

ELECTRICAL SWITCHES

Switch: Switch is an electrical control device to 'make' & break', 'on' & 'off', to open & close and energise & de-energise the circuits. There are two types of switches used in locomotives.

1. Manually operated switches

- i. Knife switch
- ii. Toggle Switch
- iii. Push button switch
- iv. Rotary switch
- v. Generator field cut out switch(GFCO)
- vi. Multiple unit shut down switch(MUSD)

2. Automatically operated switches

- i. Pressure switch (Oil & Pneumatic)
- ii. Thermal switch
- iii. Floating switch

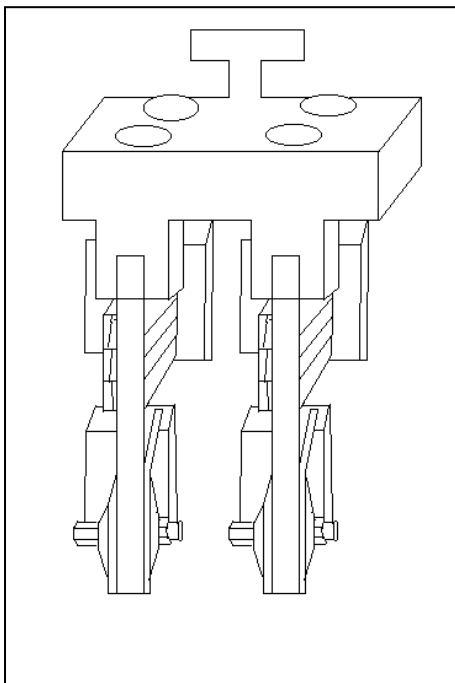
i. **Knife switch** : It is manually operated switch. In this there are two numbers.

a. **Battery Switch(BS)** :

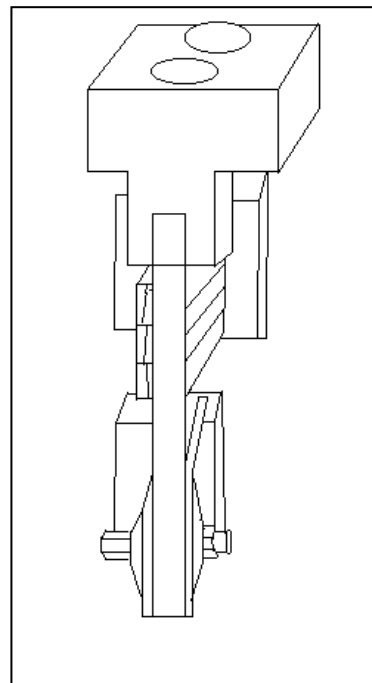
Location : It is in the nose compartment.

Purpose : Connecting battery supply to the external circuits in front panel.

If fails : a) During engine starting if it is in open Engine will not crank
b) During engine running if it is in open battery ammeter will read Zero,
No problem for Engine



Battery Knife switch



G.R. Cut out switch

b. Ground relay cut out switch(GRCO):

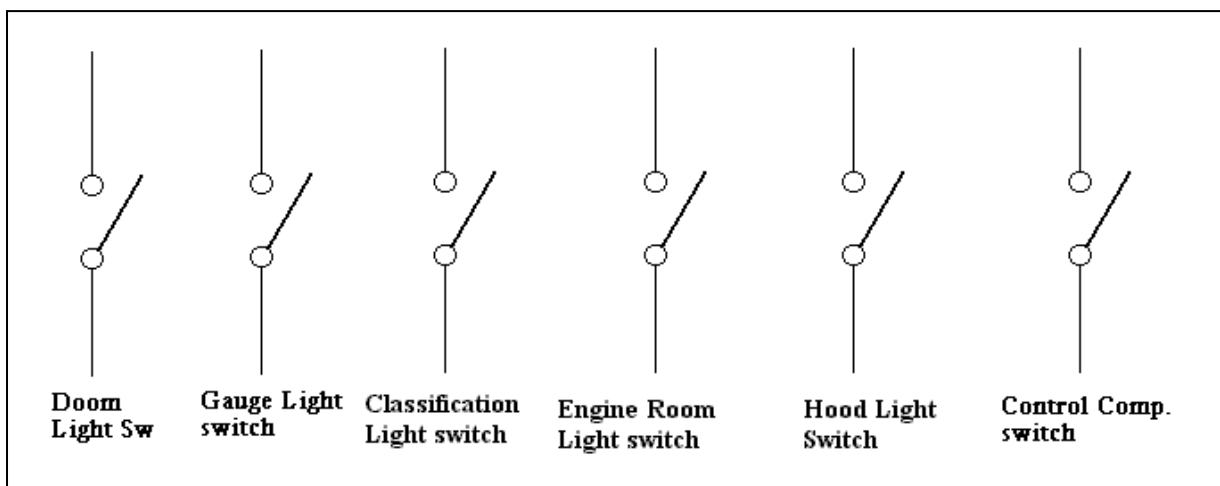
Location : It is in front panel. Normally it must be in closed and in sealed condition.

Purpose : Through this GR coil terminal is connecting to source of power.
By breaking seal and opening GRCO switch on emergency GR can be isolated.

ii. Toggle switch : It is a manually operated switch.

Location : On Front Panel and on control stands.

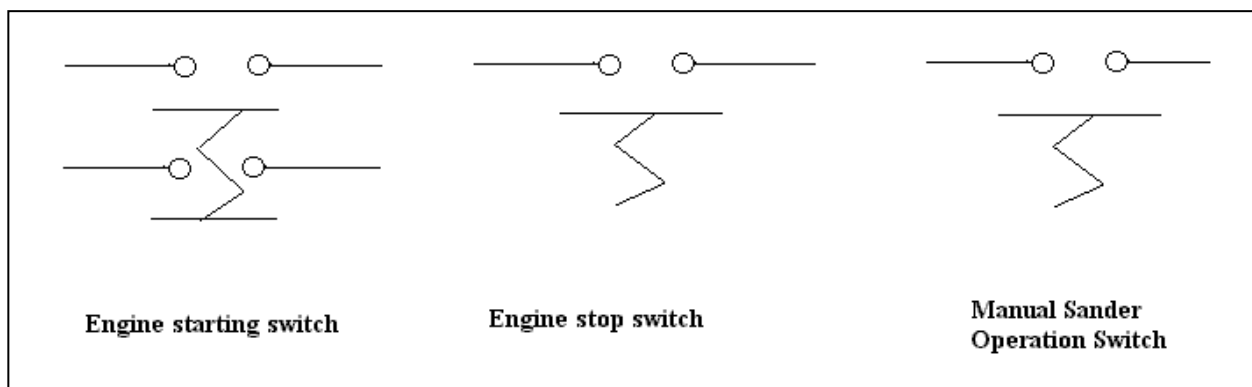
Purpose : It is mostly used to control the lights like doom light, cab lights, engine room lights, hood lights, classification lights and EPG Gov. etc



iii. Push Button switches : (Manually operated switch).

Location : On Front Panel.(Engine starting switch, Engine stop switch) and on control stands manual sanders operation switch.

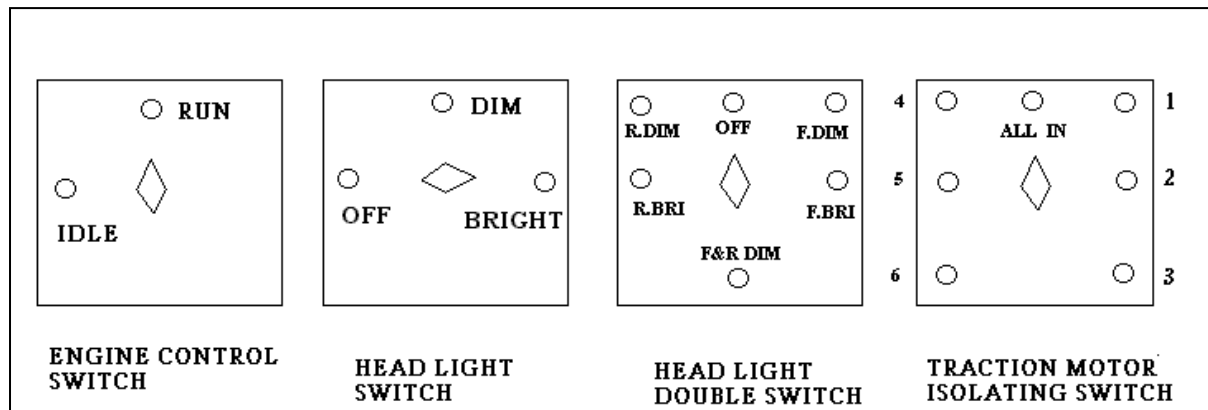
Purpose : These are used to start the Diesel engine, to shut down the diesel engine and also for manual sanders operation



iv . **Rotatory switch** : (Manually operated switch). To control different circuits in different positions.

a. Engine control switch(ECS):

Location: On Front Panel.



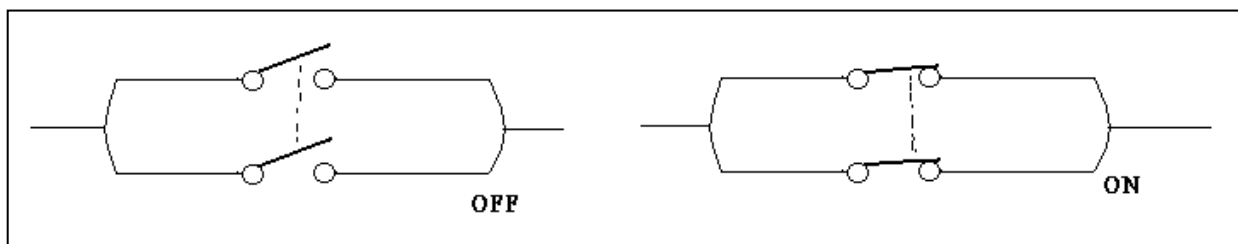
It will have two positions 1. Idle 2.Run.

b. Head light Switch: It is used to control the headlights for dim, bright, off totally two switches are located on control stands. (One on each control stand)

c. Motor Isolation Switch (Motor cut out switch): Out of 6 traction motors as if any one motor goes defective by this switch we can isolate and work further. It is available in few locomotives, this switch is located on Front Panel.

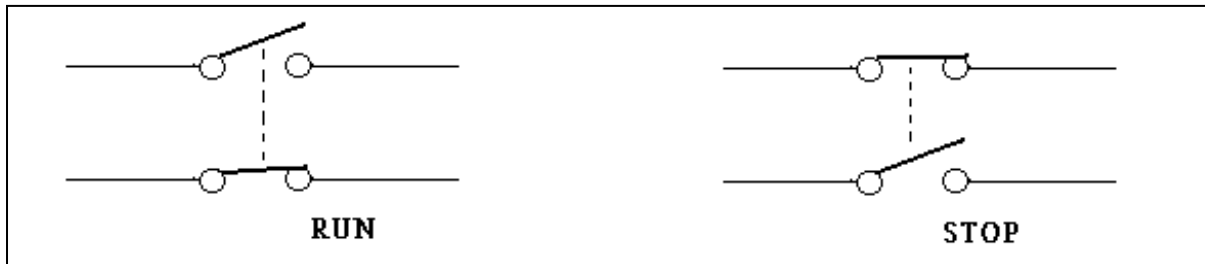
v. Generator field cut out switch(GFCO) : (Manually operated switch). Double pole with 'on' and 'off' switch. Both GFCOs on control stands are connected in series.

Location : Sides of both control stands in between MFPB & MCB breakers.



Purpose : It is used to close the generator field contactor. Because both are double pole switches if any one goes defective other switch will make circuit to close. This switch is going to be operated number of times by the driver during each trip.

vi. **Multiple unit shut down switch (MUSD)** : Manually operated with double pole switch. Out of two poles in one position one switch will be in closed and other will be in open condition, in the second position closed switch will be open and open switch will be closed condition. There by we should not call 'on'/'off' switch. In MUSD switch two positions are 'RUN'/'STOP'



AUTOMATICALLY OPERATED SWITCHES

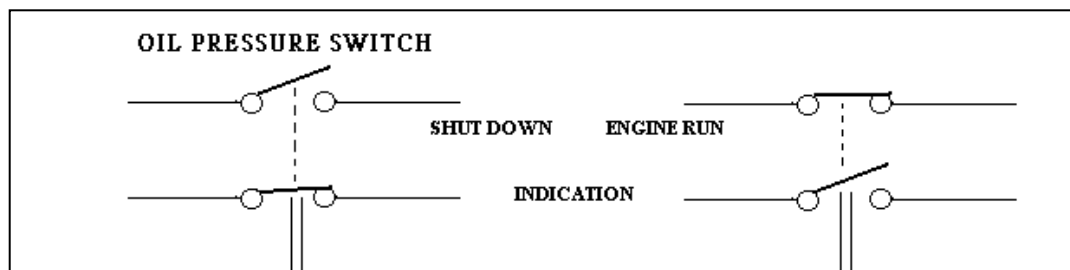
i. **Pressure switch**: These are the switches operating by air pressure or oil pressure.

Location: Near AFL unit pneumatic control switch (PCS) , in drivers cab oil pressure switch (OPS) are provided.

a. **Pneumatic control switch (PCS)**:

Refer AFL unit .

b. **Oil pressure switch (OPS)**: Provided in GE governor locomotives only. These are two switches 1) OPS-1 2) OPS-2

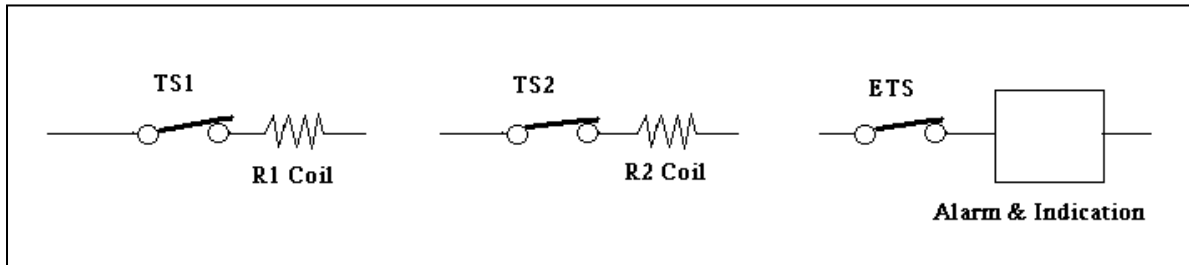


(i) **OIL PRESSURE SWITCH BELOW 1.3KG/Sq. CM L.O. PRESSURE** and **L.O PRESSURE ABOVE 1.6 KG/Sq. CMS** and connected in Engine lube oil system. After cranking if Lube oil pressure is 1.6 kg/cm^2 , it is going to pick up and makes engine to hold (Run). Whenever lube oil pressure drops below 1.3 kg/cm^2 it makes engine to shut down. It will act up to 6th notch only.

- (ii) **Oil pressure switch (OPS-2):** On 7th & 8th notches if Lube oil pressure is above 3.7 kg/cm² it will pick up and it drops below 3.5kg/cm² and makes engine to shut down

c. **Thermal switch:** It is going to operate on water temperature.

Location: There are three switches located in Expressor room and these are connected in Engine cooling water system.



Purpose:

- i. **Temperature switch (TS1):** Whenever temperature of cooling water raises to 68°C this switch will be closed, R1 contactor will close and Radiator fan starts working full speed.
- ii. **Temperature switch (TS2):** Whenever engine cooling water temperature raises to 74°C this is going to operate, R2 contactor will close and Radiator fan starts working at full speed.
- iii. **Engine temperature switches (ETS):** Whenever engine cooling water temperature raises to 90 °C this is going to operate and makes hot engine indication with alarm.

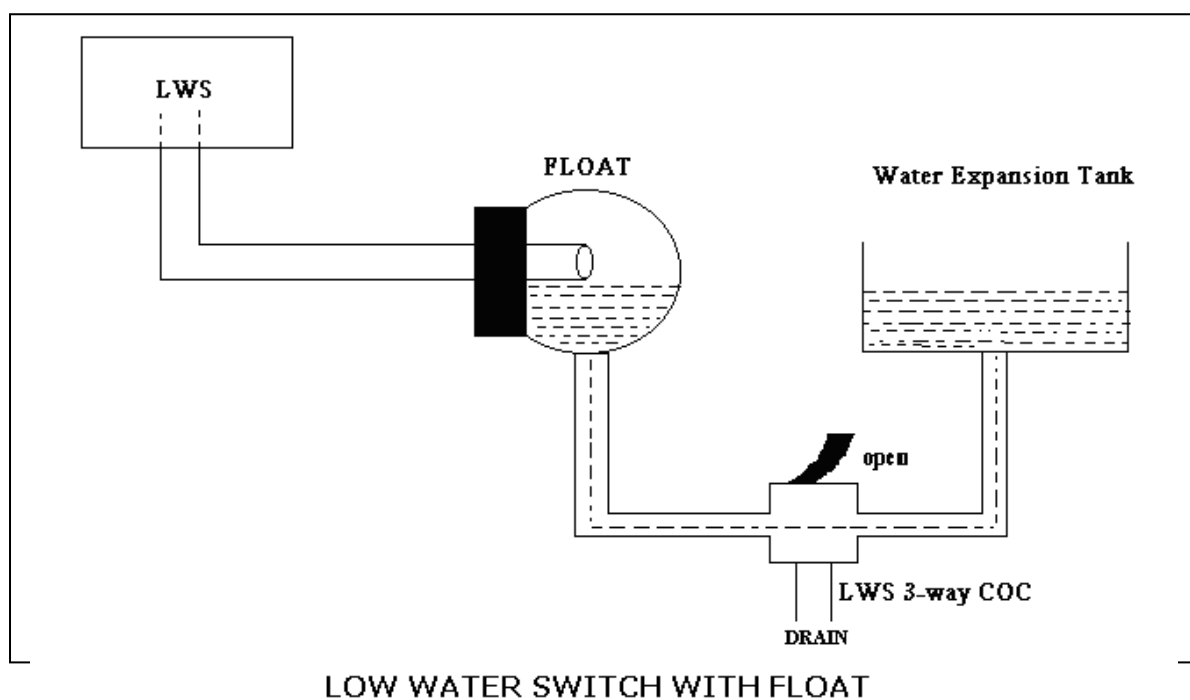
Note: No change in engine speed and locomotive speed.

- d. **Floating switch:** It is going to operate by the water level in water expansion tank.

Location: It is in cooling water system on the top of Expresser room.

Low water switch (LWS): It is connected with LWS 3-way cut out cock to expansion tank. If water level is sufficient,(In expansion tank from the bottom above 1") this switch will be in normal and allows to run the engine. Whenever water level in expansion tank reduces below 1" from the bottom of the expansion tank, this switch is going to operate and makes engine to shutdown with hot engine indication with alarm.

During engine starting with low water, Engine will crank but firing will not takes place.



For both LWS and ETS operations indication will be Hot engine with alarm. To identify if engine shuts down with HEA, LWS may be operated, if engine is in running with HEA, ETS may be operated.