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No. EL/4.2.15

Dated 29.10.2012

Chief Electrical Engineer,

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MODIFICATION SHEET NO. RDSO/2009/EL/MS/0386 Rev '1'**Dated: 29.10.2012**

[This supersedes RDSO modification sheet no. RDSO/2009/EL/MS/0386 Rev '0' dated 12.08.2010.]

1. Title:

Modification in loco control circuit for multiple unit operation (MU) max. for three locos for 25 kv ac electric locomotive working with microprocessor based control and fault diagnostic system (MPCS) as per RDSO's specification. No. ELRS/SPEC/MPC-FDS/0001 Rev-'2'- August 2005 (ver-2)

2. History:

The modification sheet no. MS 386 was issued in the month of Aug 2010 to standardize the scheme for multi loco operation. The scheme was not working for consist (three loco) operation and as such the same is being revised as Rev '1' along with other improvements.

3. Object:

The MU operation (max. for three locos) of conventional 25 kv AC electric tap changer locomotive with MPCS is to be standardized for reliable and effective operation of locomotive.

4. Modified Arrangement:

4.1 Arrangement for sharing of signals and their related circuit diagrams are given in annexure- A, B, C & D.

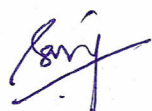
4.1.1 4 input (I-84, I-92, I-69 & I-74) and 3 output (O-40, O-41 & O-36) are shared between leading and trailing locos as per block diagram shown in Annexure- A & B. As per required modifications, these input/outputs should be connected to the MU coupler pins as shown in Annexure - A & B as per the details given below-

- a) Output of O-41 for Q49 (Wire no.237) should be connected through a VS – GR SYN to input no. I-92 (wire no. 262) of the same loco. Wire no. 262 should be connected to MU jumper no. D14 as per Annexure - A.
- b) Output of O-40 for Q51 (Wire no.259) should be connected through a VS – AU REG to input no. I-84 (wire no. 261) of the same loco. Wire no. 261 should be connected to MU jumper no. D15 as per Annexure - A.
- c) As per modification sheet no. RDSO/2008/EL/MS/0384 Rev '0', N/O interlock of BL and BLDJ were used in MTDJ branch. If the status of BLDJ key is taken into this circuit of rear locomotive, it will not allow closing of the DJ while operating from leading loco. Hence, wire no. 053 and 053/1 are to be shorted with a jumper in rear locomotive only for MU operation. When this rear loco is departed from MU operation then wire no. 053 and 053/1 jumper should be removed again for single loco operation.
- d) While forming locomotives in MU operation, it should be checked that BPEMS switch is provided, which is being provided by CLW in new locomotives since 2007. This will ensure added safety in case of breakdown of MPCS completely.
- e) Those locomotives which are not having BPEMS switch, the same should be provided in shed during AOH/IOH or at any other suitable opportunity at the earliest as an added safety features.
- f) One new input I-93 (BL_MU) of BL switch spare inter lock should be added for recognizing leading loco or trailing loco in multiple unit operation. Connection of BL switch spare interlock should be taken from both the cabs and after ORing should be fed to I-93.

4.2 Removal of MU jumpers from locomotive circuit as given in Annexure-C

4.2.1 The following wires going to MU coupler should be removed from all locomotives (for both multi unit and single unit operation) fitted with MPCS as per the modified circuit given in the loco circuit sheet 10 of CLW DRG. No. 15000.004.

- a) Since relays Q49 and Q52 are eliminated in MPCS, the ASMGR BN (I-16) and ASMGR ON (I-24) are not required in case of MU operation. So there is no need of extension of these signals to MU coupler.
- b) MU jumper no. B-7 from wire no. 072 of ASMGR (BN) used for I-16.
- c) MU jumper no. B-10 from wire no. 082 of ASMGR (ON) used for I-24.
- d) MU jumper no. B-8 from wire no. 073 of BLCP used through RGCP for I-17. This wire is required to be removed to take care of the auto cut OFF of compressors of rear locomotives from leading locomotive.



4.2.2. MU couplers are to be covered properly with spring loaded covers to protect from rain water and external foreign particles. A proper sealing arrangement should be done with RTB silicon compound as a precautionary measure. There are chances that the noise signal may generated due to moisture/water. This becomes more relevant with microprocessor based system as they are more susceptible to noise signal even at a very low level.

4.3 Addition of new MU jumper in locomotives circuit as given in Annexure-B & Annexure – C

- a) A new MU jumper no. C13 will be used for VESAs coil of sanding circuit as show in annexure-D. Two diodes (VS 20) are to be used to protect MPCS output O-23 and O-25.
- b) Two MU jumper no. B-7 & B-10 and one input I-74 through a diode VS LSGRP will be used for LSOL signaling lamp for fault indication in trailing loco in MU operation. LSOL lamp output will be fed according to the software logic as shown in annexure- B.
- c) Output of O-36 for LSGRP_S (Wire no. 235) should be connected through diode VS –LSGRP to input no. I-74 (wire no. 260) of the same loco. Wire no. 260 should be connected to MU jumper no. B-7. One Input I-69 (wire no. 263) will be connected to MU jumper no. B-10 in cross connection with B-7 as per annexure B.

5.0 Multiple unit/consist loco circuit description for notching & fault indication as per new scheme

5.1 Considerations:

5.1.1 Condition for recognition of leading loco as below:

- Input BL_MU (I-93) = 1 for leading loco.
- Input BL_MU (I-93) = 0 for trailing loco

5.1.2 There are two pilot lamps for indication of fault in trailing loco in MU operations. These are LSGRP for Recapitulation [fault] lamp (RED) and LSOL for Trailing loco fault indication Lamp (Yellow).

- a) All the logic consideration should be made according to leading locomotive.
- b) Normal condition of the loco both the lamps LSOL & LSGRP are in 'OFF' condition.
 - i. LSOL = 0
 - ii. LSGRP = 0
- c) Lamp condition in Healthy loco if fault exists in any loco.
 - i. LSOL = 1
 - ii. LSGRP = 0
- d) Lamp condition in Faulty loco.
 - i. LSOL = 0
 - ii. LSGRP = 1



e) Condition for LSGRP lamp glowing:-

- i. DJ trip condition (QV60=1).
- ii. CHBA on faulty condition (QV61=0).
- iii. Q50 becomes de-energise & QV64=1.
- iv. RSI block fuse blown (QV63=1).

5.2 Input/output & their MU jumper used:

The following I/O's & jumpers are used for Multiple unit/ consist loco circuit.

Inputs:

- | | | | |
|----|------|---|---------------|
| 1. | I-69 | =(LSGRP) from trailing loco | [jumper B-10] |
| 2. | I-74 | = Trailing loco fault signal. | [jumper B-7] |
| 3. | I-84 | = Q51 relay for auto regression of trailing loco. | [jumper D-15] |
| 4. | I-92 | = Q49 relay for notch synchronization from trailing loco. | [jumper D-14] |

Outputs:

- | | | | |
|----|------|--|---------------|
| 1. | O-36 | = LSGRP of leading loco. | [jumper B-7] |
| 2. | O-37 | = LSOL of Leading loco. | [no jumper] |
| 3. | O-40 | = Q51 relay for auto regression of leading loco. | [jumper D-15] |
| 4. | O-41 | = Q49 relay for notch synchronization of leading loco. | [jumper D-14] |

5.3 Auto regression logic for Multiple unit/ consist loco circuit.

i. Occurrence of auto regression in leading loco:-

Condition in leading loco: O-40 = 1 , I-84 =1 & D-15 = 1

Condition in others trailing locos: O-40 = 0, I-84 =1 & D-15 = 1

(Auto regression works in other loco through D-15 MU jumper.)

ii. Occurrence of auto regression in trailing loco:-

Condition in leading loco: O-40 = 0, I-84 =1 & D-15 = 1

Condition in any one of others locos in which auto reg. occur :

O-40 = 1, I-84 =1 & D-15 = 1

(Auto regression works in other loco through D-15 MU jumper.)

5.4 Notch synchronization for Multiple unit/ consist loco circuit.

i. Logic for Q49 in leading loco:-

Condition in leading loco: O-41 = 1 , I-92 =1 & D-14 = 1

Condition in others trailing locos: O-41 = 0, I-92 =1 & D-14 = 1

(Q49 logic works in other loco through D-14 MU jumper.)

ii. Notch synchronisation in trailing loco:-

Condition in leading loco: O-41 = 0, I-92 = 1 & D-14 = 1

Condition in any one of others locos in which Q49 acted :

O-41 = 1, I-92 = 1 & D-14 = 1

(Auto regression works in other loco through D-14 MU jumper.)

5.5 LSOL fault indicator logic for Multiple unit/ consist loco circuit.

(a) Positions of I/O status & its meaning in Leading loco

SN	Description	I-74	I-69	O-36	O-37
1.	Leading loco fault	1	0	1	0
2.	T. loco-1 fault	0	1	0	1
3.	T. loco-2 fault	1	0	0	1
4.	All loco healthy	0	0	0	0

(b) Positions of I/O status & its meaning for MU/C locomotives.

SN	Description	Leading loco				T. Loco-1				T. Loco-2			
		I-74	I-69	O-36	O-37	I-74	I-69	O-36	O-37	I-74	I-69	O-36	O-37
1.	Leading loco fault	1	0	1	0	0	1	0	1	1	0	0	1
2.	T. loco-1 fault	0	1	0	1	1	0	1	0	0	1	0	1
3.	T. loco-2 fault	1	0	0	1	0	1	0	1	1	0	1	0
4.	All loco healthy	0	0	0	0	0	0	0	0	0	0	0	0

5.6 If HAPR bypass switch is normal (I-70=0) in the leading loco, all the locomotives in MU operation should take HAPR as normal. If HAPR bypass switch is bypassed (I-70=1) in the leading loco, all the locomotives in MU operation should take HAPR as bypassed. The HAPR bypass is only for QD and ACP circuit. The other conditions of auto regression will still initiate auto regression.

6.0 Work to be carried out:

Modified circuit explained as above. Software should also be implemented by the manufacturer as per MS 0386 Rev '1' at the time of implementation.

7.0 Application to class of locomotive:

WAG-7, WAG5, and WAM-4 class of 25 Kv AC conventional tap changer electric locomotives with microprocessor based control and fault diagnostic system (MPCS).

The locomotives already modified as per RDSO modification sheet no. 0386 Rev '0' are to be converted to RDSO modification sheet no. 0386 Rev '1'. Locomotive circuit following MS 0386 Rev '0' cannot be formed in multi with MS 0386 Rev '1'.

8.0 Material Required:

1. Five Blocking diodes 12 amp.
2. Control cable of 2.5/3 mm² as per requirement.

9.0 Material Rendered Surplus: NIL**10.0 Modification Drawings:**

Modified circuit given in Annexure-A to Annexure-D

11.0 Agency of Implementation:

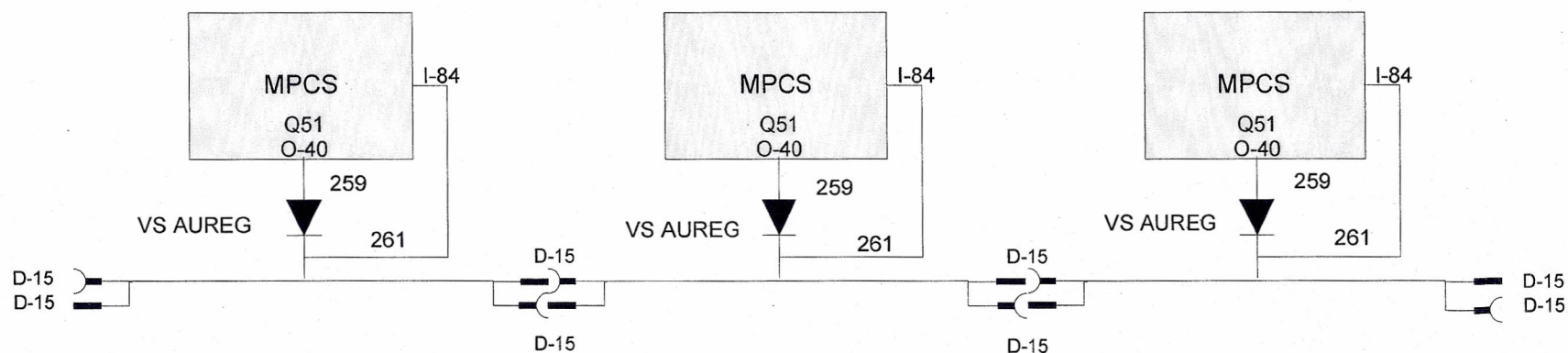
Electric loco sheds, MTR/POH workshops and CLW

Encl: As above

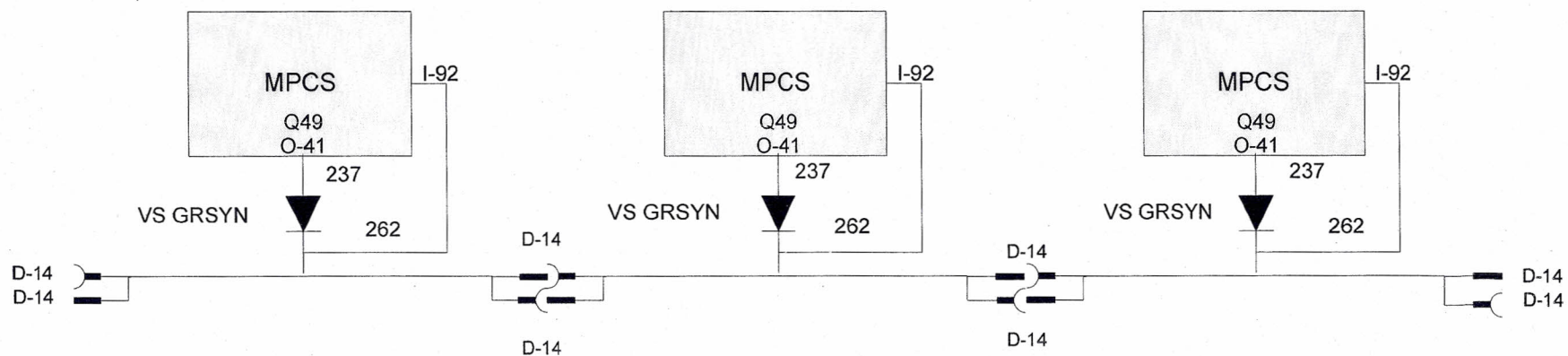


(S. K. Gupta)

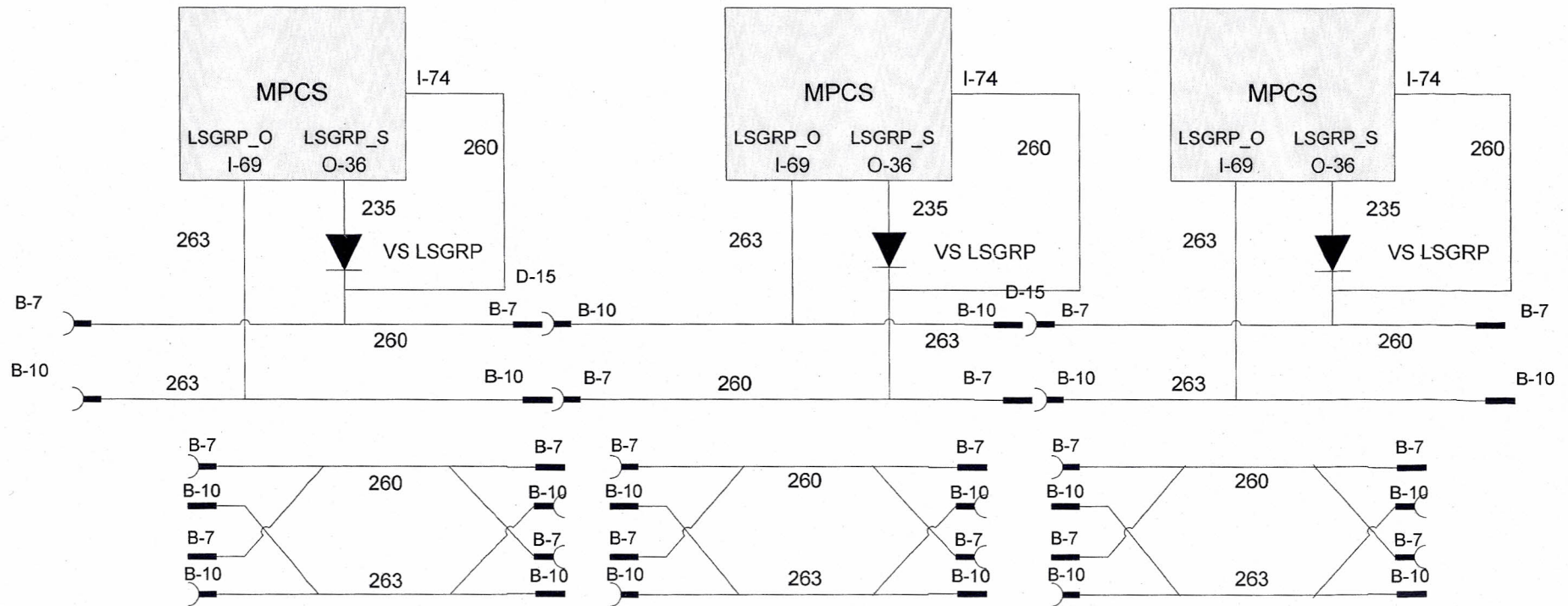
for Director General/Elect.



Auto-regression circuit for Consist/MU loco operation



Synchronization circuit for Consist/MU loco operation



LSOL fault locator circuit for MU loco operation

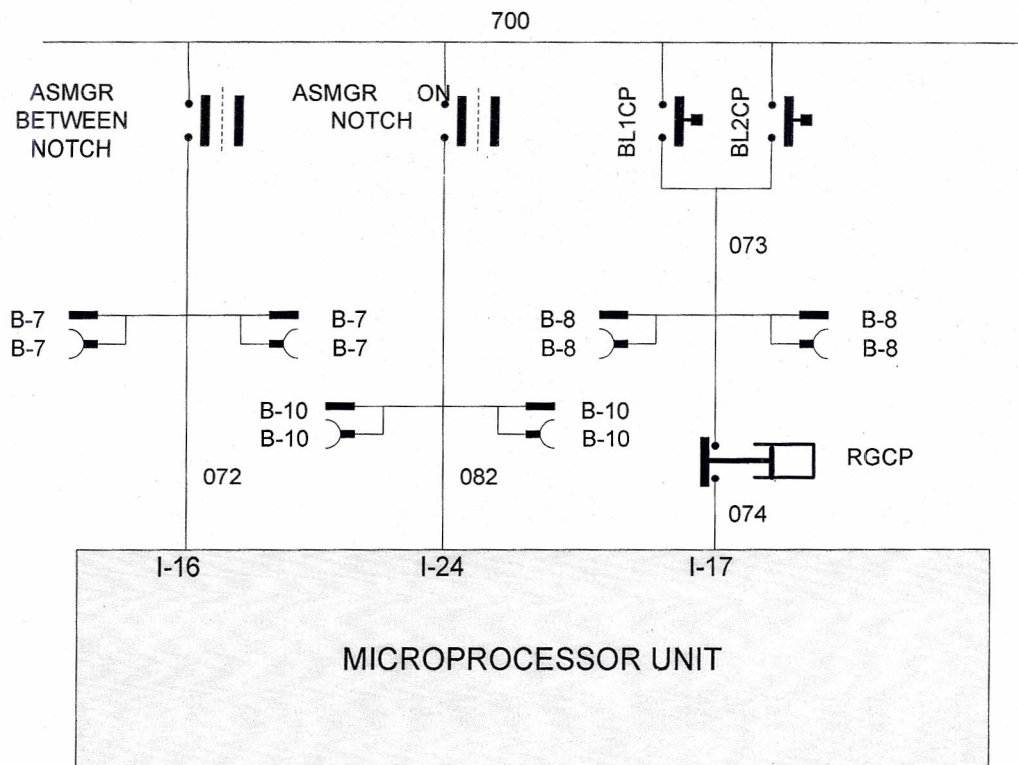
Note:- Modification in software for LSOL (O-37) lamp logic to be done by manufacturer as given below

Output O-37 of LSOL lamp = [(I-69 OR I-74) AND O-36]

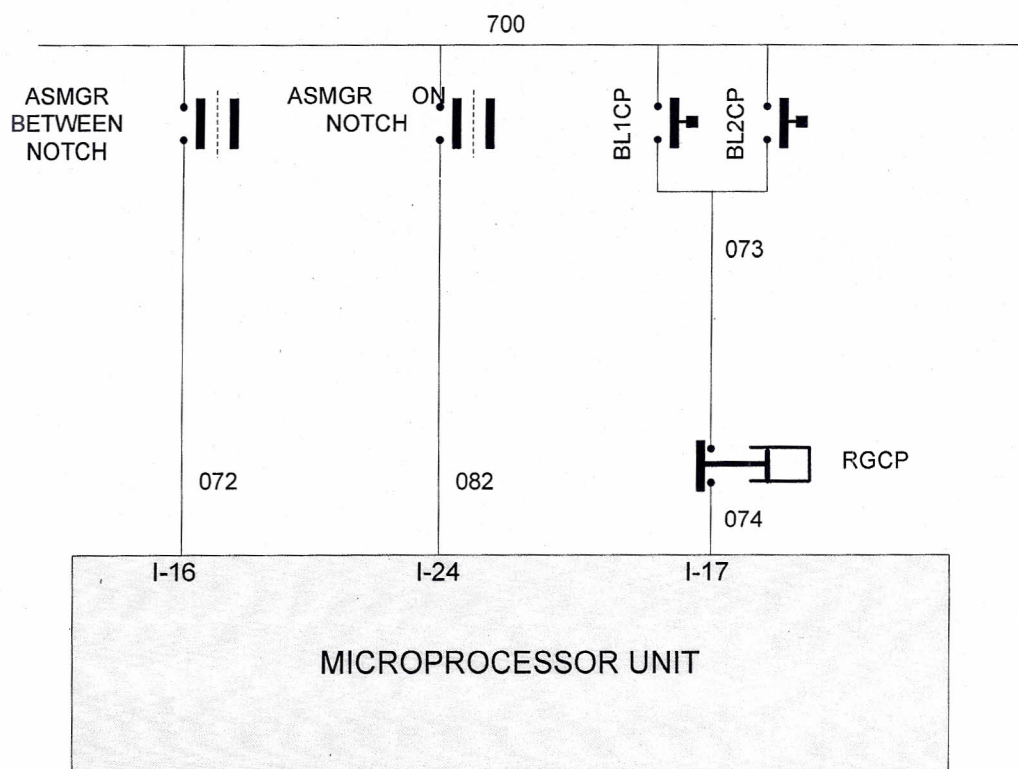
Legend: LSGRP_O means LSGRP for other loco
LSGRP_S means LSGRP for same loco

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Annexure- C



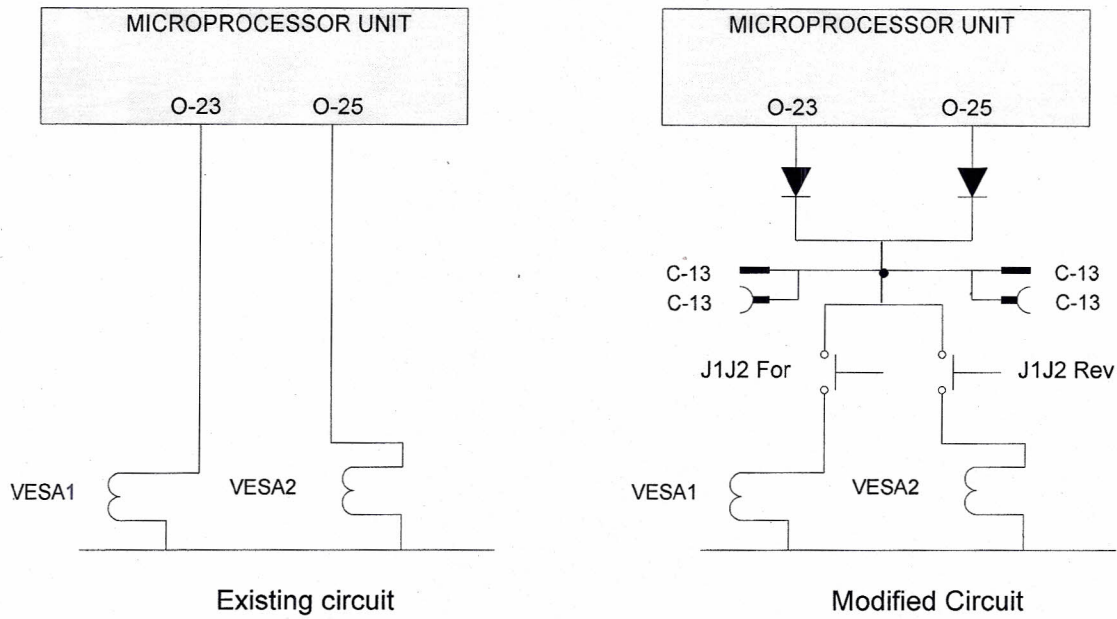
Existing Circuit



Modified Circuit

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Annexure- D



(Sender working with MU operation)

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