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Task	S7C Angle Reading Instrument Calibration			Timeframe – 1 hr.

Materials Required
1. .System reference
2. .
3. .
4. .
5. .
6. .
7. .

Equipment and tools
1. .Machine
2. .PPE as required
3. .Hand Klino/Digital Klino
4. .
5. .
6. .
7. .

SAFETY MUST BE YOUR FIRST PRIORITY

SAFE WORK INSTRUCTIONS

S7C ARI CALIBRATION PROCEDURE

	Carefully read through relevant machinery information before use		Enclosed steel capped footwear must be worn at all times
	Safety eyewear must be worn at all times		Gloves must be worn if working with high pressure oils, not with rotary equipment
	Hearing protection must be worn		

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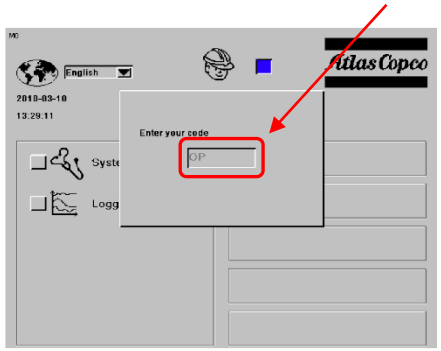
MAINTENANCE TECHNIQUE
UNDERGROUND DRILL RELIABILITY

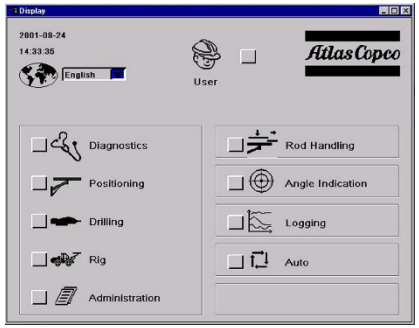
Background - Achieving competent fragmentation in blasting requires production drilling to be completed to as close to the drill plans as possible. The machines angle reading capabilities have been tried and tested as a reliable way of obtaining a correct and accurate means of drilling. As the system relies on readings from the rig level and resolver sensors, these must be in good condition and calibrated accurately to achieve reliable angles.

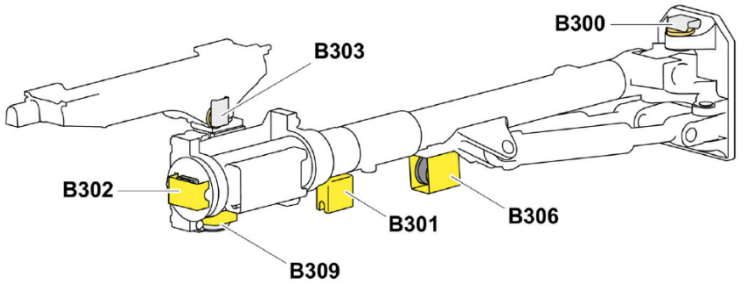
Note: Whilst calibrating sensors, a previously calibrated sensor must remain in the zero position

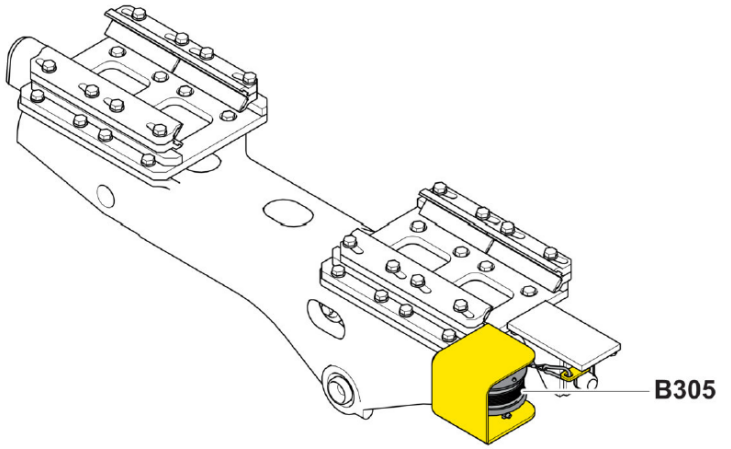
Designation	Function
B313	Rig inclination, sideways
B312	Rig inclination, lengthways
B300	Boom Swing
B301	Boom lift, angle at front end of boom
B306	Boom extension
B302	Feed Rotation
B303	Feed tilt
B309	Feed swing
B305	Feed Extension

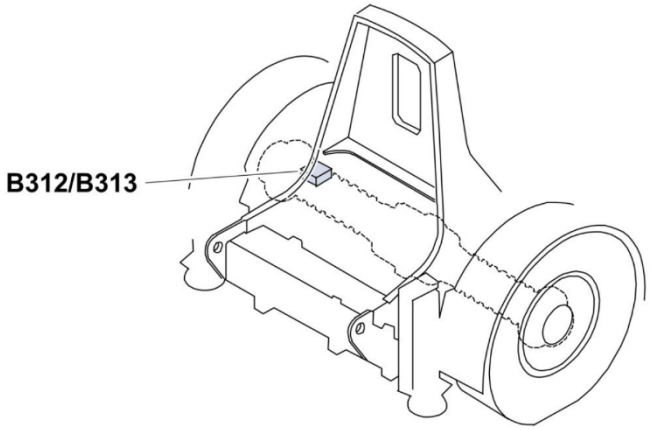
Logging in with USB, use code ↑↓↑↓, without USB ←↓↑→↓←.











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Task	Angle Reading Instrument Calibration			

MAINTENANCE TECHNIQUE
UNDERGROUND DRILL RELIABILITY

ARI Calibration

Checking the calibration of each individual sensor is critical to the operation of the system, once calibration is complete you must refer to steps 25 through 35.

B312 - Rig Level Sensor (side)

Note – When placing level/manual clino onto equipment you must ensure it is going on a machined surface where possible and that is free from foreign debris or burrs etc. (file off if present).

- *Note: Rig inclination, use the tabs located on the right-hand side of boom mounting plate to mount level or top of counterweight plate under cab if the tabs are in poor condition.*
- **Step 1.** Jack machine up to ¾ off the full raised position
- **Step 2.** Place level on the rig calibration tabs (fig. 1 & 2), or top of counterweight plate behind right hand step (fig. 3) side to side and level machine with front jacks.
- **Step 3.** Zero the Rig sidways inclination sensor by pressing the set to zero box

fig. 1. Sideways calibration shown.

fig. 2

Use tabs located at RHS of boom knuckle for rig calibration if clean and in good condition, do not use if rusty or covered in debris.

If tabs are bent broken or unable to be cleaned to a smooth Surface, clean and use the counterweight behind right hand step as shown for lengthwise and sideways calibration.

B313 - Rig Level Sensor (lengthwise)

- *Note: Rig inclination, use the tabs located on the right-hand side of boom mounting plate to mount level or top of counterweight plate under cab if the tabs are in poor condition.*
- *Note: Ensure when achieving a level length way position that the rig side inclination remains in the zero position this is best acheived if the rig is steered straight.*
- **Step 4.** Place level on the rig caloibration tabs (fig. 1 & 2), or top of counterweight plate behind right hand step (fig. 3) and level machine with front jacks and rear jacks. (fig 2)
- **Step 5.** Zero the Rig inclination sensor by pressing the set to zero box.

Lengthways calibration Shown.
fig. 3

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MAINTENANCE TECHNIQUE
UNDERGROUND DRILL RELIABILITY

B300 – Boom Swing Sensor (Resolver)

- *Note: Ensure when calibrating ARI sensors that the rig side and length inclination remains in the zero position.*
- **Step 6.** Place the boom straight forward by measuring the boom lift/swing cylinders are at the same length (measure from centre of rod end pin to cylinder barrel) see fig. 2
- **Step 7.** Zero the Rig resolver sensor by pressing the set to zero box as shown in fig. 1.

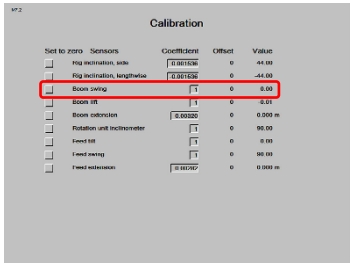

Fig. 1

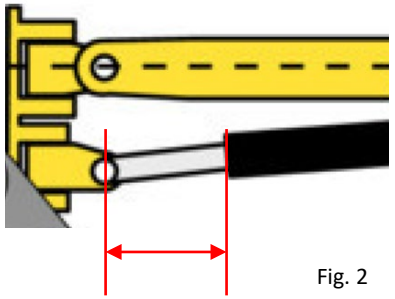

Fig. 2

Ensure this distance is the Same for both cylinders.

B301 – Boom Lift Sensor (Inclinometer)

- *Note: Ensure when calibrating ARI sensors that the rig side and length inclination remains in the zero position.*
- **Step 8.** With the boom still facing straight forward extend the boom extension out 2/3 of its full travel, this compensates for the tube bending encountered during an average setup.
- **Step 9.** Place the level/klino as per fig. 3, it may not be possible to place the clino on the top of the zoom tube as there is a guard fitted to most machines. Zero the resolver sensor by pressing the set to zero box.

Fig. 3

B302 – Feed Rotation Sensor (Resolver)

- *Note: Ensure when calibrating ARI sensors that the rig side and length inclination remains in the zero position.*
- **Step 10.** With the boom and the zoom tube retracted, place the feeder with the rockdrill upward and the feed parallel to the boom.
- **Step 11.** Place the level/klino as per fig. 4 (on machined surface above rollover) zero the Rig resolver sensor by pressing the set to zero box

Fig. 4

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Task	Angle Reading Instrument Calibration			

MAINTENANCE TECHNIQUE
UNDERGROUND DRILL RELIABILITY

B303 – Feed Tilt Sensor (Resolver)

- *Note: Ensure when calibrating ARI sensors that the rig side and length inclination remains in the zero position and the boom is still level and straight*
- **Step 12.** With boom and feeder in the same position as feed rotation calibration place the level/klino on the top of the feed rail as per fig. 1.
- **Step 13.** Ensure all previously calibrated sensors are still reading zero (if not use control levers to rectify), adjust feed tilt until reading zero and zero on control panel.

Fig. 1

B314 – Feed Swing Sensor (Resolver)

- *Note: Ensure when calibrating ARI sensors that the rig side and length inclination remains in the zero position.*
- **Step 14.** Rotate the feed to 90 degrees to the Left-hand side of the boom.
- **Step 15** move feed extension to the fully extended position and feed the rockdrill forward approx 300mm off the feed rail end plate.
- **Step 16.** Place the level/klino as per fig 2 (on machined feed tilt pin end cap), adjust tilt to zero and zero the resolver sensor by pressing the box.

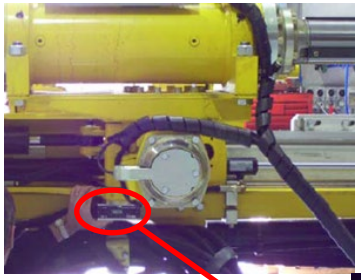

Fig. 2

Note (Quick Test) – Adjust the feed swing cylinder so the feed is at 90deg (bit down) on both axis. Open the angle screens and ensure that it reads 90/90 taking your measurement from the clip ons.

Swing the boom left 1 metre and adjust to 20 deg rotation and 0 degree dump. Place the level/klino on the clip on (ensuring that it is parallel to the machine) to check the accuracy of the rotation and dump. *(Note: There is a tolerance of 1 degree).* Swing the boom to the right and repeat steps.

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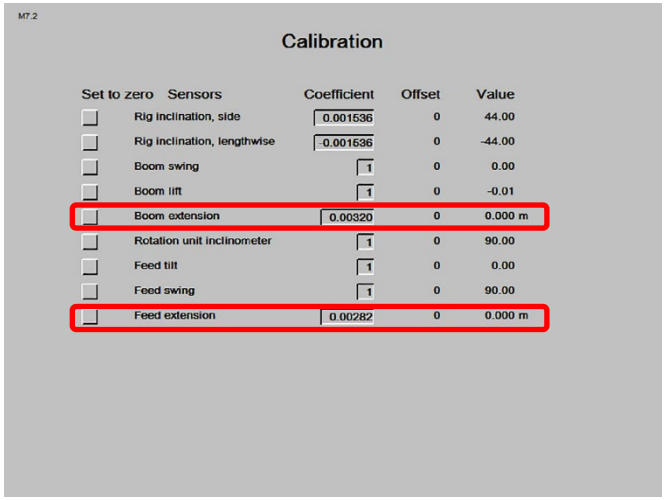
MAINTENANCE TECHNIQUE
UNDERGROUND DRILL RELIABILITY

The boom and feed extension length sensors can be set in any position, so long as they Are able to be fully extended and retracted.

B306 – Boom Extension (Zoom Tube)

- **Step 17.** Fully retract the boom extension
- **Step 18.** Set the sensor to zero using the 'set to zero' function
- **Step 19.** Fully extend the Boom extension to confirm that a positive value is obtained, if it does not increase with a positive value, change the coefficient (- or +) so that it does.
- **Step 20.** With the boom fully extended the value (length) should be 1.250 m, if not, adjust the coefficient until the value shows 1.250 m at full extension. This can be checked with a tape measure to ensure accuracy.



B305 – Feed extension

- **Step 21.** Return the feed extension (rail) to its rearmost position.
- **Step 22.** Set the sensor to zero using the 'set to zero function.
- **Step 23.** Mark the rail with a permanent marker at the forward point of where the slide contacts the rail and extend the feed extension as far forward as it will travel, measure the distance between the mark and the slide where you made the mark and ensure the value corresponds with the measurement.

Please note that if the slides are not adjusted correctly, the rail may bind up, preventing movement and an accurate measurement.

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MAINTENANCE TECHNIQUE
UNDERGROUND DRILL RELIABILITY

Confirming ARI Calibration

B312 - Rig Level Sensor Calibration Confirmation Sideways

Note – *it is critical to confirm the calibration of the rig level sensors, if the coefficient is incorrect the rig will read zero when level, but all other values will be incorrect.*

- **Step 24.** using the same locations as used in step 2, lean the machine over to the right-hand side approx. 2 degrees as per the manual klino/level (see fig. 1) and confirm the value in configuration screen increases. If value decreases or is showing a negative value with the machine leaning to the right, the value will have to be changed to either a + or – coefficent depending on what is already set. i.e. If the coefficient is set as a -0.005 it wil need to be changed to +0.005.
- **Step 25.** Ensure that the machine angle corresponds in this position, if not adjust the coeffiecent value so that it does. i.e. If and clino reads 2.00 degrees, rig reads 2.50 degrees, adjust rig to match hand clino.
- **Step 26.** Set the machine back to zero (as per the manual klino/level) and zero the sensor again if neccesary.

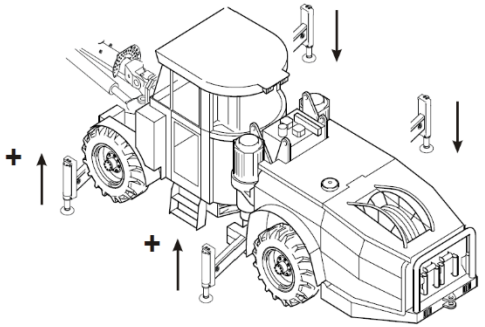

fig. 1

B313 - Rig Level Sensor Calibration confirmation Lengthwise

Note – *Ensure when achieving a level length way position ensure that the rig side inclination remains in the zero position, this is best acheived if the rig is steered straight.*

- **Step 27.** using the same locations as used in step 2, lean the machine forward approx. 2 degrees as per the manual klino/level (see fig. 2) or as far as possible and confirm the value in configuration screen increases. If value decreases or is showing a negative value with the machine leaning to the forward, the value will have to be changed to either a + or – coefficent depending on what is already set. i.e. If the coefficient is set as a -0.005 it wil need to be changed to +0.005.
- **Step 28.** Ensure that the machine angle corresponds in this position, if not adjust the coeffiecent value so that it does. i.e. If hand clino reads 2.00 degrees, rig reads 2.50 degrees, adjust rig to match hand clino.
- **Step 29.** Set the machine back to zero (as per the manual klino/level) and zero the sensor again if neccesary

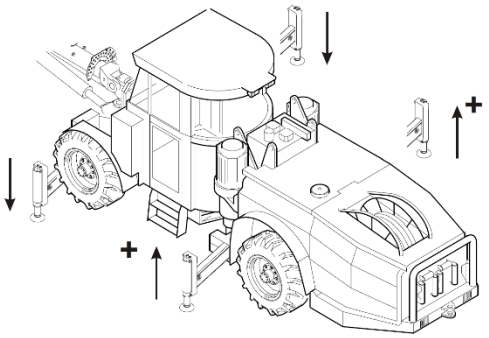

fig. 2

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Task	Angle Reading Instrument Calibration			

MAINTENANCE TECHNIQUE
UNDERGROUND DRILL RELIABILITY

Confirming ARI Calibration

Setting the Coeffecient of the Sensors – Fig 1

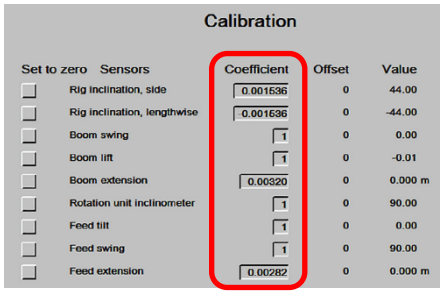


Fig. 1

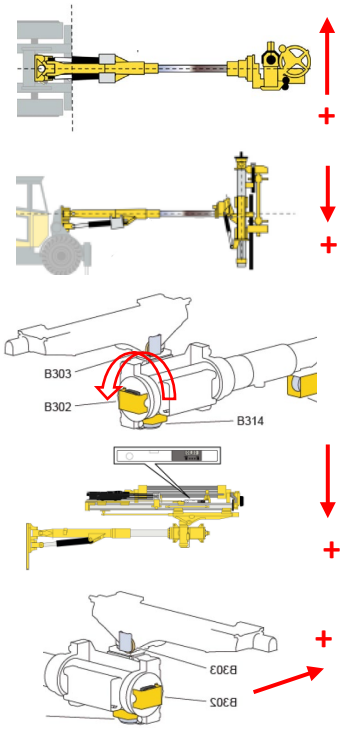
- **Step 30 - B300 Boom Swing:** Adjust the coefficent (1 or -1) so that the sensor increases in a positive value when the boom swings to the LEFT.

- **Step 31 – B301 – Boom Lift Sensor:** Adjust the coefficent (1 or -1) so that the sensor increases in a positive value when the boom is LOWERED.

- **Step 32 - B302 – Feed Rotation Sensor:** Adjust the coefficent (1 or -1) so that the sensor increases in a positive value when rotated in a CLOCKWISE direction (FROM CABIN VIEW).

- **Step 33 - B303 – Feed Tilt Sensor:** Ensure that senor values increase with a positive reading when the feed buffer is moved in a DOWNWARD direction, if not change coefficent + or -.

- **Step 34 - B314 – Feed Swing Sensor:** Adjust the coefficent (1 or -1) so that the sensor increases in a positive value when the feeder swings to the LEFT.



Note (Quick Test) – Adjust the feed swing cylinder so the feed is at 90deg (bit down) on both axis. Open the angle screens and ensure that it reads 90/90.

Swing the boom left 1 metre and adjust to 20 deg rotation and 0 degree dump. Place the level/klino on the clip on (ensuring that it is parallel to the machine) to check the accuracy of the rotation and dump. *(Note: There is a tolerance of 1 degree).* Swing the boom to the right and repeat steps.

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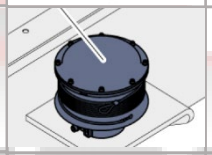
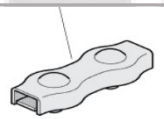
Task	S7C Angle Reading Instrument Calibration			Timeframe – 1 hr.

	MT9106 1475 65 – Signal cable. 9M armoured sensor cable, used for B301,B302, B303 & B309.		MT9772 0115 16 – Resolver Seal Kit Prevents resolver failure due to water and contamination ingress.		MT3176 9995 43 – Signal cable 1M. Rig level sensor cable.
	MT9106 1725 37– Signal cable. 2.4M armoured sensor cable, used for B300.		MT9106 2192 03 – Resolver sensor.		MT9106 0846 00 – RCS plug repair kit.
	MT9106 1725 34 – Signal cable 5M. Boom length potentiometer, M23 – M12 used for B306.		MT9106 2192 16 – Wire linear sensor.		MT3176 0010 89 – Laser cable 3.5M.
	MT9106 1447 68 – Signal cable 9.5M. Feed extension potentiometer, M23 – M12. Used for B305		3138 5051 23 – Bulldog grip. OEM supply.		
	MT3128 3077 24 – Resolver cover.		MT9106 2192 20 – Wire line assy.		
	MT3128 3115 11P – Resolver cover Feed tilt sensor.		MT3128 3059 89 – Bellows coupling.		
	MT9111 4063 59 – Inclinometer cover.		MT3129 1000 20 – Digital protractor.		
	MT9106 2192 04 – Inclinometer.		MT9106 2241 44 – Rig level sensor.		