

HEGEL DecoderBoard

HEGEL DecoderBoard™ Technology.

After intensive research into cutting edge CD-player technology, Hegel has found that the design of the CD servo-decoder board of CD-players are very important to get the best possible CD-player performance. Since 2002 all Hegel CD-players have been using CD servo-decoder boards designed in-house by Hegel.

Normally High End manufacturers of CD-players are buying the CD-mechanism and the CD servo - decoder boards from external suppliers of technology. Only a very few High End manufacturers design their own CD servo-decoder electronics. Philips, Sony and Daisy are manufacturers of complete turn-key CD-systems, including CD servo / decoder boards. Almost all High End manufacturers are using CD-solutions including CD servo-decoder boards from external suppliers such as Sony, Philips or Daisy.

Many years ago Hegel was also buying complete CD mechanisms including servo-decoder board from external suppliers like Philips, Sony and Daisy. After extensive testing Hegel found that the quality of the CD servo-decoder boards had a large impact on the final quality of the CD-players.

Hegel found that by designing our own CD servo-decoder boards in-house gave us a large advantage in getting the best possible quality of digital audio data extracted from the optical readout of the CDs, compared to using standard turn-key CD servo-decoder boards from Philips, Sony and Daisy. The reason why the turn-key servo-decoder boards from Philips and Sony is not optimal is that such OEM turn-key CD servo-decoder boards have to keep production cost down. In high volume manufacturing this is always important.

When reading the digital audio data from a CD the laser system has to dynamically track a spiralling 0.4 micrometer track of stored data with micrometer precision while the CD is spinning around at a high speed of more than 200-500 revolutions per minute. The laser system has to follow the data track closely with high precision when the CD itself is moving both horizontally and vertically because the data track will never be physically centred to the geometrical centre of the CD because of CD-stamping tolerances. For the laser system to be able to read the data track that is moving horizontally and vertically with sub micrometer precision, the laser head is

moved by servomotors horizontally and vertically. 3 different servo motors are used to move the laser head dynamically to keep the tracking and focus in the right position within sub micrometers. The servo motors will have large dynamic current flowing in the circuit boards to keep the laser system locked to the data track.

To get the data signal out from the CD, an infrared laser diode is used to illuminate the 0.4 micrometer data track on the CD. The data track on the CD is coded with a pattern of lands and pits, storing the audio and control data in a digital way. The incoming laser light is reflected by the data track on the CD, and light sensitive photo diodes are used to read back the data stored on the CD. The laser light reflected by the data track on the CD generates very small currents in the photo diodes, and the current output from these readout photo diodes are very small compared to the large servo motor currents.

Most people are thinking that reading the data from the CD is an all digital system, but the current outputs from the CD readout photo diodes are in fact high frequency analog low current signals. The small analog photo diode currents will be disturbed by the large currents from the servo motors that keep the laser system tracking the narrow 0.4 micrometer data track.

To avoid that the very small analog photo diode currents are disturbed by the much larger servo motor currents is a very important task to read out the best possible high frequency analog photo diode data without any errors. The design of the photo diode amplifier circuits and circuit board layout is extremely important to preserve a highest possible signal to noise ratio for the data signal on the CD.

The CD audio data is read out from the CD in real-time, so if some of the audio data is lost when reading the CD it cannot be reconstructed in any way, so to avoid any loss of audio data it is vital to get the read-out of the very small CD photo diode currents with highest possible accuracy.

To be able to extract the best possible audio data from the stored data on the CD is the best possible starting point when designing a high performance CD-player.

Hegel has done a lot of research to be able to design the CD servo-decoder boards in-house to extract the best possible audio data from the CDs. To be able to design these CD servo-decoder boards in the best possible way requires a lot of deep technical knowledge in the fields of low noise analog electronics, high frequency electronics, signal processing electronics and advanced circuit board layout techniques.