Caution
Protect the shaft bearing surface to prevent damage from support wheels.

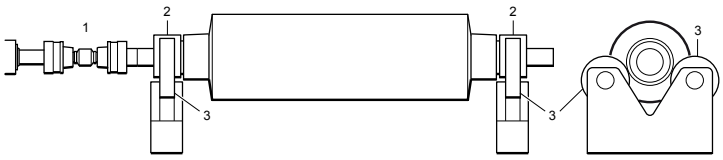


Figure X. Measuring Roll grinding method 1.

Figure positioning:

1. Couplings
2. Inner ring from bearing as protection on shaft bearing surface
3. Support wheels

3.2.7.3 General Method 2

Grinding data:

- Grinding wheel: type 33A 60 M8 VK or softer for both 313 mm and 400 mm Measuring Roll.
- Peripheral speed: grinding wheel max 30 m/s, Measuring Roll max 30 m/min.
- Lateral speed rate: 50% of grinding wheel width per revolution of the Measuring Roll.

Use this method:

1. Remove the STU. See instruction in chapter Dismantling a STU.
2. Remove the bearings. See instruction in chapter Removing Old Bearing, page 62.
3. For regrinding, set up the Measuring Roll between two centre points as shown in Figure X. Measuring Roll grinding method 2. page 62. A detachable pivot centre is supplied and marked for the Measuring Roll. Adjust so that the run-out is < 0.01 mm at both bearing surfaces.
4. Ensure a generous coolant supply, at least 40 liters/min.
5. Find the maximum diameter of the rotating Measuring Roll. Start by touching this point with the grinding disc and then grind down max 10 µm/ sweep.
6. The last five sweeps over Measuring Roll surface should be 5 µm/ sweep until the desired surface finish has been reached.
7. After regrinding a calibration verification check of the Measuring Roll can be performed (see chapter Calibration Verification Check of Measuring Roll), but this is normally not needed.

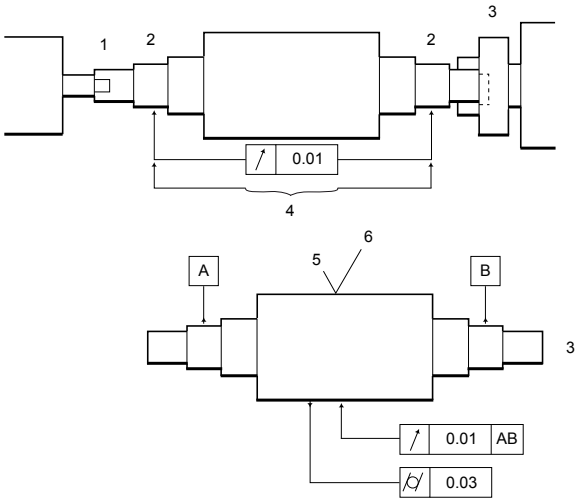


Figure X. Measuring Roll grinding method 2.

Figure positioning:

1. Fixed pivot centre
2. Bearing surfaces
3. Detachable pivot centre
4. Run-out demand before regrinding
5. R_a0,4
6. R_a corresponds to international standard ISO 221

3.2.8 Bearing Replacement

3.2.8.1 Removing Old Bearing

Following this procedure:

1. Remove the STU (with Measuring Roll still in the mill). See instructions in chapter Dismantling a STU, page 66.
2. Lift off the Measuring Roll from the mill.
3. Support the roll on the measuring surface (ring surface). Use "felt" protected wood or similar, for the support material; dimensions L = 500, h = 200, t = 100 with support radius of 160 mm or adequate.
4. Remove the bearing housings and labyrinths. The outer ring of the labyrinth seals are removed by pressing the inner ring. The rings are pressed out using a short lever (see Figure X. Removing old bearing page 63). Do not jerk or strike the components or they will be damaged.
5. Remove bearing by connecting the oil injector to the journal and pump in oil continuously until the bearing is floating on the oil film. After a short time oil begins to emerge between the bearing and the journal. Then there is a thin film of oil between the bearing and the journal, which enables the bearing to be easily pulled off the journal.
6. Pull gently, to check that the bearing is floating on the oil film.

7. Pull off the bearing in one fast go, otherwise the bearing may get stuck on the shaft, so that a puller must be used. The oil pressure drops rapidly when the bearing has passed over the groove in the mating surface. When using a puller apply the force on the inner ring.
8. Connection of an oil injector can damage the journal end, resulting in unbalance of the STU. After injector check the run-out with an indicator. Adjust with scraper so that the run-out will be < 0.03. When supporting on the bearings, the internal clearance can make the journal move.

Tip
In certain cases it may be better to remove the old bearing using a grinding machine. Cut bearing rings instead of using a puller (less damage). Do not grind on the shaft bearing surface.

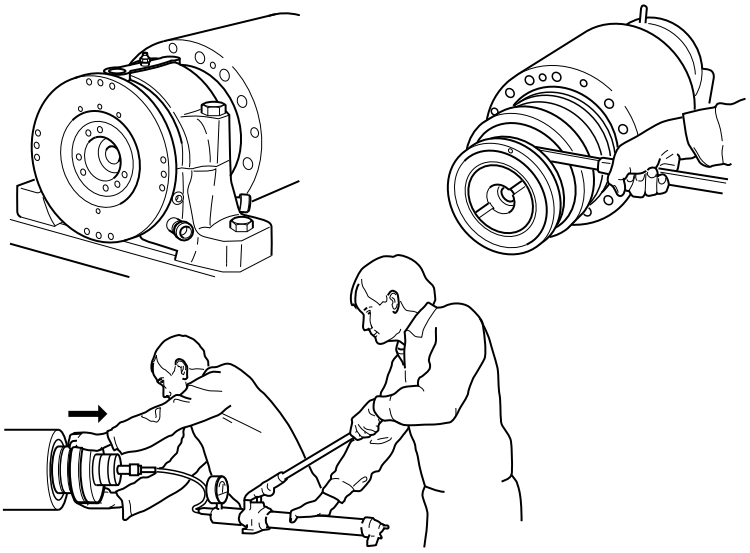


Figure X. Removing old bearing

3.2.8.2 Assembling New Bearing

Brand new bearings in an unopened and undamaged packaging are normally clean and require no further cleaning. The anti-corrosion coating on the bearings has no adverse effect on lubrication, and does not need to be removed.

Follow this procedure:

1. Inspect and clean the shaft seating and lubricate with thin machine oil.
2. Lubricate the seal rings with grease.
3. First apply on the shaft all sealing components that are to be on the inside of the bearing. Lubricate the sealing rings with grease.
4. Heat the bearing with an induction heater. An oven or a mineral-oil bath with a temperature of 100-110°C can also be used.
5. Slide the hot bearing onto the shaft with the marked face outwards.
6. Check that the inner ring is located hard against the shoulder. If shaft shoulder or distance rings for bearing location have an axial run-out of > 0.02 mm, the position of the bearing can become tilted and produce axial vibration on the Stressometer roll.
7. Fit on the locking washer and lock nut before the bearing cools off. When the inner ring of the bearing cools, a clearance is formed between the ring and the shoulder of the shaft. This clearance is intentional and necessary.
8. Lock the nut by bending the tab of the locking washer into the recess in the nut.

9. If the bearing is grease-lubricated, fill all spaces in the bearing with grease from both sides.
10. Fit the remaining seal components that must be well lubricated.
11. When the Measuring Roll is installed in the mill, mount the STU and its protection cover. See instruction in chapter Installation of Signal Transmission Unit (STU), page 46.

3.2.9 Calibration Verification Check of Measuring Roll

3.2.9.1 Introduction

The Measuring Roll is already calibrated when it is delivered from ABB. The individual sensitivity factors for each zone are stored in the system. The zone sensitivity changes over time are extremely low, due to the long term stability of the Pressductor sensors.

If the difference from the last calibration verification exceeds ±5% contact ABB.

The verification of the system and the sensitivity factors should be done approximately once a year.

Information
Verification should be performed each time a Measuring Roll has been recoated or regrinded.

3.2.9.2 Calibration Verification Equipment

The supplied calibration verification unit should be used (see Figure X. Measuring Roll calibration verification equipment page 64).

1. Mount the calibration verification beam.
2. Check the distances y and z.
3. Compare the measured values of y and z.
4. The acceptable difference between y and z is ± 0.3 mm.

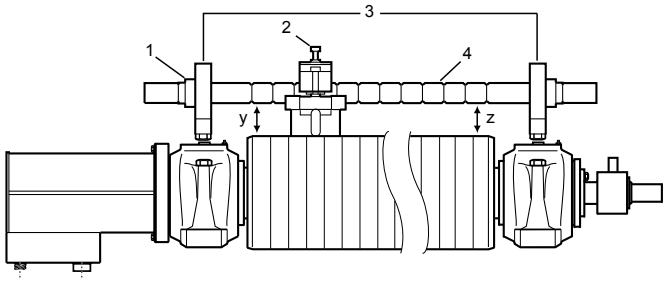


Figure X. Measuring Roll calibration verification equipment

Figure positioning:

1. Stop ring
2. Calibration verification beam
3. Bracket
4. Tube

3.2.9.3 Preparations

Danger
Avoid staying close to the rotating Measuring Roll during calibration verification. It is always recommended that the rotation is stopped when the load beams need to be moved to the next zone. Be careful when touching the Measuring Roll surface when power supply is on, as the surface temperature can be 30-40ºC higher than the ambient temperature.

- The tube should be locked to the brackets or stays in the right position with the two stop rings.
- Tube grooves should be placed in the center of the zones.
- Use composing stick on the Measuring Roll surface and distance to surface edges.

The brackets are designed to be fixed on the Measuring Roll bearing housings or on the support for the Measuring Roll.

Information
The graphite pad will be worn after one calibration verification. Grind the pad in line with tube support on the load beam.

- Check that there is no “viper-blade”, “brass-brushes” or similar on the Measuring Roll, which can cause measurement disturbance during the calibration verification check.
- Clean the surface of the Measuring Roll.
- Be sure that the wheel of the calibration weight does not load the Measuring Roll when the Measuring Roll is stationary.
- There should be no air pressure in the Measuring Roll during the calibration phase.
- Before starting the calibration allow the Measuring Roll to rotate with slow speed (100 rpm) in approximately 1/2 hour (depending on the start temperature of the Measuring Roll). Rotation produces uniform temperature on the Measuring Roll surface.
- The BM-Tool for handling of Roll Calibration is described in Appendix C.

3.3 System Check of Signal Transmission Unit

3.3.1 Visual Inspection

Inspect the STU every 6 months or earlier.

The lifetime of the brushes in the STU depends primarily on the working speed. If the speed is high, the brushes may have to be replaced after one year of service. At lower speeds the brushes may last longer.

3.3.2 Preparations

Electrical
Before any work on the STU is done (connection or disconnection) the Stressometer cabinet must be switched off. When this is done, the cables connected to the STU may be removed.

- Prevent dirt and liquid to enter into the disconnected connectors.
- At inspection and maintenance work of the Stressometer, switch off the power supply to the cabinet by operating the S1 switch on the PFSC 121 unit.

3.3.3 Dismantling a STU

Follow this procedure to remove the STU:

1. Remove the rotation stop.
2. Remove the three M4-screws.
3. Remove the protecting cap.
4. Pry off the cap. Use a screwdriver inserted in the opening shown in *Signal Transmission Unit - User Manual: Figure 5. Vibration absorber*.
5. Slide the protecting cap over the front part (the 100-pole connector).
6. Dismantle the supply unit. See instruction in Supply Unit, page 68.
7. Disconnect the ribbon cable connectors on all the signal transmission boards in the signal unit.

Information
Do not bend the Signal transmission boards while disconnecting them.
Straightening of a wire must be done carefully. Use a pair of forceps to hold the end of the wire.

8. Protect the signal unit shaft with clean and dry paper wrapped around the shaft and fastened with tape, to prevent grease, oil or dirt to reach the contact rings and the barriers.
9. The signal unit shaft can be slided out when the 6 screws in the bearing retainer at the ball-bearing have been removed, and the housing has been heated to 120°C.
10. The ball bearings 6008-2RS2/GWN and 6005-2RS2/GWN can be removed from the shaft with an extractor. STU should be sent to ABB for ball bearing changing.
11. Check the contact rings on the signal unit shaft.
12. Check the barriers.

13. Measure the diameter from the bottom of the U-grooves.

Information
Only optical measuring is allowed to avoid damage to the contact rings. Protect the rings from grease, oil and dirt. Do not clean the contact rings.

14. Check the contact rings and the shaft for proper resistance and insulation. The normal insulation value between one contact ring and an adjacent contact ring and between one contact ring and the shaft is > 200 MOhm at 100 V.

Information
Do not dismantle the shaft.

If there is any problem with the signal unit shaft, contact the local ABB representative.

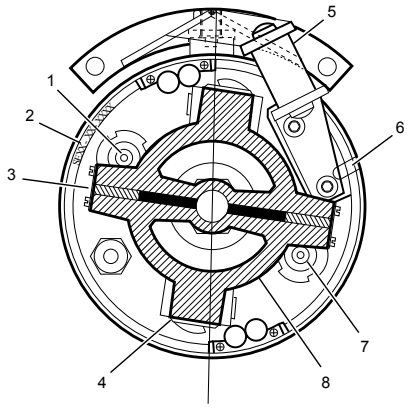


Figure X. Vibration absorber

Figure positioning:

1. Distance element ø 12
2. Serial number
3. Supply unit brushes
4. Humid air outlet
5. Vibration absorber 40° IRH
6. Opening to pry off the protecting cap
7. Distance element ø 12
8. Supply unit

3.3.4 Signal Transmission Boards

The Signal transmission boards with operational amplifiers has two types of signal collectors, see Figure X. Signal transmission board 7625013-S page 68.

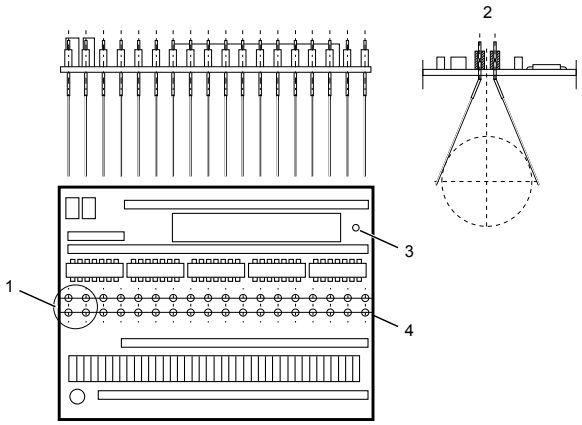


Figure X. Signal transmission board 7625013-S

Figure positioning:

1. Common signal collectors P7-type
2. Solder terminal
3. Solder terminal for open circuits. Only used when the Stressometer roll have no blind connections behind 100-pole connector. (Stressometer roll delivered before January 1994).
4. Signal collectors P4-type

P7 = sense and feedback collectors with 7 wires
P4 = signal collectors with 4 wires.

Information
Absolutely no grease or oil is allowed on the contact rings or the signal collectors.

3.3.5 Supply Unit

Use the following procedure to check the supply unit:

1. Check the resistance between the 100-pole connector and the 5-pole connector on the connection plate. A resistance of < 250 mOhm is normal if the STU has been in operation recently.
2. Remove the two inspection plugs and the two sealing plugs (see Figure X. Checking or replacing supply brushes. page 70) to inspect brushes and slip rings.
3. If cleaning is necessary, use only clean oil-free air for blowing the inside of the supply unit housing.

Information
If the brushes or the contact rings need grinding to decrease the resistance, or if they must be replaced, it is not necessary to remove the housing when new brushes with guide are used.

4. Remove the contact clips and the brushes.
5. Remove plugs from holes between the halves and clean the inside with oil-free compressed air. Clean the brushes holes with dry cotton tops.

6. The new brushes are formed to fit the slip rings. Compress the spring over the guide until the free end is straight. Align the brushes correctly. Refit the contact clips. Old type of brushes without guide should be replaced according to the description below.

Information

To avoid readjustment of the synchronization pulse, only one half of the housing should be removed at a time, if removing of the housing is needed.

7. Remove the hose nipple.
8. Remove the spacer from the half to be removed.
9. Remove the bracket (valid only for STUs for more than 32 zones).
10. Loosen the clamp on the half to be removed.
11. Remove the four M6-screws.
12. Remove the plugs from the holes between the halves. Pry off the half to be removed, using a screw driver inserted in the plug holes, without disturbing the other half. Do not touch the shaft or slip rings.
13. Check the brushes and replace if necessary. Note the following:
    - Grinding of the brushes is allowed with abrasive paper FEPA 800.
    - Blow the inside clean with oil-free compressed air. Do not blow on the bearing seals.
    - The contact clip must be removed when changing a signal collector.
    - Align the brushes correctly.
    - The new brushes are formed to fit the slip rings.
    - Ensure that the brushes slide easily in their holes.
    - Grind the rings with abrasive paper FEPA 800 if necessary.
    - Clean the slip rings with oil-free isopropyl alcohol.
14. Refit the first half and fasten the spacer and the clamp before detaching the second half. Erect the half radially toward the shaft to avoid breaking the brushes.
15. Remove the spacer and loosen the clamp for the second half and proceed in accordance with the instructions above.

16. Refit the parts. The plug with hole must be located downwards.
17. Measure the resistance again between the 100-pole connector and the 5-pole connector on the connection plate, to verify the brush resistance (< 250 mOhm).

Tip
If both halves must be detached at the same time, start by using a marker pen to mark the position of the Encoder related to the shaft and the supply unit housing positions. This is to simplify the readjustment.

Information
If the Encoder must be removed, loosen the shaft coupling screw close to the barrier, and remove the Encoder.

Caution
The shaft coupling will break if the bellows is scratched or dented.

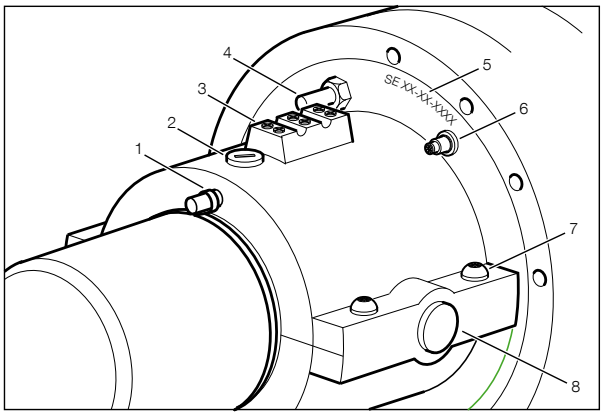


Figure X. Checking or replacing supply brushes.

Figure positioning:

1. Clamp
2. Inspection plug
3. Contact clip
4. Hose nipple
5. Serial number
6. Spacer
7. M6-screw
8. Sealing plug

3.3.6 Encoder Customer Connection

Figure X. Front and side view of the Twin Encoder page 71 shows the Twin Encoder where Encoder B is the one which is used by the customer.

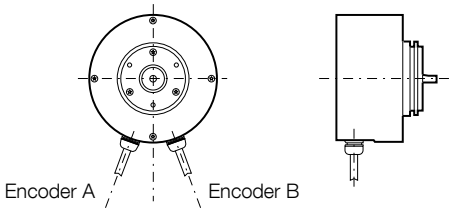


Figure X. Front and side view of the Twin Encoder

Figure X. Connection of customer Encoder B page 71 shows how to connect the Encoder B to the customer equipment.

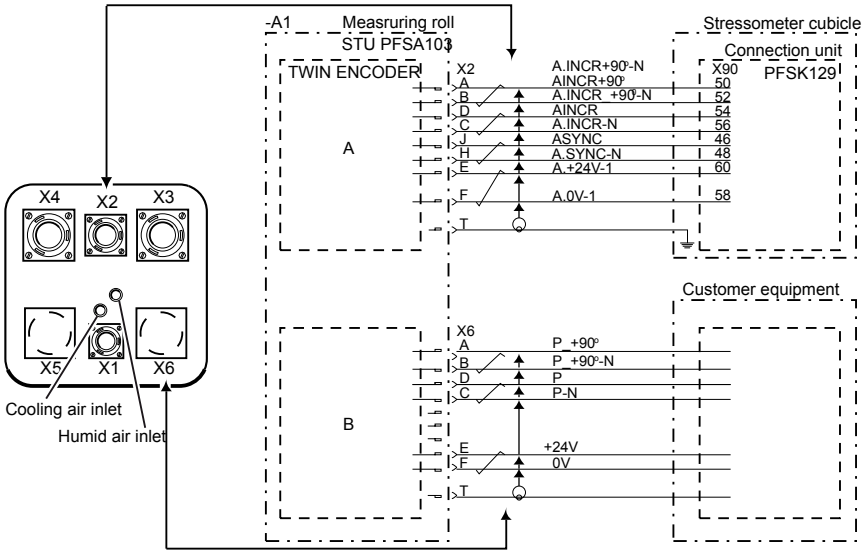


Figure X. Connection of customer Encoder B

3.3.7 Assembling STU

Assemble the STU in reverse order to removal. Note the following:

- Press on the ball bearings 6008-2RS2/GWN and 6005-2RS2/GWN on the signal unit shaft, and attach the cir-clips. This is preferably done by ABB.
- Heat the contact ring housing to approximately 120ºC before inserting the signal unit shaft in the housing.
- Place the STU vertically with a tube support on the flange.
- Check there is no support on the 100-pole connector surface and that the shaft for the supply unit is not damaged.
- Check that the signal collector wires on P4 and P7 are not bent when mounting the signal transmission boards.
- Replace the signal transmission board in the same position.

3.3.8 Coarse Adjustment of Encoder

Follow this procedure to coarsely adjust an Encoder:

1. The screw on the coupling must match with the bevelling on the Encoder shaft. Fasten the coupling on the shaft end.
2. The screw on the free end of the coupling must match with the mark on the STU shaft.
3. The point on the Encoder housing must coincide with the screws on the coupling.
4. When all marks are lined up, tighten the screw on the STU side of the coupling is.
5. If no mark on the new Encoder or on the STU shaft, look on the old Encoder and set screw mark on the STU shaft. Make marks carefully.

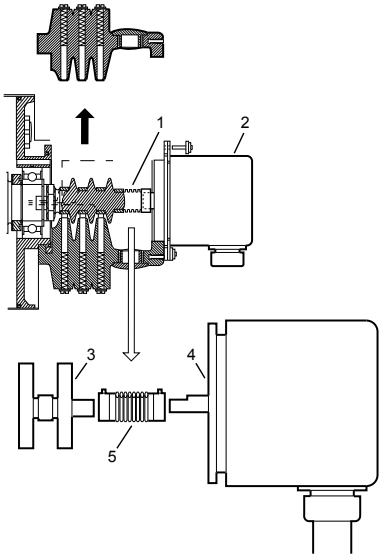


Figure X. Encoder coupling assembly

Figure positioning:

1. Shaft coupling with set screws
2. Encoder
3. Mark
4. Point on STU shaft
5. Coupling

3.3.9 Fine Adjustment of Encoder

Fine adjustment of the Encoder is performed electrically.

3.3.10 STU Replacement

Before you start the replacement of the STU make sure that the mains power switch S1 is switched off.

Parameters to be changed after a STU replacement or repair, except mechanical and electrical adjustments are:

- PWA check (Pulse Transmitter change). See chapter Automatic Force Pulse Detection and Integration, page 73.
- New Bias calibration, see chapter Bias Calibration in your Stressometer flatness system manual.

3.3.10.1 Pulse Transmitter (Encoder)

3.3.10.1.1 Encoder Pulses

The Encoder on the STU generates the pulses SYNC, INCR and INCR+90°. Turn the Measuring Roll slowly by hand and check the function of the SYNC pulse. The Data Concentrator board indicator SYNC flashes for every SYNC pulse (once per revolution).

In reversible mills with two Measuring Rolls, one Measuring Roll is connected to the left Data Concentrator board SYNC indicator and the other Measuring Roll is connected to the right Data Concentrator board SYNC indicator.

3.3.10.1.2 Roll Rotation Direction Indication

The Data Concentrator board detects roll rotation direction through the INCR and INCR+90° pulses from the Encoder(s). The direction is indicated by the Data Concentrator board indicator DIR.

In reversible mills with two Measuring Rolls, one Measuring Roll is connected to the left Data Concentrator board DIR indicator and the other Measuring Roll are connected to the right Data Concentrator board DIR indicator. Check the roll rotation direction indication while turning the Measuring Roll(s) slowly in both directions.

If the Encoder are correctly wired the indicators should illuminate according to:

- DIR extinguished = clockwise (ADCB) direction.
- DIR illuminated = counterclockwise (ABCD) direction.

Roll rotation direction definition is according to Figure X. Roll rotation direction definition page 73 below.

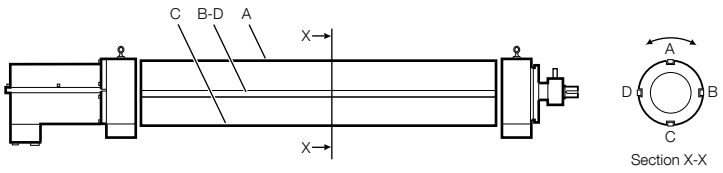


Figure X. Roll rotation direction definition

Perform a STU encoder synchronization.

3.3.11 Automatic Force Pulse Detection and Integration

The Force Pulse detection and integration is done automatically by the BM-part if selected. The term ‘Force Pulse detection and integration’ means detection (always active) of the actual force pulse position and adjustment of the Force Pulse Integration window. This window is the angle window where the system integrates (uses) the actual force pulse to make a force sensor sample.

The activation of automatic Force Pulse Integration window adjustment (based on the detected force pulse position) is done by activating Box 1 [IdentPulseEnable] in Force pulse handling setting under Configuration and maintenance > Force pulse handling.

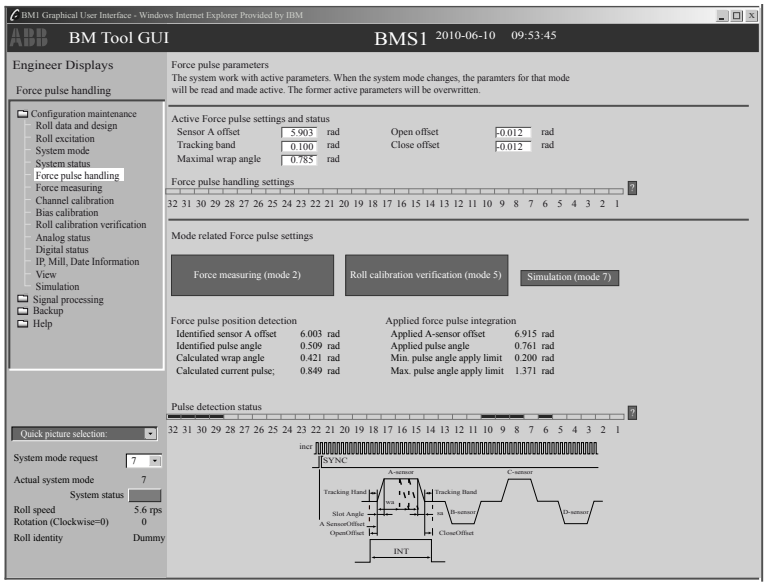


Figure X. Force pulse handling

Information

Box 2 [IdentPulseHold] should be deactivated to let the adjustment of the Force Pulse Integration window to be based on the latest detected force pulse position.

To get information about the actual status of the Force Pulse detection and integration, press the "Force measuring (mode 2) button.

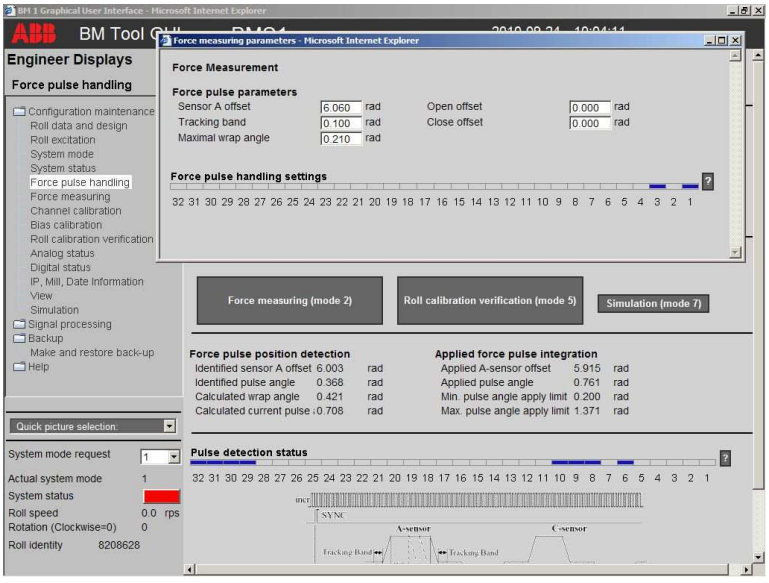


Figure X. Force measuring parameters

In Status, Box 1 [IdentPulseActive] indicates that the identified Force Pulse position is used in the adjustment of the Force Pulse Integration window. This Box should be active when automatic Force Pulse Width detection and adjustment is selected.

3.3.11.1 Definition

The Force Pulse detection and integration handling has the following definitions.

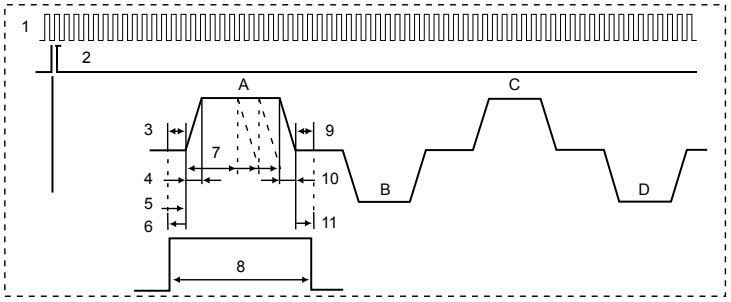


Figure X. Force pulse detection status

Figure positioning:

1. incr
2. SYNC
3. Tracking band
4. SlotAngle
5. ASensorOffset
6. +OpenOffset
7. wa
8. INT
9. TrackingBand
10. sa
11. +CloseOffset

The Sensor A offset (ASensorOffset) is not redefined at a roll rotation direction change, i.e. the ASensorOffset is either to the left or to the right depending on the roll rotation direction. The position of the current force pulse position relative to the Force Pulse Integration (INT) window can be examined by using the "View functionality".

The total force pulse angle consist of two parts, the wrap angle (wa) and the slot angle. Note that parameters above have separate values for every System mode are only updated after a System mode change, i.e. check the influence of a parameter change by changing the local copy at Configuration and maintenance > Force pulse handling and when satisfied store the result under the corresponding System mode.

The following System mode are using Force pulse parameters and Force pulse handling settings:

- Roll calibration (5)
- Force measurement (2)
- Channel calibration (3)
- Simulation (7)

3.3.11.2 Tracking Window Definition

Necessary input for the detection is the definition of the tracking window (defined by Sensor A offset, Tracking band and Maximal wrap angle). The tracking window is the angle window where the system assumes to find the force pulse of the Sensor A.

The tracking window goes from the value; Sensor A offset - Tracking band up to Sensor A offset + SlotAngle + Maximal wrap angle + Tracking band.

Above parameters have separate values for every System mode and only updated after a System mode change. For the Flatness measurement mode (2) select Configuration and maintenance > Force Measuring.

The sensor slot in radians, SlotAngle (sa), is calculated from RollCoreDiameter and SensorSlotWidth, which are found at Configuration and maintenance > Roll data and design.

3.3.11.3 Tracking Band

The Tracking band could be seen as the allowed “uncertainty” in the Sensor A offset and Maximal wrap angle parameters. The Tracking band parameter increases the allowed search area for finding the actual force pulse position.

3.3.11.4 Detection

The detection result is found as the identified Sensor A offset, Ident. Sensor A offset, and the identified pulse angle, Ident. pulse angle, see Figure X. Force pulse detection status page 75.

The identified Sensor A offset could be limited upwards using Sensor A offset + Tracking band (Box 5 deactivated in Status) and identified pulse angle could be limited downwards using Sensor A offset + SlotAngle (Box 6 deactivated in Status).

The identified pulse angle is then compensated for the nature of the detection algorithm. This is done by calculating the real current pulse angle from the identified, Calc. curr pulse angle, i.e. the total angle when force signal information is available. Calculation of identified wrap angle, Calc. wrap angle, is done by using the identified pulse angle, Ident. pulse angle.

3.3.11.5 Detection Error

Following Boxes in Status indicates that there is some faults or limitation, see Figure X. Force measuring parameters page 74:

- Box 7 [IdentSensorError] indicate that the identified sensor do not correspond to the selected, in normal case, the Sensor A.
- Box 5 [IdentASensorOffsetNotLimited] indicate that the identified Sensor A offset is not limited.
- Box 6 [IdentPulseAngleNotLimited] indicate that the identified pulse angle is not limited.

If Box 5 [IdentASensorOffsetNotLimited] or Box 6 [IdentPulseAngleNotLimited] is deactivated then the problem could be that the given tracking window (defined by Sensor A offset , Tracking band and Maximal wrap angle) is misaligned compared to the actual force pulse position.

3.3.11.6 Integration

The corresponding adjustment of the Force Pulse Integration window is found as the used (applied) Sensor A offset, Sensor A offset apply, and the used (applied) pulse angle, Pulse angle apply.

There are possibilities to manually add or subtract static angle offsets to the used (applied) Sensor A offset and the used (applied) pulse angle. Those are called Open offset and Close offset.

Above parameters have separate values for every System mode and are only updated after a System mode change. For the Flatness measurement mode (2) Configuration and maintenance > Force Measuring, see Figure X. Force pulse handling page 74.

The used (applied) Sensor A offset can be manipulated by Open offset. The used (applied) pulse angle is manipulated by both Open offset and Close offset.

When the adjustment of the Force Pulse Integration window is done automatically by the BM-part then the used (applied) Sensor A offset, Sensor A offset apply, is calculated as Ident. pulse angle + Open offset. Similarly the used (applied) pulse angle, Pulse angle apply, is calculated as Calc. curr pulse angle + Open offset + Close offset.

3.3.12 Complete Work of STU

Use the following procedure to complete work of STU:

1. Replace all the cables to the STU.
2. Switch the power on to the cabinet by operating the S1 switch. The system will start up automatically.

Information
If the system does not start up, please refer to the Troubleshooting part of the manual.

3.4 System Check of Air Humidifier Unit

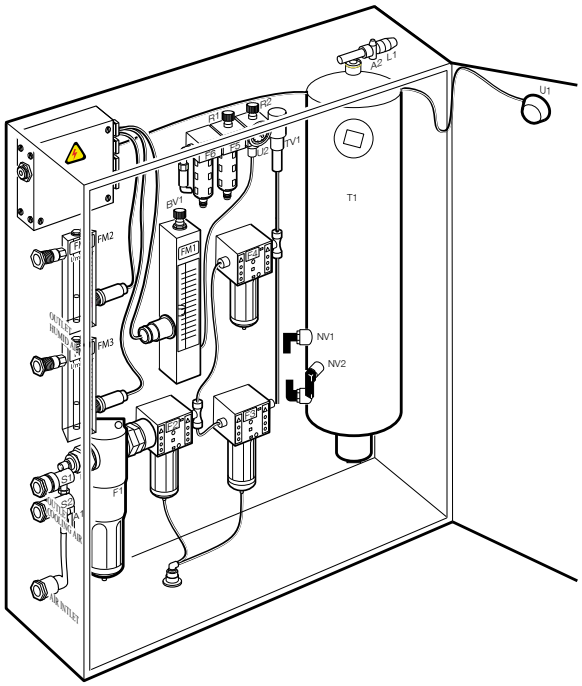


Figure X. Air Humidifier Unit.

3.4.1 Visual Inspection

Inspect the Air Humidifier Unit every 6 months or earlier.

It is normally only necessary to check the water level after a half year and to refill after one year.

3.4.2 Water Consumption Check

The water consumption can be measured by refilling after about 1 week in operation. The refilled quantity should be approx. 0.3 liter/week for 1 STU. Excessive consumption might depend on wrong pressure and/or airflow adjustment. If so, please adjust according to chapter Adjusting Pressure and Flow, page 78.

3.4.3 Filling Water Tank

Follow this procedure to fill up the water tank.

1. Close valve A1 inside the cabinet to shut off the air supply. See Figure X. Filling water tank page 78.
2. Open valve A2 positioned on the top of the water tank to purge out remaining pressure and close it when finished.
3. Unscrew the refilling plug positioned in the upper end of the tank front side.
4. Fill the tank with approximately 17 liters of distilled water or until the level is up to the refilling hole. Use the supplied funnel for easier filling.
5. Tighten the refilling plug.
6. Dry up any waste water on the bottom of the cabinet.
7. Open valve A1 and any other external valve to pressurize the cabinet.

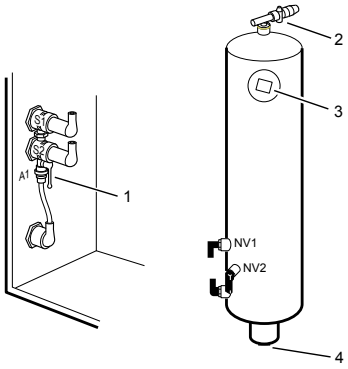


Figure X. Filling water tank

Figure positioning:

1. Valve A1
2. Valve A2
3. Refilling plug
4. Bottom plug

3.4.4 Adjusting Pressure and Flow

Use the following procedure to adjust pressure and flow in the Air Humidifier Unit:

1. Open valve A1 and any other external valve to pressurize the cabinet.

   The tank pressure regulator is preset to 0.2 MPa (2 bar) (see Table below) and cooling air regulator to 0.3 MPa (3 bar).

2. If any deviations are found, adjust air regulator R1 for tank pressure or R2 for cooling air, in order to achieve the correct working pressures.

   Pressure gauge U1 is located outside on the door and U2 inside the cabinet.

3. For humid air, adjust the airflows by means of the screws at the bottom of the flow meters (FM2 and FM3). See Figure X. Flow meters page 79.
4. For cooling, adjust the airflow by means of the knob at the top of the common flow meter (FM1).
5. If the alarm transducer (FV1) is used for two STUs, readjust its position on FM1 (cooling air). Red diodes on each transducer indicate alarm status.
6. At the first adjustment of the flow disconnect the hose from the cabinet.

   The cooling airflow must be 100 l/min at 3 bar for one STU or 200 l/min for two STU, and 3 l/min at 2 bar for humid air (see Table 8).

7. Close valve A1.
8. Connect the outlet hoses again.
9. Open valve A1 and check that all airflows are approximately the same as set before.
10. Check that air is coming out of the hoses at the STU. The cooling air is easy to detect due to the high flow. The humid air is easiest detected by keeping a wet finger in front of the hose outlet.
11. If any air supply is inadequate, check that the hose between cabinet and STU is not broken.

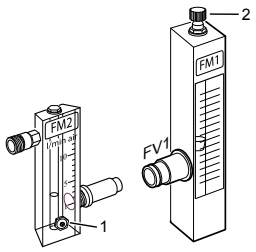


Figure X. Flow meters

Figure Positioning:

1. Adjusting screw
2. Adjusting knob

Table X Tank pressure and tank temperature.

Temperature	Pressure
15-35ºC	0.2 MPa (2 bar)
35-45ºC	0.3 MPa (3 bar)
45-60ºC	0.4 MPa (4 bar)

3.4.5 Regular Service

Daily function control is made via alarm signals delivered to the Stressometer system.

Regular service is needed once a year for one STU or twice a year for two STUs. On these occasions the filter cartridges should be replaced.

Filters F1-F3 (see dimension drawing in Binder B2) are automatically drained by hoses at their bottoms, which are connected to the drain outlet at the bottom of the cabinet. Check regularly that the drainage works properly.

Information
The drainage hole is sealed when delivered from ABB. The seal must be removed.

When necessary to open the filters, turn off the air supply with valve A1. See Figure X. Filling water tank page 78.
Check that humid air is getting through to the STU.

3.4.6 Purging Procedure

It is recommended to purge the water tank and refill it with distilled water at the regular service intervals if not recently done. To do this, follow this procedure:

1. Close valve A1 inside the cabinet to shut off the air supply. See Figure X. Filling water tank page 78
2. Open valve A2 positioned on the top of the water tank to purge out remaining pressure and close it when finished.
3. Unscrew the plug located under the water tank and place a bucket under the cabinet.
4. Remove the refill plug positioned in the upper part of the tank front.
5. Wash the inside of water tank by means of a hose connected to a water-conduit.
6. Tighten the bottom plug.
7. Refill with distilled water.
8. Tighten the refilling plug.
9. Dry up any waste water on the bottom of the cabinet.
10. Check that valve A2, positioned on the top of the water tank, is closed.
11. Open valve A1 and any other external valve to pressurize the cabinet.

3.4.7 Spare Parts

Table X Spare parts

Name	No./unit	Destination	Art. Number	Manufacturer
Filter cartridge	1	Filter F1 (40 µm)	1829207040	Bosch Rexroth AB
Filter cartridge (5 µm blue)	1	Filter F2 (0,3 µm)	R961400140	Bosch Rexroth AB
Filter cartridge (0.01 µm red)	1	Filter F3 (0,01 µm)	R961400141	Bosch Rexroth AB
Filter cartridge (25 µm white)	1	Filter F4 (0,01 µm)	R961400027	Bosch Rexroth AB
Level sensor	2	Water Tank	RFS 12P-2 Riko	Hemomatik
Inductive proximity switch	1	Flow meter cooling air	ILK-M30-FR	Kytölä Instruments

Name	No./unit	Destination	Art. Number	Manufacturer
Inductive proximity switch	2	Flow meter humid air	ILK-M18-FR	Kytölä Instruments
Pressure switch	1	Cubicle	0821-100-011	Bosch Rexroth AB

4 Repairs and Adjustments

4.1 Introduction

Electrical
Before changing any components in the Flatness System cabinet switch off mains power switch S1.

Electrical
Before any work on the STU is performed (connection or disconnection), switch off mains power switch S1 in the control cabinet. After this, disconnect the STU and the Measuring Roll, repair and replace parts if necessary. Prevent dirt and liquid from entering into the disconnected connectors.

4.2 Replacing a Measuring Roll

Before replacing the Mearing Roll, remove the STU. Which Measuring Roll is defined as A or B depends on the cabling between the Measuring Rolls and the Flatness System cabinet. The connection units for Measuring Roll A and Measuring Roll B are shown in the circuit diagram.

Follow this procedure:

1. Determine the identity of the Measuring Roll to be mounted by checking the Measuring Roll.
2. Start the BM Tool
3. Set the BM-part to Idle mode: select Configuration and maintenance > System mode and then System mode request = 1.

   This will switch off:

   - Roll excitation
   - Encoder (Pulse Transmitter) +24 V
   - STU ±12 V
4. Switch off the mains power.
5. Mechanically mount the Measuring Roll, see chapter Installation.
6. Switch on the mains power.
7. Locate the RollData file (RollDb.cfb) for the roll to be mounted.
8. Use Desktop WS_FTP Pro and FTP the roll-data file to the SystemFS:/ folder of the MVME 3100.

9. Restore roll data/parameters. Include roll data, by checking the appropriate check box: Back-up handling > Make and Restore back-up > Make, see chapter Backup and Flash Handling, page 92.
10. Check that Roll Identity is correct/as expected: select Configuration and maintenance > Roll data and design. (See Figure X. Delivery identity plate and Measuring Roll identity number. page 83)
11. Select cross-talk calculation. Also set cross-talk calculation in the FC-part accordingly.
12. Select Configuration and maintenance > System mode and then System mode request = 5 (Roll calibration verification).
13. Click on "Reset and restart" in "Roll Calibration verification" display.
14. Return to Idle mode: select Configuration and maintenance > System mode and then System mode request = 1.
15. Flash the new configuration: select Back-up handling > Make and Restore back-up > Flash, see chapter Backup and Flash Handling.
16. Set the BM system in Force measurement mode: select Configuration and maintenance > System mode and then System mode request = 2.

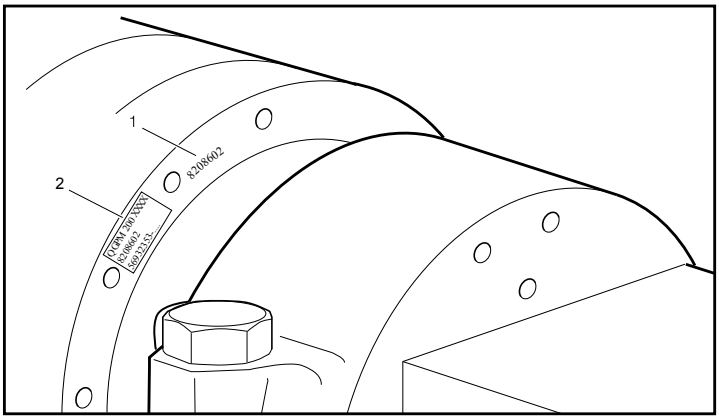


Figure X. Delivery identity plate and Measuring Roll identity number.

4.3 Replacing a STU

Electrical
Ensure that the mains power switch S1 is switched off.

Parameters to be changed after the STU replacement or repair, except mechanical and electrical adjustments are:

- PWA-check, Automatic Force Pulse Detection and Integration.
- New Bias calibration, section Bias Calibration, page 111.

4.3.1 Pulse Transmitter (Encoder)

The Encoder on the STU generates the pulses SYNC, INCR and INCR+90°.

Turn the Measuring Roll slowly, for example by hand, and check the function of the SYNC pulse. The indicator SYNC on the Data Concentrator board flashes for every SYNC pulse (once per revolution).

In reversible mills with two Measuring Rolls, one Measuring Roll is connected to DIR and SYNC indicator on the left Data Concentrator board and the other Measuring Roll is connected to DIR and SYNC indicator on the right Data Concentrator board.

The Data Concentrator board detects the roll rotation direction through the INCR and INCR+90° pulses from the Encoder(s). The indicator DIR on the Data Concentrator board indicates the direction.

Check the roll rotation direction indication while turning the Measuring Roll(s) slowly in both directions.

If the Encoder is correctly connected to the indicators it should illuminate as follows:

- DIR extinguished = clockwise (ADCB) direction.
- DIR illuminated = anti-clockwise (ABCD) direction Roll rotation direction definition is according to .Figure X. Roll rotation direction definition page 84

Perform a detection and integration of the encoder synchronization, see Automatic Force Pulse Detection and Integration, page 73

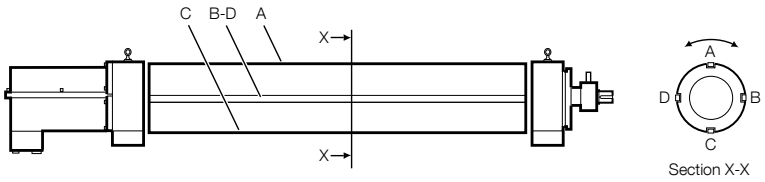


Figure X. Roll rotation direction definition

4.4 Replacing FC, ES and Rack Mounted Boards

Information
When switching on the mains power to the cabinet after board replacement, wait approximately 30 minutes after switching on. The boards need to reach working temperature before doing any calibration.

4.4.1 Replacing a Flatness Computer (FC)

Follow this procedure:

1. Switch off the mains power.
2. Replace the FC and reconnect cables.
3. Switch on the mains power.
4. After the connection is established and everything is working: restore the backup with the changes to the new FC.

Information
Changes that has been done on the HMI etc. are not accessible on the new FC.

4.4.2 Replacing an Engineering Station (ES)

Follow this procedure:

1. Switch off the mains power.
2. Replace the ES and reconnect cables.
3. Switch on the mains power.
4. After the connection is established and everything is working: restore the backup with the changes to the new ES.

4.4.3 Replacing Rack Mounted Boards

Electrical
Switch off mains power in the Flatness System cabinet before starting any work. Do not forget to switch off mains power to the cabinet before taking out any board.

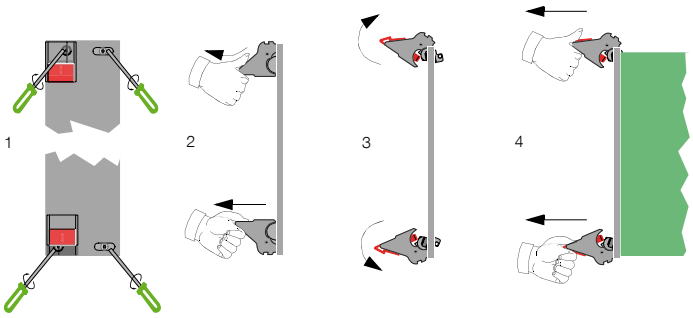


Figure X. Removing a board

Taking out a board:

1. Unlock the screws.
2. Pull out the red lock.
3. Grab the lock and gently push the lock up or down. The turning of the handles will extract the board from the backplane contact.
4. Gently pull the board out from the frame.

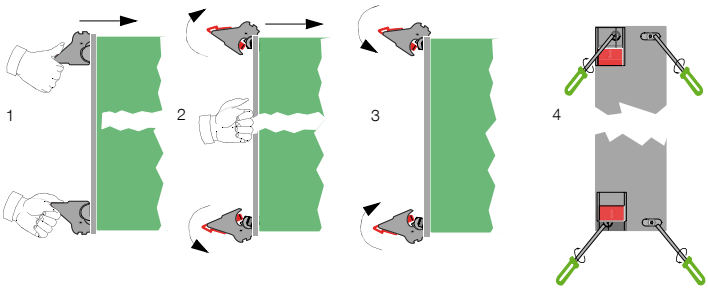


Figure X. Inserting a board

Inserting a board:

1. Insert the board.
2. Unfasten the locks and gently push the board into the backplane contact.
3. Grab the lock and gently push the lock down or up. The turning of the handles will lock the board in the backplane contact.
4. Lock the screws.

4.4.4 Replacing a Digital Signal Processing Board (PFSK 151)

Follow this procedure:

1. Switch the mains power off.
2. Replace the board, see chapter Replacing Rack Mounted Boards.
3. Run a new Channel calibration, see Section Channel Calibration, page 113.
4. Save configuration to flash: select Back-up handling > Make and Restore back-up > Flash. This saves the application to the MVME 3100 flash area.
5. Set the BM system in Force measurement mode: select Configuration and maintenance > System mode and then System mode request = 2.

4.4.5 Replacing a Data Concentrator Board (PFSK 152)

Follow this procedure:

1. Switch the mains power off.
2. Replace the board, see chapeter Replacing Rack Mounted Boards, page 85.
3. Set the BM system in Force measurement mode: select Configuration and maintenance > System mode and then System mode request = 2.

4.4.6 Replacing a Microprocessor Board (MVME 3100)

Follow this procedure:

1. Switch the mains power off.
2. Check the strappings.
3. Replace the board, see chapter Replacing Rack Mounted Boards, page 85.
4. Check the boot flash version: MVME 3100 [BMS BOOT 1.0/0]
5. Set boot parameters using "c" (see chapter Changing MVME 3100 Boot Line) according to the delivery documentation. Type "." (dot) to empty a string.
6. Transfer the BM-part software by following the restore instructions, see chapter Backup and Restore of an ES, a FC or an OS. This also restores the customer application.
7. Set the BM-part in Force measurement mode: select Configuration and maintenance > System mode and then System mode request = 2.

Information
When changing the MVME 3100 the IP-address will be lost.

8. See the delivery documentation for the IP-address.
9. To confirm, select Configuration and maintenance > IP settings and mill designation.

4.5 Changing MVME 3100 Boot Line

To alert/set the MVME 3100 boot line, for example the IP-address, the MVME 3100 start-up must be interrupted.

Follow this procedure:

1. Start the "Hyper Terminal" in the ES computer. Use the predefined icons BMS1 or BMS2.
2. In a system with two Rolls, and when only working with BMS2, check that the "Hyper Terminal" cable are connected to the MVME card to the right. See Figure X. Connection of Hyper Terminal page 88.
3. Press the Reset button on the MVME 3100 board. System auto-boot will now occur after only 2 seconds. The digit below the text "Press any key to stop auto-boot ..." in the Hyperterminal window is the counting down-time.
4. Within 2 seconds, press the space key in the Hyperterminal. If you do not succeed, go to Step 1 and make a new attempt.

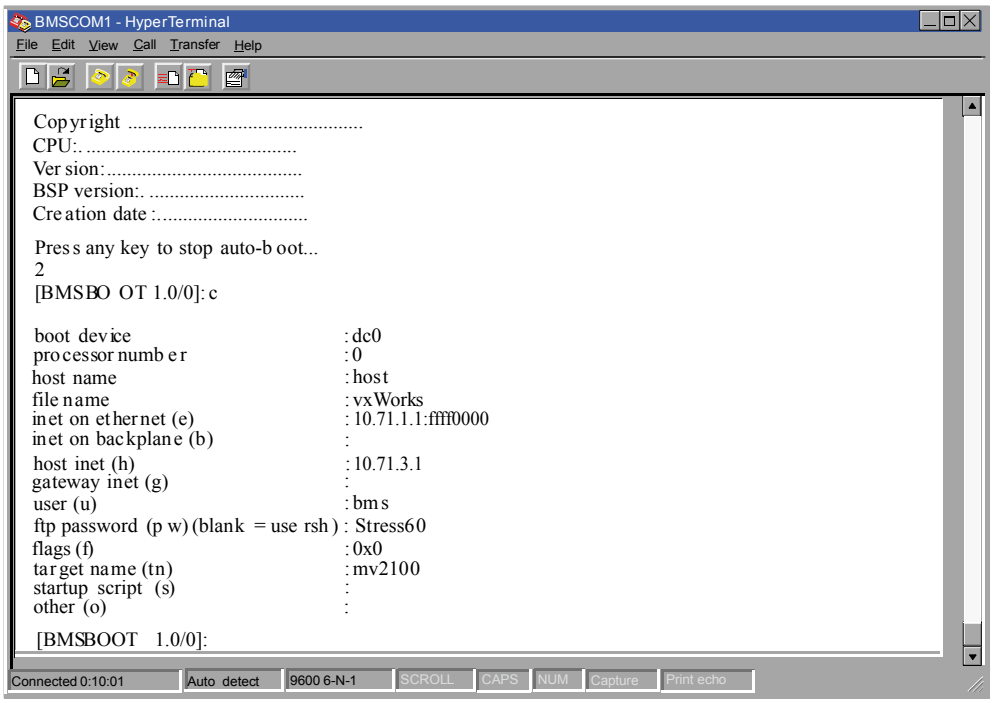


Figure X. Hyper Terminal Screenshot

5. Now you can change e.g. the IP-address: type "c" and enter the new values. The BMS1 (and BMS2) IP-address (inet on Ethernet) should be according to the Application Description. The BM Tool IP-address (host inet) is also specified in the Application Description.
6. The "IP settings and mill designation" tool display can be used to check the IP-addresses.

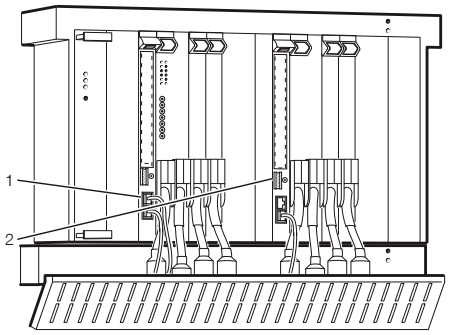


Figure X. Connection of Hyper Terminal

Figure positioning:

1. Connection of Hyper Terminal for BMS1
2. Connection of Hyper Terminal for BMS2

4.6 Adjusting Software Parameters

Information
To permanently keep modified parameter values a Save configuration (Flash) operation is required.

Information
Modified parameters only affect the behavior of the System when the System mode changes.

4.6.1 Manually Deactivating/Activating Sensors

This section describes how to manually deactivate/activate sensors/zones/channels using the BM Tool GUI. Select "Roll data and design" in the menu. In this view, select the zone you want to disable/enable.

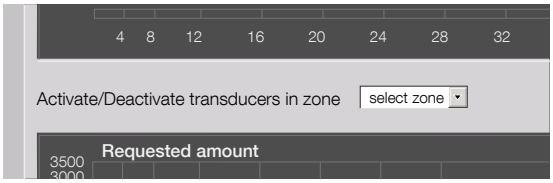


Figure X. Select Zone

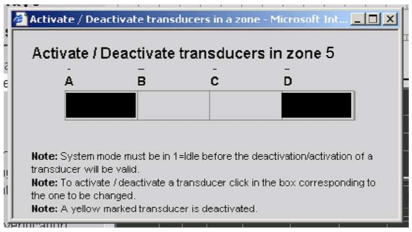


Figure X. Activate/deactivate transducers

To deactivate a complete zone or channel, use the "all sensors" alternative (= 15), e.g. deactivate sensors A through D of zone 5.

To verify that the sensors have been properly enabled/disabled: select Configuration and maintenance > Roll data and design.

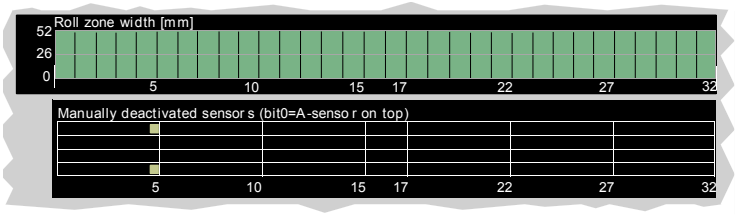


Figure X. Part of roll data and design display

4.7 Partly Covered Zone, Strip Stress Profile Display

4.7.1 Introduction

This section describes how the strip edges are handled in the Stressometer software.

The system measures where the strip is located in relation to the Measuring Roll. This is used to calculate the strip covers for each zone and on which zones the strip edges are located.

The system has four strip edge indicators, two for each side, One gives the current edge position and one displays the edge on the HMI system.

LowZone and HighZone variables in the profile hold information for display purposes. LowEdgeZone and HighEdgeZone variables hold the physical strip edge position.

The strip edge handling is controlled as follows:

- Parameter edgeActive: if TRUE then the partly covered edge zones is displayed on the HMI.
- Parameter minIndicationLimit: defines the minimum cover zone to be displayed on the HMI, and is used to calculate the LowZone and HighZone values.

- Parameter minCoveredLimit; defines the minimum cover width for calculation purposes, and is used to calculate the LowEdgeZone and HighEdgeZone values.
- Parameter minEdgeDeadband defines the dead band that is used to define the beginning of the zone.

  a1 = minCoveredLimit (default 13 mm)

  b = stripEdgeDeadband (default 2 mm)

  y = minIndicationLimit (default 13 mm)

  x = strip covered zone width

  z = zone number

  xw = Zone width

Table X Definition of edge handling

Definition value for zone z	edgeActive for HMI	EdgeZone for control	Zone for HMI	Cover width at zone z
$x < a_1$	N/A	z±1	z±1	0
$x > a_1 + b$ $x < y$	N/A	z	z±1	x
$x > y$ $x < xw$	TRUE	z	z	x
$x > y$ $x < x_w$	FALSE	z	z±1	x

4.7.2 Minimum Coverage for Stress Calculation

Parmeter minCoveredLimit (..) defines the smallest coverage in mm that is required for considering the zone as partly covered. If the FEMS part of the system considers the zone as partly covered, the edge zone compensated value of the zone will be sent to the control part of the system. This will then be presented on an Engineer display. Default minCoveredLimit is 13 mm.

The zone is considered partly covered if the strip covers a part of the Measuring Roll which is larger than minCoveredLimit + stripEdgeDeadband (..). The zone is not covered if the strip covers less than minCoveredLimit.

4.7.3 Zone Edge Indication Limit

Parameter minIndicationLimit (..) decides whether the value of the zone shall be presented on the Operator display when the "Edge ind." button is pressed. If "Edge ind." is not pressed only fully covered zones will be presented on the Operator display. Default minIndicationLimit is 13 mm.

When the Edge position is calculated into the hysteresis set in the HMI (..) consideration will be taken. A new edge position will not be calculated if the new edge position has moved less than the settings of the hysteresis in the HMI.

4.7.4 Edge Cover Handling

Follow this procedure to set the parameters (see the Engineer display):

1. Select Measurement settings > Strip edges > Edge cover handling.

4.8 Edge Zone Compensation

The influence of the edge zone in the flatness calculation can be modified through the edge zone compensation function in the FS-part.

The distributed force of the edge zone is calculated as follows:

Soft edge compensation
Fd = (w(x) - Force [edge zone])/(cover width [edge zone]) + ((1 - w(x)) Force [edge zone -/+ 1])/(cover width [edge zone -/+ 1]) where x = covered part of the edge zone (mm) and w(x) = weight as a function of the strip cover degree.

The weight w(x) is a function of the strip cover degree (in mm) and described in four points. The actual weight is interpreted between the given function points, limited to 0..1. The function is constant or growing with increasing x values. The function is configurable through HMI.

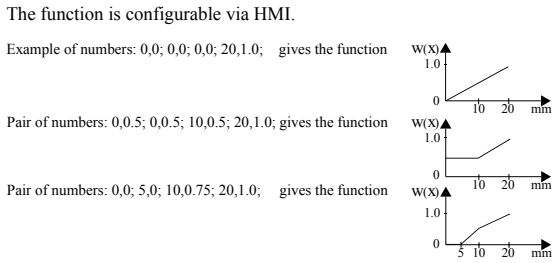


Figure X. Examples of functions for pairs of numbers

Follow this procedure to set the parameters (see the Engineer display):

1. Select Measurement settings > Strip edges > Edge cover weight handling.

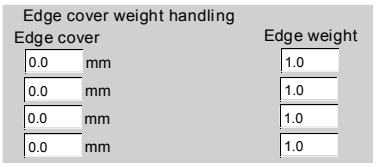


Figure X. Edge cover weight handling settings

Information
Partly covered zone compensation is activated when cover edge is > 0. It will not affect the measurement before the edge cover is higher than the minimum coverage limit, see Section 4.7.4.

5 Backup and Flash Handling

5.1 Introduction

The following parts can be backed up or restored in the Stressometer system:

- The BM-part
- The FC-part
- The FC-part HMI
- The complete system

5.2 Backup/Restore of the BM-part

5.2.1 Folder Structure

It is necessary to have a back-up of the software of the BM system. Figure X. Example of BM Tool folders for file administration page 92 shows an example of a folder structure.

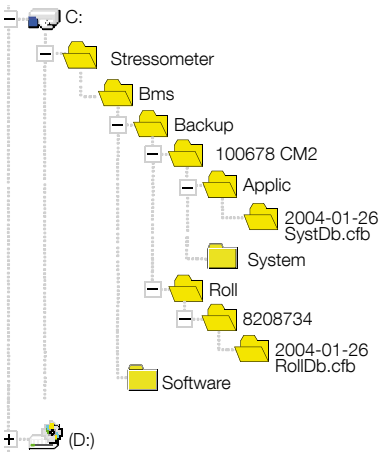


Figure X. Example of BM Tool folders for file administration

The logical name of the drives can vary depending on the computer settings, e.g. if a restore is done from the CD-ROM it will be D:\Stressometer\Bms.

SystDb.cfb is the file name for "system logical back-up". RollDb.cfb is the file name for "roll logical back-up".

Examples:

- Back-up of the BM system software, for example C:\Stressometer\Bms\Backup\100678 CM2\System (100678 CM2 = order number, mill designation).
- Back-up area for the BMS application (the SystDb.cfb file), for example C:\Stressometer \Bms\Backup\100678 CM2\Applic\2004-01-26, containing system logical back-up (100678 CM2 = order number, mill designation, 2004-01-26 = date)
- Back-up of the Measuring Roll(s) (the RollDb.cfb file), for example C:\Stressometer\Bms \Backup\Roll\8208734\2004-01-26, containing Measuring Roll logical dump (8208734 = Roll identity)
- Current area for BM system upgrade: C:\Stressometer\Bms\Software\ Initpub:
  - C:\Stressometer\wwwroot\bms\html_BMS1
  - C:\Stressometer\wwwroot\bms\html_BMS1

5.2.2 Saving Configuration to Flash

The system configuration is kept in the primary volatile memory while you are working with the system. This configuration will be lost if you switch off the power to the cabinet, it must be saved if you wish to keep it for later use. This section describes how this is done.

Follow this procedure:

1. Use the BM-Tool to change to Idle mode: select Configuration and maintenance > System mode and then System mode request = 1.
2. Select Back-up handling > Make and Restore back-up, see Figure X. Make and Restore Back-up page 94.

Information
Before you start to Flash, never press the Restart(RST) or Abort(ABT) buttons on the MVME 3100 board or switch off the power.

3. To save the system in the Flash memory, click on "Flash" under "Save configuration to flash" (see Figure X. Make and Restore Back-up page 94). Flash active is indicated by Status bit DumpBinDbActive, Box 6 and LED I5 is lit red. Flash is successfully completed when Status bit DumpBinDbOk, Box 7 and LED I5 lits green for 0.5 seconds.

Information
Restore is automatically handled by the BM-part at init or start-up of the system. It means that the contents of the Flash memory are transferred into the primary memory.

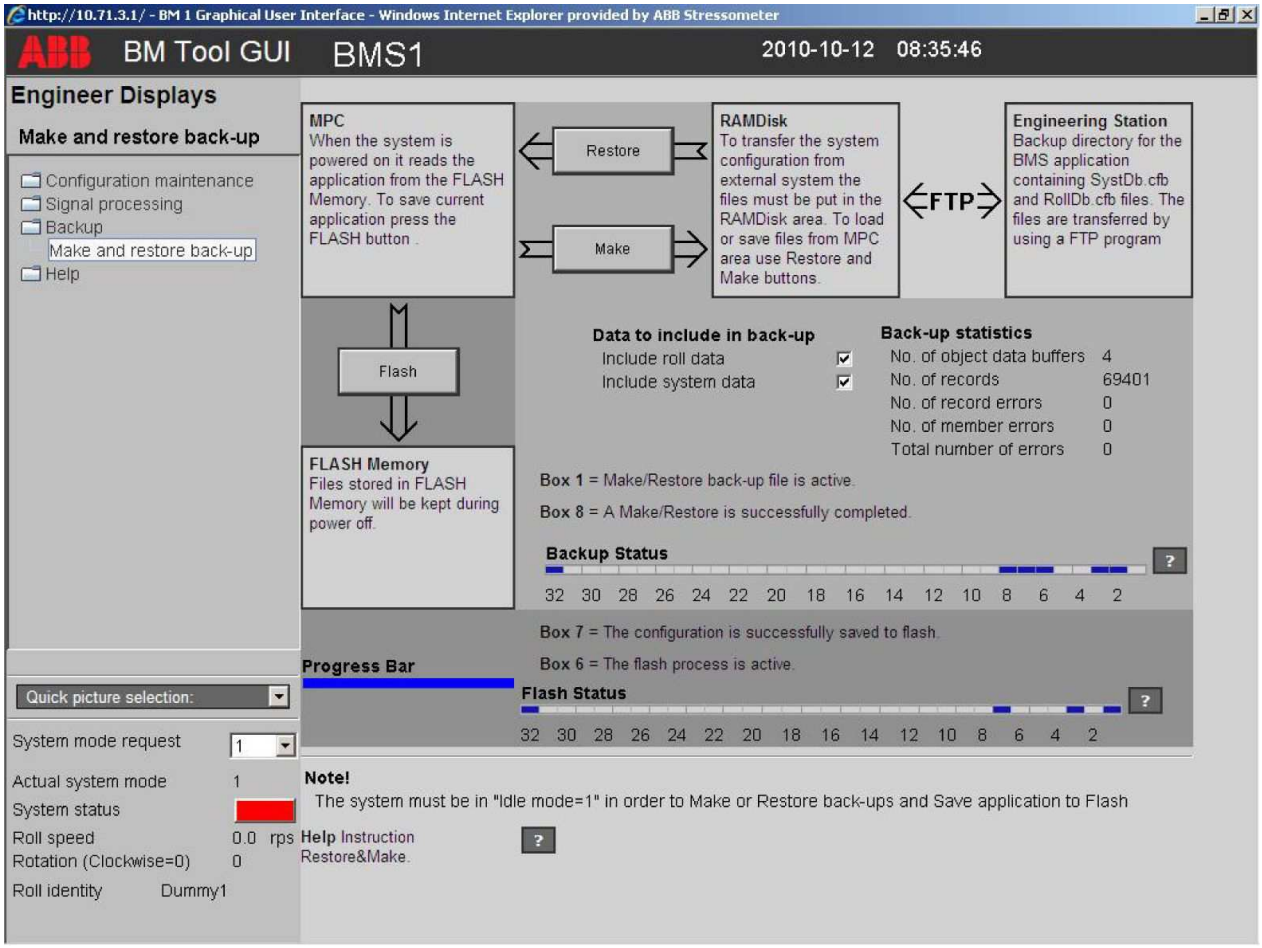


Figure X. Make and Restore Back-up

5.2.3 Making Backup

Follow this procedure:

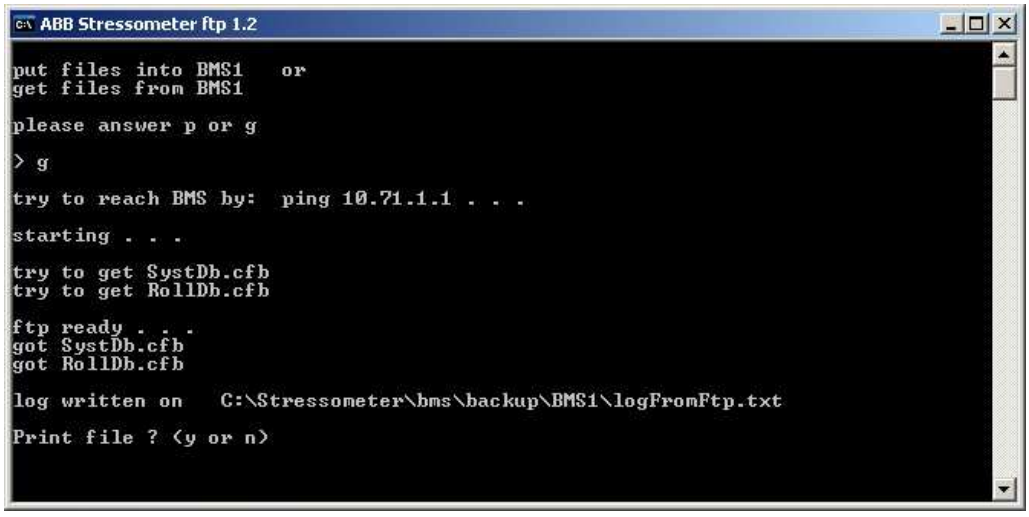
1. Use the BM Tool to change to Idle mode: select Configuration and maintenance > System mode and then System mode request = 1.
2. Select Back-up handling > Make and Restore back-up see Figure X. Make and Restore Back-up page 94.
3. To select file RollDb.cfb, put a mark in the check box for "Include roll data" see Figure X. Make and Restore Back-up page 94.
4. To select file SystDb.cfb, Put a mark in the check box for "Include system data" see Figure X. Make and Restore Back-up page 94.

Information

Do not press the Reset/Abort buttons on the MVME 3100 board during the Restore operation. Do not switch off the power during the Make operation.

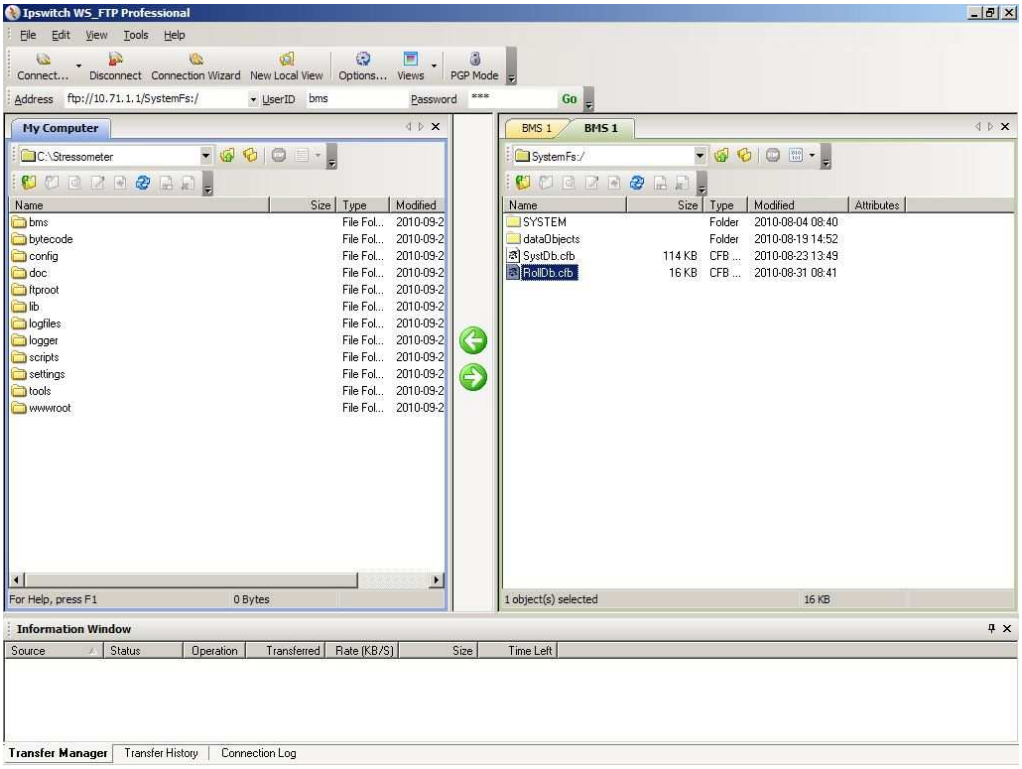
5. To back-up the primary memory contents into the selected files, click on "Make" under "Make/Restore back-up". Back-up Make active is indicated by Status bit DumpActive, Box 1 and LED I5 on PFSK 152 is lit red. Back-up is successfully completed when Status bits FileOkay, RecOkay, MembOkay, gtRecOkay, Box 3, 6, 7, 8 and LED I5 on PFSK 152 lits green for 0.5 seconds.
6. Create new BM Tool folders for the new files.
7. Close the BM Tool and Internet Explorer.
8. If an icon named "FTP BMS1(2)" exists on the desktop, go to item 9. If not, go to item 12.
9. Double click on the icon "FTP BMS1(2)" to backup the files RollDB and SysDB.

10. When the direction dialog box appears, select "g".



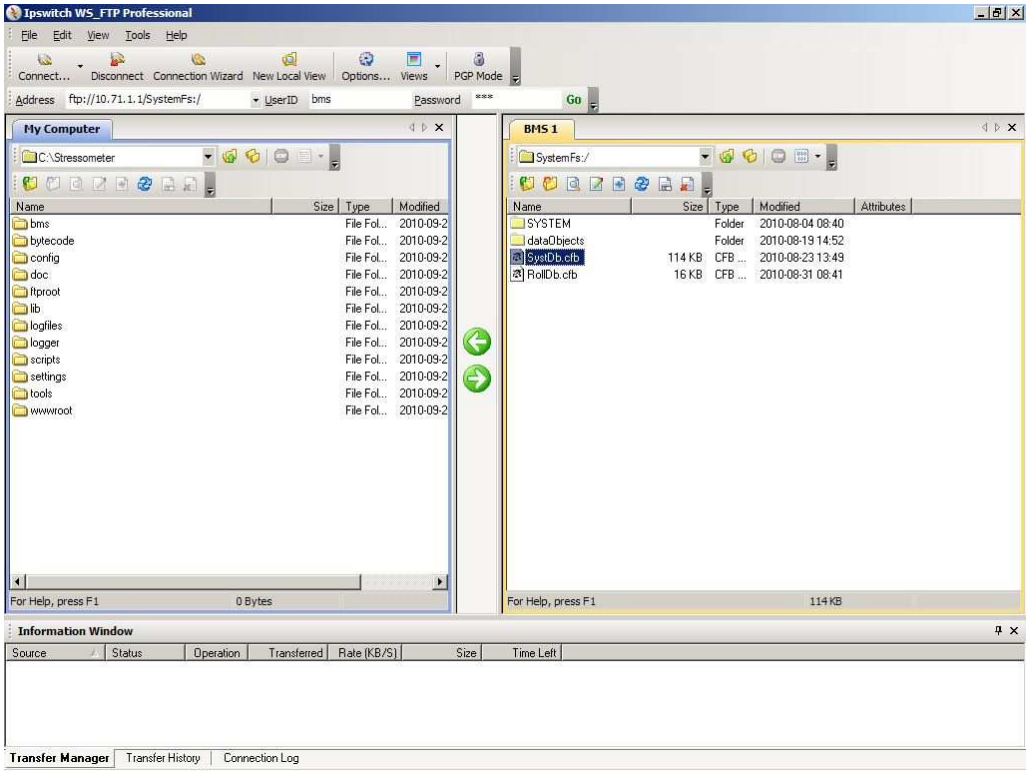
11. The backup is finished. Go to item 22.

12. Use Desktop WS_FTP Pro and locate the roll data file (RollDb.cfb) from the folder SystemFS:/ of the MVME 3100 to the Backup directory, see Figure below.



13. Select "Binary" as file transfer mode see Figure above.
14. Select file RollDb.cfb see Figure above.
15. Click on arrow <-- to copy the file to the Local System.
16. Click on "Refresh". When the file is visible in "Local System", the file is copied.

17. Locate the system data file (SystDb.cfb) from the folder SystemFS:/ of the MVME 3100 to the Backup directory (see Folder Structure), see Figure below.



18. Select "Binary" as file transfer mode.
19. Select file SystDb.cfb see Figure above.
20. Click on arrow <-- to copy the file to the Local System.
21. Click on "Refresh". When the file is visible in "Local System", the file is copied.
22. Start BM Tool.
23. Change to Force measurement mode: select Configuration and maintenance > System mode and then System mode request = 2.

5.2.4 Restoring Backup

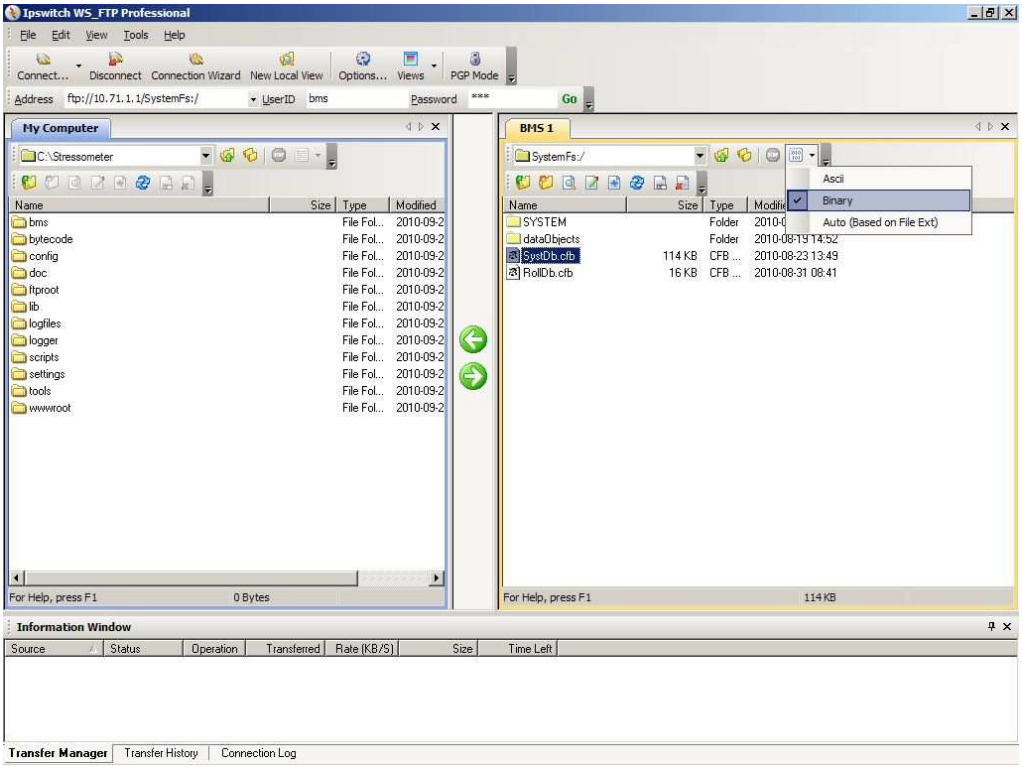
Follow this procedure:

1. Use the BM Tool to change to Idle mode: select Configuration and maintenance > System mode and then System mode request = 1.
2. Close the BM Tool and the Internet Explorer.
3. If an icon named "FTP BMS1(2)" exists on the desktop, go to item 4. If not, go to item 7.

4. Double click on the icon "FTP BMS1(2)" to restore the files RollDB and SysDB.

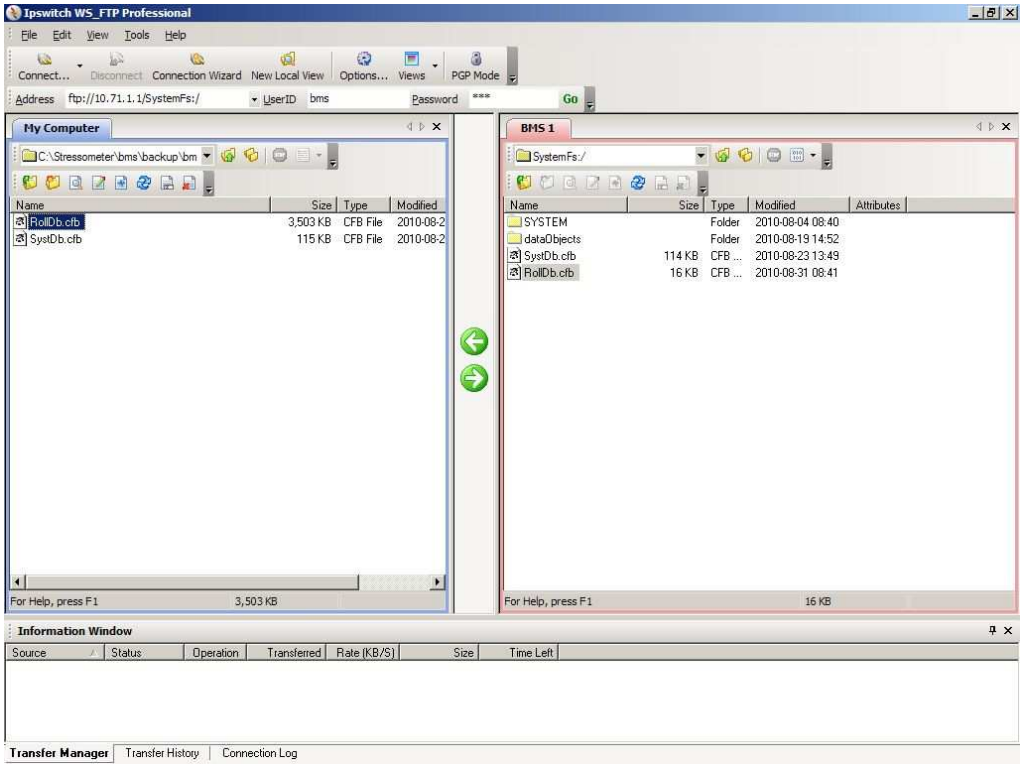
5. When the direction dialog box appears, select "p".
6. The restore is finished. Go to item 13.
7. Use Desktop WS_FTP Pro and locate the valid system data file (SystDb.cfb) from your backup directory (see Folder Structure, page 92 for information about the folder structur), see Figure below.

   Desktop WS_FTP Pro is a program used to transfer files from the back-up place and restore them into the BM system, and vice versa.



8. Select "Binary" as file transfer mode see Figure above.
9. Select file SystDb.cfb see Figure above.
10. Click on arrow --> to copy the file to folder SystemFS:/ of the MVME 3100 in the BM-part.
11. Click on "Refresh" see Figure above. When the file is visible in "Remote Site", the file is copied.

12. Locate the valid roll data file (RollDb.cfb) from your Backup directory (see Folder Structure), see Figure below.



13. Select "Binary" as file transfer mode.
14. Select file RollDb.cfb see Figure above.
15. Click on arrow to copy the file to folder SystemFS:/ of the MVME 3100 in the BM-part.
16. Click on "Refresh". When the file is visible in "Remote site", the file is copied.
17. Start the BM Tool.
18. Select Back-up handling > Make and Restore back-up see Figure X. Make and Restore Back-up page 94.
19. To select file RollDb.cfb, tick the check box for "Include roll data" see Figure X. Make and Restore Back-up page 94.
20. To select file SystDb.cfb, tick the check box for "Include system data" see .Figure X. Make and Restore Back-up page 94

Information

Do not press the Reset/Abort buttons on the MVME 3100 board during the Restore operation. Do not switch off the power during the Restore operation.

21. To transfer the selected files into the primary memory, click on "Restore" under "Make/ Restore back-up". Back-up Restore active is indicated by Status bit PopDbRun, Box 1 and LED I5 on PFSK 152, is lit red. Restore is successfully completed when Status bits FileOkay, RecOkay, MembOkay, gtRecOkay, Box 3, 6, 7, 8 and LED I5 on PFSK 152 lits green for 0.5 seconds.
22. Select Back-up handling > Make and Restore back-up see Figure X. Make and Restore Back-up page 94.
23. To save the configuration to Flash: click on "Flash" under "Save configuration to flash" see Figure X. Make and Restore Back-up page 94.
24. Press the Reset button on the MVME 3100 board.
25. Wait until start-up is completed.
26. Restart the BM Tool to get Measuring Roll geometry.

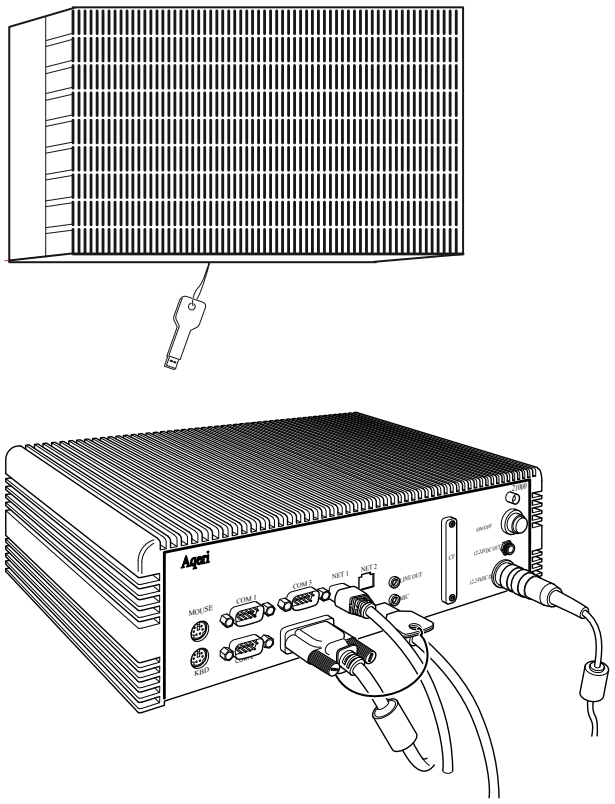
27. Run a new Channel calibration, see Channel Calibration.
28. Run a new Bias calibration (if used, check the AD), see Bias Calibration.
29. Select Back-up handling > Make and Restore back-up see Figure X. Make and Restore Back-up page 94.
30. To save the configuration to Flash: click on "Flash" under "Save configuration to flash" see Figure X. Make and Restore Back-up page 94.
31. Change to Force measurement mode: select Configuration and maintenance > System mode and then System mode request = 2.

5.3 Backup and Restore of an ES, a FC or an OS

5.3.1 Backup/Restore Procedure

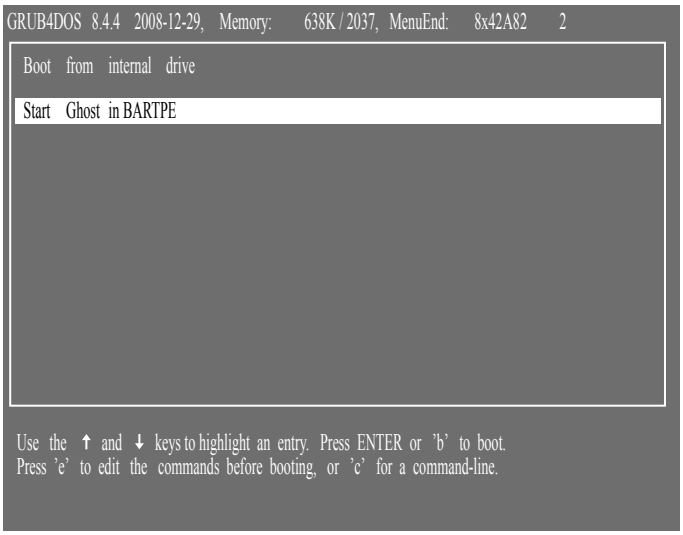
Follow this procedure:

1. Turn off the station/computer.
2. Connect the USB-stick



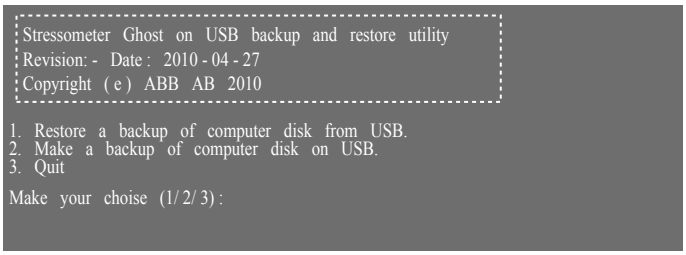
3. Restart your station/computer.

4. When the following text appears on screen, select "Start Ghost..."



If this screen does not appear, but the computer starts up windows, go to the chapter Change the Boot Device Order, page 101.

5. When the following picture appears on the screen, select the operation you want to perform and press Enter.

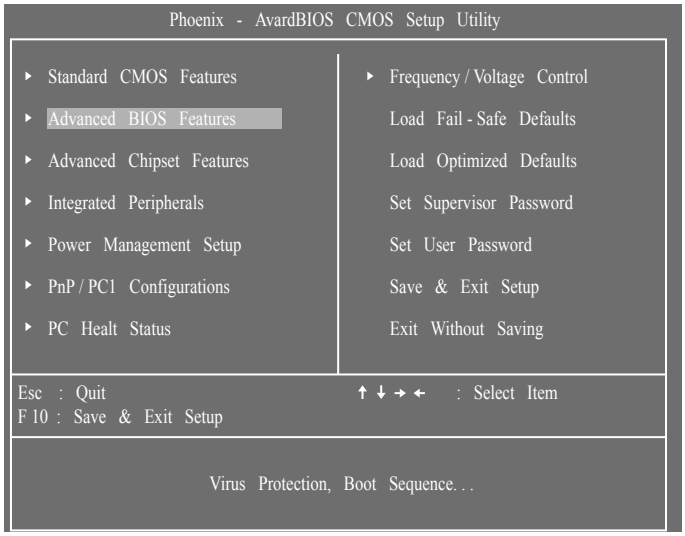


6. The selected action will take approximately 10-15 minutes to perform. When the action is complete remove the USB stick and restart the computer.

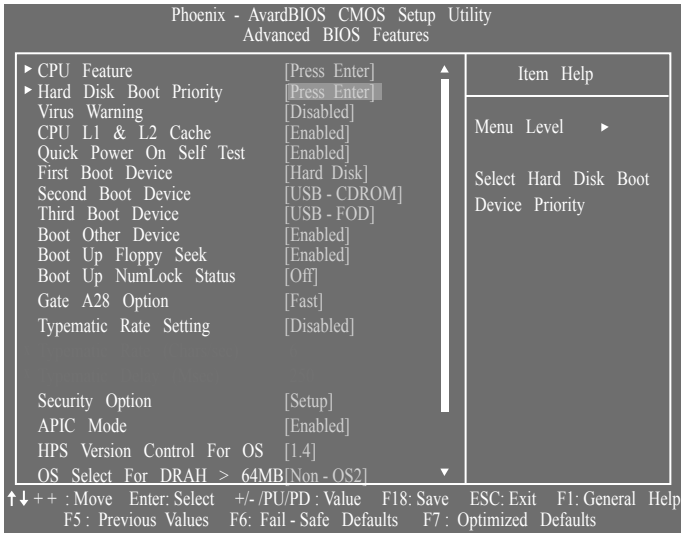
5.3.2 Change the Boot Device Order

1. Turn off the computer.
2. Insert the USB stick.
3. Restart your computer.
4. Press the Delete button frequently to get into the Bios set-up menu.

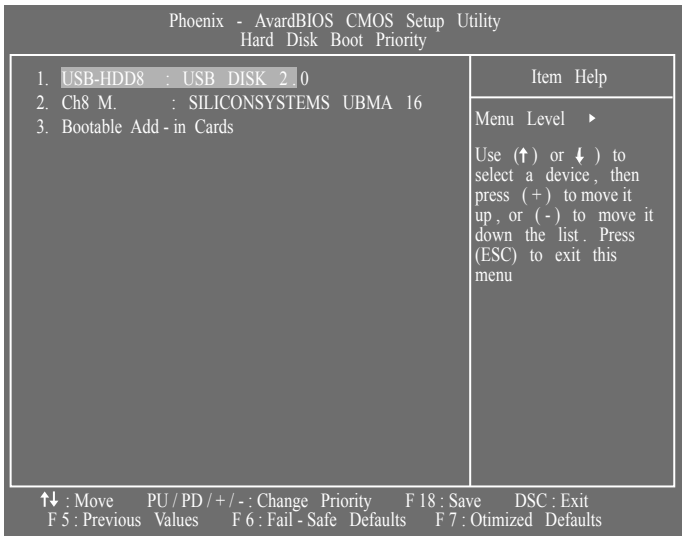
5. When the following screen appears choose "Advanced BIOS Features" and press Enter.



6. When this screen appears choose "Hard disk Boot...". and press Enter.



7. Use the Page Up or Page Down button to select "USB-..." in paragraph 1.



8. Press F10 to save.

9. Press Escape to exit the BIOS set-up.
10. The computer will reboot and you can continue with step 4 in chapter Backup/Restore Procedure, page 100.

6 Troubleshooting

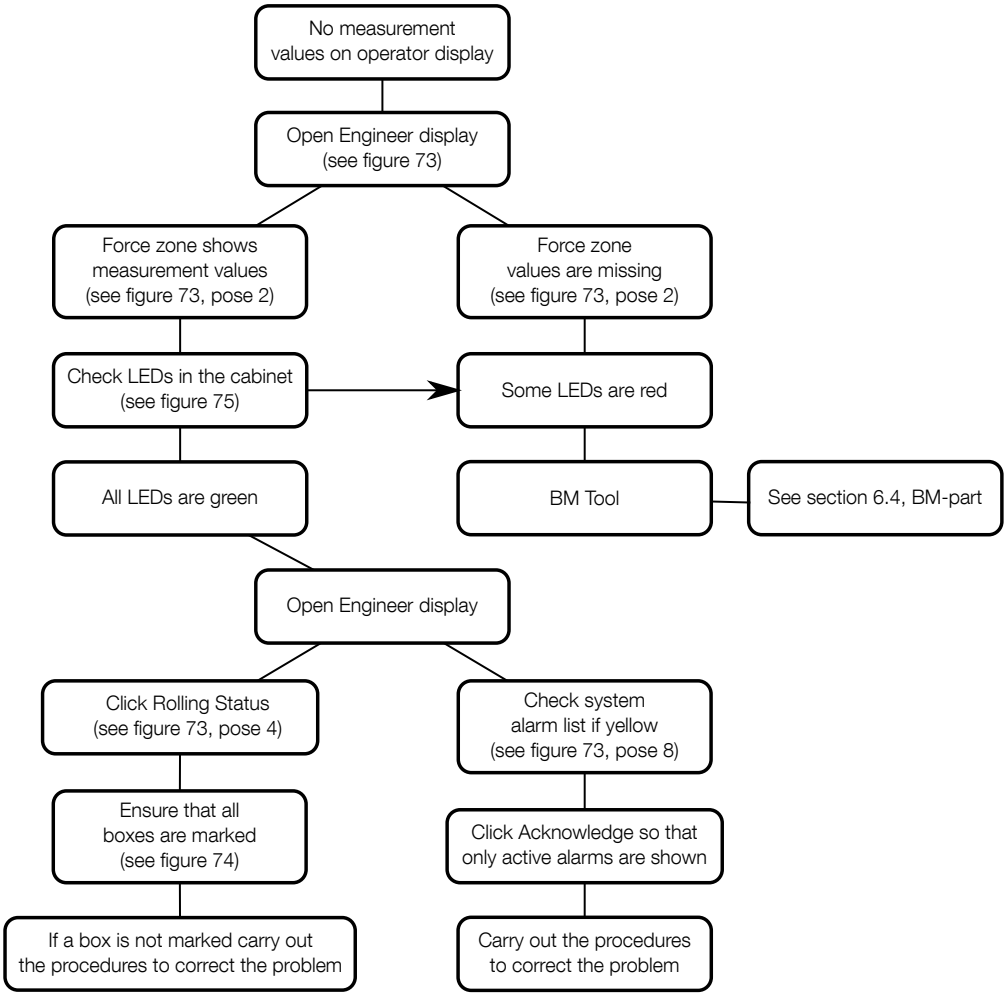
Information
To perform troubleshooting the system network communication must be up and running.

Troubleshooting is based on two different scenarios:

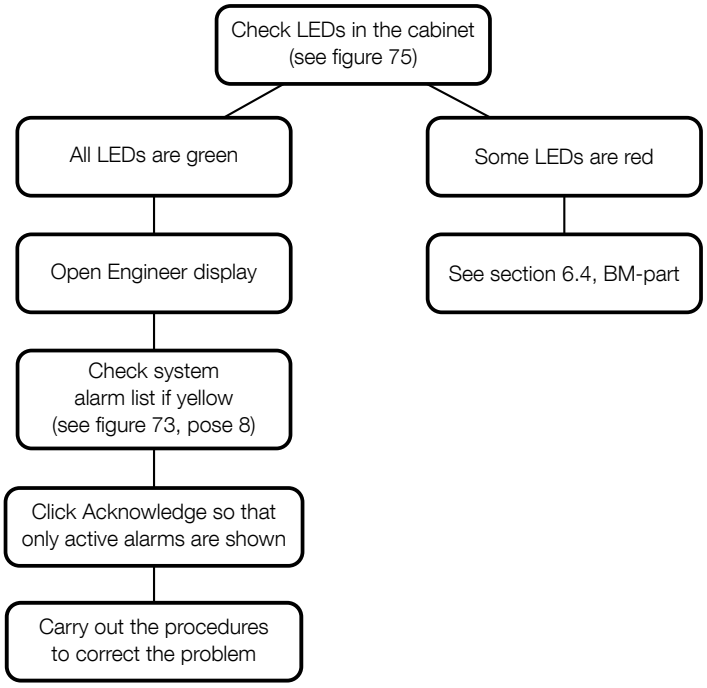
1. Fault Tracing During Rolling, page 105
2. Fault Tracing Without Rolling

Follow the pertinent flow chart to locate and solve problems.

6.1 Fault Tracing During Rolling



6.2 Fault Tracing Without Rolling



6.3 Troubleshooting Displays

6.3.1 Engineer Display

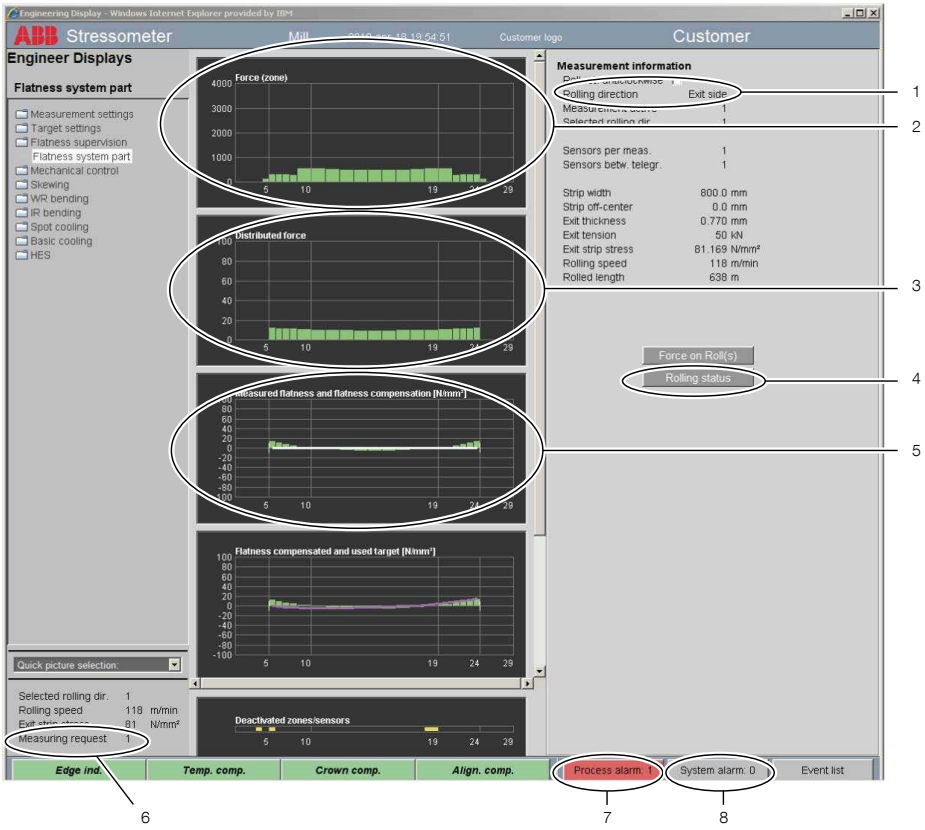


Figure X. Engineer display.

Figure positioning:

1. Rolling direction
2. Force zone
3. Distributed force
4. Rolling status
5. The Operators display
6. Measuring request
7. Process alarm
8. System alarm

6.3.2 Rolling Status

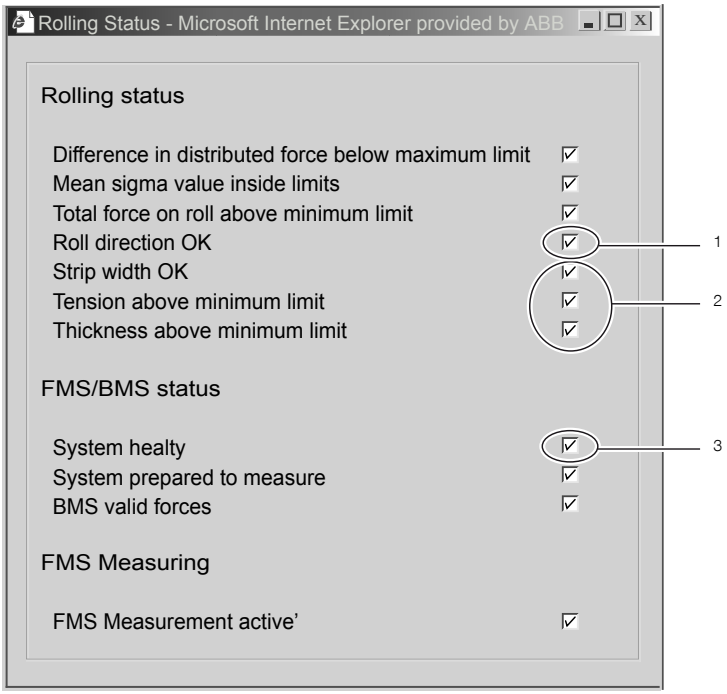


Figure X. Rolling status.

Figure positioning:

1. The mill is rolling in the right direction.
2. Actual values from strip width, thickness and tension are OK.
3. Ticked box, all communication links are working and all FSA-objects are in running state.

6.4 BM-part

The electronic equipment in the ABB cabinet sometimes display one or several red LEDs, it may occur on the roll excitation unit located high up in the cabinet or on the cards in the VME-rack located below the roll excitation. See Figure X. LED indication for successfully completed MVME3100 application startup. page 108 and Figure X. LEDs on the PFSA 140 Roll excitation. page 109.

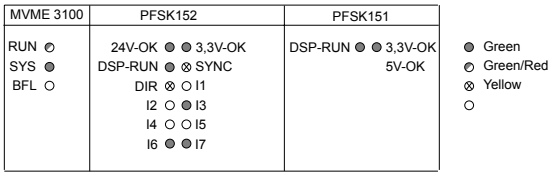


Figure X. LED indication for successfully completed MVME3100 application startup.

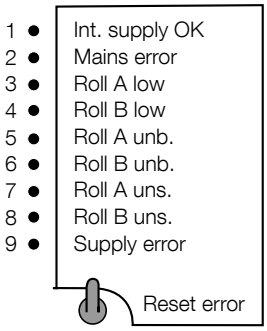


Figure X. LEDs on the PFSA 140 Roll excitation.

If a red LED is active, do as follows:

1. Open the BM Tool.
2. Select display ”System status”. This display will tell what object is alarming. Box 32 (see Figure X. BM Tool - System status. page 109) should be true on all objects. However, box 32 on one or several objects will be false if the hardware shows red LED.

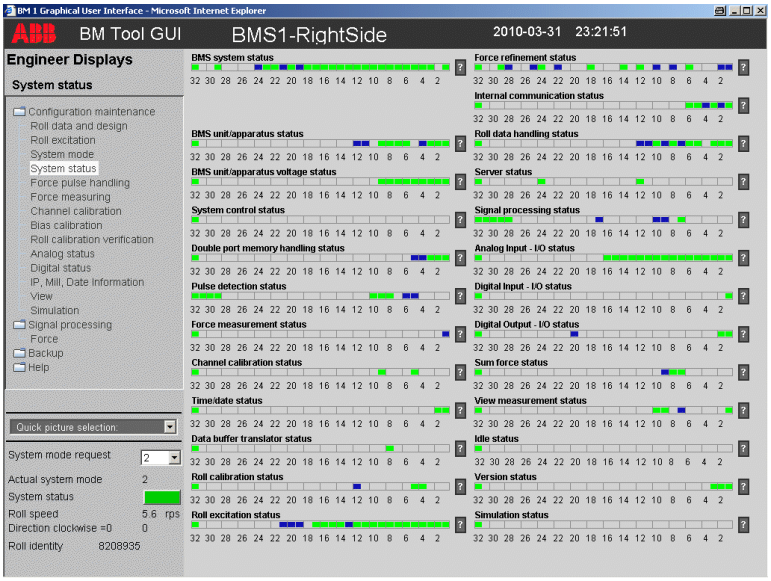


Figure X. BM Tool - System status.

6.4.1 Common Problem Areas

The two most common problem areas are the Air Humidifier unit and the Roll Excitation unit. The Air Humidifier status can be obtained under the object name ”BMS unit/apparatus status”. The Roll Excitation unit status can be obtained under the object name ”Roll excitation status”.

6.4.1.1 Air Humidifier Unit

The most common problems wich the Air Humidifier unit are no air pressure or no water in the tank.

To check whether the four humidifier alarm check boxes are ticked or not, select display ”I/O status”. The alarm signal should be checked in the humidifier box to make sure the status is normal.

One of the four input signals should be inverted, see “Digital input – control” and compare with a backup screen dump showing OK status.

Information
It is possible to acknowledge one or several alarm signals. However, if the alarm is persistent despite preventive efforts, contact ABB for more information.

6.4.1.2 Roll Excitation Unit

The most common reason for Roll Excitation fault is no air or unclean air purge supply to the drive side of the Stressometer. Another fault reason is a dirty or dusty STU, heavy vibrations or heavy impact on the Stressometer that cause the carbon brushes bounce inside the STU. Carbon brushes with stiffer springs should replace the standard brushes if bouncing happens. Another reason could be wrong resistance or earth fault in the circuit due to damage cables or other parts. In some cases the roll excitation unit is malfunctioning.

To restart the Roll Excitation unit, select display ”Roll excitation” and click box 6 (Reset Counter and Restart) or select Idle mode (mode 1) and then back to Force mode (mode 2).

If the roll excitation shuts down it indicates something being wrong with the power circuit running from the roll excitation unit via cables and the STU to the Stressometer roll.

Select display ”I/O status” and check if digital inputs are inverted correctly. Several input signals should be inverted, see “Digital input – control” and compare with a backup screen dump showing OK status.

Information
It is possible to acknowledge one or several alarm signals. However, if the alarm is persistent despite preventive efforts, contact ABB for more information.

6.5 Operator Station

6.5.1 Message "No network connection!"

When selecting a new display and the message "No network connection!" is shown on the screen, the reason is that the Socket communication with ES is not working.

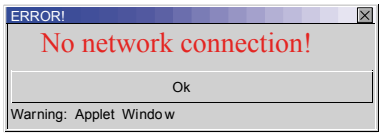


Figure X. Display with No network connection

1. If there are HTML displays but no dynamic data, then check wether the HMI Server For FSA application is started and is running on ES1.
2. Check the cables and the LAN switch LEDs.
3. Excecute a ping command to test the link between ES1 and operator station, IP: 10.71.3.1.

Bias Calibration

A

1. Start the BM Tool.
2. Set the BM system to Bias calibration mode.
   Configuration and maintenance > System mode > System mode request = 4
3. Select the Bias calibration display.
   Configuration and maintenance > Bias calibration.
4. Start the Calibration (the button text become ‘bold’ and the Box 1 in Status will be activated).
5. The Bias calibration is ready when the start button become ‘plane’ and the Box 1 in Status is deactivated.
6. If Box 2 and 6 are activated the Bias calibration is successful.
   If Box 2 and 6 are not activated the calibration process is not successful.

   Box 4, 5, 7, 8 and 9 together with the indication which channel currently have been measured, see MeasChan, it can give a hint which type of error that has occurred and which channels that has been affected.
7. To activate Bias (tare) compensation for Roll calibration select Configuration and maintenance > Roll calibration verification. Go to Force compensation setting and click on Box 3 [SensorBiasCompEnable]).
   To activate Bias (tare) compensation for Force measuring select Configuration and maintenance > Force measurement. Go to Force compensation setting and click on Box 3 [SensorBiasCompEnable]).
8. To save the new configuration select Back-up handling > Make and restore backup > Flash.
9. To backup the new configuration select Back-up handling > Make and restore backup > Make. Note, only the check box that includes roll data has to be checked.

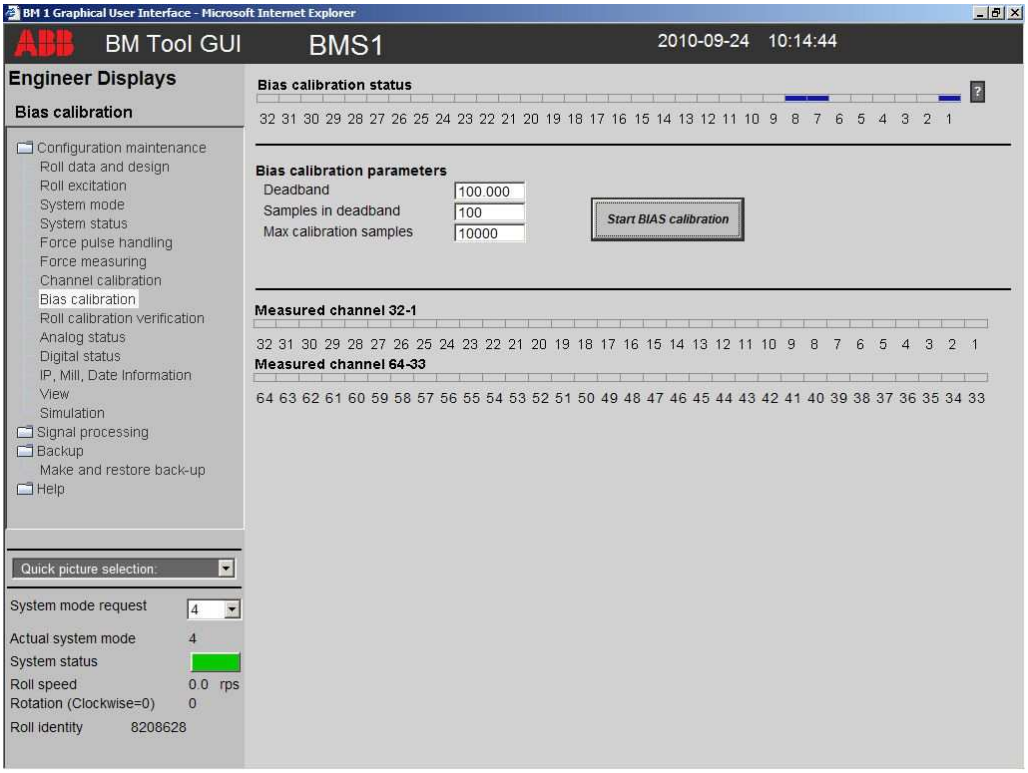


Figure X. Bias calibration.

B Channel Calibration

Information
The system should be powered for at least 30 minutes before starting the calibration. It is important that the Channel calibration is performed first, then the Bias calibration and finally the Roll calibration verification.

1. Start the BM Tool.
2. Set the BM system to Channel calibration mode.
   Configuration and maintenance > System mode > System mode request = 3
3. Select the Channel calibration display
   Configuration and maintenance > Channel calibration.
4. Start the Calibration (the button become ‘red’ and the Box 1 in Status will be activated.)
5. The Channel calibration is ready when the start button change its color from red to gray and the Box 1 in Status is deactivated.
6. If Box 2 and 5 is activated then the Channel calibration is successful. If Box 2 or 5 is not activated then the calibration process is not successful.
   Box 4, 6 and 7 together with the showed array (measured and filtered channel sensitivity) can give a hint about which type of error that has occurred and which one of the channels has been affected.
7. To save the new configuration
   Back-up handling > Make and restore back-up > Flash.

   If rearrangement of zones (relative channels) should be used then Force compensation settings bit ‘ZoneVsChannelEnable’ (Box 5) should be active in all of the following displays (modes): Roll calibration (5), Force measurement(2), Channel calibration(3) and Simulation(7).

Information
If Channel Calibration, Force compensation settings ‘ZoneVsChannelEnable’ (Box 5) is altered from On to Off or Off to On (with cross-connection-table not 1:1) or the cross-connection-table content is altered (with ‘ZoneVsChannelEnable’ On) a new channel calibration must be done. The Force compensation settings bit "ManDeactSensDisable" (Box 28) in Channel Calibration mode should always be active (and deactivated in all other modes).

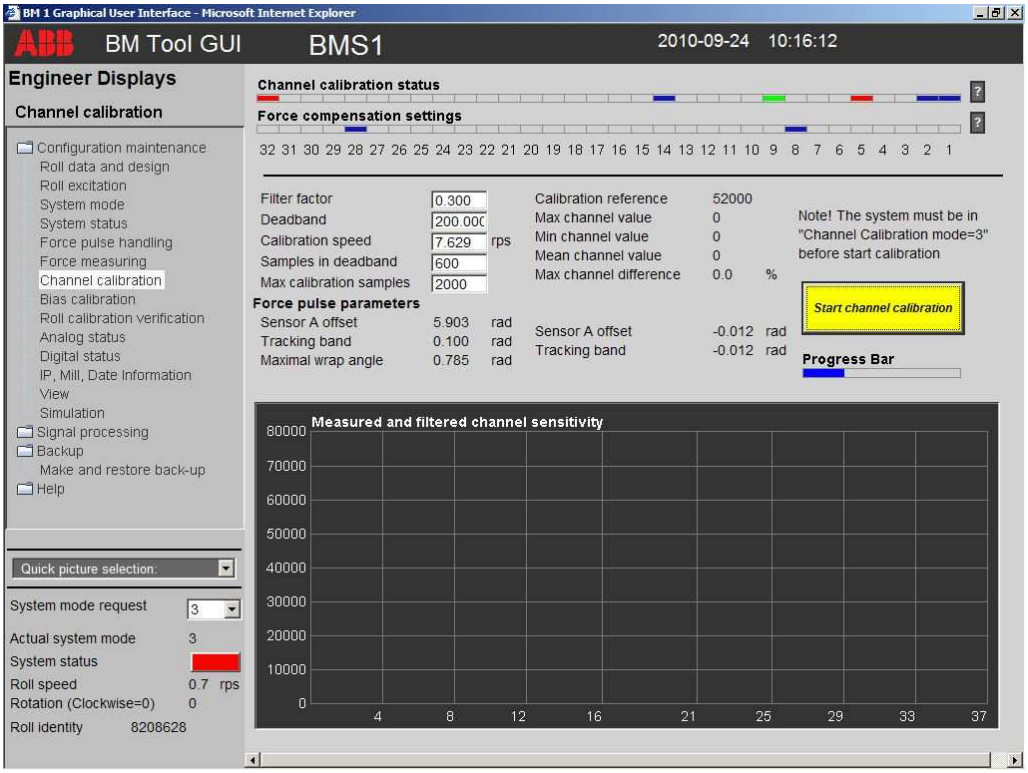


Figure X. Channel calibration.

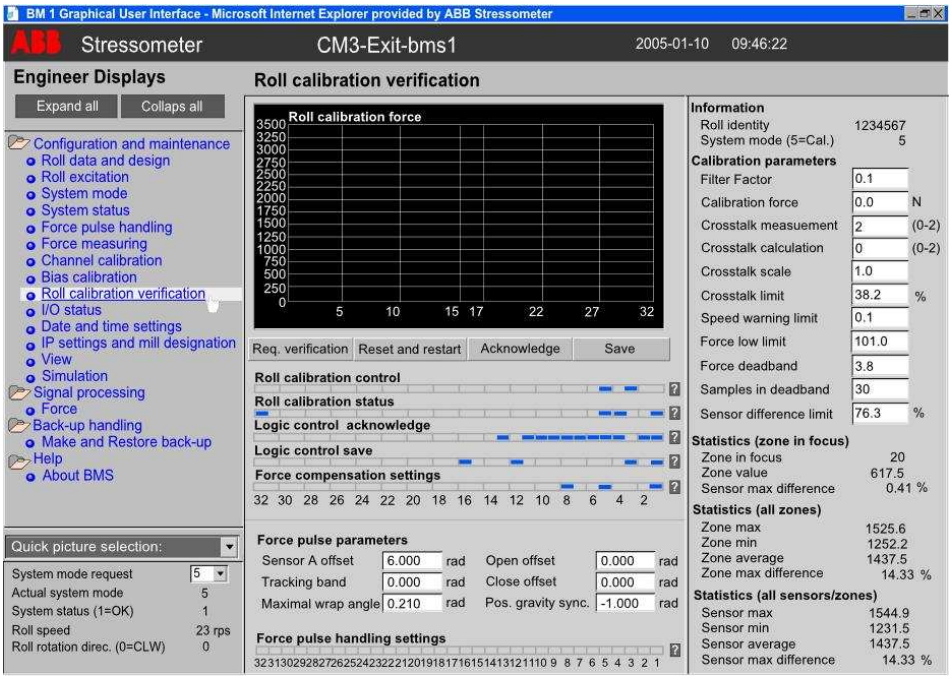
C Roll Calibration Verification

C.1 Procedure

Information
The system should be powered for at least 30 minutes before starting the calibration. Run the Measuring Roll at 100 - 600 rpm with no load for a few minutes before starting the calibration.

1. Start the *BM Tool*, if not already started.
2. Set the BM system to ***Roll calibration verification***.
   Configuration and maintenance > ***System mode*** System mode request = 5

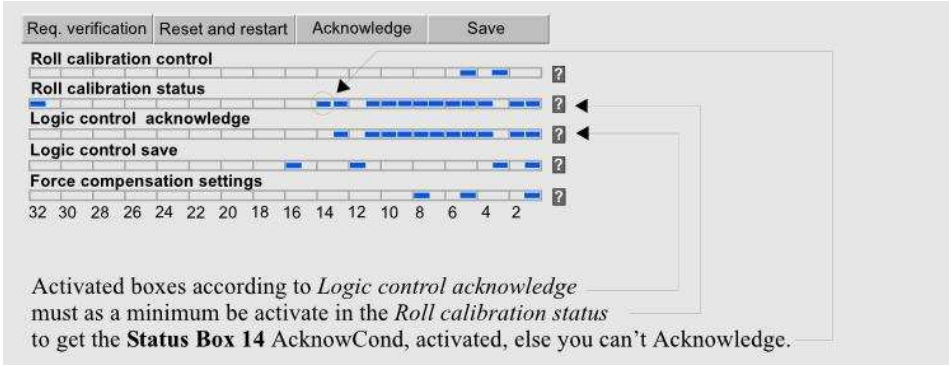
3. Select the ***Roll calibration verification*** display ***Configuration and maintenance > Roll calibration verification.***



Roll calibration mode active is indicated by the Status bit *RoCalibrAct* **Box1**.

> **Information**
> If cross-talk is used the **Force compensation settings** bit *ForceLimEnable* **(Box 27)** must not be On.
> See also Appendix "Roll calibration force diagram".

4. If it is a new verification click on the **Reset and restart** button, before the **Req. verification** button is activated.
5. Click on the **Req. verification** button (the button-text become '**bold**') to activate the ***Roll verification***. Verification active is indicated by the **Status** bit *VerifyActive*, **Box 2.**
6. Load a zone at a time using the calibration device, see chapter "Calibration Verification Equipment".
7. Check the *force* signal by using an oscilloscope. Use the ***View*** function to set the ***ZoneBigForce*** bit, **Box 7**.
8. Click on the **Acknowledge** button when the zone reach the final value and are stable. The **Status***AckowCond* bit **(Box 14)** must be set to allow zone **Acknowledge**.



Successful zone **Acknowledge** is indicated by **Status** bit AcknowActive, **(Box 15)**. LED I5 is lit green for 1 second.

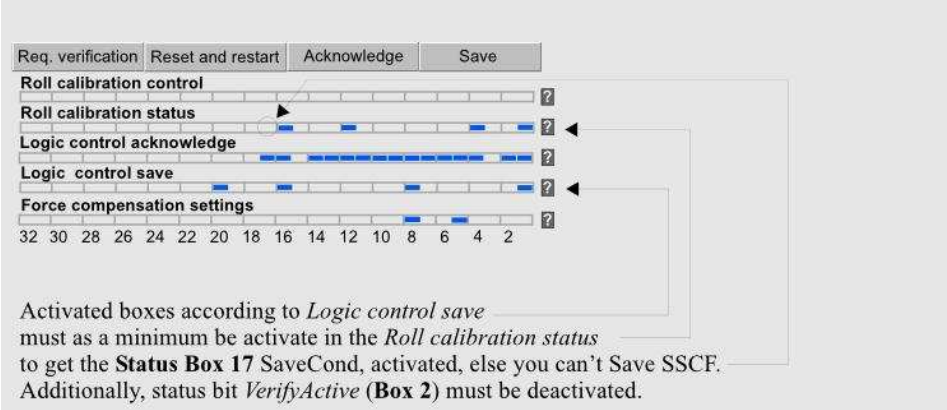
9. Move the calibration weight to the next zone and repeat step 6-9 until all zones are done.

10. The result (SSCF) is OK if a straight line ± tolerance is achieved.
If *Roll calibration control* bit *OrgZscfComp* (Box 6) is set the display indicates *SSCF* compensated with stored (roll-data) SSCF.

    If *Roll calibration control* bit *OrgZscfComp* (Box 6) is not set the Roll calibration force diagram indicates measured raw *SSCF*.
11. Click on Req.Verification button to turn it Off (the button text become plane). Verification Off is indicated by Status bit *VerifyActive* (Box 2) being extingquished.
12. Do NOT Save
The normal is to do a verification only, which means that the *Roll calibration* data is not permanently saved.

    If the decision is to keep the new parameter values click on the Save button, else don't click on it.

    The Status bit *SaveCond* (Box 17) must be set, else the *SSCF* can't be saved.



    Successful Save is indicated by Status bit *SaveCompl* (Box 18).

    LED I5 lit green for 2 seconds.

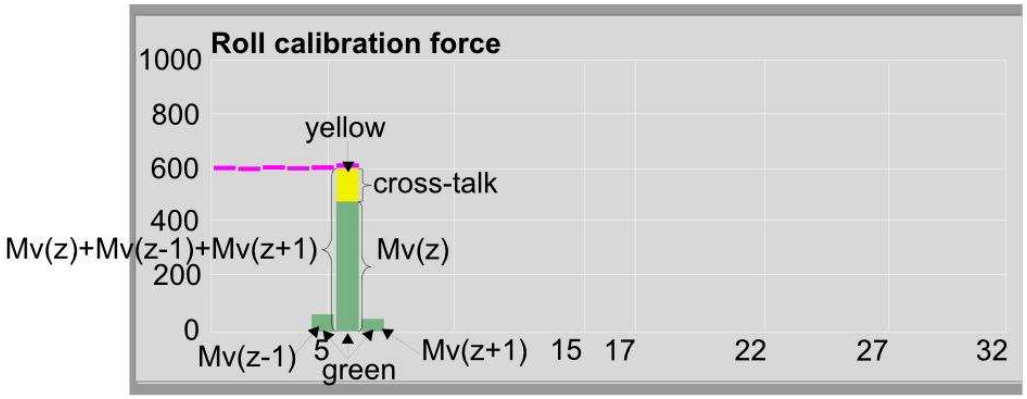
    If Save fails, LED I5 lit red for 2 seconds.
13. To Flash the new configuration select Back-up handling > Make and Restore back-up > Flash, see chapter "Saving Configuration to Flash, page 93".
This is to check/compare the latest verified *SSCF* with the used/permanent *SSCF*.
14. To back-up the new configuration select Back-up handling > Make and Restore back-up > Make, see chapter "Making Backup".
The system back-up will include even the unsaved roll calibration values, if you want to import them into Excel, etc. for examination.

    This is to check/compare the latest verified *SSCF* with the used/permanent *SSCF*.

Information
If you want to restart the ***Roll calibration verification*** from the beginning, go back to step 2, and click Reset and restart button.
Note that all acknowledged zones done so far, are cleared (canceled).

C.2 Roll Calibration Force Diagram

In the Figure below the 'green' bars indicates the measured SSCF values. The 'yellow' bar indicates the SSCF and cross-talk force.



According to the above Figure we have:
Fr(z) = Mv(z)/S(z) + Mv(z-1)/S(z-1) +Mv(z+1)/S(z+1)

where:

Fr(z) = radial calibration force

Mv(z) = measured SSCF value for loaded zone in focus (z)

S(z) = sensitivity of sensors for zone (z)

(z-1) = zone index on the left side of the zone in focus

(z+1) = zone index on the right side of the zone in focus

The ‘yellow’ bar in the diagram indicates the cross-talk and the normalization part when the *Roll calibration* control bit *OrgZscfComp* (Box 6) is active.

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