

Drive Assemblies

The Drum/Spindle locking pin and plunger, *fig 5.15*, may be replaced by removing the spider as described previously, and unscrewing the locking pin using a slotted screwdriver. The spring-loaded plunger should self-eject when the screw is removed.

Ensure that the plunger and spring are greased, fitting new ones (if required). The cut away flat area on the horizontal plunger is on the top. Hold the plunger in place whilst locating and screwing in the new locking pin. Refit the spider ensuring that the spider peg engages correctly.

If the Dowel Pin (MR2929) *fig 5.15*, is damaged and requires replacement, it may be removed by either gripping with a pair of pliers and pulling vertically upwards, or if the pin is sheared off, by rotating the spindle such that the pin is over the locking slot in the top of the bearing housing, and then knocking the broken pin through.

The new pin should be knocked in, such that its top is approx. 2mm below the top of the locking pin.

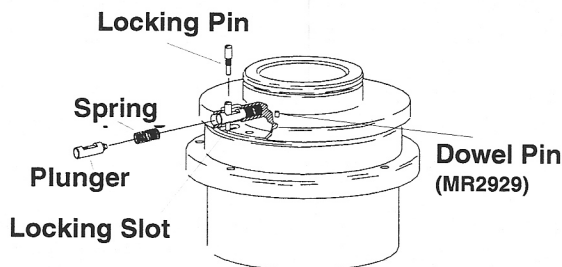


Fig 5.15: Drum/Spindle Locking Mechanism

ROTATE MOTOR BELT



Ensure that the scanner is isolated from the mains power supply before accessing the belt.

Belt Guard Removal / Replacement

Two types of belt guard may be encountered on the scanner:

- Two metal guards, painted red, and located **inside** the belt, adjacent to each pulley, their action being to deflect any intrusive fingers away from the pulleys. The guards do not normally need to be removed for belt access, but the one protecting from the drum spindle will require removal for Heidenhain encoder adjustment. This type of guard is not used on 330i scanners.
- A two-piece ABS cover which completely covers the **outside** of the belt and pulley system. This cover requires complete removal to access the belt.

The red metal guards may each be removed by accessing and unscrewing the two screws holding them, by using a 3mm Allen key through two holes in the underside of the guard.

To remove the ABS guard, it must first be split into two pieces by removing the two clips located at the front and rear. Once split each half may be removed by unscrewing the two screws holding them, located in front and behind the square section of the optic arm assembly, using a 3mm Allen key.

To replace, follow the reverse of the above procedure.



When replacing the ABS cover ensure that it is positioned such that the belt sideways movement will not hit the side. If this happens it will require repositioning.

Drive Assemblies

Belt Removal/Replacement

1. Defeat the drum mechanical interlock to rotate the spindle as described previously.
2. If the belt is to be replaced it will be necessary to disconnect the five electrical connectors on the Lamp Tag PCB located under the lamp on the lower optical (lamp) assembly, the two D type plugs connected to the EHT unit under the lower end of the optic arm, and the earth strap wire to the optic arm.



Ensure that the lamp has cooled for 5 minutes before accessing lamp assembly.

WARNING

3. If the scanner is fitted with the complete external ABS belt guard it must be removed. There is no need to remove the red internal belt guard (see earlier).
4. It should be possible to slip the belt off the pulleys, dropping it down to the bottom of the optics arm casting if removing it completely. If necessary the four 3mm motor retaining bolts may be loosened to slacken the belt prior to ease removal.
5. Refit the belt by slipping the belt upwards from the bottom of the optics casting. Locate squarely on the motor and drum spindle pulleys, ensuring that the ridges and grooves in the belt and pulley are correctly located with respect to each other. Rotate the spindle by hand to verify.
6. Replace the lamp connections, EHT connections and earth strap removed in step 2.
7. Rotate the spindle by hand and ensure that the belt runs true. If not, the motor will require slight rotational realignment about its fixing screws.
8. Ensure that the belt is tensioned correctly using the following procedure.

Belt Tension

1. With the belt correctly located, slacken the four motor bolts holding the motor to its mounting plate. (On 330i it is necessary to remove the PC unit to access the adjusting bolts).
2. Slide the motor to tension the belt. (On 350i/355i you may use the external circlip pliers inserted between the end of the nut plate cutout and its retaining screw as illustrated in Fig 5.16 Adjust the bottom of the plate first. Closing pliers tightens belt).

The current tension is indicated by a deflection of 10mm to 15mm at the centre of the belt span, under light finger pressure.

3. Ensure that the ends of the nut plates are equal distances from the motor plate edge i.e. that the edge of the motor base plate is parallel to the edge of the mounting plate and tighten the motor retaining screws.



The belt is designed to run slack (10 to 15mm of movement). Do not overtighten or spindle/drum vibration will occur.

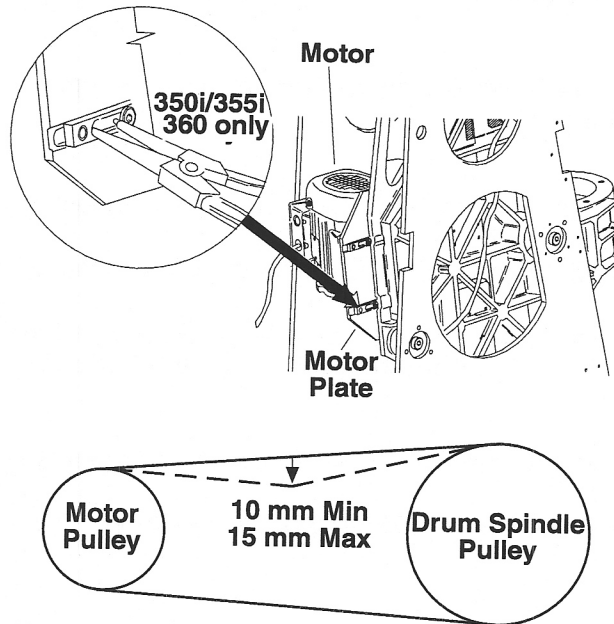


Fig 5.16: Belt Tension

SCAN SPINDLE AND INTEGRAL ROTARY ENCODER

The scan spindle complete with encoder may be removed from the main drive assembly, either for replacement or to reduce the overall weight prior to removal of the main traverse assembly.

Encoder Types

The rotary encoder currently used is manufactured by Heidenhain and may be optical or magnetic, (other types may be fitted in the future). The encoder is part of the spindle assembly and as such is not a field replaceable item. The model used can be identified as followed:

- Heidenhain optical:- this type has a separate glass-faced black 40 mm square reading head located behind the spindle under the belt-guard, and requires a separate Encoder Interface PCB located on the main frame of the machine, above the Mains Enclosure. The reflective encoder surface is gold coloured with visible tracks and marker.
- Heidenhain magnetic:- this type is used as an alternative to the optical encoder from mid-1997. It has a separate 40 mm square reading head located behind the spindle under the belt-guard which has a metal detector face and is currently silver in colour. The encoder itself has a matt black magnetic surface with no visible tracks and marker. The head is also directly compatible with the Machine Controller PCB input, and therefore does not require the Encoder Input PCB (OK3500221) to be fitted. This encoder should prove to be impervious to dust contamination and should therefore require minimum servicing.



CAUTION

Ensure that spindles fitted with a magnetic encoders are kept away from strong magnetic fields. The reading head is sensitive to damage from ESD (Electrostatic Discharge). Do not disassemble the connector plug or touch its pins without taking suitable precautions for grounding. (Refer to page 5-5-2)

Drive Assemblies

Scan Spindle and Heidenhain Encoder Removal/Replacement

 **WARNING** Ensure that the scanner is isolated from the mains supply before accessing the belt or removing spindle.

1. Follow the procedure described previously in this chapter to remove the belt guard and belt.
2. Remove the Illumination Objective Lens Assembly at the top of the Optic arm (two 3mm screws).
3. Locate the square reading head mounted behind the spindle. (On 350i/355i/360 the red belt guard obscures it). Use a 3 mm Allen key to unscrew the guard and the encoder reading head, and remove carefully.
4. Undo the five 4 mm Allen screws holding the spindle to the casting and lift it out squarely.

 **WARNING** The unit is heavy. Be careful not to trap your fingers.

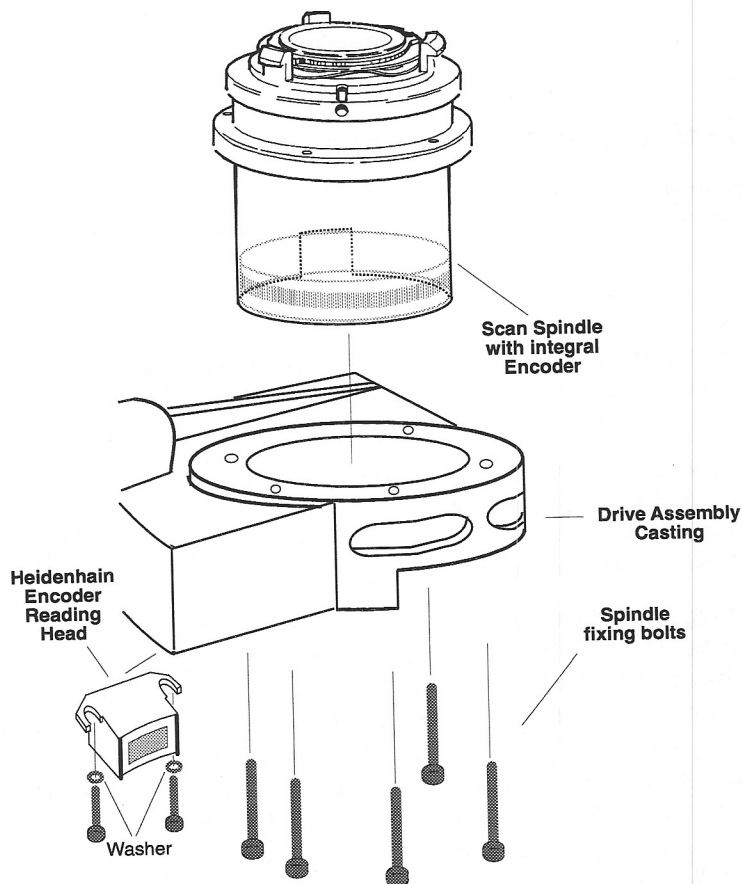


Fig 5.17: Scan Spindle Assembly

5. Locate the replacement spindle into main assemble, lowering carefully and squarely ensuring that the drum locking pin slot is correctly located at the front. Push the spindle backwards towards the rear of the main assembly, and fix using the five bolts previously removed.

If a scan spindle fitted with a magnetic encoder is retrofitted in place of an optical one, the reading head must be changed for the one supplied with the spindle, and the Encoder Interface PCB discarded. To enable the spindle to be removed in the future without the need to remove the side panels on 350i/355i scanners, the reading head cable may be routed into the PC compartment via the hole in the chassis located below the mains switch to feed the optic arm cables.

 **CAUTION** Ensure that the reading head cable is clipped such that it does not foul on the belt or impede optic arm movement.

6. Locate the reading head using the two 3mm Allen screws and washers, but do not tighten.
7. Both the optical and magnetic reading heads are adjusted in the same way:
Set the gap between the outer edge of the reading head and the encoder outer surface, using a 0.1mm (0.004") plastic foil for the optical head *part MR2868*, and a 0.15mm (0.006") plastic foil for the magnetic head *part MR2976*, and then tighten the reading head fixing bolts. *Fig 5.18*. The foil should just slide out when pulled. It must not be gripped too tightly and compressed.
The gap is very critical, re-check after tightening the screws.

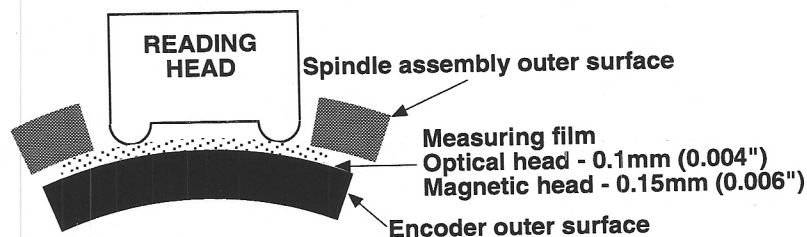


Fig 5.18: Heidenhain Encoder Reading Head Adjustment

8. Replace the belt and tension to give 10mm to 15mm centre movement as described previously.
9. Replace the belt guard and refit the Illumination Objective Lens Assembly (3mm Allen screws).
10. Run the Engineering test, **test - cell - mech** rotate tests to verify correct operation in both directions at all speeds.

Heidenhain Optical Encoder Setup Verification

It is essential for operation of the rotate servo that the Heidenhain encoder reading head is correctly adjusted. Correct operation may be verified if required, using an oscilloscope and the engineering test, **test - cell - mech - r1750** menus to rotate the spindle, *refer to chapter 4-2*.

1. Monitoring of the Encoder PCB "Mark" testpoint (TP2) with the oscilloscope should show a single negative going pulse of 80 to 90 μ S duration at 750 rpm. "Gated Mark" (TP5) on the Machine Controller PCB in the PC should show only one marker per drum revolution at all drum speeds; multiple markers indicate incorrect setting.

Drive Assemblies

2. Further detailed checking of the encoder operation may be carried out as follows:
 - (a) Rotate at 1500rpm (**r11500**).
 - (b) Monitor the differential input on the Encoder PCB by connecting the oscilloscope to access resistor R6 (**R+**, **R-**). *Fig 5.19(a)*.
 - (c) On the oscilloscope **invert** channel B, and switch to **A+B**. Ground both channels and centre the trace on the screen to establish a **threshold** reference height.
 - (d) Redisplay the signals as **A+B**, *fig 5.19(b)*, and note the mark area above the shoulder. It should be approximately centred vertically around the threshold level.

If the signal is not correct the gap setting of the encoder should be rechecked.

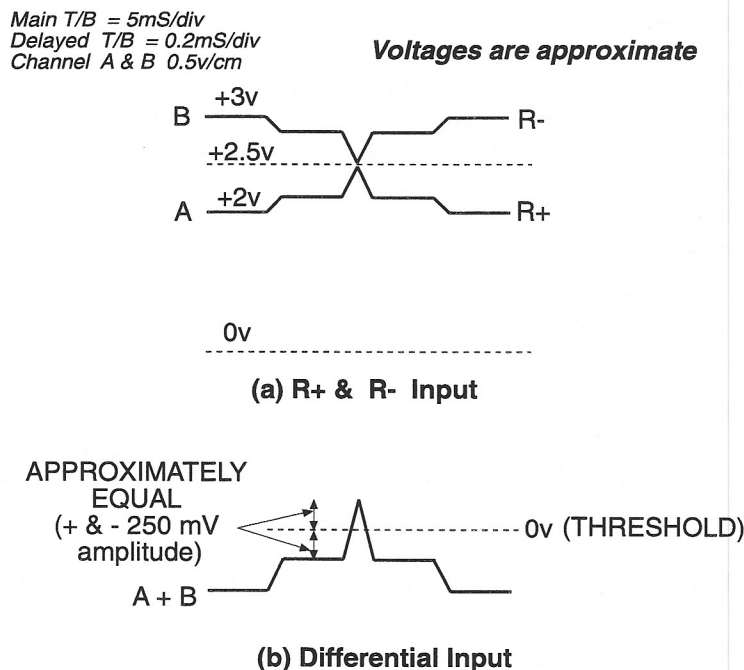


Fig 5.19: Heidenhain Optical Encoder Signals

ROTATE MOTOR

1. To remove the rotate motor, the Mains Unit must be accessed to remove the power connections.



This unit contains the 240V distribution system. Isolate the scanner from the supply and wait for 3 minutes before accessing.

Disconnect the motor connections from M1, M2 and M3 on the Rotate Inverter (Motor Driver 3Ø)
 Disconnect the ground connection and white screen connection from the Rotate Isolation board.

2. If the complete belt guard is fitted, remove it as described earlier in this chapter. Release and remove the belt.

3. Undo the four bolts holding the motor plate to the drive assembly casting, and remove the mountings to free the motor complete with plate. These should be two part rubber on 330i/350i/360, and two part nylon on 360 scanners
4. Undo the four 3mm Allen screws holding the motor to the plate and remove the motor.
5. Refit the motor to its plate ensuring that its mountings are located correctly. Refit the plate and motor to the drive assembly casting. Refit the electrical connection to the Mains Unit.



The order of the three power wires is normally M1-black, M2-brown, M3-blue, however they may vary if a different motor type is used in the future. See step 7.

6. Refit the belt and tension using the procedure described previously in this chapters. Refit the belt-guard if removed.
7. Repower the scanner and run the engineering tests, **test - cell - mech**. Use the rotate tests (*chapter 4-2*) to verify correct operation. When testing, if the motor runs in the opposite direction to that expected, then the connections to the motor are incorrect. **Remove power from the scanner, wait 3 minutes**, then access the Mains Unit, and interchange any two M1, M2 or M3 connections.

TRAVERSE MOTOR



Ensure that the scanner is isolated from the mains supply before accessing the motor.

WARNING

The traverse motor (and flexible coupling) may be replaced without removing the traverse assembly, as follows:

1. Switch off the scanner and disconnect the motor electrical connection.
2. Loosen the two lower screws of the flexible coupling on the motor shaft.
3. Undo the four 3mm bolts holding the motor bracket, accessible from the outside (lefthand side) of the drive assembly casting, and remove the bracket complete with motor.
4. Remove the motor from the bracket and replace with the new motor.

A new flexible coupling may be fitted at this point if required.

5. Refit the bracket, complete with motor, to the main assembly. Tighten the flexible coupling screws and reconnect the motor electrical connection.
6. Power the scanner and run **test - cell - mech - ttm** to verify correct operation of the traverse motor system. *Chapter 4-2*.



The leadscrew and rails are normally self-cleaning. DO NOT GREASE. Severe contamination may be removed by wiping sparingly with a light machine oil.

Drive Assemblies

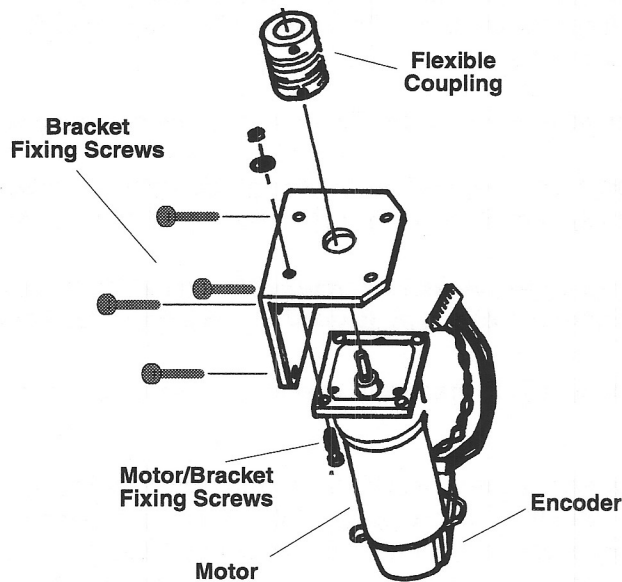


Fig 5.20: Traverse Motor

TRAVERSE DRIVE ASSEMBLY

The complete drive assembly is held to the main frame of the scanner by rubber bushes. On 350i/355i/360 there are three on the left-hand side, (front centre, and rear top and bottom), and one on the right-hand side (front centre). On 330i the rear top bush is not fitted.

No adjustments or replacement parts can be fitted to the assembly in the field, other than leadscrew cleaning or traverse motor / flexible coupling replacement (see earlier). The complete drive assembly must be removed from the scanner and changed if other traverse drive problems are diagnosed.

The field removal procedure can be summarised as follows:

- Removal of the doorlock mechanism (not 360 scanners).
- Removal of the four optical assemblies and disconnection of associated cables.
- Removal of the belt, spindle and rotate motor. *Necessary to make the complete assembly lighter and easier to handle.*
- Removal of the optics casting from the traverse drive system (350i/355i/360 only).
- Removal of the drive assembly from the scanner main frame.



This procedure involves removal of several sub-assemblies, and may take several hours.

350i/355i/360 Scanner Traverse Drive Assembly Removal/Replacement

Reference should be made to fig 5.21 for details of components.

1. Isolate the scanner from the mains supply.