# Service Manual

# WHEEL BALANCER

EEWB314A, EEWB525A, EEWB721A

**SEPTEMBER 2005**

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## CHAPTER 3 CHECKOUT, CALIBRATION AND MAINTENANCE

# INTRODUCTION

## GENERAL

The EEWB525A and EEWB721A wheel balancer is designed to compute static and dynamic imbalance of car, light truck, motorcycle and truck wheels. For a more detailed description of each application see the Operators Manual

## FUNCTIONAL DESCRIPTION

### BASIC BALANCER OPERATION

Once the balancer reaches balancing speed (120 RPM) a tone will sound, this alerts the operator to release the handle. The balacers display will show **"Spn"**, calculation is done at this time. Once the weight imbalance and location is known the balancer will send 12VDC to a brake solenoid braking the the shaft and bringing the shaft to a stop. Imbalance amounts and corrective weight locations will be shown on the display.

### WEIGHT APPLICATION

Rotate the wheel until the center green LED in the right hand row of LEDs illuminates. Apply the corrective weight at top dead center (12 o'clock position) on the right side of the wheel. Repeat this process for the left side of the wheel referring to the left LED's.

### ALLOY MODES

In addition to the standard Dynamic and Static modes there are 5 Alloy modes, each of which are illustrated by LEDs on the balancer touch panel when activated. These modes are used for vehicle tire and wheels. Alloy modes 1 through 5 are accessed by first toggling the MODE key until the balancing mode desired is displayed. See the Operator's Manual for an explanation of Alloy Mode balancing. The last used mode will again be used even when power is cycled.

### ALU-S MODE

ALU-S mode balancing allows the operator to balance custom wheels in a true dynamic mode using concealed weights while maintaining specified weight separation. See the Operator's Manual for an explanation of ALU-S mode balancing.

### DISPLAY / CONTROL PANEL

The display of the hand spin balancer shows weight amount and position for counterbalancing, plus acts as a message center for the operator of the machine or for the technician who is repairing the machine.

The balancer may be controlled either manually or automatically. SAPE inputs for wheel distance is normally automatic and is entered when the SAPE is drawn out and the gauge finger touched to the wheel and returned to the nested position. If the automatic features of the SAPE are nonfunctional, parameter information may be entered manually.

# GENERAL SPECIFICATIONS AND MACHINE FEATURES

## MAJOR FEATURES

Auto Brake After Measuring Cycle
Two Window Display
Easy Electronic Access
SAPE (1d) Auto Distance Parameter Entry
Membrane Panel Data Entry
Four (4) Mounting Cones
ALU-S Function
Quick Nut With Speed Knobs
Match Balance
Total Spin Counter
Calibration Counter
Resettable Counter
Operator Productivity Counter
2 Operator Mode

## SPECIFICATIONS

Shaft size: 28.5mm (1 1/16”)
Balance (shaft) speed: 90RPM
Cycle time: 15 seconds with an 'average' 14" tire & wheel combination
Balance Types: Five 2-plane alloy modes, plus static, dynamic and Match Balance modes.
Accuracy: 0.1 oz. (2.8g)
Weight Positioning resolution: 0.7 degrees
Rim Width capacity: 3"-20" (406mm)
Rim Diameter capacity: 6"-30" (152mm-660mm)
Maximum Tire Diameter: 44" (1118 mm)
Maximum Tire Width: 20" (483 mm)
Tire Weight: 120 lbs. (54.5kg)
Shipping Weight: 170 lbs. (77kg)
Power requirements: 115 **/** 230 VAC; 60 hz; 2 amp

## STANDARD EQUIPMENT

EAA0247G21A- Rim Width Caliper
EAM0005D40A- Calibration Weight
EAA0260D63A- Standard Adapter Kit (4 cone system - 1.66" - 5.25", clamping hood, quick nut) See Part Reference for individual part listings.

# IMPORTANT SAFETY INSTRUCTIONS

**When using this equipment, basic safety precautions should always be followed, including the following:**

1. **Read all instructions.**

2. **Do not operate equipment with a damaged power cord or if the equipment has been damaged - until it has been examined by a qualified authorized service technician.**

3. **If an extension cord is used, a cord with a current rating equal to or more than that of the machine should be used. Cords rated for less current than the equipment may overheat. Care should be taken to arrange the cord so that it will not be tripped over or pulled.**

4. **Always unplug equipment from electrical outlet when not in use. Never use the cord to pull the plug from the outlet. Grasp plug and pull to disconnect.**

5. **To reduce the risk of fire, do not operate equipment in the vicinity of open containers of flammable liquids (gasoline).**

6. **Keep hair, loose fitting clothing, fingers and all parts of the body away from moving parts.**

7. **Adequate ventilation should be provided when working on operating internal combustion engines.**

8. **To reduce the risk of electric shock, do not use on wet surfaces or expose to rain.**

9. **Do not hammer on or hit any part of the control panel with weight pliers.**

10. **Do not allow unauthorized personnel to operate the equipment.**

11. **Use only as described in this manual. Use only manufacturer's recommended attachments.**

12. **Always securely tighten the wing nut before spinning the shaft.**

13. **ALWAYS WEAR SAFETY GLASSES. Everyday eyeglasses only have impact resistant lenses, they are NOT safety glasses.**

14. **Balancer is for indoor use only.**

## SAVE THESE INSTRUCTIONS

## ELECTRICAL SAFETY PRECAUTIONS

Make sure the balancer is unplugged before disconnecting any wires in preparation for replacing any boards, cables or other items within the unit. Use the *"Lockout and/or Tagout"* procedure.

## SERVICE GUIDELINES / HANDLING STATIC SENSITIVE PCB'S

### Electrostatic discharge can destroy high impedance ICs if uncontrolled. Use the following techniques to avoid damaging ICs:

- Leave new circuit boards in their antistatic bags until ready for use.
- When replacing boards, proms, etc. be sure to turn off power to the machine first
- Use an anti-static wrist strap. Connect it to chassis ground on the equipment or to an available raw ground.
- Touch the chassis of the equipment to put yourself at the same static potential as the equipment.
- Grasp the PCB from opposite sides using your fingertips. Do not grasp the components on the board.

**⚠ WARNING!**

**When inserting PCB's:**

- Place boards on a grounded static mat after removal.
- Remove the new PCB from the original package onto a grounded static mat. Save packaging to use when returning defective boards.
- Remove power from the machine (un-plug from wall) before installing the PCB.
- Avoid handling components needlessly.
- Do not set PCBs on insulating surfaces such as paper, glass, rubber, or plastic.
- Static is generated by friction. The following actions promote static generation:
- Wearing silk or nylon clothing.
- Walking on carpets.
- Walking with rubber soled shoes.

Static generation is increased when certain environmental conditions exist. Conditions of low humidity combined with wearing silks or nylons, walking on carpets, or walking with rubber soled shoes may create large electrostatic charges on your person, capable of blowing a hole in the substrate of an IC.

# CHAPTER 1
# AC/DC POWER DISTRIBUTION

## LOCKOUT AND/OR TAGOUT SYSTEM PROCEDURE

1. Notify all affected employees that a lockout or tagout system is going to be utilized and why. The authorized employee should know the electrical power the machine uses and it's hazards.

2. If the machine or equipment is running, shut it down by the normal stopping procedure (depress the stop button, open toggle switch, etc.)

3. Use appropriate devices to isolate the equipment from the power source(s). Stored energy (such as that in springs, elevated machine members, rotating flywheels, hydraulic systems, and air gas, steam or water pressure, etc.) must be dissipated or restrained by methods such as repositioning, blocking, bleeding down, etc.

4. Lockout and/or tagout the energy isolating devices with individual lock(s) or tag(s).

5. After ensuring that no personnel are exposed, and as a check on having disconnected the energy sources, operate the push button or other normal operating controls to make certain the equipment will not operate. ***CAUTION: RETURN OPERATING CONTROL(S) TO "NEUTRAL" OR "OFF" POSITION AFTER THE TEST [DE-ENERGIZED STATE].***

6. The equipment is now locked out or tagged out.

## ELECTRICAL REQUIREMENTS

***NOTE: ANY ELECTRICAL WIRING MUST BE PERFORMED BY LICENSED PERSONNEL. ALL SERVICE MUST BE PERFORMED BY AN AUTHORIZED SERVICE TECHNICIAN.***

Check on the plate of the machine that the electrical specifications of the power source are the same as the machine. The balancer requires 115VAC, 50-60Hz, 1Ph, 2.0 Ampere. A 230VAC adapter is available if required.

The balancer will also take a rechargeable portable battery pack (Versavolt). The input is able to accept a 12V, 14.4 or 18V versavolt battery pack. These are the same batteries used on the Snapon's power tools.

***NOTE: THIS MACHINE PERFORMS A SELF-TEST ROUTINE ON START-UP. THERE WILL BE A DELAY OF SEVERAL SECONDS BEFORE THE DISPLAY IS ACTIVATED.***

***NOTE: ANY ELECTRICAL OUTLET INSTALLATION MUST BE VERIFIED BY A LICENSED ELECTRICIAN BEFORE CONNECTING THE BALANCER.***

***NOTE: CHECK THAT IF AN AUTOMATIC GROUND FAULT CIRCUIT BREAKER WITH A DIFFERENTIAL CIRCUIT IS BEING USED THAT IT BE SET AT 30 MA.***

# AC / DC DISTRIBUTION

The balancer is supplied with a power transformer. It is critical to have the proper input voltage in order for the balncer to operate correctly. The transformer is rated at 9VAC @ 1900 milliamps. 9VAC is supplied to the Power Supply pcb. The 9VAC passed through a bridge rectifier converting it into 12VDC. The 12VDC then is passed through a voltage regulator coverting it into 5VDC which is used to power the processor pcb, display pcb and the encoder pcb.

The processor pcb, display pcb and encoder all have an LED which signals that the pcb is receiving 5VDC power.

## To check power cable:

- Disconnect the power supply.
- Using a VOM, check for an output voltage at the end of the power plug 9VAC +/- 1VAC. 

The electronic brake is controlled by a 12VDC solenoid. While the balancer is spinning, the main processor pcb is gathering information from the encoder and transducers. After the needed information is gathered the main pcb sends a signal to the power supply pcb which sends 12VDC to the brake solenoid braking the balancer and bringing the shaft to a stop. This 12VDC can be checked at either X23 on the power supply pcb or directly at the brake solenoid. 12VDC is only present during the brake cycle of the balancer.

# DC THEORY OF OPERATION

### PROCESSOR BOARD
The operating voltage for the Main Processor is 5VDC. It receives this power from the Power Supply Board at X1 pins 32 and 34. This 5 volts also passes through the Processor Board and supplies the Encoder PCB and the Distance SAPE.

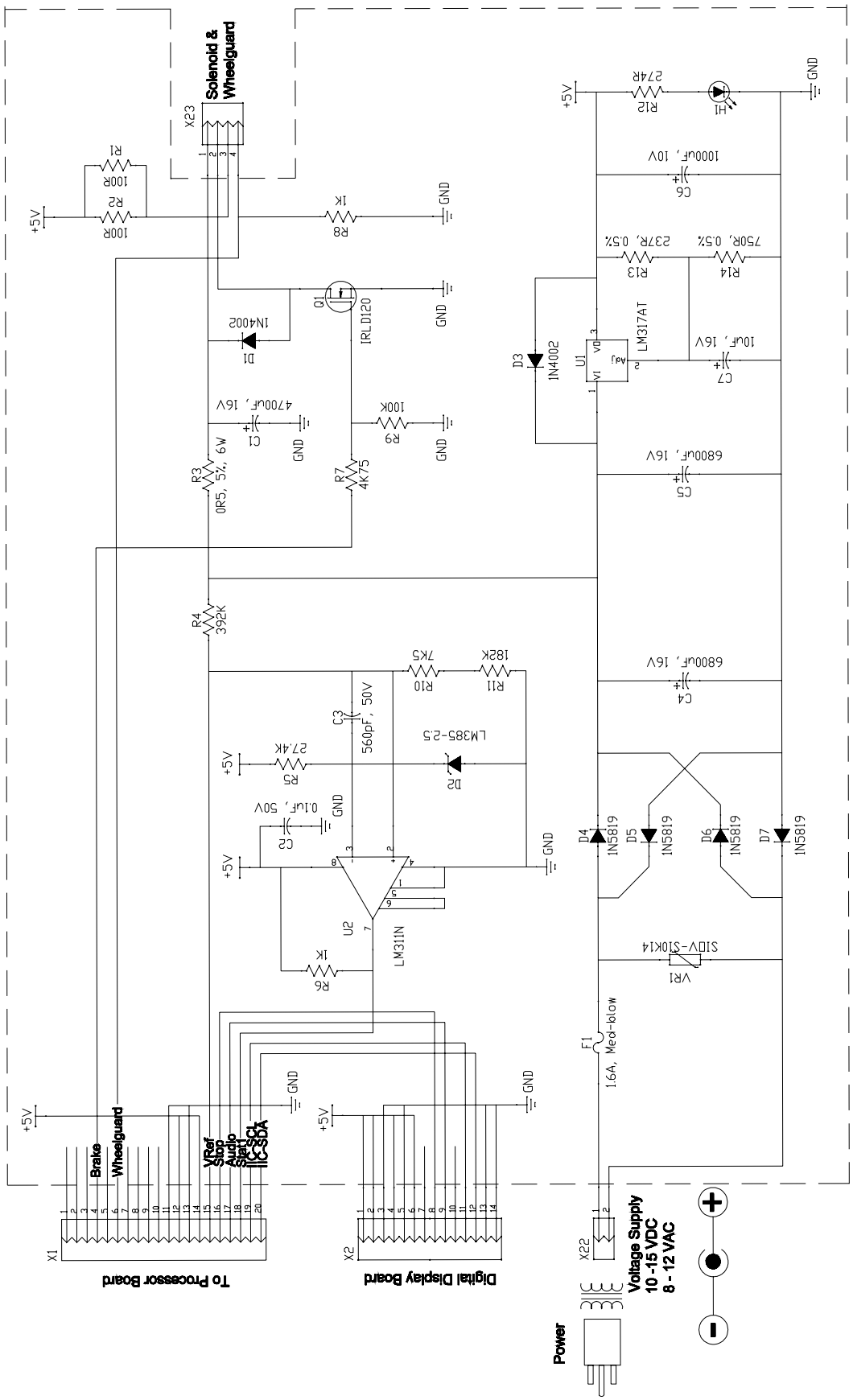
### ENCODER BOARD
The encoder receives 5VDC from the Processor Board. This voltage can be measured at the Processor Board at X3 pin 6. The encoder is built so that there are no adjustments. The encoder disk is built onto the shaft and cannot be replaced without replacing the vibratory member. The encoder is fitted in the vibratory tube and consists of a reflective slotted sleeve which is mounted on the main shaft and the optoelectronic unit.

### DISTANCE POTENTIOMETER
The distance potentiometer is a 5K pot. It is supplied 5VDC from the main processor. This input voltage can be measured at the Processor Board X6 pin 3. The output voltage is dependent upon the deflection of the guage from the home position.

### TRANSDUCERS
The transducers are installed in a manner that it forms a virtual transducer on each end of the shaft. This configuration gives the balancer greater accuracy along with minimal amount of erroneous readings. Both measuring transducers are arranged in one plane. The tranducers produce a DC output. The DC voltage that is generated is sent back to the processor.

### DISPLAY BOARD
The Display Board receives 5VDC from the Power Supply Board. This 5 volts can be checked at the harness of the display board X2 pin 6 or at the Power Supply Board X2 pin 6.

### KEYPAD
The keypad allows operator input to the Main Processor Board. The output signal passes through the Power Supply Board directly to the Main Processor.

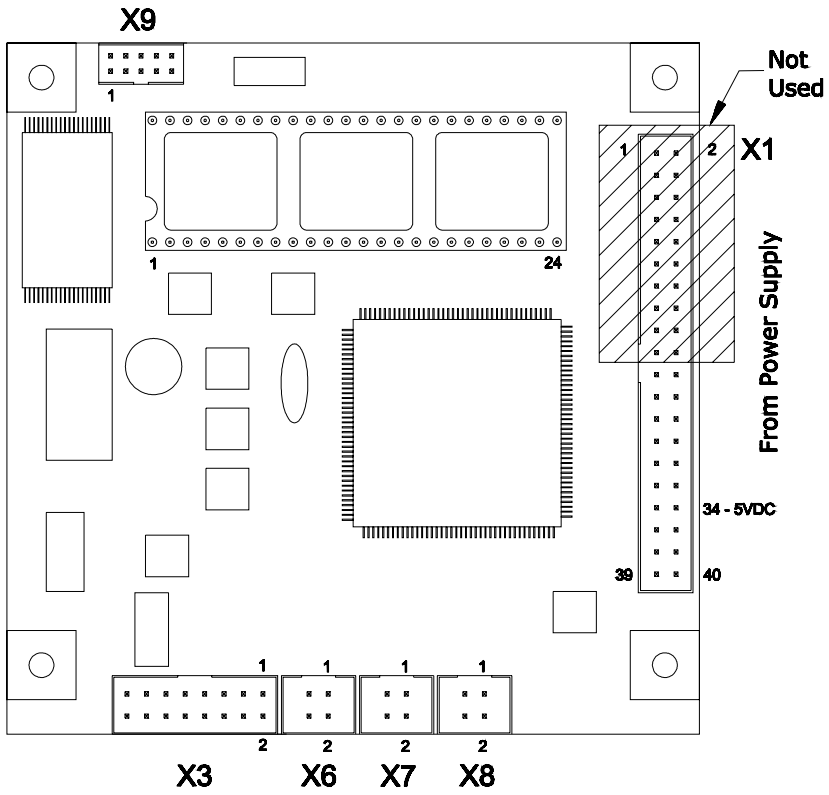



Power Supply Schematic

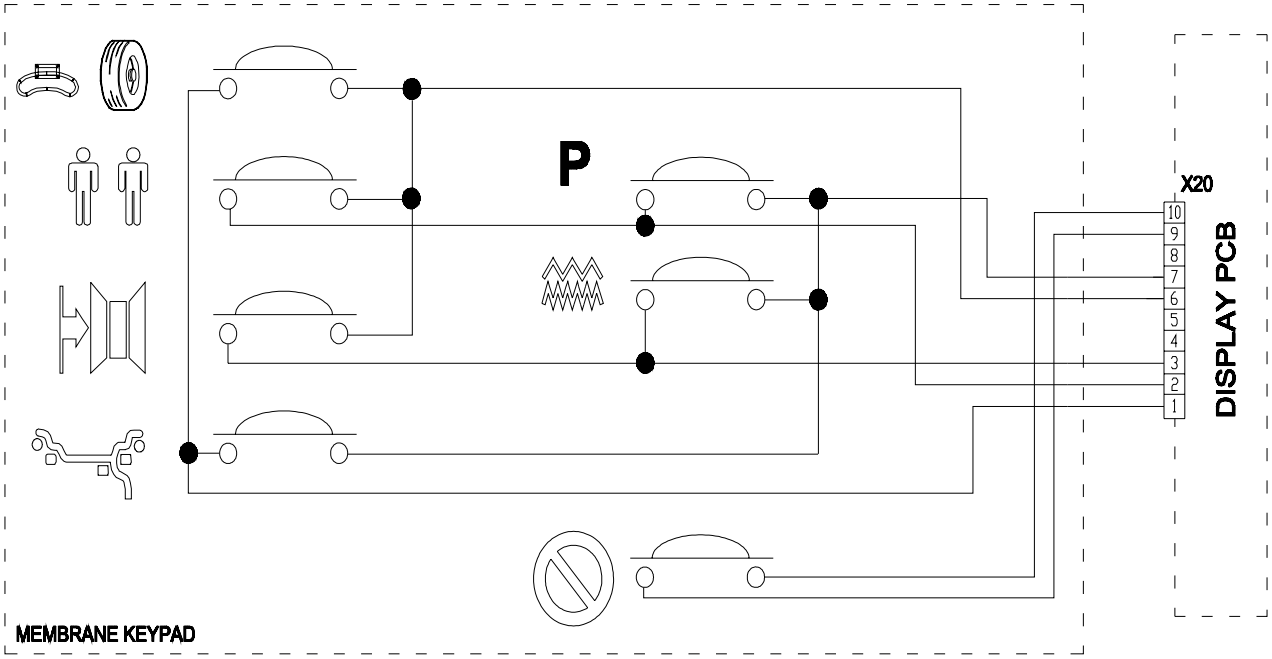
## PROCESSOR PCB

X1 - From Power Supply.
X3 - Encoder, Tranducers & Temp Sensor.
X6 - Distance SAPE
- Pin 1=Gnd
- Pin 2=Output
- Pin 3=5 VDC

X7 - Not Used on Hand Spin
X8 - Not Used on Hand Spin
X9 - Not Used on Hand Spin




## KEYPAD SCHEMATIC



# TROUBLESHOOTING

| COMPLAINT | CORRECTIVE ACTION |
|---|---|
| **I. Machine will not power up.** | Is the machine plugged in at the wall?<br>**NO->** Plug machine in.<br><br>Is the balancer plugged in at the back?<br>**NO->** Plug machine in.<br><br>Does transformer output read 9 VAC at the end of the receptacle?<br>**NO->** Replace power transformer.<br><br>Is 9 VAC present at pins 1 and 2 at X22 of Power Board?<br>**NO->** Replace power wiring harness.<br><br>Is 9 VAC present at F1 on the Power Board? (See diagram page 1-2)<br>**NO->** Replace fuse.<br><br>Is 5 VDC present at pins 11 and 14 at X1?<br>**NO->** Replace Power Board.<br><br>Is 5 VDC LED lit up on Processor Board?<br>**NO->** Replace Processor Board.<br><br>Is 5 VDC present at pins 3 and 6 at X2?<br>**NO->** Replace Power Board.<br><br>Are LED lit up on Display Board?<br>**NO->** Replace Display Board. |
| **II. Machine will not brake.** | Is 12 VDC present at pins 1 and 2 at X23 during brake cycle?<br>**NO->** Replace Power Board.<br><br>Is 12 VDC present at the brake solenoid during brake cycle?<br>**NO->** Replace wiring harness.<br><br>Replace brake solenoid.<br><br>Replace Processor Board. |
| **III. Keypad will not function.** pins of non working function. | Use keypad schematic (See diagram on page 1-3) jumper<br><br>**NO->** Replace keypad.<br>Replace Display Board.<br>Replace Main Processor. |

**IV. Machine chases weights.**

Are the mounting accessories in good condition?

**NO->** Clean backing plate and all accessories.
Replace if necessary.

Has the balancer been calibrated?

**NO->** Perform P14 and retest.
Perform P80 and P83 and retest (Pruefrotor required).
Perform P84 and retest (Pruefrotor required).

Check vibratory system mounting bolts, are they tight?

**NO->** Tighten to specification and retest.

Check P 64 does the left display change and then stabilize when the shaft is hit?

**NO->** Replace the rear transducer.

Check P 64 does the right display change and then stabilize when the shaft is hit?

**NO->** Replace the front transducer.

Is both the Front and Rear transducer tight?

**NO->** Adjust to specification and retest.

Check P 36, does the left display change from 0 to 511 and the right display change from 0.00 to 359?

**NO->** Replace the Encoder Board.
Replace the Main Processor.
Replace the Vibratory System.

Does the shaft spin smoothly and freely?

**NO->** Replace vibratory system.

**V. Distance guage does not work.**

Check pins 1 and 3 at connector X6 on the Processor Board. Is the voltage reading 5 VDC +/- 1 volt?

**NO->** Replace Processor Board and retest**.**

Press P 50 and pull the distance guage out, does the voltage reading on the display change?

**NO->** Check to make sure string is attached to distance guage.
Replace potentiometer.

Check P 50 with the SAPE in the home position, is the voltage reading 4.00 VDC +/- .10 volts?

**NO->** Readjust voltage reading to desired setting.

# CHAPTER 2
# THEORY OF OPERATION

## FUNCTIONAL DESCRIPTION

The EEWB314A wheel balancer is designed to compute static and dynamic imbalance of car, light truck, motorcycle and truck wheels.

Wheels are attached to the shaft using precision centering adapters and retainers. The shaft rotates on precision bearings on the shaft support. The rotating shaft is perfectly balanced. The wheels attached normally represent an imbalance, which creates centrifugal force and a dynamic momentum as it is spun on the balancer shaft. The wheel is spun by hand.

The centrifugal force and dynamic momentum created by the imbalance are detected by 2 transducers located between the shaft support and the machine frame. These transducers contain small discs of special quartz which generate millivolts of electric current when compressed. The current created is linearly proportional to the compression force.

Centrifugal force and momentum vectors are generated by a rotating wheel imbalance. This causes a signal to be generated by the transducers (which pick up only the vertical component of the constrained forces) in the form of a periodic sine wave.

This signal is not perfectly sinusoidal, due to periodic noises from shaft bearings, support frame vibration, gyroscopic effect, etc., which are added to the signal generated by the imbalance of the wheel. Because of these extraneous noises, the signal produced must be filtered to compute actual imbalance.

To find wheel imbalance, knowledge of signal magnitude and timing are both required. Timing is determined by the encoder, which consists of a electronic pcb connected to the tube of the shaft. A series of timing marks are on the shaft which trigger light being transmitted between two optocouplers, thus generating a DC Square wave each time a mark moves past an optocoupler. One additional mark offset from the encoders' metallic strip, interrupts the third optocoupler on the board, and creates a zero-signal reset or home position. The encoder detects 512 angular positions during each turn of the shaft, plus the home or reset position. The frequency of the DC square wave generated by the encoder allows the balancer to compute wheel speed, wheel acceleration and weight location. The encoder and transducer signals are processed together by the CPU to give weight amount and location readings.

The CPU board gathers the information generated from the encoder and transducer via ribbon cable. This board is powered with 9 VAC received from the transformer.

To compute correct imbalance values, the parameters (diameter, width, and offset) of the wheel to be balanced must be entered. Enter wheel parameters using the Distance Entry Arm. Slide the gauge to touch the rim and hold. The distance to the rim will be entered automatically. Measure the rim width with the rim width calipers (supplied) and enter the measured value. This is done by manually turning the left hand knob on the display panel. The rim diameter is measured by turning the right hand knob on the display panel until the desired number is shown.

Calculated imbalance values are then shown on the LED display panel after a spin cycle.

# TERMINOLOGY

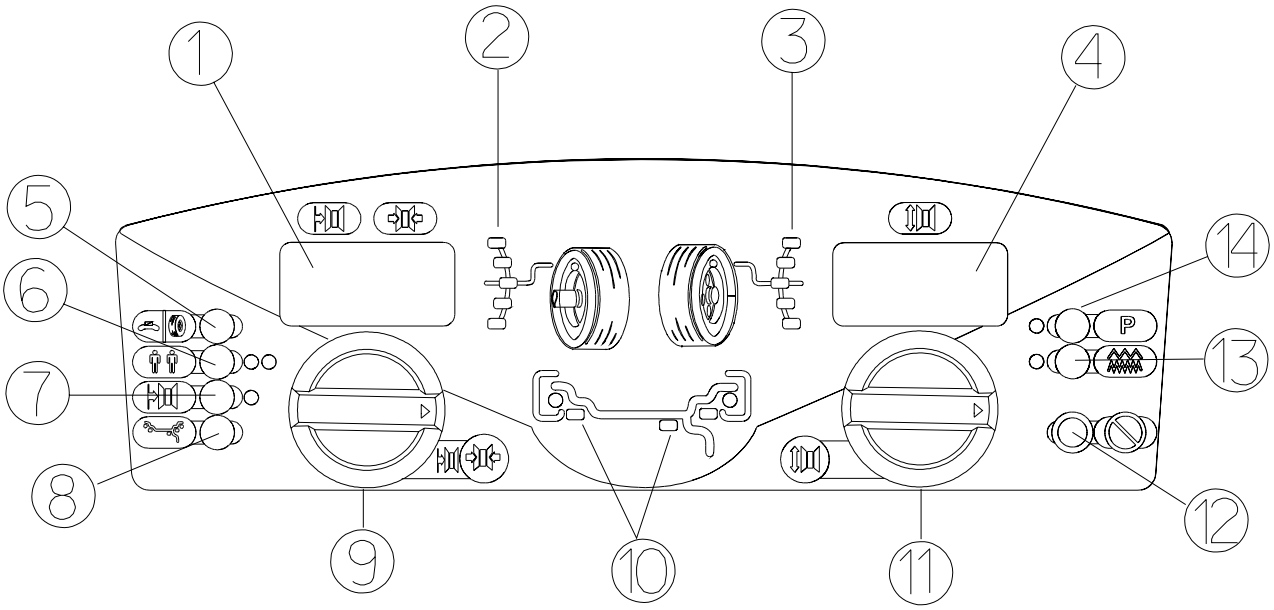



**Figure 2-1 Display Layout**

Before using the wheel balancer it is suggested that you become familiar with the terminology of the machine's components. Refer to Figures 2-1 and 2-2.

1. ***Display for inner plane imbalance***
2. ***Inner plane imbalance position indicator***
3. ***Outer plane imbalance position indicator***
4. ***Display for outer plane imbalance***
5. ***Display all parameters button***
6. ***Operator A-B toggle***
7. ***Rim offset button***
8. ***Mode select button***
9. ***Rim width knob & manual distance entry***
10. ***Balance mode indicator***
11. ***Diameter/Function knob***
12. ***Cancel/Stop button***
13. ***Fine-Normal button***
14. ***Function button - "P" codes***

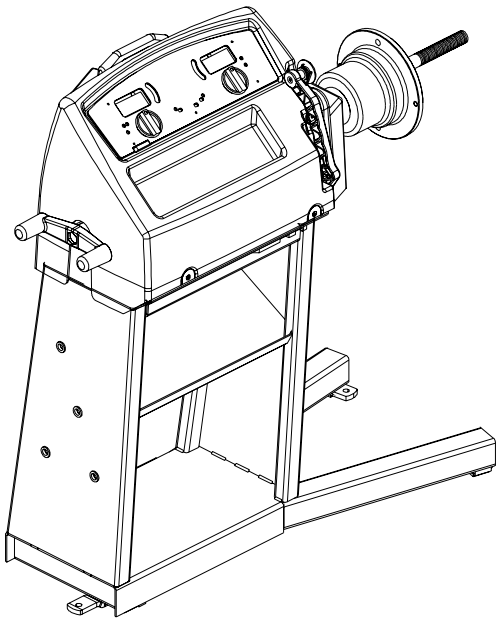


**Figure 2-2**

# BALANCER COMPONENTS

## UPPER DISPLAY

The upper display is made up of 4 major components. Main processor, Power Supply, Digital Display, Keypad. The upper display processes all information along with providing all electrical requirements to all sub components.

## MAIN PROCESSOR PCB

The microcontroller normally takes its instructions from the FLASH memory. The 40-pin IC socket is merely used to transfer the program from an EPROM to the FLASH memory. Unlike EPROMs, FLASH memories do not require windows for UV light in order to delete data - they can be cleared and programmed electrically. Therefore the chips of the FLASH memories can be incorporated in economical SMD enclosures made of plastic, which can be soldered onto the PCB. Unless otherwise stated in the program revisions, new program versions can be installed without the need for adjustment. The main processor receives its power from the power supply pcb and distributes the power to the encoder, transducers.

## POWER SUPPLY PCB

The power supply pcb receives 9VAC from the power adapter. The power then passes through a bridge rectifier converting it to DC power. This 12VDC is used to stop the shaft via the brake solenoid. The 12VDC is sent to a voltage regulator that reduces the voltage to a clean steady 5VDC that is used throughout the balancer.

## KEYPAD

The keypad is used to input data into the display pcb. It connects directly to the display pcb via ribbon cable.

## DISPLAY PCB

The display pcb receives power directly from the power supply pcb. It passes 5VDC to power the encoders for both input knobs and the tone generator and the LED display. It receives the information from the main processor pcb via the power supply pcb. This information is passed back to the processor via the power supply.

## TEMPERATURE SENSOR

The system has a new force guidance structure (patent pending). The forces at the measuring transducers have been reduced, thus achieving good long-term stability and high measuring accuracy. The pre-tensioning of the transducers is achieved by two leaf springs. On the vibratory system the measuring transducers are very close together so that the difference in temperature is only slight. The current vibratory sensor has a temperature sensor. The transducers can therefore be measured by **one** temperature sensor and taken into account in a fraction of a second. The temperature sensor is attached to the vibratory plate by means of a U-shaped spring.

## TRANSDUCERS

The transducers are installed such that it forms a virtual transducer on each end of the shaft. This gives the balancer greater accuracy along with mininmal amount of erroneous readings. Both measuring transducers are arranged in one plane. The **rear** transducer picks up the alternating forces of the left-hand virtual measuring plane and is supported on the machine housing. The **front** measuring transducer is clamped between the vibratory tube and vibratory plate, and transforms the alternating forces of the right-hand virtual plane into electrical signals.

## VOLTAGE REGUALTOR

Thebalancer is capable running off of Snapon's versapack battery packs used to power the hand tools. The balancer incoporates an internal voltage regulator so that the balancer can accept either the 12 Volt, 14.4 Volt or 18 Volt battery packs. These batteries are rechargeable using Snapon's external battery charger. The balancer WILL NOT recharge these batteries.

## ENCODER

The encoder is built into the shaft with no adjustments. The encoder disk is built onto the shaft and cannot be replaced without replacing the vibratory member.The new incremental encoder is fitted in the vibratory tube and consists of a reflective slotted sleeve which is mounted on the main shaft and the optoelectronic unit. To prevent dirt and light entering, the opening in the vibratory tube **must** be sealed with black adhesive (electrical tape) tape. A red visible LED and four light detectors are fitted in the encoder part of the optoelectronic unit, behind the lenses. Part of the light is reflected back from the webs of the slotted sleeve to the encoder part and focussed by the lens, such that the web-slot pattern of the sleeve is mapped on the four light detectors. Two light detectors are connected to one amplifier respectively in the encoder part. The difference in brightness between the detector pairs determines the instantaneous output states of channels A and B. To exclude interference from extraneous signals and to guarantee EMC-reliability, the two signals are amplified by an IC. One slot in the sleeve is wider than the other 255 slots. Therefore the absolute angular position of the main shaft can be determined at constant rotating speed. The surface of the slotted sleeve must be clean and shiny, the slots must have a dull black background. Should a dirt particle have settled on a web or in a slot, it can be lifted off of the slotted sleeve with self-adhesive tape by applying it onto a strip of strong paper so that half of the tape is on the paper and the other half overhanging. **CAUTION!** If the slotted sleeve is twisted relative to the main shaft when being cleaned, the step Compensation of residual shaft unbalance has to be carried out with P84. A defective slotted sleeve cannot be replaced in the field because the ball bearings of the main shaft are pressed in. The incremental encoder can be checked with test functions P36.

## ELECTRONIC BRAKE

The brake solenoid is provided with 12VDC to brake the balancer. This system has been used on other balancers with great success. While the balancer is spinning, the main processor pcb is gathering information from the encoder and transducers. After the needed information is gathered the main pcb sends a signal to the power supply pcb which sends 12VDC to the brake solenoid braking the balancer and bringing the shaft to a stop.

## SAPE (SEMI-AUTOMATIC-PARAMETER-ENTRY)

The handspin balancer utilizes a 1D SAPE to automatically input the distance from the balancer to the inside weight location. The SAPE plugs into the main processor at connection X6. As the SAPE is pulled out towards the wheel the voltage changes the correct distance is determined using the calibrated values.

## VIBRATORY SYSTEM

The vibratory member is the foundation of the balancer. It houses the encoder and transducers along with a temperture sensor for the tranducers.

# CHAPTER 3
# CHECKOUT, CALIBRATION AND MAINTENANCE

## SHAFT IMBALANCE, WHEEL ADAPTER TO SHAFT REMOUNT TEST

This test proves the wheel balancer centering device is balanced, turns true and proves the centering device inside taper and balancer shaft outside taper (mating surfaces) are true.

1. Mount a medium size wheel assembly (14”), input the rim dimensions and balance the wheel assembly to 0.00 ounces imbalance in both planes. This must be balanced to exactly 0.00 in both planes.

2. Spin the balancer several times. Verify that no more than 0.05 oz. imbalance is displayed.

3. Loosen the Speed nut and rotate the tire and wheel assembly 180 degrees, making sure the cone does not rotate. ***NOTE: DO NOT REMOVE THE WHEEL ASSEMBLY.***

4. Operate the balancer. The new imbalance displayed should not exceed 0.25 oz.

***TEST PRODUCES READINGS OUT OF TOLERANCE:***

5. Remove the tire and wheel assembly from the balancer.

6. Check the tapered surfaces of the basic centering device and balancer shaft. They should be clean and smooth. Clean and retest. If the test still produces unacceptable results:

7. Using a dial indicator, measure runout of the balancer shaft tapered mounting surface. Acceptable tolerance is 0.0015" T.I.R. (Total Indicated Runout). If the surface measures out of tolerance, replace the vibratory system.

8. Perform a P80 and a P83 using the Pruefrotor and retest. These test can be found later in this Chapter.

## BALANCER DIAGNOSTICS (TROUBLESHOOTING)

Many problems may be found by process of elimination. By determining the problem, then eliminating potential problem areas starting with the *most-likely to fail* items, solutions to problems may be rapidly found. The Hand Spin balancer is composed of subsystems, each requiring several inputs for proper function. With proper inputs the subsystem performs as expected and produces an output. Every piece of equipment, when operable, operates in a predetermined manner. Events have to take place in the proper sequence every time. A balancer must:

Be supplied with correct power and ground.
Give a display output.
Accept Keypad input.
Process commands through the Computer.
Receive and process encoder/transducer inputs.
Brake
Display proper weight amount and location.

in that order every time, in order to balance tires. The technician should watch a machine work and make performance assessments based on what is seen. If subsystem failure is suspected, use diagnostic tests to confirm the failure. Remember, every part requires input to produce the expected output. These outputs in turn become inputs for further use by the system.

## TROUBLESHOOT USING CORRECT DIAGNOSTICS PROCEDURES!

Balancers are relatively simple pieces of machinery. With proper diagnostic procedures, balancer problems should be quickly resolved. The Basics that the technician must *never* overlook are:

1. AC Power. The unit must be supplied with correct AC power.

2. Ground. These machines depend on proper Grounding for proper and safe function. Improper or poor ground will create problems that are quite difficult to diagnose, *and may create a dangerous condition*. Check, never *assume* ground is correct!

3. DC Power. The microprocessor will not run correctly (if at all) if it is not supplied with proper DC power and ground. Check DC power for ripple or drift ( may indicate faulty regulation or failing PCB's). Ensure there is *enough* power and a good ground.

4. Inputs. Check for proper Encoder and Transducer signals.

5. Output - Once all voltages and signal levels are present a proper output can be expected.

## TOOLS REQUIRED WHEN SERVICING THE HANDSPIN BALANCER

**Tools**

Metric Sockets (4mm Thru 15mm)
Metric Wrenches (6mm Thru 15mm)
Assorted Hex Wrenches metric / standard
Inch Pound Torque Wrench
Foot Pound Torque Wrench
#2 Phillips Screwdriver
#2 Flat Head Screwdriver
Digital Volt-ohm Meter
Small Screwdriver
Hilti Rotor hammer drill (Installation Option)
Pruefrotor (H6416946)
Program EPROM

Mounting the Pruefrotor

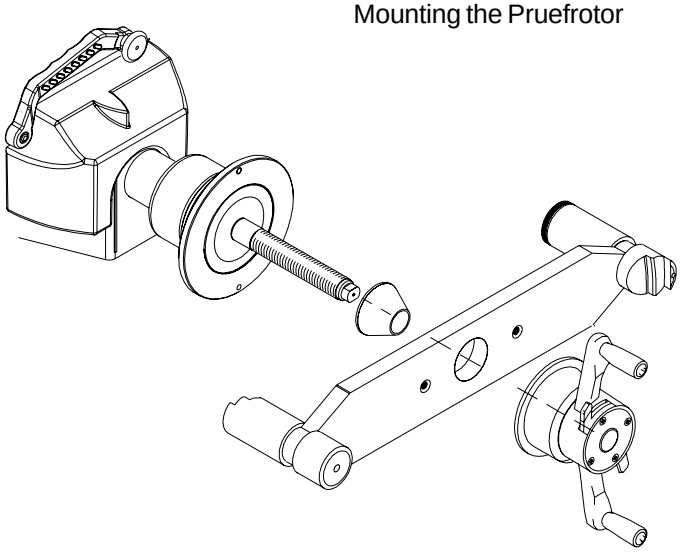


**Figure 3-1 Pruefrotor**

### OTHER SUPPLIES

Loctite #242 and #272 or #609
Silicone based grease - Used for transducer ball placement
Putty for fine wheel balancing.
1, 2 and 3 ounce weights verified accurate (weigh on postal scales and trim to exact weight - paint and label)

*A test tire and wheel balanced to within 0.10 oz (2.8 gr.) on both inside and outside planes or 0.20 oz. statically (mode 7) is required during some troubleshooting procedures.*

In the event of vibratory system replacement, the use of a certifed Pruefrotor (Figure 3-1) will be required to confirm conformance to design specifications and certification requirements.

# FUNCTIONS OF HAND SPIN BALANCER

All the service codes are part of P codes. The procedure for activating a P code is described below.

1. Press the P key, the left window displays letter **"P"** and right window displays current P code number. If the machine does not activate a P code in this power cycle, it displays a number of **"0"**.

2. Hold the P key and turn the right knob, the number in right window increases or decreases while operator turns the pot clockwise or counter-clockwise.

3. Release the P key when the right number displays the **"P"** code with this corresponding number to activate the particular P code.

4. In general, the P code will display some brief information to operator for 1 or 2 seconds, and machine enters the corresponding function.

In the following paragraph, the functions and operations of various service codes are addressed.

## SERVICE CODES

P2 Toggle switch between inch and millimeter display of width.
P3 Toggle switch between gram and ounce display
P4 Toggle Adapter Application
P7 Toggle switch of millimeter and inch for diameter measurement
P12 Read counters
P14 Calibration by user
P18 Enter ALU-S mode (press balancing mode key to exit and back to DYN mode)
P19 ALU-S Single Plane Balancing mode
P20 Toggle Passenger / Motorcycle Tire Balancing mode
P21 Check revision of balancing kernel software
P28 Check last 10 kernel error message
P36 Toggle reading the positions and angles of left and right weights
P43 Read or reset re-setable counter
P44 Read or reset productivity of user. Display counter number of default user only.
P50 Read output voltage of potentiometer of distance measurement of SAPE
P53 Display test
P59 Read resident unbalances of shaft in fine mode. (the fine mode LED indicator is automatically turn on and off if the machine is in regular accuracy mode)
P64 Read outputs of transducers
P72 Measuring the Phase Shift of the Vibratory System.
P74 Read position and angle of spin shaft
P80 Calibration of SAPE
P83 Manufacture calibration
P84 Empty Calibration of bare shaft
P85 Copy contents of EEP1 to EEP2, only available in initialization.
P86 Copy contents of EEP2 to EEP1, only available in initialization.
P90 Enter match balancing mode
P91 Optimization Balancing
P95 Erase EEProm contents

# P CODE DESCRIPTIONS OF THE BALANCER

## P2 RIM WIDTH INCH / MILLIMETER

Selecting P2 toggles the balancer between inch and millimeters for rim width. Unit will display **"DtH I NCH"** for inches pressing P2 again toggles to millimeters and the display changes to **"DtH"** for millimeters.

## P3 GRAM / OUNCE

Selecting P3 toggles the balancer between Grams and Ounces.

## P4 CALIBRATION WITH ADAPTER OR DISABLE ADAPTER COMPENSATION

Some special tires and those wheels whose center holes are not the primary reference but are lug centric require an adapter or a Motorcycle Adapter. In this case, the adapter may introduce an unbalance to the spin system (Motorcycle Adapter). This means that this unbalance has to be taken away after tire unbalance is measured. This P code is used to measure the unbalance of shaft and adapter together and saves it in memory and set an adapter compensation flag to tell the program to use adapter compensation after tire balance is done. Also the P4 is a toggle switch, it is used to turn this flag off.

- After P4 is activated, machine displays **"CAL ADP"** for one second. And then it displays **"SPN 1".** Operator spins the shaft just like ordinary balancing. When the machine is taking data and calculation, it displays **"CAL BAL"** to tell the operator the machine is working on the balancing procedure. Once the calibration is done, machine displays **"ADP FIN"** to indicate the calibration is successful. Once the shaft stops, machine displays **"--- ---"** and exits the P4 automatically. The machine is now in an idle state.

- When the machine is working under the application of an adapter, the balancing mode display is different for ordinary balancing. In ordinary balancing the machine displays **"--- 2PL"** while the machine is taking data. In balancing with an adapter, the machine displays **"AdP 2PL"** as it takes data. This reminds the operator he is under adapter compensation mode. So if the operator does not use an adapter and the machine displays **"AdP"** in left the window, the operator should turn off the adapter compensation by toggling **P 4**, or just recycle the power.

## P7 TOGGLE MILLIMETER AND INCH FOR DIAMETER

If a metric tire is to be balanced, the diameter can be changed to enter the tire parameters in millimeter opposed to inches. The default is set up to inches. Pressing P7 again toggles the balancer back. **"dIA ICH"** = inches, **"dIA ---"** = millimeters.

## P12 READ COUNTERS.

The balancer has 4 counters that keeps track of total number of cycles for a certain parameter. The balancer will automatically cycle through the counters after P12 is pressed. The order of the counters.

1. Display **"Ctr ALL"** for one second.
   Counter number of all spins.
2. Display **"Ctr CAL"** for one second.
   Counter number of spins since last calibration.
3. Display **"Ctr SrV"** for one second.
   Counter number of service spins.
4. Display **"Ctr USR"** for one second.
   Counter number of user spins.

## P14 USER CALIBRATION PROCEDURE

The calibration function compares current transducer output to factory calibration transducer output (P83). If the range is not acceptable the balancer reverts back to the known last calibration. If a unit continues to chase weight after P14 the unit will require further diagnostics. **A Pruefrotor is preferred however a fine balanced (.10) tire and wheel can be substituded.**

***NOTE: TO CALIBRATE THE MOTORCYCLE BALANCER, A 28MM SHAFT, CONE AND WING NUT IS NEEDED.***

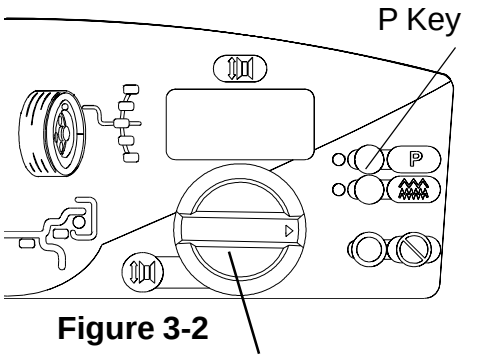



**Figure 3-2**

1. **Activate Calibration**. Press and hold the **P** key while turning the *Diameter/Function* Knob (Figure 3-2) until the display reads **"P" "14"**.
   - Once P14 activates, the display will read **"CAL" " GAN"** for one second.
   - The display will then read **"SPN" " 1 "**.
   - Mount a balanced wheel/tire to the shaft. (Figure 3-2)

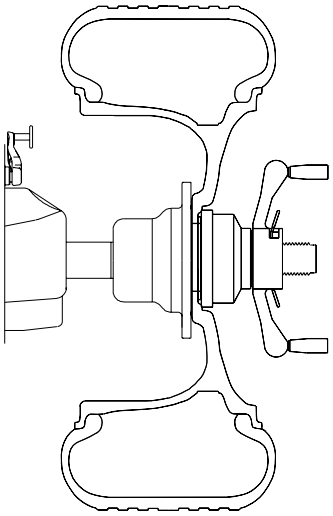


**Figure 3-3**

2. **Spin shaft with balanced wheel only**. (Figure 3-3)
   - Displays **"SPN" "UP"** when shaft reaches 60 rpm.
   - Displays **"COA" "ST "** with a beep sound when shaft speed has exceeded 120 rpm.
   - Displays **"CAL" "1"** when the speed drops to 119 rpm. The machine is taking data and doing calcula tions. After taking data, shaft is automatically braked to a stopped.
   - Displays **"SPN" "2"** when shaft stops.

3. **Spin shaft with calibration slug on the left side**. Mount calibration slug (EAM0005D13A) to the shaft. (Figure 3-4).
   - Displays **"SPN" "UP"** when shaft reaches 60 rpm.
   - Displays **"COA" "ST "** with a beep sound when shaft speed is over 120 rpm.
   - Displays **"CAL" "2"** when the speed drop down to 119 rpm. At this moment the machine is taking data and doing calculation work. After taking data, shaft is automatically stopped.
   - Displays **"CAL" "FIN"** when the second step of calibration is finished and machine says the calibration result is *FINE*.
   - Displays **"---" "---"** when shaft stops and machine is in the idle state.

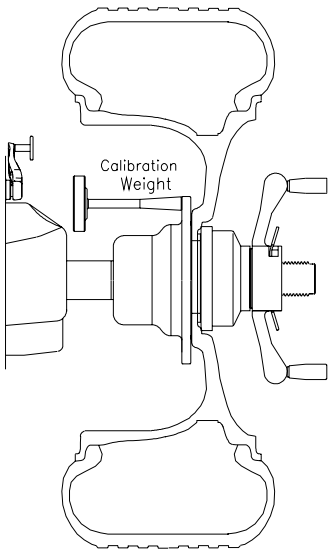



**Figure 3-4**

***NOTE: THE BALANCER WILL NOT FUNCTION UNTIL A VALID CALIBRATION HAS BEEN PERFORMED. ERROR MESSAGES WOULD BE DISPLAYED IN THE EVENT PROBLEMS OCCUR DURING THE CALIBRATION PROCESS.***

## P18 ALU-S MODE

Aluminum Static: See the operation manual for a detailed explanation.

## P19 ALU-S SINGLE PLANE BALANCING MODE

See the operation manual for a detailed explanation.

## P20 TOGGLE VEHICLE / MOTORCYCLE SOFTWARE

Enters the balancer software into a motorcycle software mode. See the operators manual for a detailed explanation of the use of the motorcycle software.

***NOTE: SELECTING THIS MODE REQUIRES THAT A P4 CALIBRATION BE DONE BEFORE ENTERING THE MOTORCYCLE SOFTWARE.***

## P21 KERNEL SOFTWARE

1. When the P21 is activated, machine displays **"REV" " "** for 1 second.
2. Then it displays **"PES" " "** for 1 seconds.
3. Then display object revision for 3 seconds.
4. Then it displays **"B " " "** for 1 seconds.
5. Then display revision of balancing kernel software for 3 seconds.
6. Then it displays **"UI " " "** for 1 seconds.
7. Then display revision of user interface software for 3 seconds.
8. Then it goes back to previous state.
9. User can press **STOP** button to interrupt the display and go back to previous state.

## P28 KERNEL ERROR MESSAGES

Used to check the last 10 kernel error messages recorded by the balancer. More detailed instructions and explanations of error codes can be found later in this manual.

## P36 TOGGLE ANGLES OF LEFT AND RIGHT WEIGHTS.

After P36 is activated, machine displays **"POS ANG"** first. Once the shaft moves, machine displays encoder position in integer form (from 0 to 511) in left window and angle in floating form (from 0.00 to 359) in right window. Meanwhile, machine lights on the position bars to indicate the left weight position. So working with number and position LEDs, it is very easy to find the left weight's position value and angle value. Once user presses **P** key, this function switches to fine right weight position value and angle value. This function is very useful to check the position accuracy. Press the **STOP** key to exit this function.

## P43 RESETTING THE COUNTERS

The counter can be reset using this code:

1. Hold the P key and turn Diameter funtion knob until P43 is displayed and release the P key.
2. The balancer will display **"Ctr rSt"**.
3. The display shows the total number of spins since last reset. Press the **STOP** key while this number is displayed.
4. The total number of spins since the last reset has been reset to zero.
5. The display changes to **"rE- Set"** for one second.

## P44 READ OR RESET PRODUCTIVITY OF USER

This displays or resets the total number of spins for either operator A or operator B depending what is chosen on the main display.

1. Choose the operator that you would like to read or reset from the main pcb.
2. Hold the **P** key and turn Diameter funtion knob until **"P" "44"** is displayed and release the **P** key. The balancer will display **"Ctr A"** or **"Ctr b"**.
3. The next display shows the total number of spins for the operator chosen. Press the **STOP** key while this number is displayed.
4. The total number of spins for that operator is now reset to zero.
5. The display changes to **"rSt A"** or **"rSt b"** for 1 second.

## P50 READ OUTPUT VOLTAGE OF POTENTIOMETER OF SAPE.

This displays the output voltage of the distance potentiometer.

1. Slide the SAPE in the home position.
2. Hold the **P** key and turn Diameter funtion knob until P50 is displayed and release the **P** key.
3. Display in the Right Hand window should read 4.00VDC +/- 0.10.

***NOTE: SEE SAPE ADJUSTMENT IF READINGS ARE NOT CORRECT (CHAPTER 3).***

## P53 DISPLAY TEST

Used to diagnose the display panel. Once activated the display will scroll the alphabets and numbers, watch to make sure all LED's light up.

## P59 DISPLAYS THE UNBALANCE OF THE BARE SHAFT

Display should read 0.10 or less. Anything greater than .10 requires bare shaft calibration P84.

## P64 DISPLAYS THE TRANSDUCER OUTPUT

Transducer output should be steady. Any slight vibration of the unit should cause the readings to fluctuate. After activating F64 the display will change to **"ADE" "1-2" "___"** for one second. The display then changes to **"1"** in the left window and the output of the rear transducer will be displayed in the middle and RH display. Force the shaft rearward should cause the voltage to a negative polarity, forcing the shaft forward should cause a positive polarity. The maximum amount of voltage for both positive and negative polarity is 1.5VDC. Press the **<P>** button to toggle the display output to the front transducer.

## P74 READ SHAFT POSITION AND ANGLE

After P74 is activated, machine displays **"POS ANG"** first. Once the shaft moves, machine displays encoder position in integer form (from 0 to 511) in left window and angle in floating form (from 0.00 to 359) in right window. Press **STOP** key to exit this function.

## P80 SAPE GAUGE CALIBRATION

To recalibrate the Offset gauge.

1. Make sure the SAPE arm is in the home position as shown in (Figure 3-5).
2. Activate the gauge calibration program. Pressing and hold the **P** key and turn right knob until **80** is displayed on right display window.
3. The right display will read **"CAL SAP"** for one second. This means **CAL**ibration **SAP**E. Then it displays **"SAP OUT"**. The SAPE calibration procedure is activated.
4. Gently pull the **SAP**E arm **OUT** until it is fully extended, (Figure 3-6) hold it steady for about 1 second.
5. Display will read **"H" "POS"** followed by a beep.
6. Return the SAPE arm to the home position, display will flash **"Goo" "d"** along with a beep.

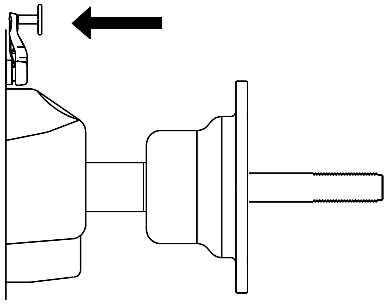


**Figure 3-5**

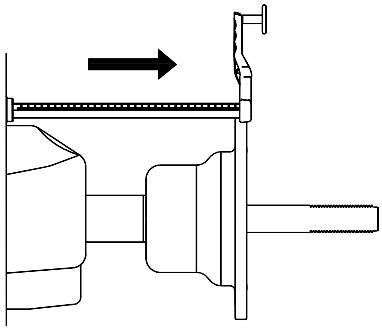


**Figure 3-6**

**CALIBRATION COMPLETE**

## P 83 FACTORY CALIBRATION PROCEDURE

***NOTE: THE F80 CALIBRATION MUST BE DONE BEFORE THIS OPERATION.***
***NOTE: THE MOTORCYCLE BALANCER REQUIRES A 28MM SHAFT, CONE AND WING NUT TO FIT THE SHAFT BE USED.***

A balanced tire and wheel assembly can be substituted if a Pruefrotor is not available. The calibration procedures are the same and can easily be performed. However custom parameters must be used for this procedure if using a balanced tire and wheel assembly

**Beginning with a balanced Tire and Wheel assembly**

- Mount the tire and wheel assembly on the shaft. For this example a 14" X 5.5" wheel will be used.
- Enter the distance, diameter and width (user defined).
- Press and hold the **<P>** key while turning the *Diameter/Function* Knob until **"P" "83"** is displayed and press **<ENTER>** to activate function of P 83.
- After entering the P83 function the balancer will automatically switch to default parameters (15" X 6.5").
- Press the **<P>** button to change from default parameters to user defined parameters. The display will change to **"USE" "CST" "PAR"** for one second and then display **"SPN" "1"**. Pressing the **<P>** button again will toggle the unit back to factory defaults.

***NOTE: IF A TIRE AND WHEEL ASSEMBLY IS USED PROCEED TO STEP 6.***

**Beginning with a Pruefrotor**

1. Mount the Pruefrotor on the balancer shaft (Figure 3-7)
2. Pull the distance gauge arm out and touch the Pruefrotor (Figure 3-8).
3. Return the Distance Gauge to the home position.
4. Press and hold the **<P>** key while turning the *Diameter/Function* Knob until **"P 83"** is displayed. The display changes to **"CAL" "BAL"** for one second.
5. The display then changes to **"SPN" "1".**
6. Spin shaft with the Pruefrotor/Tire & Wheel by lowering the hood or pressing the enter key. The board displays the information in the following order.
   - Displays **"CAL" "1"** when the shaft reaches calibration speed. The machine is taking data and doing calculations. After taking data, shaft is automatically braked to a stopped.
   - Displays **"SPN" "2"** when shaft stops.

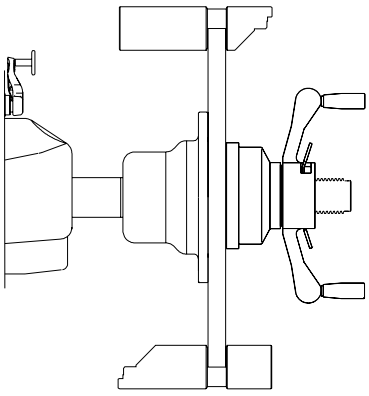


**Figure 3-7**

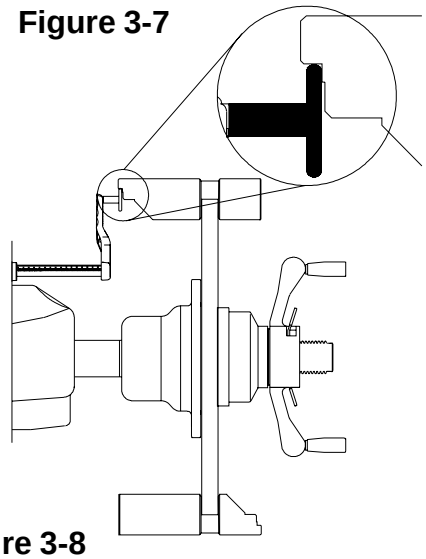


**Figure 3-8**

7. Attach the 3.5 ounce weight (100 gr) on the inside of the Pruefrotor/Tire & Wheel.

   (Figure 3-9)

   - Spin the Pruefrotor/Tire & Wheel by lowering the hood or pressing the enter key.
   - Displays **"CAL" '2"** when the shaft reaches 90 RPM's. The machine is taking data and doing calculations. After taking data, shaft is automatically braked to a stopped.
   - Displays **"SPN" "3"** when shaft stops.

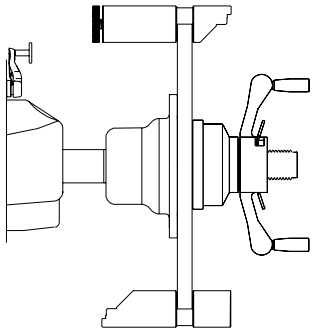


**Figure 3-9**

8. Attach the 3.5 ounce weight (100 gr) on the outside of the Pruefrotor/Tire & Wheel. (Figure 3-10)

***NOTE: IF USING A TIRE AND WHEEL ASSEMBLY ATTACH THE 3.5 OZ WEIGHT ON THE OUTSIDE 180 DEGREES OPPOSITE THE INSIDE WEIGHT LOCATION.***

   - Spin the Pruefrotor/Tire & Wheel by lowering the hood or pressing the enter key.
   - Displays **"CAL" '3"** when the shaft reaches calibration speed. The machine is taking data and doing calculations. After taking data, shaft is automatically braked to a stopped.
   - Displays **"CAL" "GOO" "d"** when the third step of calibration is finished and the calibration is successful or displays **"CAL" "FAL" "L"** if the calibration fails.
   - Displays **"SPN" "4"**

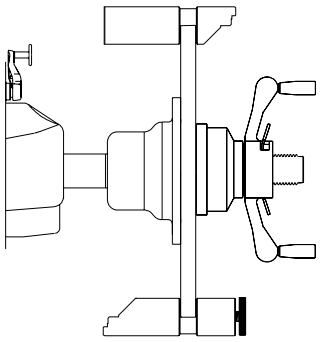


**Figure 3-10**

9. Remove the 3.5 oz weight from the Pruefrotor/Tire & Wheel.

   - Spin the Pruefrotor/Tire & Wheel by lowering the hood or pressing the enter key (Figure 3-11). The board displays the information in the following order.
   - Displays **"CAL" '4"** when the shaft reaches calibration speed. The machine is taking data and doing calculations. After taking data, shaft is automatically braked to a stopped.
   - Displays **"SPN" "5"** when shaft stops.

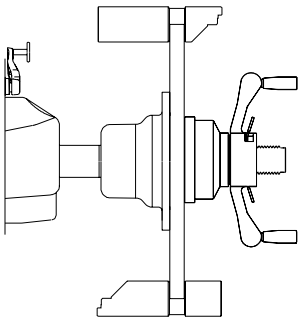


**Figure 3-11**

10. Install the calibration slug on the left side of the bell housing. (Figure 3-12) Spin the shaft by lowering the hood or by pressing the enter key.

    - Displays **"CAL" "5"** when the shaft reaches calibration speed. The machine is taking data and doing calculations. After taking data, shaft is automatically braked to a stopped.
    - Displays **"CAL" "FIN" "ISH"** after a successful calibration.
    - Displays **"---" "---"** when shaft stops and machine is in a stand-by mode. Must complete F/P 84 after this function!

**CALIBRATION COMPLETE**

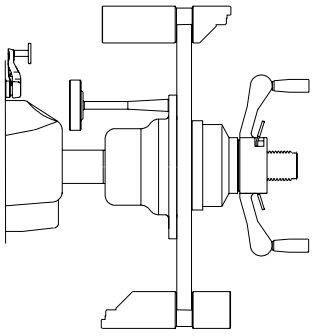


**Figure 3-12**

## P84 EMPTY SHAFT CALIBRATION PROCEDURE

***NOTE: THIS PROCEDURE CAN ONLY BE DONE USING THE PRUEFROTOR.***

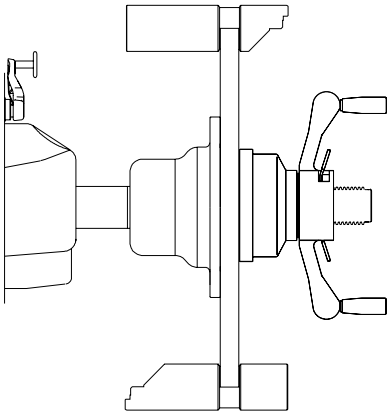


**Figure 3-13**

1. Hold the **P** key and turn Diameter funtion knob until **"P" "84"** is displayed and release the **P** key. The display changes to **"CAL" "SHF"** for one second.

2. Then it displays **"SPN" "1".**

3. Spin shaft with Pruefrotor only. (Figure 3-13)
   The board displays the following information.
   - Displays **"SPN" "UP"** when shaft reaches 60 RPM.
   - Displays **"COA" "ST"** with a beep sound when shaft speed is over 120 RPM.
   - Displays **"CAL" " 1"** when the speed drop down to 119 rpm. At this moment the machine is taking data and doing calculation work. After taking data, shaft is automatically stopped and displays **"SHF" "FIN"** for one second. The machine displays the shaft resident unbalances in fine mode. The fine mode LED indicator is automatically on.
   - By pressing **STOP** key to exit P84 and return to idle state. The fine mode LED indicator is automatically turned off

## P85 COPY CONTENTS OF MAIN PCB TO ENCODER, ONLY AVAILABLE IN INITIALIZATION.

When an Encoder PCB is replaced and on initial power up the unit will display "P85". The technician needs to simply press the **<P>** key to transfer the calibration factors from the Main PCB over to the new Encoder.

## P86 COPY CONTENTS OF ENCODER TO MAIN PCB, ONLY AVAILABLE IN INITIALIZATION.

When a Main PCB is replaced and on initial power up the unit will display "P85". The technician needs to press the **<STOP>** key to toggle the display to "P86". Once the display changes to P86 the technician should press the **<P>** key to transfer the calibration factors from the Encoder to the Main PCB.

## P90 MATCH BALANCE

Matches the tire to the wheel. See operators manual for detailed information.

## P91 OPTIMIZATION

See operators manual for details.

## P 95 CLEAN & RESET EEPROM 1 & 2

Care should be taken before running this function. All information in the EEPROM will be lost including manufacture calibration which can not be reversed once performed. However this function can be very useful if data is corrupted on the EEPROM's. Performing this function can be much quicker than re-flashing the software.

1. Press and hold the **<P>** key while turning the *Diameter/Function* Knob until **"P" "95"** is displayed. The machine displays "**CLN EEP**" immediately. The user can press the **<STOP>** button at anytime before step 5 to abort this procedure.
2. Press **P** button, the balancer displays " **1 1 1** ".
3. Press **P** button again, the balancer displays " **2 2 2** ".
4. Press **P** button again, the balancer displays " **3 3 3** ".
5. If user press **P** button again, balancer displays " **CLN EE**P" and erases all information in the EEPROM and resets the machine. All factory calibration procedures are now required.

# SERVICING THE BALANCER

***NOTE: BEFORE OPENING THE MACHINE FOR SERVICE, DISCONNECT ELECTRICAL SUPPLY LINE.***

The balancer is supplied with a power transformer. It is critical to have the proper input voltage in order for the balancer to operate correctly. The transformer is rated at 9VAC @ 1900 milliamps.

## To check power cable:

- Disconnect the power supply from the balancer.
- Using a VOM, check for an output voltage at the end of the power plug 9VAC +/- 1VAC.

### CONTROL PANEL REMOVAL AND REPLACEMENT

- Using a small pocket screwdriver, gently pry the display from the weight tray. The display is held in place with velcro and should remove easily. (Figure 3-14
- There are four (4) major components on the control panel. (Figure 3-15
  - Digital Processor PCB
  - Power PCB
  - Display PCB
  - Keypad
- Both the digital processor and power supply PCB are held in place with (4) 8mm nuts. Disconnect the harnesses leading to the PCB's and remove the nuts.
- In order to remove the Display PCB the technician must remove both the digital processor and the power supply PCB. Disconnect the keypad and remove the (8) standoffs.
- Once the keypad is removed from the panel it cannot be reused. The keypad can be removed by gently peeling back at a corner. If a keypad is suspect for replacement, it is suggested testing a new keypad before replacement.

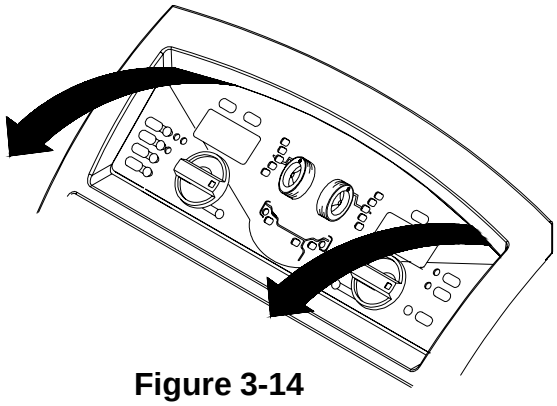


**Figure 3-14**

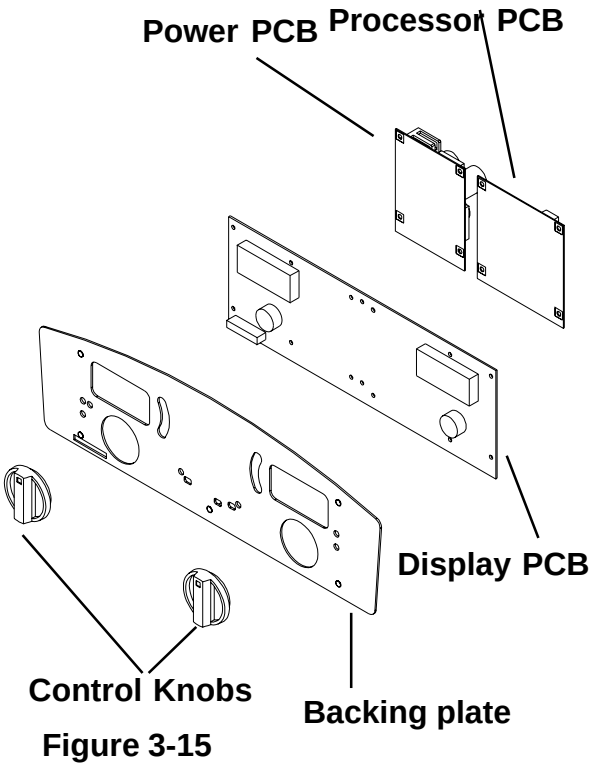



**Figure 3-15**

## MAIN PROCESSOR REPLACEMENT

**Tools required:**

- Programmed EPROM

The Processor must be programmed with software before it can be used.

1. Disconnect the power from the unit.
2. Locate the Main Processor PCB, on the rear of the Display PCB.
3. Insert the program EPROM in the socket on the processor board.

   ***NOTE: THE NOTCH ON THE END FACE OF THE EPROM MUST POINT TOWARDS THE NOTCH ON THE SOCKET OF THE PCB. SEE ILLUSTRATION ON THE BACK OF THIS CARD.***
4. Plug the power cable into the balancer and switch the balancer to the on position. The balancer will emit three beeps. The upload will take approximately 45 seconds. After the completion of the upload the balancer will continuously emit beeps.

   ***CAUTION!: DO NOT REMOVE POWER FROM THE UNIT DURING THE UPLOAD PROCESS, PERMANENT DAMAGE TO THE MAIN PCB WILL OCCUR.***
5. When the upload is complete remove power from the balancer. Remove the EPROM off of the socket using a screwdriver, and place it in packaging for transport.
6. Reassemble the balancer.

Flashing the Main Processor

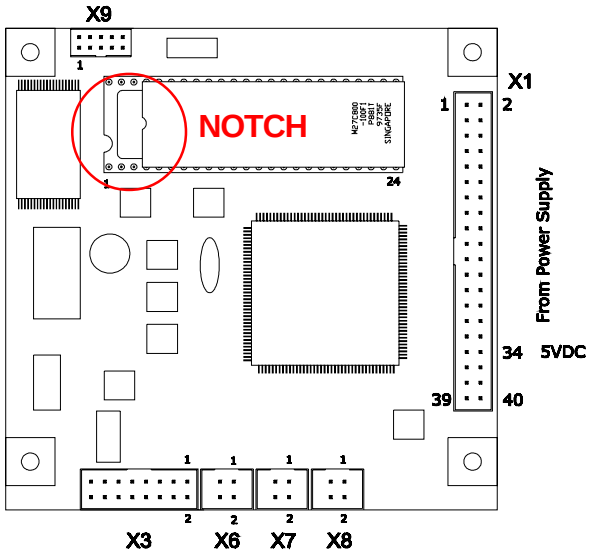



**Figure 3-16**

### TO ACCESS THE INSIDE OF THE MACHINE:

1. Remove the Main Control Panel
2. Remove the screws from the front and rear of the weight tray.
3. Standing at the front of the machine, rotate the SAPE arm to it's full most outward position. Lift and remove the weight tray. Avoid breaking or damaging wire harnesses. Harnesses may be held in place with various retainer clips.

   ***NOTE: WHEN INSTALLING THE WEIGHT TRAY, BE CAREFUL NOT TO CRUSH WIRES.***

## TRANSDUCER REMOVAL

- The transducers are held in place with setscrews and jam nuts.
- Disconnect the power from the rear of the machine.
- Remove the display panel.
- Remove the weight tray.
- Using a 2.5mm hex key remove the preload plate. (Figure 3-18)
- Using a 13mm wrench loosen the jam nut.
- Using a 5mm hex key, back the set screw off by turning counterclockwise. (Figure 3-19) Do not lose the ball bearings on each end of the tranducers. These allow the transducer to center easily on the vibratory member.
- If the transducer is being replaced using a marker mark the front and rear transducer harnesses. Cut the two wires at the transducer. The positive lead of the harness is marked with a black band. (When using a harness and transducer assembly, this step is unnecessary.

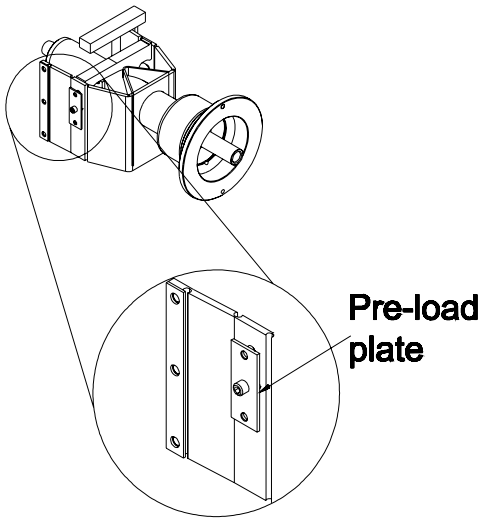



**Figure 3-18**

## INSTALLATION OF TRANSDUCER

- The front and rear transducer must be installed correctly in order for the balancer to function correctly. (Figure 3-19). The rear transducer uses the last 2 wires pins 15-16 in the harness.
- Connect the positive and negative lead to the transducer. The positive lead is marked with a black band.
- Insert the clip into the transducer firmly snapping it into place. Once the wire is installed it cannot be removed without destroying the transducer.
- Apply a small amount of grease to each end of the transducer. Place the ball bearings in place on the transducer. Place the transducer assembly in the vibratory system.
- Finger tighten the set screw to position the transducer. The wire connection should be on the bottom. A properly installed transducer will be able to rotate freely but must have ***no*** side to side motion.
- Snug the jam nut that holds the setscrew. This nut should be tightened solidly, but need not be extremely tight. Recheck the transducer to ensure that no lateral movement exists after tightening the jam nut. Adjust as necessary.
- Hold the pre-load plate in position up to the jam nut and finger tighten the set screws to just hold the plate in place without movement. Tighten the upper screw ½ turn, then tighten the lower screw one full turn, then tighten the upper screw an additional ½ turn.
- Reassemble the complete balancer and perform a complete factory calibration to ensure proper operation.

***NOTE: MOVING THE TRANSDUCER AFTER CALIBRATION WILL CHANGE THE ACCURACY AND REQUIRE FACTORY CALIBRATION***

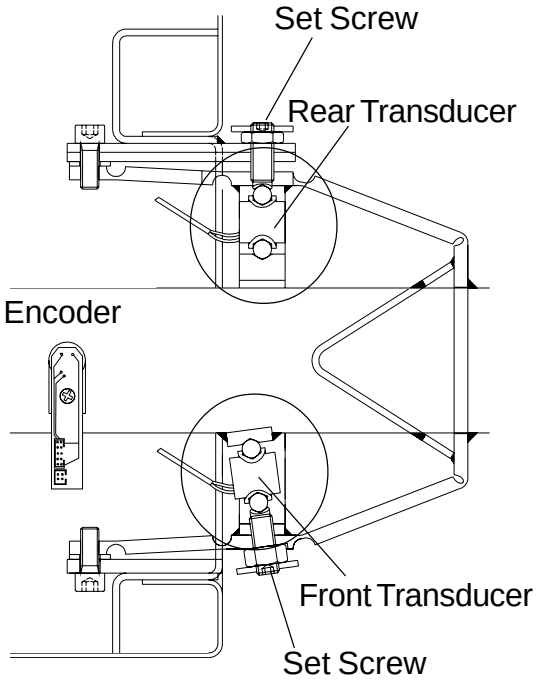



**Figure 3-19**

## BRAKE SOLENOID

- Disconnect the power from the rear of the machine.
- Remove the Display panel
- Remove the weight tray.
- Disconnect wiring harness from the brake solenoid.
- Remove the two #2 phillip screws. (Figure 3-20)
- Reverse procedures for installation.

## BRAKE SOLENOID ADJUSTMENT

- Loosen the two phillip screws holding the brake pad and arm and move towards the brake band. The gap between the brake pad and brake band is 1/16". Tighten the two screws holding the brake arm.
- Loosen the two phillip screws holding the brake solenoid in place.
- Slide the brake solenoid towards the brake pad until the solenoid plunger makes contact with the back of the brake pad, maintaining the 1/16 between the brake pad and the brake band.
- Tighten the two screws holding the solenoid and test the brake.

## SHAFT BRAKE BAND

- Disconnect power.
- Remove Main PCB.
- Remove weight tray.
- Using a 1/2" socket remove the two self locking nuts and flat washers.
- Remove both brake bands.
- Apply a small amount of white lithium grease between the shaft and band before installing.
- Using a 15" tire and wheel tighten bands to where the tire and wheel assembly will stop after 1 1/2 to 2 revolutions after the brake kicks in.

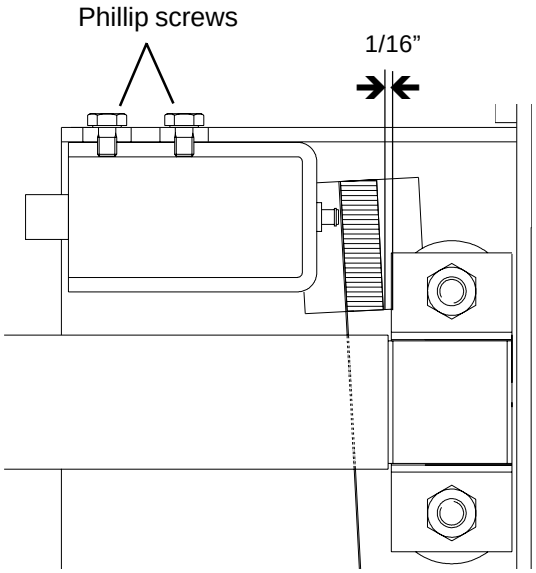



**Figure 3-20**

## SAPE SYSTEM

This process outlines the procedure when working with the SAPE return spring. Care should be taken before working with the SAPE return sping, failure to follow these procedures may cause the SAPE spring to un-wind and could cause injury.

Always remove the SAPE assembly from the balancer before installing a new SAPE spring and/or distance potentiometer. Removing the assembly from the balancer gives the technician access to the bottom of the system. **Using a small tie wrap secure the SAPE spring.** (Figure 3-26) After securing the spring with a tie wrap disconnect the SAPE string from the SAPE wheel and slowly let the SAPE wheel release tension from the spring.

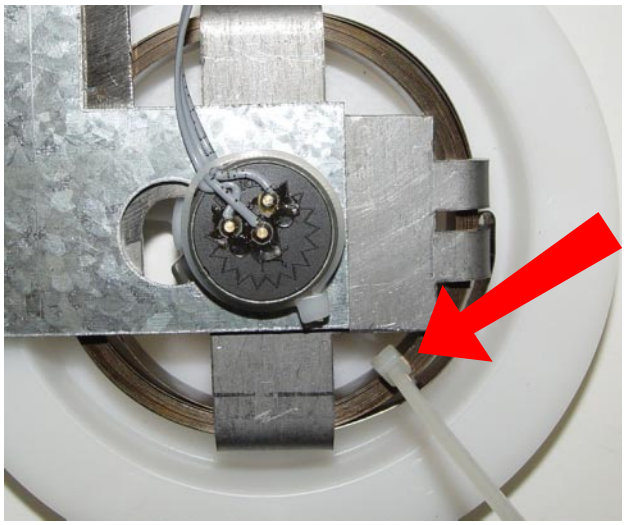


**Figure 3-26**

From the top side of the SAPE assembly loosen the 10mm nut securing the SAPE wheel to the potentiometer and remove the wheel. The excess part of the spring will need to be released from the SAPE wheel.

Using a 13mm socket remove and replace the distance potentiometer. (Figure 3-27)

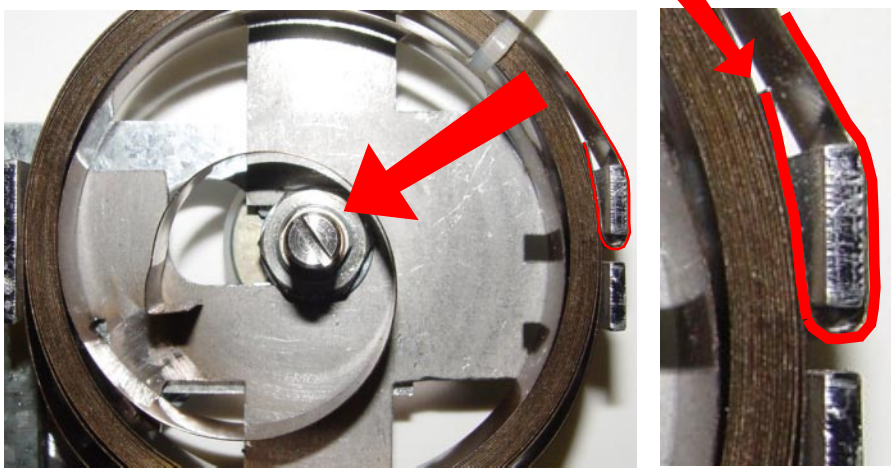



**Figure 3-27**

To reinstall the SAPE wheel, pull the excess spring from the assembly and insert the bent end into the cutout in the center of the SAPE wheel. Carefully wrap the excess spring around the inner part of the SAPE wheel. (Figure 3-28)

**Figure 3-28**

Flip the SAPE wheel over and slide the SAPE center hole over the distance potentiometer and secure tighten the 10mm nut securing the SAPE wheel. (Figure 3-29) Once the nut has been secured using a pair of cutters snip the tie wrap and remove.

**Figure 3-29**

If the SAPE string was removed or broken, thread the looped end through the hole in the outer part of the SAPE wheel and pull the string through until the crimped end reaches the hole. (Figure 3-30) The SAPE string is 20.5" from the end of the loop on one end to the crimped end.

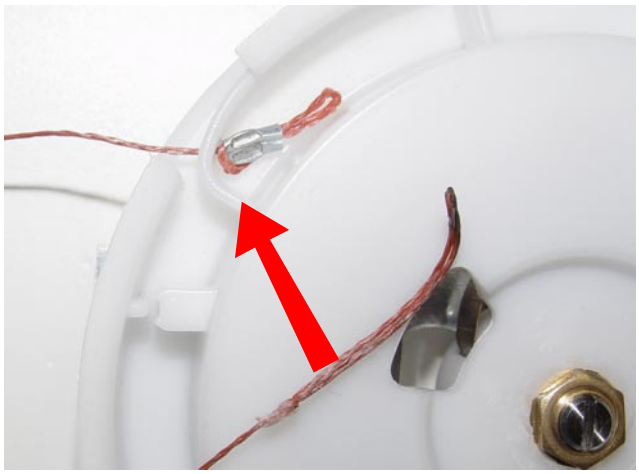


**Figure 3-30**

Attached the looped end of the string to the SAPE guage as shown (red arrow). Gently rotate the SAPE wheel counter clockwise (yellow arrows) 6 full turns and run the string over the guide (blue arrow) that is attached on the SAPE bracket and loop the excess string around the SAPE wheel. Let go of the SAPE wheel, while the SAPE wheel is un-winding guide the excess string around the SAPE wheel until all excess slack in the string is taken up.

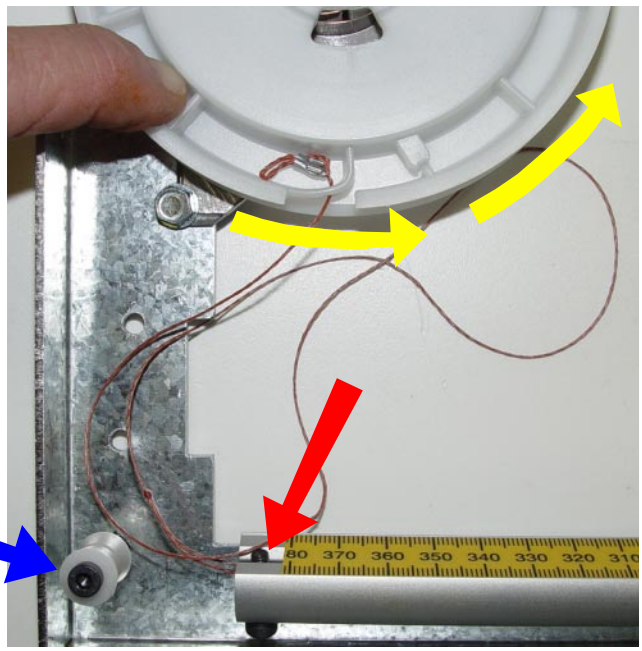


**Figure 3-31**

## VOLTAGE REGULATOR

The balancer can operate using AC power or using the Snap-on Versavolt battery pack used to power Snap-on power tools. The balancer will accomodate either the 12V, 14.4V or 18V battery pack. The voltage regulator is designed to keep the incoming power from the battery regulated to 12VDC. Should a battery require charging the balancer can quickly be switched from battery voltage to shop power with the flip of a switch.

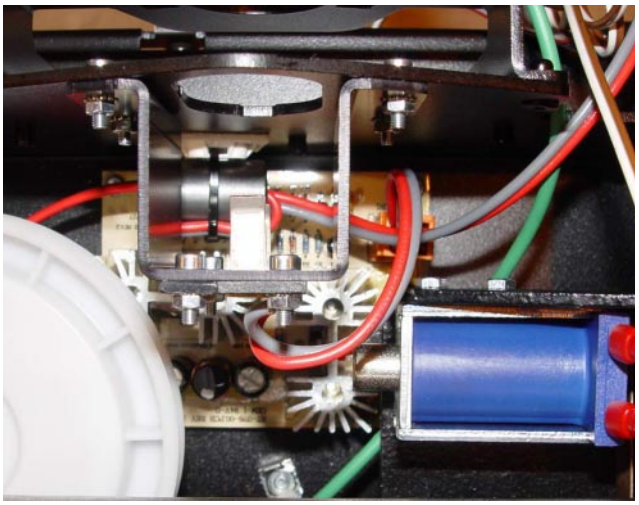


**Figure 3-32**

To replace the Voltage Regulator the SAPE assembly and bottom tray must be removed to allow access to the screws securing the voltage regulator.

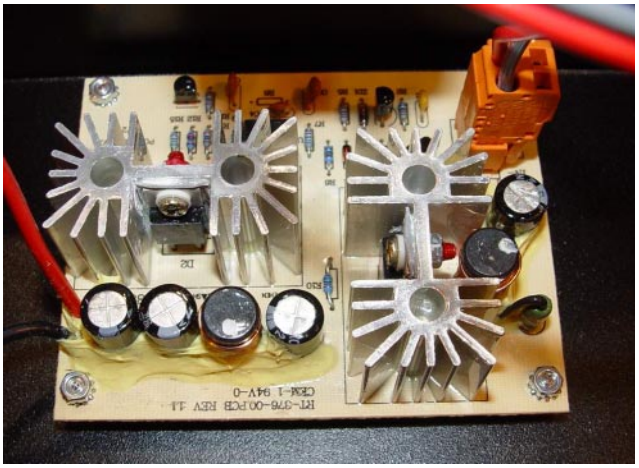


**Figure 3-33**

## POWER SWITCH

The switch used on the balancer is a double throw switch. To switch the power off the switch must be set in the middle position.

Red Arrow - battery input
Blue Arrow - To Processor PCB
Green Arrow - Incoming power

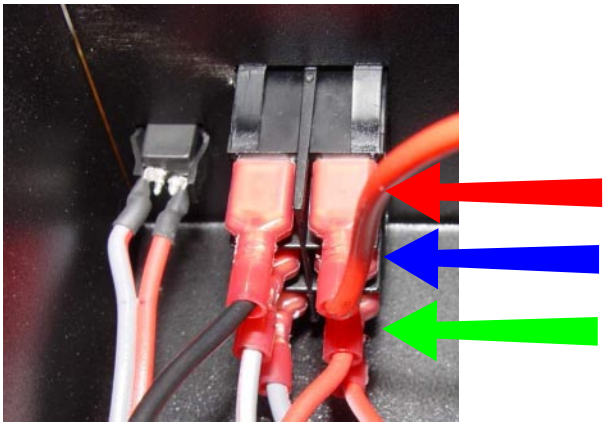


**Figure 3-34**

## VIBRATORY MEMBER REMOVAL

- Disconnect the power from the rear of the machine.
- Remove the Display panel.
- Remove the weight tray.
- Remove the rear transducer.
- Using 1/4" drive 6mm hex head SOT part # TMAM6E remove the six (6mm) hex bolts to the vibratory. Pay special attention of spacer placement. (Figure 3-35)
- Lift up on the vibratory member and remove.

## VIBRATORY INSTALLATION

- Lift and set vibratory member into the balancer housing.
- Insert spacers.
- Apply Loctite® to the hex bolts.
- With the aid of a helper start the two lower hex bolts.
- Install the 4 remaining hex bolts and tighten to 22ft. lbs. +/- 3 in. lbs.
- Install the rear transducer and follow transducer installation.
- Install weight tray.
- Install control panel assmebly.
- Connect power and follow all calibration procedures **P83, P84** and test.

***NOTE: THE SERVICE TECHNICIAN MUST USE THE PRUEFROTOR AFTER THE INSTALLATION OF A VIBRATORY MEMBER IN ORDER TO ENSURE ISO 9000 STANDARDS.***

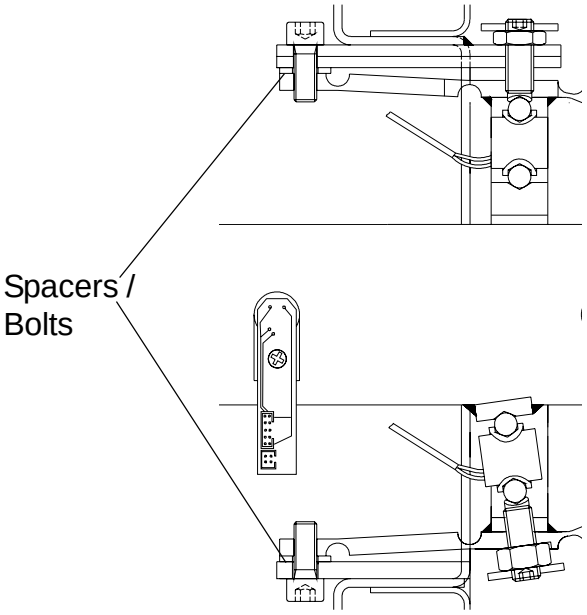



**Figure 3-35**

## ENCODER REMOVAL

(Figure 3-36)

- Disconnect power.
- Remove Main PCB.
- Remove weight tray.
- Disconnect the 10 Pin ribbon cable from the encoder PCB.
- Remove the phillip screw holding the encoder pcb to the shaft tube.

***NOTE: BE CAREFUL NOT TO LET FOREIGN DEBRIS FALL INSIDE THE TUBE.***

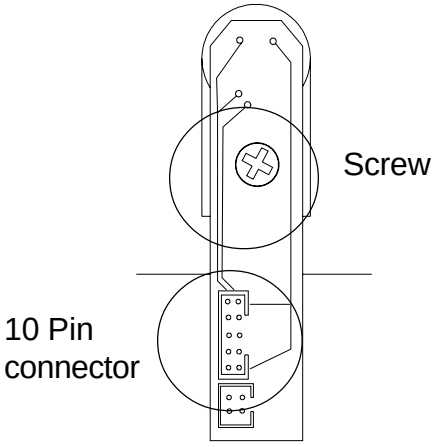



**FIGURE 3-36**

**Snapon Equipment Services**
**309 Exchange Avenue**
**Conway, AR 72034**

TEEWB325A (REV A)

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