

# **Prism**<sup>\*\*</sup>

## **USER'S MANUAL**

**Original Instructions** 

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> Printed in the U.S.A. This manual supports the BTE Prism™ 40059001 Rev. A, CO 5619 Date of Publication: 2022-06-17

> > Manufacturer's Information

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#### WARRANTY

We guarantee that the BTE rehabilitation products are free of manufacturer defects in both workmanship and material. We will replace or repair defective parts or equipment for a period of time and in accordance with the conditions set forth below:

This warranty covers the structure and framework for 1 year of normal institutional use. All mechanical components including bearings, bushings, pulleys and glides are warranted from manufacturer defects in both workmanship and material for a one-year period. Cords and padding are covered for a one-year period under normal use.

This limited warranty is in lieu of all warranties, expressed or implied and all other obligations or liabilities on the part of BTE. We neither assume nor authorize any person to assume any other obligation or liability in connection with the sale of this product.

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Your system may not include all components described in this manual. Please contact BTE Customer Support at BTE if you have any questions



- I. SAFETY AND REGULATORY INFORMATION
- II. HARDWARE SETUP
- III. TOOLS AND DEVICES
- IV. SYSTEM USE
- V. TROUBLESHOOTING AND MAINTENANCE
- VI. APPENDIX

## **Description, Intended Use, and Application Specification**

Trade Names: PTK, Prism

Regulatory Name: PTK

PTK Products and Models:

- PTK 1
- Prism Prism1

#### **Short Description**

A rehabilitation system used to quantify muscle strength and range of motion, as well as quantify compound physical abilities needed for the performance of functional tasks.

#### **General Description**

The PTK device is used to quantify muscle strength and range of motion as related to the performance of physical and functional tasks.

The system includes load cells, mechanical adapters for various applications, tool communication hardware, control module, software, attachment frame, heart rate monitor (chest strap or wrist watch), and range of motion (ROM) equipment. Calibration weights and fixtures allowing in-field calibration are also included.

#### Intended Use (Intended Purpose)

The PTK is intended to be used for musculoskeletal testing. Applications include occupational and physical therapy and industrial rehabilitation.

#### **Application Specification**

Intended Medical Indication

The system is intended to quantify muscle strength and range of motion of the spine and joints of the upper and lower extremities.

#### **Contraindications**

Contraindications for use include conditions where tensile strength of tissues and/or structures is compromised e.g., healing bone fractures and tendon, ligament, and muscle repairs.

<sup>1</sup> Heart rate monitoring is included to help clinicians decide whether the evaluation and testing needs to be terminated to reduce risks to the client's health. During physical demand analysis, heart rate monitoring provides a data point for determination whether the client gives the maximum effort. The device is not intended for use with clients that are in life-threatening circumstances or in a condition that precludes performing activities required for physical assessment.



#### Intended Patient Population

General Population: Anyone whose muscle strength or range of motion (ROM) needs to be measured. There are no age, weight, or height restrictions.

Intended Anatomical Applicability

Evaluation of the musculoskeletal system

Intended User Profile

Health professionals

Intended Conditions of Use

Office or clinic setting

Frequency of Use

There are no frequency of use restrictions for this device.

#### Use of Energy Source

An electric power source is required to provide power to the tool communication hardware and for computing purposes.

#### Transfer of Energy to Client

There is no transfer of energy to the client as the device is only used for measuring isometric forces and range of motion.

#### **Operating Principle**

The PTK is a device that supplies a means for assessing strength and range of motion through the use of a hand grip, pinch strength, ROM devices, pull/push devices, and lifting apparatus. The tools include a pinch gauge, hand grip, and a portable load cell. The PTK measures isometric push/pull forces applied to the tool by the client and the duration of time force is applied. The data collected allows the program to track a client's capabilities through multiple calculated variables. Reports are generated from the computer program that can be used to evaluate a client's capabilities over single or multiple uses of the PTK.

#### **Essential Performance**

The PTK does not have any essential performance characteristics.

#### **Essential Functions**

- Provides means to measure muscle strength associated with push, pull, grip, pinch and lift tasks
- Provides means to measure range of motion
- Records setup information and data
- Saves results to a client record database
- Creates reports presenting results and trending

#### Frequently Used Functions

All device functions are used on a regular basis. The PTK features a streamlined interface as the device supports measurement of only range of motion, muscle strength, and positional tolerance. It is used primarily for testing but does have use in exercise. Multiple parameters can be selected to accommodate the client's physical features and the testing and exercise objectives. Measurement of muscle strength and range of motion and reporting of those measures are the most frequently used functions of the device.

#### **Applied Parts**

Prism applied parts include all tools, tool attachments, heart rate monitor, and the Bluetooth Hip Unit. All applied parts are type B.

#### **Performance Characteristics**

- Support Column safe workload is 300 lbs
- Hand Grip has the capability to measure push forces in range 1 lb to 200 lbs (± 0.75 lb.)
- Pinch Gauge has the capability to measure push forces in range 1 lb to 45 lbs (± 0.2 lb.)
- PTK Portable Load Cell (PLC) has the capability to measure push and pull forces in range 1 lb to 300 lbs. Tolerances are:  $\pm$  0.75 lbs in 1 -100 lbs range and  $\pm$  2 lbs in 101-300 lbs range
- Goniometer has the capability to measure 0 to 360 degrees of movement in 1 degree increments (± 3 degrees)
- Inclinometer has the capability to measure 1 to 360 degrees of movement in 1 degree increments (± 1 degree)
- Heart rate system allows for constant and real time monitoring during testing. Best connection for constant monitoring is dependent on distance from the control module and other environmental factors. The further away the watch is from the bluetooth dongle the weaker the wireless signal will be. Obstructions between dongle and watch may also interfere with performance. In most cases, the device will remain connected at 7.5 meters (25 ft) unobstructed.
- Two Functional Range of Motion (FROM) Panels are on the system.

## **EXPLANATION OF SYMBOLS AND CERTIFICATION MARKINGS**



## **CAUTION AND WARNING**

#### Marking on the Equipment



#### Permissible Environmental Conditions for Transport and Storage







Weights used for lifting tests are marked as follows:



- 20 Lb Weight (Green Label)

- 10 Lb Weight (White Label)

- 5 Lb Weight (Yellow Label)



### **Important Information for Safety**

#### **Prior to Each Use**

- Check that the PTK Portable Load Cell (PLC) and PTK Portable Load Cell (PLC) Tools are not damaged.
- Prior to conducting testing, verify that the Support Legs are unfolded and the Leg Pull Pins are in place.
- Check that the Prism system is securely placed against a structurally supported wall.

#### Warnings

#### WARNING

The heart rate system is not intended for use with clients that are in life-threatening circumstances or in condition that precludes performing activities required for physical assessment.

#### WARNING

Do not modify this equipment without authorization of the manufacturer.

#### CAUTION

TIPPING HAZARD Do not place Support Column against non-structural wall.

#### CAUTION

TIPPING HAZARD Extend Column Legs and secure Leg Pull Pins prior to using Pull Test Frame Attachment.

#### CAUTION

TRIPPING HAZARD When the Pull Test Frame Attachment is not in use, the Column Support Legs should be folded to reduce tripping hazard.

#### CAUTION

TIPPING HAZARD Do not lean on Pull Test Frame Attachment.

#### CAUTION

PINCH POINT Do not place hands near hinges located at each end of the Pull Test Frame Attachment gate.



#### CAUTION

Do not hold the Pull Test Frame Attachment outside of the designated area that includes 1/3 of the frame arm's length from the gate outwards.

#### CAUTION

TIPPING HAZARD Do not push using Pull Test Frame Attachment or pull using the Carriage Mounting Block.

#### CAUTION

Do not pull/push at angles exceeding 30 degrees.

#### CAUTION

Verify that pins are fully seated prior to testing.

#### CAUTION

Verify that knobs are fully tightened prior to testing.

#### CAUTION

Do not perform testing without verifying Lift Test Integration Fixture is properly assembled.

#### CAUTION

Portable Load Cell (PLC) and PLC attachments shall not be serviced while in use with a client. Inspections of these components shall be performed prior to use.

#### WARNING

To avoid the risk of electric shock, the control module must only be connected to supply mains with protective earth.

#### CAUTION

Anti-virus software is installed on the control module. If the control module is connected to the Internet, the software must be updated regularly to protect the control module against viruses.

#### CAUTION

The Prism is not intended to be connected to a network, do not do so unless instructed by BTE.



#### CAUTION

The Prism shall only be transported unassembled.



#### ELECTROMAGNETIC FIELD WARNING

The heart rate watch and USB charging dongle contain strong magnets that can affect pacemakers and implantable cardioverter-defibrillators (ICDs). Consult medical professional or device manufacturer before using the watch.

#### **ELECTROMAGNETIC FIELD WARNING**

The Heart Rate watch and USB charging dongle contain strong magnets that can affect pacemakers and implantable cardioverter-defibrillators (ICDs). Consult doctor or device manufacturer before using the watch.

#### Permissible Environmental Conditions for Transport and Storage

Permissible Environmental	Operating Conditions
Atmospheric pressure:	550 hPa to 1060 hPA
Relative humidity:	30% to 90%
Ambient temperature:	-20°C to +40°C

Ambient temperature: +10°C to +40°C

Relative humidity: 30% to 75%

Atmospheric pressure: 700 hPa to 1060 hPa

#### **Electromagnetic Interference**

The Equipment needs to be placed into service according to electromagnetic compliance information provided in the manual Appendix.

#### **Environmental Protection**

- Dispose of batteries in accordance with all local, state, and federal laws.
- At the end of the equipment service life, dispose of the device components in accordance with all local, state, and federal laws for electronic recycling.

#### Interchangeable or Detachable Parts by Service Personnel.

• There are no components that are designated as repairable by service personnel. Components will be replaced if needed in accordance with BTE service policy

#### Servicing

- No parts shall be serviced or maintained while in use with a client.
- Upon request BTE will provide circuit diagrams, component parts lists, descriptions, calibration instructions, or other information to assist customer service personnel to repair parts.

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## **II. SETUP & OPERATION**

## **1. PRISM EQUIPMENT CHECKLIST**

It is recommended that while unpacking the equipment you also review your packaging slip to ensure you have all required parts.

#### A. EQUIPMENT

- Prism Assembly Component Parts
  - Support Column (Including two Functional Range of Motion Panels (FROM))
  - Carriage
  - Pull Test Frame Attachment
  - Bottom Cross Tube
  - Counterweight
  - Prism Lifting Shelf
  - Pulley Assembly
  - Support Legs (2)
  - Left & Right Support Bracket
  - Top Hard Stops (2)
  - Endcaps (4)
  - Adhesive Backed Pads (2)
- PTK Portable Load Cell (PLC) Attachments
  - PTK D-Handle
  - PTK Narrow Round Grip
  - PTK Straight Bar
- RJ45 Cables (3 ft cables and 5 ft cables)
- Plastic Pegs (Qty: 30)
- Hand Grip with Convex and Concave Handle
- Hand Grip 5 lb Calibration Weight
- Hand Grip Calibration Base
- Pinch Gauge (Pinch Grip)
- Pinch Gauge Calibration Block
- Pinch Gauge Calibration Fixture
- PTK Portable Load Cell (PLC)

- Lift Test Kit (2 Platforms & 1 Calibration Plate)
- 10 Lb & 15 Lb Calibration Weights
- 10 Lb Lifting Crate
- Lifting Weight Set
  - 20 Lb Weight, Qty: 4
  - 10 Lb Weight, Qty: 1
  - 5 Lb Weight, Qty: 1
- Bluetooth Heart Rate System
- NiMH AA Rechargeable Batteries (or AA Alkaline Batteries) Qty: 8
- AA Battery Charger
- Dual Inclinometer
- Goniometer
- Goniometer Arm Set (2 Small, 1 Medium, 1 Large)
- Prism Control Module with Software
- Prism User's Manual\*
- BTE Lumen Software User's Manual\*

#### B. TOOLS

- 3/16" Hex L-Key Wrench
- 9/16" Open Ended Wrench
- 1/4" Ball End Hex Key

#### **C. IDENTIFICATION OF PRISM SYSTEM COMPONENTS**







• Support Column (With FROMs)

- Counterweight
- Carriage
- Lifting Shelf Knobs
- Support Legs
- Left and Right Support Bracket
- Pulley Assembly
- Pull Test Frame Attachment
- Pull Test Frame Attachment Knobs
- Top Hard Stops
- End Caps and Adhesive Backed Pads

#### **D. IDENTIFICATION OF EVALUATION TOOLS & ATTACHMENTS**

Included in the system are tools and attachments that evaluate the client's strength and range of motion.

#### Portable Electronic Tools and data acquisition components.













#### **Dynamic Lifting Crate and Weights**



#### **Calibration Equipment**



#### **FROM Panel Plastic Pegs**



#### BTE Lumen User's Manual\*



\*Provided electronically. Available in print upon request. Contact BTE for further information.

## 2. PRISM ON-SITE ASSEMBLY

The Prism System requires on-site assembly. Refer to work instructions 751W3120 for assembly instructions.

#### CAUTION

TIPPING HAZARD Do not place Support Column against non-structural wall.

Adjust accordingly so that the backside of the support column is making contact with the wall.

#### CAUTION

TIPPING HAZARD Extend Column Legs and secure Leg Pull Pins prior to using Pull Test Frame Attachment.







The Prism system weighs approximately 125 lbs. When moving the system, it is recommended that two or more people are used to safely lift the Prism.

## 3. GENERAL OPERATION OF THE SYSTEM

#### WARNING

Do not modify this equipment without authorization of the manufacturer.

Any changes or modifications, not expressly approved by BTE shall void the user's authority to operate equipment.

#### CAUTION

TIPPING HAZARD Do not place Support Column against non-structural wall.

#### A. WORKING SPACE REQUIREMENTS OF THE PRISM SYSTEM

Space requirements - The Prism System requires a minimum working area of:

- Wall Width: 48 inches
- Wall Height: 96 inches
- Floor Depth: 70 inches

#### **B. SETTING THE SYSTEM HEIGHT**

1) The Prism Carriage adjusts vertically from Position 1 to Position 43, with Position 1 being closest to the floor. The Carriage is held in place at a position by the Carriage Pull Pin.





2) To disengage the Carriage Pull Pin, pull it outwards, towards the user.





3) Then, while the Carriage Pull Pin is disengaged, raise or lower the Carriage to the desired position. Then, once the desired position is achieved, re-engage the Carriage Pull Pin, thus locking the Carriage in place. Verify that the pin is fully engaged. The Carriage is connected to a Counterweight system which allows for assisted vertical adjustment with minimal lifting force from the user.



4) The Prism can be used for Push Tests, Pull Tests, Pull Down Tests, and Dynamic Lifting Tests. Each position on the Prism has a corresponding height relative to the floor that is dependent on the type of test being performed and the tool being used with that test. For tests involving the D-Handle, Straight Bar, or Narrow Round Grip, the height is measured from the floor to the center axis or the handle. For Dynamic Lifting Tests, the distance is from the floor to the top of the Lifting Shelf. The positions and corresponding heights for all tests are listed below:

	Push Test			Pull Test			Pull Down Test			
			Narrow			Narrow			Narrow	Dumanaia Liftina Taat
		Straight	Round		Straight	Round		Straight	Round	Dynamic Litting Test
Position	D Handle	Bar	Grip	D Handle	Bar	Grip	D Handle	Bar	Grip	
1										22.0
2										23.5
3										25.0
4										26.5
5										28.0
6										29.5
7	30.0	30.0	30.0	30.0	30.0	30.0	20.1	22.4	22.4	31.0
8	31.5	31.5	31.5	31.5	31.5	31.5	21.6	23.9	23.9	32.5
9	33.0	33.0	33.0	33.0	33.0	33.0	23.1	25.4	25.4	34.0
10	34.5	34.5	34.5	34.5	34.5	34.5	24.6	26.9	26.9	35.5
11	36.0	36.0	36.0	36.0	36.0	36.0	26.1	28.4	28.4	37.0
12	37.5	37.5	37.5	37.5	37.5	37.5	27.6	29.9	29.9	38.5
13	39.0	39.0	39.0	39.0	39.0	39.0	29.1	31.4	31.4	40.0
14	40.5	40.5	40.5	40.5	40.5	40.5	30.6	32.9	32.9	41.5
15	42.0	42.0	42.0	42.0	42.0	42.0	32.1	34.4	34.4	43.0
16	43.5	43.5	43.5	43.5	43.5	43.5	33.6	35.9	35.9	44.5
17	45.0	45.0	45.0	45.0	45.0	45.0	35.1	37.4	37.4	46.0
18	46.5	46.5	46.5	46.5	46.5	46.5	36.6	38.9	38.9	47.5
19	48.0	48.0	48.0	48.0	48.0	48.0	38.1	40.4	40.4	49.0
20	49.5	49.5	49.5	49.5	49.5	49.5	39.6	41.9	41.9	50.5
21	51.0	51.0	51.0	51.0	51.0	51.0	41.1	43.4	43.4	52.0
22	52.5	52.5	52.5	52.5	52.5	52.5	42.6	44.9	44.9	53.5
23	54.0	54.0	54.0	54.0	54.0	54.0	44.1	46.4	46.4	55.0
24	55.5	55.5	55.5	55.5	55.5	55.5	45.6	47.9	47.9	56.5
25	57.0	57.0	57.0	57.0	57.0	57.0	47.1	49.4	49.4	58.0
26	58.5	58.5	58.5	58.5	58.5	58.5	48.6	50.9	50.9	59.5
27	60.0	60.0	60.0	60.0	60.0	60.0	50.1	52.4	52.4	61.0
28	61.5	61.5	61.5	61.5	61.5	61.5	51.6	53.9	53.9	62.5
29	63.0	63.0	63.0	63.0	63.0	63.0	53.1	55.4	55.4	64.0
30	64.5	64.5	64.5	64.5	64.5	64.5	54.6	56.9	56.9	65.5
31	66.0	66.0	66.0	66.0	66.0	66.0	56.1	58.4	58.4	67.0
32	67.5	67.5	67.5	67.5	67.5	67.5	57.6	59.9	59.9	68.5
33	69.0	69.0	69.0	69.0	69.0	69.0	59.1	61.4	61.4	70.0
34	70.5	70.5	70.5	70.5	70.5	70.5	60.6	62.9	62.9	71.5
35	72.0	72.0	72.0	72.0	72.0	72.0	62.1	64.4	64.4	73.0
36	73.5	73.5	73.5	73.5	73.5	73.5	63.6	65.9	65.9	74.5
37	75.0	75.0	75.0	75.0	75.0	75.0	65.1	67.4	67.4	76.0
38										
39										
40										
41										
42										
43										

#### C. ATTACHING THE PTK PORTABLE LOAD CELL (PLC) TO THE MOUNTING BLOCK

1) Locate the PTK PLC. The PTK PLC is designed to interface with any of the three mounting blocks on the Prism System. Two of these Mounting Blocks are located on the Carriage and are used for Push Tests and Pull Down Tests. The third Mounting Block is located on the Pull Test Frame Attachment, and is used for Pull Tests.



2) The PTK PLC comes with two PLC Pins. A PLC Pin is used to secure the PTK PLC to the PLC Mounting Block.



3) Insert the PTK PLC into the desired PLC Mounting Block. The "Carriage" side label should be oriented towards the Carriage for the two Mounting Blocks located on the Carriage, with the label visible to the user.



4) Then, press the button on the end of the PLC Pin; insert it through the PLC Mounting Block and through the PTK PLC Shaft. The PLC Pin must be fully seated in the Mounting Block.



5) The PTK PLC is now secured to the PLC Mounting Block. To remove the PTK PLC, simply press the button on the PLC Pin and remove it. Then, remove the PTK PLC from the Mounting Block.

#### D. SECURING PTK PORTABLE LOAD CELL ATTACHMENTS

- 1) The PTK PLC is designed to interface with the PTK D-Handle, Straight Bar, and Narrow Round Grip tool attachments. The PTK tool attachments can be oriented in 90 degree increments. Of note, for Pull Down Tests the Straight Bar and Narrow Round Grip tool attachments may only be secured in one orientation.
- 2) Select the desired PTK tool attachment to interface with the PTK PLC. Place the PTK tool attachment onto the PLC Shaft on the side designated "Tool". Rotate the tool into the desired orientation.



3) Then, press the button on the end of the PLC Pin and insert it through the tool attachment and through the PTK PLC Shaft. The pin must be fully seated and extend through both sides of the attached tool.



4) The tool attachment is now secured to the PTK PLC. To remove the tool attachment from the PTK PLC, simply press the button on the PLC Pin and remove the pin. Then, remove the tool from the PTK PLC.

#### E. ATTACHING THE PULL TEST FRAME ATTACHMENT TO THE CARRIAGE

- 1) In order to use the Pull Test Frame Attachment, the Lifting Shelf and the PTK PLC must not be connected to the Carriage. If either of these components are connected, remove them and set them aside.
- 2) If the Pull Test Frame Attachment has not been previously assembled, this must be done first. Locate the Pull Test Frame Attachment components. Orient the Center Tube (Gate) of the Pull Test Frame Attachment as shown below, and secure it using the two Pull Pins.



3) Locate the two Pull Test Frame Attachment Locking Knobs. If the Pull Test Frame Attachment Locking Knobs are secured into the Receiving Tubes of the Carriage, unscrew them, remove them from the receiving tubes, and place them into the Holding Brackets of the Carriage.



4) Next, grasp the Pull Test Frame Attachment side tubes, and insert them into the receiving tubes of the Carriage. The attachment will bottom out when fully inserted into the Carriage.

#### CAUTION

Do not hold the Pull Test Frame Attachment outside of the designated area that includes 1/3 of the frame arm's length from the gate outwards.



5) Locate the two Pull Test Frame Attachment Locking Knobs. Screw them into the Receiving Tubes of the Carriage until they bottom out. To reduce excessive play and potential binding between the Pull Test Attachment and the Carriage when screwing the knobs in, lift up gently on the Pull Test Frame Attachment.



6) The Pull Test Frame Attachment is now ready for use. When using the Pull Test Frame Attachment, it does not need to be removed for ingress and egress. Simply pull out one of the Pull Test Frame Attachment Pins and swing the center tube out of the way. Once ingress and egress has been completed, swing it back into place and fully secure with the pin.

#### CAUTION

PINCH POINT Do not place hands near hinges located at each end of the Pull Test Frame Attachment Gate.







8) Then, remove the Pull Test Frame Attachment out of the Carriage and set it aside.



#### F. ATTACHING THE LIFTING SHELF TO THE CARRIAGE

- 1) In order to use the Lifting Shelf, the PTK PLC and the Pull Test Frame Attachment must not be connected to the Carriage. If either of these components are connected, remove them.
- 2) Position the top of the Carriage to a convenient working height.
- 3) Remove the two Lifting Shelf Knobs that are connected to the Carriage Locating Screws of the Carriage as shown below.



**Sec Prism** 

4) Locate the Lifting Shelf and place it onto the Carriage. The Lifting Shelf must be centered with the two holes in alignment with the Carriage Locating Screws.



5) Once the Lifting Shelf is placed onto the Carriage, fully secure it to the Carriage with the two Lifting Shelf Knobs. Of note, there is a small amount of play with the Carriage Locating Screws. They may be required to be moved slightly in order to properly seat the Lifting Shelf onto the Carriage prior to screwing on the Lifting Shelf Knobs onto the locating screws.

#### CAUTION

Verify that knobs are fully tightened prior to testing.



6) The Lifting Shelf is now ready for use. Adjust the Carriage height accordingly for testing. To remove the shelf, simply unscrew the two Lifting Shelf Knobs, remove the Lifting Shelf, and then screw the two knobs back onto the Carriage Locating Screws so that they are not misplaced.



#### **G. ASSEMBLING THE LIFT TEST INTEGRATION FIXTURE**

1) Locate the PTK PLC and the two Lift Test Platforms.



2) Each Platform has a screw located on the inside of the Platform Hub. This screw will be used to assemble the platforms to the PTK PLC Shafts.



3) Take the PTK PLC and screw it onto the Platform in a clockwise rotation. The PTK PLC should be spun onto the Platform until the shaft bottoms out in the Platform Hub and is restrained from moving.



4) Then, take the remaining Platform and screw it onto the other PTK PLC Shaft in a clockwise rotation. The platform should be spun onto the PLC Shaft until the shaft bottoms out in the Platform Hub and is restrained from moving.



NOTE: THE PLATFORMS ARE NOT REQUIRED TO BE IN ROTATIONAL ALIGNMENT WITH ONE ANOTHER. OVER TWISTING OF A PLATFORM MAY RESULT IN DAMAGE TO THE PTK PLC AND THE PLATFORM.

5) Place the now assembled Lift Test Integration Fixture onto the floor in the desired location, and then orient the fixture accordingly. The fixture is now ready for use. Of note, the bottom and top Platform are not required to be in alignment with one another.

#### CAUTION

Do not perform testing without verifying Lift Test Integration Fixture is properly assembled.



6) To disassemble the Lift Test Integration Fixture, twist both of the platforms off the PTK PLC.

#### H. GENERAL SOFTWARE AND TOOL OPERATION

#### 1. SETUP

- Ensure bluetooth dongle is inserted into the control module USB port.
- Insert batteries into BHU if not already present.
- Note that the batteries have charged before shipping; however, rechargeable batteries will self-discharge over time. It is recommended that you recharge the batteries before using the system for an extended length of time. Keep a set fully charged during use in case batteries need to be changed out during use.

#### 2. CONNECTING A TOOL TO THE HIP UNIT

RJ45 cables are included with the system. These are the only cables that should be used to connect the tools to the Bluetooth Hip Unit.

#### 3. IDENTIFYING TOOL SERIAL NUMBERS

Each tool is assigned a unique serial number, which is how the calibration data is stored in the software.

The serial number can be found on the label near the RJ45 jack on each tool.

#### 4. MANAGING TOOLS

The Tool Management feature can be accessed in the software by going to the Hamburger menu and selecting Tool Calibration.

The screen includes a snapshot of all the tools which are plugged into a powered BHU. Note that the Heart Rate icon will be green whenever the heart rate watch is activley reading heart rate.

In addition, the screen may display the input values whenever a tool name is selected. The tool icon must be green in order for the input values to be displayed.

If a tool or BHU is replaced, refer to the Troubleshooting and Maintenaince section for instructions setup in BTE Tool Suite.

#### 5. BATTERIES

The provided rechargeable batteries are not charged before shipping; Rechargeable batteries will self-discharge over time. It is recommended that you recharge the batteries before using the system for an extended length of time.

When fully charged, the batteries should power the BHU for up to 5 hours of continuous testing. This will vary depending on how much battery capacity is available, how many tools are plugged in at once, and which tools are being used (e.g. the Dual Inclinometer and Goniometer use more battery power than the Hand Grip, Pinch Gauge, and Portable Load Cell).

The amount of charging time depends on the remaining capacity of the battery in addition to the charge rate set on the charger. Refer to the battery charger manual for information on the estimated charge time. Whenever possible, only charge the batteries after they have been drained. Short-charging batteries can degrade them over time.

#### 6. MAINTAINENCE AND CARE

Refer to the Troubleshooting and Maintenaince section.

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# III. SOFTWARE AND TOOL USE

# **1. SETUP CONTROL MODULE AND ASSOCIATED HARDWARE**

(includes BHU, Bluetooth dongle, Heart Rate System)

Fully charge the batteries as they are not charged prior to shipping. Refer to the manufacturer's instructions regarding use of the charger and batteries.

Prepare the control module by connecting power cord to control module and power source. Once the control module is powered on, insert the BHU dongle into an available USB port of control module.

Plug the Heart Rate USB charger into a USB port of the control module. Attach the watch to the charger. Do not use the HR watch dongle; the BHU dongle will detect the watch. Refer to the manufacturer's instructions regarding setup and use of the HR system.

Once the 2 batteries are fully charged, insert them into the BHU.

## 2. ESTABLISHING TOOL COMMUNICATION WITHIN SOFTWARE

Using the icon on the Desktop, open the BTE Lumen software.



If this is the first time utilizing the software, a first-time use wizard will appear to get you started. You may refer to the BTE Lumen User's Manual for more information. Log in with valid credentials at the login screen. From the Hamburger Menu (upper left corner of window), select Tool Calibration.



Be sure the BHU is powered on and check that the communication symbol is green. Proceed to connect the Hand Grip to the BHU using the RJ-45 cable and verify its communication with the software. When connected, red icons associated with the tool will turn green. Proceed to verify the other tools also register as they are connected.

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	<b>4</b>
🖕 Goniometer 😽	
🗕 Pinch Gauge 😽	
	Verification Reading
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# **3. INTRODUCTION TO AVAILABLE TOOLS AND DEVICES**

## A. BLUETOOTH HIP UNIT (BHU) AND BLUETOOTH DONGLE

The Bluetooth Hip Unit (BHU) serves as a transmitter of data. With a tool attached, the BHU captures the data from the tool and transmits it to the receiver which is the Bluetooth dongle. The data is then captured by BTE Lumen software.

There is no on/off switch for the BHU. It will automatically turn on if moved and will shut off after period of no movement. Since it uses rechargeable batteries. It is best to keep spare batteries in the charger and put fresh batteries in the BHU each day.





#### **B. HEART RATE SYSTEM / WATCH**

#### **1. INTRODUCTION**

The Heart Rate (HR) System is comprised of the HR monitor watch and USB Bluetooth 4.0 low energy radio adapter (the dongle). Additional item includes the USB charging adapter that comes with the watch. The Bluetooth (dongle) of the HR system is not needed as the dongle associated with the BHU will recognize the watch.

The watch uses two green LEDs and an electro-optical cell which are integrated into the back plate of the watch. The LEDs shine light into the skin, which enables the electro-optical cell to detect the pulsing volume of blood flow.

#### ELECTROMAGNETIC FIELD WARNING



The heart rate watch and USB charging dongle contain strong magnets that can affect pacemakers and implantable cardioverter-defibrillators (ICDs). Consult medical professional or device manufacturer before using the watch.

#### 2. USING THE HEART RATE SYSTEM

Step 1. Fasten the HR watch snugly on your arm above, not on, the wrist bone.

Step 2. Press and hold the HR button until the watch beeps and the display says FIND.



Step 3. Hold your arm still until the watch beeps again and displays heart rate.

Notes:

1) It takes a few seconds for heart rate to register.

2) With proper fit, there should be no visible light between the watch and skin. Make necessary adjustments in fit.

Refer to the manufacturer's Quick Start Guide and Warranty and Regulatory booklet for additional information related to set up and use of the HR system.

#### **C. HAND GRIP DYNAMOMETER**

#### **1. INTRODUCTION**

The Hand Grip Dynamometer, also known as the Hand Grip, is used to measure hand grip strength up to 250 lb./113 kg. Through the use of multiple attachment points and protocols, a client's hand grip strength can be evaluated for safe, maximum force capacity, comparison to available comparative/normative data, and consistency of effort.

#### 2. HAND GRIP HANDLES

The Hand Grip comes with 2 different handles, the concave (gray) and convex (blue). The concave grip is used for all standardized hand grip tests and may be used for custom tests. The convex grip is provided to simulate custom applications and can also be used as a handle for the user in order to provide support of the tool and guide the pace of alternating repetitions during testing.



Note: The concave grip handle is asymmetrical in thickness. To correctly attach the concave handle to the hand grip posts, ensure the U-shaped connector is attached to the black upper post and the C-shaped connector is attached to the grey bottom rung (the end that has the RJ45 port). The convex grip is symmetric, so it may be positioned in either direction.

#### 3. HAND GRIP POSITIONS

The Hand Grip was designed such that the detachable grip handle may be located in 5 different positions. Be sure to read each protocol to determine in which position the grip must be.

Note: Position 1 is closest to the Hand Grip base.

Note: Position 6 is unique to the BTE Hand Grip. The primary use is to provide attachment point for the convex handle which permits the user to support and transfer tool from side to side during testing.

#### 4. UTILIZING THE HAND GRIP DYNAMOMETER

Connect the Hand Grip to the BHU via the RJ45 cable. If you are at a test window, check that tool connection icon is green. If not at test window, you may also go to Tool Calibration to check status.

Identify the appropriate rung position for the concave handle. The Setup Notes that

accompany the pre-programmed Hand Grip Tests (5-Rung and Rapid Exchange Grip Protocol and the Hand Grip – Three Trials Position 2 Test) provide that information. Apply concave grip handle in correct orientation; U-shaped connector at top and C-shaped connector at base of hand grip.

#### D. PINCH GAUGE

#### **1. INTRODUCTION**

The Pinch Gauge, also known as the Pinch Dynamometer, is used to measure finger strength up to 50 lb/23 kg.



#### 2. UTILIZING THE PINCH GAUGE

Connect the Pinch Gauge to the BHU via the RJ45 cable. If you are at a test window, check that tool connection icon is green. If not at test window, you may also go to Tool Calibration to check status. Refer to setup notes in the software for positioning with the client that accompany the pre-programmed Pinch tests.

#### **E. DUAL INCLINOMETER**

#### **1. INTRODUCTION**

The Dual Inclinometer is used to evaluate range of motion while allowing for sections to be tested in isolation. This is accomplished by a sensor in each Inclinometer side which calculates the rotational displacement, and then subtracting or adding the two values to arrive at a true range of motion value.

The Dual Inclinometer is comprised of two sensors: the master and the remote. The master side is identified by the button switch on the front side. In addition, the master side is connected to the BHU via an RJ45 cable. A link cable then connects the remote to the master. Depending on the testing situation, you may choose to use the master side alone or use both Inclinometer sides together.



Note that whenever you are testing with the Dual Inclinometer, the sides must always be positioned in the same plane (as shown in right picture). The sensors are not able to accurately measure the change in angle if the sides are not properly facing each other.

#### 2. UTILIZING THE DUAL INCLINOMETER

Connect the master inclinometer to the BHU via the RJ45 cable. If you are at a test window, check that tool connection icon is green. If not at test window, you may also go to Tool Calibration to check status.

Determine if measurement to be taken requires use of both sides or only one (the master side) and proceed accordingly. For compound joint movement, use both Inclinometer sides by placing one side distally and one side proximally to the joint being assessed. Be sure no other joints are involved in the compound movement and make certain to align the sides in the plane of movement. For isolated joint movement, use a single Inclinometer side by placing it distally in the plane of movement of the joint being assessed.

#### A) UTILIZING ONE INCLINOMETER SIDE

If you wish to use only one Inclinometer side, then you must use the master side. Simply remove the coiled link cable from the master side and begin testing. Refer to the Cervical Rotation section of this chapter for a pictorial example.

#### **B) UTILIZING BOTH INCLINOMETER SIDES**

If you wish to use both Inclinometer sides for the testing, make sure the coiled link cable is properly secured to the master side and the remote side.

#### 3. COLLECTING DATA

The Dual Inclinometer is most useful in its ability to measure spinal range of motion. The most common evaluations are related to the cervical spine, thoracic spine, lumbosacral spine, sacral hip flexion/extension, gross combined hip and spinal flexion/ extension, and straight leg raise.

The inclinometers are used to capture the start point and end point of the available range of motion; in other words, they measure the arc of motion demonstrated by the client. Therefore, a motion is measured by pressing the button on the master inclinometer at the beginning point of the range or arc of motion and then again at the end point of the range or arc of motion.

#### **F. GONIOMETER**

#### 1. INTRODUCTION

The goniometer is the recognized standard tool for measuring range of motion of joints of the extremities.

The BTE Goniometer tool uses a sensor to calculate the amount of displacement in degrees and arrive at a true range of motion value.

Included with the Goniometer are three different types of arms: 2 short arms, 1 medium arm, and 1 long arm. The various lengths of arms facilitate the measurement of the range of motion of smaller joints, such as in the hand and foot, as well as larger joints, such as the knee, hip, and shoulder.



#### 2. UTILIZING THE GONIOMETER

Connect the goniometer to the BHU via the RJ45 cable. If you are at a test window, check that tool connection icon is green. If not at test window, you may also go to Tool Calibration to check status.

Determine which combination of arms (short, medium, or long length) are appropriate for the joint to be measured and attach to goniometer. The arms are screwed into the top of the goniometer so they may be easily removed and attached. Make sure they are tight once screwed in.

#### 3. COLLECTING DATA

The goniometer is used to capture the start point and end point of the available range of motion; in other words, they measure the arc of motion demonstrated by the client. Therefore, a motion is measured by pressing the button on the goniometer at the beginning point of the range or arc of motion and then again at the end point of the range or arc of motion.

### G. PTK PORTABLE LOAD CELL (PTK PLC)

#### **1. INTRODUCTION**

The PTK Portable Load Cell's is designed to measure up to 250 lbs for Push and Pull Tests and 300 lbs for Pull Down Tests.

All of the PTK Portable Load Cell attachments can be used with the PTK PLC. These include the D-Handle, Straight Bar, and the Narrow Round Grip.



#### 2. UTILIZING THE PTK PORTABLE LOAD CELL

Connect the PTK Portable Load Cell to the BHU via the RJ45 jack. Note, sometimes it is easier to position the PTK PLC where it needs to be, then connect the to the BHU.

Always attach the PTK PLC to the desired Mounting Block using the PTK PLC Pin. Then, Attach the desired PTK Load Cell Tool Attachment to the "Tool" side of the PTK PLC using the PTK PLC Pin.

Refer to the SYSTEM USE chapter of this manual for a pictorial examples.

#### CAUTION

Verify that pins are fully seated prior to testing.

The BTE Lumen software includes several pre-defined tests and protocols. For information on assigning and administering tests in the software, refer to Chapters 3, 5, and 6 of the BTE Lumen User's Manual.

# 4. CALIBRATION & VERIFICATION

#### A. INTRODUCTION

The calibration and verification processes are performed to ensure the accuracy of the load cell readings of tools. Prior to first use, each tool must be calibrated and/or verified.

It is recommended that tools are verified daily. However, a tool is required to be verified once per calendar week. A tool with an expired calibration will be prevented from being used at test execution until it has been verified successfully or recalibrated. Upon a successful verification, the last calibration continues to be valid for another week.

#### **B. ACCESSING THE CALIBRATION & VERIFICATION SCREENS**

The Tool Calibration may be accessed from the Hamburger menu, selecting Tool Calibration. Additional access to the tool calibration is located at the test execution screen.

#### **C. PERFORMING CALIBRATION & VERIFICATION**

To calibrate and/or verify the tools, refer to the instructions provided in the software as they will walk you through the process for each tool. In general, you will place a tool into the required housing/block and/or attach appropriate fixture. This is followed by placement or attachment of designated weight fixture. Place requested weight on to the weight fixture. The software will indicate whether the tool passed or failed calibration and/or verification.

Should calibration and/or verification fail,

- check that correct weight is being used
- remove weight and check that tool is set up correctly using the appropriate block and/ or fixture(s). Then proceed through same process shown on screen.

#### **1. HAND GRIP DYNAMOMETER**

Calibration of the Hand Grip is performed at the factory. Therefore, verification only is necessary in the field. To verify the Hand Grip is measuring accurately, go to Tool Calibration which is found in the Hamburger Menu (upper left corner of Client Records window). Be sure the BHU is powered on. Connect the Hand Grip to the BHU using an RJ45 cable. The Hand Grip tool icon will turn green once connection is established. Click on the tool name, in this case Hand Grip. Information about Hand Grip will appear on the screen including:

Tool ID

Last Verification Date

Give me Verification Reminders (with check box)

Live Verification Reading



To initiate the Verification process, click on the Verify icon located at the bottom of the window. Remove handle(s) from the hand grip and proceed to set up the Hand Grip as shown on screen. In general, you will place the Hand Grip into the circular base and then place the 5 lb./ 2.27 kg weight fixture on to the posts of the tool. The Verification Reading will indicate whether the tool passed or failed. If it passes, click the Save button.



#### FAILURE TO VERIFY HAND GRIP

Should the Hand Grip fail verification, check that the tool is firmly seated in the base and is on a level and stable surface. Remove and then replace the weight making sure it is fully loading the posts. If you have followed these steps and still cannot get the Hand Grip to pass verification, contact BTE Technologies.

#### 2. PTK PORTABLE LOAD CELL (PTK PLC) AND PINCH GAUGE

Both calibration and verification of these tools are performed in the field.

For calibration and verification, go to Tool Calibration located in the Hamburger Menu. Be sure the BHU is powered on. Connect tool to the BHU using an RJ45 cable. The tool icon should turn green once connection is established. Click on the tool name. Information about that tool will appear on the screen including:

Tool ID

A ITT Luca

Last Calibration Date

Last Verification Date

**Option to get Verification Reminders** 

Live Verification Reading

≡		Tool Calibration	8 6
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🚺 Digital F	tand Grip 🔅	Last Calibration Date : Last Verification Date : (2) Give new Verification Beninders	
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To calibrate and verify the PLC and/or Pinch Gauge, select the Calibrate icon located at the bottom of the window and then proceed to follow the instructions that appear on screen. The process will be described across 4 windows:

- Step 1 Shows initial setup of tool and calibration fixture and where zero weight is established.
- Step 2 Shows placement of the weight fixture.
- Step 3 Provides instruction related to the weights to be placed on the weight fixture; this is the calibration step in the process.
- Step 4 Provides instruction related to the weight to be placed on the weight fixture; this is the verification step in the process.

#### PTK PLC Calibration Process



At Step 4, the Verification Reading will indicate whether the tool passed or failed. If it passes, click the Save button.

To verify only, click on the Verify icon located at the bottom of the window (Figure 5). Follow the instructions provided on screen. In general, you will place the tool into the required housing and/or attach appropriate fixture(s). Place requested weight on to the weight fixture. The software will indicate whether the tool passed or failed verification.

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≡		Tool Calibration	8 F
🔍 Search Tools		Pinch Gauge	
📫 PTK Load Cell	*	Tool ID: 50000987	
🚺 Digital Hand Grip	*	Last Californition Date : 3/15/2022 5/48 PM Last Verification Date : 3/15/2022 5/48 PM	
Dual Inclinometer	*	Give me Verification Reminders	
🖕 Goniometer	*		
- Pinch Gauge	*		
		Verification Reading	
		0 (lbs)	
BTE HIP UNIT		1 Calibrate 17 Verify C Advanced ~	

#### FAILURE TO CALIBRATE OR VERIFY

- Ensure that the calibration assembly is placed on a stable and level surface during calibration.
- Make sure the calibration fixture is not on the tool for the zeroing step of calibration.
- Make sure to configure the weights as shown on screen.
- Remove the weights from the calibration fixture before placing the verification weight on the plate. This will allow the load cell to return to zero.
- Click on Recalibrate icon within the calibration screen and repeat the steps, but wait 3 seconds between applying the weight and clicking on the yellow proceed button.
- For PTK PLC, double check the calibration fixture is screwed into the side that says "Carriage" and the lift plate is attached at the "Tool" end.

If you have followed these steps and still cannot get the PTK PLC or Pinch Gauge to pass verification, contact BTE Technologies.

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# IV. SYSTEM USE - TEST CONFIGURATIONS AND PARAMETERS

The Prism system can be used for the following tests: Push Test, Pull Test, Pull Down Test, Dynamic Lifting Tests, Pinch Grip Test, Hand Grip Test, and Range of Motion using FROM Panels.

## CAUTION

Do not pull/push at angles exceeding 30 degrees.

# **1. PUSH TEST**

### A. CAPACITY:

Force range is 0 to 250 lbs

#### **B. TEST PARAMETERS:**

Test requires the use of the PTK PLC. The following tools may be used with a Push Test: D-Handle, Straight Bar, Narrow Round Grip



#### **C. PUSH TEST SETUP**

- 1) Verify that the Lifting Shelf and Pull Test Frame Attachment are not attached to the system at this time. If they are attached, remove them and set them aside accordingly.
- 2) Verify that both Support Legs are fully deployed and secured with the Leg Pull Pin before performing a Push Test, and that the system is firmly against a structural support wall.

#### CAUTION

TIPPING HAZARD Do not place Support Column against non-structural wall.

#### CAUTION

Verify that pins are fully seated prior to testing.

- 3) Set the Carriage to the desired height using the Carriage Pull Pin.
- 4) Insert the PTK PLC into the PLC Mounting Block on the Carriage. The PTK PLC must be oriented so that the "Carriage" label is on top and is facing the Carriage side. Fully secure the PTK PLC with the PLC Pin.



- 5) Attach the BHU to the Carriage Bracket. Connect the RJ57 cable to both the BHU and the PTK PLC.
- 6) Attach the desired tool to the PTK PLC and secure it using the PLC Pin.





7) The PTK PLC is now ready to use for a Push Test. When performing a Push Test, the user should push horizontally into the center axis of the load cell. Pushing at an angle not in line with the load cell axis will cause reduced readings.



### **D. SOFTWARE SETUP**

Now that the system is ready for use, verify that the PTK PLC is connected and calibrated per the GENERAL SOFTWARE AND TOOL OPERATION chapter. Additionally refer to the BTE Lumen Software test setup notes for test specific test setup, operation, and clincal instruction. Refer to the BTE Lumen User's Manual for creating custom tests.

# 2. PULL TEST

#### A. CAPACITY:

Force range is 0 to 250 lbs.

#### **B. TEST PARAMETERS:**

Test requires the use of the PTK PLC. The following tools may be used with a Push Test: D-Handle, Straight Bar, Narrow Round Grip.



#### **C. PULL TEST SETUP**

- 1) Verify that the Lifting Shelf and PTK PLC are not attached to the system at this time. If they are attached, remove them and set them aside accordingly.
- Verify that both Support Legs are fully deployed and secured with the Leg Pull Pins before performing a pull test, and that the system is firmly against a structural support wall.

#### CAUTION

TIPPING HAZARD Do not place Support Column against non-structural wall.

#### CAUTION

TIPPING HAZARD Extend Column Legs and secure Leg Pull Pins prior to using Pull Test Frame Attachment.

3) Set the Carriage to the desired height using the Carriage Pull Pin.

4) Attach the Pull Test Frame Attachment to the Carriage. Fully secure it using the Pull Test Attachment Knobs. Verify that the Pull Test Attachment Gate is secured with pins.



5) Insert the PTK PLC into the PLC Mounting Block on the Pull Test Frame Attachment. The PLC must be oriented so that the "Carriage" label is on top and facing the Mounting Block. Fully secure the PTK PLC to the Mounting Block with the PLC Pin.



6) Attach the BHU to the Pull Test Attachment Bracket. Connect the RJ57 cable to both the BHU and the PTK PLC.



Attach the desired tool to the PLC Shaft and secure it using the PLC Pin.



# BTe Prism

The PTK PLC is now ready to use for a Pull Test. When performing a pull test, the user should pull horizontally from the center axis of the load cell. Pulling at an angle not in line with the load cell axis will cause reduced readings.

#### CAUTION

Verify that pins are fully seated prior to testing.



#### **D. SOFTWARE SETUP**

Now that the system is ready for use, verify that the PTK PLC is connected and calibrated per the GENERAL SOFTWARE AND TOOL OPERATION chapter. Additionally refer to the BTE Lumen Software test setup notes for test specific test setup, operation, and clincal instruction. Refer to the BTE Lumen User's Manual for creating custom tests.

# **3. PULL DOWN TEST**

### A. CAPACITY:

Force range is 0 to 300 lbs.

#### **B. TEST PARAMETERS:**

Test requires the use of the PTK PLC. The following tools may be used with the Pull Down Test: D-Handle, Straight Bar, Narrow Round Grip. Of note, the Straight Bar and Narrow Round Grip may only be placed in one orientation.



#### **C. PULL DOWN TEST SETUP**

- 1) Verify that the Lifting Shelf and Pull Test Attachment are not attached to the system at this time. If they are attached, remove them and set them aside accordingly.
- 2) Verify that both Support Legs are fully deployed and the Leg Pull Pins are secured before performing a Pull Down Test, and that the system is firmly against a load bearing wall.
- 3) Set the Carriage to the desired height using the Carriage Pull Pin.
- 4) Insert the PTK PLC into the bottom Mounting Block on the Carriage. The PTK PLC must be oriented so that the "Carriage" label points towards the Carriage. Fully secure the PTK PLC to the Mounting Block with the PLC Pin.



5) Attach the BHU to the Carriage Bracket. Connect the RJ57 cable to both the BHU and the PTK PLC.

6) Attach the desired tool to the PLC shaft and secure it using the PLC Pin. Note that the Narrow Round Grip and the Straight Bar can only be placed in one position.



7) The PTK PLC is now ready to use for a Pull Down Test. When performing a Pull Down Test, the user should pull down vertically in line with the center axis of the load cell. Pulling down at an angle not in line with the load cell axis will cause reduced readings.

#### CAUTION

Verify that pins are fully seated prior to testing.

#### CAUTION

Verify that knobs are fully tightened prior to testing.





#### **D. SOFTWARE SETUP**

Now that the system is ready for use, verify that the PTK PLC is connected and calibrated per the GENERAL SOFTWARE AND TOOL USE chapter. Additionally refer to the BTE Lumen Software test setup notes for test specific test setup, operation, and clincal instruction. Refer to the BTE Lumen User's Manual for creating custom tests.

# **4. DYNAMIC LIFTING TEST**

#### A. CAPACITY:

Weight range is 10 to 100 lbs.

#### **B. TEST PARAMETERS:**

Lift Test Integration Fixture, Lifting Shelf, Lifting Crate, and Weights



#### **C. DYNAMIC LIFTING TEST SETUP**

- 1) Verify that the Pull Test Attachment and PTK PLC are not attached to the system at this time. If they are attached, remove them and set them aside accordingly.
- 2) Verify that both Support Legs are fully deployed and the Pull Pins are secured before performing a Lift Test and that the system is firmly against a stuctural support wall.

3) Position the height of the Carriage at a convenient working height and remove the two Lifting Shelf Knobs that are connected to the Carriage locating screws. Place the Lifting Shelf onto the Carriage and secure it with the Lifting Shelf Knobs.





4) Raise or lower the Carriage(Lifting Shelf) to the desired location.



5) Attach the two Lift Test Platforms to the PTK PLC. Note that each Platform has a screw located inside the Platform Hub and that the platforms screw into the PTK PLC Shafts. The platform should be screwed securely onto the PTK PLC Shaft until the shaft bottoms out on the hub and is restrained from moving. The platforms are not required to be in rotational alignment with each other.



6) Place the Lift Test Integration Fixture at the desired position on the floor. Note that the bottom and top Platforms are not required to be in alignment with one another. Do not over-tighten the Platforms as it may result in damage to the PTK PLC and the Platforms.



7) Place the BHU underneath the Lift Test Integration Fixture, next to the PTK PLC. Attach the RJ57 cable to both the BHU and the PTK PLC.



- 8) The Lifting Crate weighs 10 lbs. Additionally, there are 6 weights that are provided with the system. The following weights are available:
  - 20 Lb Weight (Green Label), Qty: 4
  - 10 Lb Weight (White Label), Qty: 1
  - 5 Lb Weight (Yellow Label), Qty: 1
  - 1) The system is designed for the Lifting Crate to be lifted from the Lift Test Integration Fixture to the Lifting Shelf. The Lifting Crate may be loaded with the desired weight by placing the weights into the Lifting Crate.



### **D. SOFTWARE SETUP**

Now that the system is ready for use, verify that the PTK PLC is connected and calibrated per the GENERAL SOFTWARE AND TOOL OPERATION chapter. Additionally refer to the BTE Lumen Software test setup notes for test specific test setup, operation, and clincal instruction.

# **5. FUNCTIONAL RANGE OF MOTION**

#### **A. TEST PARAMETERS FROM PANELS**

The Prism system has two standard FROM panels.

#### **B. FUNCTIONAL RANGE OF MOTION (FROM) TEST SETUP**

1) Verify that the Lifting Shelf, PTK PLC and Pull Test Attachment are not attached to the system at this time. If they are attached, remove them and set them aside accordingly.



- 2) Verify that both Support Legs are fully deployed and that the Leg Pull Pins are secured before performing a FROM test and that the system is firmly against a structural support wall.
- 3) There are two FROM Panels on the Prism. The panels are labeled Panel 1 and Panel 2. Each FROM Panel has three Zones, A, B, & C. Each Zone has 5 rows of position holes. Each row has a color designation. The rows from top to bottom are White, Red, Blue, Green, and Yellow.
- 4) The system is designed to allow for the use of Zones A & B together, or Zones B & C together. If using Zones A&B, lower the Carriage to Position 1. If using Zones B & C, raise the Carriage to Position 55.

5) The system has 30 FROM Panel Pegs. These pegs are designed to be used with the FROM panels, and are designed to be inserted into FROM position holes. Be mindful not to leave any pegs in the position holes while moving the Carriage up or down, as this will permanently damage the pegs.



#### **C. SOFTWARE SETUP**

Refer to the BTE Lumen software's test setup notes for test specific test setup, operation, and clincal instruction. Refer to the BTE Lumen User's Manual for creating custom tests.

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# TROUBLESHOOTING AND MAINTENANCE GUIDE

# **1. TROUBLESHOOTING**

### A. BLUETOOTH HIP UNIT (BHU)

If the unit is not functioning:

- 1. Be sure unit is powered on. To power on, simply move the unit.
- If no response to movement, insert freshly charged batteries. Have some standard AA batteries available in case there is an issue with the battery charger or lifeend of the rechargeable batteries.
- 3. Verify the Bluetooth dongle/transmitter is plugged into the control module.
- 4. The BHU may have been dropped.

#### **B. BTE DIGITAL HAND GRIP**

If the Hand Grip is not connecting or not reading any value:

Verify that:

- 1. The batteries in the BHU are charged and less than a year old.
- 2. The Bluetooth dongle/transmitter is plugged into the control module and BHU is powered on.
- 3. The Hand Grip, BHU, and RJ45 cable are not damaged, dirty at the connections, or have loose components.

Attempt the following:

- 1. Insert freshly charged batteries and ensure batteries in BHU are secure.
- 2. Try a different combination of batteries if one of the batteries has gone bad, then the BHU will not work properly.
- 3. Attach a new RJ45 cable to the Hand Grip and BHU.

#### C. PINCH GAUGE

If the Pinch Gauge is not connecting or not reading any value:

Verify that:

- 1. The batteries in the BHU are charged and less than a year old.
- 2. The Bluetooth dongle/transmitter is plugged into the control module and BHU is powered on.
- 3. The Pinch Gauge, BHU, and RJ45 cable are not damaged, dirty at the connections, or have loose components.

Attempt the following:

- 1. Insert freshly charged batteries and ensure batteries in BHU are secure.
- 2. Try a different combination of batteries if one of the batteries has gone bad, then the BHU will not work properly.

3. Attach a new RJ45 cable to the Pinch Gauge and BHU.

## D. PTK PORTABLE LOAD CELL (PTK PLC)

If the PLC is not connecting or not reading any value:

Verify that:

- 1. The batteries in the BHU are charged and less than a year old.
- 2. The Bluetooth dongle/transmitter is plugged into the control module and BHU is powered on.
- 3. The PTK PLC, BHU, and RJ45 cable are not damaged, dirty at the connections, or have loose components.

Attempt the following:

- 1. Insert freshly charged batteries and ensure batteries in BHU are secure.
- 2. Try a different combination of batteries if one of the batteries has gone bad, then the BHU will not work properly.
- 3. Attach a new RJ45 cable to the PTK PLC and BHU.

If PTK PLC shows connected and force is not recording in strength test:

- 1. Make sure to secure the tool attachment to the PTK PLC labeled "Tool" (not the "Carriage" side).
- 2. Check the actual test situation (i.e. how the client is performing the test) matches the expected test setup (i.e. what is specified under the Software Test Setup).
- 3. Check all of the settings within the Software Test Setup are correct (e.g. the test is set properly to Push or Pull).

#### **E. DUAL INCLINOMETER**

If the Dual Inclinometer is not connecting or not reading any value:

Verify that:

- 1. The batteries in the BHU are charged and less than a year old.
- 2. The Bluetooth dongle/transmitter is plugged into the control module and BHU is powered on.
- 3. The Dual Inclinometer, BHU, and RJ45 cable are not damaged, dirty at the connections, or have loose components.

Attempt the following:

- 1. Insert freshly charged batteries and ensure batteries in BHU are secure.
- 2. Try a different combination of batteries if one of the batteries has gone bad, then the BHU will not work properly.
- 3. Attach a new RJ45 cable to the Dual Inclinometer and BHU.

4. Detach and reattach the link cable from both the Master side and the Remote side.

#### **F. GONIOMETER**

If the Goniometer is not connecting or not reading any value:

Verify that:

- 1. The batteries in the BHU are charged and less than a year old.
- 2. The Bluetooth dongle/transmitter is plugged into the control module and BHU is powered on.
- 3. The Goniometer, BHU, and RJ45 cable are not damaged, dirty at the connections, or have loose components.

Attempt the following:

- 1. Insert freshly charged batteries and ensure batteries in BHU are secure.
- 2. Try a different combination of batteries if one of the batteries has gone bad, then the BHU will not work properly.
- 3. Attach a new RJ45 cable to the Goniometer and BHU.
- 4. If the top housing of the Goniometer is not properly secured, the Goniometer may not read a change in angle. To check, do the following:

If the goniometer arms seem to be loose

- 1. Attach the long arm to the top of the Goniometer.
- 2. Place the Goniometer in a horizontal position and position the arms parallel to the floor.
- 3. Let go of the top arm if it falls freely, then the top rotation housing screw needs to be tightened.
- 4. Use a 5/64" Allen key, which is supplied with the system (this is the smallest Allen key in the set), to tighten the top set screw.



Check if Top Housing is Loose





Tighten Set Screw

#### **G. HEART RATE SYSTEM**

Best connection for constant monitoring is dependent on distance from the control module and other environmental factors. The further away the watch is from the bluetooth dongle the weaker the wireless signal will be. Obstructions between dongle and watch may also interfere with performance. In most cases, the device will remain connected at 7.5 meters (25 ft) unobstructed.

If heart rate watch is turned on but is not being recognized in testing screens. Review the following:

If heart rate is green on the test screen, double-check the heart rate toggle button is not set to Manual.

If heart rate is red on the test screen, go to the Hamburger menu -> Tool Calibration. Then locate the Heart Rate device on the left menu of tools. If this value is green, highlight the tool and ensure the 'use this HR' checkbox is checked. If it is red, turn off the hr monitoring on the watch and then reconnect. If issue persists contact support.

For Troubleshooting and Maintenance of the Heart Rate System, please refer to the included manufacturer's information.



#### **ELECTROMAGNETIC FIELD WARNING**

The heart rate watch and USB charging dongle contain strong magnets that can affect pacemakers and implantable cardioverter-defibrillators (ICDs). Consult medical professional or device manufacturer before using the watch.

## 2. GENERAL MAINTENANCE AND CARE

#### **A. CONTROL MODULE CARE**

Since control modules are sensitive to extremes of temperature, do not place equipment close to a direct source of heat or cold (for example, in direct sunlight, next to a radiator, or next to an air conditioner).

Do not install any additional software onto the control module. The BTE Technologies BTE Prism system is in constant communication with the control module, so a "clean", dedicated control module is crucial to the integrity of this communication system.

If your control module was purchased through BTE and unapproved software has been installed, the control module will not be covered under the BTE warranty.

#### **1. ANTI-VIRUS SOFTWARE**

The BTE warranty is void if the product malfunctions as a result of software virus.

Anti-virus software is installed on the control module. If the control module is connected to the internet, the software must be updated regularly to protect the control module against viruses. In addition, the software license must be renewed each year.

If the anti-virus software is not approved by your IT department, contact BTE before making any changes.

#### 2. CONTROL MODULE MAINTENANCE

Using proper Windows shut-down procedures, shut down the control module every night to keep it running smoothly during testing.

#### **B. TOOLS AND ATTACHMENTS**

#### **1. CLEANING**

Regularly wipe down the tools and attachments with an alcohol-based solvent or disinfectant wipes.

Periodically inspect the tools and attachments for any unusual wear or damage.

#### 4. BHU

Replace the rechargeable batteries every 6 months if used frequently and every year if used occasionally. Keep some standard AA batteries available in case you experience any issues with the rechargeable batteries or the charger itself.

#### 5. CABLES

Periodically inspect the entire length of the cables used to attach the tools to the BHU. Inspect the connector ends since they can be damaged. Replace any cables that are damaged or do not seem to allow for proper communication.

#### 6. BATTERIES

Rechargeable batteries will self-discharge over time, even when not in use; therefore, be sure to fully charge the batteries before using the system.

When fully charged, the batteries should power the BHU for up to 5 hours of continuous testing. This will vary depending on how much battery capacity is available and which tools are being used (e.g. the Dual Inclinometer and Goniometer use more battery power than the Hand Grip, Pinch Gauge, and Portable Load Cell).

Be sure to disconnect tools when not in use to save optimize battery life.

The amount of charging time depends on the remaining capacity of the battery in addition to the charge rate set on the charger. Refer to the battery charger manual for information on the estimated charge time. Whenever possible, only charge the batteries after they have been drained. Short-charging batteries can degrade them over time and shorten their life expectancy.

Portable Load Cell (PLC) and PLC attachments shall not be serviced while in use with a client. Inspections of these components shall be performed prior to use.

# **3. STRONGLY RECOMMENDED ADDITIONAL PURCHASES**

In addition to the equipment shipped to you from BTE Technologies, the purchase of the following items from a local supplier is strongly recommended:

• For adequate protection of your client data, USB flash drives or a USB external hard drive for backing up and archiving copies of client data.

NOTE: Exported databases from BTE Lumen are encrypted to protect patient health information.

- Disinfectant wipes to clean the commonly used surfaces on the tools and accessories.
- Standard AA batteries for backup in case there are any issues with the rechargeable ones.

## 4. BTE TOOL SUITE

The function of the BTE Tool Suite is to configure which tools can communicate with the software. Once configured, the software only recognizes and communicates with those tools.

#### Tool Configuration is required only if a tool or BHU is replaced.

#### A. HOW TO CONFIGURE ADDITIONAL TOOLS

Locate the BTE Tool Suite icon on the Desktop and open that program.

Open the Hamburger Menu and select 'Load Configuration'.

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Select the current hardware configuration file 'HwConfigFile" and click Open.

The saved BHU/transmitter, dongle/receiver, and tool information will be displayed.



If adding a Heart Rate Watch, put the watch into find mode. Once the watch has a heart rate reading, click the 'Discover' button

If adding a Tool, activate/power on the Bluetooth Hip Unit (BHU) by simply moving it (there is no ON/Off switch). Proceed to attach the new tool to the BHU using a RJ45 cable, click the 'Discover' button.

The software will search for the tool and once discovered, the tool icon and ID will appear in the window.

After adding newly acquired tools, you may wish to remove the tools that you will no longer be using. Refer to the next section.

Ensure the 'PTK' setting is checked so the software knows what type of system you are using.



Once you are done, click the Hamburger Menu icon in the upper left corner of the window and click 'Save Configuration'. Click Yes when asked if you want to replace the existing file and then exit the BTE Tool Suite.



Select the Exit option from the Hamburger Menu or use Close icon to close the BTE Tool Suite.

Any new tools will then need to be calibrated in the BTE Lumen software.

#### **B. TOOL REPLACEMENT**

Should a tool replacement ever be necessary, the replacement tool must be discovered, and the Configuration file saved. The existing tool can remain or may be deleted from the configuration file. To change a tool, go to the BTE Tool Suite. Open the Hamburger Menu

and select 'Load Configuration'. From the tool configuration presented, choose the tool to be replaced and click Delete button.



Connect the replacement tool to BHU, click the Discover button, and wait for the software to add it to the existing configuration. Once recognized, return to the Hamburger Menu and select 'Save Configuration'. Click Yes when asked if you want to replace the existing file and then exit the BTE Tool Suite.

#### **C. BHU REPLACEMENT**

Should a BHU replacment ever be necessary, the replacement BHU must be discovered, all tools must be connected, and the configuration file is saved.

The existing BHU can remain or may be deleted from the configuration file. The same steps apply from the previous section. Once the new BHU is discovered connect each of your tools, as they are connected they will be added on screen.

Once recognized, return to the Hamburger Menu and select 'Save Configuration'. Click Yes when asked if you want to replace the existing file and then exit the BTE Tool Suite.

All tools will require recalibration before they can be used when transmitters are replaced.

### **5. TECHNICAL SUPPORT**

If you are able to verify all of the possible solutions related to the scenario, but the problem still exists, then please use the following avenues for further assistance:

To contact BTE Technologies:

By Telephone:	1-800-331-8845 (U.S. & Canada)		
	1-410-850-0333 (Domestic & International)		
By Email:	support@btetechnologies.com		

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## BTe Prism

# 1. INFORMATION RELATED TO ELECTROMAGNETIC DISTURBANCES

The PTK is intended for use at:

- 1) Professional healthcare facility such as a hospital or large clinic and
- 2) Small clinic that could be located in a residential or office area.

The PTK does not have any essential performance functionality.

WARNING: Use of this equipment adjacent to other equipment should be avoided because it could result in improper operation. If such use is necessary, this equipment and other equipment should be observed to verify that they are operating normally.

There are no cables, transducers or other accessories replaceable by the responsible organization that are likely to affect the PTK compliance with the IEC 60601-1-2:2014 (4th ed.) standard requirements, in particular with Clause 7 (emissions) and Clause 8 (immunity) requirements.

WARNING: Use of accessories, transducers and cables other than those provided or specified by BTE could result in increased electromagnetic emissions or decreased electromagnetic immunity of this equipment and result in improper operation.

WARNING: Portable RF communications equipment (including peripherals such as antenna cables and external antennas) should be used no closer than 30 cm (12 inches) to any part of the PTK, including cables provided or specified by BTE. Otherwise, degradation of the performance of this equipment could result.

The PTK is classified class A according to CISPR 11.

NOTE: The emissions characteristics of this equipment make it suitable for use in industrial areas and hospitals (CISPR 11 class A). If it is used in a residential environment (for which CISPR class B is normally required) this equipment might not offer adequate protection to radio-frequency communication services. The user might need to take mitigation measures, such as relocating or re-orienting the equipment.

No action needs to be taken to prevent adverse events to the patient and operator due to electromagnetic disturbances.

The PTK has been tested by an accredited laboratory and is in compliance with every applicable emissions and immunity standard or test specified by IEC 60601-1-2:2014 (4th ed.) standard. In particular, the equipment has been tested for compliance with Group 1, Class A requirements specified in CISPR 11. The PTK does not have any essential performance characteristics.

No deviations from the IEC 60601-1-2:2014 standard or allowances have been applied during testing.

No special instructions are required for maintaining basic safety with regard to electromagnetic disturbances for the expected service life.

RF transmitters and receivers incorporated in the device operate in the following frequencies:

- Bluetooth Hip Unit (BHU): 2.4 GHz; The Effective Radiated Power (ERP) is equal to 2mW.
- Bluetooth heart rate monitor: 2.4 GHz; The Effective Radiated Power (ERP) is equal to 1mW
- Portable Dock URFIO 900 MHZ or 868 MHz (Portable Dock can be incorporated in the system instead of the BHU.); The configuration as setup at BTE and cannot be changed by the user. The Effective Radiated Power (ERP) is equal to 12.6mW.
- Polar heart rate monitor; (Polar HR monitor can be incorporated instead of the Bluetooth heart rate monitor, if used with the Portable Dock.) The Effective Radiated Power (ERP) is equal to 2.8mW