Subject: Cassette Tape Alignment
Posted by Wayne Parham on Fri, 12 Jul 2019 20:25:41 GMT
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I have a Sony KA1ESA cassette deck. It's a really nice three-head unit that sounds better than CD when using high-quality tapes. It also sounds good with a variety of tapes, thanks to its adjustable bias control. I learned how useful that was back in the early 1980s, and have never owned a deck without adjustable bias since then.

Unfortunately, the bias baseline on my Sony deck had drifted over time, so that it had to be adjusted fully to one side to work with most CrO2 tapes. Many tapes couldn't even be dialed-in. So I decided to open it up and align the deck. I have a service manual and test tape, so I rolled up my sleeves and went through the recommended alignments, one by one.

Subject: Re: Cassette Tape Alignment
Posted by Wayne Parham on Fri, 12 Jul 2019 20:37:43 GMT
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The test tape I'm using has several sections. There is a 400Hz sine for basic amplitude adjustments, a 3kHz sine for tape speed adjustment and a 10kHz sine for head alignment and bias baseline adjustments.

Test Tape Section 1: 400Hz, 0:09 - 2:03

Test Tape Section 2: 10kHz, 2:04 - 3:58

Test Tape Section 3: 400Hz, 3:59 - 5:51

Test Tape Section 4: 3kHz, 5:52 - 8:23

File Attachments
1) Test_Tape_1_400Hz_0.09-2.03.png, downloaded 551 times
2) Test_Tape_2_10kHz_2.04-3.58.png, downloaded 549 times
3) Test_Tape_3_400Hz_3.59-5.51.png, downloaded 538 times
4) Test_Tape_4_3kHz_5.52-8.23.png, downloaded 557 times

Subject: Re: Cassette Tape Alignment
Posted by Wayne Parham on Fri, 12 Jul 2019 20:45:30 GMT
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The main thing with any tape deck is the position of the head in relation to the tracks. If it's too far off, the tape will curl at its edges. But most times, it's not that far off, just enough to reduce the high-frequency content. So using 10kHz signal on the test tape, adjust the playback head alignment screw for highest amplitude.

I've done tape head alignments by ear too. Just use a store-bought pre-recorded cassette, because they are made on an aligned production system. Don't use a tape you've recorded, because even an unaligned tape head will play it's own tapes perfectly. A tape recorded on an unaligned deck just won't sound good in another tape deck. So use a pre-recorded cassette and adjust the tape head for the best crisp treble response.

Truthfully, the tape head doesn't usually need adjustment on a home deck because it doesn't usually change unless the deck is bumped. I do see it a lot on car stereos with cassette decks.

Subject: Re: Cassette Tape Alignment
Posted by Wayne Parham on Fri, 12 Jul 2019 20:50:12 GMT
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Next is a speed adjustment. Using the 3kHz signal, adjust the speed potentiometer to be exactly 3kHz.

You can see mine was off a little bit. A small turn of the speed adjustment potentiometer RV71 brings it right to where it needs to be.

File Attachments
1) Speed_Before.png, downloaded 521 times
2) Speed_Set.png, downloaded 549 times

Subject: Re: Cassette Tape Alignment
Posted by Wayne Parham on Fri, 12 Jul 2019 20:55:33 GMT
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Next is the bias adjustment. There are separate bias adjustments for right (RV221) and left (RV121) channels. Set each so that amplitude is the same at 315Hz and at 10kHz. There are also record level adjustments RV112 for left and RV212 for right which have a slight effect on the bias. They should be set so the output level is 50mV for each channel while simultaneously providing the proper bias. There is some slight interaction between the two, so I find i best to set bias, then record amplitude and the re-examine bias and reset as necessary.

Note that this adjustment optimizes for a particular tape. If you could sample all tapes, you would find some that need bias adjusted far to one side and others that needed bias adjusted far to the other. The goal is to be able to set the internal potentiometers for the center of this range, so that the external bias control knob can be set to provide balanced response with any tape.

The service manual suggests using a tone generator to create a 315Hz and a 10kHz sine for setting the bias. The deck is set to record with the external bias adjustment knob is set to its middle setting and the playback head is monitored. Switch the input signal between 315Hz and 10kHz and adjust the potentiometers on the circuit board to set the amplitude of the output signal matching the levels of the 315Hz sine with the 10kHz sine.

File Attachments
1) Left_Tape_315Hz.png, downloaded 513 times
2) Right_Tape_315Hz.png, downloaded 472 times
3) Left_Tape_10kHz.png, downloaded 530 times
4) Right_Tape_10kHz.png, downloaded 516 times

Subject: Re: Cassette Tape Alignment
Posted by Wayne Parham on Fri, 12 Jul 2019 20:59:35 GMT
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I did that for a while, and then decided to create a dual-tone signal that combined the 315Hz sine with the 10kHz sine. I monitored the output with Daqarta's spectrum analyzer so I could see both the 315Hz content and the 10kHz content. That made it easier to set the levels to match. Then as a "sanity check," I used single-frequency sines of 315Hz and 10kHz to make sure the levels were matched when a pure sine wave was presented.

Pay attention to the relative amplitudes of the signals below at 315Hz and at 10kHz:

Before adjusting bias: Right channel bias NOT set

Right channel bias properly set

Left channel bias properly set

File Attachments

1) Right_Tape_315Hz_and_10kHz_Bias_NOT_Set.png, downloaded 528 times
2) Right_Tape_315Hz_and_10kHz_Bias_Set.png, downloaded 504 times
3) Left_Tape_315Hz_and_10kHz_Bias_Set.png, downloaded 519 times

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Subject: Re: Cassette Tape Alignment
Posted by Wayne Parham on Fri, 12 Jul 2019 21:02:30 GMT
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Now that all potentiometers are set, the tape deck records perfectly on all the tapes I have. I used a Maxell CrO2 tape to set the bias, so that is my baseline. I also have some Sony Fe2O3 (standard) tapes, which need the external bias knob turned to about the 2:00 o'clock position for best results. That's pretty good, 'cause full scale is 5:00 o'clock. I think I can expect most tapes to work well with the adjustments I've made.

Subject: Re: Cassette Tape Alignment
Posted by Leot55 on Fri, 09 Oct 2020 02:07:38 GMT

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This was brilliant! How nice of you to go through the steps and share how you fixed things at each point. If you don't mind my asking, how did you know what the problem was in the first place though?

Subject: Re: Cassette Tape Alignment
Posted by gofar99 on Fri, 09 Oct 2020 02:51:00 GMT
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Hi Wayne, The same procedures go for reel to reel as well. Set playback azimuth response with a pre-recorded commercial tape or an alignment tape then make the adjustments.