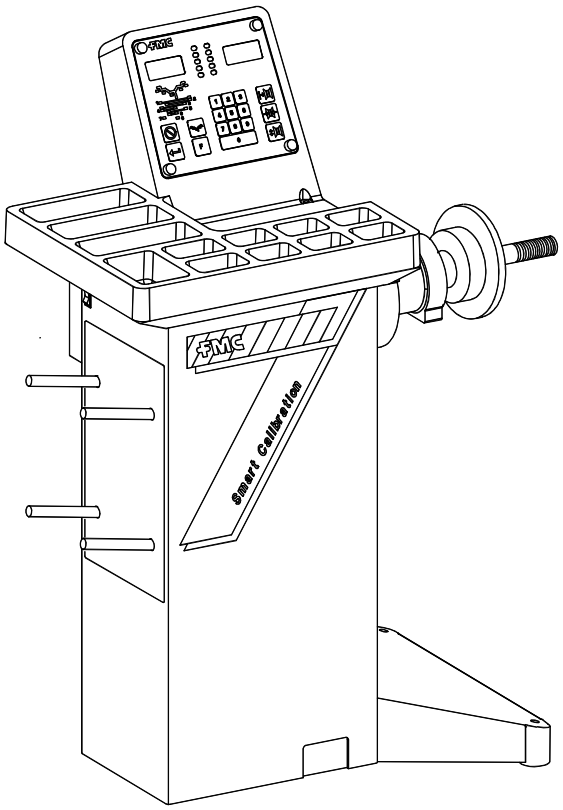
*Match-Balance Series*

# *MODEL 3.2 WHEEL BALANCER*




# *Service GUIDE*

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# INTRODUCTION

**1.0 Introduction** The 4200 was introduced to fill a world wide market need. Many shops having space restrictions will find the 4200 Hand Spin Balancer space efficient, extremely accurate and portable.

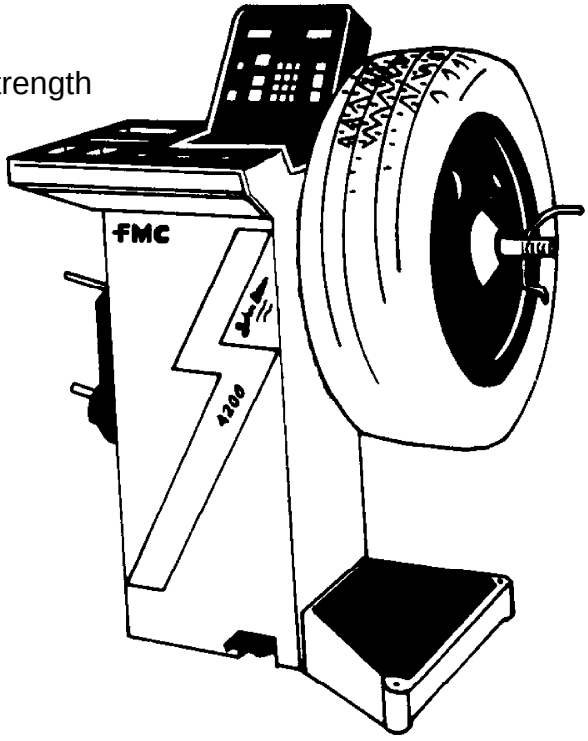
The 4200 Hand Spin Balancer features:

- Microcontroller Technology
- Ease of Operation
- Self Calibration
- Eight Balancing Modes
- Operation in Grams or Ounces
- Sleep mode when not in use
- Large wheel capacity
- Battery or AC power operation
- Built in diagnostics
- Low cost maintenance
- Ease of repair
- Multiple balancing applications with many optional mounting adapters available.

The 4200 Hand Spin Balancer is designed to handle today's and tomorrow's wheel balancing needs.

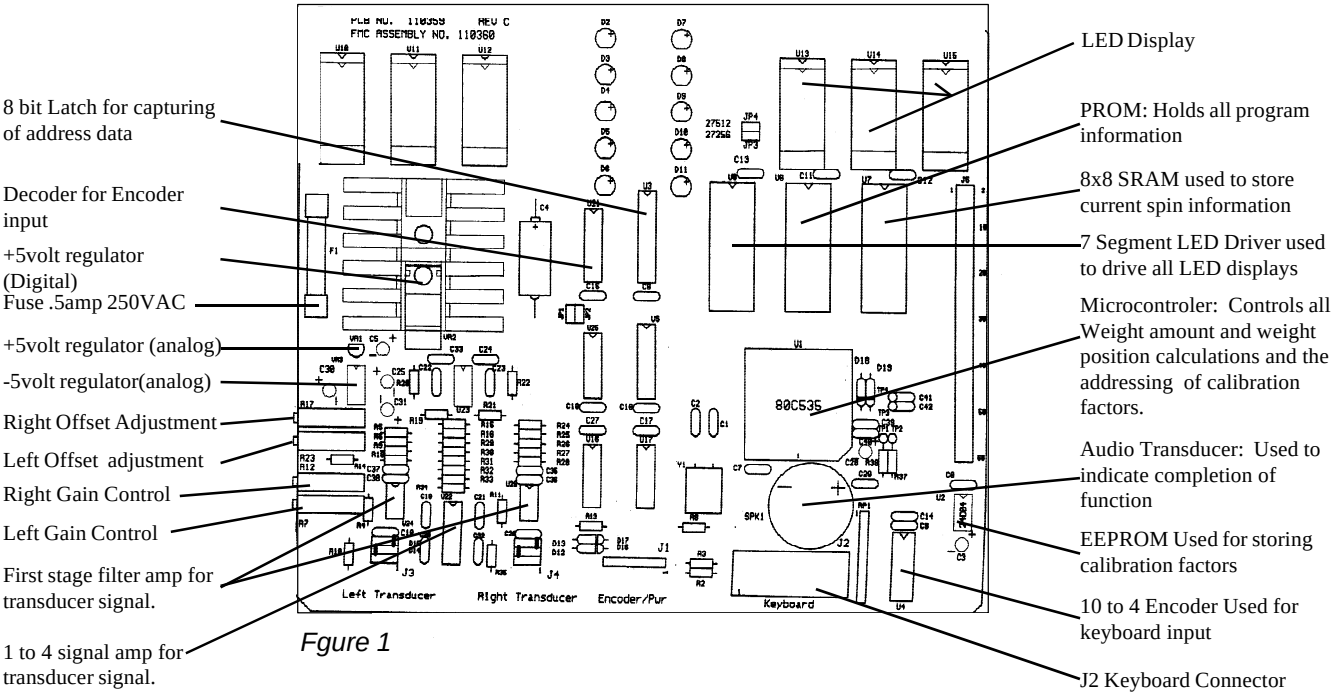
**2.0 SPECIFICATIONS:**

Types of Balance: 2 Static and 6 Dynamic Modes
Accuracy: 0.1 oz. (2.8g)
Spin Cycle Time: Depends on size of tire and spin strength
Rim Width: 3"-19" (76-483mm)
Rim Diameter: 8"-24" (203-610mm)
Tire Diameter: 44" (1112mm)
Tire Weight: 154 lbs. (70kg)
Shipping Weight 275 lbs. (125kg)
Shipping Volume 20.5 cu.ft. (.5 cu.M.)



# 3.0 4200 SYSTEM(S) EXPLANATIONS

## MICROCONTROLLER PRINTED CIRCUIT BOARD




*Fgure 1*

## 3.1 Microcontroller PCB Functions

- Receives Analog Data from Crystal pickups, determining weight amount calculations.
- Receives Digital data from Encoder System for determining weight position and shaft rotation speed.
- Processes Analog and Digital Data through summing circuits.
- Stores input data in Ram and challenges calibration factors stored in EEPROM.
- Receives keyboard input and accesses ROM for program routine.
- Provides output through the LED readout, color position LEDs and piezo speaker.
- Provides diagnostic codes and readings stored in ROM.
- Allows manual calibration of the gain and offset adjustments for the pickup amplifier.
- Regulates voltage and provides fused protection for all digital circuits.

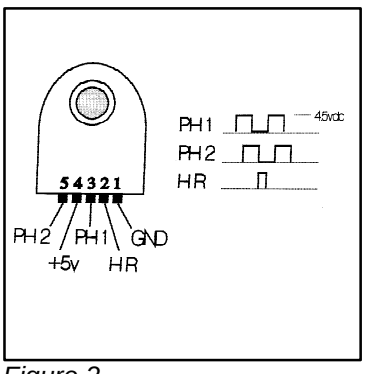



*Figure 2*

## 3.2 Encoder

- Phase 1 and 2 are responsible for locating the position of the imbalance.
- Home reference is used to sense shaft movement and provide this input to the Mircrocontroler.
- Stabilizer arm is used to ensure the encoder does not rotate.
- Uses 100 windows which is multiplied 4 times by the computer to give a reading of 400 (0 to 399) or a resolution of .9 degrees.

**3.3 Brake system :** Used to stop the tire's rotation during any part of it's spin cycle. The brake is also used to hold the wheel in position during weight placement. It is critical the brake pad does not touch the flywheel during the balancer's spin cycle.

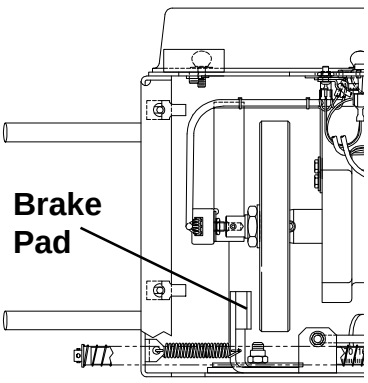



***Figure 3***

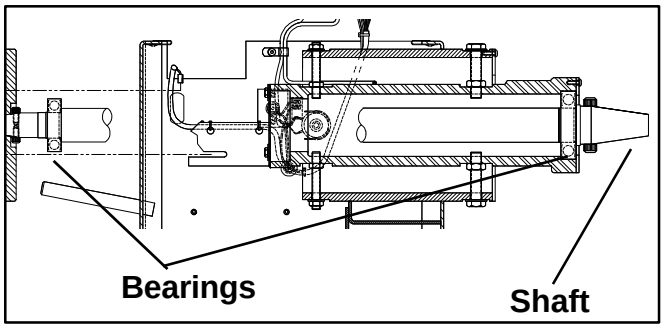



***Figure 4***

**3.4 Shaft and Bearings:** Are designed to operate in a noise free environment. The shaft is balanced to within 0.03 ounces at the time of manufacturing. The bearings are Ball bearings which are shielded not sealed. Sealed bearings induce noise in the system and would not allow the bearings to operate smoothly. A grease coating is applied to the bearings, shaft and bearing housing to help eliminate noises which could interfere with the operation of the balancer.

Locktite should not be used to hold the bearings in place.

The shaft and bearings are available only as an assembly.

**3.5 Transducers:** Are used to provide imbalance information to the Microcontroller. The input information is a voltage which varies in amplitude depending on the amount of force being applied. The transducer information is also used to determine when the shaft is in a free spin mode. The Microcontroller will begin calculating weight amount readings once the proper transducer input is provided.

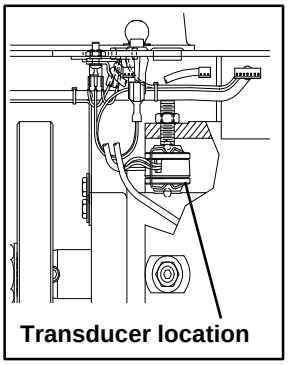



***Figure 5***

The transducers sense the amount of force being applied while cranking. This information of a repetitive static imbalance coupled with the shaft speed information being provided by the encoder will activate the audio beeper, the position LEDs and the dash display appears in in all windows which tells the operator to let go

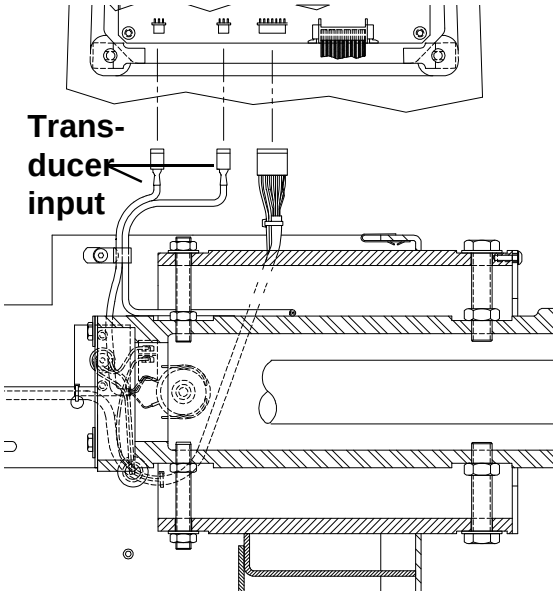



***Figure 6***

of the crank and allow the balancer to free spin and begin taking its readings.

**3.6 Touch panel:** Used for the entry of all commands to the microcontroller. It consists of a metal plate for the mounting of the printed circuit board and a vinyl overlay with an eleven conductor ribbon cable. Twisting or crimping the ribbon cable will damage the conductors. Striking the touch panel with anything other than a finger may damage it.
Clean the touch panel with a dampened cloth of mild ammonia or use a lanolin based hand cleaner without grit. Don't use harsh chemicals to clean the touch panel.
Refer to the Operators Manual for touch panel operation.

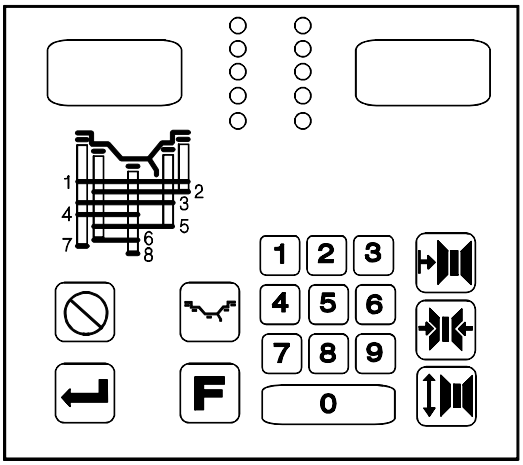
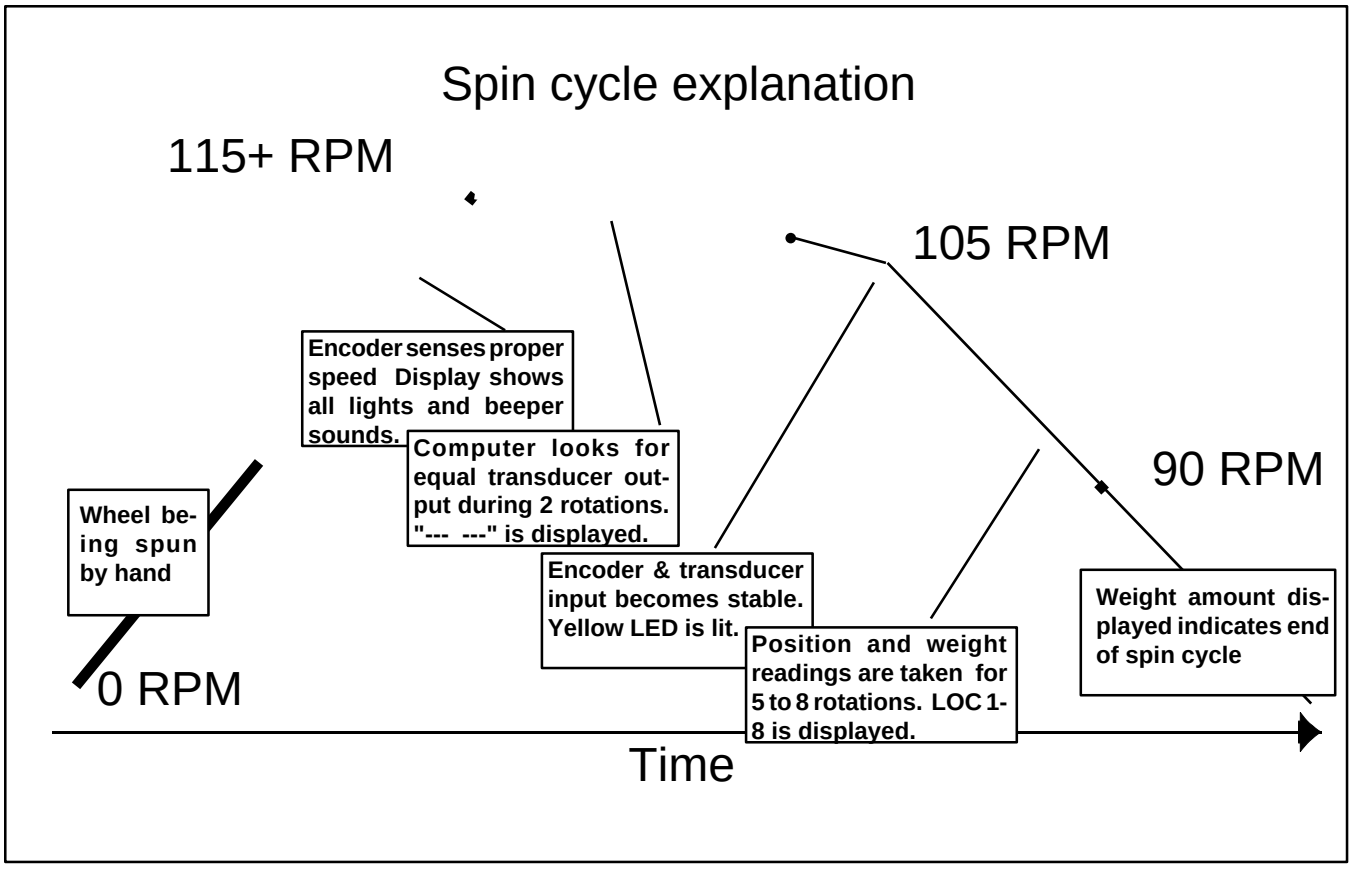



***Figure 7***




**4.0 Spin cycle explanation**

# 5.0 4200HS Self diagnostic "F" Codes

The 4200HS incorporates self diagnostics to assist the user and technician in troubleshooting, calibration and repair.

## 5.1 F0 - RE-CALCULATE AND DISPLAY WEIGHT AMOUNT FROM LAST SPIN.

Data from the last spin in current memory is used with any new parameters or set-ups to display new weight amounts. Current memory is maintained until the next spin cycle or until the unit is turned off.

## 5.2 F1 - BALANCER CALIBRATION

(BASIC END-USER CALIBRATION)

A wheel must be mounted on the balancer to perform this calibration. It need not be perfectly balanced, but if not balanced to within 1.0 ounce in each plane, the calibration routine will call for the operator to more closely balance the wheel and begin again. The parameters of the wheel must be entered into the balancer prior to beginning the calibration.

Press "F1 ENTER"

A: **If EEPROM has not been initialized (this is the first time the board has been calibrated), then the balancer will first ask for calibration of the distance gauge as follows:**

1 "CAL DIS" will be displayed.
2 Press "ENTER".
3 Initialization calibration distance value (140) will be displayed.
4 Measure to left face of the bell flange with the distance gauge.
5 Enter this number via the keyboard.
6 Perform steps B.1 through B.9.

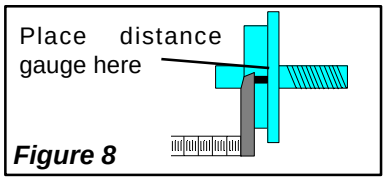


***Figure 8***

B**: If EEPROM had already been initialized, then the balancer will go directly to this procedure to set calibration factor for span and encoder (end user calibration):**

1 "CAL SLU" will be displayed.
2 Install calibration slug onto left face of bell.
3 Press "ENTER". "SLU BDC" will be displayed (Slug Bottom Dead Center).
4 Rotate the bell at least one full revolution Place the calibration slug at the 6 o'clock or bottom dead center (BDC) position. Place foot on brake to hold slug at bottom . Press "ENTER". "SPN" will be displayed.
5 Spin wheel up to speed. "—- -—" is displayed.
6 Unit will coast down, display "CAL —-" during readings, and then display "SLU OFF".
7 Remove calibration slug.
8 Spin wheel up to speed. "—- -—" is displayed.
9 Unit will coast down, display "CAL -—" during readings, and then display "CAL G".

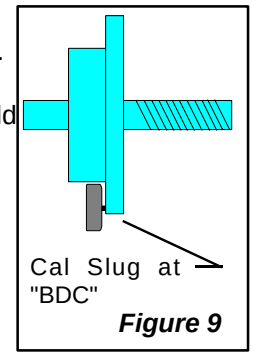


***Figure 9***

Unit is now calibrated.

NOTE - If the wheel was not balanced to within one ounce in each plane, the display will flash "CAL ER" and "BAL TIR" alternately. Press "ENTER". The wheel's imbalance readings are now displayed. Place corrective weights on the wheel, and return to step of pressing "F1 ENTER". The unit should now accept the calibration.

This information will be recorded in non-volatile memory. When the balancer is turned off and on, this information will be maintained.

## 5.3 F2 - ROUND-OFF MODE (WEIGHT AMOUNT DISPLAY)

Weight amounts are rounded off to the nearest 0.25 ounce (5 gram) increment. Imbalances of 0.30 ounces or less (8.5 grams or less) will round to zero. This is the turn-on (or default) mode.

## 5.4 F3 - NON-ROUND-OFF MODE (WEIGHT AMOUNT DISPLAY)

Weight amounts are displayed in 0.05 ounce (1 gram) increments. This setting is in volatile memory, and reverts to "F2" when the unit is turned on.

## 5.5 F4 - OUNCES MODE

Sets weight amount display to ounces. This setting is in non-volatile memory. When the balancer is turned off and on, this mode of operation will be maintained.

## 5.6 F5 - GRAMS MODE

Sets weight amount display to grams. This setting is in non-volatile memory. When the balancer is turned off and on, this mode of operation will be maintained.

## 5.7 F7 - CONVERT WHEEL DIAMETER TO MILLIMETERS MODE

Allows direct entry of metric wheel diameters (i.e. 390 mm) when balancing this type of wheel. Selecting F7 toggles between "CON ON" (dia in mm) and "CON OFF" (dia in inches).
Press any key to exit this set-up.
This setting is in volatile memory. When the balancer is turned off and back on, the setting reverts to "CON OFF" (dia in inches).

## 5.8 F8 - WEIGHT PLACEMENT ANGLE SIZE SELECTION MODE

The entry of this code causes the green light to be displayed for either one encoder count or two Selecting "F8" toggles between the following modes:

1 .When the "FIN ON" message is displayed, the balancer will then be in the fine angle resolution mode (narrow window). The resolution for the wheel weight position display is set at 0.90 degrees (one encoder count).
2. When the "FIN OFF" message is displayed, the balancer will then be in the wide angle resolution mode (wide window). The resolution for the wheel weight position display is set at 1.80 degrees (two encoder counts).

This display mode entry will be recorded in non-volatile memory. When the balancer is turned off and on, this mode of operation will be maintained.

## 5.9 F9 - "CHIRP AT TOP" TO INDICATE WEIGHT LOCATION

The entry of this code enables/disables the "CHIRP AT TOP" feature as a toggle. "CHIRP AT TOP" causes the beeper to chirp once (left plane) or twice (right plane) to indicate the location for weight placement.

1. When the "CRP ON" message is displayed, press "ENTER" the balancer will be in the chirp mode.
2. When the "CRP OFF" message is displayed, press "ENTER", the balancer will be in the silent mode.

This feature is maintained in non-volatile memory, so the preferred setting will be maintained, even when power is cycled.

## 5.10 F12 - CALIBRATE DISTANCE GAUGE

"CAL DIS" will be displayed.
Press "ENTER" and the old factor will be displayed. Place the distance gauge against the left face of the backing collar (bell). Read the distance gauge, and enter the new reading into the computer through the keyboard. The computer will automatically exit this routine when the last digit has been entered.
This data entry will be recorded in non-volatile memory.
Even though the balancer is turned off and on, this information will be maintained.

## 5.11 F20 - DISPLAY SHAFT IMBALANCE

The entry of this code causes the computer to display the shaft imbalance value which was recorded in non-volatile memory during the last shaft imbalance diagnostic procedure (F21). For this information to be meaningful, the following parameters must be entered: **(DIST=62,WIDTH=5.5, DIA=13.0)**
This information will remain the same until the F21 diagnostic procedure is run again.

## 5.12 F21 - SHAFT IMBALANCE DIAGNOSTIC

Diagnostics of the shaft's imbalance is important when troubleshooting the balancer for weight amount errors.
Mount a medium or small wheel. Enter the following wheel parameters **(DIST=62/WIDTH=5.5/DIA=13.0).**
Press F21 "ENTER". "SFT 0" will be displayed.
Spin the wheel up to speed. "CAL -—" will be displayed . The balancer references the imbalance of the shaft and wheel assembly during this spin cycle, then "COL 180" will be displayed. This is telling you to turn the backing plate COLlar 180 degrees.
Without removing the tire from the backing collar, loosen and remove the backing collar/wheel assembly from the shaft and rotate the assembly 180 degrees (An Allen wrench is provided with each balancer for the purpose of removing the backing collar assembly).
**NOTE: THE TIRE MUST NOT MOVE RELATIVE TO CLAMPED POSITION ON THE BACKING COLLAR DURING THIS PROCEDURE - DO NOT LOOSEN WING NUT.**
Tighten the backing collar/wheel assembly in the new position. Spin the wheel up to speed."CAL —-" will be displayed. The balancer references the first spin readings and compares them to the second spin readings. Thi s will determe the shaft imbalance and the readings are displayed.
Limits are 0.10 ounces statically (location 7), and 0.20 ounces in each plane (location 1). Values greater than these indicate an imbalance problem . Refer to the trouble shooting section of the service manual for more details.

## 5.13 F30 - TEST THE DISPLAY

The entry of this code causes the computer to turn on all 7 segments of each display block for 2 seconds.
Allows you to verify that all 7 segments of each LED is functioning. (all 7 segment displays show 8's).
All characters will begin to scroll across the display in sequence.
This test also verifies the computer understands input commands and has the ability to provide correct output.
Press "CANCEL" to exit this routine.

## 5.14 F31 - TEST THE KEYBOARD

The entry of this code causes the computer to display each key as it is pressed.
With "CANCEL" being the last entry to be made, you can now press each key and verify the proper response is present on the display.
Press "CANCEL" to exit this routine.

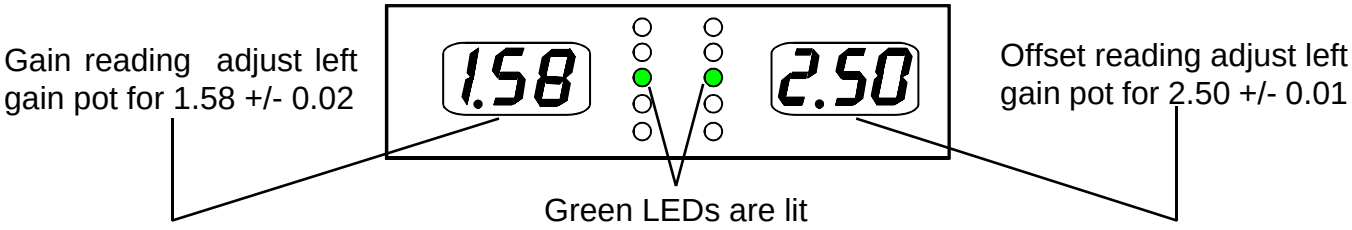
## 5.15 F40 - DISPLAY POWER SUPPLY VOLTAGE

The voltage delivered by the power source (in volts) will be shown on the display.
With new batteries or the battery eliminator, the reading should be approximately 8.50.
Low voltage is considered 7.00 or less. Refer to the troubleshooting section of this manual for more details.
This test is valid for whatever acceptable form of power source is used to supply the balancer.
Press "CANCEL" to exit this routine.

## F42 - DISPLAY LEFT AMPLIFIER GAIN AND PLATFORM

## 5.16 F42 - DISPLAY LEFT AMPLIFIER GAIN AND OFFSET

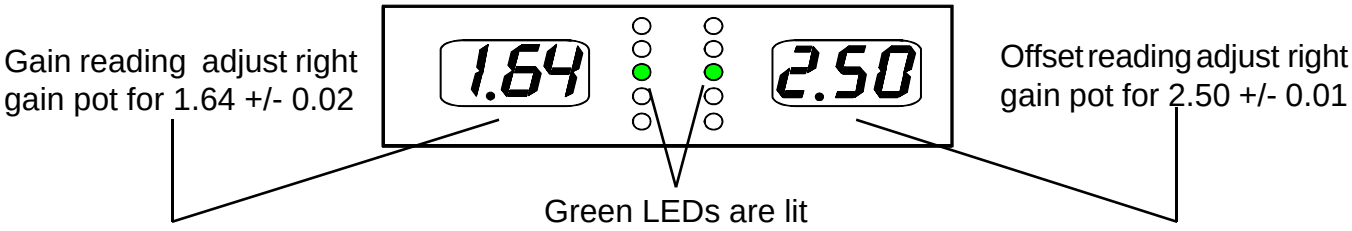
This display is used to check and calibrate the left channel amplifier gain and off set.
Note: These values are only meaningful when using a balanced wheel and the standard calibration slug.
Locate the left gain and offset adjustment potentiometers through the access plugs or on the microcontroller PCB (see figure 1). They are labeled on the back side of the printed circuit board. Adjust using a potentiometer adjustment screwdriver.
Calibrate gain and offset as follows;
Spin the wheel up to a speed . This means the red or yellow position LEDs are lit.
Allow the wheel to coast until the green LED is lit.




Observing readings.
The left display should show a gain reading centered on 1.58 +/- 0.02 (volts) when the green LED is lit.
Adjust left gain potentiometer until the proper readings are obtained .
The right display should show the value of the amplifier offset voltage centered on 2.50+/- 0.01 (volts) when the green LED is lit.. Adjust left offset potentiometer until the proper readings are obtained .
NOTE - The gain adjustment will have some effect on the offset voltage. Make sure both displays are within specification.
Press “CANCEL” to exit this routine.

## 5.17 F43- DISPLAY RIGHT AMPLIFIER GAIN AND OFFSET

This display is used to check and calibrate the right channel amplifier gain and offset
Note: These values are only meaningful when using a balanced wheel and the standard calibration slug.
Locate the right gain and offset adjustment potentiometers through the access plugs or on the microcontroller PCB (see figure 1). They are labeled on the back side of the printed circuit board. Adjust using a potentiometer adjustment screwdriver.
Calibrate gain and offset as follows;
Spin the wheel up to a speed . This means the red or yellow position LEDs are lit.
Allow the wheel to coast until the green LED is lit.




Observing readings.
The right display should show a gain reading centered on 1.64 +/- 0.02 (volts) when the green LED is lit.
Adjust right gain potentiometer until the proper readings are obtained .
The right display should show the value of the amplifier offset voltage centered on 2.50+/- 0.01 (volts) when the green LED is lit.. Adjust right offset potentiometer until the proper readings are obtained .
NOTE - The gain adjustment will have some effect on the offset voltage. Make sure both displays are within specification.
Press “CANCEL” to exit this routine.

## 5.18 F50 - DISPLAY ENCODER POSITION

Numbers between “0” and “399” will be displayed on the right display, indicating the current encoder pulse.
Dashes will be displayed on the left display, indicating phase “1” (first dash), phase “2” (second dash), and home reference (third dash) of the encoder.
Press “CANCEL” to exit this routine.

## 5.19 F51 - DISPLAY TOTAL ENCODER COUNTS IN ONE REVOLUTION

Display should read “399” when the wheel is turning.
Press “CANCEL” to exit this routine.

## 5.20 F53 - DISPLAY SHAFT SPEED IN RPM

***Spin the shaft and the RPM will be displayed. Press “CANCEL” to exit this routine.***

## 5.21 F54 - CALIBRATE ENCODER

Calibrates the encoder’s zero count..
Rotate the bell adapter one complete revolution and then press “ENTER”.
”ENC OFF” will be displayed.
Press ”ENTER” the encoder position will be displayed.
Install the calibration slug, and rotate the shaft so the slug is directly at the 6 o’clock position.
Press “ENTER” to cause the computer to record the present position as the correct encoder zero position stored in non-volatile memory and exit the routine, or press “CANCEL” to exit this routine without changing the encoder calibration.

## 5.22 F60 - DISPLAY PROGRAM REVISION LEVEL

Left hand display will show “HS”, and right hand display will show revision level (i.e. “2.00”).
Press “CANCEL” to exit this routine.

## 6.0 OTHER SELF DIAGNOSTIC CODES

**6.1 Idle mode:** is used to prolong battery life. After 15 seconds of inactivity, the display will turn off. Pressing any key or rotating the shaft will reactivate the display. If a key is pressed, this will only serve the function of reactivating the display and the key will have to be pressed a second time to perform its normal function.

**6.2 Low battery** voltage message will warn the operator if the batteries have dropped below 7.0 volts. When the unit is first turned on, the display will show “BAT LO”, and then flash for all subsequent operations. If the unit’s voltage drops during operation, the display will start flashing when the balancer is reactivated from the idle mode.

**6.3 Direction Error:** If the unit is spun in the wrong direction, “DIR ER” will be displayed.

**6.4 CAL ER** : Will flash should a error occur during the calibration procedure or should the system detect a problem when accesing the EEPROM for its calibration factors.

**6.5 BAL TIR:** Will flash during the calibration procedure should the tire and wheel assembly be greater than 1.0 ounce (10 grams) out of balance. This code means you should balance the tire and wheel before proceding with the calibration procedure. Press enter to display balance weights and perform calibration.

# 4200HS systematic troubleshooting

**Basic troubleshooting of the 4200HS:** is simplified using a systematic check of the various systems. This manual will assume the following;

1. The neccesary hand tools are available (See tool list page 18)
2. A basic understanding of systems functions.
3. The use of this manual in its entirety.

**Identify the symptom**

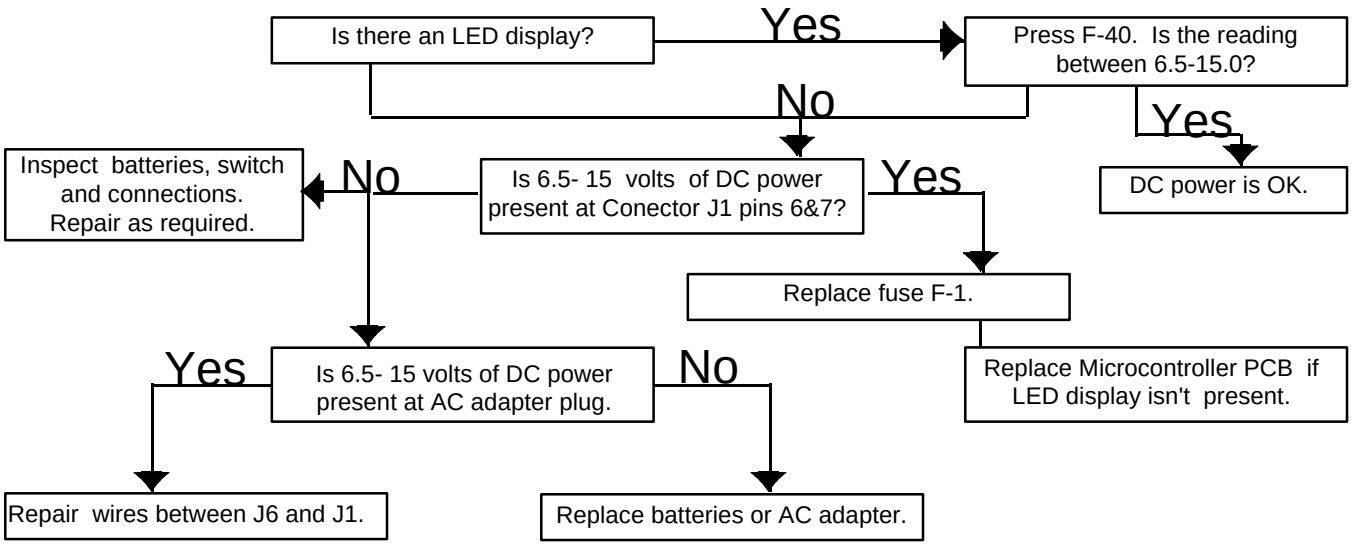
No display
No keyboard entry
No spin cycle
No position indication
No weight amount display
Requires multiple spins to balance wheel
Vibration on vehicle after balance
No brake functions

**7.0 Systematic troubleshooting:** is a recommend procedure for repairing the balancer. Follow these steps when repairing the 4200HS.

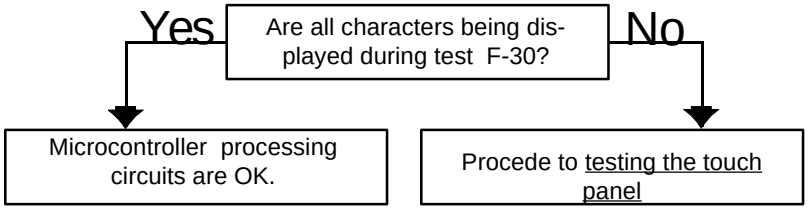
**7.1 Check AC power**:

AC power is used to power the AC adaper which converts 120/220 volts AC to DC power 7.5 volts - 15 volts depending on the output of the adapter. DO NOT assume the power outlet is good. Verify the AC output from the wall outlet by volt meter, substitution of a known good AC powered device, or the use of a polarity tester.

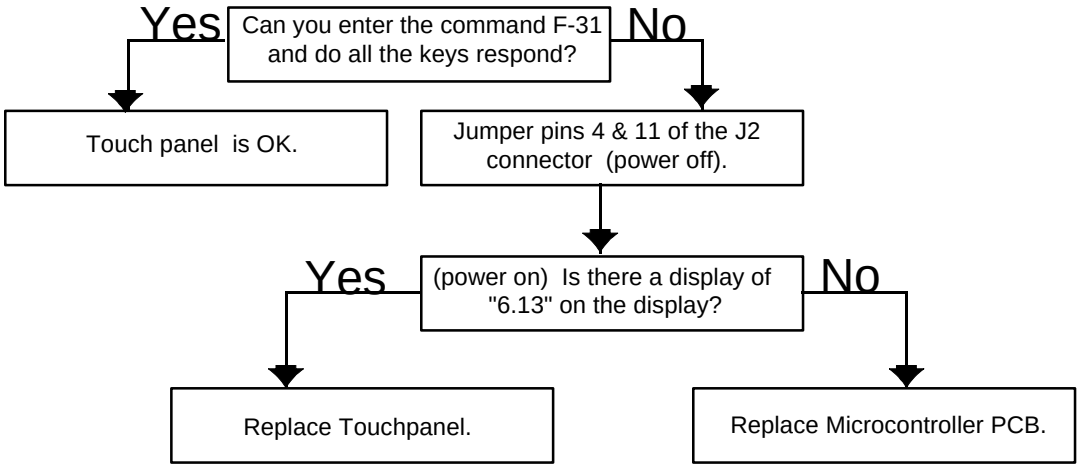
**7.2 Check DC power**: (Refer to the schematic Figure 20 of this manual).



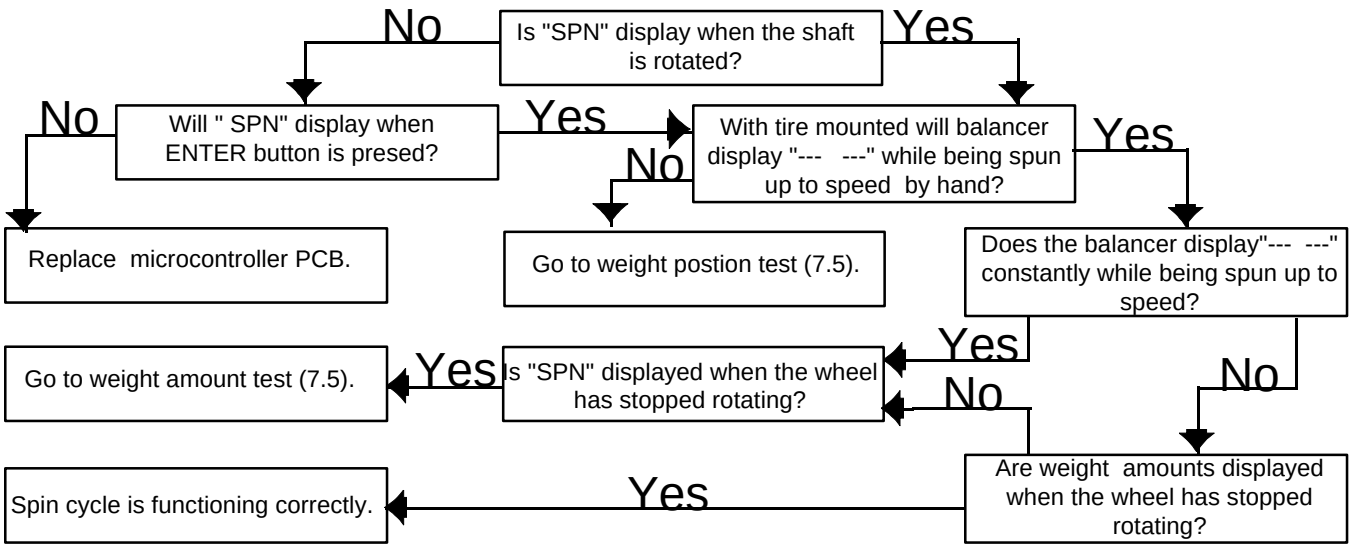
**7.3 Check computer functions:** the Microcontroller self tests itself every time power is cycled. If the CPU has found a problem in any of its address, data, or control circuits it will cease proccesing functions and the sonic beeper will begin to sound. A stuck key on the touch panel would also cause this symptom.
An easy way to test the microcontroller is to run test F-30.



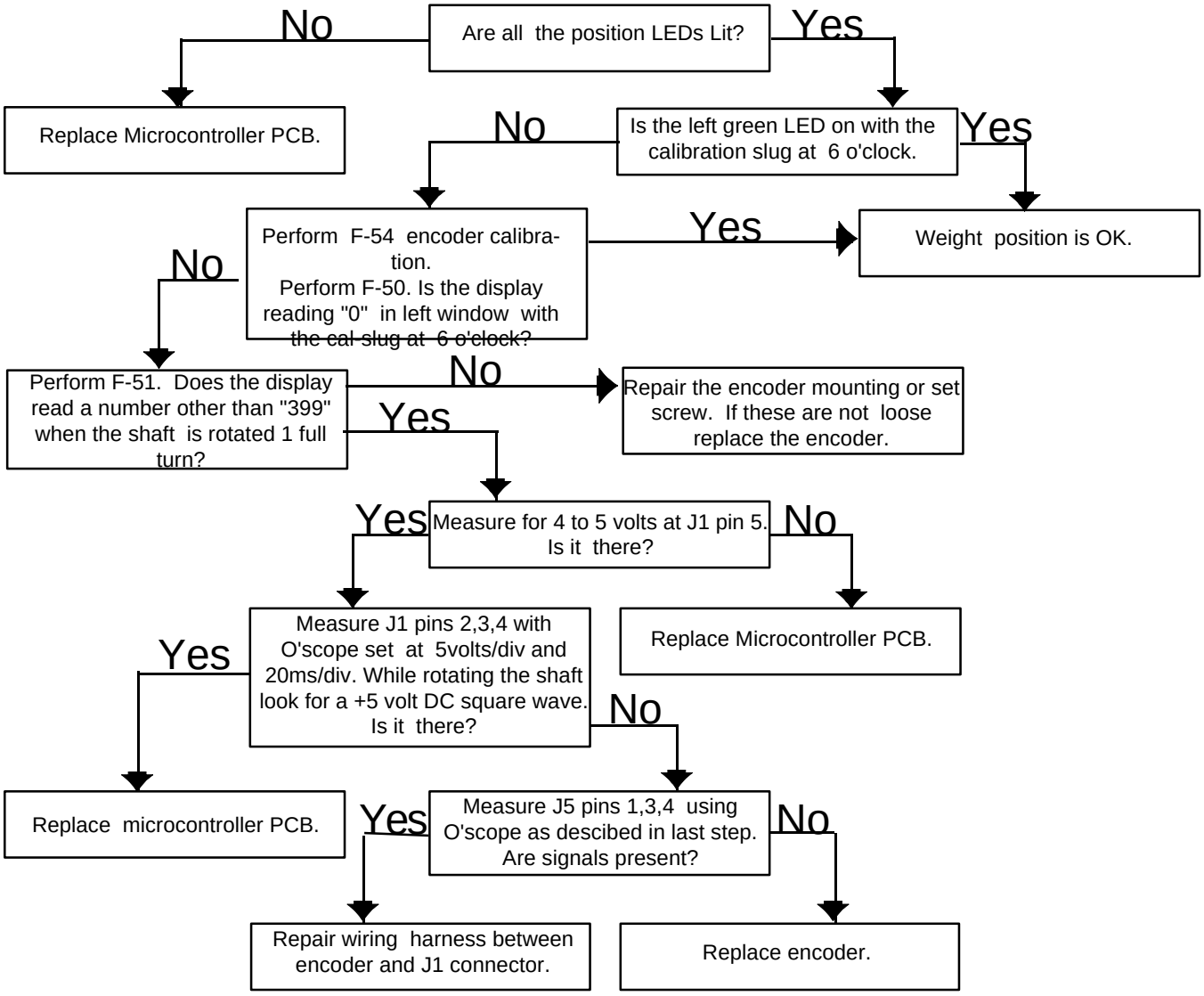

**Testing the touch panel** (Refer to figure 21)




**7.4 Spin cycle test:**



**7.5 Weight position test:** Before beginning the following tests; mount a wheel and calibration slug on the balancer. Turn the balancer on and spin the wheel using the "location 7" balancing mode.



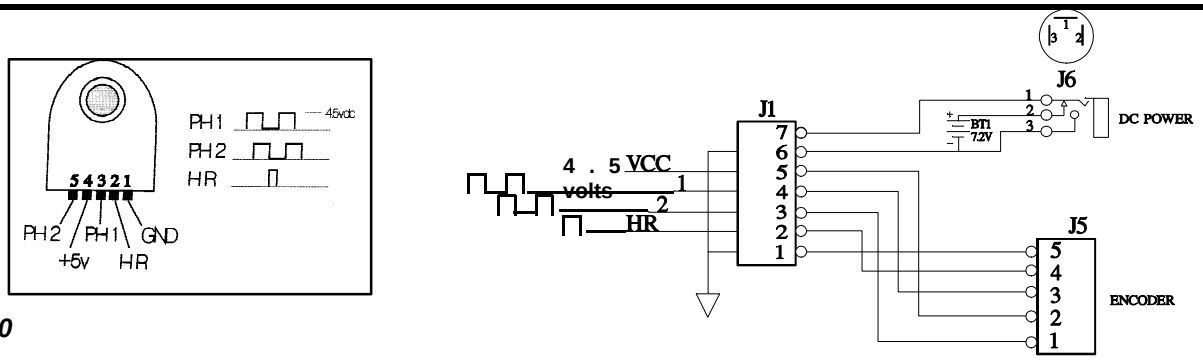
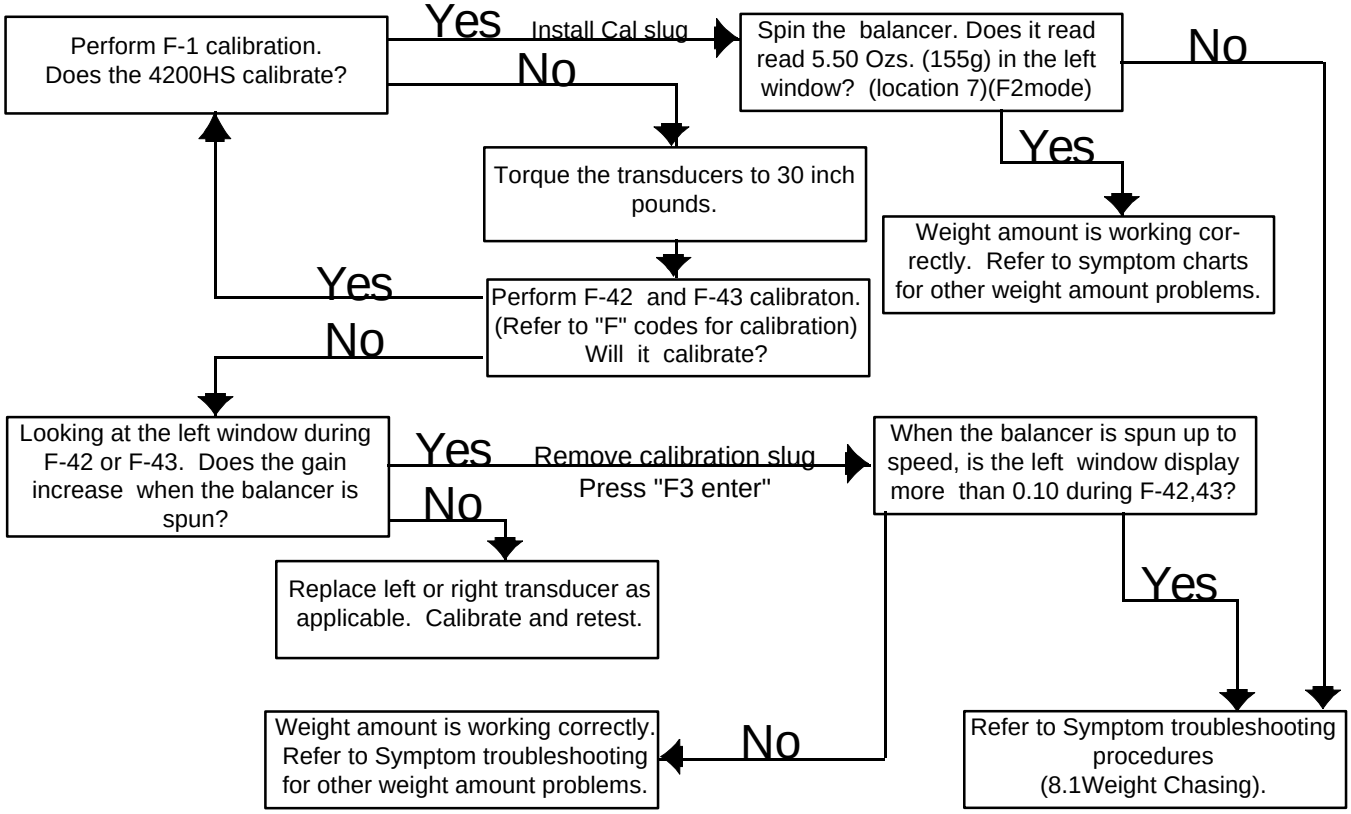




***Figure 10***

**7.6 Weight amount test:** Before beginning the following tests; mount a balanced wheel (less than 0.10 oz.) and calibration slug on the balancer. Turn the balancer on and enter the tire's parameters. Insure the balancer is in the Location 1 balancing mode except where indicated by flow chart.




Any repairs or mechanical calibrations will require complete End User calibration (F-1) before returning the 4200HS to operation.

# 8.0 Symptom troubleshooting

Symptom troubleshooting assumes all systematic troubleshooting techniques have been used and that the various systems in the balancer are in working order.

## 8.1 Additional weight needed to balance tire. (Weight Chasing)

Static weight chase.

Using a balanced wheel assembly, enter the tire's parameters.
Place the cal slug on the balancer and using location 7, spin the balancer.
If the balancer reads other than 5.50 ounces, check the following;

1. Shaft imbalance (F-20)
2. Flywheel or bell housing runout. (see 8.2 and 8.3)
3. Transducer gain and offset (F-42, F-43)

Dynamic weight chase

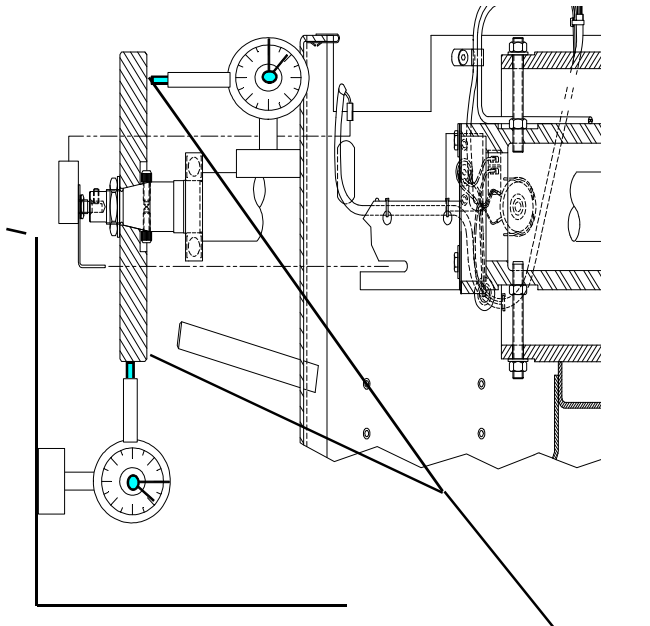
Remove the calibration slug.
Using "location 1"add a 3 ounce test weight to the inside plane of the wheel.
Spin the balancer. If the balancer reads other than 3 ounces check the following;

1. Bell housing runout.
2. Transducer gain and offset.
3. Mounting adapters
4. Transducer linearity. (the ability of the transducer to produce consistent output)
5. Distance gauge calibration or physical damage to the distance gauge.

If a reading of 3 ounces is obtained , move the weight to the outside plane. If the weight reads other than 3 ounces check the following;

1. Bell housing runout.
2. Transducer gain and offset.
3. Mounting adapters
4. Transducer linearity. (the ability of the transducer to produce consistent output)
5. Distance gauge calibration or physical damage to gauge.

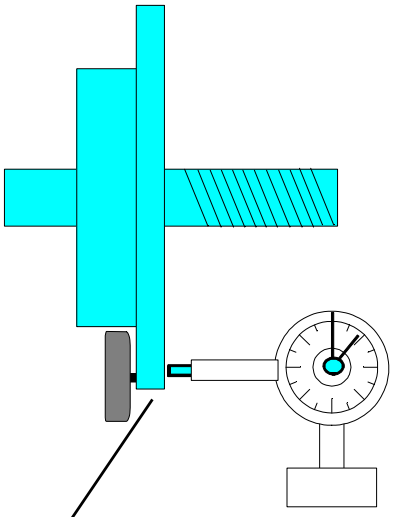
***Figure 11***



Flywheel runout not to exceed 0.001 of an inch.

## 8.2 Measuring flywheel runout

***Figure 12***



Bell housing runout not to exceed 0.002 of an inch.

## 8.3 Measuring Bell face runout

Runout should be measured when the balancer requires more than one weight per tire side to balance the wheel.

**8.4 Transducer Output:** Using Location mode 7 and F-42 for the left transducer and right transducer, check the transducer linear output in the following manner;
Use a balanced wheel

1) Spin the balancer until the green LED position indicator is lit.
Output should be 0.00 to 0.10 with a balanced wheel.

2) Add a one ounce weight to the inside plane. Refer to the chart and then to the reading.

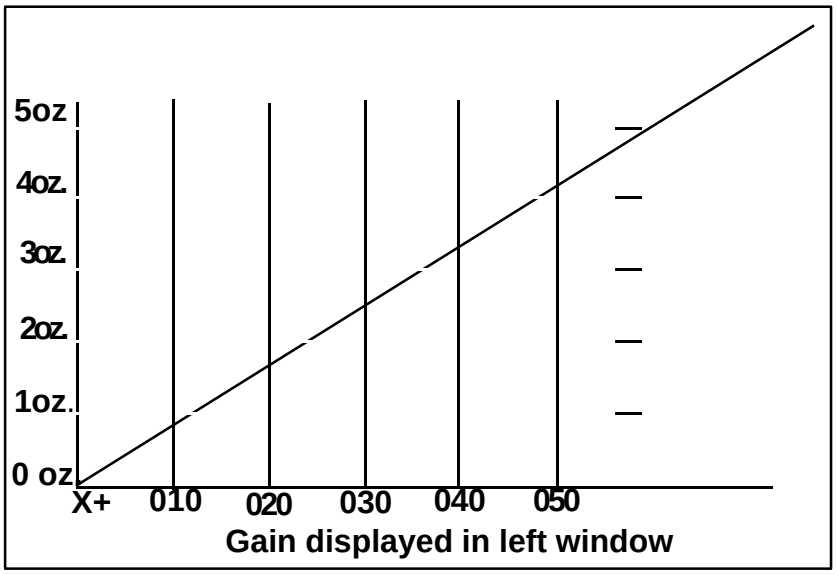
3) Continue to add weight using only 1 weight in the same wheel position. Readings should be very close +/- 0.10 to those values shown on the chart.

4) Remove the right and left transducer connections from the main PCB.
Connect the right transducer plug to the left transducer connector on the Main PCB.
Perform the steps 1 to 3.
Again the readings should compare to the chart. Numeric values may be vary but linier output should remain constant.

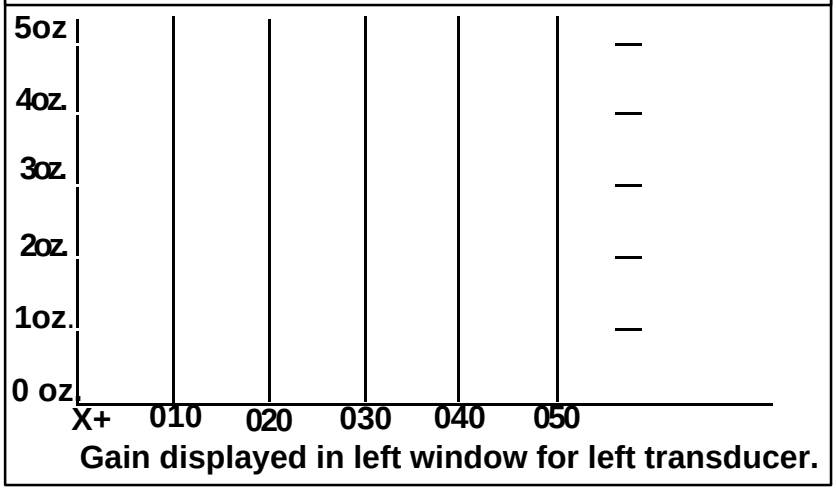
If the transducer will not give a linear output replace it. Torque the new transducer in place and re-test.

5) Be sure to calibrate (F-1) the balancer when you have completed this procedure.

Use the blank chart to record your actual readings for the left and right transducers.




**Determine transducer linear output**

**8.5 Tire vibration after the balance:** Generally speaking this condition will occur in a wheel throughout all speed ranges if the balancer is not working properly.

If the condition only exists during given speed range look for:

Tire runout (radial and axial),
Bent rims
Wheels which are not hub centric. (Rims that are not centered by the center hole) and require the use of an optional mounting method.
Damaged bearing races or bent axles.

If the balancer has passed all systematic troubleshooting procedures and it appears to be functioning correctly, check the following:

1. Follow the procedures given for the F-20 and F-21 (shaft imbalance test)
2. Check cones for play when mounted to the shaft.
   **Cone tolerance is .003 inches of up and down movement on the shaft.**
3. Check the encoder's Phase 1 and Phase 2 signal to ensure they are at 90 degrees to each other. (See figure 2 and troubleshooting guide for weight position)
4. Check the torque of the suspension system bolts.

If these suggestions do not solve your problem.

## Remember

FMC is striving to be **OUR CUSTOMERS MOST VALUED EQUIPMENT SUPPLIER**.

If you requre additional assistance;
Phone our technical assistance desk at:

1-800 FMC-TEAM inside the continental United States or
1 - (501) 327-4433 for all overseas customers.

Our FAX number is (501)-450-1585

Please direct all technical questions to the attention of technical assistance.

## 9.0 Tools required to service the 4200HS

### Tools Required to service the 4200HS

**Wrenches**

5/16" or 8mm wrench or nut driver
1/2" or 13mm Wrench
9/16" or 14mm wrench
5/8" wrench
3/4" or 17mm wrench

**Allen Wrenches**

1/8" Allen wrench
5/32" Allen wrench
3/16" Allen wrench
5/16" or 8mm Allen wrench
12mm Allen wrench

**Other Tools**

Inch pound torque wrench
Foot pound torque wrench
6 inch in1/16" increments or 50mm ruler
#2 Phillips or cross tip screwdriver
Digital volt / ohm meter
Potentiometer adjustment screwdriver

### Supplies

Loctite #222 and #609
Silicone based grease (NAPA Balkamp #765-1351)
Putty for fine wheel balancing.

***A tire/wheel balanced to within 0.10 oz (1gr.) on the inside and outside or 0.20 oz. statically is required for the troubleshooting procedures.*

# 10.0 Disassembly of the 4200HS

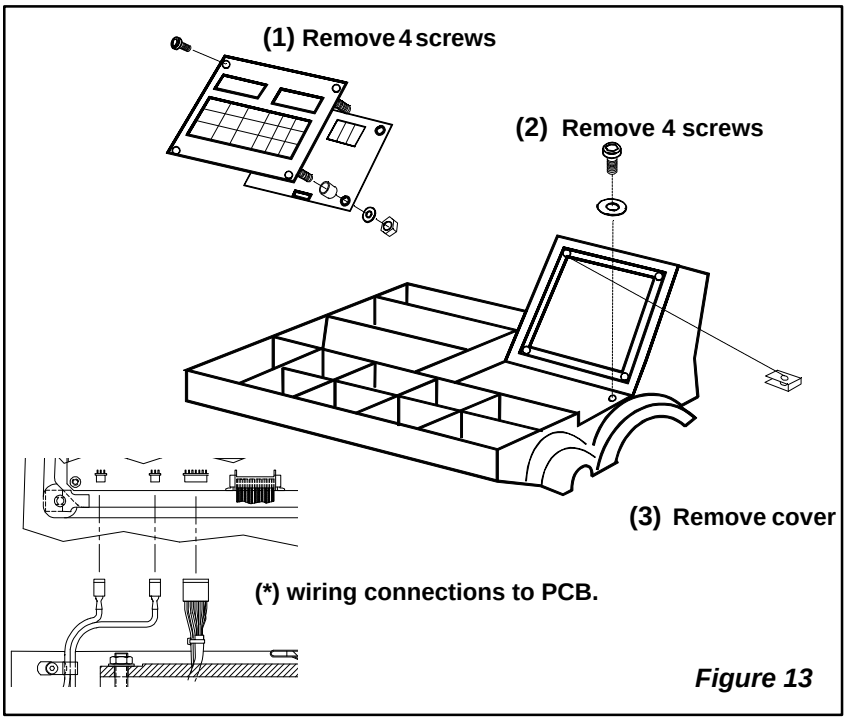


*Figure 13*

## 10.1 Remove the weight tray and Microcontroller PCB

Remove the top cover of the 4200 HS by removing the Touchpanel first. Be careful when pulling the panel back and watch for the wires which are attached to the PCB.(*)
Disconnect the wires by gently raising the connector clip and pulling back on the wire's socket. **DO NOT PULL ON THE WIRES OR ATTEMPT PULLING UP ON THE CONNECTOR.**
Squeeze the touchpanel's connector side clips and gently pull back to disconnect the flat ribbon cable.
Refer to the drawing and remove the upper cover in the numbered order. Assembly is the reverse order.

## 10.2 Removing the Encoder

Refer to the drawing and remove the encoder in the numbered order. Assembly is the reverse of disassembly. Care should be taken to insure the encoder's slotted shaft is correctly inserted in the shaft opening. The encoder should not wobble when the shaft is turned.
Once installation of the encoder is complete and power is restored to the balancer, you will need to refer to the Encoder calibration section of this manual to complete the installation procedure.

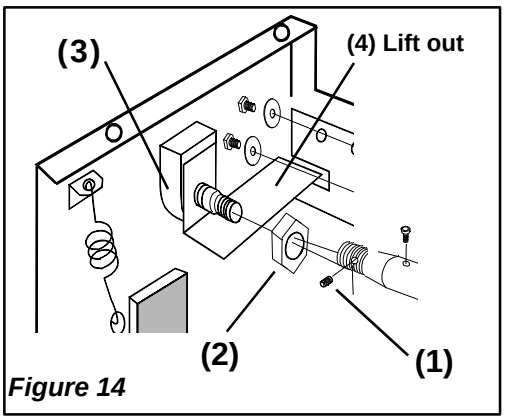


*Figure 14*

## 10.3 Transducer

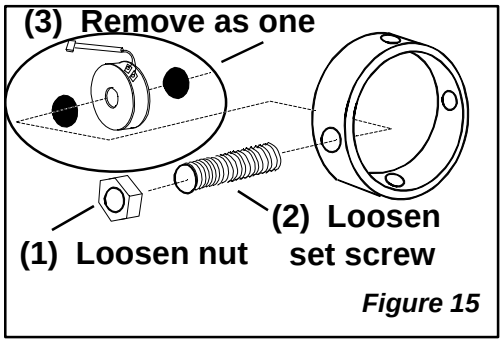


*Figure 15*

Follow the numbered sequence in the drawing for removal of the transducers. The transducers have two small balls held in position by the torque of the set screw. Grease is applied to these balls during assembly to help hold them in place.
When placing the transducer back in the machine be sure the cables are disconnected to avoid damage to the transducer and apply more grease. Torque the transducer to **30 inch lbs., loosen 1/2 turn then torque again to 30 inch pounds.** Once power has been restored to the machine refer to the F42 and F43 calibraton procedure in this manual to set ampifier gain and offset. F1 calibration must be performed after m[illegible] transducer adjustments. Remember if you were to adjust the b[illegible] support or the shaft housing this would effect transducer torque and you would need to adjust as necessary.

**removal**

## 10.4 Removing the Shaft and Bearings

Refer to the numbered sequence for removal of the shaft and bearings from the 4200HS. **!! During the removal of the shaft care should be taken to not damage the bearings through heavy impact.** The shaft and bearings are available only as an assembly.Inspect for burrs or rust in the bearing tube before returning the shaft to service. Coat the bearings and the bearing seat with silicone grease to protect the bearings from rust and eliminate noise. After complete assembly of all shaft components, refer to the shaft calibration portion of this manual. Remember to use the F-1 calibration procedure to complete the installation of the shaft and bearing assembly.

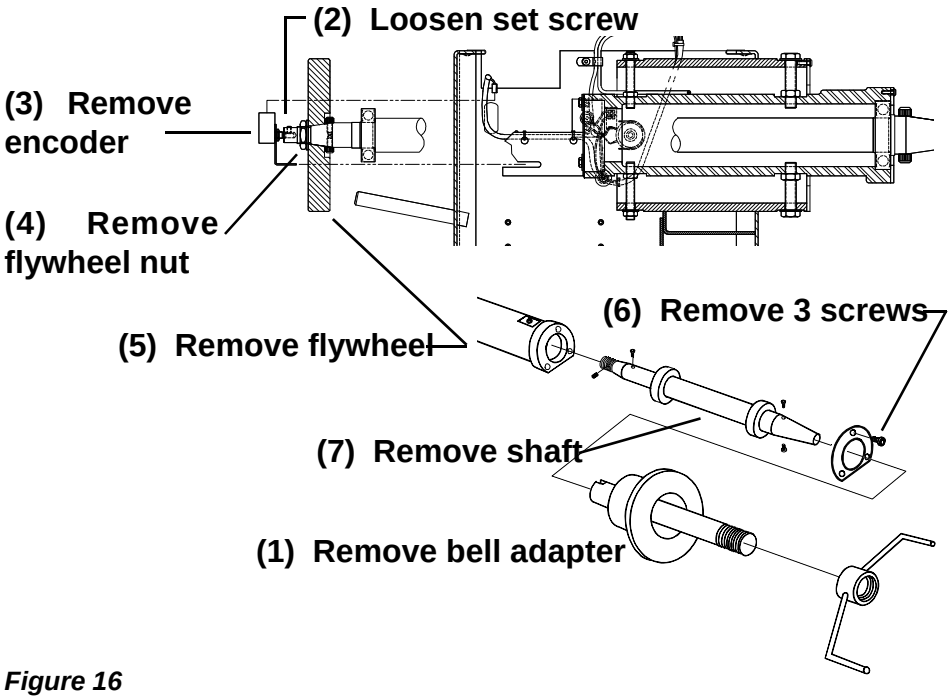



*Figure 16*

## 10.5 Brake system disassembly

Refer to the drawing to remove the brake system components. Removal of the brake pad may facilitate easier access to other systems such as the flywheel and shaft. Installation of the brake system is the reverse of disassembly. Adjust the brake pad clearence to 1/8" using the adjustment nut. Apply locktite 222 to help hold the nuts in place.

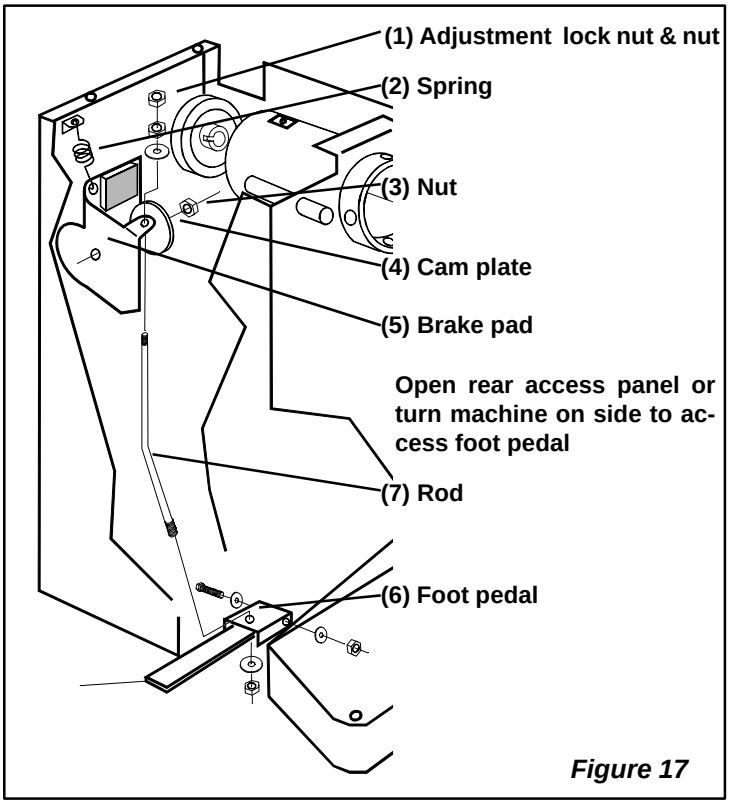
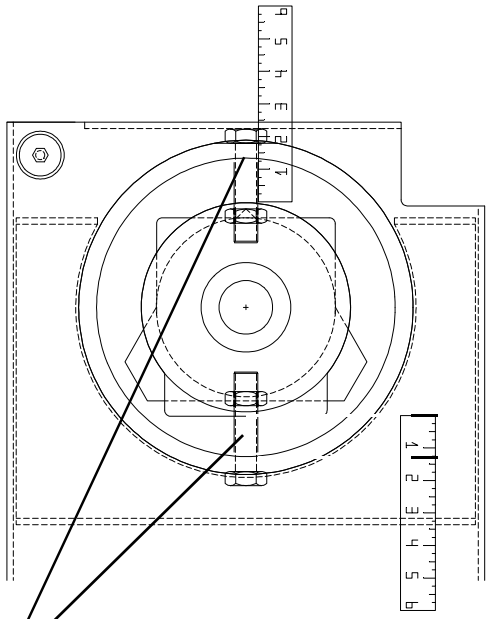



*Figure 17*

**10.6 Suspension system:** The bearing tube, shaft and bearings are designed to work in a low noise and free floating enviroment.
Limited service is required for this system.
After removal of the shaft/bearing assembly, remove the four bearing tube suspension bolts. (see drawing) Remove the tube.
Assembly of the suspension is the reverse of disassembly. Deviation of the assembly procedure will add to your assembly time.
Center the tube front and rear as shown in the picture and torque the front suspension bolts to **35 foot pounds** alternating from top to bottom one quarter turn at a time.



**Center tube in housing 1 5/16" (33mm) alternating top and bottom bolts**

*Figure 18*

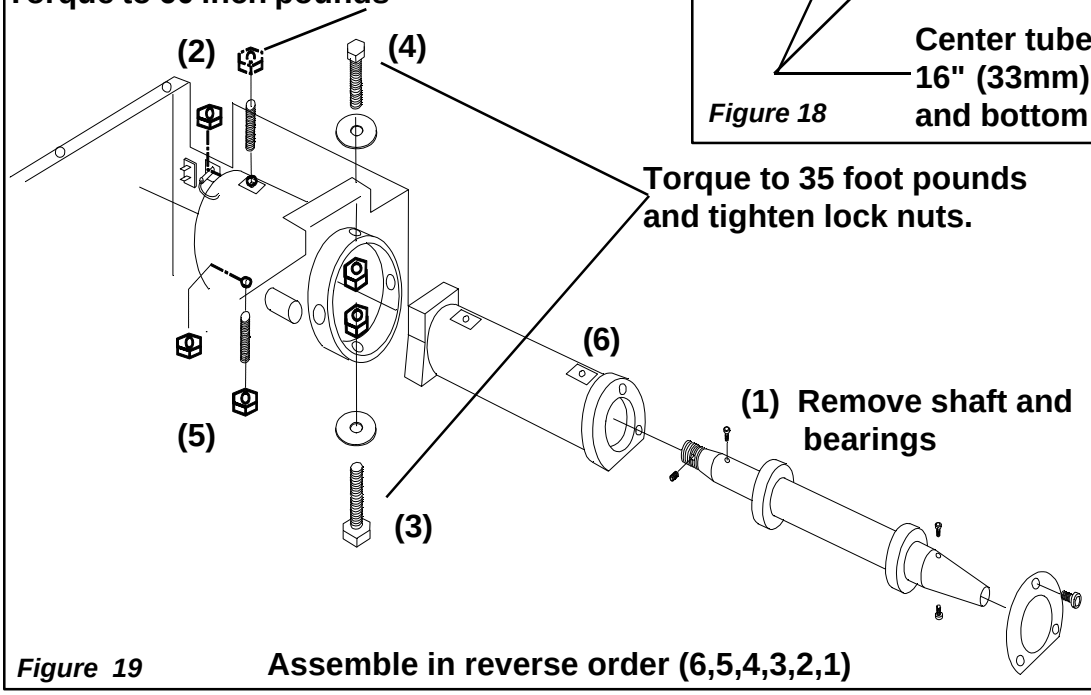



*Figure 19*

**Assemble in reverse order (6,5,4,3,2,1)**

Torque the top rear set screw to 60 inch pounds. When the proper torque has been obtained, check the bearing tube for proper centering. Adjust as necessary.

Once assembly of the balancer has been completed perform all calibration steps to the unit. Please refer to the calibration section of this manual.

# Reference drawings, charts and figures

# 11.0 4200HS wiring diagram

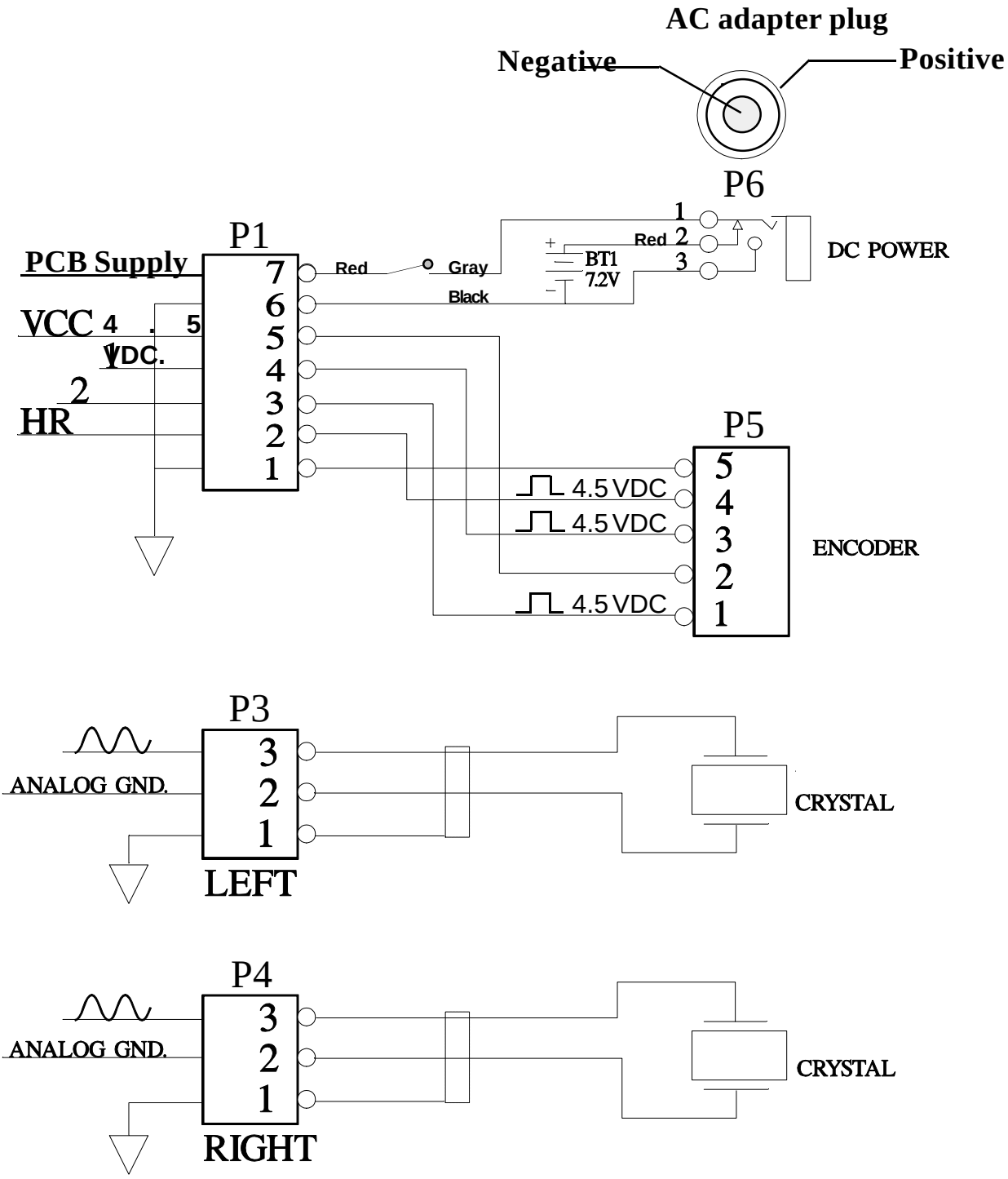
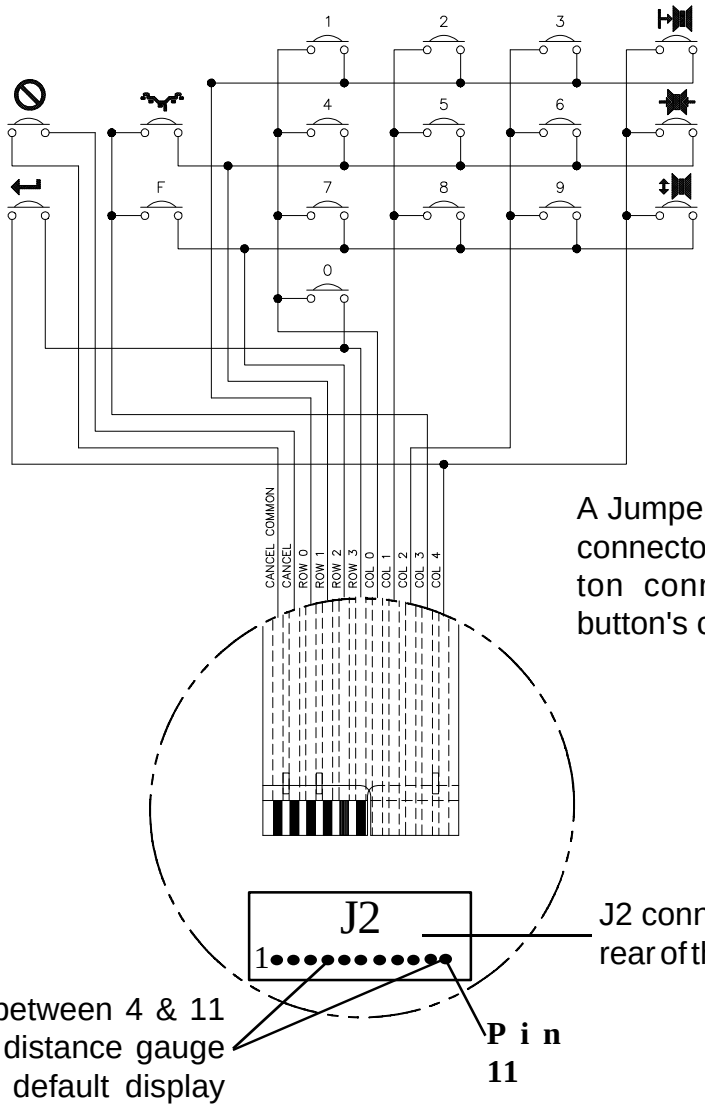



***Figure 20***

# 4200HS Touch panel layout




A Jumper wire placed on the J2 connector between any two button connections enters the button's command and display.

J2 connector as seen from the rear of the microcontroller PCB.

Jumper wire between 4 & 11 produces the distance gauge display. The default display will be "6.13"

**Figure 21**

# 4200HS Wiring harness

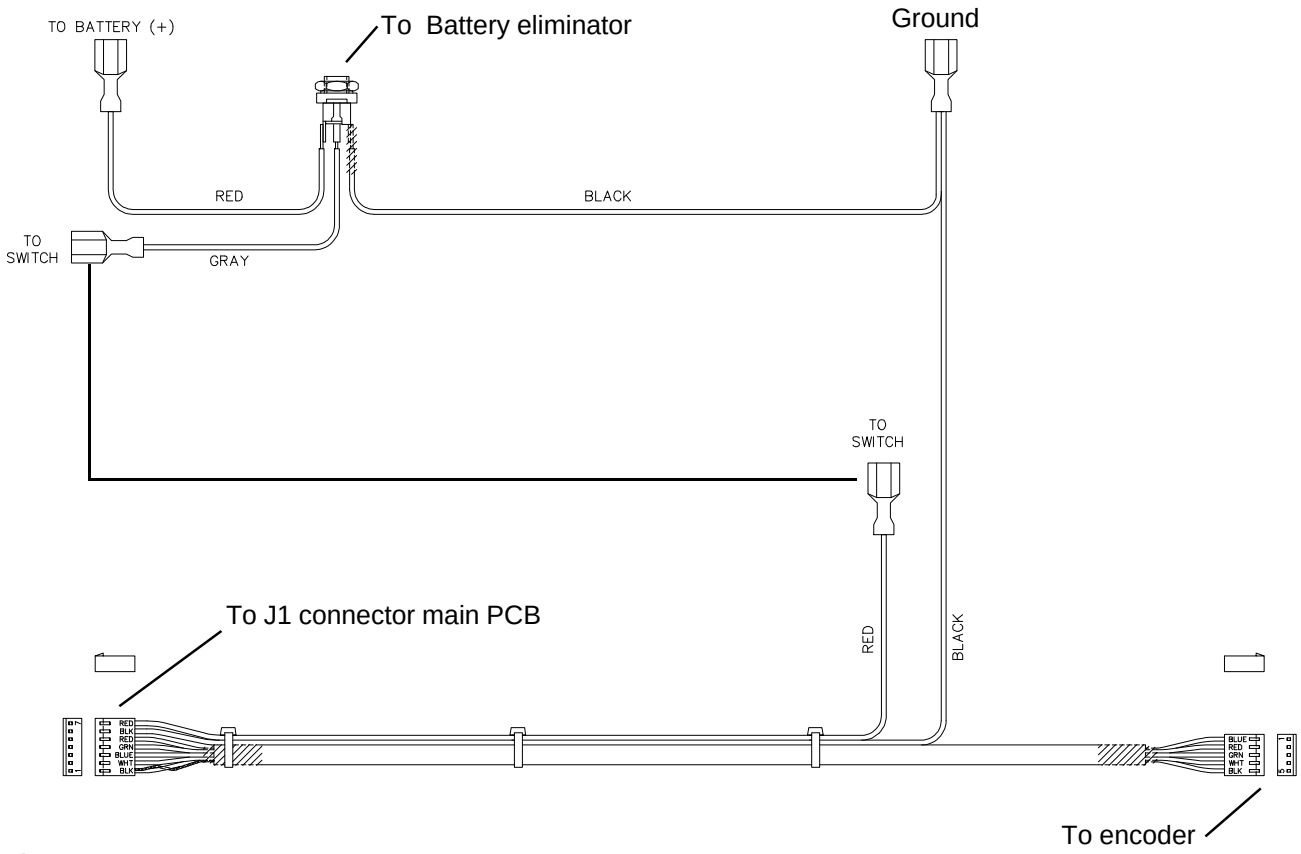



**Figure 22**