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Operation Manual

Portable Limb Load Monitor_Touch (PLLM)

August 2021

Portable Limb Load Monitor Assist Device
Featuring Touch Screen, Data Logger and Audio/Visual Feedback on
Weight Bearing When Walking

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Specifications Control Unit

General

Rated power source	9v DC
Format	Battery PP3
Max current consumption	116mA
Dimensions (L x W x H)	141 x 81 x 40 mm
Weight	266g

Specifications Wireless

Transmission (Tx) Data Logger Unit

General

Rated power source	3.7V DC
Format	Li Po (500mAh)
Max current consumption	92mA
Dimensions (L x W x H)	92 x 66 x 28 mm
Weight	101g

Cleaning

All surfaces of this system should be cleaned with WET WIPE between each use.

Indications and Intended Use

PLL M is an Assist Device and along with the practitioner they will guide the user through rehabilitation by monitoring gait, movement and balance. The PLL M Assist Device is with the gait rehabilitation user all the time and augments gait rehabilitation and enhances gait retraining.

The PLL M is designed to aid recovery from the following pathologies/injuries: Lower Limb Amputation, Acquired Brain Injury, Cerebral Vascular Accident (stroke), Parkinson's Disease as well as most conditions which affect the Central Nervous System.

PLL M will also assist orthopedic surgical users to comply with a Weight Bearing Program.

Theory of Operation

The PLL M default setting is to “**Alert After Target**” mode which means the user gets feedback when their weight to their affected limb falls at or above the target. This mode maybe used to **discourage** weight-bearing.

The alternative setting is “**Alert Before Target**” mode which means the user gets feedback when their weight to their affected limb is at or below the target. This mode maybe used to **encourage** weight-bearing.

Next consideration is the choice of two Load Challenges to be undertaken by the user:

1. Level Challenge – recommended here the PLL M Assist Device provides a numeric level of user’s effort according to forefoot and heel sensors (you can use scales to associate the numeric level with the scale reading);

2. Percentage of Body Weight Challenge is for restricted weight-bearing as prescribed by the specialist. This is achieved by the user applying 100% body weight, putting all weight through the non-affected leg. Press Start on the Control Unit to capture 100% Body Weight. The insole with sensor pads then needs to be swapped to the shoe on the affected leg. **For further instructions see page 7.**

Contents: PLLM + Tx Data Logger

If you have ordered the PLLM + Tx Data Logger you should have the following:

Operation Manual; version: nCounters August 2021

Control Unit with stylus; nCounters Model: PLLM D1

Control Unit Pouch; nCounters Model: Classified 30

Wireless Transmission Tx Data Logger Unit; nCounters Model: NCPLLMWD

Ankle Strap; nCounters Model: ASTX

Sensor Pads; nCounters: Forefoot NCFFP and Heel NCHP Pads

Insoles: nCounters – six sizes – Left and Right

1 x headphone; Electrovision Model: A069 for individual use, or supply your own 3.5 mm stereo headphones

1x 9v Lithium Ultra Life batteries (included)

1 x USB stick with Excel program, Back-up program and Manual

User Instruction

Install battery

First out of package task is to install the battery

You will require one 9V Lithium Batteries (recommend ULTRALIFE PP3) for Control Unit. Tx Data Logger Unit has inside a rechargeable Li-Po battery. Slide back panel at rear of control unit enclosure and attach the 9V battery clip to the battery.

Caution: ENSURE CORRECT POLARITY

Sensor pad placement

To obtain accurate / consistent results and maintain comfort we recommend that the user wears shoes with an insole that can be easily removed such as runners / sneakers.

1. Choose one of the supplied 12 nCounters' (Right and Left) insoles that matches the user's shoe size. You can order more insoles via our website, or by contacting us by email at sales@ncountersonline.com.

Setting Up

2. Place the heel sensor against the corresponding Velcro on the heel section of the underside of the insole that matches the user's shoe size and the forefoot sensor on the forefoot section of the underside of the supplied insole. Heel sensor can be used on its own. Make sure sensor cables are coming out the same side of user's shoe.

- **Turn the insole over and place into shoe.**



Forefoot and heel sensor pad placement on insole

3. Then place the user's foot inside the shoe. Ask the user to transfer weight from heel to ball of foot in a rocking motion for approximately 10 seconds. This is to condition the sensors.
4. Secure the ankle strap above the ankle



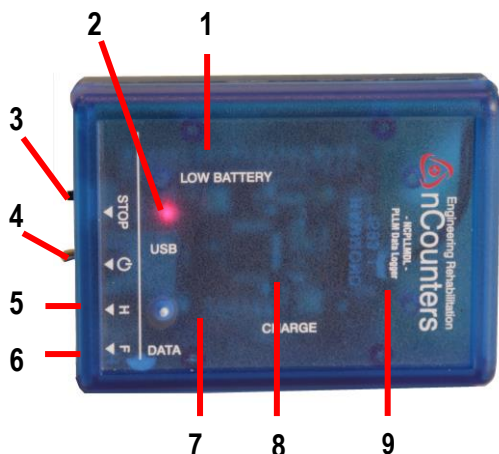
After securing the ankle strap with Tx Data Logger Unit above the ankle, put sensor pad leads into sockets and turn unit by via the toggle switch.

Tx Data Logger unit in position

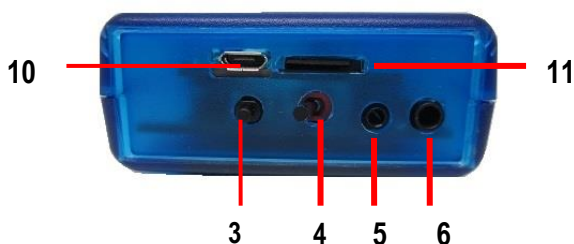


The Transmitter (Tx) Data Logger Unit

What's what?



1. **Low battery light**
2. **Data Logger “on” LED**
3. **“Stop” button**
Single press to halt recording of data and ensure all data is captured and logged. Then turn unit off.
4. **On / Off toggle switch**
5. **Heel socket (H)**
Plug from heel sensor pad is inserted here.
6. **Forefoot socket (F)**
Plug from forefoot sensor pad is inserted here.
7. **Flashing red and green LEDs**
Indicates that data is being recorded 20 sec after turning on
8. **CHARGE LED**
Unit will be charged while connected via the USB to computer. LED on while charging. LED off when battery is fully charged.
9. **Yellow LED. Transmitting Data (Tx)**



10. **MicroB USB cable socket (USB cable supplied)**
11. **MicroSD card (Capacity 2GB) - does not need to be removed.**

Using The Tx Data Logger Unit

- A. After switching the unit ON and the red On LED appears, your unit is transmitting load data. You can now communicate with the control unit.
- B. After about 20 secs the data LEDs will flash this means the unit is storing data to the SD card.
- C. To turn off the recording it is recommended to press stop button to grab all data in buffer, then switch unit off, or just switch unit off.
- D. If low battery LED appears then the unit should be plugged into a PC's USB port for charging via cable. Once fully charged low battery LED will go off.

Instructions: How to Import and Graph Data from the TX Data Logger

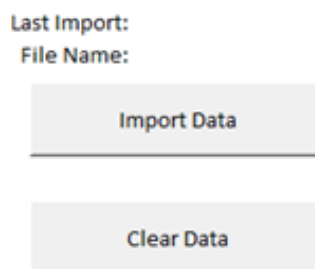
Load nCounters' Excel macro

nCounters Excel macro has been provided on USB stick (Chart scroll proto v3.32.xlsm). In your documents folder create an nCounters sub folder and copy Excel macro file from USB stick to this folder.

To Download Data

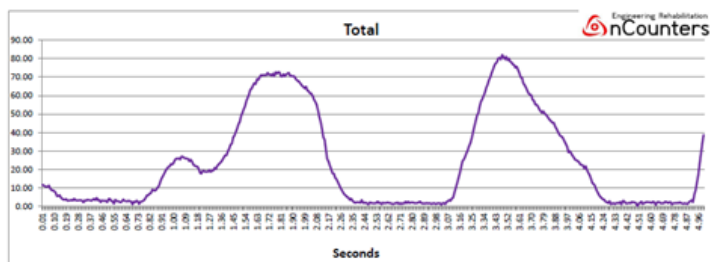
Connect USB cable from Tx Data Logger to free USB port on PC. Tx Data Logger Unit must be turned on otherwise PC can't read your unit as a USB drive labelled NC_DL. Double click on Excel file you copied, to open.

Click on Import Data button



Choose latest Log file from your Tx Data Logger Unit. The latest Log file will be the one with the highest number.

Data will be automatically imported and graphed as shown below.



Data is also automatically stored as raw data in a worksheet named "Data Import" and Graphs are in a different worksheet titled "Graphs".

User Data Vs Target

To see how the user has performed against the target

Click on "Key Temporal Gait Measures", button.

Enter the target you specified on the control unit at which point the user was receiving feedback.

Then click calculate target.

Enter Target	10
% Time above Target	10.96%
% Time at Target	0.68%
% Time below Target	88.37%
Calculate Target	

Key Temporal Gait Measures

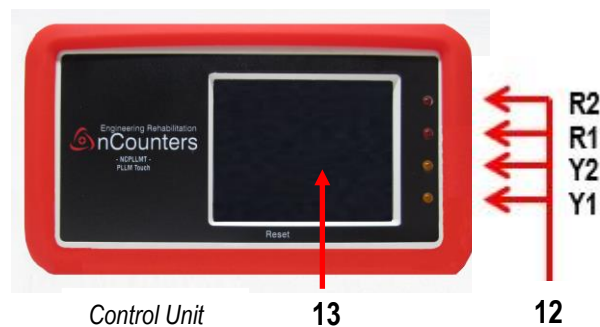
Swing time	0.59
Stance time	1.69
Stride time	2.28
Step time	1.14
Cadence steps/min	52.66
% Stance time	74.16%
% Swing time	25.84%
% Double Support time*	48.32%

Min	0.00
Max	16.25
Average	5.81

* If double support time is less than or equal to 0, then subject is running.
The higher the negative value, the faster they are running.

The Control Unit

The Control Unit is the control to PLLM Assists Device. This is the device that provides audio visual feedback to user and practitioner / therapist while guiding the user through rehabilitation by monitoring gait, movement and balance.



12 Four LEDs

Two yellow and two red LEDs indicate how far the user is above / below target.

No lights indicate that target has been achieved.

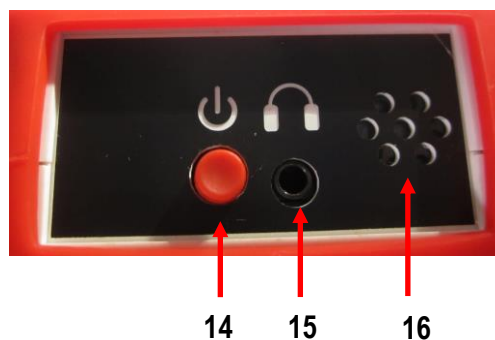
- R2 LED Red 2: very high under / over target
- R1 LED Red 1: high under / over target
- Y2 LED Yellow 2: medium under / over target
- Y1 LED Yellow 1: low under / over target

13 Graphic Display Screen

The screen provides Mode of Operations with:

- Help instructions
- User settings
- Live Data analysis

Power Switch, Headphone socket and Speaker



Side panel CONTROL UNIT

- 14 On / Off Button - Single press - on / off
- 15 Headphone socket – headphone plug is inserted here.
- 16 Speaker output

Individual Headphones



For individual use, or supply your own 3.5 mm Headphones

Wearing the Control Unit



Control Unit pouch

The Control Unit is only inserted into the pouch after the settings have been finalized by the therapist.



Two ways of wearing the pouch.

Position the pouch securely onto the user using the strap as shown:



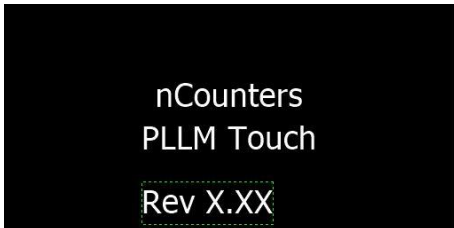
Pouch attached using belt



Pouch attached using strap

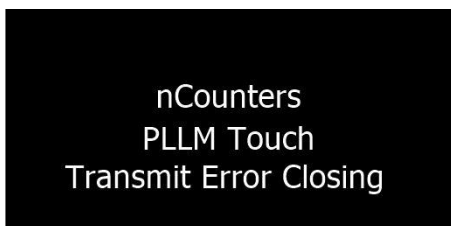
User Instructions for PLLM

1. After completing the Sensor pad placement, turn on the Tx Data Logger Unit by toggling the on/off switch and Tx unit “on”, red and yellow LEDs light.
2. NEXT turn on the Control Unit with a single press of the on / off button and the following welcome screen appears:



Welcome screen

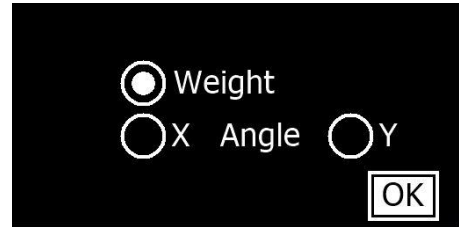
3. Has the user conditioned the sensor, if this has NOT been done go to step 3 of the Sensor pad placement instructions. It is important that the sensors are conditioned.
4. The Transmit Error Closing Screen means the Tx Data Logger Unit is not transmitting. It is either not turned on or battery is low.



Transmit Error screen

5. Once the Tx Data Logger Unit is transmitting to the Control Unit the following “CHOICE SCREEN” appears. **Weight is the default setting so press OK.**

The Angle option is only available if you have the nCounters Portable Angle Monitor (PAM)



Choice screen

See PLLM Mode of Operations screens for mode and load options and detailed examples of operation pages 10 - 11

The SETTING SCREEN for WEIGHT

Your options are:

Select mode of feedback

- Before mode (Alert ON at or below Target)
- After mode (Alert ON at or above Target)

NB After mode is selected by default

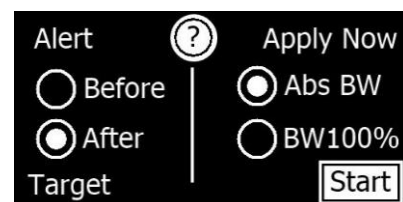
Select Load Challenge

- **Abs BW - ABSOLUTE BODY WEIGHT** the threshold is a number corresponding to the weight though the forefoot and heel sensors – Recommended
- **BW100%** the threshold is a **Percentage of Body Weight** corresponding to the weight though the forefoot and heel sensors

After the therapist has selected the Mode of feedback and the Load challenge press the **START** button

USING THE PLLM FOR ABSOLUTE BODY WEIGHT (Abs BW)

Use the Setting Screen to select mode of feedback

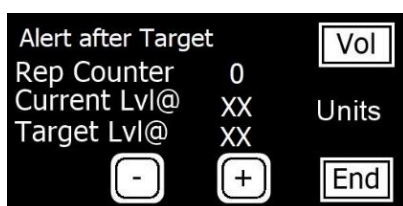


Setting screen Mode After / Load AbsBW selected

Load the affected limb with **the target weight** at which you want the user to receive feedback

A set of scales maybe useful when using this mode to correlate the number on the Control Unit screen with the weight shown on the scales.

If the therapist has chosen Alert After Target and Absolute Weight as above, they will see this Live Data screen.



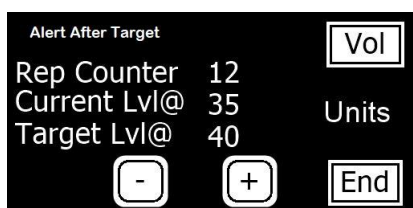
Example of Live Data screen
Mode After / Load AbsBW

The **Rep Counter** records the number of times the user has reached or gone above the target

Current Level is the numeric weight that the user is placing though the forefoot and heel sensors at any one time.

Target Lvl (Level) @ XX (Live Data screen 1) represents the numeric weight at which the user receives feedback after the session has been started.

Target can be altered using the “-“ or “+“ button



Live Data screen
Mode After / Load AbsBW

Feedback on numeric weight bearing

Alert after target selected.

User has received feedback 12 times by reaching or going above target 12 times.

Numeric value of weight through pads is 35 (currently under target).

User currently receiving NO feedback.

Target = 40 this value was set when the user pressed the START button. The Target Lvl @ value can be changed using “-“ and “+“ buttons.

USING THE PLLM FOR PERCENTAGE OF BODY WEIGHT (% BW)

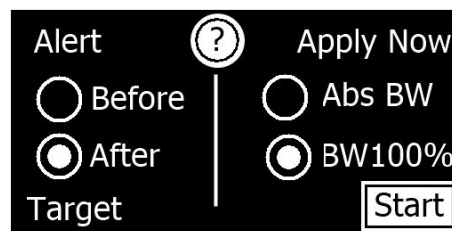
Obtain 100% body weight by:

inserting the insole with correctly positioned sensor pads (see earlier instructions page 2) in the shoe of the non-affected leg.

Turn on Tx Data Logger Unit and Turn on Control Unit

1. See Welcome screen
2. See Choice Screen
3. Choose WEIGHT
4. Encourage the user to put all their weight through non affected leg.

THEN PRESS Start



Setting screen Mode After / %BW selected

Once the user presses Start, and the user has 100% BW through the sensor pads, then the Control Unit captures that numeric value as representing 100% BW

Then, insole with sensor pads in place must be swapped to the shoe on the affected leg.

Explaining the Live Data screen

The **XX** below **BW**: is the numeric value of 100% Body Weight – this number does not change

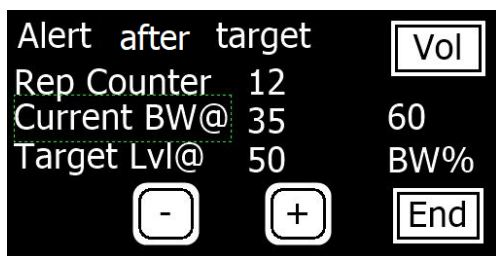
The “**Current BW@ XX**” represents the current value of weight going through the sensor pads at any one time.

The Target Level (Target Lvl @ 100 represents 100% Body Weight for e.g. if user wants the target to be 50% use the “-“ button the reduce the % BW at which the user receives feedback.



Example Live Data screen
Mode After / %BW selected

An example of a Live Data screen after the user presses start is below:



Live Data screen
Mode After / %BW selected

Explaining the Live Data screen:

60 represents the numeric value at 100% BW – this value does NOT change

Target level of 50% of total BW

Current BW@ 35 represents the weight currently through the sensor pads and that value keeps changing.

NB In this instance the BW of 35 is above the target and the user will receive feedback

Rep Counter records that the user has exceeded the target 12 times.

END button / Analysis Screen

When you wish to finish the session press the **END button** and the following screen will appear.



Visual Feedback screen

Understanding the Visual Feedback screen with graphs, repetitions and time.

The number shown at top left of screen (in this instance 140 secs) changes, as this number is the total maximum number in seconds any one LED was on for.

XX REPS number of times user received feedback.

T MINS Total Session Time.

Press **OK** and Goodbye screen appears and the Control Unit turns off by itself.

The Tx Data Logger Unit must be manually turned off.

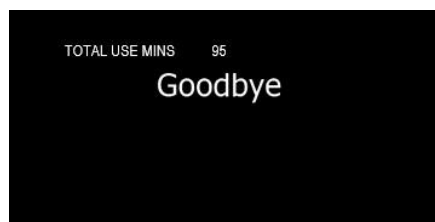
Turning off the Control Unit

Press” OK” on the “Analysis” screen to turn Control Unit off.

Or press on/off button >2secs.

The “Goodbye” screen (Figure 16) will appear and allow the unit to turn itself off. You will be notified If the battery requires replacing.

The Goodbye screen shows the total use time in minutes as shown below. Turn Off Tx Unit.



Goodbye screen

Once the PLLM Control Unit has been used for 50 hours, you will be notified that the Unit and the Sensor pads require re-calibration. Please contact nCounters.

Volume (Vol) button

Headphone and Speaker have different volume controls and maybe used at the same time. Check either HPhone or Speaker radio button. Adjust volume using “-“ and “+” buttons. Speaker button **MUST** be checked to hear feedback through Speaker. Press **OK** and return to Live Data screen

Troubleshooting

The forefoot pad appears to have different sensitivity to the heel pad.

The two pads should be equally sensitive. This can be tested by rocking the foot backwards and forwards. It is almost always that the forefoot pad not the heel pad is the one that needs repositioning. If the pad feels too sensitive, then move the pad back further behind the ball of the foot. If the pad seems not sensitive enough then move it towards or slightly under the ball of the foot.

The yellow light on the Tx Data Logger Unit goes out, and the words “no data”, appear on the Control Unit.

Try switching the TX Data Logger Unit, off then on again and wait for the node to reconnect with the Control Unit. The session will proceed as normal and the words “No Data”, will disappear from the screen. At the end of the session check the Tx Data Logger Unit’s battery.

To look at other information on the Portable Limb Load Monitor please refer to our website, for videos and other resources.

My PC is not recognizing the Tx Data Logger Unit

The Tx Unit has not been turned on, using toggle switch.
Or battery is low.

New data files are no longer being recorded on onto Tx Data Logger Unit

On the USB stick there is a file FW.SFE. Try copying that file and pasting it into the Tx Data Logger Unit.

I can’t import data to Excel spreadsheet other than from the data that is saved on the micro SD Card of the Data Logger

That is correct. Only files saved to the Data Logger can be imported into the Excel software that comes with this unit. If you save data files to say Microsoft “notepad”, application and later try to import them into our Excel program it won’t work.

Warranty

- This device comes with 12 month warranty on parts from date of purchase. See our support page
- Wherever possible a replacement unit will be provided

Returns / Repairs Policy

All items for return or repair must have a returns number given by nCounters attached to it.

Items should be sent to:

nCounters

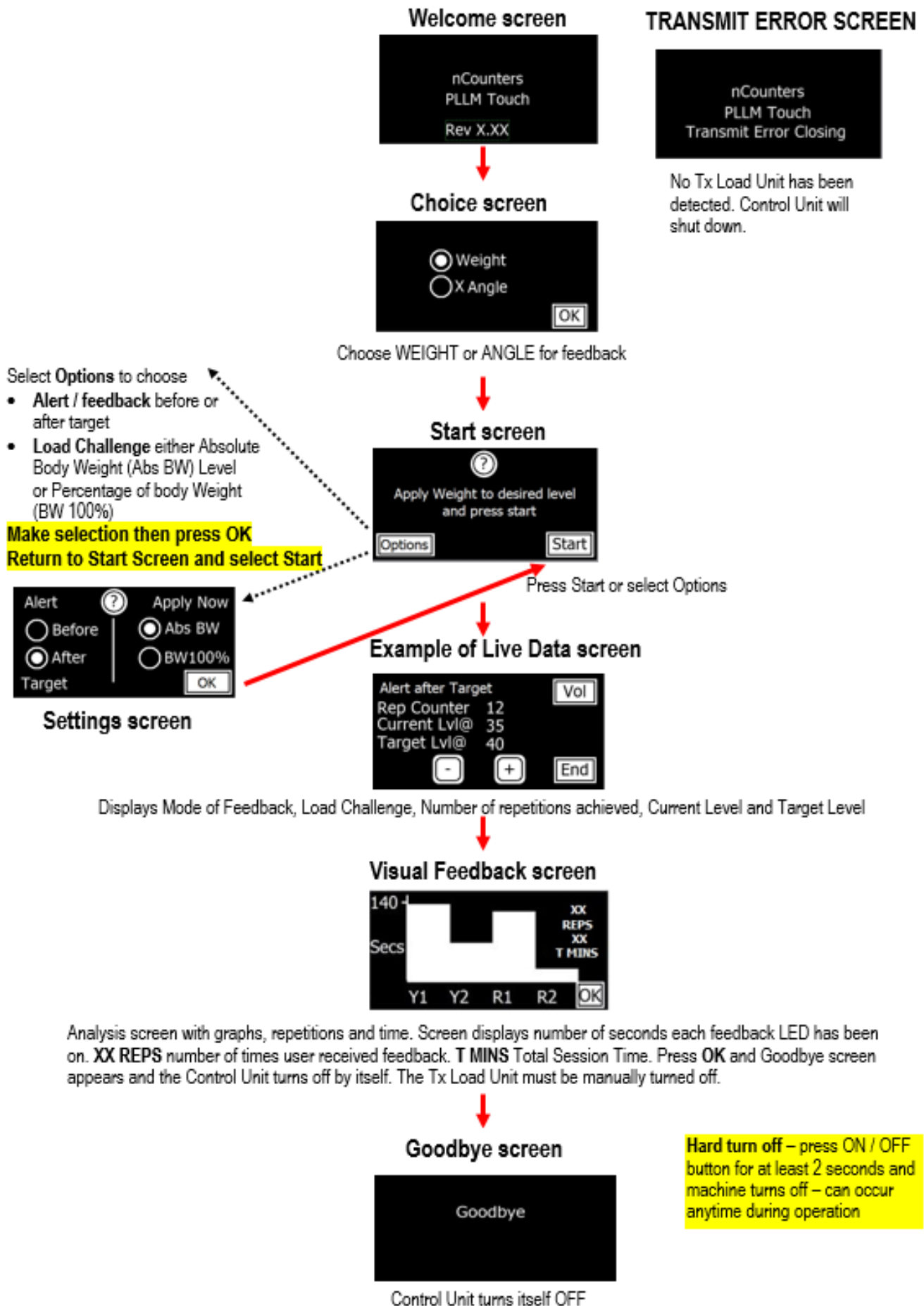
PO BOX 2336
KEW VICTORIA 3101
AUSTRALIA

Visit our website:

ncountersonline.com

For tips on different ways of using the PLLM and for any updates on products or services to complement your device from nCounters.

PLLM MODE OF OPERATIONS SCREENS



SETTINGS SCREEN

Choose mode of feedback:

- Before mode (Alert ON at or below Target)
- After mode (Alert ON at or above Target) **DEFAULT MODE**

Select Load Challenge:

- **Abs BW - Absolute Body Weight - DEFAULT MODE** - threshold is a number corresponding to the weight through forefoot and heel sensors
- **BW100%** the threshold is a **Percentage of Body Weight** corresponding to the weight through forefoot and heel sensors

Settings screen



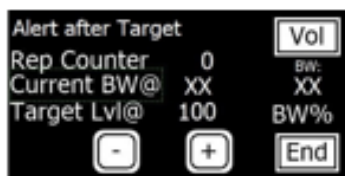
Live Data screen



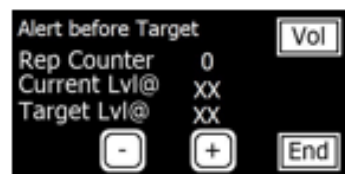
Examples - Live Data screens



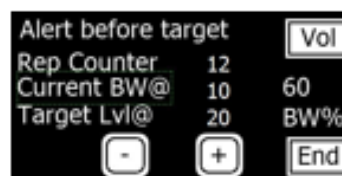
Live Data screen 1



Live Data screen 2



Live Data screen 3



Live Data screen 4

LIVE DATA SCREEN

Rep Counter If Alert AFTER target has been selected the Rep Counter records the number of times the patient has reached at or above the target. If Alert BEFORE target has been selected the Rep Counter records the number of times the patient has been below or at the target.

Current Lvl (Level) @ XX (Live Data screens 1 and 3) represents the numeric weight that the patient is placing through the forefoot and heel sensors at any one time (represented as **UNITS**).

Target Lvl (Level) @ XX (Live Data screens 1 and 3) represents the numeric weight at which the patient receives feedback after the session has been started.

Current BW (Body Weight) @ XX (Live Data screens 2 and 4) represents the current numeric value of weight that the patient is placing through the forefoot and heel sensors at any one time

Target Lvl (Level) @100 (Live Data screens 2 and 4) represents 100% Body Weight. This percentage value can be changed after the session has been started.

BW: XX **BW:XX** (Live Data screens 2 and 4) represents the numeric value for 100% of Body Weight and does NOT change. For example if Target Lvl @ is changed from 100% to 50% and BW is 80, then Target Lvl @ corresponds to 40.

TWO EXAMPLES OF LIVE DATA SCREENS EXPLAINED



Feedback on numeric weight bearing

Alert after target selected. Patient has received feedback 12 times by reaching or going above target 12 times. Numeric value of weight through pads is 35 (currently under target). Patient currently receiving NO feedback. Target = 40 this value was set when the user pressed the START button. The Target Lvl @ value can be changed using "-" and "+" buttons.



Feedback on percentage of body weight bearing

Alert after target selected. Patient has received feedback 12 times by reaching or going above target 12 times. Current BW @ 35 is the numeric value of weight through the pads (currently over target). Patient is receiving feedback. (NB Target value is 50% of 60 = 30). Target Level @ % of Body Weight = 50%. The Target Lvl @ value can be changed using "-" and "+" buttons. BW: 60 is value of 100% Body Weight that was set when the user pressed the START button. This value does NOT change.

UTILITY SCREENS

HELP SCREEN



Before = Fback off at target
After = Fback on at target
Abs W = Target abs weight
BW = Target a % of BW

OK

NO DATA SCREEN



Alert before Target

Rep Counter 0

Current Lvl@ XX

Target Lvl@ XX

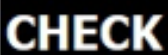
NO DATA! - + End

Probable causes for "No Data" and alarm sounding:

- **Low Battery** in Tx Load Unit
- Two units are **out of range** – when back in range the alarm will stop, the words "No Data" will disappear and device will return to normal operation. Tx Load Unit accidentally turned off.
- **Electromagnetic interference** is disrupting transmission.

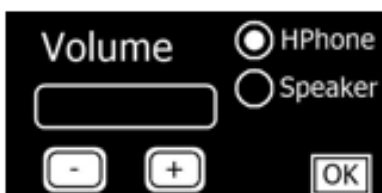
If the unit is not put back in range after 30 seconds the device will turn off.

CHECK SCREEN



User to CHECK if sensor plugs are fully inserted into sockets in Tx Load Unit

AUDIO FEEDBACK via headphone and / or speaker



Speaker and headphone have different volume controls and maybe used at the same time. Speaker is on by default. To deselect speaker, press Vol and uncheck button then press OK. Check HPhone radio button to use headphones. Adjust volume using "-" and "+" buttons. Press OK and return to Live Data screen.

