

		<input type="checkbox"/> New Product Release <input type="checkbox"/> Sales Bulletin <input checked="" type="checkbox"/> Service Bulletin <input type="checkbox"/> Service Procedure	<input type="checkbox"/> Calibration Procedure <input type="checkbox"/> Operation Procedure <input type="checkbox"/> Part / Accessory
		Release Date: March, 2008 Priority Status: When Subject Exist	Model(s) Affected: All Y2k balancers
<b>Balancer Diagnostic Codes</b>			

**GENERAL OVERVIEW:**

Balancers that have been manufactured since 2000 contain diagnostic codes to aid the technician in troubleshooting 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. All future code updates will be documented on this bulletin and redistributed.

**ACTION TO BE TAKEN:**

Use the appropriate Service Manual to look up the procedures to access the Balancer Diagnostic Codes. The balancers can store up to 10 diagnostic codes in memory.

Before calling technical support for assistance about any errors codes it is recommended that ALL error codes be documented using C28.

Codes are listed in the following order

1.2 Recommended service steps .....	2
1.3 Self-test during start-up (CRT/HNA/HWT).....	3
2 All Codes .....	14
2.1 H codes (CRT/HNA/HWT).....	14
2.2 E codes (CRT/HNA/HWT) .....	15
2.3.1 Structure of an error code.....	18
2.3.3 Priority ID.....	19
2.3.4 Error ID.....	20
2.4 IBP codes .....	26

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)

## 1.1 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
  - 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

The machine is now ready for use.

## 1.2 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

The following codes allow some deeper tests of the vibratory system:

- C67 - Indicate the phase stability/shift of the vibratory system
- C72 - Measure the angular deviation of the vibratory system
- C63 - Continuous measurements to check measurement deviation.

### 1.3 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
<p>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.</p>		
2.	Check home position of left SAPE	E3
<p>Affected models: Models with 1D-, 2D-SAPE or geodata            Service Codes : C80 (&amp; 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.</p>		
3.	Check home position of right SAPE	E4
<p>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.</p>		
4.	Check weights usage database	E50
<p>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</p>		
5.	Power clamp service interval expired	E85
<p>Affected models: Models with power clamp            Service Codes : All codes available for the model</p>		
6.	Check Keyboard	E89
<p>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.</p>		
7.	Check Pedal switches	E85
<p>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.</p>		

8.	Disable left SAPE	E92
<p>Affected models: Models with 1D-, 2D-SAPE or geodata  Service Codes : C80 (&amp; 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.</p>		
9.	Disable right SAPE	E93
<p>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.</p>		
10.	Check content of permanent memories	E145
<p>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.</p>		
11.	Check availability of keyboard	E300
<p>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.</p>		
12.	Check Optima Calibration	E360
<p>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,</p>		
13.	Check Optima Hardware	E360
<p>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,</p>		
14.	Check Optima Hardware	E362
<p>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.</p>		
15.	Check Optima inner scanner	E363
<p>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.</p>		

16.	Check Optima outer scanner	E364
<p>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.</p>		
17.	Check Optima rear scanner	E365
<p>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.</p>		
18.	Check Optima main camera board memory	E366
<p>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</p>		
19.	Check Optima motor power supply	E367
<p>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</p>		
20.	Check Optima main camera board A/D converter	E368
<p>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</p>		
21.	Check Optima main shaft encoder zero mark	E369
<p>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</p>		
22.1.	Check Optima inner CCD signals	E370
<p>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</p>		

- 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 drivers  
Corrective 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 drivers  
Corrective 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 board  
Corrective 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.**

## 2 All Codes

### 2.1 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

## 2.2 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 activated 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 180° 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.

### 2.3.1 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
<b>81</b>	<b>0</b>	<b>511</b>

### 2.3.2 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

### 2.3.3 Priority ID

Prior. ID	Description
0	Critical error (will be recorded in user mode)
1	Warning message
2	For information only
3	All of above, but will not be recorded in the error record (persistent objects p30 to p39)

### 2.3.4 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 RS-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 RS-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.

## 2.4 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	-