HHP Locomotive's
Starting Circuit & Its Components

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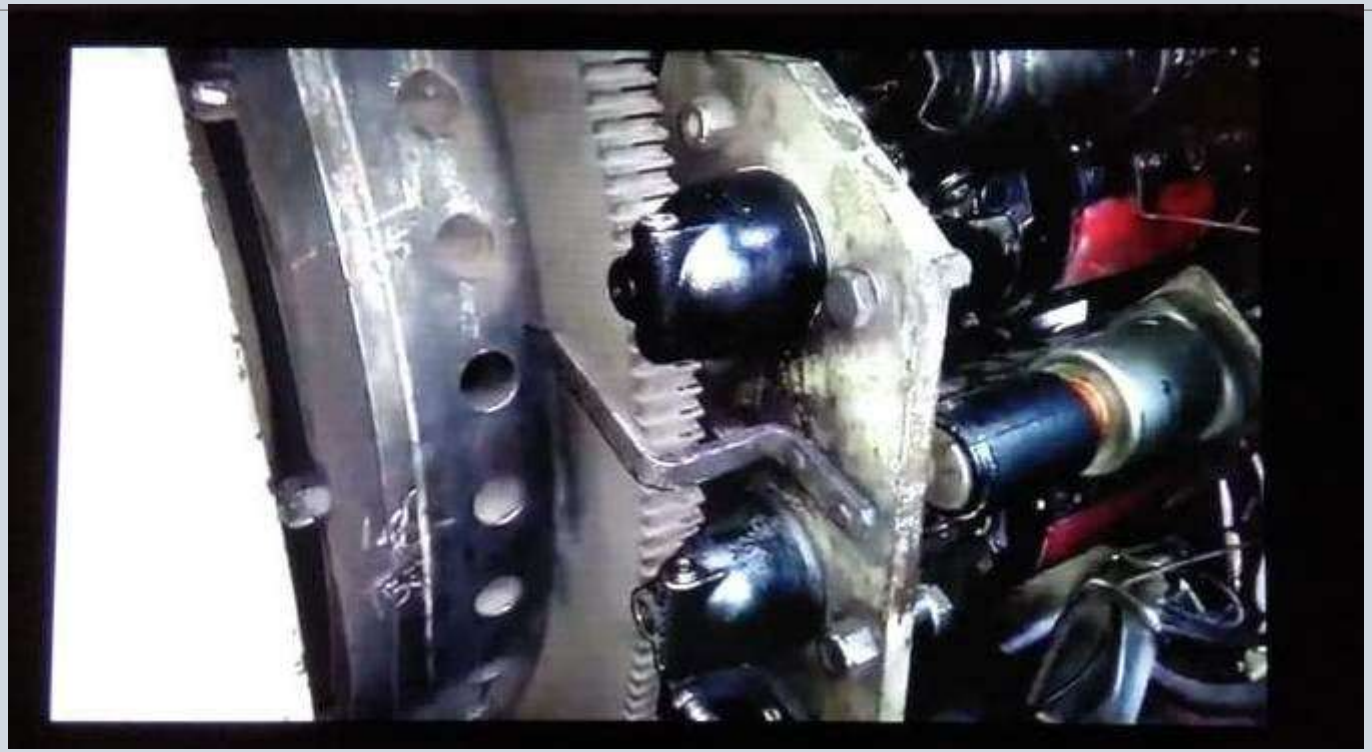
OBJECTIVES

- Starting Circuit -- Introduction
- Pre-requirement for starting a locomotive
- Main Components of starting Circuits
- Starting and Running Circuits

Starting Circuit

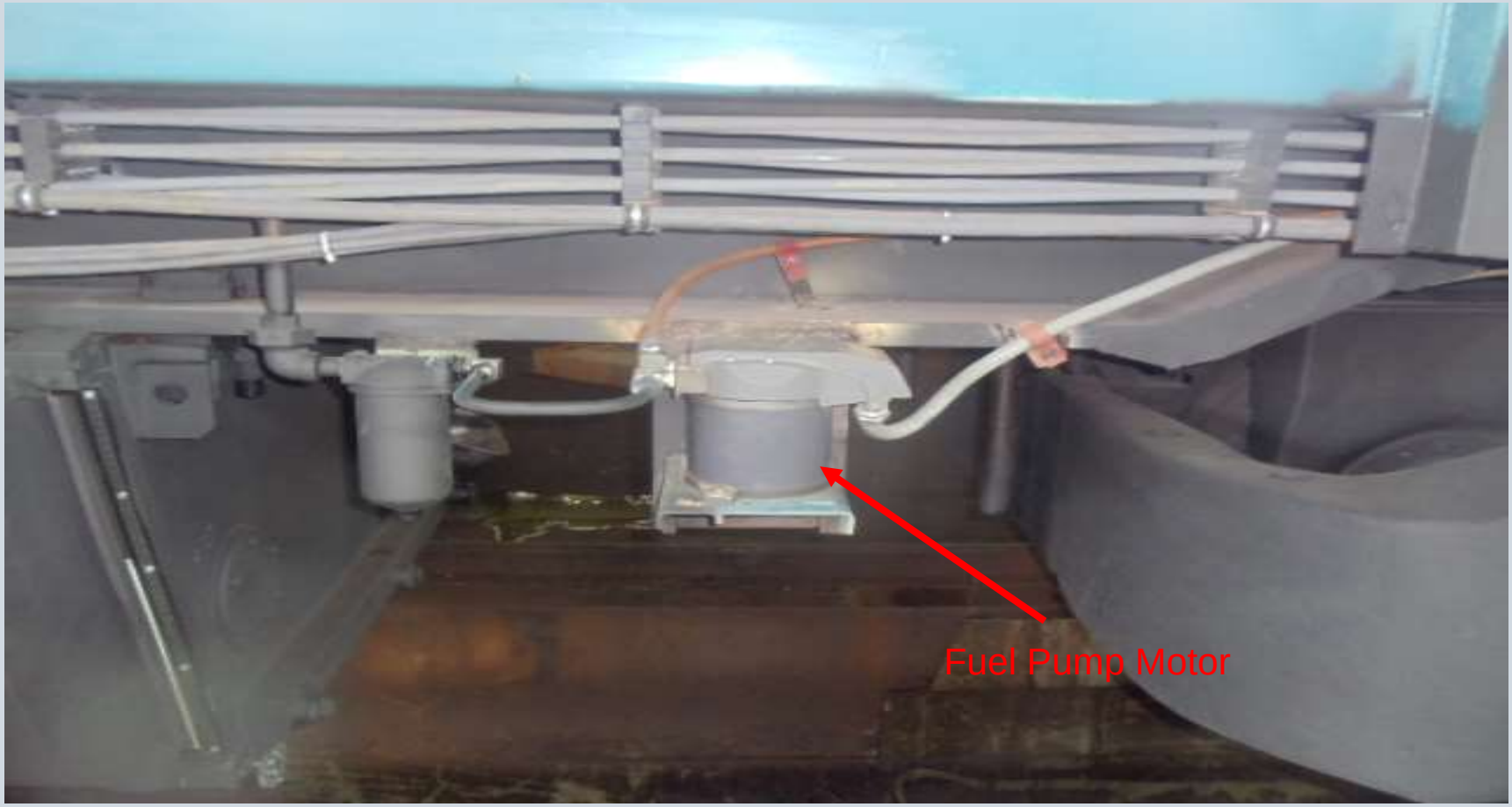
This is an electrical circuit designed to help crank the locomotive engine by two electric motors powered by the starting batteries.



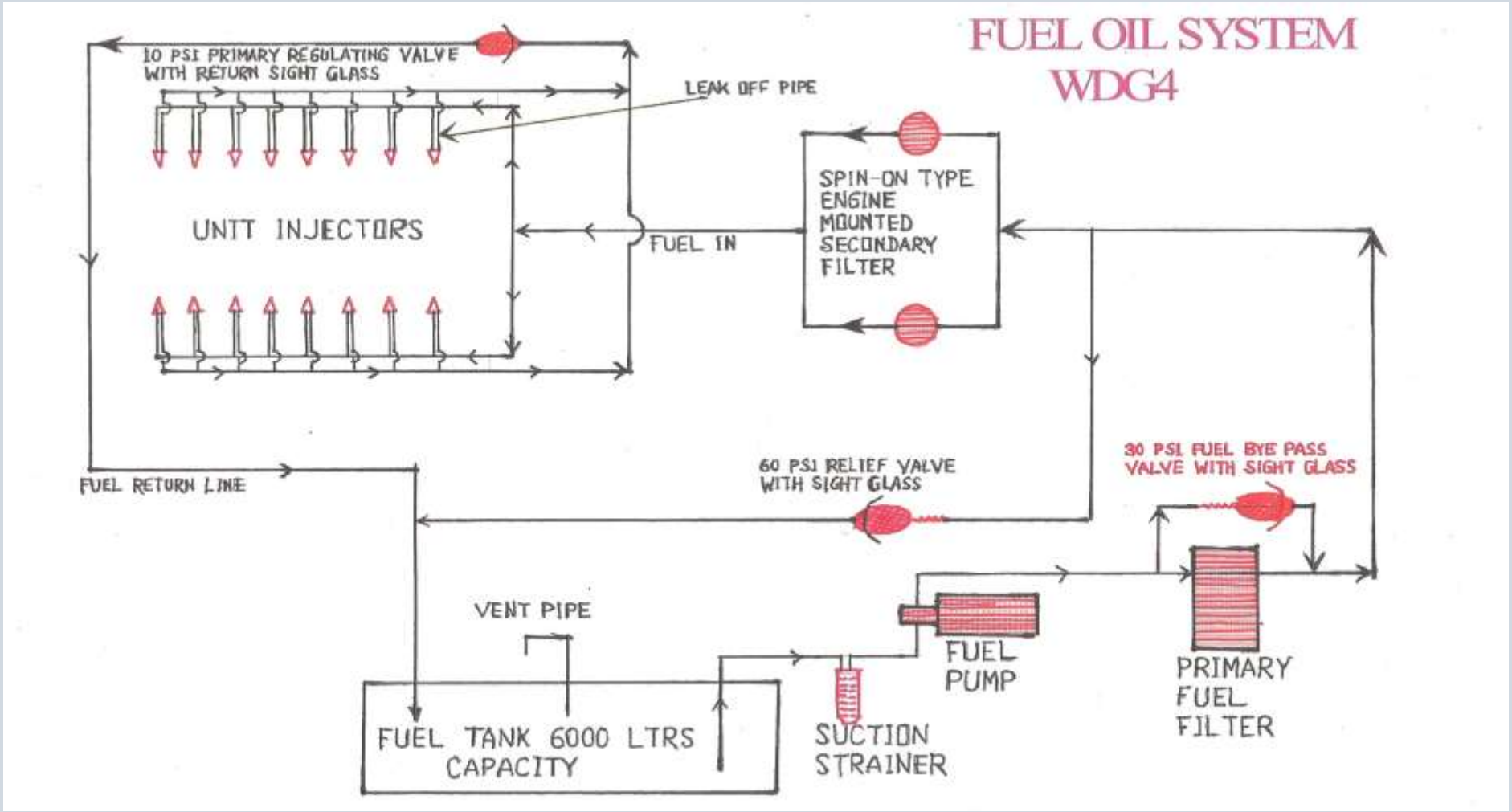
Pre-requirement for starting a loco

- Sufficient FOP created by AC Fuel Pump Motor driven by Starting Batt./ Aux. Gen.
- Motor RPM – 1200
- Motor capacity – 24.6 Liters/min.
- Located near Fuel tank.

FUEL PUMP MOTOR LOCATION IN LOCOMOTIVE



FUEL PUMP MOTOR LOCATION IN FUEL OIL SYSTEM



FUEL PUMP MOTOR CIRCUIT

Fig 5.4 shows the fuel pump motor circuit from the schematic. This is also a three phase ac motor. To troubleshoot this circuit, be sure about 64 volt dc is present at the RED and BLK terminals. If so and the motor does not turn, disconnect the motor from the pump and be sure that the pump is not binding. Be sure that the polarity of the connection is correct. If everything check out and the motor does not bind, replace the motor.

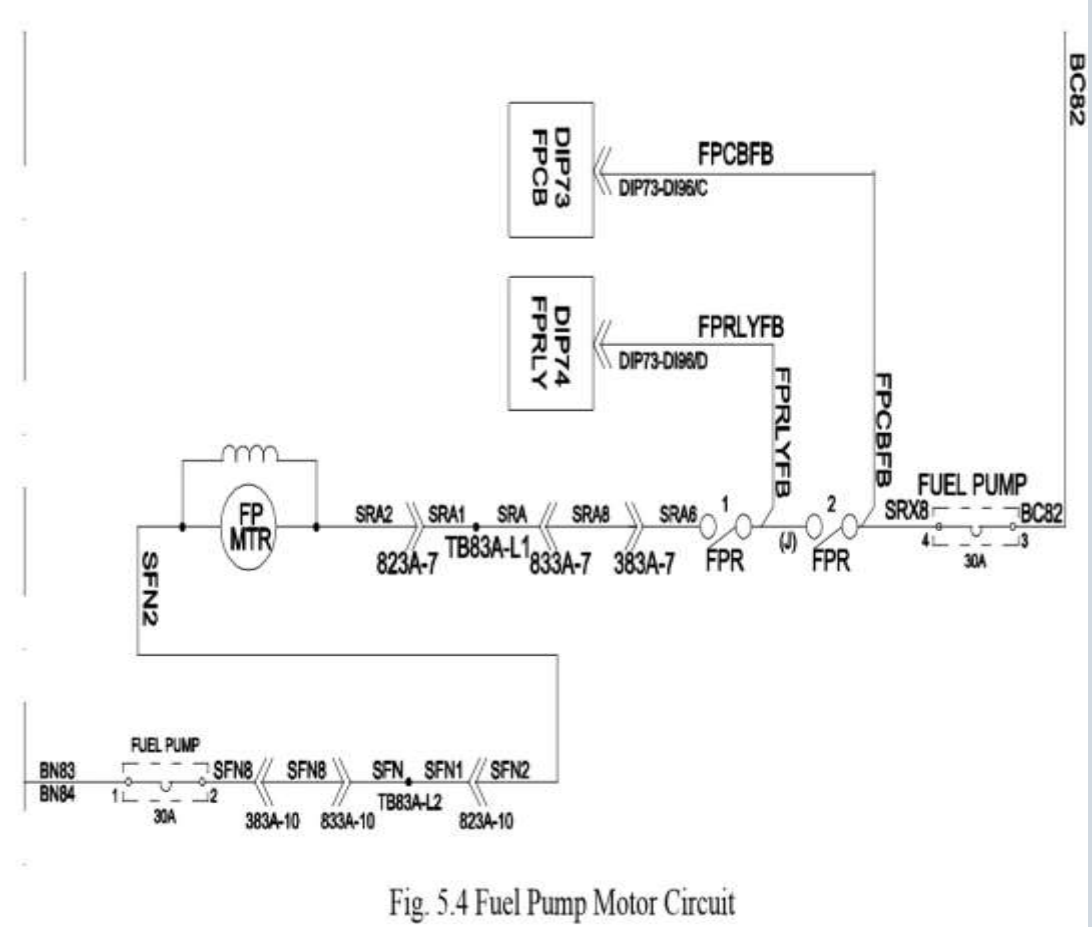


Fig. 5.4 Fuel Pump Motor Circuit

Pre-requirement for starting a loco

Sufficient LOP Created by Lube oil pump driven by Main shaft gear :

To monitor this a OPS is fitted in the Woodward Governor and this is set at

1.6 Kg/cm2 (Pick up)

1.3 Kg/cm2 (Drop)

Oil pressure switch location in Woodward Governor

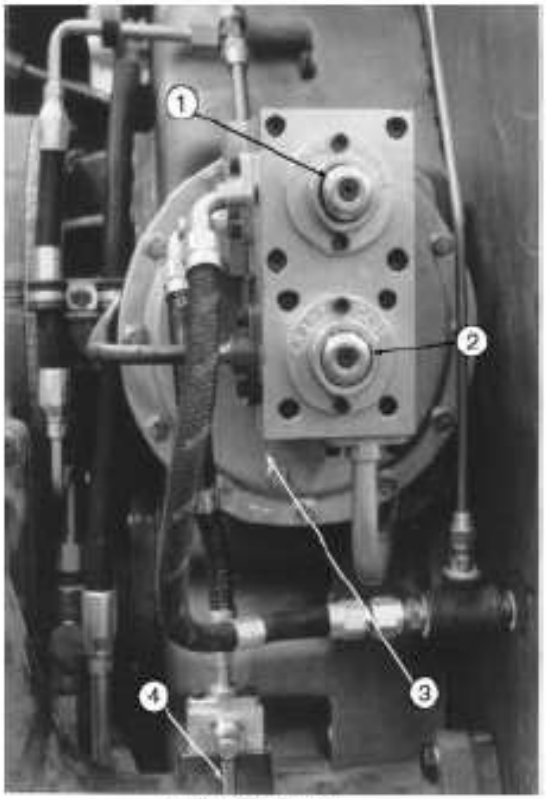
Pre-requirement for starting a loco

Sufficient water pressure created by sufficient water quantity and close loop pressurized water cooling system.

- For this sufficient water quantity 1045 liters and water level top-up.
- Water level should be higher than 1 inch in the water tank.
- Water cooling system completely closed.

ENGINE PROTECTION DEVICE

- This safety device is spring loaded bypass valve. It has two diaphragm in the stack, One sensing water pressure into the engine water and other sensing engine crankcase negative pressure (vacuum).
- When water pressure falls, the device dump oil from the governor OPS supply line, causing engine shut down.
- When crankcase pressure rises, the device dump oil from the governor OPS supply line, causing engine shut down.
- The following condition will cause EPD to trip-
  - Loss of water level.
  - Low water pressure.
  - Excessive engine crankcase pressure.



1. Low Water Portion
2. Crankcase Pressure Portion
3. Vent And Test Fitting
4. Test Cock

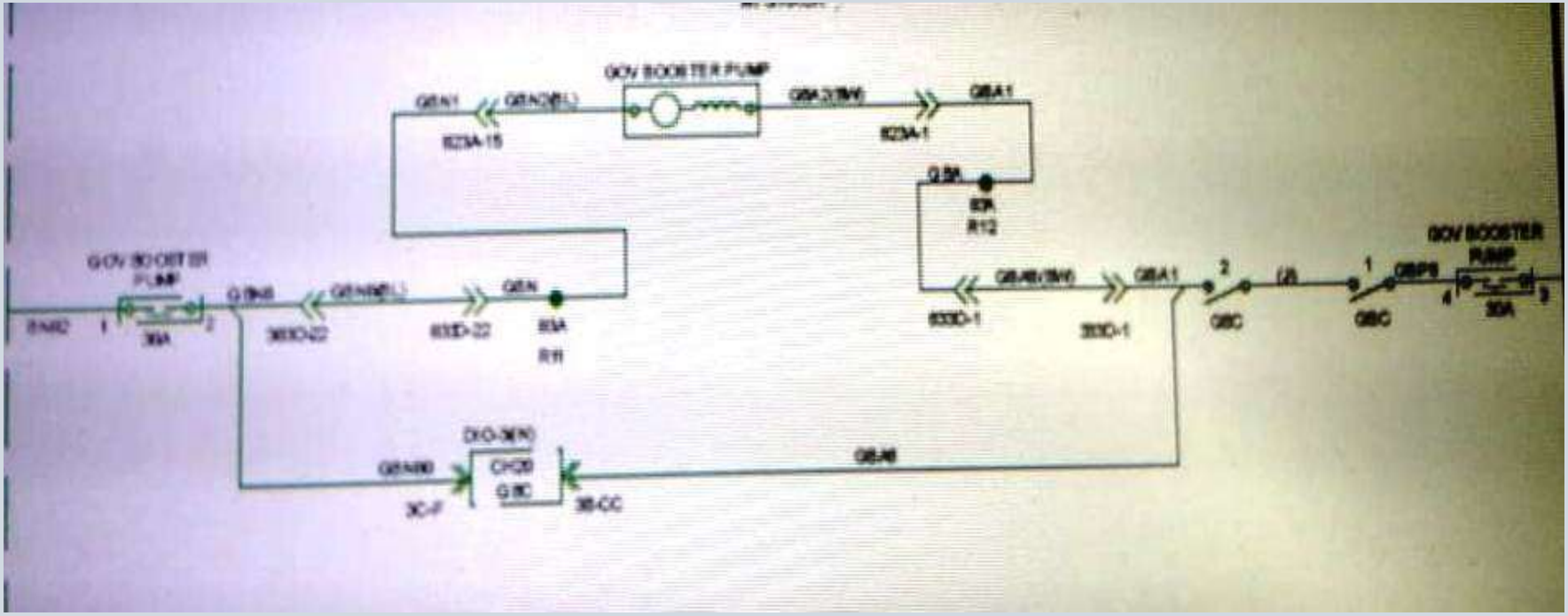
F29234

Pre-requirement for starting a loco

Sufficient Hydraulic Pressure to run the governor : in Woodward gov. – 100 psi created by governor pump.

(Control Shaft controls mechanically the movements of Fuel Unit Injector racks of all cylinders of the Diesel engine And the movements of this control shaft is controlled by the Hydraulic Pressure through Gov. Linkages.)

Governor Pump Motor Circuit



Precautions Before Starting the Engine

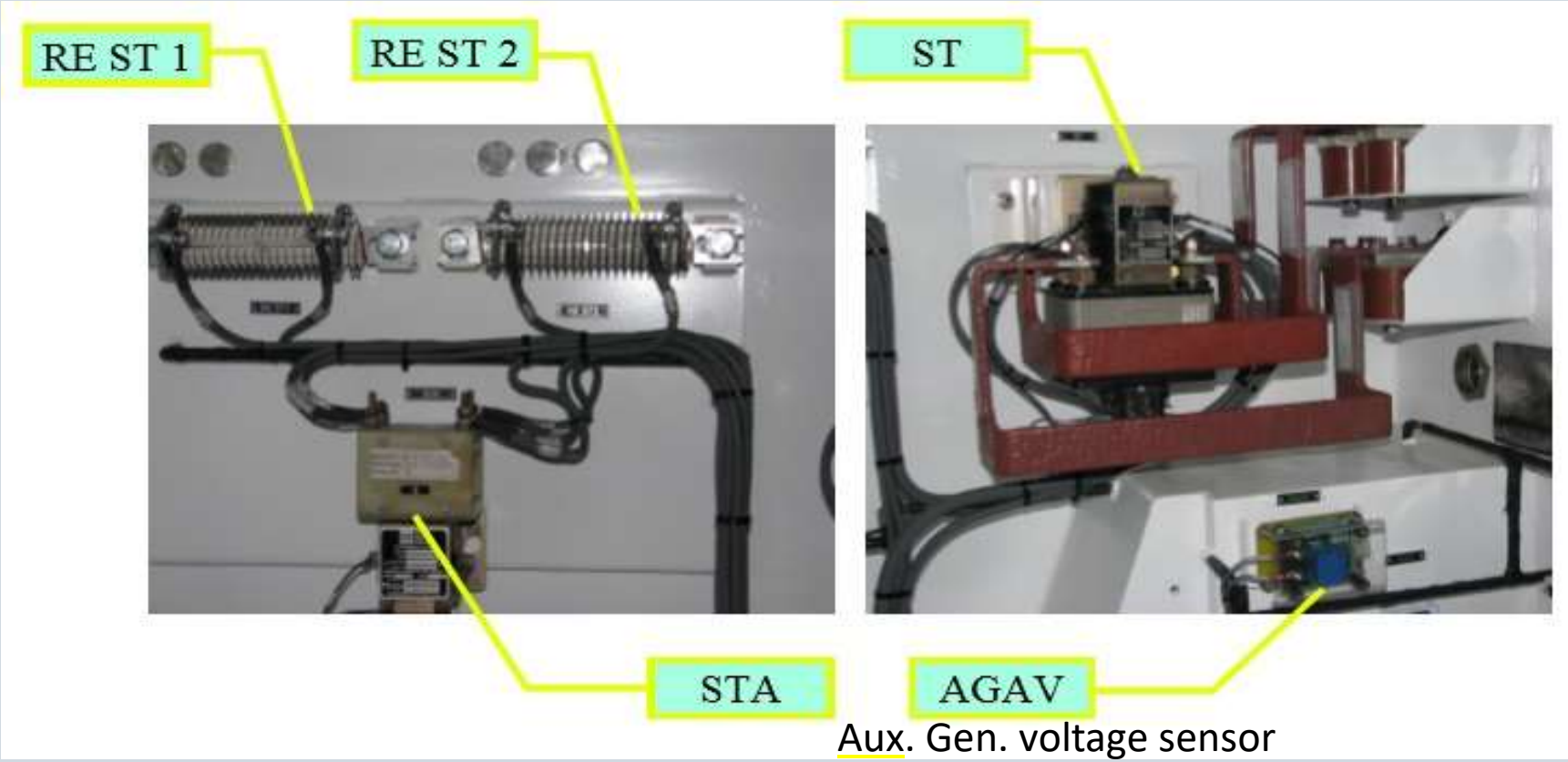
Ensure –

Throttle handle - In IDLE
Reverser handle - In center
Isolation Switch - In isolate position
Coolant water level - full(In water tank)
Compressor oil - Sufficient level
Engine lube oil - Sufficient level
Governor oil - Sufficient level
MU Switch - In RUN position
Over speed trip(OST) - In normal condition
Low Lube Oil shutdown plunger - In reset
Crankcase pressure detector - In reset
Low water pressure detector - In reset.
Battery Knife switch, Circuit Breakers (Black, White & Yellow) - on
Control & FP Switch - on

Main Components of starting Circuits

- STA - Auxiliary starting contactor.
- ST - Starting contactor.
- Pick up coil. Less(1 ohm) .
- Hold coil.
- SM1&SM2 Contacts.
- Starter motors.
- RE – Resistance 0.6 ohm.
- Starting Battery.

STA-ST Contactors and Resistors in ECC#2



Aux. Gen. voltage sensor

STARTER MOTOR

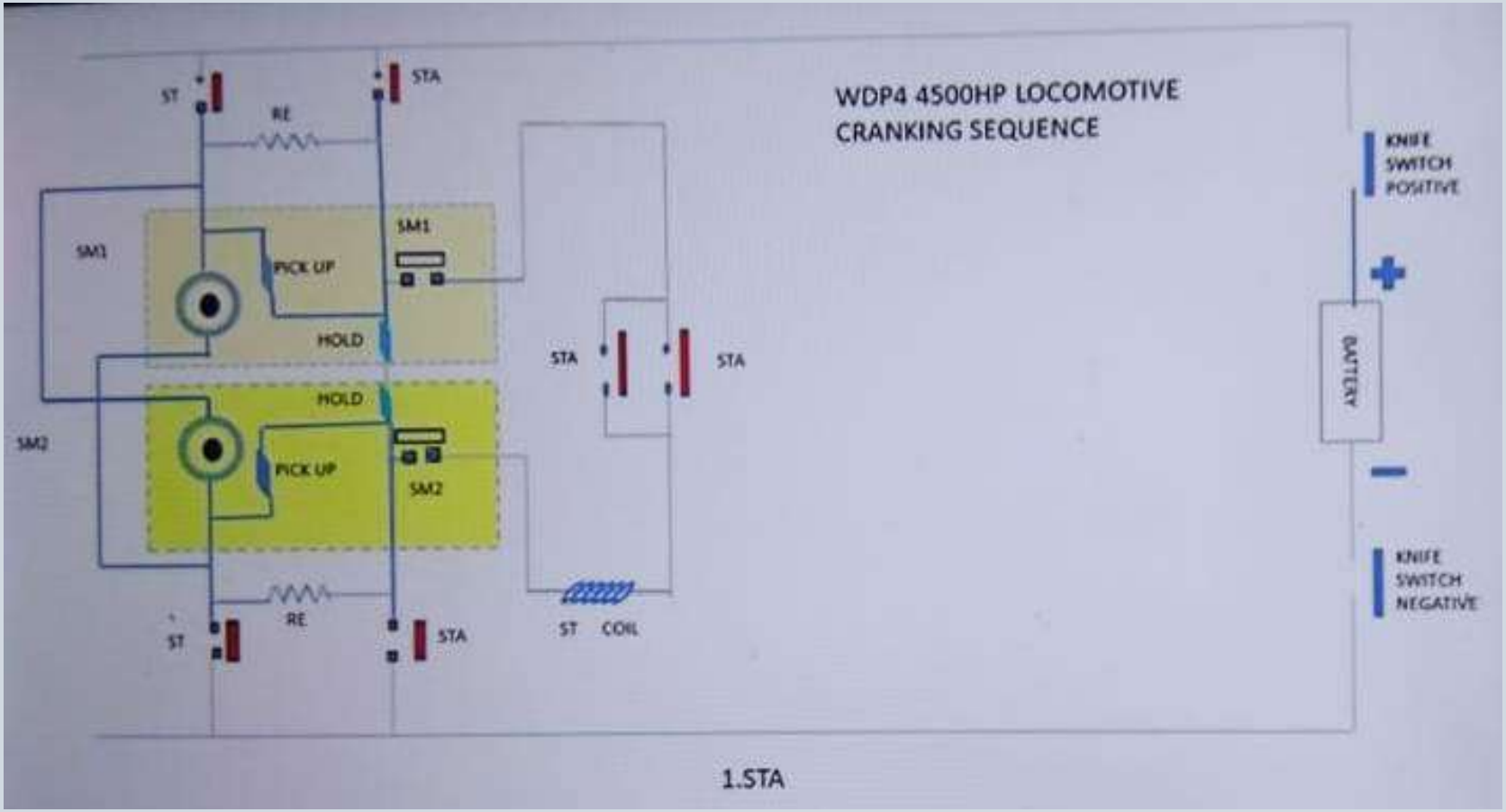
STARTER MOTOR RATING

Starting motor :

- *Model – Series 50 MT, Type 400 of DPG make*
- *Motor-DC series motor*
- *Nominal voltage-64V DC*
- *Nominal current- 950A*
- *Permissible max Speed- 10,000 RPM*

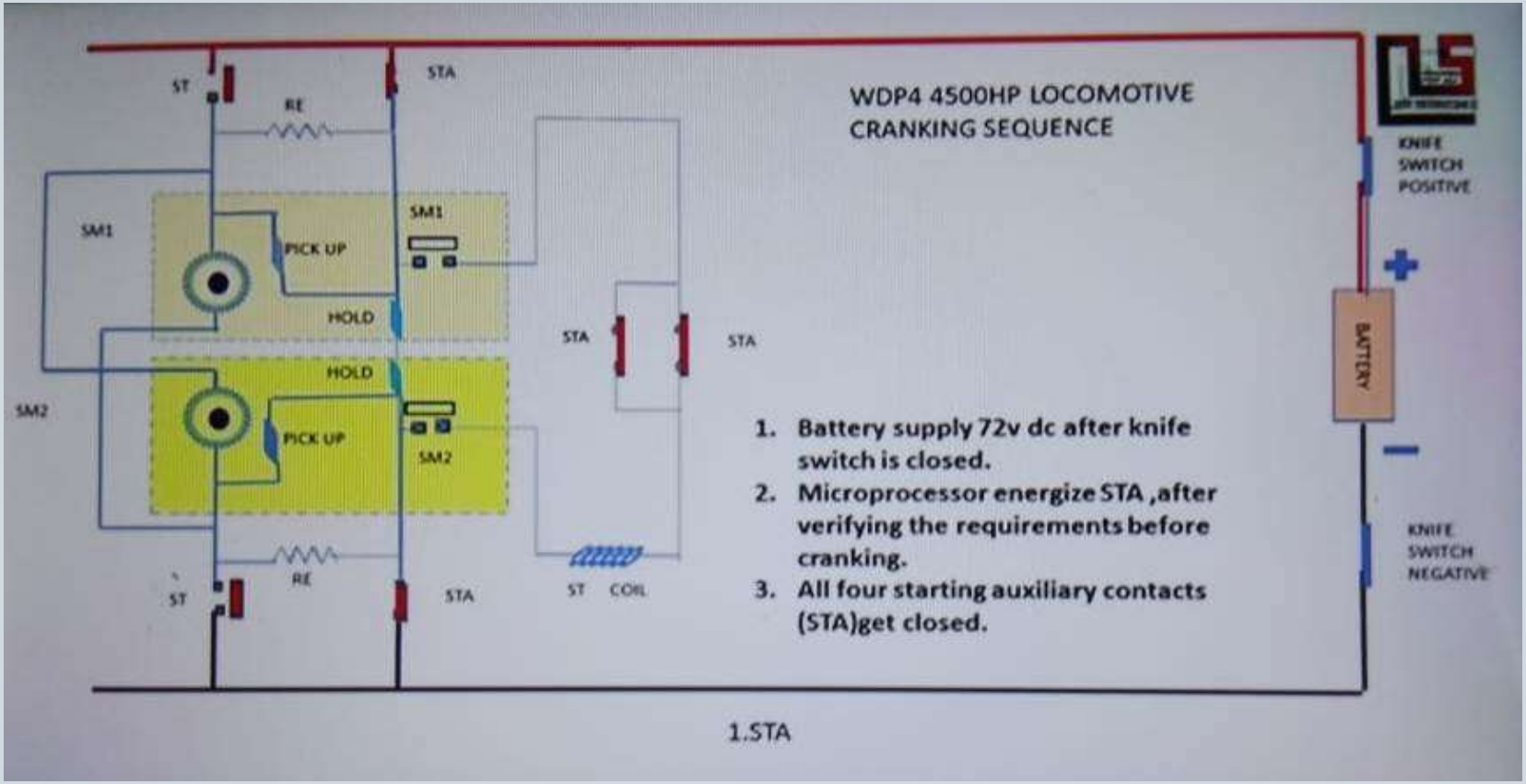
Crank shaft gear of starter motor towards the ring gear of main engine to engage

Starting circuit



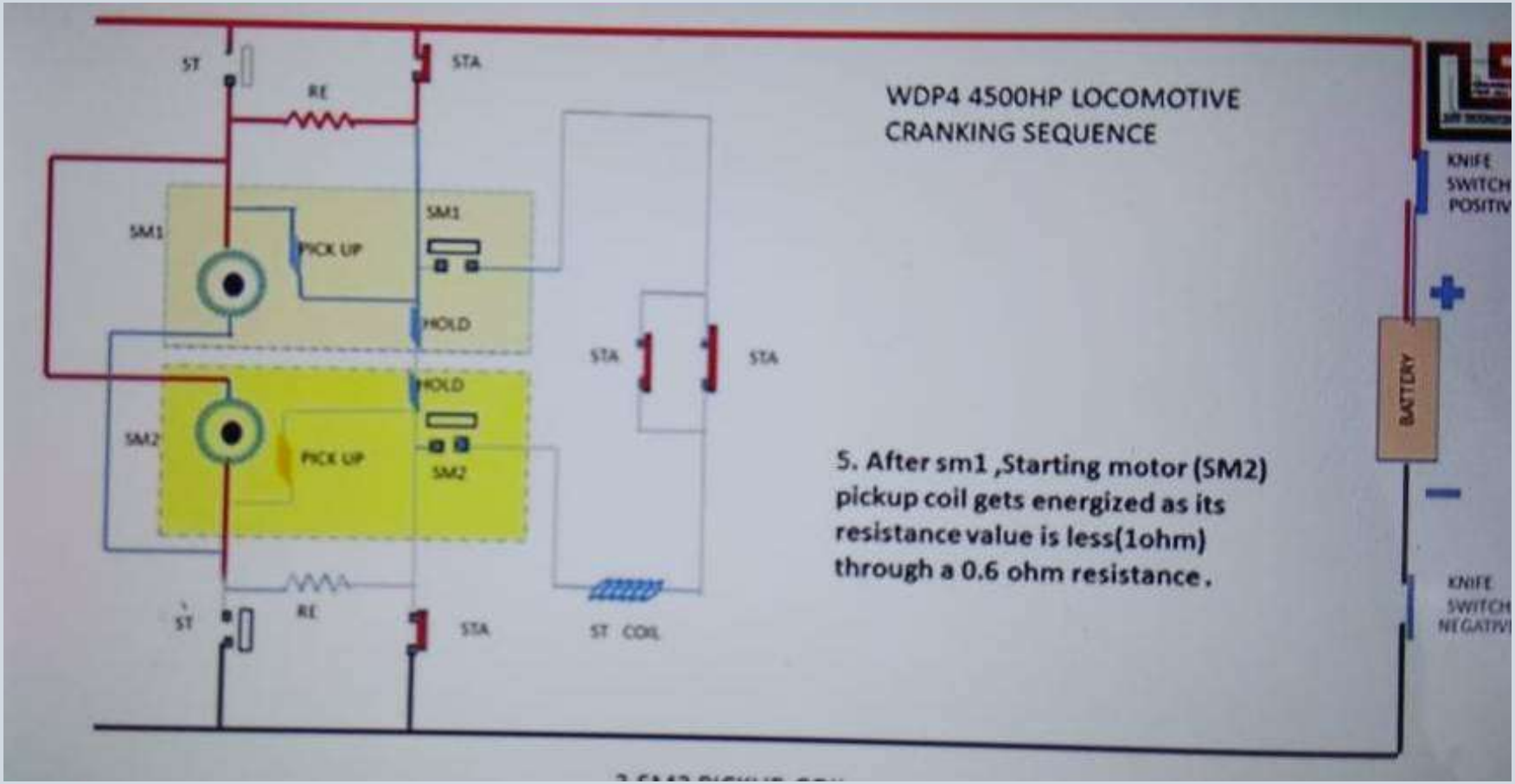
Engine Control Panel

Microprocessor to energize STA

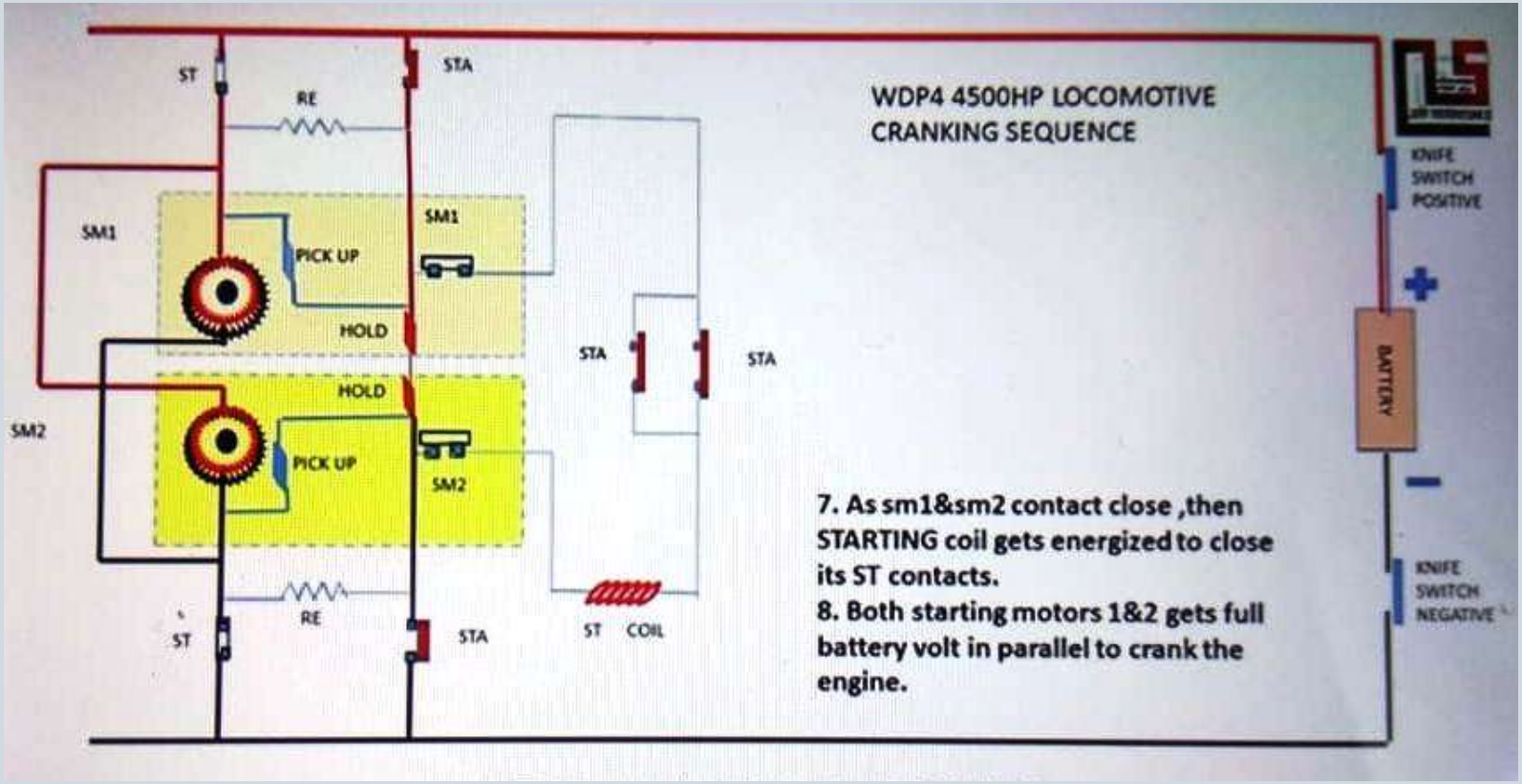


Starting motor(SM1) pickup coil gets energized

Starting motor(SM2) pickup coil gets energized



Both starting motors gets full Battery voltage



THANK YOU