Audio Restoration Project – Repair Arcam CD92 dCS Ring DAC CD Player

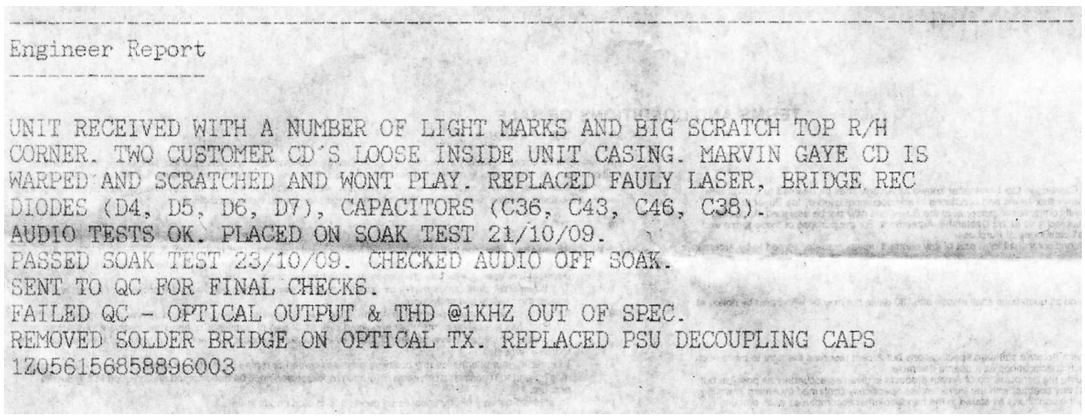
This applies to all similar type models CD72 , CD73 , CD82 , and their TEXT readout derivatives, the FMJ CD23 and the previous range Alpha 7SE , Alpha 8SE , and Alpha 9 which share common circuit boards.

The CD92 is regarded as one of the all-time holy-grail CD players, based on the dCS Ring DAC, a superbly accurate, exotic and incredibly expensive English DAC. It plays also HDCD's.

Correctly restored, the sound quality is superb, and it puts many other CD players, irrespective of their age, to shame.

Symptoms: This unit came onto my lab-bench after an Arcam UK factory repair, costing a whopping GBP145. According to the Engineer Report (below), the Arcam tech was not successful in fully correcting the distortion problem, and the unit was rejected in-house. After the second attempt at repair, Arcam did not specify whether the unit passed the final QC test. Nevertheless the unit was returned to the customer, and it was then delivered to me.

The sound was not satisfactory, to say the least, and it was difficult for me to understand how Arcam decided to deliver this unit to the customer in this condition. Working with Arcam for many years, I have become accustomed to (and spoilt by) their exceptional level of professional support to their service centers, so I was very surprised to see this. During their attempted diagnosis, I would have expected to have seen a capability level of at least that (if not higher) of my own. I can only assume that this unit slipped through their normally high level of checks and quality control.



Engineer Report

UNIT RECEIVED WITH A NUMBER OF LIGHT MARKS AND BIG SCRATCH TOP R/H CORNER. TWO CUSTOMER CD'S LOOSE INSIDE UNIT CASING. MARVIN GAYE CD IS WARPED AND SCRATCHED AND WONT PLAY. REPLACED FAULY LASER, BRIDGE REC DIODES (D4, D5, D6, D7), CAPACITORS (C36, C43, C46, C38).
AUDIO TESTS OK. PLACED ON SOAK TEST 21/10/09.
PASSED SOAK TEST 23/10/09. CHECKED AUDIO OFF SOAK.
SENT TO QC FOR FINAL CHECKS.
FAILED QC - OPTICAL OUTPUT & THD @1KHZ OUT OF SPEC.
REMOVED SOLDER BRIDGE ON OPTICAL TX. REPLACED PSU DECOUPLING CAPS
1Z0561568588960O3

This is the Engineer's Report, as it appeared on the original Arcam invoice

Before starting work, I read this report, and attempted to read between the lines, to decipher not what the Engineer had already written, but what the Engineer chose not to write.

After some reflection, I had a pretty good idea of where to start looking for the unresolved problems. I examined the Service Manual, and the first discrepancy which I discovered, was that the Engineer did not replace the Bridge Rectifier Diodes (D4, D5, D6, D7) as mentioned above, but in fact replaced 4 others (D8, D9, D10, D11), and then not with the specified high-speed diodes (UF4003), but an inferior equivalent (1N4003). Sloppy resoldering was the clue to which components had been worked on during this repair.

The Engineer also did not replace all of the capacitors specified above – the 1998 Manufacturer's date-code on the non-replaced capacitors was clear evidence of that.

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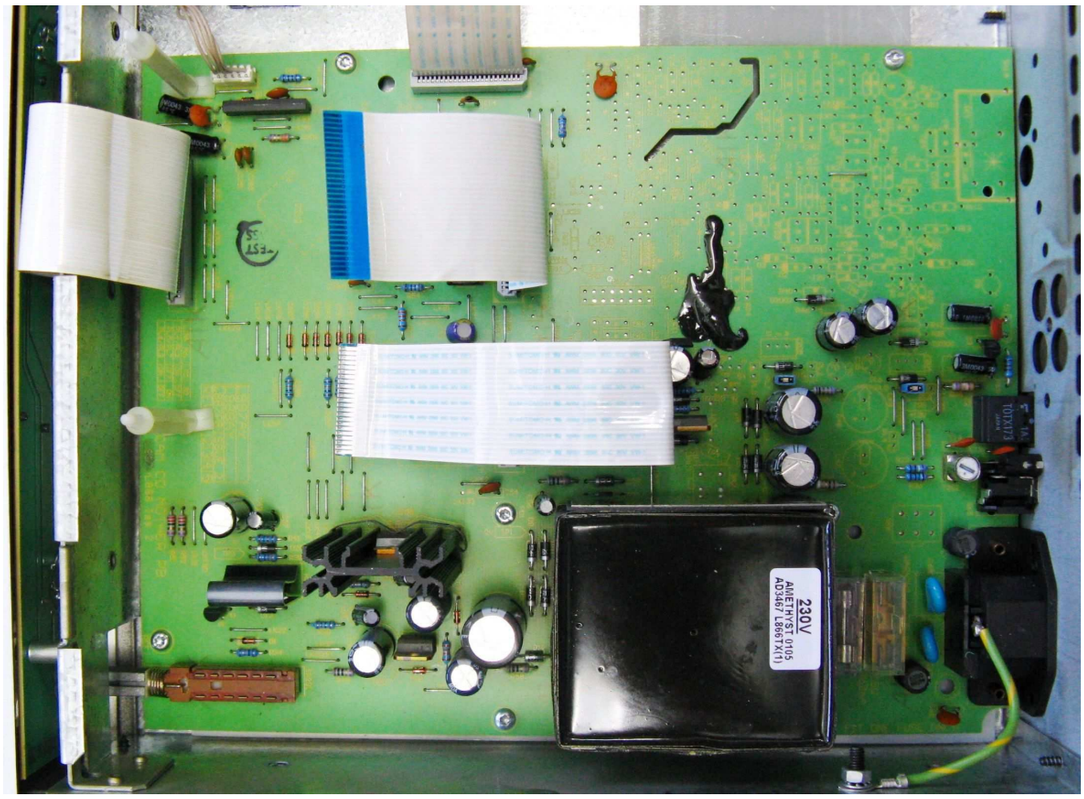

This is the Main PCB, with the power supply components at the bottom of the board. The unpopulated upper 1/3rd of the PCB is the space normally occupied by the DAC components on the CD72, CD73, and CD82 models. On the CD92, the dCS Ring DAC is on a separate daughter-board.

The Main PCB is very well laid-out, with lots of space, and no crowding of components. The circuits are very simple, with no pretensions at designing in dubious exotic enhancements. Even without the Service Manual, a good tech should easily find his way around the circuits.

The first Full-Wave bridge-rectifier provides the +12VDC and -12VDC circuits, the second Full-Wave bridge-rectifier provides +7.3VDC to the CDM14 / KSS240A laser and transport, +11VDC to the Clock, and +5VDC to the DAC, and then a Half-Wave rectifier provides -30VDC.

The first thing I did was remove the 8 1N/UF4003 bridge-rectifier diodes and replace them with 8 Schottky 11DQ10 diodes. These diodes are proven to contribute to a major increase in sound-quality, as compared with regular 1N400x, or even the high-speed UF400x diodes.

I then connected my Tek 2465B oscilloscope to the PSU test-points - those in the Service Manual, and also others which are not specified, but which experience dictates should be tested.

DC Ripple was absolutely unacceptable on all test-points (except for the +11VDC input to Z206), and obviously this was the major contributor to the customer's original complaint of distortion.

At this point, just to confirm my suspicions, I got busy with my ESR meter, and of the 19 Rubycon 85°C YK electrolytic capacitors, 15 exceeded ESR limits.

I decided that, as it appeared to be a wholesale degeneration of these capacitors, I would replace 17 of the 19, leaving only the Sanyo OsCon 25uF 20V (now Vishay OsCon) and the newly-replaced 3300uF 25V PSU decoupling capacitor (with a 2007 date-code).

My standard capacitor replacement policy is as follows:

1. In the Power supply section – Panasonic EB and Nichicon PW.
2. The main power-decoupling caps in this case are mainly Panasonic FM.
3. In the Audio Path, Nichicon KT, Panasonic FM and sometimes FC, and all electrolytics below 6.8uF and smaller are replaced by Wima MKS2 non-polar film caps.
4. Elsewhere Panasonic FC and Nichicon HE and PW.

This policy works, and I've never been disappointed with the results. Note that they are all 105°C capacitors, with exceptionally long-life and reliability. Sometimes the customer will specifically

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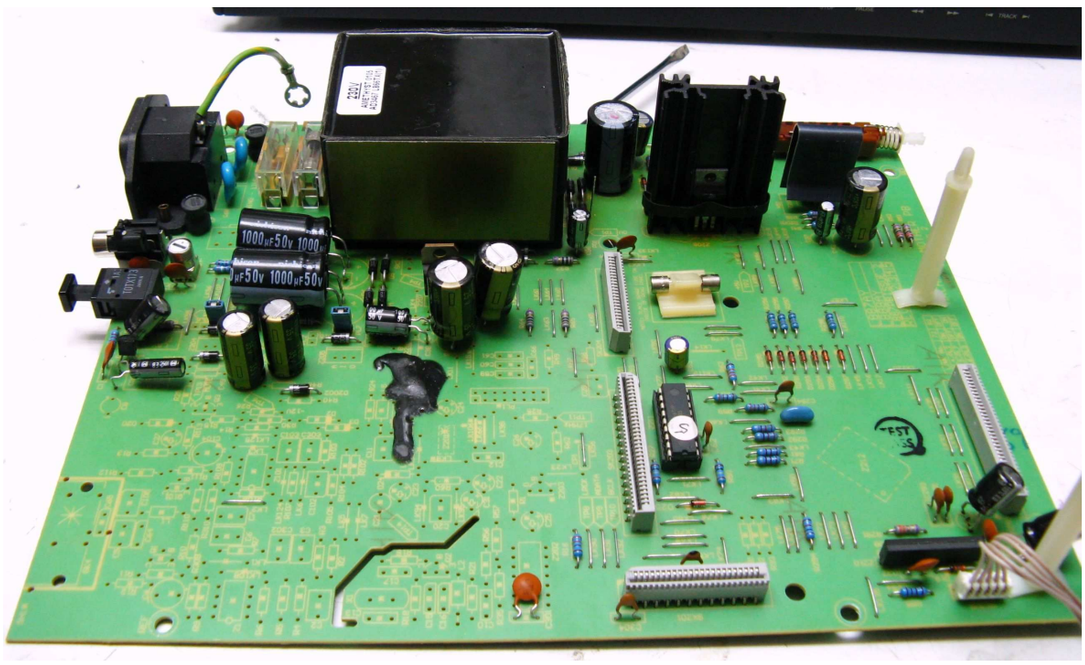
request Boutique capacitors (Blackgate, Muse, OsCon), and I will install them as per the customer's request.



Here are all the 17 new capacitors, mostly much larger (physically) than the original, which requires them to be mounted horizontally, in order to not interfere with the DAC daughter-board mounted from above

I don't use el-cheapo off-the-shelf Chinese capacitors with no track record. I don't like my customers complaining that their restored stereo isn't working. My goal is an absolute-zero comeback rate for at least 5 years.

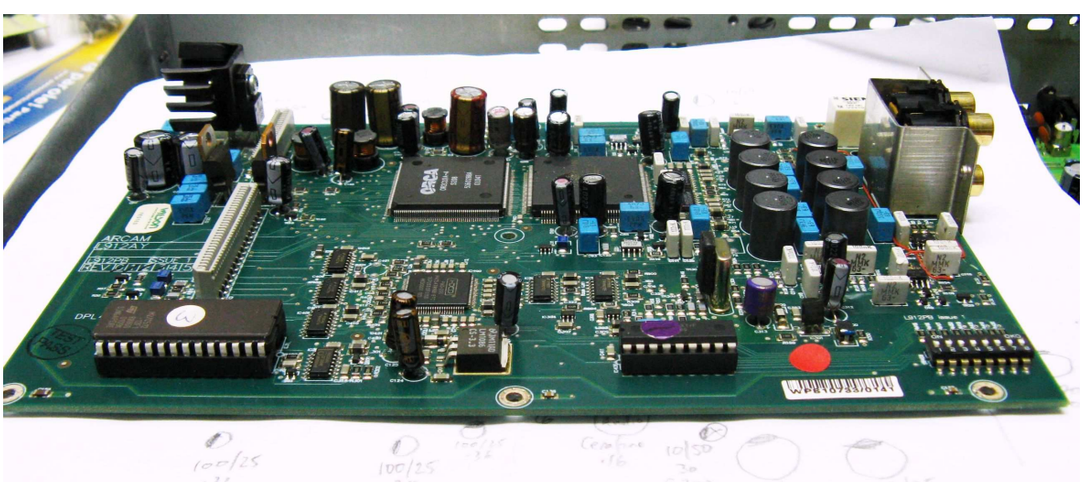
I connected power to the Main PCB, to check the results of installing these high-quality capacitors. As expected, the DC ripple was now well within acceptable limits. This by itself would account for the elimination of most of the distortion experienced by the customer, and I cannot understand why Arcam did not complete at least this level of an elementary repair.

However, while ripple was within limits, some voltages were definitely not.

Two problems surfaced.

1. At TP2, the +5VDC output to the DAC was +6.9VDC. The cause was traced to the 7805 5V regulator, which I replaced. Arcam missed that, and it was no surprise that the 7805 rippled itself to death whilst connected to decoupling capacitors which had died long ago.
2. At TP6, the voltage was -2.3VDC, instead of the expected -12VDC. I traced the problem to R45, a 1-ohm fusible resistor, which was open. I replaced it.

The voltage check was now perfect, and I considered the Main PCB 100% serviceable, and useable for at least the next 5 years with no problems expected.



Here is the dCS Ring DAC daughter-board prior to restoration.

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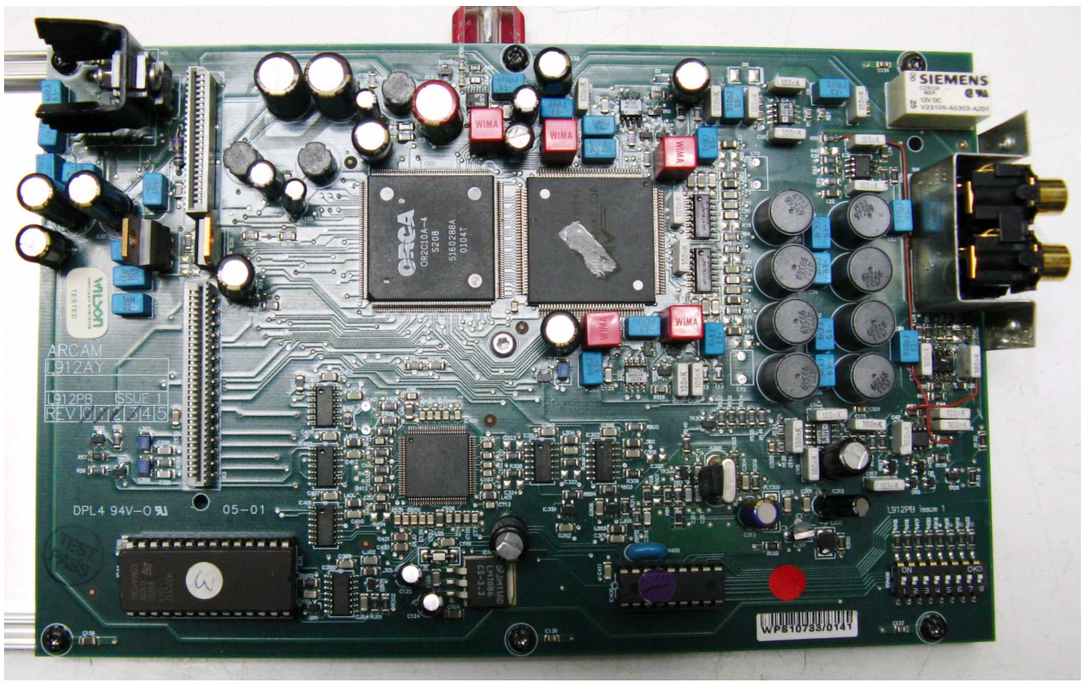
I now turned my attention to the DAC PCB.

Having drawn experience from the extreme degradation of the Main PCB capacitors, I did not even bother with ripple checks on the DAC PCB's 27 electrolytic capacitors. I jumped right into testing for ESR on each capacitor.

Of the 27 Electrolytic capacitors on this PCB, 16 exceeded ESR limits. All of them were Rubycon YK types (The CD73 PCB had the highest quality audiophile capacitors everywhere – why such mediocre quality capacitors in the CD92?).

There was evidence of 3 x 10uF 50V capacitors having been recently replaced by (I'm very disappointed to say) el-cheapo no-name Chinese capacitors. If this was Arcam's doing, there is no excuse and they could have done much better than this.

Even though these 3 capacitors checked OK for now (they should have – they're brand new), they wouldn't have lasted more than a year, and that's not the way I play cricket in my work. My quality-control goal is zero-comeback for at least 5 years.



Here is the dCS Ring DAC daughter-board after restoration.

Once again, with such a high degradation ratio on this PCB, it was an easy decision to replace all the electrolytics, except for the 3 Elna Cerafine/Silmic units. As expected (these are in the signal path, so subject to very little stress), these still tested exceptionally good, even after about 10 years.

The Sanyo OsCon 22uF now measured 16uF, causing a degradation in bass response. These organic capacitors have an undesireable characteristic of losing capacitance with time. So I replaced it with a 33uF OsCon, which will take a long time to degrade to the original design spec of 22uF.

I replaced the 5 BiPolar 10uF 63V units (C27, C30, C38, C97, C98) with red Wima MKS2 10uF film capacitors. Substitution with these film capacitors also contributes greatly to improved sound quality, especially in this part of the DAC circuit.

I now opened up the CD transport assembly, just out of curiosity. There are no field-technician serviceable components on the KSS series of lasers, and the laser must be replaced as a complete unit.

I am quite familiar with this laser transport, and I was very surprised to see the aged, yellowed plastic gears in their entirety. Generally, when I replace a KSS213C laser, I replace it with its entire transport, including new gears. So why, if the Engineer's Report specified that the laser was replaced, was the entire transport not changed?

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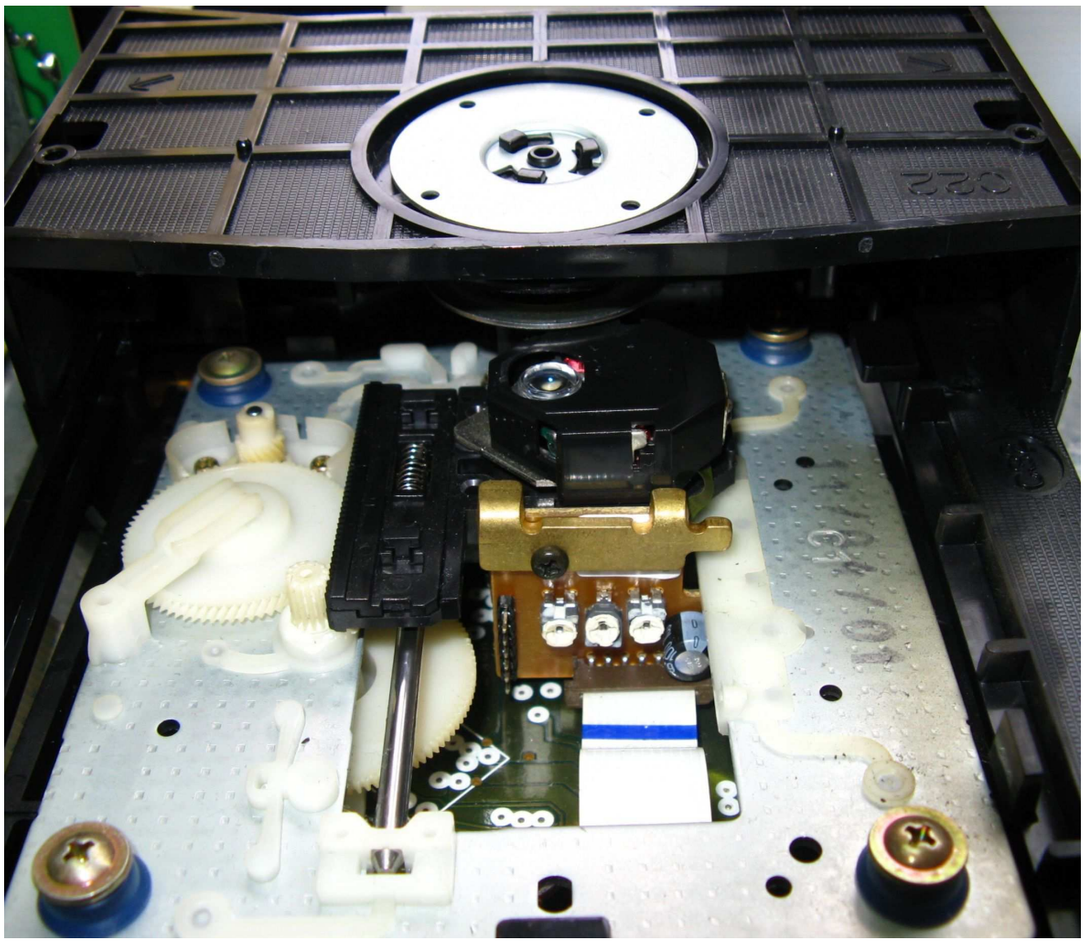

Here is the CDM14 / KSS240A unit showing the aged, yellowing plastic gears. They should have been replaced.

The original Arcam spec is a high-quality KSS213C laser. During the repair it was replaced with a lower-quality run-of-the-mill KSS240A laser. The 213 is a longer-lasting unit and reads poor-condition CD's easily, so the replacement is a definite downgrade.

There were too many discrepancies in this repair, to write it off to a "slipped pen" when the Engineer was detailing the work done. Arcam needs to look very closely at the way they do repairs to customer equipment, and pull up their socks drastically when it comes to quality-control.
To my dear friends at Arcam, please take to heart that the market expects MUCH BETTER from you!

Anyway, the time came to connect all the parts together, and test. Needless to say, everything operated flawlessly now, and the sound is superb, definitely the standard for which Arcam is renowned.

I am very satisfied with the end results, from both a technical-quality and sound-quality point. The sound is exceptionally clear, not missing a single fine-point. Bass is tight and controlled, and treble is pointed without being bright to fatigue.

A definitely memorable listening experience, and one which rates as a close second to my highly-modified 1987 Philips CD650 with the legendary TDA1541 DAC. But since this CD92 is basically a stock unit with no substantial modifications, I must conclude that it stands unchallenged among unmodified units in a class of its own.

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Here is the unit after complete restoration and reassembly – the DAC daughter-board is clearly visible mounted above the PSU board. Lots of free space for adding extra modifications (like an ECC81 tube output-stage ;-) .....

Parts for this restoration

Parts and advice are available for owners who wish to tackle this project by themselves.

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