

I/96651/2026

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File No: RDSO-SIG0GEN (GEN)/3/2026

Dated: As Signed

The PCSTEs
All zonal railways
Indian Railways
(Through E-mail)

Sub: Revised Compendium of Axle Counter TANs – STS/E/TAN/7010 Ver. 2.0 regarding guidelines and precautions for installation of Digital Axle Counters.

Ref.: Compendium of Axle Counter TANs – STS/E/TAN/7010 Ver. 1.0 dated 20.11.2024.

A consolidated Technical Advisory Note(TAN) for DACs was issued by this office vide reference above. Subsequent to it, based on feedback, suggestions, and field experiences received from Zonal Railways this TAN for DACs has been revised to incorporate additional guidelines and precautions aimed at enhancing the performance, reliability, and maintainability of Digital Axle Counter installations.

Accordingly, the revised Compendium of Axle Counter TANs, STS/E/TAN/7010 Ver. 2.0 dated 06.06.2026, is enclosed herewith for information, dissemination to concerned field units, and necessary compliance.

Any feedback/suggestion in this regard will be very helpful in further improving it.

Encl.: STS/E/TAN/7010 Ver. 2.0 dated 06.06.2026.

Digitally Signed by
Triambak Tiwari
Date: 06.06.2026 16:41:17
(Triambak Tiwari)
Reason: Approved
Director, Signal II

Copy to:

1. PED/SM, ED/Signal and ED/SD, Railway board, Rail Bhawan, New Delhi- for kind information please.
2. All RDSO approved vendors of Digital Axle Counters-For kind information and necessary action please.

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Amendment history:

S.N.	Date of amendment	No. of Page	Version	Reasons for amendment
1.	20.11.2024	08 pages	1.0	First Issue
2.	04.06.2026	09 Pages	2.0	<p>Following Clauses are modified /removed/updated</p> <p>(i) A-Indoor Installations A-5-Typographical error is corrected.</p> <p>(ii) B-Outdoor Installation B-6, B-7 & B-9 are modified.</p> <p>(iii) C-wiring and cabling Practices C-10, C-11, C-14, C-15, C-19, C-22, C24 are modified.</p> <p>(iv) D-Power Supply Installations D-26, D-30 are modified.</p> <p>(v) E-Earthing and Surge Protection Devices E-31, E-34, E-37, E-38 E-40, E-41 E-42, E-43, E-44 are modified.</p> <p>(vi) F-Precautions during maintenance of DACs F-47, F-49, F-54 is added.</p> <p>(vii) G-Dual Detection using DACs and HASSDACs G-55, G-56, G-59- (Typographical error), G-63, G-65 are modified.</p> <p>(viii) H-Communication H-68 is removed.</p> <p>(ix) I-General Items I-70, I-71, I-72, I-75 are modified. I-73, I-74 are removed.</p>

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A compilation of instructions given in different advisories for digital axle counter systems is being published.

SI	Description
A.	Indoor Installations
1.	For MSDAC, Evaluators should be kept in dust free and ventilated rooms.
2.	For IBS/ABS installation using MSDAC, line wise electronics should be planned. In which, the requirement is that there shall be no single point of failure that can affect both the lines at the same time. MSDAC can provide multiple track section monitoring by single evaluator but it shall be ensured that one evaluator failure does not affect signals on both UP & Down lines. This primarily leads to provision of line wise evaluators with separate power supply modules.
3.	Line side portable cabins/relay huts etc. shall have sufficient space for keeping circuit books, manuals, and diagnostic PC on a table of adequate size and also for movement of staff during routine maintenance and fault finding.
4.	Battery shall not be installed in the same space where electronic systems are installed. Battery room shall be separate and sufficiently ventilated.
5.	The line side portable cabins/relay huts etc. shall be preferably located near Level crossings for quick access otherwise a suitable access route shall be identified and approved by open line.
B	Outdoor Installations
6.	Continuity of Traction bonds in the vicinity of the sensors (for minimum 50meters on the both sides of axle sensor) should be ensured to keep earth potential rise near DP minimum.
7.	Axle sensors should be installed minimum 30 meters away from the neutral section.
8.	Sensors should be sufficiently far away from rail joints.
9.	As far as possible, TX/ RX coils need to be installed on non-cess rails. This will prevent failures due to movement of rail dolly etc.(Applicable for single axle counter territories)
C	Wiring and Cabling Practices
10.	Avoid bunching of power and DAC cables in relay room. DAC circuits in location shall also not be bunched in parallel along with relay/power circuits. Relay circuits are known to generate switching transients that can couple enough energy in parallel circuits nearby and interfere with low power DAC data circuits.
11.	For indoor wiring, used for data communication to a longer distance (e.g. wiring between different rooms such as OFC room and relay room etc.), only shielded cable shall be used. Shielded cable should be earthed with less than 1 ohm earth terminal.
12.	Wiring and cabling shall not be bent abruptly and shall be given sufficient bending radius to ensure that conductors inside the cabling/wiring are not damaged due to bending. Wiring shall be properly supported by channels troughing, cable clamps and other means to ensure that connections are not under pressure due to wire hang. Wiring and cabling shall not be supported at any sharp-edged object to ensure that conductors are not damaged during their installation/ maintenance.
13.	Relay circuits shall preferably be not taken in same cable as DAC circuits. In unavoidable circumstances relay circuits shall be in furthest quad (spatially) from the one containing DAC circuits.
14.	Quad cable shall be terminated in cage clamp type terminals that provide solid 360-degree surface connection and sufficient pressure on the wire to make a good electrical contact. Any unused/spare conductor of the quad cable shall be terminated and tightened properly at CTR, Locations and in between junction boxes.

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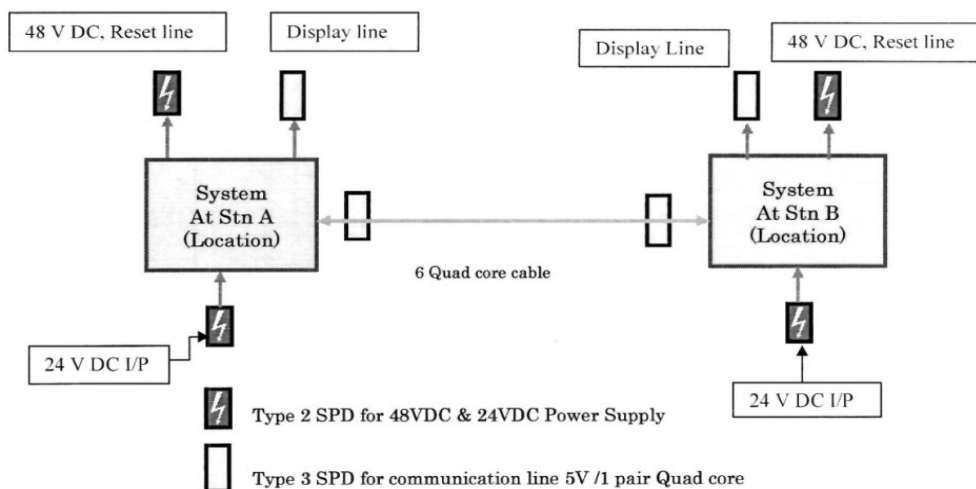
15.	Cables shall be terminated at the bottom portion of location box keeping equipment and their wiring at higher level inside location box. This will help in keeping wiring of different types segregated from each other. All earth wires and surge protection devices also shall be kept at the lower levels for the same reasons.
16.	Twisted pairs are required to avoid mutual interference between low level data signals. Even short lengths of non- twisting (few inches) can couple enough noise to interfere with low voltage DAC communication signals.
17.	Quad cable twisting shall be ensured during termination so that minimum one twist per inch is maintained till the last inch into terminations.
18.	Any wiring from quad cable terminations to equipment shall be done using twisted singles of indoor signalling cable (1 mm square) or any other approved indoor twisted pair cable.
19.	Signalling cable or any other untwisted cable pair shall never be used in DAC communication (Data signal) circuits to avoid intermittent type of failures.
20.	Requirement is that parallel circuits shall be as far spaced, spatially, as possible. Long parallel circuits shall be avoided in the same quad. So, one long and one short circuit can be accommodated in same quad but not both long circuits.
21.	DAC circuits in BPAC of up and down lines in double line sections shall be in separate quads and kept one/two quad distance away from each other to avoid mutual interference in long parallel circuits.
22.	Any other parallel wiring (relay circuits/power circuits/earthing wires etc.) shall cross DAC circuits (containing data signal) at perpendicular and any unavoidable parallel portion shall be kept at minimum 150mm (lateral distance) away from the wiring for DAC circuits.
23.	Cabling, as far possible, shall be planned line wise in such a way that single cable failure does not affect the signalling on other line and there are sufficient spares for concerned line.
24.	Periodic checking of Quad cable parameters including IR, Loop Resistance, attenuation and cross talk. (i) Insulation Resistance should be equal to or better than 10M ohms, (ii) Loop resistance should not exceed 56 ohms/km(with temperature correction as specified in quad cable maintenance guidelines), (iii) Attenuation loss should not be greater than 30dB for SSDAC/HASSDAC and 20dB for MSDAC, (iv) FEXT /NEXT should be better than 55dB (measured at test tone 150 KHz).
D	Power Supply Installations
25.	Power supply ripples shall be ensured to be less than 50 mv peak to peak as per IPS specifications. This should be part of routine maintenance measurements and records.
26.	Separate power supply/modules for DAC to be used. All the power supplies shall be monitored from analog inputs of the data logger.
27.	To realise full advantage of line wise electronics provisions, evaluators for each line shall be supplied from independent power supply modules.
28.	Power supply for evaluator shall not be shared for anything else like cabinet fan or track section relays etc.
29.	Power supply module feeding external circuits shall never be used for feeding indoor electronic systems like evaluators that require separate isolated supply.
30.	For taking full advantage of dual detection systems/HASSDACs two pairs of separate power conductors shall be provided. Each pair of such power conductor shall be connected to separate sets of DC-DC converters in the IPS and power supply cards of dual detection system/HASSDAC.
E	Earthing and Surge Protection Devices

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31.	Availability and intactness of Class B & C SPDs, which are being supplied along with IPS in a separate wall mountable box should be checked and ensured. The size of cable from these SPDs to earth bus bar shall be 16 sq. mm copper cable and the size of cable from equipment to earth bus bar should be minimum 10 sq. mm copper cable.
32.	The equi-potential bonding of indoor signalling equipment including IPS racks should be provided in the power room and connected to low resistance earth of less than 1 Ohm
33.	Earth connections shall be kept as short and as straight as possible because any loop or turns can create inductive elements that impede quick discharge of transients and surges to ground. The length of cables from SPDs to earth bus bar and from equipment to earth bus bar should be shortest possible without any bends Loops should not be present.
34.	Type-II/Type-III SPDs used in DAC systems should be earthed using multistrand copper cable of cross-sectional area not less than 4 sq. mm.
35.	All connections from equipment or SPD to earth bus bar shall be exothermic welded or soldered.
36.	Suitable Class-C SPDs should be provided in the power line, communication line and reset line for surge protection in DACs. In this way, it has to be ensured that wherever power cables/data lines go out of location/relay room, proper SPDs need to be provided at both ends.
37.	In quad cable, the armour, screen and inner sheath continuity should be maintained while jointing it. Screening of quad cable is effective only when sufficient induced current can flow in the screen thereby cancelling/reducing the induction from 25KV AC for the cable conductors. For adequate induced current to flow in screen, it is necessary that good earth connections are provided for cable screen, armour and inner sheath (3- layer earthing). Combined earth for armour, screen and inner sheath (3- layer earthing) at intermediate locations shall have earth value less than 1 Ohm.
38.	Low resistance earth of value less than 1 Ohm-shall be provided in the location boxes where field unit of Digital Axle Counter is provided.
39.	All equipment, cables in the location box need to be connected firmly to the earth bar inside location. Periodical checking of earth bus bar continuity and earth values should be undertaken and recorded.
40.	Screen of axle detector/sensor cables shall be properly earthed at location end.
41.	In DACs high quality, high speed & self-diagnosing/indicative type SPDs with potential free contacts should be used. Monitoring of SPDs through datalogger duly wiring the potential free contacts shall be ensured. SPDs & their wiring — short and straight wire with low inductance away from other wiring of electronics, SPD of proper quality needs to be ensured. OEM shall select appropriate rating of SPDs for use in quad cable considering effect of induced voltage in it.
42.	Intactness and availability of SPDs in DACs should be recorded in maintenance logbooks. To ensure their availability in the system, their health should be monitored /checked periodically, specially before monsoon, after every heavy rain/lightning, storm and during maintenance/inspection. In case of failure or deterioration in performance, same should be replaced.
43.	Record of SPDs with make and model details should be recorded in PCCL.

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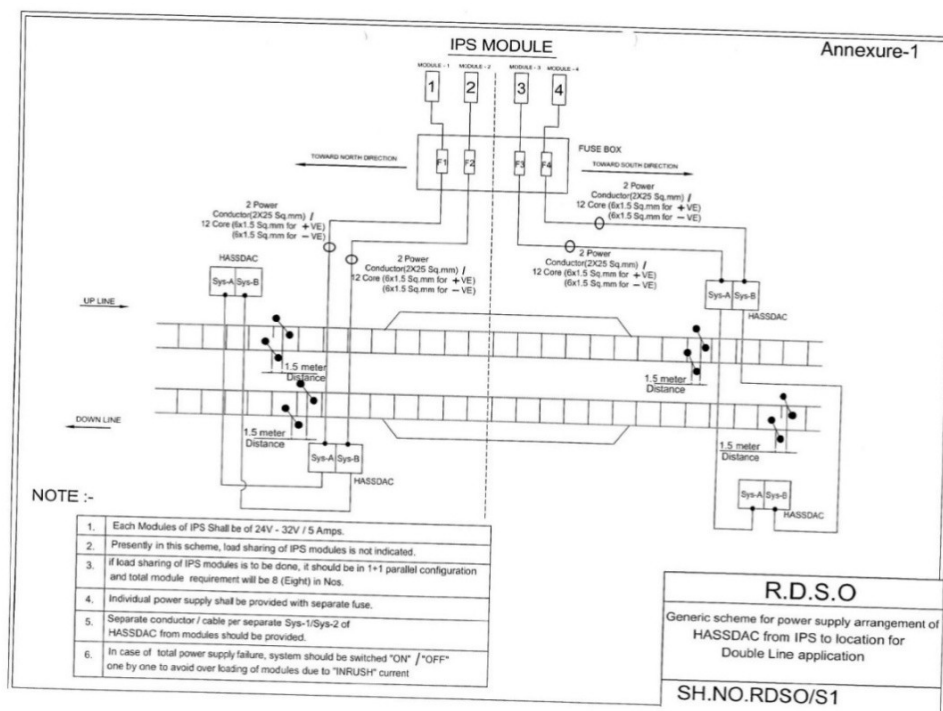
44. For surge protection arrangement in HASSDAC a generic scheme is shown below:



The SPDs as indicated above shall have properties mentioned in point 41 above.

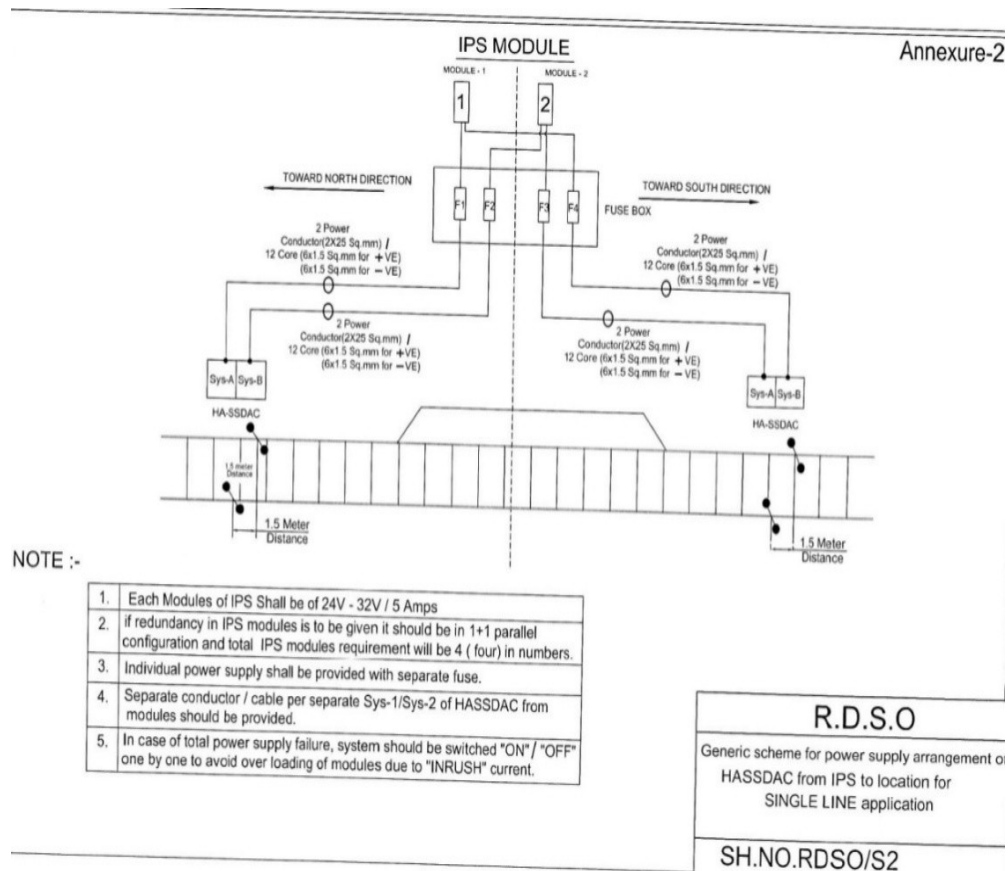
45. Earthing & Bonding arrangement to be ensured as per RDSO/SPN/197 Ver. 1.0 or latest.

46. Generic scheme for power supply arrangement-
(i) Use of HASSDAC for double line application –



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(ii) Use of HASSDAC for single line application-



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F	Precautions during maintenance of DACs
47.	Maintenance activity shall be done with utmost care and as per technical manuals of OEMs related to this subject. As a general rule, any maintenance activities in track device area, like, ballast packing & rail changing etc., that require disconnection of track devices and adjustments of axle counter parameters shall not be done in working system. If so required, maintenance staff shall take proper disconnection, duly de-energizing (powering off) the related sections of SSDAC/HASSDAC/MSDAC from CT rack/disconnection terminals before starting indoor/outdoor maintenance activities.
48.	Once work is completed the section should be connected/ energized following all precautions related to resetting, checking of parameters as stipulated and physical clearance of track section before reconnection.
49.	<p>Routine Maintenance Activities like measurement of parameters, cleaning etc. which does not interfere with working of system, may be carried without disconnection</p> <p>Specific Checks on Track Device Periodic preventive checks by maintenance staff to ensure that, (i) Properly fitted at site with fixing nuts/bolts are properly tight and intact (ii) Connections of track device cables are proper. (iii) Protective deflector plates are available and tightly placed at suitable distance. Any damage/irregularity noticed shall be attended and rectified. Fixing Nuts/Bolts shall be used as recommended by OEM.</p>
50.	<p>Handling of Track Devices: 1 Wheel sensors / Track devices are the most sensitive element in DAC technology and these needs to be handled with utmost care. OEM instructions for removing, installing and adjusting shall always be adhered to. Any attempt to experiment with wheel sensors on an operational system can lead to unforeseen hazards. If there are any doubts, railways can always raise those to RDSO, in turn required testing and checks will be done and a mitigation for those doubts will be undertaken in RDSO without jeopardizing the working system on operational railway.</p>
51.	<p>Handling of Track Devices: 2 All Wheel sensor / Track devices installed so far on IR, work on principal of electromagnetic flux linking between transmitter and receiver coils. Electronics connected to these track devices keeps monitoring the track devices continuously for the changes in current/voltage induced in receiver coils due to change in flux linkage between transmitter and receiver coils. When a ferromagnetic metallic item is brought near to the track device, it influences the flux linking between the transmitter and receiver coils to a certain level and if this change is less than the set threshold level, then electronics ignores that change. This is how a trolley is, generally, suppressed, as the change in induced receiver voltage is less than set threshold for electronics to process that signal for wheel detection.</p>
52.	<p>Handling of Track Devices: 3 If the change in receiver voltage is beyond the set threshold level, then associated electronics starts processing that signal for detecting and counting train wheels. Track devices detect the train wheel based on a specific pattern of flux changes in receiver coil. Any Receiver voltage change beyond the set threshold but not followed by specific wheel detection pattern will lead to the section going into occupancy as a failsafe response.</p>

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53.	<p>Handling of Track Devices: 4</p> <p>If any attempt is made to displace the track device components in a manner that flux linkage between transmitter and receiver coils does not result in threshold being crossed then it may lead to a situation where track device is no more installed in the manner specified by OEM. Such attempt may then create unwanted scenario of track section neither going to occupied condition nor the track device being able to count a train wheel.</p> <p>It is again reiterated that any such concern related to track device displacement shall be discussed and analyzed in lab environment and not in operational field conditions where it can impact signaling system in an undesirable manner.</p>
54.	<p>Handling of Track Devices: 5</p> <p>Axle sensor cables come in 3 lengths- 5 meters, 10 meters and 15 meters. While ordering, suitable length as per site condition must be selected. Any excess of axle sensor cable should be kept in mushroom/location box with care and excess cable coil should not be buried in earth.</p>
G	Dual Detection using DACs and HASSDACs
55.	Track devices for both the DAC systems shall be provided on separate rails with staggering of minimum 1.5 meters and with minimum diagonal distance of 2 meters. Suitable maximum distance between them, to simultaneous failures of both the systems, due to 'to and fro movement' of the train stopping on the sensor, may be worked out as per site requirement.
56.	In dual system and HASSDAC, two DAC systems work in parallel. Health of individual systems to be monitored through Data logger and exception reports/ alarms to be generated for predictive maintenance. Data logger logic should be designed in such a way that one count for one failure of individual system is counted and unsuccessful reset attempts should not be counted as individual failures inflating failure numbers.
57.	For HASSDAC, the status of LR (logic relay)/RR relay (Reset relay) shall be connected in relay room using 2 cores of Signalling cable from location to relay room.
58.	For M/s CEL HASSDAC, the information of LR/RR relay is available at pin 15, 16 of VR-Box. Normally there is no continuity between these two pins. When there is a failure in any of the system, pin 15 and 16 shorts. This information shall be provided to data logger and exception report/alarm needs to be generated when shorting continues for more than 10 seconds (10 second exception is compulsory to avoid false alarm).
59.	For M/s GG Tronics HASSDAC, repeater relays of the vital relays of each individual system are available in relay room also. Pick UP contacts should be used in data logger to monitor the status of individual systems and to generate exception report/alarm.
60.	Two set of independent cables shall be provided between locations to station for individual systems.
61.	Diversity has to be built right from the stage of power supply and the connecting cables and the method of train sensing and train detection.
62.	Wherever Axle Counters have been used as one of the Train Detection Systems, the resetting shall invariably be activated automatically by the other train Detection Device. Resetting of Axle Counters shall always be in the preparatory mode.
63.	Each of the two train detection devices used in dual detection shall be separately monitored by the data loggers and exception reports/alarms be transmitted to maintenance team & signal control, in case of mismatch/failure of devices. Messages received about mismatch/failure of the devices should be promptly attended and prolong single system failures should be avoided.
64.	During failure of any one device of Dual Detection, train shall be dealt on proper signal. Failed device shall be attended & rectified, where required, only under proper disconnection taken

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	during lean period of traffic.
65.	In case of failure of both the devices, trains shall be dealt as per provisions of extant station working rules. Rectification and restoration work should be done after receipt of failure memo/under proper disconnection as required as per extant practice.
66.	Dual Train Detection Devices should be checked and inspected regularly as per the stipulated periodicity of maintenance and inspection.
H	Communication
67.	Redundancy in media can be planned where communication failures are high. Media changeover arrangement/ switch should be provided for this.
68.	Both the systems of HASSDAC systems shall be provided with media diversity for reliability i.e. one system on dark optical fibre or dedicated EI channel (point to point) and the other system on 6 quad cable
I	General Items
69.	OEMs have been advised to give on-site training to staff as per requirement of Railway. Before commissioning of a system at a station sufficient number of railway staff should be trained about the system and a certificate in this regard should be issued by DAC OEM staff responsible for training at the site.
70.	Implementation of effective installation and commissioning procedures as per PCCL should be ensured. All columns of the PCCL should be filled with proper values in it, avoiding general terms such as 'OK' etc and only then signed. After commissioning OEM's certificate in this record should be taken and kept in records.
71.	Association of OEM during pre-commissioning check to be ensured. OEM's Personnel signing the PCCL should be different from personnel deputed for installation so that additional check is enforced.
72.	Methodology for calculation of FRPCPY of different types of DACs (MSDAC, HASSDAC and SSDAC) is prescribed vide the Railway Board letter no. 2022/Sig/19-FRPCPY/12 dated-15.07.2022, same should be followed. An OEM wise FRPCPY record should be maintained for assessing the performance of different OEMs.
73.	Latest version of this TAN may be found at IR's intranet, at following address- http://10.100.2.19/01_english/signal/policy/DAC/technical_advisory_note.html