Serial Number:_____
(Please refer to this number for service)

Exer 3/6 Treadmill, Treadmill Controller, and Treadmill Software

Instruction Manual

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1. INTRODUCTION

1.0. System Overview

The Columbus Instruments Exer 3/6 Treadmill is an economical treadmill designed for general-purpose animal exercising. The overall running surface is divided into individual lanes by use of clear or opaque lane dividers. By default, the outermost lane dividers are clear to allow the user to view the animal in the outside lanes. All remaining dividers are opaque to provide isolation. The treadmill is capable of exercising from 1 to 3 rats or from 1 to 6 mice simultaneously. The running surface can be inclined up to 25° above the horizontal in 5° steps. An optional Downhill Running Adapter allows the running surface to be declined down to 15° below the horizontal in 5° steps. A clear one-piece lid and hinge cover all of the lanes. The lid and dividers are easily removed for cleaning. The use of a brushless motor provides very long life and eliminates the need for brush replacement or commutator refinishing.

The Treadmill Controller allows the user to set the parameters for the treadmill belt speed and optional Electric Stimulus. The treadmill belt speed is adjustable from 0.0 to 102.3 meters per minute (m/min). A toggle switch commands the treadmill belt to "RUN", "STOP" and "ACCELERATE", a new feature of the controller. An LCD display reports the current speed setting, treadmill belt status as well as the accumulated distance traveled. The optional Electric Stimulus is a 200 millisecond (ms) pulse of electric current adjustable from 0.34 to 1.60 milliamperes (mA). The pulse is presented 1, 2 or 3 cycles per second (Hertz, Hz). Individual toggle switches associated with each lane on the treadmill controls the application of the Electric Stimulus to the shock grids.

The Treadmill Software communicates with the Treadmill Controller, which is used to set the acceleration parameters as well as report the status of the treadmill belt speed and the accumulated distance traveled. Once set, the acceleration parameters are saved in the Treadmill Controller, which are immediately available the next time the Treadmill Controller is used with or without the host computer.

Summaries of the features are as follows:

- The Exer 3/6 Treadmill can exercise 1-3 rats or 1-6 mice simultaneously.
- Treadmill belt speed is adjustable from 0.0 to 102.3 m/min.
- Microsoft Windows® software programmable acceleration which is saved in the Treadmill Controller.
- Any combination of clear or opaque lane dividers can be used.
- +25° of inclination in 5° steps.
- Optional -15° of declination in 5° steps.
- New brushless motor ensures long life with no maintenance!
- Optional Electrical Stimulus.

1.1. System Specifications

1.1.0. Minimum Computer Specifications

IBM compatible computer with Windows operating system.
CD-ROM drive for software installation.
5 MB of free hard drive space for software installation.
1 free RS-232 serial port.

1.1.1. Computer Interface Specifications

Power Requirements:	12 V @ 35 mA.
Physical Dimensions:	4.7" x 3.2" x 1.9" (120 x 82 x 49 mm).
Physical Weight:	0.4 lbs. (186 g).
Power Connection:	Coaxial Jack: 5.5mm O.D. x 2.1mm I.D. (any polarity)
Computer Connection:	RS-232, 9-pin Female D-sub.
Controller Connection:	CI-Bus, 8-pin RJ45 Jacks (x2).
Communication:	19200 bps, 8 data bits, no parity, 1 stop bit (typical)

1.1.2. Computer Interface Power Supply

North America / Japan:	Input Power: 100-120 VAC, 50/60 Hz, 10 W.
	Output Power: 12 VDC @ 500 mA.
	Power Connection: Coaxial Plug (-) 5.5mm O.D. x (+) 2.1mm I.D.
	Weight: 0.6 lbs. (300 g)
Continental Europe	Input Power: 230 VAC, 50/60Hz, 10 watts.
	Output Power: 12 VDC @ 500mA.
	Power Connection: Coaxial Plug (+) 5.5mm O.D. x (-) 2.1mm I.D.
	Weight: 0.8 lbs. (400 g)

1.1.3. Treadmill Controller

Power Requirements:	200 W, 115 VAC or 230 VAC, 50/60 Hz (factory selected).
Physical Dimensions:	13.0" x 11.4" x 4.0" (33.1 x 29.0 x 10.2 cm).
Physical Weight:	7.0 lbs. (3.2 kg).
CI-Bus Connection:	8-pin RJ45 Jacks (x2).
Motor Connection:	6-pin Amphenol Circular Female Jack.
Shocker Connection:	15-pin Female D-sub.

1.1.4. Exer 3/6 Treadmill

Physical Dimensions:	33.0” x 20.0” x 20.0” (83.8 x 50.8 x 50.8 cm).
Physical Weight:	55 pounds (25 kilograms).
Belt Speed:	0.0 - 102.3 m/min.
Angle of Inclination:	0° - 25° above the horizontal in 5° steps.
Mouse Lane Dimensions:	2.3” x 16.3” (5.7 x 41.3 cm).
Mouse Platform:	2.3” x 4.2” with 0.4” brush (5.7 x 10.7 cm with 1.0 cm brush)
Rat Lane Dimensions:	4.6” x 16.3” (11.8 x 41.3cm).
Rat Platform:	4.6” x 4.2” with 0.4” brush (11.8 x 10.7 cm with 1.0 cm brush)
Motor Connection:	6-pin Amphenol Circular Female Jack.
Shocker Connection:	15-pin Female D-SUB. (optional).

1.1.5. Optional Electric Stimulus (replaces treadmill platform)

Mouse Grid Dimensions:	0.1” x 4.5” rods, 0.4” apart, 5-6 rods typical. (0.3 x 11.4cm rods, 1.0 cm apart, 5-6 rods typical)
Rat Grid Dimensions:	0.1” x 4.5” rods, 0.4” apart, 11 rods typical. (0.3 x 11.4 cm rods, 1.0 cm apart, 11 rods typical)
Stimulus Voltage:	163 V.
Stimulus Current:	0.34 - 1.60 mA.
Stimulus Duration:	200 ms.
Stimulus Repetition Rate:	1, 2 or 3 Hz.
Stimulus Control:	2-position toggle switch (on/off).

1.1.6. Optional Downhill Running Adapter (modifies treadmill feet)

Adapter Dimensions:	10.0” x 19.5” x 10.9” (25.4 x 49.5 x 27.7cm).
Adapter Weight:	2.3 pounds (1.0 kilograms).
Adapter Effect:	adds +11.8” (+30.0cm) to the overall height.
Angle of Declination:	0° - 15° below the horizontal in 5° steps.

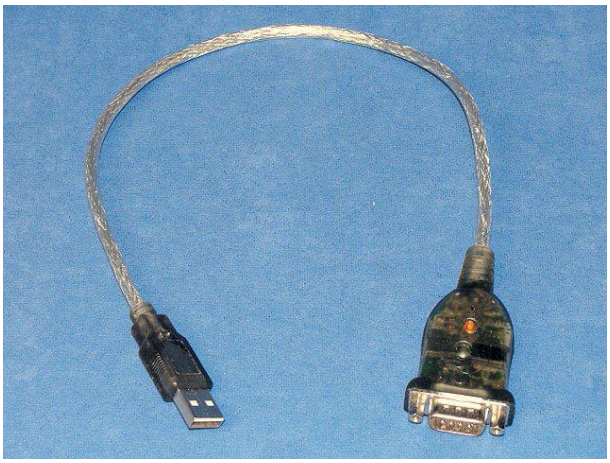
2. COMPUTER SETUP

2.0. Serial Port Installation

- The host computer must have one free RS-232 serial port.
  For best performance, it is recommended to use a native (built-in) serial port.

- If a native port is not available or already in use, a PCI Serial I/O card is the next best option. It provides multiple, serial ports in the same way as a native serial port, however, it requires that the host computer have 1 free PCI slot.

- A USB-to-Serial adapter is an option for computers that cannot support an I/O card (typical of laptops). It requires 1 free USB port and is problably the most easy to use, however, the performace is directly affected by the chipset used in the USB-to-Serial adapter, the host computer speed, the host USB port type and other USB devices that are being serviced over the USB system. Once may be included with the system for convienence.



Refer to the documentation that came with your hardware to install and use your particular serial port.

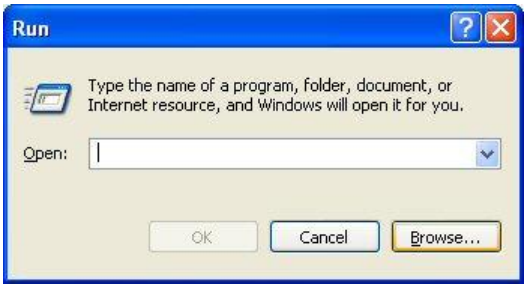
2.1. Treadmill Software Installation

You must have administrator rights/privledges on the host computer for the software to install successfuly. The software is expected to be installed and run locally on the host computer's hard drive and not from a remote mapped network resource.

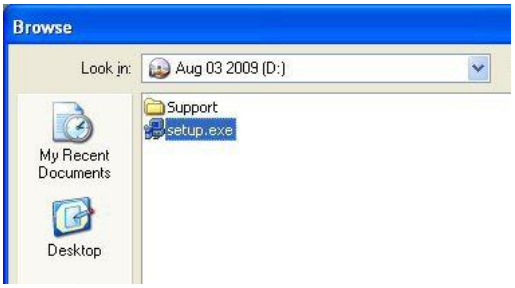
- **Follow these steps to install the Treadmill software:**

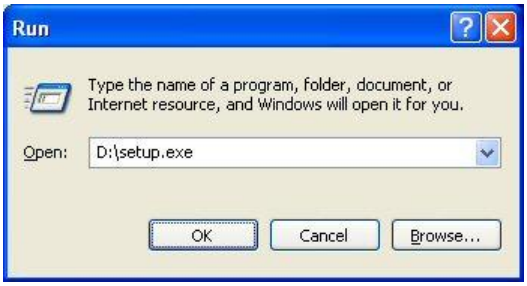
Insert the Treadmill Software CD-ROM into the host computer. If the "Treadmill Software Setup" application does not automatically launch, then you must manually launch the installation program.

1. Select "**Start » Run...**" from the desktop taskbar. A "Run" window will open.
2. Click the Browse button. A "Browse" window will open.



3. Select the CD-ROM drive from the "**Look in:**" combo box.
4. Click once to highlight "**Setup.exe**" from the list of files on the CD-ROM.
5. Click the Open button. The "Browse" window will close and return focus back to the "Run" window.
6. Click the OK button to begin the installation program.



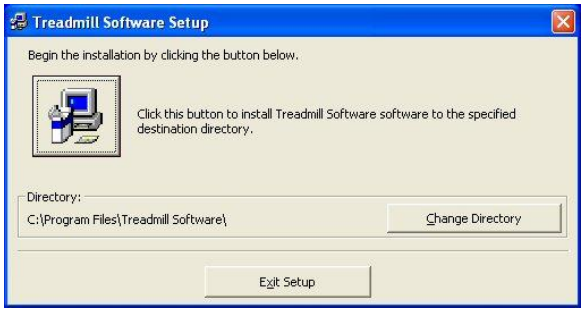


- Upon initialization, some install files will be processed and copied to the host computer. These files will be removed if setup is cancelled. Then a blue "Treadmill Software Setup" backdrop and installation window will be displayed.

2.1. Treadmill Software Installation (continued)

7. Click the OK button to continue.

8. Click the square button marked with a computer and floppy disks to continue.



9. Click the Continue button to begin the copy and installation procedure into the default Program Group.

The install program will check for necessary disk space and then begin to copy the program. It is recommend to keep any files on your system that are newer than the ones being copied. Upon completion, the program will update the Windows system and create program icons inside the group folder on the start menu.

10. Click the OK button to finish the install program.
    The "Treadmill Software Setup" screen will close and return to the user desktop.

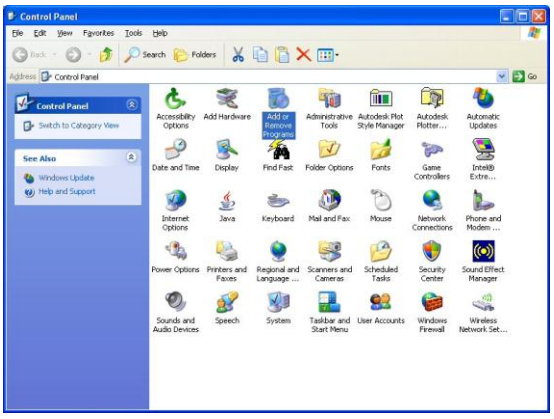
2.2. Removing the Software

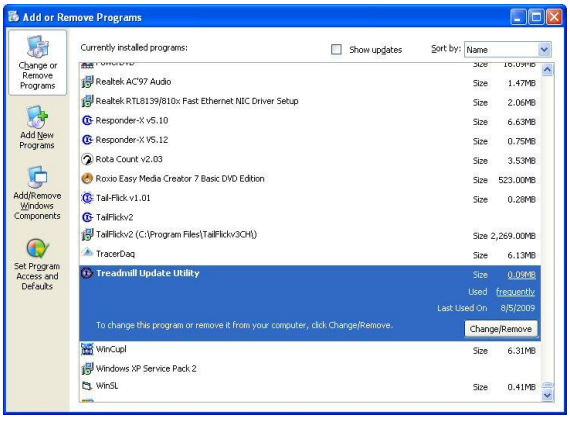
Removing the Treadmill Software application is required when upgrading to a newer version of the application or relocating the application to a new host computer. When upgrading, this ensures that all of the support files packaged with the application are copied and installed to the host computer.

Follow these steps to remove the Treadmill Software:

1. Select **"Start » Control Panel"** from the desktop taskbar. This will open the "Control Panel" window.

2. Run the "Add or Remove Programs" application. This will open the "Add or Remove Programs" window.
3. Under the "Change or Remove Programs" selection, scroll through the list of installed programs and click once to highlight "Treadmill Software".
4. Click the Change/Remove button. The PC screen will change to a blue "Treadmill Software Removal" screen.



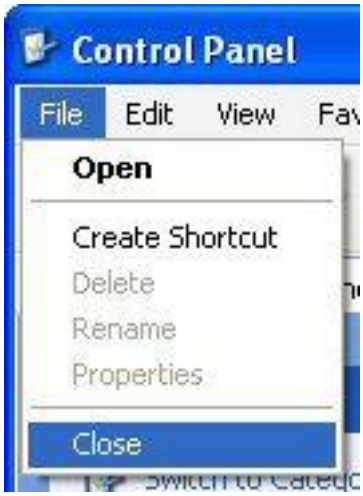


2.2. Removing the Software (continued)

5. Click Yes to begin the removal of the Treadmill Software program.

6. Click OK to close the "Application Removal" window and return to the "Add or Remove Programs" window.

7. Click X in the top-right corner of the "Add or Remove Programs" window to close.
8. Click X in the top-right corner of the "Control Panel" window or select "File >> Close" from the menu bar.



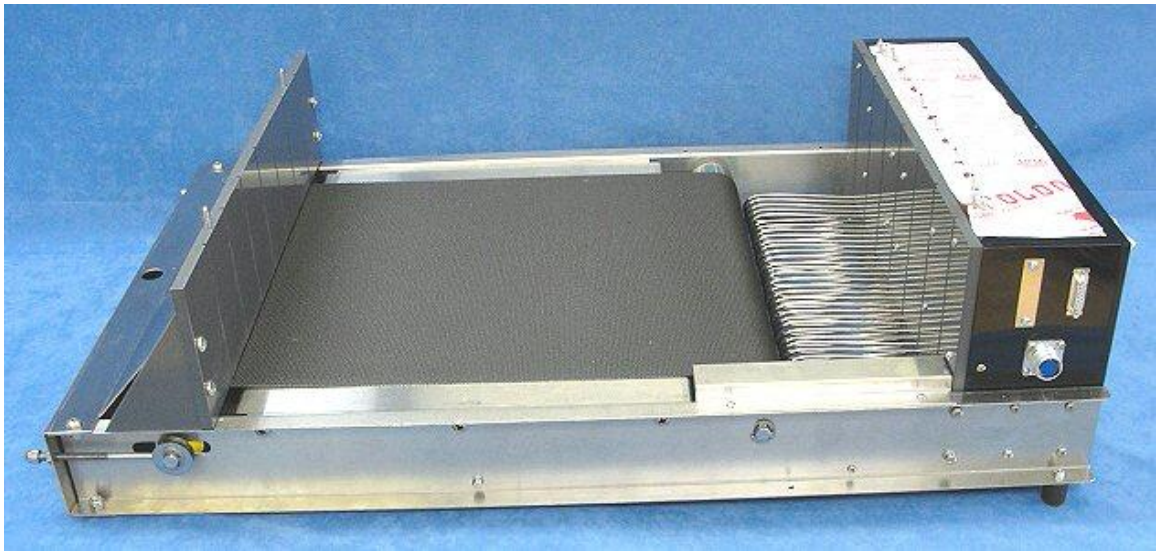
3. HARDWARE SETUP

3.0. Item Inventory

A typical Treadmill system will contain the following items:

- 1 x USB-to-Serial adapter package (may be included).
- 1 x Computer Interface with power supply.
- 1 x RS-232 serial extension cable, 1.8m (6-foot), 9-pin male-female.
- 1 x RJ-45 cable, 1.8m (6-foot), 8-pin 8-conductor, plug-plug.
- The Treadmill Controller with power cord.
- 1 x D-Sub shock cable, 1.8m (6-foot), 15-pin 15-conductor male-male.
- 1 x Amphenol motor cable 1.8m (6-foot), 6-pin 6-conductor circular plug-plug.
- 1 x instruction manual
- 1 x Treadmill Software CD-ROM.

3.0. Item Inventory (continued)

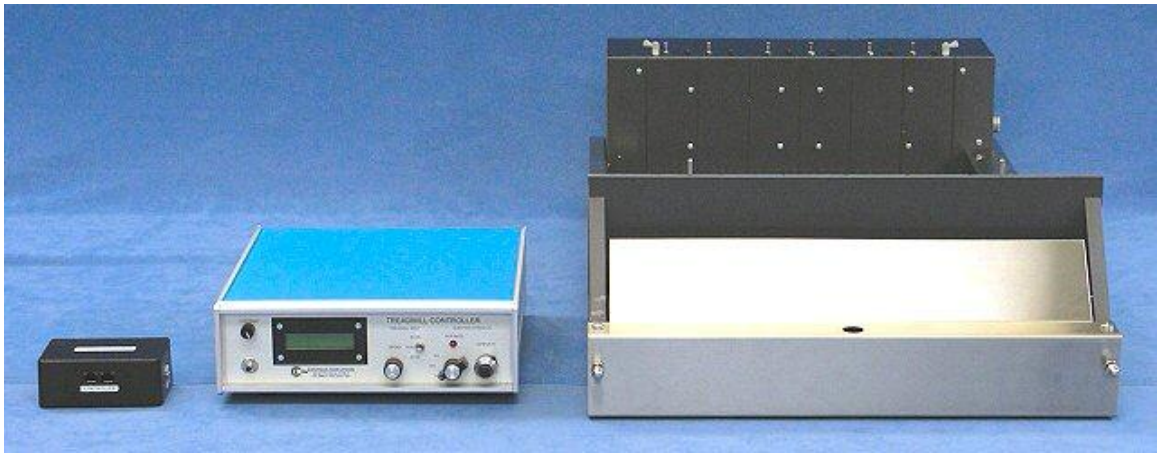


- The Exer 3/6 Treadmill with optional shock grid.

- 1 x treadmill lid
- 1 x feces tray.
- 1 x package of lane dividers: 5 opaque and 2 clear dividers are shown for mice.
- 1 x inclination rod, 51cm (20-inch) with spring pin.
- 2 x thumbnuts for securing the treadmill lid.
- 1 x 7/16-inch open-end wrench for adjusting the tension of the treadmill belt.

Note: The Treadmill system is easy to assemble provided that the components of the system are placed correctly. A working surface that averages 2m x 1m (6-ft x 3-ft) with access to the front and back is recommended. It will facilitate adjustments to the inclination rod as well as loading and unloading the animals.

- The components of the system are best placed in the order as follows. The host computer is not shown:



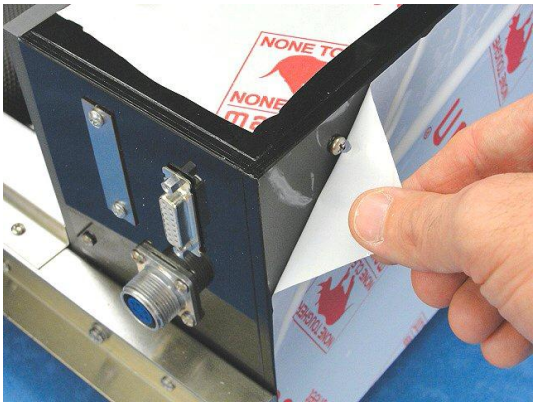
You may also need the following tools for assembling the system:

- Phillips (cross-point) screwdriver, medium tip.
- Common (flat-point) screwdriver, small tip.
- 5/16-inch (7.5mm) wrench.

Note: It is recommended to use an AC power strip to provide a common short-distance access to AC power for all components of the Treadmill system. Most AC power strips incorporate a master switch that can switch on and off the AC power to the entire system and protect against electrostatic discharge. It also provides a beneficial common ground between all components to help prevent unintentional ground loops.

3.1. Assembling the Exer 3/6 Treadmill

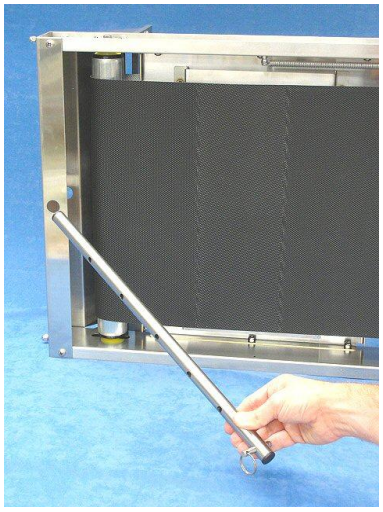
1. Remove any protective plastic film that may cover pieces of the treadmill.



2. Note that various holes are positioned along the length of the Inclination Rod. Insert the spring pin into the hole that is positioned closest to the end of the rod. This end of the Inclination Rod is considered the bottom, the opposite end is the top.

3.1. Assembling the Exer 3/6 Treadmill (continued)

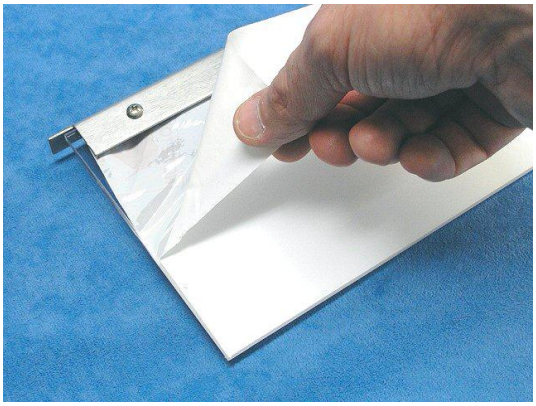
3. Turn the Exer 3/6 Treadmill on its side.
4. Then insert the top of the Inclination Rod through the hole in the front of the treadmill. (Now it is easier to remove the protective film from the bottom of the treadmill too).



5. Turn the Exer 3/6 Treadmill onto its feet.

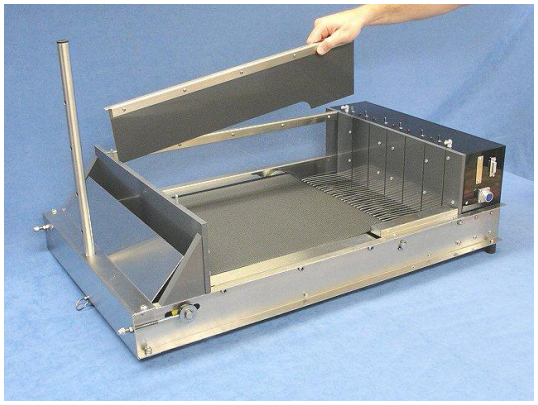
3.1. Assembling the Exer 3/6 Treadmill (continued)

6. Remove any protective plastic film that may cover the lane dividers.



7. Insert one of the clear lane dividers into the set of slots on the far side of the treadmill.

8. Insert all of the opaque dividers into the slots in the middle of the treadmill. Leave one set of slots vacant between the 2 dividers for rats. Or populate all 5 slots for mice (as shown).
9. Then insert the other clear lane divider into the set of slots on the near side of the treadmill

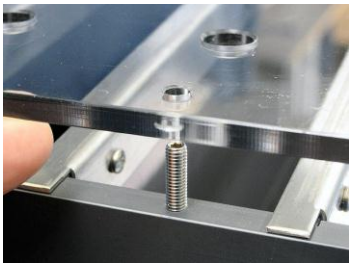


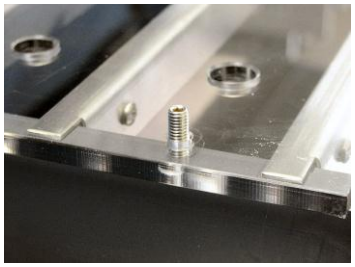
3.1. Assembling the Exer 3/6 Treadmill (continued)

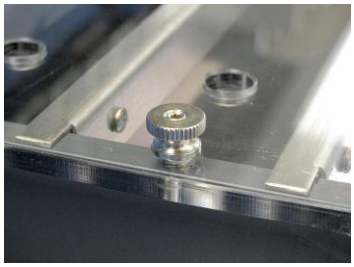
10. Remove all protective plastic film that may cover the treadmill cover and lid.

11. Fold the lid onto the cover.

12. Place the holes of the cover over the posts in the front of the treadmill and secure with the two #6-32 thumb-nuts.

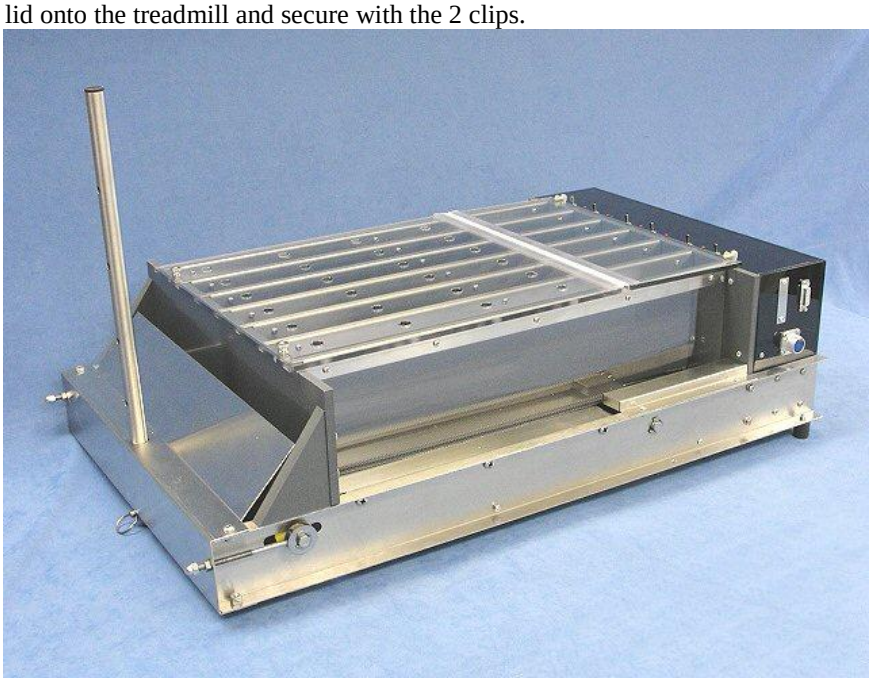


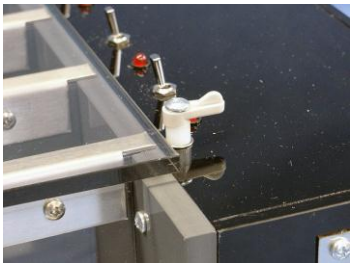


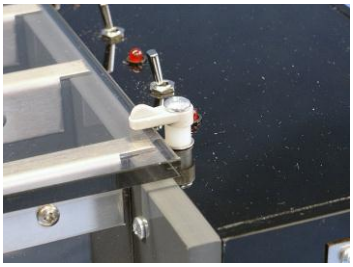


3.1. Assembling the Exer 3/6 Treadmill (continued)

13. Unfold the lid onto the treadmill and secure with the 2 clips.



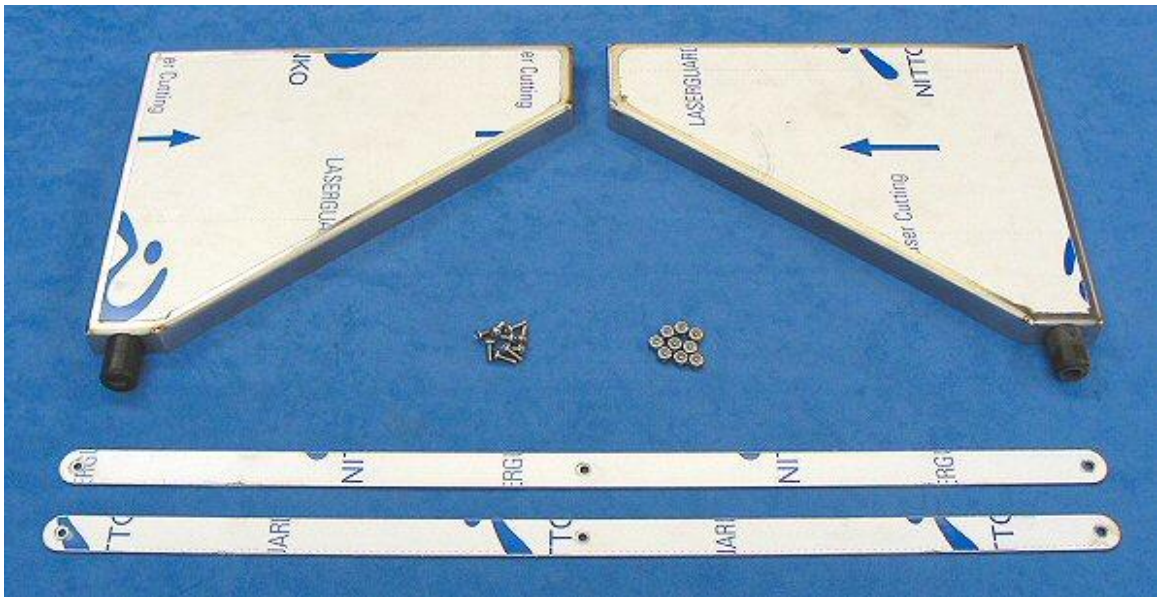




14. Place the Feces Tray underneath the treadmill below the platform and treadmill belt.
15. This completes the assembly of the Exer 3/6 Treadmill.

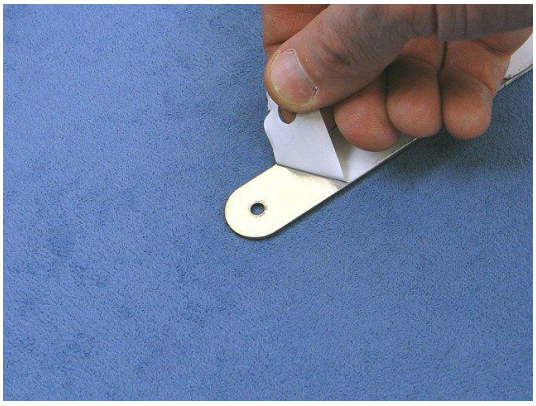
3.2. Downhill Running Adapter

- If the Exer 3/6 Treadmill came with the Downhill running adapter, then the system should contain the following:



- 1 x Right leg with rubber foot.
- 1 x Left leg with rubber foot.
- 2 x Braces for the legs.
- 9 x #6-32 x 3/8-inch screws.
- 9 x #6-32 hex nuts with nylon locking inserts.

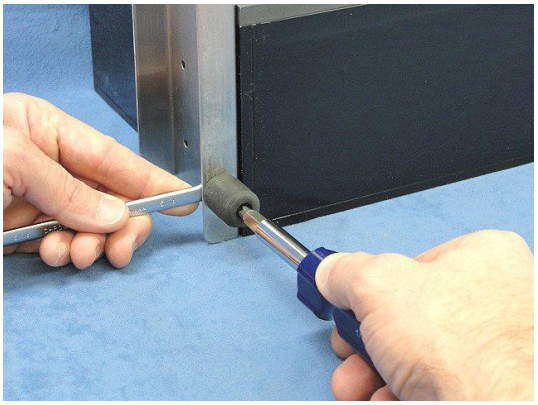
1. Remove any protective plastic film that may cover the pieces of the Downhill Running Adapter.



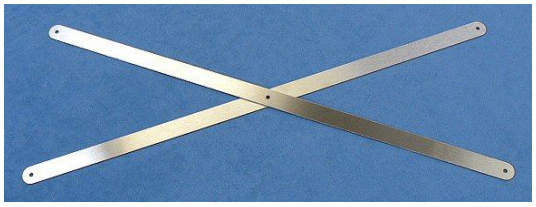
3.2. Downhill Running Adapter (continued)

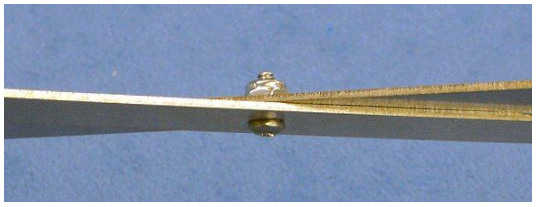
2. Raise the front so the treadmill will rest entirely on the rear panel. Remove the Inclination Rod with spring pin as set aside.

3. Using the Phillips screwdriver and 5/16-inch wrench, remove both feet from the bottom of the treadmill.



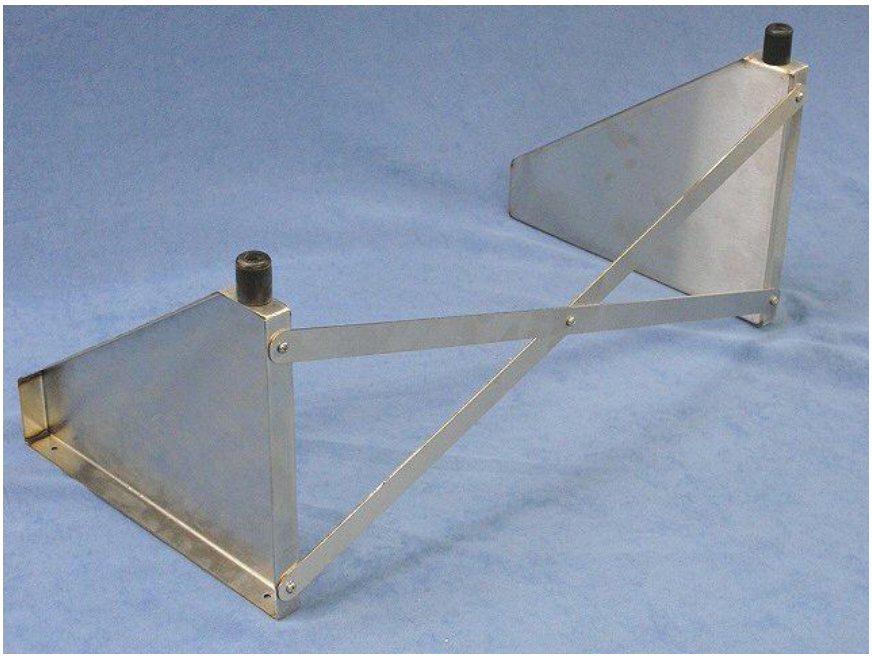
4. Using one screw and nut, connect the two braces together in the middle. Do not tighten. The screw and nut should hold the braces closely together but allow them to move.





3.2. Downhill Running Adapter (continued)

5. Using four screws with nuts connect the legs and the braces together in the orientation as shown. Again, do not tighten. The screws and nuts should hold the pieces closely together but allow them to move.
6. Now, apply pressure to force the rubber feet of the legs apart and tighten the two screws and nuts near the feet. This will hold the feet farthest apart for better stability.



7. Position the assembled Downhill Adapter with the braces on the bottom next to the bottom of the treadmill as shown and secure with the remaining 4 screws and nuts as shown. Tighten completely.

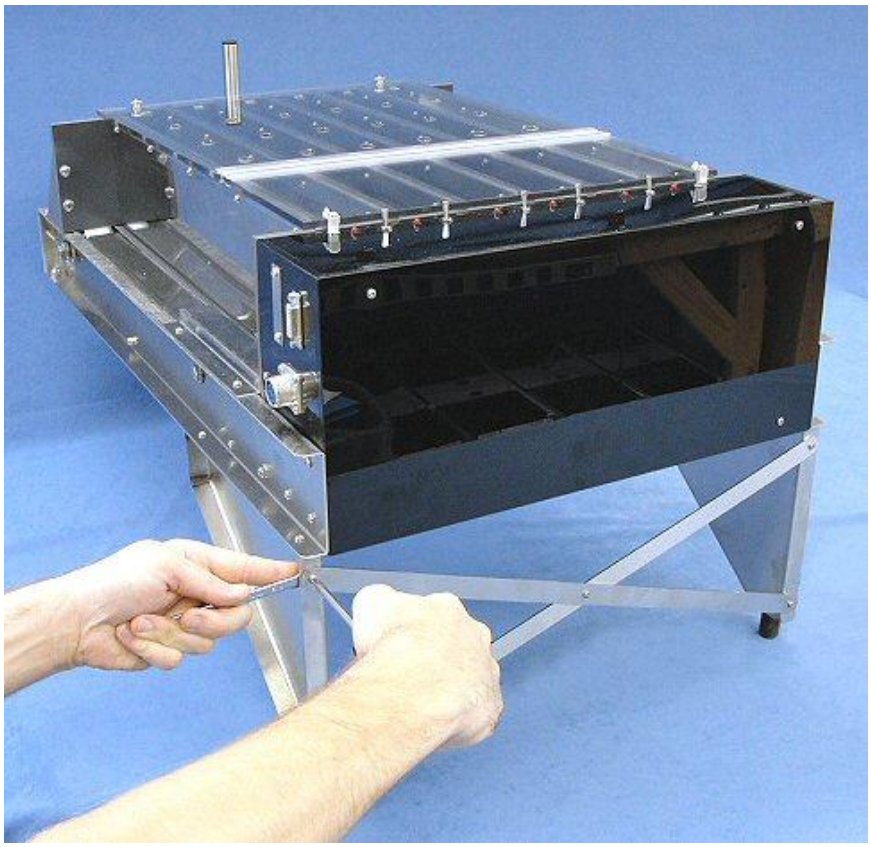
3.2. Downhill Running Adapter (continued)

8. Reposition the spring pin from the hole at the bottom to the hole in the middle of the Inclination Rod.

9. Insert the Inclination Rod through the hole in the front of the treadmill. Then lower the front so the treadmill rests on the Downhill Adapter feet and Inclination Rod.

3.2. Downhill Running Adapter (continued)

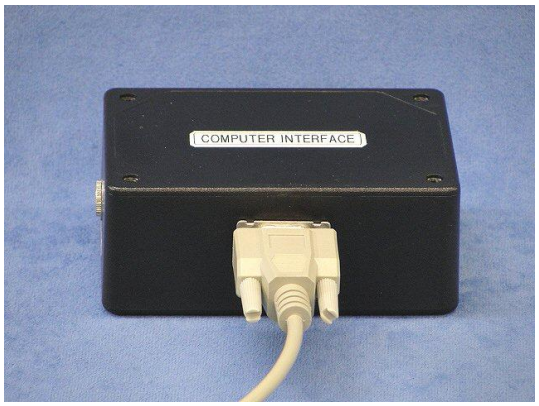
10. Tighten all remaining screws and nuts of the legs and braces.



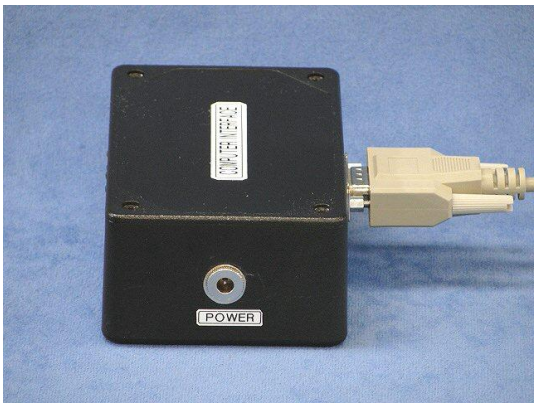
11. This completes the assembly of the Downhill Adapter.

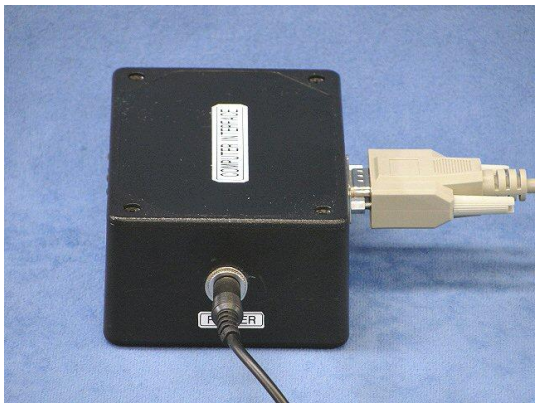
3.3. Connecting the Components

1. Connect the female end of the RS-232 cable to a free serial port on the host computer (not shown).
2. Connect the male end of the RS-232 cable to the “COMPUTER” port of the Computer Interface.

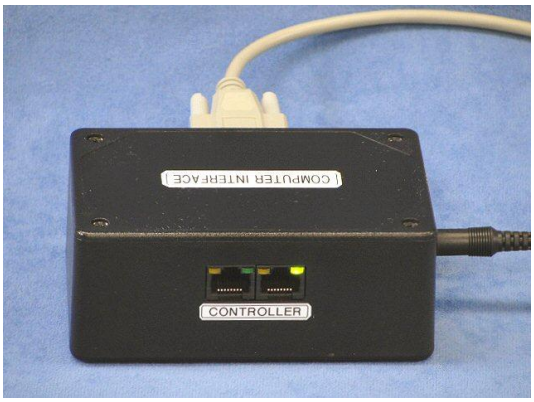


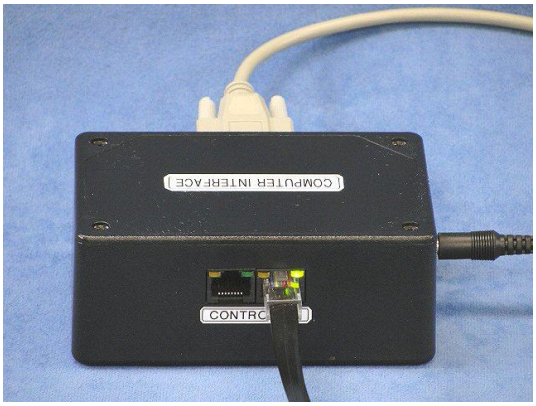
3. Connect the power plug of the power supply to the “POWER” port of the Computer Interface.
4. Install the power supply into the appropriate AC outlet (not shown). The power indicator (top right green LED on the “CONTROLLER” port) will light continuously.





5. Connect one end of the RJ-45 cable to any of the “CONTROLLER” ports of the Computer Interface.

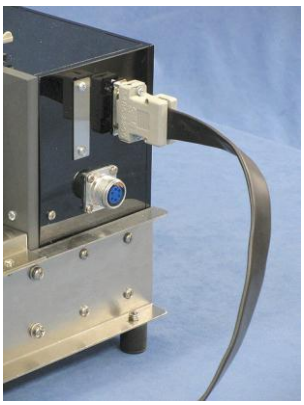




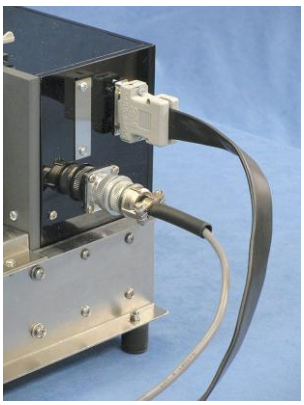
3.3. Connecting the Components (continued)

6. Connect the other end of the RJ-45 cable to any of the “CIBUS”” ports of the Treadmill Controller.

7. Connect one end of the 15-pin shock cable to the rear “Shocker Box” port of the Treadmill Controller.
8. Connect the other end of the 15-pin shock cable to the 15-pin D-Sub jack on the Exer 3/6 Treadmill.
9. Use the common screwdriver to secure the 15-pin connectors to the ports.



10. Connect one end of the motor cable to the “Motor” port of the Treadmill Controller.
11. Connect the other end of the motor cable to the 6-pin Amphenol jack on the Exer 3/6 Treadmill.



3.3. Connecting the Components (continued)

12. Connect the AC power cord to the rear panel AC power receptacle of the Treadmill Controller and insert the other end into an appropriate AC outlet.

DO NOT power up the Treadmill Controller at this time!
(Refer to **SECTION 4 – PERFORMING AN EXPERIMENT)** for further instructions.

3.4. Setting the Angle of Inclination or Declination

The angle of inclination is set by the location of the spring pin in holes of the Inclination Rod. The holes range from 0° to 25° in 5° steps. With the Downhill Running Adapter, the holes range from 0° to -15° in 5° steps.

1. Lift the front of the treadmill to release the pressure on the spring pin and remove it from the Inclination Rod.
2. Now raise the treadmill above the new height of inclination and replace the spring pin into the corresponding hole in the Inclination Rod.
3. Slowly lower the treadmill onto the spring pin.

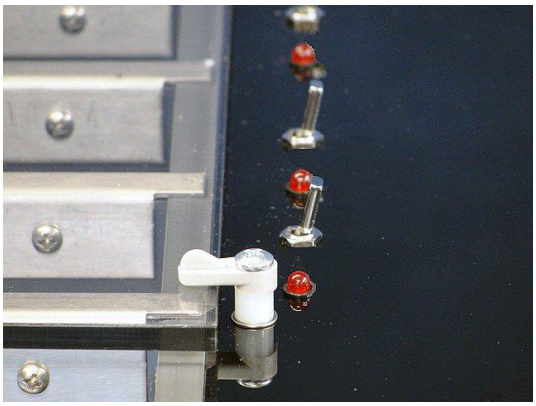
4. PERFORMING AN EXPERIMENT

An experiment is performed by initializing the Treadmill Controller. If acceleration is to be employed, then the Treadmill Software must be launched to initialize the acceleration parameters in the Treadmill Controller. Then the subjects are loaded. The shock intensity will be set. Then the treadmill belt will be set to "RUN" and experiment begins. When desired, the treadmill belt can be set to "ACCEL" to apply acceleration. When the experiment is finished, the subjects are removed.

4.0. System Initialization

Attention! Use the following procedure to prevent the application of an undesirable treadmill belt speed or high shock intensity.

1. Disable the shock stimulus for all lanes by setting toggle switches toward the rear of the treadmill.

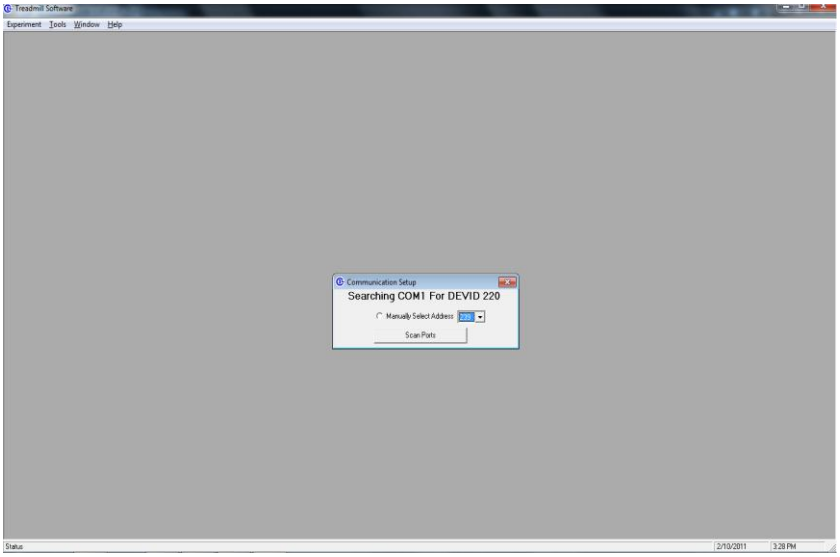


2. Turn the "INTENSITY" knob counter-clockwise, all of the way, to zero.
3. Set the "TREADMILL BELT" toggle switch to "STOP" on the front panel of the Treadmill Controller.
4. Switch on the Treadmill Controller. The power switch is integrated into the power receptacle on the rear panel above the AC power cord.

Note: The front panel display should report the current speed setting and an accumulated odometer distance of zero.

4.1. Treadmill Software Initialization

From the desktop taskbar, select **"Start » All Programs » Treadmill Software » Treadmill Software".**

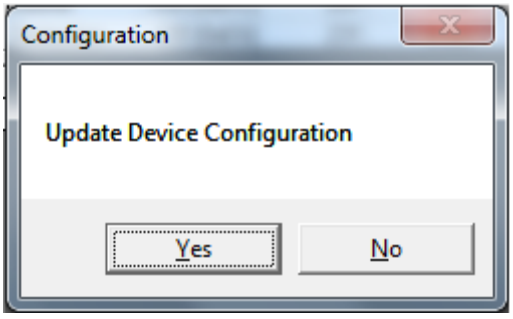


- Upon initialization, the software will automatically scan the Treadmill Controller's available serial communication ports (COM) for existing devices and associated address identification numbers.
- The starting device identification address (DEVID 220) is assigned to the Treadmill Controller(s) with additional addresses following numerically for multiple devices.
- The starting device identification address (DEVID 230) is assigned to the Shock Controller(s) in this same manner.

To rescan the Treadmill Controller for the presence or addition of connected devices, select **"Tools » Device Scan"** from the Treadmill Software main window**.**

- Click the "Scan for New Devices" button to add any devices previously not configured.
- Click the "Scan Configured Devices" button to rescan devices already present in the latest configuration file.
- Click on the "Exit" button to complete the process and close the "Communication Scan" window.

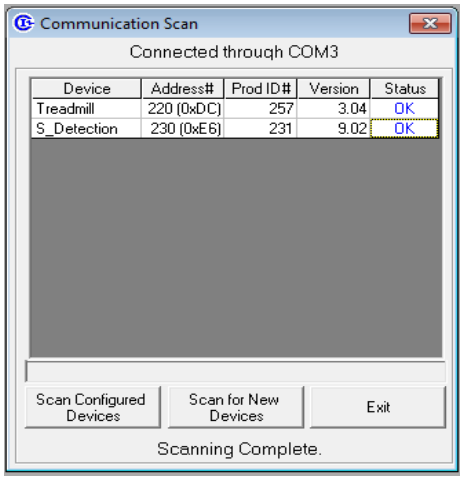
After closing the window, an "**Update Device Configuration"** prompt will appear



- Click the "Yes" button to save the new device configuration.
- Click the "No" button to keep the previous device configuration.

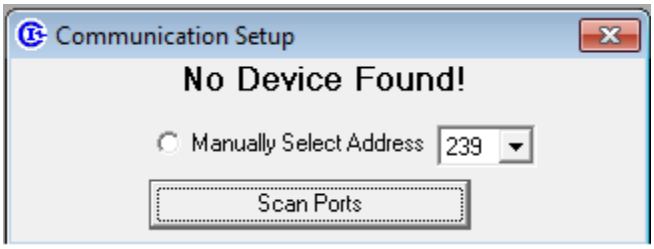
4.1. System Initialization (continued)

Upon successful identification the Treadmill Controller by the application, the host COM port and Treadmill Controller information are displayed at the top of the window as shown below:



4.2. No Device Connected

If the Treadmill Controller could not be found, the following message is displayed:



To re-attempt device connection after a failed communication,

- Click the Scan Ports button to automatically search all available serial (COM) ports for the Treadmill Controller.
- For Advanced Users when the device address is already known,
    - Select the "Manually Select Address" radio button.
    - Choose the correct device number from the pull-down menu.
    - Click the Scan Ports button to scan an individual port.
- If multiple attempts at device connection still result in "No Device Found!" prompts see the Troubleshooting section of this manual.
- If the problem cannot be remedied by the suggested troubleshooting tips, contact Columbus Instruments.

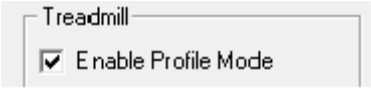
4.3. Experiment Setup via Software Interface

- From the Treadmill Software main window select **"Experiment » Run".**
- This launches the "Experiment" window within the **"Profile Mode"** tab as shown below:

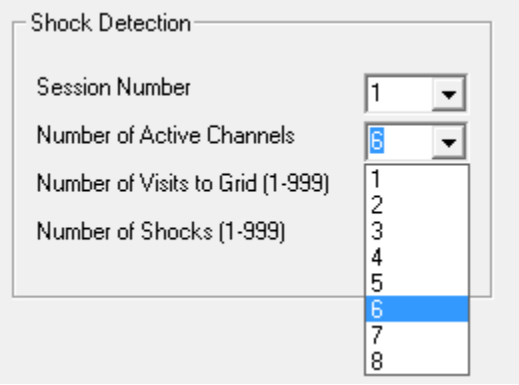
4.3.0. Utilizing Profile Mode

When a specific set of treadmill parameters will be revisited multiple times or will be recalled for additional experimentation a profile may be desired.

- First, select the "**Manual**" tab see that the "Enable Profile Mode" box is checked. This ensures that a profile will be properly recorded.



- While in the "**Manual**" tab, if electrical stimulus is needed select the desired "Number of Active Channels" from the pull down menu located under the Shock Detection settings.

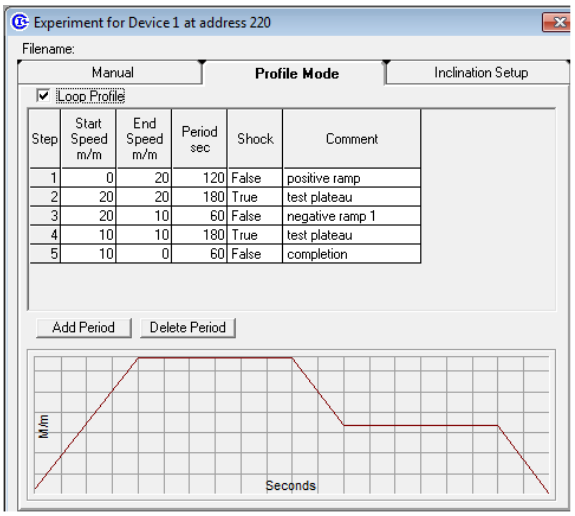


- Return to the "**Profile Mode**" tab to begin creating a profile.

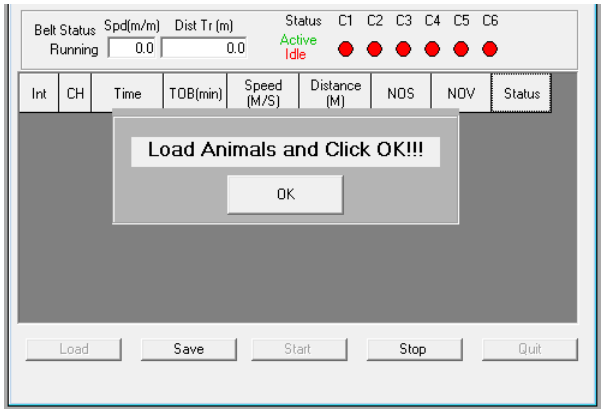
4.3.1. Creating a Profile

1. Enter “Start Speed” and “End Speed” in meters per min (m/min).
    - Enter the “Period” in seconds. (This is the time required for a step to reach the end speed from the starting speed)
2. If the Shock Detection unit is present, select whether to turn the unit “On” or “Off” during the step duration.
3. Enter comments in textbox if needed.
4. If a multi-step activity routine* is desired and the initial treadmill parameters are entered,
    - Click the Add Period button and enter desired values as described above.
    - Click the Delete Period button to remove the last step that was created.
5. Select the “Loop Profile” checkbox if multiple iterations of the profile are desired.

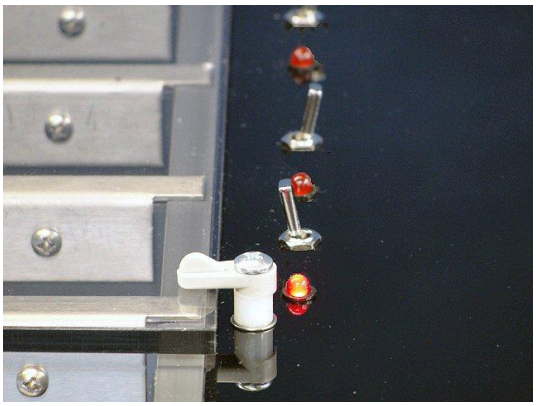
    ***Note**: When editing multi-step routines, the “End Speed” of a preceding step must be identical to the “Start Speed” of the step that follows it.



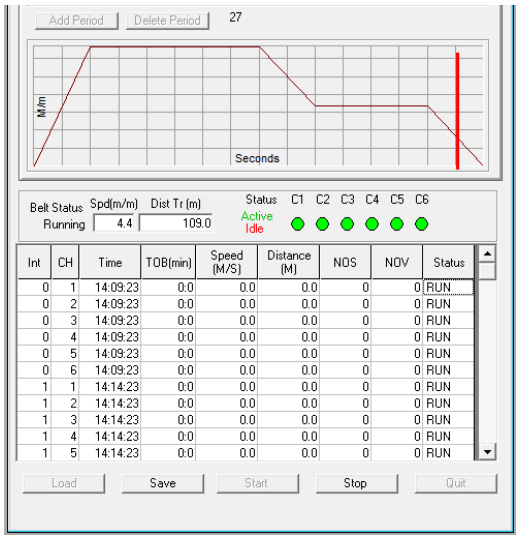
6. A graphical representation of the profile will also be created in the form of a plot of speed (m/min) vs. time (sec).
7. Once all profile parameters are complete, click the Save button to store the information in a .csv file format, or click the Load button to recall a previously saved profile.
8. Next, click the Start button to begin the desired profile.
9. Proceed by loading the test subjects* and clicking the OK button to begin.



***Note**: Before loading or unloading the subjects, place a paper towel on top of the treadmill cabinet to protect the toggle switches and indicators and not allow urine inside. Turn the clips that secure the lid and fold the lid on top of the cover. Load the subjects onto the shock grid (which is turned off). Reclose the lid and secure with the clips.

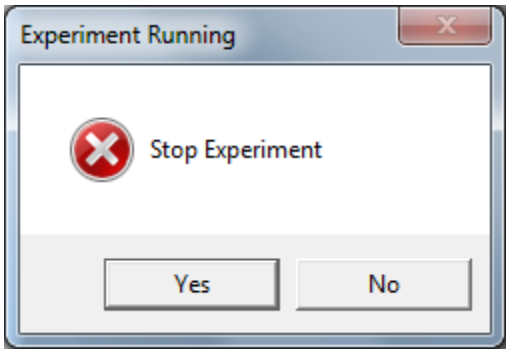


Once the profile has begun, treadmill belt status and data collection are displayed in real-time as the routine progresses.



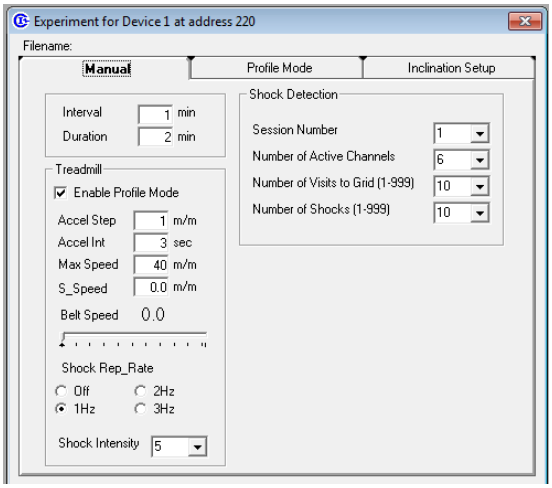
For data table heading descriptions and output see section 4.5.7.

10. As the final step is reached the profile will end, unless the "Loop Profile" is selected resulting in the restart and execution in its entireity. Profile repetition and data generation will continue until the Stop button is clicked at the user's discretion.
11. A subsequent "Stop Experiment" prompt window will open,
    - Click the "Yes" button to finish the routine.
    - Click the "No" button to continue specified profile.



4.4. Manual Mode

For manual entry of Treadmill System settings select the "**Manual**" tab on the experiment window as shown below:



- Manual settings can be entered for:
  - Interval and duration
  - Acceleration and speed parameters
  - Shock repetition rate, shock intensity, and detection parameters (with presence of shock detection unit).

4.4.0. Interval and Duration

- Interval is defined as the time elapsed between data collections.
- Duration is defined as the total elapsed time of the experiment.

4.4.1. Treadmill Acceleration and Speed Parameters

- Acceleration Step Size (Accel Step): 0.0 to 25.5 meters per minute (m/min).
- Acceleration Interval (Accel Int): 0 to 255 seconds (sec).
- Maximum Speed (Max Speed): 0.0 to 102.3 meters per minute (m/min).
- Starting Speed (S_Speed): 0.0 to 102.3 meters per minute (m/min).

Example: to apply an acceleration equal to 1m/min every 2 minutes and limit the maximum speed to 50.0 m/min, use the following settings:

- Accel Step: 1.0
- Accel Int: 120
- Max Speed: 50.0
- S_Speed: 0.0

Belt speed adjustment can also be achieved in a fast and convenient manner by moving the slider to the desired speed even while the treadmill is active.

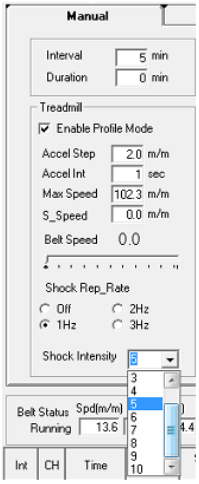
4.4.2. Shock Repetition Rate, Shock Intensity, and Shock Detection

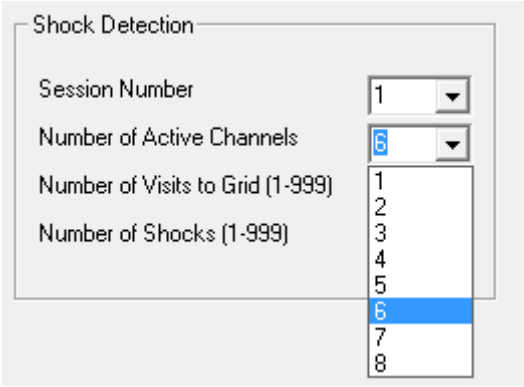
- Shock Repetition Rate is defined as the electrical stimulus grid energizing rate with settings of "Off", 1 Hz, 2 Hz, and 3 Hz.
- Shock intensity is selected on a scale of 0-10. Shock intensity levels should be determined based on subject weight and responsiveness to electrical stimulus. The minimum intensity level corresponds to a voltage of 25 VAC and current value of 0.34 mA at zero scale. The maximum intensity level corresponds to a voltage of 120 VAC and current of 1.60 mA at full scale based on an animal resistance of 75k ohms. An intensity level is achieved by altering the stimulus grid voltage resulting in changes in current values based on animal resistance. The table below lists the shock intensity settings and the corresponding voltage and current values.

Intensity

Setting	Current	Voltage
0.0	0.34 mA	25 VAC
1.0	0.46 mA	35 VAC
2.0	0.59 mA	44 VAC
3.0	0.72 mA	54 VAC
4.0	0.84 mA	63 VAC
5.0	0.97 mA	73 VAC
6.0	1.09 mA	82 VAC
7.0	1.22 mA	92 VAC
8.0	1.34 mA	100 VAC
9.0	1.47 mA	110 VAC
10.0	1.60 mA	120 VAC

- Shock detection parameters
  - Session or experiment number.
  - Number of active channels with a range of (1-8). For the Exer 3/6 Treadmill System the maximum number of active channels is 3 for rat subjects and 6 for mice subjects.
  - Number of visits to grid (NOV) contains a range of (1-999). This sets the number of times the subject makes contact with the grid before it is disabled.
  - Number of shocks (NOS) also has a range of (1-999). This allows the user to set the number of times the subject receives a shock before the grid is disabled.





Like the profile mode, the lower portion of the "**Manual**" tab provides a real-time status of the Treadmill System. This includes:

- Belt Status
- Shock detection channels and status
- Treadmill System recorded data saved in the .csv file format that can be conveniently imported into Microsoft® Excel or similar spreadsheet applications.

4.4.3. Belt Status

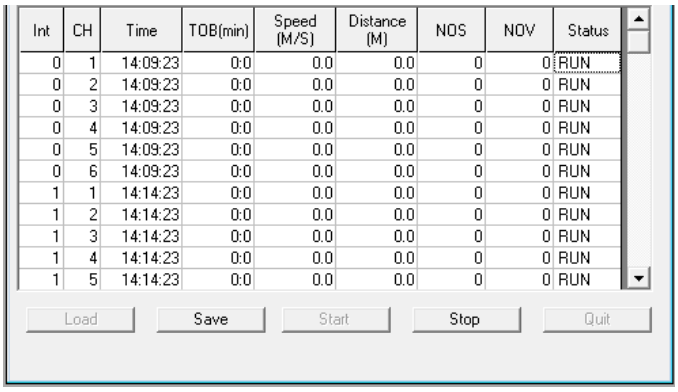
- Belt Status provides a real-time display of speed (Spd) in meters per minute and distance traveled (Dist Tr) in meters.

4.4.4. Shock Detection Status and Channel State

- The number of active channels (C1-C6) is represented by virtual LEDs within the status bar.
- "Active" channels denote the presence of electrical stimulus and are indicated by the green LEDs.
- "Idle" channels denote lack of electrical stimulus and are indicated by the red virtual LEDs.
- If a Treadmill Shock Detection unit is not present, the channels will always be displayed in red.

4.4.5. Data Generation and Output

As experimental data is generated it is displayed in columnar form and can be saved as a comma delimited (.csv) file for analysis in Microsoft® Excel or similar spreadsheet applications.



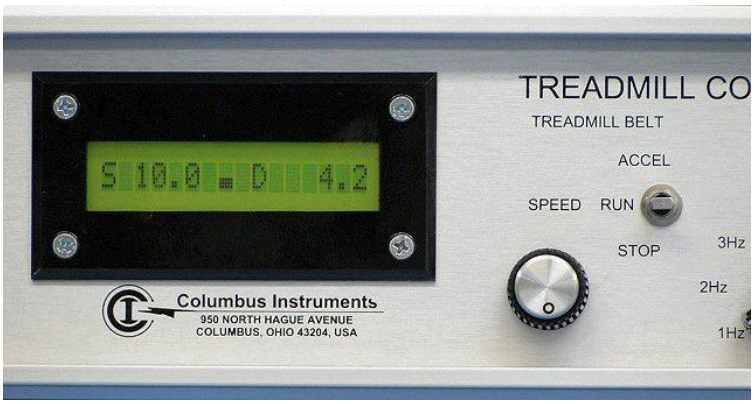
Column heading descriptions are as followed,

- **Interval (Int)**: Interval as entered within the interval and duration setting.
- **Channel (CH)**: Channels selected within Shock Detection settings.
- **Time**: Time of day in 24-hour format in which experiment interval was recorded.
- **Time on Belt (TOB)**: Recorded time in which subject was on the treadmill belt and not the grid.
- **Speed**: Speed (m/s) recorded for experiment interval.
- **Distance**: Distance in meters for specified experimental interval
- **Number of Shocks (NOS)**: The recorded number of shocks administered by the grid.
- **Number of Visits (NOV)**: The number of recorded visits to the grid within an interval.
- **Status**: Status of treadmill belt indicating RUN or IDLE.

4.5. Treadmill Setup

1. Set the "REP RATE" to "1Hz" (the "INTENSITY" should already be zero).
2. Enable the shock stimulus for each lane by setting toggle switch toward the front of the treadmill. The stimulus indicator will begin to flash on the treadmill as well as the controller.
3. Slowly increase the "INTENSITY" until each subject moves off of the shock grids.

4. Then set the "TREADMILL BELT" mode to "RUN" and adjust the "SPEED" knob to the desired minimum speed (10.0 m/min is shown below).
   A mode indicator, in the middle of the display, will show a progress bar that grows from left to right. Likewise, the odometer will begin to accumulate distance traveled.



5. Observe the subjects. If any begin to rest on the shock grids, you may increase the "REP RATE" to "2 Hz", or "3 Hz" or increase the "INTENSITY" setting.
6. The experiment has begun after the shock stimulus and treadmill belt speed is set.

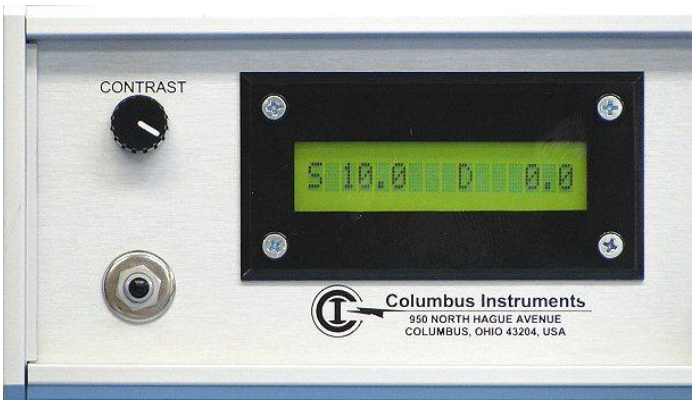
4.6. Controlling the Treadmill via Front Panel

If a PC is not available for treadmill control or if manual control is desired, the front panel display can be utilized.

4.6.0. Odometer Reset

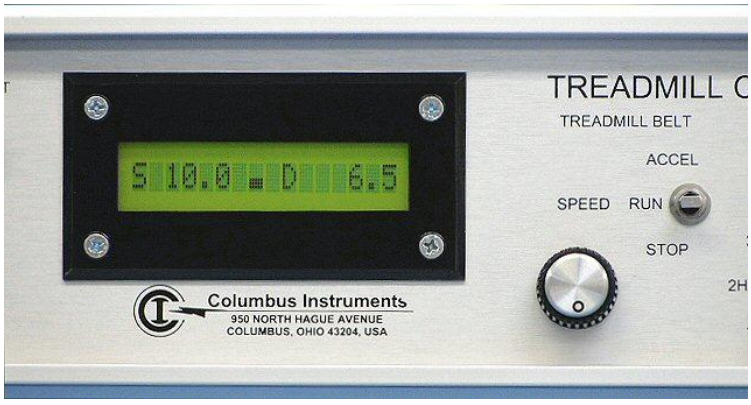
The odometer will always measure the distance traveled by the treadmill belt in all modes of operation. When the experiment has begun, typically, the odometer is reset to record the distance the subjects have run.

1. Press the black round button in the lower left corner of the Treadmill Controller to reset the odometer. The odometer will begin to count when the button is released.
   Or, you may press the Clear Dt button within the Treadmill Software Diagnostics window.



4.6.1. Run

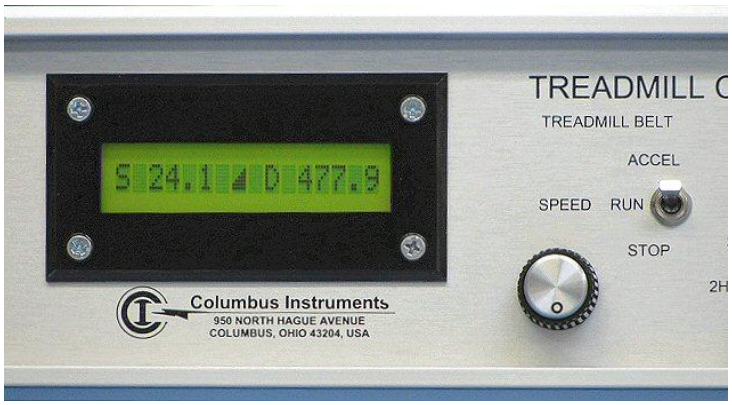
By setting the "TREADMILL BELT" toggle switch to "RUN" the result will be an adjusted speed correlating to the value set by the "SPEED" knob.
The display will report the speed value set by the "SPEED" knob and the mode indicator will be a progress bar that grows from left to right.



4.6.2. Accel

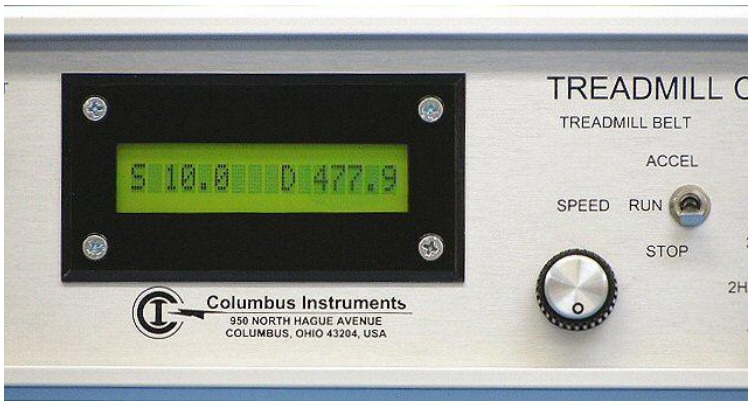
When the "TREADMILL BELT" toggle switch is set to "ACCEL", then the treadmill belt speed will increase from the speed set by the "SPEED" knob up to the "MAX SPEED" setting at a ramping rate calculated from the acceleration parameters in 0.1m/min steps.

The display will report the current speed of the treadmill belt and the mode indicator will be a staircase that grows from left to right and bottom to top.



4.6.3. Stop

Setting the "TREADMILL BELT" toggle switch to "STOP" will result in the treadmill belt being rapidly decelerated to zero.
The display will report the speed set by the "SPEED" knob and the mode indicator will be blank.



4.7. Troubleshooting

4.7.0 Hardware

The following tips might aid in identifying hardware issues:

- Check the AC outlets for power. Does a switch control power to the outlet?
- Are you using a DB25-DB9 serial adapter with your serial port? Some of these are made specifically for connecting mice and modems to the computer that may interfere with the communication of the CI-Bus. Contact Columbus Instruments if uncertain.
- Check the power indicator on the Computer Interface. The top right green LED on the "CONTROLLER" port should be lit continuously.
- Check the Power Supply for the Computer Interface. Is the power plug installed correctly in the Computer Interface? Is the power supply inserted into AC power?
- Check the AC power cord. Is it fully inserted into the Treadmill Controller and AC power?

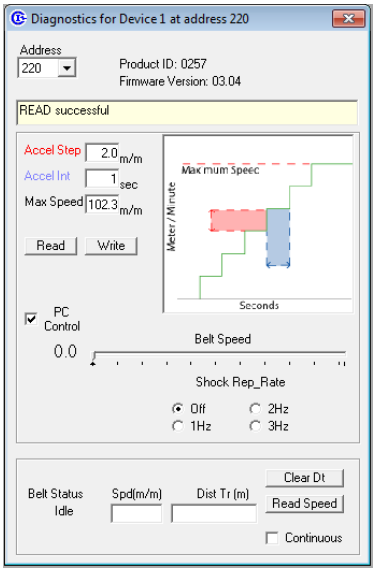
- Check the fuses of the Treadmill Controller (it may require the use of an ohmmeter to verify conductivity).
- Check the LCD of the Treadmill Controller. It should be lit continuously. There should be text on the LCD (adjust the contrast knob fully clockwise to view). If not, contact Columbus Instruments. This may be an indication of a fault within the Treadmill Controller.
- Check the serial cable between the host computer and the Computer Interface? When properly connected, the transmit indicator (top left yellow LED on the "CONTROLLER" port of the Computer Interface) will flash very briefly when the computer sends information to the CI-Bus. Likewise, the receive indicator (top middle green LED on the "CONTROLLER" port of the Computer Interface) will flash briefly when any device sends information to the CI-Bus.
- Check the RJ-45 cable between the Computer Interface and the Treadmill Controller. It should be fully inserted with the connector locking tab snapped into the jack.

4.7.1 Treadmill Diagnostics

The Treadmill Diagnostics provides additional controls for monitoring the treadmill system while an experiment is active. To access the Diagnostics window, select **"Tools » Treadmill Control"** from the Treadmill Software main window**.**

The window is divided into 3 sections.

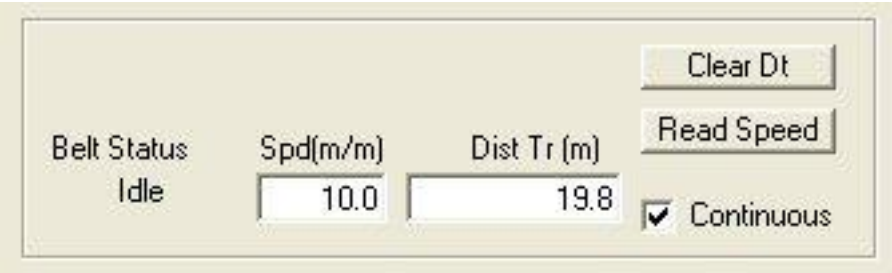
- The top section displays information about the Treadmill Controller and the serial port communications.
- The middle section provides controls for reading and writing the acceleration parameters.
- The bottom section is used to read the current treadmill belt speed and distance traveled.



Notes: Values outside the ranges listed may not be accepted and may cause the application to close.
Fractional values for "Accel Step" and "Max Speed" must be entered with the decimal point (.).
Acceleration will be zero if "Accel Step" = 0.0 or "Accel Int" = 0.
"Max Speed" limits the treadmill belt for "RUN" and "ACCEL" modes of the Treadmill Controller.

1. Click the Write button to apply the settings and save them to the Treadmill Controller.
2. Click the Read button to read the settings currently saved in the Treadmill Controller.

Notes: The acceleration parameters entered in the text boxes will not be applied and become current until the Write button is clicked.



The Clear Dt button will clear the odometer on the Treadmill Controller (the same as the push button).
The Read Speed button will update the Belt Status, Spd(m/min) and Dist Tr (m).

- Belt Status: "Idle", "Running" and "Accel" are reported for treadmill belt modes "STOP", "RUN" and "ACCEL" respectively.
- Spd(m/min): the speed displayed by the Treadmill Controller.
- Dist Tr (m): the distance traveled recorded by the odometer.

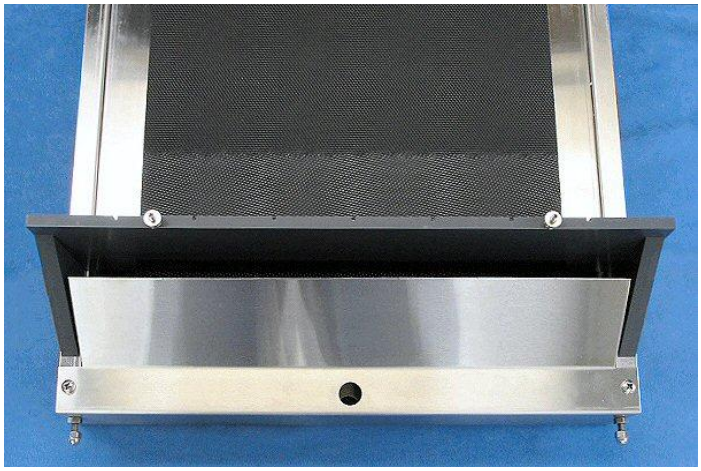
If the "Continuous" option is checked when the Read Speed button is clicked, then the update will repeat every 1 second. To stop the continuous update, click to uncheck the "Continuous" option and click the Read Speed button again.

5. MAINTENANCE

5.0. Treadmill Belt Adjustment

As the treadmill is used, the treadmill belt and the pulleys will begin to wear in. This may cause the belt to stretch and become loose which may also coincide with the belt beginning to track away from the center of the treadmill. Adjustments can be made to return the belt to the center of the treadmill.

1. Remove the treadmill cover and the lane dividers.
2. Set the treadmill belt to a high speed, 50.0 m/min or greater, and switch the "TREADMILL BELT" toggle switch to "RUN".
3. Observe the treadmill belt from above the front (the inclination rod has been removed for clarity).



Using the 7/16-inch wrench supplied with the treadmill, tighten and loosen the nuts as follows:

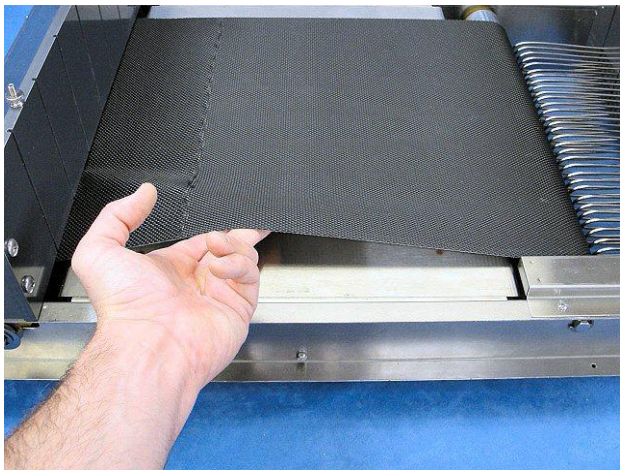
- If the belt is right of center: tighten the nut on the right and loosen the nut on the left.
- If the belt is left of center: tighten the nut on the left and loosen the nut on the right.

Make small adjustments to the nuts, only 1/4 turns, and allow 1 minute for the belt to settle to the new tracking position. Typically the belt will stretch with wear; therefore, only tightening may be necessary. When the belt is in the center, check the overall belt tension.

5.0 Treadmill Belt Adjustment (continued)

During adjustment, if the mechanical sounds of the treadmill begin to increase, the overall tension on the belt may be too high. Check the overall belt tension as follows:

4. Set the "TREADMILL BELT" toggle switch to "STOP"
5. Lift the edge of the belt from the treadmill surface.



The belt should **NOT** be less than 4cm (1.5-inches) from the treadmill surface. If required, loosen both nuts equally until a height of the belt is greater than 4cm.

5.1. Cleaning

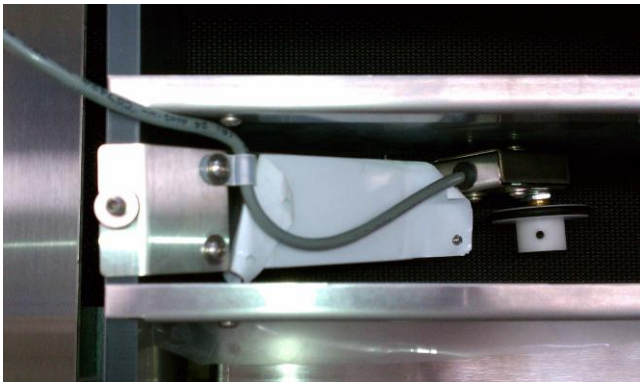
For safety, switch off and unplug all of the equipment. Remove the cover with lid and all of the lane dividers. All of the parts can be cleaned with a mild soap solution. Do not immerse the treadmill and try to prevent liquids from entering the components as this may damage the electronics inside.

5.2. Belt Speed Calibration

Recommended calibration of the treadmill belt speed and acceleration parameters should be performed every 3 months.

The calibration procedure is as follows,

1. Ensure the Treadmill Controller front panel toggle is set to “STOP”.
2. Place speed sensor on treadmill belt lane1 and securely fasten with screw nut in position shown below.



3. Using the dial on the Treadmill Controller front panel, adjust the speed to 88.7 m/min.
4. Next, set the electric stimulus frequency to 2 Hz on Treadmill Controller front panel.
5. Push the “ODOMETER RESET” button to initialize calibration procedure. The LCD on the front panel will read “AutoCal Speed” as shown below.

6. Push the “ODOMETER RESET” button a second time to advance to belt calibration start. The LCD on the front panel will read “Run to Start…” as shown.

7. Set toggle to “RUN” to begin the series of belt speed and acceleration tests.

8. Upon belt calibration completion, the most recent calibration is automatically saved, and speed sensor counts (OD counts) are displayed. Obtaining count values between 4000-5000 indicates calibration was successful.

Serial Number:_____
(Please refer to this number for service)

Exer 3/6 Treadmill Shock Detection Upgrade

Instruction Addendum

6/20/2011

0257-903L

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Exer 3/6 Treadmill Shock Detection Upgrade Instructions.

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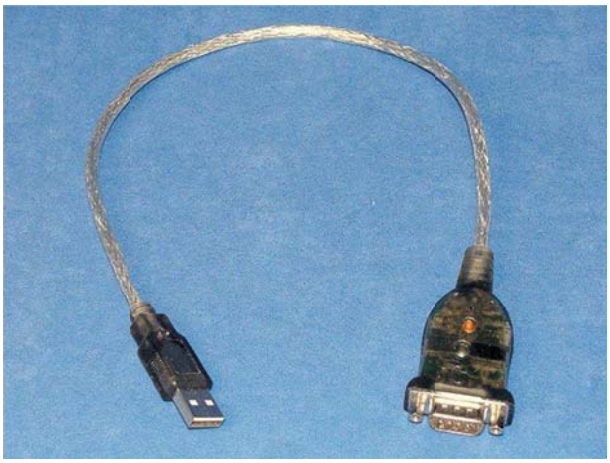
1. COMPUTER SETUP

1.0. Serial Port Installation

- The host computer must have one free RS-232 serial port.
  For best performance, it is recommended to use a native (built-in) serial port.

- If a native port is not available or already in use, a PCI Serial I/O card is the next best option. It provides multiple, serial ports in the same way as a native serial port, however, it requires that the host computer have 1 free PCI slot.

- A USB-to-Serial adapter is an option for computers that cannot support an I/O card (typical of laptops). It requires 1 free USB port and is probably the most easy to use, however, the performance is directly affected by the chipset used in the USB-to-Serial adapter, the host computer speed, the host USB port type and other USB devices that are being serviced over the USB system. Once may be included with the system for convenience.



Refer to the documentation that came with your hardware to install and use your particular serial port.

2. INSTALLING SOFTWARE

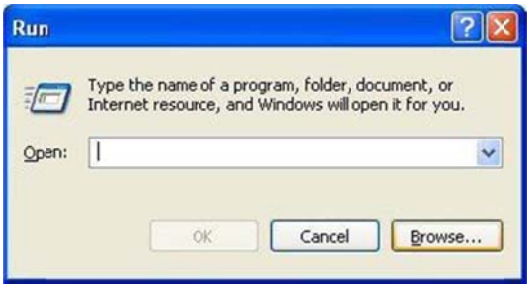
2.1. Treadmill Software Installation

You must have administrator rights/privledges on the host computer for the software to install successfuly. The software is expected to be installed and run locally on the host computer's hard drive and not from a remote mapped network resource.

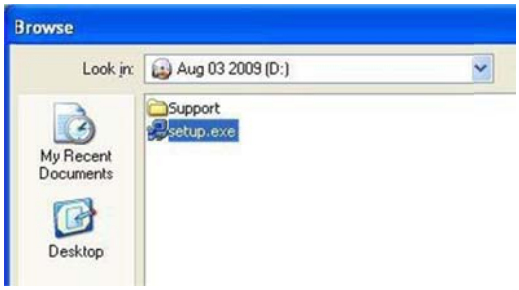
- **Follow these steps to install the Treadmill software:**

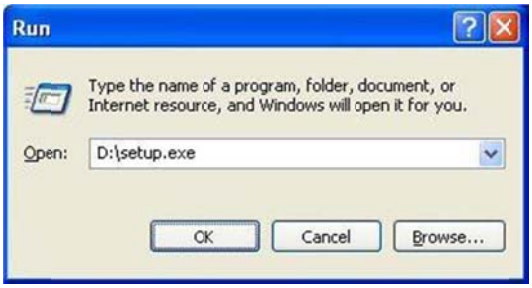
Insert the Treadmill Software CD-ROM into the host computer. If the "Treadmill Software Setup" application does not automatically launch, then you must manually launch the installation program.

1. Select "**Start » Run...**" from the desktop taskbar. A "Run" window will open.
2. Click the Browse button. A "Browse" window will open.



3. Select the CD-ROM drive from the "**Look in:**" combo box.
4. Click once to highlight "**Setup.exe**" from the list of files on the CD-ROM.
5. Click the Open button. The "Browse" window will close and return focus back to the "Run" window.
6. Click the OK button to begin the installation program.





- Upon initialization, some install files will be processed and copied to the host computer. These files will be removed if setup is cancelled. Then a blue "Treadmill Software Setup" backdrop and installation window will be displayed.

2.1. Treadmill Software Installation (continued)

7. Click the OK button to continue.

8. Click the square button marked with a computer and floppy disks to continue.

9. Click the Continue button to begin the copy and installation procedure into the default Program Group.

The install program will check for necessary disk space and then begin to copy the program. It is recommend to keep any files on your system that are newer than the ones being copied. Upon completion, the program will update the Windows system and create program icons inside the group folder on the start menu.

10. Click the OK button to finish the install program.
    The "Treadmill Software Setup" screen will close and return to the user desktop.

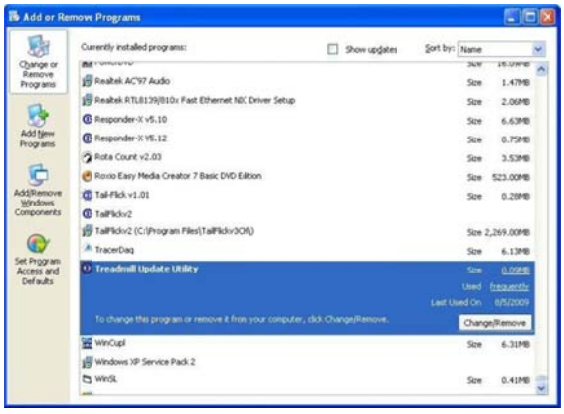
2.2. Removing the Software

Removing the Treadmill Software application is required when upgrading to a newer version of the application or relocating the application to a new host computer. When upgrading, this ensures that all of the support files packaged with the application are copied and installed to the host computer.

Follow these steps to remove the Treadmill Software:

1. Select **"Start » Control Panel"** from the desktop taskbar. This will open the "Control Panel" window.

2. Run the "Add or Remove Programs" application. This will open the "Add or Remove Programs" window.
3. Under the "Change or Remove Programs" selection, scroll through the list of installed programs and click once to highlight "Treadmill Software".
4. Click the Change/Remove button. The PC screen will change to a blue "Treadmill Software Removal" screen.



2.2 Removing the Software (continued)

5. Click Yes to begin the removal of the Treadmill Software program.

6. Click OK to close the "Application Removal" window and return to the "Add or Remove Programs" window.

7. Click X in the top-right corner of the "Add or Remove Programs" window to close.
8. Click X in the top-right corner of the "Control Panel" window or select "File >> Close" from the menu bar.

3. HARDWARE SETUP

Connecting the Shock Detection Interface to the Treadmill

3.1 Item Inventory

Treadmill Shock Detection components included with the shipment are as pictured below. The following instructions make use of these parts and will reference parts included with the treadmill when it was originally purchased. If any of the original components are missing, inquire with us for replacements.

- 1 x RJ-45 cable, 38cm (15 inch), 8-pin 8-conductor, plug-plug.
- 1 x D-Sub shock cable, 38cm (15-inch), 15-pin 15-conductor male-male.

- 1 x 25-pin male-male shock detection cable.
- The Shock Detection Interface.

You may also need the following tools for assembling the system:

- Phillips (cross-point) screwdriver, medium tip.
- Common (flat-point) screwdriver, small tip.
- 5/16-inch (7.5mm) wrench.

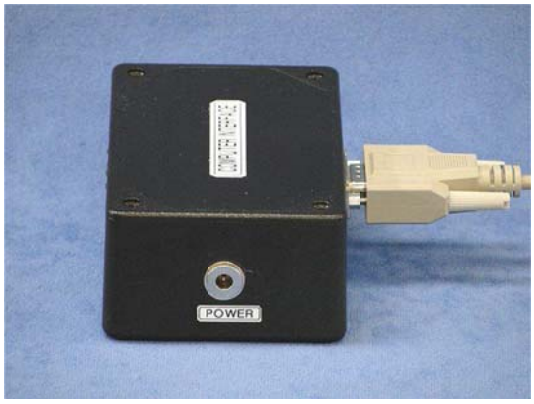
Note: It is recommended to use an AC power strip to provide a common short-distance access to AC power for all components of the Treadmill system. Most AC power strips incorporate a master switch that can switch on and off the AC power to the entire system and protect against electrostatic discharge. It also provides a beneficial common ground between all components to help prevent unintentional ground loops.

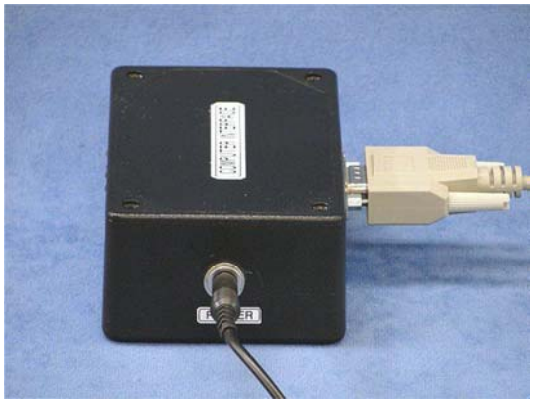
3.2 Connecting the Computer Interface

The computer interface and cables were included originally with the treadmill. If you already have the treadmill connected to a PC, or do not wish to use the software, you can skip this step and proceed to section 3.3.

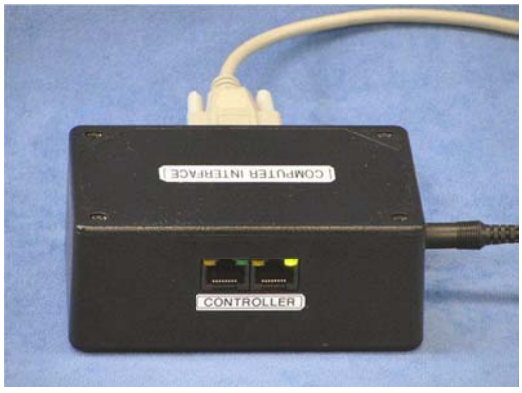
1. Connect the female end of the RS-232 cable to a free serial port on the host computer (not shown).
2. Connect the male end of the RS-232 cable to the "COMPUTER" port of the Computer Interface.

3. Connect the power plug of the power supply to the "POWER" port of the Computer Interface.
4. Install the power supply into the appropriate AC outlet (not shown). The power indicator (top right green LED on the "CONTROLLER" port) will light continuously.





5. Connect one end of the RJ-45 cable to any of the "CONTROLLER" ports of the Computer Interface.

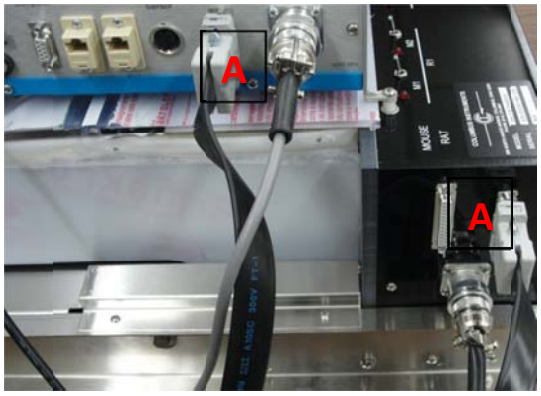


3.2 Connecting the Computer Interface *(Continued…)*

6. Connect the other end of the RJ-45 cable to any of the "CIBUS"" ports of the Treadmill Controller.

3.3 Connecting the Treadmill and Controller to the Shock Detection Interface

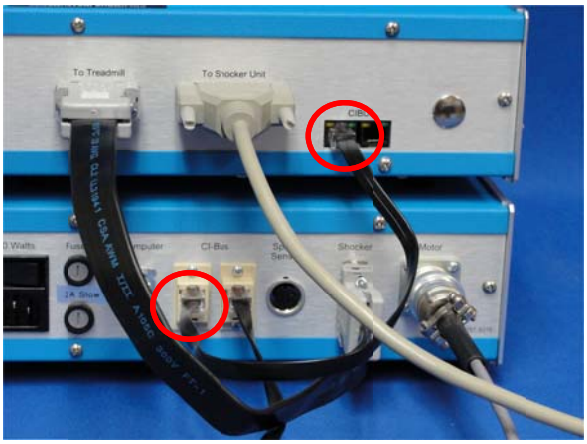
1. Place the Shock Detection Interface on top of the treadmill controller in such a manner that you have access to the rear panels of both. Disconnect the power cord from the treadmill controller for safety.
2. Remove the flat, black, 15-pin shock cable (**A**) that presently connects the treadmill to the controller and set it aside. It will not be used in the shock detection setup. Note: nothing will connect to the port labeled **B** on the treadmill in the shock detection setup.

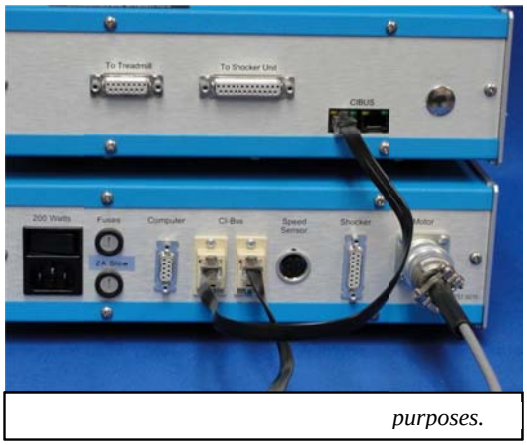


3. Using the shorter D-sub shock cable that came with the Shock Detection Interface, connect one end to the Treadmill Contoller in the port labeled "Shocker." The other end, connect to the Shock Detection Interface labeled "To Treadmill."

4. Connect the 25-pin cable to the Shock Detection Interface to the port labeled “To Shocker Unit.” The other end will connect to the side panel of the treadmill itself, as illustrated below.

5. The short black RJ-45 cable that came with the Shock Detection Interface will connect the Shock Detection Interface to the Treadmill Controller via the ports labeled “CI-Bus.”





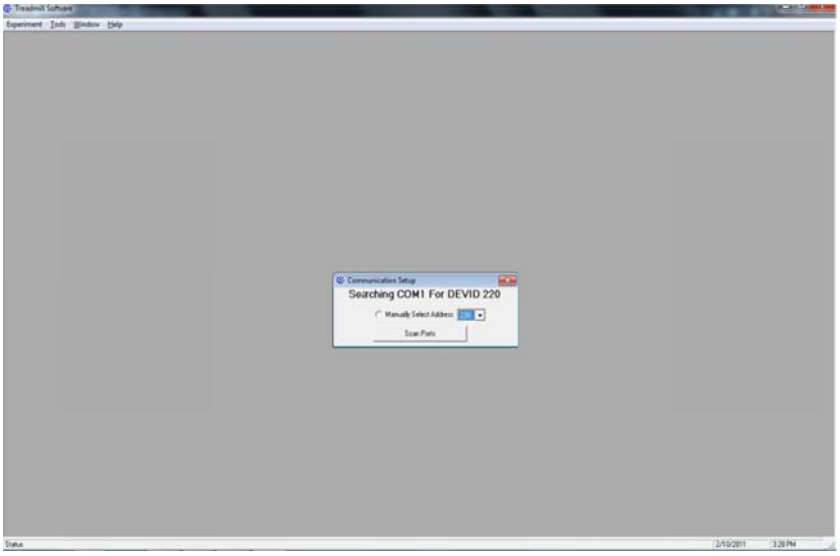
purposes.

6. Reconnect the AC power cord to the rear panel AC power receptacle of the Treadmill Controller and insert the other end into an appropriate AC outlet.

4.0 SOFTWARE SETUP

4.1. Treadmill Software Initialization

From the desktop taskbar, select **"Start » All Programs » Treadmill Software » Treadmill Software".**

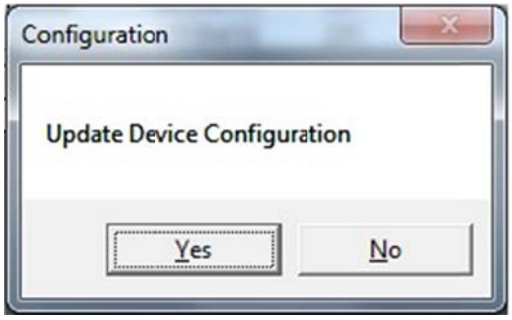


- Upon initialization, the software will automatically scan the Treadmill Controller's available serial communication ports (COM) for existing devices and associated address identification numbers.
- The starting device identification address (DEVID 220) is assigned to the Treadmill Controller(s) with additional addresses following numerically for multiple devices.
- The starting device identification address (DEVID 230) is assigned to the Shock Controller(s) in this same manner.

To rescan the Treadmill Controller for the presence or addition of connected devices, select **"Tools » Device Scan"** from the Treadmill Software main window**.**

- Click the "Scan for New Devices" button to add any devices previously not configured.
- Click the "Scan Configured Devices" button to rescan devices already present in the latest configuration file.
- Click on the "Exit" button to complete the process and close the "Communication Scan" window.

After closing the window, an "**Update Device Configuration"** prompt will appear



- Click the "Yes" button to save the new device configuration.
- Click the "No" button to keep the previous device configuration.

4.1 System Initialization (continued)

Upon successful identification the Treadmill Controller by the application, the host COM port and Treadmill Controller information are displayed at the top of the window as shown below:

No Device Connected?

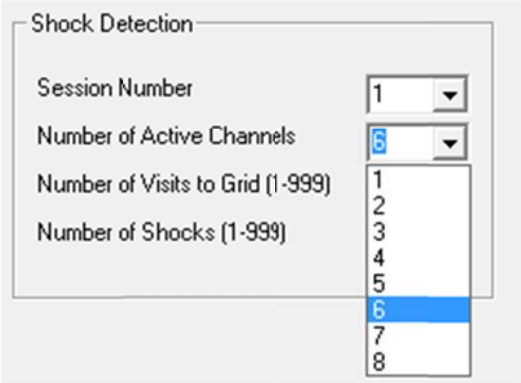
If the Treadmill Controller could not be found, the following message is displayed:

To re-attempt device connection after a failed communication,

- Click the Scan Ports button to automatically search all available serial (COM) ports for the Treadmill Controller.
- For Advanced Users when the device address is already known,
    - Select the "Manually Select Address" radio button.
    - Choose the correct device number from the pull-down menu.
    - Click the Scan Ports button to scan an individual port.
- If multiple attempts at device connection still result in "No Device Found!" prompts see the Troubleshooting section of this manual.
- If the problem cannot be remedied by the suggested troubleshooting tips, contact Columbus Instruments.

4.2 Shock detection parameters

- Session or experiment number.
- Number of active channels with a range of (1-8). For the Exer 3/6 Treadmill System the maximum number of active channels is 3 for rat subjects and 6 for mice subjects.
- Number of visits to grid (NOV) contains a range of (1-999). This sets the number of times the subject makes contact with the grid before it is disabled.
- Number of shocks (NOS) also has a range of (1-999). This allows the user to set the number of times the subject receives a shock before the grid is disabled.

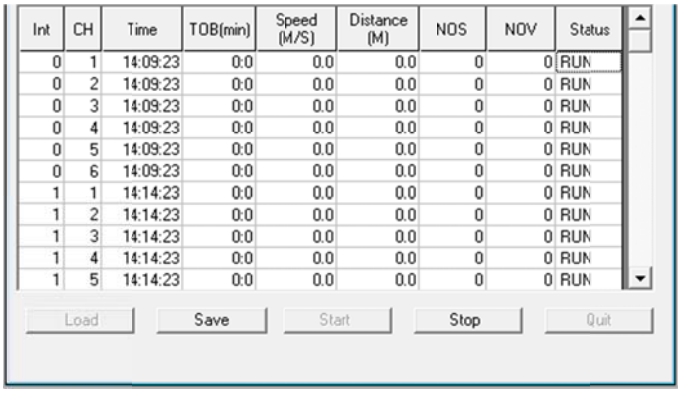


4.3 Shock Detection Status and Channel State

- The number of active channels (C1-C6) is represented by virtual LEDs within the status bar.
- "Active" channels denote the presence of electrical stimulus and are indicated by the green LEDs.
- "Idle" channels denote lack of electrical stimulus and are indicated by the red virtual LEDs.

4.4. Data Generation and Output

As experimental data is generated it is displayed in columnar form and can be saved as a comma delimited (.csv) file for analysis in Microsoft® Excel or similar spreadsheet applications.



Column heading descriptions are as followed,

- **Interval (Int)**: Interval as entered within the interval and duration setting.
- **Channel (CH)**: Channels selected within Shock Detection settings.
- **Time**: Time of day in 24-hour format in which experiment interval was recorded.
- **Time on Belt (TOB)**: Recorded time in which subject was on the treadmill belt and not the grid.
- **Speed**: Speed (m/s) recorded for experiment interval.
- **Distance**: Distance in meters for specified experimental interval

- **Number of Shocks (NOS)**: The recorded number of shocks administered by the grid.
- **Number of Visits (NOV)**: The number of recorded visits to the grid within an interval.
- **Status**: Status of treadmill belt indicating RUN or IDLE.

5.0 TROUBLESHOOTING

5.1 Hardware

The following tips might aid in identifying hardware issues:

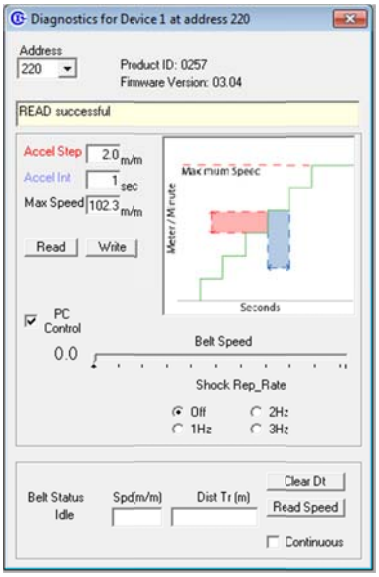
- Check the AC outlets for power. Does a switch control power to the outlet?
- Are you using a DB25-DB9 serial adapter with your serial port? Some of these are made specifically for connecting mice and modems to the computer that may interfere with the communication of the CI-Bus. Contact Columbus Instruments if uncertain.
- Check the power indicator on the Computer Interface. The top right green LED on the "CONTROLLER" port should be lit continuously.
- Check the Power Supply for the Computer Interface. Is the power plug installed correctly in the Computer Interface? Is the power supply inserted into AC power?
- Check the AC power cord. Is it fully inserted into the Treadmill Controller and AC power?
- Check the fuses of the Treadmill Controller (it may require the use of an ohmmeter to verify conductivity).
- Check the LCD of the Treadmill Controller. It should be lit continuously. There should be text on the LCD (adjust the contrast knob fully clockwise to view). If not, contact Columbus Instruments. This may be an indication of a fault within the Treadmill Controller.
- Check the serial cable between the host computer and the Computer Interface? When properly connected, the transmit indicator (top left yellow LED on the "CONTROLLER" port of the Computer Interface) will flash very briefly when the computer sends information to the CI-Bus. Likewise, the receive indicator (top middle green LED on the "CONTROLLER" port of the Computer Interface) will flash briefly when any device sends information to the CI-Bus.
- Check the RJ-45 cable between the Computer Interface and the Treadmill Controller. It should be fully inserted with the connector locking tab snapped into the jack.

5.2 Treadmill Diagnostics

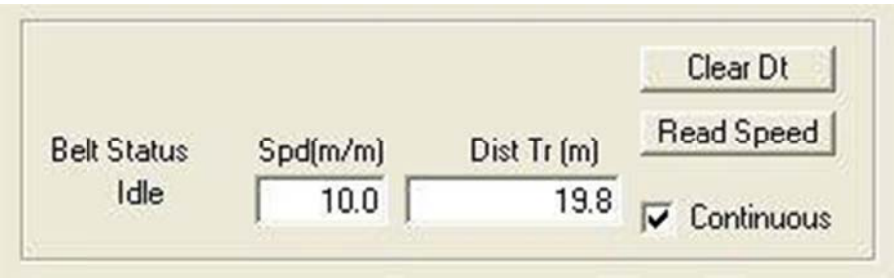
The Treadmill Diagnostics provides additional controls for monitoring the treadmill system while an experiment is active. To access the Diagnostics window, select **"Tools » Treadmill Control"** from the Treadmill Software main window**.**

The window is divided into 3 sections.

- The top section displays information about the Treadmill Controller and the serial port communications.
- The middle section provides controls for reading and writing the acceleration parameters.
- The bottom section is used to read the current treadmill belt speed and distance traveled.



1. Click the Write button to apply the settings and save them to the Treadmill Controller.
2. Click the Read button to read the settings currently saved in the Treadmill Controller.



The Clear Dt button will clear the odometer on the Treadmill Controller (the same as the push button).
The Read Speed button will update the Belt Status, Spd(m/min) and Dist Tr (m).

- Belt Status: "Idle", "Running" and "Accel" are reported for treadmill belt modes "STOP", "RUN" and "ACCEL" respectively.
- Spd(m/min): the speed displayed by the Treadmill Controller.
- Dist Tr (m): the distance traveled recorded by the odometer.

If the "Continuous" option is checked when the Read Speed button is clicked, then the update will repeat every 1 second. To stop the continuous update, click to uncheck the "Continuous" option and click the Read Speed button again.