

**OPERATIONAL MANUAL
FOR THE
ANATOMETER® II
AND
ANATOMETER® II PLUS**

The Anatometer II

Co-invented by Dr. Ralph Gregory and Peter Benesh, CME
And is Manufactured by



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INTRODUCTION-

Congratulations on the purchase of your Anatometer!

Every effort has been made to include all information in this manual to properly assemble,

calibrate, operate, and care for your new Anatometer. However, Benesh Corporation is only the manufacturer of the Anatometer. While Benesh Corporation has been intimately involved with doctors for over twenty-five years in constantly updating and improving the Anatometer, we are not doctors! It is therefore *very* strongly recommended that N.U.C.C.A., or a doctor who has extensive experience with the Anatometer, be called on to fully explain the proper techniques involved for taking correct, consistent, and repeatable readings.

If any questions, problems, or comments arise over your new Anatometer or this manual, please contact Benesh Corporation. Or visit our web page. It is constantly being updated to include the latest information on the Anatometer.

The instruction sheet, “GSE 661 Anatometer Operation”, is provided separately as a handy quick guide to keep near the Anatometer until the basic functions are mastered.

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CHAPTER 1-

ASSEMBLY
OF THE ANATOMETER II
AND
ANATOMETER II PLUS

***Note:** The following information is supplied for those customers that need to disassemble the Anatometer for shipping to a new location or for those who assemble the Anatometer themselves. The following is a guideline. Contact Benesh Corporation if there are any questions regarding assembly or disassembly the Anatometer.*

REQUIRED EQUIPMENT-

- 1- Allen wrench set (inch).
- 2- Needle-nose pliers.
- 3- Twelve foot length of rope and/or pair of gloves.
- 4- Slot screwdriver
- 5- All equipment needed for Anatometer II setup and calibration.
- 6- Uncrating supplies.

The Anatometer II and Anatometer II Plus is shipped in four main pieces:

- 1- The base assembly including the transducers (scales) and cables.
- 2- The caliper assembly housing (including encoders for Anatometer II Plus).
- 3- The column.
- 4- The counterweight assembly.

In addition the following components are also shipped:

- 5- The GSE 661 scale indicator.
- 6- A printer. Generally an Epson LX-300+.
- 7- Final Radial Zero tester.
- 8- This manual.
- 9- Set of lifting hooks.
- 10- Class F certified 25 lb. weight.
- 11- Bevel level with vertical reading capacity.
- 12- Two leveling blocks.

***Note:** If shipped by Benesh Corporation, the Anatometer will arrive in a large crate. As with any precision machine, great care should be taken when uncrating the Anatometer. After all parts have been unpacked, check to make sure all ordered components are present and undamaged. The following steps should be followed in the correct order.*

INSTALLING THE COLUMN

After placing the base assembly in the desired location, remove the key found at the top of the base pyramid with an Allen wrench. Also, back out the four set screws found along the rear of the base pyramid. Carefully insert the column (sometimes called the post) into the pyramid, making sure the four small “flats” machined on the column are facing toward the rear of the machine to match up with the set screws after insertion. Place the key back into the slot. Slightly rotate the column if needed to match up with the key. Tighten the flat head screw with an Allen wrench. Then tighten all four set screws with the same Allen wrench.

A three inch diameter rubber O-ring is also supplied with the column to keep the caliper assembly housing from hitting the top of the pyramid. Place it over the column and slide it down onto the top of the base pyramid.

INSTALLING THE CALIPER ASSEMBLY HOUSING

Next, take the caliper assembly housing and slide it over the top of the column. ***NOTE:*** *Extreme care must be taken to insure the key located inside the caliper housing at the bottom is lined up with the column keyway before sliding the housing over the column. Otherwise damage to the Anatometer will occur.* Gently slide the caliper housing down the column until it rests on the O-ring. ***Warning:*** The caliper housing assembly and the counterweight assembly each weigh 25 pounds. Do not attempt to install either the caliper assembly *or* the counterweight assembly if the weight is too much to comfortably handle. If needed, have an assistant to help hold and stabilize both assemblies.

INSTALLING THE COUNTERWEIGHT ASSEMBLY

Thread a length of rope through the eyelet until the rope is doubled up on itself. Standing on top of a chair or stable platform, place the counterweight inside the column. Using the rope, slowly let the counterweight down until it rests on the floor. The counterweight can be lowered by the attached steel cable, but gloves must be worn to protect the hands. Have an assistant help if needed. Make sure the steel cable does not get bound up while dropping the weight down. Release one end of the rope and pull it out.

Place the aluminum end-cap attached to the other end of the steel cable into the top of the column. Screw in the supplied flat head screw through the hole at the top of the column. Before tightening the screw, make sure the pulley turns freely and doesn't rub against the slot. When the pulley moves freely, tighten the screw with a slot screwdriver. Sometimes the act of tightening the screw will cause the pulley to rub again. If this happens, just *barely* loosen the screw and *gently* tap the pulley away from the side it is rubbing. Finally, re-tighten and double-check for rubbing. This procedure may have to be repeated a few times before the pulley turns freely.

CONNECTING THE COUNTERWEIGHT TO THE CALIPER ASSEMBLY HOUSING

To attach the caliper housing assembly to the counterweight, raise the caliper housing to the top of the column. While holding the housing up, insert the clevis pin through the bracket found on the top of the caliper housing *and* the small eyelet attached to the end of the steel cable. After the clevis pin has been fully pushed through both the bracket and eyelet, insert the cotter pin. Using a pair of needle-nose pliers, spread the ends of the cotter pin apart so it cannot work its way out. Double check to make sure the entire assembly rides freely up and down and the pulley does not rub.

GSE 661 SCALE INDICATOR AND PRINTER CONNECTION

The connector plugs from the scales and the GSE 661 indicator are labeled “L” (scale 1) for the left scale and “R” (scale 2) for the right scale. Plug both connectors together. These plugs are nine pin sub-D and will only go in one way. Then connect the printer cable, also coming from the back of the GSE 661 indicator, to the printer. For the Anatometer II Plus, plug in the third sub-D plug to the mating encoder plug found on the left back side of the caliper housing assembly. Using a small slot screwdriver, tighten all plug connections. For the encoder plug, bolt the connected plug back onto the back of the caliper housing assembly using the supplied aluminum plate. Plug in the power cables for both the GSE 661 indicator and the printer.

DISASSEMBLY OF THE ANATOMETER II

To disassemble the Anatometer, reverse the order of the above outline, paying particular attention to supporting the caliper assembly housing once the cotter pin has been removed. When pulling the counterweight out, gloves must be worn as protection against the cable. Remember to loosen all four set screws *and* remove the column key before attempting to remove the column from the pyramid base.

SUMMARY AND ADDITIONAL NOTES

The GSE 661 scale indicator comes with a universal mount. It can be set on a table and tilted to the desired position or bolted to a wall and tilted to suit. Feel free to position the GSE 661 indicator as desired. A small table or stand will come in handy to set the printer. The printer can handle both continuous-feed paper or single sheet paper of various sizes. Make sure enough space is planned to accommodate the GSE 661, the printer, and printer paper.

Benesh Corporation is only a reseller of the printer. Be sure to read the instruction manual that comes with the printer if any questions arise concerning the operation of the printer. Also, be sure to fill out the printer’s warranty card. Otherwise, please refer to the “Troubleshooting” section for any printer problems that have a direct bearing on correct Anatometer operation.

And finally, a complete set up and calibration must be done after assembling the Anatometer. Please refer to the next chapter, “Anatometer- Set up and Calibration” for complete instructions.

CHAPTER 2-

HOW TO SET UP AND CALIBRATE
THE
ANATOMETER II®
AND
ANATOMETER II PLUS®

REQUIRED EQUIPMENT-

- 1- Two adjustable wrenches; 3/4 inch capacity.
- 2- Small flathead screwdriver.
- 3- Flathead screwdriver.
- 4- Accurate level with both horizontal and vertical capacity (supplied).
- 5- Final radial zero tester (supplied).
- 6- Two gauge blocks of the same size (supplied).
- 7- 25 LB. Certified class "F" test weight (supplied).

OPTIONAL EQUIPMENT-

- 1- Machinist's level.

This chapter is divided into the following sections:

- Leveling the Base-----page 2-2.
- Calibrating the Frontal Plane-----page 2-3.
- Calibrating the Transverse Plane-----page 2-4.
- Calibrating the Neck Probe (Fixed Point)----page 2-5.
- Calibrating the Scales-----page 2-5.
- Laser Pointer (Neck Probe) adjustment-----page 2-7.
- Heel Stop adjustment-----page 2-8.

***Note:** The following directions should be followed in the proper order. Failure to do so may result in an improperly set up Anatometer. If there are any questions or problems at any point, contact Benesh Corporation.*

SECTION ONE **LEVELING THE BASE**

Overview-

The Anatometer must be level and all anatomical readings calibrated to provide accurate data. Always keep in mind the accuracy of the Anatometer is completely dependent on how accurately the Anatometer has been leveled and calibrated. The greater the accuracy of your set up and calibration, the greater the accuracy of your Anatometer!

Step One-

[At each corner of the Anatometer base can be found the floor support legs. These legs can be screwed in or out with an adjustable wrench to change the height of the Anatometer. A locking nut will also be found; the locking nut must be unlocked before attempting to adjust each leg.]

First, place the gauge blocks on the middle of each footpad where the patient will be placing their feet. Place a good level cross-wise on the gauge blocks. Check for level. If the Anatometer is not level, adjust either the right or left set of legs until the Anatometer reads level.

Step Two-

Place the level length-wise on the base of the Anatometer and check for level. If not level, adjust either the front or rear set of legs until the Anatometer reads level. Next place the level back in the cross-wise position to see if the reading has changed. It probably has. The Anatometer *must* read level in both directions at the same time. The above process will most likely have to be repeated a few times before the Anatometer reads level in both directions.

Step Three-

Once level, check the Anatometer for any "rocking" by pressing down firmly on each corner. (If movement cannot be felt by hand, place the level back on the base and watch the bubble for any movement.) If any rocking is present, adjust the proper leg until the weight of the Anatometer is evenly distributed on all four legs. Once again, check for level in both directions to make sure the Anatometer is still reading level.

In most cases, all three steps will need to be repeated a few times before cross-wise level, length-wise level, and even weight distribution is achieved. Once all three readings are correct, lock all four leveling pads using both wrenches: one to tighten the locking nuts, and the other to keep the leveling pads from moving while locking the nuts. Once all four legs have been locked, double check to make sure the Anatometer is still level and the weight is evenly distributed on all four legs, since tightening the locking nuts can also change the level of the Anatometer. Checking and re-checking cannot be stressed enough to insure the Anatometer is as level as possible!

Optional Method-

A more accurate method of leveling the Anatometer can be employed. A machinist's level can be placed on top of the gauge blocks instead of using the bevel level. Machinist's levels have greater accuracy--generally 0.001"-0.002" per foot. If Benesh Corporation sets up the

Anatometer, this will be the type of level used during the initial set up.

Technical Note: Cross-wise readings should be taken directly from the footpads as cross-wise (side to side) level is critical. The footpads are manufactured to be level and in line with the base within 0.010 of an inch, therefore using just the base as a leveling platform for cross-wise level does not take into account this manufacturing deviation.

THE BASE MUST BE LEVEL BEFORE PROCEEDING!

SECTION TWO **CALIBRATING THE FRONTAL PLANE**

Overview for Anatometer II Plus Owners-

Directions for setting up the encoders are included in this section, but the “Calibrate the Encoders” portion of the “GSE 661 Operation” chapter should be read before proceeding to become familiar with calibrating the encoders.

Step One-

Place both caliper arms in the closed and locked position--but make sure the frontal plane locking knobs are left unlocked. Place an accurate level across the caliper arms. Gently move the frontal plane until a level reading is achieved and then tighten both frontal locking knobs. Check again to make sure the reading is still level.

Step Two-

While locked, inspect both brass indicators located on both sides to see if they read "0". If they do not read zero, loosen the screws that hold the brass indicators with a small slot screwdriver and adjust both indicators until they read exactly "0". Finally, retighten all screws.

For Anatometer II Plus owners, press the [SETUP] key, then press the [F1] (= CALIBRATION) key. Then choose “CAL ENCODERS” by pressing the [F2] key. At this point the GSE 661 screen will show all three anatomical choices: Frontal, Transverse, and Fixed Point. Press the [F1] key for Frontal calibration. Making sure the reading is still level and the Frontal plane locked, press the [ENTER] key to zero out the Frontal encoder. Pressing [F4] (=EXIT) will return the display to the main calibration screen, ready for when the other two encoders need to be calibrated.

Note: Once in a great while, after proper level has been reached, the brass indicators will not move far enough to read “0” when loosened. This is true for the Frontal brass indicators, the Transverse indicator, and the Neck Probe indicator. If this happens, completely remove the brass indicator(s) and open up the hole(s) that hold the brass indicator with either a slightly larger drill or a small round file. After the hole has been opened up or elongated enough for the brass indicator to read “0”, re-attach the indicator using both of the small screws that were previously removed. (*Hint:* A small round file is the preferred method since a file can remove the proper amount of material from the correct part of the hole to get the indicator to read “0”.) Most

hardware stores carry both drills and files of various sizes. If the correct tool can not be found, or there is a question on how to proceed, contact Benesh Corporation.

SECTION THREE **CALIBRATING THE TRANSVERSE PLANE**

Step One-

Raise the caliper assembly housing (the entire assembly that rides up and down the column) high enough so the plumb bob attached to the “Final Radial Zero Tester” can swing freely. Then lock the vertical travel.

Insert the Zero Tester between both caliper arms by pushing the caliper arms together between the Zero Tester tabs. Make sure the Tester is butted up against the caliper rod holder. The caliper arms have a slight amount of play. To remove any play, press the caliper arms inward while locking both caliper arms. Any play in the caliper arms will now show up as a small gap between the edge of the Zero Tester plate and the end of the caliper arms. In most cases the gap will be the same for both arms. If so, continue with “Step Two”. However if the edge of the Zero Tester is closer to one caliper arm than the other, use folded pieces of paper between the edges of the Zero Tester and both caliper arms to “split the difference”. A large rubber band can also be used to keep everything in place. *Note-* The rather exacting procedure outlined above is generally not needed for the Anatometer II as maximum caliper arm error translates to about 0.1 degree.

Step Two-

Make sure the frontal plane reads “0” and is locked in place. Next, unlock the vertical travel and slowly lower the caliper assembly housing until the plumb bob just misses touching the base. Re-lock the vertical travel. A line has been scribed into the base of the Anatometer, located between the footpads. This line is the “master centerline” for the post, column, and heel-stops.

Step Three-

Carefully move the transverse housing back and forth until the plumb bob pointer rests directly over the center-line. Remember, all knobs except for radial movement should be in the locked position. (*Hint:* by turning the radial locking knob until the radial housing *just* starts to lock up will help keep the housing in place after each movement check.) Once the plumb bob pointer is centered *exactly* over the center-line, lock the radial housing in place. Inspect the radial housing brass indicator to see if it reads “0”. If it does not read zero, loosen the screws that hold the brass indicator with a small slot screwdriver and adjust the pointer to read exactly “0”. Retighten both screws.

See the “*Note:*” in section two—“Leveling the Frontal Plane”—if the brass pointer can not be moved far enough to read “0”.

For Anatometer II Plus owners, press the [F2] key for “CAL TRANSVERSE” (after getting to the “Cal Encoders” screen as outlined in the previous section). Making sure the plumb bob is still exactly over the centerline and all knobs are locked, press the [ENTER] key to zero out the Transverse encoder. Press the [F4] (= EXIT) to return to the main calibration page.

SECTION FOUR **CALIBRATING THE NECK PROBE (FIXED POINT)**

Step One-

Place the level against the side of the vertical aluminum arm of the neck probe. Unlock the neck probe arm. While holding the level tight against the side of the neck probe arm, slowly move the neck probe arm back and forth until the neck probe arm is level. Then lock the neck probe arm. Double check to make sure the neck probe arm is still level. If so, inspect the brass indicator to see if it reads “0”. If it does not read zero, loosen the screws holding the brass indicator with a small slot screwdriver and adjust the brass indicator until it reads “0”. (*Hint:* By raising the caliper assembly housing almost to the top, a direct visual inspection is obtained without having to peer around the column.) Finally, retighten both screws.

See the “*Note:*” part of section two—“Leveling the Frontal Plane and Caliper Arm”—if the brass indicator will not move far enough to read “0”.

For Anatometer II Plus owners, press the [F3] key, “Cal Fixed Point” (after getting to the “Cal Encoders” screen). Making sure the neck probe arm is still level and locked, press the [ENTER] key to zero out the Fixed Point encoder. Press the [F4] (= EXIT) key to return to the main calibration screen.

SECTION FIVE **CALIBRATING THE SCALES**

Note: The following is a quick run-through for zeroing and calibrating the scales (also called transducers or load cells). For complete details on using the GSE 661 scale indicator, please refer to the “GSE 661 Operation” chapter.

Overview-

A set of “[]” will be used when referring to which command keys to push on the GSE 661. For example, “500 [ENTER]” means pushing the “5” key followed by the “0” key followed by the “0” key followed by the “ENTER” key. And don’t forget that “0” and “[ZERO]” are two entirely different keys!

To calibrate the scales, an *accurate* weight will be needed. The weight should be at least twenty pounds and fit entirely within the footpads. The GSE 661 indicator uses a straight line interpolation to calibrate the scales so an inaccurate weight will magnify how much it is off. For example, if a ten pound weight is a half-pound off, a 200 pound patient will be about 5 pounds off. Therefore, an accurate weight will produce accurate patient weight data and an accurate *heavier* weight will reduce interpolation error as well.

For Anatometer II Plus owners- ***The Frontal, Transverse and Fixed point must all be set to exactly zero before proceeding!*** Anytime the parameters for the indicator are reset--such as calibrating the scales--the encoders will lose position and default to zero.

Step One-

The default screen for the GSE 661 indicator after powering up is called the weight mode. The screen will display the left and right weight along with the prompt “[F1] = CHECK PATIENT”. In this mode both scales can be reset to zero by pressing the [ZERO] key.

Note: The parameters of the GSE 661 are set to give a reading of zero if the scales detect anything less than 0.5 LB. Therefore, this step is used primarily for informational purposes. A more accurate zeroing out of both scales is part of a full calibration.

Step Two-

To perform a full calibration of both scales, press the [SETUP] key. The screen will show:

[F1] = CALIBRATION
[F2] = TIME/DATE
[F4] = EXIT

Press the [F1] key. The screen will advance to the prompt:

[F1] = CAL SCALE
[F2] = CAL ENCODERS
[F4] = EXIT

Press the [F1] key to start the “Quick Cal” routine for the scales.

Step Three-

After the GSE 661 indicator momentarily displays “SETUP Quick Cal!”, the screen will show the following prompt:

Keyin Scl #

Press either the [1] or [2] key and then the [ENTER] key to calibrate scale 1 or 2.

Pressing [1] will calibrate the left scale.

Pressing [2] will calibrate the right scale.

Pressing the [CLR] key at any time during the routine will go back to the previous screen and will clear out any numeric entry.

After the desired scale number has been entered, the screen will show:

0.0 New Zero?

There should no weight on the scale at this time. The weight of the scale is displayed and is asking to zero out the scale. Press the [ENTER] key to reset the scale to zero and advance to the next screen. “UNITS = lb” will flash briefly and then display:

0.0 Keyin CalWT

Using the numeric keypads on the indicator, enter the weight being used then press

[ENTER]. For example, if a twenty-five pound weight is used, press **[2]** , **[5]** , **[ENTER]**. The indicator will then display:

0.0 Add CalWT

(The indicator will not display what was just keyed in.) Place the weight being used on the proper scale. This is when the actual calibration takes place. The indicator will “ramp up” and display how much weight it thinks is on the scale:

25.0 Add CalWT

Press the **[Enter]** key after the weight display has not changed for a few seconds. The indicator will then display either:

ReCal Req'd
(or)
CAL OK?

If “ReCal Req’d” is displayed, press **[ENTER]** and the display will return to the “New Zero?” prompt. This happens usually when the weight entered and what the GSE 661 indicator *thinks* it weighs is off by a significant margin and the indicator wants to recheck the calibration.

If “CAL OK?” is displayed and the displayed weight matches the keyed in weight, press **[ENTER]**. The display will advance to the “Keyin Scl #” prompt again. The other scale can be calibrated by entering the appropriate number, pressing **[ENTER]**, and going through the calibration routine again. When done calibrating both scales, press **[CLR]** at the “Keyin Scl #” prompt. “Cal Exit” will flash briefly, then display:

SETUP ENTER=SAVE

Press **[ENTER]** to save the calibration changes made to the scales. The display will show:

SETUP ENTER=EXIT

Press **[ENTER]** to exit the setup routine. The display will restart itself and default to weight mode by displaying the Right and Left weight.

SECTION SIX **LASER POINTER ADJUSTMENT**

The Laser Pointer up/down motion is controlled by two spring plungers located in the laser base. The internal springs push a small nylon ball against the inside of the vertical track. To adjust the movement, use a small flat head screwdriver. The spring plungers only need to be

screwed in or out a very small amount to make a large change in feel.

Note- See the “Care and Maintenance” chapter for details on changing the batteries.

SECTION SEVEN **HEEL STOP ADJUSTMENT**

The Heel Stops have a lift up and slide action to change location. The “snap” required to pull up the Heel Stops is controlled by two spring plungers. To make the Heel Stops harder or easier to lift up (or eliminated entirely) remove both end stop screws located near the ends of the Heel Stop Rails. Completely remove both Heel Stops and place them with the backs facing up. Using a small flat head screwdriver push the nylon tips down with a firm hand until the screwdriver meets the slot. Turn a small amount to adjust to suit. Since the right release point is a subjective thing, a few tries might be needed to meet individual taste. When satisfied, replace the Heel Stops and put the end stop screws back in.

SUMMARY

If the above steps have been followed correctly, the Anameter should give consistent and accurate data. Keep in mind the accuracy of the Anameter is only as good as the initial set up and calibration.

If there are any problems or questions, contact Benesh Corporation.

The Anameter II

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CHAPTER 3-

GSE 661 Anameter II and Anameter II Plus Operation

Model Note-

Both the Anameter II and Anameter II Plus use the GSE 661 indicator. This section is valid for both models. However, Anameter II owners should disregard operations concerning the digital encoders.

Contents-

- **Power up and Default Display ----- page 3-1.**
- **Check Patient Menu ----- page 3-2.**
 - Weight Check ----- page 3-2.
 - Posture Check ----- page 3-4.
 - Full Check (Weight and Posture) ----- page 3-5.
- **Calibration ----- page 3-6.**
 - Calibrate the Scales ----- page 3-7.
 - Calibrate the Encoders ----- page 3-8.
- **Time and Date ----- page 3-9.**
- **Print Menu ----- page 3-9**
 - One Patient ----- page 3-10.
 - All Patients ----- page 3-10.
- **Additional Notes ----- page 3-11.**

Power Up and Default Display

After powering up the indicator, the display will show left and right weight:

```
0.0 lb LEFT
0.0 lb RIGHT
```

[F1] = CHECK PATIENT

This is called the default weight mode. When in this mode, the [ZERO] key can be pressed to zero out both scales. A scale calibration may be called for as well if the scales do not show zero and is explained in the “Calibration” section. The [SELECT] key can also be pressed. This will toggle the display to show the posture readings:

```
0.0 FRONTAL
0.0 TRANSVERSE
0.0 FIXED POINT
[F1] = CHECK PATIENT
```

Pressing the **[SELECT]** key toggles the display back and forth between weight mode and posture mode. In both modes the display dynamically shows and updates all data. Therefore, a quick and “unofficial” patient check can be made by just looking at the readings.

NOTE: The following buttons on the GSE 661 have no function: **[UNITS]**, **[TARE]**, **[SCALE SELECT]**, **[START]**, **[STOP]**, and **[ID]**.

CHECK PATIENT MENU

If **[F1]** (=CHECK PATIENT) is pressed, the following menu is displayed:

```
[F1]=CHECK WEIGHT
[F2]=CHECK POSTURE
[F3]=FULL CHECK
[F4]=EXIT
```

This menu is the starting point for checking and recording patient data. All three routines, CHECK WEIGHT, CHECK POSTURE, and FULL CHECK follow a similar format. A patient number is asked for and entered and then a choice of pre- or post- treatment is asked for. The indicator then gathers the information. The data is displayed and then can be printed, stored in the database or redone. As a general rule, all routines can be aborted or started over by pressing the **[F4]** key.

Check Weight

Check weight is the first of three choices when gathering patient information. Pressing **[F1]** = CHECK WEIGHT will bring up the following menu:

```
Enter Patient #:
[      ]
```

```
[F4]=EXIT
```

There will be a blinking square inside the brackets. Using the numeric keys **[0]** - **[9]**, enter a number for the patient being checked. A number from one to nine digits long can be entered. Press the **[ENTER]** key after the patient number has been entered.

Pressing **[F4]** will return the display to default weight mode.

When **[ENTER]** is pressed the next screen is:

```
[F1]=PRE-TREATMENT
[F2]=POST-TREATMENT
```

```
[F4]=EXIT
```

Choose **[F1]** or **[F2]** to record the data as pre- or post- treatment readings.

Pressing **[F4]** will return the display to the weight mode.

*One second after **[F1]** or **[F2]** is pressed the indicator will start taking weight readings.*

The screen will show “WEIGHT READING IN PROCESS”. The weight reading takes about three seconds.

After the indicator is done, the screen will show:

PROCESSING COMPLETE!

[F1]=REVIEW DATA
[F4]=EXIT

Pressing **[F4]** will return the display to weight mode.

Pressing **[F1]** will advance the screen to show a review of the collected data similar to the following:

```
LEFT AVG.      87.8 lb
RIGHT AVG.     76.7 lb
TOTAL AVG.    164.5 lb
[F1]=CONTINUE
```

Pressing **[F1]** will advance the screen to show the rest of the weight data:

```
DIFFERENCE    -11.1 lb
% WT DIFF.    -6.7 %
[F1]=CONTINUE
[F4]=EXIT
```

In the above example, note the difference is a negative number. The default programming for the indicator is ***right weight minus left weight*** ($76.7 - 87.8 = -11.1$). The percentage weight difference (% WT. DIFF), is also a “negative” number to show that the left weight is greater.

Pressing **[F4]** will return the display to weight mode.

Pressing **[F1]** will show the data screen:

```
[F1] = PRINT DATA
[F2] = STORE DATA
[F3] = REDO WEIGHT
[F4] = EXIT
```

If **[F1]** is pressed, the GSE 661 indicator will print the data without saving it to the database. The following is an example printout (of a person badly in need of an adjustment):

```
PATIENT #      11
02:06 pm 10/15/2002

113.7 LEFT Average
 51.8 RIGHT Average
165.5 TOTAL Weight
-61.8 Weight Differential (Right weight minus Left weight.)
-37.4 % Weight Difference (Negative sign: Left side weighs more.)
Pre-Treatment
```

Pressing **[F2]** will store the patient information to the database. The screen will momentarily show “DATA STORED!” to show the operator that the patient data has been stored and then returns back to the data screen.

Pressing **[F3]** will take the indicator back to the “ENTER PATIENT #” screen if another weight reading is desired or the first reading was off for some reason.

Pressing [F4] will return the indicator to weight mode.

Check Posture

When [F2] = CHECK POSTURE is pressed at the main patient menu, the following is displayed:

```
Enter Patient #:
[          ]
[F4]=EXIT
```

Enter the patient number and then press the [ENTER] key. The indicator will then ask whether this is a pre- or post- treatment:

```
[F1]=PRE-TREATMENT
[F2]=POST-TREATMENT
[F4]=EXIT
```

Pressing [F1] will store the readings as a Pre-Treatment. Pressing [F2] will store the readings as a Post-Treatment. Pressing [F4] will return the indicator to weight mode.

When either [F1] or [F2] is pressed, the screen will show for example:

```
[F1]  FRONTAL      +1.6
[F2]  TRANSVRS     -0.8
[F3]  FIXED PT     +2.4
[F4]  CONTINUE
```

Pressing the appropriate key will “lock in” the corresponding encoder. The indicator will no longer dynamically update the reading(s) and will hold those readings in memory. Pressing the same key again will unlock the encoder. ***The posture keys--[F1], [F2], and [F3]--must be pressed before going on for the data to be printed or stored!*** Otherwise, the memory will default to 360.0 for all “unlocked” readings.

Pressing [F4] advances the screen to the data menu:

```
[F1] = PRINT DATA
[F2] = STORE DATA
[F3] = REDO POSTURE
[F4] = EXIT
```

Pressing [F1] will print out the posture data without saving it to memory. The following is an example printout:

```
PATIENT #      12
02:07 pm 10/15/2002

-4.6 Frontal      (Negative sign: right side is high.)
-13.0 Transverse  (Negative sign: rotated left.)
+2.9 Fixed Point  (Negative sign: body leans to the left.)
Pre-Treatment
```

Pressing [F2] will store the patient information to the database. The screen will momentarily show “DATA STORED!” to show the operator that the patient data has been stored and then returns back to the data screen.

Pressing [F3] will take the indicator back to the “ENTER PATIENT #” screen if another reading is desired or the first reading was off for some reason.

Pressing [F4] will return the indicator to weight mode.

Full Check

Pressing [F3] = FULL CHECK at the patient menu is the third option. Full Check is a combination of Weight Check and Posture Check. The weight data will be collected first and has the same steps to follow as the Weight Check. The following is a summary:

- The Enter Patient # screen is displayed.
- Enter the patient number and press the [ENTER] key.
- The Pre- Post- Treatment screen will be displayed.
- Choose either Pre-Treatment or Post-Treatment.
- The screen will momentarily show “WEIGHT READING IN PROCESS”.
- When the weight data has been collected, the screen will show “PROCESSING COMPLETE!”.
- Press [F1] to continue.
- The screen will show Left Average, Right Average, and Total Weight.
- Press [F1] to continue.
- The screen will show Weight Difference and Percentage Weight Difference.
- Press [F1] to continue.

At this point the indicator will display the encoder readings. The Posture Check data is now collected. The following is a summary:

- Press the corresponding keys to lock in the three anatomical readings. Pressing the same key again will unlock the encoder. ***The posture keys--[F1] [F2] and [F3]--must be pressed before going on for the data to be printed or stored!*** Otherwise, the memory will default to 360.0 for all “unlocked” readings.
- Press [F4] to continue.

The data menu will be displayed:

[F1] = PRINT DATA
 [F2] = STORE DATA
 [F3] = REDO FULL CHK
 [F4] = EXIT

Pressing [F1] will print out the data without saving it to memory. The following is an example printout:

```

PATIENT #      13
02:08 pm 10/15/2002
  89.7 LEFT Average
  74.8 RIGHT Average
 164.5 TOTAL Weight
-14.9 Weight Differential (Right side minus Left side.)
  -9.1 % Weight Difference (Negative sign: Left side weighs more.)

  -3.0 Frontal (Negative sign: right hip is high.)
  +5.3 Transverse (Negative sign: hip rotated left.)
  +2.7 Fixed Point (Negative sign: body leans to the left.)
Post-Treatment

```

Pressing **[F2]** will store the patient information to the database. The screen will momentarily show “DATA STORED!” to show the operator that the patient data has been stored and then returns back to the data screen.

Pressing **[F3]** will take the indicator back to the “ENTER PATIENT #” screen if another reading is desired or the first reading was off for some reason.

Pressing **[F4]** will return the indicator to weight mode.

Calibration

The **[SETUP]** key is used to access the calibration routines for the scales and the encoders as well as changing the time and date. The indicator must be in weight mode (the screen showing Right/Left weight).

Pressing the **[SETUP]** key will bring up the main Setup screen:

```

[F1] = CALIBRATION
[F2] = TIME/DATE

[F4] = EXIT

```

Pressing **[F1]** will advance the indicator to the calibration menu:

```

[F1] = CAL SCALE
[F2] = CAL ENCODERS

[F4] = EXIT

```

Calibrate Scales

To calibrate the scales, an *accurate* weight will be needed. The weight should be at least twenty pounds and fit entirely within the footpads. The GSE 661 indicator uses a straight line interpolation to calibrate the scales so an inaccurate weight will magnify how much it is off. For example, if a ten pound weight is a half-pound off, a 200 pound patient will be about 5 pounds off. Therefore, an accurate weight will reduce total error and an accurate heavier weight will reduce total error and interpolation error.

For Anatometer II Plus Owners: **The Frontal, Transverse and Fixed point must all be set to exactly zero before proceeding!** Anytime the parameters for the indicator are reset--such as calibrating the scales--the encoders will lose position and default to zero.

Pressing [F1] = CAL SCALE will enter the GSE 661's "Quick Cal" routine. The screen will briefly display "SETUP Quick Cal!" and then show the following prompt:

```
Keyin Scl #
```

Press either the [1] or [2] key and then the [ENTER] key to calibrate scale 1 or 2.

Pressing [1] will calibrate the left scale.

Pressing [2] will calibrate the right scale.

Pressing the [CLR] key at any time during the routine will go back to the previous screen and will clear out any numeric entry.

After the desired scale number has been entered, the screen will show:

```
0.0 New Zero?
```

There should no weight on the scale at this time. The weight of the scale is displayed and is asking to zero out the scale. Press the [ENTER] key to reset the scale to zero and advance to the next screen. "UNITS = lb" will flash briefly and then display:

```
0.0 Keyin CalWT
```

Using the numeric keypads on the indicator, enter the weight being used then press [ENTER]. For example, if a twenty-five pound weight is used, press [2] , [5] , [ENTER]. The indicator will then display:

```
0.0 Add CalWT
```

(The indicator will not display what was just keyed in.) Place the weight being used on the proper scale. This is when the actual calibration takes place. The indicator will "ramp up" and display how much weight it thinks is on the scale:

```
25.0 Add CalWT
```

Press the [Enter] key after the weigh display has not changed for a few seconds. The indicator will then display either:

```
ReCal Req'd
(or)
CAL OK?
```

If "ReCal Req'd" is displayed, press [ENTER] and the display will return to the "New Zero?" prompt. This happens usually when the weight entered and what the GSE 661 indicator *thinks* it weighs is off by a significant margin and the indicator wants to recheck the calibration.

If “CAL OK?” is displayed and the displayed weight matches the keyed in weight, press [ENTER]. The display will advance to the “Keyin Scl #” prompt again. The other scale can be calibrated by entering the appropriate number, pressing [ENTER], and going through the calibration routine again. When done calibrating both scales, press [CLR] at the “Keyin Scl #” prompt. “Cal Exit” will flash briefly, then display:

```
SETUP    ENTER=SAVE
```

Press [ENTER] to save the calibration changes made to the scales. The display will show:

```
SETUP    ENTER=EXIT
```

Press [ENTER] to exit the setup routine. The display will restart itself and default to weight mode by displaying the Right and Left weight.

Calibrate the Encoders

NOTE- The Anatometer II Plus *must* be calibrated before zeroing out the encoders. See the “Setup and Calibration” chapter for details.

Pressing [F2] (= CAL ENCODERS) at the main calibration menu will advance the indicator to the following screen:

```
[F1] CAL FRONTAL
[F2] CAL TRANSVERSE
[F3] CAL FIXED POINT
[F4] EXIT
```

Pressing [F4] will return the display to the calibration screen.

Press the desired encoder to be calibrated. The indicator will display a screen similar to the following:

```
FRONTAL      +1.2

[ENTER] = CAL to 0
[F4] = EXIT
```

The screen will dynamically display the encoder chosen. Pressing the [ENTER] key will reset the encoder to zero. Obviously, the selected encoder must be physically set to zero before pressing the [ENTER] key! Set the brass pointer for the selected encoder *exactly* to zero and lock it before pressing [ENTER].

NOTE- This Assumes the brass pointers for the Frontal, Transverse and Fixed point have all been mechanically set to zero as outlined in the “Setup and Calibration” chapter.

Pressing [F4] will return the display to the Calibration screen. The next encoder can be calibrated by pressing the appropriate key and following the same routine, or [F4] can be pressed again to exit the Calibration screens.

Time and Date

Pressing the [F2] (= TIME /DATE) key at the main calibration screen will bring up the following screen:

```
NEW TIME [ : : ]
24 hour [hh:mm:ss]

01:50 PM    10/16/02
```

The new time is entered using the numeric keypads. An underline will be displayed showing at what point the entry is. The second line of the display is a reminder for the correct format and the bottom line is what the indicator thinks is the time and date. *The hour must be entered in 24 hour format*, i.e., 4:00 PM would be entered as [1] [6]. The [CLR] key can be used to erase a number if an error was made. When the correct time has been entered, press the [ENTER] key to advance to the “NEW DATE” display. If the time is correct, pressing the [ENTER] key without entering anything will also advance the display:

```
NEW DATE [ / / ]
          [mm/dd/yy]

01:51 PM    10/16/02
```

The new date is entered in month-day-year format as shown on the second line of the display. After the correct date has been entered, press the [ENTER] key. If the date is correct, pressing the [ENTER] key without entering anything will also return the display to the main calibration screen. Using the [CLR] key will erase a mistake if one has been made.

Print Menu

Pressing the [PRINT] key will access the main print menu. Unlike the custom printouts during the three “Check Patient” routines, all of the following choices will print out in a database format. This must be done in the default weight mode.

```
[F1] ONE PATIENT
[F2] ALL PATIENTS
[F3] BY DATE
[F4] EXIT
```

One Patient

If data on a specific patient is desired, press the [F1] key. The indicator will bring up the following screen:

```
Enter Patient #:
[          ]
```

```
[F4] = EXIT
```

Enter the patient number to be printed and press [ENTER]. If the patient number entered

is not in the database, the screen will momentarily show “Patient not found!” and return to the main print menu. Otherwise, after the patient number has been entered, the following screen is displayed:

```
[F1] CURRENT VISIT
[F2] PREVIOUS VISIT
[F3] ALL VISITS
[F4] EXIT
```

Pressing [F1] will print out the most recent data stored in the database for the patient number entered.

Pressing [F2] will print out the next to the last data stored for that patient.

Pressing [F3] will print out all data stored for that patient.

Pressing [F4] will return the display to the default weight mode.

The following is an example printout:

Patient#	-Treat	L Avg.	R Avg.	T.W.	W.D.	%W.D.	Front.	Trans.	Fix P.	Date
13	Post	89.7	74.8	164.5	-14.9	-9.1	-3.0	5.3	2.7	10/15/02

All Patients

If [F2], “ALL PATIENTS”, is pressed at the main print menu, data for all patients will be printed. The data will be arranged by consecutive patient number. The screen will then prompt:

```
[F1] CLEAR DATABASE?
```

```
[F4] EXIT
```

If [F1] is pressed, *the entire database will be erased*. **Warning!** Do not press [F1] unless the entire database is to be cleared!

Pressing [F4] will return the display to the main print menu.

The following is an example of a full database printout:

Patient#	-Treat	L Avg.	R Avg.	T.W.	W.D.	%W.D.	Front.	Trans.	Fix P.	Date
11	Pre	113.7	51.8	165.5	-61.8	-37.4	360.0	360.0	360.0	10/15/02
12	Pre	0.0	0.0	0.0	0.0	0.0	-4.6	-13.0	2.9	10/15/02
13	Post	89.7	74.8	164.5	-14.9	-9.1	-3.0	5.3	2.7	10/15/02

Pressing [F3], “BY DATE”, will print the entire database in descending date order. The same prompt will appear:

```
[F1] CLEAR DATABASE?
```

```
[F4] EXIT
```

Pressing [F1] will *delete everything in the database*.

Pressing [F4] will return the display to the main print menu.

Additional Notes

Entering patient name instead of a number-

For those doctors wishing to record data under a patient's name instead of a number, the GSE 661 has been programmed to accept and record names. The GSE 661 keypad has small arrows on the [F1], [F3], [F4] and [F5] keys. These four keys are used to navigate through the alpha-numeric and symbol choices.

At the "Enter Patient #:" prompt, press any number. Then press the [F3] key (the back arrow) to activate the alpha-numeric choices--and to clear the number just entered. Pressing the [F5] key (the forward arrow) will cause the display to show the letter "A". Use the [F1] key (up arrow) and the [F4] key (down arrow) to scroll through the choices until the correct letter is shown. Press the [F5] key to advance to the next space and repeat the process until the name is spelled out.

With practice, a patient's name can be entered almost as fast as a number.

Encoders losing position-

As mentioned in the Calibration section, the encoders lose position when the scales are calibrated. The same is true if the GSE 661 loses power. The encoders must be set to exactly zero before the indicator is unplugged. If power is lost, the encoders must be recalibrated.

Encoder quick check-

An obvious quick check for all encoders is to move the Frontal, Transverse, and Probe Point until all three brass pointers read exactly zero. Push the [SELECT] key (if needed) to view the anatomical readings. All three readings should read zero. If they don't, the encoders need to be re-zeroed. See the "Calibrate the Encoder" section earlier in this chapter.

Laser pointer (Neck Probe) operation-

The laser pointer has a button on the side of the barrel. Pushing the button activates the laser beam. Releasing the button automatically turns the beam off. While not as accurate, just the tip of the laser pointer can also be used as a quick Neck Probe check. This might come in handy if the batteries give out in the middle of checking a patient! Details on changing the batteries can be found in the "Care and Maintenance" chapter.

Conclusion

The default program for the GSE 661 has been highly modified to carry out all the functions required by the Anatometer II and Anatometer II Plus. If desired, the parameters for the GSE 661 can be custom fitted to the individual doctor's needs. However, GSE Scale Systems of Farmington, Michigan has done the vast majority of the programming. They would have to be contacted for any major programming changes. But for fairly simple changes, Benesh Corporation would be happy to make any programming changes within our range of expertise. If there are any doctors interested in programming the GSE 661 themselves, please contact Benesh Corporation. We would be more than happy to hear from you!

CHAPTER 4-

**CARE AND MAINTENANCE OF THE
ANATOMETER II® AND ANATOMETER II PLUS®**

Note: The following maintenance routines should help keep your Anatometer in good working condition. However, if a problem occurs, please refer to the "Troubleshooting" section or contact Benesh Corporation.

THE FIRST WEEK

Overview-The Anatometer should be completely checked. The following is a quick guideline; for complete details, refer to "Anatometer II- Set up and Calibration".

One- With an accurate leveling device, make sure the base and footpads are level. Unlock and adjust the leveling pads (found at each corner of the base) with a wrench if the footpads and base are not level. Make sure the frontal plane is level, the neck probe column is vertical, and the transverse reading is zero using the Final Radial zero tester. Adjust the appropriate brass pointers as needed. This is to insure no "settling" has occurred after initial set-up. This is especially important if the Anatometer is resting on a surface that has give to it, such as carpeting and/or padding.

Two- The scales should be checked with an *accurate* weight, preferably something over twenty pounds. (The accuracy of the scales will only be as good as the weight being used!) Recalibrate if necessary.

Note: The GSE 661 indicator can be left plugged in, but if for some reason the GSE 661 is unplugged every night or power is lost, wait a minimum of five minutes before checking the scales. The scale indicator and scale transducers need a few minutes to warm up before a consistent reading can be achieved.

For Anatometer II Plus owners-

All three anatomical readings must be set to exactly zero before unplugging the GSE 661! The encoders lose position and default to zero when power is lost.

A quick check of the encoders can be done by returning all three anatomical readings exactly to zero using the brass pointers--assuming the pointers are calibrated. Then press the [SELECT] key to display the three anatomical readings. If the screen does not show "0.0", the encoder(s) must be recalibrated.

ONCE A WEEK

One- Visually inspect the Anatometer, paying particular attention to the following areas: The keyway running the length of the column, the rods the caliper arms ride on, and the small opening around both footpads. Remove or vacuum away any foreign material or dust found.

Two- Manipulate all moving parts to their full range and check all locks at various points to insure proper operation. See "troubleshooting" section if any component is not working properly.

Three- Dust or wipe down the entire machine with a clean, soft cloth. A vacuum cleaner can be used to get to those hard-to-reach areas.

Four- Check the scales with an accurate weight. Recalibrate if needed. This can be reduced to once a month (or less) if the scales give a consistent reading the first few weeks.

ONCE A MONTH

One- The Anatometer will need lubrication for some components. Apply a drop of light machine oil (3-in-1 oil is fine) or a *small* amount of light grease on all four caliper rods. Use your finger to evenly spread the grease or oil. Open and close the calipers a few times to coat the linear bearings as well. As an option, a *very* light amount of powdered graphite, available at most hardware stores, can be applied to both racks.

A few considerations should be taken into account. The Anatometer has been designed to use as few corrosion-prone parts as possible. For example, the 3/8" diameter caliper rods are made of hardened stainless steel and the column has been chrome plated. However, no steel is completely corrosion proof. The Anatometer will be constantly subjected to use by people--and people tend to have fairly high acid levels on their hands, arms, clothes, etc.! The Anatometer may also end up in a high humidity environment. So if corrosion starts to happen for *any* reason, the use of oil or grease is recommended on the following components as well: the column, the steel counterweight cable, and the cable pulley. The drawback to applying oil to any part of the Anatometer is it will attract dust and dirt particles that can adversely affect proper operation of the Anatometer. Therefore constant checks should be made to keep all oiled parts free of dirt and dust. Carefully wiping down all surfaces before applying lubrication is essential.

Powdered graphite will not attract dirt and dust the way oil will, but on the other hand graphite is a very "dirty" lubricant. Graphite will discolor everything it comes into contact with including hands and clothing. Therefore graphite should not be used on any part of the Anatometer except possibly the caliper racks.

Be aware that over time all metals will discolor. Other than affecting the overall look of the Anatometer, discoloration of the rods, column, etc., will not change the function of the Anatometer. However, if the discoloration starts to have a rough feel, true corrosion is setting in. Contact Benexel Products for some possible remedies to stop or slow down the problem component. If the problem becomes severe, the "rusted out" part will have to be replaced.

In conclusion, inspecting the Anatometer regularly and taking corrective action right away will greatly enhance the look and life-span of the Anatometer.

Two- Check the Anatometer for level. Unlock and adjust the leveling pads if needed. Also check for Frontal level, Transverse zero (using the Final Radial Zero Tester), and that the Neck Probe arm is vertical. Adjust the appropriate brass indicators. If no change has been noted, these checks can be reduced to a couple times a year.

Three- Check the scales and recalibrate if necessary. Again, if no change has been noted, this check can be further reduced to a couple times a year.

Four- The Anatometer can be waxed and polished. This is not a requirement, merely an option to enhance the overall appearance of the Anatometer. A car wax in paste or liquid is recommended and can be applied with a clean, soft cloth. Do not use the spray-on variety near any moving parts as this can gum up the bearings. Also, do not wax or polish the column or caliper rods. Simply wipe these parts with a clean cloth and apply grease or oil as outlined in step one. All of the brass indicators can also be removed with a small slot screwdriver and cleaned with Brasso or a similar product as they are subject to tarnishing over time. ***Important:*** Do not forget to engage all locks on the Anatometer II before unscrewing the brass indicators or your readings will be incorrect!

Anatometer II Plus Owners- All encoders should be checked to make sure they are still reading true zero. This is especially true for the Transverse encoder as it is possible for the radial

rack and pinion to either loosen up or wear over time.

ONCE A YEAR

One- Review all weekly and monthly checks.

Two- Check exposed parts for corrosion or rust. If any is present, read the discussion on lubrication. Use fine steel wool to remove any rust spots, but be careful not to let any foreign material or bits of steel wool that may break off get caught in any moving parts of the Anatometer. Use a vacuum cleaner with a hose attachment to remove any particles that may have fallen into the Anatometer.

Three- Check all moving components for excessive wear. While this is generally not a concern for at least five years, common sense dictates that extreme hard use or “crashes” should be checked. Contact Benesh Corporation if any component needs to be adjusted or replaced. The “Troubleshooting” chapter has instructions to correct some possible wear conditions.

CHANGING THE LASER POINTER BATTERIES FOR THE NECK PROBE

The laser pointer for the Fixed Point uses two batteries that last about three or four hours of continuous use. The battery specifications are as follows:

0.46” diameter X 0.21” height; 1.5 volt.

Standard numbers are LR44 (Alkaline battery) or SR44 (Silver Oxide battery). Most brand names use those numbers, but a few different ones that also work are “D357”, “357”, “PX76A” and “A76”. Silver oxide batteries will last a little longer, but are also a bit more expensive. They can be picked up at most department stores.

To change the laser pointer batteries, completely remove the Laser Pointer assembly. Firmly grip the base in one hand and the laser pointer barrel in the other and unscrew the barrel. The positive terminals (+) should both be facing *away* from the front of the laser pointer. Screw the pointer back onto the base and slide the assembly back into the Neck Arm track.

SUMMARY

The Anatometer should require very little maintenance. After the initial set up, all maintenance routines boil down to two primary components. The first is verifying that the initial Anatometer set up and calibration remains correct, and the second is keeping the machine clean--especially around critical moving components. If these two basic steps are followed, the Anatometer will deliver many years of accurate, repeatable data. While corrosion can be a real danger, it may help to know that many Anatometers in the field, some for over twenty years, have had no lubrication at all--and they are all still functioning properly.

However, if there are any questions, comments, or problems, please refer to the “Troubleshooting” section or contact Benesh Corporation.

CHAPTER 5-

ANATOMETER II
AND
ANATOMETER II PLUS
TROUBLESHOOTING

Contents-

- GSE 661 Operation -----page 5-1.
- Printer Operation -----page 5-3.
- Anatometer Operation -----page 5-4.

***Note:** The following section will be in a question and answer format. If this section does not solve the problem, please contact Benesh Corporation.*

GSE 661 OPERATION

***Question:** The GSE 661 indicator display is not showing anything.*

***Answer:** Make sure the GSE 661 is plugged in and there is power to the outlet.*

***Question:** Yes it's plugged in, but the GSE 661 still won't display anything.*

***Answer:** A fuse may be blown inside the GSE 661 indicator. The GSE 661 has an internal 0.8 AMP, 250 volt, two prong, slow-blow fuse. The fuse can be bought at most hardware stores, or contact Benesh Corporation for a replacement fuse. Replacing the fuse will require taking the rear panel off. **Important:** Extreme care must be taken when removing the rear panel or serious injury and/or damage to the indicator may result.*

First make sure the indicator, printer, and scale connections are all unplugged. Place the GSE 661 indicator display side down on a nonconductive surface, such as a wooden desk. Remove all eight screws with a Phillips screwdriver or metric socket set. Then *lift* and open up the rear panel much like opening a book because wires are connected from one side of the rear panel to the indicator display panel. Most of the electronics will actually be on the rear panel. The fuse, labeled "F1", can be found in the lower left section of the rear panel close to the power chord and next to the primary transformer. Replace the blown fuse and reassemble the back panel.

A visual inspection can also be performed at this time for obvious burned out components, usually accompanied with a burned insulation smell.

Reconnect all scale and printer plugs *first* and then plug in the GSE 661 power supply unless an obviously burned out component was noted. If the indicator display *still* does not work--or burned components were observed--the GSE 661 should be shipped to Benesh Corporation for repair or replacement.

Question: The GSE 661 displays “-----”, “UnderLoad!” or a negative number.

Answer: Try recalibrating the scale (see section five, “Calibrating the Scales” of Anatometer II-Set up and Calibration for further details). If the problem persists, or if stepping on the scale(s) doesn’t change the weight being displayed, the fault may be a broken or disconnected wire in the scale cable. See the following question.

Question: The GSE 661 displays, but the weight doesn’t change.

Answer: As a test, disconnect the power supply to the GSE 661 indicator. Then disconnect the suspect scale plug. (***Note:*** if both scales went bad at the same time, the fault probably lies in the indicator and should be returned to Benesh Corporation.) Plug the indicator back in. If the indicator displays the same thing as before, the wiring for the scale may be bad.

After disconnecting the power supply and scale leads, take a small screwdriver and open up the plug (this is a sub “D” type serial plug) found at the end of the scale cable. There should be six colored wires soldered to the back of the plug. If any wires have come loose or broken free, they must be reconnected or re-soldered. (***Note:*** only qualified personnel should attempt to re-solder any wiring.) The mating plug coming from the indicator should also be checked for loose or broken wires. Contact Benesh Corporation if unsure how to proceed or if a complete wiring diagram is desired.

If all connections look good, the problem may be a disconnected wire *inside* the GSE 661. After removing the rear panel (see question “...the GSE 661 still won’t display anything” above, for proper panel removal), inspect the six scale wires to see if any have come loose. Also check to make sure the ground wire is connected. If any wires have come loose, a small slot screwdriver will be needed to attach them. The wire connections inside the GSE 661 are spring loaded; by pushing down on the connection with the screwdriver, the loose wire can be re-inserted.

If everything up to this point still looks good, there is either a short somewhere in the cable itself or a wire connected directly to the scale has broken. This means the scale needs to be replaced and should be done only by Benesh Corporation or an approved contractor.

Question: When I check a patient’s posture the encoder reading(s) don’t change.

Answer: As mentioned in the “GSE 661 Operation”, pressing the appropriate key locks that encoder. So if the patient moves after an encoder has been locked, the GSE 661 display will not change. Whatever the indicator happens to be displaying the instant the key is pressed, is what it will display no matter how much it is consequently moved. This is also the same reading that will be printed out and stored in the database. Press the same key again to unlock it. That particular posture reading will now change when moved. All encoder readings can be locked and unlocked as many times as desired before moving on to the next step in the routine--which might come in handy for a patient that doesn’t stand still!

Question: When I print out a Posture Check, all the readings are 360.0!

Answer: If the [F1], [F2] and [F3] keys are not pressed to lock in the three readings during a Posture Check (or Full Check) the GSE 661 will default to 360.0. This is the same problem as the previous question in reverse. The encoder readings *must* be locked before the readings will be put in memory for later printout and database storage. The “360.0” reading is

deliberately programmed into the GSE 661 to let the doctor know a Posture Check was not performed when a database print is done.

Question: *The GSE 661 won't go past the "Enter Patient #:" screen.*

Answer: When "Enter Patient #:" is displayed, something must be entered. If just [ENTER] is pressed without entering something, the GSE 661 will sit there and do nothing. Entering anything before pressing the [ENTER] will solve the problem.

Question: *My encoder readings are way off.*

Answer: As mentioned elsewhere in this manual, anytime a scale calibration is done or whenever power is lost, the encoders lose position and revert to zero--no matter where its position is. If this happens the encoders will have to be recalibrated (or reset to true zero). Follow the directions in the "GSE 661 Operation" chapter to recalibrate the encoders.

For the Transverse encoder, it is possible the radial rack (the curved gear bolted to the top of the housing) has come loose or moved. To check this, press the [SELECT] key to show the Posture readings. Lock the Transverse plane. Gently try to move the Brass gear (the pinion) back and forth with your fingers. If the indicator display changes more than +/- 0.1 degree, loosen the two screws holding the curved rack in place with a small slot screwdriver. Unlock the Transverse plane and move it to approximately 14 degrees. Retighten the screw nearest the meshing gears while gently pushing the curved rack against the brass gear. Move the Transverse plane all the way to the opposite reading and retighten the second screw in the same manner. Check to make sure full motion is still free. If not, the curved rack is now pressing too hard against the brass gear. Also check that the display does not change more than +/- 0.1 degree. If not, the process will have to be repeated. It is possible over time that excessive wear has occurred. The easiest way to fix this is to open up the two holes in the curved rack with a slightly larger drill to get the gears to mesh up tight against each other. The aluminum angle plate that holds the encoder and pinion can also be loosened with an Allen wrench and repositioned. Care must be used to keep the pinion both square and against the rack as well as not dropping down to rub against the top of the linear housing. If there are any questions, or unsure how to proceed, contact Benesh Corporation.

Printer Operation

Note: *For typical printer questions, such as setting up for single sheet paper of various sizes or continuous sheet paper, ribbon replacement, etc., please refer to the printer manual.*

Question: *When I print out my database, it doesn't look right.*

Answer: The wrong font is being used. The Anatometer is generally shipped with an Epson LX-300+ because it is quick and easy to switch fonts. (Refer to the Epson LX-300+ operating manual for full details on printer font set up.) When printing out patient data at the "[F1] = PRINT DATA" prompt, any font style will work. But when printing out the database *or* when printing out patient data when using the [PRINT] key, "Draft" or "Draft Condensed" will work well. This is because the number of columns in the database exceed the width of regular (8 1/2 X 11) paper when using any font except Draft or Draft Condensed. A suggestion would be to

use one of the “prettier” fonts for normal patient output--especially if the patient receives a copy--and switch to Draft for database output.

Question: *My printer won't print.*

Answer: Turn the printer off (while leaving the GSE 661 on) and wait a few seconds. Then turn it back on. This resets the communication protocols. Also make sure the printer cable from the GSE 661 is securely connected to the printer. If that doesn't work, a communication error may be happening. Either the printer or the GSE 661 communication protocols have been changed or corrupted. The printer will generally accept anything sent to it, but if for some reason the advanced features have been changed, the printer must be changed back to its default values. Refer to the printer manual for full details. If the printer checks out, the GSE 661 indicator defaults may be incorrect. The default indicator protocols are: baud rate of 19200, 8 bit, no parity, and Xon. Contact Benesh Corporation for details on GSE 661 parameter changes.

If all the communication protocols are correct, the problem may be a broken printer wire or bad printer plug. In that case, The GSE 661 will need to be taken apart to remove the printer cable and sent to Benesh Corporation for repair or replacement. See question “...*The GSE 661 still won't display anything*” for proper panel removal. After the back panel has been removed, use a small slot screwdriver to press the small levers holding the printer cable wires. There should only be three wires (!), located in the upper left area of the rear indicator panel. Of course, if any wires have come loose, re-insert them as follows: the Red wire to TX, the Black wire to GND, and the White wire to CTS.

If all else fails, the problem may be the printer itself. Either get a new printer with the same basic capabilities as an Epson LX-300+, or contact Benesh Corporation for suggestions for a new printer.

Question: *How can I change the type of information printed, or alter the way that information is printed.*

Answer: The printer is controlled by a number of “custom transmit” parameters programmed into the GSE 661 indicator and is generically programmed to output all the information most doctors have requested in the format most doctors prefer. Benesh Corporation would be more than happy to make simple changes to customize patient printouts. But for more complex changes or those changes that may impact other portions of GSE 661 programming, Benesh Corporation will *attempt* to write new programming for a fee. Or, for a fee, the parameters can be re-written directly by GSE Scale Systems. This can not only be a big headache, but can be very expensive as well. However, for those wishing to reprogram printer output--or try their hand at reprogramming *any* phase of the GSE 661 operation for that matter--please feel free to contact Benesh Corporation for more advanced programming information. Benesh Corporation welcomes any and all doctors willing to collaborate on expanding the way in which the indicator is used.

Anatometer Operation

Note: Please review the “Care and Maintenance” section as most mechanical problems boil down to an incorrectly set up Anatometer or contaminates interfering with the smooth operation of the Anatometer.

Question: One of my scales won't go over [for example] 60 pounds.

Answer: First make sure the scales are correctly calibrated. If so, something may be interfering with the scales. Inspect the edge of the footpad to see if it is touching or rubbing against the base of the Anatometer. There *must* be an air gap all the way around the footpad or the scale will not read correctly. If the footpad is rubbing, it will need to be loosened and repositioned. Unbolt the four flat head screws using an Allen wrench. **Note:** This places stress on the scale. Therefore pieces of shim stock (usually two per side will be needed for a total of eight) approximately 1/16” thick should be placed between the footpad and the base. After the footpad has been loosened, reposition the shims equally around the footpad and re-tighten the four bolts.

If this doesn't work, have a heavier person stand on only *one* scale at a time to make sure the scale still stops at about the same pound reading. If the scale still stops at about the same reading, something has gotten inside the Anatometer base and is keeping the scale from moving the full range. The footpad will have to be taken off (see above for footpad removal). After the footpad has been removed, take a piece of paper and slide it *under* the scale. (The scale itself looks like a 1 1/2” X 1 1/2” X 6” block of aluminum bolted to the bottom of the Anatometer II base.) This is to see if anything has gotten between the scale and the bottom of the Anatometer II. If any foreign material has gotten stuck, remove it.

Some transducer models have a set screw stop which has moved down and needs to be adjusted. (The set screw is a mechanical stop to protect the scale from damage when too much weight is applied.) The scales will only “move down” about 0.016 of an inch when full weight--200 pounds--is applied, so the set screw will only need to be backed out, or turned counterclockwise, about half a turn by using an Allen wrench. When the proper gap of 0.016” between the bottom of the set screw and the base has been achieved, bolt the footpad back on, being careful to use the shims to properly position the footpad.

NOTE- The GSE 661 also has a software safety. If more than about 205 lb. is applied, the indicator will display “-----” or “Over Load!”. While this does not actually protect the scale from damage, it *will* notify the operator that too much weight is being applied.

If the problem still persists, the scale itself may be bad and will need to be replaced. Contact Benesh Corporation to repair or replace the defective scale.

Question: The caliper arms won't move.

Answer: This is probably due to something getting on the rods and then becoming stuck inside the caliper arm bearings. This is true for all moving parts on the Anatometer, but especially for the caliper arm rods and the main column because they are more exposed to dust and dirt. If possible, take an airgun to clean out the affected bearing. A vacuum cleaner may also work. Another possibility is to force the caliper arms back and forth in an effort to dislodge whatever is causing the problem. Use common sense here; the arms and rods are designed to withstand a lot of abuse, but everything has its breaking point.

If this doesn't work, something may have gotten inside one of the caliper locks. Make sure the locks have a little bit of play when unlocked. If not, loosen the small set screw that holds the dowel in place with an Allen wrench. Push the dowel pin out to remove the locking arm and

remove the arm. Inside will be found the locking block. Take that out as well. Look inside and remove any foreign material that is found. Also inspect the curved part of the locking block. If there are any bumps or if any material is imbedded, they will have to be removed and the curved surface smoothed out with a radius file and sandpaper.

Another possibility is foreign material causing the racks to bind up with the spur gears found underneath the coverplate (and holds the Frontal encoder for Anatometer II Plus owners). Take the nameplate cover off (and the encoder) and remove anything found stuck between the racks and the brass spur gears. Clean both racks as well. Before putting the locking mechanism back together, or the cover plate back on, make sure the caliper arms move freely. If they still don't move--or move only with great difficulty--the problem may be more severe, such as a bent rod. In that case, the entire assembly will need to be shipped to Benesh Corporation for inspection and repair. However, the problem is usually *something* causing the bearings, the racks, or the lock to bind up.

Question: *The caliper housing assembly won't move up and down.*

Answer: Again, this is almost always caused by dirt or some foreign material. Thoroughly clean the column and the slot in the post that the caliper housing assembly rides on. If possible, blow out the slot with an airgun as well. Also check to see if anything has become imbedded in the sides of the slot or if any bumps are present. If so, the sides of the slot (or keyway) will need to be carefully reconditioned with a small file. A small key, bolted to the inside bottom part of the caliper housing assembly, is what actually rides inside the keyway. It may also have picked up something and should be inspected and cleaned. The entire caliper housing assembly may have to be removed (if possible) to clean the key. Refer to the "Assembly" chapter to remove the caliper housing assembly. If this doesn't work, something larger may have fallen inside the gap between the caliper assembly and the post. Moderately forcing the assembly up and down may also release whatever is caught inside. If this doesn't work, the bearings inside the housing may have gotten jammed up and the entire caliper assembly housing will need to be returned to Benesh Corporation for inspection and repair.

Question: *My vertical (or transverse, or frontal, or caliper) locks don't work.*

Answer: First, all locks are designed to be used with a decent amount of force; don't be afraid to use them! If the problem is with the vertical or transverse locks, the threads may be stripped out. (The knobs turning without tightening up is a dead giveaway.) If so, the entire caliper housing assembly must be sent to Benesh Corporation for repair.

If the problem is the frontal locks, either the threaded rod or the threads inside the plastic knob are stripped out. Both the threaded rod and the plastic knob can be removed and sent to Benexel Products for replacement. ***Note:*** The threaded rod can be removed by tightening two 1/4-28 (fine thread) nuts to the end of the threaded rod with wrenches after the plastic knob has been taken off. The threaded rod can then be unscrewed from the aluminum plate.

If the problem is the caliper arm lock, the locking arm may be worn out. The locking arm works by cam action. Remove the locking arm (see question "*The caliper arms won't move*" for directions on taking apart the locking mechanism), turn the arm around to use the other side of the cam, and then re-assemble the locking arm. Don't forget to attach the plastic ball on the other

side, if desired. Each arm actually has four locking points--two at each end--but if none of these work correctly, the locking block may be worn out. If so, the worn locking block can be removed and sent to Benesh Corporation for replacement.

Question: *The caliper housing assembly seems loose riding on the post.*

Answer: Over time, all moving parts will wear. But if the play is excessive, the “king” bearing may need to be tightened. The principle is simple. Four bearings ride against the post while the king bearing has been custom-fitted to each post by shimming the king bearing within 0.0005”. To fix the problem, simply remove the correct amount of shims to retighten the king bearing up against the post. Unfortunately, the entire caliper housing assembly must be taken apart to do this. Therefore it is recommended that Benesh Corporation make the adjustment. Another possibility is to talk through the entire process over the phone.

Question: *The caliper arms are loose [either up and down or when locked].*

Answer: If the up and down play is excessive, the arms can be tightened up with an Allen wrench set. Try tightening the shoulder bolt found on top of the caliper housing. The aluminum disk under the caliper housing is bolted in place with a 10-24 socket head, but make sure that it does not turn when tightening the shoulder bolt. However, the shoulder bolt can only be tightened up so much and then either material will have to be removed from the aluminum disk or the dual thrust bearings inside the caliper housing will need to be shimmed. This should be done by Benesh Corporation.

If there is excessive play against the caliper arm lever locks, the aluminum disk can be rotated to take up some of the play. By loosening both the shoulder bolt and the smaller 10-24 socket head, the aluminum disk can be rotated slightly to decrease the clearance between the lever and the slots machined inside the caliper arms. Rotate the disk, while the caliper arm lever lock(s) are in the locked position, until the locking lever starts to tighten up. Retighten the 10-24 bolt first and then the shoulder bolt until the caliper arm(s) move laterally freely but has no up and down play.

Final Note

No troubleshooting section is ever complete, and as problems arise, they will be incorporated into this section. The above answers are also only a guideline. If there are any questions or problems *at all*, contact Benesh Corporation. Sometimes amazing things can be accomplished over the phone! Keep in mind that Benesh Corporation only manufactures the Anatometer. While Benesh Corporation has been intimately involved with doctors for over twenty-five years in constantly trying to update and improve the Anatometer, we are not doctors! It is therefore *very* strongly recommended that N.U.C.C.A., or another doctor who has extensive experience on the Anatometer, be called on to fully explain the proper techniques involved for taking correct, consistent, and repeatable readings.

Finally, this whole section may seem a bit dismaying. Keep in mind that in over thirty years, only a few of the above problems have actually happened in the field!