Health, Safety, Quality and Environment
Toll Rail
Auckland

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RAIL OPERATING CODE SUPPLEMENT

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The attached new pages which replace all pages in the Current Section 4.13 of the Rail Operating Code will operate from 1200 hours on Monday 1st May 2006.

Completely reissued section which has been revised provides more technical information regarding brake pipe modifications and takes into account updated information from semi-permanent bulletins.

RAIL OPERATING CODE

CODE SUPPLEMENT 4.13

OPERATING INSTRUCTIONS FOR TR SHUNTING TRACTORS

ILLUSTRATION

Issue No	Effective Date	Inserted By	Date	Checked by	Date
Original	1st May 2006				
1					
2					
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TABLE OF ISSUES

Page No	Issue No	Page No	Issue No	Page No	Issue No
i					
ii					
iii					
iv					
v					
1.1					
1.2					
2.1					
2.2					
2.3					
2.4					
2.5					
2.6					
3.1					
4.1					
4.2					
5.1					
6.1					
6.2					
6.3					
6.4					
6.5					
7.1					
8.1					
9.1					
9.2					
10.1					
10.2					
10.3					
11.1					
12.1					
12.2					
13.1					
13.2					
13.3					
14.1					

Authorised by: National Manager, HSQE Toll Rail

TABLE OF CONTENTS

CODE SUPPLEMENT 4.13
OPERATING INSTRUCTIONS FOR TR SHUNTING TRACTORS

			Page Nos.
Introduction			v
1.	TR315-511, 534-563, 603-649 & 989, 874-966	– Servicing	1.1 - 2
2	"	Driving	2.1 - 6
3	"	Faults	3.1
4	"	Diagrams	4.1 - 2
5.	TR586, 592, 655-799	Servicing	5.1
6.	"	Driving	6.1 - 5
7.	"	Faults	7.1
8.	"	Diagram	8.1
9.	TR 816-868 Servicing		9.1 - 2
10.	"	Driving	10.1 - 3
11	"	Diagram	11.1
12.	No. 4 Brake		12.1 - 2
13	Brakes TR874-966		13 .1 -3
14	Maximum Load on grades		14.1

TR SHUNTING TRACTORS

INTRODUCTION

There is no standard TR Shunting Tractor as different manufacturers have been involved in their production over the years. However, these instructions cover those at present operating for Toll Rail and with minor variations, most of those operating in private sidings.

The lubricating oil schedules are based on the present supplier contract and their brand names, however, if those products are not available then a suitable equivalent may be used.

1.0 TR315-511 (83kw (107hp) 15 TONNE). TR 534-563, 603-649 & 989, 874-966 (112KW (150 hp) 20 TONNE) TORQUE CONVERTER

1.1 SERVICING

Daily

(a) Check fuel, engine oil and radiator water levels. Top up if necessary.
Fuel - Diesel
Engine oil- Mobil Delvac 1130

(b) (TR315-511)top up Oil in jackshaft bearing marine boxes (in cab). Use Mobile Delvac 1130. Check the trimmings (wicks) in the marine boxes.

(c) Grease 8 side rod bearings with Mobilplex 47 grease. (Screw down grease cups until grease is under pressure or use grease gun).

Weekly

(a) **Drain air reservoirs** of water by opening drain cocks.

(b) **Check oil levels in compressor, torque converter and final drive** and top up if necessary.

Compressor	Mobil Delvac 1130 (the oil level should be above the filter in the elbow).
Torque Converters fluid (TR315-413)	Mobifluid 62. (The fluid tank is alongside the converter)
Torque Converter lube oil	Mobil Delvac 1130
Final Drive	Mobil DTE BB – (Access to dipstick under cab floor cover).

(c) **Check for Leaks** – (fuel, oil, water and air) and arrange for repairs if required. (If continually topping up with radiator water, then arrangements should be made to have inhibitor concentration levels checked). Note minor faults in the defect book.

(d) Ensure **vee belts** for fan and compressor are not loose.

(e) Check **brake blocks**. Adjustment is required when there is more than 20mm slack at the middle of each block, when the brakes are released. Arrange adjustments if necessary.

(f) Top up sandboxes as required.

Monthly

(a) Check **battery** water level and top up if necessary. Do not overfill.
(b) **Wash** down tractor and clean cab.
(c) Check **fire extinguisher** has current inspection certificate, and is properly secured. Extinguisher seal (clip) must not be broken, if broken replace extinguisher.

2.0 DRIVING

Engine Starting Procedure

(a) Check that:-

(i) **Handbrake** is applied (turned clockwise).
(ii) Engine **shut down** control (Stop-Pull knob) is pushed into the running position.
(iii) **Throttle** is slightly open,
(iv) Battery isolating switch (TR874-966) is on.

(b) Switch on "Main Switch".

(i) (On TR488-511, switch on the 'Starter & Oil" switch as well). The low oil pressure warning light should glow as should the 'No Charge' light if fitted.

(ii) The '**Disengage' light** (light not in TR315-511) for the torque converter clutch is glowing. This light indicates that the clutch is disengaged, which is the correct position for starting. If the light is not on, move the clutch lever to the 'disengage' position provided there is sufficient air pressure.

(c) Press the **starter button** and release immediately the engine fires.

To avoid overheating the starter motor, do not crank for more than 30 seconds at a time.

If the engine fails to start, do not re-press the button until the starter motor has stopped rotating as this could damage the starter motor and ring gear.

If the engine does not start after four periods of cranking, have the engine checked.

Note: The **torque converter clutch** can only be disengaged if there is sufficient air pressure available. Do not attempt to disengage the clutch if the air pressure is low because the clutch linkage may jam and be damaged.

It is permissible to start the engine with the clutch engaged, providing the hand brake is securely on. The clutch should then be disengaged as soon as the air pressure has built up. (Do not rev the engine above idle while the clutch is engaged).

After Starting

(a) **Oil Pressure:** with the engine at a regular idling speed, observe that the engine oil pressure builds up on the gauge and that the low oil pressure warning light goes out. DO NOT RUN THE ENGINE ABOVE IDLING SPEED UNTIL THE OIL PRESSURE BUILDS UP.

If no oil pressure shows after 15-20 seconds running, and the oil pressure warning light does not go out, stop the engine and have it checked. The correct oil pressure is 300 kPa or 45 PSI (TR315-511 only) and 200 kPa or 30 PSI for the others.
When the oil pressure is normal, run the engine at half throttle for a few minutes to warm up the engine and build up air pressure for controls and brakes.

(b) **Control Pressure:** Wait until air pressure builds up before operating the clutch or forward / reverse levers. DAMAGE TO THE CLUTCH CAN RESULT IF THE TRACTOR IS DRIVEN WITH LOW AIR PRESSURE.

The correct operating pressure is 400 kPa (60 PSI) on the Control Pressure gauge. TR 436-511 and 874-966 have the clutch supplied from the main reservoir which should be at 600 kPa (85 PSI).

(c) **Battery Ammeter:** Check the ammeter to ensure that the generator is charging the batteries when engine is running above idle speed. Some ammeters indicate charging with a '+' sign. The 'No Charge' light (if fitted) should go out when the engine is running above idle.

(d) **Brakes :** Check that the main air reservoir pressure (shown by the red pointer on the Westinghouse brake duplex gauge) is 600-700 kPa (85-100 PSI) and brake cylinder pressure (black pointer) is at least 350 kPa (50 PSI) at emergency brake application. (Air brake handle turned fully counter-clockwise).

Test the air brake to make sure that the brake blocks apply and release from the tyres (brake cylinder move in and out).

(e) **Sands:** Operate the sanding valves and observe that sand is supplied to all wheels.

(f) **Lights:** Before moving, ensure the headlights are on.

To Move the Tractor

(a) Apply air brake and release **handbrake** (turn counter clockwise).

(b) Place the **forward / reverse** lever in the desired position. On some TR's it is necessary to hold the clutch lever in the 'disengage' position in order to free the interlocked forward / reverse lever. (Ensure throttle is closed).

(c) Push the **clutch lever** to the 'engage' position. Hold the lever in this position for one or two seconds to ensure the clutch engages properly, then release the lever. The disengage light (when fitted) will go out.

(d) Sound the horn, release the air brake and ease the **throttle** lever open. The tractor will then move and can be accelerated as required.

(TR315-511) – The **engine speed** should be maintained at a moderate level, i.e. about 1300 RPM and the speed of the tractor should be kept within the range 5-25 km/h whenever possible in order to minimise slip in the torque converter and thus minimise heating of the converter fluid.

(Others) - The **engine speed** should be maintained at a moderate level, i.e. about 1000 RPM and the speed of the tractor should be kept within the range 5-25 km/h in order to minimise slip in the torque converter and thus minimise heating of the converter fluid.

Prolonged operation below 5 km/h will overheat the torque converter, damaging the seals with consequent leakage of fluid. It may be necessary to reduce the load to avoid this.

The torque converter temperature should be kept within (TR315-511) 65-95º C (150-200º C), or for the others 70-105º C (160-220ºF). The maximum allowable temperature is 120º C), so the tractor should not be operated at temperatures above this, i.e. DO NOT OPERATE IN THE RED PORTION OF THE TORQUE CONVERTER TEMPERATURE GAUGE.

TR407 and 436-511 use diesel in the torque converter and overheating could cause vaporization of the fuel in the fuel tank creating a possible fire hazard.

To Stop the Tractor

(a) Close the **throttle.**
(b) Apply the **air brake.**
(c) The **clutch** may be left engaged if the tractor is to stand for a short time with the engine idling, then move off again in the same direction.

The clutch should only be disengaged:
(i) When changing direction.
(ii) If the cab is to be left for any reason.
(iii) If the tractor is to stand for more than five minutes.
(iv) When the engine is to be shut down.
(v) If the engine is to be revved up, e.g. to raise air pressure after starting.

Keeping the clutch engaged when idling for short periods helps to cool the torque converter because the fluid continues to be circulated through the cooler by the converter pump.

Note:
- **TR880** has an air brake modification fitted in the cab which when the brake tap is operated in an emergency applies the brakes on the attached wagons only and not on the TR.

- **TR920** is equipped with train brakes. When shunting “air connected” a coupling link must be used between the TR and the first vehicle; this vehicle maybe a runner wagon but must have full operational brakes. These precautions are to ensure at least one wagon is always able to provide adequate braking for the TR if an uncoupling occurs in the air braked rake.

- Also see Instruction 13 for intending braking changes to TR874.966.

To Change Direction

(a) Bring the tractor to a **stop** and keep the brakes applied.
(b) **Disengage the clutch** by moving the lever to the 'disengage' or 'free' position and check the disengage light (where fitted) is on.
(c) Move the **forward / reverse lever** to the desired position.
Ensure the throttle is closed (engine is idling) before reversing. DO NOT OPERATE THE FORWARD / REVERSE LEVER UNTIL THE TRACTOR HAS STOPPED COMPLETELY. (Attempting to change direction while moving can damage the final drive).

Driving Notes

(a) Try to use just enough **throttle** to move the load. Opening the throttle fully will not shift the load any faster, but instead will heat up the torque converter unnecessarily.

(b) If the clutch slips do not attempt to continue driving by holding the clutch lever in the 'engage' position. Stop the tractor and advise repair staff who will quickly adjust the clutch to eliminate slippage.

(c) If **wheelslip** occurs, decrease throttle and use sand.

(d) Stop the engine if the tractor is to **standby** for 10 minutes or longer.

Shutting Down

(a) With the tractor airbrake applied and CLUTCH DISENGAGED, pull the **shut down control** out and hold until the engine stops.

(b) Return the shut down control to its normal running position.

(c) Switch off **main switch**, (and starter and oil switch in TR488-511), or battery isolating switch in TR874-966.

(d) Apply **handbrake**.

Note: Do not operate forward / reverse lever when shut down. If the control air pressure is low this can cause the final drive to operate incompletely, resulting in a 'ratcheting' noise when restarting. If this occurs, shut down the engine momentarily and the final drive should engage properly. If not, shut down the engine and call repair staff.

Finish of Day's Work

(a) Park in a lockable **shed** or under shelter if possible.
(b) Ensure all **lights and switches** are off.
(c) Close all **windows and doors** (lock if possible)
(d) Observe the local rules regarding provision of anti-freeze mixture in the radiator water. (Only necessary in areas of extreme frost).

Refuelling

(a) Do not allow the tractor to run out of fuel as this can damage the fuel injection equipment. Also, repair staff will be required to prime the engine after refueling in order to restart the engine.
(b) If the fuel gauge is not working, use a wooden dipstick.
(c) Smoking is prohibited when refueling. Stop engine.
(d) If a bulk fuel supply is not available, the tractor can be refueled from drums using the hand operated fuel-lift pump (if fitted). Fuel drums should be kept under cover to prevent rainwater getting in.

Cold Starting

(a) If the engine will not fire, press the 'cold start' button under the front of the fuel pumps and try again.
(b) If the engine will not crank over quickly (e.g. if the battery is flat) pull up the decompression levers on the engine. Get someone else to crank the engine with the starter, and when it is turning over quickly, push down the decompression levers one at a time, to the horizontal running position. If this does not start the engine, call repair staff.

Emergency Towing

(a) Ensure clutch is disengaged, engine is stopped and handbrake applied.

(b) Engage the neutral lock in the final drive as follows:

- (i) Lift cab floor cover off final drive unit and place the neutral lock in the 'locked' position, i.e. lift ring, turn and allow it to drop into position in the deep slot.
- (ii) Move the forward / reverse lever to ensure that the neutral lock engages.
- (iii) Check that the driveshaft between the final drive and the torque converter can be turned by hand, or when tractor is being towed check that the driveshaft does not turn.

(c) Release air brake and open drain cocks to exhaust air pressure from the reservoirs.

(d) Switch off main switch.

(e) Release handbrake when the assisting locomotive has been coupled up and is ready.

> **Note:** When towing to another station or depot the side rods must be removed by repair staff.

Control Air Pressure in Emergency – Auxiliary Hand Pump

(a) If the engine or compressor fails and air pressure is required for disengaging the clutch or engaging the neutral lock, a hand air pump is fitted under the control panel on some TR's

(b) Operate the three way air cock under the control panel to connect the pump to the gear control valve, and pump sufficient air for control operation.

(c) Remember that the tractor should not be driven unless 400kPa (60 PSI) is available for the clutch and for the air brake.

3.0 FAULTS

(a) Engine oil pressure warning light lights up, or oil pressure falls below 170 kPa (25 PSI)
Stop engine immediately and check oil level. Top up if necessary. If oil level is OK then call repair staff.

(b) Engine Overheating
Stop engine and check fan belts. If belts are loose call repair staff, if belts are OK wait for temperature to cool, then check radiator water level, and top up if necessary. If overheating or loss of water continues call repair staff.

(c) Loss of Power Due to Low Pressure in Torque Converter
Normal converter operating pressure is about 350 kPa (50 PSI). If pressure is low, check the converter fluid level and top up if necessary. If the level is low, check for leaks.

If level is OK and pressure remains low, call repair staff.

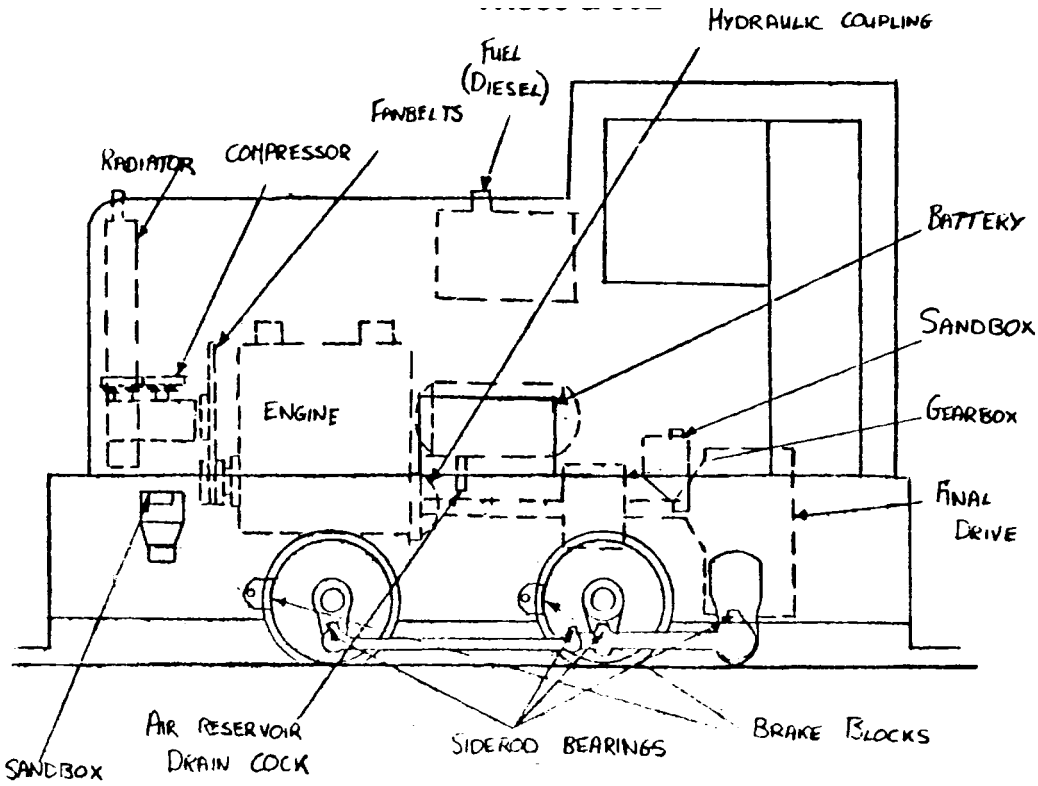
Note: TR426-511 and 407 use diesel in the torque converter instead of fluid. These TR's do not have fluid tanks as the diesel is supplied from the fuel tank. If the converter pressure is low call repair staff.

(d) Clutch Slipping (i.e. if tractor can only be driven by holding the clutch lever in the engaged position).
Do not attempt to continue driving. Call repair staff.

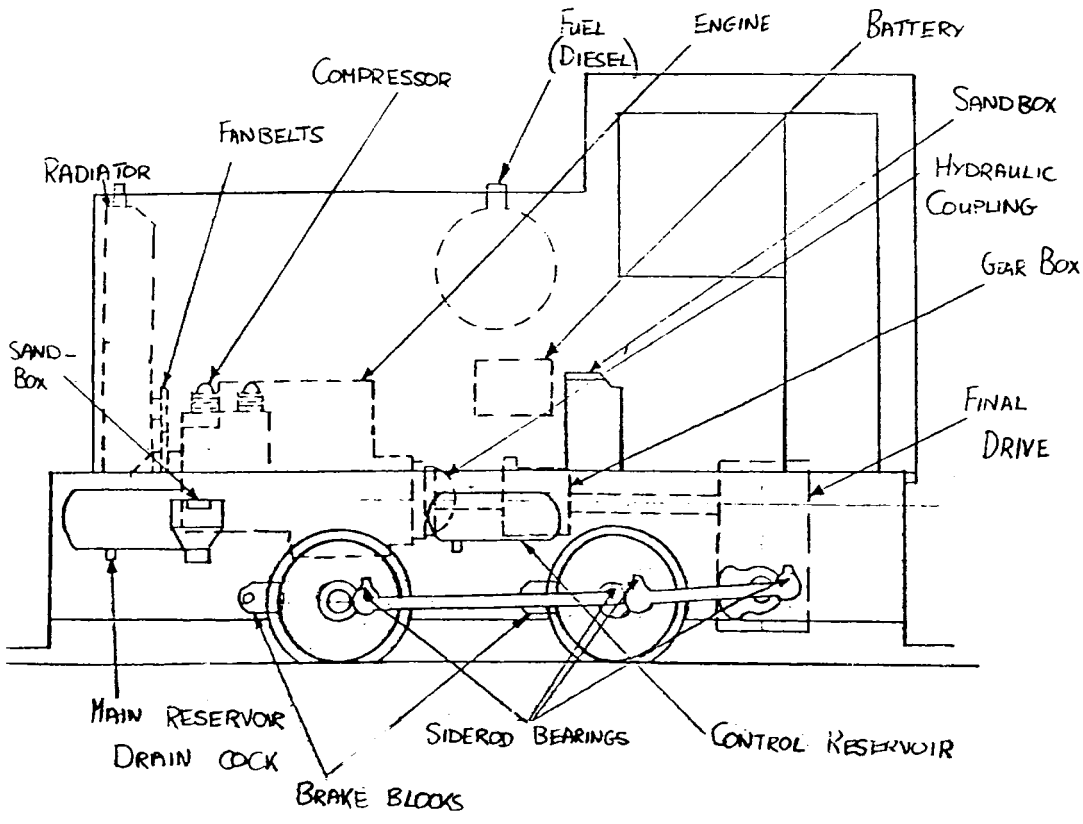
Unusual Operation
If anything unusual occurs, e.g. noises, clutch slipping, battery not charging, overheating, loss of water or oil etc, the tractor should not be used until the repair staff are advised and repair carried out.

Minor Defects
Minor defects should be noted in the defect book for attention by repair staff.

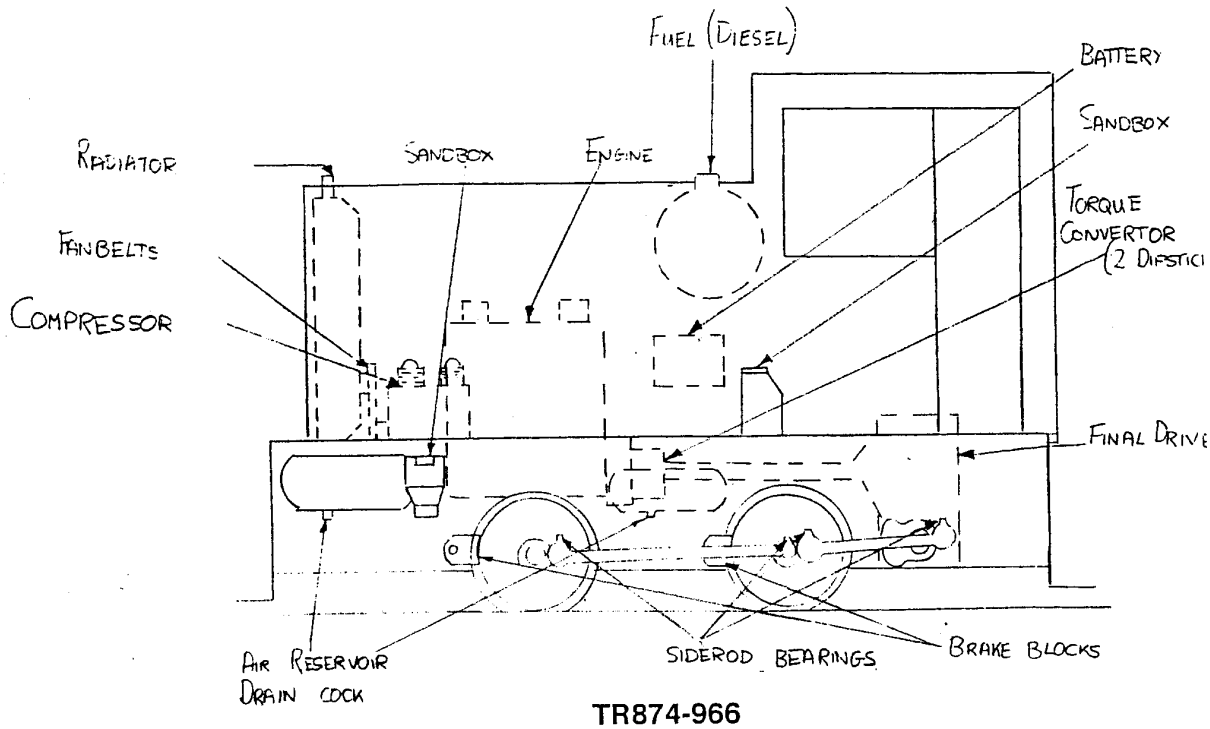
4.0 DIAGRAM - GENERAL DESCRIPTION



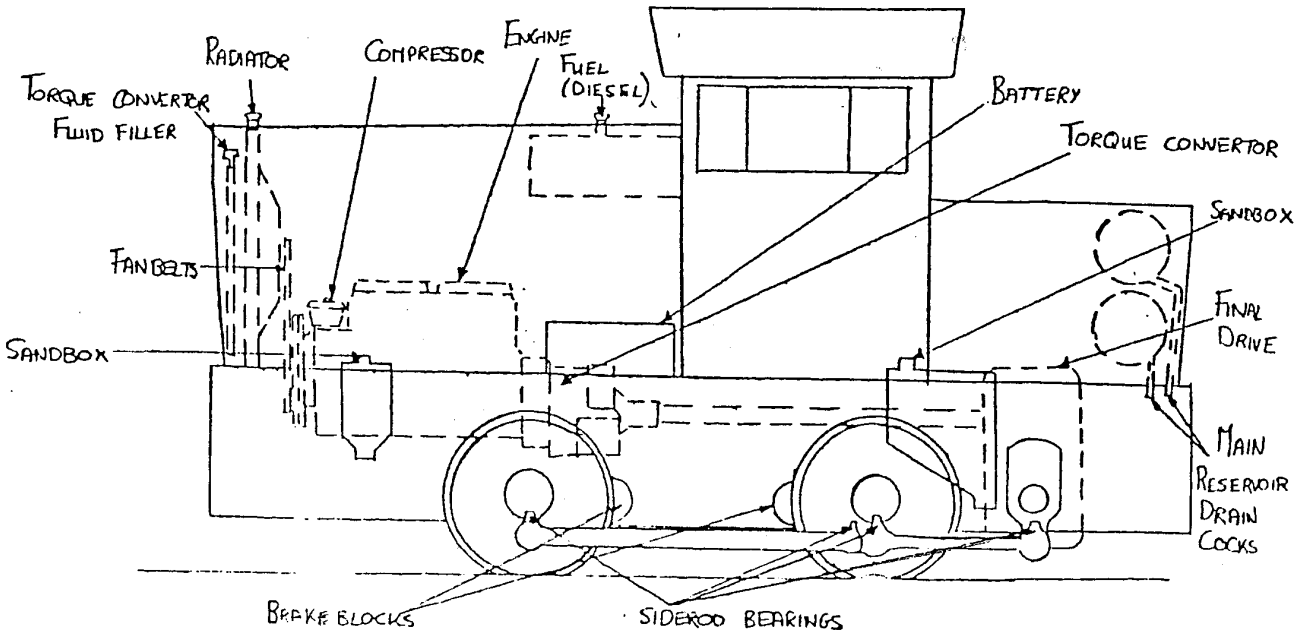
TR655-799



TR603-649 & 989



TR874-966



TR 586, 592 AAND 655-799 (115kw (153hp) 20 tonne) (Mechanical Gearbox)

5.0 SERVICING

Daily

(a) **Check fuel, engine oil and radiator water** levels. Top up if necessary. (if fuel gauge not working use wooden dipstick)

Fuel	-	Diesel
Engine Oil	-	Mobil Delvac 1130

(b) **Grease** 8 side trod bearings with Mobilplex 47 grease. (Screw down grease cups until grease is under pressure or use grease gun).

Weekly

(a) **Drain air reservoirs** of fluid by opening drain cocks.

(b) **Check oil levels in compressor, gearbox and final drive** and top-up if necessary.

Compressor	Mobil Delvac 1130 (the oil level should be above the filter in the elbow.
Gearbox	Mobil DTE BB
Final Drive	Mobil DTE BB (access to dipstick under cab floor cover)

(c) **Check for leaks** – (fuel, oil, water and air) and arrange for repairs if required. (If continually topping up with radiator water, then arrangements should be made to have inhibitor concentration levels checked). Note minor faults in the defect book.

(d) Ensure **vee belts** for fan, generator and compressor are not loose.

(e) Check **brake blocks**. Adjustment is required when there is more than 20mm slack at the middle of each block when the brakes are released. Arrange adjustment if necessary.

(f) Top **up sandboxes** is required.

Monthly

(a) Check **battery** water level and top up if necessary. Do not overfill.
(b) **Wash** down tractor and clean cab.
(c) Check **fire extinguisher, seals, certificate secure**

6.0 DRIVING – TR 586, 592 & 655-799

Engine Starting Procedures

(a) Check that:

(i) **Handbrake** is applied. (Turned clockwise)

(ii) **Gear lever** is in Neutral or 'N" position. If not, damage can result to gearbox bands or plates as air pressure builds up.

(iii) Engine **shut down** control (Stop – pull knob) is pushed in to the running position.

(iv) **Throttle** is lightly open.

Switch on '**Main Switch".** The low oil pressure warning light should glow.

(b) Press the **starter button** and release immediately the engine fires.

To avoid overheating the starter motor, do not crank for more than 30 seconds at a time.

If the engine fails to start, do not repress the button until the starter motor has stopped rotating as this could damage the starter motor and ring gear.

If the engine does not start after four periods of cranking, have the engine checked.

After Starting

(a) **Oil Pressure:** With the engine at a regular idling speed, observe that the engine oil pressure builds up on the 'Oil' gauge and that the low oil pressure warning light goes out. **DO NOT RUN THE ENGINE ABOVE IDLING SPEED UNTIL THE OIL PRESSURE BUILDS UP.**

(b) If no pressure shows after 15-20 seconds running, and the oil pressure warning light does not go out, stop the engine and have it checked. The minimum oil pressure is 170 kPa (25 PSI). Run the engine at half throttle for a few minutes to warm up the engine, and build up air pressure for controls and brakes.

(c) **Control Pressure:** Wait until air pressure builds up to 400 kPa (60 PSI) before engaging gear, or operating forward / reverse lever. **DAMAGE TO GEARBOX BANDS OR PLATES CAN RESULT IF THE TRACTOR IS DRIVEN WITH LOW AIR PRESSURE.**

(d) **Battery Ammeter:** Check the ammeter to ensure that the generator is charging the batteries when engine is running above the idle speed Some ammeters indicate charge with a "+" sign.

(e) **Brakes:** Check that the main air reservoir pressure, (shown by the red pointer on the Westinghouse Brake duplex gauge) is 600-700 kPa (85-100 PSI) and brake cylinder pressure (black pointer) is at least 350 kPa (50 PSI) at emergency brake application. (Air brake handle turned fully counter clockwise).

(f) Test the air brake to make sure that the brake cylinder moves in and out as well as brake blocks apply and release from the wheels..

(g) **Sands:** Operate the sanding valves and observe that sand is supplied to all wheels.

(h) **Lights:** before moving, ensure the headlights are on.

To move the Tractor

(a) Apply air brake and release **handbrake** (turn counter clockwise).

(b) Place the **forward / reverse** lever in the desired position. (Ensure throttle is closed).

(c) Place the **gear lever in first_** gear position.

(d) Sound the horn, release the air brake and ease the **throttle** lever open. The tractor will then move and can be accelerated as required.

(e) To engage second gear close the throttle and shift the gear lever to second gear position. Allow about two seconds for the gearbox to change gear and then gradually open the throttle as required.

(f) Similarly, third and fourth gear can be engaged when speed and loads permit. (Some tractors may have fourth gear removed).

Always start off in first and change up one gear at a time. Note that longer intervals between gear changes (and higher speeds for changing) are needed under the heavier loads.

In order to reduce slip in the hydraulic coupling and thus reduce heating of the fluid and loss of power, the engine speed should be maintained at a moderate level. If a tachometer is fitted, the engine speed should be kept within the range shown in the green section, i.e. 740-1200 RPM.

Change from first to second gear at 7km/h (4 mph)
Change from second to third gear at 12 km/h (7 mph)
Change from third to top gear at 16 km/h (10 mph)

To Stop the Tractor

(a) Close the **throttle**
(b) Apply the **air brake**.
(c) After the tractor has come to rest move the **gear lever** back to neutral. Do not move the lever back to neutral with the tractor in motion as this will cause over-speeding of gear trains.

To Change direction of the Tractor

When the tractor has been brought to a stop and the gear lever has been placed in neutral, move the **forward / reverse lever** to the reverse position.

DO NOT OPERATE THE FORWARD / REVERSE LEVER UNTIL THE TRACTOR HAS STOPPED COMPLETELY. (Attempting to reverse while moving can seriously damage the final drive).

Ensure the throttle is closed (engine is idling) before changing direction.

Driving Notes

(a) Do not allow the tractor to remain at rest with the **gears engaged** other than for stops of momentary duration. The hydraulic coupling will be stalled at 100% slip and will overheat.
Always engage neutral if not restarting immediately.

(b) **Overloading** will not stall the engine but it will cause excessive slip in the hydraulic coupling, which will result in overheating and may melt the fusible plug and disable the tractor.

Consequently, never 'hang on' to a higher gear when engagement of the next lower ratio will ease the load on the engine and enable it to attain its higher speed range.

(c) **Changing down** a gear is carried out by moving the lever back to the next position with the throttle kept partly open.

If the engine is running at high speed in any gear, do not try to engage a lower gear as this could cause over-speeding of the engine.

(d) Always close the throttle when **changing up** to a higher gear. If the throttle is left open extra wear occurs on gearbox bands.

(e) If **wheelslip** occurs decrease throttle and use sand.

(f) Shut down the engine if the tractor is to **standby** for ten minutes or longer.

Shutting Down

(a) With the tractor air brake applied and **GEAR LEVER IN NEUTRAL,** pull the **shut down control** out and hold until the engine stops.

(b) Return the shut down control to its normal running position.
(c) Switch off main switch.
(d) Apply handbrake

Note: Do not operate forward / reverse lever when shut down. If the control air pressure is low this can cause the final drive to operate incompletely, resulting in a 'ratcheting' noise when restarting. If this occurs, shut down the engine momentarily and the final drive should engage properly. If not, shut down the engine and call repair staff.

Finish of Day's Work

(a) With the engine shut down and with control air pressure about 400 kPa (60 PSI) engage each gear (except fourth) six times to automatically **adjust the gearbox bands.** Pause about two seconds each time to allow the automatic mechanism to act.

After this, the gear lever should be left in neutral.

(b) The **handbrake** should be applied.

(c) The **main switch** should be turned off. Ensure all lights are off.

(d) Close all **windows and doors** (lock if possible).

(e) Observe the local rules regarding provision of anti-freeze mixture in the radiator water. (Only necessary in areas of extreme frost).

Refuelling

(a) Do not allow the tractor to run out of fuel as this can damage the fuel injection equipment. Also repair staff will be required to prime the engine after refueling in order to restart the engine.

(b) Smoking is prohibited when refueling. Stop engine.

(c) Book any fuel and oil used.

(d) If a bulk fuel supply is not available, the tractor can be refueled from drums using hand operated fuel-lift pump (if fitted). Fuel drums should be kept under cover to prevent rainwater getting in.

Cold Starting

(a) If the engine will not fire, press the 'cold start' button under the front of the fuel pumps and try again.

(b) If the engine will not crank over quickly, (e.g. if the battery is flat) pull up the decompression levers on the engine to the horizontal position. Get someone else to crank the engine with the starter, and when it is turning over quickly, push down the decompression levers one at a time to the vertical running position. If this does not start the engine, call repair staff.

Emergency Towing

(a) Ensure gear lever is in neutral, engine is stopped and handbrake applied.
(b) Engage the neutral lock in the final drive as follows:
   i. Lift cab floor cover off final drive unit and place the neutral lock in the "locked" position i.e. lift ring, turn and allow it to drop into position in the deep slot.
   ii. Move the forward / reverse lever to ensure that the neutral lock engages.
   iii. Check that the driveshaft between the final drive and the gearbox can be turned by hand, or when tractor is being towed check that the driveshaft does not turn.

(c) Release air brake and open drain cocks to exhaust air pressure from the reservoirs.

(d) Switch off main switch.

(e) Release handbrake when the assisting locomotive has been coupled up and is ready.

Note: when towing to another station or depot the side rods must be removed by repair staff.

Control Air Pressure in Emergency – Auxiliary Hand Pump

(a) If the engine or compressor fails and air pressure is required for engaging the neutral lock, a hand air pump is fitted under the control panel on some TR's.
(b) Operate the three way air cock under the control panel to connect the pump to the gear control valve, and pump sufficient air for control operation.
(c) Remember that the tractor should not be driven unless 400 kPa (60 PSI) is available for the gearbox and for the air brake.

7.0 FAULTS – TR 586, 592 & 655-799

(a) Oil Pressure Warning Light Lights Up, or Oil Pressure Falls Below 170 kPa (25 PSI)

Stop engine immediately and check oil level. Top up if necessary. If oil level is OK then call repair staff.

(b) Overheating (i.e. if engine water temperature exceeds the normal 60-70ºC (140-160ºF)

Stop engine and check fan belts. If belts are loose call repair staff, if belts are OK wait for temperature to cool, then check radiator water level, and top up if necessary. If overheating or loss of water continues call repair staff.

(c) Leaking Hydraulic Coupling (tractor will have less pulling power and hydraulic coupling will overheat).

Advise repair staff and keep hydraulic coupling topped up.

Note: The unit should not be completely filled. The correct level is obtained by rotating the engine until the hydraulic coupling filler plug is at 45º (24 teeth) from the vertical. Fluid should be up to the filler hole level.

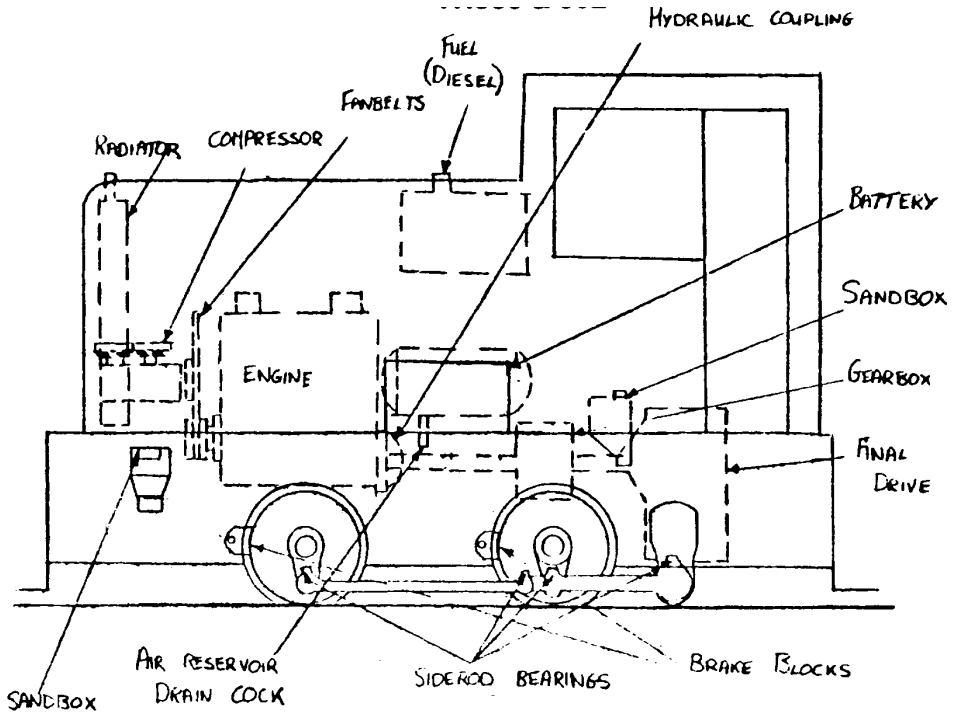
Unusual Operation

If anything unusual occurs, e.g. noises, slipping in gear, battery not charging, overheating, loss of water or oil etc; the tractor should not be used until the repair staff are advised and repairs carried out.

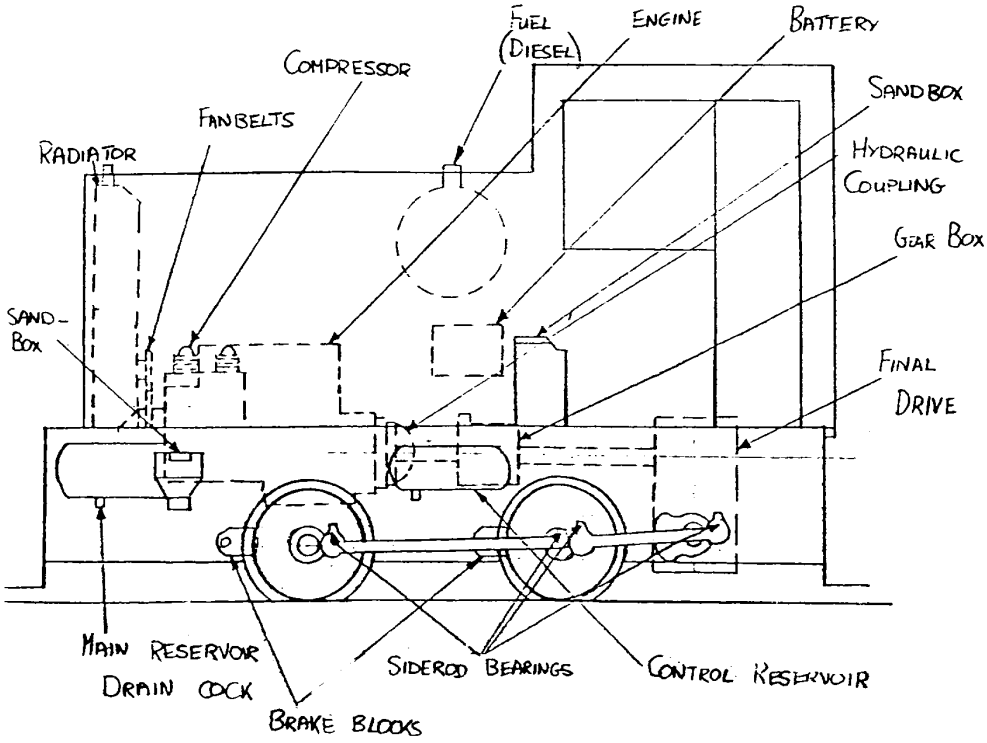
Minor Defects

Minor defects should be noted in the defect book for attention by repair staff on the next visit.

8.0 DIAGRAM - TR586 & 592



TR655-799



TR 816-868 Hitachi (185 hp, 20 tonne), Diesel Hydraulic Rod Drive

9.0 SERVICING

Before starting the engine check:

1. Radiator is full. There are two test cocks inside engine room
2. Fuel tank contains an adequate supply of fuel and cock in fuel line under tank is turned ON.
3. Engine sump, torque converter, reverse box, final drive box and air compressor oil levels are correct.
4. Vee belts are satisfactory.
5. All drain and operating cocks are correctly positioned.
6. Brake blocks, brake rigging and spring gear is in good order.
7. Handbrake is on.
8. Throttle control handle is at idle, converter control handle and reverse control handle are at neutral.

Starting Engine

1 Close the battery isolating switch.
2 Ensure the auxiliary switch for engine start is in the 'OFF' position and the start switch is in the 'RUN' position.
3 Check the following lights are displayed.
   a. Engine oil pressure
   b. Neutral converter
4 Place the start switch in the start position; this must not be held in this position for longer than 30 seconds. If the engine does not fire and run in this time the switch must be released. Before placing the start switch again in 'start' the starter motor must have been at reset for 40 seconds. If the engine does not start after three attempts, the fault must be found and rectified before operating the start switch again. It may be necessary to move to ¼ throttle to allow the engine to fire.
5 When the engine starts and runs, ensure the oil pressure builds up and the oil pressure light goes out. If pressure does not build up in 10 to 15 seconds stop the engine and check the lubricating oil system.

After the Engine has Started and Settled Down

1 Check engine oil pressure is in normal range 20 PSI to 60 PSI.
2 Switch the auxiliary start switch to 'ON' but not before the lubricating oil shows in the normal range on the gauge.
3 Ensure the start switch has returned to "RUN" position.
4 Make an inspection of the engine and tractor for fuel, oil, water, lube oil and air leaks. Listen for any unusual sounds and recheck engine oil level.
5 Check that the torque converter oil pressure (red hand) and clutch (black hand) oil pressure show in the normal range.
6 Ensure the battery ammeter shows a charge. Check that main reservoir pressure is between 85 PSI and 100 PSI and control air pressure is at 70 to 72 PSI.
7 Test the brake valve in different positions and check brake cylinder travel (Adjust if necessary).
8 Place the reverse control handle in Forward and Reverse positions and check the F or R indicating light is illuminated when each position is engaged. **The reverse control lever must not be operated until control air pressure is correct.**
9 Place the TC control handle in the torque converter position and check that the torque converter charging oil pressure is between 85 to 114 PSI and the hydraulic indicating light is displayed.

10.0 DRIVING

When all preparation duties have been carried out and the tractor is ready to move, release the handbrake and proceed as follows:

1 Turn on the necessary lights and ensure all gauges are showing the correct pressures
2 Place the reverse control handle in the direction required. (This must only be done with the tractor stationary). Check the correct indicating light is displayed.
3 Sound horn, move the TC control handle to the TC position; this position **must** always be used when starting off. Release air brake.
4 When the torque converter light is displayed, move the throttle control handle to increase the fuel supply to the engine and the tractor speed will increase. Throttle operation should be performed according to the load of the train.
5 If wheelslip occurs, decrease throttle and use sand.
6 If tractor speed increases to **10 km/h** Direct drive can be used. To engage direct drive proceed as follows:
   a. Hold the throttle lever in the same position.
   b. Move the converter operating handle from TC drive to Direct drive.
   c. When the changeover is complete the direct indicating light will be displayed.
   d. Engine speed will pick up and road speed will increase.

Note: it must be remembered that before changing to Direct drive, always ensure that conditions are favourable for this drive to be used and never exceed the top speed of **20 km/h.**

If the correct road speed cannot be maintained in Direct drive, torque converter drive must be re-engaged.

The following speeds must be maintained in the different drives:

Torque converter drive	3.5 km/h to 10 km/h
Direct drive	10 km/h to 20 km/h

Stopping

a. Close the throttle.
b. When the road speed decreases to torque converter speed range move the control handle from Direct to Torque converter and then use the brake as required to stop the tractor.

Note: The Direct drive clutch must never be left engaged below its operating range but the Torque converter drive clutch may be left engaged when stationary except when:

a) The tractor is to change direction.
b) The cab is to be left for any reason
c) The engine is to be stopped
d) The tractor is to be put away
e) The tractor is to stand for more than 10 minutes
f) The engine speed is to be increased to enable air pressure to be built up quickly.

The following TR locomotives are equipped with train brakes – 822, 851 and 868.
When shunting “air connected” a coupling link must be used between the TR and the first vehicle; this vehicle may be a runner wagon but must have fully operational brakes.
These precautions are to ensure at least one wagon is always able to provide adequate braking for the TR if an uncoupling occurs in the air braked rake.

Coasting

When the tractor is in motion the correct speed range for the different drives must be maintained and the tractor **must not be** allowed to coast with the converter control handle in the neutral position. At all times, except when being towed dead, one of the clutches must be engaged; which one depends on what speed the tractor is travelling at.

Reversing

When the direction of travel is to be reversed, proceed as follows:

a) Bring the tractor to a stand.
b) Place the converter control handle at neutral.
c) Check the converter neutral light is showing.
d) Place the reverse control handle in the new direction.
e) Check the correct indicating light is displayed for F or R.
f) If the reverse clutch does not engage correctly leave reverse control handle in the direction required and engage torque converter drive for a second and then disengage.

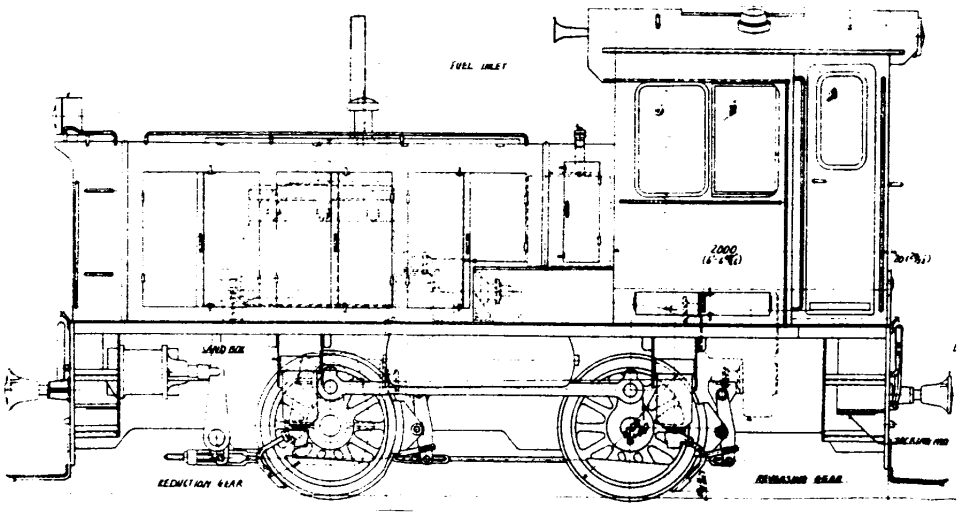
Putting away

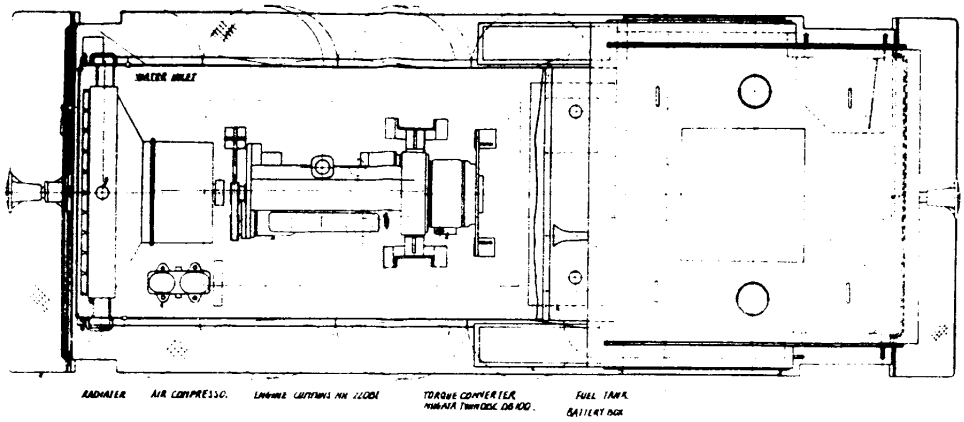
1 Take fuel, sand and water and check engine while running.
2 Stop the engine by placing the start switch to 'Stop' position.
3 Ensure the torque converter handle and reverse control handle are at neutral.
4 Apply the handbrake.
5 Open main reservoir drains.
6 Turn off all switches.
7 Open battery isolating switch.
8 Examine all running gear and adjust brakes if required.
9 Check all oil levels and top up if necessary.
10 Book all defects, report any serious ones.

Towing Dead

a) Stop the engine.
b) Open the battery isolating switch
c) Place the brake valve in the release position.
d) Place the reverse control handle and torque converter control handle at neutral.
e) Screw back the lock nut on the set screw on the air motor of the reverse box. Screw in set screw fully and tighten lock nut.
f) Check that the driveshaft does not rotate when the tractor is moved slowly.

11.0 DIAGRAM -


FUEL INLET
SAND BOX
REDUCTION GEAR


RADIATOR
AIR COMPRESSOR
TORQUE CONVERTER
FUEL TANK
BATTERY BOX

12.0 No. 4 BRAKE

The No.4 Brake has been fitted to some TR Shunting Locomotives.

This brake valve has these positions:

- Release
- Running
- Lap
- Service
- Emergency

Release Position
This position is used to release the train brakes and or recharge the brake pipe. It allows main reservoir air flow to direct into the brake pipe.

Care must be taken not to have the brake valve handle in this position for too long a period otherwise the brake pipe pressure will increase above 80 psi (550 kPa), causing the brakes to remain applied.

Running Position
This is the normal position of the brake valve handle. In this position the brake pipe pressure is maintained at 80 psi (550 kPa). Do not use this position to release the brakes as the brakes may not release fully causing dragging brakes.

Lap Position
The brake valve handle is placed in this position after a service application of the brakes has been made. It stops any further loss of brake pipe air to atmosphere (other than for brake pipe leakage). This position holds the brakes applied.

Service Position
This position is used to apply the brakes. Once the required brake pipe pressure reduction has been made, place the brake valve handle in Lap.

The initial reduction of brake pipe pressure should be between 7 and 8 psi (50-60 kPa). Further reductions can be made to stop the train as required. After the train has come to a stop the brake pipe reduction should be increased to 15psi (100kPa) before releasing the brakes. This greater reduction allows a better release of the train brakes. Do not make a reduction of greater than 215 psi (175 kPa). The brakes are fully applied at this stage and will not go on any harder.

Emergency Position
This position is only to be used in an emergency. It will dump the brake pipe air directly to atmosphere; the brakes will apply rapidly and with full force.

Do not release the brake until the train comes to a stop, otherwise the locomotive may run out causing the train to break in two.

Testing

1 Straight air brake fully applied.
2 Ensure that all pressure are correct –
   i. Brake pipe pressure 80 psi (550 kPa)
   ii. Main reservoir pressure 110 psi (760 kPa)
3 Make a 10 psi (75 kPa brake pipe reduction then place the brake valve handle in Lap. Close the brake valve isolating cock.
4 Place the brake valve handle in Running.
5 Check that the brake pipe pressure does not fall more than 3 psi (20 kPa) per minute.
6 If all is correct cut in the brake valve isolating cock and release the brakes.

Over charged Brake Pipe

Make a series of brake pipe reductions and releases as per the following:

1. Make a 15 psi (100 kPa) reduction.
2. Place the brake valve handle in Lap
3. Wait until pressures have equalized and the main reservoir pressure is between 95 psi and 100 psi (650-750 kPa). The higher the pressure the better the release.
4. Place the brake valve handle momentarily in the release position, then move the handle back to the running position.
5. Wait until the pressures have again equalized before making another brake pipe reduction as above.
6. Repeat this sequence approximately 4 or 5 times.
7. If the brakes still do not release it will then be necessary to release the brakes by hand, by the operation of the triple valve release wires.

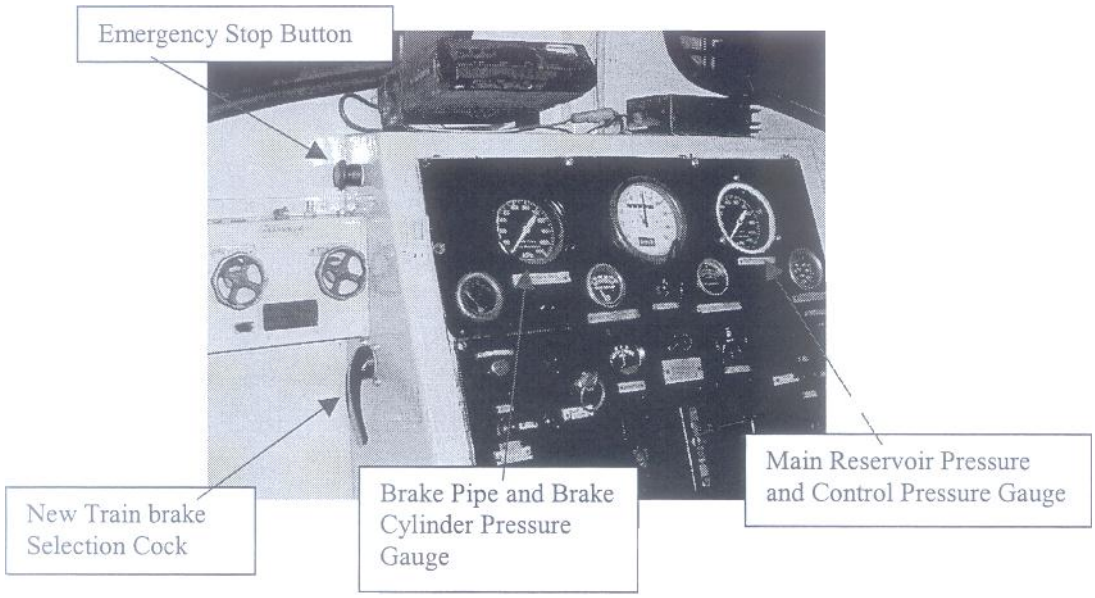
13.0 BRAKES TR894-966

These locomotives are being fitted with a Brake Pipe Control Valve to allow the control of the brakes on attached wagons.

Independent Brake Control

The 'W' Type Straight Air brake which is used to control the brake on the locomotive is unchanged

Train Brake



Set Up

There is a selection cock located on the left hand side of the central control desk.

This is a three position cock, in the central position isolates the Train brake system completely, moving the cock forward activates the B Side Desk, while moving the cock backwards will activate the A Side desk.

The active desk is indicated by a **green** pressure indicator.

Note
You can still apply the brakes from a 'deactivated' desk i.e. if the selection cock is in 'isolate' or selected to the other desk. The selection cock only prevents charging of the brake pipe.

Train Brake Control Valve in each Control Desk

The Brake Pipe Control Valve provided on each desk is a three position valve.

Apply

When in this position, the Brake Pipe is being exhausted at a controlled rate, and hence will result in a brake application on the Locomotive and the attached wagons.

The size of the brake application (Brake Cylinder Pressure) will depend on how long you leave the Brake Pipe Control Valve in the APPLY position.

When the desired amount of braking is obtained, return the Brake Pipe Control Valve to the LAP position.

Dropping the Brake Pipe pressure below 400kPa will not result in any further brake cylinder force.

If an independent air brake application is made to the locomotive prior to the Train Brake application, the brakes on the locomotive will come on further when the train brake application is made. A safety release valve will prevent the Brake Cylinders on the TR from over charging. The brakes on the wagon will behave normally

Lap

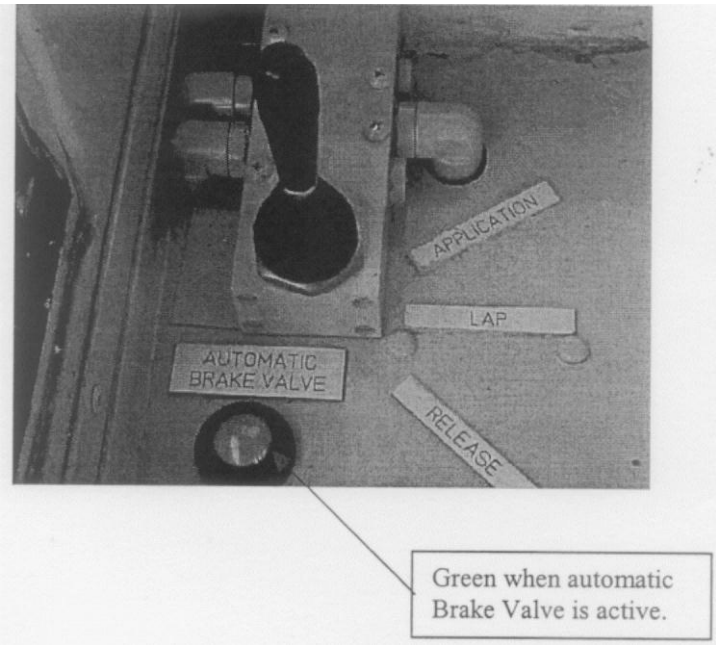
When in this position the Brake Pipe is being blocked, i.e. it will hold its current brake application.

The Brake Pipe Control Valve is not a maintaining valve, i.e. if there are any leaks in the brake pipe, the pressure will slowly drop over time and hence the brakes may apply.

Release / Charge

When in this position it will allow the charging of the Brake Pipe up to a maximum pressure of 550kPa and hence release the brakes on the locomotive and the attached wagons.

Due to the capacity of the compressor on the TR tractors it may take longer than other locomotives to release the brakes.



Emergency STOP Push Button
There is an emergency stop push button on each side of the control desk, which allows the brake pipe pressure to be quickly dumped to atmosphere and hence a rapid full brake application is made to the locomotive and the attached wagons.

To release the Emergency Stop, the push button is required to be twisted to get it to pop out and release, then the Brake Pipe Control Valve needs to be placed into the Release / Charge Position.

Low Main Reservoir Capacity
While charging up of a rack of wagons the main reservoir pressure on the TR may drop considerably, due to its relatively small capacity. Always ensure that the Brake Pipe is fully charged 550kPa and the main Reservoir is also above 500kPa prior to moving the locomotive under power.

Shut Down and Start Up Practices
Prior to shutting down the locomotive ALWAYS ensure that the clutch is disengaged, the air and hand brakes are applied. Failure to do so may result in the locomotive moving away under power upon start up.

14.0 MAXIMUM LOAD ON GRADES

Grade								
TR Group	1 in 40	1 in 50	1 in 60	1 in 70	1 in 80	1 in 90	1 in 100	Level
315-413	50	66	80	102	116	135	147	160
436-511	48	62	76	87	111	129	140	153
534-592	63	83	101	128	147	171	186	202
603-649 & 989	62	81	100	126	145	168	181	200
655-799	55	72	89	114	130	152	165	184
816-868	72	93	114	143	14	190	203	225
874-966	75	97	119	150	171	198	215	235