

Fax : (0522)-2452581
Telephone: (0522)-2465715
Telegram : 'RAILMANAK', Lucknow
Email : dsetplgroup@gmail.com



भारत सरकार – रेल मंत्रालय
अनुसंधान अभिकल्प और मानक संगठन
लखनऊ – 226011
Government of India - Ministry of Railways
Research, Designs & Standards Organization,
LUCKNOW - 226011

No. EL/11.5.5/4

Date: 05/05/2017

Chief Electrical Engineer,

- Central Railway, HQs Office, 2nd floor, Parcel Office Bldg., Mumbai-400 001
- East Central Railway, Hajipur (Bihar)-844 101
- Eastern Railway, Fairlie Place, Kolkata – 700 001
- East Coast Railway, Railway Complex, Bhubneshwar – 751 023
- Northern Railway, Baroda House, New Delhi-110 001
- North Central Railway, Allahabad – 211 001
- South East Central Railway, Bilaspur-495 004
- South Central Railway, HQs Office, Rail Nilayam, Secunderabad-500 071
- South Eastern Railway, Garden Reach, Kolkata- 700 043
- Southern Railway, Park Town, Chennai – 600 003
- West Central Railway, HQs Office, Opp. Indira Market, Jabalpur-482 001
- Western Railway, Churchgate, Mumbai – 4000 020
- Chittaranjan Locomotive Works, Chittaranjan- 713 331 (W.B.)

Sub: Modification in three phase electric locomotive provided with MICAS based VCUs to ensure complete redundancy FLG-1/2, HBB-1/2 and STB-1/2 of processors cards.

Ref: CLW letter no. C-D&D/T/42 dated 24-03-2017

Initially in the three phases electric locomotives there was no functional redundancy of input/output signals from either cabs of locomotive. In case failure of any processor or I/O card of the locomotive, complete Loco get failed. RDSO and CLW studied the problem and finally RDSO had issued Modification Sheet No. RDSO/2014/EL/MS/429, Rev-0 dated 26-02-14 to achieve cab redundancy in three phase electric locomotives. The same is being implemented by zonal railways

To achieve complete redundancy of processors FLG-1/2, HBB-1/2 and STB-1/2, Modification Sheet no. **RDSO/2017/EL/MS/0459, Rev-0** is being issued for implementation in class WAG-9/WAG-9H Locomotives. The Soft copies of modified drawing are also being sent by email for better legibility.

(Suresh Kumar)
For director general /Elect

Encl: as above

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- East Coast Railway, Railway Complex, Bhuvneshwar – 751 023
- Northern Railway, Baroda House, New Delhi-110 001
- North Central Railway, Allahabad – 211 001
- South East Central Railway, Bilaspur-495 004
- South Central Railway, HQs Office, Rail Nilayam, Secunderabad-500 071
- South Eastern Railway, Garden Reach, Kolkata- 700 043
- Southern Railway, Park Town, Chennai – 600 003
- West Central Railway, HQs Office, Opp. Indira Market, Jabalpur-482 001
- Western Railway, Churchgate, Mumbai – 4000 020
- Chittaranjan Locomotive Works, Chittaranjan- 713 331 (W.B.)

MODIFICATION SHEET NO. RDSO/2017/EL/MS/0459, REV-0 DATED 05-05-2017

1.0 Title:

Modification in three phase electric locomotive provided with MICAS based VCUs to ensure complete redundancy FLG-1/2, HBB-1/2 and STB-1/2 of processors cards.

2.0 Object:

Initially in the three phases electric locomotives there was no functional redundancy of input/output signals from either cabs of locomotive. In case failure of any processor or I/O card of the locomotive, complete Loco get failed. RDSO and CLW studied the problem and finally RDSO had issued Modification Sheet No. RDSO/2014/EL/MS/429, Rev-0 dated 26-02-14 to achieve cab redundancy in three phase electric locomotives.

Further studies led to successful implementation of full redundancy of FLG-1/2, HBB-1/2 and STB-1/2 processors in Loco no. 31769 and dispatched to ELS/AQ in Sep-16. Later on Loco no. 31791 was also turned out with complete VCU redundancy and dispatched to ELS/WAT in Dec-16. This MS gives details of implementation of processor redundancy in WAG-9/WAG-9H class of Locomotives.

3.0 Existing arrangement with cross references of respective design document:

RDSO has issued Modification sheet No. RDSO/2014/EL/MS/429, Rev-0 dated 26-02-14 for avoiding necessity of cab change in case of failure of processor cards of VCU in three phase electric locomotive. The same is being implemented by zonal railways.

4.0 Modified arrangement to replace existing arrangement as given above in 3.0:

To achieve complete redundancy of processors FLG-1/2, HBB-1/2 and STB-1/2, modification in the loco control wiring has been made and provision of two additional cards URB512 D15 followed by necessary software modification has been done. Modified software version may be downloaded from CLW website.

5.0 Application to class of locomotives:

WAG-9/WAG-9H three phase electric Locomotives.

6.0 Material required :

- i. Cables for as per **Annexure-1** for modified wiring
- ii. Two Cards URB512 D15

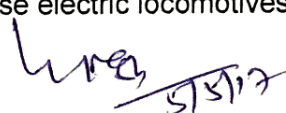
7.0 Material required surplus: Nil

8.0 Reference: CLW letter no. C-D&D/T/42 dated 24-03-2017.

9.0 Modification drawing: Enclosed as **Annexure-II**

10.0 Agency of implementation: All Zonal railways holding three phase electric locomotives.

Encl: as above


(Suresh Kumar)
For director general /Elect

(Copy to as per standard mailing list no. EL-M-4.2.3-19 latest revision.)

Modified Cable Index for Complete Redundancy in 3-Phase Locomotive**1.0 INPUT REDUNDANCY FOR STB-1**

Sl. No.	Signal Name	Scheme No.	Cable No.	Cable Size in Sq.mm	From SB-1		To		Length in meter
					Location	Wago No.	To	SUB-D: Pin	
1	AMSB_0103-LEmgStop	06B	3005A	0.5	XF22S:03	25	411	MA : 01	3.6
2	AMSB_0103-LSwComprOff	06E	3034A	0.5	XF22S:03	27	411	MA : 02	3.6
3	AMSB_0103-LSwComprDir	06E	3035A	0.5	XF22S:03	28	411	MA : 10	3.6
4	AMSB_0103-LEDemand	08C	2520A	0.5	XF22S:02	22	411	MA : 03	3.6
5	AMSB_0103-BEDemand	08C	2521A	0.5	XF22S:02	23	411	MA : 11	3.6
6	AMSB_0103-L/BDem>1/3	08C	2522A	0.5	XF22S:02	24	411	MA : 04	3.6
7	AMSB_0103-L/BDem>2/3	08C	2523A	0.5	XF22S:02	25	411	MA : 12	3.6
8	Power Supply	09A	4201	0.5			411	MA : 15	3.6
9	Power Supply	09A	2050	0.5			411	MA : 08	3.6
10	AMSB_0103-LPBFaultAck	17A	5671A	0.5	XF22S:02	36	411	MD : 01	3.6
11	AMSB_0103-MFuseAux	05F	2854	0.5	XF22S:01	18	411	MD : 09	3.6
12	AMSB_0103-MEFR415/110	05G	2859	0.5	XF22S:01	19	411	MD : 02	3.6
13	AMSB_0103-MEFRHotel	05G	2860	0.5	XF22F	4	411	MD : 10	3.6
14	AMSB_0103-MEFRControl	05G	2870	0.5	89.7	8	411	MD : 03	3.6
15	AMSB_0103-LFootSwLoBk	06D	3033A	0.5	XK22A:02	11	411	MD : 11	3.6
16	Power Supply	09A	4201	0.5			411	MD : 15	3.6
17	Power Supply	09A	2050	0.5			411	MD : 08	3.6
Total Cable Length in meter									61.2

2.0 OUTPUT REDUNDANCY FOR STB-1

Sl No.	Signal Name	Scheme No.	Cable No.	Cable Size in Sq.mm	From SB-1		To		Length in meter
					Location	Wago No.	To	SUB-D:Pin	
1	AMSB_0203-MLampFind	17A	5672A	0.5	XK22A:02	37	411	MG : 19	3.6
			2099A	0.5	XF22S:02	8	411	MG : 07	3.6
2	AMSB_0203-MLampFault	17A	5673A	0.5	XK22A:02	38	411	MG : 20	3.6
			2099A	0.5	XF22S:02	8	411	MG : 07	3.6
3	AMSB_0203-BBuzzBlack	11B	2099A	0.5	XF22S:02	8	411	MG : 18	3.6
			4237A	0.5	XK22A:02	34	411	MG : 06	3.6
4	AMSB_0203-BBuzzRed	11B	2099A	0.5	XF22S:02	8	411	MG : 14	3.6
			4239A	0.5	123/5	3	411	MG : 02	3.6

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Modified Cable Index for Complete Redundancy in 3-Phase Locomotive

3.0 INPUT REDUNDANCY FOR HBB-1

Sl. No.	Signal Name	Scheme No.	Cable No.	Cable Size in Sq.mm	From SB-1		To		Length in meter
					Location	Wago No.	To	SUB-D: Pin	
1	AMSB_0103-MMCBCompr1	05F	2840A	0.5	XK22H	23	411	RA : 01	3.6
2	AMSB_0103-LParkBrake	06B	3060A	0.5	XK22A:02	14	411	RA : 09	3.6
3	AMSB_0103-LHotelOn	05D	2803A	0.5	XF22S:03	15	411	RA : 02	3.6
4	AMSB_0103-LActkSwD	08A	2500A	0.5	XF22S:02	17	411	RA : 10	3.6
5	AMSB_0103-LActkSwC	08A	4242A	0.5	XK22A:02	35	411	RA : 03	3.6
6	AMSB_0103-LConstSpeed	08E	2541A	0.5	XF22S:03	12	411	RA : 11	3.6
7	AMSB_0103-LHotelOff	05D	2804A	0.5	XF22S:03	16	411	RA : 04	3.6
8	AMSB_0103-LFootSwSand	06C	3117A	0.5	XK22A:02	26	411	RA : 12	3.6
9	Power Supply	09A	4201	0.5			411	RA : 15	3.6
10	Power Supply	09A	2050	0.5			411	RA : 08	3.6
11	AMSB_0103-LVigOff	11A	3000/1	0.5	237.1	8	411	RD : 01	3.6
12	AMSB_0103-MContHotel	05D	2806	0.5	XF22F	3	411	RD : 09	3.6
13	AMSB_0103-LSwBogOut1	17B	2401	0.5	154	2	411	RD : 02	3.6
14	AMSB_0103-LSwBogOut2	17B	2402	0.5	154	4	411	RD : 10	3.6
15	AMSB_0103-LSwKSim	17A	5676	0.5	XF22S:01	42	411	RD : 03	3.6
16	AMSB_0103-LSwFailMode	17A	5675	0.5	152	2	411	RD : 11	3.6
17	AMSB_0103-MIPrimHigh	05C	2088	0.5	78	B	411	RD : 04	3.6
18	Power Supply	09A	4202	0.5			411	RD : 15	3.6
19	Power Supply	09A	2050	0.5			411	RD : 08	3.6

Total Cable Length in meter

68.4

4.0 OUTPUT REDUNDANCY FOR HBB-1

Sl. No.	Signal Name	Scheme No.	Cable No.	Cable Size in Sq.mm	From SB-1		To		Length in meter
					Location	Wago No.	To	SUB-D: Pin	
1	AMSB_0203-MLampWSlip	08E	2542A	0.5	XF22S:03	13	411	RG : 19	3.6
			2099A	0.5	XF22S:02	05	411	RG : 07	3.6
2	AMSB_0203-MLampCSpeed	08E	2532A	0.5	XF22S:03	10	411	RG : 20	3.6
			2099A	0.5	XF22S:02	05	411	RG : 07	3.6
3	AMSB_0203-MLampHotel	05D	2807A	0.5	XF22S:03	17	411	RG : 23	3.6
			2099A	0.5	XF22S:02	06	411	RG : 10	3.6
4	AMSB_0203-MLampParkBK	06B	3071A	0.5	XK22A:02	20	411	RG : 18	3.6
			2099A	0.5	XF22S:02	06	411	RG : 06	3.6
5	AMSB_0203-BContHotel	05D	2801A	0.5	XK22F	2	411	RJ : 09	3.6
			2801A	0.5	89/7	A	411	RJ : 02	3.6
6	AMSB_0203-BAirDryer	06D	3047	0.5	XF22S:01	21	411	RJ : 03	3.6
			4201	0.5	XF22S:01	31	411	RJ : 10	3.6
7	AMSB_0203-BRelMCOFF	08A	4201	0.5	XF22S:01	31	411	RG : 12	3.6
			2066	0.5	123/7	9	411	994	3.6
8	AMSB_0203-MLampTPart	06B	3020A	0.5	XF22S:03	26	411	RG : 09	3.6
			2099A	0.5	XF22S:02	6	411	RG : 22	3.6

Total Cable Length in meter

57.6

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Modified Cable Index for Complete Redundancy in 3-Phase Locomotive

5.0 INPUT REDUNDANCY FOR STB-2

Sl. No.	Signal Name	Scheme No.	Cable No.	Cable Size in Sq.mm	From SB-2		To		Length in meter
					Location	Wago No.	To	SUB-D: Pin	
1	AMSB_0103-MMCBCompr2	05F	2804B	0.5	XK77A.02	7	412	MA :01	3.6
2	AMSB_0103-LEmgStop	06B	3005B	0.5	XF77S.03	24	412	MA :09	3.6
3	AMSB_0103-MPrSw75bar	06E	3038	0.5	XF77S.01	24	412	MA :02	3.6
4	AMSB_0103-LSwComprOff	06E	3034B	0.5	XF77S.03	26	412	MA :10	3.6
5	AMSB_0103-LSwComprDir	06E	3035B	0.5	XK77A.02	13	412	MA :03	3.6
6	AMSB_0103-LTEDemand	08D	2520B	0.5	XK77A.01	29	412	MA :11	3.6
7	AMSB_0103-LBEDemand	08D	2521B	0.5	XK77A.01	30	412	MA :04	3.6
8	AMSB_0103-LT/Bdem>1/3	08D	2522B	0.5	XK77A.01	31	412	MA :12	3.6
9	Power Supply	09B	4203	0.5			412	MA :15	3.6
10	Power Supply	09B	2050	0.5			412	MA :08	3.6
11	AMSB_0103-LT/Bdem>2/3	08D	2523B	0.5	XK77A.01	32	412	MD :01	3.6
12	AMSB_0103-LPBFAck	17A	5671B	0.5	XK77A.02	36	412	MD :09	3.6
13	AMSB_0103-MPRSwAFLOW	06A	3050	0.5	XF77S.01	31	412	MD :02	3.6
14	AMSB_0103-MBrakElecOk	06H	3008	0.5	XF77S.01	17	412	MD :10	3.6
15	AMSB_0103-MPRSw8bar	06E	3036	0.5	XF77S.01	23	412	MD :03	3.6
16	AMSB_0103-MPRSwLowMR	06E	3044	0.5	XF77S.01	28	412	MD :11	3.6
17	AMSB_0103-MFireAlarm	11B	4227	0.5	XF77S.02	32	412	MD :04	3.6
18	AMSB_0103-MPRSwBkCyl2	06A	3053	0.5	XF77S.01	30	412	MD :12	3.6
19	Power Supply	09B	4204	0.5			412	MD :15	3.6
20	Power Supply	09B	2050	0.5			412	MD :08	3.6
21	AMSB_0101-MPRSwLocoBk	06A	3059	0.5	XF77S.01	38	412	JA :01	3.6
22	AMSB_0101-LEmgBkOut	06A	3055	0.5	XF77S.01	36	412	JD :10	3.6

Total Cable Length in meter

79.2

Note

Additional wiring of sl. No. 21 & 22 shall be done on existing I/O card UR BS12

5.0 OUTPUT REDUNDANCY FOR STB-2

Sl. No.	Signal Name	Scheme No.	Cable No.	Cable Size in Sq.mm	From SB-2		To		Length in meter
					Location	Wago No.	To	SUB-D: Pin	
1	AMSB_0203-MLampFlnd	17A	5672B	0.5	XK77A.02	37	412	MG :19	3.6
			2099B	0.5	XF77S.03	10	412	MG :07	3.6
2	AMSB_0203-MLampFault	17A	5673B	0.5	XF77S.02	38	412	MG :20	3.6
			2099B	0.5	XF77S.03	10	412	MG :07	3.6
3	AMSB_0203-3BUzBlack	11B	4237B	0.5	XF77S.03	32	412	MC :15	3.6
			2099B	0.5	XF77S.03	10	412	MC :03	3.6
4	AMSB_0203-3BUzRed	11B	4239B	0.5	XF77S.01	33	412	MC :09	3.6
			2099B	0.5	XF77S.03	10	412	MC :02	3.6
5	AMSB_0113-BVigControl	11A	3101	0.5	XF77S.01	41	412	MG :19	3.6
			4224	0.5	XF77S.02	39	412	MG :07	3.6
6	AMSB_0113-3-PSand13	06C	3101	0.5	XF77S.01	41	412	MG :19	3.6
			3028	0.5	XF77S.01	42	412	MG :04	3.6
7	AMSB_0113-4-PSand14	06C	3101	0.5	XF77S.01	42	412	MG :19	3.6
			3029	0.5	XF77S.01	43	412	MG :12	3.6
8	AMSB_0113-4-PSand15	06B	3101	0.5	XF77S.01	41	412	MG :19	3.6
			3047	0.5	XF77S.01	29	412	MG :09	3.6
9	AMSB_0202-BVigReset	11A	4204	0.5	XF77S.02	37	412	MG :12	3.6
			4206	0.5	XF77S.02	39	412	MG :04	3.6
10	AMSB_0114-4-PSand16	06B	3101	0.5	XF77S.01	42	412	MG :19	3.6
			3048	0.5	XF77S.01	30	412	MG :06	3.6
11	AMSB_0115-4-PSand17	A	3054	0.5	XF77S.01	37	412	MG :19	3.6
			3058	0.5	XF77S.01	38	412	MG :19	3.6
12	AMSB_0116-4-PSand18	A	3054	0.5	XF77S.01	37	412	MG :19	3.6
			3058	0.5	XF77S.01	38	412	MG :19	3.6

Total Cable Length in meter

86.4

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Modified Cable Index for Complete Redundancy in 3-Phase Locomotive

7.0 INPUT REDUNDANCY FOR HBB-2

Sl. No.	Signal Name	Scheme No.	Cable No.	Cable Size in Sq.mm	From SB-2		To		Length in meter
					Location	Wago No.	To	SUB-D: Pin	
1	AMSB_0103-LParkBrake	06B	3060B	0.5	XK77A:02	14	412	RA : 01	3.6
2	AMSB_0103-LHotelOn	05D	2803B	0.5	XK77A:02	6	412	RA : 09	3.6
3	AMSB_0103-LActSwD	08A	2500B	0.5	XF77S:03	20	412	RA : 02	3.6
4	AMSB_0103-LActSwC	08A	4242B	0.5	XF77S:03	34	412	RA : 10	3.6
5	AMSB_0103-LConstSpeed	08F	2541B	0.5	XK77A:02	4	412	RA : 03	3.6
6	AMSB_0103-LHotelOff	05D	2804B	0.5	XK77A:02	7	412	RA : 11	3.6
7	AMSB_0103-LFootSwSand	06C	3117B	0.5	XK77A:02	36	412	RA : 04	3.6
8	AMSB_0103-MSpeed105%	10A	4208	0.5	XF77S:02	24	412	RA : 12	3.6
9	Power Supply	09B	4203	0.5			412	RA : 15	3.6
10	Power Supply	09B	2050	0.5			412	RA : 08	3.6
11	AMSB_0103-MSpeed110%	10A	4244	0.5	XF77S:02	40	412	RD : 01	3.6
12	AMSB_0103-MSpeedAlarm	10A	4207	0.5	XF77S:02	23	412	RD : 09	3.6
13	AMSB_0103-MPrSwBkCyl1	06A	3052	0.5	XF77S:01	33	412	RD : 02	3.6
14	AMSB_0103-MSmogWarn	11B	4228	0.5	XF77S:02	32	412	RD : 10	3.6
15	AMSB_0103-MFailFireEq	11B	4229	0.5	XF77S:02	33	412	RD : 03	3.6
16	AMSB_0103-MVigWarn	11A	4220	0.5	XF77S:02	28	412	RD : 11	3.6
17	AMSB_0103-MEmgBkVig	11A	3000	0.5	XF77S:01	16	412	RD : 04	3.6
18	AMSB_0103-MEFRBUR	05G	2858	0.5	XF77S:01	15	412	RD : 12	3.6
19	Power Supply	09B	4204	0.5			412	RD : 15	3.6
20	Power Supply	09B	2050	0.5			412	RD : 08	3.6

Total Cable Length in meter

72

8.0 OUTPUT REDUNDANCY FOR HBB-2

Sl. No.	Signal Name	Scheme No.	Cable No.	Cable Size in Sq.mm	From SB-2		To		Length in meter
					Location	Wago No.	To	SUB-D: Pin	
1	AMSB_0203-MLampWSlip	08E	2542B	0.5	XK77A:02	5	412	RG : 19	3.6
			2099B	0.5	XF77S:03	7	412	RG : 07	3.6
2	AMSB_0203-MLampCSpeed	08E	2532B	0.5	XK77A:02	2	412	RG : 20	3.6
			2099B	0.5	XF77S:03	8	412	RG : 07	3.6
3	AMSB_0203-MLampHotel	05D	2807B	0.5	XK77A:02	8	412	RG : 23	3.6
			2099B	0.5	XF77S:03	9	412	RG : 10	3.6
4	AMSB_0203-MLampParkBK	06B	3071B	0.5	XK77A:02	20	412	RG : 18	3.6
			2099B	0.5	XF77S:03	7	412	RG : 06	3.6
5	AMSB_0203-MLampTPart	06F	3020B	0.5	XK77S:03	25	412	RG : 22	3.6
			2099B	0.5	XF77S:03	8	412	RG : 09	3.6

Total Cable Length in meter

36

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Annexure - II

VCB Aux. Contacts Electronics

01

02

03

04

VCB Aux. Contacts for Cab Indication

Cab-1

Cab-2

05

06

07

08

09

10

Max. Current Detection

11

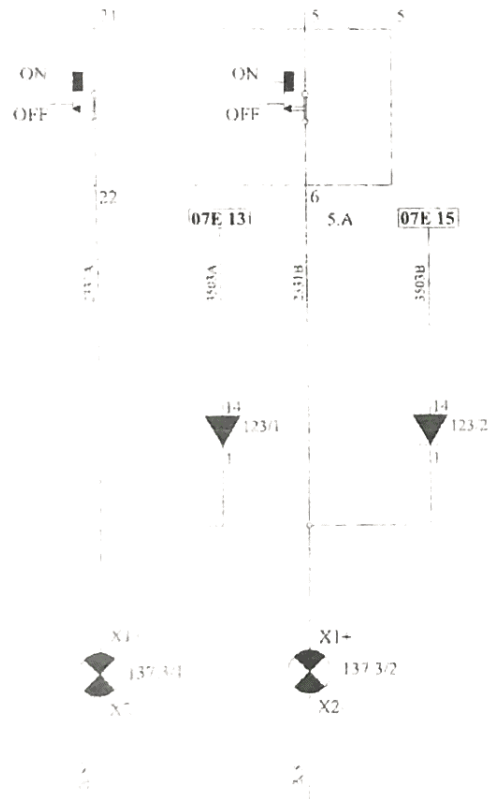
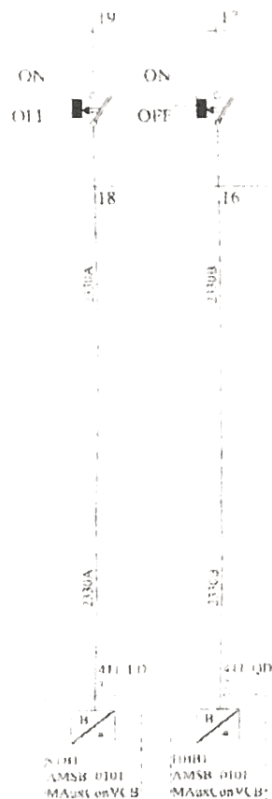
12

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14

Position : Location : Description : Part Number :

1	Wamp Connect (K1) (K2) (K3)	10
2	Wamp Connector (K1) (K2) (K3)	11
3	Maximum Current Detection	12
4	Block Diagram of Max. Current Detection	13
5	Indication of Max. Current Detection	14
6	Wamp Connector (K1) (K2) (K3)	15
7	Wamp Connector (K1) (K2) (K3)	16
8	Wamp Connector (K1) (K2) (K3)	17
9	Wamp Connector (K1) (K2) (K3)	18



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CHITTARANJAN LOCOMOTIVE WORKS
Chittaranjan - 713301
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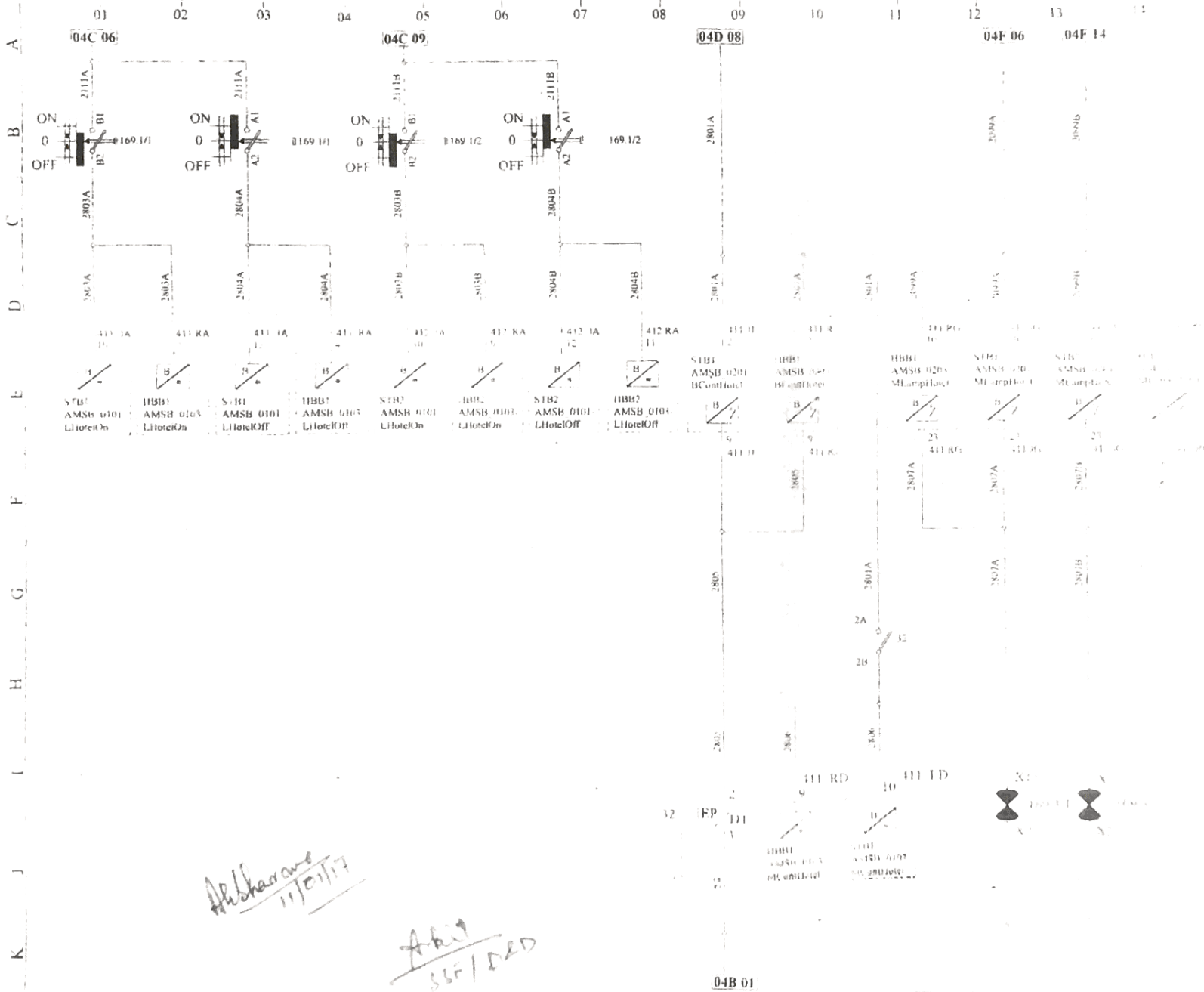
Switch Cab 1

Switch Cab 2

Indication Lamp

Cab-1 Cab-2

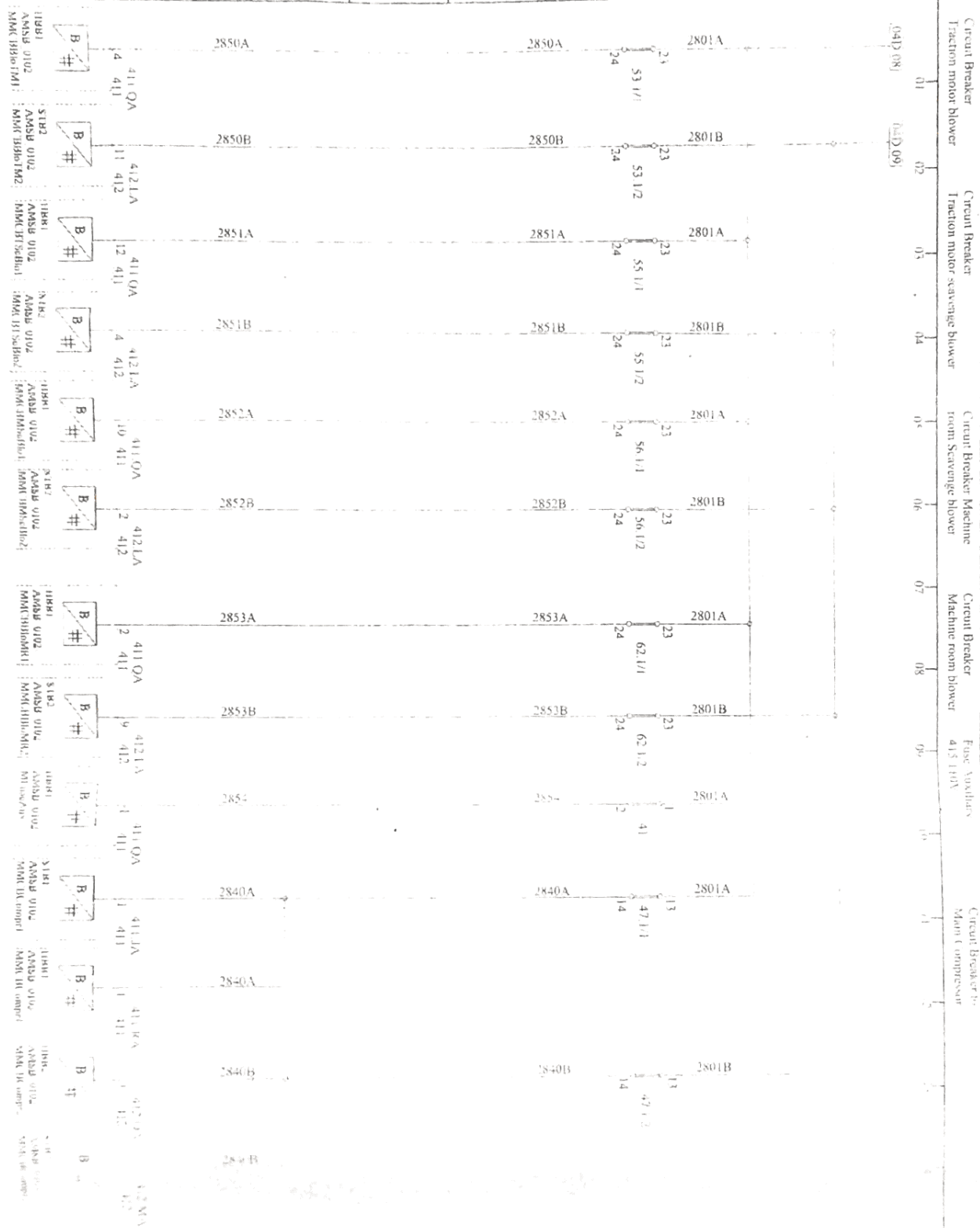
Position	Functional Description	Pin Layout
15	32 Contactor Hotel Load Supply	
	169.1 Spring Loaded Switch Hand (SLO) MEHO	704
	169.2 Indication Lamp Hotel Load (SLO)	641
	411 Central Electronics	783
	411 JA Connector	2804
	411 JB Connector	2805
	411 JC Connector	2806
	411 LD Connector	2807
	412 Central Electronics	784
	412 JA Connector	2808
	412 JB Connector	2809



Dr. GT/200



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Chittaranjan - 713331
CENTRE FOR DESIGN & DEVELOPMENT



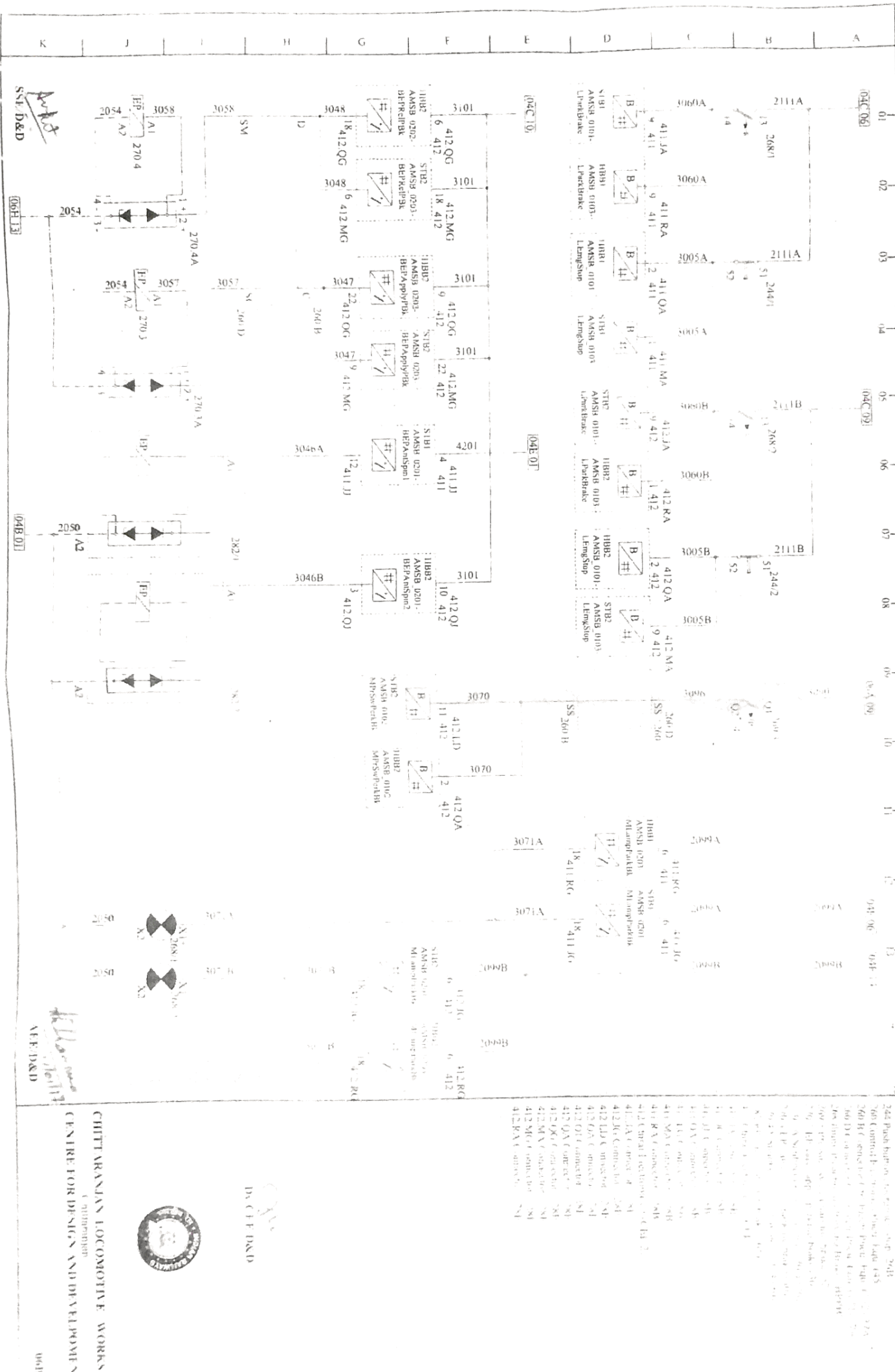
SSE/D&D

AET D&D



D. J. D&D

CHITARANJAN LOG ENGINEERING WORKS
CENTRE FOR DESIGN AND DEVELOPMENT



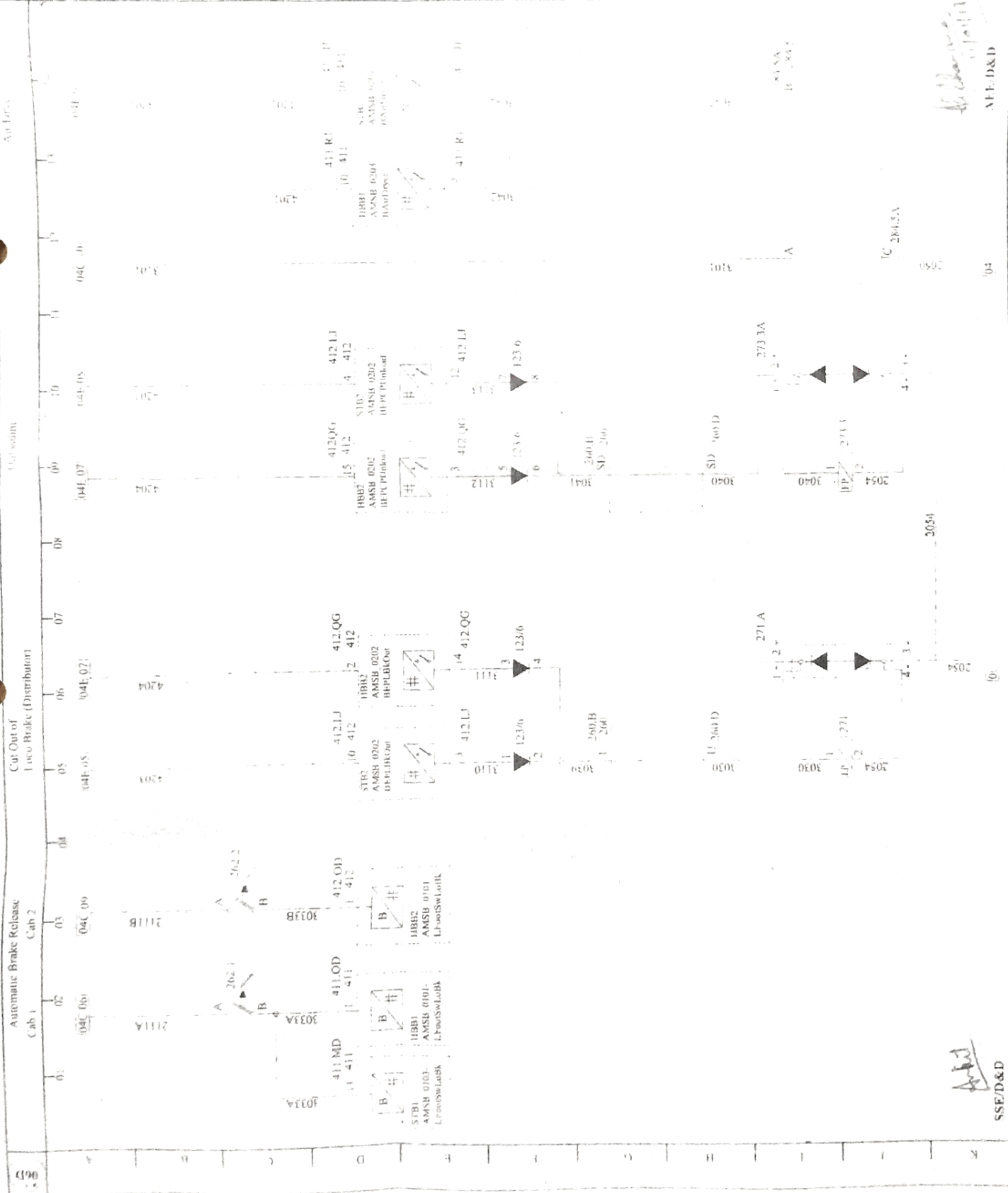
CHITTARANJAN LOCOMOTIVE WORKS
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DR. C. F. DAND

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Position Function Description Page No.

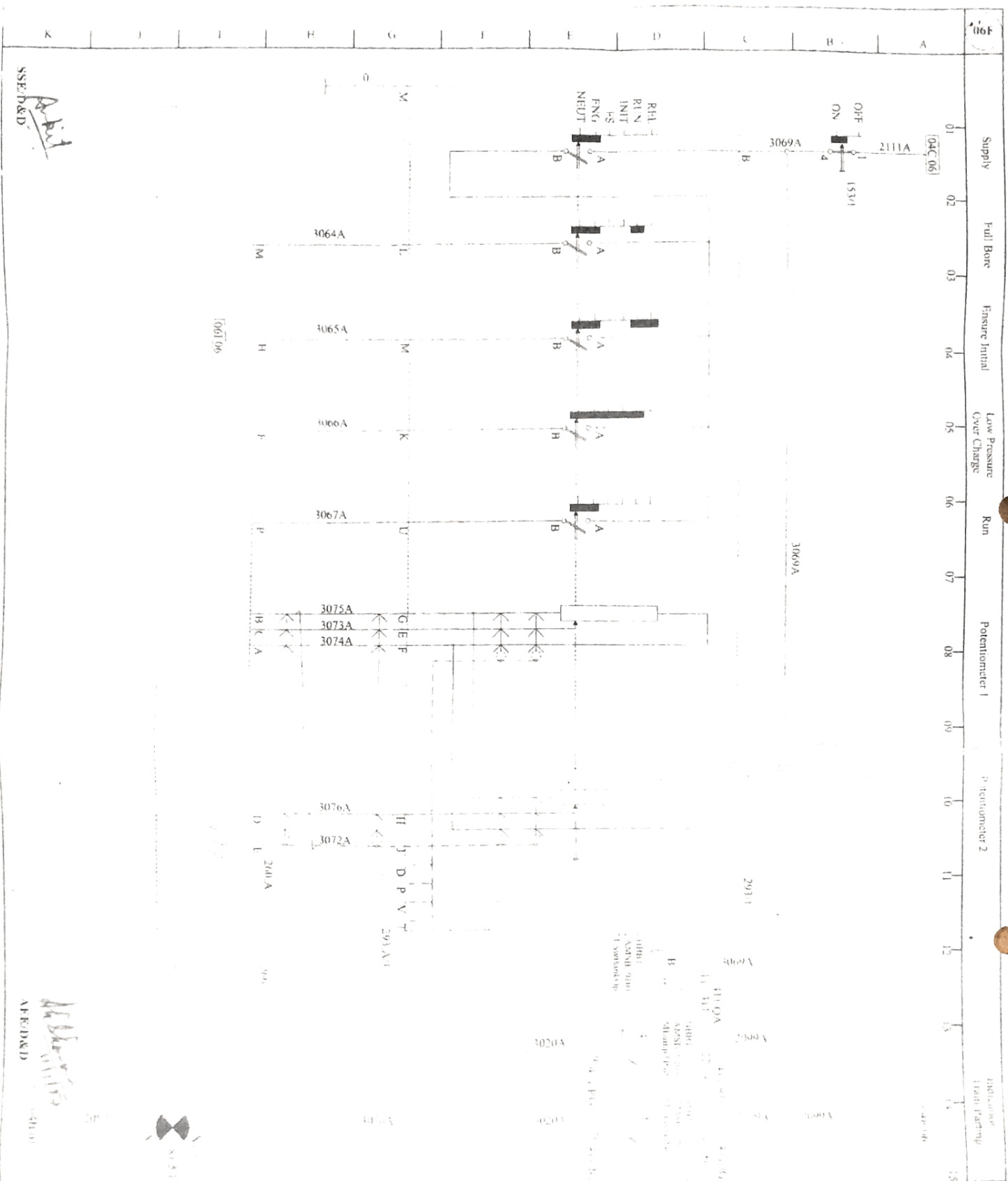
- 27. Braking Diagram
- 28. Control Diagram
- 29. Brake Pipe Diagram
- 30. Brake Pipe Diagram
- 31. Brake Pipe Diagram
- 32. Brake Pipe Diagram
- 33. Brake Pipe Diagram
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- 99. Brake Pipe Diagram
- 100. Brake Pipe Diagram



DR. C.E. D&D



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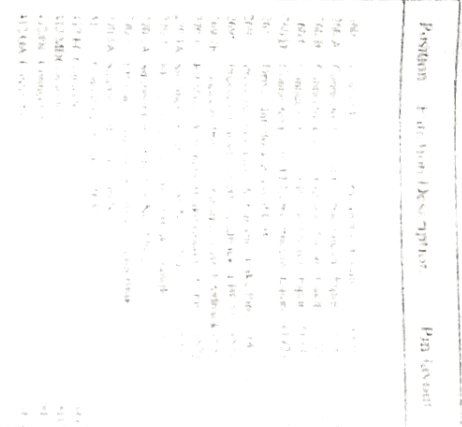
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81.5	Indicator Train Parting	1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20, 21, 22, 23, 24, 25, 26, 27, 28, 29, 30, 31, 32, 33, 34, 35, 36, 37, 38, 39, 40, 41, 42, 43, 44, 45, 46, 47, 48, 49, 50, 51, 52, 53, 54, 55, 56, 57, 58, 59, 60, 61, 62, 63, 64, 65, 66, 67, 68, 69, 70, 71, 72, 73, 74, 75, 76, 77, 78, 79, 80, 81, 82, 83, 84, 85, 86, 87, 88, 89, 90, 91, 92, 93, 94, 95, 96, 97, 98, 99, 100
81.5	Indicator Train Parting	1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20, 21, 22, 23, 24, 25, 26, 27, 28, 29, 30, 31, 32, 33, 34, 35, 36, 37, 38, 39, 40, 41, 42, 43, 44, 45, 46, 47, 48, 49, 50, 51, 52, 53, 54, 55, 56, 57, 58, 59, 60, 61, 62, 63, 64, 65, 66, 67, 68, 69, 70, 71, 72, 73, 74, 75, 76, 77, 78, 79, 80, 81, 82, 83, 84, 85, 86, 87, 88, 89, 90, 91, 92, 93, 94, 95, 96, 97, 98, 99, 100

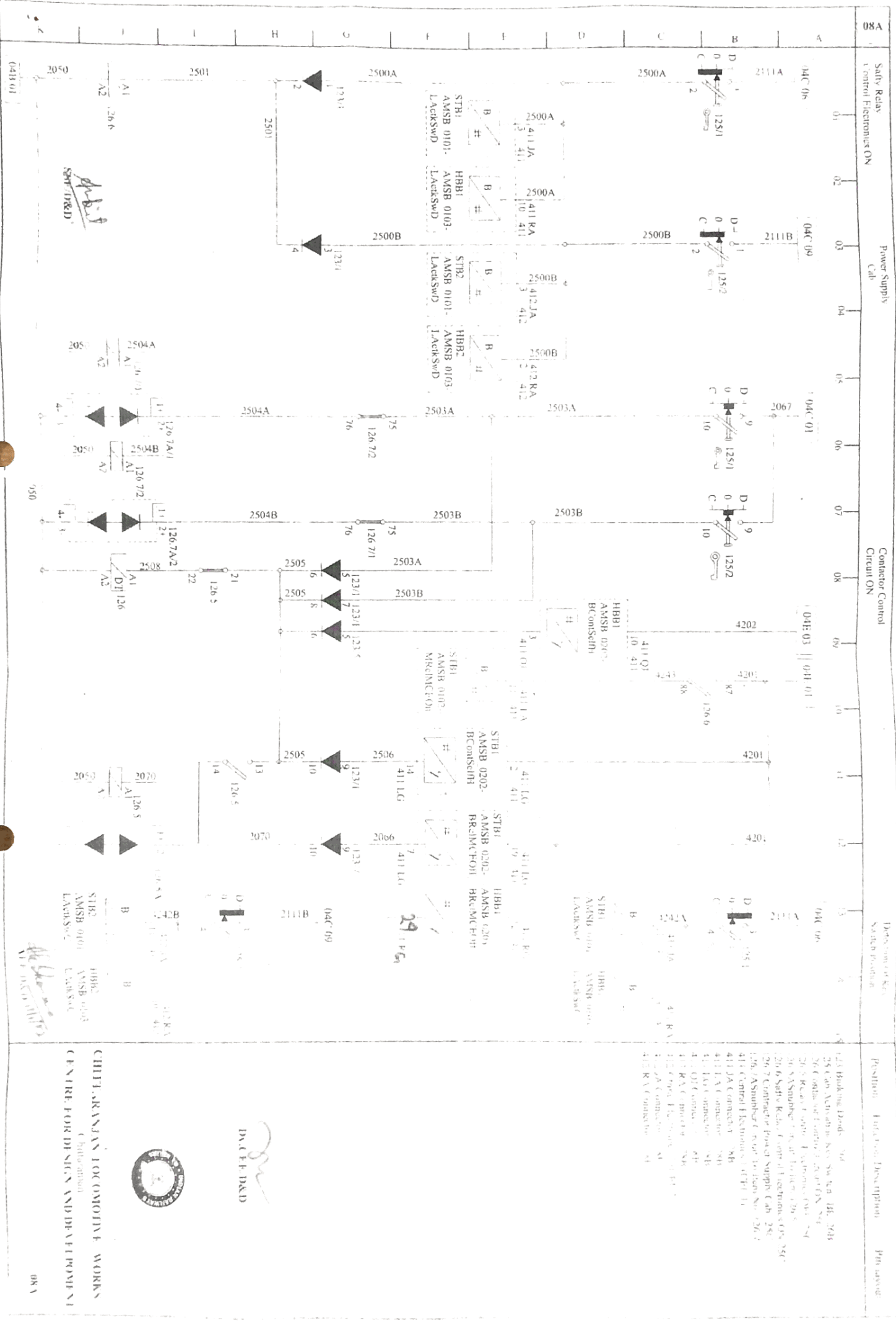


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SSE/D&D

A.P.E/D&D





CHITRAKANTH LOCOMOTIVE WORKS
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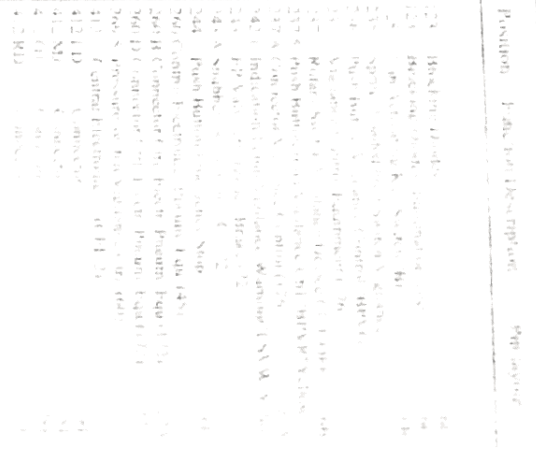
Attest: _____
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APPENDIX



DISCUSSION

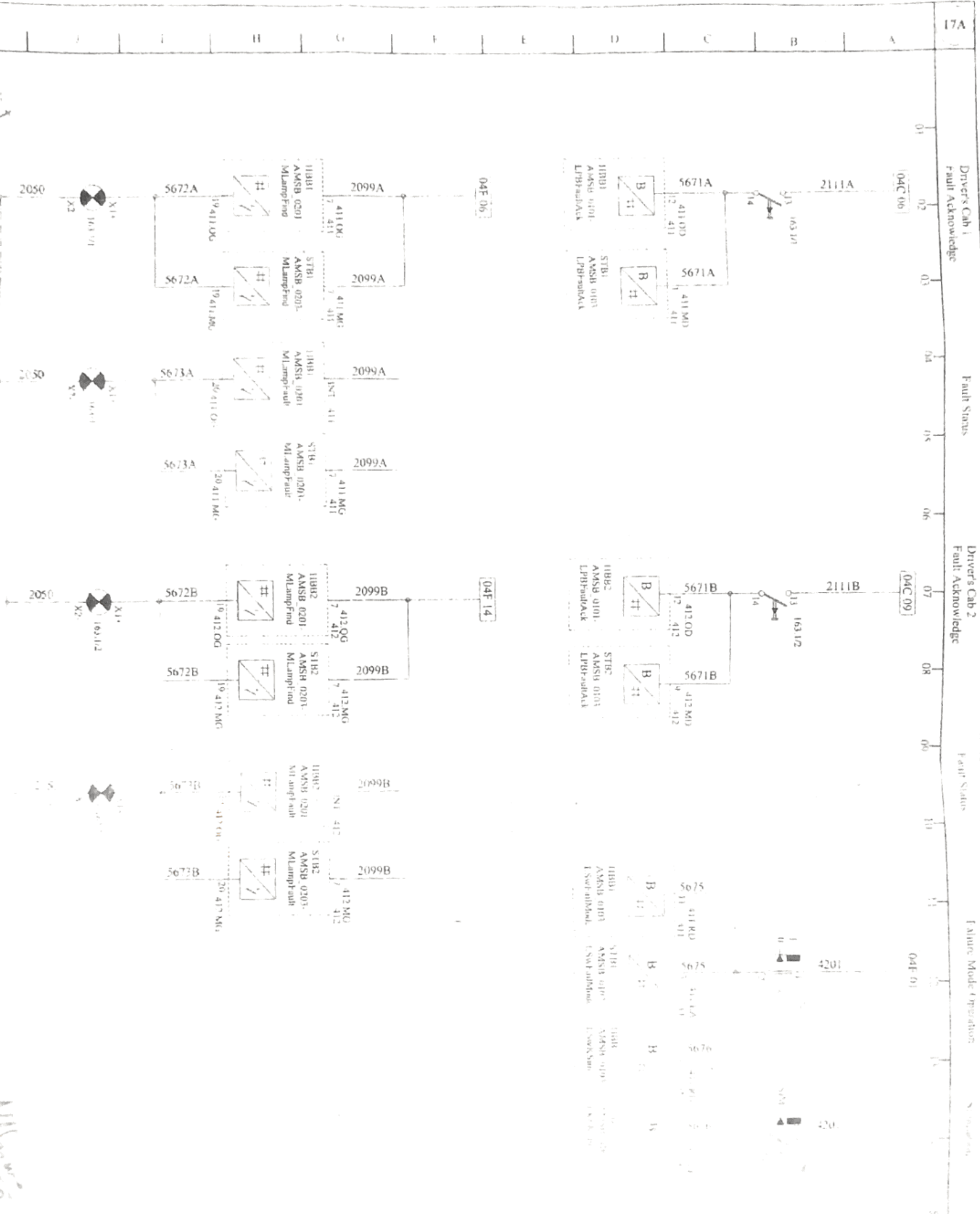


CUTTARANJAN FOR COMPETITIVE WORKS CENTRE FOR DESIGN AND DEVELOPMENT

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 CONSULT FOR DESIGN AND DEVELOPMENT

DATE: 01/01/2020

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