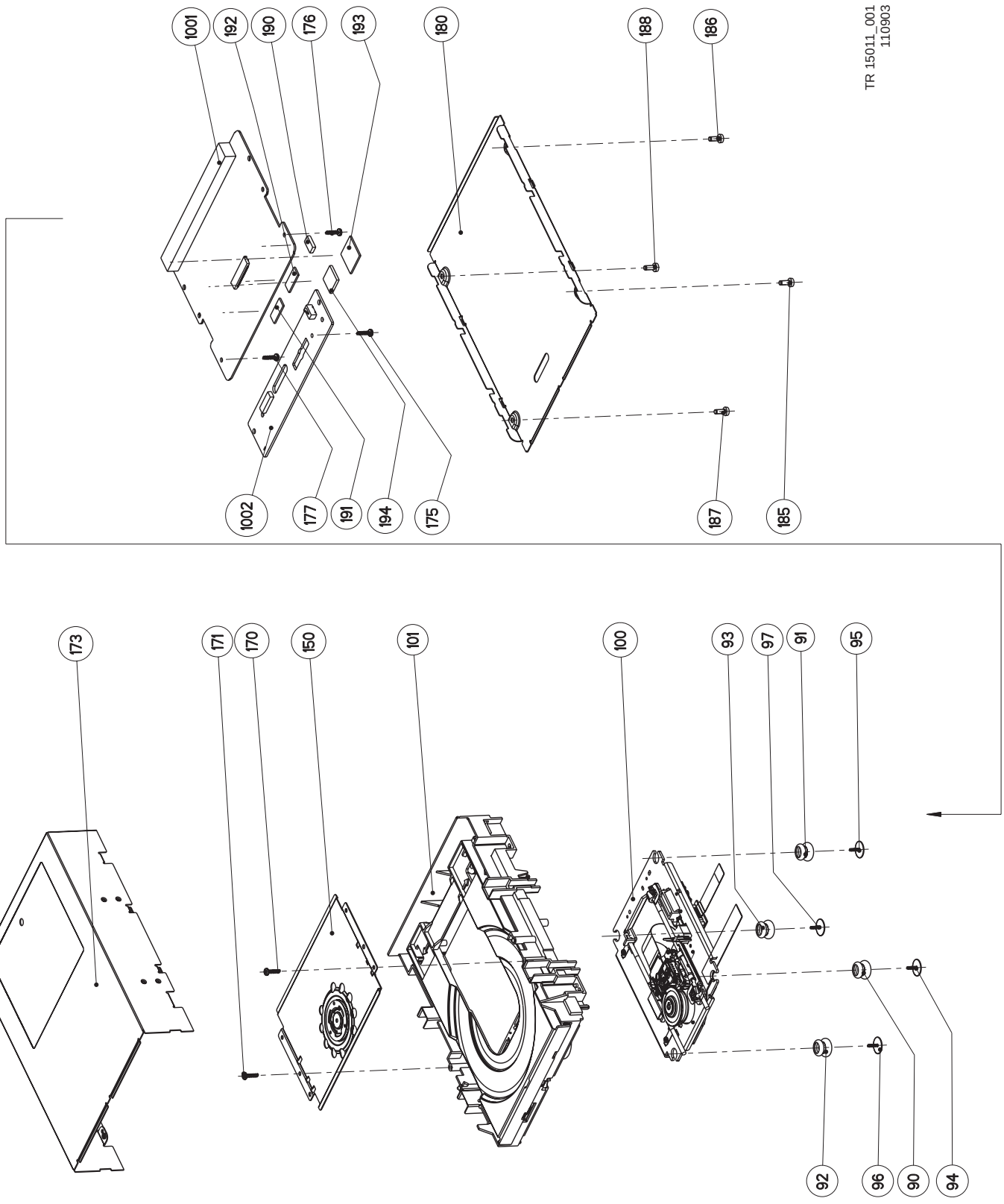
9.9 Abbreviation list

ADC ..... Analogue to Digital Converter
ADIP ..... Address In Pre-groove
AGC ..... Automatic Gain Control
CD ..... Compact Disc
CLV ..... Constant Linear Velocity
DROPPI ..... Dvd Rewritable Opu Pre-Processor IC
AM ..... Amplitude Modulation
BE ..... Basic Engine
ComPair ..... Computer aided rePair
CD-DA ..... CD Digital Audio
CS ..... Chip Select
DAC ..... Digital to Analogue Converter
DAIO ..... Digital Audio Input Output
DENC ..... Digital Encoder
DFU ..... Direction For Use: description for the end user
DNR ..... Dynamic Noise Reduction
DRAM ..... Dynamic RAM
DSD ..... Direct Stream Digital
DSP ..... Digital Signal Processing
DVD ..... Digital Versatile Disc
EEPROM ..... Electrical Erasable Programmable ROM
EFM ..... Eight to Fourteen bit Modulation
FDS ..... Full Diagnostic Software
HF ..... High Frequency
I2C ..... Integrated Ic bus (signals at 5V level)
I2S ..... Integrated Ic Sound bus (signals at 3.3V level)
IC ..... Integrated Circuit
IF ..... Intermediate Frequency
IRQ ..... Interrupt ReQuest
LADIC ..... LAser Driver IC
LLD ..... Loss Less Decoder
LPCM ..... Linear Pulse Code Modulation
LRCLK ..... Left/Right CLocK
MACE ..... Mini All Cd Engine
MPEG ..... Motion Pictures Experts Group
NC ..... Not Connected
NVM ..... Non Volatile Memory: IC containing DVD related data e.g. alignments
OPC ..... Optimum Power Calibration
OPU ..... Optical Pickup Unit
PCB ..... Printed Circuit Board (see PWB)
PCS ..... Position Control Sledge
PLL ..... Phase Locked Loop
PCM ..... Pulse Code Modulation
PCM_CLK ..... Audio system clock for DAC
PCM_OUTx ..... Audio serial output data
PSU ..... Power Supply Unit
PWB ..... Printed Wiring Board (see PCB)
RAM ..... Random Access Memory
RGB ..... Red, Green and Blue colour space
ROM ..... Read Only Memory
RF ..... Radio Frequency
S2B ..... Serial to Basic engine, communication bus between host- and servo processor
SCL ..... Serial Clock I2C
SCLK ..... Audio serial bit clock
SDA ..... Serial Data I2C
SDRAM ..... Synchronous DRAM
SMC ..... Surface Mounted Components
S/PDIF ..... Sony Philips Digital InterFace
SPIDRE ..... Signal Processing Ic for Dvd R Ewritable
SRAM ..... Static Random Access Memory
STBY ..... STandBY
SVCD ..... Super Video CD
SW ..... SoftWare
THD ..... Total Harmonic Distortion
TTL ..... Transistor Transistor Logic (5V logic)
uP ..... Microprocessor
VCD ..... Video CD
Y/C ..... Luminance (Y) and Chrominance (C) signal
YUV ..... Component video

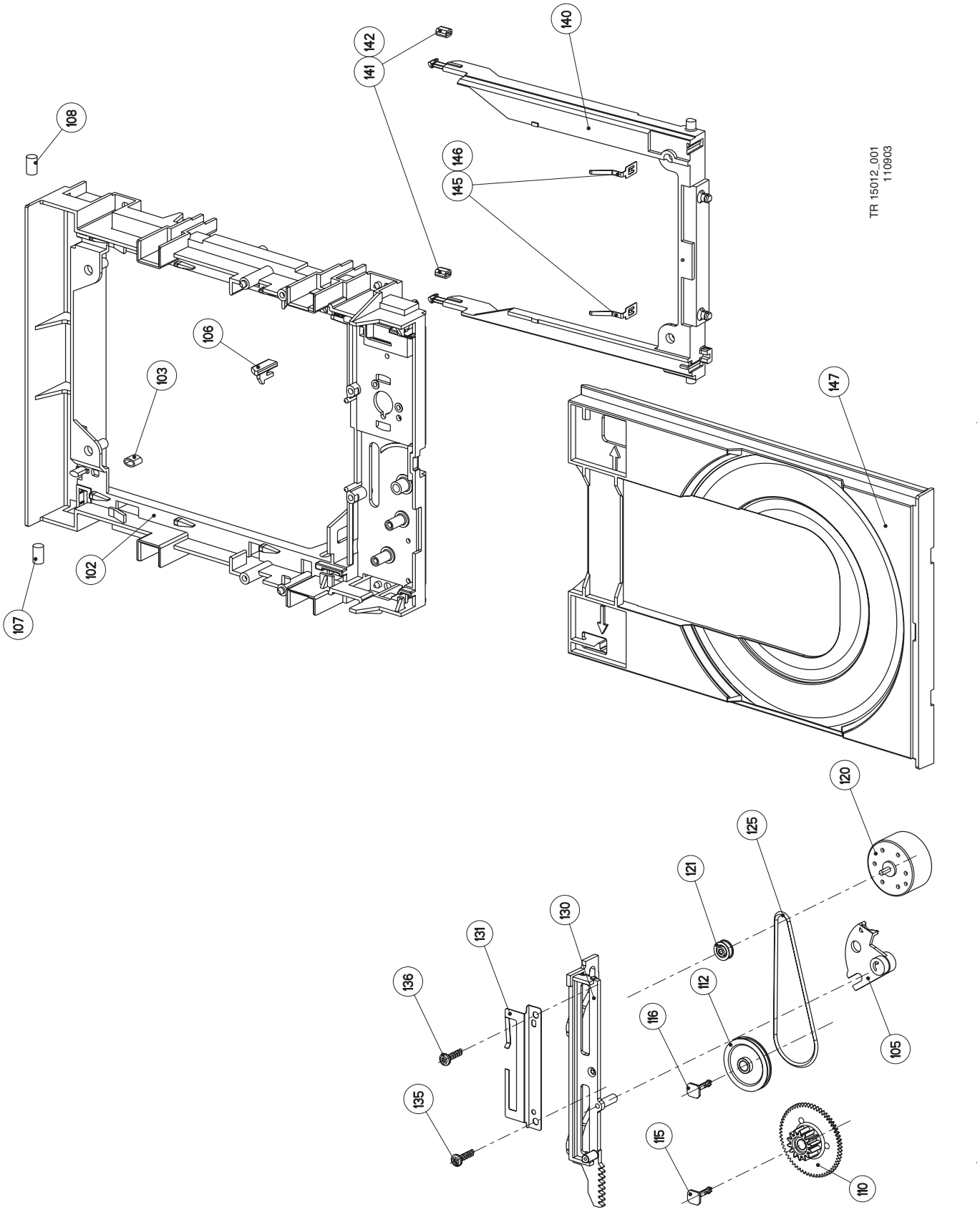
10. Spare Parts List

10.1 Exploded Views

Basic Engine



Loader


140
142
141
108
146
145
TR 15012_001
110903
106
103
147
102
107
120
125
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131
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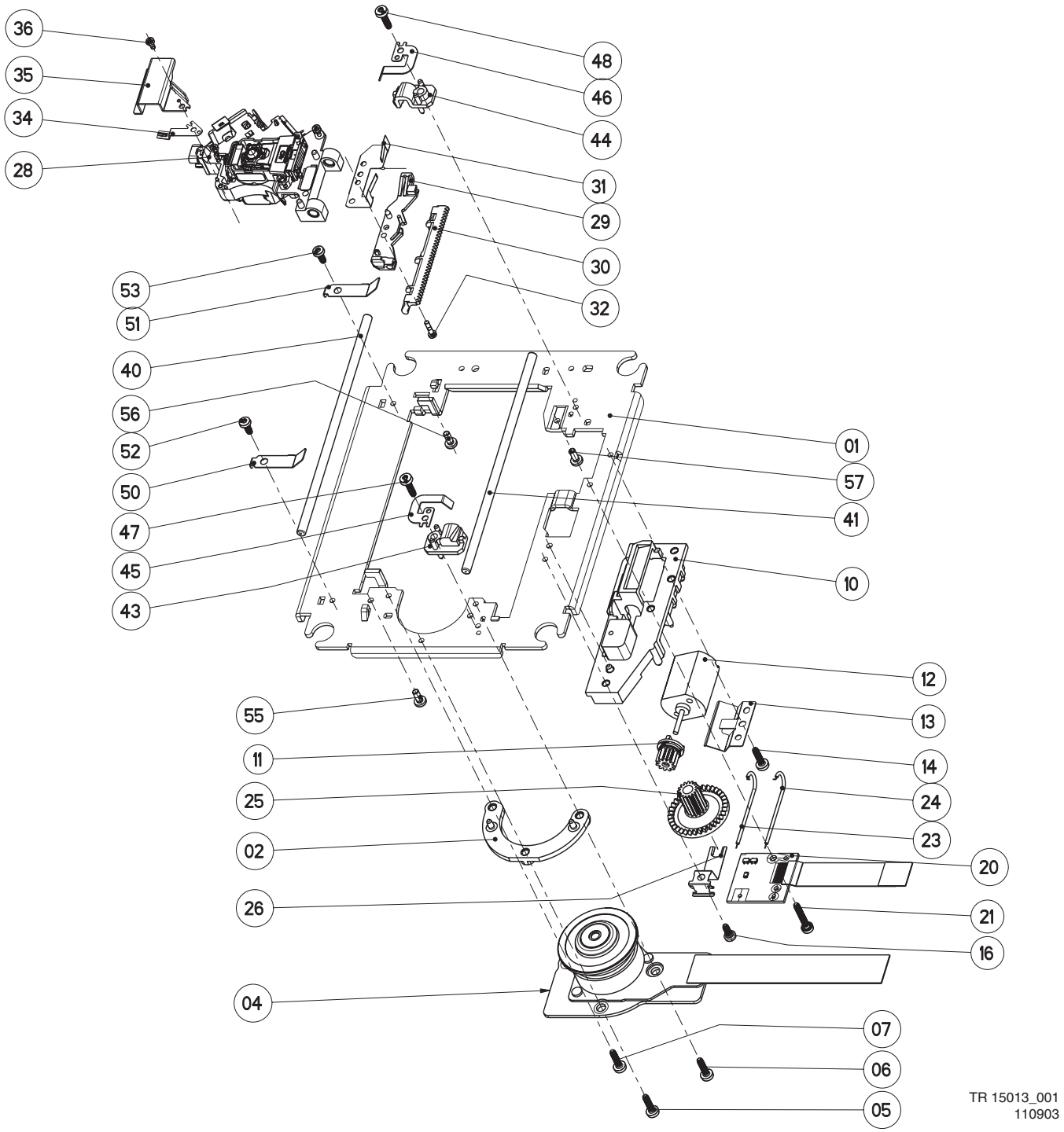
112
116
105
135
115
110

DVD-M


36
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45
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01
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41
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14
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21
16
55
11
25
02
26
04
07
06
05
TR 15013_001
110903

Basic Engine VAD8031

Various

	7104 099 91731	LVP 12.01 MARGINAL DISC
	7104 099 96581	CD-RW LOW REFLECTION AUDIO DISC
10-12	3104 148 01500	SLEDGE MOTOR ASSY
0090	3104 144 03901	SUSPENSION
0091	3104 144 03901	SUSPENSION
0092	3104 144 03901	SUSPENSION
0093	3104 144 03901	SUSPENSION
0094	3104 140 40622	DVDM MOUNTING SCREW
0095	3104 140 40622	DVDM MOUNTING SCREW
0096	3104 140 40622	DVDM MOUNTING SCREW
0097	3104 140 40622	DVDM MOUNTING SCREW
0100	9305 022 83001	DVDM 8031/01 (AV3)
0101	3122 487 90041	LOADER ASSY
0125	3104 144 10121	TRAY MOTOR BELT
0147	3104 144 04272	TRAY
0150	3122 487 90021	CLAMPER PLATE
1002	3104 128 09061	LOADER TRAY MOTOR ASSY
8000	3104 157 12231	FLEX CONNECTION WIRES (ALL)

PCB Assy 4343 Data 3

Various

1100	2422 025 17821	CON H 45P F 0.50
1302	2422 543 01025	Crystal 16.93 MHz
1400	2422 025 17361	CON BM H 9P
1401	2422 025 17264	CON BM H 11P
1600	2422 033 00396	SOC COMBI H 56P
1702	2422 025 17359	CON BM H 15P

⊣⊢

2100	2238 586 59812	100nF 20-80% 50V 0603
2101	4822 126 13883	220pF 5% 50V
2102	2238 586 59812	100nF 20-80% 50V 0603
2103	2020 552 94427	100pF 5% 50v 0603
2104	2238 586 59812	100nF 20-80% 50V 0603
2105	2238 586 59812	100nF 20-80% 50V 0603
2106	2238 586 59812	100nF 20-80% 50V 0603
2107	2022 552 05635	22µF 16V X5R 10%
2108	2238 586 59812	100nF 20-80% 50V 0603
2206	2238 586 59812	100nF 20-80% 50V 0603
2207	2238 586 59812	100nF 20-80% 50V 0603
2209	2238 586 59812	100nF 20-80% 50V 0603
2210	2238 586 59812	100nF 20-80% 50V 0603
2211	2238 586 59812	100nF 20-80% 50V 0603
2212	2238 586 59812	100nF 20-80% 50V 0603
2213	2238 786 56642	27nF 16V 0603 X7R 10%
2214	5322 126 11583	10nF 10% 50V 0603
2215	5322 126 11583	10nF 10% 50V 0603
2217	3198 017 34730	47nF 16V 0603
2218	5322 126 11583	10nF 10% 50V 0603
2219	2238 586 59812	100nF 20-80% 50V 0603
2220	2238 586 59812	100nF 20-80% 50V 0603
2221	2238 586 59812	100nF 20-80% 50V 0603
2222	2238 586 59812	100nF 20-80% 50V 0603
2223	2238 586 59812	100nF 20-80% 50V 0603
2300	2238 586 59812	100nF 20-80% 50V 0603
2301	2238 586 59812	100nF 20-80% 50V 0603
2302	2238 586 59812	100nF 20-80% 50V 0603
2303	4822 122 33752	15pF 5% 50V
2304	4822 122 33752	15pF 5% 50V
2305	2238 916 15641	22nF 10% 25V 0603
2306	2238 586 59812	100nF 20-80% 50V 0603
2307	2238 586 59812	100nF 20-80% 50V 0603
2310	2238 586 59812	100nF 20-80% 50V 0603
2311	5322 126 11578	1nF 10% 50V 0603
2312	4822 122 33752	15pF 5% 50V
2400	2238 586 59812	100nF 20-80% 50V 0603
2401	2238 586 59812	100nF 20-80% 50V 0603
2403	2238 586 59812	100nF 20-80% 50V 0603
2405	2238 586 59812	100nF 20-80% 50V 0603
2406	2238 586 59812	100nF 20-80% 50V 0603
2407	2238 586 59812	100nF 20-80% 50V 0603
2409	2238 586 59812	100nF 20-80% 50V 0603
2411	2020 552 94427	100pF 5% 50v 0603
2412	2238 586 59812	100nF 20-80% 50V 0603
2413	2238 586 59812	100nF 20-80% 50V 0603
2414	5322 126 11583	10nF 10% 50V 0603
2415	2238 916 15641	22nF 10% 25V 0603
2417	2238 586 59812	100nF 20-80% 50V 0603
2418	4822 126 14238	2.2nF 50V 0603
2419	4822 126 14238	2.2nF 50V 0603
2420	4822 126 14238	2.2nF 50V 0603
2421	4822 126 13193	4.7nF 10% 63V
2426	4822 126 14043	1µF 20% 16V
2427	2238 586 15628	2.7nF 10% 50V 0603
2430	2238 586 59812	100nF 20-80% 50V 0603
2431	4822 124 23002	10µF 20% 16V
2432	2238 586 59812	100nF 20-80% 50V 0603
2433	2022 552 05636	10µF 1210 X5R 16V 10%
2434	4822 126 14238	2.2nF 50V 0603
2435	4822 126 14238	2.2nF 50V 0603
2436	4822 126 14238	2.2nF 50V 0603
2438	2238 586 59812	100nF 20-80% 50V 0603
2440	2238 586 59812	100nF 20-80% 50V 0603
2441	2238 586 59812	100nF 20-80% 50V 0603
2442	2022 552 05635	22µF 16V X5R 10%
2443	2022 552 05635	22µF 16V X5R 10%
2444	2022 552 05616	4.7µF 6.3V 0805 X5R
2445	2238 586 59812	100nF 20-80% 50V 0603
2500	2238 586 59812	100nF 20-80% 50V 0603
2501	2238 586 59812	100nF 20-80% 50V 0603
2502	2238 586 59812	100nF 20-80% 50V 0603
2503	4822 126 13879	220nF 20% 16V
2504	5322 126 11578	1nF 10% 50V 0603
2505	5322 126 11583	10nF 10% 50V 0603
2506	5322 126 11583	10nF 10% 50V 0603
2507	5322 126 11582	6.8nF 10% 63V
2509	4822 126 13881	470pF 5% 50V
2511	4822 126 13881	470pF 5% 50V
2512	4822 126 13881	470pF 5% 50V
2514	2238 586 59812	100nF 20-80% 50V 0603
2515	4822 124 23002	10µF 20% 16V
2516	2238 586 59812	100nF 20-80% 50V 0603
2517	2238 586 59812	100nF 20-80% 50V 0603
2518	2238 586 59812	100nF 20-80% 50V 0603
2519	2238 586 59812	100nF 20-80% 50V 0603
2520	2238 586 59812	100nF 20-80% 50V 0603
2521	2238 586 59812	100nF 20-80% 50V 0603
2522	2238 586 59812	100nF 20-80% 50V 0603
2523	2238 586 59812	100nF 20-80% 50V 0603
2524	2238 586 59812	100nF 20-80% 50V 0603
2525	2238 586 59812	100nF 20-80% 50V 0603
2526	2238 586 59812	100nF 20-80% 50V 0603
2527	2238 586 59812	100nF 20-80% 50V 0603
2528	2238 586 59812	100nF 20-80% 50V 0603
2529	2238 586 59812	100nF 20-80% 50V 0603
2530	2238 586 59812	100nF 20-80% 50V 0603
2531	2238 586 59812	100nF 20-80% 50V 0603
2533	4822 124 23002	10µF 20% 16V
2534	2238 586 59812	100nF 20-80% 50V 0603
2536	2238 586 59812	100nF 20-80% 50V 0603
2538	4822 124 23002	10µF 20% 16V
2540	2238 586 59812	100nF 20-80% 50V 0603
2550	5322 126 11583	10nF 10% 50V 0603
2551	4822 122 33753	150pF 5% 50V
2552	4822 122 33753	150pF 5% 50V
2561	3198 017 34730	47nF 16V 0603
2562	3198 017 34730	47nF 16V 0603
2565	2238 586 59812	100nF 20-80% 50V 0603
2566	2238 586 59812	100nF 20-80% 50V 0603
2567	2238 586 59812	100nF 20-80% 50V 0603
2568	2238 586 59812	100nF 20-80% 50V 0603
2569	2238 586 59812	100nF 20-80% 50V 0603
2570	2238 586 59812	100nF 20-80% 50V 0603
2571	2238 586 59812	100nF 20-80% 50V 0603
2577	5322 126 11582	6.8nF 10% 63V
2578	4822 126 14549	33nF 16V 0603
2579	2238 586 59812	100nF 20-80% 50V 0603
2580	2022 552 05635	22µF 16V X5R 10%
2581	2238 586 59812	100nF 20-80% 50V 0603
2602	5322 126 11583	10nF 10% 50V 0603
2603	5322 126 11583	10nF 10% 50V 0603
2605	4822 122 33741	10pF 10% 50V
2607	2238 586 59812	100nF 20-80% 50V 0603
2608	2238 586 59812	100nF 20-80% 50V 0603
2610	2238 586 59812	100nF 20-80% 50V 0603
2611	2238 586 59812	100nF 20-80% 50V 0603
2612	2022 552 05635	22µF 16V X5R 10%
2615	2022 552 05635	22µF 16V X5R 10%
2616	4822 124 11131	47UF 6.3V
2617	2022 552 05635	22µF 16V X5R 10%
2618	2238 586 59812	100nF 20-80% 50V 0603
2621	4822 124 11131	47UF 6.3V
2622	4822 124 11131	47UF 6.3V
2623	2238 586 59812	100nF 20-80% 50V 0603
2624	2238 586 59812	100nF 20-80% 50V 0603
2625	2238 586 59812	100nF 20-80% 50V 0603
2626	2238 586 59812	100nF 20-80% 50V 0603
2650	2238 586 59812	100nF 20-80% 50V 0603
2651	2022 552 05635	22µF 16V X5R 10%
2652	2022 552 05635	22µF 16V X5R 10%
2653	2022 552 05635	22µF 16V X5R 10%
2654	2022 552 05635	22µF 16V X5R 10%
2656	2020 552 96637	10µF 6.3V 0805 X5R
2657	3198 017 31530	15nF 20% 50V 0603
2658	4822 122 33753	150pF 5% 50V
2659	2022 552 05635	22µF 16V X5R 10%
2660	2022 552 05635	22µF 16V X5R 10%
2661	2238 586 59812	100nF 20-80% 50V 0603
2662	2022 552 05635	22µF 16V X5R 10%
2663	4822 126 13883	220pF 5% 50V
2664	2238 916 15641	22nF 10% 25V 0603
2665	2022 552 05635	22µF 16V X5R 10%
2700	5322 126 11583	10nF 10% 50V 0603
2701	5322 126 11583	10nF 10% 50V 0603
2702	5322 126 11583	10nF 10% 50V 0603
2703	5322 126 11583	10nF 10% 50V 0603
2704	5322 126 11583	10nF 10% 50V 0603
2705	5322 126 11583	10nF 10% 50V 0603
2706	5322 126 11583	10nF 10% 50V 0603
2707	5322 126 11583	10nF 10% 50V 0603

⊣WW⊢

3100	4822 117 13501	82Ω 5% 0.62W 0603
3101	4822 117 13501	82Ω 5% 0.62W 0603
3103	4822 051 30102	1kΩ 5% 0.062W
3104	4822 051 30101	100Ω 5% 0.062W
3105	4822 051 30102	1kΩ 5% 0.062W
3106	4822 051 30102	1kΩ 5% 0.062W
3107	4822 051 30102	1kΩ 5% 0.062W
3110	4822 051 30103	10kΩ 5% 0.062W
3111	4822 051 30103	10kΩ 5% 0.062W
3112	4822 051 30102	1kΩ 5% 0.062W
3113	4822 051 30102	1kΩ 5% 0.062W
3114	4822 117 12968	820Ω 5% 0.62W
3115	4822 051 30332	3.3kΩ 5% 0.062W
3116	4822 051 30152	1.5kΩ 5% 0.062W
3117	4822 051 30221	220Ω 5% 0.062W
3118	4822 051 30102	1kΩ 5% 0.062W
3200	4822 051 30101	100Ω 5% 0.062W
3201	4822 051 30101	100Ω 5% 0.062W
3203	4822 051 30103	10kΩ 5% 0.062W
3205	5322 117 13029	47kΩ 1% 0.063W 0603
3206	5322 117 13029	47kΩ 1% 0.063W 0603
3207	4822 051 30103	10kΩ 5% 0.062W
3208	4822 051 30103	10kΩ 5% 0.062W
3209	4822 117 12903	1.8kΩ 1% 0.063W 0603
3210	4822 117 12903	1.8kΩ 1% 0.063W 0603
3211	4822 117 12903	1.8kΩ 1% 0.063W 0603
3212	4822 117 12903	1.8kΩ 1% 0.063W 0603
3213	4822 051 30183	18kΩ 5% 0.062W
3214	4822 051 30273	27kΩ 5% 0.062W
3217	4822 051 30333	33kΩ 5% 0.062W
3301	4822 051 30103	10kΩ 5% 0.062W
3302	4822 117 12917	1Ω 5% 0.062W 0603
3303	4822 051 30151	150Ω 5% 0.062W
3309	4822 117 12903	1.8kΩ 1% 0.063W 0603
3315	4822 051 30339	33Ω 5% 0.062W
3316	4822 051 30103	10kΩ 5% 0.062W
3400	4822 051 30103	10kΩ 5% 0.062W
3401	4822 051 30103	10kΩ 5% 0.062W
3403	4822 051 30103	10kΩ 5% 0.062W
3404	4822 051 30103	10kΩ 5% 0.062W
3405	4822 051 30103	10kΩ 5% 0.062W
3406	4822 051 30102	1kΩ 5% 0.062W
3407	4822 051 30563	56kΩ 5% 0.062W
3408	4822 051 30103	10kΩ 5% 0.062W
3409	4822 051 30103	10kΩ 5% 0.062W
3410	4822 051 30563	56kΩ 5% 0.062W
3411	4822 051 30472	4.7kΩ 5% 0.062W
3412	4822 117 13501	82Ω 5% 0.62W 0603
3418	4822 117 12917	1Ω 5% 0.062W 0603
3420	4822 051 30123	12kΩ 5% 0.062W
3421	4822 117 12925	47kΩ 1% 0.063W 0603
3422	4822 051 30203	20K00 5% 0,062W
3423	4822 051 30103	10kΩ 5% 0.062W
3425	4822 117 13501	82Ω 5% 0.62W 0603
3426	4822 051 30562	5.6kΩ 5% 0.063W 0603
3427	2322 702 60184	180kΩ 5% 0603
3428	4822 051 30562	5.6kΩ 5% 0.063W 0603
3429	4822 051 30272	2.7kΩ 5% 0.062W
3430	2322 702 60511	510Ω 0603 RC21 PM5
3440	5322 117 13036	1.2kΩ 1% 0.063W 0603
3444	5322 117 13053	6.8kΩ 1% 0.063W 0603
3445	5322 117 13036	1.2kΩ 1% 0.063W 0603
3446	4822 117 11817	1.2kΩ 1% 1/16W
3447	5322 117 13053	6.8kΩ 1% 0.063W 0603
3450	5322 117 13053	6.8kΩ 1% 0.063W 0603
3451	4822 117 11817	1.2kΩ 1% 1/16W
3452	5322 117 13036	1.2kΩ 1% 0.063W 0603
3453	5322 117 13053	6.8kΩ 1% 0.063W 0603
3454	5322 117 13036	1.2kΩ 1% 0.063W 0603
3457	5322 117 13053	6.8kΩ 1% 0.063W 0603
3460	5322 117 13036	1.2kΩ 1% 0.063W 0603
3461	4822 117 11817	1.2kΩ 1% 1/16W
3462	5322 117 13053	6.8kΩ 1% 0.063W 0603
3464	5322 117 13036	1.2kΩ 1% 0.063W 0603

3471	2322 702 60279	27Ω 5% 0.1W 0603
3472	4822 051 30123	12kΩ 5% 0.062W
3473	4822 051 30103	10kΩ 5% 0.062W
3474	4822 051 30123	12kΩ 5% 0.062W
3475	4822 051 30103	10kΩ 5% 0.062W
3477	4822 051 30123	12kΩ 5% 0.062W
3479	4822 051 30103	10kΩ 5% 0.062W
3480	4822 051 30103	10kΩ 5% 0.062W
3481	4822 117 12917	1Ω 5% 0.062W 0603
3482	4822 051 20108	1Ω 5% 0.1W
3483	4822 051 30103	10kΩ 5% 0.062W
3484	4822 051 30103	10kΩ 5% 0.062W
3485	4822 051 30103	10kΩ 5% 0.062W
3486	4822 051 30103	10kΩ 5% 0.062W
3487	4822 051 30102	1kΩ 5% 0.062W
3488	4822 051 30102	1kΩ 5% 0.062W
3489	2322 702 60279	27Ω 5% 0.1W 0603
3490	2322 702 60279	27Ω 5% 0.1W 0603
3491	2322 702 60279	27Ω 5% 0.1W 0603
3492	4822 051 30102	1kΩ 5% 0.062W
3493	4822 051 30471	470Ω 5% 0.062W
3494	4822 051 30471	470Ω 5% 0.062W
3495	4822 117 11817	1.2kΩ 1% 1/16W
3496	4822 117 11817	1.2kΩ 1% 1/16W
3497	4822 117 11817	1.2kΩ 1% 1/16W
3498	4822 117 11817	1.2kΩ 1% 1/16W
3499	4822 117 11817	1.2kΩ 1% 1/16W
3500	4822 051 30562	5.6kΩ 5% 0.063W 0603
3501	4822 051 30472	4.7kΩ 5% 0.062W
3502	4822 051 30272	2.7kΩ 5% 0.062W
3503	4822 051 30472	4.7kΩ 5% 0.062W
3504	4822 051 30472	4.7kΩ 5% 0.062W
3507	4822 051 30102	1kΩ 5% 0.062W
3508	4822 051 30102	1kΩ 5% 0.062W
3509	4822 051 30102	1kΩ 5% 0.062W
3510	4822 051 30682	6.8kΩ 5% 0.062W
3511	4822 051 30682	6.8kΩ 5% 0.062W
3512	4822 051 30682	6.8kΩ 5% 0.062W
3513	4822 051 30682	6.8kΩ 5% 0.062W
3514	4822 117 13632	100kΩ 1% 0603 0.62W
3515	4822 117 13632	100kΩ 1% 0603 0.62W
3516	4822 117 13525	24kΩ 1% 0.62W 0603
3517	4822 051 30103	10kΩ 5% 0.062W
3519	4822 051 30103	10kΩ 5% 0.062W
3520	4822 051 30103	10kΩ 5% 0.062W
3522	4822 117 12917	1Ω 5% 0.062W 0603
3524	4822 051 30103	10kΩ 5% 0.062W
3527	4822 051 30103	10kΩ 5% 0.062W
3529	4822 051 30222	2.2kΩ 5% 0.062W
3530	4822 051 30222	2.2kΩ 5% 0.062W
3531	4822 051 30479	47Ω 5% 0.062W
3532	4822 051 30479	47Ω 5% 0.062W
3541	4822 117 13576	NETW 4 X 33R 5% 1206
3542	4822 117 13576	NETW 4 X 33R 5% 1206
3543	4822 117 13576	NETW 4 X 33R 5% 1206
3545	4822 051 30339	33Ω 5% 0.062W
3546	4822 051 30339	33Ω 5% 0.062W
3547	4822 051 30334	330kΩ 5% 0.062W
3548	4822 051 30103	10kΩ 5% 0.062W
3550	4822 051 30102	1kΩ 5% 0.062W
3551	4822 051 30103	10kΩ 5% 0.062W
3560	4822 051 30101	100Ω 5% 0.062W
3562	4822 117 13526	150Ω 5% 0.63W
3574	4822 051 30103	10kΩ 5% 0.062W
3577	4822 051 30103	10kΩ 5% 0.062W
3578	4822 051 30332	3.3kΩ 5% 0.062W
3579	4822 051 30223	22kΩ 5% 0.062W
3580	4822 051 30472	4.7kΩ 5% 0.062W
3582	4822 051 30103	10kΩ 5% 0.062W
3583	4822 117 13526	150Ω 5% 0.63W
3584	4822 117 13526	150Ω 5% 0.63W
3585	4822 117 13526	150Ω 5% 0.63W
3586	4822 117 12968	820Ω 5% 0.62W
3587	4822 117 13526	150Ω 5% 0.63W
3588	4822 117 13526	150Ω 5% 0.63W
3589	4822 117 13526	150Ω 5% 0.63W
3591	4822 051 30151	150Ω 5% 0.062W
3592	4822 051 30151	150Ω 5% 0.062W
3593	4822 051 30151	150Ω 5% 0.062W
3594	4822 051 30151	150Ω 5% 0.062W
3595	4822 051 30151	150Ω 5% 0.062W
3596	4822 051 30151	150Ω 5% 0.062W
3597	4822 051 30151	150Ω 5% 0.062W
3598	4822 051 30151	150Ω 5% 0.062W
3599	4822 051 30151	150Ω 5% 0.062W
3602	4822 117 13632	100kΩ 1% 0603 0.62W
3603	4822 117 13632	100kΩ 1% 0603 0.62W
3604	4822 051 30103	10kΩ 5% 0.062W
3605	4822 051 30102	1kΩ 5% 0.062W
3606	4822 051 30471	470Ω 5% 0.062W
3607	4822 051 30471	470Ω 5% 0.062W
3608	4822 051 30102	1kΩ 5% 0.062W
3609	4822 051 30221	220Ω 5% 0.062W
3610	4822 051 30221	220Ω 5% 0.062W
3611	4822 051 30103	10kΩ 5% 0.062W
3612	4822 051 30103	10kΩ 5% 0.062W
3613	4822 051 30103	10kΩ 5% 0.062W
3614	4822 051 30103	10kΩ 5% 0.062W
3615	2350 035 10829	RST NETW SM ARV24 4X 82R PM5
3619	4822 117 13501	82Ω 5% 0.62W 0603
3620	4822 051 30103	10kΩ 5% 0.062W
3621	4822 051 30103	10kΩ 5% 0.062W
3622	4822 117 12139	22Ω 5% 0.062W
3623	4822 117 13501	82Ω 5% 0.62W 0603
3624	4822 051 30103	10kΩ 5% 0.062W
3625	4822 117 12139	22Ω 5% 0.062W
3626	4822 117 13501	82Ω 5% 0.62W 0603
3627	4822 051 30103	10kΩ 5% 0.062W
3628	4822 117 13501	82Ω 5% 0.62W 0603
3629	4822 051 30103	10kΩ 5% 0.062W
3630	4822 117 12139	22Ω 5% 0.062W
3631	2120 108 94458	RST NETW SM RAC16 4X 56R PM5 R
3635	2120 108 94458	RST NETW SM RAC16 4X 56R PM5 R
3639	2120 108 94458	RST NETW SM RAC16 4X 56R PM5 R
3643	2120 108 94458	RST NETW SM RAC16 4X 56R PM5 R
3647	4822 051 30103	10kΩ 5% 0.062W
3648	4822 117 13501	82Ω 5% 0.62W 0603
3650	4822 117 13578	4X10K 5% MNR14
3651	4822 117 13578	4X10K 5% MNR14
3652	4822 117 13578	4X10K 5% MNR14
3653	4822 117 13578	4X10K 5% MNR14
3660	2322 704 68203	82kΩ 0603 RC22H PM1
3661	2322 704 61504	150k 1% 0603
3662	4822 117 12917	1Ω 5% 0.062W 0603
3665	4822 051 30101	100Ω 5% 0.062W
3684	4822 051 30103	10kΩ 5% 0.062W
3686	4822 051 30331	330Ω 5% 0.062W
3689	4822 117 13501	82Ω 5% 0.62W 0603
3690	4822 117 12139	22Ω 5% 0.062W
3692	4822 051 30472	4.7kΩ 5% 0.062W
3693	4822 117 11817	1.2kΩ 1% 1/16W
3694	4822 051 30392	3.9kΩ 5% 0.063W 0603
3709	4822 051 30103	10kΩ 5% 0.062W
3717	4822 051 30339	33Ω 5% 0.062W
3718	4822 051 30103	10kΩ 5% 0.062W
4105	4822 051 30008	Jumper 0603
4108	4822 051 30008	Jumper 0603
4110	4822 051 30008	Jumper 0603
4112	4822 051 30008	Jumper 0603
4201	4822 051 30008	Jumper 0603
4303	4822 051 30008	Jumper 0603
4400	4822 051 20008	Jumper 0805
4402	4822 051 30008	Jumper 0603
4403	4822 051 20008	Jumper 0805
4404	4822 051 20008	Jumper 0805
4405	4822 051 20008	Jumper 0805
4406	4822 051 20008	Jumper 0805
4407	4822 051 20008	Jumper 0805
4413	4822 051 30221	220Ω 5% 0.062W
4415	4822 051 30008	Jumper 0603
4416	4822 051 20008	Jumper 0805
4419	4822 051 30008	Jumper 0603
4422	4822 051 30008	Jumper 0603
4427	4822 051 30008	Jumper 0603
4502	4822 051 30008	Jumper 0603
4525	4822 051 30008	Jumper 0603
4604	4822 051 30008	Jumper 0603
4610	4822 051 30008	Jumper 0603
4611	4822 051 30008	Jumper 0603
4612	4822 051 30008	Jumper 0603
4700	4822 051 30008	Jumper 0603

5101	2422 549 43062	Bead 600Ω at 100MHz
5102	2422 549 43062	Bead 600Ω at 100MHz
5103	2422 549 43062	Bead 600Ω at 100MHz
5104	3198 018 51090	10µH 10% 0603
5201	2422 549 43062	Bead 600Ω at 100MHz
5202	2422 549 43062	Bead 600Ω at 100MHz
5204	2422 549 43062	Bead 600Ω at 100MHz
5300	2422 549 43062	Bead 600Ω at 100MHz
5301	2422 549 43062	Bead 600Ω at 100MHz
5400	2422 536 00501	IND FXD SM D62LCB 10U PM20 R
5405	2422 549 43062	Bead 600Ω at 100MHz
5406	2422 549 43062	Bead 600Ω at 100MHz
5501	2422 549 43062	Bead 600Ω at 100MHz
5502	2422 549 43062	Bead 600Ω at 100MHz
5504	2422 549 43062	Bead 600Ω at 100MHz
5602	2422 549 43062	Bead 600Ω at 100MHz
5603	2422 549 43062	Bead 600Ω at 100MHz
5604	2422 536 00501	D62LCB 10U PM20 R
5607	2422 549 45322	0603 EMI 100MHZ 150R R
5609	2422 536 00501	D62LCB 10U PM20 R
5613	2422 549 43062	Bead 600Ω at 100MHz
5614	2422 549 43062	Bead 600Ω at 100MHz
5615	2422 549 45322	EMI 100MHZ 150R R
5616	2422 549 43062	Bead 600Ω at 100MHz
5617	2422 536 00593	IND FXD SM D62LCB 47U PM20 R

6100	4822 130 11397	BAS316
6401	9340 548 52115	PDZ5.1B
6603	9322 168 86685	SK14
6604	4822 130 11522	UDZ15B
6605	9322 159 72685	MM3Z6V2
6606	9322 189 14668	SL12
6607	9322 189 14668	SL12

7101	5322 130 60159	BC846B
7102	5322 130 60159	BC846B
7103	5322 130 60159	BC846B
7104	9340 547 21215	BSH205
7105	9352 697 76118	LM75ADP
7201	9352 714 71557	TZA1039HL
7300	9352 713 77157	TZA1042HL
7400	5322 209 82941	LM358D
7401	5322 209 82941	LM358D
7402	9352 656 66118	SZA1015TT BMC12
7405	4822 209 63709	LM324D
7408	9322 164 64668	BA5995FM
7409	9322 164 64668	BA5995FM
7500	9352 730 44557	PNX7850E_Z_M1D
7502	9322 186 84685	MAX6352SVUK
7503	3104 123 96850	IC FLASH ASSY DATA 3
7504	9322 166 67668	MT48LC4M16A2TG-7E
7603	4822 209 17398	LD1117DT33
7604	9352 610 38118	TEA1207T_N1
7605	9322 184 76668	ST735CD
7606	9322 191 07668	L5970D