

LOCOMOTIVE ASSISTANT-TO-ENGINE DRIVER 2ND-GRADE – *MECHANICAL* EXAMINATION Q & A (North Island)

1. When should the driver check the sump-oil level on a diesel engine, and how can fuel dilution be detected?

When taking a locomotive into service, at intervals when on the road, and when putting a locomotive away. Fuel dilution can be detected by keeping an eye on the oil pressure gauge, and by checking the engine sump oil level. Fuel dilution will mean an increase in the engine sump oil level.

2. What are the indications and what action would the engine driver take if a turbo-blower fails?

- Greater-than-usual vibration
- possibly some noise
- overheating of the bearings
- overheating of exhaust manifold
- loss of power and black smoke if in higher notches.

Inspect the turbo-blower. Stop the engine immediately and fit the locking plate. To do this, drain the oil from the turbine and remove the end covers. Remove the oil pump cover plate and secure the shaft in position with a locking plate. Replace the end cover and book the matter.

The locomotive can now be worked to a major depot at reduced power. In this case, the driver must be alert for a Hot Engine warning. Reduce trainload if necessary and operate in lower notches.

If there is no locking plate or it cannot be fitted, leave the engine shut down and get assistance.

3. What does the colour of the exhaust gas indicate?

- BLACK- too much fuel being injected, or not interfering being drawn in. Complete combustion is not taking place. Possible causes are blocked filters, supercharger failure, faulty fuel nozzles, faulty timing, or badly calibrated fuel pump(s)
- WHITE- too much air is being supplied for the amount of fuel. The mixture is too lean. Possible causes are blocked fuel filters, faulty fuel nozzles, air entering fuel lines, incorrect valve timing, or water entering cylinder (hydraulic)
- BLUE- lube oil is leaking past piston rings, or excessive lube oil is passing down the valve guides and entering the cylinder via the inlet valve, and is burning. Possible causes are faulty piston rings or worn valve guides
- LIGHT GREY or COLOURLESS - complete combustion is taking place.

4. Describe the operation of a fluid coupling

Vanes in the saucer-like impeller and runner pockets which become filled or partially-filled with fluid (oil). When the impeller is turned or spun by the engine, its vanes tend to rotate the fluid, which in turn tends to rotate the runner. At very low engine speeds, the impeller tends to churn through the fluid and transmits very little power to the runner. In other words, there is almost 100% slip in the coupling.

As engine speed increases, more and more fluid is picked up by the vanes in the impeller and given a "whirling" action inside the coupling. The centrifugal force of the whirling fluid also increases with engine speed and causes the fluid to form a "solid" annular ring inside the coupling, thus tending to lock both impeller and runner as one. The impeller and runner will now turn at almost the same

speed. Note: there is always 1- 2% slip in most hydraulic couplings when delivering full load at full speed.

5. When should the clutch be disengaged on a DSB locomotive fitted with a torque converter?

- when pumping up the train BP pressure and engine speed is increased to allow the compressor to supply more air
- after stopping to reverse the locomotive
- when operating a train down steep gradients and air pressure cannot be maintained at engine idle speed
- when putting the locomotive away
- when the engine is stopped for any reason
- when the cab is left unattended for any reason.

6. State how to prepare a DSB locomotive for towing dead, and the towing speeds allowed.

- stop the engine
- disengage the clutch
- close the brake isolating cock
- place both brake valve handles in RELEASE
- lift cover over final drive
- ensure the deep slot in the locking device is clean
- lift the locking pin and turn it to allow it to drop into the deep slot
- place the Forward/Reverse lever over to REVERSE position and then back to FORWARD position
- check that the locking pin drops fully into the deep slot
- book in the repair book that the final drive is isolated (remove side-rods if necessary). Note:
[1] if there is no Main Reservoir air pressure, use the hand pump to operate the reverse gear.
[2] Towing speed with side-rods removed is 40 km/h. Towing speed without side-rods removed is 24 km/h.

7. How would you reset the automatic shut-off device on a DSB locomotive, and what reasons would cause it to operate?

The device has two push buttons with a knob underneath. To reset, push in the top button and push the bottom knob up until the shut-off mechanism latches. The knob will stay up when correctly latched.

Possible causes of operation are low oil pressure, high water temperature, engine overspeed, or operation of the manual Stop button.

8. What is Dynamic Braking, how does it operate, and how is the amperage controlled?

It is a form of speed retardation that operates only on the locomotive and is obtained by changing the traction motors into generators. When acting as generators the traction motors are forced to turn inside a strong magnetic field. This tends to prevent the armature and hence the driving wheels from rotating, and therefore a retarding force against the speed of the train is established.

A resistance is connected in the circuit which uses up electricity generated by converting it to heat which is dissipated by resistance-grid cooling fans powered by this electricity.

Amperage, or *braking effort* is controlled by the driver who, by moving the controller or braking selector lever, operates a rheostat to vary the amount of Main Generator excitation, and thus the current to the traction motor field coils.

9. Why are fuses and circuit breakers provided and what must be done if a fuse blows or a circuit breaker trips?

They are safety devices placed in electrical circuits to protect those circuits under fault conditions. If a fuse blows, it must be replaced with another of the same amperage. Isolate the circuit first and test the new fuse for inserting it. Leave the old fuse nearby and book the matter.

If a fuse continues to blow, a serious fault exists and must be located. A tripped circuit breaker must be reset. If it keeps tripping out, a serious fault exists and must be located. To reset, place it to OFF then to ON. If it is a thermal-type circuit breaker, it will be necessary to allow it to cool for a few seconds before it can be reset.

10. What is the purpose of traction motor blowers and why are they necessary?

They provide ventilating air for the traction motors and to cool the traction motor wiring. The ventilating air provided by these blowers reduces the amount of dust and other foreign matter entering the traction motors when the locomotive is moving and keeps the motors at their correct operating temperature.

11. How do you prepare a DA locomotive up to starting the engine after a 12-hour layover (DA 1440 onwards)

Remove the 400A starting fuse and check the following:

- the repair book for faults outstanding
- that the handbrake is applied
- around the bogies
- brake blocks and rigging for wear and adjustment
- traction motor cables and a flexible blower air ducts
- springs, and suspension bearing oil levels
- cowcatcher, drawgear, hose cocks and dummy couplings
- that jumper box covers are closed
- fuel tank, header tank, and sandbox levels
- compressor, governor, and engine oil levels
- airbox drains for discharge (and drain cocks closed)
- air reservoir draincocks closed
- for loose or dragging parts
- Low Oil Pressure button on governor in correct position
- water level gauge-glass cocks open and header tank overflow valve shut
- compressor unloader, fan, and a shutter air cocks correctly positioned
- that all breakdown and spare equipment, jumper cable, and fire extinguishers are in correct places
- that the Overspeed device has not tripped
- open all decompression valves 3 turns, and bar the engine over one revolution. Report any discharge
- if no discharge, tighten relief valves firmly
- fuel, oil, and water leaks
- remove waste or any other fire hazard from the engineroom.

12. Starting the diesel engine and checks to be made after starting (DA 1440 onwards)

- Replace 400A starting fuse
- close knife switches
- check that all circuit breakers are ON
- place Isolation Switch to START
- place Control & Fuel Pump switch ON

- if fitted with a Prime/Start switch, prime the fuel system
- check fuel flow in return sight-glass. Glass should be full, and the fuel free of bubbles
- operate the Engine Start button or switch for not more than 15 seconds and release when engine fires.

After starting, check the following;

- that the battery ammeter shows the charge
- running levels of oil in engine, compressor, and governor
- cylinder test valves for leakage
- lube oil pressure
- for fuel, boil, and water leaks
- that air is flowing from traction motor vents
- the beat of the engine for unusual sounds
- close airbox drain cocks
- that electrical cabinet covers are in place
- all the pressures are correct and the unloader operates at the correct pressure
- that brake gear is set up correctly
- operation of both brake valves
- brake cylinder piston travel, and adjust if necessary
- test sanders, vigilance device, lights, and horn
- that locomotive responds to the throttle.

13. To shut down and isolate a unit in service and care to be taken if a lead unit

- place the Isolation Switch to START and stop the engine
- trip the Fuel Pump circuit breaker
- leave all knife switches closed
- leave the Control & Fuel Pump switch, Engine Run switch, and Ground Relay switch (on drivers control stand) in ON position
- on DA 1400-1439 lock the Reverser switch in NEUTRAL
- from the lead unit, operate the controls as normal to control the other units irrespective of which unit has been shut down
- reduce the amount of lighting.

When operating in this manner and it is the lead unit which is shut down, the battery on this unit is being used to control the trail unit, and as it is not on charge it will in time become flat and all control circuits will be lost. To overcome this possibility, the units should be reversed at the first possible opportunity.

On the Trail unit, Place the Isolation Switch to START and stop the engine, open battery knife switch, lock Reverser switch in NEUTRAL (if DA 1400-1439) and a check the Brake switch it is in the BRAKING position.

14. State the procedure for starting off and notching up with a 500-tonne goods train, and a state and bridges allowed (DA)

- release all brakes (if on the gradient release as far as is safely possible)
- open the throttle and if necessary advance through the lower notches, pausing briefly between each movement until the train begins to move
- if on a gradient, release the brake
- as the train begins to move, reduce the throttle if necessary to ensure a smooth take-up of any slack
- after the train is fully stretched, advanced the throttle one notch at a time keeping a check on the driving ammeter taking care not to exceed the maximum allowable amps

- weight until the rising ammeter needle becomes steady before advancing the throttle another notch
- watch the wheelslip light and reduce power and apply sand if the locomotive slips excessively.

Maximum amperage allowed when starting is 490 amps, which must only be used for ¼ of an hour. 455 amps may be used for half-hourly intervals, 435 amps for periods of not more than one hour, and 406 amps may be held continuously when driving. In other words, the ¼-hour rating = 490 amps, the ½-hour rating = 455 amps, the 1-hour rating = 435 amps, and the continuous rating = 406 amps.

15. State the procedure for coupling two 1440-model DA locomotives in multiple, and what tests must be made after coupling?

- bring the locomotives together and make the mechanical coupling using a kidney hook. Couple all hoses on one side and open the coupling cocks. Couple side chains
- place both Isolation Switches to START
- in the cab to be used for driving APPLY the Independent brake and place the Automatic brake valve handle to RELEASE. Place the brake valve cut-off valve to IN and the MU2A valve to LEAD
- in the non-operating cab, place the cut-off valve to OUT and the MU2A valve to TRAIL. Place the Automatic brake valve handle to HANDLE OFF and the Independent brake valve handle to RELEASE
- place all switches on the drivers control stand to OFF
- centre the Reverse lever, place Selector lever in OFF, and remove the Reverse lever which must be placed in the electrical cabinet
- check pins in jumper boxes and ensure the jumper heads are clean
- insert the jumper plugs and ensure that each one is completely home and held tight by the catch on its jumper box lid
- if going into service, fully prepare each locomotive
- on the lead locomotive, set the headlight control switch to the applicable position and test headlights, horn, vigilance, sanders, and both brake valves in all positions
- place Isolation Switch on the trail locomotive to RUN and turn all other switches off. Proceed to the lead locomotive and test the operation of the jumper cable.

16. Describe the Start circuits of DA locomotive No. 1440

- with the main battery knife switch closed, current will flow via the 100A battery charge fuse, the control circuit breaker, and the Control & Fuel Pump switch (ON) to the PC wire to energise the coil of the fuel pump contactor (FPC)
- FPC will now close its contacts allowing a battery feed via the 100A battery charge fuse, fuel pump circuit breaker, and FPC to the fuel pump motor which will run and charge the fuel system
- to start the engine, current is supplied to the PC wire as above and thence via the Isolating switch in START position to the Start button contacts which, when the button is pressed, complete the circuit to energise the coil of GS (generator starting) contactor
- this contactor now closes providing a battery feed via the main battery knife switch, 400A starting fuse, GS positive contacts, main generator (MG) armature, MG series field windings, GS negative contacts, and back to battery negative, thus motoring the MG to start the engine. The circuit is broken when the Start button is released.

17. What is the Load Regulator and what is its purpose?

The load regulator is an automatically-operated rheostat connected in series with the MG battery field. It controls the output of the MG by adding or removing resistance to the battery field circuit, and increasing or reducing MG excitation and thus the load on the diesel engine.

18. What precautions should be taken to prevent a crankcase explosion, and why?

- allow 15 to 20 minutes after stopping the engine before removing crankcase covers
- keep naked lights away from the engine
- after removing the crankcase covers, disperse the gases with a non-electric blower
- if the engine has stopped through seizure (or suspected seizure), no attempt must be made to start the engine or bar it over until it has completely cooled down.

Crankcase gases are ordinarily too rich to support combustion, but if diluted with air they become highly inflammable and possibly explosive.

19. What precautions must be taken when attending to a battery?

- first isolate the battery
- never lay tools or any uninsulated material on top of the battery
- keep naked lights and lighted cigarettes away from the battery
- while the current is flowing, never cause sparks by breaking connections or by other means, as the gases given off by the battery during and after charging are explosive
- do not allow the fluid contents of the battery to come in contact with the skin or clothes, as it is corrosive and burns the area of contact.

20. What precautions must an enginedriver take before allowing electrical equipment to be worked on?

- only authorised persons must be allowed to attend to electrical equipment
- shut down the engine and isolate the battery before touching high-voltage equipment
- don't assume that the equipment is dead. Always make sure
- do not remove or replace high-voltage equipment covers or shields with the engine running
- to authorised persons must be present when observing high-voltage equipment which is live
- it sure that no article being held comes into contact with any live equipment
- before touching low-voltage equipment ensure it is dead, either by switching it OFF or removing its fuse
- if the above is not possible, shut the engine down and open the battery isolating switch
- always ensure the safety of all other persons under your control.

21. Name the types of fire extinguisher and the fires they can be used on

- Carbon dioxide (CO₂): all types of fires but especially electrical fires
- Dry Powder: for all types of fires
- Soda Acid: for free-burning, combustibles such as paper and wood etc. May be used on electrical fires if the circuits are dead and CO₂ or Dry Powder is not available. Do not use on oil or paint fires
- Foam: for free-burning combustible fires, and those involving liquids and semi-solids, e.g. oil, grease, and paint. Do not use on electrical fires
- Carbon Tetrachloride: all types of fires but emits poisonous vapour. Do not inhale, or use in a confined space.

22. Why must a locomotive not stand with power applied to the traction motors for more than a few moments?

The heavy load current applied to the traction motors when they are unable to turn may result in overheating damage being done to the motor as follows. Commutator bars may become burnt and lift, causing brush-bounce when the locomotive moves, which will break brushes and eventually cause of flashover thus disabling the locomotive.

23. What action should the enginedriver take if the battery ammeter on a DA locomotive showed a continual discharge?

- check that the 30A auxiliary generator AG field circuit breaker or fuse (whichever is fitted) is correct
- check that the 250A AG fuse is intact
- check that the 100A battery charging fuse (if fitted) is intact
- check that the battery charging contactor BCC (if fitted) is closed
- if BCC is not closed, check that RCR contacts are closed and clean
- check that the main battery knife switch is closed and the AG knife switch (if fitted) is closed
- book the defect and advise the train control operator
- do not shut down the engine if the battery is low

24. What indication would the engine driver get and what action would he take if the prime mover on a DA locomotive overheated?

A warning bell will ring on the locomotive (on all units if a multiple consist) and a warning light will show on the instrument panel of the affected unit.

- stop the train. Position controls normally. Apply brake
- place Isolation Switch to START
- check water level in the header tank and if low, wait until engine temperature drops to 60° C and top up
- check for leaks in the cooling system and rectify if possible
- if water level is normal check to see if the cooling fan is working and if the shutters are open
- if fan and shutters are not working, check the ear cock to the fan clutch and shutter mechanism
- if the fan is defective, prepare the locomotive for towing
- if the shutters are defective, block them open with a piece of wood
- if fan and shutters are operating correctly, place the GF switch to OFF and the Isolation Switch to RUN
- increase engine speed to notch 4 or 5 to speed up the fan
- when the engine cools, continue working the train but work in a lower power notch if overheating occurs again.

25. Describe the fuel system of a DA locomotive

Fuel is drawn from the fuel tank through a suction filter by an electric, gear-type fuel pump and then forced through a discharge filter to an engine-mounted filter. From here, the fuel flows to the injectors.

Excess fuel not used by the injectors is return through a return sight glass. An orifice restricts the flow of fuel into this glass causing a slight back-pressure of fuel on the injectors. This ensures of a positive supply of fuel to the injectors as long as the fuel pump is operating.

The engine-mounted filter has two sight-glasses and a bypass valve set at 315 kPa (45 psi). The left-hand glass shows the normal state of the fuel system while the right-hand one will only have fuel in it if the bypass valve is open, thus indicating a blocked filter. In the case of a blocked filter, the fuel is bypassing back to the tank instead of being used by the injectors.

The suction and discharge filters are placed in one housing and on the discharge filter side, a 105 kPa (15 psi) relief valve is fitted. This will open and allow fuel to bypass the discharge filter and pass to the engine-mounted filter if the element in the discharge filter becomes clogged.

On the later DA models and on the DB, no discharge filter is fitted.

26. State five reasons for a DA locomotive not moving if the engine speeds up

- if driving amps are obtained, are the brakes applied?
- the throttle may require to be advanced (if so, reduce as the train moves so that slack can be taken-in slowly)
- the Reverser may be in the wrong direction or the Selector lever may not be in RUN (or position 1)
- the 80A battery field fuse may not be intact
- BF contactor not closed and clean.

27. State the procedure to test the jumper cable between two DA locomotives coupled in multiple

- set up all controls on both locomotives
- on the lead locomotive, turn the Isolation Switch to START and the GF switch to OFF
- advance the throttle to notch 4 or 5 and check that the trailing unit's engine responds
- return the throttle to IDLE and turn the GF switch ON
- release all breaks and place the Reverser in direction of travel
- notch up until the trail unit pushes the lead unit
- return the throttle to IDLE and place the Isolation Switch to RUN
- open the throttle and check that driving amps are obtained on the lead unit and that the engine responds.

28. What action would the engine driver take if a DA engine rotated but did not fire?

- check that the decompression relief valves are closed
- if the engine won't turn past the first compression, check for water in the cylinders (bar the engine over) or check to see if the battery is discharged (if so rest the battery for 10 minutes and check battery fluid level)
- check to see if the fuel pump motor is running. If not check the following:
- that the fuel pump circuit breaker is not tripped
- that electrical connections to the fuel pump motor are secure
- that the fuel pump contactor FPC is closed and clean
- that the fuel pump motor brushes are in good order

If the fuel pump motor is running, check the following:

- fuel level in tank
- coupling between fuel pump and motor
- that the overspeed device has not tripped
- that the low oil pressure button LOP on the governor is IN
- that the return sight-glass is full
- that there are no suction leaks in the fuel piping
- that the suction filter is not blocked
- check that engine sump and governor oil levels are correct.

29. What action by an engine driver could cause a traction motor flashover?

- poor driving habits
- excessive wheelslip causing traction motor overspeed
- standing in power with brakes applied
- failing to notch back when passing over points, level crossings, or crossovers at speeds above 56 km/h.

30. What faults would the engine driver look for if a DA engine rotated but did not fire, and the fuel pump is running?

The answer to this question is contained within the answer to question 28.

31. Why might the brake transfer switch BKT on a DA locomotive not throw to POWER position although all controls are in their normal positions. What action would the engine driver take?

- lack of control air pressure (ensure control air cock is open and that pressure builds up)
- BK contactor stuck closed (check and remedy if possible. If unable to obtain control air pressure, operate manual pushbuttons on BK to throw it to the correct position. If necessary, use the bar provided to manually turn the reverser switch by inserting the bar through the hole in the nut on the lower end of the reverse of switch shaft).

32. What would cause a DA engine not to rotate although the fuel pump is running?

- 400A fuse blown
- Isolation Switch not at START position
- brake transfer switch BKT (if fitted) not in correct position (top left-hand contacts making)
- faulty contacts of Start button or switch
- GS1 and 2 not closed and clean
- battery discharged.

33. Why might a DA engine fire but fail to keep running?

- Start button or switch not held long enough
- fuel system not primed (if fitted with Prime switch)
- low oil pressure button LOP on the governor may be OUT
- fuel pump circuit breaker may have tripped
- control circuit breaker CCB may have tripped
- overspeed device may have tripped after the engine started
- possible fault in fuel system
- on locomotives fitted with a Prime/Start switch, the 250A and 30A fuses may not be intact, causing the fuel pump motor to stop running. If so, the battery ammeter will show a discharge or no charge
- Boyle may be called causing high suction which would in turn cause the low oil pressure button LOP to come OUT
- if the engine stops after the Isolation Switch is turned to RUN, the throttle lever is in the EMERGENCY STOP position.

34. State four reasons the battery field contactor BF on a DA locomotive will not close although the engine speeds up when the controller is notched up

- GF switch on driver's panel is OFF
- We also realise on the wire to BF coil (if fitted) not closed and clean
- interlocks of BK on wire to BF coil not closed
- interlocks of GS 1 and 2 not closed.

35. What would cause a DA engine to go to IDLE with the fuel pump still running?

- ground relay GR may have tripped
- pneumatic control PC switch may have tripped
- engine run ER switch is turned OFF
- the cable to the governor may be loose
- the Isolation Switch has been turned to START position.

36. What would prevent a DA engine from rotating when the Start button is pressed? Note, fuel pump not running

- battery discharged or battery connections insecure
- battery knife switch OPEN
- Isolation Switch not at START
- 100A battery charge fuse (if fitted) not intact

- control circuit breaker CCB tripped
- control & fuel pump switch OFF
- control knife switch (if fitted) OPEN.

37. If the 250 or 30A fuse blew on a DA locomotive fitted with a Prime/Start switch, what would be affected?

The auxiliary generator would not give an output and charge the battery or run the fuel pump.

38. What might cause the Engine Run relay to de-energise on a DA locomotive and what action would begin to drive it take if this happened?

- FPC (if fitted) on wire to ER coil has opened
- GR has tripped (Reset)
- Isolation Switch has been turned to START. Return the switch to RUN
- PCR has opened. Regain brake pipe pressure
- ER switch this OFF (turn ON)
- CCB has tripped (Reset).

39. What are the engine driver's responsibilities regarding booking and reporting repairs?

The driver must enter in the Loco 54D repair book on each locomotive any defects or malfunctions he finds or notices while the locomotive is under his care. He must examine this book whenever he prepares a locomotive for service, to see that all repairs for the locomotive have been signed off.

If the locomotive is not running into the main depot, any need for repairs of an urgent nature must be reported to the nearest Locomotive Supervisor by telephone or telegraph.

When changing over en-route, the engine driver must inform his opposite number of any defects noticed in or bookings made to the locomotive he is handing over.

Entries must be concise and legible. Do not soil the book all write abuse in it.

40. Describe how to prepare a DX locomotive for towing dead.

- set up the 26L air brake as follows:
- brake valve cut-out valve to OUT position
- Automatic brake valve to HANDLE OFF position
- Independent brake valve to RELEASE position
- MU2A valve to LEAD OR DEAD position
- OPEN Dead Engine Device
- lead the No. 2 main reservoir to 350 kPa (50 psi)
- place throttle and selector levers to NEUTRAL
- place EC switch at STOP and leave there. When engine has stopped, open the battery knife switch
- place the reverser lever to NEUTRAL, remove the handle, and place in the driver's-side number-light box
- turn off all light and heater switches
- open CCB
- manually centre the reverser switch and check that the brake transfer switch is in BRAKE position.

41. What indication would the engine driver get and what action would he take if the GR tripped on a DA locomotive?

- the engine of the defective unit will return to 'Idle' unless the throttle is in notch 5 or 6, in which case the engine will shut down. In both cases all power will be lost
- an alarm bell will ring on all units and a light will illuminate on the driver's panel of the affected unit
- to reset, place the throttle at IDLE (stop the train if necessary)
- place the Isolation Switch on the affected unit to START and press the Reset button
- restart the engine if necessary and turn the Isolation Switch to RUN. The warning light should be extinguished and the bell silent
- notch up carefully
- if GR continues to trip, reset and operate in a lower notch
- book the matter
- if unable to continue, obtain assistance.

42. Describe the start circuits of a DX locomotive.

- with the main battery knife switch BS closed, a battery feed can now flow on the 49 wire via the auxiliary generator circuit breaker AGCB to the 50 wire and fuel pump circuit breaker FPCB, to the 16 wire. With the EC at START, current can flow from the 16 wire via the fuel pump test switch FTS, contacts 6 and 8 of the EC switch and the crankcase over pressure switch CPS, to the fuel pump relay coil FPR
- being now energised, FPR coil closes FPR contacts and allows current to flow to the fuel pump motor from the 16 wire to run the fuel pump
- with the EC switch in START, current also flows from the 16 wire via FTS, contacts 3 and 5 of the EC switch, and an auxiliary contact of the alternator field contactor AF to the coils of cranking contactors CK1 and 2
- CK1 and 2 will now close their main contacts. CK1 completes a circuit from the 49 wire to the auxiliary generator crank field and the armature of the auxiliary generator which now becomes a series motor. CK2 completes a circuit from the 49 wire so that the exciter generator also becomes a series motor. These two series motors will now crank the engine until it fires and runs.

43. What are the causes if a DX engine rotates but does not fire?

- emergency stop switch ESS not turned to RUN or throttle is in the EMERGENCY STOP (DX 2615 onwards)
- LOP, LWP, or CPS lights may be illuminated
- decompression relief valves not closed
- fuel pump motor not running or fuel pressure not sufficient
- overspeed governor may have tripped (also check that LOP and LWP buttons on the back of the governor are properly set)
- fuel tank empty or possible fuel line leakage
- air in fuel lines
- incorrect governor oil level
- if the engine won't turn past the first compression, check that the battery is not discharged and that the battery fluid level is correct (use lights to test for low battery charge)
- open decompression relief valves and turn the engine over again. Watch for water and fuel in cylinders
- if the engine fires but fails to keep running, try another start, but ensure EC switch is held in PUMP position after the engine fires and until oil pressure develops. Recheck the overspeed governor.

44. What are the causes if a DX engine will not rotate?

- CK1 and 2 are not closing
- EC switch is not fully in START position
- BS is open
- AGCB is open
- FPCB is open
- AF is closed but auxiliary contacts not closed and clean
- FTS is in TEST position
- battery is discharged or battery connections are loose.

45. What are the causes if a DX engine goes to IDLE after operating normally?

- 'alternator overload' or 'paper filter warning' lights may be illuminated. They will be accompanied by an alarm bell
- PC may be open
- DMR (safety control relay) contacts not clean and closed
- ROR has tripped - warning light illuminated (only on DX 2615 onwards)
- GR tripped - alarm bell ringing
- jumper connection to governor is loose
- fuel fault - engine hunting
- if engine speed will not increase after coming out of 'dynamic brake', check that BKCR1 is not stuck in the ENERGISED position.

46. What are the causes if a DX engine stops after operating normally?

- check for COP, LOP, LWP warning lights illuminated. All will be accompanied by an alarm bell
- the overspeed governor may have activated
- engine start switch ESS may be at STOP or (on DX 2615 onwards) throttle may have been placed in EMERGENCY STOP
- fuel tank may be empty
- FPCB may have tripped.

47. What are the causes if a DX locomotive will not move when the throttle is opened and AF does not close?

- AOLR light illuminated
- GR tripped
- CK1 and 2 stuck closed and there are auxiliary contacts not closed and clean
- reverser low voltage contacts not closed and clean and BKT in POWER position
- BKCR2 not closed and clean (relay de-energised)
- ROR opened (DX 2615 onward).

48. State three reasons why BKT on a DX locomotive doesn't throw to POWER position.

- brake switch tow relay BKR not energised
- no control air pressure
- control air cocks are closed.

49. What action must the engine driver take if AOL is illuminated on a DX locomotive?

Close the throttle and operate the reset button AOLR. After resetting, notch up. If the device trips again, reset and work in a lower power notch. If the device continues to trip, prepare for towing and book the defect.

50. What action must the engine driver of a DX locomotive take if ROT is illuminated?

Stop the engine, and check all driveshafts to the equipment blower (check to see if the driveshaft attached to the fan can be turned by hand. If so, prepare for towing). If all seems correct, restart the

engine and if the light extinguishes, continue. If the light stays on, shut down and prepare for towing. This light can only be extinguished by stopping the diesel engine and then restarting it.

51. What is the purpose of the Power Match switch, where is it located, and when is it to be operated?

When operated, this switch lowers the balancing speed of a DX locomotive to 21 km/h. It is in the bottom left-hand side of the auxiliary control compartment and must be placed in the MATCHING position when the locomotive is working in multiple with a DA locomotive. Normally, the balancing speed of a DE locomotive is 28 km/h whereas the balancing speed of the DA is 20 km/h.

52. What action must the engine driver of a DX locomotive take if COP is illuminated?

Check the engine to see if a crankcase explosion has taken place. Don't open crankcase doors if there has been an explosion. Check the engine sump to see that it is not overfull. If all seems correct, reset the device, and restart the engine. If the device operates again, prepare for towing. Book the defect.

53. What action must the engine driver of the DEX locomotive take if PRL is illuminated?

Reset traction motor excitation by using the switch provided on the MD734 card in the auxiliary control compartment. If the excitation again reverts to the 'emergency mode' after 5 to 8 seconds (as indicated by the Power Reduction Light) all the excitation cards should be checked to see that they are securely in place. If so, do not reset the excitation. If the gradient allows, work the train at low speed to the nearest loop or siding and request assistance. The locomotive may be operated as a light engine while in the 'emergency excitation' mode.

54. Where are wheelslip brake cut-out cocks located?

- DA, DB (1000-1004), DI, DJ: one cock on each bogie, engine driver's side
- DB (1005-1016): front bogie cut-out cock is on the compressor-room floor on the engine driver's side. The rear bogie cut-out cock is in the fan room on the engine driver's side



CIRCUIT PROTECTION – DA-class LOCOMOTIVES

1400-1439: 400A starting fuse, 250A auxiliary generator fuse, 80A battery field fuse, 30A auxiliary generator field circuit breaker

1440-1451, 1472>, All DBs: 400A starting fuse, 250A auxiliary generator fuse, 100A battery-charging fuse, 80A battery field fuse, 30A auxiliary generator field fuse

1452-1471: Same as DB above, except no 100A fuse

1452>, All DBs: Utilise a 'blocking rectifier' instead of a battery-charging contactor and a Reverse Current Relay

