

DOPPLER RADAR BASED ADHESION CONTROL SYSTEM
FOR
WAG9 CLASS LOCOMOTIVES

USER MANUAL



ADVANCED RAIL CONTROLS PRIVATE LIMITED

#59/1-2, II FLOOR (ABOVE BANK OF INDIA)

G-BLOCK, SAHAKARANAGAR

BANGALORE-560 092

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INDEX

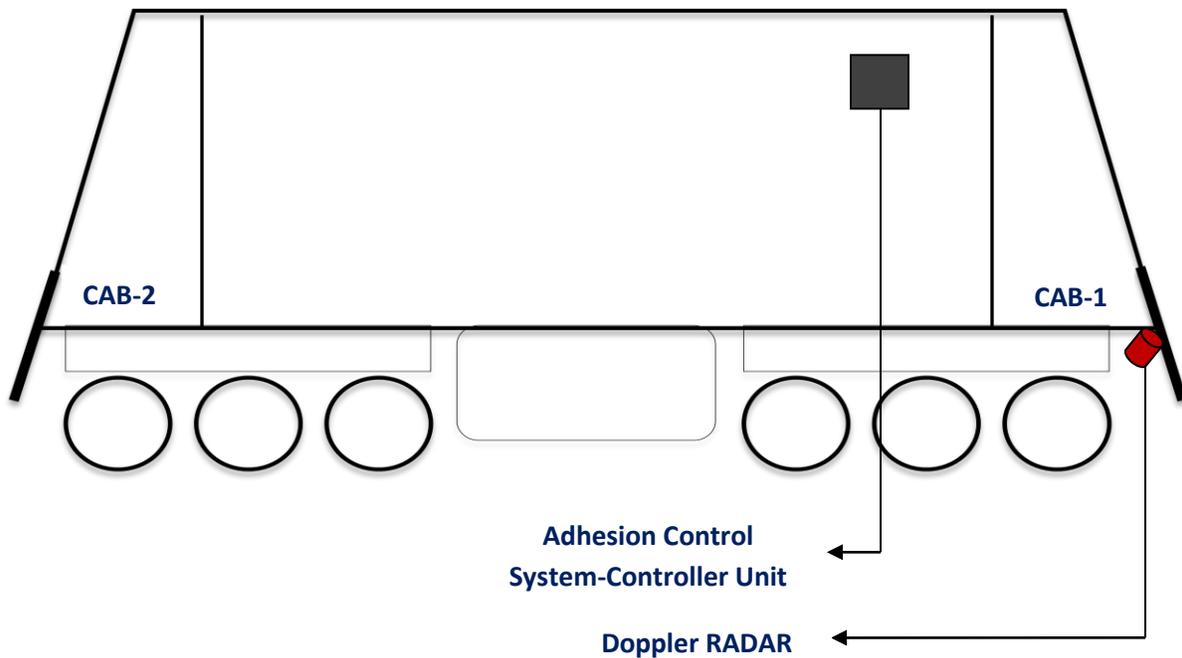
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1.0 Introduction:

Adhesion is a physical property during the interaction of rail & wheel. Adhesion Control means realizing the most optimum adhesion between rail and wheel at a given situation so that the tractive effort or breaking effort transferred is maximized. So the adhesion control system has to detect the slip fast and then act upon the traction control system to correct the slip. In order to find the slip, it is necessary to compare the axle speeds with an independent reference speed. For measuring the reference speed or ground speed, Doppler radar is used.

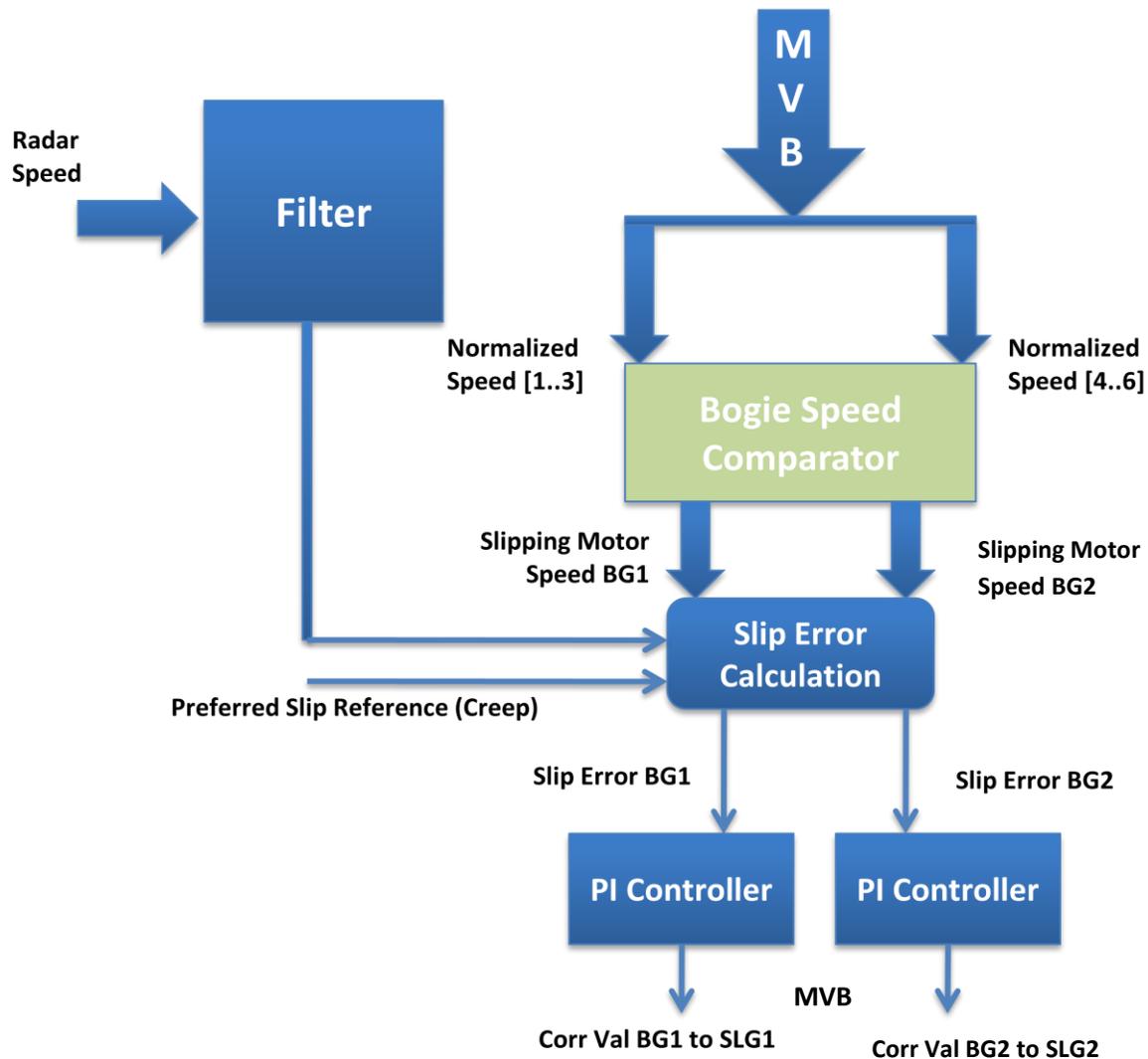
With an effective reference speed measurement from the Doppler radar, slip generated will effectively get corrected and the adhesion performance of the locomotive will get improved.

2.0 Location of Doppler radar and Adhesion Control System



The above diagram shows the location of the Doppler radar and the Adhesion Control system’s Controller unit. Doppler radar is mounted on the body of the loco at CAB-1 side, just above the cattle guard at an angle of 45 degree. The Adhesion control system’s Controller unit is mounted on the side wall of the loco in CAB-1 side between MR and HB1 panel.

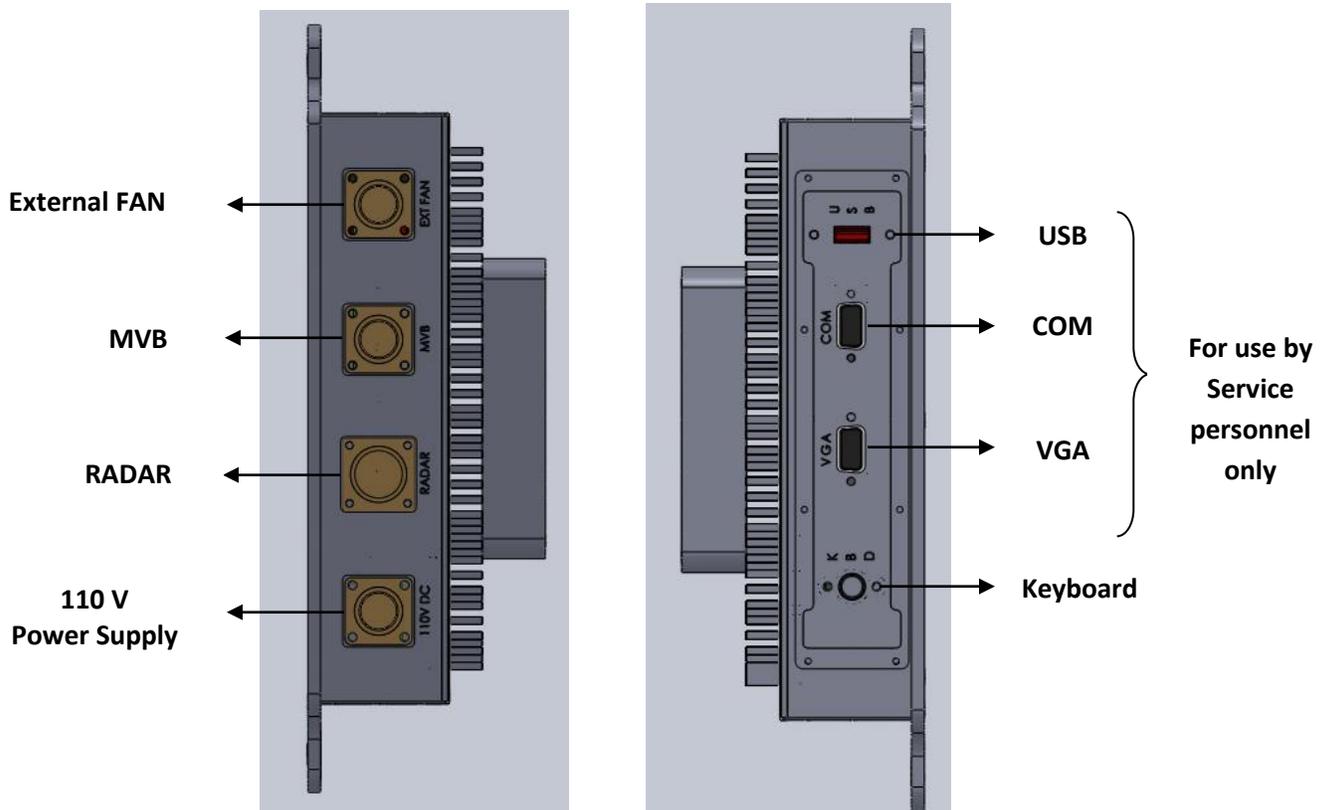
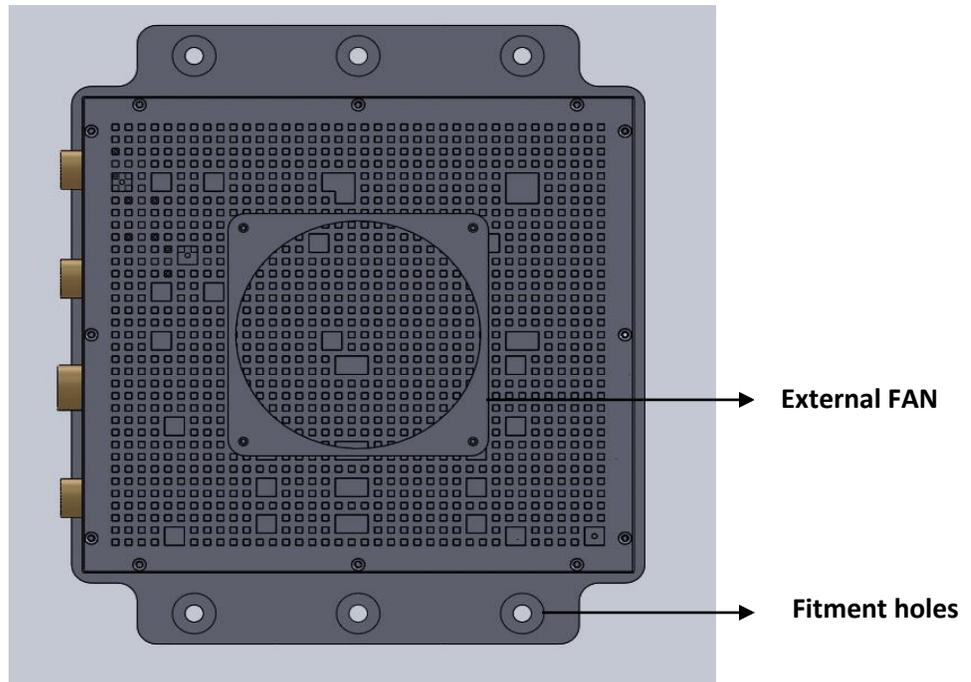
2.1 SLIP CALCULATION AND CORRECTION LOGIC:



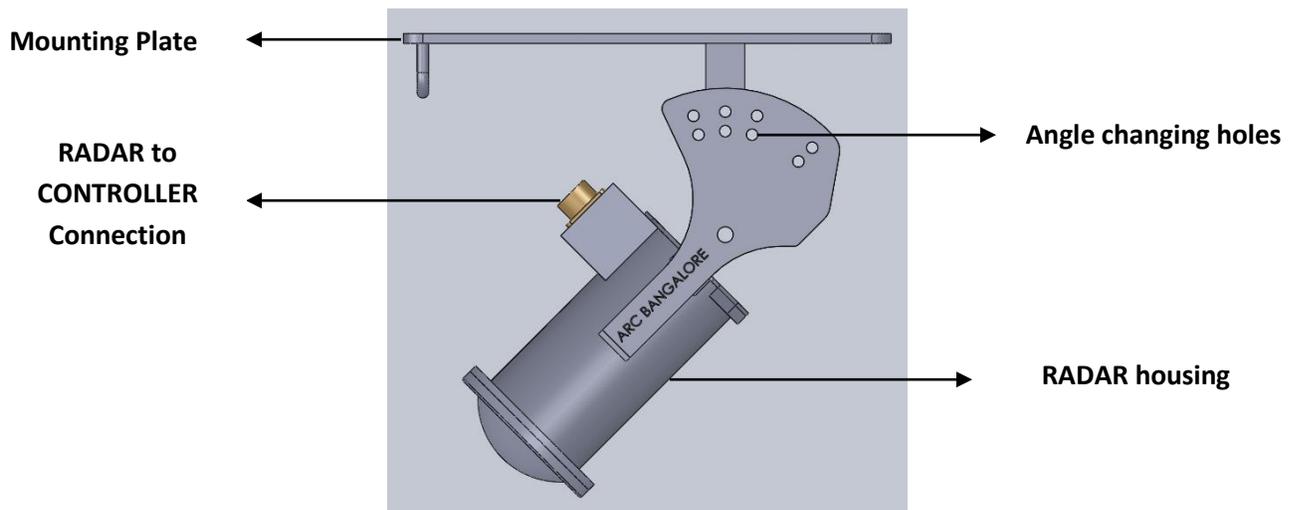
The Slip Calculation and Correction logic is shown in above block diagram. The Adhesion Control System reads Radar speed from Doppler radar mounted under the loco and all axle speeds from MVB. It considers the Radar speed as the reference ground speed for slip calculation. The radar speed is compared with all the axle speed to find out the **Slip error** (Difference between radar speed and axle speed). Then it generates the Correction value to reduce the slip and send the correction value to SLG where the correction is done by reducing the Tractive Effort (TE). The system does not reduce the TE if loco is already moving with applied braking effort (BE). The system will be disabled after 40Kmph and will not be active during regenerative braking.

3.0 ADHESION CONTROL SYSTEM – Mechanical Details

3.1 CONTROLLER UNIT



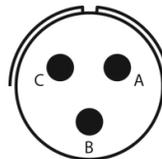
3.2 DOPPLER RADAR



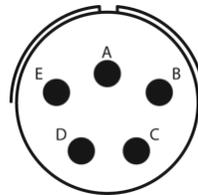
3.3 CONNECTOR DETAILS

3.3.1 CONNECTORS IN CONTROLLER UNIT

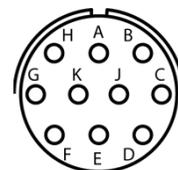
3.3.1.1 POWER SUPPLY (110 v) Connector



3.3.1.2 RADAR Connector

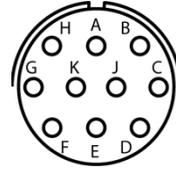


3.3.1.3 MVB Connector



3.3.2 CONNECTORS IN DOPPLER RADAR HOUSING

3.3.2.1 RADAR Connector



3.3.3 MVB DISTRIBUTION CARD

MVB connector to be put in
Any one channel of Distribution Card



ARC MVB Distribution
Card in 'V' slot of VCU1

4.0 CABLE INDEX

Cable INDEX for Doppler Radar Retro fitment locos only

Cable No./Loom No	No. of cable	Size	Connector	Pin	Connector	Pin
2810	01	1.50	127.26	02	XF22S-01	40
2810	01	1.50	XF22S-01	40	3 Pin female Circular coupler Cable no.	1 A
2050	01	2.50	XB22S-01	12	3 Pin female Circular coupler Cable no.	2 B
DRACS_PS/1	02	0.50	KPSC06f12-3s	03 Female	KPSC06f12-3s Adhesion Controller	03 Male
DRACS_RAD_CON/1	04	0.50	KPSC06F14-5s Adhesion Controller	05 Female	KPSC06F14-5s Adhesion Controller	05 Male
DRACS_RAD_CON/1	04	0.50	KPSE07F12-10S Other end	10 Male	Fixed to TM-1 SS Plate	-
DRACS_RAD_CON/2	04	0.50	KPSE07F12-10P	10 Female	TM-1 SS Plate	10 Male
DRACS_RAD_CON/2	04	0.50	KPSE07F12-10P	10 Female	Doppler Radar UF	10 Male
DRACS_MVB_CON/1	10	0.50	KPSE06F12-10s	10 Female	KPSE06F12-10s Adhesion Controller	10 Male
DRACS_MVB_CON/1	10	0.50	TRACHSTS15C121	15 Female	VCU-1 V-Slot	15 A

5.0 FAULT CONDITION

If Doppler radar Based Adhesion Controller system fails or if RADAR starts giving wrong values then the system will generate a Driver Diagnostics (DDS) message, “**FAULT IN RADAR SYSTEM**”. And the system will automatically switch to normal mode of slip correction (MICAS slip correction). If it’s a temporary fault then the system will become normal after POWER ON reset. If the fault is permanent the system will be isolated permanently.

To isolate RADAR system manually, switch off the MCB in the SB1 panel.

