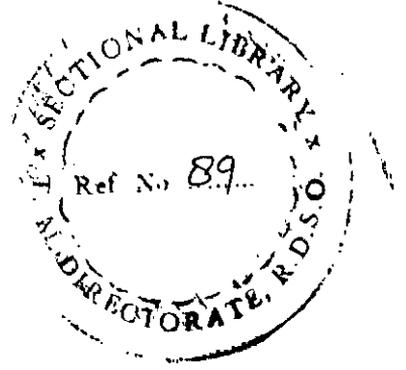


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GOVERNMENT OF INDIA
MINISTRY OF RAILWAYS



**TROUBLE SHOOTING MANUAL
OF
DUOMATIC TIE TAMPING MACHINE
(08-32)**

REPORT NO. TM - 89

JULY -- 2005

07508

**RESEARCH DESIGNS AND STANDARDS ORGANISATION
LUCKNOW-226011**

P_R_E_F_A_C_E

About 418 On-Track Machines are presently working on Indian Railways covering different works related to track maintenance and renewals. To improve utilization of these machines, it is important to reduce their downtime and repair them in the shortest possible time. In this context, need was felt to develop Trouble Shooting Manuals for different On-track Machines. The Trouble Shooting Manuals for Continuous Tamping Machine (CSM09-32), Ballast Cleaning Machine (BCM), Ballast Regulating Machine (Model 66-4) & TTM (Uno) (Final) and Provisional Trouble Shooting Manuals for Point and Crossing Tamping Machine (UNIMAT), Dynamic Track Stabilizer (DGS), Point and Crossing Changing Machine (T-28), Shoulder Ballast Cleaning Machine (FRM-80), PQRS, Plasser make WST (08-32), and draft of Track Relaying Train (P811S) have already been prepared and issued. This Trouble shooting manual of TTM (Duo) is also an effort in the same direction.

It is hoped that this manual will be quite useful for field staff attending breakdown of machines. However, there is always scope for improvement for which suggestions may be sent to the undersigned.

JULY—2005

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EXPLANATORY NOTES

While preparing the text of trouble shooting manual of DUOMATIC tie tamping machine (08-32), the terms used and their meanings are explained below:

- CHECK - Ensure a specific condition does (or does not) exist.
- INSPECT - Look for damage and defects including breakage, distortion cracks, corrosion and wear, check for leaks, security and that all items are completed.
- REPLACE - Remove old parts and substitutes with a new or overhauled or reconditioned part. Fit reconditioned/overhauled/new part in place of missing part.
- OVERHAUL - Dismantle, examine, recondition or renew parts as necessary against given specifications, reassemble, inspect and test.

S. No.	Faults	Probable Causes	Remedial Actions
1.	Engine does not start.	1. Emergency stop switch is operated. 2. No fuel in the tank. 3. Shutdown mechanism stuck. 4. Air in fuel system. 5. Governor is stuck. 6. Misconnection of starting switch. 7. Valve clearance is not proper. 8. Weak batteries. 9. Injectors not properly functioning.	1. Emergency stop switch should be in release position. 2. Fill fuel in the tank. Bleed air from fuel system as explained below: i) Loosen the bleed plug on the fuel filter and operate the priming pump until the fuel is free from air bubbles. Tighten the bleed plug. ii) Then loosen Banjo Plug on injection pump and operate priming pump until fuel is free from air bubbles. Tighten the Banjo Plug. 3. Check shut down mechanism i) Release engine shutdown lever from stop position. ii) Check electrical shutdown circuit for proper functioning. 4. Bleed air from fuel system as explained in s. no. 1, item 2 above. 5. Replace complete fuel injector pump. 6. Check starting switch and if any misconnection is noticed, rectify it. 7. Adjust the valve clearances as given in engine manual. 8. Check voltage by multimeter. Check electrolyte level and strength by hydrometer in the batteries. Terminals should be cleaned and the charging system should be in working condition. Over-aged batteries should be replaced. 9. Remove defective injectors and get it overhauled/calibrated or replace it with new one.

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S. No.	Faults	Probable Causes	Remedial Actions
		10. Valves not seating properly.	10.i) Check the valve springs and replace the broken spring if any. ii) Lap the valves. iii) Lap the valve seat, if required.
		11. Too much fuel in engine.	11.i) Clean fuel return pipe. ii) If return pipe is already clean, calibration of fuel pump may be defective and should be got calibrated.
2.	Excessive black smoke at idle speed.	1. Restricted fuel lines 2. Plugging of injector spray holes 3. Cracked injector body 4. Long idle period 5. Gasket blow-by or leakage 6. Broken or wrong piston rings 7. Injectors needs calibration	1. Check the fuel lines and clean as per requirement. 2. Injectors needs cleaning 3. Replace the broken one. 4. Do not run the engine at idle speed for long period 5. Replace the defective gasket 6. Replace the piston rings of standard part no. from engine manufacturer 7. Get the injectors calibrated.
3.	Excessive white smoke at idle speed.	1. Poor quality of fuel. 2. Cracked injector body 3. Long idle periods 4. Incorrect valve and injection timing	1. Use proper grade of fuel. It will be better if fuel is tested chemically. 2. Replace the broken one. 3. Do not run the engine at idle speed for long periods. 4. Calibrate the valve and injection timing
4.	Excessive smoke under load	1. Restricted air in take 2. Dirty turbo charger compressor 3. Poor quality of fuel 4. Restricted fuel lines 5. Fuel pump calibration incorrect 6. Injector needs calibration	1. Clean the air filter or replace it if required 2. Get it clean 3. Same as 3(1). 4. Check the fuel lines and clean it as per requirement 5. Get the fuel pump calibrated. 6. Get the injector calibrated.

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S. No.	Faults	Probable Causes	Remedial Actions
		7. Engine due for overhaul	7. Get the engine overhauled.
5.	Engine speed irregular	<ol style="list-style-type: none"> 1. Air in fuel system 2. Governor stuck up 3. Incorrect fuel pump calibration 4. External/internal fuel leakage. 	<ol style="list-style-type: none"> 1. Bleed air from fuel system 2. Governor needs repair. 3. Get the fuel pump calibrated 4. Check leakage and prevent it.
6.	Engine running too hot.	<ol style="list-style-type: none"> 1. Oil cooler/cooling fins choked. 2. Air Blower coupling broken. 3. Valve clearance is not proper. 4. Temperature of atmospheric air surrounding engine is too high. 5. Oil level too low. 6. Air cleaner contaminated. 7. Turbocharger defective. 8. Engine overloaded. 	<ol style="list-style-type: none"> 1. Clean oil cooler/cooling fins with recommended chemicals. 2. Replace broken coupling/ bushes. 3. Adjust valve clearance as given in engine manual. 4. Check. 5. Keep the oil level within limits. 6. Clean/replace the cleaner as per schedule. 7. Replace. 8. Do not run the engine beyond prescribed load.
7.	Engine knocking	<ol style="list-style-type: none"> 1. Incorrect injector setting or defective injector. 2. Mechanical damage to piston/piston rings /liners. 3. Connecting rod bearing damaged 4. Injector pipe leaking 5. Fuel pre-filter/fine filter contaminated. 6. Incorrect tappet clearance. 7. Faulty damper/ flywheel balance. 8. Fuel pump calibration incorrect. 	<ol style="list-style-type: none"> 1. Remove the faulty injector and get it reset or alternatively replace it with new one. 2. Replace the damage ones. 3. Replace connecting rod bearing. 4. Replace the damage one. 5. Check/clean/replace. 6. Adjust tappet clearance as indicated in sl.1.7. 7. If the movement of damper/fly wheel is eccentric replace the same. 8. Get the fuel pump calibrated.

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S. No.	Faults	Probable Causes	Remedial Actions
8.	Output of the engine too low.	1. Dirty fuel filter and fuel line. 2. Air in fuel system. 3. Faulty Injector. 4. Air filter choked. 5. Improper compression. 6. Governor is stuck.	1. Replace fuel filter and clean fuel line. 2. Bleed air from system as explained in sl. no. 1(2). 3. Remove faulty injector and get it overhauled or replace it with new one. 4. Clean/replace air filter element. 5. Engine needs repairs. 6. Governor needs repairs.
9.	Oil pressure low.	1. Dirty lube oil filter. 2. Improper oil grade. 3. Oil control valve not working. 4. Oil level too low 5. Excessive inclination of engine. 6. Dirty oil cooler 7. Excessive wear in connecting rod/ main bearing. 8. Mixing of diesel in Engine oil.	1. Replace the lube oil filter element. 2. Use proper grade of engine oil. 3. Repair/replace the control valve. 4. Fill the oil upto required level. 5. Check and rectify 6. Clean the oil cooler. 7. Engine needs to be overhauled. 8. Check/replace oil if required
10.	Oil film present in crank case ventilation.	1. Incorrect compression. 2. Wrong grade of lube oil.	1. Engine needs repairs. 2. Use lube oil of proper grade as recommended by the OEM.

S. No.	Faults	Probable Causes	Remedial Actions
11.	Fuel consumption too high.	1. Lube oil level too high. 2. Incorrect setting of Injector. 3. Incorrect valve and injection timing. 4. Clogged air-filter. 5. Poor compression.	1. Keep the lube oil within limits. 2. Replace or overhaul faulty injector. 3. Get the timing reset. 4. Clean air filter/replace if required. 5. Engine needs repairs.
12.	Lube oil consumption too high.	1. Incorrect lube oil grade. 2. Excessive inclination of engine. 3. Oil level too high. 4. External and internal Oil leaks. 5. Poor compression. 6. Broken or wrong piston rings & worn out piston/liners	1. Use proper grade and quality lube oil as recommended by OEM. 2. Check and rectify. 3. Keep the lube oil level within limits. 4. Prevent the leakages. 5. Replace compression rings or valve. Valve seat have to be lap. 6. Replace the broken/worn out parts
13.	Mixing of diesel in oil.	1. External or internal fuel leaks. 2. Damaged injector O-rings. 3. Long idle periods	1. Prevent the leakage. 2. Replace the defective one. 3. Do not run the engine at idle speed for long periods.

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II. MACHINE GENERAL

A. TAMPING UNIT

S. No.	Faults	Probable Causes	Remedial Actions
1.	LHS Tamping Unit is not going downward	<ol style="list-style-type: none"> 1. Tamping unit lock not open 2. Proportional valve is inoperative. 3. Electrical circuit may be malfunctioning 	<ol style="list-style-type: none"> 1. Ensure the lock is properly open. 2. See whether all the switches connected with tamping unit lowering are in 'ON' position or not, put them in 'ON' position. 3. Check the deflection in Ammeter 2g2 by pressing the tamping pedal. If deflection not appears then follow the steps as given below: <ol style="list-style-type: none"> a) Check 24V supply at coupler of coil 1s19, if it is coming there then electrical circuit is 'OK' and problem is in proportional valve for left hand side tamping unit up/down. Operate the proportional valve manually. If tamping unit operates, then solenoid coil is defective. Replace it with new one. If does not operates, proportional valve is defective. b) Clean the spool of proportional valve with petrol. If still not working then replace it with new one. c) If 24V supply is not coming at coupler of solenoid coil 1s19, the electrical supply is defective. Check it as follows: <ol style="list-style-type: none"> i) Check the supply at terminal 56 of panel box no. B2, if it is coming there then wire between terminal 56 and solenoid coil 1s19 may be broken. Check and rectify the problem.

S. No.	Faults	Probable Causes	Remedial Actions
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- ii) If 24V supply is not coming at terminal 56 then check the output at 28d of EK-16V00 (2u2). If it is not coming there, check the fuse on PCB 2u2 and do the needful. If fuse is found 'OK' then relay Re2 may be defective. Check and replace it.
 - iii) If 28d of 2u2 is not showing 24V and fuse & relay Re2 are 'OK', and terminal 4db is also showing 24V then any component of EK 16V00 (2u2) may be defective. Repair the defective PCB.
 - iv) If terminal 4db of 2u2 is not showing 24V then check the circuit breaker 2e4 of 5A. It may be tripped or defective. Check and do needful.
 - c) Fork of tamping unit depth transducer may be loose and not in proper position, due to which output voltage will not be proper. Potentiometer may also be defective, check and do needful.
4. Safety limit switch 1b78 is defective
4. Check 24V at terminal 61 in P.u no. B2, if it is coming there then safety limit switch for L.H.T/U Lock/Un lock (1b78) may be defective and giving the wrong signal. Check and replace it.
5. No system pressure
5. If no system pressure, check delivery from 38 X 22 hydraulic pump. If delivery is OK, check non return valve, unloader valve and safety valve. Replace the defective one.

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S. No.	Faults	Probable Causes	Remedial Actions
2.	RHS Tamping Unit is not going downward.	<ol style="list-style-type: none"> 1. Tamping unit lock not open 2. Proportional valve is inoperative. 3. Electrical circuit may be malfunctioning. 	<ol style="list-style-type: none"> 1. Ensure the lock is properly open. 2. See whether all the switches connected with tamping unit lowering are in 'ON' position or not. Put them in 'ON' position. 3. Check the deflection in Ameter 2g3 by pressing the tamping pedal. If deflection not appears then follow the steps as given below: <ol style="list-style-type: none"> a) Check 24V supply at coupler of coil 1s18, if it is coming there then electrical circuit is 'OK' and the problem is in proportional valve for right hand side tamping unit up/down. Operate the proportional valve manually. If tamping unit operates, then solenoid coil is defective. Replace it with new one. If does not operates, proportional valve is defective. Clean the spool of proportional valve with petrol. If still not working then replace it with new one. b) If 24V supply is not coming at coupler of solenoid coil 1s18 then electrical supply is defective. Check it as follows: <ol style="list-style-type: none"> i) Check the supply at terminal 58 of panel box no. B2. If it is coming there then wire between terminal 58 and solenoid coil 1s18 may be broken. Check and rectify it. ii) If 24V is not coming at terminal 58 then check the out put at 28d of EK-16V00 (2u3). If it is not coming there then check the fuse on PCB 2u3 and do the needful. If fuse is found 'OK' then relay RE2 may be defective. Check and replace it.

S. No.	Faults	Probable Causes	Remedial Actions
			iii) If 28d of 2u3 is not showing 24V and fuse & relay RE2 are 'OK', and terminal 4db is also showing 24V, then any component of EK 16V00 (2u3) may be defective. Repair the defective PCB. iv) If terminal 4db of 2u3 is not showing 24V then check the circuit breaker 2e4 of 5A. It may be tripped or defective. Check and do needful. c) Fork of tamping unit depth transducer may be loose and not in proper position, due to which output voltage will not be proper. Potentiometer may also be defective, check and do needful.
	4. Safety limit switch 1b79 is defective	4. Check 24V at terminal 62 in P.L. no. B2. If it is coming there then safety limit switch for T/U Lock/Un lock (1b79) may be defective and giving the wrong signal. Check and replace it.	
	5. No system pressure	5. If no system pressure, check delivery from 38 X 22 hydraulic pump. If delivery is OK, check non-return valve, unloader valve and safety valve. Replace the defective one.	
3.	LHS Tamping Unit is not coming upward.	1. Proportional valve is inoperative. 2. Electrical circuit may be malfunctioning	1. See whether all the switches connected with tamping unit lifting are in 'ON' position or not. Put them in 'ON' position. 2i) Check the fork of L.H.S Tamping depth transducer. It may be slipped or broken. Check it and do the needful.

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S. No.	Faults	Probable Causes	Remedial Actions
			<ul style="list-style-type: none"> ii) +10V is not coming at terminal 1 of Potentiometer of L.H.S. T/U depth transducer. Then check it at 8db of EK-813 (2u4). If it is showing +10V then wire between potentiometer and 8db(2u4) may be broken. Check and do needful. iii) If 8db is not showing +10V then adjust it by Potentiometer P1 on 2u4. If still not rectified then replace the power pack of 2u4. iv) Check 24V supply at coupler of coil 1s17, if it is coming there then electrical circuit is 'OK' and the problem is in proportional valve for left hand side tamping unit up/down. Operate the proportional valve manually. If tamping unit operates, then solenoid coil is defective. Replace it with new one. If does not operate, proportional valve is defective. Clean the spool of proportional valve with petrol. If still not working then replace it with new one. (v) If 24V supply is not coming at coupler of solenoid coil 1s17, then electrical supply is defective. Check it as follows: <ul style="list-style-type: none"> a) Check the supply at terminal 66 of panel box no. B2, if it is coming there then wire between terminal 66 and solenoid coil 1s17 may be broken. Check and rectify it. b) If 24V is not coming at terminal 66 then check the out put at 28b of EK-16V00 (2u2). If it is not coming there then check the fuse on PCB 2u2 and do the needful. If fuse is found 'OK' then relay Re1, Re2 & Re5 may be defective check and do needful.

S. No.	Faults	Probable Causes	Remedial Actions
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			<p>c) If 28b is not showing 24V and fuse & relay Re1, Re2 & Re5 are 'OK', and terminal 4db is also showing 24V then any component of 2u2 16V00 (2u2) may be defective. Repair the defective PCB.</p> <p>d) If terminal 4db of 2u2 is not showing 24V then check the circuit breaker 2e4. It may be tripped or defective. Check and do needful.</p> <p>vi) Fork of tamping unit depth transducer may be loose and not in proper position, due to which output voltage will not be proper. Potentiometer may also be defective, check and do needful.</p>
	<p>4. No system pressure</p>	<p>4. If no system pressure, check delivery from 38 X 22 hydraulic pump. If delivery is OK, check non-return valve, unloader valve and safety valve. Replace the defective one.</p>	
<p>4. RHS tamping Unit is not coming upward.</p>		<p>1. Proportional valve is inoperative.</p> <p>2. Electrical circuit may be malfunctioning</p>	<p>1. See whether all the switches connected with tamping unit lifting are in 'ON' position or not, put them in 'ON' position.</p> <p>2.i) Check the fork of RHS tamping depth transducer. It may be slipped or broken. Check it and do the needful.</p> <p>ii) +10V is not coming at terminal 3 of potentiometer of R.H.S. T/U depth transducer. Then check it at 8db of EK-813 (2u4). If it is showing +10V then wire between potentiometer and 8db (2u4) may be broken. Check and do needful.</p> <p>iii) If 8db is not showing +10V, then adjust it by potentiometer P1 on 2u4. If still not rectified, then replace the power pack of 2u4.</p>

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S. No.	Faults	Probable Causes	Remedial Actions
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- (iv) Check the 24V supply at coupler of coil 1s20, if it is coming there then electrical circuit is 'OK' and the problem is in proportional valve for right hand side tamping unit up/down. Operate the proportional valve manually. If tamping unit operates, then solenoid coil is defective. Replace it with new one. If does not operates, proportional valve is defective. Clean the spool of proportional valve with petrol. If still not working then replace it with new one.
- v) If 24V supply is not coming at coupler of solenoid coil 1s20, then electrical supply is defective. Check it as follows:
 - a) Check the supply at terminal 67 of panel box no. B2, if it is coming there then wire between terminal 67 and solenoid coil 1s20 may be broken. Check and rectify it.
 - b) If 24V is not coming at terminal 67 then check the out put at 28b of EK-16V00 (2u3). If it is not coming then check the fuse on PCB 2u3 and do the needful. If fuse is found 'OK' then relay Re1, Re2 & Re5 may be defective check and do needful.
 - c) If 28b is not showing 24V and fuse & relay Re1, Re2 & Re5 are 'OK', and terminal 4db is also showing 24V then any component of EK 16V00 (2u3) may be defective. Repair the defective PCB.
 - d) If terminal 4db of 2u3 is not showing 24V then check the circuit breaker 2e4. It may be tripped or defective. Check and do needful.

S. No.	Faults	Probable Causes	Remedial Actions
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			vi) Fork of tamping unit depth transducer may be loose and not in proper position, due to which output voltage will not be prop. Potentiometer may also be defective, check and do needful.
	5. No system pressure	5. No system pressure	5. If no system pressure, check delivery from 38 X 22 hydraulic pump. If delivery is OK, check non-return valve, unloader valve and safety valve replace the defective one.
5.	Semi auto working is not functioning	1. Semi auto switch 2b17 is not 'ON' 2. Auto squeezing switch 2b13 is not 'ON'. 3. Lowering and driving switch 1b42 is not 'ON'. 4. +24 V is not coming at 10db of 2u1 (EL-T1116-02) 5. Relay Re1, Re2, Re3 or/and Re4 on PCB 2u1 may be defective. 6. Any component on PCB 2u1 may be defective.	1. Put it to 'ON' position. 2. Put it to 'ON' position. 3. Put it to 'ON' position. 4. Circuit breaker 2e4 may be tripped/defective or wire between 2e4 and 10db of 2u1 may be damaged. Check and do needful. 5. Check and do needful. 6. If +24 V is coming at 10db and Relays Re1, Re2, Re3 or/and Re4 are also 'OK'. Then repair the PCB for any other defect

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S. No	Faults	Probable Causes	Remedial Actions
6.	LHS inner squeezing cylinders are inoperative.	1. Switch 1b39 (Squeezing pedal) is not operated. 2. +24V is not coming at terminal 2c 3. No supply at coupler of solenoid 1s5.	1. Pedal has to be operated. 2. Circuit breaker 2e3 may be tripped/defective or wire between 2e3 and 2c may be damaged. Check and do needful. 3i) Check supply at coupler of 1s5, if it is showing 24V then electrical circuit is 'OK'. Operate the 4-way solenoid valve HY-10RSD-1 for LH inner cylinders manually. If it operates, then coil is defective. Replace the solenoid coil. If it does not operate then valve is defective. Clean it with petrol. If still not working, then replace it with new one. ii) If coupler of solenoid coil is not showing 24V supply, then check it at terminal 19 in panel box no. B2, if it is coming there then violet wire between terminal 19 and coil 1s5 is damaged/broken. Check and do the needful. iii) If terminal 19 in panel box no. B2 is not showing 24V supply, then check it at terminal n28 of diode plate LK2 in panel box no. B2. If found there then violet wire between terminal 19 and terminal n28 of LK2 may be damaged. Check and do the needful. iv) If terminal n28 is not showing 24V supply, then check it at contact no.3 of relay B in PCB 2u8. If it is coming there, then check the orange wire between contact 3 of relay B (2u8) and terminal n28 of LK2, it may be damaged/broken. Check and do the needful.

S. No.	Faults	Probable Causes	Remedial Actions
			<ul style="list-style-type: none"> v) If contact 3 of relay B (2u8) is not showing 24V then check it at contact 5. If it is not coming there then relay B is defective. Replace it. vi) If contact 5 of relay B (2u8) is showing 24V then check it at contact 3 of relay 2d15. If it is not showing 24V then brown wire between contact 5 of relay B and contact 3 of 2d15 may be damaged/broken. Check and do the needful. vii) If contact 3 of relay 2d15 is not showing 24V then check it at terminal 52. If it is not coming there then relay 2d15 may be defective. Replace it with new one.
		2. Any hydraulic problem may be there.	<ul style="list-style-type: none"> i) If electrical circuit found 'OK' then check system pressure at pressure gauge by shifting the selector to position 1. Unloader valve may be set far below the standard rating. It should be set at 130-140 bar. ii) safety valve should be set at 170 bar. iii) Overflow valve should be set at 35 bar.
7.	LHS outer squeezing cylinders are inoperative.	1. No supply at coupler of solenoid 1s201.	<ul style="list-style-type: none"> i) Check supply at coupler 1s201, if it is showing 24V then electrical circuit is 'OK'. Operate the 4-way solenoid valve HY-10RSD-1 for L.H. outer cylinders manually. If it operates, then coil may be defective. Replace the solenoid coil. If it does not operate, then valve is defective. Clean it with petrol. If still not working then replace it with new one.

S. No.	Faults	Probable Causes	Remedial Actions
			<ul style="list-style-type: none"> ii) If coupler of solenoid coil is not showing 24V supply, then check it at terminal 122 in panel box no.B2, if it is coming there then transparent wire between terminal 122 and coil 1s201 is damaged/ broken. Check and do the needful. iii) If terminal 122 in panel box no.B2 is not showing 24V supply, then check it at terminal n37 of diode plate LK4 in panel box no.B2. If found there then transparent wire between terminal 122 and terminal n37 of LK4 may be damaged. Check and do the needful. iv) If terminal n37 is not showing 24V supply, then check it at contact no.3 of relay B on PCB 2u8. If it is coming there, then check the transparent wire between contact 3 of relay B (2u8) and terminal n37 of LK4, it may be damaged/ broken. Check and do the needful. v) If contact 3 of relay B (2u8) is not showing 24V then check it at contact 5. If it is not coming there then relay B is defective. Replace it. vi) If contact 5 of relay B (2u8) is showing 24V then check it at contact 3 of relay 2d15. If it is not showing 24V then brown wire between contacts 5 of relay B and contact 3 of 2d15 may be damaged/broken. Check and do the needful.

S. No	Faults	Probable Causes	Remedial Actions
		<p>2. Any hydraulic problem may be there.</p>	<p>vii) If contact 3 of relay 2d15 is not showing 24V then check it at terminal 52. If it is not coming there then relay 2d15 may be defective. Replace it with new one.</p> <p>i) If electrical circuit found 'OK' then check system pressure at pressure gauge by shifting the selector to position 1. Unload valve may be set far below the standard rating. It should be set at 130-140 bar.</p> <p>ii) Safety valve should be set at 170 bar.</p> <p>iii) Overflow valve should be set at 35 bar.</p> <p>iv) Pressure reducing valve should be set at 110-125 bar.</p>
8.	RHS inner squeezing cylinders are inoperative.	1. No supply at coupler of solenoid coil 1s7.	<p>i) Check supply at coupler 1s7. If it is showing 24V then electrical circuit is 'OK'. Operate the 4-way solenoid valve HY-10R3D-1 for R.H inner cylinders manually. If it operates, then coil is defective. Replace the solenoid coil. If it does not operate then valve is defective. Clean it with petrol. If still not working, then replace it with new one.</p> <p>ii) If coupler of solenoid coil is not showing 24V supply, then check it at terminal 43 in panel box no.B2. If it is coming there then green wire between terminal 43 and coil 1s7 is damaged/ broken. Check and do the needful.</p>

S. No.	Faults	Probable Causes	Remedial Actions
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- iii) If terminal 43 in panel box no.B2 is not showing 24V supply, then check it at terminal n29 of diode plate LK2 in panel box no.B2. If found there then green wire between terminal 43 and terminal n29 of LK2 may be damaged. Check and do the needful.
- iv) If terminal n29 is not showing 24V supply, then check it at contact no.3 of relay A in PCB 2u8. If it is coming there, then check the green wire between contact 3 of relay A (2u8) and terminal n29 of LK2, it may be damaged/ broken. Check and do the needful.
- v) If contact 3 of relay A (2u8) is not showing 24V then check it at contact 5. If it is not coming there then relay A is defective. Replace it.
- vi) If contact 5 of relay A (2u8) is showing 24V then check it at contact 3 of relay 2d15. If it is not showing 24V then green wire between contact 5 of relay A and contact 3 of 2d15 may be damaged/broken. Check and do the needful.
- vii) If contact 3 of relay 2d15 is not showing 24V then check it at terminal 52. If it is not coming there then relay 2d15 may be defective. Replace it with new one.

S. No.	Faults	Probable Causes	Remedial Actions
		2. Any hydraulic problem may be there.	2i) If electrical circuit found 'OK' then check system pressure at pressure gauge by shifting the selector to position 1. Unloader valve may be set far below the standard rating. It should be set at 130-140 bar. ii) Safety valve should be set at 170 bar. iii) Overflow valve should be set at 35 bar.
9.	RHS squeezing cylinders are inoperative.	1. No supply at coupler of solenoid 1s202.	i) Check supply at coupler 1s202. If it is showing 24V then electrical circuit is 'OK'. Operate the 4-way solenoid valve HY-10 RSD-1 for RHS outer cylinders manually. If it operates, then coil may be defective. Replace the solenoid coil. If it does not operate then valve is defective. Clean it with petrol. If still not working then replace it with new one. ii) If coupler of solenoid coil is not showing 24V supply, then check it at terminal 123 in panel box no.B2, if it is coming there then black wire between terminal 123 and coil 1s202 is damaged/ broken. Check and do the needful. iii) If terminal 123 in panel box no. B2 is not showing 24V supply, then check it at terminal n39 of diode plate LK4 in panel box no.B2. If found there then orange wire between terminal 123 and terminal n39 of LK4 may be damaged. Check and do the needful.

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S. No.	Faults	Probable Causes	Remedial Actions
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- iv) If terminal n39 is not showing 24V supply, then check it at contact no.3 of relay B in PCB, 2u8. If it is coming there, then check the orange wire between contact 3 of relay B (2u8) and terminal n39 of LK4, it may be damaged/broken. Check and do the needful.
 - v) If contact 3 of relay B (2u8) is not showing 24V then check it at contact 5. If it is not coming there then relay B is defective. Replace it.
 - vi) If contact 5 of relay B (2u8) is showing 24V then check it at contact 3 of relay 2d15. If it is not showing 24V then orange wire between contact 5 of relay B and contact 3 of 2d15 may be damaged/broken. Check and do the needful.
 - vii) If contact 3 of relay 2d15 is not showing 24V then check it at terminal 52. If it is not coming there then relay 2d15 may be defective. Replace it with new one.
2. Any hydraulic problem may be there.
- 2i) If electrical circuit found 'OK' then check system pressure at pressure gauge by shifting the selector to position 1. Unloader valve may be set far below the standard rating. It should be set at 130-140 bar .
 - ii) Safety valve should be set at 170 bar.
 - iii) Overflow valve should be set at 35 bar.
 - iv) Pressure reducing valve should be set at 110-125 bar.

S. No.	Faults	Probable Causes	Remedial Actions
10.	Tamping unit does not go to the required depth.	<ol style="list-style-type: none"> 1. Defective calibration. 2. Hard bed 3. Vibration pressure is not proper. 4. Pump may be failed 	<ol style="list-style-type: none"> 1. Calibrate the tamping depth transducer. 2. Do pre-tamping operation or deep screening. 3. Check vibration pressure on pressure gauge at position 2 and 3 of pressure selector. It should be 150 bar. If not so then adjust the overflow valve for vibration circuit at 150 bar. 4. Check the delivery and do needful.
11.	Play in tamping unit.	<ol style="list-style-type: none"> 1. Play in steel and bronze bush at 55 mm link pin. 2. Improper lubrication 3. Hard bed 	<ol style="list-style-type: none"> 1. Replace th same. 2. Ensure proper lubrication. 3. Do deep screening.
12.	Shearing of piston bolts	<ol style="list-style-type: none"> 1. Zero counter pressure 2. Bolts not properly locked. 	<ol style="list-style-type: none"> 1. Check 14 GPM pump, relief valve and rectify accordingly. 2. Lock the bolts at prescribed torque.
13.	Seizure of bearing.	<ol style="list-style-type: none"> 1. Clearance not proper. 2. Greasing not done regularly. 3. Oil lubrication not proper. 	<ol style="list-style-type: none"> 1. Bearing clearance should be C₄. 2. Grease after every 2-3 hrs. of working. 3. In main bearing housing lubrication should be done properly. Oil reservoirs should be top up regularly.
14.	Failure of drive coupling and damping ring.	<ol style="list-style-type: none"> 1. The center of plate guard and eccentric shaft are not concentric. 2. Excessive relief valve setting. 	<ol style="list-style-type: none"> 1. Adjust the alignment. 2. Correct setting of relief valve.
15.	Leakage of oil in main housing and seals.	<ol style="list-style-type: none"> 1. Breathers defective. 2. Oil seal defective 3. Oil is thin out 	<ol style="list-style-type: none"> 1. Clean breathers. 2. Change the seal. 3. Put oil of correct viscosity.

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S. No.	Faults	Probable Causes	Remedial Actions
16.	Voids under sleeper after packing.	<ol style="list-style-type: none"> 1. Hard bed, clean cushion 150 mm not available. 2. Less vibration 3. Improper depth of tamping tools. 4. Excessive worn out tamping tools. 5. Less squeezing time. 	<ol style="list-style-type: none"> 1. Pre-tamping or deep screening operation should be done before tamping otherwise ballast will not come in semifluid state and the sleeper will not be packed. 2. Check the pump, overflow valve & motor. 3. Adjust the depth as per track structure. 4. Replace wornout tamping tools. 5. Adjust the squeezing time as per ballast condition. Let the tamping unit completes its cycle automatically.
17.	Packing density not uniform.	<ol style="list-style-type: none"> 1. Unequal squeezing force for small & big arms. 2. Unequal size of tamping tools blades. 	<ol style="list-style-type: none"> 1. Set squeezing force for big & small squeezing cylinder. 2. Change the worn out tamping tools.

B. LIFTING UNIT

S. No.	Faults	Probable Causes	Remedial Actions
1	Lifting unit is not lifted up.	1. No system pressure. 2. No supply on solenoid. 3. Flow control valve is restricted. 4. Lifting cylinder piston side port is restricted.	1. System pressure should be 130-140 bar. Check pump, unloader valve, hydraulic line for any defect. 2. Check electrical circuit. 3. Clean the valve. 4. Check and clean the cylinder.
2.	Lifting unit is not lowered down.	1. No supply on solenoid 2. Flow control valve is restricted. 3. Pilot operated check valve is not functioning.	1. Check electrical circuit. 2. Clean the valve. 3. Check and clean the valve and replace it if required.
3.	Lifting unit guide column get bent	1. If brake is not effective during working drive, the jerk, thrust come on tamping unit and lifting unit guide column when machine is stopped at sleepers.	1. Brake should be effective. Brake pressure should not be less than 30 bar. Pressure reducing valve should be checked.
4.	No fast lifting is done.	1. No supply on solenoid of 2 nd D.C. Valve. 2. D.C. Valve restricted.	1. Check supply and source of supply. 2. Open and clean the valve.
5.	Rail is not clamped properly.	1. Rail clamp cylinder is not working properly. 2. Roller discs are badly worn-out. 3. Bearings get jammed in roller clamp sleeve. 4. Rail clamps roller discs are not adjusted properly.	1. Check internal leakage in cylinder, and rectify if required. 2. Replace by new roller discs. 3. Replace the defective bearings. 4. Adjust the rail clamps keeping the front roller 05mm below and rear roller 10mm below the rail head.

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C. MAIN GEAR BOX

S. No.	Faults	Probable Causes	Remedial Actions
1.	Crown wheel teeth get worn out.	The teeth on crown gears U070.03 provided on main shaft and UD 70.04 provided on drive shaft not match properly.	Both crown gears should be manufactured by same firm. Their backlash should lie between 0.1 to 0.2 mm after fitment. Thickness of tooth, tooth space and whole depth etc. should be as per proper specification.
2.	Bearing No. 22310 on drive shaft get seized	Shaft alignment is not proper or non standard bearing.	Use standard bearing and check the alignment of shaft at the time of fitment.
3.	Pump not engages easily.	Engager assembly worn out or misaligned.	Check the alignment of engager assembly and joints, And rectify or replace if required
4.	Drive shaft get broken	Cardon shaft is eccentric.	Cardon shaft and drive shaft should be kept aligned.
5.	Splines of drive shaft get worn out.	Drive shaft is of non standard quality	Use standard quality of drive shaft as recommended by OEM.
6.	Internal splines of flange get shear.	Shock loading	Avoid the shock loading
7.	Train of gears running not proper	Gears on Train of gears are not fit properly.	Check backlash. This should be between 0.07 to 0.25mm.
8.	Intermediate shaft rotates with gear.	Lock on axle cone 2E 71.03 had not been fit properly.	Fit lock properly.

D. CLUTCH ASSEMBLY

S. No.	Faults	Probable Causes	Remedial Actions
1.	Clutch plate burn.	1. Withdrawal bearing CT-1310 get jammed. 2. Fingers not working properly. 3. Springs not working properly.	1. Replace withdrawal bearing. 2. Fingers (6 Nos.) & cones get properly & replace if required. 3. Springs should be checked and replace the defective one, if required.

E. POWERTAKE OFF ASSEMBLY

1.	Output shaft (1240.310.013) get broken. Bearing also damage.	i) Lock of shaft broken. ii) Lock bolt loose.	i) Replace the shaft and bearing if required ii) Tighten the lock bolt and adjust the flange at proper place.
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F. AXLE GEAR BOX:

1.	Bearings (NU 2315 and 31313) of tail pinion get seized.	i) Plunger pump not operate properly. ii) Hydraulic pipe may be chocked.	i) Spring of pump should be checked and change if required. ii) Clean the hydraulic pipe through which gear oil is passing to bearings at tail pinion.
2.	Teeth at crown and tail pinion get damaged.	Not matching properly	The teeth matching should be done properly.

G. REVERSING GEAR BOX:

1.	Gear teeth get sheared.	Lever for changing direction is not properly operated. The teeth on sliding sleeve and gear may shear.	1. Lever for forward and reverse movement should be fully engaged. 2. At running time level should not be disturbed.
2.	Bearing damage at intermediate shaft.	Improper lubrication.	Oil drip pan should be checked and cleaned.

III. HYDRAULIC PUMP

S. No.	Faults	Probable Causes	Remedial Action
1.	Pump not delivering oil.	<ol style="list-style-type: none"> 1. Pump driven in wrong direction (at the time of new pump fitment, this problem may occur). 2. Oil level too low in the reservoir (if oil level is very low, aeration may take place and pump will not deliver oil). 3. Intake filter/pipe choked. 4. Air leaks in pump intake joints. 5. Broken pump shaft or rotor. 6. Pump speed too slow. (The delivery rate of discharge is prescribed at a certain rpm of engine. If engine speed becomes less than ideal speed, it may affect the proper suction of oil). 	<ol style="list-style-type: none"> 1. Check the pump rotation by hand priming. Pour the hydraulic oil into inlet port and rotate the shaft. See whether the oil is delivering through outlet port or not. If not, change the rotation according to the engine shaft rotation. 2. Check oil level in reservoir. It should be above minimum mark. If necessary, recoup the oil. 3. Clean or replace filter for proper flow of oil. 4. Pour hydraulic oil on intake joints and on observing abnormal sound, tighten the intake joint as required. 5. Replace the broken shaft or rotor. Also align the prime mover shaft. 6. Pump should run at prescribed speed. Engine rpm should be checked.

S. No.	Faults	Probable Causes	Remedial Action
		7. Dirty suction filter.	7. Replace the filter.
		8. Faulty suction valve.	8. Repair or change the valve.
		9. Air in system.	9. Discharge air from the system.
		10. Pump drive inoperative.	10.i) Replace the broken pump shaft. ii) Replace the sheared spline. iii) Change defective coupling.
		11. Clutch out of adjustment.	11. Adjust clutch.
		12. Pump is damaged.	12. Replace with new one.
2.	Pump makes noise	Aeration.	1i) Fill the reservoir with oil up to required level to prevent aeration. ii) Check all connections on inlet side of pump and pour hydraulic oil over suspected leak. If noise stops, leakage has been found. Fill hydraulic tank to the full mark. iii) Check condition of pump shaft seal. Change, if required.
		2. Intake line or suction filter partly clogged.	2. Clean or replace the filter or line.
		3. Pump running too fast.	3. Reduce speed up to prescribed limit.
		4. Coupling misaligned (Due to this, bearing may get damaged, there will be play at shaft, abnormal sound will be observed).	4. Realign the pump shaft and prime mover shaft.
		5. Reservoir not vented properly.	5. Air breather should be cleaned.
		6. Suction Filter too small in size.	6. Replace by proper size of filter.
		7. Air leaks at pump intake pipe joints and air drawn through inlet line.	7. Take action as explained in s.no.1, item no. 4.

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S. No.	Faults	Probable Causes	Remedial Action
		8. Oil viscosity too high. (In cold climate, oil viscosity becomes high so no free flow will take place and cavitation will occur).	8. Start the engine for few minutes to warm-up the hydraulic oil used in machine for proper flow. Use only proper grade of oil.
		9. Cavitation.	9. i) Check condition of suction filter and return line filters. Clean or change as necessary. ii) Check clogging of inlet line. Clean or change as necessary. iii) Check loose fittings on suction lines. Tighten, if required. iv) Clean hydraulic tank breather.
		10. Leakage in shaft seal.	10. Replace the seal.
		11. Foams in oil.	11. Vent the system.
		12. Casing leaks.	12. First tighten bolts and then check for cracks and sealing.
		13. Vane spring broken.	13. Change spring.
		14. Any part of pump defective.	14. Replace defective parts.
		15. Pump mounting bolts are loose.	15. Check mounting alignment. Tighten bolts uniformly.
		16. Foreign bodies in suction line.	16. Remove foreign bodies. If needed, flush the system.
		17. System dirty.	17. Flush the system
		18. Sharp bends in suction line.	18. Eliminate or reduce the bends in suction line.
		19. Oil temperature too high.	19. Check the hydraulic circuit. Oil cooler may be ineffective. Rectify the failure
		20. Boost pump failed.	20. Check boost pump and repair if required.
		21. Vibration in system	21. Check unusual occurrence in the system
		22. Pump worn or damaged.	22. Pump should be overhauled or replaced.

S. No.	Faults	Probable Causes	Remedial Action
3	Pump overheats	<ol style="list-style-type: none"> 1. Wrong oil grade. 2. Oil speed in system too high. 3. Oil level too low. 4. Pump rotor groove worn out. 5. Radial or axial loading too high. 6. Initial speed rises. 7. Inadequate cooling. 8. Cooling system is dirty. 9. Differential pressure too low. 10. Pressure too high. 11. Wrong type of pressure valve. 12. Wrong seal size. 13. Filter dirty or too small. 14. Pump running speed high. 15. Cavitation. 16. Foams in oil. 17. Venting dirty. 18. System contaminated. 19. Sharp bends in suction line. 20. Boost pump failed. 	<ol style="list-style-type: none"> 1. Fill oil as recommended. 2. Install pipes of proper size. 3. Fill the oil up to safe level. 4. Change the worn out parts. 5. Loading should be restricted to prescribed limit to acceptable amount. Check alignment limit. 6. Check max. pressure if needed replace with larger capacity and install pipes of nominal bore. 7. Increase cooling capacity. 8. Clean the cooling system. 9. Increase pressure setting of relief valve. 10. Reduce pressure setting. 11. Replace by appropriate type of valve. 12. Replace by suitable size of seals. 13. Clean filter or replace by larger type. 14. Reduce speed. 15. Bleed the system. 16. Vent the system. 17. Clean the vents. 18. Flush the system. 19. Eliminate bends or at least reduce them. 20. Check boost pump and repair as required.
4.	Pump develops no pressure	<ol style="list-style-type: none"> 1. Wrong pressure setting. 2. Pressure valve spool stuck. 	<ol style="list-style-type: none"> 1. Modify the pressure setting. 2. Repair/Replace the valve.

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S. No.	Faults	Probable Causes	Remedial Action
		3. Leakage in system.	3. Replace defective parts.
		4. Pump shaft broken.	4. Replace shaft.
		5. System contaminated.	5. Flush system completely.
		6. Improper gaskets and seal.	6. Replace seals and gaskets.
5.	Speed loss on pump.	1. Inlet pressure too low. 2. Outlet pressure too high. 3. Port plate does not make contact. 4. Oil temperature too high.	1. Increase pressure. 2. Check system pressure. 3. Dismantle the pump and repair as required. 4. Check circuit.
6.	Pump does not work.	1. Pressure too low. 2. 'O' Ring on port plate defective. 3. Too much play in the shaft.	1. Increase pressure setting. 2. Replace 'O' Ring. 3. Replace bearing.
7.	Hydraulic oil overheated.	1. System pressure is too high. 2. Dirty oil 3. Oil level is low. 4. Hydraulic oil of incorrect viscosity. 5. Faulty cooling system. 6. Hydraulic oil by passing internally due to worn pump, valve, motor and cylinder.	1. Adjust the pressure to the required limit. 2. Clean or change filters and strainers. 3. Fill up the oil to the upper mark. 4. Check oil for proper viscosity. If change of oil is required, flush the entire system and change filter before adding fresh oil. 5. Check oil cooler for trash on outside cooling surfaces. Clean with air pressure, or steam pressure. 6. Overhaul or replace faulty components.

S. No.	Faults	Probable Causes	Remedial Action
8.	Bearing failure.	<ol style="list-style-type: none"> 1. Chips or other contaminants in bearing. 2. Coupling misaligned. 3. Inadequate lubrication. 4. Pump running too fast. 5. Excessive or shock loads. (Excessive loads due to operating pressure may damage the bearing). 	<ol style="list-style-type: none"> 1. Replace bearings and check intrusion of contaminants. 2. Align prime mover shaft and pump. 3. Lubricate system properly. 4. Adjust speed of prime mover. 5. Reduce operating pressure.

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IV. HYDRAULIC RELIEF VALVE

S. No.	Faults	Probable Causes	Remedial Actions
1.	Erratic pressure.	<ol style="list-style-type: none"> 1. Foreign material in the oil. 2. Worn poppet valve or seat. (oil from pilot stage will go to tank due to worn poppet valve or seat and pressure will drop). 3. Piston sticking in main body. 	<ol style="list-style-type: none"> 1. Drain the oil, clean the tank and refill with clean oil. 2. Replace poppet valve or seat as required. 3. Clean piston after dismantling. Check free movement after re-assembling.
2.	Low pressure or no pressure.	<ol style="list-style-type: none"> 1. Valve improperly adjusted. 2. Vent connection is open (at the time of starting the work, if vent remain open, then oil will go to the tank and no pressure will develop). 3. Balance hole in main piston choked. 4. Poppet in cover not seating. (So, oil will continuously go to tank line and pressure will drop). 5. Broken or weak spring (oil will push the poppet easily and go to tank. So pressure will drop). 6. Dirt, chip etc keeps valve partially open. 	<ol style="list-style-type: none"> 1. Adjust valve by adjusting knob to proper pressure setting. 2. Plug the vent connection. 3. Remove piston and clean the orifice. Clean the tank and replace hydraulic oil. 4. Check the poppet condition. If required, replace it. 5. Replace the spring and again set the pressure with adjusting knob. 6. Clean the complete valve.

S. No.	Faults	Probable Causes	Remedial Actions
3.	Excessive noise or chatter.	<ol style="list-style-type: none"> 1. High oil velocity through valve. 2. Distorted control spring. 3. Worn poppet or seat in cover. 4. Vent line too long. 5. Valve pressure setting too close to that of another valve in circuit. 	<ol style="list-style-type: none"> 1. Check valve flow rating. Replace with larger valve, if necessary. 2. Replace spring. 3. Replace poppet or seat. 4. Replace restrictions e.g. needle valve or orifice. Plug in vent line next to the relief valve. 5. Set relief valve pressure atleast 150 PSI higher than other valves in circuit.
4.	Valve do not function	<ol style="list-style-type: none"> 1. Spool sticks. 2. Water condensation in system. 3. Oil temperature too high. 4. Oil speed too high. 5. Internal leakage. 6. Tank line under high pressure. 7. Control line dirty. 	<ol style="list-style-type: none"> 1. Clean stuck spool. 2. Check condensed water. 3. Check the function of oil cooler and clean the radiator fins. 4. Check speed of the pump. 5. Prevent leakage. 6. Check pressure in tank line. 7. Clean lines properly.
5.	Valve heating over-	<ol style="list-style-type: none"> 1. System pressure too high. 2. Dirt in the system. 3. Spool sticks. 4. Spool defective 	<ol style="list-style-type: none"> 1. Adjust system pressure. 2. Clean the system. 3. Check and clean spool. 4. Check and replace spool, if defective.

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V. HYDRAULIC UNLOADER VALVE

S. No.	Faults	Probable Causes	Remedial Actions
1.	Low or no pressure.	<ol style="list-style-type: none"> 1. Orifice of main piston choked. 2. Vent connection open to tank. 3. Safety valve at zero setting 4. Broken or weak spring 5. Worn ball or seat. 	<ol style="list-style-type: none"> 1. Clean the orifice. 2. Plug the vent connection. 3. Set the safety valve at proper pressure. 4. Replace the spring. 5. Replace the ball or seat.
2.	Fails to completely unload pump.	<ol style="list-style-type: none"> 1. Valve pressure setting too high. 2. Valve spool binding in body. 3. Incorrect assembly. 4. Nil or low nitrogen pressure in the accumulator. 5. Punctured bladder. 	<ol style="list-style-type: none"> 1. Set valve at proper pressure. 2. Clean the spool and oil in the tank. 3. Assemble as per proper drawing. 4. Check pressure and recharge the accumulator. 5. Change the bladder.

VI. HYDRAULIC MOTOR

S. No.	Faults	Probable Causes	Remedial Action
1.	Motor makes loud Noise.	<ol style="list-style-type: none"> 1. Vane spring broken. 2. Shaft seal leaks. 3. Casing leaks. 4. Oil temperature too high. 5. Motor parts defective. 6. Aeration. 	<ol style="list-style-type: none"> 1. Change the spring. 2. Replace the seal. 3. First tighten bolts, then check for cracks and sealing. 4. Check cooling circuits. 5. Replace defective parts. Tighten bolts uniformly. 6.i) Fill the reservoir with oil up-to required level to prevent aeration. ii) Check all connections on inlet side of motor and pour hydraulic oil over suspected leak. If noise stops, leakage has been found, fill hydraulic tank to the full mark. -iii) Check condition of motor shaft seal. Change, if required.
		<ol style="list-style-type: none"> 7. Intake line or suction filter partly clogged. 8. Motor running too fast. 9. Coupling misaligned (Due to this, bearing may get damaged, there will be a play at shaft, abnormal sound will be observed). 	<ol style="list-style-type: none"> 7. Clean or replace the filter or line. 8. Reduce speed up to prescribed limit. 9. Realign the motor shaft.
		<ol style="list-style-type: none"> 10. Air leaks at motor intake pipe joints and air drawn through inlet line. 11. Oil viscosity too high. (In cold climate, oil viscosity becomes high. So no free flow will take place and cavitation will occur). 	<ol style="list-style-type: none"> 10. Take action as explained in s.no.1, item no. 6. 11. Start the engine for few minutes to warm-up the hydraulic oil used in machine for proper flow. Use only proper grade of oil.

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S. No.	Faults	Probable Causes	Remedial Action
		12. Cavitation.	12.i) Check condition of suction filter and return line filters. Clean or change as necessary. ii) Check clogging of inlet line. Clean or change as necessary. iii) Check loose fittings on suction lines. Tighten, if required. iv) Clean hydraulic tank breather.
		13. Foams in oil.	13. Vent the system.
		14. Casing leaks.	14. First tighten bolts, then check for cracks and sealing.
		15. Motor stressed.	15. Check mounting alignment. Tighten bolts uniformly.
		16. Foreign bodies in suction line.	16. Remove foreign bodies If needed flush the system.
		17. System dirty.	17. Flush the system.
		18. Sharp bends in suction line.	18. Eliminate or reduce the bends in suction line.
		19. Motor worn or damaged.	19. Motor should be overhauled or replaced.
2.	Motor overheats	1. Wrong oil grade. 2. Oil speed in system too high. 3. Motor rotor groove worn out. 4. Radial or axial loading too high. 5. Initial speed rises	1. Fill oil as recommended. 2. Install pipes of proper size. 3. Change motor parts. 4. Limit to acceptable amount, check alignment limit. 5. Check max, pressure, if needed replace with larger capacity and install pipes of nominal bore.

S. No.	Faults	Probable Causes	Remedial Action
		6. Inadequate cooling. 7. Cooling system is dirty.	6. Increase cooling capacity 7. Clean the cooling system.
		8. Differential pressure too low. 9. Pressure too high. 10. Wrong type of pressure valve. 11. Wrong seal size. 12. Motor running speed high. 13. Cavitation. 14. Oil foams. 15. Venting dirty. 16. System contaminated. 17. Sharp bends in suction line. 18. Motor is of under capacity	8. Increase pressure setting of relief valve. 9. Reduce pressure setting. 10. Replace by appropriate type of valve. 11. Replace by suitable seals. 12. Reduce speed. 13. Bleed the system 14. Vent the system. 15. Clean the vents. 16. Flush the system. 17. Eliminate bends or at least reduce them. 18. Install motor of proper capacity
3.	Speed loss on motor.	1. Inlet pressure too low. 2. Motor parts defective. 3. Oil temperature too high 4. Out let pressure too high 5. Port plate does not make contacts.	1. Increase pressure by resetting relief valve. 2. Change defective parts. 3. Check cooling circuit. Hydraulic oil cooler may be defective. 4. Check the system pressure. 5. Dismantle the motor and repair as per requirement.

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VII. HOSE ASSEMBLY

S. No.	Faults	Probable Causes	Remedial Actions
1.	The hose has burst on examination after stripping back the cover of the wire reinforcement reveals random broken wires in the entire length of the hose.	This indicates high frequency pressure impulse condition. SAE impulse test requirements are as under: (a) For a double wire braid reinforcement are 2,00,000 cycles of 133% of recommended working pressure. (b) For a four spiral wrapped reinforcement (100R-9) are 3,00,000 cycles at 133% maximum operating pressure at +200°F (93°C).	If the extrapolated impulses in a system amount to over a million in a relatively short time a spiral reinforced hose would be the better choice.
2.	The hose has burst, but there is no indication of multiple broken wires in the entire length of the hose. The hose may have burst in more than one place.	This would indicate that the pressure has exceeded the minimum burst strength of the hose.	Either a stronger hose is needed or the hydraulic circuit has a mal-function which is causing unusually high pressure conditions.
3.	Hose has burst. An examination indicates the wire braid is rusted and the cover has been cut, abraded or deteriorated badly.	The primary function of the cover is to protect the reinforcement. Elements that may destroy or remove the hose covers are: 1. Abrasion. 2. Cutting 3. Battery Acid. 4. Chemical Cleaning Solutions. 5. Heat. 6. Extreme Cold.	Once the cover protection is gone, the wire reinforcement is susceptible to attack from moisture or other corrosive matter. hence take care of item no. 1 to 6 of para 3 mentioned in probable causes.

S. No.	Faults	Probable Causes	Remedial Actions
4.	Hose appears to be flattened out in one or two areas and appears to be kinked. It has burst in this area and also appears to be twisted.	Torquing of a hydraulic control hose will tear off the reinforcement layers and allow the hose to burst through the enlarged gaps between the braided plaits of wire strands.	Use swivel fittings or joints to be sure that there is no twisting force on a hydraulic hose.
5.	Fitting blew off at the end of the hose.	It may be due to the wrong fitting has been put on the hose. In the case of a crimped fitting the wrong machine setting may have been used resulting in over or under-crimping. The fitting may have been fixed improperly to the hose.	Check manufacturer's instructions. The hose should be installed with enough slack to compensate for the possible 4% shortening that may occur when the hose is pressurized. Recheck the manufacturer's specification and part nos. The fitting should be fixed properly.
6.	The hose fitting has been pulled out of the hose. The hose has been considerably stretched out in length.	1. This may not be high pressure application hose. 2. Insufficient support of the hose. It is essential to support very long lengths of hose, especially if they are vertical.	1. Use the hose as per the pressure of fluid line. 2. All the hoses should be supported by clamping the same at proper distance giving sufficient slacks between two clamps to make up for the possible 4% shortening that could take place when the hose is pressurized.

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IMPORTANT ITEMS FOR DUO

1. Longer blocks should be stressed for effective working.
2. Track should be surveyed thoroughly for broken sleepers & rail pieces etc. which may obstruct the working.
3. Signal cables and rods passing under the track must be attended by S&T official at site.
4. Idle shifting of DUO from one location to another should be avoided to achieve good work and adequate progress.

General Safety Notes

- The machine has to be operated as per existing Indian Railways rules and regulations.
- The safety of yourself and other people is a most important consideration in the operation and maintenance of the machine.
- Always keep your eyes open for other men working close to the machine.
- Make sure that all protection equipment and safety devices are in place in machine's store and in working order.
- Always, keep the machine clean. Excessive oil or grease on the machine can cause you to slip and fall and is also a potential fire hazard.
- Whenever you have the opportunity while waiting to get out on a job, do some of the smaller maintenance jobs such as tightening loose nuts and bolts and cleaning the machine.
- Do not permit unauthorized persons to operate the machine.
- It is prohibited to use exposed light or fire on or near the machine.

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