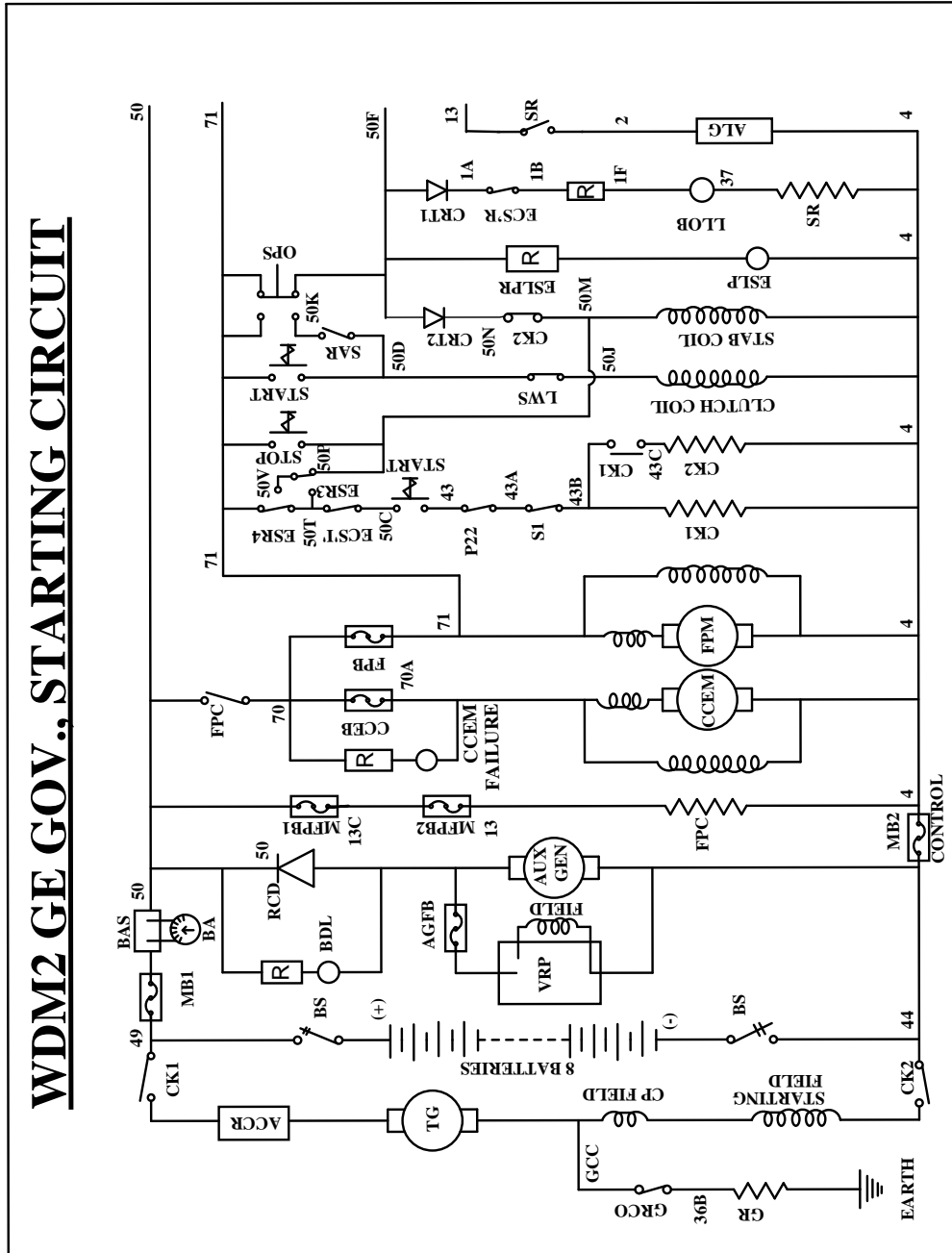


ENGINE STARTING SYSTEM (GE GOVERNOR.)



Engine starting system can be divided into three parts.

1. Engine cranking,
2. Engine Firing and
3. Engine holding.

1. Engine Cranking: Means CK1 & CK2 contactors closing and battery supply is feeding to main generator to work as a motor to crank the Diesel engine.

- a. Battery knife switch to be switched on.
- b. MB1 (Battery) breaker to be switched on.

Result: Battery discharging lamp (Auxiliary Generator failure) indication will glow.

- c. MB2 (Control) breaker to be switched on.

Result : Switch on all the lighting breakers and switches (except doom light and flasher light) , lamps will glow.

- d. .MFPB1 & MFPB2 to be switched "on" on both control stands.

Result: FPC contactor coil will be energized and with click sound contactor will close.

- e. If FPC contactor closed properly,

Result: CCE motor failure indication will glow.

- f. CCEM breaker to be switched on.

Result: CCE motor failure indication will goes off and CCEM starts working.

- g. FPB breaker to be switched on.

Result:

- i) Fuel pump motor will start and fuel oil pressure will build up to 3.8 kg/cm².
- ii) Engine starting lamp will glow.
In governor, stabilizing coil will energize with click sound.
- h. ECS to be kept in run position for 3 times.

Result: With low lube oil indication SR will energize and bell will ring.

- i. MUSD in both control stands must be in run condition.
- j. ECS must be in idle condition.
- k. Start button to be pressed (This will have two switches).

Result: (Switch no.1) : Through ESR-4 N/C interlock, through ECS RUN closed interlock, through start button, through P-22 power contactor N/C interlock, through S1 power contactor N/C interlock , CK1 contactor will pick up. Through CK1 closed bridge interlock, CK2 contactor will energize
 When CK1 and CK2 contactors are closed, Generator will work as a motor and engine is going to crank.

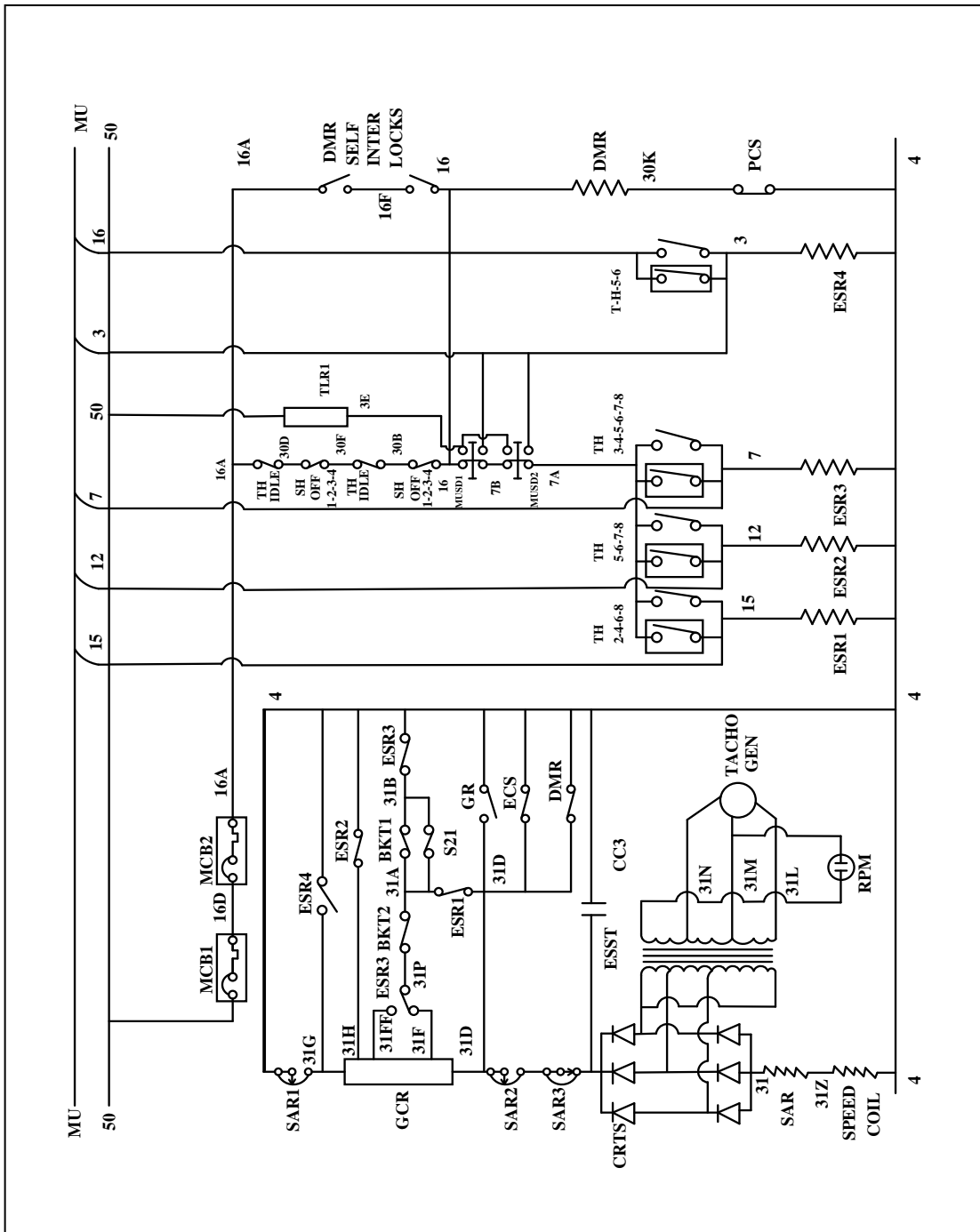
2. **Firing** : Means stabilizing coil energizing, clutch coil energizing and stabilizing coil de-energizing.
- a. Already stabilizing coil energized when FPB switched ON.
 - b. (Start Switch No.2) : Clutch coil will energize through LWS (if sufficient water is available).
 - c. When CK2 contactor picks up CK2 bridge interlock will open and makes stabilizing coil to de-energize.

Result: Fuel racks will move towards Fuel increasing and engine will get firing.

3. **Holding**: If engine starting lamp goes off, leave start button. Engine will run on its own then it is called Holding.
- a) SAR will pick up whenever engine speed reaches more than 220 RPM.
 - b) OPS will pickup whenever lube oil pressure builds up 1.6 kg/cm²

Result: Clutch coil will get permanent supply and engine will hold.

ENGINE SPEED CIRCUIT (GE GOVERNOR)



If engine speed is responding according to the throttle handle position, we can say that throttle is responding.

It can be divided into three parts.

1. DMR energizing.
2. ESRs energizing.
3. Governor speed coil circuit.

1. DMR ENERGISING :

- a. MCB1 & MCB2 to be switched on (closed) on both the control stands.
- b. Throttle handle in idle and selector handle "0" , 1, 2, 3, 4 position in working control stand.
- c. Throttle handle in idle and selector handle '0', 1, 2, 3, 4 position in non working control stand.
- d. PCS must be in normal position (closed).

Result: DMR will pick up (energise).

Throttle handle in idle, DMR is energizing and throttle handle in first notch, if DMR is dropping (de-energising) "DMR SELF INTER LOCKS " are defective.

2. ESRs ENERGISING :

- a. Through MUSD1 closed switch and MUSD2 closed switch in both control stands for throttle handle supply readily available.
- b. Through throttle handle inter locks ESR relays will energise.
- c. ESR 4 will get power directly from DMR self interlocks(it is not under control of MUSD 1&2)

ESR RELAYS	NOTCH POSITION
ESR 1	2, 4, 6, 8
ESR2	5, 6, 7, 8
ESR3	3, 4, 5, 6, 7, 8
ESR4	5, 6

Throttle handle 1, 2, 3, 4 notches engine speed is not raising and in 5th notch engine is shutting down "MUSD1 or MUSD2" switches may be defective or wire cut.

Engine starting system can be divided into three parts.

1. Engine cranking.
2. Engine Firing and
3. Engine holding.

1. Engine Cranking : It means CK1 & CK2 contactors closing and battery supply is feeding to main generator to work as a motor to crank the Diesel engine.

- a. Battery knife switch to be switched on.
- b. MB1 (Battery) breaker to be switch held on.

Result : Battery discharging lamp (Auxiliary Generator failure) indication will glow

- c. MB2 (control) breaker to be switched on.

Result: switch on all the lighting breakers and switches, (except doom light and flasher light) lamps will glow.

- d. MFPB1 & MFPB2 to be switched "on" on both control stands.

Result : FPC contactor coil will be energized and with click sound contactor will close

- e. If FPC contactor closed properly,

Result: CCE motor failure indication will glow.

- f. CCEM breaker to be switched on.

Result: CCE motor failure indication will goes off.. and CCEM starts working.

- g. FPB breaker to be switched on.

Result: Fuel pump motor will start and fuel oil pressure will build up to 3.8 kg/cm².

- h. MUSD in both control stands must be in run condition.

- i. ECS must be in idle, condition

- j. Start button to be pressed.

Result: Through ECS idle closed interlock, through engine start button closed switches, through P 22 power contactor N/C interlock, through S1 power contactor N/C interlock , through MUSDR relay N/C switch (Run) CK1 contactor will pick up. Through Ck1 closed bridge interlock, CK2 contactor will pickup.

When CK1 & CK2 contactors are closed, generator will work as motor and engine is going to crank.

- k. Firing and holding will be done by Woodward governor.

ENGINE SPEED CIRCUIT W.W. GOVERNOR

If engine speed is responding according to the throttle handle position, we can say that throttle is responding.

It can be divided into two parts.

1. DMR energizing,
2. Solenoids energizing,

1. DMR ENERGISING :

- a. MCB1 & MCB2 to be switched on (closed) on both the control stands.
- b. Throttle handle in idle and selector handle "0", 1,2,3,4 positions in working control stand.
- c. Throttle handle in idle and selector handle "0", 1,2,3,4, position in non-working control stand.
- d. PCS must be in normal position (Closed)

Result : DMR will pickup (energize)

Throttle handle in idle, DMR is energizing and throttle handle in first notch, if DMR is dropping (de-energising) "DMR SELF INTER LOCKS' are defective.

- e. ERR will pickup (energise)

Through ECS "R" closed interlock, GR N/C interlock, stop button closed switch and LWS closed switch ERR will pickup

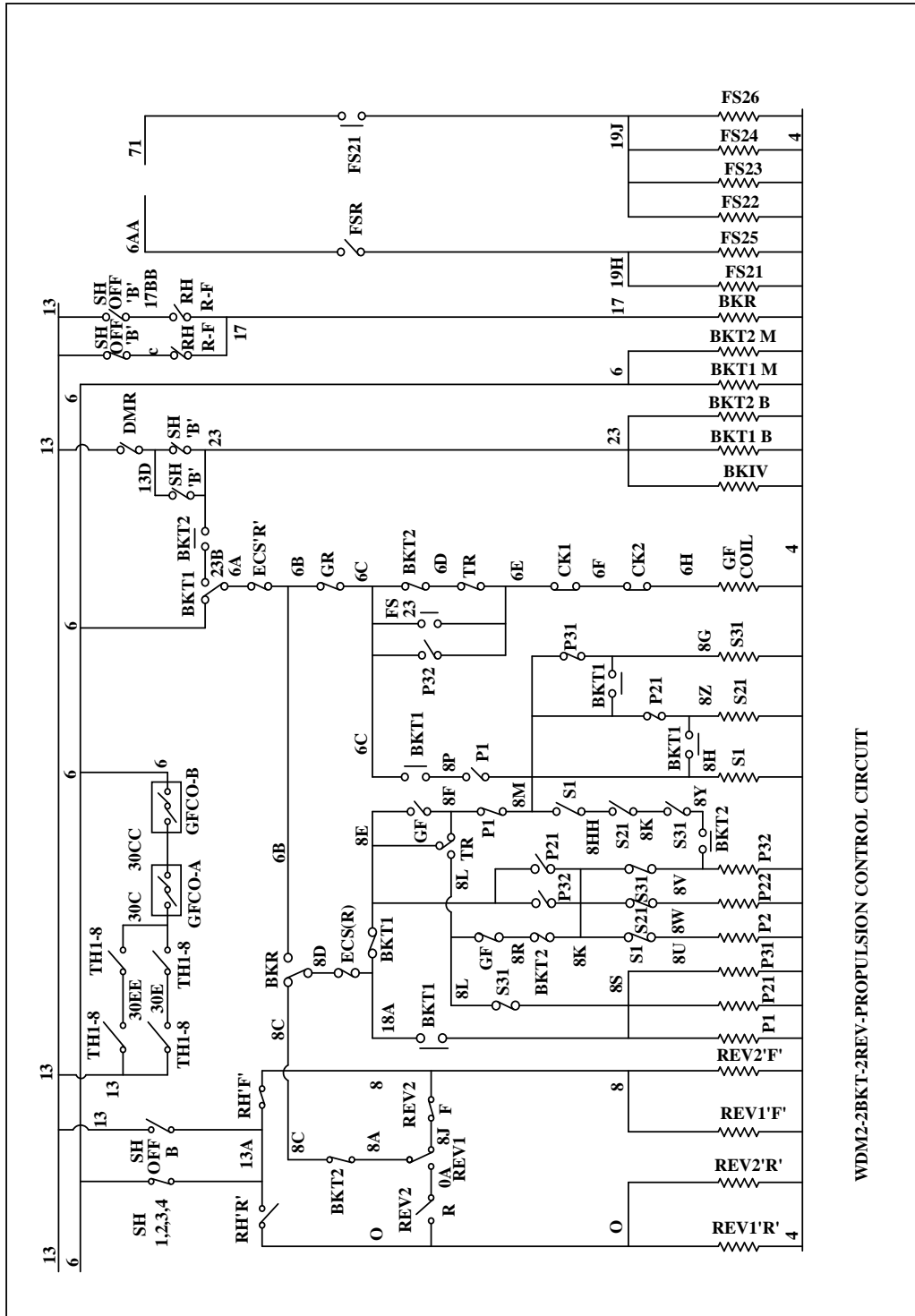
2. SOLENOIDS ENERGISING :

- a. Through MUSD1 closed switch and MUSD2 closed switch in both control stands for throttle handle supply readily available.
- b. Through throttle handle interlock through BKR2 relay N/C interlock and ERR relay closed interlock AV solenoid will energise.
- c. Through throttle handle inter lock and ERR relay closed interlock BV solenoid will energise.
- d. Through throttle handle inter lock through BKR2 relay N/C interlock and ERR relay closed interlock CV solenoid will energise.
- e. Through throttle handle interlock and ERR relay closed interlock DV solenoid will energise.

SOLENOIDS	NOTCH POSITION
AV Solenoid	2, 4, 6, 8
BV Solenoid	5, 6, 7, 8
CV Solenoid	3, 4, 5, 6, 7, 8
DV Solenoid	5, 6

Throttle handle 1, 2, 3, 4 notches engine speed is not raising and in 5th notch engine is shutting down "MUSD1 or MUSD2" switches may be defective or wire cut.

PROPULSION CONTROL CIRCUIT



WDM2-2BKT-2REV-PROPULSION CONTROL CIRCUIT

GF CONTACTOR CLOSING

1. Through TH closed interlock 1- 8 notch (13 - 30EE - 30C).
2. Through Both GF switches ON (30C - 30CC - 6)
Result: BKT 1 & 2 will throw towards motoring direction.
3. Through BKT1 (M) closed interlock (6 - 6A)
4. Through ECS (R) closed interlock (6A -6B)
5. Through GR N/C interlock (6B - 6D)
6. Through BKT2 (M) closed inter lock (6C - 6D)
7. Through TR N/C interlock (6D - 6E)
8. Through CK1 N/C Bridge interlock (6E -6F)
9. Through CK2 N/C Bridge interlock (6F - 6H)
10. GFC coil will energize (6H - 4)

S1 S21 & S31 POWER CONTACTOR CLOSING

1. Through SH closed interlock 1 - 4 positions (13 - 13A)
2. Through RH in forward closed interlock (13A - 8).
Through: If RH in REV (13A - 0).
Result: REV1 & REV2 will throw towards forward/Reverse direction.
3. Through REV 2 (F) closed interlock (8 - 8J)
 - (a) REV 1 (F) closed interlock (8J - 8A)
 - (b) REV 2 (R) closed interlock (0 - 0A)
 - (c) REV 1 (R) closed interlock (0A -8A)
4. Through BKT 1 (M) closed interlock (8A - 8C)
5. Through BKR N/C interlock (8C - 8D)
6. Through ECS (R) closed interlock (8D - 18A)
7. Through BKT1 (M) closed interlock (18A - 8E)
8. Through GF closed interlock/TR N/C interlock (8E - 8F)
9. Through P1 N/C interlock (8E -8F)
Result: S1 power contactor will pick up (8M - 4)
10. Through P21 N/C interlock (8M - 8Z)
Result: S21 power contactor will pick up (8Z - 4)
11. Through P31 N/C interlock (8M - 8F)
Result: S31 power contactor will pick up (8F - 4)

DURING 1ST TRANSITION (30 KM)

Axle driven alternator signal to (TET - 207 - 210/1)

Result: FSR relay will energize (6x - 4)

1. Through FSR closed interlock (6AA - 19H)
Result: FS21 & FS25 contactors will pick up (19H - 4)
2. Through FS 21 closed bridge interlock (71 - 19J)
Result: FS22, FS23, FS24 & FS26 contactors will pick up
(19J - 4)

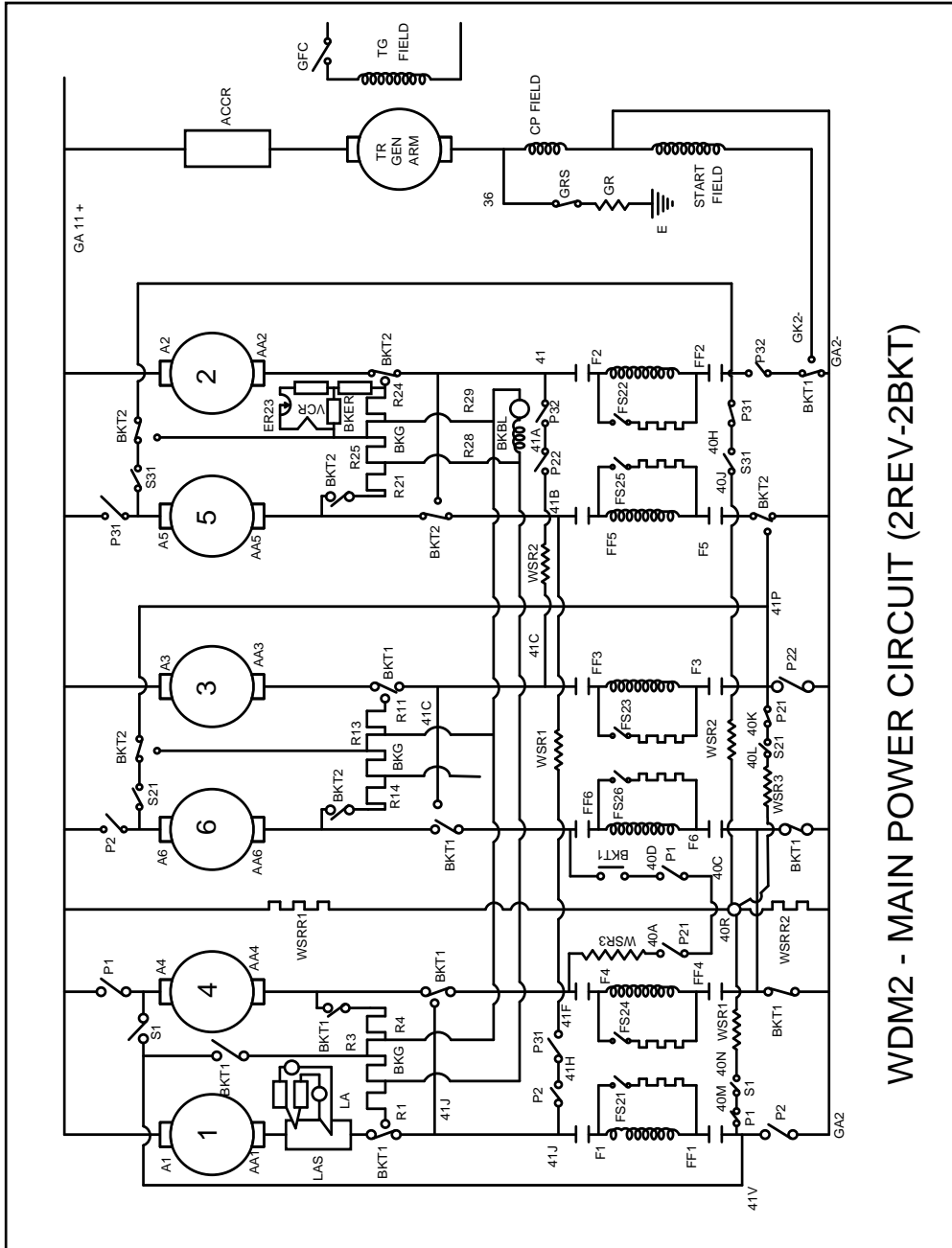
DURING 2ND TRANSITION (48KM) (TET- 207-210/2)

1. Transition relay will pick up (18A-4)
Result :(a)FSR relay will drop
(b) FS contactors will drop (6AA - 19H) open
(c) GF contactor will drop (6D - 6E) open
(d) S1, S21, S31 contactors will drop (8E - 8F) open
2. Through TR closed interlock (8E - 8L)
Result: (a) P1, P21, P31 contactors will pick up (8L - 8S - 4)
(b) P2, P22, P32 contactor will pick up (8E - 8K - 4)
3. Through P32 closed interlock (6C - 6E)
Result: GF contactor will pick up

DURING 3RD TRANSITION (80 KM) (TET - 207 - 210/3)

1. FSR relay will energize.
The sequence operation like **1st transition**.

POWER CIRCUIT



WDM2 - MAIN POWER CIRCUIT (2REV-2BKT)