भारतसरकार- रेल मंत्रालय Govt. of India – Ministry of Railways
भारतीय रेल सिगनल इंजीनियरी और दूरसंचार संस्थान
Indian Railways Institute of Signal Engineering and Telecommunications
तारनाका रोड, सिकंदराबादTarnaka Road, Secunderabad – 500017 (भारत)(INDIA)

IRISET/CoE/Kavach/Misc

Date: 26.12.2023

M/s Medha Servo Pvt. Ltd, 2-3-2/A, behind Mint Compound, Cherlapally, R. R. District, Hyderabad-500051	**M/s Kernex Microsystems(India) Ltd, 1/1 kancha imarat, Raviryal Village, Maheswaram Mandal, Hyderabad**	**M/s HBL Power Systems Ltd., No.8-2-601, Road No:10, Banjara Hills, Hyderabad-500034.**

Sub: Approval of arrangement of Kavach (IR-ATP) interfacing scheme with E-70 brake system in Three Phase Electric Locomotives -Reg.

Ref: (1) This office letter of even no. dt. 12.09.2023
(2) RDSO Letter no. EL/3.2.19/3-Phase/TCAS/E-70 dt. 24.12.2023

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With reference to the above subject, Electrical Directorate of RDSO has communicated the approval for the arrangement of Kavach (IR-ATP) interfacing scheme with E-70 brake system in Three Phase Electric locomotives vide letter dated 24.12.2023 cited under ref .2.

Hence, OEMs are requested to ensure the interfacing scheme as per the above mentioned scheme.

Encl: As above

26.12.23

(ललित के. मनसुखानी, Lalit K. Mansukhani),
Officer on Special Duty (OSD)
Centre of Excellence

C/- **For kind information please**
PED/S&T/DEV/RB, PED/SM/RB, PED/RD/RB, PED/S&T/RDSO, PED/RS/RDSO
PCSTEs/PCEEs ECR, ER, NCR, NR, SCR, WCR & WR
ED/Tele-II/RDSO/SC

For necessary action
GG Tronics India Pvt Ltd,
Plot 10, 3rd Phase,
6th Main, Peenya Industrial Area, Bengaluru – 560058

Quadrant Future Tek Limited,
Banur, Shambhu Road, Village Basma,
Dist Mohali, Punjab - 140417

2454243/2023/O/o PED/TRACTION/RDSO

भारत सरकार–रेल मंत्रालय
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सत्यमेव जयते

Government of India
Ministry of Railways
Research, Designs &
Standards Organization,
LUCKNOW-226011

No. EL/3.2.19/3-Phase/TCAS/E-70 Date: 24.12.2023

OSD Center of Excellence,
IRIEST, Tarnaka Road,
Secundrabad-500017

Sub: Approval of arrangement of KAVACH (IR-ATP) interfacing scheme with E-70 brake system in 3-Phase Electric locomotives.

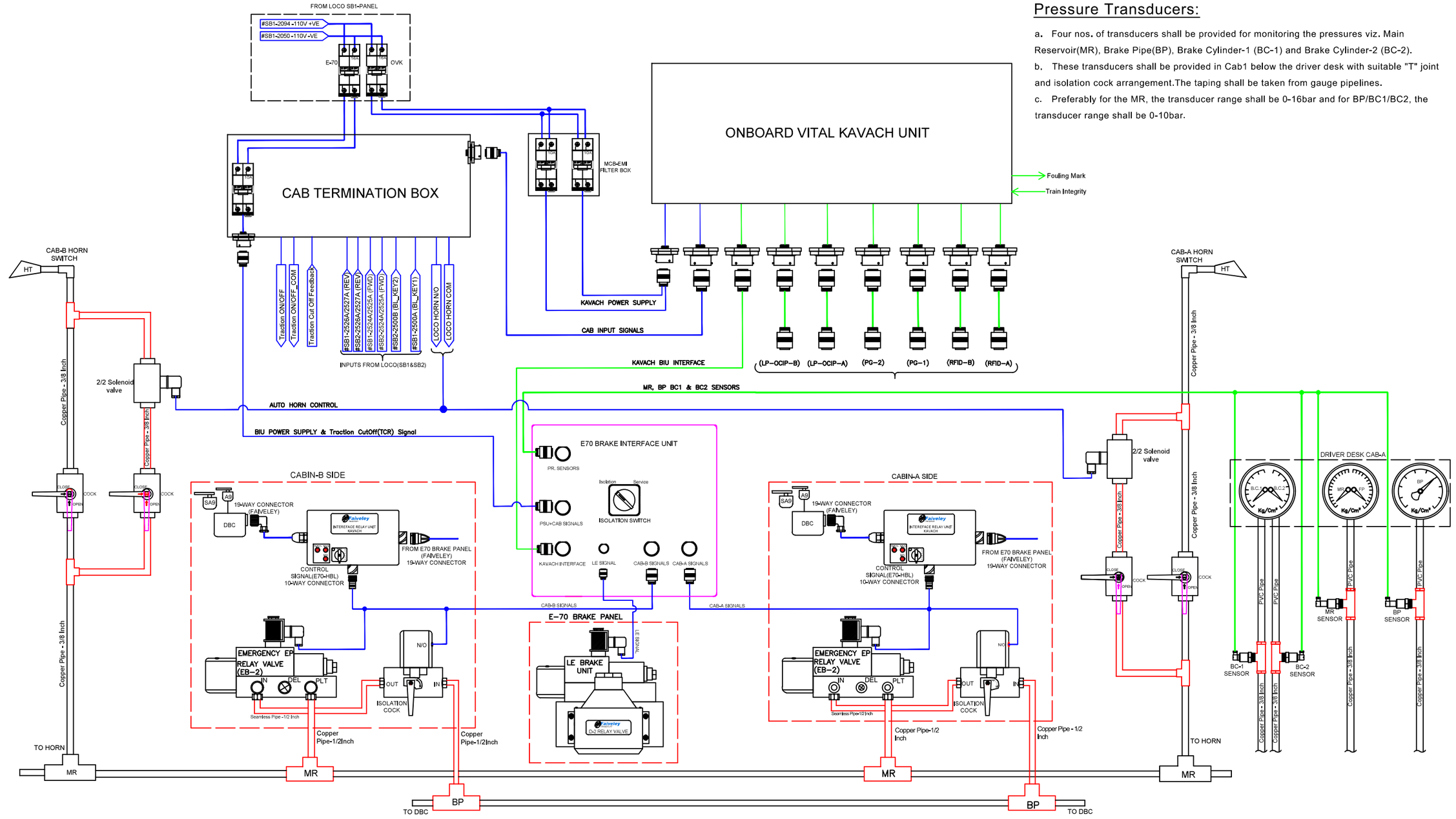
Ref: IRISET Letter no. IRISET/RS/RDSO dated 12.09.2023

1. CoE/IRISET vide reference above, has submitted the arrangement of KAVACH interfacing scheme with E-70 brake system in 3-Phase Electric locomotives and requested this directorate to examine and approve. The proposed interfacing scheme of KAVACH with E-70 brake system is signed by them & RDSO (S&T directorate).
2. The proposed Interfacing scheme of KAVACH with E-70 brake system has been examined and found generally in order. However, “it has been observed that whenever there is a braking operation initiated by KAVACH, Emergency Brake Pressure switch message will be recorded in 3-phase loco DDS irrespective of whether the Emergency brakes have been applied by or not”. Brake initiated by KAVACH in Emergency Brake/Service brake application can only be distinguished by comparing the VCU data with KAVACH logged data.
3. Considering above facts, the arrangement of KAVACH interfacing scheme with E-70 brake system in 3-Phase Electric locomotives is being approved, copy of same is attached.

   This issues with approval of competent authority.

(Rajesh Kumar)
for Director General Std./Elect.

Encl: As above



Pressure Transducers:

a. Four nos. of transducers shall be provided for monitoring the pressures viz. Main Reservoir(MR), Brake Pipe(BP), Brake Cylinder-1 (BC-1) and Brake Cylinder-2 (BC-2).

b. These transducers shall be provided in Cab1 below the driver desk with suitable "T" joint and isolation cock arrangement.The taping shall be taken from gauge pipelines.

c. Preferably for the MR, the transducer range shall be 0-16bar and for BP/BC1/BC2, the transducer range shall be 0-10bar.

Different Brake Levels for WAP–5, WAP–7 & WAG–9 in Light Engine and Formation modes are listed in following tables.

#	BRAKE LEVEL	LIGHT ENGINE BP Pressure Kg/Cm² (WAP–5,WAP–7,WAG–9)	LIGHT ENGINE BC Pressure Kg/Cm² (WAP–5)	LIGHT ENGINE BC Pressure Kg/Cm² (WAP–7,WAG–9)
1	LE (High)	Equal to pressure levels of NB(High), FSB (High), EB1(High), EB2(Low) as the case may be.	5.15±0.3	3.5±0.2

#	BRAKE LEVEL	FORMATION BP Pressure Kg/Cm² (WAP–5,WAP–7,WAG–9)	FORMATION BC Pressure Kg/Cm² (WAP–5)	FORMATION BC Pressure Kg/Cm² (WAP–7,WAG–9)
1	NB (High)	4.6±0.1	0.75±0.15	0.4±0.1
2	FSB (High)	3.35±0.2	5.15±0.3	2.5±0.1
3	EB1 (High)	<0.3	5.15±0.3	2.5±0.1
4	EB2 (Low)	<0.3	5.15±0.3	2.5±0.1

Note:
EB1 is the Emergency Brake command give by TPS to the E70 interface. EB2 is the Emergency Brake command given by TPS to an independent valve which is directly connected to the Brake pipe. When EB1 is high, EB2 shall be low and when EB1 is low, EB2 shall be high. (EB1 and EB2 signals are given simultaneously by TPS)

LEGENDS:
- KAVACH PNEUMATIC CONNECTIONS
- KAVACH ELECTRICAL CONNECTIONS
- 110V DC ELECTRICAL CONNECTIONS
- EP E70 BIU

OVK – Onboard Vital Kavach

Approved by:

T NAGARAJ (Digitally signed by T NAGARAJ Date: 2023.09.08 13:15:20 +05'30')	Lalit Kumar Mansukhani (Digitally signed by Lalit Kumar Mansukhani Date: 2023.09.11 16:03:32 +05'30')		MADHUP MOHAN SRIVASTAVA (Digitally signed by MADHUP MOHAN SRIVASTAVA)		PAVAN KUMAR (Digitally signed by PAVAN KUMAR Date: 2023.09.11 16:11:21 +05'30')
T NAGARAJ Dir/Elect/CoE/Kavach	Lalit K. Mansukhani OSD/CoE	RAJESH KUMAR Jt Dir/Elect	M M SRIVASTAVA Dir/Sig–IV/RDSO	Sanjay Kumar Tiwari ED/RS/RDSO	G Pavan Kumar ED/Tele–II/RDSO

ARRANGEMENT OF KAVACH (IR–ATP) INTERFACING WITH E70 BRAKE SYSTEM IN WAP–5,WAP–7 & WAG–9 LOCOMOTIVES		PAGE 1 OF 3
		SUPERSEDES
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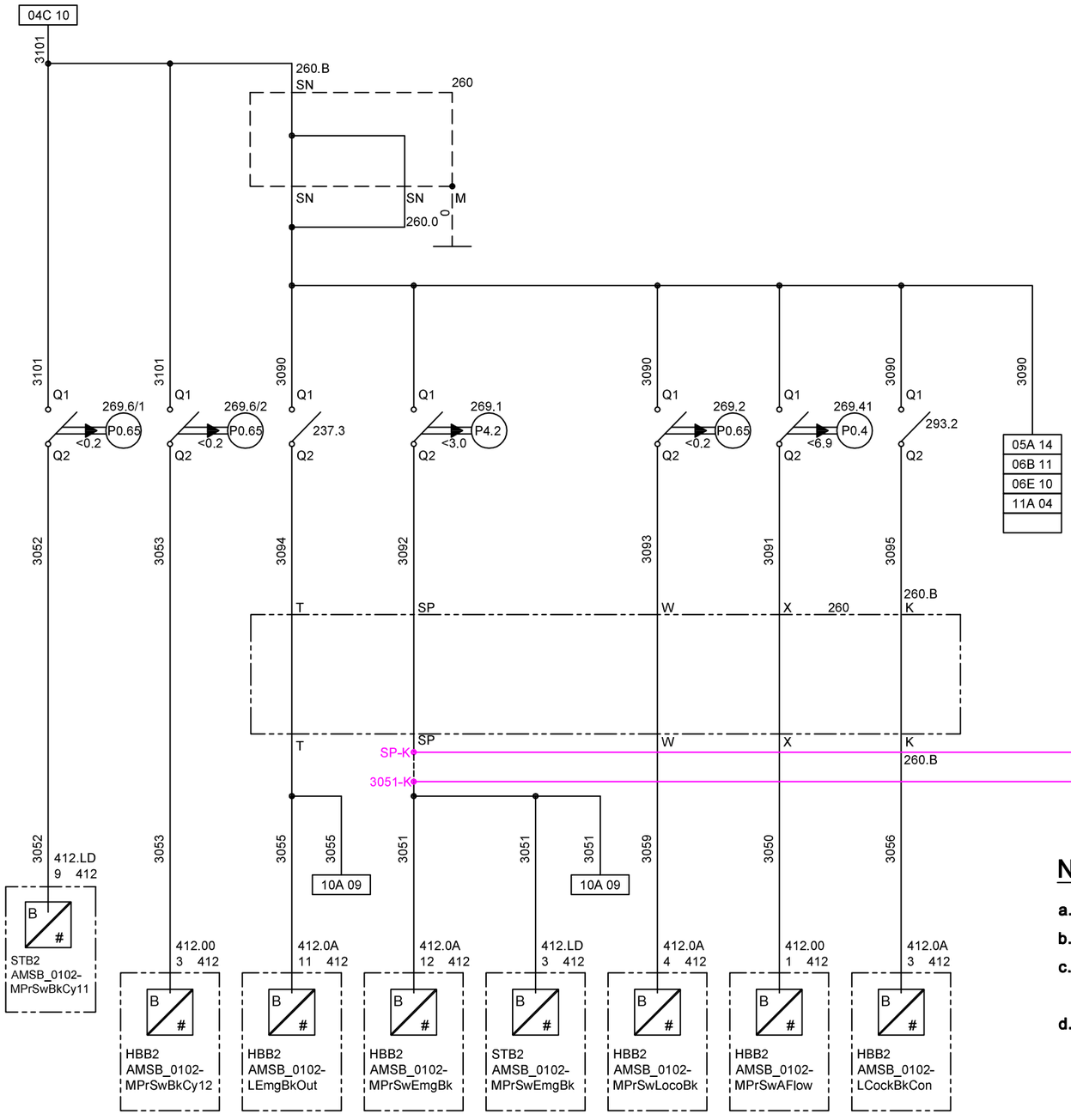

Note:-

a. Traction Cut off Relay (TCR) is a part of onboard Kavach.

b. TCR is normally kept energized by onboard Kavach when there is no brake command.

c. Whenever brake command is generated by onboard Kavach, the TCR is de-energized to open the "NO" interlock to perform traction cut off.

d. Whenever Kavach is isolated, the "NO interlock" of TCR shall be bypassed through Potential Free closed contact of "Kavach Isolation Switch".

Approved by:					
T NAGARAJ Digitally signed by T NAGARAJ Date: 2023.09.03 11:23:56 +05'30'	Lalit Kumar Mansukhani Digitally signed by Lalit Kumar Mansukhani Date: 2023.09.03 21:35:58 +05'30'		MADHUP MOHAN SRIVASTAVA Digitally signed by MADHUP MOHAN SRIVASTAVA		PAVAN KUMAR Digitally signed by PAVAN KUMAR Date: 2023.09.11 15:03:15 +05'30'
T NAGARAJ Dir/Elect/CoE/Kavach	Lalit K. Mansukhani OSD/CoE	RAJESH KUMAR Jt Dir/Elect	M M SRIVASTAVA Dir/Sig–IV/RDSO	Sanjay Kumar Tiwari ED/RS/RDSO	G Pavan Kumar ED/Tele–II/RDSO
ARRANGEMENT OF KAVACH (IR–ATP) INTERFACING WITH E70 BRAKE SYSTEM IN WAP–5,WAP–7 & WAG–9 LOCOMOTIVES					PAGE 2 OF 3
					SUPERSEDES
			R.D.S.O S&T . DTE	SDO/S&T/KAVACH/010	SUPERSEDED BY

Annexure for Onboard Kavach Interfacing Scheme:

1.Inputs from Existing Wiring :

a.Input Power Supply: 2094(110V +ve) and 2050 (110V –ve) for input power supply from 4sq.mm cables and routed through two MCBs (one for Brake System and One for Onboard Kavach) each 10A.

b.Six inputs viz. CAB1 Active (2500A), CAB1 Forward (2524A), CAB1 Reverse (2526A), CAB2 Active (2500B), CAB2 Forward (2524B), CAB2 Reverse (2526B) are taken and given as inputs to Kavach System through a diode. Any shorting/merging of cables in Kavach system shall not lead to fault condition on locomotive.

c.Traction cut off feature has been implemented using cable no. 3051. Whenever Kavach applies brake, the traction disabled by opening of cable no. 3051 through a potential free interlock from onboard Kavach system. To ensure the traction has been cut off, after opening the 3051 interlock, the availability of voltage at 3051 is monitored as a feedback to Kavach System.

2.Interfacing with Brake System:

a.In each CAB, one Interface relay unit (Faiveley) is provided which is used for executing the brake activation through A9 interface. The interface relay unit receives 6 nos. of cables viz. NB command, FSB Command, EB command, GND, IRU bypass input and IRU bypass feedback. These cables are output cables from Onboard Kavach Unit. These cables are routed through a 10pin connector to each CAB.

b.To execute the commands through SA9 interface, a light engine valve has been provided in the E-70 panel (mounted on top of D2 Direct Relay Valve). The Onboard Kavach provides LE signal input through 2nos. of cables i.e. LE Valve (+ve) and LE Valve (GND) These cables are output cables form Onboard Kavach Unit.

c. Each CAB is provided with one Vital EB (Emergency EP Relay) Valve. This valve has three ports viz. IN as BP, PLT as MR and Exhaust. When Pilot is not available, then BP is connected to exhaust. The operation of pilot pressure is controlled through EP coil and two cables are provided from Onboard Kavach unit to each CAB for operation of the EP Coil. These cables are EP coil +ve and EP Coil –ve. Further the BP pipe can be isolated from the Vital EB Valve by closing a bypass cock. Further the status of opening/closing of bypass cock are monitored through a micro switch. Two cables are laid for Vital EB switch to monitor the status. The micro switch output status shall be “HIGH” when the bypass cock is Open. This arrangement is provided in both CABs.

d.To detect the working of brake interface unit and to get the feedback for the Kavach initiated brake commands, MR/BP/BC-1/BC-2 transducers are provided and tapping for the pressures has been taken from CAB-1 pneumatic gauges as per the arrangement shown in the drawing.

3.Interfacing with Horn :

a.As per the Kavach specification No. RDSO/SPN/196/2020 version 4.0 Functional Requirement Specification clause no. 32, auto whistling feature on approach of LC gates has been incorporated.

b.To meet the requirement as per specification, HT horn of each CAB has been integrated with Kavach. For this purpose, existing MR pipeline going to HT horn has been tapped by inserting a ‘T’ arrangement through an isolation cock. A 2/2 solenoid valve has been provided whose input is MR and output is connected to HT horn inlet pressure using a ‘T’ arrangement. 2nos. of cables viz. horn coil +ve and –ve are drawn from onboard Kavach unit to feed the 2/2 solenoid valve in each CAB to enable the auto whistling feature.

Precautions:

1.All OEMs to ensure that any wiring fault either due to earth fault or opening of cable shall not result in unsafe situation due to wrong detection of status of Vital EB bypass cock.

2.OEMs shall also ensure the execution of Kavach generated brake commands and take appropriate action based on the feedback obtained through transducers.

3.OEMs shall also monitor the status of IRU bypass switch of each IRU and to ensure that any wiring fault either due to earth fault or opening of cable shall not result in unsafe situation due to wrong detection of status of IRU bypass switch.

4.The feedback status of Vital EB Bypass Cock and IRU bypass switch shall be maintained as “HIGH”(Onboard Kavach should get feedback voltage when cock is “open” and IRU bypass switch is “Normal”) if only one type of interlock is used.

Future Use:

“Fouling Mark” will be provided by onboard Kavach as input to EOTT and EOTT will provide “Train Integrity” as input to onboard Kavach. The actual scheme of interfacing of these variables is yet to be decided.

NOTE:

1. In some makes Cab Termination Box & E-70 Brake Interface unit are integral parts of Onboard Kavach unit.
2. The preferable range of transducers is indicated for guidance only.

Approved by:

T NAGARAJ (Digitally signed by T NAGARAJ Date: 2023.09.03 11:24:31 +05'30')	Lalit Kumar Mansukhani (Digitally signed by Lalit Kumar Mansukhani Date: 2023.09.03 21:34:33 +05'30')		MADHUP MOHAN SRIVASTAVA (Digitally signed by MADHUP MOHAN SRIVASTAVA)		PAVAN KUMAR (Digitally signed by PAVAN KUMAR Date: 2023.09.11 15:02:43 +05'30')
T NAGARAJ Dir/Elect/CoE/Kavach	Lalit K. Mansukhani OSD/CoE	RAJESH KUMAR Jt Dir/Elect	M M SRIVASTAVA Dir/Sig–IV/RDSO	Sanjay Kumar Tiwari ED/RS/RDSO	G Pavan Kumar ED/Tele–II/RDSO
ARRANGEMENT OF KAVACH (IR–ATP) INTERFACING WITH E70 BRAKE SYSTEM IN WAP–5,WAP–7 & WAG–9 LOCOMOTIVES					PAGE 3 OF 3
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