TORO®

260 Series Tractor

Service Manual

ABOUT THIS MANUAL

This service manual was written expressly for Toro service technicians. The Toro Company has made every effort to make the information in this manual complete and correct.

Basic shop safety knowledge and mechanical/electrical skills are assumed. The Table of Contents lists the systems and the related topics covered in this manual.

For additional information on the electrical system, please refer to the Toro Electrical Demystification Guide (492-4404). For service information on drive systems, please refer to the appropriate service manual: Tuff Torq (492-0699), Hydro-Gear (492-0682), Peerless (contact Tecumseh Products). For information specific to the engines used on this unit, refer to the appropriate engine manufacturer's service and repair instructions.

Tractor model years 1994 - 2002 are covered in this manual. The manual may also be specified for use on later model products.

The hydrostatic transaxle is a sophisticated piece of machinery. Maintain strict cleanliness control during all stages of service and repair. Cover or cap all hose ends and fittings whenever they are exposed. Even a small amount of dirt or other contamination can severely damage the system.

We are hopeful that you will 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.

TABLE OF CONTENTS

SPECIFICATIONS

General Specifications . . . . . 1 - 1
Tecumseh Peerless Transaxle . . . . . 1 - 2
Identification: Tecumseh Peerless Model 820-024 . . . . . 1 - 2
General Specifications . . . . . 1 - 2
Hydrostatic Transaxles . . . . . 1 - 3
Identification: Tuff Torq Model K61A Transaxle . . . . . 1 - 3
General Specifications . . . . . 1 - 3
Identification: Hydro-Gear Model 322-3000 & 330-3000 Transaxle . . . . . 1 - 4
General Specifications . . . . . 1 - 4
Torque Specifications . . . . . 1 - 5
Fastener Identification . . . . . 1 - 5
Standard Torque for Dry, Zinc Plated, and Steel Fasteners (Inch Series) . . . . . 1 - 6
Standard Torque for Dry, Zinc, and Steel Fasteners (Metric Fasteners) . . . . . 1 - 7
Other Torque Specifications . . . . . 1 - 8
SAE Grade 8 Steel Set Screws . . . . . 1 - 8
Thread Cutting Screws (Zinc Plated Steel) . . . . . 1 - 8
Conversion Factors . . . . . 1 - 8
Wheel Bolts and Lug Nuts . . . . . 1 - 8
Thread Cutting Screws (Zinc Plated Steel) . . . . . 1 - 8
Equivalents and Conversions . . . . . 1 - 9
Decimal and Millimeter Equivalents. . . . . 1 - 9
U.S. to Metric Conversions . . . . . 1 - 10

CHASSIS

Model and Serial Number Location . . . . . 2 - 1
Greasing and Lubrication . . . . . 2 - 1
Front Wheel Toe-in . . . . . 2 - 2
Front Wheel Toe-in Adjustment . . . . . 2 - 3
Front Wheel and Spindle Removal and Installation . . . . . 2 - 3
Removal . . . . . 2 - 3
Front Axle Removal and Installation . . . . . 2 - 4
Steering Gear . . . . . 2 - 6
Description . . . . . 2 - 6
Steering Backlash Adjustment . . . . . 2 - 6
Steering Gear Shaft Disassembly . . . . . 2 - 7
Steering Gear Assembly . . . . . 2 - 10
Sector Gear Disassembly . . . . . 2 - 11
Sector Gear Assembly . . . . . 2 - 12
Tilt Steering . . . . . 2 - 12
Description . . . . . 2 - 12
Tilt Steering Disassembly . . . . . 2 - 13
Tilt Steering Assembly . . . . . 2 - 14
Steering Specifications . . . . . 2 - 15
Hood Removal . . . . . 2 - 16
Seat and Fender Removal . . . . . 2 - 16

TABLE OF CONTENTS

Gas Tank Removal . . . . . 2 - 17
Lift Lever Linkage . . . . . 2 - 18
Dial-A-Height Linkage . . . . . 2 - 19
Lift Arm Linkage . . . . . 2 - 20
Adjustments . . . . . 2 - 21
Lift Height . . . . . 2 - 21
Leveling . . . . . 2 - 21
Side to Side . . . . . 2 - 21
Power Lifts . . . . . 2 - 21
Electrohydraulic Lift (2000 and Prior Models) . . . . . 2 - 21
Electric Lift (2001 and Later Models) . . . . . 2 - 21
Removal . . . . . 2 - 21
Installation . . . . . 2 - 21

TUFF TORQ TRANSAXLE

Tuff Torq Hydrostatic Transaxle . . . . . 3 - 1
Internal Service . . . . . 3 - 1
Fluid Change . . . . . 3 - 1
Transaxle Removal – Tuff Torq . . . . . 3 - 1
Installation - Tuff Torq Transaxle . . . . . 3 - 4
Belt Replacement – Tuff Torq Transaxle . . . . . 3 - 6
Belt Routing . . . . . 3 - 10
Belt Adjustment . . . . . 3 - 13
Troubleshooting – Tuff Torq Transaxle . . . . . 3 - 14
Purging Procedures – Tuff Torq Transaxle . . . . . 3 - 15
Brake – Tuff Torq Transaxle . . . . . 3 - 15
Checking the Brake . . . . . 3 - 15
Adjusting the Brake – Tuff Torq Transaxle . . . . . 3 - 15
Foot Control Adjustment Procedure . . . . . 3 - 16
Neutral Adjustment – Tuff Torq Transaxle . . . . . 3 - 17

TABLE OF CONTENTS

HYDRO-GEAR TRANSAXLE

Hydro-Gear Hydrostatic Transaxle . . . . . 4 - 1
Internal Service . . . . . 4 - 1
Fluid Change . . . . . 4 - 1
Transaxle Removal - Hydro-Gear . . . . . 4 - 1
Installation - Hydro-gear Transaxle . . . . . 4 - 4
Belt Adjustment . . . . . 4 - 7
Purging Procedures – Hydro-Gear Transaxle . . . . . 4 - 8
Brake – Hydro-Gear Transaxle . . . . . 4 - 9
Checking the Brake . . . . . 4 - 9
Brake Adjustment – Hydro-Gear Transaxle . . . . . 4 - 9
Foot Control Adjustment Procedure . . . . . 4 - 10
Troubleshooting Chart for the Hydro-Gear Transaxle . . . . . 4 - 11
Belt Replacement – Hydro-Gear Transaxle . . . . . 4 - 11
Belt Routing Diagram . . . . . 4 - 15
Belt Adjustment . . . . . 4 - 16
Neutral Adjustment – Hydro-Gear Transaxle . . . . . 4 - 17

GEAR DRIVE

Transaxle Removal – Gear Drive . . . . . 5 - 1
Installation – Gear Drive Transaxle . . . . . 5 - 3
Troubleshooting . . . . . 5 - 5
Internal Service . . . . . 5 - 5
Symptom: Unit Jumps Out Of Gear . . . . . 5 - 6
Symptom: Unit Can Not Be Shifted (or Difficult to Shift) . . . . . 5 - 6
Symptom: Unit Does Not Drive . . . . . 5 - 6
Belt Replacement – Gear Drive . . . . . 5 - 7
Belt Routing Diagram . . . . . 5 - 9
Belt Adjustment . . . . . 5 - 12
Proper Shifting Procedures - Gear Drive . . . . . 5 - 13
Shift Linkage Adjustment . . . . . 5 - 13
Shift Detent Tension Adjustment . . . . . 5 - 14
Brakes . . . . . 5 - 14
Checking the Brake . . . . . 5 - 14
Adjusting the Brake . . . . . 5 - 15

TABLE OF CONTENTS

ELECTRICAL SYSTEMS

Gear Drive Models . . . . . 6 - 1
Hydrostatic Models . . . . . 6 - 1
Relay . . . . . 6 - 1
Purpose . . . . . 6 - 1
Location . . . . . 6 - 1
How It Works . . . . . 6 - 1
Testing . . . . . 6 - 2
Solenoid . . . . . 6 - 2
Purpose . . . . . 6 - 2
Location . . . . . 6 - 3
How it Works . . . . . 6 - 3
Testing . . . . . 6 - 3
Ignition Switch . . . . . 6 - 4
Purpose . . . . . 6 - 4
Location . . . . . 6 - 4
How It Works . . . . . 6 - 4
Testing . . . . . 6 - 5
Low Voltage Module . . . . . 6 - 5
Purpose . . . . . 6 - 5
Location . . . . . 6 - 5
How It Works . . . . . 6 - 5
Testing . . . . . 6 - 6
Electric (PTO) Clutch . . . . . 6 - 6
Purpose . . . . . 6 - 6
Location . . . . . 6 - 6
How It Works . . . . . 6 - 6
Testing . . . . . 6 - 6
Coil Resistance Measurement . . . . . 6 - 6
Measuring Clutch Current Draw . . . . . 6 - 7
Setting the Air Gap on 1999 and Prior Model 260 Series Tractors . . . . . 6 - 8
Clutch Burnishing Procedure . . . . . 6 - 8
PTO Switch . . . . . 6 - 8
Purpose . . . . . 6 - 8
Location . . . . . 6 - 8
How it Works . . . . . 6 - 8
Testing . . . . . 6 - 8
Microswitches . . . . . 6 - 9
Purpose . . . . . 6 - 9
Testing . . . . . 6 - 9
Location . . . . . 6 - 10
Neutral Switch - Plunger Type (Used on 2000 and Later Hydrostatic Models) . . . 6 - 11
Purpose . . . . . 6 - 11
Location . . . . . 6 - 11
How it Works . . . . . 6 - 11
Testing . . . . . 6 - 12

Brake Switch (Used on 2000 and Later Hydrostatic Models) . . . . . 6 - 12
Purpose . . . . . 6 - 12
Location . . . . . 6 - 12
How it Works . . . . . 6 - 12
Brake Switch Testing . . . . . 6 - 13
Seat Switch . . . . . 6 - 13
Purpose . . . . . 6 - 13
Location . . . . . 6 - 13
How It Works . . . . . 6 - 14
Testing . . . . . 6 - 13
KeyChoice™ Reverse Operating System – Used on 1999 and Later Tractors . . . . 6 - 14
Testing the Key Choice™ Reverse Operating System - Unactivated . . . . . 6 - 14
Testing the KeyChoice™ Operating System - Activated . . . . . 6 - 14
KeyChoice™ Reverse Operating System Switch . . . . . 6 - 16
Purpose . . . . . 6 - 16
How It Works . . . . . 6 - 16
Testing . . . . . 6 - 16
Reverse Switch (Hydrostatic Models) . . . . . 6 - 16
Purpose . . . . . 6 - 16
Location . . . . . 6 - 16
How It Works . . . . . 6 - 16
Testing . . . . . 6 - 16
Reverse Switch (Gear Drive Tractors) . . . . . 6 - 17
Purpose . . . . . 6 - 17
Location . . . . . 6 - 17
How It Works . . . . . 6 - 17
Testing . . . . . 6 - 17
KeyChoice™ Reverse Operating System Module . . . . . 6 - 17
Purpose . . . . . 6 - 17
Location . . . . . 6 - 18
How It Works . . . . . 6 - 18
Testing - No Power to Circuit (With Module Out of Circuit) . . . . . 6 - 19
Testing - Powered Circuit (With Module Out of Circuit) . . . . . 6 - 19

THIS PAGE INTENTIONALLY LEFT BLANK

General Specifications

Item	Specification
Engines	All tractors since 1994 were manufactured with Kohler engines ranging from 14 to 20 Horsepower. For more information on servicing the engines, please contact the Kohler Company.
Domestic Units	High RPM Setting (no load) 3250 +/- 100 RPM
International Models	High RPM Setting (no load) 2700 +/- 100 RPM
Fuel Capacity	3.9 Gallons (14.7 liter)
Wheel Base	49.5” (125.7cm)
Length	69.0” (175.2cm)
Width	35.5” (90.1cm) without the mower
Steering	Sector and Pinion
Turning Radius	16 in. (40.6cm)
Electrical System	15 amp regulated DC alternator

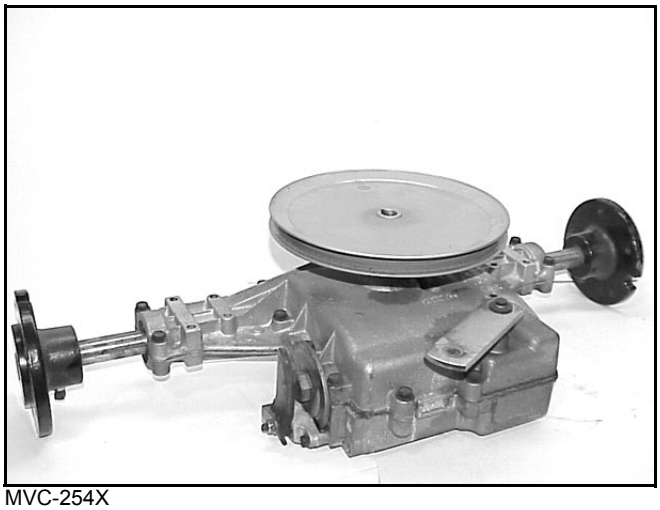
Weight (Net Weight)

Model	Weight	
264-6 / 265-6	521 lbs.	(236.3kg)
264-H / 265-H (Tuff Torq)	510 lbs.	(231.3kg)
267-H / 268-H (Tuff Torq)	540 lbs.	(244.9kg)
269-H / 270-H (Tuff Torq)	560 lbs.	(254.0kg)
265-H/266-H (Hydro-Gear)	530 lbs.	(240.4kg)
268-H (Hydro-Gear)	560 lbs.	(254.0kg)
270-H (Hydro-Gear)	580 lbs.	(263.0kg)

SPECIFICATIONS

Tecumseh Peerless Transaxle

Identification:
Tecumseh Peerless Model 820-024



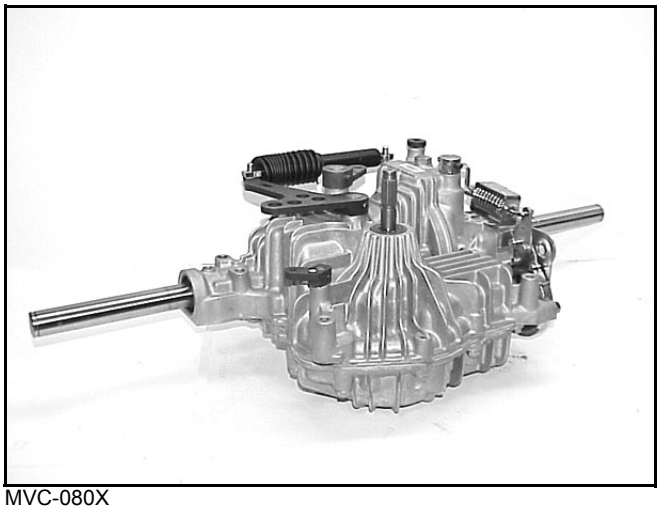
MVC-254X

General Specifications

Lubrication	Bentonite grease (available through Tecumseh)	
Ground Speed	1st Gear	.7 MPH (1.1km/h)
	2nd Gear	1.4 MPH (2.2km/h)
	3rd Gear	2.2 MPH (3.5km/h)
	4th Gear	3.3 MPH (5.3km/h)
	5th Gear	4.2 MPH (6.7km/h)
	6th Gear	5.3 MPH (8.5km/h)
	Reverse	2.4 MPH (3.8km/h)

Hydrostatic Transaxles

Identification:
Tuff Torq Model K61A Transaxle



MVC-080X

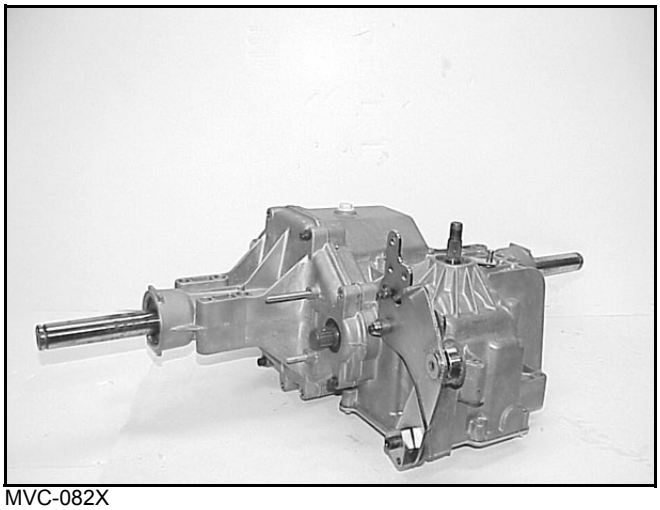
General Specifications

Used	1994 – 1999	
Lubrication	SAE 10W-30 API Service Classification SH or higher. Alternate oil: A synthetic oil (5w50 or similar viscosity range) may be used in place of SAE 10w30. This will permit an increase in the maximum operating temperature of approximately 18°F (10°C).	
Oil Capacity	3.5 qt. (3.3 liter)	
Oil Level	Check when transaxle is cold. Oil should be checked at the reservoir cup, located under the front hood, on the panel support; oil level should be at the cold mark.	
Fluid Change	The transaxle is factory filled and does not require regular oil changes.	
Ground Speed	Forward	0-5.2 MPH (0-8.3km/h)
	Reverse	0-2.3 MPH (0-3.7km/h)

SPECIFICATIONS

Hydrostatic Transaxles

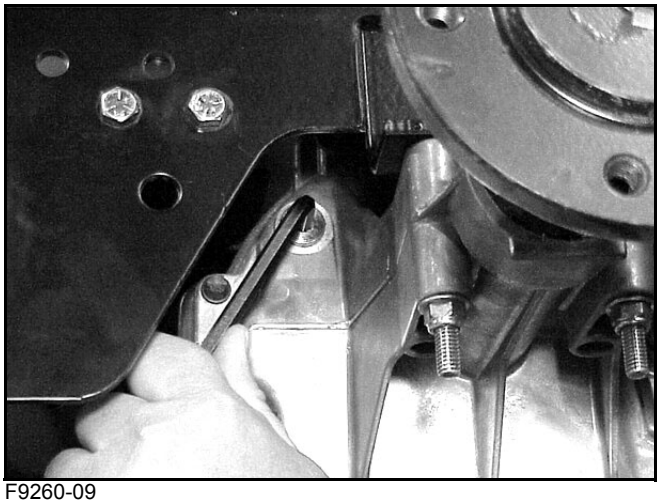
Identification:
Hydro-Gear Model 322-3000 & 330-3000 Transaxle



MVC-082X

General Specifications

Used	2000 to 2002
Lubrication	SAE 20W-50 API Classification SH/CD
Oil Capacity	3.8 qt. (3.6liters)
Oil Level	The transaxle is a sealed system and does not require periodic checking. If the oil needs to be checked, **IT CAN ONLY BE CHECKED COLD.** There is a plug located on the right rear side of the transaxle. Using a ¼ inch Allen wrench, slowly remove the plug. Oil level should be to the bottom of the port.



F9260-09

General Specifications

Ground Speed	Forward	0 – 6.3 MPH (10.1km/h)
	Reverse	0 – 2.3 MPH (3.7km/h)

Torque Specifications

Recommended fastener torque values are listed in the following tables. For critical applications, as determined by Toro, either the recommended torque or a torque that is unique to the application is clearly identified and specified in the service manual.

These torque specifications for the installation and tightening of fasteners shall apply to all fasteners which do not have a specific requirement identified in the service manual. The following factors shall be considered when applying torque: cleanliness of the fastener, use of a thread sealant (Loctite), degree of lubrication on the fastener, presence of a prevailing torque feature, hardness of the surface underneath of the fastener's head, or similar condition which affects the installation.

As noted in the following tables, torque values should be **reduced by 25% for lubricated fasteners** to achieve the similar stress as a dry fastener. Torque values may also have to be reduced when the fastener is threaded into aluminum or brass. The specific torque value should be determined based on the aluminum or brass material strength, fastener size, length of thread engagement, etc.

The standard method of verifying torque shall be performed by marking a line on the fastener (head or nut) and mating part, then back off fastener 1/4 of a turn. Measure the torque required to tighten the fastener until the lines match up.

Fastener Identification

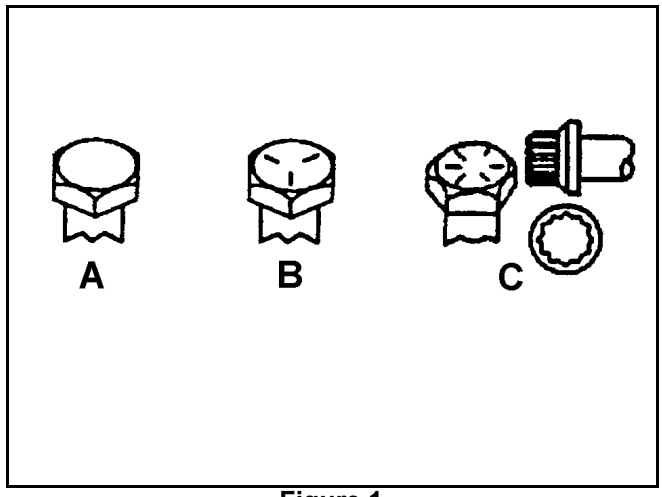


Figure 1

Inch Series Bolts and Screws	
(A) Grade 1 (B) Grade 5	(C) Grade 8

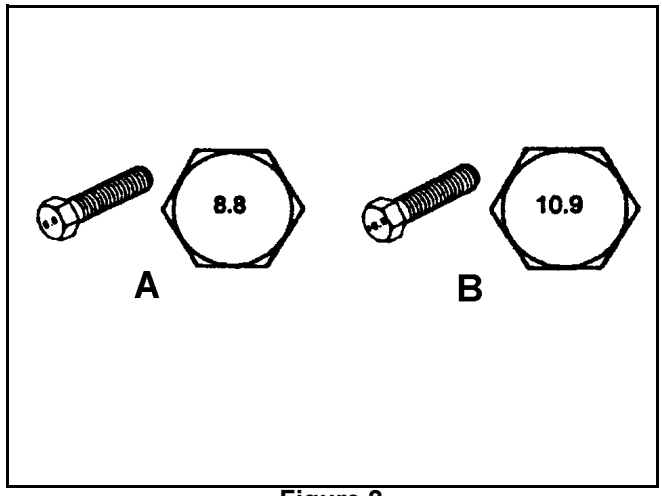


Figure 2

Metric Bolts and Screws	
(A) Class 8.8	(B) Class 10.9

SPECIFICATIONS

Standard Torque for Dry, Zinc Plated, and Steel Fasteners (Inch Series)

Thread Size	Grade 1, 5, & 8 with Thin Height Nuts	SAE Grade 1 Bolts, Screws, Studs, & Sems with Regular Height Nuts (SAE J995 Grade 2 or Stronger Nuts)		SAE Grade 5 Bolts, Screws, Studs, & Sems with Regular Height Nuts (SAE J995 Grade 2 or Stronger Nuts)		SAE Grade 8 Bolts, Screws, Studs, & Sems with Regular Height Nuts (SAE J995 Grade 2 or Stronger Nuts)	
	In-lb	In-lb	N-cm	In-lb	N-cm	In-lb	N-cm
# 6 - 32 UNC	10 ± 2	13 ± 2	147 ± 23	15 ± 2	170 ± 20	23 ± 2	260 ± 20
# 6 - 40 UNF				17 ± 2	190 ± 20	25 ± 2	280 ± 20
# 8 - 32 UNC	13 ± 2	25 ± 5	282 ± 30	29 ± 3	330 ± 30	41 ± 4	460 ± 45
# 8 - 36 UNF				31 ± 3	350 ± 30	43 ± 4	31 ± 3
# 10 - 24 UNC	18 ± 2	30 ± 5	339 ± 56	42 ± 4	475 ± 45	60 ± 6	674 ± 70
#10 - 32 UNF				48 ± 4	540 ± 45	68 ± 6	765 ± 70
1/4 - 20 UNC	48 ± 7	53 ± 7	599 ± 79	100 ± 10	1125 ± 100	140 ± 15	1580 ± 170
1/4 - 28 UNF	53 ± 7	65 ± 10	734 ± 113	115 ± 10	1300 ± 100	160 ± 15	1800 ± 170
5/16 - 18 UNC	115 ± 15	105 ± 17	1186 ± 169	200 ± 25	2250 ± 280	300 ± 30	3390 ± 340
5/16 - 24 UNF	138 ± 17	128 ± 17	1446 ± 192	225 ± 25	2540 ± 280	325 ± 30	3670 ± 340
	ft-lb	ft-lb	N-m	ft-lb	N-m	ft-lb	N-m
3/8 - 16 UNC	16 ± 2	16 ± 2	22 ± 3	30 ± 3	41 ± 4	43 ± 4	58 ± 5
3/8 - 24 UNF	17 ± 2	18 ± 2	24 ± 3	35 ± 3	47 ± 4	50 ± 4	68 ± 5
7/16 - 14 UNC	27 ± 3	27 ± 3	37 ± 4	50 ± 5	68 ± 7	70 ± 7	68 ± 9
7/16 - 20 UNF	29 ± 3	29 ± 3	39 ± 4	55 ± 5	75 ± 7	77 ± 7	104 ± 9
1/2 - 13 UNC	30 ± 3	48 ± 7	65 ± 9	75 ± 8	102 ± 11	105 ± 10	142 ± 14
1/2 - 20 UNF	32 ± 3	53 ± 7	72 ± 9	85 ± 8	115 ± 11	120 ± 10	163 ± 14
5/8 - 11 UNC	65 ± 10	88 ± 12	119 ± 16	150 ± 15	203 ± 20	210 ± 20	285 ± 27
5/8 - 18 UNF	75 ± 10	95 ± 15	129 ± 20	170 ± 15	230 ± 20	240 ± 20	325 ± 27
3/4 - 10 UNC	93 ± 12	140 ± 20	190 ± 27	265 ± 25	359 ± 34	374 ± 35	508 ± 47
3/4 - 16 UNF	115 ± 15	165 ± 25	224 ± 34	300 ± 25	407 ± 34	420 ± 35	569 ± 47
7/8 - 9 UNC	140 ± 20	225 ± 25	305 ± 34	430 ± 45	583 ± 61	600 ± 60	813 ± 81
7/8 - 14 UNF	155 ± 25	260 ± 30	353 ± 41	475 ± 45	644 ± 61	660 ± 60	895 ± 81

Note: Reduce torque values listed in the table above by 25% for lubricated fasteners. Lubricated fasteners are defined as threads coated with a lubricant such as oil, graphite, or thread sealant such as Loctite.

Note: Torque values may have to be reduced when installing fasteners into threaded aluminum or brass. The specific torque value should be determined based on the fastener size, the aluminum or base material strength, length of thread engagement, etc.

Note: The nominal torque values listed above for Grade 5 and 8 fasteners are based on 75% of the minimum proof load specified in SAE J429. The tolerance is approximately ± 10% of the nominal torque value. Thin height nuts include jam nuts.

Standard Torque for Dry, Zinc, and Steel Fasteners (Metric Fasteners)

Thread Size	Class 8.8 Bolts, Screws, and Studs with Regular Height Nuts (Class 8 or Strong Nuts)		Class 10.9 Bolts, Screws, and Studs with Regular Height Nuts (Class 10 or Strong Nuts)	
M5 X 0.8	57 ± 5 in-lb	640 ± 60 N-cm	78 ± 7 in-lb	885 ± 80 N-cm
M6 X 1.0	96 ± 9 in-lb	1018 ± 100 N-cm	133 ± 13 in-lb	1500 ± 150 N-cm
M8 X 1.25	19 ± 2 ft-lb	26 ± 3 N-m	27 ± 2 ft-lb	36 ± 3 N-m
M10 X 1.5	38 ± 4 ft-lb	52 ± 5 N-m	53 ± 5 ft-lb	72 ± 7 N-m
M12 X 1.75	66 ± 7 ft-lb	90 ± 10 N-m	92 ± 9 ft-lb	125 ± 12 N-m
M16 X 2.0	166 ± 15 ft-lb	225 ± 20 N-m	229 ± 22 ft-lb	310 ± 30 N-m
M20 X 2.5	325 ± 33 ft-lb	440 ± 45 N-m	450 ± 37 ft-lb	610 ± 50 N-m

Note: Reduce torque values listed in the table above by 25% for lubricated fasteners. Lubricated fasteners are defined as threads coated with a lubricant such as oil, graphite, or thread sealant such as Loctite.

Note: Torque values may have to be reduced when installing fasteners into threaded aluminum or brass. The specific torque value should be determined based on the fastener size, the aluminum or base material strength, length of thread engagement, etc.

Note: The nominal torque values listed above are based on 75% of the minimum proof load specified in SAE J1199. The tolerance is approximately ± 10% of the nominal torque value. Thin height nuts include jam nuts.

Other Torque Specifications

SAE Grade 8 Steel Set Screws

Thread Size	Recommended Torque	
	Square Head	Hex Socket
1/4 - 20 UNC	140 ± 20 in-lb	73 ± 12 in-lb
5/16 - 18 UNC	215 ± 35 in-lb	145 ± 20 in-lb
3/8 - 16 UNC	35 ± 10 ft-lb	18 ± 3 ft-lb
1/2 - 13 UNC	75 ± 15 ft-lb	50 ± 10 ft-lb

Wheel Bolts and Lug Nuts

Thread Size	Recommended Torque**	
7/16 - 20 UNF Grade 5	65 ± 10 ft-lb	88 ± 14 N-m
1/2 - 20 UNF Grade 5	80 ± 10 ft-lb	108 ± 14 N-m
M12 X 1.25 Class 8.8	80 ± 10 ft-lb	108 ± 14 N-m
M12 X 1.5 Class 8.8	80 ± 10 ft-lb	108 ± 14 N-m

** For steel wheels and non-lubricated fasteners.

Thread Cutting Screws (Zinc Plated Steel)

Type 1, Type 23, or Type F	
Thread Size	**Baseline Torque***
No. 6 - 32 UNC	20 ± 5 in-lb
No. 8 - 32 UNC	30 ± 5 in-lb
No.10 - 24 UNC	38 ± 7 in-lb
1/4 - 20 UNC	85 ± 15 in-lb
5/16 - 18 UNC	110 ± 20 in-lb
3/8 - 16 UNC	200 ± 100 in-lb

Thread Cutting Screws (Zinc Plated Steel)

Thread Size	Threads per Inch		Baseline Torque*
	Type A	Type B	
No. 6	18	20	20 ± 5 in-lb
No. 8	15	18	30 ± 5 in-lb
No. 10	12	16	38 ± 7 in-lb
No. 12	11	14	85 ± 15 in-lb

* Hole size, material strength, material thickness and finish must be considered when determining specific torque values. All torque values are based on non-lubricated fasteners.

Conversion Factors

in-lb X 11.2985 - N-cm
ft-lb X 1.3558 = N-m

N-cm X - 0.08851 = in-lb
N-cm X 0.73776 - ft-lb

Equivalents and Conversions

Decimal and Millimeter Equivalents

Fractions	Decimals	mm	Fractions	Decimals	mm
1/64	0.015625	0.397	33/64	0.515625	13.097
1/32	0.03125	0.794	16/32	0.53125	13.484
3/64	0.046875	1.191	35/64	0.546875	13.891
1/16	0.0625	1.588	9/16	0.5625	14.288
5/64	0.078125	1.984	37/64	0.578125	14.684
3/32	0.9375	2.381	19/32	0.59375	15.081
1/8	0.1250	3.175	5/8	0.6250	15.875
9/64	0.140625	3.572	41/64	0.640625	16.272
5/32	0.15625	3.969	21/32	0.65625	16.669
11/64	0.171875	4.366	43/64	0.671875	17.066
3/16	0.1875	4.762	11/16	0.6875	17.462
13/64	0.203125	5.159	45/64	0.703125	17.859
7/32	0.21875	5.556	23/32	0.71875	18.256
15/64	0.234375	5.953	47/64	0.734375	18.653
1/4	0.2500	6.350	3/4	0.7500	19.050
17/64	0.265625	6.747	49/64	0.765625	19.447
9/32	0.28125	7.144	25/32	0.78125	19.844
19/64	0.296875	7.541	51/64	0.796875	20.241
5/16	0.3125	7.541	13/16	0.8125	20.638
21/64	0.328125	8.334	53/64	0.828125	21.034
11/32	0.34375	8.731	27/32	0.84375	21.431
23/64	0.359375	9.128	55/64	0.859375	21.828
3/8	0.3750	9.525	7/8	0.8750	22.225
25/64	0.390625	9.922	57/64	0.890625	22.622
13/32	0.40625	10.319	29/32	0.90625	23.019
27/64	0.421875	10.716	59/64	0.921875	23.416
7/16	0.4375	11.112	15/16	0.9375	23.812
29/64	0.453125	11.509	61/64	0.953125	24.209
15/32	0.46875	11.906	31/32	0.96875	24.606
31/64	0.484375	12.303	63/64	0.984375	25.003
1/2	0.5000	12.700	1	1.000	25.400
1 mm = 0.03937 in.			0.001 in. = 0.0254 mm		

U.S. to Metric Conversions

	To Convert	Into	Multiply By
Linear Measurement	Miles	Kilometers	1.609
	Yards	Meters	0.9144
	Feet	Meters	0.3048
	Feet	Centimeters	30.48
	Inches	Meters	0.0254
	Inches	Centimeters	2.54
	Inches	Millimeters	25.4
Area	Square Miles	Square Kilometers	2.59
	Square Feet	Square Meters	0.0929
	Square Inches	Square Centimeters	6.452
	Acre	Hectare	0.4047
Volume	Cubic Yards	Cubic Meters	0.7646
	Cubic Feet	Cubic Meters	0.02832
	Cubic Inches	Cubic Centimeters	16.39
Weight	Tons (Short)	Metric Tons	0.9078
	Pounds	Kilograms	0.4536
	Ounces (Abdp.)	Grams	28.3495
Pressure	Pounds/Sq. In.	Kilopascal	6.895
Work	Foot-pounds	Newton-Meters	1.356
	Foot-pounds	Kilogram-Meters	0.1383
	Inch-pounds	Kilogram-Centimeters	1.152144
Liquid Volume	Quarts	Liters	0.9463
	Gallons	Liters	3.785
Liquid Flos	Gallons/Minute	Liters/Minute	3.785
Temperature	Fahrenheit	Celsius	1. Subtract 32° 2. Multiply by 5/9

Model and Serial Number Location

The model and serial number plate location is under the seat (Figure 3).

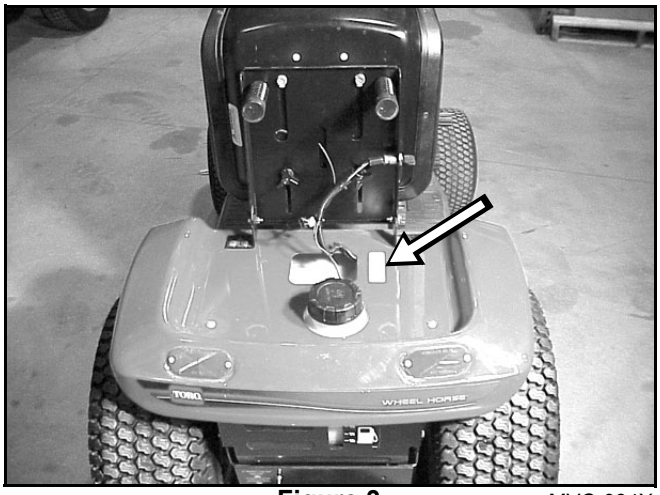


Figure 3 MVC-084X

Greasing and Lubrication

The machine should be greased every 50 hours or yearly, whichever occurs first. You should grease more frequently when operating conditions are extremely dusty or sandy.

Grease Type: General-purpose grease.

There are 5 grease fittings located in the front axle area:

1. One located on the inside of each wheel hub (2 total).
2. One located on each end of the front axle for the spindles (2 total).
3. One located on the front axle pivot area (1 total) (Figure 4).

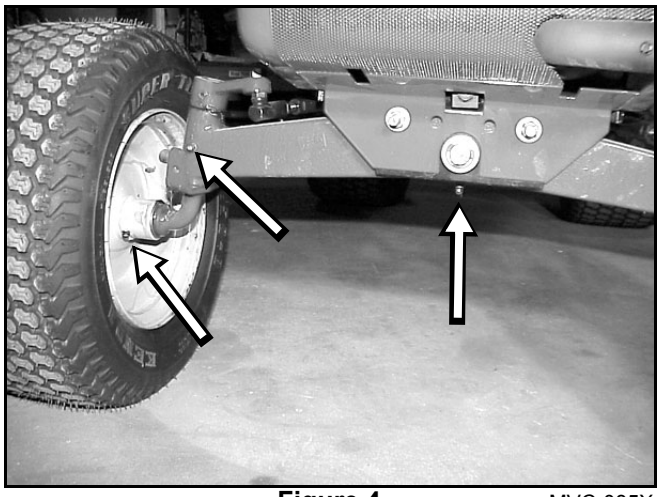


Figure 4 MVC-085X

Hydrostatic model tractors have one grease fitting on the forward/reverse pedal (Figure 5).

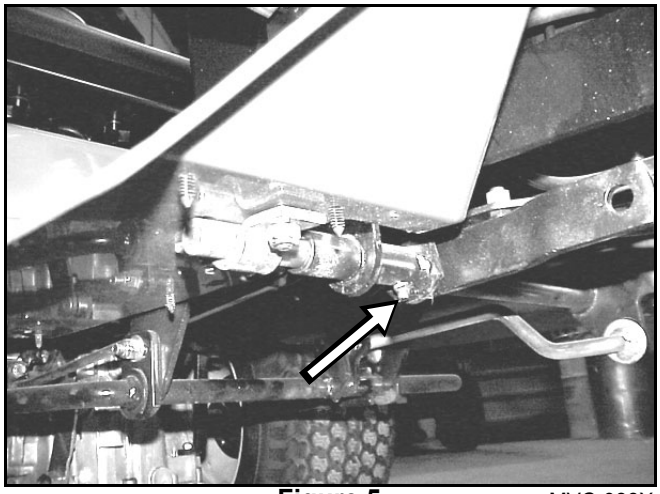


Figure 5 MVC-088X

On the gear drive tractors, there is a grease fitting located on both the clutch and brake pedal (Figure 6).

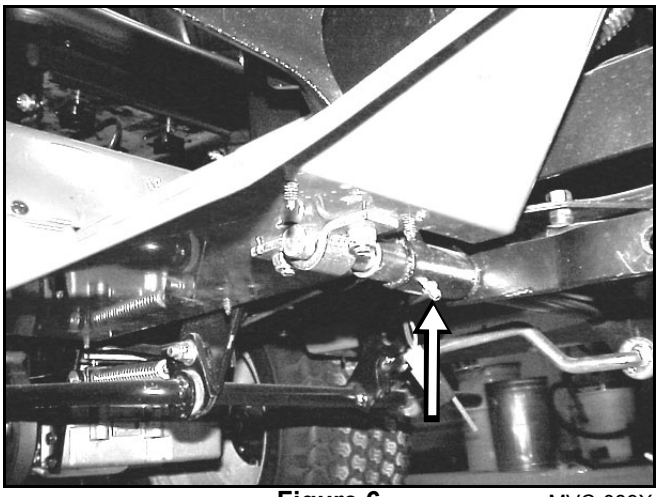


Figure 6 MVC-089X

Front Wheel Toe-in

If there is uneven tire wear, lawn scuffing, or hard steering, toe-in may need to be adjusted. The front toe-in measurement should be 1/8" to ¼" (3 to 6mm). This should be checked every 100 hours or once a year, whichever occurs first.

MEASUREMENT:

1. Disengage the PTO, set the parking brake, and turn the ignition key to ***OFF*** to stop the engine. Remove the key.

2. Push the front of the tires out to remove normal looseness in the linkage (Figure 7).

Figure 7 MVC-091X

3. Measure the distance between both the front rims at spindle level, in front and rear of the wheels. You can also measure between the tread mold marks if the tires are new (Figure 8).

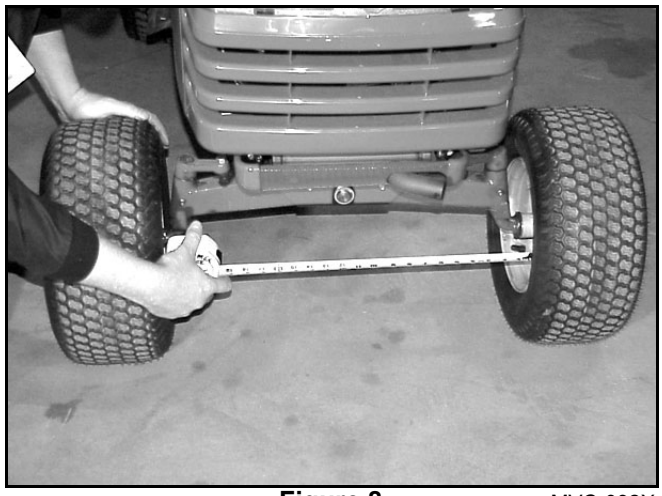


Figure 8 MVC-092X

4. The front measurement should be 1/8" to ¼" (3 to 6mm) less than the rear measurement (Figure 9). If needed, follow the adjustment procedure.

Figure 9 MVC-094X

Front Wheel Toe-in Adjustment

1. Remove the tie rod from one steering arm.

2. Loosen the jam nut securing the ball joint to the steering rod. Rotate the ball joint one turn: clockwise to increase toe-in; counterclockwise to decrease toe-in (Figure 10).

   IMPORTANT: If more than one turn is required to meet specifications, alternate between the right and left steering rods to maintain steering wheel alignment.

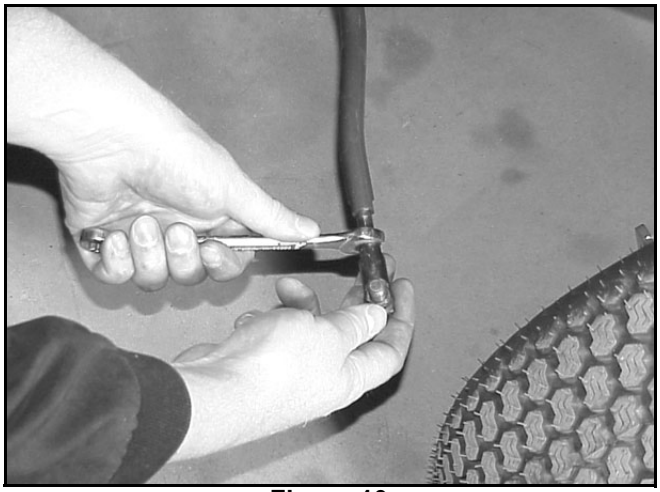


Figure 10 MVC-095X

3. Hold flats on the ball joint to align with the flats on the tie rod and tighten the jam nut (Figure 11).

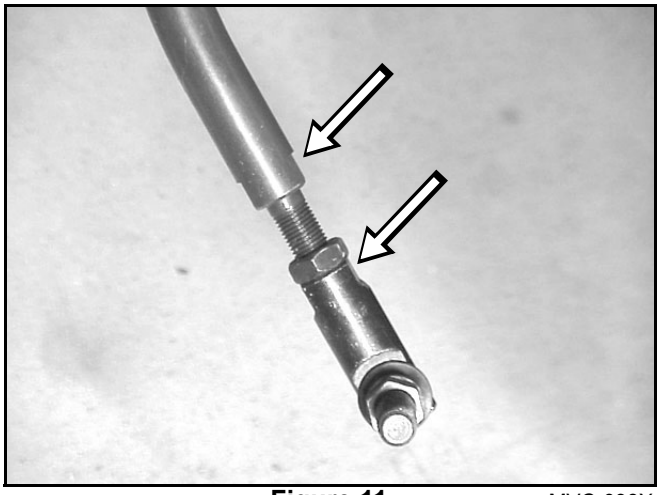


Figure 11 MVC-098X

4. Install the ball joint to the steering arm and check the toe-in as described in the measurement section (Figure 12).

Figure 12 MVC-099X

Front Wheel and Spindle Removal and Installation

Removal

1. Disengage the PTO. Set the parking brake, and turn the ignition key to ***OFF*** to stop the engine. Remove the key.

2. Raise the front axle by putting a jack under the side you are removing the wheel or spindle from.

3. Remove the outer hub cap, cotter pin, washer, and hub cap washer. Slide the wheel and tire off the spindle (Figure 13).

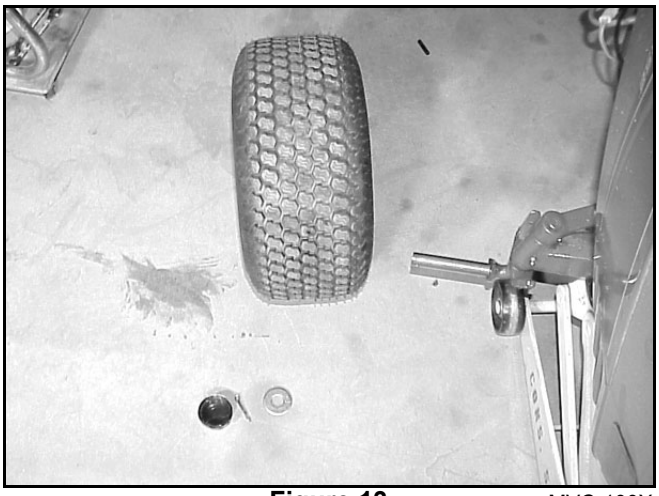


Figure 13 MVC-100X

4. Remove the tie rod from the front spindle arm. With a drift punch and hammer, drive the roll pin out of the front spindle arm (Figure 14).

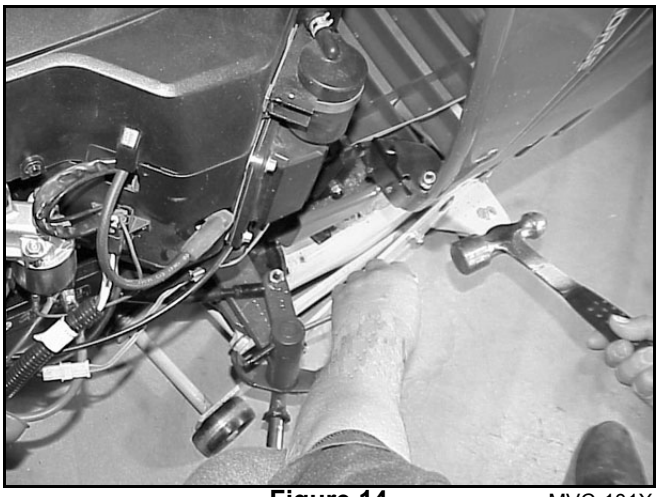


Figure 14 MVC-101X

5. The spindle can now be removed out the bottom of the front axle assembly (Figure 15).

Figure 15 MVC-102X

6. Installation – reverse the order of removal.

Front Axle Removal and Installation

1. Jack-up the front of the tractor. Put jack stands under the frame, just behind the front axle assembly (Figure 16).

Figure 16 MVC-103X

2. Remove right and left tie rods from the front spindle arms (Figure 17).

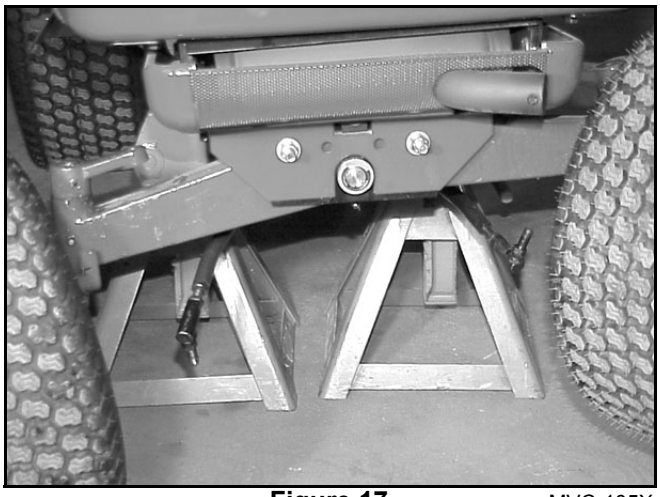


Figure 17 MVC-105X

3. On the front of the axle, in the center, remove the E-ring and washers (Figure 18).

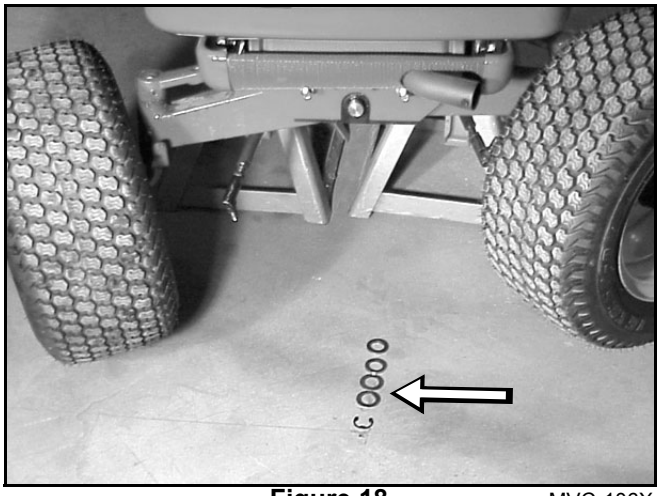


Figure 18 MVC-106X

4. Remove the electric PTO clutch from the engine crankshaft.

5. On the back side of the axle, remove the bolt on the axle pin (Figure 19).

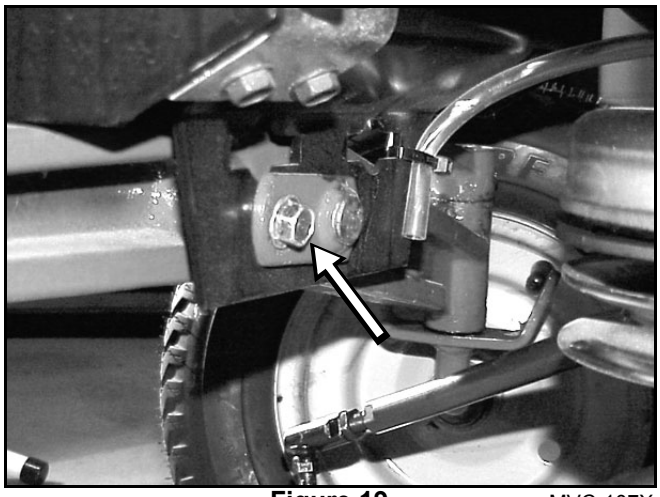


Figure 19 MVC-107X

6. Remove the axle pin; use a drift punch and hammer to tap the axle pin out; if needed (Figure 20).

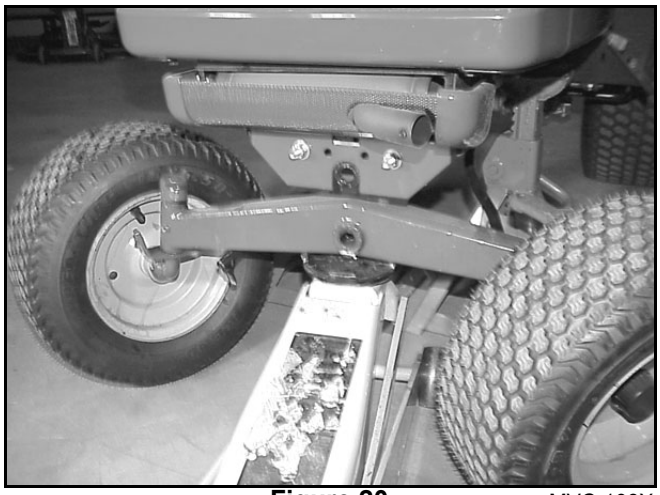


Figure 20 MVC-108X

7. Installation – reverse the order of removal.

Steering Gear

Description

The steering gear assembly is made up of a vertically mounted steering shaft and a horizontal sector gear. The sector gear is adjustable so that excessive backlash play in steering gears can be removed (Figure 21).

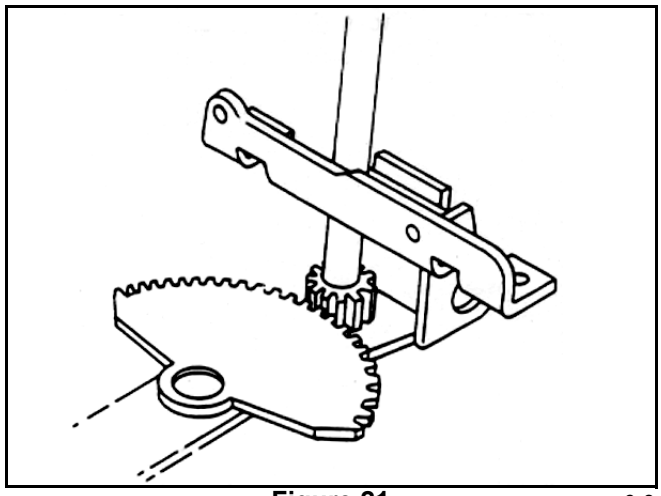


Figure 21 6-8

Steering Backlash Adjustment

Use the following procedure if there is excessive steering backlash.

1. Remove battery and battery tray from the tractor.
2. Position the steering wheel so the tie rods clear the front axle and remove them from the steering arms (Figure 22).

Figure 22 MVC-263X

3. Loosen the locking nut on the eccentric (Figure 23). Position the steering wheel spokes so they extend outward left to right.

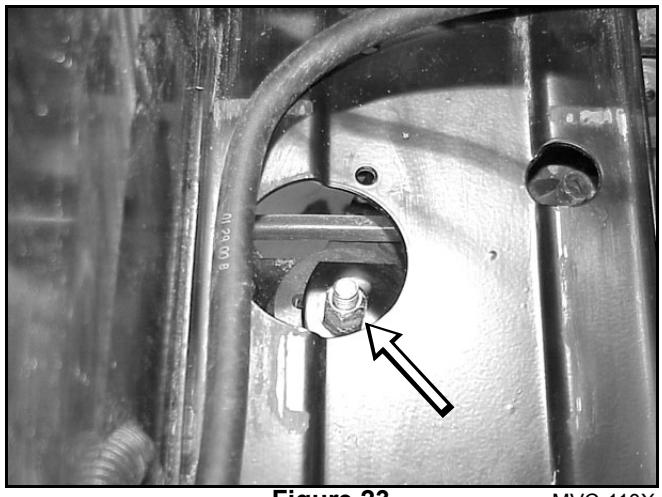


Figure 23 MVC-110X

4. Tighten the nut until the eccentric turns with a small amount of friction (Figure 21).

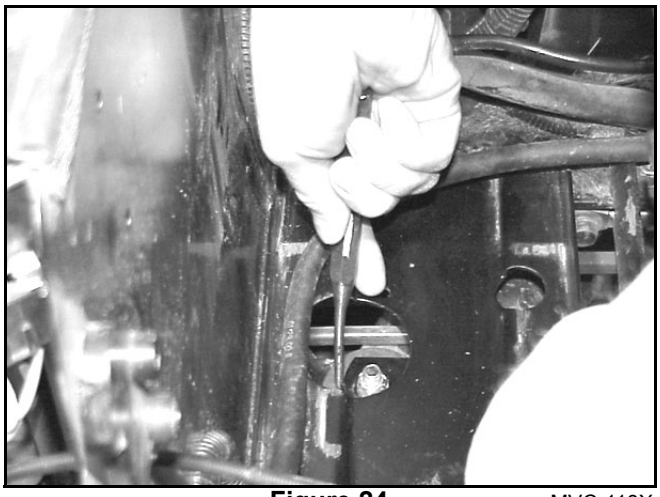


Figure 24 MVC-113X

5. Using a punch, turn the eccentric clockwise until zero clearance is obtained between the end of the steering shaft gear and the steering sector (Figure 24).

6. Tighten the nut to 25 – 35 ft lb (34 – 48 Nm). DO NOT OVERTIGHTEN.

7. Apply some multipurpose grease to the steering gear teeth.

8. Connect the tie rod ends to the steering arms.

9. Turn the wheels left and right. Recheck for zero clearance (Figure 25).

Figure 25 MVC-115X

10. Reinstall the battery tray and battery.

Steering Gear Shaft Disassembly

1. Disconnect the negative battery cable.

2. Remove the roll pin, steering wheel, spacer, and spring from the top of the steering shaft (Figure 26). **(Note: Some units use a retaining nut and washer located under the center cover of the steering wheel).**

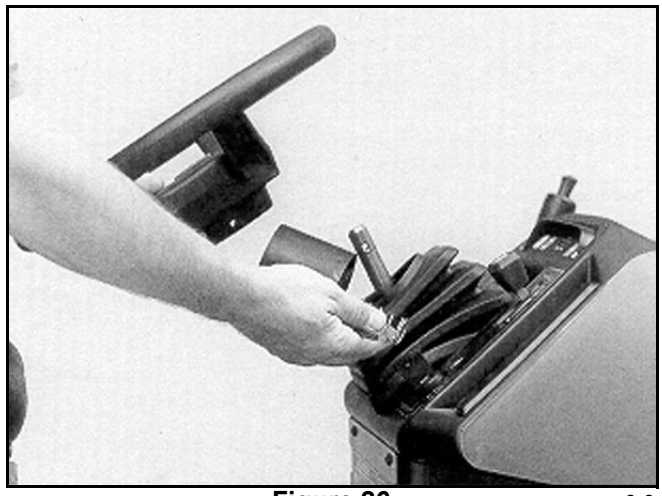


Figure 26 6-9

3. Remove the rubber boot from the steering shaft and console (Figure 27).

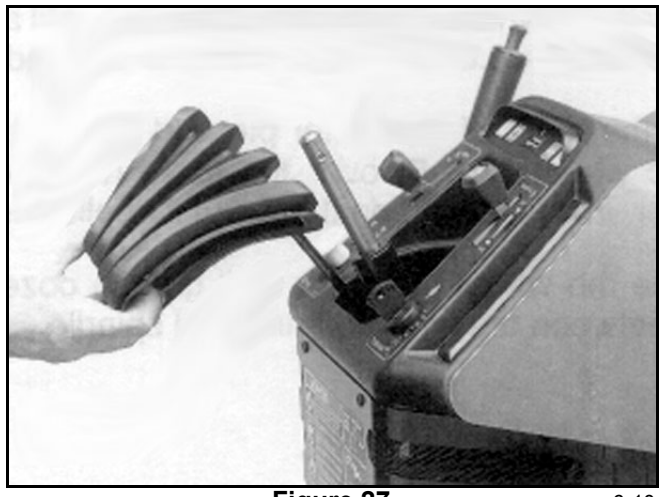


Figure 27 6-10

4. Rotate the steering shaft until the top bolt of the universal joint faces the rear of the tractor. Remove the bolt (Figure 28).

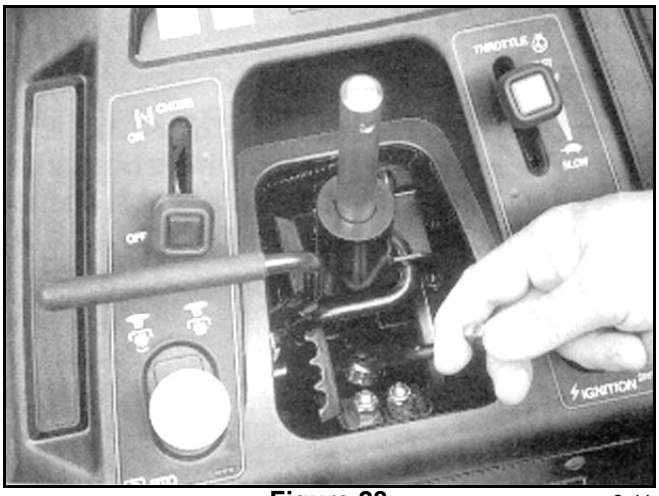


Figure 28 6-11

5. Pull the top shaft from the universal joint and remove it from the top of the tractor (Figure 29).

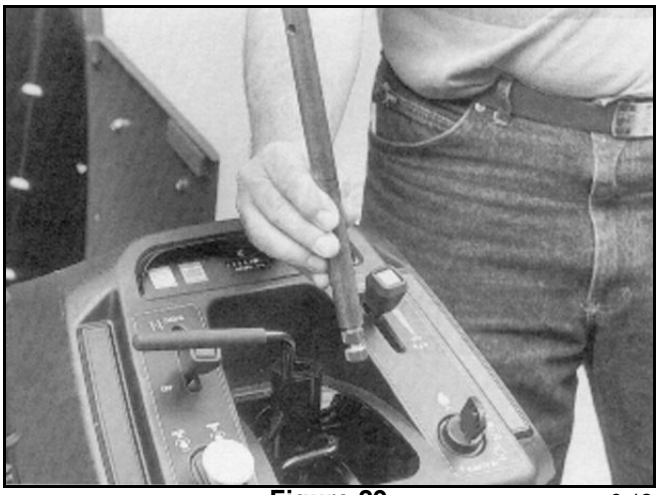


Figure 29 6-12

6. Disconnect the relays from the mounting bracket and remove the bracket from the tractor. Place the wiring harness and fuse block to the side of the console (Figure 30).

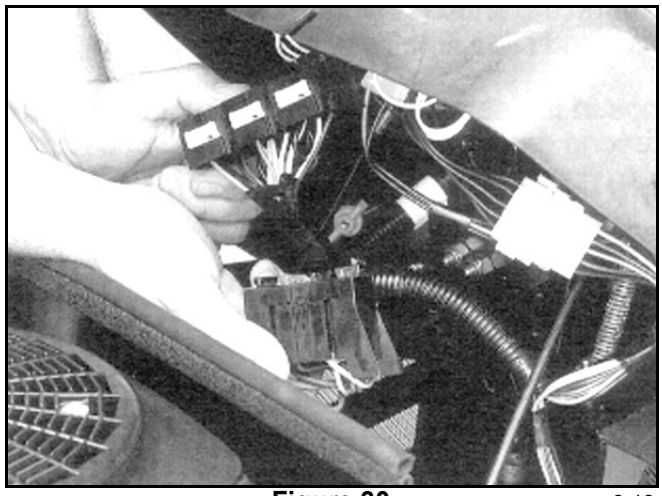


Figure 30 6-13

7. Rotate the steering gear shaft until the bottom bolt of the universal joint faces the front of the tractor. Remove the bolt (Figure 31).

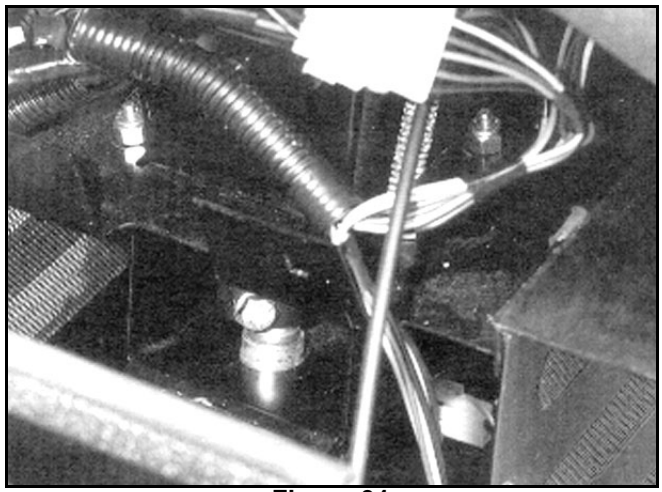


Figure 31 6-14

8. Tilt steering to the rear position and remove the universal joint from the steering shaft gear. Remove the universal joint from the top of the tractor (Figure 32).

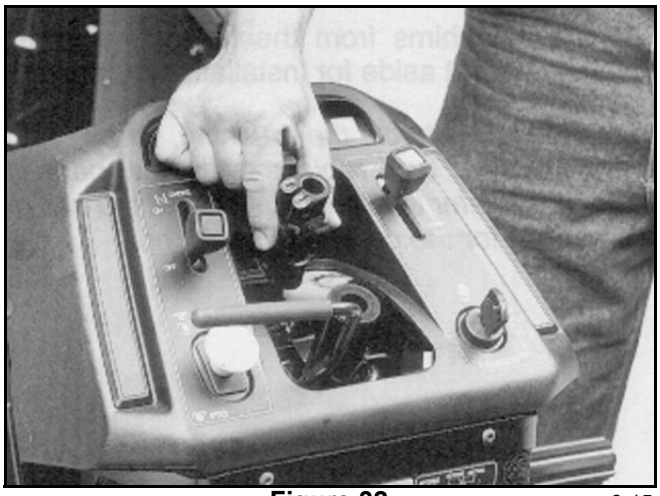


Figure 32 6-15

9. Expand the snap ring found on the steering gear shaft and slide if halfway down the shaft. Loosen the setscrew on the locking collar of the steering gear shaft and move it until it meets the snap ring (Figure 33).

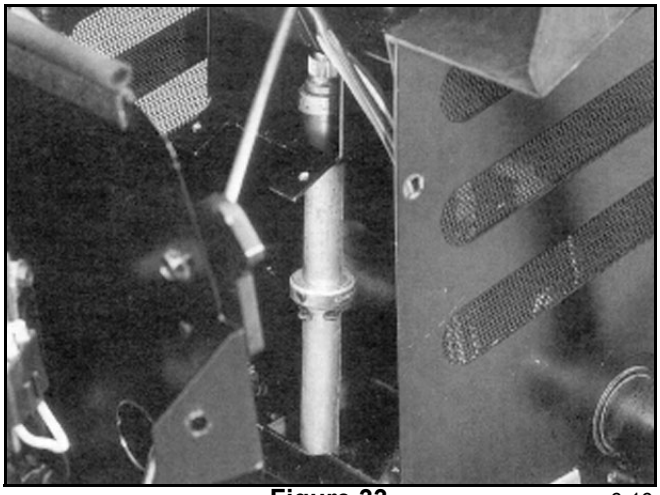


Figure 33 6-16

10. Lift the steering shaft upwards, out of the lower bushing and through the opening in the mounting bracket. Tilt the shaft towards the front of the tractor and remove it (Figure 34).

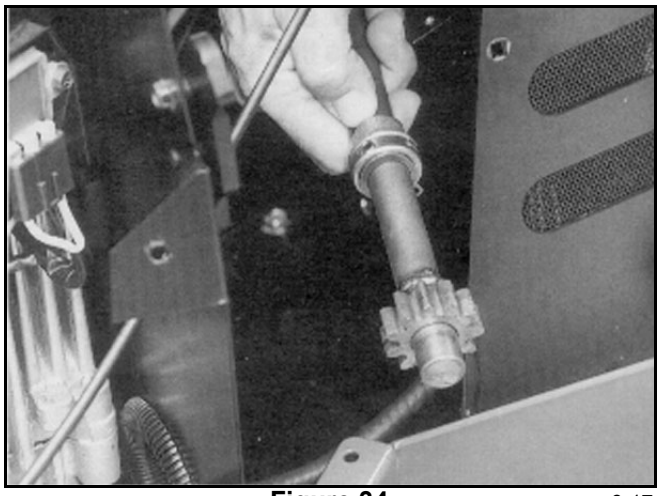


Figure 34 6-17

11. Remove the shims from the top of the lower bushing and set aside for installation process (Figure 35). **Important:** Check the bushing, shaft, and gears for wear and replace with new parts if necessary. Refer to “Steering Specifications” on page 2 - 15.

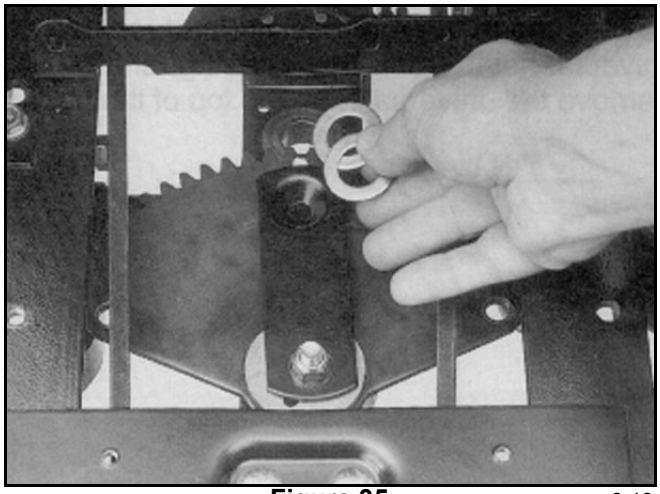


Figure 35 6-18

Steering Gear Assembly

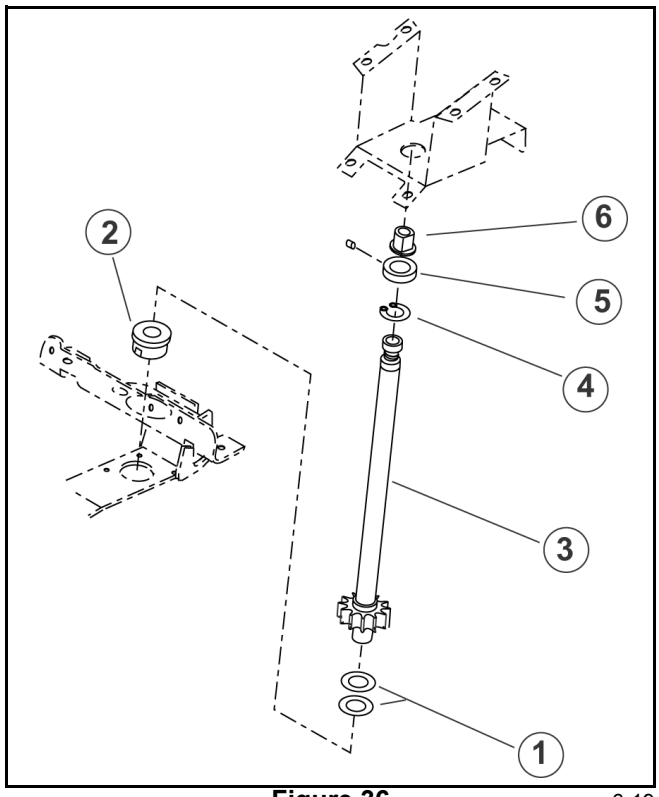


Figure 36 6-19

(1)	Shims	(4)	Snap Ring
(2)	Lower Bushing	(5)	Locking Collar
(3)	Steering Gear Shaft	(6)	Mid Bushing

1. Place two 0.05” (1.27mm) shims,1, between the top of the bushing, 2, and the steering gear shaft, 3.

   Note: Lubricate the bushing with never seize lubricant during assembly.

2. Align the front wheels so that they face straight ahead.

3. Install snap ring, 4; locking collar, 5; and upper bushing, 6, onto the steering gear shaft.

4. Insert the steering gear shaft through the opening in the mounting bracket and onto the lower bushing.

   Note: The shims must be in place.

5. Move the locking collar upward on the shaft until it touches the column support mid bushing. Tighten the collar set screw, then move the snap ring upward on the shaft until it meets the bottom of the locking collar (Figure 36).

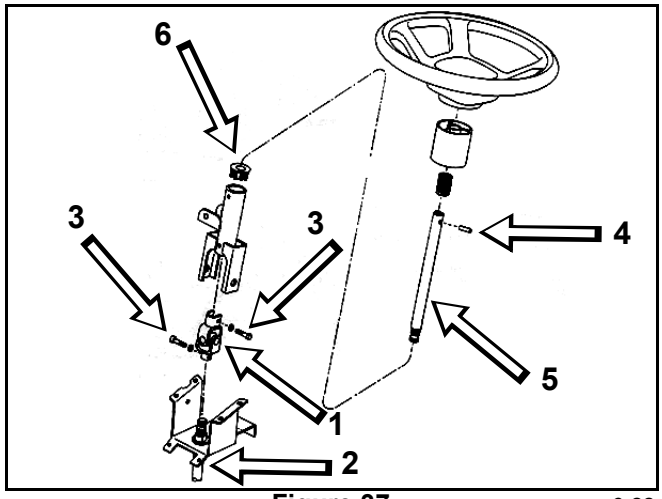


Figure 37 6-22

(1)	Universal Joint	(4)	Roll Pin
(2)	Lower Steering Gear Shaft	(5)	Upper Steering Shaft
(3)	Retaining Bolts	(6)	Steering Bushing

6. Tilt steering to the rear position and place the universal joint,1, onto the top end of the lower steering gear shaft, 2. Install the retaining bolt, 3, of the universal joint through the joint and steering gear shaft.

7. Place upper steering shaft, 5, onto the upper end of the universal joint,1. Position the upper steering shaft so that the roll pin hole runs perpendicular (90°) to the tractor’s center line. Install the retaining bolt, 3, through the upper end of the universal joint and upper steering shaft.

   Note: Ensure that electrical wiring can not come into contact with upper steering shaft of universal joint in any position.

8. Install the rubber boot over the steering shaft and console (Figure 38).

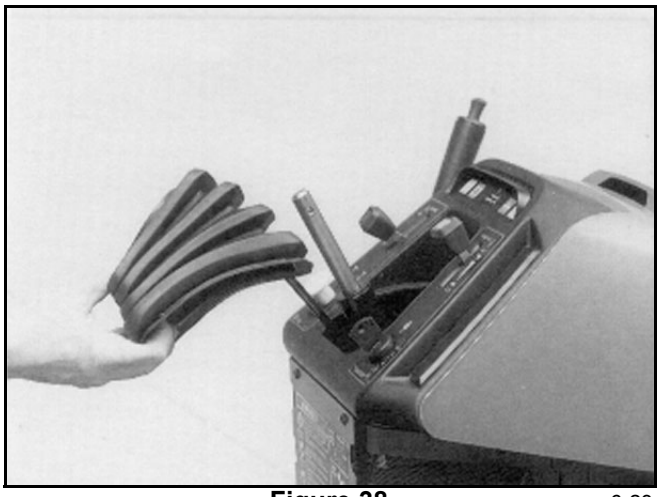


Figure 38 6-23

9. Place the spring, spacer and steering wheel on the steering shaft and install the roll pin. (**Note:** Some steering wheels are secured with a retaining nut and washer located under the center cover of the steering wheel.) Install the relay bracket, fuse block, battery tray, and battery.

   Important: Ensure that all hardware is securely fastened, that the steering wheel is centered when the wheels are straight ahead, and that the steering operates properly.

   Note: Ensure that electrical wiring can not come into contact with upper steering shaft of universal joint in any position.

Sector Gear Disassembly

1. Remove the battery and plastic battery tray from the tractor. Disconnect both steering tie rods from the sector gear. Using the access hole in the mounting bracket, remove the locknut and carriage bolt holding the sector in place (Figure 39).

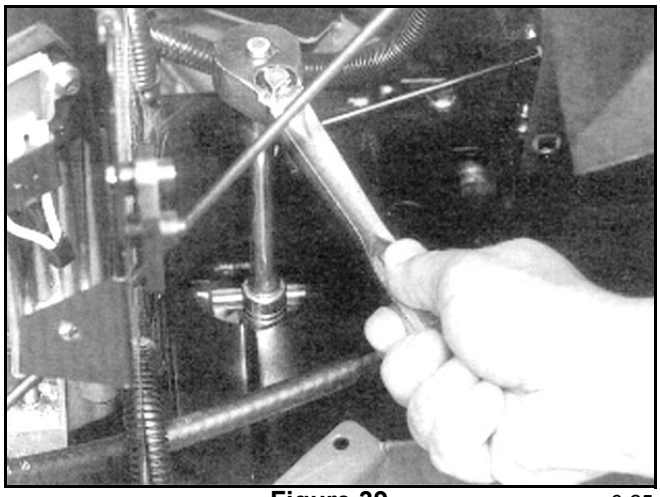


Figure 39 6-25

2. Remove the locking plate from the top of the sector gear (Figure 40).

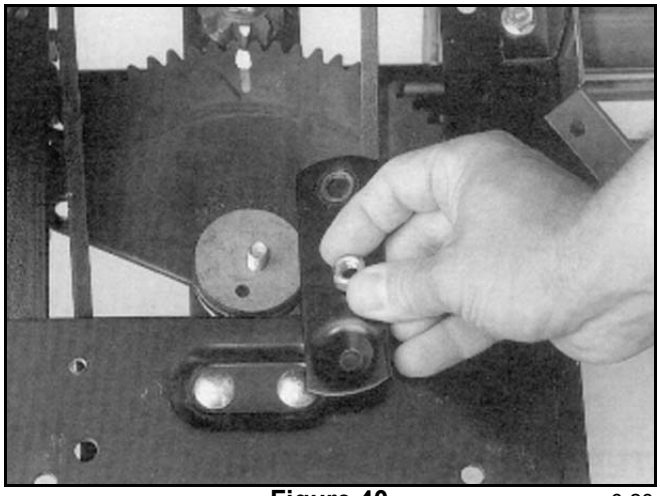


Figure 40 6-26

3. Remove the cam bushing, 3, from the sector gear. Separate the sector gear, 2, from the mounting bracket (Figure 41).

   Important: Inspect the sector gear teeth and cam bushing for wear and replace if necessary.

Sector Gear Assembly

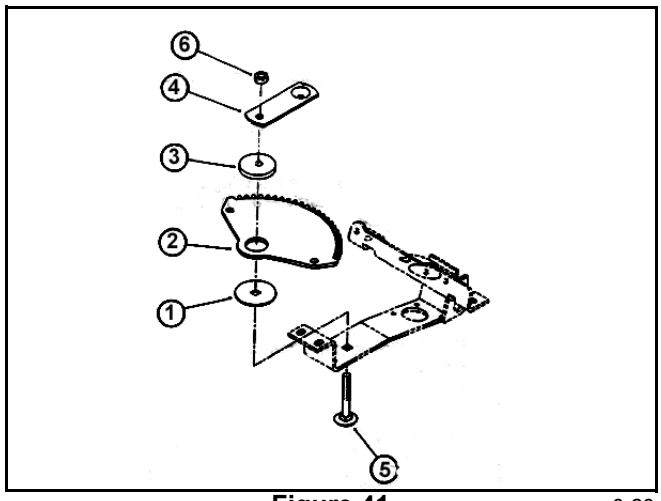


Figure 41 6-28

(1) Washer Bearing	(4) Locking Plate
(2) Sector Gear	(5) Carriage Bolt
(3) Bushing	(6) Locknut

1. Install the bearing washer, 1, on the mounting bracket (Figure 41).

2. Place the sector gear, 2, on top of the bearing washer with the teeth facing the rear of the tractor (Figure 41).

3. Center the steering shaft with the sector gear (Figure 42). Make sure the steering wheel is centered.

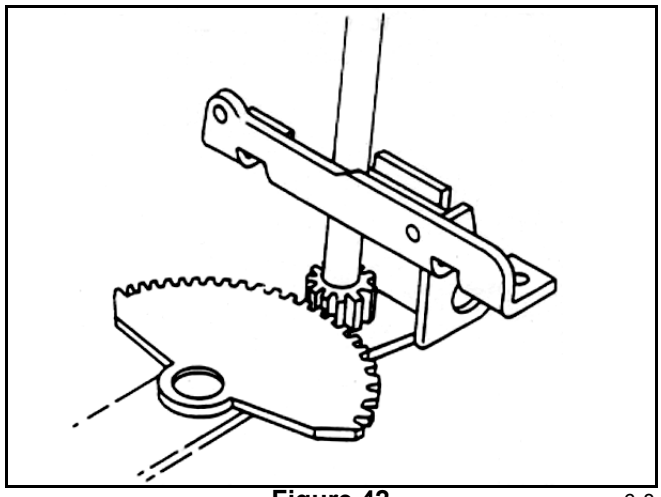


Figure 42 6-8

4. Insert the cam bushing, 3, into the bore of the sector gear (Figure 41).

5. Place the locking plate, 4, on the cam bushing (Figure 41).

6. From the bottom, insert the carriage bolt, 5, through the bearing washer, cam bushing, and the locking plate. Secure the bolt with the locknut, 6 (Figure 41).

7. Adjust the steering gear, refer to “Steering Backlash Adjustment” on page 2 - 6.

8. Fasten both steering arms onto the sector gear. Check wheel alignment and toe-in.

Tilt Steering

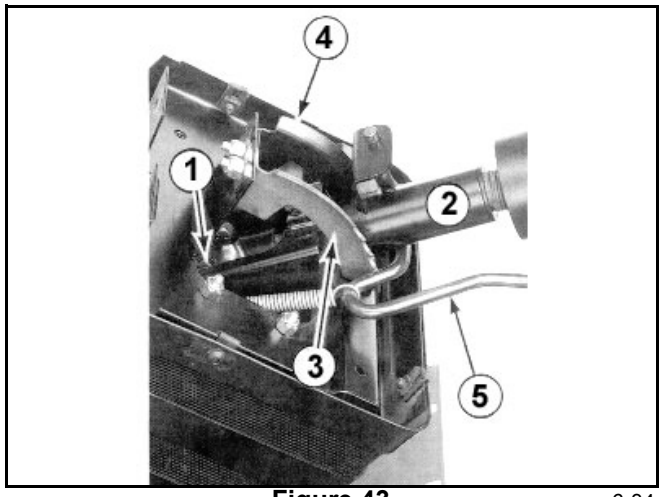


Figure 43 6-34

Description

The tilt steering assembly is made up of the following components (Figure 43):

1. Universal joint.

2. Steering column (bushing mounted).

3. Detent bracket (left side).

4. Support bracket (right side).

5. Spring-loaded control handle.

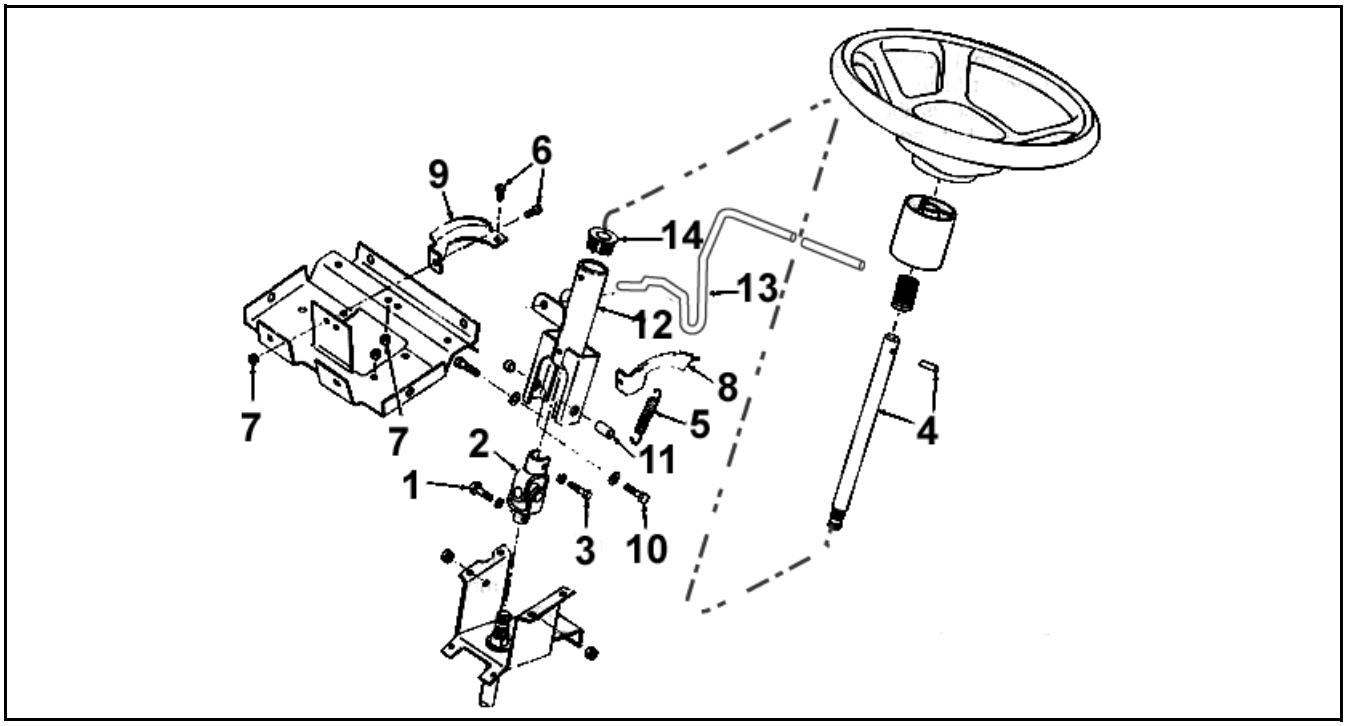


Figure 44 6-35

(1) Retaining Bolt (2) Universal Joint (3) Retaining Bolt (4) Upper Steering Shaft and Roll Pin (Note: Some units have retaining nut and washer located in the center steering wheel cover.)	(5) Spring Extension (6) Bolts (7) Nuts (8) Detent Bracket (9) Support Bracket (10) Retaining Bolt (11) Spacer-Yoke (12) Column (13) Tilt Lever (14) Steering Bushing

Tilt Steering Disassembly

1. Remove the roll pin, steering wheel, spacer, and spring from top of the steering shaft (Figure 45). (Note: Some units use a retaining nut and washer located under the center cover of the steering wheel.)

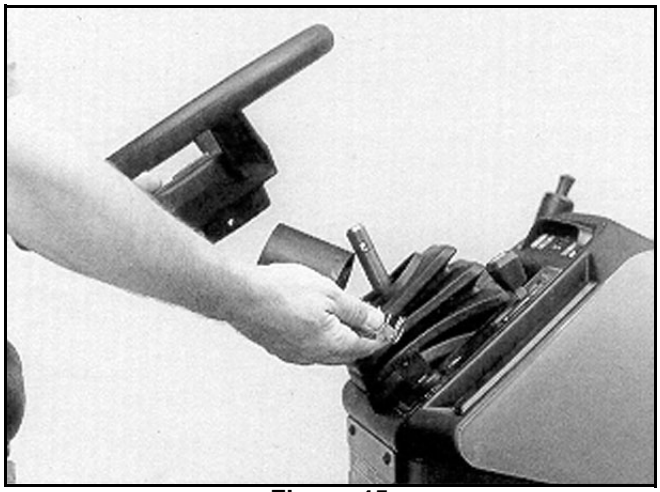


Figure 45 6-9

2. Remove the rubber boot from the steering console (Figure 46).

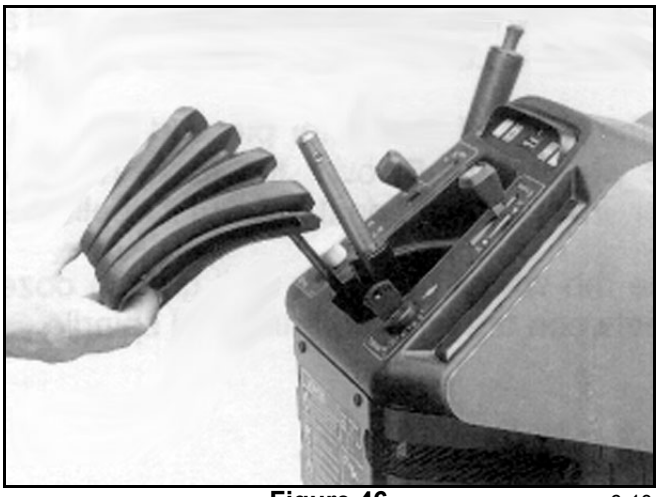


Figure 46 6-10

3. Remove the bottom retaining bolt, 1, from the universal joint, 2 (Figure 44).

4. Remove the top retaining bolt, 3, from the universal joint and disconnect the top steering shaft, 4, from the tractor (Figure 44).

5. Tilt steering to the rear position and detach the universal joint from the steering gear shaft. Take the universal out of the tractor from the top side.

6. Remove the spring, 5, from the left pivot spacer and tilt control handle (Figure 44).

7. Remove the four bolts, 6, and nuts, 7, from the left and right support brackets, 8, and 9, and remove the brackets (Figure 44).

8. Remove the two side pivot bolts, 10, and spacers, 11, from the steering column. Lift the column, 12, out of the tractor (Figure 44).

9. Slide the tilt control handle, 13, off the steering column bracket (Figure 44).

10. Remove the bushing, 14, from the top of the steering column (Figure 44).

    Important: Inspect all bushings and pivot areas for wear and replace as necessary. Refer to “Steering Specifications” on page 2 - 15.

Tilt Steering Assembly

1. Place bushing, 14, on top of the steering column (Figure 44).

2. Insert the tilt control handle, 13, into the steering column bracket (Figure 44).

3. Secure the steering column to the mounting bracket with pivot bolts, 10; spacers, 11; and locknuts (Figure 44).

    Note: The longer spacers should be positioned on the left-hand side.

4. Install the left, 8, and right, 9, support brackets. Fasten the notched bracket to the left side using four bolts, 6, and nuts, 7. Adjust the brackets to obtain minimal side play between the column and brackets (Figure 44).

5. Attach the spring, 5, to the tilt handle and left pivot spacers (Figure 44).

6. Tilt steering to its farthest rearward position and place the universal joint, 2, on the steering gear shaft. Pass the bottom bolt, 1, of the universal joint through the universal and steering gear shaft and secure (Figure 44).

7. Insert the top steering shaft, 4, onto the upper end of the universal joint. Check the front wheel alignment, wheels should be straight ahead. Position the steering shaft so that the roll pin hole, (if the steering wheel is retained by a roll pin), runs perpendicular (90º) to the tractor's center line. Install the retaining bolt, 3, through the upper end of the universal joint and steering shaft (Figure 44).

    Note: Ensure electrical wiring can not come into contact with upper steering shaft or universal joint in any position.

8. Install the rubber boot over the steering shaft and console (Figure 47).

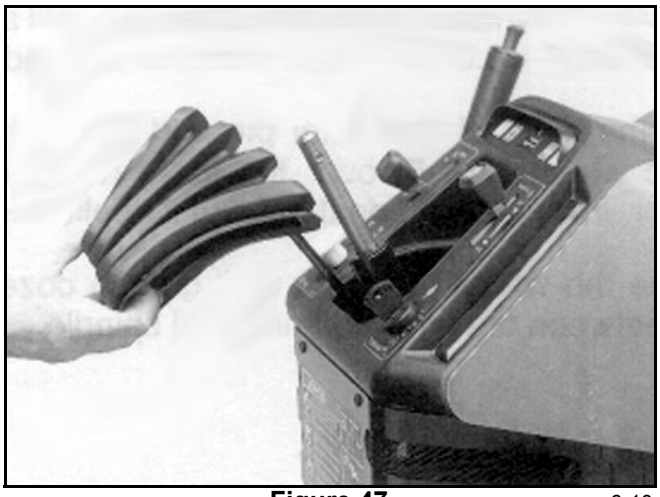


Figure 47 6-10

9. Place the spring, spacer, and steering wheel on the steering shaft. Secure the steering wheel with a roll pin or with the washer and nut as applicable (Figure 48).

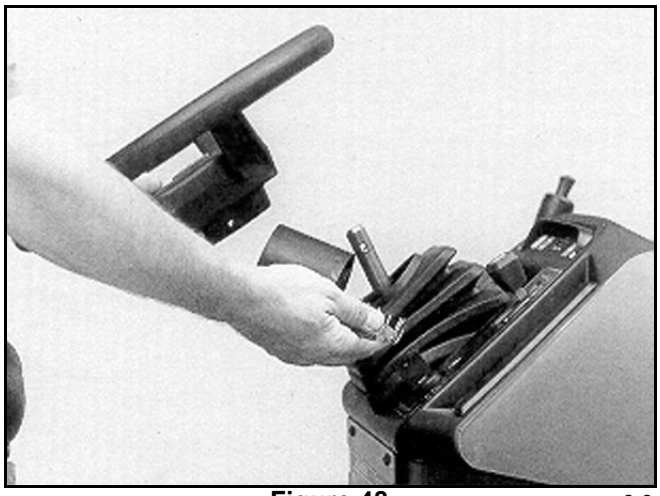


Figure 48 6-9

Steering Specifications

Item	Specification
Free Play – front axle pivot pin	0 – 0.015” (0 – 0.4mm)
End Play – wheel to spindle	0 – 0.015” (0 – 0.4mm)
Toe-In	1/8” – ¼” (3 – 6mm)
Steering Wheel Free Play	0.5” – 1.0” (13 – 25mm)
Steering Shaft Bushings (standard dimensions)	
Top (Fiber)	ID 0.752 – 0.756” (19.1 – 19.2mm) OD 1.310 – 1.320” (33.3 – 33.5mm)
Mid (Metal)	ID 0.755 – 0.760” (19.2 – 19.3mm) OD 0.988 – 1.00” (25.3 – 25.4mm)
Bottom (Metal)	ID 0.753 – 0.758” (19.1 – 19.2mm) OD 1.380 – 1.385” (35.0 – 35.2mm)

Hood Removal

1. Disconnect the headlight wiring harness (Figure 49).

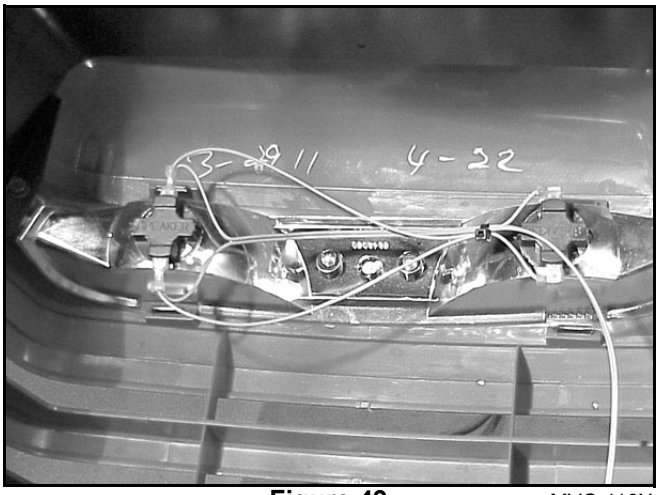


Figure 49 MVC-116X

2. Remove the bolts and nuts located at the bottom of the hood (Figure 50).

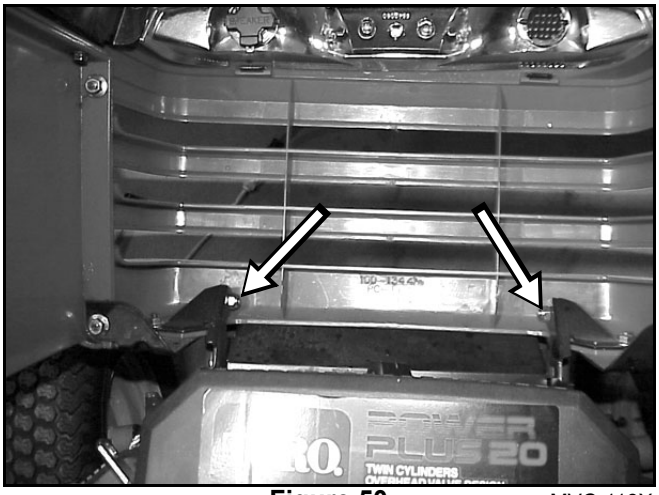


Figure 50 MVC-118X

3. Reinstall the hood in reverse order.

Seat and Fender Removal

1. Unplug the seat switch, and if equipped with KeyChoice™ Reverse operating system, unplug the KeyChoice™ switch (Figure 51).

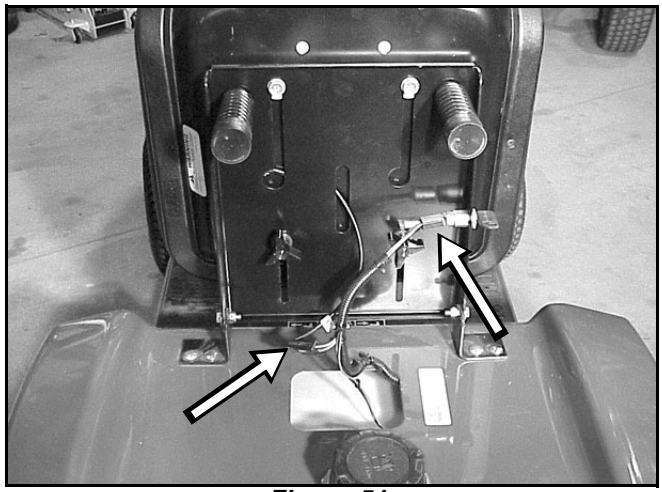


Figure 51 MVC-121X

2. To make it easier to remove the fasteners for the fender assembly, jack the tractor up in the rear and remove both rear tires.

3. Remove the two rear carriage bolts, washers, and nuts located in the rear of the fender assembly (Figure 52).

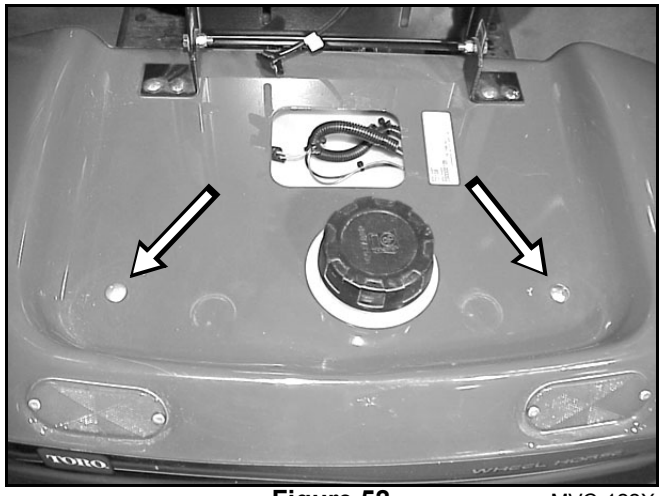


Figure 52 MVC-122X

4. Remove the four carriage bolts, washers, and nuts, (two on the right and two on the left), that are located between the footrest and fender (Figure 53).

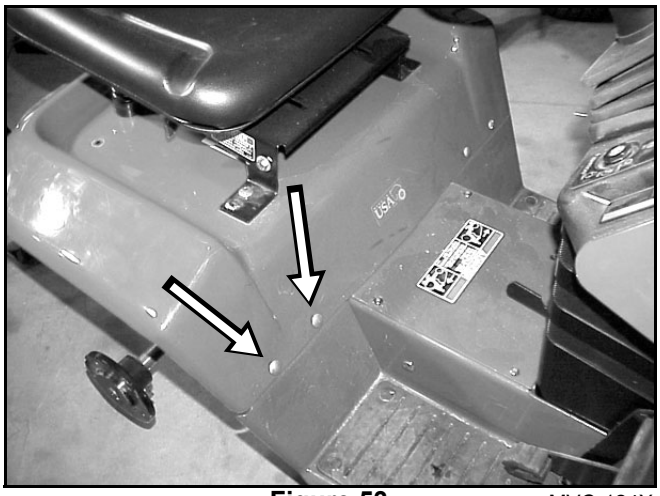


Figure 53 MVC-124X

5. Remove the seat and fender together as one piece (Figure 54).

Figure 54 MVC-126X

6. Installation - follow the removal procedure in reverse.

Gas Tank Removal

1. Follow the procedure for removing the rear fender and seat.

2. Remove the two screws and spacers in the front of the gas tank (Figure 55).

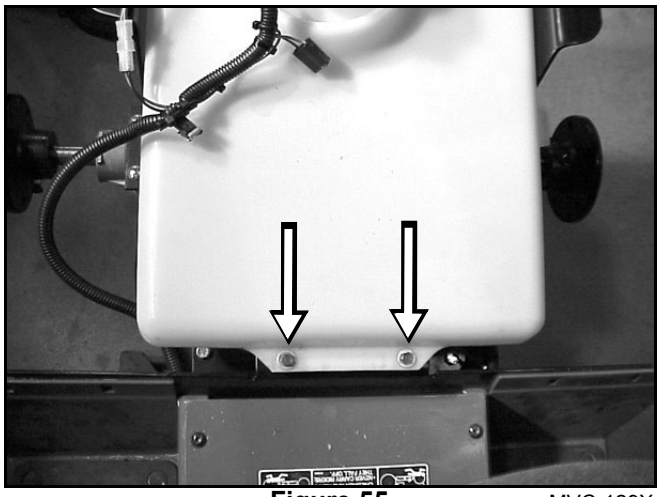


Figure 55 MVC-129X

3. Lift the gas tank from the frame, close the gas shut-off valve, and disconnect the gas line from the shut-off valve (Figure 56).

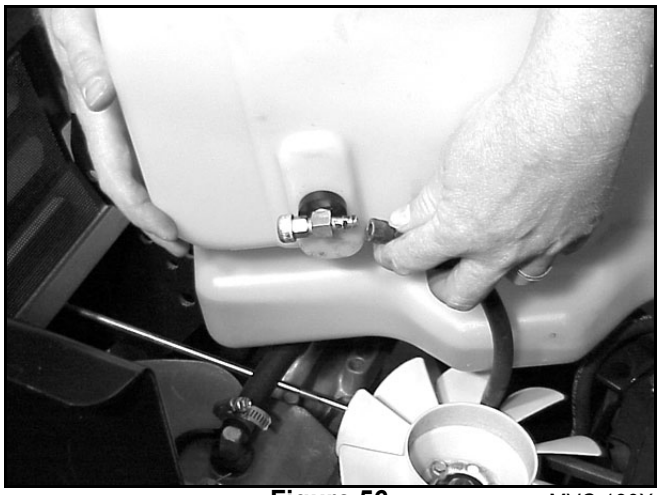


Figure 56 MVC-130X

4. Carefully remove the gas tank.

5. Installation - reverse the order of removal.

Lift Lever Linkage

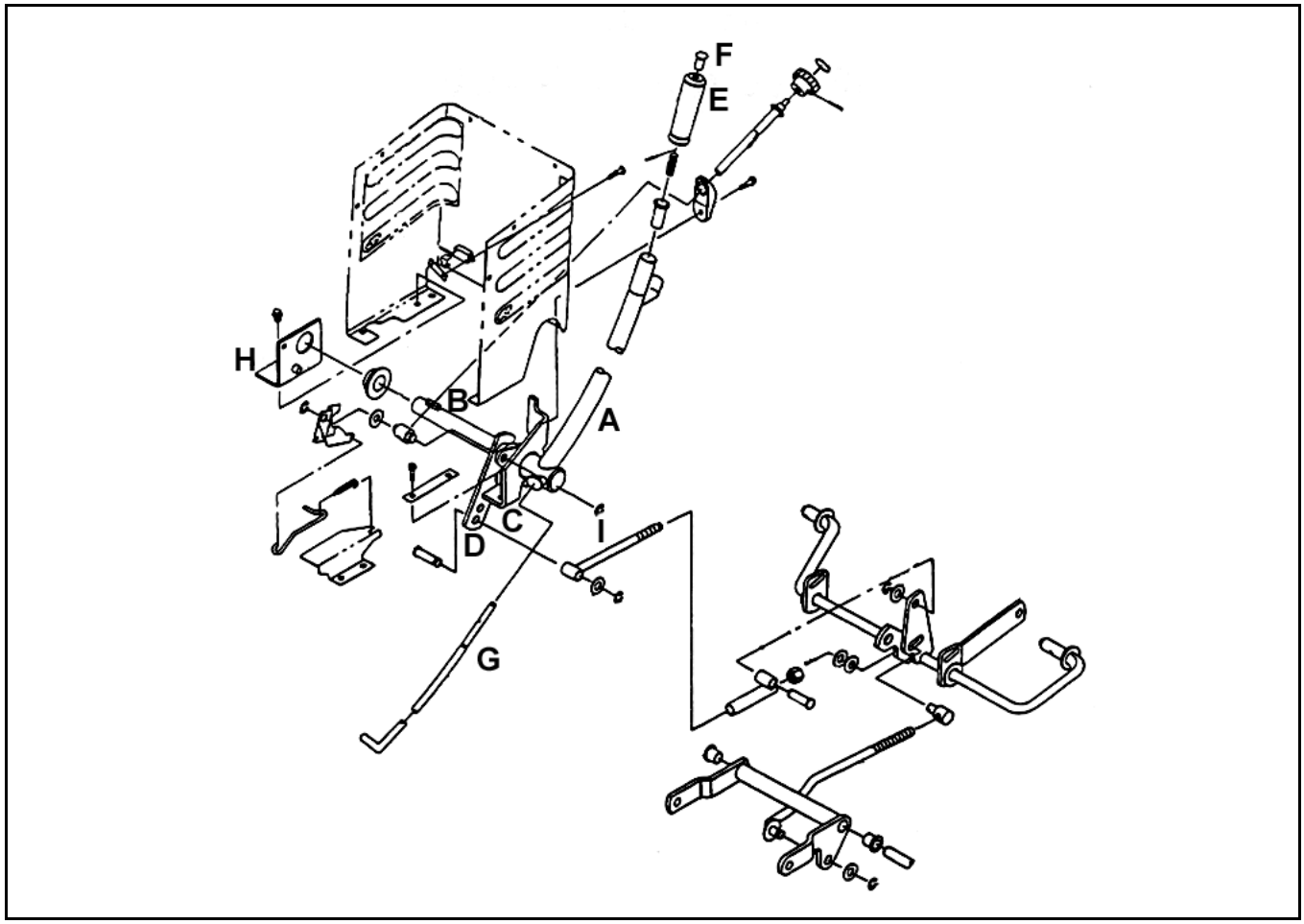


Figure 57 7-1

(A) Lift Lever (B) Lift Arm Cross-Shaft (C) Mounting Bracket (D) Control Arm (E) Handle Grip	(F) Tip Rod Button (G) Lift Lever Rod (H) Pivot Linkage Bracket (I) Lift Rod

The main components of the lift lever weldment are the:

- Lift Lever, A
- Lift Arm Cross-Shaft, B
- Mounting Brackets, C and H
- Control Arm, D

The mounting brackets, C and H, secure the lift weldment to the tractor frame and hold the lift arm cross shaft, B, in place.

Handle Grip, E; spring-loaded button, F; and rod, G, is released from its latching socket. This allows the lift lever to rotate with the lift lever cross-shaft.

When the lift lever is returned to the latched position, the spring tension pulls rod, G, back into the latching socket, and the mower deck is secured in the raised position.

Dial-A-Height Linkage

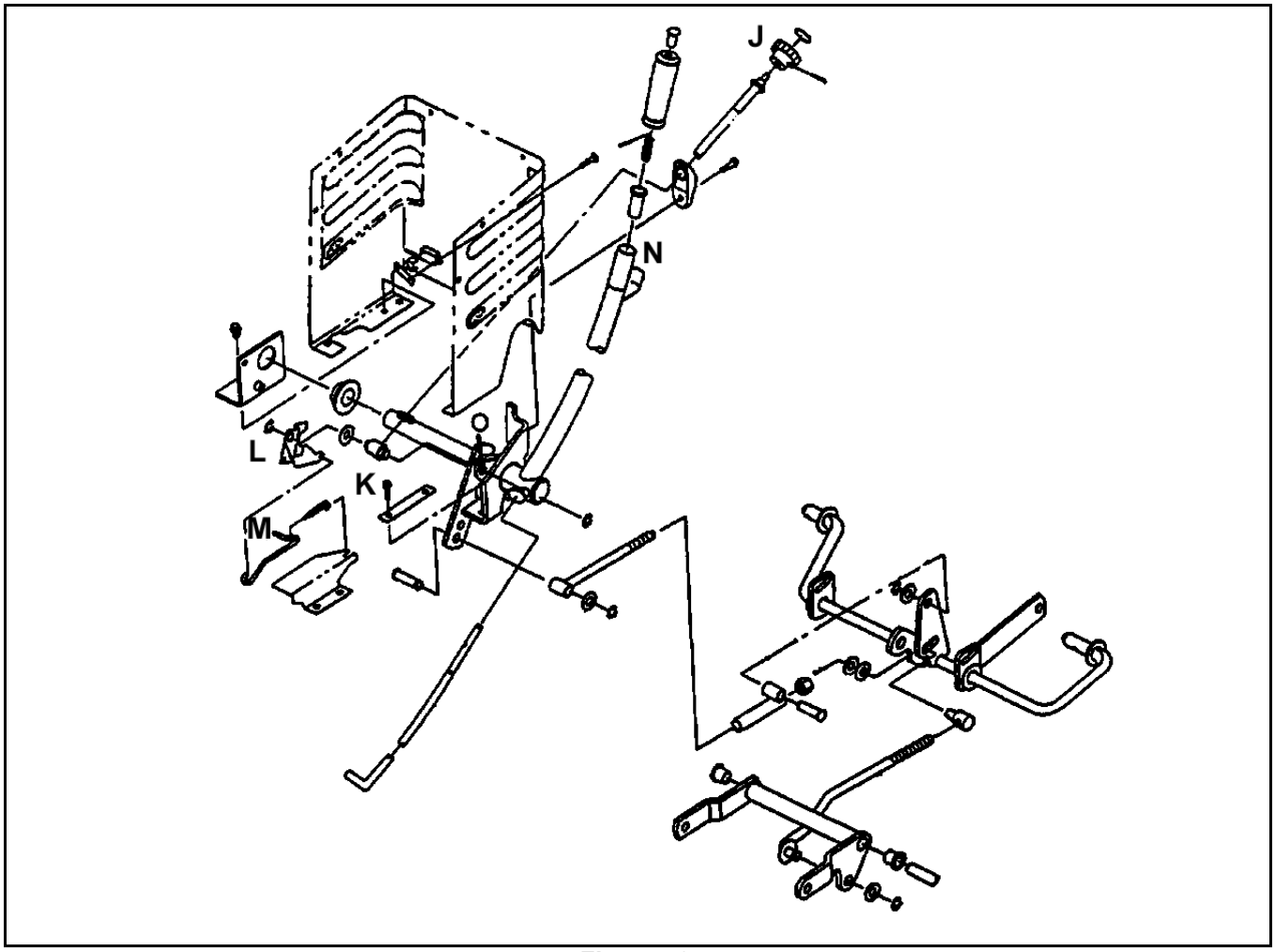


Figure 58 7-2

(J) Knob
(K) Trunnion
(L) Plate-HOC Gauge Bracket
(M) Rod-HOC Indicator Rod
(N) Lift Lever Weldment

The Dial-A-Height knob, J, is threaded through a trunnion, K. A bracket, L, is attached to the trunnion and the spring-loaded Dial-A-Height indicator rod, M. The trunnion is also connected to the lift lever weldment at point N.

As the Dial-A-Height knob, J, is adjusted through the trunnion, K, the trunnion rotates the bracket, L. This moves the Dial-A-Height rod, M.

Note: The Dial-A-Height rod is visible through the center access plate between the fender and the hood console.

At the same time, the trunnion rotates the cross shaft at point, N, on the lift lever weldment, controlling the distance the linkage will lower.

Lift Arm Linkage

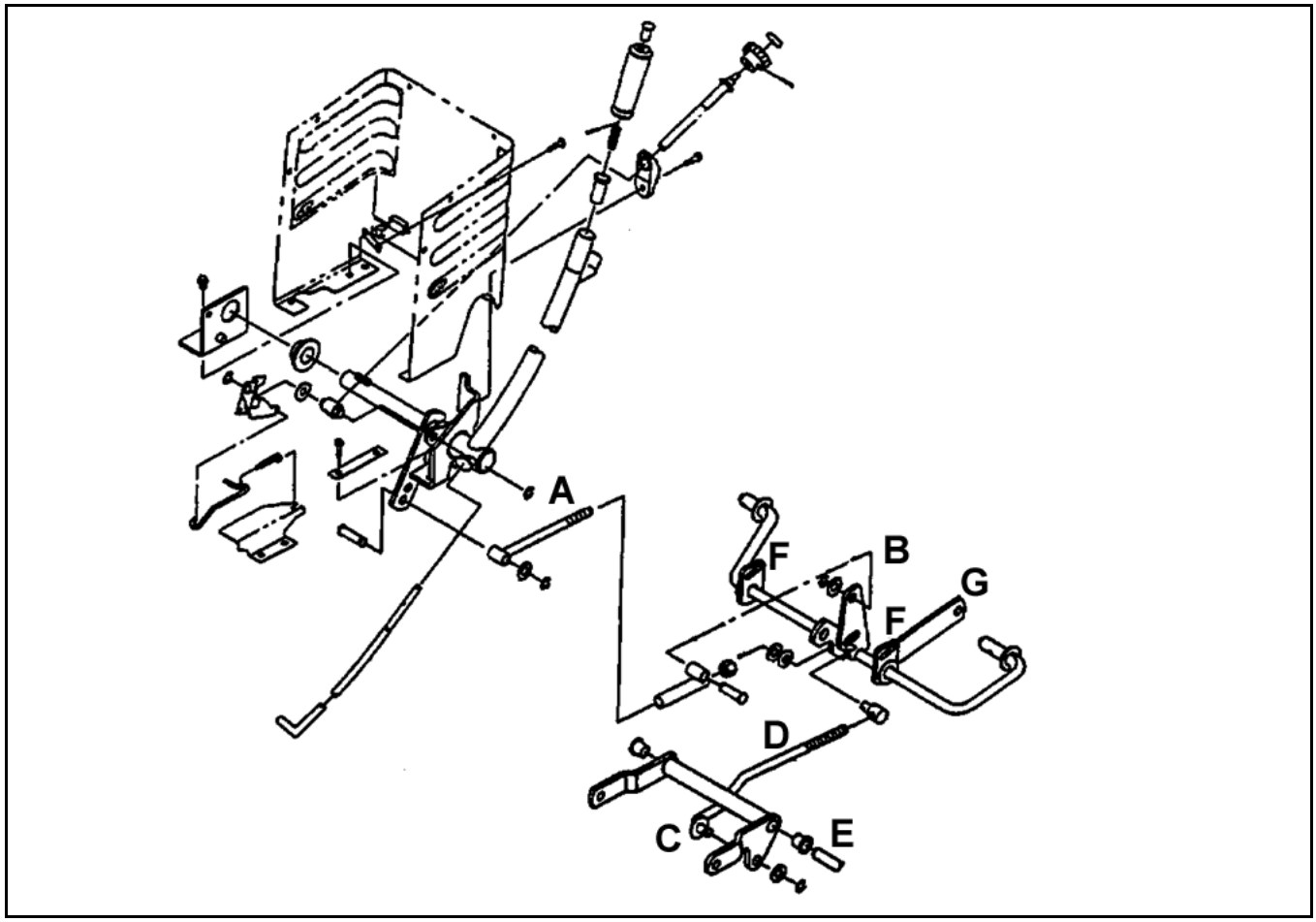


Figure 59 7-3

(A) Rod	(D) Leveling Rod
(B) Rear Lift Arm Assembly	(E) Cross Shaft
(C) Front Lift Arm Assembly	(F) Mounting Brackets

The lift arm linkage is responsible for raising and lowering the attachment and is made up of the following main components:

- Lift rod
- Rear lift arm assembly
- Front lift arm assembly
- Leveling rod
- Cross shaft
- Gauge wheel lift link
- Mounting brackets

The lift rod, A, is connected to the lift lever weldment and the rear lift arm assembly, B. The rear lift arm assembly is attached to the front lift arm assembly, C, by a leveling rod, D. It is also bolted to rear frame hangers at the mounting brackets, F.

The front lift arm assembly, C, is secured to the tractor by a cross shaft, E, which is mounted to the bottom of the footrests. The mower gauge wheel lift link is connected to the rear lift arm assembly at point G.

When the lift lever is moved, the lift rod, A, rotates the rear lift arms, B, through the mounting brackets, F. The gauge wheel lift link (connected to the rear lift arm assembly at point G) raises and lowers with the lift arms.

The front lift arms, C, rotate on the cross shaft, E. Because the front lift arms are connected to the rear lift arm assembly by a leveling rod, D. They also raise and lower with the rear lift arms.

Adjustments

Lift Height

To obtain a positive latch when the lift handle is in the full raised position, turn the ¾" nut on the lift rod, A, to increase or decrease movement of the lift arm assemblies, B and C.

Leveling

To position the two front lift arms parallel to the tractor frame, disconnect the leveling rod, D, from the front lift arms and turn the rod through the trunnion to alter its length. This rotates the front lift arm assembly, C, on the cross shaft, E.

Side to Side

When required, perform a side to side adjustment of the rear lift arms by loosening and repositioning the 9/16" bolts found in the slots of the mounting brackets, F.

Power Lifts

Electrohydraulic Lift (2000 and Prior Models)

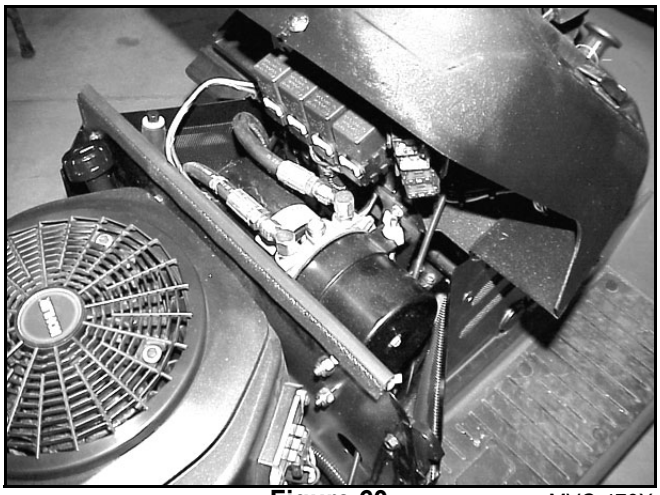


Figure 60 MVC-470X

For information on removal and repair of the Electrohydraulic Lift, refer to Electrohydraulic Lift Service Manual, Form Number 492-0704.

Electric Lift (2001 and Later Models)

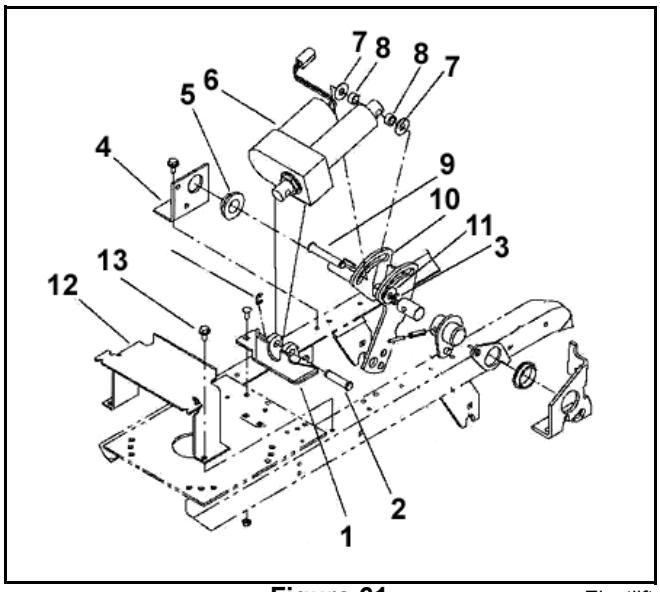


Figure 61 Electlift

(1)	Actuator Bracket Assy.	(8)	Spacer
(2)	Clevis Pin	(9)	Clevis Pin
(3)	E-Ring	(10)	Lift Arm Assembly
(4)	Pivot Bracket Linkage	(11)	Flat Washer
(5)	Flange Bearing	(12)	Battery Bracket
(6)	Actuator	(13)	Screw
(7)	Flat Washer		

Removal

1. Remove the hoodstand side panels to the battery compartment.
2. Disconnect the negative and positive cables from the battery.
3. Remove the screws, 13, from the battery bracket, 12, and remove the battery bracket.
4. Unplug the actuator, 6, from the wiring harness.
5. Remove the e-ring, 3, from the end of the clevis pin, 9.
6. Remove the clevis pin, 9, washers, 7, and spacers, 8.
7. Remove e-ring, 3, and remove clevis pin, 2.
8. Remove the actuator

Installation

Reverse the order of removal.

THIS PAGE INTENTIONALLY LEFT BLANK

Tuff Torq Hydrostatic Transaxle

Internal Service

Internal service information is contained in the Tuff Torq KGIA Transaxle Service Manual, Form 492-0699.

Fluid Change

The Tuff Torq transaxle is factory filled, sealed, and does not require oil changes. However, in the event of oil contamination or degradation, oil replacement may correct certain performance problems. Refer to the Transaxle Service Manual.

Transaxle Removal – Tuff Torq

1. Disconnect the negative battery cable from the battery.

2. Raise the rear of the tractor and remove the right and left rear tires. Support the rear frame, just in front of the transaxle. Remove the fender, seat, and gas tank. (Refer to the “Chassis” section on page 2 - 16.) Remove the center access plate between the fender and hoodstand (Figure 62).

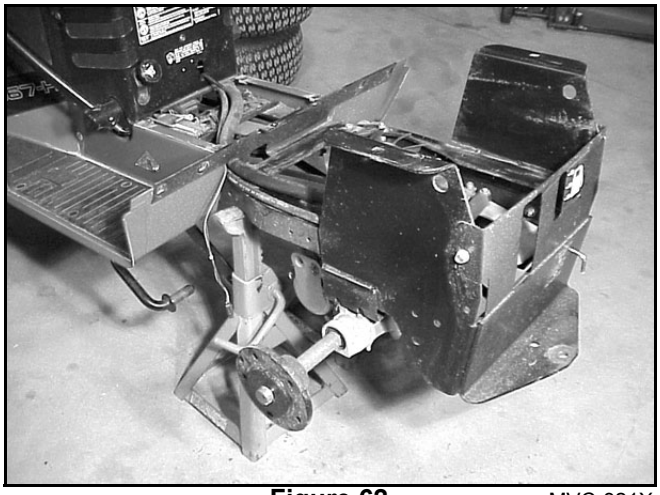


Figure 62 MVC-321X

3. Disconnect the cotter pin and the washer to the brake rod (Figure 63).

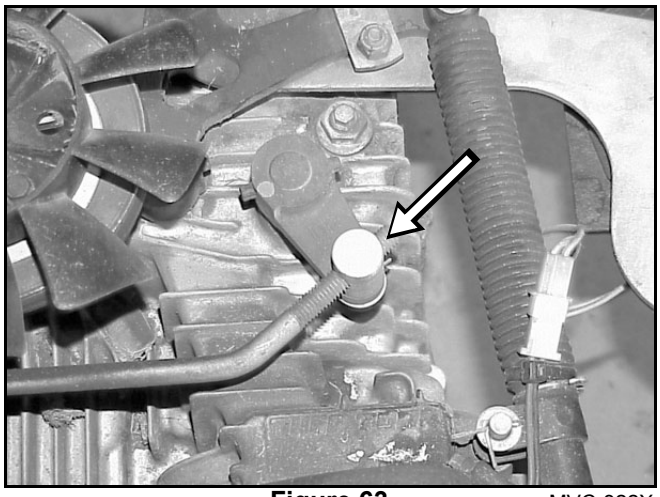


Figure 63 MVC-322X

4. Disconnect the cotter pin for the free wheeling valve rod (Figure 64).

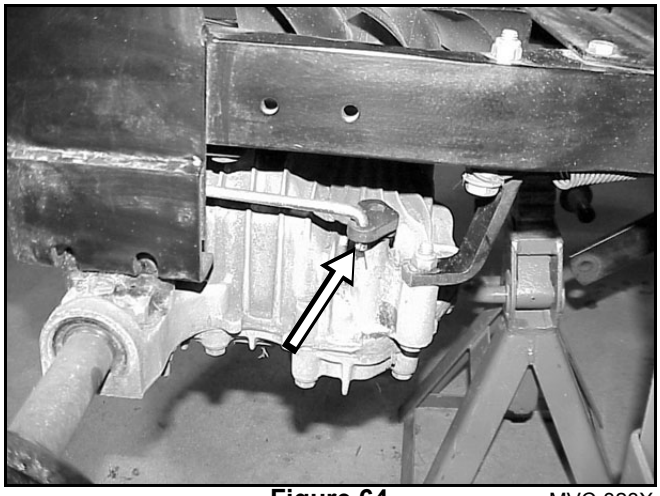


Figure 64 MVC-323X

5. Loosen the hose clamp around the reservoir hose and remove from the top of the transaxle. Clean the area from around the hose before removing (Figure 65).

Figure 65 MVC-324X

6. Unbolt the forward/reverse control rod. Note: This tractor has cruise control and the forward/reverse control rod is disconnected from the cruise plate which is bolted to the control shaft assembly (Figure 66).

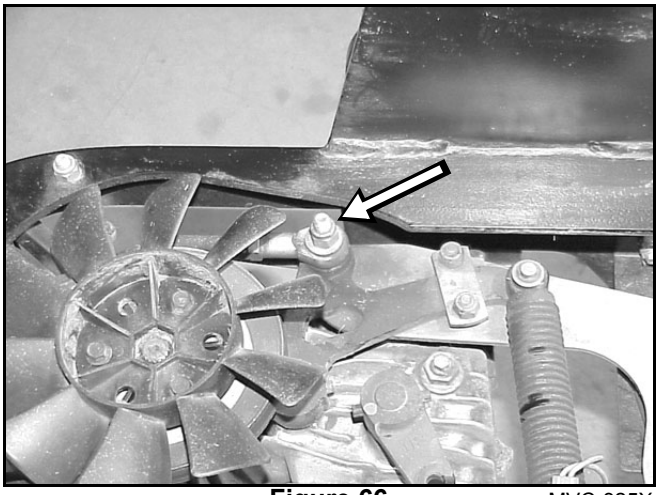


Figure 66 MVC-325X

7. If the tractor is equipped with cruise control, disconnect the plug and jack for the cruise control magnet. Unbolt the cruise control magnet bracket (Figure 67).

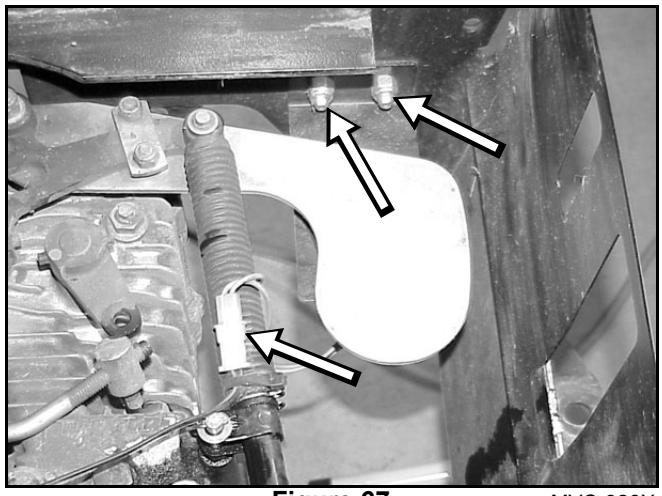


Figure 67 MVC-326X

8. Unhook the idler spring at the bolt and spacer located on the right side of the frame (Figure 68).

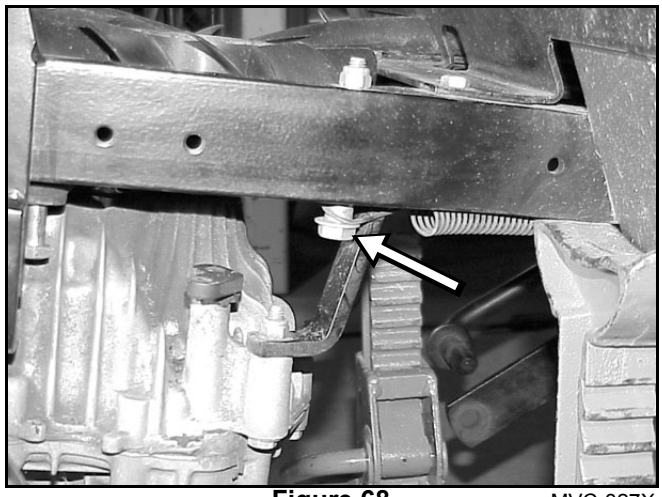


Figure 68 MVC-327X

9. Remove the 3 screws retaining the transaxle fan to the input pulley; this will give you enough clearance to remove the drive belt from the transaxle input pulley (Figure 69).

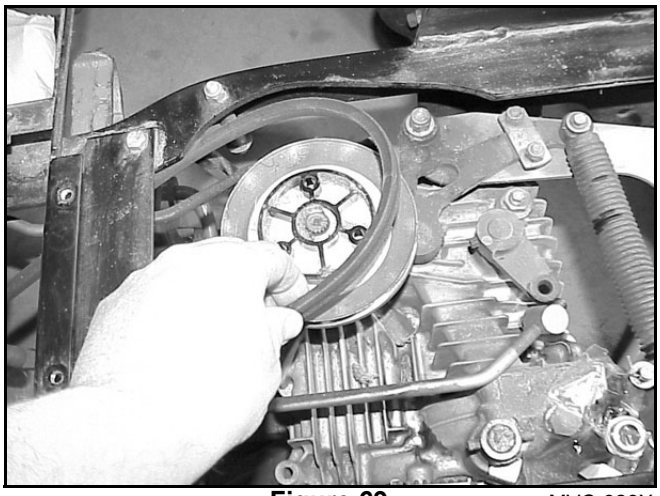


Figure 69 MVC-328X

10. Use a floor jack and put it under the transaxle to help lower the transaxle from the frame (Figure 70).

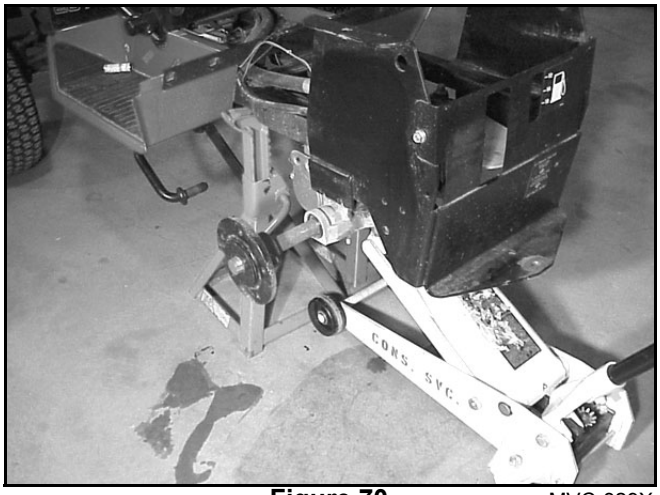


Figure 70 MVC-329X

11. Located on the right front side of the transaxle is a torque strap. Remove the bolt and nut (Figure 71).

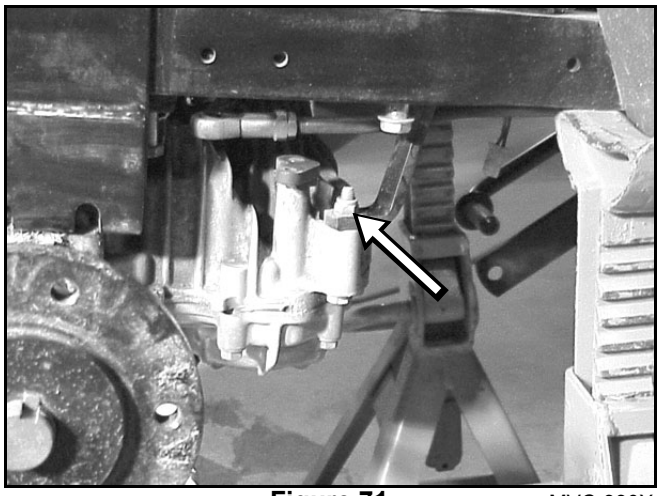


Figure 71 MVC-330X

12. Remove the 4 nuts from the U-bolts which hold the two axle shafts to the frame (Figure 72).

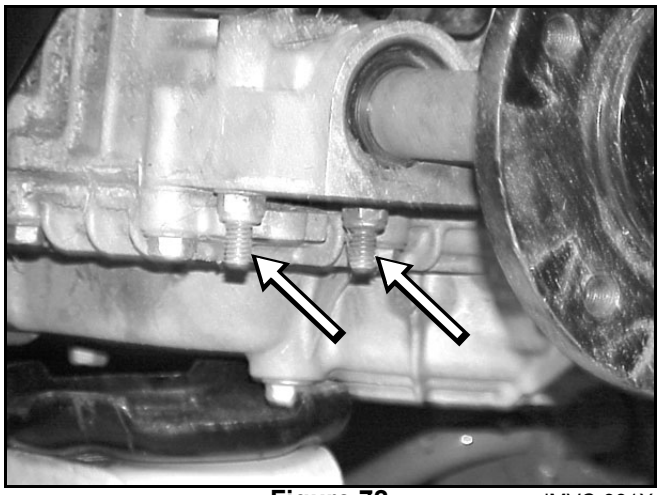


Figure 72 IMVC-331X

13. Slowly lower the transaxle out of the frame (Figure 73).

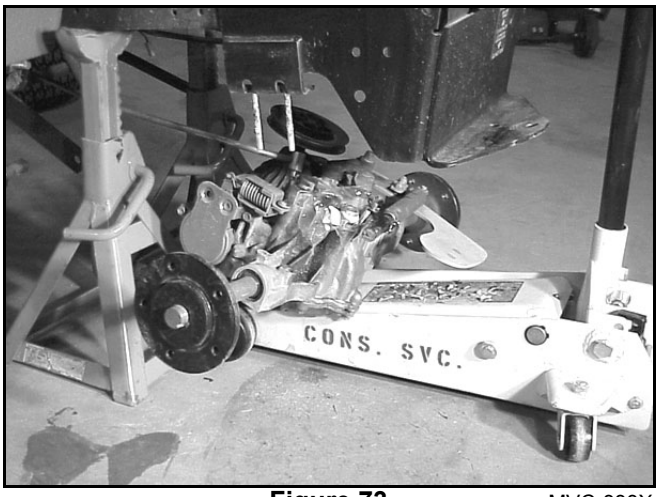


Figure 73 MVC-333X

Installation - Tuff Torq Transaxle

1. Raise the transaxle up toward the frame (Figure 74).

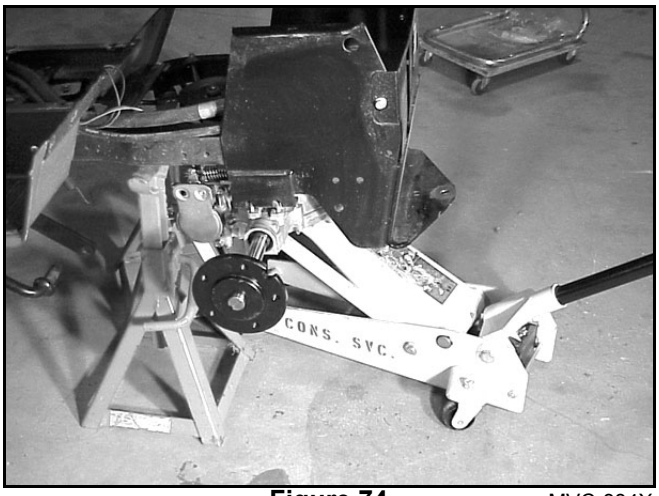


Figure 74 MVC-334X

2. Install the 4 washers and nuts to the U-bolts retaining the two axle shafts to the frame and tighten (Figure 75).

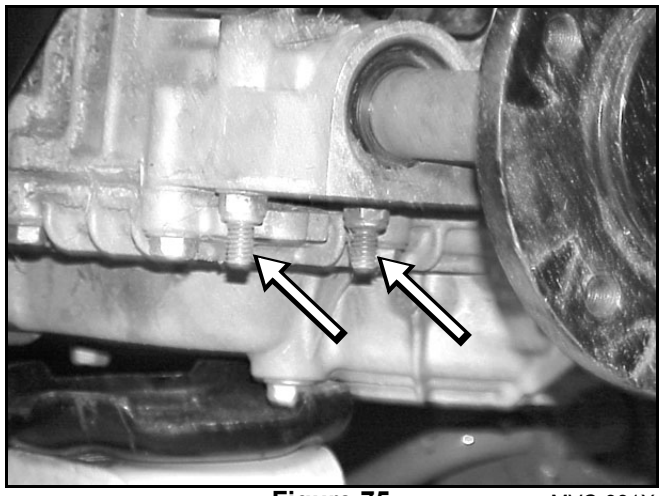


Figure 75 MVC-331X

3. Install the bolt, washer, and nut for the torque strap and tighten (Figure 76).

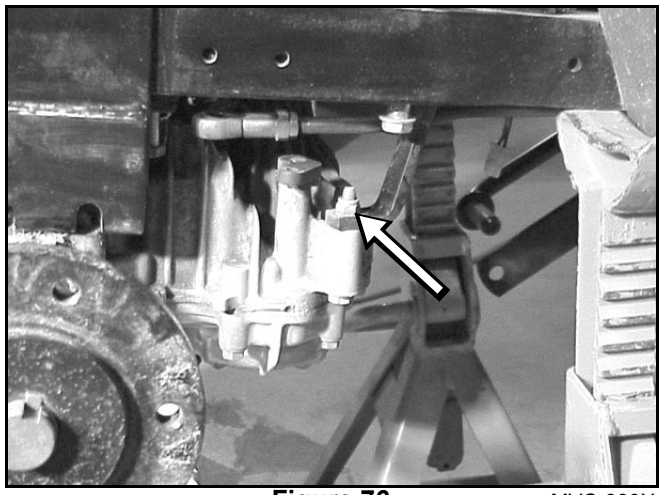


Figure 76 MVC-330X

4. Bolt the forward/reverse control rod to the control shaft assembly (Figure 77).

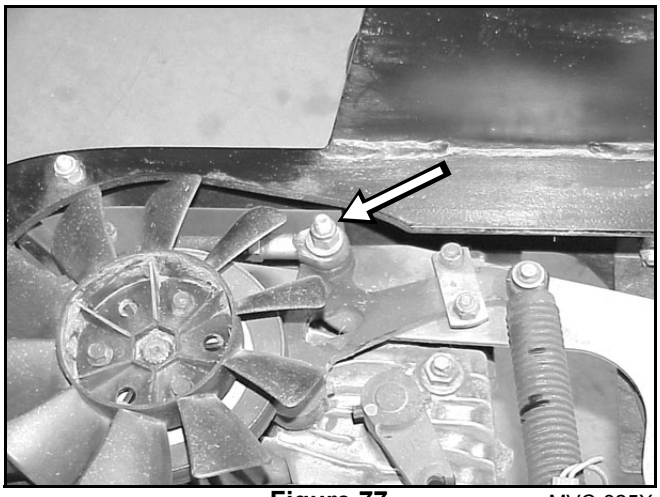


Figure 77 MVC-325X

5. Before installing the brake rod trunnion into the brake control lever, make sure the brake control lever is in its most rearward position and hold it there. Adjust the trunnion on the brake rod until it slips into the brake control lever. Secure with washer and cotter pin (Figure 78).

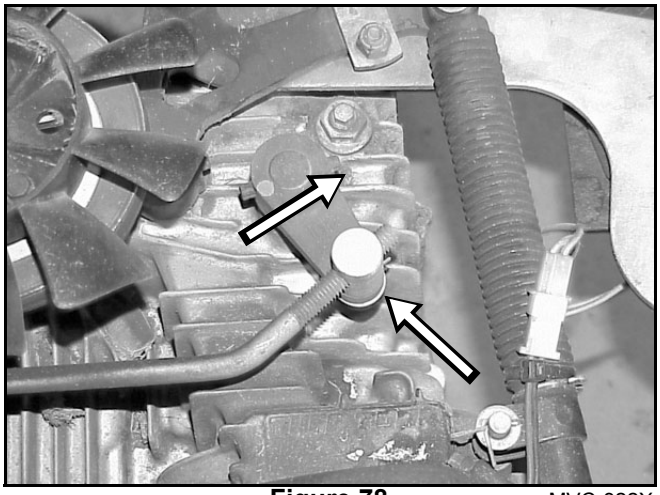


Figure 78 MVC-322X

6. Attach the freewheeling rod to the lever with a cotter pin (Figure 79).

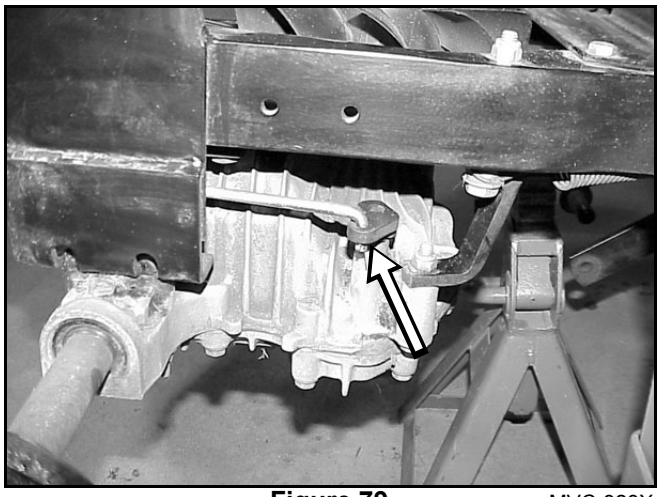


Figure 79 MVC-323X

7. Install the hose clamp and the reservoir hose to the top of the transaxle. Add oil to the reservoir cup located under the front hood to the cold mark, located on the side of the cup (Figure 80).

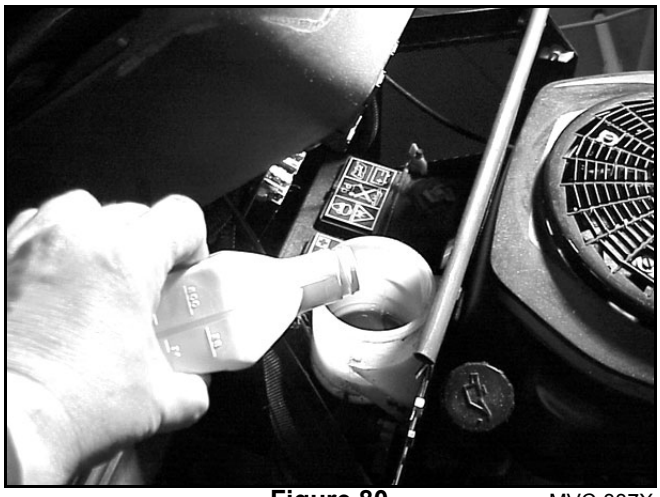


Figure 80 MVC-337X

8. Install the drive belt around the transaxle pulley and also install the transaxle cooling fan with the 3 retaining screws (Figure 81).

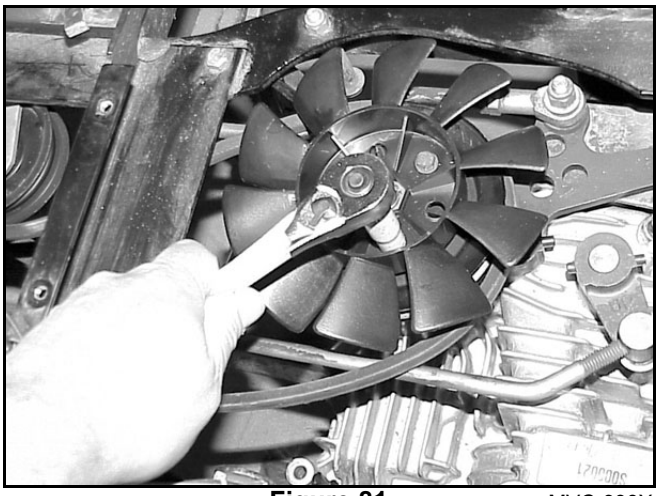


Figure 81 MVC-338X

9. If the tractor has cruise control, reinstall the cruise control magnet bracket and reconnect the plug and jack wiring. Use a tie wrap to tie the wire to the transaxle damper (Figure 82).

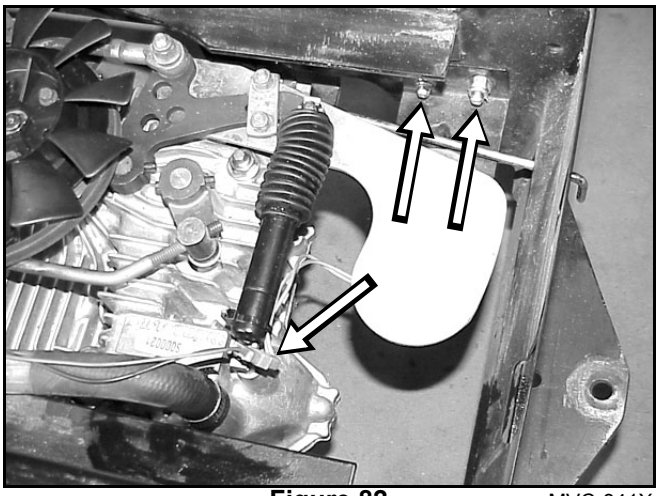


Figure 82 MVC-341X

10. Check the belt routing through the idler pulleys and hook the idler spring at the bolt and spacer located on the right side of the frame (Figure 83).

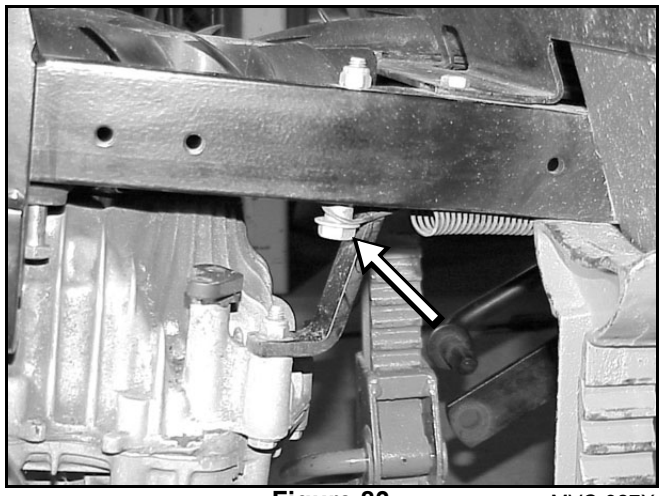


Figure 83 MVC-327X

11. Purging of the transaxle is needed to remove trapped air after repairs. Follow the “Purging Procedures – Tuff Torq Transaxle” on page 3 - 15.

12. Check the neutral adjustment. If the unit needs to be neutralized, follow the procedures, “Neutral Adjustment – Tuff Torq Transaxle” on page 3 - 17).

13. Reconnect the battery negative cable and test operate the tractor, making sure the safety circuits and the tractor are operating properly.

14. Recheck the transaxle oil reservoir level; top off if needed.

Belt Replacement – Tuff Torq Transaxle

Note: Perform belt installation, routing, and inspection procedures from beneath the tractor.

1. Disconnect the negative battery cable. Disconnect the electric PTO clutch wire. There is a tie strap through the frame of the tractor around the clutch wire that needs to be cut to release the clutch wire. Also, remove the battery drain tube from the tie strap (Figure 84).

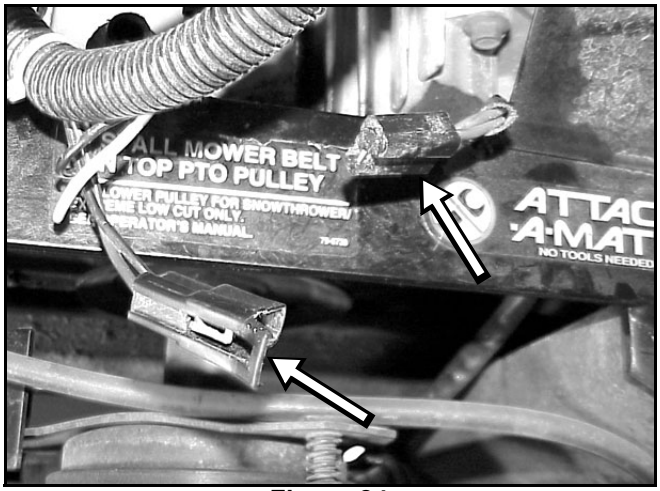


Figure 84 MVC-342X

2. Remove the two steering tie rods from the steering sector gear (Figure 85).

3. Remove the fender, seat, and gas tank (refer to the “Chassis” section on page 2 - 16

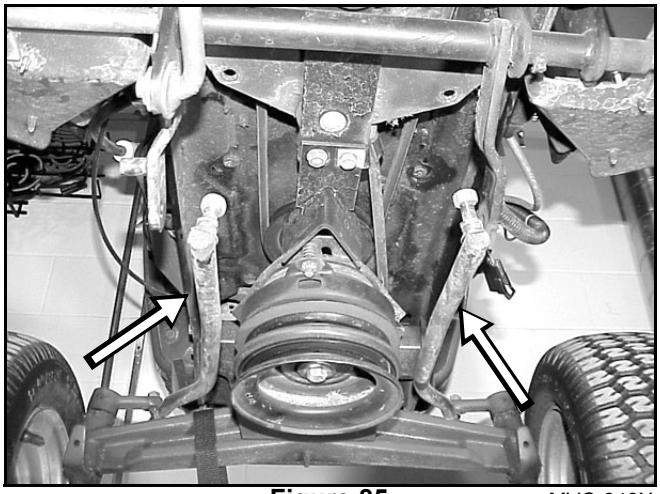


Figure 85 MVC-343X

4. Unhook the idler spring at the bolt and spacer located on the right side of the frame (Figure 86).

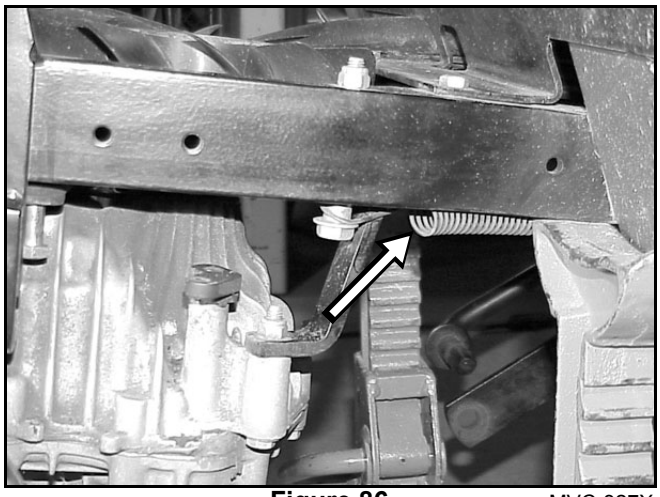


Figure 86 MVC-327X

5. Remove the cotter pin and washer on the brake rod at the transaxle (Figure 87).

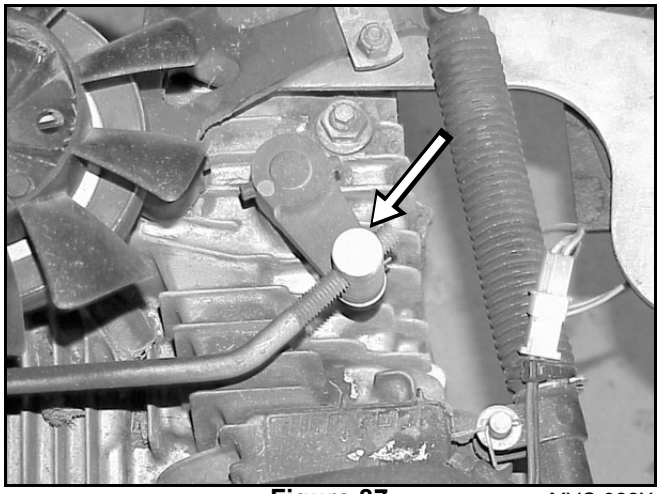


Figure 87 MVC-322X

6. Remove the 3 screws retaining the transaxle fan to the input pulley (Figure 88).

Figure 88 MVC-344X

7. Unbolt the hydrostatic control rod from the forward/reverse control pedal (Figure 89).

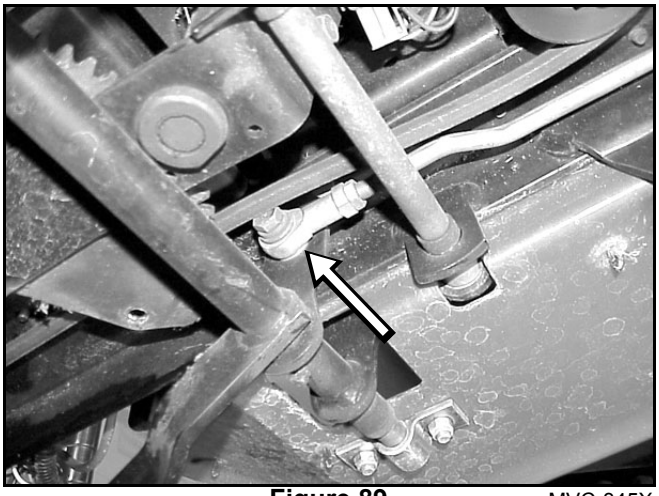


Figure 89 MVC-345X

8. Remove the 2 bolts holding the safety neutral switch bracket (Figure 90).

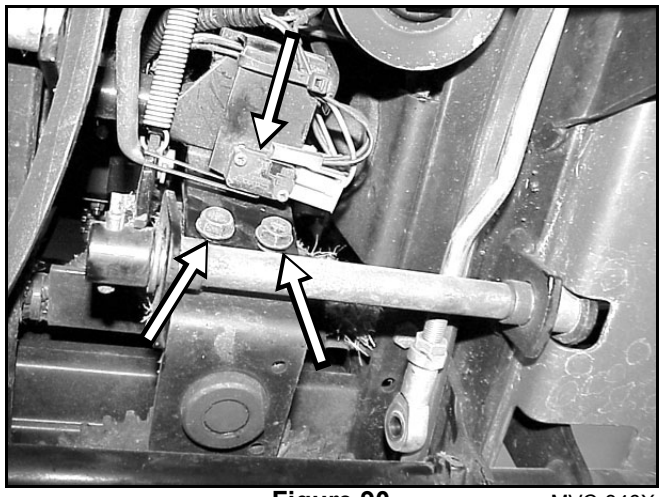


Figure 90 MVC-346X

9. Remove the 2 carriage bolts holding the right-hand footrest to the frame (Figure 91).

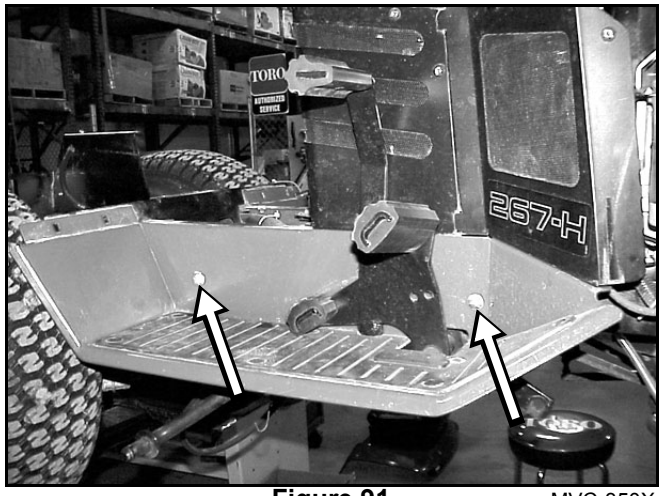


Figure 91 MVC-350X

10. Loosen the left pedal pivot shaft clamp. Remove the right pedal pivot shaft clamp (Figure 92).

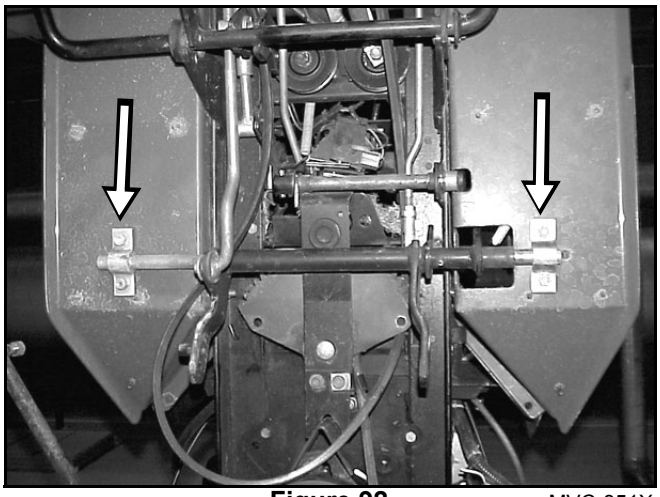


Figure 92 MVC-351X

11. Unhook the brake rod return spring, located under the center access plate (Figure 93).

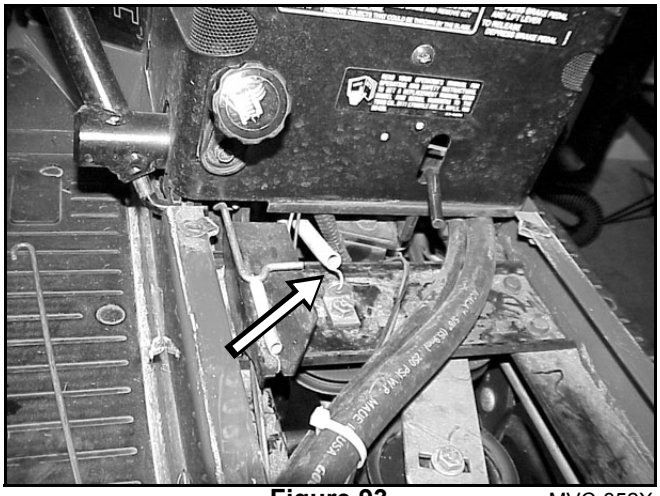


Figure 93 MVC-352X

12. Remove the roll pin holding the brake cross shaft and slide the shaft out to clear the bushing (Figure 94).

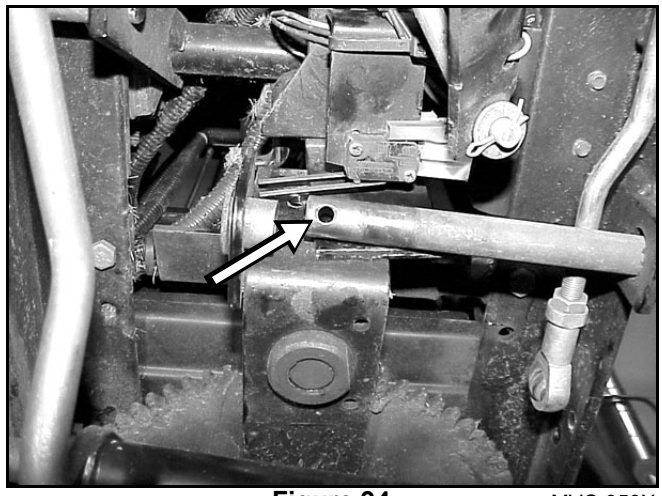


Figure 94 MVC-353X

13. Install the belt around and above the electric clutch. Feed the belt above the steering sector gear and over the brake shaft and pedal pivot shaft (Figure 95).

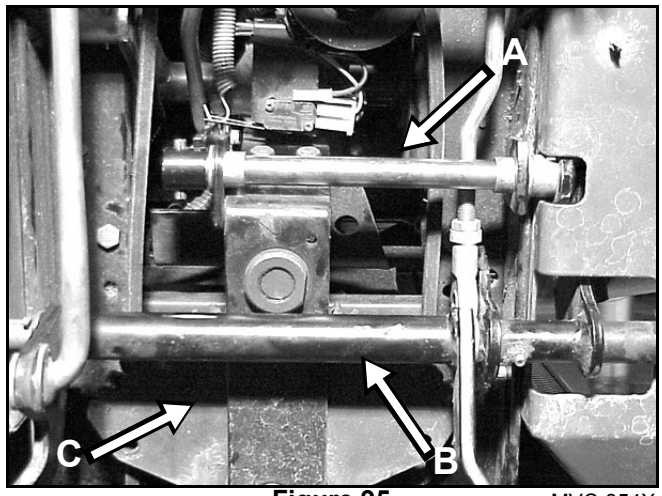


Figure 95 MVC-354X

(A) Brake Shaft (B) Pedal Pivot Shaft	(C) Steering Sector Gear

Belt Routing

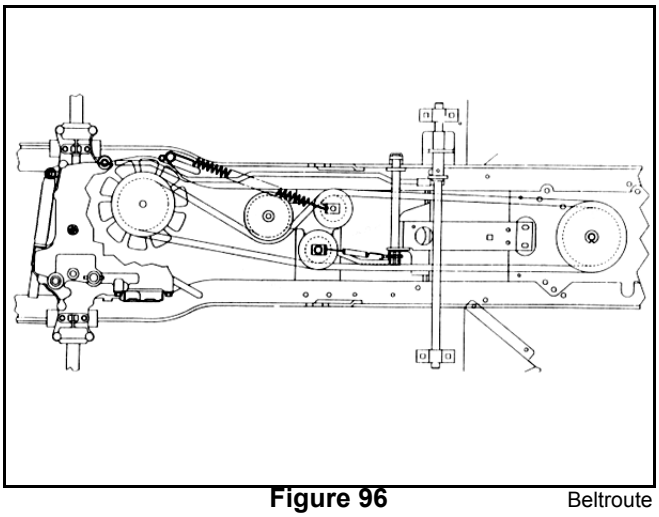


Figure 96 Beltroute

14. Install the belt around the transaxle input pulley and then around the idler pulley assembly. Install the idler spring to the bolt, spacer, and washer located on the right side of the frame (Figure 97).

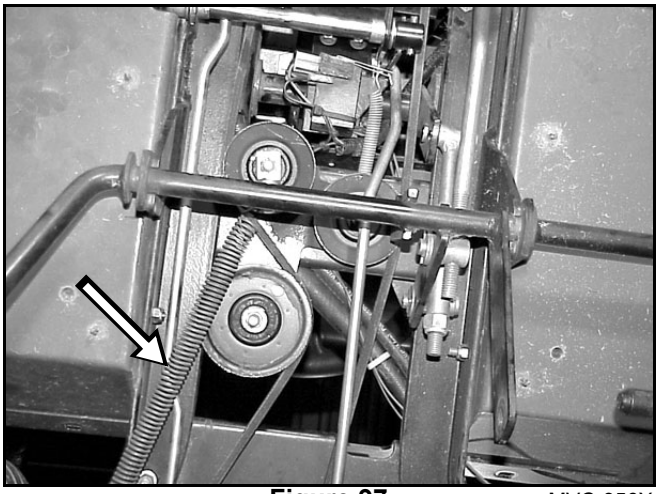


Figure 97 MVC-356X

15. Slide the brake shaft back through the bushing and install the roll pin. Raise the pedal pivot shaft up to the footrest and install and tighten the clamps (Figure 98).

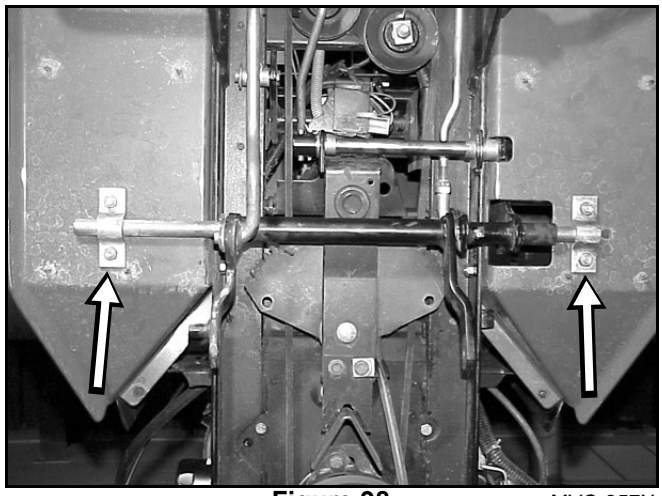


Figure 98 MVC-357X

16. Install the 2 bolts in the safety neutral bracket and tighten the bolts (Figure 99).

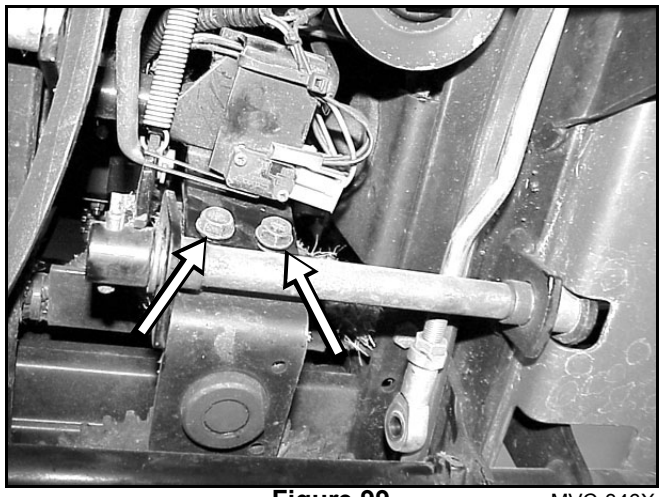


Figure 99 MVC-346X

17. Reattach the brake rod return spring, located under the center access plate (Figure 100).

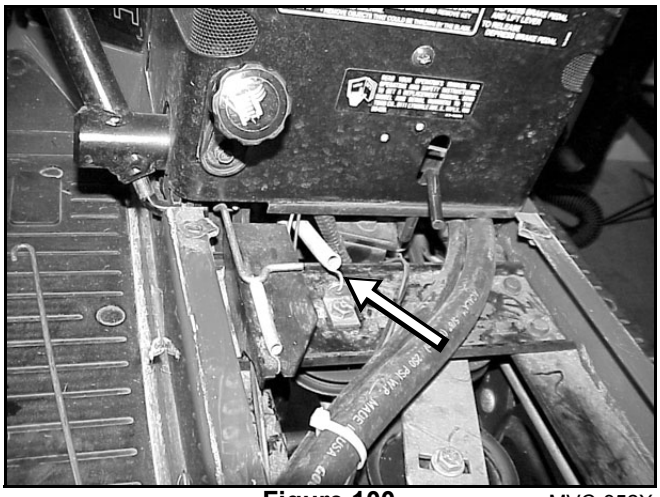


Figure 100 MVC-352X

18. Bolt the hydrostatic control rod to the forward/ reverse control pedal.

    NOTE: Before tightening the bolt, check the pedal adjustment (Figure 101). Refer to "Foot Control Adjustment Procedure" on page 3 - 16.

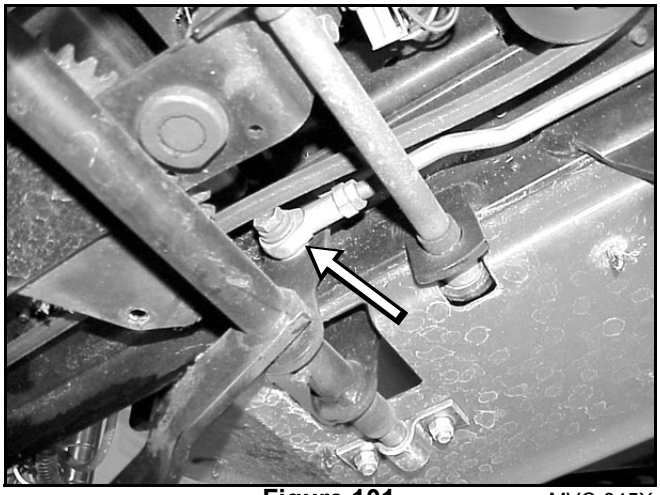


Figure 101 MVC-345X

19. Check the belt tension. If adjustment is needed, refer to "Belt Adjustment" on page 3 - 13.

20. Reroute the PTO clutch wire through the frame and tie strap the wire to the frame. Connect the PTO clutch wire back into the plug. Install the battery drain tube in the tie strap (Figure 102).

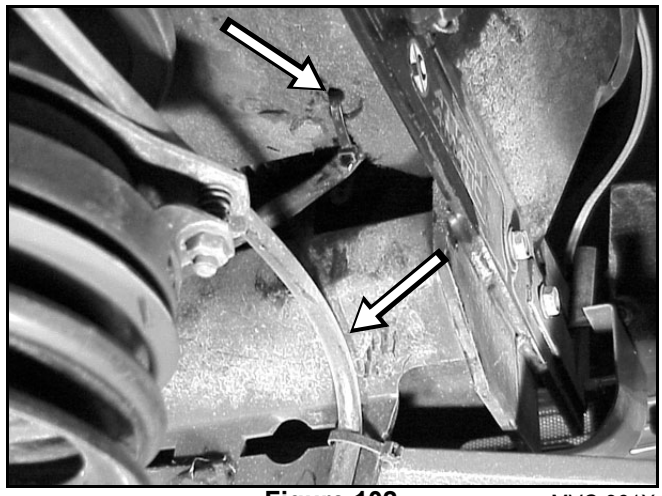


Figure 102 MVC-361X

21. Reconnect the steering tie rods to the steering sector gear (Figure 103).

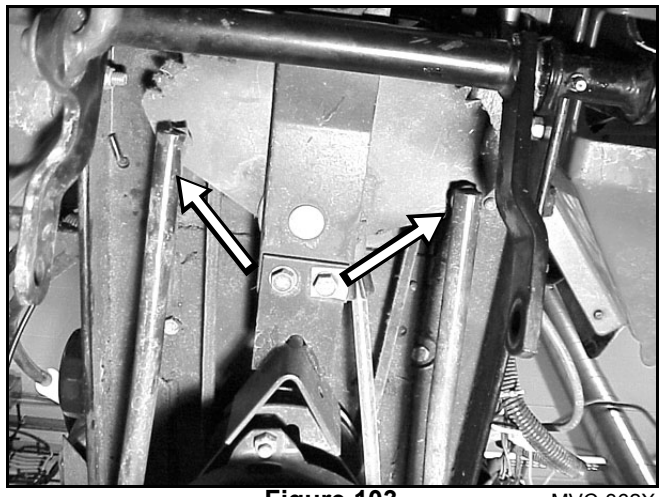


Figure 103 MVC-362X

22. Connect the brake rod to the brake lever on the transaxle using a washer and cotter pin (Figure 104).

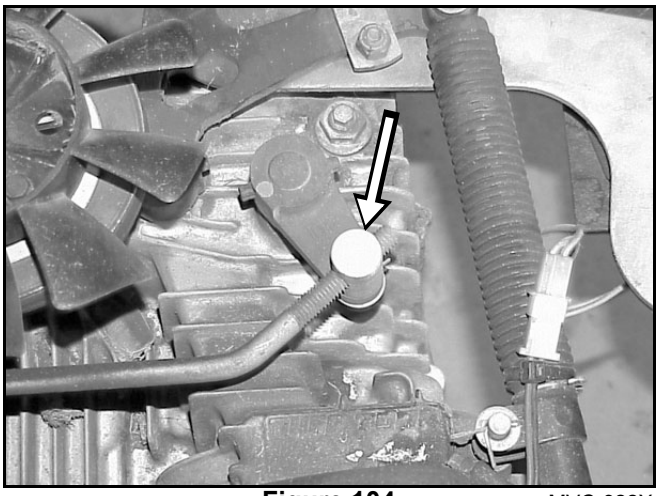


Figure 104 MVC-322X

23. Install the fan on the transaxle input pulley (Figure 105).

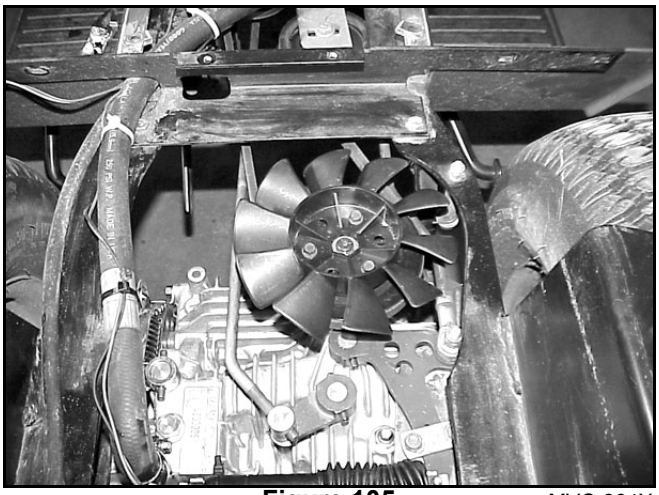


Figure 105 MVC-364X

24. Check the routing of the drive belt (Figure 106 and Figure 107).

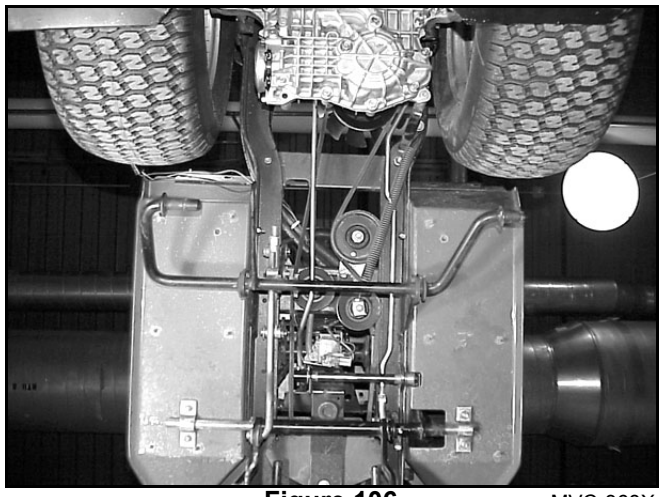


Figure 106 MVC-368X

Rear underside of tractor

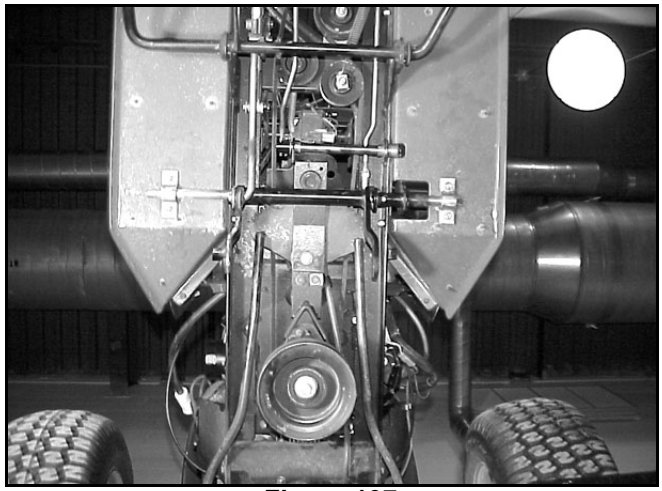


Figure 107 MVC-367X

Front underside of tractor

25. Reconnect battery negative cable. Reinstall fender, seat, and gas tank.

26. Test the tractor, making sure all the safety devices operate properly.

Belt Adjustment

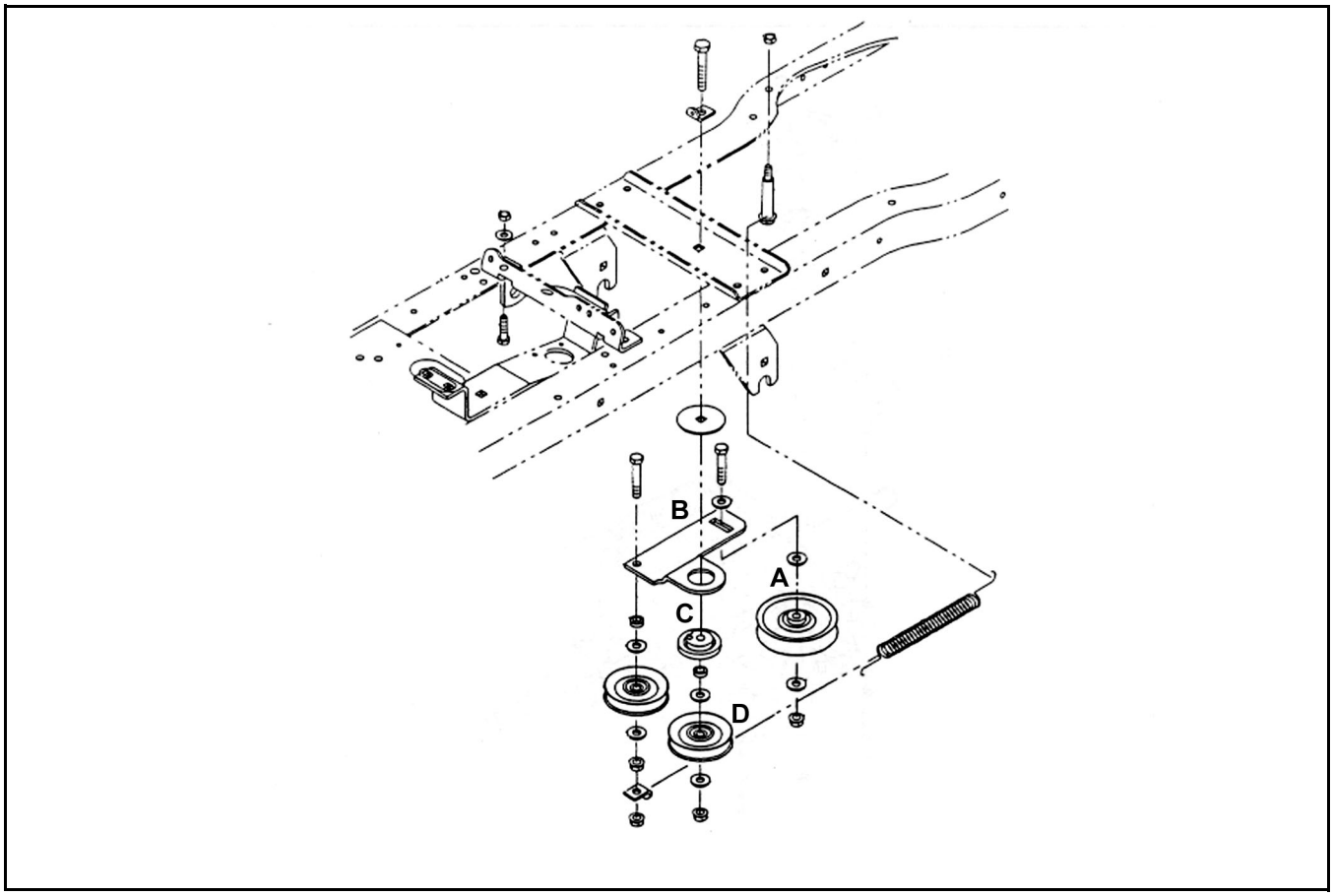


Figure 108 beltadjustment

(A) Back Side Idler Pulley
(B) Idler Arm
(C) Eccentric
(D) Eccentric Mounted Idler Pulley

Remove the tunnel cover to check or adjust the belt tension. Loosen the back side idler pulley, A, and move it in the slotted mounting hole on the idler arm, B. For additional adjustment, turn the eccentric C, on the eccentric mounted idler pulley, D.

Troubleshooting – Tuff Torq Transaxle

Problem	Possible Cause
No Drive	• Incorrect oil/oil level in unit. • Drive belt has failed, is worn, or is out of adjustment. • Push valve in push position. • Parking brake engaged. • Control pedal linkage worn, loose disconnected. • Engine pulley or transmission pulley sheared/missing. • Wheel hub key sheared/missing. • Push valve stuck or spring broken. • Damage to rotating groups or internal valving. • Damaged pinion shaft or differential assembly.
No Drive – one direction	• Control pedal bent or broken. • Control pedal rod bent or binding. • Control arm roll pin sheared. • Directional valves sticking, broken springs, or need to be cleaned of debris.
Low Power – both directions	• Incorrect oil/oil level in unit. • Drive belt has failed, is worn, is out of position, at incorrect tension, or engine. RPM is low. • Push valve partially activated. • Parking brake engaged or binding. • Control pedal or linkage binding. • Engine or transaxle drive pulleys loose, damaged, or worn. • Directional valves sticking, need to be cleaned of debris, broken springs. • Damage to rotating groups or valve body. • Swash plate worn, damaged, not operating properly. • Damaged output pinion or differential assembly.
Low Power – one direction	• Incorrect oil/oil level in unit. • Control pedal or shaft bent, binding, or travel. • Control rod bent or binding. • Control arm is not secure on shaft. • Swash plate worn, damaged, not operating properly. • Damaged output pinion or differential assembly.
Creeps in neutral	• Neutral adjustment eccentric out of position. • Control pedal bent or binding. • Swash plate control lever pin damaged, bent, binding, or worn. • Swash plate cradle bearings failed, worn, or damaged. • Swash plate control arm ball and socket damaged or worn. • Neutral return spring failed, fatigued, or out of position.

Refer to K61A Transaxle Service Manual, form # 492-0699, for internal service procedures.

Purging Procedures – Tuff Torq Transaxle

Due to the effects air has on efficiency in hydrostatic drive applications, it is critical that it be purged from the system.

These purge procedures should be implemented any time a hydrostatic system has been opened to facilitate maintenance or any additional oil has been added to the system.

Air creates inefficiency because its compression and expansion rate is higher than that of the oil normally approved for use in hydrostatic drive systems. The resulting symptoms in hydrostatic systems may be:

1. Noisy operation.
2. Lack of power or drive after short term operation.
3. High operation temperature and excessive expansion of “oil”. In the latter case, oil may overflow.

Before starting, make sure the transaxle is at the "cold" oil level; refer to “General Specifications” on page 1 - 3. Top off as needed during the process.

1. Raise the two rear tires from the ground and support the tractor securely with jack stands.
2. Disconnect the seat switch and attach a jumper wire across the terminals so that the tractor will run without an operator in the seat.
3. Start the engine and maintain low idle speed.
4. Depress the forward and reverse hydrostatic control pedals alternately until the wheels begin to rotate. Shut the engine off.
5. Lower the tractor to the ground.

Use extreme caution while completing the following purging process.

6. Restart the engine and set at low idle speed.
7. Depress the forward hydrostatic control pedal and push the tractor rearward. Then depress the reverse hydrostatic control pedal and push the tractor forward until the tractor is able to move under its own power.
8. Increase engine speed to full RPM.
9. Operate the tractor from seated position, making quick starts and panic stops, until the transaxle is operating properly. Top forward speed is 5.2 MPH (8.3km/hr).
10. Top off the reservoir with oil through the reservoir/ fill cap, filling it to the cold fill mark.

Brake – Tuff Torq Transaxle

Always set the parking brake when you stop the machine or leave it unattended. If the parking brake does not hold securely, an adjustment is required.

Checking the Brake

1. Park the machine on a level surface, disengage the power take off (PTO), set the parking brake, and turn the ignition key to “OFF” to stop the engine. Remove the ignition key.
2. Rear wheels must lock and skid when you try and push the tractor forward. Adjustment is required if the wheels turn and do not lock; refer to “Adjusting the Brake – Tuff Torq Transaxle” on page 3 - 15.
3. Release the brake and move the drive control rod to the “PUSH” position. Wheels should rotate freely.
4. If both conditions are met, no adjustment is required.

Adjusting the Brake – Tuff Torq Transaxle

The brake lever is on top of the transaxle (Figure 109). If the parking brake does not hold securely, an adjustment is required.

1. Check the brake before you adjust it, refer to “Checking the Brake” on page 3 - 15.

2. Release the parking brake if engaged.

3. To adjust the brake, remove the rear access plate and remove the cotter pin and washer from the brake lever (Figure 110) and remove the trunnion from the brake lever (Figure 110).

4. Push the brake lever towards the rear of the tractor and hold (Figure 110).

5. Rotate the trunnion so it smoothly slides into the brake lever hole.

6. Secure the trunnion to the brake lever with the washer and cotter pin.

7. Check the brake operation again.

IMPORTANT: With the parking brake released, the rear wheels must rotate freely when you push the mower. If brake action and free wheel rotation cannot be achieved, refer to the Tuff Torq® K-61A Transaxle Service Manual, Form Number 492-0699.

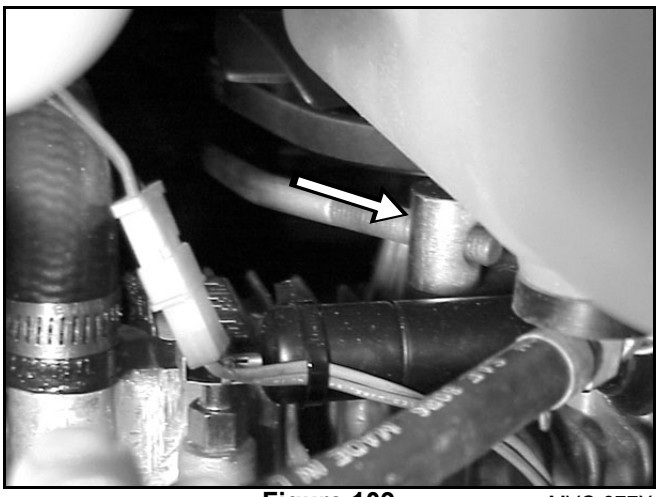


Figure 109 MVC-377X

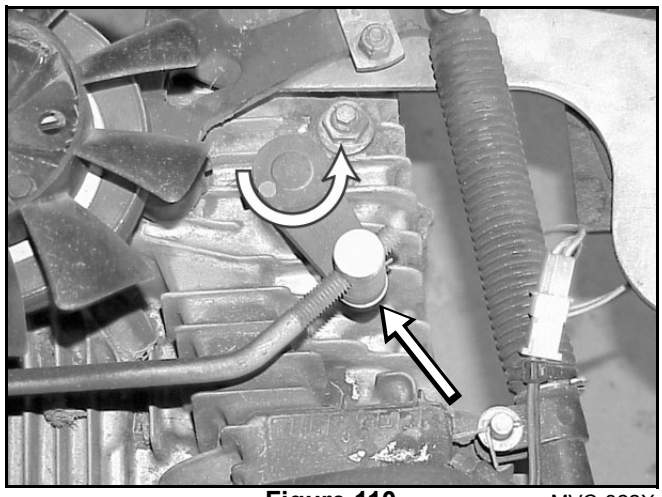


Figure 110 MVC-322X

Foot Control Adjustment Procedure

If there is not enough ground speed in reverse and too much in forward; or, too much in reverse and not enough in forward, adjustment can be made to correct this.

1. Measure the distance between the footrest and the back of the forward/reverse control pedal. There should be 1¼” (31.74mm) gap (Figure 111).

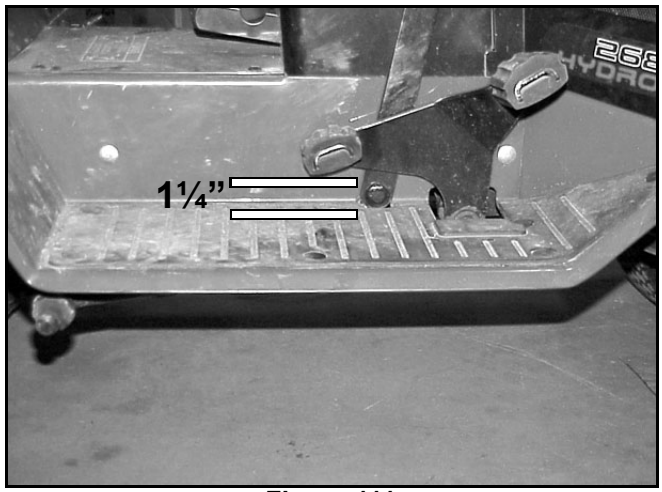


Figure 111 MVC-195X

2. If adjustment is needed, unbolt the hydro control rod where it connects to the froward/reverse pedal. The location is under the tractor on the inside of the frame (Figure 112).

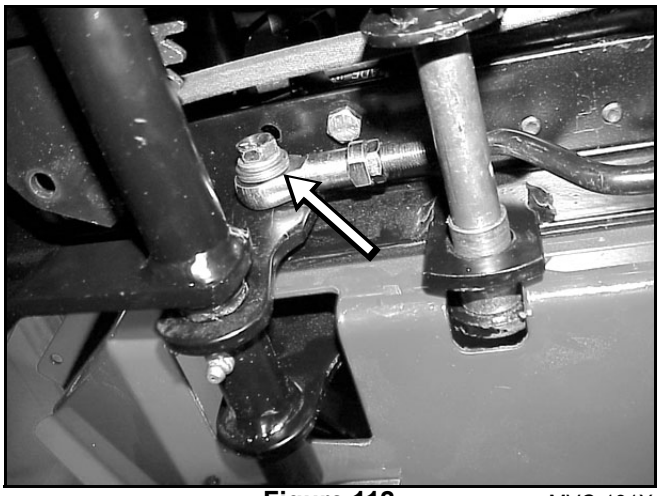


Figure 112 MVC-191X

3. Loosen the jam nut and turn the rod end to achieve 1¼" (31.74mm) gap between the footrest and the back side of the forward/reverse control pedal (Figure 113).

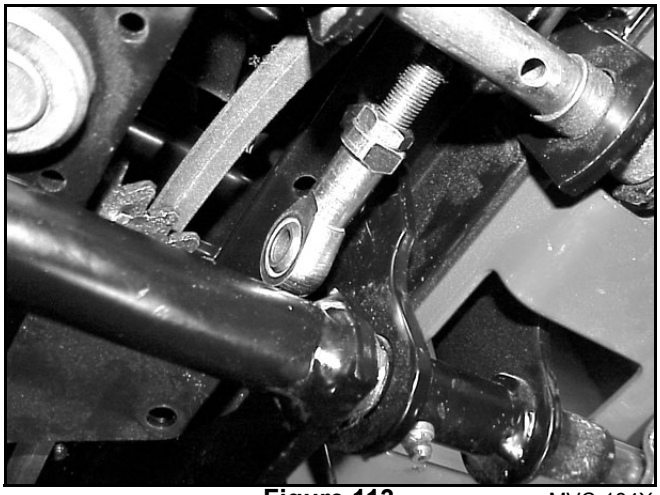


Figure 113 MVC-184X

Neutral Adjustment – Tuff Torq Transaxle

You must perform a neutral adjustment whenever a tractor creeps in neutral, or whenever a new or rebuilt transaxle is installed in the tractor.

Before making a neutral adjustment, the transaxle must be warmed up, usually 5 to 10 minutes. Steps to perform neutral adjustment:

1. Jack-up and support the right rear end of the tractor, allowing enough clearance to remove the right rear tire. Make sure the left rear tire stays on the ground (Figure 114).

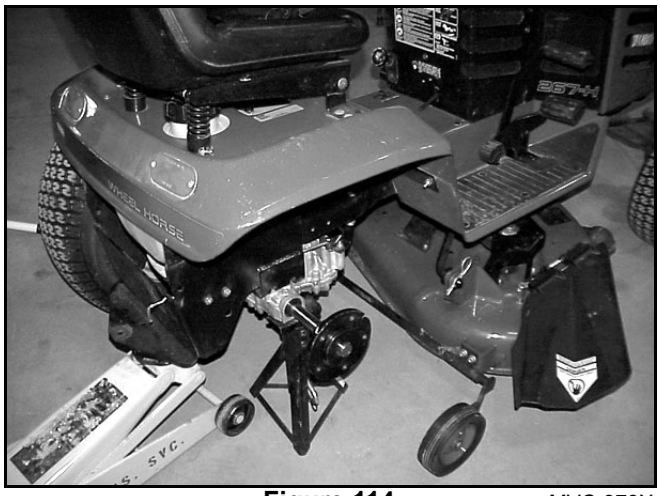


Figure 114 MVC-379X

2. Remove the access panel at the rear of the tractor to gain access to the neutral adjusting eccentric, which is located on the top right-hand side next to the gas damper arm (Figure 115).

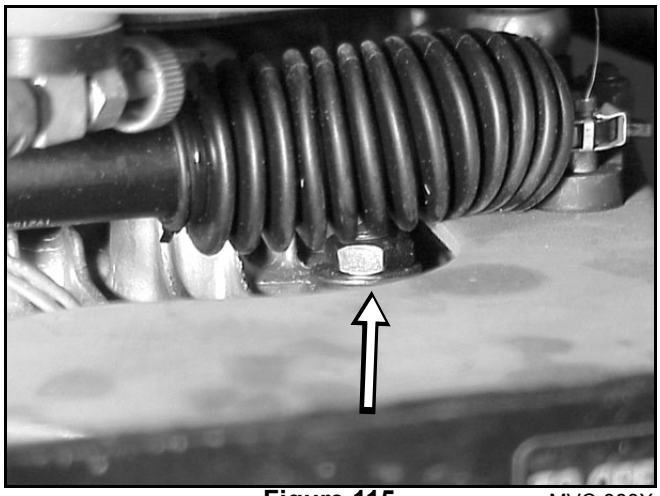


Figure 115 MVC-383X

3. Disconnect the seat switch and attach a jumper wire across the terminals. This enables the tractor to run without an operator in the seat.

4. Start the tractor and set the engine speed at ¾ to full throttle.

5. Loosen the locknut (B), (Figure 116), and turn the eccentric (A), (Figure 116) clockwise until the axle starts to rotate.

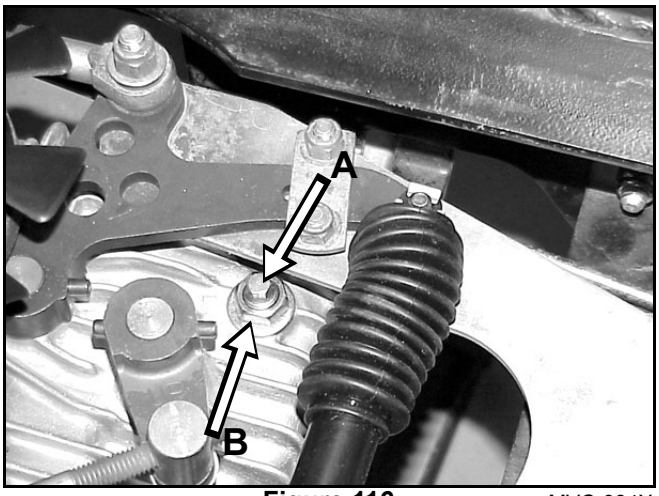


Figure 116 MVC-384X

(A) Eccentric	(B) Locknut

6. Now rotate the eccentric counterclockwise until the axle starts to rotate the other direction. You want to adjust the eccentric so it is set mid-point between the forward and reverse axle rotation, tighten the locknut.

7. Check the neutral adjustment by depressing the motion control pedal in forward and reverse. At full throttle, there should be no wheel movement after the pedal returns to neutral. Readjust as needed until neutral is obtained.

Hydro-Gear Hydrostatic Transaxle

Internal Service

Internal service information is contained in the Hydro-Gear Transaxle Service Manual, Form # 492-0682.

Fluid Change

The Hydro-Gear transaxle is factory filled, sealed, and does not require oil changes. However in the event of oil contamination or degradation, oil replacement may correct certain performance problems.

Using the Transaxle Removal procedure, remove transaxle and drain oil from the fluid fill port. Fill unit to the proper level, refer to “General Specifications” on page 1 - 4. Reinstall transaxle and perform ”Purging Procedures – Hydro-Gear Transaxle" on page 4 - 8.

Transaxle Removal - Hydro-Gear

1. Disconnect the negative battery cable from the battery.

2. Raise the rear of the tractor and remove the right and left rear tires. Support the rear frame, just in front of the transaxle. Remove the fender, seat, and gas tank. Refer to the “Chassis” section on page 2 - 16. Remove the center plate between the seat and the hoodstand (Figure 117).

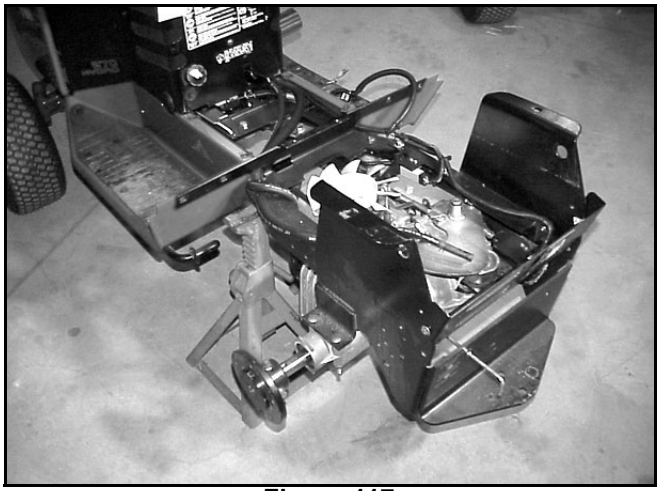


Figure 117 MVC-132X

3. Disconnect the free wheeling valve rod and the vent hose clamp (Figure 118).

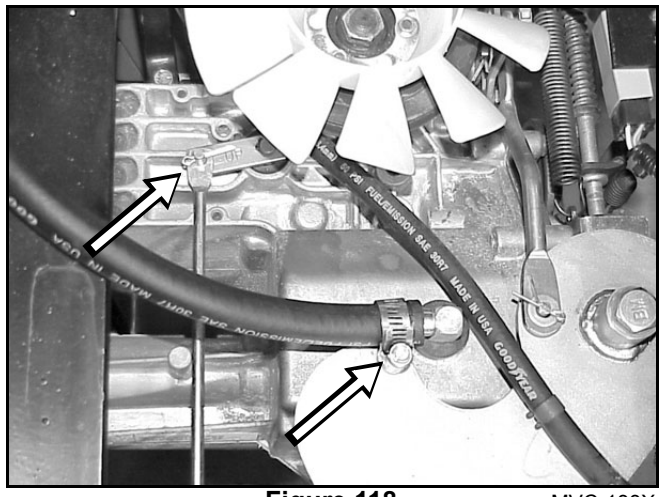


Figure 118 MVC-133X

4. Remove the cotter pin located on the crown nut for adjusting the brakes. Remove the crown nut, brake bracket, brake arm spring and brake rod (Figure 119).

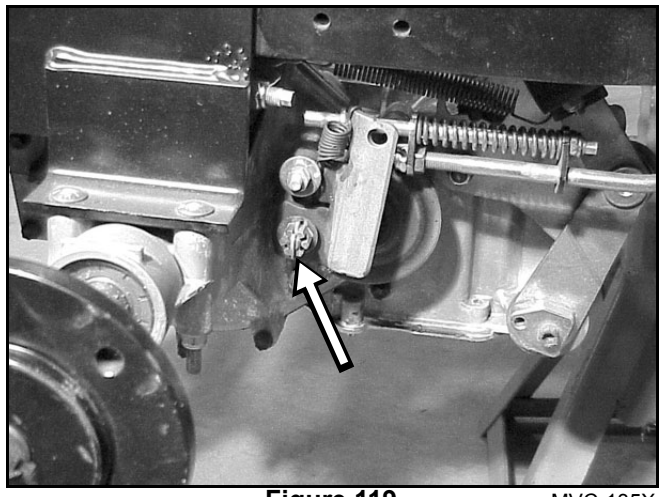


Figure 119 MVC-135X

5. If the tractor is equipped with cruise control, unplug the cruise control magnet and the reverse plunger switch wiring plugs (Figure 120).

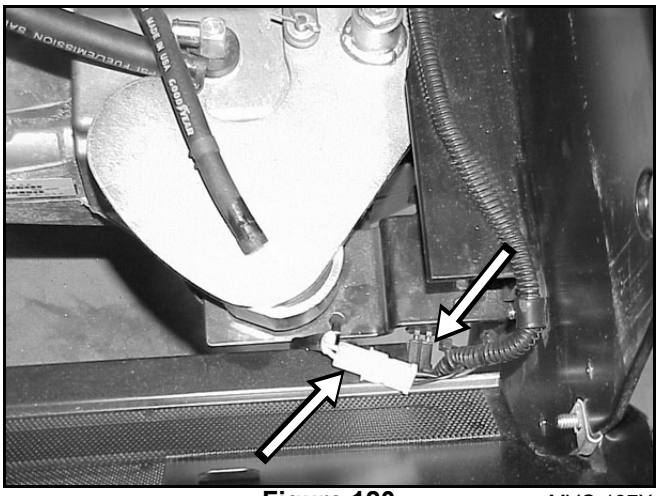


Figure 120 MVC-137X

6. Unbolt the cruise control magnet bracket from the side of the frame (Figure 121).

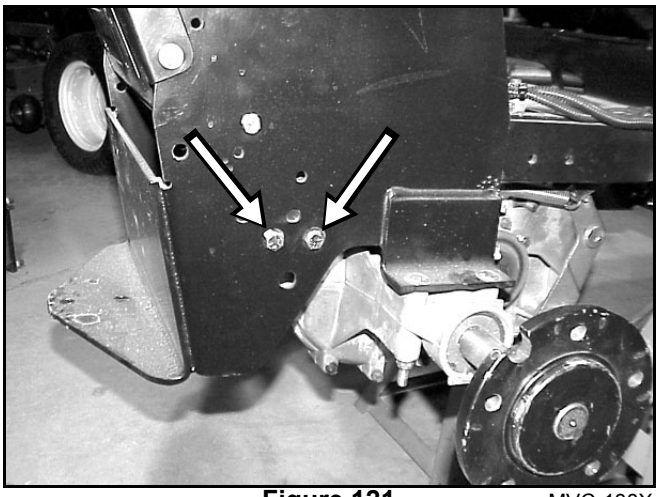


Figure 121 MVC-138X

7. Unhook the Idler pulley spring from the torque strap bracket (Figure 122).

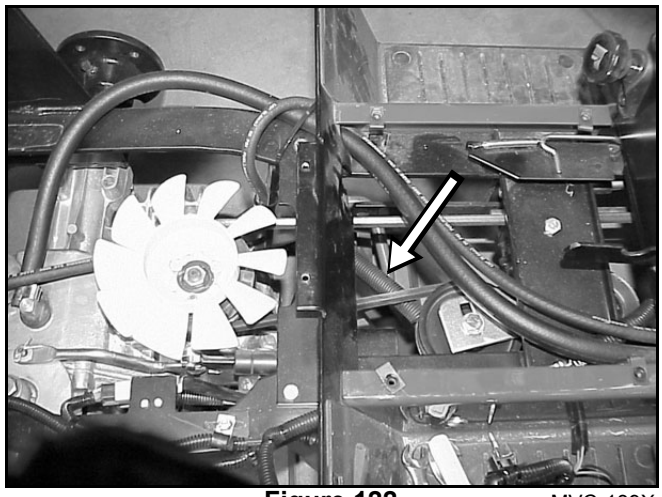


Figure 122 MVC-139X

8. Remove the gas damper cylinder located next to the transaxle input pulley. To remove the fastener on the end of the cylinder, use a small blade screwdriver and insert the blade of the screwdriver between the back side of the fastener and the shaft. Apply a little pressure toward the back of the fastener and pull the damper cylinder off the shaft (Figure 123).

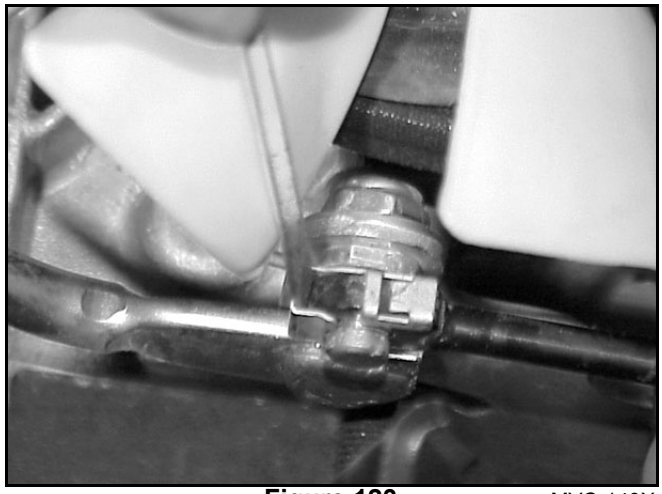


Figure 123 MVC-140X

9. Slip the belt off the engine drive pulley and move the belt slack toward the rear of the transaxle and remove the belt around the transaxle input pulley (Figure 124).

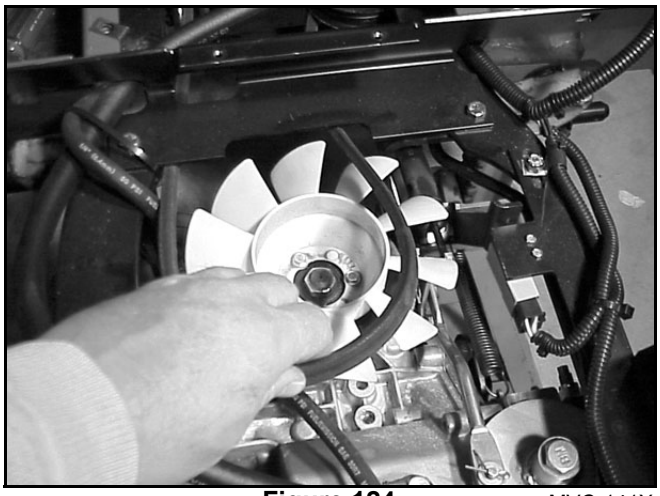


Figure 124 MVC-141X

10. Use a floor jack and put it under the transaxle to help lower the transaxle from the frame of the tractor (Figure 125).

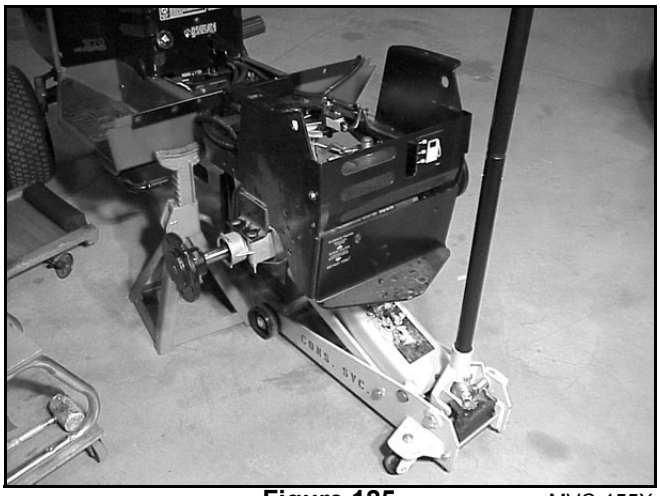


Figure 125 MVC-155X

11. Remove the front torque strap, nut, and washer (Figure 126).

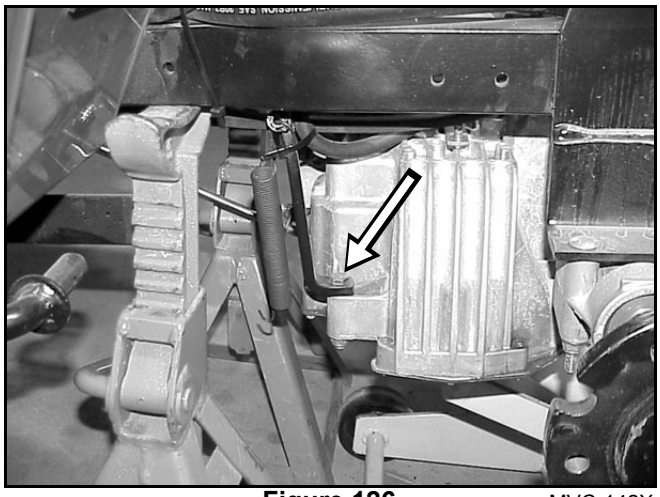


Figure 126 MVC-142X

12. Remove the two nuts and washers that are located on each side of the transaxle axle housing holding the transaxle to the frame (Figure 127).

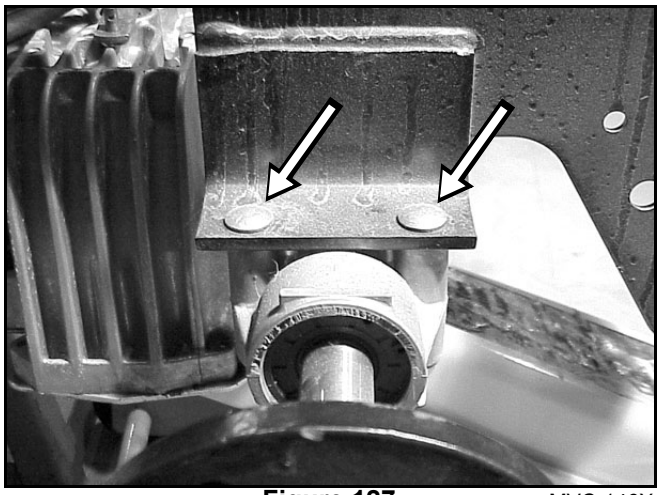


Figure 127 MVC-146X

13. Slowly lower the transaxle slightly and STOP. You will need to disconnect the hydro rod from the cruise plate. Remove the cotter pin and washer (Figure 128).

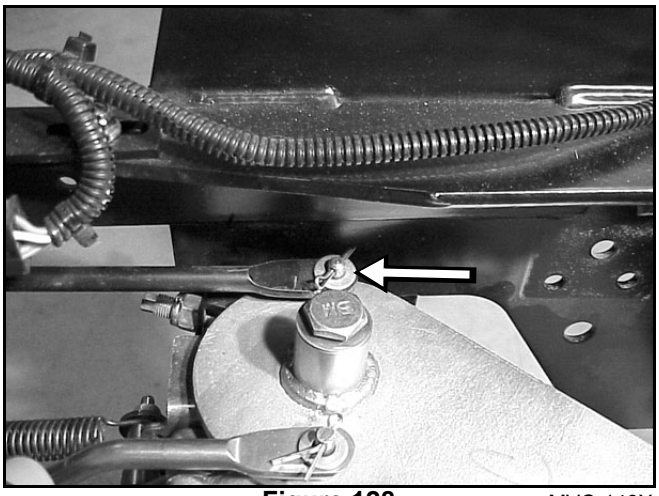


Figure 128 MVC-148X

14. Continue to lower the transaxle out of the tractor frame (Figure 129).

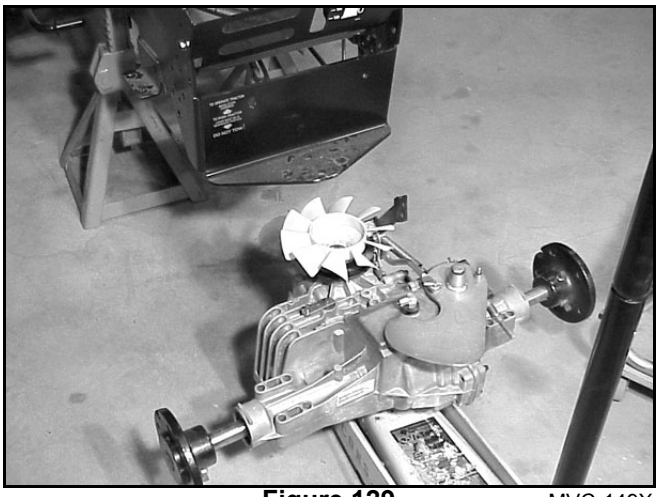


Figure 129 MVC-149X

Installation - Hydro-Gear Transaxle

1. Raise the transaxle up toward the frame allowing enough room to install the hydro rod to the cruise plate and secure with the cotter pin and washer (Figure 130).

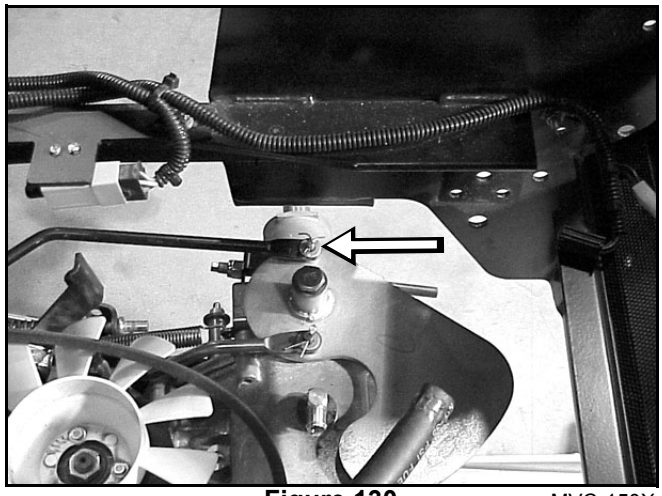


Figure 130 MVC-150X

2. Install the four carriage bolts, washers, and nuts from the transaxle frame brackets through the transaxle housing (Figure 131).

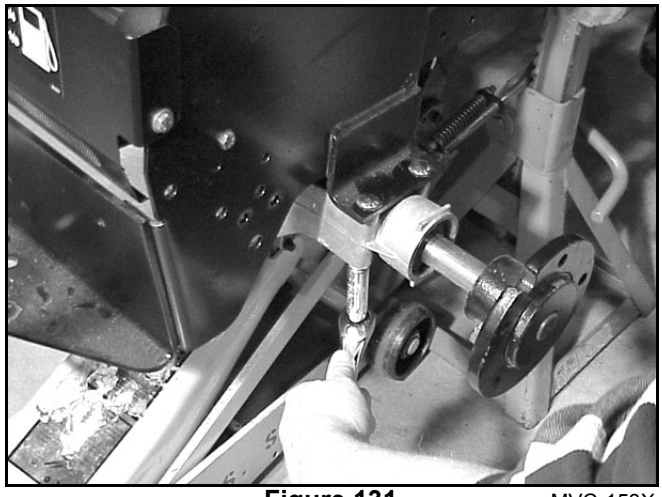


Figure 131 MVC-153X

3. Install the bolt, washer, and nut through the front of the transaxle to the torque strap (Figure 132).

Figure 132 MVC-154X

4. Install the drive belt around the transaxle input pulley, through the idler pulleys, and around the engine drive pulley. Install the idler spring from the torque strap to the idler bracket (Figure 133).

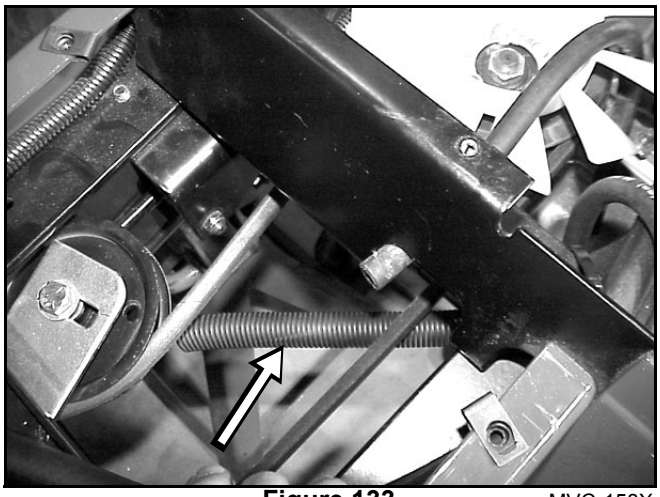


Figure 133 MVC-158X

5. Connect the damper cylinder to the control linkage (Figure 134).

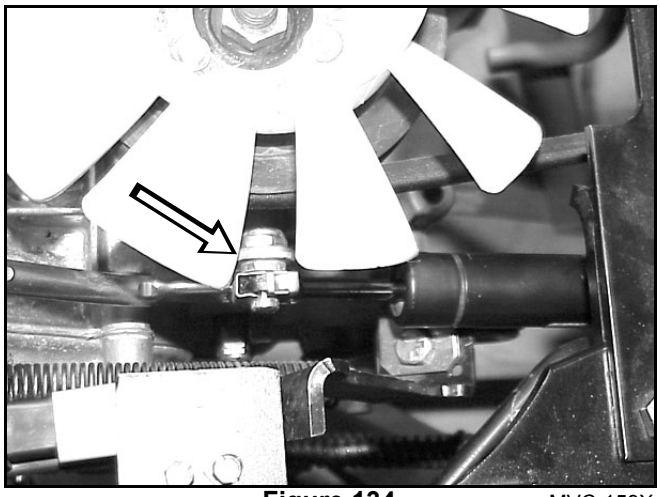


Figure 134 MVC-159X

6. If the tractor is equipped with cruise control, install the cruise control bracket, making sure the reverse operating rod fits through the hole opposite the reverse plunger switch. Bolt the cruise bracket to the side of the frame (Figure 135).

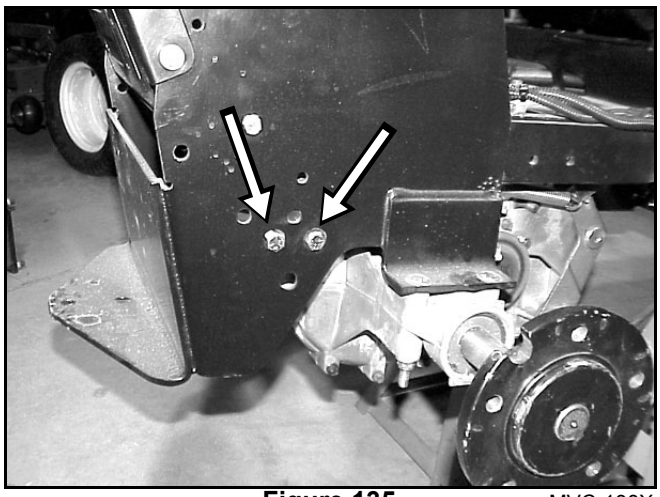


Figure 135 MVC-138X

7. Reconnect the cruise control magnet and the reverse plunger switch if applicable (Figure 136).

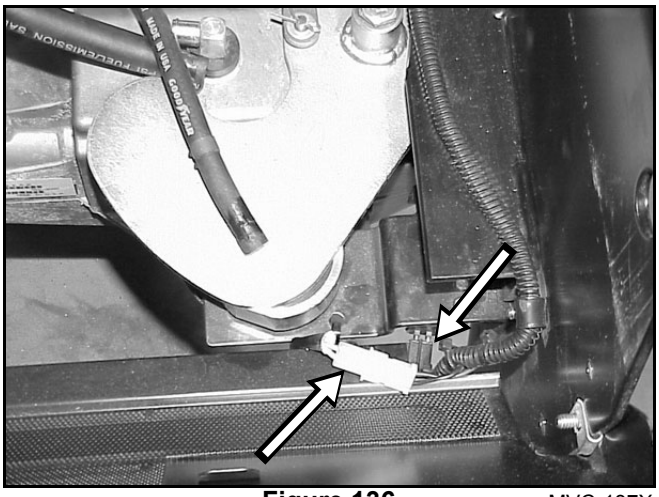


Figure 136 MVC-137X

8. Install the brake arm with the brake rod and brake spring, on the brake stud. Install the castle nut, but do not install the cotter pin until brake adjustment has been performed (Figure 137). Refer to ”Brake Adjustment – Hydro-Gear Transaxle" on page 4 - 9.

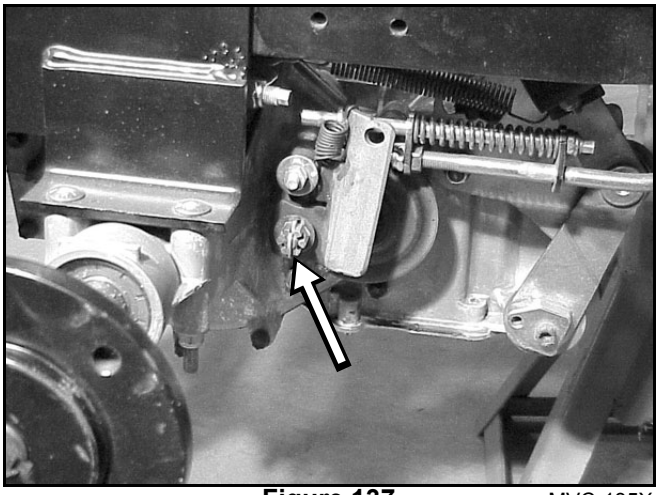


Figure 137 MVC-135X

9. Connect the free wheeling valve rod and the vent hose clamp (Figure 138).

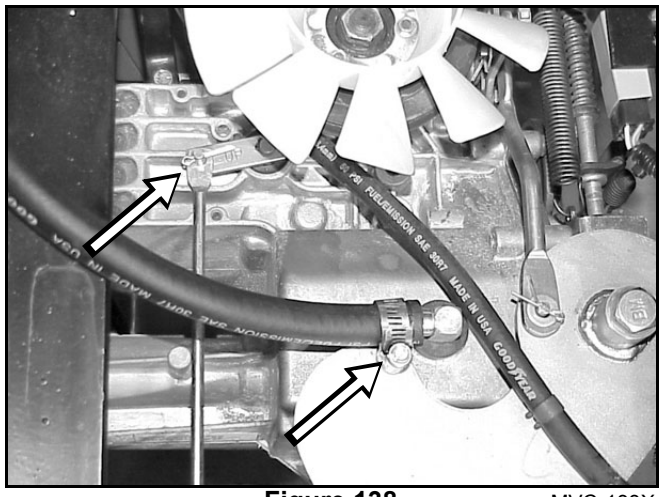


Figure 138 MVC-133X

10. Reconnect the gas line to the gas tank and install the gas tank (Figure 139).

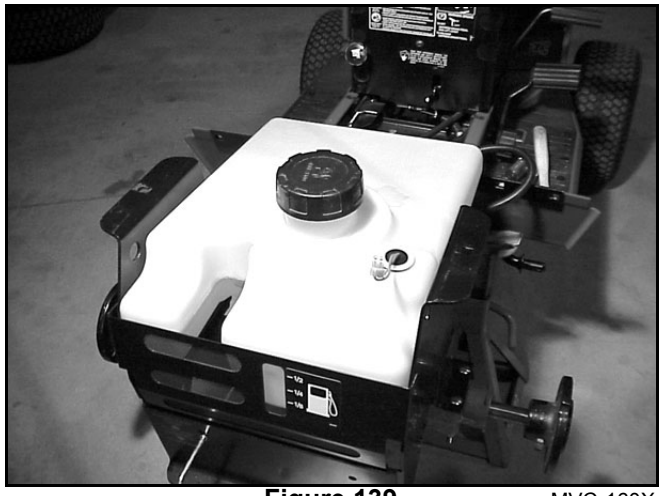


Figure 139 MVC-160X

Belt Adjustment

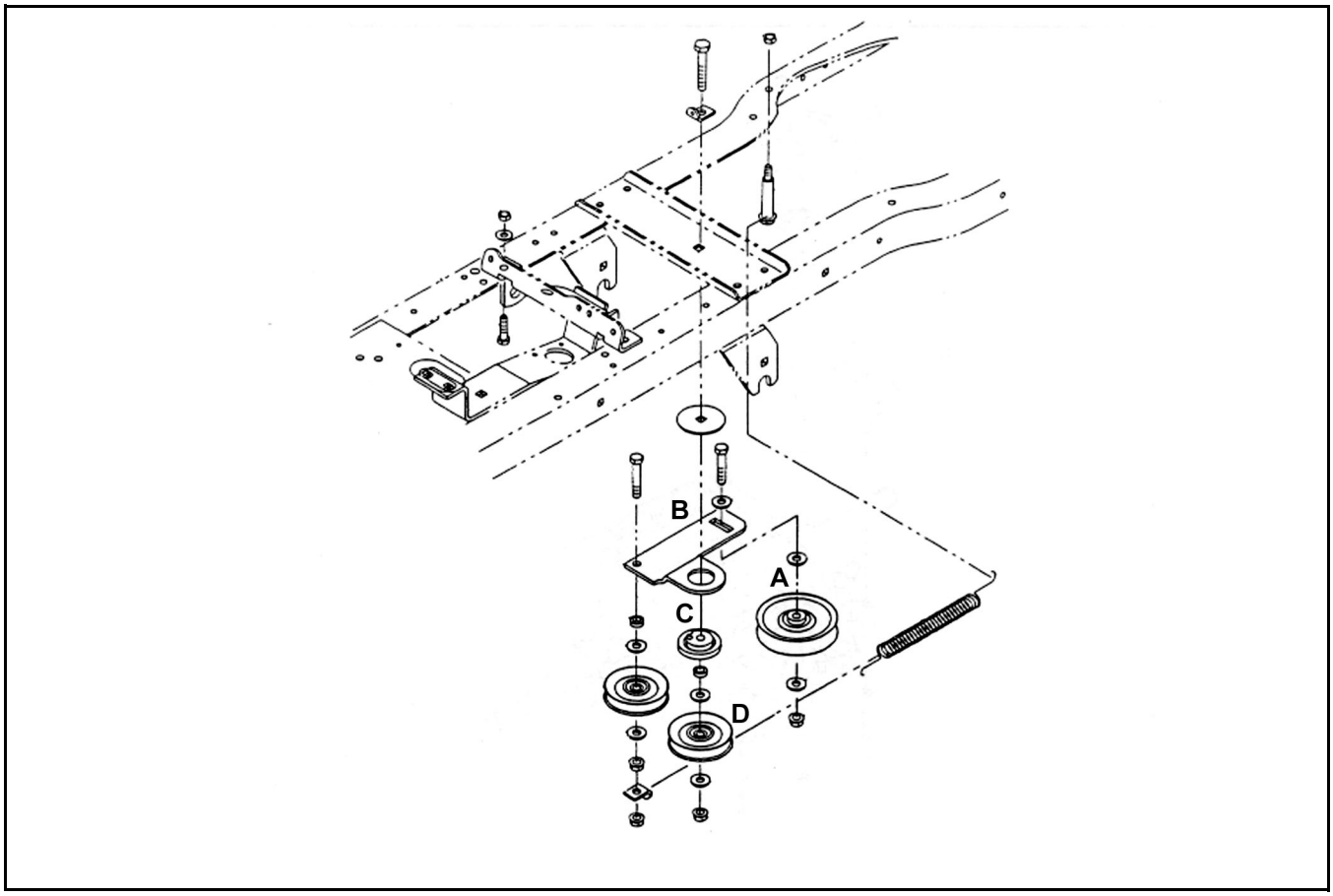


Figure 140 beltadjustment

(A) Back Side Idler Pulley
(B) Idler Arm
(C) Eccentric
(D) Eccentric Mounted Idler Pulley

11. Remove the tunnel cover to check or adjust the belt tension. Loosen the back side idler pulley, A, and move it in the slotted mounting hole on the idler arm, B. For additional adjustment, turn the eccentric C, on the eccentric mounted idler pulley, D. Install the left rear tire only (Figure 141).

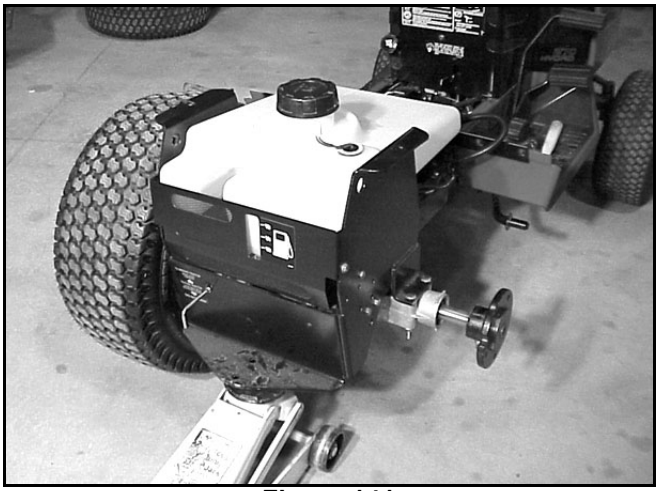


Figure 141 MVC-161X

NOTE: When installing a new transaxle in the machine or if any work was performed internally on the transaxle, make sure the system is purged prior to doing any neutral adjustment. Refer to ”Purging Procedures – Hydro-Gear Transaxle" on page 4 - 8.

12. Reconnect the negative battery cable.

13. Attach a jumper wire across the seat switch plug terminals so the tractor will run without an operator in the seat. If adjustment is needed, refer to the ”Neutral Adjustment – Hydro-Gear Transaxle" on page 4 - 17.

14. Install the fender and seat assembly and install the center plate between the fender and seat. Install the right tire.

15. Operate the tractor and make sure all safety features are working. Check the forward and reverse operation of the tractor. If you find there is not enough speed in reverse or forward, follow the adjustment procedures for the foot control; refer to ”Foot Control Adjustment Procedure" on page 4 - 10.

Purging Procedures – Hydro-Gear Transaxle

Due to the effects air has on efficiency in hydrostatic drive applications, it is critical that it be purged from the system.

These purge procedures should be implemented any time a hydrostatic system has been opened to facilitate maintenance or any additional oil has been added to the system.

Air creates inefficiency because its compression and expansion rate is higher than that of the oil normally approved for use in hydrostatic drive systems.

The resulting symptoms in hydrostatic systems may be:

1. Noisy operation.

2. Lack of power or drive after short term operation.

3. High operation temperature and excessive expansion of “oil”; in the latter case, oil may overflow.

Before starting, make sure the transaxle is at the specified oil level; refer to page 1 - 4.

The following procedures should be performed with the vehicle drive wheels off the ground, then repeated under normal operating conditions.

1. With the bypass valve open and the engine running, slowly move the directional control (foot control) in both forward and reverse directions 5 to 6 times; as air is purged from the unit, the oil level will drop.

2. With the bypass valve in the closed position and the engine running, slowly move the directional control valve (foot control) in both forward and reverse directions 5 to 6 times. After stopping the engine, check the oil level and add oil as required.

3. It may be necessary to repeat steps 1 and 2 until all the air is completely purged from the system. When the transaxle moves forward and reverse at normal speed, purging is complete.

CAUTION – DO NOT OVERFILL. If you overfill the transaxle while the unit is “cold”, it may overflow as it reaches normal operating temperatures. The oil level should not be above the level described on page 1 - 4. This will allow the space needed for the oil to expand as it warms up.

Brake – Hydro-Gear Transaxle

Always set the parking brake when you stop the machine or leave it unattended. If the parking brake does not hold securely, an adjustment is required.

Checking the Brake

1. Park the machine on a level surface, disengage the power take off (PTO), set the parking brake, and turn the ignition key to “OFF” to stop the engine. Remove the ignition key.

2. Rear wheels must lock and skid when you try to push the tractor forward. Adjustment is required if the wheels turn and do not lock; refer to”Brake Adjustment – Hydro-Gear Transaxle" on page 4 - 9.

3. Release the brake and move the free-wheeling lever to the “PUSH” position. Wheels should rotate freely.

4. If both conditions are met, no adjustment is required.

Brake Adjustment – Hydro-Gear Transaxle

1. Check the brake before you adjust it; refer to ”Checking the Brake" on page 4 - 9.

2. Release the parking brake.

3. To adjust the brake, remove the cotter pin and loosen the castle nut slightly (Figure 142).

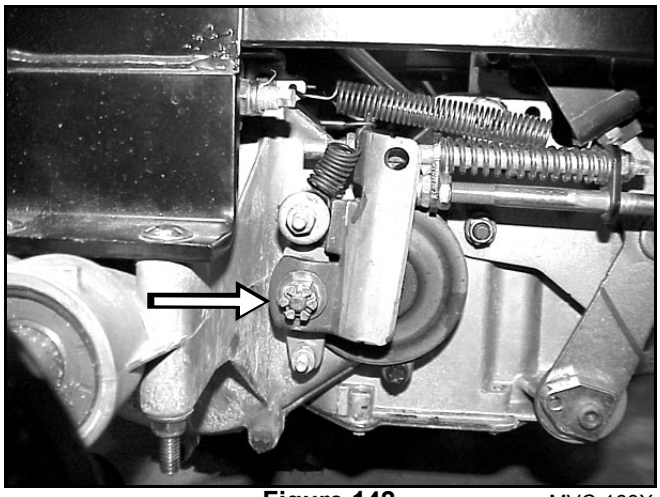


Figure 142 MVC-163X

4. Carefully insert a 0.020” (.508mm) feeler gauge between the outer brake pad and rotor disc (Figure 143).

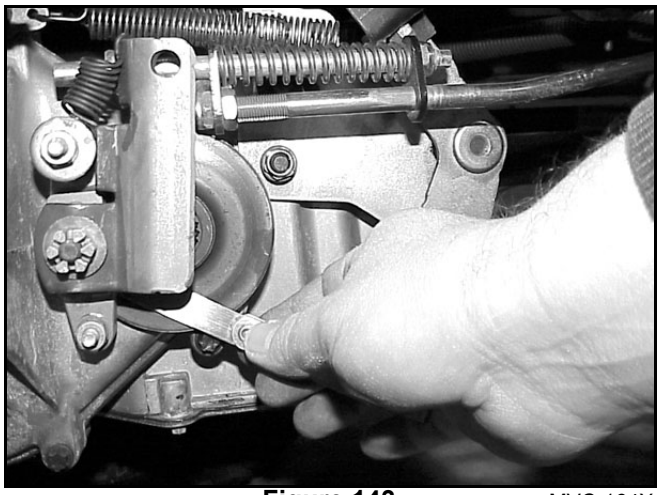


Figure 143 MVC-164X

5. Tighten brake adjusting (crown) nut until slight resistance is felt on the feeler gauge when sliding it in and out. Install cotter pin.

6. Check the brake operation again.

IMPORTANT: With the parking brake released, the rear wheels must rotate freely when you push the tractor. If the 0.020” (.508mm) clearance cannot be achieved, new brake pucks may need to be installed.

Foot Control Adjustment Procedure

If there is not enough ground speed in reverse and too much in forward, adjustment can be made to correct this.

1. Measure the distance between the footrest and the back of the forward/reverse control pedal. There should be 1¼" (31.75mm) to 1-3/8" (34.925mm) gap (Figure 144).

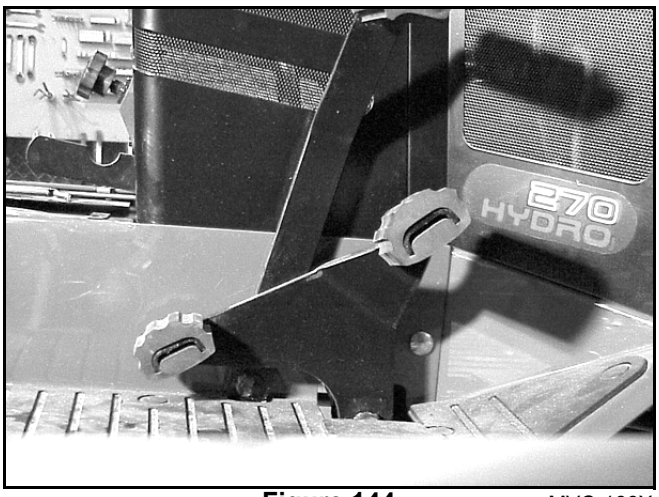


Figure 144 MVC-166X

2. If adjustment is needed, unbolt the hydro control rod where it connects to the hydro forward/reverse pedal. The location is under the tractor on the inside of the frame (Figure 145).

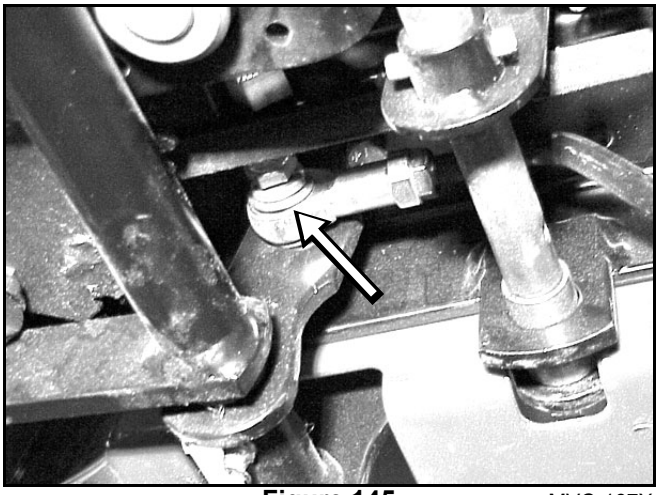


Figure 145 MVC-167X

3. Loosen the jam nut and turn the rod end until you achieve 1¼" (31.75mm) to 1-3/8" (34.925mm) gap between the footrest and the back side of the forward/reverse control pedal (Figure 146).

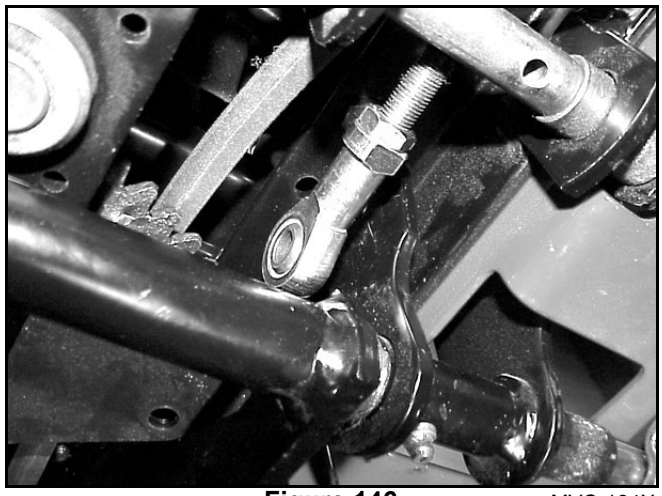


Figure 146 MVC-184X

Troubleshooting Chart for the Hydro-Gear Transaxle

Symptom	Possible Cause	Corrective Action
Operates in one direction	• Inspect control linkage • Inspect drive belt and pulleys	• **Repair or replace • Repair or replace
Unit is Noisy	• Check oil level and condition • Check for excessive loading • Check brake setting • Check for loose parts • Check bypass valve linkage operation • Check frame mount	• Fill to proper level or change oil • Reduce vehicle loading • *Adjust brake to proper setting • Repair or replace loose parts • Repair or replace linkage • Tighten to frame
Low Power	• Check engine RPM • Check drive belt and pulleys • Check oil level and condition • Check for excessive loading • Check brake setting • Check for loose parts • Check bypass valve linkage operation • Check for loose or improper linkage	• Adjust to correct setting • Repair or replace • Fill to proper level or change oil • Reduce vehicle load • *Adjust brake to proper setting • Repair or replace loose parts • Repair or replace linkage • Tighten linkage or replace
Operating Hot	• Check for debris build up • Check oil level and condition • Check for excessive loading • Check brake setting • Check fan condition	• Clean off debris • Fill to proper level or change oil • Reduce vehicle loading • *Adjust brake to proper setting • Replace if needed

* Make sure brake isn't stuck in "on" position. Remove brake parts as necessary to test.

** If installing new transaxle, be sure bolt securing linkage in neutral position is removed and discarded.

Belt Replacement – Hydro-Gear Transaxle

Note: Perform belt installation, routing, and inspection procedures from beneath the tractor.

1. Disconnect the electric PTO clutch wire. Detach the belt idler spring (Figure 147).

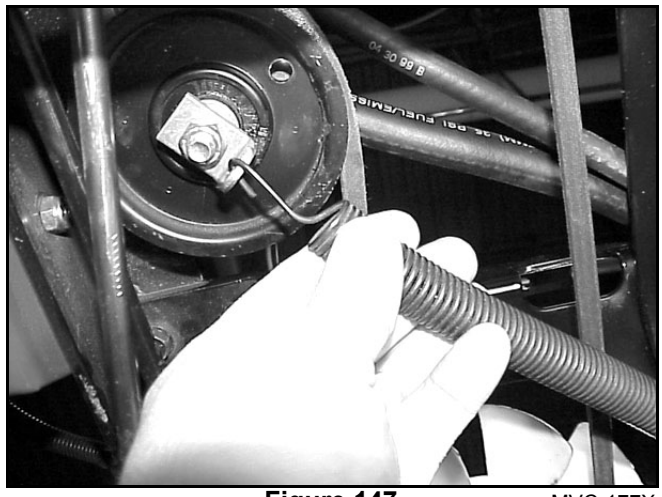


Figure 147 MVC-177X

2. Remove the two steering tie rods from the steering sector gear (Figure 148).

Figure 148 MVC-181X

3. Disconnect the brake rod at the transaxle by removing the cotter pin, brake spring, and castle nut (Figure 149).

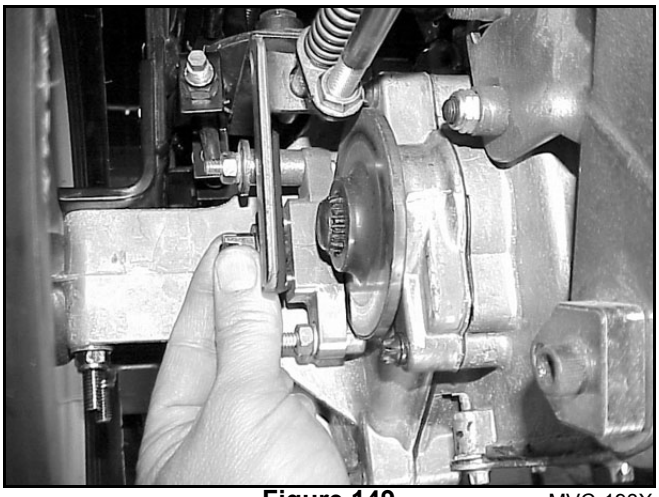


Figure 149 MVC-193X

4. Remove the two carriage bolts and nuts holding the right side footrest on (Figure 150).

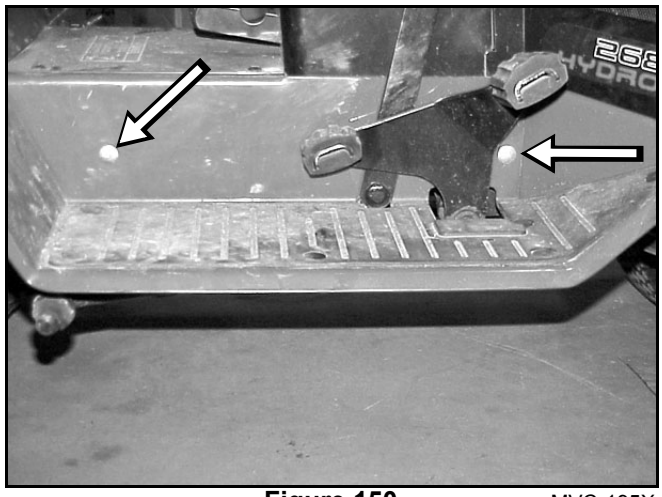


Figure 150 MVC-195X

5. Remove the 2 roll pins that are located on the brake cross shaft (Figure 151).

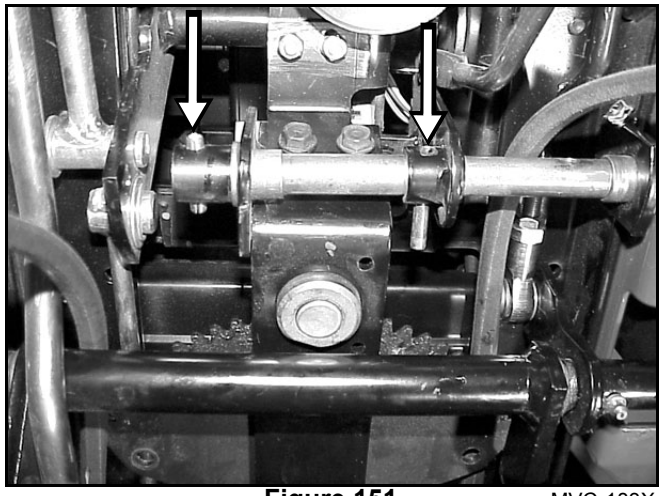


Figure 151 MVC-183X

6. Disconnect the hydrostatic control rod from the forward/reverse pedal (Figure 152).

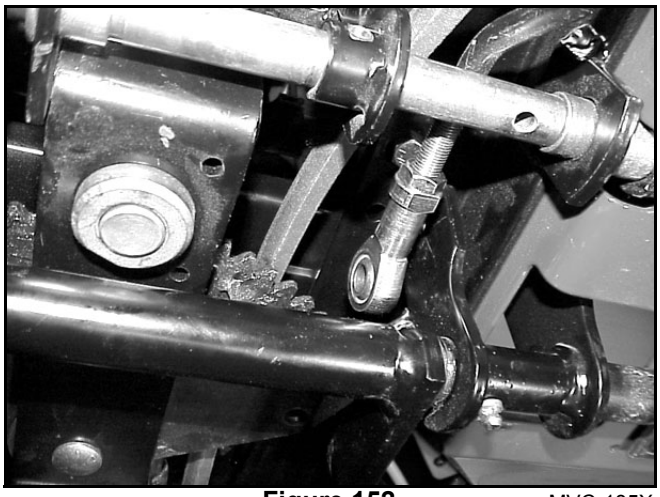


Figure 152 MVC-185X

7. Loosen the left side support clamp for the pedal pivot shaft and remove the right side support clamp (Figure 153).

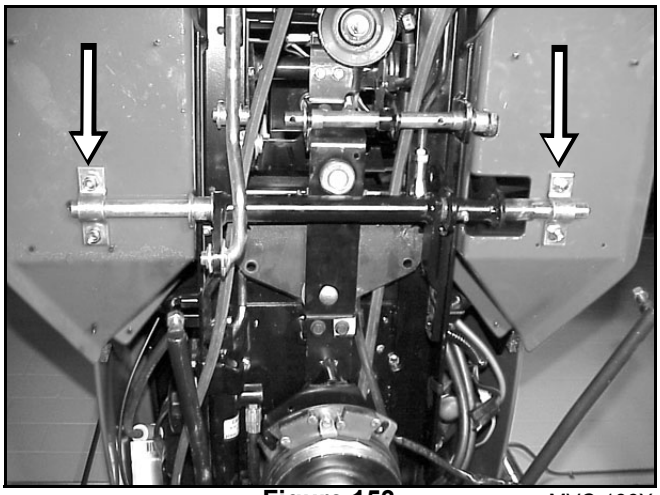


Figure 153 MVC-186X

8. Drive the brake cross shaft and pedal out the right-hand side of the tractor enough to get clearance to install the drive belt above the shaft (Figure 154).

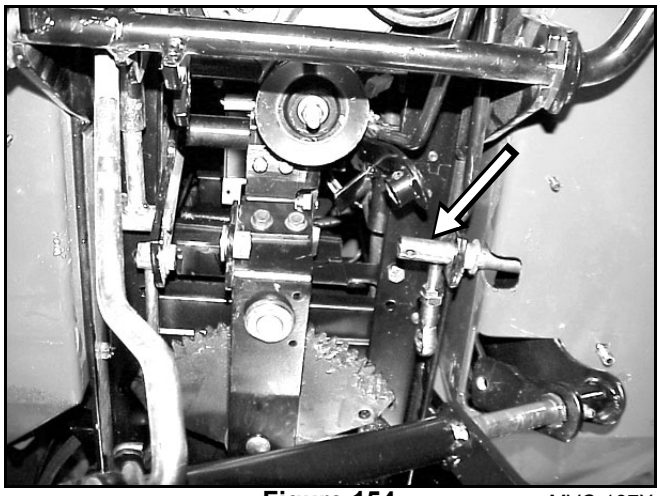


Figure 154 MVC-187X

9. Install belt around and above the electric clutch. Feed the belt above the steering sector gear and over the pedal pivot shaft. The right side of the belt should wrap around the two idler pulleys, then around the transaxle input pulley (Figure 155).

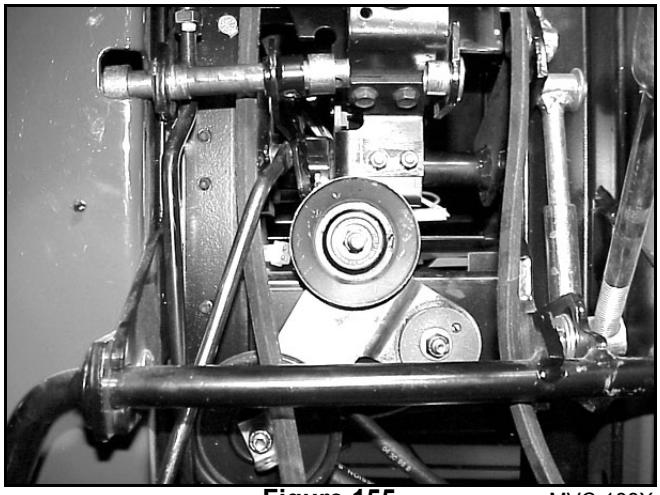


Figure 155 MVC-188X

10. Make sure the belt is routed to the outside of the brake rod (Figure 156).

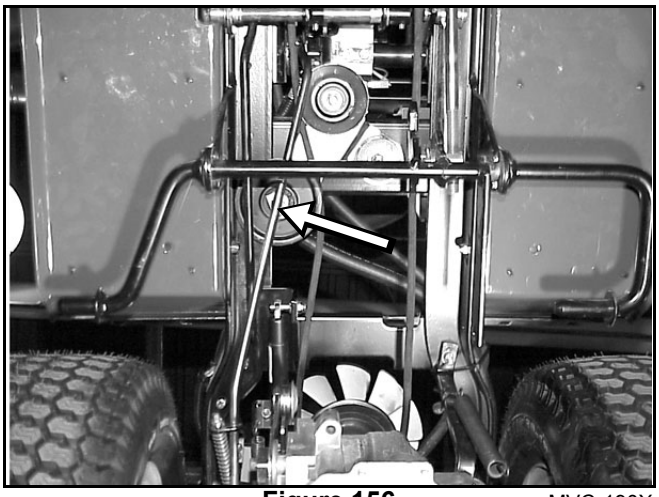


Figure 156 MVC-190X

11. Connect the hydrostatic rod to the forward/reverse hydro pedal (Figure 157).

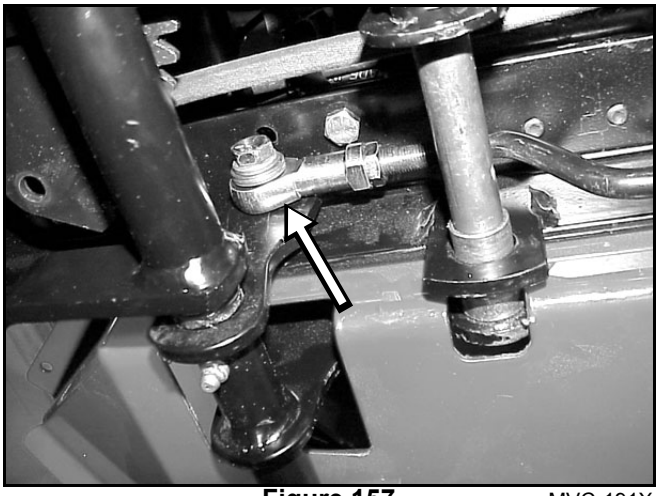


Figure 157 MVC-191X

12. Install the two steering links to the steering sector gear (Figure 158).

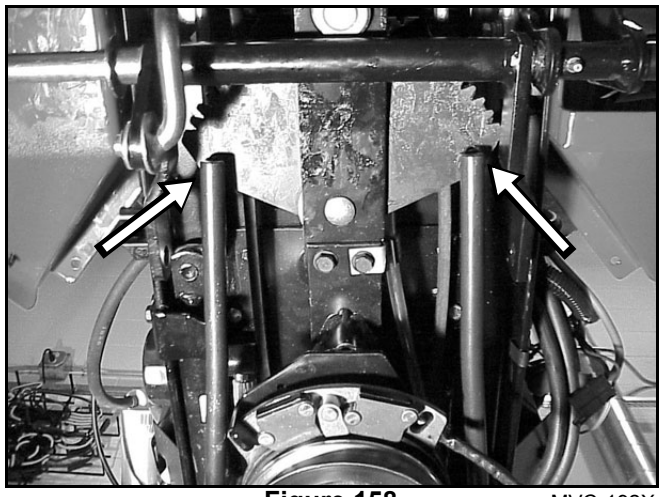


Figure 158 MVC-192X

13. Reconnect the brake rod at the transaxle. Install the castle nut and spring (Figure 159). Before installing the cotter pin, check the brakes, refer to ”Checking the Brake" on page 4 - 9.

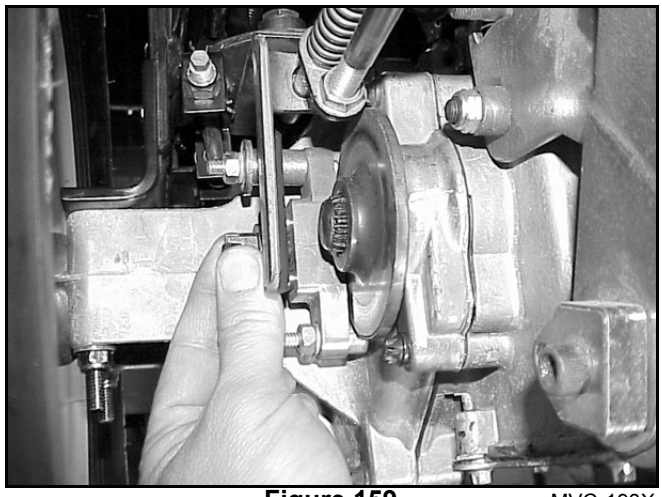


Figure 159 MVC-193X

14. Reconnect the idler spring to idler assembly (Figure 160).

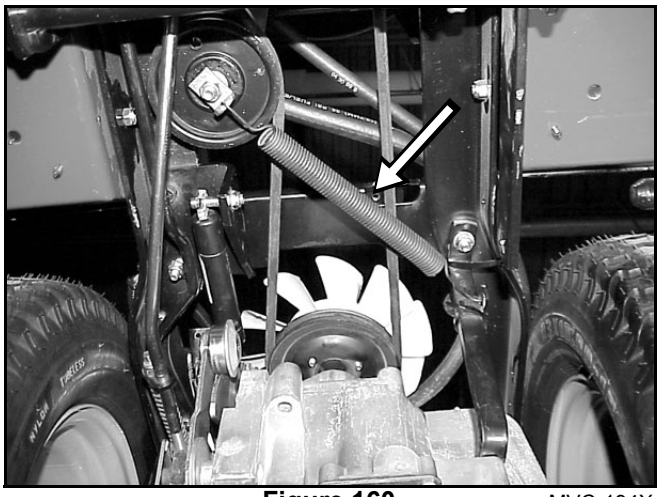


Figure 160 MVC-194X

15. Reconnect the electric clutch wire.

16. Check the routing of the drive belt.

Belt Routing Diagram

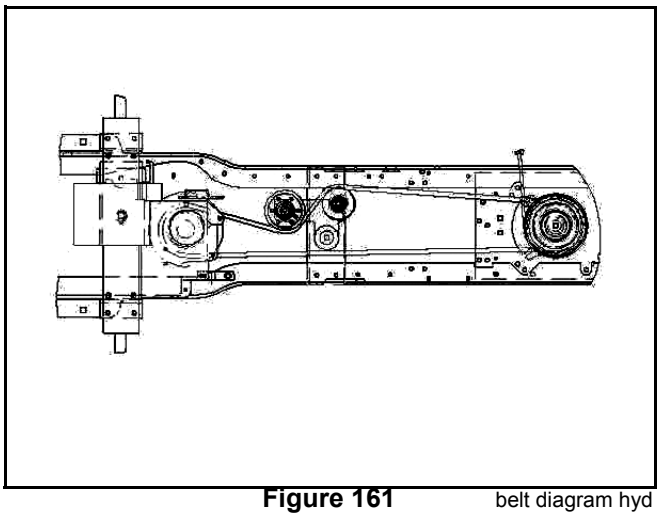


Figure 161 belt diagram hyd

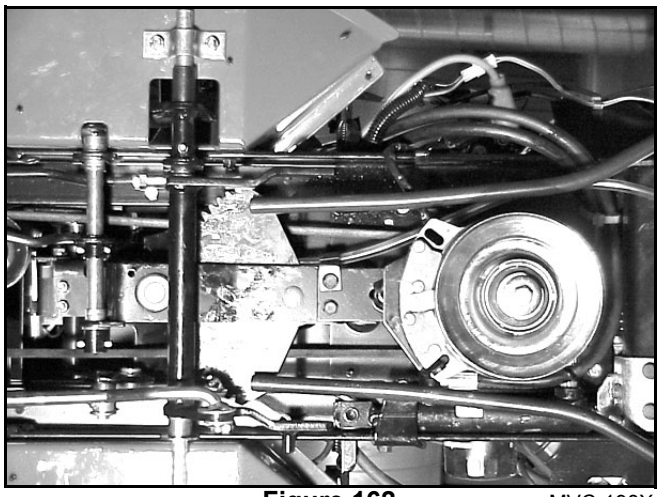


Figure 162 MVC-198X

Front portion of the tractor

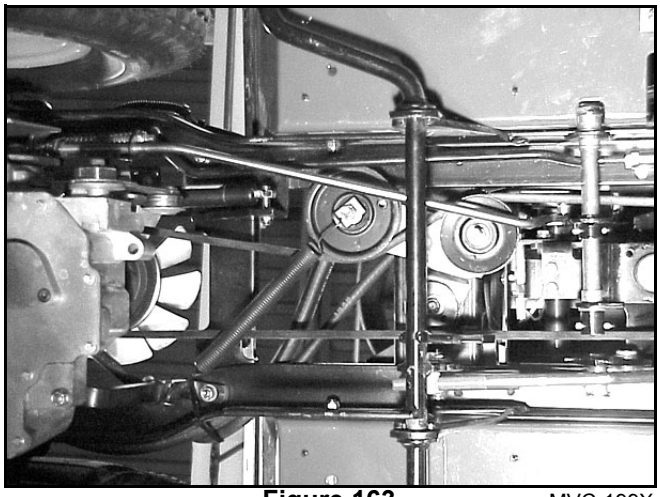


Figure 163 MVC-199X

Rear portion of the tractor

17. Test the tractor to make sure all the safety devices operate properly.

Belt Adjustment

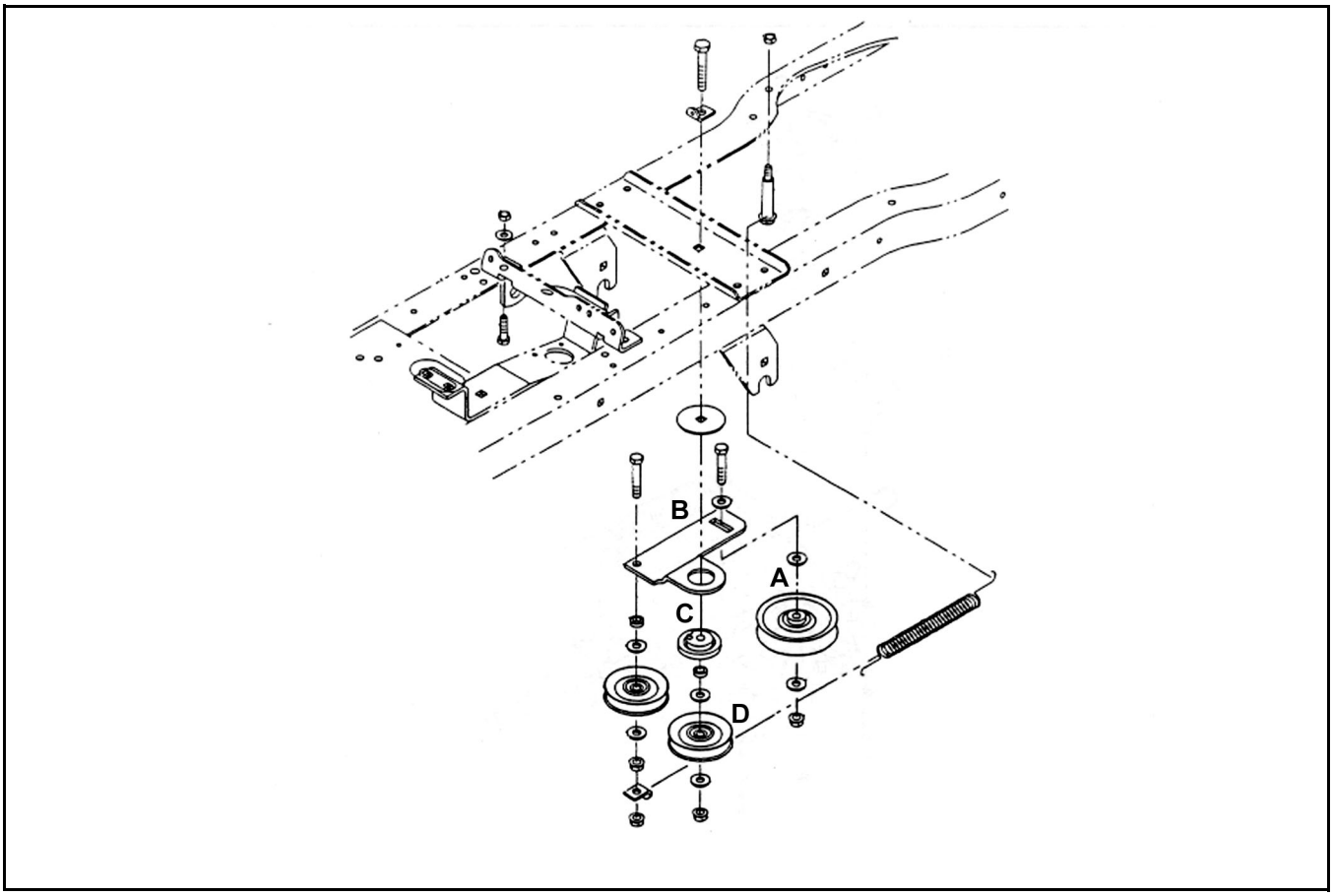


Figure 164 beltadjustment

(A) Back Side Idler Pulley
(B) Idler Arm
(C) Eccentric
(D) Eccentric Mounted Idler Pulley

Remove the tunnel cover to check or adjust the belt tension. Loosen the back side idler pulley, A, and move it in the slotted mounting hole on the idler arm, B. For additional adjustment, turn the eccentric C, on the eccentric mounted idler pulley, D.

Neutral Adjustment – Hydro-Gear Transaxle

Before making a neutral adjustment, the transaxle must be warmed up, usually 5 to 10 minutes. Steps to perform neutral adjustment:

1. Jack-up and support the right rear end of the tractor, allowing enough clearance to remove the right rear tire. Make sure the left rear tire stays on the ground (Figure 165).

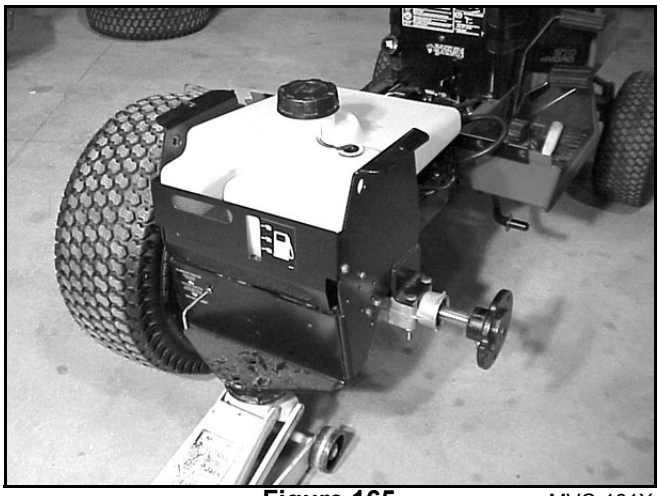


Figure 165 MVC-161X

2. Loosen the two bolts and nuts retaining the neutral switch bracket, so it can be moved with a small amount of force (Figure 166).

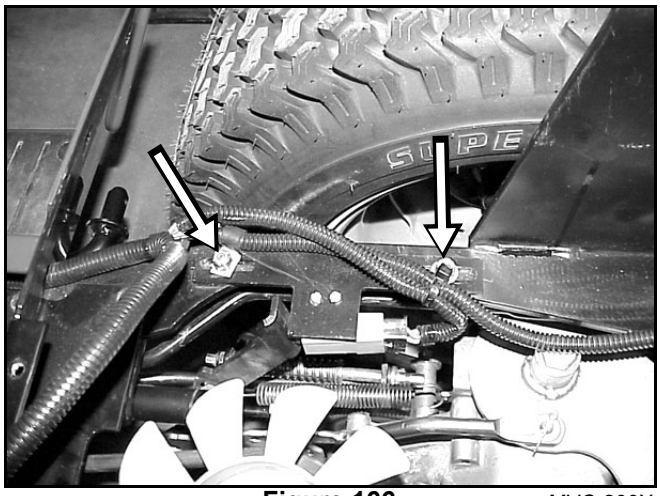


Figure 166 MVC-200X

3. Locate the adjusting puck and loosen the Allen head set screw (Figure 167).

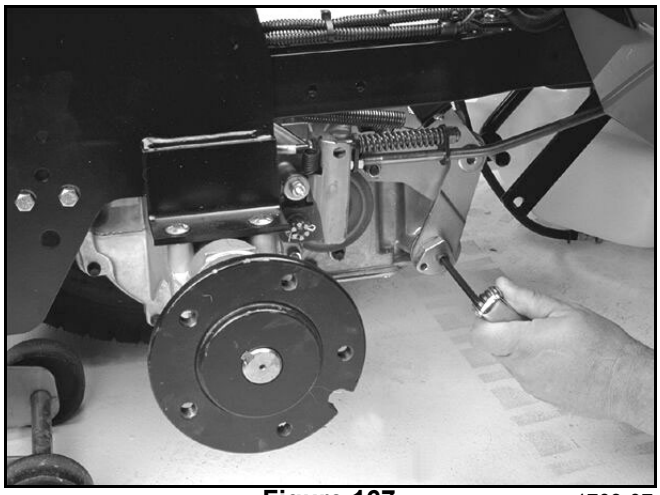


Figure 167 1703-07

4. Start the engine and run at ¾ to full throttle.

5. Rotate the adjusting puck in both directions and watch the axle direction. You want to adjust the puck so it is set at the mid-point between forward and reverse axle rotation. Make sure the axle is not moving (Figure 168).

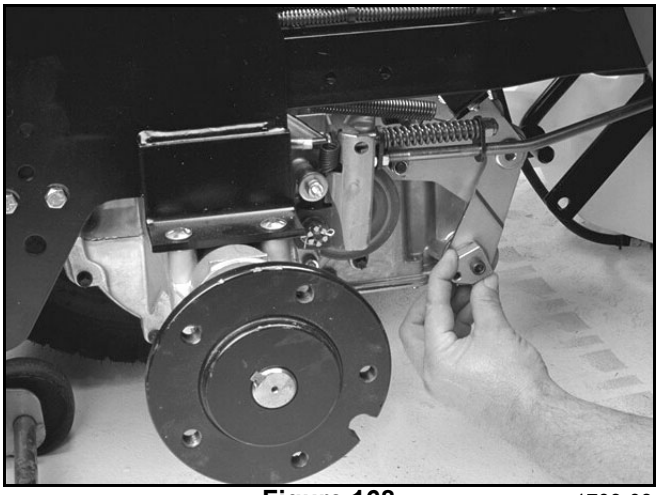


Figure 168 1703-08

6. Once you are in neutral, hold the puck with an adjustable wrench so it won't move when you re-tighten the Allen set screw (Figure 169).

Figure 169 MVC-226X

7. Operate the foot control in forward and reverse and allow the pedal to return to the neutral position to test the adjustment.

8. Adjust the neutral switch bracket so there is approximately 1/16" (1.6mm) between the bracket and the arm that plunges the neutral switch with the transaxle in neutral. Retighten the bolts. Readjust as needed to eliminate creeping.

NOTE: You may not be able to eliminate creep entirely, due to the narrow neutral zone of this transaxle. In this case, adjust for the smallest amount of reverse creep possible. Correctly adjusted, a very light tap on the foot control pedal should be all that is needed to stop the reverse creep.

Transaxle Removal – Gear Drive

1. Disconnect the negative battery cable from the battery.

2. Raise the rear of the tractor and remove the right and left rear tires. Support the rear frame, just in front of the transaxle. Remove the fender, seat, and gas tank. Refer to the “Chassis” section on page 2 - 16. Remove the center plate between the seat and the hood stand (Figure 169).

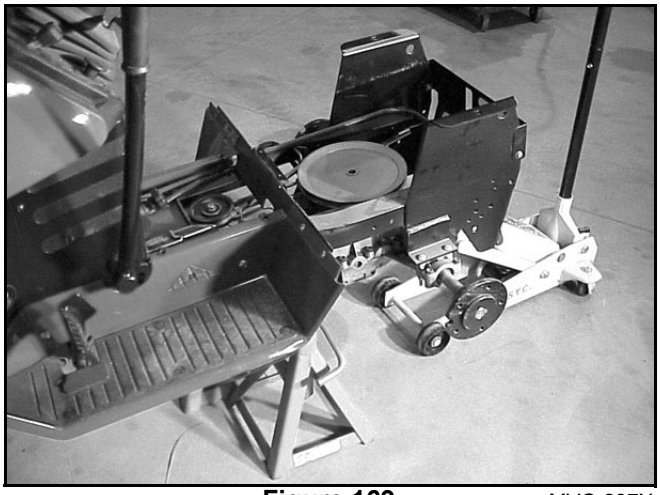


Figure 169 MVC-237X

3. Unhook the idler pulley spring at the frame bracket next to the transaxle input pulley (Figure 170).

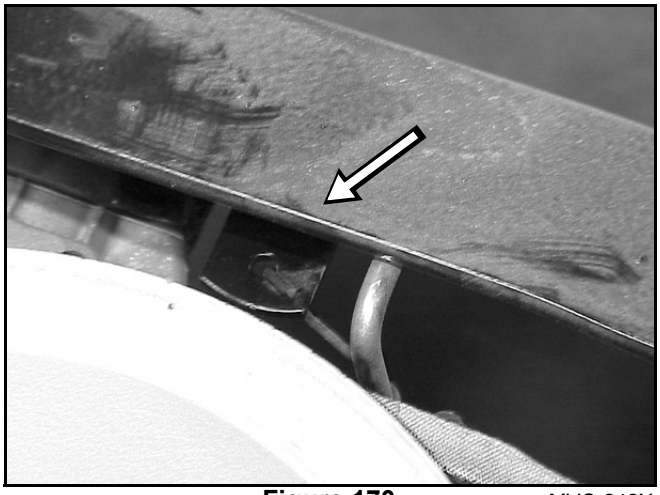


Figure 170 MVC-242X

4. Loosen the left and right side transaxle belt guide (Figure 171 and Figure 172).

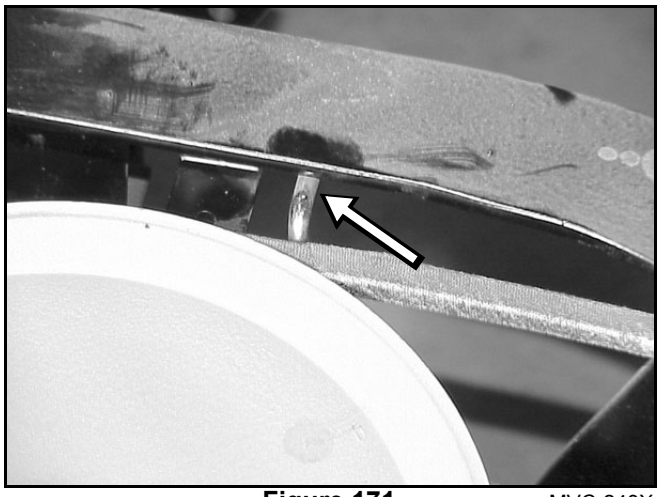


Figure 171 MVC-243X

Left Side Belt Guide

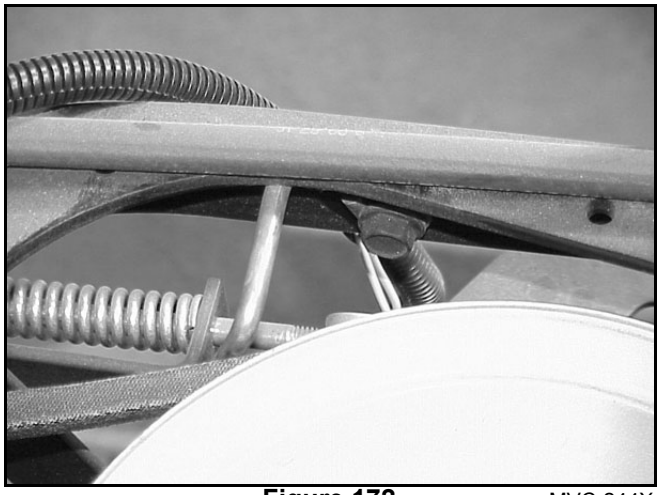


Figure 172 MVC-244X

Right Side Belt Guide

5. Push the clutch pedal down and remove the drive belt around the transaxle input pulley (Figure 173).

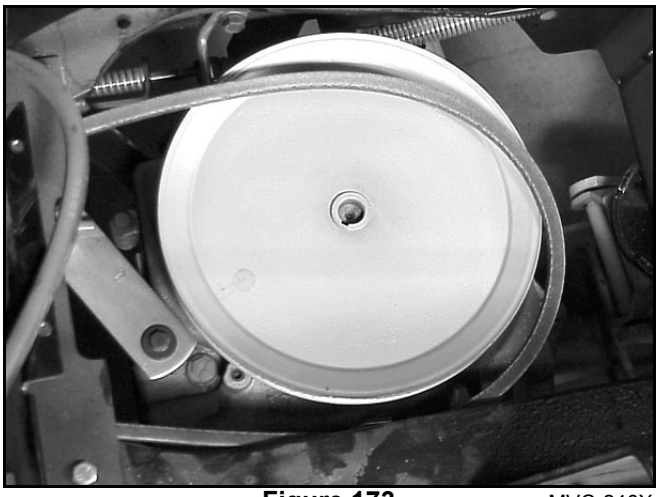


Figure 173 MVC-246X

6. Unhook the brake return spring from the rear of the frame (Figure 174).

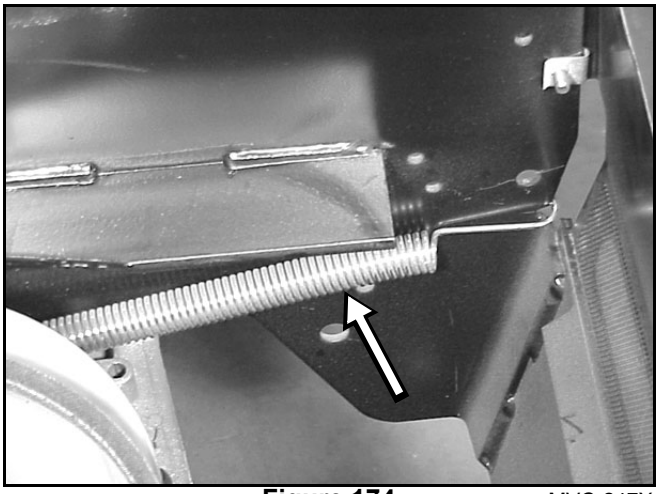


Figure 174 MVC-247X

7. Remove the cotter pin connecting the brake rod to the brake lever (Figure 175).

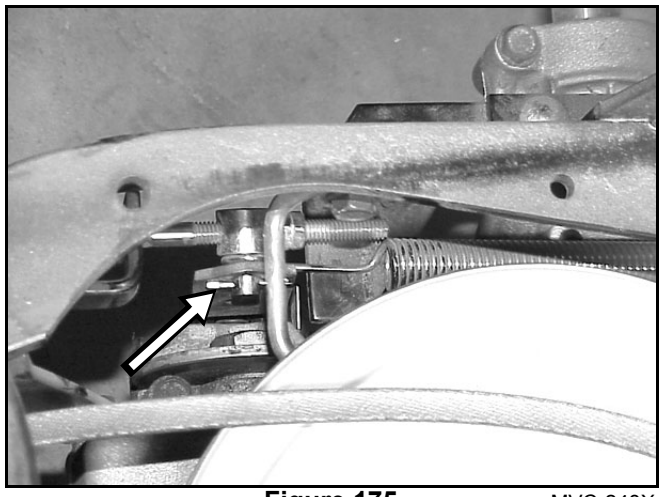


Figure 175 MVC-248X

8. Remove the cotter pin and washer holding the shift rod to the transaxle shift bracket (Figure 176).

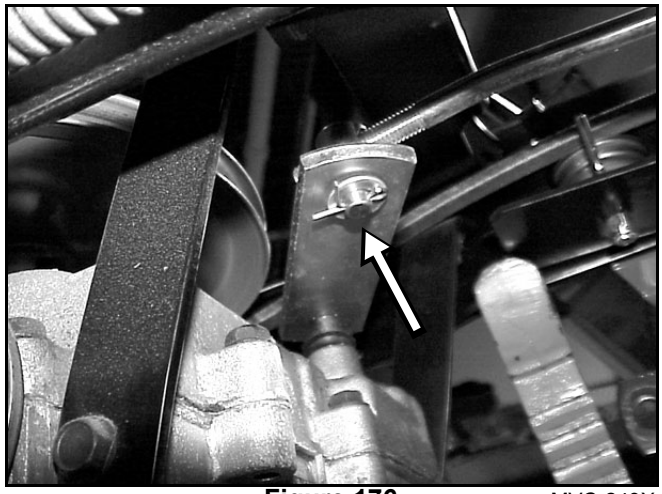


Figure 176 MVC-249X

9. Place a floor jack under the transaxle. Remove the bolts holding the front right and left torque straps (Figure 177).

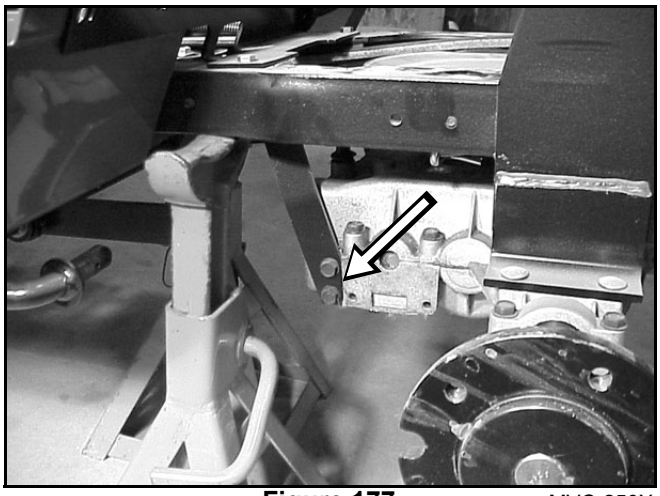


Figure 177 MVC-250X

10. Remove the four carriage bolts, washers, and nuts securing each side of the transaxle axle housing to the frame (Figure 178).

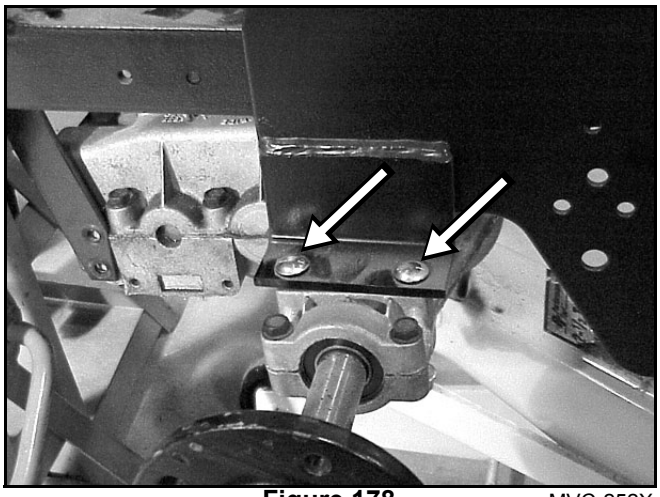


Figure 178 MVC-252X

11. Lower the transaxle out of the frame (Figure 179).

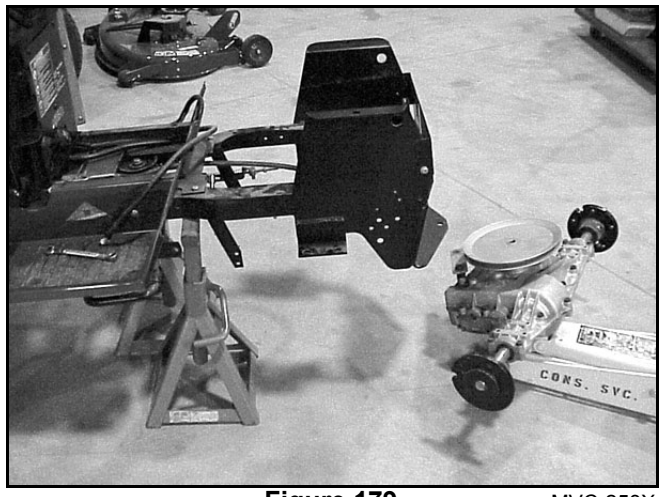


Figure 179 MVC-253X

Installation – Gear Drive Transaxle

1. Raise the transaxle up toward the frame and install the four carriage bolts, washers, and nuts. On the right side, make sure the brake stop bracket is installed between the transaxle and the frame (Figure 180).

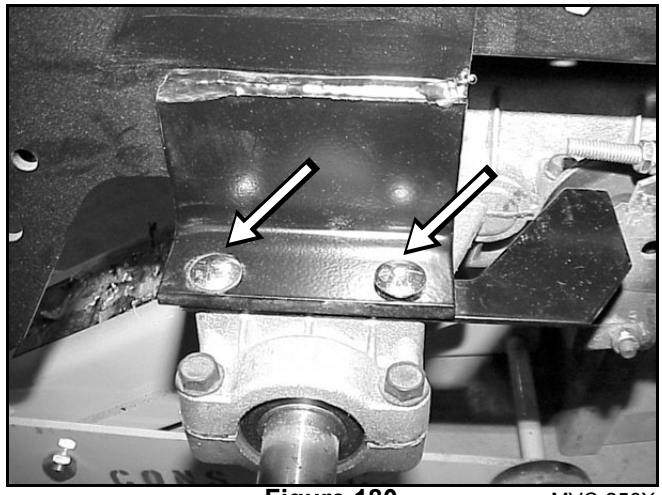


Figure 180 MVC-256X

2. Install the four bolts through the right and left torque straps and tighten (Figure 181).

Figure 181 MVC-258X

3. Engage the clutch pedal and reinstall the drive belt around the transaxle input pulley (Figure 182).

Figure 182 MVC-259X

4. Install the cotter pin and washer connecting the shift rod to the transaxle shift bracket (Figure 183).

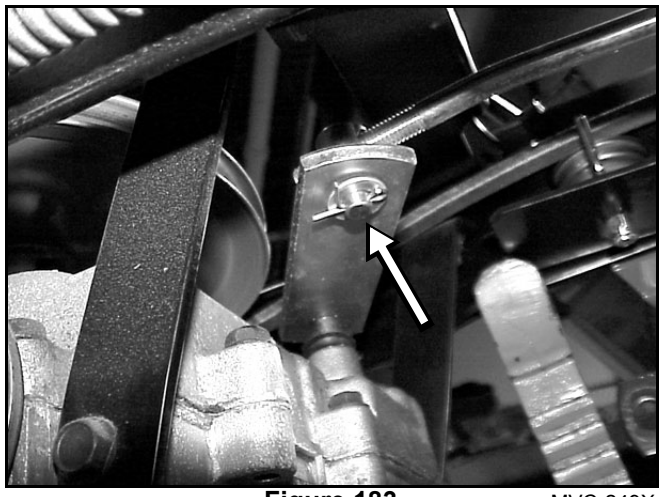


Figure 183 MVC-249X

5. Install the cotter pin connecting the brake rod to the brake lever (Figure 184).

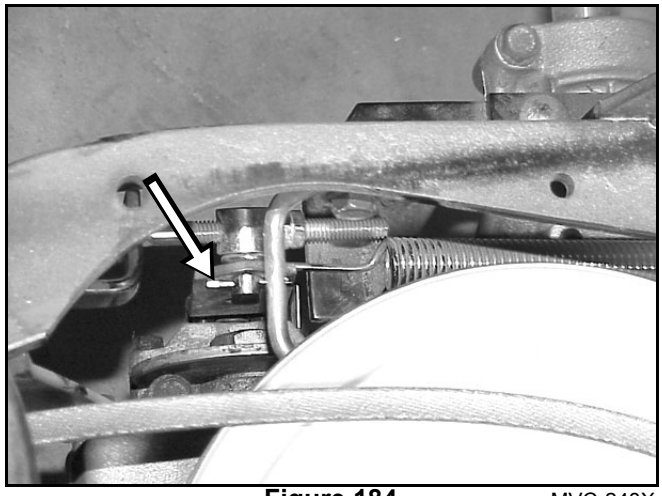


Figure 184 MVC-248X

6. Hook the brake return spring to the rear of the frame (Figure 185).

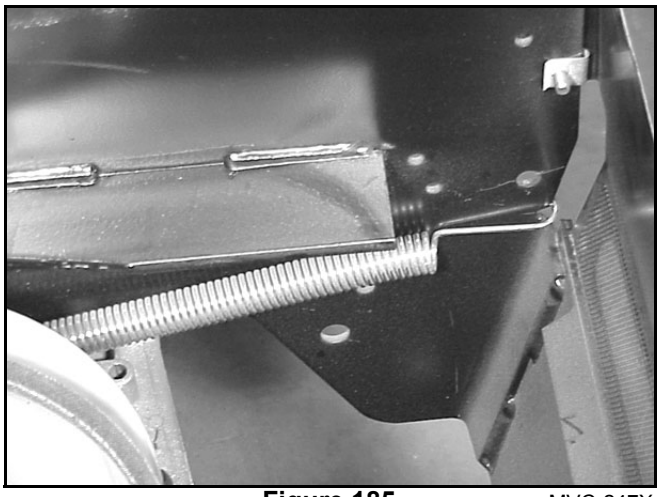


Figure 185 MVC-247X

7. Hook the idler pulley spring to the frame bracket (Figure 186).

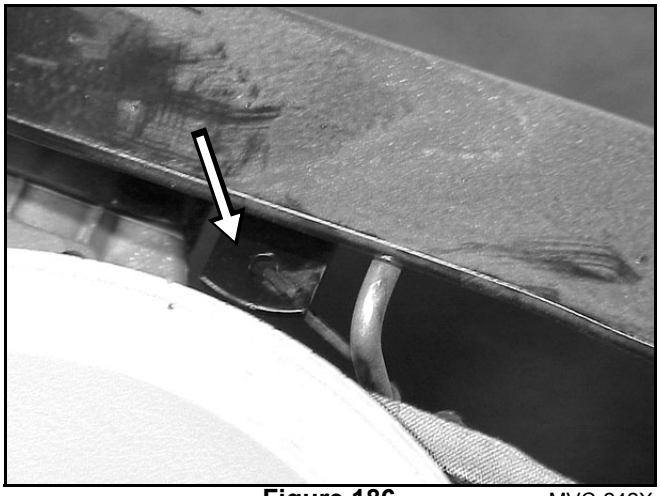


Figure 186 MVC-242X

8. Install and adjust the right belt guide to the frame and tighten. Also, tighten the left belt guide. The guides should be adjusted within 1/8" (3mm) from belt (Figure 187).

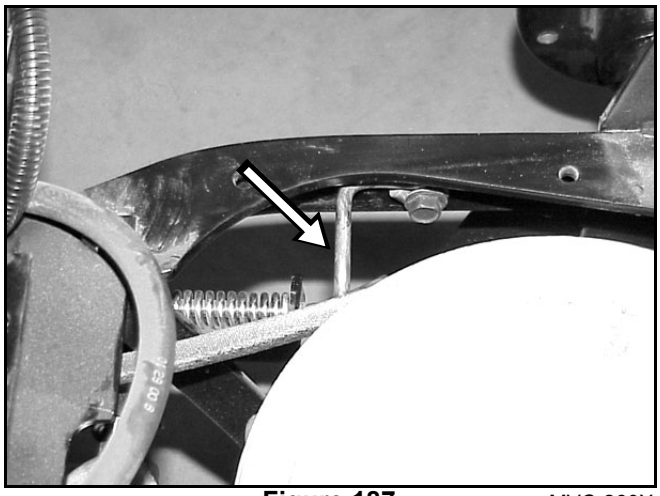


Figure 187 MVC-260X

9. Reconnect the negative battery cable.

10. Check the brakes, (refer to "Checking the Brake" on page 5 - 14).

11. Check the shift linkage, (refer to "Shift Linkage Adjustment" on page 5 - 13).

12. Reinstall the fender, seat, and gas tank. Refer to the “Chassis” section on page 2 - 16.

Troubleshooting

The first rule in transaxle troubleshooting is to check for proper adjustment of the belts, belt guides, brake clutch, shifter, and linkage. Check pulleys for sheared keys, bad keys, bad bearings, or damaged or worn sheaves. If the problem is related to shift difficulties, make sure the belt fully declutches and check all linkages for proper operation. This assures the problem is not associated with belt disengagement.

Internal Service

Repair procedures for the Peerless 820 transaxle are available from Tecumseh Products Company, Technician's Handbook # 691218.

GEAR DRIVE

Symptom: Unit Jumps Out of Gear

Possible Cause	Remedies
Equipment clutch not disengaging	Adjust clutch according to equipment instructions
Shifting washers in backwards	Chamfered or rounded side of washer must be toward keys.
Improper fit of case cover	Recheck positioning of thrust washers. A misplacement or omission of washers can cause binding.
Shifting keys broken or damaged	Replace keys and check unit for other damage.
Chamfer on shift gear on wrong side	Check that bevels on shifter gears are correct (fork flanges should be toward each other). On 3 gear cluster, small gear and medium gear chamfers go down toward big gear.
Shifter stop assembled backwards	Determine that notch in STOP aligns with shifter forks in NEUTRAL position.
Gear improperly installed	Review positioning of gearing.
Forks and rod assembly incorrectly installed	Remove assembly. Recheck and correctly position parts.
Shifter/brake shaft keyway damaged	Remove nicks and burrs from keyway.
Parts missing	Install missing parts.

Symptom: Unit Can Not Be Shifted (or Difficult to Shift)

Possible Cause	Remedies
Shifter lever improperly installed	Disassemble shifting lever and check for proper assembly.
Teeth of gears are worn beyond tolerances	Replace worn gears.
Spring in shift fan weak or broken	Replace Spring.
Attaching screws for shift lever and housing assembly not properly torqued	Torque screws to 10 ft lb (13.6 Nm)
Shifter/brake shaft improperly assembled	Reassemble properly.
Keys weak or worn – shift gear damage	Replace keys/shift gear.
Shift lever bent and hitting unit frame	Replace shift lever.
Shift rod worn	Replace rods.
Constant mesh gears improperly installed on counter shaft	Reposition gears.
Belt guides on engine/transmission/idler assembly are out of adjustment	Adjust belt guides.

Symptom: Unit Does Not Drive

Possible Cause	Remedies
Keys sheared in drive pulleys	Replace
Shift keys broken	Replace keys, check keyways and shift gears.
Broken input gear	Replace
Differential bevel gears broken	Replace
Stripped teeth on gears	Replace

Belt Replacement – Gear Drive

1. Position the steering wheel so the tie rod ends clear the front axle and remove them from the steering arms (Figure 188).

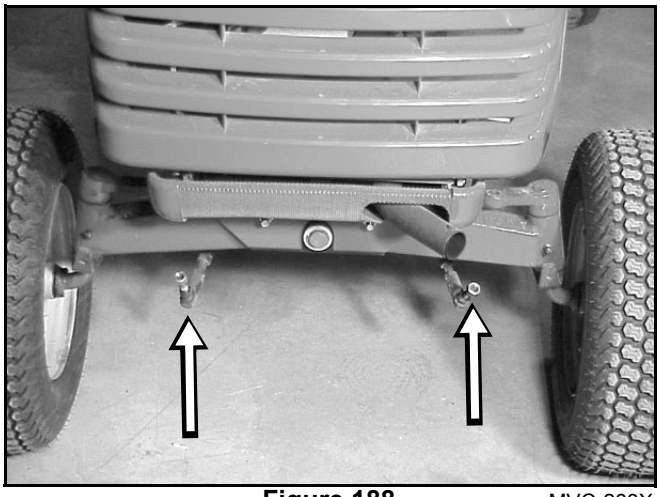


Figure 188 MVC-263X

2. Disconnect the electric PTO (Power Take Off) wiring harness and remove the battery drain tube from the tie strap (Figure 189).

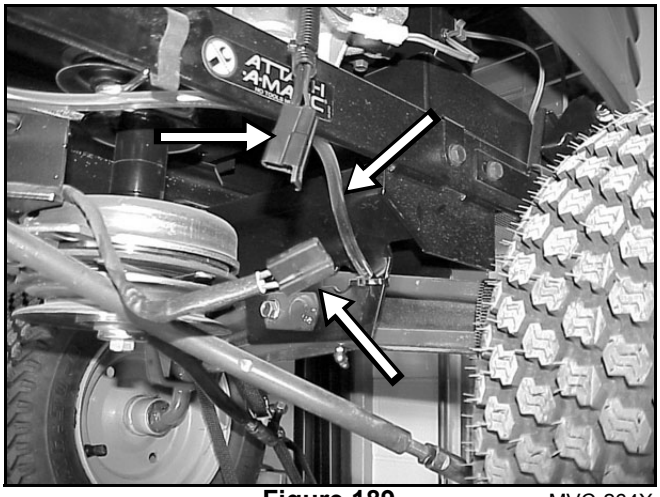


Figure 189 MVC-264X

3. Loosen the belt guide located on the left side of the engine drive pulley and move away from the drive belt (Figure 190).

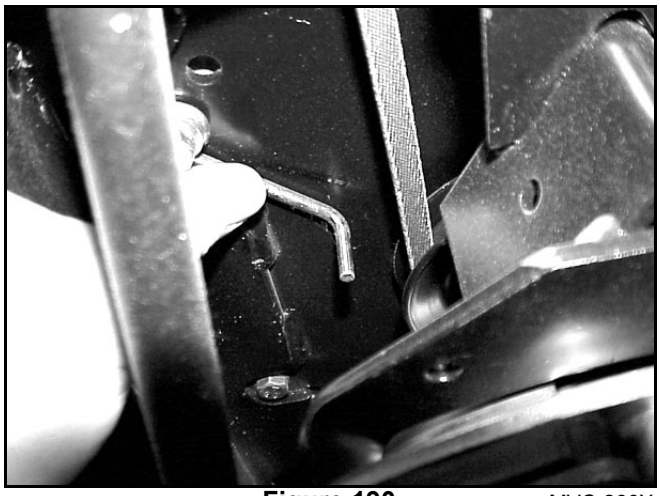


Figure 190 MVC-266X

4. Loosen and move the belt guide located on the idler pulley on the right side of the engine drive pulley (Figure 191).

Figure 191 MVC-267X

5. Disconnect the idler assembly spring from the bracket located on the left side of the frame next to the transaxle input pulley. Also, loosen and move the belt guide located on the same bracket (Figure 192).

Figure 192 MVC-268X

6. Loosen and move the belt guide located on the right side of the frame next to the transaxle input pulley (Figure 193).

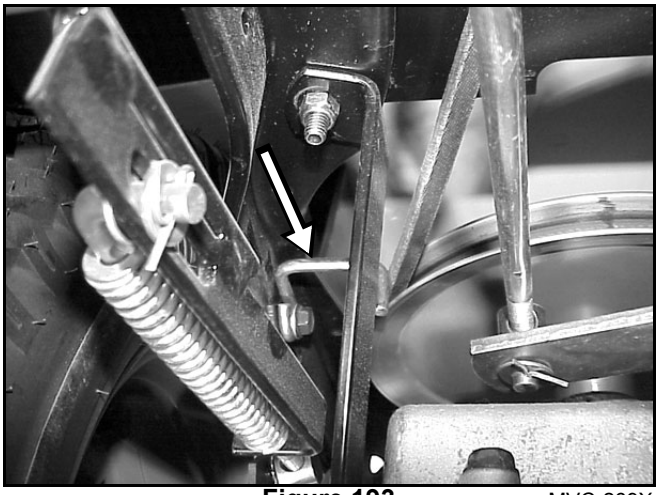


Figure 193 MVC-269X

7. Remove one screw and loosen the other screw on the brake pedal safety switch. Turn the switch out of the way when lowering the clutch/brake cross shaft (Figure 194).

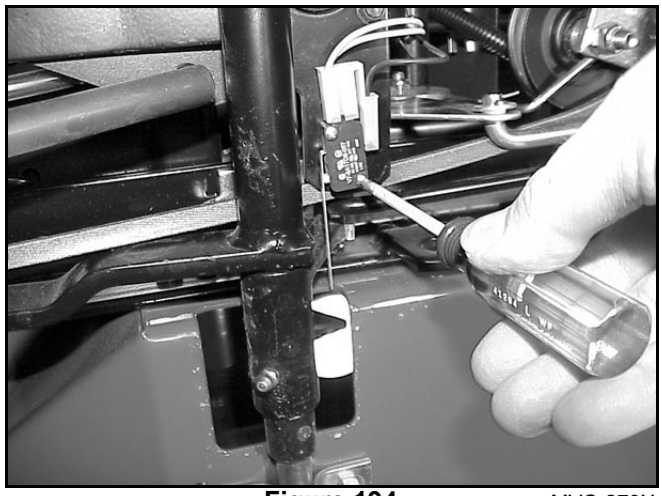


Figure 194 MVC-270X

8. Remove the brackets for the clutch/brake cross shaft (Figure 195).

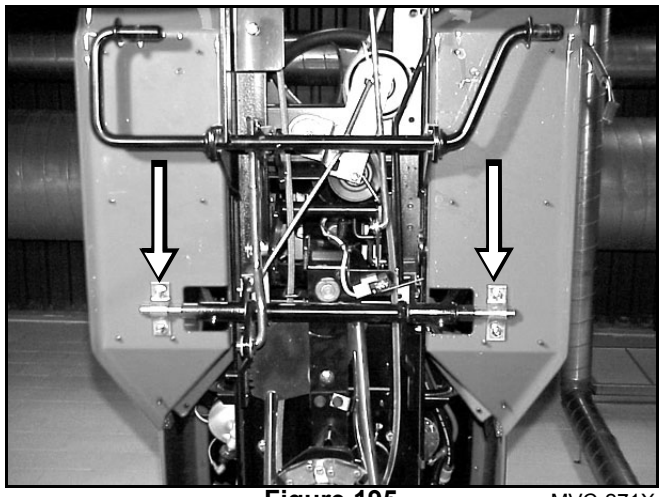


Figure 195 MVC-271X

9. Remove the cotter pin and washer from the shift lever rod and remove the shift lever rod (Figure 196).

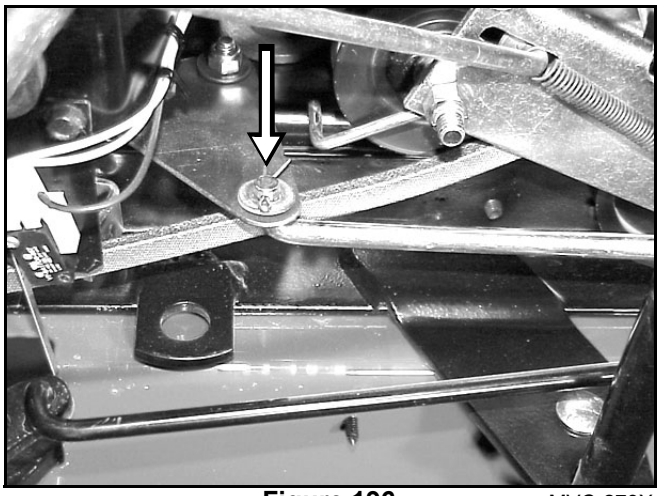


Figure 196 MVC-273X

10. Remove the idler pulley assembly at the pivot bolt (Figure 197).

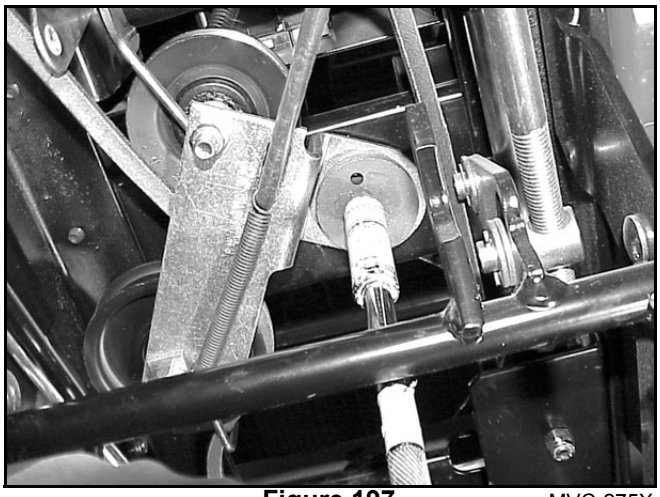


Figure 197 MVC-275X

Belt Routing Diagram

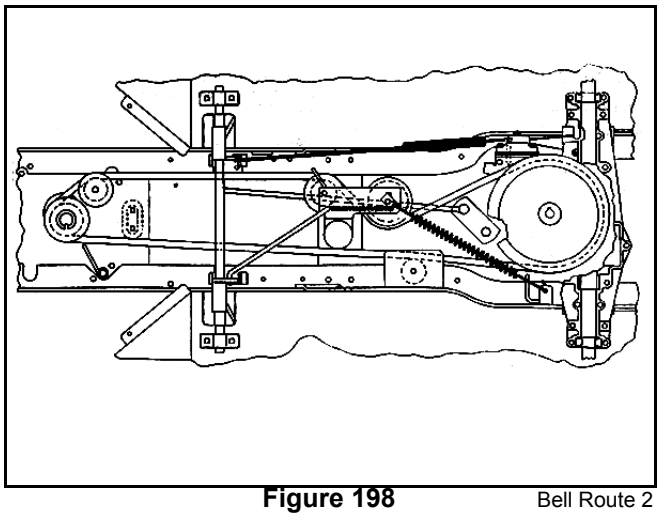


Figure 198 Bell Route 2

11. Install the new belt through the idler pulley assembly, around the V-idler pulley and the flat idler pulley. Reinstall the pivot bolt for the idler assembly.

12. Take the slack of the belt forward over the steering sector, over each tie rod and around the engine drive pulley. Starting from the front, make sure the belt fits between the belt guide and idler pulley, on the right side of the engine drive pulley (Figure 199).

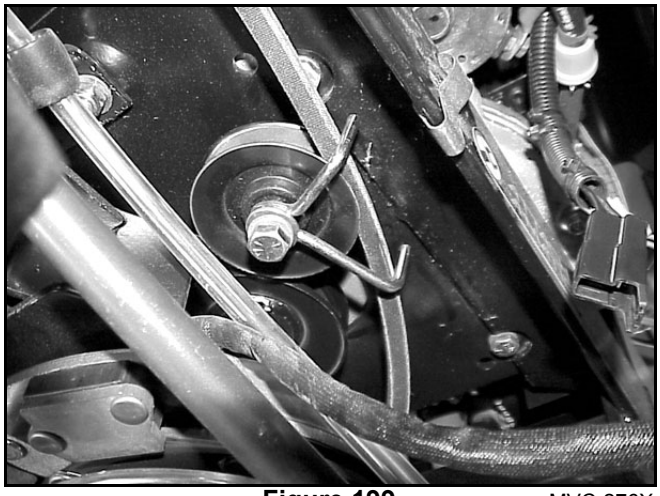


Figure 199 MVC-276X

13. There is a belt guide located in the mid-section of the tractor. Make sure the belt gets routed through the wire guide (Figure 200).

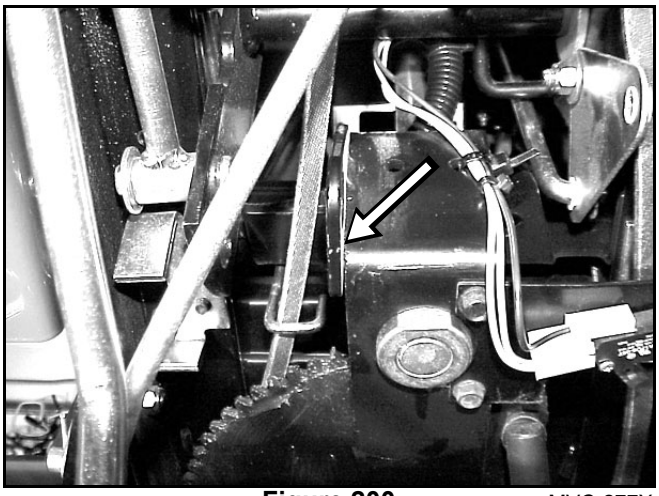


Figure 200 MVC-277X

14. Install the cotter pin and washer for the shift lever rod (Figure 201).

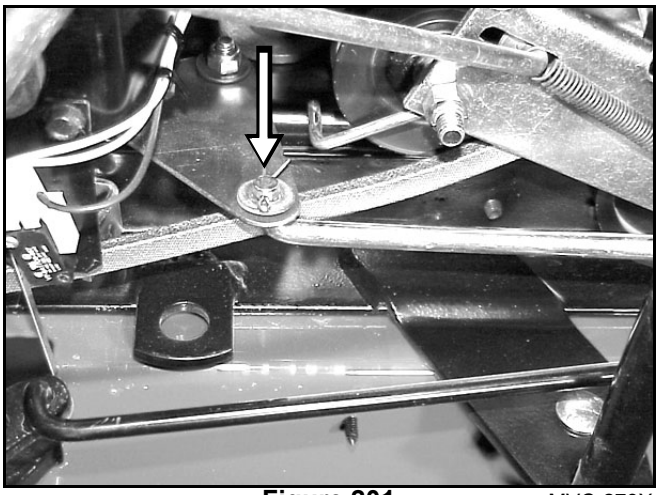


Figure 201 MVC-273X

15. Reinstall the clutch/brake cross shaft and tighten the brackets (Figure 202).

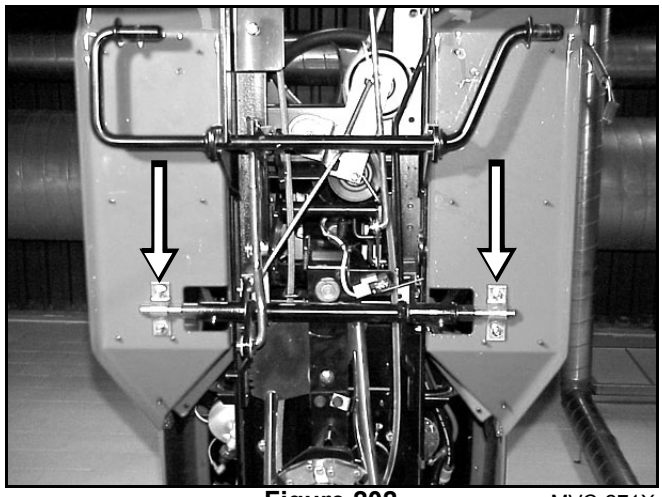


Figure 202 MVC-271X

16. Install the screw to the safety switch and make sure the switch is adjusted in the closed position (Figure 203).

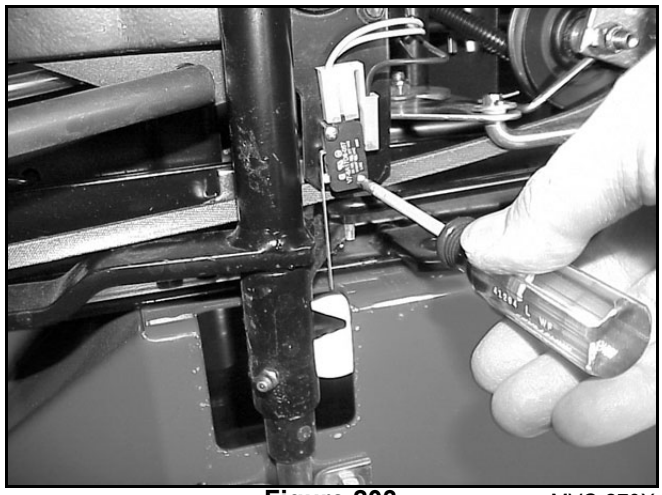


Figure 203 MVC-270X

17. Install the belt around the transaxle input pulley.

18. Connect the idler spring to the frame bracket (Figure 204).

Figure 204 MVC-268X

19. Adjust the front idler belt guides (located on the right side of the engine drive pulley) within 1/8” (3mm) from the belt. Adjust the belt guide located on the left side of the engine drive pulley so it is within 1/8” (3mm) from the belt (Figure 205).

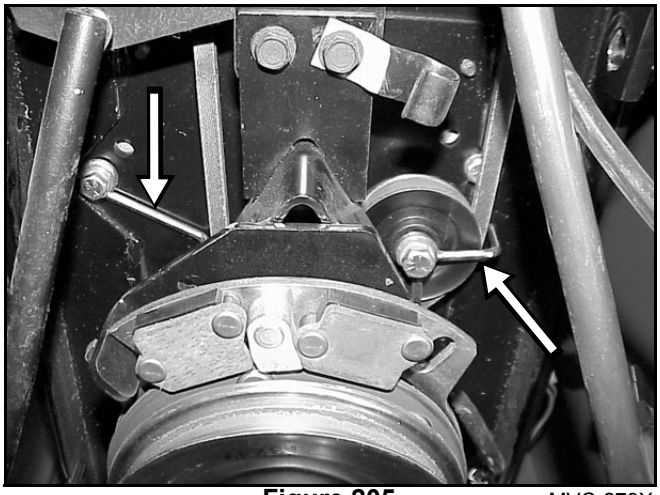


Figure 205 MVC-279X

20. Reconnect the electric PTO and route the battery drain tube through the tie strap (Figure 206).

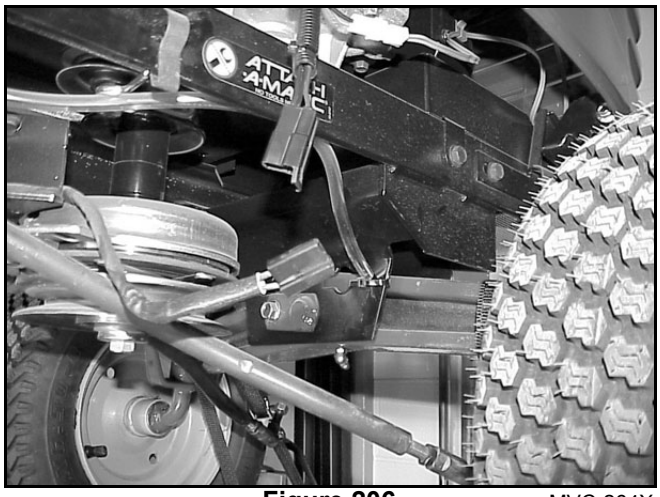


Figure 206 MVC-264X

21. Connect the tie rod ends to the steering arms (Figure 207).

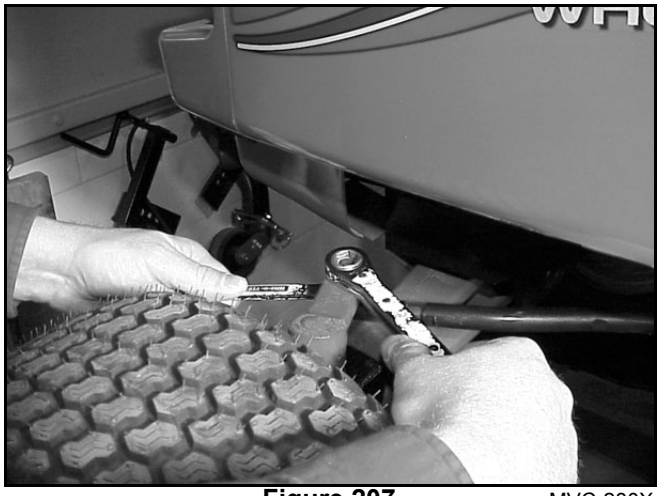


Figure 207 MVC-280X

22. Check the routing of the belt and that all belt guides are adjusted properly (Figure 208).

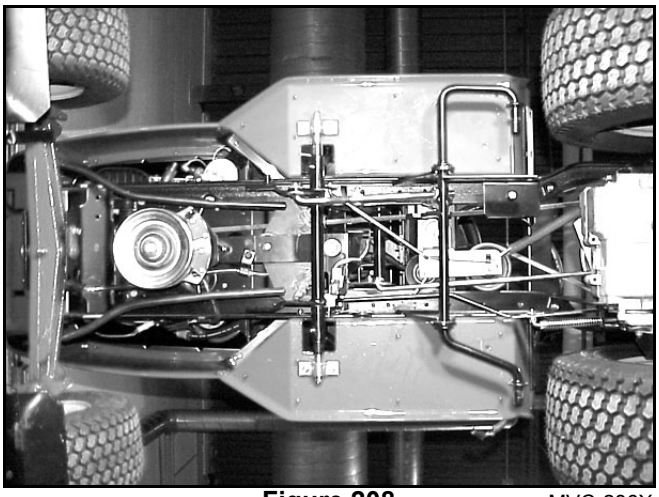


Figure 208 MVC-286X

Belt Adjustment

The 260 Series Gear Drive Tractor uses a sliding idler pulley to adjust the drive belt tension. Proper tension will provide ½" (12.700 mm) belt deflection under light pressure. To check the belt adjustment:

1. Remove the center access plate located between the fender and the hood stand.

2. Loosen the belt guide and check the belt tension, which should be ½" (12.700 mm) belt deflection under light pressure (Figure 209).

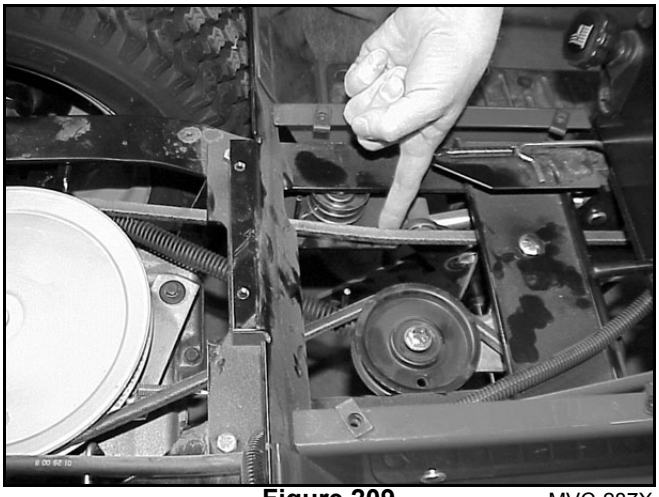


Figure 209 MVC-287X

3. Loosen the bolt and nut holding the idler pulley to the bracket. Adjust the pulley as necessary to achieve the ½" (12.700 mm) deflection (Figure 210).

Figure 210 MVC-288X

4. Tighten the bolt and nut.

5. Tighten the belt guide.

6. Recheck the belt tension.

7. Reinstall the access plate.

Proper Shifting Procedures - Gear Drive

IMPORTANT: This is not a “shift on the go” system. The operator must depress the clutch pedal and the tractor must be stopped before shifting to the next gear. Shifting the tractor without the use of the clutch may cause severe damage to the transaxle (Figure 211).

Figure 211 MVC-289X

Shift Linkage Adjustment

If the gear shift lever and the internal shift detents do not align, use the following procedure to correct the problem:

1. Disengage the PTO, set the parking brake, turn the ignition key to ***OFF*** and remove the key.
2. Place the gear shift lever in 6th gear (Figure 212).

Figure 212 MVC-292X

3. Disconnect the linkage rod at the transaxle shift arm (Figure 213).

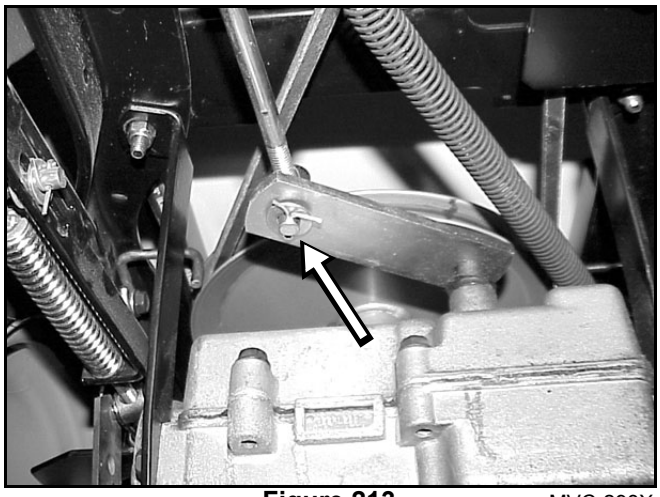


Figure 213 MVC-293X

4. Shift the transaxle to the 6th gear using the transaxle shift arm (Figure 214).

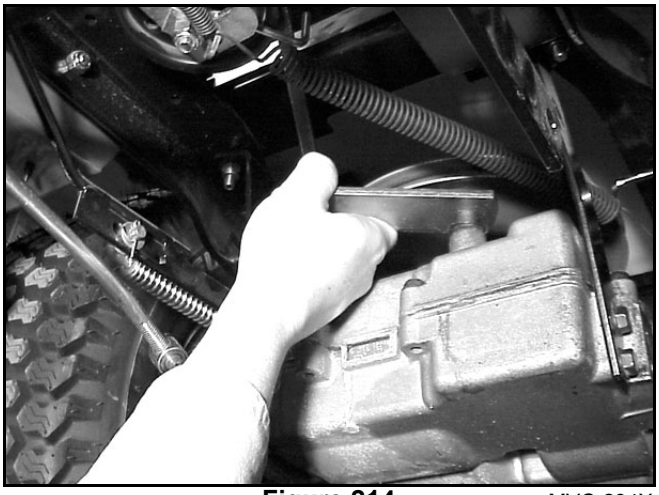


Figure 214 MVC-294X

5. Turn the trunion until it aligns with the hole in the transaxle shift arm (Figure 215).

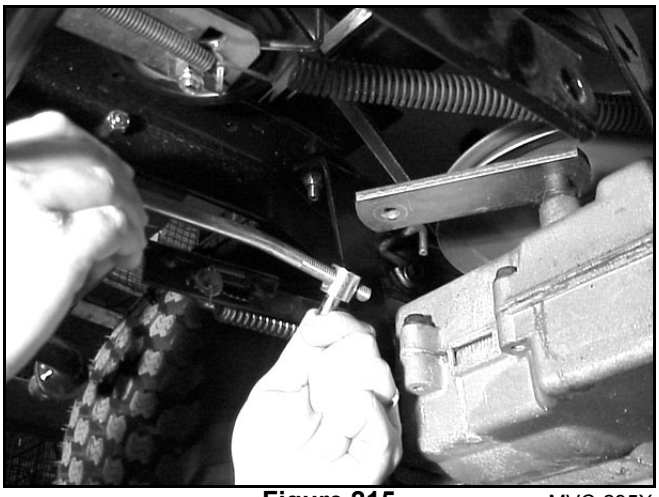


Figure 215 MVC-295X

6. Reconnect the linkage.

7. Check that the gear shift lever is centered in the gate.

8. Shift linkage that is misadjusted, loose, or worn will result in shifting problems.

Shift Detent Tension Adjustment

The detent ball on the shifter in the transaxle must have the proper tension for the transaxle to operate properly. If this tension is not correctly set, the transaxle will either shift hard or correct gear selection will be difficult.

To have the proper tension on the detent ball, the index set screw should be ½ turn in from the top of the case (Figure 216). If this adjustment is insufficient to correct the problem, consult the troubleshooting guide on page 5 - 6, or Tecumseh/Peerless Mechanic's Handbook, available through Tecumseh Products.

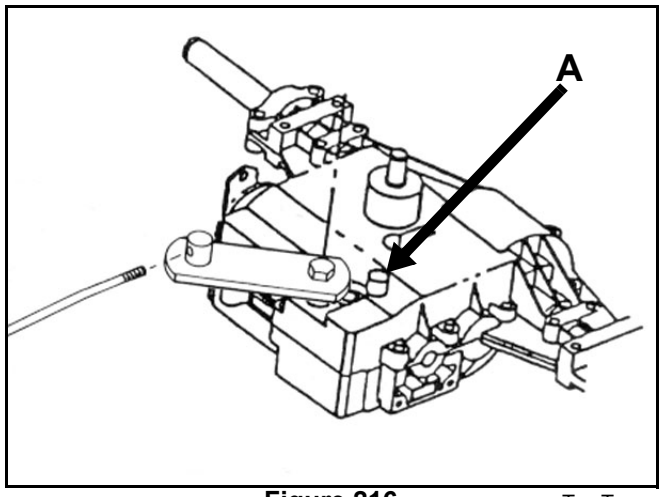


Figure 216 Tec Trans

(A) Index Set Screw

Brakes

The brake is on the right side of the rear axle, inside the rear tire. If the brake does not hold securely or stopping power is insufficient, an adjustment is required.

Checking the Brake

1. Park the machine on a level surface, disengage the power take off (PTO), shift into neutral, set the parking brake, and turn the ignition key to "OFF" to stop the engine. Remove the key.

2. If the rear wheels lock and skid when you push the tractor forward, no adjustment is required. An adjustment is required if the wheels turn and do not lock; refer to "Adjusting the Brake" on page 5 - 15.

Adjusting the Brake

1. Check the brake before you adjust it.

2. To increase braking resistance, tighten the brake adjusting nut 1/8 turn clockwise; then check the brake again. Continue this adjusting and checking process until the brake is set properly (Figure 217).

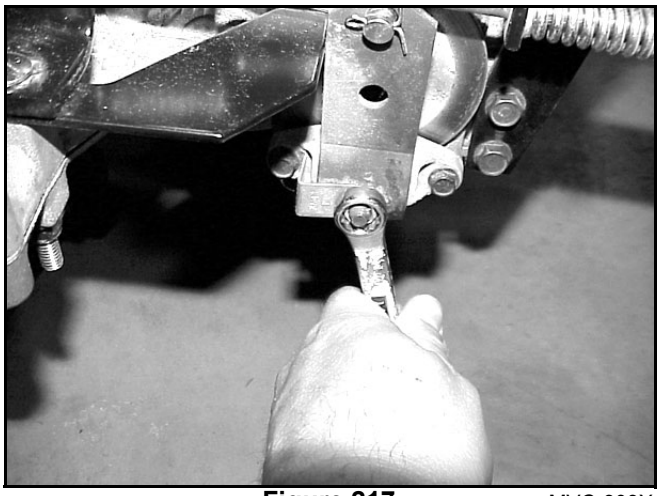


Figure 217 MVC-303X

3. Push down on the brake pedal to release the parking brake.

IMPORTANT: With the parking brake released, the rear wheels must rotate freely when you push the tractor. If the brake seems to “drag,” loosen the adjusting nut slightly until the wheels rotate freely. If both conditions cannot be achieved, inspection of the transaxle brake components is necessary. Consult the Tecumseh/Peerless Mechanic’s Handbook, available through Tecumseh Products.

THIS PAGE INTENTIONALLY LEFT BLANK

The electrical system in the 260 Series Lawn and Garden Tractors differ between Gear Drive and Hydrostatic Drive models. Following is a brief explanation.

Gear Drive Models

Two things happen when turning the ignition switch to the “START” position. (1) Current flows from the ignition switch through the PTO (Power Take Off) switch, brake switch, neutral switch, seat switch, and activates the interlock relay, which sends voltage to the coil of the starter solenoid. This solenoid actuates and allows voltage to the starter motor of the engine. (2) At the same time, with the ignition in the “START” position, current will flow to the kill relay, which activates and takes the engine magneto ground wire off of ground to allow the engine to have spark.

Hydrostatic Models

The hydrostatic model tractors start in a similar manner except instead of a starter solenoid we use a start relay. The starter on the engine is a solenoid shift starter.

Once you have the tractor running, you can now engage the PTO (Power Take Off) switch which will engage the electric clutch for the mower only if you are in the seat, activating the seat switch. Anytime you vacate the seat with the electric clutch activated for the mower, the seat switch will open and cut off voltage to the relay, which will deactivate and ground the engine magneto and stop the engine. If you vacate the seat with the PTO switch disengaged and the park brake engaged, the engine will continue to run.

The following electrical section covers most of the electrical components used on the 260 Lawn and Garden Tractors. It covers each electrical component’s purpose, how it works, testing procedures, and location on the tractor. To help you further to troubleshoot electrical problems, the Riding Products Electrical Demystification Guide, Form # 492-4509, is available with complete wiring and circuit diagrams to help diagnose electrical problems.

Relay

Purpose

The 260 Series Lawn and Garden Tractors use relays to direct current flow to different areas of the tractor. The most complex models have four relays: cruise control relay, interlock relay, kill relay, and a start relay. Electrically, they all operate the same.

Location

The relays are located on the firewall of the tractor (Figure 218).

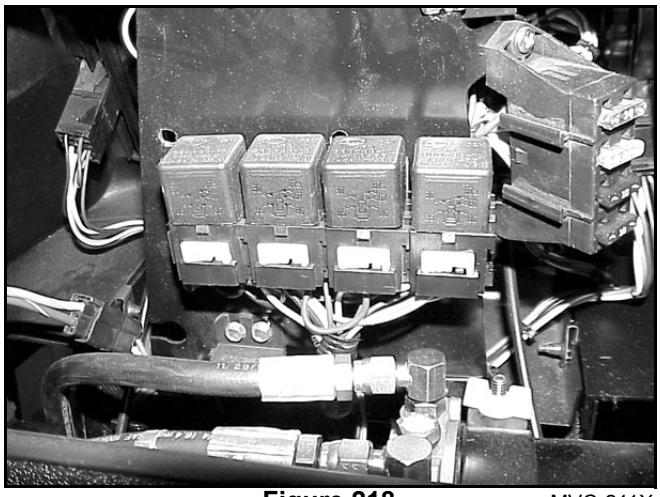


Figure 218 MVC-211X

How It Works

A relay is an electrically actuated switch.

1. Coil: Terminals 85 and 86 are connected to a coil. Applying 12 volts to these terminals energizes the coil turning it into an electromagnet.

2. Switch: Terminals 30, 87, and 87a are actually part of a single pole, double throw (SPDT) switch. Terminal 30 is the common lead. The switch is spring loaded so that 30 and 87a are connected when the coil is not energized. When the coil is energized, the switch is “thrown” and 30 and 87 are connected (Figure 219).

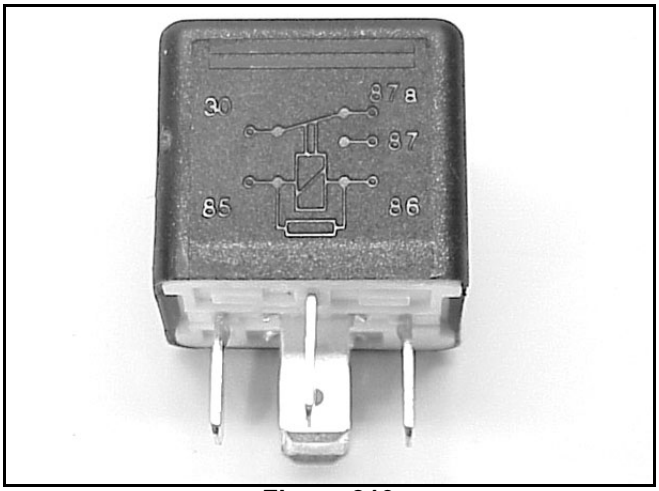


Figure 219 MVC-671X

Testing

1. Disconnect the relay from the harness.

2. Verify the coil resistance between terminals 85 and 86 with a multimeter (ohms setting). Resistance should be from 70 to 90 ohms. There should be continuity between terminals 87a and 30.

3. Connect multimeter (ohms setting) leads to relay terminals 30 and 87. Ground terminal 86 and apply +12 VDC to terminal 85. The relay should make and break continuity between terminals 30 and 87 as 12 VDC is applied and removed from terminal 85.

4. Connect multimeter (ohms setting) leads to relay terminals 30 and 87a. Apply +12 VDC to terminal 85. With terminal 86 still grounded, the relay should break and make continuity between terminals 30 and 87a as 12 VDC is applied and removed from terminal.

5. Disconnect voltage and multimeter leads from relay terminals.

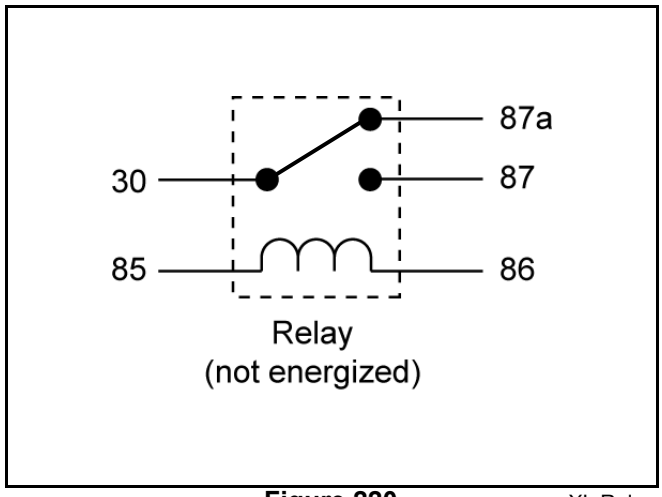


Figure 220 XL Relay

Solenoid

Purpose

The solenoid’s purpose is simply to connect the battery to the starter motor when the ignition switch is turned to “START”. The solenoid is used to protect the ignition switch from the high current drawn by the starter motor.

Location

The solenoid is located under the front hood, mounted to the firewall of the tractor (Figure 221).

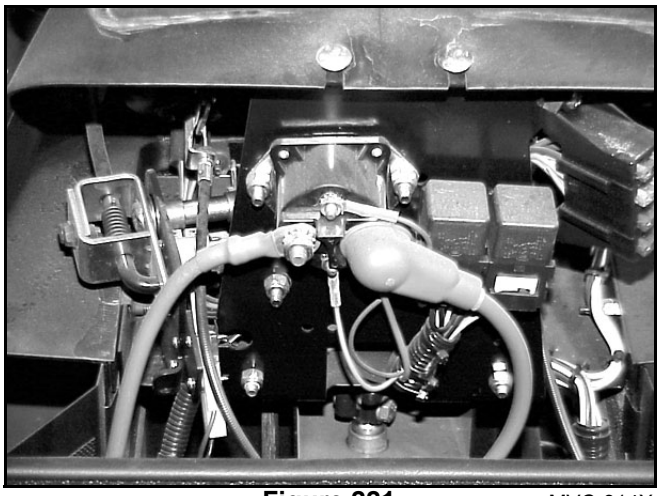


Figure 221 MVC-314X

How it Works

The solenoid has two primary parts. One is a coil of wire wrapped around an iron core. Whenever 12 volts is applied to the coil, it becomes a magnet. The other part is a bar type switch. Because it has a large contact area with the contact terminals it can easily handle the high current loads required by the starter motor.

When 12 volts is applied to the coil, it becomes an electromagnet. This quickly pulls the bar toward contacts and closes the switch. When power is removed from the coil, the spring loaded bar returns to its “normally open” position. The solenoid closes and opens the switch very quickly. This minimizes the “arcing” that can damage other types of switches.

The ignition switch is protected because only a small amount of current is needed to activate the coil.

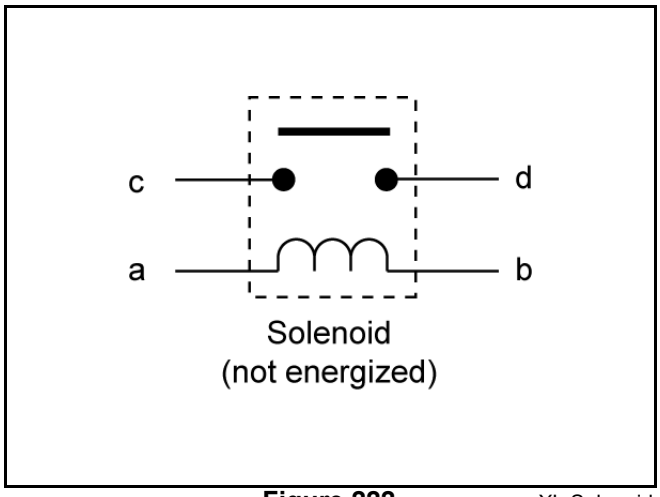


Figure 222 XL Solenoid

Testing

1. Disconnect the solenoid from the wiring harness.

2. With a multimeter (ohms setting), check to ensure that terminals “c” and “d” are open (no continuity) (Figure 222).

3. Apply +12 VDC to terminal “a” and ground terminal “b”. Terminals “c” and “d” should now be closed (continuity) (Figure 222).

4. You should be able to hear the solenoid switch “click” when you make the connection (Figure 223).

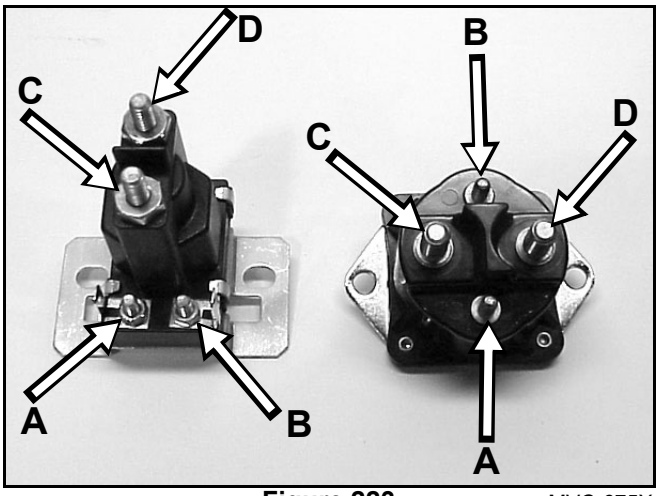


Figure 223 MVC-675X

(A) & (B) Coil Terminals	(C) & (D) Contact Terminals

Ignition Switch

Purpose

This component provides the proper switching for the starter, ignition, PTO, lights, safety, and accessory circuits if so equipped.

Location

The ignition switch is located on the lower right side of the tractor’s dash (Figure 224).

Figure 224 MVC-767X

How It Works

Detents inside the switch give it four positions: OFF, LIGHTS (ACCESSORIES), RUN, and START. The START position is spring loaded so the cylinder automatically returns to RUN once the key is released.

Terminals of the ignition switch as viewed from the terminal end.

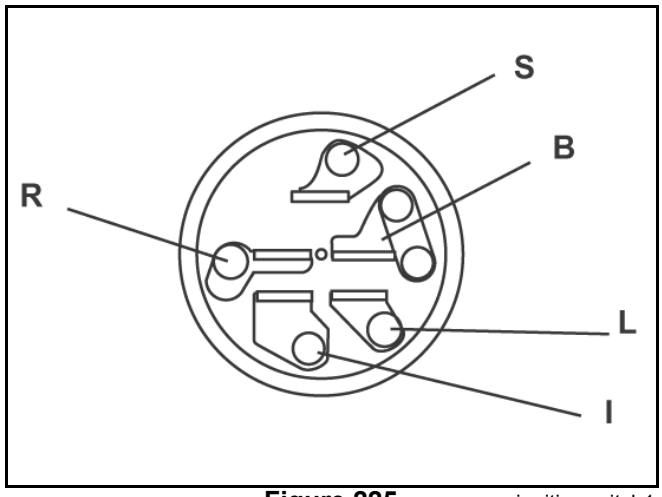


Figure 225 ignitionswitch1

B = Battery voltage “in” S = Starting Circuit I = Safety & Ignition Circuit	R = Regulator Circuit L = Light Circuit

Testing

1. Disconnect the switch from the wiring harness.

2. Verify that continuity exists between the terminals listed for the switch position. Verify that there is **NO** continuity between terminals not listed for the switch position.

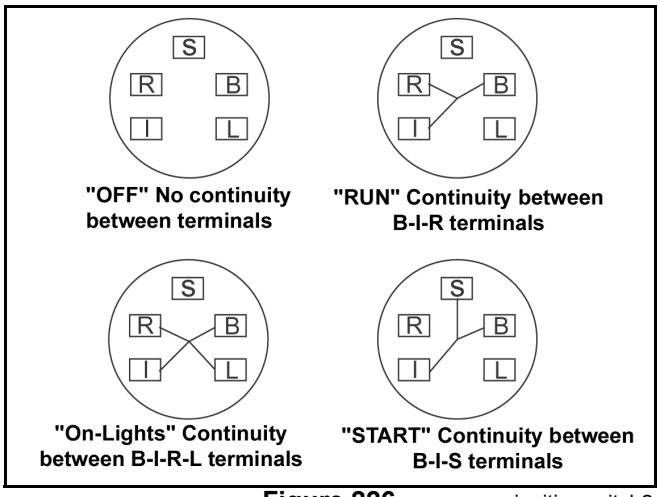


Figure 226 ignitionswitch2

Low Voltage Module

Purpose

The illumination of the battery light on the dash indicates the battery voltage is too low. This is sensored through the low voltage module.

Location

The low voltage module is located under the front hood, on the lower end of the front side of the firewall of the tractor (Figure 227).

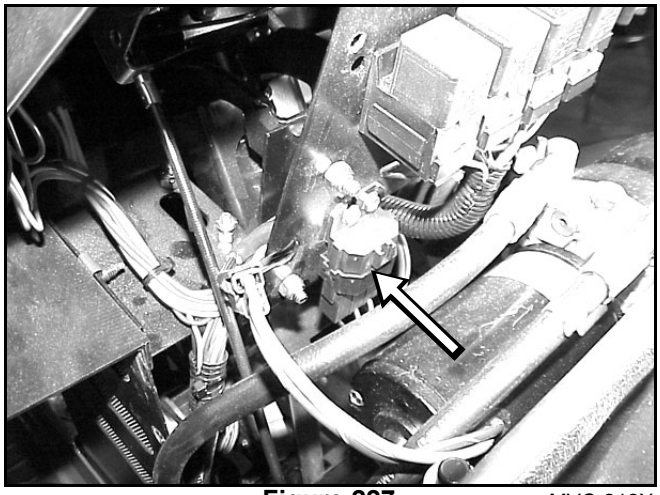


Figure 227 MVC-212X

How It Works

The low voltage module (Figure 228) is a voltage comparator, checking the charge voltage from the engine regulator/rectifier system. If the charge voltage is less than 11.3 volts D.C., the low voltage module senses this and activates the indicator lamp on the dash which will light until the voltage is over 12 volts D.C.

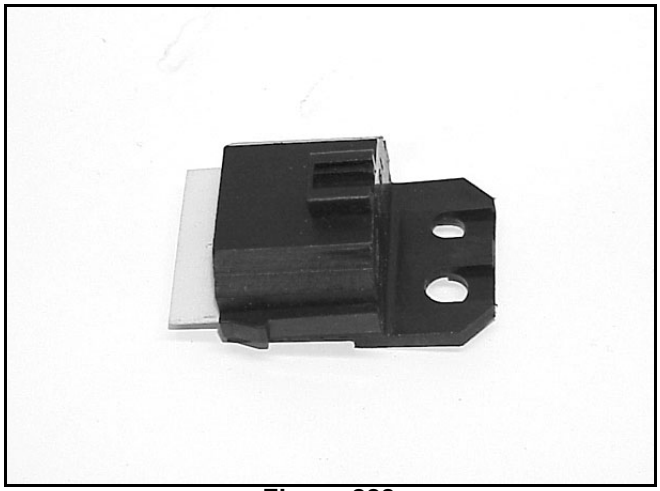


Figure 228 MVC-388X

Testing

1. Before replacing the low voltage module, test the battery to make sure it is fully charged and is in good shape.

2. Next check the charging system of the engine; follow the procedure in the Kohler Engine Service Manual.

3. If the battery checks out and is in good condition and the charging system checks out and is charging properly and the battery light on the dash is on, replace the low voltage module. Without specialized test equipment, it is not practical to test the low voltage module in the field.

Electric (PTO) Clutch

Purpose

This clutch electrically controls the engagement and disengagement of the Power Take Off (PTO) pulley.

Location

The electric clutch is located on the PTO end of the engine crankshaft (Figure 229).

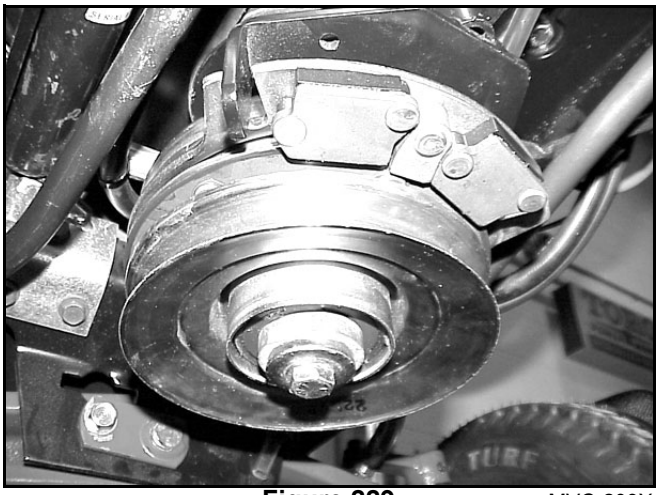


Figure 229 MVC-209X

How It Works

The PTO clutch is composed of three major components; the field, the clutch plate, and the friction plate. The clutch plate always turns with the engine. The field is a coil of wire on an iron core, which becomes an electromagnet when power is applied.

The friction plate is the only piece that can slide up and down on the crankshaft axis. It is normally spring loaded so that it is not in contact with the clutch plate and is pressed against the brake material opposite the clutch. When power is applied, the friction plate is drawn toward the clutch plate and the two rotate as one.

Testing

If the electric PTO clutch is not engaging or is suspected as a cause of electrical problems, use the troubleshooting steps. These procedures will help you determine if the clutch has failed or is the cause of the electrical problem.

Coil Resistance Measurement

1. Disengage the PTO, set the parking brake, turn the ignition key to ***OFF*** and remove the key.

2. Disconnect clutch wire connector.

3. Set the multimeter or volt/ohm meter to check resistance (ohms).

4. Connect the meter lead wires to the wires in the clutch connector (Figure 230).

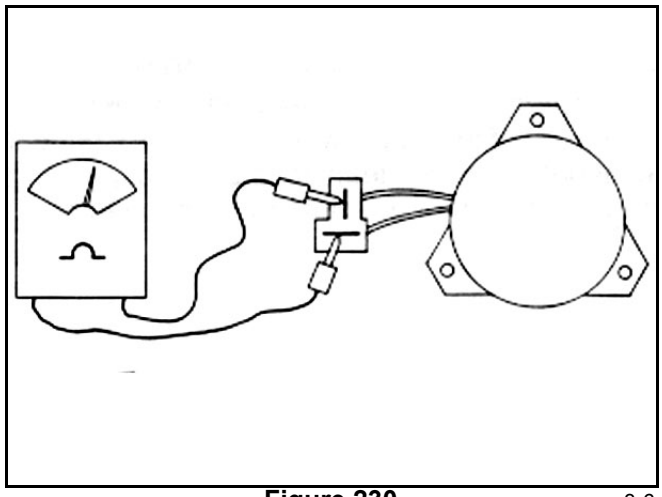


Figure 230 3-6

5. The meter should read between 2.40 ohms and 3.40 ohms. If the reading is above or below these readings, the field has failed and needs to be replaced. If the reading is between these two limits, measure the clutch current draw.

Measuring Clutch Current Draw

1. Disengage the PTO, set the parking brake, and turn the ignition to ***OFF***.
2. Disconnect the clutch wire connector.
3. Set the multimeter to check amps (10 amp scale).
4. Connect the positive meter lead to the tractor terminal (1) of the clutch wire, Figure 231.
5. Connect the negative meter lead to the corresponding wire terminal (3), Figure 231.
6. Connect a short jumper lead from terminal (2) to (4), Figure 231.
7. Turn the ignition switch to the “RUN” position and the PTO switch to the “ON” position.
8. If the meter reading is 3.5 amps or above, the system is functioning properly. If the meter reading is below 3.5 amps, check the electrical system for problems (i.e., the battery, ignition switch, PTO switch, or wiring harness may be malfunctioning).

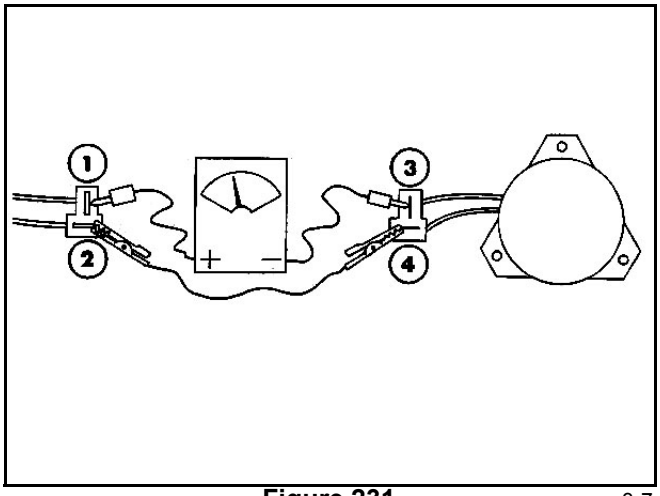


Figure 231 3-7

On 1999 and prior model 260 Lawn and Garden Tractors, the air gap between the clutch plate and the friction plate is adjustable. The 2000 and later model PTO clutch is self-adjusting.

Note: The 2000 and later model 260 Series tractors use a non-adjustable PTO clutch.

Setting the Air Gap on 1999 and Prior Model 260 Series Tractors

1. Turn the ignition and PTO switches to the “OFF” position.
2. Locate the three access windows where the clutch air gap must be checked (Figure 232).

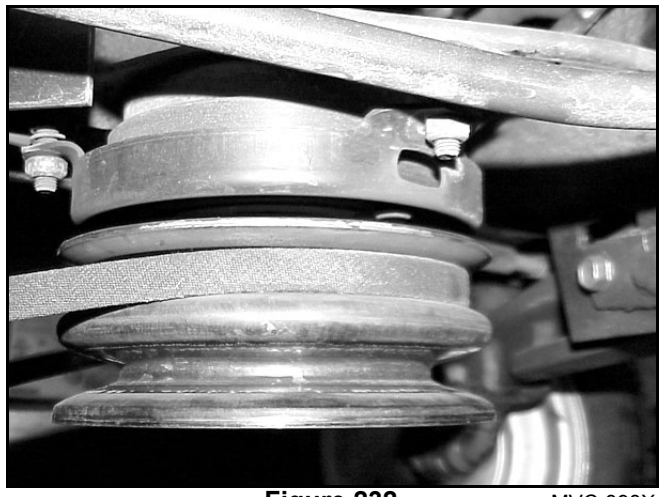


Figure 232 MVC-393X

3. All three air gaps should be set to 0.012” (0.3mm).
4. To increase the size of the air gap, loosen the three locknuts and springs.
5. To decrease the size of the air gap, tighten the three locknuts and springs (Figure 233).

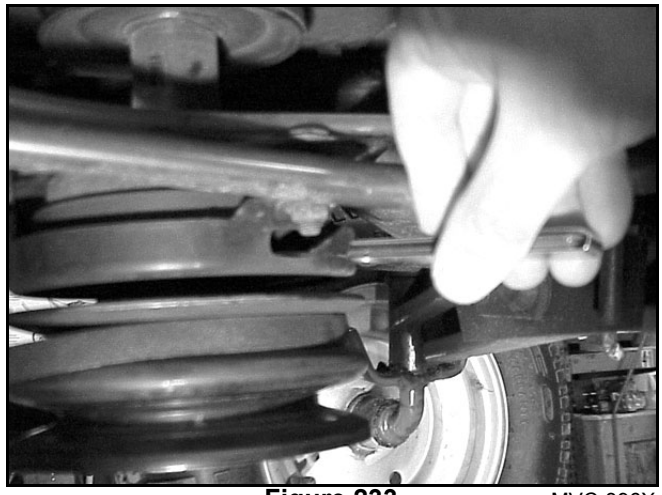


Figure 233 MVC-396X

Clutch Burnishing Procedure

The clutch should be burnished as part of the pre-delivery service, or whenever a new clutch is installed. Burnishing polishes the clutch plate, allowing for smooth clutch engagement.

With a PTO driven attachment installed (i.e., mower, snowthrower, or tiller), run the engine at half throttle. Engage and disengage the clutch 5 times (10 seconds on/10 off).

Increase engine RPM to ¾ to full throttle. Engage and disengage clutch 5 times (10 seconds on/10 seconds off). Check and adjust the PTO clutch air gap (not required on 2000 and later models).

PTO Switch

Purpose

The PTO switch is typically used to turn on the Electric PTO Clutch and to function as part of the safety interlock system.

Location

The PTO switch is located on the lower left side of the dash (Figure 234).

Figure 234 MVC-387X

How it Works

When the PTO switch is pulled out to the “ON” position, contacts inside the switch electrically connect various terminals. One terminal is connected to the wire that goes directly to the electric clutch. When the PTO is pulled out to the “ON” position, voltage flows to the electric clutch and engages.

Testing

1. Disengage the PTO, set the parking brake, and turn the ignition to ***OFF*** and remove the key.
2. Disconnect the wiring harness from the PTO switch.
3. Press in on the locking tabs, on each side of the switch, and pull the switch out of the dash (towards the rear of the tractor).
4. Verify that there is continuity between the appropriate terminals in the “ON” and “OFF” positions, Figure 235.
5. Replace the switch if your test results do not correspond with those given in Figure 235.
6. Mount the PTO switch back into the dash and reinstall the wiring harness.

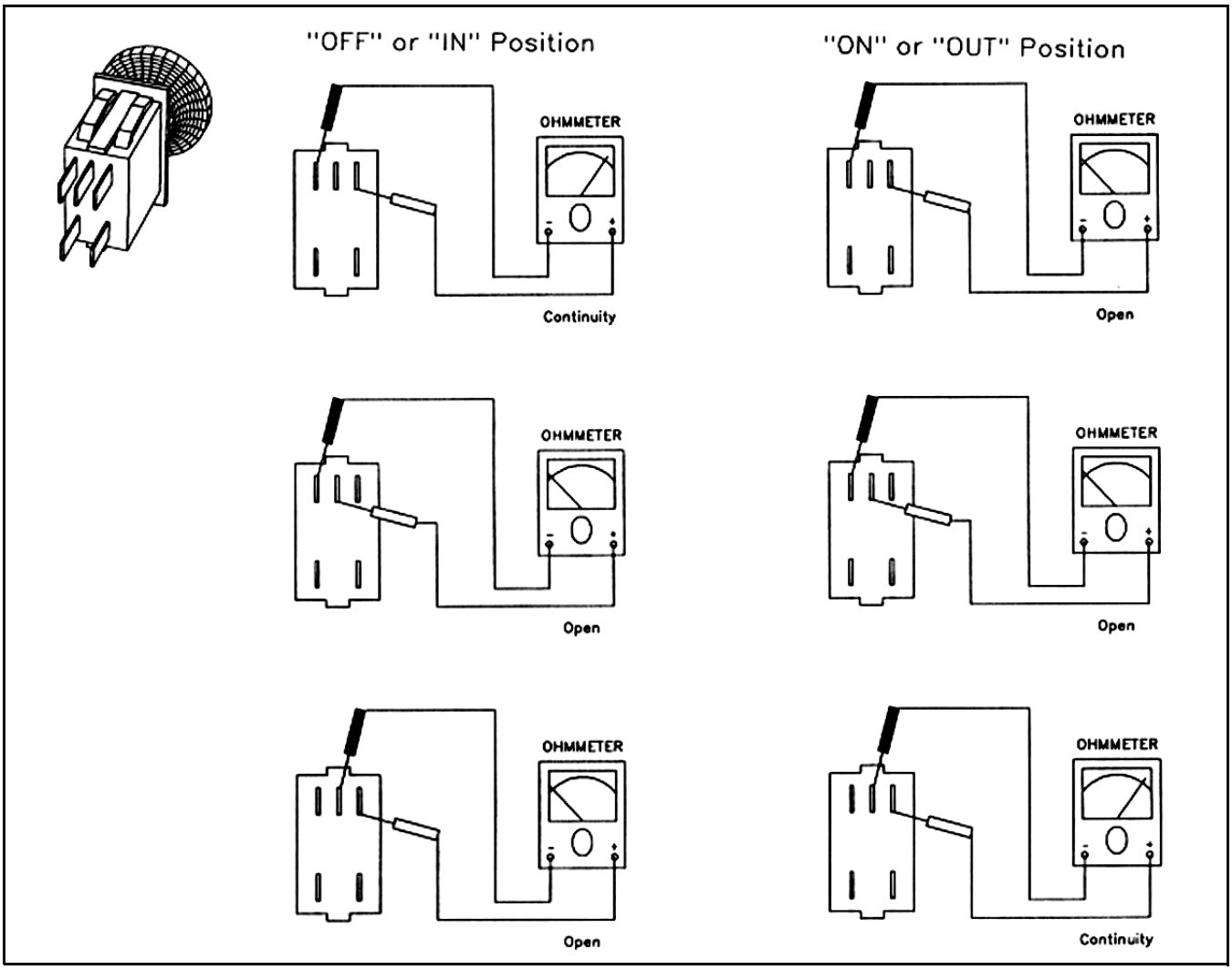


Figure 235 2-24

Microswitches

Purpose

Microswitches are used to monitor whether or not a lever or pedal is in the correct position.

How It Works

This SPDT (Single Pole Double Throw) microswitch has three terminals. The lever is spring loaded in the “up” position. When the button is pushed down, continuity switches from COM and NC to COM and O.

Testing

1. Disconnect the switch from the harness.
2. Using a multimeter (ohm), connect one meter lead to the “COM” terminal, and other lead to the “NC” terminal.
3. With the switch in the spring loaded “up” position, there should be continuity; the switch is operating properly. Push the button “down”. There should be **no** continuity; the switch is operating properly.
4. Connect one meter lead to the “COM” terminal and the other lead to the “NO” terminal.
5. With the button in the “OUT” spring loaded position, if there is **no** continuity, the switch is operating properly.

6. Then move the switch button to the “down” position. If there is continuity, the switch is operating properly (Figure 236).

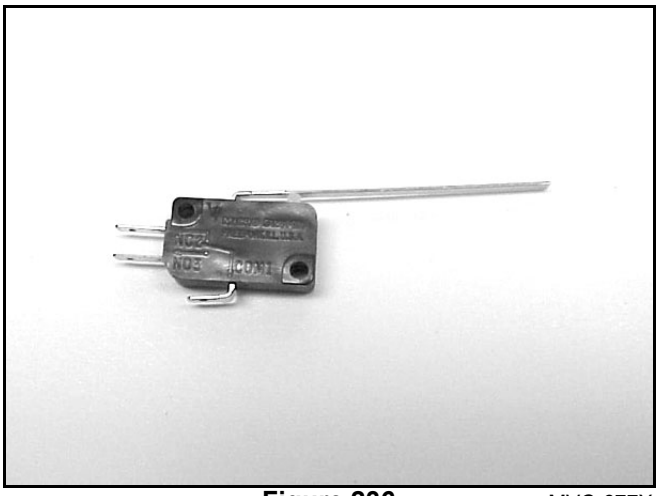


Figure 236 MVC-677X

Location

There are several different microswitch locations on 260 Series Lawn and Garden Tractors.

1999 and prior model hydrostatic models have the brake switch located on the bottom side of the steering sector mount (Figure 237). The brake linkage activates it. **Note:** On units with cruise control, there are two switches mounted together.

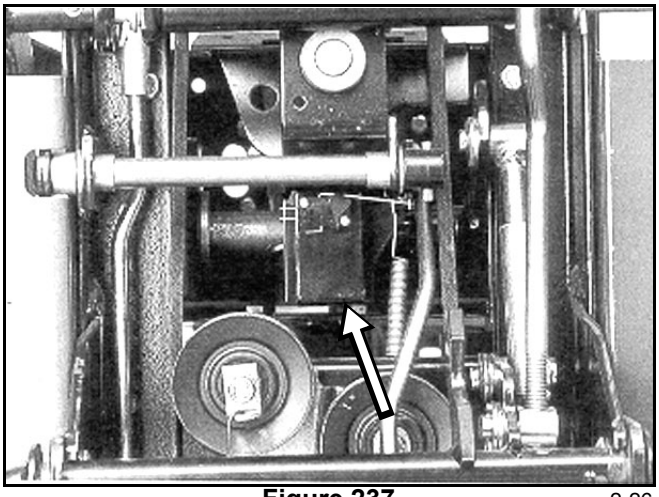


Figure 237 2-26

The brake switch on gear model tractors is located under the frame, under the brake pedal (Figure 238).

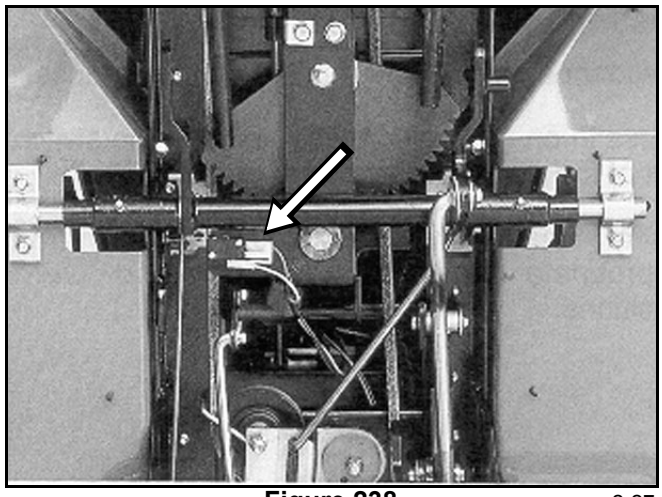


Figure 238 2-27

The parking brake switch is located on the front side of the lower console on both hydro and gear drive tractors (Figure 239).

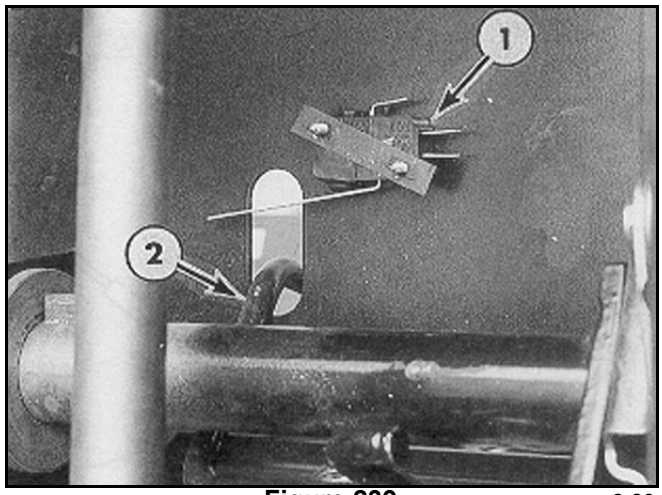


Figure 239 2-28

(1)	Parking Brake Switch
(2)	Parking Brake Lever

The neutral switch on 1998 and prior gear drive tractors is located on the upper shift linkage (Figure 240).

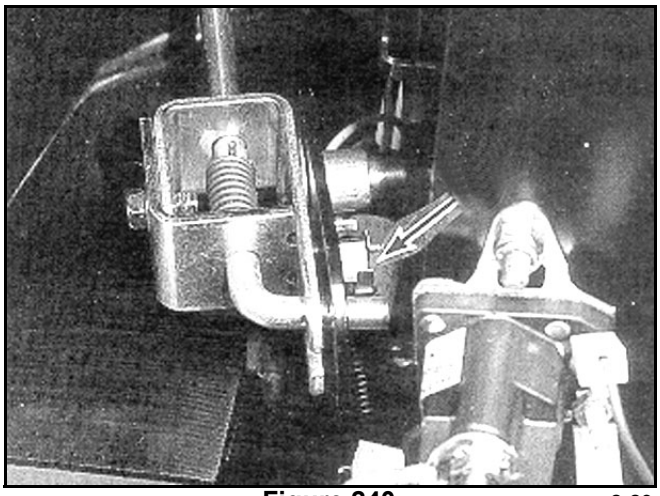


Figure 240 2-29

The neutral switch on 1999 and later gear drive tractors is located on the upper shift linkage (Figure 241). There are two neutral switches mounted together.

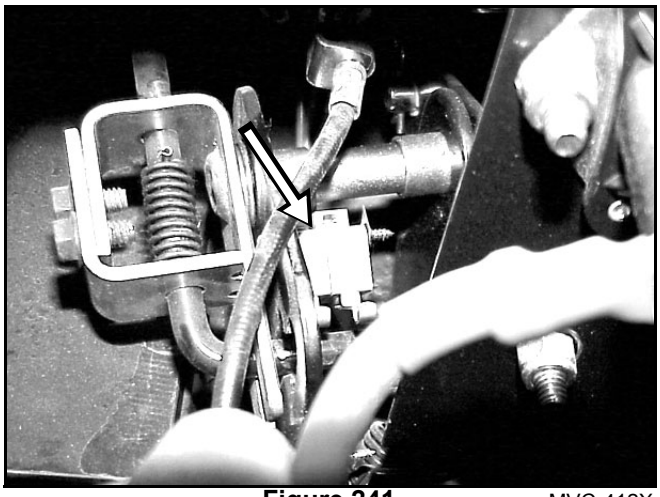


Figure 241 MVC-412X

Neutral Switch - Plunger Type (Used on 2000 and Later Hydrostatic Models)

Purpose

Used to ensure the transmission is in neutral when starting the unit. It is activated when the brake pedal is depressed.

Location

The neutral switch - plunger type - is located under the seat and fender area of the tractor on the right side of the transaxle (Figure 242).

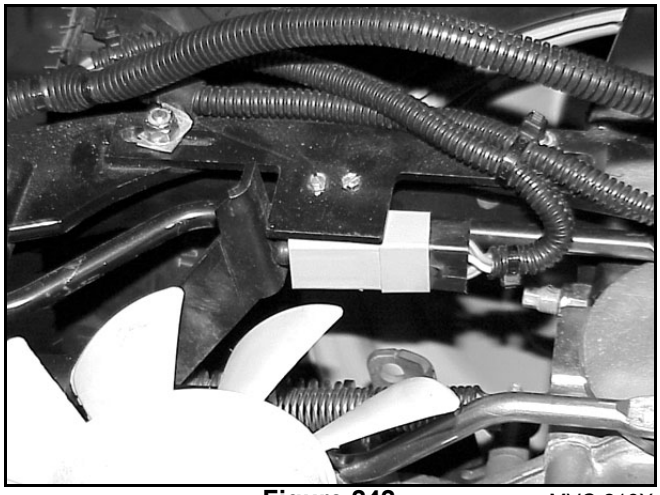


Figure 242 MVC-218X

How it Works

This double pole plunger type switch has four terminals (Figure 243). When the brake pedal is depressed, it pulls an arm that pushes on the plunger of the switch, closing the contacts, and connecting the four terminals.

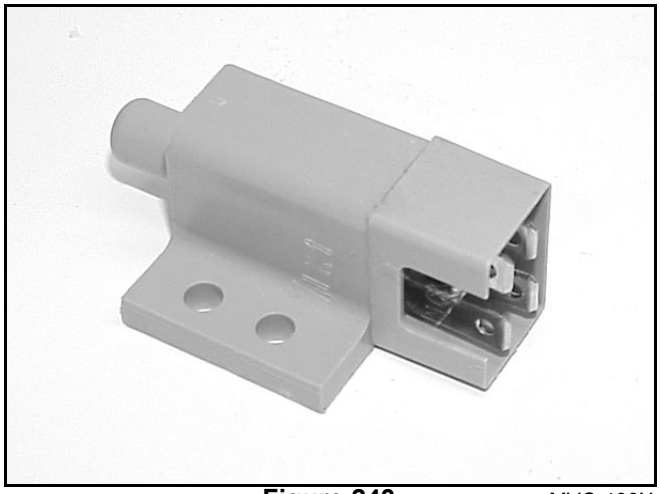


Figure 243 MVC-400X

Testing

1. Disconnect the switch from the wiring harness.

2. Using a multimeter, follow the procedure listed below (Figure 244):

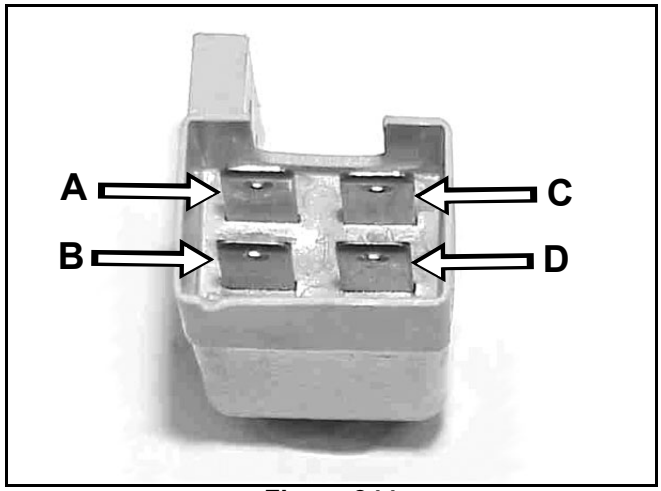


Figure 244 Neutral Switch

Note: Terminals on actual switch not labeled.

Plunger Not Depressed	Plunger Depressed
A/B Terminals - Open Circuit - No Continuity	A/B Terminals - Closed Circuit - Continuity
C/D Terminals - Open Circuit - No Continuity	C/D Terminals - Closed Circuit - Continuity

Brake Switch (Used on 2000 and Later Hydrostatic Models)

Purpose

This double pole plunger type switch has four terminals. When the brake pedal is depressed, it completes the safety circuit for start. On tractors with cruise control, the cruise control circuit is connected to the brake switch. When the brake pedal is depressed, the switch opens and the cruise control magnet disengages.

Location

The neutral switch is located under the tractor, on the right side of the steering sector mount, above the brake assembly arm (Figure 245).

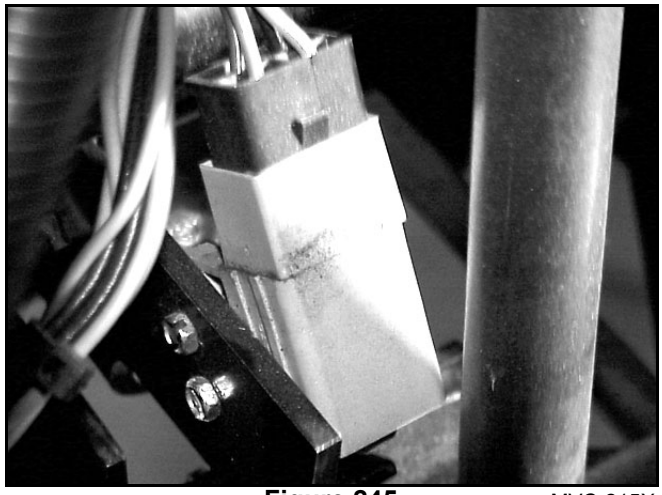


Figure 245 MVC-215X

How it Works

This double pole plunger switch has four terminals. When the brake pedal is depressed, it pushes on the plunger, closing and opening the contacts in the switch.

Brake Switch Testing

1. Disconnect the switch from the wiring harness.

2. Using a multimeter, follow the procedures listed below (Figure 246):

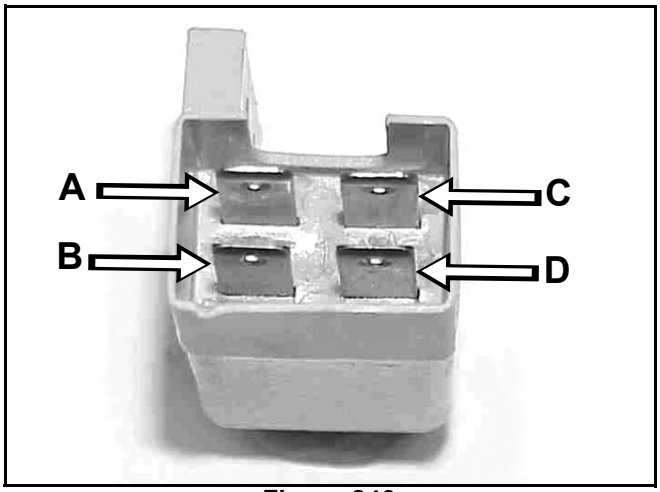


Figure 246 Brake Switch.doc

Note: Terminals on actual switch not labeled.

Plunger Not Depressed	Plunger Depressed
A/B Terminals - Closed Circuit - Continuity	A/B Terminals - Open Circuit - No Continuity
C/D Terminals - Open Circuit - No Continuity	C/D Terminals - Closed Circuit - Continuity

Seat Switch

Purpose

The switch is in the safety circuit. If the engine is running and the operator vacates the seat with either PTO engaged or the parking brake off, the engine will shut down.

Location

There are two different style seat switches used. The ribbon type switch is located in the bottom of the seat between the seat cushion and the seat base (Figure 247). The mushroom type is fastened to the bottom of the seat base (Figure 248).

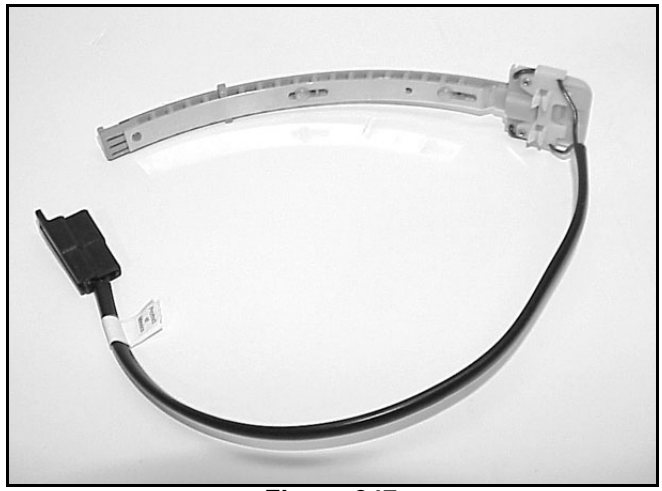


Figure 247 MVC-391X

Seat switch (ribbon type) used on 2000 and prior models

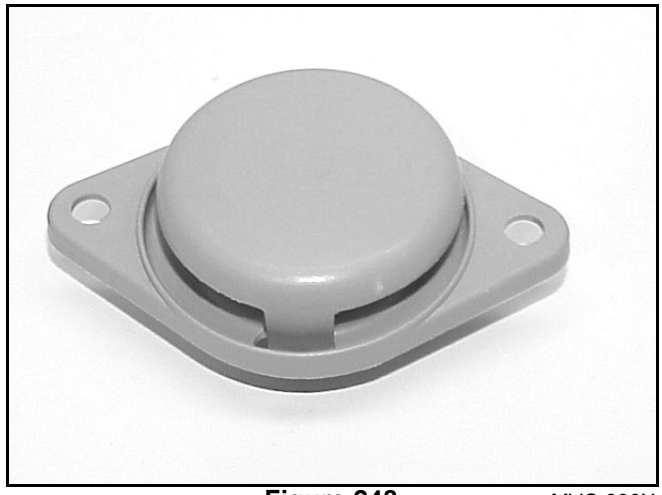


Figure 248 MVC-390X

Seat switch (mushroom type) used on 2001 and later models

How It Works

When the seat is vacated, the switch is open and there is no continuity between the two terminals. When the seat is occupied the switch closes and there should be continuity between the two terminals.

Testing

1. Disconnect the switch from the wiring harness.

2. With a multimeter, check the continuity between the two terminals of the switch. There should be NO continuity.

3. With weight or pressure on the seat, check the continuity again on the two terminals of the switch. There should be continuity.

KeyChoice™ Reverse Operating System – Used on 1999 and Later Tractors

This interlock feature is provided to prevent unintentional engine-powered attachment operation in reverse. If the tractor is shifted into reverse while the mower blade or other Power Take Off (PTO) driven attachment is engaged, the electric clutch will stop. **DO NOT MOW WHILE BACKING UP UNLESS ABSOLUTELY NECESSARY.** If you need to mow while in reverse or use other PTO drive attachments (such as a snowthrower), this interlock feature may be temporarily deactivated.

Before deactivating this feature, be sure there are no children present on or near property where you are using the tractor and that are likely to appear while you are mowing or operating an attachment. Be extra observant after you have chosen to deactivate the interlock feature because the sound of the tractor's engine might prevent you from being aware that a child or bystander has entered the area where you are operating the tractor.

Once you are sure you can safely mow in reverse or operate an attachment, deactivate the reverse operating system by turning the KeyChoice™ switch, located on the right side of the seat, after engaging the PTO electric clutch. A red light will illuminate on the dash as a reminder that the reverse operating system interlock has been deactivated. Once the interlock is deactivated, it stays in this mode **WITH YOUR MOWER BLADE OR ATTACHEMENT OPERATING WHENEVER YOU BACK-UP**, and the dash light stays on until either the electric PTO clutch is disengaged, or the engine is turned off.

Testing the Key Choice™ Reverse Operating System - Unactivated

1. With the parking brake released, seat occupied, turn the ignition key to "RUN" without starting the engine.

2. Pull the PTO electric clutch switch "ON".

3. You should hear an audible click, indicating the PTO is activated and the PTO light will come on.

4. Move the forward/reverse pedal to reverse. On the gear drive tractors, shift the gear selector to reverse.

5. You should hear an audible click indicating the PTO is deactivated and PTO light, on the dash, should turn off.

Testing the KeyChoice™ Reverse Operating System - Activated

1. With the parking brake released, seat occupied, turn the ignition switch to "RUN" without starting the engine.

2. Pull the PTO electric clutch switch to “ON” (Figure 249).

Figure 249 MVC-387X

3. Turn the “Key Choice” key and release (Figure 250).

Figure 250 MVC-422X

4. The “Key Choice” warning light on the dash should come on (Figure 251).

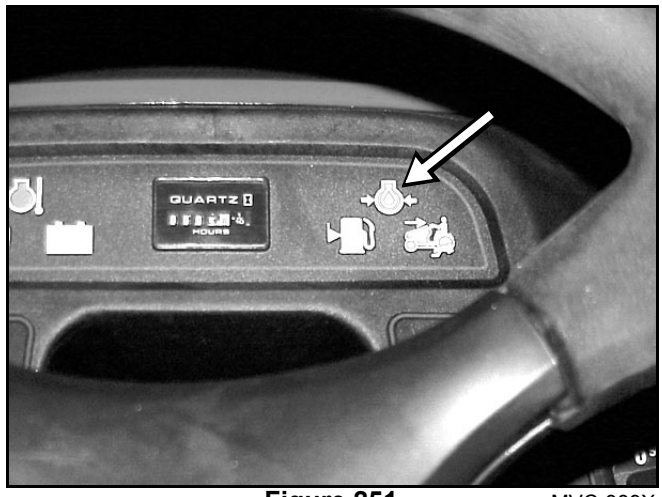


Figure 251 MVC-389X

5. Move the foot pedal to reverse. On gear drive model tractors, move the gear selector to reverse.

6. The PTO and PTO light on the dash should remain on.

7. Push the PTO switch to “OFF”.

8. The PTO light and the “Key Choice” warning light should turn off.

KeyChoice™ Reverse Operating System Switch

Purpose

This switch is used in the KeyChoice™ Reverse Operating System circuit. When turned to the ON position, it allows the operator to mow in reverse.

How It Works

The switch is basically an on/off switch spring loaded to return to off position. When turned to the ON position with the PTO engaged, it activates circuits in the KeyChoice™ Reverse Operating System reverse module and allows the operator to mow in reverse (Figure 252).

Figure 252 MBC-422X

Testing

1. Disconnect the switch from the circuit.
2. With a mulitmeter, check the continuity across the two terminals.
3. Turn the key to the “ON” position and hold, since the switch is spring loaded. There should be continuity across the two terminals.

Reverse Switch (Hydrostatic Models)

Purpose

This switch works in the KeyChoice™ Reverse Operating System circuit when the mower (PTO) is engaged.

Location

The switch is located in the right rear corner of the tractor. To obtain access to the switch, remove the rear panel. The switch is mounted to the bottom of the cruise control bracket (Figure 253).

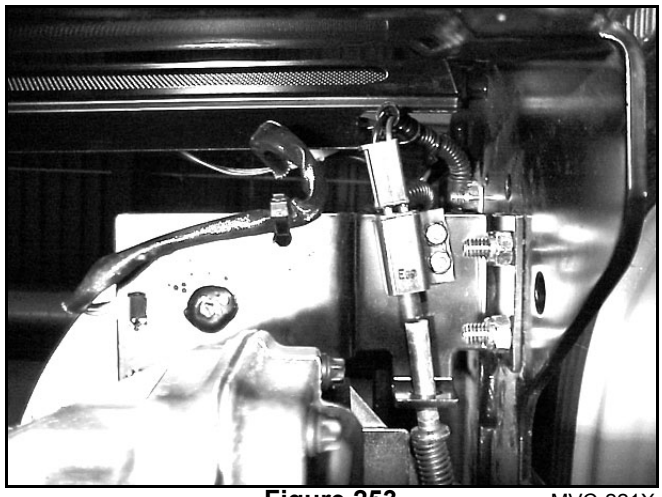


Figure 253 MVC-221X

How It Works

This single pole plunger type switch has two terminals. When the unit is shifted in reverse while the mower (PTO) electric clutch is engaged, the reverse switch opens and will stop the electric (PTO) clutch, unless the KeyChoice™ switch has been operated.

Testing

1. Disconnect the switch from the wiring circuit.
2. With a multimeter, check the continuity across the terminals. There should be continuity.

3. Depress the plunger on the switch and check the continuity across the terminals, there should be NO continuity (Figure 254).

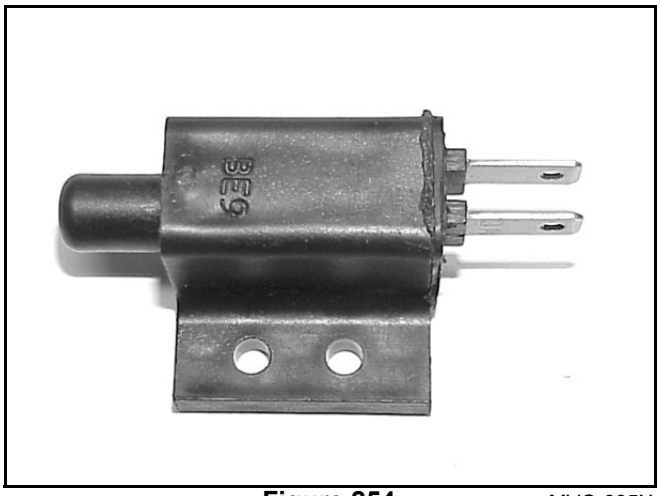


Figure 254 MVC-685X

Reverse Switch (Gear Drive Tractors)

Purpose

Operates the same way as the reverse switch on the hydrostatic models.

Location

The location of the reverse switch on the gear drive tractors is on the upper shift linkage, inside the dash (Figure 255).

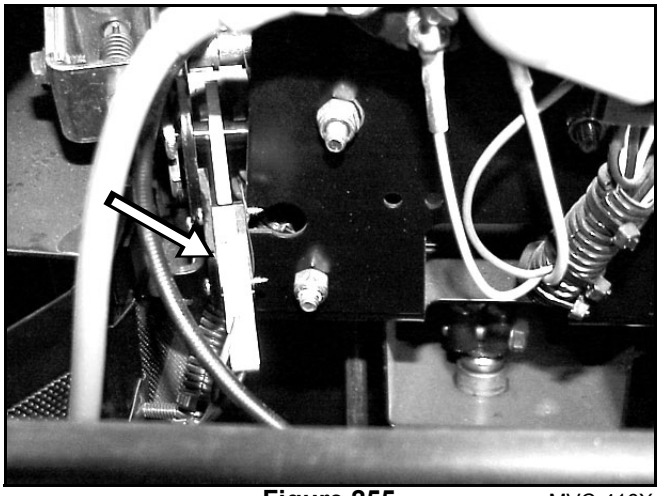


Figure 255 MVC-416X

How It Works

When the gear shift selector is moved to the reverse position, the microswitch button is pushed in and the switch contacts open and the electric (PTO) clutch will stop, unless the KeyChoice™ switch has been operated.

Testing

Follow the same test procedure for the microswitch, page 6 - 9.

KeyChoice™ Reverse Operating System Module

Purpose

The KeyChoice™ Reverse Operating System Module (Figure 256) works with the KeyChoice™ switch, PTO switch, and the reverse switch. It responds to the reverse switch. If the override switch (KeyChoice™ switch) is not activated and the PTO is engaged, it will stop the electric PTO clutch.

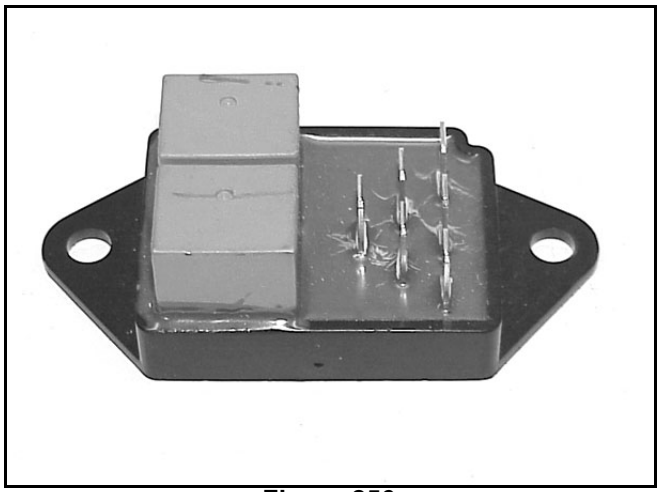


Figure 256 MVC-385X

Location

The KeyChoice™ Reverse Operating Module is located under the front hood, on the inside of the firewall (Figure 257).

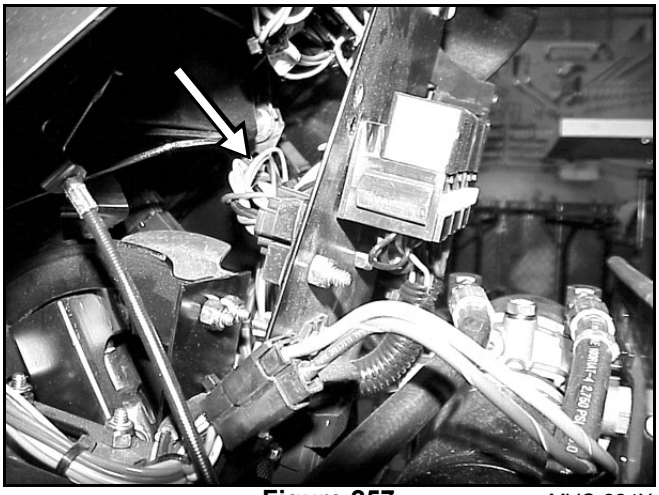


Figure 257 MVC-224X

How It Works

The KeyChoice™ Reverse Operating System Module is made up of several components, such as diodes and relays. When it is connected in the circuit, voltage is applied to certain terminals of the KeyChoice™ Reverse Operating System module from the PTO switch, reverse switch, and the override switch, which energizes certain relays in the module. If voltage is not applied to proper terminals on the KeyChoice™ Reverse Operating System Module, the electric PTO clutch will stop.

Testing

The KeyChoice™ Reverse Operating System Module must be removed from the wiring harness. Using a multimeter check the following (Figure 258):

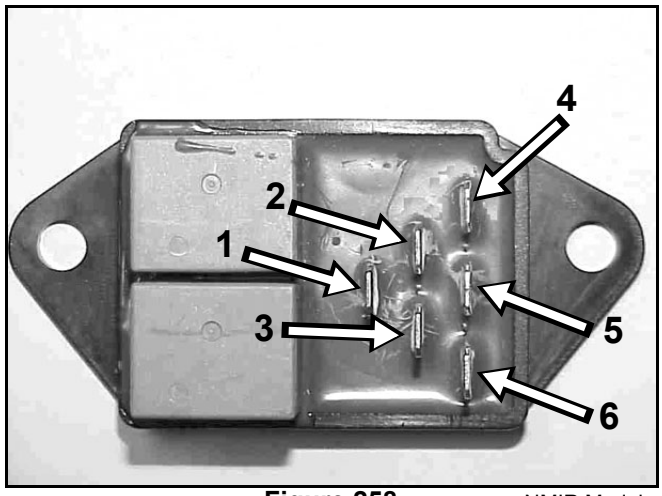


Figure 258 NMIR Module

Testing - No Power To Circuit (With Module Out of Circuit)

Meter Scale	Meter Probe Negative	Meter Probe Positive	Meter Reading
Ohms	Pin 3	Pin 5	Open (More than 100K ohms)
Diode*	Pin 3	Pin 6	.5 to 1 Volt
Diode*	Pin 3	Pin 1	.5 to 1 Volt
Diode*	Pin 3	Pin 4	.5 to 1 Volt
Ohms	Pin 1	Pin 4	350 to 400 ohms
Ohms	Pin 2	Pin 4	Open (more the 100K ohms)

***Note:** If the multimeter does not have a diode test feature, this test can not be performed. This is not a problem if powered tests are done. Powered tests must be performed to test relays (see table below).

Testing - Powered Circuit (With Module Out of Circuit)

	Volt Meter		Battery		
Meter Scale	**Neg Probe**	**Pos Probe**	**Neg Lead**	**Pos Lead**	**Meter Reading**
Ohms	Pin 2	Pin 5	Pin 3	Pin 6	< 10 Ohms
Volts (Caution)	Pin 1	Pin 2	Pin 1	Pin 4	12 Volts***
Volts (Caution)	Pin 3	Pin 2	Pin 3	Pin 4	12 Volts***

*** Same as battery voltage

Note: A 12 volt battery is needed for this test. **USE CAUTION WHEN MEASURING RESISTANCE WITH A POWERED CIRCUIT. CONTACTING A VOLTAGE SOURCE WITH A METER IN OHMS POSITION CAN SERIOUSLY DAMAGE THE METER.**

THIS PAGE INTENTIONALLY LEFT BLANK