



Electronic Service Manuals

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TIGERRAY MODELS

21, 24 & 27

INTRODUCTION

OPERATING & MAINTENANCE INSTRUCTIONS

READ THIS BOOK

This operator's book has important information for the use and safe operation of this machine. **Read and understand the Engine Operator's Manual and this manual before starting the machine.** Keep this book and tell all operators to read the book. **If you do not follow the instructions, you can cause an injury or damage equipment, furniture or buildings.**

For new books write to:

Pacific

2259 S. Sheridan

Muskegon, MI 49442-6252

Carefully inspect all components to ensure that there is no concealed freight damage. If such damage is discovered, file a "CONCEALED DAMAGE REPORT" immediately with the delivering carrier.

The contents of this manual are based on the latest product information available at the time of publication. Pacific reserves the right to make changes or improvements to its machines without notice.

**FOR YOUR CONVENIENCE, RECORD THE MACHINE
AND ENGINES MODEL AND SERIAL NUMBERS HERE:**

MACHINE MODEL _____

MACHINE SERIAL NUMBER _____

ENGINE MODEL _____

ENGINE SERIAL NUMBER _____

TABLE OF CONTENTS

IMPORTANT SAFETY INSTRUCTIONS	3
TRANSPORTING THE MACHINE	4
A. Transport Position	
B. Position for Maintenance and Cleaning	
PREPARATION	4
A. Maintenance Schedule	
B. Check Engine Oil	
C. Fill LP Tank & Check for Leaks	
D. Connecting HP Hose to Tank	
E. Install Fresh Pad	
OPERATION	5
A. Prepare Machine	
B. Start Engine	
C. Movement	
D. Stop Engine	
E. Transporting	
F. Cleaning Equipment	
G. Storing Machine & Tank	
MAINTENANCE	6
A. Machine & Engine Maintenance	
B. Engine Maintenance Meter	
C. Troubleshooting Electrical System	
D. Belt, Pad Drive Facing, Idler Pulley or Drive Shaft Replacement	
TROUBLESHOOTING	7
PARTS LISTS	
A. TigerRay 21	8
B. TigerRay 24	10
C. TigerRay 27	12
WARRANTY POLICY	16

IMPORTANT SAFETY INSTRUCTIONS

READ AND UNDERSTAND ALL INSTRUCTIONS AND WARNINGS BEFORE OPERATING THIS MACHINE!

WARNINGS:

1. DO NOT STORE OR USE GASOLINE OR OTHER FLAMMABLE VAPORS AND LIQUIDS IN THE VICINITY OF THIS MACHINE. ALWAYS STORE EQUIPMENT AWAY FROM HEATER ROOMS, BOILERS, GAS-FIRED WATER HEATERS OR ANY OTHER SOURCE OF OPEN FLAME.
2. NO SMOKING, NO SPARKS, NO FLAMES NEAR UNIT OR LP TANK.
3. OPERATE ONLY IN WELL VENTILATED AREAS. BUILDINGS MUST BE PROVIDED WITH :
 - A) A CONTINUOUS MECHANICAL VENTILATION THAT REMOVES THE PRODUCTS OF COMBUSTION TO THE OUTDOORS OF NOT LESS THAN 300 CFM FOR EACH 10,000 BTUH OR FRACTION THEREOF; OR
 - B) NATURAL VENTILATION OF NOT LESS THAN 300 CFM FOR EACH 10,000 BTUH INPUT OR FRACTION THEREOF, BASED ON A MAXIMUM OF ONE-QUARTER AIR EXCHANGE PER HOUR FOR THE NET BUILDING VOLUME.
4. IF YOU SMELL LP GAS, STOP THE UNIT AND CHECK FOR LEAKS. ALSO OPEN WINDOWS, DON'T TOUCH ELECTRICAL SWITCHES, EXTINGUISH ANY OPEN FLAMES. CALL YOUR GAS SUPPLIER IF NO LEAKS ARE FOUND.
5. DO NOT ADJUST THE FUEL SYSTEM WITHOUT THE PROPER ANALYSIS EQUIPMENT.
6. NEVER TURN THE UNIT ON ITS SIDE.
7. NEVER TILT & TRANSPORT WHILE ENGINE IS RUNNING.
8. KEEP HANDS AND FEET CLEAR OF ALL MOVING PARTS.
9. TURN THE GAS OFF AT THE TANK TO KILL THE ENGINE.
10. REMOVE THE LP TANK AND STORE IT IN AN APPROVED AREA WHEN NOT IN USE. A "NO SMOKING" SIGN SHOULD BE PERMANENTLY DISPLAYED AT THE STORAGE AREA.
11. ALWAYS VENT AN OVER-FULL BOTTLE USING THE TANK'S BLEED VALVE, OUT OF DOORS AWAY FROM ALL CLOSED PLACES AND AWAY FROM ANY FIRE OR FLAME PRODUCING DEVICE.
12. KEEP ALL OBJECTS CLEAR OF THE EXHAUST SYSTEM DURING AND AFTER OPERATION.
13. DO NOT LEAVE THIS MACHINE UNATTENDED WHILE THE ENGINE IS RUNNING.
14. ALWAYS STORE EQUIPMENT AWAY FROM POSSIBLE DAMAGE BY FALLING OBJECTS IN WAREHOUSE-TYPE AREAS. ALWAYS STORE LPG TANKS OUTSIDE IN A SECURE, WELL-VENTILATED AREA.
15. WHEN THE LP TANK IS ATTACHED TO THE MACHINE AND NOT RUNNING, THE OPERATOR SHOULD NOT LEAVE THE MACHINE UNATTENDED EXCEPT FOR SHORT PERIODS OF TIME SUCH AS REST STOPS, WASH-ROOM OR MEAL STOPS.
16. THE OPERATOR MUST COMPLETELY UNDERSTAND ALL INSTRUCTIONS, WARNINGS AND OPERATING PROCEDURES BEFORE USING THIS MACHINE.
17. THIS MACHINE MUST BE MAINTAINED IN ACCORDANCE WITH THIS MANUALS RECOMMENDED MAINTENANCE INSTRUCTIONS AND THE ENGINE MANUFACTURERS RECOMMENDED MAINTENANCE PROCEDURES. FAILURE TO DO SO MAY CAUSE DAMAGE TO THE MACHINE, EQUIPMENT, FURNITURE, BUILDINGS OR PERSONAL INJURY!

TRANSPORT & PREPARATION

WARNING! Follow the instructions given in this booklet, the Engines Owners Manual and the training given by your supervisor for the safe operation of this machine. Failure to do so can result in personal injury and/or damage to the machine or property.

The TigerRay 21 and TigerRay 24 propane have a 13 HP Kawasaki engine with 115V electric start.

The TigerRay 27 propane has a 17 HP Kawasaki with a 12 volt battery starter.

TRANSPORTING THE MACHINE

NEVER TRANSPORT WHILE ENGINE IS RUNNING!

A. TRANSPORT POSITION

To transport the machine it is necessary to tilt the machine back on the rear wheels so the pad is not in contact with the floor.

B. POSITION FOR MAINTENANCE & CLEANING

To perform certain maintenance & cleaning tasks the machine should be placed in the “tilt back” position and the handle must be in the shipping (forward) position. **The handle must be in the forward position to ensure stability in the “tilt back” position. A second person should aid in the lift and secure the machine while being serviced.**

DO NOT OPERATE THIS MACHINE IN AN EXPLOSIVE ENVIRONMENT!

PREPARATION

A. CHECK THAT THE SUGGESTED MAINTENANCE SCHEDULE HAS BEEN OBSERVED.

All machines are equipped with a multi-function maintenance meter. The functions include the following: hour meter, service alert and tachometer. (See Engine Maintenance Meter Instructions)

B. CHECK THE ENGINE OIL BEFORE EVERY OPERATION!

Make sure the machine is level when checking the oil. Always take 2 readings of the dip stick before adding oil. If the oil level is below the full mark, add just enough oil to the engine to bring the oil level up to the full mark. **Never over fill.** Follow the guidelines in your Engine Owners Manual. Recommended oil is SAE 10W-30. Check for foreign material on the dipstick.

C. PROPERLY FILL AND CHECK YOUR LP TANK AND ALL LP FUEL LINES FOR LEAKS!

1. Every tank has been pressure and leak tested. However, **every time a tank is filled and/or connected to the machine it should be soap tested.** All LP lines must be pressurized and every inch of line and connections must be sprayed. If you find a leak, make the proper repairs before operating the machine. **NOTE:** The connection and disconnection of the LP tank must be done in a well ventilated area with NO source of ignition within 10 feet (3 meters) from the point of connection.

2. **Never over fill the LP tank!** The LP tank is designed to hold just 20 pounds of propane. Make sure to weigh the tank as it is being filled. The gross weight of a full tank should not exceed 48 pounds. If while operating the machine you notice frost forming on the LP lines or the regulator, your tank has been over filled. If you continue to operate the machine in this condition damage will occur. The excess propane in the tank must be removed before normal operations resume. The bleeding of a propane tank should be done in a safe location outside the building. In some cases the regulator must defrost before restarting the engine.

D. CONNECTING THE HIGH PRESSURE HOSE TO THE LP TANK: Make sure the couplers are in line and screwed together hand tight. If this is not done properly, fuel will not pass through to the regulator. Never complete the connection of the tank to the machine by using a wrench. Always do it by hand. Listen for the rush of fuel to the lock-out device when you open the tank valve. If you hear this, it indicates a good connection has been made at the tank.

NEVER CHANGE OR ALTER THE PROPANE CONTROL EQUIPMENT!

E. INSTALL A FRESH PAD BEFORE EVERY JOB

If not new, at least clean. To install a fresh pad, tilt the machine back and adjust the handle forward. Unscrew and remove the pad-centering ring. Remove the old pad and center the new pad onto the pad driver. Reinstall the pad-centering ring. Never “flip” a pad. Keep the same side down throughout the life of the pad. Even after a pad is cleaned, you can tell the down side by the centering ring indentation. This practice will increase the pad life and help maintain a properly functioning pad driver. **NEVER TILT A MACHINE ON ITS SIDE!**

OPERATION

PROVIDE AND USE EAR PROTECTION DURING OPERATION.

NEVER LET AN UNTRAINED PERSON OPERATE OR PERFORM REPAIRS ON THE MACHINE. THEY MAY HURT THEMSELVES, DAMAGE THE FLOOR OR THE EQUIPMENT.

ENGINE SPEED NOT TO EXCEED 3400 RPM.

THIS MACHINE IS NOT SUITABLE FOR PICKING UP HAZARDOUS DUST.

DO NOT USE ON SURFACES WITH A GRADIENT EXCEEDING 2%.

A. PREPARE THE MACHINE FOR OPERATION

1. Follow steps A through E in the previous section and determine the best pad for the task.

B. START ENGINE.

1. Start engine with machine tilted so pad is off floor.
2. Open propane (LPG) tank valve (counter clockwise).
3. For the 21" & 24" machines with the electric start system, plug the starter into a 115V outlet.
4. Set the throttle control at idle for 12V system or choke for electric start system.
5. **12 volt system** - Turn key to the start position and move throttle toward fast position. If engine does not start, release key and return to step "4".

Electric start system - Push "Start" button and move throttle toward fast position. If engine does not start, release starter button and return to Step 4. Note: Starter should not be engaged for more than 10 seconds at a time. Release the starter button and adjust the throttle. Unplug the cord.

C. MOVEMENT

1. Follow the machine (straight ahead) at a moderate walking speed. Always keep the machine moving while the pad is touching the floor.
2. Keep hands, fingers and feet clear of all moving parts while the machine is in operation.

NEVER TILT BACK MACHINE TO MAINTENANCE POSITION WHILE ENGINE IS RUNNING.

DO NOT USE FOR WET SCRUBBING OPERATIONS

D. STOPPING THE ENGINE

1. Turn the propane tank valve clockwise to a closed position, then turn the key OFF.

NOTE: The exhaust system will be very hot and takes several minutes to cool, so keep yourself and all materials clear!

E. TRANSPORTING THE MACHINE

The tank should be securely fastened and tank valve must be closed.

F. CLEAN THE EQUIPMENT

Place machine in the "tilt back" position with the handle forward and clean the equipment.

G. STORING THE MACHINE & TANK

1. Remove the LP tank from the machine and store the tank in a well ventilated approved area.
2. Store your machine in a safe area: away from enclosed high heat, away from sparks or flames, away from traffic lanes of heavy equipment.

MAINTENANCE

A. MACHINE & ENGINE MAINTENANCE

1. Refer to engine manufacturer's owners manual and comply completely with the instructions. Change the oil and filter according to the Engine Owners Manual. Recommended oil is SAE 10W-30.
2. Keep a good service log on the machine with the date, hour meter reading, type(s) of service performed and the name of the person who performed them.
3. Clean the entire unit after each use. When cleaning the unit, check for possible loose nuts and bolts.

B. ENGINE MAINTENANCE METER

This multi-function meter acts as a preventive maintenance tool; which benefits you with increased fuel economy, less down time and longer engine life.

The meter's displays are:

HOUR METER: Displays total run hours when machine is off.

TACHOMETER: Indicates engine R.P.M. during operation.

SERVICE ALERT: The display flashes to alert you to lube and change the oil at 25 hour intervals. The service alert only flashes during operation and it warns you to change the oil for only two hours. After the two hours is reached, the alert will automatically reset to the next 25 hour interval. Therefore, it is recommended that a separate maintenance log be kept to track oil changes.

REMEMBER THAT BEING SAFE IS A FULL-TIME, EVERY DAY JOB. FOLLOW ALL INFORMATION POSTED ON THE MACHINE AND THE LP TANK.

NEVER ALLOW ANYONE TO OPERATE THIS MACHINE THAT HAS NOT READ OR CANNOT UNDERSTAND THE GIVEN INSTRUCTIONS.

C. TROUBLESHOOTING THE ELECTRICAL SYSTEM

1. Check all wire connections for obvious problems. Remove LPG tank, then remove battery box cover. Check all connections visibly and physically. If any "loose", damaged or unconnected wires are noticed, replace or repair as needed.

2. Check the battery posts and wires. **Always wear a face shield, safety glasses and protective clothing when working around a battery!** The gases can be explosive and the acid is highly corrosive to metals, cloth and ALL HUMAN TISSUE (skin, eyes, etc.) If the battery post(s) are corroded, remove the wires and clean posts and wires. Applying some axle grease on the posts or the battery after they are cleaned will slow down the battery corrosion process.

If nothing obvious is noted, a more detailed investigation is warranted. Before any such troubleshooting begins, the following things should be done:

3. Replace propane (LPG) tank with one from a machine that runs.
4. Charge the battery or provide an absolute source of 12 volt DC power capable of 50 amperes total output. (A pair of good jumper cables from your car or truck battery will suffice.) Equip yourself with an inexpensive 12 volt test light.
5. If the trouble seems to be in the electrical control equipment, you may wish to disconnect the starter from the system so as to check the system without spinning the engine.

D. BELT, PAD DRIVE FACING, IDLER PULLEY OR DRIVESHAFT REPLACEMENT

1. Tilt the machine back and adjust the handle forward to enable the machine to stand on its' rear wheels for maintenance. A second person should aid in the lift and secure the machine while being serviced.
2. Remove the pad drive nut, pad centering device and four bolts (9/16" wrench).
3. Remove pad driver (replace if worn).
4. Remove idler pulley (replace if worn).
5. Remove belt(s). Replace if worn.
6. To remove driveshaft unit: Remove retaining bolt and clip, then pull driveshaft out of housing (a slide hammer may assist in removal, do NOT pry with crow bar). While drive shaft is removed spin bearings. If roughness is felt, bearing replacement may be necessary.
7. Reassemble, follow above steps in reverse order.

TROUBLESHOOTING

PROBLEM

SOLUTION

Engine cranks but will not start:

- | | |
|--|---------------------------------------|
| 1. Empty fuel cylinder. | 1. Refill cylinder. |
| 2. Cylinder shut-off valve closed. | 2. Open valve. |
| 3. Clogged, obstructed, kinked or cut fuel or vacuum line. | 3. Remove obstruction or replace. |
| 4. Spark plug lead disconnected. | 4. Conenct lead to spark plug . |
| 5. Faulty choke or throttle settings. | 5. Set controls to correct positions. |
| 6. Faulty ignition coil. | 6. Replace coil. |
| 7. Faulty kill switch. | 7. Replace switch. |
| 8. Faulty regulator. | 8. Replace or rebuild regulator. |

Engine starts hard:

- | | |
|--|--|
| 1. Faulty choke or throttle settings. | 1. Set controls to correct positions. |
| 2. Clogged, obstructed, kinked or cut fuel or vacuum line. | 2. Remove obstruction or replace. |
| 3. Faulty regulator. | 3. Replace or rebuild regulator. |
| 4. Low compression. | 4. Have engine serviced by trained technician. |

Engine will not crank:

- | | |
|--|--------------------------------|
| 1. Battery is discharged. | 1. Charge or replace battery. |
| 2. Lose or faulty connections or wires. | 2. Tighten, repair or replace. |
| 3. Faulty ignition key switch or starter control switch. | 3. Repair or replace. |
| 4. Faulty electric starter. | 4. Repair or replace. |

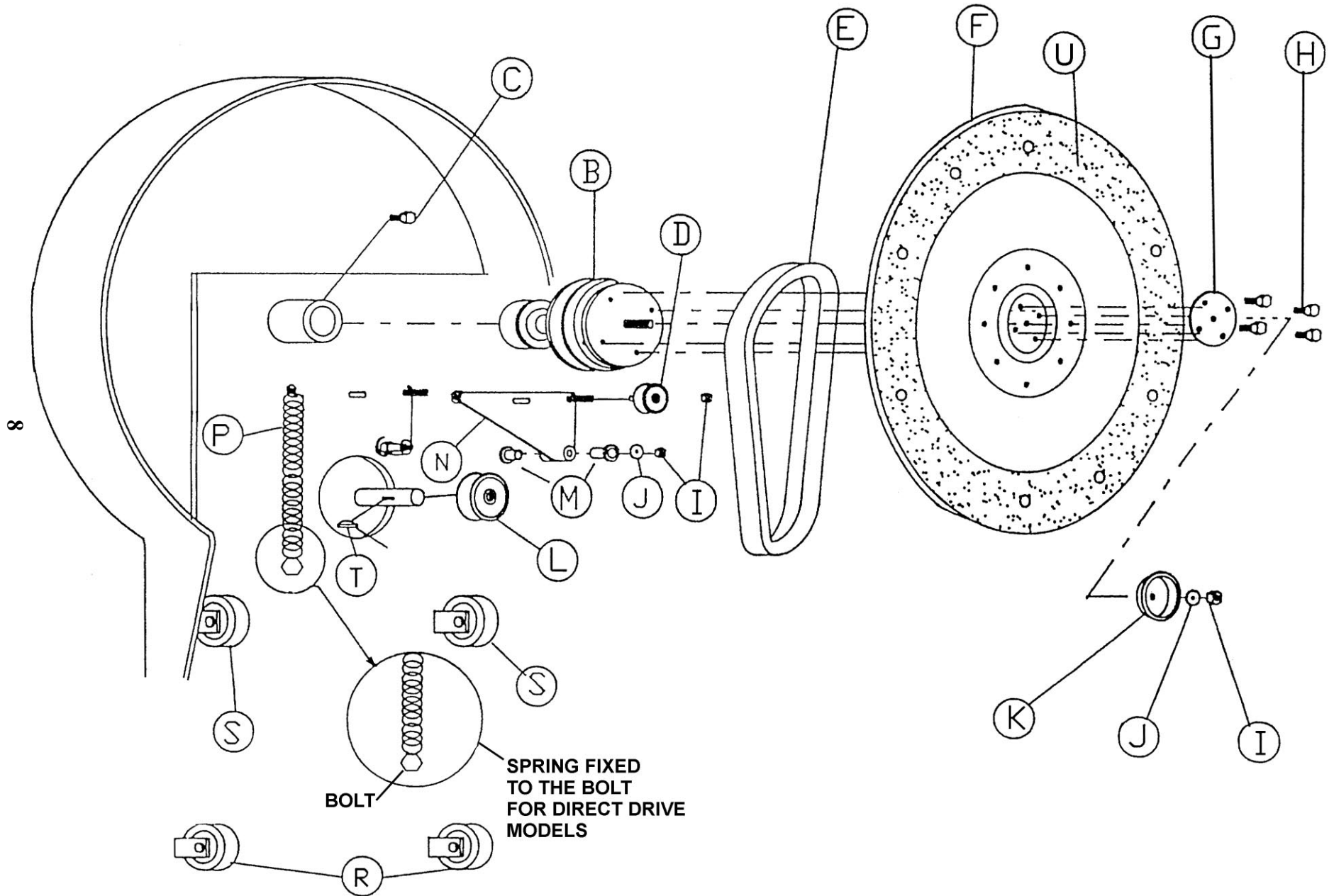
Engine over heats:

- | | |
|---|--|
| 1. Incorrect fuel settings. | 1. Have engine serviced by trained technician. |
| 2. Air intake filter, screen, cooling fins clogged with debris. | 2. Clean or replace. |
| 3. Low oil level. | 3. Check and add oil if necessary. |

Exhaust emission or propane odors:

- | | |
|--|---|
| 1. Carburetor or regulator settings incorrect. | 1. Have engine serviced by trained technician. |
| 2. Dirty or clogged air filter. | 2. Replace air filter. |
| 3. Choke engaged. | 3. Adjust to correct setting. |
| 4. Loose fittings, clamps or hoses. | 4. Tighten, seal or replace. Recheck with soap and water solution. If bubbles occur, there is still a leak. |
| 5. Cracked, cut or leaking fittings. | 5. Tighten, seal or replace. Recheck with soap and water solution. If bubbles occur, there is still a leak. |

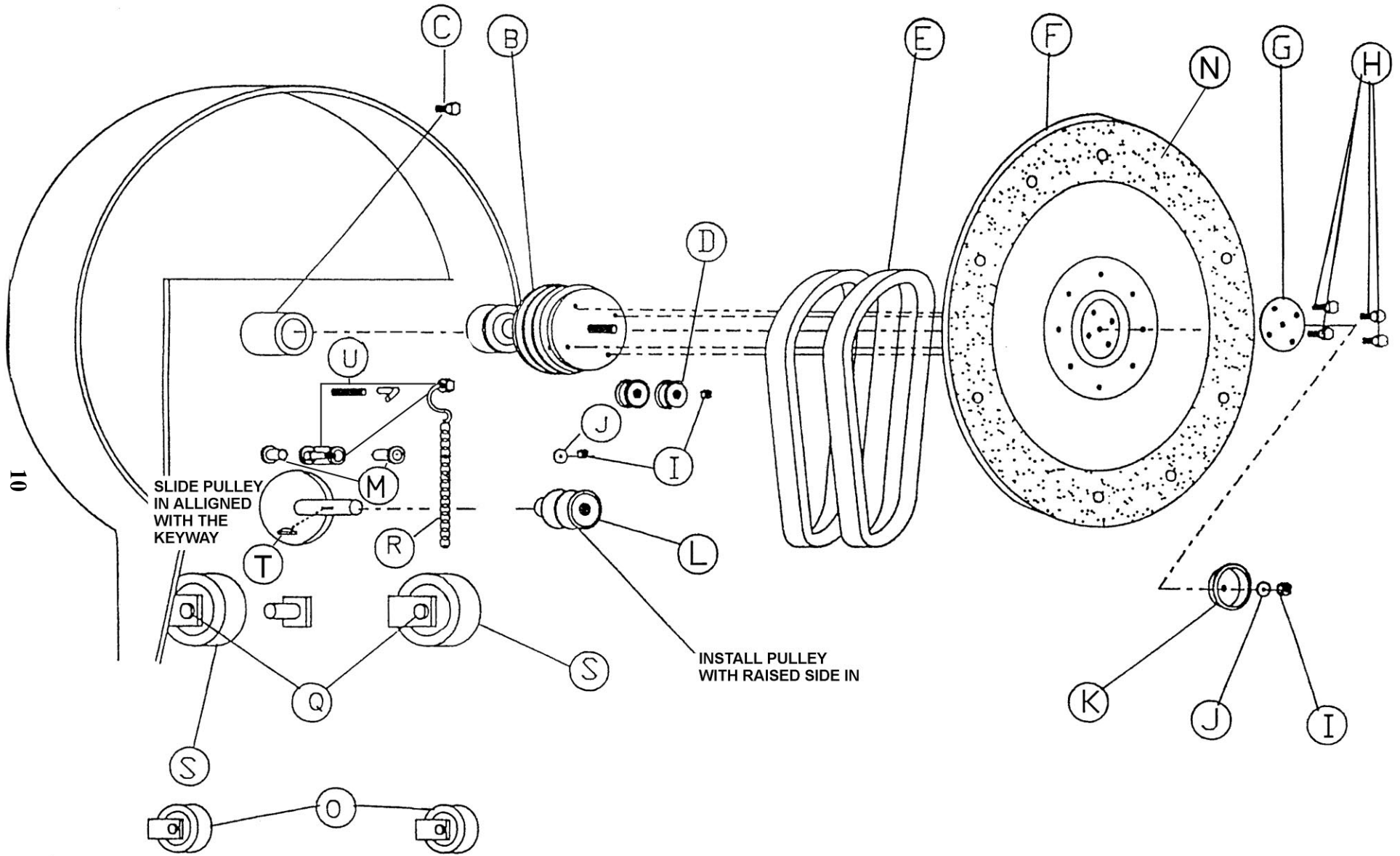
TigerRay 21



TigerRay 21

ITEM	PART NUMBER	DESCRIPTION	QTY
B	277701	Drive Shaft	1
C	W183D	Bolt, 1/4 x 20 x 1/2" Hex Hd.	1
D	276906	Flat Idler Pulley	1
E	903027	Drive Belt, L5 Ser.-34.5"	1
F	275904	Pad Driver Complete (includes U)	1
G	277005	Washer Plate, 5-1/2"	1
H	W504D	Bolt, 3/8 - 16 x 3/4"	4
I	920002	Hex Nut, 3/8-16	3
J	980007	Flat Washer, 5/16"	2
K	272405	Drawn Cup	1
L	276907	Engine Crank Pulley, 3.0P x 1"	1
M	271113	Nylon Bushing	2
N	274802	Idler, Clutching	1
P	278304	Spring - 7"	1
R	279704	Wheel, 3 x 1.25 Poly	2
S	279706	Wheel, 4"	2
T	915004	Key, 1/4 Square X 1.25 Long	1
U	273303	Harpoon Dish, 21"	1
13 H.P. Kawasaki Engine Maintenance Items Not Shown:			
	273301	Filter, Top Foam Engine	1
	273306	Filter, Pre Foam Carb	1
	273307	Filter, Paper Carb Intake	1
	273308	Filter, Oil	1

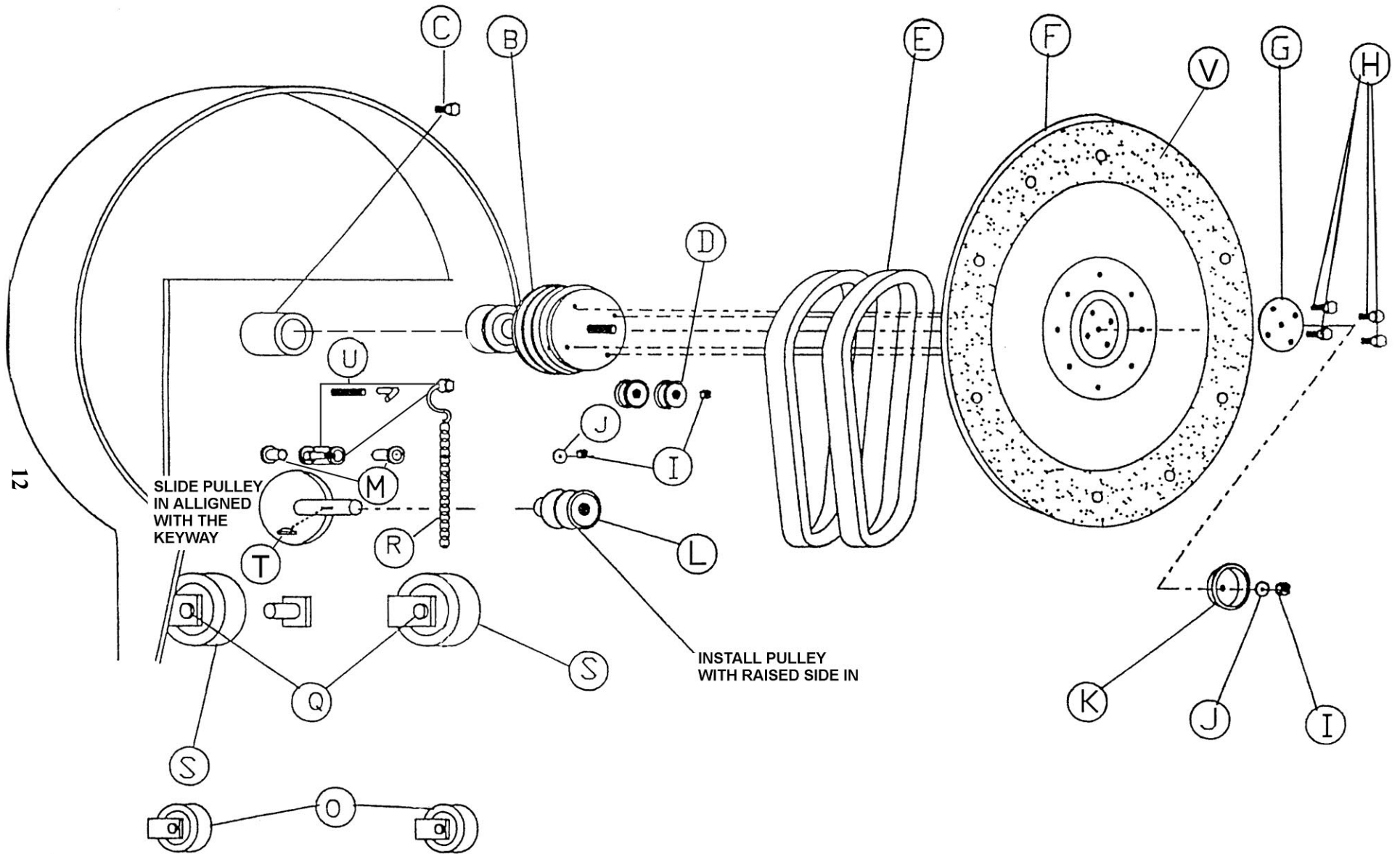
TigerRay 24



TigerRay 24

ITEM	PART NUMBER	DESCRIPTION	QTY
B	277702	Drive Shaft	1
C	W183D	Bolt, 1/4 x 20 x 1/2" Hex Hd.	1
D	276901	Vee Idler Pulley	2
E	903026	Belt, L548	2
F	275903	Pad Driver Complete (includes N)	1
G	277004	Washer Plate, 8-1/2"	1
H	W504D	Bolt, 3/8 - 16 x 3/4"	4
I	920002	Hex Nut, 3/8-16	4
J	980007	Flat Washer, 5/16"	2
K	272405	Drawn Cup	1
L	276908	Engine Pulley	1
M	271113	Nylon Bushing	2
N	273304	Harpoon Dish, 24"	1
O	279704	Wheel, 3 x 1.25 Poly	2
Q	962148	Wheel Bolt, 3/8 x 16 x 2	2
R	278304	Spring, 7"	1
S	279707	Wheel	2
T	915004	Key, 1/4 Square X 1.25	1
U	274803	Idler, Clutching	1
13 H.P. Kawasaki Engine Maintenance Items Not Shown:			
	273301	Filter, Top Foam Engine	1
	273306	Filter, Pre Foam Carb	1
	273307	Filter, Paper Carb Intake	1
	273308	Filter, Oil	1

TigerRay 27



TigerRay 27

ITEM	PART NUMBER	DESCRIPTION	QTY
B	277702	Drive Shaft	1
C	W183D	Bolt, 1/4 x 20 x 1/2" Hex Hd.	1
D	276901	Vee Idler Pulley	2
E	903025	Belt, L549	2
F	275902	Pad Driver Complete (includes V)	1
G	277004	Washer Plate, 8-1/2"	1
H	W504D	Bolt, 3/8 - 16 x 3/4"	4
I	920002	Hex Nut, 3/8-16	4
J	980007	Flat Washer, 5/16"	2
K	272405	Drawn Cup	1
L	276909	Engine Pulley	1
M	271113	Nylon Bushing	2
O	279704	Wheel, 3 x 1.25 Poly	2
Q	962148	Wheel Bolt, 3/8 x 16 x 2	2
R	278304	Spring, 7"	1
S	279707	Wheel, 5"	2
T	915004	Key, 1/4 Square X 1.25	1
U	274803	Idler, Clutching	1
V	273305	Harpoon Dish, 24"	1
17 H.P. Kawasaki Engine Maintenance Items Not Shown:			
	273301	Filter, Top Foam Engine	1
	273306	Filter, Pre Foam Carb	1
	273307	Filter, Paper Carb Intake	1
	273308	Filter, Oil	1

MAINTENANCE LOG

MAINTENANCE LOG

WARRANTY POLICY TIGERRAY MODELS

The **Pacific** TigerRay has been manufactured, tested and inspected in accordance with specific engineering requirements and is **WARRANTED** to be free from defects in workmanship and materials as follows:

Two (2) years parts and labor - Engine (Warranty through Kawasaki)

One (1) year parts and labor - All other components unless excluded below (Warranty through Pacific).

This warranty extends to the original user/purchaser and only when used, operated and maintained in accordance with **Pacific** Operating and Maintenance instructions.

This warranty does not apply to the wear parts and accessories of the machine including belts, brushes, pad drivers and starters.

Nor does it apply to damage or failure caused by improper use, abuse or neglect. Warranty credit or replacement of return parts including motors, etc., is subject to incoming inspection of those items.

To secure repair under this warranty, the following procedure should be taken:

- If the warranty issue is not the engine, the inoperative machine or warranted parts must be delivered to the authorized **Pacific** dealer with shipping and delivery charges prepaid. If unable to locate the Dealer, you may contact **Pacific** at the address listed herein for the location of the nearest **Pacific** repair center or agent or for other instructions pertaining to your warranty difficulty.
- For **Engine Warranty** repair deliver the machine to the nearest **Kawasaki Warranty Service Center**. To locate the nearest Kawasaki Service Center call 1-800-433-5640 or go to www.kawpowr.com and choose "Dealer Locator", then select the Product Category "KAWASAKI ENG SVC: ALL OEMS" and input your zip code.
- Upon compliance with the above warranty procedure, all warranted repairs would be completed at no additional charge or cost to the user.
- Only **Pacific** or its authorized dealers and agents may make no charge warranty repairs on this product. All others do so at their own risk.

This warranty limits **Pacific** liability to the repair of the product and/or warranted parts replacement and does not include incidental or consequential damages arising from the use of a **Pacific** machine whether defective or not.

This warranty is in lieu of all other expressed or implied warranties and is extended to the original purchaser/user.



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