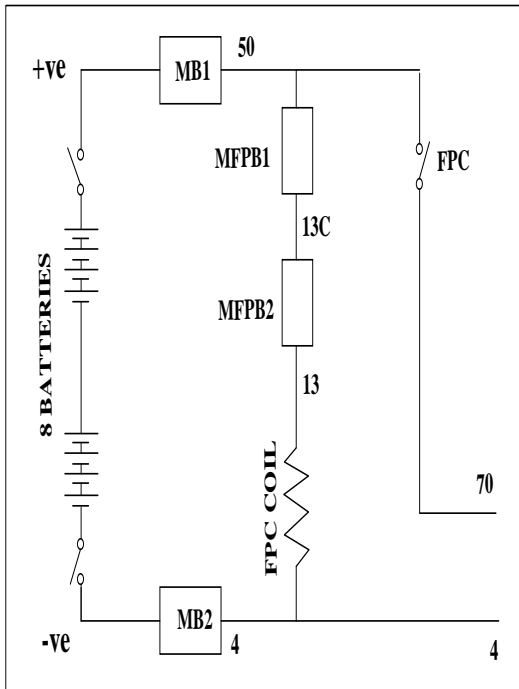
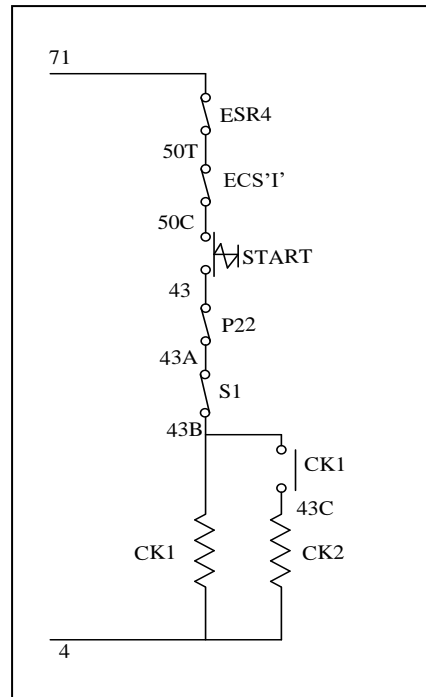


TROUBLE SHOOTING (ELECTRICAL)

I. ENGINE NOT CRANKING:



A



B

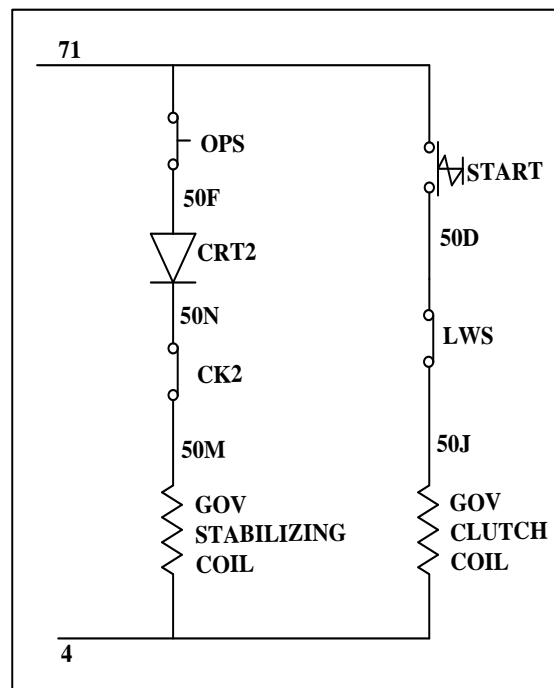
A FUEL PUMP CONTACTOR MAY BE IN OPEN CONDITION.

1. Battery knife switch may be in open.
2. MB1 may be tripped or defective. (49 - 50)
3. MB2 may be tripped or defective. (44 - 4)
4. MFPB1 may be tripped or defective (50 - 13C)
5. MFPB2 may be tripped or defective (13C - 13)
6. Fuel pump contactor coil may be in open (13,4) or defective contactor (50-70)

B. CK1 AND CK2 CONTACTORS NOT CLOSING

1. Fuel pump breaker may be tripped or defective. (70 - 71)
2. MUSD1 may be in stop or defective
3. MUSD2 may be in stop or defective
4. ESR4 N/C interlock defective (71 - 50T)
5. ECS may be in RUN or defective N/C interlock in ECS idle (50T -50C)
6. Defective start button (50C - 43)
7. Defective P22 N/C interlock (43 - 43A) or contactor may be welded.
8. Defective S1 N/C interlock (43A - 43B) or contactor may be welded.
9. Defective CK1 contactor coil (43B - 4)
10. Defective CK1 bridge interlock when CK1 is in closed (43B - 43C)
11. Defective CK2 contactor coil (43C - 4)
12. Defective traction generator.

II. ENGINE CRANKING BUT NOT FIRING:



A:

1. OPS may be struck up in pick up position (switch in open condition) or defective switch (71 - 50F)
2. CRT2 may be open circuited (50F - 50N)
3. CK2 N/C bridge inter lock may be defective (50N - 50M) or in open.
4. Amphinol plug (GE Gov.) may be slack (50M - 4)

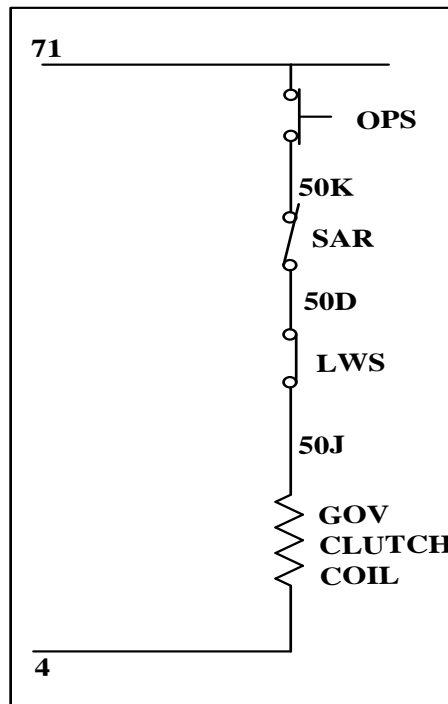
B:

1. Start button may not be closing properly or defective (71 - 50D)
2. LWS may be defective or low water in expansion tank (50D - 50J)
3. After energizing CK2 its bridge interlock may not be opened (50N - 50M)

C:

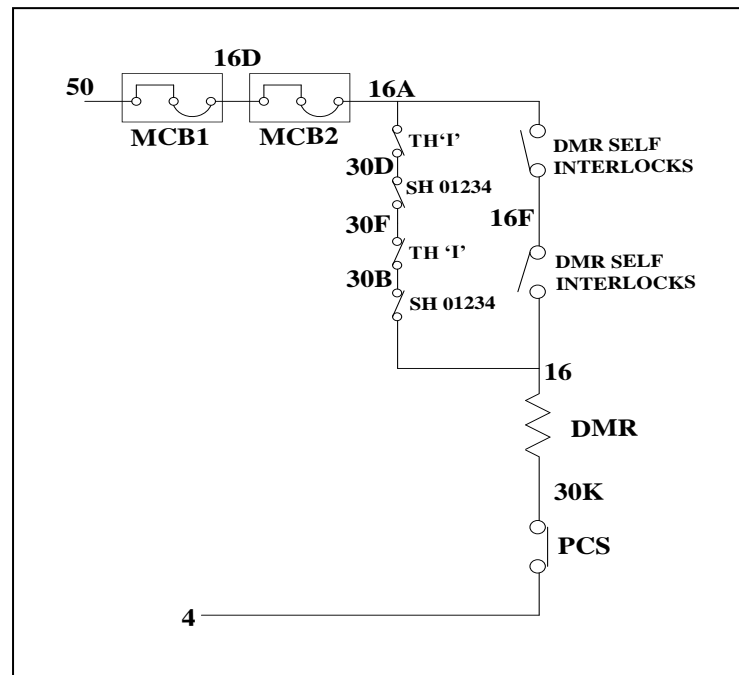
1. OST may be in tripped condition
2. Fuel oil pressure may be zero
3. Fuel pump motor may be failed.
4. Fuel booster pump may be defective.
5. Fuel booster pump love joy coupling may be failed.
6. Fuel oil system may be defective.
7. GE Governor Booster pump may be defective.
8. GE Governor Booster pump love joy coupling may be defective.
9. Governor oil may be less.
10. Governor linkage may be disconnected with fuel linkage.
11. Fuel oil level may be less.
12. W.W. Gov. low lube oil button (LLOB) may be in tripped condition.

III. ENGINE CRANKING, FIRING BUT NOT HOLDING:



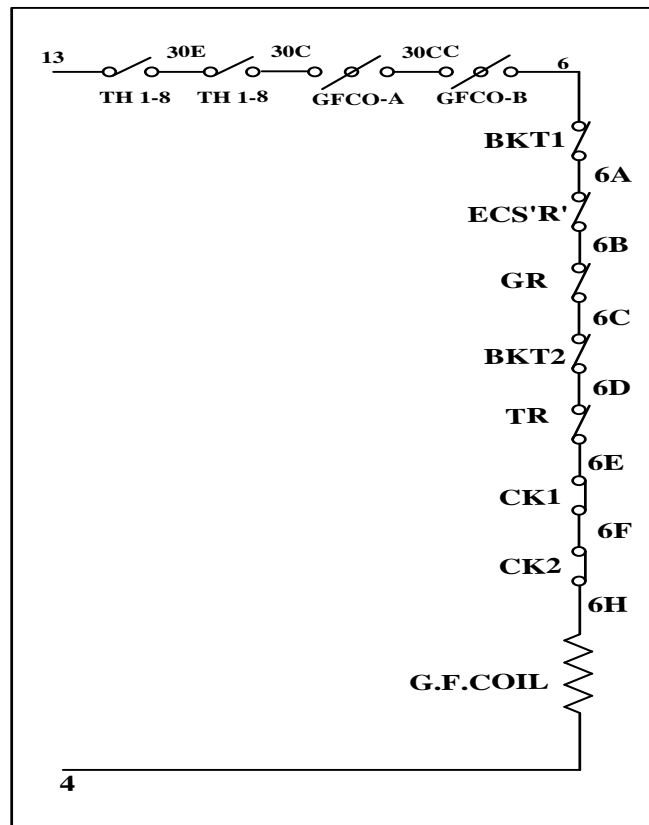
1. Lube oil pressure may be below 1.6 Kg/cm²
2. Lube oil system may be defective
3. OPS defective (Switch defective) (71 - 50K)
4. SAR closed interlock (N/O) defective (50K - 50D)

IV THROTTLE NOT RESPONDING:



1. MCB1 may be defective (50 - 16D) or tripped.
2. MCB2 may be defective (16D - 16A) or tripped.
3. TH N/C interlock defective in S.H.C.S. (16A - 30D) or TH may not be in Idle.
4. SH N/C interlocks defective in S.H.C.S (30D - 30F) or SH may not be in OFF, 1,2,3,4
5. TH N/C interlock defective in L.H.C.S. (30F - 30B) or TH may not be in Idle
6. SH N/C interlocks defective in L.H.C.S. (30B - 16) or SH may not be in OFF, 1,2,3,4
7. Defective DMR (16 -30K)
8. Defective PCS (30K - 4) or PCS may be knocked out
9. DMR self interlocks defective (16A - 16F - 16)
10. ESR` s not energizing or defective interlocks.
11. ECS may be in idle.
12. GR may be in tripped condition
13. W.W. Gov. Am phenol plug slack
14. In AC/DC locos GFOLR may be tripped

V. LOAD METER NOT RESPONDING:



With this circuit we can get generator field excitation and main generator induced EMF connected to traction motors through BKT, REV and Power contactors.

1. LOAD METER NOT RESPONDING.

This may be due to following reasons.

- Generator field contactor not closing (GFC)
- S1, S21, S31 power contactors not closing
- Excitation cards slack or defective

GENERATOR FIELD CONTACTOR NOT CLOSING

Control air pressure may be less than 5 Kg/CM²

- Throttle handle interlocks in working control stand may be defective or open
- GF switch No. 1 or No. 2 may be defective or wire cut
- BKT 1 or BKT 2 May not be thrown properly or its inter lock may be defective
- ECS may be in idle or defective switch
- GR may be tripped or defective
- Transition relay inter lock may be defective
- CK 1 welded or bridge inter lock may be defective
- CK 2 welded or bridge inter lock may be defective
- GF contactor may be defective

Note : If BKT 1 or 2 operating towards motoring properly, even then GFC not closing Pack GFC and work on wards. Before packing GFC ensure that CK 1 & CK 2 must be in deenergized condition (open).

S1, S21, S31 Power contactors not closing

- a. Reversed handle not thrown properly or its interlocks may be defective
- b. Reverser 1 & 2 May not be thrown properly or its interlocks may be defective.
- c. BKT 1 or BKT 2 interlocks may be defective
- d. ECS inter lock may be defective
- e. BKR inter lock may be defective
- f. TR & GFC inter lock may be defective
- g. P1 power contactor may be welded or its inter lock may be defective
S21 Alone not picking up
P21 Power contactor may be welded or inter lock may be defective
S31 Alone not picking up
P31 Power contactor may be welded or inter lock may be defective

EXCITATION CARDS SLACK

- a. Remove safety bar from the excitation panel.
- b. Slack all the 7 Excitation cards and press for proper fitment

LOAD METER NOT RESPONDING AFTER PICKING UP 2nd TRANSITION

- a. P32 power contactor may not be closed (not energized)
- b. P32 power contactor interlock may be defective

LOAD METER NOT RESPONDING DURING MOTORING AFTER WORKING DYNAMIC BRAKE

1. BKT 1 or BKT 2 may not thrown properly towards motoring
2. BKT 1 or BKT 2 interlocks may be defective

LOAD METER NOT RESPONDING IN ONE DIRECTION

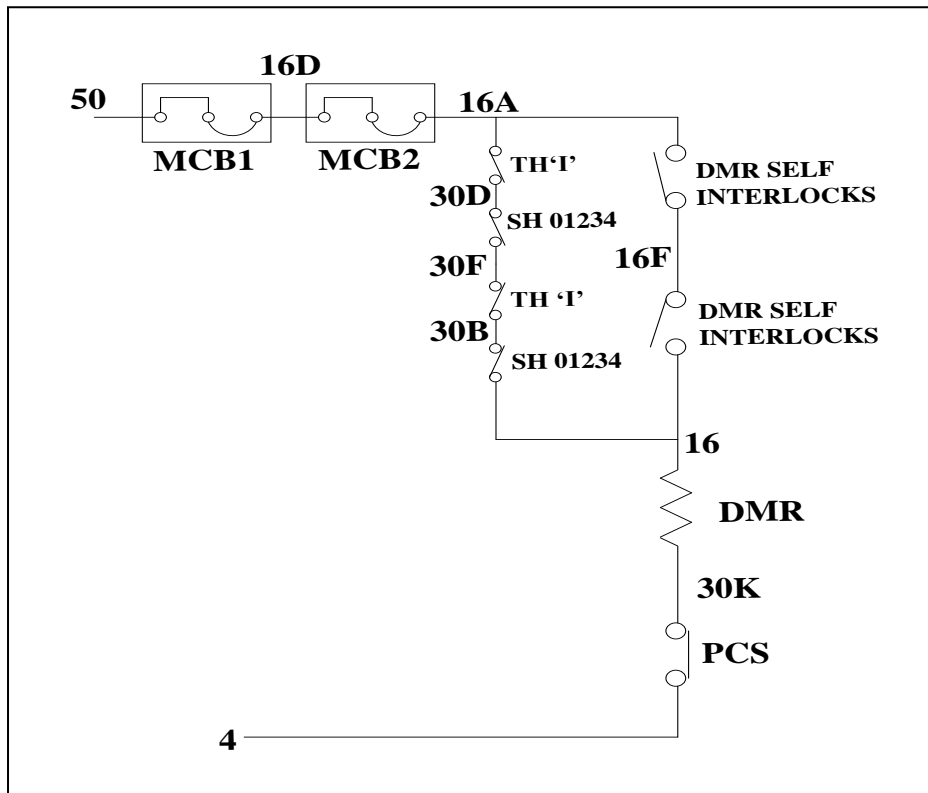
- a. Working control stand reverser handle defective
- b. Non working control stand with or with out reverser handle kept in one direction
- c. REV 1 & 2 may not thrown properly on one direction
- d. REV 1 & 2 interlock may be defective.

LOAD METER NOT INDICATING: (But power available)

- 1 During Loco starting (Moving) S1 power contactor is not picking up.
- 2 TM1 or TM4 may be defective
- 3 LAS may be defective
5. Load ammeters and its circuit may be defective.
6. After picking up IInd transition P2 Power contactor is not picking up.

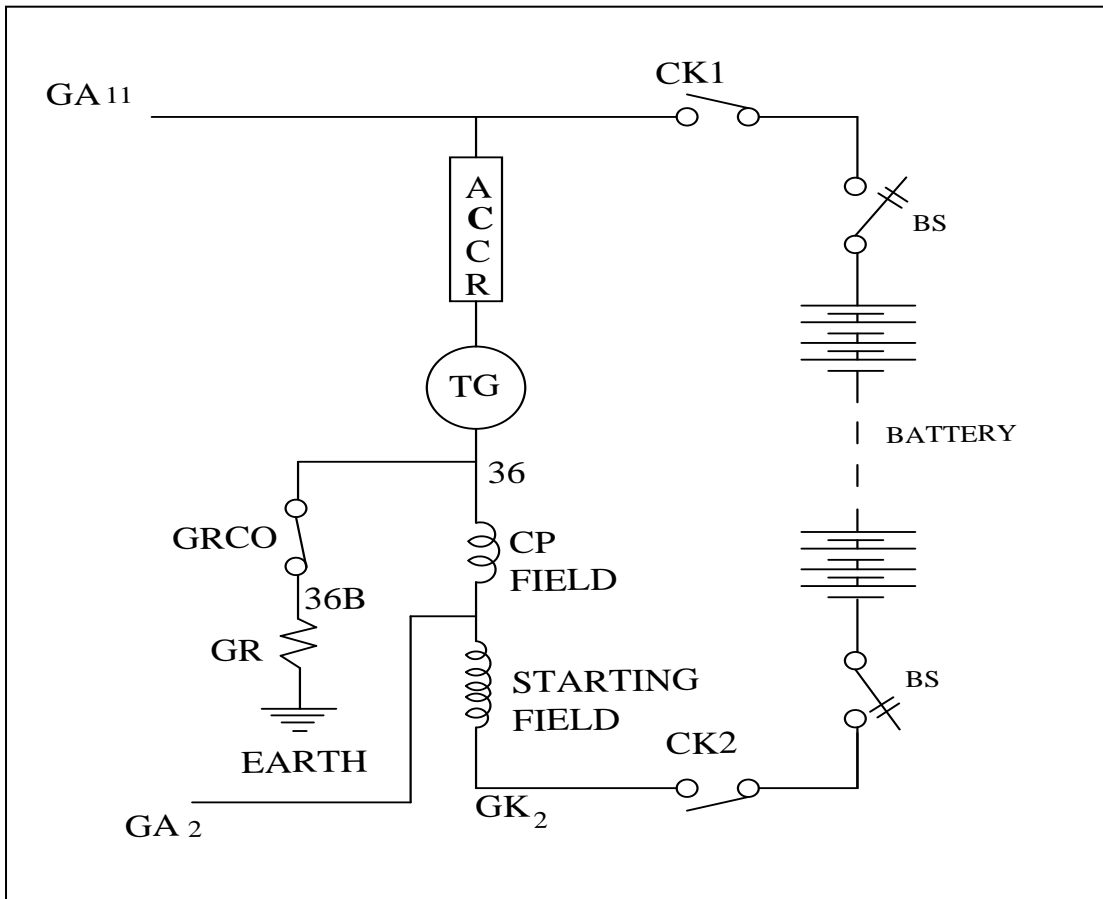
SAFETY DEVICES FITTED IN DIESEL ELECTRIC LOCOMOTIVE

(Electrical) DEAD MAN'S RELAY



- 1. DEADMAN'S RELAY:** This is fitted in front panel of control compartment. When MCB1 and MCB2 switched ON, this relay will energize, through PCS. Whenever PCS is knocked out DMR will de-energize and engine will come to idle. The PCS will be operated during emergency brake application, train parting and in accidents.

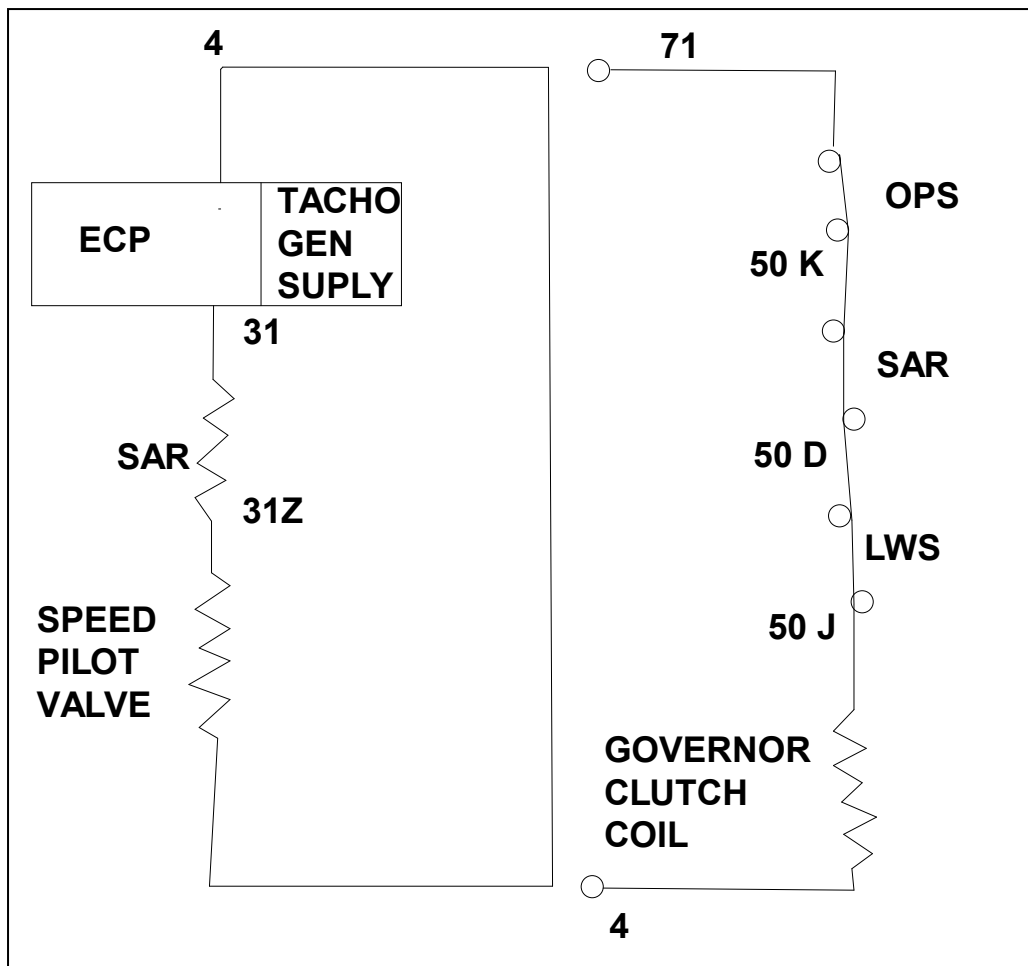
GROUND RELAY



2. GROUND RELAY: GR is fitted in front panel right side of the control compartment. When ever power circuit gets earth fault during running or whenever control circuit gets earth fault during engine starting this relay will energize.

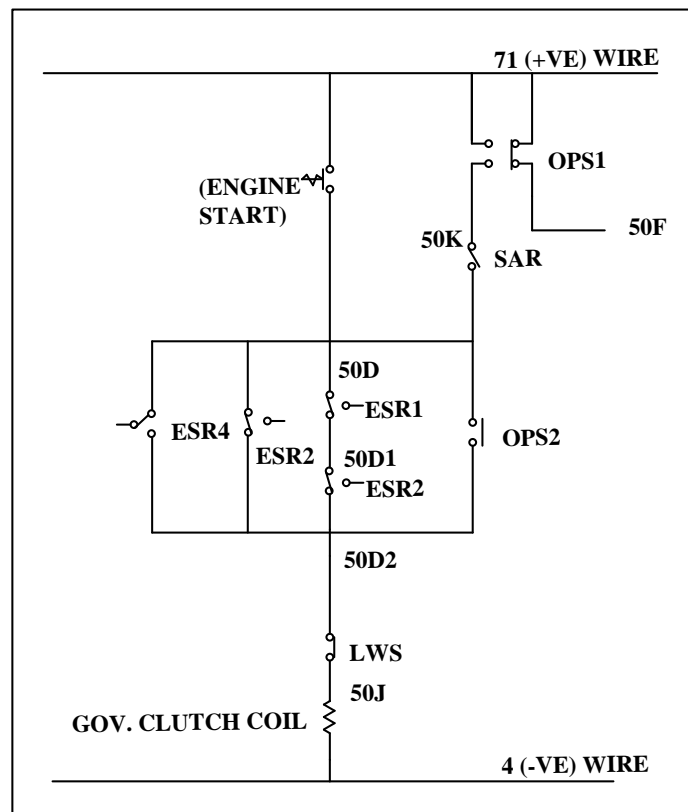
GR is connected in between -VE of main generator and locomotive body through GRCO. If any insulation punctures, leakage takes place or any bus bar or cable touches the body (ground), the leakage current flows through the GR coil and energize. With this load meter will drop to zero, engine comes to idle with GR indication and alarm.

SAFETY AUXILLIARY RELAY



3. SAFETY AUXILIARY RELAY: This relay is provided in GE governor locomotives to protect the engine (During engine running) from over speeding in case of any open circuit takes place in Governor speed coil circuit. This SAR is connected in series with speed coil (Pilot Valve). When engine is in running if speed coil current reduces below 220 Milli Amps. (from 475 Milli Amps) SAR will be de-energized. The closed interlock connected in clutch coil will open and supply will cut off to clutch coil, there by `A` Arm and `B` Arm will be separated, `B` Arm comes to no fuel position and engine will come to shut down without any indication.

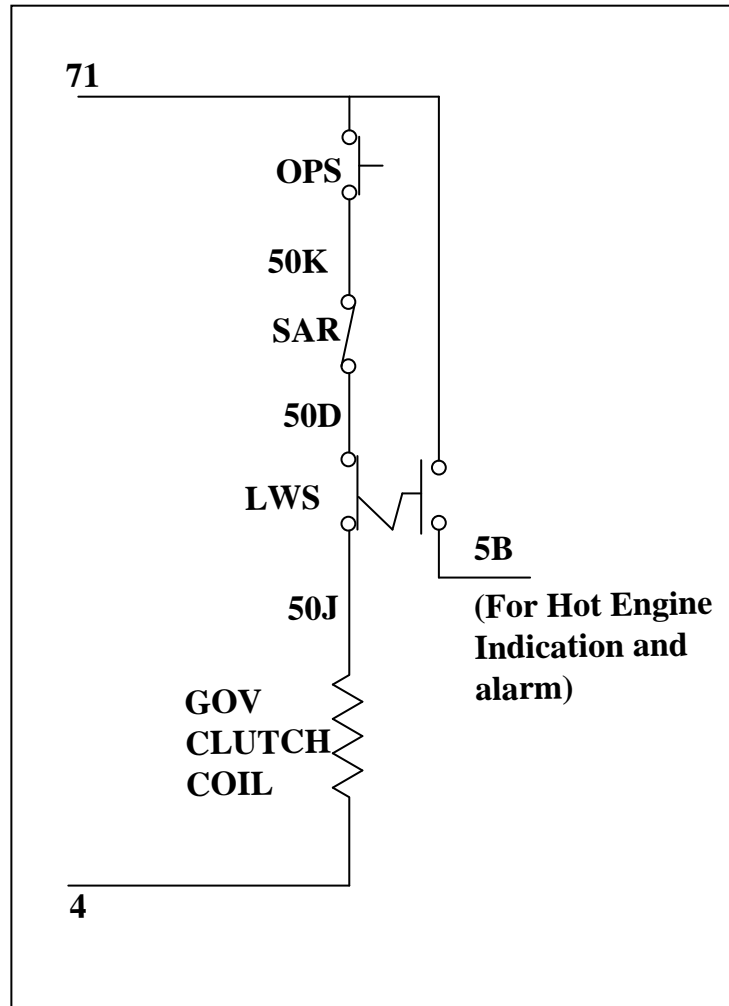
OIL PRESSURE SWITCHES



4. a.) OIL PRESSURE SWITCH 1: These are fitted in GE governor locomotives only. It is located in drivers cab. On run if TH handle is below 6th notch if lube oil pressure drops below 1.3 kg/cm² this switch will drop. Its closed interlock will open, and clutch coil will be de-energized. There by `A` and `B` arms will separate and `B` arm will come to no fuel position. Engine will come to shut down. OPS open interlock will close and low lube oil indication with bell will come. (Audio and visual indication) .OPS picks up at 1.6 kg/cm².

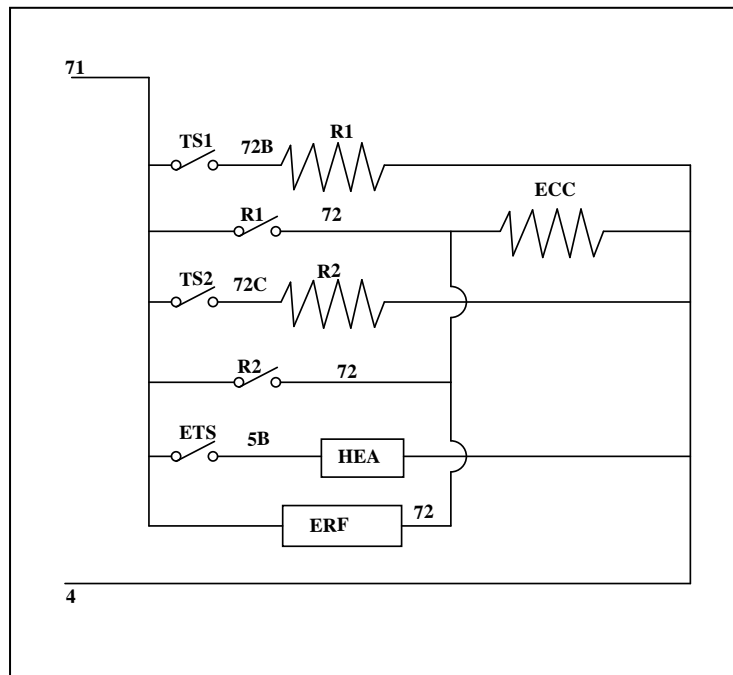
b.) OIL PRESSURE SWITCH 2: On run if TH handle is above 7th notch if lube oil pressure drops below 3.5 kg/cm² this switch will drop. Its closed interlock will open, and clutch coil will be de-energized. There by `A` and `B` arms will separate and `B` arm will come to no fuel position. Engine will come to shut down. OPS open interlock will close and low lube oil indication with bell will come. (Audio and visual indication) . OPS picks up at 3.7 kg/cm².

LOW WATER SWITCH



5.LOW WATER SWITCH: LWS is fitted in cooling water system and located in compressor/expressor room. It is connected in series with Governor clutch coil by its closed switch. (If cooling water level is above 1" from the bottom of expansion tank) Whenever water level is reduced below 1" from the bottom in expansion tank, LWS will operate and its closed interlock will open and cut off supply to Governor clutch coil. `A` arm `B` arm will be separated `B` arm will come to no fuel position and engine comes to shutdown. LWS open interlock will close and hot engine indication with alarm will come. (Audio and visual indication)

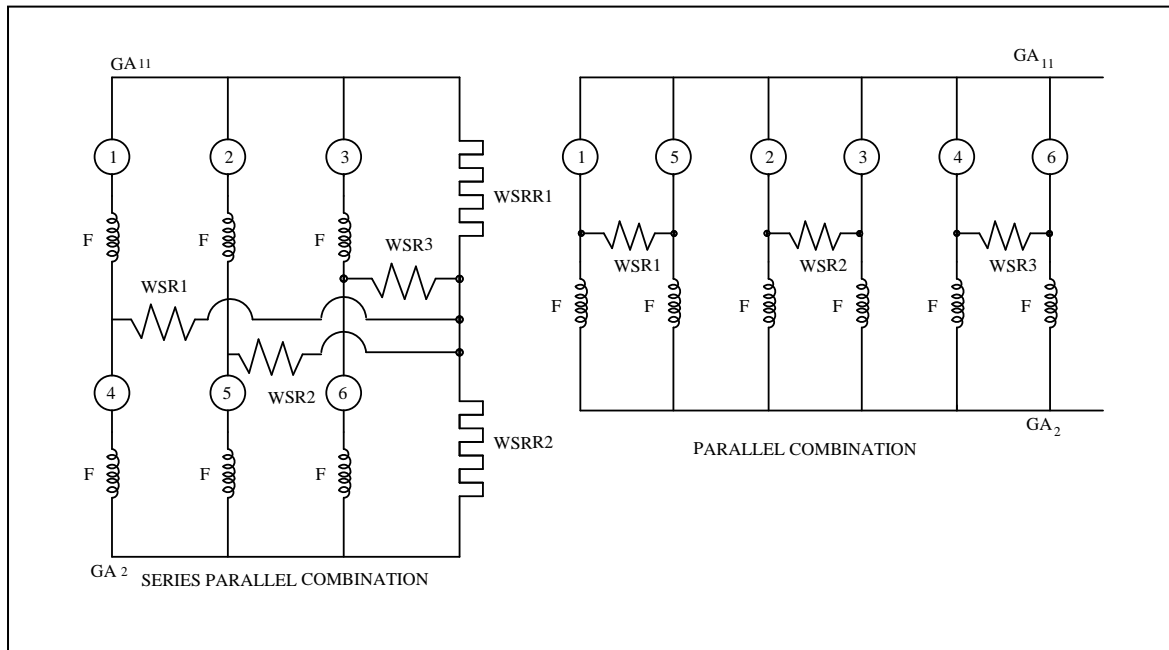
ENGINE TEMPERATURE SWITCHES



6. ENGINE TEMPERATURE SWITCHES: The heat generated in the engine cylinders has to be dissipated efficiently; pressurized water-cooling system is employed in the diesel engine. The cooled water is collected from the radiators and pumped through various channels in the engine block by the water pump, which is gear driven by the engine crank shaft. After exchanging the heat, the water is cooled in the radiators by forced air. Atmospheric air is drawn through the radiator FINS by the radiator fan coupled to the engine by eddy current clutch.

- At 68°C TS1 switch will close R1 operating coil will energize. R1 contactor will close and ECC will get supply. Now radiator fan will work in full speed.
- At 74°C TS2 will close R2 operating coil will energize. R2 contactor will close and ECC will get supply. Now also radiator fan will work in full speed only.
- At 90°C ETS will close and hot engine indication with alarm will come.
- If radiator fan is not working switch ON ERF. Now ECC will get direct supply by passing entire electrical control system.

WHEEL SLIP RELAY



7. WHEEL SLIP RELAY: In the locomotive all the six wheels are powered by six individual traction motors coupled through a gear, if any one of the wheel is slipped due to loss of adhesive or not rotating due to locked axle, the wheel will skid and has to be machined. To detect the locked axle or pinion slip or wheel slipping on the track, a safety device is called WSR is provided to operate. If any potential difference takes place between any two Traction motors this relay will operate and T.G. Field excitation will be reduced (nullified) and load meter drops to zero, wheel slip indication with buzzer and auto sand application will take place.

To identify the particular motor there are two WSR coils in each relay. One is in series parallel combination another is in parallel combination.

8. OVERSPEED TRIPPING ASSEMBLY: In case of any electric speed signals (Circuit) problem there is every chance of engine RPM shooting and damage to the engine and crankshaft. A mechanical tripping device is connected to the fuel rack when the engine RPM is increased beyond 1140 RPM the fuel racks are forcibly brought to no fuel position by tripping OSTA and engine will come to shut down without indication.

If engine is re-cranked with OSTA tripping position, engine will crank firing will not take place resulting batteries discharging.

REASONS FOR ENGINE AUTOMATIC SHUT DOWN (WITH INDICATION)

1. Water level in Expansion Tank is reduced from the bottom below 1" and causing LWS operation. (Hot Engine indication with Alarm)
2. Lube oil pressure dropping below 1.3 kg/cm², up to 6th notch causing OPS-1 dropping. (Low Lube oil indication with alarm)
3. Lube oil pressure dropping below 3.5 kg/cm² in 7th & 8th notches causing OPS 2 dropping. (Low Lube oil indication with alarm)

(WITHOUT INDICATION)

4. In G.E. Governor Locos Governor Amphinol Plug slack
5. In G.E. Governor Locos Tacho Generator signal failed to Governor and causing SAR Relay dropping
6. Fuel Pump Breaker tripping.
7. Fuel Pump contactor opening.
8. MFPB-1 or MFPB-2 tripping.
9. MB-2 Breaker tripping.
10. MB-1 & AGFB together tripping.
11. Battery Knife switch open and AGFB tripping at a time.
12. Fuel Pump Motor fail.
13. Fuel Booster Pump or Governor Booster Pump failed.
14. Fuel Booster Pump Lovejoy coupling or Governor Booster Pump Love joy coupling failed.
15. Fuel Oil system defective.
16. Fuel oil very less in tank.
17. Governor Oil less in tank.
18. Governor oil pressure may be less.
19. Governor linkage may be disconnected.
20. OSTA may be tripped.

**REASONS FOR AUTOMATIC ENGINE COMING TO IDLE
(WITH INDICATION)**

1. G.R. may be operated (explosive or non-explosive P.G.)
2. GFOLR may be operated (AC/DC Locos).

(WITHOUT INDICATION)

3. DMR may be de-energized:
 - a) PCS-2 knocked out due to A-9 emergency.
 - b) P2 may be closed due to BP dropping below 4.4 kg/cm² in Brake pipe.
 - c) PCS-1 knocked out due to vacuum train pipe vacuum dropped.
 - d) Fire man emergency may be operated.
 - e) MCB-1 or MCB-2 may be tripped.
 - f) DMR self interlocks may not be having proper contact(Defective)
4. ERR Relay may be de-energized (in W.W. Gov. Loco)
5. Governor Amphenal plug slack. (in W.W. Gov. Loco).

REASONS FOR CONTINUOUS WHEEL SLIP

1. Locked axle.
2. Traction motor defective.
 - a) Pinion slipped
 - b) Loose connections any where in power circuit(T.M).
 - c) Open Circuit in TM internal connections
 - d) TM Bearing seized.
3. Any FS contactor may be welded.
4. During 1st and 3rd any one FS contractor not pick up.
5. Paper or tape between any contactors (PC, BKT, REV, FS contractor).
6. WSR resistance 1 or WSR resistance 2 may be open circuited causing continuous wheel slip below IInd transition (From starting of Loco)

Identification of defective traction motor

In series parallel picking up of WSR relay	In parallel picking up of WSR relay	Defective Traction motor
WSR 1	WSR 1	No. 1
WSR 2	WSR 2	No. 2
WSR 3	WSR 2	No. 3
WSR 1	WSR 3	No. 4
WSR 2	WSR 1	No. 5
WSR 3	WSR 3	No. 6

REASONS FOR POWER GROUND.

1. In power system some where earthed.
2. Power contactors fluttering
3. Transition pickup & dropout at the same time.
4. Control Air pressure may be improper.
5. Water or oil entered in electrical machinery.
6. Cables or bus bars rubbing any where to loco body.

I PACKING OF FPC CONTACTOR IN NORMAL.

1. Open battery knife switch and switch OFF all the breakers.
2. Pack the contactor with wooden wedge.
3. Switch on BS and all the breakers.

II PACKING OF FPC CONTACTOR IF COIL IS IN BURNT CONDITION.

1. Remove 13 +ve wires in FPC contactor coil terminal and join all the 13 wires with conducting wire outside the terminal.
2. Remove 4 -ve wires in FPC Contactor Coil terminal and join all the 4 wires with conducting wire outside the terminal

III. PACKING OF GF CONTACTOR IN NORMAL.

Note:- Before packing ensure CK1 & CK2 must be in open condition (De-Energized)

1. Keep TH-I, REV Neutral, both GFC-OFF and ECS - idle.
2. Pack the GF contactor with wooden wedge.
3. ECS - run both GFCO-ON, REV- Required direction SA9 - full application, A9-minimum and open TH-1 notch.

Load meter will shoot to abnormal and jerk will be experienced, after few seconds LM will come to normal.

IV. Packing of GF contactor If coil is in burnt condition.

After doing item (1) in above, GF coil 6H terminal wires to be removed and join all the wires with conducting wire outside the terminal.

GF coil 4 terminal wires to be removed and join all the wires with conducting wire outside the terminal.

Continue above procedure item 2&3 in "III" for GF packing.

Note :-IInd transition will not pickup with GF contactor packing

- (a). After getting more than 48 Km speed close the TH to idle and open, now IInd transition will pickup.
- (b). Close the TH to idle and apply manual transition (irrespective of Loco speed) open TH IInd transition will pick up.
- (c). DB should not be used.