



TROUBLE-SHOOTING GUIDE



A PRODUCT TRAINING INVESTIGATION

INTRODUCTION

The Product Training Department of TEREX Division is currently undertaking an investigation dealing with the feasibility of producing a TEREX Trouble-shooting Guide. Thus far, the Product Training Department has reviewed many methods of trouble-shooting, ranging from ones used in our own heavy earthmoving equipment industry to those used in the highly innovative automotive industry. After reviewing the various trouble-shooting methods, the Product Training Department decided to make this presentation to exhibit to all interested parties the trouble-shooting method which we thought to be the best.

On the following pages is presented an example of a 33 Series Hauler Steering Trouble-shooting Guide. The method used can currently be found in the General Motors Diagnosis and Repair Manual, an automotive publication. The trouble-shooting procedures were developed by the Service Research Center of the General Motors Technical Center in Warren, Michigan. The highly illustrative format was incorporated by the publisher of the General Motors Diagnosis and Repair Manual, Creative Universal, Inc.

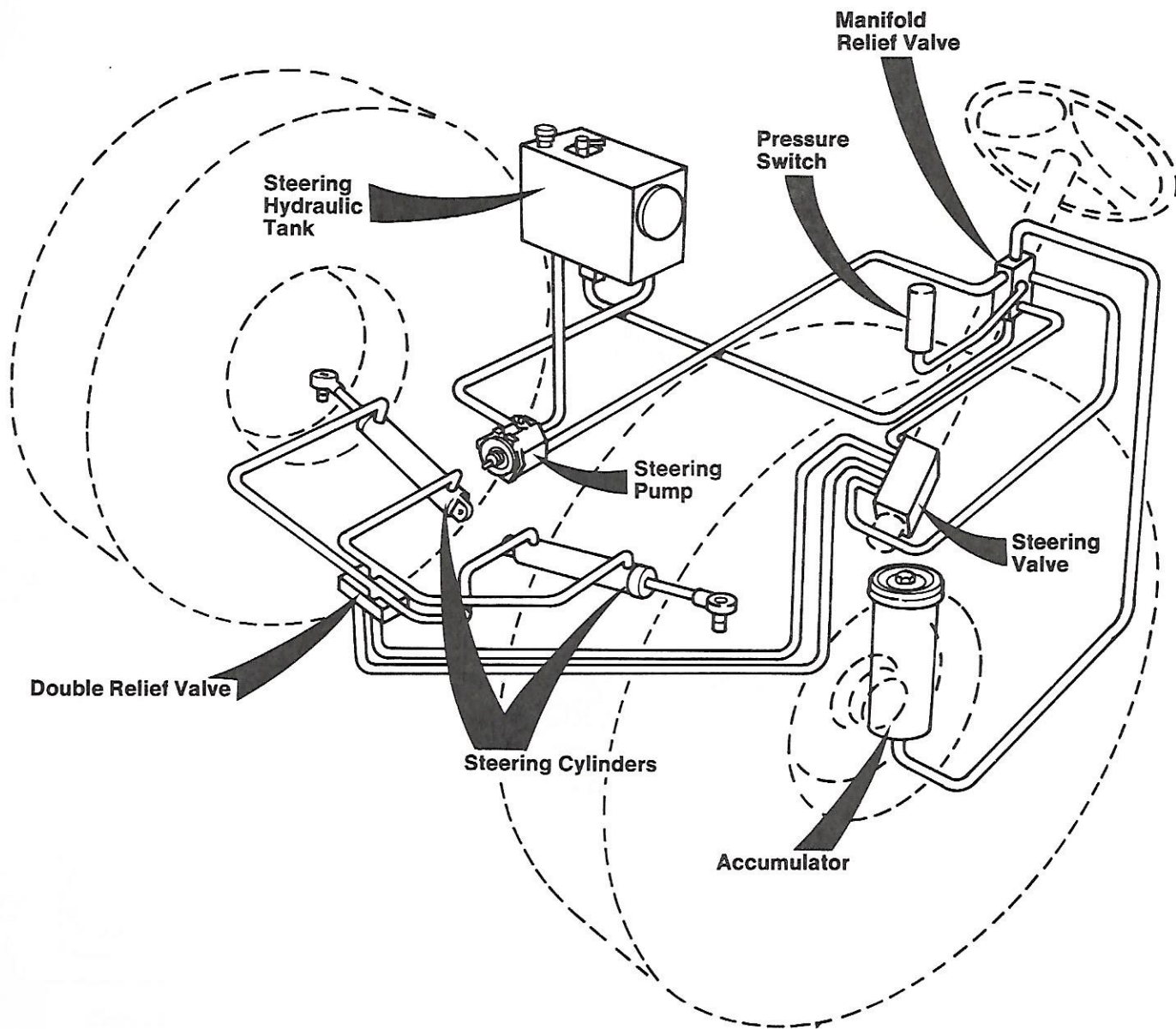
The Product Training Department wishes to know your viewpoints on the applicability of using this format on our heavy earthmoving equipment. Therefore, any positive or negative comments would be greatly appreciated.

Hank Gleissner

Hank Gleissner
Product Training

TEREX Trouble – Shooting Guide

Hauler Steering Locator



HAULER	SYSTEM PRESSURE	<i>Accum</i> RELIEF PRESSURE <i>Precharge</i>	LOW WARNING LIGHT SWITCH PRESSURE	<i>Relief</i> ACCUMULATOR PRECHARGE <i>Pressure</i>	DOUBLE RELIEF VALVE PRESSURE
33-05B	1750	800	1200	2500	2000
33-07	2000	800	1200	2500	2250
33-09	2000	800	1200	2500	2250
33-11B	2000	800	1200	2500	2250

TEREX Trouble Shooting Guide – Hauler Steering

Symptom: Slow Steering

Procedure

Results

<div>1</div> <div> <p>Check: All Hoses Or Fittings For Damage All Steering Linkage For Damage Tires For Low Pressure</p> </div> <div> </div> <div> <p>Repair As Necessary</p> </div> <div> <p>Steering Not OK</p> </div> <div> <p>Steering OK</p> </div>	<div>2</div> <div>STOP</div>
<div>2</div> <div> <p>Cold Check Steering Hydraulic Tank Oil Level</p> </div> <div> </div> <div> <p>Low Oil Level</p> </div> <div> <p>Fill To Cold Mark</p> </div> <div> <p>Oil Level OK</p> </div> <div> <p>Steering Not OK</p> </div> <div> <p>Steering OK</p> </div>	<div>3</div> <div>STOP</div> <div>3</div>
<div>3</div> <div> <p>Check Steering Time</p> </div> <div> </div> <div> <p>33-05B 4 Sec. 33-07 4 Sec. 33-09 4.6 Sec. 33-11B 5.8 Sec.</p> </div> <div> <p>Steering OK</p> </div> <div> <p>Steering Not OK</p> </div> <div> <p>Warning Light On</p> </div> <div> <p>Warning Light Off</p> </div>	<div>7</div> <div>STOP</div> <div>4</div>

*Times Are Approximate For New Steering Components

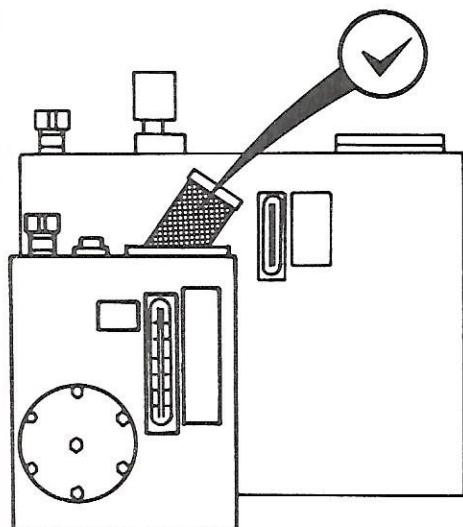
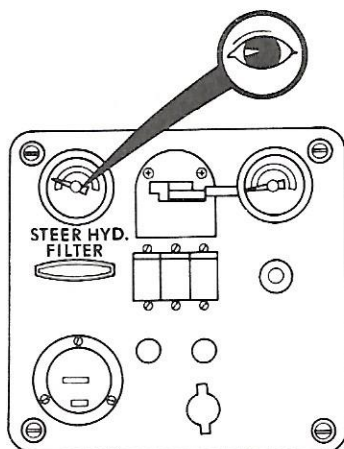
Symptom: Slow Steering — (Cont.)

Procedure

Results

4

Check Steering Hydraulic Filter



Less Than
20 PSI
OK

Check Filter For Dirt



**More Than
20 PSI
Not OK**

**If Dirty
Clean Steering
System
As Necessary**



**Steering
OK**

5



STOP



**Steering
Not OK**

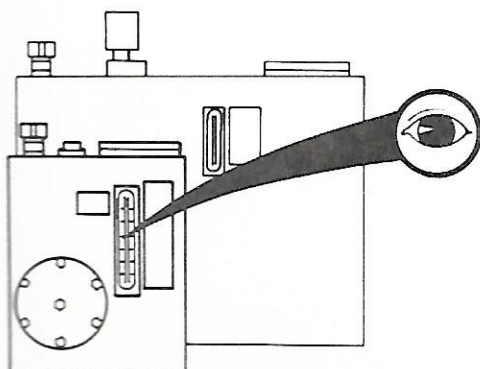
5

**If Not Dirty
Check Gage
Operation**

5

5

Hot Check Steering Hydraulic Tank Oil Level



OK

Oil Level
OK



Low Oil Level

**Fill To
Cold Mark**



**Steering
OK**



**Steering
Not OK**

6



6

Symptom: Slow Steering — (Cont.)

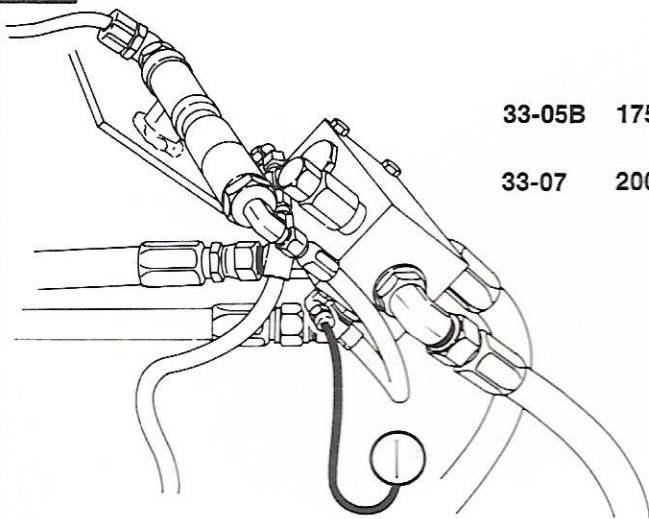
(33-05B/07)

Procedure

Results

6

Check System Pressure



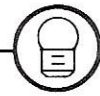
33-05B 1750 PSI

33-07 2000 PSI



OK

On



Low Pressure
Warning Light

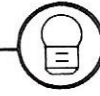
7



Off

8

On



Low Pressure
Warning Light

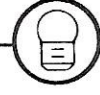
7



Off



On



Low Pressure
Warning Light

7



Off

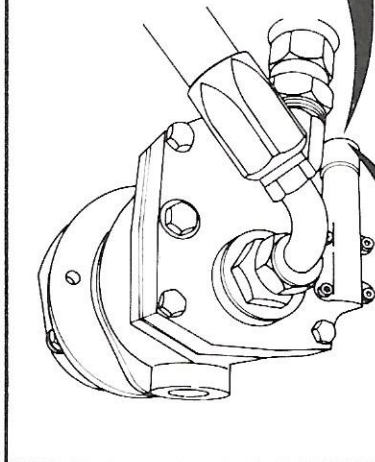
8

11



Not OK

Adjust At Pump
Compensator
Valve



Steering
OK

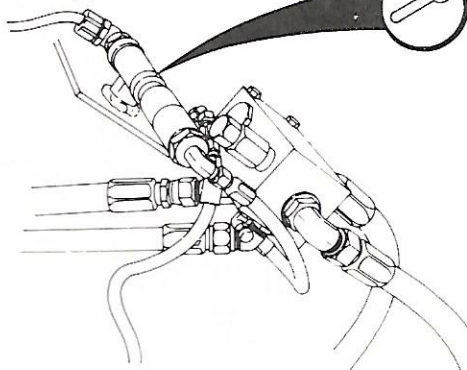


Steering
Not OK

Adjusting Pump
Compensator Valve
Has No Effect

7

Replace Low Pressure Warning Switch



Steering
OK



Steering
Not OK

8

Symptom: Slow Steering — (Cont.)

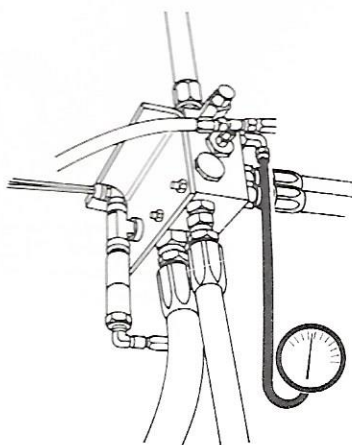
(33-09/11B)

Procedure

Results

6

Check System Pressure



33-09 2000 PSI

33-11B 2000 PSI



OK

On



Low Pressure
Warning Light

7



Off

8

On



Low Pressure
Warning Light

7



Off



On



Low Pressure
Warning Light

7



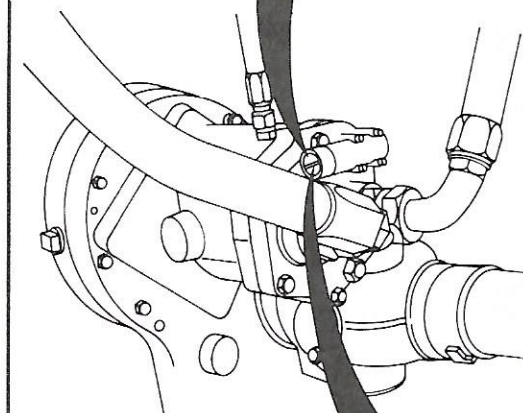
Off

8



Not OK

Adjust At Pump
Compensator
Valve



Steering
OK



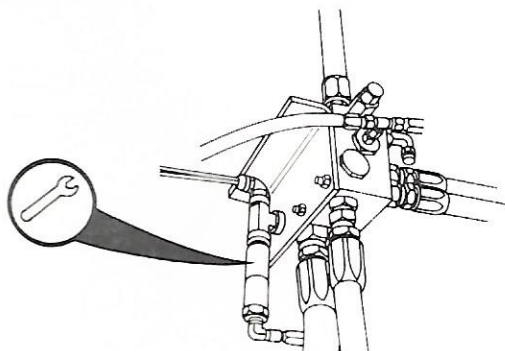
Steering
Not OK

Adjusting Pump
Compensator Valve
Has No Effect



7

Replace Low Pressure Warning Switch



Steering
OK



Steering
Not OK

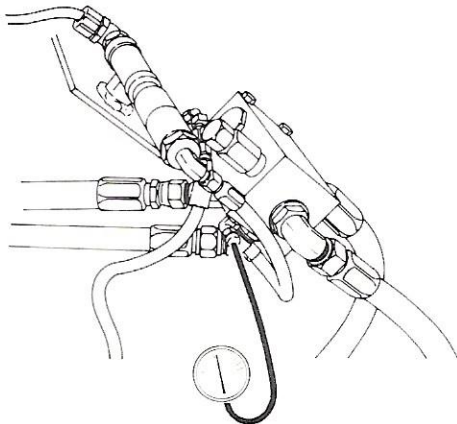
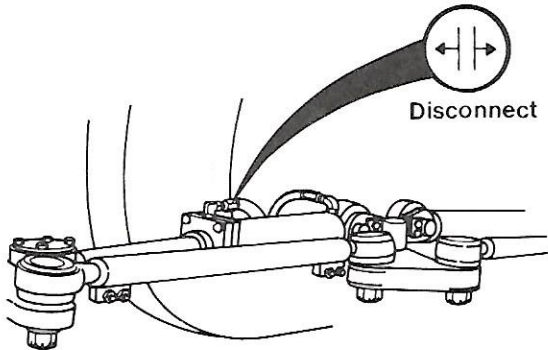
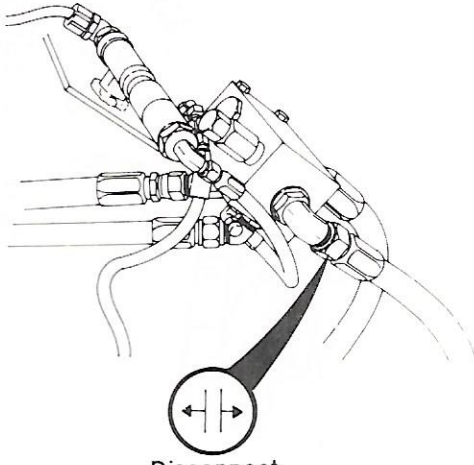
8

Symptom: Slow Steering — (Cont.)

(33-05B/07)

Procedure

Results

8	<p>Check Accumulator Precharge</p>  <pre> graph LR A((OK Less Than 800 PSI Not OK)) --> B[Charge Accumulator] B --> C((Steering OK)) B --> D((Steering Not OK)) C --> E[9] D --> F[9] G((OK 800 PSI OK)) --> F </pre>	<p>STOP</p> <p>9</p> <p>9</p>
9	<p>Check Steering Cylinders For By-Passing Oil</p>  <pre> graph LR A((OK Not OK)) --> B[Repair Or Replace As Necessary] B --> C((Steering OK)) B --> D((Steering Not OK)) C --> E[10] D --> F[10] G((OK OK)) --> F </pre>	<p>STOP</p> <p>10</p> <p>10</p>
10	<p>Check Secondary Relief Valve For By-Passing Oil</p>  <pre> graph LR A((OK OK)) --> B[11] C((OK Not OK)) --> D[Repair Or Replace As Necessary] D --> E((Steering OK)) D --> F((Steering Not OK)) E --> G[11] F --> G </pre>	<p>11</p> <p>STOP</p> <p>11</p>

Symptom: Slow Steering — (Cont.)

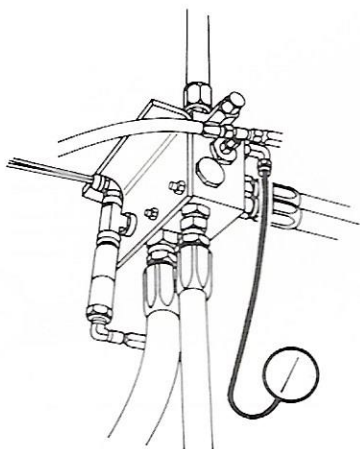
(33-09/11B)

Procedure

Results

8

Check Accumulator Precharge



OK
Less Than
800 PSI
Not OK

Charge
Accumulator

OK
800 PSI
OK

**Steering
OK**

**Steering
Not OK**

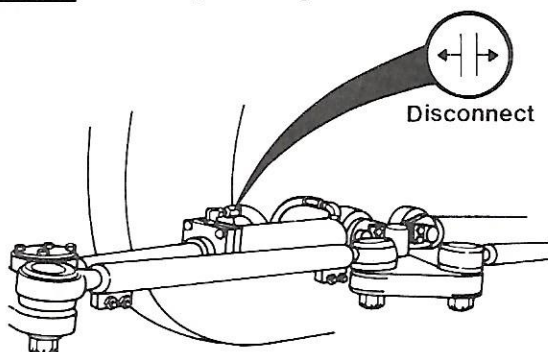
STOP

9

9

9

Check Steering Cylinders For By-Passing Oil



OK
Not OK

Repair Or
Replace As
Necessary

OK
OK

**Steering
OK**

**Steering
Not OK**

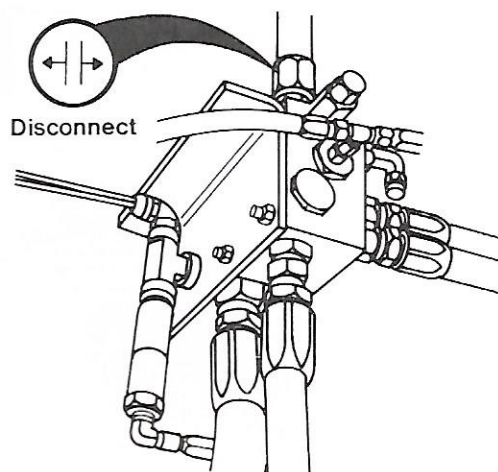
STOP

10

10

10

Check Secondary Relief Valve For By-Passing Oil



OK
OK

OK
Not OK

Repair Or
Replace As
Necessary

**Steering
OK**

**Steering
Not OK**

11

STOP

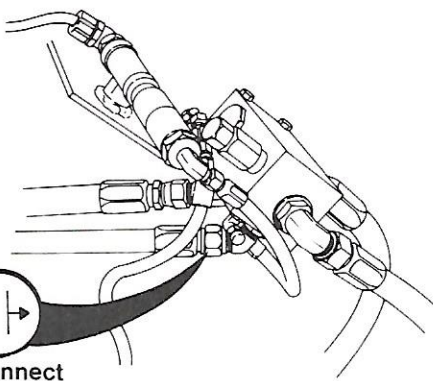
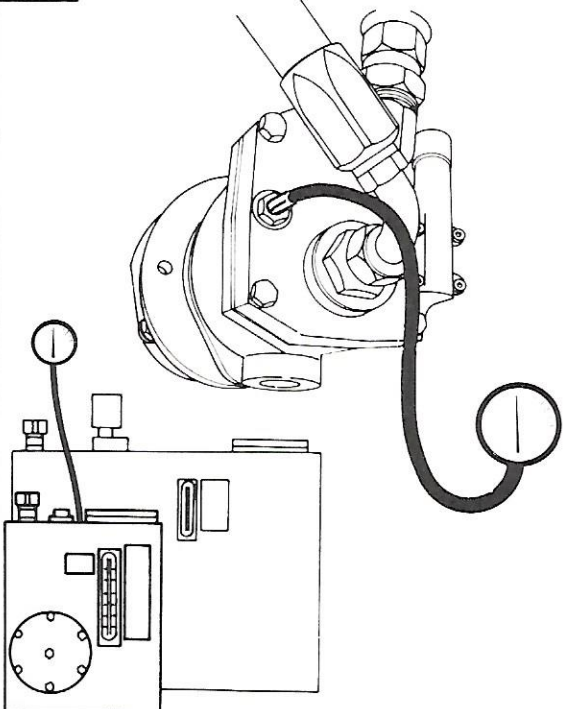
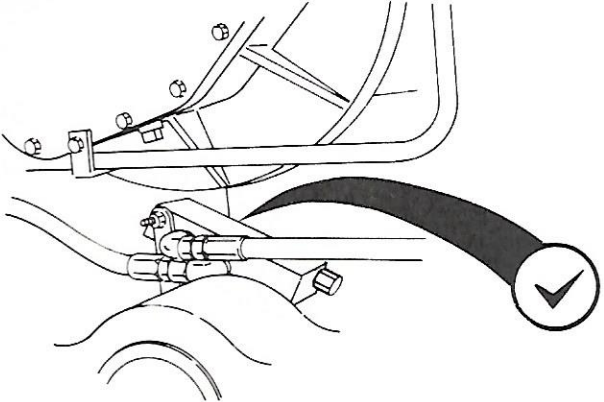
11

Symptom: Slow Steering — (Cont.)

(33-05B/07)

Procedure

Results

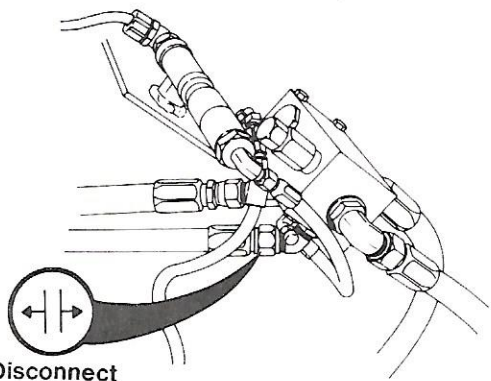






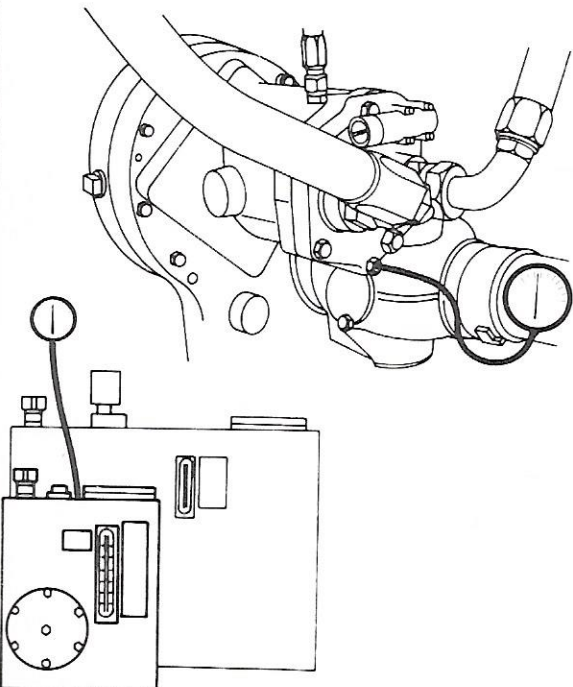






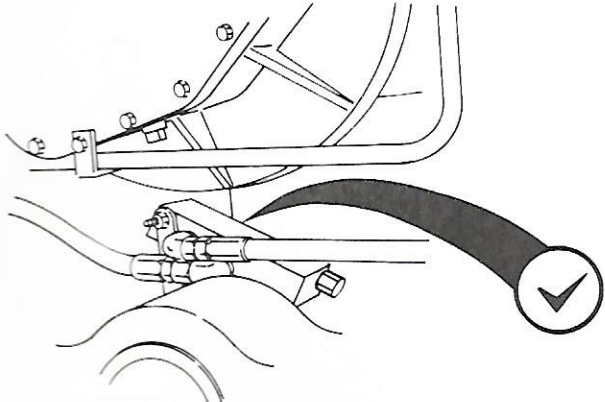


<p>11</p>	<p>Check Steering Valve For By-Passing Oil</p>  <p>Disconnect</p> <p>OK (with crossed-out O) → Not OK → Repair Or Replace As Necessary</p> <p>OK → Steering OK → STOP</p> <p>OK → Steering Not OK → 12</p>	<p>STOP</p> <p>12</p> <p>12</p>
<p>12</p>	<p>Check Pump Operation</p>  <p>OK → 13</p> <p>OK (with crossed-out O) → Not OK → Repair Or Replace As Necessary</p> <p>OK (with crossed-out O) → Steering OK → STOP</p> <p>OK (with crossed-out O) → Steering Not OK → 13</p>	<p>13</p> <p>STOP</p> <p>13</p>
<p>13</p>	<p>Check Double Relief Valve Operation</p>  <p>Repair Or Replace As Necessary</p> <p>→ STOP</p>	<p>STOP</p>

Symptom: Slow Steering — (Cont.)

(33-09/11B)

Procedure

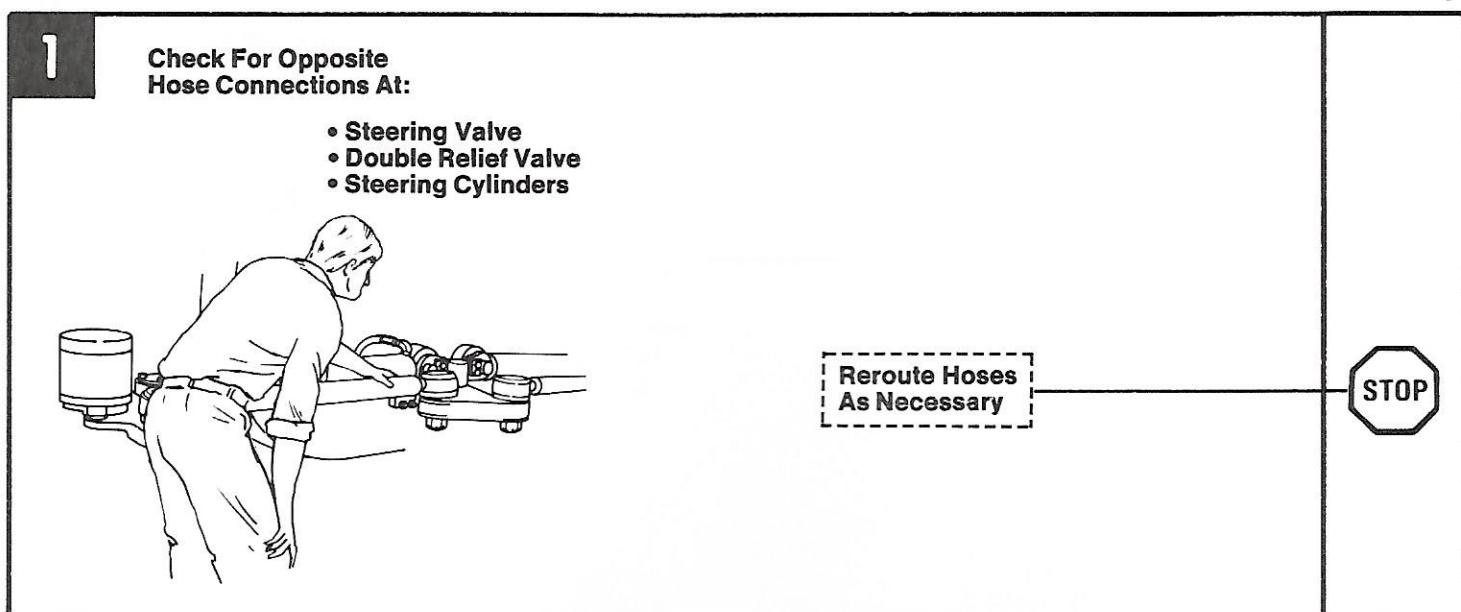
Results

11	Check Steering Valve For By-Passing Oil	 <div>  Not OK </div> <div>  Repair Or Replace As Necessary </div> <div>  OK </div> <div>  Steering OK </div> <div>  Steering Not OK </div>	<div>  </div> <div> 12 </div> <div> 12 </div>
12	Check Pump Operation	 <div>  OK </div> <div>  Not OK </div> <div>  Repair Or Replace As Necessary </div> <div>  Steering OK </div> <div>  Steering Not OK </div>	<div> 13 </div> <div>  </div> <div> 13 </div>
13	Check Double Relief Valve Operation	 <div>  Repair Or Replace As Necessary </div>	<div>  </div>

Symptom: Opposite Steering

Procedure

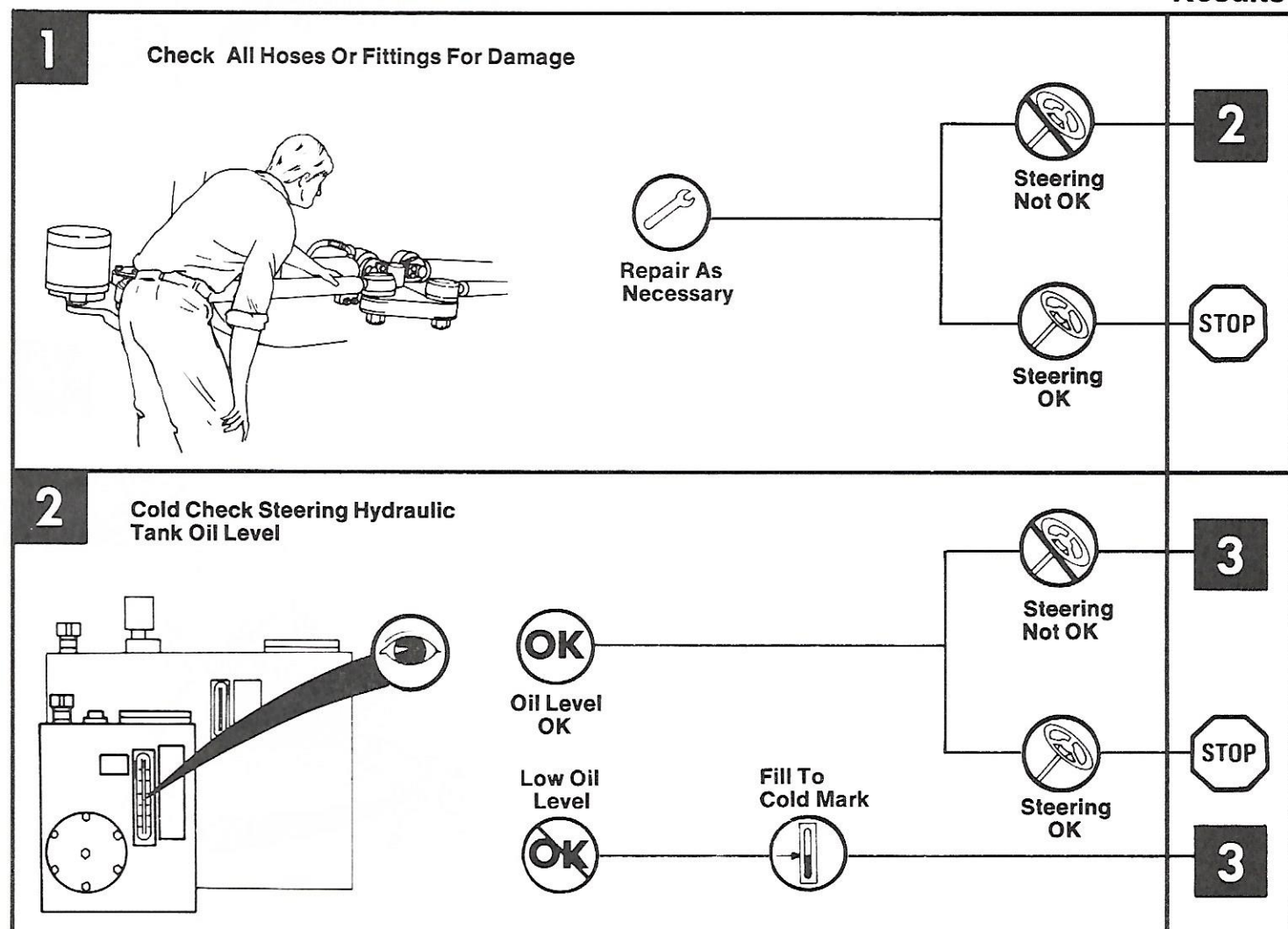
Results



Symptom: No Steering Action

Procedure

Results



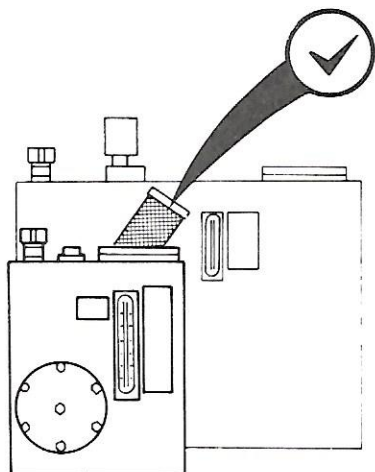
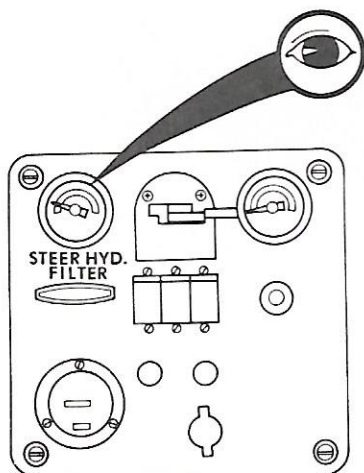
Symptom: No Steering Action — (Cont.)

Procedure

Results

3

Check Steering Hydraulic Filter



Less Than
20 PSI
OK



More Than
20 PSI
Not OK

Check Filter
For Dirt



If Dirty
Clean Steering
System
As Necessary

If Not Dirty
Check Gage
Operation



Steering
OK



Steering
Not OK

4

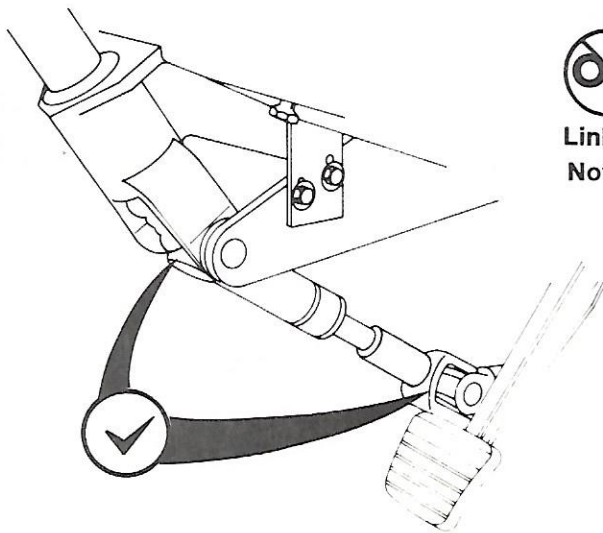


4

4

4

Check Steering Column Linkage



Linkage
Not OK



Repair Or
Replace As
Necessary



Steering
Not OK



Steering
OK



Linkage
OK

5



5

Symptom: No Steering Action — (Cont.)

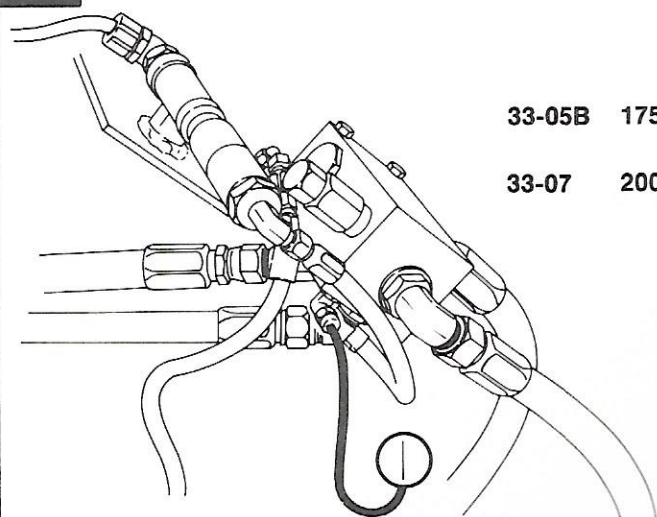
(33-05B/07)

Procedure

Results

5

Check System Pressure



33-05B 1750 PSI

33-07 2000 PSI



OK

On



6

Low Pressure
Warning Light



7

Off

On



6

Low Pressure
Warning Light



Off

On



6

Low Pressure
Warning Light



7

Off



Not OK

Adjust At Pump
Compensator
Valve



Steering
OK



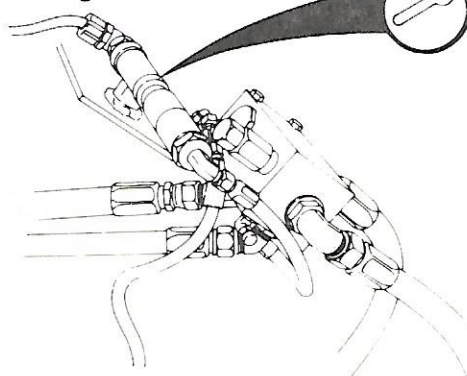
Steering
Not OK

Adjusting Pump
Compensator Valve
Has No Effect



6

Replace Low Pressure Warning Switch



Steering
OK



Steering
Not OK

7

Symptom: No Steering Action — (Cont.)

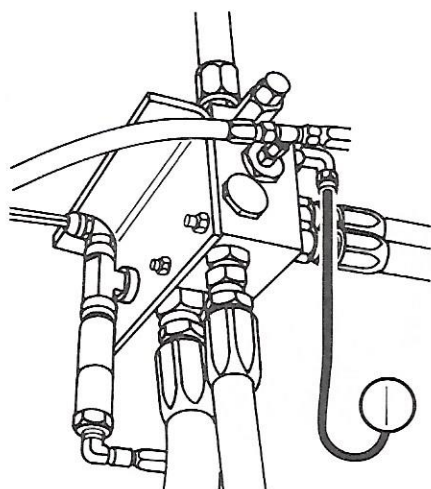
(33-09/11B)

Procedure

Results

5

Check System Pressure



33-09 2000 PSI
33-11B 2000 PSI



OK

On



Low Pressure
Warning Light

6



Off

7

On



6

Low Pressure
Warning Light



Off



On



6

Low Pressure
Warning Light



Off

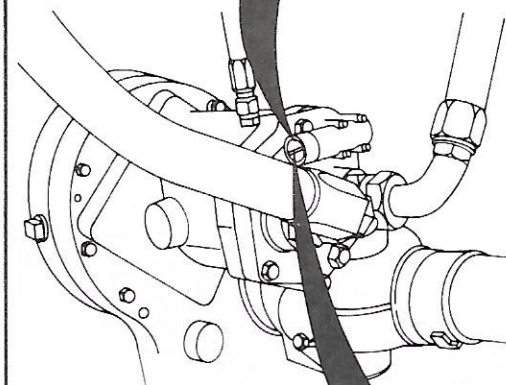
7

7



Not OK

Adjust At Pump
Compensator
Valve



Steering
OK

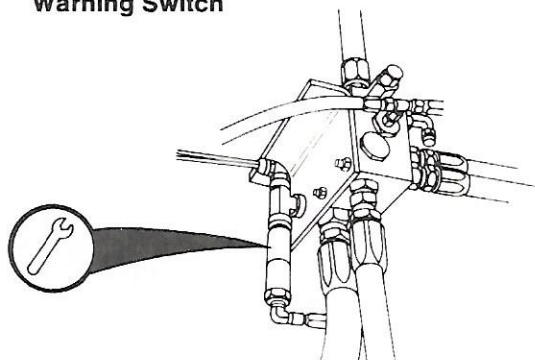


Steering
Not OK

Adjusting Pump
Compensator Valve
Has No Effect

6

Replace Low Pressure Warning Switch



Steering
OK



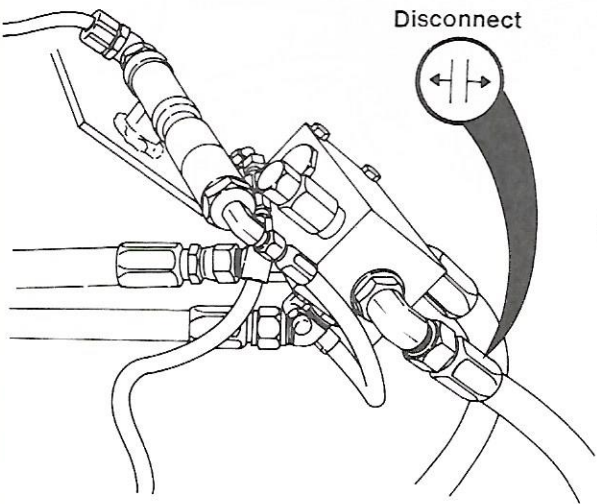





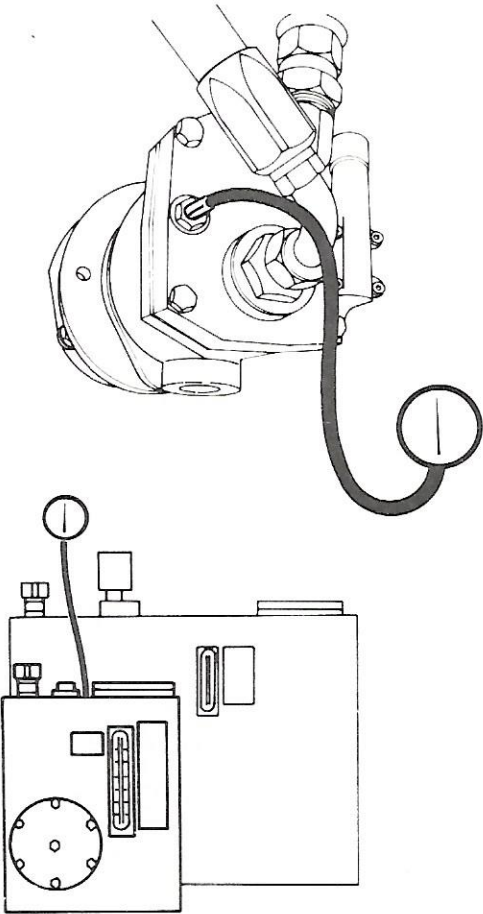





Steering
Not OK

7

Symptom: No Steering Action — (Cont.)

(33-05B/07)
Results

Procedure

<div>7</div> <div>Check Secondary Relief Valve For By-Passing Oil</div> <div></div> <div> OK</div> <div> Not OK</div> <div> Repair Or Replace As Necessary</div> <div> Steering OK</div> <div> Steering Not OK</div>	<div>8</div> <div>STOP</div> <div>8</div>
<div>8</div> <div>Check Pump Operation</div> <div></div> <div> OK</div> <div> Not OK</div> <div> Repair Or Replace As Necessary</div> <div> Steering OK</div> <div> Steering Not OK</div>	<div>9</div> <div>STOP</div> <div>9</div>

Symptom: No Steering Action — (Cont.)

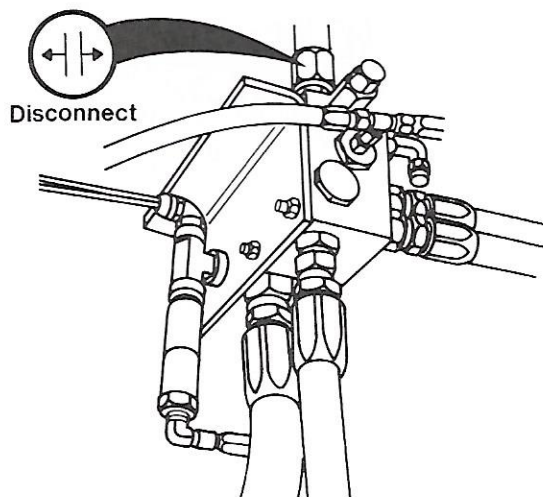
(33-09/11B)

Procedure

Results

7

Check Secondary Relief Valve For By-Passing Oil



OK
OK

Not OK

Repair Or
Replace As
Necessary

Steering
OK

Steering
Not OK

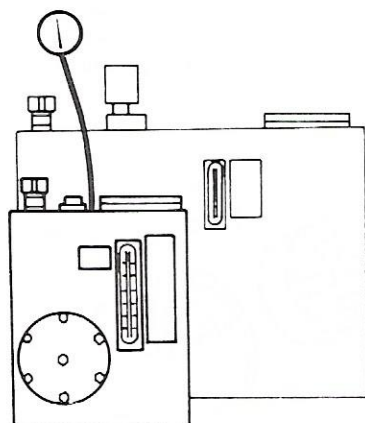
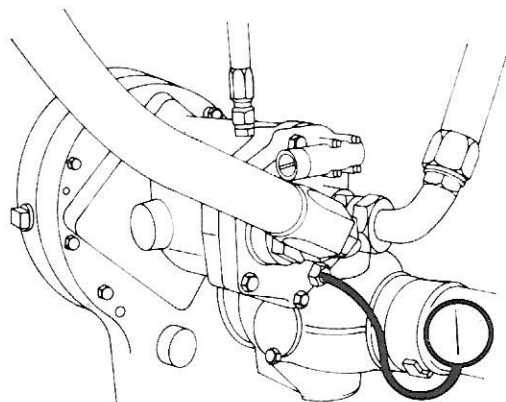
8

STOP

8

8

Check Pump Operation



OK
OK

Not OK

Repair Or
Replace As
Necessary

Steering
OK

Steering
Not OK

9

STOP

9

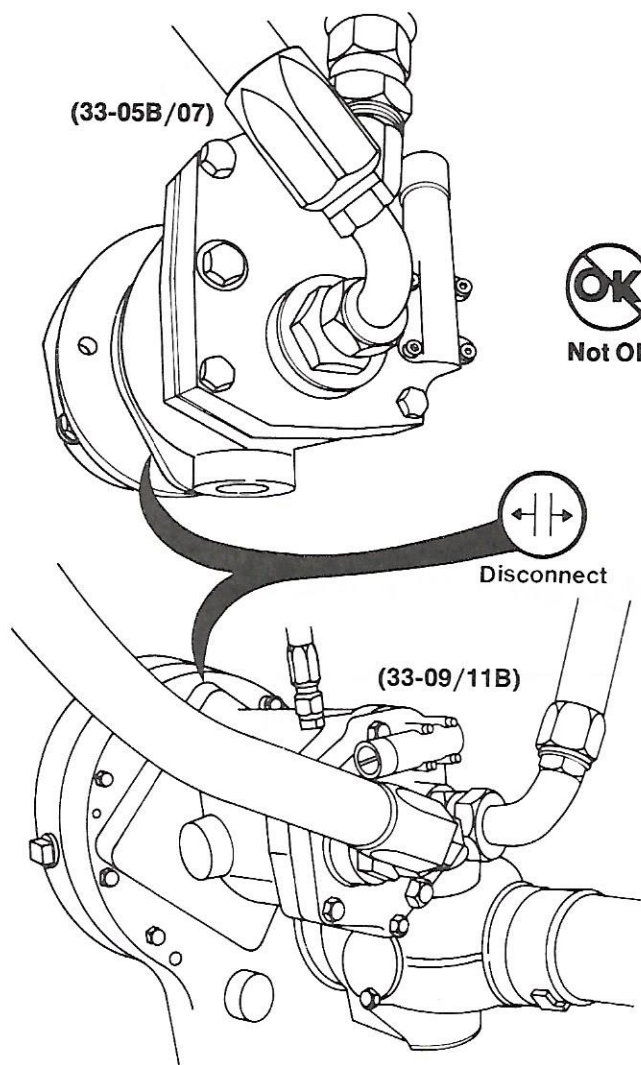
Symptom: No Steering Action — (Cont.)

Procedure

Results

9

Check Pump Drive



Not OK



Repair Or
Replace As
Necessary



Steering
OK



Steering
Not OK

10

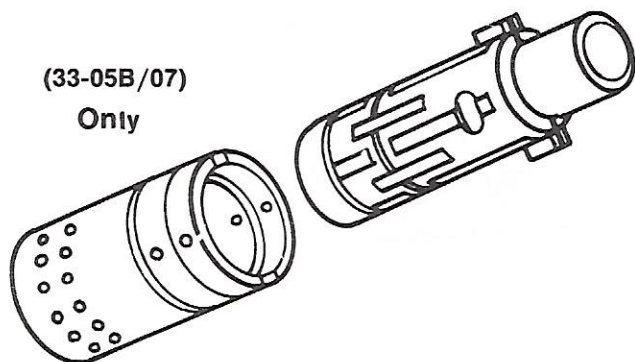


OK

10

10

Check For Dirt In Sleeve And Spool Steering Valve





Clean Or
Replace As
Necessary



Symptom: Steering Wheel Does Not Center

Procedure




Results

<div>1</div> <div>Check For:</div> <div>Broken Springs In Steering Valve (33-05B/07)</div> <div>Broken Torsion Bar In Steering Valve (33-09/11B)</div> <div>Replace As Necessary</div> <div></div>	<div></div>
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Symptom: Low Pressure Warning Light Never Goes On

Procedure

Results

<div>1</div> <div>Check For Electrical Shorts In The Low Pressure Warning Switch Circuit</div> <div></div> <div>Replace As Necessary</div> <div></div>	<div></div>
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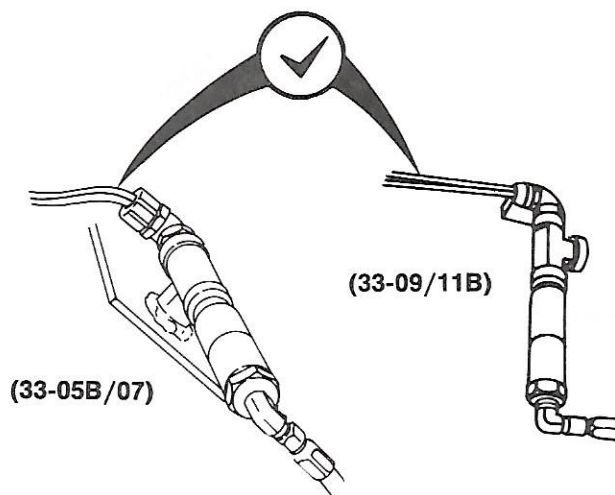
Symptom: Steering O.K., Low Pressure Warning Light Never Goes Out

Procedure

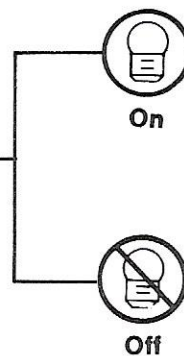
Results

1

Check For Electrical Shorts
In The Low Pressure Warning
Switch Circuit



Repair Or
Replace As
Necessary

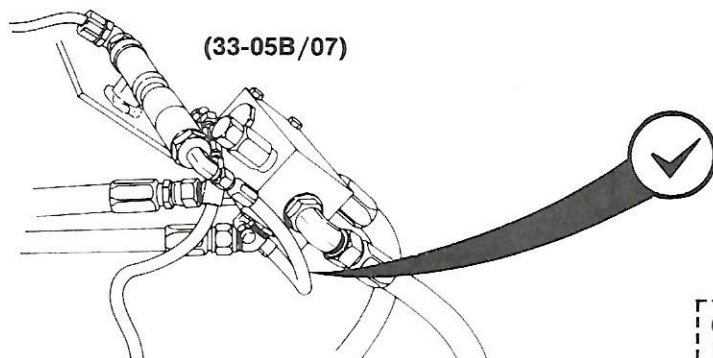


2

STOP

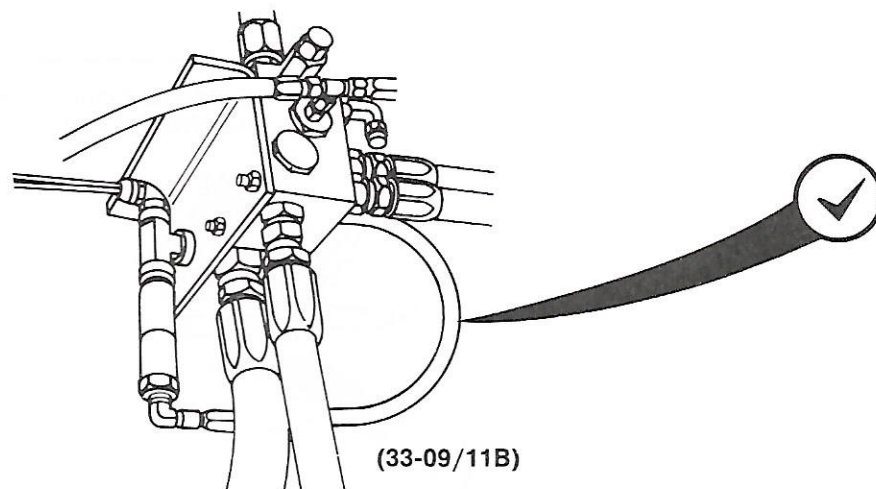
2

Check For Plugged Hydraulic
Line Between Manifold Relief
Valve And Pressure Switch



Clean As
Necessary

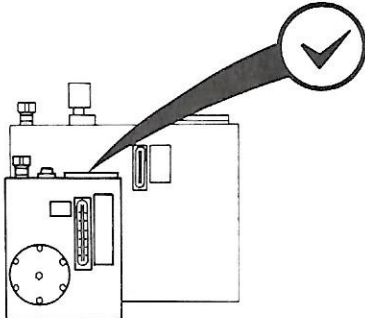




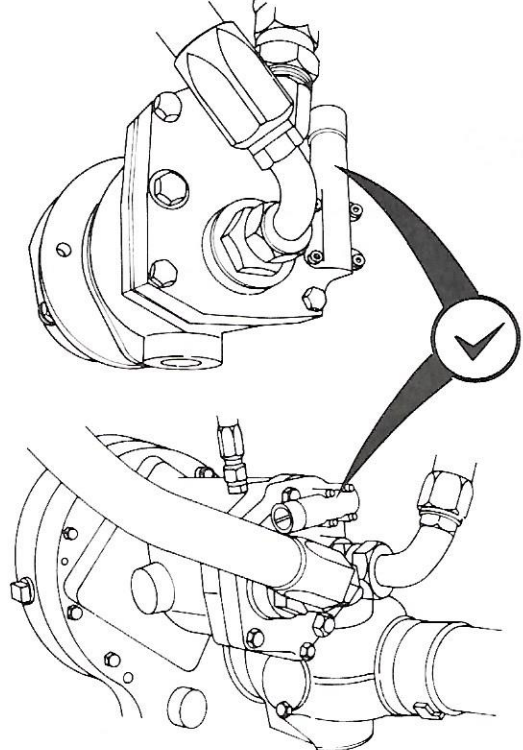




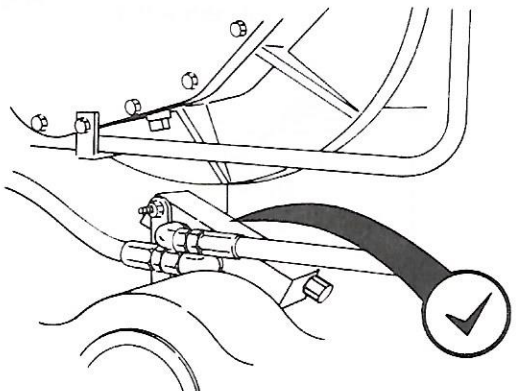

STOP



Symptom: Erratic Steering

Procedure

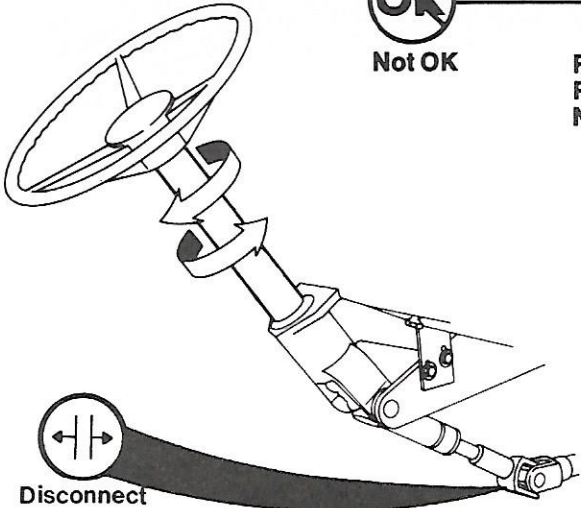
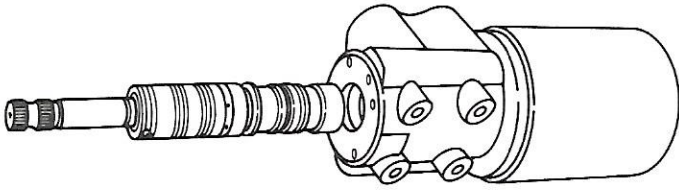
Results

1	<div>Check For Foaming Hydraulic Oil</div> <div></div> <div> Oil OK</div> <div> Foaming Oil</div> <div>Flush System As Necessary</div> <div> Steering OK</div> <div> Steering Not OK</div>	<div>2</div> <div>STOP</div> <div>2</div>
2	<div>Inspect Compensator Valve On Steering Pump</div> <div></div> <div> Compensator Valve OK</div> <div> Compensator Valve Not OK</div> <div>Repair Or Replace As Necessary</div> <div> Steering OK</div> <div> Steering Not OK</div>	<div>3</div> <div>STOP</div> <div>3</div>
3	<div>Check Double Relief Valve Operation</div> <div></div> <div> Repair Or Replace As Necessary</div>	<div>STOP</div>

Symptom: Hard Steering

Procedure

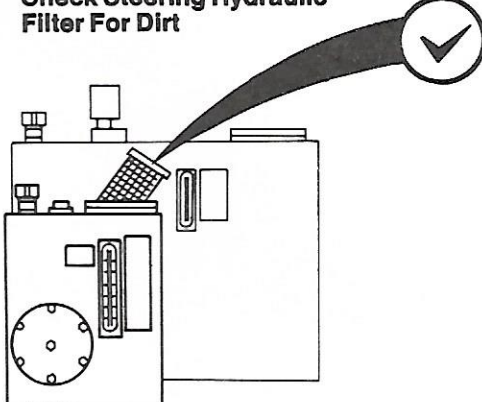
Results

<div><div>1</div><div>Check Steering Column For Binding</div><div><div><div>Not OK</div><div>Repair Or Replace As Necessary</div><div>Steering Not OK</div><div>Steering OK</div><div>OK</div></div></div></div>	<div><div>2</div><div>STOP</div><div>2</div></div>
<div><div>2</div><div>Check Steering Valve Input Shaft For Binding</div><div><div>Clean Or Replace As Necessary</div></div></div>	<div><div>STOP</div></div>

Symptom: No Steering When Steering Wheel Is Turned Slowly

Procedure

Results

<div><div>1</div><div>Check Steering Hydraulic Filter For Dirt</div><div><div><div>Replace And Clean System As Necessary</div></div></div></div>	<div><div>STOP</div></div>
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