

SINGLE STAGE SNOWTHROWER SERVICE MANUAL

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TORO®

Single Stage Snowthrower Service Manual



PREFACE

ABOUT THIS MANUAL

This manual was written expressly for the Toro brand single stage snowthrowers. The Toro Company has made every effort to make the information in this manual complete and correct.

This manual was written with the assumption that the reader has basic mechanical and electrical knowledge and skills. The book contains material covering snowthrowers built by The Toro Company from 1965 through 2000, and will be specified for use on machines built after 2000 that are similar in design.

We hope that you find this manual a valuable addition to your service shop. If you have questions or comments regarding this manual, please contact us at the following address:

The Toro Company
Consumer Service Department
8111 Lyndale Avenue South
Bloomington, MN 55420-1196

The Toro Company reserves the right to change product specifications or this manual without notice.

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This book covers a variety of models built over several years. Look in the following Table Of Contents for the portion of the machine that you wish to work on. Within that section we will cover each of the systems used.

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ENGINES

Several different engines have been used on the single stage snowthrower product line. Refer to the chart beginning on page 1 - 1 to determine the engine manufacturer. Engine manuals may be obtained from the following sources.

Tecumseh Products Co.
900 North St.
Grafton, WI 53024

Tecumseh Engine Models:

- AH520, AH600, HSK600

Toro Engines:

Order the following service manuals through any Authorized Toro Service Dealer:

- Model 38350 Gas Power Shovel (the engine is covered in this book).
- Toro 47P series - Use Toro manual 492-0260.
- Toro R tek (E engine) series - Use Toro manual 492-0647.

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ENGINE APPLICATIONS

Model #	Model Name	Width	Years of Mfg	Eng Mfg	Eng Model	Mix Ratio	Max RPM	Spark Plug *	Gap (in.)
31405	Snow Pup	14"	1976-1977	Tec.	AH520	32:1	4100-4500	Champion RJ18YC	.035
31410	Snow Pup	14"	1966-1967	Tec.	AH520	16:1	4300-4700	Champion RJ18YC	.035
31411	Snow Pup	14"	1968-1971	Tec.	AH520	16:1	4100-4500	Champion RJ18YC	.035
31412	Snow Pup	14"	1972-1975	Tec.	AH520	16:1	4300-4700	Champion RJ18YC	.035
31500	Snow Husky	21"	1966-1967	Tec.	AH520	16:1	4300-4700	Champion RJ18YC	.035
31501	Snow Pup	21"	1968-1971	Tec.	AH520	16:1	4300-4700	Champion RJ18YC	.035
31502	Snow Pup	21"	1972-1974	Tec.	AH520	16:1	4300-4700	Champion RJ18YC	.035
31505	Snowmaster	20"	1975	Tec.	AH520	32:1	4100-4500	Champion RJ18YC	.035
31506	Snowmaster	20"	1976-1977	Tec.	AH520	32:1	4100-4500	Champion RJ18YC	.035
38014	Snowmaster	14"	1978	Tec.	AH520	32:1	4100-4500	Champion RJ18YC	.035
38020	Snowmaster	20"	1978	Tec.	AH520	32:1	4100-4500	Champion RJ18YC	.035
38030	Snowmaster	20"	1978	Tec.	AH520	32:1	4100-4500	Champion RJ18YC	.035
38100	S140	14"	1979-1981	Tec.	AH520	32:1	4100-4500	Champion RJ18YC	.035
38110C	CR20	20"	1987-1990	Tec.	AH600	32:1	4300-4500	Champion RCJ8Y	.030
38111C	CR20	20"	1987	Tec.	AH600	32:1	4300-4500	Champion RCJ8Y	.030
38115C	CR20	20"	1987-1990	Tec.	AH600	32:1	4300-4700	Champion RCJ8Y	.030
38116	CR20	20"	1988-1989	Tec.	AH600	32:1	4300-4700	Champion RCJ8Y	.030
38116C	CR20	20"	1987	Tec.	AH600	32:1	4300-4700	Champion RCJ8Y	.030
38120	S200	20"	1979-1984	Tec.	AH520	32:1	4100-4500	Champion RJ18YC	.035
38130	S200	20"	1979-1981	Tec.	AH520	32:1	4100-4500	Champion RJ18YC	.035
38162	S620	20"	1984-1991	Tec.	AH600	32:1	4300-4700	Champion RCJ8Y	.030
38162C	S620	20"	1984-1986	Tec.	AH600	32:1	4300-4700	Champion RCJ8Y	.030
38165	S620	20"	1985-1991	Tec.	AH600	32:1	4300-4700	Champion RCJ8Y	.030
38165C	S620	20"	1986	Tec.	AH600	32:1	4300-4700	Champion RCJ8Y	.030
38167C	S620	20"	1986	Tec.	AH600	32:1	4300-4700	Champion RCJ8Y	.030
38170	Powerlite	16"	1991-2000	Tec.	HSK600	50:1	4300-4700	Champion RCJ8Y	.030
38171	Powerlite	16"	1992-1998	Tec.	HSK600	50:1	4300-4700	Champion RCJ8Y	.030
38172	Powerlite	16"	2000	Tec.	HSK600	50:1	4300-4700	Champion RCJ8Y	.030

ENGINE APPLICATIONS

Model #	Model Name	Width	Years of Mfg	Eng Mfg	Eng Model	Mix Ratio	Max RPM	Spark Plug *	Gap (in.)
38173	Powerlite	16"	2000	Tec.	HSK600	50:1	4300-4700	Champion RCJ8Y	.030
38175	Powerlite	16"	1991-1999	Tec.	HSK600	50:1	4300-4700	Champion RCJ8Y	.030
38176	Powerlite	16"	1992-1998	Tec.	HSK600	50:1	4300-4700	Champion RCJ8Y	.030
38177	Powerlite	16"	1999	Tec.	HSK600	50:1	4300-4700	Champion RCJ8Y	.030
38178	Powerlite	16"	1999	Tec.	HSK600	50:1	4300-4700	Champion RCJ8Y	.030
38180	CCR2000	20"	1986-1996	Toro	47P**	50:1	3550-3850	NGK BPMR4A	.032
38180C	CCR2000	20"	1987-1989	Toro	47P**	50:1	3550-3850	NGK BPMR4A	.032
38181	CCR2000	20"	1990-1996	Toro	47P**	50:1	3550-3850	NGK BPMR4A	.032
38182	Powerlite	16"	2000	Tec.	HSK600	50:1	4300-4700	Champion RCJ8Y	.030
38183	Powerlite	16"	2000	Tec.	HSK600	50:1	4300-4700	Champion RCJ8Y	.030
38185	CCR2000	20"	1987-1996	Toro	47P**	50:1	3550-3850	NGK BPMR4A	.032
38185C	CCR2000	20"	1988-1998	Toro	47P**	50:1	3550-3850	NGK BPMR4A	.032
38186	CCR2000	20"	1990-1996	Toro	47P**	50:1	3550-3850	NGK BPMR4A	.032
38190	CCR1000	20"	1990-1996	Tec.	HSK600	50:1	4300-4700	Champion RCJ8Y	.030
38191	CCR1000	20"	1992-1996	Tec.	HSK600	50:1	4300-4700	Champion RCJ8Y	.030
38195	CCR1000	20"	1990-1996	Tec.	HSK600	50:1	4300-4700	Champion RCJ8Y	.030
38196	CCR1000	20"	1992-1996	Tec.	HSK600	50:1	4300-4700	Champion RCJ8Y	.030
38210	S140	14"	1979-1980	Tec.	AH520	32:1	4100-4500	Champion RJ18YC	.035
38220	S200	20"	1979	Tec.	AH520	32:1	4100-4500	Champion RJ18YC	.035
38225	S200	20"	1980	Tec.	AH520	32:1	4100-4500	Champion RJ18YC	.035
38230	S200	20"	1979	Tec.	AH520	32:1	4100-4500	Champion RJ18YC	.035
38232	S200	20"	1981-1985	Tec.	AH520	32:1	4100-4500	Champion RJ18YC	.035
38235	S200	20"	1980-1983	Tec.	AH520	32:1	4100-4500	Champion RJ18YC	.035
38242	S200	20"	1981-1983	Tec.	AH520	32:1	4100-4500	Champion RJ18YC	.035
38252	S200	20"	1981	Tec.	AH520	32:1	4100-4500	Champion RJ18YC	.035
38350	Gas Power Shovel	14"	1983-1985	Toro	NA	32:1	7800-8800	Champion RCJ8	.022
38400	CCR1000	20"	1999-2000	Tec.	HSK635	50:1	4300-4700	Champion RCJ8Y	.030
38405	CCR1000	20"	1999-2000	Tec.	HSK635	50:1	4300-4700	Champion RCJ8Y	.030
38409	CCR2400	20"	1998-1999	Toro	R tek	50:1	3450-3950	NGK BPMR4A	.032
38410	CCR2400	20"	1997	Tec.	HSK850	50:1	3550-3850	Champion RCJ8Y	.030
38411	CCR2400	20"	1997	Tec.	HSK850	50:1	3550-3850	Champion RCJ8Y	.030
38412	CCR2400	20"	1998-1999	Toro	R tek	50:1	3450-3950	NGK BPMR4A	.032

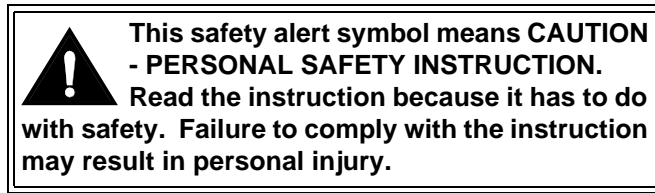
ENGINE APPLICATIONS

Model #	Model Name	Width	Years of Mfg	Eng Mfg	Eng Model	Mix Ratio	Max RPM	Spark Plug *	Gap (in.)
38413	CCR2450	20"	2000	Toro	R tek	50:1	3550-4050	NGK BPMR4A	.032
38414	CCR2400	20"	1998-1999	Toro	R tek	50:1	3450-3950	NGK BPMR4A	.032
38415	CCR2400	20"	1997	Tec.	HSK850	50:1	3550-3850	Champion RCJ8Y	.030
38416	CCR2400	20"	1997	Tec.	HSK850	50:1	3550-3850	Champion RCJ8Y	.030
38417	CCR2400	20"	1998	Toro	R tek	50:1	3450-3950	NGK BPMR4A	.032
38418	CCR2400	20"	1999	Toro	R tek	50:1	3450-3950	NGK BPMR4A	.032
38419	CCR2450	20"	2000	Toro	R tek	50:1	3550-4050	NGK BPMR4A	.032
38420	CCR2500	20"	1997	Tec.	HSK850	50:1	3550-3850	Champion RCJ8Y	.030
38421	CCR2500	20"	1997	Tec.	HSK850	50:1	3550-3850	Champion RCJ8Y	.030
38422	CCR2500	20"	1998-1999	Toro	R tek	50:1	3550-4050	NGK BPMR4A	.032
38423	CCR2500	20"	1998	Toro	R tek	50:1	3550-4050	NGK BPMR4A	.032
38424	CCR2500	20"	1998-1999	Toro	R tek	50:1	3550-4050	NGK BPMR4A	.032
38425	CCR2500	20"	1997	Tec.	HSK850	50:1	3550-3850	Champion RCJ8Y	.030
38426	CCR2500	20"	1997	Tec.	HSK850	50:1	3550-3850	Champion RCJ8Y	.030
38427	CCR2500	20"	1998	Toro	R tek	50:1	3550-4050	NGK BPMR4A	.032
38428	CCR2450	20"	2000	Toro	R tek	50:1	3550-4050	NGK BPMR4A	.032
38429	CCR2450	20"	2000	Toro	R tek	50:1	3550-4050	NGK BPMR4A	.032
38430	CCR3000	20"	1997-1999	Toro	47P**	50:1	3550-3850	NGK BPMR4A	.032
38431	CCR3000	20"	1997-1998	Toro	47P**	50:1	3550-3850	NGK BPMR4A	.032
38432	CCR3000	20"	1999	Toro	R tek	50:1	3650-4150	NGK BPMR4A	.032
38433	CCR3000	20"	1999	Toro	R tek	50:1	3650-4150	NGK BPMR4A	.032
38435	CCR3000	20"	1997-1999	Toro	47P**	50:1	3550-3850	NGK BPMR4A	.032
38436	CCR3000	20"	1997-1998	Toro	47P**	50:1	3550-3850	NGK BPMR4A	.032
38437	CCR3000	20"	1999	Toro	R tek	50:1	3650-4150	NGK BPMR4A	.032
38438	CCR3000	20"	1999	Toro	R tek	50:1	3650-4150	NGK BPMR4A	.032
38439	CCR3600	20"	2000	Toro	R tek	50:1	3650-4150	NGK BPMR4A	.032
38440	CCR3650	20"	2000	Toro	R tek	50:1	3750-4250	NGK BPMR4A	.032
38441	CCR3650	20"	2000	Toro	R tek	50:1	3750-4250	NGK BPMR4A	.032
38442	CCR3650	20"	2000	Toro	R tek	50:1	3750-4250	NGK BPMR4A	.032
38445	CCR3650	20"	2000	Toro	R tek	50:1	3750-4250	NGK BPMR4A	.032

* RJ18YC replaces RJ18Y

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GENERAL SAFETY INSTRUCTIONS



Personal Safety

- Never allow children to operate the snowthrower. Adults should operate the snowthrower only after reading the owner's manual and receiving proper instructions.
- Keep everyone, especially children and pets, away from the area of operation.
- Wear adequate winter clothing and footwear that will improve footing on slippery surfaces.

Before Operating

- Familiarize yourself with the controls. Know how to stop the engine and disengage controls quickly.
- Since fuel is highly flammable, handle it with care. Fill the fuel tank with a mixture of gasoline and oil before trying to start the engine.
- Use an approved fuel container for storing the gasoline/oil mixture. Store fuel outside unless it is stored in a fireproof cabinet.
- Fill fuel tank outdoors, not indoors. The fuel tank must not be filled when engine is running or when engine is hot.
- Install the gasoline container cap, fuel tank cap, and wipe up any spilled gasoline before starting the engine.
- Keep all shields and safety devices in place. If a shield or safety device is defective, make all repairs before operating the snowthrower. Also tighten all nuts, bolts, and screws.

During Operation

- Never operate the snowthrower without good visibility or light. Always maintain a secure footing and keep a firm grip on the handle when clearing snow: WALK, NEVER RUN. DO NOT USE SNOWTHROWER ON A ROOF.
- Do not run the engine indoors.

- Keep face, hands, feet, and other parts of your body or clothing away from concealed, moving, or rotating parts. Stay behind the handle while operating the snowthrower. **STAY CLEAR OF DISCHARGE OPENING AT ALL TIMES.**
- Do not attempt to make adjustments while engine is running.
- Use extreme caution when clearing snow from walk, road, or a gravel drive. Push down on the handle to raise skid and impeller blades to avoid picking up rocks and throwing them. Stay alert for hidden hazards and traffic on roads.
- Never direct discharge of the snowthrower at bystanders, glass enclosures, automobiles, trucks, and window wells. Keep children and pets away.
- If a solid object is hit or if the snowthrower vibrates abnormally, turn key to OFF so engine stops. Next, remove high tension wire from the spark plug; then check snowthrower for possible damage, an obstruction, or loose parts. Repair damage before starting and operating the snowthrower.
- Before adjusting, cleaning, repairing, or inspecting the snowthrower, and before unclogging the discharge guide, shut engine off and wait for all moving parts to stop. Next remove high tension wire from spark plug, and keep wire away from plug to prevent accidental starting.
- Use caution when operating snowthrower as the exhaust pipe is hot and could cause personal injury or damage to clothing.

Electric Start Safety Precautions

- Use the extension cord provided with the Electric Start (P.N. 28-9170) or any 16 gauge 2 or 3 wire cord.
- Do not plug the extension cord into the outlet while standing in water or when hands are wet.
- Do not use or connect the cord if gasoline has been spilled on it.
- Always replace a damaged extension cord immediately.
- Authorized Toro Service Dealers are certified for electrical repairs and electrical servicing. Do not attempt to repair 110V products.

GENERAL INFORMATION

Storage During Snow Season

- When storing the snowthrower, REMOVE THE KEY FROM SWITCH. Store the key in a memorable place.
- Never leave gasoline in a snowthrower fuel tank when snowthrower is stored in a building where a flame or spark may be present. Allow the engine to cool before storing. Never store a snowthrower in the house or basement because of potential fire hazard.
- Before performing any maintenance or servicing to the snowthrower, turn key to OFF and wait for engine and all moving parts to stop. Remove the key switch and pull high tension wire from spark plug.
- Reinstall the fuel cap when the top cover is removed for maintenance procedures. Perform maintenance and use storage instructions described in this manual.
- Keep all nuts, bolts, and screws tight to assure snowthrower is in safe working condition. Be sure to check the rotor and the engine mounting bolts.
- ALWAYS USE TORO REPLACEMENT PARTS AND ACCESSORIES TO ASSURE SAFETY AND OPTIMUM PERFORMANCE. NEVER USE "WILL-FIT" REPLACEMENT PARTS AND ACCESSORIES.

IDENTIFICATION AND ORDERING

IDENTIFICATION:

All Toro Products, including single stage snowthrowers, have two identification numbers: a model number and serial number. In any correspondence concerning your snowthrower, always supply the model and serial number, to assure the correct information or replacement parts are obtained. The two numbers are stamped on a decal, which are located in various places on the snowthrowers. The location will vary depending on the model and year the unit was manufactured. Please note the diagrams to determine the location of the model and serial number decal on your unit (Figure 1 through Figure 3).

14" and 21" Models

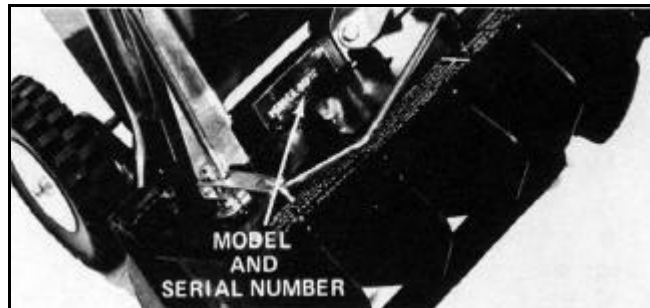


Figure 1

0217-001

Location: Right side of the square tubing on the main frame. Shroud will need removal to read.

20" Models

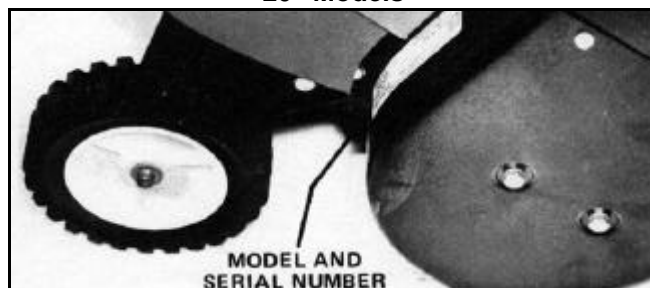


Figure 2

0217-002

Location: Right side of the impeller housing just ahead of the right wheel.

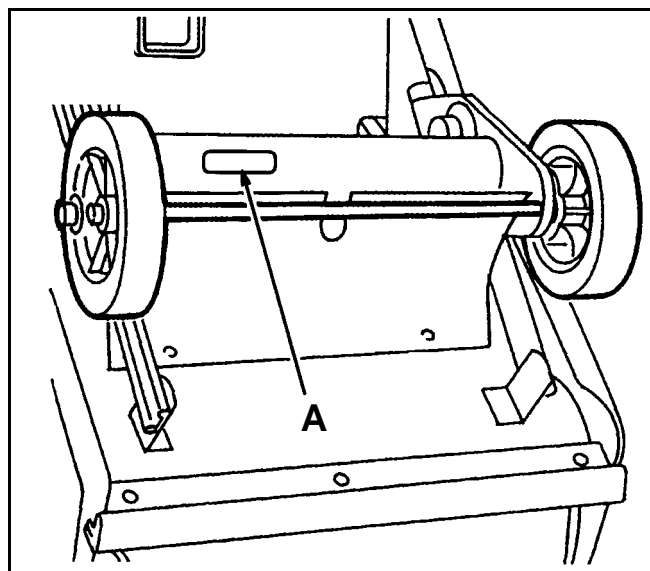


Figure 3

0530-01

(A) Model and Serial Number Decal

GENERAL INFORMATION

ORDERING: Toro parts are available through your local Authorized Toro Service Dealer.

NOTE: To find the nearest Authorized Toro Service Dealer in your area, please consult your yellow pages under "lawn mowers" or "snowthrowers".

Parts:

To order replacement parts from an authorized TORO Dealer, the following information is needed:

1. Model and serial number of the snowthrower.
2. Description of the part(s) and quantity of part(s) desired. If a parts manual is being used, use the PART NUMBER and the description.

Manuals:

Should a replacement owner's manual or parts manual be needed, please send the complete model and serial number along with your name and address to:

The Toro Company
8111 Lyndale Avenue South
Minneapolis, MN 55420
ATTN: Parts Department

MIXING INSTRUCTIONS FOR GASOLINE AND OIL

Safety Instructions



CAUTION

Gasoline is flammable and caution must be used when handling or storing it. Do not fill the fuel tank while snowthrower is running, while it is hot, or when it is in an enclosed area. Keep away from an open flame, an electrical spark, and DO NOT SMOKE while mixing fuel or filling the fuel tank. Fill the fuel tank to within 1/4 - 1/2 inch from top of the tank to provide space for expansion of fuel. Never fill the fuel tank to the top of filler neck. Always fill the fuel tank outdoors and use a funnel or spout to prevent spilling. Make sure to wipe up any spilled fuel before starting the engine.

Store gasoline in a clean, approved container, and keep the cap in place on the container. Keep gasoline in a cool, well ventilated place; never in the house. Never buy more than a 30 day supply of gasoline to assure volatility. Gasoline is intended to be used as a fuel for internal combustion engines; therefore, do not use gasoline for any other purpose. Since many children like the smell of gasoline, keep it out of their reach because the fumes are dangerous to inhale, as well as being explosive.

PROPER FUEL AND OIL

Three basic engine configurations have been used in this product group. Due to internal differences, there are three different fuel/oil mix ratios. See the charts on page 2 - 4 and 2 - 5 for the proper ratio for your model.

Mixing Procedures

Use the following procedures to assure the fuel is properly mixed:

1. Add 1 quart of unleaded REGULAR gasoline to a gasoline container.
2. If your snowthrower requires a 16:1 gas to oil ratio; pour one cup or 8 ounces of Toro 2-cycle engine oil into the gasoline container (Figure 4).

GENERAL INFORMATION

- If your unit requires a gasoline/oil ratio of 32:1, pour 1/2 cup or 4 ounces of TORO 2-cycle engine oil into the gasoline container (Figure 5).
- If your snowthrower requires a 50:1 gas to oil ratio; pour 2.6 oz. of Toro 2-cycle oil into the gasoline container (Figure 6).
- Shake the gasoline container vigorously so oil mixes with gasoline. Remember to install cap on gasoline container before shaking.
- Add an additional 3 quarts of gasoline to the premixed gasoline. Fuel mixture is now ready to use in your snowthrower.

Mix With One U.S. Gallon

Ratio	Oil
16:1	8 oz.
32:1	4 oz.
50:1	2.6 oz.



CAUTION

Do not store the oil near an open flame or in an extremely warm environment as the oil is flammable.

IMPORTANT: If the fuel and Toro 2-cycle oil are not mixed at the correct ratio for your snowthrower, (either 16:1, 32:1, or 50:1) piston damage and other engine damage may occur. It is important that the fuel and oil be mixed at temperatures above 40° F to ensure complete mixing.

Note: To assure the fuel and oil mixes completely, store your Toro 2-cycle Oil indoors, so it will be at room temperature (above 50° F).

Filling The Fuel Tank

IMPORTANT: Do not fill the fuel tank with gasoline that has not been mixed with Toro 2-cycle engine oil in the correct ratio for your snowthrower. Do not use gasoline additives, engine damage could result.



Figure 4

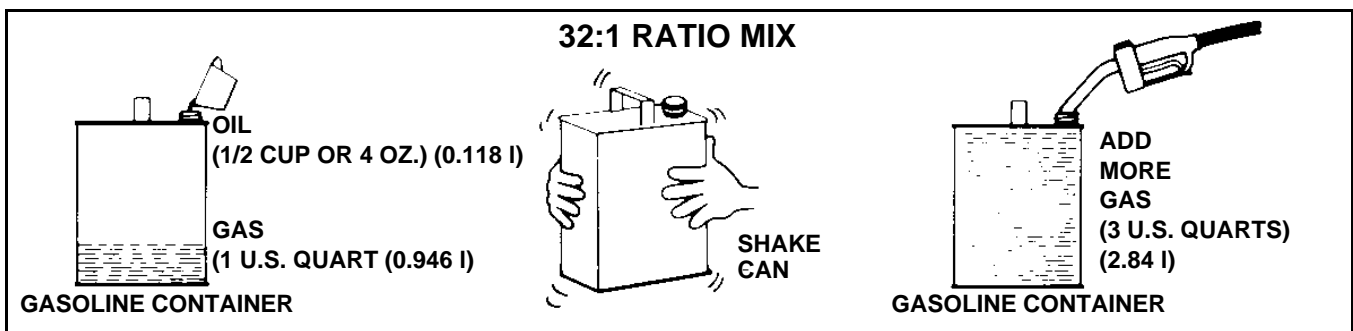


Figure 5

GENERAL INFORMATION

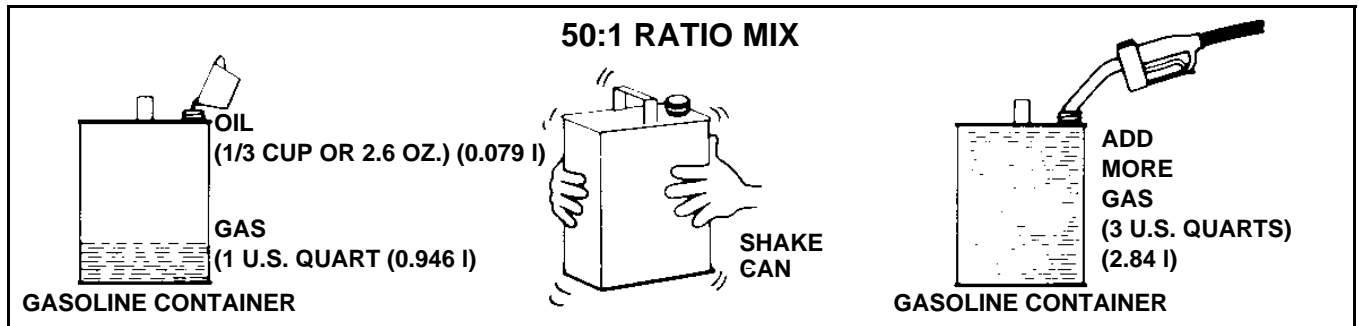


Figure 6

1. Mix the gasoline and oil in the correct ratio for your unit. Refer to "MIXING INSTRUCTIONS FOR GASOLINE AND OIL" on page 2 - 3.
2. Clean the area around snowthrower fuel tank cap so foreign matter does not get into the fuel tank. Remove the cap from the fuel tank.
3. Fill snowthrower fuel tank to within 1/4 - 1/2 inch from the top of the tank, not the filler neck.
4. Install the cap securely on snowthrower fuel tank.

2. Use the primer and choke and start the engine. It should run several minutes to consume the fuel in the carburetor and fuel line. When the engine stops, attempt to start it again. Use the primer and choke. The engine may start and stop 2 or 3 times. Repeat until you cannot start the engine.

Note: Draining the fuel tank and letting the unit run out of fuel is a critical servicing procedure when preparing your snowthrower for storage. Expending fuel from the engine will prevent gum-like varnish deposits from forming in the carburetor, fuel line, and fuel tank. Such deposits, if allowed to form, will cause starting problems the following season.

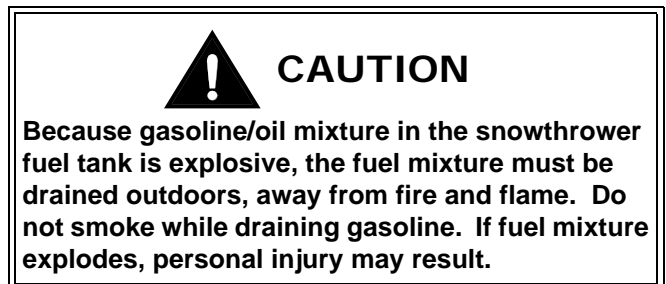
Draining The Fuel Tank



To assure safe servicing of your snowthrower, it is critical that the fuel tank be drained. To drain the fuel tank on your snowthrower, use the following procedure:

1. Use a pump type siphon to remove as much fuel from the tank as possible. Dispose of fuel properly. One method of disposing of left over fuel is to put it in the car. If you have a half tank of fuel in the car, a gallon or two of fuel mix will blend with the gas and have no effect. If the fuel is extremely old and does not smell like gasoline, we would not recommend its use in any engine. Contact your local authorities for disposal instructions.

OFF SEASON STORAGE



Properly preparing the machine for off season storage is the single most important thing that can be done to prevent problems. The summer heat will rapidly evaporate fuel in the tank and carburetor. Dried fuel in the carburetor can and often does plug the fuel passages and prevent starting the following snow season. We recommend the use of a petroleum based fuel stabilizer during the snow season. The stabilizer will help keep fuel fresh and assist with starting.

GENERAL INFORMATION

1. Use a pump type siphon to remove as much fuel from the tank as possible. Dispose of fuel properly. One method of disposing of left over fuel is to put it in the car. If you have a half tank of fuel in the car, a gallon or two of fuel mix will blend with the gas and have no affect. If the fuel is extremely old and does not smell like gasoline, we would not recommend its use in any engine. Contact your local authorities for disposal instructions.
2. Use the primer and choke and start the engine. It should run several minutes to consume the fuel in the carburetor and fuel line. When the engine stops, attempt to start it again. Use the primer and choke. The engine may start and stop 2 or 3 times. Repeat until you cannot start the engine.
3. With the key off, slowly pull the starter rope until resistance is felt, release the starter rope.
4. Tighten loose nuts and bolts.
5. On the 14" models with chain drive (Snow Pup), remove the chain guard and lightly oil the chain with 30 wt. engine oil. Install the chain guard.
6. Store the machine in a clean dry area, cover if you wish. (DO NOT store any gasoline powered machine in the house, basement, or near any appliance that contains fire or flame.)
7. Remove the key and place in a memorable place.

CONTROLS/LOCATION AND OPERATION

The primer and choke controls have been located in different areas throughout the years. Figure 7, Figure 8, Figure 9, and show the various locations.

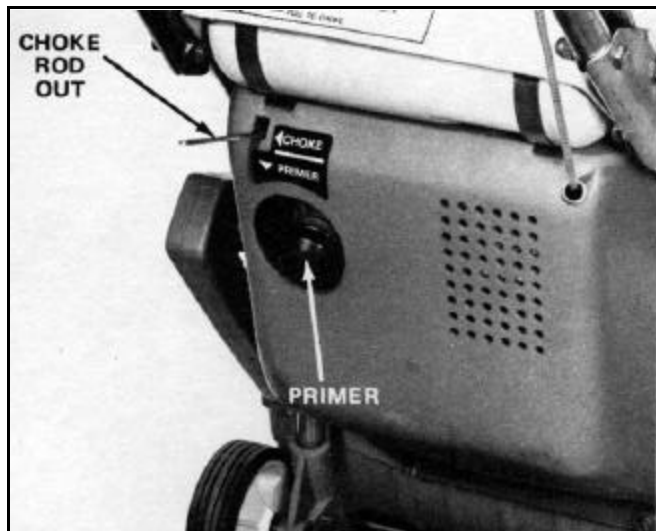


Figure 7 0217-004

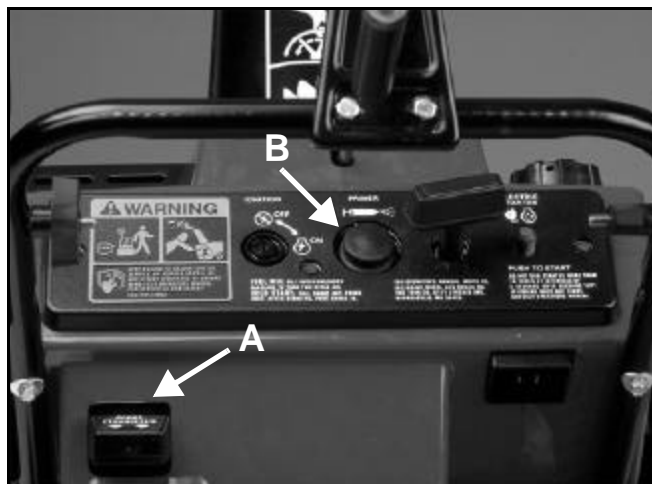


Figure 9 1854-28

(A) Choke (B) Primer

The ignition switch has been located in the same position on the control panel since introduction of the 1975 Snowmaster (Figure 8). Prior to 1975, the unit's engine was stopped by depressing the spark plug kill lever. This lever was located below a translucent boot on the upper shroud. The lever would ground the spark to frame of the snowthrower when depressed (Figure 10). Press and hold until the engine stops completely.

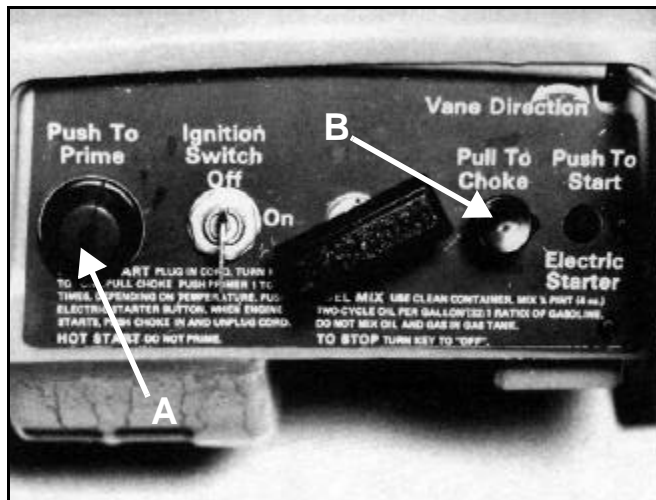


Figure 8 0217-005

(A) Primer (B) Choke



Figure 10 0217-006

CONTROLS/LOCATION AND OPERATION

PRIMER

The primer, used on most single stage snowthrowers, is designed to pump a small amount of fuel from the carburetor into the carburetor throat. This extra fuel mixture allows the engine to be started in cold temperatures.

The primer is operated by depressing the primer bulb with a finger, ensuring the finger covers the vent hole in the bulb. Depress the primer button, release, wait about 3 seconds, then depress the primer again. Repeat as often as needed. The pause in between primes allows time for the prime well in the carburetor to refill.

Operator priming instructions vary depending on the year your snowthrower was manufactured. On those units manufactured from 1972 and before, in a cold start application, the primer should be pressed approximately 10 times (Figure 11). The 1973 through 1977 single stage snowthrower primer should be pressed 5 times. Snowthrowers produced from 1978 through 1980, the primer should be pushed one to four times (Figure 8, Figure 11, or Figure 12). For temperatures above +20° F (-7° C) use one or two primes; below +20° F (-7° C) use three or four primes. For extremely cold temperatures below -10° F (-23° C) use five or six primes. For 1981 and newer models, depress the primer one or two times, with a pause in between. Additional primes may be necessary in colder temperatures.

Note: On early production, the diaphragm cover was vented, and on later production, the primer bulb incorporates the vent. Those models with a vented diaphragm cover require more primes.

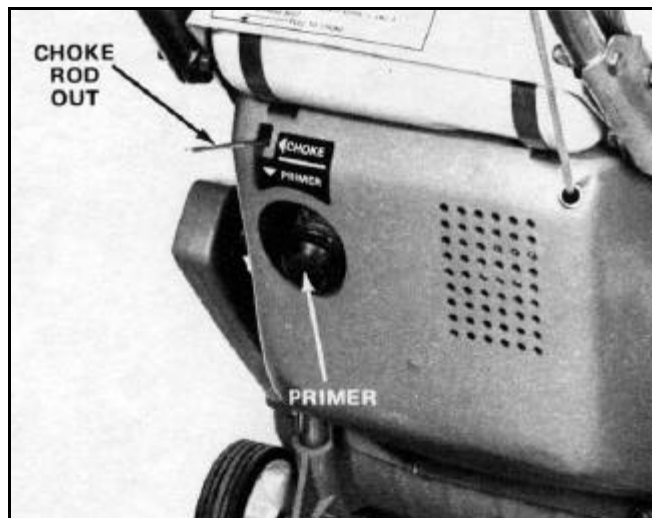


Figure 11

0217-007



Figure 12

0217-008

PRIMING CHART

Years	Number of times primer is depressed
1965-1972	10
1973- 1977	5
1978- 1980	1-4
1981 - Up	1-2

CONTROLS/LOCATION AND OPERATION

CHOKE

The carburetor choke control, or shutter, meters the amount of air passing into the engine. When starting the engine, the carburetor choke should be closed (Figure 13). If your snowthrower has either the choke cable, choke rod, or handle design to close the choke shutter, the cable, rod, or handle should be pulled out. If you have a single stage snowthrower manufactured in 1980, the choke control should be rotated clockwise to close the shutter, counterclockwise to open the shutter.

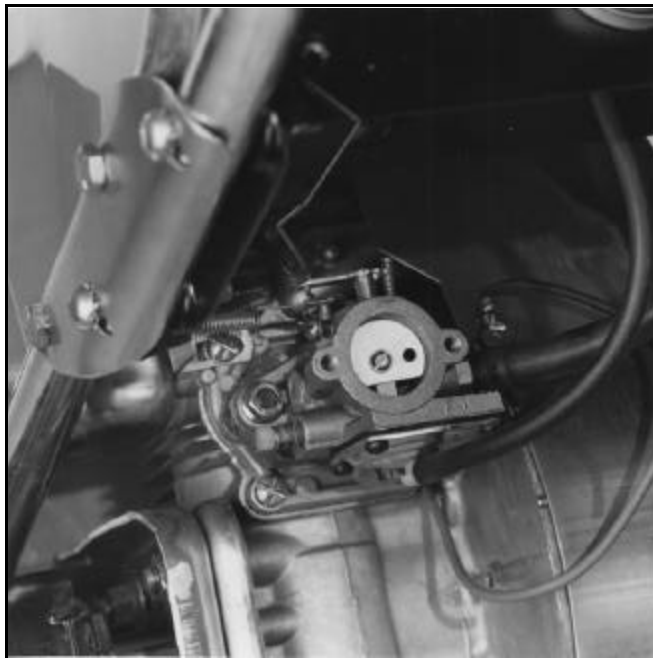


Figure 13

0217-009

Closing the choke shutter allows air to enter the carburetor only through openings in and around the choke shutter (Figure 14). When the engine is cranked, a low pressure area is created in the engine and it extends into the carburetor. Since only a limited amount of air can enter this low pressure area because of the closed choke shutter, a greater amount of fuel is drawn through the fuel passages to fill the void. This creates the richer mixture needed for engine starting and restarting after the engine is warm.

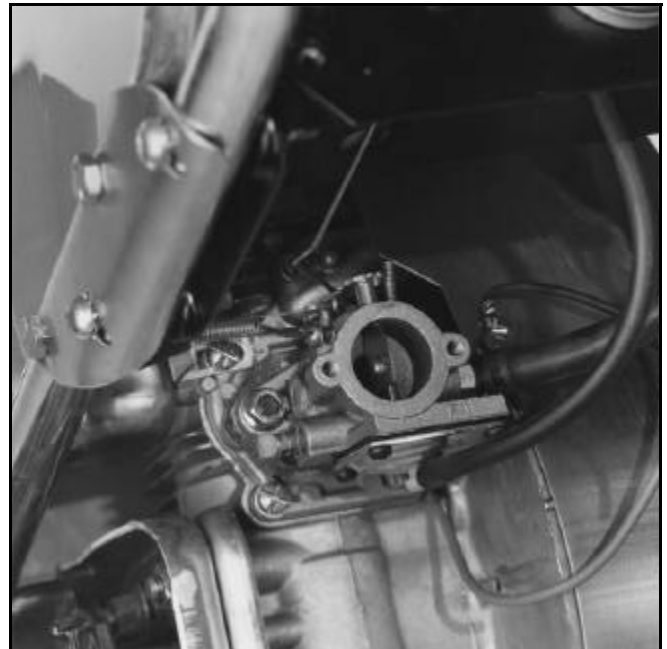


Figure 14

0217-010

After the engine starts, more air must pass into the engine. Therefore, after the engine is started, open the choke shutter to allow more air to pass into the engine. Again, to open the choke shutter on those models that have a choke cable, rod, or handle, push the choke control lever in. On 1980 snowthrowers, the choke control lever should be rotated counterclockwise.

THROTTLE: On Toro applications, the carburetor throttle is controlled by the governor only. Therefore, Toro single stage snowthrowers, are not equipped with an engine speed control for the operator.

ON/OFF IGNITION SWITCH

The ignition switch found on Toro single stage snowthrowers produced since 1975, allows the engine to be started when the key is in the ON position. Rotating the key to the OFF position will stop the engine by allowing magneto current to flow to ground (Figure 12).

CONTROLS/LOCATION AND OPERATION

CHECKING THE IGNITION SWITCH

The tools used to check for defective switches are a continuity tester/light or an ohmmeter (Figure 15). A continuity tester or ohmmeter, as the names imply, are used to test for a completed current flow in an electrical circuit. To test the ignition switch on your snowthrower:



Figure 15 0217-011

1. Remove the upper shroud.
2. Slide the terminal connector off the ignition switch (Figure 16). With the key in the OFF position, place the continuity light or ohmmeter leads, one to each terminal on the ignition switch (Figure 17); the light or meter, depending on the instrument used, should show continuity. (The continuity light should be on or the ohmmeter needle should move to a zero ohms reading.) If not, the switch is defective and needs to be replaced.



Figure 16 0217-012

CONTINUITY CHART FOR SWITCHING

Switch	Continuity Light	Ohm Meter
ON	light off	∞ Ohms
OFF	light on	Zero Ohms



Figure 17 0217-013

Now, turn the key to the ON position, the meter or light from the tester should not indicate continuity (Figure 18). (The continuity light, if being used, should be OFF. An ohmmeter should move close to ∞ .) If not, replace the switch.

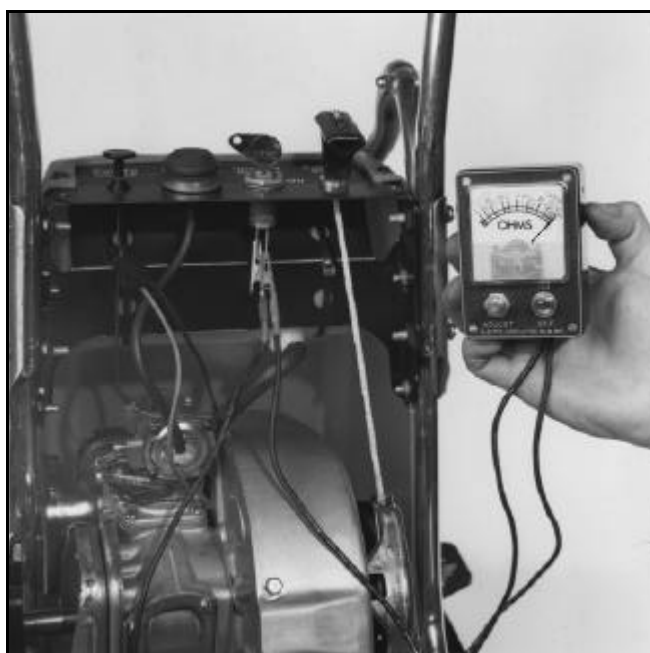


Figure 18 0217-015

CONTROLS/LOCATION AND OPERATION

3. Slide the terminal connector back onto the ignition switch terminals (Figure 16).
4. Replace the upper shroud.

Note: Toro single stage snowthrowers produced between 1965 and 1975 did not utilize an ignition switch. These units were equipped with a translucent boot in the upper shroud. By depressing the boot on these models, the engine could be stopped (Figure 10). A small metal lever, which was attached to the frame, would ground the spark to the frame when depressed.

VANE CONTROL - SNOW PUP - SNOWMASTER S-200 - S-620

The vane control, found on Toro single stage snowthrowers, directs the discharge of snow to the left, right, or straight forward (Figure 19).

Note: It is a good practice to set the vanes in a vertical position (place the vane control so the vanes are positioned straight forward), when your unit is not in use. This helps prevent the vanes from taking a permanent curved shape.

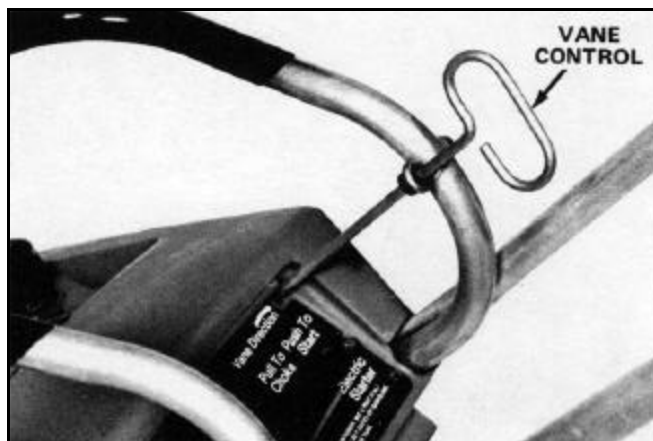


Figure 19

0217-016

CHUTE CONTROL

All Powerlite and 20" CCR models use a chute to direct the snow (Figure 20). There are three methods to control the chute rotation. The crank style and two types of the lever style (Figure 21). However, the chute itself is basically the same.



Figure 20

2261-04



Figure 21

2261-01

CONTROLS/LOCATION AND OPERATION

The curved rotor is necessary to draw the snow towards the center, where the chute is (Figure 22). The upper part of the rotor housing is an inverted cone, which has two functions. This directs the snow towards the chute, and also serves to resist plugging.



Figure 22

1352-01

The discharge chute and deflector are not interchangeable from model to model (Figure 23). However, they are made from the same basic design. The deflector mounts on top of the chute and determines the height of the snow stream.



Figure 23

1352-05

The bolts on either side of the deflector must be sufficiently tight to prevent the snow stream from causing the deflector to move.

CHUTE ROTATION AND DETENT SYSTEMS

Powerlite Chute System

On Powerlite models, the chute attaches to a handle, which also is the base and contains detents which resemble gear teeth. The handle or base sets in a groove at the top of the rotor housing. The front of the housing is open to allow the handle to slip in. The front opening is closed by the addition of the chute retainer, which is held in place by four screws (Figure 24).

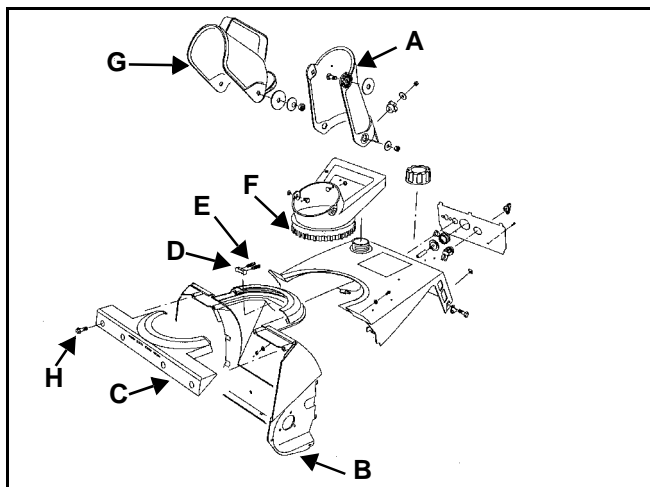


Figure 24

0310-01

- | | |
|---------------------|---------------------|
| (A) Discharge Chute | (E) Detent Spring |
| (B) Rotor Housing | (F) Chute Handle |
| (C) Chute Retainer | (G) Chute Deflector |
| (D) Chute Detent | (H) Screw (4) |

CONTROLS/LOCATION AND OPERATION

To keep the chute in the desired position, a spring loaded chute detent is located in the rear of the housing (Figure 25). As the chute is rotated manually, a ratchet sound indicates that the detent is working properly. As the handle, housing, and chute retainer are all made of plastic, no lubrication is necessary



Figure 25

1854-40

To access the chute assembly, remove the 4 screws holding the chute retainer to the housing and remove the chute retainer. The chute assembly can then be pulled forward and removed from the housing.

Reassembly is accomplished by installing the springs on the chute detent and installing the chute detent into the rotor housing. The chute assembly can be slid into place and the chute retainer installed (Figure 24).

20" CCR Manual Chute System

Some 20" CCR models were equipped with a manual chute system. As with the others, the component parts are all plastic to eliminate the need for lubrication and reduce icing.

On this version, the discharge chute attaches to the handle and chute ring. Three carriage head bolts and washers connect the parts. Below the upper shroud is the balance of the chute components.

To access the balance of the chute parts, remove the 3 carriage bolts and nuts at the base of the discharge chute (Figure 26). Remove the chute, deflector and handle. The upper shroud must now be removed. Remove the bolt in each front corner.



Figure 26

1854-12

Remove the 2 screws holding the nameplate to the chassis. Allow the nameplate to hang loose from the starter rope (the nameplate has 3 tabs that engage the upper shroud). Remove the two bolts and locknuts, one in each front corner of the shroud and 2 screws, one in each rear corner of the shroud (Figure 27 and Figure 28).



Figure 27

1352-03

CONTROLS/LOCATION AND OPERATION



Figure 28 1352-08

Remove the gas cap and lift the upper shroud off the machine. Replace the gas cap to prevent fuel spillage or dirt from entering the fuel system. Now you see the chute ring, the two chute ring retainers, and the detent arm and spring (Figure 29). To remove the chute ring, remove the 4 bolts and nuts that retain the left and right chute ring retainers.



Figure 29 1854-40

Note: The rear bolt in the left hand chute ring retainer is also the pivot for the detent arm. This arm engages the notches in the chute ring to prevent unwanted rotation of the chute. With the four bolts removed, the retainers and chute ring will then lift off.

These parts are all plastic to eliminate the need for lubrication and resist icing.

Reassembly is the reverse of disassembly.

Note: The rounded heads of the carriage bolts must be on the inside of the chute. The smooth head prevents snow from building up on the bolt head.

20" CCR Crank System

The third system, used on CCR2000 as well as the 2400, 2500 and 3600 series uses a crank that is mounted to the handle.

Rotating the handle turns a set of gears that engage a ring gear that the chute is mounted to. The gears are contained in a bracket located under the upper shroud.

The chute ring gear rests on a support and is held in place by two retainers. The chute retainers allow the ring gear to rotate only.

To access the chute ring and gears:

1. Remove the 3 carriage head bolts and locknuts at the base of the chute and lift off the chute assembly.
2. Remove the 2 bolts and nuts that hold the chute crank rod bracket to the lower handle and draw the rod out of the upper shroud (Figure 30).

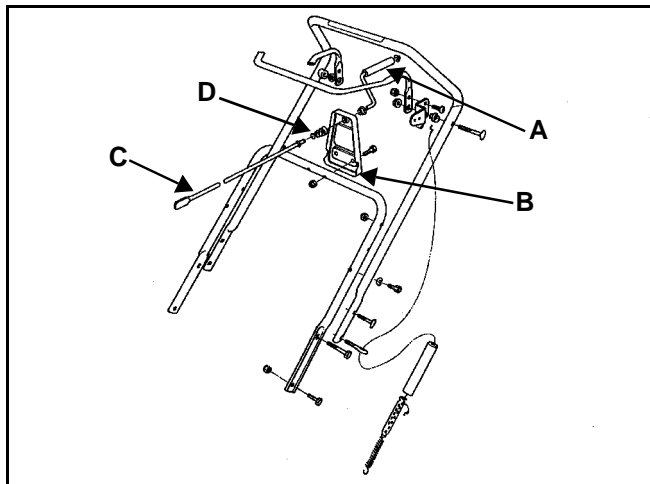


Figure 30 0309-22

- | | |
|-------------------------|---------------------|
| (A) Crank Handle Grip | (C) Chute Crank Rod |
| (B) Chute Crank Support | (D) Spring |

CONTROLS/LOCATION AND OPERATION

- To remove the upper shroud, remove the two bolts and locknuts in the front corners of the shroud (Figure 31).

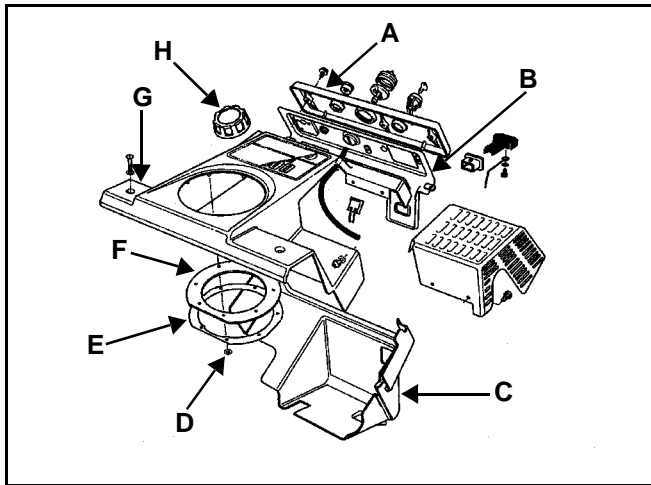


Figure 31

- | | |
|-------------------|-------------------------|
| (A) Nameplate | (E) Chute Seal Retainer |
| (B) Control Panel | (F) Chute Seal |
| (C) Lower Shroud | (G) Upper Shroud |
| (D) Push Nut | (H) Gas Cap |

- Remove 3 screws that hold the face plate to the control panel and let the face plate hang from the starter rope.
- Remove the gas cap and lift the upper shroud, replace the gas cap. The chute ring and gears are now all exposed.

- The gears are held in the bracket by a shaft with a push nut on either end (Figure 32). To remove the shaft, remove one of the push nuts and pull the shaft out.

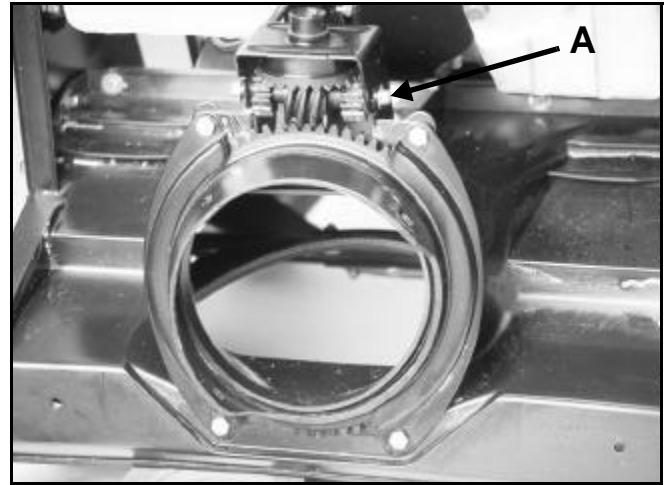


Figure 32

1854-19

- | |
|------------------------|
| (A) Shaft and Push Nut |
|------------------------|

- To reassemble, reverse the process.

Note: When installing the chute, the rounded heads of the carriage bolts must be on the inside of the chute. The smooth head prevents snow from building up on the bolt head.

CONTROLS/LOCATION AND OPERATION

Chute Seal

This system has a seal incorporated into the upper shroud (Figure 33). This is to prevent melted snow from seeping into the engine compartment. To replace the seal, remove the upper shroud in the same manner as accessing the chute gears. Turn the shroud over and remove the 8 pushnuts. (Cutting them with a side cutter is the best way to remove them.) Slide the seal and retainer off the mounting pegs and replace the seal and retainer. Install new pushnuts, using a socket to push them into place.

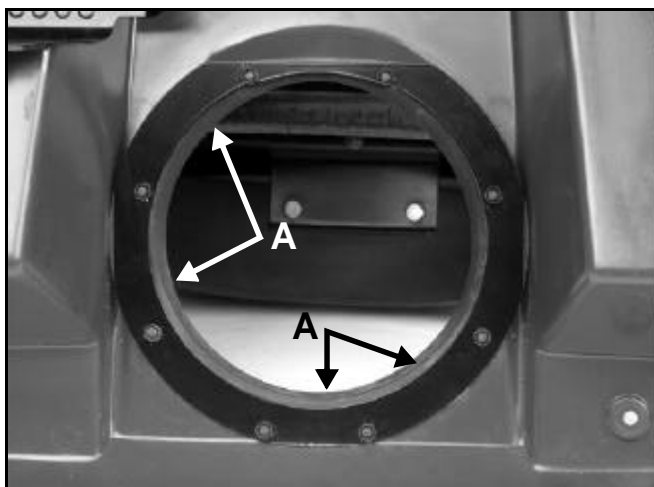


Figure 33

1854-38

(A) Seal

ENGINE REMOVAL AND INSTALLATION

1965 - 1985 MODELS, ENGINE REMOVAL

Certain engine servicing procedures will require removing the engine from your snowthrower. The following procedures are required for engine removal:

1. Drain the gasoline from the fuel tank. Refer to "Draining The Fuel Tank" on page 2 - 5.
2. Remove all the mounting screws retaining the upper shroud on 20" units. On all 14" and 21" snowthrowers, remove both the upper and lower shrouds. Be certain to install the gas cap after the upper shroud is removed.
3. Disconnect the spark plug wire.
4. Pull the rope from the starter and tie a small knot in the starter rope before the starter housing (Figure 34). Allow the starter rope to retract until the knot stops the starter rope at the starter housing. Next, remove the knot in the starter handle and slide the handle off the starter rope.

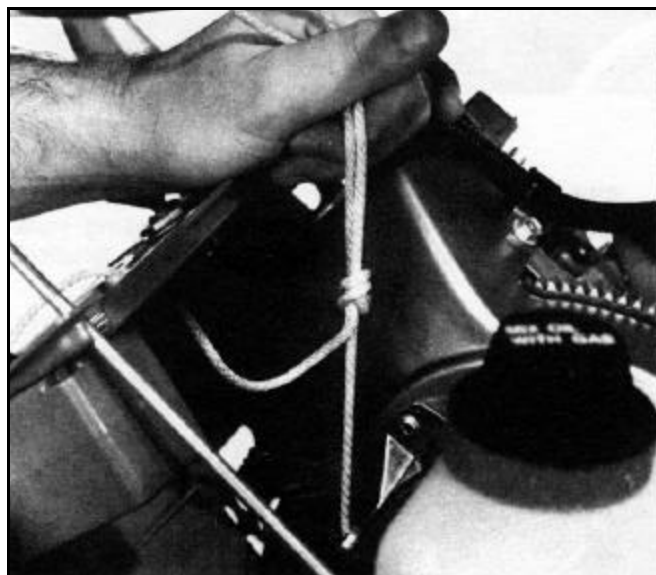


Figure 34

0217-017

5. Belt Drive Units:
 - A. Remove the left side plate and belt. Refer to "Replacing Drive Belt" on page 5 - 1. Complete steps 1 through 4.
 - B. Remove the crankshaft pulley. Refer to "Replacing Drive Belt" on page 5 - 1. Complete step 2.

Chain Drive Units:

- A. Remove the left side plate, chain guard and chain. To remove the chain, refer to "Chain Replacement" on page 5 - 25. Consult step 2.
 - B. Remove the crankshaft sprocket. Refer to "Crankshaft Sprocket Replacement (all models)" on page 5 - 21. Consult step 3.
6. Remove the switch terminal from the key switch if your unit is so equipped. Some 1980 model S-200's may have a terminal connection slightly below the key switch. It will be necessary to separate the two terminals.
 7. Slide the primer hose off the primer bulb fitting.
 8. Remove the choke control. **Note:** Do not bend or misform the carburetor choke control linkage.
 9. Remove the mounting screws retaining the lower shroud on all 20" units. On electric start 20" units, remove screws retaining the switch and plug assembly to the lower shroud.
 10. Using a hose clamp pliers or a needle nose pliers, compress the fuel line clamp at the carburetor fitting and slide the clamp down the fuel line hose (Figure 35). Remove the fuel line from the carburetor.

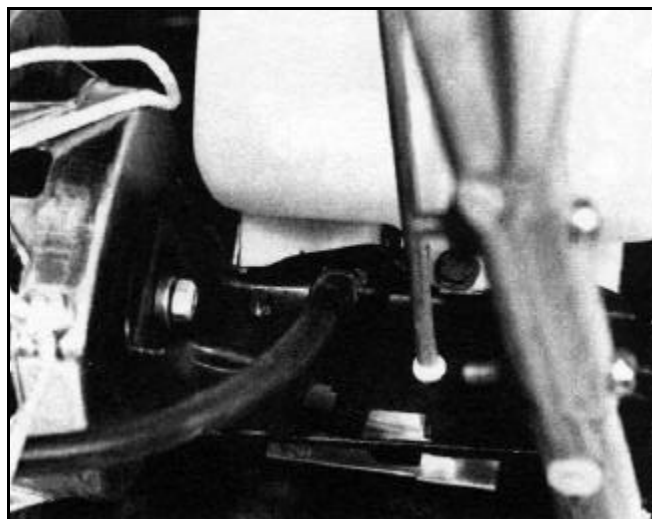


Figure 35

0217-018

ENGINE REMOVAL AND INSTALLATION

11. If your 20" Snowthrower is equipped with an electric starter, remove the bolts retaining the electric starter to the engine mounting bracket (Figure 36). Also, remove the bolt and cable clamp retaining the wire harness to the engine. Finally, remove the motor tie down strap.

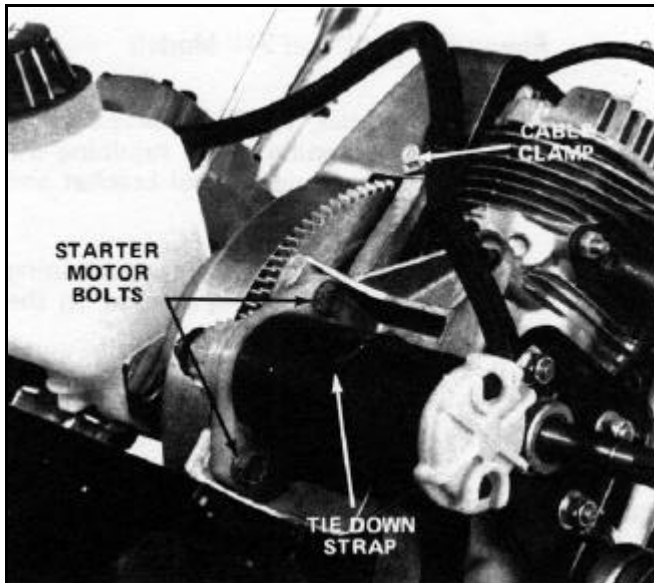


Figure 36 0217-019

12. Remove the engine mounting bracket that supports the engine on the starter housing side (Figure 37 and Figure 38).



Figure 37 – 20" Model 0217-020

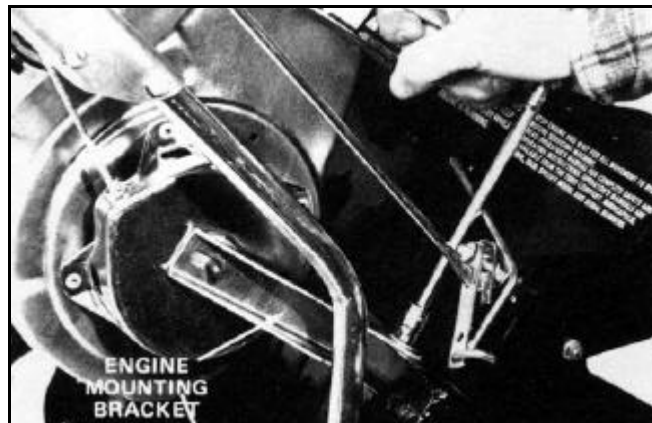


Figure 38 – 14" and 21" Models 0217-021

Note: On the 20" models, it will be necessary to remove the small self-tapping screw retaining the vane control rod to the vane control bracket and remove the muffler mounting nuts.

13. Lastly, remove the four mounting nuts retaining the engine to the engine mounting bracket on the crankshaft side (Figure 39).

The engine can now be removed from the unit for servicing.

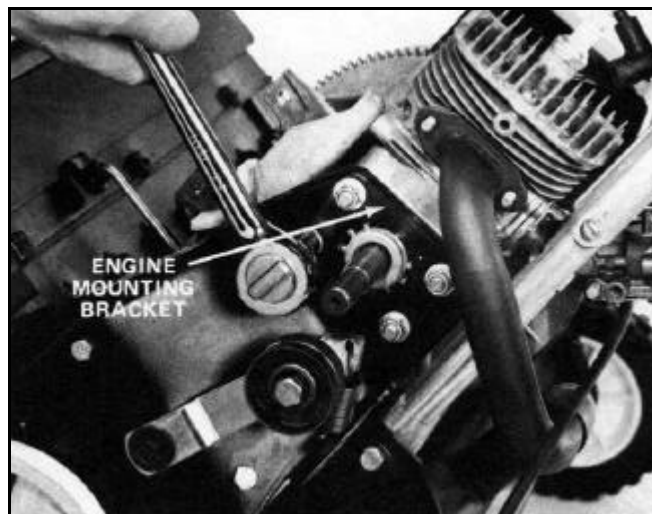


Figure 39 0217-022

ENGINE REMOVAL AND INSTALLATION

1965 - 1985 MODELS, ENGINE INSTALLATION

After performing the necessary servicing procedures to your engine, install the engine back into the unit. Proceed with the following:

1. Slide the engine into the engine mounting bracket. Loosely install the four mounting nuts to retain the engine to the mounting bracket (Figure 40).



Figure 40 0217-023

2. Install the engine mounting bracket that supports the engine on the starter housing side. Loosely install the starter housing nut (Figure 41). Tighten the engine mounting bracket to the frame.

Note: On all 20" snowthrowers, install the small self-tapping screw retaining the vane control rod to the vane bracket. Refer to your parts manual if additional guidance is necessary.

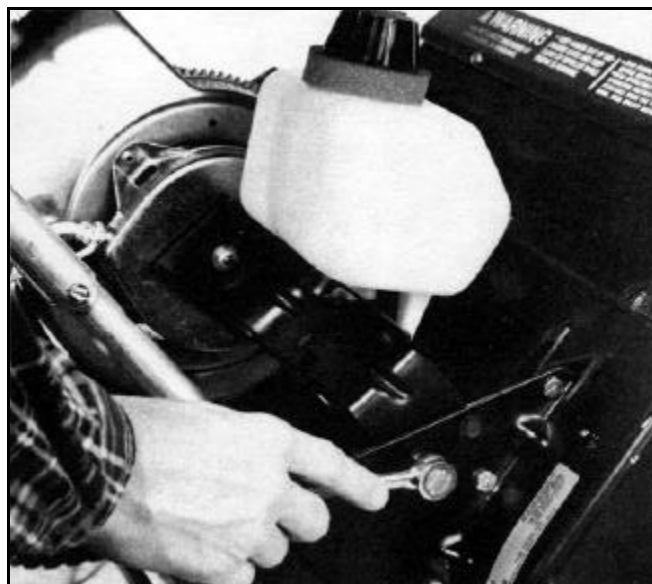


Figure 41 0217-024

3. Slide the fuel line or hose onto the carburetor fitting. Compress the fuel line clamp and slide into position.
4. On 20" models, install the lower shroud.
5. Install the switch terminal back onto the switch if your unit is so equipped. (On some 1980 S-200 models, the key switch has pig tail leads running to a receptacle. This receptacle should be connected to the terminal.)
6. Install the choke linkage and choke control. Take care not to bend or misform the choke control linkage.
7. Slide the primer hose onto the primer fitting.

ENGINE REMOVAL AND INSTALLATION

8. Pull the recoil starter rope through the hole in the control panel (Figure 42). Next, slide the rope onto and through the starter handle and make a small knot. Slide the starter rope back into the starter handle. Remove the knot in the starter rope at the starter housing and allow the starter rope to retract into the starter.

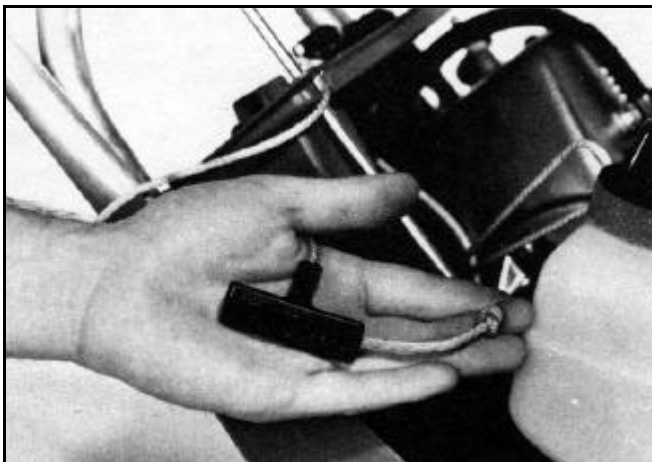


Figure 42 0217-025

9. On 20" models, slide the muffler into place on the engine. Torque the muffler nuts to 90 - 120 in-lbs. (Figure 43).

Note: Do not over torque the nuts, you may crack the engine block.

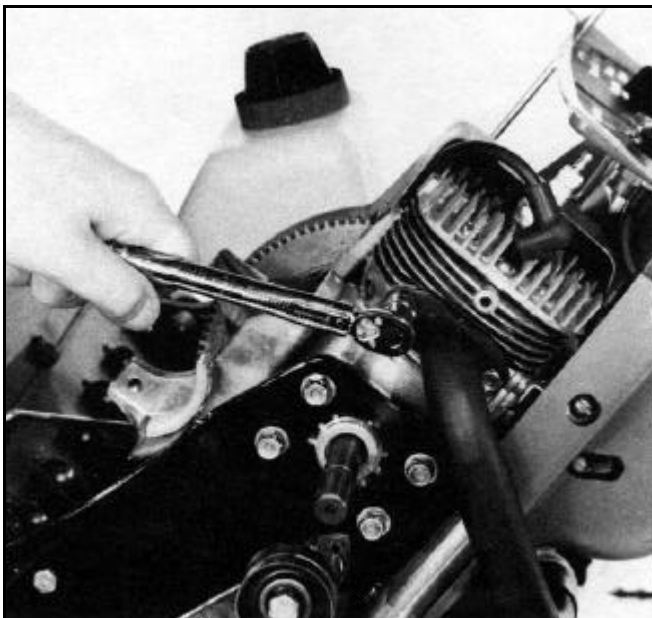


Figure 43 0217-026

10. If your snowthrower is equipped with an electric starter, install the starter to the engine mounting bracket (Figure 44). Torque the starter mounting bolts at the mounting bracket to 120 - 180 in-lbs. Install the wire harness with the cable clamp to the engine. Replace the starter motor tie down strap. Finally, mount the switch and plug assembly to the lower shroud.



Figure 44 0217-027

11. Belt Drive Units:

- A. Torque the crankshaft engine mounting nut to 170 - 220 in-lbs. Then tighten the starter nut to 70 - 120 in-lbs (Figure 45).

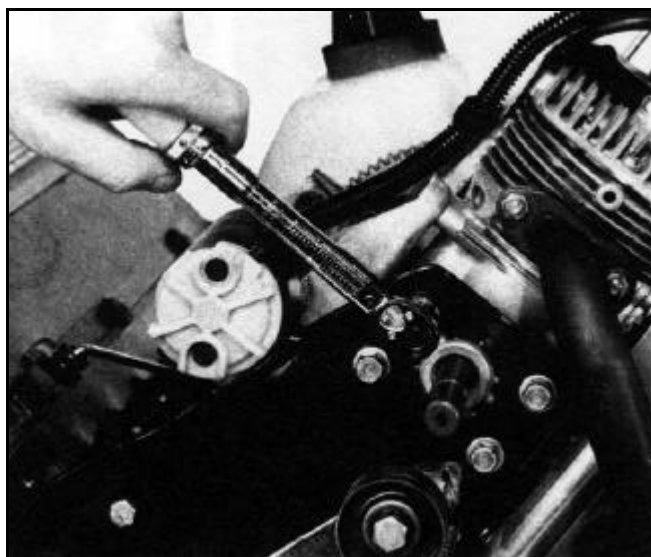


Figure 45 0217-028

ENGINE REMOVAL AND INSTALLATION

- B. Install the crankshaft pulley. Refer to "Crankshaft Pulley Replacement" on page 5 - 3.
- C. Connect the spark plug lead wire.
- D. Install the belt and side plate. Refer to "Replacing Drive Belt" on page 5 - 1. Complete Steps 5 through 7.

Chain Drive Units:

- A. Install the crankshaft sprocket. Be certain to align the keyway (slot) of the crankshaft sprocket with the location key on the crankshaft. Should the locating key on the crankshaft show signs of wear, replace.
- B. Install the chain. Refer to "Chain Replacement" on page 5 - 25. Do Step 3. Align and adjust the chain. Refer to "Crankshaft Sprocket Replacement (all models)" on page 5 - 21. Consult Steps 5 through 8.
- C. Install left side plate and chainguard.
- D. Connect the spark plug lead wire.

POWERLITE, ENGINE REMOVAL

- 1. Use a pump type siphon to remove the fuel from the fuel tank.
- 2. Remove the belt cover from the left side (Figure 46).



Figure 46

1854-35

- 3. Remove the belt from the engine pulley and remove the engine pulley and key if so equipped (Figure 47).



Figure 47

1854-35-2

- 4. Remove the two screws at the bottom of the control panel and remove the control panel cover (Figure 48).

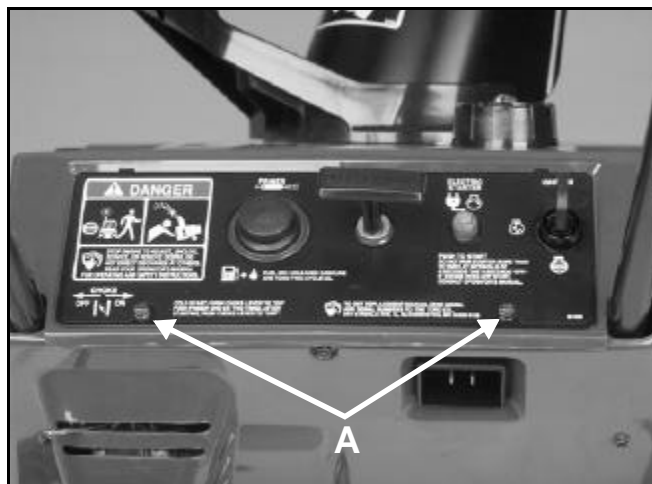


Figure 48

1854-42

(A) Screws

ENGINE REMOVAL AND INSTALLATION

5. The upper shroud/fuel tank is retained by one screw in each corner. On electric start models only, remove the three screws surrounding the starter button (Figure 52). These screws hold the switch box to the upper shroud. Unless they are removed the wire harness between the switch box and the starter motor will prevent complete shroud removal (Figure 49). Once they are removed the upper shroud and tank can be lifted enough to remove the primer line, unplug the wiring from the switch and the fuel line from the fitting on the bottom of the tank. **Note:** There might be a small amount of fuel in the fuel line. Be prepared with a shop towel to catch any remaining fuel. Depending on what work is to be done, the shroud could hang from the starter rope. If the engine is to be removed, tie a knot in the starter rope between the recoil starter and the shroud. The knot in the starter handle can now be untied and the rope pulled through the shroud.

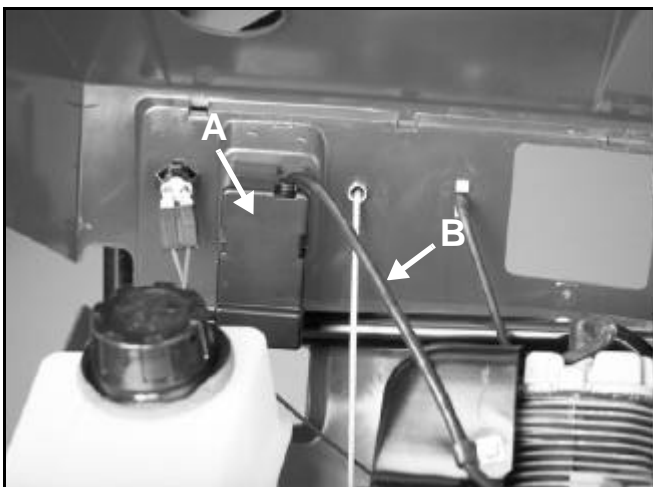


Figure 49 1854-06

(A) Switch Box (B) Wire Harness

6. The recoil side of the engine is supported by a bracket. Remove the bracket or remove the locknut holding the bracket to the recoil (it may be necessary to loosen the bracket to disengage it from the stud on the recoil) (Figure 50). Remove the 4 nuts around the crankshaft and slide the plate off the crankshaft.

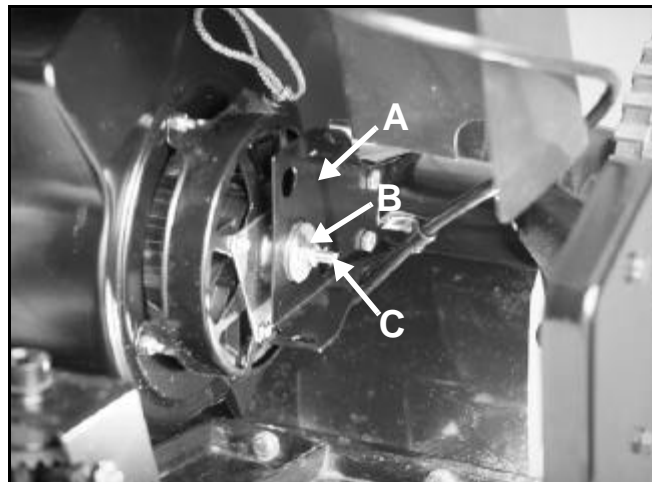


Figure 50 1854-17-2

(A) Bracket (C) Stud
(B) Locknut

7. The engine can now be moved to the right until the 4 mounting studs clear the side plate and the engine can be lifted out. (**Caution:** The choke arm protrudes through a slot in the lower shroud, do not damage it when lifting the engine out of the chassis.) (Figure 51). You may prefer to remove the lower shroud as there are only two screws holding it on. **Note:** There is a second engine plate on the inside of the side plate, this may fall off when the engine is lifted out of the chassis.



Figure 51 1854-36

ENGINE REMOVAL AND INSTALLATION

Alternate Method

1. Remove the fuel with a pump type siphon. Tilt the machine forward so it rests on the rotor housing and the chute.
2. Remove the belt cover, belt, and engine pulley.
3. Remove the two screws holding the control panel and let the control panel hang from the starter rope.
4. Remove the two hex head capscrews holding the lower shroud to the handles.
5. As you lift the lower shroud up, you will need to reach in and unhook the primer line and the wiring to the switch. Pull the starter rope out and tie it to the handle so it doesn't restrict the removal of the lower shroud. **Caution:** The choke lever goes through a slot in the lower shroud. Do not damage the lever while removing the shroud.
6. The balance of engine removal is the same as the previous process.

POWERLITE, ENGINE INSTALLATION

Installation is the reverse of removal. There are some things worthy of mentioning.

1. One engine side plate must be installed over the engine mounting studs before the engine is placed in the chassis.
2. When installing the engine, be sure to feed the choke lever through the slot in the lower shroud.
3. After the engine is located in the chassis, install the second engine plate and the 4 mounting nuts.
4. Install the stabilizer bracket to the recoil side of the engine and torque the nut to 30 in-lbs. Tighten the 4 engine mounting nuts to 170 - 220 in-lbs.

20" CCR, ALL MODELS, ENGINE REMOVAL

The engine can be removed from the top or bottom. We will cover the steps for both.

1. Remove the 3 bolts on the chute and 2 more where the chute crank attaches to the handle (on models so equipped). Some models use a chute handle to rotate the chute; this will come off when the chute is removed.
2. Drain the fuel tank using a pump type siphon.
3. Remove the 3 screws securing the control panel. Let the panel hang from the starter rope.
4. The upper shroud is retained with a bolt and locknut in each front corner and some have a screw in each rear corner. On some models, the rear of the shroud is retained by the control panel.

Electric Start models only - The electric start switch box is attached to the upper shroud or the control panel (Figure 52). There are 3 screws next to the electric start button that must be removed or the wire harness between the switch box and starter motor will prevent removal of the shroud (on some models) and engine removal on all models. Remove the gas cap and the shroud will lift off.

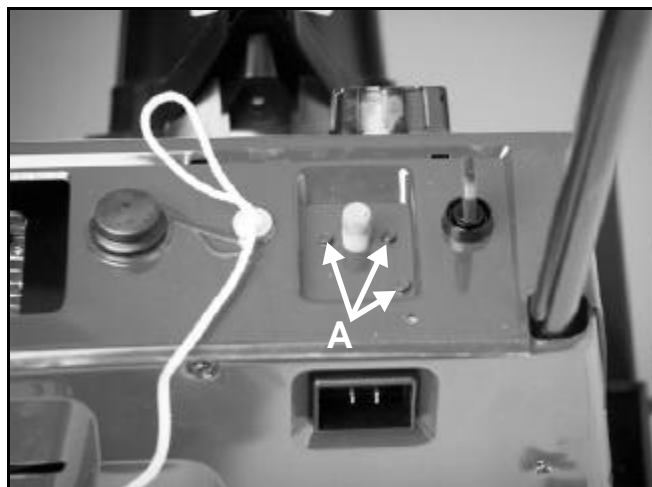


Figure 52

1854-11

(A) 3 Screws

ENGINE REMOVAL AND INSTALLATION

5. On most models, the fuel tank is mounted at 3 points with capscrews and locknuts on two of the points, the third point is a pin on the chassis that goes through a rubber grommet (Figure 53) on the bottom of the tank. CCR1000's use a tongue and groove system and one (Figure 54) mounting screw. Remove them and lift the tank out. Now disconnect the fuel line. **Caution:** If the tank had fuel in it, there will be some remaining in the fuel line. Be prepared to clamp the end of the fuel line or drain it. **Note:** Do not use a screw or bolt to plug the end of the fuel line. The threads can damage the inside of the fuel line and prevent it from sealing.

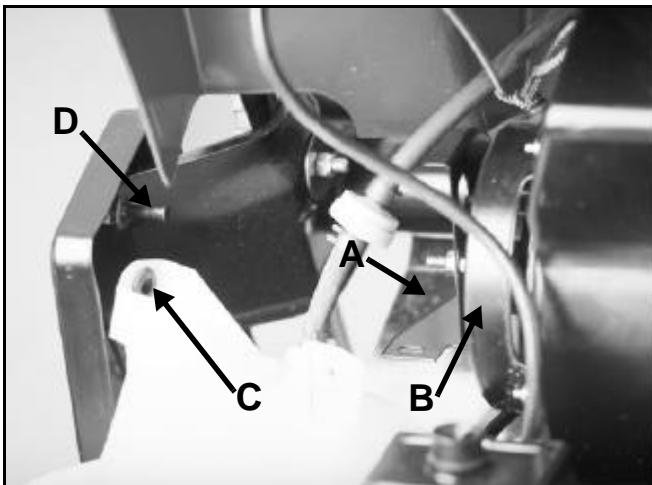


Figure 53 1854-18

- | | |
|------------------------|--------------------|
| (A) Stabilizer Bracket | (C) Rubber Grommet |
| (B) Recoil Starter | (D) Pin |

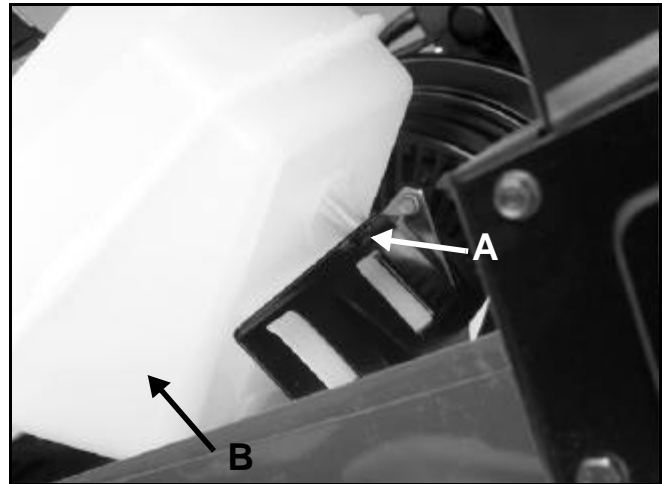


Figure 54 1854-14

- | | |
|-----------|---------------|
| (A) Screw | (B) Fuel Tank |
|-----------|---------------|

6. Disconnect the wiring to the switch and the primer line.
7. Tie a knot in the starter rope BETWEEN the control panel and the engine. The knot in the starter handle can now be untied and the rope pulled through the control panel. (A slip knot is recommended, it can be untied, at any time, by merely pulling on the rope.)
8. Remove the locknut connecting the engine stabilizer bracket to the recoil starter. You may wish to loosen the bracket at the other end to pivot it away from the engine.
9. Remove the belt cover and roll the belt off the engine pulley. Loosen the 2 set screws, remove the engine pulley and key (Figure 55).

ENGINE REMOVAL AND INSTALLATION

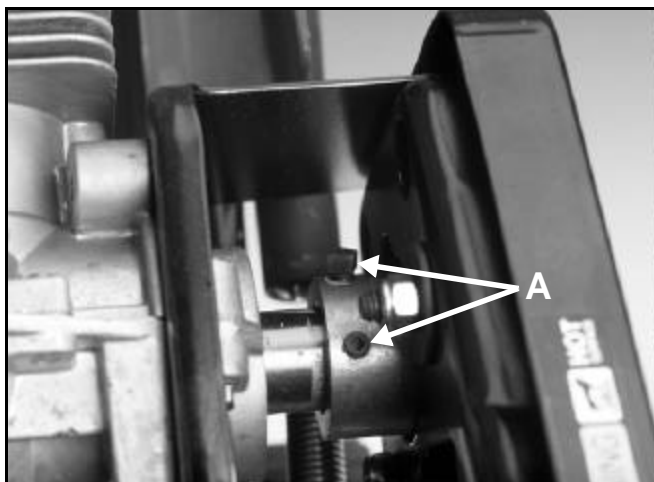


Figure 55 1854-02

(A) Set Screws

10. Remove the screw securing the choke knob to the choke rod. Note how the choke rod is connected to the engine, then remove the choke rod.
11. Remove the 4 bolts or locknuts (depending on the model) around the crankshaft (Figure 56). These are the last fasteners retaining the engine. Lift the engine out of the chassis.

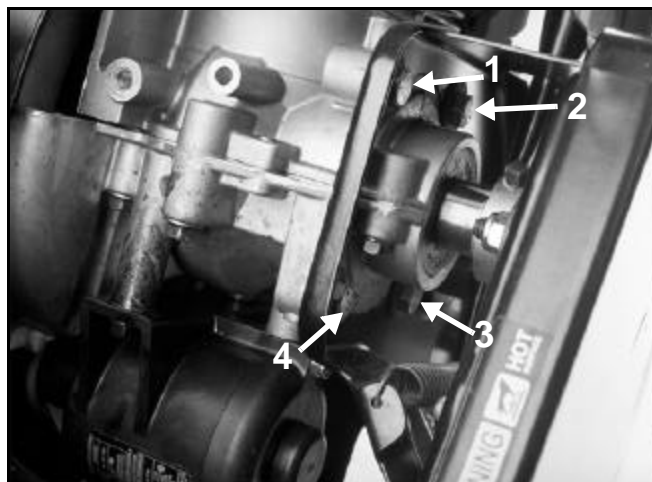


Figure 56 1854-03

1-4 engine mounting bolts or locknuts (depending on model)

20" CCR, ALL MODELS, ENGINE ASSEMBLY

Assembly is the reverse of the removal procedure. Torque the 4 engine mounting nuts to 170 - 220 in-lbs. and the nut on the engine stabilizer bracket to 30 in-lbs.

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DRIVE SYSTEM (BELT) SNOWMASTER - S-200, S-620

The Toro belt drive system, which is utilized on all 20" Snowmasters and S-200's, consists of a crankshaft pulley, a rotor pulley, a spring loaded idler and a multigrooved V-belt (Figure 57.). The power from the engine is transferred from the crankshaft pulley to a rotor pulley by the multigrooved V-belt. A constant tension is supplied to the V-belt from the spring loaded idler.

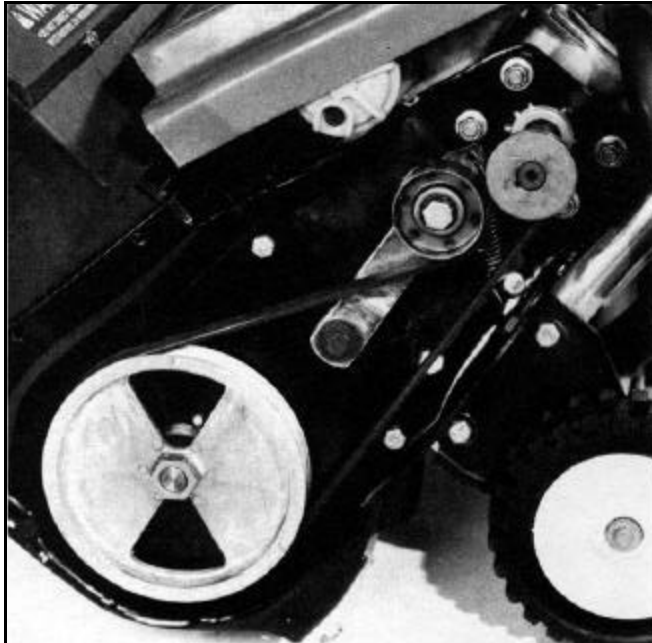


Figure 57

0217-029

Replacing Drive Belt

The belt that drives the impeller may become worn after many hours of use. This wear will cause the impeller to slip. If the impeller slips, the V-belt should be replaced.

To Replace The Belt

1. Turn the key to the "OFF" position.
2. Remove the washer faced cap screw. On the 1975 Snowmaster, the cap screw is located at the top of the drive cover. Next, remove the four screws and locknuts holding the drive cover in place (Figure 58). Remove the cover.

3. Move the idler pulley up and away from the V-belt and pull the belt out so it is free; then allow the spring loaded idler to release (Figure 59).

Note: Do not allow the idler to snap when released as damage to components may occur.

4. Remove the drive belt from the impeller pulley and engine pulley.

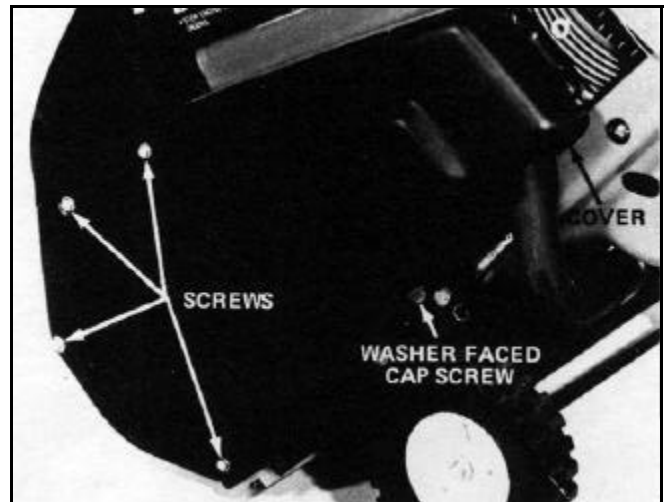


Figure 58

0217-030

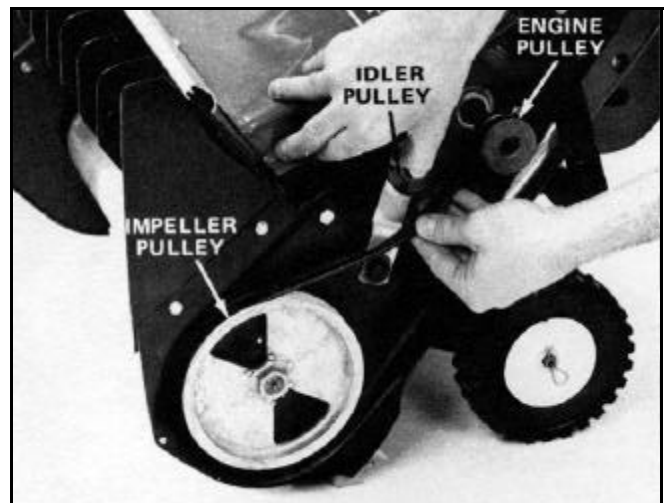


Figure 59

0217-031

DRIVE SYSTEMS

5. When installing the replacement belt, loop the belt around the engine pulley and under the idler pulley. Now start the belt around the impeller pulley (Figure 60).

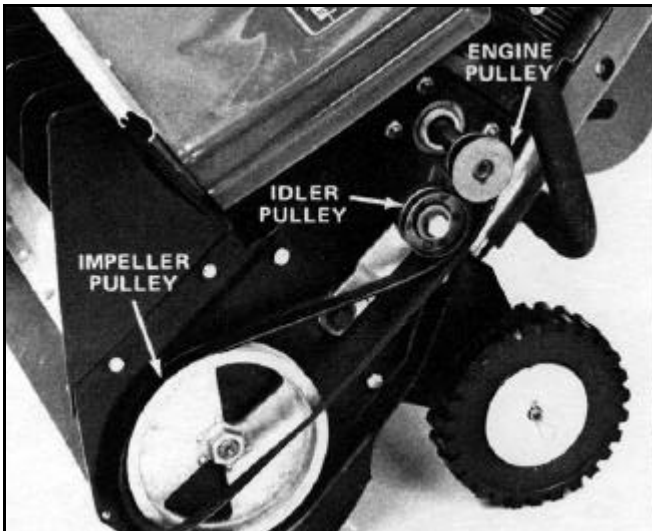


Figure 60

0217-032

6. After the belt is started around the impeller pulley, pull the idler up and rotate the impeller pulley forward allowing the belt to roll on (Figure 61).

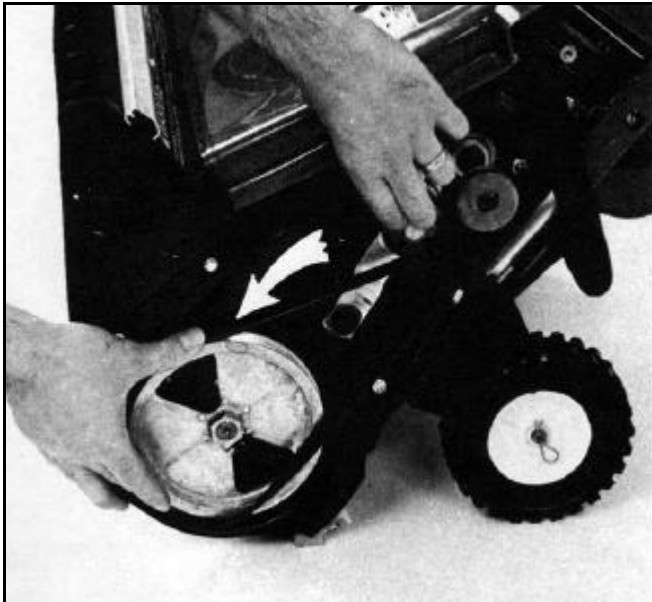


Figure 61

0217-033

7. Finally, install the drive cover with the washer-faced cap screw, four screws, and locknuts.

Belt Alignment

Whenever a pulley is removed, or if belt jumping is experienced, belt alignment will be necessary. To align the crankshaft pulley and rotor pulley perform the following procedures. They are:

1. Refer to "Replacing Drive Belt" on page 5 - 1. Complete steps 1 and 2.
2. Loosen the two allen head screws on the crankshaft pulley (Figure 62).

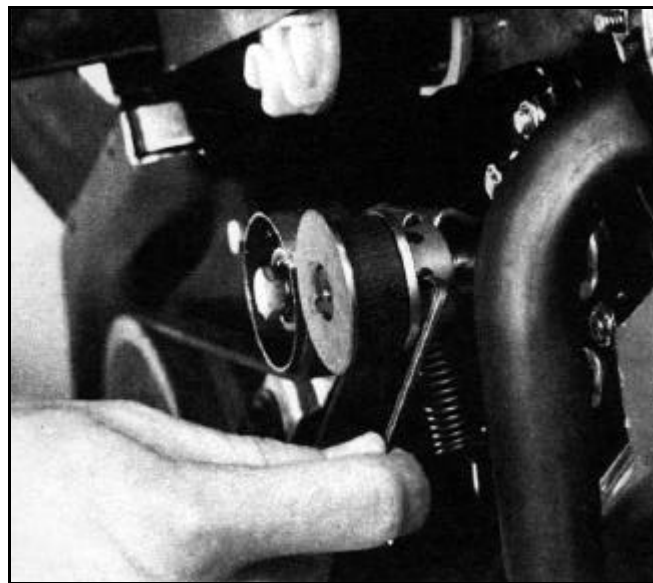


Figure 62

0217-034

3. Align the crankshaft pulley and rotor pulley with a straight edge (ie. ruler, piece of wood, etc...) (Figure 63).

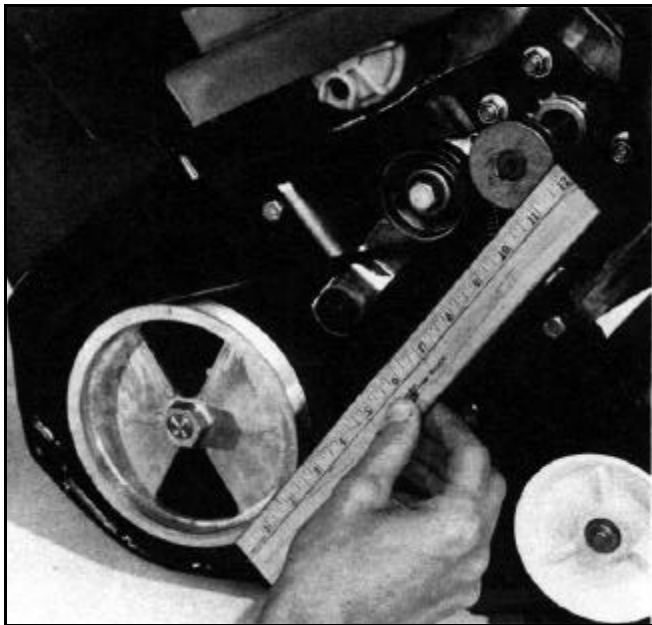


Figure 63 0217-035

4. When both pulleys are aligned with respect to the straight edge, tighten the allen head screws on the crankshaft pulley.
5. If the idler pulley is not centered with respect to the V-belt, adjust by bending the idler arm.
6. Refer to "Replacing Drive Belt" on page 5 - 1. Complete step 7.

Crankshaft Pulley Replacement

1. Refer to "Replacing Drive Belt" on page 5 - 1. Complete steps 1 through 4.
2. Loosen the two allen head screws on crankshaft pulley. Slide pulley off crankshaft (Figure 62).
3. Slide replacement crankshaft pulley on the crankshaft. Be certain to align the keyway (slot) in the crankshaft pulley with the location key on the crankshaft. Should the location key on the crankshaft show signs of wear, replace (Figure 64).

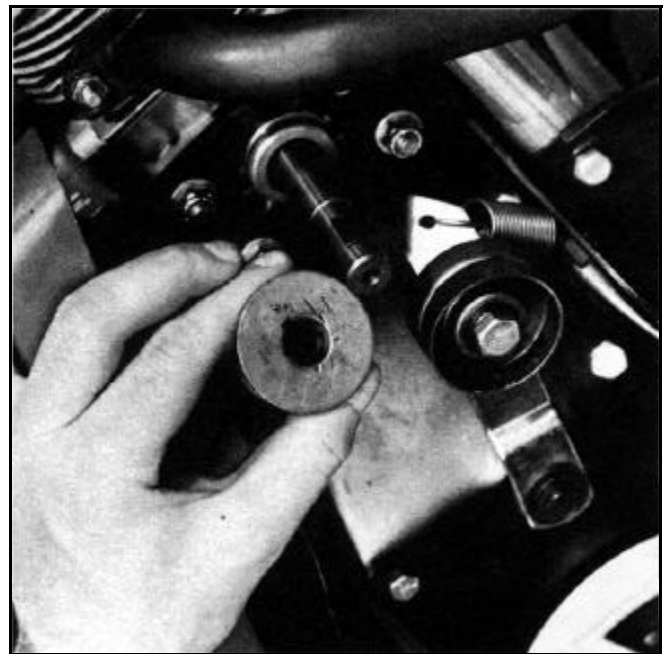


Figure 64 0217-036

4. Refer to "Belt Alignment" on page 5 - 2 (Figure 63). Perform steps 3 through 5.
5. Refer to "Replacing Drive Belt" on page 5 - 1. Complete steps 5 through 7.

DRIVE SYSTEMS

Idler Spring Replacement

1. Refer to "Replacing Drive Belt" on page 5 - 1. Complete steps 1 through 4.
2. Using a needle nose pliers, remove the idler spring from the idler arm then from the left side plate (Figure 65). Pay close attention to the shape of the ends of the idler spring. The ends have different shapes; the more closed end of the spring rides in a small hole in the idler arm, while the more open end is fastened to a small hole in the left side plate.

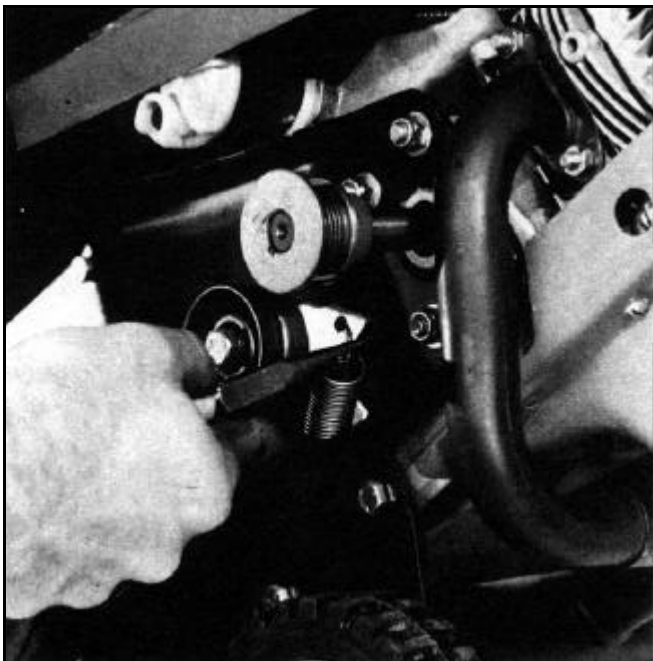


Figure 65

0217-037

3. When installing the replacement spring, slide the more opened end of spring into the left side plate first (Figure 66). Next, slip the more closed end of the spring into the small hole in the idler arm.

4. Refer to "Replacing Drive Belt" on page 5 - 1. Complete the idler spring replacement with steps 5 through 7.

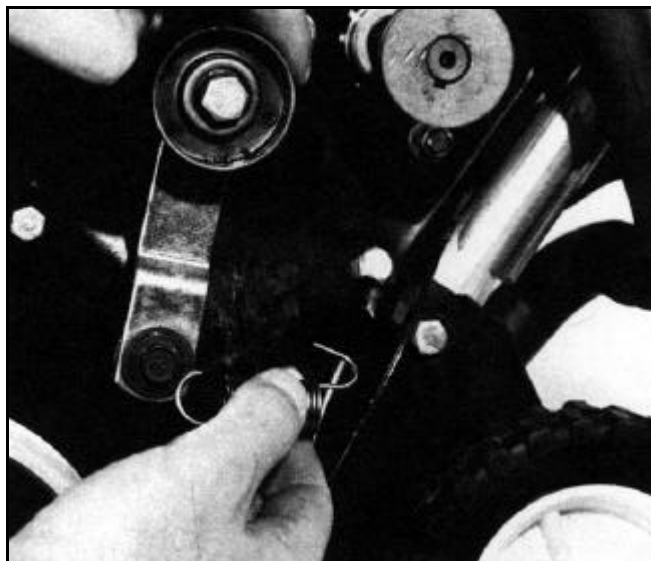


Figure 66

0217-038

Idler Arm And Pulley Replacement

1. Refer to "Replacing Drive Belt" on page 5 - 1. Begin with steps 1 through 4.
2. Remove all the self-tapping screws retaining the upper shroud to the snowthrower. Remove the upper shroud. Also, remove the idler spring. Refer to "Idler Spring Replacement" on page 5 - 4. Complete step 2.

IMPORTANT: When servicing the idler assembly, pay special attention as it is disassembled. When you reassemble the idler assembly, you may wish to consult the parts manual for your unit.

- Using a 5/8" open end wrench and a 1/2" socket wrench, remove the shoulder bolt, washers, and nut, retaining the idler assembly to the left side plate (Figure 67). At this point, inspect the entire assembly. If the idler arm is misformed, replace. Also, inspect the washers for excessive wear. Replace if necessary.

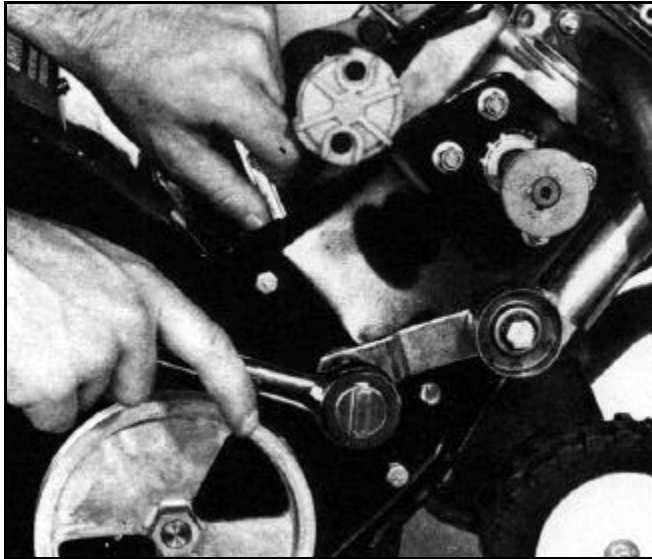


Figure 67

0217-039

- By removing the capscrew and locknut that retains the idler pulley to the idler arm, the idler pulley can be removed and the bearings can be inspected (Figure 68). Should the bearing have unusual side to side play or be "wallowed" (oval shaped), replace the idler pulley and the capscrew.

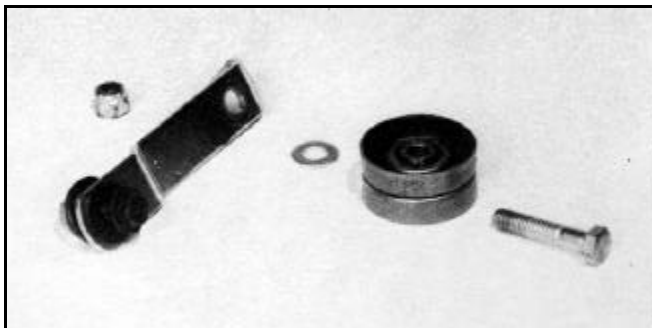


Figure 68

0217-040

- Reassemble the idler assembly and attach it to the left side plate with shoulder bolt, washers, and nut (Figure 69). Tighten the nut firmly.

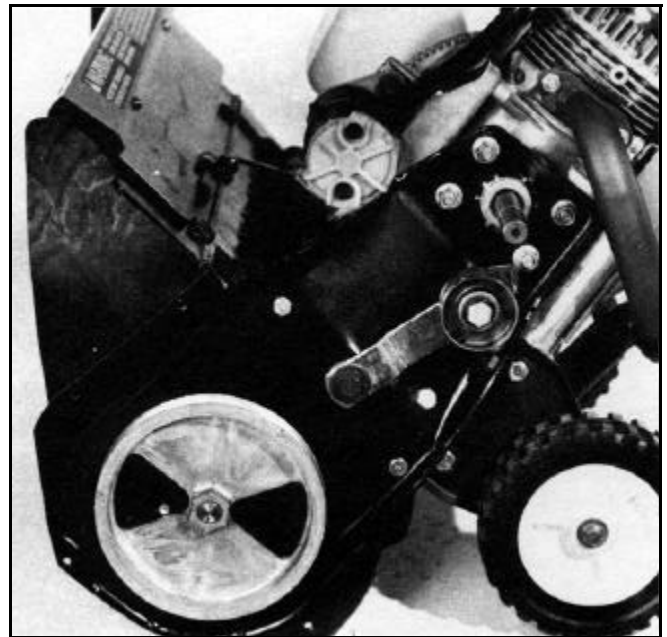


Figure 69

0217-041

- Attach idler spring. Refer to "Idler Spring Replacement" on page 5 - 4. Complete step 3.
- Attach belt. Refer to "Replacing Drive Belt" on page 5 - 1. Complete steps 5 through 7. Replace the upper shroud.

DRIVE SYSTEMS

Rotor Pulley Replacement

1. Refer to "Replacing Drive Belt" on page 5 - 1. Complete steps 1 through 4.
2. Place a block of wood, (2" x 4") as a wedge between the rotor assembly and the housing (Figure 70). With the use of a socket and a large breaker bar turn the rotor pulley clockwise (**Note:** The pulley is a left hand thread.) Remove the rotor pulley.

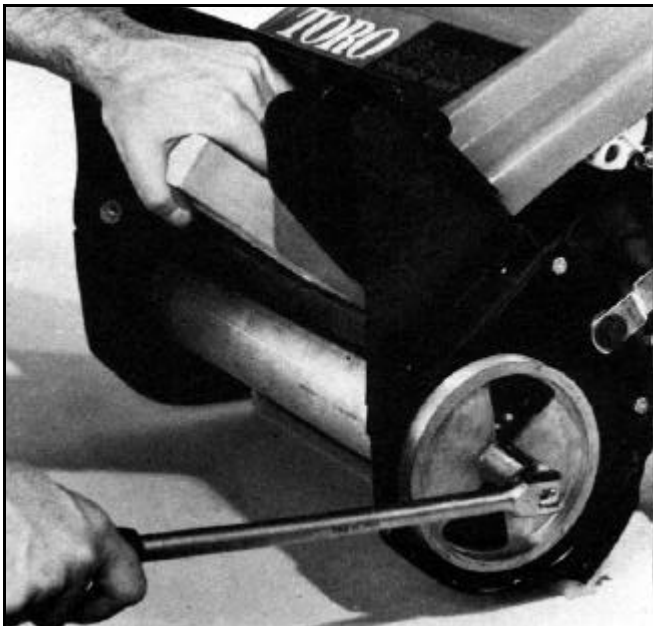


Figure 70

0217-042

3. Before replacing with a new rotor pulley, be certain to place the thin washer over the shaft first (Figure 71). If not, it will be very difficult to remove in the future and binding between the rotor and side plates may occur.

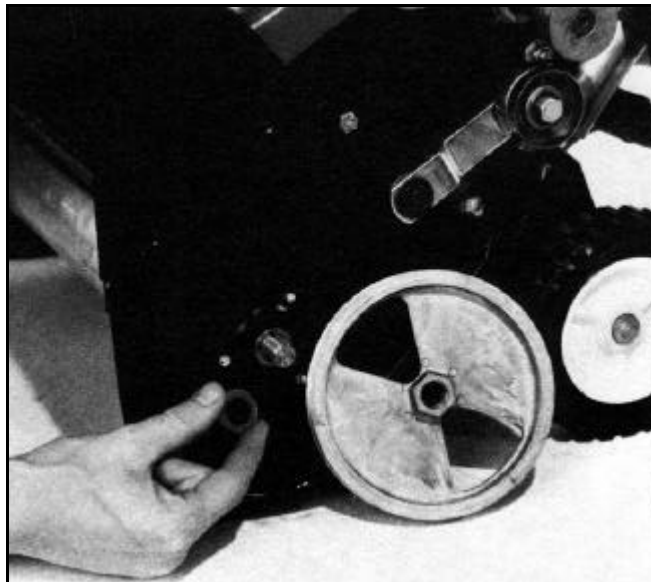


Figure 71

0217-043

4. Next, turn the rotor pulley onto the shaft (counterclockwise) finger tight (Figure 72). The rotation of the pulley during operation will tighten the pulley to the proper torque.
5. Replace the belt. Refer to "Replacing Drive Belt" on page 5 - 1. Complete steps 5 through 7.

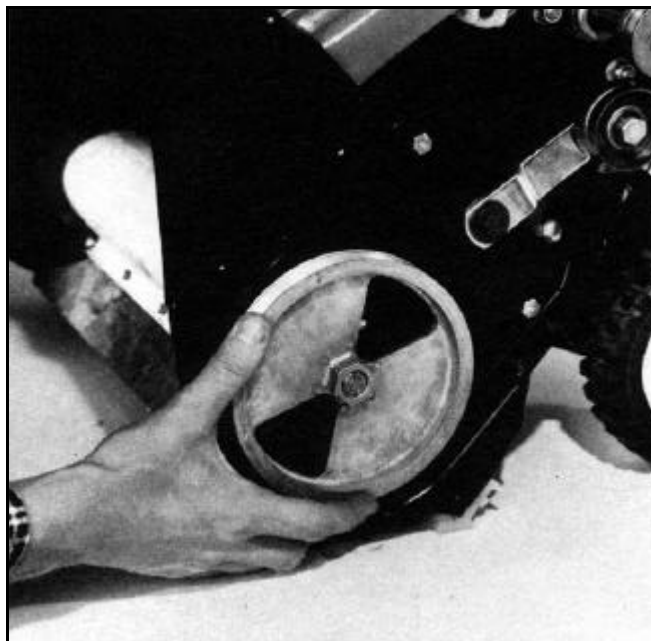


Figure 72

0217-044

End Cap/Shaft And Bearing Replacement For 1980 S-200's

1. Refer to "Replacing Drive Belt" on page 5 - 1. Complete steps 1 through 4.
2. Refer to "Rotor Pulley Replacement" on page 5 - 6. Complete step 2 only.
3. Remove all screws retaining the rotor paddles to the rotor halves. Also, remove the four self-tapping rotor screws, which locate the rotor halves in the correct position around the end cap assemblies (Figure 73). (**Note:** Earlier models may not have rotor location screws.) Remove rotor halves and paddles.

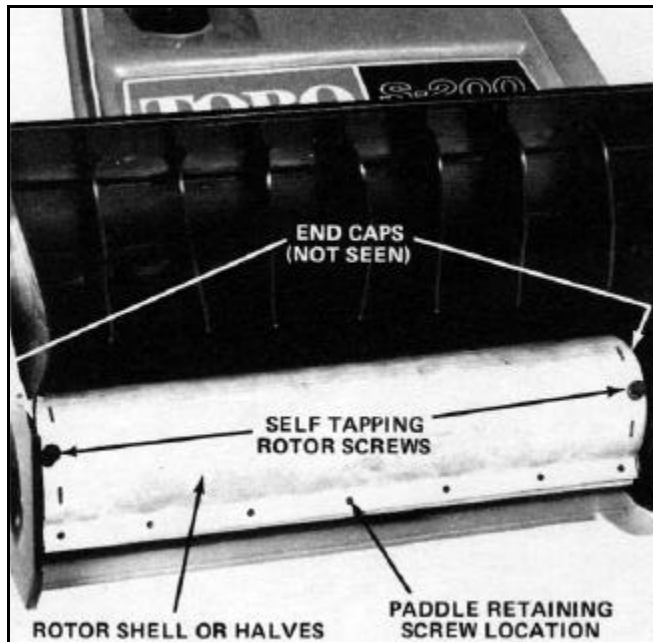


Figure 73

0217-045

4. R. H. (right hand) end cap/bushing and shaft servicing:
 - A. Slide the end cap/bushing assembly off the shaft (Figure 74). Should the bushing surface appear to be "walled" out (oval shaped), replace both the end cap/bushing assembly and the shaft mounted in the R. H. (right hand) side plate.

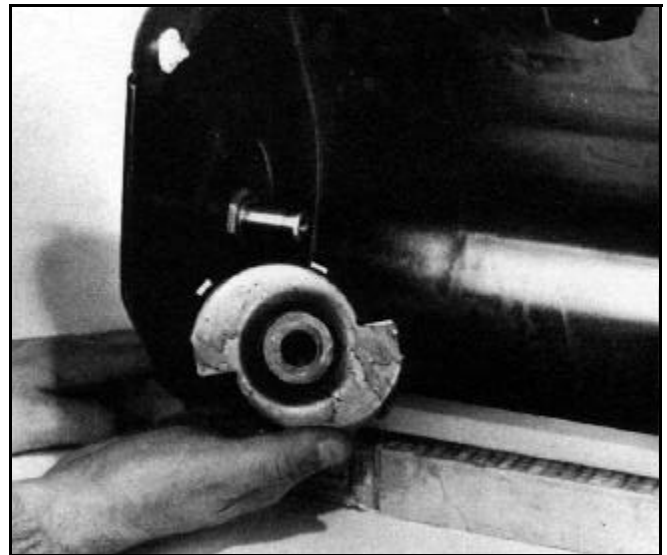


Figure 74

0217-046

5. L. H. (left hand) end cap/shaft and bearing servicing:
 - A. Remove the thin washer and spacer on the shaft.

DRIVE SYSTEMS

- B. Slide the end cap/shaft assembly from the bearing (Figure 75). If, upon your inspection, noticeable wobble exists between the end cap/shaft assembly and the bearing, both should be replaced.

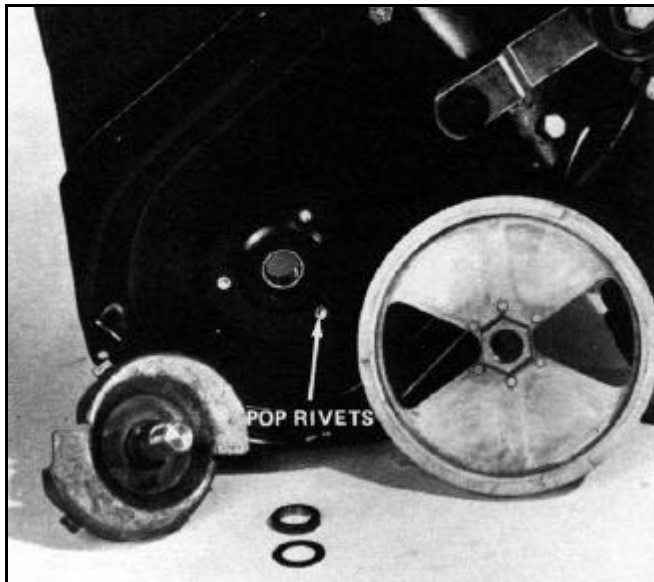


Figure 75

0217-047

Note: Often if the bearing should seize, heat is generated. The heat will cause the bearing and shaft to become blue in color. Again, both the end cap/shaft assembly and bearing should be replaced.

- C. To remove the bearing from the L. H. side plate, drill out three pop rivets retaining the bearing in the bearing retainer or flange (Figure 75). Replace the bearing and the bearing retainer. Use pop rivets (Toro P.N. 3292-7) to reassemble.

Note: A pop rivet gun can be obtained through many hardware stores in your area.

- D. Replace the end cap/shaft assembly.

6. Assemble rotor halves. To locate the rotor halves into the correct position in the end plates, loosely install the four self-tapping location screws (Figure 73).

7. Assemble both paddles to the rotor halves. Torque each screw 15 in-lbs (Figure 76). Lastly, tighten the four self-tapping rotor location screws. (**CAUTION:** Do not overtorque screws, the threads may be damaged.)

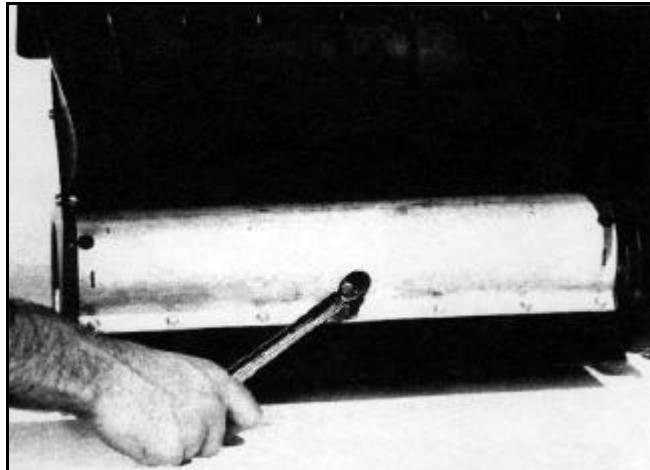


Figure 76

0217-048

8. Replace rotor pulley. Be certain to replace both the spacer and washer, before turning the rotor pulley onto the shaft (counterclockwise). Tighten the rotor pulley finger tight (Figure 72). The rotation of the pulley during the operation of the unit will tighten the pulley to the proper torque.
9. Replace belt. Refer to "Replacing Drive Belt" on page 5 - 1. Complete steps 5 through 7.

R.H. (Right Hand) End Cap/Shaft Replacement On 20" Snowthrowers Produced From 1975 To 1979

1. Refer to "End Cap/Shaft And Bearing Replacement For 1980 S-200's" on page 5 - 7. Perform steps 1 through 3.
2. Slide the end plate assembly off the shaft (Figure 74). Remove both screws retaining the rotor shaft to the R. H. side plate (Figure 77). If the bushing in the end plate is "wallowed" (oval shaped), replace the bushing, end cap, and rotor shaft.



Figure 77 0217-049

3. Refer to "End Cap/Shaft And Bearing Replacement For 1980 S-200's" on page 5 - 7. Complete steps 6 through 9.

L.H. (Left Hand) End Cap/Shaft And Bearing Replacement For 20" Snowthrowers Produced From 1977 To 1979

The L. H. (left hand) bearing replacement procedure for 20" snowthrowers manufactured between 1977 and 1979, is identical to bearing replacement servicing for 1980 S-200's. Refer to "End Cap/Shaft And Bearing Replacement For 1980 S-200's" on page 5 - 7. Perform the entire servicing procedure, steps 1 through 9.

L.H. (Left Hand) End Cap/Shaft And Bushing Replacement For 20" Snowmasters Produced In 1975 And 1976.

On the 20" Snowmasters manufactured in 1975 and 1976, the drive systems was designed with an oil impregnated bushing on the left side of the unit. Production after these years utilized a ball bearing design.

If a noticeable wobble exists between the bushing and drive shaft, replacement is necessary. Currently, Toro has a Rotor Bearing Replacement Kit for 20" Snowmasters produced in 1975 and 1976.

IMPORTANT: Although the ball bearing design is somewhat more tolerant to alignment differences, extreme care should be followed when installing the bearing kit.

The Rotor Bearing Replacement Kit consists of a template, an end cap/shaft, bearing flange or retainer, steel washer, a spacer, three machine screws and locknuts, and a bearing (Figure 78). (P.N. 38-7360).

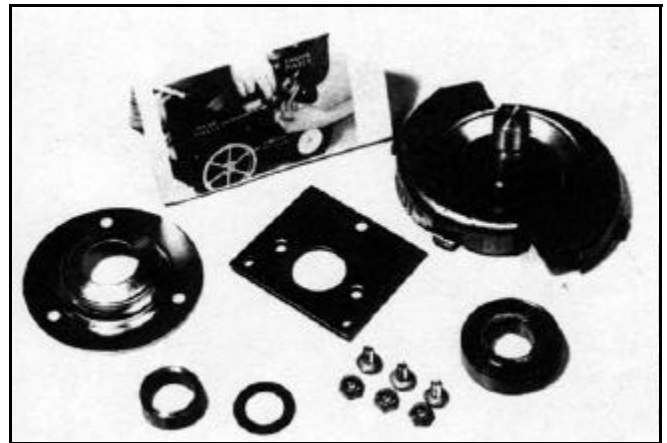


Figure 78 0217-050

1. Drain the fuel tank. Refer to "Draining The Fuel Tank" on page 2 - 5. Complete steps 1 and 2.
2. Remove drive cover and belt. Refer to "Replacing Drive Belt" on page 5 - 1. Complete steps 2 through 4.
3. Remove rotor pulley. Refer to "Rotor Pulley Replacement" on page 5 - 6. Complete step 2.
4. Remove rotor halves and paddles. Refer to "End Cap/Shaft And Bearing Replacement For 1980 S-200's" on page 5 - 7. Complete step 3.

DRIVE SYSTEMS

- Remove screws securing rotor bearing to left sideplate and remove end cap (Figure 79).

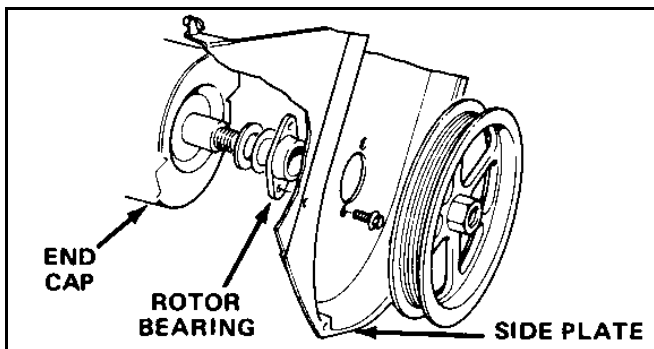


Figure 79 0217-051

- Using hole template, locate and mark new mounting holes as shown in Figure 80.

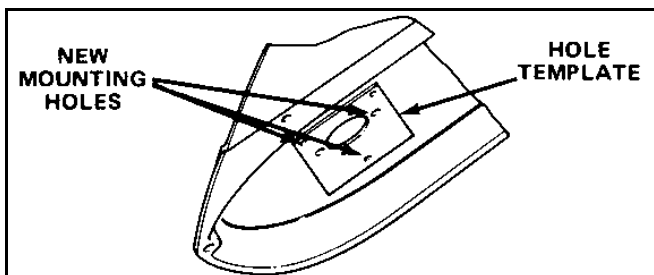


Figure 80 0217-052

- Drill (3) 3/16 diameter holes in sideplate. Pack the inside of the bearing flange with enough heavy grease to fill excess space in the cavity when bearing is inserted (Figure 81).

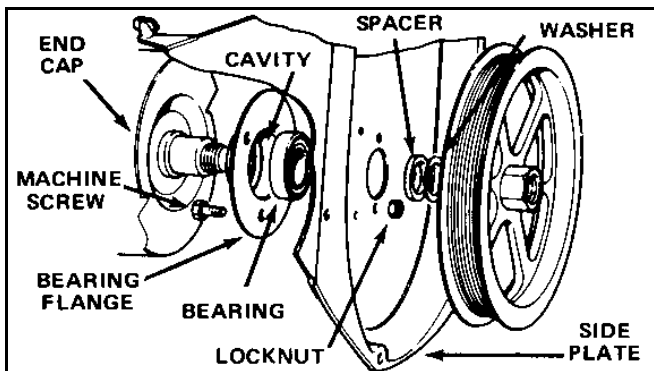


Figure 81 0217-053

Mount the bearing flange and bearing to the sideplate with (3) machine screws and locknuts (Figure 81).

Slide the end cap shaft through bearing flange, bearing, and sideplate (Figure 81).

Install the spacer, washer, and rotor pulley on the end cap shaft. Tighten the rotor pulley by turning nut counterclockwise finger tight (Left hand thread) (Figure 81.).

Note: The rotation of the rotor pulley during operation will tighten the pulley to the correct torque.

- Assemble the rotor halves and paddles. Refer to "End Cap/Shaft And Bearing Replacement For 1980 S-200's" on page 5 - 7. Complete steps 6 and 7.

IMPORTANT: Some earlier units were not designed with the four self-tapping rotor locating screws. After the rotor halves are secured to the new end cap, holes must be drilled. Using holes in the rotor halves as guides, drill (2) 7/32" holes in end cap (Figure 82).

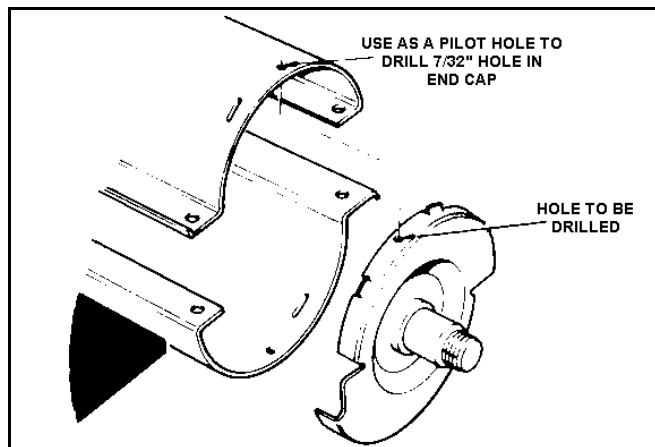


Figure 82 0217-054

- Reinstall belt. Refer to "Replacing Drive Belt" on page 5 - 1.

DRIVE SYSTEMS

In the 1999 manufacturing year, some models were built with the spring loaded idler system and some with the handle controlled rotor engagement. Although the pulleys and idler on Powerlite models are in the same locations and function the same as the older models, the belt is different. All Powerlite's and some CCR 1000's use a conventionally shaped V belt instead of the flat multi-grooved belt used on older models and all other CCR models.

Spring Loaded Idler System

To access the drive system, remove the belt cover on the left hand side of the machine. The belt drive system is now fully exposed. The belt is routed as shown in Figure 84.

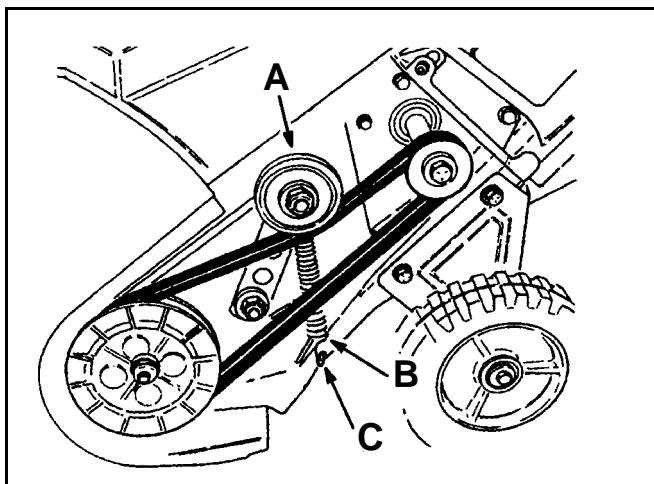


Figure 84

0623-06

- | | |
|------------------|-----------|
| (A) Idler Pulley | (C) Notch |
| (B) Idler Spring | |

To remove the belt, pull the idler pulley upward and pull the belt out from under the idler, release the idler slowly. The belt can now be rolled off the rotor pulley. To replace the belt, route around the engine pulley, then around the rotor pulley, then finally pull the idler upward and locate the belt under the idler. In order for the system to function, the idler pulley must be free to rotate and the idler arm must be free to pivot (Figure 85). If the idler pulley can not take up the slack in the belt, either the belt is badly worn and must be replaced or one of the pulleys has failed.

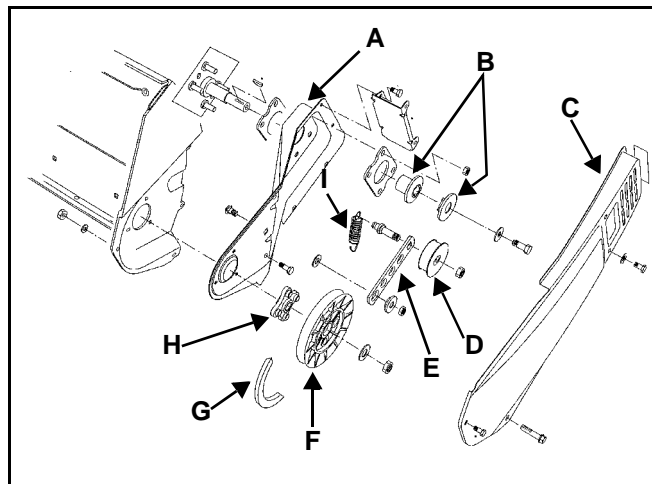


Figure 85

0309-11

- | | |
|------------------------|------------------|
| (A) Side Plate | (E) Idler Arm |
| (B) Engine Pulley Half | (F) Rotor Pulley |
| (C) Belt Cover | (G) Belt |
| (D) Idler Pulley | (H) Hub |
| | (I) Idler Spring |

Bail Controlled Rotor Engagement System (1999 And Newer Powerlites And All 20" CCR Models)

The basic parts of this system are identical to the spring loaded idler system. The difference is that the idler arm has been replaced with a combination idler and brake arm (Figure 86). The idler/ brake arm is controlled by a cable from a bail on the upper handle. With the belt cover removed the idler/brake arm is visible. There is a spring connected to the idler/brake arm. However, in this application the spring applies pressure to disengage the belt and engage the rotor brake. When the operator squeezes the bail, the idler is pulled down, tightening the belt and disengaging the brake. Because this system has the belt both tight and loose, a belt guide is necessary to prevent the belt from falling off the engine pulley when disengaged. The arms on the belt guide should be about 1/8" from the back side of the belt, when the belt is engaged.

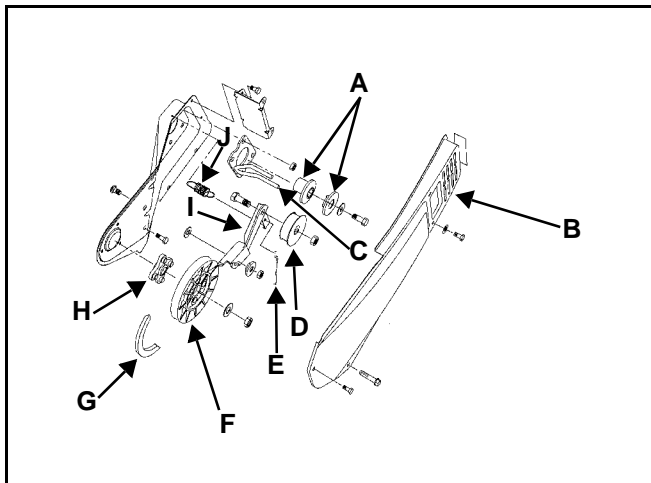


Figure 86

0309-09

- | | |
|-------------------|---------------------|
| (A) Engine Pulley | (F) Rotor |
| (B) Belt Cover | (G) Belt |
| (C) Belt Guide | (H) Hub |
| (D) Idler Pulley | (I) Idler/Brake Arm |
| (E) Cable | (J) Brake Spring |

Rotor Cable Adjustment

The objective for proper adjustment is that the cable should be as tight as possible, yet allowing enough slack that the belt fully disengages and the brake is applied when the handle is released (Figure 87).

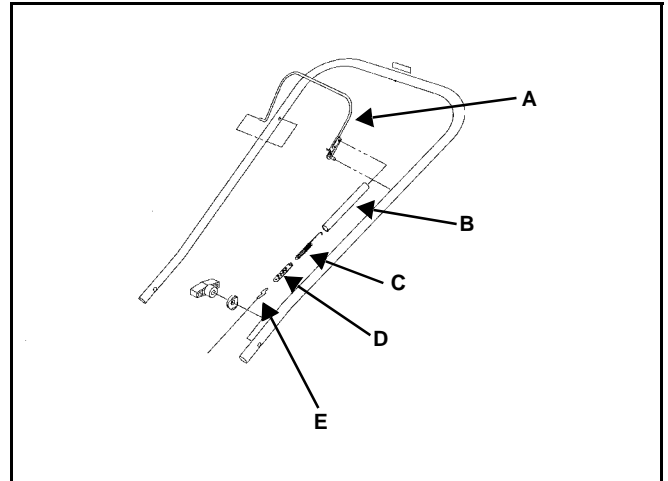


Figure 87

0309-08

- | | |
|------------------|--------------------|
| (A) Bail | (D) Cable Adjuster |
| (B) Spring Cover | (E) Cable |
| (C) Spring | |

The bail on the upper handle has two holes. The standard position is in the hole closest to the pivot. (The outer position is intended for temporary use. If the belt starts to slip while blowing snow, the cable can be easily moved to the outer hole in the bail. This provides extra travel and belt tension to allow finishing the job.) Following the cable down, locate the spring cover and pull it back to expose the end of the cable and the cable adjuster. With the bail released, select the hole that allows a minimum slack in the cable. Slip the spring cover back into position.

Remember a new belt will wear in during the first use and readjustment will be necessary.

DRIVE SYSTEMS

BELT REPLACEMENT

The belt drive models use one of two systems; the spring loaded or constant tension system and the control bail system. Depending on the model you might see a standard V belt or a wide flat belt with several V grooves. Note there are two versions of the multi-groove belt. While they look alike, there is a difference in width. Use the parts list for your model to assure you use the correct belt for the application.

To Replace The Drive Belt On A Constant Tension System

Remove the belt cover on the left hand side of the machine. Typically there are 5 fasteners holding the belt cover on. Those in the front near the rotor are bolts with locknuts. In the rear of the cover, there are self-tapping screws. With the cover off, the drive system is exposed. Lift the idler pulley and slide the belt out towards you. Release tension on the idler slowly. Then slip the belt off the engine and rotor pulleys. With the belt removed, visually inspect the rotor and engine pulleys for damage or wear and replace as necessary. Inspect the idler pulley and the idler arm to ensure free rotation and smooth travel. The idler spring has one end hooked into the idler arm and the other is typically hooked into a notch in the frame directly below the idler. To install a new belt, route the belt around the engine and rotor pulleys. Then pull the idler arm upward and slip the belt under the pulley. The arm must sit on top of the belt and push it downward.

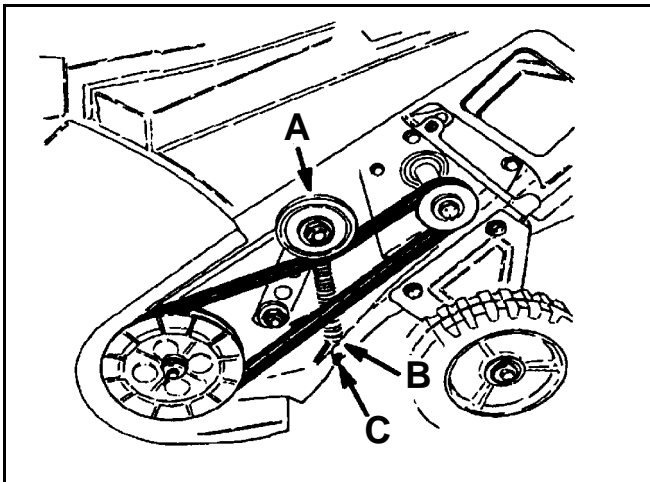


Figure 88

0623-05

- | | |
|------------------|-----------|
| (A) Idler Pulley | (C) Notch |
| (B) Idler Spring | |

Belt Replacement, Bail System

Remove the belt cover (Figure 89).



Figure 89

1854-04

The drive system is now exposed. Pull the idler pulley up and slip the belt out from under the pulley, release tension on the idler slowly. Slip the belt off the engine and rotor pulleys and from under the brake arm assembly.

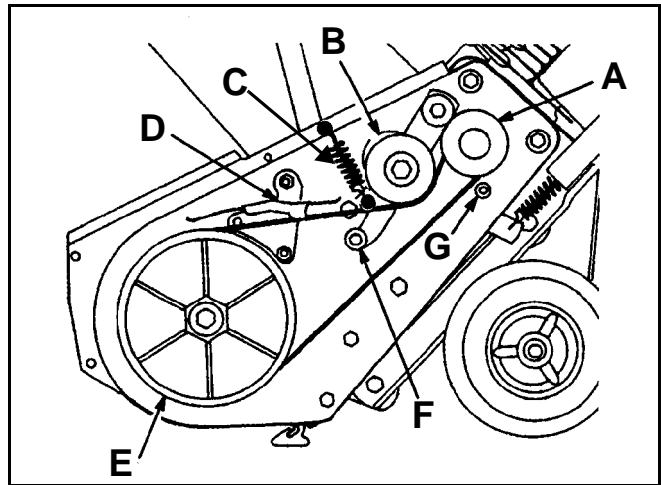


Figure 90

0623-10

- | | |
|------------------------|------------------|
| (A) Engine Pulley | (E) Rotor Pulley |
| (B) Idler Pulley | (F) Roller |
| (C) Brake Spring | (G) Belt Guide |
| (D) Brake Arm Assembly | |

Reverse the process to install the new belt. Note the belt must route under the brake and idler pulley. See Figure 90.

BELT/PULLEY ALIGNMENT

While perfection is not required in this application, the pulleys should be aligned fairly close. Use a straight edge long enough to run from the lower end of the rotor pulley to the upper end of the engine pulley. Applying the straight edge to the two pulleys will indicate how close the pulleys are to being in line. Within 1/8" of alignment will provide good belt life.



Figure 91

1352-06

ADJUSTING PULLEY ALIGNMENT

Powerlite Models

On Powerlite models, neither the rotor or engine pulleys can be moved inward. However, either pulley could be shimmed out using spacer washers. Adding a spacer washer between the hub and rotor pulley or between the engine pulley and the shoulder on the crankshaft would shim the pulley outward.

CAUTION: Excessive shimming may cause the pulley to contact the belt cover. Be sure to test fit the cover to make sure there is no contact.

The bolt on the engine pulley and the locknut on the rotor pulley are both counterclockwise to remove.

Note: If you do not have an impact wrench, it may be necessary to hold the crankshaft or the rotor in order to loosen the nut or bolt.

During reassembly torque the engine pulley bolt to 225 in-lbs (2540 ± 280 N·cm) and the rotor pulley to 55 ± 5 ft-lbs (75 ± 7 N·m).

20" CCR models have an engine pulley that is held on with two set screws. Move the engine pulley in or out to achieve alignment. Tighten the engine pulley set screws with the square head screw first, then the hex head screw (Figure 92). Torque both to 120 -150 in-lbs (1356 N·cm - 1695 N·cm).

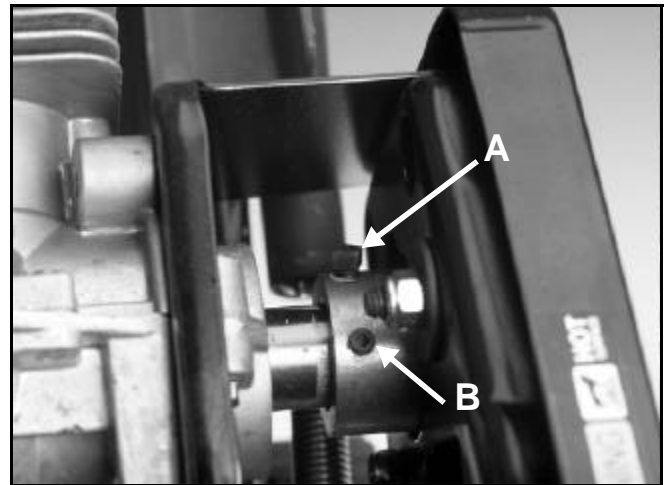


Figure 92

1854-02

(A) Square Head Screw (B) Hex Head Screw

ENGINE PULLEY REPLACEMENT

Powerlite Models

The Powerlite models have the engine pulley keyed to the crankshaft and retained with one bolt through the pulley into the end of the crankshaft (Figure 93). The preferred method of removing this bolt is with an impact wrench. However, if an impact wrench is not available, any wrench of the proper size will work. It will be necessary to hold the crankshaft with a vise grip or other tool to prevent rotation. When installing the new pulley, install the key in the crankshaft, slide the pulley half over the key. Apply blue Loctite to the screw and secure both pulley halves with the capscrew. Follow the steps under "ADJUSTING PULLEY ALIGNMENT" on page 5 - 15.

DRIVE SYSTEMS



Figure 93

1854-34

20" CCR Models

The 20" CCR models have the engine pulley mounted with a key and two set screws (Figure 92). Loosen the set screws and the pulley will come straight off. When installing a new pulley, apply blue Loctite to the set screws, install the key in the crankshaft. Adjust and tighten the setscrews as indicated in "ADJUSTING PULLEY ALIGNMENT" on page 5 - 15.

ROTOR PULLEY REPLACEMENT

Powerlite Models

Remove the belt cover on the left hand side of the machine. Remove the belt (Refer to "Replacing Drive Belt" on page 5 - 1). Wedge a 2x4 into the paddles to prevent rotation. Rotate the locknut in the center of the pulley counterclockwise to remove (Figure 93). Pull the pulley straight off.

To replace the pulley, place the pulley on the hub, making sure the 4 lugs in the hub engage the holes in the pulley (Figure 94). Install the washer and locknut. Either use a new locknut or apply blue Loctite or equivalent to the threads. Torque the nut to 16 ± 2 ft-lbs (22 ± 3 N·m).



Figure 94

1854-25

20" CCR Models

Remove the belt cover on the left side of the machine. Remove the belt (Refer to "Replacing Drive Belt" on page 5 - 1). Wedge a 2x4 into the paddles to prevent rotation. Turn the bolt in the center of the pulley counterclockwise to remove. Pull the pulley straight off to remove (Figure 95). Note the pulley and shaft are connected with a key. It may stay in the shaft or come off with the pulley.

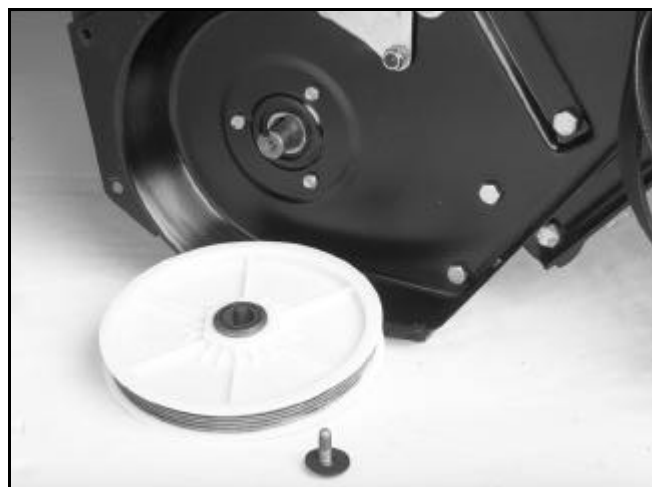


Figure 95

1854-01

To replace the pulley, make sure the key is in place and slide the pulley on the shaft. Install the washer and bolt. Torque the bolt to 53 ± 7 in-lbs (599 ± 79 N-cm).

IDLER ARM / IDLER PULLEY REPLACEMENT

Powerlite Models

Remove the belt cover.

Unhook the idler spring and slip the belt off the idler pulley, note or mark where the idler spring attaches. The idler pulley can now be removed by removing the single bolt and nut that holds the pulley to the idler arm (Figure 96).

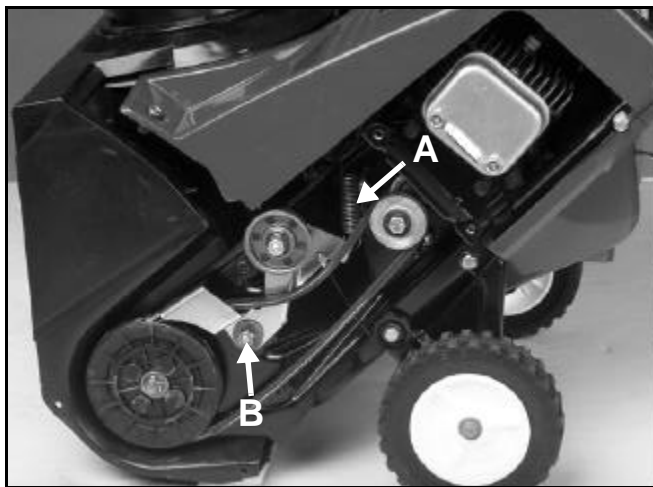


Figure 96 1854-35

(A) Spring

(B) Carriage Bolt and Nut

Idler Arm Removal

The idler arm pivots on the end opposite the pulley. As a carriage bolt is used as the pivot bolt, only one wrench is needed to remove the pivot nut. Reach behind the idler plate and press the bolt head into the side plate. The square head of the bolt will keep it from turning. **Note:** The orientation of the idler bushing. Either pull the idler bolt out of the frame or tape it in place to keep it from falling out. The idler pulley can now be removed from the idler arm. Before installing the pulley, wipe the idler pin clean, and if undamaged, apply a light coat of grease to the shaft before installing the pulley. Either replace the locknut or apply blue Loctite to the threads before torquing the nut to 16 ± 2 ft-lbs (22 ± 3 N-m).

ASSEMBLY

Install the carriage bolt through the side plate then the washer and idler arm. Apply a light coat of grease to the arm and bushing. The shoulder on the idler bushing must slide into the hole in the idler arm. Install a new locknut or use blue Loctite on the threads. Torque the nut to 16 ± 2 ft-lbs (22 ± 3 N-m). Check the idler arm for free movement. Install the idler spring, belt, and belt cover.

20" CCR STYLE IDLER ARM

Remove the belt cover (Figure 97). Unhook the brake spring, note or mark the location of the spring hooks. The idler pulley can now be replaced. Be sure to use a new locknut or blue Loctite on the threads.



Figure 97 1854-04

If the nylon brake roller must be replaced, it is best to remove the idler arm assembly. The brake roller is retained with a push nut. To remove the old push nut, it is necessary to cut them with a side cutter. To install a new push nut, it must be driven on with a hammer. If the idler arm is removed from the machine, it will be much easier to install the new push nut.

CCR2000 IDLER ARM REMOVAL

Remove the belt cover. Note the location of the hooks on the idler spring and unhook one end of the spring. The idler arm pivots on a special shoulder bolt. To remove this bolt, remove the upper shroud for access to the locknut on the back side of the side plate. When you remove the shoulder bolt, note the location of the washers for assembly. Apply a light coat of grease to the idler pivot. Tighten the bolt and locknut to 16 ± 2 ft-lbs (22 ± 3 N-m).

DRIVE SYSTEMS

ROTOR BEARING/ ROTOR SHAFT REPLACEMENT

Powerlite Style

Remove the belt cover and drive belt. Wedge a block of wood in the rotor and remove the locknut holding the rotor pulley in place. Remove the rotor pulley and hub. The bearing will now slide off the shaft. Note there is a sleeve inside the bearing; slip it out of the bearing (Figure 98).

Next remove the 3 capscrews that hold the bearing flange (Figure 98). There are 3 more capscrews on the opposite side of the snowthrower holding the bearing flange on that side (Figure 99). Remove them at this time.



Figure 98

1854-24



Figure 99

1854-33

Loosen the 4 screws on the right side of the machine several turns (Figure 100). Push the rotor towards the drive side and spread the rotor housing (Figure 101). Pull the right side (opposite the drive) of the rotor forward until it clears the housing. The drive side of the rotor can now be pulled out of the housing (Figure 102). The bearing on the right side (opposite the drive) of the rotor is retained by a nut (Figure 103). It will be necessary to hold the rotor shaft in a vise or with a pipe wrench or vise grip in order to remove the nut.

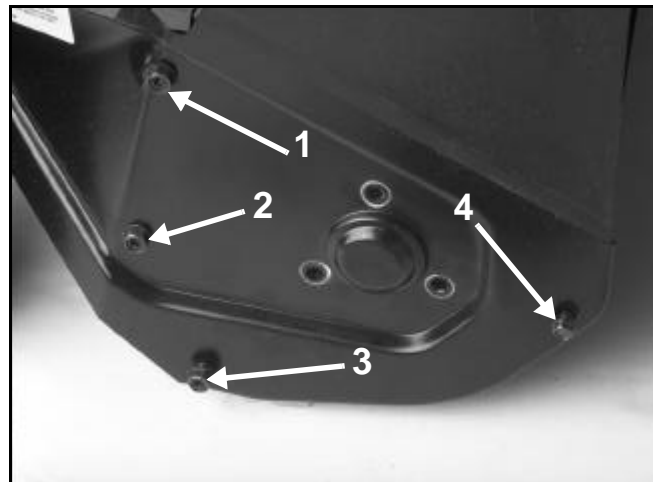


Figure 100

1854-15



Figure 101

1854-23



Figure 102

1854-22

20" CCR Style

The 20" CCR rotor has only minor differences when compared to the Powerlite. The rotor pulley is attached to the rotor shaft with a key and a bolt (later models have the key built into the pulley). The bearing retainers are slightly different in that some of them have threaded studs in place of bolts. On the side opposite the drive, the outer bearing flange is a separate part. With the exception of these things, the Powerlite procedure is used.

DRIVE SYSTEM (CHAIN) SNOW PUP - S-140

The Toro chain drive system, found on all Toro 14" and 21" single stage snowthrowers has not changed to any great degree since originally designed for the first Snow Pup in 1965.

Lubrication:

All the bearings used on the Toro 14" and 21" snowthrowers are lubricated for life at the factory and require no additional lubrication. However, a few drops of light machine oil on the drive chain once a year will adequately lubricate the chain and sprockets.

Components And Operation

The major components to the 14" and 21" chain drive system include the engine sprocket, impeller sprocket and drive chain (Figure 104). Power is transferred from the engine sprocket, which is keyed to the engine crankshaft, by a chain to the larger impeller sprocket fastened to the rotor halves.



Figure 103

1854-21

(A) Bearing

(B) Nut

NOTE: Do not damage the splines or threads in an attempt to hold the shaft while removing the nut.

New bearings can now be installed on the shaft. Tighten the nut retaining the right side bearing (opposite the drive) to 200 - 300 in-lbs.

Assembly

After the new bearings are installed, the rotor can be reinstalled. Insert the drive side first and push the rotor towards the drive side, spread the rotor housing, and insert the non drive side into the hole in the housing.



Figure 104

0217-064

DRIVE SYSTEMS

Chain Adjustment Procedure (all models)

Proper chain adjustment is critical to all 14" and 21" single stage snowthrowers. If the chain is too slack or misaligned, the teeth of the impeller sprocket can shear. Also, if the chain is loose, the stripper assembly can break. If the chain is too tight, the drive system can bind, or potentially, break the crankshaft. When properly adjusted, the chain should be snug, with not more than 1/8 inch deflection or slack. If an adjustment is necessary, proceed with the following:

1. Drain the fuel from the fuel tank. Refer to "Draining The Fuel Tank" on page 2 - 5. Complete step 1.
2. Remove the chain guard from the left side of the unit.
3. Remove the upper and lower shrouds by removing the fuel cap and mounting screws. After removing the shrouding, reinstall the fuel cap. Disconnect the spark plug lead wire.
4. Loosen the four engine mounting nuts on the left side of the engine (Figure 105).

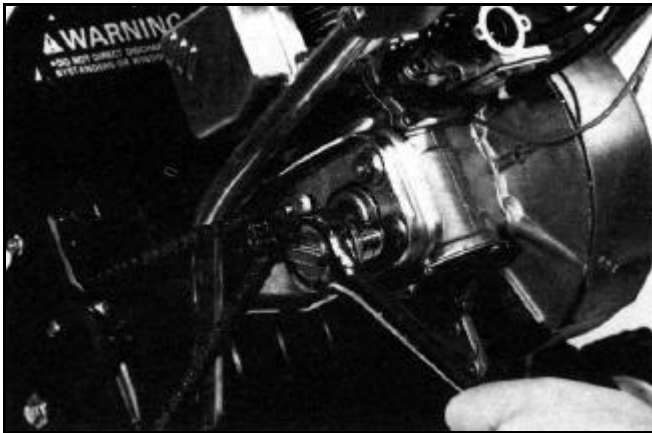


Figure 105

0217-056

5. Loosen one bolt on the starter housing located on the right side of the engine (Figure 106).

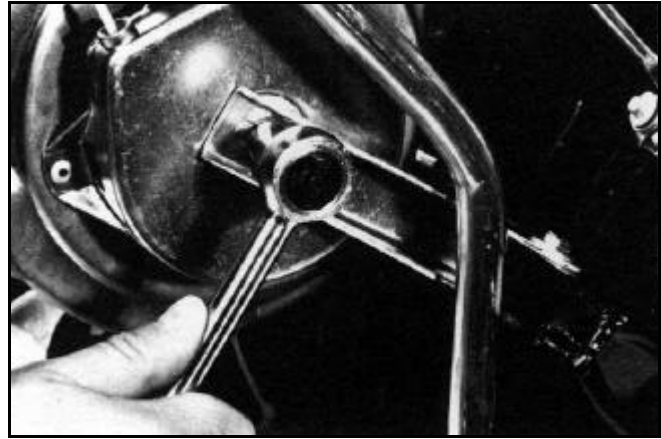


Figure 106

0217-057

6. Pull the engine back until the chain is snug, with no more than 1/8 inch deflection or slack (Figure 107).

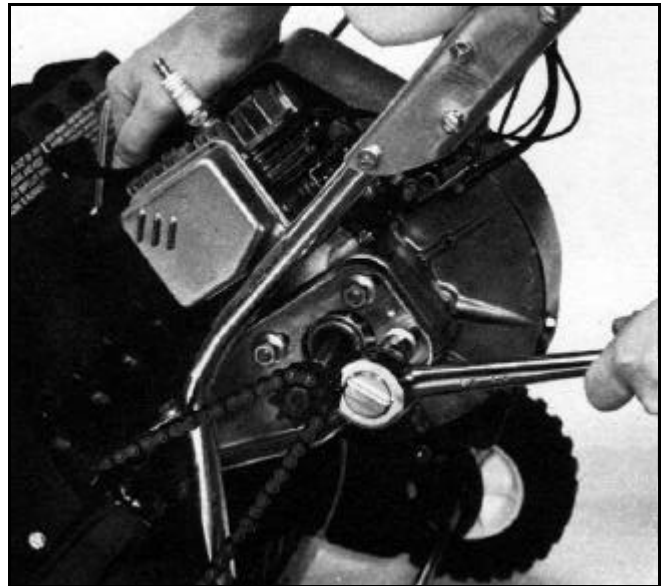


Figure 107

0217-058

7. Retighten the four bolts in the sequence shown (Figure 108). Then tighten the starter housing bolt on the right side of the unit (Figure 107). The four nuts located on the crankshaft side (left side of unit) of the engine should be torqued to 170 - 220 in-lbs. The bolt on the starter housing should be torqued to 90 - 120 in-lbs.

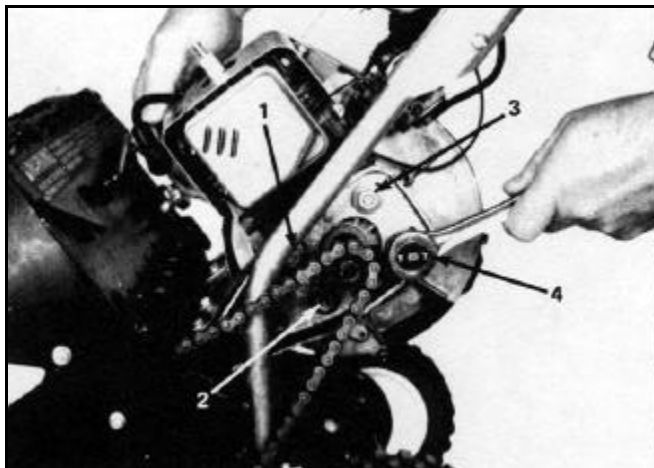


Figure 108

0217-059

Note: Not following the tightening sequence can lead to crankshaft breakage due to excessive stress. Also, if the four nuts are over tightened, the engine casting may break.

Note: Never attempt to install the chain to the engine sprocket by rolling the chain onto the sprocket with the engine firmly mounted to the equipment.

8. Replace the shrouding, chain guard, spark plug, and lead wire.

Crankshaft Sprocket Replacement (all models)

1. Refer to "Chain Adjustment Procedure (all models)" on page 5 - 20. Complete steps 1 through 5.
2. Slide the engine forward until the chain is slack.

3. Using a needle nose pliers, remove the locking clip on the master connecting link of the chain. Remove the chain (Figure 109).



Figure 109

0217-060

4. Using the appropriate allen wrench, loosen the allen head screws on the crankshaft sprocket (Figure 110). Remove the old sprocket from the crankshaft.



Figure 110

0217-061

DRIVE SYSTEMS

5. It will be necessary to align the keyway (slot) of the crankshaft sprocket with the location key on the crankshaft (Figure 111). Should the locating key on the crankshaft show signs of wear, it may be necessary to replace the key.

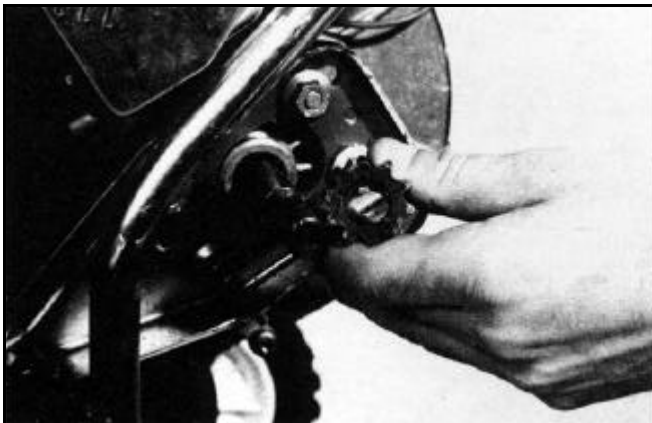


Figure 111 0217-062

6. From the rear of the unit, visually align the crankshaft sprocket and chain with the impeller sprocket. Once the sprocket and chain have been installed (Figure 112) it is essential the chain be aligned properly. If not, crankshaft or sprocket damage will occur. **Note:** Figure 112 shows an improperly aligned chain and sprocket.

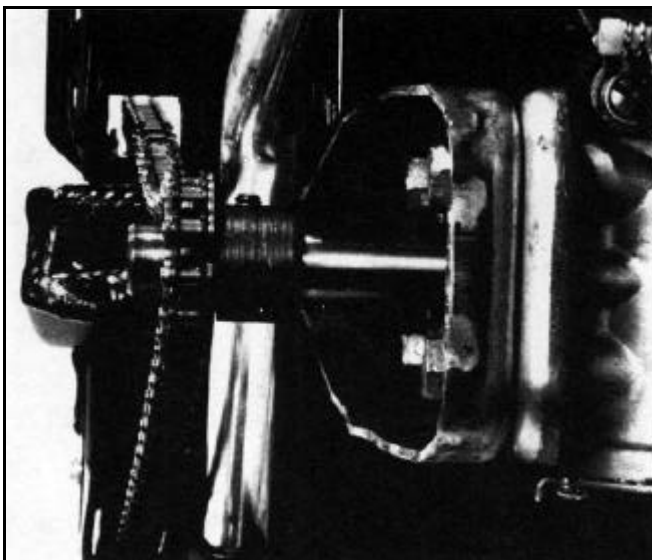


Figure 112 0217-063

7. After aligning the chain, tighten the allen head screws on the crankshaft sprocket (Figure 113).



Figure 113 0217-064

8. Pull the engine back until the chain is snug, with no more than 1/8 inch deflection or slack (Figure 107).
 9. Retighten the four bolts on sequence illustrated in the Chain Adjustment procedure (Figure 108). Torque to 170 - 220 in-lbs. Then tighten the starter housing bolt, on the right side of the unit, 70 - 120 in-lbs. (Figure 106).
- Note:** Not following this tightening sequence can lead to crankshaft breakage.
10. Replace the shrouding, chain guard, and spark plug lead wire.

L.H. And R.H. (Left Hand And Right Hand) End Cap/ Bushing Replacement (1972-1980) 14" And 21" Models

Note: Left hand end cap contains the impeller sprocket. The proper chain adjustment, discussed earlier, is essential to the service life of the impeller sprocket. If the chain is too loose, the impeller sprocket teeth can shear while operating under load. Also, when the chain is loose, the bushings can "wallow" (become oval shaped) out. To replace, proceed with the following:

1. Refer to "Crankshaft Sprocket Replacement (all models)" on page 5 - 21. Complete steps 1 and 2.

2. Using a needle nose pliers, remove the locking clip on the master connecting link of the chain (Figure 109). The master link can now be pulled apart.
3. After removing the chain from the impeller and crankshaft sprockets, remove the two self-tapping screws retaining the stripper assembly (Figure 114 and Figure 115).



Figure 114

0217-065



Figure 115

0217-066

4. Next, remove all four bolts, two on the left side of the impeller housing and two in the right side of the impeller housing (Figure 116). Remove the entire rotor assembly and stripper from the snowthrower housing (Figure 115 and Figure 117).



Figure 116

0217-067

5. Next, remove the rotor shafts from the rotor bushings at the impeller sprocket end cap and the right hand end cap (Figure 118).

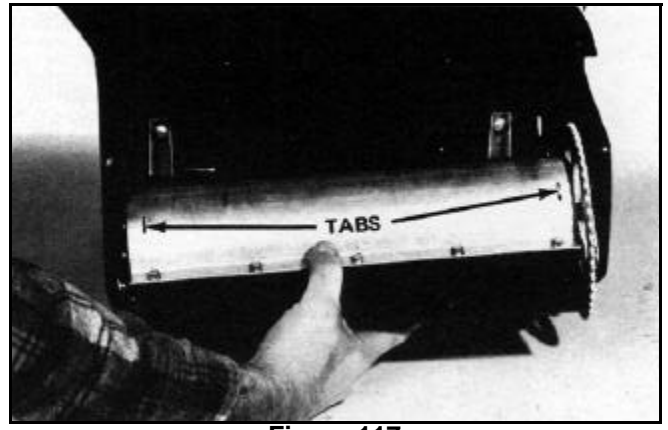


Figure 117

0217-068

DRIVE SYSTEMS

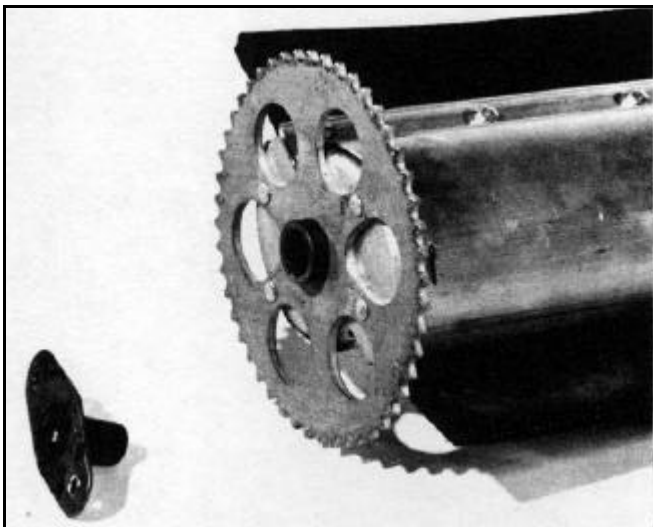


Figure 118

0217-069

6. Remove all screws retaining the rubber paddles to the rotor shells (Figure 119).

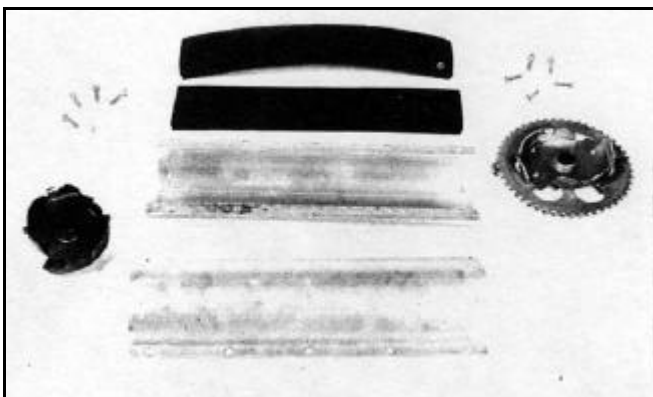


Figure 119

0217-070

7. Remove the impeller sprocket/end cap assembly from both rotor shells (Figure 119).
8. When replacing with the new impeller sprocket/end cap assembly, be certain to align the small tabs on the end plate with the slots in the rotor shells (Figure 117). The same procedure is also used on the right hand end cap.

9. After fitting the new end caps in position, slide the paddles into position and reinstall the screws (Figure 120). The screws that hold the impeller assembly together should be torqued to 15 in-lbs. (DO NOT OVERTORQUE!)

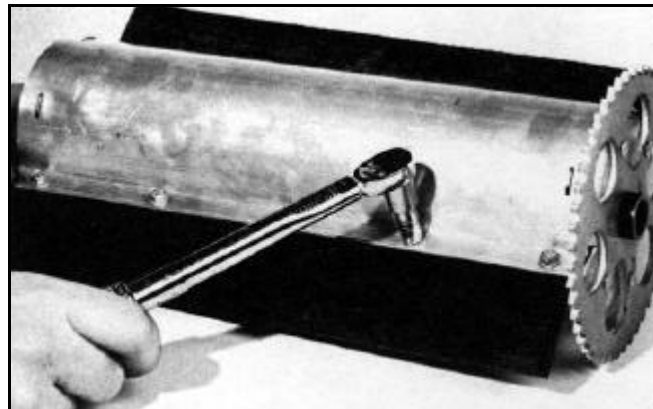


Figure 120

0217-071

10. When replacing the end caps, the rotor shafts should also be replaced.
11. Slide the rotor shell assembly back into the housing of the snowthrower and align the rotor shafts with the four mounting holes. Tighten all four carriage bolts (Figure 116).
12. Reinstall the stripper assembly over the impeller sprocket with both self-tapping screws (Figure 115). (**Note:** The mounting holes for the stripper assembly are slotted. Rotate the impeller assembly to assure the impeller sprocket moves freely within the stripper assembly.) Should the stripper assembly be worn, replace.

13. Place the chain around both sprockets (Figure 121). Install the master connecting link. When reinstalling the locking clip, slide the clip over one end of the master connecting link, and with the use of a needle nose pliers, lift the other end of the locking clip in place.



Figure 121

0217-072

14. Pull the engine back until the chain is snug, with no more than 1/8 inch deflection or slack (Figure 107).
15. Retighten the four bolts in sequence as illustrated in the Chain Adjustment Procedure (Figure 108). Torque to 170 - 220 in-lbs. Then tighten the starter housing bolt, on the recoil starter housing, 70 - 120 in-lbs (Figure 106).
16. Replace the shrouding, chain guard, and spark plug lead wire.

Impeller Sprocket/Tube Assembly And Bushing Replacement (1965 - 1971) 14" And 21" Models

As discussed in the "Chain Adjustment Procedure (all models)" on page 5 - 20, the proper chain tension is critical to the impeller sprocket service life. The correct chain tension, when properly maintained, will also increase the life of the rotor shafts and bushings.

Should the impeller sprocket, bushings or rotor shafts need replacement, proceed with the following:

1. Refer to "Crankshaft Sprocket Replacement (all models)" on page 5 - 21. Complete steps 1 and 2.
2. Using a needle nose pliers, remove the locking clip on the master connecting link of the chain (Figure 109). Remove master link and remove the chain.

3. After removing the chain, remove the four bolts, two on the left side and two on the right side of the impeller housing, retaining the paddles, impeller sprocket, bushings, and rotor shafts (Figure 116).
4. Remove the entire impeller assembly from the snowthrower (Figure 117).

Note: If your unit is equipped with a stripper assembly, remove the two self-tapping screws, and remove from the housing (Figure 114 and Figure 115).

5. Remove both rotor shafts from each end of the sprocket and tube assembly (Figure 119). Inspect shafts, bushings, and sprocket.
6. Remove all screws retaining paddles to sprocket/tube assembly (Figure 119). (Note position of reinforcing strap over paddles.)
7. Replace with a new sprocket/tube assembly. It is a good idea to also replace the bushings and rotor shafts at this time. Replace paddles if needed.
8. Slide new sprocket/tube assembly back into housing of snowthrower and align the rotor shafts with the four mounting holes. Tighten the four bolts (Figure 116).
9. Reinstall stripper assembly, if your unit is so equipped. Some stripper assemblies have slotted holes on the housing for the stripper to be adjusted.

Rotate the paddles to assure proper clearance. Should the stripper show wear, replace.
10. Refer to "L.H. And R.H. (Left Hand And Right Hand) End Cap/Bushing Replacement (1972-1980) 14" And 21" Models" on page 5 - 22. Complete steps 13 through 16.

Chain Replacement

Design of the 14" and 21" snowthrowers, like any mechanical product, is a compromise between durability, performance, and cost. After a period of time, moving parts, like the chain on your 14" and 21" snowthrower, are expected to wear out. This can be due to environmental effects, unusual use, irregular maintenance, and other causes.

DRIVE SYSTEMS

Should you need to replace the drive chain on your snowthrower, perform the following service procedure:

1. Refer to "Crankshaft Sprocket Replacement (all models)" on page 5 - 21. Complete steps 1 and 2.
2. Using a needle nose pliers, remove the locking clip on the master connecting link of the chain (Figure 109). The master connecting link can now be pulled apart and the old chain removed.

Note: When replacing the new chain, inspect both the crankshaft sprocket and impeller sprocket for unusual wear. It may be necessary to replace one or both sprockets. If sprocket replacement is needed, refer to the "Crankshaft Sprocket Replacement (all models)" on page 5 - 21, the "L.H. And R.H. (Left Hand And Right Hand) End Cap/Bushing Replacement (1972-1980) 14" And 21" Models" on page 5 - 22, and "Impeller Sprocket/Tube Assembly And Bushing Replacement (1965 - 1971) 14" And 21" Models" on page 5 - 25.

3. Place the chain around both sprockets (Figure 121). Install the master connecting link. Install the locking clip with the use of a needle nose pliers.

Note: If sprockets were also replaced with the chain, be certain to align the chain with respect to both sprockets. Refer to "Crankshaft Sprocket Replacement (all models)" on page 5 - 21, step 6.

4. Refer to "Crankshaft Sprocket Replacement (all models)" on page 5 - 21. Complete 7 through 10.

Rotor Shell Replacement (1972 - 1980):

Note: Does not apply to models prior to 1972 – the rotor shell design was not used.

1. Refer to "Chain Adjustment Procedure (all models)" on page 5 - 20. Complete steps 1 through 5.
2. Slide the engine forward until the chain is slack.
3. Using a needle nose pliers, remove the locking clip on the master connecting link of the chain (Figure 109). The master link can now be pulled apart.
4. Remove the chain from both the crankshaft sprocket and impeller sprocket.
5. Remove the four bolts retaining the rotor in the impeller housing (Figure 116). Two of the bolts are on the left side and two are on the right side of the impeller housing.
6. Remove the entire rotor shell assembly from the snowthrower (Figure 117).
7. Remove all ten screws retaining the rubber paddles to the rotor shells (Figure 119).
8. Replace the rotor shells. When replacing, fit the end cap tabs into the slots in the rotor shells.
9. Slide the paddles into position and torque the screws to 15 in-lbs (Figure 120). (DO NOT OVERTORQUE!)
10. After installing both rotor shafts in the bushings of the end plates, slide the rotor shell assembly back into the housing of the snowthrower, and align the rotor shafts with the four mounting holes. Tighten all four bolts firmly (Figure 116).
11. Refer to "L.H. And R.H. (Left Hand And Right Hand) End Cap/Bushing Replacement (1972-1980) 14" And 21" Models" on page 5 - 22. Proceed with steps 13 through 16.

Belt Driven Systems

S-620 Model 38162 — 5000001 and up.

The drive system uses a "through shaft" rotor design that is supported by two ball bearings (Figure 122).

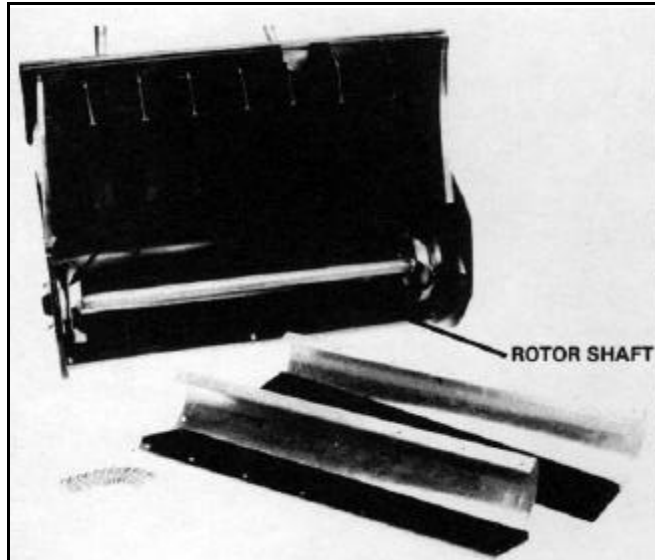


Figure 122

0406-001

Shaft And Bearing Disassembly

1. Remove the drive belt. Refer to "Replacing Drive Belt" on page 5 - 1. Complete steps 1 through 4.
2. Remove the rotor pulley by placing a block of wood as a wedge between the rotor assembly and the housing. With the use of a socket and breaker bar or ratchet turn the pulley in a clockwise direction (Figure 123). **NOTE:** The pulley has left hand thread.

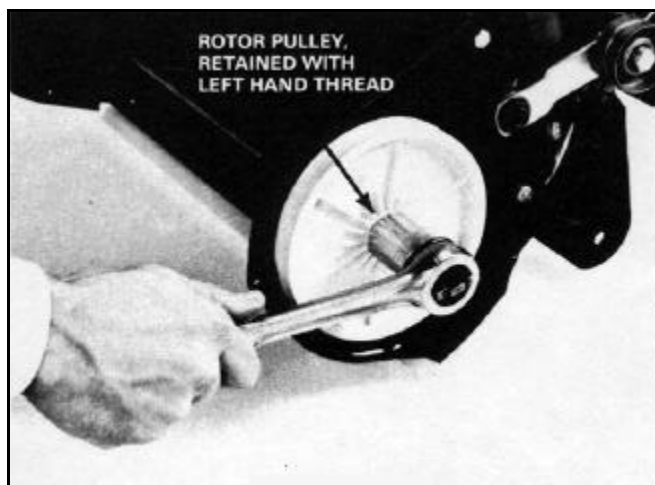


Figure 123

0406-002

3. Refer to page 6 - 7, step 3 for rotor paddle removal.
4. Remove the three nuts and washers securing the right hand bearing retainer (Figure 124).

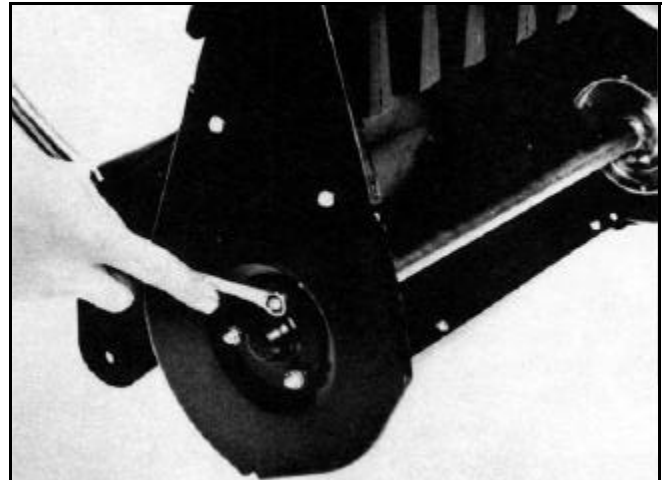


Figure 124

0406-003

5. Remove the bearing retainer, rubber washer, and the hexhead flange screw in the end of the rotor shaft (Figure 125). The bearing may now be removed and/or replaced.



Figure 125

0406-004

DRIVE SYSTEMS

6. If the shaft must be completely removed from the housing, remove the three screws retaining the right hand side plate to the rotor housing (Figure 126). Flex the side plate and withdraw the complete shaft, bearing flange, and thrust washer.

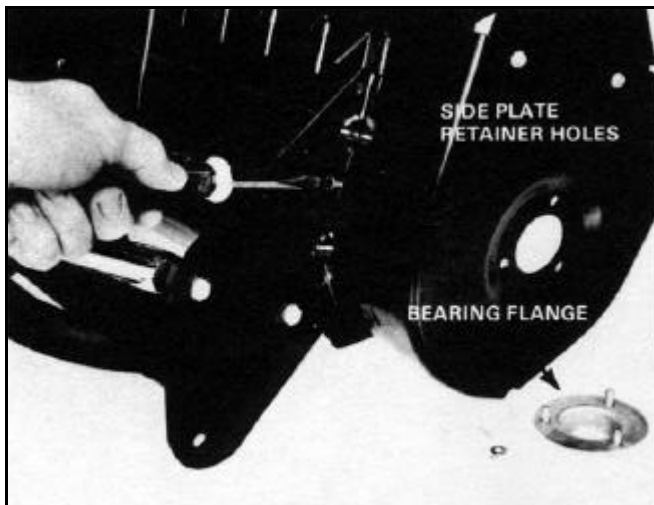


Figure 126

0406-005

7. If the left hand rotor bearing must be removed, drill out the rivets securing the bearing retainer or flange. When the bearing flange is installed, use three rivets (Figure 127).

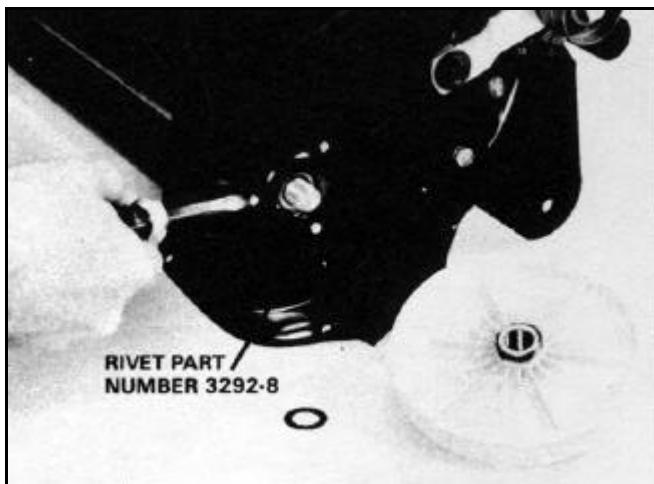


Figure 127

0406-006

Shaft And Bearing Reassembly

1. Insert the right hand bearing flange with studs attached.
2. Install thrust washer on the externally threaded end of the rotor shaft.

3. Flex the right hand side plate and insert the rotor shaft with externally threaded end through the left hand side plate and bearing.
4. Tighten all the side plate retaining screws previously loosened.
5. Install the remaining thrust washer on the internally threaded end of the rotor shaft.
6. Install the bearing on the rotor shaft.
7. Secure the bearing with the hexhead flange screw and washer.
8. Install the rubber sealing washer, bearing retainer, washers, and nuts.
9. Reinstall the rotor paddles and pulley. Refer to page 6 - 8, steps 6, 7, 8, and 9.

Wheel Bracket Replacement

Unlike the wheel bracket assembly used on the 1980 Model Toro S-200E, the S-620 wheel bracket/muffler assembly has an engine support bracket which is welded to it (Figure 128).

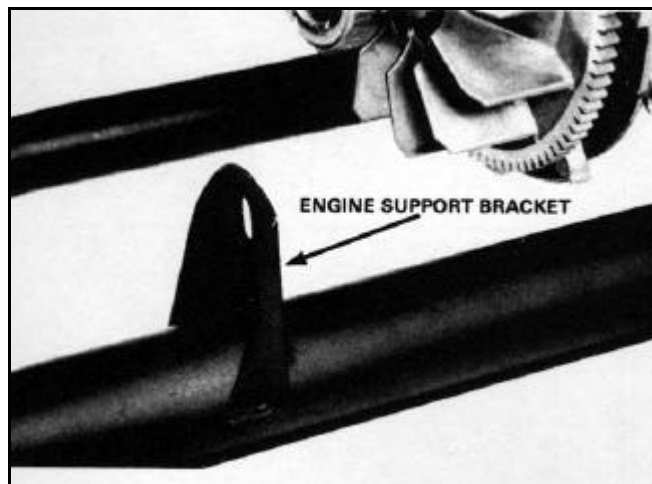


Figure 128

0406-007

To replace the wheel bracket assembly on Model S-620:

1. Drain all fuel from the fuel tank. Refer to page 2 - 5.
2. Remove the upper shroud. After removing the upper shroud, place the gas cap on the gas tank.
3. Remove the flange nut and cap screw at the base of the engine support bracket refer to (Figure 129).
4. After tipping the unit forward, remove the mounting bolts retaining the wheel brackets to the lower handle (Refer to page 7 - 1, Figure 161).
5. Inspect all parts and replace if necessary.

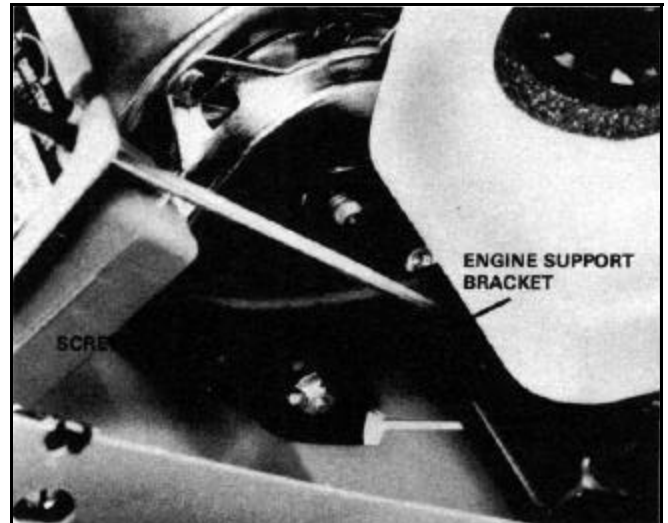


Figure 129

0406-058

CHAIN DRIVE SYSTEM TROUBLESHOOTING CHART

CAUSES	CORRECTIVE ACTION
ENGINE RUNS BUT PADDLES DO NOT TURN OR CHAIN JUMPING	
Sprocket not aligned properly.	Align sprockets. Refer to "Crankshaft Sprocket Replacement (all models)" on page 5 - 21.
Improper chain tension.	Adjust chain tension.
Crankshaft and impeller sprocket damage.	Refer to "Crankshaft Sprocket Replacement (all models)" on page 5 - 21 and "L.H. And R.H. (Left Hand And Right Hand) End Cap/Bushing Replacement (1972-1980) 14" And 21" Models" on page 5 - 22.
<p>Note: To alleviate "icing" of drive parts, allow the unit to run until the heat generated from the engine melts any compacted snow or ice that may have developed during operation of the unit.</p>	

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ELECTRIC START SYSTEM

INTRODUCTION

The electric start single stage snowthrowers use a 120-volt starting system. When the starter is supplied with voltage, the helical shaft spins forcing the pinion gear to slide out on the shaft and engage the ring gear.

CCR POWERLITE STARTER REMOVAL

1. Drain the fuel from the fuel tank using a pump type siphon. **Caution:** Ignition of fuel can result in severe personal injury or death. Store fuel in an approved fuel storage container.
2. Remove the two bolts holding the upper shroud to the front housing (Figure 130).



Figure 130 1854-26

3. Remove the two bolts (Figure 131) holding the upper shroud to the handle.

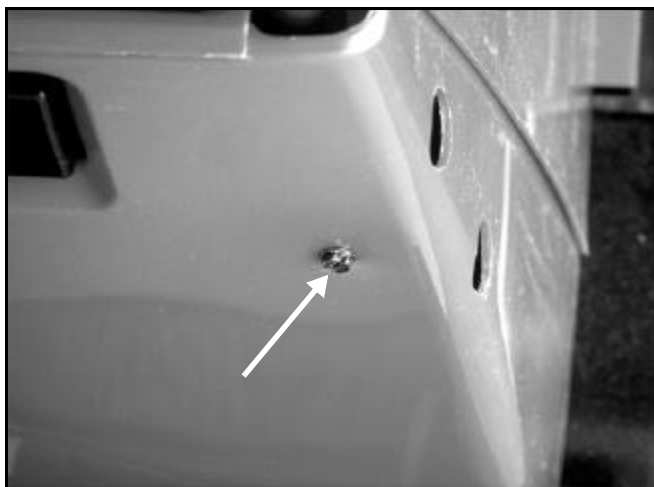


Figure 131 1352-02

4. Remove the three bolts (Figure 132) to the starter switch box.

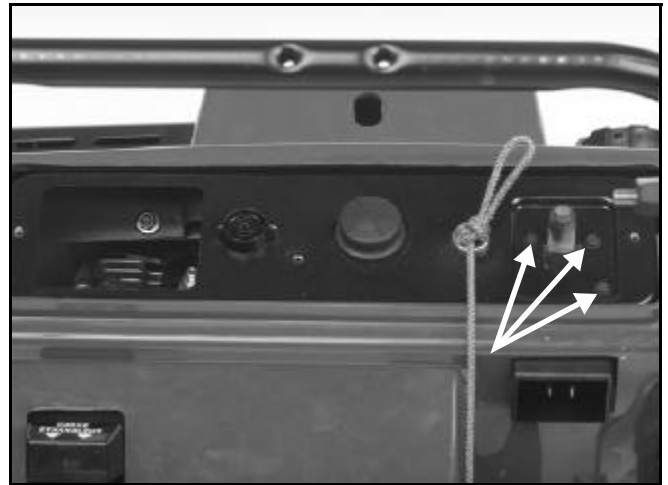


Figure 132 1854-37

5. Lift upper shroud up and remove the wires to the key switch (Figure 133).

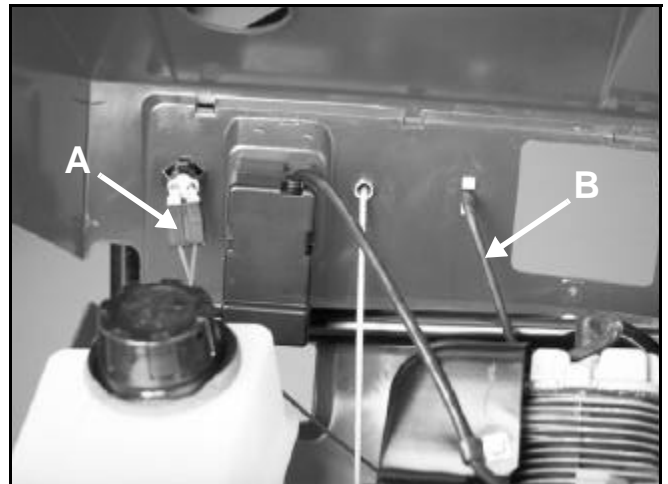


Figure 133 1854-06

(A) Wires

(B) Primer Hose

ELECTRIC START SYSTEM

6. Disconnect the spark plug wire from the spark plug to prevent accidental starting (Figure 134).

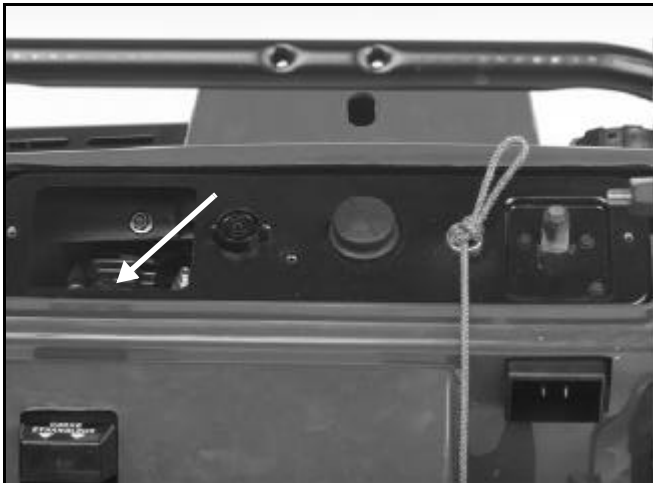


Figure 134

1854-37

7. Disconnect the primer hose to the primer bulb (Figure 133).
8. Disconnect the fuel line from the fuel tank to the carburetor. **Caution:** There might be a small amount of fuel in the fuel line. Be prepared with a shop towel to catch any remaining fuel. Thoroughly clean up any spilled fuel.
9. Remove the upper shroud leaving the starter rope attached and position the upper shroud out of the working area.
10. Remove the two bolts on the starter and snip the wire tie holding the starter in position (Figure 135).

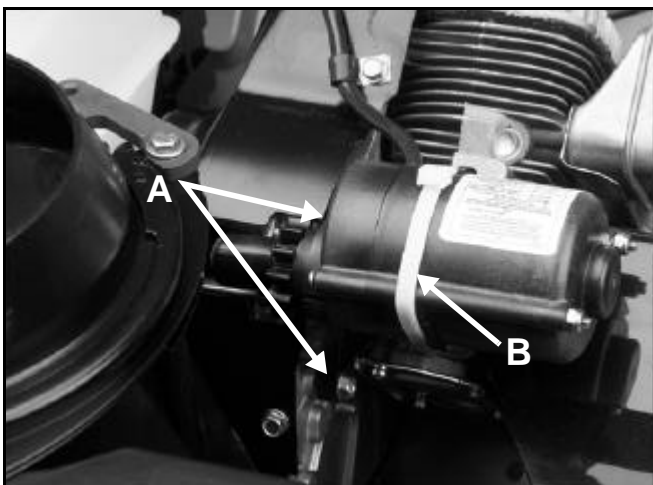


Figure 135

1854-39

(A) Mounting Screws

(B) Wire Tie

11. Remove the starter assembly, wiring, and starter switch box.

Installation

Reverse the removal procedures. **Note:** Incorrect routing of the wire harness can cause electrical shock. Route and fasten the wire harness away from all moving parts. The wire tie for the starter must be tightly secured to the starter.

CCR 1000/TECUMSEH HSK 635 STARTER REMOVAL

1. Drain the fuel from the fuel tank using a pump type siphon. **Caution:** Ignition of fuel can result in severe personal injury or death. Store fuel in an approved fuel storage container.
2. Remove the three bolts for the chute and chute handle (Figure 136).



Figure 136

1854-12

ELECTRIC START SYSTEM

3. Remove the two bolts holding the upper shroud to the front housing (Figure 137).

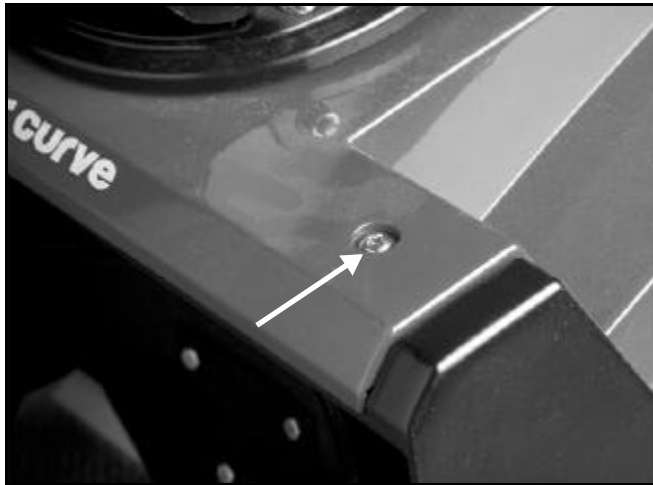


Figure 137

1352-03

6. Remove the three bolts to the starter switch box (Figure 139).

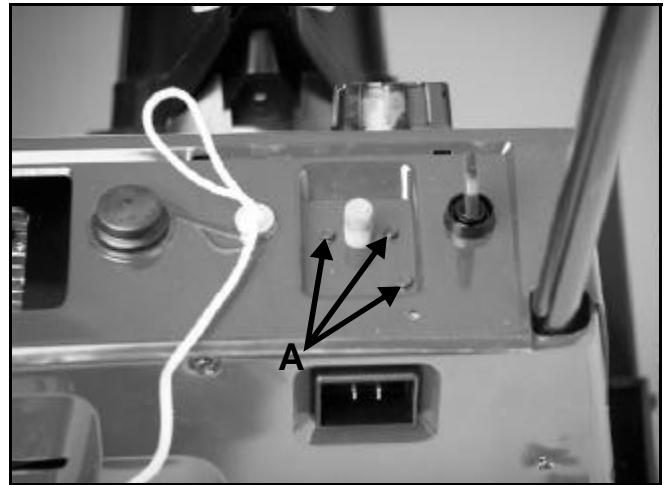


Figure 139

1854-11

4. Remove the two screws holding the dash in position (Figure 138).

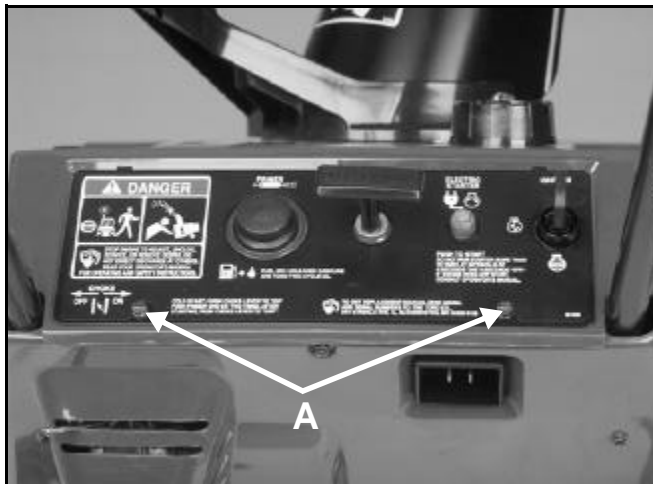


Figure 138

1854-42

(A) Screws

7. Lift the upper shroud up and remove the wires to the key switch (Figure 140).

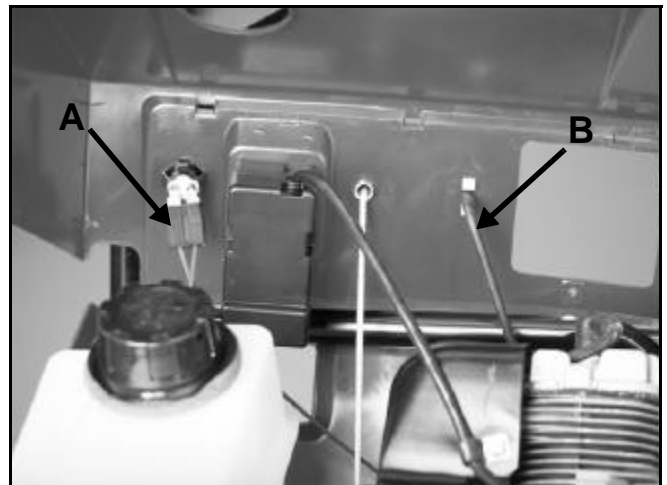


Figure 140

1854-06

(A) Key Switch Wires (B) Primer Hose

5. Remove the gas cap and cover the fuel tank opening with a clean plastic bag and rubber band to prevent debris from entering.

8. Disconnect the primer hose to the primer bulb (Figure 140).
9. Disconnect the spark plug wire from the spark plug to prevent accidental starting.

ELECTRIC START SYSTEM

10. Remove the upper shroud leaving the starter rope attached and position the upper shroud out of the working area.
11. Remove the two screws on the starter and snip the tie holding the starter in position (Figure 141).

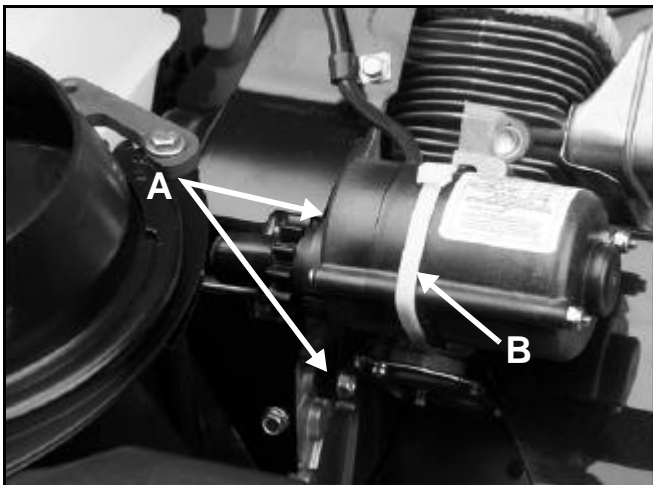


Figure 141 1854-39

(A) Screws

(B) Wire Tie

12. Remove the starter assembly, wiring, and starter switch box.

Installation

Reverse the removal procedures. **Note:** Incorrect routing of wire harness can cause electrical shock. Route and fasten the wire harness away from all moving parts. The wire tie for the starter must be tightly secured to the starter.

20" CCR/R TEK STARTER REMOVAL

1. Drain the fuel from the fuel tank using a pump type siphon. **Caution:** Ignition of fuel can result in severe personal injury or death. Store fuel in an authorized fuel storage container.

2. Remove the three screws holding the control panel nameplate and let the control panel nameplate hang by the starter rope (Figure 142).

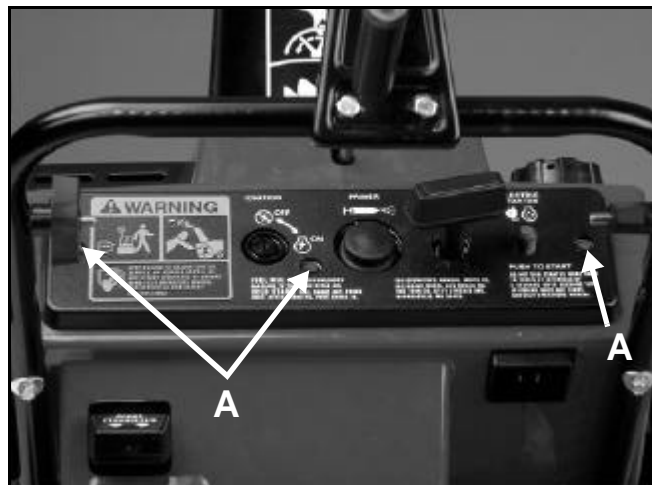


Figure 142

1854-28

(A) Screws

3. Remove the three mounting bolts for the chute assembly. **Note:** Some models are equipped with a manual chute system (Figure 143).



Figure 143

1854-12

4. Remove the gas cap and cover with a clean plastic bag and rubber band to prevent debris from entering.
5. Remove the two bolts on the upper shroud and remove the two bolts on the chute crank rod (if equipped). Remove the chute crank rod and the upper shroud assembly.

ELECTRIC START SYSTEM

6. Disconnect the spark plug wire from the spark plug to prevent accidental starting.
7. On the starter, remove the top bolt on the upper starter mounting plate (Figure 144).

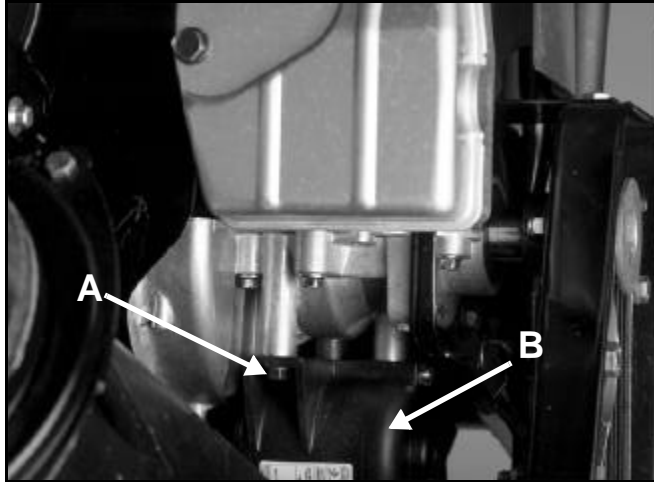


Figure 144 1352-15

- | | |
|--------------|-------------|
| (A) Top Bolt | (B) Starter |
|--------------|-------------|

8. Remove the two screws on the handle holding the lower shield in position (Figure 145).



Figure 145 1352-08

9. Remove the two nuts on the lower black cover (Figure 146).

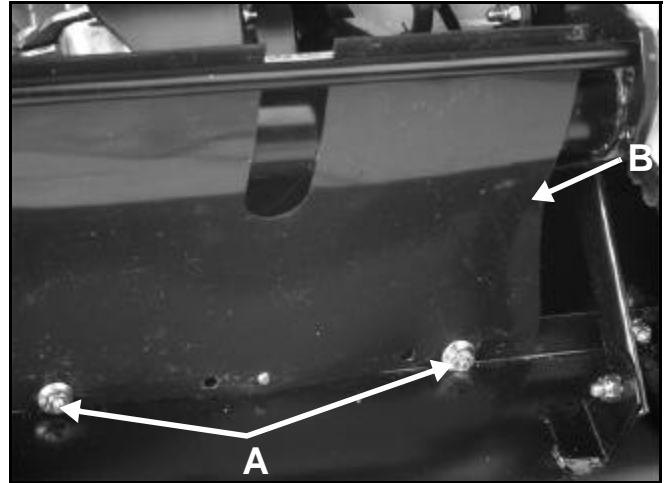


Figure 146 1854-05

- | | |
|----------|-----------|
| (A) Nuts | (B) Cover |
|----------|-----------|

10. Remove the three screws for the starter switch box (Figure 147).

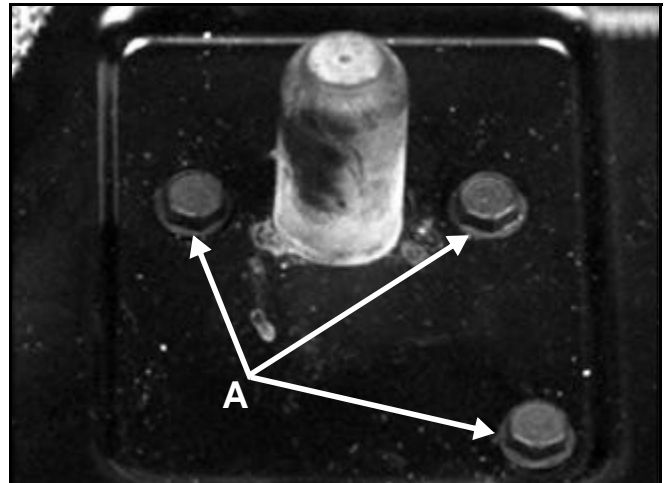


Figure 147 1854-37-2

- | |
|--------------------------------|
| (A) Switch Box Mounting Screws |
|--------------------------------|

11. Remove the starter wire mounting bracket.

ELECTRIC START SYSTEM

12. Remove the second starter bolt and remove the starter assembly, wire harness, and starter switch box (Figure 148).

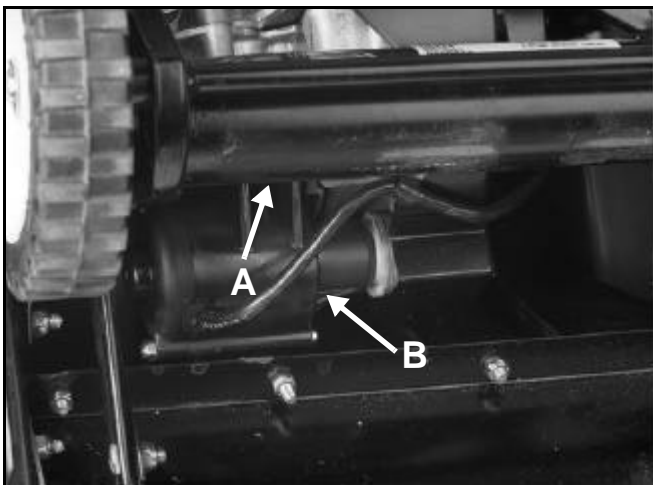


Figure 148

1854-10

(A) Starter Mounting Bolt

(B) Motor

Installation

Reverse the removal procedures. **Note:** Incorrect routing of the wire harness can cause electrical shock. Route and fasten the wire harness away from all moving parts.

SNOWMASTER 20", 5200 – 5620/ TECUMSEH AH520 STARTER REMOVAL

1. Drain the fuel from the fuel tank using a pump type siphon. **Caution:** Ignition of fuel can result in severe personal injury or death. Store fuel in an authorized fuel storage container.

2. Remove the three screws from the front of the upper shroud, located between the directional vanes (Figure 149).

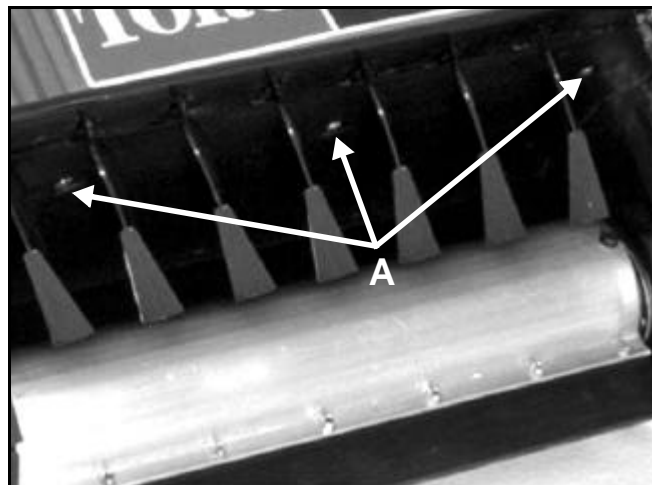


Figure 149

2261-06-2

(A) Screws

3. Remove the gas cap and cover the fuel tank opening with a clean plastic bag and rubber band to prevent debris from entering.
4. Remove the two self-tapping screws from either side of the upper shroud to the handle and remove upper shroud (Figure 150).

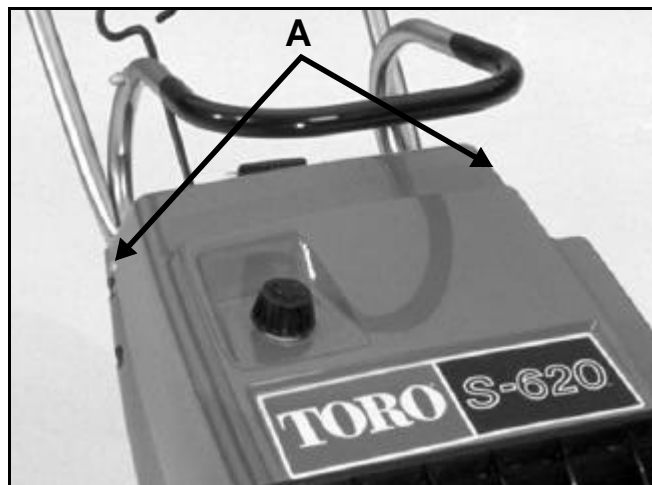


Figure 150

2261-06-3

(A) Screws

5. Disconnect the spark plug wire from the spark plug to prevent accidental starting.

ELECTRIC START SYSTEM

- Remove the three screws securing the starter switch assembly to the control panel (Figure 151).

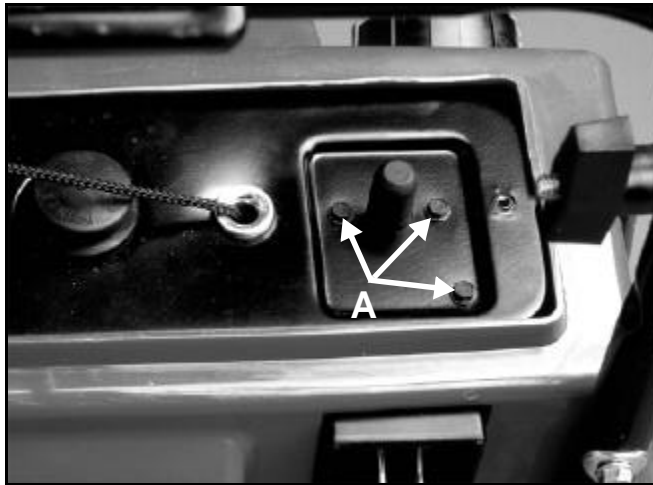


Figure 151

1352-09

(A) Screws

- Remove the screw and R-clamp retaining the wire harness to the engine.

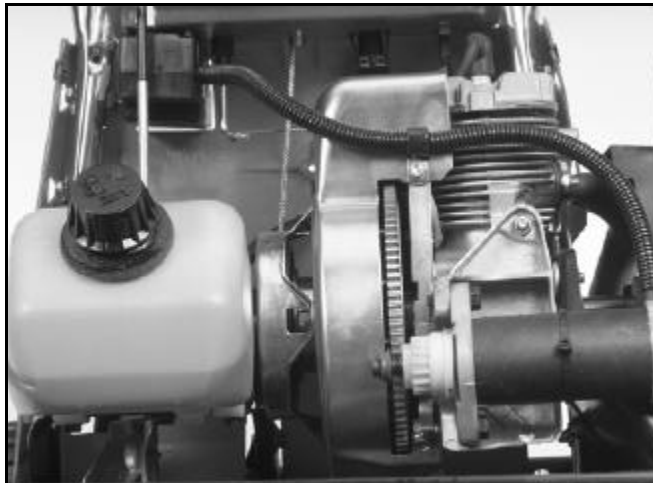


Figure 152

2261-02

- Remove the two screws securing the starter motor to motor mounting bracket (Figure 152).
- Remove the starter assembly, wiring, and starter switch box.

Installation

Reverse the removal procedures. **Note:** Incorrect routing of the wire harness can cause electrical shock. Route and fasten the wire harness away from all moving parts.

STARTER SWITCH WITH RECTIFIER TROUBLESHOOTING

Testing The Starter Switch Rectifier

On models with a rectifier as part of the starter switch assembly, the rectifier converts alternating current into pulsating direct current. This enables the use of a direct current starter motor on a 120-volt alternating current power supply (Figure 153). These instructions do not apply to units with 120-volt AC starter motors.

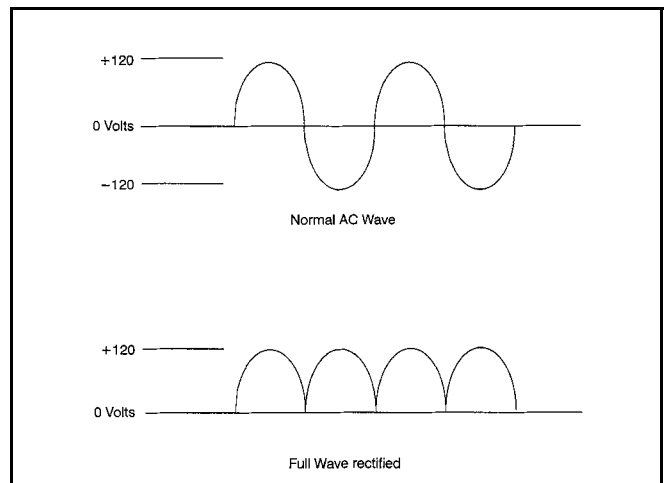


Figure 153

0623-07

ELECTRIC START SYSTEM

How It Works

Coming straight from the 120-volt outlet, the current is half-positive and half-negative. The rectifier charger polarity "filters" out the negative half of the wave to give you a direct current (Figure 154).

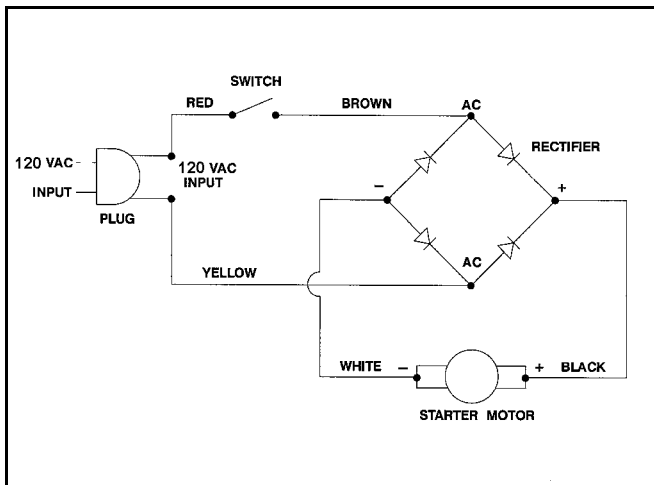


Figure 154

0623-08

Rectifier Troubleshooting

1. Disconnect the rectifier assembly from the wiring harness.
2. Check continuity between the terminals (two side by side terminals) on one side of the rectifier with a Volt-Ohmmeter (Figure 155). Note the results.

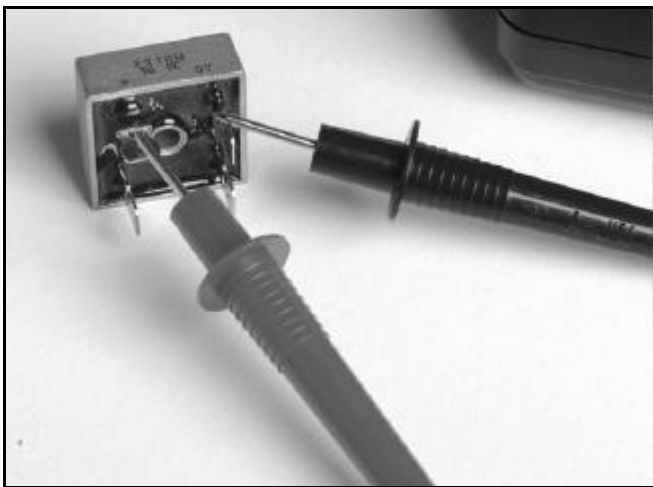


Figure 155

1352-13

3. Reverse the VOM leads and recheck the same two terminals. Note the results. You should have found continuity in one direction, but not the other. If not, replace the rectifier. This test must be performed on all four sides of the rectifier.



Figure 156

1352-14

Refer to "CHECKING THE STARTER SWITCH" on page 6 - 10 for additional troubleshooting.

Starter Replacement

The original starter part # 28-9140 has been discontinued. Refer to service bulletin #48 (Dated March 9, 1994) for replacement parts and installation procedures.

ELECTRIC START SYSTEM

TROUBLESHOOTING

Warning: The electric starter uses 120-volt current, which can cause electrical shock. Do not touch electrical components or wires while starter circuit is energized.

STARTER MOTOR FAILS TO TURN

Possible Cause	Correction
Power not reaching product	Plug another appliance into extension cord, insure cord is OK.
Engine has seized	Verify that the engine turns over freely.
Starter switch malfunctioning	Check switch using a volt/ohmmeter set for resistance. Ensure that there is continuity when the switch is depressed. (Refer to: "CHECKING THE STARTER SWITCH" on page 6 - 10).
Starter wiring not connected	Check wire harness for broken wiring or bad connections.
Pinion gear sticking on shaft	Clean debris from the pinion gear and/or motor shaft or replace pinion gear assembly.
Damaged pinion gear or flywheel ring gear	Replace pinion gear and/or flywheel ring gear.
Starter motor has failed	If all the above conditions are checked and the starter still fails to turn, the motor must be replaced

Starter Pinion Inspection

Inspect the pinion and spline teeth for wear, damaged or missing teeth. If wear or damage exist, replace pinion. Rotate the pinion clockwise and see if it turns freely up the motor shaft. Check the motor shaft and the inside of the pinion gear for excessive lubrication and/or dirt buildup. No lubrication is required on the motor shaft and pinion assembly (Figure 157).



Figure 157

1352-20

ELECTRIC START SYSTEM

Starter Pinion Removal

1. Remove the pinion cap dust cover (if equipped).
2. Push down on pinion spring stop and remove the pinion lock ring (Figure 158).



Figure 158

1352-21

3. Remove the pinion stop and the anti-drift spring.
4. Slide pinion off of motor shaft. Inspect and replace if necessary.

CHECKING THE STARTER SWITCH

The tools used to check for defective switches are a continuity tester/light or an ohmmeter. A continuity tester or ohmmeter, as the names imply, are used to test for a completed current flow in an electrical circuit.

STARTER SWITCH INSPECTION

1. Check the rubber boot on the starter switch for excessive wear or tear in the rubber boot. Damage to the boot may let moisture enter damaging the switch. Replace boot if damaged.

2. Slide the connector off the starter switch. With the switch in the resting position (switch not depressed), place the continuity light of ohmmeter leads, one to each terminal on the starter switch. The light or meter, depending on the instrument used, should not indicate continuity. The continuity light, if being used, should be off. If not, replace the switch (Figure 159).



Figure 159

1352-17

3. Depress the starter switch. The meter should show continuity. (The continuity light, if being used, should be ON.) If no continuity is found, replace the switch (Figure 160).



Figure 160

1352-12

WHEEL BRACKET REPLACEMENT (1975 AND OLDER MODELS)

Often, when a single stage snowthrower is operated on the wheels instead of tipped forward, the wheel bracket holes will "wallow" (become oval shaped) and necessitate replacement.

To replace the wheel brackets:

1. Drain all fuel from the fuel tank. Refer to "Draining The Fuel Tank" on page 2 - 5. Complete step 1.
2. After tipping the unit forward, remove the mounting bolts retaining the wheel brackets to the lower handle (Figure 161). Inspect the axle for wear, if evident, replace.

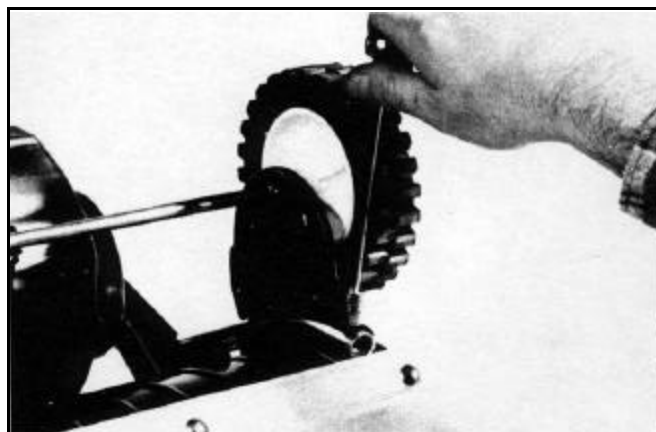


Figure 161

0217-073

Note: Some earlier models were equipped with a shoulder bolt and nut retaining the wheel to the wheel bracket. Inspect all parts for wear and replace if necessary.

The 20" single stage snowthrowers have used two different means of attaching the wheels.

1975 Models — The axle passes through both the muffler and the side plates. Either or both parts may require replacement. If the muffler cannot be separated from the exhaust pipe easily, remove the two capscrews holding the exhaust pipe to the engine.

The side plates can be removed only by complete disassembly of the snowthrower.

1976 Models — The axle rides on the side plates only. Complete disassembly of the snowthrower is necessary as the side plates are part of the frame.

1977 And Newer Models — The muffler and wheel bracket assembly must be removed. If the muffler will not easily separate from the exhaust pipe, remove the two bolts holding the exhaust pipe to the engine.

IMPORTANT: Model 38014 14" Snowmaster 8000001 and up. The 1978 14" Snowmasters use the larger wheels found on the 20" model. To obtain the proper spacing between the wheels, the wheel brackets have been reversed and the axle slightly shortened.

If the wheel brackets are bent inward, the axle appears to be too long. If this occurs, the wheel and tire assembly may contact the lower handle.

To correct this rubbing, bend the wheel brackets slightly outward to remove the slack. If bending the brackets is not satisfactory, additional washers can be installed between the bracket and wheel. If bending the brackets or the addition of one or two washers does not remove the slack, use a bushing as a spacer. Install the bushing between the wheel bracket and single washer on each side.

SCRAPER REPLACEMENT

For All 16" Powerlite And 20" Single Stage Snowthrowers:

1. Drain the fuel from the fuel tank. Refer to "Draining The Fuel Tank" on page 2 - 5. Complete Step 1.
2. Remove the three carriage bolts and locknuts securing the scraper to the snowthrower housing. Remove the worn scraper (Figure 162).



Figure 162

0217-074

MAINTENANCE

3. Replace with a new scraper and secure to the housing with the three carriage bolts and locknuts.

For All 14" And 21" Single Stage Snowthrowers:

1. Drain the fuel from the fuel tank. Refer to "Draining The Fuel Tank" on page 2 - 5. Complete step 1.
2. Remove the four carriage bolts and locknuts securing the scraper support bracket to the snowthrower housing (Figure 163).

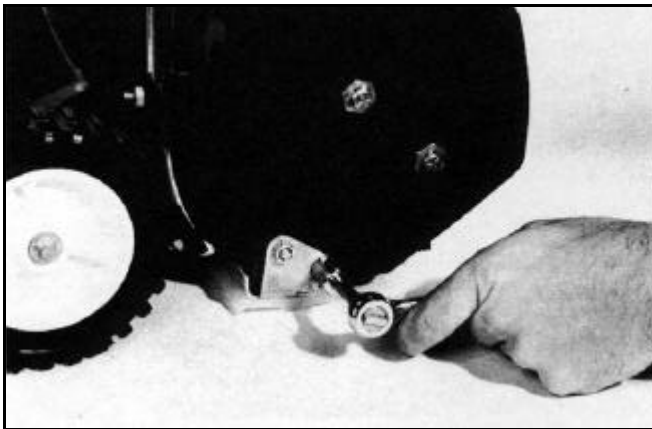


Figure 163

0217-075

3. Remove the old scraper assembly and replace.

Note: The 14" and 21" model snowthrowers produced from 1965 to 1977 were equipped with a plastic scraper riveted to the scraper support bracket. Therefore, it was necessary to replace the entire bracket and plastic scraper.

On 14" snowthrowers produced from 1978 to 1980, (21" units are no longer in production), the plastic scraper only is replaced. The scraper support and plastic scraper are bolted together with carriage bolts (Figure 164).

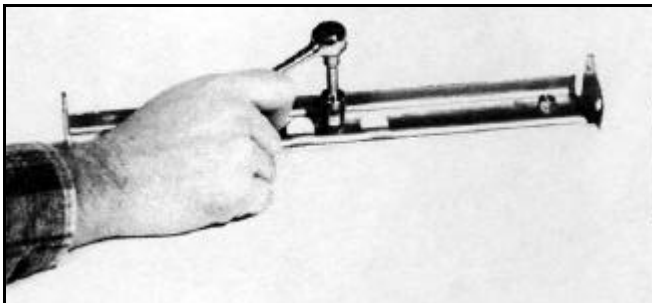


Figure 164

0217-076

14" Snowthrowers With Adjustable Scrapers

All 14" snowthrowers manufactured between 1978 and 1980 were designed with an adjustable scraper. After you install a replacement scraper to a 14" snowthrower manufactured during one of these years it is essential the scraper be adjusted properly. To adjust the scraper:

1. Loosen the four scraper support bracket mounting bolts, and adjust the skid so that there is 1/16" to 1/8" clearance between the rotor blades and the leading edge of the skid (Figure 165).

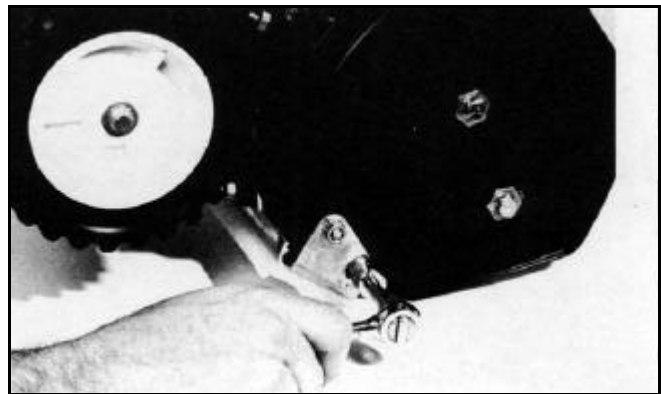


Figure 165

0217-077

2. Rotate the rotor assembly and check the clearance of both rotor paddles.

Note: The 14" snowthrowers should be tipped forward during the operation of the unit and not resting on the wheels. Therefore, adjust the scraper with the unit tipped forward in the operating position.

PADDLE REPLACEMENT - STRAIGHT PADDLE

After a period of extended use, the impeller paddles may need to be replaced.

Paddle Replacement For Snowthrowers With Rotor Shell Design

1. Drain fuel from the fuel tank. Refer to "Draining The Fuel Tank" on page 2 - 5. Complete step 1.
2. Tip the unit back until the upper handle rests on the floor.

3. With the impeller housing facing you, loosen the screws securing one paddle to the rotor halves. Remove the worn paddle and replace (Figure 166).



Figure 166

0217-078

4. Reinstall the screws that retain the paddle and rotor halves. Torque the screws 15 in-lbs (DO NOT OVERTORQUE!) (Figure 167).

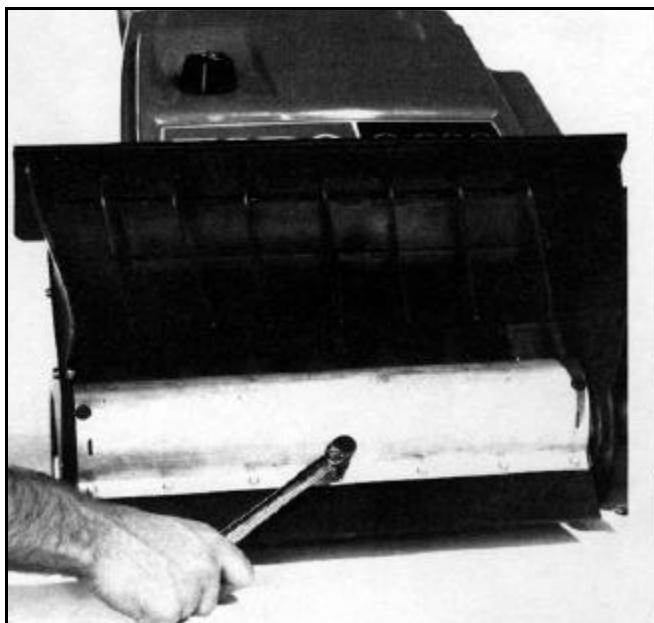


Figure 167

0217-079

5. Repeat steps 3 and 4 for the second paddle.

Paddle Replacement For Snowthrowers With Impeller Sprocket/Tube Design:

1. Refer to "Paddle Replacement For Snowthrowers With Rotor Shell Design" on page 7 - 2. Complete step 1 and 2.
2. With the impeller housing facing you, loosen the carriage bolts that retain the paddles and reinforcing straps to the impeller sprocket/tube (Figure 168).

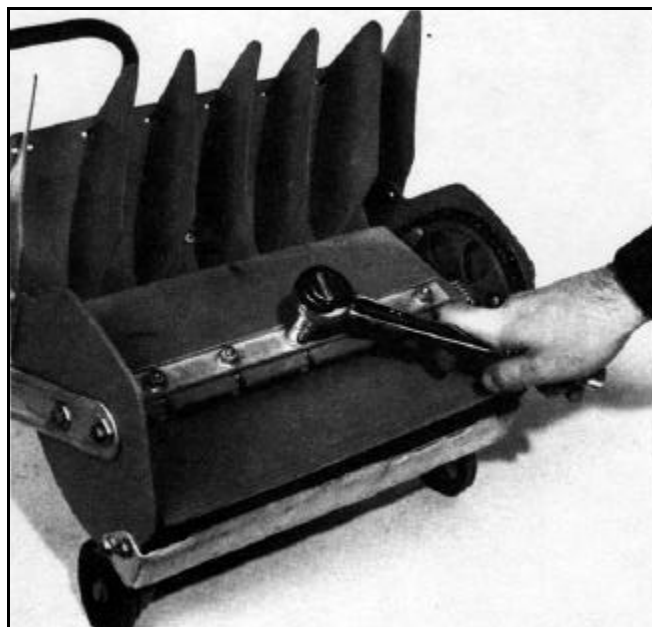


Figure 168

0217-080

3. Fit the new paddles in position with the reinforcing straps. Install the carriage bolts and tighten.

MAINTENANCE

REPLACING ROTOR BLADES (CURVED ROTOR MODELS)

There are two means of attaching the rotor blades to the rotor.

The method shown in Figure 169 was used on the CCR2000 through 1992.

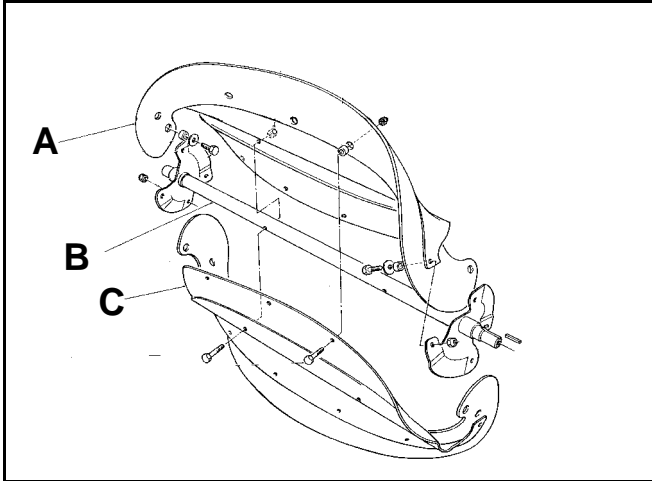


Figure 169

0623-03

- | | |
|--------------------------|----------------|
| (A) Blade - Rotor | (C) Rotor Half |
| (B) Rotor Shaft Assembly | |

All Powerlite and 20" CCR models built since that time use the style shown in Figure 170.

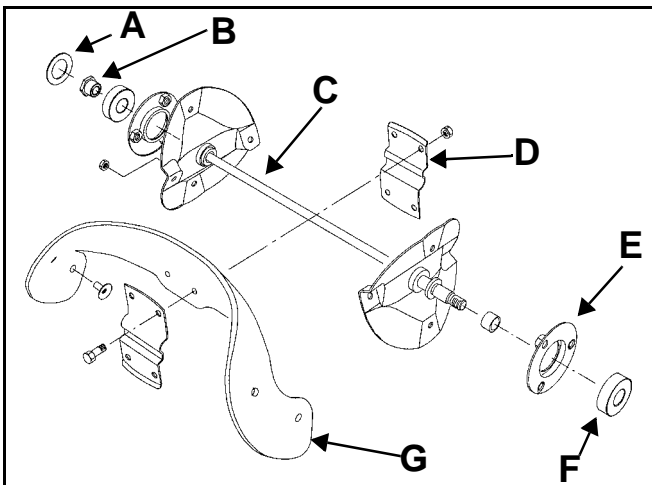


Figure 170

0623-09-2

- | | |
|-------------------|----------------------|
| (A) Rubber Washer | (E) Bearing Retainer |
| (B) Nut | (F) Bearing |
| (C) Rotor | (G) Rotor Blade |
| (D) Rotor Support | |

Rotor Blade Replacement Early CCR2000 Style

Note: Always replace BOTH blades at the same time. One new and one worn blade will create a severe imbalance condition that may damage the machine.

We also recommend that the scraper be replaced whenever the rotor blades are replaced to assure proper operation and performance.

Wear indicators were not standard at that time. The way to determine if a rotor blade needs replacement is to measure it as shown in (Figure 171). If the blade measures less than 1 9/16", it should be replaced. A worn blade rapidly loses efficiency and throw distance.

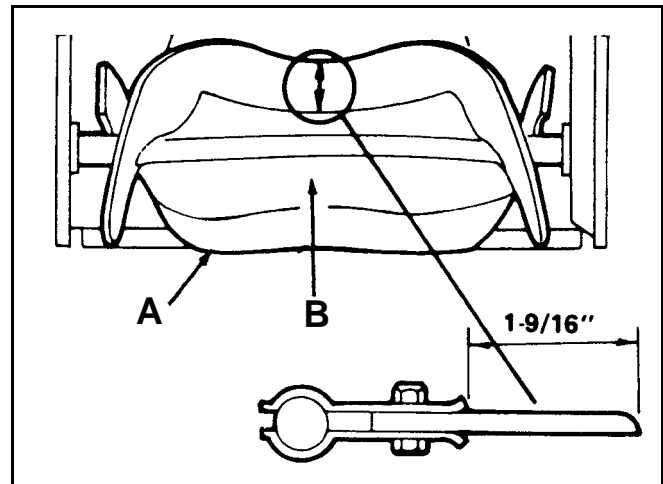


Figure 171

0623-04

- | | |
|-----------------|-----------------|
| (A) Rotor Blade | (B) Steel Plate |
|-----------------|-----------------|

Removing Rotor Blade

Remove and replace one blade before starting on the other.

Remove (8) 7/16" bolts, (4) washers, and (8) locknuts on one blade. **Note:** Only the bolts on the end have washers.

Slide the blade out from between the steel plates and push the (8) spacer bushings out of the blade holes. Keep the spacers for reuse.

Installing The New Blade

The rotor blades are made of laminated rubber. Examine the edge of a blade to see the differences in the thickness of the layers. (Some blades have a part number on the thick side of the blade.)

Both blades **MUST** be installed with the thicker layer facing down. If this is not done, the blades will be unbalanced, causing the snowthrower to hop or bounce.

Press the spacer bushings into the holes in the new blade.

Insert the new blade between the steel plates and secure it with the original bolts and nuts. Position the bolt heads on the thick (bottom) side of the blade (Figure 172). We suggest starting with the center bolts and move outward towards the ends. After all bolts are installed, tighten all bolts.

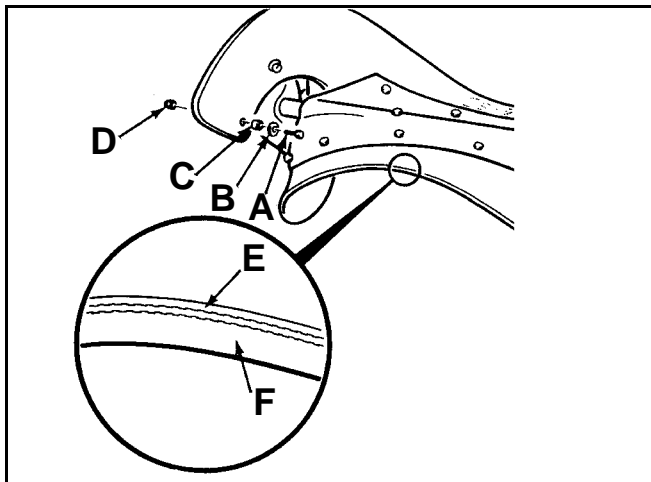


Figure 172

0623-02

- | | |
|-------------|----------------|
| (A) Bolt | (D) Locknut |
| (B) Washer | (E) Thick Side |
| (C) Bushing | (F) Thin Side |

1992 And Newer Style

Beginning in 1992 the method of attaching the blades changed slightly and a wear indicator hole also became standard (Figure 173).

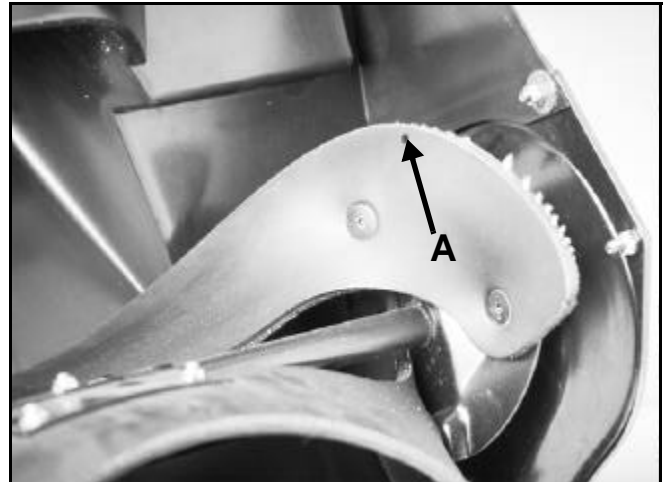


Figure 173

1854-16

- | |
|--------------------|
| (A) Wear Indicator |
|--------------------|

When the paddle wears to this indicator, we recommend replacing the blades.

The rotor blades are supported on both ends and in the center only. **Note:** Completely remove and replace one blade before starting on the other.

Many models require a Torx driver or ratchet to remove some of the screws holding the paddles to the rotor. These are typically used on the outer ends where snow would build up on a conventional hex head bolt.

MAINTENANCE

VANE REPLACEMENT

Removal

1. Remove all mounting screws retaining the upper shroud to the snowthrower. Remove the shroud.
2. To remove the vane from the vane mount, grasp the vane near the vane mount and turn it 90° either to the left or right and gently remove the vane (Figure 174).



Figure 174

0217-081

3. Next, to remove the vane from the snowthrower, using a screwdriver, gently tuck the vane in the small slot in the shrouding. At the same time, apply a slight downward pressure on the vane (Figure 175).

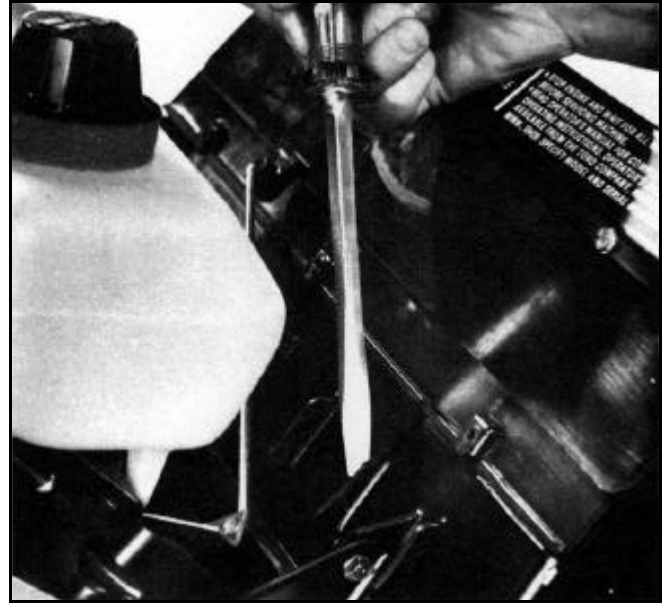


Figure 175

0217-082

Replacement

1. Holding the vane firmly at the base, slide the base of the vane into the small slot in the shroud (Figure 176).

Note: Sliding the vane at an angle to the slot will ease installation.

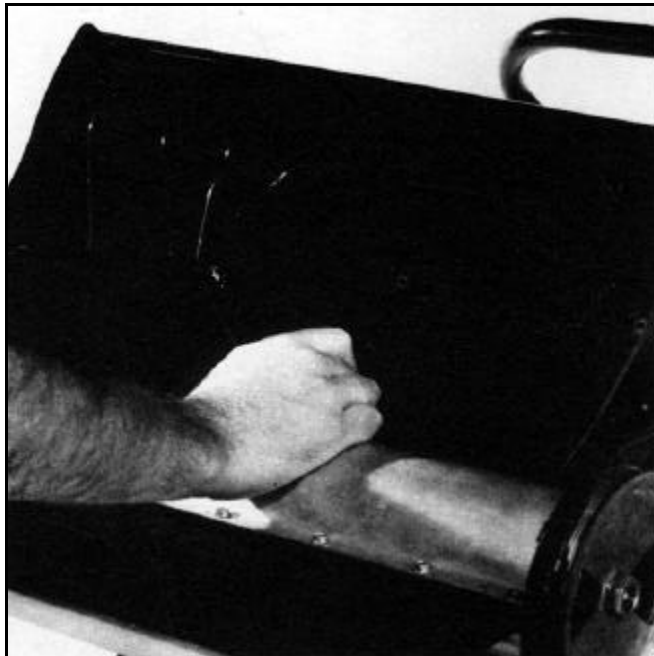


Figure 176

0217-083

2. At the vane mount, turn the vane 90° either to the left or right. Slide the vane into the vane mount and turn the vane either right or left to the upright position.

Note: The vanes to the far right and left of the snowthrower may be retained by mounting screws. It will be necessary to remove these when replacing these vanes.

VANE CONTROL SERVICING ON 14" AND 21" SNOWTHROWERS FROM 1965-1967

The 14" and 21" snowthrowers produced between 1965 and 1967 were designed with a notched selector plate. To service this design, please consult the parts manual for your unit.

VANE CONTROL SERVICING

14" Units 1968-1980

21" Units 1968-1975

1. Remove all the mounting screws retaining the upper shroud to the unit. Remove the shroud.
2. Remove eye bolt nut from eye bolt at the lower handle (Figure 177). If the rubber grommet is worn or missing, replace. Next, slide the vane control rod from the small slot in the vane bracket.

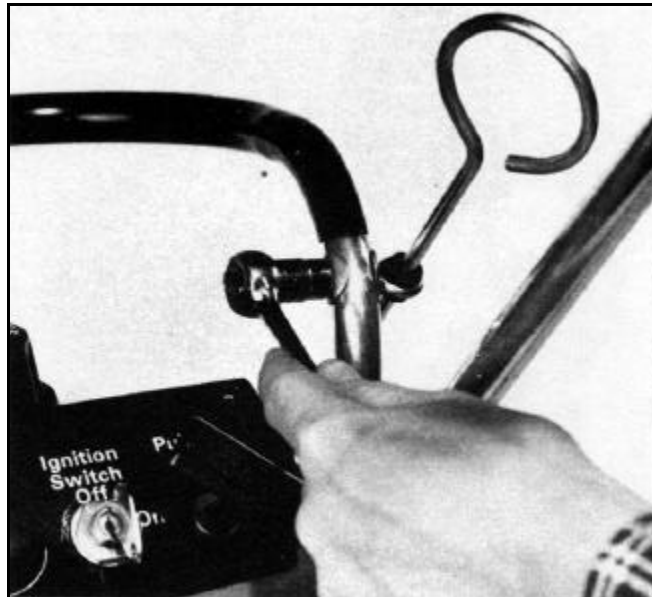


Figure 177

0217-084

3. Remove the push-on retainer and slide the washers and vane bracket off the carriage bolt. Should the carriage bolt be loose, tighten. Replace the carriage bolt and locknut if needed (Figure 178).

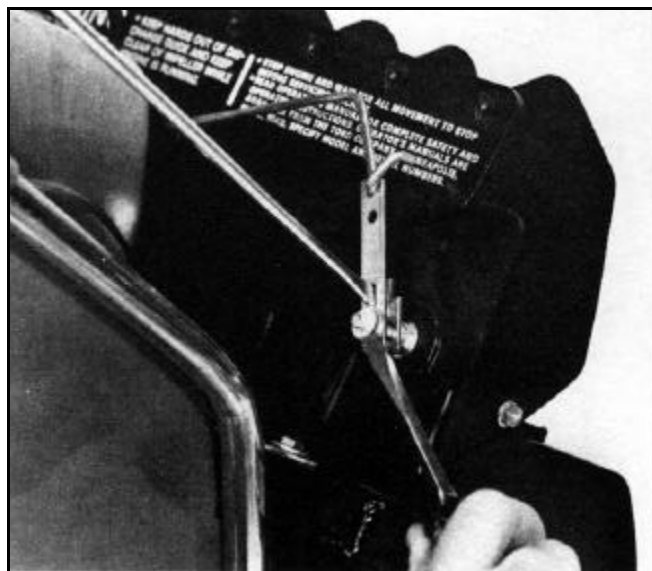


Figure 178

0217-085

MAINTENANCE

- Next, unfasten the vanes at the upper vane mount. Refer to "VANE REPLACEMENT" on page 7 - 6. Both the vane linkage and vane mount can then be removed together as one piece.
- To remove the vane linkage from the vane mount, support the vane mount and linkage with a vise or two blocks of wood (Figure 179). Using a punch, lightly drive the vane link from the vane mount. Replace the vane mount or vane link if bent or misformed.

Note: On some models (Figure 179), the vane linkage is retained to the vane mount with a screw and nut.

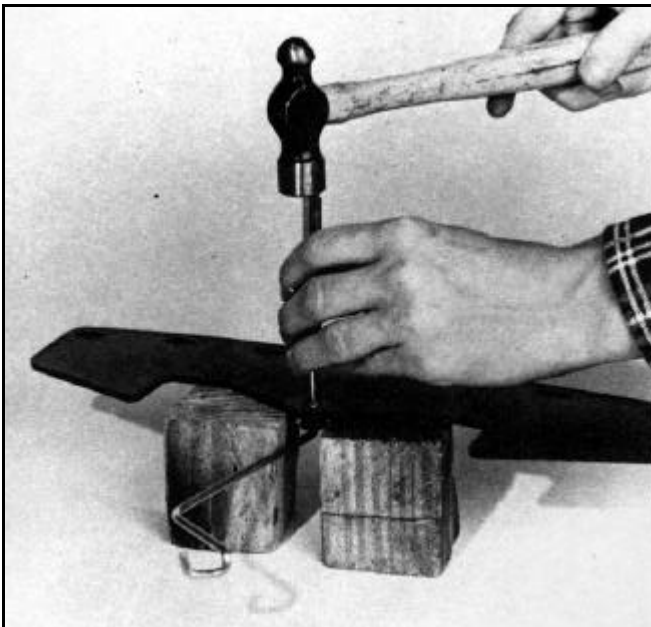


Figure 179 0217-086

- Reinstall the vane control assembly with the new hardware. Use the parts manual for your unit as a guide to reassemble the vane control. Finally, using mounting screws, install the upper shroud.

VANE CONTROL SERVICING: ALL 16" POWERLITE AND 20" SINGLE STAGE SNOWTHROWERS

- Drain fuel from fuel tank. Refer to "Draining The Fuel Tank" on page 2 - 5. Complete step 1.
- Remove all the mounting screws retaining the upper shroud to the unit. Remove the shroud.

- Remove the eye bolt nut from the eye bolt at the lower handle (Figure 180). Remove the eye bolt from lower handle. If the rubber grommet is worn or missing, replace.



Figure 180 0217-087

- Next, remove the small self-tapping screw retaining the vane control rod to the vane bracket (Figure 181). Should the vane control rod or the vane bracket be bent or misformed, replace.



Figure 181 0217-088

5. Unfasten all the vanes at the vane mount. Refer to "VANE REPLACEMENT" on page 7 - 6. The vane mount and vane linkage can be removed together. Using a punch, lightly drive the vane link from the vane mount. Should the vane mount or link be misformed or bent, replace.

Note: It will be necessary to support the vane mount with a block of wood or vise when driving the linkage from the vane mount (Figure 182).

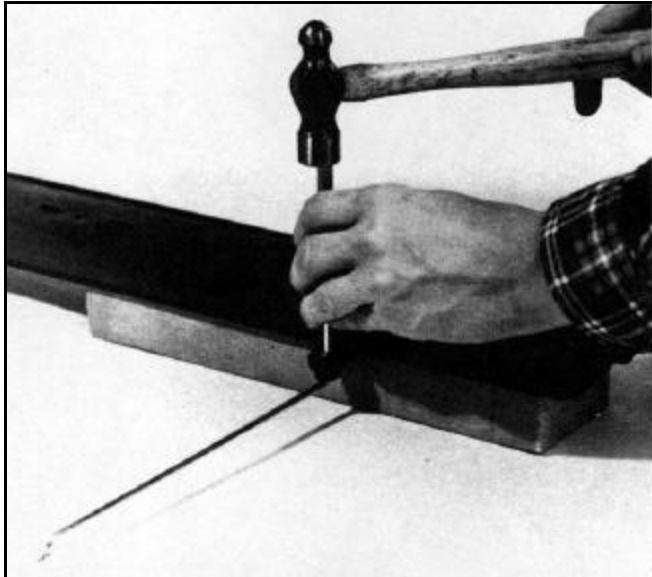


Figure 182

0217-089

6. Reinstall the vane control assembly with the new hardware. Use your parts manual as a guide during reassembly. Lastly, using the appropriate mounting screws, install the upper shroud.

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TROUBLESHOOTING TIPS - FAILURE TO START

This section is not intended to cover everything that might happen. We will cover the most common problems and provide some tips to speed troubleshooting and repair.

OLD FUEL

By far the most common cause of failure to start is old or dried fuel due to improper storage procedures. The correction procedure varies from engine to engine. The following is an abbreviated carburetor cleaning process which often will get the engine started.

Tecumseh AH520 And AH600 Series Engines

These engines all used diaphragm type carburetors. In this style carburetor, there is a nylon check ball behind the adjustable high speed jet. Storage without running the engine dry often results in some fuel sitting on top of this check ball. It evaporates and effectively glues the check ball down. Fuel cannot pass through the high speed or power circuit. The symptom is often that the engine will not run unless the choke is engaged.

Solution

Supplies: A can of pressurized carburetor cleaner with a small hose which fits into the nozzle. A pump type siphon and something to drain the old fuel into and some fresh fuel mix.

Remove the gas cap and using a pump type siphon, remove as much of the old gas from the fuel tank as possible. Replace with fresh fuel mix.

Follow the left hand handle down to the engine shroud. You will find a slot in the shroud and in that slot will be one or two adjustment needles. On those with two needles, the one we want is on the right. Those with single needles it is the only one there. Turn the needle clockwise until just finger tight (count the revolutions, this will be important later) then turn the needle counterclockwise and remove it.

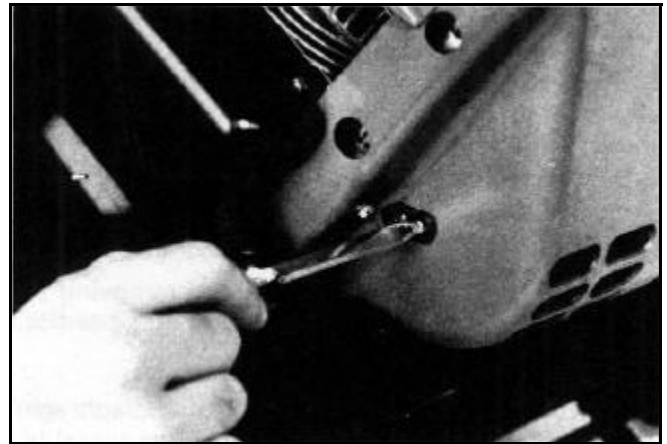


Figure 183

0217-093

Insert the small hose into the nozzle of the carburetor cleaner and work the hose down into the bottom of the hole that the needle was in. Hold firmly and spray a VERY short burst of carburetor cleaner into the hole. If you held the hose firmly, the carburetor cleaner is directed into the passage where the check ball is. Sometimes you can even hear the ball pop loose. Allow the excess carburetor cleaner to drain, just a minute or so. Wipe the end of the needle with a rag dampened with carburetor cleaner and install the needle. Turn the needle all the way in until you feel it bottom and back it out the same number of turns that it was originally.

The engine will be hard to start as the carburetor cleaner does not burn like gasoline. Go through the starting process 3 or 4 times. If the engine will start, allow it to run for at least 10 minutes. The fresh gasoline flowing through the carburetor will finish the cleaning.

If the engine will not start after the above process is followed, the carburetor may need soaking and a more thorough cleaning. Complete disassembly may be required.

TROUBLESHOOTING

CCR2000 With The 47P Series Engine

This is a fixed jet carburetor so there is no adjustment needle to remove. However, some cleaning can be done without removing the lower shroud. Again drain the old fuel using a pump type siphon. If possible, put the machine on a workbench. Right below the choke control is a cut out in the lower shroud (Figure 184).

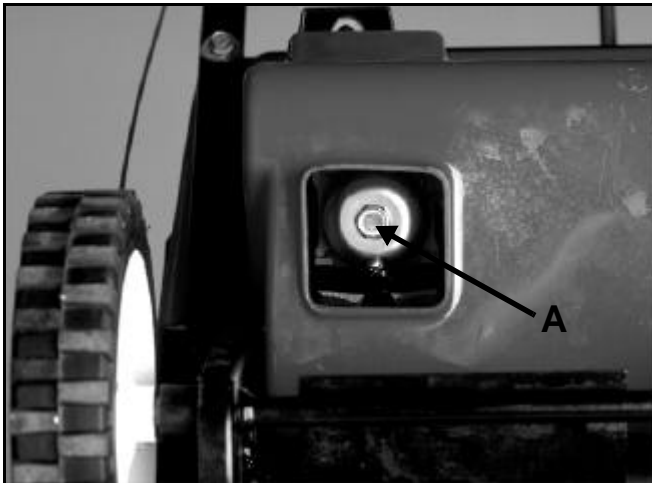


Figure 184

1352-16

(A) Bowl Nut

This is to access the carburetor bowl. Remove the bowl nut and be prepared to catch any fuel that is in the carburetor bowl and fuel line.

The float hinge can be removed with a needle nose pliers and the float and needle removed (Figure 185). **Note:** There is a very fine spring attached to the float hinge.

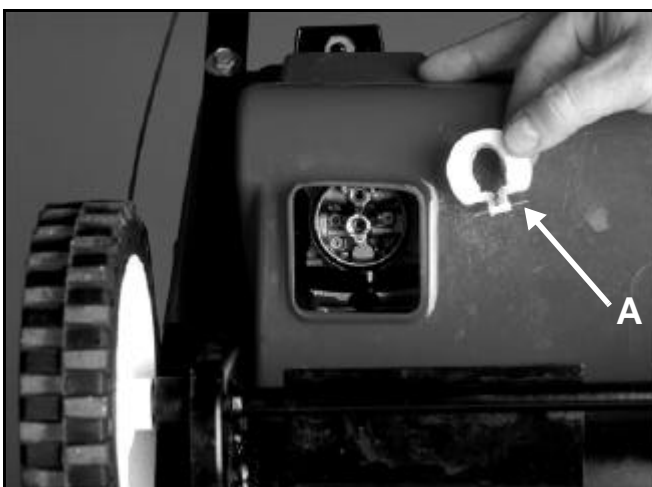


Figure 185

1352-10

(A) Float Hinge

The main jet in this carburetor (Figure 186) is in the center hub or boss. It can be removed with a flat blade screwdriver. Spray the seat area where the needle was and the center where the jet was with carburetor cleaner, allow to drain.

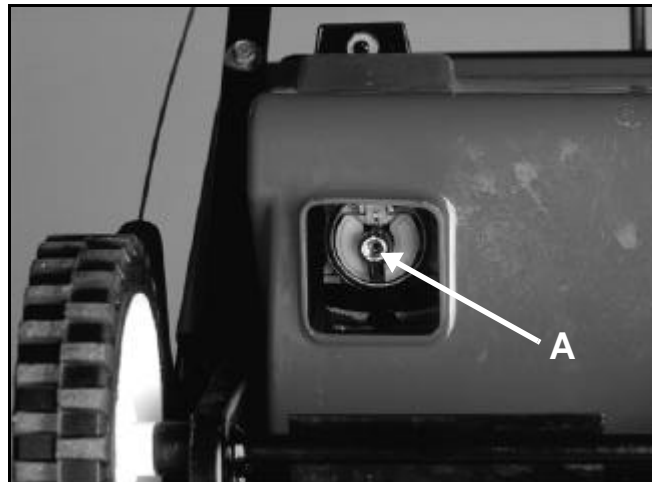


Figure 186

1352-11

(A) Main Jet

Clean the jet. The best way to do that is to pass something through the hole in the jet. A strand of copper wire is good for this. Do not use something that would enlarge the hole. Reassemble the carburetor, add fresh fuel, and try to start the engine. As before, if it starts, allow it to run for at least 10 minutes. If fuel still cannot pass through the carburetor, it will be necessary to remove the carburetor to fully clean and rebuild.

CCR's With R tek Engines

Drain the fuel tank with a pump type siphon.

To access the carburetor, it will be necessary to remove the lower shroud. Refer to the "ENGINE REMOVAL AND INSTALLATION" section for the necessary steps.

With the machine setting upright, remove the carburetor bowl and catch any fuel from the bowl or fuel line.

Remove the float hinge, float, and needle. Remove the filter screen over the hub in the center of the carburetor. The main jet is located in this center hub or boss under the screen and can be removed with a small flat blade screwdriver. Spray carburetor cleaner in the hub where the main jet was and in the hole where the needle fits. Allow the carburetor cleaner to drain out. Wipe the needle with a cloth dampened in carburetor cleaner and clean the main jet with a piece of copper wire (do not use anything that will enlarge the jet). Reassemble the carburetor and add fresh fuel. Test start the engine. Allow it to run for at least 10 minutes. If the engine will not start, the carburetor must be removed to properly clean and rebuild it.

CCR's With HSK850 Engine

As with the other models, step one is to remove the fuel from the tank with a pump type siphon.

To access the carburetor the lower shroud must be removed. The steps for removing the shrouds appear in the "ENGINE REMOVAL AND INSTALLATION" section.

With the snowthrower sitting upright, remove the bolt in the center of the carburetor bowl. Be prepared with a pan to catch any fuel from the carburetor bowl and fuel line. Remove the bowl and bowl gasket. Remove the float hinge pin, the float and needle.

Spray carburetor cleaner into the passage where the needle was and into the center hub of the carburetor. Allow the excess cleaner to drain.

The main jet is in the bolt that held the carburetor bowl on. The jet/bowl nut should be cleaned with carburetor cleaner and a fine wire run through the small drilled hole in the jet.

Assemble the carburetor and install the bowl. Add fuel to the tank and attempt to start the engine. If it starts, allow it to run for at least 10 minutes. The fresh fuel will help clean the carburetor. If it will not start, removing and rebuilding the carburetor may be necessary.

SPARK PLUGS

If the proper fuel oil mix is used, a spark plug can last many years. However, if the engine is flooded, it may be necessary to remove the plug and dry it. Heating the tip of the plug with a match or lighter for a few seconds is all that is necessary. If the plug is heavily coated with oil or carbon, it is best to replace it.

THE ENGINE RUNS BUT IT DOES NOT THROW SNOW

These models drive the paddle or rotor system through a chain or belt.

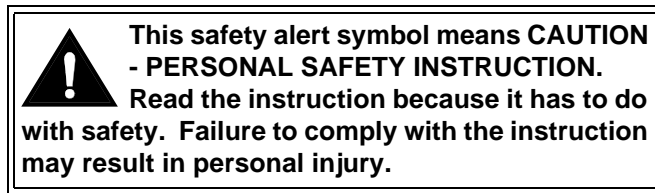
The chain drive models require periodic adjustment of the chain or it can fall off the sprockets. Refer to "Chain Adjustment Procedure (all models)" on page 5 - 20.

There are two types of belt drive systems. If your specific machine (most of the CCR models) has a handle that must be moved to engage the paddle, periodic adjustments to the belt are necessary. Refer to the "DRIVE SYSTEMS" section. If adjustment will not correct the problem, the belt or paddles may need replacement. See "BELT REPLACEMENT" on page 5 - 14 or "PADDLE REPLACEMENT - STRAIGHT PADDLE" on page 7 - 2.

Some models (Some CCR, Powerlite, S140, Snowmaster, S200, S620, and CR20) have a continuous drive system. No adjustment is possible. If the machine does not throw well, the belt or paddles may need replacement.

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GENERAL INSTRUCTIONS



The Power Shovel is designed and tested to offer safe and effective service, provided it is operated in strict accordance with the following Safety Instructions. Failure to comply with the following instructions MAY RESULT IN PERSONAL INJURY.

PERSONAL SAFETY

- Never allow children to operate the Power Shovel. Adults should operate the Power Shovel only after **READING THE OPERATORS MANUAL**.
- Keep everyone, especially children and pets, away from the area of operation.
- Wear adequate winter clothing and footwear that will improve footing on slippery surfaces.

BEFORE OPERATING

- Familiarize yourself with the controls. Know how to stop the engine quickly.
- Since fuel is highly flammable, handle it with care. Fill the fuel tank with a mixture of gasoline and oil before trying to start the engine.
 - A. Use an approved fuel container for storing the gasoline oil mixture.
 - B. Fill the fuel tank outdoors, not indoors. The fuel tank must not be filled when the engine is running or when the engine is hot.
 - C. Install gasoline container cap and fuel tank cap, and wipe up any spilled gasoline before starting the engine.
- Thoroughly inspect the area where the Power Shovel will be used. Remove all door mats, sleds, boards, wires, and any other foreign objects.

- Keep all shields and safety devices in place. If a shield or safety device is defective, make all repairs before operating the Power Shovel. Also tighten loose nuts, bolts, and screws.
- Start the engine and let it warm up outdoors for about two minutes.

WHILE OPERATING

- Never operate the Power Shovel without good visibility or light. Always maintain secure footing and keep a firm grip on the handle when clearing snow: walk never run. **DO NOT USE THE POWER SHOVEL ON A ROOF.**
- Do not run the engine indoors.
- Keep face, hands, feet, and any other part of your body or clothing away from concealed, moving, or rotating parts. Stay behind the handle while operating the snowthrower. **STAY CLEAR OF THE DISCHARGE AREA AT ALL TIMES.**
- Use extreme caution when clearing snow from a walk, road, or gravel drive. Stay alert for hidden hazards and traffic on roads.
- Never direct the discharge toward or operate the Power Shovel near glass enclosures, motor vehicles, window wells, or a drop-off. Keep children and pets away.
- Never direct the snow discharge at bystanders, and do not allow anyone in front of the Power Shovel.
- Never clear snow from steep slopes. Exercise extreme caution when changing direction on slopes.
- Do not overload the Power Shovel by clearing snow at too fast a rate.
- If a solid object is hit or if the Power Shovel vibrates abnormally, turn the engine OFF and wait for the engine and all moving parts to stop. Check the Power Shovel for possible damage, and obstruction, or loose parts. Repair the damage before starting and operating the Power Shovel.
- Before adjusting, cleaning, repairing and inspecting the Power Shovel, or before unclogging the discharge area, shut the engine off and wait for all moving parts to stop. Remove the spark plug wire. (Refer to "Removing The Upper Shroud" on page 9 - 4.)

GAS POWER SHOVEL

- Let the engine run for a few minutes after clearing snow so moving parts do not freeze when stored.

MAINTENANCE AND STORAGE

- Never leave fuel in the Power Shovel fuel tank when the Power Shovel is stored in a building where there is flame or spark present. Allow the engine to cool before storing. Never store the Power Shovel in the house, basement, or car, as gasoline and fumes are highly flammable, explosive, and dangerous if inhaled.
- Before performing any maintenance or servicing the Power Shovel, turn the engine OFF and wait for the engine and all moving parts to stop.
- Reinstall the fuel cap when the top cover is removed for maintenance procedures. Perform maintenance and use storage instructions described in this manual.
- Keep all nuts, bolts, and screws tight to assure the Power Shovel is in safe working condition.
- ALWAYS USE TORO REPLACEMENT PARTS AND ACCESSORIES TO ASSURE SAFETY AND OPTIMUM PERFORMANCE. NEVER USE "WILL-FIT" REPLACEMENT PARTS AND ACCESSORIES.

IDENTIFICATION AND ORDERING

IDENTIFICATION: All Toro products, including single stage snowthrowers, have two identification numbers: a model number and serial number. In any correspondence concerning your snowthrower, always supply the model and serial number, to assure the correct information or replacement parts are obtained. The location will vary depending on the model and year the unit was manufactured. Please note the diagram to determine the location of the model and serial number decal on your unit (Figure 187).

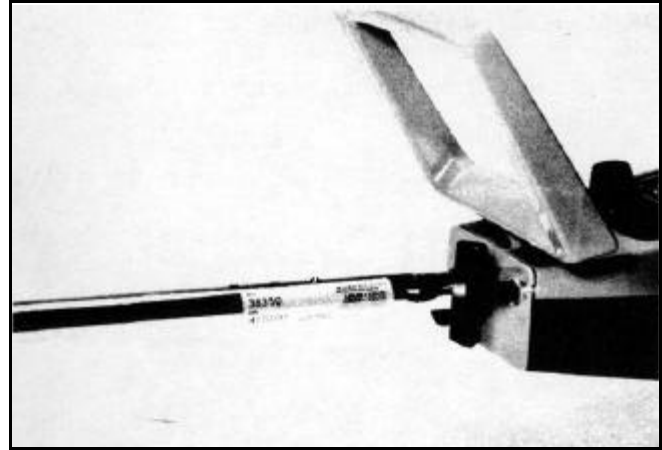


Figure 187

0406-008

ORDERING: Toro parts are available through your local Authorized Toro Service Dealer.

Parts: To order replacement parts from an Authorized Toro Dealer, the following information is needed:

1. Model and serial number of the snowthrower.
2. Description of the part(s) and quantity of the part(s) desired. If a parts manual is being used, use the part number and the description.

NOTE: To find the nearest Authorized Toro Service Dealer in your area, please consult your yellow pages under "lawn mowers" or "snowthrowers".

Manuals: Should a replacement owner's manual or parts manual be needed, please send the complete model and serial number along with your name and address to:

The Toro Company
8111 Lyndale Avenue South
Minneapolis, MN 55420
ATTN: Publications Department

MIXING INSTRUCTIONS FOR GASOLINE AND OIL

Safety Instructions



CAUTION

Gasoline is flammable and caution must be used when handling or storing it. Do not fill the fuel tank while snowthrower is running, while it is hot, or when it is in an enclosed area. Keep away from an open flame, an electrical spark, and DO NOT SMOKE while mixing fuel or filling the fuel tank. Fill the fuel tank to within 1/4 - 1/2 inch from top of the tank to provide space for expansion of fuel. Never fill the fuel tank to the top of filler neck. Always fill the fuel tank outdoors and use a funnel or spout to prevent spilling. Make sure to wipe up any spilled fuel before starting the engine.

Store gasoline in a clean, approved container, and keep the cap in place on the container. Keep gasoline in a cool, well ventilated place; never in the house. Never buy more than a 30 day supply of gasoline to assure volatility. Gasoline is intended to be used as a fuel for internal combustion engines; therefore, do not use gasoline for any other purpose. Since many children like the smell of gasoline, keep it out of their reach because the fumes are dangerous to inhale, as well as being explosive.

Proper Fuel And Oil

The Toro Gas Power Shovel is powered by a 2-cycle engine which requires a 32:1 mixture of gasoline and Toro 2-Cycle Engine Oil.

Mixing Procedures

Use the following procedure to assure the fuel is properly mixed:

1. Add one quart of unleaded regular gasoline to a gasoline container.
2. Pour 4 ounces of Toro 2-cycle engine oil into the gasoline container before shaking.
3. Shake the gasoline container vigorously so the oil mixes with the gasoline. Remember to install the cap on the gasoline container before shaking.

4. Add an additional three quarts of gasoline to the premixed gasoline. The fuel mixture is now ready to use in your snowthrower.



CAUTION

Do not store the oil near an open flame or in an extremely warm environment as the oil is flammable.

IMPORTANT: If the fuel and Toro 2-cycle oil are not mixed at the correct ratio for your snowthrower, (32:1) piston damage and other engine damage may occur. It is important that the fuel and oil be mixed at temperatures above 40°F to ensure complete mixing.

Note: To assure the fuel and oil mixes completely, store your Toro 2-Cycle Oil indoors, so it will be at room temperature (above 50°F).

Filling The Fuel Tank

IMPORTANT: Do not fill the fuel tank with gasoline that has not been mixed with Toro 2-cycle engine oil in the correct ratio for your snowthrower. Do not pour Toro 2-Cycle Engine Oil directly into the snowthrower fuel tank. Do not use gasoline additives or fuels that contain methanol or over 10% ethanol.

1. Mix the gasoline and oil in the correct ratio for your unit. "MIXING INSTRUCTIONS FOR GASOLINE AND OIL" on page 9 - 3
2. Clean the area around the snowthrower fuel tank cap so foreign matter does not get into the fuel tank. Remove the cap from the fuel tank.
3. Shake the fuel mixture in the gasoline container; then fill the snowthrower fuel tank to within 1/4 - 1/2 inch from the top of the tank, not the filler neck.
Note: When filling the fuel tank with a gasoline/oil mixture that has been sitting for some time, shake the mixture before filling the fuel tank to assure the gasoline and oil properly mix.
4. Install the cap securely on snowthrower fuel tank.

GAS POWER SHOVEL

Draining The Fuel Tank



CAUTION

Because the gasoline/oil mixture in the snowthrower fuel tank is explosive, the fuel mixture must be drained outdoors, away from fire and flame. Do not smoke while draining gasoline.

To assure safe servicing of your snowthrower, it is critical that the fuel tank be drained. To drain the fuel tank on your snowthrower, use the following procedure:

1. Remove the cap from the snowthrower fuel tank and tip the unit upside down so the fuel drains into a container approved for gasoline. After the fuel is drained, install the cap on the fuel container. Wipe up any fuel that may have spilled.
2. Replace the fuel tank cap. Start and run the engine until it runs out of fuel and stops. When the engine sputters, turn the choke knob to the "ON" position so that the fuel in the carburetor is expended.

Removing The Upper Shroud

Many servicing procedures for the Toro Gas Power Shovel require removing the upper shroud.

To Remove the Upper Shroud:

1. Drain all of the fuel from the fuel tank. Leave the cap off the tank.
2. The choke and ignition knobs may be left in place.

3. Remove the three Phillips screws which attach the upper and lower shrouds in the impeller housing area (Figure 188).

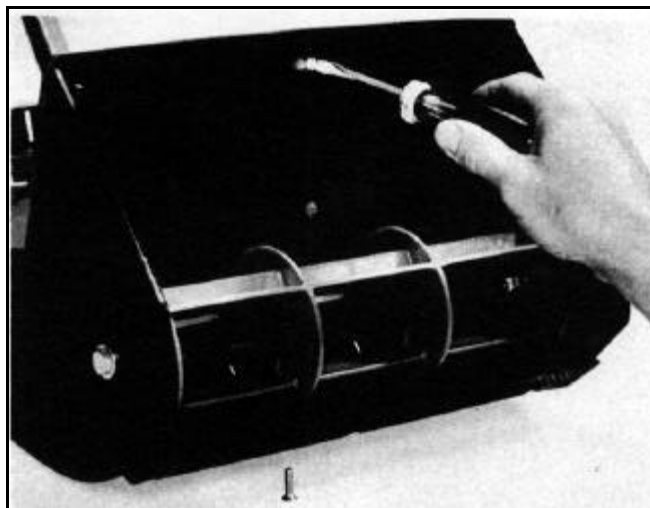


Figure 188

0406-009

4. Remove the six screws from the back of the snowthrower (Figure 189).

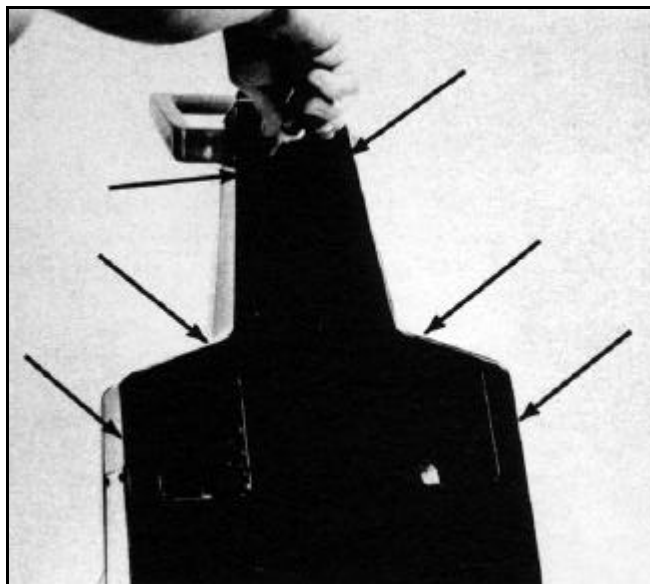


Figure 189

0406-010

GAS POWER SHOVEL

5. Lift the upper shroud away from the lower shroud. Replace the gas cap on to the gas tank to contain gas fumes and to prevent excess fuel mixture from dripping out of the fuel tank.

Note: Aligning the upper shroud for replacement onto the snowthrower is eased by inserting the rubber isolator mount into the upper shroud, as shown (Figure 190).

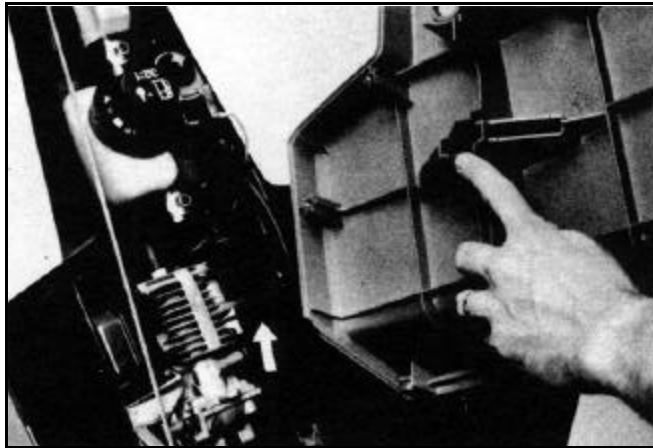


Figure 190

0406-011

CONTROLS — LOCATION AND OPERATION

The controls on the Gas Power Shovel are located in two areas. The choke and ignition switch are on the panel of the upper shroud (Figure 191). The primer bulb and the recoil starter rope are located on a panel at the base of the handle (Figure 192).



Figure 191

0406-012

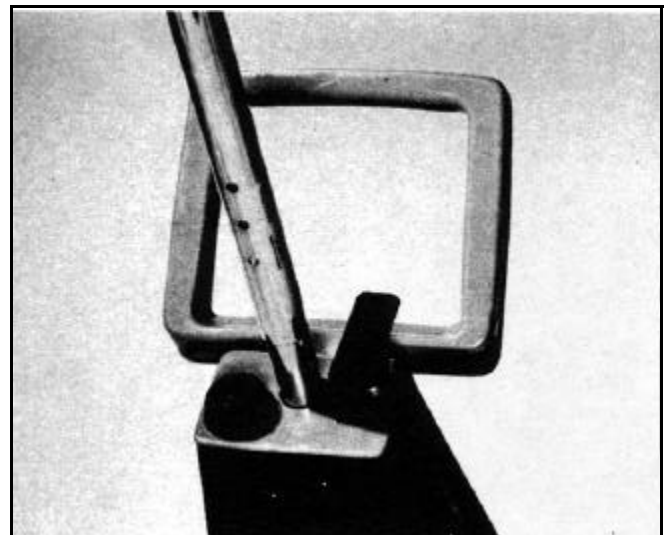


Figure 192

0406-013

GAS POWER SHOVEL

PRIMER OPERATION

The primer, used on the Toro Gas Power Shovel is designed to pump a small amount of fuel from the carburetor into the carburetor throat. This extra fuel mixture assists with starting of a cold engine.

The primer is operated by depressing the primer bulb while ensuring that the vent hole in the bulb is covered. Pressing the primer bulb forces air against the outside of the diaphragm in the carburetor. The upward movement on the diaphragm lifts the inlet needle and allows fuel into the fuel chamber. The fuel in the fuel chamber is then forced through the fuel passages and into the carburetor throat. For temperatures below 0°F (-18°C) use two or three primes. For temperatures above 0°F (- 18°C) use one or two primes. In colder conditions, more primes may be necessary. If the engine is warm, do not use the primer.

CHOKE OPERATION

The carburetor choke control or shutter meters the amount of air passing into the engine. When starting the engine, the carburetor choke should be closed. The choke shutter allows air to enter the carburetor only through openings in and around the choke shutter. When the engine is cranked, a low pressure area is created in the engine and carburetor. Since only a limited amount of air can enter the low pressure area because of the closed choke shutter, a greater amount of fuel is pushed through the fuel passages to fill the void. This creates the richer mixture needed for engine starting and restarting after the engine is warm.

After the engine starts, more air must pass into the engine. Therefore, after the engine is started, open the choke shutter to allow more air to pass into the engine. On the Toro Gas Power Shovel, the choke control knob should be rotated clockwise to open the choke.

On/Off Switch

The Gas Power Shovel ignition switch allows the engine to be started with the switch knob in the "ON" position. Rotating the knob to the "OFF" position will ground the ignition system and will stop the engine.

TESTING THE SWITCH

The On/Off switch used on the Gas Power Shovel consists of a set of contact switch terminals and an actuator switch (Figure 193).

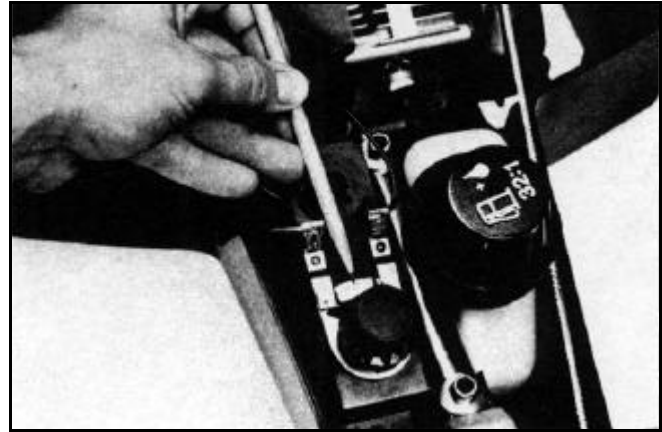


Figure 193

0406-014

To check the switch:

1. Visually inspect the individual switch parts for damage. To determine if the contact switch terminals have adequate contact pressure against the actuator switch, gently pull upward on both of the switch terminals to ensure that they spring back into position. If the individual switch parts are damaged, they should be replaced.

The switch contact terminals are riveted to the control bracket. The rivets can be removed from the bracket with a punch and new terminals can be attached to the bracket with a rivet gun.

2. Disconnect either one or both of the ignition module wires from the contact switch terminals. Inspect the wires for damage.
3. Remove the On/Off switch knob from the upper shroud and insert it into the On/Off switch control. With the switch knob "arrow" turned counterclockwise to the 10 o'clock position, the raised portion of the switch actuator should be located midway between the two contact switch terminals.

- Place one continuity light or volt/ohmmeter lead to each of the switches. The test instrument used should register continuity (Figure 194).

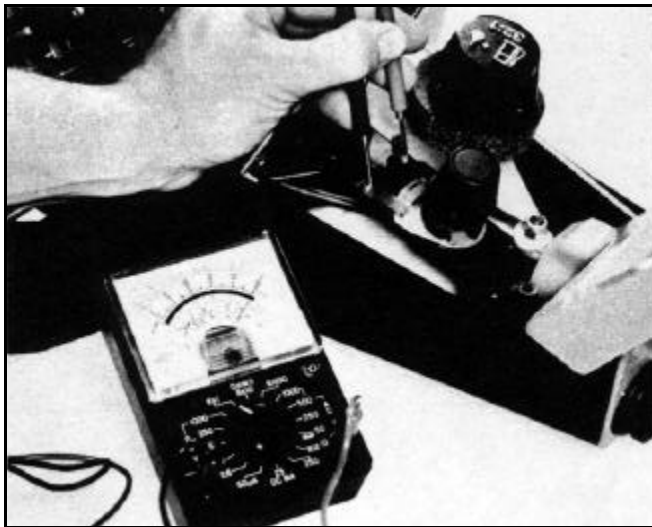


Figure 194

0406-015

- Now, turn the ignition switch to the "ON" or the 2 o'clock position. Visually check to ensure that the switch actuator is not in contact with the contact switch terminals. The tester should not register continuity when the switch is in the "ON" position (Figure 195). Switch parts which are loose, bent, or damaged should be replaced.

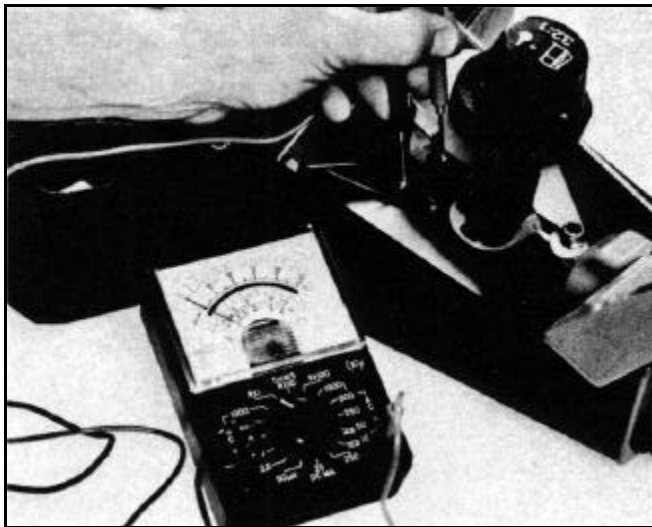


Figure 195

0406-016

- Connect the coil wire(s) to the switch and replace the upper shroud.

ENGINE OPERATING THEORY

2-Cycle Engine – Theory Of Operation

2-cycle engines are used on the Toro Gas Power Shovel because of their:

- Lightweight.
- Excellent power-to-weight ratio.
- Ability to operate in any position.
- Easy maintenance.
- Simple construction.

The Toro 2-cycle engine used on Toro Gas Power Shovels is a third-port, loop-scavenged design. This design name describes the path of the fuel/air mixture into the crankcase and combustion chamber, and the exhausting of spent gases (Figure 196). The piston in Figure 196 is shown in a lower than normal position, to clearly show the individual ports.

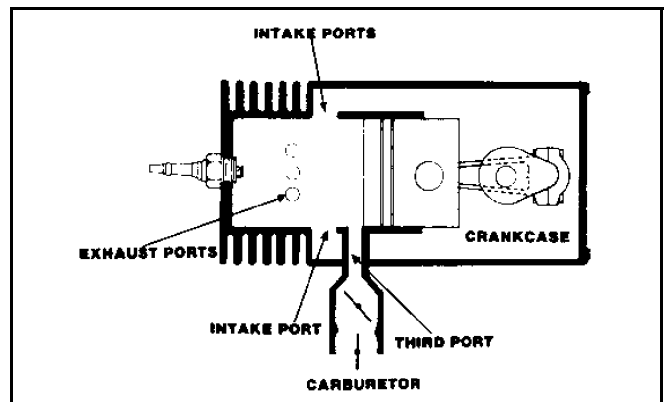


Figure 196

0406-017

GAS POWER SHOVEL

In a loop-scavenged engine with a third-port, the flow of the fuel/air mixture can be described as follows: (Figure 197).

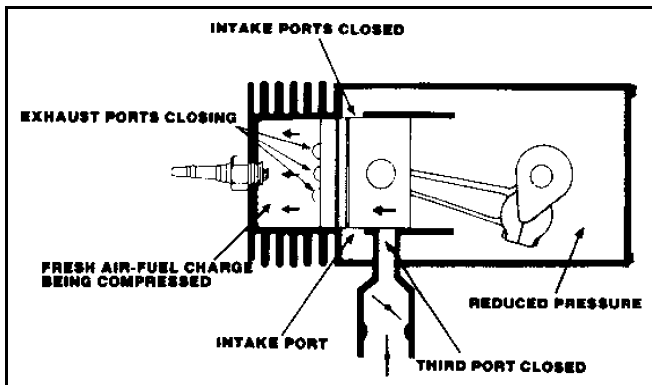


Figure 197 0406-018

1. The fresh fuel/air mixture enters the crankcase through the third-port on the side of the cylinder. The oil in the fuel/air mixture lubricates the moving parts within the crankcase.
2. The fuel/air mixture is transported through the fuel transfer ports to the combustion chamber where it is compressed, ignited, and then expelled from the engine through the exhaust port.

Engine Operation

The piston closes all engine ports as it moves toward the combustion chamber. The moving piston creates high pressure in the combustion chamber and partial vacuum in the crankcase. Refer to Figure 198.

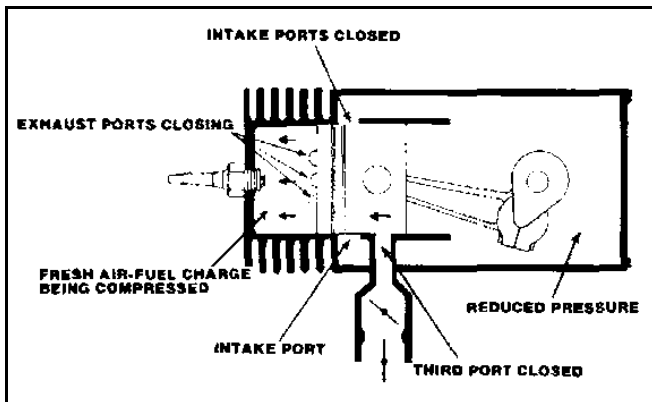


Figure 198 0539-02

At a point slightly before top dead center (BTDC) of the piston travel, the spark from the plug ignites the fuel/air mixture. Also, at this time, the third-port opens allowing the fresh fuel/air mixture to rush into the crankcase to equalize the partial vacuum. Refer to Figure 199.

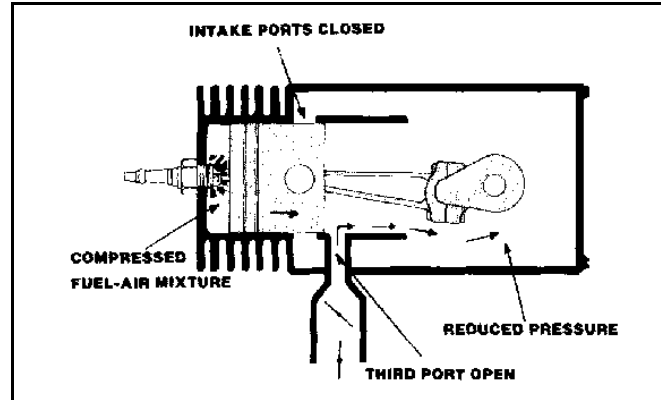


Figure 199 0530-03

The expanding gases from the burning fuel in the combustion chamber force the piston down the cylinder, closing the third-port and increasing the pressure in the crankcase. At a point approaching the bottom of the stroke, the exhaust port opens and the burnt gases begin to be expelled from the combustion chamber. Refer to Figure 200.

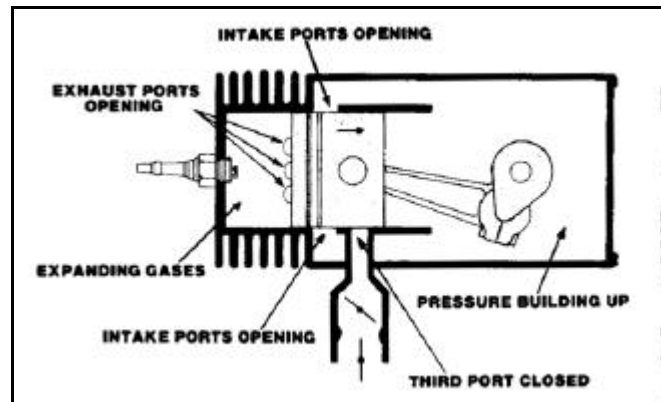


Figure 200 0530-04

At a point of piston travel slightly before bottom dead center (BBDC) the fuel transfer ports, on the sides of the cylinder walls, are uncovered and the compressed fuel/air mixture in the crankcase is allowed to enter the combustion chamber where they help expel the burnt gases and charge the chamber for the following piston stroke. Refer to Figure 201.

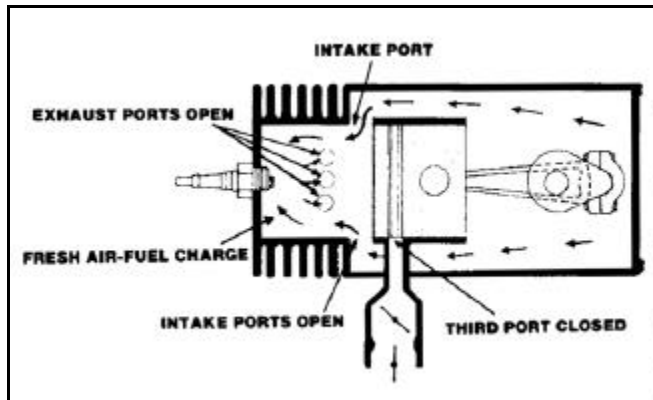


Figure 201

0530-05

Fuel System

Diaphragm Carburetor Theory

The Toro Gas Power Shovel is equipped with a Walbro WTA-2 Diaphragm Carburetor. The Walbro Carburetor operates on pressure differentials or alternating pressure – vacuum pulses.

As the engine's recoil starter is pulled, piston movement in the cylinder causes the carburetor fuel pump diaphragm to fluctuate.

Diaphragm movement causes fuel to be drawn from the gas tank through the fuel inlet valve in the fuel pump diaphragm. The fuel inlet valve opens during a pressure pulse to allow fuel flow to the fuel outlet valve in the pump diaphragm which is closed during a pressure pulse.

As a vacuum pulse is developed within the carburetor, the fuel inlet valve closes and the outlet valve opens, which allows fuel to flow through the filter screen to the metering chamber.

During the vacuum pulse, the metering diaphragm is drawn up which causes the metering lever to pivot on the metering lever pin. This in turn, causes the inlet needle to lift off of the seat which allows fuel to flow to the metering chamber. As the metering chamber fills with fuel, spring pressure on the metering lever closes the needle valve. Refer to Figure 204 to Figure 214.

Engine vacuum pulses then draw fuel up through the nozzle check valve and the nozzle well and forces the fuel into the carburetor throat. Increased air velocity at the nozzle which is created by the venturi, develops a low pressure area and atmospheric pressure pushes fuel into the throttle bore to deliver the fuel to the crankcase.

CARBURETOR ADJUSTMENT

Adjusting Carburetor

The carburetor has been adjusted at the factory, but an adjustment may be required to compensate the differences in fuel, temperature, and altitude.

1. Mixture Adjustment Screw (Figure 202) – Close the screw by gently rotating it clockwise until a slight seating resistance is felt. Next, rotate the mixture adjusting screw one turn counterclockwise.

IMPORTANT: Do not close the screw too tight because the screw and seat will likely be damaged.

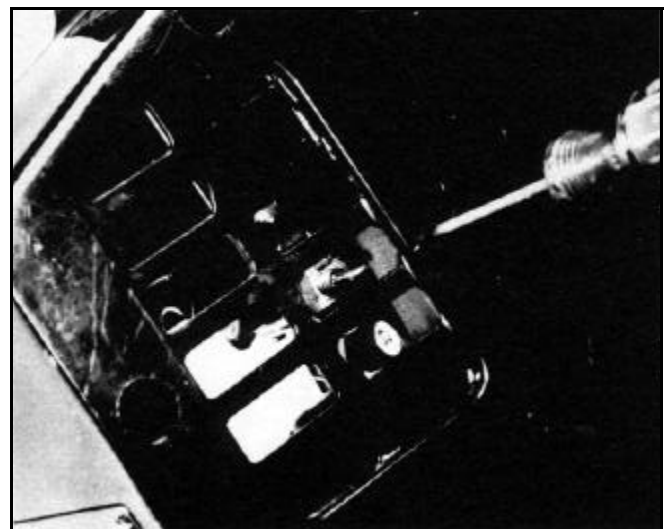


Figure 202

0406-019

GAS POWER SHOVEL

NOTE: This setting is approximate; however, this setting will allow the engine to be started so the carburetor can be fine tuned – steps 2 through 3.

2. Start the engine and let it warm up for approximately five minutes. Do not adjust the carburetor when the engine is cold. Be sure to perform carburetor adjustments while at a temperature that will be the average outdoor temperatures at which the Power Shovel will be used.



CAUTION

The engine must be running so final adjustment of the carburetor can be performed. To guard against possible personal injury, keep hands, feet, and face away from concealed, moving, or rotating parts.

NOTE: When making the adjustment, turn the adjustment screw 1/8 turn at a time and wait for the engine to respond to change.

3. With the engine running, turn the mixture adjustment screw slowly clockwise until engine falters. Remember this location. Now turn the screw counterclockwise until the engine just starts to sputter. Remember this location. Turn the screw clockwise until it is halfway between the first position where your engine faltered and the last position where your engine started to sputter. This should be the optimum setting on your carburetor.

NOTE: In extremely low temperatures or heavy loading conditions, the mixture adjustment screw may have to be rotated counterclockwise another 1/8 turn.

CARBURETOR SERVICE

Carburetor Removal

1. Drain all fuel from the gas tank. Refer to "Draining The Fuel Tank" on page 9 - 4.
2. Remove upper shroud. See "Removing The Upper Shroud" on page 9 - 4.
3. Place the gas cap on the gas tank to contain gas fumes and excess fuel/oil mixture from dripping out of the tank during service.
4. Remove both the fuel line and primer hose from the carburetor.
5. Loosen the carburetor hex socket head screws with an 1/8 inch allen wrench.
6. As the carburetor is being removed, disconnect the choke linkage from the choke lever (Figure 203).

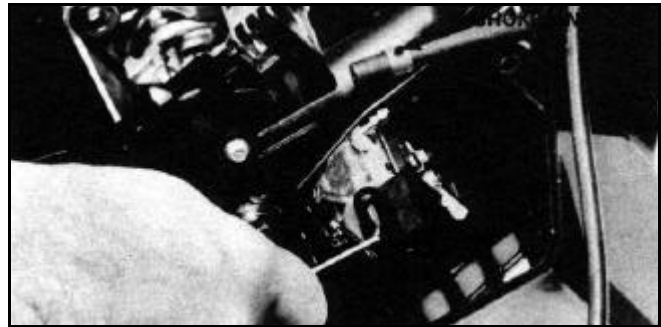


Figure 203

0406-020

Carburetor Disassembly

1. Remove the pump cover screw, pump cover, pump cover gasket, and the pump diaphragm (Figure 204).

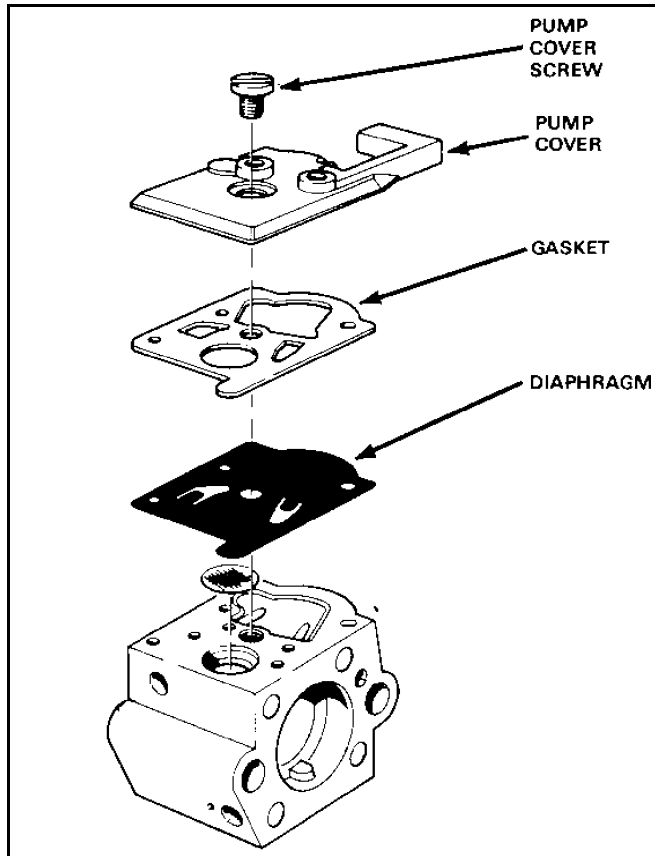


Figure 204

0406-021

2. Remove the four metering diaphragm cover screws, metering diaphragm assembly, and metering diaphragm gasket (Figure 205).

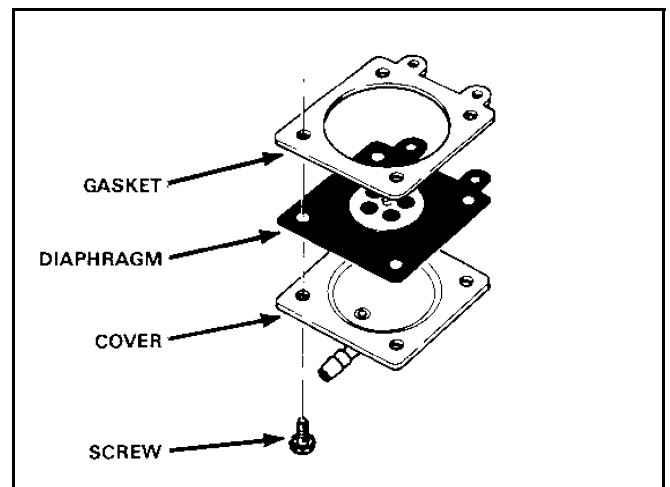


Figure 205

0406-022

3. Remove the choke valve from the choke shaft assembly (Figure 206).

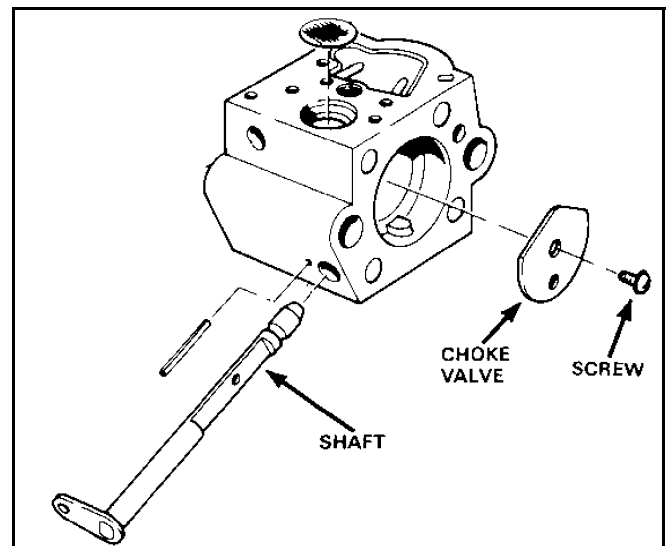


Figure 206

0406-023

GAS POWER SHOVEL

4. Remove the high speed needle. Inspect the tip of the needle and replace it if it is blunt or damaged (Figure 207).

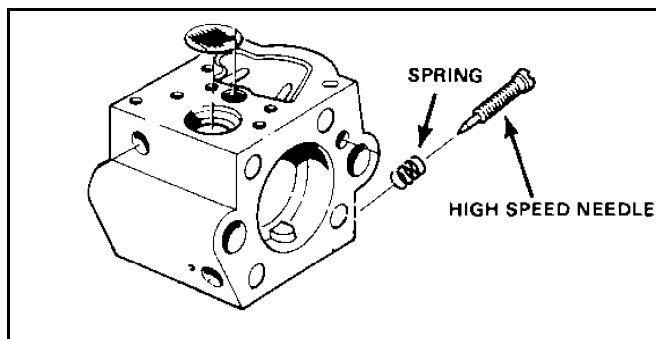


Figure 207

0406-024

5. Remove the metering lever pin screw and the inlet needle valve, metering spring, metering lever, and metering lever pin (Figure 208).

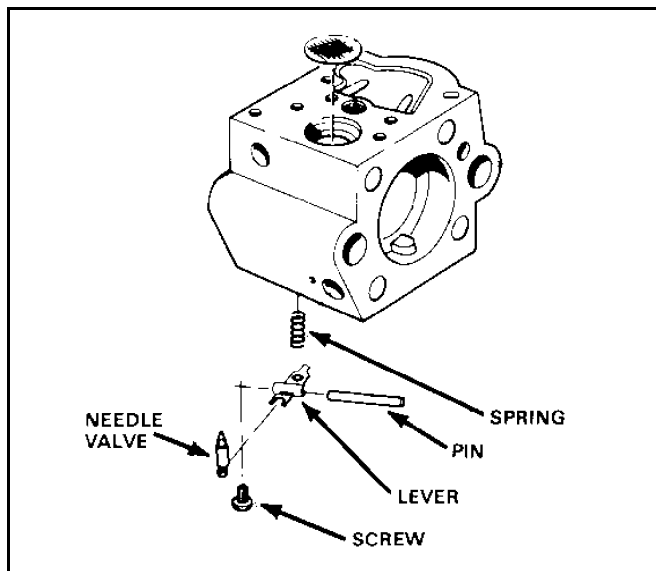


Figure 208

0406-025

6. Remove the fuel inlet screen (Figure 209).

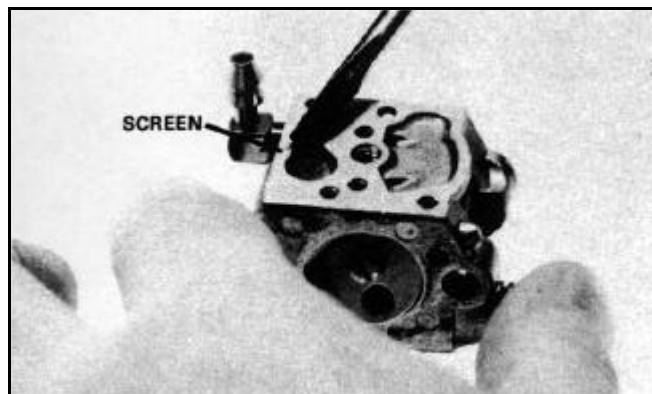


Figure 209

0406-026

7. Scrape all excess diaphragm and gasket material away from the pump cover, the metering diaphragm cover, and the carburetor body with a putty knife or wooden dowel. Be careful not to scratch the metal surfaces while cleaning them.
8. Blow through all the holes in the carburetor casting to ensure that no obstructions exist.
9. Soak all metal carburetor parts in a high quality carburetor solvent. **Note:** Do not soak rubber components or gaskets in the carburetor solvent.

CARBURETOR ASSEMBLY

After old carburetor diaphragms and gaskets are removed from the carburetor, they should be replaced with new diaphragms and gaskets. Check the parts catalog for part numbers.

GAS POWER SHOVEL

1. Install the fuel inlet screen with a .300 inch diameter hollow tube. Ensure that the screen is properly seated (Figure 210).

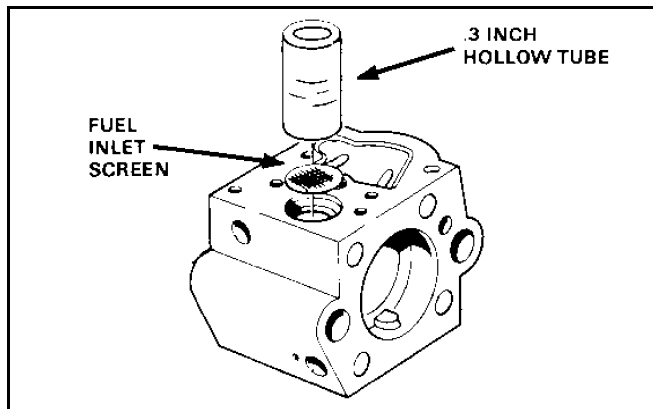


Figure 210

0406-027

2. Install the pump components over the locating pins and on to the pump cover in this order:
 - A. Pump Gasket
 - B. Pump Diaphragm

Assure that the pump gasket and pump diaphragm are flush with the surface of the pump cover (Figure 211).

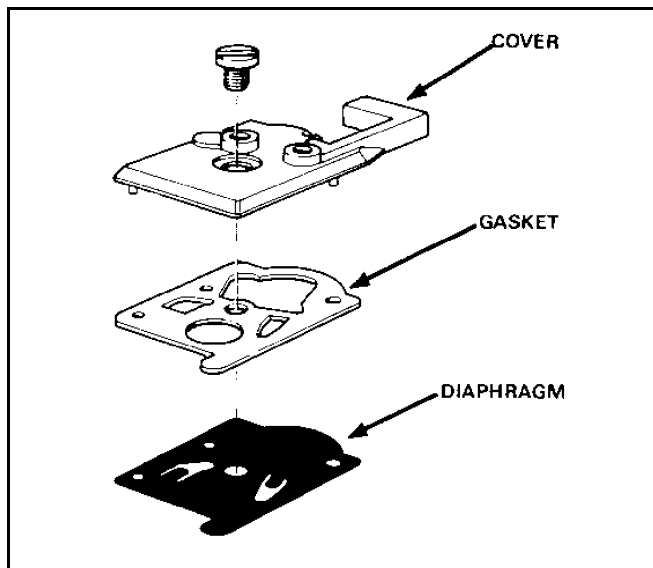


Figure 211

0406-028

3. Install the fuel pump components onto the carburetor body. **NOTE:** Prior to tightening the pump cover screw, ensure that the fuel pump gasket is in contact with the fuel pump cover and that the fuel pump diaphragm is in contact with the carburetor body.
4. Install the metering lever components. The metering lever is properly adjusted when the top surface of the lever is aligned to the carburetor body with a straight edge (Figure 212). The lever can be adjusted by gently bending it until it is flush with the carburetor casting surface. **NOTE:** Perform steps 5 and 6 in order.

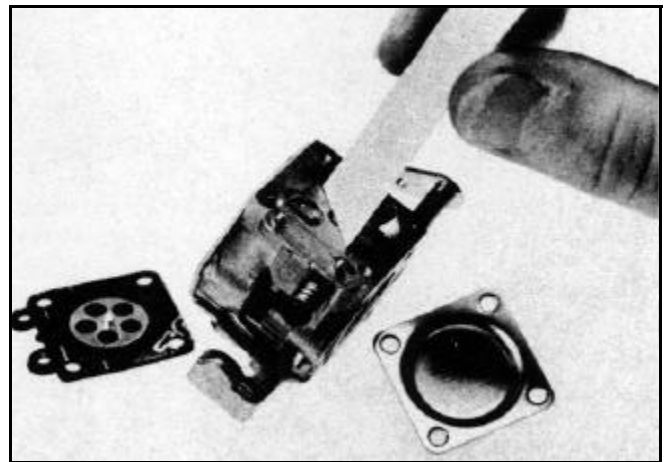


Figure 212

0406-029

5. Install the metering diaphragm gasket over the locating pins on the carburetor body (Figure 213).

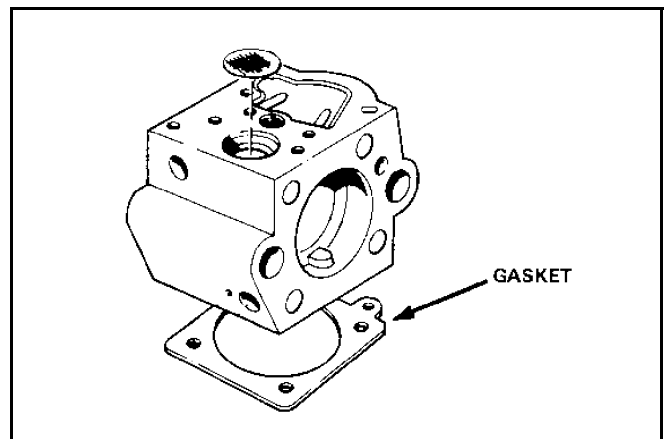


Figure 213

0406-030

GAS POWER SHOVEL

6. Install the metering diaphragm over the gasket and locating pins on the carburetor body. The metering diaphragm should be installed with the metering disc toward the carburetor body (Figure 214).

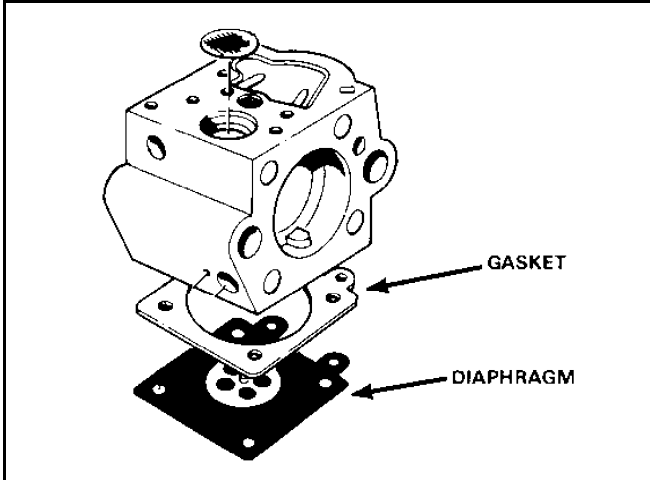


Figure 214

0406-031

7. Install metering diaphragm cover.
8. Connect the choke linkage to the choke lever.
9. Install the carburetor onto the engine backing plate with a new carburetor gasket and a new spitback cup gasket. Torque the carburetor mounting screws at 35 - 40 in·lbs (.4 - .45 Kg·in) (Figure 215).

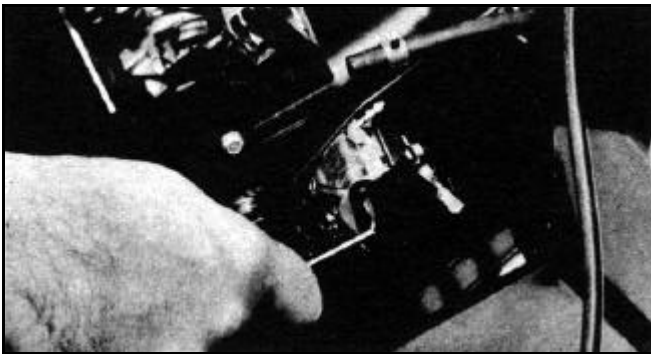


Figure 215

0406-032

ENGINE SERVICE

Service Items Which Require Removing The Engine

- Recoil Starter
- Muffler
- Ignition Timing
- Flywheel Replacement
- Short Block
- Backing Plate Replacement
- Cooling Shroud Replacement
- Lower Housing Replacement
- Decarboning the Cylinder

Prior To Removing The Engine, These preliminary Checks Should Be Made:

1. Check the ignition switch and switch wires. Refer to Figure 194.
2. Check the spark plug:
 - A. To ensure the correct type (NGK BMR-6A or Champion RCJ-8, Autolite AR7N).
 - B. For damage to the insulator.
 - C. For excessive carbon or burnt electrodes.
 - D. For the correct gap .020 - .024 (.5 - .6mm).
 - E. Check for spark – Refer to "CHECKING FOR SPARK" on page 9 - 15.
3. Fuel Supply
 - A. Check the choke position.
 - B. Check the condition of the fuel for freshness, contaminants, and proper mixture.
 - C. Check fuel tank for contaminants and flush the tank with a small amount of fresh fuel.
 - D. Gas cap and gas cap vent valve.
 - E. Fuel line for kinks, bends, or obstructions.

4. Cylinder Compression

- A. Cranking pressure is 100 psi. Refer to "Compression Test Procedures" on page 9 - 16.

Checking Fuel Tank Venting

The fuel tank cap vent allows air into the tank as fuel is consumed. If this vent is blocked with dust or dirt, the engine will eventually stall.

1. Remove the fuel tank cap and inspect the vent. If the cap is contaminated with dirt particles, the vent may need to be replaced (Figure 216).

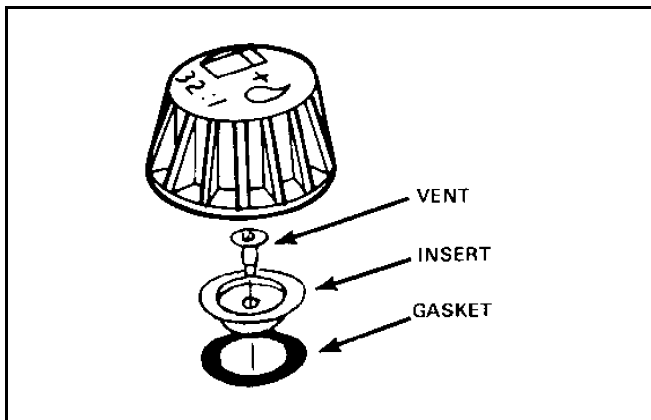


Figure 216

0406-033

2. The cap can be disassembled by prying up the insert with a flat screwdriver. Care should be used to prevent damage to the insert and the valve.
3. Remove the valve, squeeze the valve to close it, release it, and hold it up to a light. No light should be visible through the valve. If light can be seen, the valve should be cleaned or replaced (Figure 217). Serial Nos. 5000001 and up use a vent that does not require this test.

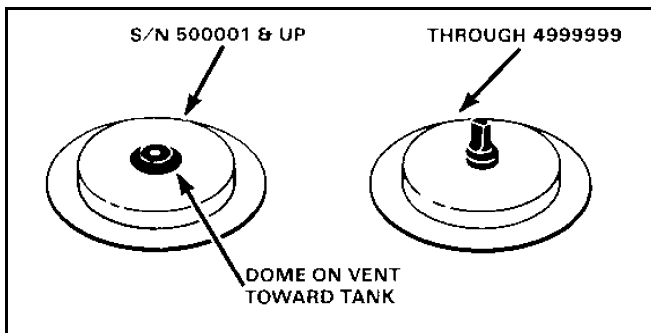


Figure 217

0406-034

1. Visually inspect the bottom of the fuel tank for dirt or other contaminants.
2. If dirt, water, or other contaminants are present, the tank should be flushed with a small amount of fuel, and refilled with fresh fuel.

CHECKING FOR SPARK

1. Pull off the spark plug cap and remove the spark plug.
2. Inspect the spark plug for wear, carbon deposits, and damage. Replace the plug if it is burnt or fouled. **NOTE:** Do not sandblast, scrape, or clean the spark plug electrodes with a wire brush because grit may eventually fall into the cylinder and engine damage will likely result.
3. Check the spark plug gap and adjust it if necessary to .020 - .024 in (.5 - .6mm).
4. Turn the ignition switch to the "ON" position. (If the ignition wires have been removed from the switch, ensure that they are not in contact with each other or grounding against metal.) Install the spark plug cap onto the spark plug and ground it to the cylinder and crank the engine. If a hot spark jumps the spark plug gap, the ignition system is working satisfactorily.



CAUTION

Do not test for spark where gasoline has been spilled or flammable vapors may exist. A fire could result.

NOTE: The spark may be difficult to see in daylight or other brightly illuminated areas. This test will not ensure that the ignition system is operating at full potential.

5. If no spark is seen, disconnect the ignition switch and repeat the spark test. If no spark is seen, replace the CDI module.

GAS POWER SHOVEL

COMPRESSION TEST

Compression Test Procedures

1. Install the compression gauge into the spark plug hole. **IMPORTANT:** Be certain that no more than 1/2" of the gauge is threaded into the cylinder as damage to the piston may result.
2. Pull the starter rope several times to obtain the highest compression reading.
3. If the compression reading is below 100 psi (689 kPa), cylinder, piston, or ring damage should be suspected. If so damaged, a new engine short block should be installed.

ENGINE REMOVAL

1. Completely drain all fuel from the fuel tank.
2. Remove upper shroud (Figure 218). Refer to "Removing The Upper Shroud" on page 9 - 4.

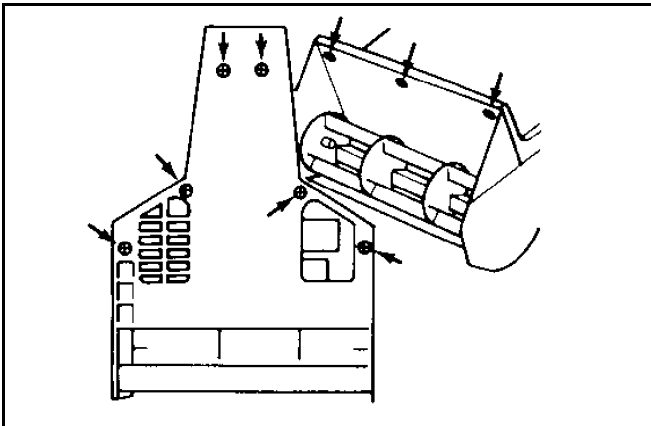


Figure 218

0406-035

3. Place the fuel tank cap back on the fuel tank.
4. Disconnect the spark plug high tension wire.

5. Fully extend the recoil starter rope and tie a knot in the rope at the starter idler pulley (Figure 219).

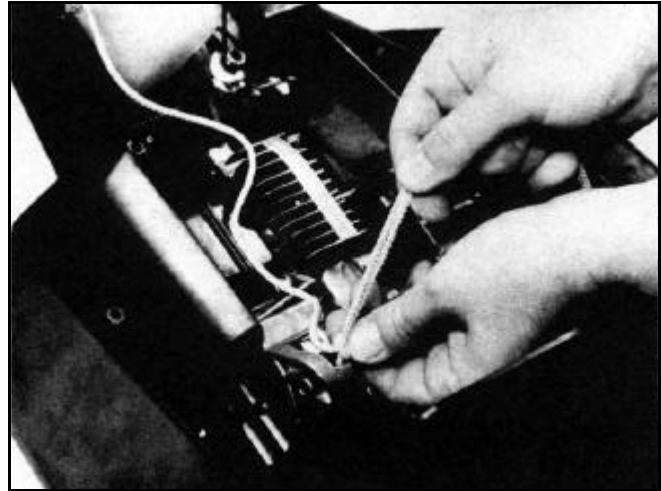


Figure 219

0406-036

6. Thread the knot at the end of the recoil starter rope through the side of the rope handle and untie the knot.
7. Remove the choke linkage, fuel line, and primer hose from the carburetor.
8. Disconnect the lead wires from the On/Off switch.

9. The engine is mounted on a single engine mount and is supported with a rubber isolator mount. To disconnect the engine from the housing, remove the screw and nut which hold the engine mount to the housing (Figure 220).

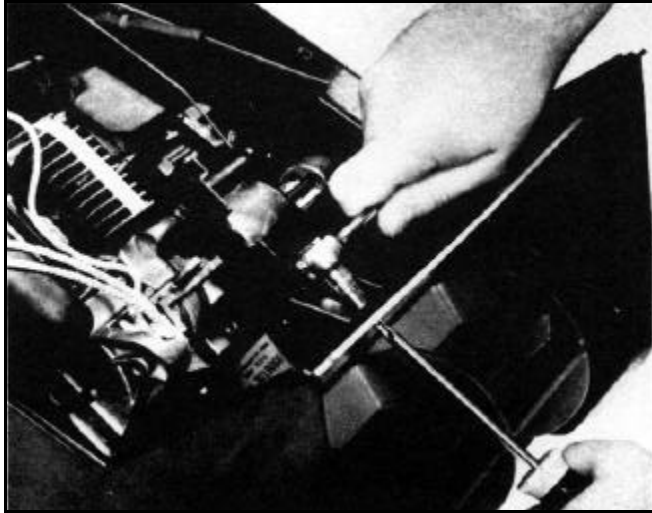


Figure 220

0406-037

10. Remove the rubber drive coupling from the crankshaft adaptor and remove the engine from the housing (Figure 221).

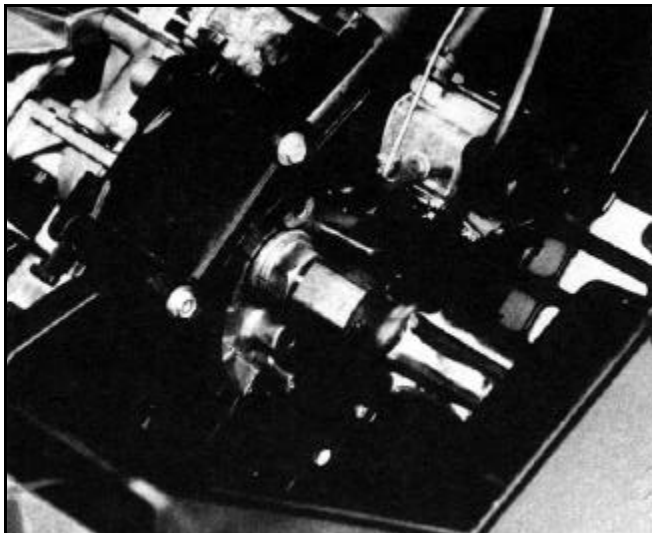


Figure 221

0406-038

ENGINE SHORT BLOCK

If engine compression falls below 100 psi, or if internal damage to the cylinder has occurred, the engine short block must be replaced. An engine short block is available as a factory sealed assembly only. Individual replacement short block parts (such as a piston, piston ring, crankshaft, cylinder, and crankcase) are not available.

To Replace An Engine Short Block

1. Remove the engine from the snowthrower frame (Refer to "ENGINE REMOVAL" on page 9 - 16).
2. Remove the carburetor and stress plate screws. Scrape excess gasket material away from the carburetor body with a putty knife or a wooden dowel (Figure 222).

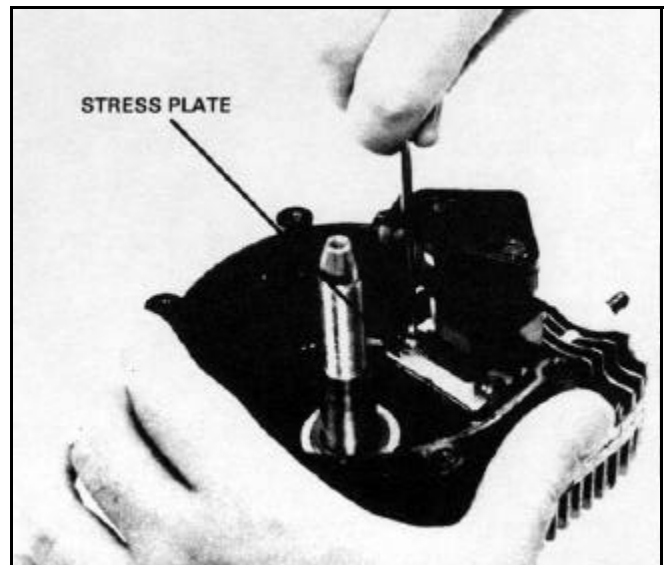


Figure 222

0406-039

GAS POWER SHOVEL

3. Remove the muffler and dried gasket material and carbon build up with a putty knife or wooden dowel (Figure 223).

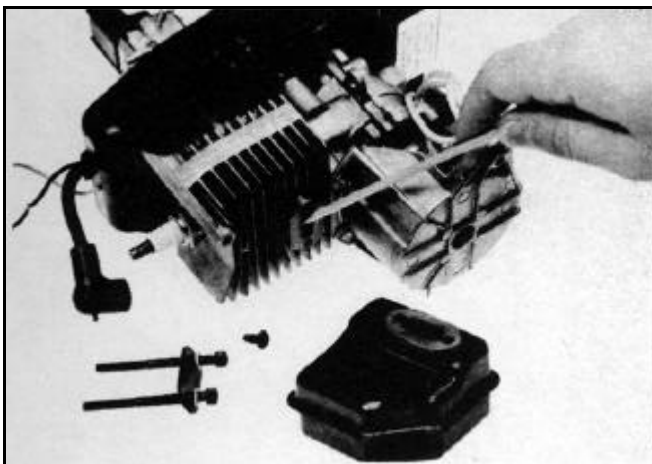


Figure 223 0406-040

4. Remove the recoil starter assembly. Check the condition of the starter rope. If the rope is worn, replace it with #4 Diamond Braid Rope (Figure 224).

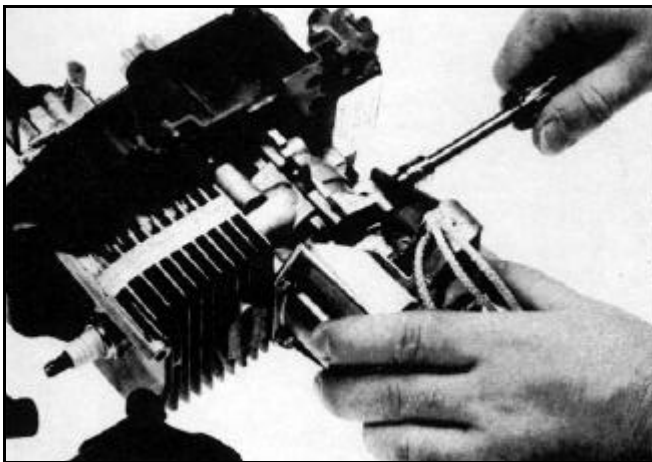


Figure 224 0406-041

5. Remove the cooling shroud (Figure 225).

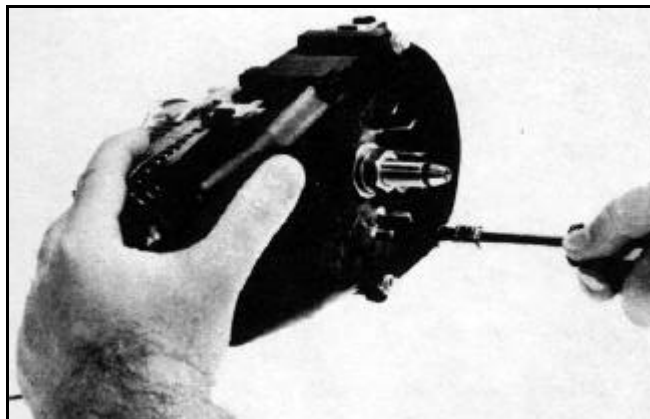


Figure 225 0406-042

6. Remove the ignition module. Inspect the module and wire insulation for damage. Replace as needed (Figure 226).

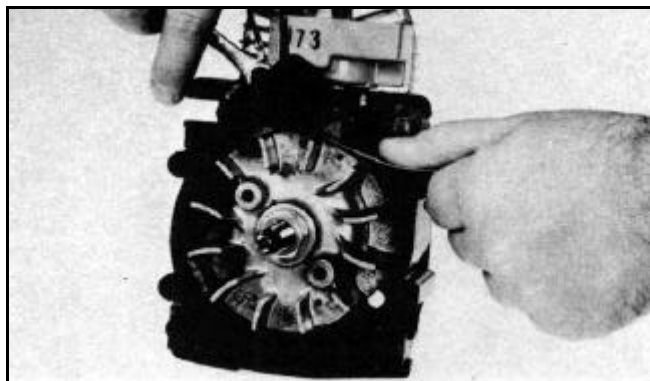


Figure 226 0406-043

7. Remove the flywheel (Refer to "FLYWHEEL REMOVAL" on page 9 - 19).
8. Remove the backing plate. **NOTE:** When reinstalling the backing plate, replace the intake gasket with a new gasket. To ensure that the intake gasket, backing plate, and cylinder intake port are in proper alignment and that the gasket is sealing properly, install the stress plate and tighten the intake screws at 20 - 30 in-lbs. prior to tightening the backing plate screws.

FLYWHEEL REMOVAL

1. Remove the engine (Refer to "ENGINE REMOVAL" on page 9 - 16).
2. Remove the cooling shroud.
3. Remove the recoil starter assembly.
4. Anchor the starter cup with Toro Multi-Purpose Tool #45-1390 and remove the flywheel nut with a 3/4" open end wrench (Figure 227).

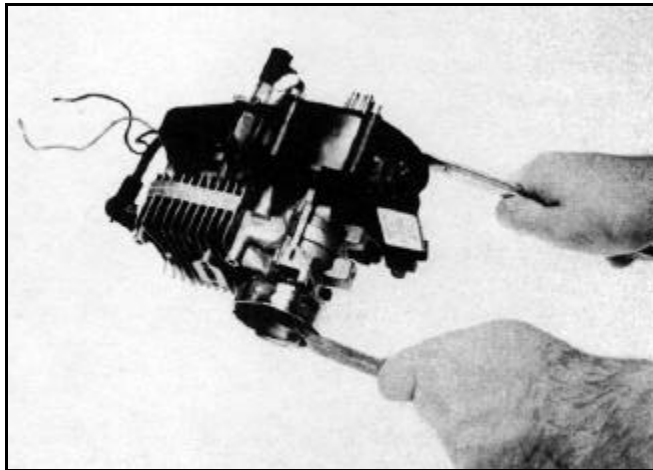


Figure 227

0406-044

5. Tap the 2 cored flywheel holes with a 1/4 - 20 tap (Figure 228).

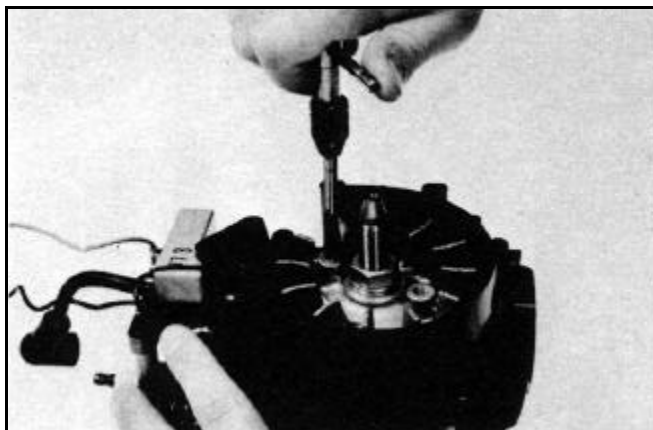


Figure 228

0406-045

6. Install the Toro Multi-Purpose Tool with two 1/4 - 20 x 2 inch screws so that the flat portion of the tool is in contact with the end of the crankshaft.

7. Alternate tightening the 1/4 - 20 x 2 inch screws into the cored holes until the seat between the crankshaft and the flywheel is loosened (Figure 229).

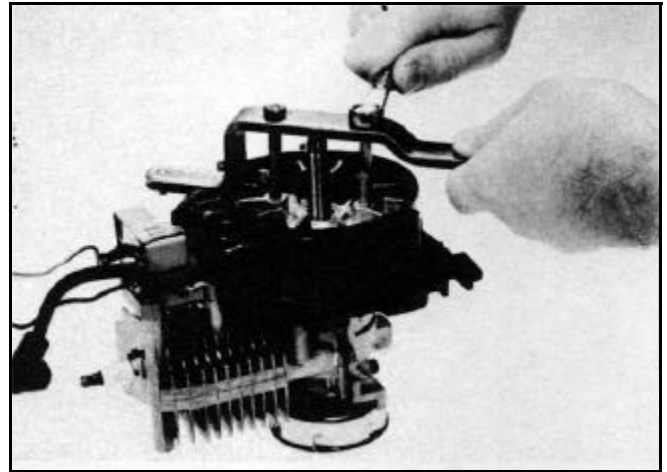


Figure 229

0406-046

IGNITION TIMING/GOVERNOR

The Toro Gas Power Shovel is equipped with a speed limiting capacitor discharge ignition (C.D.I.) module. The C.D.I. module electronically performs the functions of coil, points, and condenser as well as governing the engine speed.

To Properly Time the Engine:

1. Remove the engine from the snowthrower frame.
2. Remove the carburetor.
3. Remove the cooling shroud.
4. Loosen the C.D.I. module mounting screws.

GAS POWER SHOVEL

5. The C.D.I. module legs should be gapped at .008 - .012 inch (.2 - .3mm) from the flywheel magnets (Figure 230) and the module mounting screws tightened at 25 - 35 in-lb (28 - 40 kg cm).

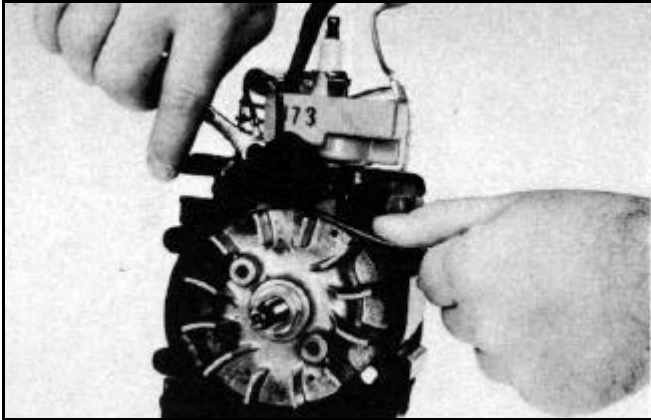


Figure 230

0406-047

DECARBONING THE EXHAUST PORT AND THE MUFFLER

In order to decarbon the exhaust port and muffler, the engine must be removed from the snowthrower frame.

Remove the muffler and scrape any excess carbon build up away from the muffler and the exhaust port opening (Figure 231). **NOTE:** Rotate the crankshaft so the piston covers the exhaust port. A wooden stick or dowel should be used so that the metal is not scratched. Scrape any excess gasket material away from the exhaust port and the muffler. Install a new exhaust gasket.

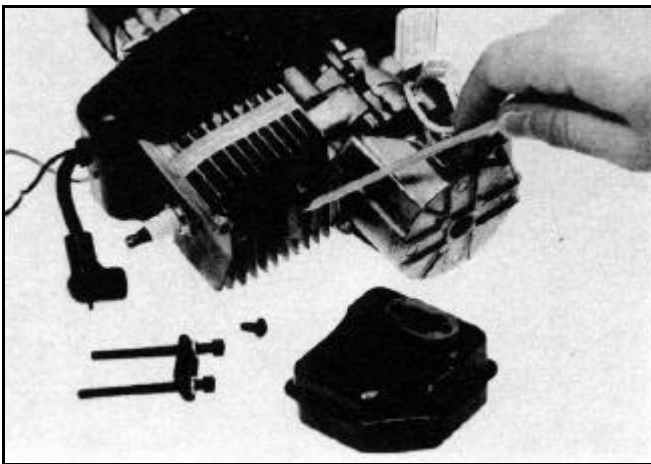


Figure 231

0406-048

RECOIL STARTER SERVICING

To Replace The Starter Rope:

1. Remove the three screws which hold the recoil starter to the cylinder.
2. Fully extend the recoil starter rope and align the cut out sections of both the rope pulley and the metal pulley cover (Figure 232).

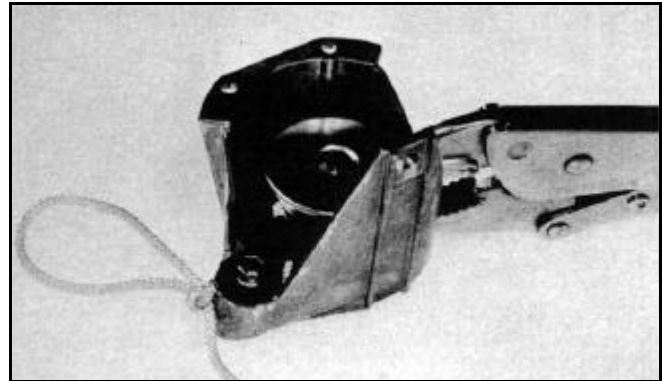


Figure 232

0406-049

3. Tie a slip knot in the rope at the idler pulley.
4. Remove the Phillips screw from the center of the starter assembly and carefully remove the metal pulley cover from the pulley (Figure 233). The pulley may be held in place with a locking plier.

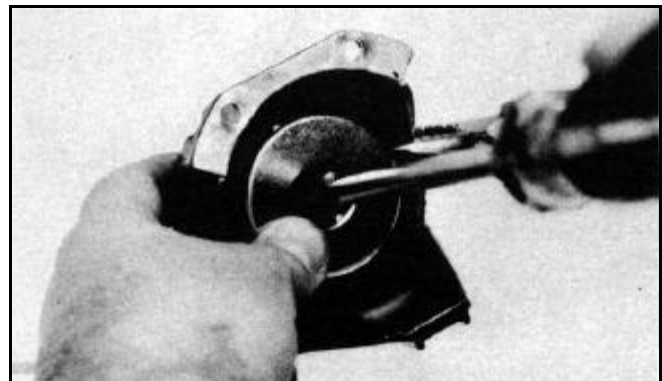


Figure 233

0406-050

5. Remove the rope from the pulley and measure the rope. Replace the rope with #4 Diamond Braid Rope (Figure 234).



Figure 234

0406-051



CAUTION

Carefully remove the rope pulley by slowly pulling it straight upwards. The recoil starter spring is attached to a small plastic boss on the underside of the rope pulley. Injury may result if the spring unwinds from the recoil starter housing.

DRIVE SYSTEM

The Toro Gas Power Shovel drive system consists of a crankshaft adapter, a rubber drive coupling, a series of three drive gears, and a rotor.

Engine power is transferred from the engine crankshaft and crankshaft adapter (through the rubber drive coupling) through the gear train to the rotor (Figure 235).

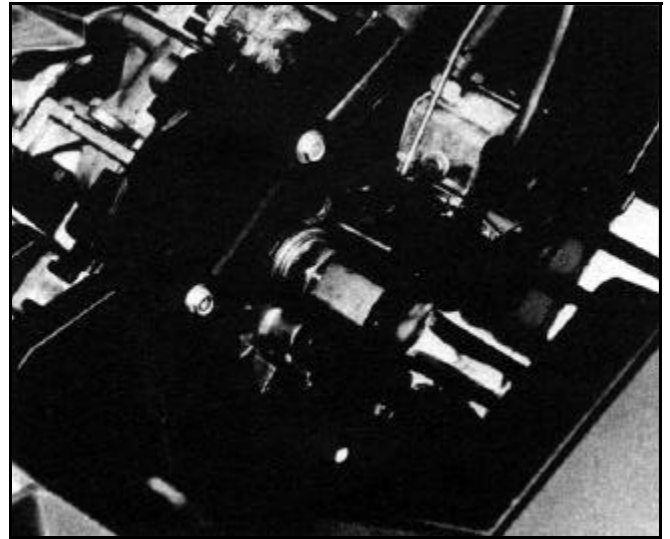


Figure 235

0406-052

To service the drive system, assure that the rubber drive coupling is fully seated on the crankshaft adapter and into the drive gear assembly.

To check the gear train, remove the nut on the drive side of the rotor (Figure 236) and remove the six Phillips screws from the gear carrier plate (Figure 237).

GAS POWER SHOVEL

Examine the gear teeth for wear and assure that the gears are fully engaging each other.

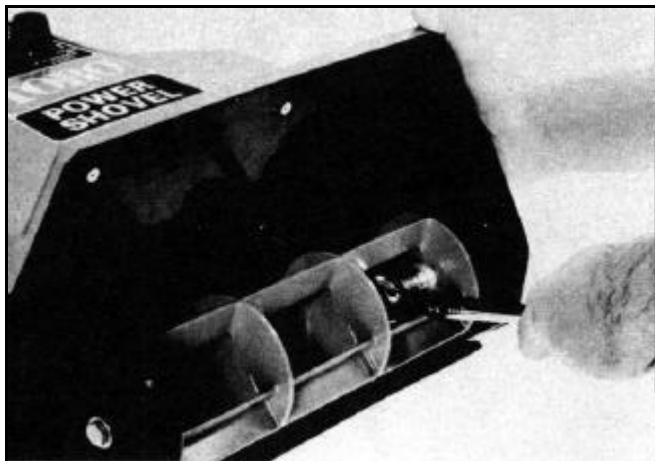


Figure 236

0406-053



Figure 237

0406-054

The drive gear bushings are made of a self lubricating material and they do not require lubrication. However, to dampen noise or gear chatter, you may wish to coat both the gear mounting posts and the inside diameter of the bushings with a high quality lithium based grease.

REMOVING ROTOR

1. Remove the rotor pin, locknut, and washer securing rotor to right side of housing (Figure 238).

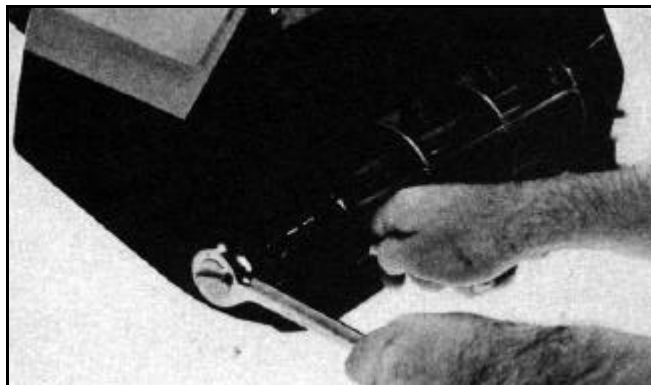


Figure 238

0406-055

2. Remove the locknut and washer from the opposite end (Figure 239).

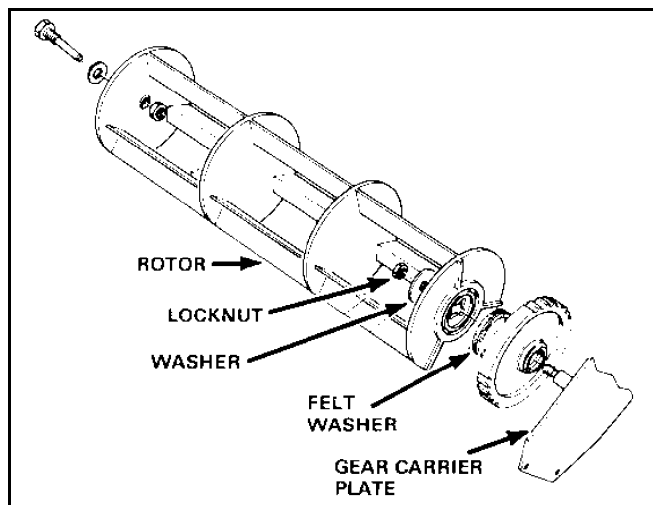


Figure 239

0406-056

3. Remove the rotor and felt washer (Figure 239).

NOTE: Upon reinstalling the rotor, ensure that the rotor gear has fully seated in the rotor.

REPLACE SCRAPER

The scraper blade located on the bottom of the Power Shovel should be replaced if worn.

1. Remove the rotor; refer to "PADDLE REPLACEMENT - STRAIGHT PADDLE" on page 7 - 2).
2. Remove the three screws, six washers, and three locknuts used to hold the scraper blade (Figure 240).
3. Attach the new scraper blade taking care to hook scraper over front edge of the housing. Secure with existing screws, washers and locknuts, and tighten.

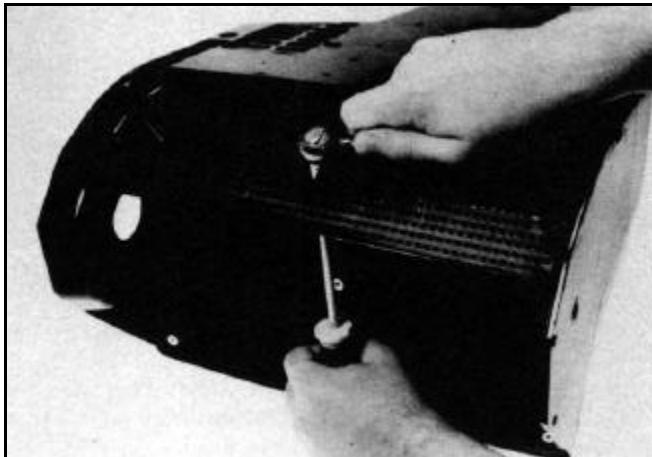


Figure 240

0406-057

STORAGE

1. Refer to "Draining The Fuel Tank" on page 9 - 4. Complete all steps on page 9 - 4.
2. Remove the spark plug.
3. Next, pour two teaspoons of engine oil into the spark plug hole.
4. Pull the recoil starter slowly to distribute oil on the inside of the cylinder.
5. Replace the spark plug.
6. Clean the rotor, rotor housing, and exterior of Power Shovel. Tighten all screws and nuts. If any part is damaged, repair or replace it.
7. Store the Power Shovel in a clean dry place and cover the unit to give it protection. Never store the unit in the house or basement.

GAS POWER SHOVEL

GAS POWER SHOVEL ENGINE SPECIFICATIONS

ENGINE:	
Type	Toro built, air-cooled, 2-cycle, single cylinder gasoline engine
Rotation	CCW
Displacement CC (cu-in)	20.9 cc (1 .28 cu-in)
Bore mm (in)	32mm (1.26 in)
Stroke mm (in)	26mm (1.02 in)
Compression Ratio	7:1
Cranking Pressure	689 kPa (100 psi minimum)
Operating Speed	7800 - 8800 RPM Low RPM can be affected by carburetor adjustment
FUEL:	
Fuel to Oil (Gas:Oil) Mixture	32:1
GASOLINE:	
Fuel Tank Capacity	Unleaded regular One quart - leaded fuel is an acceptable substitute
CARBURETOR:	
Type	Walbro WTA 2
Adjustment	7/8 to 1-1/2 turns from closed
IGNITION SYSTEM:	
Ignition Timing Fixed Magneto Air Gap, in.(mm)	.008 - .012 in (.20 - .30mm)
Spark Plug, Recommended (Alternates)	NGK BMR-6A (Champion RCJ 8 or Autolite AR7N)
Spark Plug Gap	.020 - .024 (.5 - .6mm)

GAS POWER SHOVEL

ENGINE TORQUE SPECIFICATIONS

	Torque kg-cm/kgm	Torque in-lb/ft-lbs
Backing Plate Starter Screws	35 - 41 kg-cm	30-45 in-lbs
*Intake Stress Plate Screws	23 - 35 kg-cm	20 - 30 in-lbs
Ignition Coil Screws	29 - 40 kg-cm	25 - 35 in-lbs
Cooling Shroud Screws	8 - 20 kg-cm	7 - 17 in-lbs
Muffler Tab to Cylinder Screw	35 - 46 kg-cm	30 - 40 in-lbs
°Muffler Screws	46 - 58 kg-cm	40 - 50 in-lbs
Carburetor Screws	40 - 46 kg-cm	35 - 40 in-lbs
Starter Cup Screw	1.4- 1.7 kg-m	10 - 12 ft-lbs
Recoil Starter Mounting Screw	35 - 52 kg-cm	30 - 45 in-lbs
Flywheel Nut	2.8 - 3.2 kg-m	20 - 23 ft-lbs
Spark Plug	1.9 - 2.4 kg-m	14 -17 ft-lbs

Metric Torque Conversions: Inch-pounds x 1.1 52 = Kilogram-Centimeters
Foot-pounds x .1383 = Kilogram-Meters

*To be tightened prior to backing plate screws to assure gasket and plate alignment.

°Lightly oil the muffler screws to prevent damage to the threads in the cylinder casting.

NOTES

NOTES

