CU University of Colorado
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Rachel RAMA4942 <rama4942@colorado.edu>

Re: Questions about remote control of treadmill [ref:_00D708PxE._5003n2O6RFr:ref]
6 messages

Support <support@bertec.com>   Fri, Aug 14, 2020 at 9:54 AM
To: "alaa@colorado.edu" <alaa@colorado.edu>
Cc: "rachel.marbaker@colorado.edu" <rachel.marbaker@colorado.edu>

Hi Alaa and Rachel,

Sorry for the delay. This week started off with some technical difficulties that pushed everything back.

If it's cyclical then it should be safe, but keep me posted about the sound.

And then, I remember and see my email that mentions them. I've reached out to the person, but they are currently on a special project install that should last this whole week. They said they would review my question and let me know. Is there a specific point in your process that you are getting hung up on? Maybe I could assist with some researching while we wait.

Regards,
Carley

--------------- Original Message ---------------
From: Alaa Ahmed [alaa@colorado.edu]
Sent: 8/6/2020 3:03 PM
To: support@bertec.com
Cc: rachel.marbaker@colorado.edu
Subject: Re: Questions about remote control of treadmill [ref:_00D708PxE._5003n2O6RFr:ref]

Hi Carley,

Thanks for the shipping label. I will try to send it back next week and will let you know when I do so.

I think the sound is cyclical, but we will check and confirm that and also let you know.

Lastly, we have been trying to make headway with the SDK and Simulink, but are having some issues moving forward. Would it be possible to chat with one of the engineers you had mentioned earlier, and make sure we are on the right track and not missing critical software?

Thanks so much!

Best,
alaa

On Aug 3, 2020, at 1:36 PM, Support <support@bertec.com> wrote:

Hi Alaa,

I tried looking back at my notes, but I'm not sure if I recorded it. Did you say the noise you are concerned about is cyclical or constant? According to the Lead Field Engineer that's our critical item for determining how to proceed in

this case.

Regards,
Carley

--------------- Original Message ---------------
From: Support [support@bertec.com]
Sent: 8/3/2020 11:40 AM
To: alaa@colorado.edu
Subject: Re: Questions about remote control of treadmill [ref:_00D708PxE._5003n2O6RFr:ref]

Hi Alaa,

Sorry for the delay. Thanks for sending these over. I hope to get them looked at today, and a fresh response to you tomorrow for scheduling.

Additionally, attached to this email is that shipping label. All you need to do is print it out, remove the old label, affix the new label to the box, close the box back up, and drop it off where it will be picked up by UPS. If your university handles mail or packages, they should be able to drop it off or schedule pick up for you. They may be able to box it up for you as well, although, due to COVID you may need to check before you go or drop the box off.

Regards,
Carley

--------------- Original Message ---------------
From: Alaa Ahmed [alaa@colorado.edu]
Sent: 7/28/2020 11:38 PM
To: support@bertec.com
Subject: Re: Questions about remote control of treadmill [ref:_00D708PxE._5003n2O6RFr:ref]

Hi Carley,

Thanks for getting back to me. Below is a link to a folder that has two photos and two movies.
https://drive.google.com/drive/folders/16Lee6TFVtIGkVkj3im1Rvfb4nvk4n-xd?usp=sharing

The photo and movie labeled 'bad belt' are obviously the ones of the belt where there is a slight bulge (barely noticeable) but you also here a noise when the belt is moving. You can barely hear it in the movie.

Then I added a picture and movie of the good belt for comparison. Let me know if you have any issues accessing the files.

Best,
alaa

On Jul 28, 2020, at 10:45 AM, Support <support@bertec.com> wrote:

Hi Alaa,

As mentioned on our last call, this email has attachments including a guide for the belt tracking adjustment. This may also be related to the tension on the belt, so I have also attached that instruction. Both adjustments are completed by adjusting the tension bolts on the black boxes on the rear end of the treadmill (the end without the motor). You will need:

1/4" hex key or socket

1/2" wrench
3 mm hex key or socket
Calipers or a permanent marker

In addition to the provided guide, we would like for you to first measure the roller arm distance that way we can be more precise in the adjustment of the belts or marker one point on the tension bolt with a permanent marker. I'll need the video and picture to provide how much to adjust the belt by.

I've attached an image to show you how to measure the roller arm if you have calipers.

After you make this adjustment, keep us posted on the condition of the treadmill.

Regards,
Carley

ref:_00D708PxE._5003n2O6RFr:ref

<Belt Tension Adjustment.pdf><Rear Roller Arm Measurement.jpg><Belt Tracking Adjustment.pdf>

Rachel Marbaker <Rachel.Marbaker@colorado.edu>   Mon, Aug 17, 2020 at 9:52 AM
Reply-To: Rachel.Marbaker@colorado.edu
To: Support <support@bertec.com>
Cc: "alaa@colorado.edu" <alaa@colorado.edu>

Hi Carley,

Here are some videos demonstrating the treadmill sound at a little higher speed so the sound is more obvious. Based on these, I am unsure whether the sound is cyclic. This link should include 3 videos taken from the back of the treadmill - the belt on the right side is making the noise. I will try to get the roller arm measurement in the next couple of days.

As far as questions for the engineers about connecting to the treadmill, we are encountering some challenges receiving data from the treadmill, and we would like to get all the force plate data feeding smoothly into simulink, matlab, or even a serial port from which the data package can be decoded. If the data input can be smoothly integrated to simulink that would be wonderful, otherwise I believe that some details of the treadmill communication protocol will be important:

- We believe the digital output from the amplifiers is sent to the computer via serial - these serials do not show up in the COM port listings of the computer, should we be finding them here? Is the serial somehow connected to the computer in a different way?
- If this is a serial connection, what is the baud rate? is it possible that we are not requesting the data at the proper rate?
- Once we access this connection, we are interested in understanding the communication protocol that would be necessary to decode the serial packages. Ideally this would be a kind of dictionary allowing us to translate packages into data points.
- What is the communication limitation that prevents us from commanding and receiving data via the same computer? Can the TCP/IP interface be used to receive force plate data?

Thank you! If there is any additional information on integrating the SDK into the matlab or simulink programming that would also be very helpful.

best,
Rachel
[Quoted text hidden]

Support <support@bertec.com>   Tue, Aug 18, 2020 at 3:45 PM

To: "rachel.marbaker@colorado.edu" <rachel.marbaker@colorado.edu>
Cc: "alaa@colorado.edu" <alaa@colorado.edu>

Hi Rachel and Alaa,

That static-y sound that is more constant is from the v-guide and is considered normal. I understand though not wanting it around. I think we've had one other customer that really didn't like the sound and was successful in making several adjustments to get rid of it, but it did require a lot of trial and error on their own time. I think one thing that helped was adding some additional lubricant and then trying to loosen the belts and then re-tighten, testing frequently at each step. Do you have a clear bottle from us with a clear liquid that is in a baggie?

We would probably start with the treadmill lubricant, like the other customer, and then do a series of adjustments to find the "sweet" spot. It would be important to record that roller arm length before attempting any of this. Let's go ahead and set a time aside to have a video call. It'll be a bit more exploratory and open, but it may be possible to resolve this during the call or you'll at least have the starting blocks to resolve relatively soon after the call. Currently, Friday afternoon is open. Would that work for you?

For the SDK for the data and the remote control function of the treadmill, those will be routed to the computer via a USB A to B. Those will appear in the device manager as USB devices or USBs. As far as where those will appear in Simulink, I do not know.

I did get a response from the engineer here at Bertec. He is originally from Brazil, so I guess I misheard. Normally I am better about that. He has used a simulink program someone else wrote and he has written a program in Labview, but not written a program in simulink. He thinks they are similar, but as a precaution, he recommended checking out this github information first:

https://github.com/smsong/self-paced-treadmill

Maybe the github images will reveal something about the connection. Additionally, if there is a way to reach out to them it could be handy as well. Though... as I'm looking at the github, I noticed "Speedgoat" in their simulink program. I think that means they are using a third party device to connect the program to the data..... That's a bit different than what I'm used to. Normally, the functions that are in the documentation for both the remote control and the SDK can be used in Matlab. The data commands just need to be migrated to Matlab compatible commands. Hmm.

I believe you can read and write to both the treadmill control cabinet and the treadmill data pathway from the same computer as I think one customer has done it. They just take different command functions and structures. The TCP/IP structure can't be used for the data pathway. The commands for the data pathway are determined from the documentation in the SDK.

Now, one other thing that came to mind is that you may be needing to read the data packets from the control system (motor control). I know we have writing the data packets explicitly demonstrated in the example code, but not the reading of those packets. Here is how to read the data packets:

So preparing a packet looks like the following:
1) You enter a value and the tm_set code changes it to the appropriate units (in mm/s for velocity, mm/s^2 for accelerate, and 0.01 deg by multiplying all values by 1000)
2) Values are checked for maximums (I believe maximums based on bit values)
3) The values for speed are changed to a 16-bit signed integer array and the incline is changed to a 16-bit unsigned integer array
4) The values for speed are then changed to a 16-bit unsigned integer array (this was done for the purpose of controlling the number of bits assigned to the number - I believe - that way it would be consistent every time a velocity was entered)
5) Bitwise math is performed - both a shift and an AND so that way the binary number in full can be recorded (seeing how values are multiplied by 1000 there would be over 8 digits of information and need these two operations to later identify the number)
6) The data packet at this point is then changed to an 8-bit unsigned integer array and an XOR applied as well as padding

For pulling the information out of the packet, you will want to use the answers from the bitwise math to determine what your original decimal number values are.
1) If you take the shifted value and truncate it in front of what was created from the AND function, then you can convert the binary value back to decimal. So something like this:

desired binary number = [bitshift_value bitand_value]
then convert the decimal number = converted desired binary number (if using matlab I believe you could use bin2dec(desired binary number))
2) From there, if you had a negative sign, then you would probably have some number larger than 65535 (-1 should be 65535). To bring those values back to a signed value, you would need to take away the maximum unsigned integer value as well as 1. I believe the conversion to the unsigned value is the following:
unsigned value = max_unsigned_int_value+1+absolute_value_of_signed_integer
*You might have to double check that the max unsigned integer value is 65535. It's been a bit since I've handled unsigned versus signed values. The equation could be more like 2*32767+1+absolute_value_of_signed_integer

Here is a quick example:
If speed is 2 m/s, then the number generated from the tm_set code for the packet is 2000, which would be a binary value of 11111010000. This binary value is not in the packet. Instead what's in the packet is these two values: 7 & 208. These come from the SHIFT and AND functions, respectively with 7 being 00000111 in binary and 208 being 11010000. Truncating the two together you get 11111010000 once more, which you can convert back decimal value (2000).

If that speed was -2 m/s, then you would get a value of 63536 (1111100000110000), which is broken up into values of 248 (11111000) and 48 (00110000). The 248 value is from the shift and the 48 is from the AND function.

One thing to note is that for combining the two binary numbers, you need to make sure that all zeros are present. Matlab/Octave tries to shorten the 00110000 to 110000.

I'll also ask the other engineer as well.
[Quoted text hidden]

Rachel Marbaker <Rachel.Marbaker@colorado.edu>   Thu, Aug 20, 2020 at 11:20 PM
Reply-To: Rachel.Marbaker@colorado.edu
To: Support <support@bertec.com>
Cc: "alaa@colorado.edu" <alaa@colorado.edu>

Hi Carley,
Thank you for all the detailed information! Unfortunately, we are stuck very early on: the two data line connections appear as USB Serial Converters, but even with drivers checked and updated, they do not appear in COM ports - is there a way we can access these in a serial monitor via com port or otherwise (so that we can see the two value packets coming in)?
Thank you again!
best,
rachel
[Quoted text hidden]

Support <support@bertec.com>   Wed, Aug 26, 2020 at 10:38 AM
To: "rachel.marbaker@colorado.edu" <rachel.marbaker@colorado.edu>
Cc: "alaa@colorado.edu" <alaa@colorado.edu>

Hi Rachel,

Sorry for the delay. I am trying to see if I can get a more direct resource for you on the simulink front. In the meantime, maybe we should back up and try to access the plates from just Matlab. This may help us identify issues with the connection to Simulink. For accessing the plates in Matlab alone, I have assisted a few people in diving through forums to identify what they need to do to get started. After that, they seem to be able to do what they want. What happens in Matlab, is that the SDK's file needs to be converted to a mex file. Would you be up for attempting this?

If so or unsure and need some more context, here is the documentation for this:
There is a forum that mentions using matlab and a need to use mex files to compile the code for the c files:
https://biomch-l.isbweb.org/threads/30984-integration-of-Bertec-force-plate-with-matlab-software
[Just make sure to click all the way through the conversation using the navigation at the top. The mention of mex files is with this comment: jbaxter44 Re: integration of Bertec... 02-13-2018, 04:15 PM)]

To do mex files as was mentioned in the other webpage you will need this help page:
https://www.mathworks.com/help/daq/sdk/buildadaptor.html

It is possible that you need the mex file to make the connection to Simulink and be able to access the devices in the USB COM ports. What the mex file does is it brings a file with c coding into Matlab terms and thus makes it usable in Matlab's framework. I don't know if Simulink would require a different file type than the mex, but since it's part of Matlab I would expect it to be the same. I will look into this today and see if Simulink requires a different file.

[Quoted text hidden]

Support <support@bertec.com>   Wed, Aug 26, 2020 at 11:35 AM
To: "rachel.marbaker@colorado.edu" <rachel.marbaker@colorado.edu>
Cc: "alaa@colorado.edu" <alaa@colorado.edu>

Hi Rachel,

Sorry for the second email. But scratch the troubleshooting I laid out in the previous email. I found the resource here at Bertec that was familiar with Simulink, he is the Engineering Project Manager, Mohan. He doesn't have Simulink on his system currently, but he's familiar with setting up devices on it.

Originally, he said that you can't use the plates in Simulink as the DLLs can only be used in matlab code. However, if you create a device in Simulink that uses our DLLs then it's possible to use the DLLs (and thus the plates) in Simulink. He originally, didn't know how easy this was, but he did some searching. He found the following:

Mathworks documents it as : https://www.mathworks.com/help/simulink/sfg/writing-level-2-matlab-s-functions.html

This guy gives the full example: https://www.mathworks.com/support/search.html/answers/91975-how-can-i-use-a-dll-file-in-simulink.html?fq=asset_type_name:answer%20category:simulink/implement_algorithms_c-code&page=1

[Mohan] thinks its doable but you need to know this part of matlab/simulink. step by step examples are provided: https://www.mathworks.com/matlabcentral/fileexchange/44197-calling-shared-libraries-from-simulink

Mohan may have further questions for me for you. Currently, it will be set up with me as the go between.

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