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SERVICE INSTRUCTION

DATE January 7, 2019

Service Instruction No. 1011N
(Supersedes Service Instruction No. 1011M)
Engineering Aspects are
FAA Approved

SUBJECT: Tappets and Lifters

MODELS AFFECTED: All Lycoming engines

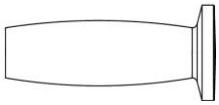
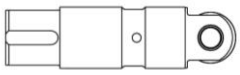
TIME OF COMPLIANCE: At overhaul or at owner's discretion

REASON FOR REVISION: Added new engine model, TEO-540 Series to Table 3.

NOTICE: Incomplete review of all the information in this document can cause errors. Read the entire Service Instruction to make sure you have a complete understanding of the requirements.

This Service Instruction includes replacement part numbers, part supersedures, as well as inspection and replacement guidelines for tappets, hydraulic lifter assemblies, and hydraulic plungers on Lycoming Engines. Table 1 identifies the types of tappets and their respective part numbers. Table 2 shows the types of lifters and their respective part numbers. Table 3 identifies approved parts to be installed on Lycoming engines that use hydraulic lifters and tappets. Table 4 identifies the parts progression history for relevant superseded parts.

Table 1
Tappet Types

Straight Body Tappets		**Hyperbolic Tappet**	**Roller Tappet**
 Figure 1 Straight Body Solid Tappet*	 Figure 2 Hydraulic Spherical Tappet*	 Figure 3 Hyperbolic Tappet*	 Figure 4 Hydraulic Roller Tappet
15B28739 Supersedes: 15B26091	**15B26588** Supersedes: 15B26064	**15B26262** Supersedes: 15B21318	**LRT23381**
Before installation, apply undiluted lubricant to the face of the tappet.**			Before installation, apply make-up engine oil to the tappets.**
* Do not interchange with roller tappets.* (A different crankcase is necessary for roller tappets.) **Refer to the latest revision of Service Instruction No. 1059.			

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ISSUED			REVISED			PAGE NO.	REVISION
MO	DAY	YEAR	MO	DAY	YEAR	1 of 9	N
09	23	60	01	07	19		

Table 2
Lifters

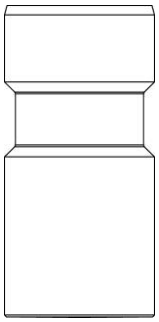
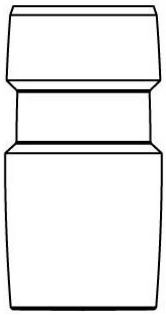
 Figure 5 Straight Hydraulic Lifter*	 Figure 6 Hyperbolic Hydraulic Lifter*
15B28093* Supersedes: 15B26090	**15B28037** Supersedes: 15B26088
*Contains a non-replaceable plunger assembly and push rod socket. Replace this lifter as a complete assembly because of the matched fit between the body and the plunger.	

Table 3
Replacement Part Numbers

Engine Model Series	**Tappets**			**Roller Tappets**
	Tappet Body	Plunger Assembly	Hydraulic Lifter Assy.	Tappet Body Assy.
O-235	15B28739	N/A	N/A	N/A
O❖/IO/AIO/AEIO/LIO-320 O♦/IO/LO***/LIO/HO/HIO*/AIO/AEIO/TIO**-360 VO/IVO-360 IO/HIO/AEIO-390 O/IO■/AEIO/TIO-540-AJ1A TEO-540 IO/AEIO-580	15B26262 or 15B26588†	15B26066		LRT23381 (A different crankcase is necessary for roller tappets.)
O-290-D2 O-340 O/GO/VO/TVO-435 GO/GSO/IGSO-480 IO-540-AG1A5 TIO/LTIO-540 (except -AJ1A) IGO-540 IGSO-540-A, -B VO/IVO/TIVO-540	15B26262 or 15B26588†	15B26066		
HIO-360-D1A, -F1AD; TO/TIO-360-C IO-720	15B26262	15B26066		

Table 3 (Cont.)
Replacement Part Numbers

Engine Model Series	Tappets			Roller Tappets
	Tappet Body	Plunger Assembly	Hydraulic Lifter Assy.	Tappet Body Assy.
O-320-H O-360-H O/LO/TO/LTO-360-E			15B28093	
TIO-541-E TIGO-541			15B28037	

┼ P/N 15B26588 is an approved alternate to P/N 15B26262 for the engine models indicated.

* Except HIO-360-D1A and HIO-360-F1AD models

** Except TIO-360-C Series

*** Except LO-360-E Series

❖ Except O-320-H Series

♦ Except O-360-E Series

■ Except IO-540-AG1A5 Series

Table 4
Superseded Component Part Numbers

Superseded by	Superseded by	Superseded by	Description of Latest P/N
15B26064	15B26262* or 15B26588**		Body - Hydraulic Tappet
15B26262*			Body - Hydraulic Tappet
15B26066			Plunger Assy - Hydraulic Lifter
15B26090		15B28093	Lifter Assy - Hyperbolic (Assy) Short
15B26089♦			Lifter - Hydraulic
15B26088	15B28037		Lifter - Hydraulic
15B26091	15B28739		Tappet Assy - Valve - Solid
LRT23381			Roller Tappet Body

* Refer to latest revision of Service Instruction No. 1543.

** The straight body spherical tappet P/N 15B26588 is an approved alternate to the bow-shaped hyperbolic tappet P/N 15B26262 especially in engine models in Table 3 with **"high time" or that have multiple field-overhauls or have lower than expected oil pressure (within specified limits) after installation of new hyperbolic tappets P/N 15B26262**.

♦ No longer available. There is no superseding replacement part. Engines that use this small diameter hydraulic lifter can be converted to use hydraulic lifter P/N 15B28093 which has a larger diameter. Refer to the latest revision of Service Instruction 1406.

NOTICE: Figure 7 shows the location of part number stampings (the last 5 digits of the part number) of the various parts identified in Tables 3 and 4.

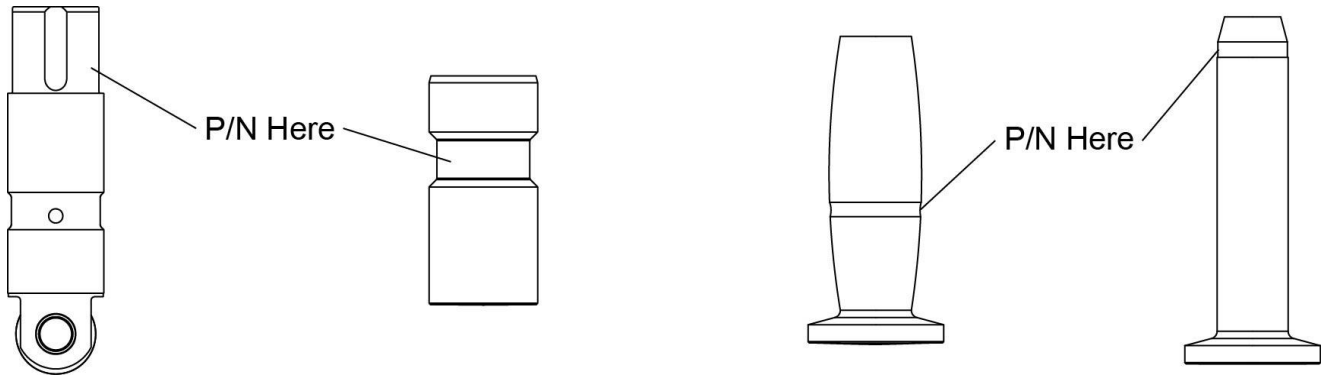


Figure 7
Part Number Locations on Tappets and Hydraulic Lifter Assembly

NOTICE: Be sure to replace all tappets with a complete set of new tappets on the engine. Do not intermix tappets with different part numbers on an engine.

Camshaft Replacement Guidelines

In most cases when replacing tappets or lifters with tappets or lifters that have superseding part numbers, replace the camshaft. It is not necessary to replace a serviceable camshaft if replacing tappet P/N 15B26262 with P/N 15B26588 lifter use with P/N 15B28093.

Plunger Replacement Guidelines

⚠ **CAUTION:** DO NOT MIX PLUNGER OR LIFTER ASSEMBLIES WITH DIFFERENT PART NUMBERS IN THE SAME ENGINE. THE DIFFERENT LEAK DOWN RATES WILL CAUSE INCORRECT ENGINE OPERATION.

NOTICE: During overhaul, all plungers must be replaced in accordance with the latest revision of Service Bulletin No. SB-240.

1. During scheduled maintenance or other in-service repairs that includes disassembly/reassembly of the valve train, examine the plungers in accordance with the instructions in this Service Instruction before reinstalling.
2. However, if valve train failure was identified, replace the hydraulic plunger with a new hydraulic plunger.

Inspection Overviews

Inspection of the hydraulic lifter includes:

Inspection Task	Referenced Section in this Document
Tappet Body Inspection	Tappet Body Inspection Guidelines -Attachment 1
Plunger Inspection (only on hydraulic tappets)	Plunger Inspection Guidelines - Attachment 2

Fluorescent Penetrant Inspection

Except for roller tappets which are replaced during overhaul, Fluorescent Penetrant Inspection (FPI) is recommended to be completed on all other types of tappets for verifiable assurance that no cracks have been introduced into the tappet body while in service. FPI is recommended in lieu of magnetic particle inspection on these parts due to the original manufacturing techniques used to make these parts. Refer to the latest revision of Service Instruction No. 1285 for information about FPI.

Post-Inspection Tasks

After inspections are complete, do the following tasks:

Assembly Task	Referenced Section in this Document
Assemble the plunger	Assembly of the Plunger
Assemble and install the hydraulic lifter	Assembly and Installation of the Hydraulic Lifter

Assembly of the Plunger

⚠ **CAUTION:** ALL PARTS OF EACH HYDRAULIC PLUNGER ASSEMBLY ARE SELECTIVELY FITTED AND ARE NOT INTERCHANGEABLE. MATING PARTS MUST BE KEPT TOGETHER. IF THERE IS ANY DOUBT AS TO WHETHER THE PARTS HAVE BECOME MIXED, INSTALL NEW PLUNGER ASSEMBLIES.

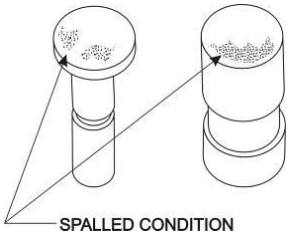
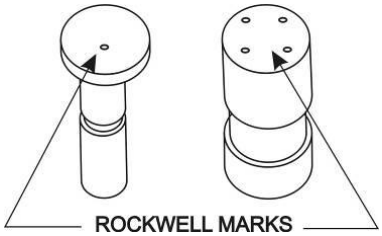
1. Clean and lightly coat the lifter parts with engine oil before assembly.
2. To assemble the unit, unseat the ball by inserting a thin clean bronze wire through the oil inlet hole.
3. With the ball off its seat, insert the plunger and turn it clockwise until the spring engages.

Assembly and Installation of the Hydraulic Lifter

1. When returning parts to service, all parts must be installed in their original location in the engine.
2. Liberally coat the tappet faces and cams with an approved lubricant identified in the latest revision of Service Instruction No. 1059.
3. Measure the dry tappet clearance and adjust as necessary in accordance with instructions in the applicable Lycoming Maintenance or Overhaul Manual.

ATTACHMENT 1

Tappet Body Inspection Guidelines

Task	Findings	Corrective Action
1. Examine the tappet body (and plunger on the tappet) for part number identification as shown in the illustrations in Figure 7.		If the part number cannot be identified, remove and replace the tappet body with a new tappet body.
2. Use a 10 power or greater magnifier to examine the face of the tappet body for signs of spalling or pitting (Figure 8). **NOTICE:** The tappet face also could have one or more Rockwell marks (Figure 9). Rockwell marks look round; whereas a spall mark has an irregular pattern. Rockwell marks alone are not sufficient cause to replace a tappet body.		If spalling or pitting is found: 1. Remove and discard the tappet body and replace it with a new tappet body. 2. Visually examine the cam lobe for any surface irregularity, scuffing, pitting, or feathering at the edge of the lobe. If any of these conditions are found on the cam lobe, replace the camshaft.
 **Figure 8** **Spalling on Tappet Face**		 **Figure 9** **Rockwell Marking on Tappet Face**
3. If a new camshaft is installed in the engine, replace all of the tappet bodies.		Replace all tappet bodies.
4. Look for discoloration, with circular wear and/or wavy patterns on the face of the tappet body (Figure 10).	Circular wear Wavy pattern(s) Discoloration	If circular wear and/or wavy patterns found, discard the tappet body and replace with a new tappet body. Discoloration, without wavy or circular wear patterns on the tappet face, is not sufficient reason to replace the tappet.
 **Figure 10** **Unacceptable Surfaces**		

Tappet Body Inspection Guidelines

Task	Findings	Corrective Action
5. Look for damage to the lifter face.		If damage is found, discard the tappet body and replace with a new tappet body of the same part number*.
6. Examine the interior bore of the tappet body. a. Look for wear at the interior shoulder. b. Look for a feathered or chipped edge around the shoulder (Figure 11).	Wear found at the interior shoulder and/or Feathered or chipped edge around the shoulder	If wear, feathering or chipped edge found, replace with the tappet body of the same part number*.

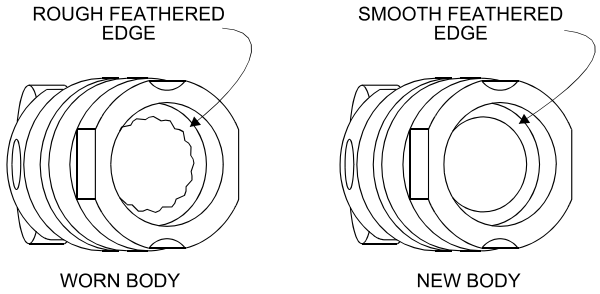


Figure 11
Comparison Between Worn and New Tappet Body

7. Record the completion of this inspection in the engine logbook.

* If an acceptable superseding tappet part number is installed, replace all tappets with tappets of the same replaced part number. Refer to Table 4.

ATTACHMENT 2

Plunger Inspection Guidelines

NOTICE: This inspection is to be completed any time the plunger is removed from the crankcase during scheduled inspections or engine maintenance. At overhaul, the plunger must be removed, discarded, and replaced.

Task	Findings	Corrective Action
⚠ **CAUTION:** DO NOT USE A MAGNET TO REMOVE THE PLUNGER BECAUSE THE CHECK VALVE BALL COULD BECOME MAGNETIZED WHICH WOULD MAKE THE PLUNGER NOT OPERATE.		
1. Examine the plunger for chipping on the shoulder (Figure 12).		If chipping is found, discard the plunger and replace with a new plunger.

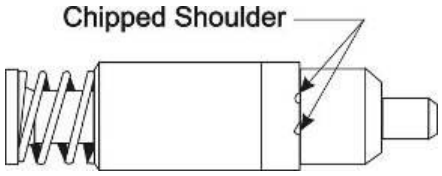


Figure 12
Chipped Shoulder

2. Examine the plungers for collapse as follows: a. Align all of the removed hydraulic plungers side by side on a clean flat surface. b. Put a straight edge across the shoulder surface of the plungers (Figure 13). c. Measure the distance from the straight edge of any plunger that is not touching the straight edge. d. If there is any plunger that is more than 1/32 in. (0.79 mm) below the straight edge, the plunger is collapsed.		Discard and replace any collapsed plunger with a new plunger.

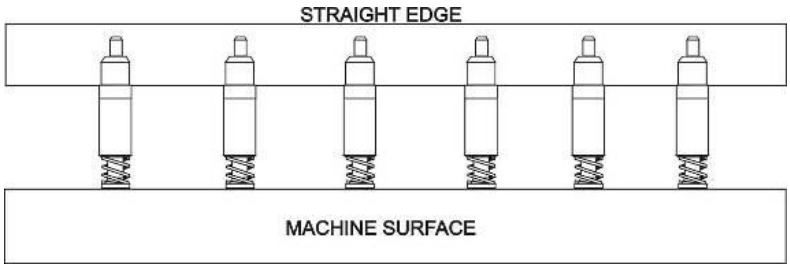
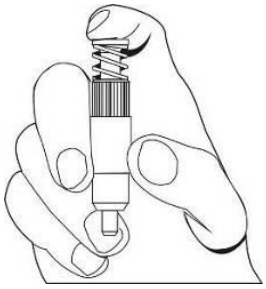


Figure 13
Straight Edge Across Shoulder Surface of Plungers

ATTACHMENT 2 (Cont.)

Plunger Inspection Guidelines

Task	Findings	Corrective Action
3. Examine the body of the plunger for cracks.		Discard and replace any cracked plunger with a new plunger.
4. Disassemble and clean the acceptable (non-collapsed, non-cracked) plunger with solvent; back flush the plunger with solvent.		
5. Look for a leaking check valve on the plunger as follows: a. Dip the plunger in engine oil. b. Hold the hydraulic cylinder between the thumb and middle finger in a vertical position with one hand. c. Hold the plunger in position where it just enters the cylinder. **NOTICE:** Hold the plunger as shown in Figure 14. Do not cover the tube extending from the bottom of the plunger; otherwise, the check will not be satisfactory. d. Press the plunger quickly with the index finger.		If the plunger bounces back, the unit is satisfactory. If the plunger does not bounce back but stays collapsed, the check valve is leaking and is not seating properly; replace the plunger with a new plunger - do this valve operational check on the new plunger to be sure it operates correctly.
 **Figure 14** **Plunger**		
Record the completion of this inspection in the engine logbook.		