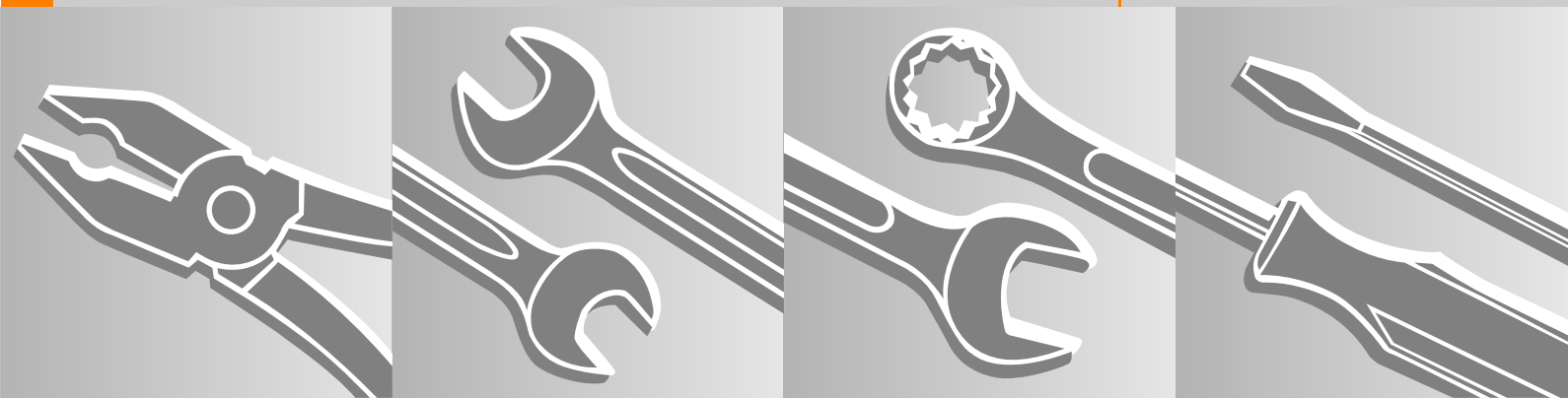


STIHL FS 120, 200, 300, 350, 400, 450
STIHL FR 350, 450

2003-04



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STIHL®

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1. INTRODUCTION

This service manual contains detailed descriptions of all the repair and servicing procedures specific to this power tool series.

There are separate handbooks for servicing procedures for standardized parts and assemblies that are installed in several STIHL power tool models. Reference is made to these handbooks in the appropriate chapters in this manual.

As the design concept of models FS 120, FS 200, FS 300, FS 350, FS 400, FS 450 and FR 350, FR 450 is almost identical, the descriptions and servicing procedures in this manual generally apply to all models. Differences are described in detail.

You should make use of the illustrated parts lists while carrying out repair work. They show the installed positions of the individual components and assemblies.

Refer to the latest edition of the relevant parts list to check the part numbers of any replacement parts needed.

Parts lists on microfiche and CD-ROM are always more up to date than printed lists.

A fault on the power tool may have several causes. Consult the troubleshooting charts for all assemblies in the "Standard Repairs, Troubleshooting" handbook.

Refer to the "Technical Information" bulletins for engineering changes which have been introduced since publication of this service manual. Technical information bulletins also supplement the parts list until a revised edition is issued.

The special servicing tools mentioned in the descriptions are listed in the last chapter of this manual.

Use the part numbers to identify the tools in the "STIHL Special Tools" manual.

The manual lists all special servicing tools currently available from STIHL.

Symbols are included in the text and pictures for greater clarity.

The meanings are as follows:

In the descriptions:

- = Action to be taken as shown in the illustration (above the text)

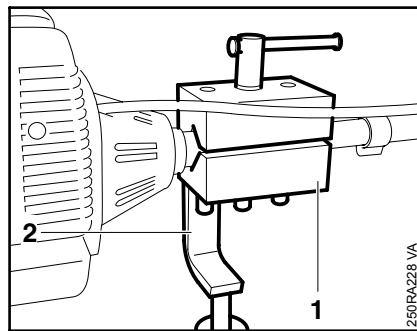
- = Action to be taken that is not shown in the illustration (above the text)

In the illustrations:

➔ = Pointer

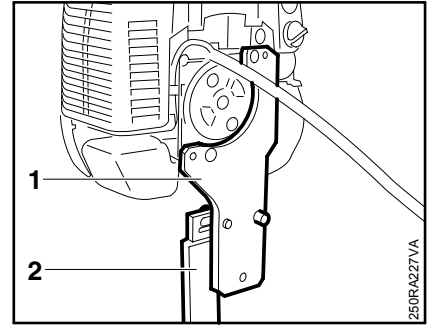
➡ = Direction of movement

Service manuals and all technical information bulletins describing engineering changes are intended exclusively for the use of STIHL servicing dealers. They must not be passed to third parties.



Servicing and repairs are made considerably easier if the machine is mounted on assembly stand (2) 5910 890 3100 with the aid of clamp (1) 5910 890 8800.

Secure the clamp to the assembly stand with two washers and two M8 nuts.



Servicing and repairs to the powerhead are considerably easier if it is mounted on assembly stand (2) 5910 890 3100 with the aid of clamping plate (1) 5910 890 2101.


First remove the clutch housing and secure the powerhead to the stand with two M6x20 and two M10x25 hex. head screws.

The machine or powerhead can then be swivelled to the best position for the ongoing repair and this leaves both hands free.

Always use original STIHL replacement parts.

They can be identified by the STIHL part number,

the

and the STIHL parts symbol .

The symbol may appear alone on small parts.

2. SPECIFICATIONS

2.1 Engine

STIHL single cylinder two-stroke engine with special impregnated cylinder bore

	FS 120/300	FS 200/350 FR 350	FS 400	FS 450 FR 450
Displacement:	30.8 cm ³ 1.88 cu.in	36.3 cm ³ 2.21 cu.in	40.2 cm ³ 2.45 cu.in	44.3 cm ³ 2.70 cu.in
Bore:	35 mm 1.38 in	38 mm 1.49 in	40.0 mm 1.57 in	42.0 mm 1.65 in
Stroke:	32 mm 1.26 in	32 mm 1.26 in	32 mm 1.26 in	32 mm 1.26 in
Power output:	1.3 kW (1.8 bhp) at 9,000 rpm	1.6 kW (2.2 bhp)	1.9 kW (2.6 bhp)	2.1 kW (2.8 bhp)
Max. permissible engine speed without cutting tool (cut-off speed):	12,500 ± 1000 rpm		12,500 ± 800 rpm	
Idle speed:	2,800 rpm			
Bearings:	Crankshaft supported in heavy-duty ball bearings, needle cages on small and big ends			
Piston pin diameter:	10 mm (0.39 in)			
Rewind starter:	ElastoStart			
Pawls:	Single pawl system			
Reserve pull on rope rotor:	min. 1/2 turn			
Starter rope:	3.0 mm (0.12 in) dia. x 800 mm (31.5 in)			
Clutch:	Centrifugal clutch without linings			
Clutch engages at:	4,300 rpm			
Crankcase leakage test				
at gauge pressure:	0.5 bar (7.25 psi)			
under vacuum:	0.5 bar (7.25 psi)			

2.2 Fuel System

Carburetor:	Diaphragm carburetor		
Standard setting on carburetors with three adjusting screws			
High speed screw H:	Open approx. 1 turn		
Low speed screw L:	Open approx. 1 turn		
Carburetor leakage test			
at gauge pressure:	0.8 bar (11.6 psi)		
Function of tank vent			
at gauge pressure:	≤ 0.3 bar (4.35 psi)		
under vacuum:	≤ 0.05 bar (0.725 psi)		
Fuel tank capacity:	0.64 l (1.35 US pt)		0.68 l (1.44 US pt)
Octane rating:	min. 90 RON (US/CAN; pump octane min. 87)		
Fuel mixture:	Regular brand name gasoline and two-stroke engine oil		
Mix ratio:	50:1 with STIHL two-stroke engine oil 25:1 with other brand name two-stroke, air-cooled engine oils		
Air filter:	Paper filter		

2.3 Ignition System	Type:	Electronic magneto ignition (breakerless) with integral trigger unit and electronic speed governor
	Air gap:	0.2 - 0.5 mm (0.008 - 0.020 in)
	Length of ignition lead:	305 mm * (12 in)*
	Spark plug (suppressed):	Bosch WSR 6F, NGK BPMR 7 A or Champion RCJ 6Y
2.4 Gearhead	Electrode gap:	0.5 mm (0.020 in)
	Spark plug thread:	M14x1.25
	Length of thread:	9.5 mm (0.37 in)
2.5 Special Accessories	Type:	Spiral-toothed bevel gear drive
	Gear ratio:	1:1.4 ** 1:1.235
	Bearings:	Deep groove ball bearings
	Lubrication:	STIHL gear lubricant 0781 120 1117 (7 g / 0.25 oz)
2.5.1 For User	Full harness	
	Safety glasses	
	Transport guard for metal cutting tools	
	STIHL gear lubricant (80 g/3 oz tube)	0781 120 1109
2.5.2 For Service	STIHL gear lubricant (80 g/3 oz tube)	0781 120 1117
	Carburetor parts kit	4134 007 1060
	Set of gaskets for FS 120, 200, 300, 350, FR 350	4134 007 1050
	Set of gaskets for FS 400, 450, FR 450	4128 007 1050

* FS 400/450 only

** FS 120, 200, 350 and 450

2.6 Tightening Torques

DG and P screws (Plastoform) are used in polymer and lightmetal components. These screws form a permanent thread when they are installed for the first time. They can be removed and installed as often as necessary without detrimentally affecting the strength of the screwed assembly, providing the specified tightening torque is observed. For this reason it is **essential to use a torque wrench**.

Fastener	Thread size	For component	Torque		Remarks
			Nm	lbf.ft	
Self-tapping screw	IS-B3.5x6.5	Rewind spring/fan housing	1.5	1.1	
Self-tapping screw	IS-B4.2x9.5	Muffler/spark arresting screen	2.5	1.8	1) 2)
Spline screw	IS-DG4x20	Ignition module/crankcase	4.5	3.3	3) 4) 5)
Spline screw	IS-DG5x24	Ignition module/crankcase	6.0	4.4	1) 2)
Spline screw	IS-DG5x12	AV sleeve/drive tube (fixing screw)	2.5	1.8	3)
Spline screw	IS-DG5x12	Guard ring/gear housing	5.0	3.7	1) 4)
Spline screw	IS-DG5x20	Fan housing/crankcase	6.0	4.4	
Spline screw	IS-DG5x20	Fan housing/shroud/crankcase	6.0	4.4	
Spline screw	IS-DG5x20	Carburetor housing/crankcase/ cylinder	6.0	4.4	
Spline screw	IS-DG5x20	Filter housing/ground wire/ crankcase	6.0	4.4	
Spline screw	IS-DG5x20	Ground wire/crankcase	6.0	4.4	1) 2)
Spline screw	IS-DG5x26	Fuel tank/crankcase	6.0	4.4	
Spline screw	IS-DG5x24	Bracket/crankcase	6.0	4.4	1)
Spline screw	IS-DG5x20	Shroud/clutch housing	6.0	4.4	
Spline screw	IS-DG5x26	Guard plate/fuel tank/ crankcase	6.0	4.4	1) 2)
Spline screw	IS-DG5x28	Cylinder/crankcase	10.5	7.5	
Spline screw	IS-DG5x24	Muffler/crankcase	8.5	6.3	
Spline screw	IS-DG5x24	Muffler/cylinder	8.5	6.3	
Spline screw	IS-DG5x24	Crankcase	8.5	6.3	
Spline screw	IS-DG5x24	Clutch housing/crankcase	8.5	6.3	1) 2) 4) 5)
Spline screw	IS-DG5x24	Clutch housing/crankcase	6.0	4.4	3)
Spline screw	IS-DG6x28	Clutch housing/drive tube	12.0	8.8	1) 6)
Spline screw	IS-DG5x24	Clutch housing/drive tube	8.5	6.3	4)
Spline screw	IS-DG5x24	Gear housing/drive tube	8.5	6.3	2) 3) 5)
Spline screw	IS-DG5x25	Gear housing/drive tube			
		Stage 1	1.5	1.1	1) 4)
		Stage 2	7.5	5.5	1) 4)
Collar nut	M5	Filter housing/carburetor housing	3.5	2.6	
Collar screw	M5/P6	Carburetor housing	4.0	3.0	
Spline screw	IS-M5x12	Clamp/control handle/ drive tube (loop handle)	2.0	1.5	3) 4)
Spline screw	IS-M5x16	AV sleeve/drive tube (clamp screw)	5.5	4.0	3)
Spline screw	IS-M5x12	Clamp/control handle/drive tube	2.0	1.5	2) 5)
Spline screw	IS-M5x16	Clamp/drive tube (for harness)	4.5	3.3	3)
Spline screw	IS-M5x30	Control handle (bike handle)	2.0	1.5	6)

Fastener	Thread size	For component	Torque		Remarks
			Nm	lbf.ft	
Spline screw	IS-M6x25	Clamp/loop handle	4.5	3.3	3)
Spline screw	IS-M6x25	Support/drive tube	6.0	4.4	1) 4) 6)
Spline screw	IS-M6x35	Clamp moldings/support block (handle support/bike handle)	4.5	3.3	3)
Spline screw	M8	Carrier	24.0	17.7	1) 2) 4) 5)
	IS-M6x18	Clutch shoe/carrier	12.0	8.8	
	M8	Flywheel	32.0	23.6	
	M10	Decompression valve	14.0	10.3	
	M14x1.25	Spark plug	20.0	15.0	
Screw plug	M11x10	Gearhead	8.5	6.3	
Spline screw	IS-M5x14	Filter cover/filter housing	6.0	4.4	1) 2)
Plastoform screw	IS-P4x16	Control handle/handle moldings	1.0	0.75	
Collar screw	IS-P3.5x10.6	Detent spring/slide control (bike handle)	1.1	0.80	1) 3) 4)
Nut	M12x1.5 L	Cutting tool	25.0	18.5	
Spline screw	IS-M5x16	Cutting tool deflector/gearhead	4.3	3.2	
Spline screw	IS-M6x14	Spring/support plate	10.0	7.5	2) 5)
Spline screw	IS-M6x25	Housing/shaft clamp screw	4.5	3.3	2) 5)
Spline screw	IS-M6x14	Bearing housing/support frame	10.0	7.5	2) 5)
Spline screw	IS-M10x20	Support plate/ball bearing/ support frame	20.0	15.0	2) 5)

Use the following procedure to fit a DG or P screw in an existing thread:

- Place the DG or P screw in the hole and rotate it counterclockwise until it drops down slightly.
- Tighten the screw clockwise to the specified torque.

This procedure ensures that the screw engages properly in the existing thread and does not form a new thread.

- 1) FS 400/450
- 2) FR 450
- 3) FS 120/200
- 4) FS 300/350
- 5) FR 350
- 6) with washer

Note: Power screwdriver speed settings for polymer: Plastoform screws max. 600 rpm
DG screws max. 500 rpm

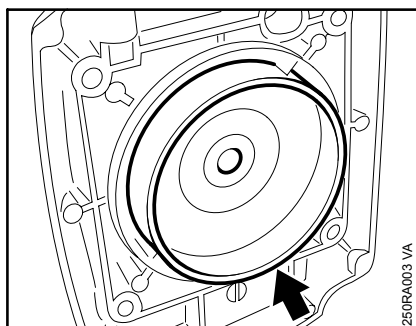
3. CLUTCH

3.1 Removing and Installing

Removal

Troubleshooting chart - see "Standard Repairs, Troubleshooting" handbook.

- Remove clutch housing - see 9.1 or 11.2.

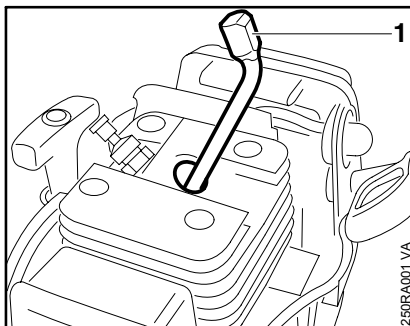


All models

- Inspect clutch drum. There should be no scores or signs of excessive wear.

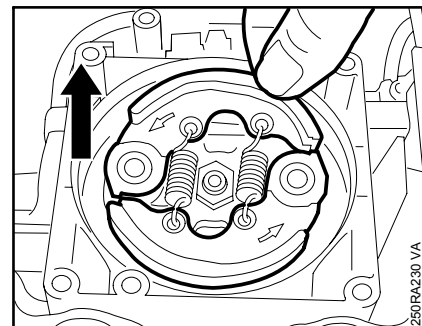
Important: If there are signs of serious wear on the inside diameter, fit a new clutch drum - see 11.2.

- Remove the shroud - see 4.1.
- Pull off the spark plug boot.
- Unscrew the spark plug.

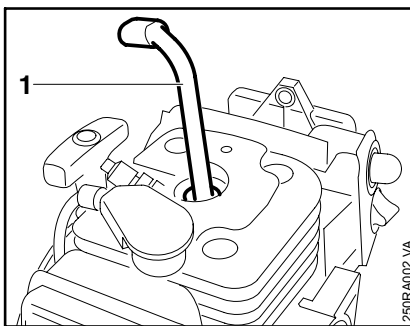


FS 120...350, FR 350

- Fit locking strip (1)
0000 893 5903.

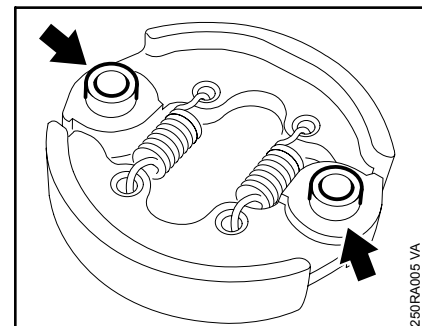


- Remove clutch shoes with bushings.

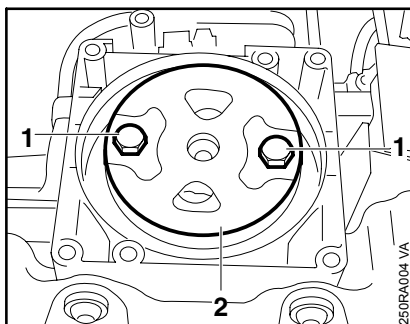


FS 400/450, FR 450

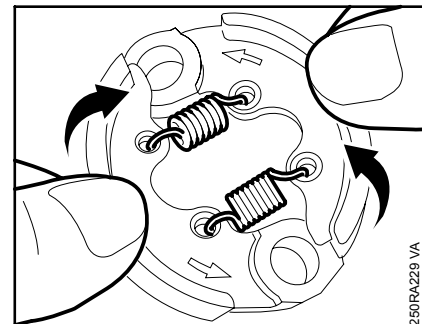
- Fit locking strip (1)
4221 893 5900.



- Take bushings out of the clutch shoes.

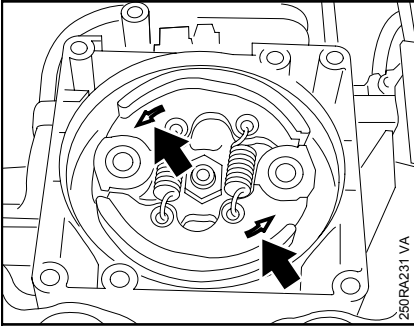


- Take out screws (1).
- Remove cover (2).



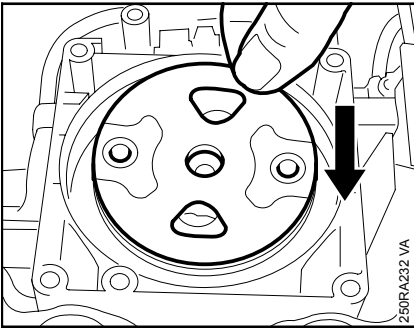
- Twist the clutch shoes and detach the springs.

Important: Clutch shoes and springs must always be replaced in pairs.

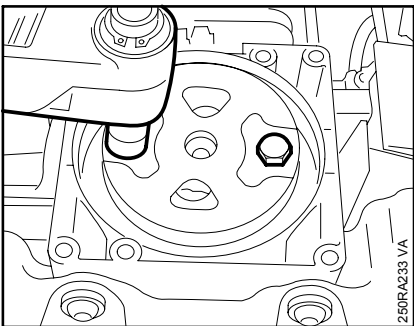


Installation

- Fit clutch shoes with springs and bushings so that the arrows point counterclockwise.



- Fit cover in position.

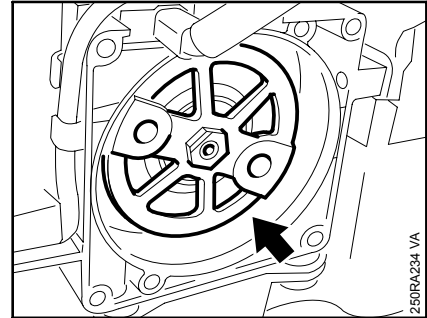


- Insert screws and tighten down to 12 Nm (8.8 lbf.ft).

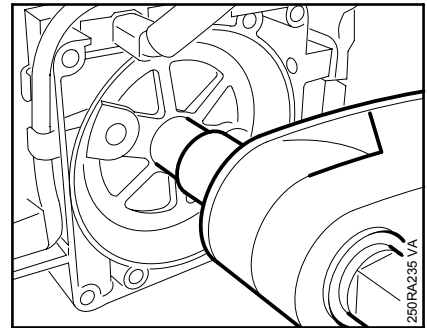
- Pull locking strip out of cylinder.
- Fit spark plug and tighten down to 20 Nm (15 lbf.ft).

Important: If the spark plug comes with a separate terminal nut, always fit the nut on the thread and tighten it down securely.

- Fit the boot on the spark plug.
- Fit the shroud - see 4.1.
- Fit clutch housing - see 9.1 or 11.2.



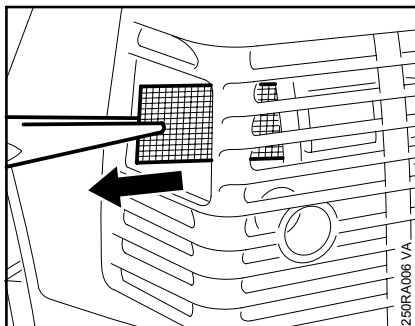
- Remove clutch - see 3.1.
- Unscrew carrier from end of crankshaft.



- Fit the carrier and tighten it down to 24 Nm (17.7 lbf.ft).
- Install the clutch - see 3.1.

4. ENGINE

4.1 Exhaust Muffler/Spark Arresting Screen

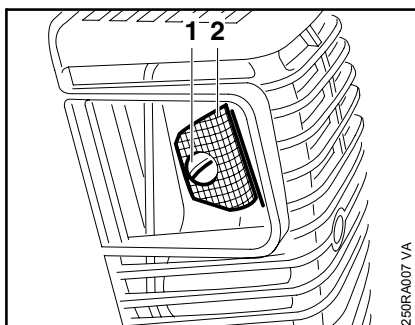


Troubleshooting chart - see "Standard Repairs, Troubleshooting" handbook.

Spark arresting screen

FS 120...350, FR 350

- Pull spark arresting screen out of the muffler.
- Clean or replace spark arresting screen if necessary.



FS 400/450, FR 450

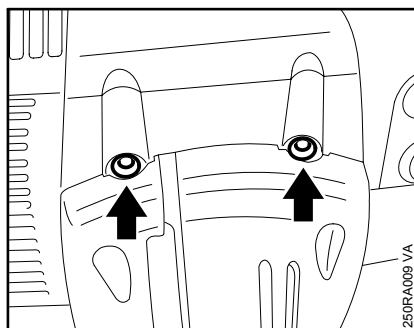
- Take out the screw (1).
- Pull spark arresting screen (2) out of the muffler.

- Clean or replace spark arresting screen if necessary.
- Tighten down screw to 2.5 Nm (1.8 lbf.ft).

Muffler

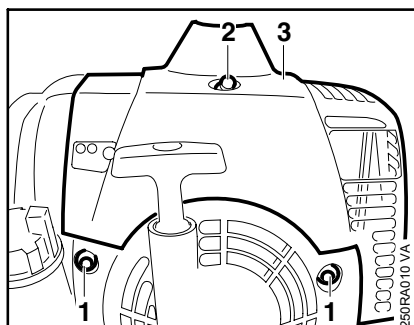
FS 400/450, FR 450

- Remove air filter cover - see 8.1.

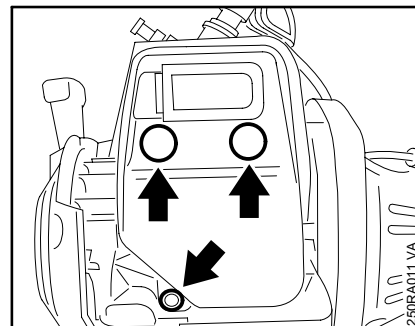


All models

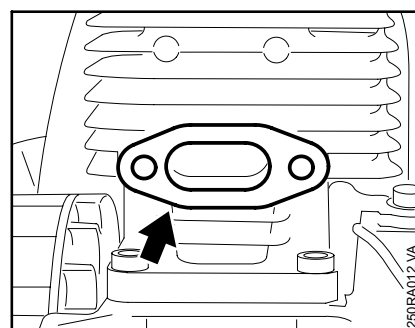
- Remove screws from clutch housing.



- Take out screws (1).
- Press down the decompression valve (2).
- Remove the shroud (3).



- Take out the screws.
- Lift away the muffler.



- Remove the gasket.

Reassemble in the reverse sequence.

- Use a new gasket.
- Tighten down screws to 8.5 Nm (6.3 lbf.ft).

4.2 Leakage Test

Defective oil seals, gaskets, cracks in castings or a faulty sealing ring between the carburetor housing and cylinder are the usual causes of leaks. Such faults allow air to enter the engine and thus upset the fuel-air mixture.

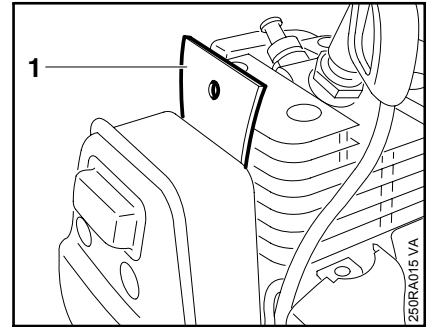
This makes adjustment of the prescribed idle speed difficult, if not impossible.

Moreover, the transition from idle speed to part or full throttle is not smooth.

The crankcase can be checked thoroughly for leaks with the carburetor and crankcase tester and the vacuum pump.

4.2.1 Preparations

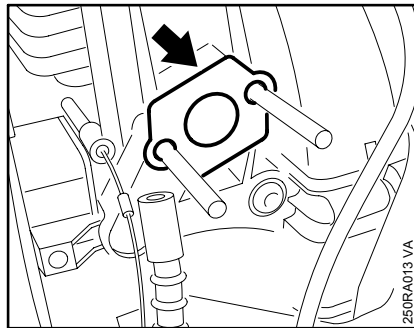
- Remove the carburetor - see 8.2.1 and 8.2.2.
- Set the piston to top dead center (T.D.C.). This can be checked through the inlet port.
- Make sure the spark plug is properly tightened down.



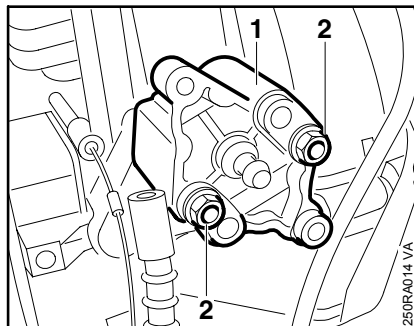
- Back off the muffler mounting screws half-way.

- Slide the sealing plate (1) 0000 855 8106 between the gasket and cylinder exhaust port and retighten the mounting screws moderately.

Note: The sealing plate must completely fill the space between the two mounting screws.

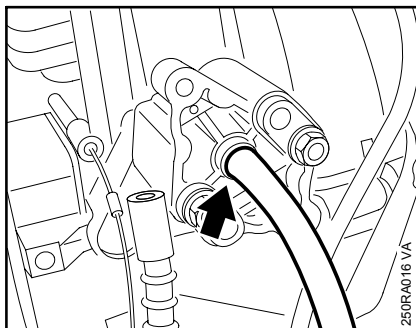


- Slide a new gasket over the carburetor studs.

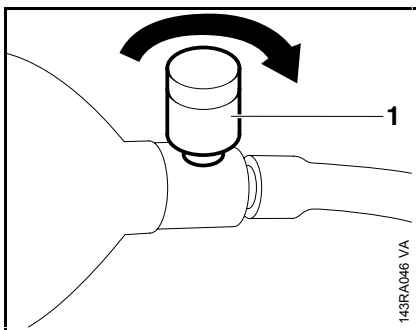


- Push the test flange (1) 1128 850 4200 into position.
- Fit and tighten down the nuts (2) firmly.

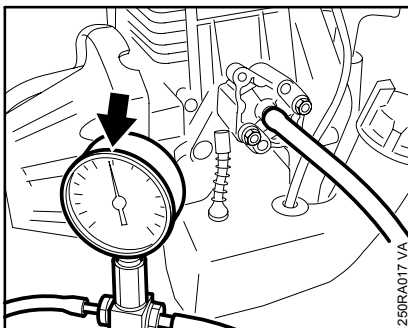
4.2.2 Pressure Test



- Carry out preparations - see 4.2.1.
- Connect pressure hose of tester 1106 850 2905 to nipple on test flange.



- Close the vent screw (1) on the rubber bulb.
- Use rubber bulb to pump air into the crankcase until the gauge indicates a pressure of 0.5 bar (7.25 psi). If this pressure remains constant for at least 20 seconds, the crankcase or decompression valve, if fitted, is airtight.



- However, if the indicated pressure drops, the leak must be located and the faulty part replaced.

Note: To find the leak, coat the suspect area with oil and pressurize the crankcase again. Bubbles will appear if a leak exists.

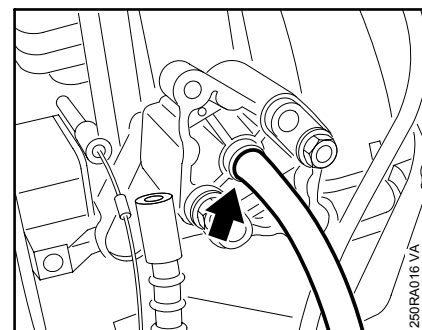
- If the decompression valve is not airtight, install a new one - see 4.8.
- Repeat the pressure test.
- Carry out the vacuum test - see 4.2.3.
- After finishing the test, open the vent screw and disconnect the hose.
- Remove the test flange.
- Slacken off the muffler mounting screws.
- Pull out the sealing plate and tighten down the screws to 8.5 Nm (6.3 lbf.ft).
- Install carburetor - see 8.2.1 or 8.2.2.

4.2.3 Vacuum Test

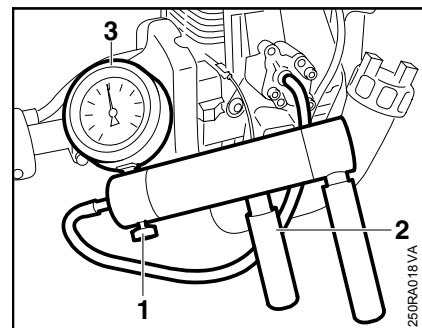
Oil seals tend to fail when subjected to a vacuum, i.e. the sealing lip lifts away from the crankshaft during the piston's induction stroke because there is no internal counterpressure.

An additional test can be carried out with the vacuum pump to detect this kind of fault.

- Carry out preparations - see 4.2.1.



- Connect the suction hose of vacuum pump 0000 850 3501 to test flange nipple.



- Close vent screw (1) on pump cylinder.
- Operate lever (2) until the gauge (3) indicates a vacuum of 0.5 bar (7.25 psi).

4.3 Oil Seals

Note: If the vacuum reading remains constant, or rises to no more than 0.3 bar (4.25 psi) within 20 seconds, it can be assumed that the oil seals are in good condition.

However, if the pressure continues to rise (reduced vacuum in the crankcase), the oil seals must be replaced.

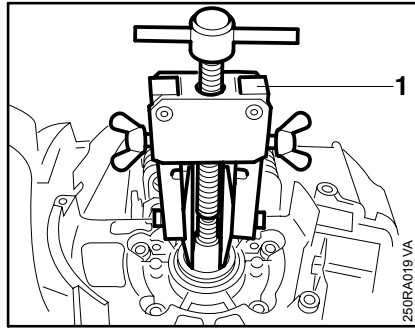
- After finishing the test, open the vent screw and disconnect the hose.
- Remove the test flange.
- Sacken off the muffler screws.
- Remove the sealing plate tighten screws to 8.5 Nm (6.3 lbf.ft).
- Install carburetor - see 8.2.1 and 8.2.2.

It is not necessary to disassemble the complete engine to replace the oil seals.

The FS 200 engine is shown in the illustrations.

Starter side:

- Remove the flywheel - see 5.4.
- Tap the oil seal with a suitable piece of pipe or a punch to release it from its seat.

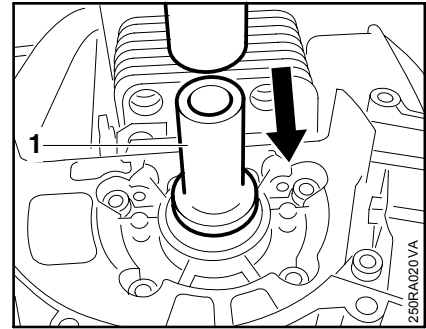


- Apply the puller (1) 5910 890 4400 (with No. 3.1 jaws 0000 893 3706).

- Tension the arms.
- Pull out the oil seal.

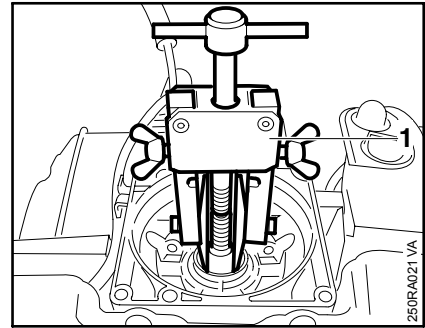
Important: Take care not to damage crankshaft stub.

- Clean sealing surface with a standard solvent-based degreasant containing no chlorinated or halogenated hydrocarbons - see 13.2.
- Lubricate sealing lips of oil seal with grease - see 13.2.
- Slide the oil seal, open side facing the crankcase, over the end of the crankshaft.



- Use the press sleeve (1) 4112 893 2401 to press it fully home.

- Install flywheel - see 5.4.



Clutch side:

- Remove carrier - see 3.2.
- Tap the oil seal with a suitable piece of pipe or a punch to release it from its seat.

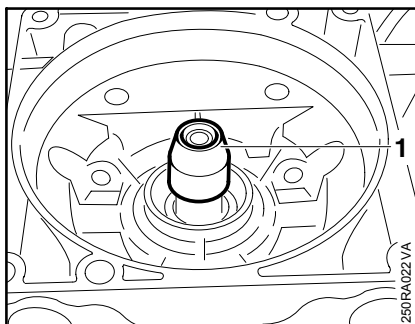
- Apply the puller (1) 5910 890 4400 (with No. 3.1 jaws 0000 893 3706).

- Tension the arms.
- Pull out the oil seal.

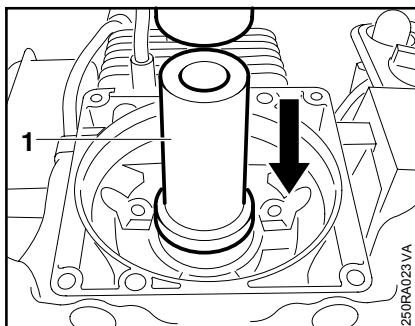
Important: Take care not to damage crankshaft stub.

- Clean sealing surface with a standard solvent-based degreasant containing no chlorinated or halogenated hydrocarbons - see 13.2.
- Lubricate sealing lips of oil seal with grease - see 13.2.

4.4 Exposing the Cylinder



- Slip installing sleeve (1) 4112 893 2400 over the end of the crankshaft.

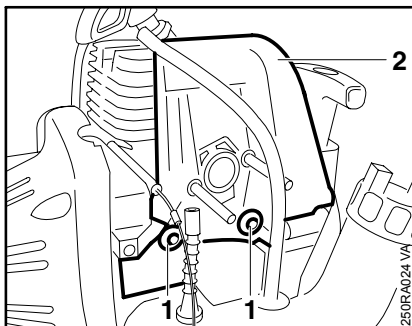


- Push the oil seal, open side facing the crankcase, over the installing sleeve and press it home with the press sleeve.
- Press home with press sleeve (1) 1118 893 2401.
- Remove the installing sleeve.
- Install carrier - see 3.2.

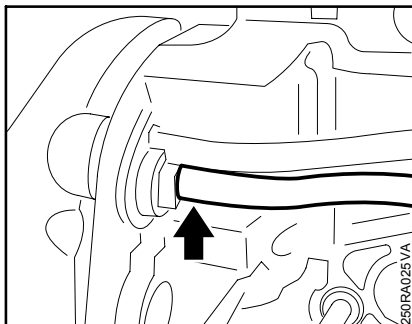
Always check and, if necessary, repair the fuel system, carburetor, air filter and ignition system before looking for faults on the engine.

Troubleshooting chart - see "Standard Repairs, Troubleshooting" handbook.

- Remove the muffler - see 4.1.
- Remove the carburetor - see 8.2.1 and 8.2.2.

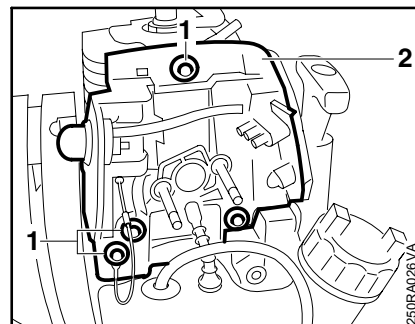


- Take out screws (1).
- Pull away the carburetor housing (2).



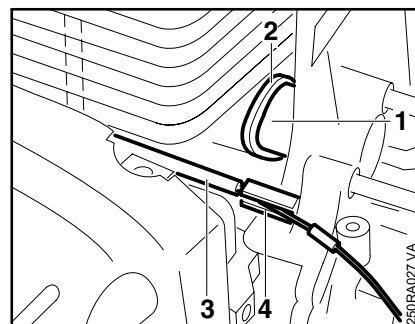
FS 400/450, FR 450

- Disconnect hose from fuel pump and pull it out of the guide.



- Take out screws (1).
- Pull away the carburetor housing (2), ease grommet out of carburetor housing and pull the extended throttle cable out of the housing opening.

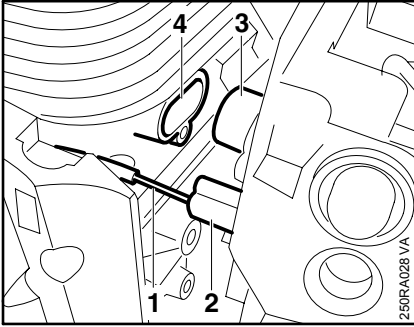
Assemble in the reverse sequence.



- Fit stub (1) on carburetor housing in the sealing ring (2) and throttle cable (3) in the retainer (4).
- Tighten down screws to 6 Nm (4.4 lbf.ft).

4.5 Cylinder and Piston Removal

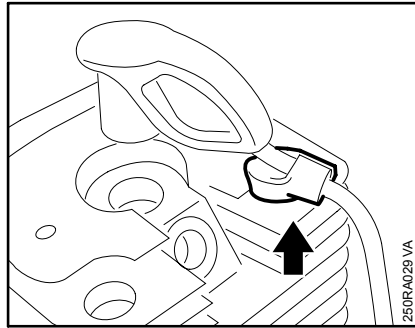
4.5.1 Removal



FS 400/450, FR 450

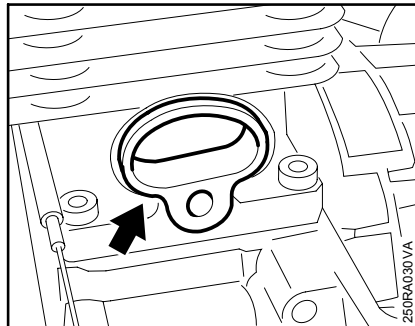
- Fit throttle cable (1) and grommet (2) in opening in carburetor housing.
- Insert stub (3) in the sealing ring (4).
- Secure lug of extended throttle cable between the raised marks and tighten down the screws to 6 Nm (4.4 lbf.ft).

- Preparations - see 4.4.
- Remove clutch housing - see 9.1 and 11.2.
- Pull off the spark plug boot.
- On FS 120...350, FR 350: Take ignition lead out of the retainers on the throttle cable holder.
- Unscrew the spark plug.
- Unscrew the decompression valve, if fitted.



FS 400/450, FR 450

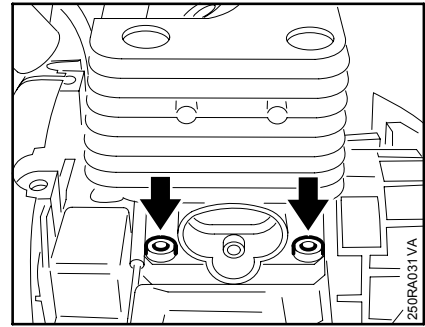
- Take cable retainer out of cylinder.



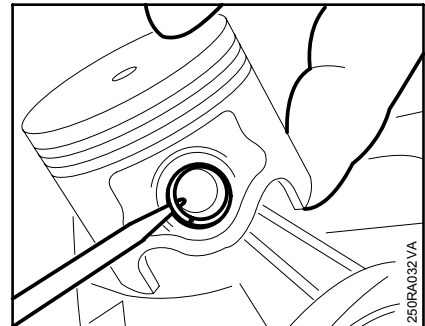
All models:

Illustrations show the FS 200 engine.

- Pull out the sealing ring.

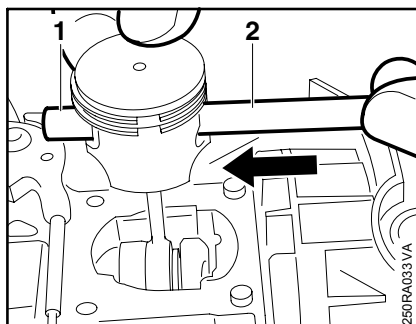


- Release and unscrew the four cylinder base screws.
- Pull the cylinder off the piston.
- Inspect the cylinder and replace it if necessary.
- If a new cylinder has to be installed, always fit the matching piston. New cylinders are only available with piston.
- Before removing the piston, decide whether or not the crankshaft has to be removed as well. To remove the clutch and carrier, block the crankshaft by sliding the wooden assembly block between the piston and crankcase.
- Remove the cylinder gasket.



- Ease the hookless snap rings out of the grooves in the piston bosses.

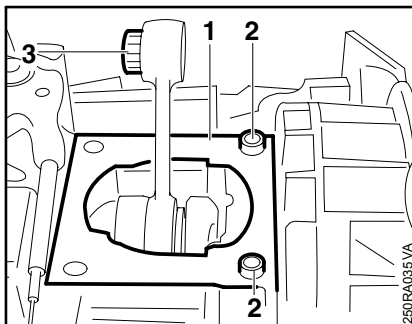
4.5.2 Installation



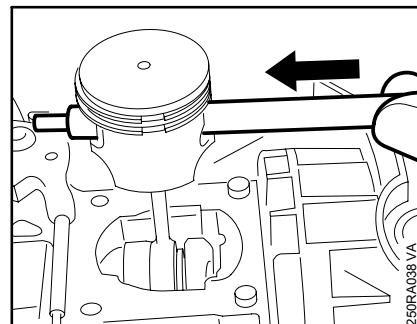
- Now use the assembly drift (2) 1110 893 4700 to push the piston pin (1) out of the piston.

Note: If the piston pin is stuck, tap the end of the drift lightly with a hammer if necessary. **Hold the piston steady** during this process to ensure that no jolts are transmitted to the connecting rod.

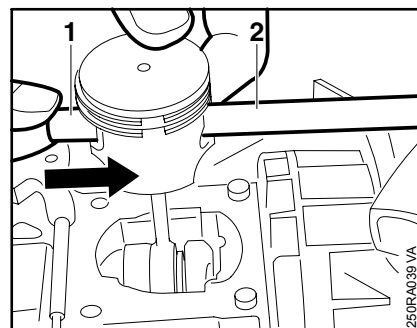
- Remove piston and take the needle cage out of the connecting rod.



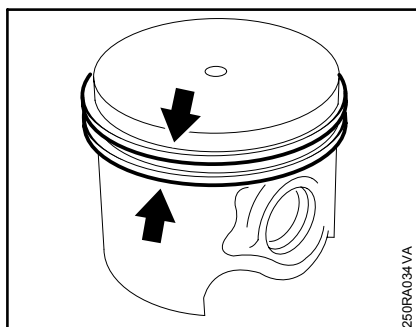
- Thoroughly clean the gasket seating surface (1).
- Check that adapter sleeves (2) are in place. Fit them if necessary.
- Lubricate the needle cage (3) with oil and fit it in the connecting rod.



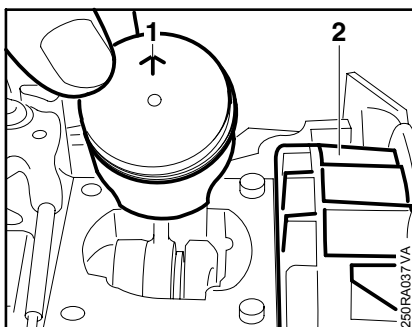
- Push the assembly drift, small diameter first, through the piston and small end (needle cage) and line up the piston.



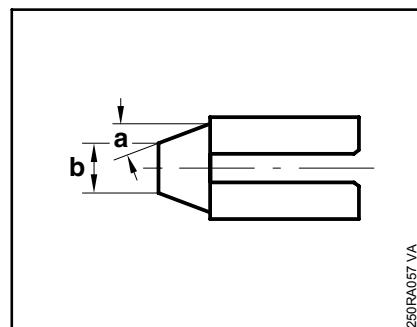
- Fit the piston pin (1) on the assembly drift (2) and slide it into the piston (the pin slides home easily if the piston is hot).



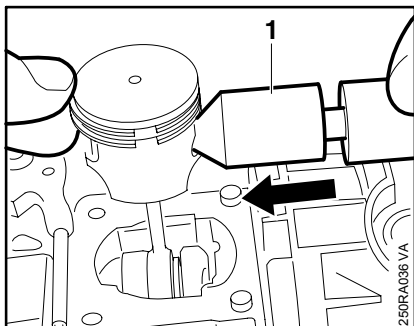
- Inspect piston rings and replace if necessary - see 4.6.



- To simplify assembly, heat the piston and slip it over the connecting rod.
- Installed position of piston:
1 = Marking
2 = Flywheel

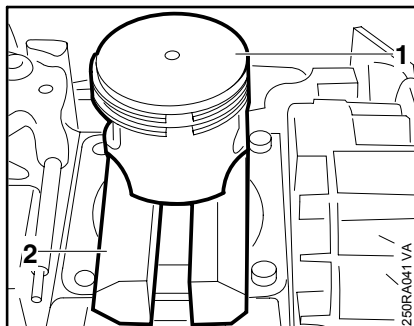


- Modify sleeve of installing tool 5910 890 2210 as shown in drawing.
a = 30 degrees
b = Ø 10 mm

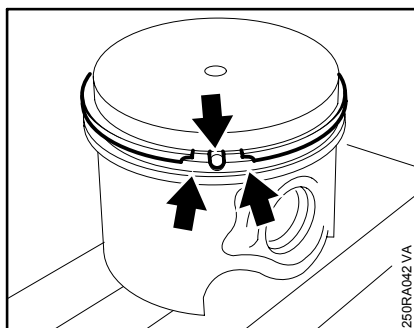


- Use installing tool (1) 5910 890 2208 to fit the snap rings.

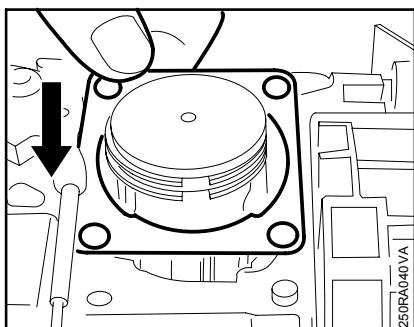
Note: For instructions on how to use the installing tool see "Standard Repairs, Troubleshooting" handbook.



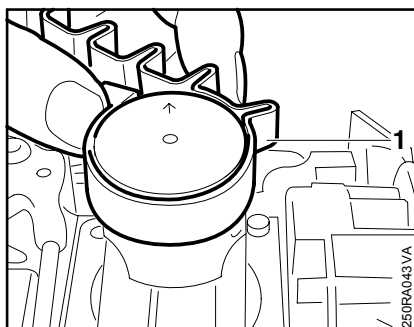
- Lubricate piston and piston rings with oil. Rest piston (1) on wooden assembly block (2) 1108 893 4800.



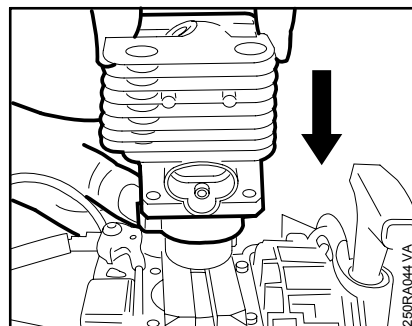
- Position the piston rings so that the radii at the ring gap meet at the fixing pin in the piston groove when the rings are compressed.



- Fit new cylinder gasket on the crankcase.



- Use the clamping strap (1) 0000 893 2600 to compress the piston rings around the piston and check that the piston rings are correctly positioned.

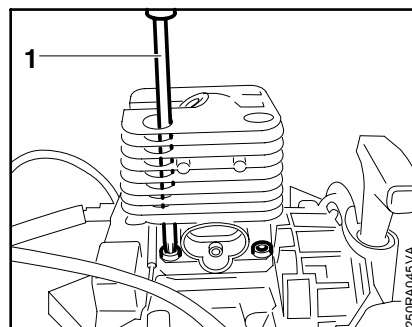


- Lubricate the inside of the cylinder with oil and line it up so that it is positioned as it will be in the installed condition. It is important to observe this point as the piston rings might otherwise break.

- Slide the cylinder over the piston
 - the clamping strap is pushed downward as the piston rings slip into the cylinder.

- Remove the clamping strap and wooden assembly block.

- Line up the cylinder and gasket.



- Use socket (1) 0812 542 2104 to tighten down cylinder base screws to 8.5 Nm (6.3 lbf.ft).

Assemble all other parts in the reverse sequence.

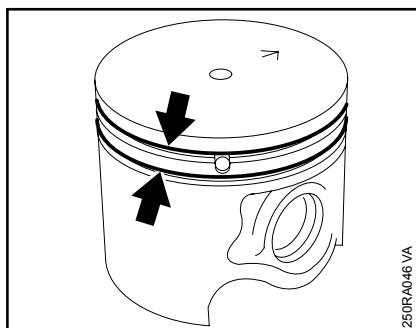
4.6 Piston Rings

- Remove the piston - see 4.5.1.

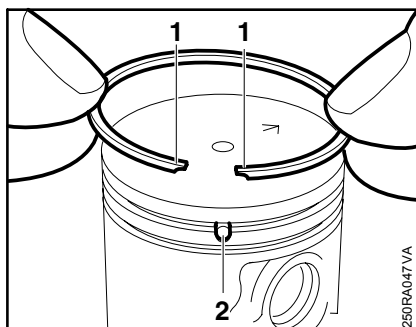
Note: The piston must be removed to make sure that no residue can fall into the crankcase when installing the piston rings and cleaning their grooves.

Illustrations show piston in model FS 200.

- Remove rings from piston.



- Use a piece of old piston ring to scrape the grooves clean.

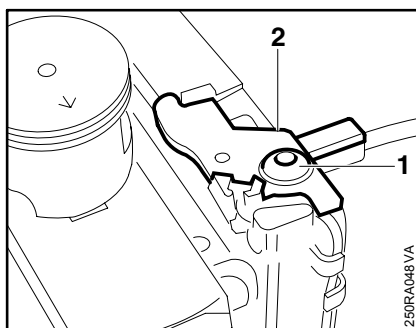


- Install the new piston rings in the grooves so that the radii (1) face the fixing pin (2).
- Install the piston - see 4.5.2.

4.7 Crankcase

4.7.1 Removing Crankshaft

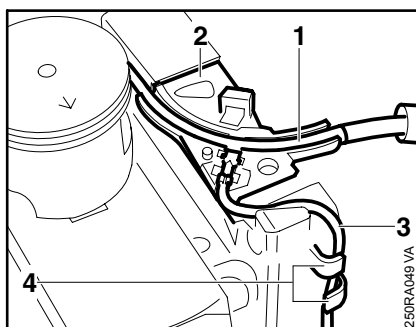
- Remove the ignition module - see 5.3.2 and 5.3.3.
- Remove the fuel tank - see 8.5.
- Remove the cylinder - see 4.5.1.



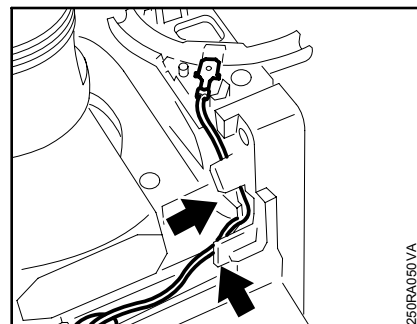
All models

- Take out screw (1).
- Remove top of cable guide (2).

FS 120...350, FR 350

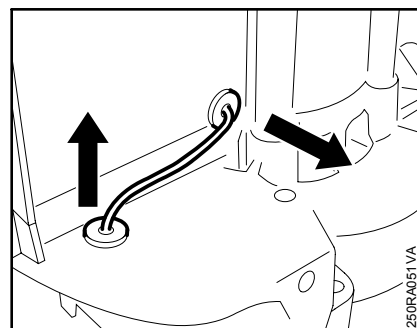


- Take throttle cable (1) out of base of guide (2).
- Take short circuit wire (3) out of base of guide and remove it from the retainers (4).

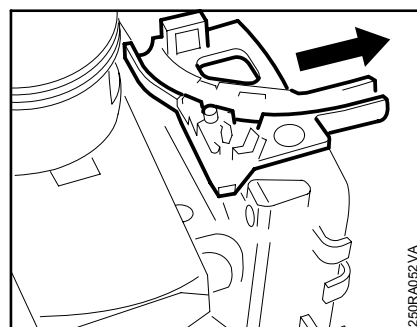


FS 400/450, FR 450

- Remove short circuit wire from the retainers.

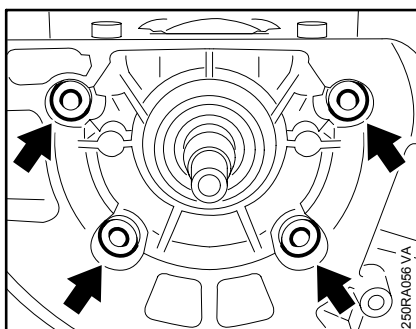


- Ease the grommets out of the housing and pull out the short circuit wire.



All models

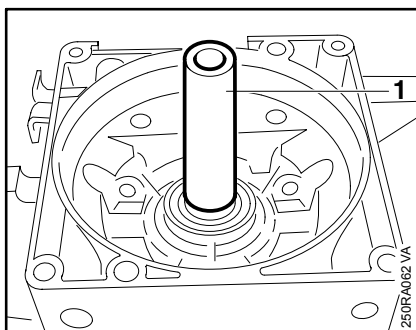
- Pull the base of the guide off the housing.
- Remove the carrier - see 3.2.



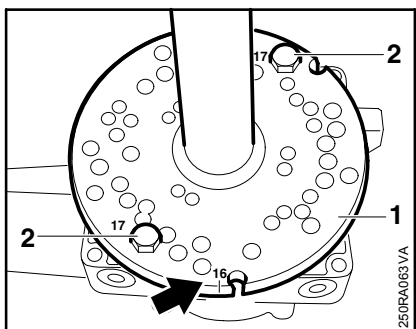
- Remove the flywheel - see 5.4.

- Remove the piston - see 4.5.1.

• Take out the screws.



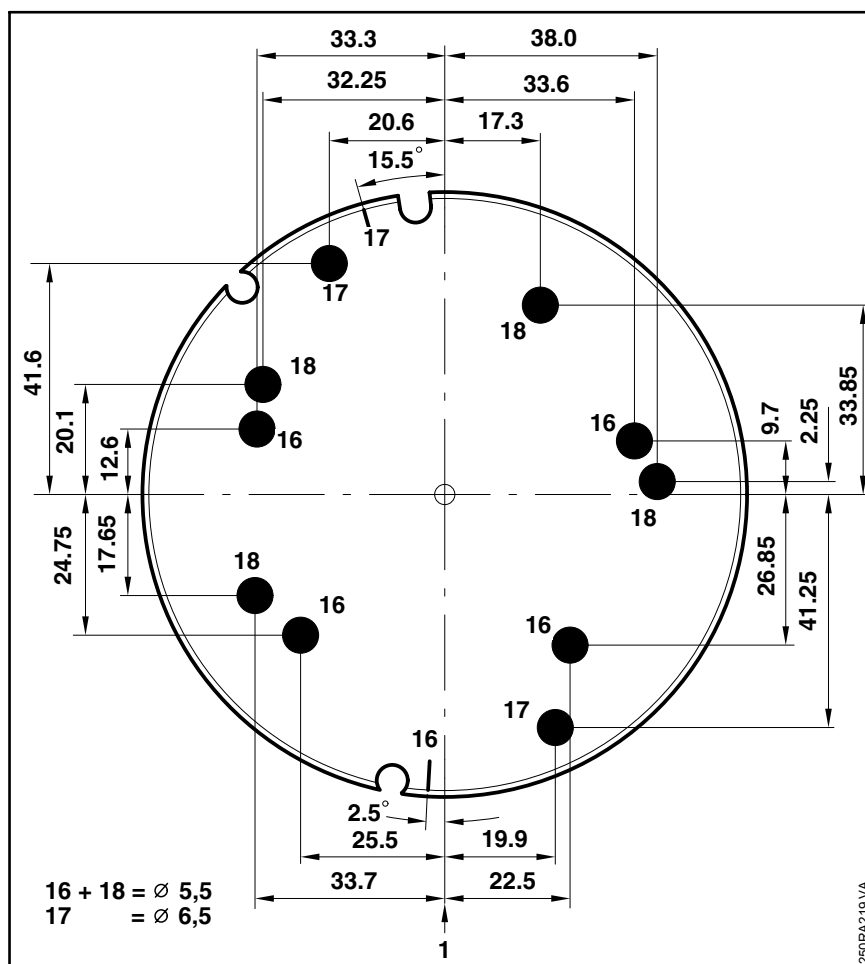
• Place extension (1) 4116 894 1000 on crankshaft stub at clutch side of crankcase.



• Back off spindle (left-hand thread) of ZS installing tool (1) 5910 890 2220 a little.

• Hold ZS installing tool against clutch side of crankcase so that the notch marked "16" is at the bottom.

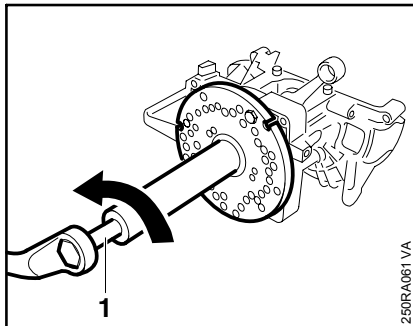
• Insert M6x20 screws (2) in holes marked "17" and tighten them down against the drilled plate.



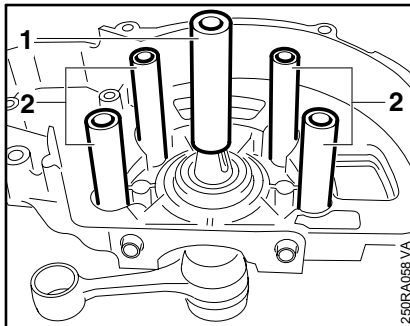
Note: ZS installing tools without holes "16", "17" and "18" and notches "16" and "17" can be modified as shown in the illustration.

Holes "16" and "18" are needed at the starter side of the crankcase.

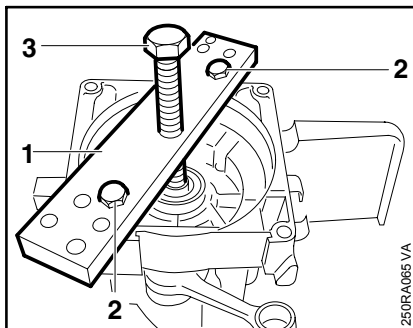
The illustration shows the underside of the drilled plate.



- Rotate spindle (1) counterclockwise until the crankshaft comes out of the ball bearing. The two halves of the crankcase are separated in this process.



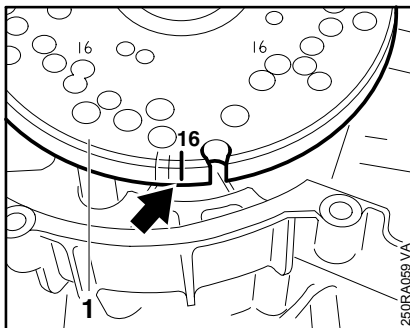
- Place extension (1) 4116 894 1000 on crankshaft stub and sleeve (2) 1123 851 8300 on bores at starter side of crankcase.



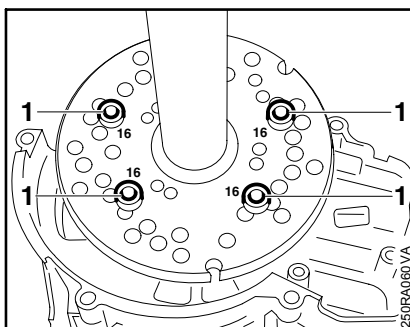
- Puller (1) 4119 890 4600 can be used in place of the ZS installing tool. It is mounted to the clutch side of the crankcase with M6x20 screws (2).
- Turn thrust bolt (3) clockwise until the crankshaft is released from the ball bearing.

FS 120...350, FR 350

- Back off spindle (left-hand thread) of ZS installing tool 5910 890 2220 a little.



- Hold ZS installing tool (1) 5910 890 2220 against starter side of crankcase so that the notch marked "16" is at the bottom.

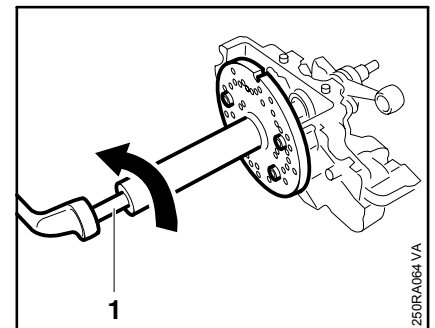


- Insert screws (1) 9022 341 1190 (from ZS installing tool kit) in holes marked "16", fit washers at other side and screw on nuts.

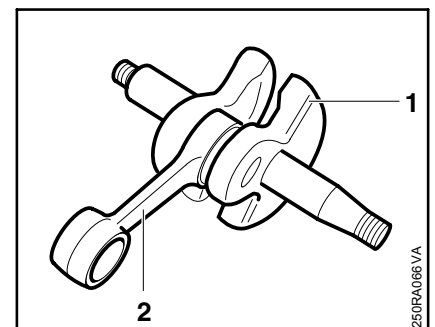
FS 400/450, FR 450

- Hold ZS installing tool against starter side of crankcase so that the notch marked "17" is at the bottom.
- Insert M5x60 screws in holes marked "18", fit washers at other side and screw on nuts.

All models

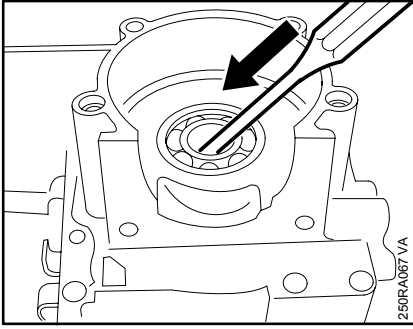


- Rotate spindle (1) counterclockwise until the crankshaft comes out of the ball bearing.



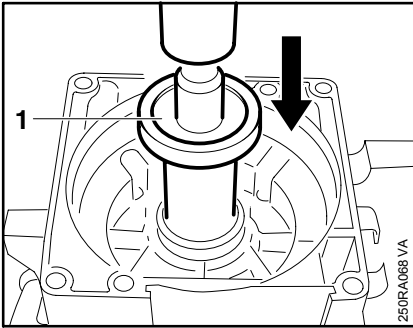
- The crankshaft (1), connecting rod (2) and needle bearing form an inseparable unit. It must always be replaced as a complete unit.

4.7.2 Installing Crankshaft

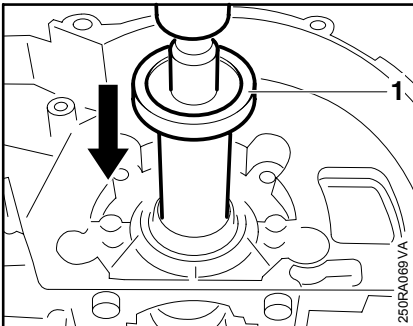


- When fitting a replacement crankshaft always install new oil seals and ball bearings.

- Carefully knock the oil seals out of the crankcase.



- Use press arbor (1) 4119 893 7200 to remove ball bearing.

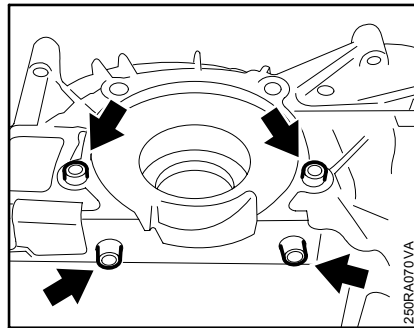


- Use press arbor (1) 4119 893 7200 to remove ball bearing.
- Inspect both halves of the crankcase for cracks and replace if necessary.

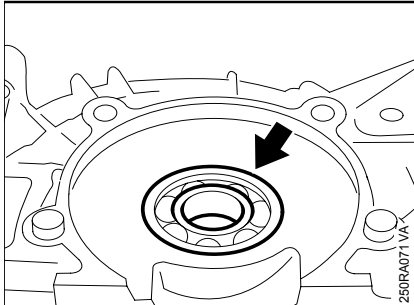
Each half of the crankcase may be replaced separately.

New crankcases come with factory-installed ball bearings.

If the original crankcase is used again, remove the gasket residue and clean the mating surfaces - they must be cleaned very thoroughly to ensure a perfect seal.

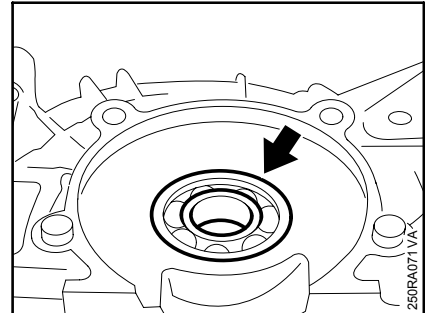


- Check that bushings are in position. If necessary, drive bushings into the crankcase.
- Heat area of bearing seat on starter side of crankcase to approx. 120°C (250°F).

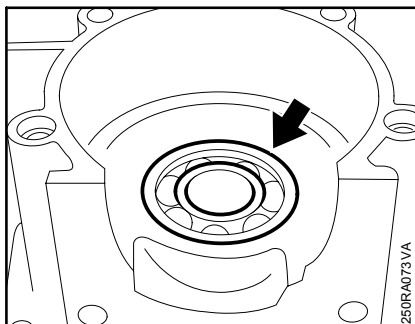


- Fit ball bearing in crankcase by hand and push it home as far as stop.

Note: This operation must be carried out very quickly because the bearing absorbs heat immediately and begins to expand.

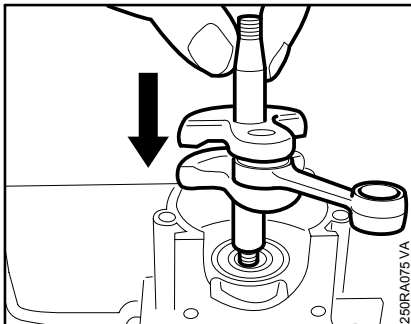


- If it is not possible to heat the starter side of the crankcase, use press arbor (1) 4119 893 7200 to press in the ball bearing as far as stop.
- Heat area of bearing seat on clutch side of crankcase to approx. 120°C (250°F).

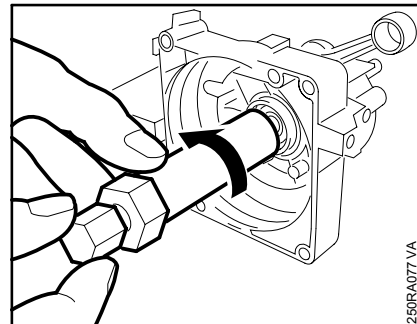


- Fit ball bearing in crankcase by hand and push it home as far as stop.

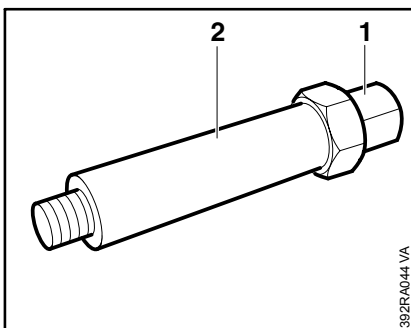
Note: This operation must be carried out very quickly because the bearing absorbs heat immediately and begins to expand.



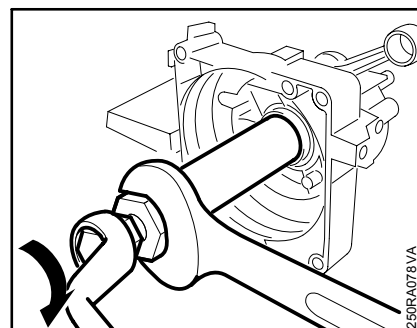
- Position the straight stub of the crankshaft in the bearing at the clutch side of the crankcase.



- Hold the spindle steady and rotate sleeve counterclockwise until it butts against the ball bearing.

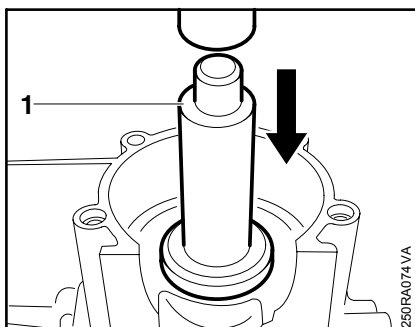


- Screw spindle (1) of installing tool 5910 890 2202 fully into the sleeve (2) (left-hand thread).

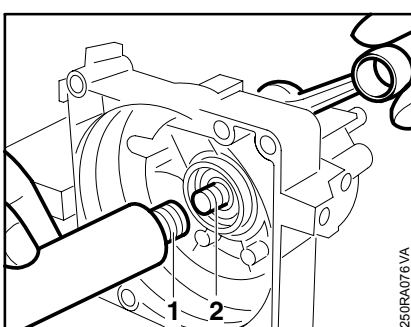


- Hold the sleeve steady and rotate spindle clockwise until the crankshaft butts against the ball bearing.

Important: During this process the connecting rod (without piston) must point towards the cylinder flange.



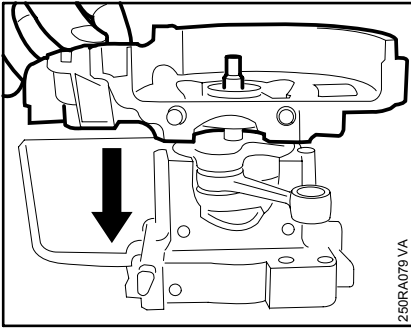
- If it is not possible to heat the clutch side of the crankcase, use press arbor (1) 4119 893 7200 to press in the ball bearing as far as stop.



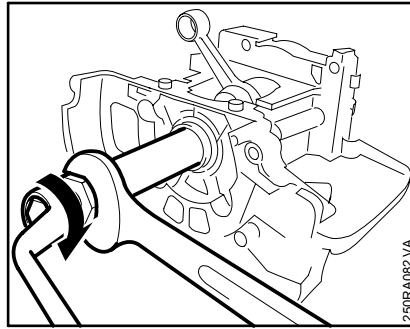
- Hold the crankshaft steady and screw the spindle (1) clockwise onto the stub (2) as far as stop.

- Hold the crankshaft steady and unscrew spindle from the stub.
- Apply a thin coating of sealant to crankcase mating face - see 13.2.

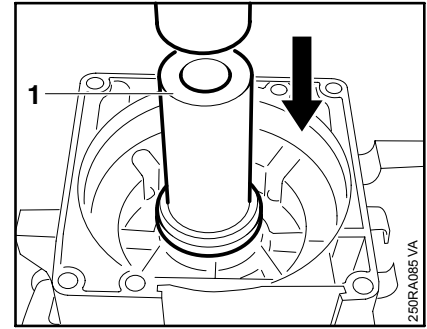
Important: Follow manufacturer's instructions.



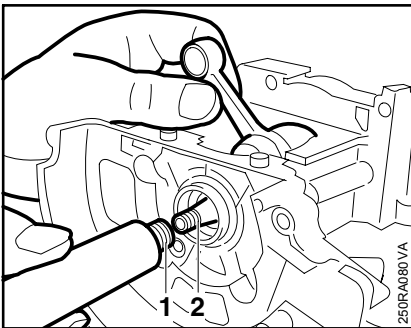
- Fit starter side of crankcase over the crankshaft stub.



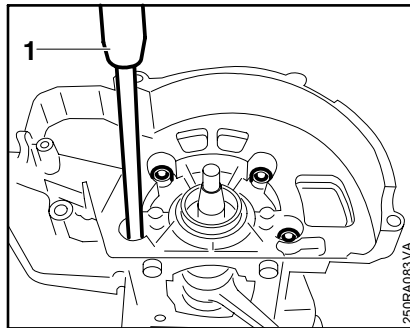
- Hold the sleeve steady and rotate spindle clockwise until the two halves of the crankcase are together.
- Remove the installing tool.



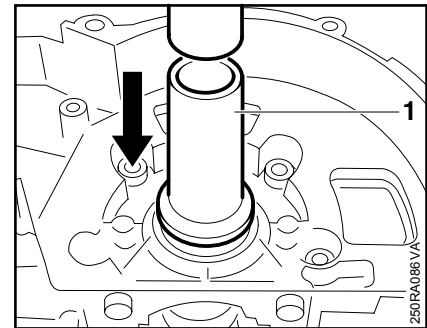
- Slide the oil seal, open side facing the crankcase, over the installing sleeve.
- Press home with press sleeve (1) 1118 893 2401.



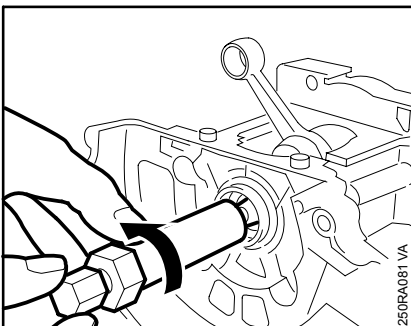
- Hold crankshaft steady and screw the spindle (1) clockwise onto the stub (2) as far as stop.



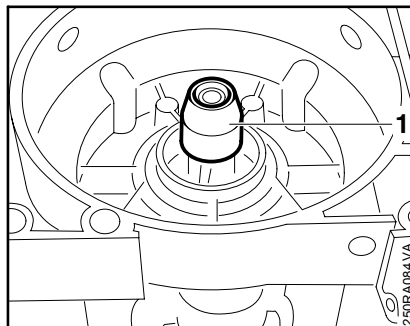
- Insert screws and use socket (1) 0812 542 2104 to tighten them down to 8.5 Nm (6.3 lbf.ft).
- Lubricate sealing lips of oil seals with grease - see 13.2.



- Remove the installing sleeve.
- Slide the oil seal, open side facing the crankcase, over the starter end of the crankshaft.
- Press home with press sleeve (1) 4112 893 2401.



- Hold the spindle steady and rotate sleeve counterclockwise until it butts against the ball bearing.

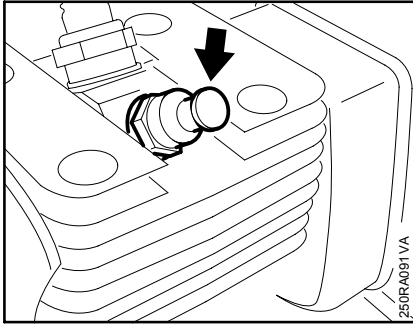


- Fit installing sleeve (1) 4112 893 2400 over the clutch end of the crankshaft.

Assemble as other parts in the reverse sequence.

- Adjust throttle cable - see 7.5.2.

4.8 Decompression Valve

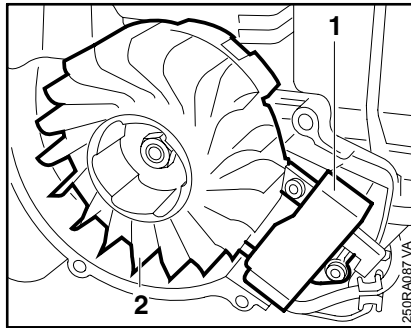


- Remove the shroud - see 4.1.
- Use standard commercial long-reach 13 mm socket to unscrew the decompression valve.
- Install new decompression valve and tighten down to 14 Nm (10.3 lbf.ft).
- Fit the shroud.

5. IGNITION SYSTEM

Warning! Exercise extreme caution when carrying out maintenance and repair work on the ignition system. The high voltages which occur can cause serious or even fatal accidents!

Troubleshooting on the ignition system should always begin at the spark plug. See "Standard Repairs, Troubleshooting" handbook.

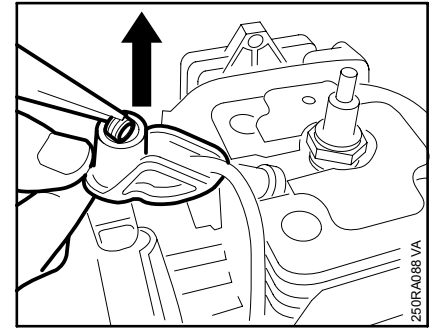


Note: The electronic (breakerless) ignition system basically consists of an ignition module (1) and flywheel (2).

The illustration shows the FS 200.

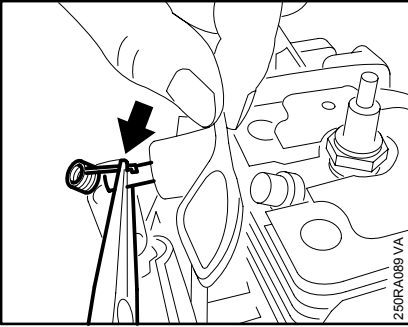
5.1 Spark Plug Boot

- Remove the shroud - see 4.1.
- Pull off the spark plug boot.
- On FS 400/450, FR 450, take cable holder off the cylinder.

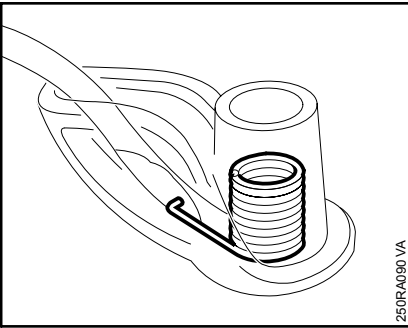


- Use pliers to grip the leg spring and pull it out of the spark plug boot.
- Unhook the leg spring from the ignition lead.
- Pull spark plug boot off the ignition lead.
- Coat end of the ignition lead (about 20 mm/3/4") with oil.
- Fit spark plug boot over the ignition lead.
- Use pliers to grip the end of the ignition lead inside the spark plug boot and pull it out.

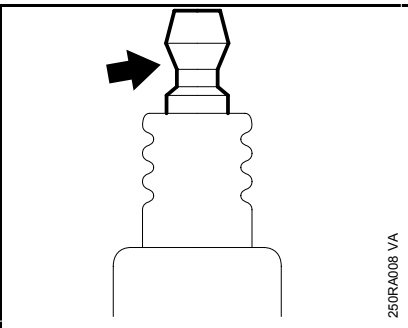
5.2 Ignition Lead (FS 400/450, FR 450)



- Pinch hook of leg spring into the center of the lead, i.e. about 10 mm (3/8") from the end of the lead.

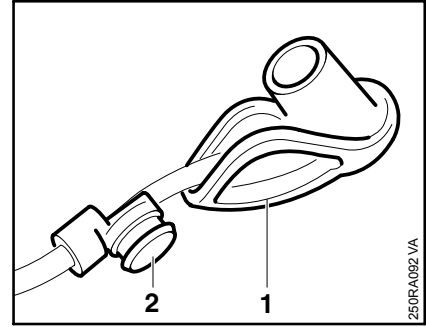


- Pull the lead back into the boot so that the leg spring locates properly inside it.

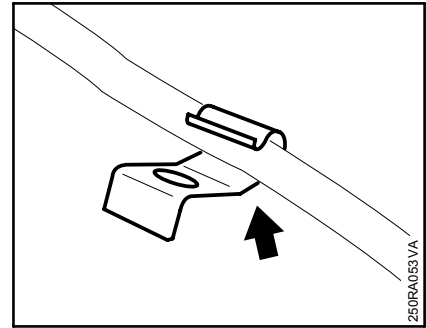


Important: If the spark plug comes with a separate terminal nut, always fit the nut on the thread and tighten it down securely.

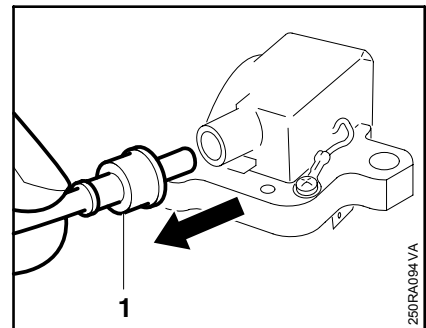
- On FS 400/450, FR 450, attach the cable retainer to the cylinder.
- Fit the boot on the spark plug.
- Fit the shroud - see 4.1.



- Remove the ignition module - see 5.3.3.
- Remove spark plug boot (1) - see 5.1.
- Pull off the cable retainer (2).



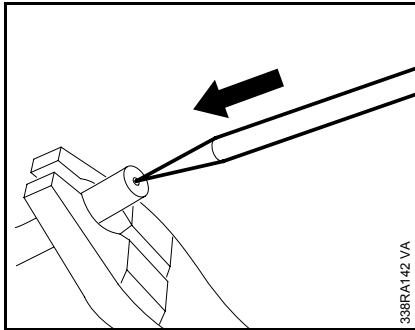
- Remove the retainer.



- Pull rubber boot (1) off the high voltage output.
- Unscrew the ignition lead from the contact pin and pull it out of the high voltage output.

5.3 Ignition Module

- Slip the rubber boot off the ignition lead.
- Cut new ignition lead to length (see parts list or cut to same length as old lead).

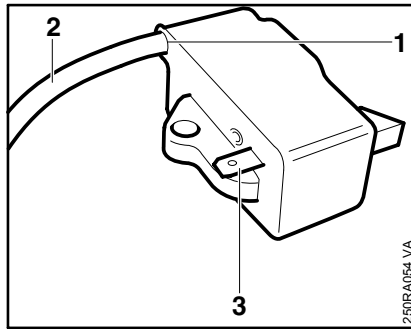


- Use a pointed tool (awl or gimlet) to pierce the center of the ignition lead that is to be screwed into the module.

- Slip the rubber boot over the lead.
- Pack the high voltage output with STIHL multipurpose grease - see 13.2.

Important: Do not use graphite grease (Molykote) or silicone insulating paste for this job.

- Screw home the ignition lead.
- Fit rubber boot on the high voltage output.
- Fit cable retainer and spark plug boot.
- Fit the ignition module - see 5.3.3.



The ignition module accommodates all the components required to control ignition timing.

FS 120...350, FR 350

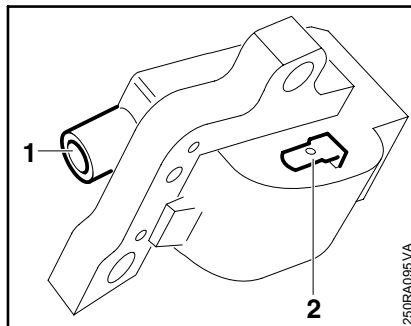
There are two electrical connections on the coil body:

1. the high voltage output (1) with ignition lead (2)
2. the connector tag (3) for the short circuit wire

A vibration damping pad is bonded to the side of the ignition module.

FS 400/450, FR 450

There are two electrical connections on the coil body:



1. the high voltage output (1)
2. the connector tag (2) for the short circuit wire

Accurate testing of the ignition module is only possible with sophisticated test equipment. For this reason it is only necessary to carry out a spark test in the workshop. A new ignition module must be installed if no ignition spark is obtained (after checking that wiring and stop switch are in good condition).

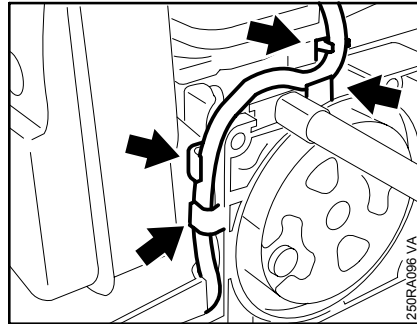
5.3.1 Ignition Timing

Ignition timing is not adjustable.

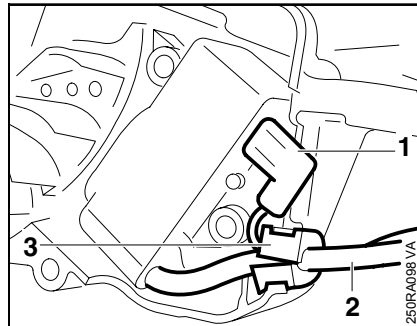
Since there is no mechanical wear in these systems, ignition timing cannot get out of adjustment. However, an internal fault in the circuit can alter the switching point in such a way that a spark test will still show the system to be in order although timing is outside the permissible tolerance. This will impair engine starting and running behavior.

5.3.2 Removing and Installing (FS 120...350, FR 350)

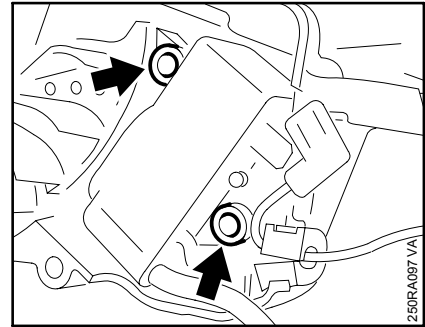
- Remove the shroud - see 4.1.
- Pull the boot off the spark plug.
- Remove the fan housing - see 6.2.
- Remove clutch housing - see 9.1.



- Remove ignition lead from the retainers.



- Pull short circuit wire connector (1) off tag on ignition module.

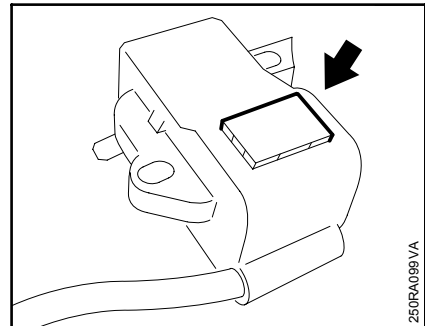


- Take out the screws.
- Remove the ignition module.
- Remove the spark plug boot - see 5.1.

Note: The ignition lead is molded to the ignition module.

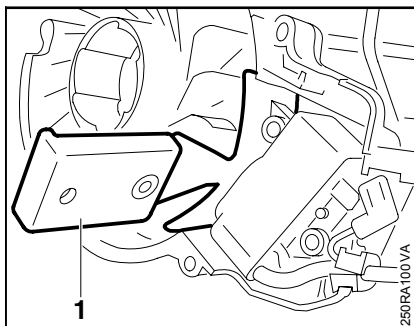
Important: Before installing a new ignition module, make sure area for vibration damping pad is free from grease, dirt and moisture.

- Peel the backing off the new vibration damping pad.



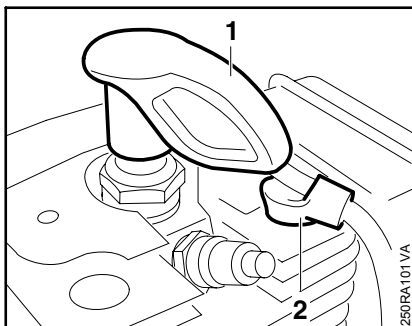
- Place the pad on the ignition module and apply firm and uniform pressure.

5.3.3 Removing and Installing (FS 400/450, FR 450)

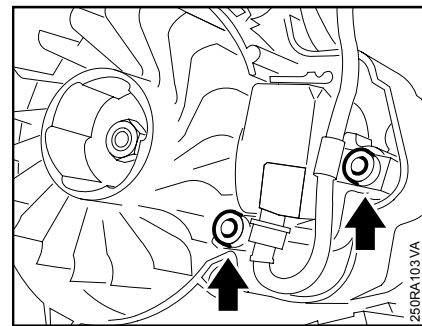


- Place the module in position, insert the screws but do not tighten them down yet.
- Check that ignition lead is properly seated in grommet.
- Slide the setting gauge (1) 1127 890 6400 between the arms of the ignition module and the flywheel magnet poles.
- Press the ignition module against the flywheel and tighten down the mounting screws to a torque of 4.5 Nm (3.3 lbf.ft).

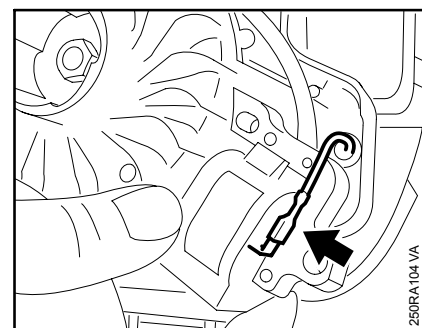
Reassemble all other parts in the reverse sequence.



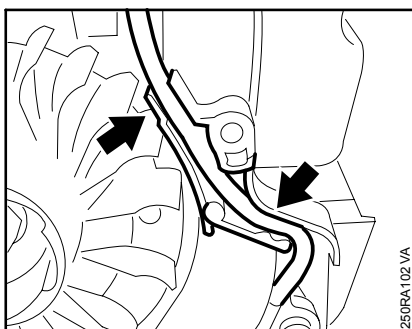
- Remove the shroud - see 4.1.
- Remove the fan housing - see 6.2.
- Pull boot (1) off the spark plug.
- Pull cable retainer (2) out of cylinder.



- Take out the screws.

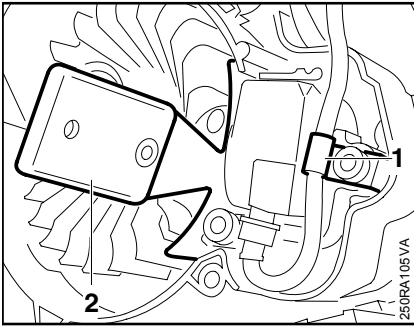


- Lift ignition module away slightly and disconnect short circuit wire from ignition module.
- Remove the ignition lead - see 5.2.
- Connect the short circuit wire, place the module in position, insert the screws but do not tighten them down yet.



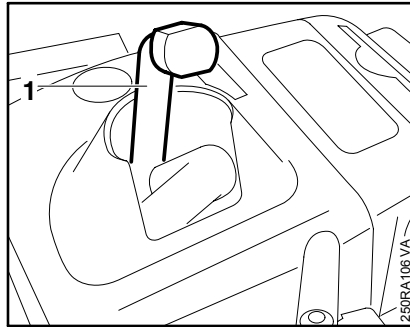
- Take ignition lead out of guide.

5.4 Flywheel



- Secure cable retainer (1) with outer screw.
- Slide the setting gauge (2) 1127 890 6400 between the arms of the ignition module and the flywheel magnet poles.
- Press the ignition module against the flywheel and tighten down the mounting screws to a torque of 6.0 Nm (4.4 lbf.ft).

Reassemble all other parts in the reverse sequence.



Removing the flywheel:

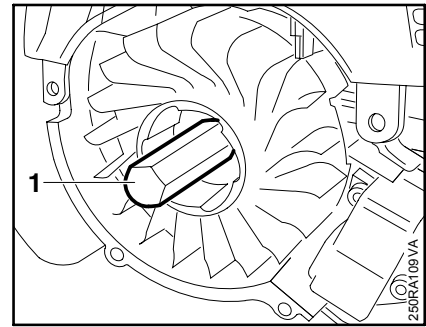
- Remove the fan housing - see 6.2.
- Pull off the spark plug boot.
- Unscrew the spark plug.

FS 120...350, FR 350

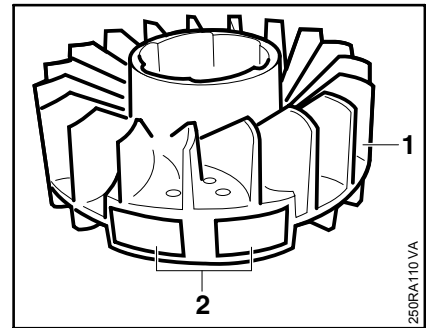
- Fit locking strip (1) 0000 893 5903.

FS 400/450, FR 450

- Fit locking strip 4221 893 5900.



Note: If the flywheel cannot be removed by hand, screw on the puller (1) 4133 893 0800 and tap its end to release the flywheel. Unscrew the puller.



Inspect the flywheel (1) and magnet poles (2). If you find any damage, install a new flywheel.

Installing the flywheel:

Important: Clean the stub of the crankshaft and the flywheel hub bore with a standard commercial, solvent-based degreasant which contains no chlorinated or halogenated hydrocarbons - see 13.2.

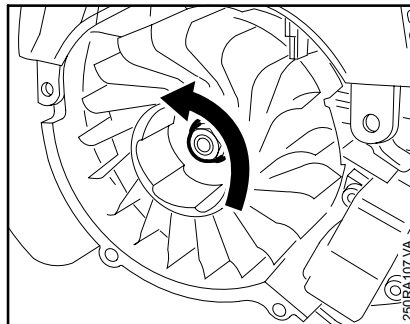
- Fit the flywheel.

Note: Check position of slot.

Assemble all other parts in the reverse sequence.

- Fit flywheel nut. Tighten nut on FS 120 to 24 Nm (17.7 lbf.ft). Tighten nut on all other models to 32 Nm (23.6 lbf.ft).

All models

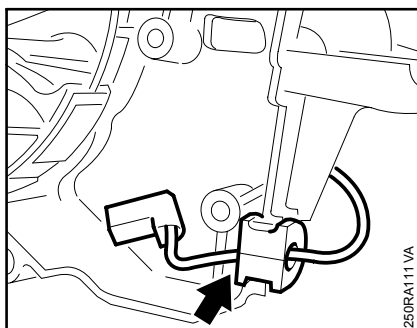


- Unscrew the flywheel nut.
- Pull off the flywheel.

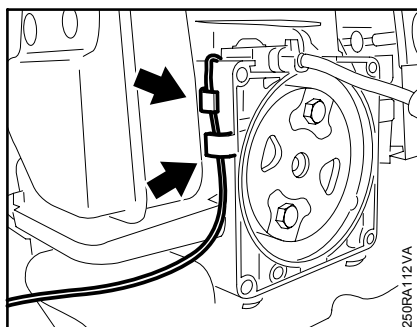
5.5 Short Circuit Wire

- Remove the ignition module - see 5.3.2 and 5.3.3.
- Remove clutch housing - see 9.1 and 11.2.

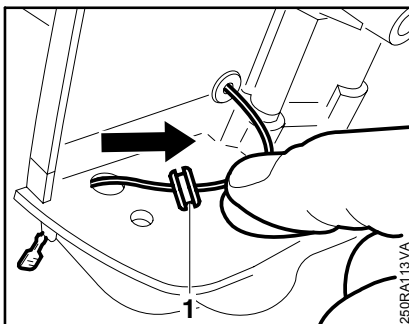
FS 120...350, FR 350



- Pull short circuit wire out of grommet.

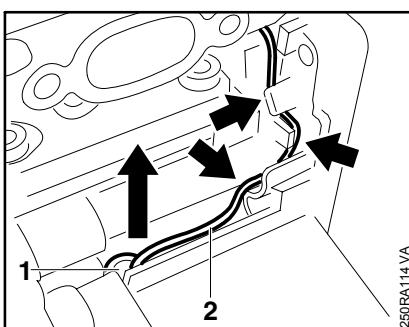


- Remove short circuit wire from retainers.

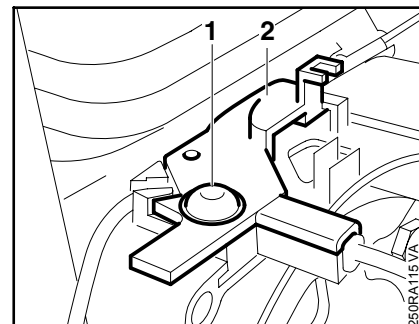


FS 400/450, FR 450

- Remove the fuel tank - see 8.5.
- Remove the muffler - see 4.1.
- Push out the outer grommet (1).
- Pull short circuit wire out of housing bore and remove grommet.

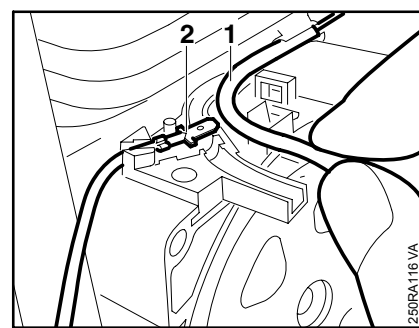


- Push out the grommet (1).
- Pull short circuit wire (2) out of housing bore, remove it from the retainers and pull off the grommet.



All models

- Take out the screw (1).
- Remove top of cable guide (2).



- Lift the throttle cable (1) a little.
- Remove short circuit wire connector (2) from base of cable guide.

Assemble in the reverse sequence.

- Check and adjust throttle cable - see 7.5.2.

6. REWIND STARTER

6.1 General

If the action of the starter rope becomes very stiff and the rope rewinds very slowly or not completely, it can be assumed that the starter mechanism is in order but plugged with dirt. At very low outside temperatures the lubricating oil on the rewind spring may thicken and cause the spring windings to stick together. This has a detrimental effect on the function of the starter mechanism. In such a case it is sufficient to apply a few drops of paraffin (kerosine) to the rewind spring.

Then carefully pull out the starter rope several times and allow it to rewind until its normal smooth action is restored.

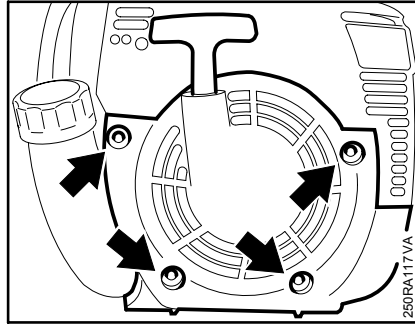
If clogged with dirt or pitch, the entire starter mechanism, including the rewind spring, must be removed and disassembled. Take special care when removing the spring.

Wash all parts in paraffin or white spirit.

Lubricate the rewind spring and starter post with STIHL special lubricant, see 13.2, before installing.

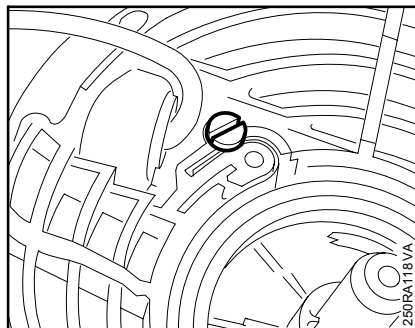
6.2 Rewind Spring

6.2.1 Replacing



Troubleshooting chart - see "Standard Repairs, Troubleshooting" handbook.

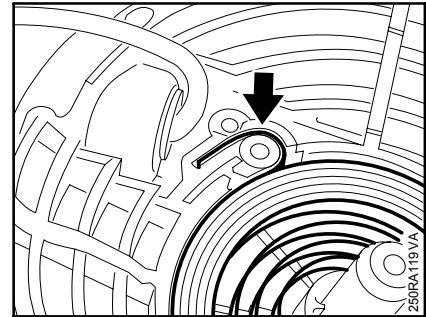
- Take out the screws.
- Remove fan housing with rewind starter.
- Remove the rope rotor - see "Standard Repairs, Troubleshooting" handbook.



- Take out the screw and remove any remaining pieces of spring from the fan housing.

Note: The replacement spring comes ready for installation and is secured with a washer.

- It should be lubricated with a few drops of STIHL special lubricant before installation - see 13.2.

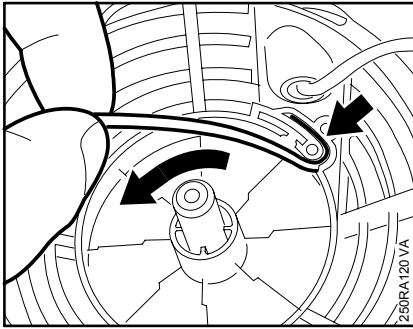


- The washer slips off the rewind spring as it is pushed into the fan housing. Engage the outer spring loop in the recess in the fan housing at the same time.

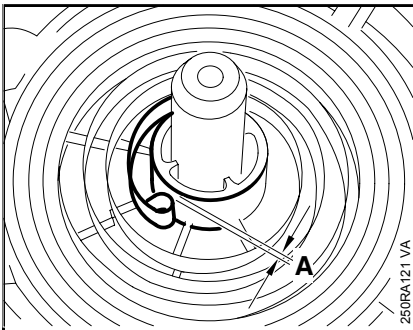
Caution: The rewind spring may pop out and uncoil during installation.

- If the rewind spring has popped out, refit it as follows:

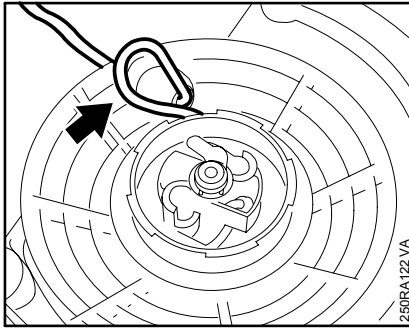
6.2.2 Tensioning



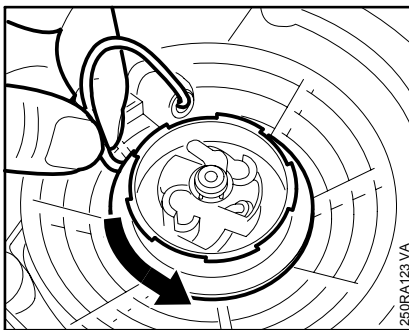
- Engage outer spring loop in the recess and refit rewind spring in fan housing in the counterclockwise direction, starting outside and working inwards.



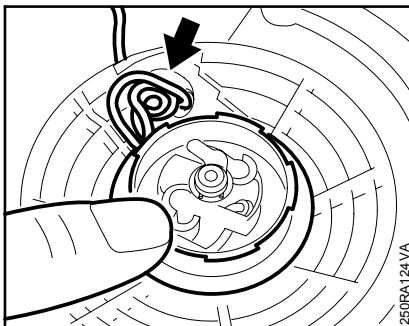
- Check the position of the inner spring loop. It should be 2 mm (0.08") away from the hub.
- Fit screw and tighten it down to 1.5 Nm (1.1 lbf.ft).
- Install the rope rotor - see "Standard Repairs, Troubleshooting" handbook.
- Tension the rewind spring - see 6.2.2.



- Make a loop in the starter rope.

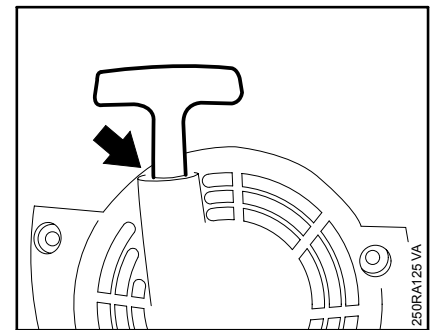


- Grip the rope **close** to the rotor and use it to turn the rope rotor six full turns counterclockwise.



- Hold the rope rotor steady.
- Pull out the rope with the starter grip and straighten it out.

- Hold the starter grip firmly to keep the rope tensioned.
- Let go of the rope rotor and slowly release the starter rope so that it can rewind properly.



Note: The rewind spring is correctly tensioned when the starter grip sits firmly in the rope guide bush without drooping to one side. If this is not the case, tension the spring by one additional turn.

When the starter rope is fully extended, it must still be possible to rotate the rope rotor at least another half turn before maximum spring tension is reached. If this is not the case, pull the rope out, hold the rope rotor steady and take off one turn of the rope.

Do not overtension the rewind spring as this will cause it to break.

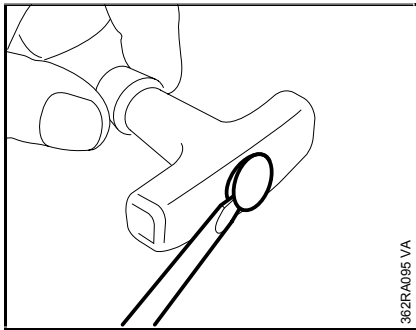
- Fit fan housing, insert screws and tighten down to 6.0 Nm (4.4 lbf.ft).

6.3 Starter Rope/Starter Grip (ElastoStart)

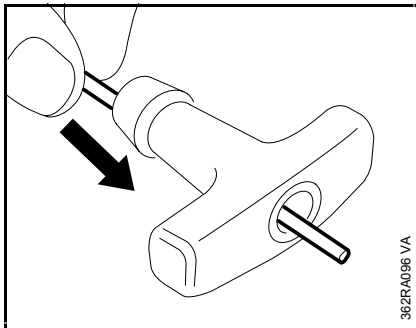
- Remove fan housing with rewind starter - see 6.2.

Starter rope

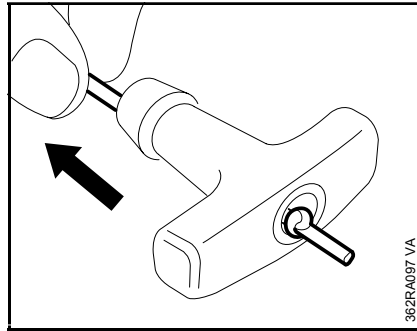
- Remove rope rotor - see "Standard Repairs, Troubleshooting" handbook.
- Remove the starter rope from the rotor.



- Pry cap out of starter grip.
- Pull rope out of starter grip.
- On FR 350/450, slip tube (75 mm/2.95") over the starter rope.



- Thread end of new starter rope through the underside of the starter grip.
- Secure end of rope with a simple overhand knot.

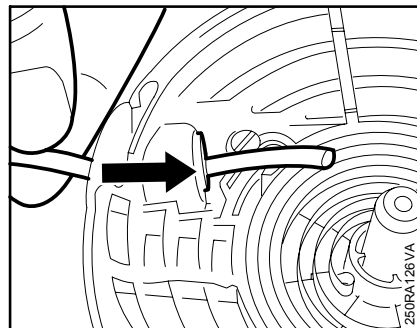


- Pull the rope back to locate the knot in the starter grip.
- Push cap into starter grip.
- Secure starter rope to rope rotor.
- Install the rope rotor.

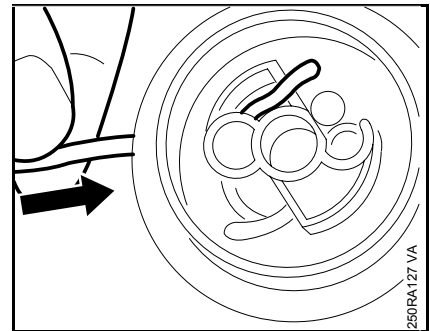
Starter grip

The starter grip is supplied with starter rope.

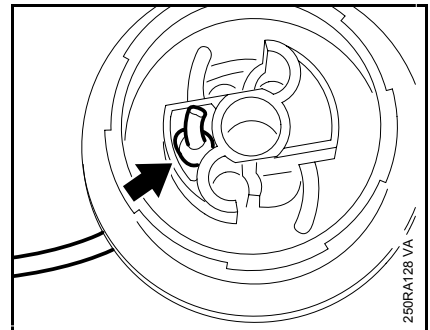
- Remove the rope rotor - see "Standard Repairs, Troubleshooting" handbook.
- Pull the knot out of the recess in the rope rotor.
- Undo the knot and pull the rope out of the rotor and fan housing.
- On FR 350/450, slip tube (75 mm/2.95") over the starter rope.



- Thread the starter rope 0000 195 8200 through the guide bush from outside the fan housing.



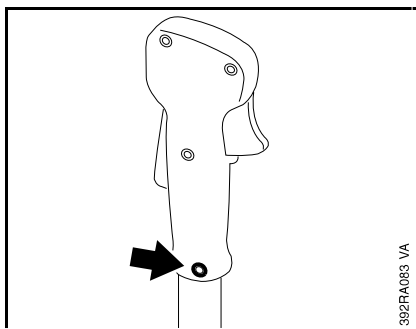
- Thread rope through the hole in the side of the rotor.
- Secure the starter rope with a simple overhand knot.



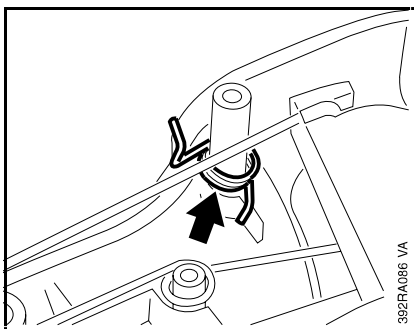
- Pull the rope back into the rotor so that the knot locates in the recess.
- Install the rope rotor - see "Standard Repairs, Troubleshooting" handbook.
- Tension the rewind spring - see 6.2.2.
- Fit fan housing with rewind starter - see 6.2.2.

7. THROTTLE CONTROL

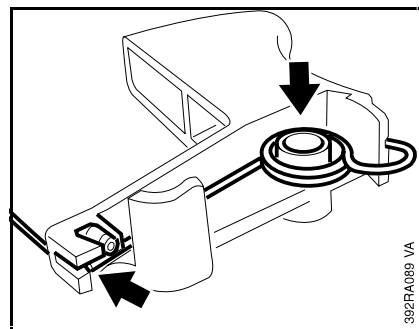
7.1 Throttle Trigger/Interlock Lever (Bike Handle)



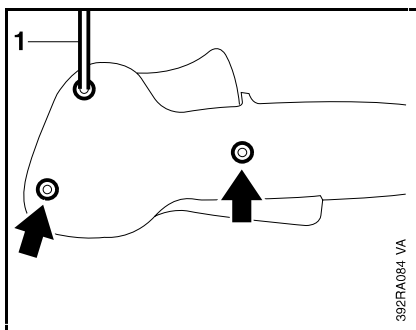
- Take out screw and washer.
- Pull off the control handle.



- Remove the torsion spring.

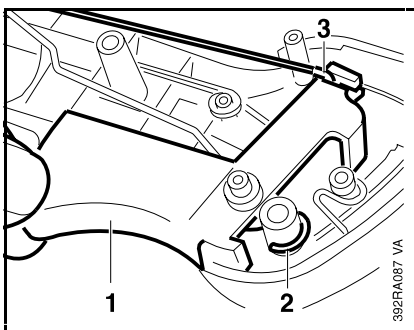


- Attach the throttle cable, then position torsion spring as shown and push its long arm into the slot.

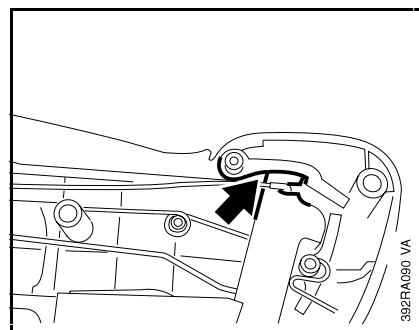


Warning: To avoid risk of electric shock, do not start the unit while the control handle is open.

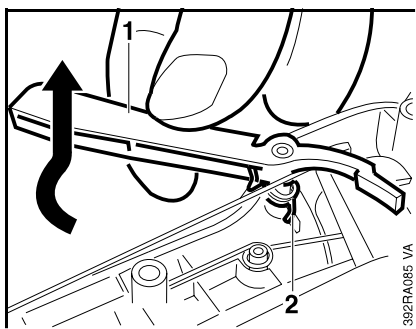
- Use screwdriver (1) 5910 890 2301 to take out the screws.
- Separate the two halves of the handle.



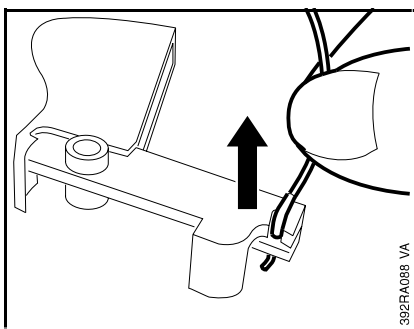
- Take the throttle trigger (1) with torsion spring (2) and throttle cable (3) off the peg.



- The interlock lever must be behind the throttle trigger.

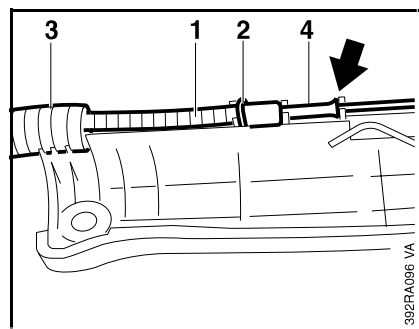


- Lift the interlock lever (1) slightly and turn it to one side until the torsion spring (2) is relaxed.
- Pull the interlock lever off the peg.



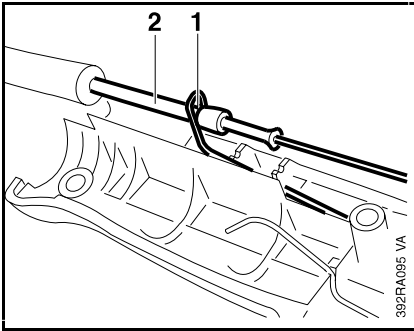
- Disconnect throttle cable from trigger.

Assemble in the reverse sequence.

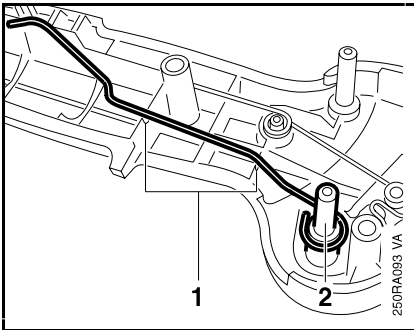


- Check correct positions of throttle cable (1), contact spring (2), protective tube (3) and insulator (4).

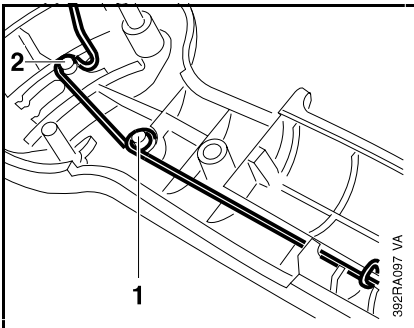
7.2 Contact Springs/Detent Spring in Control Handle (Bike Handle)



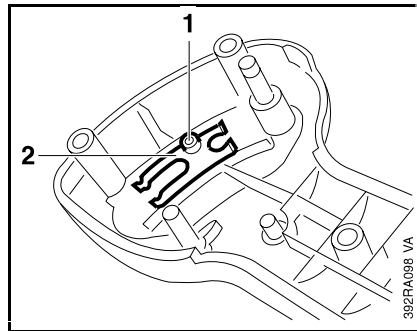
- Remove the throttle trigger - see 7.1.
- Lift contact spring (1) a little and remove the throttle cable (2).



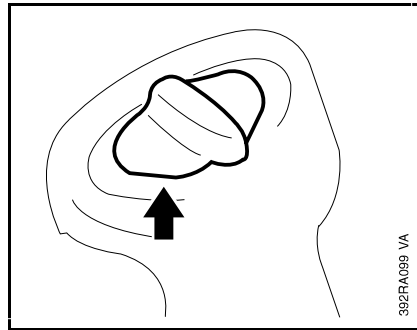
- Remove spring from seats (1) and peg (2).



- Remove contact spring from peg (1) and collar screw (2).



- Take out slide control's collar screw (1).
- Remove detent spring (2).

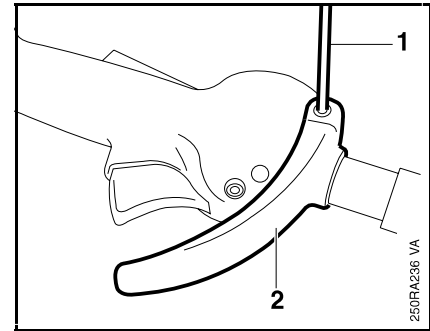


- Pull slide control out of handle molding.

Assemble in the reverse sequence.

- Engage contact spring correctly in groove of collar screw.

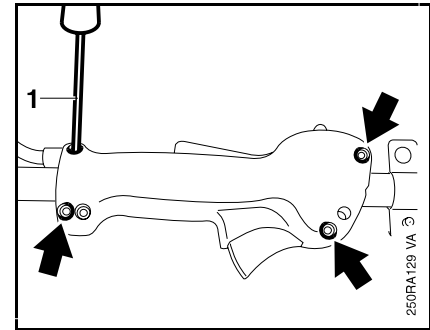
7.3 Throttle Trigger/Interlock Lever (Loop Handle)



FR 350/450

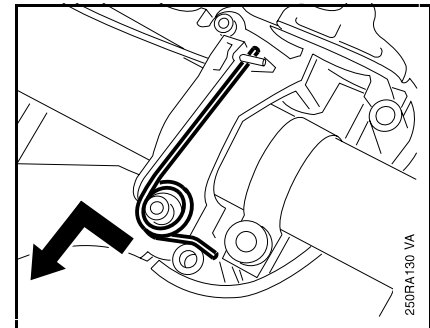
- Use screwdriver (1) 5910 890 2301 to remove screw.
- Push guard (2) forward.

All models



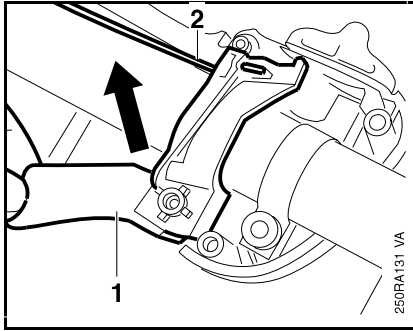
Warning: To avoid risk of electric shock, do not start the unit while the control handle is open.

- Use screwdriver (1) 5910 890 2301 to take out the screws.
- Remove handle molding.

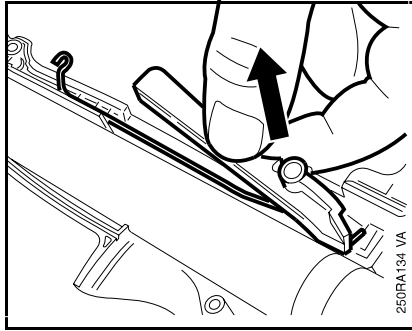


- Remove torsion spring.

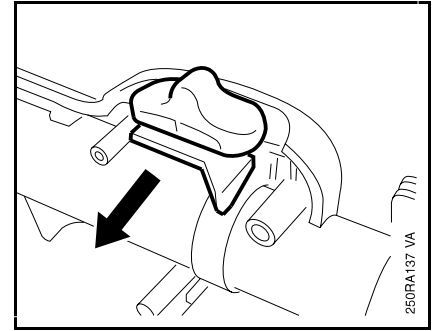
7.4 Slide Control (Loop Handle)



- Pull throttle trigger (1) with throttle cable (2) off the peg.

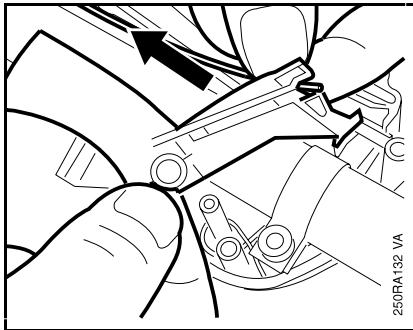


- Pull interlock lever with contact spring off the peg.

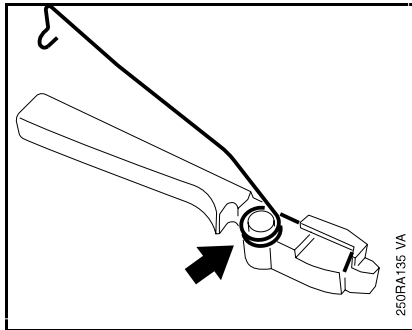


- Remove the interlock lever - see 7.3.

- Pull slide control off the handle molding.

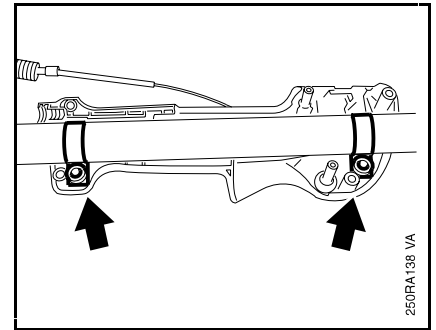


- Disconnect throttle cable from trigger.



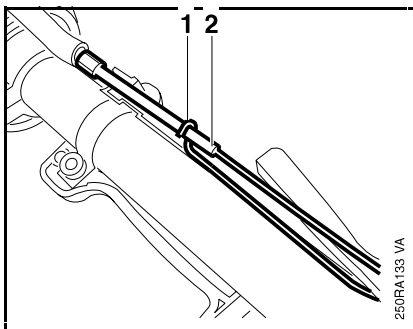
- Remove contact spring from interlock lever.

Assemble in the reverse sequence.

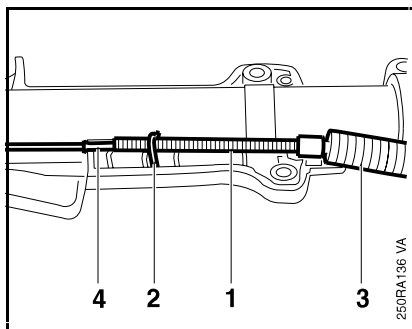


- Remove screws from clamps.

- Take handle molding off the drive tube.

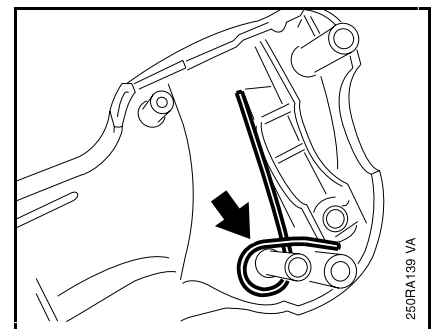


- Lift contact spring (1) a little and remove the throttle cable (2).



- Check positions of throttle cable (1), contact spring (2), protective tube (3) and insulator (4).

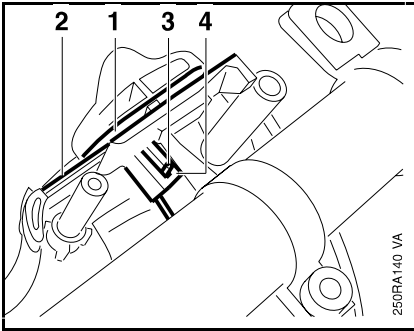
- Tighten screws to 1.0 Nm (0.75 lbf.ft).



- Remove torsion spring from peg.

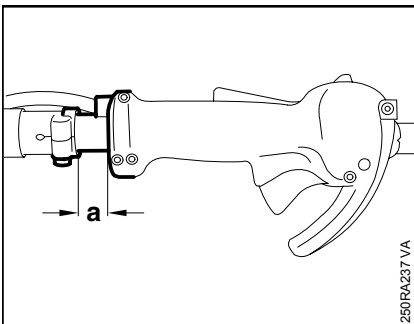
7.5 Throttle Cable

7.5.1 Replacing



Assemble in the reverse sequence.

- Tighten clamp screws to 2 Nm (1.5 lbf.ft).
- The groove (1) in the slide control must engage over the outer edge (2) of the handle molding.
- The torsion spring (3) must engage the recess (4) in the slide control.

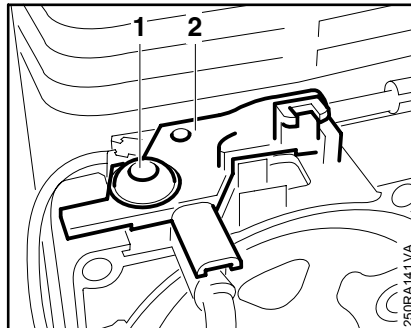


- On FR 350/450, the distance "a" between the control handle and housing must be 20 mm (0.8").

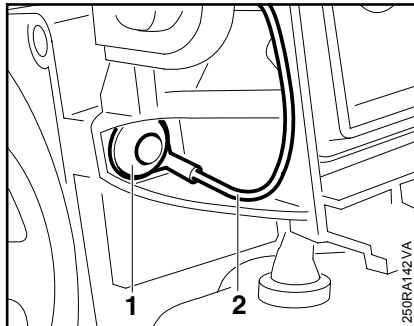
All models

- Remove the shroud - see 4.1.
- Remove clutch housing - see 9.1 and 11.2.
- Remove the air filter - see 8.1.
- Take throttle cable off the contact spring - see 7.2 and 7.3.

Note: On FS 120...350, FR 350, remove spark plug boot and take ignition lead out of retainers on top and base of cable guide.

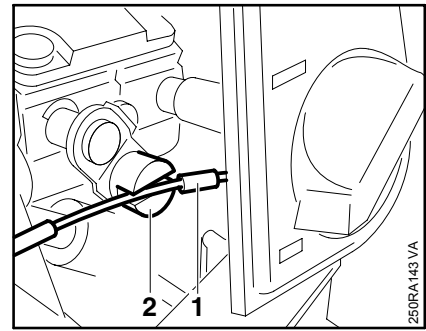


- Take out the screw (1).
- Remove top of cable guide (2).

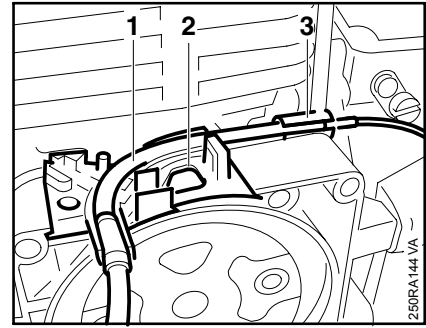


FS 120...350, FR 350

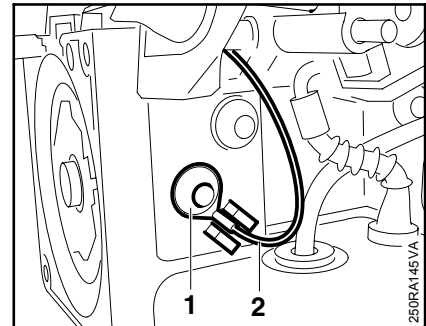
- Remove screw (1) from extended throttle cable (2).



- Disconnect throttle cable nipple (1) from slotted pin (2) on throttle lever.

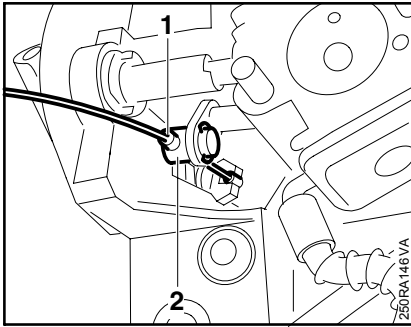


- Take throttle cable (1) out of base of cable guide (2) and retainer (3) on carburetor housing.

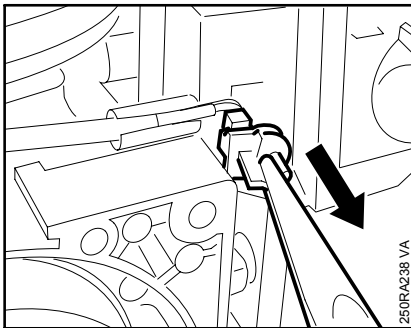


FS 400/450, FR 450

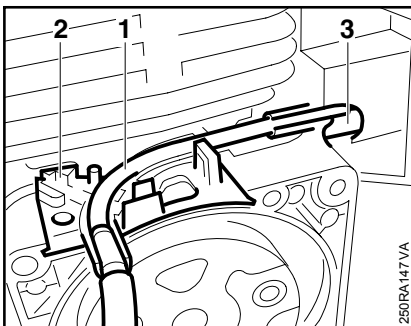
- Remove the air filter housing - see 8.2.2.
- Remove screw (1) from extended throttle cable (2).



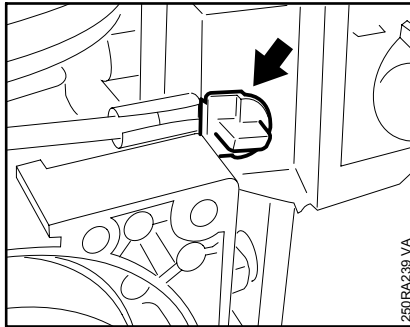
- Disconnect throttle cable nipple (1) from slotted pin (2) on throttle lever.



- Pull grommet out of carburetor housing.



- Take throttle cable (1) out of base of cable guide (2) and pull it out of opening (3) in carburetor housing.



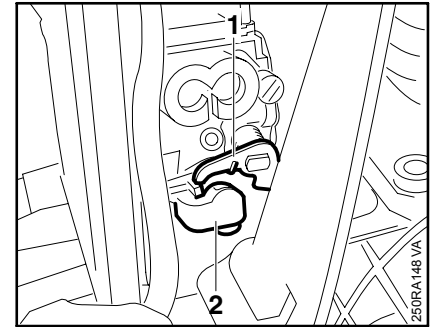
Reassemble in the reverse sequence.

FS 400/450, FR 450

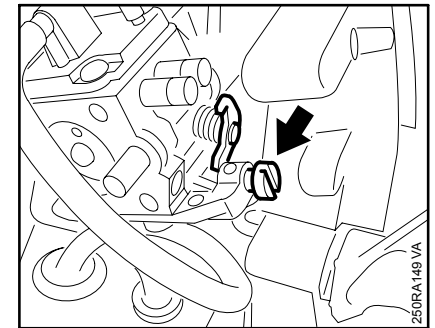
- Make sure grommet is properly located in the carburetor housing.
- Secure lug between the raised marks.

FS 120...350, FR 350

- Place lug and extended throttle cable in the corner of the filter housing.
- Tighten screw of extended throttle cable to 6.0 Nm (4.4 lbf.ft).
- Adjust throttle cable - see 7.5.2.



- Throttle lever (1) must butt against the stop on the carburetor cover (2) when throttle trigger is squeezed (full throttle).



- On carburetors with an idle speed screw: Throttle lever must butt against the idle speed screw when the trigger is in the idle position.

Note: The filter housing is not shown in the illustration.

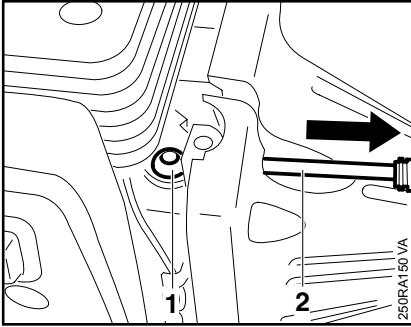
Adjustment is effected by moving the throttle cable in the holder.

- Remove the shroud - see 4.1.
- On FS 300...450, remove cover from AV housing - see 9.2.
- Check correct setting of idle speed screw (if fitted).

Important: Note adjustment range of idle speed screw.

8. FUEL SYSTEM

8.1 Air Filter



- Release screw (1) and pull throttle cable (2) out a little.

Note: The throttle lever moves towards the carburetor cover.

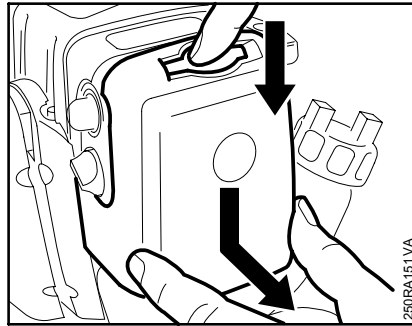
- Squeeze throttle trigger all the way (full throttle position), hold it steady and tighten screw to 6.0 Nm (4.4 lbf.ft).
- Release throttle trigger (idle position). The throttle lever must butt against the idle speed screw, if fitted.
- On FS 300...450, fit cover on AV housing.
- Fit the shroud.

Dirty and clogged air filters reduce engine power, increase fuel consumption and make starting more difficult.

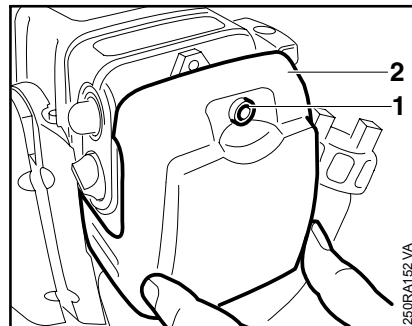
The air filter must be cleaned when there is a noticeable loss of engine power.

- Close the choke shutter.
- Clean away any loose dirt from around the filter and filter cover.

FS 120...350, FR 350



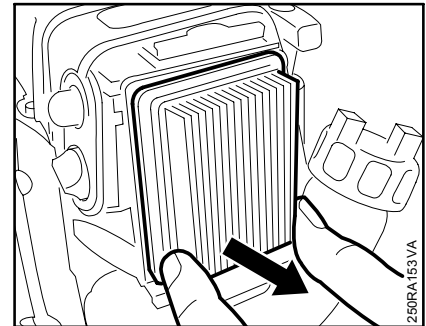
- Press down the tab.
- Push the filter cover downwards and take it off the lower lugs on the filter housing.



FS 400/450, FR 450

- Take out screw (1).

- Swing the filter cover (2) forwards and take it off the lower lugs on the filter housing.



All models

- Remove the filter.
- If the filter is heavily loaded with dirt or damaged, fit a new one.
- Fit filter in the housing.
- Position filter cover so that it locates properly in the lower lugs.
- On FS 400/450, FR 450: Tighten screw to 3.0 Nm (2.2 lbf.ft).

8.2 Carburetor

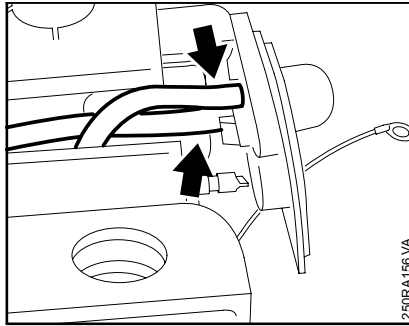
8.2.1 Removing and Installing

FS 120...350, FR 350

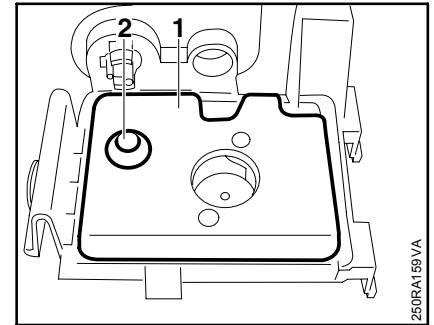
Troubleshooting chart - see "Standard Repairs, Troubleshooting" handbook.

Important: In the event of trouble with the carburetor or the fuel supply system, always check and clean the tank vent - see 8.3.

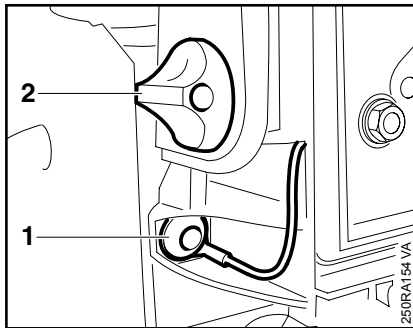
- Remove the shroud - see 4.1.
- Remove the air filter - see 8.1.



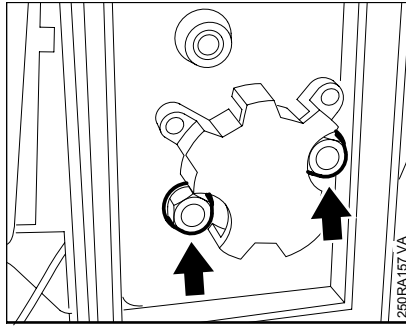
- Disconnect fuel hoses from manual fuel pump.



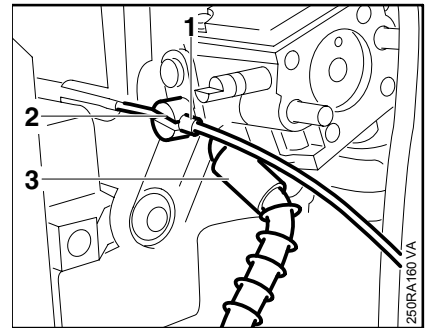
- Check heat shield (1). If necessary, push out the grommet (2) and remove the heat shield.



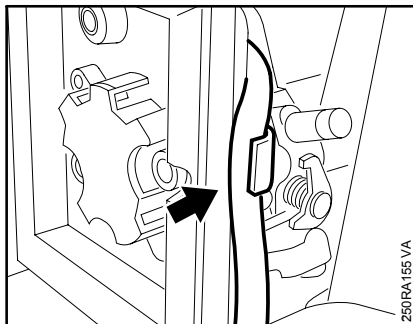
- Take out screw (1) of extended throttle cable.
- Pry choke knob (2) out of filter housing and pull it off the choke shaft.



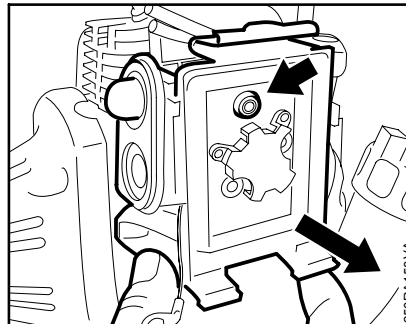
- Unscrew the nuts.



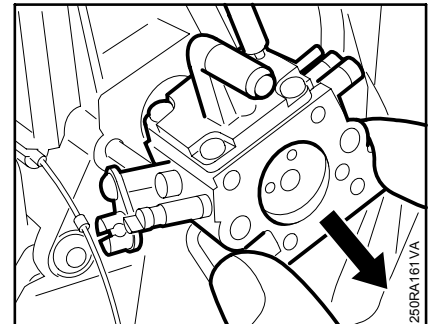
- Disconnect throttle cable nipple (1) from slotted pin (2) on throttle lever.
- Pull the fuel hose (3) off the elbow connector on the carburetor.



- Take fuel hose out of retainer in filter housing.

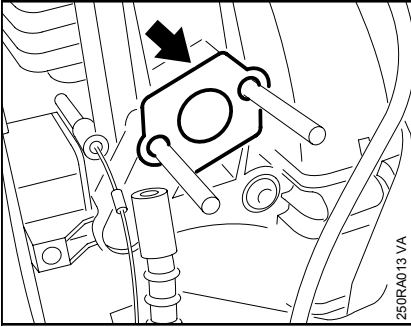


- Remove the filter housing and pull stub out of grommet at the same time.



- Pull carburetor off the studs.
- If necessary, pull fuel hose off carburetor.

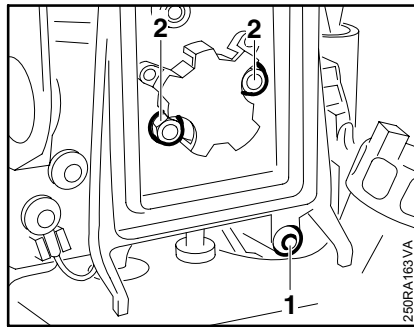
8.2.2 Removing and Installing



- Remove the gasket.

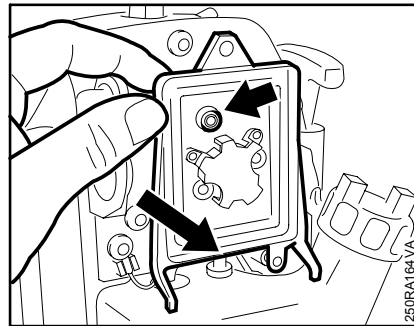
Reassemble in the reverse sequence.

- Use a new gasket.
- Tighten down nuts on filter housing to 3.5 Nm (2.6 lbf.ft).
- Tighten down screw on extended throttle cable to 6.0 Nm (4.4 lbf.ft).

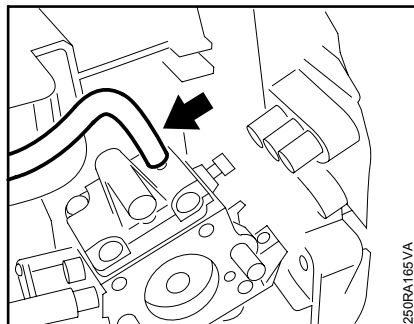


FS 400/450, FR 450

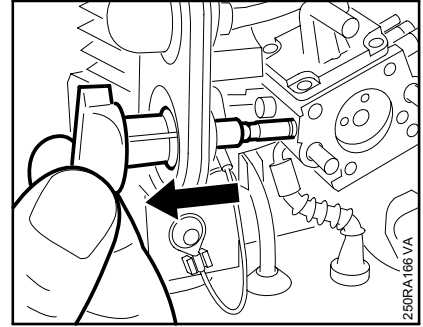
- Remove the shroud - see 4.1.
- Take out screw (1).
- Unscrew the nuts (2).



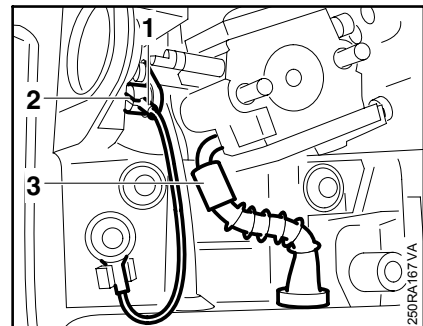
- Remove the filter housing and pull stub out of grommet at the same time.



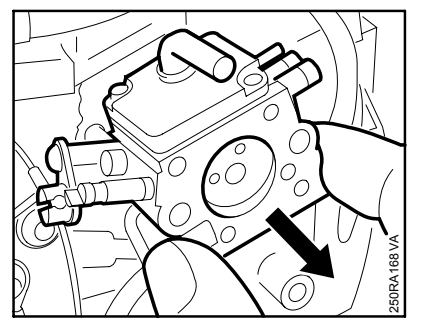
- Disconnect fuel hose from connector.



- Pry choke knob out of carburetor housing and pull it off the choke shaft.

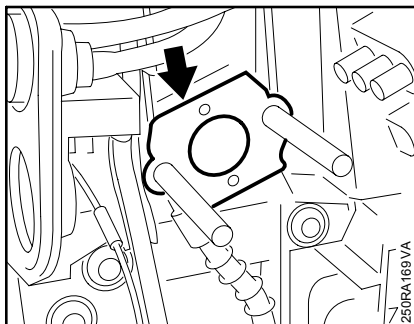


- Disconnect throttle cable nipple (1) from slotted pin (2) on throttle lever.
- Disconnect fuel hose (3) from carburetor.



- Pull carburetor off the studs.

8.2.3 Leakage Test

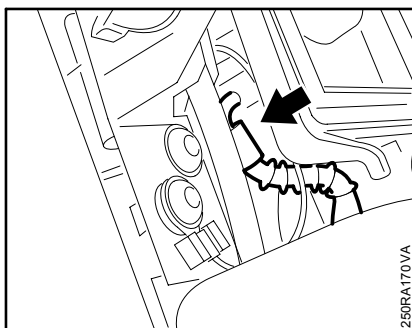


- Remove the gasket.

Reassemble in the reverse sequence.

- Use a new gasket.
- Tighten down nuts on filter housing to 3.5 Nm (2.6 lbf.ft).
- Tighten down screw on filter housing to 6.0 Nm (4.4 lbf.ft).

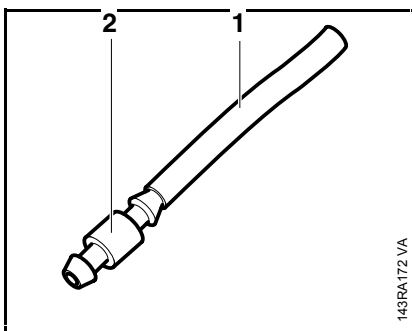
The carburetor can be tested for leaks with the carburetor and crankcase tester 1106 850 2905.



FS 400/450, FR 450

- Remove the shroud - see 4.1.

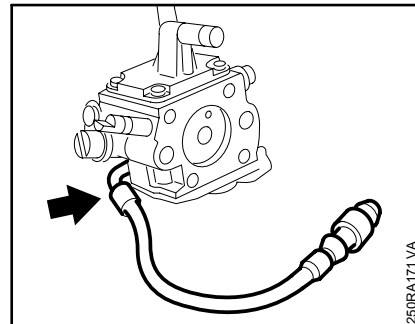
- Pull fuel hose off carburetor's elbow connector.



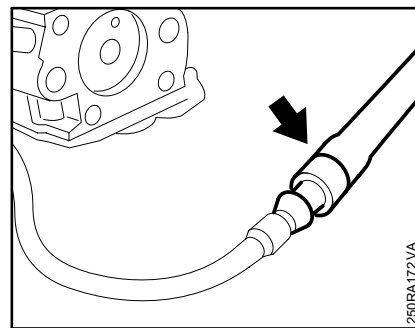
FS 120...350, FR 350

- Remove the carburetor - see 8.2.1.

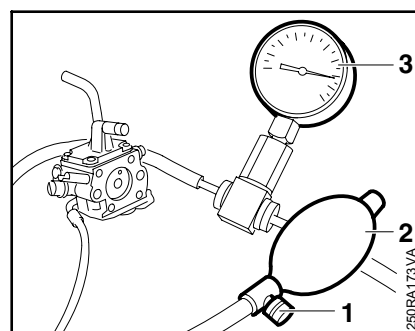
- Fit fuel hose (1) 1110 141 8600 on nipple (2) 0000 855 9200.



- Push the fuel hose with nipple onto the carburetor elbow connector.



- Push the nipple into the tester's pressure hose.



- Close the vent screw (1) on the rubber bulb (2) and pump air into the carburetor until the pressure gauge (3) shows a reading of approx. 0.8 bar (11.5 psi).

8.2.4 Adjusting (three screws)

If this pressure remains constant, the carburetor is airtight. However, if it drops, there are two possible causes:

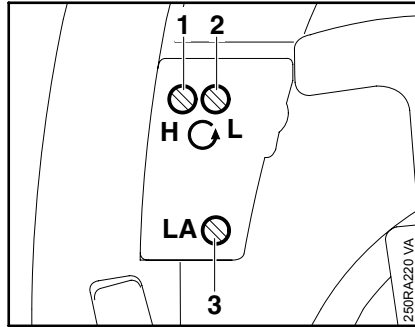
1. The inlet needle is not sealing (foreign matter in valve seat or sealing cone of inlet needle is damaged or inlet control lever sticking).
2. The metering diaphragm is damaged.

In either case the carburetor must be removed and serviced - see "Carburetor" handbook.

- After completing test, open the vent screw and pull the fuel hose off the elbow connector.
- Install the carburetor - see 8.2.1.

FS 400/450, FR 450

- Push the fuel hose onto the elbow connector.
- Fit the shroud - see 4.1.



Standard setting

If the carburetor has to be adjusted from scratch, first carry out the standard setting.

- Carefully screw in both adjusting screws clockwise until they are hard against their seats.

Now make the following adjustments:

- H** = Open high speed screw (1) one full turn
- L** = Open low speed screw (2) one full turn

A slight correction to this setting may be necessary at high altitudes (mountains) or near sea level. Use the following procedure:

- Mount approved cutting tool.
- Check the air filter, replace if necessary.
- Check spark arresting screen, clean or replace as necessary.
- Start the engine and allow it to warm up.

Turn high speed screw (**H**) clockwise for leaner mixture at high altitude, or counterclockwise for richer mixture at sea level.

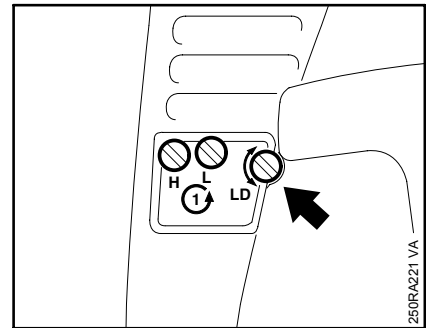
Turn screw slowly and carefully – slight changes have a noticeable effect on engine running behavior.

Adjusting idle speed

Engine stops while idling:

- Carry out standard setting.

Turn the idle speed screw (**LA**) clockwise until cutting tool begins to rotate, and then turn screw back one half turn.



Turn the idle speed screw (**LD**) clockwise until engine runs smoothly – cutting tool must not rotate.

Cutting tool rotates while engine is idling:

- Carry out standard setting.

Turn the idle speed screw (**LA**) counterclockwise until cutting tool stops rotating – and then turn it about another one full turn in the same direction.

8.2.5 Adjusting (one screw)

Turn the idle speed screw **(LD)** counterclockwise until cutting tool stops rotating –and then turn it about another one full turn in the same direction.

Note:

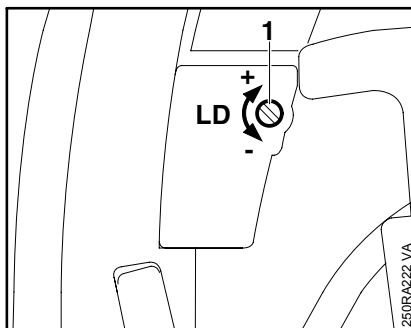
If the engine does not reach 6,000 rpm in starting throttle position, readjust the throttle cable, see 7.5.

The carburetor has no adjusting screws for maximum engine speed (H screw) or idle mixture (L screw).

The carburetor is tuned so that the engine receives an optimum fuel-air mixture in all operation conditions.

A slight correction of the idle speed may be necessary. Use the following procedure:

- Mount approved cutting tool.
- Check the air filter, replace if necessary.
- Check spark arresting screen, clean or replace as necessary.
- Start the engine and allow it to warm up.



Adjust idle speed correctly with the idle speed screw **(LD)**: the cutting tool must not rotate.

Adjusting idle speed

Engine stops while idling:

Turn the idle speed adjusting screw **(LD)** clockwise until engine runs smoothly –cutting tool must not rotate.

Cutting tool rotates while engine is idling:

Turn the idle speed screw **(LD)** counterclockwise until cutting tool stops rotating –and then turn screw about another one full in the same direction.

Note:

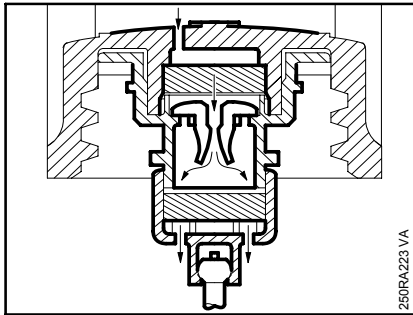
If the engine does not reach 6,000 rpm in starting throttle position, readjust the throttle cable, see 7.5.

8.3 Tank Vent

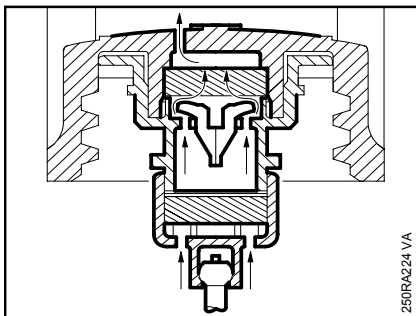
Correct operation of the carburetor is only possible if atmospheric pressure and internal fuel tank pressure are equal at all times. This is ensured by the tank vent.

Important: If problems occur on the carburetor or the fuel supply system, always check and clean the tank vent.

Check function by performing pressure and vacuum tests on the tank via the fuel hose.



Equalization of pressure from the outside inwards takes place via the hole in the fuel filler cap, the sintered filter, the valve and holes in the cap.



Equalization of pressure from the inside outwards takes place via the holes in the cap, the holes in the valve body, the sintered filter and the hole in the fuel filler cap.

8.4 Pickup Body

The diaphragm pump draws fuel out of the tank and into the carburetor via the fuel hose. Any impurities mixed with the fuel are retained by the pickup body (filter). The fine pores of the filter eventually become clogged with minute particles of dirt. This restricts the passage of fuel and results in fuel starvation.

Important: In the event of trouble with the fuel supply system, always check the fuel tank and the pickup body first. Clean the fuel tank if necessary.

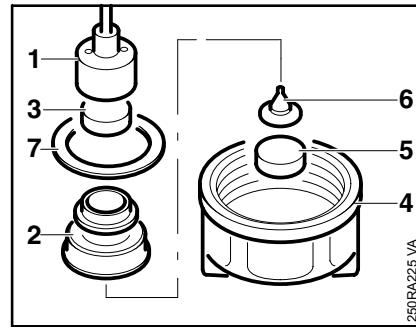
Cleaning the fuel tank

- Unscrew the filler cap and drain the tank.
- Pour a small amount of clean gasoline into the tank.
- Close the tank and shake the unit vigorously.
- Open the tank again and drain it.

Note: Dispose of fuel properly.

Pickup body

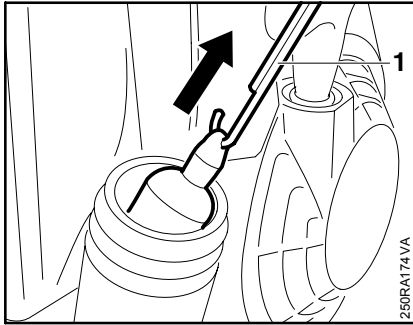
- Unscrew the filler cap and remove it together with the retainer.



Cleaning

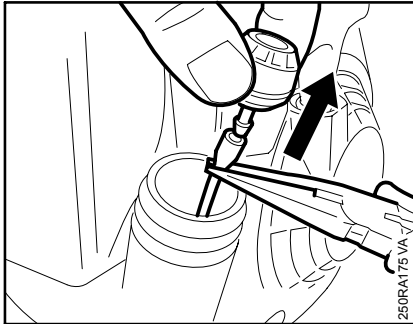
- Unscrew the fuel filler cap.
- Ease the cap (1) off the valve body (2).
- Take sintered filter (3) out of cap.
- Pry valve body out of fuel filler cap (4).
- Pry sintered filter (5) out of fuel filler cap.
- Wash valve body in clean gasoline.
- If diaphragm in the valve (6) is damaged, pull it out of valve body and fit new one.
- Push new sintered filter (5) into filler cap.
- Fit sealing ring (7) over valve body.
- Fit valve body in filler cap and press it home until it snaps into position.
- Fit new sintered filter in the cap.
- Fit cap on valve body and press it down until it snaps into position.
- Refit the fuel filler cap.

8.5 Fuel Tank/ Hoses



- Use hook (1) 5910 893 8800 to pull the pickup body out of the fuel tank.

Note: Do not stretch the fuel hose.



- Pull the pickup body off the fuel hose.

- Fit new pickup body.

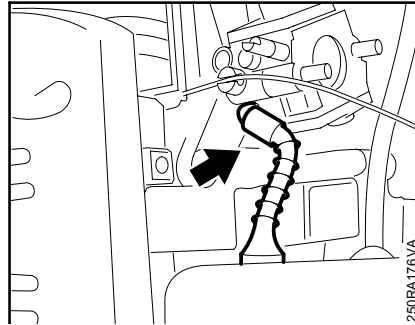
Install in the reverse sequence.

All models

- Drain the fuel tank.
- Remove the shroud - see 4.1.
- Remove the fan housing - see 6.2.1.

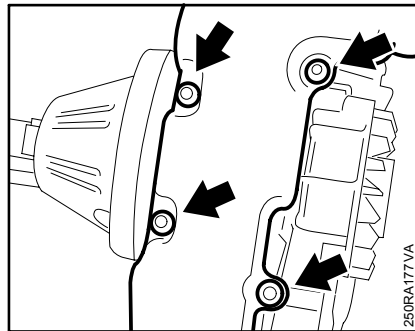
FS 120...350, FR 350

- On FR 350, remove powerhead from support frame - see 9.3.



- Remove the filter housing - see 8.2.1.

- Pull fuel hose off carburetor elbow connector.



- Take out the screws.
- Remove the fuel tank.
- Replace sleeves and grommets if necessary.

- Remove fuel hoses if necessary.

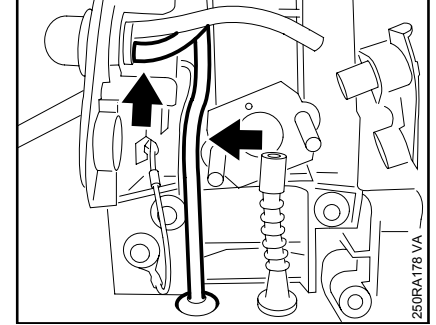
Reassemble in the reverse sequence.

- Tighten down screws to 6.0 Nm (4.4 lbf.ft).

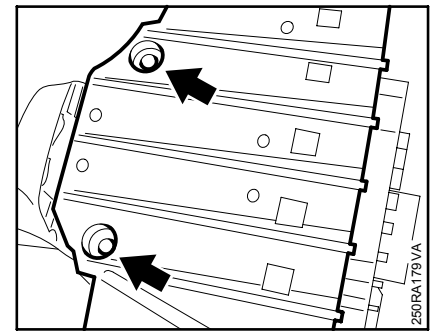
FS 400/450, FR 450

- On FR 450, remove powerhead from support frame - see 9.3.

- Remove the carburetor - see 8.2.2.

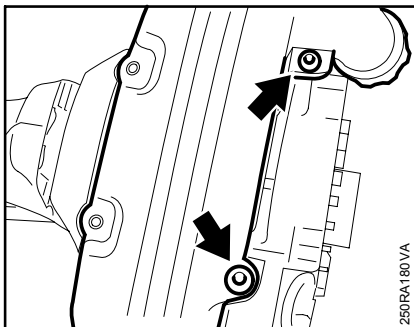


- Disconnect fuel hose from lower connector on manual fuel pump and pull it out of the guide.

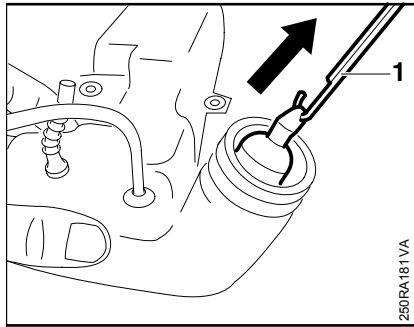


FS 400/450 only

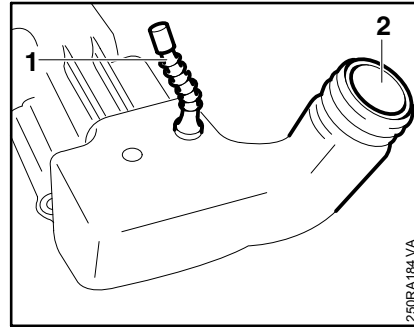
- Take out the screws.
- Remove the guard plate.



- Take out the screws.
- Remove the fuel tank.

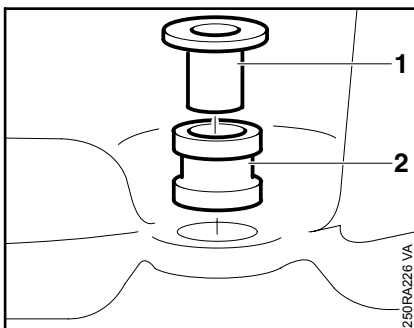


- Use hook (1) 5910 893 8800 to pull pickup body out of tank.



Install in the reverse sequence.

- On FS 400/450, FR 450, fit fuel hose (1) next to filler neck (2).



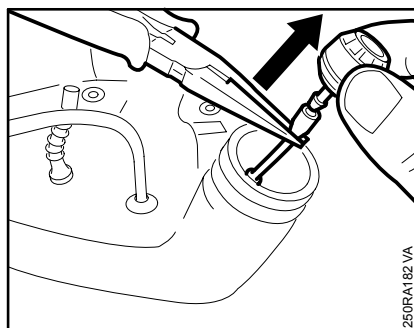
- Take sleeves (1) out of grommets.
- Ease grommets (2) out of fuel tank.
- Remove fuel hoses if necessary.

Reassemble in the reverse sequence.

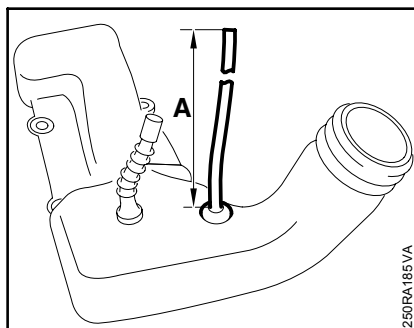
- Tighten down screws to 6.0 Nm (4.4 lbf.ft).

Fuel hoses

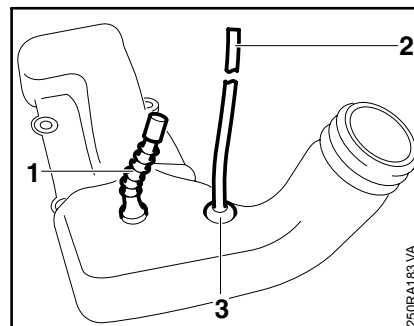
- Unscrew filler cap and remove together with retainer.



- Pull pickup body off the fuel hose.

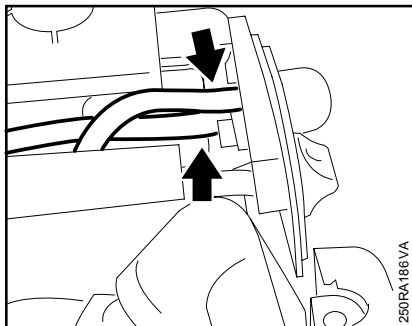


- Length "A" of return hose must be 190 mm (7.5") on FS 120...350 and 200 mm (7.9") on FS 400/450.

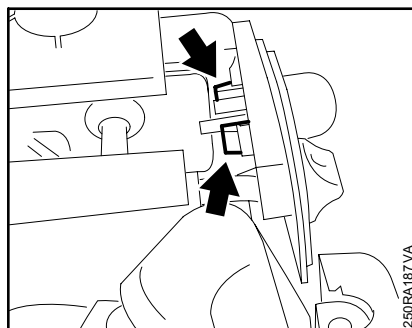


- Pull out the fuel hose (1).
- Pull out the return hose (2) together with grommet (3).

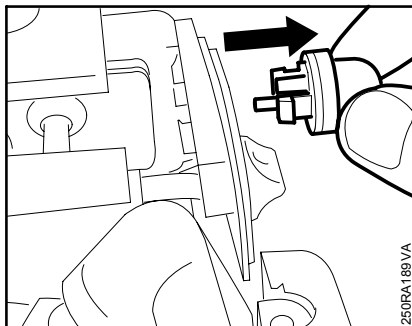
8.6 Manual Fuel Pump



- Remove the shroud - see 4.1.
- On FS 120...350, FR 350, remove the air filter - see 8.1.
- Disconnect hoses from connectors.



- Carefully push back the retaining tabs.



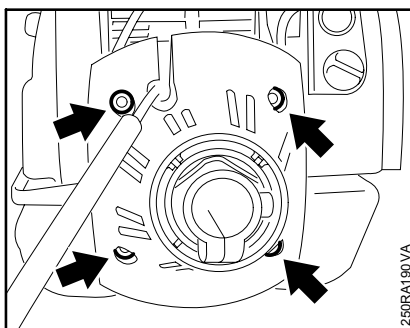
- Pull fuel pump out of its seat in the filter/ carburetor housing.

Install in the reverse sequence.

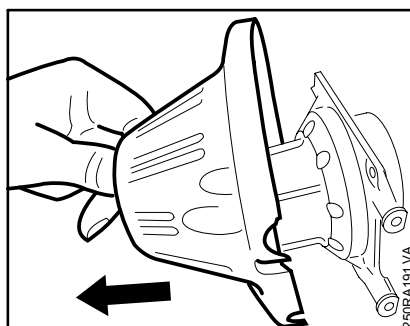
9. AV SYSTEM 9.1 Repair (FS 120/200)

The anti-vibration (AV) connection between the engine and drive tube consists of a rubber element installed in the clutch housing.

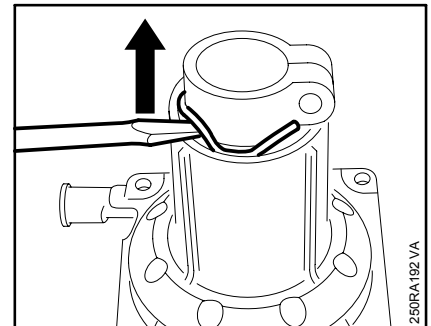
- Remove the drive tube - see 10.6.



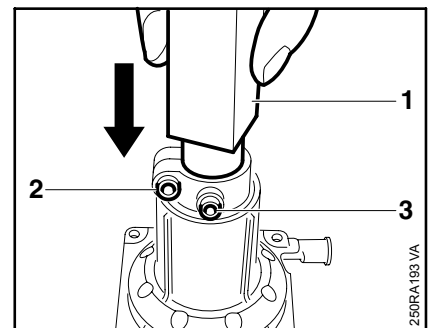
- Take out the screws.
- Remove the clutch housing and clutch shroud.



- Take the clutch shroud off the clutch housing.

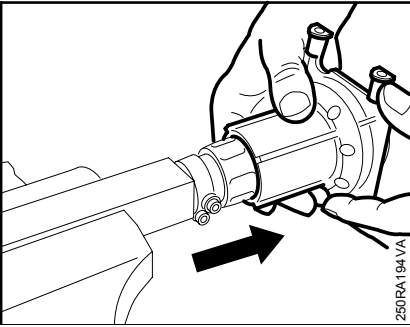


- Lever the retaining ring out of the clutch housing.
- Remove retaining ring over the AV sleeve.

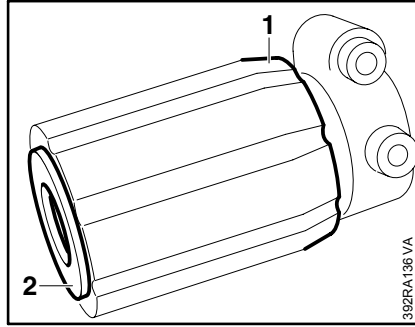


- Push installing tool (1) 4126 893 4900 into AV sleeve as far as stop.
- Tighten down clamp screw (2).
- Tighten fixing screw (3) moderately if necessary.
- Apply a little lubricant (e.g. washing-up liquid) between the clutch housing and rubber element.

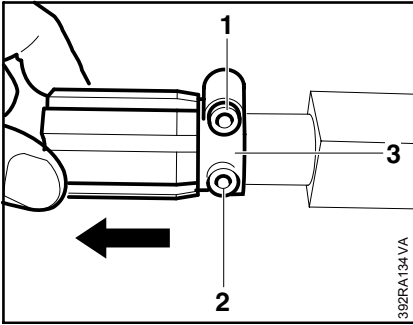
9.2 Repair (FS 300...450)



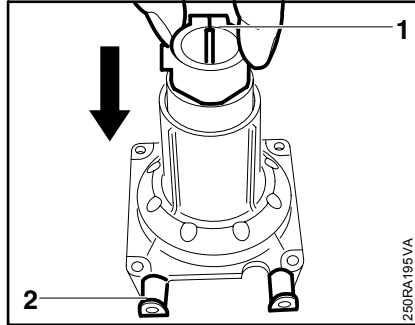
- Clamp installing tool in vice.
- Pull clutch housing off the rubber element.



- Push the rubber element, tapered end (1) first, onto the AV sleeve until the flange (2) is behind the rubber element.



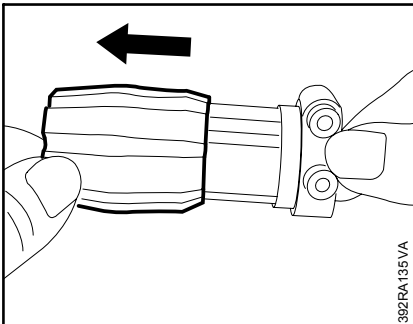
- Release clamp screw (1) and fixing screw (2) if necessary.
- Pull the AV sleeve (3) off the installing tool.



- Coat rubber element with a lubricant (e.g. washing-up liquid).
- Push the rubber element into clutch housing as far as stop so that slot (1) is opposite the lug (2).

Assemble all parts in the reverse sequence.

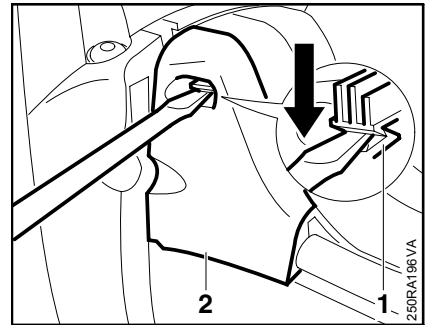
- Retaining ring must locate properly in the groove in the clutch housing.
- Tighten down clutch housing mounting screws to 6.0 Nm (4.4 lbf.ft).



- Pull the rubber element off the AV sleeve.

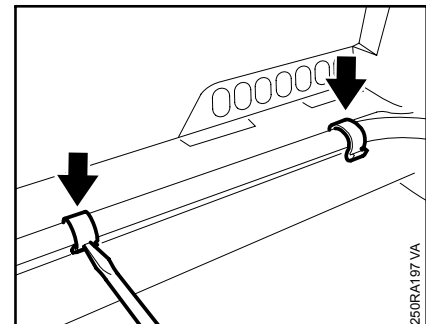
The anti-vibration (AV) connection between the engine and drive tube consists of four rubber buffers in the AV housing.

- Remove the control handle - see 10.1.

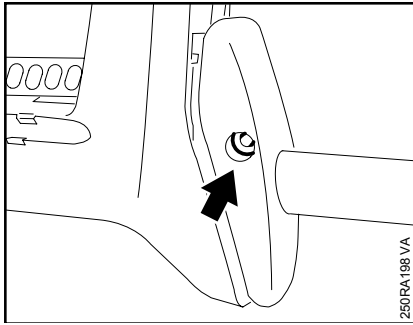


Rubber buffers

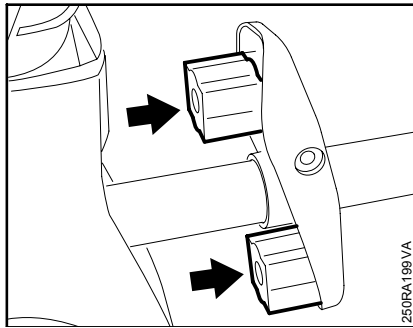
- Press snap hook (1) down and remove the cover (2).



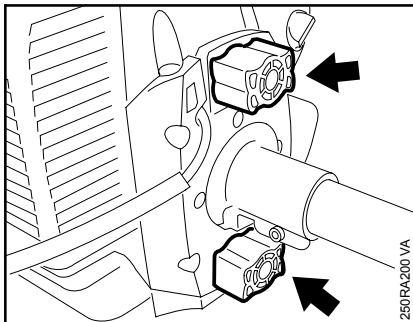
- Carefully ease the cable retainers out of the AV housing.



- Release clamp screw on support.

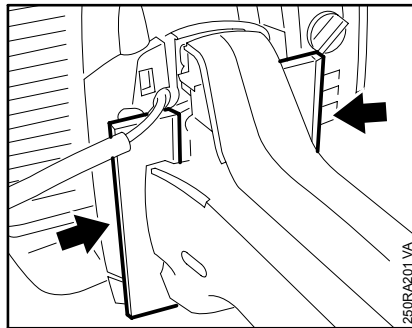


- Push the support forwards and pull off the rubber buffers.

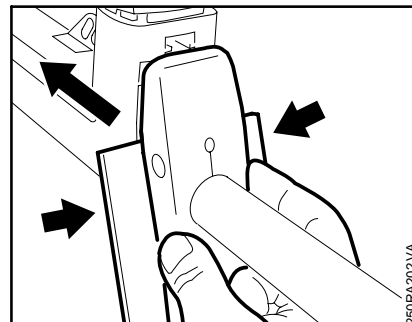


- Push the AV housing forwards.
- Pull the rubber buffers off the clutch housing.

- Slip the rubber buffers over the pegs on the clutch housing and support.
- Coat rubber buffers with a **little** lubricant (e.g. washing-up liquid).
- Push AV housing onto the rubber buffers.
- Push support onto AV housing and engage the rubber buffers at the same time.



- To set the gap (7 mm/0.27") between the clutch housing and AV housing, fit steel bar (e.g. 120x30x7 mm) at both sides (see ill.).



- Fit a steel bar (e.g. 90x30x7 mm) at both sides between the AV housing and support.

- Push support in direction of AV housing until the four steel bars are tight.

- Tighten down screw to 6.0 Nm (4.4 lbf.ft).

- Take out the steel bars.

Assemble all parts in the reverse sequence.

- Place cover in the lower slot and push it home until it snaps into position.

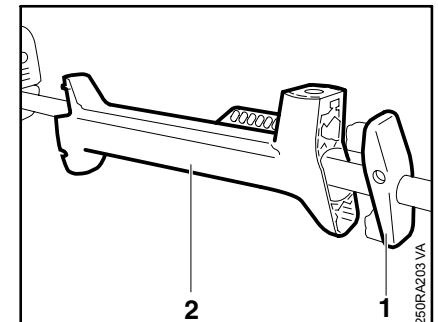
AV housing

- Remove bike handle - see 10.2.

- Remove the gearhead - see 11.1.

- Remove throttle cable from AV housing.

- Release clamp screw on support.



- Pull the support (1) and AV housing (2) off the drive tube.

9.3 Repair (FR 350/450)

- Inspect rubber buffers, replace if necessary.
- Adjust gap after fitting the AV housing and support.

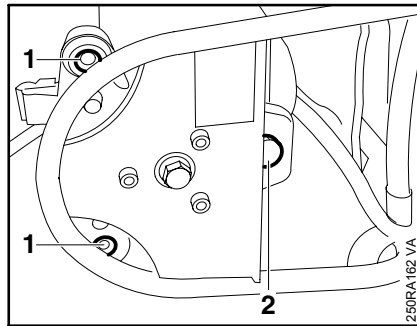
Assemble all parts in the reverse sequence.

The anti-vibration connection between the engine and support frame consists of three springs.

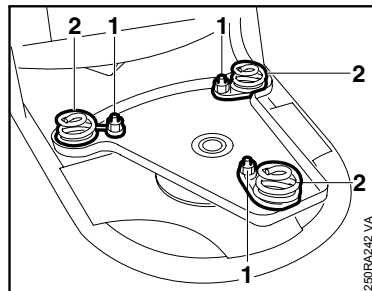
- Remove flexible shaft from clutch housing - see 10.5.

Reassemble in the reverse sequence.

- Use new locknuts and tighten them down to 10 Nm (7.5 lbf.ft).
- Tighten down spline screws and hexagon head screw to 10 Nm (7.5 lbf.ft).

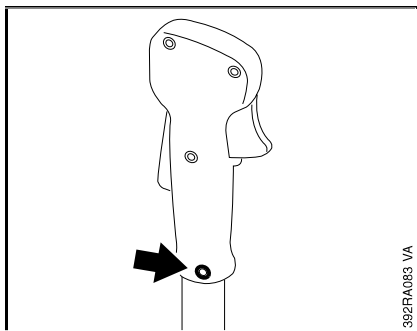


- Take spline screws (1) and hex. head screw (2) out of clutch housing.
- Take powerhead off the support plate.

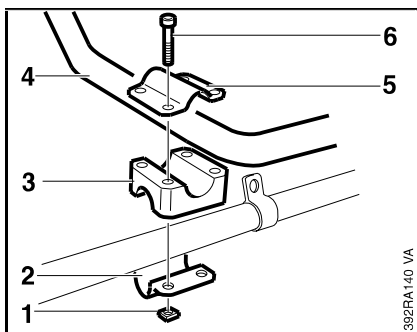


- Hold screws steady and unscrew the nuts (1).
- Remove the springs (2) from the support plate.

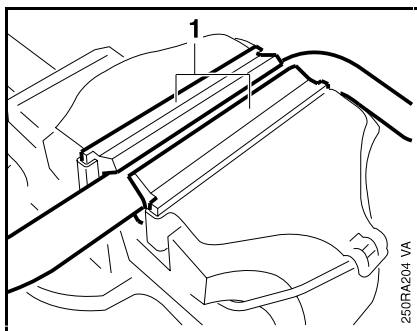
10. SHAFT 10.1 Bike Handle (FS 120/200)



- Take out the screw.
- Pull off the control handle.



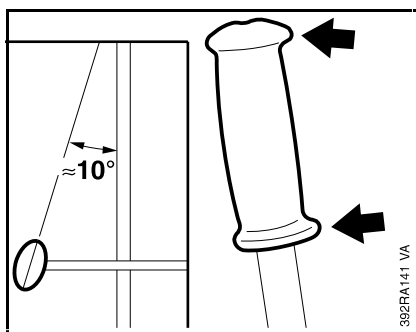
- Unscrew the nuts (1).
- Remove lower clamp (2), support block (3), bike handle (4) and upper clamp (5) with screws (6).



- Use jaws (1) 5910 893 2700 to clamp bike handle tube in vice.

- To replace left grip, carefully cut it open and pull it off.
- Coat inside of new grip with a little lubricant (e.g. washing-up liquid).

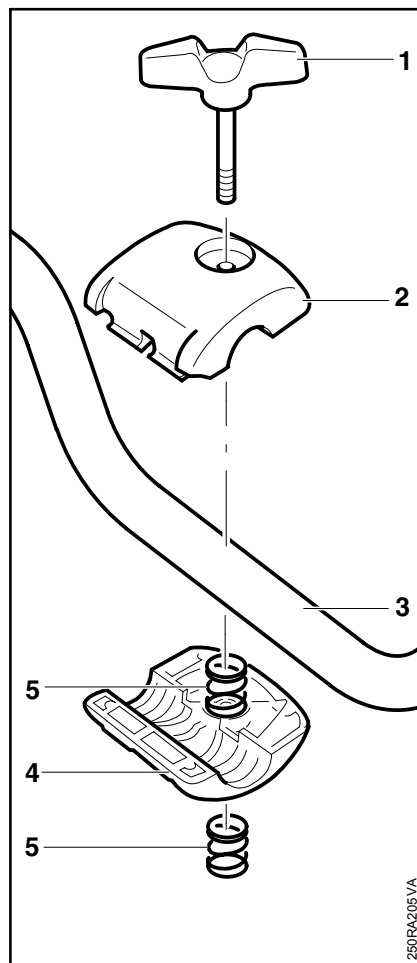
Note: If too much lubricant is used, the grip will twist on the tube. Always leave it to dry for a while after fitting.



- Push the grip into position so that the longer ends (see arrows) point toward the gearhead at an angle of 7 - 15 degrees to the shaft.

Assemble all parts in the reverse sequence.

10.2 Bike Handle (FS 300...450)

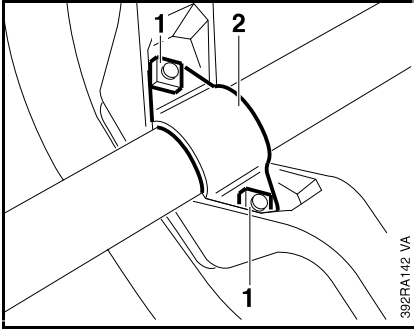


- Remove the control handle - see 10.1.
- Take out the clamp screw (1).
- Swing open the upper clamp (2) and lift it away.
- Remove bike handle (3) and lower clamp (4).
- If necessary, take springs (5) of out lower clamp.
- Replace left grip if necessary - see 10.1.

Reassemble in the reverse sequence.

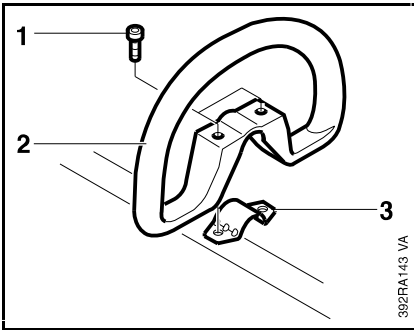
- Lubricate thread of clamp screw with STIHL multipurpose grease - see 13.2

10.3 Loop Handle



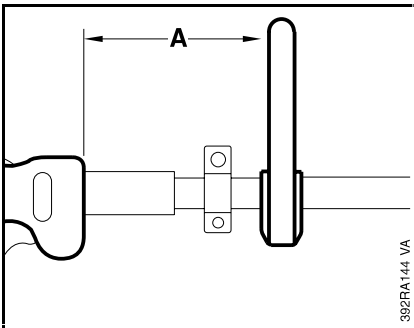
Loop handle without barrier bar

- Unscrew the nuts (1).
- Remove lower clamp (2).

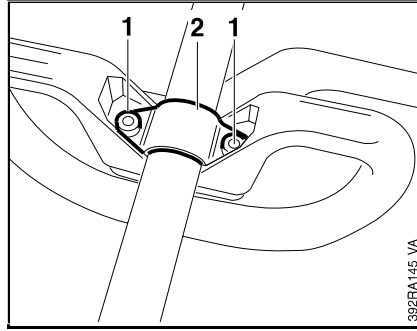


- Remove screws (1).
- Remove the loop handle (2) and upper clamp (3).

Reassemble in the reverse sequence.

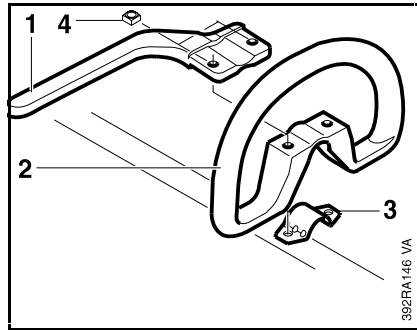


- Align the loop handle at distance "A" = 20 cm (8") from the control handle and tighten down firmly.



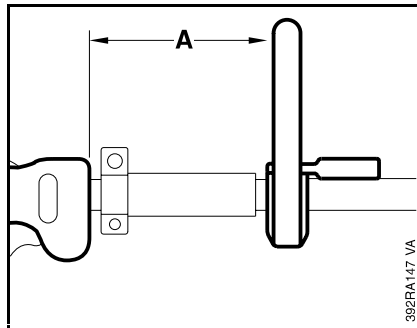
Loop handle with barrier bar

- Take out screws (1).
- Remove lower clamp (2).



- Remove the barrier bar (1), loop handle (2) and upper clamp (3).
- Take the square nuts (4) out of the barrier bar.

Reassemble in the reverse sequence.



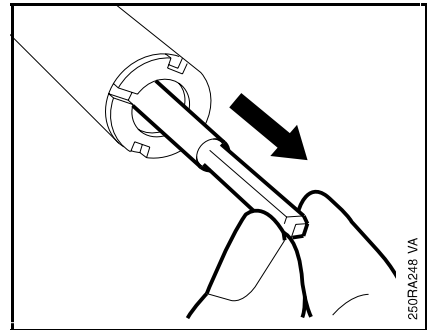
- Align the loop handle at distance "A" = 20 cm (8") from the control handle and tighten down firmly.

10.4 Drive Shaft/ Flexible Liner

The drive shaft is supported in a flexible liner inside the drive tube. The ends of the drive tube are sealed with plugs.

- Remove the gearhead - see 11.1.

Drive shaft



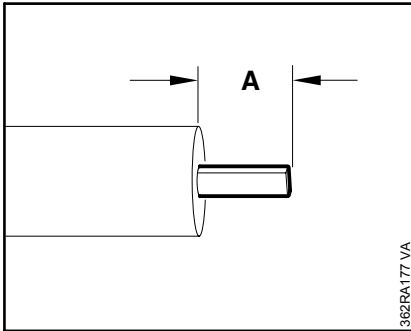
- Pull the drive shaft out of the drive tube.

Note: If the shaft has turned blue, fit a new one.

- Coat the drive shaft with STIHL gear lubricant 0781 120 1109, see 13.2, before installation.

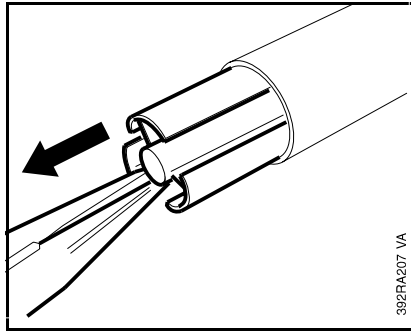
Important: Apply the grease uniformly and thinly to the whole drive shaft. Do not pump grease directly into the drive tube.

- Push the drive shaft into the drive tube.

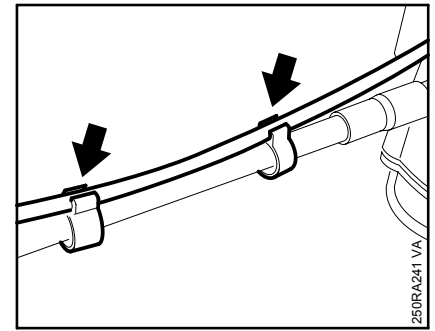


- Push the drive shaft into the drive tube until dimension "A" is 20 mm/0.8" (FS 120/200) or 30 mm/1.2" (FS 300...450). If necessary, apply slight pressure to the shaft and rotate it slowly until it can be pushed in to the specified dimension.

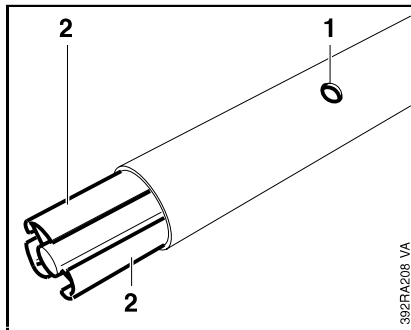
- Fit the gearhead - see 11.1.



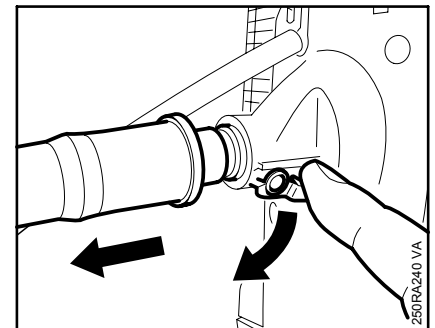
- Pull out the flexible liner.



- Take throttle cable out of the two retainers.



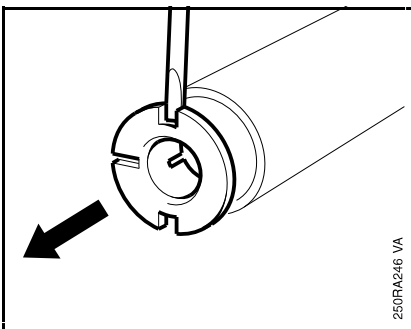
- On FS 120/200, the hole (1) must be between the spokes (2).
- Insert plug, install the drive tube - see 10.6.



- Press down lever on clutch housing.

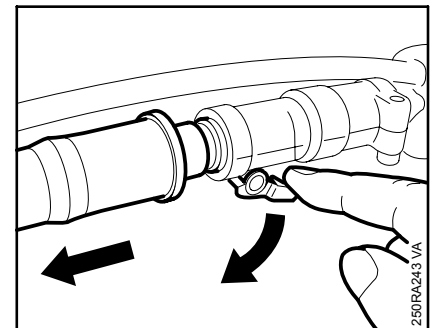
- Pull out the shaft.

Flexible liner



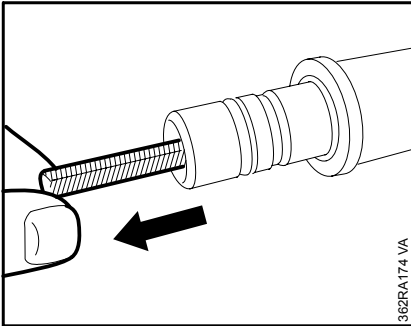
- Remove the drive tube - see 10.6.

- Pry the plug out of the drive tube.



- Press down lever on housing.

- Pull out the shaft.



- Pull flexible shaft out of the drive tube.

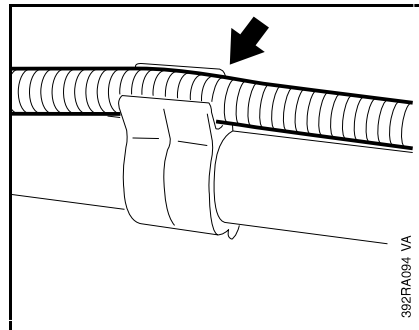
Note: If flexible shaft has turned blue, fit a new one.

- Coat the flexible shaft with STIHL gear lubricant 0781 120 1109, see 13.2, before installation.

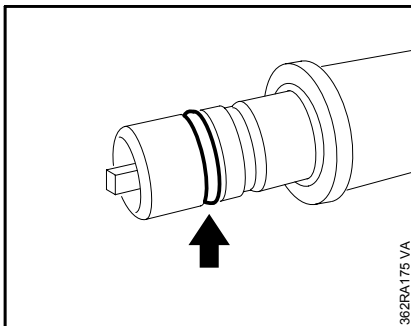
Important: Apply the grease uniformly and thinly to the whole shaft. Do not pump grease directly into the drive tube.

FS 120/200

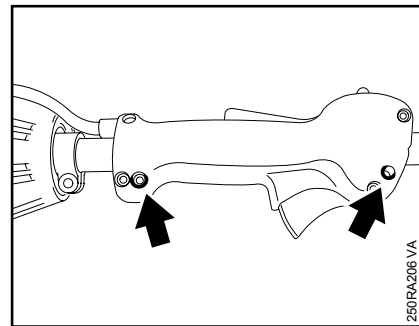
- Remove the drive shaft - see 10.4.
- Remove the bike or loop handle - see 10.1 and 10.3.



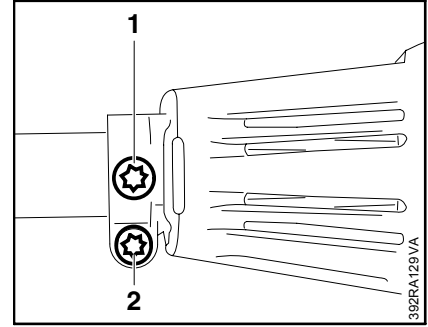
- On machines with bike handle, take throttle cable out of retainers.



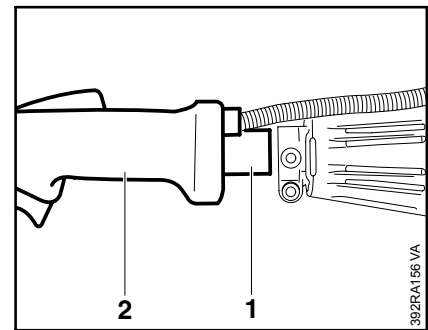
- Inspect the O-ring and fit a new one if necessary.
- Install flexible shaft and fit throttle cable in the retainers.



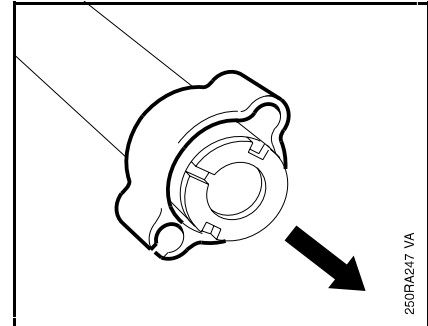
- On machines with loop handle, release screws on control handle clamps.



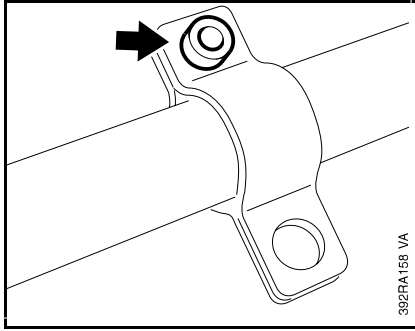
- Take the fixing screw (1) out of the AV sleeve.
- Release the clamp screw (2).



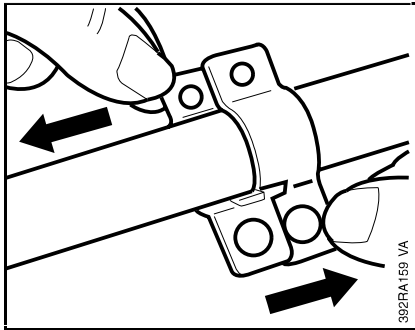
- Pull out the drive tube.
- On machines with loop handle, pull the drive tube (1) out of the control handle (2) at the same time.



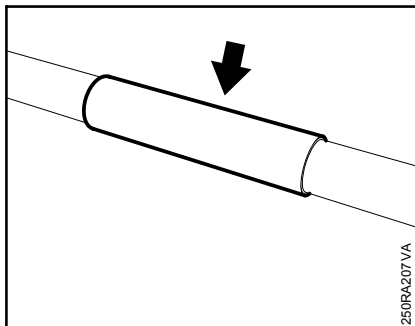
- Slip the throttle cable retainer, if fitted, off the drive tube.



- Remove screw from hose clamp for harness.

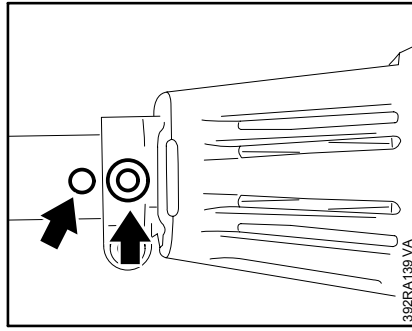


- Pull the hose clamp apart and take it off the drive tube.

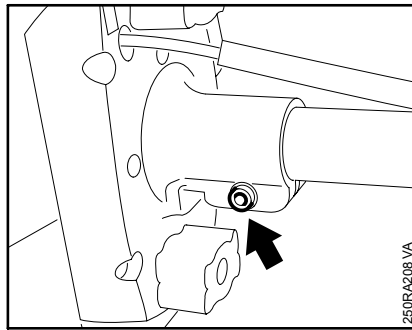


- Pull off the sleeve, if fitted.

Reassemble in the reverse sequence.



- Degrease the clamp mounting area and push the drive tube home so that the holes line up.
- Tighten down fixing screw to 2.5 Nm (1.8 lbf.ft) and clamp screw to 5.5 Nm (4.0 lbf.ft).

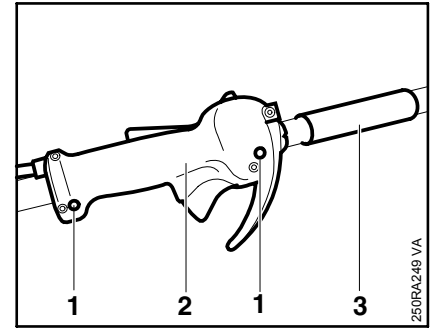


FS 300...450

- Remove the AV housing - see 9.2.
- Remove the drive shaft - see 10.4.
- Release the clamp screw.
- Pull the drive tube out of the clutch housing.

Reassemble in the reverse sequence.

- Degrease the clamp mounting area and push the drive tube home into clutch housing as far as stop.
- Tighten down clamp screw to 8.5 Nm (6.3 lbf.ft) (FS 300/350) or 12 Nm (8.8 lbf.ft) (FS 400/450).



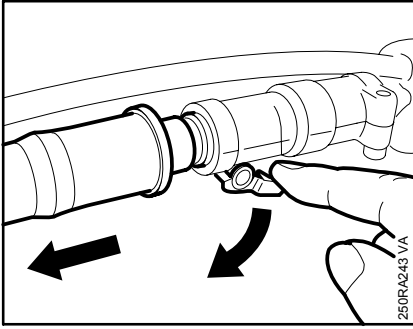
FR 350/450

- Remove the drive shaft - see 10.4.
- Remove the housing - see 10.7.
- Release screws (1) on clamps of control handle (2).
- Pull off the control handle.
- Pull off the sleeve (3).

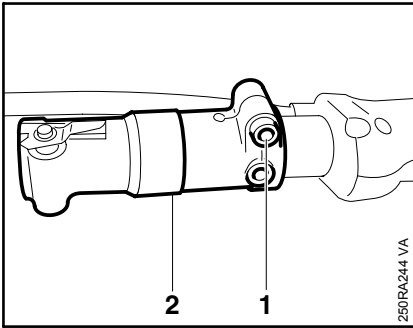
Reassemble in the reverse sequence.

- Line up control handle relative to housing - see 7.4.
- Tighten screws on clamps to 2.0 Nm (1.5 lbf.ft).

10.7 Housing (FR 350/450)



- Press down the lever.
- Pull out the flexible shaft.



- Release the clamp screw (1).
- Pull off the housing (2).
- Service the housing - see "Standard Repairs, Troubleshooting" handbook.

Reassemble in the reverse sequence.

- Degrease clamp mounting area.
- Tighten down clamp screw to 4.5 Nm (3.3 lbf.ft).

11. CUTTING TOOL DRIVE Gearhead

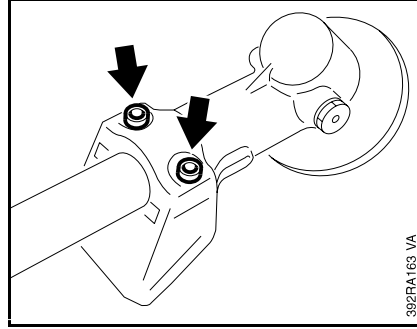
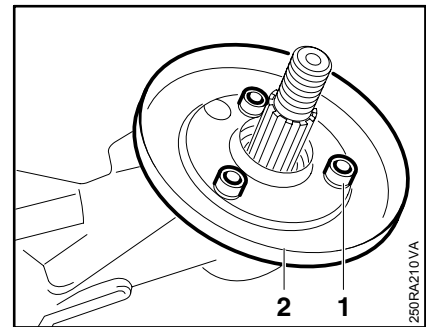
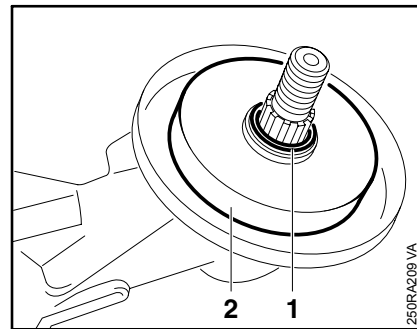


Illustration shows FS 120/200 gearhead.

- Remove deflector or stop, if fitted.
- Release clamp screws.
- Pull gearhead off the drive tube.



- Take out screws (1).
- Remove the guard ring (2).
- For other disassembly and assembly procedures see "Standard Repairs and Troubleshooting" handbook.
- On FS 300...450, tighten down screws on guard ring to 5.0 Nm (3.7 lbf.ft).
- Install a new retainer.
- Degrease clamp mounting area.
- Slide the gearhead onto the drive tube - turn the output shaft back and forth at the same time so that the square end of the drive shaft engages the square socket in the drive pinion.
- Push the gearhead as far as stop and line it up.
- On FS 120/200 and FR 350/450, tighten down clamp screws to 8.5 Nm (6.3 lbf.ft).
- On FS 300...450, first tighten clamp screws to 1.5 Nm (1.1 lbf.ft) and then finally tighten them down to 7.5 Nm (5.5 lbf.ft).
- Refit the deflector or stop.



FS 300...450

- Remove retainer (1) - if fitted - and thrust washer (2) from the output shaft.

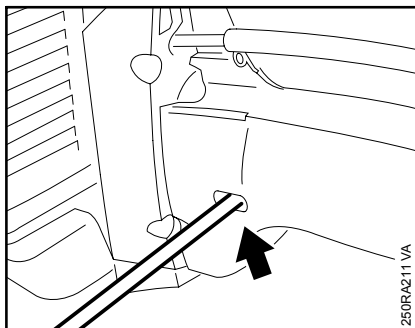
11.2 Clutch Drum

FS 120/200

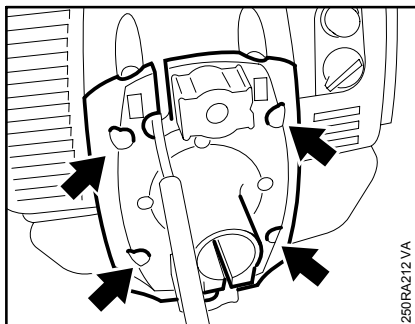
- Take rubber element (AV system) out of clutch housing - see 9.1.

FS 300...450

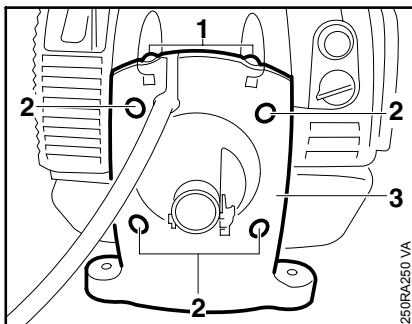
- Remove the control handle - see 10.1.
- Remove the throttle cable from the AV housing - see 9.2.



- Release the clamp screw.
- Pull the drive tube out of the clutch housing.



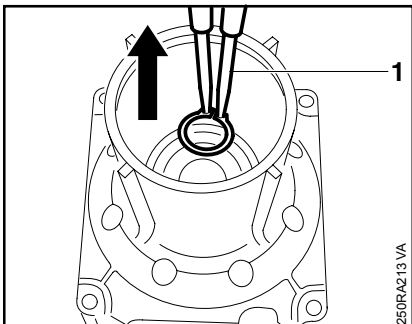
- Inspect rubber buffers, replace if necessary.
- Take out the screws.
- Pull off the clutch housing.



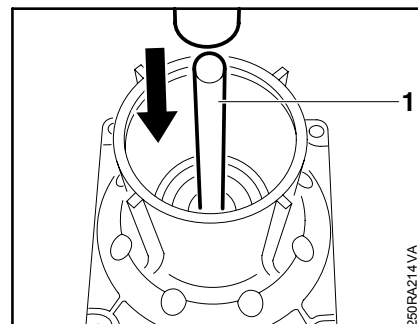
FR 350/450

- Remove the powerhead from the support frame - see 9.3.
- Remove screws (1) from the shroud.
- Remove screws (2) from the clutch housing (3).
- Take off the clutch housing.

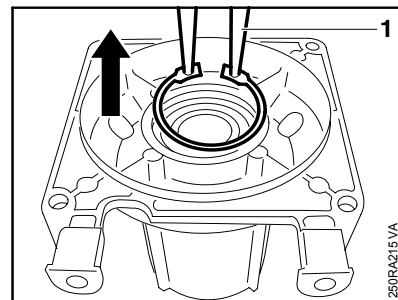
Illustrations show the FS 120/200 clutch housing.



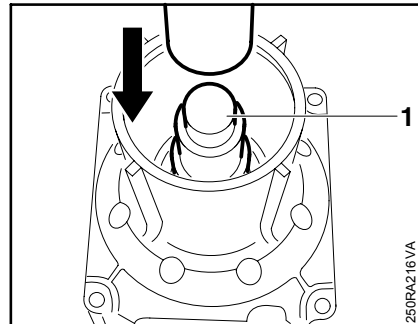
- Use pliers (1) 0816 610 1495 to remove retaining ring from the clutch drum stub.



- Use drift (1) 1108 893 4700 or 1110 893 4700 to press clutch drum out of ball bearing.



- Use pliers (1) 0811 641 8380 to take retaining ring out of clutch housing.

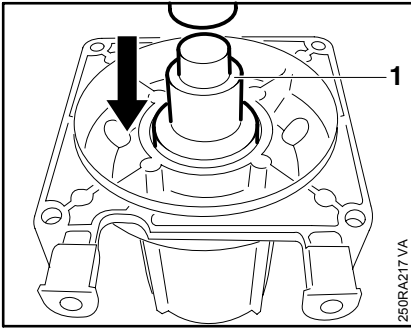


- Use press arbor (1) 1120 893 7200 to remove ball bearing from clutch housing.

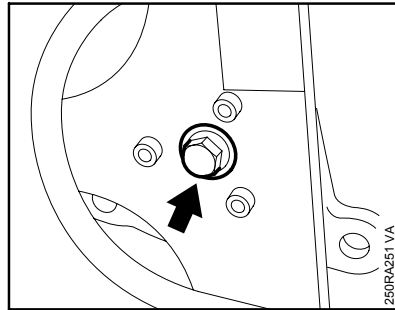
Install in the reverse sequence.

12. SUPPORT FRAME (FR 350/450)

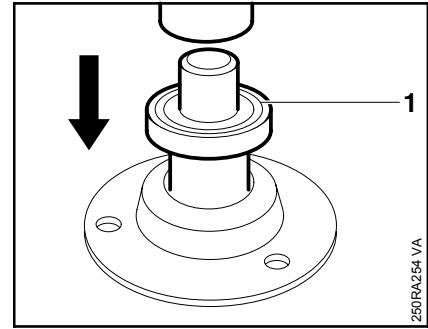
12.1 Repair



- Use press arbor (1) 1118 893 7200 to press home ball bearing as far as stop.

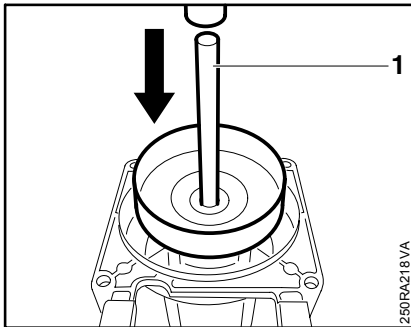


- Remove the powerhead from the support frame - see 9.3.
- Remove screw from support frame.

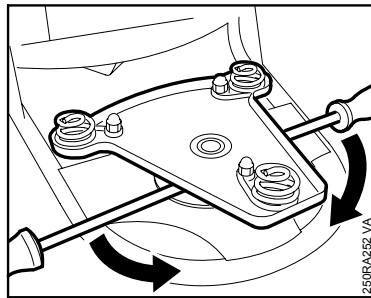


- Use press arbor (1) 1118 893 7200 to remove ball bearing from bearing housing.

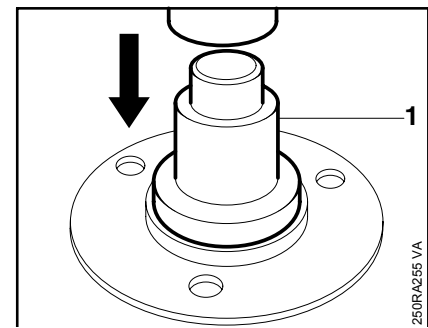
Reassemble in the reverse sequence.



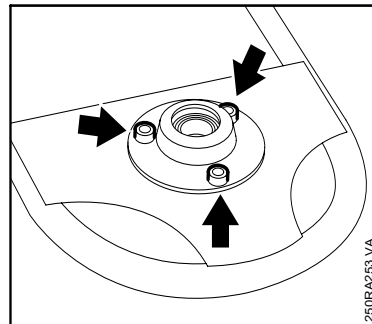
- Use drift (1) 1108 893 4700 or 1110 893 4700 to press home clutch drum as far as stop.
- On FS 300...450, adjust gap - see 9.2.
- Tighten down clutch housing mounting screws to 8.5 Nm (6.3 lbf.ft).
- On FS 120/200, tight down clutch housing mounting screws to 6.0 Nm (4.4 lbf.ft).



- Lever the support frame out of the ball bearing.



- Use press arbor (1) 1118 893 7200 to press home ball bearing as far as stop.
- Tighten down bearing housing mounting screws to 10.0 Nm (7.5 lbf.ft).
- Tighten down support frame mounting screw to 20.0 Nm (15 lbf.ft).



- Take out the screws.
- Remove bearing housing from support frame.

13. Special Servicing Tools and Aids
13.1 Special Servicing Tools

No.	Part Name	Part No.	Application	Rem.
1	Locking strip for piston	0000 893 5903	Blocking crankshaft	1) 2)
2	Locking strip for piston	4221 893 5900	Blocking crankshaft	2) 3)
3	Press sleeve	4112 893 2401	Fitting oil seal (starter side)	
4	Press sleeve	1118 893 2401	Fitting oil seal (clutch side)	
5	Installing sleeve	4112 893 2400	Protecting oil seal (clutch side)	
6	Puller	5910 890 4400	Removing oil seals	4)
7	- Jaws (No. 3.1 + 4)	0000 893 3706		
8	Puller	4133 893 0800	Removing flywheel	
9	Crimping tool	5910 890 8210	Attaching connectors to electrical wires	
10	Assembly drift	1110 893 4700	Removing and fitting piston pin Removing and installing clutch drum	2) 3)
11	Clamping strap	0000 893 2600	Compressing piston rings	
12	Wooden assembly block	1108 893 4800	Fitting piston	
13	Carburetor and crankcase tester	1106 850 2905	Testing carburetor for leaks	
14	Vacuum pump	0000 850 3501	Testing crankcase for leaks	
15	- Nipple	0000 855 9200		
16	- Fuel hose	1110 141 8600		
17	Sealing plate	0000 855 8106	Sealing exhaust port for leakage test	
18	Test flange	1128 850 4200	For leakage test	
19	Setting gauge	1127 890 6400	Setting air gap between ignition module and flywheel	
20	Socket, 13 mm	5910 893 5608	Clutch and flywheel nut, decompression valve	
21	Torque wrench	5910 890 0301	0.5 - 18 Nm (0.4 - 13.5 lbf.ft)	5)
		5910 890 0302		6)
22	Torque wrench	5910 890 0311	6 - 80 Nm (4.4 - 60 lbf.ft)	5)
		5910 890 0312		6)
23	Spline screw socket T27x125	0812 542 2104	IS screws	
24	Hook	5910 893 8800	Removing pickup bodies	
25	Installing tool	5910 890 2210	Installing hookless snap rings in piston	
26	Press arbor	4119 893 7200	Removing and installing ball bearings	
27	Service tool ZS	5910 890 2220	Removing crankshaft	
28	- Sleeve (4x)	1123 851 8300		1) 2)
29	- Extension	4116 894 1000		1) 2)
30	- Spline screw	9022 341 1190		1) 2)
31	Puller	4119 890 4600	Removing crankshaft (clutch side)	

No.	Part Name	Part No.	Application	Rem.
32	Installing tool	5910 890 2202	Installing crankshaft	
33	Installing tool	4126 893 4900	Removing rubber element from AV sleeve	
34	Circlip pliers	0816 610 1495	External circlip on clutch drum	
35	Pliers C19	0811 641 8380	Internal circlip in clutch housing	
36	T-handle screwdriver QI-T27x150	5910 890 2400	For all IS screws	7)
37	Screwdriver T20x100	5910 890 2301	Separating handle moldings	
38	Assembly drift	1108 893 4700	Removing and installing clutch drum	1) 2)
39	Vice jaws	5910 893 2700	Holding drive tube and bike handle	
40	Press arbor	1120 893 7200	Removing ball bearing in clutch housing	
41	Press arbor	1118 893 7200	Installing ball bearing in clutch housing, removing and installing ball bearing in bearing housing (support frame)	2)
42	Assembly stand	5910 890 3100	Holding FS and FR units	
43	- Clamp	5910 890 8800	Holds drive tube of FS units for repairs (in conjunction with assembly stand)	
44	- Clamping plate	5910 890 2101	Holds powerhead of FS and FR units for repairs (in conjunction with assembly stand)	

Remarks:

- 1) FS 120...350
- 2) FR 350/450
- 3) FS 400/450
- 4) Equivalent to puller 0000 890 4400, but with longer spindle 5910 890 8400.
- 5) Always use torque wrench to tighten DG/P screws.
- 6) Wrench has optical/acoustic signal.
- 7) On DG/P screws, use for releasing only.

13.2 Servicing Aids

No.	Part Name	Part No.	Application
1	Lubricating grease (225 g/0.79 oz tube)	0781 120 1111	Oil seals
2	Standard commercial, solvent-based degreasant containing no chlorinated or halogenated hydrocarbons		Cleaning crankshaft stub
3	STIHL special lubricant	0781 417 1315	Bearing bore in rope rotor, rewind spring in rope rotor
4	Ignition lead HTR (10 m/33')	0000 930 2251	
5	Dirko sealant (100 g/3 1/2 oz tube)	0783 830 2120	Crankcase sealing faces
6	STIHL gear lubricant - 80 g/3 oz tube: - 225 g/8 oz tube:	0781 120 1109 0781 120 1110	Drive shaft and clamp screw on bike handle
7	STIHL gear lubricant - 80 g/3 oz tube: - 225 g/8 oz tube:	0781 120 1117 0781 120 1118	Gearhead lubrication

