TORO/LAWNBOY BATTERY & ELECTRIC POWERED MOWER SERVICE MANUAL

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TORO®

BATTERY AND ELECTRIC POWERED MOWER SERVICE MANUAL

LAWN-BOY®

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PREFACE

ABOUT THIS MANUAL

This manual was written expressly for the Toro and Lawn-Boy brand electric and battery powered mowers. The Toro Company has made every effort to make the information in this manual complete and correct.

This manual was written with the service technician in mind. The book contains material covering mowers that operate on 120 volt alternating current (North America only), and battery powered mowers that operate on 24 volt or 36 volt direct current.

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.

Models Covered In This Manual

North American Models

Models covered by this manual. All are built on the same 18" chassis. The only differences are in the electrical systems.

Model No.	Brand	Power
10101	Lawn-Boy	120 vac
10120 & 10122	Lawn-Boy	24 vdc
10123	Lawn-Boy	36 vdc
20645 20646 20050	Toro	120 vac
20647 & 20648 20652	Toro	24 vdc
20649	Toro	36 vdc

International Models

These models are offered in Europe, U.K., and Switzerland. These models use 230 volt AC to charge the batteries. The electrical portion of these models will be covered in a separate section.

Model No.	Brand	Power	Sold In
10701	Lawn-Boy	24 vdc	Europe
21040	Toro	24 vdc	Europe
10702	Lawn-Boy	24 vdc	U.K.
21042	Toro	24 vdc	U.K.
10703	Lawn-Boy	24 vdc	Switzerland
21043	Toro	24 vdc	Switzerland

NOTE: This manual may apply to model numbers other than those in the tables above. Differences between models, other than voltage, may include different original packaging or different standard equipment. For example, a model may include a side discharge chute, a bagger, both, or neither.

Model/Serial Number Location

On all battery or electric powered mowers, the model and serial number is engraved in the lower rear of the body or on a metal tag at this location (Figure 1).

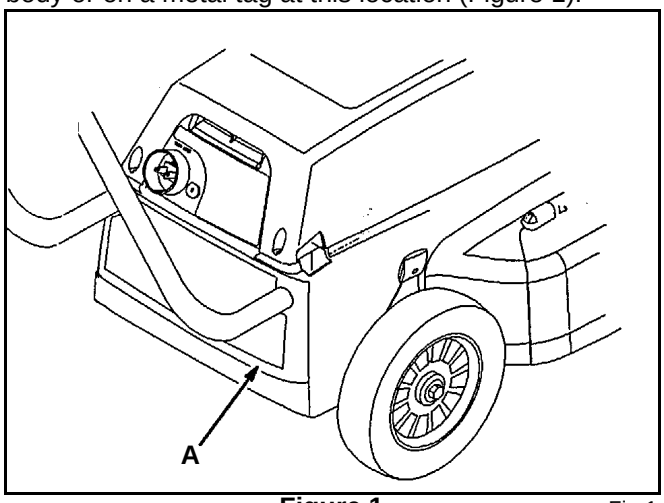


Figure 1 Fig-1

(A) Model and Serial Number

SPECIFICATIONS

Specifications (120 Volt Models)

Item	Specification
Width of Cut	18” (46 cm)
Motor	Universal wound 120 volt motor. Motor rated at 12 amps continuous duty.
RPM	Motor 20,500 with step down belt drive ratio 5.8-1. Blade speed at 20,500 fps is 3,534 rpm.
Blade Tip Speed @ 3600 rpm	16,493 fps
Weight	38 lbs. net dry.
Standard Function	The mowers come with mulching capability and a side discharge deflector.
Options	Side bagging kit.
Compliance	Conforms to UL #1447, CSA #C22.2 No. 147-M90, ANSI B71.1 and CPSC requirements.

Specifications (Battery Models)

These models are built on the same basic chassis as the 120 volt models. However, the major differences will be due to the different style and quantity of batteries. This will affect the weight as well as the wiring, motor, and solenoid. All batteries are of the sealed lead acid type.

Model	Brand	Battery	Operating Volts	Weight/Net Dry	Run Time
10120	Lawn-Boy	4 - 6 volt (12.5 ah)	24 vdc	58 lbs.	45 - 60 min.
10122	Lawn-Boy	4 - 6 volt (12.5 ah)	24 vdc	60 lbs.	45 - 60 min.
10123	Lawn-Boy	6 - 6 volt (12.5 ah)	36 vdc	68 lbs.	65 - 90 min.
20052	Toro	4 - 6 volt (12.5 ah)	24 vdc	60 lbs.	45 - 60 min.
20647	Toro	2 - 12 volt (17 ah)	24 vdc	70 lbs.	60 - 90 min.
20648	Toro	4 - 6 volt (12.5 ah)	24 vdc	60 lbs.	45 - 60 min.
20649	Toro	3 - 12 volt (17 ah)	36 vdc	84 lbs.	90 - 120 min.

Motor

	24 Volt Models	36 Volt Models
Type	24 volt permanent magnet	36 volt permanent magnet
Speed	3750 ± 375 rpm	3600 ± 360 rpm
Torque	165 oz.-in. @ 3100 rpm	180 oz.-in. @ 2950 rpm
Rated Continuous Duty	22 amps	15 amps
No Load Amps	8 amps	4.5 amps
Blade Tip Speed	17,180 fps @ 3750 rpm	16,473 fps @ 3600 rpm
Compliance	Conforms to UL #1447, CSA #C22.2 No. 147-M90, ANSI B71.1 and CPSC requirements	
Standard Function	Mulching and side discharging	
Options	Side bagging kit	

European Models

Model No.	Brand	Battery	Operating Volts	Weight	Run Time	Sold In
21040	Toro	4/6 volt	24 vdc	27kg	45 - 60 min.	Europe
21042	Toro	4/6 volt	24 vdc	27kg	45 - 60 min.	U.K.
21043	Toro	4/6 volt	24 vdc	27kg	45 - 60 min.	Switzerland

Charging - On board charging converts 230 volt AC line voltage to DC.

*Motor and blade speed specs same as North American models.

Metric Torque and Blade Tip Speeds

	24 Volt	36 Volt
Motor Torque	1.165 Newton-Meter 1165 Newton-Millimeter	1.271 Newton-Meter 1271 Newton-Millimeter
Blade Tip Speed	5236.5 Meters/Minute @ 3750 rpm	5021 Meters/Minute @ 3600 rpm

SPECIFICATIONS

Assembly Requirements

Item	Assembly Information
Deck to liner screws	15 - 20 in. lbs. (17.3 - 23.0 kg cm)
Wheel bolts	180 - 240 in. lbs. (207 - 276 kg cm)
Motor to deck screws	80 - 85 in. lbs. (92 - 97 kg cm)
Spindle pulley nut (120 volt)	200 - 300 in. lbs. (230 - 345.5 kg cm)
Spindle to deck screws	80 - 85 in. lbs. (92 0 97 kg cm)
Blade bolt (battery models)	35 - 40 ft. lbs. (4.8 - 5.5 kg m)
Blade bolt (120 volt)	45 - 50 ft. lbs. (6.2 - 6.9 kg m)
Blade bolt/belleville washer	cup side towards blade
Control cable bracket (battery models)	Upper position
Control cable bracket (120 volt)	Lower position

Special Tools

Most repairs can be made using normal hand tools. However, the use of a powered screwdriver will prove invaluable.

A volt/ohmmeter is necessary for troubleshooting the electrical system. A good digital meter will simplify taking the necessary readings.

120 VAC models will require high potential testing after making repairs to the electrical components.

120 Volt Models

IMPORTANT SAFETY INSTRUCTIONS

This machine meets or exceeds CPSC blade safety requirements for walk-behind rotary mowers and the B71.1 specifications of the American National Standards Institute, in effect at time of production. However, improper use or maintenance by the operator or owner can result in injury. To reduce the potential for injury, comply with these safety instructions and always pay attention to the safety alert symbol ⚠ which means CAUTION, WARNING or DANGER — "personal safety instruction." Failure to comply with the instruction may result in personal injury.

WARNING: To reduce the risk of fire, electric shock, and personal injury when using electric lawn mowers, always follow these basic safety precautions.

READ ALL INSTRUCTIONS BEFORE USING THIS MOWER

SAVE THESE INSTRUCTIONS FOR FUTURE REFERENCE!

Safe Operating Practices

This product is capable of amputating hands and feet and throwing objects. Always follow all safety instructions to avoid serious injury or death.

This mower is designed for cutting and mulching grass or, when equipped with a grass bag, for catching cut grass. Any use for purposes other than these could prove dangerous to user or bystanders.

General Operation

1. Read this manual carefully before operating the mower. Become familiar with the controls and proper use of the mower. Never allow children under 16 years of age to operate the mower. Never allow adults to operate mower without proper instructions.
2. The operator of the mower is responsible for keeping everyone, especially children and pets, away from area of operation. The operator is responsible for accidents or hazards occurring to other people or their property.
3. Thoroughly inspect area where mower will be used and remove sticks, stones, wire, and debris that could be picked up and thrown by mower. Watch for foreign objects while mowing. Objects struck by the lawn mower blade can cause severe injuries to persons.
4. Wear long pants and substantial shoes. Do not operate mower while wearing open-toed shoes, jewelry, loose clothing or when barefoot. Use of rubber gloves and footwear is recommended when working outdoors.
5. Keep all guards, shields, safety devices, side discharge chute or optional grass catcher in place. Repair or replace damaged parts, including decals. Never tamper with safety devices. Check their proper operation regularly.
6. The motor and blade are designed to stop within 3 seconds after releasing the control bail. Ensure that the control bail functions properly before each use of mower. If the blade does not stop within 3 seconds, or if there is a grinding or scraping metal-to-metal noise when the control bail is released, contact your local Authorized Toro Service Dealer for proper "On/Off" and blade brake adjustment or replacement.
7. Before using, always visually inspect to see that the blades, blade fasteners and cutter assembly are not worn or damaged. Replace worn or damaged blades and fasteners in sets to preserve balance.
8. Only use those accessories and attachments designed to be used with this product. Use of any accessory or attachment not designed for this product may increase the risk of injury.
9. Ground Fault Circuit Interrupter (GFCI) protection should be provided on the circuit(s) or outlet(s) to be used for the lawn mower.

   Receptacles are available having built-in GFCI protection and may be used for this measure of safety.

10. **WARNING:** To prevent electric shock, use only with an extension cord suitable for outdoor use, such as SW-A, SOW-A, STW-A, STOW-A, SJW-A, SJOW-A, SJTW-A, or SJTOW-A.

11. Extension Cord — Make sure your extension cord set is in good condition. When using an extension cord, be sure to use one heavy enough to carry the current your product will draw. Refer to Extension Cord Chart, see page 3 - 1. An undersized cord will cause a drop in line voltage resulting in loss of power and overheating.

12. Properly connect extension cord to mower in order to prevent disconnection of the cord (Figure 2).

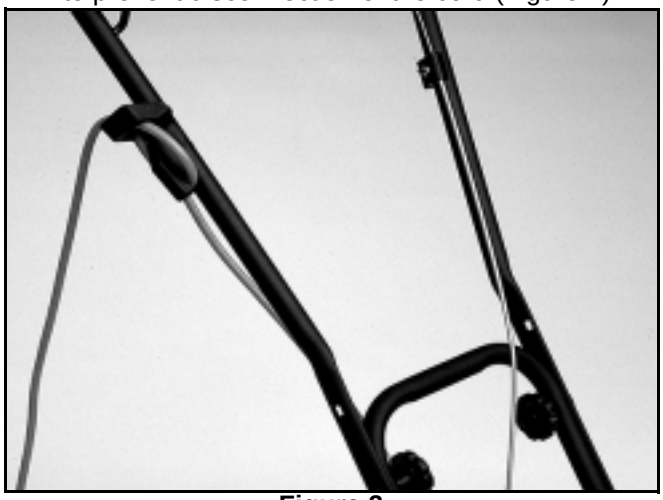


Figure 2 0663-002

13. To reduce the risk of electric shock, this mower has a polarized plug (one blade is wider than the other) (Figure 3) and will require the use of a polarized extension cord. The polarized extension cord receptacle will fit onto the mower plug only one way. If the extension cord receptacle does not fit fully onto the mower plug, reverse the cord receptacle. If the cord receptacle still does not fit, obtain a correct polarized extension cord. A polarized extension cord will require the use of a polarized wall outlet. The extension cord plug will fit into the polarized wall outlet only one way. If the cord plug does not fit fully into the wall outlet, reverse the cord plug. If the cord plug still does not fit, contact a qualified electrician to install the proper wall outlet. Do not change the mower plug, extension cord receptacle, or extension cord plug in any way.

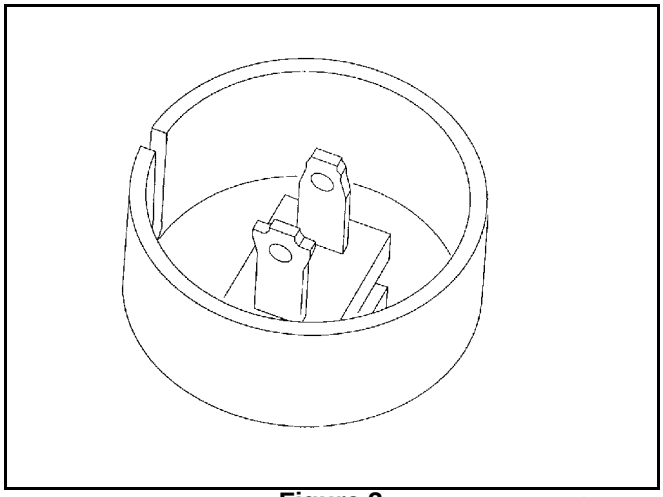


Figure 3 Scan7-a

While Operating

1. Do not connect extension cord to mower until you are ready to mow.

2. Start the motor carefully according to instructions and with feet well away from the blade.

3. Use Right Appliance — Do not use mower for any job except that for which it is intended.

4. Stay Alert — Watch what you are doing. Do not operate mower when tired or under the influence of drugs, alcohol, or medication.

5. Be alert and turn mower off if children enter the area.

6. Use extra care when approaching blind corners, shrubs, trees, or other objects that may obscure vision.

7. Do not mow near drop-offs, ditches, or embankments. The operator could lose footing or balance.

8. Avoid dangerous environments. Never operate mower in wet grass or damp locations. Do not use mower in the rain.

9. Do not run motor indoors.

10. Do not operate mower in gaseous, explosive atmospheres. Normal sparking of motor could ignite fumes.

11. Always maintain secure footing. Keep a firm grip on the handle and walk; never run. Mow only in daylight or in good artificial light.

12. Mow across the face of slopes; never up and down. Use extreme caution when changing direction on slopes. Do not mow excessively steep slopes. Wear skid resistant shoes on slopes.

13. Don't Overreach — Keep proper footing and balance at all times.

14. Do not force the mower. It operates best and safest at the rate for which it was designed.

15. Always wear safety glasses or eye shields during operation to protect eyes from foreign objects that may be thrown from the machine. (Regular eyeglasses are **not** safety glasses.)

16. Always wear an approved dust mask when using unit in dusty conditions.

17. Keep face, hands, and feet away from the mower housing and cutter blade when the motor is running. Blade can cause injury to hands and feet. Stay behind the handle until the motor stops.

18. Use extreme caution when reversing or pulling the mower toward you. Before and while moving backwards, look behind and down for small children.

19. Since the blade rotates for a few seconds after the control bar is released, stay behind the handle until all moving parts stop.

20. After striking a foreign object or if mower vibrates abnormally, stop motor and disconnect extension cord. Check mower for damage and make all repairs before using mower again. If major repairs are ever needed or if assistance is desired, contact your local Authorized Toro Service Dealer.

21. Do not operate mower if it has been dropped or damaged in any way. Repair any damage before operating mower.

22. Do not run the mower over the extension cord.

23. Inspect extension cord periodically and replace cord if damaged.

24. Don't abuse extension cord. Never pull mower by cord or yank cord to disconnect it from receptacle. Keep cord away from heat, oil, and sharp edges.

25. Stop the motor, wait for all moving parts to stop, and disconnect extension cord from mower before adjusting the height-of-cut.

26. Stop the motor when pushing the mower outside the lawn area.

27. Stop the motor and disconnect extension cord from mower before removing side discharge chute or optional grass catcher.

28. Stop motor before leaving the operator's position — behind the handle. Disconnect extension cord from mower if mower will be unattended.

29. If mower must be lifted to be transported, stop motor, stay behind the handle until all moving parts stop and disconnect extension cord from mower.

Maintenance And Storage

1. Perform only those maintenance instructions described in this manual. If major repairs are ever needed or if assistance is desired, contact your local Authorized Toro Service Dealer.

2. Before mower is cleaned, inspected, serviced, or adjusted, stop motor and wait for all moving parts to stop. Disconnect extension cord from mower.

3. To ensure the mower is in safe operating condition, frequently check and keep all nuts, bolts, and screws tight. Ensure blade bolt is tightened to 45-50 ft.lbs. (61-68 N·m).

4. Always keep a sharp blade on your mower. When servicing blade, refer to blade maintenance section for correct installation and servicing procedures. Use identical replacement blades only.

5. To reduce fire hazard, keep motor free of excessive grass, leaves, and accumulations of dirt.

6. This unit is provided with double insulation. Use only identical replacement parts. See “Servicing Double-Insulated Mower” on page 3 - 5.

7. When not in use, store mower indoors in a dry, locked-up place out of the reach of children. Allow motor to cool before storing in an enclosure.

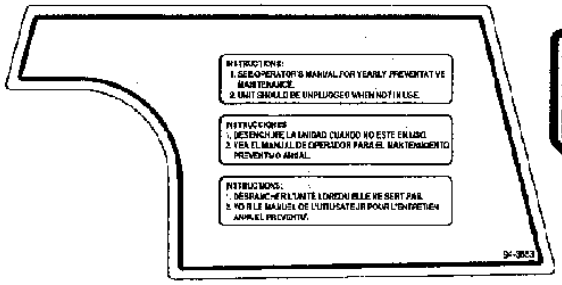
8. Check optional grass catcher bag frequently for wear or deterioration. Replace with a new bag when worn or damaged for your protection.

9. At the time of manufacture, the mower conformed to the safety standards in effect for rotary mowers. To assure best performance and continued safety certification of the mower, use genuine Toro replacement parts and accessories. Replacement parts and accessories made by other manufacturers may result in non-conformance with the safety standards, and that could be dangerous.

SAVE THESE INSTRUCTIONS FOR FUTURE REFERENCE!

Safety and Instruction Decals

Safety decals and instructions are easily visible to the operator and are located near any area of potential danger. Replace any decal that is damaged or lost.



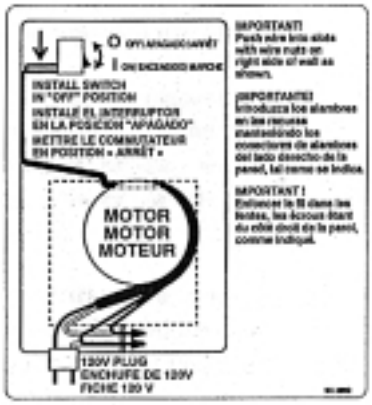
ON CONTROL PANEL

ON MULCH PLUG

ON MULCH PLUG

ON MULCH PLUG

ON REAR OF MOWER



UNDER COVER
(Part No. 94-3860)

Battery Powered Models

Introduction

Thank you for purchasing a Toro product.

All of us at Toro want you to be completely satisfied with your new product, so feel free to contact your local Authorized Service Dealer for help with service, genuine Toro parts, or other information you may require.

Read this manual carefully to learn how to operate and maintain your product correctly. Reading this manual will help you and others avoid personal injury and damage to the product. Although Toro designs, produces and markets safe, state-of-the-art products, you are responsible for using the product properly and safely. You are also responsible for training persons who you allow to use the product about safe operation. The Toro warning system in this manual identifies potential hazards and has special safety messages that help you and others avoid personal injury, even death. DANGER, WARNING, and CAUTION are signal words used to identify the level of hazard. However, regardless of the hazard, be extremely careful.

DANGER signals an extreme hazard that will cause serious injury or death if the recommended precautions are not followed.

WARNING signals a hazard that may cause serious injury or death if the recommended precautions are not followed.

CAUTION signals a hazard that may cause minor or moderate injury if the recommended precautions are not followed.

Two other words are also used to highlight information. "Important" calls attention to special mechanical information and "Note" emphasizes general information worthy of special attention.

The left and right side of the machine is determined by standing behind the handle in the normal operator's position.

Safety

IMPORTANT SAFETY INSTRUCTIONS

Improper use or maintenance by the operator or owner can result in injury. To reduce the potential for injury, comply with these safety instructions and always pay attention to the safety alert ⚠ symbol which means CAUTION, WARNING or DANGER — "personal safety instruction." Failure to comply with the instruction may result in personal injury.

READ ALL INSTRUCTIONS BEFORE USING THIS MOWER

SAVE THESE INSTRUCTIONS FOR FUTURE REFERENCE!

WARNING: To reduce the risk of personal injury while using battery lawn mower, always follow these basic safety instructions.

Safe Operating Practices

This product is capable of amputating hands and feet and throwing objects. Always follow all safety instructions to avoid serious injury or death.

This mower is designed for cutting and mulching grass or, when equipped with a grass bag, for catching cut grass. Any use for purposes other than these could prove dangerous to user or bystanders.

General Operation

1. Read this manual carefully before operating the mower. Become familiar with the controls and proper use of the mower. Never allow children under 16 years of age to operate the mower. Never allow adults to operate mower without proper instructions.

2. The operator of the mower is responsible for keeping everyone, especially children and pets, away from area of operation. The operator is responsible for accidents or hazards occurring to other people or their property.

3. Thoroughly inspect area where mower will be used and remove sticks, stones, wire, and debris that could be picked up and thrown by mower. Watch for foreign objects while mowing. Objects struck by the lawn mower blade can cause severe injuries to persons.

4. Wear long pants and substantial shoes. Do not operate mower while wearing open-toed shoes, jewelry, loose clothing, or when barefoot. Use of rubber gloves and footwear is recommended when working outdoors.

5. Keep all guards, shields, safety devices, side discharge chute, or optional grass catcher in place. Repair or replace damaged parts, including decals. Never tamper with safety devices. Check their proper operation regularly.

6. The motor and blade are designed to stop within 3 seconds after releasing the control bail. Ensure that the control bail functions properly before each use of mower. If the blade does not stop within 3 seconds, or if there is a grinding or scraping metal-to-metal noise when the control bail is released, contact your local Authorized Toro Service Dealer for proper "On/Off" and blade brake adjustment or replacement.

7. Before using, always visually inspect to see that the blades, blade fasteners and cutter assembly are not worn or damaged. Replace worn or damaged blades and fasteners in sets to preserve balance.

8. Only use those accessories and attachments designed to be used with this product.

   Use of any accessory or attachment not designed for this product may increase the risk of injury.

While Operating

1. Do not insert key into plug receptacle until you are ready to mow.

2. Do not operate mower in gaseous, explosive atmospheres. Normal sparking of motor could ignite fumes.

3. Start the motor carefully according to instructions and with feet well away from the blade.

4. Use Right Appliance — Do not use mower for any job except that for which it is intended.

5. Stay Alert — Watch what you are doing. Do not operate mower when tired or under the influence of drugs, alcohol, or medication.

6. Be alert and turn mower off if children enter the area.

7. Use extra care when approaching blind corners, shrubs, trees, or other objects that may obscure vision.

8. Do not mow near drop-offs, ditches, or embankments. The operator could lose footing or balance.

9. Avoid dangerous environments. Never operate mower in wet grass or damp locations. Do not use mower in the rain.

10. Always maintain secure footing. Keep a firm grip on the handle and walk; never run. Mow only in daylight or in good artificial light.

11. Mow across the face of slopes; never up and down. Use extreme caution when changing direction on slopes. Do not mow excessively steep slopes. Wear skid resistant shoes on slopes.

12. Don't Overreach — Keep proper footing and balance at all times.

13. Do not force the mower. It operates best and safest at the rate for which it was designed.

14. Always wear safety glasses or eye shields during operation to protect eyes from foreign objects that may be thrown from the machine. (Regular eyeglasses are **not** safety glasses.)

15. Always wear an approved dust mask when using unit in dusty conditions.

16. Keep face, hands, and feet away from the mower housing and cutter blade when the motor is running. Blade can cause injury to hands and feet. Stay behind the handle until the motor stops.

17. Use extreme caution when reversing or pulling the mower toward you. Before and while moving backwards, look behind and down for small children.

18. Since the blade rotates for a few seconds after the control bar is released, stay behind the handle until all moving parts stop.

19. After striking a foreign object or if mower vibrates abnormally, stop motor and disconnect extension cord. Check mower for damage and make all repairs before using mower again. If major repairs are ever needed or if assistance is desired, contact your local Authorized Toro Service Dealer.

20. Do not operate mower if it has been dropped or damaged in any way. Repair any damage before operating mower.

21. Stop the motor, wait for all moving parts to stop, and disconnect extension cord from mower before adjusting the height-of-cut.

22. Stop the motor when pushing the mower outside the lawn area.

23. Stop the motor and remove the key from the plug before removing side discharge chute or optional grass catcher.

24. Stop motor before leaving the operator's position — behind the handle. Disconnect extension cord from mower if mower will be unattended.

25. If mower must be lifted to be transported, stop motor, stay behind the handle until all moving parts stop and remove key from the plug receptacle.

Maintenance And Storage

1. Perform only those maintenance instructions described in this manual. If major repairs are ever needed or if assistance is desired, contact your local Authorized Toro Service Dealer.

2. Before mower is cleaned, inspected, serviced, or adjusted, stop motor and wait for all moving parts to stop. Remove key from plug.

3. Do not charge lawn mower in rain or in wet locations.

4. To prevent electric shock while charging, repair or replace any damaged electrical cords immediately.

   Note: The extension cord is only needed to recharge the battery. It is not used for mowing with the mower.

5. Don't abuse extension cord while charging. Do not yank cord to remove it from plug receptacle. Keep cord away from heat, oil, and sharp edges.

6. When replacing batteries, all batteries should be replaced at the same time. Mixing fresh and discharged batteries could increase internal cell pressure and rupture the battery(ies).

7. When inserting the batteries into this product, the proper polarity or direction must be observed. Reverse insertion of batteries can result in burned wires, sparks, leakage, or explosion of batteries.

8. Remove key before servicing, cleaning, or removing material from the lawn mower.

9. Use only replacement battery(ies) of approved type and size.

10. Do not dispose of the battery(ies) in a fire; the cell may explode. Check with local codes for special disposal instructions.

11. Do not open or mutilate the battery(ies). Released electrolyte is corrosive and may cause damage to the eyes or skin. It may be toxic if swallowed.

12. Exercise care in handling batteries in order not to short the battery (contact both positive and negative battery posts) with conducting materials such as rings, bracelets, and keys. The battery or conductor may overheat and cause burns.

13. To ensure the mower is in safe operating condition, frequently check and keep all nuts, bolts, and screws tight. Ensure blade bolt is tightened to 35-40 ft. lbs. (48-54 N·m).

14. Always keep a sharp blade on your mower. When servicing blade. See “Blade” section on page 3 - 14 for correct installation and servicing procedures. Use identical replacement blades only.

15. To reduce fire hazard, keep motor free of excessive grass, leaves, and accumulations of dirt.

16. Check optional grass catcher bag frequently for wear or deterioration. Replace with a new bag when worn or damaged for your protection.

17. When not in use, remove key and store mower indoors in a dry, locked-up place out of the reach of children. Allow motor to cool before storing in an enclosure.

18. At the time of manufacture, the mower conformed to the safety standards in effect for rotary mowers. To assure best performance and continued safety certification of the mower, use genuine Toro replacement parts and accessories. Replacement parts and accessories made by other manufacturers may result in non-conformance with the safety standards, and that could be dangerous.

SAVE THESE INSTRUCTIONS FOR FUTURE REFERENCE!

Sound Emissions

This unit has a maximum airborne noise emission, based on measurement of identical machines:

Sound Pressure Level - 76dB(A)*
Sound Power Level - 88 LwA*

* Unit tested under no load condition.

Vibration Level

This unit has a maximum vibration level of 2.5 m/s^2, based on measurement of identical machines*.

*Unit tested under no load condition.

Symbol Glossary

Safety alert triangle

General safety alert symbol

Read operator's manual

Severing of toes or fingers, rotary mower blade

Severing of fingers, rotary mower blade

Severing of toes, rotary mower blade

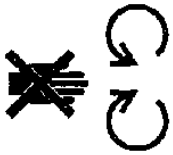
Switch off: Remove plug from mains before adjusting, cleaning, if cable is entangled, or before leaving the lawn mower unattended for any period.

Shut off engine and remove key before leaving operator position, walk power mower.

Thrown or flying objects, whole body exposure.

Thrown or flying objects, keep safety shields in place, rotary mower.

Do not open or remove safety shields while engine is running.



Wait until all machine components have completely stopped before touching them (blades continue to rotate after machine is switched off).

SAFETY INFORMATION

Keep dry

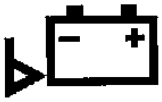
Electrical shock, electrocution

Cutting element - height of cut

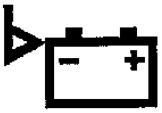
C. E. Mark

Double Insulated

Battery charge level - low

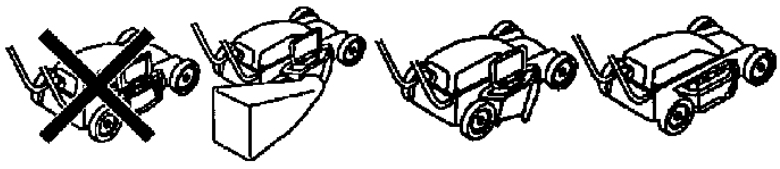


Battery charge level - high



Push gray button forward, rotate bail to handle to run mower

Avoid serious injury, operate only with deflector, mulch plug or entire catcher in place



Low

High

Splash-proof construction

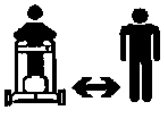
Negative

Positive

Alternating current/sine wave

Insert plug to operate mower

Stay a safe distance from the machine, walk power mower



Before Starting

Secure Extension Cord

Use only a UL listed (CSA certified in Canada) extension cord recommended for outdoor use. Refer to Extension Cord Chart.

EXTENSION CORD CHART		
If length of extension cord is less than or equal to:	100 ft.	150 ft.
Assure wire size gauge (A.W.G.) in cord is:	14	12

Note: Use of an extension cord over 150 feet is not recommended.

⚠ WARNING

POTENTIAL HAZARD
- Contact with water while operating unit could cause electric shock.

WHAT CAN HAPPEN
- Electric shock can cause injury or death.

HOW TO AVOID THE HAZARD
- Don't handle plug or mower with wet hands or while standing in water.
- Use only a UL listed (CSA certified in Canada) extension cord recommended for outdoor cold weather use. Refer to “EXTENSION CORD CHART,” on page 3 - 1.

To reduce the risk of electric shock, this mower has a polarized plug receptacle (one blade is wider than the other) (Figure 4). An extension cord plug will fit in a polarized outlet only one way. If the plug does not fit fully in the receptacle, reverse the plug. If it still does not fit, consult a qualified electrician to install the proper plug. Do not change the plug receptacle in any way.

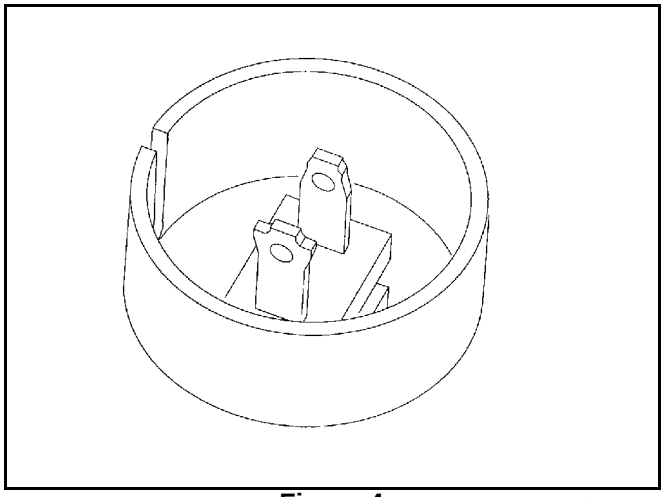


Figure 4 Scan7-a

1. Form a loop in extension cord and secure it in cord lock (Figure 5).

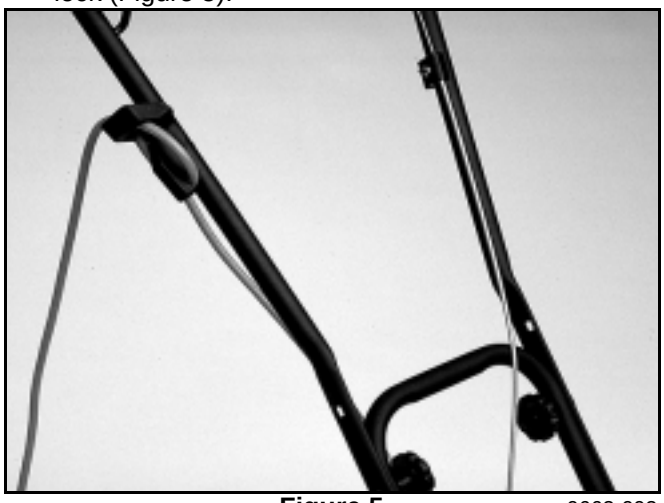


Figure 5 0663-002

2. Connect extension cord to mower (Figure 5).

   Note: Do not unplug extension cord by pulling on cord. To unplug, grasp the plug, not the cord.

OPERATIONAL TIPS (120 VOLT MODELS)

WARNING

POTENTIAL HAZARD
- The electrical cord could be damaged.

WHAT CAN HAPPEN
- A damaged electrical cord could cause a shock or fire.

HOW TO AVOID THE HAZARD
- Thoroughly inspect electrical cord before charging unit. If cord is damaged, do not charge unit. Replace or repair damaged cord immediately. Contact your TORO service dealer for assistance.

Plan Your Mowing Pattern

By following the suggested mowing pattern, the risk of running over the cord with the mower will be reduced, and the cord will not sustain unnecessary wear. Do not allow extension cord to wrap around trees, shrubs or other obstacles.

1. Begin mowing near the electrical outlet and work outward (Figure 6). Mow back and forth.

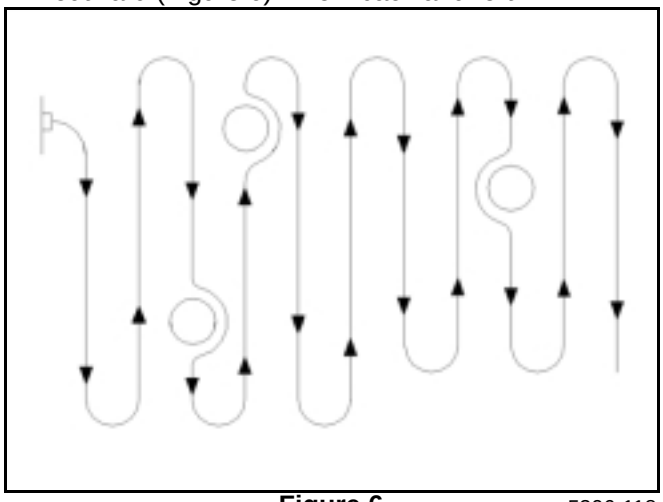


Figure 6 5306-118

2. When turning at the end of a cut path, be very careful not to mow across the extension cord.

   WARNING: If extension cord is damaged, do not operate unit. Replace or repair damaged cord immediately. Contact your TORO service dealer for assistance.

Maintenance

WARNING

POTENTIAL HAZARD
- When extension cord is connected to mower and plugged into a normal household outlet, the mower is operational. Someone could accidentally start the mower.

WHAT CAN HAPPEN
- Accidental starting of mower could seriously injure you or other bystanders.
-

HOW TO AVOID THE HAZARD
- Always remove extension cord from mower receptacle when leaving mower unattended, even for a short period of time.

Cleaning

Before cleaning mower, stop motor, wait for all moving parts to stop, and disconnect extension cord from mower.

IMPORTANT: Do not clean mower with a garden hose. Moisture can be trapped in mower and may cause corrosion of internal parts.

After Every Use

- Clean the underside of the mower housing. Be particularly careful to keep the front cavity clear of all debris (Figure 7). Remove dirt and grass clippings with a hardwood scraper. Avoid burrs and sharp edges.

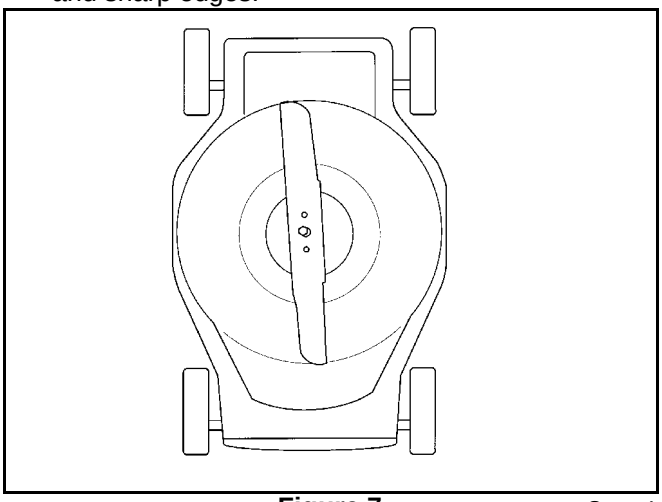


Figure 7 Scan-4

- Brush all debris off top of mower housing.

Once A Year

- Remove top shroud (Figure 8) and clean out any debris underneath it with compressed air, a vacuum cleaner, or a brush.

  IMPORTANT: Do not use metal objects to clean around battery. If metal objects contact the positive and negative posts at the same time, this could short the battery. The battery or conductor may overheat and cause burns.

Figure 8 0663-006

- Check for any discolored or charred wires or switch contacts. If any are damaged, see your Authorized Toro Service Dealer for repairs.

Blade

Always mow with a sharp blade. A sharp blade cuts cleanly and without tearing or shredding the grass blades like a dull blade.

⚠ WARNING

POTENTIAL HAZARD
- Motor could be started by someone accidentally.

WHAT CAN HAPPEN
- Accidental starting of motor could cause serious injury to operator or bystanders.

HOW TO AVOID THE HAZARD
- Do not attempt to inspect, remove or replace blade without first disconnecting extension cord from the mower.

1. Stop motor and wait for all moving parts to stop. Disconnect extension cord from mower.

2. Tip mower on its side (Figure 9).

Figure 9 0663-008

OPERATIONAL TIPS (120 VOLT MODELS)

3. EXAMINING BLADE - Carefully examine blade for sharpness and wear, especially where flat and curved parts meet. Since sand and abrasive material can wear away the metal that connects the flat and curved parts of the blade, check blade before using the mower. If a slot or wear is noticed replace blade (Figure 10). Refer to step 4.

   Note: For best performance, install new blade before cutting season begins. During the year, file down small nicks to maintain the cutting edge.

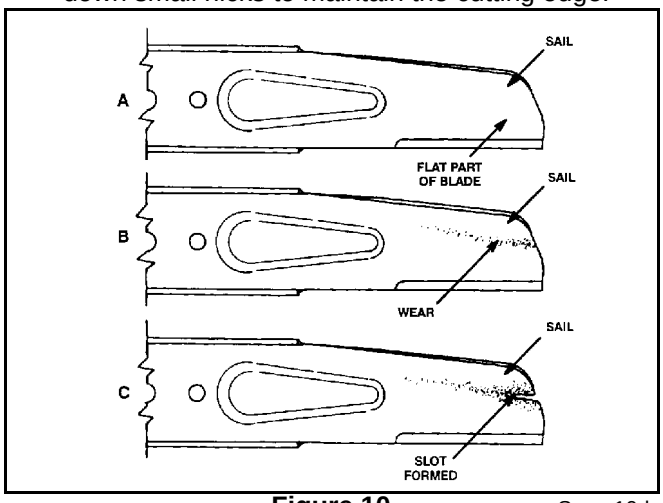


Figure 10 Scan-10-b

⚠ WARNING

POTENTIAL HAZARD

- A worn or damaged blade could break and a piece of blade could be thrown in operator's or bystander's direction.

WHAT CAN HAPPEN

- A thrown piece of blade could cause serious personal injury or death to operator or bystanders.

HOW TO AVOID THE HAZARD

- Inspect blade periodically for wear or damage.
- Replace a worn or damaged blade.

4. REMOVING BLADE - Grasp end of blade using a rag or thickly padded glove. Remove blade bolt, washer and blade (Figure 11).

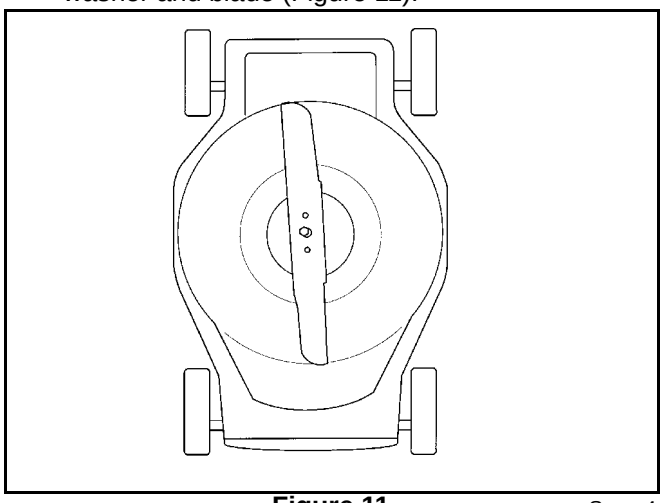


Figure 11 Scan-4

5. SHARPENING BLADE - Using a file, sharpen top side of blade and maintain original cutting angle (Figure 12). The blade will remain balanced if same amount of material is removed from both cutting edges.

   IMPORTANT: Check balance of blade by putting it on a blade balancer. An inexpensive balancer can be purchased at a hardware store. A balanced blade stays in a horizontal position and an unbalanced blade settles to the heavy side. If blade is not balanced, file more metal off cutting edge on heavy end of blade.

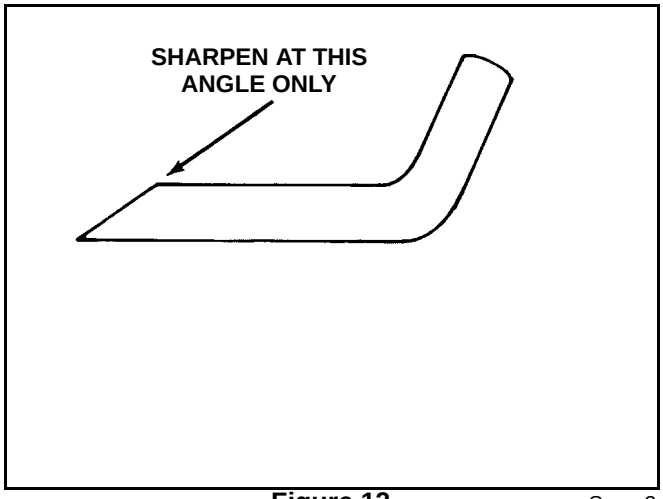


Figure 12 Scan-2

6. Reinstall sharp, balanced blade, washer and blade bolt. Sail part of blade must point toward top of mower housing to ensure correct installation. Washer is curved and must be reinstalled with curve side down as shown in (Figure 13). Tighten blade bolt to 35-40 ft. lbs. (48-54 N·m).

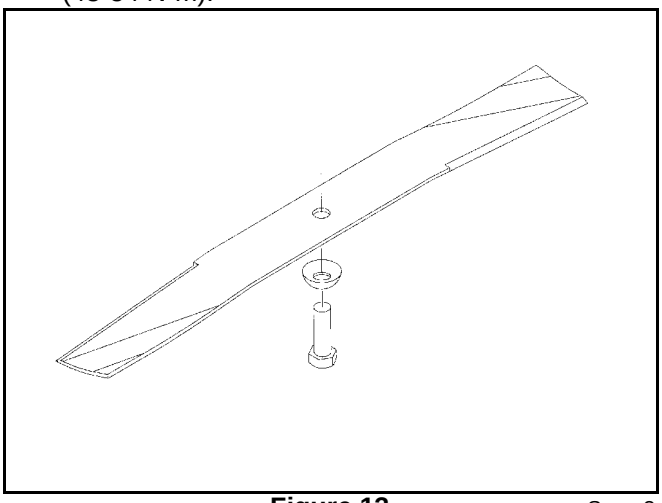


Figure 13 Scan-3

Servicing Double-Insulated Mower

In a double-insulated mower, two systems of insulation are provided instead of grounding. No grounding means is provided on a double-insulated mower, nor should a means for grounding be added to the mower. Servicing a double-insulated mower requires extreme care and knowledge of the system, and should be done only by qualified service personnel. Replacement parts for a double-insulated mower must be identical to the parts they replace. A double-insulated mower is marked with the words "DOUBLE INSULATION" or "DOUBLE-INSULATED." The symbol (square within a square) ⧈ may also be marked on the mower.

Storage

Store mower in a cool, clean, dry place. Cover mower to keep it clean and protected.

1. Clean mower housing. See “Cleaning” section on page 3 - 2.

2. Remove grass clippings, dirt and grime from external parts of the shrouding and top of mower housing.

3. Check condition of blade. See “Blade” section on page 3 - 3.

4. Tighten all nuts, bolts, and screws.

Charging (battery powered models)

Standard with all battery powered models is an automatic charger. This charger will periodically check the charge status of the batteries and charge them as needed. When the batteries are fully charged, the charger turns off. This charger also has the ability to sense when the batteries are too hot or too cold to be charged. In that situation, charging is suspended until the temperature returns to a normal range.

⚠ WARNING

POTENTIAL HAZARD
- Contact with water while operating unit could cause electric shock.

WHAT CAN HAPPEN
- Electric shock can cause injury or death.

HOW TO AVOID THE HAZARD
- Don't handle plug or mower with wet hands or while standing in water.
- Use only a UL listed (CSA certified in Canada) extension cord.

It takes approximately 12-16 hours to charge a fully discharged battery. **Charge the battery after every use. If the battery is not recharged after every use, the battery life will be shortened. Recharge even if mower is only run for a few minutes. This battery does not have a "memory."**

Note: The battery is charged at the factory. However, before using mower the first time, it is necessary to recharge battery and ensure it has a full charge before operating.

Note: Battery Charger Power Draw
When Charging - 50 watts
Not Charging - 4 - 5 watts

To charge battery:

1. Always charge mower in a dry area protected from the weather. Also, keep mower away from water and any flammable substances.
2. If key is in plug receptacle, remove it (Figure 14).

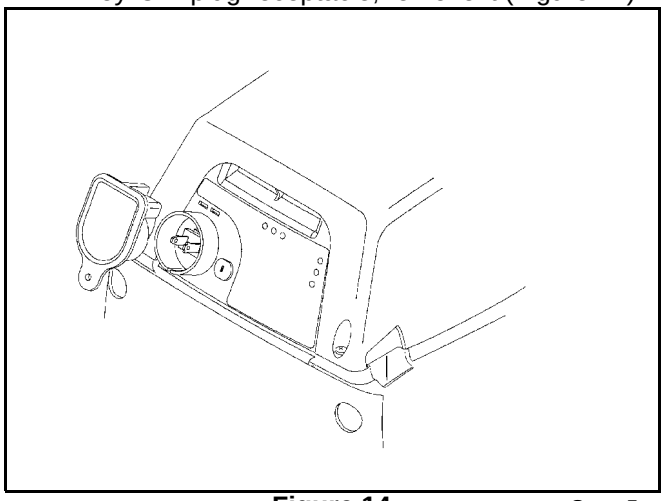


Figure 14 Scan-5-a

3. **(North American Models)**
   Insert extension cord into the plug receptacle and connect other end of extension cord to a normal 120 volt household outlet (Figure 15). See “Secure Extension Cord” on page 3 - 1.

   (European Models Only)
   Lift the rain shield, insert the extension cord into the plug receptacle, then connect other end of extension cord to a normal 230 volt household outlet (Figure 15). Use only a CE listed extension cord (included with mower).

Figure 15 1463-003-a

OPERATIONAL TIPS (24/36 VOLT MODELS)

4. The three vertical LED lights on the control panel will indicate the charging status (Figure 16). Refer to the Charging Chart below (Figure 17) for a summary of the LED lights.

   The red light on the control panel will begin to flash to indicate battery is present and is ready to charge.

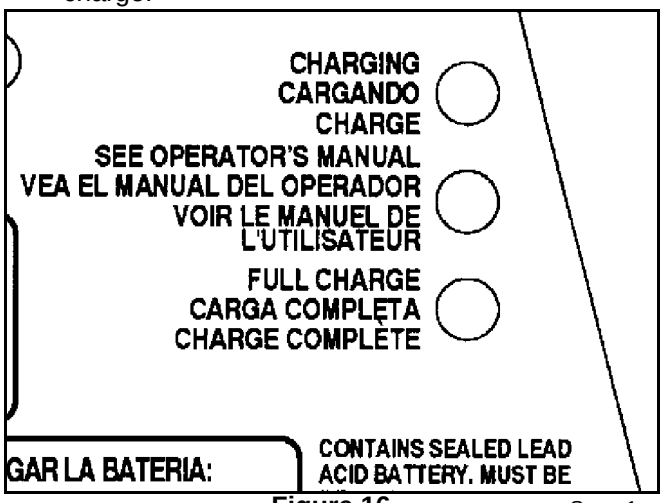


Figure 16 Scan-1-a

5. After a few minutes, the red light will stop flashing and become a steady red. This indicates the battery is charging.

6. When the battery is almost fully charged, the red light will go out and the green light will go on. The red and green light will alternately turn on and off. When the green light is on more than the red light, the battery is fully charged.

   IMPORTANT: Your mower has been designed to be safe if left continually on charge for extended periods of time. It is recommended that the battery be left continually on charge when it is not in use. During the non-mowing season, the mower can be unplugged and stored if the battery is fully charged.

   Note: When the mower is left on charge, it is normal for the red and green lights to alternately turn on and off.

LED CHARGING LIGHTS CHART

Charging Status	Red	Green	Yellow
Pre-charge qualification — charger testing battery condition/trickle charging battery. Trickle charge can last from minutes to hours.	blinking	off	off
Battery charging	on	off	off
Battery charged	off	on	off
Battery absent or defective	off	off	on
Charging fault - charger malfunctioning	not applicable	not applicable	not applicable
Charge pending — temperature too hot or too cold to charge	not applicable	not applicable	blinking

Figure 17

Storage (battery models)

The best storage for a battery is a cool dry place. In fact, a fully charged battery will withstand temperatures of about -50° F without freezing. (Windchill is not a factor for batteries, this is thermometer temperature.) However, a discharged battery will freeze at +32° F, the freezing point of water.

New mowers are charged before shipping. This charge is good for about six months. Inventory must be charged at six month intervals. An access panel is in the carton to allow easy plug in with an extension cord. We would recommend charging overnight 12-14 hours.

Consumers should leave the machine plugged in when not in use. The automatic charger will prevent battery failure from over or under charging, the most common cause of battery failure. Make sure that the outlet used is not switched (turned off with the light switch). The amount of electricity used would be difficult to identify on the electric bill as it will generally be very small. During the Winter, the charger will come on and test the battery; if it is too cold or the battery is fully charged, the charger shuts off. Even when charging the batteries, the current draw will not be large.

Battery Life — If the charging recommendations are followed, batteries will generally need replacing every 4-5 years. However, if stored in a discharged condition, the batteries can fail in a few months.

Battery Power Status

The three horizontal LED lights at the top of the control panel indicate approximately how much charge is left in the battery while the mower is in operation (Figure 18). The lights are only accurate when the mower is operating and cutting grass. The following is an explanation of the symbols under the battery power status LED lights:

- Full Box — Battery is between 50% - 100% charged.
- Half Full Box — Battery is between 5% - 50% charged.
- Empty Box — Battery has less than 5% charge left and should be recharged.

  IMPORTANT: The battery's life will be shortened if mower is run after battery lights have turned off. Do not continue to mow. Recharge battery.

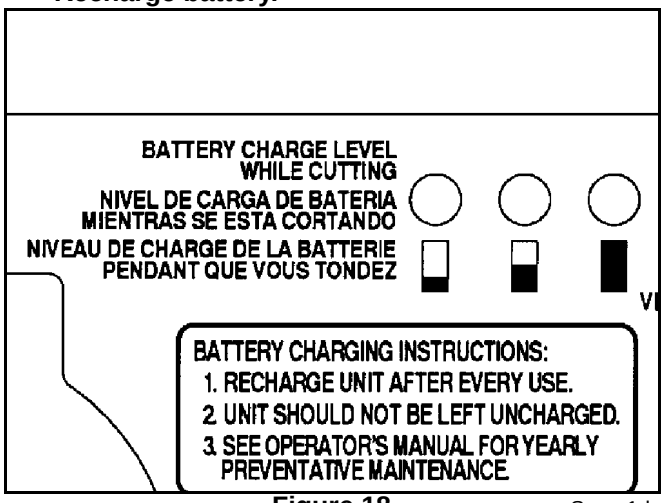


Figure 18 Scan-1-b

Operation

This mower is intended for residential use only.

Key

The mower will only operate when key is fully seated in plug receptacle (Figure 19). To prevent accidental starting or unauthorized use of mower, always remove key from plug receptacle when leaving mower unattended. The key has a tab with a hole in it to allow key to be hung from a nail, out of the reach of children. Read warning label on key.

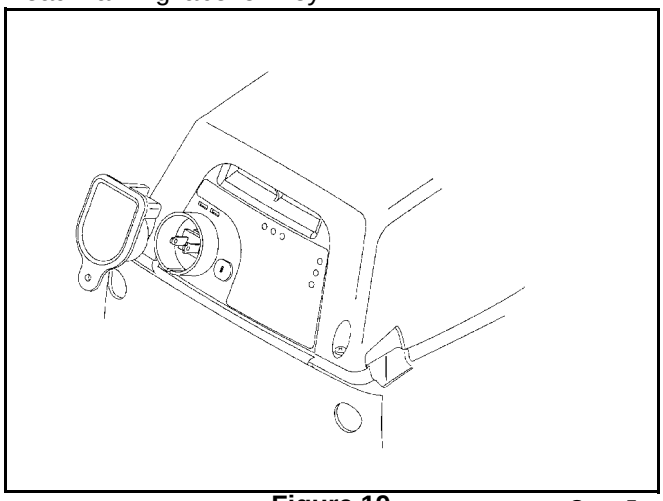


Figure 19 Scan-5-a

Starting/Stopping Instructions

To Start Motor

1. Push mower onto a flat concrete or asphalt surface.

   Note: Starting mower in thick grass could cause mower to clog.

2. Insert key fully into plug receptacle (Figure 20).

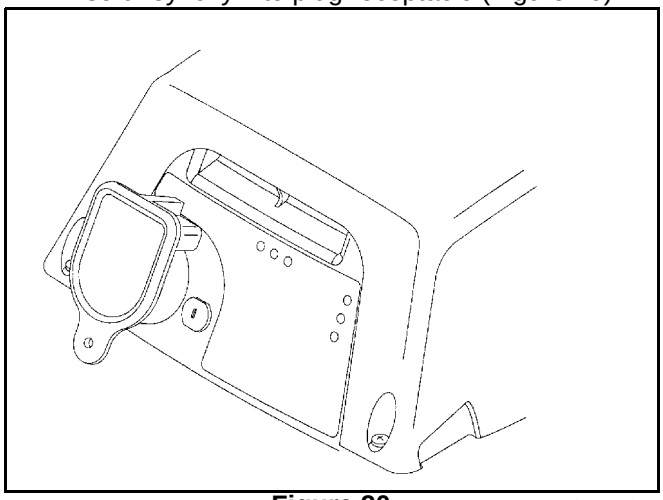


Figure 20 Scan-6-a

3. Pull control bar toward handle while pushing down slide on control (Figure 21).

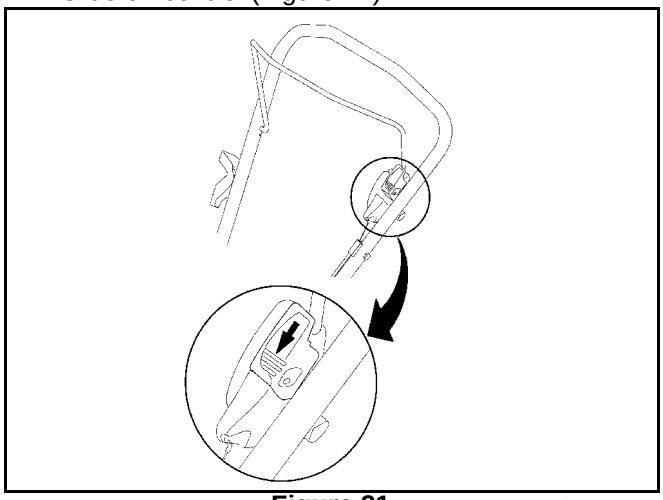


Figure 21 Scan-11-a

4. Squeeze control bar to handle (Figure 22).

   Note: Keep mower running when turning mower. Turning mower off when making a turn does not save battery energy.

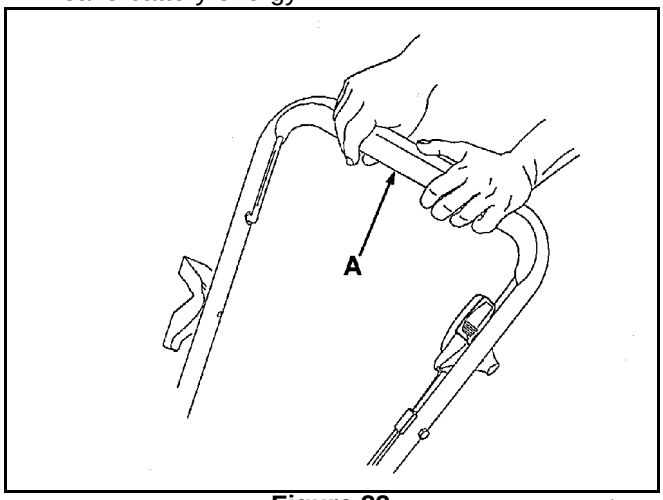


Figure 22 Fig 15

(A) Control Bar and Handle

To Stop Motor

1. Release control bar.

2. Remove key from plug receptacle if mower will be unattended for any period of time. Hang key in a high place out of reach of children.

3. **Always charge battery immediately after each use of mower. If battery is not charged after each use, battery life will be shortened.** See "Charging (battery powered models)" on page 3 - 7.

   IMPORTANT: Your mower has been designed to be safe if left continually on charge for extended periods of time. It is recommended that the battery be left continually on charge when it is not in use during the mowing season. During the non-mowing season, the mower can be unplugged and stored if the battery is fully charged.

Circuit Breaker

If mower is run under too much load, the circuit breaker will trip. Follow these instructions to reset circuit breaker.

IMPORTANT: Never reset circuit breaker when key is in receptacle and control bar is squeezed to handle.

1. Remove key from plug receptacle (Figure 23).

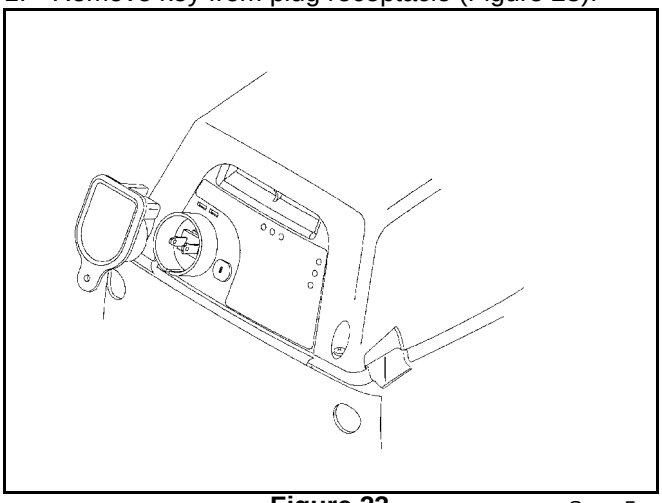


Figure 23 Scan-5-a

2. Wait 30 seconds to 1 minute before pushing in circuit breaker button (Figure 24).

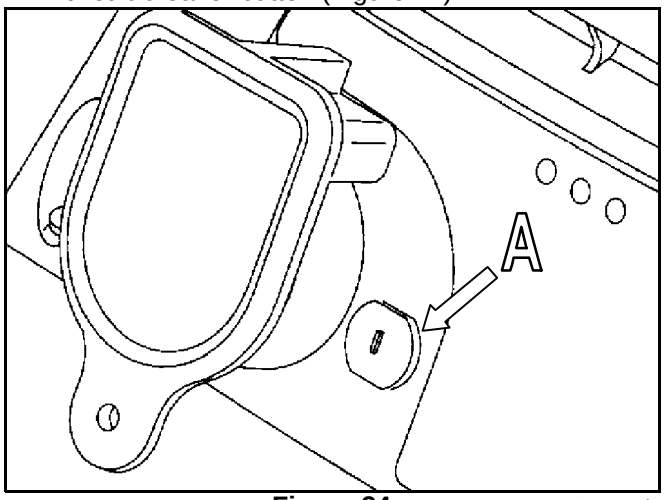


Figure 24 Scan-6-b

(A) Reset Button

3. Reinstall key in plug receptacle.

4. Resume cutting under less load.

If circuit breaker repeatedly trips, raise the height-of-cut or side discharge.

Mowing Tips

Battery Run Time

With a battery powered lawn mower, the condition of the grass and the way that you mow the grass will affect how long the battery will run on a single charge at each mowing.

The following are some things that will affect battery run time:

- Moisture content of grass — The more moisture there is in the grass, the faster the battery will run down.

- Walking/mowing speed — The faster you walk, the faster the battery will run down.

- Mode of operation — Mulching grass requires the most battery energy. Bagging requires the second highest amount of battery energy, and side discharging uses the least.

OPERATIONAL TIPS (24/36 VOLT MODELS)

- Height-of-cut setting - If you are experiencing problems with the battery running down too fast, try raising the height-of-cut setting one notch.

General Mulching Tips

Your mower is designed to mulch grass when the mulch door is completely closed (Figure 25).

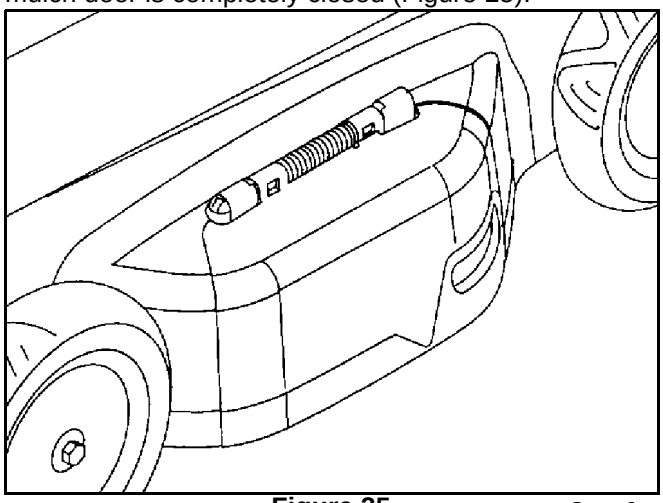


Figure 25 Scan-9-a

Follow these instructions whether cutting grass or leaves for the best cutting results and lawn appearance:

- Maintain a **sharp blade** throughout the cutting season. Periodically file down nicks on blade.
- **Only mow dry grass or leaves.** Wet grass and leaves tend to clump on yard and may cause mower to plug or motor to stall. They may also be slippery to walk on and could cause you to slip and fall.

⚠ WARNING

POTENTIAL HAZARD
- Wet grass or leaves can cause you to slip and contact blade.

WHAT CAN HAPPEN
- Blade contact can seriously injure you.

HOW TO AVOID THE HAZARD
- Mow only in dry conditions.

- Clean clippings or leaves from underside of mower deck after each mowing.
- Grass grows at different rates at different times of the year. In the heat of summer, it is generally best to cut grass at the 2-1/2", 3" or 3-1/2" height-of-cut settings. Only about 1/3 of the grass blade should be cut off. Cutting below the 2-1/2"setting is not recommended unless grass is sparse or it is late fall when grass growth begins to slow down.
- When changing height-of-cut from the established setting (ex. 2-1/2", 3", or 3-1/2") to a lower height, the grass may appear ragged or uneven until the grass adjusts to the new established height-of-cut and regains its normal appearance.
- When cutting grass over six inches tall, you may want to first mow using the side discharge chute or try the highest height-of-cut setting and a slower walking speed; then mow again at a lower setting for best lawn appearance. If grass is too long and leaves clumps on top of lawn, mower may plug and cause motor to stall.
- Alternate mowing direction. This helps disperse clippings over lawn for even fertilization.

If the finished cut lawn appearance is unsatisfactory, try one or more of the following:

- Sharpen the blade.
- Walk at a slower pace while mowing.
- Raise the height-of-cut setting on your mower.
- Cut grass more frequently.
- Overlap cutting swaths instead of cutting a full swath with each pass.
- Set height-of-cut on front wheels one notch lower than rear wheels. (Example: set front wheels at 2 inch setting and rear wheels at 2.5 inch setting.)

Cutting Leaves

- When cutting is complete, always be sure that 50% of the lawn shows through the cut leaf cover. This may require one or more passes over the leaves.
- For light leaf coverage, position all wheels at the same height-of-cut setting.

- Walk at a slower mowing speed if leaves are not being cut up finely enough to be hidden down in the grass.

- If you cut up a lot of oak leaves, you might want to add lime to your grass in the spring. Lime reduces the acidity of oak leaves.

Adjusting Height-of-Cut

The mower has five height-of-cut adjustments: 1-1/2", 2", 2-1/2", 3", and 3-1/2". The rear adjustment lever adjusts the height-of-cut for both rear wheels, and the front adjustment lever adjusts both front wheels.

WARNING

POTENTIAL HAZARD
- Adjusting height-of-cut levers could bring hands into contact with moving blade.

WHAT CAN HAPPEN
- Contact with blade could cause serious personal injury.

HOW TO AVOID THE HAZARD
- Stop motor, disconnect extension cord from mower and wait for all moving parts to stop before changing the height-of-cut.
- Do not put fingers under housing to lift mower when adjusting height-of-cut levers.

1. Stop motor and wait for all moving parts to stop. Disconnect extension cord from mower.

2. For easier adjustment, lift housing up so wheels are off the ground. **Do not place hands under deck to lift housing.** Squeeze adjustment lever toward wheel and move lever to desired setting (Figure 26). Ensure pin on adjustment lever engages notch in mower housing. Adjust all wheels to the same setting.

   Note: For easier adjustment of rear wheels, grasp lower handle with one hand and lift up mower slightly so wheel is off the ground. Then squeeze adjustment handle toward wheel.

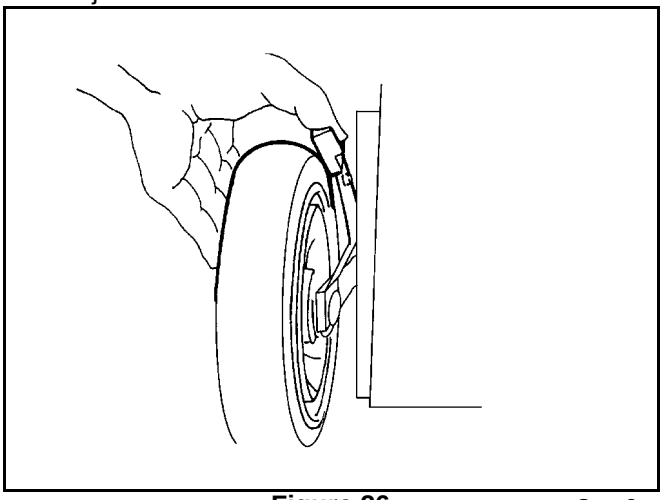


Figure 26 Scan8-a

Maintenance

WARNING

POTENTIAL HAZARD
- When extension cord is connected to mower and plugged into a normal household outlet, the mower is operational. Someone could accidentally start the mower.

WHAT CAN HAPPEN
- Accidental starting of mower could seriously injure you or other bystanders.

HOW TO AVOID THE HAZARD
- Always remove extension cord from mower receptacle when leaving mower unattended, even for a short period of time.

OPERATIONAL TIPS (24/36 VOLT MODELS)

Cleaning

Before cleaning mower, stop motor, wait for all moving parts to stop, and disconnect extension cord from mower.

IMPORTANT: Do not clean mower with a garden hose. Moisture can be trapped in mower and may cause corrosion of internal parts.

After Every Use

- Clean the underside of the mower housing. Be particularly careful to keep the front cavity clear of all debris (Figure 27). Remove dirt and grass clippings with a hardwood scraper. Avoid burrs and sharp edges.

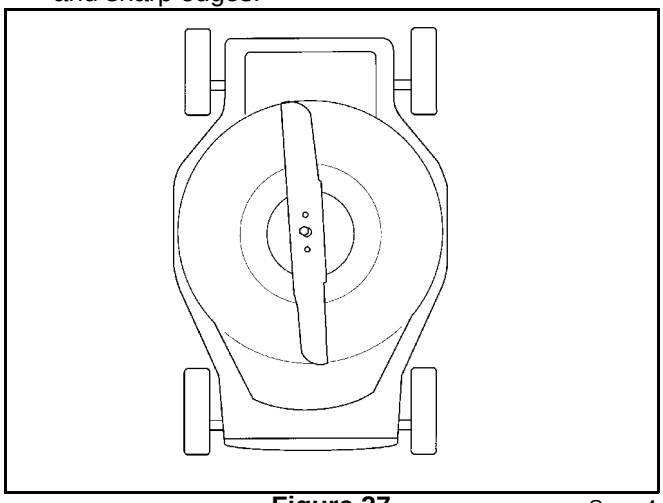


Figure 27 Scan-4

- Brush all debris off top of mower housing.

Once A Year

- Remove top shroud (Figure 28) and clean out any debris underneath it with compressed air, a vacuum cleaner, or a brush.

  IMPORTANT: Do not use metal objects to clean around battery. If metal objects contact the positive and negative posts at the same time, this could short the battery. The battery or conductor may overheat and cause burns.

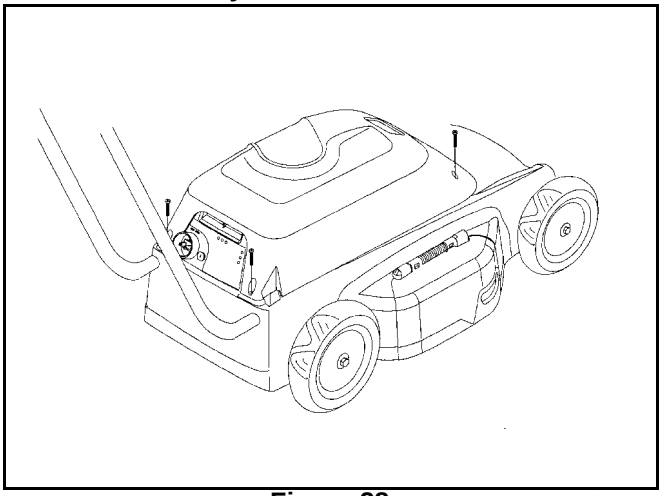


Figure 28 Scan-9

- Check for any discolored or charred wires or switch contacts. If any are damaged, see your Authorized Toro Service Dealer for repairs.

Blade

Always mow with a sharp blade. A sharp blade cuts cleanly and without tearing or shredding the grass blades like a dull blade.

WARNING

POTENTIAL HAZARD

- Motor could be started by someone accidentally.

WHAT CAN HAPPEN

- Accidental starting of motor could cause serious injury to operator or bystanders.

HOW TO AVOID THE HAZARD

- Do not attempt to inspect, remove or replace blade without first disconnecting extension cord from the mower.

1. Stop motor and wait for all moving parts to stop. Disconnect extension cord from mower.

2. Tip mower on its side (Figure 29).

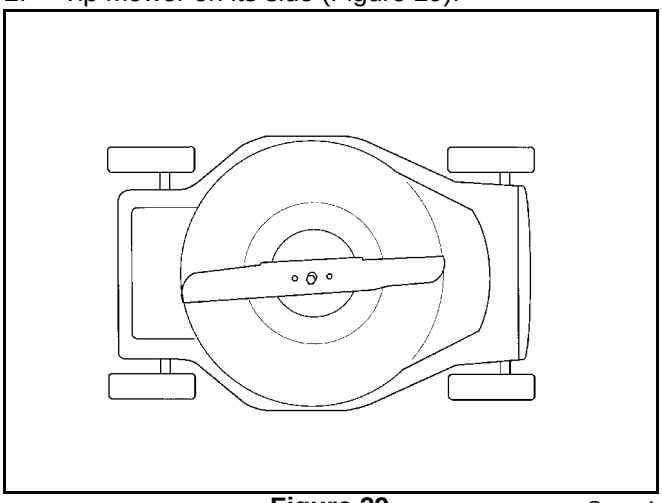


Figure 29 Scan-4

3. EXAMINING BLADE — Carefully examine blade for sharpness and wear, especially where flat and curved parts meet. Since sand and abrasive material can wear away the metal that connects the flat and curved parts of the blade, check blade before using the mower. If a slot or wear is noticed, replace blade (Figure 30). Refer to step 4.

   Note: For best performance, install new blade before cutting season begins. During the year, file down small nicks to maintain the cutting edge.

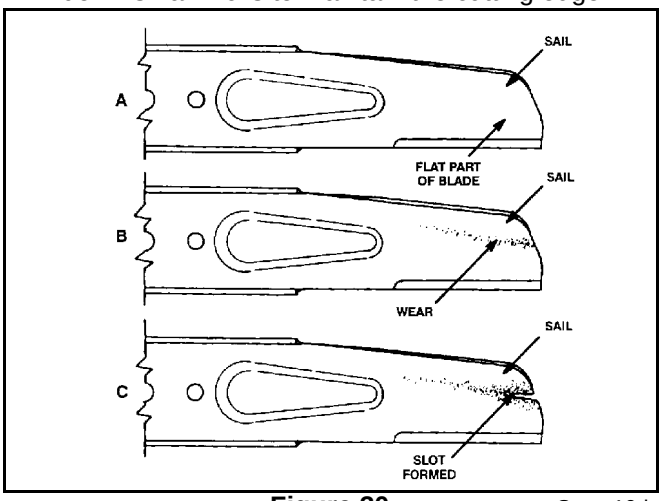


Figure 30 Scan-10-b

WARNING

POTENTIAL HAZARD

- A worn or damaged blade could break and a piece of blade could be thrown in operator's or bystander's direction.

WHAT CAN HAPPEN

- A thrown piece of blade could cause serious personal injury or death to operator or bystanders.

HOW TO AVOID THE HAZARD

- Inspect blade periodically for wear or damage.
- Replace a worn or damaged blade.

4. REMOVING BLADE — Grasp end of blade using a rag or thickly padded glove. Remove blade bolt, washer, and blade (Figure 31).

Figure 31 0663-008

OPERATIONAL TIPS (24/36 VOLT MODELS)

5. SHARPENING BLADE — Using a file, sharpen top side of blade and maintain original cutting angle (Figure 32). The blade will remain balanced if same amount of material is removed from both cutting edges.

   IMPORTANT: Check balance of blade by putting it on a blade balancer. An inexpensive balancer can be purchased at a hardware store. A balanced blade stays in a horizontal position and an unbalanced blade settles to the heavy side. If blade is not balanced, file more metal off cutting edge on heavy end of blade.

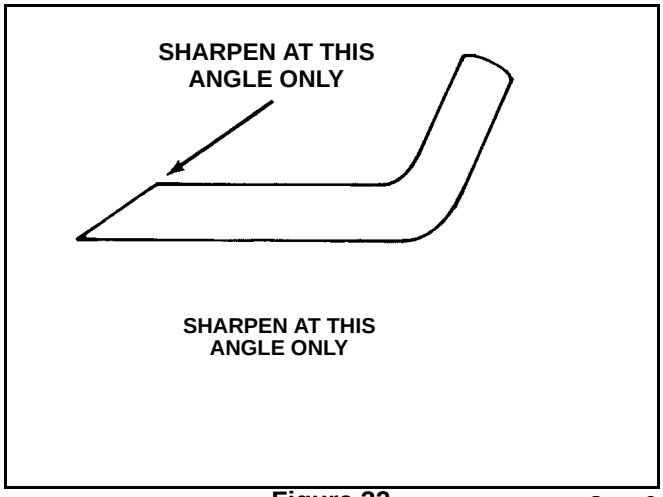


Figure 32 Scan-2

6. Reinstall sharp, balanced blade, washer, and blade bolt. Sail part of blade must point toward top of mower housing to ensure correct installation. Washer is curved and must be reinstalled with curve side down as shown in (Figure 33). Tighten blade bolt to 35-40 ft. lbs. (48-54 N·m).

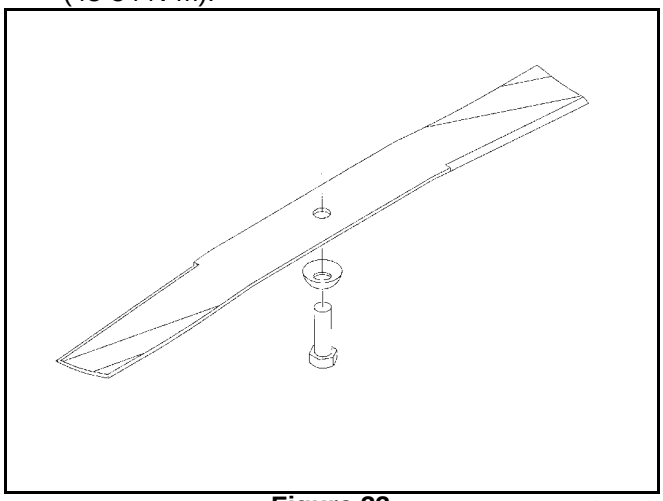


Figure 33 Scan-3

120 Volt Models

There are four components in the electrical system:

A. Motor.
B. 2 wires between the motor and switch.
C. Switch.
D. Wires between the switch and the plug receptacle.

Safety Information

Electric products have a different set of safety guidelines:

- Use common sense. High voltage and high current potentials are present.
- Remove all jewelry (i.e. rings, watches) before performing service work to prevent accidental short circuits. An accidental short *could* cause severe burns. This is especially important on battery powered units.
- Do not touch live wires as the resulting shock could be unpleasant or even fatal.

Wiring Diagrams

Always consult the wiring diagram under the cover for proper wire connections, location, and polarity (Figure 34).

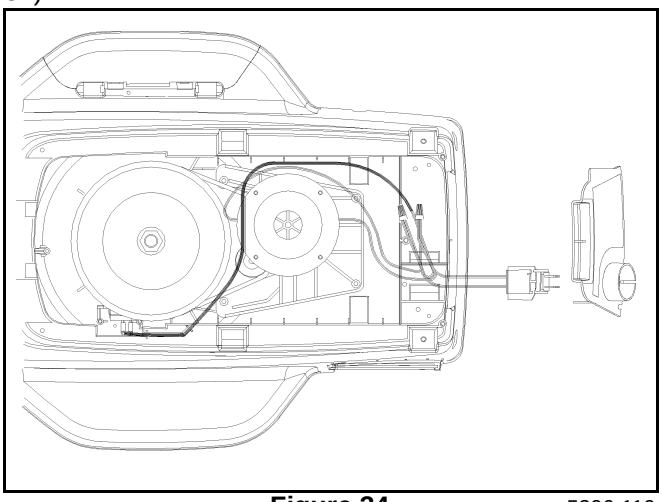


Figure 34 5306-119

120 Electrical System Testing

Because of the simplicity of the system, there are only two tests that need to be made.

Description	Specification
Motor Input Voltage	108 - 132 VAC
Motor Resistance*	0.8 to 1.2 ohms

*Measure at motor leads with power disconnected.

A. Motor test (Figure 35).

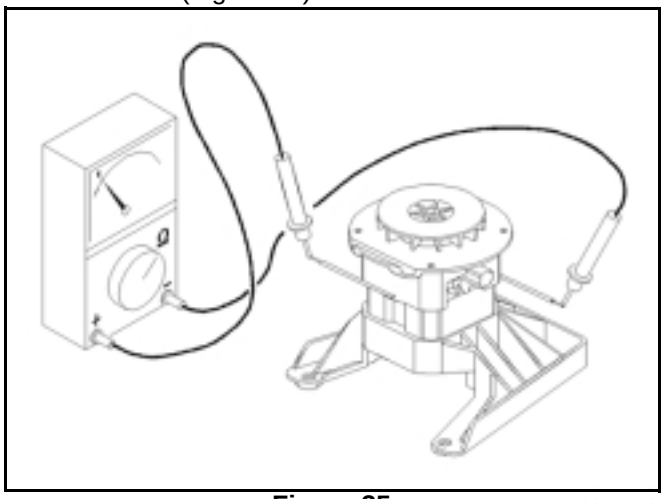


Figure 35 5306-120

B. Wires between the motor and switch — check for breaks, damaged insulation or loose terminals.

C. Switch — the switch is a standard on-off switch and can be checked with a continuity light or ohmmeter.

NOTE: As this switch is activated by a cable, verify that the cable adjustment correctly activates the switch.

D. Wires between the switch and plug receptacle — these wires should be checked in the same way as the motor to switch wires. There is one additional possibility. The use of an extension cord with a poor terminal may result in burnt terminals on the mower. A loose connection between the cord and mower can cause arcing and burnt terminals. Should this occur, replace the terminals on the mower and either the extension cord or the plug on the end of the cord.

TESTING ELECTRICAL COMPONENTS

Battery Powered Models

The electrical components in a battery powered model are as follows:

A. Motor.
B. Solenoid.
C. Batteries.
D. Charger — includes indicator lights.
E. Transformer.
F. Switch.
G. Wire harness.
H. Safety key terminals.
I. Circuit breaker.

Motor Testing

There is one simple test that can be made on the motor. Unplug the motor from the wire harness. Set an ohmmeter on Rx1 and zero the meter. Attach one test probe to each of the wires going to the motor and note the reading. SLOWLY rotate the armature of the motor and watch the tester. The needle should move a little, but at no time should it go to the extreme ends of the scale. There should be some resistance there at all times. If the needle reads zero, there is a short circuit in the motor and it should be replaced. If the needle goes to infinity (looks like an 8 on its side) a wire inside is broken or the brushes are not contacting the armature. If you find a broken wire accessible and can splice it, do so. If the broken area cannot be found or is in an area where it cannot be spliced, the motor must be replaced.

SPECIAL NOTE: If you rotate the armature too fast, it will not only distort your readings, but could possibly damage your tester. Remember when a permanent magnet motor has its armature turned manually, it becomes a generator.

Solenoid Testing

A solenoid is used to protect the switch from arcing when it's turned on and off (Figure 36).

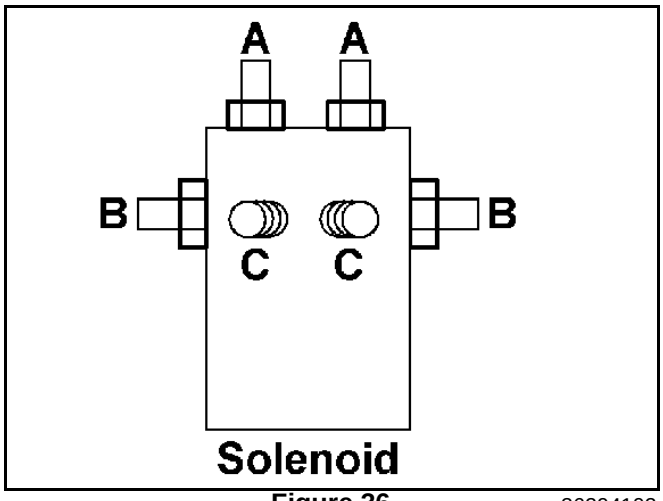


Figure 36 36294102

Terminals	Description
A - A	Normally closed terminals
B - B	Normally open terminals
C - C	Connections to coil

Disconnect the wire harness from the solenoid terminals prior to performing this resistance test. Connect an ohmmeter set on the RX1 scale to the coil terminals as shown below. The coil resistance should read between 46 and 55 ohms (Figure 37).

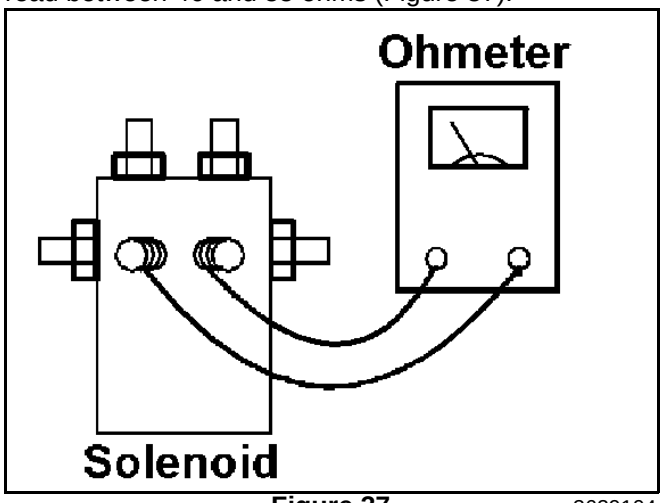


Figure 37 3629104

Measurement	Specification
Solenoid coil resistance	46 - 55 ohms

This 24 volt solenoid requires a minimum of 18 volts to engage, therefore, it is necessary to use the actual mower batteries to test it (Figure 38). Test the A - A terminals by connecting power and the ohmmeter as shown below.

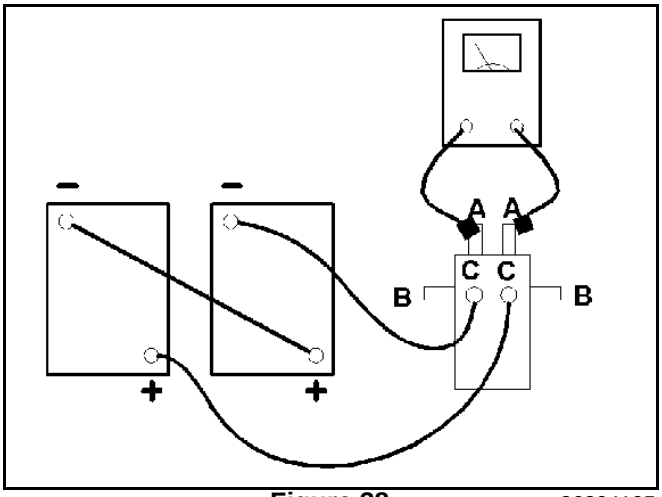


Figure 38 36294105

A properly functioning solenoid will yield the following results:

Power	Result at Terminals A - A
Not connected	Continuity (R = 0 ohms)
Connected to C - C	No Continuity (R = infinity)

Perform the same test as above on the B - B terminals (Figure 39).

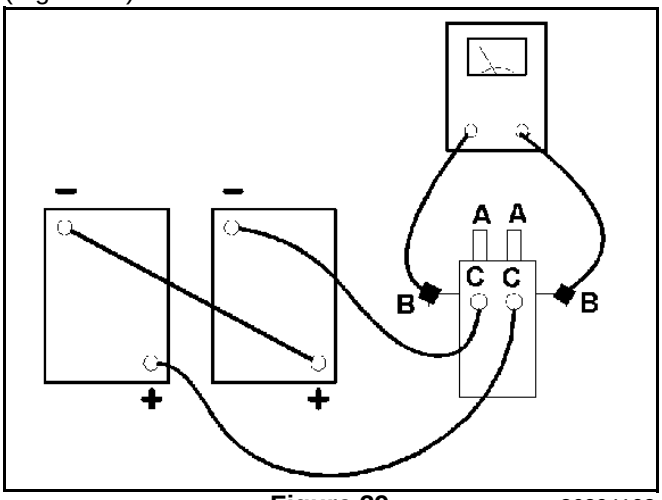


Figure 39 36294103

The following results indicate a solenoid that is functioning properly:

Power	Result at Terminals B - B
Not connected	No Continuity (R = infinity)
Connected to C - C	Continuity (R = 0 ohms)

Testing Batteries

Before reading voltage, the batteries must rest a minimum of one hour after charging to prevent an incorrect reading. Test the batteries using a digital voltmeter.

Note: Voltage will increase from original reading about .25 volts per hour for up to 4 hours. Also, charge output voltages will vary with temperature: higher in cold and lower in heat.

Combined Voltage Test	24 Volt	36 Volt
Combined voltage (charger off)	24 - 26 VDC	36 - 39 VDC
Combined Voltage (charger on at room temp.)	26.5 - 30.5 VDC	39.5 - 45.5 VDC

Individual Voltage Test	Toro 20647 & 20649 Only	All Others
Individual Voltage	12 - 13 VDC	6 - 6.5 VDC

TESTING ELECTRICAL COMPONENTS

Charger Testing

This charger's control system cannot be tested using common testing equipment. However, if the charging lights work, the charger is likely working.

There is one test that can indicate if the charger has output. Attach a DC voltmeter to the battery terminals (positive on one end of the pack and negative on the other). You should read about 24 or 36 volts, depending on the model. Plug the charger into the mower and wait for it to go through its testing cycle. when the red light glows steadily, note the reading on the voltmeter. If you cannot see a voltage increase, wait a few minutes and check the reading again. When the charger starts charging, it may take as much as 30 minutes to get up to full voltage. If it reads the same as before, the charger has no output. Before replacing the charger, check the transformer and wires that supply power to the charger. If there is power going into the charger but not coming out, the charger is bad. Remember if the batteries are fully charged, the charger will read that and turn off. If you suspect that is the problem, run the mower for a time to drain the batteries somewhat.

Charging Indicator Lights

There are two sets of indicator lights (actually light emitting diodes or LEDs). One set is the charging indicators and the other indicates the charge remaining. In the next few paragraphs, we'll be covering the information communicated by each of the lights (Figure 40).

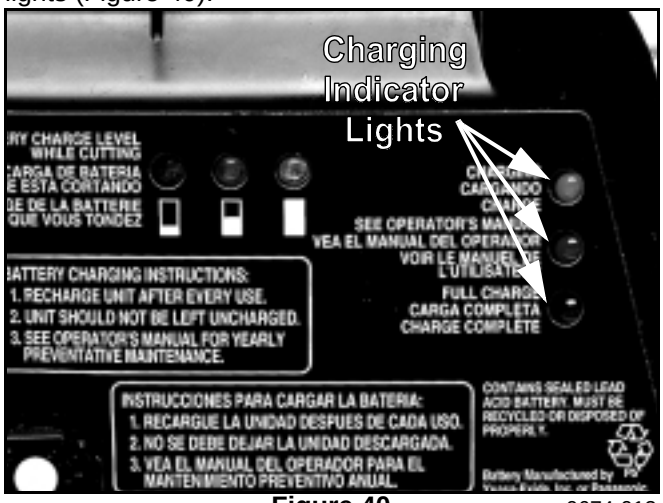


Figure 40 0674-013

Flashing Yellow Charging Indicator

A flashing yellow indicator shows that the temperature is either too hot or too cold. When the temperature situation is corrected, the red indicator will illuminate and the charger will resume charging at the rate last determined (Figure 41).

Note: If left in the garage over the Winter, the charger may flash yellow for months, only to begin charging on the first warm Spring day. This situation is perfectly normal. The unit should be left plugged in while the yellow light flashes.

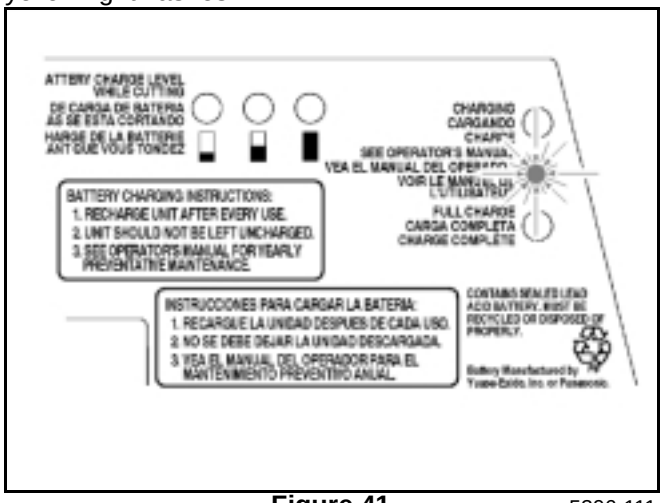


Figure 41 5306-111

Flashing Red Charging Indicator

A flashing red light indicates that the charger is performing the "*Pre-Charge Qualification.*" During this stage, the charger sends a trickle charge to the batteries to determine if they will be able to take a charge. The charger also evaluates the ambient temperature to insure that its not too hot or too cold to charge (Figure 42).

Note: The Pre-Charge Qualification generally takes about **4 minutes** and occurs each time the cord is plugged in. If the batteries are extremely discharged, the charger may continue attempting to charge them before giving up and lighting the yellow failure indicator.

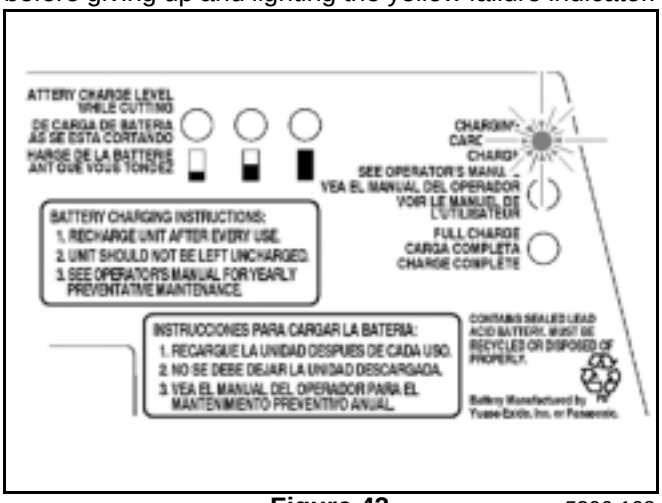


Figure 42 5306-108

Steady Red Charging Indicator

After completion of the "Pre-Charge Qualification, the red charging indicator will glow steady red if no problems were discovered. This indicates that the charger is charging. If the batteries were fully charged, the charger will charge at an extremely low rate for about 30 minutes before lighting the green light. When the batteries are in need of charging, the red light indicates charging at the "full charge" rate (Figure 43).

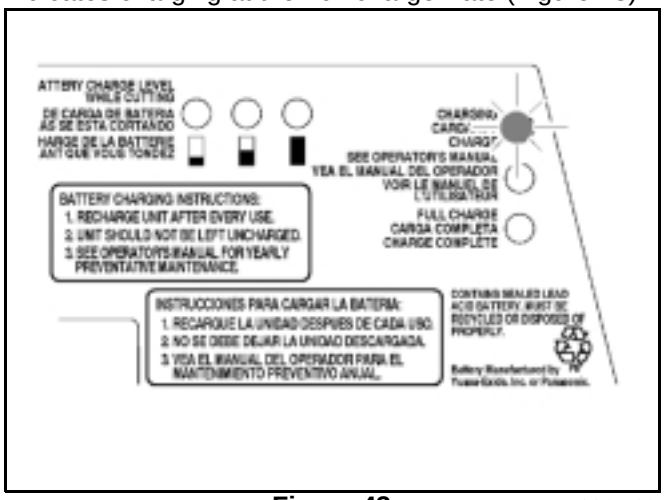


Figure 43 5306-109

Steady Yellow Charging Indicator

If an open circuit, fault, or VERY low battery voltage was discovered, the charger will turn itself off and turn on a steady yellow charging indicator. This indicates a problem (Figure 44).

The Operator's Manual recommends bringing the unit to a Toro Authorized Service Dealer whenever a steady yellow light is on.

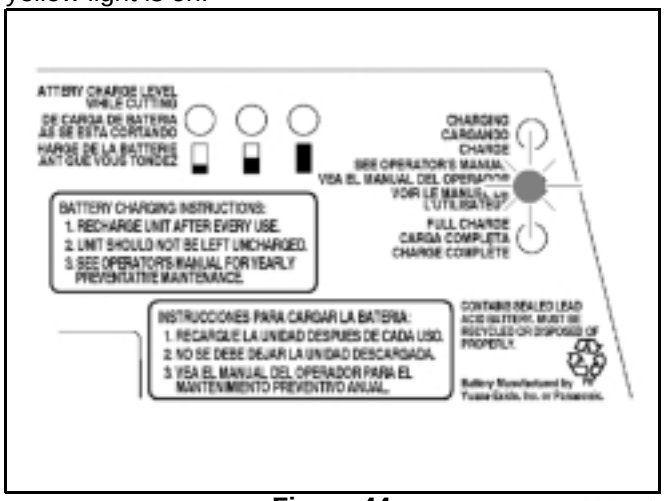


Figure 44 5306-110

TESTING ELECTRICAL COMPONENTS

Steady Green Charging Indicator

A steady green charging indicator shows that the batteries are fully charged. Even once the fully charged level is achieved, the charger still periodically re-evaluates battery condition to determine if they need to be “topped off.” If so, the charger will switch to the charge mode (indicated by the steady red indicator). Once the batteries are topped off, the charger discontinues charging and illuminates the green light (Figure 45).

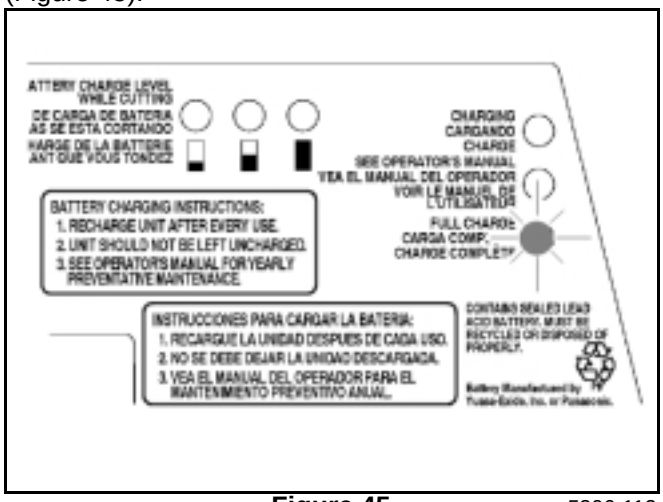


Figure 45 5306-112

Charge Remaining Indicator Lights

The battery power status indicator lights show how much charge remains (Figure 46).

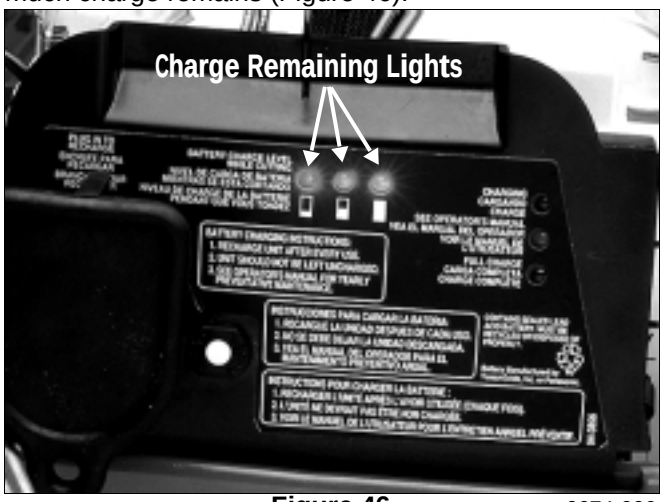


Figure 46 0674-006

They indicate the following:

Lights	Charge Remaining
Three Lights	50 - 100%
Two Lights	25 - 50:
One Light	5 - 25%

Transformer Testing

Test the transformer using a volt/ohmmeter (Figure 47).

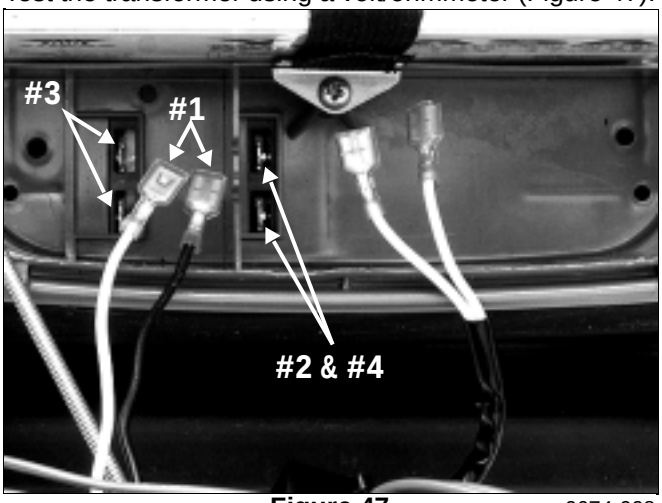


Figure 47 0674-008

US & Canadian Models

European, U.K., & Swiss Models

#	Test	24 Volt Models	36 Volt Models	
1	Transformer Input Voltage	108 to 132 VAC	108 to 132 VAC	207 - 244 VAC @ 50 hz
2	Transformer Output Voltage*	37.8 to 42.1 VAC*	52.0 to 57.8 VAC*	43.2 VAC*
3	Transformer Primary Resistance	4.5 to 5.3 Ohms	4.6 to 5.4 Ohms	23 - 29 Ohms
4	Transformer Secondary Resistance (wires removed)	0.6 to 1.0 Ohms	1.2 to 1.6 Ohms	1 - 1.4 Ohms

* Open circuit voltage measured with wires removed and input voltage at 120 volts A.C.

*Open circuit voltage measured with wires removed and with the input voltage at 230 VAC.

NOTE: As the input line voltage varies from normal (120 VAC or 230 VAC) the output will vary accordingly.

Switch Testing

Switch Testing (battery powered models)

The switch used is a two position, three terminal switch. Two tests must be made to assure the switch works properly. An ohmmeter or continuity light will properly test this switch. Continuity must be present as shown in the diagram (Figure 48).

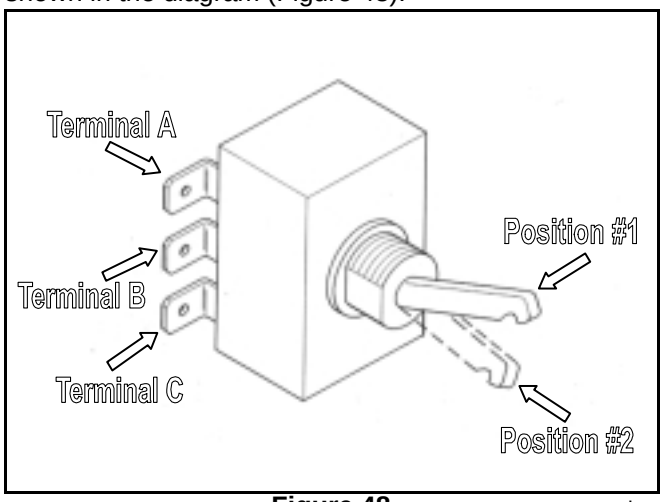


Figure 48 plug

Position 1	Position 2
B + C continuity	B + A continuity

Wire Harness

The wire harness on battery powered models does not contain any special components, such as diodes. Wires can be tested for continuity in a normal manner.

Possible failure modes include broken wires, loose terminals, or damaged insulation.

Wiring diagrams are located on the underside of the hood (motor cover) and in the parts catalog. Be sure to use the diagram for your specific model.

Testing Safety Key Terminals

Test by checking for 24 or 36 volts between both terminals with the key removed and the control bar in the ON position (Figure 49). **NOTE:** The charge remaining indicator will light. (It is not necessary to remove any connectors for this test.) Assure the circuit breaker is closed for this test.

NOTE: The safety key handles high current. A poor connection could result in burnt terminals.

Important — Do not distort connectors by forcing test probes into them.

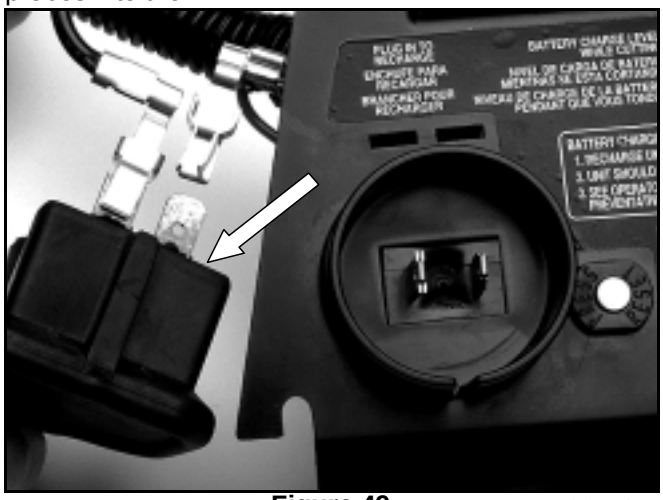


Figure 49 0674-011

Circuit Breaker Testing

Test the circuit breaker (Figure 50) with an ohmmeter for continuity. It should be continuous.

NOTE: The circuit breaker is a push to reset type.

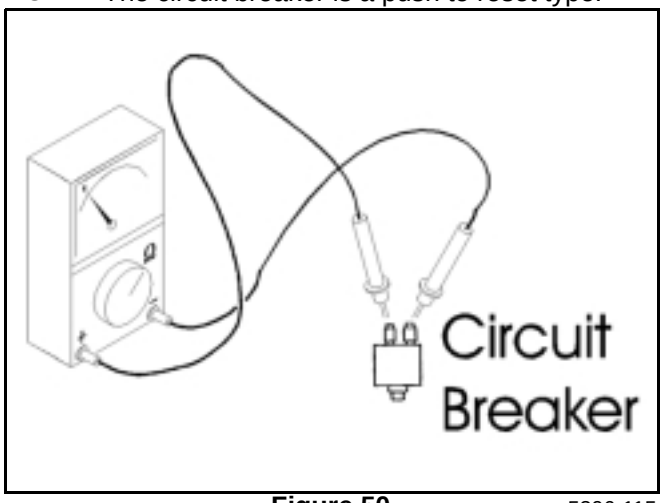


Figure 50 5306-115

Blade Stopping Systems

There are two blade stopping systems in use on the various battery and electric powered mowers — one for the 120 vac models and the other for the battery powered models. Both systems are designed to stop the blade within three seconds of the operator releasing the bail on the handle.

120 Volt Blade Stopping System

The 120 vac mowers use a spring loaded brake applied to a brake drum. When the control bail on the handle is squeezed, this brake is retracted by a means of a cable (Figure 51).

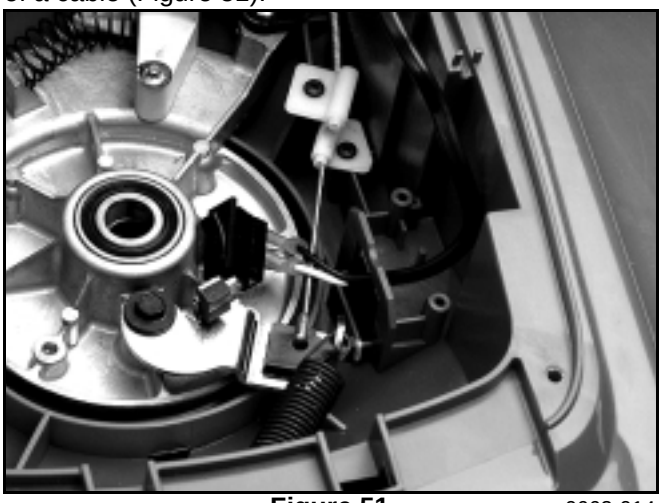


Figure 51 0663-014

Battery Mower Systems

The battery powered models use a permanent magnet motor. If you turn the armature of a permanent magnet motor by hand, the motor becomes a generator. We use that electricity to stop the motor. With the motor running normally, the operator releases the handle. The switch disconnects the battery from the motor then connects the two wires from the motor together (shorting them together). By doing this, the electricity the motor then generates is directed back into the motor in the opposite direction. This results in slowing the motor. Also, as the motor slows down, it generates less electricity. Soon the two forces balance each other out and the motor stops. This system is very effective and does not require brake parts to achieve the required stopping time. See “Switch Testing” on page 4 - 8 for the internal workings of the switch.

Disassembly — Battery Models

All the electrical components are located under the hood. The on/off switch is controlled by a cable that runs alongside the handle. With the hood removed, there is access to the test points of all electrical components.

To access the motor, wiring, switch, and batteries, charger and solenoid (on battery models), remove the four screws retaining the hood and lift the hood off.

To remove the motor, on battery powered models, remove the hood and disconnect the battery terminals and remove the solenoid. Turn the mower over and remove the blade, bushing fan, washer, and the four screws holding the motor in place.

NOTE: On battery models, the solenoid must be removed first as it uses one of the motor mounting screws.

Transformer Replacement — Battery Models

Remove the hood and disconnect the battery cables. Lift the charger assembly from its slot. Below the charger are four wires which plug into the charger terminals through slots in the body. Unplug these four wires, note that the wires are in pairs; tag them if necessary to remember which wires go where. Remove the nut holding the solenoid mounting bracket to the motor mounting screw. Turn the mower on its side and remove the blade, bushing, fan, and spacer. Remove the four screws holding the motor to the chassis. Be ready to catch the motor and set it aside. Remove the 11 screws holding the liner to the chassis. Lift the liner off. The transformer is between the rear wheels inside a plastic housing. Note the orientation of the transformer when it is removed. Replace the transformer in the housing and replace the housing in the chassis. Make sure the transformer terminals are in the correct slots. Reinstall the liner, blade, fan, etc. See the specifications for the proper torque on all hardware.

Battery Replacement

The batteries are held in place by a strap. To remove the strap, remove either of the screws securing the ends of the strap. However, the batteries are resting on double sided tape. It will be necessary to slide a putty knife or similar object under the batteries to break the tape loose. The battery pack can then be removed. Note the way the battery terminals are positioned so the new batteries can be installed property.

Blade Replacement — 120 Volt Models

The blade is attached to a spindle shaft. Tip the mower on its side. Remove the blade retaining nut and washer.

NOTE: You may find it helpful to remove the motor cover and hold the large drive pulley to tighten or loosen the blade nut.

Blade Brake — 120 Volt Models

1. Remove the motor cover retained with four screws.

2. Roll the belt off the large pulley. See ”Belt Replacement" on page 6 - 3.

3. Remove the nut on the large pulley and remove the pulley (Figure 52).

   NOTE: The blade and spindle shaft may drop down when the pulley is removed.

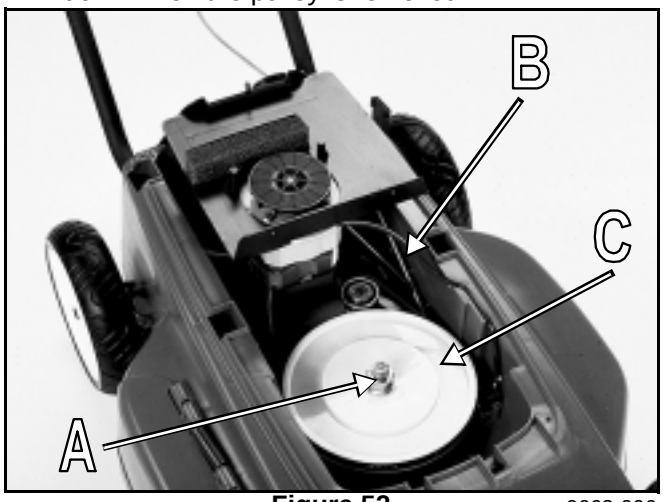


Figure 52 0663-006

(A) Nut	(B) Belt	(C) Pulley

4. Lift the brake drum off the spindle shaft.

Brake Drum

The brake drum is now accessible. Unhook the cable and remove the brake arm pivot bolt (Figure 53). Replace in reverse order.

NOTE: There is a double cable support bracket. The 120 volt models use the lower location as shown.

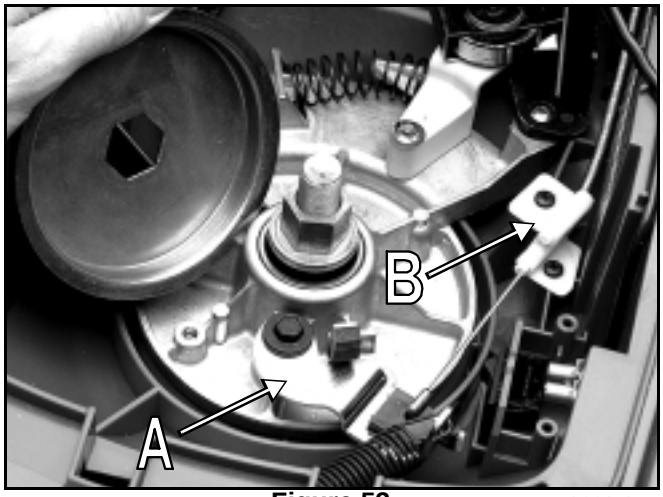


Figure 53 0663-011

(A) Brake Arm	(B) Cable Support Bracket

120 Volt Motor Replacement

1. Remove the motor cover (four screws).

2. Remove the belt.

3. Remove the plastic baffle on top of the motor (4 screws).

4. The motor and the mounting base are one piece. Remove and replace them as an assembly. The base is attached to the chassis by four screws (Figure 54).

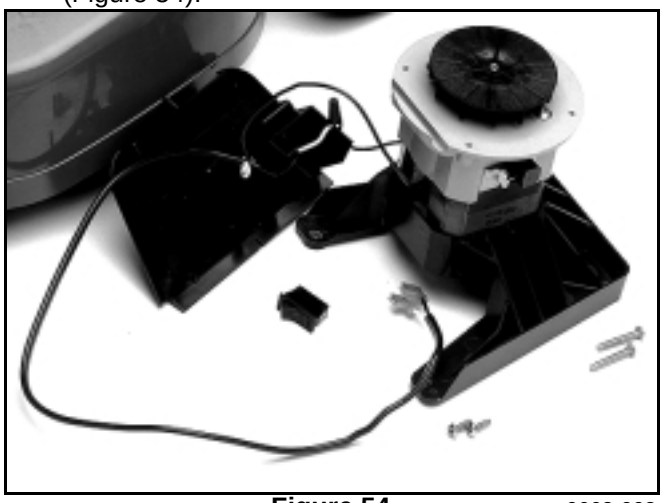


Figure 54 0663-003

Replacing Blade Spindle or Spindle Bearings

Remove the nut on the large pulley and remove the pulley.

1. Remove the motor cover retained with four screws.
2. Roll the belt off the large pulley. See Belt Replacement on page 6 - 3.
3. Remove the nut on the large pulley and remove the pulley.

   NOTE: The blade and spindle shaft may drop down when the pulley is removed.

Cable Replacement — All Models

1. Remove the motor cover (4 screws).
2. The cable has 2 fasteners — 1 bolt on the upper handle and 1 screw in the left rear corner of the mower body.
3. Unhook the “Z” bend on both ends of the cable.
4. There is a bracket supporting and guiding the cable near the switch end. This guide bracket is slotted so the cable inner wire can be removed without removing the bracket (Figure 55).

   Note that this is a double bracket. The upper retainer is used on battery models while the lower is used on 120 volt models.

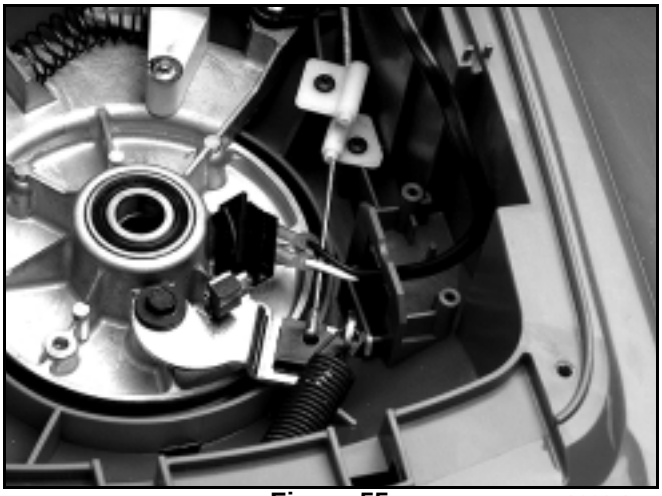


Figure 55 0663-014

Cable Adjustment

Lower the bail to the rest position. The switch should be off. Proper adjustment is achieved when the slack is removed from the cable, but no tension is applied.

Belt Replacement — 120 Volt Models

1. Remove four screws and lift cover off (Figure 56).

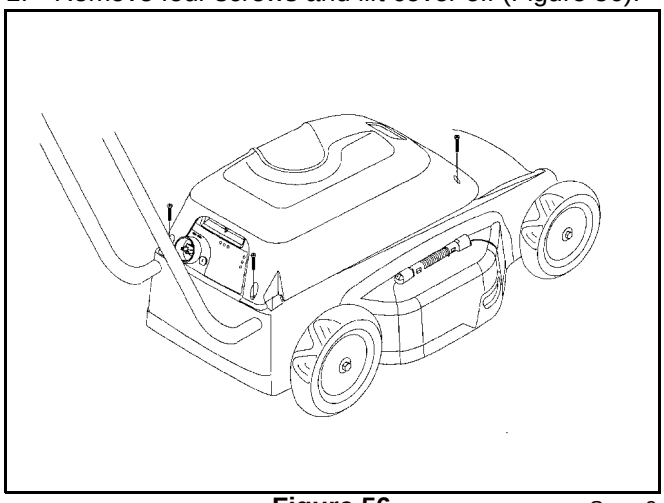


Figure 56 Scan-9

2. Push on the spring loaded idler assembly to remove tension from the belt. Rotate the spindle pulley and walk the belt from the spindle pulley (Figure 57).

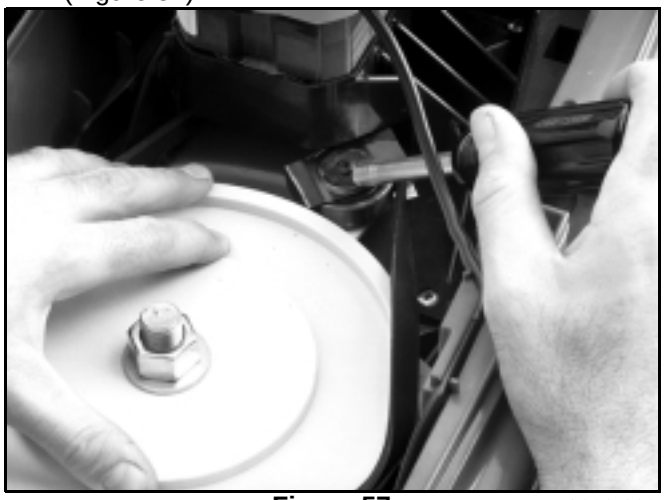


Figure 57 0663-009

3. Remove the belt from the motor pulley.
4. Install the belt in reverse order.
5. Install cover.

Introduction

120 volt mowers should be hipot tested to assure a safe product after any electrical repairs are performed.

Hipot Tester Safety Rules

Safety Rule #1

- Turn the voltage to the lowest setting (if applicable) and the power switch to OFF when not using the tester. This will prevent inadvertently energizing the test probes.

Safety Rule #2

- Do not touch the product when the tester is connected to the product. This goes for anyone else in the area. Hipot testing is a one-person job. Extra hands increase the likelihood of a shock.

Safety Rule #3

- Do not test any product that is wet or snow covered. You will almost certainly get an incorrect reading. Worse yet, the moisture could act as a conductor and you could get a shock.

Safety Rule #4

- Do not rest the product to be tested on a metal bench. If you contact the bench, you could receive a shock.

Safety Rule #5

- Always test to make sure the electrical outlet is properly grounded before plugging in the hipot tester.

Testing the Outlet for Ground

1. Set a voltmeter on the AC volt scale to read 110 VAC.

2. Place one probe in the round (ground) and the other in one of the two flat terminals. The voltmeter should read 110 VAC (Figure 58).

3. If there is no reading, move the probe to the other flat terminals.

4. If still no voltage, the ground is disconnected and you must have the outlet repaired or find a grounded outlet.

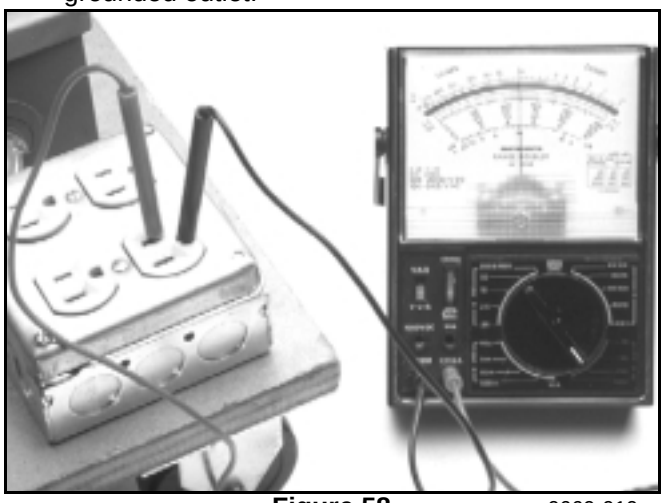


Figure 58 0669-010-a

Testing Procedure

Hipot testing can be done quickly and safely using the following FIVE simple steps.

Step #1: Check the Hipot Tester

Set the tester and the lowest value and touch the two probes together (Figure 59). The tester should signal a failure (audible or visual or both depending on tester used).

If the tester does not signal a failure, the tester requires repair.

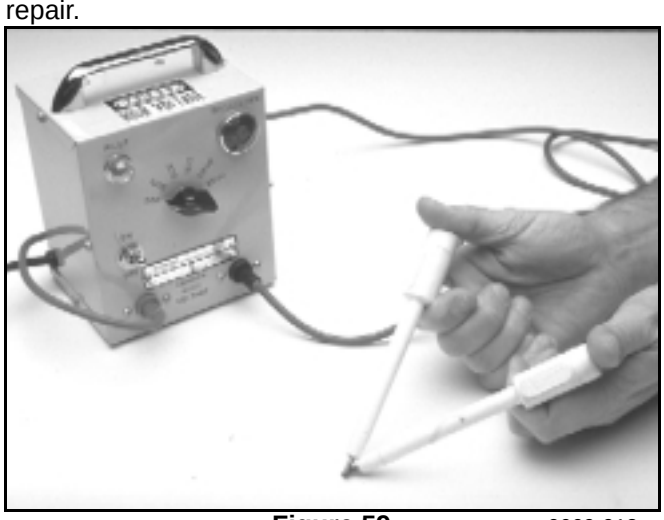


Figure 59 0669-012-a

HIPOT TESTING

Step #2: Tape the Power Switch "ON"

Prepare the unit to be tested by taping the power switch in the "ON" position (Figure 60). This completes the circuit inside the equipment and helps insure that your hipot test includes ALL wires inside the product.

NOTE: A continuity test across the two input terminals can be performed to assure the switch is on and there is a complete circuit. Continuity indicates all wires are being tested.

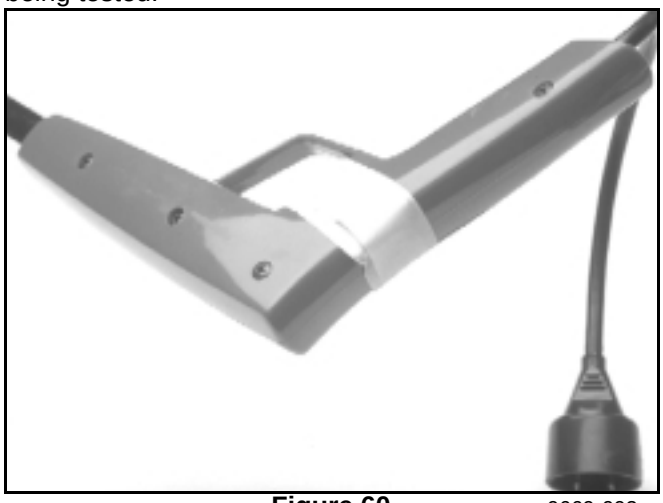


Figure 60 0669-002-a

Step #3: Connect the Tester

Follow the instructions that came with your tester. Proper connection of the tester typically requires both terminals of the power plug be connected to the tester (Figure 61).

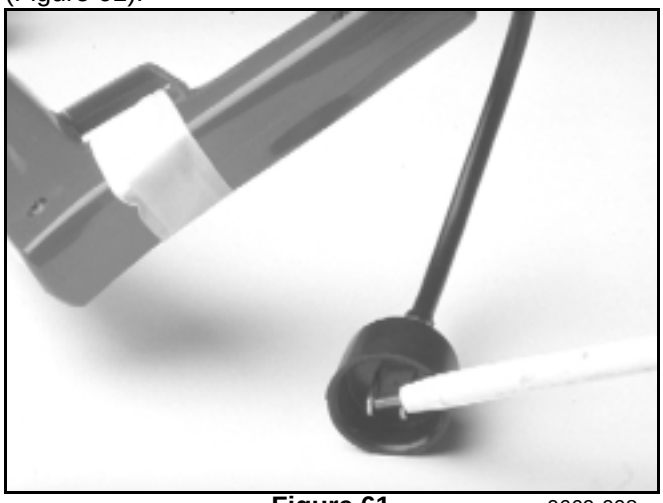


Figure 61 0669-008-a

Step #4: Select the Correct Voltage

Turn the tester on and set the voltage at recommended test voltage (Figure 62). The "pre" and "post" tests are usually performed at different voltages as indicated below.

Pre-Service Test: usually 500 volts

Post-Service Test: usually 1000 volts

Figure 62 0669-011

Step #5: Perform the Test

Using the other tester probe, touch all exposed metal including the handle and any exposed fasteners. If the tester signals a failure, you will not only have to correct the original problem, you will have to inspect the internal wiring for cracked or otherwise damaged insulation (Figure 63). (Use electrical tape to reinsulate if necessary.)

NOTE: If you detect a failure, it's a good idea to retest. The instruments are sensitive and can sometimes be set off by static electricity.

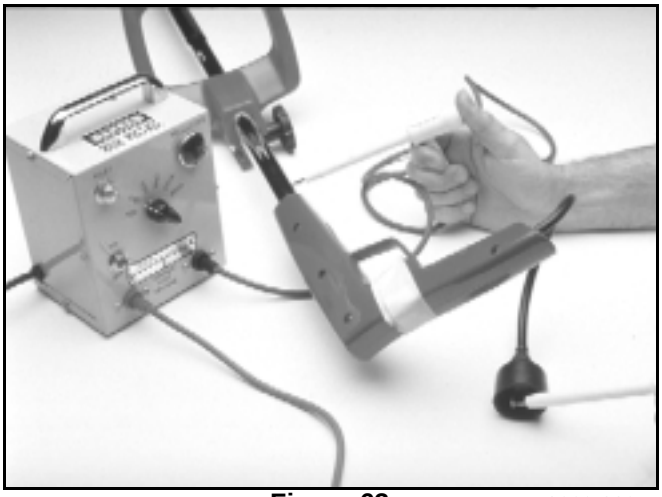


Figure 63 0669-009-a

Testing the Motor

If in the process of repair of product you expose the motor, it is a good idea to test the motor itself. The motor should have internal insulation to prevent voltage from reaching the case or output shaft.

Set the tester to the desired voltage and test between the motor case and the two wires that normally supply power to the motor (Figure 64). The tester should NOT signal a failure. If the tester does signal a failure, the internal insulation has failed and the motor will fail soon.

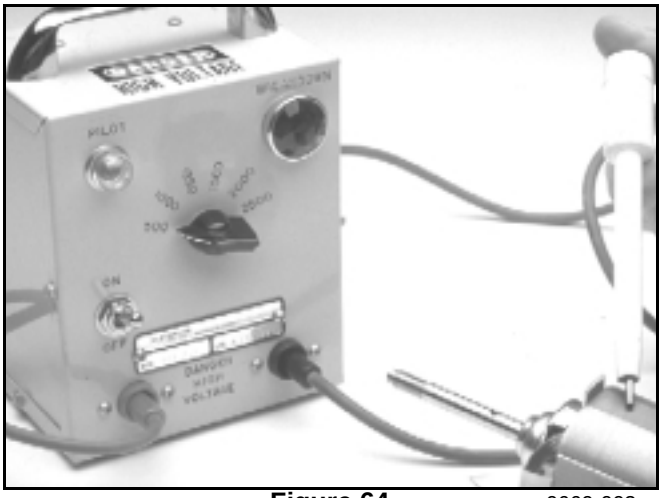


Figure 64 0669-003-a

Perform a second test between the output shaft and the wiring at the same voltage as below (Figure 65).

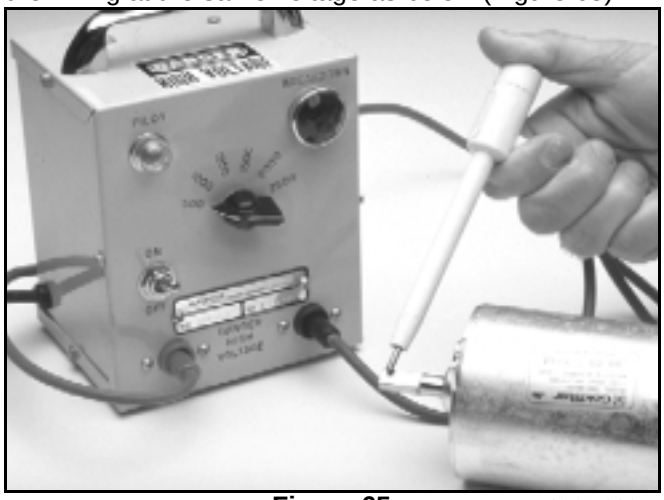


Figure 65 0669-006-a

If the tester signals a failure, it will be necessary to disassemble the unit and inspect the electric components that are near the area where the tester signaled a failure. (For example, if you probed a screw when the tester indicated failure, look for insulation damage near that screw.) Repair the damaged insulation and reassemble the unit.

Retest to insure your repair was effective.

Make a note on the work order that the product was hipot tested and at what voltage.