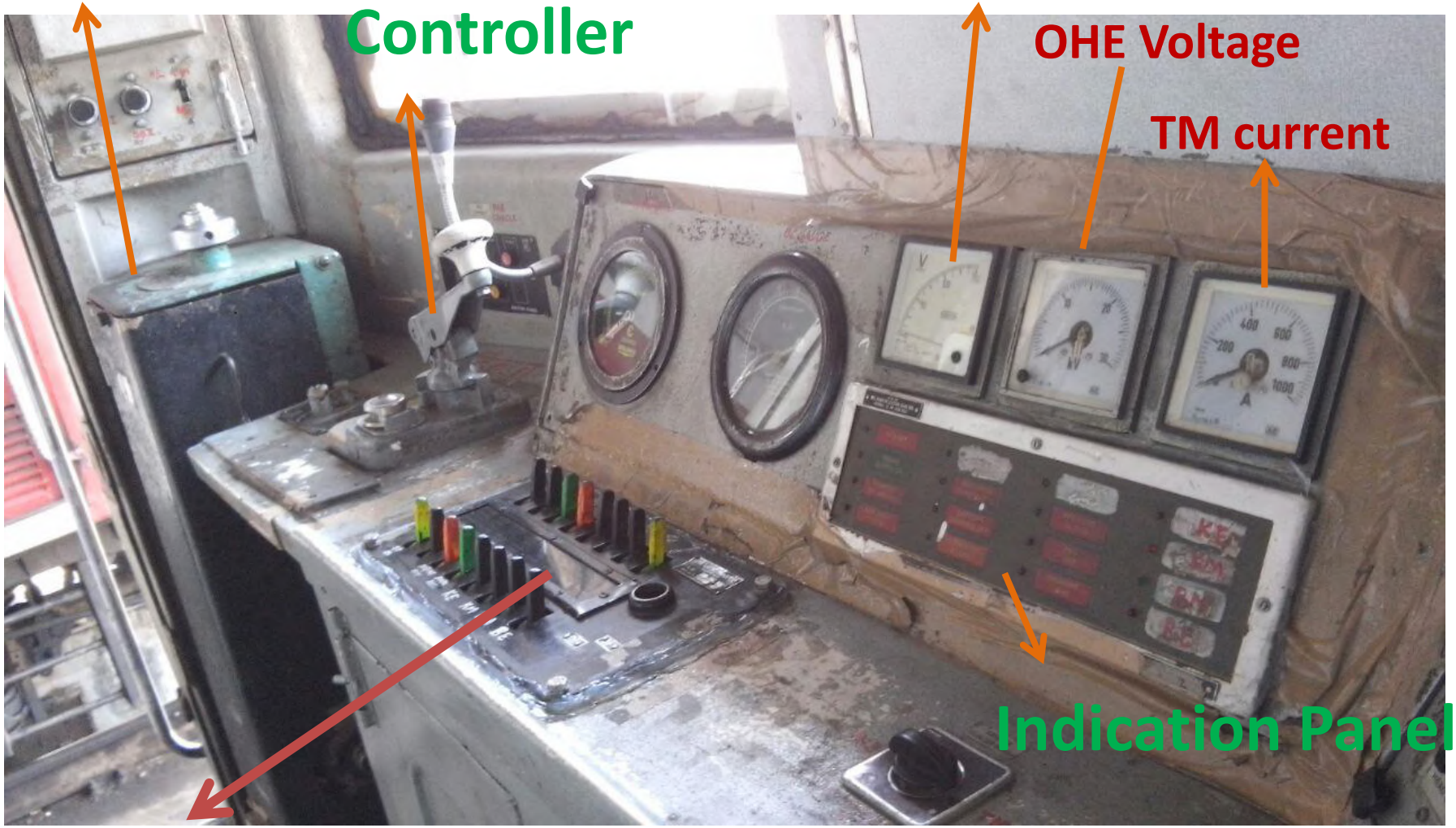
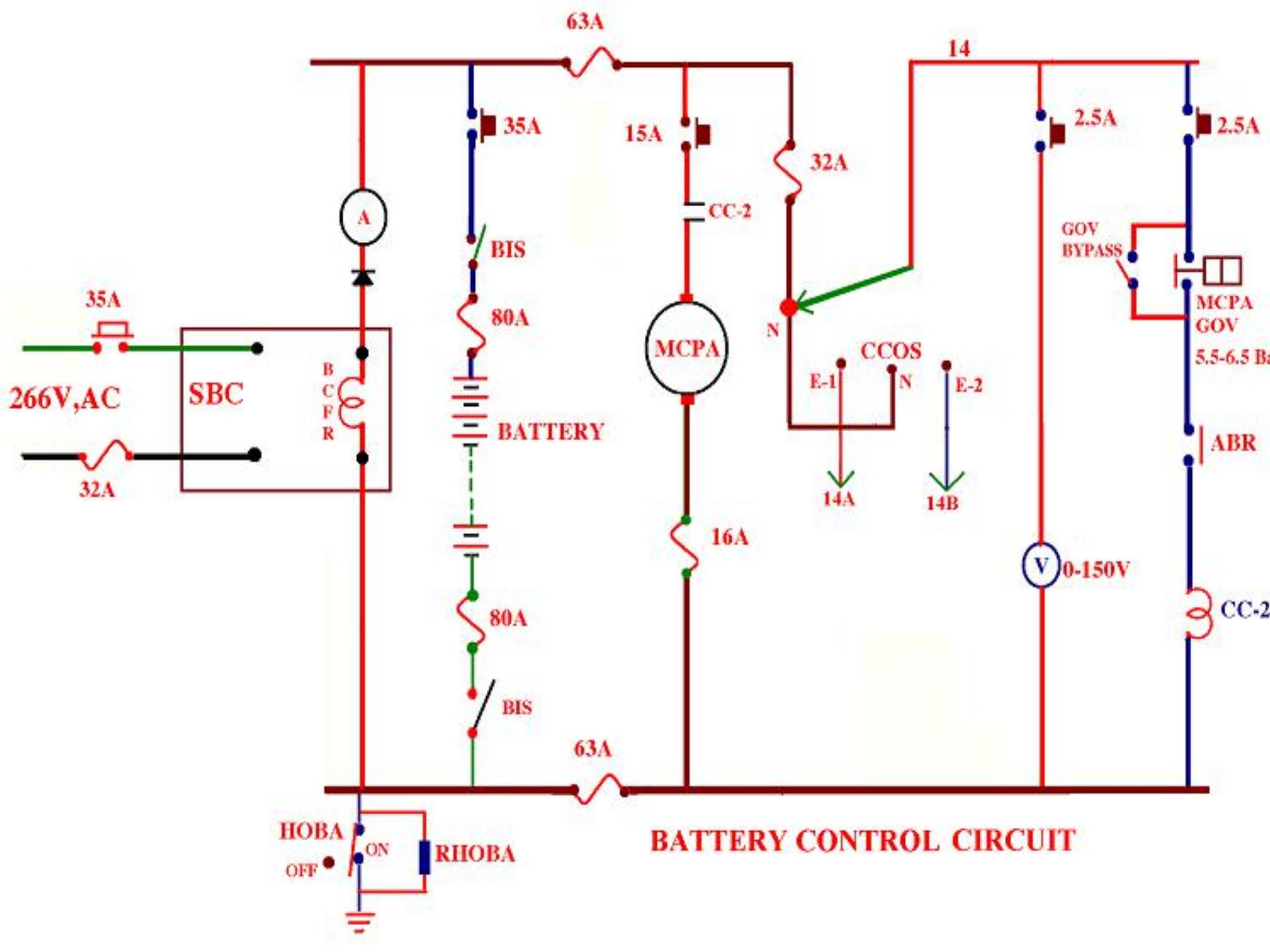
Control Circuits of AC EMU/MEMU Con.

N.D.Turkar/PL/PSTC/IRIEEN/NK

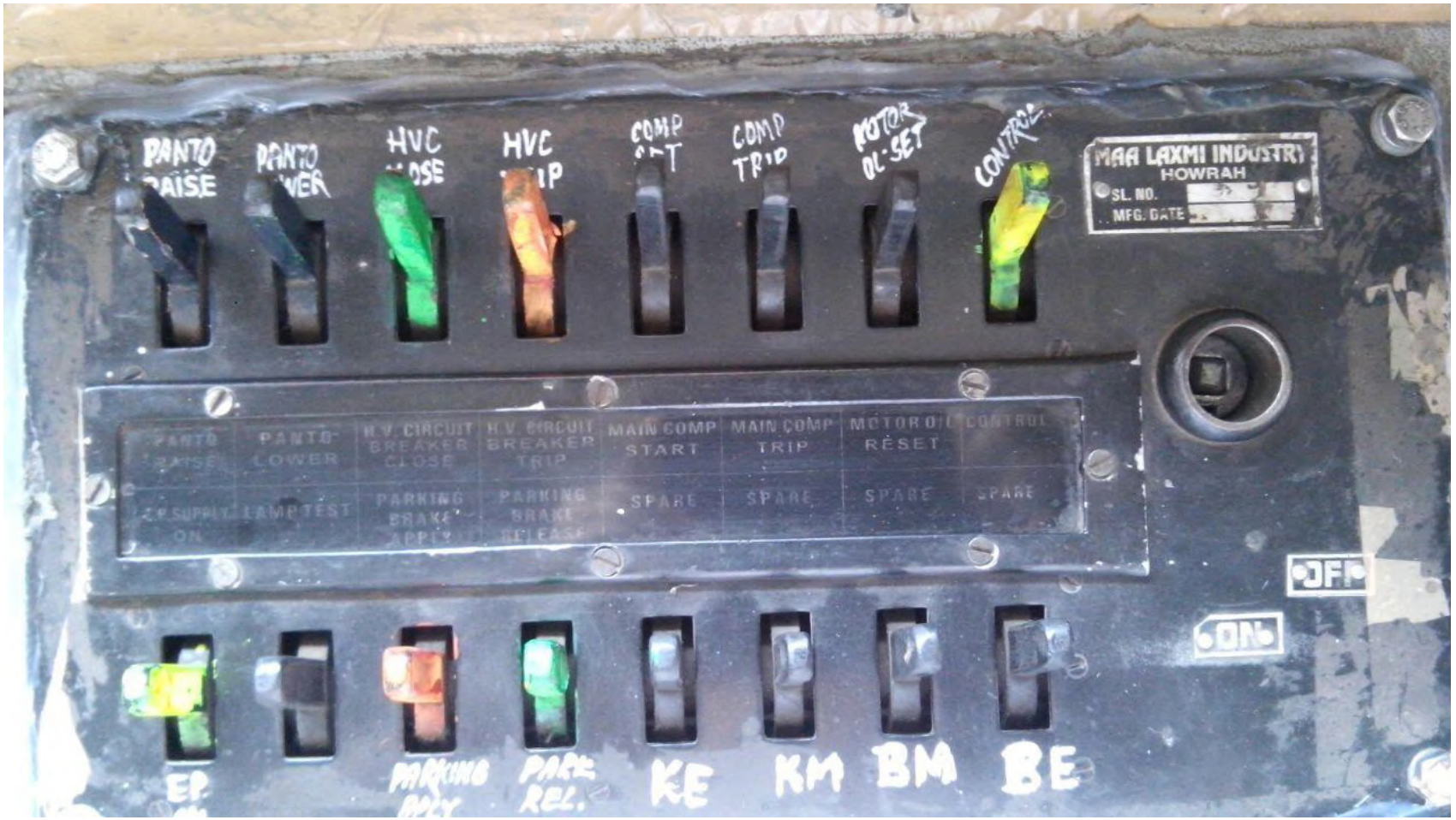
DRIVER'S DESK



Battery Isolating switch(BIS)


63A
14
35A
15A
32A
2.5A
2.5A
A
BIS
CC-2
GOV
BYPASS
35A
80A
MCPA
N
CCOS
MCPA
GOV
266V,AC
SBC
B
C
F
R
E-1
N
E-2
5.5-6.5 Ba
BATTERY
ABR
14A
14B
16A
V
0-150V
80A
CC-2
BIS
63A
HOBA
ON
OFF
RHOBA
BATTERY CONTROL CIRCUIT

Button Lever (BL) box

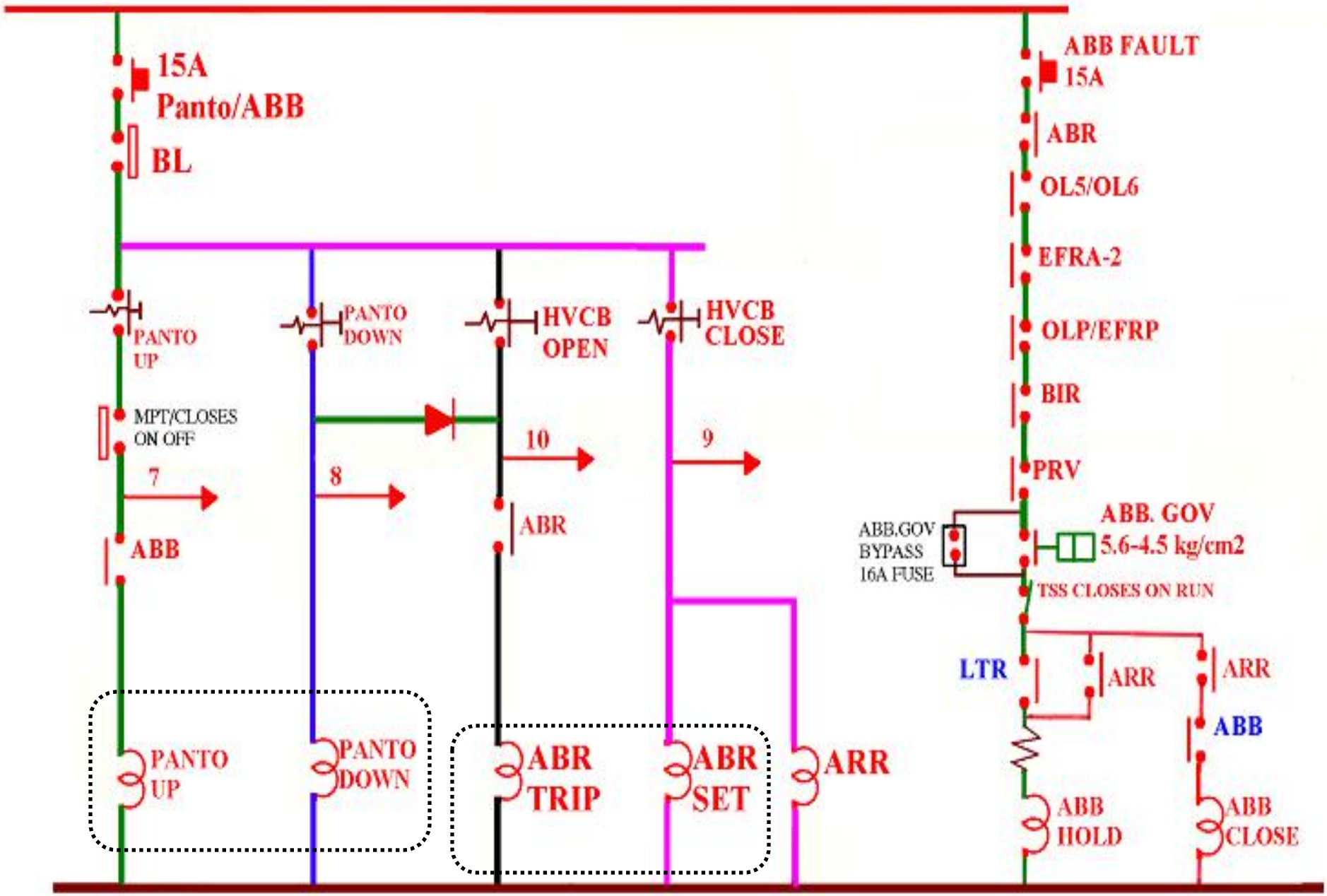


Test sequence switch

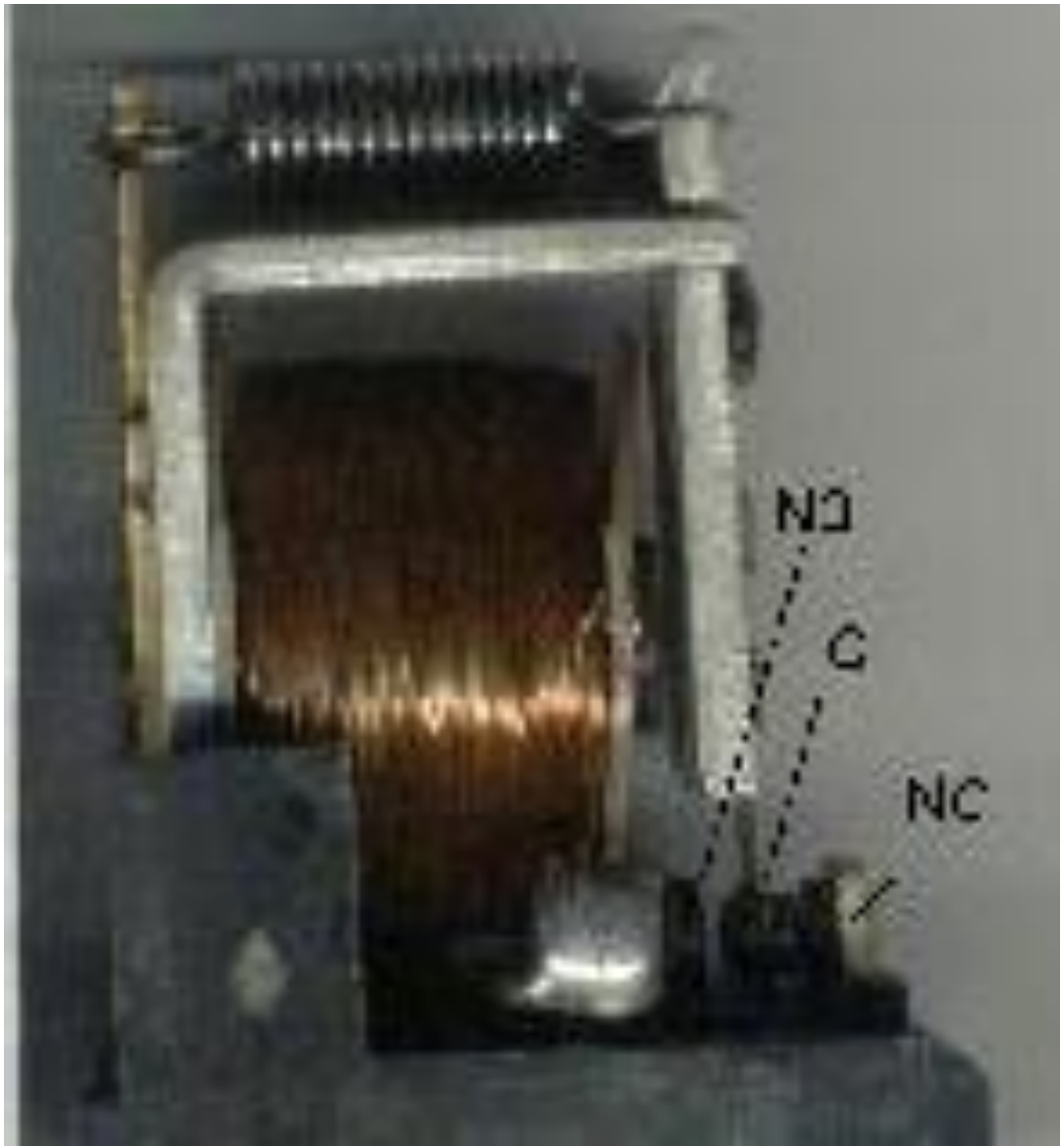
Conditions to close ABB/VCB

1. Sufficient air pressure is available.
2. Transformer is healthy means inside pressure and gas formation should within limit.
3. PRV should be intact.
4. BIR in dropped condition.
5. No overloading in primary and secondary of transformer.
6. No earth fault in primary or Aux II circuit.
7. TSS is in Run position.

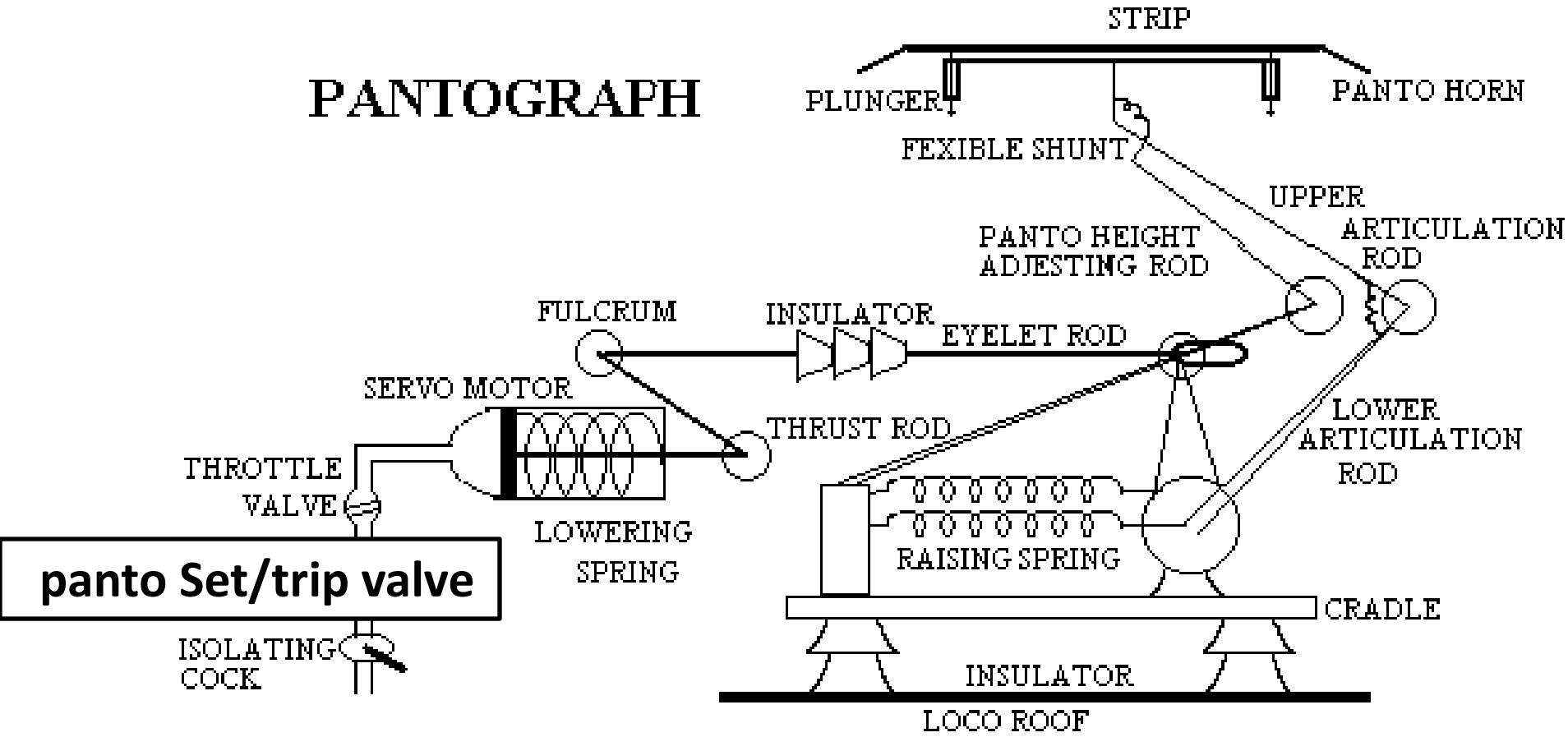
PANTO/ABB CONTROL CIRCUIT



Relay



PANTOGRAPH



panto Set/trip valve

Raising of Pantograph

- When pantograph raise switch is pressed, wire no 7 will be energized causing pantograph up coil to energize and pantograph will raise in all motor coaches, provided PANTO/ABB MCB is ON position, BL is unlocked and MPT is OFF position & ABB is open .For lowering pantograph, pantograph lower switch to be pressed.

Closing of ABB/VCB

- When ABB close switch is pressed, wire no.9 will be energized through PANTO/ABB MCB which causes ABR set and ARR to energize in all motor coaches.
- Then ABB closing coil is energized through ABB fault MCB is on, ABR N/O interlock, OL5/6, EFRA-2, OLP/EFRP, BIR, are in normal condition, ABB governor interlock is closed, TSS in run position, PRV is normal, ARR N/O interlock and ABB N/C interlock. Simultaneously ABB hold coil also will energize through ARR N/O interlock.

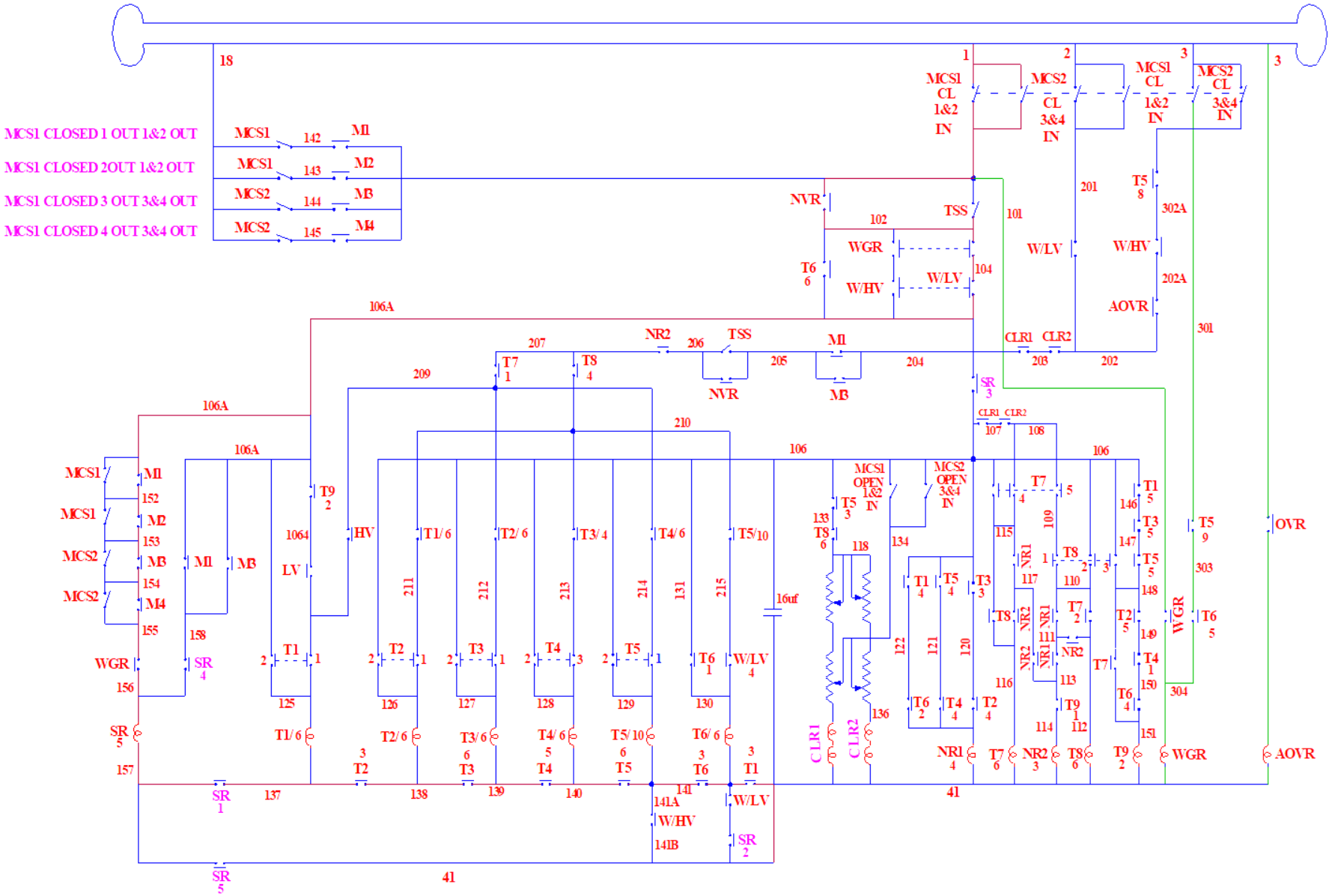
Closing of ABB/VCB

- When ABB closing coil is energized ABB closes in all motor coaches and ABB trip lamp extinguishes. As soon as ABB is closed ABB N/C interlock opens and ABB closing coil de energizes.
- Further ABB hold coil is maintained in energized condition through LTR which is energized as soon as ABB is closed.

OPENING OF ABB

- When ABB trip switch is pressed wire NO.10 will be energized through PANTO/ABB MCB and which causes ABR trip coil to get energized thereby ABB hold coil will de-energizes and ABB will trip in all motor coaches. This will be indicated by glowing of ABB trip light in the driver's cab.
- Whenever the relays OL5/OL6, EFRA II, OLP/EFRP, BIR, LTR are acted or when the air pressure drops below 4.5kg/cm2 or incase of ABB fault MCB trips, ABB holding coil will de energize and ABB will trip in defective motor coach automatically.

CONTROL CIRCUIT OF TAP CHANGER



CONTROL CIRCUIT OF TAP CHANGER

This circuit is provided for the correct operation of tap changer and transfer contactors. Relay SR ensure opening of all tapping contactors initially. For energizing SR relay the following conditions to be fulfilled.

1. NVR in energized condition.
2. Motor contactors M1 to M4 are closed.
3 Winding change over switch is in LV side.
4.Tapping contactors T1 to T6 are in open condition]

WARNING: **SR shall not be manipulated or packed.**

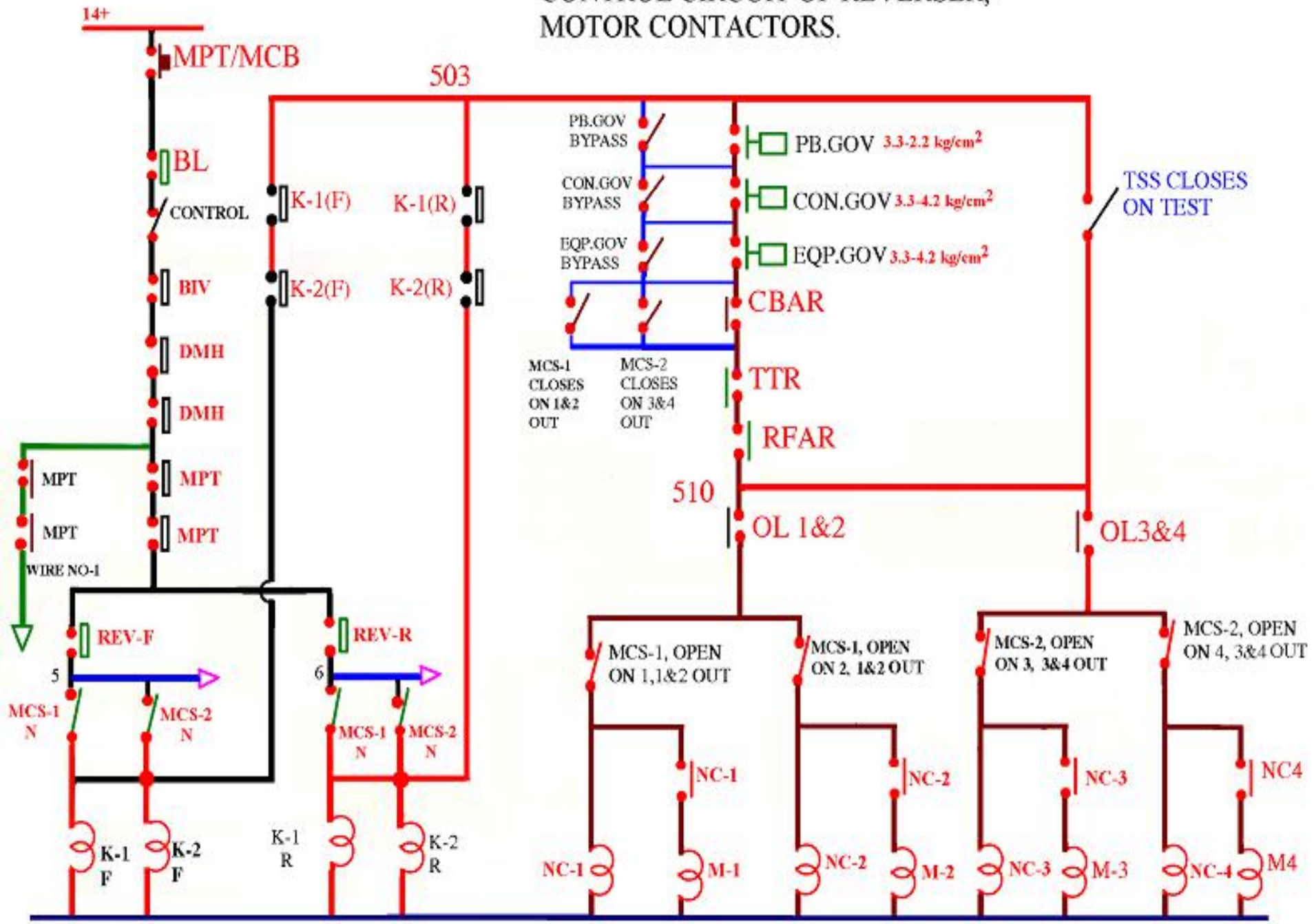
When MPT is moved to shunt, wire No.1 will energize. When wire no.1 energizes through the MCS-1 & MCS-2 contacts, normally open interlock of NVR, Normally closed interlock of WGR, and through LV interlock of W, wire no.106A energizes. This in turn energize SR (starting relay), through the normally open interlock of M-1 to M-4 which is now closed, normally closed interlock of WGR on positive side and in the negative side SR is being completed through its own SR normally closed inter lock and T-2, T-3, T-4, T-5, T- 6 & T- 1 normally closed interlock.

As soon as SR is energized, its four normally open interlocks are closing in different branches, but SR will be maintained through its normally open interlock. Another normally open interlock of SR, which is in series with the normally open interlocks of M-1, & M-3 to maintain SR in additional parallel path from 106A. Another normally open interlock of SR closes in 106A wire which in turn energies wire no.106 holding wire and also gives feed to wire no.107 & wire no.108 through normally closed interlock of CLR-1 & 2. The SR fourth normally open interlock closes in then negative side of tap changing contactors connected in series with W/LV contact to maintain the circuit when T1 is in closed condition on first notch.

From wire no 106, T9 contactor coil is energized through normally closed interlock of T-8, T -2, T-4 and T-6. At the same time T-7 contactor coil is energized from wire no. 108, N/C of T-7, T-8.

Through wire no.106A, the T-1 contactor coil energizes through normally open interlock of T-9, W/LV contact and normally closed interlock of T-1. The negative of the T-1 coil is maintained through normally closed interlocks of T-2 to T-6, W/LV and normally open interlock of SR. Now the T-1 is maintained through its own normally open interlock. In this condition the contactors T- 1, T-7 and T-9 are closed and first notch is completed.

CONTROL CIRCUIT OF REVERSER, MOTOR CONTACTORS.



CONTROL CIRCUIT OF REVERSERS AND MOTOR CONTACTORS

Condition for closing motor contactors and setting reversor
1.MR pressure is above 6 kg/cm2.
2.BIV is turned on & BP pressure is 5 kg/cm2.
3.Control switch is ON.
4.EP supply BL switch is ON and EP supply on- light is glowing..
5.MCB for MPT in good condition.

Motor contactors will close only when MPT moves to shunt. For this press MPT , throw reversor key forward and then move MPT to SHUNT position. Now the wire numbers 1 & 5 are energizing simultaneously provided MPT 15A MCB is ON, BL is unlock, control switch is ON and BIV is turned ON. When wire no 5 is energized, through MCS 1&2 contacts, Reversor K1 & K2 forward coils will energize, K1 & K2 will be thrown in forward direction.

As soon as K1 and K2 are thrown in forward direction, wire number 503 will energize. Motor contactors coil will get supply from wire no 503 through parking brake governor, control governor, equipment governor interlocks in closed position, normally closed interlock of CBAR, TTR and normally opened interlocks of RFAR, OL1&2, OL3&4. When motor contactor closing coil gets supply motor contactors will close. Motorman will get an indication in the cab by glowing and extinguishing of MSTL lamp.

1. Control governor:

(Setting open 3.3 close 4.2 kg/cm^2)
This is a pressure switch provided in the BP pipe line to ensure the sufficient BP pressure of 5 kg/cm2 is available for the auto brake. For any reason if BP pressure is reduced control governor interlock will open in motor contactor circuit and motor contactors will open. By pass switch is provided in GS panel

2. Equipment governor

(Setting open 3.3 close 4.2 kg/cm^2)
Equipment governor ensure sufficient pressure in control reservoir for operation of contactor such as tapping contactors, transfer contactors and motor contactors. When pressure drops in control reservoir, its inter lock will open in motor contactors branch and motor contactors will open. By pass switch is provided in GS panel.

3.CBAR:

When ever any one branch rectifier fuse blown out CBR(A) relay will energize and a pilot lamp indication will come in cab and no consequence will experience. When more than one rectifier branch fuse blown out CBR(B) relay will energize and CBAR relay will trip and motor contactors will open. This ensures no overloading of rectifiers when more than one fuse is blown. To resume traction CBAR interlock can be by-passed by placing MCS-1 in 1&2 out or MCS-2 in 3&4 out position.

4.TTR:

TT is a thermal switch provided to detect transformer oil temperature. Whenever the transformer oil is heated above the set valve of 75 degree TT will sense it and TTR relay will trip and motor contactors will open. When temperature comes down TTR will set automatically and motor coach will respond. During this time Motorman to ensure working of radiator fan, MCB of oil pump and radiator fan.

5.RFAR:

An air flow relay RFR is provided in the rectifier cubicles to ensure the working of rectifier fan motor (RF). If the rectifier fan is not working RFR will drop and causing its interlock to open in RFAR circuit resulting RFAR de energizing and a TRIP indication will appear on the relay. When RFAR trips motor contactors will open and not responding will experience

STARTING RELAY SR

This relay is provided to prove that the equipment is in the correct condition before allowing the train to start. It is connected in such a way that it proves motor contactors M1 to M4, relay WGR, and tapchange contactors T2 to T6, as described later.

WINDING-GROUPING SWITCH W

This is an electro-pneumatic, cam-operated change-over switch arranged to select one section of the transformer secondary winding or both sections in series.

WINDING-GROUPING RELAY WGR

This is an electro-pneumatic relay which controls the above change-over switch.

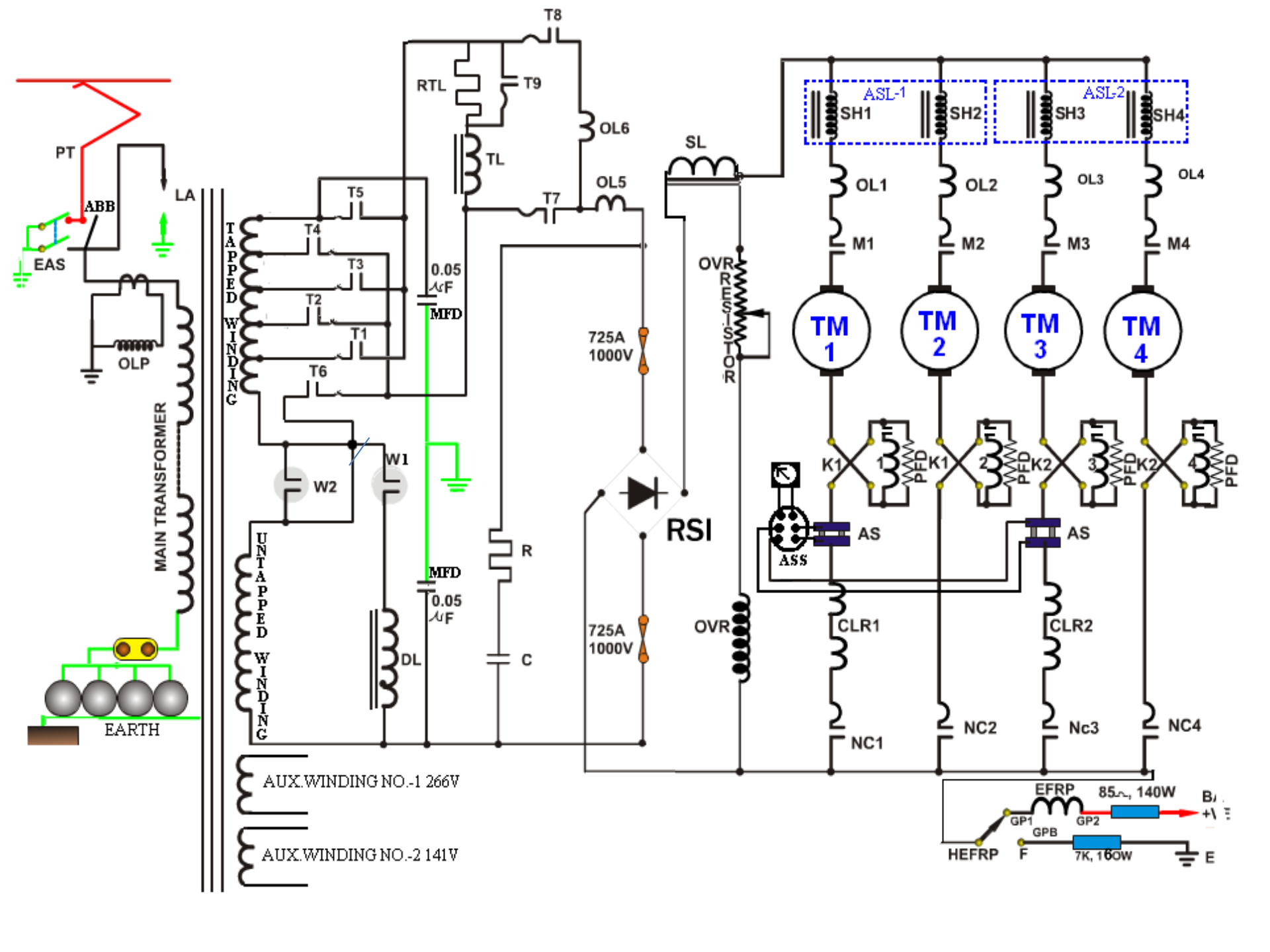
NOTCHING RELAYS NR1 AND NR2

These are electro-pneumatic relays which ensure that the operation of the tapchange contactors T1 to T9 occurs in the correct sequence and with the right timing.

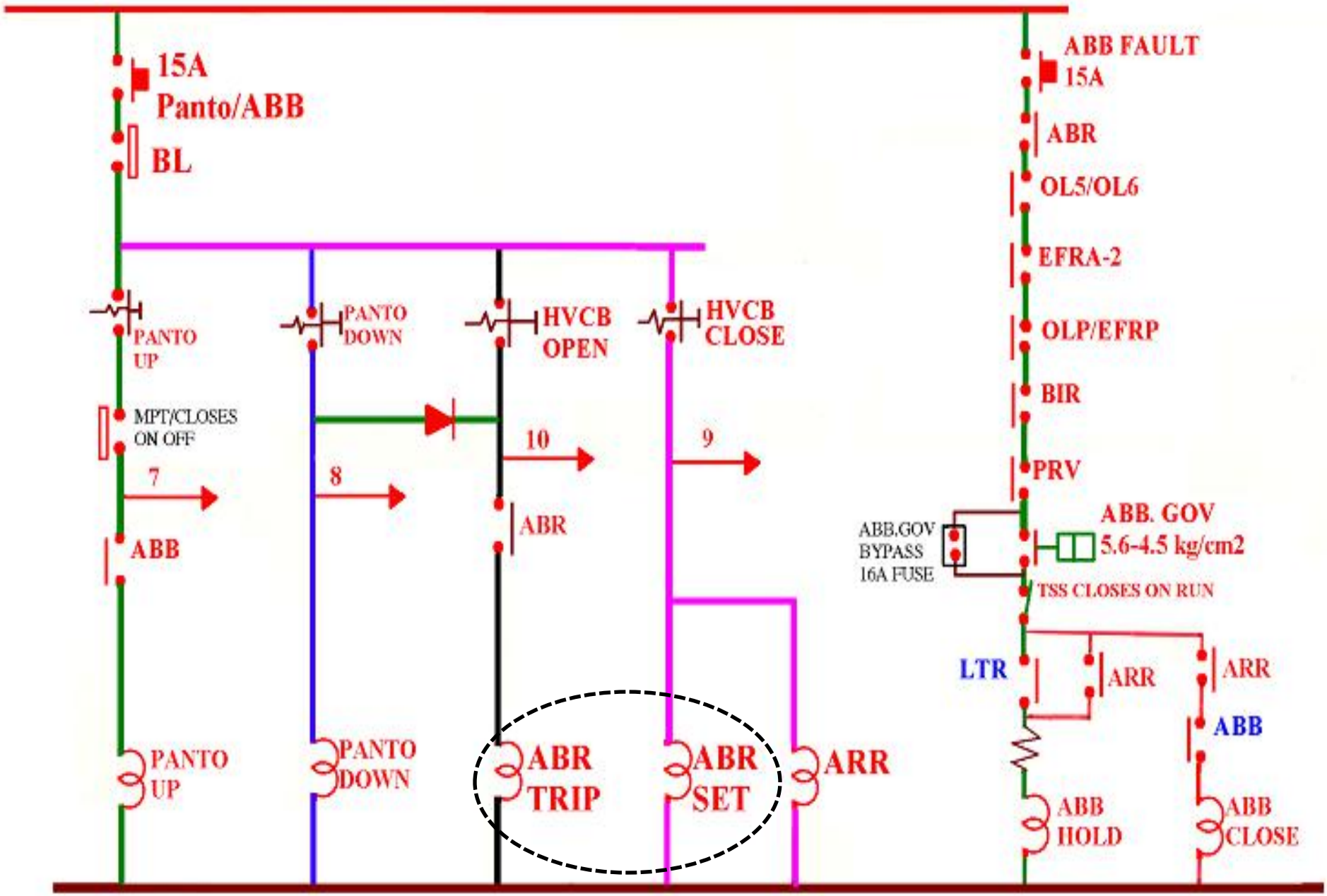
Relay NR1 is arranged, by means of restrictions in the air supply, to close and open slowly. Relay NR2 similarly arranged to close normally and open slowly. By these means, the correct timings of the contactors are obtained.

INTERLOCKS

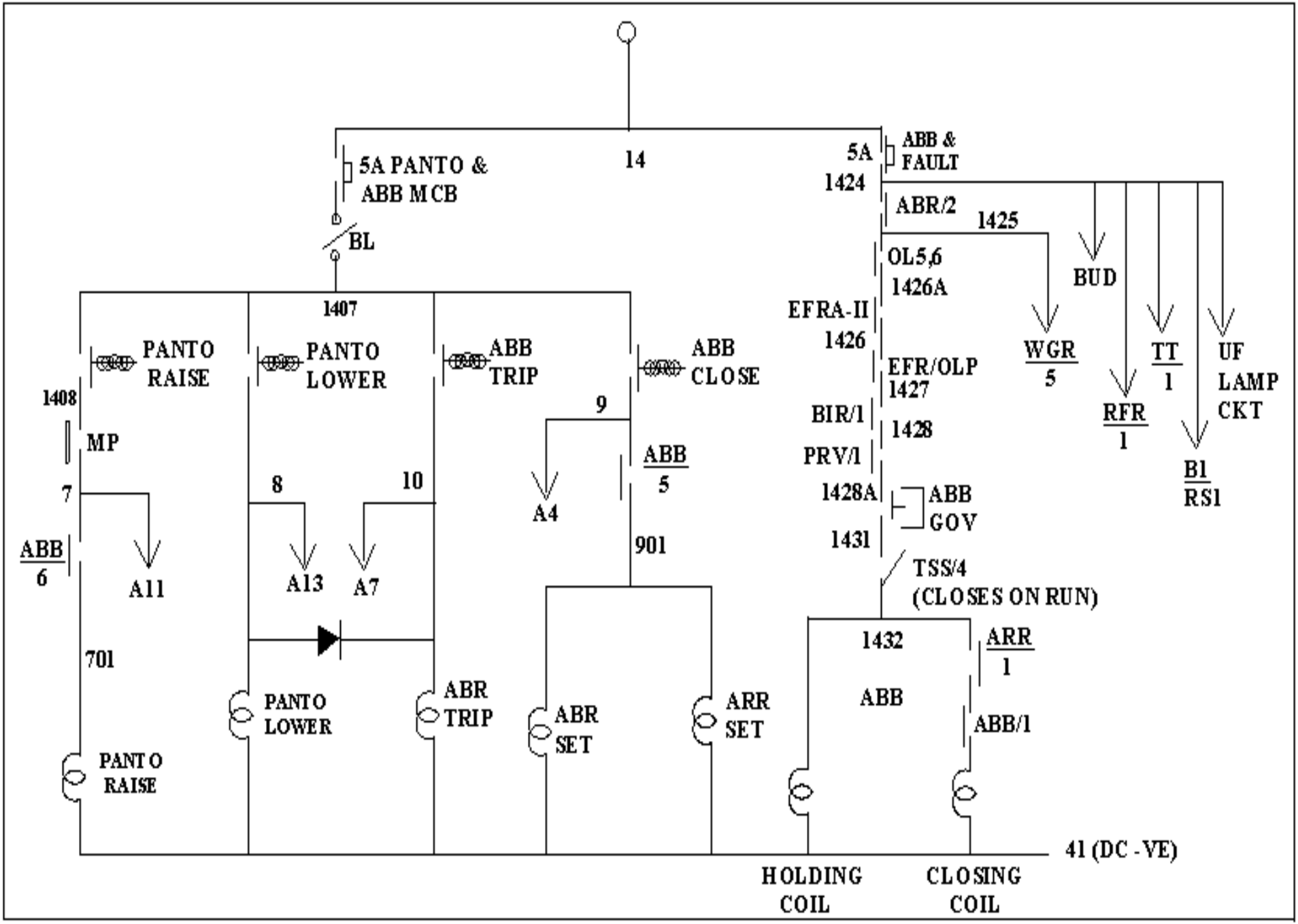
All contacts are shown with the contactors or relays in the open or de-energised position. An **IN** contact is closed when the contactor or relay is energised and an **OUT** contact is closed when the contactor or relay is de-energised.


PT
ABB
LA
EAS
OLP
MAIN TRANSFORMER
EARTH
TAPPED WINDING
UNTAPPED WINDING
T1
T2
T3
T4
T5
T6
T7
T8
T9
RTL
TL
OL5
OL6
0.05 μF
MFD
W1
W2
DL
R
C
725A 1000V
725A 1000V
RSI
SL
OVR RESISTOR
OVR
ASL-1
ASL-2
SH1
SH2
SH3
SH4
OL1
OL2
OL3
OL4
M1
M2
M3
M4
TM 1
TM 2
TM 3
TM 4
K1
K2
PFD
AS
ASS
CLR1
CLR2
NC1
NC2
Nc3
NC4
AUX.WINDING NO.-1 266V
AUX.WINDING NO.-2 141V
EFRP
85Ω, 140W
GP1
GP2
GPB
HEFRP
F
7K, 160W
E

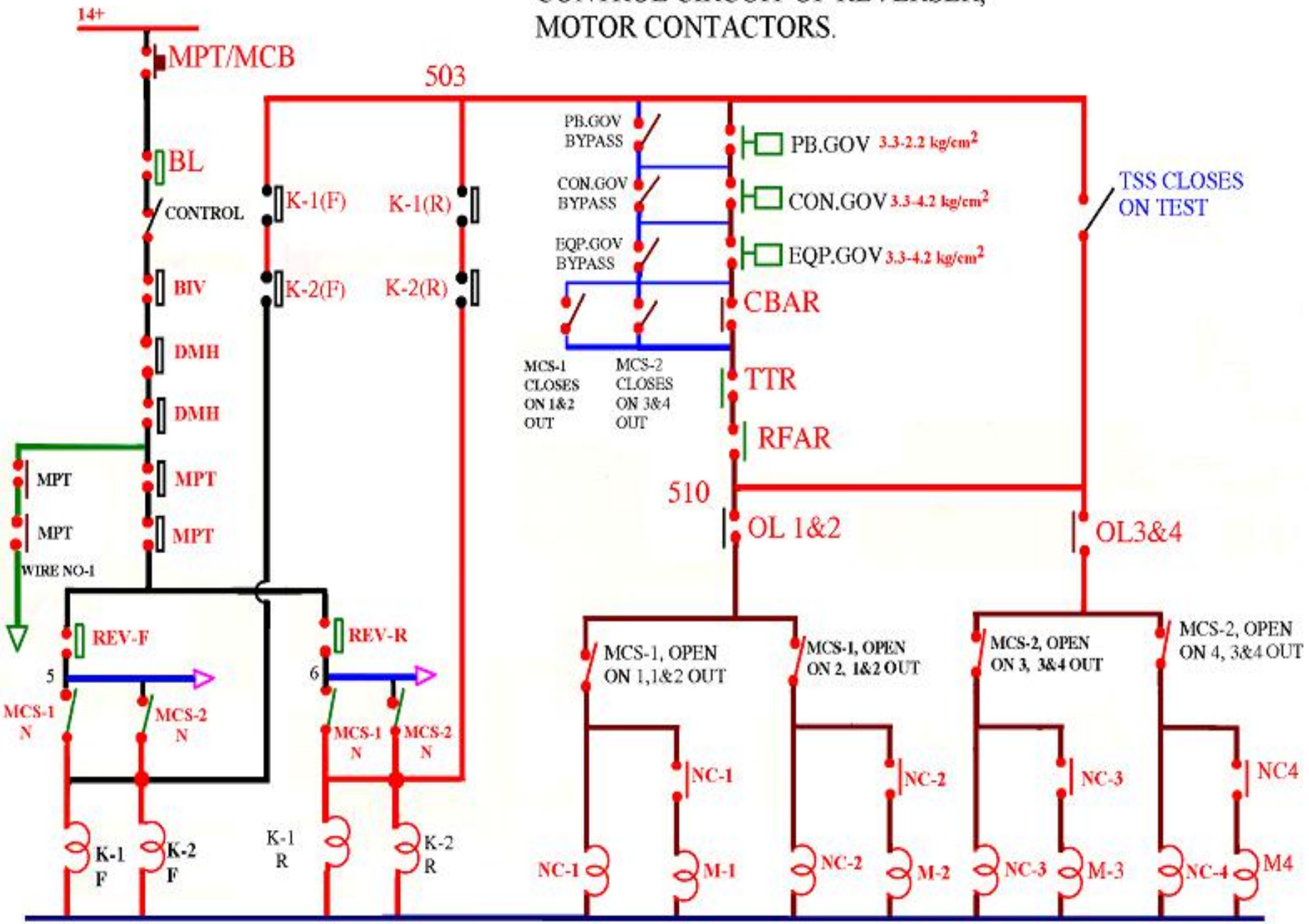
PANTO/ABB CONTROL CIRCUIT



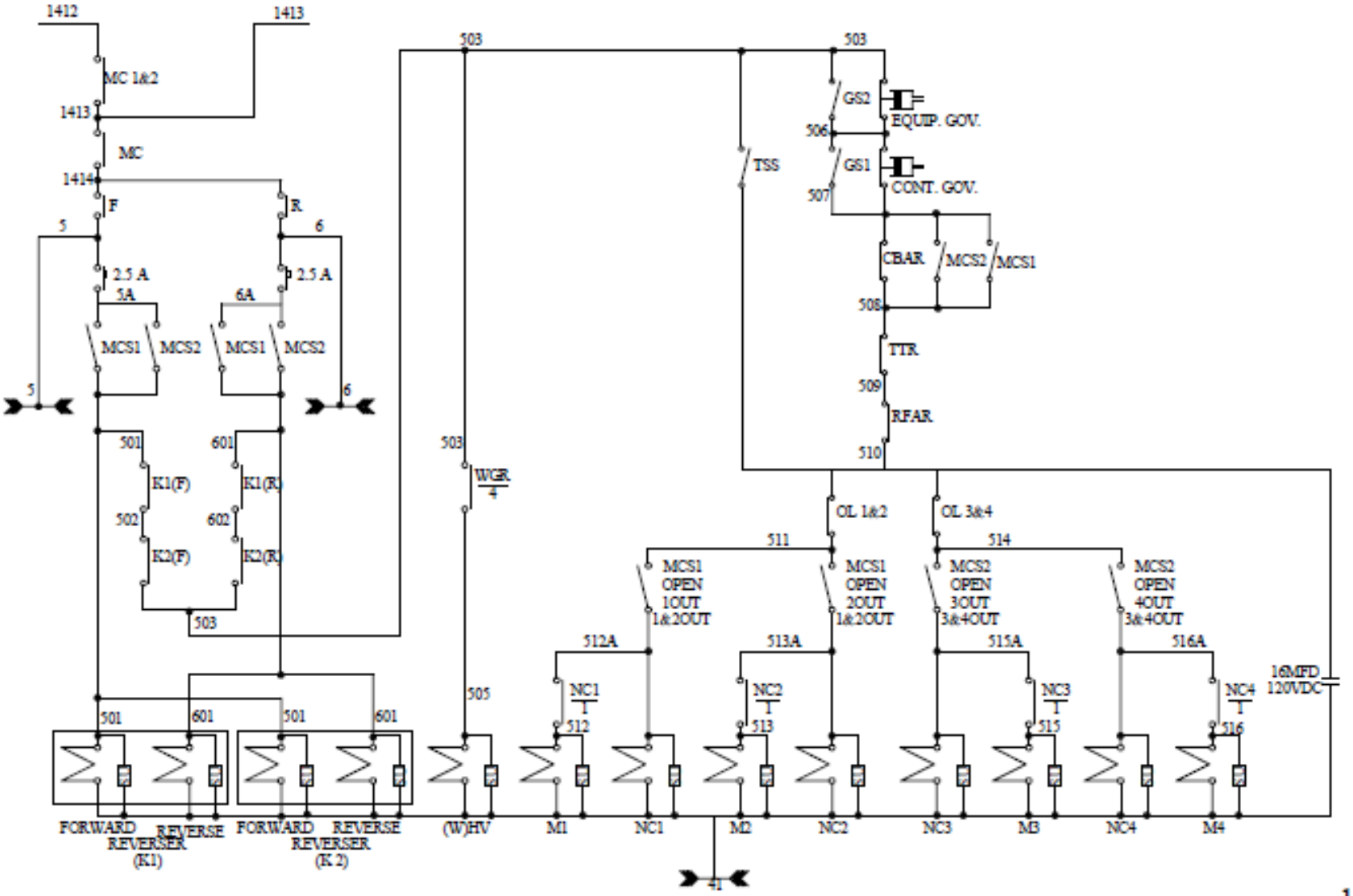
PANTO & ABB CLOSING CIRCUIT



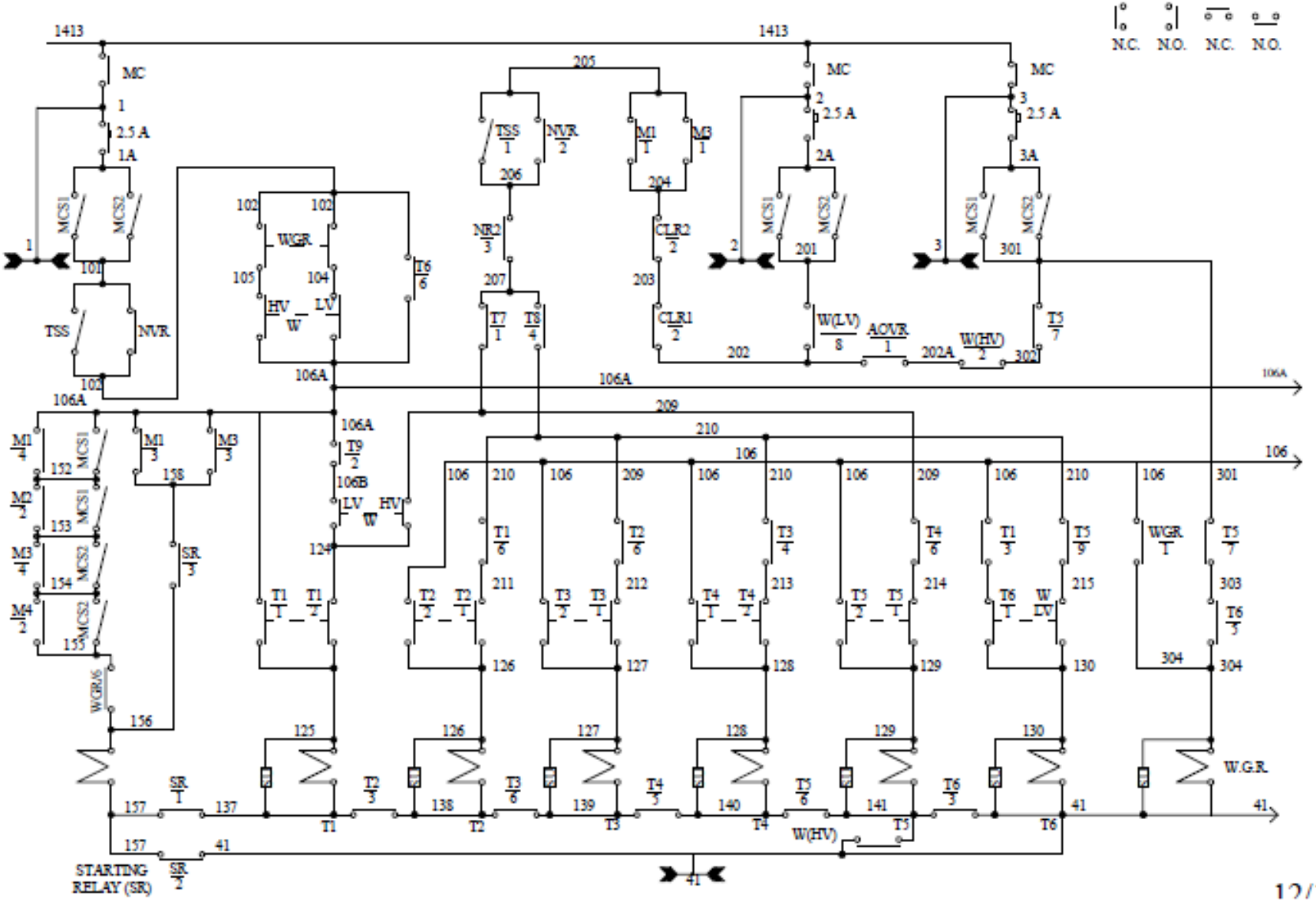
CONTROL CIRCUIT OF REVERSER, MOTOR CONTACTORS.



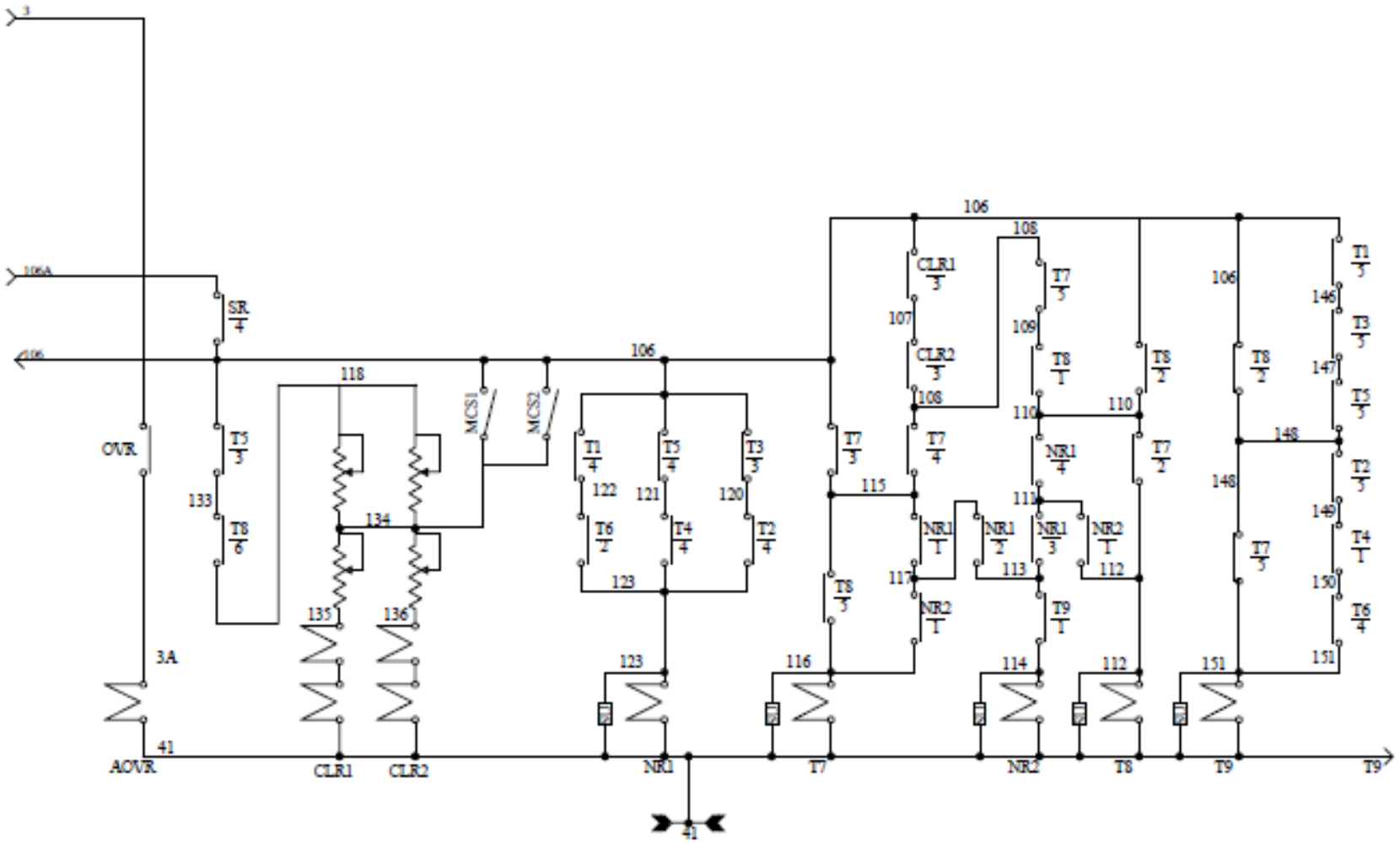
SCHEMATIC OF REVERSER & MOTOR CONTACTOR CONTROL CIRCUIT

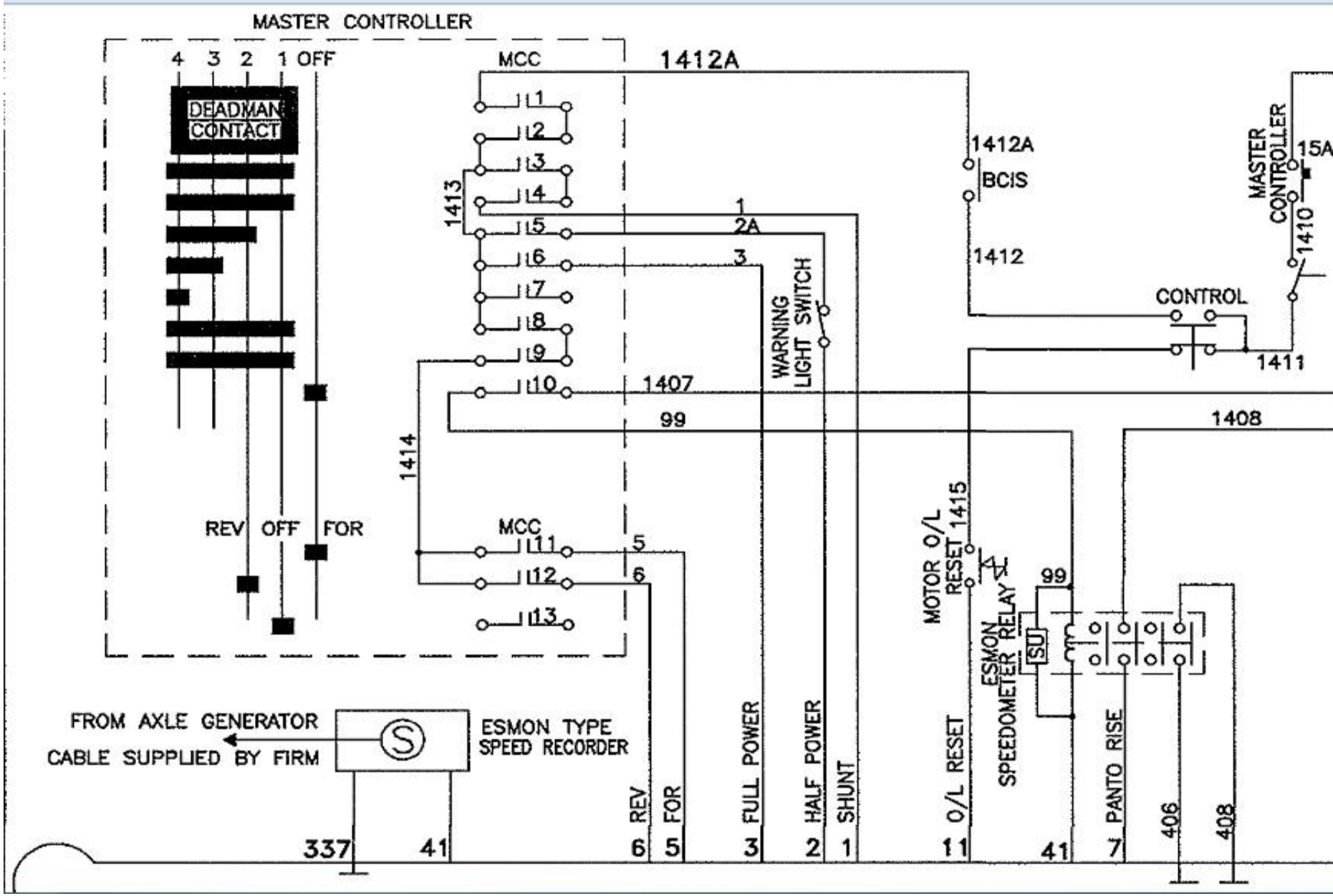


SCHEMATIC OF TAP CHANGER CONTACTOR CONTROL CIRCUIT-1

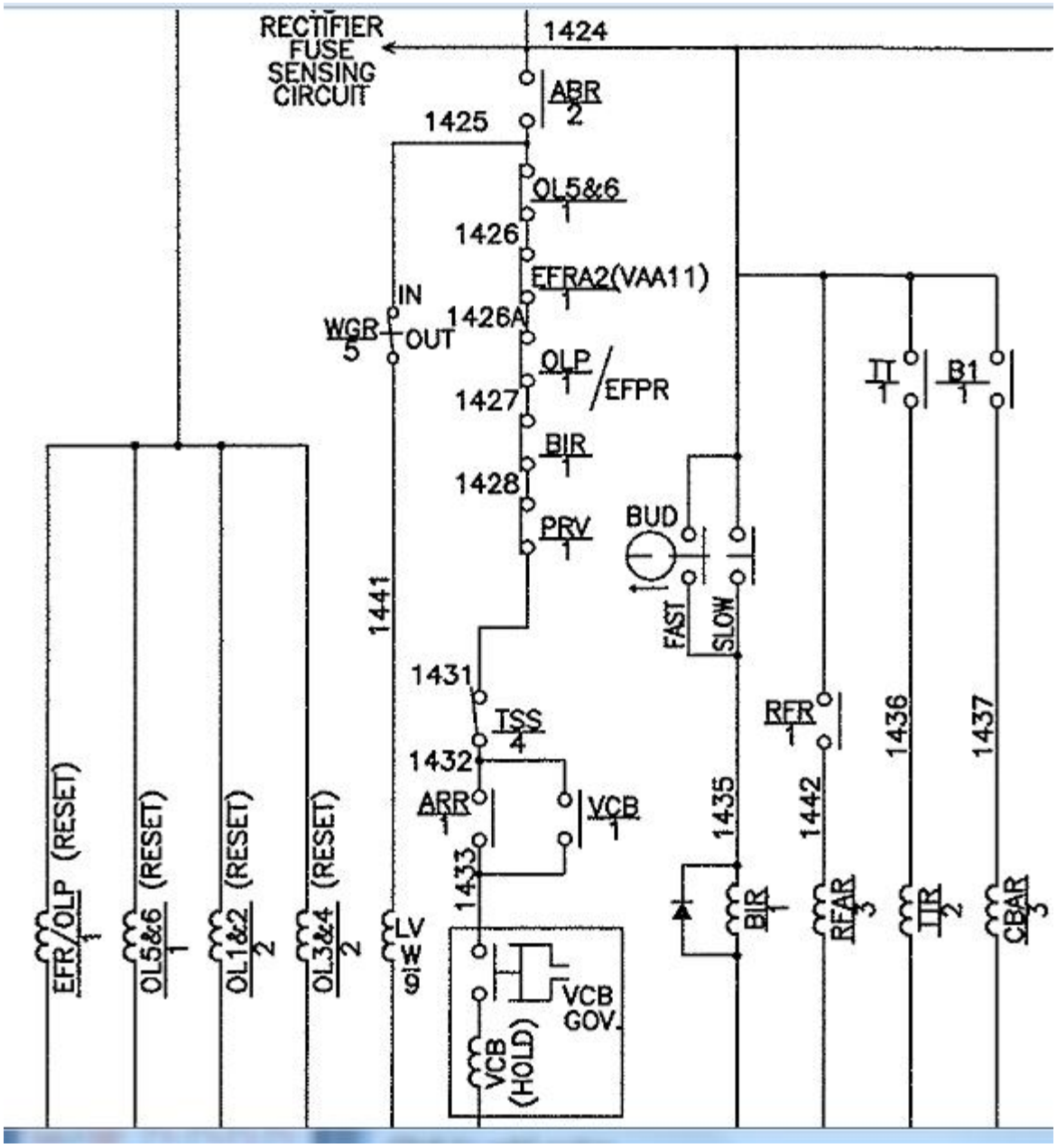


SCHEMATIC OF TAP CHANGER CONTACTOR CONTROL CIRCUIT-2

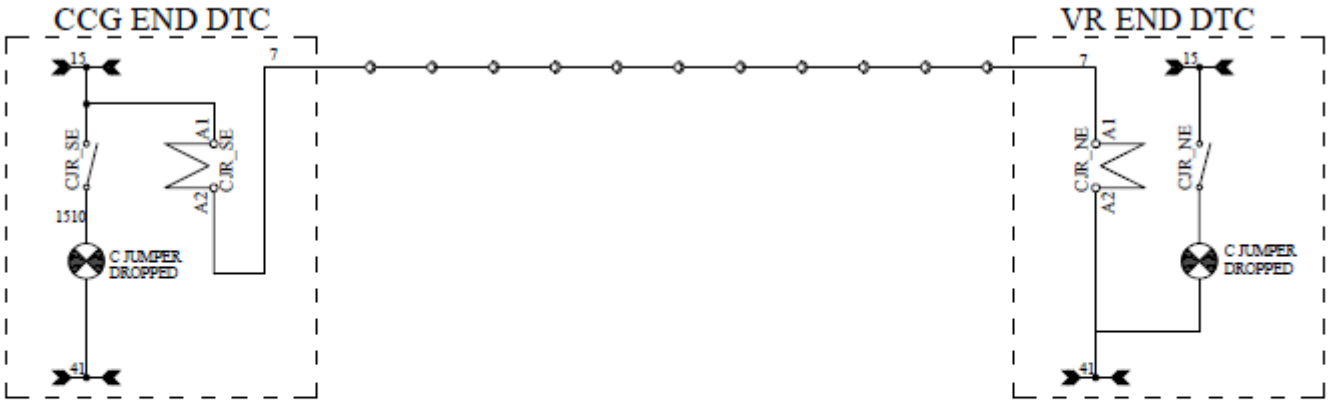



MASTER CONTROLLER
4 3 2 1 OFF
DEADMAN CONTACT
REV OFF FOR
MCC
1412A
1412A
BCIS
1412
1413
1414
1407
99
1408
1415
WARNING LIGHT SWITCH
MASTER CONTROLLER
15A
1410
CONTROL
1411
MOTOR O/L RESET
ESMON SPEEDOMETER RELAY
SU
FROM AXLE GENERATOR
CABLE SUPPLIED BY FIRM
ESMON TYPE SPEED RECORDER
337
41
6 REV
5 FOR
3 FULL POWER
2 HALF POWER
1 SHUNT
11 O/L RESET
41
7 PANTO RISE
406
408

14
5A
FAULT INDICATION
5A
1409
PANTO&VCB
15A
1406
MAIN COMP
5A
1404
EP BRAKE
5A
1402
DRIVERS KEY SWITCH
DCS
1407
1405
1403
FAULT INDICATION
15
LAMP TEST
LT
(IL SW. IN DRIVER SW.PANEL)
PANTO LOWER
8
VCB CLOSE
9
VCB TRIP
10
MAIN COMP.SET
12
MAIN COMP.TRIP
42
E.P. BRAKE
36
PARKING BRAKE APPLICATION
3604
PARKING BRAKE RELEASE
3606


RECTIFIER FUSE SENSING CIRCUIT
1424
ABR 2
1425
OL5&6 1
1426
EFRA2(VAA11) 1
IN
WGR 5
OUT
1426A
OLP 1
EFPR
1427
BIR 1
1428
PRV 1
1441
1431
ISS 4
1432
ARR 1
VCB 1
1433
LV
VCB (HOLD)
VCB GOV.
BUD
FAST
SLOW
1435
BIR 1
RFR 1
1442
RFAR 3
II 1
B1 1
1436
IIR 2
1437
CBAR 3
EFR/OLP (RESET) 1
OL5&6 (RESET) 1
OL1&2 (RESET) 2
OL3&4 (RESET) 2

'C' JUMPER CONTINUITY



Note
1. The indication LED will glow only when the C Jumper dropped.
2. This scheme is provided in Alstom rake and working satisfactorily.

Material Required.
1. Controll Relay with 2NO&2NC contact having Coil of 48V DC
   (CA4KN22EW3 OF M/S Schneider or similar of L&T, ABB)
2. 1.5sq.mm cable-5mtr.

Thanking You All