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IGNITION TIMING

NIPPONDENSO TRIGGER COIL SYSTEM

Normally ignition timing adjustment should not be required. It has been set at factory and it should remain correctly adjusted since every part is fixed and not adjustable. The only time the ignition timing might have to be changed would be when replacing the crankshaft, the magneto flywheel, the trigger coil or the MPEM. If the ignition timing is found incorrect, first check for proper crankshaft alignment. This might be the indication of a twisted crankshaft.

The ignition timing can be checked with either the engine hot or cold. Also, the ignition timing is to be checked at 3500 RPM with a timing light.

NOTE: Between 3000 and 4000 RPM, the spark advance does not change. So when checking ignition timing at 3500 RPM, a change in engine speed within ± 500 RPM will not affect the timing mark when checked with the timing light.

IMPORTANT: During the first 8 hours (4 hours on Summit models) the timing curve is retarded by 3° between 4500 RPM and maximum RPM. Because checking ignition timing is done at a lower RPM, this will not affect the 3500 RPM timing specification. There will be no further timing adjustment required before and after these hours.

No tools were available at printing time for timing procedure.

SPARK PLUGS

NGK SPARK PLUG

All Models

NGK SPARK PLUG NUMBERING SYSTEM

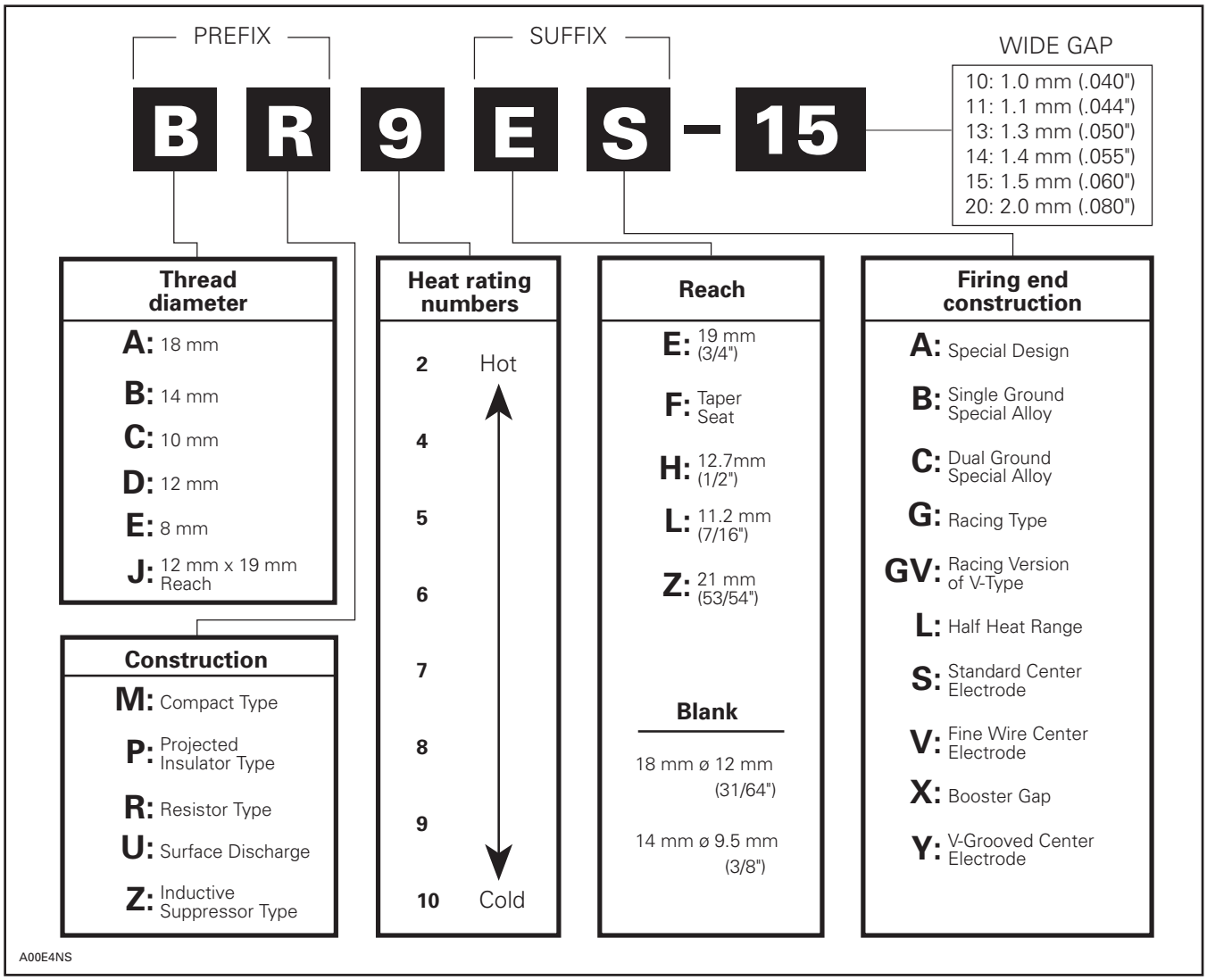
Bombardier uses NGK brand spark plugs on all its snowmobile models.

The heat range identification system is:

Low number → hot plug

High number → cold plug

DESIGN SYMBOLS USED IN NGK SPARK PLUGS



CROSSCUTS AND GAP STYLES OF SPARK PLUGS

DISASSEMBLY

First unscrew the spark plug 1 turn.

Clean the spark plug and cylinder head with pressurized air, then completely unscrew.

⚠ WARNING

Whenever using compressed air, always wear protective eye wear.

HEAT RANGE

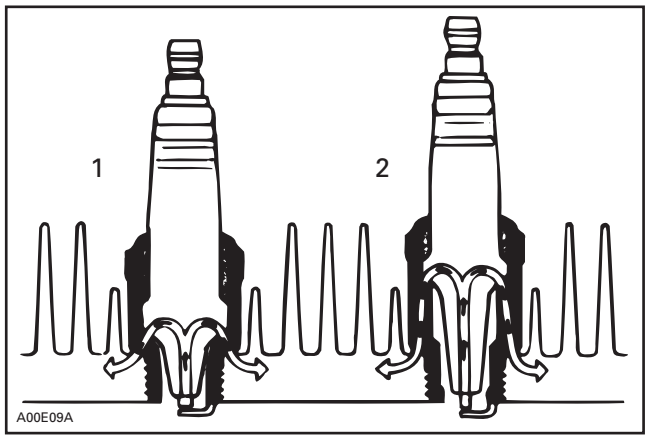
The proper operating temperature or heat range of the spark plugs is determined by the spark plug ability to dissipate the heat generated by combustion.

The longer the heat path between the electrode tip to the plug shell, the hotter the spark plug operating temperature will be — and inversely, the shorter the heat path, the colder the operating temperature will be.

A **cold** type plug has a relatively short insulator nose and transfers heat very rapidly into the cylinder head.

Such a plug is used in heavy duty or continuous high speed operation to avoid overheating.

The **hot** type plug has a longer insulator nose and transfers heat more slowly away from its firing end. It runs hotter and burns off combustion deposits which might tend to foul the plug during prolonged idle or low speed operation.



1. Cold
2. Hot

CAUTION: Severe engine damage might occur if a wrong heat range plug is used.

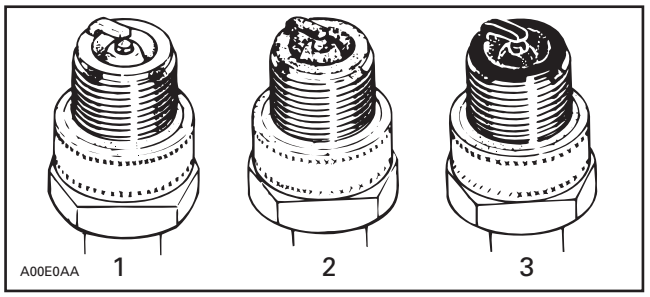
A **too hot** plug will result in overheating and pre-ignition, etc.

A **too cold** plug will result in fouling (shorting the spark plug) or may create carbon build up which can heat up red-hot and cause pre-ignition or detonation.

FOULING

Fouling of the spark plug is indicated by irregular running of the engine, decreased engine speed due to misfiring, reduced performance, and increased fuel consumption. This is due to a loss of compression. Other possible causes are: prolonged idling, or running on a too rich mixture due to a faulty carburetor adjustment or incorrect fuel and/or fuel mixing. The plug face of a fouled spark plug has either a dry coating of soot or an oily, glossy coating given by an excess either of oil or of oil with soot. Such coatings form a conductive connection between the center electrode and ground.

SPARK PLUG ANALYSIS



1. Overheated (light grey)
2. Normal (brownish)
3. Fouled (black)

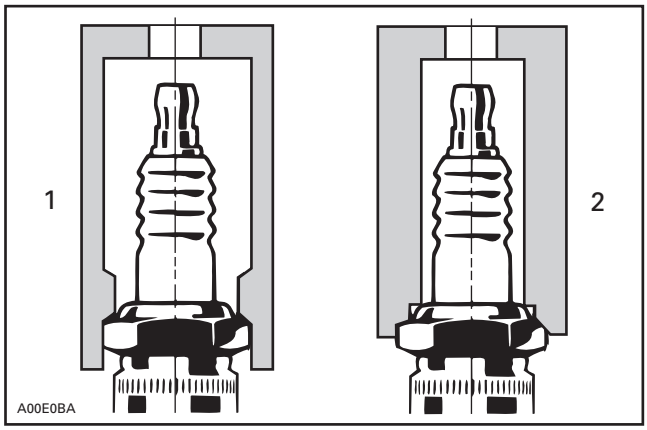
The plug electrode and piston dome reveal the condition of the engine, operating condition, method of driving and fuel mixture. For this reason it is advisable to inspect the spark plug at regular intervals, examining the plug electrode and the piston dome.

SPARK PLUG INSTALLATION

Prior to installation make sure that contact surfaces of the cylinder head and spark plug are free of grime.

1. Using a wire feeler gauge, set electrode gap according to TECHNICAL DATA.
2. Apply anti-seize lubricant (P/N 293 800 070) over the spark plug threads to prevent possible seizure.

3. Hand screw spark plug into cylinder head and tighten with a torque wrench and a proper socket.



1. Proper socket
2. Improper socket

SPARK PLUG TIGHTENING TORQUE

MODELS	SPARK PLUGS	TORQUE N•m (lbf•ft)
All models	NGK	27 (20)

BATTERY

BATTERY TESTING

There are 2 types of battery tests: unloaded and loaded. An unloaded test is made on a battery without discharging current. It is the simplest and commonly used. However, be aware that the voltage test can be good while the battery has not enough power to start the engine. A load test gives more accuracy of the battery condition.

Unload Test

Check charge condition using a multimeter.

With a multimeter, voltage readings appear instantly to show the state of charge. Always respect polarity. A fully charged battery will have a reading of 12.6 Vdc.

Load Test

This is the best test of battery condition under a starting load. Use a load testing device that has an adjustable load.

Apply a load of 3 times the ampere-hour rating of the battery. After 14 seconds check battery voltage; if battery is in good condition, it will have at least 10.5 Vdc.

REMOVAL

⚠ WARNING

Battery BLACK negative cable must always be disconnected first and connected last.

⚠ WARNING

Never charge or boost battery while installed on vehicle.

Unfasten battery retaining strap.

Withdraw battery from vehicle.

CLEANING

Clean the battery, battery casing, cables and battery posts using a solution of baking soda and water.

Remove corrosion from battery cable terminals and battery posts using a firm wire brush.

INSPECTION

Visually inspect battery case for cracks or other possible damage. If case is damaged, replace battery and thoroughly clean battery support and close area with water and baking soda.

⚠ WARNING

Should the battery casing be damaged, wear a suitable pair of non-absorbent gloves when removing the battery by hand.

Inspect battery posts for security of mounting.

BATTERY STORAGE

Disconnect and remove battery from the vehicle.

The battery must always be stored in fully charged condition.

Clean battery terminals and cable connections using a wire brush. Apply a light coat of dielectric grease (P/N 413 701 700) or petroleum jelly on terminals.

Clean battery casing and caps using a solution of baking soda and water. Rinse battery with clear water and dry well using a clean cloth.

Store battery on a wooden shelf in a cool dry place. Such conditions reduce self-discharging to a minimum.

Check for full charge condition every 40 days. Recharge battery as required.

ACTIVATION OF NEW BATTERY

⚠ WARNING

Never charge or boost battery while installed on vehicle.

CAUTION: Prior to charging the battery, always remove it from the vehicle.

Connect a 10 A battery charger for a few hours.

NOTE: It is recommended to verify the battery charge once a month. If necessary, fully charge battery.

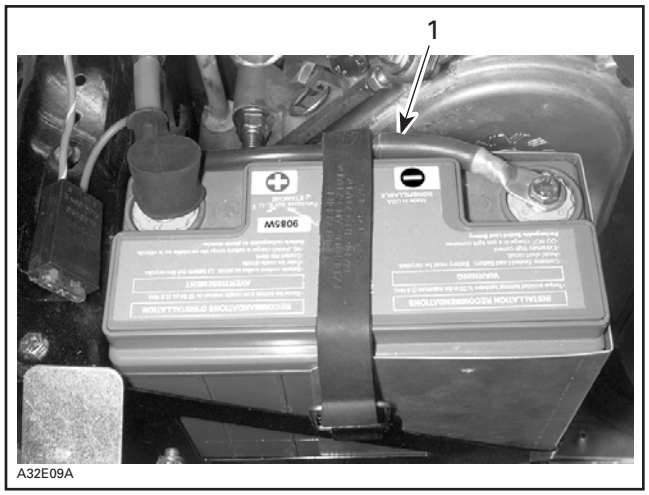
⚠ WARNING

Do not place battery near open flame.

INSTALLATION

Position battery onto battery support on vehicle.

Fasten battery retaining strap making sure that negative cable is positioned as illustrated.



1. Negative cable under battery strap

⚠ WARNING

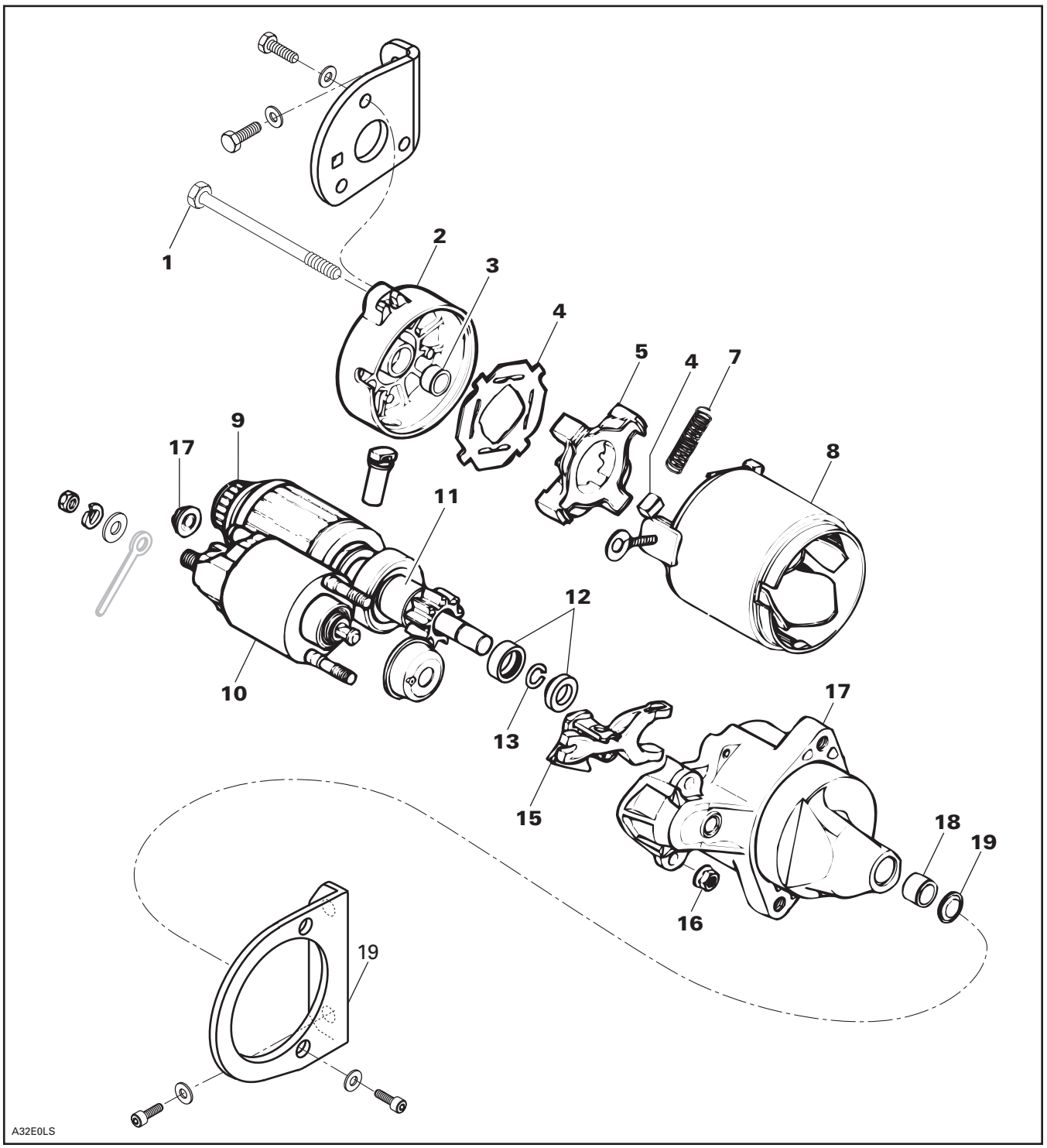
Always connect the battery cables exactly in the specified order. Connect RED positive cable first, then BLACK negative ground cable.

Apply silicone dielectric grease (P/N 413 701 700) on battery posts and connectors.

CAUTION: Negative battery terminal should always be disconnected FIRST and reconnected LAST.

ELECTRIC STARTER

ZX Series with Electric Starting



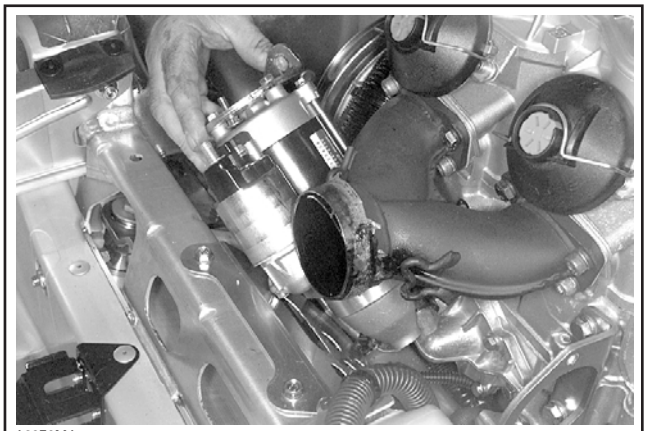
REMOVAL

– 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 and RED/GREEN wire from starter relay.
– Disconnect ground cable from MAG side bracket.
– Unbolt starter from PTO side bracket.
– Unbolt MAG side bracket from engine.
– Remove starter from engine.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DISASSEMBLY

Disconnect bare wire linking starter and relay.

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

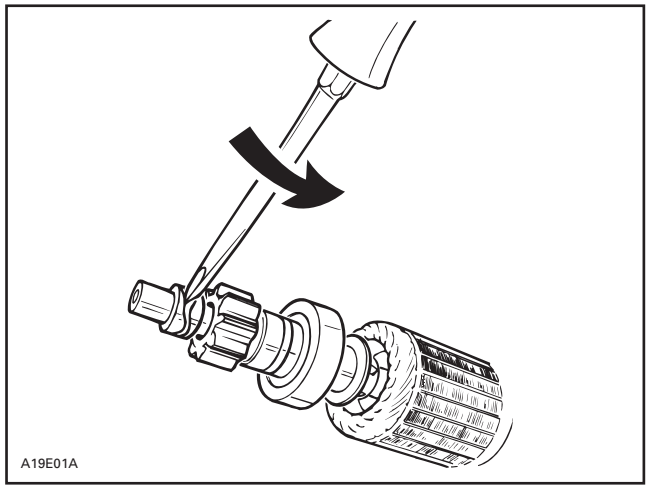
Unscrew starter screws (long) **no. 1** then pull yoke **no. 8** with end frame **no. 2** to separate from drive housing **no. 17**.

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.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TYPICAL

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

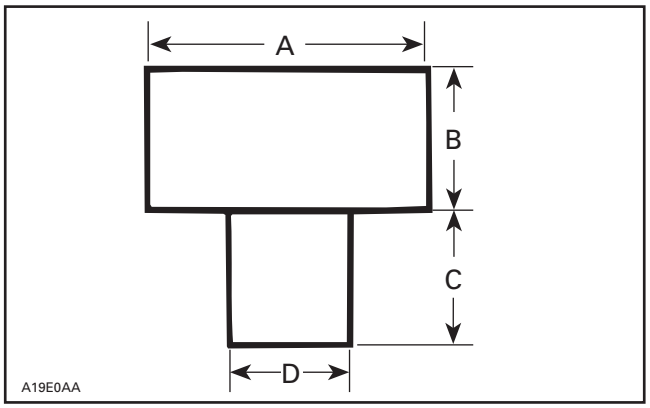
Remove outer collar, circlip then inner collar.

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.

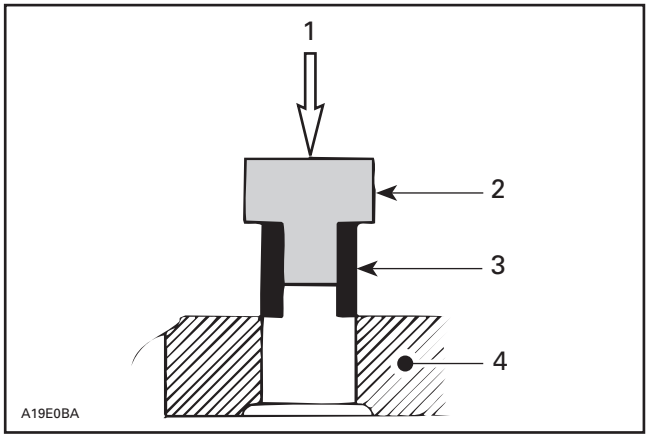
The radial play should not exceed 0.20 mm (.008 in). If greater, replace the bushing. To replace, press out the old one toward bushing cover and press in a new one with a bushing pusher. The correct size of the bushing pusher to use is given on next illustration.

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



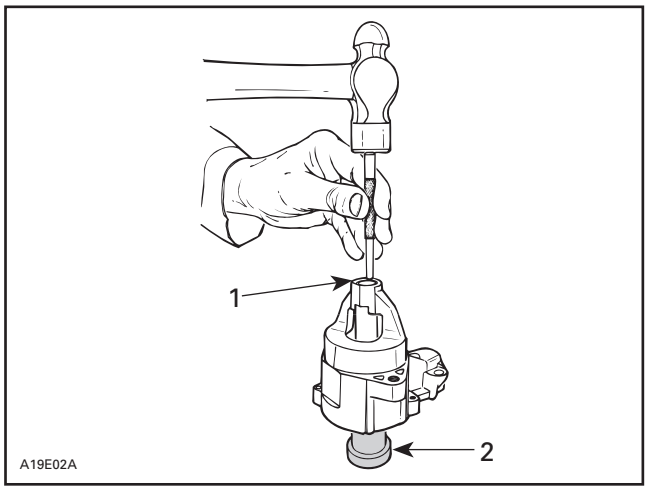
BUSHING PUSHER

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.



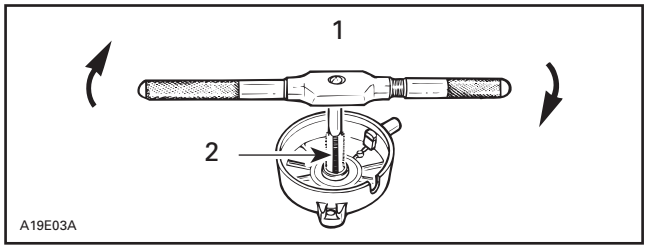
1. Stake bushing cover
2. Support

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.



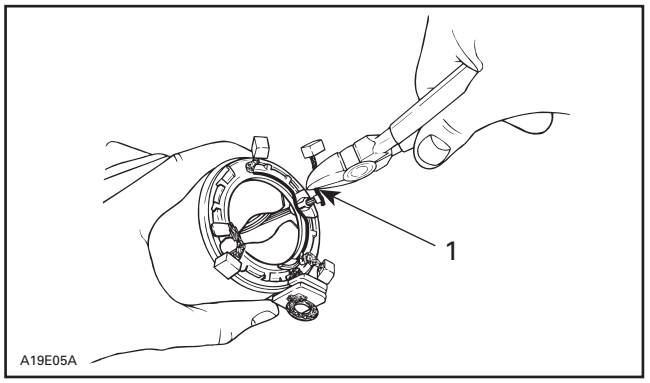
1. Turn until bushing goes out
2. 12 mm tap

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.



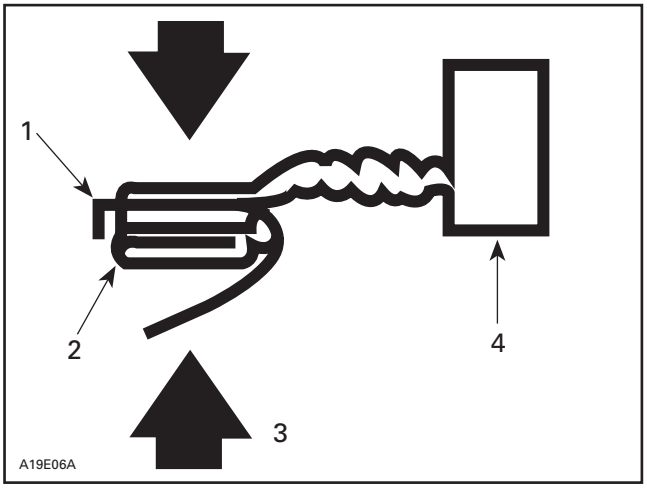
1. Cut close to connector

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.

CLEANING AND INSPECTION

CLEANING

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, 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, dry cloth.

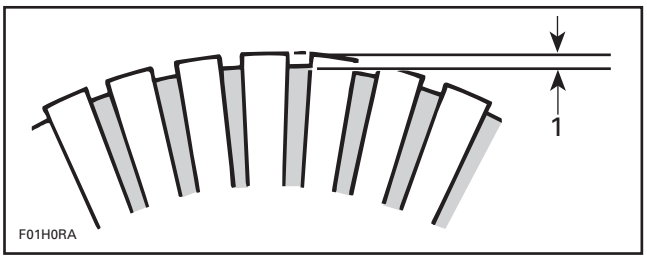
INSPECTION

Armature

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.

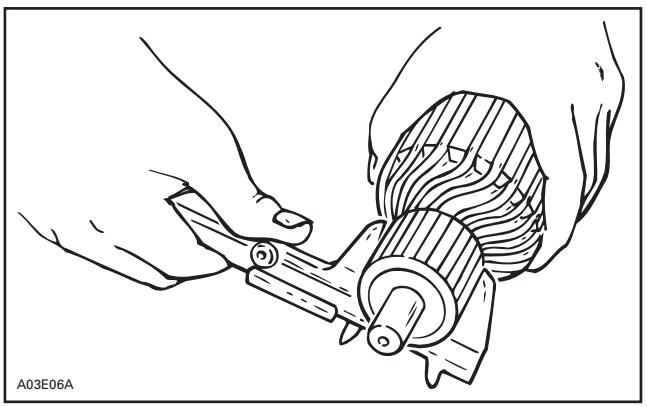
Check the commutator for mica depth. If the depth is less than 0.20 mm (.008 in), undercut the mica. Be sure that no burrs are left and no copper dust remains between the segments after the undercutting operation is completed.



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.

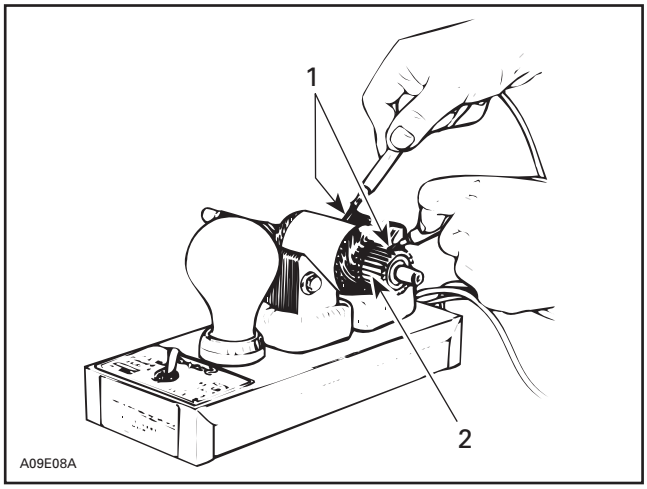
Check commutator outer diameter. If less than specified value, replace.



MODEL	WEAR LIMIT
ZX SERIES	27 mm (1.063 in)

Test for Ground Circuit in the Armature:

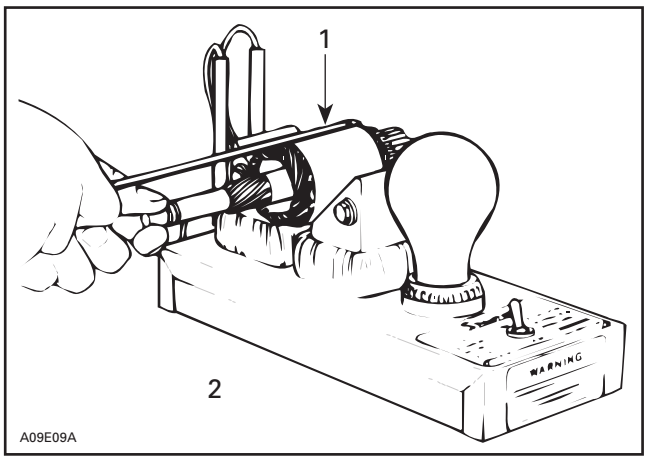
Use growler test probes. Check between armature core and the commutator bars. If growler lamp turns on, bars are grounded. If so, replace armature.



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

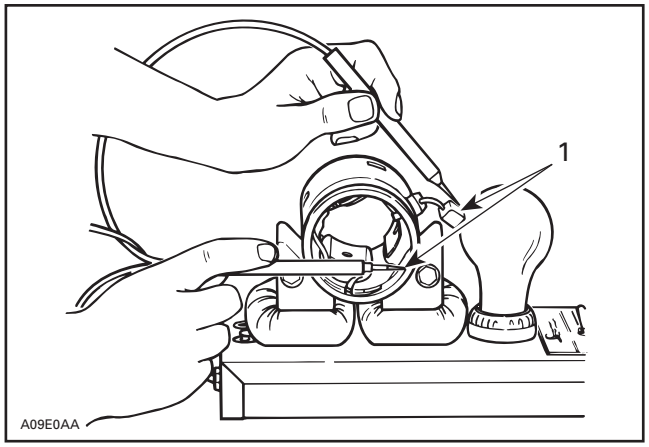
Test the Armature for Open Circuit:

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

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.

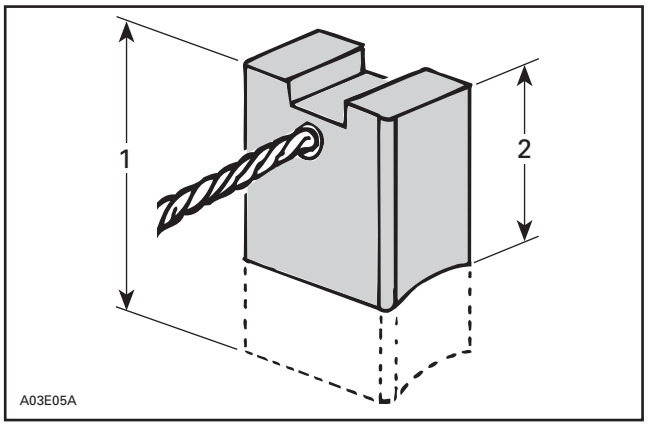
Brush Holder

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

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

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



TYPICAL
1. *New*
2. *Wear limit*

Overrunning Clutch

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.

RELAY

Inspect connections and clean as necessary. Relay condition can be checked with an ohmmeter. Install test probes on **large** connectors of relay when it is activated (+ on RED/GREEN wire and – on relay body).

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

ASSEMBLY

Prior to assembling, coat sliding surfaces and moving parts on armature shaft splines, overrunning clutch, relay plunger, drive lever and bushings with 10W30 engine oil.

Proceed as follows for assembling.

Secure drive housing in a vise.

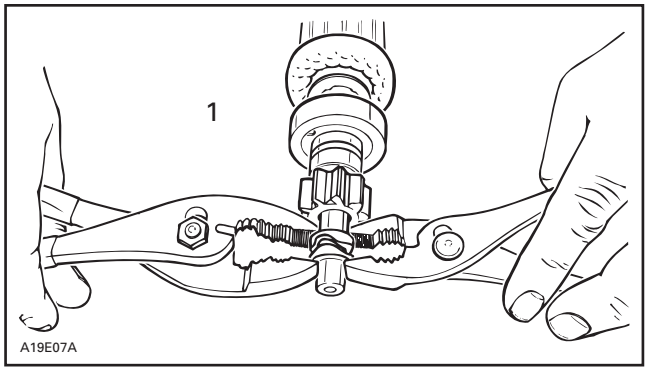
CAUTION: Do not overtighten since housing might be damaged.

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

CAUTION: Always install a new circlip when servicing.

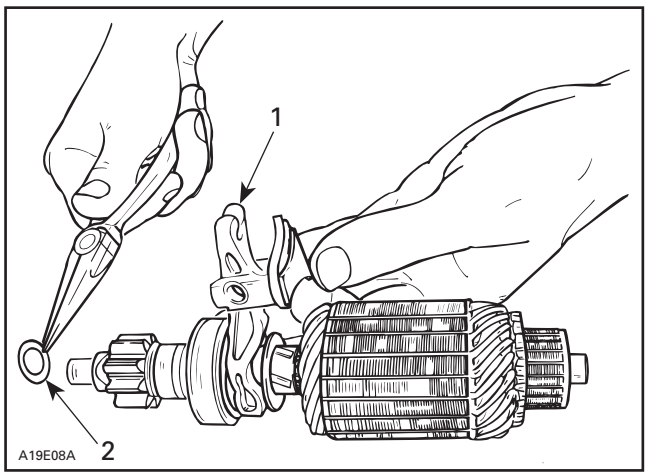
Insert **outer** collar being careful to match protrusions with notches of collars.

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



1. *Squeeze evenly*

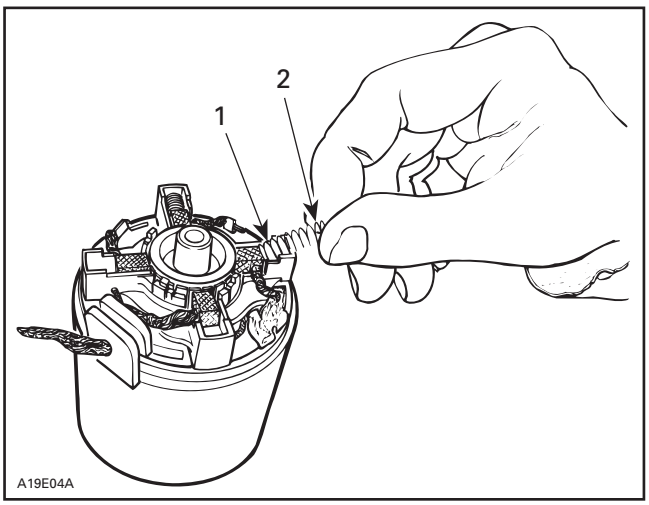
Install thrust washer against outer stop collar. Place drive lever onto overrunning clutch then insert into drive housing.



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.



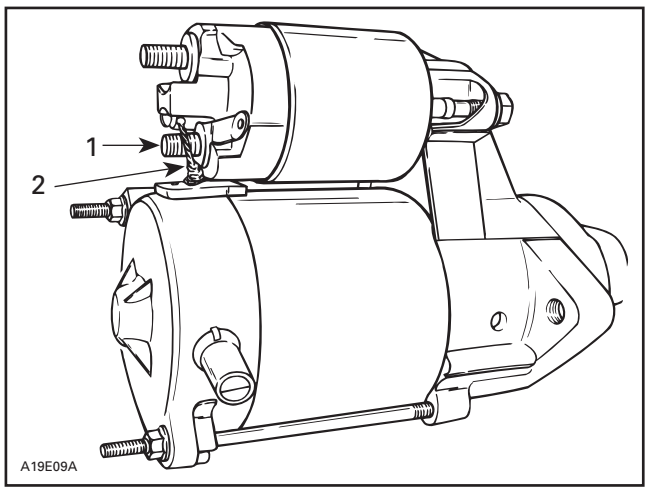
1. This end first
2. Push this end to complete

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

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

Connect starter bare wire to relay.

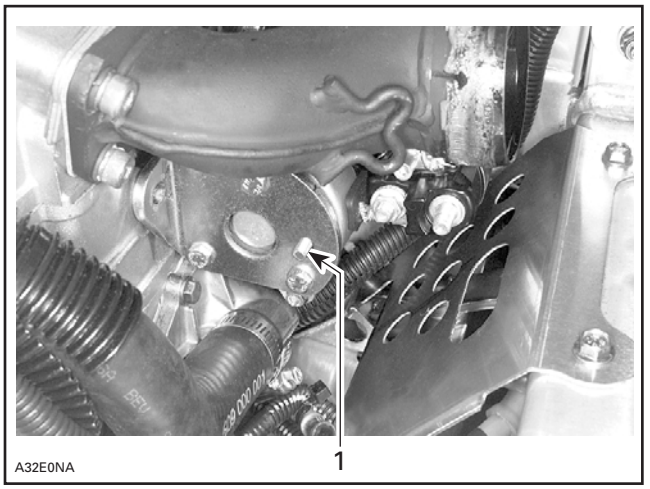
NOTE: Connect this wire on the **shorter** relay stud.



TYPICAL
1. Shorter stud
2. Bare wire

INSTALLATION

Install carriage bolt in MAG side bracket before installing starter.



1. Carriage bolt must be in place before starter installation

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

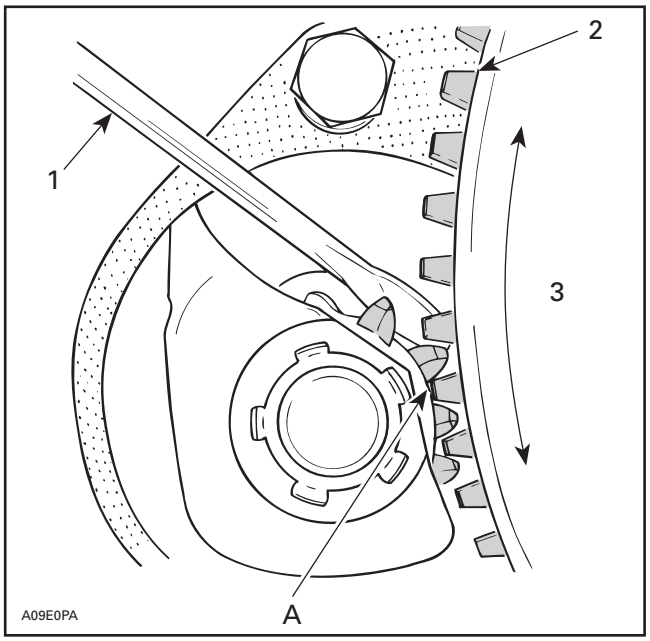
CAUTION: Make sure that both starter brackets are well seated against engine crankcase and starter before torquing all retaining bolts.

Torque all M8 bolts to 29 N•m (21 lbf•ft).

Torque all M6 bolts to 11 N•m (97 lbf•**in**).

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: Always install new self-locking fasteners.



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 relay. Connect RED/GREEN wire to small terminal of relay.

Connect BLACK cable to MAG side bracket.

Connect BLACK cable to battery.

⚠ WARNING

Always disconnect ground cable first and connect last.

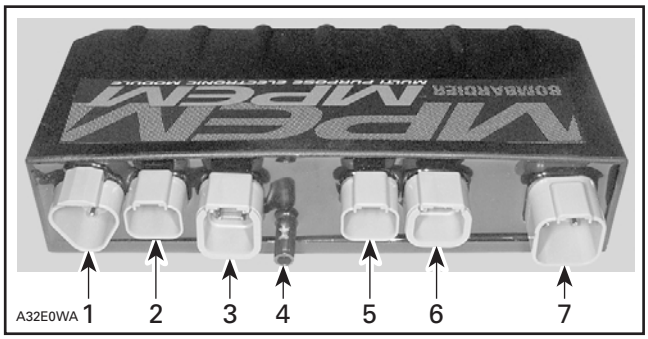
TESTING PROCEDURE

GENERAL

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

ENGINE TYPE	IGNITION SYSTEM	CHARGING SYSTEM OUTPUT
493, 593, 693 and 793	BOMBARDIER 290 W	290

Multi-Purpose Electronic Module (MPEM) Connections



TYPICAL — BOMBARDIER 290 W MPEM

1. *Generating coil and ground, 11-DB housing*
2. *Trigger coil, 11-DC housing*
3. *DPM solenoid, 11-DG housing*
4. *Atmospheric pressure nipple*
5. *High tension coil, 11-DD housing*
6. *Air temperature sensor, 11-DF housing*
7. *DESS, ignition and kill switches, DESS pilot lamp, 11-DA housing*

Checking Calibration Program

CAUTION: Do not interchange MPEM from a model to an other. 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

All Models

If the below mentionned 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.

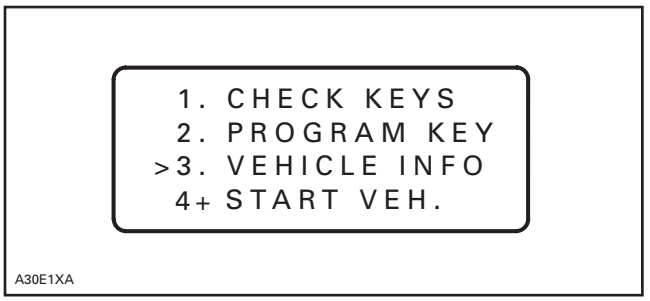
With Engine Stopped

All Models

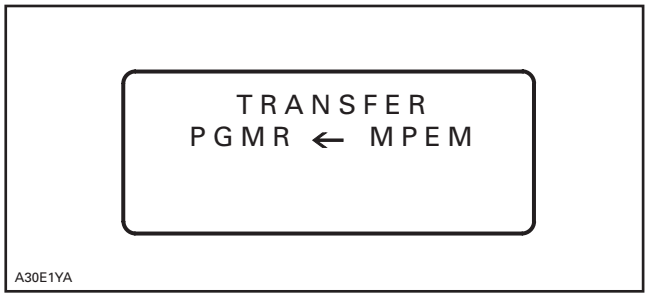
Connect 9-volt adaptor (P/N 529 035 675) to MPEM.

Turn on programmer then enter password.

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

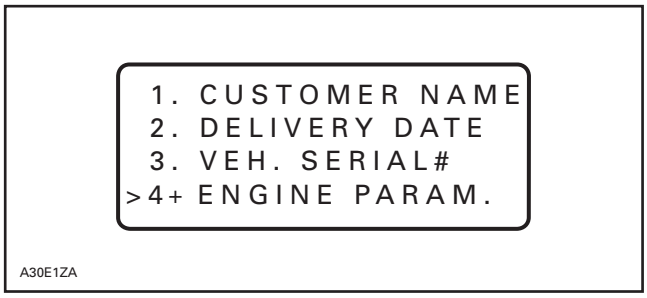


Vehicle information is transferred from MPEM to programmer.

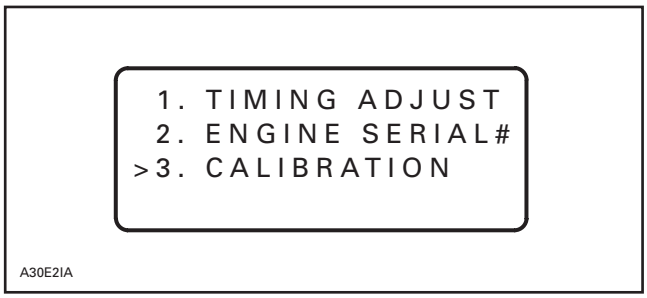


NOTE: In fact the programmer takes a **copy** of all vehicle parameters scribed in MPEM. This copy will be modified within the programmer then transferred to the MPEM.

Select no. 4. ENGINE PARAMETER.

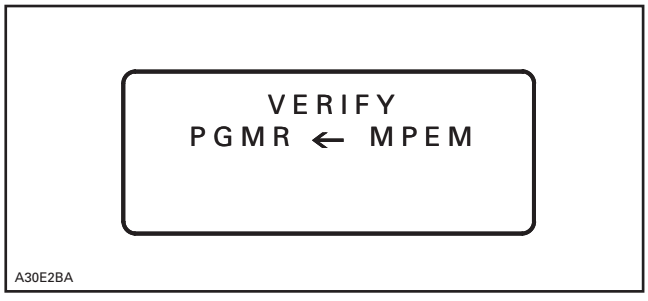


Select no. 3 CALIBRATION.

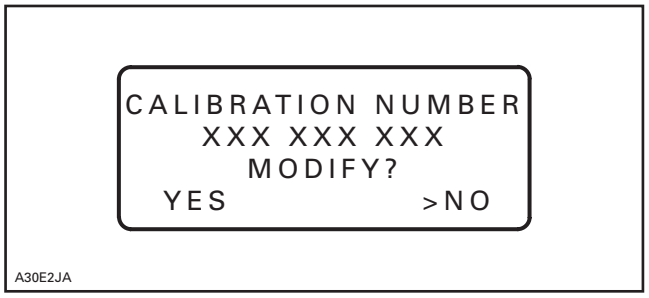


Press ENTER ←**Trs**.

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.

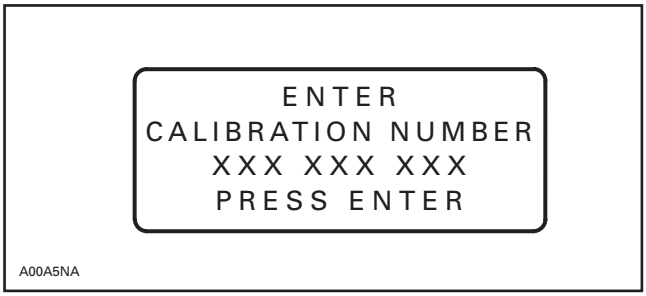
Press MENU twice; ←**Trs** then turn off programmer, unplug it from MPEM. Remove 9-volt adaptor.

Stop engine when using **With Engine Running** procedure.

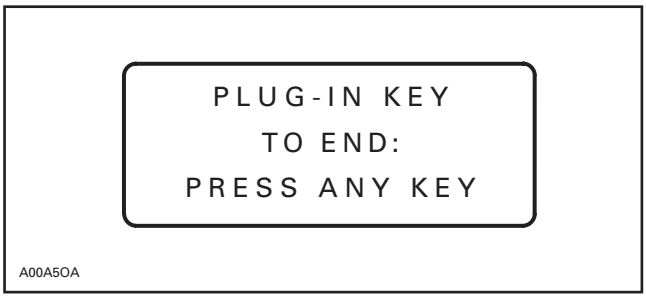
MODEL	CALIBRATED MPEM P/N (HARDWARE AND SOFTWARE)	CALIBRATION PROGRAM NUMBER (SOFTWARE)	MPEM P/N (HARDWARE)
Grand Touring 500 Formula DLX 500 MX Z 500 STD/TRAIL	515 175 380	512 059 137	512 059 201
Grand Touring 600 MX Z 600 STD/TRAIL Formula DLX 600	512 059 300	512 059 299	512 059 201
MX Z 600 ADRENALINE/X	512 059 298	512 059 299	512 059 202
Summit 600	512 059 296	512 059 297	512 059 353
Formula DLX 600 GSE	512 059 298	512 059 299	512 059 202
MX Z 700 STD/TRAIL	512 059 383	512 059 384	512 059 201
Grand Touring 700 GS Formula DLX 700 GS/GSE MX Z 700 ADRENALINE/X	512 059 385	512 059 384	512 059 202
Summit 700 STD/X/H.M./H.M X	512 059 380	512 059 381	512 059 382
MX Z 800 STD	512 059 387	512 059 432	512 059 201
MX Z 800 ADRENALINE/X	512 059 431	512 059 432	512 059 202
Summit 800 STD/X/H.M. X	512 059 360	512 059 361	512 059 382

Changing MPEM Calibration Program

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

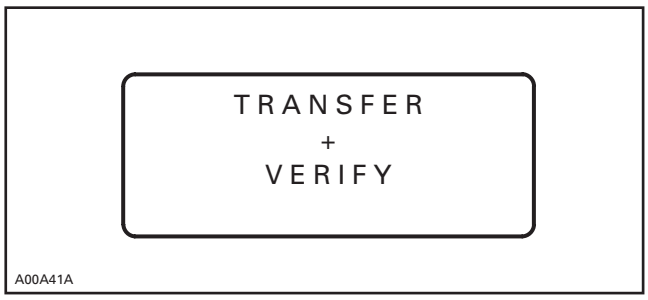


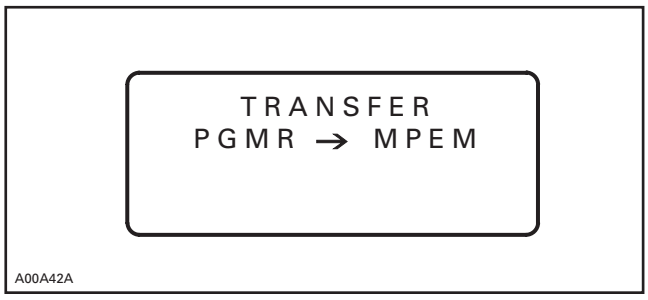
Enter new calibration number and press ENTER, following screen appears:

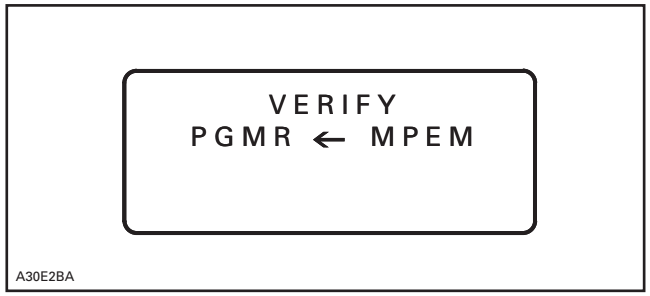


Simultaneously with the following operation a transfer will occur; ←**Trs**. At this point, be ready to rev the engine so it won't fall below the 2000 RPM mark when not using 9-volt adaptor.

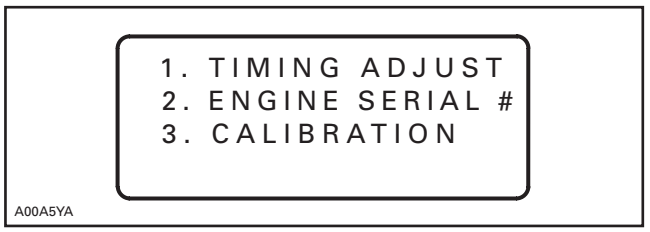
Plug-in the desired calibration cartridge (special red key) onto the programmer post, the following screens will appear temporarily:



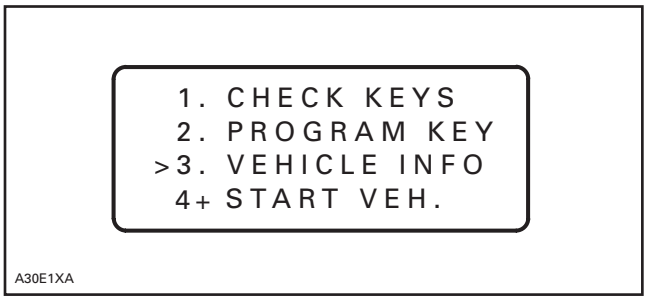




Press any key, display will show followed by next screen:



Press MENU twice, following screen will show:



After procedure is completed, ensure engine idle speed with engine hot is 1800 - 2000 RPM.

Stop the engine.

SYSTEM TESTING

IGNITION SYSTEM TESTING SEQUENCE

In the 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 switches, DESS switch and emergency switch.
4. Ignition generator coil.
5. Trigger coil.
6. MPEM voltage.
7. High voltage coil.

LIGHTING SYSTEM TESTING SEQUENCE

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

Testing Conditions

Voltage measurements are always taken upon vehicle starting. Readings 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 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

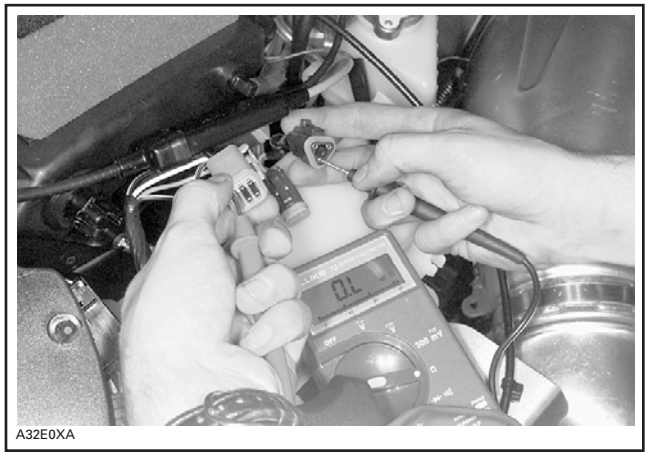
During this operation, it is important to use the snowmobile spark plug and not a new one. Bring the plug in contact with the engine. Pull rewind starter. If no spark is produced, replace the spark plug with a new one and do the test again.

2. ELECTRICAL CONNECTOR TESTING

Make sure that none of the connectors are disconnected.

3. IGNITION SWITCH, TETHER CORD SWITCH AND EMERGENCY SWITCH TESTING

Disconnect connector housings from MPEM and check resistance as indicated in IGNITION table.


A32E0XA

If readings are acceptable, go on to next step.

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

DESS Switch

Tether Cord Switch

Check using a multimeter by connecting probes to BLACK/GREEN and BLACK/WHITE wires. The multimeter should indicate a closed circuit (0 Ω) in operating position and a open circuit (0.L $M\Omega$) in off position.

DESS Switch Wire

Check continuity (null resistance) between switch center terminal and WHITE/GRAY wire connector.

Check continuity (null resistance) between switch side ring and BLACK/GREEN wire connector.

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

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

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

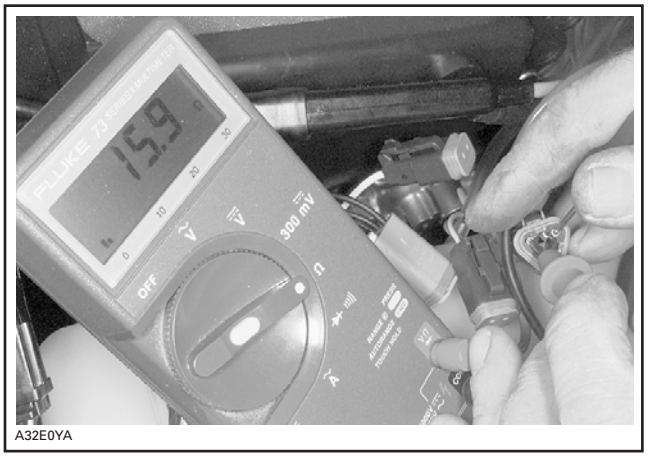
Disconnect all switches from the main wiring harness and check the continuity of each wire by connecting probes to the end of wires of the same color. Repeat with all other wires. It is important to mention that all wires of the same color within a given harness are connected together. These wires should 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 TESTING

Resistance Testing

1. Disconnect housing between the magneto and the MPEM.
2. Connect multimeter probes to WHITE and RED wires and measure resistance.



A32E0YA

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

Voltage Testing

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 housing between the magneto and the MPEM.
2. Connect multimeter probes to BLACK/RED and RED wires and bring the selector switch to $\tilde{V}$ and the scale to 00.0V_{AC}.

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 TESTING

Resistance Testing

1. Connect probes to WHITE/YELLOW and BLUE/YELLOW wires from trigger coil housing.

A32E10A

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

Voltage Testing

1. Connect probes to WHITE/YELLOW and BLUE/YELLOW wires from trigger coil housing.
2. Activate the manual starter and check values indicated by the multimeter.
3. Repeat operation 3 times.
4. Compare readings with those appearing in the IGNITION table.

6. MPEM VOLTAGE TESTING

1. Disconnect the housing between module and high voltage coil.
2. Connect multimeter probes to WHITE/BLUE and BLACK wires coming out from module. Place the selector switch to $\tilde{V}$ and the scale to 00.0^{Vac}.

A32E0ZA

TYPICAL

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.

7. HIGH VOLTAGE COIL TESTING

Resistance Testing

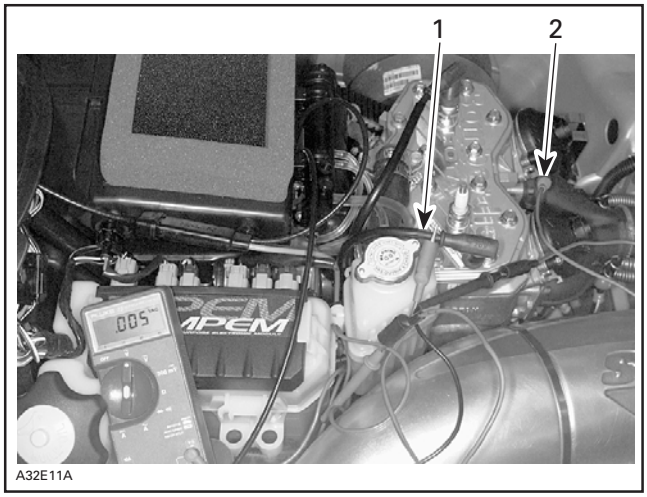
1. Unplug housing between high tension coil and MPEM.
2. Connect multimeter probes to WHITE/BLUE and BLACK wires and measure resistance.

A32E12A

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

Voltage Testing

1. Disconnect spark plug cap from spark plug.
2. Fasten alligator clip to spark plug cable, near the spark plug.
3. Connect other multimeter wire to engine (ground), then place selector switch to Ṽ and scale to 0.00^{Vac}.



1. MAG side spark plug cable
2. Connected to ground

4. Activate the manual starter and check values indicated by the multimeter.
5. Repeat operation 3 times.
6. Compare readings with those appearing in the IGNITION table.

CONCLUSION

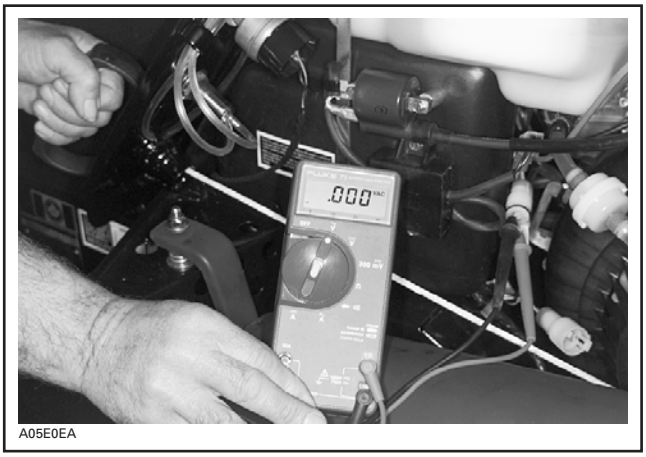
If none of the above testing operations produced valid results, it is strongly recommended to keep on testing according to the list appearing in the Resistance column of the IGNITION table.

Set the multimeter as indicated.

LIGHTING GENERATOR COIL VOLTAGE TESTING

NOTE: For 290 W system, 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 round housing from engine (YELLOW, YELLOW wires).
2. Connect multimeter probes to YELLOW wires, then place selector switch to Ṽ and scale to 0.00^{Vac}.
3. Activate the manual starter and check values indicated by the multimeter.
4. Repeat operation 3 times.



TYPICAL

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 (ZX SERIES — 290 W)								
PART	TEST TO BE PERFORMED	WIRE COLOR	MULTIMETER PROBE CONNECTION	RESISTANCE Ω		VOLTAGE V		NOTE
				VALUE (OHMS)	MULTIMETER SCALE	VALUE (VOLTS)	MULTIMETER SCALE	
Ignition and kill switches	Running insulation	BK and BK/YL	11-DB-C-F 11-DA-3-F	0.L	00.0 MΩ	—	—	No stop switch must be in run position.
	Continuity in stop position	BK and BK/YL	11-DB-C-F 11-DA-3-F	00.0 - 00.5	00.0 Ω	—	—	Only one stop switch must be in run position. Test one at a time.
DESS switch	Insulation in stop position	BK/GN and BK/WH	11-DA-2-F 11-DA-1-F	0.L	00.0 MΩ	—	—	Tether cord cap should be off.
	Running continuity	BK/GN and BK/WH	11-DA-2-F 11-DA-1-F	00.0 - 00.5	00.0 Ω	—	—	Tether cord cap should be in place.
Ignition generator coil	Output	RD and BK/RD	11-DB-A-F 11-DB-B-F	11.6 - 21.6	00.0 Ω	15.0 - 30.0	00.0 Vac	—
	Coil insulation	BK and RD	11-DB-A-F 11-DB-C-F	0.L	00.0 MΩ	—	—	—
	Ground continuity	BK and engine	11-DB-C-F 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	11-DC-2-F 11-DC-1-F	190 - 300	00.0 Ω	.200 - .350	.000 Vac	—
MPEM	Output voltage	WH/BL and BK	11-DD-1-F 11-DD-2-F	—	—	25.0 - 100.0	00.0 Vac	No switch must be in run position and tether cord cap must be in place.
High voltage coil	Primary winding resistance	WH/BL and BK	11-DD-1-F 11-DD-2-F	00.0 - 00.9	00.0 Ω	—	—	—
	All 493 and 593 engines and 693 on DLX and GT: Secondary winding resistance (spark plug wires and caps included)	PTO spark plug cap and MAG spark plug cap	In spark plug caps	17.6 K - 26.4 K	00.0 KΩ	**CAUTION:** Do not measure high voltage coil output voltage otherwise multimeter will be damaged.		
	793 engine and 693 on Summit and MX Z: Secondary winding resistance (spark plug wires and caps included)	PTO spark plug cap and MAG spark plug cap	In spark plug caps	14.5 K - 23.5 K	00.0 KΩ			
	All 493 and 593 engines and 693 on DLX and GT: Secondary winding resistance (without spark plug cap)	BK and BK	In spark plug wires	9.6 K - 14.4 K	00.0 KΩ			
	793 engine and 693 on Summit and MX Z: Secondary winding resistance (without spark plug wire and cap)	—	On high voltage coil	9.6 K - 14.4 K	00.0 KΩ			
	Secondary winding voltage	BK and engine	On spark plug wire and on engine	—	—	0.2 - 2.0	0.00 Vac	The measurement must be taken on the MAG spark plug wire, MAG spark plug cap disconnected but PTO spark plug cap installed on its spark plug.
	Insulation	Spark plug cap and BK	In spark plug cap 11-DD-2-F	0.L	00.0 MΩ	—	—	—
Spark plug cap	All 493 and 593 engines and 693 on DLX and GT: Cap resistance	—	Spark plug side and wire side	4.0 K - 6.0 K	00.0 KΩ	—	—	—

M: Male F: Female

NOTE: Stop switches include the ignition switch and the emergency 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 (ZX SERIES — 290 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	Output	YL and YL	2-MO-B-F and 2-MO-C-F	00.1 - 00.4	00.0 Ω	0.5 - 2.0	00.0 Vac	—
	Coil insulation	YL and engine	2-MO-(B,C)-F 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	2-MO-A-F and engine	00.0 - 00.5	00.0 Ω	—	—	

M: Male F: Female

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.

INSPECTION OF AC CIRCUIT INSULATION

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

INSPECTION

Disconnect regulator/rectifier.

Connect one digital ohmmeter probe (needle ohmmeter will not offer enough precision) to frame and other probe to YELLOW wire (2-MO).

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

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

INSPECTION OF HEATING ELEMENTS

All measurements must be performed at 21°C (70°F).

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 20.7 ohms
HIGH INTENSITY	YELLOW/BLACK wire ORANGE wire	8.73 to 10.67 ohms