IDENTIFY CARBURETOR AND GOVERNOR

1. Check number on metal identification disc riveted to top of float bowl cover and number stamped on governor housing cover (Figure 1) against specification chart. Use only adjustment specifications that are listed under both the carburetor assembly number and number stamped on governor housing cover. This procedure covers governors with prefix number 350 and 351 on the cover.

DISASSEMBLED VIEW

2. The disassembled view (Figure 2) will identify the various component parts of the throttle body and governor and show the relation to assembly. Use the disassembled view and legend to identify and
locate parts when performing the disassembly and reassembly operations. Refer to tool illustration for correct tools to be used. (Figure 9.)

DISASSEMBLY

3. Remove the two screws (61) - (62) and lock washers (60) on the side of the throttle body opposite the governor housing and remove the throttle lever and driver assembly (57) and gasket (56). **NOTE:** If lever is mounted on governor cover, rotate lever easily and lift internal driver out of governor housing to avoid "hooking" into compensating spring.

4. Remove the screw (55) and lock washer (54), then lift the internal driver (53) from end of throttle shaft.

5. Remove the two governor seal wires and the two governor adjustment seal channel screw plugs (79 & 80) from small end of governor housing.

6. Remove the two lead plugs (71) which seal two of the six governor housing cover screws. **NOTE:** This can be done by driving a \( \frac{3}{16} \)" screwdriver blade or similar tool into lead plug near the edge of a lead plug near the edge of a 45 degree angle. After getting a "bite" in the plug it can be pried out with a little additional driving.

7. Remove the six (6) governor housing cover screws (70) and lock washers (69) and take off the cover (68) and gasket (67).

8. Remove the compensating lever (84) by lifting it up and out of governor assembly.

9. Remove the compensating spring and block assembly (82) by lifting it up and out of the governor assembly.

10. Unscrew the compensating spring adjusting screw (83) and block assembly from the compensating spring block. **NOTE:** Do not remove the compensating spring from the compensating spring block (hex).

11. Unscrew main spring adjusting screw from seal passage (counterclockwise) until it is free of the main spring block assembly (76) and remove screw.

12. Remove the main spring block assembly (76) and compression spring (77) by lifting it up and out of the governor housing. **NOTE:** To complete this operation it will be necessary to disengage the main spring link from the flywheel link.

13. Remove the tapered compression spring from the square end of the main spring block (77).

14. Remove the flywheel nut (75) and lock washer from the flywheel end of the throttle shaft (72) with (Zenith C160-25) cap jet wrench.

15. Remove the flywheel.

(a) Install the flywheel puller (Zenith C-161-77) by inserting large pin of the puller into the hole in the flywheel with the hook-end of the puller next to the pointed center on the flywheel. Swing puller away from pointed center and guide the hook-end of the puller into the slot in the side of the flywheel until the screw in the center of the puller is in line with the threaded end of the throttle shaft.

(b) Screw down (clockwise) on the screw (hex) in the puller until it contacts the throttle shaft and then screw down until the flywheel is forced off the throttle shaft with (Zenith C161-25) cap jet wrench.

16. Remove the flywheel puller from flywheel. **NOTE:** It will be necessary to back puller screw out (counterclockwise) before puller can be swung back in position to remove.

17. To avoid confusion during reassembly, first mark the governor housing and the throttle body at adjacent points with a file or center punch, then remove the Phillips screws (66), governor housing (65) and gasket (64).

18. Lift the bearing race lock washer (65) from the bearing race located directly under the governor housing.

19. Remove the two screws and throttle plate (47). **NOTE:** The threaded end of the two screws are riveted and must be filed flat before removal to avoid breakage or stripping of threads in the shaft. In some cases it may be necessary to use a small \( \frac{1}{4} \)" round file and cut slightly below the surface of the shaft because of a slight counter bore around the screw hole. Be sure to avoid striking and cutting the side of the throttle body bore or the throttle plate when filing the screws.

20. Remove the throttle shaft (72) by unscrewing the bearing race (50) from the side of the throttle body at the threaded end of the throttle shaft. **NOTE:** There are fourteen (14) steel balls (51) in each side of the throttle shaft. Hold throttle body over a suitable container to catch the balls as they will drop out when the bearing race is unscrewed. It is very easy to lose a few of the balls in this operation and particular care must be exercised to avoid this if new balls are not available.

21. Remove the pressed-in ball bearing race (52) from the throttle shaft opening in the side of the throttle body opposite the governor housing:

(a) Insert tool (Zenith C161-130) ball race remover through the threaded throttle shaft hole until it reaches the bearing race on the opposite side and drive out. **NOTE:** The pressed-in bearing race should not be removed, unless damaged or worn. This can be determined by visual inspection after
parts are cleaned and all carbon removed. Do not remove this race unless a new part is available as it may be damaged in the removal operation.

CLEAN AND INSPECT PARTS

22. Clean Parts. Clean all metal parts thoroughly with cleaning solution and rinse in solvent.

(a) Be sure all carbon deposits have been removed from the throttle body bore and idle port. It is advisable to reverse flow of compressed air in all passages to insure all dirt has been removed.

INSPECT PARTS

23. Inspect Parts.

(a) Pressed-in Bearing Race. Replace if there is evidence of wear, pit marks or grooves.

(b) Ball Bearings (28 of these). Replace if balls show evidence of flat spots, rust or corrosion.

(c) Throttle Shaft. If inner races on throttle shaft are only slightly worn or scratched it can be reused. Throttle shafts cannot be replaced separately because of the necessity for special equipment to install the flywheel and flywheel hub on the shaft to obtain the correct throttle plate angle. Replace shaft with complete matched throttle shaft and flywheel assembly. Be sure the part number of the matched assembly used is for the particular carburetor being serviced, for the throttle plate angle on carburetor assemblies of this series may be either 13, 16 or 19 degrees.

(d) Throttle Lever and Driver Assembly. Replace if bearing and bearing cap is loose and can be tipped or rocked on the shaft. Bearings should turn freely.

(e) Compensating Spring and Block Assembly (82). Replace if coils are broken or worn.

(f) Adjustable Ball Race (threaded). Replace if surface which balls contact shows evidence of wear, grooves or pit marks.

(g) Compensating Spring Adjusting Screw Block. Make sure inner screw turns freely in the block.

(h) Governor Housing Cover. Replace if warped or bent. Cover must contact entire machined surface of housing to insure tight dust seal.

24. Verify Correctness of the following Parts. Compare number or letter shown on Specifications Chart or Zenith Bulletin No. 261, with number found stamped on each part. Main Spring and Block Assembly; Flywheel and Link Assembly; Compensating Spring and Block Assembly; and Compensating Lever.

REASSEMBLY

25. Install the pressed-in bearing race in throttle body.

(a) Screw the adjustable ball race into the threaded throttle shaft opening. NOTE: The adjustable ball race acts as a guide for the tool used in installing the pressed-in ball race to avoid installing the race in a cocked position.

(b) Place a new ball race on the shoulder of the tool (Zenith C161-105) so that the surface which the balls will contact faces away from the shoulder.

(c) Insert the pilot end of tool (Zenith C161-105) bearing race pilot driver through the throttle shaft opening and through the adjustable ball race on the opposite side of the throttle body.

(d) Drive the ball race carefully into place with a light hammer. NOTE: Care must be exercised as the race approaches the bottom of the counterbore, so that when the race is seated the throttle body casting will not be damaged.

(e) Leave the tool in place and center punch the center of the eight indentations to tighten the race securely. Remove burrs.

(f) Remove the tool and adjustable ball race.

Figure 3—Assembling Throttle Shaft and Adjustable Ball Race

26. Assemble the adjustable ball race, ball bearings and throttle shaft (Figure 3).

(a) Place the ball race, throttle shaft, and ball race retaining tool (Zenith C161-103) (knurled, counterbored and threaded sleeve), and ball scoop tool (Zenith C161-107) in a conveniently accessible position.
(b) Try the adjustable ball race in the throttle body to make sure it turns freely in the threads in the body. Remove the adjustable race and insert threaded end of the throttle shaft in the large opening of the race.

(c) Fill the ball scoop (Zenith C161-107) with balls. The scoop will hold only fourteen, and the last ball will be clearly visible. Hold the scoop in the right hand and complete the following step.

(d) Hold threaded end of throttle shaft between thumb and forefinger of left hand leaving just enough room between the ball race and throttle shaft for the ball bearings to pass and pour the balls from the scoop into the bearing race.

(e) Work the throttle shaft down into the bearing race to locate the balls in their proper position.

(f) Hold bearing race tightly in position so balls cannot fall out and screw the bearing race retainer tool (Zenith C161-103) (knurled, counterbored and threaded sleeve) on to the threaded end of the throttle shaft with the counterbored opening facing the ball race until it contacts. After this step the balls cannot fall out during the remainder of the procedure.

![Figure 4—Assembling Throttle Shaft in Body](image)

27. Load the pressed-in ball race with fourteen (14) ball bearings and assemble throttle shaft in body.

(a) Reload the ball scoop with fourteen balls.

(b) Hold the throttle body facing the mounting flange in the left hand, with governor side up, and cover the bottom throttle shaft opening with the middle finger of the same hand.

(c) Take the ball scoop (with 14 balls) and empty it into the inside of the bottom throttle shaft opening and arrange the balls in a circle around the tip of the finger so that the balls contact the pressed-in ball race.

(d) Insert the prepared throttle shaft assembly through the upper shaft opening in the throttle body and screw the adjustable ball race into the body until the bottom end of the shaft contacts the balls. Rotate the shaft slightly as the ball race is screwed further into the body and gradually work the throttle shaft through the pressed-in ball race, displacing the finger. **NOTE:** Keep the middle finger pressed upward against the throttle shaft as it forces the finger away from the pressed-in race until the shaft is properly located against the balls or otherwise the balls may drop out between the race and the shaft.

(e) Remove the bearing race retainer tool from threaded end of throttle shaft and adjust the bearing race by screwing in (clockwise) until the throttle shaft "drags" slightly when turned, then unscrew bearing race (counterclockwise) one-quarter turn to allow proper end play in the throttle shaft. **NOTE:** Use the fingers when adjusting the ball race. If too tight, use wrench very lightly.

28. Install the throttle plate and two screws.

(a) Hold the throttle body assembly with the mounting flange up and facing the brass idling port plug on the inside of the throttle body bore.

(b) Rotate the throttle shaft to face the cut-out section. The threaded ends of the screw holes will then be facing towards the idling port plug.

(c) Insert the throttle plate, center it, and then rotate counterclockwise to close it. **NOTE:** The two screw holes in the throttle plate are placed off center. To properly install the plate start the side with the longest distance between the screw holes and the beveled edge into the shaft first. The plate is made with two opposite edges beveled to fit the throttle body bore when closed. The plate will not close properly if installed upside down.

(d) Turn the throttle body over and start the screws into shaft loosely. Tap the plate lightly to center it and tighten screws firmly. Pressure must be maintained on the plate as the screws are tightened. **NOTE:** The screws are put in from the side of the throttle body opposite the mounting flange. Do not attempt to rivet throttle plate screws because the ball bearings, races or throttle shaft may be damaged, causing irregular governor action.

(e) Make sure throttle plate opens and closes freely and that the plate does not bind in the throttle body bore. **NOTE:** Any friction of shaft or plate will interfere with governor performance.
29. Place the bearing race lock washer and the throttle body to governor housing gasket in place on the throttle body. NOTE: The outer edge of the lock washer, which is saucer-shaped, must be up (towards the threaded end of the throttle shaft).

30. Install the governor housing, and four Phillips screws on the throttle body in the correct position (as indicated by markings suggested in disassembly step) and tighten screws evenly and securely.

31. With the throttle plate in wide open position, recheck the bearing adjustment. Grip edge of throttle plate between thumb and forefinger and try to shift throttle plate and shaft lengthwise. The end play should be plainly perceptible. (If necessary, remove the governor housing again to realign the ball race.)

32. Install flywheel and flywheel link assembly on throttle shaft.

(a) Hold the throttle plate in a closed position and install the flywheel on the throttle shaft aligning the flat sides of the shaft with those in the flywheel shaft hole. NOTE: When properly installed, the bottom side of the flywheel rests on the shoulder stop on the throttle shaft and just clears the bottom of the governor housing.

(b) Install flywheel lock washer and nut and tighten firmly with (Zenith C161-25) cap jet wrench.

33. Install the tapered compression spring on the square formed end of the main spring block assembly.

34. Install the main spring block assembly with the slotted side upwards, first hooking the main spring link to the flywheel link. NOTE: The main spring block assembly should fit in governor housing without binding.

35. Insert the main spring adjusting screw into the governor housing and screw it into the main spring block until the block is in a position about 1/4” from the end of the housing.

36. Install the compensating spring block assembly and adjusting screw block as follows (Figure 6).

(a) Assemble the compensating spring and block assembly and adjusting screw block.

(b) Adjust the length of the completed assembly to conform to the measurement (Figure 6) as shown on the governor specification chart or Zenith Bulletin No. 261. NOTE: Measure the length from the end of the spring to the nearest edge of the slot in the adjusting screw block (Figure 6). The correct adjustment of the length of the compensating spring block assembly is one of the most important calibrations of the governor. Be sure that the carburetor assembly number and the number on the governor housing cap compare with the measurements selected from the chart.

(c) Install the completed compensating spring block assembly into governor housing with the spring towards the flywheel.
37. Reset the main spring adjusting screw to correct specifications as follows (Figure 7):

(a) Obtain setting information from the governor specification chart or Zenith Bulletin No. 261.

(b) Turn the main spring adjusting screw until the distance between the main spring block and the small end of the governor housing conforms to the measurement given in the chart. NOTE: The governor adjustment specifications have been selected by the vehicle manufacturer as one that will provide accurate engine speed control. The specifications given are considered the most practical for the particular engine in question. To adjust governor on vehicle refer to the adjustment instructions or Zenith Bulletin No. 262.

38. Insert the compensating lever so that the three pins fall into the proper slots for the main spring block, compensating spring block assembly and governor housing. NOTE: When properly assembled the compensating lever is flush with the surface of the main and compensating spring block assemblies. It is important that the compensating spring should not buckle when compressed. The throttle should be closed fully and the action of the compensator spring observed. If it buckles remove the compensating spring and block assembly and rotate it one-sixth turn at a time until it is in a position where it will not buckle when compressed by the flywheel at closed throttle. Recheck compensating spring and block calibration (Figure 6) using screw in end of block to change calibration without removing assembly from governor housing.

39. Install both large and small threaded channel plugs in governor seal passages in small end of governor housing.

40. Install governor housing cover and gasket, six screws and four lock washers. NOTE: No lock washers are used with the two screws that will be sealed with lead plugs.

42. Install the two governor seal wires and seal.

43. Install internal driver (Figure 8), lock washer and set screw on the throttle shaft on side opposite governor. NOTE: When properly installed a line through the two lugs of the driver will be nearly parallel to the surface of the mounting flange when the throttle is closed.

44. Install throttle driver and lever assembly, gasket and two screws to the throttle body.

(a) Place screws and lock washers in assembly plate with long-headed screw in hole contacting idle adjustment screw.

(b) With throttle in wide open position place throttle driver and lever assembly on throttle body and start long-headed screw into threaded passage next to mounting flange.

(c) Tighten screws evenly and check throttle plate opening and closing with lever in wide open position.

NOTE: If throttle lever is mounted on governor housing cover proceed as follows: Install throttle driver and lever assembly, gasket, two screws and lock washers.

(a) Place gasket on lever bearing cap and align holes.

(b) Install lever assembly on governor housing cover with driver facing away from mounting flange.

(c) Rotate entire assembly (anti-clockwise) to align holes in bearing cap with threaded screw holes in cover.

(d) Install large head assembly screw (idle stop screw) and lock washer in screw hole next to wide end of governor housing.

(e) Install small head assembly screw and lock washer in opposite bearing cap screw hole.

(f) Tighten screws evenly and check throttle opening and closing with lever in wide open position.
**Figure 9—Governor Tools (550-551 Type Governors)**

<table>
<thead>
<tr>
<th>Ref. No.</th>
<th>Part No.</th>
<th>Description</th>
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<tbody>
<tr>
<td>1</td>
<td>C161-105</td>
<td>Bearing Race Driver</td>
</tr>
<tr>
<td>2</td>
<td>C161-103</td>
<td>Bearing Race Retainer</td>
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<tr>
<td>3</td>
<td>C161-77</td>
<td>Flywheel Puller</td>
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<tr>
<td>4</td>
<td>C161-107</td>
<td>Ball Scoop</td>
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<td>5</td>
<td>C161-130</td>
<td>Ball Race Remover</td>
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<td>C161-100</td>
<td>Angle Gage, 13°</td>
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<td>C161-101</td>
<td>Angle Gage, 16° (20, 23, 28, 63 and 450)</td>
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<td>C161-102</td>
<td>Angle Gage, 19° (Series Carburetors)</td>
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<td>C161-143</td>
<td>Angle Gage, 13° (29-14R)</td>
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