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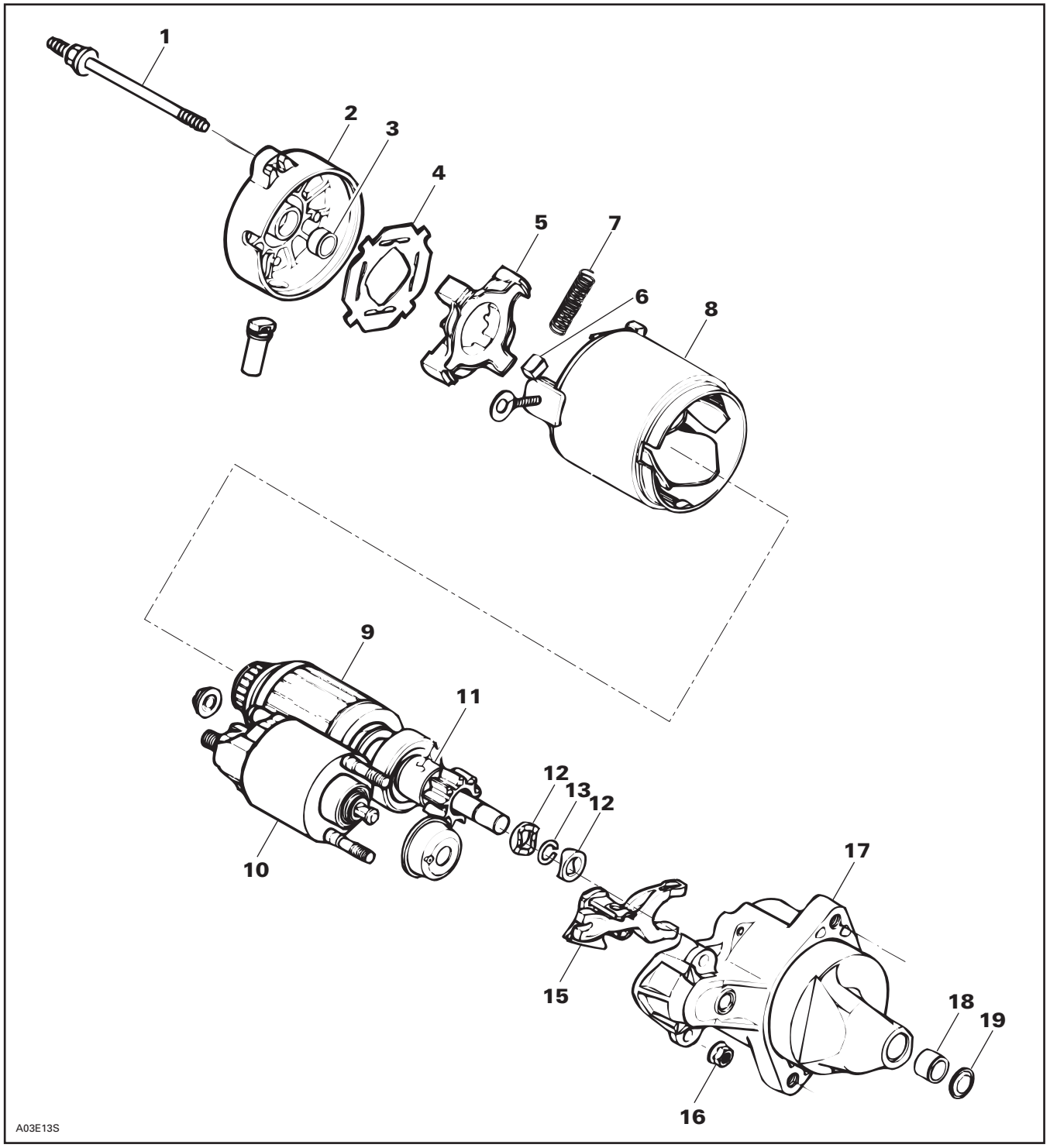
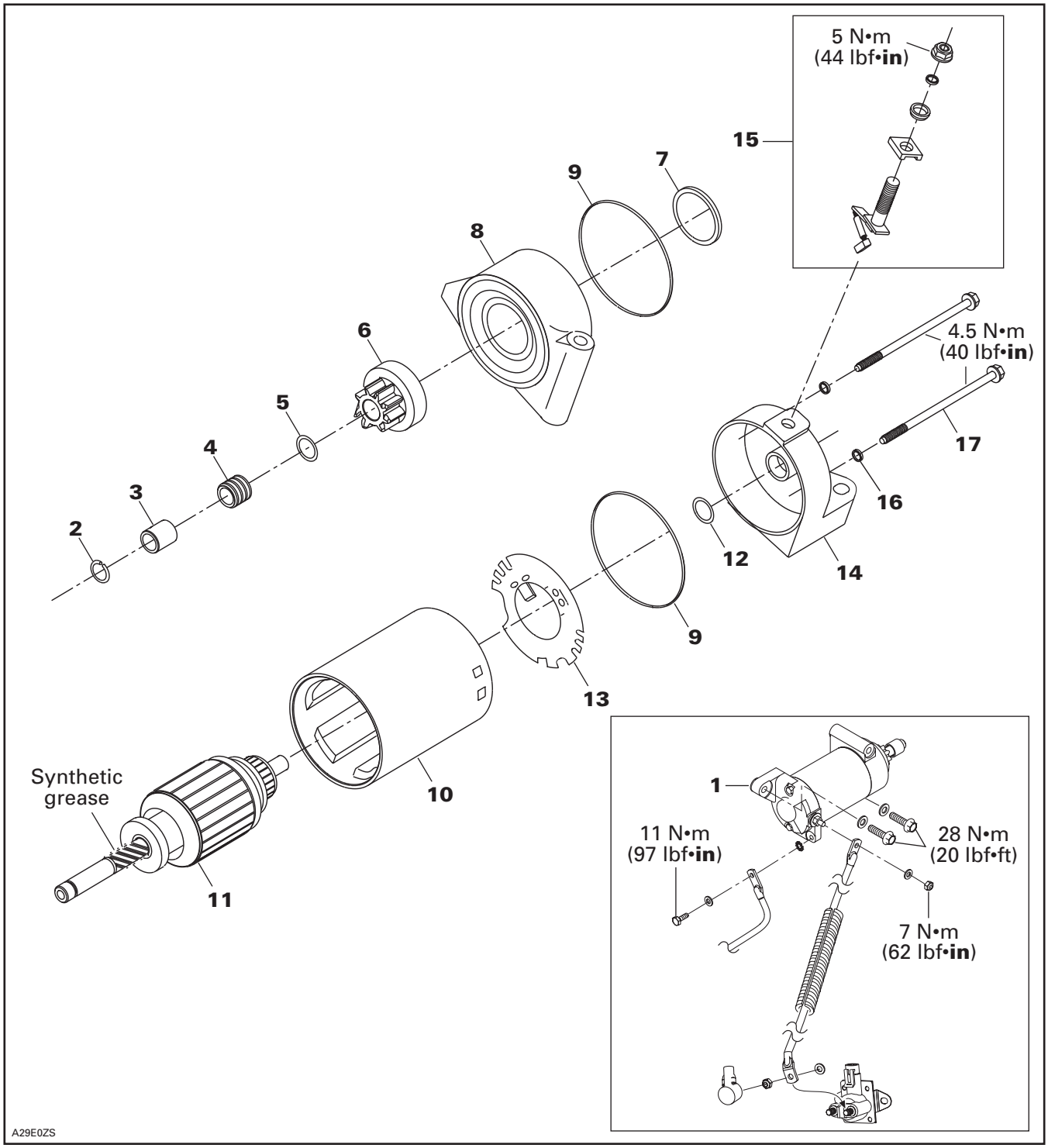
ELECTRIC STARTER

Skandic WT/SWT/LT E



Skandic WT LC/SUV



REMOVAL

Skandic WT/SWT/LT E

– Disconnect BLACK ground cable from battery.
– Disconnect RED positive cable from battery.

⚠ WARNING

Always disconnect ground cable first and connect last.

– Disconnect RED cable and RED/GREEN wire from starter solenoid switch.
– Remove starter from engine.

Skandic WT/LC/SUV

– Disconnect BLACK ground cable from battery.
– Disconnect RED positive cable from battery.

⚠ WARNING

Always disconnect ground cable first and connect last.

– Remove tuned pipe.
– Disconnect RED cable from starter.
– Disconnect ground cable from starter.
– Unbolt and remove starter from engine.

DISASSEMBLY

Skandic WT/SWT/LT E

Disconnect bare wire linking starter and solenoid.

Remove nuts **no. 16** then solenoid switch **no. 10** by lifting and pulling to disengage from drive lever **no. 15**.

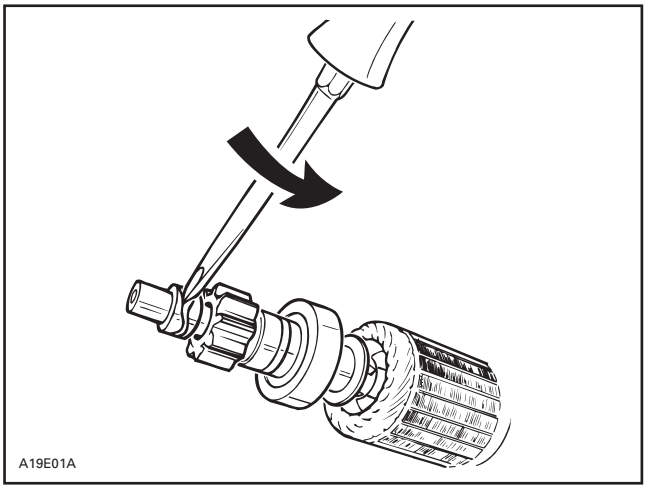
Unscrew starter screws (long) **no. 1** then pull yoke **no. 8** with end frame **no. 2** to separate from drive housing **no. 17**.

Pull armature **no. 9** with drive lever **no. 15**.

Remove insulator **no. 4** then brush springs **no. 7** being careful not to lose them since they will be projected out.

Pull brush holder **no. 5** from yoke **no. 8**.

Insert blade of a small screwdriver between stop collars.



Twist screwdriver to separate stop collars **no. 12** thus giving access to circlip **no. 13**.

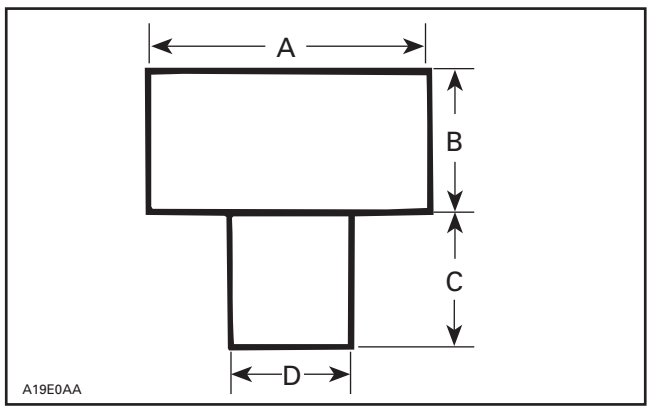
Remove outer collar, circlip then inner collar.

Remove overrunning clutch **no. 11**.

Check the wear on bushing **no. 18** by measuring the amount of radial play between the armature shaft and the bushing.

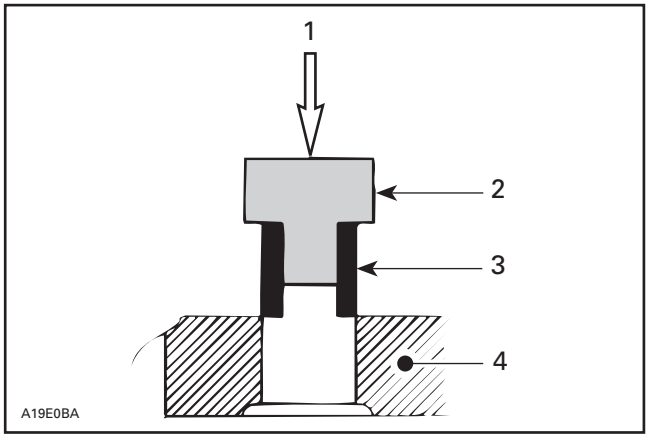
The radial play should not exceed 0.20 mm (.008 in). If greater, replace the bushing. To replace, press out the old one toward bushing cover and press in a new one with a bushing pusher. The correct size of the bushing pusher to use is given on next illustration.

CAUTION: Support drive housing adequately to prevent damage when pressing bushing.



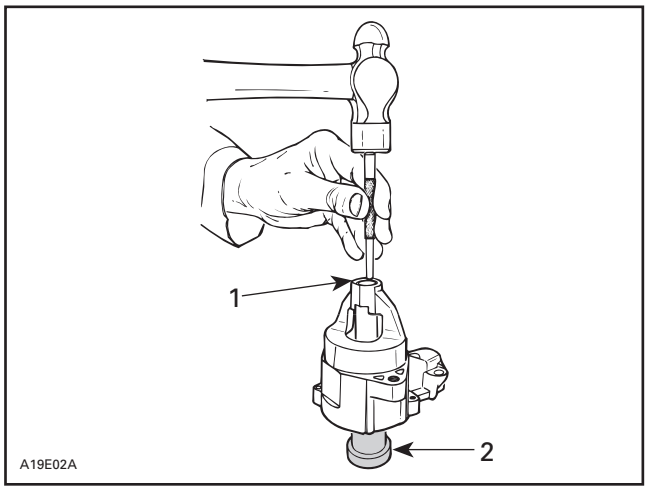
BUSHING PUSHER

A. 16 mm (5/8 in) diameter
B. 13 mm (1/2 in)
C. 11 mm (7/16 in)
D. 11.0 mm (.433 in)



1. Press-in
2. Bushing pusher
3. Bushing
4. Drive housing

Install bushing cover **no. 19** then, using a punch, stake bushing cover in place.



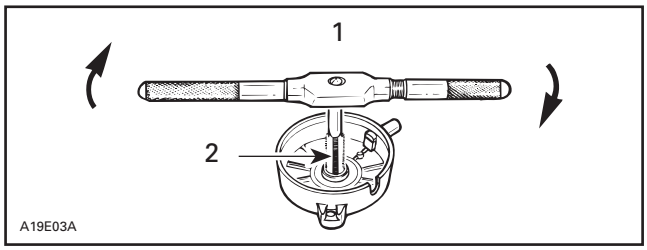
1. Stake bushing cover
2. Support

3, Bushing (end frame)

Check the wear on bushing **no. 3** by measuring the amount of radial play between the armature shaft and the bushing.

The radial play should not exceed 0.20 mm (.008 in). If greater, replace bushing as follows:

Using a 12 mm tap, cut threads into bushing so that the tap contacts the end frame. Continue to rotate tap until the bushing comes free.



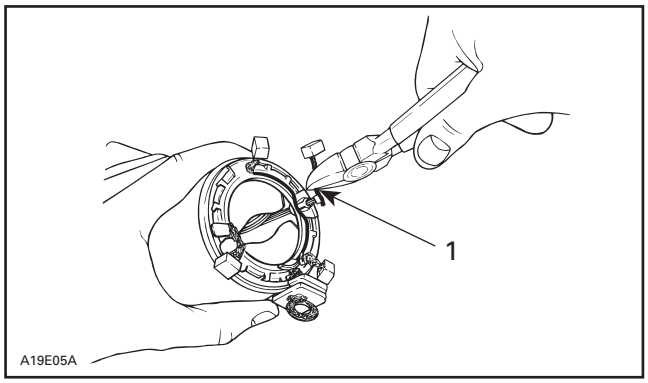
1. Turn until bushing goes out
2. 12 mm tap

To install new bushing, use the same bushing pusher as for drive housing bushing installation.

6, Brush

To replace brush **no. 6**, proceed as follows:

Cut brush wire close to connector at the welded portion.



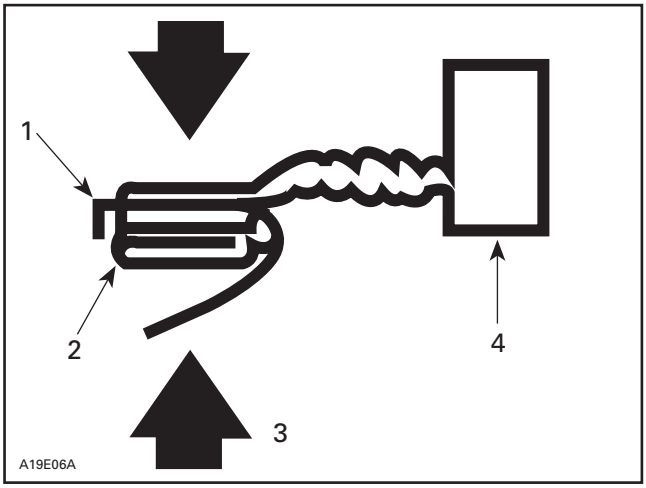
1. Cut close to connector

Remove burrs with a file on the remaining welded portion.

CAUTION: Be careful not to damage plastic portion of yoke.

Place spare brush plate edge against yoke connector edge (welded portion).

Crimp plate over yoke connector with a pair of pliers.



1. *Plate edge*
2. *Yoke connector*
3. *Crimp*
4. *Spare brush*

Solder the crimped portion.

CAUTION: Do not overheat and quickly perform soldering to prevent solder from flowing to the brush through the wire. Preferably use a heat sink.

Skandic WT/LC/SUV

Before disassembling, trace index marks on starter housing **no. 10** and starter housing assembly **no. 8** to ease further assembly.

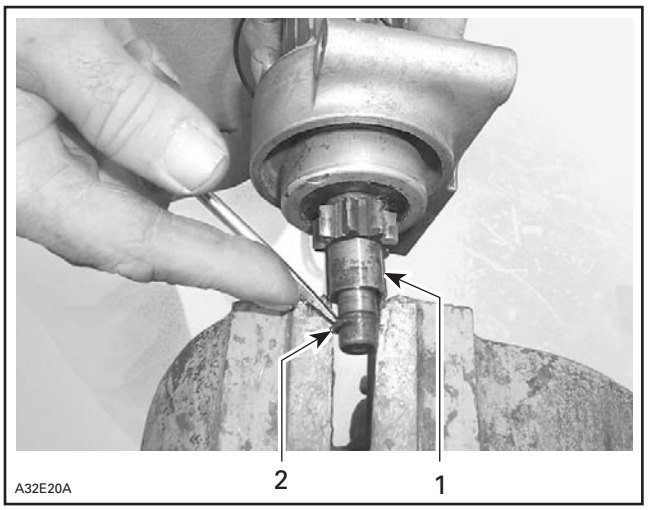
Remove starter through bolts **no. 17**. Separate end frame housing **no. 14** from starter housing **no. 10**. Withdraw starter housing from armature **no. 11**.

Brush holder **no. 13** can be removed from end frame housing **no. 14** by disconnecting the end frame attached brush from brush holder **no. 13**.

Check the radial play between the armature shaft and end frame bearing. Replace the end frame bearing or replace starter. If parts are in good condition then coat with synthetic grease (P/N 413 711 500) before reinstalling them.

Push back the collar **no. 3** using a screwdriver.

Remove snap ring **no. 2**. Remove collar **no. 3** and spring **no. 4**.



1. *Collar*
2. *Snap ring*

Turn starter clutch **no. 6** clockwise to remove it from armature assembly **no. 11**.

Pull housing from armature.

CLEANING AND INSPECTION

CLEANING

All Models

CAUTION: Armature starter yoke ass'y and drive unit assembly must not be immersed in cleaning solvent.

Clean brushes and holder with a clean cloth soaked in solvent. Brushes must be dried thoroughly with a clean cloth.

Blow brush holder clean using compressed air.

⚠ WARNING

Always wear safety goggles when using compressed air.

Remove dirt, oil or grease from commutator using a clean cloth soaked in suitable solvent. Dry well using a clean and dry cloth.

Clean engine starter gear teeth and drive unit (clutch).

NOTE: Bushings must not be cleaned with grease dissolving agents.

Immerse all metal components in cleaning solution. Dry using a clean and dry cloth.

INSPECTION

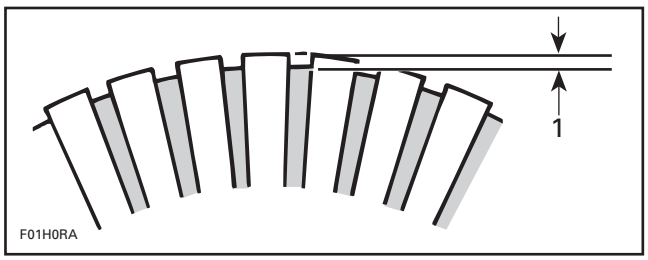
Armature

All Models

NOTE: An ohmmeter may be used for the following testing procedures, except for the one concerning the shorted windings in the armature.

Check the commutator for roughness, burnt or scored surface. If necessary, turn the commutator on a lathe, enough to remove grime only.

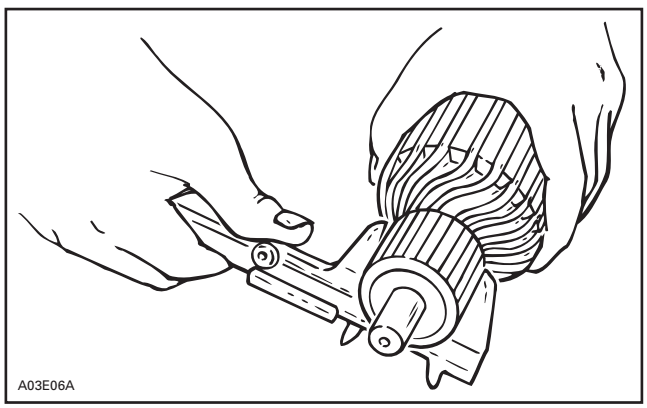
Check the commutator for mica depth. If the depth is less than 0.20 mm (.008 in), undercut the mica. Be sure that no burrs are left and no copper dust remains between the segments after the undercutting operation is completed.



1. Commutator undercut 0.20 mm (.008 in)

Check the commutator out-of-round condition with V Blocks and an indicator. If the commutator out-of-round is more than 0.40 mm (.016 in), the commutator should be turned on a lathe.

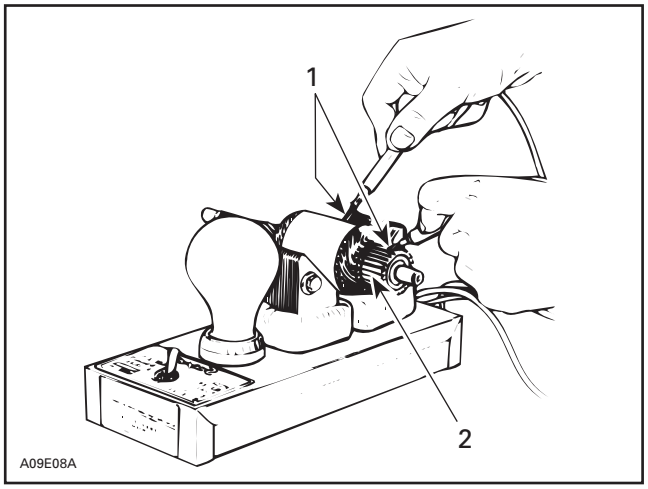
Check commutator outer diameter. If less than specified value, replace.



MODEL	WEAR LIMIT
All	27 mm (1.063 in)

Test for Ground Circuit in the Armature

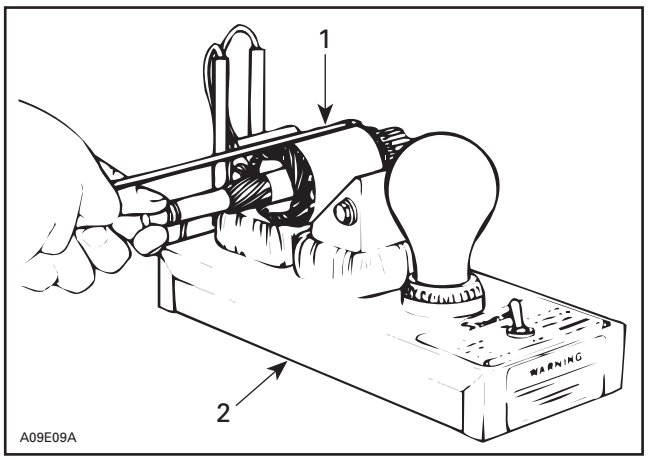
Use growler test probes. Check between armature core and the commutator bars. If growler lamp turns on, bars are grounded. If so, replace armature.



1. Test probes
2. Commutator bars

Test Armature for Shorted Winding

When the armature is rotated in the growler with a steel strip (hacksaw blade) held above it, the strip will vibrate over that area of the armature which has short circuit. Replace armature if so.



1. Steel strip (hack-saw blade)
2. Growler

Test the Armature for Open Circuit

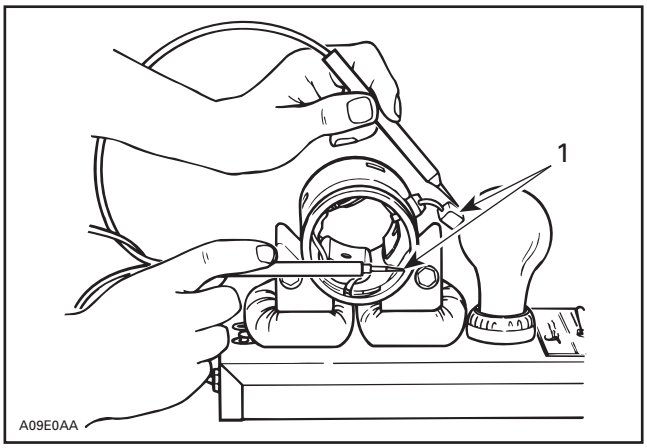
Use growler test probes. Place one test probe on a commutator bar and the other test probe on the neighboring bar. Repeat this operation for all bars, moving one test probe at a time. If the growler lamp does not turn on, the armature circuit between these 2 bars is opened. The armature should be replaced or repaired; open circuits most often occur at the commutator riser where coils are soldered. (Burnt commutator bars are usually an indication of an open-circuit armature coil).

Field Windings and Brushes

Skandic WT/SWT/LT E

Test the Field Winding for Open Circuit

Use growler test probes. Place one test probe on the negative brush and the other test probe on the yoke. If growler lamp does not turn on, the field winding has an open-circuit. The yoke has to be repaired or replaced.



1. Test probes

Check the dynamic brake winding for open circuit by placing one test probe on the positive brush and the other probe on the negative brush.

If growler lamp does not turn on, the winding circuit is open-circuit and the yoke has to be repaired or replaced.

Brush Holder

All Models

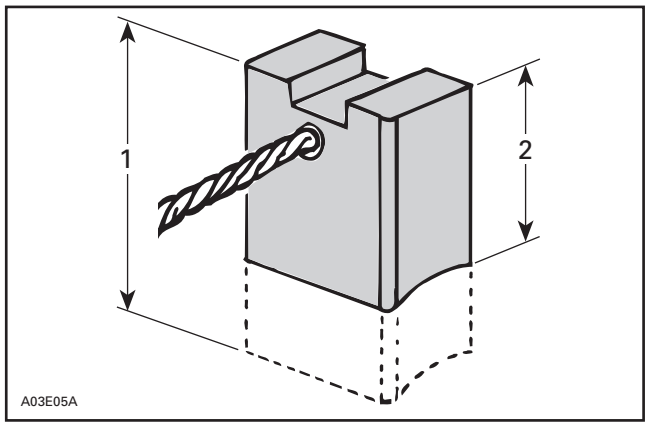
Check the brush holder for insulation using growler test probes. Place one test probe on the insulated brush holder and the other test probe on the brush holder plate. If the growler lamp turns on, the brush holder has to be repaired or replaced.

Brush Length

All Models

Measure brush length. If less than the specified value, replace them.

MODEL	LENGTH	
	NEW	WEAR LIMIT
All	10 mm (.400 in)	6 mm (.236 in)

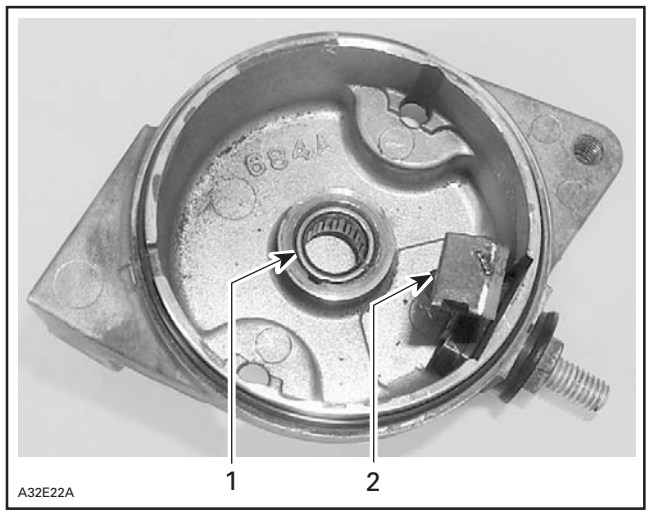


TYPICAL
1. New
2. Wear limit

End Housing

Skandic WT/LC/SUV

Check the mica insulation of the positive brush and also the roller bearing condition. Replace, if required.



1. Roller bearing
2. Positive brush

Overrunning Clutch

All Models

The pinion of the overrunning clutch should turn smoothly in a clockwise direction, and should not slip in a counterclockwise direction. If defective, replace.

Check the pinion teeth for wear and damage. If defective, replace.

SOLENOID SWITCH

Inspect connections and clean as necessary. Solenoid switch condition can be checked with an ohmmeter. Install test probes on **large** connectors of solenoid when it is activated (+ on RED/GREEN wire and – on solenoid body for the fan cooled models and – on the black wire for liquid cooled models).

IMPORTANT: No current must be present on large cables when using ohmmeter, otherwise meter could be damaged.

ASSEMBLY

Skandic WT/SWT/LT E

Prior to assembling, coat sliding surfaces and moving parts on armature shaft splines, overrunning clutch, solenoid switch plunger, drive lever and bushings with synthetic grease (P/N 413 711 500).

Proceed as follows for assembling.

Secure drive housing in a vise.

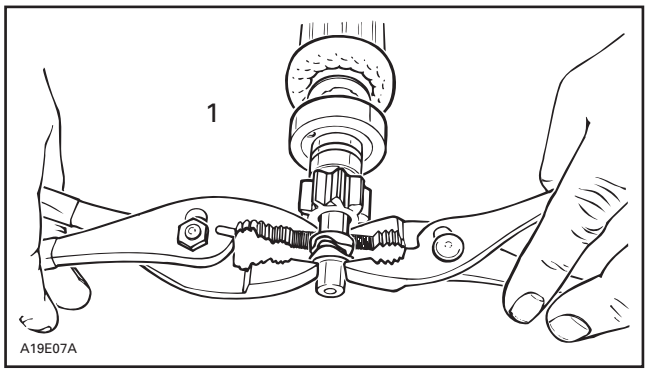
CAUTION: Do not overtighten since housing might be damaged.

Install overrunning clutch onto armature shaft. Insert **inner** collar onto shaft. Install a new circlip.

CAUTION: Always install a new circlip when servicing.

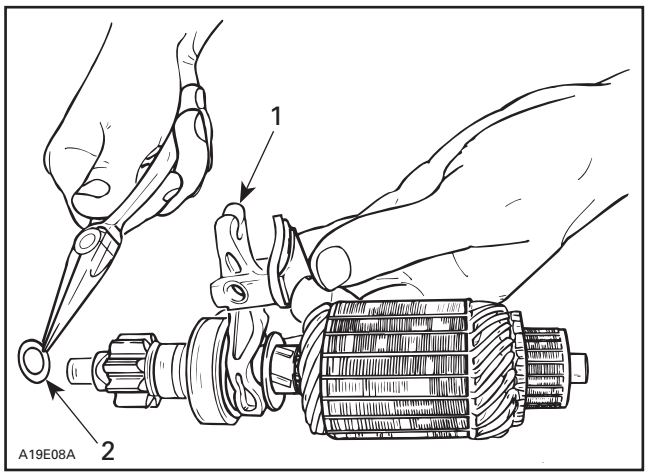
Insert **outer** collar being careful to match protrusions with notches of collars.

Using a pair of pliers on each side of stop collars, squeeze evenly until collars sit over circlip.



1. Squeeze evenly

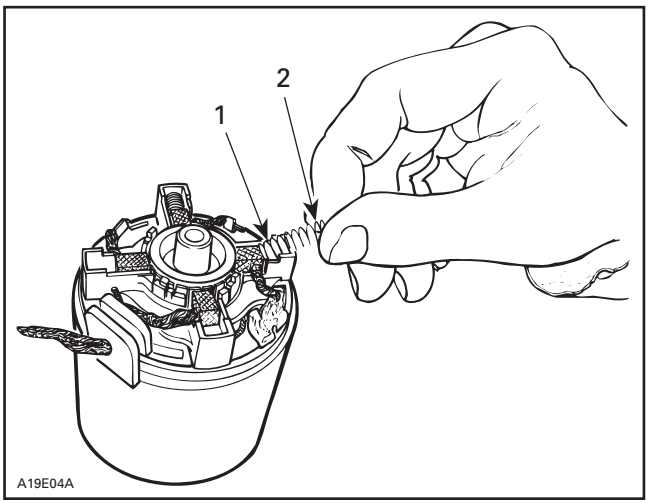
Install thrust washer against outer stop collar. Place drive lever onto overrunning clutch then insert into drive housing.



1. Install on overrunning clutch
2. Install thrust washer

Slide yoke over armature.

Install brush holder then brushes in their housings. Insert springs as follows: place one end of spring against brush, compress, then push the other end of spring onto its housing. Repeat for remaining springs.



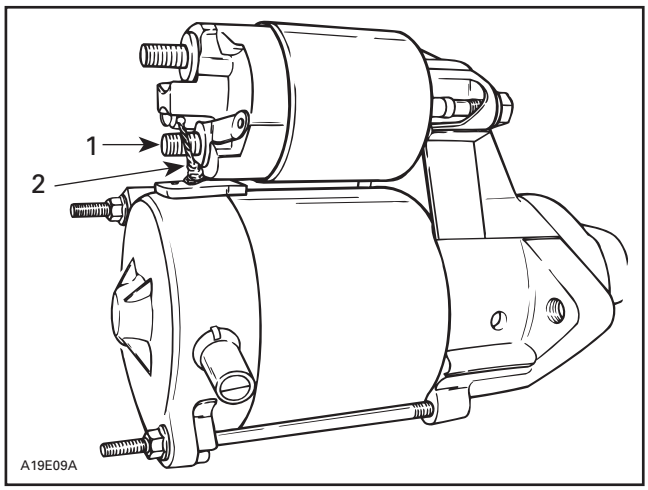
1. This end first
2. Push this end to complete

Secure insulator over brushes and springs. Properly install end frame and tighten screws.

Insert solenoid plunger inside of drive lever fork and secure to drive housing.

Connect starter bare wire to solenoid.

NOTE: Connect this wire on the **shorter** solenoid stud.



1. Shorter stud
2. Bare wire

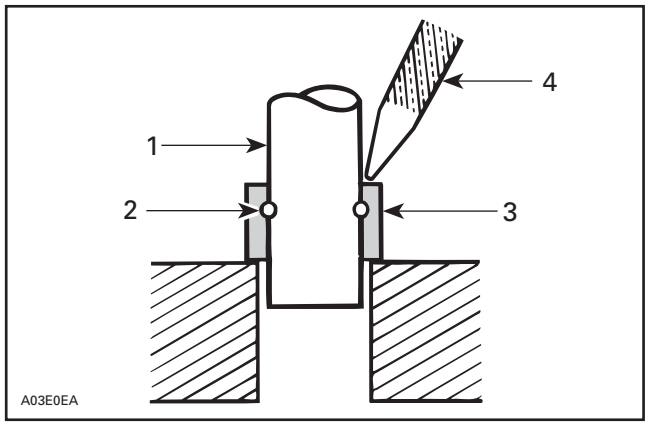
Skandic WT/LC/SUV

Reverse the order of disassembly to reassemble starter. However, attention should be paid to the following operations.

Prior to assembling, coat sliding surfaces on armature shaft splines, overrunning clutch, bushing and roller bearing with synthetic grease (P/N 413 711 500).

After placing collar **no. 3** on armature shaft **no. 11**, fit new snap ring **no. 2** on armature shaft, then make sure that it is properly secured.

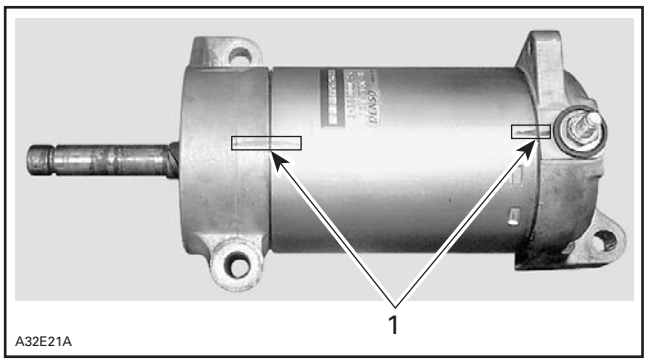
Slide collar **no. 3** over snap ring **no. 2** and secure in place by punching it at two or three places.



1. Armature shaft
2. Snap ring
3. Collar
4. Punch

Starter Housing Assembly and Starter Housing

Align previously traced indexing marks.

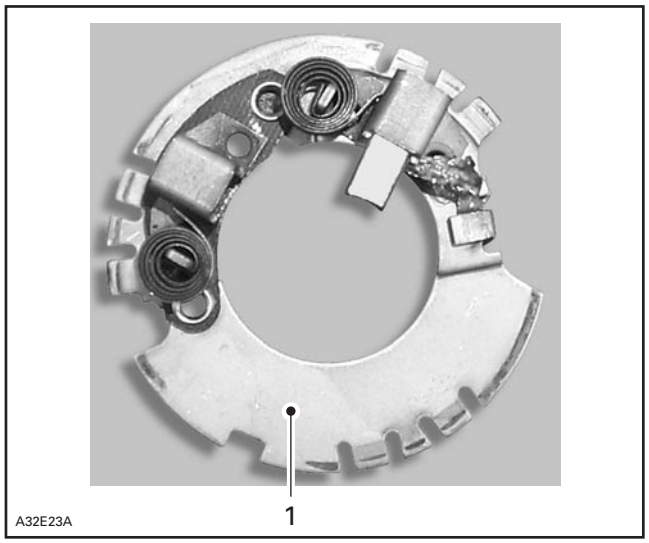


TYPICAL

1. Aligned indexing marks

Open brushes and slide over commutator.

Align end frame locating notch with yoke locating protrusion and properly sit brush holder no. 13 into housing no. 14.



1. Brush holder

To ease end frame installation, retain brush holder with a small screwdriver while installing armature assembly.

CAUTION: Make sure to place two end housings on a flat surface before tightening the through bolts.

CAUTION: Make sure end frame fits perfectly on yoke.

INSTALLATION

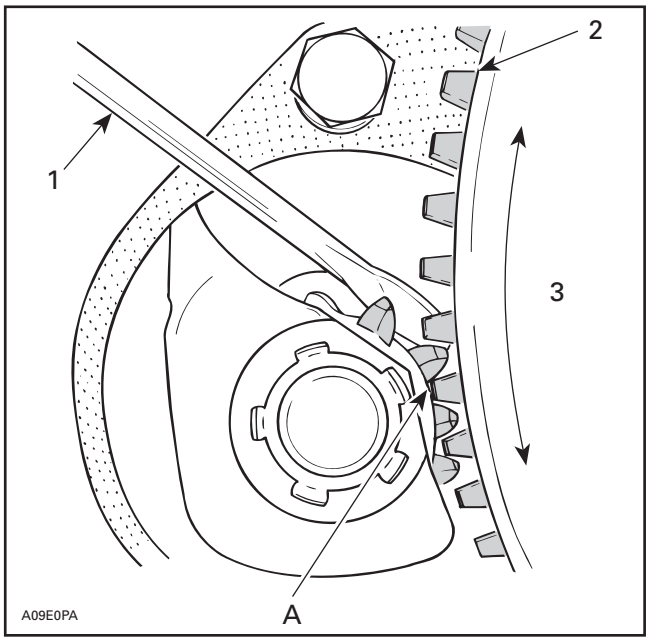
Skandic WT/SWT/LT E

Make sure that starter and engine mating surfaces are free of grime. Serious trouble may arise if starter is not properly aligned.

Install starter.

NOTE: Check proper engaging depth of starter pinion teeth to ring gear teeth (see illustration). Install hardened washers (P/N 503 007 900) between engine and starter supports accordingly.

CAUTION: All starter bracket fasteners must be secured with Loctite 271 (P/N 293 800 005).



1. Screwdriver pulling starter pinion
2. Ring gear
3. No excessive backlash
A. 0.5 to 1.5 mm (.020 to .060 in)

Connect the RED battery cable and the RED wire to the large terminal of the solenoid. Connect RED/GREEN wire to small terminal of solenoid.

Connect BLACK cable to battery.

⚠ WARNING

Always disconnect ground cable first and connect last.

Skandic LC/SUV

– Use new teflon washers on the 3 bolts retaining starter to engine.
– Torque the bolts to 28 ± 1 N•m (20 ± 1 lbf•ft).
– Make sure that starter and engine mating surfaces are free of grime. Serious trouble may arise if starter is not properly aligned.
– Connect the RED battery cable and the RED wire to the large terminal of the starter.
– Torque large terminal nut to 7 N•m (62 lbf•**in**).

⚠ WARNING

Always disconnect ground cable first and connect last.

– Connect ground cable to the starter with star washer in between.
– Torque ground cable connecting bolt to 11 N•m (97 lbf•**in**).

TESTING PROCEDURE

GENERAL

The following chart gives the engine types with their implemented system.

ENGINE TYPE	IGNITION SYSTEM	CHARGING SYSTEM OUTPUT
277 on Tundra R	① RER dual trigger coil CDI (single cylinder)	240
503 on Skandic WT/SWT	② Ducati trigger coil CDI	240
443 on Skandic LT/LT E	③ RER dual trigger coil CDI (twin cylinder)	240
593 on Skandic WT LC/ SUV	④ Nippondenso trigger coil CDI	290

CDI System Identification

① RER Dual Trigger Coil CDI (single cylinder)

The RER dual trigger coil CDI system has an ignition coil integrated to the MPEM which is mounted on air silencer.

MPEM is programmed to recognize a signal sent by the switch located on snowmobile console.

When switch is activated, MPEM cuts off ignition and engine rev drops at approximately 700 RPM for 277 engine (Tundra R).

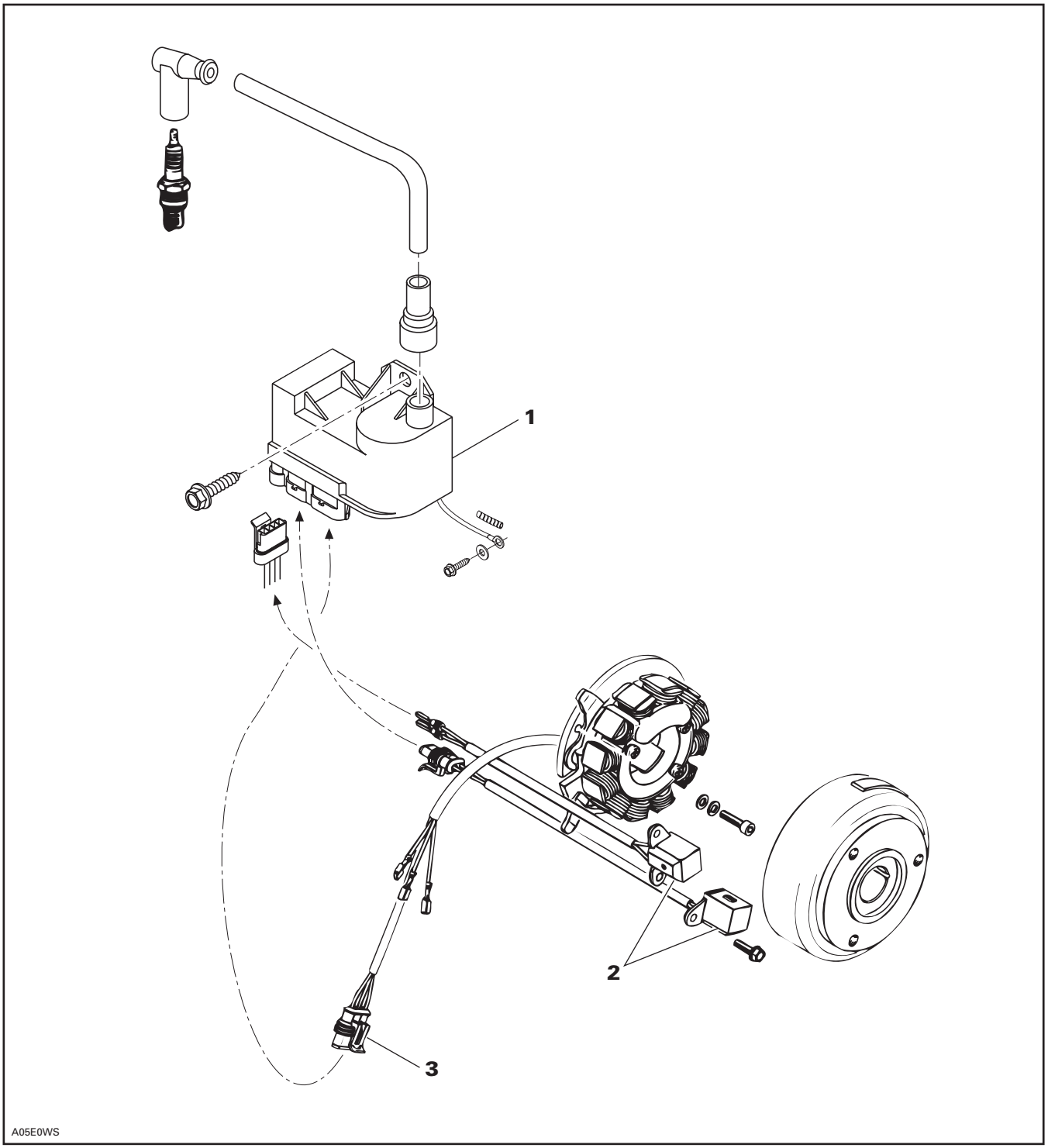
MPEM fires a spark at a great advance creating a thrust which reverses engine rotation.

Second trigger coil located on crankcase takes over to produce spark in reverse rotation.

A safety device is incorporated to MPEM preventing it from reading any signal coming from reverse switch at following engine revs.

Below 800 RPM and above 3500 RPM = no reverse signal.

MPEM is connected to a single ignition generator coil via a 3-connector housing (BLACK and RED wires).



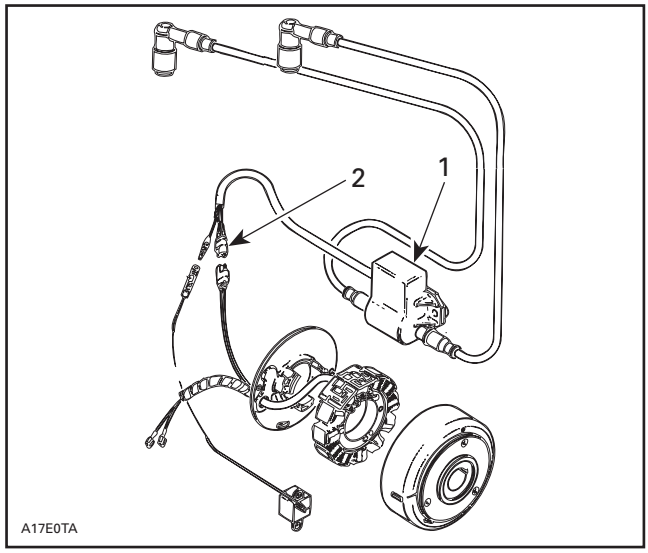
① *RER DUAL TRIGGER COIL CDI SYSTEM (SINGLE CYLINDER)*

1. *MPEM*
2. *Trigger coils*
3. *4-DB housing (BLACK and RED wires)*

② Ducati Trigger Coil CDI

The DUCATI trigger coil CDI system has a combined ignition module/ignition coil which is mounted on air silencer, below carburetors.

Ignition module is connected to the ignition generator coil via a 4-connector housing (GREEN and WHITE wires).



② *DUCATI TRIGGER COIL CDI SYSTEM*

1. *Combined ignition module/ignition coil mounted on air silencer below carburetors*
2. *4-connector housing (GREEN and WHITE wires)*

③ RER Dual Trigger Coil CDI (twin cylinder)

The RER dual trigger coil CDI system has an ignition coil integrated to the MPEM which is mounted on oil reservoir.

MPEM is connected to a single ignition generator coil via a 3-connector housing (BLACK and RED wires).

MPEM is programmed to recognize a signal sent by the switch located on snowmobile console.

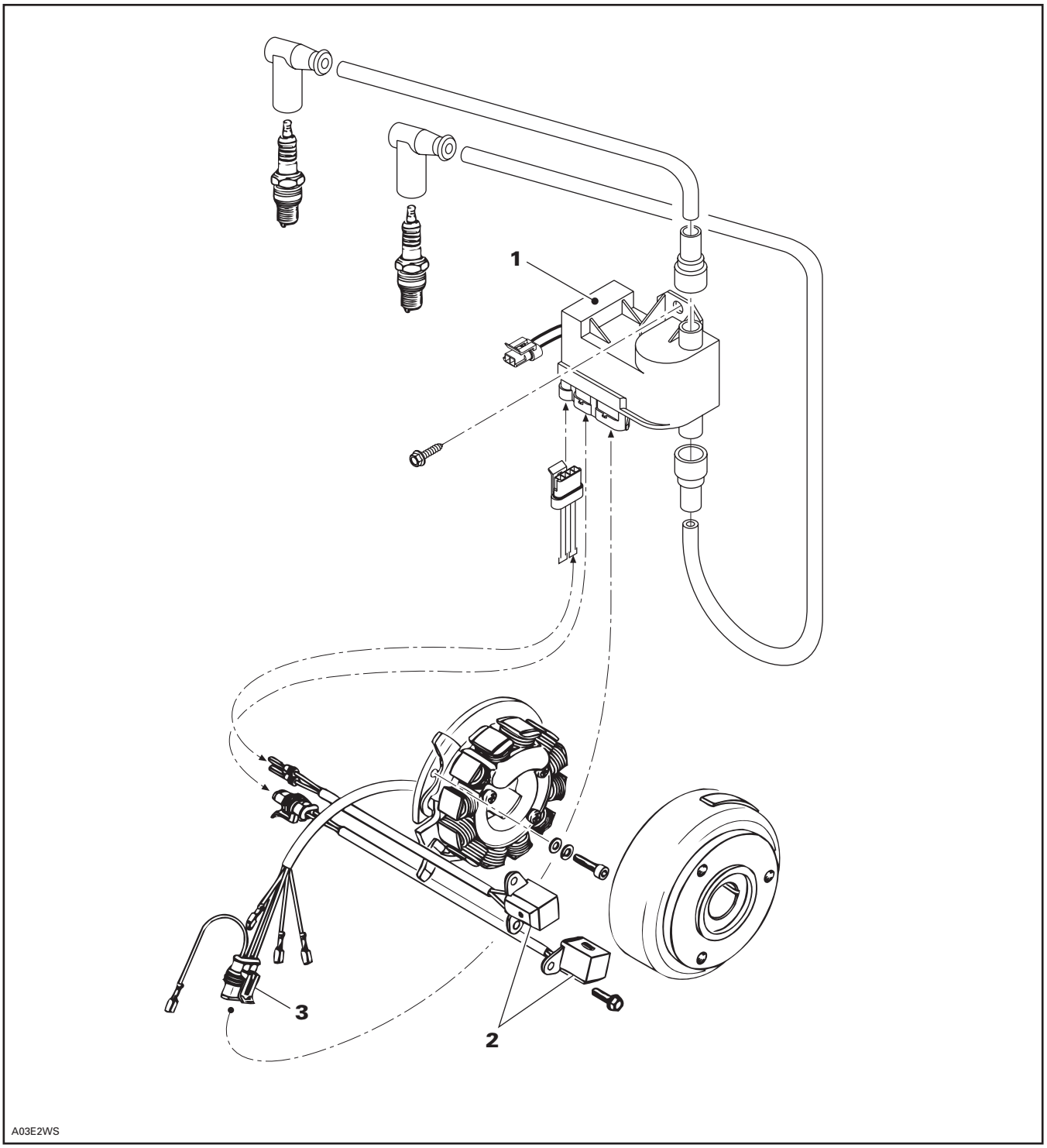
When switch is activated, MPEM cuts off ignition and engine rev drops at approximately 450 RPM.

MPEM fires a spark at a great advance creating a thrust which reverses engine rotation.

Second trigger coil located on crankcase takes over to produce spark in reverse rotation.

A safety device is incorporated to MPEM preventing it from reading any signal coming from reverse switch at following engine revs.

Below 1000 RPM and above 3500 RPM = no reverse signal.



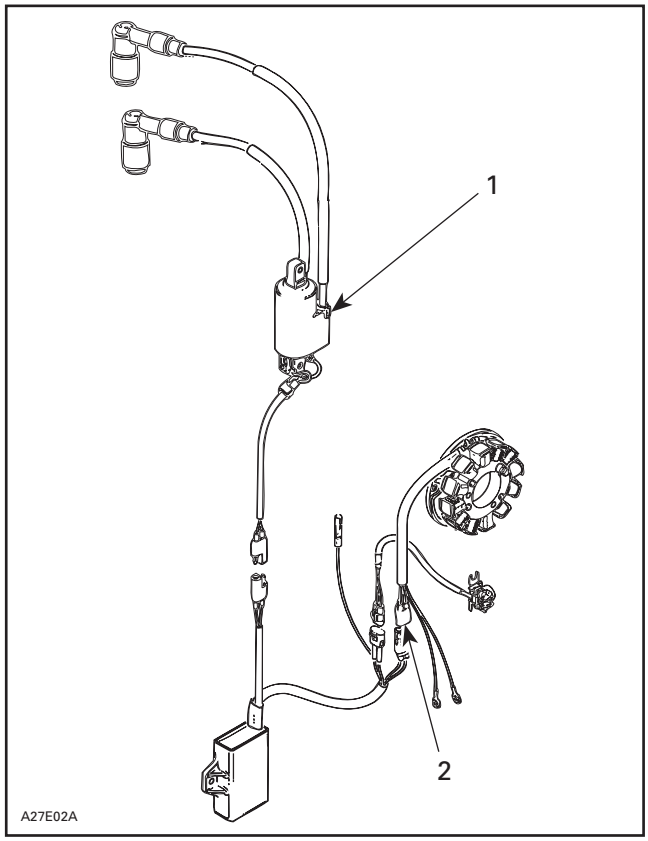
③ *RER DUAL TRIGGER COIL CDI SYSTEM (TWIN CYLINDER)*

1. *MPEM*
2. *Trigger coils*
3. *3-connector housing (BLACK and RED wires)*

④ Nippondenso Trigger Coil CDI

The NIPPONDENSO CDI system has a separate ignition coil which is mounted on the reservoir support.

Ignition module is connected to the ignition generator coil via a 3-wire connector (RED, BLACK/RED and BLACK wires).



④ *NIPPONDENSO TRIGGER COIL CDI SYSTEM*

1. *Separate ignition coil mounted on reservoir support*
2. *Three-wire connector (RED, BLACK/RED and BLACK)*

Checking Calibration Program

Skandic WT LC/SUV Only

CAUTION: Do not interchange MPEM from a model to another. Even if the P/N stamped on the MPEM is the same, calibration program may be different. When ordering a new MPEM always refer to appropriate model *Parts Catalog*. The service P/N published in *Parts Catalogs* are the ones with the good calibration program according to model.

With Engine Running

If the below mentioned tool is not available start engine. Turn on programmer then enter password.

Increase engine speed to 2000 - 2500 RPM then follow the same procedure as WITH ENGINE STOPPED.

CAUTION: Engine must run till the end of the procedure.

When data are being transferred, you must rev the engine at 2000 - 2500 RPM and make sure connection between programmer and vehicle is good.

IMPORTANT: In following procedure each time ←**Trs** symbol appears, make sure to rev engine between 2000 and 2500 RPM.

Engine will misfire while vehicle information is being transferred from MPEM to programmer. If engine stalls, restart it, keep engine speed at 2000 - 2500 RPM and select no. 3 VEHICLE INFO again.

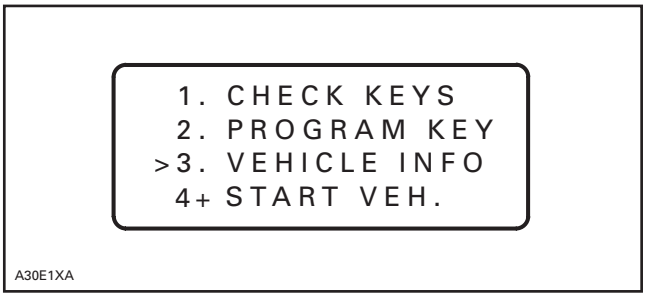
With Engine Stopped

Connect 9-volt adaptor (P/N 529 035 675) to MPEM.

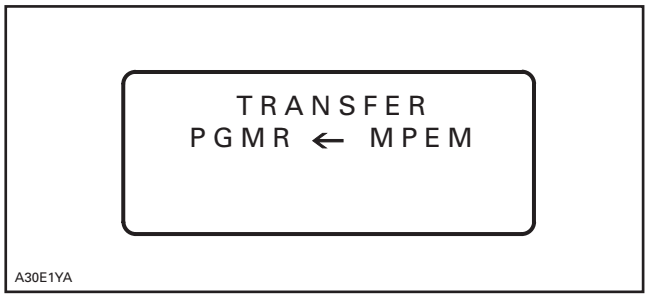
TYPICAL

Turn on programmer then enter password.

From main menu select no. 3. VEHICLE INFO; ←**Trs**.

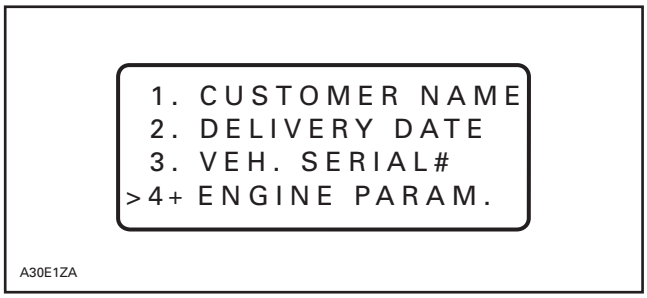


Vehicle information is transferred from MPEM to programmer.

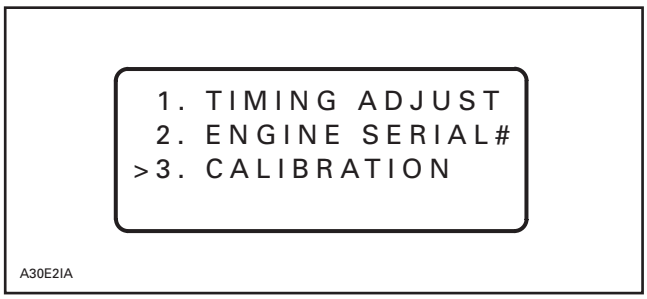


NOTE: In fact the programmer takes a **copy** of all vehicle parameters scribed in MPEM. This copy will be modified within the programmer then transferred to the MPEM.

Select no. 4. ENGINE PARAMETER.

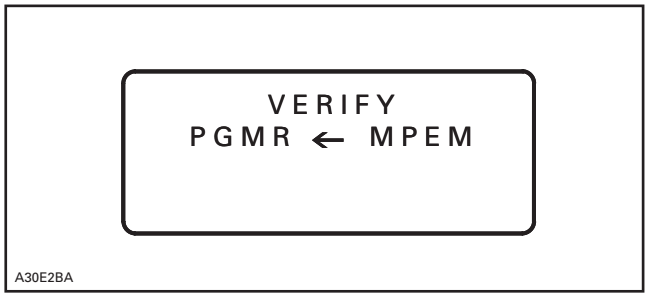


Select no. 3 CALIBRATION.

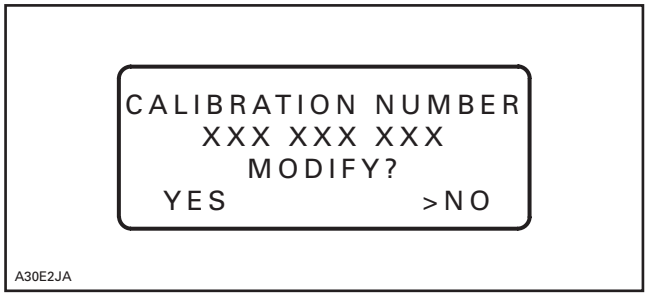


Press ENTER ←**Trs**.

Following screen appears temporarily:



And then following screen showing the actual calibration number in the MPEM.



Check for proper calibration number. See table below.

Select NO and press ENTER.

Press MENU twice; ←**Trs** then turn off programmer, unplug it from MPEM. Remove 9-volt adaptor.

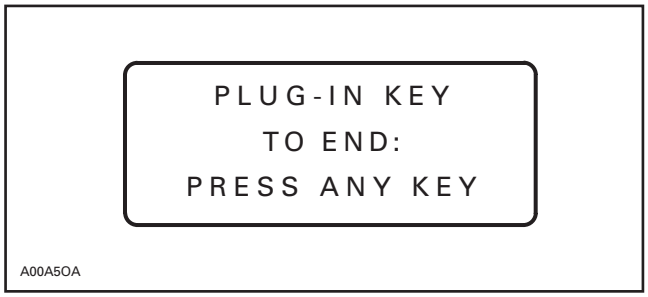
Stop engine when using WITH ENGINE RUNNING procedure.

MODEL	CALIBRATED MPEM P/N (hardware and software)	CALIBRATION PROGRAM NUMBER (software)	MPEM P/N (hardware)
Skandic WT LC/SUV	524 7879	524 7878	512 059 239

Changing MPEM Calibration Program

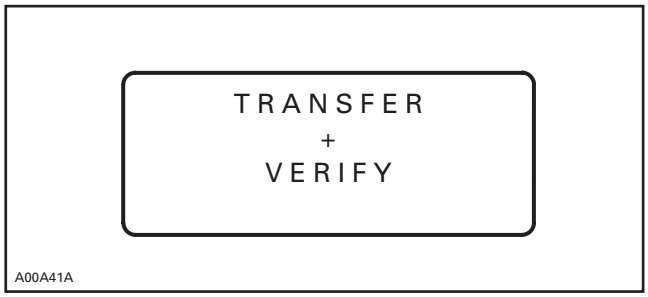
Proceed the same as for checking MPEM calibration but select YES to MODIFY? and press ENTER following screen appears:

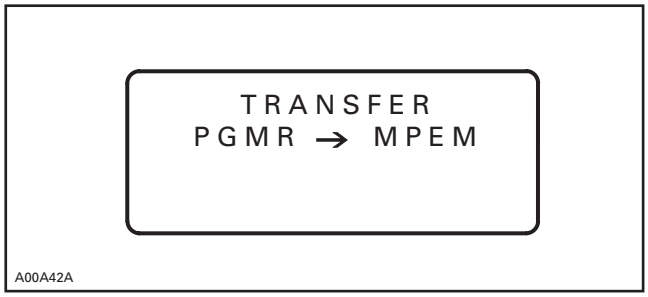
Enter new calibration number and press ENTER, following screen appears:

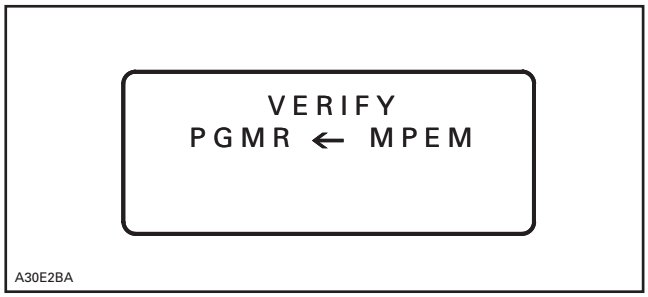


Simultaneously with the following operation a transfer will occur; ←**Trs**. At this point, be ready to rev the engine so it won't fall below the 2000 RPM mark when not using 9-volt adaptor.

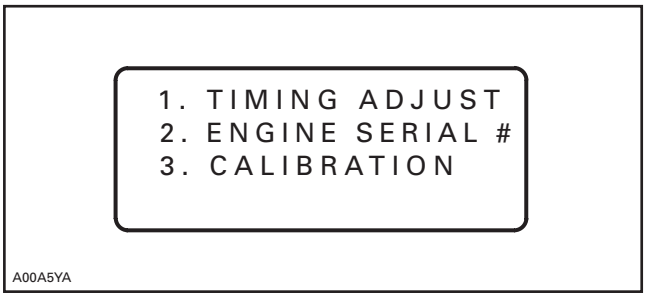
Plug-in the desired calibration cartridge (special red key) onto the programmer post, the following screens will appear temporarily:



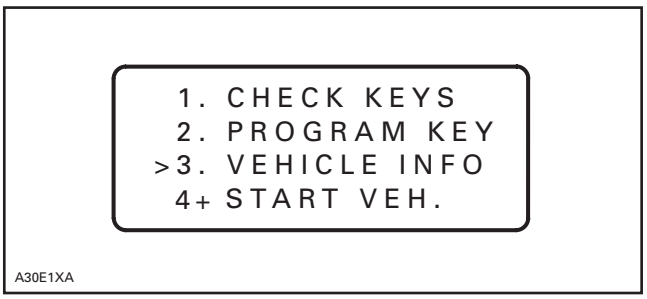




Press any key, display will show followed by next screen:



Press MENU twice, following screen will show:



After procedure is completed, ensure engine idle speed with engine hot is 1700 - 2100 RPM.

Stop the engine.

DUCATI TRIGGER COIL CDI SYSTEM TESTING

Skandic WT/SWT

IGNITION SYSTEM TESTING SEQUENCE

In case of ignition problems, check the following in the prescribed order until the problem can be solved.

1. Sparking/spark plug condition.
2. Electrical connectors.
3. Ignition switch, tether cord cap and engine cut-out switch.
4. Ignition coil output.
5. Trigger coil output.

LIGHTING SYSTEM TESTING SEQUENCE

1. Electrical connectors.
2. Magneto output (lighting generator coil).

Testing Conditions

Voltage measurements are always taken upon starting the vehicle. Readings taken when the engine is running will be higher than indicated range.

Part temperature must be approximately 20°C (68°F) (room temperature), otherwise readings could be distorted.

Analysis of Readings

Voltage Readings

When testing the different magneto components, it is important to take into consideration that readings vary according to the force applied onto the manual starter. It is therefore important to employ enough force upon each trial.

The reading must be 3 times within or above the range indicated in the corresponding table. If the reading is too low, the part is considered to be defective and it must be replaced.

Resistance Readings

Place multimeter selector switch to Ω in order to measure resistance. Readings must be within the indicated range. Otherwise, the part is considered to be defective and must be replaced.

CAUTION: When taking measurements, it is useless to try to start the vehicle since readings would then be distorted.

Intermittent Ignition Problems

It is difficult to make a diagnostic in the case of intermittent ignition problems. Thus, problems occurring only when the engine operating temperature is normal must be checked in similar conditions.

In most cases when problems are caused by temperature or vibrations, these can only be solved by replacing parts. Most problems cannot be detected when the engine is stopped.

Multiple Problems

As a matter of fact, more that one component can be defective. As a result, if the problem remains although a part was replaced, start over the whole verification from the beginning in order to identify the other defective component.

1. SPARKING

During this operation, it is important to use the snowmobile spark plug and not a new one. Bring the plug in contact with the engine. If no spark is produced, replace the spark plug with a new one and do the test again.

2. ELECTRICAL CONNECTOR TESTING

Make sure that none of the connectors are disconnected.

3. IGNITION SWITCH, TETHER CORD SWITCH AND ENGINE CUT-OUT SWITCH TESTING

Disconnect connector housing 2-01 from engine, and using a multimeter, check resistance as indicated in IGNITION table.

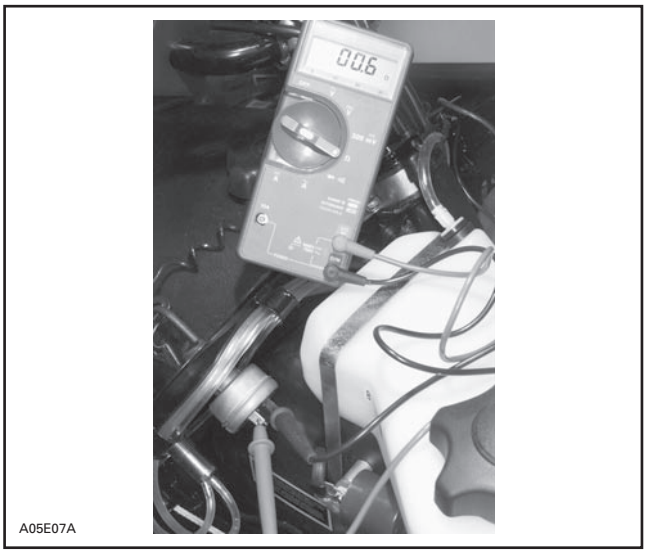

A03E1IA

If readings are acceptable, go on to next step.

If readings are inadequate, individually check each switch as follows.

Ignition Switch (key)

Disconnect switch housing. Using a multimeter, check between MAG and GRD terminals if the circuit is open (0.L $_{M\Omega}$) in operating position and if the circuit is closed (0 $_{\Omega}$) in off position.



TYPICAL

If readings do not correspond to the above-mentioned indications, replace switch.

If readings are acceptable, check other switches.

Engine Cut-Out Switch

Unplug switch block connected to main wiring harness. Check using a multimeter. Connect probes to 6-02-C-M and 6-02-D-M terminals. The multimeter should indicate an open circuit (0.L $_{M\Omega}$) in operating position and a closed circuit (0 $_{\Omega}$) in off position.

TYPICAL

If readings do not correspond to the above-mentioned indications, replace switch.

If readings are acceptable, check other switches.

Tether Cord Switch

Unplug switch block connected to main wiring harness. Check using a multimeter by connecting probes to 6-03-B-M and 6-03-A-M wires. The multimeter should indicate an open circuit (0.L $_{M\Omega}$) in operating position and a closed circuit (0 $_{\Omega}$) in off position.

TYPICAL

If readings do not correspond to the above-mentioned indications, replace switch.

If readings are acceptable, check other switches.

If none of these verifications are conclusive, the problem finds its source in the main wiring harness. Proceed as follows:

NOTE: For this next step, no stop switch must be connected to the main wiring harness.

Disconnect all stop switches from the main wiring harness and check the continuity of each wire by connecting probes to the end of wires of the same color. Repeat with all other wires. It is important to mention that all wires of the same color within a given harness are connected together. These wires should therefore have a closed circuit. On the other hand, BLACK and BLACK/YELLOW wires must have an open circuit (0.L $_{M\Omega}$).

Repair or replace if necessary.

4. IGNITION GENERATOR COIL VOLTAGE TESTING

General

When manually starting the engine while the spark plug is installed, the engine will tend to accelerate beyond the compression point. This will result in higher magneto output power.

1. Disconnect the 4-wire housing between the ignition module and the magneto wiring harness (4-02).
2. Connect multimeter probes to GREEN and WHITE wires (female end), then bring selector to Ṽ and scale to 00.0VAC.
3. Activate the manual starter and check values indicated by the multimeter.
4. Repeat operation 3 times.

A03E1JA

5. Compare readings with those appearing in the IGNITION table.

5. TRIGGER COIL VOLTAGE TESTING

1. Disconnect 4-wire housing between the ignition module and the engine (4-02).
2. Connect multimeter probes to RED/WHITE wire (female side) and to the engine, then bring selector switch to Ṽ and scale to 00.0VAC.
3. Activate the manual starter and check values indicated by the multimeter.
4. Repeat operation 3 times.
5. Compare readings with those appearing in the IGNITION table.

CONCLUSION

If none of the above testing operations produced valid results, it is strongly recommended to keep on testing according to the list appearing in the Resistance column of the IGNITION table.

Set the multimeter as indicated.

LIGHTING GENERATOR COIL VOLTAGE TESTING

NOTE: The lighting generator coil is not part of the ignition system. It is a self-contained system used to supply current to the lighting system and to other devices working on alternating current. However, this system can be tested using a multimeter.

1. Disconnect housing from engine (2-01).
2. Connect multimeter wires to YELLOW and YELLOW/BLACK wires (female side), then place selector switch to Ṽ and scale to 0.00VAC.
3. Activate the manual starter and check values indicated by the multimeter.
4. Repeat operation 3 times.

A03E1LA

5. Compare readings with those appearing in the LIGHTING table.

CONCLUSION

If none of the above testing operations produced valid results, it is strongly recommended to keep on testing according to the list appearing in the Resistance column of the LIGHTING table.

Set the multimeter as indicated.

IGNITION SYSTEM TESTING (Skandic WT/SWT)							
PART	TEST TO BE PERFORMED	WIRE COLOR	RESISTANCE Ω		VOLTAGE V		NOTE
			VALUE (ohms)	MULTIMETER SCALE	VALUE (volts)	MULTIMETER SCALE	
Stop switch	Running insulation	BK and BK/YL	0.L	00.0 MΩ	—	—	All switches must be in run position.
	Continuity in stop position	BK and BK/YL	00.0 - 00.5	00.0 Ω	—	—	At least one stop switch must be operational.
Ignition generator coil	Output	WH and GN	230.0 - 330.0	00.0 Ω	30.0 - 60.0	00.0VAC	All switches must be in run position.
	Ground continuity	WH and engine	00.0 - 00.5	00.0 Ω	—	—	The term "engine" refers to the engine metal parts connected to the magneto housing.
Trigger coil	Continuity	RD/WH and engine	140.0 - 180.0	00.0 Ω	2.0 - 9.0	00.0VAC	
Ignition module and high voltage coil	Secondary winding resistance with caps	—	13.1 K - 18.3 K	00.0 KΩ	**CAUTION:** Do not measure high voltage coil output voltage.		
High voltage coil	Secondary winding resistance with caps	Spark plug cap Spark plug cap	8.90 K - 13.1 K	00.0 KΩ	**CAUTION:** Do not measure high voltage coil output voltage.		
	Secondary winding resistance without caps	BK BK	0.90 K - 1.10 K	00.0 KΩ	**CAUTION:** Do not measure high voltage coil output voltage.		
	Secondary winding voltage	BK engine	—	—	.100 - .250	0.00VAC	The measurement must be taken on the spark plug cable (without the spark plug).
Spark plug cap	Cap resistance	—	4.0 K - 6.0 K	00.0 KΩ	—	—	—

NOTE: Stop switches include the ignition switch, the tether cord switch and the engine cut-out switch.

It is important to take note that voltage measurements must be taken while starting the vehicle using the manual starter.

Voltages obtained upon starting are proportional to the force applied onto the manual starter. A low voltage is therefore normal under a low cranking force.

Perform testing in the prescribed order and replace any parts not performing according to specifications.

It is important to resume all tests when replacing a component.

If not specified, the probe connecting sequence is not important.

LIGHTING SYSTEM TESTING (Skandic WT/SWT)							
PART	TEST TO BE PERFORMED	WIRE COLOR	RESISTANCE Ω		VOLTAGE V		NOTE
			VALUE (ohms)	MULTIMETER SCALE	VALUE (volts)	MULTIMETER SCALE	
Lighting generator coil	Power	YL and YL/BK	0.05 - 0.6	00.0 Ω	2.5 - 7.0	00.0 VAC	—
	Insulation	YL and engine	0.L	00.0 MΩ	—	—	—
	Ground continuity	BK engine	00.0 - 00.5	00.0 MΩ	—	—	—

NOTE: Stop switches include the ignition switch, the tether cord switch and the engine cut-out switch.

It is important to take note that voltage measurements must be taken while starting the vehicle using the manual starter.

Voltages obtained upon starting are proportional to the force applied onto the manual starter. A low voltage is therefore normal under a low cranking force.

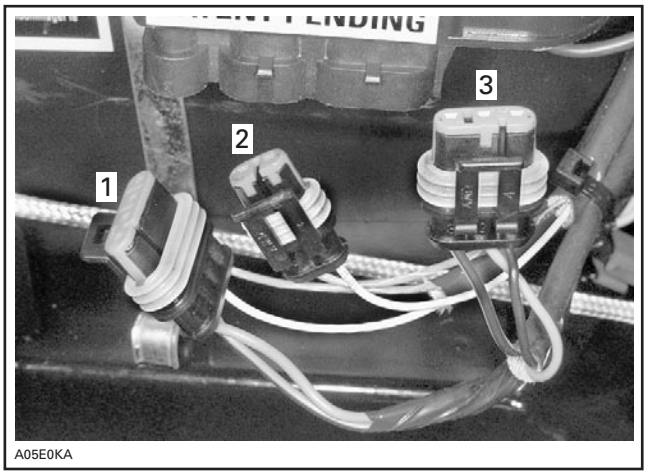
Perform testing in the prescribed order and replace any parts not performing according to specifications.

It is important to resume all tests when replacing a component.

If not specified, the probe connecting sequence is not important.

RER DUAL TRIGGER COIL CDI SYSTEM TESTING

Tundra R and Skandic LT/LT E



MPEM

1. *Reverse switch, reverse indicator and trigger coil*
2. *Trigger coil*
3. *Generator output and cut-off switches*

IGNITION SYSTEM TESTING SEQUENCE

In case of ignition problems, check the following in the prescribed order until the problem can be solved.

1. Sparking/spark plug condition.
2. Electrical connectors.
3. Ignition switch, tether cord cap and engine cut-out switch.
4. Ignition coil output.
5. Trigger coil output.

NOTE: Refer to DUCATI CDI SYSTEM TESTING and appropriate model IGNITION SYSTEM TESTING TABLE at the end of this chapter for complete detailed testing procedure.

LIGHTING SYSTEM TESTING SEQUENCE

1. Electrical connectors.
2. Magneto output (lighting generator coil).

NOTE: Refer to DUCATI CDI SYSTEM TESTING and appropriate model LIGHTING SYSTEM TESTING TABLE at the end of this chapter for complete detailed testing procedure.

Testing Conditions

Voltage measurements are always taken upon starting the vehicle. Readings taken when the engine is running will be higher than indicated range.

Part temperature must be approximately 21°C (70°F) (room temperature), otherwise readings could be distorted.

Analysis of Readings

Voltage Readings

When testing the different magneto components, it is important to take into consideration that readings vary according to the force applied onto the manual starter. It is therefore important to employ enough force upon each trial.

The reading must be 3 times within or above the range indicated in the corresponding table. If the reading is too low, the part is considered to be defective and it must be replaced.

Resistance Readings

Place multimeter selector switch to Ω in order to measure resistance. Readings must be within the indicated range. Otherwise, the part is considered to be defective and must be replaced.

CAUTION: When taking measurements, it is useless to try to start the vehicle since readings would then be distorted.

Intermittent Ignition Problems

It is difficult to make a diagnostic in the case of intermittent ignition problems. Thus, problems occurring only when the engine operating temperature is normal must be checked in similar conditions.

In most cases when problems are caused by temperature or vibrations, these can only be solved by replacing parts. Most problems cannot be detected when the engine is stopped.

Multiple Problems

As a matter of fact, more than one component can be defective. As a result, if the problem remains although a part was replaced, start over the whole verification from the beginning in order to identify the other defective component.

1. SPARKING

During this operation, it is important to use the snowmobile spark plug and not a new one. Bring the plug in contact with the engine. If no spark is produced, replace the spark plug with a new one and do the test again.

2. ELECTRICAL CONNECTOR TESTING

Make sure that none of the connectors are disconnected.

3. IGNITION SWITCH, TETHER CORD SWITCH AND ENGINE CUT-OUT SWITCH TESTING

Disconnect connector housing from engine, and using a multimeter, check resistance as indicated in IGNITION table.

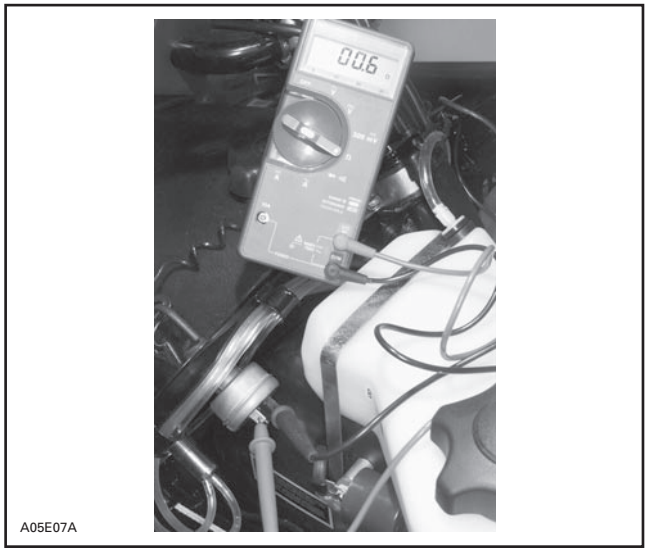

A03E1IA

If readings are acceptable, go on to next step.

If readings are inadequate, individually check each switch as follows.

Ignition Switch (key)

Disconnect switch housing. Using a multimeter, check between **MAG** and **GRD** terminals if the circuit is open (0.L $_{M\Omega}$) in operating position and if the circuit is closed (0 $_{\Omega}$) in off position.


A05E07A

TYPICAL

If readings do not correspond to the above-mentioned indications, replace switch.

If readings are acceptable, check other switches.

Engine Cut-Out Switch

Unplug switch block connected to main wiring harness. Check using a multimeter. Connect probes to terminals. The multimeter should indicate an open circuit (0.L $_{M\Omega}$) in operating position and a closed circuit (0 $_{\Omega}$) in off position.


A05E08A

TYPICAL

If readings do not correspond to the above-mentioned indications, replace switch.

If readings are acceptable, check other switches.

Tether Cord Switch

Unplug switch block connected to main wiring harness. Check using a multimeter by connecting probes to wires. The multimeter should indicate an open circuit (0.L $_{M\Omega}$) in operating position and a closed circuit (0 $_{\Omega}$) in off position.

TYPICAL

If readings do not correspond to the above-mentioned indications, replace switch.

If readings are acceptable, check other switches.

If none of these verifications are conclusive, the problem finds its source in the main wiring harness. Proceed as follows:

NOTE: For this next step, no stop switch must be connected to the main wiring harness.

Disconnect all stop switches from the main wiring harness and check the continuity of each wire by connecting probes to the end of wires of the same color. Repeat with all other wires. It is important to mention that all wires of the same color within a given harness are connected together. These wires should therefore have a closed circuit. On the other hand, BLACK and BLACK/YELLOW wires must have an open circuit (0.L $_{M\Omega}$).

Repair or replace if necessary.

4. IGNITION GENERATOR COIL VOLTAGE TESTING

General

When manually starting the engine while the spark plug is installed, the engine will tend to accelerate beyond the compression point. This will result in higher magneto output power.

1. Disconnect the 3-wire housing between the ignition module and the magneto wiring harness (4-DB).
2. Connect multimeter probes to RED and BLACK wires (female end), then bring selector to $\tilde{V}$ and scale to 00.0^{VAC}.
3. Activate the manual starter and check values indicated by the multimeter.
4. Repeat operation 3 times.
5. Compare readings with those appearing in the IGNITION table.

5. TRIGGER COIL VOLTAGE TESTING

1. Disconnect 4-wire housing (4-DA) and 2-wire housing (4-DC) between the ignition module and the engine.
2. Connect multimeter probes to BLUE/YELLOW wire and to WHITE/YELLOW wire, then bring selector switch to $\tilde{V}$ and scale to 00.0^{VAC}.
3. Activate the manual starter and check values indicated by the multimeter.
4. Repeat operation 3 times.
5. Compare readings with those appearing in the IGNITION table.

BUZZER TESTING

Using jumper wires, connect battery positive post to buzzer positive tab.

Connect battery negative post to buzzer negative tab.

CAUTION: To avoid buzzer damage, ensure that polarity is respected.

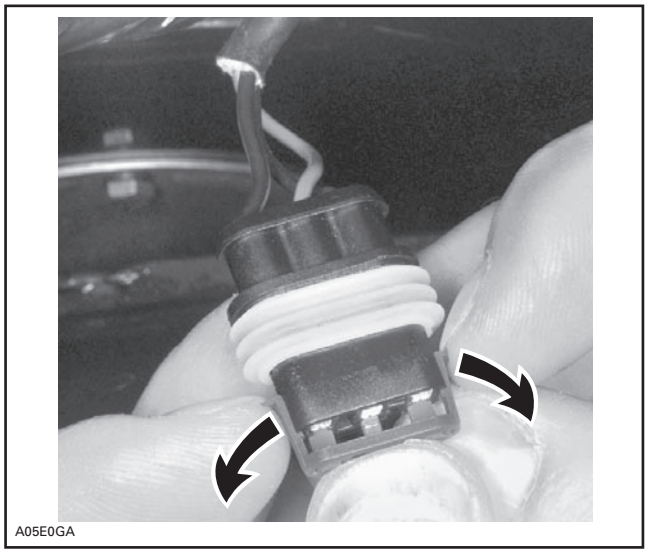

A03E21A

12-VOLT BATTERY PLUGGED TO BUZZER

MPEM CONNECTORS

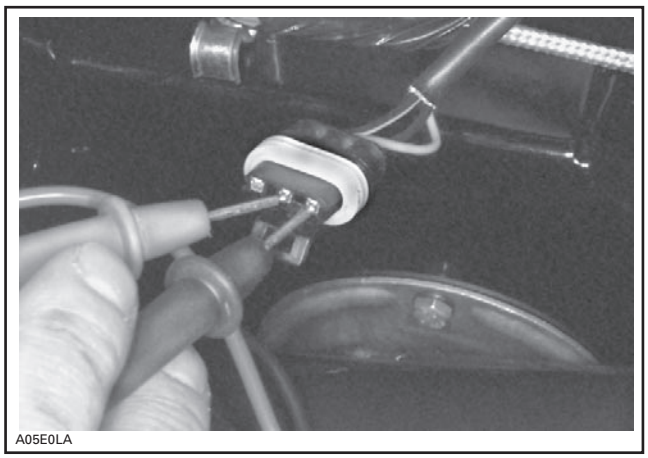
To ease electrical readings on MPEM connectors, connector cap must be removed.

Hold connector in hands then lift both tabs to remove connector cap.


A05E0GA

LIFT TABS TO REMOVE CAP

Insert multimeter probes into connector.


A05E0LA

TEST USING MULTIMETER PROBES

IGNITION SYSTEM TESTING (Tundra R 240 W)								
PART	TEST TO BE PERFORMED	WIRE COLOR	MULTIMETER PROBE CONNECTION	RESISTANCE Ω		VOLTAGE V		NOTE
				VALUE (ohms)	MULTIMETER SCALE	VALUE (volts)	MULTIMETER SCALE	
Stop switch	Running insulation	BK BK/YL	4-MOC-M 4-MOA-M	0.L	00.0 MΩ	—	—	No stop switch must be operational.
	Continuity in STOP position	BK BK/YL	4-MOC-M 4-MOA-M	00.0 - 00.5	00.0 Ω	—	—	Only one stop switch must be operational. Test them one after the other.
Ignition generator coil	Output	RD BK	4-DB-1-F 4-DB-2-F	4.5 - 6.5	00.0 Ω	7.0 - 15.0	00.0VAC	—
	Ground continuity	BK engine	4-DB-2-F engine	00.0 - 00.5	00.0 Ω	—	—	The term "engine" refers to the engine metal parts connected to the magneto housing.
Trigger coil	Front	WH/YL BU/YL	4-DC-2-F 4-DC-1-F	160 -180	00.0 Ω	.100 - .300	.000VAC	—
	Rear	WH/YL BU/YL	4-DA-4-F 4-DA-3-F	160 -180	00.0 Ω	.100 - .300	.000VAC	—
MPEM and high voltage coil	Secondary winding resistance with caps	Spark plug cap engine	In spark plug cap and on the engine	4.90 K - 7.10 K	0.00 KΩ	**CAUTION:** Do not measure high voltage coil output voltage.		
	Secondary winding resistance without caps	BK engine	Inside spark plug cable and on the engine	0.90 K - 1.10 K	0.00 KΩ	**CAUTION:** Do not measure high voltage coil output voltage.		
	Secondary winding voltage	BK engine	On spark plug cable housing and on the engine	—	—	.150 - .350	.000VAC	The measurement must be taken on the spark plug cable (without the spark plug).
Spark plug cap	Cap resistance	—	Spark plug side and cable side	4.0 K - 6.0 K	00.0 KΩ	—	—	—

NOTE: Stop switches include the ignition switch, the tether cord switch and the engine cut-out switch.

It is important to take note that voltage measurements must be taken while starting the vehicle using the manual starter.

Voltages obtained upon starting are proportional to the force applied onto the manual starter. A low voltage is therefore normal under a low cranking force.

Perform testing in the prescribed order and replace any parts not performing according to specifications.

It is important to resume all tests when replacing a component.

If not specified, the probe connecting sequence is not important.

LIGHTING SYSTEM TESTING (Tundra R 240 W)								
PART	TEST TO BE PERFORMED	WIRE COLOR	MULTIMETER PROBE CONNECTION	RESISTANCE Ω		VOLTAGE V		NOTE
				VALUE (ohms)	MULTIMETER SCALE	VALUE (volts)	MULTIMETER SCALE	
Lighting generator coil	Power	YL YL	4-MOB-F 4-MOA-F	00.0 - 00.6	00.0 Ω	3.0 - 7.0	00.0 VAC	—
	Insulation	YL engine	4-MO (A,B)-F engine	0.L	00.0 MΩ	—	—	The term "engine" refers to the engine metal parts connected to the magneto housing.
	Ground continuity	BK engine	4-MOC-F engine	00.0 - 00.5	00.0 Ω	—	—	—

NOTE: It is important to take note that voltage measurements must be taken while starting the vehicle using the manual starter.

Voltages obtained upon starting are proportional to the force applied onto the manual starter. A low voltage is therefore normal under a low cranking force.

Perform testing in the prescribed order and replace any parts not performing according to specifications.

It is important to resume all tests when replacing a component.

If not specified, the probe connecting sequence is not important.

IGNITION SYSTEM TESTING (Skandic LT/LT E with RER 240 W)							
PART	TEST TO BE PERFORMED	WIRE COLOR	RESISTANCE Ω		VOLTAGE V		NOTE
			VALUE (ohms)	MULTIMETER SCALE	VALUE (volts)	MULTIMETER SCALE	
Stop switch	Running insulation	BK BK/YL	0.L	00.0 MΩ	—	—	All switches must be in run position.
	Continuity in STOP position	BK BK/YL	00.0 - 00.5	00.0 Ω	—	—	Only one stop switch must be in stop position. Test them one after the other.
Ignition generator coil	Output	RD BK	4.5 - 6.5	00.0 Ω	7.0 - 15.0	00.0VAC	—
	Ground continuity	BK engine	00.0 - 00.5	00.0 Ω	—	—	The term "engine" refers to the engine metal parts connected to the magneto housing.
Front trigger coil	Resistance and output	WH/YL BL/YL	160 -180	00.0 Ω	.150 - .350	.000VAC	—
Rear trigger coil	Resistance and output	WH/YL BL/YL	160 -180	00.0 Ω	.150 - .350	.000VAC	—
MPEM and high voltage coil	Secondary winding resistance with caps	Spark plug cap Spark plug cap	8.90 K - 13.1 K	00.0 KΩ	**CAUTION:** Do not measure high voltage coil output voltage.		
	Secondary winding resistance without caps	BK BK	0.90 K - 1.10 K	00.0 KΩ	**CAUTION:** Do not measure high voltage coil output voltage.		
	Secondary winding voltage	BK engine	—	—	.100 - .250	0.00VAC	The measurement must be taken on the spark plug cable (without the spark plug).
Spark plug cap	Cap resistance	—	4.0 K - 6.0 K	00.0 KΩ	—	—	—

NOTE: Stop switches include the ignition switch, the tether cord switch and the engine cut-out switch.

It is important to take note that voltage measurements must be taken while starting the vehicle using the manual starter.

Voltages obtained upon starting are proportional to the force applied onto the manual starter. A low voltage is therefore normal under a low cranking force.

Perform testing in the prescribed order and replace any parts not performing according to specifications.

It is important to resume all tests when replacing a component.

If not specified, the probe connecting sequence is not important.

LIGHTING SYSTEM TESTING (Skandic LT/LT E with RER 240 W)							
PART	TEST TO BE PERFORMED	WIRE COLOR	RESISTANCE Ω		VOLTAGE V		NOTE
			VALUE (ohms)	MULTIMETER SCALE	VALUE (volts)	MULTIMETER SCALE	
Lighting generator coil	Power	YL YL/BK	00.0 - 00.6	00.0 Ω	3.0 - 7.0	00.0 VAC	—
	Insulation	YL engine	0.L	00.0 MΩ	—	—	The term "engine" refers to the engine metal parts connected to the magneto housing.
	Ground continuity	BK engine	00.0 - 00.5	00.0 Ω	—	—	

NOTE: It is important to take note that voltage measurements must be taken while starting the vehicle using the manual starter.

Voltages obtained upon starting are proportional to the force applied onto the manual starter. A low voltage is therefore normal under a low cranking force.

Perform testing in the prescribed order and replace any parts not performing according to specifications.

It is important to resume all tests when replacing a component.

If not specified, the probe connecting sequence is not important.

NIPPONDENSO CDI SYSTEM TESTING

593 on Skandic WT LC/SUV

IGNITION SYSTEM TESTING (Skandic WT LC/SUV 290 W)							
PART	TEST TO BE PERFORMED	WIRE COLOR	RESISTANCE Ω		VOLTAGE V		NOTE
			VALUE (ohms)	MULTIMETER SCALE	VALUE (volts)	MULTIMETER SCALE	
Stop switches	Running insulation	BK and BK/YL	0.L	00.0 MΩ	—	—	All switches must be in run position.
	Continuity in stop position	BK and BK/YL	00.0 - 00.5	00.0 Ω	—	—	Only one stop switch must be in stop position. Test one at a time.
	Insulation in stop position	BK/GN and BK/WH	0.L	00.0 MΩ	—	—	Tether cord cap must be off.
	Running continuity	BK/GN and BK/WH	00.0 - 00.5	00.0 Ω	—	—	Tether cord cap must be in place.
Ignition generator coil	Output	RD and BK/RD	11.6 - 21.6	00.0 Ω	15.0 - 30.0	00.0VAC	—
	Coil insulation	RD and BK	0.L	00.0 MΩ	—	—	—
	Ground continuity	BK and engine	00.0 - 00.5	00.0 Ω	—	—	The term "engine" refers to the engine metal parts connected to the magneto housing.
Trigger coil	Resistance and output	WH/YL and BL/YL	190 - 300	00.0 Ω	.200 - .350	.000VAC	—
MPEM	Output voltage	WH/BL and BK	—	—	25.0 - 100.0	00.0VAC	All switches must be in run position.
High voltage coil	Primary winding resistance	WH/BL and BK	00.0 - 00.9	00.0 Ω	—	—	—
	Secondary winding resistance (spark plug cap included)	Spark plug cap and Spark plug cap	19.5 K - 26.5 K	00.0 KΩ	**CAUTION:** Do not measure high voltage coil output voltage.		
	Secondary winding resistance (without spark plug cap)	BK and BK	9.6 K - 14.4 K	00.0 KΩ	**CAUTION:** Do not measure high voltage coil output voltage.		
	Secondary winding voltage	BK and engine	—	—	0.1 - 1.4	0.00VAC	The measurement must be taken on the spark plug wire (without the spark plug).
	Insulation	Spark plug cap and BK	0.L	00.0 MΩ	—	—	—
Spark plug cap	Cap resistance	—	4.0 K - 6.0 K	00.0 KΩ	—	—	—

NOTE: Stop switches include the ignition switch and the engine cut-out switch.

It is important to take note that voltage measurements must be taken while starting the vehicle using the manual starter.

Voltages obtained upon starting are proportional to the force applied onto the manual starter. A low voltage is therefore normal under a low cranking force.

Perform testing in the prescribed order and replace any parts not performing according to specifications.

It is important to resume all test when replacing a component.

It not specified, the probe connecting sequence is not important.

LIGHTING SYSTEM TESTING (Skandic WT LC/SUV 290 W)							
PART	TEST TO BE PERFORMED	WIRE COLOR	RESISTANCE Ω		VOLTAGE V		NOTE
			VALUE (ohms)	MULTIMETER SCALE	VALUE (volts)	MULTIMETER SCALE	
Lighting generator coil	Output	YL and YL	00.1 - 00.4	00.0 Ω	0.5 - 2.0	00.0 VAC	—
	Coil insulation	YL and engine	0.L	00.0 MΩ	—	—	The term "engine" refers to the engine metal parts connected to the magneto housing.
	Ground continuity	BK and engine	00.0 - 00.5	00.0 Ω	—	—	

NOTE: Stop switches include the ignition switch and the engine cut-out switch.

It is important to take note that voltage measurements must be taken while starting the vehicle using the manual starter.

Voltages obtained upon starting are proportional to the force applied onto the manual starter. A low voltage is therefore normal under a low cranking force.

Perform testing in the prescribed order and replace any parts not performing according to specifications.

It is important to resume all test when replacing a component.

It not specified, the probe connecting sequence is not important.

INSPECTION OF AC CIRCUIT ISOLATION

All Electric Start Models

If AC circuit is not isolated from frame, headlamp beam will weaken.

INSPECTION

Disconnect regulator/rectifier.

On models with hydraulic brake, pull off the rubber boot from brake light microswitch assembly.

Connect one digital ohmmeter probe (needle ohmmeter will not offer enough precision) to frame and other probe to one of 2 YELLOW magneto wires.

Measured resistance must be infinite. If such is not the case, it means there is a connection between AC circuit and DC circuit.

Disconnect one accessory at the time to identify the faulty circuit.

INSPECTION OF HEATING ELEMENTS

Skandic LT/LT E/WT/SWT/WT LC/SUV

Throttle Lever Heating Element

Current Measurement

HIGH INTENSITY	BROWN wire	0.23 A minimum
LOW INTENSITY	BROWN/YELLOW wire	0.13 A minimum

Handlebar Grip Heating Element

Resistance Measurement

LOW INTENSITY	YELLOW/BLACK wire ORANGE/VIOLET wire	17.7 to ① 20.7 ohms
HIGH INTENSITY	YELLOW/BLACK wire ORANGE wire	8.73 to ① 10.67 ohms

① When measuring resistance at terminals the actual value will be half the measurement in table. The reason for that is the elements are connected in parallel. Therefore the total resistance is half the resistance of one element.