TECUMSEH

Service Dealer's and Technician's Training and Informational Series

Tecumseh Quick Reference Service Information

Covers Engine and Transmission Product

TECUMSEH®

ENGINES & TRANSMISSIONS

IMPORTANT NOTICE!

This booklet is intended for individuals who have a general understanding of internal combustion engines, adequate training, experience and who practice proper tool usage. Service procedures should be clearly understood and practiced when servicing Tecumseh Engines.

Safety Definitions

Statements in this booklet preceded by the following words and graphics are of special significance:

⚠ WARNING

Or

⚠ WARNING

WARNING indicates a potentially hazardous situation which if not avoided, could result in death or serious injury.

⚠ CAUTION

CAUTION indicates a potentially hazardous situation which, if not avoided, may result in minor or moderate injury.

CAUTION

CAUTION without the safety alter symbol indicates a potentially hazardous situation which, if not avoided, may result in serious property damage.

NOTE
Refers to important information and is placed in italic type.

It is recommended that you take special notice of all items discussed on pages 1 and 2 and wear the appropriate safety equipment.

Notice Regarding Emissions

NOTE
Engines which are certified to comply with California and U.S. EPA emission regulations for SORE (Small Off Road Equipment), are certified to operate on regular unleaded gasoline, and may include the following emission control systems: (EM) Engine Modification and (TWC) Three-way Catalyst (if so equipped).

Tecumseh Contact Information

Contact your nearest Authorized Tecumseh Servicing Dealer if:

- You are unable to perform service procedures covered in this booklet.
- You have questions about service procedures covered in this booklet.
- You would like to order service tools.
- You would like to request additional printed copies of this booklet.

You may find your Authorized Tecumseh Servicing Dealer on our website at www.TecumsehPower.com or call Tecumseh Power Company at 1-800-558-5402 or 262-377-2700 if you are located outside the U.S. or Canada.

Introduction

This booklet contains the quick reference and basic troubleshooting information previously found on Tecumseh wall charts and in the Technician's Handbooks.

This booklet is designed to be used as a work bench quick reference guide when servicing Tecumseh engines and motion drive systems.

Technician's Note:

Tecumseh engines are manufactured to meet EPA and CARB standards. As a technician, it is unlawful to re-calibrate or replace a fuel nozzle or jet (bowl nut) with a part from any other carburetor that was not originally designed for that engine. All speed adjustments must remain within the limits that are specified for each engine and are not to exceed the maximum. This can only be deviated from if specifically approved by Tecumseh Power Company, EPA and CARB.

Contents

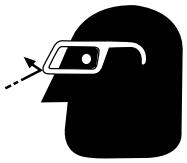
General Safety Precautions

WARNING

Read the original equipment manufacturer's manual(s) and this booklet thoroughly before servicing Tecumseh engines.
Always follow recommended service procedures. Such procedures affect the safe operation of the equipment and the safety of you and/or the operator. Failure to follow the instructions and warnings may result in serious injury or death. Call Tecumseh Power Company at 1-800-558-5402 or visit www.TecumsehPower.com if you have any questions.

A. Use Personal Protective Equipment

To avoid injury, wear protective equipment including appropriate clothing, eyewear, safety shoes and ear plugs when servicing Tecumseh products.



B. Stay Away from Rotating Parts

Rotating parts can cause severe injury or death. Use special care when making service adjustments with covers or guards removed.
Keep tools, hands, feet, hair, jewelry, and clothing away from all moving parts. Replace covers and guards before operating equipment.

C. Stay Away from Hot Surfaces

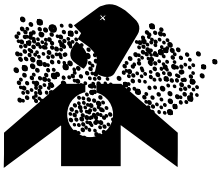
Parts of equipment being serviced become extremely hot during operation and remain hot after the equipment has stopped. To avoid severe burns, stay away from hot surfaces or allow the unit to cool prior to service.

D. Avoid Accidental Equipment Movement

To prevent accidental movement of equipment, always set the parking brake. For gear-driven products that do not have a parking brake, leave equipment in gear and chock the wheels. Refer to original equipment operator manuals for additional information.
Pulley bosses that hold the rewind spring inside the keeper and spring housing may not be secured and can be easily loosened. Use special care when handling this housing. Failure to do so could cause spring to "fly out" which could result in minor or moderate injury.
Always discard gaskets, O-rings and seals after removal. Use only new gaskets, O-rings and seals for assembly. Failure to do so could result in leakage from engine areas that use these parts.

E. Always Provide Adequate Ventilation

To avoid serious injury or death, always ensure that you are working in a properly ventilated facility. Special precautions are required to avoid carbon monoxide poisoning.



All engine exhaust contains carbon monoxide, a deadly gas. Breathing carbon monoxide can cause headaches, dizziness, drowsiness, nausea, confusion and eventually death.
Carbon monoxide is a colorless, odorless, tasteless gas which may be present even if you do not see or smell any engine exhaust.
Deadly levels of carbon monoxide can collect rapidly and you can quickly be overcome and unable to save yourself. Also, deadly levels of carbon monoxide can linger for hours or days in enclosed or poorly-ventilated areas.
If you experience any symptoms of carbon monoxide poisoning, leave the area immediately, get fresh air, and SEEK MEDICAL TREATMENT.
To prevent serious injury or death from carbon monoxide:

- ALWAYS direct engine exhaust outdoors.
- NEVER run engine outdoors where engine exhaust can be drawn into a building through openings such as windows and doors.

F. Use Proper Methods When Cleaning

To reduce the risk of serious injury or death from fires and/or explosions, NEVER use flammable solvents (e.g., gasoline) to clean serviceable parts. Use a water-based, non-flammable solvent such as Tecumseh Degreaser Cleaner.

G. Compressed Air Precautions

Never use compressed air to clean debris from yourself or your clothing. When using compressed air to clean or dry serviceable parts:

- Wear appropriate eye protection.
- Use only approved air blow nozzles.
- Air pressure must not exceed 30psi (206kPa).
- Shield yourself and bystanders from flying debris.

H. Inspect and Adjust Brake(s)

Always inspect and adjust flywheel brake components whenever servicing equipment that has a Tecumseh engine. Refer to this Technician's Handbook and bulletins for proper brake adjustment.

I. Operate Equipment Safely

Operation of equipment presented for service can be hazardous. To avoid serious injury or death, DO NOT operate equipment, until:

- all relevant inspection procedures presented in this book are performed and
- technician is satisfied equipment can be operated safely.
- Starter pulley springs hold the starter rope and control tension by winding the rope around the pulley. Use caution when pulling and releasing the rope to and from the starter housing. Failure to do so could cause the rope to unexpectedly jerk back which could result in minor or moderate injury.

J. Avoid Gasoline Fires

Gasoline (fuel) vapors are highly flammable and can explode. Fuel vapors can spread and be ignited by a spark or flame many feet away from engine. To prevent injury or death from fuel fires, follow these instructions:

- NEVER store engine with fuel in fuel tank inside a building with potential sources of ignition such as hot water and space heaters, clothes dryers, electric motors, etc.
- NEVER remove fuel fill cap or add fuel when engine is running.
- NEVER start or operate the engine with the fuel fill cap removed.
- Allow engine to cool before refueling.
- NEVER fill fuel tank indoors. Fill fuel tank outdoors in a well-ventilated area.
- DO NOT smoke while refueling tank.
- DO NOT pour fuel from engine or siphon fuel by mouth.

K. Avoid Accidental Starts

To prevent accidental starting when working on equipment always:

- Disconnect spark plug wire and keep it away from spark plug.
- Keep the disconnected spark plug wire securely away from metal parts where arcing could occur.
- Attach the spark plug wire to the grounding post, if provided.
- Turn off all engine switches.

General Information

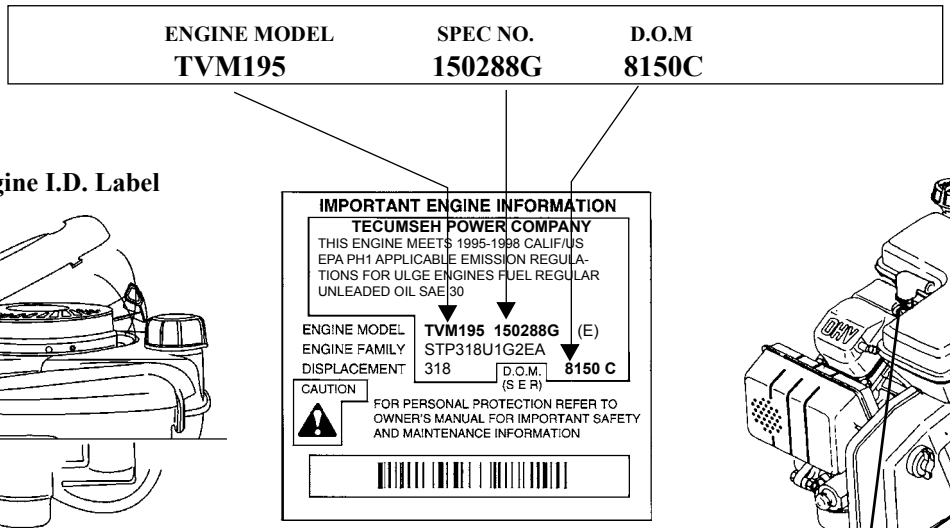
The following information is being provided to assist you in locating and recording your engine model and specification numbers. This information will be needed to use this book or obtain parts from a local Tecumseh dealer.

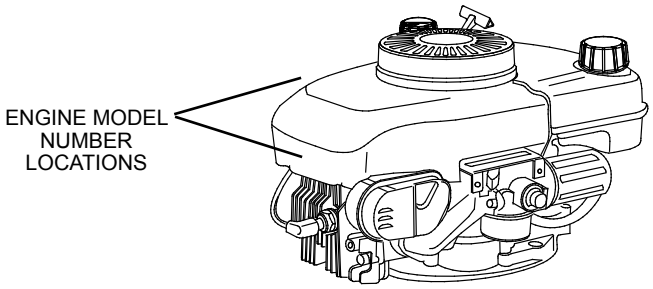
Model Numbering System for Tecumseh's Full Engine Line Prior to 2004 Production

LOCATING AND READING ENGINE MODEL AND SPECIFICATION

THE FOLLOWING WILL BE NEEDED TO LOCATE PARTS FOR YOUR ENGINE.

	Model	Specification	(DOM)
ENGINE:	TVM195	150288G	8150C





Model Numbering System for Current Tecumseh's Full Engine Line

Reviewing The Engine ID Label

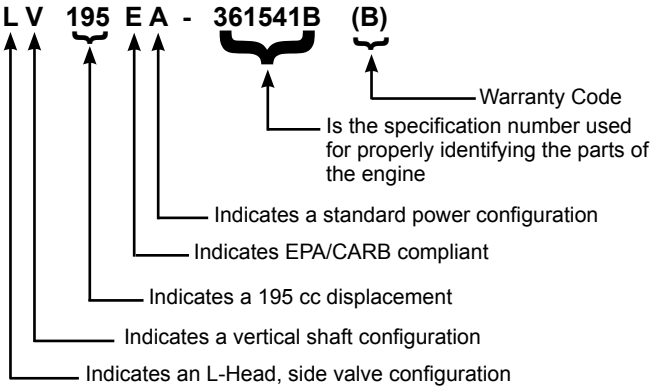
Effective with the 2004 Model Year, we have changes to the engine I.D. label on our products. The following pages will explain the information contained on the label dependent on the age of your product.

Specification Number

The numbers following the model number make up the specification number.

Using model **LV195EA-361541B**, as an example, interpretation is as follows:

LV195EA-361541B is the model and specification number.



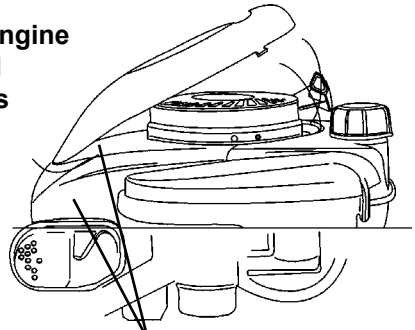
Date of Manufacture

The Date of Manufacture (D.O.M.) indicates the production date.

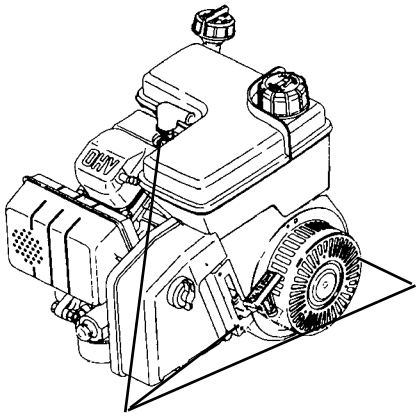
For this example, **03188BC0010** is the D.O.M. (Date of Manufacture).

Year	Day of Year	Mfg Facility	Assembly Line / Shift	Individual Serial #
2005	188th			10th unit built
05	**188**	**B**	**C**	**0010**

Typical Engine I.D. Label Locations

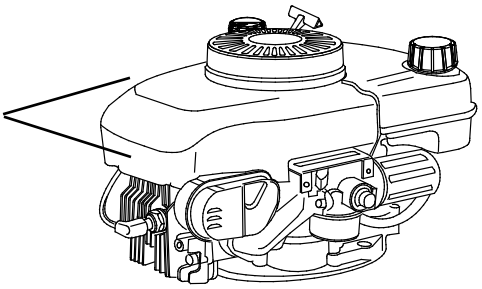


ENGINE MODEL NUMBER LOCATED UNDER COVER



ENGINE MODEL NUMBER LOCATIONS

ENGINE MODEL NUMBER LOCATIONS



Model Numbering Identification for Tecumseh's Full Engine Line

CURRENT CODE *(effective 2004 production)*
1st Space - Valve Orientation
T = Two Cycle
O = Overhead Valve
L = L-Head
2nd Space - Crank Orientation
V = Vertical
H = Horizontal
M = Multi-position
3rd, 4th and 5th Space - Displacement
6th Space - Emissions Class
E = 50 State/Global Emissions Compliant
X = Not for sale in California, except exempt applications
S = Snow Emission Compliant
7th Space - Engine Specifics
A = Standard (OHH50-60), (OHSK50-70)
P = Power Up (OHH65-70, OHSK75-775)

Prior to 2004 Model Number Conversion Chart

4-Cycle

LEV90	- LV148EA	**OHH60**	- OH195EA
LEV120	- LV195EA	**OHH65**	- OH195EP
HSSK50	- LH195SA	**OHSK70**	- OH195SA
HSSK55	- LH195SP	**OHSK75**	- OH195SP
VSK90	- LV148SA	**HMSK90**	- LH318SA
OHV135	- OV358EA	**HMSK110**	- LH358SA
OHV180	- OV490EA	**OHSK110**	- OH318SA
TVT691	- OV691EA	**OHSK130**	- OH358SA
VTX691	- OV691EP	**OHM110**	- OH318EA

2-Cycle

TC300 - TM049XA
HSK870 - TH139SP
HSK600 - TH098SA
AV520 - TV085XA

4-Cycle

ECH - Exclusive Craftsman Horizontal
ECV - Exclusive Craftsman Vertical
H - Horizontal Shaft
HH - Horizontal Heavy Duty (Cast Iron)
HHM - Horizontal Heavy Duty (Cast Iron) (Medium Frame)
HM - Horizontal Medium Frame
HMSK - Horizontal Medium Frame (Snow King)
HMXL - Horizontal Medium Frame (Extra Life)
HS - Horizontal Small Frame
HSSK - Horizontal Small Frame (Snow King)
HXL - Horizontal (Extra Life)
LAV - Lightweight Aluminum Frame Vertical
LEV - Low Emissions Vertical
LH - L-Head Horizontal
LV - L-Head Vertical
OH - Overhead Valve Heavy Duty (Cast Iron)
OHH - Overhead Valve Horizontal
OH195 - Overhead Valve Horizontal (195 cc's)
OHM - Overhead Valve Heavy Duty Horizontal (Medium Frame)
OHSK - Overhead Valve Horizontal (Snow King)
OHV - Overhead Valve Vertical (Medium Frame)
OV - Overhead Valve Vertical
OVM - Overhead Valve Vertical (Medium Frame)
OVRM - Overhead Valve Vertical (Small Frame) (Rotary Mower)
OVXL - Overhead Valve Vertical (Medium Frame) (Extra Life)
TNT - Toro 'N' Tecumseh (Toro Exclusive Series)
TVEM - Tecumseh Vertical European Model
TVM - Tecumseh Vertical (Medium Frame) (Replaces V & VM)
TVS - Tecumseh Vertical Styled
TVT - Tecumseh Vertical Twin
TVXL - Tecumseh Vertical (Extra Life)
V - Vertical Shaft
VH - Vertical Heavy Duty (Cast Iron)
VLV - Vector Lightweight Vertical
VLXL - Vector Lightweight Vertical (Extra Life)
VM - Vertical Shaft (Medium Frame)
VSK - Vertical Snow King
VTX - Vertical Twin

2-Cycle

TH - Two Cycle Horizontal Shaft
TM - Two Cycle Multiposition Operation
TV - Two Cycle Vertical Shaft

Cross Reference for Specification - To - Model Number Designation

This cross reference chart allows you to determine an engine Model Number if you only have the Specification Number.

VERTICAL 4-CYCLE ENGINES

Specification Number Series	Model Number
10000	TNT100
12000	TNT120
20000	LAV25, OVRM55
20500	OVRM105
21000	OVRM60
21800	OVRM60
22000	OVRM65, OVRM120
23000	OV195EA (RM)
23500	OV195EA (Utility)
30000	LAV30
33000	TVS75
40000	LAV35
42000	OVRM905 (Sears Only)
42600	OVRM40, OVRM45 (Premier Engine)
42900	OVRM40 (High Tech Look)
43000	TVS90
43600	TVS90 (Premier Engine)
43700	TVS90, TVXL90
43900	TVS90 (High Tech Look)
44000	TVS100
44600	TVS100 (Premier Engine)
44800	TVS100
46000	TVS90, TVXL90
46600	TVS90
48000	TVS90
50000	V40
50200	LAV40
52600	OVRM50, OVRM55 (Premier Engine)
52800	OVRM50, OVRM55
52900	OVRM50, OVRM55 (High Tech Look)
53000	TVS105
53600	TVS105 (Premier Engine)
53800	TVS105
53900	TVS105 (High Tech Look)
54000	TVXL105
56000	TVS105, TVS & TVXL115
56600	TVS105, TVS115 (Premier Engine)
56800	TVS115
56900	TVS105, TVS115 (High Tech Look)
57000	TVS & TVXL115
57600	TVS115 (Premier Engine)
57800	TVS115
57900	TVS115 (High Tech Look)
60000	V50, TVM125
61000	TVS & TVXL115
61600	TVS & TVXL115
61800	TVS115
61900	TVS115
62000	LAV50
62100	LAV50 & TVS115
63000	TVS120
63200	TVS120, TVEM120
63600	TVS120 (Premier Engine)
63900	TVS120 (High Tech Look)
66000	TVS120
66100	TVS120
70000	V60, TVM140
80000	VH40
90000	VH50
100000	VH60
125000	V70
127000	VM70, TVM170
127200	TVXL170
135000	VH70

Specification Number Series	Model Number
145000	ECV100
147000	ECV105
148000	VH80
149000	VH100
150000	V & VM80, TVM195
150200	TVM & TVXL195
150500	TVM195
151000	ECV110, TVM195
151500	TVM220
152000	ECV120
157000	VM100, TVM220
157200	TVM & TVXL220
157400	TVM220
200000	OVM120
202000	OVXL120, OVXL125
202200	OVXL120 (I/C)
202300	OHV11, OHV115
202400	OVXL125
202500	OHV115
202600	OVXL125 (I/C)
202700	OHV12, OVXL120 (Tec.1200)
203000	OHV125, OVXL125 (Tec1250)
203200	OHV13
203500	OVXL125 (Tec.1250I/C), OHV13/135
203600	OHV14/140
203800	OHV145
204000	OHV15/150
204200	OHV16/160
204400	OHV165
204500	OHV155
204600	OHV17/170
204800	OHV175
206000	OHV110
206200	OHV115
206400	OHV120
206600	OHV125
206800	OHV130
206900	OHV135,OV358EA (Sm. Enduro)
208000	OHV180,OV490EA (Lg. Enduro)
334000	LEV90, LV148EA
334500	VSK90, LV148SA
335000	LEV100
338000	LEV100
338500	VSK100
340000	LEV100
345000	LEV100
346000	LEV105
347000	LEV105
348500	VSK105
350000	LEV115
355000	LEV115
360000	LEV115
361000	LEV120
361400	VSK120
361500	LEV120, LV195EA (Utility)
362000	LEV120, LV195EA (RM)
400000	VLV40
500000	ULT, VLV B24, VLXL50, & VLV126
501000	ULT, VLV, VLXL55, & VLV126
502000	ULT, VLV60, VLV65, & VLV126
502500	VLV65, VLV66
600400	TVT691
600800	TVT691, OV691EA (Twin)
600900	VTX691, OV691EP (Twin)

Cross Reference for Specification - To - Model Number Designation

This cross reference chart allows you to determine an engine Model Number if you only have the Specification Number.

HORIZONTAL 4-CYCLE ENGINES

Specification Number Series	Model Number
15000	H22
25000	H25
26000	OHH45
35000	H30
35400	HSK30
35800	H30
36700	H30
45000	H & HT35
45400	HSK35
45800	H35
46700	H35
47000	HXL35
55000	H40
55200	HS & HSSK40
55500	HSK40
55700	H40
55800	H40
55900	HSSK40
65000	H50
65300	HSK50
67000	HS & HSSK50, LH195SA
67500	HSSK55, LH195SP
68000	OHH50
68500	OHSK50
69000	OHH55
69500	OHSK55
71100	OHH60, OH195EA
71500	OHSK60
71700	OHH65
71800	OHH65, OH195EP
71900	OHSK65
72000	OHH70
72500	OHSK70, OH195SA (Premium)
73500	OHSK75, OH195SP (Premium)
75000	H60
76000	HSK60
85000	HH40
95000	HH50
105000	HH60
110000	HH80
115000	HH100

Specification Number Series	Model Number
120000	HH120
130000	H70
130200	HSK70
132000	HM & HMSK70
132500	HMXL70
140000	HH70
146000	ECH90
155000	H & HM80
155000	HMSK80
155800	HM85
155900	HM & HMSK85
156000	HM90
156500	HMSK90, LH318SA
159000	HM & HMSK100, LH358SA
159900	HMSK105
159950	HMSK110
160000	HH & OH140
170000	HH150 & 160
170000	OH160
175000	OH120
180000	OH180
190000	HHM80
220000	OHM120
221000	OHSK110
221200	OHSK80
221400	OHSK90
221600	OHSK100
221700	OHSK110
221800	OHSK115, OH318SA (Premium)
222000	OHSK120
222300	OHM90
222500	OHM100
222700	OHM110, OH318EA
223000	OHSK90
223400	OHSK110
223600	OHSK120
223700	OHSK125
223800	OHSK130, OH358SA (Premium)

VERTICAL 2-CYCLE ENGINES

Specification Number Series	Model Number
3600	TC300, TM049XA
670000	AV520, TV085XA

HORIZONTAL 2-CYCLE ENGINES

Specification Number Series	Model Number
1720	HSK635, TH098SA
8300	HSK850, TH139SA
8700	HSK870, TH139SP

TORQUE SPECIFICATIONS

Two Cycle Engines

NOTES

Torque specifications listed should not be confused with the torque value observed on engines which have been run.

The torque specifications take relaxation into account so sufficient clamping force exists after an engine has reached operating temperature.

Torques listed are intended to cover highly critical areas. More extensive torques are found in the respective repair manual.

840 - 870 and TH139SA Two Cycle Engine Series

Location	Inch lbs. Torque	Nm	Engine Designation			
			TVS	TVXL	TH139SA	HXL
Crankcase to Cylinder	120-204	13.5-23	■	■	■	■
Flywheel Nut	360-420	41-47.5	■	■	■	■
Adapter Plate to Cylinder	160-220	18-25	■	■		

TC / TM Two Cycle Engine Series

Location	Inch lbs. Torque	Nm	Engine Designation			
			TC200	TC300	TCH200/300	TM049
Cylinder to Crankcase	80-95	9-11	■	■	■	
Crankcase Cover to Crankcase	70-100	8-11	■	■	■	
Flywheel Nut	190-250	21.5-28.5	■	■	■	■
Crankcase Cover to Cylinder	105	12				■

Two Cycle Engine Series (AV520/600, TVS600, AH520, AH/HSK600, TH and TV)

Location	Inch lbs. Torque	Nm	Engine Designation			
			AV520/600 TV035XA	TVS600	AH/HSK600 TH098	AH520
Connecting Rod	40-50	4.5-5.5	■	■	■	■
Housing Base to Cylinder	80-120	9-13.5	■	■	■	■
Cylinder Head to Cylinder	100-140	11-16	■	■	■	■
Flywheel Nut AV (Point Ignition) (670 Series AV520 and All AV600)	216-300	24.5-34	■			■
Flywheel Nut (C.D. Ignition)	264-324	30-36.5	■	■	■	■

TORQUE SPECIFICATIONS

Four Cycle Engines

NOTES

Torque specifications listed should not be confused with the torque value observed on engines which have been run.

The torque specifications take relaxation into account so sufficient clamping force exists after an engine has reached operating temperature.

Torques listed are intended to cover highly critical areas. More extensive torques are found in the respective repair manual.

Four Cycle Light Frame Engine Series (TVS, TNT, ECV, LAV, LH, LV, LEV, H, HS, OH, OHH, OV, OVRM, VLV and VSK)

Location	Inch lbs. Torque	Nm	Engine Designation									
Aluminum Light Frame Engines			TVS	TNT	ECV	LAV	H/HSK	HS/HSSK/ LH	OVRM. OV	VLV	LEV / LV	OHH / OH
Rocker Arm Stud Lock Nut	100-140	11-16							■			■
Connecting Rod	95-110	11-12.5	■	■	■	■	■	■	■	■	■	■
Cylinder Head	160-210	18-24	■	■	■	■			■			
Cylinder Head	220-240	25-27							■			■
Cylinder Head	180-220	20.5-25								■		
Mounting Flange or Cylinder Cover	100-130	11-14.5	■	■	■	■	■	■	■	■	■	■
Flywheel Nut (Cast Iron)	500-600	42-50	■	■	■	■	■	■	■	■	■	■
Flywheel Nut (Aluminum)	400-500	45-56.5	■	■	■	■	■	■	■	■	■	■

Four Cycle Medium Frame Engine Series (TVM, TVXL, H, V, HM, LH, OH, OVM, OVXL, OHM, OHSK, OV and OHV)

Location	Inch lbs. Torque	Nm	Engine Designation									
Aluminum Medium Frame Engines			TVM125, 140	H50-60	V70	H70	TVM & TVXL 170-195-220	HM/HMSK70-100 LH318 - 358	OVM/OVXL, OHV120-125	OHSK80-130 OHM120, OH318-358	OHV11-13,OHV110-135, 206 Series	OHV135-145 / OV358 203 Series OHV15-18 / OV490 204 Series
Connecting Rod	160-180	18-20.5	■	■								
Connecting Rod	200-220	22.5-25			■	■	■	■	■	■	■	
Connecting Rod	200-240	22.5-27										■
Cylinder Head Bolts	220-240	25-27									■	■
Cylinder Head Bolts	180-240	20.5-27							■	■		
Cylinder Head Bolts	160-210	18-24	■	■	■	■	■	■				
Rocker Adj. Lock Screw	65-80	7-9										■
Rocker Arm Stud Lock Nut	110-130	12.5-14.5									■	
Rocker Arm Hex Jam Nut	15-20	2							■	■		
Rocker Arm Studs	170-210	19-24							■	■		■
Rocker Arm Box to Head	75-130	8.5-14.5							■	■		
Rocker Box Cover	15-20	2							■	■		
Rocker Box Cover (Four Screw)	40-65	4.5-7								■	■	■
Mounting Flange or Cylinder Cover	100-130	11-14.5	■	■	■	■						
Mounting Flange or Cylinder Cover	110-140	12.5-16					■	■	■	■	■	■
Flywheel Nut	400-550	45-62	■	■	■	■						
Flywheel Nut (External Ignition)	600-800	68-90					■	■	■	■	■	■

Torque Specifications - continued

Four Cycle Heavy Frame Engine Series (Cast Iron Block HH, VH and OH)

Location	Inch lbs. Torque	Nm	Engine Designation		
Cast Iron Engines			HH	VH	OH
Connecting Rod	86-110	10-12.5	■	■	■
Cylinder Head	180-240	20.5-27	■	■	■
Mounting Flange & Cylinder Cover	100-130	11-14.5	■	■	■
Rocker Arm Shaft to Box	180-220	20.5-25			■
Rocker Arm Box to Cylinder Head	80-90	9-10			■
Flywheel Nut	600-660	68-74.5	■	■	■

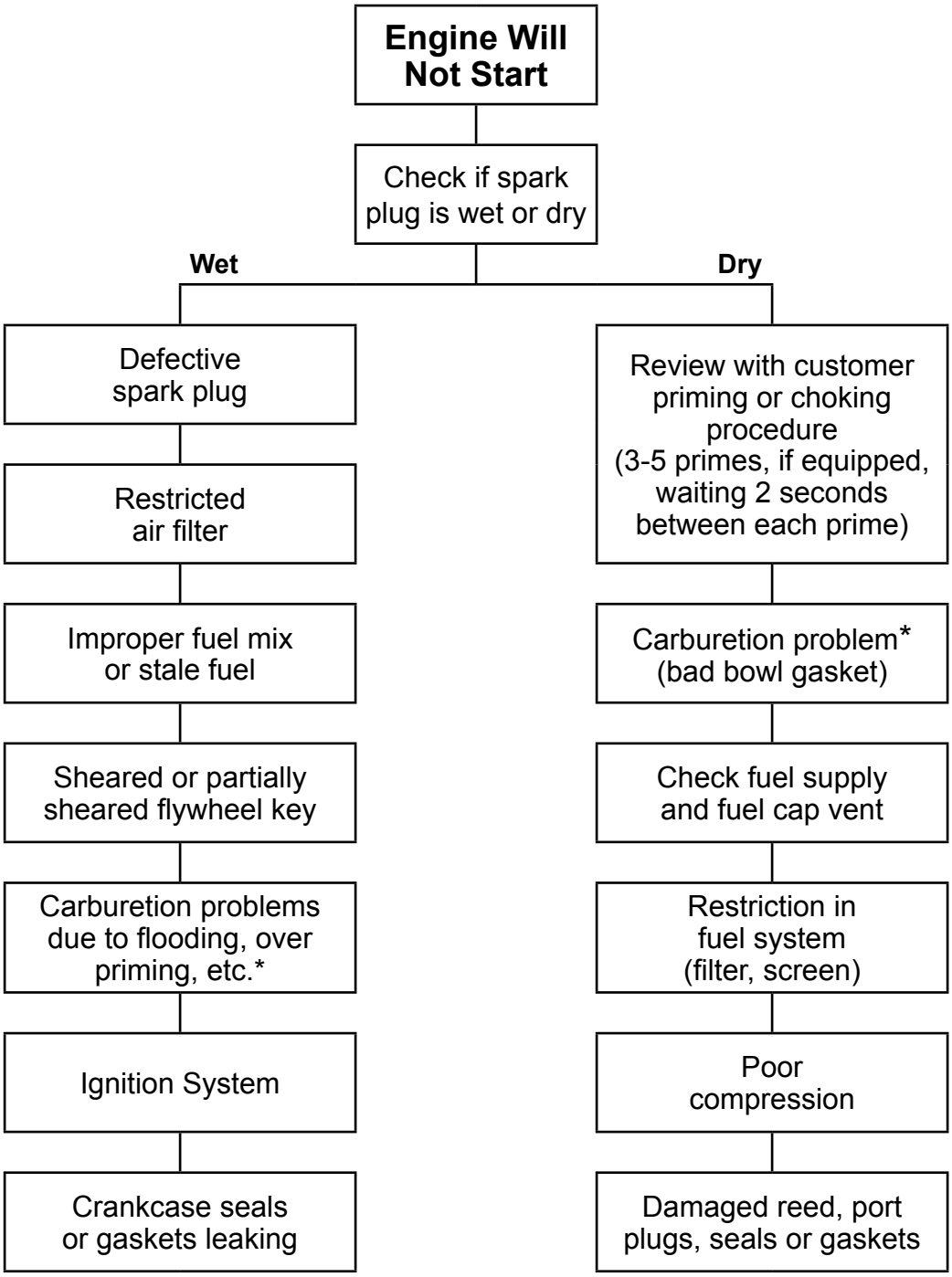
Four Cycle Large Frame Engine Series (V-TWIN)

Location	Inch lbs. Torque	Nm	Engine Designation		
V-Twin Engines			TVT	VTX	OV691
Connecting Rod	200-220	22.5-25	■	■	■
Cylinder Head Bolts	220-240	25-27	■	■	■
Rocker Arm Jam Nut	110-130	12.5-14.5	■	■	■
Rocker Arm Cover Mounting Screw	52	6	■	■	■
Mounting Flange/Cylinder Cover	240-260	27-29	■	■	■
Flywheel Nut	600-800	68-90	■	■	■

Two Cycle Troubleshooting

As an aid in troubleshooting any piece of equipment, interview the customer, and review conditions and symptoms of the problem. Examine exterior for clues: leaks, excessive dirt, damaged or new parts. Follow safety precautions when working with the fuel system. See page 2-J. Avoid Gasoline Fires.

FUEL SYSTEM

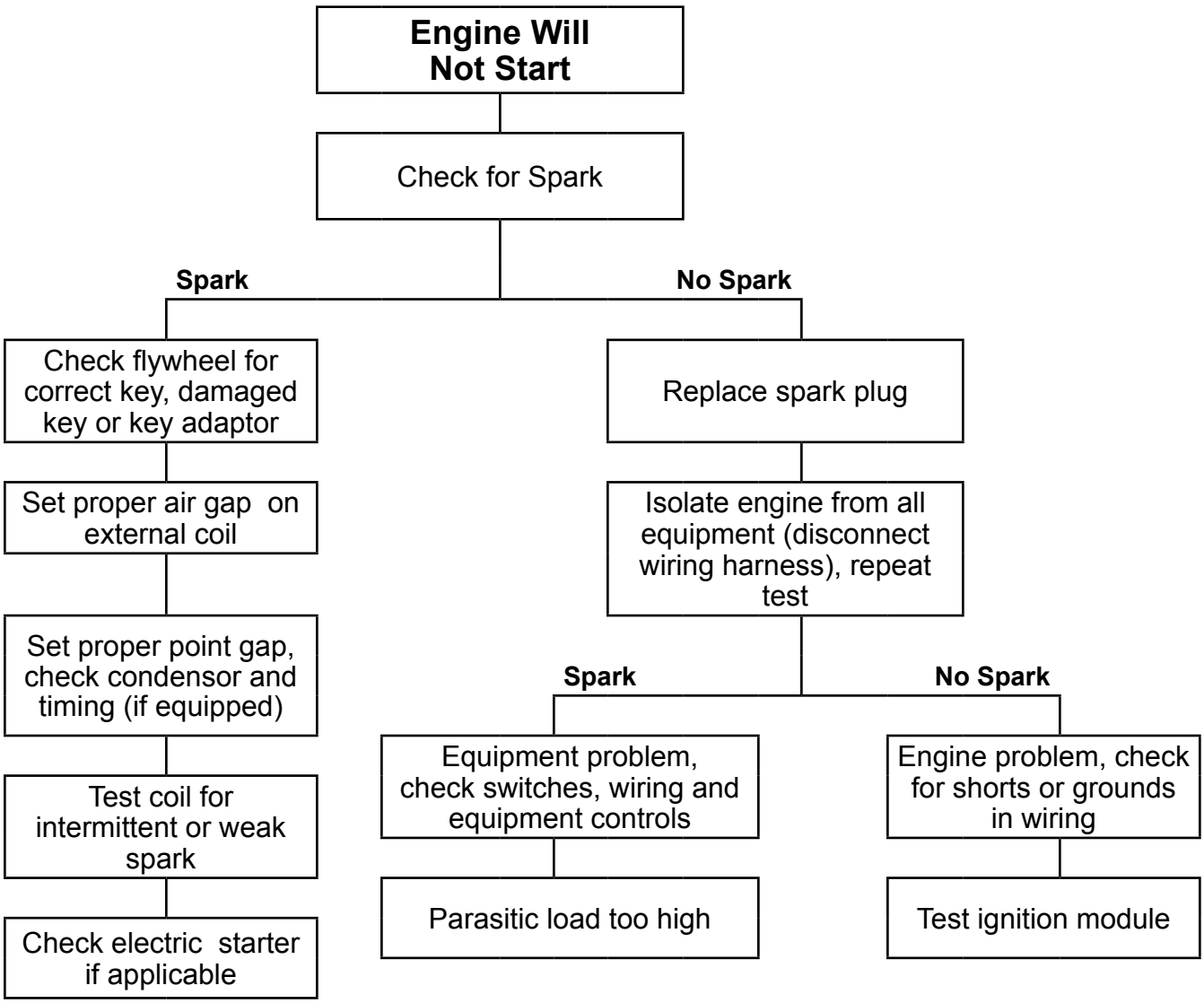


NOTE: Refer to Technician's Handbook, Form No. 692508 for a more detailed list.

*Carburetor Troubleshooting use Technician's Handbook or Carburetor Troubleshooting Booklet, Form No. 695907.

Two Cycle Troubleshooting - continued

IGNITION SYSTEM

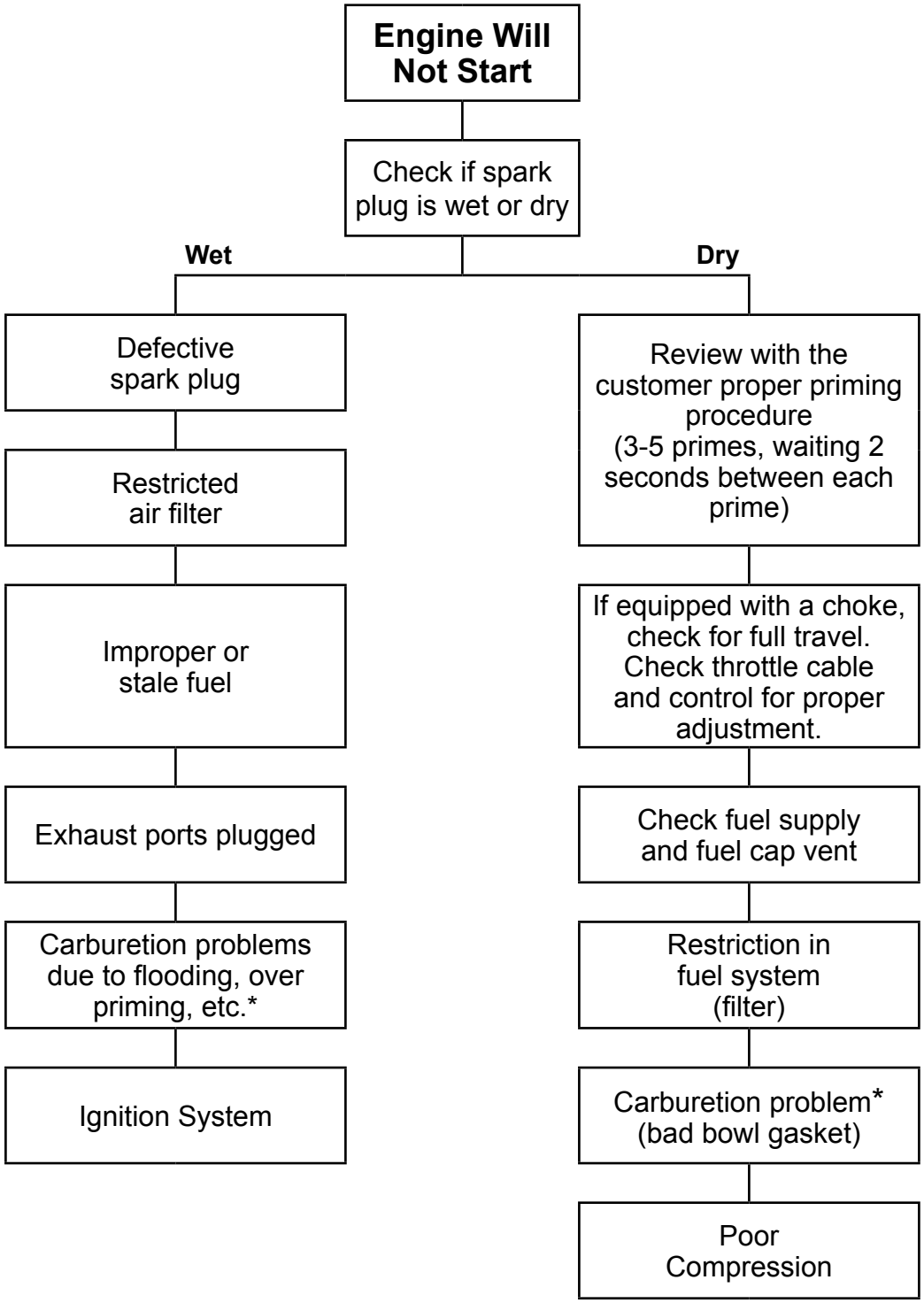


NOTE: Refer to Technician's Handbook, Form No. 692508 for a more detailed list.

Four Cycle Troubleshooting

As an aid in troubleshooting any piece of equipment, interview the customer, and review conditions and symptoms of the problem. Examine exterior for clues: leaks, excessive dirt, damaged or new parts. Follow safety precautions when working with the fuel system. See page 2-J. Avoid Gasoline Fires.

FUEL SYSTEM

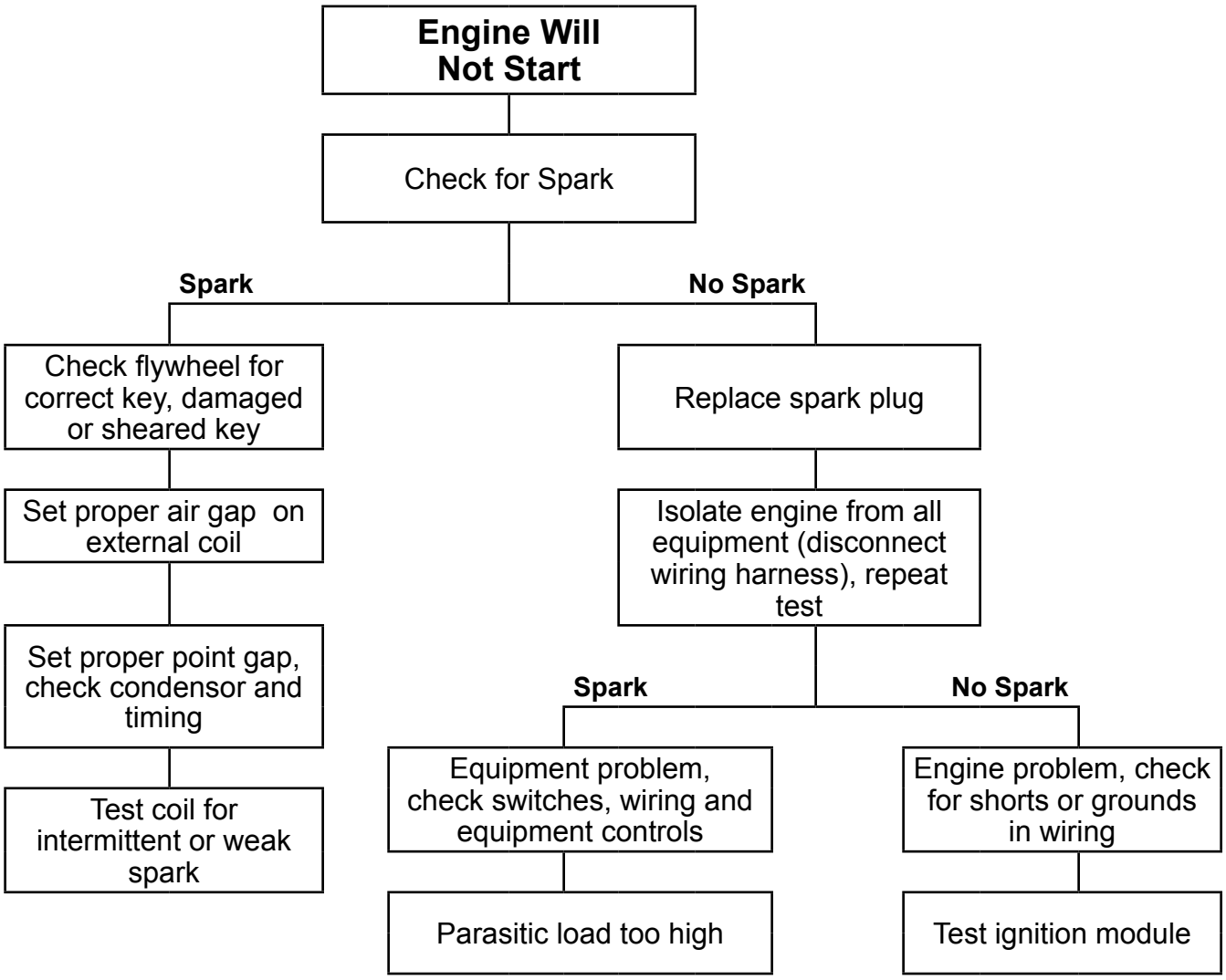


NOTE: Refer to Technician's Handbook, Form No. 692509 for a more detailed list.

*Carburetor Troubleshooting, use Technician's Handbook or Carburetor Troubleshooting Booklet, Form No. 695907.

Four Cycle Troubleshooting - continued

IGNITION SYSTEM



NOTE: Refer to Technician's Handbook, Form No. 692509 for a more detailed list.

CARBURETORS AND GOVERNORS

Tecumseh 2-Cycle Diaphragm Adjustments

NOTE
For meeting emission requirements, some carburetors have fixed-main or idle jets. The absence of the adjustment screw indicates fixed jets and no adjustment is necessary.

Diaphragm-Dual Adjustment

Turn mixture adjusting screws in finger tight to the closed position, then one (1) turn out from closed position. This setting is approximate. This will allow the engine to be started so the carburetor can be fine tuned.

Start the engine and let it warm up for approximately 3-5 minutes. **Do not adjust the carburetor when the engine is cold.**

Set the throttle control to idle. If it is a fixed speed type, manually hold the throttle against the idle speed adjustment screw.

The throttle lever must be held against the crack screw for low speed adjustments or all adjustments will be incorrect and cause poor performance and unsatisfactory operation.

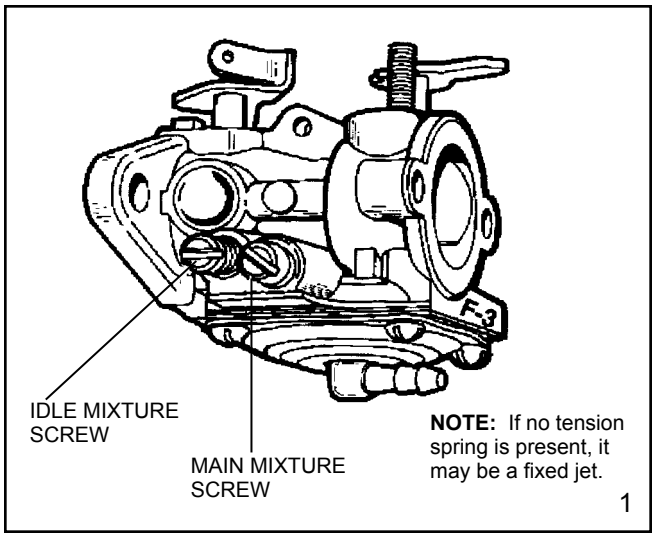
With the engine idling and throttle lever against the idle speed regulating screw, turn the low speed adjustment screw slowly clockwise from the NORMAL setting until the engine falters. Remember this location. Turn the screw counterclockwise until engine just starts to sputter or drops in R.P.M. Remember this location. Turn the screw clockwise until it is halfway between your first position where the engine faltered and your last position where the engine started to sputter. This will be the optimum low speed setting on your carburetor.

Next run the engine at governed speed. The high speed adjustments are made basically the same as the low speed adjustments, with the exception of the settings being made 1/8 of a turn at a time, from the NORMAL settings.

NOTE
It may be necessary to re-check the idle mixture adjustment after performing the high speed adjustment.

Diaphragm-Single Adjustment

Turn the mixture adjustment screw finger tight to the closed position, then one (1) turn out from the closed position. This setting is approximate and will allow the engine to be started so the carburetor can be fine-tuned.



Start the engine and let it warm up for approximately 3-5 minutes. Do not adjust the carburetor when the engine is cold.

Set the throttle control to idle. If it is a fixed speed type, manually hold the throttle against the idle speed adjustment screw.

NOTE
If the engine falters or stops after the choke lever is moved to the "OFF" position, open the mixture adjusting screw 1/4 turn (counterclockwise) and restart the engine.

With the engine running, place the speed control in the "slow" position to make mixture adjustments. Turn the mixture screw slowly clockwise from the NORMAL setting until the engine falters. Remember this location. Turn the screw counterclockwise until the engine just starts to sputter or drops in R.P.M. Remember this location. Turn the screw clockwise until it is halfway between your first position where the engine faltered and your last position where the engine started to sputter. This will be the optimum setting on your carburetor.

TC/TM Governor Adjustment

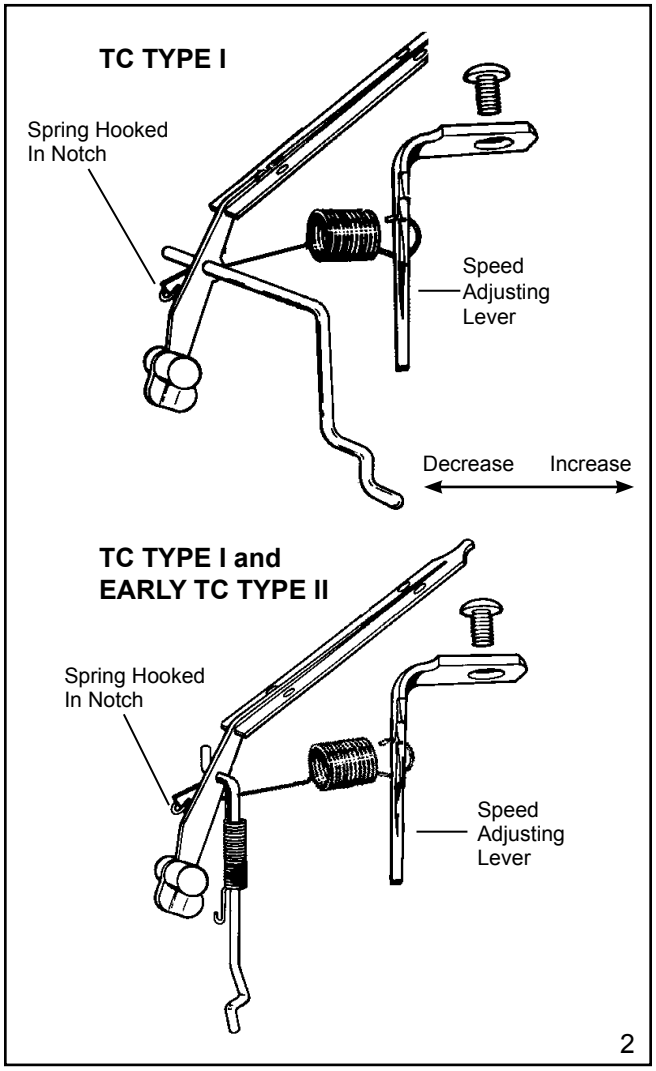
Three different styles of governor systems are used on TC/TM engines. Use the following illustrations (diags. 2 and 3) to identify the governor system used and the following procedure to adjust the governed engine speed.

1. Allow the engine to run for at least 5 minutes to reach the operating temperature. Make sure the air filter (if equipped) is clean and the choke is in the off position.

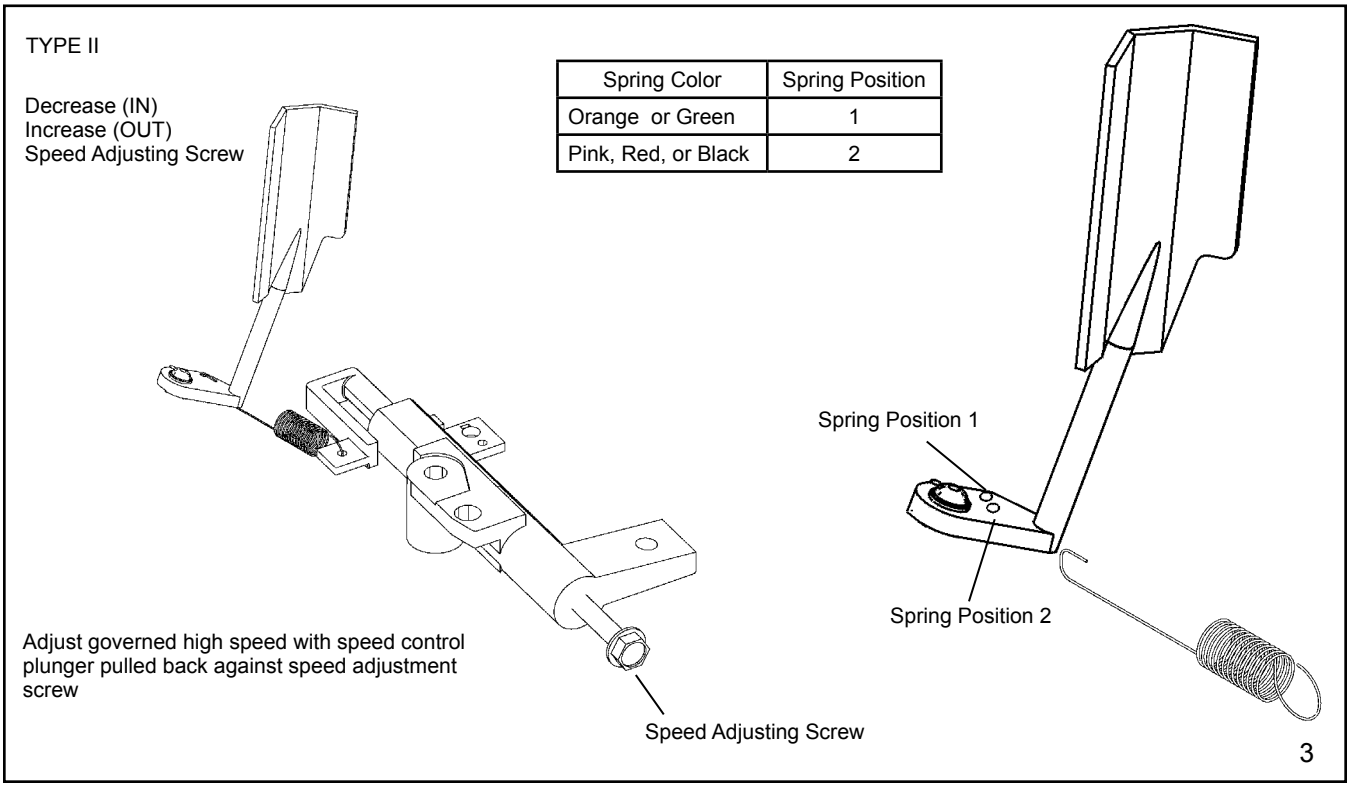
2. Using a Vibratach **(part #670156)** or other tachometer, determine the engine's R.P.M at idle and wide open throttle. Consult microfiche card #30 or the computer parts lookup to obtain the recommended engine speeds.

3. Using the applicable illustration, either bend the speed adjusting lever toward the spark plug end of the engine to decrease high speed R.P.M., or bend the lever in opposite direction to increase R.P.M. On TC Type II/TM engines, turn the speed adjusting screw out to increase or in to decrease engine high speed R.P.M. If the speed adjustment screw is turned out to increase the engine R.P.M., the speed control lever must be moved to allow the speed control plunger to contact the speed adjustment screw.

4. The low speed is set by moving the throttle control to the lowest speed position and adjusting the low speed adjustment screw on the carburetor.



2

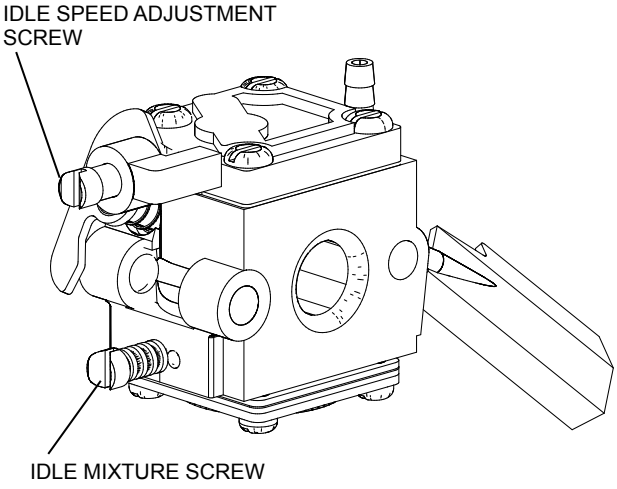


3

Walbro (WTA, WT) and Tillotson (HU) Diaphragm Adjustment

Carburetor Pre-Set and Adjustment

Both the Walbro and the Tillotson carburetors used on TC engines have non-adjustable main mixture jets. Only the idle mixture is adjustable by turning the idle mixture screw. Use the following procedure to pre-set the idle mixture screw. Turn the idle mixture screw (clockwise) finger tight to the closed position, then turn the screw counterclockwise to obtain the proper preset (diag. 4).
Walbro Model WTA, WT 1 - 1-1/8 turns
Tillotson Model HU 1-1/4 - 1-3/8 turns

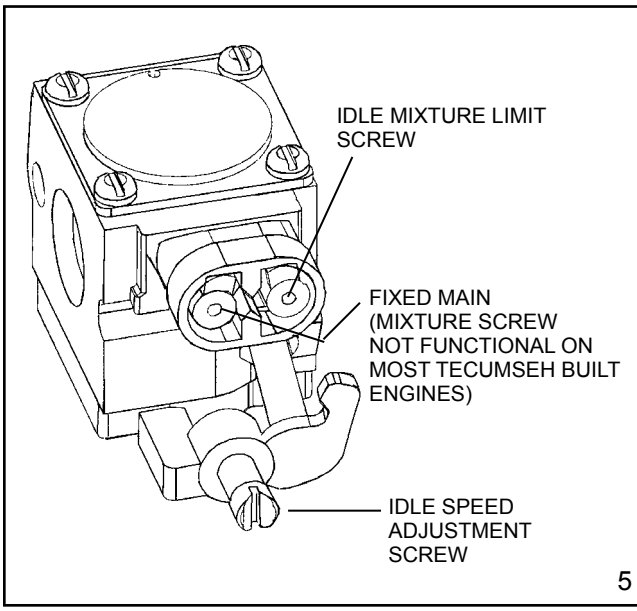


4

Final Idle Mixture Adjustment

Start the engine and allow it to reach normal operating temperature (after 3-5 minutes). As the speed control is set at the idle position, turn the idle mixture screw slowly clockwise until the engine R.P.M. just starts to decrease. Stop and note this screw position. Turn the idle mixture screw slowly counterclockwise, the engine will increase in R.P.M. Continue to slowly turn the screw until the engine R.P.M. starts to decrease. Note this position and turn the mixture screw back clockwise halfway between the two engine R.P.M. drop off positions. The idle mixture adjustment is complete.

Some carburetors come equipped with a main mixture adjusting screw. To adjust the main mixture, follow the steps for idle adjustment.



5

Emissionized Tillotson

Similar in design and operation, the Tillotson emission carburetor uses a fixed main jet with an adjustable idle. The idle circuit has a limiter cap to prevent over richening. The cap is locked onto the adjustment screw in a rich position, allowing only a leaner adjustment. The main is fixed on these, which means that the main mixture limiter is non-functional on Tecumseh built engines (diag. 5).

In compliance with E.P.A. and C.A.R.B. regulations the following procedure must be followed.

NOTE

These caps can be removed for servicing of the carburetor. Follow these steps.

1. Turn the caps clockwise until they contact the stops.
2. Remove the caps with a pointed instrument such as an awl.
3. Then turn the screws in until softly seated, note the number of turns. The screws must be reinstalled to this same static setting. Replacement of the caps is required to maintain E.P.A. and C.A.R.B. emission compliance.

Emissionized TC/Tilloston Carburetor

The Tillotson carburetor is an emissions grade carb. It has a married idle and high speed circuitry with limited jet adjustments on the idle (diag. 6).

Emissions Carburetor Idle Mixture Adjustment Procedures

The carburetor is preset at the factory at a normal setting required for initial engine operation.

Allow the engine to reach normal operating temperature (after 3-5 minutes).

Set the engine speed control in the idle position.

NOTE

With the engine at idle speed, it must be less than 2400 R.P.M. for accurate adjustment.

Using a small tip screw driver that fits through the access hole in the limiter cap, adjust the mixture screw slowly clockwise until the engine R.P.M. just starts to decrease. Stop and note this screw position. Turn the idle mixture screw slowly counterclockwise. As the engine increases R.P.M. continue to slowly turn the screw counterclockwise until the engine R.P.M. starts to decrease. Note this position and turn the mixture screw back clockwise halfway between the two engine R.P.M. drop off positions.

Verify the engine will accelerate from low speed to high speed and that the idle speed remains at the desired setting.

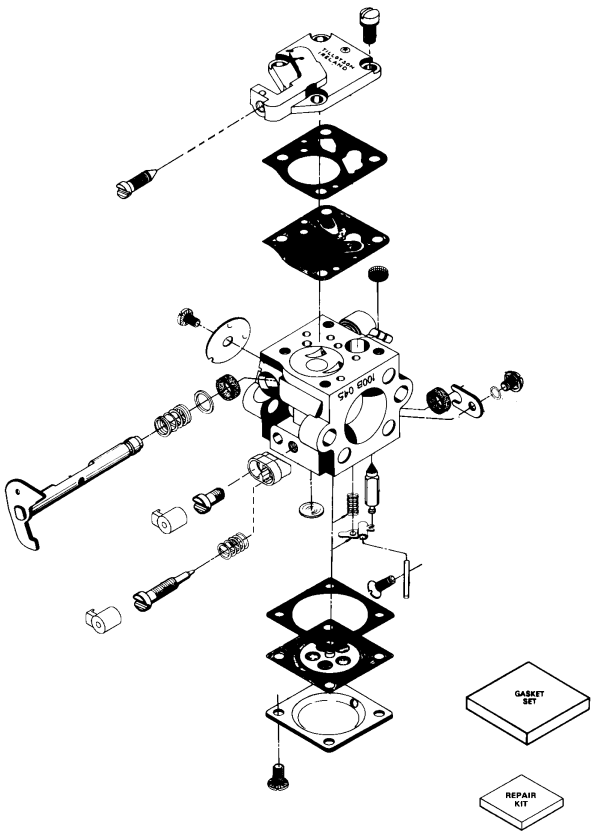
Once adjustments are complete, center the adjustment limiter cap between the two stops and press inward to engage the limiter. The limiter will snap into position and engage the adjusting screw. All future adjustments should now be made using the adjusting slot in the limiter cap.

NOTE

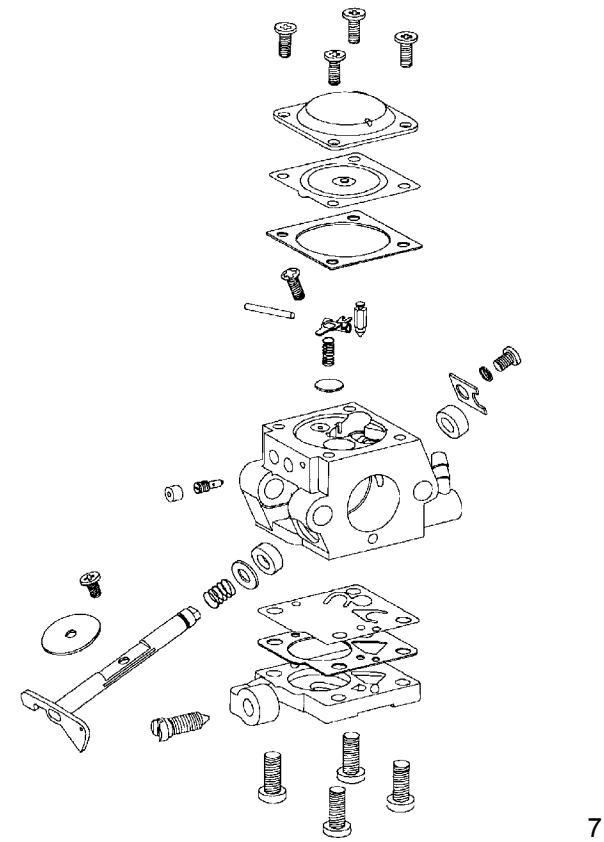
Once the limiter cap is snapped into place it is not possible to remove the limiter or to adjust the mixture screw beyond the limits of the limiter assembly. Make sure that initial adjustments are made per the above procedure prior to engaging the limiter cap.

TC/TM, Emissionized Tecumseh Carburetor

The Tecumseh emissions diaphragm carburetor has fixed main and idle jets (diag. 7). It uses a married idle and high speed circuitry. The idle has a metering jet that can be removed for cleaning. It is covered by a small cap that must be removed to expose the jet for servicing. No adjustments or presets are required. The idle jet should be turned until tight 5-8 inch pounds (0.5 Nm), and the cap should then be installed to cover the jet.

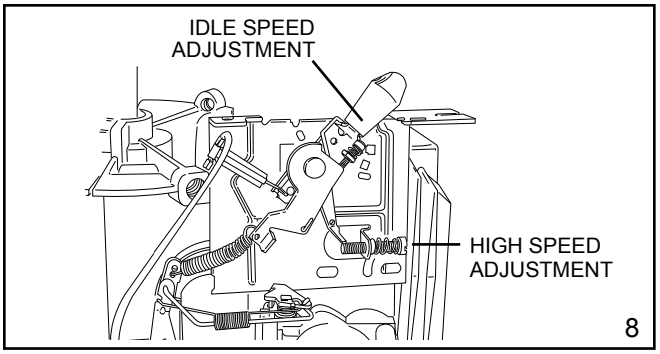


6



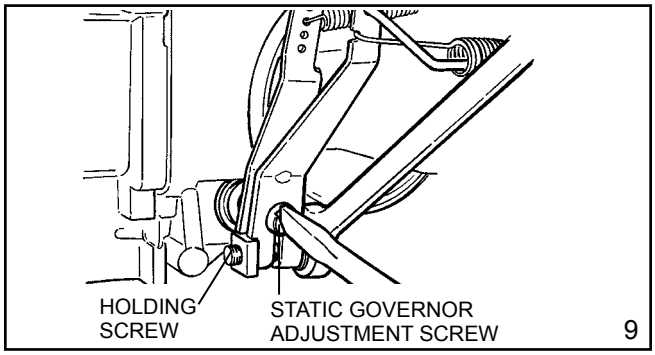
7

2-Cycle Engine Speed and Governor Adjustments: TVS/TVXL840



Linkage Location

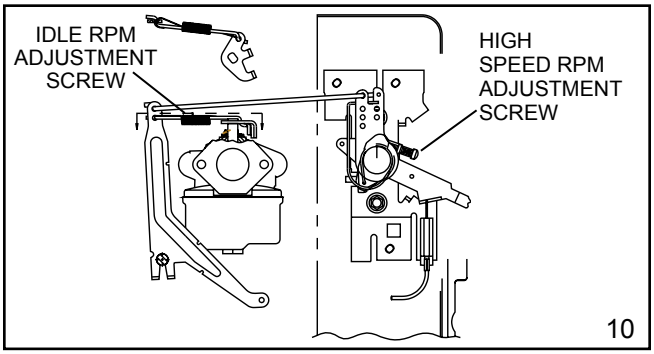
To aid in the proper reassembly of the governor linkage, mark the linkage locations.



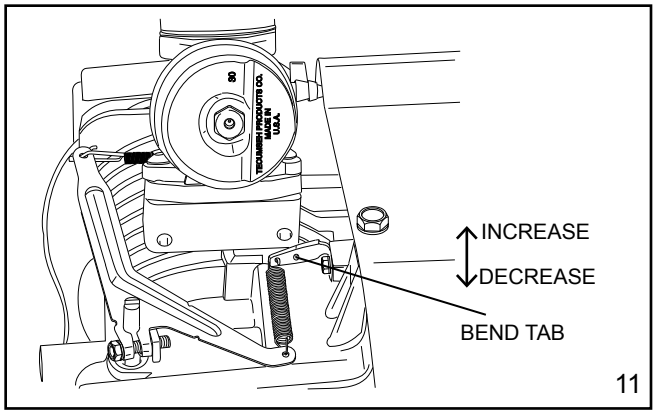
Static Governor Adjustment

To adjust the static governor, loosen the holding screw, rotate the governor arm and slotted shaft in the direction that will open the throttle to the wide open position, and then re-tighten the holding screw.

HSK/HXL840-870/TH139

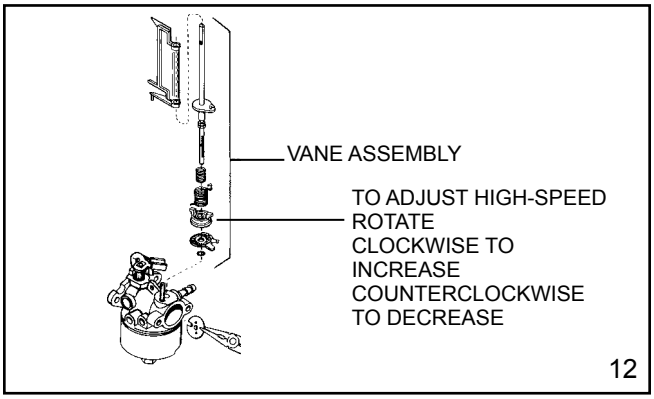


The HXL840 - 870 Series with variable speed control have the following adjustments. Idle speed is set at the carburetor crack screw. High speed is set with the screw shown above. Always check Microfiche card 30 or Parts Manager Pro computer program for correct speed settings.



R.P.M. adjustment of fixed speed models is done by bending the tab as shown.

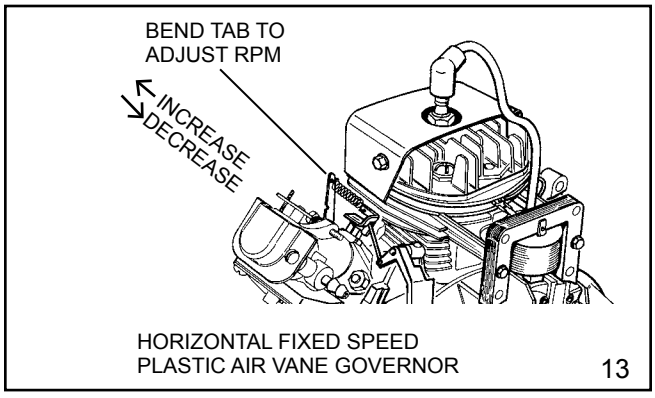
Governors and Linkage for Air Vane



Rotate sleeve clockwise to increase R.P.M., counter-clockwise to decrease R.P.M.

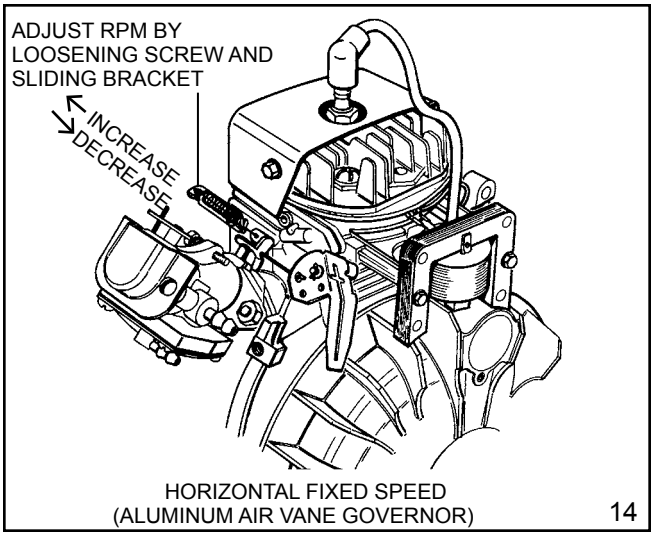
NOTE

The sleeve is serrated to rotate in a clockwise direction and must be raised using the sleeve tabs before it can be rotated counterclockwise.

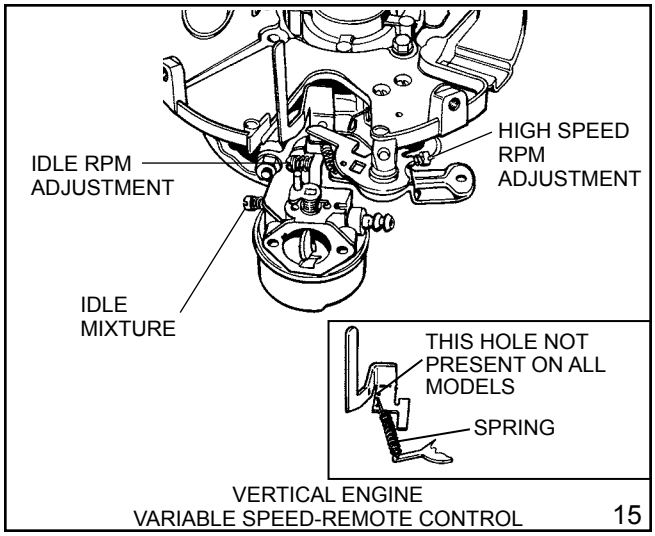


To disassemble, remove choke shutter with needle-nose pliers; the vane assembly may then be removed from the carburetor.

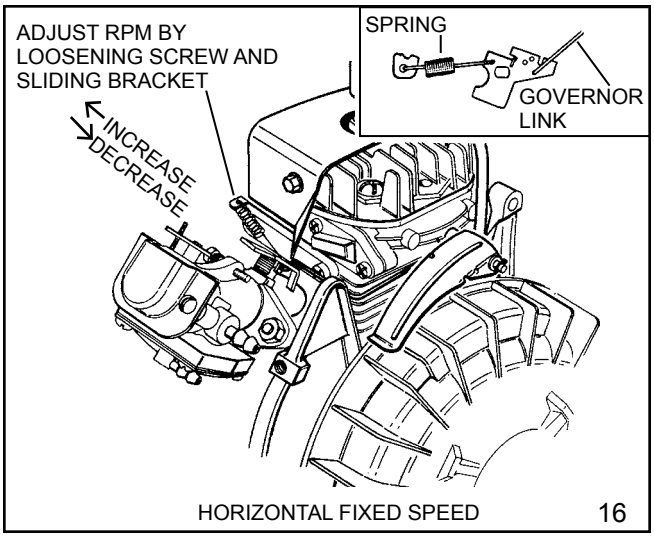
Governors and Linkage for Air Vane - continued



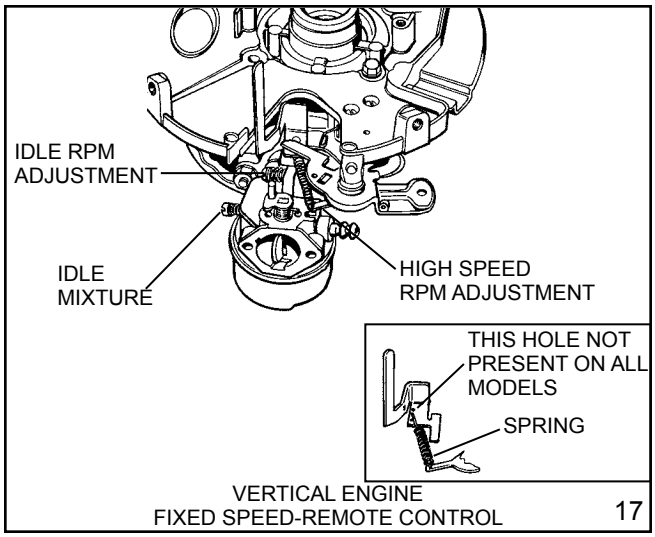
HORIZONTAL FIXED SPEED
(ALUMINUM AIR VANE GOVERNOR) 14



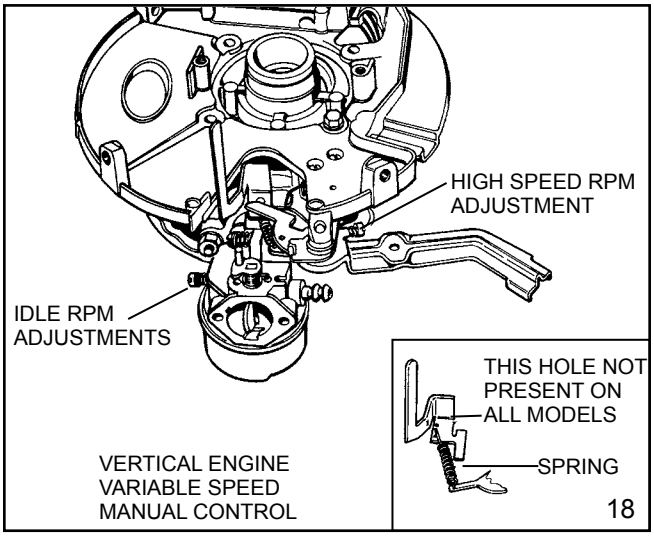
VERTICAL ENGINE
VARIABLE SPEED-REMOTE CONTROL 15



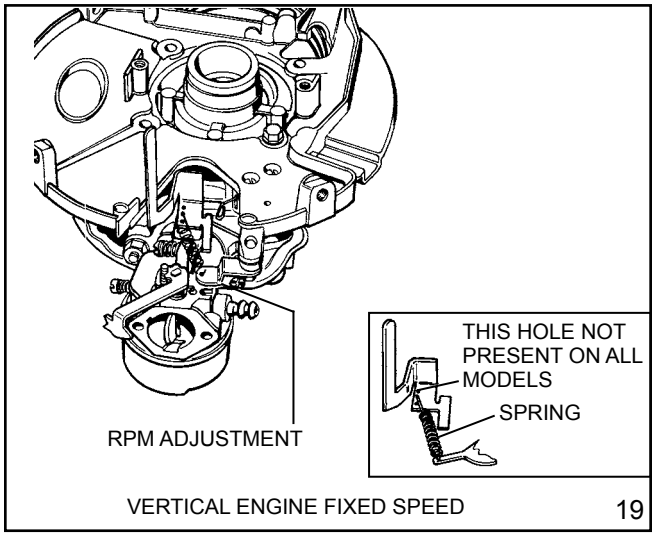
HORIZONTAL FIXED SPEED 16



VERTICAL ENGINE
FIXED SPEED-REMOTE CONTROL 17



VERTICAL ENGINE
VARIABLE SPEED
MANUAL CONTROL 18



VERTICAL ENGINE FIXED SPEED 19

4-Cycle Static Governor Adjustments

The purpose of making a static governor adjustment is to remove all free-play between the governor spool and the carburetor (diag. 20). Any free-play here will result in hunting/surging or erratic running. After completing this procedure, always re-check the engine speeds using the steps outlined in the following pages.

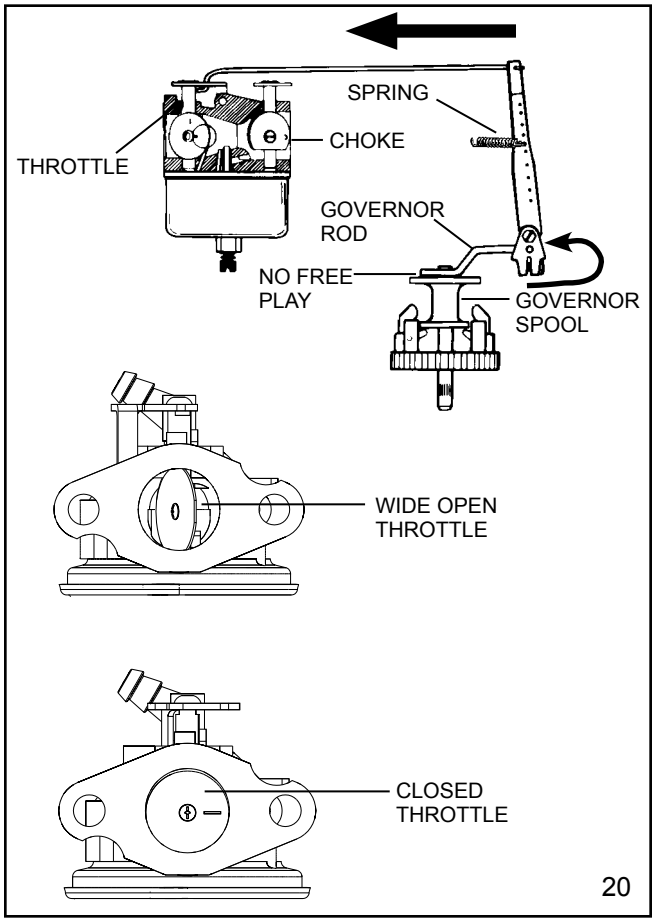
To set the static governor, do the following:

1. Be sure the engine is stopped or damage may occur.

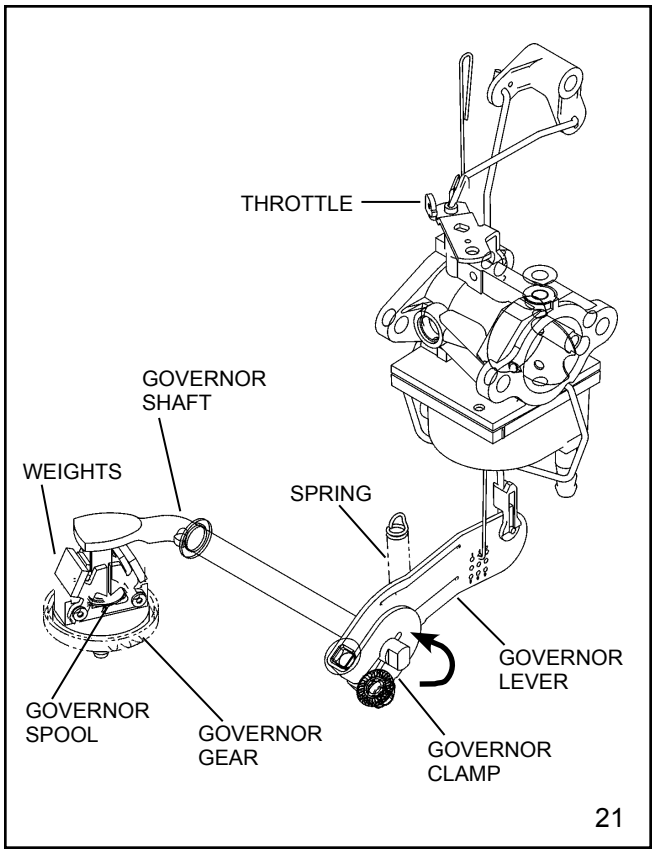
2. If equipped with a throttle control, place the throttle in the high speed position.

3. Loosen the governor clamp or screw.

4. Hold the governor arm and link in the W.O.T. (wide open throttle) position, then rotate the shaft or shaft/clip assembly in the same direction and tighten the screw.



20



21

Governor Shaft Pressed In Depth

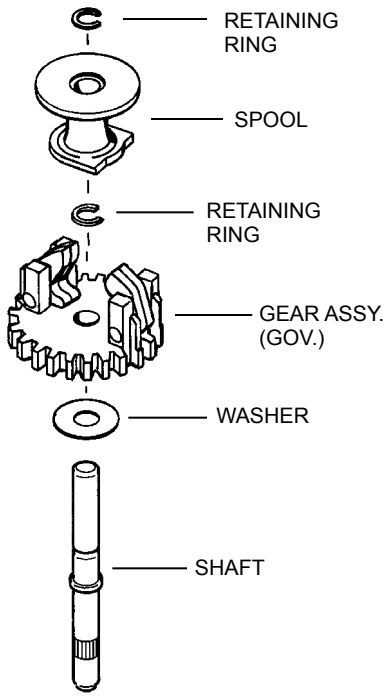
When assembling governor shaft into a flange or cover mounting boss, refer to this chart for exposed shaft length.

Engine Model	Exposed Shaft Length
ECH 90 ECV 100 H30, 35 HS40, 50 LAV (all) LEV (all) LV (all) OH, OHH (all) OVRM (all) OV195 TNT100, 120 TVS (all) VLV (all)	Mounting flange to top 1.319 - 1.334" (33.502 - 33.883 mm)
TVM (all) V50, 60, 70 VH50, 60, 70	Mounting flange to top 1.581 - 1.596" (40.157 - 40.538 mm)
HH100, 120 VH100	Mounting flange to top 1.016 - 1.036" (25.806 - 26.314 mm)

Engine Model	Exposed Shaft Length
H50, 60, 70, LH195 HH60, 70 HHM80, LH318 - 358 HM70, 80, 100	Mounting flange to shoulder 1.283 - 1.293" (32.588 - 32.842 mm)
OV358-OV490 OHV11-17 OVM120 OVXL120, 125	Mounting flange to top 1.350 - 1.365" (34.290 - 34.671 mm)
OHM90-120 OHSK90-130 OH318 - 358	Mounting flange to top 1.085 - 1.100" (27.559 - 27.940 mm)
OH120-180	Mounting flange to top 1.00" (25.400 mm)
TVT - OV691	Mounting flange to top 1.196" (30.378 mm)

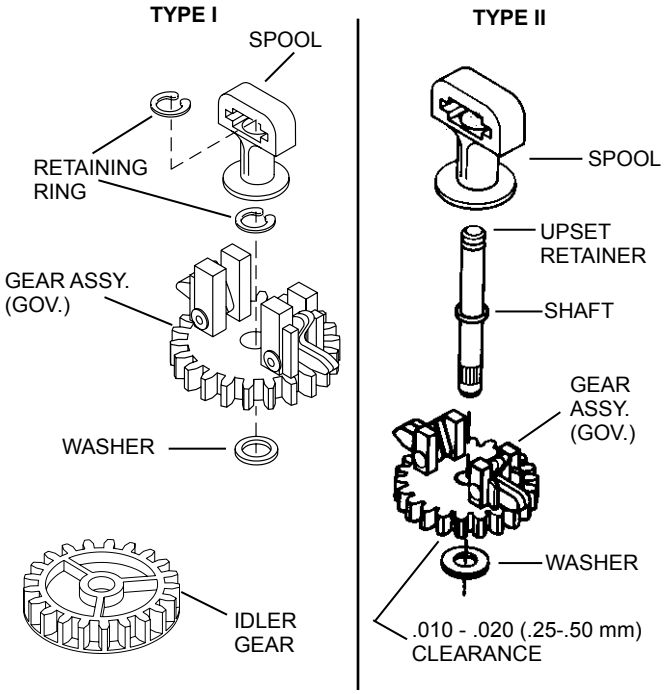
Small Frame, Vertical and Horizontal*

Models: LAV35,40,50 - H25,30,35 - HS40,50 - HSK - HSSK -TNT100,120 - ECH90 - TVS75,90,105,115,120 - OVRM ALL - ECV100,105,110,120 - ALL LEV, LV and LH195



* As of August 1992, all small frame engines, including VLV40-6.75, use a retainerless shaft. Service replacement shafts will be retainerless for all small frame and VLV engines.

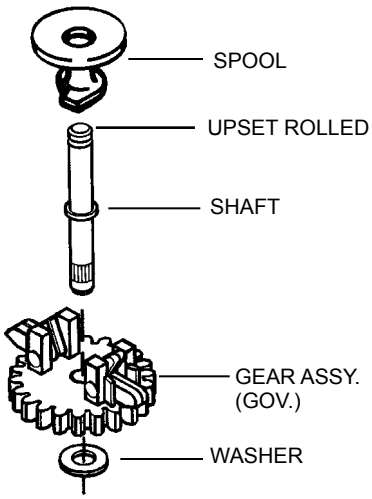
VLV*40, 50, 55, 60, 65, 66



NOTE: Gear assembly must have .010 - .020 (.25 - .50 mm) end play after shaft is installed into flange.

* As of August 1992, all small frame engines, including VLV40-6.75, use a retainerless shaft. Service replacement shafts will be retainerless for all small frame and VLV engines.

Retainerless Governor System for Small Frames*

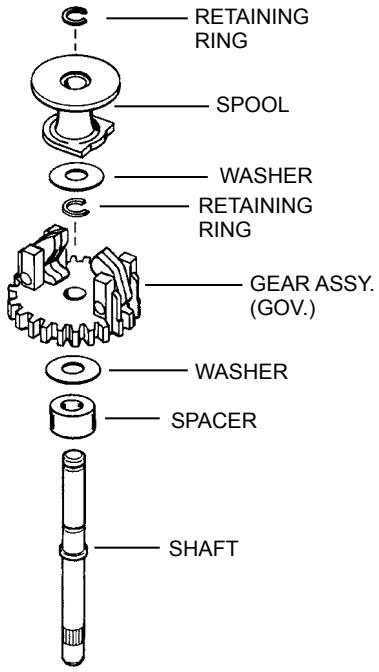


NOTE: Gear assembly must have .010 - .020 (.25 - .50 mm) end play after shaft is installed into flange.

* As of August 1992, all small frame engines, including VLV40-6.75, use a retainerless shaft. Service replacement shafts will be retainerless for all small frame and VLV engines.

Medium Frame Vertical

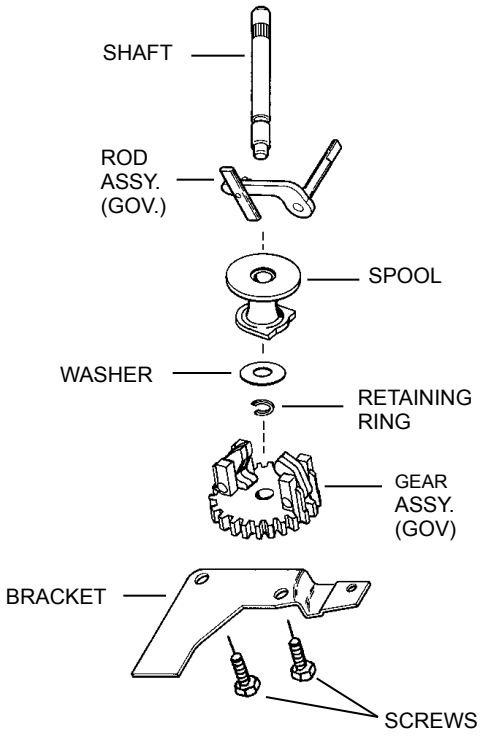
Models: TVM125, 140, 170, 195, 220 - V50,60,70 - VH50,60,70



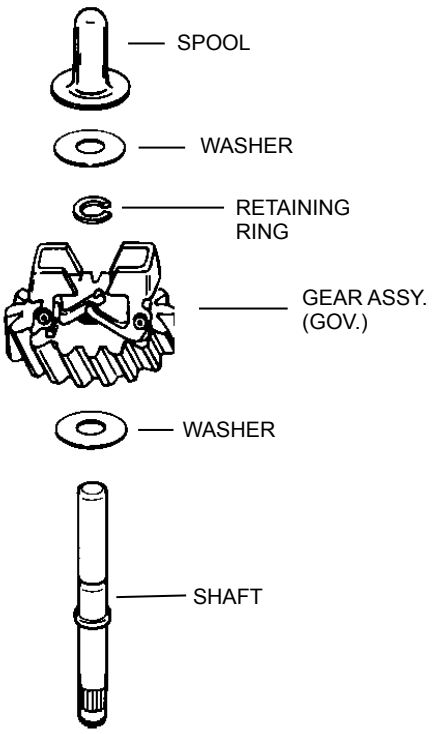
OV195

Medium Frame Horizontal

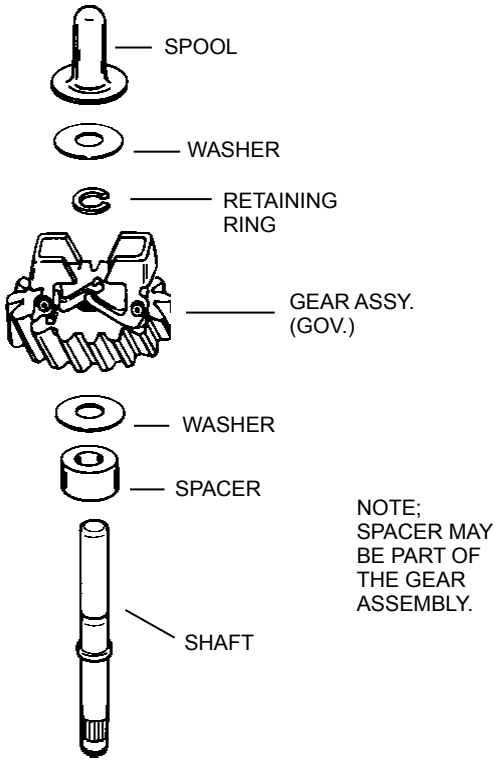
Models: HH60,70 - H50,60,70 - HM70,80,100 - HMSK - LH318 - LH358



OHM120 - OHSK 80-130 - OH318 - OH358

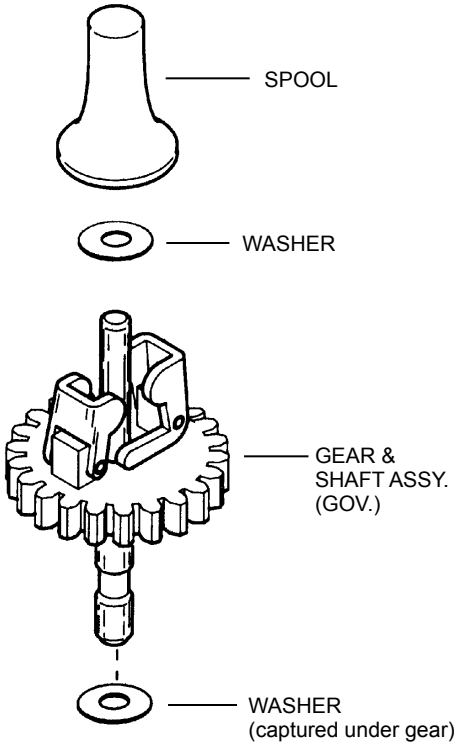


OVM120, OVXL120, 125 - OHV11-17 - OV358 - OV490

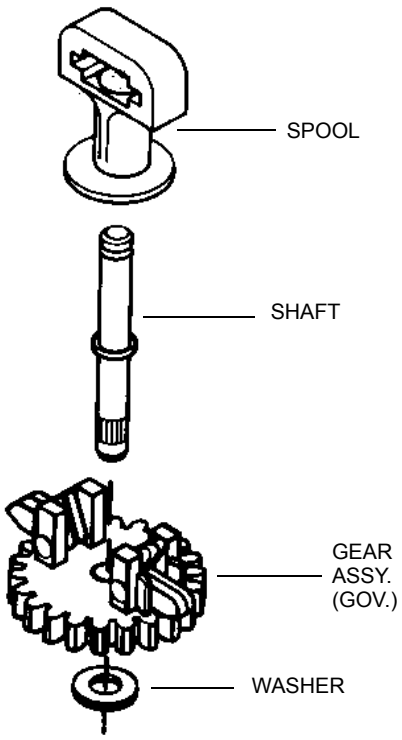


NOTE: On models OHV13.5-17, the spacer is cast as part of the governor gear with the washer placed below the gear assembly.

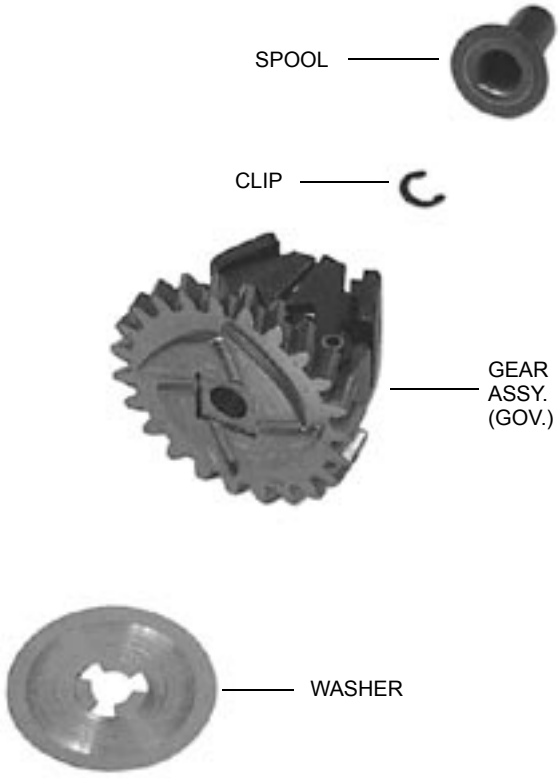
OH120, 140, 160, 180



OH195 / OHH



TVT / VTX / OV691



Engine Speed and Mixture Adjustments

NOTE

Starting and operating problems may exist when engines are used at high elevations (over 4,000 feet above sea level). In cases where a fixed main carburetor is used, refer to Bulletin 110 for correction.

Engines which are identified as compliant with CARB (California Air Resources Board) or EPA (US Environmental Protection Agency) regulations can NOT be changed from their factory jetting unless specifically authorized.

Before making any speed or carburetor adjustments be sure to adjust the governor and control bracket.

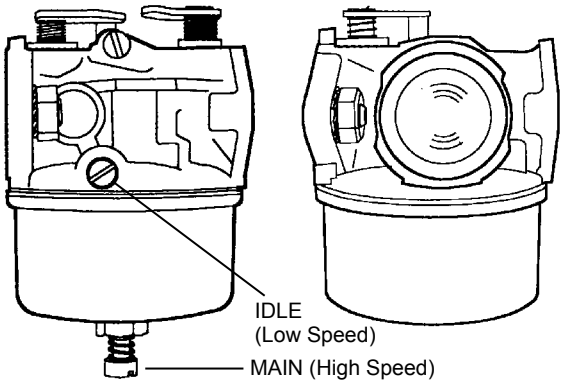
To adjust the speed control bracket, determine whether the carburetor is an adjustable type, then proceed.

Some carburetors may have a choke lever which is operated by the speed control bracket. To adjust the speed control bracket for full choke operation, loosen the speed control bracket mounting bolts and move the speed control lever to the high speed/full choke position. Next, insert a small piece of wire through the hole in the speed control bracket, choke actuating lever, and the choke lever (diag. 23). When all three holes are aligned tighten the mounting bolts.

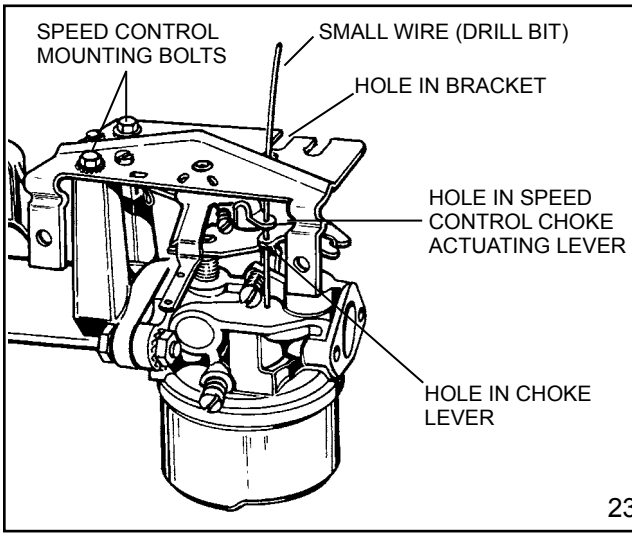
It may be necessary to preset the carburetor mixture screws.

Tecumseh Carburetors		
Engine Model	**Main Pre-set**	**Idle Pre-set**
All models with float-type carburetors	1-1/2 turn	1 turn
All models with diaphragm-type carburetors	1 turn	1 turn

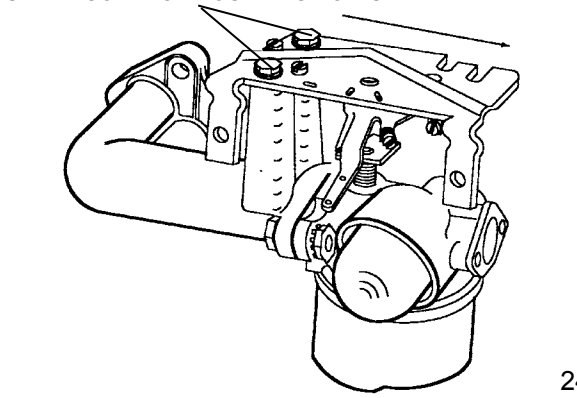
Some speed control brackets are adjusted by loosening the speed control bracket mounting bolts and sliding the bracket all the way to the right and re-tightening the mounting bolts (diag. 24).



22



23



24

Mixture Adjustment Procedure for Adjustable Carburetors

Once the speed control bracket is adjusted, the main and idle fuel mixtures can be adjusted. Start the engine and allow it to warm up to normal operating temperature (3 - 5 minutes). Set the speed control to the HIGH or FAST position, then turn the main mixture adjustment screw in (clockwise) slowly until the engine begins to run erratic (lean). Note the position of the screw. Now, turn the screw out (counterclockwise) until the engine begins to run erratic (rich). Turn the screw in (clockwise) midway between these two positions. This will be the best setting.

Set the speed control to the IDLE or SLOW position. Adjust the idle mixture screw following the same procedure used to adjust the main mixture adjustment.

NOTE

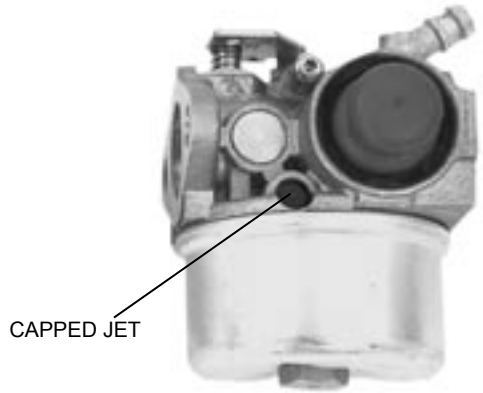
Some carburetors have fixed main jets. The absence of the adjusting screw indicates a fixed jet and no adjustment is necessary (diag. 25).

After adjusting the fuel mixtures, engine speeds can be adjusted. The correct operating speeds are found on Microfiche card 30 of the Tecumseh Master Parts Manual, or the computer parts look-up program (Parts Manager Pro). On engines with adjustable carburetors (diag. 26 and 27) the high speed adjustment will be in one of two places. The first location is on the speed control lever (diag. 26).

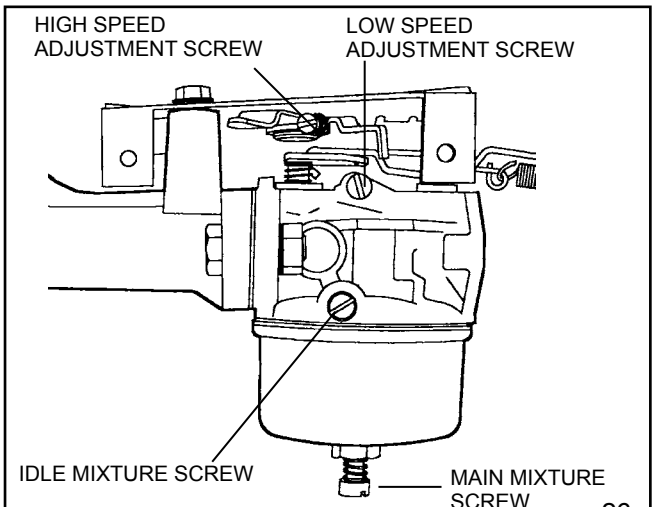
The second is on a bracket located between the blower housing and the speed control (diag. 27). Low speed is adjusted by the throttle crack screw on the carburetor (diag. 26 and 27).

The high speed adjustment screw is located on the speed control lever (diag. 28) Some carburetors are fixed speed and are adjusted by bending the adjusting tab attached to the intake manifold (diag. 30).

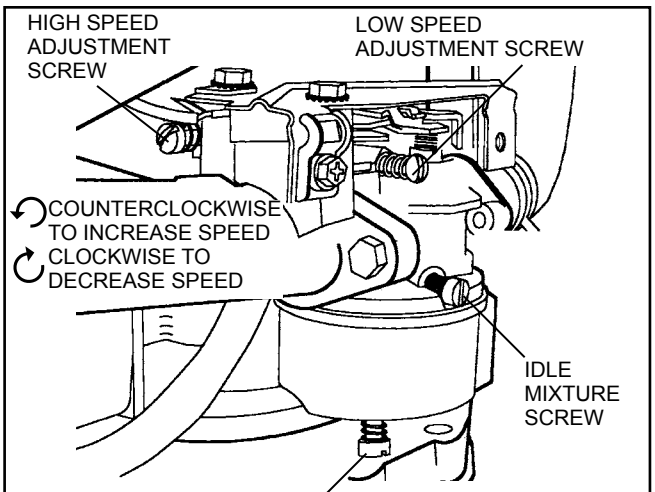
After setting the engine speeds recheck the fuel mixtures, then recheck the engine speeds.



TYPICAL NON ADJUSTABLE CARBURETOR 25

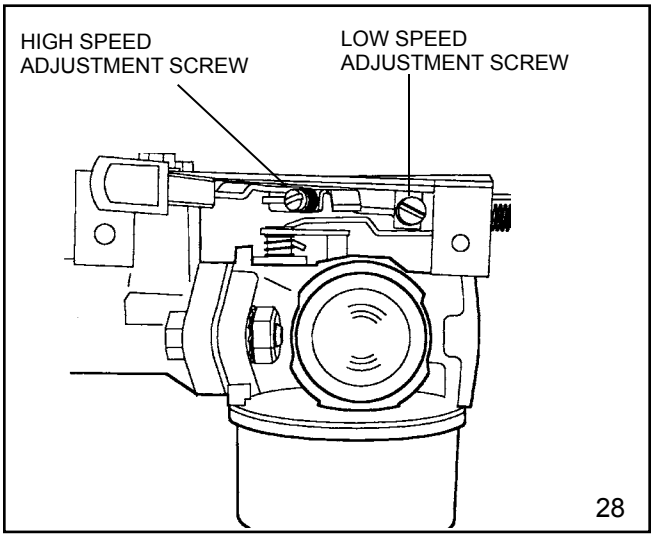


26

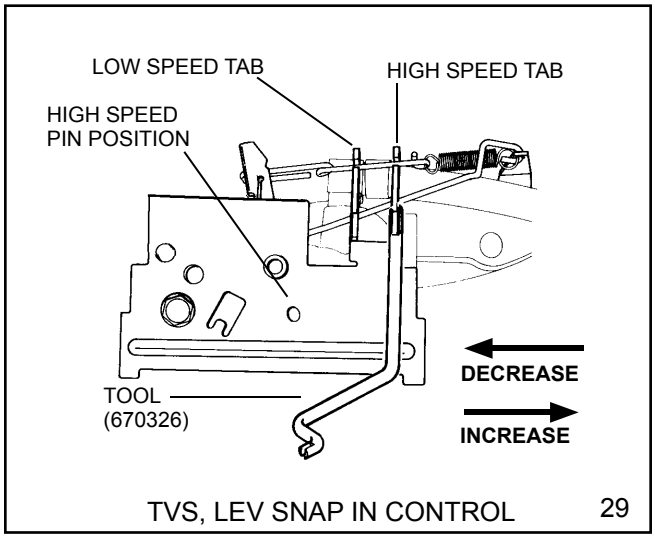


27

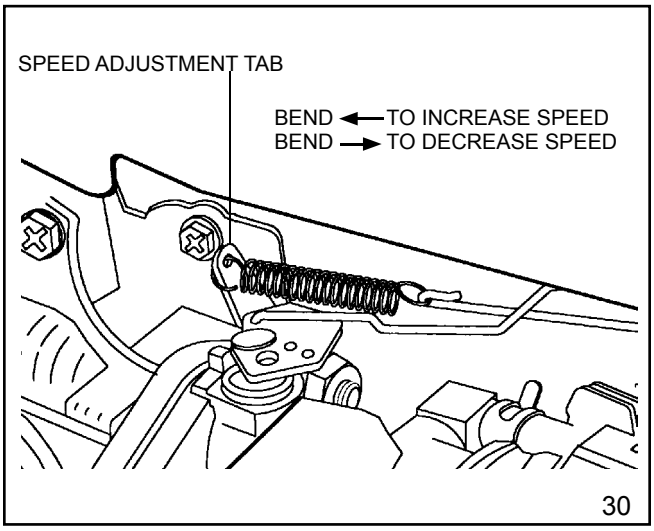
Common Engine Speed Controls and Governor Linkages



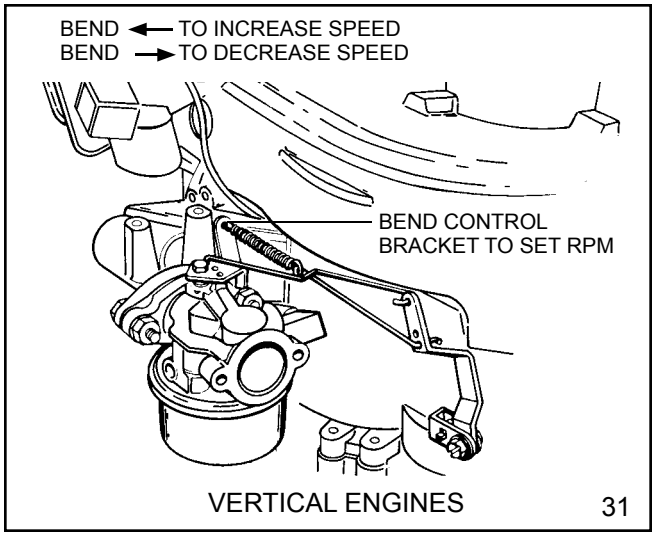
28



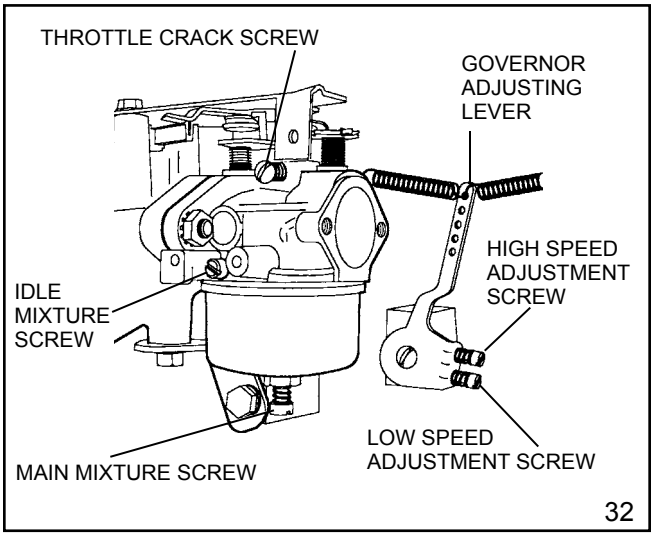
TVS, LEV SNAP IN CONTROL 29



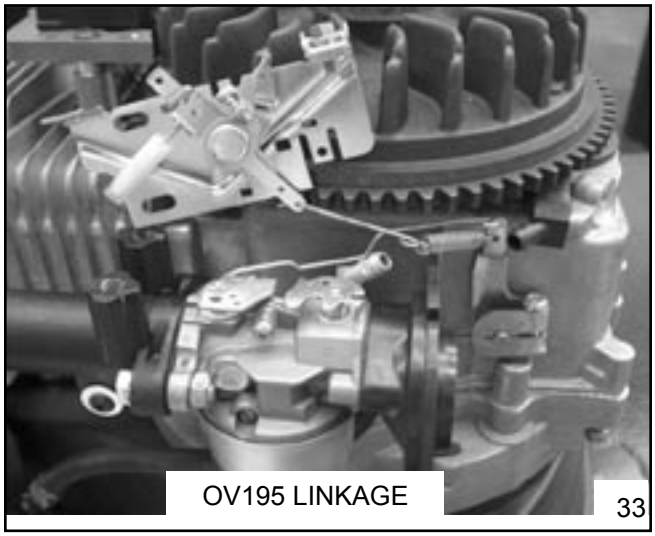
30



VERTICAL ENGINES 31

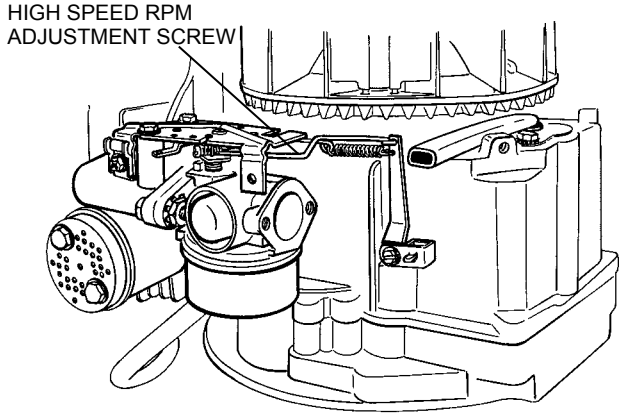


32



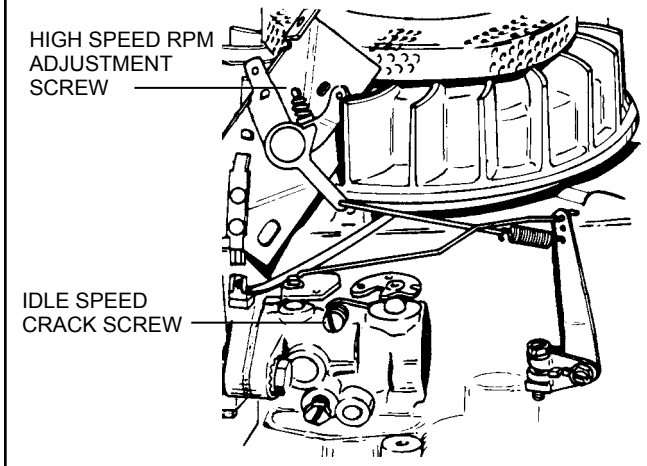
OV195 LINKAGE 33

Common Engine Speed Controls and Governor Linkages - continued



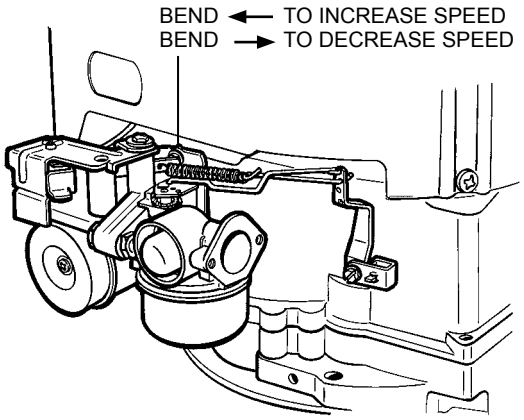
TVS, LEV AND LV ENGINE"S WITH PRIMER STYLE CARBURETOR AND REMOTE SPEED CONTROL

34



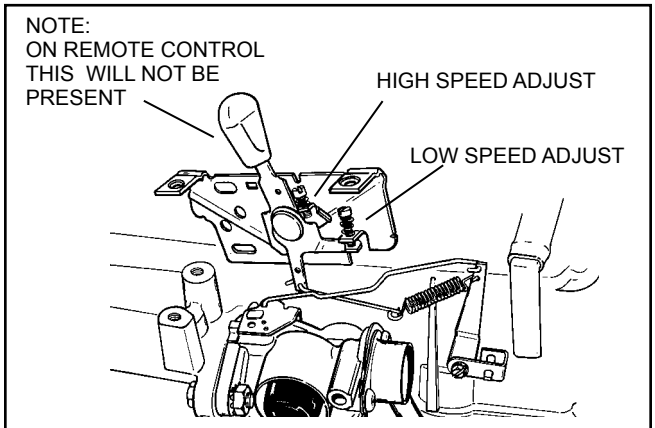
VERTICAL SHAFT ENGINES

35



TNT 100 VERTICAL ENGINES

36



TYPICAL LATE MODEL LIGHT WEIGHT VERTICAL WITH ADJUSTABLE SPEED CONTROL

37

VLV Governor and Linkage

Static Adjustment - Governor

With the engine stopped, loosen the screw holding the governor lever to the governor shaft. Push the governor lever up to move the carburetor throttle plate to the wide-open throttle position. Rotate the governor rod in the same direction. Hold the lever and rod in this position while tightening the screw (diag. 38).

Linkage Installation

The solid link is always connected from the throttle lever on the carburetor to the lower hole on the governor lever. The shorter bend has to be toward the governor. The governor extension spring is connected with the spring end hooked into the upper hole of the governor lever and the extension end hooked through the speed control lever. To remove the governor spring, carefully twist the extension end counterclockwise to unhook the extension spring at the speed control lever. Do not bend or distort the governor extension spring (diag. 38).

Speed Controls

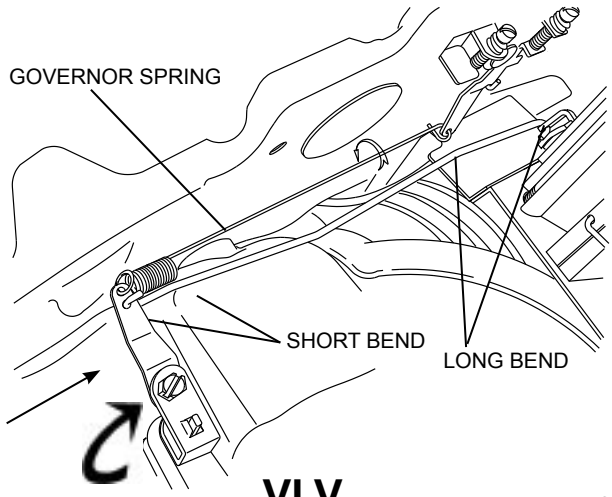
This engine has an adjustable speed control. Never exceed the manufacturer's recommended speeds.(diag. 39).

NOTE

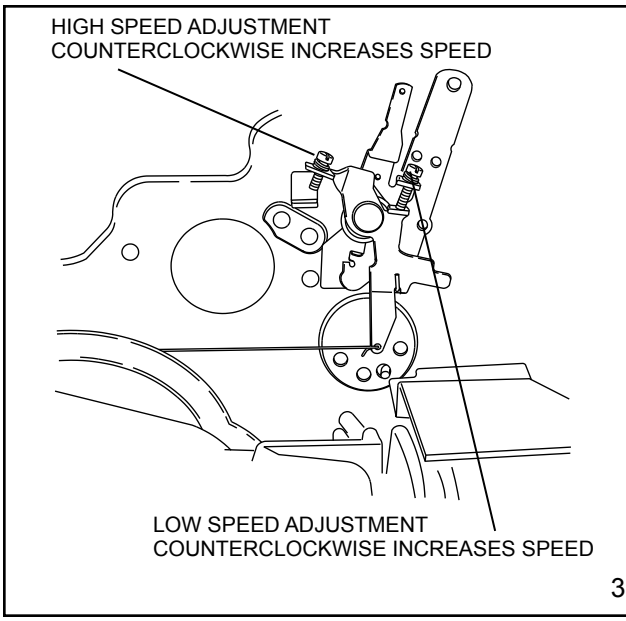
Governor adjustment screw will be a Torx head (T-10).

Fixed Speed

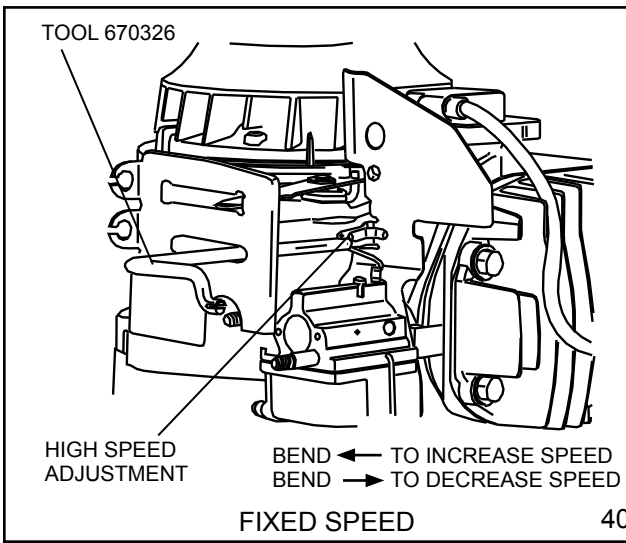
High speed governor adjustment is accomplished by bending a tab to increase and decrease engine R.P.M. (diag. 40).



38



39



40

Engine Speed and Mixture Adjustments

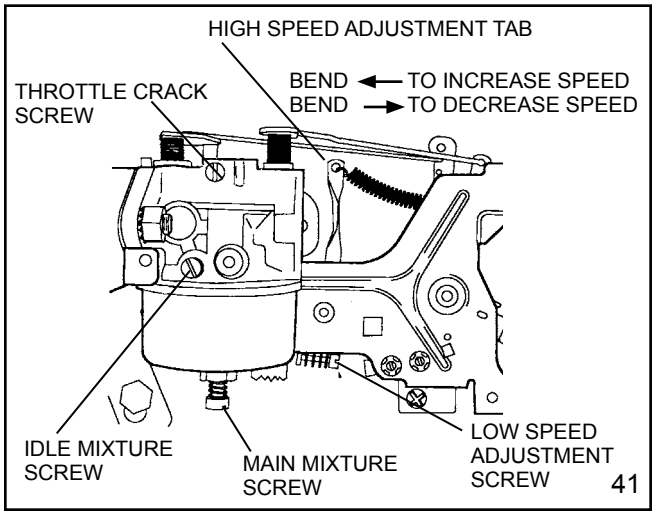
Medium Frame Vertical Shaft Engines

To adjust high speed on an up/down control (diag. 41) bend the adjustment tab. Low speed is adjusted by a screw at the bottom of the control bracket. Both the governor override system and the up/down speed control have a governed idle. On these systems it is important to also adjust the throttle crack screw. To adjust the throttle crack screw use your finger to hold the throttle shutter tight against the throttle crack screw and adjust the engine speed to approximately 600 R.P.M. less than the recommended low speed.

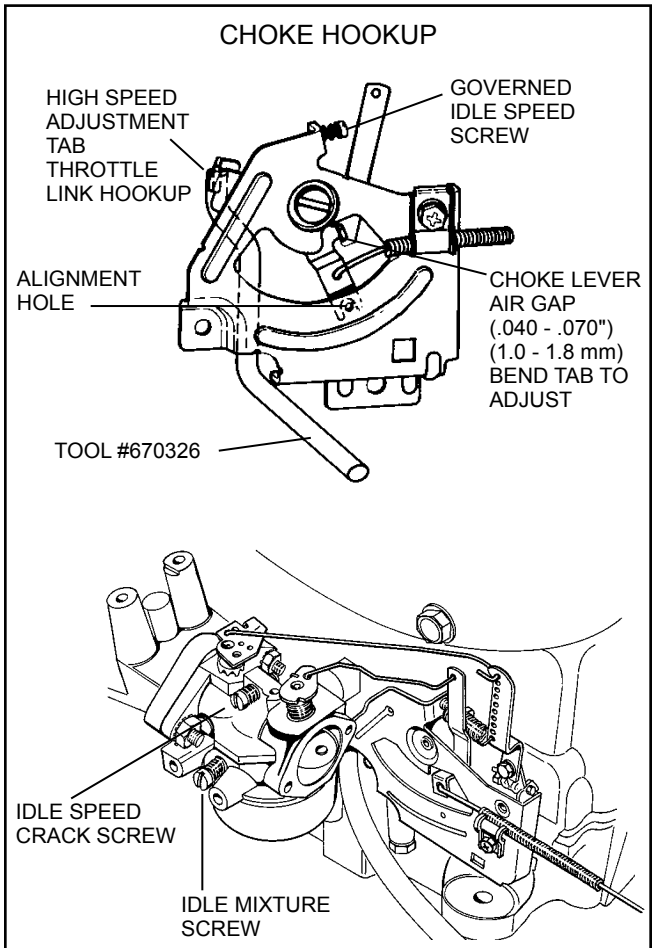
The idle speed is adjusted by turning the idle speed screw clockwise to increase engine R.P.M. and counterclockwise to decrease R.P.M. Use tool **part #670326** to adjust the high speed engine R.P.M. Place the slotted end of the tool onto the adjustment tab and bend the tab to the left (toward the spark plug end) to increase engine R.P.M. (diag. 42).

NOTE

Be sure that the throttle cable has full travel from wide open throttle to full choke. ***Hard Starting*** *could result if the cable is not properly adjusted to allow for full choke.*

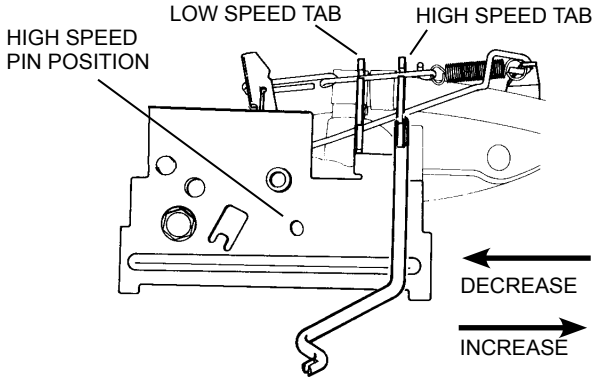


41

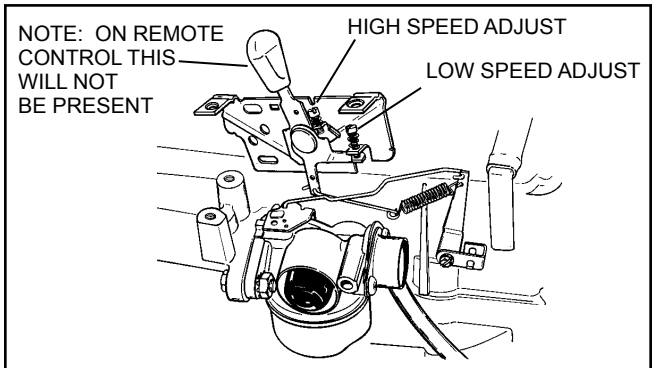


TVXL220, OHV 11-18, OV358EA, OV490EA STYLE SPEED CONTROL
42

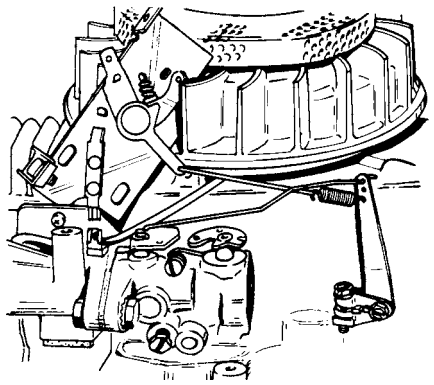
Engine Speed Controls and Governor Linkages



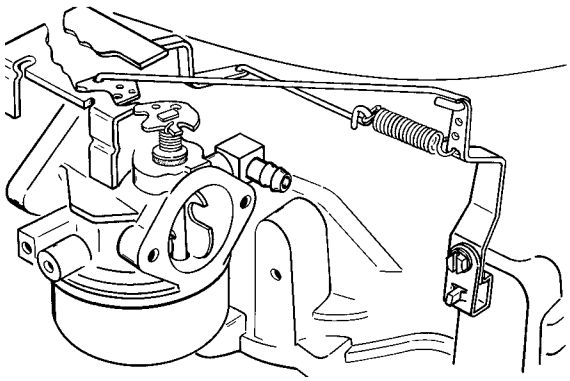
LEV, LV / TVS, OVRM SNAP IN CONTROL 43



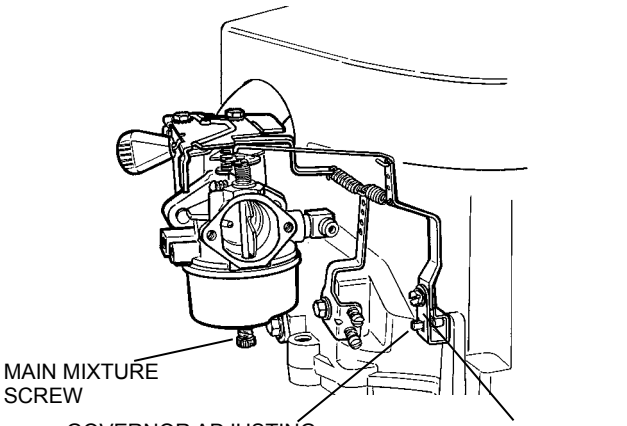
TYPICAL LIGHTWEIGHT VERTICAL WITH MANUAL SPEED CONTROL 44



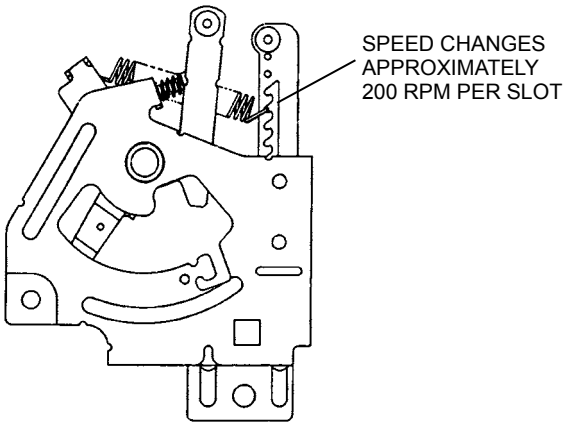
TYPICAL LIGHTWEIGHT VERTICAL WITH REMOTE SPEED CONTROL 45



STANDARD TVM ENGINE WITHOUT GOVERNOR OVERRIDE 46



OVM/OVXL,TVM 170, 195 & 220 47



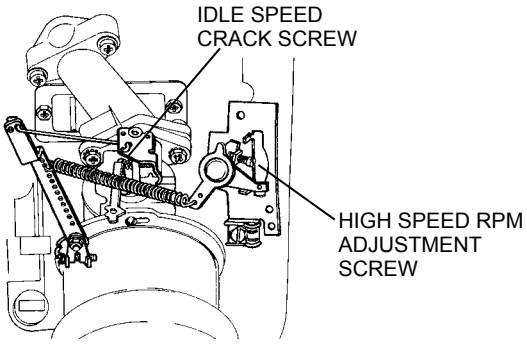
OHV 11-18, OV358 - OV490 48

Governor Override System for TVM170, 195 and 220 Engines (diag. 47)

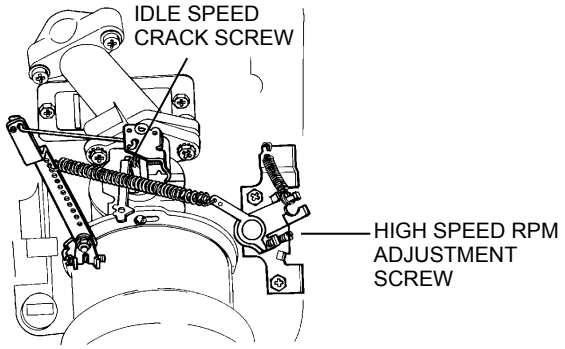
This system will be found starting on 1985 production models and will not retrofit onto older engines. It is designed to allow the governor to regulate the low and high speeds of the engine. The high speed is adjusted at the top screw of the override lever; to increase R.P.M. turn the screw out (counterclockwise), to decrease R.P.M. turn the screw in (clockwise). The low speed is adjusted at the bottom screw of the override lever; to increase R.P.M. turn the screw in or clockwise, to decrease R.P.M. turn the screw out or counterclockwise (diag. 47).

Engine Speed Controls and Governor Linkages - continued

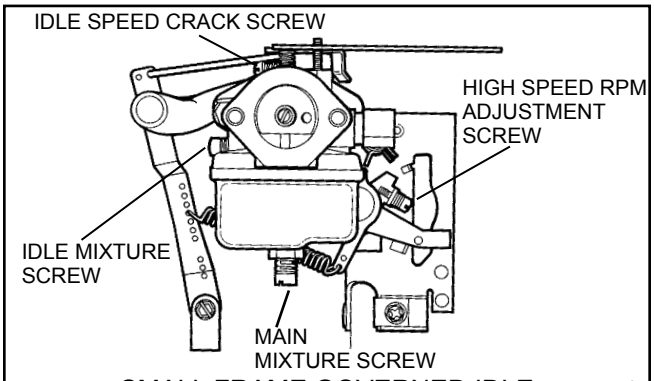
Horizontal Shaft Engines



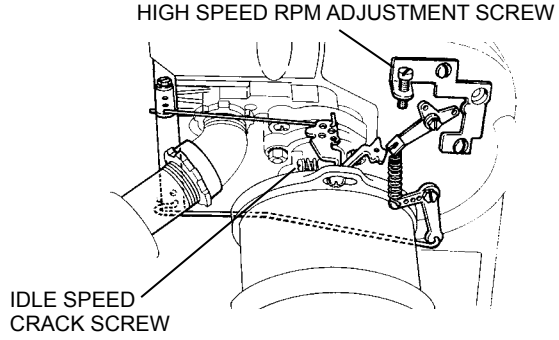
HORIZONTAL LIGHTWEIGHT 49



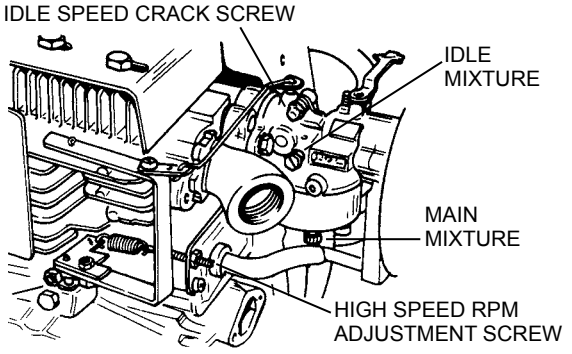
LIGHTWEIGHT R.V. TYPE 50



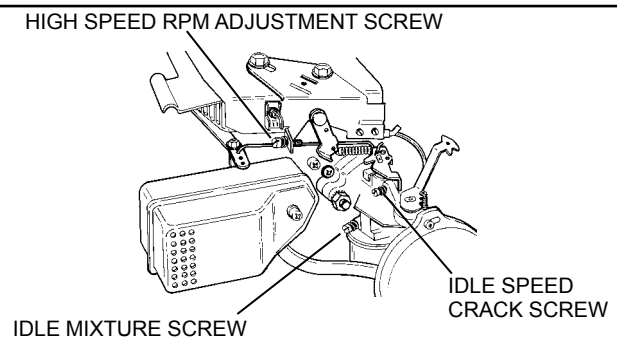
SMALL FRAME GOVERNED IDLE 51



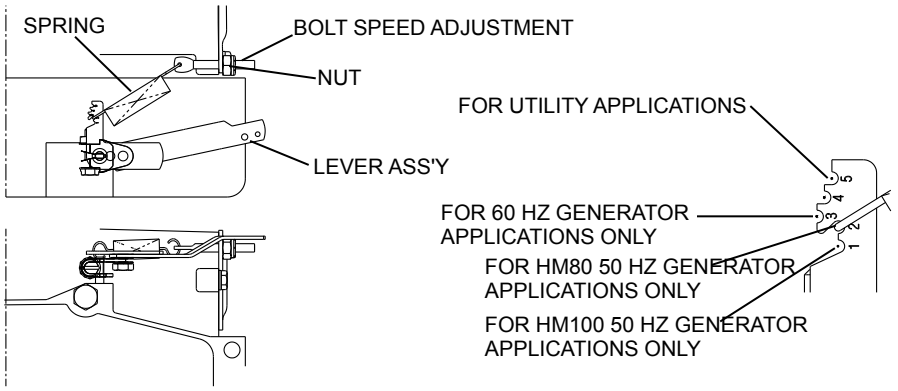
HORIZONTAL MEDIUM FRAME 52



CONSTANT SPEED APPLICATIONS 53



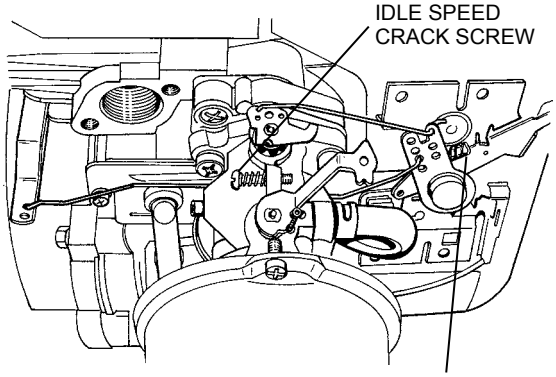
HORIZONTAL MEDIUM FRAME 54



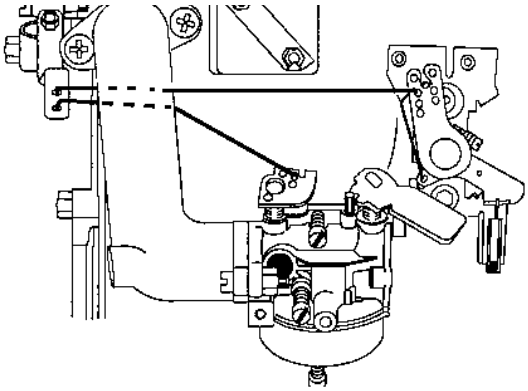
HM / OHM, LH, OV 55

Engine Speed Controls and Governor Linkages - continued

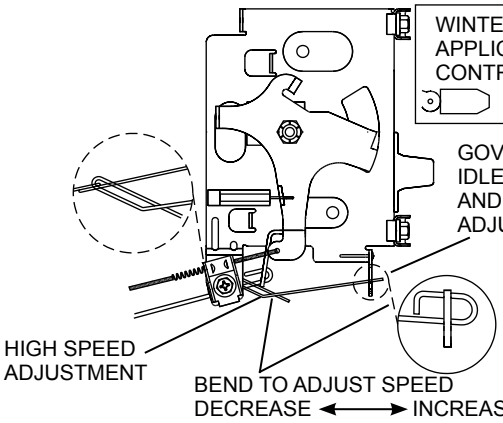
Horizontal Shaft Engines



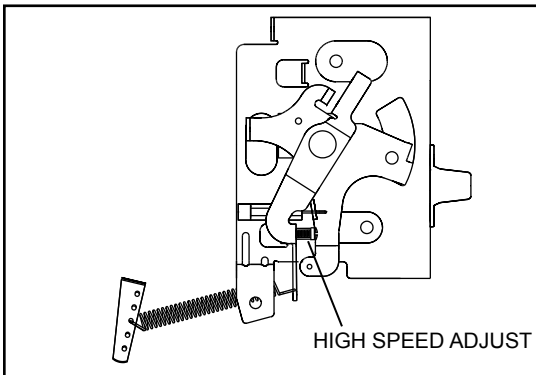
MEDIUM FRAME 56



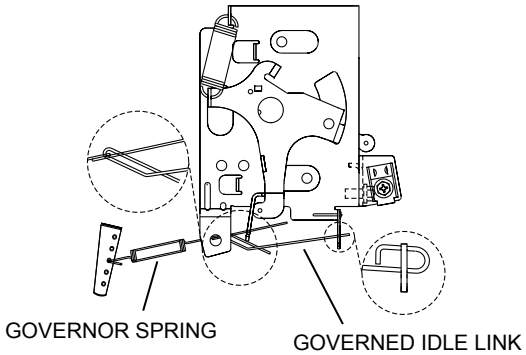
HM80-100, LH318, LH358 SERIES 57



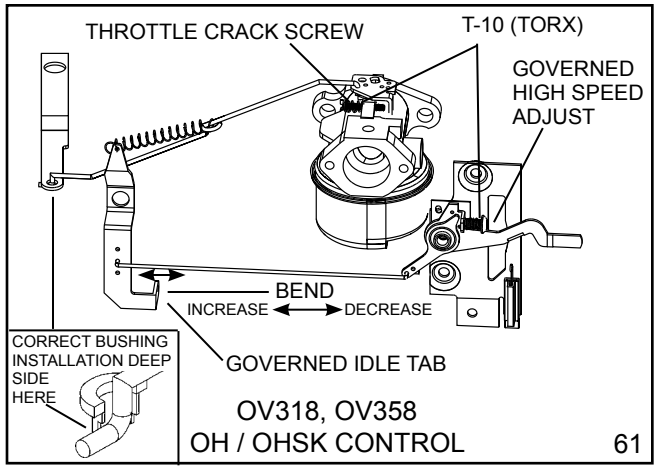
OHH - OH195 REMOTE & MANUAL 58



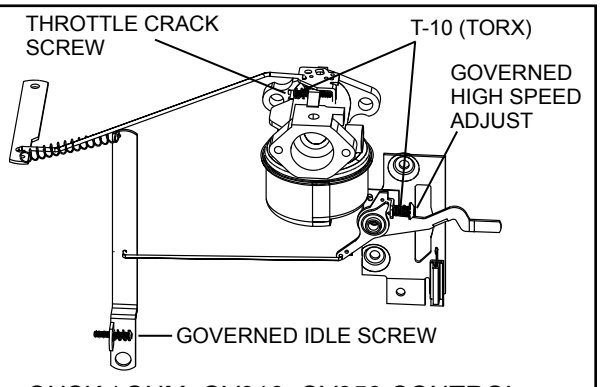
OHH - OH195 FIXED SPEED 59



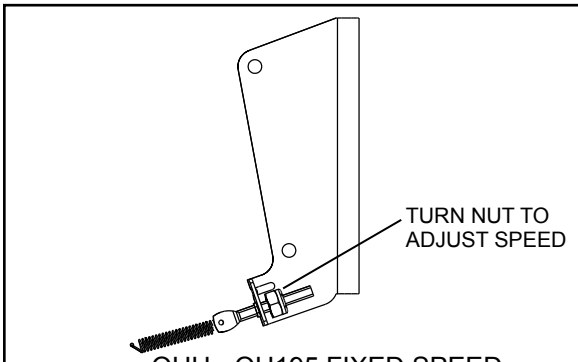
OHH - OH195 RV CONTROL 60



OV318, OV358
OH / OHSK CONTROL 61



OHSK / OHM, OV318, OV358 CONTROL 62



OHH - OH195 FIXED SPEED 63

Engine Speed Adjustments

8-18 HP, Cast Iron

Governor Adjustment for Horizontal Engines

Move the remote controls to the RUN position.
Loosen Screw "A".
Pivot plate "B" counterclockwise and hold.
Move lever "C" to left.
Tighten screw "A" securely.

When the governor is properly set the carburetor throttle lever will be in a wide open position when the controls are set for starting.

The governor spring is to be anchored in the bottom center hole (D) of plate "B". Do not stretch or cut the governor spring. Above adjustments will correct any variations in governor control (diag. 64).

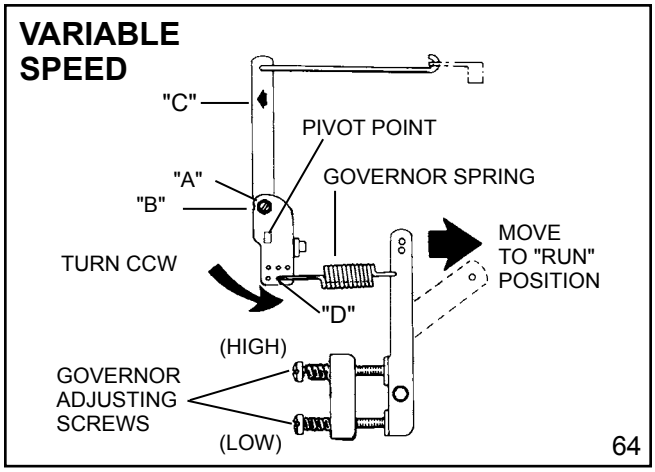
⚠ WARNING To avoid serious injury, and engine or equipment damage, DO NOT exceed the factory recommended R.P.M. engine speed. Doing so can be dangerous and will VOID THE ENGINE WARRANTY.

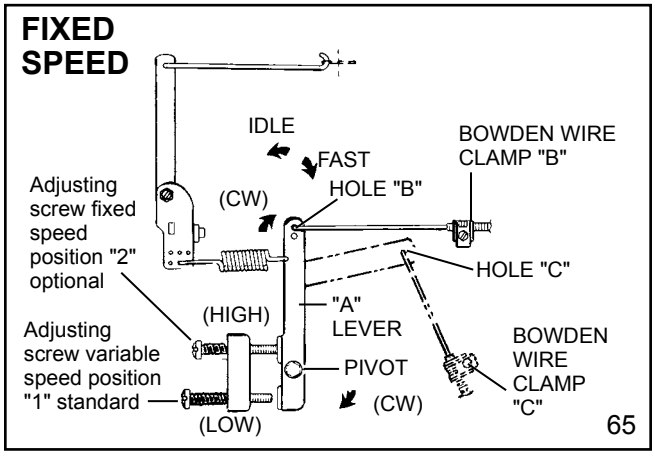
NOTE
Factory recommended R.P.M. engine speed specifications can be located on microfiche card #30 or the computerized parts look-up system.

1. **Setting Variable Speed Adjusting Screw**. Before attaching the bowden wire, set the engine for maximum R.P.M. (See Mfg. specifications) with engine running. Use a good tachometer. Move lever "A" clockwise until lower end strikes the adjusting screw at position "1" (diag. 65).

   Loosen lock nut on adjusting screw and turn in to decrease R.P.M. Turn out to increase R.P.M.

2. **Adjusting Fixed Speed**. The fixed speed adjusting screw is the optional position "2". Adjust it by starting the engine, then loosening the locknut. Turn the screw in to increase R.P.M. and out to decrease R.P.M.





TVT / VTX / OV691 Governors and Linkage

General Information

The TVT / VTX / OV691 engine is equipped with an internal mechanical governor. The governor's function is to maintain a R.P.M. setting when engine loads are added or taken away. This chapter includes governor assembly linkage illustrations to aid in governor or speed control assembly.

Operation

As the speed of the engine increases, the weights on the governor gear move outward from centrifugal force lifting the governor spool. The contact between the spool and governor rod causes the attached outer governor lever to push the solid link and close the throttle plate. When the engine speed decreases, the lower centrifugal force allows the governor weights to be pulled in by the governor spring. The governor rod rotates and the solid link moves the throttle plate to a more open position (diag. 66).

Troubleshooting

NOTE

Engine overspeed must be corrected immediately, before serious engine damage occurs.

Erratic engine operation where the governor is suspect, may be the result of other engine system problems. Hunting (engine R.P.M. surging up and down) can be an indication of fuel starvation or an air leak. Low power (engine will not hold R.P.M. under load) can indicate, fuel, ignition or internal concerns. Use the following procedure to diagnose a suspected governor problem.

Engine Speed Adjustments

Before attempting to set the governed high or low R.P.M. speeds, locate the recommended R.P.M. setting according to the engine model and specification numbers.

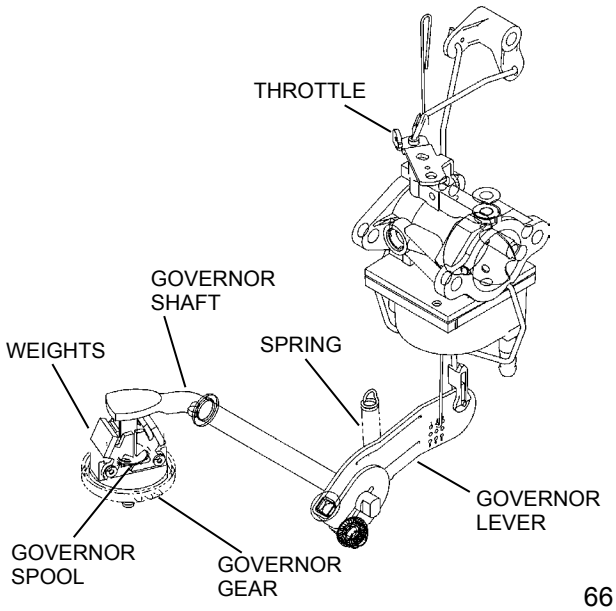
⚠ WARNING To avoid serious injury, and engine or equipment damage, DO NOT exceed the factory recommended R.P.M. engine speed. Doing so can be dangerous and will VOID THE ENGINE WARRANTY.

NOTE

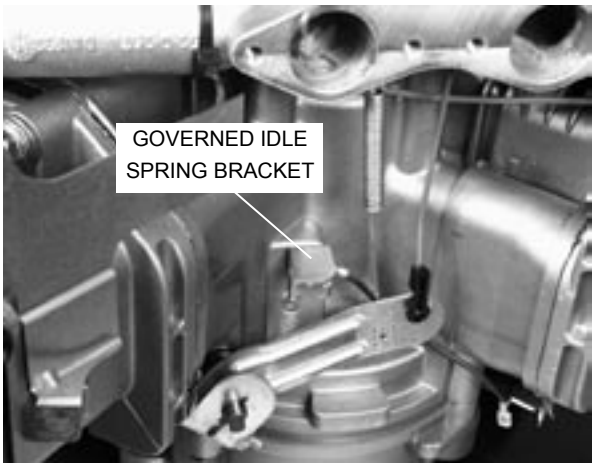
Factory recommended R.P.M. engine speed specifications can be located on microfiche card #30 or the computerized parts look-up system.

Start the engine and allow it to warm up to normal operating temperature (3 - 5 minutes). Set the speed control to the low speed position. Check the governed idle speed **(not true idle).** Adjustment is made by bending the governor spring bracket upward to increase the idle R.P.M. or downward to lower idle R.P.M. (diag. 67).

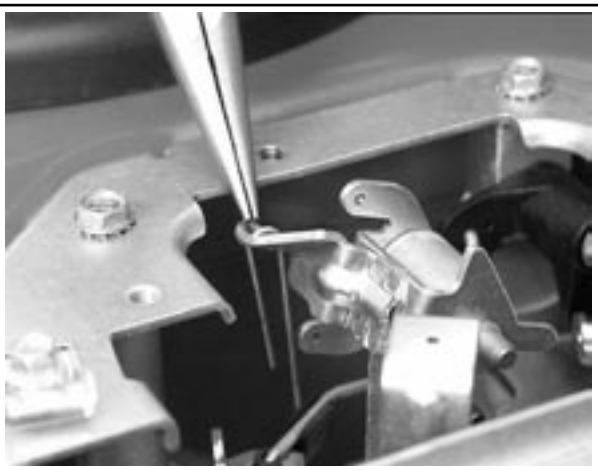
Set the speed control to the HIGH or FAST position. Check engine speed. To adjust, bend the tang on the control lever upward to increase high speed R.P.M. or downward to lower high speed R.P.M. (diag. 68).



66



67



68

Engine Overspeed

1. If the engine runs wide open (faster than normal), shut the engine off **immediately.**

⚠ WARNING Failure to shut off the engine if overspeeding, can result in serious injury or death.

2. Check the condition of the external governor shaft, linkage, governor spring, and speed control assembly for breakage or binding. Correct or replace binding or damaged parts.

3. Follow the governor static adjustment procedure and reset the governor.

4. Start the engine. Be ready to shut the engine off if an overspeed condition still exists. If the problem persists, attempt to hold the solid link between the governor arm and the carburetor throttle plate in one position. If this controls the condition, the engine will require disassembly to inspect the governor gear assembly for damage, binding, or wear.

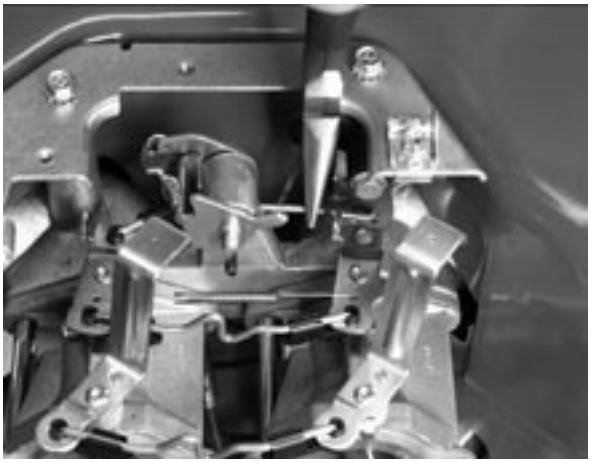
5. Remove the governor gear assembly. Repair or replace as necessary.

Engine Surging

1. Try to stabilize engine R.P.M. by holding the solid link between the bell crank lever and the carburetor throttle plate in a fixed position using a pliers or fingers (diag. 69).

2. If the engine R.P.M. stabilizes, re-adjust the governor setting. Check the governor shaft, linkage, bushing clips and spring for binding, wear, or improper hookup. Replace as necessary. If none of these correct the problem it may be necessary to disassemble the engine for internal governor repair.

3. If the engine R.P.M. does not stabilize, it may require additional checks of the fuel system, see the fuel system troubleshooting section.

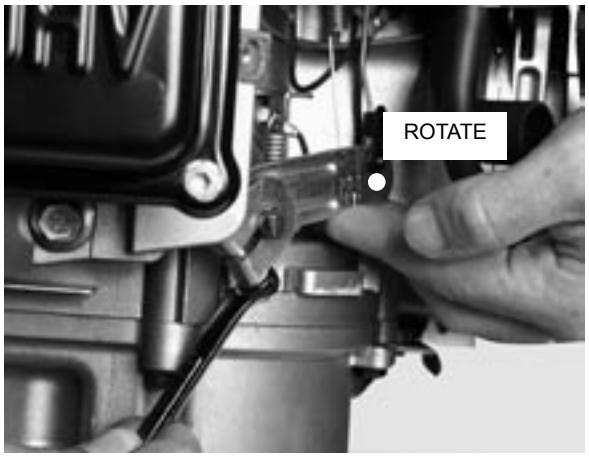


69

GOVERNOR SERVICE

Static Adjustment - Governor

With the engine stopped, loosen the screw holding the governor lever to the governor shaft. Push the governor lever up to move the carburetor throttle plate(s) to the wide-open throttle position. Rotate the governor rod in the same direction. Hold the lever and rod in this position while tightening the screw (diag. 70).



70

Speed Controls and Linkage

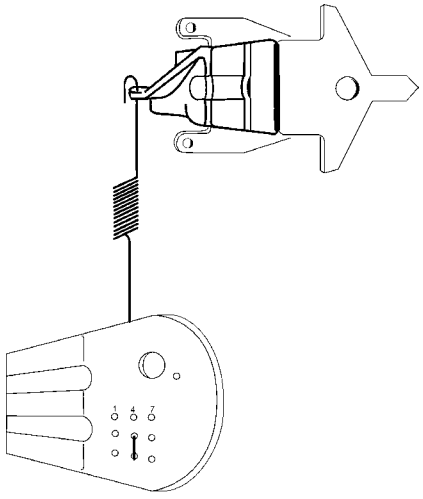
The TVT series engine offers the adaptability of throttle cable connection from either side of the engine. Either cable position must pull against the governor spring force, to increase the engines speed.

NOTES

Both the upper and lower governor spring connections must be installed correctly to prevent improper operation (diags. 71 and 72).

Whenever the carburetor or the governor linkage is removed or replaced, the engines governed R.P.M.'s must be checked. Use microfiche card #30 or the computer parts look-up system to locate the correct R.P.M. settings for the engine model and specification you are repairing.

71



72

Synchronizing the Carburetors

Some TVT / VTX / OV691 series use twin carburetors, which **MUST** be synchronized if the linkage or carburetor body has been disturbed. The following step by step procedures must be followed to synchronize both the throttle and choke. Inspect all link connectors. If excessively worn or damaged replace them. To perform this service the carburetors must be mounted and all linkage must be connected.

1. Remove the control assembly cover, air cleaner cover, air cleaner, carburetor deflector and air cleaner body from the engine (diag. 73).

2. Remove the link connector bushing clip holding the throttle link to the #1 cylinder carburetor (diag. 74).

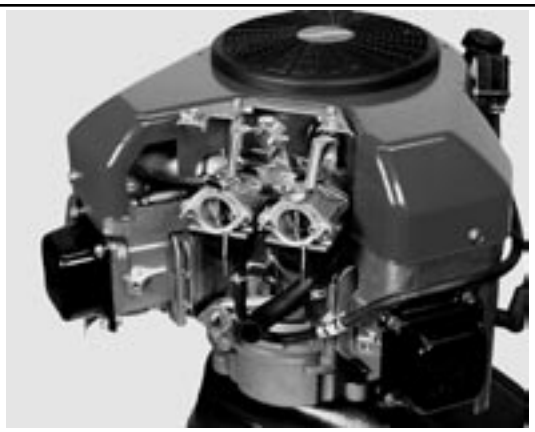
3. Manually rotate the throttle shaft on the number #2 carburetor to the idle position. Next back out the idle R.P.M. adjustment screw until it no longer contacts the throttle plate tang (diag. 75).

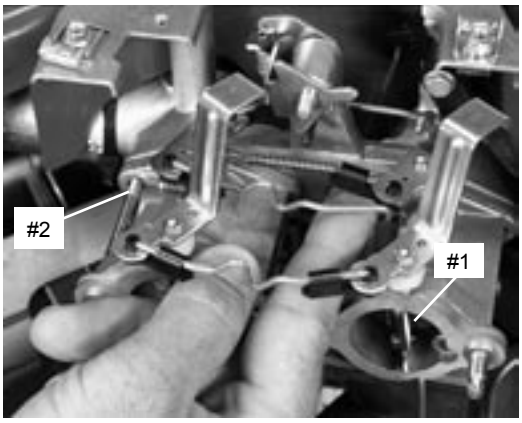
4. While holding the number #2 carburetor throttle shaft in the idle position turn in the idle R.P.M. adjustment screw to 1/4 turn past first contact.

NOTE

It is critical to find first contact of the R.P.M. adjustment screw to the throttle plate tang.

5. With the bushing clip still detached, back out the idle R.P.M. adjustment screw on the #1 carburetor. Hold the throttle plate in the idle position and turn the idle R.P.M. adjustment screw in until first contact with the tang is made (diag. 76).


73



74


75

76

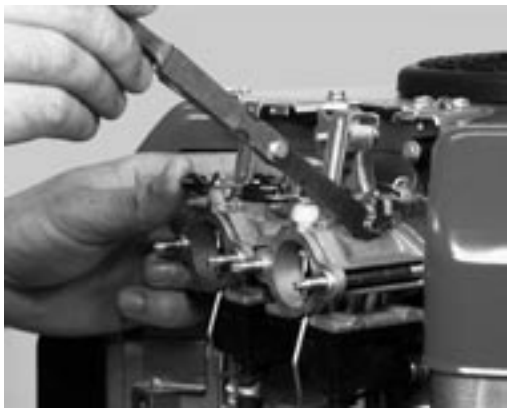
6. Connect both carburetors by attaching the link and link connector bushing clip to the # 1 carburetor.

7. Hold the throttle plate on the #2 carburetor in the true idle position. (Screw against the tang).

NOTE

Do not set the gap using the idle R.P.M. adjustment screw. Use a ***.010" (.254 mm)*** *feeler gauge to set the air gap between the idle R.P.M. adjustment screw and the throttle plate tang on the #1 carburetor (diag. 77).*

The throttle cross link will need to be bent inward (toward the engine) to increase the air gap or pulled outward to decrease (diag. 78).


77

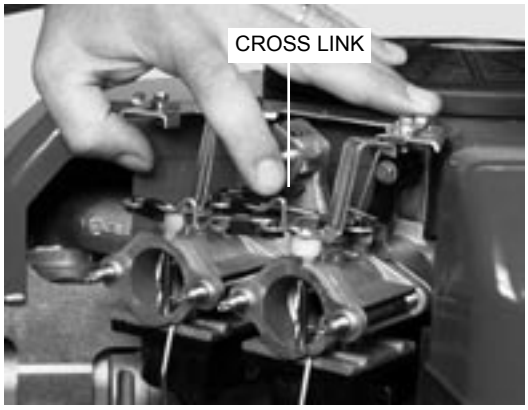
Choke Synchronization

1. Engage the choke control cable of the equipment to the full choke position.

2. Remove the control assembly cover, air cleaner cover, air cleaner and air cleaner baffle (diag. 79).

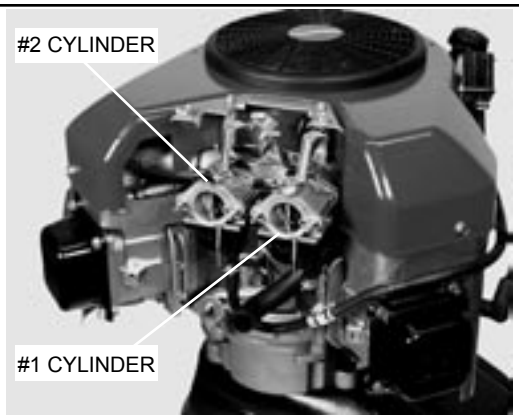
3. Visually inspect that the choke shutter plate on the # 2 carburetor is completely closed. If the plate is not completely closing, choke cable adjustment is necessary.

4. Apply and hold light pressure closing the choke lever on the #2 carburetor. Attempt to rotate or move the choke plate on the #1 carburetor (diag. 80). If movement can be found or the choke shutter is not completely closing, the choke cross-link will need to be adjusted. To adjust, bend the cross-link inward towards the cylinder block until both choke shutters completely close at the same time.



78

Re-assemble the components, ensure the cable clamps are tight. Start the engine and allow it to warm up (3-5 minutes). Set the governed idle and top no-load R.P.M. The correct R.P.M. settings can be located on microfiche card #30 or the computer parts look-up system. The use of a vibra-tach Tecumseh **part #670156** or a digital engine tachometer **part #670341** will aid in this procedure.



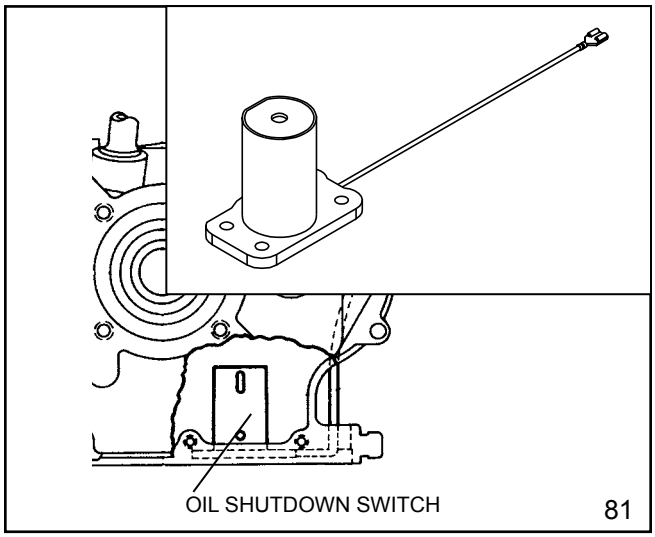
79


80

Switches, Sensors and Solenoids

Low Oil Shutdown Switches

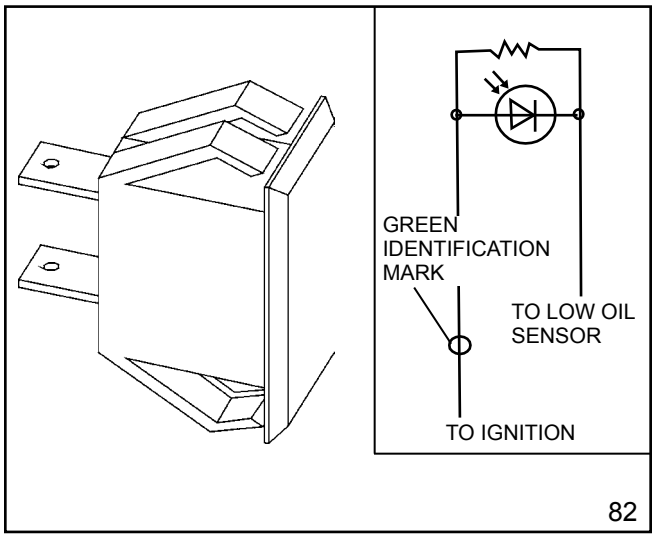
Check the L.O.S. switch while it is in the engine. The engine must be level, and the oil level at the full mark. Place the speed control in the run position. Remove the spark plug wire from the spark plug. Install a gap type tester connected to the spark plug wire and a good engine ground. Spin the engine over using the electric or recoil starter. A bright blue spark should be seen at the tester. If not, remove the blower housing and disconnect the L.O.S. lead from the ignition module. Reinstall the blower housing and spin the engine over. If spark occurs now, replace the L.O.S. switch. If no spark is seen, replace the ignition module (diag. 81).



81

Low Oil Shutdown Indicator Light

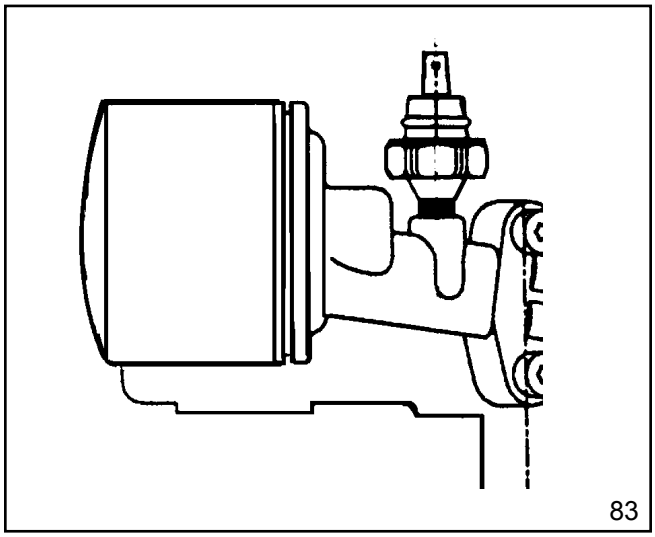
If equipped, the indicator light will flash if the oil level is at or below the add mark when the engine is turned over while attempting to start. Test by turning the engine over with the oil level below the add mark. If the indicator light does not flash, replace the indicator light (diag. 82).



82

Low Oil Pressure Sensor

Test the sensor on a running engine using an ohmmeter or continuity tester with one test lead connected to the sensor terminal and the other to an engine ground. An open circuit should be found with the engine running and continuity should exist when the engine is shut off. If continuity is found or the oil pressure indicator is on at low engine R.P.M.'s, remove the sensor and install a master oil pressure gauge. The oil pressure of a running engine should be 7 p.s.i. (.500 bar) or higher, if lower an internal engine problem exists (diag. 83).

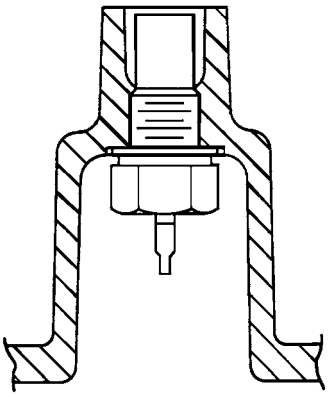


83

Switches, Sensors, and Solenoids - continued

Low Oil Sensor

This sensor must use a #194 bulb, resistance of the bulb MUST be .27 ampere in series with the sensor for proper operation and to prevent sensor damage. Remove the sensor from the engine and attach the electrical plug. Attach a jumper lead from an engine ground to the threaded portion of the sensor. Place the keyswitch in the run position. The indicator light should come on with the tip of the sensor in air (uncovered) and go off when oil covers the sensor tip. The response time of the sensor is between 5 and 15 seconds with 13 volts D.C. at the battery. Lower battery voltage will result in a longer response time. Use teflon-type pipe sealant on the sensor threads to prevent oil leakage when reinstalling (diag. 84).

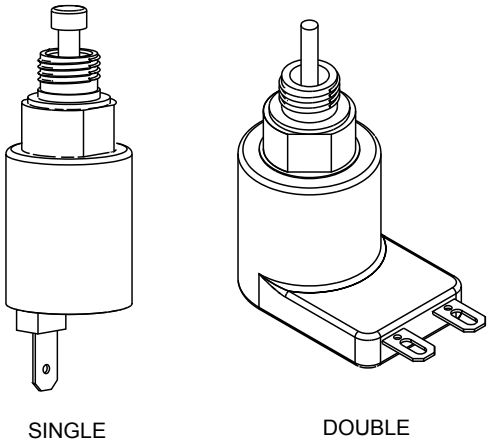


84

Fuel Shutdown Solenoids

If the engine is running, the solenoid can be checked by removing the electrical plug-in at the base of the solenoid. Almost immediately the engine should shutdown, if not replace the solenoid (diag. 85).

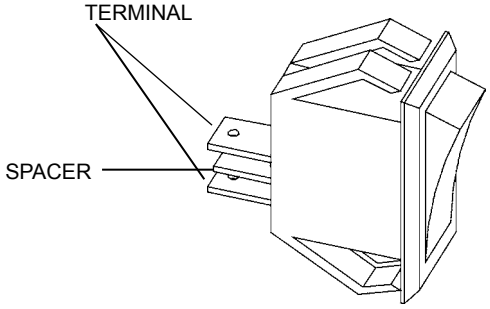
Test the solenoid off the carburetor by applying 12 volt D.C. from the battery positive terminal to a solenoid terminal. Connect a jumper wire from the metal housing (or other terminal) to a negative battery terminal. The plunger should retract the full travel distance. Disconnect the negative jumper lead and the plunger should return to the extended position. Replace if necessary (diag. 85).



85

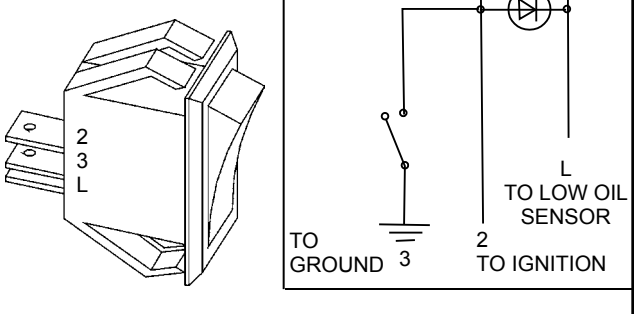
On/Off Switches

Engine On/Off Rocker Switch



2 TERMINAL 86

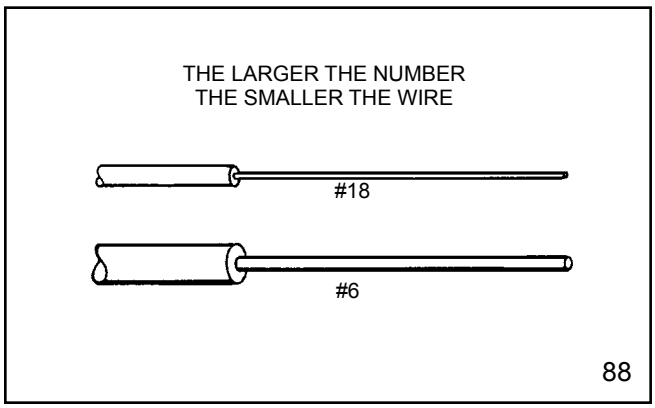
Lighted Engine On/Off Rocker Switch with Low Oil Shutdown



3 TERMINALS 87

Wiring

CONDITION. All wiring must be fully insulated between connection points, securely fastened and free of foreign material (such as rust and corrosion) at the connection points. This is especially important in the use of batteries where much of the potential may be lost due to loose connections or corrosion. Remember to check the insulation on the wire. All it takes is a pin hole for a wire to "ground out" on the engine or frame. This is of special concern when moisture or water is present. This may cause the engine to run erratically or be impossible to start.



88

WIRE GAUGE: Proper thickness of wire is necessary in all electrical circuits. Wire diameter is measured in increments of gauge numbers. The larger the number, the smaller the diameter of the wire. The smaller the number, the larger the diameter of the wire (diag. 88).

1. Starter circuit wiring must be rated at #6 or lower gauge number.

2. Charging circuit wiring must be rated at #16 or lower gauge number. (20 amp system requires #14 or lower gauge number).

3. Magneto circuit wiring (ground circuit) must be rated at #18 or lower gauge number.

Color Codes

Code		Product
Yellow	-	Alternator A.C. Leads
Red	-	Alternator D.C. (+) Leads
Brown	-	Alternator D.C. (-) Leads
Black	-	Alternator Ground Leads, Battery Ground Leads
Orange	-	12 Volt Starter B (+) Leads
Dark Green	-	Ignition Shut-Off Leads

Ammeters

An ammeter is used to measure the rate of current flow from the alternating system to the battery. If no current flow is indicated by the ammeter, remove the ammeter from the circuit and check all other components in the system. Use the ohmmeter to check continuity across the ammeter. If no continuity exists, replace the ammeter.

Diodes

In order to charge a battery it is necessary to convert alternating current (A.C.) to direct current (D.C.) This is accomplished by using a diode or rectifier. Using a single diode will make use of one half of the A.C. signal and is known as HALF WAVE RECTIFICATION. This is acceptable in certain applications. In certain situations it is necessary to make use of the entire A.C. signal. To accomplish this we use multiple diodes in a bridge configuration which produces FULL WAVE RECTIFICATION (diag. 89).

Solenoids

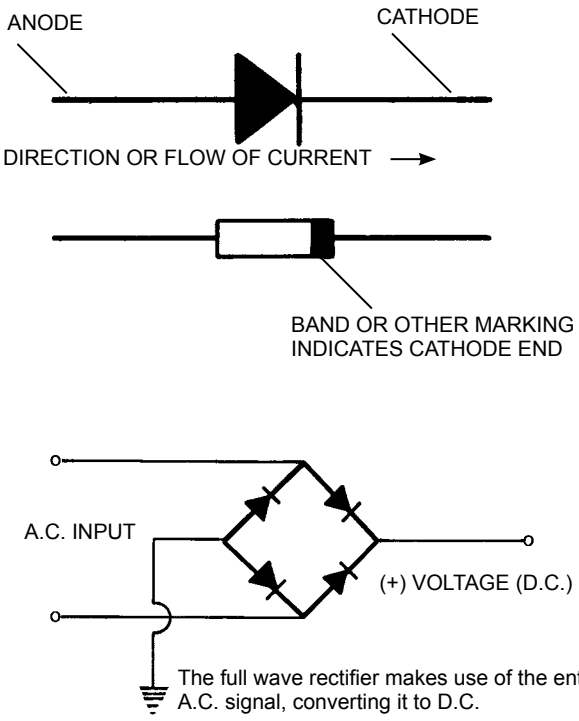
A solenoid is a heavy duty switching mechanism used to handle large amounts of current. It consists of a heavy strip of metal activated by an electromagnet. The metal strip connects two contact points and "makes" or "breaks" the electric circuit. Because the metal strip is heavier than most switch contacts, it does not pit or burn away as lighter switch contacts will.

To test a grounded solenoid, connect positive (+) solenoid terminal (next to solenoid ground) to the positive (+) battery terminal. Connect negative ground (-) terminal of the solenoid to the negative (-) battery terminal. If solenoid is in good condition, the plunger will "snap" and close the main contacts (diag. 90).

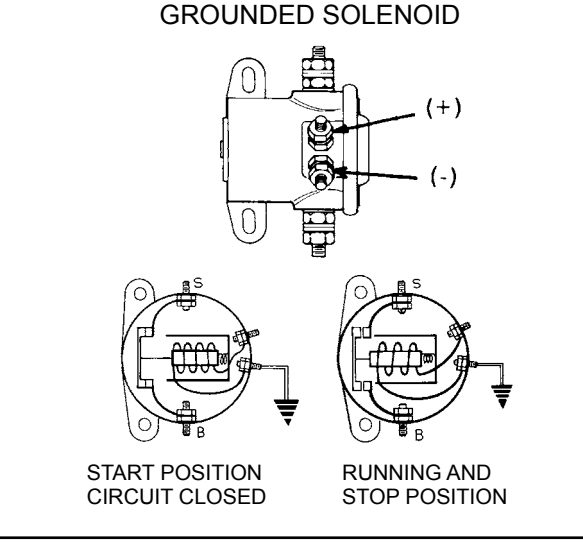
NOTE

With a grounded solenoid, battery B(+) is supplied to activate. With insulated solenoid, battery B(-) is supplied to activate.

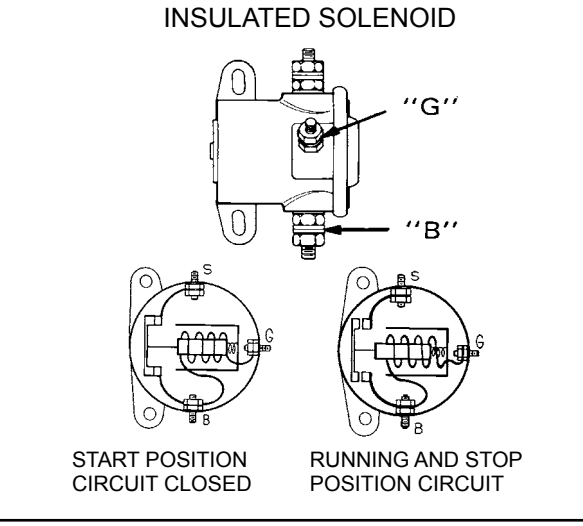
To test an insulated solenoid, connect the terminal marked "B" to the positive (+) battery terminal. Connect terminal marked "G" to the negative (-) battery terminal. If the solenoid is in good condition, the plunger will "snap" and close the main contacts (diag. 91).



89



90



91

Key Switches

Switches are the common point on the vehicle where most of the wiring centrally comes together. There are many varieties of switches available. Replace damaged or failed switches according to the equipment manufacturer's specifications. NEVER substitute an automotive switch for a switch replacement on a small engine application, or a switch from an engine with a battery ignition.

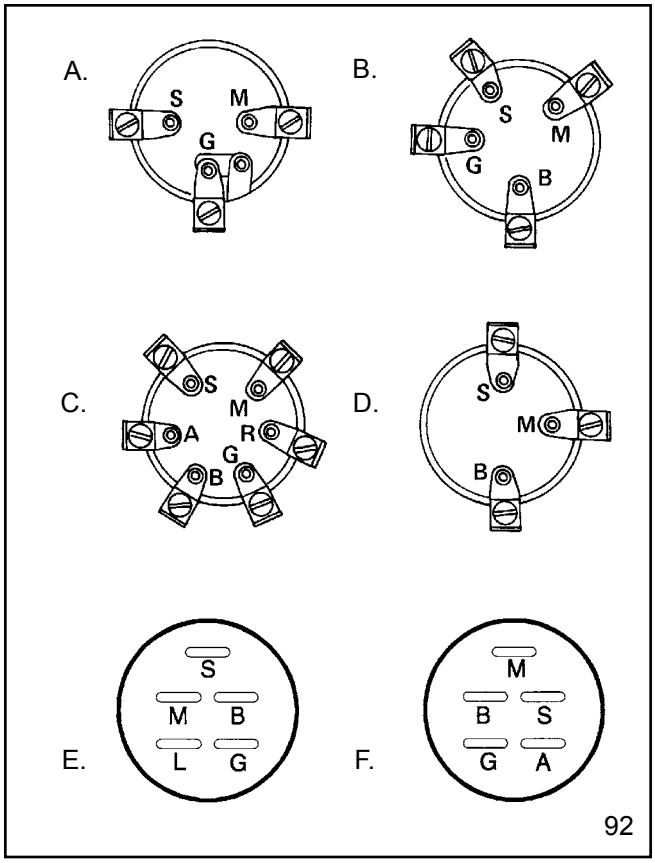
The more common switches are shown: (diag. 92)

Importance of Using Correct Switch

Some switches are too small to take the continual "make" and "break" without burning the electrical contacts. This is when it is advisable to install the recommended manufacturers switch.

NOTE

Warranty is void for the engine components being burned out due to a faulty switch.



92

Continuity Check for Switches

NOTE

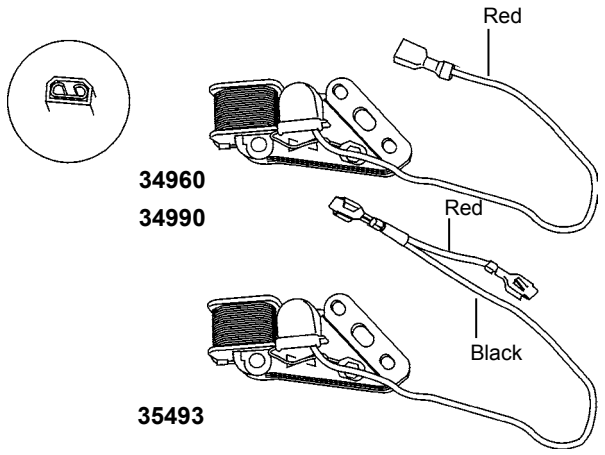
This is only a generic test, manufacturer's may differ in switch terminals and functions.

	Continuity w / key in start position	Continuity w / key in off position	NO Continuity in any key position	Continuity w / key in run position
Switch A Connect Ohmmeter Leads to:				
S & G	X			
M & G		X		
M & S			X	
Switch B (metal case) Connect Ohmmeter Leads to:				
S & G			X	
S & B	X			
S & A, S & metal case			X	
M & B			X	
M & A, M & metal case		X		
B & A				X
B & metal case			X	
A & metal case		X		
with 5th terminal				
R & S, R & M			X	
R & B, R & A				X
R & metal case			X	
Switch C Connect Ohmmeter Leads to:				
A & S			X	
A & M, A & G (3)		X		
A & R, A & B				X
S & M, S & R, S & G (3)			X	
S & B	X			
M & R, M & B			X	
M & G (3)		X		
R & G (3)			X	
R & B				X
B & G (3)			X	

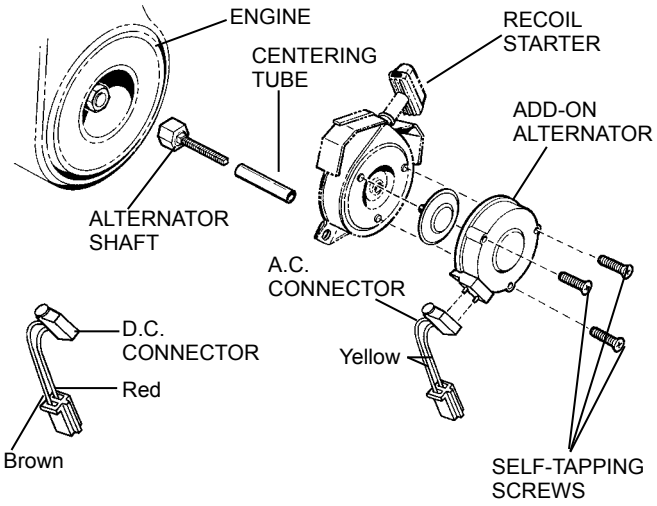
	Continuity w / key in start position	Continuity w / key in off position	NO Continuity in any key position	Continuity w / key in run position
Switch D (metal case) Connect Ohmmeter Leads to:				
S & B	X			
M & Switch Case		X		
M & B			X	
M & S			X	
Switch E Connect Ohmmeter Leads to:				
M & S			X	
M & B			X	
M & G		X		
M & L			X	
S & B	X			
S & G			X	
S & L	X			
G & L			X	
B & G			X	
B & L	X			X
Switch F Connect Ohmmeter Leads to:				
A & G		X		
A & B				X
A & M			X	
A & S			X	
G & B			X	
G & M		X		
G & S			X	
B & M			X	
B & S	X			
M & S			X	

Charging System

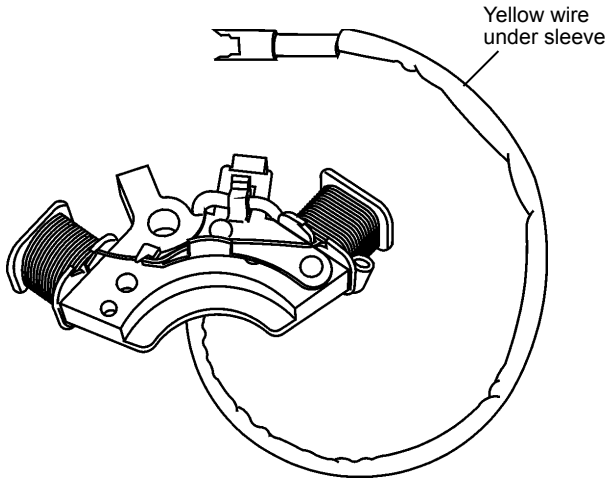
350 Milliamp



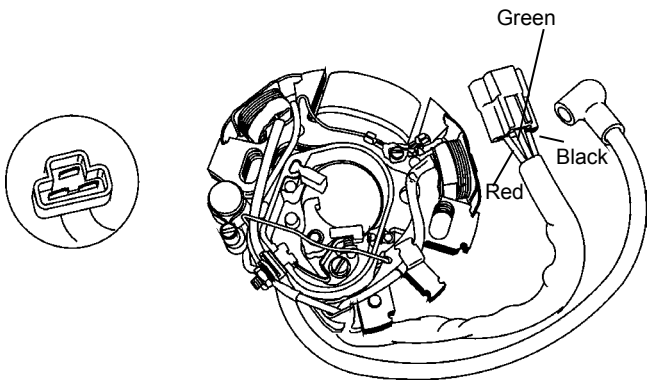
1 AMP (18 WATT) A.C. - ADD-ON ALTERNATOR
611077 (Alternator Only)



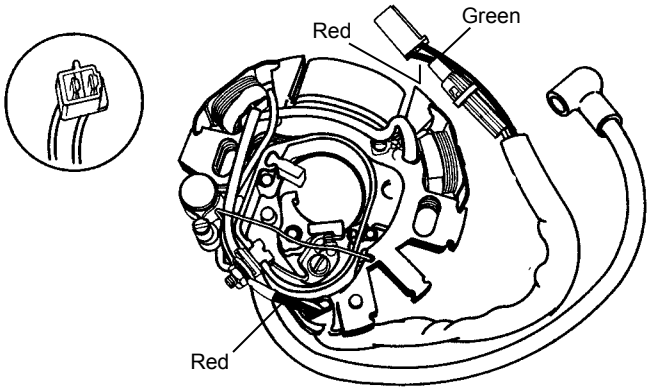
18 Watt A.C. Lighting
611111



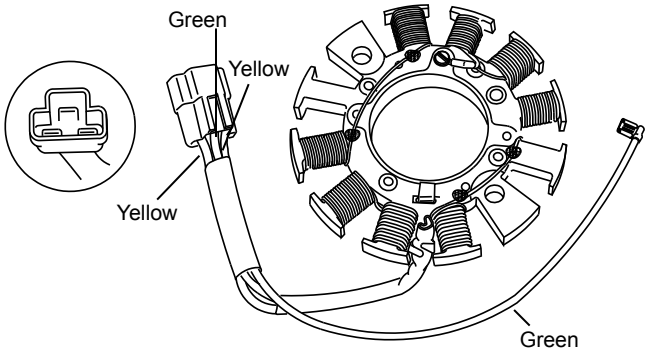
3 Amp A.C.
610981



3 Amp D.C.
610968



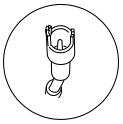
3 Amp A.C.
611095



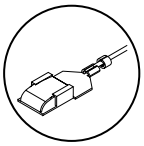
Yellow - Alternator A.C. Leads	Brown - Alternator D.C. (-) Leads	Orange - 12 Volt Starter (+) Leads
Red - Alternator D.C. (+) Leads	Black - Alternator Ground/Battery Ground	Dark Green - Ignition Shut-off Leads

Charging System - continued

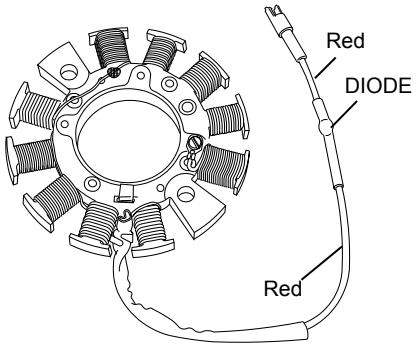
2 and 3 Amp D.C.
611116 (3 AMP)



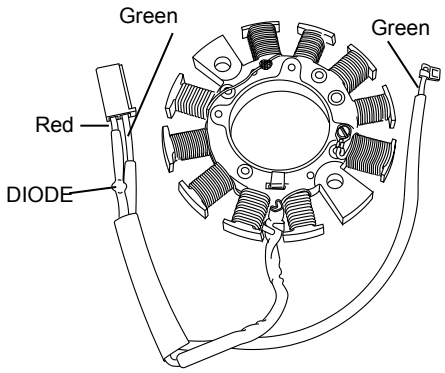
3 Amp



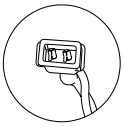
2 Amp
(requires optional flywheel)

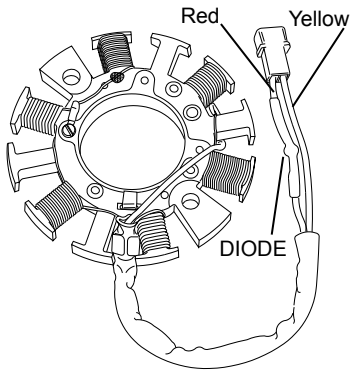


3 Amp D.C.
611113

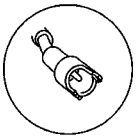


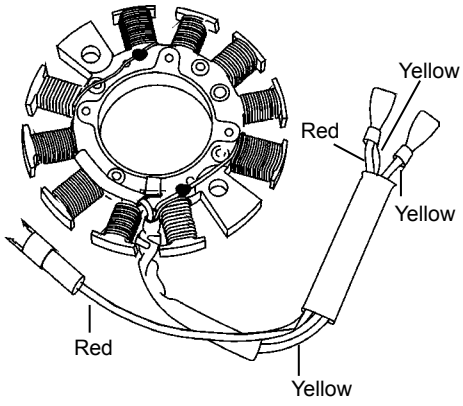
3 Amp D.C. - 5 Amp A.C.
611104





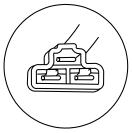
5 Amp D.C.
611176

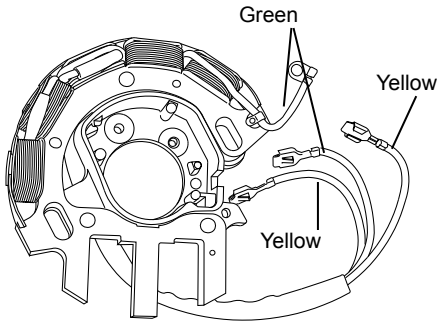




* Uses regulator/rectifier 611175A

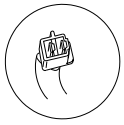
7 Amp D.C.
610818

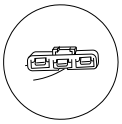


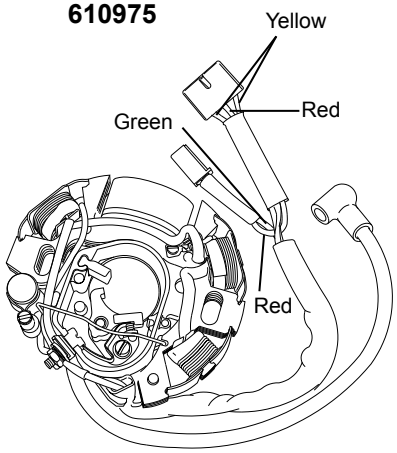


* Uses regulator/rectifier 610749

7 Amp D.C.
610975





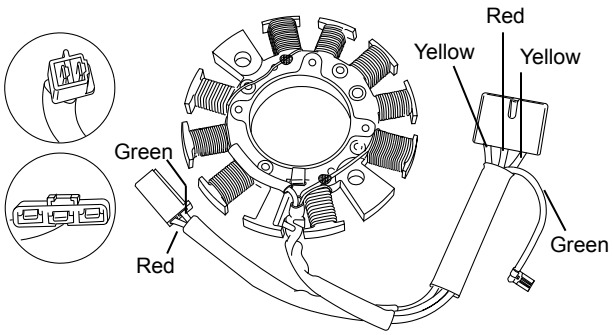


* Uses regulator/rectifier 610938

Yellow - Alternator A.C. Leads	Brown - Alternator D.C. (-) Leads	Orange - 12 Volt Starter (+) Leads
Red - Alternator D.C. (+) Leads	Black - Alternator Ground/Battery Ground	Dark Green - Ignition Shut-off Leads

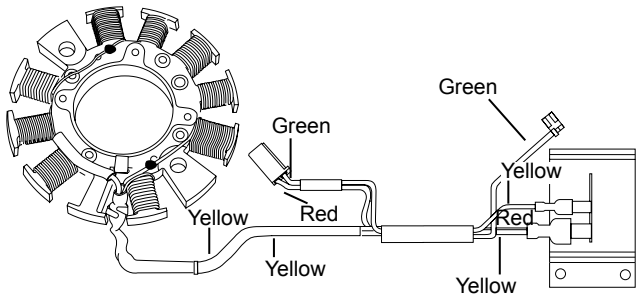
Charging System - continued

7 Amp D.C.
611097

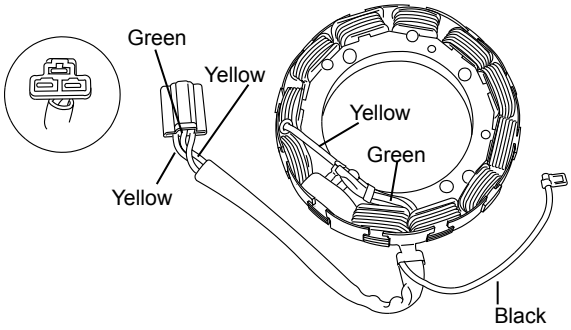


* Uses regulator/rectifier 611098; an open circuit D.C. voltage check cannot be made.

7 Amp D.C.
611256

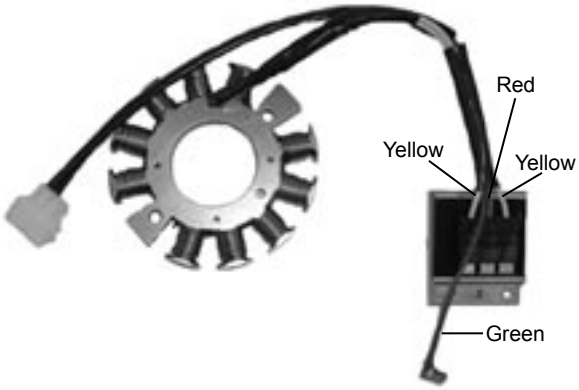


10 Amp D.C.
610761

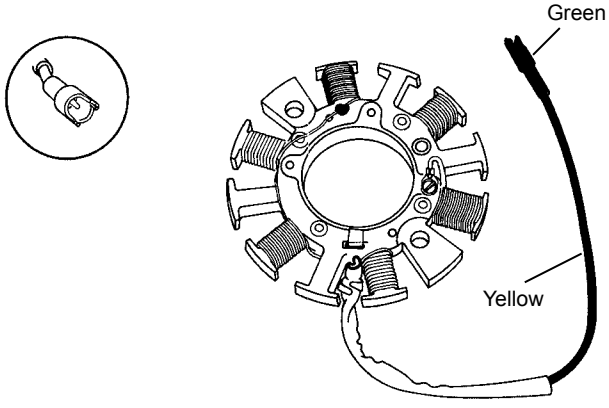


* Uses regulator/rectifier 610749

10 Amp D.C.



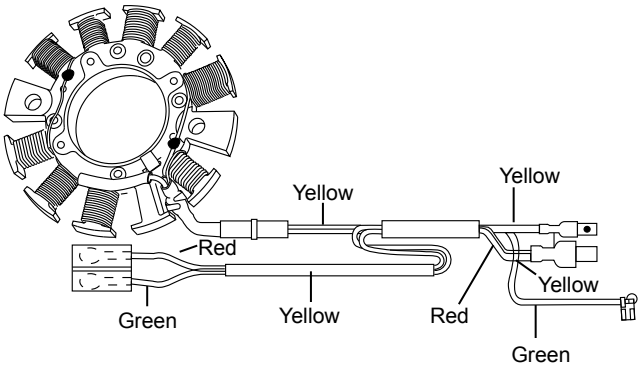
10 Amp Alternator
611159



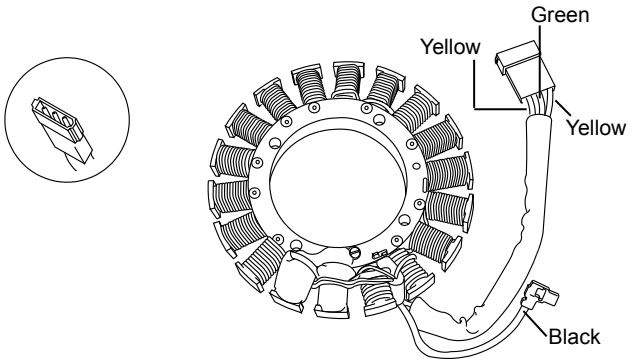
Yellow - Alternator A.C. Leads	Brown - Alternator D.C. (-) Leads	Orange - 12 Volt Starter (+) Leads
Red - Alternator D.C. (+) Leads	Black - Alternator Ground/Battery Ground	Dark Green - Ignition Shut-off Leads

Charging System - continued

12 Amp D.C.

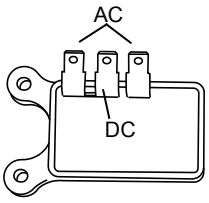


20 Amp Alternator
610902

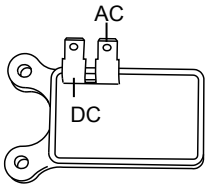


* Uses regulator/rectifier 610996 or 610907A; depending on spec. number; an open circuit D.C. voltage check cannot be made.

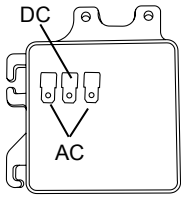
Regulator/Rectifiers



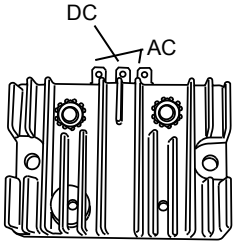
7 Amp
611098



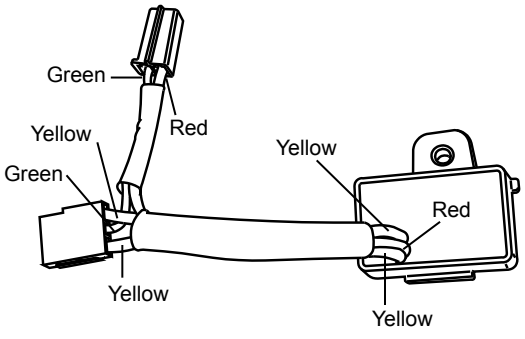
5 Amp, 7 Amp
611175



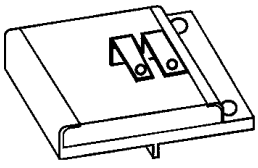
7 Amp
610938



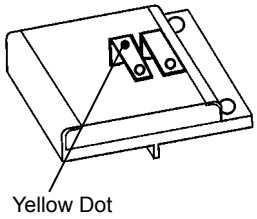
7 Amp, 10 Amp
610749



20 Amp
610996
610907A



5 Amp, 7 Amp
611175A



12 Amp
611274

Yellow - Alternator A.C. Leads	Brown - Alternator D.C. (-) Leads	Orange - 12 Volt Starter (+) Leads
Red - Alternator D.C. (+) Leads	Black - Alternator Ground/Battery Ground	Dark Green - Ignition Shut-off Leads

Testing Procedures

CAUTION When testing Alternator/Charging System: DO NOT disconnect positive lead(s) from the battery while the engine is running. With the engine stopped, disconnect lead(s), then perform test and stop engine before re-connecting. Connecting or disconnecting while the engine is running will send a voltage surge through the regulator, causing damage.

D.C. Charging Adaptor

Rectifier Bridge Check With Ohmmeter for D.C. Adaptor

Continuity should exist during one of the two following tests. No continuity should exist while performing the opposite test.

If continuity exists during both tests, or if no continuity exists during both tests, the D.C. adaptor is defective.

TEST NO. 1 - Connect negative probe of meter to red output lead. Connect positive probe of meter to both A.C. terminals and black output lead (diag. 93).

2000 R.P.M. - 8.0 Volts A.C.
3000 R.P.M. - 10.5 Volts A.C.
3600 R.P.M. - 12.0 Volts A.C.

TEST NO. 2 - Connect positive probe of meter to red output lead. Connect negative probe of meter to both A.C. terminals and black output lead.

Connect negative probe of meter to black output lead. Connect positive probe of meter to both A.C. terminals and red output lead.

If the D.C. adaptor is not defective and a known good battery fails to hold a charge, then perform an A.C. output voltage test.

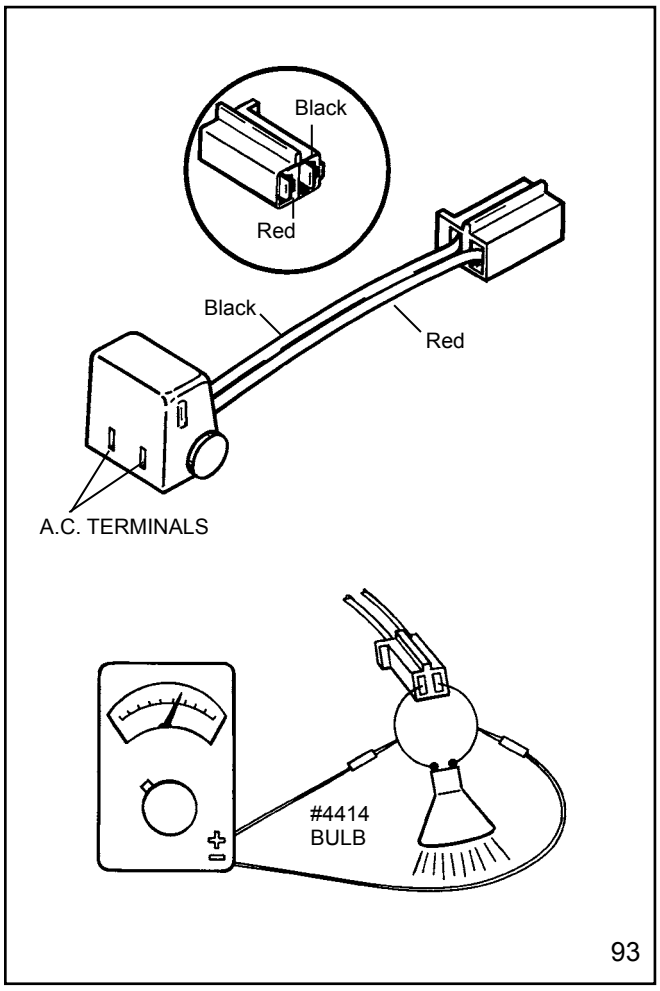
NOTE
Prior to August 1992, the black wire was brown.

CHECKING THE SYSTEM: To check the system, disconnect the D.C. adaptor from the add-on alternator. Connect a No. 4414, 18 watt bulb in line with each terminal in the alternator. Start engine and test circuit using an A.C. voltmeter as shown.

With the engine running, minimum A.C. voltage values across the bulb should be:

2000 R.P.M. - 8.0 Volts A.C.
3000 R.P.M. - 10.5 Volts A.C.
3600 R.P.M. - 12.0 Volts A.C.

If the minimum values are noted, alternator is okay. If the minimum values are not noted, the alternator or A.C. connector is defective.



93

350 Milliamp Charging System

CHECKING THE SYSTEM: The battery must be in the circuit to perform the test properly. Set the voltmeter to the 0-20 D.C. volt scale. Connect a voltmeter across the battery. The voltmeter should read battery voltage. Start the engine. With the engine running, there should be an increase in the voltage reading. If there is no change in the voltage reading, the alternator is defective and should be replaced (diag. 94).

18 Watt A.C. Lighting Alternator

Models: H35, HS & HSSK 40-50, LH195, HM & HMSK 70-80-100, LH318, LH358

CHECKING THE SYSTEM: To check the system, disconnect the plug from the rest of the lighting system. Connect a wire lead from the single pin connector coming out of the engine to one terminal of a No. 4414, 18 watt bulb. Connect another wire to the remaining terminal of the bulb and run it to a good ground on the engine. Start the engine and test the circuit using the A.C. voltmeter as shown (diag. 95).

With the engine running the minimum A.C. voltage across the bulb should be:

2000 R.P.M. - 6.0 Volts A.C.
3000 R.P.M. - 8.5 Volts A.C.
3600 R.P.M. - 10.0 Volts A.C.

If minimum values are noted, the alternator is okay. If less than the minimum values, the alternator is defective.

35 Watt A.C.

Before making any exterior tests, check for an inoperative switch, shorted wires and burned out headlight and/or stop tail light. To check out the alternator, check the A.C. lead to ground at each yellow wire (diag. 96).

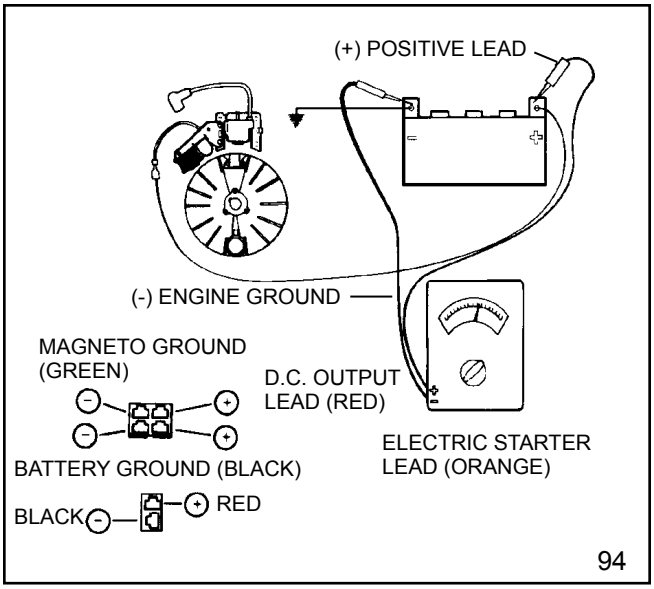
With engine running, minimum values should read:

2500 R.P.M. - 8.0 Volts A.C.
3000 R.P.M. - 9.5 Volts A.C.
3300 R.P.M. - 10.5 Volts A.C.
3600 R.P.M. - 11.5 Volts A.C.

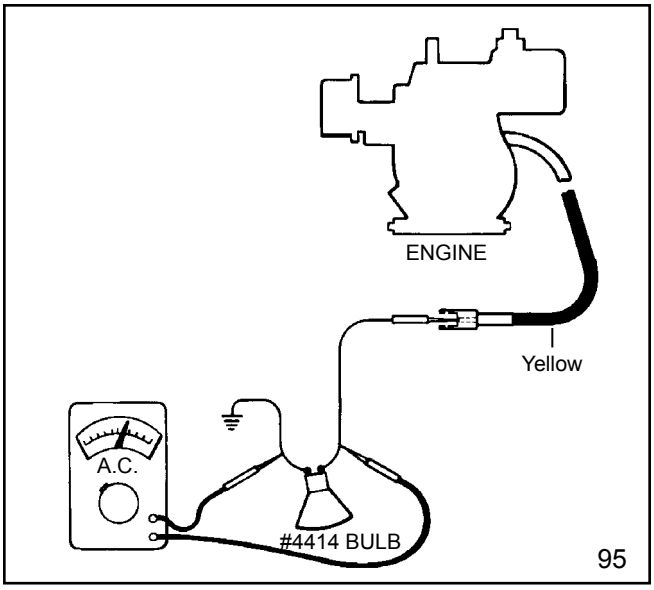
If the above minimum readings are noted, the alternator is okay. Check for defective lights, wiring or switches. If less than the above readings, the alternator is defective.

NOTE

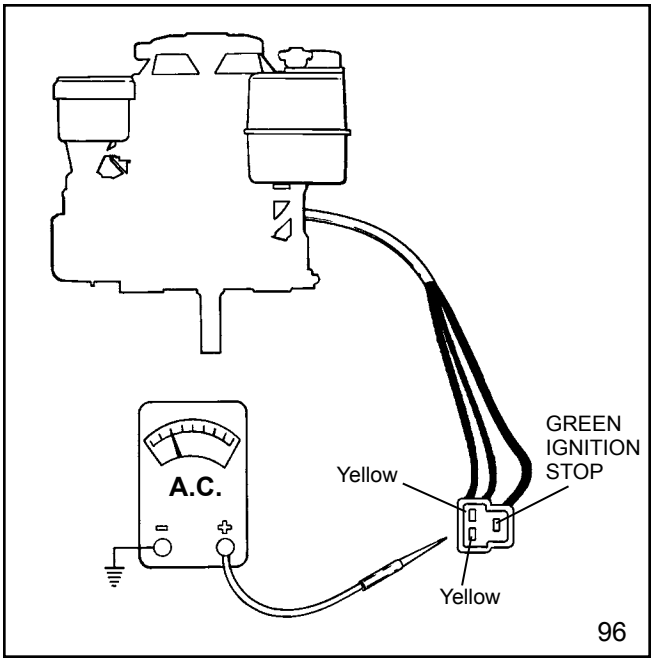
On older point ignition systems, the A.C. output leads are black and red.



94



95



96

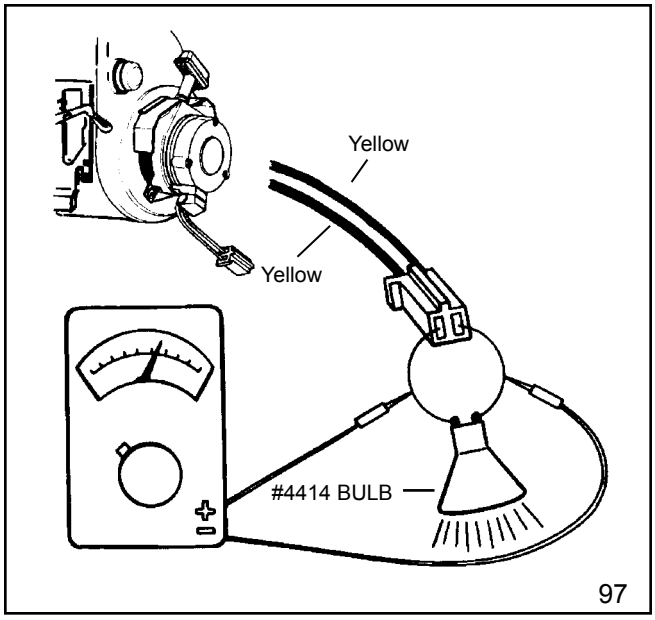
1 Amp (18 Watt) Add-on Alternator

CHECKING THE SYSTEM: To check the system, disconnect the plug from the rest of the lighting system. Connect a No. 4414, 18 watt bulb in line with each terminal in the plug. Start the engine and test the circuit using a voltmeter as shown (diag. 97).

With the engine running the minimum A.C. voltage values across the bulb should be:

2000 R.P.M. - 8.0 Volts A.C.
3000 R.P.M. - 10.5 Volts A.C.
3600 R.P.M. - 12.0 Volts A.C.

If minimum values are noted, the alternator is okay. If the minimum values are not noted, the alternator or A.C. connector is defective.



97

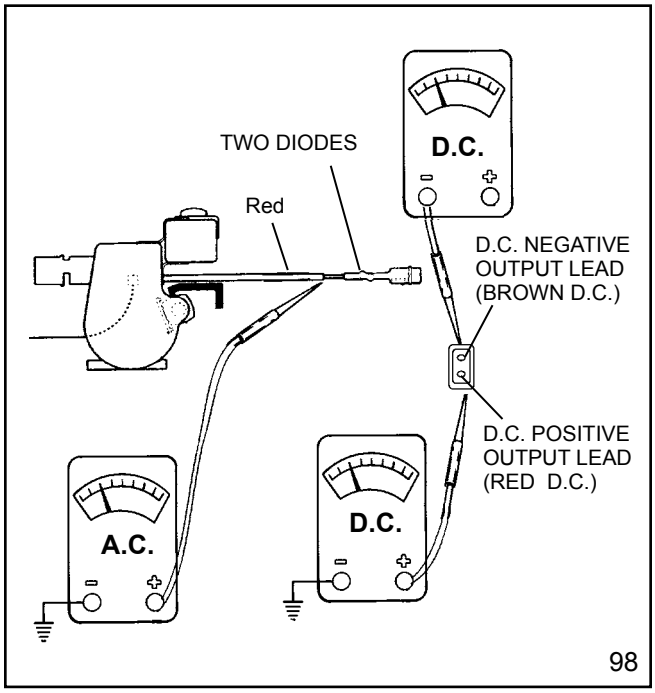
2.5 Amp D.C., 35 Watt Lighting

If output is below standard listed, pull back protective coating in front of the diode and check A.C. output. If A.C. is good check each diode it services as required (diag. 98).

D.C. value (+) or (-); check both sides of A.C. outputs.

R.P.M. Volts D.C.	**R.P.M. Volts A.C.**
2500 - 8.0 Volts D.C.	2500 - 18.0 Volts A.C.
3000 - 9.5 Volts D.C.	3000 - 22.0 Volts A.C.
3300 - 10.5 Volts D.C.	3600 - 26.0 Volts A.C.
3600 - 11.5 Volts D.C.	

NOTE
These minimum numbers should be obtained by your meter and will often be higher.



98

2 and 3 Amp DC Alternator System - Diode in Harness

Models: H30-35, HS40, H50-60, HH50-60, HM70-80-100, HMSK, HHM80, HSK, HSSK, LH195, LH318, LH358 Rotary Mower Engines

This system has a diode included in the red wire which converts the alternating current (A.C.) to direct current. The direct current (D.C.) is used to provide a trickle charge for the battery. The leads from the alternator and the type of connector may vary, but the output readings will be the same.

CHECKING THE SYSTEM: Remove the fuse (if equipped) from the fuse holder and check the fuse to make certain it is good. If faulty, replace with a six (6) AMP fuse.

To check D.C. output, separate the connectors at the engine. Place the probe (+) in the red wire lead connector. Ground the other probe to the engine (diag. 99).

With the engine running the minimum values should read:

2500 R.P.M. - 8.0 Volts D.C.
3000 R.P.M. - 9.5 Volts D.C.
3300 R.P.M. -10.5 Volts D.C.
3600 R.P.M. -11.5 Volts D.C.

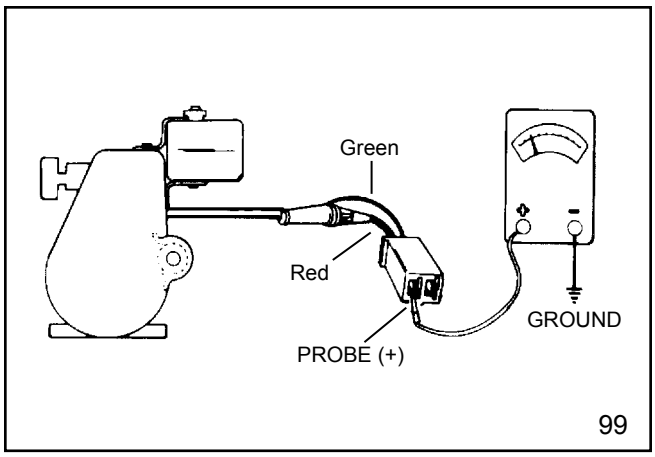
If these minimum readings are noted, the system is okay. Check for bad battery, ammeter, wiring, etc.

If less than the above readings, proceed in making an A.C. output check by pulling back the protective coating from the fuse holder and diode. Using an A.C. voltmeter, check voltage from a point between the engine and the diode as shown in the diagram (diag. 100).

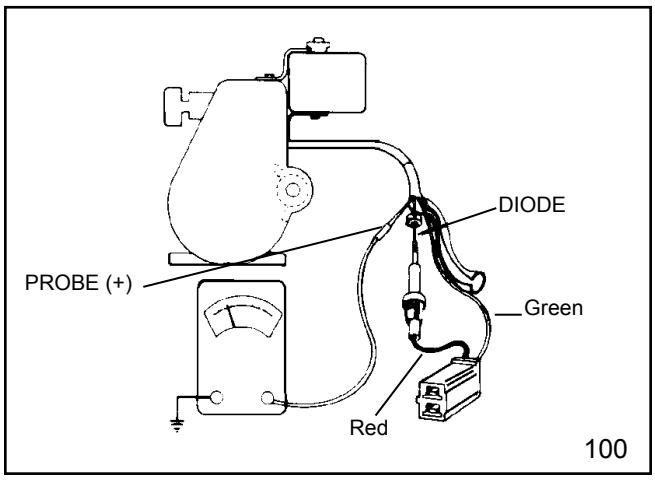
With the engine running the minimum values should read:

2500 R.P.M. - 18.0 Volts A.C.
3000 R.P.M. - 22.0 Volts A.C.
3300 R.P.M. - 24.0 Volts A.C.
3600 R.P.M. - 26.0 Volts A.C.

If low or no voltage is experienced, replace the alternator. If the alternator puts out the minimum A.C. voltage, replace the diode.



99



100

3 Amp D.C. Alternator System - Rectifier Panel

This 3 Amp system is readily identified by the rectifier panel in the circuit. The panel includes two diodes and a fuse for overload protection. The rectifier panel does not regulate the output of this system.

CHECKING THE SYSTEM: Check the fuse to determine if it is good. A continuity light or ohmmeter can detect a faulty fuse. Replace with a six (6) Amp fuse if necessary. Determine if the diodes are functioning properly. A continuity light may be used to check diodes (diag. 101).

When replacing the diode in the rectifier panel, locate the undercut on one end of the diode and match it to the detent on terminal clip of the rectifier panel.

Test the D.C. output of the rectifier panel as follows:

Disconnect the battery lead from the terminal of the rectifier panel. Use a D.C. voltmeter probe on the + battery terminal (diag. 102). Connect negative lead to engine ground.

Minimum values should read:

2500 R.P.M. - 12.0 Volts D.C.
3000 R.P.M. - 14.0 Volts D.C.
3300 R.P.M. - 16.0 Volts D.C.
3600 R.P.M. - 18.0 Volts D.C.

If these minimum readings are noted, the system is okay. Check for bad battery, ammeter, wiring, etc.

If reading is less, proceed to make an A.C. output check. With the battery lead disconnected from rectifier panel, probe the A.C. terminals with the voltmeter on the A.C. scale (diag. 103).

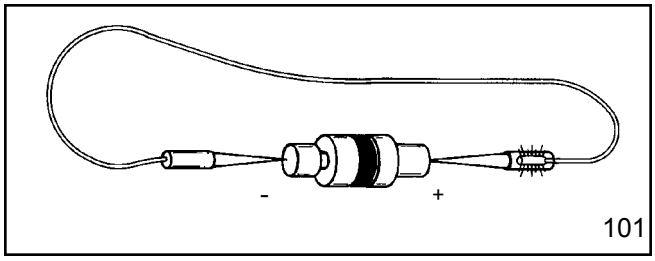
Minimum values should read:

2500 R.P.M. - 24.0 Volts A.C.
3000 R.P.M. - 29.0 Volts A.C.
3300 R.P.M. - 32.0 Volts A.C.
3600 R.P.M. - 35.0 Volts A.C.

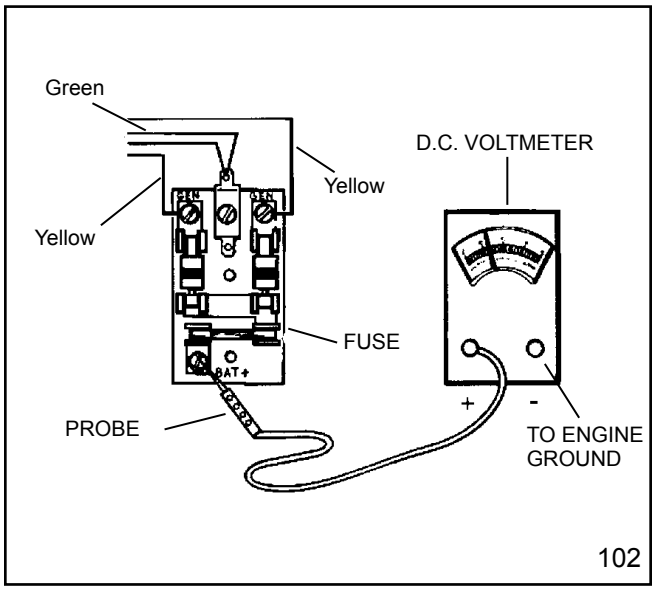
If less than above output, generating coil assembly is defective.

NOTE
If there is no regulator in this system. The total output of the two diodes is three (3) AMPS.

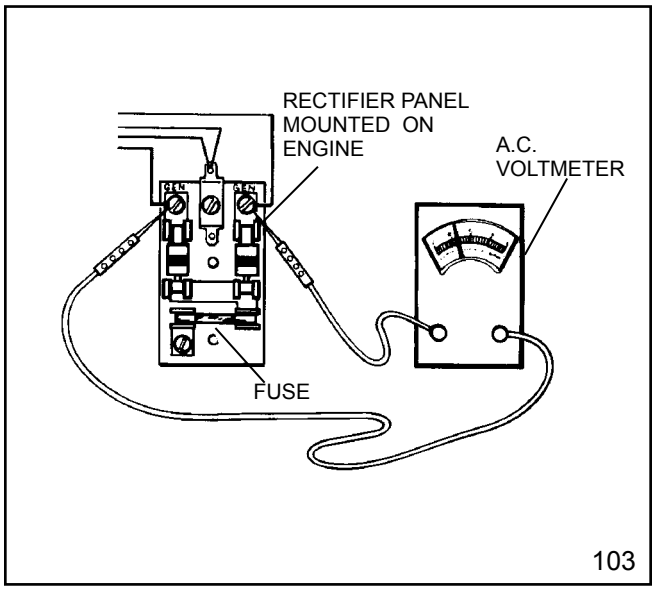
⚠ CAUTION If the battery is overcharging (boiling and bubbling), reduce the D.C. input by one-half by removing one of the diodes. Failure to do so may result in personal injury.



101



102



103

3 Amp D.C. 5 Amp A.C. Alternator

Models: OVM/OVXL 12.5, OHV12.5-18.0, OV358, OV490

This unit combines a 3 Amp D.C. system used to charge a battery and a 5 Amp A.C. system used for lighting. Located in the red wire of the harness is a diode which converts the alternating current to direct current for charging the battery. The yellow wire provides the A.C. voltage for the lighting circuit.

A wire harness **(part #36588)** may be added to the 3 Amp D.C./5 Amp A.C. charging system to power an electric clutch without the use of a battery. Test the diode in the harness by doing a continuity test (diag. 104).

Replace the diode if continuity exists after reversing tester leads or if no continuity is found.

CHECKING THE SYSTEM: To check the system, disconnect the plug and measure the D.C. voltage at the red wire terminal (diag. 105). Measure the A.C. voltage at the yellow wire terminal. With the engine running the minimum values should be: (diag. 106)

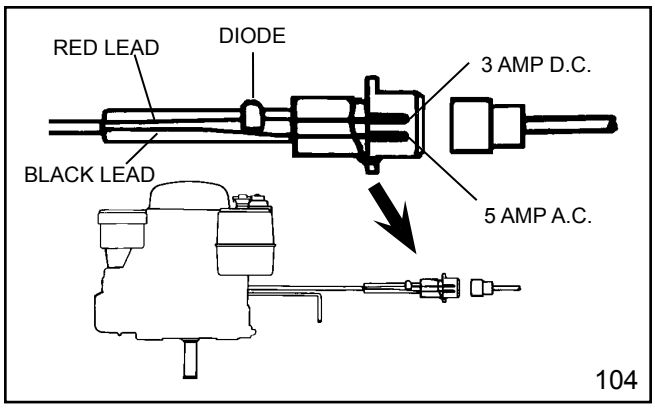
Models OVM/OVXL/OHV
3 Amp D.C. (Red wire)
2500 R.P.M. - 8.0 Volts D.C.
3000 R.P.M. - 11.0 Volts D.C.
3600 R.P.M. - 13.0 Volts D.C.

5 Amp A.C. (Yellow wire)
2500 R.P.M. - 8.5 Volts A.C.
3000 R.P.M. - 11.0 Volts A.C.
3600 R.P.M. - 13.0 Volts A.C.

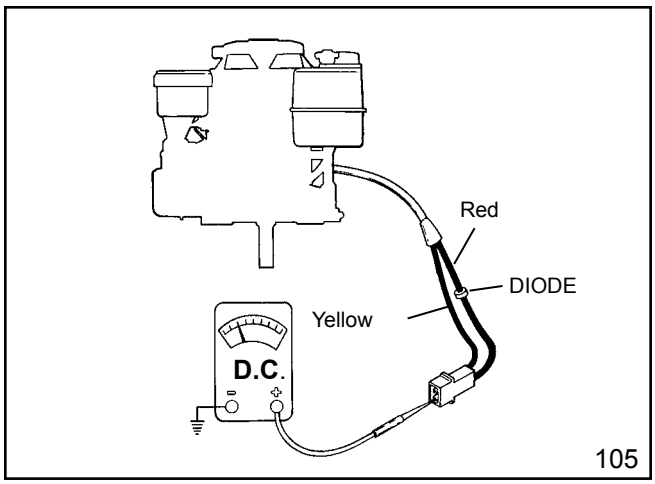
Models OHV 13.5 - 18.0, OV358, OV490
(3/5 Amp split)
3 Amp D.C. (Red wire)
2500 R.P.M. - 6.5 Volts D.C.
3000 R.P.M. - 9.0 Volts D.C.
3600 R.P.M. - 11.0 Volts D.C.

5 Amp A.C. (Yellow wire)
2500 R.P.M. - 15.0 Volts A.C.
3000 R.P.M. - 18.0 Volts A.C.
3600 R.P.M. - 22.0 Volts A.C.

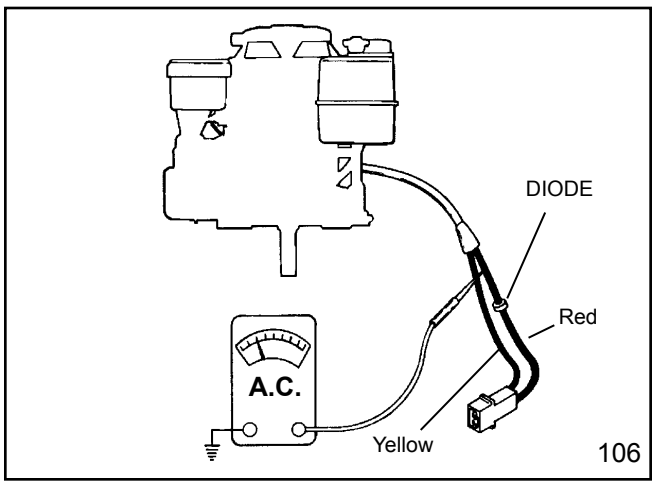
If the above minimum values are noted, the system is okay. Check for defective lights, wiring or switches. If less than above values are noted, pull back the protective shrink tubing from the diode. Using an A.C. voltmeter, check the voltage between the alternator and diode as shown (diag. 107). If low or no voltage is experienced, replace the alternator.



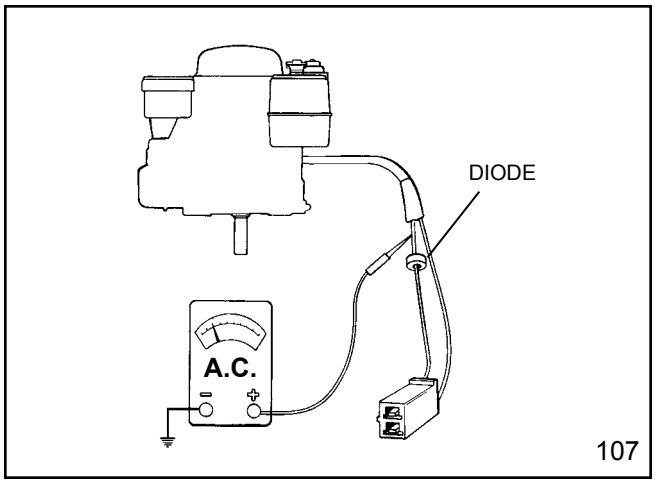
104



105



106



107

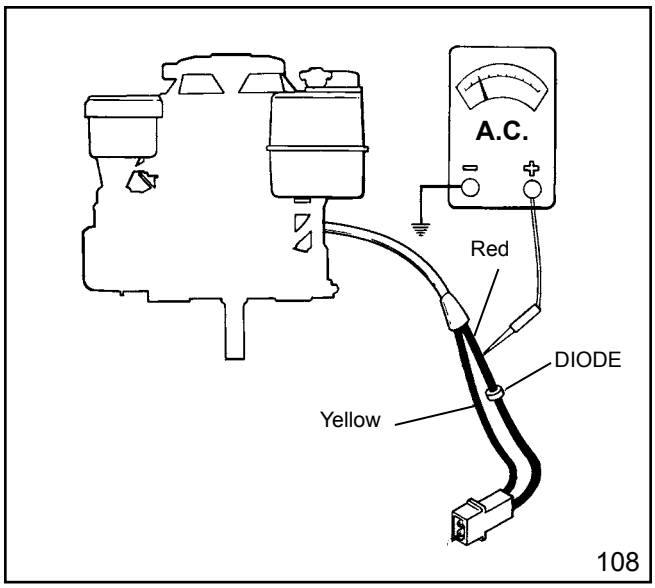
Models OVM/OVXL/OHV
(Read between Engine and Diode, diag. 108 and 109)

With the engine running the minimum values should read:

2500 R.P.M. - 20.0 Volts A.C.
3000 R.P.M. - 25.0 Volts A.C.
3300 R.P.M. - 26.5 Volts A.C.
3600 R.P.M. - 29.0 Volts A.C.

Models OHV13.5-17.0
(Read between Engine and Diode)
2500 R.P.M. - 17.0 Volts A.C.
3000 R.P.M. - 21.0 Volts A.C.
3600 R.P.M. - 24.5 Volts A.C.

If low or no voltage is experienced, replace the alternator. If the alternator puts out the minimum A.C. voltage, replace the diode.



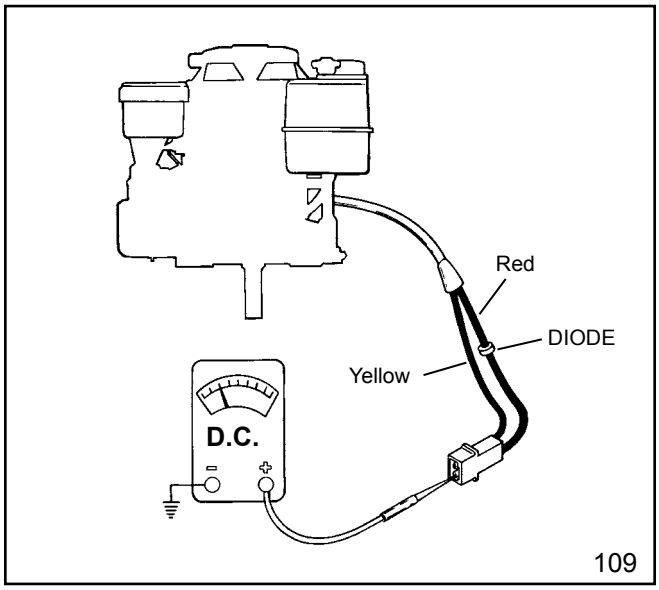
108

3 Amp D.C. 5 Amp A.C. Alternator

Models: H & HSK 50-60, HH50-60, HM & HMSK 70-80-90-100, LH318, LH358, TVM125-140-170-195-220, TVXL195-220

This unit combines a 3 Amp D.C. system used to charge a battery and a 5 Amp A.C. system used for lighting. Located in the red wire of the harness is a diode which converts the alternating current to direct current for charging the battery. The yellow wire provides the A.C. voltage for the lighting circuit.

CHECKING THE SYSTEM: To check the system, disconnect the plug and measure the D.C. voltage at the red wire terminal (diag. 109). Measure the A.C. voltage at the yellow wire terminal. With the engine running the minimum values should be:

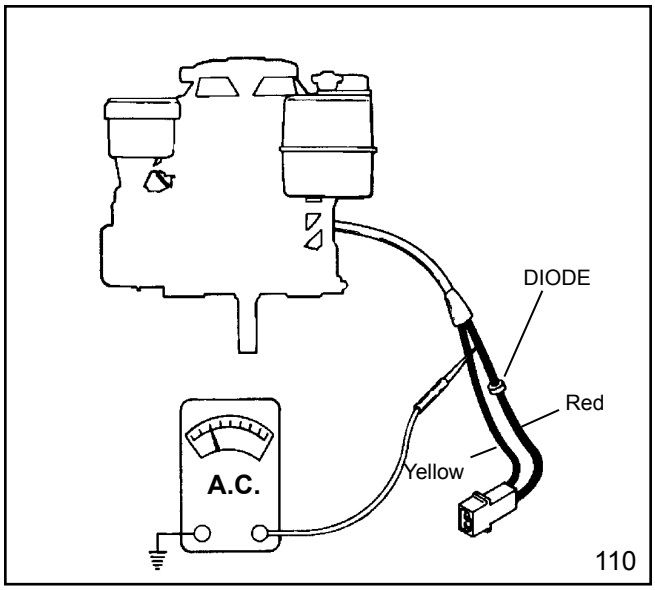


109

3 Amp D.C.
2500 R.P.M. - 8.0 Volts D.C.
3000 R.P.M. - 11.0 Volts D.C.
3600 R.P.M. - 13.0 Volts D.C.

5 Amp A.C.
2500 R.P.M. - 8.0 Volts A.C.
3000 R.P.M. - 11.0 Volts A.C.
3600 R.P.M. - 13.0 Volts A.C.

If the above minimum values are noted, system is okay. Check for defective lights, wiring or switches. If less than above values are noted, pull back the protective shrink tubing from the diode. Using an A.C. voltmeter, check the voltage between the alternator and diode as shown (diag.110).



110

All Models

With the engine running the minimum values should read:

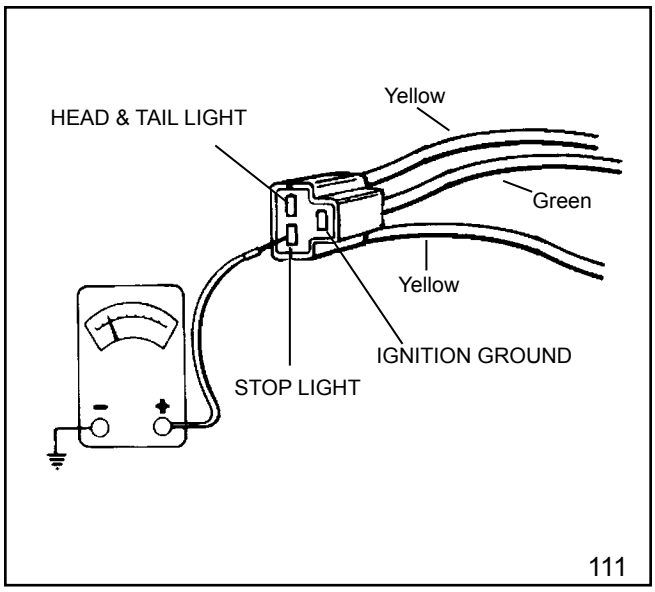
2500 R.P.M. - 20.0 Volts A.C.
3000 R.P.M. - 25.0 Volts A.C.
3300 R.P.M. - 26.5 Volts A.C.
3600 R.P.M. - 29.0 Volts A.C.

If low or no voltage is experienced, replace the alternator. If the alternator puts out the minimum A.C. voltage, replace the diode.

3 Amp A.C. Lighting Alternator

Models: H & HSK 30- 35, HS & HSSK 40, LH195, H & HSK 50-60, HH50-60, HM & HMSK 70-80-100, HHM80, LH318, LH358

Before making any exterior tests, check for an inoperative switch, shorted wires and burned out headlight and/or stop tail light. To check out the alternator, check the A.C. lead to ground (diag. 111).



With engine running the minimum values should read:

2500 R.P.M. - 8.0 Volts A.C.
3000 R.P.M. - 9.5 Volts A.C.
3300 R.P.M. - 10.5 Volts A.C.
3600 R.P.M. - 11.5 Volts A.C.

If the above minimum readings are noted, the alternator is okay. Check for defective lights, wiring or switches. If less than the above readings, the alternator is defective.

NOTE
On older point ignition systems, the A.C. output leads are black and red.

5 Amp Alternator System Regulator-Rectifier Under Blower Housing

CHECKING THE SYSTEM: An open circuit D.C. voltage check cannot be made with this system. If a known good battery fails to maintain a charge, proceed in making an A.C. voltage test.

To do this, the blower housing must be removed, and the regulator-rectifier must be brought outside of the blower housing.

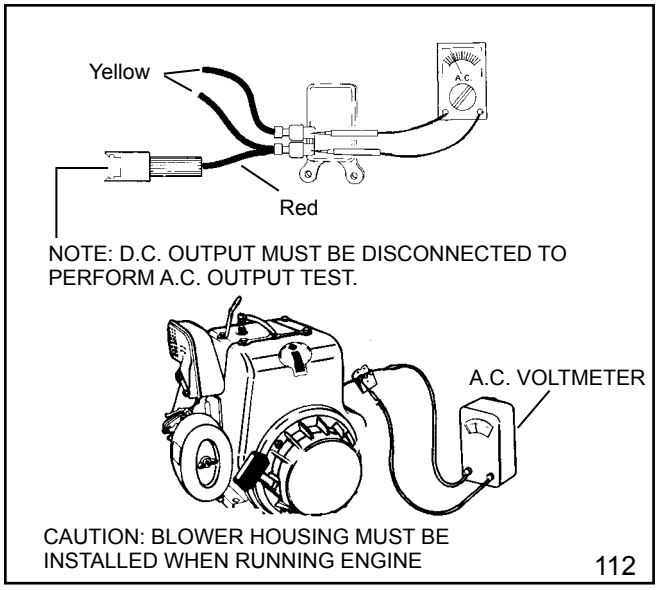
Disconnect the red D.C. output connector at the wiring harness **(not at the regulator-rectifier)** and connect the probes from an A.C. voltmeter to the wire terminals at the regulator-rectifier (diag. 112).

⚠ CAUTION To avoid injury, at no time should the engine be started with the blower housing removed.

With the engine running the minimum values should read:

2500 R.P.M. - 19.0 Volts A.C.
3000 R.P.M. - 23.0 Volts A.C.
3300 R.P.M. - 26.0 Volts A.C.
3600 R.P.M. - 28.0 Volts A.C.

If the minimum values are noted, the regulator-rectifier is defective. If less than above readings, the alternator is defective.



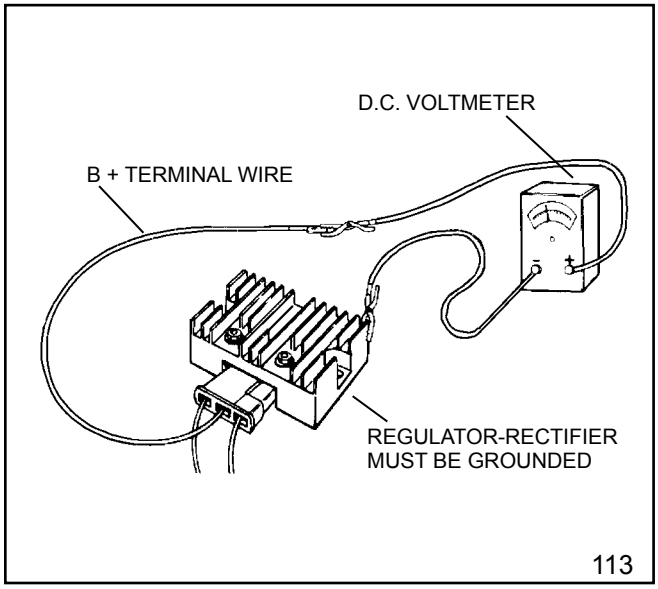
7 Amp Alternator System Regulator-Rectifier External to Engine

CHECKING THE SYSTEM: To check the system, disconnect the D.C. or B (+) wire at the switch end and measure D.C. voltage between the lead and ground (diag. 113).

With the engine running the minimum values should read:

2500 R.P.M. - 9.0 Volts D.C.
3000 R.P.M. - 11.0 Volts D.C.
3600 R.P.M. - 14.0 Volts D.C.

If the minimum readings are noted, system is okay.

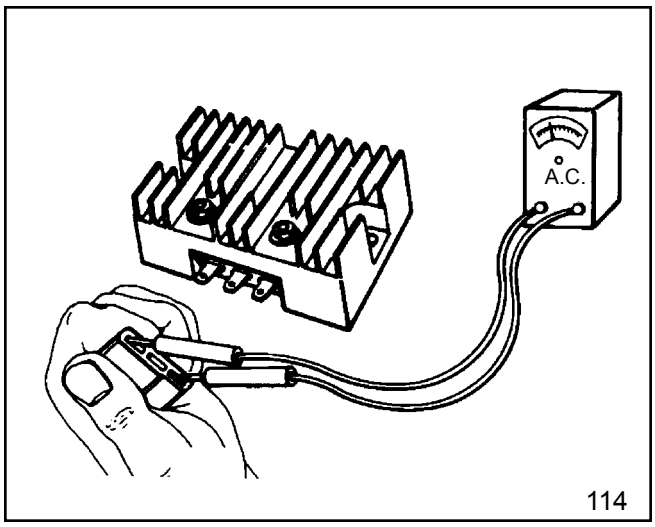


Check for a defective ammeter, wiring, etc. If less than the above readings, disconnect the plug from the regulator-rectifier, and insert the A.C. voltmeter probes in the two outside terminals (diag. 114).

With the engine running the minimum values should read:

2500 R.P.M. - 12.0 Volts A.C.
3000 R.P.M. - 14.0 Volts A.C.
3600 R.P.M. - 18.0 Volts A.C.

If the minimum readings are noted, the regulator-rectifier is defective. If less than the above readings, the alternator is defective.



114

7 Amp Alternator System Regulator-Rectifier Under Engine Block Housing

Models: H50-60, HH50-60, HM70-80-100, HHM80, LH318, LH358, TVM125-140-170-195-220

In this system, the regulator and rectifier are combined in one solid state unit mounted under the blower housing of the engine.

Various types of regulator-rectifiers have been used on different applications. Test procedures for all types are the same. However, regulator styles are not interchangeable (diag. 115).

CHECKING THE SYSTEM: An open circuit D.C. voltage check cannot be made with this system. If a known good battery fails to maintain a charge, proceed in making an A.C. voltage test.

To do this, the blower housing must be removed, and the regulator-rectifier must be brought outside of the blower housing.

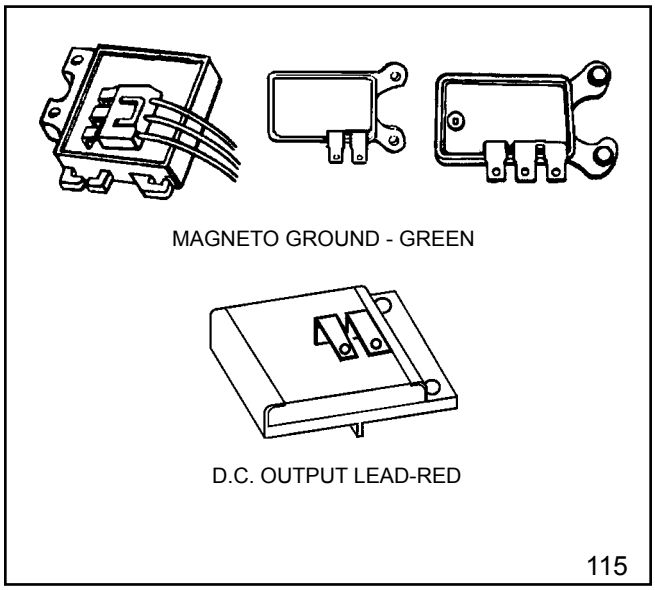
Keep the A.C. leads attached to the regulator-rectifier. Install the blower housing with the regulator-rectifier outside the housing. With an A.C. voltmeter probe the regulator as shown (diag. 116).

⚠ CAUTION To avoid injury, at no time should the engine be started with the blower housing removed.

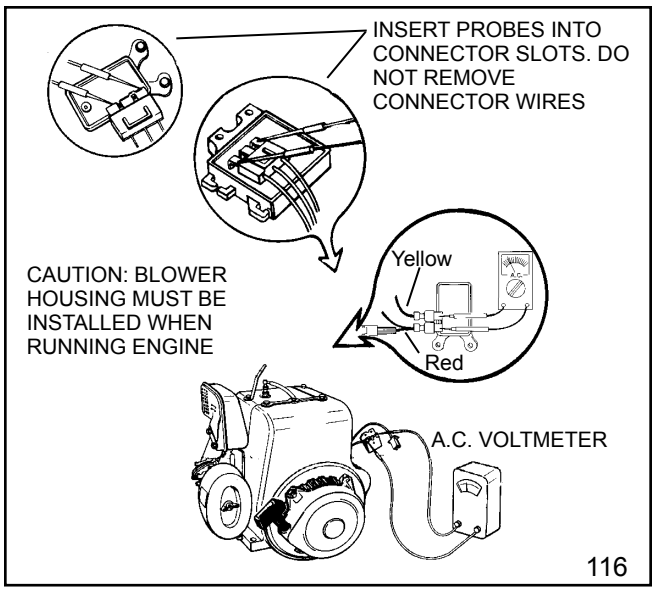
With engine running, minimum A.C. voltage from lead to lead should be:

2500 R.P.M. - 16.0 Volts A.C.
3000 R.P.M. - 19.0 Volts A.C.
3300 R.P.M. - 21.0 Volts A.C.
3600 R.P.M. - 23.0 Volts A.C.

If the minimum readings are noted, the alternator is okay. If the system fails to charge a known good battery, the regulator-rectifier must be defective.



115



116

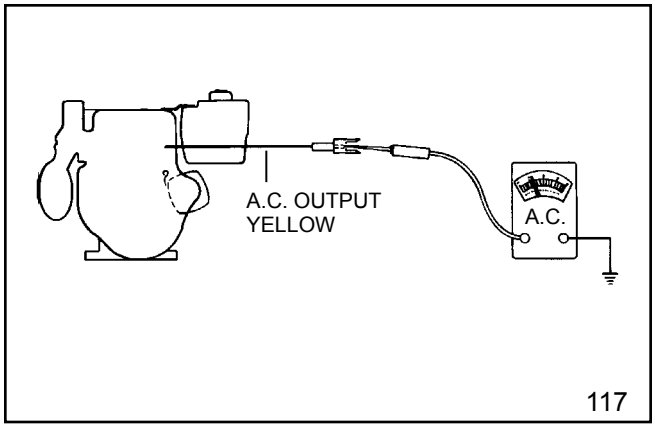
10 Amp A.C. Alternator

CHECKING THE SYSTEM: Unplug the connector at the wiring harness supplied by the O.E.M. Proceed to make an A.C. output check. Place one lead of the A.C. voltmeter into the center of the connector. Place the other lead to engine ground (diag. 117).

With the engine running the minimum values should read:

2500 R.P.M. - 16.0 Volts A.C.
3000 R.P.M. - 20.0 Volts A.C.
3300 R.P.M. - 22.0 Volts A.C.

If less than above output, the alternator assembly is defective.



117

10 Amp Alternator System – Regulator-Rectifier – External to Engine

In this system, the regulator and rectifier are combined in one solid state unit.

CHECKING THE SYSTEM: To check the system, disconnect the D.C. or B (+) wire at the switch end and measure D.C. voltage between the lead and ground (diag. 118).

With the engine running the minimum values should read:

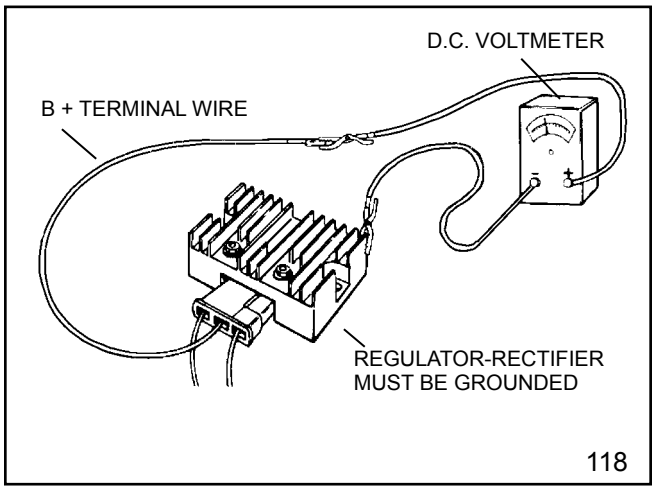
2500 R.P.M. - 13.0 Volts D.C.
3000 R.P.M. - 16.0 Volts D.C.
3600 R.P.M. - 20.0 Volts D.C.

If the minimum values are noted, the system is okay. Check for a defective ammeter, wiring, etc. If less than the above readings, disconnect the plug from the regulator-rectifier, and insert the A.C. voltmeter probes in the two outside terminals (diag. 119).

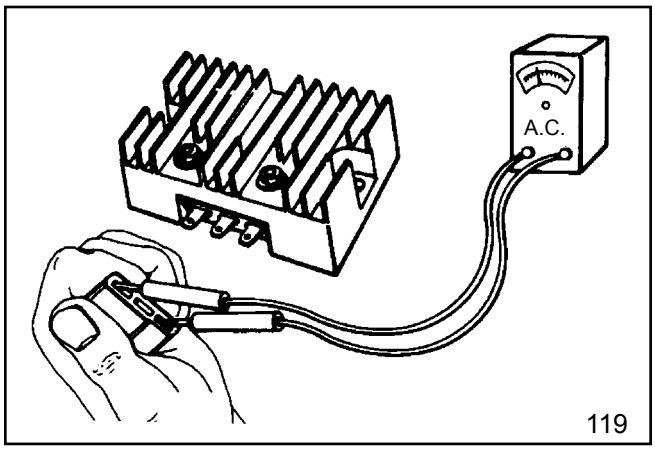
With the engine running the minimum values should read:

2500 R.P.M. - 16.0 Volts A.C.
3000 R.P.M. - 19.0 Volts A.C.
3600 R.P.M. - 24.0 Volts A.C.

If the minimum readings are noted, the alternator is okay.



118



119

16 Amp Alternator System with External Regulator

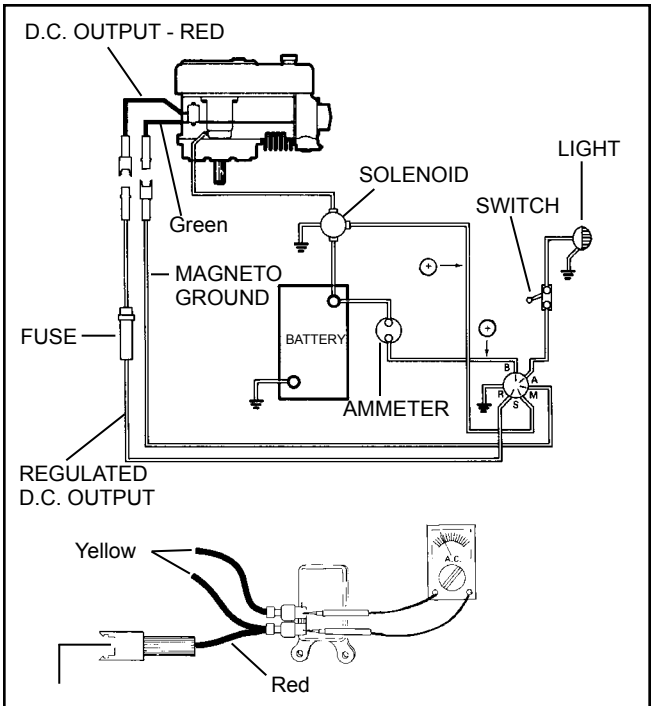
CHECKING THE SYSTEM: An open circuit D.C. voltage check cannot be made with this system. If a known good battery fails to maintain a charge, proceed in making an A.C. voltage test.

Disconnect the red D.C. output connector at the wire harness and connect the probes from an A.C. voltmeter to the wire terminals at the regulator-rectifier (diag. 120).

With the engine running the minimum values should read:

2500 R.P.M. - 21.0 Volts A.C.
3000 R.P.M. - 26.5 Volts A.C.
3600 R.P.M. - 31.0 Volts A.C.

If the minimum values are noted, the alternator is operating properly. If less than the above values are noted, the alternator is defective.



120

20 Amp Alternator System

In this system, the regulator and rectifier are combined in one solid state unit which is mounted into the blower housing of the engine.

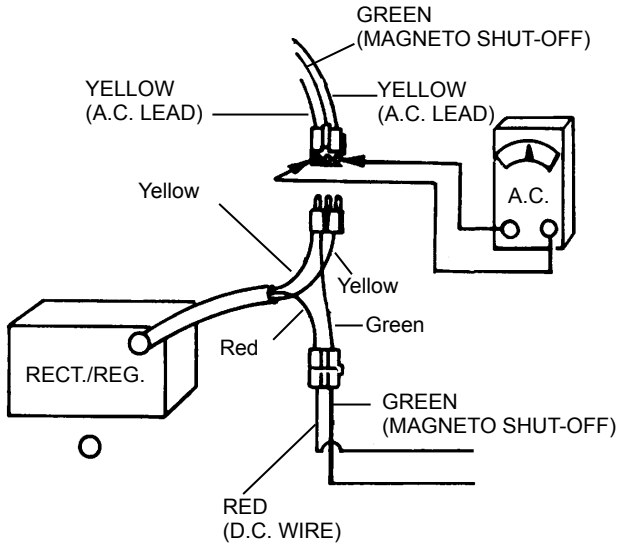
CHECKING THE SYSTEM: An open circuit D.C. voltage check cannot be made. If a known good battery fails to maintain a charge, proceed to make an A.C. voltage test.

Disconnect the plug leading to the regulator-rectifier, and insert the A.C. voltmeter probes into the two outside terminals (diag. 121).

With the engine running the minimum values should read:

2500 R.P.M. - 32.0 Volts A.C.
3000 R.P.M. - 38.0 Volts A.C.
3600 R.P.M. - 45.0 Volts A.C.

If the minimum readings are noted, alternator is okay. If the system fails to charge a known good battery, regulator-rectifier must be defective.



121

Standard Wiring Harness Connector Adapters

In an effort to standardize all of the connectors on our wiring harnesses, we have created new connectors to match O.E.M. standard wiring. No matter what size of alternator our large frame engines are equipped with the connector and will have six wire positions with the wires going into assigned positions. Connector **part #611296** is set up for engines with a 3/5 split alternator. It will mate with the engine harness and will have the appropriate connectors for the equipment.

611296

The connector **part #611297** is set up for engines with a 16 Amp charging system.

611297

A basic six-pin connector **part #611294** has been established for any remaining systems and includes all of the wires. The necessary wires for the equipment will have to be spliced into the O.E.M. wiring.

611294

On older engines which use (2) two-pin connectors, an adapter exists to convert to a six-pin connector, **part #37642**.

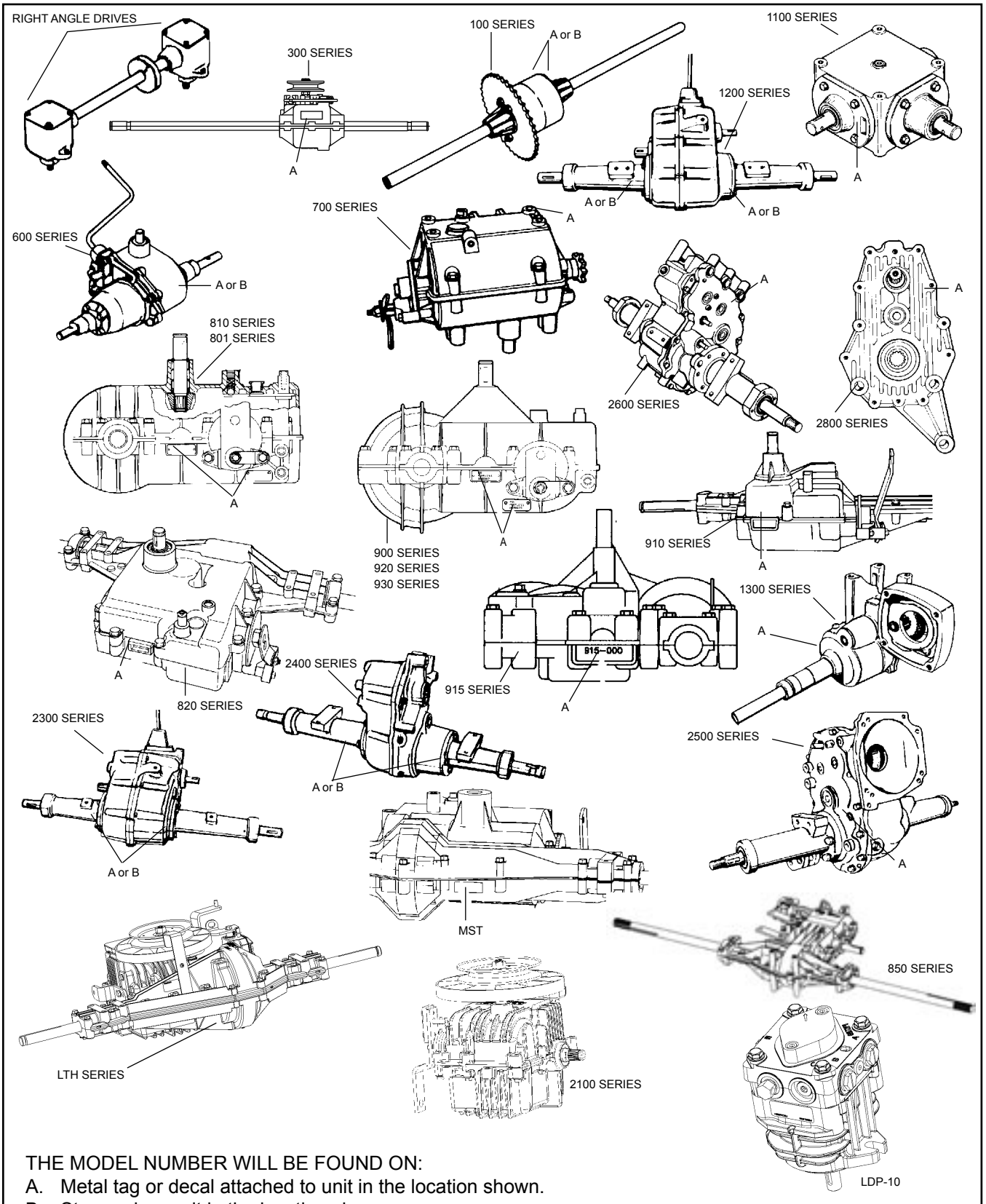
37642

For small and medium frame engines, a standard four-pin connector has been established, **part #611293**. Also spliced into the O.E.M. wiring, these will be especially helpful in the re-powering of units that may have had a different original engine as the connectors fit the standards used by most O.E.M.'s.

611293

TECUMSEH AND PEERLESS®
MODEL AND SPECIFICATION NUMBERS

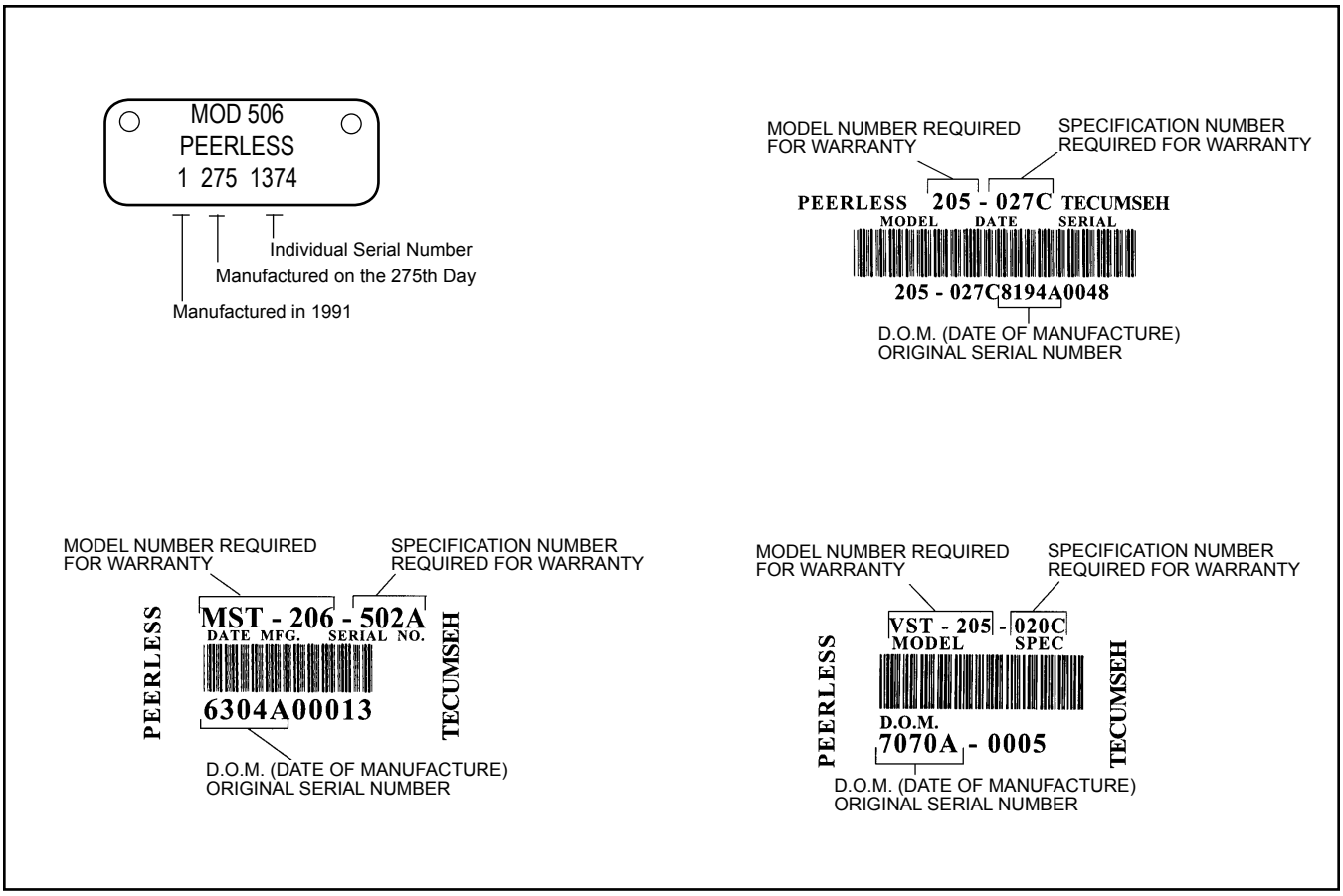
The following information is being provided to assist you in locating and recording your Tecumseh transmission components model and specification numbers. This information will be needed to use this book or obtain parts from a local Tecumseh dealer.



THE MODEL NUMBER WILL BE FOUND ON:

A. Metal tag or decal attached to unit in the location shown.
B. Stamped on unit in the location shown.

Various Styles of Identification Used On Tecumseh and Peerless Transmission, Transaxle and Gear Products



Early Models were not identified with a model number on the unit.

Transaxle Troubleshooting

In-Line Shift Models (i.e. 800, 820, 915, 920, 930, MST)

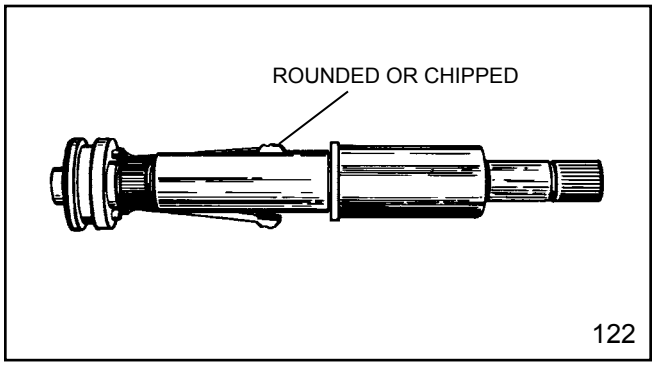
Transaxle troubleshooting can be a mystery to many technicians, but by using a common sense approach that most technicians use for engine troubleshooting, the mystery will disappear and be replaced with confidence, skill and eventually, mastery of transaxle service.

Before you begin to take off the wheels (the hardest part of transaxle repair) check the associated equipment.

A. Check belts for proper adjustment.
B. Check for proper adjustment of brake, clutch, shifter and related linkages, etc.
C. Check pulleys for sheared keys and proper belt disengagement.
D. Check for proper shifting by removing drive belt. If transaxle does not shift freely it would indicate an internal transaxle problem.

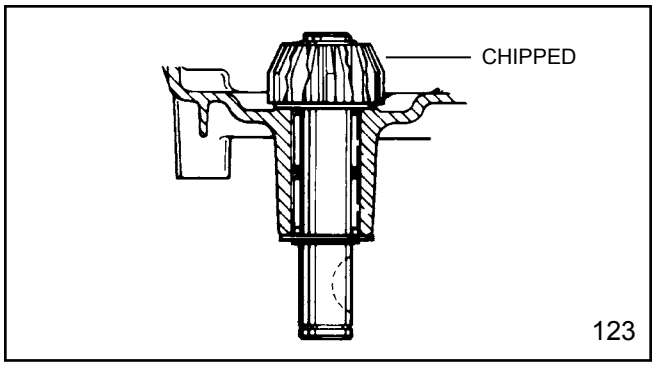
After you have made all preliminary checks it may now become necessary to remove the transaxle from the equipment.

The first area to check after removing the transaxle cover is the shifting keys. The keys are the safety link to protect against serious gear damage. Check keys for breaks, cracks, stress marks, worn shift key ends and proper spring tension (diag. 122).



122

Check input bevel gears for excessive wear. If gears are damaged, the cover should be checked for distortion (diag. 123).

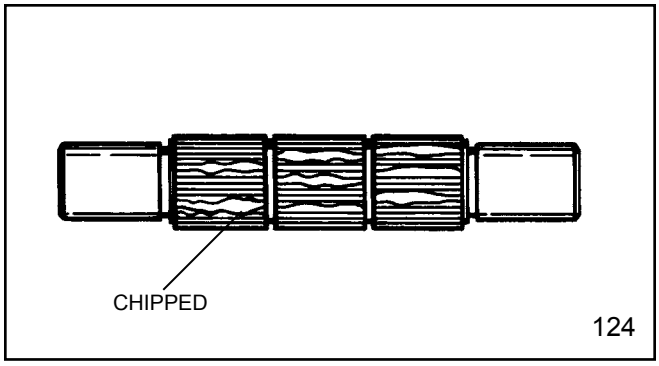


123

To properly troubleshoot and inspect the transaxle further, it is necessary to clean grease from parts during disassembly.

During disassembly check shifting gears and washers for proper assembly.

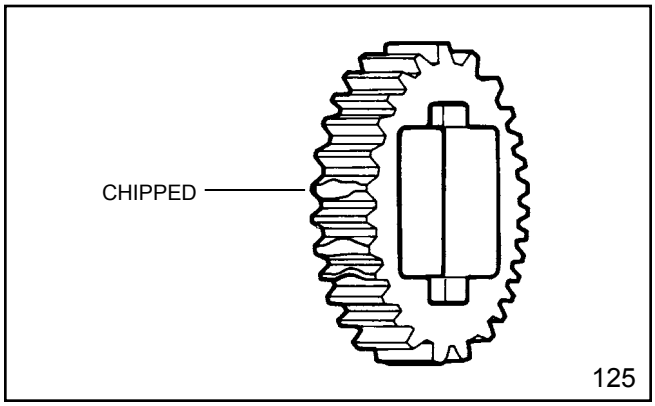
Check countershaft splines and splines on inner diameter of countershaft gears (diag. 124).



124

Check reverse sprockets for damaged teeth and if applicable, inner diameter spline area. Check chain for damage or excessive stretching.

Check differential ring gear and bevel gears for excessive wear. Bevel gears should be replaced as a set if any gear is damaged. When replacing snap rings, put flat side of snap ring against the thrust side of gear. Do not over stretch the snap rings when removing and installing (diag. 125).



125

Check axles and as applicable, axle bearings or transaxle case/cover for wear or damage.

Hard Shifting Transaxles and Drive Belts

Often hard shifting is blamed on an internal problem in the transaxle.

To determine if the problem is transaxle or equipment related make these simple checks.

1. Turn the unit off so that all power is removed to the transaxle.

2. With the unit off move the shift lever through the shift gate. Movement of the lever should have only slight resistance. The shifting effort should be equal when the engine is off and when running. If the unit is difficult to shift the problem would be internal and the transaxle would need to be removed and repaired.

3. If the unit shifts with ease, check the following areas that would be equipment related. Check to see if the belt is releasing from the pulley on the engine and transmission / transaxle, it may require that the belt guides be repositioned. The distance required from the pulley to the guide is typically 1/16" to 3/16" (1.6 mm - 4.8 mm), always check the O.E.M. specs.

4. Check to see if the pulley is damaged and may not be releasing the belt.

5. Make sure that the belt is the correct belt in case the customer has replaced it with a non original, possibly more aggressive belt.

6. Check the brake/clutch pedal to make sure that when the pedal is depressed that the idler pulley is releasing the belt tension before it applies the brake. If this does not happen the unit will still be under a load and be impossible to shift.

7. The final area to check would be for damaged or binding shift linkage.

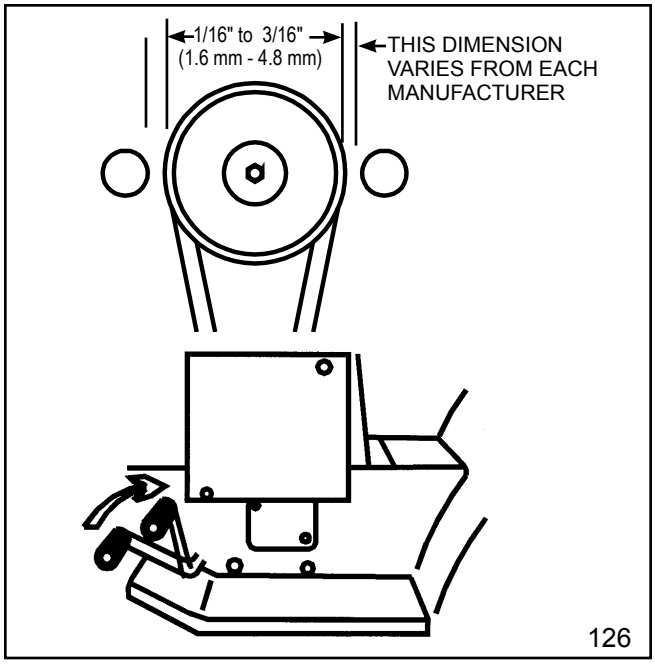
Hard shifting with the engine off could be caused by:

1. Shift linkage out of adjustment.

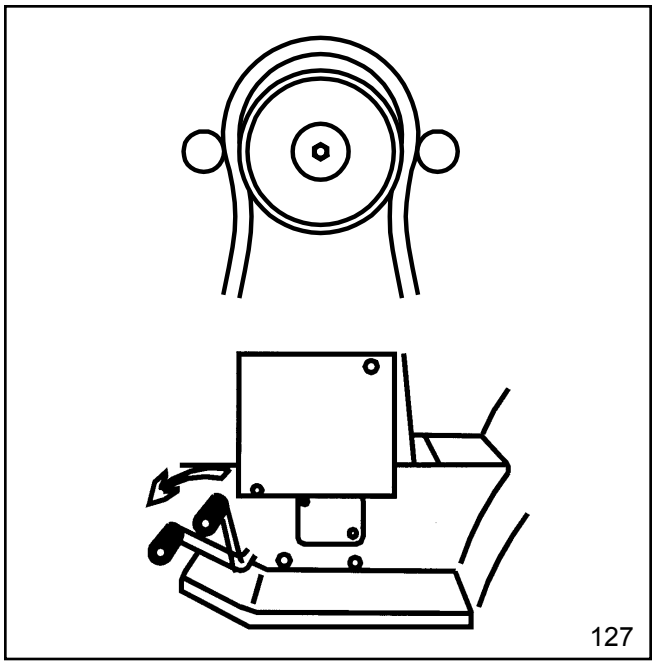
2. Corrosion in the transaxle or transmission.

3. Damaged shift keys, gears, or shifter brake shaft.

4. Belt guides missing or improperly adjusted. (See equipment manufacturer specs.)



For proper declutching to occur, it is very important that the engine belt guide be set at a predetermined gap (set by the manufacturer) and away from the belt with the belt engaged.



With clutch disengaged, it is very important that the belt blossoms away from the engine pulley. Belt must stop turning before transaxle shifting can occur.

Tecumseh and Peerless Transmission, Transaxle and Gear Products

NOTE

Before troubleshooting any system problem, see original equipment manufacturer's (O.E.M.) instructions.

Make your troubleshooting easier by preparing as follows:

- Work in a clean, well-lighted place.
- Keep proper tools and materials nearby.
- Keep an adequate supply of clean petroleum-based solvent.

To avoid carbon monoxide poisoning, make sure engine is outdoors in a well-ventilated area.

⚠ WARNING Some maintenance procedures can not be performed until the vehicle wheels are secured and off the ground. Failure to do so could result in death or serious injury to yourself and/or bystanders.

⚠ WARNING **DO NOT** attempt any maintenance procedures with the engine running. Doing so could result in death or serious injury to yourself and/or bystanders.

⚠ WARNING Use care when performing inspection of the drive belt assembly including all vehicle linkage. Failure to do so could result in death or serious injury to yourself and/or bystanders.

LTH-2000 Series Troubleshooting Chart

Tecumseh's lawn tractor hydrostatic transaxle (LTH) includes a hydrostatic transmission attached to a final drive. Use of this troubleshooting chart will aid in determining the source of a problem; the hydrostatic transmission, final drive or vehicle's belt drive and/or linkage systems.

Tecumseh LTH-2000 Series Hydrostatic Transaxle Troubleshooting

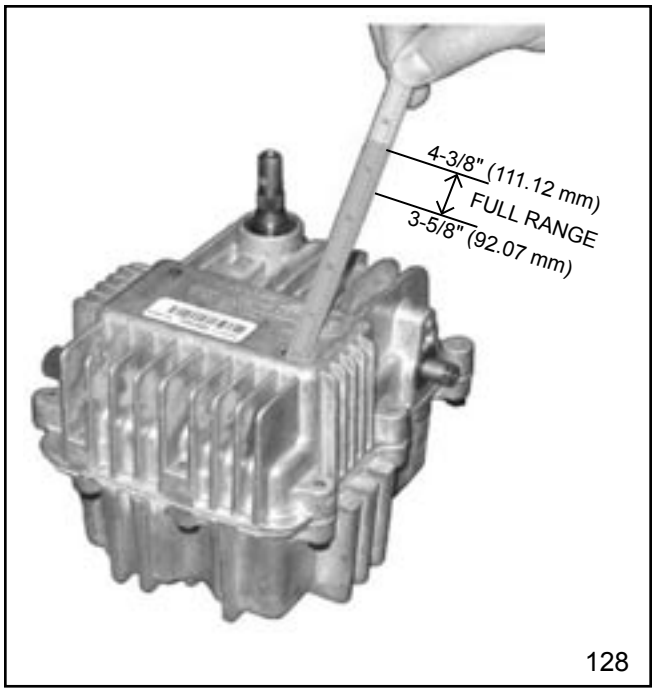
SYMPTOM	PROBLEM	CORRECTIVE ACTION
REDUCED POWER	Improper belt tension	Belt worn, replace
	Belt worn, glazed, or oil saturated	Replace belt
	Drive pulley worn	Replace pulley and belt (See O.E.M. equipment manual)
	Brake set too tight	Set brake adjustment (See O.E.M. equipment manual)
	Shifter linkage misadjusted or broken	Linkage damaged or loose, replace or adjust (See O.E.M. equipment manual)
	Fluid low in hydrostatic transmission	Check and add fluid if low (Part No. 730228A)
	Hydrostatic transmission bad	Replace hydrostatic transmission
DIFFICULT TO SHIFT	Linkage broken or bent	Repair or replace linkage (See O.E.M. equipment manual)
	Hydrostatic transmission pump seized	Replace hydrostatic transmission
	Hydrostatic transmission control friction pack misadjusted	Replace friction pack washers, tighten nut to 100 in. lbs. (11.2 Nm) loosen nut 4-turns

Tecumseh LTH-2000 Series Transaxle Troubleshooting - continued

SYMPTOM	PROBLEM	CORRECTIVE ACTION
UNIT IS NOISY	Final drive gear noise	Check, add gear oil to final drive Check, replace worn gears Check, replace worn bearings
	Hydrostatic transmission noise	Replace hydrostatic transmission
	Transaxle clicking	Mechanical disconnect not properly engaged, check for obstruction Check, replace mechanical disconnect components (If hydrostatic transmission shaft is damaged, replace transmission)
DOES NOT DRIVE	Improper belt tension	Belt worn, replace (See O.E.M. equipment manual)
	Brake setting incorrect	Adjust brake to proper setting (See O.E.M. equipment manual)
	Belt worn, glazed, or oil saturated	Replace belt (See O.E.M. equipment manual)
	Drive pulley worn	Replace pulley and belt (See O.E.M. equipment manual)
	Transaxle - hydrostatic transmission bad	Replace hydrostatic transmission
	Shifter linkage misadjusted or broken	Linkage damaged or loose, replace or adjust (See O.E.M. equipment manual)
	Fluid low in hydrostatic transmission	Check and add fluid if low (Part No. 730228A)
	Disconnect is in freewheel position	Move control to connected position (See O.E.M. equipment manual)
	Sheared or missing axle key	Replace missing or broken key
	Damaged or broken final drive gear	Check, replace worn or damaged gear
	Hydrostatic transmission leaking	Replace hydrostatic transmission
LEAKING LUBRICANT	Hydrostatic transmission leaking	Replace hydrostatic transmission
	Final drive leaking at seam	Split final drive housing, clean old sealant off, replace seals, apply new sealant (torque bolts 80-120 in. lbs.[9.0 Nm - 13.5 Nm])
	Final drive leaking at shaft seal	Split final drive housing, clean old sealant off, replace seals, apply new sealant (torque bolts 80-120 in. lbs. [9.0 Nm - 13.5 Nm])
BRAKE NOT WORKING	Linkage out of adjustment	Adjust brake linkage (See O.E.M. equipment manual)
	Linkage bent or broken	Replace components, set brake (See O.E.M. equipment manual)
	Brake setting incorrect	Adjust brake to proper setting (See O.E.M. equipment manual)

Check Fluid Level on Hydrostatic Transmission

- After THROUGHLY cleaning the outside of the case near the expansion tank, and the chassis. Carefully remove the expansion tank.
- Insert the scale through the expansion tank opening until it stops, at about 5-5/8" (142.8 mm).
- The oil level should be between 3-5/8" and 4-3/8" (92.07 mm and 111.27 mm). (2.0" to 2.75" [64.69 mm - 69.85 mm] if measured from the top of casting.)



NOTES

If low add ONLY Tecumseh's hydraulic oil ***part #730228A.***

New Hydrostatic Transmission replacement units come with oil. It is a good practice to check the level before installing. DO NOT OVERFILL.

We do not recommend checking the fluid level of the Hydrostatic Transmission unless there is a specific problem that may be caused by the fluid level. Any contaminants that get into the Hydrostatic Transmission can destroy it in a short time.

1800 / VST Troubleshooting

The information on this page has been provided to help understand the internal operation of the VST. Do not use this information to attempt any internal repairs.

Tecumseh's current policy on hydrostatic transaxles that have internal failures is to replace the complete unit. This has not changed. However, Tecumseh would like to provide a failure checklist to assist in making an accurate evaluation of the complete tractor to eliminate any unnecessary replacements. Here is a list of items to check and corrective actions to take.

To properly test the unit for power loss.

1. Allow the unit to cool before trying the following steps.
2. Put the shift lever in a position that is 1/2 of the travel distance from neutral to forward.
3. Place the tractor on a 17° grade.
4. Drive the tractor up the grade (without the mower deck engaged). The loss of power experienced should be approximately 20%. This is considered normal. If the loss of power is approximately 50%, this would be considered excessive.
5. Bring the unit to neutral, shift into forward and note the response. Care should be taken to move the lever slowly to avoid an abrupt wheel lift.

To determine if the problem is with the hydro unit, all external problem possibilities must be eliminated. Here are some potential problem areas.

1. **Overheating:** Heat can cause a breakdown in the viscosity of the oil which reduces the pressure used to move the motor. Remove any grass, debris, or dirt buildup on the transaxle cover and / or between the cooling fins and fan. Buildup of material will reduce the cooling efficiency.
2. **Belt slippage:** A belt that is worn, stretched, or the wrong belt (too large or wide) can cause belt slippage. This condition may have the same loss of power symptom as overheating. Typically, the unit which has a slipping belt will exhibit a pulsating type motion of the mower. This can be verified visually by watching the belt and pulley relationship. If the belt is slipping, the belt will chatter or jump on the pulley. If the belt is good, a smooth rotation will be seen. Replace the belt and inspect the pulley for damage.
3. **Leakage:** The VST and 1800 Series have two oil reservoirs which can be checked for diagnostic purposes. The first is the pump and motor expansion bellows. With a small diameter blunt or round nose probe, check the bellows depth through the center vent hole. Proper depth from the edge of that hole is 3-1/4 - 3-1/2 inches (8.25 - 8.9 cm).

   The second chamber is for the output gears including the differential. FIRST make sure the tractor is level, then remove the drain/fill plug. NOTE: Some units that do not have differential disconnect will have two plugs. We recommend using only the primary plug. With a small pocket rule insert until you touch bottom of case. You can then remove it and check for 1/4 - 3/8 inches (6.5 - 9.5 mm) contact, this is full at its 8 oz. capacity.
4. **Low ground speed:** If the linkage is not synchronized to absolute neutral, or the shift lever is not properly fastened to the tapered control shaft, full forward travel may not be achieved. This may cause a false reading and be misdiagnosed as a low power condition. This also could be caused by the brake not releasing.

   To determine absolute neutral, the hole in the tapered control shaft must face straight up and down, at this point make sure the O.E.M. linkage is in neutral. To properly fasten the control lever to the shaft, torque the nut to 25-35 ft. lbs. (34 - 48.3 Nm) of torque with the shaft and the lever in neutral.

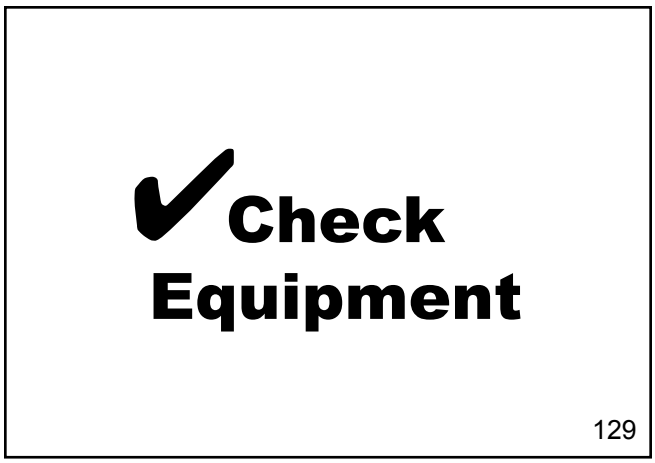
   When attaching the shifter arm to the shaft you must prevent any rotation during torquing. This can be done by placing a long 5/16" bolt in the hole of the shaft. Hold the bolt until the tapers are locked and the nut torque is correct.

   To make sure that the brake is not binding, drive the unit up a slight grade. Position the speed control lever into neutral. The unit should coast backwards. If the unit does not coast back slowly, the brake is not released from the brake disk. Adjust the brake linkage to release the brake completely when the foot pedal is released.
5. **Hard to shift:** Typically hard to shift symptoms are not caused by the hydrostatic unit. The shift arm should move with relative ease. Approximately 40-50 in. lbs. (4.48 - 5.6 Nm) at the transaxle for foot pedal units or 150-200 in. lbs. (16.8 -22.4 Nm) for hand operated units. This varies depending on the type of linkage. Binding may occur in the linkage connections due to rust or moisture. Lubricating these connections and checking for bent or damaged parts should resolve hard shifting.

Replacing Bellows or Adding Oil

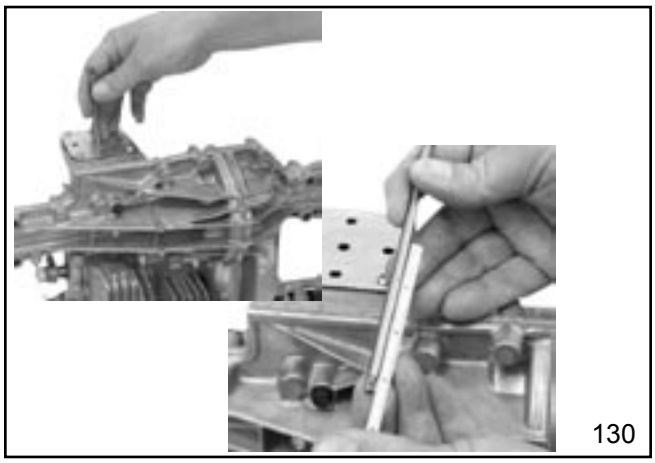
The following step by step procedure **MUST** be followed exactly if a proper repair is to be done.

1. Before assuming the transaxle has an internal problem causing low power or slow speed, it is critical to check the belt system. Many problems of this nature are in fact a glazed or worn belt, a damaged pulley or a tension problem requiring service.



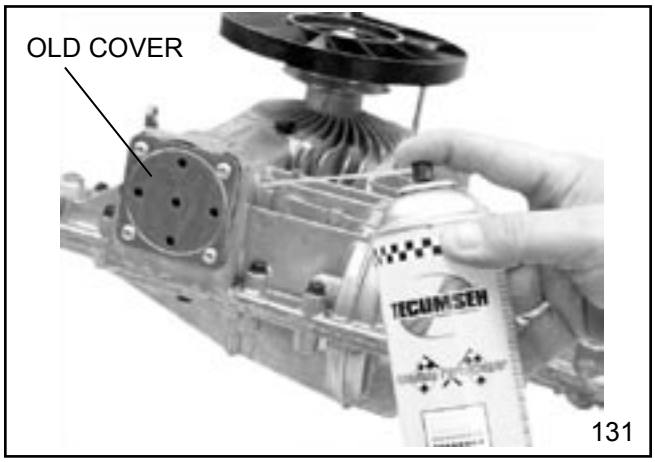
129

2. Before adding oil, it is critical to determine if it is low. This is done by using a blunt instrument as shown. The depth should be 3-1/4 to 3-1/2 inches (8.25-8.9 cm)


130

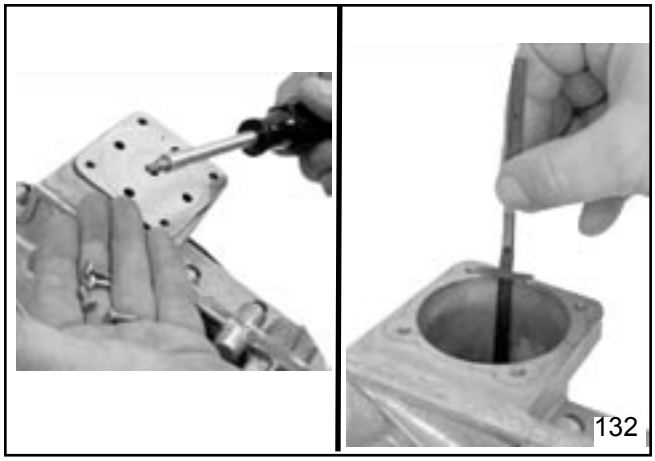
3. If the measurement is beyond the dimensions listed, the next step is to remove the transaxle from the frame. Then thoroughly wash and blow dry the bellows cover area as shown. Remove all impurities before removing the bellows cover.

CAUTION Any impurities allowed into the unit can cause un-repairable damage.

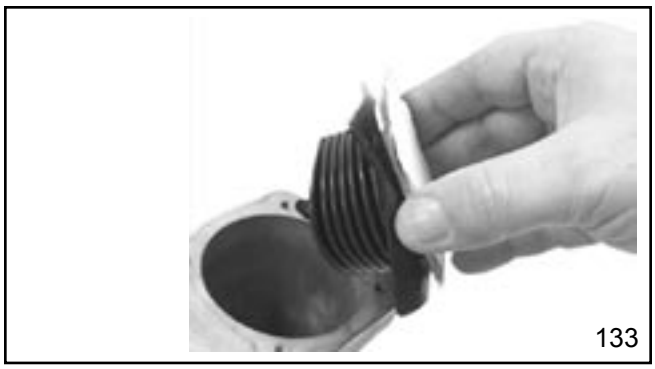


131

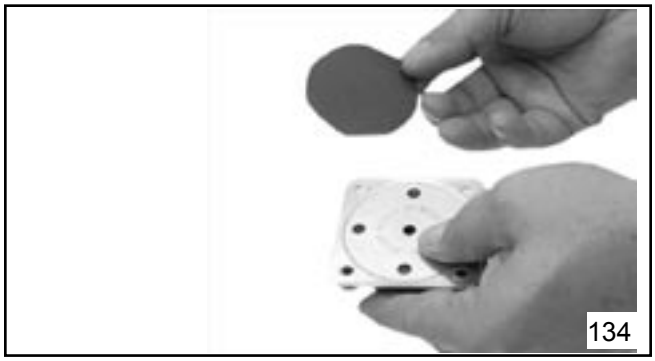
4. Turn the unit so that the bellows chamber faces up as shown. Remove the bellows cover screws using Tecumseh tool **part #670332** torx bit. Then add oil **part #730228A** until the amount present measures 1-29/32 inch (48.41 mm) from the top edge of the bellows housing.


132

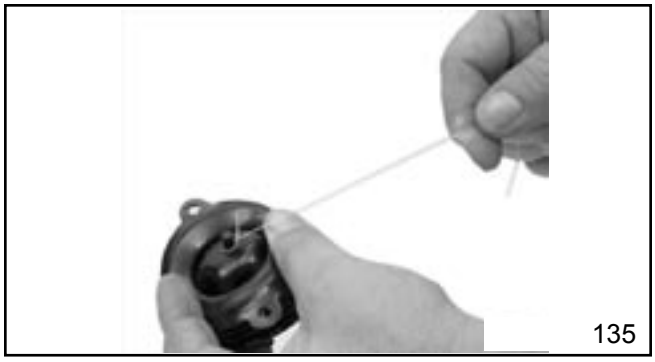
5. To prepare the “NEW” bellows for installation, place the bellows on the cover as shown. Then compress the bellows and place a piece of tape over the hole to keep it compressed during installation.


133

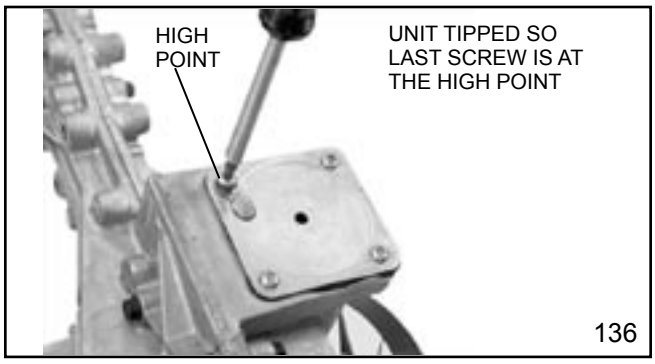
This can also be done by using a refrigerator magnet cut to cover the hole. (The new bellows cover comes with only one hole in the center and seals very easily).


134

When reusing the old cover it is difficult to seal all five holes. One other way to compress the bellows is to invert the inside tab and place a slip knot made from thin string over it. Push the end of the bellows back to its original form and pull the string through the cover. When step six is complete, cut the string.

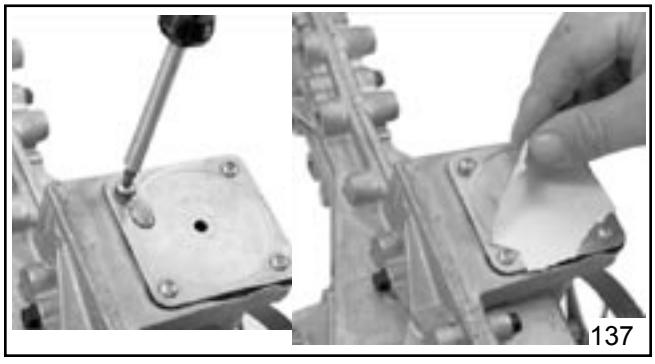

135

6. Install the bellows snugging down three of the four screws, DO NOT tighten them completely. Install the fourth screw a few threads then tip the unit slightly so the highest point is at the loose screw.



136

7. Remove the tape or cut the string allowing the bellows to expand into the oil. This expansion into the oil will push out most of the air from the chamber. When oil comes out from the loose screw tighten it and all other screws in a “X” pattern to a torque of 18-30 inch lbs. (2-3Nm). The unit is ready for installation.


137

Tecumseh and Peerless® Lubrication Requirements

NOTE

Use ONLY the recommended lubricant in all models as listed to insure proper operation and long life.

TRANSAXLES	
Model No.	**Quantity**
301	Non-Serviceable
600	24 oz./710 ml Oil
800	30 oz./887 ml Grease
801	36 oz./1065 ml Grease
820	36 oz./1065 ml Grease
900	26 oz./769 ml Grease
910	18 oz./532 ml Grease
915	10 oz./296 ml Grease
920	30 oz./887 ml Grease
930	30 oz./887 ml Grease
1200	48 oz./1420 ml Oil ††
1301 1305 1309 1313	32 oz./946 ml Oil
1302 1303 1304 1306 1307 1308 1310 1311 1312 1314 1315 1316 1317 1318 1319 1320 1321 1322 1325 1328 1329	44 oz./1301 ml Oil
1323 1326 1327	24 oz./710 ml Oil
MST200	16 oz./473 ml Oil
VST205 and 1800's 2300	†††† 64 oz./1892 ml Oil
2400	32 oz./946 ml Oil

TRANSMISSION	
Model No.	**Quantity**
2500	†
2600	†
700 700H	12 oz./355 ml Grease 12 oz./355 ml Grease
2800	†
HYDROSTATIC TRANSAXLES and TRANSMISSIONS	
1800 Series	Limited service; use Kit Part No. 799030
VST205/705	Limited service; use Kit Part No. 799030
LTH 2000	Limited service; final drive ONLY 8 oz./240 ml Oil
2100	Non-Serviceable
LDP-10	Non-Serviceable

RIGHT ANGLE AND T-DRIVES	
Model No.	**Quantity**
All Models Except *	4 oz./118 ml Grease
*1408-P91 *1409-P91 *1410-P91 *3002 *3003 *3028 *3029 *3035	3 oz./89 ml Grease
1000 Series	6 oz./180 ml Oil †††
1100	16 oz./473 ml Oil
DIFFERENTIALS	
All Models	3 oz./89 ml Grease
TWO SPEED AXLE	
All Models	2 oz./59 ml Grease
THREE SPEED AXLE	
All Models	2 oz./59 ml Grease

Grease: Bentonite Grease
Part Number 788067C

Oil: SAE E.P. 80W90 Oil
Part Number 730229B

† Refer to O.E.M. Technician's Manual for type of lubricant.

†† To be filled through shift lever opening.

††† Some 1000 Right Angle and T-Drives use Bentonite Grease.

†††† Tecumseh's current policy on VST and 1800 Series transaxles with internal failure, is to replace the complete unit. VST and 1800's have two separate reservoirs which can be checked for diagnostic purpose only. The output gear reservoir can be checked with a small pocket rule as outlined in the Tecumseh & Peerless Transmission and Drive Products Handbook.

Refer to Tecumseh & Peerless Transmission and Drive Products Handbook, 691218.

Peerless Torque Chart

TORQUE VALUE				
PART	**MODELS AFFECTED**	**IN-LBS**	**FT-LBS**	**Nm**
Bolt 5/16-18 (Housing) Nut 5/16-18 (Drive Gear)	100 Series 100 Series	228-264 120-156	19-22 10-13	25.8 - 29.9 13.6 - 17.7
Bolt 1/4-20 (Case to Cover) Bolt 5/16-18 (Axle Support Housing) Bolt 1/4-20 (Shift Lever Housing) Bolt 1/4-20 (Brake Disc)	600 Series 600 Series 600 Series 600 Series	84-108 156-180 84-108 84-108	7-9 13-15 7-9 7-9	9.5 - 12.2 17.7 - 20.4 9.5 - 12.2 9.5 - 12.2
Bolt 1/4-20 (Case to Cover) Bolt 1/4-20 (Brake Disc)	800 & 900 Series (Except 820) 800, 900 & MST Series	90-100 85-110	7.5-8.3 7.1-9.2	10.2 - 11.3 9.7 - 12.5
Bolt 5/16-18 (Case to Cover) Bolt 1/4-20 (Bearing Cap) Bolt 1/4-20 (Differential) Bolt 1/4-20 (Brake Disc)	820 Series 820 Series 820 Series 820 Series	180-216 90-100 84-120 85-110	15-18 7.5-8.3 7-10 7.1-9.2	20.4 - 24.5 10.2 - 11.3 9.5 - 13.6 9.7 - 12.5
Bolt 5/16 x 18	1100 Series	180-216	15-18	20.4 - 24.5
Bolt 5/16 x 18	2800 Series	180-216	15-18	20.4 - 24.5
Bolt 1/4-20 (Case to Cover) Bolt 1/4-20 (Shift Lever Housing) Bolt 1/4-20 (Differential)	1200 Series 1200 Series 1200 Series	96-120 84-108 84-120	8-10 7-9 7-10	10.9 - 13.6 9.5 - 12.2 9.5 - 13.6
Bolt 1/4-20 (Case to Cover) Bolt 1/4-20 (Differential)	1300 Series 1300 Series	90-110 84-120	7.5-9.2 7-10	10.2 - 12.5 9.5 - 13.6
Bolt 1/4-20 (Case to Cover) Bolt 1/4-20 (Shift Lever Housing) Bolt 1/4-20 (Differential)	1400 Series 1400 Series 1400 Series	96-120 84-108 84-120	8-10 7-9 7-10	10.9 - 13.6 9.5 - 12.2 9.5 - 13.6
Bolt 1/4-20 (Case to Cover) Bolt 1/4-20 (Shift Lever Housing) Bolt 5/16-18 (Axle Support Housing) Bolt 1/4-20 (Differential) Bolt 3/8-16 (Axle Support Housing)	2300 Series 2300 Series 2300 Series 2300 Series 2300 Series	96-120 96-120 180-216 84-120 240-312	8-10 8-10 15-18 7-10 20-26	10.9 - 13.6 10.9 - 13.6 20.4 - 24.5 9.5 - 13.6 27.2 - 35.4
Bolt 1/4-20 (Case to Cover) Bolt 1/4-20 (Axle Support Housing) Bolt 1/4-20 (Differential)	2400 Series 2400 Series 2400 Series	96-120 96-120 84-120	8-10 8-10 7-10	10.9 - 13.6 10.9 - 13.6 9.5 - 13.6
Bolt 5-16/18 (Case to Cover) Bolt 3/8-16 (Differential) Bolt 1/2-13 (Axle Support Housing)	2500 Series 2500 & 2600 Series 2500 & 2600 Series	180-216 420-480 720-780	15-18 35-40 60-65	20.4 - 24.5 47.6 - 54.4 81.6 - 88.4
Screws No. 10-24 (Cover) Bolts 1/4-20 (Retainer Cap)	R.A.D. R.A.D.	20-24 90-110	1.6-2 7.5-9.2	2.2 - 2.7 10.2 - 12.5

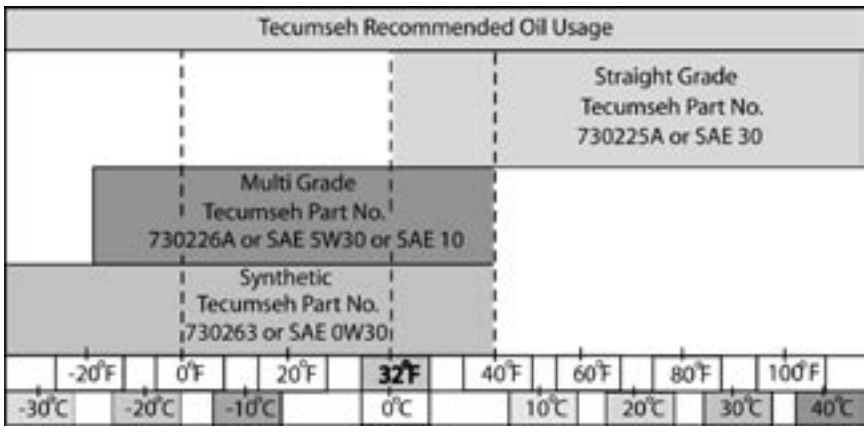
NOTE

On all units containing two jam nuts, secure brake lever, hold bottom nut and torque top nut to 100 in. lbs. (9.3 Nm).

Differential Bolts	7 ft. lbs. - 9.5 Nm
“T” Drive Bolt	8-11 ft. lbs. - 10.9 - 15.0 Nm
“T” Drive Cover Screw	20-24 in. lbs. - 2.24 - 3.7 Nm

TECUMSEH 4-CYCLE LUBRICATION REQUIREMENTS

Tecumseh recommends the use of a high quality, brand name oil with a minimum classification of SL/SJ. Very few air cooled engines have any type of oil filtration system, making regular oil changes critical to remove impurities from the engine and maximize engine life. **Consult the operator's or repair manual for the oil change interval and viscosity based on equipment operating temperature.**



TECUMSEH 4-CYCLE ENGINE OIL

shown with model names prior to 2004

CLASSIFICATIONS: "SL/SJ"
DO NOT USE 10W40
CAPACITIES:

Engine Model	ml	Oz.
All LAV, TVS, LEV, OVRM	630	21
ECV, TNT	630	21
V & VH50-70	810	27
TVM 125, 140	810	27
TVM 170-220	960	32
VM70-100, HHM80	960	32
VH100	1500	50
All VLV	810	27
VSK90-100	630	21
OVM120, OVXL120, 125	960	32
OHV11-13 Without Filter	960	32
OHV11-13 With Filter	1170	39
OHV13.5-17 With Filter	1800	61
OHV13.5-17 Without Filter	1650	55
TVT691 With Filter	2150	71
TVT691 Without Filter	1950	64
H, HSK30-35	630	21
HS, HSSK40-50	630	21
H, HH, HSK50-70	570	19
OHH/OHSK50-70	630	21
HMSK, HM70-100	720	26
OHSK80-100	720	26
OHM120, OHSK110*-130	840	28
HH100,120, OH120-180	1560	52

**NOTE: Model OHSK110 with a spec. of 221000 and up, have a capacity of 26 oz. (720 ml).*

TECUMSEH 4-CYCLE ENGINE OIL

shown with model names 2004 production and later

Engine Model	ml	Oz.
LH195SA, LH195SP	630	21
LH318SA, LH358SA	720	26
LV148EA, LV148SA	630	21
LV195EA	630	21
OH195EA, OH195EP	630	21
OH195SA, OH195SP	630	21
OH318EA	720	26
OH358SA	840	28
OV195EA	630	21
OV358EA With Filter	1170	39
OV358EA Without Filter	960	32
OV490EA With Filter	1800	61
OV490EA Without Filter	1650	55
OV691EA With Filter	2150	71
OV691EA Without Filter	1950	64
OV691EP With Filter	2150	71
OV691EP Without Filter	1950	64

EUROPA MODELS *

	ml	Oz.
VERTICALS		
Vantage	630	21
Prisma	630	21
Synergy	630	21
Synergy "55"	810	27
Spectra	630	21
Futura	630	21
HTL	630	21
BVS	630	21
HORIZONTALS		
BH Series	630	21
Geotec Series 35-50	630	21

NOTE: Vertical shaft engines with auxiliary PTO: 26 oz. (700 ml).

TECUMSEH 2-CYCLE ENGINE OIL REQUIREMENTS

The proper type and ratio of 2-cycle oil is critical to long life and low maintenance of the engine. The use of non-certified oils and improper mix ratio's can cause severe engine damage and possibly void warranty consideration.

The following is a list of 2-cycle engine oil classifications which are certified for use in Tecumseh 2-cycle engines:

- National Marine Manufactures Association, (NMMA), TC-WII or TC-W3
- American Petroleum Institute, (API), TC
- Japanese Automobile Standard Organization, (JASO), FB or FC

TWO-CYCLE FUEL/OIL MIX RATIOS		
24:1	**32:1**	**50:1**
AV520 Types 670 & 653, TV085 TV085XA (AV600 Type 600-10 & Up) TC200, TCH200, TCH300 TM049XA (TC300) MV100S	TVS600 ALL TYPES AH600	TVS / TVXL HSK840 - 870 - TH139 HSK600 - 635 - TH098

Sears/Craftsman 40:1 2-Cycle Oil has been tested and approved for use in all engines, EXCEPT the TC / TM Models which require a 24:1 Ratio.

2-CYCLE SYNTHETIC BLEND

ENGINE OIL WITH FUEL STABILIZER

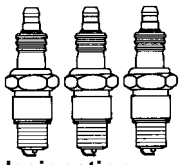
PART NO. 730227D

TECUMSEH 2-CYCLE ENGINE OIL may be used in a variety of 2-cycle engines including: outboards, lawnmowers, snow-blower, string trimmers, and edgers at any fuel/oil mixing ratio up to 50:1.

- Superior Lubricity ***Extends*** engine life by reducing wear
- Longer Spark Plug life through reduced fouling
- Reduces Carbon Build-Up extending required service intervals
- Helps maintain emissions compliance which helps our environment
- Contains Fuel Stabilizer-Extends fuel life and protects fuel system

ENGINE FUEL MIX				
	U.S. Gasoline	U.S. Amount of Oil To Be Added	METRIC Petrol	METRIC Amount of Oil To Be Added
24:1	1 Gallon	5 oz.	4 Liters	167 ml
	2 Gallons	11 oz.	8 Liters	333 ml
	5 Gallons	27 oz.	20 Liters	833 ml
32:1	1 Gallon	4 oz.	4 Liters	125 ml
	2 Gallons	8 oz.	8 Liters	250 ml
	5 Gallons	20 oz.	20 Liters	625 ml
50:1	1 Gallon	2.5 oz.	4 Liters	80 ml
	2 Gallons	5 oz.	8 Liters	160 ml
	5 Gallons	13 oz.	20 Liters	400 ml

TECUMSEH Spark Plug Replacement



NOTE: Only models which will continue to be manufactured long term will have an updated Model designation.

4-CYCLE SPARK PLUG

Service Number 35395

RJ19LM

ECV100-120
HMSK70, LH318SA (HMSK80), HMSK90
HSK30-70
HSSK40, LH195SA (HSSK50), LH195SP (HSSK55)
LH358SA (HMSK100), HMSK110
LEV80, LV148EA (LEV90), LV195EA (LEV120)
LV148SA (VSK90), VSK100
TNT100
TNT120
TVS75-120
TVXL90-120

Service Number 34645

RN4C

OH318EA (OHM90-110)
† OHM120
OH195EA (OHH60), OH195EP (OHH65)
OHH/OHSK40-130
OH195SA (OHSK70), OH195SP (OHSK75)
‡ OH318SA (OHSK110), OH358SA (OHSK120-130)
OH180
OV195EA
OV358EA (OHV110-135), OV490EA (OHV140-180)
OV691EP (VTX691, TVT691)
OVM120
* OVXL120
* OVXL/C120
* OVXL125
OV195

Note:

*** OVXL models with specification nos. below 202700 use RL86C.**

† OHM120 models with specification nos. below 224000 use RL86C.

‡ OHSK110 - 130 models with specification nos. below 223000 use RL86C.

Service Number 34046

RL86C

† OHM120
‡ OH318SA (OHSK110), OH358SA (OHSK120-130)
OVM120
* OVXL120
* OVXL/C120
* OVXL125

Note:

*** OVXL models with specification nos. 202700, 203000 and up, use RN4C.**

† OHM120 models with specification nos. 224000 and up, use RN4C.

‡ OHSK110, OHSK120-130 models with specification nos. 223000 and up, use RN4C.

Service Number 33636

RJ17LM

H30-80
HM70-100
HS40-50
TVM195-220
TVXL195-220
VLV-all

Service Number 35552

RL82C

HH140-160
OH120-160

Service Number 34277

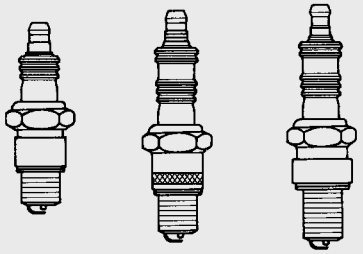
RJ8C

H22
H25
HH40-120
HHM80
HMXL70
HT30
HT35
HXL35
LAV25-50
TVM125-170
V40-80
VH40-100
VM70-100

NOTE: THE SERVICE NUMBERS LISTED BELOW WILL GIVE CORRESPONDING CHAMPION AND AUTOLITE SUBSTITUTIONS.

		Champion	Autolite
35395	-	**RJ19LM**	**NA**
35552	-	**RL82C**	**4092**
34046	-	**RL86C**	**425**
34645	-	**RN4C**	**403**
33636	-	**RJ17LM**	**245**
34277	-	**RJ8C**	**304**

SPARK PLUG AIR GAP ON ALL MODELS IS .030 (.762 mm)

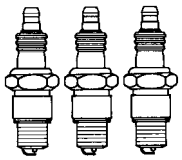


3/8" 9.525 mm | 1/2" 12.700 mm | 3/4" 19.050 mm

NOTE:
Not all spark plugs have the same heat range or reach. Using an incorrect spark plug can cause severe engine damage or poor performance. Tecumseh uses all three of the reaches shown.

FOR TWO CYCLE INFORMATION REFER TO NEXT PAGE.

TECUMSEH Spark Plug Replacement



NOTE: Only models which will continue to be manufactured long term will have an updated Model designation.

2-CYCLE SPARK PLUG

Service Number 611100	Service Number 33636	Service Number 35395	Service Number 611049	
RCJ6Y	**RJ17LM**	**RJ19LM**	**RCJ8Y**	
TC300	AV600	TVS840	AH520	HSK600
TCH300	AV520	TVXL840	AH600	HSK635
TM049XA	TVS600		HSK840	TH139SA
	TV085XA		HXL840	HSK845, 850
			TC200	TH139SP
			TCH200 Type 1500	HSK870
			TH098SA	

EUROPA MODELS

4-CYCLE SPARK PLUG

Service Number 33636	
RJ17LM	
All Horizontal Models	LAV
BV	Legend
BVL	Premier 153/173
BVS	Prisma
Centura	Spectra
Futura	Synergy
HTL	Vantage

Service Number 34645		
RN4C		
Centrua OHV	Geotec OHV	Synergy OHV
Futura OHV	Premier 45/55	

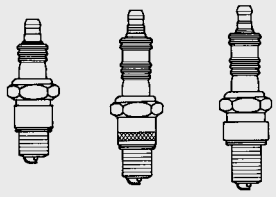
2-CYCLE SPARK PLUG

Service Number 33636		
RJ17LM		
AV85/125	MV100S	
AV520/600	TVS600	

NOTE: THE SERVICE NUMBERS LISTED BELOW WILL GIVE CORRESPONDING CHAMPION AND AUTOLITE SUBSTITUTIONS.

		Champion	Autolite
35395	**-**	**RJ19LM**	**NA**
33636	**-**	**RJ17LM**	**245**
611100	**-**	**RCJ-6Y**	**2974**
611049	**-**	**RCJ-8Y**	**2976**

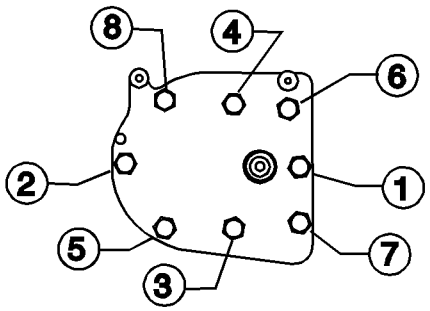
SPARK PLUG AIR GAP ON ALL MODELS IS .030 (.762 mm)



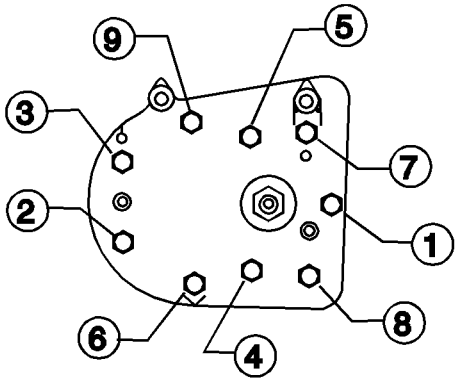
3/8" 9.525 mm | 1/2" 12.700 mm | 3/4" 19.050 mm

NOTE:
Not all spark plugs have the same heat range or reach. Using an incorrect spark plug can cause severe engine damage or poor performance. Tecumseh uses all three of the reaches shown.

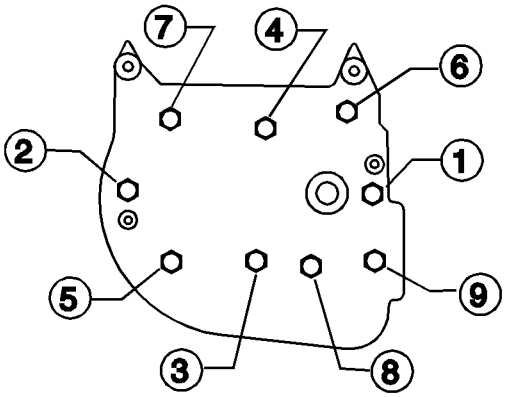
Head Bolt Torque Sequence



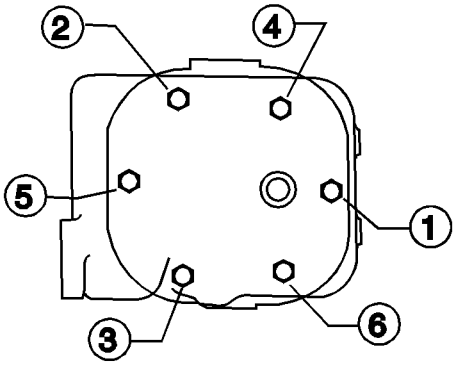
LEV, TVS75-120, H, HSK30-70, HS, HSSK40-50, V50-70, TVXL105-115, TVM125-140
Torque bolts in 50 in. lb. (5.5 Nm) increments.



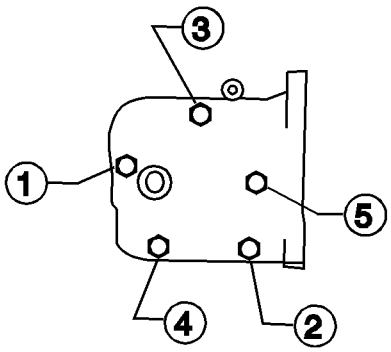
TVM-TVXL170-220, VM, HM, HMSK80-100
Torque bolts in 50 in. lb. (5.5 Nm) increments.



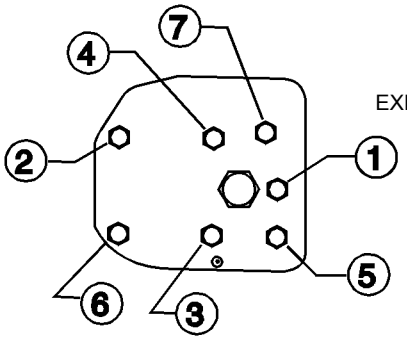
HH, VH80-120
Torque bolts in 50 in. lb. (5.5 Nm) increments.



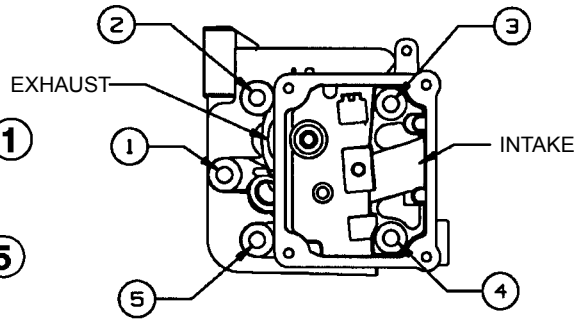
OHV11-17, OH120-180, OHM, OHSK, OVM, OVXL
Torque bolts in 60 in. lb. (7 Nm) increments.



OVRM40-60, OHH, OHSK50-70
Torque bolts in 60 in. lb. (7 Nm) increments.



VLV40-6.75
Torque bolts in 50 in. lb. (5.5 Nm) increments.



OV195EA
Torque bolts in 60 in. lb. (7 Nm) increments.

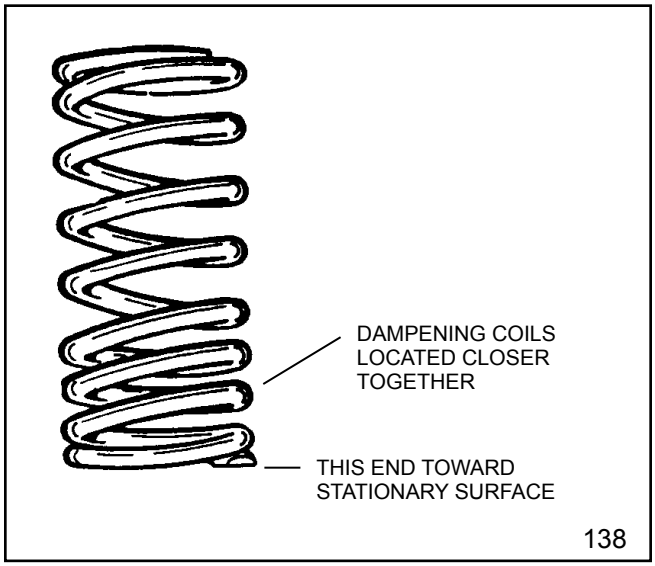
Valve Clearance

	Valve Clearance (Cold) * ±.002 (.05 mm)	
Engine Model	**Intake Valve**	**Exhaust Valve**
LAV35,50 LEV80-120, LV195 TVS75-120 ECV & TNT100-120 H30-35 & HS40-50	.006" (.004" - .008") .15 mm (.10 - .20 mm)	.006" (.004" - .008") .15 mm (.10 - .20 mm)
VLV40-6.75	.006"* (.15 mm)	.006"* (.15 mm)
TVT (V-Twin), VTX	.004 (.10 mm)	.004 (.10 mm)
TVM125-220 V & VH50-70 H & HH50-70 HM70-100 & HHM80 LH318 - 358	.010"* (.25 mm)	.010"* (.25 mm)
OHSK80-130, OHM, OVM120 OVXL120 & OHV11-17, OV318, 358, OV358, OV490	.004"* (.10 mm)	.004"* (.10 mm)
HH100-120	.010"* (.25 mm)	.020"* (.5 mm)
OH120-180	.005"* (.13 mm)	.010"* (.25 mm)
OVRM40-6.75, OV195, OH195 OHH/OHSK50-70	.004"* (.10 mm)	.004"* (.10 mm)
HSK60-70 HMSK80-100	.006"* (.15 mm)	.006"* (.15 mm)

Valve clearance is checked with engine cold and piston at T.D.C. of compression stroke.

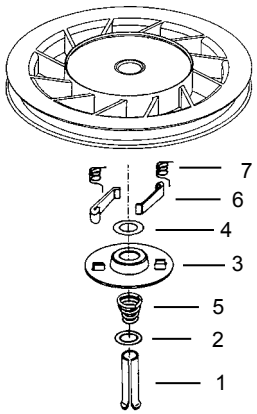
NOTE

If the valve spring has dampening coils, it should be installed with the dampening coils away from the valve cap and retainers (opposite the keepers) or towards stationary surface.

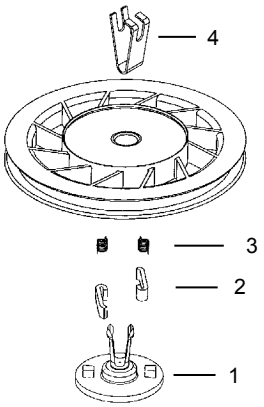


Recoil Quick Reference Parts

During the past few years we have introduced you to several new styles of recoil assemblies. These recoils are used on all small and medium frame series engines. To assist you in making repairs, we have developed the quick reference illustrations below. By looking at the direction and style of ribs between the inner and outer parts of the pulley, you can use this chart to obtain the correct parts. Due to various ropes and housings, these parts will not be shown. Please consult the regular parts list for a complete illustration or replacement.



NOTE: The pulleys are identical but the retaining system changes between these two.

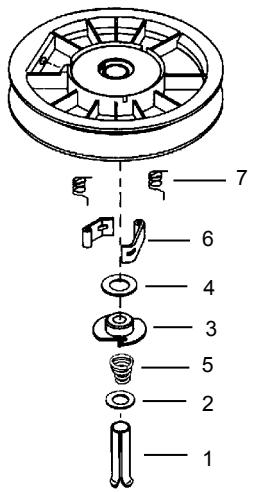


TYPE I

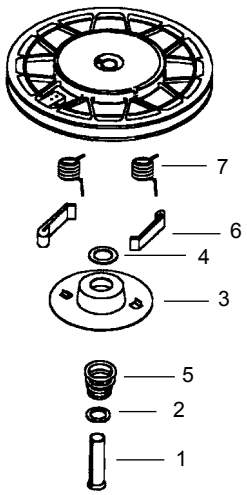
1	590599A	Spring Pin (Incl. No. 4)
2	590600	Washer
3	590696	Retainer
4	590601	Washer
5	590697	Brake Spring
6	590698	Starter Dog
7	590699	Dog Spring

TYPE II

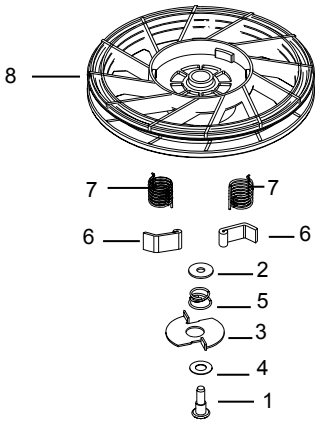
1	590740	Retainer
2	590616	Starter Dog
3	590617	Dog Spring
4	590760	Locking Tab



1	590599A	Spring Pin (Incl. No. 4)
2	590600	Washer
3	590679	Retainer
4	590601	Washer
5	590678	Brake Spring
6	590680	Starter Dog
7	590412	Dog Spring



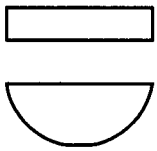
1	590599A	Spring Pin (Incl. No. 4)
2	590600	Washer
3	590696	Retainer
4	590601	Washer
5	590697	Brake Spring
6	590698	Starter Dog
7	590699	Dog Spring



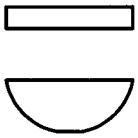
1	590409A	Center Screw
2	590755	Washer
3	590754	Washer
4	590753	Washer
5	590482	Brake Spring
6	590680	Starter Dog
7	590412	Dog Spring
8	590757	Pulley

Flywheel Key Quick Reference

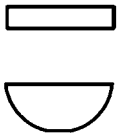
Identification Chart - Keys are shown actual size.



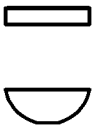
650592
Steel



32589
Steel

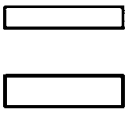


611191
Steel

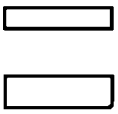


650455
Steel

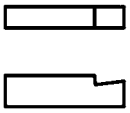
611054
Steel



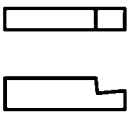
611298
Steel



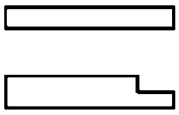
650496
Steel



610951
Steel

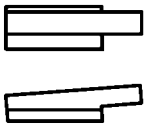


610961
Aluminum Alloy

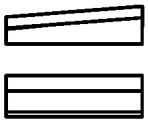


30884
Steel

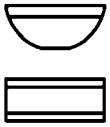
611154
Aluminum Alloy



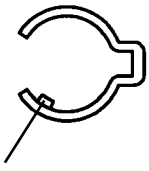
610995
Aluminum Alloy



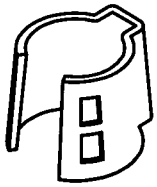
611004
Aluminum Alloy



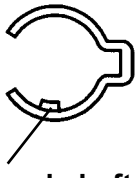
611107
Aluminum Alloy



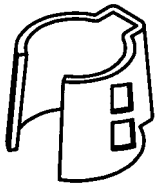
Crankshaft
Timing Tabs



611014A
Point Ignition



Crankshaft
Timing Tabs



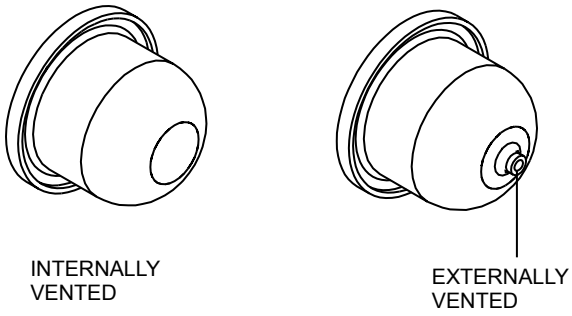
611032
Solid State Ignition

Primer Bulb Identification

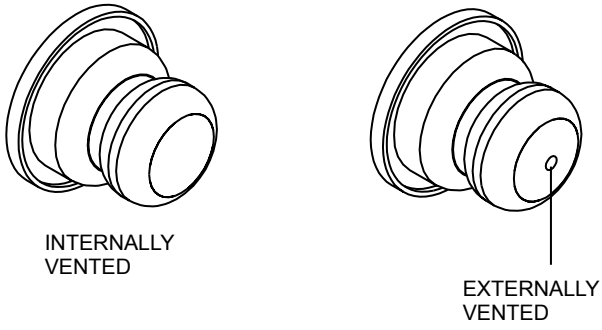
Caution must be used when replacing carburetor primer bulbs. Using the wrong primer bulb could cause hard starting and operating problems. Currently, Tecumseh uses five different carburetor mounted bulbs. To avoid problems, use the Master Parts Manual for the correct application.

The primer bulbs offered feature two different shapes; derby and stepped (or hourglass).

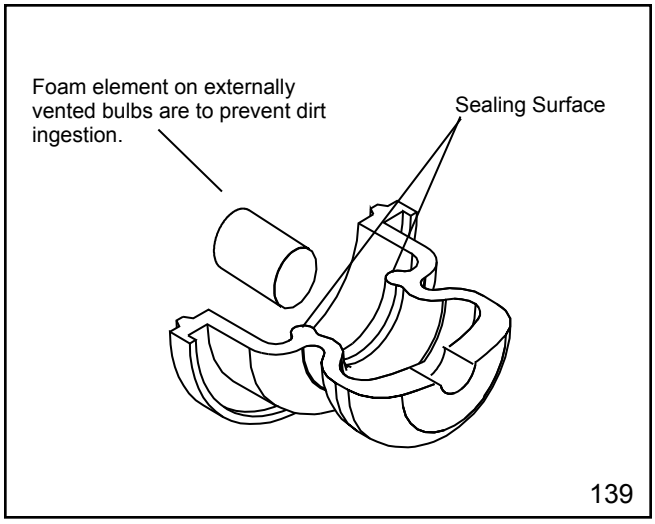
DERBY STYLE



STEPPED

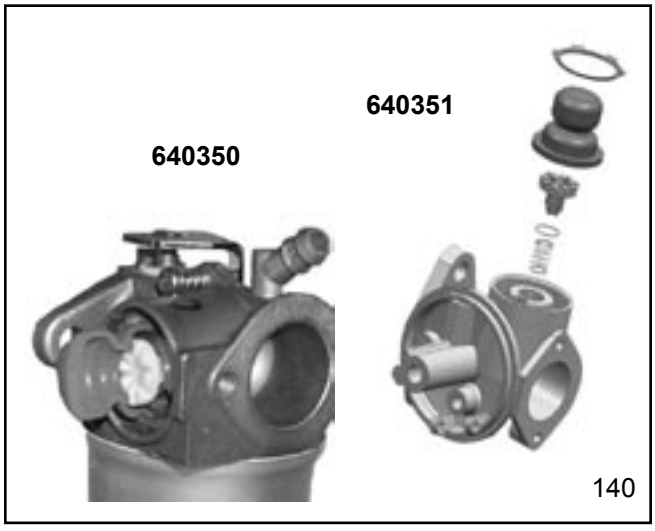


The stepped primer bulb is used to force a charge of air into the bowl through the atmospheric vent chamber. The sealing surface (diag. 139), prevents air from going back into the air filter while priming.



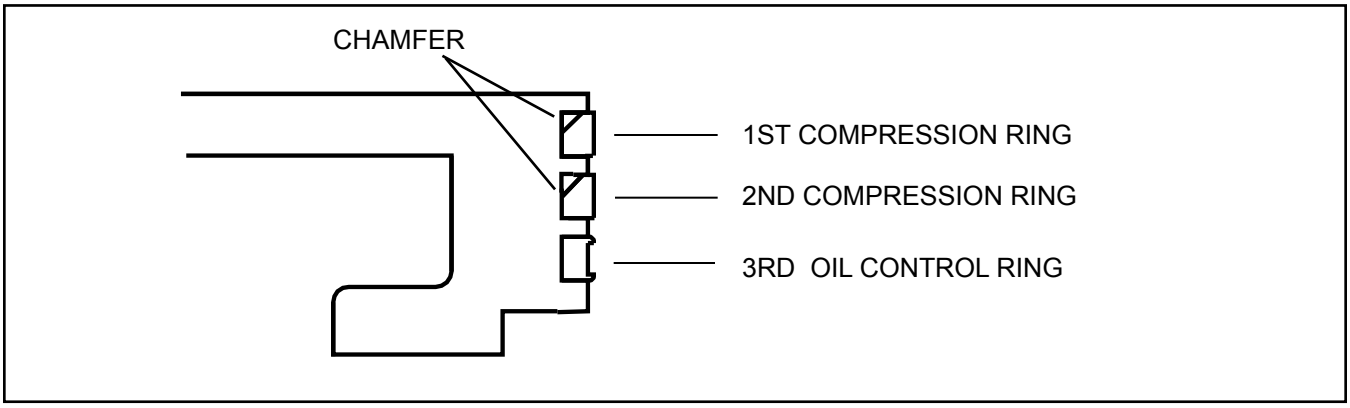
Series 12 Carburetor

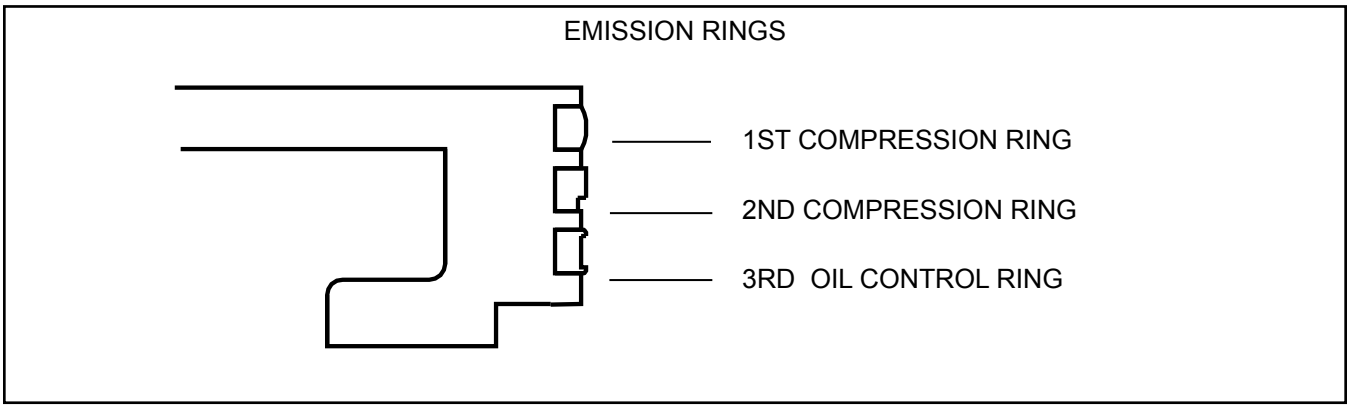
A new carburetor, **part #640350**, has been released to produce improved starting on our 5 to 7 horsepower walk behind mower engines. The carburetor was designed to eliminate human error from the priming process. The Accu-Prime™ system consists of a spring loaded plunger behind the primer bulb that will create a full seal each time the bulb is depressed no matter what angle it is depressed at. Testing has shown a 15% improvement in average prime volume. The Series 12 carburetor body is similar to the Series 11, which uses an extended run fuel well to aid in starting. The exception is the primer area, which includes changes to the body of the carburetor that do not allow the new primer components to retro-fit older carburetors. The primer assembly will be available as a kit to service the carburetor under **part #640351**. This kit will include the primer bulb, retaining ring, plunger and spring (diag. 140).



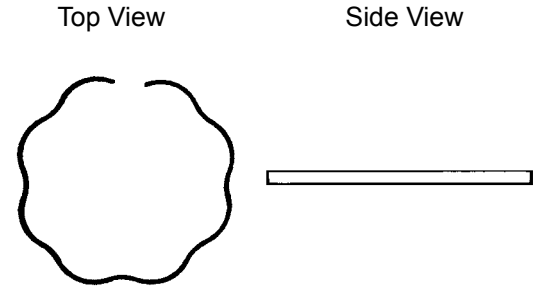
Piston Ring Installation

Piston ring orientation: Compression rings may have either an inside chamfer or an outside notch. Inside chamfers always face up towards the top of the piston. Outside notches, which are generally the second compression ring always face down towards the skirt of the piston.

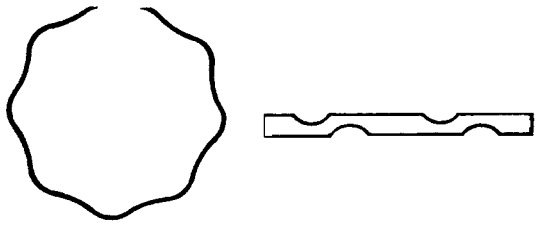




The following are the two types of ring expanders used by Tecumseh:



This expander is always used behind the second compression ring.



This expander is always used behind the oil control ring.

Quick Reference for Dipsticks

SCREW-IN DIPSTICK FEMALE THR'D, PLASTIC TUBE	
SERVICE NO.	**ID NO.**
35507	104
35556	115
35561	116
35576	108
35578	106 or 125
35582	105
35583 (OBS)	111
35594	113
35595	114
35598	110
35599	83
35611 use 35507	104
35639	106
35648	107
35658	14
35700	117
35706 (OBS)	118
35822	96 or 124
35835	88
35843 (OBS)	103
35925	129
35931	94
35940	130
35973	131
35984	132
36064	123
36147	123
36205	133
36223	134
36259	124
36366	135
36593	137
36640 use 36902	139
36801	125
36878	141
36902	139
37246	91
37421	143
37426	125

LARGE SCREW-IN DIPSTICK MALE THR'D, METAL TUBE	
SERVICE NO.	**ID NO.**
30140	21
30272 (OBS)	92
30787 (OBS)	25
31569A	85
31904 (OBS)	86
32206 (OBS)	29
32909 (OBS)	42
33055 (OBS)	42
33068	45
33258 (OBS)	48
33336 (OBS)	76
33358 (OBS)	88
33469 use 33764	54
33760 (OBS)	18
33761 (OBS)	63
33764	54
34012	65
34201 (OBS)	72
34227 (OBS)	84

TUBE & GAUGE ASSY. DIPSTICK	
SERVICE NO.	**ID NO.**
35836	35835
35837	35576
35842	35599
36879	35582

LARGE TWIST-LOCK	
SERVICE NO.	**ID NO.**
33894A	76
33950A (OBS)	74
33984A	82
34011A	81
34048 (OBS)	25
34053A (OBS)	76
34122A	79
34178A	75
34249	90 or 101
34267	84
34313 (OBS)	89
34319 (OBS)	86
34675	92
34676	94
34763 (OBS)	95
34933	18
35163	99
35347	102

SMALL SCREW-IN DIPSTICK	
SERVICE NO.	**ID NO.**
29668	18
29760	14
30924A (OBS)	24
31297	25
31986 (OBS)	29
32969	40
33069	76
33070 (OBS)	88
33604 (OBS)	86
33758 (OBS)	48
34165	68
34245	73
35112 (OBS)	98
35368 use 36879	76
35888	120
35941	126
35942	127
36678	138

NOTE: OBS abbreviation stands for obsolete.

Metric Conversions Factors (approximate)

Conversions **TO** Metric Measures					
	Symbol	**When You Know**	**Multiply By**	**To Find**	**Symbol**
LENGTH	in.	inches	25.4	millimeters	mm
	in.	inches	2.54	centimeters	cm
	ft.	feet	30	centimeters	cm
	yd.	yards	0.9	meters	m
	mi.	miles	1.6	kilometers	km
MASS (weight)	oz.	ounces	28	grams	g
	lb.	pounds	0.45	kilograms	kg
VOLUME	tsp.	teaspoons	5	milliliters	ml
	Tbsp.	tablespoons	15	milliliters	ml
	fl. oz.	fluid ounces	30	milliliters	ml
	c	cups	0.24	liters	l
	pt.	pints	0.47	liters	l
	qt.	quarts	0.95	liters	l
	gal.	gallons	3.8	liters	l
	in^3	cubic inch	16.39	cubic centimeters	cc
TORQUE	in./lbs.	inch/pounds	.113	Newton meters	Nm
	ft./lbs.	foot/pounds	1.36	Newton meters	Nm
TEMP.	°F	Fahrenheit Temp.	subtract 32 then x .555	Celsius	°C

Conversions **FROM** Metric Measures					
	Symbol	**When You Know**	**Multiply By**	**To Find**	**Symbol**
LENGTH	mm	millimeters	0.04	inches	in.
	cm	centimeters	0.4	inches	in.
	m	meters	3.3	feet	ft.
	m	meters	1.1	yards	yd.
	km	kilometers	0.6	miles	mi.
MASS (weight)	g	grams	0.035	ounces	oz.
	Kg	kilograms	2.2	pounds	lb.
VOLUME	ml	milliliters	0.0338	fluid ounces	fl. oz.
	l	liters	2.1	pints	pt.
	l	liters	1.06	quarts	qt.
	l	liters	0.26	gallons	gal.
	cm^3	cubic centimeters	0.061	cubic inches	in^3
TORQUE	Nm	Newton meters	8.85	inch/pounds	in./lb.
	Nm	Newton meters	.738	foot/pounds	ft./lb.
TEMP	°C	Celsius Temp.	x 1.8 then add 32	Fahrenheit Temp.	°F

Notes

TECUMSEH®

ENGINES & TRANSMISSIONS

Tecumseh Power Company
900 North Street
Grafton, WI 53024
Phone: 262-377-2700
Fax: 262-377-4485

Tecumseh Europa S.p.A.
Strada delle Cacce, 99
10135 Torino, Italy
Tel. (39) 0 11 391-8411
Telefax (39) 0 11 3910031

www.TecumsehPower.com

Form No. 695933 R 10/05

Litho in U.S.A.