TRANSITION & Motor control

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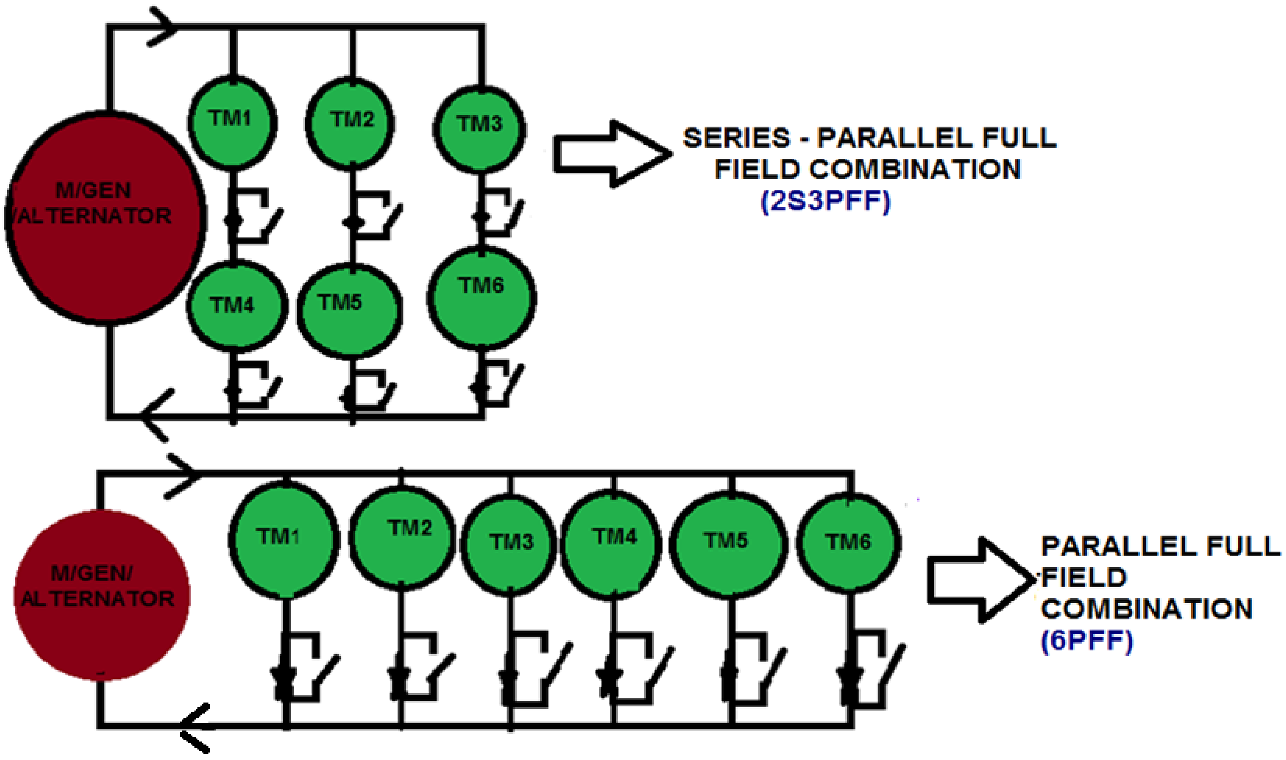
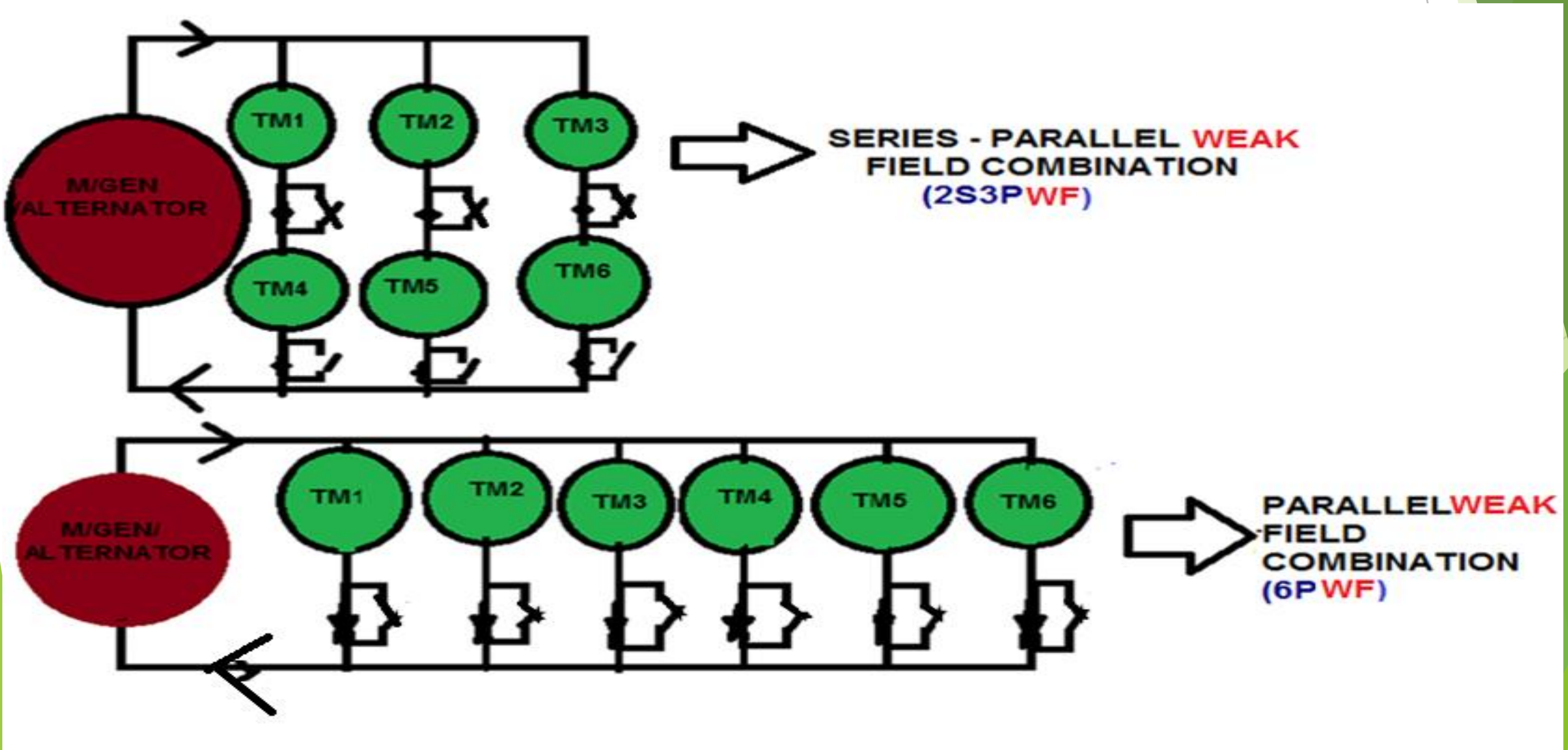
OBJECTIVES

- Different combinations of TMs
- Load curve(s) of Main Gen/Alternator
- Limitations of speeds
- Transition & its type
- Different Transitions
- Transition Components –for checking during trouble shootings

TR.MOTORS COBINATIONS ACROSS THE MAIN GEN./ALTERNATOR WITH FULL FIELD

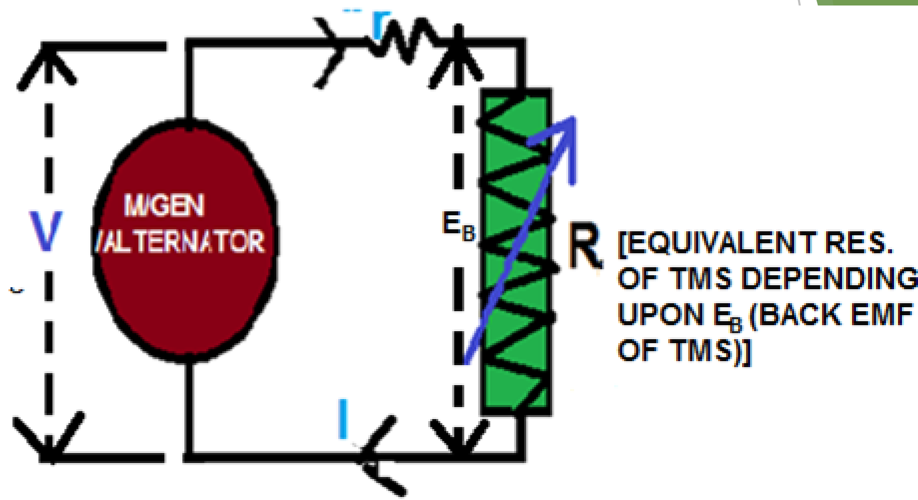


TR. MOTORS COBINATIONS ACROSS THE MAIN GEN./ALTERNATOR WITH WEAK FIELD

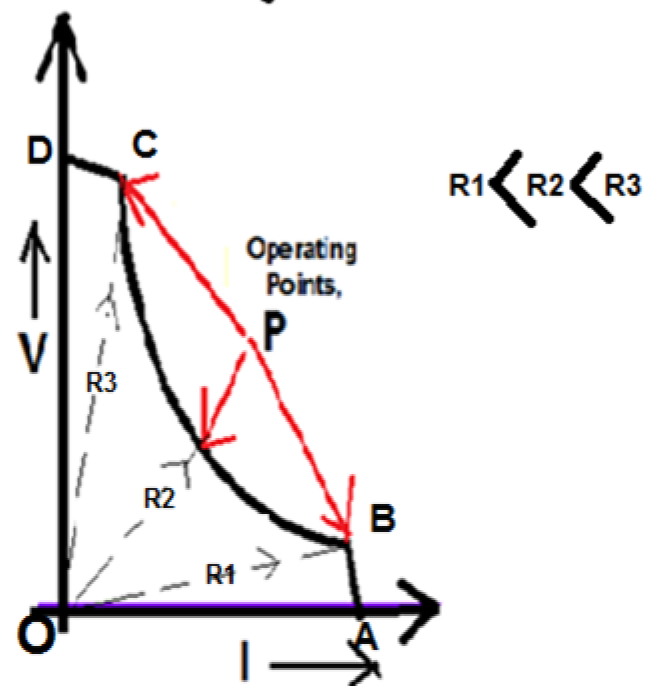


LOAD CURVE OF MAIN GEN./ALTERNATOR SET BY EXCITATION SYSTEM

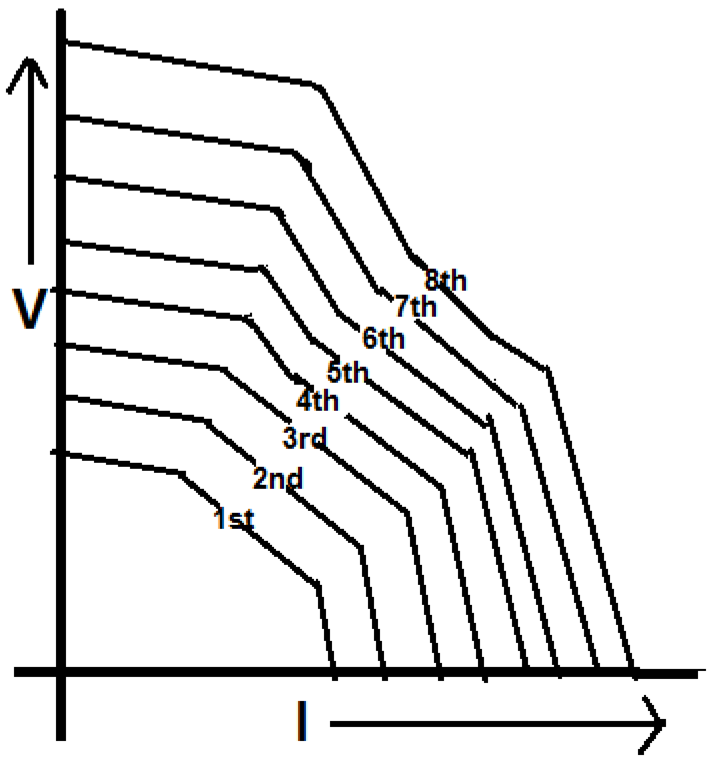
If speed of TMs increases
→Back EMF increases
→Equivalent Resistance increases
→The operating pt.moves from 'B' to 'C'



If speed of TMs decreases
→Back EMF decreases
→Equivalent Resistance decreases
→The operating pt.moves from 'C' to 'B'



LOAD CURVE AT EACH NOTCH (FROM 1TH TO 8TH NOTCH)SET BY EXCITATION SYSTEM



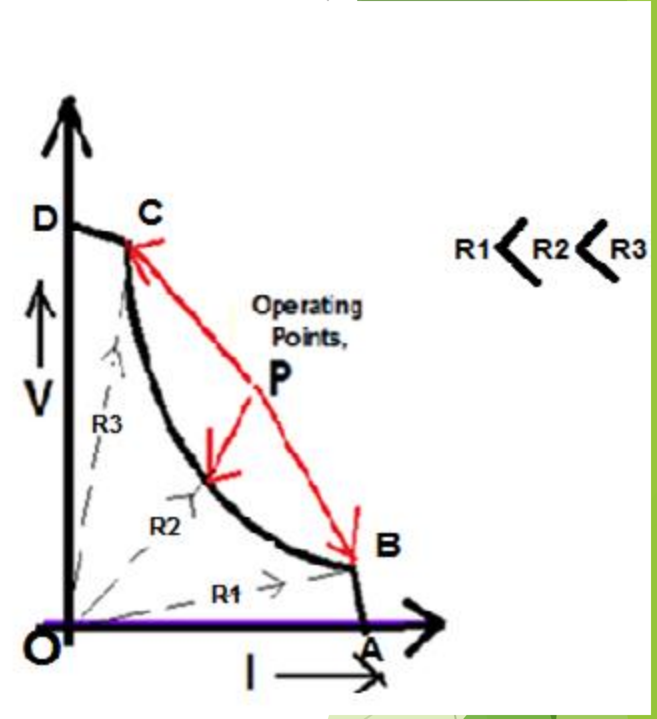
LIMITATIONS OF TMS SPEEDS

<u>If the speed of TMs increases</u>

- The voltage increases and reaches its limit (C)
- The corresponding speed is also limited

<u>If the speed of TMs decrea</u>

- The current increases ar reaches its limit(B)
- The corresponding speed is also limited



TRANSITION

- Implies change(s) of

i)TMs combinations

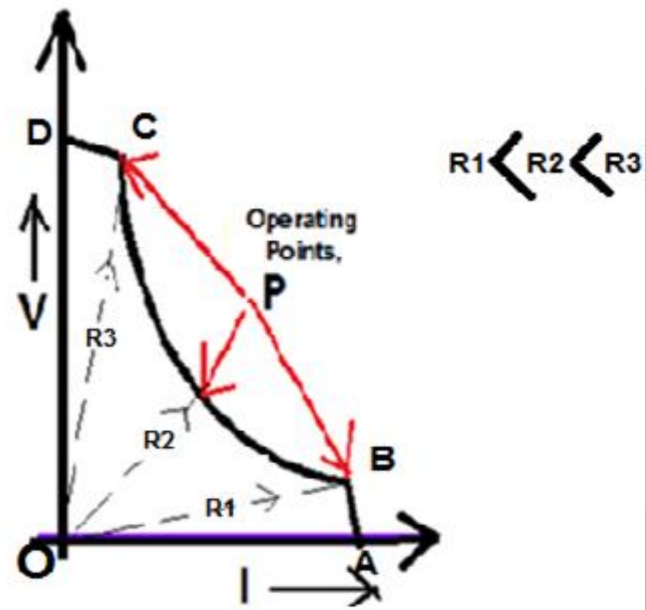
(SP to P or P to SP)

ii) TMs field excitation

(FF to WF or WF to FF)

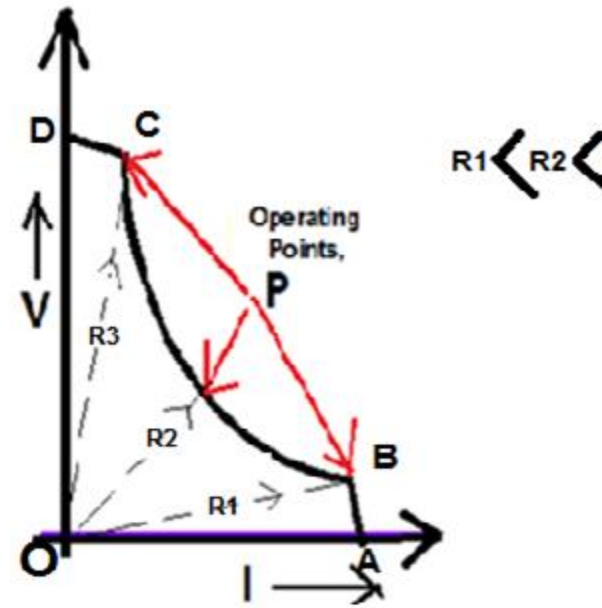
iii)Both of above

- Done for speed increase or decrease when it reaches the limit of maximum Gen. voltage(C) or Current(B).



AUTOMATIC TRANSITION

- Transition is done automatically by control circuits
- The control circuit operates at corresponding speeds when the M/Gen voltage or current reaches the limits (C or B) of the constant load curv M/Gen.



TRANSITION-TYPE

FORWARD TRANSITION

-Done for speed increase

BACKWARD TRANSITION

-Done for speed decrease

FORWARD TRANSITION

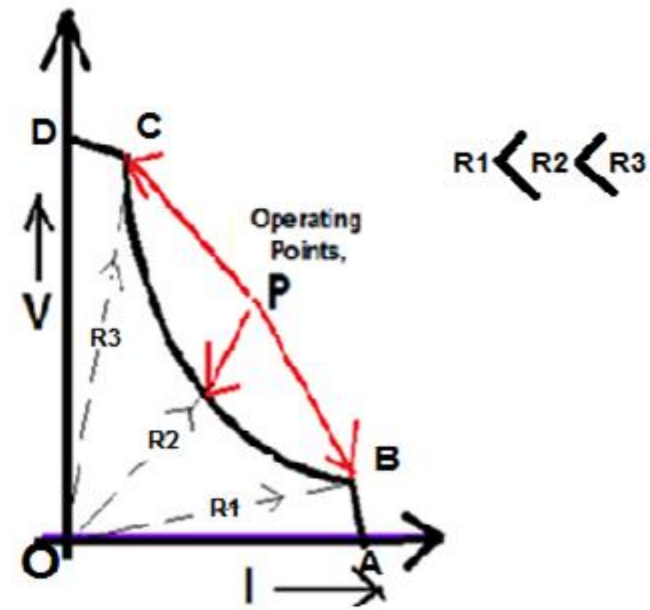
Done when -

Gen. Voltage reaches at its

Maximum limit(C)

Done by -

Reducing the back emf of TMs' combination thereby reducing of the Main Gen. Voltage



BACKWARD TRANSITION

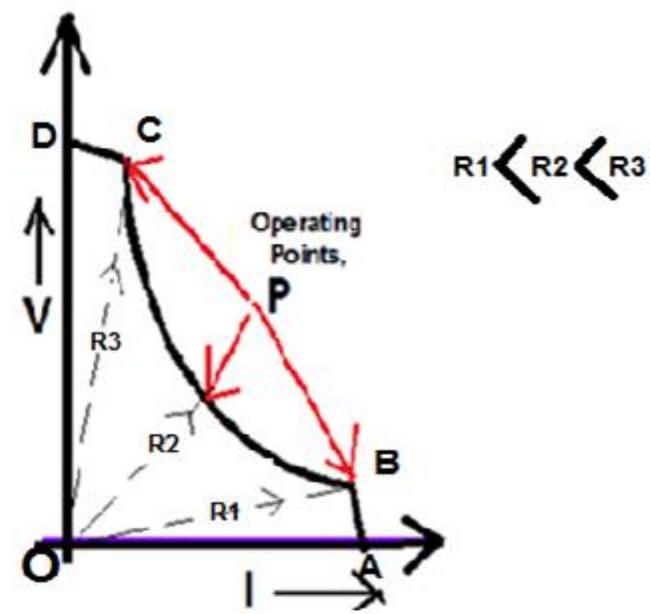
<u>Done when -</u>

The Gen. Current reaches at its Maximum limit(B)

<u>Done by -</u>

Increasing the back emf of TMs' combination thereby increasing

of the Main Gen. Voltage

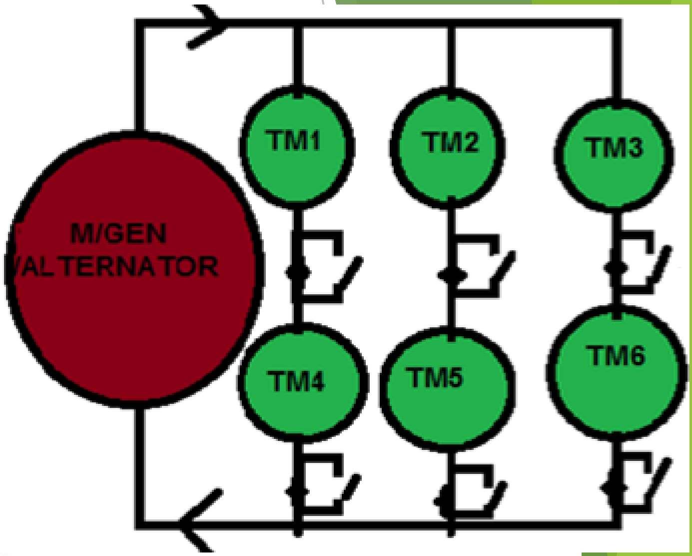


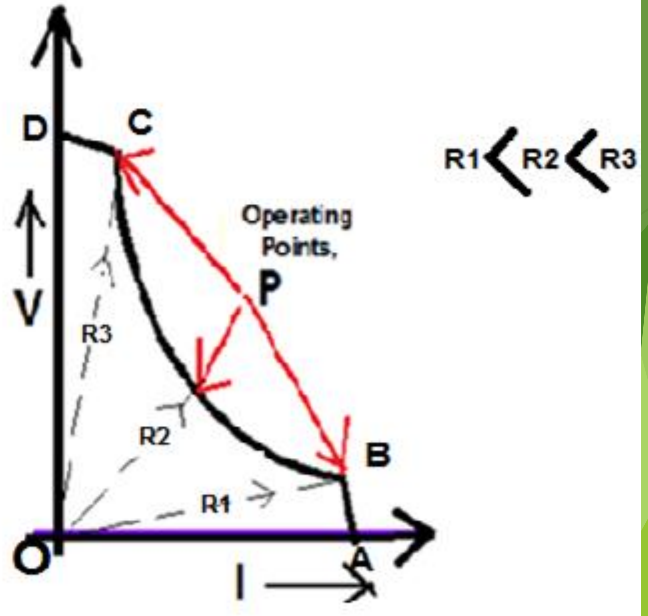
Sequence of different Transition

Sequence of Transitions	Events (Changes in TMs circuitry)
FORWARD	TRANSITIONS
1st Transition	SPFF $\rightarrow$SPWF
2nd Transition	SPWF $\rightarrow$PFF
3rd Transition	PFF $\rightarrow$PWF
BACKWARD	TRANSITIONS
1st Transition	PWF $\rightarrow$PFF
2nd Transition	PFF $\rightarrow$SPWF
3rd Transition	SPWF $\rightarrow$SPFF

INITIAL ARRANGEMENT OF CIRCUITARY OF TMS : PWF→PWF

- At stand still the TMS draw very high current(I)
- As TI α$I_A I_F$ i.e. T α I^2 ; a good initial torque (T) develops which causes rotation of TMs
- The rotation creates Back EMF (E_F α N. Φ) from the TMS.
- M/Gen. Voltage (V)also rises and reaches at ‘B’.

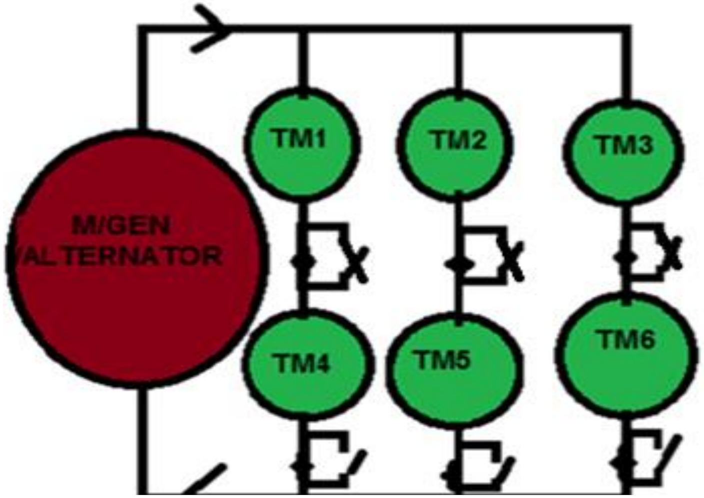


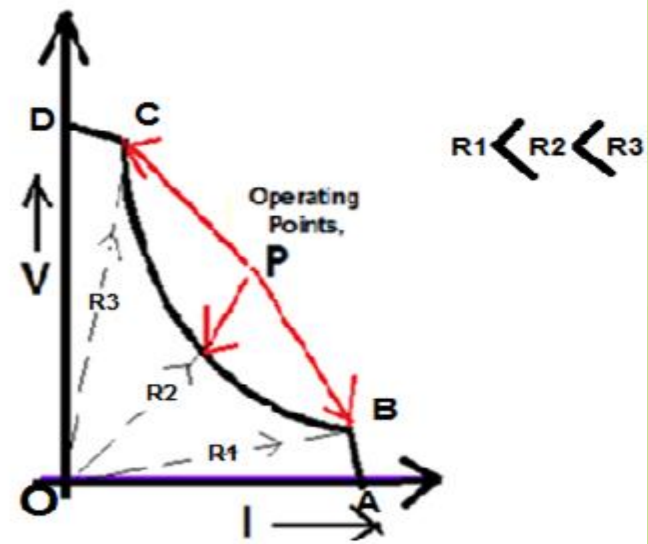


1^{st} TRANSITION : SPFF→SPWF

- As the speeds of TMs increase the Back EMFs of TMs will also increase
- The M/Gen. Voltage rises (Current reduces)when the operating pt. traverse from 'B' to 'C'
- The operating pt. will not go beyond 'C' because the voltage limitation already established by automatic excitation control system can not be exceeded.
- The speed of the loco will be stable at 29 KMPH corresponding to pt.'C'
- To increase speeds back emfs of TMs are decreased by SPFF **to** SPWF circuitry conversion such that

'P' is brought at **B'** .(1^{st} Transition)

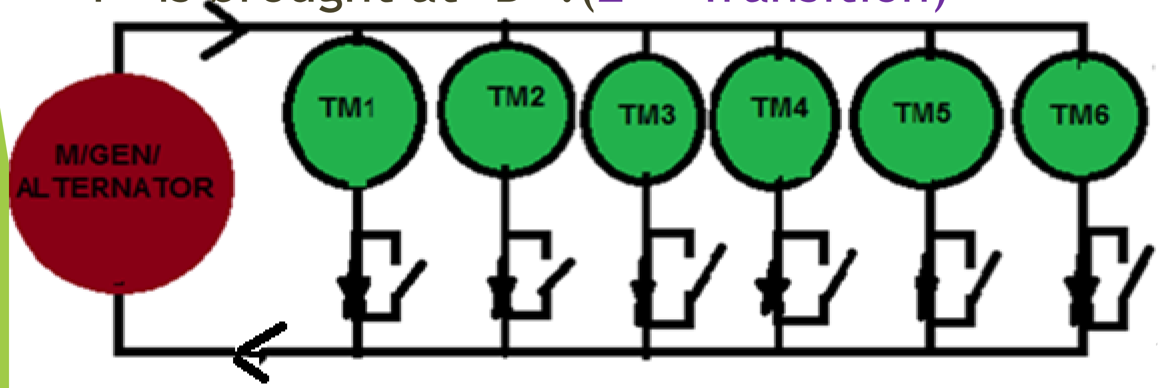


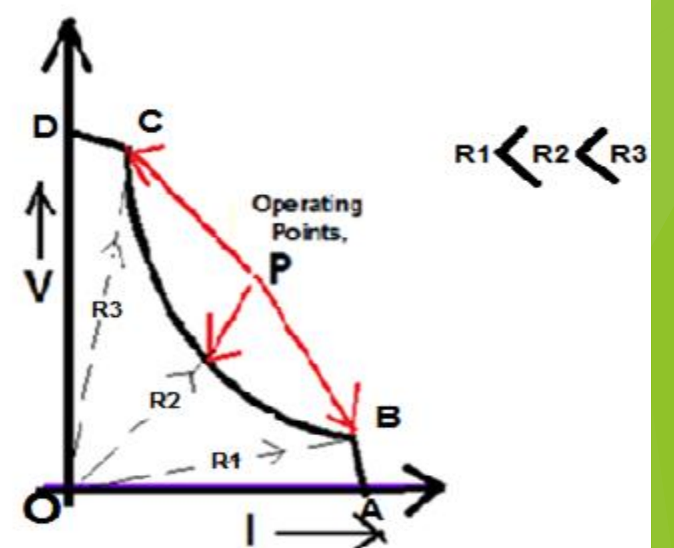


2^{ND} TRANSITION :SPWF→PFF

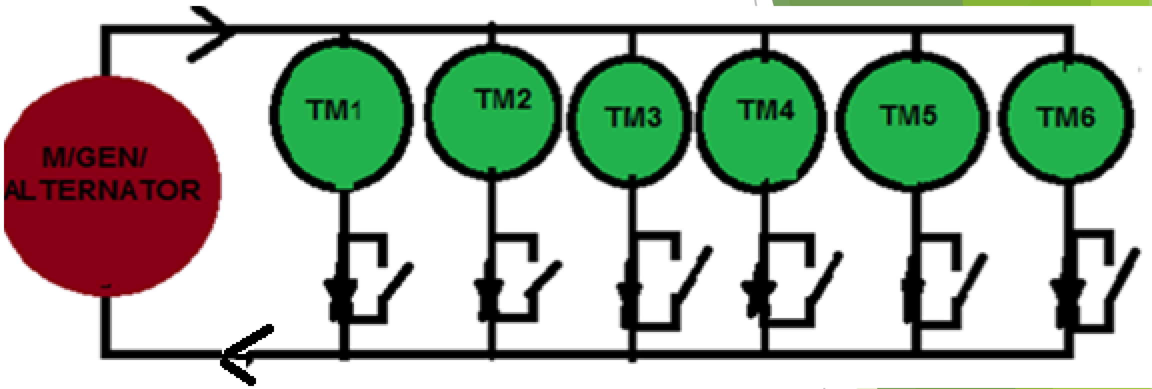
- As the speeds of TMs increase further the Back EMFs of TMs will also increase
- The M/Gen. Voltage rises (Current reduces)when the operating pt. traverse from ‘B’ to ‘C’
- The speed of the loco will be stable at 47 KMPH corresponding to pt.’C’
- To increase speeds back emfs of TMs are decr
  PFF circuitry conversion such that

  ‘P’ is brought at ‘B’ .(2^{nd} Transition)

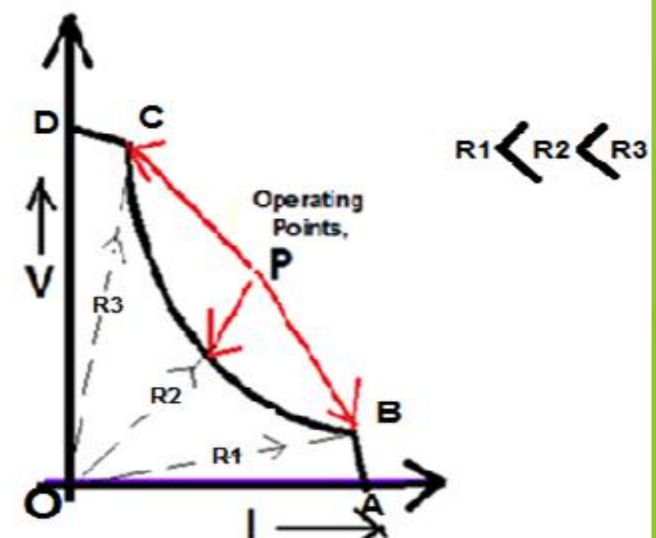




3^{rd} TRANSITION : PFF→PWF



- As the speeds of TMs increase further the Back EMFs of TMs will also increase
- The M/Gen. Voltage rises (Current reduces)when the operating pt. traverse from 'B' to 'C'
- The speed of the loco will be stable at 81 KMPH corresponding to pt.'C'
- To increase speeds back emfs of TMs are decreased by PFF **to** PWF circuitry conversion such that 'P' is brought at 'B' .(3^{nd} Transition)



TRANSITION(SUMMARY)

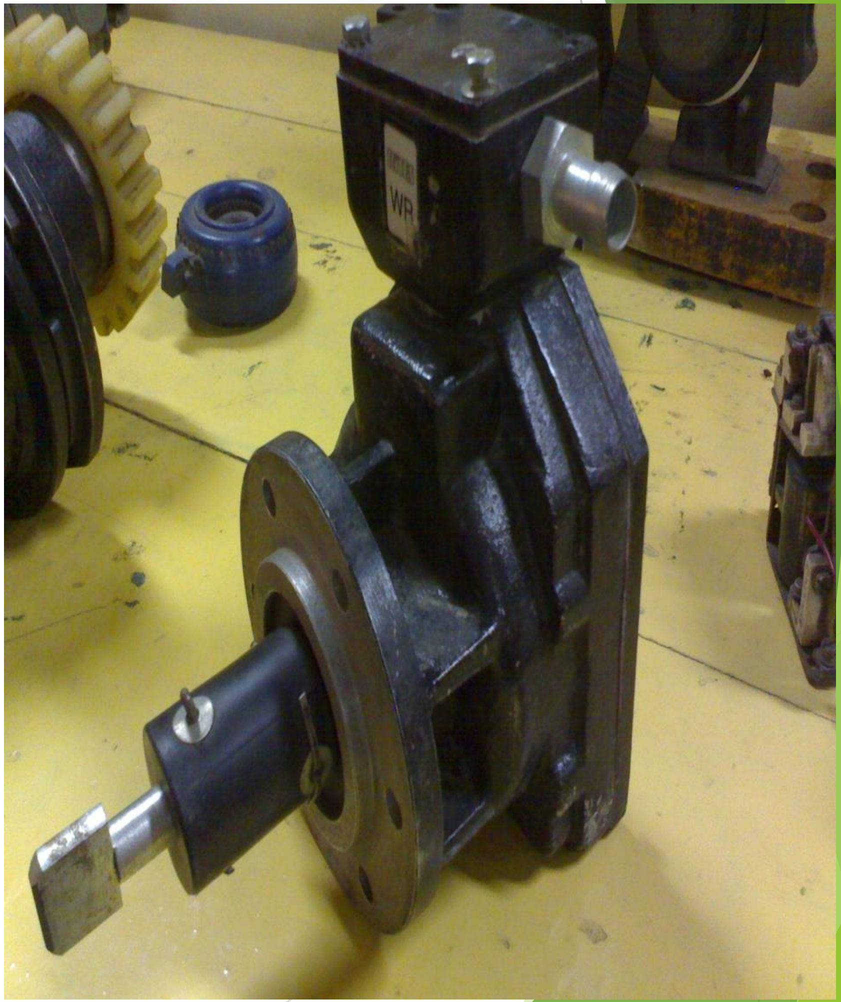
Transition	Event (Normal Combination- →SPFF)	Speed (KM/H)	RPM of wheel	Axle gen. Voltage (V)
1st forward	SPFF→SPWF	29	47	07
2nd forward	SPWF→PWF →PFF	47	78	11
3rd forward	PFF→PWF	81	133	20
3rd backward	PWF→PFF	79	131	19
2nd backward	PFF→PWF →SPWF	45	76	10
1st backward	SPWF→SPFF	27	45	06

COMPONENTS OF TRANSITION

- Axle Generator
- Transition Excitation Transformer
- Transition Regulating Panel

AXLE GENERATOR (ALTERNATOR)

- 40 poles imbedded in the plastic stator
- Rotor - shaft driven by Axle no.2
- L-shaped & straight soft iron bars in the rotor as flux guide to stator coil
- Output voltage induced in stator coil with the frequency proportional speed.



TRANSITION EXCITATION TRANSFORMER (TET)

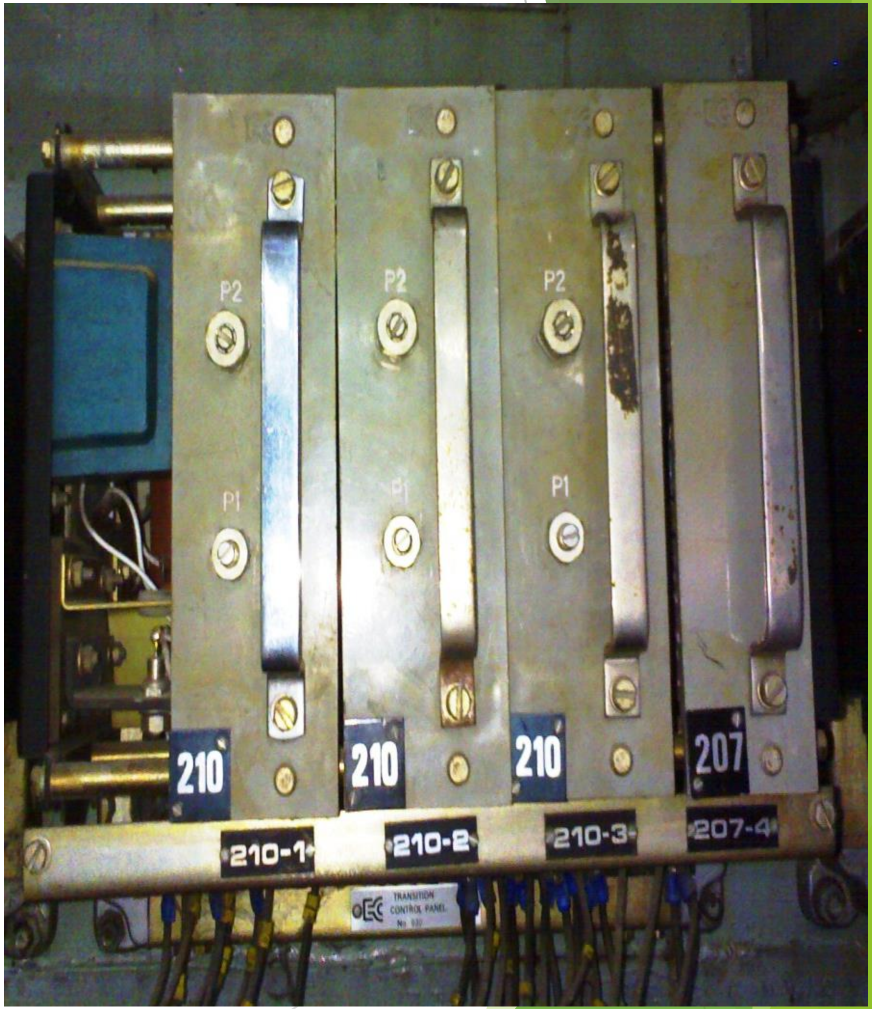
- A saturable Transformer
- Located on the front panel
- Output is volt-time pulse
- Speed proportional to no.

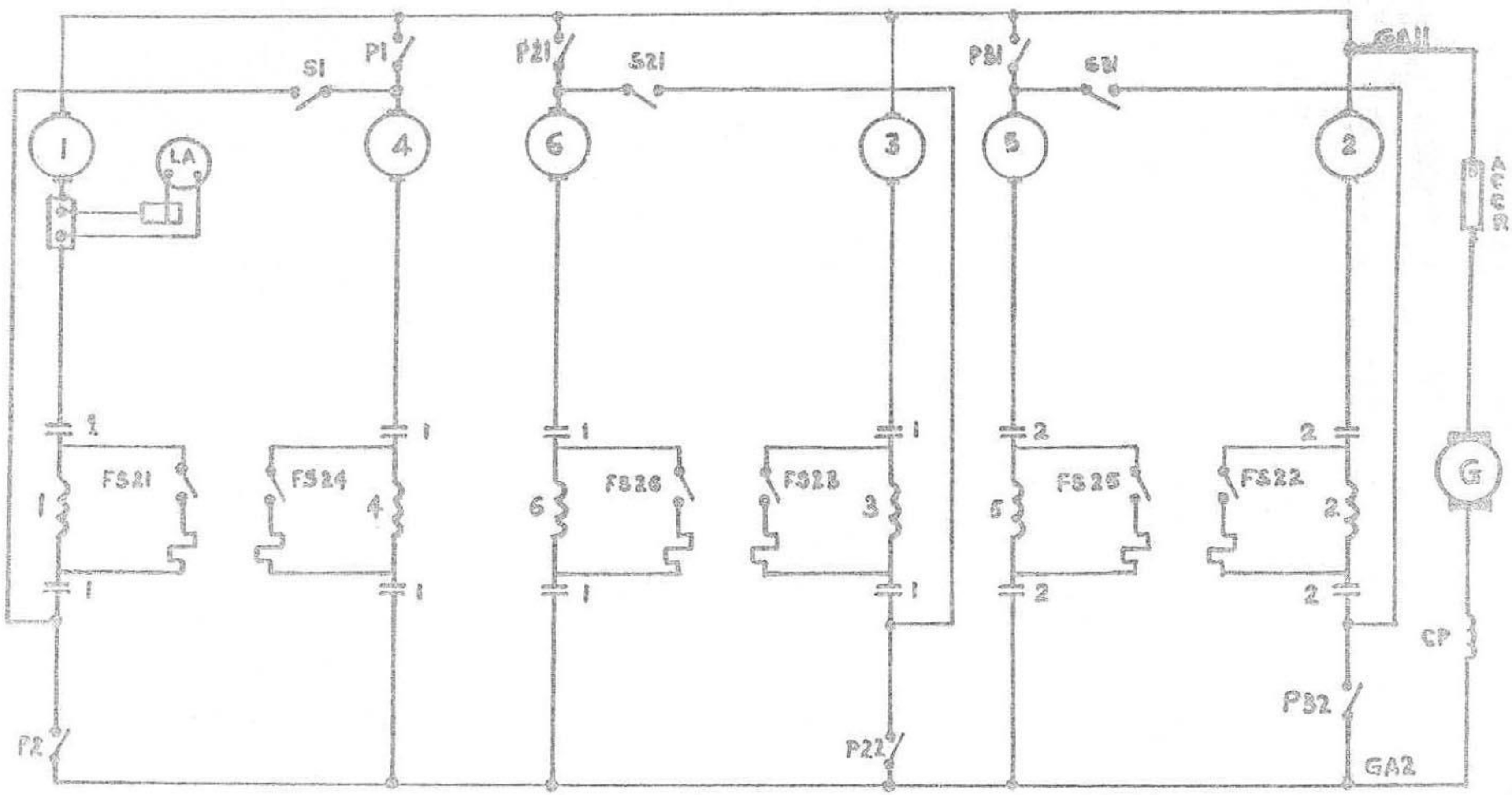
  of to pulse
- More speed, More pulses

and more average voltage

TRANSITION REGULATING PANEL (TRP)

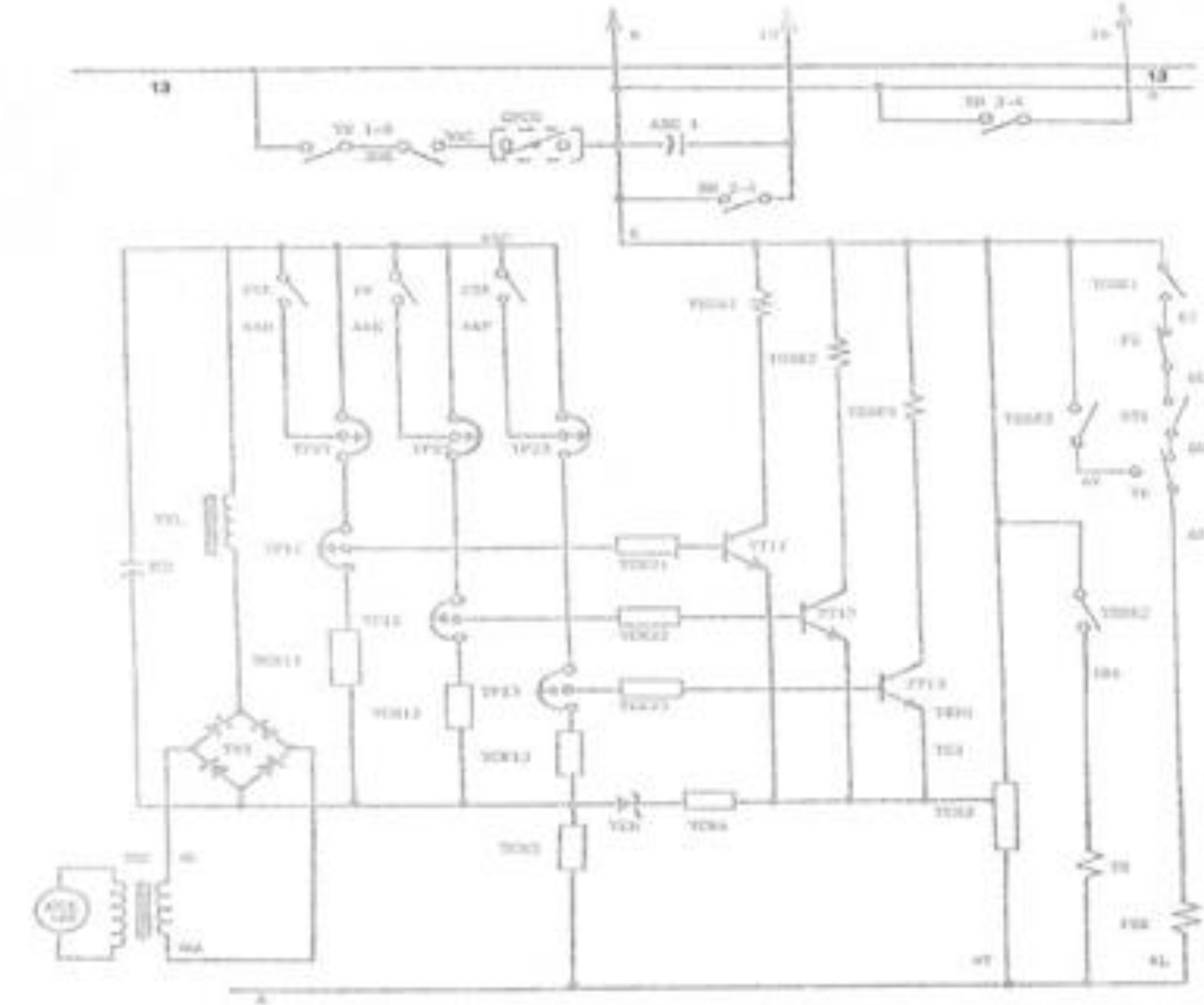
- Located on the front panel
- Comprises a set of electronic circuit cards
- Card No.210- Transition Cards
- Card no.-207 Miscellaneous Card
- No. of card no.210 = No. of Transitions(1,2 or 3)

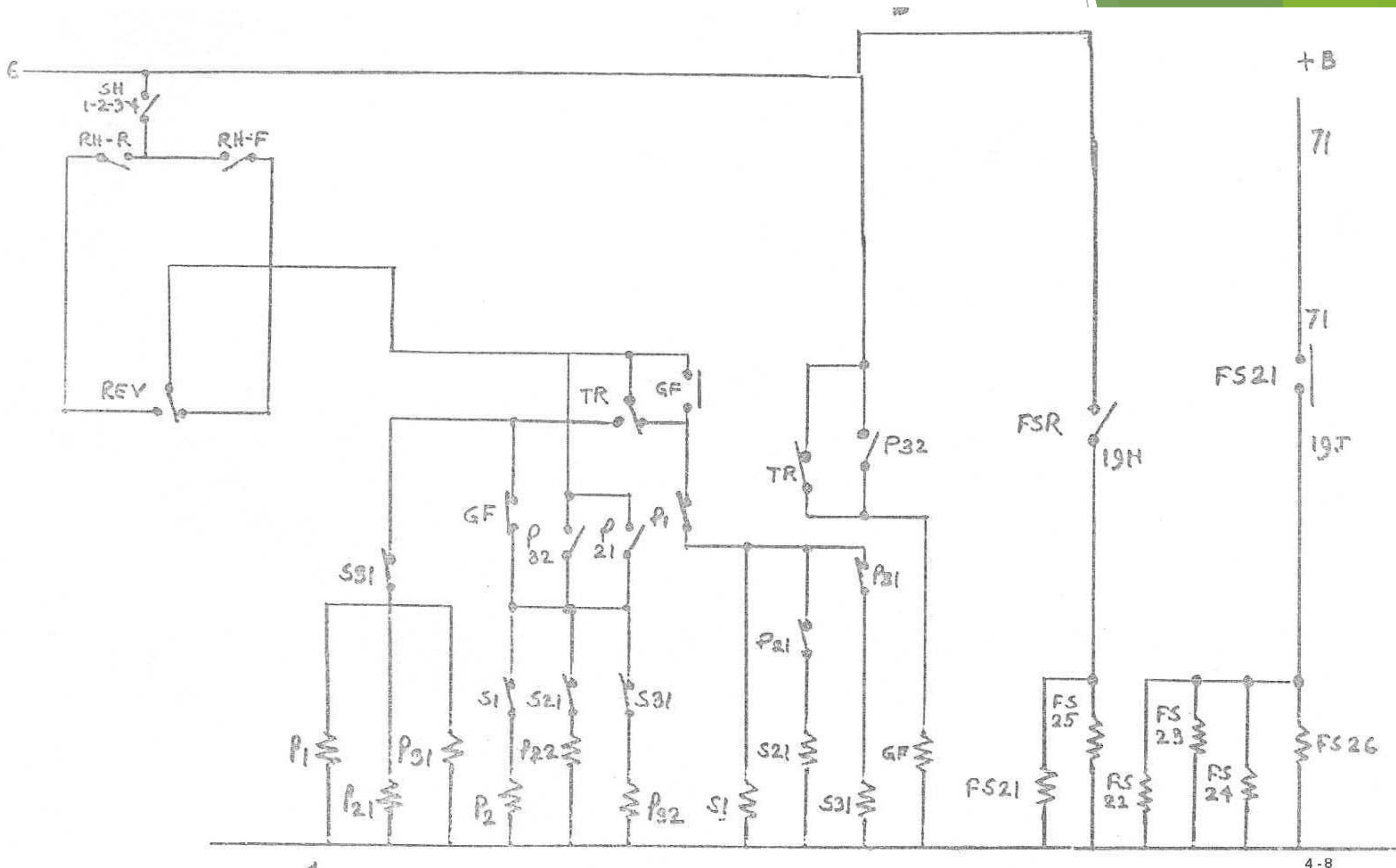




POWER CIRCUIT

CIRCUIT OPERATION





PROPUSION CONTROL

TROUBLE SHOOTING:

- Transition is not picking up-----

1.Axle Gen. Cable open.

2.Wiring of Transition Transformer open or not perfect.

- 1st Transition is not picking up----

1.Card no. 210-1 is loose

2.FSR coil is not perfect

- 2nd Transition is not picking up----

1.Card no. 210-2 is loose

2.TR coil is not perfect/ Emergency TR can be used manually.

3rd Transition is not picking up----

1.Card no. 210-3 is loose

THANK YOU