WHEEL BALANCER

EEWB502

EEWB503

EEWB304

Service Manual

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CHECKOUT, CALIBRATION AND MAINTENANCE

GENERAL

This book incorporates all motorized “Y2Kb/c” balancers manufactured in Conway Arkansas. The test codes for each digital display balancer are alike, and so are the results. The JBC balancer uses “F” to begin any service procedure, the Snapon balancer begins all service procedures with a “P” code. All “**F/P**” codes run parrallel. If a service routine is not available for any particular balancer the result will be displayed as “NOt USE”.

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 fine balanced to exactly 0.05 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. Check all mounting accessories cones, wingnut etc. making sure each fit on the shaft snug, there should be no play between the shaft and mounting accessories.

7. If the test still produces unacceptable results use 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 **F/P** 80, **F/P** 83, **F/P** 84 and a **F/P** 88 and retest. These test can be found later in this Chapter.

NOTE: A FINE BALANCED TIRE AND WHEEL ASSEMBLY ALONG WITH A 3.5 OUNCE WEIGHT CAN BE SUBSTITUTED.

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 Y2k 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, functions 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.

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.
6. Check for any registered diagnostic codes using F/P 28, in most cases these codes will point to a solution.

TOOLS REQUIRED WHEN SERVICING THE Y2K BALANCERS

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) or fine balanced
tire/wheel assembly.
3.50 ounce (100gr) wheel weight
Programmed Secure Disk (Loading Balancer Software)
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 certified Pruefrotor (Figure 3-1) will be required to confirm conformance to design specifications and certification requirements.

FUNCTIONS OF SNAPON / JBC VPI BALANCERS

All the service codes are entered using **F/P** codes. The procedure for activating an **F/P** code is described below.

1. Press and release the <**F/P**> key, the left window displays letter "**F/P**" and right window displays current **F/P** code number.
2. Press and release the **<F/P>** key, rotate the shaft to increase or decrease the number in the RH display until the desired code number is reached.
3. In general, the **F/P** code will display some brief information to the operator for 1 or 2 seconds, and the machine enters the corresponding function.

SERVICE CODES

The JBC balancer requires that the F button be pressed while the Snapon balancer uses the P button.

1	Toggle switch between fine and normal balancing mode.
2	Toggle switch between inch and millimeter display of width.
3	Toggle switch between gram and ounce display.
4	Calibration with adapter or disable adapter compensation.
7	Toggle switch of millimeter and inch for diameter measurement.
12	Read counters
14	Calibration by user
18	Enter ALU-S 2 plane mode (press the balancing mode key to exit back to the dynamic mode)
19	Enter ALU-S 1 plane mode (press the balancing mode key to exit back to the dynamic mode)
21	Check revision of balancing kernel software.
22	Power clamp lock. (JBC 3 power clamp model only)
28	Check last 10 kernel error messages & Clean all recorded error codes.
36	Toggle reading the positions and angles of left and right weights.
43	Read or reset re-setable counter.
44	Read or reset productivity of user. Display counter number of default user only.
50	Read output voltage of potentiometer of distance measurement of SAPE.
51	Read output voltage of potentiometer of the diameter measurement of the SAPE.
52	Read output voltage of potentiometer of the width measurement of the SAPE.
53	Display test
55	Check AC and DC voltages
59	Read resident imbalances of shaft in fine mode. (The fine mode LED indicator is automatically turned on and off if the machine is in the regular accuracy mode).
60	Read shaft speed RPM.
63	Continuous spin.
64	Read outputs of transducers.
79	Calibration of the width SAPE.
80	Calibration of SAPE
83	Manufacture calibration (Pruefrotor required).
84	Empty Calibration of the bare shaft.
88	Top Dead Center calibration (TDC)
90	Enter match balancing mode.
91	Optimization balancing mode.
92	Split weight mode.
94	Spoke mode.
95	Clean and reset EEPROM 1 & 2.
97	Sticky at Top.

F/P CODE DESCRIPTIONS OF THE BALANCER

F/P 1 TOGGLE FINE WEIGHT MODE

When **F/P 1** is activated, the machine displays **"FIN" "ON"** for one second (round off 0.05 oz or 1 gram). Toggle **F/P** 1 again changes back to the normal round off and display changes to **"FIN" "OFF"** for one second (round off 0.25 oz or 5 gram).

F/P 2 RIM WIDTH INCH / MILLIMETER

Selecting **F/P 2** toggles the balancer between inch and millimeters for rim width. Unit will display **"DtH I NCH"** for inches pressing **F/P 2** again toggles to millimeters and the display changes to **"DtH"** for millimeters.

F/P 3 GRAM / OUNCE

Selecting **F/P 3** toggles the balancer between Grams and Ounces. Unit will display **"OU" "NCE"** for ounce pressing **F/P 3** again toggles to Grams and the display changes to **"GR" "GR" "GR"**.

F/P 4 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. Lug-centric identifies that the tire and wheel assembly to be centered on it's axis of rotation must be mounted using the lug pattern instead of the center hole of the wheel. In this case, the adapter may introduce an unbalance to the spin system. This means that this unbalance has to be compensated for after tire unbalance is measured. This **F/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. **F/P**4 is a toggle, it is used to turn this flag off.

- After **F/P**4 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 **F/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 than 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 **<F> <4>**, or by cycling power.

F/P 7 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 millimeters instead of inches. The default is set to inches. Pressing <**F/P**7> again toggles the balancer and forth between inches and millimeters. **"DIA" "--I" "NCH"** = inches, **"DIA" "---" "---"** = millimeters.

F/P 12 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 **<F/P12>** is activated. The order of the counters.

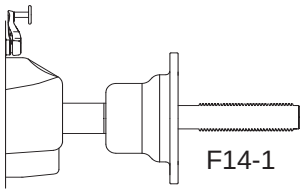
1. Display **"Ctr" "ALL"** for one second.
   Total number of spins.
2. Display **"Ctr" "CAL"** for one second.
   Total number of spins since last calibration.
3. Display **"Ctr" "SrV"** for one second.
   Total number of service spins.
4. Display **"Ctr" "USR"** for one second.
   Total number of user spins.
5. The display will cycle through continuously through each step until **"STOP"** is pressed.

F/P 14 USER CALIBRATION PROCEDURE

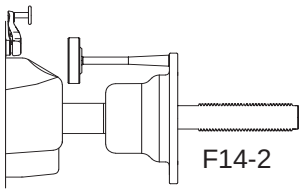
The JBC VPI and SOT balancers feature a user calibration program which requires only a few minutes to complete. Perform this procedure when the balancer has been moved, disturbed, or whenever accuracy is questioned. Occasional field calibration will ensure years of reliable service.

1. Activate Calibration. Press and release the **<F/P>** key, turn the shaft until the display reads "**F/P**" **"14"**
   - Once **F/P**14 activates, the display will read **"CAL" "GAN"** for one second.
   - The display will then read **"SPN" "1"**.

2. Spin shaft. (F14-1)
   - Lower the wheel guard and/or press the enter key. The shaft will spin.
   - Displays **"CAL" "1"** when the shaft reaches speed RPM's. The machine is taking data and doing calculations. After taking data, shaft is automatically braked to a stopped.
   - Displays **"SPN" "2"** when shaft stops.


F14-1

3. Spin shaft with calibration slug on the left side. Mount calibration slug (EAM0005D40A) to the shaft. (F14-2).
   - Lower the wheel guard and/or press the enter key. The shaft will spin.
   - Displays **"CAL" "2"** when the shaft reaches speed RPM's. At this moment the machine is taking data and doing calculation work. After taking data, shaft is automatically stopped.
   - Displays **"CAL" "FIN" "ISH"** 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.


F14-2

CALIBRATION COMPLETE

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.

F/P 18 ALU-S MODE

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

F/P 19 ALU-S ONE PLANE BALANCING MODE

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

F/P 21 KERNEL SOFTWARE

When **F/P21** is activated the machine display changes to **"REV" "ISI" "ON"** for 1 second. The display then changes to **"B" "2.0" ".10"** for 3 seconds, this is the balancer kernel revision. The display will then change to "JBC" or "SOT" "SYS" "1, 2 or 3" this is the brand. The display will then display "EEb" "XXX" "X" this is the model number. The unit will then display the user interface revision "UI" "b" "1.0". The last is the date code for the revision "Dat" 112" "607" (11/26/07).

F/P 28 KERNEL ERROR MESSAGES

Enter **F/P 28** the machine will display **"CHC Err"** for 2 seconds and then display **"Err 0"** for 1 second followed by the error code. Pressing the **<F>** again will toggle the machine to the 2nd recorded error code and so forth. The balancer can display up to 10 error codes after which the display will display **"CLN ERR"** allowing the operator to clean all recorded error codes by pressing the **<F>** the final time and clearing all codes or pressing the **<STOP>** key will cancel the "Clean" operation for further diagnostics.

F/P 36 TOGGLE ANGLES OF LEFT AND RIGHT WEIGHTS.

Begin procedure by mounting a tire and wheel assembly. Enter all wheel parameters and spin the tire and wheel assembly. After **F/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. This function is very useful to check the position accuracy. Press the **<STOP>** key to exit this function.

F/P 43 RESETTING THE COUNTERS

The counter can be reset using this code:

1. Press and release the **<F/P>** key, turn the shaft until the display reads "**F/P**" **"43"** is displayed and press enter.
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.

F/P 44 READ OR RESET PRODUCTIVITY OF USER

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

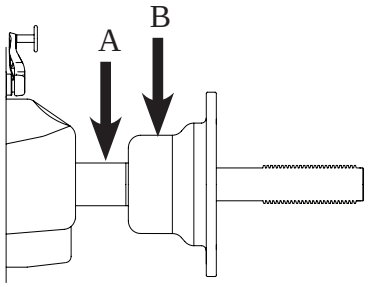
1. Choose the operator that you would like to read or reset from the main PCB by pressing the operator mode key (A,B,C or D).
2. Press and release the **<F/P>** key, turn the shaft until the display reads "**F/P**" **"44"** is displayed and press **<enter>**. The balancer will display **"A" "Ctr"** or **"B" "Ctr"** or **"C" "Ctr"** or **"D" "Ctr"**.
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.

F/P 50 READ OUTPUT VOLTAGE OF THE DISTANCE POTENTIOMETER OF SAPE

1. Slide the SAPE in the home position.
2. Press and release the **<F/P>** key, turn the shaft until the display reads "**F/P**" "50" is displayed and press enter.
3. Displays "3.10" "0.02" "3.10" With the Distance guage in the home position the voltage in the right hand display should read 3.10VDC ± 0.02. If the voltage setting is not within the tolerance the balancer will not function correctly.

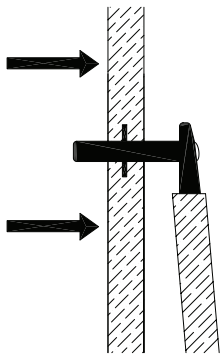
F/P 51 READ OUTPUT VOLTAGE OF THE DIAMETER POTENTIOMETER OF SAPE

1. Move the SAPE in the losest position.
2. Press and release the **<F/P>** key, turn the shaft until the display reads "**F/P**" "51" and press enter.
3. Displays "3.10" "0.05" "3.10". The voltage should read 3.10VDC ± 0.05 (point A) when the SAPE is on the vibratory tube or 2.85VDC ± 0.05 (point B) when placed on the bell housing.



F 52 READ OUTPUT VOLTAGE OF THE WIDTH POTENTIOMETER

This function is only available with the JBC VPI System III balancer.



1. Slide the SAPE in the home position.
2. Press and release the **<F>** key, toggle the **<UP / DOWN>** arrow keys until **"F" "52"** is displayed and press enter
3. Displays **"A8" "dTH"** and then changes to **"3.15" "0.05" "3.10"** The voltage should read 3.15VDC ± 0.05 in the home position and greater than 0.20VDC when the tip of the SAPE arm is touching the backing collar.

F/P 53 DISPLAY TEST

Used to diagnose the display panel. Once activated the display will either scroll a message or all LED's will light up. Pressing **<STOP>** displays **"Goo" "_d_" "ByE"** and cancels this test.

F/P 55 CHECK AC AND DC VOLTAGES

Press and release the **<F/P>** key, turn the shaft until the display reads **"F/P" "55"** and press enter. Machine displays **"POr VOL tSt"** for one second, the display toggles between AC voltage and DC voltage. Example: "AC 230" and "dc 5.15". Although some machines require only 120VAC the machine still displays AC 230 volts, the step up transformer generates 230VAC on these units. Press STOP button to exit this function.

F/P 56 CHECK PEDAL AND HOOD SWITCHES ON POWER CLAMP

Press and release the **<F/P>** key, turn the shaft until the display reads **"F/P" "56"** and press enter. Depending on the type of vibratory will depend on the status. Power Clamp vibratory will measure the status of the Hood switch and both pedal switches. Units without the power clamp vibratory will measure the status of the hood switch only.

Display	Left Window	Status	Display	Right Window	Status
Hd	▬	Hood Up	Ped	▬	Pedal Up
				▬	Pedal static
	▬	Hood Down		▬	Pedal Down

F/P 59 DISPLAYS THE UNBALANCE OF THE BARE SHAFT

Press and release the **<F/P>** key, turn the shaft until the display reads "**F/P**" "F" "59" is displayed and press enter. Display should read 0.10 or less. Anything greater than .10 requires bare shaft calibration F84. Press <STOP> to exit this function.

F/P 60 READ SHAFT RPM

This test displays the motor RPM, a reading of 190 RPM's +/- 10 on a VPI III and SOT Low Digital or 90 RPM's on a VPI I,II. It is recommended that a tire and wheel be used for this test. Press "STOP" to exit this function.

F/P 63 CONTINUOUS BALANCING

Mount a tire and wheel assembly. Activating this code puts the balancer in a continuous spin cycle and updates the amount of imbalance every 5 seconds. Press <STOP> to cancel this test.

F/P 64 DISPLAYS THE TRANSDUCER OUTPUT

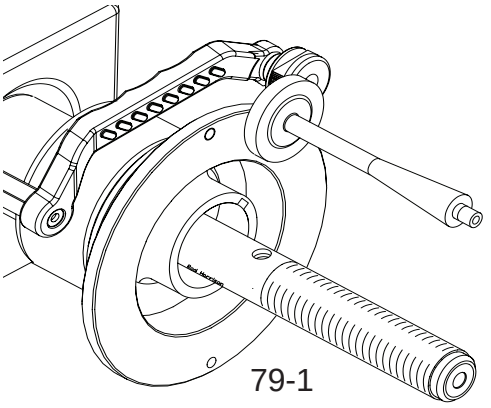
Transducer output should be steady. Any slight vibration of the unit should cause the readings to fluctuate. After activating **F/P** 64 the display will change to "ADE" "1-2" "___" for one second. By forcing the shaft rearward the read should display negative, forcing the shaft forward the reading should display a positive voltage. Press the **F/P** key to toggle to the front transducer (2).

F79 CALIBRATION OF WIDTH SAPE

Note: This procedure is part of the F80.

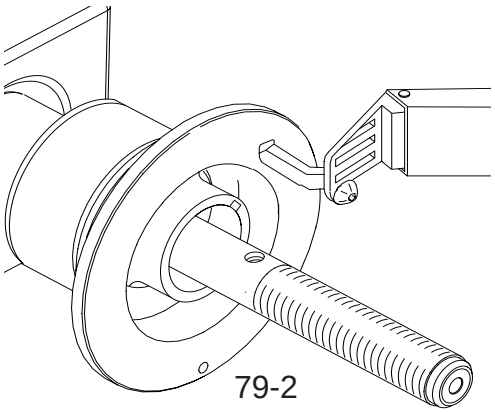
1. Press and release the <F> key, toggle the <UP / DOWN> arrow keys until “F” “79” is displayed and press <ENTER> to activate function of F79. Once activated the display will change to “CAL” “SAP” “E2” for one second and the changes to “DIS” “tO” “FLA”.

2. Pull the distance gauge to the outside flange of the backing collar, use the flat head of the calibration weight as an index (Figure 79-1). After a short beep the machine displays “bAC” “H” “POS” and changes to “tO” “FLA” “NGE”.



79-1

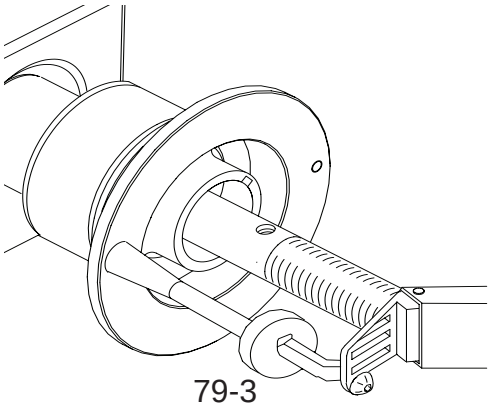
3. Touch the tip of the width gauge to the face plate and hold it for one second or press the <F> button (Figure 3-5). The display will change to “bAC “H’ ‘POS” followed by a tone. Return the SAPE arm to the home position.



79-2

4. Display will then change to “tO” “CAL” “SLG”. Screw the calibration weight onto the outside of the flange. Touch the tip of the width gauge to the tip of the calibration slug and hold it for one second or press the <F> button (Figure 79-3). The display will change to “SAP” “E-2” “FIN” for one second followed by a tone indicating a successful calibration. Unit will then go into an idle state.

CALIBRATION COMPLETE



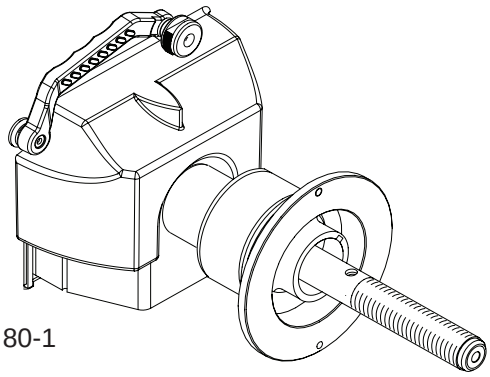
79-3

F/P 80 SAPE GAUGE CALIBRATION

To calibrate the SAPE gauge.

1. Make sure the SAPE arm is in the home position as shown in (80-1).

   NOTE: WEIGHT TRAY MUST BE INSTALLED



80-1

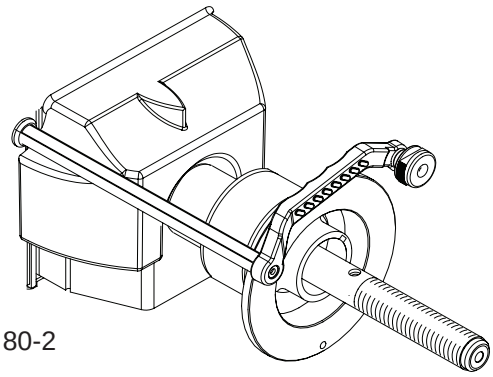
2. Activate the gauge calibration program. Press and release the **<F/P>** key, turn the shaft until the display reads "**F/P**" 80 is displayed on right display window and press enter.

3. The right display will read **"CAL" "3-D" "SAP"** for one second (Do not move the arm at this point) this means CALibration SAPE. Then it displays **"SAP" "OUT" "FUL"**. The SAPE calibration procedure is activated.

4. Gently pull the SAPE arm OUT until it is fully extended (80-2), hold it steady for about 1 second, a tone will sound.

5. Display will read **"bAC" "H" "POS"** followed by a beep. Return the arm to the home position.

   NOTE: STEP 5 IS THE FINAL STEP FOR A VPI SYSTEM I BALANCER.

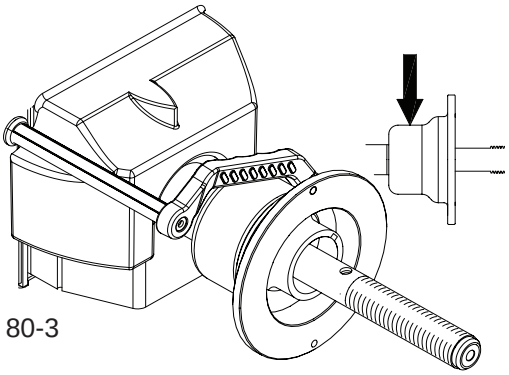


80-2

6. Display changes to **"dIA" " -18" "POS"**.

7. Gently pull the SAPE out and rest the arm of the SAPE gauge on the bell housing (80-3). A tone will sound and the display will change to **"bAC" "H" "POS"**.

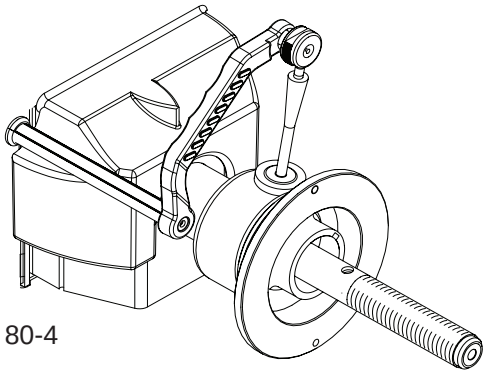
8. Return the arm to the home position. The display will change to **"dIA" "42.1" "POS"**.



80-3

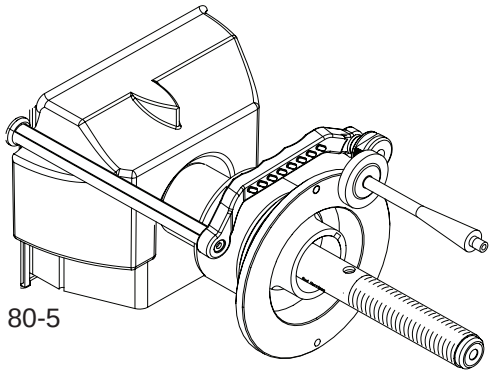
9. Locate the Calibration Weight. Place the calibration weight with the large end oriented on the bell collar. Extend the SAPE arm outward and rotate the extension to just touch the end of the calibration weight (80-4). A tone will sound and the display will change to **"bAC" "H" "POS"**. Return the SAPE arm to the home position.

   NOTE: THE REMAINING STEPS APPLY ONLY TO THE VPI SYSTEM III BALANCER.



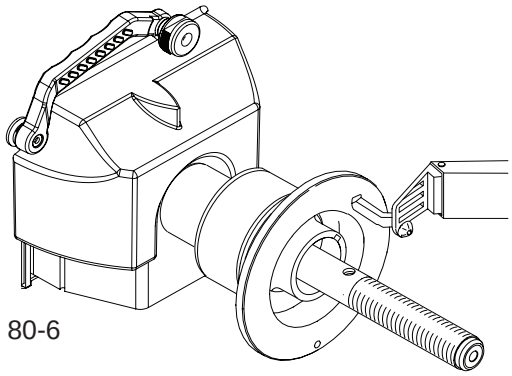
80-4

10. The display will change to **“SAP” “E-1” “FIN”** for one second and the changes to **“dis” “to” “FLA”**.
11. Pull the distance gauge to the outside flange of the backing collar, use the flat head of the calibration weight as an index (80-5). After a short beep the machine displays **“bAC” “H” “POS”** and changes to **“tO” “FLA” “NGE”**.



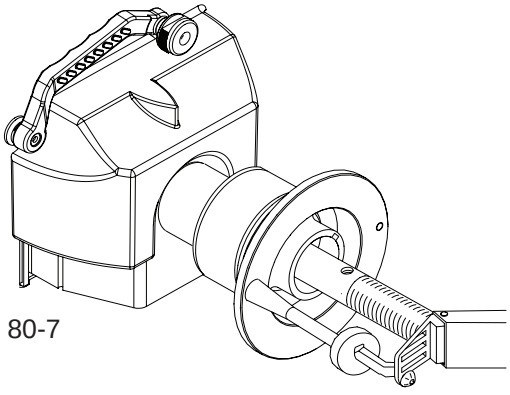
80-5

12. Touch the tip of the width gauge to the backing collar and hold it for one second or press the **<F>** button (80-6). The display will change to **“bAC “H’ ‘POS”** followed by a tone. Return the SAPE arm to the home position.



80-6

13. Display will then change to **“tO” “CAL” “SLG”**. Screw the calibration weight onto the outside of the flange. Touch the tip of the width gauge to the tip of the calibration slug and hold it for one second or press the **“F”** button (80-7). The display will change to **“SAP” “E-2” “FIN”** for one second followed by a tone indicating a successful calibration. Unit will then go into an idle state.



80-7

CALIBRATION COMPLETE

F/P 83 FACTORY CALIBRATION PROCEDURE

NOTE: THE F80 CALIBRATION MUST BE DONE BEFORE THIS OPERATION.

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

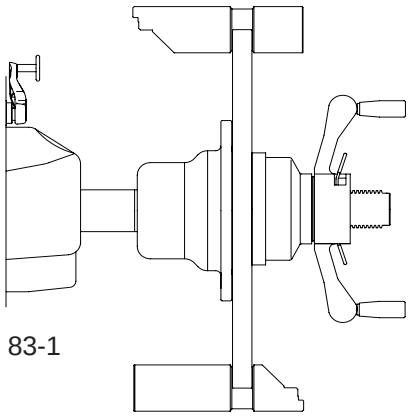
Beginning with a balanced Tire and Wheel assembly

- 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 release the **<F/P>** key, turn the shaft until the display reads “**F/P**” “83” is displayed and press <ENTER> to activate function of **F/P** 83.
- After entering the **F/P**83 function the balancer will automatically switch to default parameters (15” X 6.5”).
- Press the <**F/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 <**F/P**> button again will toggle the unit back to factory defaults.

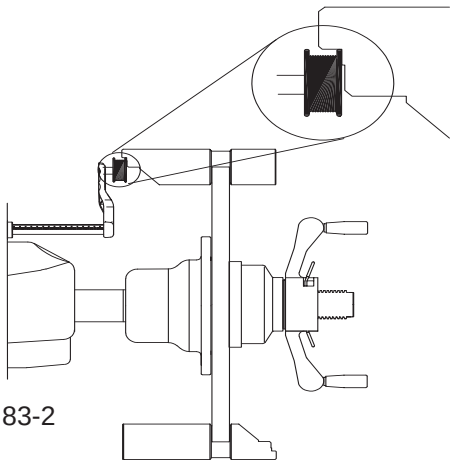
NOTE: IF A TIRE AND WHEEL ASSEMBLY IS USED PROCEED TO STEP 6.

Beginning with a Pruefrotor

1. Mount the Pruefrotor on the balancer shaft (Figure 83-1)
2. Pull the distance gauge arm out and touch the Pruefrotor (Figure 83-2).
3. Return the Distance Gauge to the home position.
4. Press and release the **<F/P>** key, turn the shaft until the display reads “**F/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.



83-1



83-2

7. Attach the 3.5 ounce weight (100 gr) on the inside of the Pruefrotor/Tire & Wheel. (Figure 3-15)
   - 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.

8. Attach the 3.5 ounce weight (100 gr) on the outside of the Pruefrotor/Tire & Wheel. (Figure 3-16)

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.
   - Display then changes to “**F/P**” “CNT” to prompt operator to press the <**F/P**> key to continue calibration, or operator can press the <STOP> key to exit out of calibration, basic calibration is all that is performed.

NOTE: IF THIS IS THE FIRST TIME FOR FACTORY CALIBRATION AND THE OPERATOR PRESSES THE STOP KEY TO STOP THE REMAINDER OF CALIBRATION F14 WILL NOT BE AVAILABLE TO THE OPERATOR.

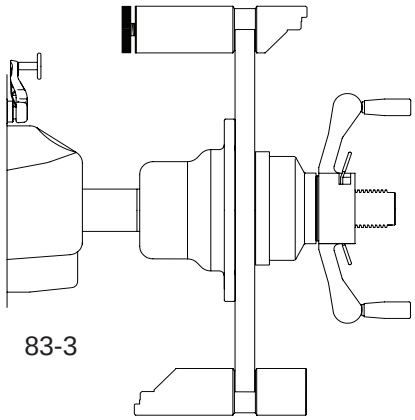
9. Press <**F/P**> to continue calibration.
   - Displays “SPN” “4”
10. Remove the Pruefrotor/Tire & Wheel from the shaft
   - Spin the empty shaft by lowering the hood or pressing the enter key (Figure 83-5). The board displays the information in the following order.

NOTE: 2 CONES AND THE POWER CLAMP NUT MUST BE USED ON A POWER CLAMP SYSTEM.

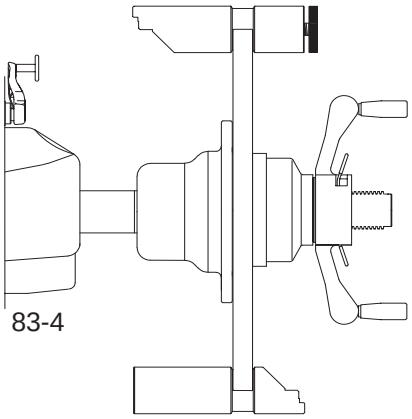
   - Displays “CAL” ‘4” when the shaft reaches calibration speed. The machine is taking data and doing calculations. After taking data, shaft is automatically braked to a stopped.
   - Displays “SPN” “5” when shaft stops.

11. Install the calibration slug on the left side of the bell housing. (Figure 3-18) 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 standby mode. Must complete **F/P** 84 after this function!

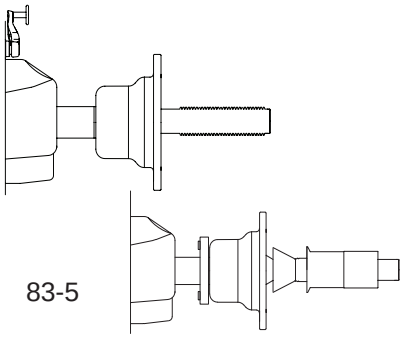
CALIBRATION COMPLETE



83-3

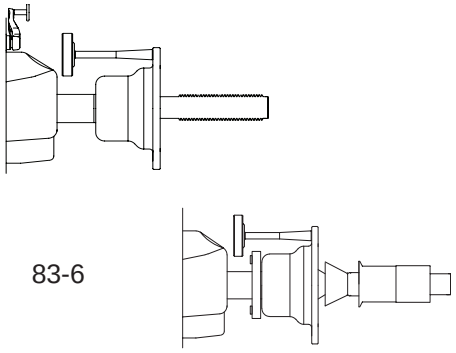


83-4



83-5

Power Clamp System



83-6

Power Clamp System

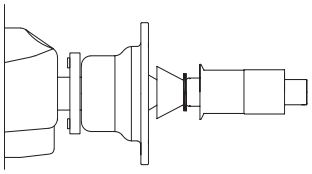
F/P 84 EMPTY SHAFT CALIBRATION PROCEDURE

1. Press and release the **<F/P>** key, turn the shaft until the display reads "**F/P**" "84" is displayed. The display changes to "CAL" "SHF" for one second.

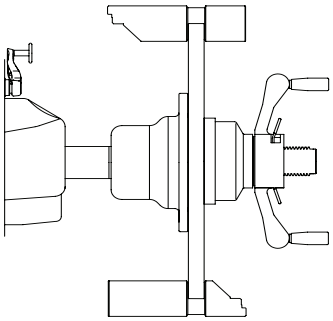
2. Then it displays "SPN" "1".

3. Spin the empty shaft by pressing the <ENTER> button or lower the hood.
4. The board displays the following information.
   - 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. Then displays "CAL" "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 F84 and return to idle state. The fine mode LED indicator is automatically turned off.

NOTE: UNITS WITH A POWER CLAMP REQUIRE A SPACER (EAM-0033D53A) BE INSTALLED BETWEEN THE CONE AND CLAMPING SLEEVE AND A SECOND SPIN CYCLE BE COMPLETED.

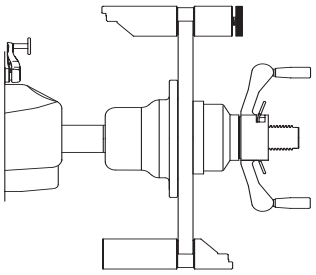


F/P 88 TDC CALIBRATION

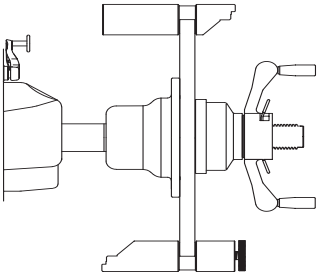


1. Mount the Pruefrotor on the balancer shaft and enter in the parameters of the Pruefrotor using the balance screen.

2. Press and release the **<F/P>** key, turn the shaft until the display reads "**F/P**" "88" is displayed. The display changes to "CAL" "ANG" for one second. Press the <START> button to begin the measurement run.



3. Attach the 100 gram weight to outside of the Pruefrotor and press the <START> button.



4. After the shaft comes to a complete stop rotate the shaft to locate the 100 gram weight at "BOTTOM DEAD CENTER" position. Press the <ENTER> key F6 (Optima/BFH) or press the <F/P> button digital balancers to save the data.

CALIBRATION COMPLETE

F/P 90 MATCH BALANCE

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

F/P 91 OPTIMIZATION

See operators manual for details.

F/P 92 SPLIT WEIGHT

See operators manual for details.

F/P 94 SPOKE MODE

See operators manual for details.

F/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 release the **<F>** key, toggle the **<UP / DOWN>** button or press and hold the **<P>** key while turning the Diameter/Function Knob until "**F/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 **F/P** button, the balancer displays **" 1 1 1 "**.
3. Press **F/P** button again, the balancer displays **" 2 2 2 "**.
4. Press **F/P** button again, the balancer displays **" 3 3 3 "**.
5. If user press F button again, balancer displays " CLN EEP" and erases all information in the EEPROM and resets the machine.

NOTE: ALL FACTORY CALIBRATION PROCEDURES ARE REQUIRED.

F/P 97 STICKY AT TOP STOP AT TOP

Used to turn "Sticky at Top" on or off. Press <F> <97> <ENTER> display changes to "STY" "TOP" "ON" sticky at top is now on. Pressing <F> <97> <ENTER> again changes the display to read "STY" "TOP" "OFF" sticky at top is now off.

SERVICING THE BALANCER

NOTE: BEFORE OPENING THE MACHINE FOR SERVICE, DISCONNECT ELECTRICAL SUPPLY LINE AND USE THE LOCKOUT / TAGOUT PROCEDURE.

⚠ WARNING!

DANGEROUS HIGH VOLTAGES ARE PRESENT IN THIS EQUIPMENT

The balancer is supplied with 110/230 VAC . It is critical to have the proper input voltage in order for the balancer to operate correctly. The balancer performs a systems check on initial power up. If a problem is detected the balancer will emit random beeps.

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 230VAC +/- 10%VAC VPI System III or 110VAC ± 10% VPI System I, II and SOT Low Digital.

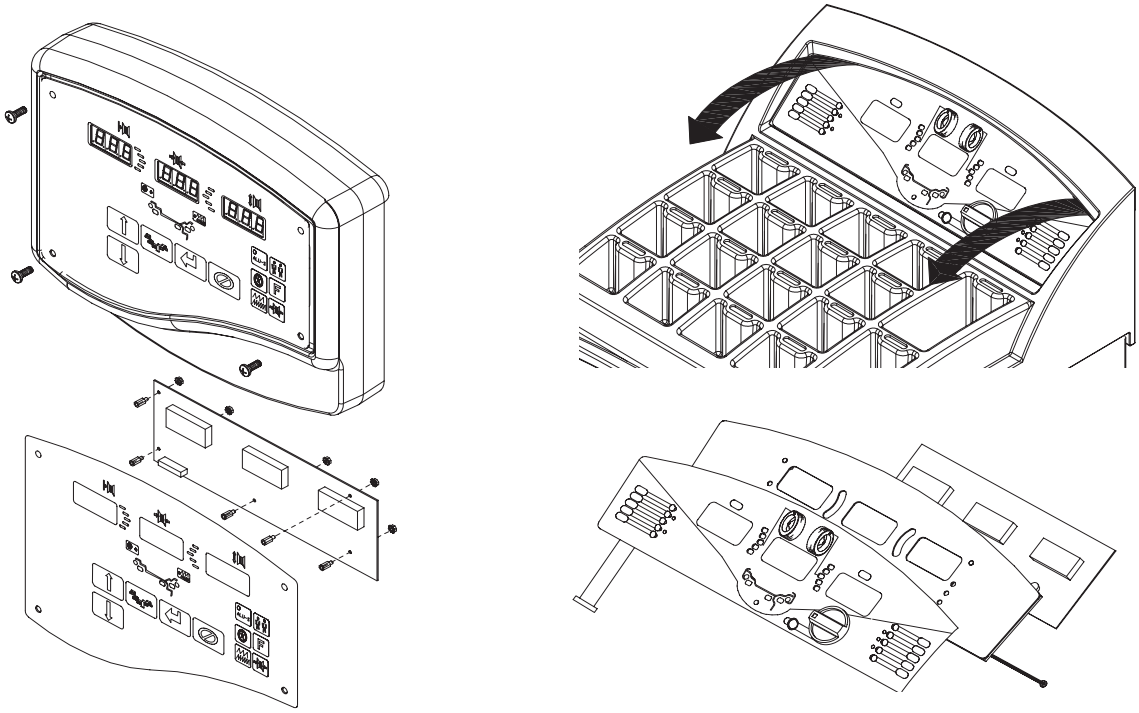
To check power to power supply box:

- Remove the weight tray.
- Using a VOM check for 230VAC at the power supply board, X41 pins 2&3 all balancers.

CONTROL PANEL REMOVAL & REPLACEMENT

The Digital Display Board is mounted directly to and behind the keypad on each balancer (Figure 3-22).

- Using a 4mm Hex Key, remove to (4) screws holding the Display Panel to the upper Display on VPI and the SOT Low Digital is held in place with velcro. gently pry the display forward.
- To remove the Display Board unplug the membrane panel and simply remove the (4) 8mm nuts holding it onto the backing plate.
- Once the keypad is removed from the backing 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.



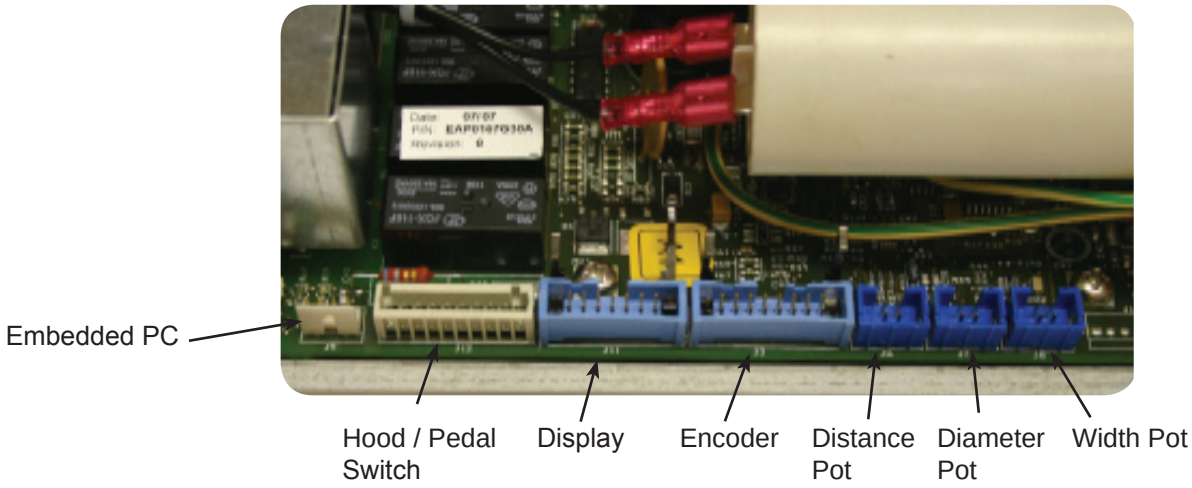
MAIN PROCESSOR REPLACEMENT

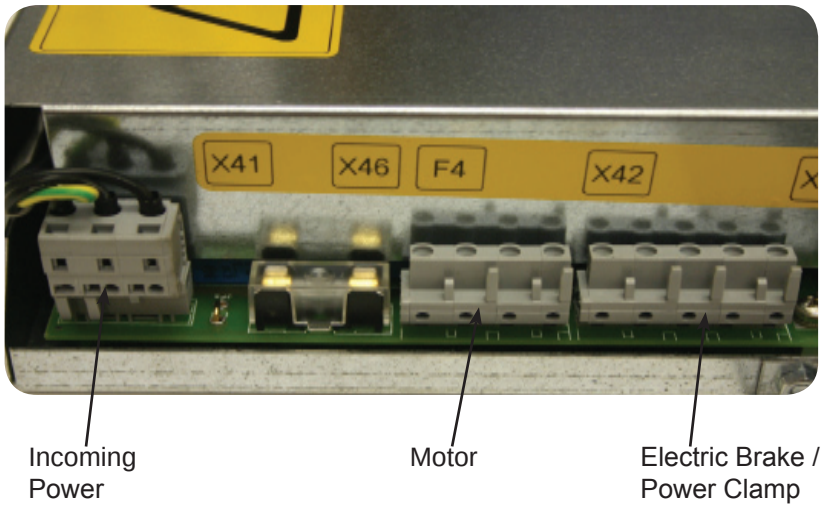
Before flashing the new Main PCB on an IBP Processor, check and adjust the SAPE potentiometers for the correct voltage settings **(F/P 50, F/P51, F52)** see chart below. The distance setting is very critical for correct operation before flashing. The voltage setting must be within the specified range or errors will occur.

SAPE voltage readings in the HOME position

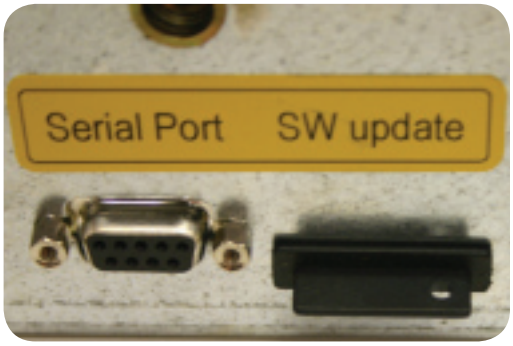
Model	F50: Distance	F51: Diameter on Bell Housing	F51: Diameter On Vibratory Tube	F52: Width
JBC System 1	3.08 ~ 3.12 V			
JBC System 2	3.08 ~ 3.12 V	2.80 ~ 2.90 V	3.05 ~ 3.15 V	
JBC System 3	3.08 ~ 3.12 V	2.80 ~ 2.90 V	3.05 ~ 3.15 V	3.10 ~ 3.20 V
Snapon Low Digital	3.08 ~ 3.12 V	2.80 ~ 2.90 V	3.05 ~ 3.15 V	

1. Remove the power from the balancer.
2. Remove the weight tray from balancer.
3. Disconnect all wiring harnesses from the Electronic box and remove the old electronic box.
4. Partially insert the new Electronic box into the back of the balancer.
5. Feed all the harnesses out the back of the cabinet through the Ebox access hole. This will make it much easier to make the connections.
6. Secure the new Ebox using the existing screws.





7. Make sure all the SAPE arms are in the home position.
8. Remove the “dummy plug” from the secure disk slot and install the new software. Please NOTE that the secure disk will only go in one way DO NOT FORCE the media into the opening.
9. Power up the balancer. When the unit begins to continually emit beeps the download process is complete. Turn off the balancer, remove the software and reinstall the “dummy plug” and re-boot.
10. After the re-boot process the balancer will identify itself. Press the <ENTER> button to confirm the model



number. The balancer will reboot. ***If the balancer is Snapon Low Digital or JBC System II the technician will need to use the <P> or <F> to toggle and select the correct model. If the balancer is a System III it will be necessary to program either “3-b” basic vibratory or press the “F” to toggle “3-P” for a power clamp unit. Press the “ENTER” key to confirm the model selected.*** If the wrong model is selected the technician will need to perform an F/P 95 to clear the EEprom.

11. It may be necessary to perform an extended F50 (digital balancer). The supply voltage from the old system to the new system has changed from 5.0V to 3.3V therefore it will be necessary to reset the value of PO 220. Place the distance gauge in the home position and program <F/P 50>. Verify the home position voltage mentioned in step 12. Press the <F/P> button, the display changes to “1 - 1”, press it again the display will change to “2 - 2” and then finally 3 after the final press “Set dis 220” will be displayed saving the home voltage to PO 220”.
12. Complete all necessary factory calibration procedures, use the service manual for proper procedures.

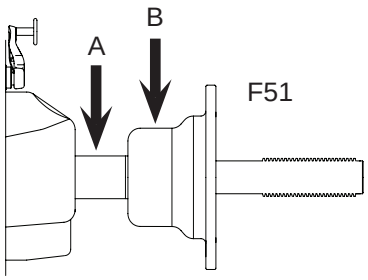
    C80 - Distance/ Diameter gauge calibration

Distance (F50)	3.08 - 3.12 Small Cabinet
	3.08 - 3.12 Medium/Large Cabinet
Diameter (F51)	3.05 - 3.15 On the Vibratory Tube (A)
	2.80 - 2.90 On Bell Housing (B)
Width (F52)	3.10 - 3.20

    C83 - Vibratory calibration

    C84 - Empty shaft calibration

    C88 - Top Dead Center (TDC) calibration.



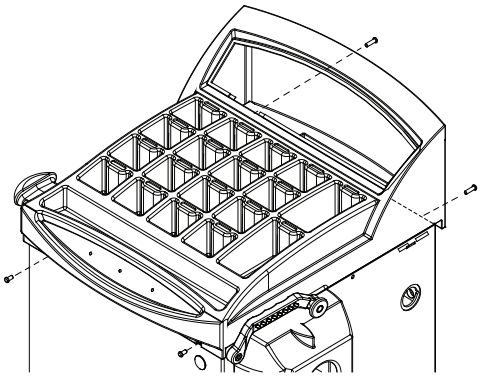
13. Mount a Tire and Wheel assembly. Using the SAPE assembly verify all data taken matches the tire and wheel being used. Balance the Tire and Wheel assembly to verify operation.

TO ACCESS THE INSIDE OF THE MACHINE

1. Remove the screws from the front and rear of the weight tray.

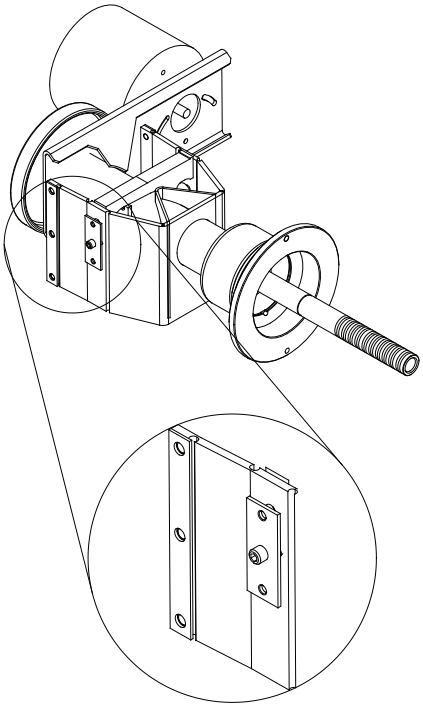
2. Standing at the front of the machine, rotate the SAPE arm to it’s full most outward position. Lift and remove the weight tray. Avoid breaking or damaging wire harnesses. Harnesses may be held in place with various retainer clips.

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



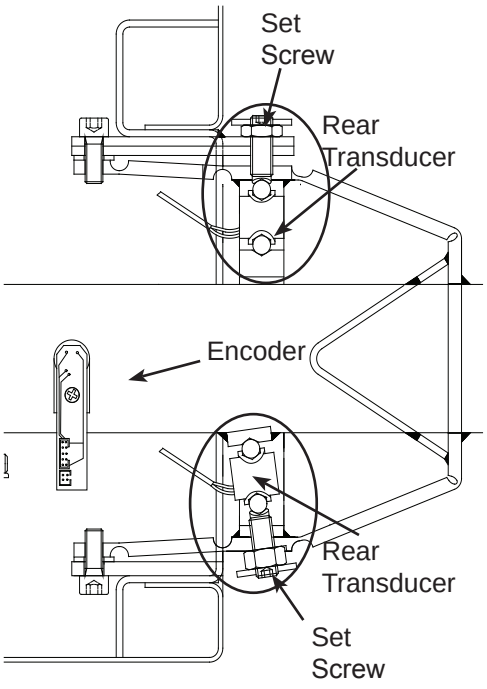
TRANSDUCER REMOVAL

- 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 3-26)
- Using a 13mm wrench loosen the jam nut.
- Using a 5mm hex key, back the set screw off by turning counterclockwise. 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.)



INSTALLATION OF TRANSDUCER

- The front and rear transducer must be installed correctly in order for the balancer to function correctly. 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.

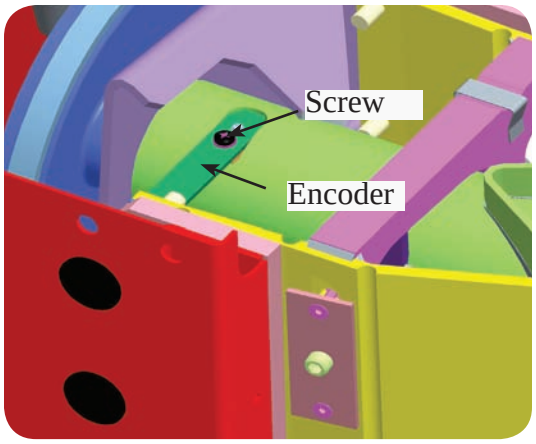
NOTE: MOVING THE TRANSDUCER AFTER CALIBRATION WILL CHANGE THE ACCURACY AND REQUIRE FACTORY CALIBRATION

ENCODER REMOVAL

All Balancers

- Disconnect power.
- 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.

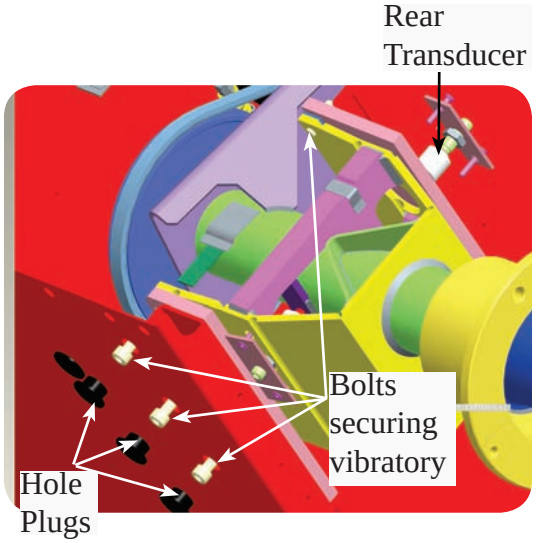
NOTE: BE CAREFUL NOT TO LET FOREIGN DEBRIS FALL INSIDE THE TUBE.



VIBRATORY MEMBER REMOVAL

All Balancers

- Disconnect the power from the rear of the machine.
- Remove the weight tray.
- Disconnect the mechanical brake at the vibratory system.
- Disconnect the motor and encoder harness from the Power Supply box.
- Remove the rear transducer.
- Remove the access plugs from the front of the balancer.
- 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.
- Lift up on the vibratory member and remove.



VIBRATORY INSTALLATION

All Balancers

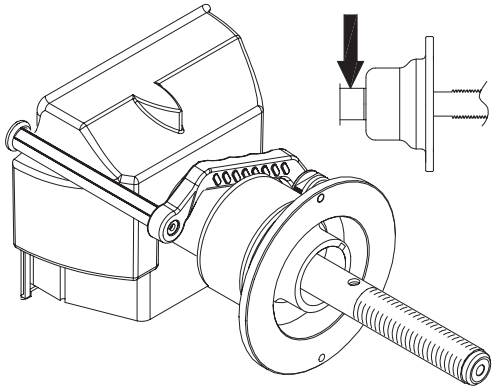
- Lift and set vibratory member into the balancer housing.
- Insert spacers.
- Apply Loctite 242 to the hex bolts.
- With the aid of a helper start the two lower hex bolts.
- Install the 4 remaining hex bolts and tighten to 22ft. lbs. +/- 3 in. lbs.
- Install the rear transducer and follow transducer installation.
- Install mechanical brake and follow mechanical brake installation.
- Install weight tray.
- Connect power and follow all calibration procedures **F/P**/C 83,84 and 88 and test.

DIAMETER SAPE / POTENTIOMETER VPI II, III IV & SOT LD

- Disconnect the power from the rear of the machine.
- Remove the Display panel.
- Remove the weight tray.
- Disconnect the 2D SAPE harness from the Main Processor Board.
- Remove the 10mm nut holding the SAPE wheel to the mounting bracket and slide the cog wheel off of the potetiometer shaft.
- Remove the 13mm nut holding the potentiometer to the frame.
- Reverse procedure for installation.

DIAMETER SAPE / POTENTIOMETER ADJUSTMENT

- Install 5K potentiometer onto bracket and tighten 13mm nut.
- Install cog wheel onto potentiometer shaft and hand tighten 10mm nut.
- Attach SAPE harness to Power Supply Board.
- With the SAPE arm in the home position program <**F/P**> <51>.
- Pull out the SAPE arm and rest it on the vibratory tube (Figure 3-32), using a flatblade screwdriver turn the potentiometer to a voltage reading of 3.10VDC +/- .05.
- Run <**F/P**/C> <80> for SAPE calibration.

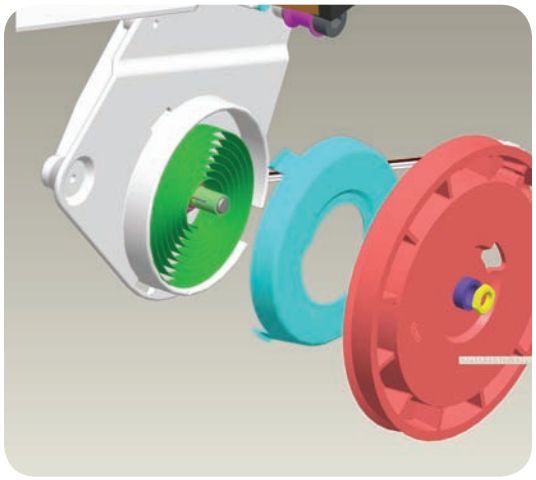


SAPE GAUGE

- To remove the index finger, remove the phillips screw from the backside of the gauge.
- To remove the SAPE arm remove the phillips screw that attaches to the distance rod.
- To remove the distance rod, disconnect the diameter string from the end of the rod.
- Slide the distance rod completely out.
- Reverse procedure for installation.

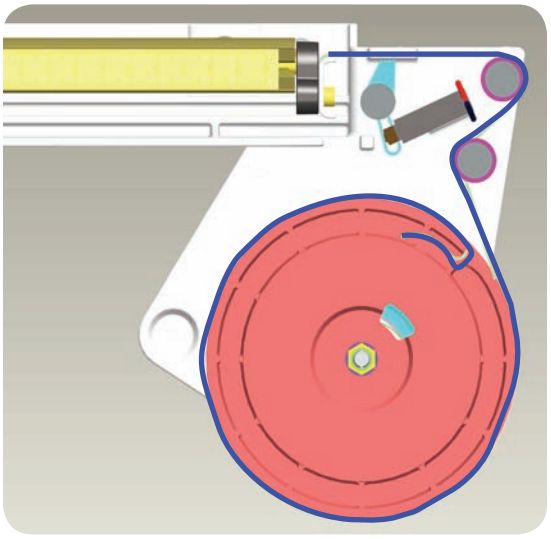
DISTANCE SAPE / POTENTIOMETER VPI III, IV

- Disconnect the power from the rear of the machine.
- Remove the weight tray.
- Disconnect the 1D SAPE belt from the distance rod.
- Remove the 10mm nut holding the SAPE wheel to the frame.
  NOTE: DO NOT LET THE RETURN SPRING UN-COIL.
- Remove the 13mm nut holding the potentiometer to the frame.



DISTANCE SAPE / POTENTIOMETER INSTALLATION

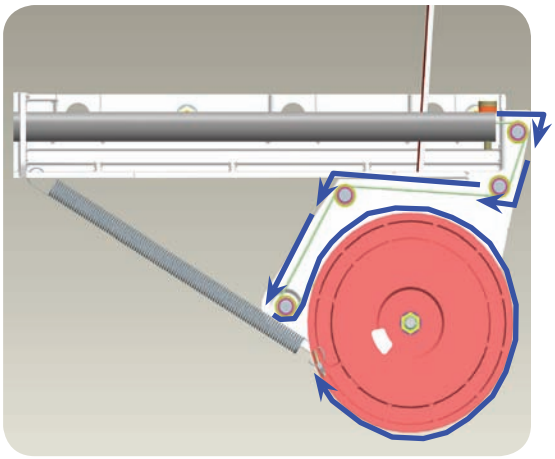
- Install 10K potentiometer onto bracket and tighten 13mm nut.
- Install SAPE Wheel onto potentiometer shaft and hand tighten 10mm nut.
- Attach SAPE belt to the guide roller.
- Route SAPE belt over guide roller.
- Loop SAPE belt through the “auto lock” mechanism and attach the SAPE belt to the distance rod.
- Test SAPE assembly by pulling on the SAPE arm to it’s full out position several times. Make sure their is no binding.
- With the SAPE arm in the HOME position program <F> <50> System IV <C80>.
- Hold the SAPE wheel firmly, using a flatblade screw-driver turn the potentiometer to a voltage reading of 3.10 ± .02.
- Run <F/C> <80> for SAPE calibration.



DISTANCE SAPE / POTENTIOMETER VPI I, II & SOT LD

- Disconnect the power from the rear of the machine.
- Remove the weight tray.
- Disconnect the 1D SAPE return spring from the lower base assembly.
- Remove the 10mm nut holding the SAPE wheel to the frame.
- Remove the 13mm nut holding the potentiometer to the frame.

DISTANCE SAPE / STRING ROUTE INSTALLATION VPI I, II & SOT LD



- Install 10K potentiometer onto bracket and tighten 13mm nut.
- Install SAPE Wheel onto potentiometer shaft and hand tighten 10mm nut.
- Attach SAPE thread to distance rod.
- Route SAPE thread over guide roller and around the spool as shown by blue arrows.
- Attach the spring from the SAPE bracket to the spool
- Test SAPE assembly by pulling on the SAPE arm to it's full out position several times. Make sure their is no binding.
- With the SAPE arm in the HOME position program <**F/P**> <50>.
- Hold the SAPE wheel firmly, using a flatblade screwdriver turn the potentiometer to a voltage reading of 3.10 ± .02V
- Run <**F/P**> <80> for SAPE calibration.

WIDTH SAPE / POTENTIOMETER INSTALLATION JBC VPI SYSTEM III, IV

- Disconnect the power from the rear of the machine.
- Remove the weight tray.
- Disconnect the 3D SAPE wire from the Power Supply box and gently pull the wire through the hood tube.
- Remove the three screws holding the top cover on the SAPE arm.
  Remove the three screws holding the bottom cover on the SAPE arm.
- Remove the 10mm nut holding the gear to the potentiometer.
- Remove the 13mm nut holding the potentiometer.
- Reverse procedure for installation.
- The potentiometer comes equipped with a standoff, insert the standoff into the hole in the housing.
- Reconnect all wiring.
- With the Width SAPE arm in the home position program <F> <52> System IV <C82>.
- Losen the 10mm nut and hold the gear. Using a flatblade screwdriver turn the potentiometer to a voltage reading of 3.15 ± .05VDC or greater than 0.20 when the tip of the SAPE is touching the backing collar.
- Run <F79 for SAPE calibration, System IV <C82>.

ELECTRIC BRAKE PEDAL ADJUSTMENT

Early model JBC VPI System III balancers

- Remove the two screws securing the brake pedal assembly.
- Remove the weight tray.
- Remove the cover from the electronic box.
- Attach a VOM to each lead of the microswitch.
- Rotate either the microswitch activator or the micro switch on the brake pedal assembly until the circuit is open.
- Check to make sure that the circuit closes when the brake pedal is depressed.

ELECTROMAGNETIC MOTOR BRAKE ADJUSTMENT

- Remove power from the balancer.
- Remove weight tray assembly.
- Losen hex set screw from the motor pulley.
- Adjust the distance between the magnetic brake and clutch plate to 0.2mm by moving the motor pulley.
- Apply power to the balancer and retest braking capability by pressing on the brake pedal.

MECHANICAL BRAKE CABLE ADJUSTMENT

- Mount a standard 15” tire and wheel assembly.
- Using your foot apply pressure to the foot pedal assembly.
  Using a 13mm wrench hold the nut located at the top of the cable as indicated on.
- Using a flatblade screwdriver turn the cable counterclockwise to apply tension to the brake or clockwise to loosen the brake.
- The cable is properly adjusted when the tire and wheel assembly has a little resistance.

MECHANICAL BRAKE CABLE

- Disconnect the power from the rear of the machine.
- Remove the Display panel.
- Remove the weight tray.
- Disconnect the brake cable from the vibratory member. Make note of the location of the springs and washers.
- Remove the two 5mm bolts holding the pedal to the frame.
- Separate the pedal from the pedal bracket.
- Pull the cable through the protective flex tubing.
- Reverse pocedures for installation.

MOTOR REMOVAL

- Disconnect the power from the rear of the machine.
- Remove the weight tray.
- Disconnect the Motor wiring harness from the Power Supply box.
- Remove the setscrew securing the motor pulley to the motor.
- Remove the (4) bolts securing the motor from the vibratory system.
- Reverse procedure for installation.
- Using a pry bar, pry against the motor spacers to tighten belt.

HOOD SWITCH / CAM / SPRING

(VPI SYSTEM III, IV)

- Disconnect the power from the rear of the machine.
- Remove the weight tray.
- Disconnect the Hood Switch from the Power Supply Board and remove the wiring from the connector.
- Remove the two (2) screws holding the switch to the mounting bracket.
- Remove the set screw holding the cam to the hood shaft and slide the cam off of the shaft.

NOTE: THE HOOD SPRING IS UNDER PRESSURE. TO RELEASE PRESSURE RAISE THE HOOD TO THE OPEN POSITION.

- Remove the screw from the shaft that attaches the hood spring.
- Reverse procedures for installation.

HOOD SWITCH / CAM / SPRING

(VPI SYSTEM II & SOT LOW DIGITAL)

- Disconnect the power from the rear of the machine.
- Remove the weight tray.
- Disconnect the Hood Switch from the Power Supply Board and remove the wiring from the connector.
- Remove the two (2) screws holding the switch to the mounting bracket.
- Remove the set screw holding the cam to the hood shaft and slide the cam off of the shaft.

NOTE: THE HOOD SPRING IS UNDER PRESSURE. TO RELEASE PRESSURE RAISE THE HOOD TO THE OPEN POSITION.

- Remove the screw from the shaft that attaches the hood spring.
- Reverse pocedures for installation.

HOOD SWITCH / CAM / SPRING

(VPI SYSTEM I)

- Disconnect the power from the rear of the machine.
- Remove the weight tray.
- Disconnect the Hood Switch from the Power Supply Board and remove the wiring from the connector.
- Remove the cover plate from the wheel guard box.
- Remove the two (2) screws holding the switch to the wheel guard box.
- Install the new switch and route the wiring harness through the access hole.
- Install the wiring into the connector.
- Reverse procedure for installation.

CHAPTER 2 DIAGNOSTIC CODES

GENERAL OVERVIEW:

Balancers that have been manufactured since 2000 contain diagnostic codes to aid the technician in trouble-shooting and repair of the balancer. There are 5 different types of diagnostic codes (Start up Errors, Error Codes, H Codes, E Codes and IBP Codes). It is important that the code type be properly identified before calling technical support for assistance. In most cases, the problem may be quickly determined and corrected by properly using the diagnostics codes to troubleshoot. This Chapter contains codes for ALL Y2k balancers.

Some notes about the operations of the wheel balancer:

All measured angular positions are related to the mass to balance the wheel; they are not the positions of the imbalance mass itself.

If the balancer is in service mode, some of the normal behavior is changed:
- Some error codes will be written into the error record in normal operation mode. This is disabled in service mode, errors will not be recorded.
- The number of revolution for a measurement run in service mode is set to
- - 20 turns (GS, JBEG models)
  - two times of the C6 setting but minimum 20 turns (CRT, HNA, HWT models)

2.1 IN FIELD REPROGRAMMING OF BALANCER

1. Turn off balancer.
2. Place EEPROM in micro-controller socket with flat end at bottom of socket close to large blue connector. Notched end is 3 spaces short of other end of socket. (IBP) Remove dummie plug and place secure disk into opening.
3. Turn on balancer.
4. Three audible beeps accompanied by three flashes of the led on the micro-controller board indicate that program is loading.
5. A continuous sequence of beeps and flashes indicates that program loading is complete.
6. Turn off balancer.
7. Remove EEPROM and turn on balancer. (IBP) Remove secure disk.
8. The normal start-up procedure will be performed.
9. Perform service codes in the following order;
   - C47 - Select machine model (BFH / Optima)
   - C80 - Calibration of inner SAPE gauge arm
   - C81 - Measurement of flange to zero plane distance
   - C82 - Calibration of outer gauge arm (Optima)
   - C83 - Basic calibration of vibratory system
   - C84 - Measurement of residual main shaft unbalance
   - C88 - Adjustment of 12 h position
   - C90 - Saving calibration data

The machine is now ready for use.

2.2 RECOMMENDED SERVICE STEPS

In case of an error it is recommended to perform some service code to check the system. The following are some common service codes for this job.

- C28 - Indicate the content of the error record
- C74 - Check the incremental encoder of the main shaft
- C54 - Some more testing for the incremental encoder of the main shaft
- C98 - Check the incremental encoder of the power clamp
- C63 - Continuous measurements for test of valid results
- C56 - Check the pedal switches. The switches and the Function-Code to lock the power clamp should be checked if the power clamp does not work.
- C75 - Check Voltages of SAPE potentiometers (AD8, AD9, AD10) or perform STEP 1 of C80 and C82
- C80 - Check Voltages for left SAPE
  ATTENTION This is a calibration function; interrupt this function after the test in STEP 1 with the STOP or ESC key
- C82 - Check Voltages for right SAPE
  ATTENTION This is a calibration function; interrupt this function after the test in STEP 1 with the STOP or ESC key
- C55 - Check lines Voltage
- C110 - Check VCC Voltage

2.3 SELF-TEST DURING START-UP (CRT/HNA/HWT)

A series of tests is accomplished after the machine has been turned on. If a test is not successful:

- a series of audible signals is given, or
- an error code is read out.

On HNA/HWT or CRT models, a three-tone signal is given once, if the machine is operative.
In case there is a functional error it must be acknowledged by pressing the STOP or ESC key and there is no three-tone signal.

1.	Communication between microcontroller and embedded PC	Blue screen

Affected models: CRT models
Service Codes : No service code available
Communication between micro-controller and embedded PC is not OK (check serial cables).This can also indicate a bad connection to the keyboard.

2.	Check home position of left SAPE	E3

Affected models: Models with 1D-, 2D-SAPE or geodata
Service Codes : C80 (& C81) to calibrate SAPE
C92 to check distance and diameter of actual calibration
Inner SAPE gauge arm not in home position.Re-place SAPE gauge arm in home position and press STOP or ESC key to continue.

3.	Check home position of right SAPE	E4

Affected models: Models with 3D-P-SAPE
Service Codes : C82 to calibrate SAPE
Outer SAPE gauge arm not in home position.Re-place SAPE gauge arm in home position and press STOP or ESC key to continue.

4.	Check weights usage database	E50

Affected models: Models with AWP
Service Codes : C125 to format the weights usage database
An attempt to access the weights usage database has failed; restart the balancer to re-initialise the database, or call service if the problem persists

5.	Power clamp service interval expired	E85

Affected models: Models with power clamp
Service Codes : All codes available for the model

6.	Check Keyboard	E89

Affected models: All models
Service Codes : No service code available
One of the keys F1 to F6, HELP, ESC, START supplies a key code. The machine will proceed with the next step only if the trouble is remedied.

7.	Check Pedal switches	E85

Affected models: Models with power clamp or electromagnetic brake
Service Codes : C56 to check the pedal switches.
C75, AdC16 to check voltage to external switches
Models with solenoid brake only and power clamp:One or, if available, both pedal switches are actuated. The user can now remedy the trouble. Press STOP or ESC key to check the pedal switch once again and to delete the error code reading. If the trouble cannot be remedied, the pedal is made inoperative.

8.	Disable left SAPE	E92

Affected models: Models with 1D-, 2D-SAPE or geodata
Service Codes : C80 (& C81) to calibrate SAPE
C92 to check distance and diameter of actual calibration
During the second attempt the inner SAPE gauge arm was again not re-placed to home position. Inner and outer SAPE gauge arms are turned off. Wait for 5 seconds, or press STOP or ESC key to continue.

9.	Disable right SAPE	E93

Affected models: Models with 3D-P-SAPE
Service Codes : C82 to calibrate SAPE
During the second attempt the outer SAPE gauge arm was again not re-placed to home position. Outer SAPE gauge arms are turned off. Wait for 5 seconds, or press STOP or ESC key to continue.

10.	Check content of permanent memories	E145

Affected models: All models
Service Codes : C85, C86 to copy content of permanent memory
Contents of both permanent memories are different, but both contain valid data. If the trouble signalled by the error code is not remedied (using service codes C85 or C86), the machine will remain in service code mode.

11.	Check availability of keyboard	E300

Affected models: CRT models
Service Codes : No service code available
The microcontroller was not able to detect a keyboard.Check cabling between microcontroller and keyboard.

12.	Check Optima Calibration	E360

Affected models: Models with optima hardware
Service Codes : C123
The optima hardware requires wheel profiler position calibration.When the camera controller board is replaced on the machine, the SW detected that calibration data are missing.Calibration procedure C122 is required to calibrate the actual position of the laser scanners with respect to the balancer reference plane,

13.	Check Optima Hardware	E360

Affected models: Models with optima hardware
Service Codes : C123
Wheel profiler is not present or is not responding during self test.The balancer controller board was not able to communicate with the camera controller board during start-up self test.Possible causes:· The camera controller board is missing or dead.· The flat cable connecting the balancer controller board and the camera controller board is unplugged, damaged or missing,

14.	Check Optima Hardware	E362

Affected models: Models with optima hardware
Service Codes : C123
Main camera board self test fail.Balancing is not possible since wheel data cannot be scanned.Problem during power up. Switch power off and on again. Should the problem not go away please call service.

15.	Check Optima inner scanner	E363

Affected models: Models with optima hardware
Service Codes : C123
Left side scanner self test fail or CCD not calibrated or zero mark not detected.Balancing is not possible since wheel data cannot be scanned.Problem during power up. Switch power off and on again. Should the problem not go away please call service.

16.	Check Optima outer scanner	E364

Affected models: Models with optima hardware
Service Codes : C123
Right side scanner self test fail or CCD not calibrated or zero mark not detected.Balancing is not possible since wheel data cannot be scanned.Problem during power up. Switch power off and on again. Should the problem not go away please call service.

17.	Check Optima rear scanner	E365

Affected models: Models with optima hardware
Service Codes : C123
Rear scanner self test fail or CCD not calibrated or zero mark not detected.Wheel data can be scanned, balancing is possible. Run out measurement of the wheel is not possible.Problem during power up. Verify if the scanner is on its rail. Switch power off and on again. Should the problem not go away please call service.

18.	Check Optima main camera board memory	E366

Affected models: Models with optima hardware
Service Codes : C123
Possible causes: there is a fault in the camera controller board
Corrective actions: check the camera controller board

19.	Check Optima motor power supply	E367

Affected models: Models with optima hardware
Service Codes : C123
Possible causes: - the cable connecting the camera controller board and the motor power supply board is unplugged, damaged or missing
- the motor power supply is not configured properly
- there is a fault in the motor power supply board
- the cable connecting the mains supply and the motor power supply board is unplugged, damaged or missing

Corrective actions:- check all items above

20.	Check Optima main camera board A/D converter	E368

Affected models: Models with optima hardware
Service Codes : C123
Possible causes: - there is a fault in the camera controller board
Corrective actions:- check the camera controller board

21.	Check Optima main shaft encoder zero mark	E369

Affected models: Models with optima hardware
Service Codes : C123
Possible causes: - there is a fault in the camera controller board
- there is a fault in the encoder
- the cable connecting the camera controller board and the encoder board is unplugged, missing or damaged

Corrective actions:- check the camera controller board
- check the encoder
- check the connections

22.1.	Check Optima inner CCD signals	E370

Affected models: Models with optima hardware
Service Codes : C123
Possible causes: - the flat cable connecting the camera controller board and the inner scanner CCD board is unplugged, missing or damaged

- there is a fault in the inner scanner CCD board
- there is a fault in the camera controller board
- the supply voltage is configured too high on the power interface board

Corrective actions:
- check all items above
- switch power off and on again; should the problem not go away please call service

22.2	Check Optima inner scanner memory	E371

Affected models: Models with optima hardware
Service Codes : C123

Possible causes:
- the flat cable connecting the camera controller board and the inner scanner CCD board is unplugged, missing or damaged
- there is a fault in the inner scanner CCD board
- there is a fault in the camera controller board

Corrective actions:
- check the connections§ check the inner scanner CCD board
- check the camera controller board
- switch power off and on again; should the problem not go away please call service

22.3	Check Optima inner scanner memory	E372

Affected models: Models with optima hardware
Service Codes : C123

Possible causes:
- the flat cable connecting the camera controller board and the inner scanner CCD board is partially unplugged or damaged
- there is a fault in the inner scanner CCD board

Corrective actions:
- check the connections
- check the inner scanner CCD board
- switch power off and on again; should the problem not go away please call service

22.4	Check Optima inner scanner calibration	E373

Affected models: Models with optima hardware
Service Codes : C123

Possible causes:
- the inner scanner has not been factory calibrated

Corrective actions:
- please call service and replace the inner scanner

22.5	Check Optima inner motor power supply	E374

Affected models: Models with optima hardware
Service Codes : C123

Possible causes:
- the cable connecting the camera controller board and the inner scanner motor is unplugged, damaged or missing
- the motor power supply is not configured properly
- there is a fault in the motor power supply board
- the cable connecting the mains supply and the motor power supply board is unplugged, damaged or missing
- there is a fault in the inner scanner motor
- there is a fault in the camera controller board motor drivers

Corrective actions:
- check all items above

22.6	Check Optima inner scanner zero mark	E375

Affected models: Models with optima hardware
Service Codes : C123

Possible causes:
- the flat cable connecting the camera controller board and the inner scanner CCD board is unplugged, missing or damaged
- there is a fault in the inner scanner CCD board
- the inner scanner is locked
- the inner scanner zero mark is missing, bent, locked or damaged
- the cable connecting the camera controller board and the inner scanner motor is unplugged, damaged or missing

- there is a fault in the motor power supply board§ there is a fault in the inner scanner motor
- there is a fault in the camera controller board motor drivers

Corrective actions:- check all items above

22.7	Check Optima inner motor missing steps	E376

Affected models: Models with optima hardware
Service Codes : C123
Possible causes:
- the inner scanner movement is not smooth or it is striking the frame
- the motor power supply is not configured properly
- there is a fault in the motor power supply board§ there is a fault in the inner scanner motor
- there is a fault in the camera controller board motor drivers
- the cable connecting the camera controller board and the inner scanner motor is partially unplugged or damaged

Corrective actions:- check all items above

22.8	Check Optima inner laser power	E377

Affected models: Models with optima hardware
Service Codes : C123
Possible causes:
- the flat cable connecting the camera controller board and the inner scanner CCD board is unplugged, missing or damaged
- the cable of the laser module of the inner scanner is damaged or there is a fault in the laser module itself
- there is a fault in the camera controller board laser driversCorrective actions:
- check all items above

22.9	Check Optima inner laser modulation	E378

Affected models: Models with optima hardware
Service Codes : C123
Possible causes:
- the flat cable connecting the camera controller board and the inner scanner CCD board is unplugged, missing or damaged
- the cable of the laser module of the inner scanner is damaged or there is a fault in the laser module itself
- there is a fault in the camera controller board laser driversCorrective actions:
- check all items above

23.1	Check Optima outer CCD signals	E380

Affected models: Models with optima hardware
Service Codes : C123
Possible causes:
- the flat cable connecting the camera controller board and the outer scanner CCD board is unplugged, missing or damaged
- there is a fault in the outer scanner CCD board §there is a fault in the camera controller board
- the supply voltage is configured too high on the power interface boardCorrective actions:
- check all items above
- switch power off and on again; should the problem not go away please call service

23.2	Check Optima outer scanner memory	E381

Affected models: Models with optima hardware
Service Codes : C123
Possible causes:
- the flat cable connecting the camera controller board and the outer scanner CCD board is unplugged, missing or damaged

- there is a fault in the outer scanner CCD board
- there is a fault in the camera controller board

Corrective actions:

- check the connections§ check the outer scanner CCD board
- check the camera controller board
- switch power off and on again; should the problem not go away please call service

23.3	Check Optima outer scanner memory	E382

Affected models: Models with optima hardware
Service Codes : C123
Possible causes:

- the flat cable connecting the camera controller board and the outer scanner CCD board is partially unplugged or damaged
- there is a fault in the outer scanner CCD board

Corrective actions:

- check the connections§ check the outer scanner CCD board
- switch power off and on again; should the problem not go away please call service

23.4	Check Optima outer scanner calibration	E383

Affected models: Models with optima hardware
Service Codes : C123
Possible causes:

- the outer scanner has not been factory calibrated

Corrective actions:- please call service and replace the outer scanner

23.5	Check Optima outer motor power supply	E384

Affected models: Models with optima hardware
Service Codes : C123
Possible causes:

- the cable connecting the camera controller board and the outer scanner motor is unplugged, damaged or missing
- the motor power supply is not configured properly
- there is a fault in the motor power supply board§ the cable connecting the mains supply and the motor power supply board is unplugged, damaged or missing
- there is a fault in the outer scanner motor
- there is a fault in the camera controller board motor drivers

Corrective actions:

- check all items above

23.6	Check Optima outer scanner zero mark	E385

Affected models: Models with optima hardware
Service Codes : C123
Possible causes:

- the flat cable connecting the camera controller board and the outer scanner CCD board is unplugged, missing or damaged
- there is a fault in the outer scanner CCD board
- the outer scanner is locked
- the outer scanner zero mark is missing, bent, locked or damaged
- the cable connecting the camera controller board and the outer scanner motor is unplugged, damaged or missing
- there is a fault in the motor power supply board§ there is a fault in the outer scanner motor
- there is a fault in the camera controller board motor drivers

Corrective actions:- check all items above

23.7	Check Optima outer motor missing steps	E386

Affected models: Models with optima hardware
Service Codes : C123
Possible causes:
- the outer scanner movement is not smooth or it is striking the frame
- the motor power supply is not configured properly
- there is a fault in the motor power supply board§ there is a fault in the outer scanner motor
- there is a fault in the camera controller board motor drivers
- the cable connecting the camera controller board and the outer scanner motor is partially unplugged or damaged

Corrective actions:
- check all items above

23.8	Check Optima outer laser power supply	E387

Affected models: Models with optima hardware
Service Codes : C123
Possible causes:
- the flat cable connecting the camera controller board and the outer scanner CCD board is unplugged, missing or damaged
- the cable of the laser module of the outer scanner is damaged or there is a fault in the laser module itself
- there is a fault in the camera controller board laser drivers

Corrective actions:
- check all items above

23.9	Check Optima outer laser modulation	E388

Affected models: Models with optima hardware
Service Codes : C123
Possible causes:
- the flat cable connecting the camera controller board and the outer scanner CCD board is unplugged, missing or damaged
- the cable of the laser module of the outer scanner is damaged or there is a fault in the laser module itself
- there is a fault in the camera controller board laser drivers

Corrective actions:
- check all items above

24.1	Check Optima rear CCD signals	E390

Affected models: Models with optima hardware
Service Codes : C123
Possible causes:
- the flat cable connecting the camera controller board and the rear scanner CCD board is unplugged, missing or damaged
- there is a fault in the rear scanner CCD board
- there is a fault in the camera controller board
- the supply voltage is configured too high on the power interface board

Corrective actions:
- check all items above§ switch power off and on again; should the problem not go away please call service

24.2	Check Optima rear scanner memory	E391

Affected models: Models with optima hardware
Service Codes : C123
Possible causes:
- the flat cable connecting the camera controller board and the rear scanner CCD board is unplugged, missing or damaged
- there is a fault in the rear scanner CCD board
- there is a fault in the camera controller board

Corrective actions:
- check the connections
- check the rear scanner CCD board
- check the camera controller board
- switch power off and on again; should the problem not go away please call service

24.3	Check Optima rear scanner memory	E392

Affected models: Models with optima hardware
Service Codes : C123
Possible causes:
- the flat cable connecting the camera controller board and the rear scanner CCD board is partially unplugged or damaged
- there is a fault in the rear scanner CCD board

Corrective actions:
- check the connections§ check the rear scanner CCD board
- switch power off and on again; should the problem not go away please call service

24.4	Check Optima rear scanner calibration	E393

Affected models: Models with optima hardware
Service Codes : C123
Possible causes:
- the rear scanner has not been factory calibrated

Corrective actions:
- please call service and replace the rear scanner

24.5	Check Optima rear motor power supply	E394

Affected models: Models with optima hardware
Service Codes : C123
Possible causes:
- the cable connecting the camera controller board and the rear scanner motor is unplugged, damaged or missing
- the motor power supply is not configured properly
- there is a fault in the motor power supply board
- the cable connecting the mains supply and the motor power supply board is unplugged, damaged or missing
- there is a fault in the rear scanner motor
- there is a fault in the camera controller board motor drivers

Corrective actions:- check all items above

24.6	Check Optima rear scanner zero mark	E395

Affected models: Models with optima hardware
Service Codes : C123
Possible causes:
- the flat cable connecting the camera controller board and the rear scanner CCD board is unplugged, missing or damaged
- there is a fault in the rear scanner CCD board
- the rear scanner is locked
- the rear scanner zero mark is missing, bent, locked or damaged
- the cable connecting the camera controller board and the rear scanner motor is unplugged, damaged or missing
- there is a fault in the motor power supply board
- there is a fault in the rear scanner motor
- there is a fault in the camera controller board motor drivers

Corrective actions:- check all items above

24.7	Check Optima rear motor missing steps	E396

Affected models: Models with optima hardware
Service Codes : C123

Possible causes: - the rear scanner movement is not smooth or it is striking the frame
- the motor power supply is not configured properly
- there is a fault in the motor power supply board
- there is a fault in the rear scanner motor
- there is a fault in the camera controller board motor drivers
- the cable connecting the camera controller board and the rear scanner motor is partially unplugged or damaged

Corrective actions:- check all items above

24.8	Check Optima rear laser power supply	E397

Affected models: Models with optima hardware
Service Codes : C123
Possible causes: - the flat cable connecting the camera controller board and the rear scanner CCD board is unplugged, missing or damaged
- the cable of the laser module of the rear scanner is damaged or there is a fault in the laser module itself
- there is a fault in the camera controller board laser drivers

Corrective actions:- check all items above

24.9	Check Optima rear laser modulation	E398

Affected models: Models with optima hardware
Service Codes : C123
Possible causes: - the flat cable connecting the camera controller board and the rear scanner CCD board is unplugged, missing or damaged
- the cable of the laser module of the rear scanner is damaged or there is a fault in the laser module itself
- there is a fault in the camera controller board laser drivers

Corrective actions:- check all items above

25.1	Check Optima rear shift motor power supply	E404

Affected models: Models with optima hardware
Service Codes : C123
Possible causes: - the cable connecting the camera controller board and the rear shift scanner motor is unplugged, damaged or missing
- the motor power supply is not configured properly
- there is a fault in the motor power supply board
- the cable connecting the mains supply and the motor power supply board is unplugged, damaged or missing
- there is a fault in the rear shift scanner motor
- there is a fault in the camera controller board motor drivers

Corrective actions:- check all items above

25.2	Check Optima rear shift scanner zero mark	E405

Affected models: Models with optima hardware
Service Codes : C123
Possible causes: - the flat cable connecting the camera controller board and the rear shift scanner CCD board is unplugged, missing or damaged
- there is a fault in the rear shift scanner CCD board
- the rear shift scanner is locked§ the rear shift scanner zero mark is missing, bent,

locked or damaged
- the cable connecting the camera controller board and the rear shift scanner motor is unplugged, damaged or missing
- there is a fault in the motor power supply board
- there is a fault in the rear shift scanner motor
- there is a fault in the camera controller board motor drivers

Corrective actions:- check all items above

25.3	Check Optima rear shift motor missing steps	E406

Affected models: Models with optima hardware
Service Codes : C123
Possible causes:
- the rear shift scanner movement is not smooth or it is striking the frame
- the motor power supply is not configured properly
- there is a fault in the motor power supply board
- there is a fault in the rear shift scanner motor
- there is a fault in the camera controller board motor drivers
- the cable connecting the camera controller board and the rear shift scanner motor is partially unplugged or damaged

Corrective actions:- check all items above

26.	Check model information	E900

Affected models: All models
Service Codes : C47 to set model
The stored machine model is not known.If the trouble signalled by the error code is not remedied (using service codes C47), the machine will remain in service code mode.

27.	Check calibration	E901

Affected models: All models
Service Codes : C80, C81, C82, C83, C84, C88, C90
Machine was not calibrated. For calibration the following calibration codes will have to be carried out in the sequence as given below:
C80 – Calibration of inner SAPE gauge arm
C81 – Measurement of flange to zero plane distance
C82 – Calibration of outer gauge arm
C83 – Basic calibration of vibratory system
C84 – Measurement of residual main shaft unbalance
C88 – Adjustment of 12 h position C90 – Saving calibration data

28.	Hardware test disturbed	H 82

Affected models: All models
Service Codes : All codes available for the model
A self test was disturbed (e.g. wheel was rotated during the transducer test)The code is read out for 3 seconds, then measurement is repeated (10 times maximum), or aborted using the STOP or ESC key.

29.	Check Optima main shaft encoder zero mark	C1- ---

Affected models: All models
Service Codes : All codes available for the model
There is an error occurred during the hardware test. The four hyphens replace the digits 0 to 9 and the letters A to F which all characterize an error/defect. The following test will be performed:
1. Power supply voltage (235V)
2. 5V line
3. Incremental encoder (Current of opto-electronic LED)
4. Transducer signal available
5. Auto Stop System (Voltage for relay)

30.1	Hardware tests - Common Errors	C10F02 C10F07 C10F18

Affected models: All models
Service Codes: All codes available for the model
A hardware tests couldn't executed successfully.
C10F02: Test returned with an error. No valid test results available.
C10F07: Test function reported an unknown error.
C10F18: Test timed out. No valid test results available

30.2	Hardware test - Power supply voltage	C10800 C10801 C10804

Affected models: Models with motor
Service Codes: C55 to check line voltage.
If the line voltage is below or above a limit the error code is displayed. ***Refer to section 2.3.4 Error ID.***

30.3	Hardware test - 5V line	C10810 C10811

Affected models: All models
Service Codes: C110 to heck 5V voltage.
If the 5V voltage is below or above a limit the error code is displayed. ***Refer to section 2.3.4 Error ID.***

30.4	Hardware test - Current of opto-electronic LED	C10705 C10706 C10707 C10708

Affected models: All models
Service Codes: C75, AdC1 to check LED
If the current / voltage is below or above a limit the error code is displayed. ***Refer to section 2.3.4 Error ID.***

30.5	Hardware test - Transducer signals	C10410 C10420 C10430

Affected models: All models
Service Codes: C103/C104 (CRT only) to check transimpedance and signal amplifiers and transducer values. If no signals from the transducers are detected the error code is displayed. ***Refer to section 2.3.4 Error ID.***

30.6	Hardware test - Auto stop system	C10380 C10381 C10382 C10383

Affected models: Models with auto stop system
Service Codes: C75, Adc21 to check voltage on capacitor of the auto stop system.
If the voltage is below or above a limit or the recharging time is above a limit the error code is displayed.
Refer to section 2.3.4 Error ID.

SERVICE CODES

2.4 H CODES (CRT/HNA/HWT)

ui_error.h revision 1.11

	H	Internal code(s)	Description
0			
	H0		Wheel running conditions cannot be improved by optimisation
	H1		Further optimisation not recommended but feasible
	H2		Weight minimization is recommended, optimisation can achieve no further improvement
20			
	H20		The correction plane cannot be re-located using the gauge arm
	H21		Indexing position does not match correction plane
	H22	0x492215	Unclamping of power clamp device is disabled
	H23		Unclamping of wheel not allowed
	H26		The gauge arm was pulled out too quickly (normal operation, ASS calibration)
	H28		NEW : The gauge arm was pulled out too slowly (ASS calibration)
80			
	H80	0x810510	No provision was made for readjustment
	H82		Self test disturbed during execution
90			
	H90	0x492203,	- acceleration during start or stop too slow- measuring speed not reached
	H91	0x492204	Speed too low during measuring run

2.5 E CODES (CRT/HNA/HWT)

ui_error.h revision 1.11

	E	Internal code(s)	Description
0			
	E1		Rim dimensions entered incorrectly
	E2		Wheel guard is not closed
	E3		Gauge arm not in home position
	E4		Outer gauge arm not in home position
	E5		Range of electrical unbalance compensation exceeded (residual adapter unbalance)
	E6	0x812560, 0x812561, 0x812565, 0x812566	Calibration weight not attached to flange
	E7		No balancing mode for this wheel type
	E8		Valve position was not entered
	E9		Optimisation was carried out incorrectly
10			
	E10		Wheel guard is not open, wheel may not be clamped / unclamped
	E12	Not available to date	Pedal is operated, measuring run not possible
	E13	Not available to date	The clearance of the solenoid brake is too wide.
	E14		The power clamping device is not clamped
	E15		Corrective terms for readjustment are out of range
	E16	0x812570, 0x812571	Calibration weight attached erroneously to flange
	E17	0x492207	Wheel slipped on adapter
20			
	E28	0x492205	Wrong direction of rotation (hand spin)
	E29		Speed too high (hand spin ?)
30			
	E30		Run-out measurement failed
	E31		Rim only mounted during geometric matching when rim and tyre expected.
	E32		The user selected to proceed with a bare rim measurement but the machine actually detects that a complete wheel is on the machine. Mount a bare rim.
50			
	E50		An attempt to access the weights usage database has failed; restart the balancer to re-initialise the database, or call service if the problem persists
80			
	E83		Vibration of the machine disturbed the unbalance measurement
	E85		Power clamp service interval expired
	E88	0x492208	The rotating speed of the main shaft exceeds the safety limit
	E89		Key contact or pedal switch closed

90			
	E92	0x441350, 0x441351, 0x441360, 0x441361	The inner gauge arm for distance and rim diameter is defective
	E93	0x441370, 0x441371	The outer gauge arm for rim width is defective
100			
	E101	0xC30E01	ASA: Status of an activeted order has changed due to network manager or shop management software activities.
140			
	E141	0x000169	Check sum of EEPROM 1 is wrong
	E144	0x00016D	Check sums of both EEPROMs are wrong
	E145	0x000168	Contents of the EEPROMs are different
300			
	E300		The micro-controller was not able to detect a keyboard.Check cabling between micro-controller and keyboard.
	E341	0x00016A	Check sum of EEPROM 2 is wrong
360			
	E360		OPTIMA hardware wheel profiler position calibration required
	E361		OPTIMA wheel profiler is not present or is not responding during self test
	E362		OPTIMA main camera board power on self test failure
	E363		OPTIMA left side scanner self test fail or CCD not calibrated or zero mark not detected
	E364		OPTIMA right side scanner self test fail or CCD not calibrated or zero mark not detected
	E365		OPTIMA rear scanner self test fail or CCD not calibrated or zero mark not detected
	E366		OPTIMA main camera board memory self test failure
	E367		OPTIMA motor power supply missing or out of range
	E368		OPTIMA main camera board A/D converter failure
	E369		OPTIMA main shaft encoder zero mark detection failure or missing cable
370			
	E370		OPTIMA inner CCD signals failure
	E371		OPTIMA inner scanner memory not responding
	E372		OPTIMA inner scanner memory not valid
	E373		OPTIMA inner scanner not calibrated
	E374		OPTIMA inner motor current sink or power supply failure
	E375		OPTIMA inner scanner zero mark not detected
	E376		OPTIMA inner motor missing steps
	E377		OPTIMA inner laser current sink or power supply failure
	E378		OPTIMA inner laser modulation failure
380			
	E380		OPTIMA outer CCD signals failure
	E381		OPTIMA outer scanner memory not responding
	E382		OPTIMA outer scanner memory not valid

	E383		OPTIMA outer scanner not calibrated
	E384		OPTIMA outer motor current sink or power supply failure
	E385		OPTIMA outer scanner zero mark not detected
	E386		OPTIMA outer motor missing steps
	E387		OPTIMA outer laser current sink or power supply failure
	E388		OPTIMA outer laser modulation failure
390			
	E390		OPTIMA rear CCD signals failure
	E391		OPTIMA rear scanner memory not responding
	E392		OPTIMA rear scanner memory not valid
	E393		OPTIMA rear scanner not calibrated
	E394		OPTIMA rear motor current sink or power supply failure
	E395		OPTIMA rear scanner zero mark not detected
	E396		OPTIMA rear motor missing steps
	E397		OPTIMA rear laser current sink or power supply failure
	E398		OPTIMA rear laser modulation failure
400			
	E400		OPTIMA pull index user calibration failure
	E404		OPTIMA rear shift motor current sink or power supply failure
	E405		OPTIMA rear shift scanner zero mark not detected
	E406		OPTIMA rear shift motor missing steps
600			
	E623	0x620530	Virtual dimensions wrong
810			
	E812		The drive pulley was not readjusted by 180º relative to the main shaft
900			
	E900		No model selected
	E901		Machine not calibrated
990			
	E990		Internal error (message server : message buffer overflow(1))Machine halts.
	E991		Internal error (message buffer overflow(2)). Machine halts.
	E992		Internal error (synchronous receive time-out). Machine halts.

2.6.1 STRUCTURE OF AN ERROR CODE

A complete error code consists of 6 hexadecimal digits.

EXAMPLE: 810 - 511
81 = Command language (Commands coming from the UI)
0 = Critical error (will be recorded in user mode)
511 = BL_BAL_ERROR_FailCalUser

Module ID: 2-digit hexadecimal value and indicates the software module which detected the error.
Priority ID: Represents the kind of error (message only, critical error).
Error ID: Determines the kind of the fault.

Module ID	Priority ID	Error ID
81	0	511

2.7.2 MODULE ID

Module ID	Description
21	Time Service
22	I2C bus device driver
23	Serial device driver
24	Sound device driver
25	External AD converter
26	Internal AD converter
27	Temperature measurement
28	Piezo transducer
29	Incremental encoder Main shaft
2A	Incremental encoder belt disc
2B	Relay management
2C	Hand-spin brake
2D	Electromagnetic brake
2E	main supply line
2F	motor
30	Supervisor
31	Watchdog timer
41	Auto stop system
42	Data conditioning
43	Rim data management
44	Sape device
45	Display device
46	Keyboard device
47	Brake device
48	Motor device
49	Drive (Motor & Brake)

4A	Power clamp
4B	Incremental potentiometer
4C	Rim light
61	Balancing algorithm
62	Balancing calibration
63	Behind the spokes placement
64	<not used>
65	Optimisation
66	Measurement control
81	Command language (Commands coming from the UI)
82	Calculator
83	Message Server (Message service from BK to UI)
84	Message Server (User messages from BK to UI)
85	Sleep command
86	Balancing Kernel : Test state machine (eg self-test during start-up)
A1	Event system
A2	User management
A3	State machine
A4	complex data type
A5	Persistent objects
A6	Pipe device
A7	Power on time counter (-> time stamp for error recording)
A8	Counter for total spins / in service-, in user mode
C1	Self test
C2	User interface
C3	User interface

2.8.3 PRIORITY ID

Prior. ID	Description
0	Critical error (will be recorded in user mode)
1	Warning message
2	For information only

2.9.4 ERROR ID

The table lists the error codes and gives some examples for an error.

Error ID	Limits	
F01		Not complete
F02		Invalid job Mod 2D, Brake : Module gets invalid event. Mod 49, Drive system : Internal error, command not valid in actual mode of operation Mod 66, Meas Control : Internal error. Module gets invalid user event. command not valid in actual mode of operation Mod C1, Self-test : Self-test failed, see error record for more information (kernel register err0,...err9 or User interface: C28).
F03		Out of memory
F04		Out of range Mod 27, Temperature: Out of Range
F05		Buffer full
F06		Channel not found
F07		Not found Mod 41, ASS : Time client not found Mod 44, SAPE : Time service not found during unregister Mod C1, Self-test : Self-test failed, result of test invalid
F08		Already exists
F09		In use Mod 44, SAPE : AWP already in use Mod 49, Drive system : Internal error, command not valid in actual mode of operation Many “490F09” errors in the error record indicates a malfunction of the pedal.
F0A		End of file
F0B		Drive full
F0C		Bad name
F0D		Xmit error Mod C3, User Interface : Communication Error between balancing kernel and user interface (BK <- UI). Machine should be restarted. This error can caused by a bad connection of the RS2-32-E serial line. Check external and internal cabling.
F0E		Format failed
F0F		Bad parameter Mod 41, ASS : Invalid time specified Mod 44, SAPE : Bad parameter during calling time service Mod 81, cmd : Parameter of a kernel command is bad. Such an error can occur as a result from a hardware malfunction.
F10		Bad medium

F11		Error in expression Mod C3, User Interface : Communication Error between balancing kernel and user interface (BK -> UI). This error can be cleared by pressing STOP or Escape. This error can caused by a bad connection of the RS2-32-E serial line. Check external and internal cabling.
F12		Overflow Mod 41, ASS : Too many time clients Mod 44, SAPE : Overflow (e.g. invalid time period)
F13		Not implemented
F14		Read only
F15		Bad line
F16		Bad data type
F17		Not running (still not initialised) This error can occur after a measuring run, if the incremental encoder of the power clamp is not able to detect the reference mark (810F17). Please check the incremental encoders with C54, C74 (main shaft) and C98 (power clamp)
F18		Timeout Mod 31, Watchdog: Recorded during start-up: Watchdog causes last reset. Please check error record (C28). Mod 42, Data cond. : Can't get data from external AD converter This error can caused by - a malfunction of the incremental encoder. Please check C74 and C54. - a malfunction of the micro-controller board Check C75 if ADE1 and ADE2 displays valid results. Mod 44, SAPE : Communication timeout (No answer from AWP) Mod C1, Self-test : Self-test failed, test function does not response (timed out)
F20		Access denied Mod 49, Drive system : Access denied : e.g. - use of the clamp device if it is not available (not a power clamp machine?) - Requested action not allowed
50		UT_CMPLX_ERROR_MatrixSingular
60		ERR_VOLTAGE_ZERO
61		ERR_VOLTAGE_BELOW_LIMIT
63		ERR_VOLTAGE_ABOVE_LIMIT
64		ERR_VOLTAGE_really_HIGH
100		Keyboard : No time client available
101		ERROR_KEYB_NO_HARDWARE_AVAILABLE
102		ERROR_KEYB_ORDER_BUSY
120		Display (Digital) : No Hardware available

130		Bad parameter for the frequency of beep command
131		Bad parameter for the volume of beep command
132		Bad parameter for the sound file of beep command
133		Bad parameter for the repetition of a beep
134		Sound file corrupted
140		RS232-E : Wrong parameter for ioctl call.
141		RS232-E : Input buffer overrun occurred
142		RS232-E : Transmission error
143		FIFO_KORRUPT
144		FIFO_WRONG_ACTION
145		FIFO_EMPTY_READ
146		FIFO_FULL_WRITE
147		FIFO_STRING_ENDE
148		PIPE_NO_COMPLETE_MESSAGE_AVAILABLE
149		SER_WRONG_ACTION
14A		SER_NO_HARDWARE
14B		SER_ERR_RESET_FIFO
14C		SER_ERRORCODE_EXISTS
160		ERROR_PO_INIT_READORDER_FAILED
161		ERROR_PO_INCORRECT_DATA_OR_HEADER_SIZE
162		ERROR_PO_EEPROM_IS_FULL
163		ERROR_PO_I2C_WRITE_ORDER
164		ERROR_PO_NO_TIMECLIENT_AVAILABLE
165		ERROR_PO_ORDER_IS_BUSY
166		ERROR_PO_ORDER_IS_FULL
167		ERROR_PO_PRODUCTION_READ_WRONG_TYPE
168		ERROR_PO_EEP1_EEP2_ARE_DIFFERENT
169		ERROR_PO_CRC_EEP1_ERROR
16A		ERROR_PO_CRC_EEP2_ERROR
16B		ERROR_PO_ORDER_HAS_FAILED
16C		ERROR_PO_NOT_AVAILABLE
16D		ERROR_PO_CRC_EEP1_EEP2_ERROR
180		ERROR_I2C_QUEUE_FULL
181		I2C_ERROR_ORDER_NOT_FOUND
182		I2C_ERROR_ORDER_TOO_BIG
183		I2C_ERROR_ORDER_BUSY
184		I2C-Bus : No order in I2C queue
185		I2C-Bus : No active order in I2C queue
186		I2C_ERROR_TOO_MANY_SOP
187		I2C_bad_SDA
188		I2C_bad_SCL

189		I2C_busy
18A		I2C_no_Acknowledge
18B		No Acknowledge from device
18C		I2C_ERROR_NO_ACK_FROM_START
18D		I2C_ERROR_NO_ACK_FROM_STOP
18E		I2C_ERROR_NO_ACK_FROM_SEND1
18F		I2C_ERROR_NO_ACK_FROM_SEND2
190		2C_ERROR_NO_ACK_FROM_RECEIVE
191		ERROR_I2C_SYNCHRONOUS_ORDER_TIMEOUT
192		ERROR_I2C_ASYNCHRONOUS_ORDER_TIMEOUT
193		ERROR_I2C_ORDER_HAS_FAILED
201		ERROR_DS_USER_BREAK
202		Drive system : Timeout during speed up - hand-spin only! speed does not settle after start command
203		ERROR_DS_SPEED_NOT_REACHED
204		Drive system : Speed slows down during measuring - speed falls below limit while measuring
205		Drive system : Wheel speeds up in reverse turn - Hand-spin only! main shaft rotating backwards on start command
206		Drive system : No acceleration during speed up or braking detected 1. Motor 2. Belt mounted? 3. Incremental encoder main shaft
207		Drive system : Slip detected (speed up to fast) 1. Wheel not clamped strong enough 2. no wheel or wheel mass to low
208		Drive system : Speed limit exceeded - speed exceeds security limit (mainly wheel guard open and drive management set to high speed)
210		Drive system : Clamping device got stuck in clamped position
211		Drive system : Clamping device got stuck in unclamped position
212		Drive system : Displacement limit exceeded during (un)clamping
213		Drive system : Belt disc rotates backward after clamping.
214		Drive system : Main shaft rotates during clamping (e.g. EMB defective?)
215		Drive system : Clamp device is locked
216		Drive system : Time limit for clamping process exceeded
300		Motor over-current detected by hardware. Over-current-LED on the power interface board will be cleared on the next activation of the motor
350	0.05 V - 0.037 V(for IBP)	First Potentiometer : Voltage below measuring range (AD value : 0..10)
351	4.45 V - 3.36 V(for IBP)	First Potentiometer : Voltage above measuring range (AD value : 1014..1024)

360	0.05 V - 0.037 V(for IBP)	Second Potentiometer : Voltage below measuring range (AD value : 0..10)
361	4.45 V - 3.36 V(for IBP)	Second Potentiometer : Voltage above measuring range (AD value : 1014..1024)
370	0.05 V - 0.037 V(for IBP)	Third Potentiometer : Voltage below measuring range (AD value : 0..10)
371	4.45 V - 3.36 V(for IBP)	Third Potentiometer : Voltage above measuring range (AD value : 1014..1024)
380	4.50 V	ASS : Voltage magnet below limit - off state.
381	1.00 V	ASS : Operating Voltage magnet below limit - on state.
382	2.00 V	ASS : Operating voltage magnet above limit - on state.
383	0.5 s	ASS : Operating Voltage magnet recharging time above limit
400		During measuring run : Data conditioning can't get proper speed information.
401		During measuring run : User break. (Measuring run stopped by user)
402		During measuring run : Temperature information invalid, 20°C used instead.
403		During measuring run : Can't perform transducer correction.
405		Channel 1 - channel 2 Phase shift too big
410		Transducer 1, No signal
411		Transducer 1, transimpedance to low
412		Transducer 1, RC time constant out of range
415		Transducer 1, transimpedance amplifier; idle voltage out of range
416		Transducer 1, DC amplifier; idle voltage out of range
418		Transducer 1, amplifier saturation
419		Transducer 1, Transfer function out of range
420		Transducer 2, No signal
421		Transducer 2, transimpedance to low
422		Transducer 2, RC time constant out of range
425		Transducer 2, transimpedance amplifier; idle voltage out of range
426		Transducer 2, DC amplifier; idle voltage out of range
428		Transducer 2, amplifier saturation
429		Transducer 2, Transfer function out of range
430		Transducer 1&2, No signal
431		Transducer 1&2, transimpedance to low
432		Transducer 1&2, RC time constant out of range
435		Transducer 1&2, transimpedance amplifier; idle voltage out of range
436		Transducer 1&2, DC amplifier; idle voltage out of range
438		Transducer 1&2, amplifier saturation
439		Transducer 1&2, Transfer function out of range

500		BL_BAL_ERROR_NoConverge
501		BL_BAL_ERROR_ResultInvalid
502		BL_BAL_ERROR_TooMuchLoops
510		BL_BAL_ERROR_NoCalUser
511		BL_BAL_ERROR_FailCalUser
512		BL_BAL_ERROR_SideCalUser
530		Distance of the virtual left plane from the reference plane out of range
560		c1 value too low, if a user calibration tool assumed
561		c2 value too low, if a user calibration tool assumed
565		c1 value too low, if a 100g weight and calibration rotor assumed
566		c2 value too low, if a 100g weight and calibration rotor assumed
570		c1 value too high, if a calibration rotor only assumed
571		c2 value too high, if a calibration rotor only assumed
580	-30°C	Temperature below -30°C or hardware fault.
581	100°C	Temperature above 100°C or hardware fault.
585	0.23 V	Temperature Input near to ground Voltage.
586	4.05 V	Temperature Input near to reference Voltage.
601		Internal error : To many event sinks
602		Internal error : Cannot register event sink
603		Internal error : Invalid event level
701		ERROR_IEMS_INV_PARAM
702		Incremental encoder not initialised. - software is not able to detect the reference mark.
703		Incremental encoder : Counter - reference mark mismatch
705	2.50 V	Opto electronic, No voltage on shunt resistor
706	4.30 V	Opto electronic, VCC on shunt resistor
707	16 mA	Opto electronic, Current through LED below limit
708	20 mA	Opto electronic, Current through LED above limit
710		Hand-spin with electromagnetic released brake - main shaft rotates backwards
800	170 V	Line voltage below limit
801	265 V	Line voltage above limit
804	275 V	Line voltage much too high
810	5.10 V	VCC below limit
811	5.35 V	VCC above limit
820	5.00 V	Keyboard/display voltage below limit
821	5.35 V	Keyboard/display voltage above limit
830	4.50 V	External voltage (pedal) below limit, see keyboard module
831		External voltage (pedal) above limit, see keyboard module

900		Power fail detected
950		OPTIMA hardware main board fault detected
951		OPTIMA hardware inner scanner fault detected
952		OPTIMA hardware outer scanner fault detected
953		OPTIMA hardware rear scanner fault detected
9FF		ERROR_SELFTEST
e01		ASA: Status of an activated order has changed due to network manager or shop management software activities.

2.10 IBP CODES

Error ID	Error tag	Equivalent Y2K error	Hofmann User error
001-001	BK_ERROR_PO_NOTFOUND	internal	-
001-002	BK_ERROR_PO_READING	internal	-
001-003	BK_ERROR_PO_WRITING	new	-
001-004	BK_ERROR_PO_EEP1_RD	internal	-
001-005	BK_ERROR_PO_EEP2_RD	internal	-
001-006	BK_ERROR_PO_EEP1_WR	new	-
001-007	BK_ERROR_PO_EEP2_WR	new	-
001-010	BK_ERROR_KBD_DISPLAY	internal	-
001-011	BK_ERROR_KBD_VOLTAGE	46x-xxx	-
001-012	BK_ERROR_KBD_READING	46x-xxx	-
001-020	BK_ERROR_DC_OVERRUN	xxx-401	E83
001-021	BK_ERROR_IEM_ZERO_MISMATCH	290-703	-
001-022	BK_ERROR_IEP_ZERO_MISMATCH	2A0-703	-
001-030	BK_ERROR_POWER_FAIL	xxx-900	-
001-031	BK_ERROR_TEMP_SENSOR	xxx-58x	-
001-032	BK_ERROR_VCC_ABOVE_LIMIT	xxx-811	-
001-033	BK_ERROR_VCC_BELOW_LIMIT	xxx-810	-
001-034	BK_ERROR_VDISP_ABOVE_LIMIT	xxx-821	-
001-035	BK_ERROR_VDISP_BELOW_LIMIT	xxx-820	-
001-036	BK_ERROR_LINE_ABOVE_LIMIT	xxx-801	-
001-037	BK_ERROR_LINE_BELOW_LIMIT	xxx-800	-
001-038	BK_ERROR_OPTO_SHORT_HIGH_CUR	xxx-708	-
001-039	BK_ERROR_OPTO_OPEN_LOW_CUR	xxx-707	-
001-040	BK_ERROR_SAPE_1D_LOW_VOLT	xxx-350	E92
001-041	BK_ERROR_SAPE_1D_HIGH_VOLT	xxx-351	E92
001-042	BK_ERROR_SAPE_2D_LOW_VOLT	xxx-360	E92

001-043	BK_ERROR_SAPE_2D_HIGH_VOLT	xxx-361	E92
001-044	BK_ERROR_SAPE_3D_LOW_VOLT	xxx-370	E93
001-045	BK_ERROR_SAPE_3D_HIGH_VOLT	xxx-371	E93
001-046	BK_ERROR_SAPE_1D_INVALID_CAL	new	E92
001-047	BK_ERROR_SAPE_2D_INVALID_CAL	new	E92
001-048	BK_ERROR_SAPE_3D_INVALID_CAL	new	E93
001-050	BK_ERROR_SIDE_CAL_BAL	xxx-512	E16
001-051	BK_ERROR_SIDE_CAL_USER	xxx-512	E16
001-052	BK_ERROR_NO_CAL_USER	xxx-510	H80
001-053	BK_ERROR_FAIL_CAL_USER	xxx-511	E15
001-054	BK_ERROR_VIRT_DIM_OUTOFRANGE	xxx-530	E623
001-055	BK_ERROR_C1_100G_LOW	xxx-565	E6
001-056	BK_ERROR_C2_100G_LOW	xxx-566	E6
001-057	BK_ERROR_C1_0G_HIGH	xxx-570	E16
001-058	BK_ERROR_C2_0G_HIGH	xxx-571	E16
001-059	BK_ERROR_C1_USERCALTOOL_LOW	xxx-560	E6
001-060	BK_ERROR_C2_USERCALTOOL_LOW	xxx-561	E6
001-070	BK_ERROR_SPOKE_SAME_POS	internal	-
001-071	BK_ERROR_UG_NOT_BET_SPOKES	internal	-
001-072	BK_ERROR_ANG_SPOKES_TOOHIGH	internal	-
001-073	BK_ERROR_ANG_SPOKES_FAIL	internal	-
001-080	BK_ERROR_SPINUP_TIMEOUT	490-202	H90
001-081	BK_ERROR_NO_ACCELERATION	490-206	H90
001-082	BK_ERROR_SPEED_LOW	490-204	H91
001-083	BK_ERROR_SPEED_HIGH	490-208	E88
001-084	BK_ERROR_REVERSE_TURN	490-205	E28
001-085	BK_ERROR_SLIP_DETECTED	490-207	E17
001-090	BK_ERROR_STUCK_CLAMP	490-210	-
001-091	BK_ERROR_STUCK_UNCLAMP	490-211	-
001-092	BK_ERROR_CLAMP_MAXDISP	490-212	E14
001-093	BK_ERROR_CLAMP_TIMEOUT	490-216	E14
001-094	BK_ERROR_CLAMP_LOCKED	490-215	H22
001-095	BK_ERROR_CLAMP_SLIP	490-214	-
001-096	BK_ERROR_CLAMP_FALLBACK	490-213	-
001-100	BK_ERROR_WATCHDOG	new	-

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