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GOVERNMENT OF INDIA
MINISTRY OF RAILWAYS

**TROUBLE SHOOTING MANUAL
OF
TRACK RELAYING TRAIN
(P811S)**

REPORT NO. TM --93

PROVISIONAL

NOVEMBER-2005

RESEARCH DESIGNS AND STANDARDS ORGANISATION

LUCKNOW-226011

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About 444 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 (BRM Model 66-4), TTM (UNO) & TTM (DUO) 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, and plasser make WST (08-32) have already been prepared and issued. This trouble shooting manual of Track Relaying Train (P811S) 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.

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Lucknow.
November, 2005

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EXPLANATORY NOTES

While preparing the Provisional Trouble Shooting Manual of Track Relaying Train (P811S), 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 substitute with a new or overhauled or reconditioned part. Fit new or overhauled or reconditioned part in place of missing part.
- OVERHAUL - Dismantle, examine, recondition or renew parts as necessary against given specifications, reassemble, inspect and test.

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I. ENGINE

S. No.	Faults	Probable Causes	Remedial Actions
1.	Engine does not start	<ol style="list-style-type: none"> 1. Emergency stop switch is pressed. 2. No fuel in the tank. 3. Shut down mechanism is stuck 4. Air in fuel system. 5. Governor is stuck. 6. Misconnection of starting switch. 7. Valve clearance is not proper. 8. Weak batteries. 	<ol style="list-style-type: none"> 1. Emergency stop switch should be in release position 2. Fill fuel in the tank and bleed air from fuel system as given in following steps: <ol style="list-style-type: none"> i) Loosen the bleed plug on the fuel filter and operate the priming pump until the fuel emerges free of bubbles. Tighten the bleed plug. ii) Then loosen banjo plug on injection pump and operate the priming pump until fuel emerges free of bubbles. Tighten the banjo plug. 3. Check the electrical supply at coil. if it is ok, then lubricate the piston of shut down coil and mechanism with lub oil and operate it manually. If still not working, then coil may be defective. Replace it. 4. Bleed air from fuel system as explained in item no. 2 above. 5. Replace the complete fuel injection pump 6. Check starting switch and if any misconnection is noticed, rectify it 7. Adjust the valve clearance as given in engine manual. 8. Check electrolyte level in the batteries. Terminals should be clean and the charging system should be working. Over-aged batteries should be replaced.

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S. No.	Faults	Probable Causes	Remedial Actions
		9. Injectors not properly functioning.	9. Remove defective injectors and get them overhauled/calibrated or replace them with new one.
		10. Valves not seating properly.	10. i) Check the valves spring and replace the broken spring if any. ii) Lap the valves. iii) Lap the valve seat, if required.
2.	Engine running too hot.	1. Coolant level too low. 2. Defective thermostat. 3. Defective water pump. 4. V-belt for water pump needs adjustment. 5. Oil cooler not working properly. 6. Valve clearance is not proper. 7. Air filter is choked.	1. Check coolant level and top up to the mark in the filler neck. 2. Check thermostat as given in the following steps: i) Drain cooling water and store it for reuse. ii) Loosen hose clamps, pull back hoses and then remove thermostat. iii) Heat the water in container to approx. 85° C and place thermostat in it. Maintain temperature of water by agitating iv) By short circuiting and radiator opening, check whether the thermostat opens fully. If not, then install new thermostat. 3. Check/repair the water pump. 4. Check the V-belt tension. To adjust, release the guide pulley and regulate tension in the belt. Then tighten the guide pulley. If required, replace the V-belt. 5. Repair / replace the Oil Cooler. 6. Adjust the valve clearance as explained in engine manual. 7. Clean the air filter.

S. No.	Faults	Probable Causes	Remedial Actions
		8. RPM of coolant fan is too low.	8. Adjust the RPM of the motor to 1600. Check hydraulic system and change pump and motor if necessary.
		9. Water radiator choked.	9. Get the radiator cleaned.
		10. Radiator cap missing or worn out	10. Fit new cap.
		11. Water hose too old.	11. Replace the water hose.
3.	Engine misfiring	1. Dirty fuel filter.	1. Replace the fuel filters.
		2. No / less fuel in tank.	2. Fill fuel in the tank and follow steps as given in s. no.1, item no.2.
		3. Air in fuel system.	3. Bleed air from the fuel system as explained in s. no.1, item no.2.
		4. Defective Injector.	4. Remove the defective injector and get them overhauled/calibrated/replace with new one as required.
		5. Valve clearance is not proper.	5 Adjust valve clearances as given in engine manual
		6. Fuel injection timing not proper.	6. Adjust the timings.
4.	Excessive engine smoking.	1. Engine oil level too high.	1. Check oil level. For this, draw dipstick and clean with lint-free cloth. Return dipstick, wait a little until the oil has wetted the dipstick. Then remove the dipstick again and check oil level.
		2. Defective injector	2. Follow the s.no.1, item no.9.
		3. Valve clearance is not proper.	3. Follow the s. no.1, item no.7.

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S. No.	Faults	Probable Causes	Remedial Actions
		4. Air in fuel system.	4. Follow the s.no.1, item no.2.
		5. Clogged air cleaner.	5. Clean the element or change if required.
		6. Excessive carbon on cylinder head and piston.	6. De-carbonise the engine.
		7. Engine overloaded.	7. Check and reduce the load.
5.	Engine stops	1. No fuel.	1. Fill fuel in the tank and follow the steps as given in s. no. 1, item no.2.
		2. Air in the fuel system.	2. Bleed air from fuel system as explained in s. no.1, item no.2.
		3. Valve clearances are not proper.	3. Adjust the valve clearances as explained in s.no.1, item no.7 above.
		4. Governor is stuck.	4. Replace complete fuel injection pump.
		5. Overheating of engine	5. Take remedial action as given in s.no.2 above.
		6. Shut down circuit fails.	6. Check the electrical circuit and repair as required.
6.	Engine knocking	1. Incorrect Injector setting.	1. Remove the faulty injector and get it reset or replace it with new one.
		2. Mechanical damage to piston/cylinder.	2. Get the engine top overhauled.
		3. Valve clearance is not proper.	3. Adjust the valve clearance as given in engine manual.
		4. Fuel injection timing is not proper.	4. Correct the timings.

S. No.	Faults	Probable Causes	Remedial Actions
7.	Output of the engine too low	<ol style="list-style-type: none"> 1. Dirty fuel filter and fuel line. 2. Air in fuel system. 3. Defective Injectors. 4. Valve clearances are not proper. 5. Air filter choked. 6. Improper compression 7. Governor is stuck. 	<ol style="list-style-type: none"> 1. Check the fuel filter and line, if necessary change the filter. 2. Bleed the air from system as explained in s. no.1, item no.2. 3. Remove the defective injectors and get them overhauled or replace with new one. 4. Adjust the valve clearances as given in engine manual. 5. Clean the air filter element or replace if required. 6. Engine needs to be top overhauled. 7. Replace the complete fuel injection pump.
8.	Oil pressure low.	<ol style="list-style-type: none"> 1. Dirty lube oil filter. 2. Oil control valve not working. 3. Dirty oil cooler 	<ol style="list-style-type: none"> 1. Replace the lube oil filter. 2. Repair the control valve or replace it. 3. Clean the oil cooler.
9.	Oil film present in crank case ventilation	<ol style="list-style-type: none"> 1. Incorrect compression. 2. Lube oil brands. 	<ol style="list-style-type: none"> 1. Engine needs to be top overhauled 2. Use lube oil of proper brand and grade as recommended by the OEM.
10.	Engine speed is irregular.	<ol style="list-style-type: none"> 1. Air in fuel system 2. Governor is stuck. 	<ol style="list-style-type: none"> 1. Bleed air from the system as explained in s. no.1, item no.2. 2. Replace complete fuel injection pump.

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S. No.	Faults	Probable Causes	Remedial Actions
11.	Fuel consumption too high.	<ol style="list-style-type: none"> 1. Use of incorrect lube oil brand. 2. Incorrect setting of Injector. 3. Incorrect engine timing. 4. Clogged air filter. 5. Poor compression 	<ol style="list-style-type: none"> 1. Use proper grade and quality lube oil. 2. Overhaul/ Replace the defective injectors. 3. Get the engine timing reset. 4. Clean the air filter. 5. Engine needs to be top overhauled.
12.	Lube oil consumption too high.	<ol style="list-style-type: none"> 1. Incorrect lube oil brand. 2. Poor compression 3. Oil filter dirty. 	<ol style="list-style-type: none"> 1. Use proper grade and quality lube oil as recommended by OEM. 2. Engine needs to be top overhauled. 3. Replace the filter.

S. No.	Faults	Probable Causes	Remedial Actions
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- iv) If 24V is not coming at terminal 1 of switch P2.4 in P. box no P2. Then wire 24A between P.box no. P2A and P2 may be damaged. Check and do needful
- v) If 24V is not coming at terminal 2 of switch P2A.1 in P. box no 2A. If it is existing there then switch P2A.1 may be malfunctioning. Check and do needful.
- vi) If 24V is not coming at terminal 1 of switch P2A.1 in P. box no. 2A, then check it terminal 1 of 2b.1 in P. box no. P2B. If it is existing there then wire 24B between both the switches may be damaged. Check and do needful.
- vii) If 24V is existing at terminal 1 of switch P2B.1 in P. box no. P2B but not coming at terminal 2. Then switch may be malfunctioning. Check and do needful.
- viii) If terminal 1 of switch P2B.1 in P. box no. P2B is not showing 24V, then circuit breaker CB1 in P. box no. P3 may be tripped. Check and do needful
- ix) If CB1 found OK and still supply is not coming at line terminal (wire no. 23A) of CB1, then check it at line terminal of circuit breaker CB10 in engine panel box. If it is existing there then either CB10 may be tripped or relay R1A in engine panel box may be defective. Check and do needful.
- x) If 24V is not coming at line terminal (wire no. 2). Then fuse (shunt) in engine panel box may be blown. Check and do needful.

S. No.	Faults	Probable Causes	Remedial Actions
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- iv) If 24V is not coming at terminal 3 of switch P2.4 in P. box no P2. Then wire 24A between P.box no. P2A and P2 may be damaged. Check and do needful
- v) If 24V is not coming at terminal 2 of switch P2A.1 in P. box no 2A. If it is existing there then switch P2A.1 may be malfunctioning. Check and do needful.
- vi) If 24V is not coming at terminal 1 of switch P2A.1 in P. box no. 2A, then check it at terminal 1 of 2B.1 in P. box no. P2B. If it is existing there then wire 24B between both the switches may be damaged. Check and do needful.
- vii) If 24V is existing at terminal 1 of switch P2B.1 in P. box no. P2B but not coming at terminal 2. Then switch may be malfunctioning. Check and do needful.
- viii) If terminal 1 of switch P2B.1 in P. box no. P2B is not showing 24V, then circuit breaker CB1 in P. box no. P3 may be tripped. Check and do needful
- ix) If CB1 found OK and still supply is not coming at line terminal (wire no. 23A) of CB1, then check it at line terminal of circuit breaker CB10 in engine panel box. If it is existing there then either CB10 may be tripped or relay R1A in engine panel box may be defective. Check and do needful.
- x) If 24V is not coming at line terminal (wire no. 2). Then fuse (shunt) in engine panel box may be blown. Check and do needful.

S. No.	Faults	Probable Causes	Remedial Actions
			<ul style="list-style-type: none"> iv) If 24V is not coming at terminal 1 of switch P2.3 in P. box no P2. Then, wire 924C between P.box no. P2 and P1 may be damaged. Check and do needful v) If 24V is not coming at terminal 2 of switch P1.4 in P. box no P1 but it is existing at terminal 1. Then switch P1.4 may be malfunctioning. Check and do needful. vi) If 24V is not coming at terminal 1 of switch P1.4 in P. box no.P1, then check it at terminal 2 of P2A.2 in P. box no. P2A. If it is existing there then wire 924B between both the switches may be damaged. Check and do needful. vii) If 24V is existing at terminal 1 of switch P2A.2 in P. box no. P2A but not coming at terminal 2.Then switch may be malfunctioning. Check and do needful. viii) If 24V is existing at terminal 1 of switch P2B.2 in panel box no. P2B but not coming at terminal 2, then switch P2B.2 may be malfunctioning. Check and do needful ix) If 24V is coming at terminal 2 of switch 2B.2 in panel box no. P2B but not coming at terminal 1 of P2A.2 of Panel box no. P2A. Then wire 924A between the two switches may be damaged Check and do needful. x) If terminal 1 of switch P2B.2 in P. box no. P2B is not showing 24V, then circuit breaker CB1 in P. box no. P3 may be tripped. Check and do needful

S. No.	Faults	Probable Causes	Remedial Actions
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4. Old sleeper conveyor (OS2) is not moving in forward direction.

i) Hydraulic problem

ii) Electrical problem

xi) If CB1 found OK and still supply is not coming at line terminal (wire no. 23A) of CB1, then check it at line terminal of circuit breaker CB10 in engine panel box. If it is existing there then either CB10 may be tripped or relay R1A in engine panel box may be defective. Check and do needful.

xii) If 24V is not coming at line terminal (wire no. 2). Then fuse (shunt) in engine panel box may be blown. Check and do needful.

i) If by operating all the electrical controls for forward movement, old sleeper conveyor (OS2) is not moving in forward direction give command to it for reverse movement. If it is moving in reverse direction, then operate the hydraulic valve manually keeping the electrical commands towards forward movement, If conveyor is not moving, then spool of valve is stick up. Clean it with petrol or replace it with new one.

ii) If old sleeper conveyor is not moving in any direction, then hydraulic pump for old sleeper pick circuit may not delivering the oil. Check and do needful.

i) Check 24 volt supply in wire no. 31 at coupler of hydraulic valve for OS2 conveyor reverse/forward movement. If it is coming, then electrical circuit is OK and problem is in hydraulic circuit. Check the hydraulic circuit as explained above.

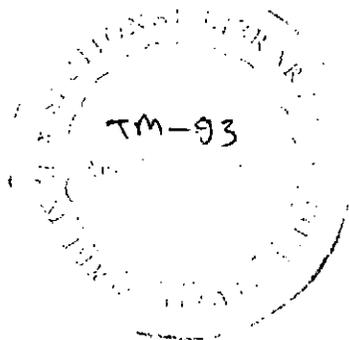
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S. No.	Faults	Probable Causes	Remedial Actions
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- ii) If supply is not found, then check it at terminal 4 of switch P2.3 in panel box no. P2. If it is coming there then wire no. 31 between switch P2.3 and coupler may be damaged. Check and do needful.
- iii) If 24 Volt is found at terminal 3 of switch P2.3 and solenoid is also operative manually, then P2.3 in P. box no. P2 may also be malfunctioning. Check and do needful.
- iv) If 24V is not coming at terminal 3 of switch P2.3 in P. box no P2. Then wire 924C between P.box no. P2 and P1 may be damaged. Check and do needful
- v) If 24V is not coming at terminal 2 of switch P1.4 in P. box no P1 but it is existing at terminal 1 then switch P1.4 may be malfunctioning. Check and do needful.
- vi) If 24V is not coming at terminal 1 of switch P1.4 in P. box no.P1, then check it at terminal 2 of 2A.2 in P. box no. P2A. If it is existing there then wire 924B between both the switches may be damaged. Check and do needful.
- vii) If 24V is existing at terminal 1 of switch P2A.2 in P. box no. P2A but not coming at terminal 2. Then switch may be malfunctioning. Check and do needful.
- viii) If 24V is existing at terminal 1 of switch P2B.2 in panel box no. P2B but not coming at terminal 2, then switch P2B.2 may be malfunctioning. Check and do needful

S. No.	Faults	Probable Causes	Remedial Actions
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5. New sleeper conveyor (NS1) is not moving in reverse direction



- ix) If 24V is coming at terminal 2 of switch 2B.2 in panel box no. P2B but not coming at terminal 1 of P2A.2 of Panel box no. P2A. Then wire 924A between the two switches may be damaged Check and do needful.
- x) If terminal 1 of switch P2B.2 in P.box no. P2B is not showing 24V, then circuit breaker CB1 in P. box no. P3 may be tripped. Check and do needful
- xi) If CB1 found OK and still supply is not coming at line terminal (wire no. 23A) of CB1, then check it at line terminal of circuit breaker CB10 in engine panel box. If it is existing there then either CB10 may be tripped or relay R1A in engine panel box may be defective. Check and do needful.
- xii) If 24V is not coming at line terminal (wire no. 2). Then fuse (shunt) in engine panel box may be blown. Check and do needful.
- i) Check 24V in wire no. 32 at coupler of solenoid valve for NS1 conveyor reverse movement by operating the concerned switch. If supply is existing and conveyor is not rotating in reverse direction, then spool of valve is stick up. Check and do needful.
- ii) Hydraulic pump for low pressure circuit may not delivering the oil. Check and do needful.
- iii) If by operating the hydraulic valve manually, conveyor is not rotating. Then motor may also be defective.
- iv) Filter for low pressure circuit pump may also be choked. Check and do needful

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S. No.	Faults	Probable Causes	Remedial Actions
		ii) Electrical problem	<ul style="list-style-type: none"> i) First of all circuit breaker CB in panel box no. P3 and CB10 in engine panel should be in 'ON' position and battery key should be in 'ON' position. ii) Now operate the concerned hydraulic valve manually. If conveyor is rotating, then check 24V in wire no. 32 at coupler of valve. If it is not existing there, then wire no. 32 between switch P3.23 on panel box no P3 and coupler may be damaged. Check and do needful. iii) If supply is coming at terminal 1 of switch P 3.23 and still solenoid is inoperative, then relay RT3 in panel box no. P3 may also be defective. Check and do needful. iv) If 24V is not coming at terminal 1 of switch P3.23 in panel box no., then wire no.24 between switch and circuit breaker CB1 may be damaged. Check and do needful. v) If wire between CB1 and switch P3.23 found OK, then check it at load terminal of circuit breaker CB10. If it is existing there, then relay R1A in engine panel may be defective. Check and do needful. vi) If relay found Ok, then wire 23A between CB1 and relay R1A may be damaged. Check and do needful.
6.	New sleeper conveyor (NS1) is not moving in forward direction	i) Hydraulic problem	<ul style="list-style-type: none"> i) Check 24V in wire no. 933 at coupler of solenoid valve for NS1 conveyor forward movement by operating the concerned switch. If supply exists and conveyor is not rotating in forward direction, then spool of valve is stick up. Check and do needful.

S. No.	Faults	Probable Causes	Remedial Actions
	ii) Electrical problem		<ul style="list-style-type: none"> ii) Hydraulic pump for low pressure circuit may not delivering the oil. Check and do needful. iii) If by operating the hydraulic valve manually, conveyor is not rotating. Then motor may also be defective. iv) Filter for low pressure circuit pump may also be choked. Check and do needful i) First of all, circuit breaker CB1 in panel box no. P3 and CB10 in engine panel should be in 'ON' position and battery key should be in 'ON' position. ii) Now operate the concerned hydraulic valve manually. If conveyor is rotating, then check 24V in wire no. 933 at coupler of valve. If it is not existing there, then wire no. 933 between switch P3.23 on panel box no P3 and coupler may be damaged. Check and do needful. iii) If supply is coming at terminal 3 of switch P 3.23 and still solenoid is inoperative, then relay RT3 in panel box no. P3 may also be defective. Check and do needful. iv) If 24V is not coming at terminal 3 of switch P3.23 in panel box no., then wire no.24 between switch and circuit breaker CB1 may be damaged. Check and do needful. v) If wire between CB1 and switch P3.23 found OK, then check it at load terminal of circuit breaker CB10. If it is existing there, then relay R1A in engine panel may be defective. Check and do needful. vi) If relay found OK, then wire 23A between CB1 and relay R1A may be damaged. Check and do needful.

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S. No.	Faults	Probable Causes	Remedial Actions
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9. Old sleeper platform is not going downward from rear side

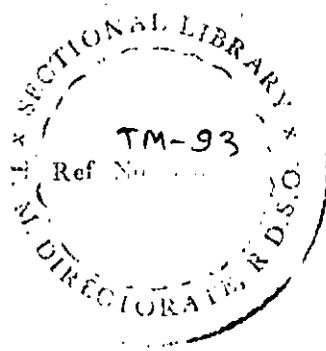
i) Hydraulic problem

ii) Electrical problem

- v) If 24V is not found at terminal 3 of switch P3.24 in panel box no. P3, then check it at load terminal of circuit breaker CB1 on panel box no. P3. If it is not found there, then wire no. 24 between CB1 and P3.24 may be damaged. Check and do needful.
- vi) Check 24V at line terminal of CB1. If it is not found there then check it at load terminal of CB10. If it is found there, then relay R1A on engine panel box may be defective. Check and do needful. In this case wire no. 3A and/or 23A may also be damaged. Check and do needful. Check 24V at coupler of concerned valve. If it is existing there then electrical circuit is OK and problem is in hydraulic circuit. Check it as follows.
 - i) Operate the hydraulic valve manually, If platform is not going downward at rear side, the spool may be stick up. Check and do needful.
 - ii) Pump for high pressure circuit may also not delivering the oil. Check and do needful.
 - iii) Hydraulic filter for high pressure circuit may also be choked. Check and do needful. If hydraulic circuit is found OK, check the electrical circuit as follows.
 - i) Battery switch should be in 'ON' position.
 - ii) Shunt on engine panel should not be blown.

S. No.	Faults	Probable Causes	Remedial Actions
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- iii) Circuit breaker CB11 should be in 'ON' position.
- iv) Fuse F2 in panel box. No. P1 should not be blown. Check and do needful.
- v) If all above found 'OK', then check electrical circuit as follows.
 - a) Operate the switch RP1.3 and RP1.2 in remote panel and check 24V at coupler of solenoid valve. If it is coming there, then electrical circuit is 'OK' and problem is in hydraulic circuit. Check it as explained above.
 - b) If 24V is not coming at coupler of solenoid valve, then check it at terminal 2 of switch RP1.3 and RP1.2. If it is coming there. Then wire no. 119 is damaged. Check and do needful.
 - c) If 24V is not found at terminal 2 of switches RP1.3,RP1.2 and wire 119 is found 'OK' but it is coming at terminal 1 of switches RP1.2 and RP1.3 on remote panel. Then switches are defective. Check and do needful.
 - d) If 24V is not found at terminal 1 of switches. Then check it at fuse F2 along with checking of fuse. If it is found there and fuse is also 'OK'. Then wire no.123 is damaged. Check and do needful.
 - e) If wire no. 119, 123 and fuse F2 found 'OK'. Then either relay R1B in engine panel or wire no. 23B may be defective. Check and do needful.
 - f) Wire no. 3B may also be damaged. Check and do needful.



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S. No.	Faults	Probable Causes	Remedial Actions
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- b) If 24V is not coming at coupler of solenoid valve, then check it at terminal 2 of switch RP1.2. If it is coming there. Then wire no. 120 is damaged. Check and do needful.
- c) If 24V is not found at terminal 2 of switch RP1.2 and wire 120 is found 'OK' but it is coming at terminal 1 of switch RP1.2 on remote panel. Then switches are defective. Check and do needful.
- d) If 24V is not found at terminal 1 of switch RP1.2. Then check it at fuse F2 along with checking of fuse. If it is found there and fuse is also 'OK'. Then wire no.123 is damaged. Check and do needful.
- e) If wire no. 119, 123 and fuse F2 found 'OK". Then either relay R1B in engine panel or wire no. 23B may be defective. Check and do needful.
- f) Wire no. 3B may also be damaged. Check and do needful.

11. Old sleeper platform is not going downward from front side

i) Hydraulic problem

- i) Operate the hydraulic valve manually, If platform is not going downward at front side, the spool may be stick up. Check and do needful.
- ii) Pump for high pressure circuit may also not delivering the oil. Check and do needful.
- iii) Hydraulic filter for high pressure circuit may also be chocked. Check and do needful.

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S. No.	Faults	Probable Causes	Remedial Actions
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ii) Electrical problem

If hydraulic circuit is found OK, check the electrical circuit as follows.

- i) Battery switch should be in 'ON' position.
- ii) Shunt on engine panel should not be blown.
- iii) Circuit breaker CB11 should be in 'ON' position.
- iv) Fuse F2 in panel box. No. P1 should not be blown. Check and do needful.
- v) If all above found 'OK', then check electrical circuit as follows.
 - a) Operate the switch RP1.3 and RP1.1 in remote panel and check 24V at coupler of solenoid valve. If it is coming there, then electrical circuit is 'OK' and problem is in hydraulic circuit. Check it as explained above.
 - b) If 24V is not coming at coupler of solenoid valve, then check it at terminal 2 of switch RP1.3 and RP1.1. If it is coming there. Then wire no. 118 is damaged. Check and do needful.
 - c) If 24V is not found at terminal 2 of switches RP1.3, RP1.1 and wire 118 is found 'OK' but it is coming at terminal 1 of switches RP1.1 and RP1.3 on remote panel. Then switches are defective. Check and do needful.

S. No.	Faults	Probable Causes	Remedial Actions
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- iv) Fuse F2 in panel box. No. P1 should not be blown. Check and do needful.
- v) If all above found 'OK', then check electrical circuit as follows.
 - a) Operate the switch RP1.3 and RP1.1 in remote panel and check 24V at coupler of solenoid valve. If it is coming there, then electrical circuit is 'OK' and problem is in hydraulic circuit. Check it as explained above.
 - b) If 24V is not coming at coupler of solenoid valve, then check it at terminal 2 of switch RP1.3 and RP1.1. If it is coming there. Then wire no. 121 is damaged. Check and do needful.
 - c) If 24V is not found at terminal 2 of switches RP1.3, RP1.1 and wire 121 is found 'OK' but it is coming at terminal 1 of switches RP1.1 and RP1.3 on remote panel. Then switches are defective. Check and do needful.
 - d) If 24V is not found at terminal 1 of switch. Then check it at fuse F2 along with checking of fuse. If it is found there and fuse is also 'OK'. Then wire no.123 is damaged. Check and do needful.
 - e) If wire no. 121, 123 and fuse F2 found 'OK'. Then either relay R1B in engine panel or wire no. 23B may be defective. Check and do needful
 - f) Wire no. 3B may also be damaged. Check and do needful.

S. No.	Faults	Probable Causes	Remedial Actions
			<ul style="list-style-type: none"> c) If supply is not coming at terminal 7 of relay R3, then check it at terminal 2 of limit switch LS100. If it is coming there then wire no. 61 between relay R3 and limit switch LS100 may be damaged. Check and do the needful. d) If supply is not coming at terminal 2 then check it at terminal 1 of limit switch LS100. If it is coming there then limit switch may defective. Check and do the needful. e) If supply is not coming at terminal 1 of limit switch LS100 then wire no. 903 may be damaged between switch P3.41 and LS100. Check and do the needful. f) Switch P3.41 may also be defective. Check and do the needful. g) If supply is not coming at input terminal of switch then wire 65 between relay R4 and switch may be damaged. Check and do the needful:
14.	Reverse traction is out of order	i) Hydraulic problem	<ul style="list-style-type: none"> i) Operate the concerned spool of Hydraulic valve manually. If traction starts then problem is in electrical circuit. ii) If traction not starts then problem is in hydraulic circuit. Check it as follows. <ul style="list-style-type: none"> a) If by operating the valve manually, spool is not moving then it may be stick up or broken. Check and do the needful. b) If spool of valve is functioning and traction is still not starts, then flow control valve may be malfunctioning. Check and do the needful. c) Pump for reverse traction may not delivering the oil. Check and do the needful.

S. No.	Faults	Probable Causes	Remedial Actions
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ii) Electrical problem

- d) If by operating the controls for forward traction, traction car is not moving forward. Then traction motor may be defective. Check and do the needful
- i) If by operating the hydraulic valve manually, reverse traction starts. Then problem is in electrical circuit. Check and do the needful.
- a) Operate the electrical control P3.39 in P.B. no. P3, the supply should come at coupler. If not so then check it at terminal 6 of relay R4 in P.B. no. P3, if it is coming there then wire no. 74 between relay R4 and coupler may be damaged. Check and do the needful
- b) If supply is not coming at terminal 6 of relay R4, then check it at terminal 7. If it is coming there, then relay R4 is defective. Replace it with new one.
- c) If supply is not coming at terminal 8 of relay R4, then check it at terminal 2 of limit switch LS100. If it is coming there then wire no. 61 between relay R4 and limit switch LS100 may be damaged. Check and do the needful.
- d) If supply is not coming at terminal 8 then check it at terminal 7 of limit switch LS100. If it is coming there then limit switch may be defective. Check and do the needful.
- e) If supply is not coming at terminal 7 of limit switch LS100 then wire no. 904 may be damaged between switch P3.39 and LS100. Check and do the needful.
- f) Switch P3.39 may also be defective. Check and do the needful.
- g) If supply is not coming at input terminal of switch then wire 66 between relay R3 and switch may be damaged. Check and do the needful.

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S. No.	Faults	Probable Causes	Remedial Actions
			<p>b) If 24V is not coming at terminal 4 of switch P3.33 but it is existing at terminal 3. Then switch is defective. Replace it with new one.</p> <p>c) If 24V is not coming at terminal 3 of switch P3.33. But it is existing at load terminal of circuit breaker CB6 in P.B. no. P3. Then wire no. 98 between circuit breaker and switch may be damaged. Check and do the needful.</p> <p>d) If 24V is not coming at load terminal of circuit breaker CB6 but it is existing at line terminal. Then either CB6 may be tripped or defective. Check and do the needful.</p> <p>e) If 24V is not coming at line terminal of CB6 but it existing at terminal 5 and 6. Then wire no. 23B may be damaged. Check and do the needful.</p> <p>f) If 24V is not coming at terminal 5 and 6 of relay R1B in engine panel but it is existing at terminal 3 and 4, then relay R1B is defective. Replace it.</p> <p>g) If 24V is not coming at terminal 3 and 4 of relay R1B in engine panel but it is existing at load terminal of circuit breaker CB11 in engine panel. Then wire no. 3B may be damaged. Check and do the needful.</p> <p>h) If 24V is not coming at load terminal of CB11 but it is existing at line terminal. Then CB11 may be tripped or defective. Check and do the needful.</p> <p>i) If 24V is not coming at line terminal but it is existing at terminal S2 of switch in engine panel. Then wire no. 2 may be damaged. Check and do the needful.</p>

III. HYDRAULIC PUMP

S. No.	Faults	Probable Causes	Remedial Action
1.	Pump not delivering oil.	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 at 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 become less than ideal speed, it may affect the proper suction of oil).	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.

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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) Change defective coupling.
		11. Clutch out of adjustment.	11. Adjust clutch.
		12. Pump is damaged.	12. Replace with new one.
2.	Pump makes noise	1. Aeration.	1i) Fill the reservoir with the oil up-to required level to prevent aeration. ii) 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, play at shaft may develop).	4. Realign the pump shaft and prime mover shaft.
		5. Reservoir not vented properly.	5. Air breather screening element 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.
		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.

S. No.	Faults	Probable Causes	Remedial Action
		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. Shaft seal leaks.	10. Replace the seal.
		11. Foams in oil.	11. Vent the system.
		12. Casing leaks.	12. First tighten bolts, then check for cracks and sealing.
		13. Vane spring broken.	13. Change spring.
		14. Any part of pump defective.	14. Replace defective parts.
		15. Foreign bodies in suction line.	15. Remove foreign bodies. Flush the system if required.
		16. System dirty.	16. Flush the system
		17. Sharp bends in suction line.	17. Eliminate or reduce the bends in suction line.
		18. Oil temperature too high.	18. Check the hydraulic circuit. Oil cooler may be ineffective. Rectify the defect.
		19. Boost pump failed.	19. Check boost pump and repair as required.
		20. Vibration in system	20. Check unusual occurrence in the system
		21. Pump worn out or damaged.	21. Pump should be replaced.
3	Pump overheats	1. Wrong oil grade.	1. Fill oil as recommended.
		2. Oil speed in system too high.	2. Install pipes of proper size.
		3. Oil level too low.	3. Fill the oil up to safe level
		4. Pump rotor groove worn out	4. Change the worn out parts
		5. Radial or axial loading too high.	5. Loading should be restricted to prescribed limit. Check alignment limit.

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S. No.	Faults	Probable Causes	Remedial Action
		6. Initial speed rises	6. Check max. pressure. If needed replace with larger capacity and install pipe of nominal bore.
		7. Inadequate cooling	7. Increase cooling capacity.
		8. Cooling system is dirty.	8. Clean the cooling system.
		9. Differential pressure too low.	9. Increase pressure setting of relief valve.
		10. Pressure too high	10. Reduce pressure setting.
		11. Wrong type of pressure valve	11. Replace by appropriate type of valve.
		12. Wrong seal size	12. Replace by suitable size of seal.
		13. Filter dirty or too small.	13. Clean filter or replace by larger size.
		14. Pump running speed high	14. Reduce speed.
		15. Cavitation	15. Bleed the system.
		16. Foams in oil	16. Vent the system.
		17. Venting dirty	17. Clean the vents.
		18. System contaminated	18. Flush the system.
		19. Sharp bends in suction line	19. Eliminate bends or at least reduce them.
		20. Boost pump failed	20. Check boost pump and repair as required.
4	Pump develops no pressure	1. Wrong pressure setting 2. Pressure valve spool stuck 3. Leakage in system 4. Pump shaft broken 5. System contaminated 6. Improper gasket and seal	1. Modify the pressure setting. 2. Repair/ Replace the valve. 3. Replace defective parts. 4. Replace shaft. 5. Flush the system completely. 6. Replace seats and gaskets.
5	Speed loss on pump.	1. Inlet pressure too low. 2. Outlet pressure too high. 3. Oil temperature too high.	1. Increase pressure. 2. Check system pressure. 3. Check the circuit.

S. No.	Faults	Probable Causes	Remedial Action
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. Internal leakage of hydraulic oil 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.
8.	Bearing failure.	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).	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.	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.	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.	1. Valve improperly adjusted. 2. Vent connection is open. 3. Balance hole in main piston choked. 4. Poppet in cover not seating. 5. Broken or weak spring. 6. Dirt, chip etc keeps valve partially open.	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.
3.	Excessive noise or chatter.	1. High oil velocity through valve. 2. Distorted control spring. 3. Worn poppet. 4. Vent line too long. 5. Valve pressure setting too close to that of another valve in circuit.	1. Check valve flow rating. Replace with larger valve, if necessary. 2. Replace spring. 3. Replace the poppet. 4. Replace restrictions e.g. needle valve or orifice. Plug in vent line next to the relief valve. 5. Set relief valve pressure at-least 150 PSI higher than other valves in circuit.

S. No.	Faults	Probable Causes	Remedial Action
4.	Valve do not function	1. Spool sticks. 2. Oil temperature too high. 3. Oil speed too high. 4. Internal leakage. 5. Tank line under high pressure. 6. Control line dirty.	1. Clean stuck spool. 2. Check the function of oil cooler and clean the radiator fins. 3. Check speed of the pump. 4. Prevent leakage. 5. Check pressure in tank line. 6. Clean lines properly.
5.	Valve over-heating	1. System pressure too high. 2. Dirt in the system. 3. Spool sticks. 4. Spool defective	1. Adjust the 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.	1. Orifice of main piston choked. 2. Vent connection open to tank. 3. Safety valve at zero setting 4. Broken or weak spring	1. Clean the orifice. 2. Plug the vent connection. 3. Set the safety valve at proper pressure. 4. Replace the spring.
2.	Fails completely unload pump.	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.	1. Set valve at proper pressure. 2. Clean the spool or replace if required 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. 	<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.
2.	Motor overheats	<ol style="list-style-type: none"> 1. Motor is of under capacity 2. Rotor worn out. 3. Inadequate cooling. 4. Pressure too high. 5. Wrong seal size. 	<ol style="list-style-type: none"> 1. Install motor of proper capacity 2. Change the rotor. 3. Check cooling pump 4. Reduce pressure setting on relief valve. 5. Replace by suitable seals.
3.	Speed loss on motor.	<ol style="list-style-type: none"> 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. 	<ol style="list-style-type: none"> 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.

GENERAL SAFETY NOTES

1. The machine has to be operated as per existing Indian Railways rules and regulations.
2. The safety of yourself and other people is a most important consideration in the operation and maintenance of the machine.
3. Remember the machine is a working unit, carrying delicate instruments. Therefore the machine should not be driven at excessive speed over bad track or turnouts.
4. Always keep your eyes open for other men working close to the machine.
5. Do not forget to look out for signals, switches and track obstructions.
6. Remember to make sure that all protection equipment and safety devices are in place on the machine and in working order especially when it is being driven from one site to another.
7. Always keep the machine clean. Excessive oil or grease on the machine can cause you to slip or fall and is also a potential fire hazard.
8. Always lock the machine before you leave. Make sure that the machine is protected in accordance with railways regulations.
9. 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.
10. Do not permit unauthorized persons to operate the machine.
11. It is prohibited to use exposed light or fire on or near the machine.

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