SECTION 4
TROUBLESHOOTING AND TESTING

4.1 GENERAL.

4-1.1 This section provides information regarding troubleshooting and testing of various systems and components of the Series 2000 tractors covered by this manual.

NOTE

See Appendix A for a listing of available Engine Service Manuals. Refer to the appropriate engine manual for information regarding troubleshooting and testing of the engine.

4-2 TROUBLESHOOTING.

4-2.1 Referring to Table 4-1, check left column for basic description most closely matching the problem being experienced.

NOTE

Battery failure is not always due to charging system defects. Improper battery activation, use of lights and PTO while the engine is running at a low speed, corroded battery cables or connectors, low water level, or prolonged storage may be probable causes.

Table 4-1. Troubleshooting

BASIC TYPES OF TROUBLE	PROBABLE CAUSES	POSSIBLE SOLUTIONS	REFER TO
BATTERY TROUBLESHOOTING			
Battery will not hold a charge	Low electrolyte level	**CAUTION** Never use electrolyte to fill an operating battery. Plate separators will be destroyed. Use pure water and fill to level indicator or 1/4 to 1/2 inch above top of the plates.	Appendix C Para. C-5.8
	Electrolyte (specific gravity)	Test each cell and evaluate the condition. • All readings even at 1.250 or above — Battery O.K. • All readings even but less than 1.250 — Recharge and retest • High-low variation between cells less than 50 gravity points — Recharge and retest. • High- low variation between cells exceeds 50 gravity points — Replace battery.	Appendix C Para. C-5.10

Table 4-1. Troubleshooting

BASIC TYPES OF TROUBLE	PROBABLE CAUSES	POSSIBLE SOLUTIONS	REFER TO
Battery will not hold a charge (cont.)	Battery capacity	Test capacity and evaluate condition. • Minimum voltage of 10.5 volts measured across battery ternminals. • Recharge battery for 10 minutes at a 25 amp charge rate, measure for an increase in voltage across terminals. If voltage increases — Recharge battery at recommended 4 amp charge rate. If no increase — Replace battery.	
No charge to battery	Charge system not operating	• With ignition switch in ON position, check for battery voltage at charge terminal of regulator. If no voltage, check wire harness for broken wires or connections. • If battery voltage is present at regulator, start the engine and check charging voltage from output terminal of regulator (12.5 to 14 VDC). If voltage is low, check engine stater output (24 VAC minimum).	Appendix D Appropriate Engine Service Manual
Battery boiling over	Battery overfilled or charging system overcharging	• Adjust electrolyte level • Check voltage regulator output	
ENGINE START TROUBLESHOOTING			
Engine cranks but does not start.	Spark plugs	• Remove plug(s) - check gap and condition of electrodes. Re-gap to engine specifications. If condition questionable - replace plug(s).	Appropriate Engine Service Manual
	Defective ignition module	• Use spark tester and check for spark at plug. **WARNING** Removal of the yellow wire will eliminate all normal and safety shutdown systems. The yellow wire must be reconnected to stop the engine. Use extreme caution when reconnecting the wire while the engine is running.	Appendix D

Table 4-1. Troubleshooting

BASIC TYPES OF TROUBLE	PROBABLE CAUSES	POSSIBLE SOLUTIONS	REFER TO
Engine cranks but does not start (cont.)	Defective ignition module (cont.)	• If no spark, remove yellow wire from connector block where tractor harness and engine harness connect. Crank engine. • If still no spark, refer to engine service manual for ignition module testing and replacement.	
	Grounded yellow wires or defective safety switches.	If engine has spark, ignition module is O.K. Test tractor harness and switches for proper operation.	Appendix D
Engine quits abruptly while operating	Defective ignition module, grounded yellow wire, or defective safety switch	• Remove yellow wire from connector block where tractor harness and engine harness connect. Crank engine. If engine has spark, ignition module is O.K. Test tractor harness and switches for proper operation. See Electrical Circuit Troubleshooting. • If no spark, refer to engine service manual for ignition module testing and replacement.	Appendix D
Engine has spark but will not start	Engine not getting fuel	**WARNING** Perform services in a well ventilated area. Fuel vapors are very flammable. Do not service the fuel system immediately after operating the tractor. Allow all tractor components to cool and remove all sources of ignition before servicing. • Check fuel tank for fuel • Check fuel flow to filter. If no flow, check tank and fuel lines for obstructions or kinks • Check fuel flow through filter. If no flow, replace clogged filter. • Check operation of fuel pump as follows: a. Disconnect carburetor fuel line at fuel pump.	

Table 4-1. Troubleshooting

BASIC TYPES OF TROUBLE	PROBABLE CAUSES	POSSIBLE SOLUTIONS	REFER TO
Engine has spark but will not start (cont.)	Engine not getting fuel (cont.)	b. Attach a test length of fuel line to the fuel pump and position over an appropriate container. c. Start engine and check for a steady stream of fuel from the test line. • If steady flow is present, refer to engine service manual. • If fuel flow is weak, check engine vacuum. Refer to engine service manual if below specifications. • If vacuum is to spacifications, replace the fuel pump.	
	Carburetor fuel solenoid not operating (Models 2160, 2165 and 2185).	**WARNING** Use extreme caution when conducting electrical system test. Short circuits and electrical sparks can cause fires, resulting in damage to the equipment and/or personal injury. • With ignition in start position, test for battery voltage at the carburetor fuel solenoid. • Models 2160 and 2165 - If no voltage, check continuity of diode assembly at starter. • Model 2185 - If no voltage, check diode assembly in engine wire harness. • If voltage is present - remove and check solenoid	Appendix D Appropriate Engine Service Manual
Engine cranks slowly	Poor engine ground	Check engine ground cable from negative terminal of battery to engine crankcase.	
Engine does not crank	PTO switch in ON position or brake pedal NOT fully depressed	Turn PTO switch OFF and fully depress brake pedal.	
	Low battery voltage		Battery Troubleshooting

Table 4-1. Troubleshooting

BASIC TYPES OF TROUBLE	PROBABLE CAUSES	POSSIBLE SOLUTIONS	REFER TO
Engine does not crank (cont.)	Starter not being activated due to one or more of the following: • Loose connections or broken wire in tractor wire harness. • Loose or broken wires in Engine wire harness • Inoperative switches. • Defective solenoid. • Defective starting motor.	Check battery cable connection at solenoid for battery voltage. If no voltage, check connections. With ignition switch in start position, check for battery voltage through the activation wire (small red wire) at the solenoid. • If no voltage, inspect the wire harness for loose or broken connections. Check operation of interlock (pedal switch), PTO, and ignition switches. • If voltage is present, check solenoid to starter cable lead for battery voltage. If no voltage, replace solenoid. If voltage is present, refer to engine service manual for starter inspection procedures.	Appendix D Appropriate Engine Service Manual
	Drive line or PTO clutch lockup	• Disconnect drive shaft and test engine. If engine cranks, inspect drive shaft and transaxle. • Remove PTO and test engine . If engine cranks inspect PTO.	
ELECTRICAL CIRCUIT TROUBLESHOOTING			
Blowing fuses	Grounded wire harness	**WARNING** Use extreme caution when conducting electrical system test. Short circuits and electrical sparks can cause fires, resulting in damage to the equipment and/or personal injury. • Check routing of harness for contact with moving parts. • Check for damaged wire insulation • Check for damaged terminals and/or insulators.	Appendix D

Table 4-1. Troubleshooting

BASIC TYPES OF TROUBLE	PROBABLE CAUSES	POSSIBLE SOLUTIONS	REFER TO
Blowing fuses (cont.)	Grounded or shorted electrical components	• Check for shorted headlight socket • Check ignition switch for internal short — test all terminals for continuity to ground terminal (G) in all switch positions. The G terminal should have continuity only to terminals L and M in OFF position only. • Check reverse relay for internal short. • Check for shorted (grounded) PTO field coil.	Appendix D
Blowing fuses when cranking engine	Failed carburetor solenoid diode	Current should flow through diode in one direction only— from power souce toward solenoid • Models 2160 and 2165— diode connected at starter • Model 2185— diodes found in engine wire harness	
Starter motor continues to spin when ignition switch is returned to the run position after starting the engine.	Defective ignition switch, improper wire harness connection, or defective solenoid.	Check primary coil lead (small red wire) at solenoid for battery voltage. • If present, check wire harness and ignition switch for improper internal connections • If no voltage present, solenoid points are stuck and solenoid should be replaced.	Appendix D
Engine shuts down when operator leaves seat with brake pedal locked down	Defective interlock switch or switch not activated.	• Check continuity of interlock switch • Check for broken, bent or loose switch actuator	Appendix C Para. 5-19
Engine continues to run when operator leaves seat with brake pedal in up position	Defective interlock or seat switch	Check continuity of seat and interlock switches	Appendix C
	Disconnected wire	Check for loose wires (yellow or green) at seat and interlock switches.	Appendix D
Engine continues to run when operator leaves seat with PTO in the ON position	Defective PTO switch or seat switch	Check continuity of seat and PTO switches (terminals 3 and 4)	Appendix C
	Disconnected wire	Check for loose wires (yellow or green) at seat and PTO switches	Appendix D

Table 4-1. Troubleshooting

BASIC TYPES OF TROUBLE	PROBABLE CAUSES	POSSIBLE SOLUTIONS	REFER TO
Amp light stays on	Low battery voltage	Measure battery voltage - Battery voltage must be above 10.5 V. DC	Battery Trouble-shooting
	Loose wires or poor ground to the voltage sensor	Check wire harness connections, then, using a jumper lead, ground sensor directly to negative terminal of battery. If amp light turns off, re-ground the sensor. Loose wires or poor grounding will result in incorrect operation and can cause failure of the sensor	Appendix D
	Defective voltage sensor	**NOTE:** VOLTAGE SENSOR READS BATTERY VOLTAGE ONLY — SENSOR DOES NOT READ CHARGING SYSTEM OUTPUT.	
Hour meter not operating	Disconnected or broken wire leads.	• With ignition switch in RUN position check for battery voltage at red wire • If voltage is present, check for proper ground through green wire If above conditions are present — Hour meter is defective	Appendix D
ELECTRICAL PTO TROUBLESHOOTING			
Electric PTO will not engage	Low battery voltage		Battery Trouble-shooting
	No voltage to PTO **NOTE:** With ignition switch in the RUN position, battery voltage should be present at the red wire of PTO connection.	Test for battery voltage in red wire at PTO connector — If no voltage, check for: • Blown fuses— check positive and ground fuses • Check for loose or broken connections in red wire to PTO If voltage is present, proceed to next test.	Appendix D
	Open circuit in PTO field coil	Disconnect PTO connector. Using an ohmmeter, measure resistance of field coil: • Models 2130, 2135, 2140 and 2145 — 6.5 to 7.5 ohms • Models 2160, 2165 and 2185 — 2.4 to 3.4 ohms	

Table 4-1. Troubleshooting

BASIC TYPES OF TROUBLE	PROBABLE CAUSES	POSSIBLE SOLUTIONS	REFER TO
Electric PTO will not engage (cont.)	Open circuit in PTO field coil (cont.)	**OR** With ignition switch in RUN position and PTO connected to wire harness, test for battery voltage in blue wire at PTO connector If measurements are NOT within specifications and/or NO voltage is present, the field coil is defective If within specifications and/or voltage is present, proceed to next test.	
	No continuity through blue wire	Test for battery voltage in blue wire connection at PTO switch • If no voltage, check wire. • If voltage is present, proceed to next test.	Appendix D
	Defective PTO switch	Disconnect wire harness and test continuity of PTO switch per Appendix C (C-3.2). If switch OK, proceed to next test	Appendix C
	Defective reverse relay	Unplug the relay from wire harness and test for proper operation per Apendix C (C-3.3). If relay OK, proceed to next test	Appendix C
	PTO safety circuit not operating correctly	Test safety circuit as follows: • Using an ohmmeter, test continuity of brown wire between the coil terminal of the relay and the PTO switch terminal (7). If NO continuity, check wire and connections. If OK, proceed to next test. • Using an ohmmeter, test continuity of brown wire between the coil terminal of the relay and the contact point terminal of the relay. If NO continuity, check wire and connections. If OK, proceed to next test. • With ignition switch in the RUN position, test for battery voltage in the white wire at the reverse relay — If voltage is present, PTO circuit is OK.— If no voltage, proceed to next test.	Appendix C and D

Table 4-1. Troubleshooting

BASIC TYPES OF TROUBLE	PROBABLE CAUSES	POSSIBLE SOLUTIONS	REFER TO
Electric PTO will not engage (cont.)	PTO safety circuit not operating correctly (cont.)	Test safety circuit as follows: (cont.) • With ignition switch in the RUN position, test for battery voltage in the red wire at the reverse switch— If voltage is present, the reverse switch is not operating correctly — If no voltage, check red wire and connections between reverse switch and ignition switch.	
PTO will not engage or disengages while operating	Air gap of PTO out of adjustment	Models 2130, 2135, 2140 and 2145 — The PTO air gap is factory preset. No air gap specifications or adjustments apply. Inspect the clutch assembly per paragraph 5-6.4 Models 2160, 2165 and 2185— Adjust air gap to 0.012-0.017 in. and retest. If problem persists, inspect the clutch assembly per paragraph 5-7.4.	Paragraph 5-6 Paragraph 5-7
	Low battery voltage		Battery Trouble-shooting
	Defective PTO bearings	Inspect PTO clutch per paragraph 5-6.4 or 5-7.4.	
PTO clutch is engaged whenever engine is running, with PTO switch in OFF position	PTO bearing seized	**WARNING** Never operate or allow tractor to be operated when the PTO cannot be disengaged. Serious personal injury could result. Inspect PTO clutch per paragraph 5-6.4 or 5-7.4 — If bearings OK, proceed to next test.	
	Blue wire in PTO circuit grounding	TURN ENGINE OFF BEFORE PERFORMING THE FOLLOWING PROCEDURE. Remove blue wire from wire harness connectors at PTO and PTO switch, then test for continuity to gound. Continuity should NOT be present — If no continuity, proceed to next test.	

Table 4-1. Troubleshooting

BASIC TYPES OF TROUBLE	PROBABLE CAUSES	POSSIBLE SOLUTIONS	REFER TO
PTO clutch is engaged whenever engine is running, with PTO switch in OFF position (cont.)	PTO field coil grounding through PTO housing	TURN IGNITION SWITCH TO THE OFF POSITION BEFORE PERFORMING THE FOLLOWING PROCEDURE • Remove blue wire from wire harness connector at PTO clutch • While turning the ignition switch to the ON position, listen for the audible click of clutch engaging. — If PTO engages, field coil is defective	
DRIVE LINE TROUBLESHOOTING			
Drive shaft vibration	Bent drive shaft	Check drive shaft run out and replace if defective.	
	Damaged, worn or missing roller barrels	Check for excessive drive shaft end play: • Disconnect drive shaft from rear adapter and push coupler/drive shaft toward engine. • Push adapter/input shaft toward clutch or hydro transmission assembly. • Measure gap between coupler and adapter. If gap measures 1/8 in. or larger, add a spacer plate to drive line. Remove drive shaft and replace damaged or missing roller barrels.	Paragraphs 5-22 and 5-23.
	Excessive drive line misalignment	Check transaxle and engine installation — Re-align if improperly installed.	
6 SPEED TRANSMISSION TROUBLESHOOTING (MODELS 2130, 2140 AND 2160)			
Tractor will not move in forward or reverse	Parking brake engaged	Disengage parking brake	
	Transmission will not shift from neutral	No detent resistance felt when moving speed control lever. • Carriage bolt of gear shift backet is loose, allowing speed control lever to slip inside gear shift bracket. Tighten carriage bolt. • Shift rod disconnected from gear shift bracket or transaxle shifter arm. Connect shift rod.	Paragraph 5-20

Table 4-1. Troubleshooting

BASIC TYPES OF TROUBLE	PROBABLE CAUSES	POSSIBLE SOLUTIONS	REFER TO
Tractor will not move in forward or reverse (cont.)	Clutch assembly not being actuated.	• Clutch adjustment rod disconnected from clutch cam on clutch shaft, or from control arm on clutch assembly. Connect adjustment rod. • Set screw securing control arm to clutch assembly is loose. Re-position control arm and tighten set screw.	Paragraph 5-20
	No input to clutch assembly.	Clutch adapter loose on clutch input shaft. Tighten bell washer and hex lock nut.	Paragraph 5-20
	Excessive clutch plate wear due to improper operation.	Rebuild or replace clutch assembly. **NOTE:** Forward or reverse pedal must be FULLY DEPRESSED when operating the tractor.	Paragraph 5-24
	Transmission locked up or unable to engage shift gears due to loose neutral spacer (Early style).	Rebuild transaxle — replacing shift shaft and neutral spacer with new style components.	Paragraph 5-29
Tractor will not reach normal operating speed in one or both directions, or operates in one direction only.	Low engine RPM	• Move throttle control lever to full throttle position. • Check and, if necessary, adjust top no load engine speed to specifications (Usually 3500-3600 RPM)	 Appropriate Engine Service Manual
	Improper brake adjustment or operation causing drag on transmission	• Check for too tightly adjusted brake rod — Readjust brake rod. • Damaged, weak or missing brake return spring — Replace spring. • Corroded or damaged brake actuator seizing in brake plate — Repair or replace necessary components. • Broken or damaged brake shoes or drum causing binding — Replace necessary components.	Section 6 — Adjustments Paragraph 5-27
	Clutch assembly not being fully actuated.	• Clutch adjustment rod not correctly installed. Pivot sleeve on adjustment rod should be installed in upper hole of control arm. Ferrule on front end of rod should be installed in forward slotted hole of clutch cam. • Clutch adjustment rod incorrectly adjusted — Readjust clutch rod.	Paragraph 5-20 Section 6 — Adjustments

Table 4-1. Troubleshooting

BASIC TYPES OF TROUBLE	PROBABLE CAUSES	POSSIBLE SOLUTIONS	REFER TO
Tractor will not reach normal operating speed in one or both directions, or operates in one direction only. (cont.)	Clutch assembly not being fully actuated. (cont.)	• Set screw securing control arm to clutch assembly is loose, allowing slippage of control arm. Re-position control arm and tighten set screw.	Paragraph 5-24
		• Clutch interlock rod incorrectly adjusted, limiting movement of control arm in one direction — Correctly adjust interlock rod.	Section 6 — Adjustments
		• Hex flange lock nut on rear end of adjustment rod not completely tightened, causing loss of forward speed — Tighten nut fully against shoulder of rod.	Paragraph 5-20
	Full input not being transmitted to clutch input shaft.	Clutch adapter loose on clutch input shaft. Tighten bell washer and hex lock nut.	Paragraph 5-22
	Improper shimming of the forward and/or reverse clutch packs.	Remove the clutch assembly, check for the .002-.007 in. clearance specification for each clutch pack and re-shim as necessary.	Paragraph 5-24
	Excessive clutch plate wear due to improper operation.	Rebuild or replace clutch assembly. **NOTE:** Forward or reverse pedal must be FULLY DEPRESSED when operating the tractor.	Paragraph 5-24
	Unable to engage all shift gears due to loose neutral spacer (Early style).	Rebuild transaxle — replacing shift shaft and neutral spacer with new style components.	Paragraph 5-29
Tractor creeps forward or rearward when forward or reverse pedals are released.	Centering spacer not properly positioned on neutral bracket.	Referring to Section 6 — Adjustments, adjust centering spacer so that clutch control arm is in neutral position.	Section 6 — Adjustments
	Clutch adjustment rod not properly adjusted.	Readjust clutch rod. The clutch rod should be readjusted whenever the centering spacer is repositioned.	Section 6 — Adjustments
	Set screw securing control arm to clutch assembly is loose.	Re-position control arm on clutch assembly and tighten set screw.	Paragraph 5-24
	Loss of tension or distortion in the neutral arm spring — preventing control arm from being consistently neutralized.	Replace damaged spring. Correct spring is black in color.	Paragraph 5-24

Table 4-1. Troubleshooting

BASIC TYPES OF TROUBLE	PROBABLE CAUSES	POSSIBLE SOLUTIONS	REFER TO
Tractor creeps forward or rearward when forward or reverse pedals are released. (cont.)	Improper adjustment or binding of the interlock rod — preventing control arm from being consistently neutralized.	Check interlock rod for interference and/or misadjustment.	
	Surface interference in neutral return bracket of clutch shaft causing sluggish return to neutral.	Remove material from the bottom surface of opening in neutral return bracket per Service Bulletin CC-292.	Service Bulletin CC-292
	Forward and/or reverse clutch packs shimmed too tight.	Remove the clutch assembly, check for the .002-.007 in. clearance specification for each clutch pack and reshim as necessary.	Paragraph 5-24
	Clutch plate damage due to improper operation.	Rebuild or replace clutch assembly. **NOTE:** Forward or reverse pedal must be FULLY DEPRESSED when operating the tractor.	Paragraph 5-24
Tractor momentarily moves in opposite direction when depressing either forward or reverse pedal.	Clutch pack shimmed too tightly.	Remove the clutch assembly, check for the .002-.007 in. clearance specification for each clutch pack and reshim as necessary.	Paragraph 5-24
Squealing or squawking noise coming from clutch assembly.	Clutch plates not fully seated.	Operate tractor in both directions while fully engaging and disengaging the clutch assembly repeatedly.	Service Bulletin CC-301
Tractor drives in either forward or reverse whenever engine is running.	Clutch pack seized (usually due to improper operation).	Repair or replace clutch assembly. **NOTE:** Forward or reverse pedal must be FULLY DEPRESSED when operating the tractor.	Paragraph 5-24
Tractor jumps/slips in drive when under load.	Clutch assembly slippage (usually caused by repeated partial actuation of clutch assembly).	• Check control arm and clutch linkage for proper installation. • Worn clutch plates — Rebuild or replace clutch assembly. **NOTE:** Forward or reverse pedal must be FULLY DEPRESSED when operating the tractor.	
	Worn shift keys and/or shift gears.	Replace worn keys and gears.	Paragraph 5-29
Cannot shift transaxle	Forward or reverse pedal depressed	Release pedal.	
	Shift interlock misadjusted.	Check that interlock arm on clutch assembly is pointing straight down and interlock lever of transaxle is in center detent position.	Section 6 — Adjustments

Table 4-1. Troubleshooting

BASIC TYPES OF TROUBLE	PROBABLE CAUSES	POSSIBLE SOLUTIONS	REFER TO
Cannot shift transaxle (cont.)	Transmission locked up due to loose neutral spacer (Early style).	Rebuild transaxle — replacing shift shaft and neutral spacer with new style components (Service Bulletin CC-288)	Paragraph 5-29
Transaxle can be shifted when forward or reverse pedal is depressed	Interlock linkage not attached.	Check and reattach interlock linkage.	Paragraph 5-24
	Interlock rod misadjusted	Check that interlock arm on clutch assembly is pointing straight down and interlock lever of transaxle is in center detent position.	Section 6 — Adjustments
Speed control lever not aligning with numbers of shifter cover.	Loose gear shift bracket.	Carriage bolt of gear shift backet is loose, allowing speed control lever to slip inside gear shift bracket. Tighten carriage bolt.	Paragraph 5-20
	Misformed or bent gear shift rod or speed control lever	Repair or replace defective rods.	
	Miswelded transmission shift arm	If severely misaligned or unable to engage all gears, replace shift arm.	Paragraph 5-29
Oil leaking from breather tube	Incorrect oil level and/or dipstick.	Reduce oil level and replace dipstick per Service Bulletin CC-286	Service Bulletin CC-286
Oil leaking between clutch assembly and transaxle.	Damaged O-ring.	**WARNING** Observe all applicable local and federal laws regulating the proper disposal of the drained oil. Drain oil from transaxle and remove clutch assembly to replace O-ring.	Paragraph 5-24
Oil leaking from clutch assembly.	Damaged O-ring or seal	Remove clutch assembly. Inspect applicable sealing surfaces of housing and replace O-ring or seal.	Paragraph 5-24
Oil leaking from transaxle assembly.	Damaged shift shaft seal.	Remove brake assembly to replace seal.	Paragraphs 5-26 and 5-27
	Improper sealing of housings.	Split and reseal applicable housings with Ultra Grey sealant (759-3746).	Paragraphs 5-26 and 5-29
Axle coming out of axle housing	Improperly installed axle retaining ring.	• Remove axle/axle housing and inspect ring groove of axle.	Paragraph 5-28

Table 4-1. Troubleshooting

BASIC TYPES OF TROUBLE	PROBABLE CAUSES	POSSIBLE SOLUTIONS	REFER TO
Axle coming out of axle housing (cont.)	Improperly installed axle retaining ring. (cont.)	• Install new retaining ring, making certain ring is seated in groove.	Paragraph 5-28
HYDRO TRANSAXLE TROUBLESHOOTING (Models 2135, 2145, 2165 and 2185)			
Tractor will not move in forward or reverse	Parking brake engaged	Disengage parking brake.	
	Hydro disengagement rod locked in disengage position.	Release disengagement rod from notch of drawbar plate.	
	Hydro transmission not being actuated.	• Hydro adjustment rod disconnected from clutch cam on clutch shaft, or from control arm on hydro transmission. Connect adjustment rod. • Set screw securing control arm to hydro transmission is loose. Re-position control arm and tighten set screw.	Paragraph 5-21
	No input to hydro transmission.	Pump adapter loose on hydro input shaft. Tighten bell washer and hex lock nut.	Paragraph 5-23
	NOTE Applies only to tractors equipped with the Model BDU-10L-219 hydro transmission. Bypass valve stuck or jammed in the engaged position.	Actuate valve button to ensure smooth operation, then check that button extends approximately 0.22 in. from bottom of plug.	Paragraph 5-25
	Hydro transmission not primed with oil.	• Check oil level in transaxle. • Inspect pickup tube and tighten tube fittings to prevent suction of air. • Remove and inspect oil filter and filter nipple. Replace plugged oil filter. Ensure nipple is not blocking oil passage of transaxle. • Remove charge pump and inspect for damage or excessive wear.	Paragraph 5-25
	Extensive internal wear or damage to hydro transmisssion.	Rebuild or replace hydro transmission.	Paragraph 5-25

Table 4-1. Troubleshooting

BASIC TYPES OF TROUBLE	PROBABLE CAUSES	POSSIBLE SOLUTIONS	REFER TO
Tractor will not move in forward or reverse. (cont.)	Drive collar disengaged inside transaxle.	**NOTE:** Make certain hydro dump arm is securelly fastened to shift yoke of transaxle. • Pull arm rearward to ensure good spring tension against drive collar. If no tension is felt, disassemble transaxle and inspect compression spring. • If tension is felt, release the dump arm while rocking the tractor forward or backward. Feel for drive collar to engage gear inside transaxle (tractor should stop abruptly). If drive collar does not engage, disassemble transaxle.	Paragraph 5-21 Paragraph 5-30
Tractor will not reach normal operating speed in one or both directions, or operates in one direction only.	Low engine RPM	• Move throttle control lever to full throttle position. • Check and, if necessary, adjust top no load engine speed to specifications (Usually 3500-3600 RPM)	Appropriate Engine Service Manual
	Improper brake adjustment or operation causing drag on transmission	• Check for too tightly adjusted brake rod — Readjust brake rod. • Damaged, weak or missing brake return spring — Replace spring. • Corroded or damaged brake actuator seizing in brake plate — Repair or replace necessary components. • Broken or damaged brake shoes or drum causing binding — Replace necessary components.	Section 6 — Adjustments Paragraph 5-27
	Trunnion arm of hydro transmission not being fully actuated.	• Hydro adjustment rod not correctly installed. Pivot sleeve on adjustment rod should be installed in lower hole of control arm. Ferrule on front end of rod should be installed in rear slotted hole of clutch cam. • Hydro adjustment rod incorrectly adjusted — Readjust clutch rod. • Hex flange lock nut on rear end of adjustment rod not completely tightened, causing loss of forward speed — Tighten nut fully against shoulder of rod.	Paragraph 5-21 Section 6 — Adjustments Paragraph 5-21

Table 4-1. Troubleshooting

BASIC TYPES OF TROUBLE	PROBABLE CAUSES	POSSIBLE SOLUTIONS	REFER TO
Tractor will not reach normal operating speed in one or both directions, or operates in one direction only. (cont.)	Trunnion arm of hydro transmission not being fully actuated. (cont.)	• Set screw securing control arm to hydro transmission is loose, allowing slippage of control arm. Re-position control arm and tighten set screw. • Damper cylinder restricting range of motion of pedal/clutch shaft. Test cylinder for full extension and retraction of piston. Replace if defective.	Paragraph 5-25 Paragraph 5-21
	Full input not being transmitted to hydro input shaft.	Pump adapter loose on hydro input shaft. Tighten bell washer and hex lock nut.	Paragraph 5-23
	NOTE Applies only to tractors equipped with the Model BDU-10L-219 hydro transmission. Bypass valve stuck in partially engaged position.	Actuate valve button to ensure smooth operation, then check that button extends approximately 0.22 in. from bottom of plug.	Paragraph 5-25
	Hydro transmission is not being properly primed with oil, or oil is contaminated with water.	• Check oil level in transaxle. • Inspect pickup tube and tighten tube fittings to prevent suction of air. • Remove and inspect oil filter and filter nipple. Replace plugged oil filter. Ensure nipple is not blocking oil passage of transaxle. • Remove charge pump and inspect for damage or excessive wear. 1. Check appearance of residual oil for foaming, indicating the suction of air. 2. Check for milky appearance, indicating water in oil. Drain and replace oil.	Paragraph 5-25
	Hydro transmission is getting hot.	• Check cooling fan for broken or missing blades. Replace fan. • Check transmission housing for dirty or plugged cooling fins. Clean housing.	

Table 4-1. Troubleshooting

BASIC TYPES OF TROUBLE	PROBABLE CAUSES	POSSIBLE SOLUTIONS	REFER TO
Tractor will not reach normal operating speed in one or both directions, or operates in one direction only. (cont.)	Check valves not properly seating.	Inspect valve poppets and seats for foreign matter, burrs or wear. Repair as necessary.	Paragraph 5-25
	Cradle bearings displaced.	Replace and reposition cradle bearings.	Paragraph 5-25
	Extensive internal wear or damage to hydro transmisssion.	Rebuild or replace hydro transmission.	Paragraph 5-25
Tractor creeps forward or rearward when forward or reverse pedals are released.	Centering spacer not properly positioned on neutral bracket.	Referring to Section 6 — Adjustments, adjust centering spacer so that hydro control arm is in neutral position.	Section 6 — Adjustments
	Hydro adjustment rod not properly adjusted.	Readjust hydro rod. The hydro rod should be readjusted whenever the centering spacer is repositioned.	Section 6 — Adjustments
	Set screw securing control arm to hydro transmission is loose.	Re-position control arm on hydro transmission and tighten set screw.	Paragraph 5-25
	Loss of tension or distortion in the neutral arm spring — preventing control arm from being consistently neutralized.	Replace damaged spring. Correct spring is yellow dichromate plated.	Paragraph 5-25
	Surface interference in neutral return bracket of clutch shaft causing sluggish return to neutral.	Remove material from the bottom surface of opening in neutral return bracket per Service Bulletin CC-292.	Service Bulletin CC-292
	Defective damper cylinder restricting normal rotation of pedal/clutch shaft.	Fully extend and retract cylinder to test for return to static (neutral) length. Replace if defective.	Paragraph 5-21
	Swashplate leveler and/or leveler pin distorted.	Repair or replace hydro transmission.	Paragraph 5-25
Tractor sluggish or noisy under load	Low engine RPM	Run tractor at full throttle.	
	Hydro transmission is not being properly primed with oil, or oil is contaminated with water.	• Check oil level in transaxle. • Inspect pickup tube and tighten tube fittings to prevent suction of air. • Remove and inspect oil filter and filter nipple. Replace plugged oil filter. Ensure nipple is not blocking oil passage of transaxle.	Paragraph 5-25

Table 4-1. Troubleshooting

BASIC TYPES OF TROUBLE	PROBABLE CAUSES	POSSIBLE SOLUTIONS	REFER TO
Tractor sluggish or noisy under load. (cont.)	Hydro transmission is not being properly primed with oil, or oil is contaminated with water. (cont.)	• Remove charge pump and inspect for damage or excessive wear. 1. Check appearance of residual oil for foaming, indicating the suction of air. 2. Check for milky appearance, indicating water in oil. Drain and replace oil.	Paragraph 5-25
	Check valves not properly seating.	Inspect valve poppets and seats for foreign matter, burrs or wear. Repair as necessary.	Paragraph 5-25
Hydro unit overheating	Low oil level	Fill to proper level.	
	Broken or missing cooling fan blades.	Replace cooling fan.	Paragraph 5-25
	Cooling fins of hydro housing dirty or plugged.	Clean housing.	
	Brake not fully releasing.	Inspect brake assembly for proper operation and correctly adjust brake linkage.	Section 6 — Adjustments
	Excessive loading of tractor.	Reduce load.	
Oil leaking between hydro transmission and transaxle.	Damaged O-ring.	**WARNING** Observe all applicable local and federal laws regulating the proper disposal of the drained oil. Drain oil from transaxle and remove hydro pump to replace O-ring.	Paragraph 5-25
Oil leaking from hydro transmission	Damaged seal, O-ring or gasket.	Inspect applicable sealing surfaces and replace damaged component.	Paragraph 5-25
	Excessive internal hydro case pressure.	**NOTE** Applies only to tractors equipped with the Model BDU-10L-219 hydro transmission. Check return tube and connector for damage or obstructions. Clear obstruction or replace components.	Paragraph 5-25

Table 4-1. Troubleshooting

BASIC TYPES OF TROUBLE	PROBABLE CAUSES	POSSIBLE SOLUTIONS	REFER TO
Oil leaking from hydro transmission (cont.)	Excessive internal hydro case pressure. (cont.)	**NOTE** Applies only to tractors equipped with the Model BDU-10L-221 hydro transmission. Check oil drain hole (near output shaft) of center section for blockage, and make certain output shaft seal is removed.	Paragraph 5-25
Oil leaking from transaxle assembly.	Damaged shift shaft seal.	Remove brake assembly to replace seal.	Paragraph 5-27
	Improper sealing of housings.	Split and reseal applicable housings with Ultra Grey sealant (759-3746).	Paragraph 5-30
Tractor will not move when hydro disengagement rod is engaged	Parking brake engaged or brake assembly not fullly releasing.	• Disengage parking brake. • Inspect brake assembly for proper operation and correctly adjust brake linkage.	Section 6 — Adjustments
	Hydro dump arm loose on shift yoke.	• Tighten hex cap screw and bell washer securing arm. • Inspect square shoulder of shift yoke and hole of arm for wear.	Paragraph 5-21
	Broken shift yoke.	Pull dump arm rearward to feel for spring tension. If no tension felt, disassemble transaxle to inspect and/or replace shift yoke	Paragraph 5-30
Axle coming out of axle housing	Improperly installed axle retaining ring.	• Remove axle/axle housing and inspect ring groove of axle. • Install new retaining ring, making certain ring is seated in groove.	Paragraph 5-28
BRAKE SYSTEM TROUBLESHOOTING			
Intermittent noise from brake assembly.	Brake drum contacting brake actuation arm.	Replace old style brake drum with new style per Service Bulletin CC-275. Drum should be approximately 0.800 in. wide.	Paragraph 5-28
Poor braking action	Brake rod incorrectly adjusted.	Readjust brake rod.	Section 6 — Adjustments
	Worn or broken brake shoes or brake drum	Replace defective components.	Paragraph 5-27
	Oil on brake components	Replace shift shaft seal.	

Table 4-1. Troubleshooting

BASIC TYPES OF TROUBLE	PROBABLE CAUSES	POSSIBLE SOLUTIONS	REFER TO
Brakes dragging	Brake rod adjusted too tightly.	Readjust brake rod.	Section 6 — Adjustments
	Corroded or damaged brake actuator seizing in brake plate.	Repair or replace necessary components.	Paragraph 5-27
	Broken or damaged brake shoes or drum causing binding.	Replace necessary components.	
STEERING TROUBLESHOOTING			
NOTE Applies to early production Models 2160, 2165 and 2185. Tires hit side panels when turning on an inclined surface.	Wheel toe-in not correctly adjusted.	Check and readjust for 1/8 in. toe-in.	Section 6 — Adjustments
	Over inflated tires.	Check and reduce air pressure to 10 - 12 psi.	
	Excessive axle side play	Adjust limiter cap screws to eliminate play.	Paragraph 5-10
	Stack-up of component tolerances altering steering geometry.	Adjust steering tolerances per Service Bulletin CC-277.	Service Bulletin CC-277
Steering is loose (excessive lost motion)	Worn ball joints	Replace ball joints.	Paragraph 5-10
	Excessive axle side play	Adjust limiter cap screws to eliminate play.	
	Worn front pivot axle and/or steering knuckle assemblies caused by lack of lubrication.	Replace excessively worn parts.	
	Worn steering housing bearings caused by lack of lubrication.	Replace worn bearings.	Paragraph 5-10
	Incorrect installation of steering shaft washers causing separation of pinion gear from segment gear and/or excessive steering shaft end play.	• Ensure that single thrust washer (approx. 0.030 in.) is placed between pinion gear and steering housing assembly. • Add washers as necessary to obtain the correct steering shaft end play.	Paragraph 5-15
Steering tight (excessive effort needed to turn)	Wheel toe-in not correctly adjusted.	Check and readjust for 1/8 in. toe-in.	Section 6 — Adjustments
	Incorrect tire inflation.	Check for proper air pressure of 10 - 12 psi.	
	Front axle pivot bolt needs lubrication.	Lubricate pivot bolt by applying grease to lube fitting.	Paragraph 5-10

Table 4-1. Troubleshooting

BASIC TYPES OF TROUBLE	PROBABLE CAUSES	POSSIBLE SOLUTIONS	REFER TO
Steering tight (cont.)	Front axle does not pivot freely.	Adjust limiter cap screws to eliminate binding.	Paragraph 5-10
	Insufficient lubrication of steering knuckles.	Apply grease to front axle lube fittings.	
	Insufficient lubrication of steering housing bearings.	Apply grease to lube fittings of steering housing. Do not over lubricate.	Paragraph 5-15
	Upper flange bearing on steering shaft misaligned	Reposition flange bearing to eliminate binding on steering shaft.	
	Improper installation of tie rods in lower steering arm.	• Models 2130, 2135, 2140 and 2145 with 14 tooth segment gear — ball joints should be installed in outer holes of steering arm. • Models 2130, 2135, 2140 and 2145 with 18 tooth segment gear — ball joints should be installed in inner holes of steering arm. • Models 2160, 2165 and 2185 should be equipped with 18 tooth gear only, with ball joints installed in inner holes of steering arm.	Paragraph 5-15
Tractor does not turn equally in both directions	Lower steering arm and/or tie rods not properly adjusted.	Ensure lower steering arm is centered and readjust tie rods.	Section 6 — Adjustments
DASH PANEL and BULKHEAD TROUBLESHOOTING			
Drive shaft rubbing dash panel	Dash panel not properly aligned.	• Loosen screws and large washers securing panel to sides of pedestal and reposition dash panel squarely on pedestal. • Readjust hood/grille brackets as necessary.	Paragraph 5-14 Section 6 — Adjustments
Dash panel and hood overlapping.	Dash panel not properly aligned and hood incorrectly adjusted.		
PTO switch pulling out of dash panel	Retaining tabs of switch broken, or hole in dash oversized.	• Inspect switch and replace if broken. • Contact Cub Cadet Service Dept. for a thin metal backing plate to secure switch in dash.	
Engine appears to be running hot	Recirculation of engine compartment air.	• Make certain that seal trim strips on sides of bulkhead are in place and sealing against side panels. • Ensure seal trim on hood baffle is sealing against top of bulkhead. • Check position and condition of intake boot or foam ring.	Paragraph 5-14