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Date: As signed.

PCMEs & CRSEs (Freight)
All Zonal Railways

Sub: Revised "Schedule of Standard Examination for 2-Coach SPART / SPARMV, 3-Coach SPART & 3-Coach HS SPART, Doc. no. MP-MISC-147 (Rev-01) March-2024".

Ref: Railway Board's letter no. 2022/M(M&P)/175/3/A/T/CRMG dtd 30.11.2022.

As directed by Railway Board vide their letter under reference, the existing RDSO's Schedule of Standard Examination for SPART/SPARMV (Doc. no. MP.MISC-147 (Rev-00) May-2004) has been reviewed and revised by incorporating the comments / suggestions of Zonal Railways and concerned groups / Dte. of RDSO. The revised ***"Schedule of Standard Examination for 2-Coach SPART / SPARMV, 3-Coach SPART & 3-Coach HS SPART no. MP-MISC-147 (Rev-01) Mar-2024",*** is **attached** herewith for your kind information and necessary action please.

The subject schedule has been uploaded on RDSO's website and can be accessed through following path:
https://rdso.indianrailways.gov.in > Specifications/Drawings > Motive Power > Schedule of Standard Examination for 2-Coach SPART / SPARMV, 3-Coach SPART & 3-Coach HS SPART, Doc. no. MP-MISC-147 (Rev-01) March-2024.

Singh 08/3/24

DA: Nil.

(Neelesh Singh)
Director / Motive Power
for Director General (MP)

Copy to:

i) CDE /Mech., ICF, Chennai
ii) DME/P-I, Railway Board, New Delhi
iii) M/s Cummins India Limited, Cummins India Office Campus, Tower A, 2 Floor, Survey no.21, Balewadi, Pune 411 045
iv) M/s SAN Engineering & Locomotive Co. Ltd., Post Box No. 4802, Whitefield Road, Mahadevapura Post, Bangalore – 560 048
v) M/s Kirloskar Pneumatic Company Limited, Plot no.-1 Hadapsar Industrial Estate, Pune, Maharashtra – 411013

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भारत सरकार
रेल मंत्रालय
GOVERNMENT OF INDIA
MINISTRY OF RAILWAYS

Schedule of Standard Examination of 2-Coach SPART/SPARMV, 3-Coach SPART (Converted) & 3-Coach HS SPART

2-डिब्बों की स्वचालित दुर्घटना राहत यान/ स्वचालित दुर्घटना राहत चिकित्सा यान,
3-डिब्बों की स्वचालित दुर्घटना राहत यान (रूपांतरित) एवं
3-डिब्बों की उच्च गति स्वचालित दुर्घटना राहत यान

MP-MISC. - 147 (REV. – 01)
March – 2024

Issued by
अनुसंधान अभिकल्प एवं मानक संगठन,
मानक नगर, लखनऊ - **226 011**
RESEARCH DESIGNS AND STANDARDS ORGANISATION
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C O N T E N T S

SCHEDULE OF STANDARD EXAMINATION OF 2-COACH SPART/SPARMV, 3-COACH SPART (CONVERTED) & 3-COACH HS SPART

General Description

1. **Introduction:**

1.1 Initially, Indian Railways had loco hauled ARTs and ARMVs to attend the unfortunate accidents / derailments. In case of any accident / derailment, arranging Diesel Locomotives required for hauling ART/ARMV to accident site was a challenging task and sometimes it consumed lot of time. As the initial time of accident is very precious, the medical aid and rescue tools must reach to accident site as soon as possible to minimise the loss of human lives and early restoration of traffic. Therefore, the need was felt to introduce new design of ARTs and ARMVs which would have its own powerpack.

1.2 2-Coach SPART (manufactured by RCF) & 2-Coach SPARMV (manufactured by ICF), capable to run at speed of 105 km/h, were introduced in 1999. Each SPART was consisting of one DPC (Supervisor Van) and one DTC (Tool Van) and SPARMV was consisting of one DPC (Auxiliary Tool Van) and DTC (Medical Van). Each DPC was fitted with two set of CIL make NTA855R (340 hp) & Voith make transmission model T211rz. For effective maintenance of these rolling stocks, a Schedule of Standard Examination No. MP.MISC-147 (Rev-00) May-2004 was issued by RDSO.

1.3 In 2003, Railway Board advised to convert all these 2-Caoch SPART/SPARMV into 3-Coach SPART by suitably inserting an ICF coach in the middle of formation. Accordingly, RDSO issued drawing nos. SK.DP-3714 to 3717 for conversion of 2-Coach SPARMV into 3-Coach SPART by inserting a non-powered coach in in the middle i.e. Tool Van. Similarily, SK.DP-3718 to 3721 were issued for conversion of 2-Coach SPART into 3-Coach SPART by inserting a non-powered coach in the middle i.e. Medical Van. Now, the consist of these 3-coach SPART (converted from 2-coach SPARMV is SV (DPC)+TV(TC)+MV(DTC) and 3-coach SPART (converted from 2-coach SPART) is SV(DPC)+MV(TC)+TV(DTC).

1.3 Further, on the recommendation of ***'High Level Committee's Report on Disaster Management over IR'*** and directives of Railway Board, 3-coach HS SPART consisting of DPC (supervisor van) + TC (Medical Van) + DPC (Tool Van) manufactured by ICF to RDSO's specification no. MP-0.08.00.59 and capable of running at a speed of 115 km/h, was introduced in 2013. Each DPC was fitted with one set of CIL make engine model N14R (430 hp) & Voith make transmission model T211.r3.

1.4 As the schedules of diesel engine, transmission and coaches used in 2-coach SPART/SPARMV were similar to those of 3-Coach HS SPART and the converted 3-coach SPART had same powerpack. Therefore, RDSO vide letter no. SD.TW.ARMV dated 29.05.2017 advised to follow the Schedule of Standard Examination Report no. MP.MISC-147 (Rev.-0.00) May-2004 for 3-coach HS SPART also.

1.5 The comparison of technical details of all these variants is tabulated below:

SN	Particulars	2-Coach SPART	2-Coach SPARMV	3-Coach SPART (Converted)	3-Coach HS SPART
1.	Specification no.	MP-0-0800-36 July-97	MP-0-0800-35 July-97	RDSO drg. nos. SK.DP-3714 to 3721	MP-0.08.00.59 Feb-2009
2.	Manufactured by	RCF	ICF	Zonal Railways	ICF
3.	Consist	SV(DPC) + TV (DTC)	ATV(DPC) + MV (DTC)	SV(DPC) + MV (TC) TV (DTC) & SV(DPC) + TV(TC) + MV (DTC)	SV(DPC) + MV (TC) TV (DPC)
4.	Diesel Engine	CIL make NTA855R of 340 HP			CIL N14R of 430 HP
5.	Transmission	Voith T211rz			Voith T211r.3
6.	Optg. Speed	105 km/h			115 km/h

1.6 Railway Board vide letter no. 2022/M(M&P)/175/3/A/T/CRMG dated 30.11.2022 constituted a technical committee for comprehensive review/framing guidelines on issues related to Disaster management. The committee had to deliberate on 12 nos. Terms of Reference among which Terms of Reference no. 7 was to review of Maintenance Schedule of 3-Coach SPART.

Accordingly, the committee reviewed the schedule after taking the views of Zonal Railways and Carriage Dte. of RDSO. Based on the recommendation of the committee, the schedule has been revised. Also, it has been decided to make this schedule as Common Maintenance schedule for all variants of Diesel Hydraulic SPARTs running on date over Indian Railways to avoid any confusion.

1.7 **Major Changes done in this revised Schedule:**

a) **C-Schedule (6-Months) of Coaches** has been renamed as IOH and periodicity has been enhanced to **12 months** as per Railway Board's directives vide letter nos.2007/M(C)/141/1 dated 26.09.2008 and 2007/M(C)/141/1 (IOH/POH) dated 20.04.2021*.

b) **Periodicity of POH of Coaches (42 Months, extended to 48 months)** was mentioned as 42 months (can be extended to 48 months) based on the Railway Board letter no. 2003/M(M&P)/7/DM(79) dated 03.06.03 in reference to the Item-79 of High-level Disaster Management Committee report.
Now, POH periodicity has been revised as **48 months** as per Railway Board's directives vide letter no. 2007/M(C)/141/1 (IOH/POH) dated 20.04.2021*.

** Based on the CAMTECH's report no. IRCAMTECH/M/GWL/IOH & POH/OCV February-2021 on IOH/POH periodicity of departmental **ICF-OCV (Other Commercial Vehicle)** Coaches, Railway Board vide its letter no. 2007/M(C)/141/1 (IOH/POH) dated 20.04.2021 has advised to enhanced IOH/POH periodicities of ART/ARME/ARMV coaches to 12 month for IOH and 48 months for POH.*

c) Also, the following schedules have been included based on the feedback of user railways:
   i) Schedule of 125kVA DA set
   ii) 3-Phase Electric motor for driving Radiator fan
   iii) 3-Phase Electric motor for driving Compressor
   iv) POH procedure for 3-Phase Electric motors
   v) Ultrasonic testing of all axles

1.8 The service periods specified in this schedule for maintenance attention are the maximum allowable periods between successive examinations. Variations in operating conditions in different regions may make it necessary to carry out examination more frequently, or introduce examinations not scheduled herein. In such cases, the matter should be brought to the notice of the appropriate Sr. DME/DME, who alone is authorised to introduce any change in the standard examination detailed herein. Sr.DME/DME in all such cases will bring to the notice of the Motive Power Directorate of RDSO, for any modification to the schedules, giving full details.

2. References:

The following documents are also required to be referred for further information.

i) Operation and Maintenance Manual, Bulletin No. 3243773-05 (December, 2003), Cummins India Limited.
ii) DHMU: Operation and Maintenance Manual for Power Packs/ Controls (Issue No.2) issued by M/s KPC, Pune, No. 2723000070.
iii) Operating Instruction for VOITH – turbo Transmission model T211rz issued by M/s KPC, Pune, No. 272300006400.
iv) Operating Instruction no. 120.00402821_EN & Maintenance Instructions no. 120.00402841_EN for VOITH- Turbo Transmission T 211 r.3
v) Instruction and Maintenance Manual for Kirloskar – Axle drive V 17 (M) issued by M/s KPC, Pune, No. 2723000069.
vi) Instruction and Maintenance Manual for Compressor 2EC38 No. 272100046100 of M/s KPC make and RR15070 of M/s Elgi make.
vii) INDIAN RAILWAYS: Maintenance Manual for ICF BG Coaches, issued by IR CAMTECH, Gwalior.
viii) Maintenance Manual for AC/DC EMU & MEMU Bogie and Under gear Manual No. CMI-K001 latest revision issued by RDSO.
ix) ***RDSO's MP.MI-18, Rev-02 for Air Dryer***

3. Scope of Maintenance Schedule:

This booklet covers maintenance schedule for different assemblies & components under different heads, as under:

PART – I : Traction Engine, Brake, Compressor, 125 kVA DA set etc.
PART–II : Hydraulic transmission, Axle drive gearbox, Cardan shaft & other accessories
PART–III : Electrics & control
PART- IV : Schedule of Coach body, Under frame, Bogie.

4. **Periodicity of maintenance**

4.**1** **Part-I: CIL engine, Electrics & Controls, Brake equipments:**

i)	Daily Schedule.	-	Daily
ii)	Weekly Schedule	-	7 Days
iii)	Half-yearly Schedule.	-	6 months ± 5 days
iv)	Yearly Schedule	-	12 months ± 7 days
v)	2 - Yearly Schedule.	-	24 months ± **15** days.
vi)	4 - Yearly Schedule (D-check)	-	48 months ± **30** days.
vii)	E-check	-	12 years on condition basis

Note: Overhauling of Air dryer & testing at test bench may be done as per RDSO's MP.MI-18, Rev-02.

4.2 Part-II: Hydraulic transmission, Axle drive gearbox, Cardan shaft etc.

i)	Daily Schedule.	-	Daily
ii)	Weekly Schedule	-	7 Days
iii)	Half-yearly Schedule.	-	6 months ± 5 days
iii)	Two-yearly Schedule.	-	24 months ± **15** days.
iv)	Four-yearly Schedule	-	48 months ± **30** days.
v)	POH Schedule	-	12 years on condition basis

4.3 Part-III: Electrics & Controls

i)	Daily Schedule.	-	Daily
ii)	Weekly Schedule	-	7 Days
iii)	Half-yearly Schedule.	-	6 months ± 5 days
iii)	Two-yearly Schedule.	-	24 months ± 15 days.
iv)	POH Schedule	-	12 years on condition basis

4.4 **Part-IV: Coach body, Underframe, Bogie assembly, Brake rigging:**

i)	Weekly .	-	7 days
ii)	Schedule 'A' / Monthly	-	1 month ± 3 days
iii)	Schedule 'B' / Quarterly	-	3 months ± 7 days
iv)	IOH	-	12 Months / - 15 days
v)	POH	-	48 months ±30 days

5. Schedules of Periodical Overhauling (POH) of Major Items:

i)	CIL Engine	:	12 years on condition basis
ii)	Diesel Engine of DA set (125 kVA)	:	12 years on condition basis
iii)	Compressor	:	4 years
iv)	Hydraulic Transmission	:	12 years
v)	Axle Drive Gear Box	:	12 years
vi)	Coach body & Under-gear	:	48 months

6. Based on the recommendations of OEM, the periodicity of change of **filters and oil** in various systems are summarised below for information.

Description	Schedule Periodicity					
	Daily	weekly	Half yearly	Yearly	2-Yearly	4-Yearly
Engine						
Oil change	-	-	√	-	-	-
L.O Filter change	-	-	√	-	-	-
L.O by-pass Filter change	-	-	√	-	-	-
Fuel filter change	-	-	√	-	-	-
Cooling System						
Hydraulic oil change	-	-	-	√	-	-
Filter change	-	-	-	√	-	-
Transmission						
Oil change	-	-	-	-	√	-
Filters change	-	-	-	-	√	-
Axle drive						
Oil change	-	-	-	-	√*	-

* First oil change after 50 hours of operation, and there after in every 2 yearly schedule.

6.1 **Recommended Lubricants for Engine lube oil**:

S.No	Name of Manufacturer	Brand name
1.	Indian Oil Corporation	SERVO-PREMIUM CF4 15W40
2.	Hindustan Petroleum Corporation	Hylube Milcy Power
3	Bharat Petroleum Corporation	MAKCF4-15W40
4.	Valvoline Cummins Limited	Valvoline Power Supreme 15 W40

6.2 Recommended Hydraulic oils for cooling system of CIL engine:

IOC - Servo System – 68
HP - Enklo – 68
BP - Hydrol – 68

6.3 Cleaning of Hydraulic oil:

Hydraulic oil is required to be periodically cleaned by Centrifuge Cleaning arrangement during oil change and also during top-up. Oil should be added through Centrifuge Cleaning arrangement so that cleanliness of oil is maintained.

6.4 High speed Diesel:

The high speed diesel oil shall be to IS 1460:2017 or latest.

7. **Recommended Transmission oil & ADGB oil**

7.1 **Transmission Oil:**

Supplier	Brand Name
IOC	SERVO TORQUE 10
BPC	MAK Hydrol TQ 32 Oil

7.2 **Axle Drive Gear Box (ADGB) oil:**

Supplier	Brand Name
IOC	Survogear HP-90
BPC	Bharat spiral EP - 90
HPC	HP Gear oil EP - 90

8. **Recommended oils for coaches of DPC, DTC:**

8.1 **Dashpot oil**

Supplier	Brand Name
IOC	Servoline 100
BPC	Bharat Univol -100
HPC	Yantrol - 100

9. **General Instructions**:

9.1 The intensive utilisation of the SPARTs necessitates properly laid down maintenance schedules to be followed. A well organised inspection is essential to ensure reliability and freedom from failure in service.

9.2 There are certain fundamental requirements that are important to any successful maintenance programme. These are:-

.1 Adequate provision of well trained supervisors and skilled workmen.

.2 Adequate provision of proper maintenance facilities and tools.

.3 Adequate time for scheduled maintenance work to be completed properly before a SPART/SPARMV is released for its next trip.

.4 Provision of lubricating oil, water treatment etc. required to ensure satisfactory engine performance.

.5 A well scheduled maintenance programme including an adequate system of maintenance of records.

.6 While carrying out the work of the schedule, all missing nuts, bolts, set-screws, cotters, split pins etc. must be REPLACED as and when found defective. Split pins and cotters once removed must not be used again, but new ones must be fitted. All loose nuts, set screws etc. must be tightened. Where ever cotters or split pins are fitted, they must be of the correct size and so fitted that they bear against the nut or washer properly. Examine and ensure that all locking devices, where ever provided, are properly secured.

.7 All measuring devices such as torque wrenches, electric meters, lubricant dispensers etc. which require calibration should be checked quarterly or sooner, if required, for accuracy.

.8 All tools and parts should be accounted for and removed from the SPART/SPARMV after any maintenance work has been performed.

.9 All work done including methods and tools used must be in accordance with the manufacturers instructions, maintenance manual or any technical orders issued.

.10 Do not mix different brands of greases. Excessive lubrication is as harmful as inadequate lubrication.

.11 Use of waste cotton on SPARTs is PROHIBITED. Use lint less rags or wiping towels. The underframe and top surface of fuel tanks should be cleaned to

remove dirt and oil. Spraying of water directly on electrical equipment should be avoided. Interior of cab, all windows, head/light and warning light lenses and interior of the passenger compartment etc., must be thoroughly cleaned.

.12 The fire extinguishers should be refilled and maintained as per the schedule. Under no circumstances should any SPARTs be allowed to leave the shed without its required number of fire extinguishers in working order.

.13 **DURING ANY SCHEDULE EXAMINATION, ALL THE ITEMS OF THE LOWER SCHEDULES SHOULD ALSO BE CARRIED OUT.**

Part – I

Schedule of Engine, Brake Power, Compressor, 125 kVA DA set etc.

Engine, Brake power, Compressor etc.

Daily Schedule

DPC/DTC/TC No: Cumulative km.
Date: Cumulative hrs.

S.No	Details of work to be carried out	Action taken	Remarks
A.	**CONDITION: DIESEL ENGINE STOPPED**		
1.	**Oil & Water filling** Check and top-up if necessary: a) Lube oil b) Fuel oil c) Coolant d) Hydraulic oil e) Compressor oil		
2.	**Drain residue from** a) Air reservoirs. b) Intercooler of compressor. c) After cooler of pneumatic circuit.		
B.	**CONDITION : DIESEL ENGINE RUNNING**		
3.	**Mechanical (General examination)** a) General visual checking to be made to detect loose, defective, missing or leaky parts in the following systems: i) Cooling water ii) Lube oil iii) Fuel oil iv) Air intake & exhaust v) Pneumatic system b) Ensure proper working of all gauges. (DPC & DTC)		
4.	Check and ensure that hydraulic valve is fully open		
5.	Check for noise free operation of radiator fan. (Hydraulic oil temperature should not be more than 70º)		
6.	Check operation of compressor to ensure that there is no noise and vibration.		
7.	Check working of wiper		
8.	Check working of horn.		
C.	**125 kVA DA set**		
1.	Check & top-up i) Lube oil ii) Coolant iii) Fuel oil		
	Repairs booked by driver		
	1.		
	2.		
	3.		
	SSE (ART/ARMV) Name & Sign	SUP Name & Sign	

Engine, Brake power, Compressor etc.

WEEKLY SCHEDULE

DPC/DTC/TC No.: Cumulative km.
Date : Cumulative hrs.

Repeat all checks of Daily Schedule

S.No	Details of work to be carried out	Action taken	Remarks
A.	**CONDITION : DIESEL ENGINE STOPPED**		
1.	**General check** : Check tightness of foundation/ mounting bolts of the following : a) Engine b) Radiators c) Compressor d) Radiator fan e) Inlet & Exhaust manifolds		
2.	Engine fuel system		
a)	Drain sediments from water separator.		
b)	Check and clean fuel tank level gauge.		
3.	**V-Belts:** Check the belts for correct tension and serviceability: a) Compressor b) Water pump c) Alternator		
4.	**Engine air intake system:** a) Remove and clean dust pan. b) Check for complete red band on vacuum indicator. Clean outer element only with dry compressed air from inside to outside. (Note: Replace outer element after 4/5 cleanings or as soon as red band appears immediately even after cleaning)		
5.	Clean the following items with dry compressed air. a) Panel filter. (engine room) b) Outer body of engine air intake filters.		
6.	Check for red indication on return line filter on hydraulic tank. If red, change the filter.		
7.	**Breathers**: (Check, clean & re-fit)		
a)	Crank case breather,		
b)	Compressor breather		
c)	Fuel Tank breather		
d)	Hyd. Tank breather		

S.No	Details of work to be carried out	Action taken	Remarks
B. CONDITION : DIESEL ENGINE RUNNING			
8.	**Cooling water system** Check that vent pipes in the system are open.		
9.	**Check and record:** a) Engine lube oil pressure: Permissible values; *1-2 kg/ $cm.^2$ at idle *3-7 kg/cm^2 at 1800rpm b) Lube oil temp: Should lie between 75°C - 105°C . c) Cooling water temp : below 95°C		
10.	**Pneumatic system (DPC, DTC)** a) Time for charging the main air reservoir from 0 to 7 kg/cm2. 10 min. b) MR cut in pressure. 6 ± 0.1 kg/cm^2 c) MR cut out pressure. 7 ± 0.1 kg/cm^2 d) MR safety valve starts blowing-off at. 7.75 kg/cm^2		
11.	**Check and record the following :** a) Brake Cylinder Pressure. DPC – 1.6 $kg./cm.^2$ DTC – 3.5 $kg./cm.^2$ b) BP pressure : 5.0 $kg./ cm.^2$ c) Feed .Pipe Pressure 6.0 $kg./ cm.^2$ d) Parking Brake pressure 3.5 $kg./ cm.^2$		
12.	Functional Test: (DPC & DTC) a) A9 valve : Apply & Release Satisfactory b) SA9 valve : ---do---- c) Deadman's device : ---do----		
13.	Check safety valve operation of compressor		
C. 125 kVA DA set			
1.	Lubrication system: Check oil pressure		
2.	Cooling System: Check Belt tension		
3.	Air system: i) Check vacuum indicator for red band ii) Clean Air Filter element, if Vacuum Indicator showing red band		
4.	Engine checks: i) Check for leakage and rectify, if required ii) Run engine and record all parameters		
	Repairs booked by driver		
	1.		
	2.		
	3.		
	SSE (ART/ARMV) Name & Sign	SUP Name & Sign	

Engine, Brake power, Compressor etc.
Half-Yearly Schedule

DPC/DTC/TC No.: Cumulative km.
Date: Cumulative hrs.

Repeat all checks of Daily & Weekly Schedules

S.No	Details of work to be carried out	Basis of changes		Remarks
		Condition	Compulsory	
CONDITION : DIESEL ENGINE STOPPED				
1.	**Engine Lube Oil System**			
a)	Lub oil Filter		Yes	
b)	By-pass filter		Yes	
c)	Change of oil		Yes	
2.	**Engine Fuel System**			
a)	Fuel Filter		Yes	
b)	Magnetic filter screen	Yes		
3.	**Air System**			
a)	Inner Element	Yes		
b)	Outer Element	Yes		
4.	**Hydraulic System**			
a)	Hydraulic oil filter	Yes		
b)	Strainer	Yes		
5.	**Belts**			
a)	Alternator	Yes		
b)	Water Pump	Yes		
6.	Check for proper MUTC (multiple Unit Throttle Controller) operation			
7.	**Pneumatic System**			
a)	Lubricate brake valve cam of A-9 & SA-9 brake valves			
b)	Clean after cooler externally by blowing compressed air.			
c)	Blow down air reservoirs with compressed air and clean.			
8.	Fuel injectors and valves **(only during first half-yearly and then during POH)** a. Adjust fuel injectors. b) Check and ensure valve clearance as: - Inlet : 0.36 mm - Exhaust : 0.69 mm. Replace Rocker cover gasket & tighten the cover cap screw to 45 Nm			
9.	**Cooling System**			
a)	Inhibitor corrosion element	Yes		
b)	Test kit	Yes		
c)	**Engines provided with Borate base coolant (i,e. Coolant Additive**	Yes		

S.No	Details of work to be carried out	Basis of changes		Remarks
		Condition	Compulsory	
	Concentrate-CAC): • Visually check coolant colour: (i) If **pink**, pH is within limit (8.5 to 10.0): no CAC to be added. (ii) If **colourless, add CAC** • Check **CAC concentration with Test strip & ensure value in unit** per litre > 0.6.			
d)	**Engines provided with corrosion resistant Coolant** Check coolant for pH (8.5 – 10) & PPM value (3500 – 5000) for chromate concentration – If pH is below 8.5, add pH controller If PPM below 3500 – Add PPM controller If PPM above 5000 – Dilute coolant **Water used should have the following maximum levels** : Calcium Magnesium: 170 PPM ($CaCO_3$+$MgCO_3$) Chloride : 40 PPM (as Cl) Sulphur : 100 PPM (as SO_4)	Yes		
10.	Hydraulic oil to be checked for water contamination, dirt by draining sample from the bottom plug.			
11.	**Compressors** i) Remove and clean the oil bath air filter.	Yes		
	ii) Change oil.		Yes	
12.	Check air piping. Visually inspect hoses, pipes for damages/cracks and clamps for looseness.			
13.	Test fire extinguisher & re-fill, if necessary.	Yes		
CONDITION : DIESEL ENGINE RUNNING				
14.	Check for leak-offs from Radiator pump & motor in the hydraulic systems. Remove leak-off hose and collect oil in measuring jar for one minute. Permissible leak-off < 2.5 litres/min.			
15.	Check for leakages in the system.			
16.	Check working of radiator fan: Raise the water temperature and check-up opening up of radiator fan thermatic valve. Thermatic valve should pick up at 82 ^{0}C and fully open at 92 ^{0}C. Radiator fan RPM can be measured with tachometer at fan shaft end. Roof mounted radiator Min. : 800 Max. : 2200			

S.No	Details of work to be carried out	Basis of changes		Remarks
		Condition	Compulsory	
	Repairs booked by driver			
	1.			
	2.			
	3.			
	SSE (ART/ARMV) Name & Sign	SUP Name & Sign		

Engine, Brake power, Compressor etc.

Yearly Schedule

DPC/DTC/TC No.: Cumulative km.
Date : Cumulative hrs.

Repeat all checks of Daily, Weekly & Half-yearly Schedules.

S.No	Details of work to be carried out	Basis of changes		Remarks
		Condition	Compulsory	
A.	**CONDITION : DIESEL ENGINE STOPPED**			
1,	**Hydraulic System**			
a)	Hydraulic oil filter		Yes	
b)	Hydraulic oil		Yes	
2.	Check water pump for free rotation			
3.	**Cooling System**			
a)	Inhibitor corrosion		Yes	
b)	Test kit		Yes	
4.	Compressor			
a)	Clean HP and LP valves		Yes	
b)	Change Breather Assembly		Yes	
c)	Re-grease Motor Bearing		Yes	
B.	**CONDITION : DIESEL ENGINE RUNNING**			
5.	Check for leakages in the system.			
C.	**125 kVA DA set**			
1.	Lubrication system: i) Change lube oil ii) Change spin-on lub oil filter			
2.	Fuel System: i) Change Fuel oil filter and Fuel-Water separator ii) Clean breather iii) Ensure all joints in fuel lines are tightened			
3.	Air system: i) Clean Air Filter in reverse direction, using dry air with max 3.5 kg/cm^2 ii) Check sealings of Air Filter elements ***Note: Do not clean inner element***			
4.	Other checks: i) Clean battery leads ii) Secure all electrical connectors in engine			
	Repairs booked by driver			
	1.			
	2.			
	SSE (ART/ARMV) Name & Sign	SUP Name & Sign		

Two-Yearly Schedule

DPC/DTC/TC No.: Cumulative km.
Date : Cumulative hrs.

Repeat all checks of Daily, Weekly, Half-yearly & Yearly Schedule

S.No	Details of work to be carried out	Basis of changes		Remarks
		Condition	Compulsory	
CONDITION : DIESEL ENGINE STOPPED				
1.	**Air System**			
a)	Inner Element		Yes	
b)	Outer Element		Yes	
2	**Compressor**			
a)	Change Oil seal and all gaskets		Yes	
b)	Change Piston rings		Yes	
c)	Change Valve and mating gaskets		Yes	
d)	Change I/C and A/C Safety Valve		Yes	
e)	Change Drain Valve Seats		Yes	
f)	Clean Copper Cooler		Yes	
CONDITION : DIESEL ENGINE RUNNING				
3.	Check for leakages in the system.			
4.	**Flexible coupling**			
a)	Inspect visibly for distortion / breakage			
b)	Check & ensure rubber hardness < 60-shore.			
c)	Check condition of rubber blocks	Yes		
	125 kVA DA set			
1.	Cooling system: i) Check belt condition & change, if required ii) Check fan hub & drive arrangement iii) Clean radiator core if clogged			
2.	**Air System:** Replace filter elements if, vacuum indicator is showing red band even after cleaning the outer element ***Note: Do not clean inner element***			
	Repairs booked by driver			
	1.			
	2.			
	3.			
	SSE (ART/ARMV) Name & Sign	SUP Name & Sign		

Engine, Brake power, Compressor etc.
Four-Yearly Schedule

DPC/DTC/TC No.: Cumulative km.
Date : Cumulative hrs.

PART - A

Repeat all checks of Daily, Weekly, Half-yearly, Yearly & two-yearly schedules.

S.No	Details of work to be carried out	Condition/action	Remarks.
A.	**Air Intake & Exhaust System**		
1.	Turbocharger i) Check oil leakages through intake & exhaust seals. ii) Check turbocharger shaft end clearance with a dial depth gauge (value: 0.05mm to 0.13 mm). iii) Repair the turbo with repair kit.		
2.	Check for leakage in air intake system, if any, rectify the same with necessary parts.		
3.	Replace air cleaner inner & outer filter elements		
4.	Check vacuum indicators for functioning of reset button & external damages and replace if necessary		
5.	Check for leakage from exhaust system, if any, rectify the same with necessary parts.		
6.	Check & replace hoses & clamps of air intake pipings on condition basis.		
7.	Check air intake and exhaust piping supports. Take corrective action accordingly.		
8.	Clean the engine room panel filters by dry compressed air and replace if necessary.		
B.	**Fuel System**		
1.	Clean water separator assembly		
2.	Replace fuel filter element.		
3.	Replace all fuel line hoses.		
4.	Calibrate the injectors after replacing the cups and O-rings.		
5.	Calibrate the PT pump by replacing the necessary parts need to be changed for calibration (magnetic filter, gasket set, etc.)		
6.	Adjust valve. Check the conditions of push rods, adjusting nut & screws, if necessary replace.		
7.	Check fuel lines & connections for leakage.		
8.	Check fuel pump linkages.		
9	Check actuator functioning.		

S.No	Details of work to be carried out	Condition/action	Remarks.
10.	Clean thoroughly fuel tank with steam and detergents and dry the tank with air blast.		
C.	**Lubricating Oil System**		
1.	Replace engine oil.		
2.	Replace full flow & bypass filter elements.		
3.	Replace all oil line hoses & clamps.		
4.	Check external oil leakage from head gasket/rocker housing gasket, seals, etc. If necessary, replace the same.		
D.	**Cooling System**		
1.	Flush cooling water tank. Replenish with CAC and water . Replace CR element of system with CAC for DPCs having CR element. Check for concentration.		
2.	Replace water pump drive belts.		
3.	Replace all hoses, clamps & coupling O-Rings of cooling system pipe lines and radiator assembly.		
4.	Remove radiator assembly (RMR) from the mounting & clean the radiator assembly.		
5.	Check all radiator Anti Vibration Mountings and replace if necessary.		
E.	**Hydraulic System**		
1.	Replace hydraulic oil.		
2.	Replace hydraulic oil return filter.		
3.	Replace vent pump belts.		
4.	Clean hydraulic system strainer.		
5.	Check thermatic valve operation.		
6.	Externally clean & check leak-offs from main hydraulic & ventilation pump at rated speed. Radiator fan pump : < 2.5 litres/min. Vent fan pump : < 0. 8 litres/min		
7.	Externally clean & check leak-offs from main hydraulic & ventilation motor at rated speed. Radiator fan motor : < 2.25 litres/min. Vent fan motor : < 0. 8 litres/min		
8.	Externally clean & check radiator fan operation		
9.	Externally clean & check vent fan operation		
10.	i) Replace all hydraulic pressure line hoses. ii) Replace all hydraulic leak-off & return line hoses on condition basis.		

S.No	Details of work to be carried out	Condition/action	Remarks.
11.	Clean hydraulic oil cooler externally.		
12.	Check & set hydraulic system pressure at 180 bar		
F.	**Compressor** :		
	i) Dismantle and overhaul. ii) Replace worn out parts. iii) Replace all 'O' rings, gaskets, oil seals. iv) Assemble and run the compressor to evaluate its performance.		
G.	**Pneumatic system :**		
	i) Dismantle and overhaul all brake valves. ii) Replace all 'O' rings seals and gaskets. iii) Assemble and test to evaluate their performance. iv) Check all gauges with master gauge and replace/repair the defective ones.		
H.	**Other checks**		
i)	Check Vibration damper, replace if necessary.		
ii)	Check for the leakages in various systems		
	Repairs advised by Shed in Pre-Shopping report.		

125 kVA DA Set:

S.No	Details of work to be carried out	Condition/action	Remarks.
	Lubrication System		
1.	Check visually for metal particles in used lub oil / filter element.		
	Cooling system		
1.	Check fan hub / belt tenshioner idler for excessive play, repair / replace if, necessary.		
2. .	Check Radiator cap sealing & replace cap if, seal is damaged.		
	Fuel system		
1.	Clean fuel tank.		
2.	Replace fuel hoses if, required.		
3.	Calibrate fuel pump & nozzles if necessary in case of low power / excessive smoke like symptoms.		
	Air system		
1.	Check turbocharger & clearances		
	Other engine checks		
1.	Tighten all clamps		
2.	Check valve lashes & adjust if required		

PART - B

List of components to be changed

S.No	Details of work to be carried out	Basis of changes		Remarks
		Condition	Compulsory	
CONDITION : DIESEL ENGINE STOPPED				
1.	**Air system**			
a	Air cleaner hose	Yes		
b.	Elbow	Yes		
c.	Vacuum indicator	Yes		
d.	Dust cap	Yes		
2.	**Lube system**			
a.	Hose turbo drain	Yes		
b.	Clamp	Yes		
c.	Gasket	Yes		
d.	Turbo oil supply hose	Yes		
e.	BP hose	Yes		
f.	LOF hose	Yes		
g.	Plain pipe elbow	Yes		
h.	Male connector	Yes		
3.	**Fuel system**			
a.	Hose flexible	Yes		
b.	**Calibration & conditioning**			
i.	Fuel pump	**Yes**		
ii.	Injector	**Yes**		
iii.	Tappet Cover gasket	Yes		
iv.	Gasket, PT pump	Yes		
v.	Spider, jaw coupling	Yes		
4.	**Cooling system**			
a.	Gasket	Yes		
b.	Thermostat seal	Yes		
c.	Thermostat	Yes		
d.	**Water pump**	Yes		
e.	Pipe coupling (1.5'' and 2.5'')	Yes		
f.	Hose	Yes		
g.	Thermostat housing gasket	Yes		
h.	Anti-vibration mounting	Yes		
i.	Radiator cleaning		Yes	
5**.**	**Exhaust system**			
a.	Turbo repair kit	Yes		
b.	Turbo mounting stud	Yes		
c.	Hex nut	Yes		
d.	Turbo gasket	Yes		
6**.**	**Hydraulic system**			
a.	Hose, Pump Leak-off	**Yes**		
b.	Hose, Pump suction	**Yes**		
c.	Hose, Delivery to Suction pipe	Yes		

S.No	Details of work to be carried out	Basis of changes		Remarks
		Condition	Compulsory	
d.	Hose, Hydraulic block	Yes		
e.	Hose, Motor 1 & return	Yes		
f.	Hose, to pressure regulator	Yes		
g.	Hose, to pressure gauge	Yes		
h.	Hose, to oil cooler	Yes		
i.	Hose, cooler to socket	Yes		
j	Hose, Sck. Rtn S/pipe	Yes		
k	Hose, suction pipe to return block	Yes		
l	Hose, Pump & T/valve	**Yes**		
m	Hose, T/valve 7 Return block	Yes		
n	Hose, Motor return (1)	Yes		
o	Hose, PRV & return socket	Yes		
p	Hose, return socket to block	Yes		
q	Dowty washer		Yes	
r	Radiator AVM	Yes		
s	Cap screw	Yes		
t	Lock washer	Yes		
u	Washer	Yes		
v	Clean radiator fan. Check its operation	Yes		
x	Clean hydraulic oil cooler	Yes		
7.	**Compressor**:			
a.	Components change	Yes		
b.	'O' rings, gaskets, oil seals		**Yes**	
8.	**Pneumatic system:**			
a.	'O' rings, gaskets, oil seals		Yes	
b.	Check gauges and replace defective one	Yes		
9.	Check vibration damper, replace if necessary	Yes		
10.	**Belts:** a) Alternator b) Water pump		Yes Yes	

Engine, Brake power, Compressor etc.

Twelve-Yearly Schedule
(E-Check of Engine)

Engine serial number: Cumulative km.
Date: Cumulative km.

S.No	Details of work to be carried out	Condition/action	Remarks.
	Major Engine Overhaul		
1.	Inspect the following & overhaul: a) Accessory Drive b) Accessory Drive Seal c) All Bearings d) Camshafts e) Cam Followers f) Crankshaft g) Crankshaft Journals h) Front and Rear Crankshaft Seals i) Front Gear Train j) Rear Gear Train k) Cylinder Head l) Rocker lever assembly m) Intake & Exhaust valve n) Injectors o) Pistons p) Piston Rings q) Connecting Rods r) Turbocharger s) Lubricating Oil Pump t) Oil Cooler u) PT pump and drive system v) Water pump w) Other remaining items on condition basis		
2.	Change all seals, gaskets and O-rings		

Note: Detailed Overhaul instructions to be obtained from Cummins India.

Part – II

Schedule of Hydraulic Transmission, Axle Drive Gearbox, Cardan Shaft etc.

(Hydraulic Transmission, Axle Drive, Cardan Shaft)

Daily Schedule

DPC/DTC/TC No.: Cumulative km.
Date : Cumulative hrs.

S.No	Details of work to be carried out	Basis of changes		Remarks
		Condition	Compulsory	
1.	Externally clean and check for leakages in transmission line.			
2.	Externally clean and check for leakages of oil in axle drive by running the engine.			
3.	Check proper working of : i) Transmission oil temperature gauge. ii) Transmission oil pressure gauge.			
4.	Check oil level of axle drive & top-up if necessary.	Yes		
5.	Check oil level of transmission & top-up if necessary.	Yes		
6.	Check tightness of flange bolt of cardan shaft. Do greasing if required.			
7.**	Change ADGB oil after first 50 hours of operation. ***Not to be repeated during the subsequent trip schedules.***			
	Repairs booked by driver			
	1.			
	2.			
	3.			
	SSE (ART/ARMV) Name & Sign	SUP Name & Sign		

Hydraulic Transmission, Axle Drive, Cardan Shaft
Weekly Schedule

DPC/DTC/TC No.: Cumulative km.
Date: Cumulative hrs.

Repeat all checks of Daily Schedule

S.No	Details of work to be carried out	Basis of changes		Remarks
		Condition	Compulsory	
1.	Check the condition of flexible coupling securing bolts.			
2.	Check the tightness of the following: i) Engine transmission mounting bolts. ii) Flange joint bolts: a) Between engine and transmission. b) Between transmission and axle drives iii) Axle drive & torque arm securing bolts (420 N-m) iv) Mounting bolts of torque reaction arm. (790 N-m)			
	Repairs booked by driver			
	1.			
	2.			
	3.			
	SSE (ART/ARMV) Name & Sign	SUP Name & Sign		

Hydraulic Transmission, Axle Drive, Cardan Shaft

Half Yearly Schedule

DPC/DTC/TC No.: Cumulative km.
Date : Cumulative hrs.

Repeat all checks of Daily & Weekly schedules

S.No	Details of work to be carried out	Basis of changes		Remarks
		Condition	Compulsory	
CONDITION : DIESEL ENGINE STOPPED				
1.	**Transmission:**			
a.	Oil - 1st change after 50 hrs. service and subsequently in Two yearly schedule.		Yes	
b.	All filters - 1st change after 50 hrs. service and subsequently in Two yearly schedule.		Yes	
2.	Check for abnormal play in universal joint of cardan shaft. Repair if necessary.			
3.	Lubricate rolling & sliding part of cardan shaft with grease			
CONDITION : DIESEL ENGINE RUNNING				
4.	Check for the leakages in the system			
	Repairs booked by driver			
	1.			
	2.			
	3.			
	SSE (ART/ARMV) Name & Sign	SUP Name & Sign		

Hydraulic Transmission, Axle Drive, Cardan Shaft

Two Yearly Schedule

DPC/DTC/TC No.: Cumulative km.
Date : Cumulative hrs.

Repeat all checks of Daily, Weekly & Half yearly schedules

S.No	Details of work to be carried out	Basis of changes		Remarks
		Condition	Compulsory	
CONDITION : DIESEL ENGINE STOPPED				
1.	Check for metal particle inside transmission.			
2.	Flush and change oil		Yes	
3.	Change Filter		Yes	
4.	Check for proper function of Forward/Reverse mechanism			
5.	Check for control piston for any burr & dress if necessary.			
6.	Visually check- i) Bearing condition ii) Monitor for high temperature and abnormal noise			
7.	**Cardan shaft-** a) Check for specified torque tightness of joint flange bolts (140 N-m). b) Grease at spline section till old grease comes out.			
8.	**Axle drive-** a) Check for oil leakage b) Clean breather c) Take sample of oil. Check for metal particle d) Top up oil if necessary			
CONDITION : DIESEL ENGINE RUNNING				
9.	Check for – i) Oil leakage ii) Condition of hoses iii) Pneumatic & hydraulic joints			
	Repairs booked by driver			
	1.			
	2.			
	SSE (ART/ARMV) Name & Sign	SUP Name & Sign		

(Hydraulic Transmission, Axle Drive, Cardan Shaft)

Four Yearly Schedule

DPC/DTC/TC No.: Cumulative km.
Date : Cumulative hrs.

Repeat all checks of Daily, Weekly, Half-yearly & Two yearly schedules

S.No	Details of work to be carried out	Basis of changes		Remarks
		Condition	Compulsory	
1.	**Transmission:** Check control parts for proper operation tightness and wear : i) Governor, ii) Sensor valves, iii) Reverse gear operating cylinder, iv) Main control valve.			
2.	**Axle drive Gear box :** i) Subject all parts to an intermediate inspection. ii) Check the wear pattern on the bevel gear drive. iii) Check the taper roller bearings for proper axial clearance (Refer 8.5 of Axle drive -V17 Maintenance manual)			
	Repairs booked by driver			
	1.			
	2.			
	3.			
	SSE (ART/ARMV) Name & Sign	SUP Name & Sign		

Hydraulic Transmission, Axle Drive, Cardan Shaft)
Twelve Yearly (144 Months) Overhauling Schedule

DPC/DTC/TC No.: Cumulative km.
Date: Cumulative hrs.

S.No	Details of work to be carried out	Basis of changes		Remarks
		Condition	Compulsory	
1.	**Overhaul of Transmission**			
a)	Completely dismantle & overhaul transmission			
i)	Filter element		Yes	
ii)	Filter Cartridge		Yes	
iii)	Seal		Yes	
iv)	Gasket		Yes	
v)	All Bearings		Yes	
vi)	'O' ring, seal, sealing ring, piston ring		Yes	
vii)	Suspension roller		Yes	
viii)	Breather filter		Yes	
ix)	Bush		Yes	
x)	Circlip		Yes	
xi)	Pin		Yes	
xii)	Union / Banjo Joint		Yes	
b)	**After Overhaul of Transmission:**			
i)	Test run to be carried out to ensure proper operation of the overhauled transmission.			
ii)	After 50 hrs. run, oil must be drained and filtered. Filter on delivery side of filling pump must be replaced.			
iii)	Filters on suction side of filling pump and secondary lubricating pump are required to be cleaned and fitted.			
2.	**Overhaul of Axle Drive** : Subject all components to major inspection and replace if necessary. (Refer : Axle drive -V17 Maintenance manual for assembly & disassembly)			
	Repairs advised by Shed in Pre-Shopping report.			

Part – III

Schedule of Electrics & Controls

Electrics & Controls

Daily Schedule

DPC/DTC/TC No.: Cumulative km.
Date : Cumulative hrs.

S.No.	Details of work to be carried out	Action taken	Remark
1	Check following items for unusual sound, high temperature and odour.		
a)	Aux. Alternator		
b)	24 volt battery charging alternator		
c)	Check working of Aux alternator and 24V battery charging alternator		
d)	Ensure proper supply for internal and external loads by means of feeders		
2.	Check the MUTC operation by raising throttle notch (engine)		
a)	Check the performance of RPM indicator		
3.	Check charging rate and voltage of auxiliary generator in each notch. Charging voltage should be above 110 volt		
4.	Check following electrical equipment for loose connection and for proper working.		
a)	Switches.		
b)	Lights		
c)	MCBs		
d)	Check working of indication lights on driver panel by indication test switches		
e)	Panels with TFT / LCD display or HMI display unit (wherever applicable)		
f)	Push Buttons (Wherever applicable)		
g)	Sockets		
h)	Alerter lamp & alarm		
i)	Emergency engine stop safety device		
5.	Check proper securing of train line couplers		
6.	Start engine and check the following:		
a)	Operation of self starter (local and remote)		
b)	Drivers and guards key switches		
c)	Proper working of relays & their sequence		
	Repairs booked by driver		
	1.		
	2.		
	SSE (ART/ARMV) Name & Sign	SUP Name & Sign	

(Electrics & Controls)

Weekly Schedule

DPC/DTC/TC No.: Cumulative km.
Date : Cumulative hrs.

Repeat all checks of Daily Schedule

S.No.	Details of work to be carried out	Action taken	Remark
1	**Check IR value between control and ground. Ensure minimum 1 mega ohm**		
2	**Master controller**		
a)	Open the cover and clean the master controller.		
b)	Check and ensure proper operation of the contactors and interlocks.		
c)	Clean the cams and contactors.		
d)	Check visually connections for tightness.		
e)	Check and ensure proper working of Deadman's application device.		
f)	Lubricate with light machine oil all bush bearings, hinges and rollers (wipe out the excessive oil)		
3	**Auxiliary Rectifier Cum Regulator**		
a)	Open the rectifier box cover and clean the rectifier with compressed air of 3kg/cm^2 and look for any abnormality like heating etc.		
4.	**Aux. Alternator**		
a)	Blow out aux. alternator with dry compressed air; of 3kg/cm^2, Open cover and tighten loose connections.		
5.	**Relay Box**		
a)	Clean all relays and their covers properly.		
b)	Check and tighten , fastening nuts and bolts.		
c)	Operate the relay by hand and ensure proper operation.		
d)	Clean contacts of all relays		
6.	Check 24 volts alternator output which should be min-25 V &max-27 V. If varies, attend and overhaul if necessary		
7.	**Batteries**		
a)	Clean batteries, battery boxes, tighten the terminal lugs and apply petroleum jelly on all terminals.		
b)	Ensure that the plugs are clean		
c)	Check and record specific gravity Specific gravity should be (1200-1240)		
d)	Check electrolyte level & to be maintained up to green mark of indicator		
e)	Check if any battery is having reverse polarity		
f)	Check and record battery voltage. Should be min -1.8 V, max -2.2 V		

S.No.	Details of work to be carried out	Action taken	Remark
6.	**Safety Devices**		
a)	Ensure that oil pr. switch is in proper working order Setting of OPS (P/U-1kg/cm2,D/O-0.8kg/cm2)		
b)	Ensure proper working of hot water temp. Safety device. LED indication should come & buzzer should sound and transmission should cut off when water temperature exceeds 95°C.		
c)	Ensure proper working of low cooling water level safety device. On pickup engine should shut down along with LED indication and buzzer should sound		
d)	Ensure proper working of engine over-speed safety device. Raise engine RPM by pressing governor plunger. Engine should shut down along with LED indication and buzzer should sound.		
e)	Check proper working of all interlocks of the cab		
f)	Proper working of Transmission oil temp safety device		
g)	Proper working of Auto Emergency Brake feature (if applicable)		
h)	Sanding Operation (If available)		
7.	Record voltage of 24 volt alternator in each notch Voltage of 24 volt alternator should be Min – 25 V and Max 27 V.		
8.	Check electrolyte level of batteries. Electrolyte level should be maintained up to green mark of level indicator fitted on each cell		
9.	Stop the engine and blow all electrical components with dry compressed air of 3kg/cm^2.		
10.	**Check the following safety items**		
a)	Pull passenger alarm chain. Buzzer should sound in the Driver's cab.		
b)	<u>Guard & Driver communication</u> On pressing the buzzer button in one cabin, buzzer should sound in other cabin.		
c)	Signal bell		
d)	Headlight, flasher lights, tail lamps, emergency headlights.		
11.	**Check V-belts of Aux. alternator (24V), (110 V)**		
12.	Check tightness of 6 pin socket on TRM & operation of transmission solenoid valve.		
13.	**3-Phase Electric motor for driving Radiator fan**		

S.No.	Details of work to be carried out	Action taken	Remark
a)	Check for any loose connections of motor, earthing and main terminals		
b)	Check for abnormal sound		
c)	Clean the space between cooling fins and fan cover		
14.	**3-Phase Electric motor for driving Compressor**		
a)	Check for any loose connections of motor terminals		
b)	Check for abnormal sound		
15.	**125 kVA DA set:** Start the alternator and check following in running conditions:		
i)	**Generator** **a)** Electrical nominal operating conditions & excitation **b)** Vibrations		
ii)	**Windings:** Temperature sensors		
iii)	**Bearings:** Temperature sensors		
iv)	**Cooling:** **a)** Air inlet temperature **b)** Air flow rate and directions		
	Repairs booked by driver		
	1		
	2		
	3		
	SSE (ART/ARMV) Name & Sign	SUP Name & Sign	

(Electrics & Controls)

Half Yearly Schedule

DPC/DTC/TC No.: Cumulative km.
Date : Cumulative hrs.

Repeat all checks of Weekly Schedule

S.No	Details of work to be carried out	Action taken	Remark
1.	Check tightness of aux. alternator foundation bolts. If found loose, tighten.		
2.	Check connection of the following (a) MUTC (b) Starter (c) 24V Alternator (d) All Terminal boards and junction boxes		
3.	Check and ensure that none of the cams is damaged or cracked.		
4.	**3-Phase Electric motor for driving Radiator fan**		
a)	Check the temperature of the body and the bearing on load.		
b)	Re-grease the bearing with Servo gem- RR3 grease.		
c)	Check the insulation resistance and make it sure, it should be more than one Meg.-ohm.		
5.	**3-Phase Electric motor for driving Compressor**		
a)	Check the temperature of the body and the bearing on load.		
b)	Re-grease the bearing with Servo gem- RR3 grease.		
c)	Check the insulation resistance and make it sure, it should be more than one meg.-ohm.		
6.	**125 kVA DA set:**		
a)	**Generator** • Environmental conditions and cleanliness. • Ambient temperature inside and outside. • Complete machine - damage, loose parts & earth bonds. • Guards, screens, warning and safety labels. • Electrical nominal operating conditions & excitation. • Vibrations.		
b)	**Windings** • Condition of all windings. • Insulation resistance of all windings.		

	• Insulation resistance of rotor, exciter and PMG. • Temperature sensors.		
c)	**Terminal Box** • All generator/customer connections and cabling		
d)	**Bearings:** • Temperature sensors		
e)	**Rectifier** • Diode and varistors		
f)	**Cooling** • Condition of fan • Air inlet temperature • Air flow rate and directions		
	Repairs booked by driver		
	1		
	2		
	3		
	SSE (ART/ARMV) Name & Sign	SUP Name & Sign	

Electrics & Controls

Two Yearly Schedule

DPC/DTC/TC No.: Cumulative km.
Date: Cumulative hrs.

Repeat all checks of Half Yearly Schedule

S.No.	Details of work to be carried out	Action taken	Remark
1.	Check in situ (a) All Safety control (b) Signal/Alarm bell		
2.	Remove and overhaul the following (a) Starter (b) 24 V Alternator		
3.	Check MUTC operation		
4.	Calibrate speedometer and ensure proper working		
	Repairs booked by driver		
	1		
	2		
	3		
	SSE (ART/ARMV) Name & Sign	SUP Name & Sign	

(Electrics & Controls)
POH Examination

DPC/DTC/TC No.: Cumulative km.
Date : Cumulative hrs.

Repeat all checks of Two- Yearly Schedule

S.No.	Details of work to be carried out	Action taken	Remark
1	Remove, overhaul , test on test bench & fit		
a)	Relays		
b)	MUTC		
c)	Voltage regulator		
d)	All safety devices (low water, low l/oil pressure, water temperature, OST)		
e)	Inspect Contractor tips and contractors		
2.	Check all electrical equipment for high temperature, unusual sound and odour, including aux. alternator, 24 V alternator and starter motor,		
3.	**Batteries**		
	a. Remove, recharge and test the batteries		
	b. Replace the batteries if codal life has been completed		
	c. Clean and paint battery boxes		
4.	**Miscellaneous** i. Blow out electrical wiring panel and remove dust and dirt with dry air ii. Check all switches and push buttons for proper working iii. Check all circuit breakers for 'ON' and 'OFF' operations iv. Clean throttle tips and check for proper operation. v. Check all gauges for proper working and readings to be noted down on idle as well as on 8th notch. vi. Blow out switch gear box.		
	Repairs advised by Shed in Pre-Shopping report.		
5.	**125 kVA DA set** • Check coupling arrangement of generator • Check sealed bearing (if necessary)		
6.	**3-Phase Electric motor for driving Radiator fan:** POH as per following procedure		
7.	**3-Phase Electric motor for driving Compressor:** POH as per following procedure		

POH procedure for 3-Phase Electric motors

Dismantling Procedure

- Disconnect the power.
- Dismantle the fan cover by loosening the M6 Hex. Bolt.
- Dismantle the fan loosening the Hex Nut M16.
- Lock the rotor.
- Remove the Motor side Mounting Brackets.
- Remove the Motor Fan cover.
- Remove the Motor Fan by loosening Nut M16.
- Remove the Motor Bearing outer cap.
- Remove the Motor Rear Cover.
- Assemble the Lifting Hook M12 in the Motor Leg holes at opposite.
- Hold the Stator in the Crane. Pull the Motor Stator.
- Remove M16 Adaptor (Motor Fan shaft) which is at end of Rotor
- Hold the Rotor in the Crane using Nylon flat belt. Tighten both M16 Bolts of special tool uniformly so that 1⁄2 round each bolt and repeat. Rotor will remove from Crankshaft taper.

Checking Instruction

- Test the insulation resistance of the stator winding.
- Check the bearing, if needed replace by new one. If bearing is found OK, Replenish with fresh grease.
- Check the oil seal and replace if required.

ASSEMBLY PROCEDURE

- Assemble the Rotor in the Crankshaft. Insert stud and Fan shaft Tighten and apply Torque as specified
- Assemble Stator. Tighten the Nuts M10 uniformly at four sides.
- Place the Bearing Cap guide tool (Stud M6 x 150) and assemble the Motor Rear cover. Ensure the Grease port matches properly.
- Assemble the Bearing outer Cap with Oil seal and remove the guide tool. Ensure the Grease port orientation in properly.
- Assemble the Motor Fan and apply specified Torque. Assemble the Motor Fan cover
- Assemble the Motor Side Mounting Bracket. Apply specified Torque.
- Fix the fan cover on rear cover by M6 hex. Screw.
- Assemble the terminal box in position and connect the leads as indicated in ferrules.

PRECAUTIONS TO BE TAKEN WHILE SERVICING

- During dismantling use proper tools only.
- Bearing should be removed and assembled by strictly. Following the recommendation of bearing manufacturers.
- Take special precaution while handling wound components, so that they are not damaged.

- If re impregnation is needed use recommended varnish only and strictly follow the Procedure as advised by the varnish manufacturers.
- If drying of winding is needed follow the approved method only. Hose proof packing should be properly maintained.
- All joint should be applied with gasketing Loctite - 574.

Part – IV

Schedule of Coach Body, Underframe, Bogie, Brake Rigging etc.

Coach body, Underframe, Bogie, Brake rigging etc.

Weekly Schedule

(On rake)

DPC/DTC/TC No.: Cumulative km.
Date : Cumulative Hrs.

No.	Details of work to be carried out	Condition/Action	Remarks
1.0	Coach		
1.1	Coach should be washed both from outside and inside.		
2.0	**Shell**		
2.1	Visually check body panels/end walls for damages.		
2.2	Visually inspect destination board brackets.		
2.3	Visually inspect window bars for damage/missing.		
2.4	Examine body side doors for working/damages.		
2.5	Inspect door handles for damages/missing.		
2.6	Inspect vestibule and its Rubber fittings for damages/missing, repair if necessary.		
2.7	Visually check vestibule fall plate, mounting brackets, pins and lock lever for ease of operation, damages/deficiency.		
3.0	**Under frame**		
3.1	Visually examine centre pivot mounting bolts and attend if needed.		
3.2	Check condition of head stock/sole bar.		
3.3	Visually inspect centre pivot cover.		
4.0	**Bogie**		
4.1	**Bogie frame**		
4.1.1	Examine visually the condition of bogie side frame, transom, longitudinal, bolster etc**.** and special attention to be given at all welded locations.		
4.1.2	Examine visually bogie frame rusting and corrosion and if found, do painting after ensuring surface preparation of affected area.		
4.1.3	Examine rubber stopper/stop screw of axle box crown for damage/missing/loose.		
4.1.4	Inspect axle box safety straps/loops for damage/broken/missing.		
4.1.5	Bolster safety straps/loops for damage/broken/missing.		
4.1.6	Brake hanger brackets for damages.		

No.	Details of work to be carried out	Condition/Action	Remarks
4.1.7	Inspect safety brackets for brake hanger pins.		
4.1.8	Check visually BSS hanger brackets.		
4.1.9	Examine visually anchor link brackets.		
4.2	**Primary Suspension**		
4.2.1	Visually examine axle box springs for crack/ breakage and clean the spring where suspected crack is observed during examination and replace in case of any crack / breakage.		
4.2.2	Visually examine dashpot oil filling special screw for deficiency.		
4.2.3	Check oil leakages in dashpot through defective seals/vent screws.		
4.2.4	Visually examine axle box clearance.		
4.3	**Secondary Suspension**		
4.3.1	Visually examine bolster springs for breakages/damages and clean the spring where suspected crack is observed during examination and replace in case of any crack / breakage.		
4.3.2	Visually examine Bolster lower spring beam.		
4.3.3	Visually examine BSS hangers, hanger blocks, BSS pins.		
4.3.4	Visually examine equalizing stay rods and pins (small and big).		
4.3.5	Visually check anchor links.		
4.3.6	Visually examine the anchor link securing bolts and attend if needed.		
4.3.7	Visually examine Equalizing stay brackets.		
4.3.8	Examine and attend safety loops of bolster.		
4.3.9	Check and attend safety loops of Equalizing stay rod.		
4.3.10	Examine vertical shock absorbers for damages / leakages.		
4.4	**Brake rigging**		
4.4.1	Check brake gear and adjust so that the piston stroke is within the limit.		
4.4.2	Examine brake beams breakages/damages.		
4.4.3	Check and attend brake beam safety wire ropes/safety straps.		
4.4.4	Check and attend brake shoe head and key and replace if necessary.		
4.4.5	Check and replace worn brake blocks.		
4.4.6	Visually inspect brake hangers, brake gear pins and cotters/split pins and replace if necessary.		
4.4.7	Visually inspect damaged/missing brake gear bushes and replace if necessary.		

No.	Details of work to be carried out	Condition/Action	Remarks
5.0	**Brake System**		
5.1	**Air brake system**		
5.1.1	Conduct brake test as per rake test and attend leakages and defective components if any.		
5.1.2	Visually inspect for damage on brake pipe, feed pipe and hose coupling.		
5.1.3	Visually inspect suspension bracket for air brake equipment and anti pilferage device for any defect and rectify.		
5.1.4	Check passenger alarm by pulling the chain with spring balance with 6.4kg to 10kg force.		
5.1.5	Carry out manual brake release test to ensure proper function of release lever.		
5.1.6	Check and adjust brake gear to achieve correct piston stroke.		
5.1.7	Service application, release test of every coach of the rake to ensure full brake power.		
5.1.8	Carry out guard van valve test to ensure proper functioning of guard van valve.		
5.1.9	Examine slack adjuster for damage and mal functioning and subsequent replacement.		
6.0	**Draw gear**		
6.1	Check and replace damage/missing split pins/cotter/rivets.		
6.2	Examine draw hook modified, socket head screws (M42x300) and rubber pads for damages.		
6.3	Check conditions of the screw coupling and its components and replace if required.		
7.0	**Buffing gear**		
7.1	Visually examine buffer plungers for damage/drooping/stroke length.		
7.2	Examine buffer mounting bolts and attend if necessary.		
7.3	Examine visually buffer casing for cracks/damages.		
8.0	**Running gear**		
8.1	Examine visually axle box for grease oozing out, warm box if any.		
8.2	Visually examine wheel tyre profile and thickness of tyre and check with tyre profile gauge if they appear to be near condemning limit.		
8.3	Visually inspect axle box covers.		
8.4	Inspect wheel tread for shattered rim, spread rim, shelled tread, thermal cracks, heat checks.		
9.0	**Seats and berths**		

No.	Details of work to be carried out	Condition/Action	Remarks
9.1	Examine middle and upper berth chains.		
9.2	Examine the holding/securing brackets for seats and berths and attend if necessary.		
9.3	Examine snack tables for damages and rectify if necessary.		
9.4	Examine and repair damaged upholstery cushions and curtains.		
9.5	Wooden seats and frames should be cleaned.		
9.6	Cushion should be cleaned with duster. Oil or head stain and dirty spots if any should be cleaned with mild soap solutions and wipe dry.		
10.0	**Doors**		
10.1	Examine doors for proper functioning and securing with hinge pivots. Doors should not graze with floor or door sill plates.		
10.2	Examine door locks, latches firmly secured with correct sized screws and properly/smoothly engaging in their slot. The tongue of gravity type latch should be in proper alignment with its slot plate.		
10.3	Visually examine window shutters for smooth working and proper locking.		
10.4	Examine visually rolling shutters/sliding doors of vestibule for smooth working.		
11.0	**Windows**		
11.1	Check window-balancing mechanism for proper function.		
11.2	Examine window safety catches for proper engagement in their slots.		
11.3	Check lavatory banjo shutters for damage/missing.		
11.4	Window bars should be provided and fixed in prescribed manner and replaced if damaged.		
11.5	Check the availability of emergency exits in coaches. Examine and attend if necessary.		
12.0	**Interior fittings**		
12.1	Examine laminated panels and mouldings for damage/cracks.		
12.2	Visually inspect amenity fittings, replace if found damaged/deficient.		
12.3	Examine tower bolts of backrests for proper working.		
12.4	Examine ventilation grills for damages.		
12.5	Examine luggage racks/bunks for breakage.		
13.0	**Lavatory and lavatory fittings**		

No.	Details of work to be carried out	Condition/Action	Remarks
13.1	Check lavatory hinge door for proper function		
13.2	Examine lavatory door latches/tower bolts for proper function		
13.3	Examine push cock and flush valve for proper function		
13.4	Check and attend leakage in pipes, pipe fittings and shower roses		
13.5	Clean drain grills and drain holes in bathroom and wash basin if found chocked		
13.6	Check and replace damaged/missing mirrors / shelves / soap dishes		
13.7	Examine squatting pans and foot rest for damages		
	Repairs booked by driver		
	1.		
	2.		
	SSE (ART/ARMV) Name & Sign	SUP Name & Sign	

Note: *Care should be taken not to keep vehicle in stationary condition for a long time. It should be shunted up and down at least once in a week.*

Coach body, Underframe, Bogie, Brake, Brake rigging etc.)
Monthly Schedule-`A'
(On rake at nominated primary depot.)

DPC/DTC/TC No.: Cumulative km.
Date : Cumulative hrs.

S No.	Details of work to be carried out	Condition/Action	Remarks
1.0	Repeat all items of Weekly Schedule		
2.0	Coach		
2.1	Disinfect and spray insecticide at corner and crevices of coaches after washing all coaches.		
2.2	Intensive cleaning of coach		
3.0	**Bogie**		
3.1	Bogie frame		
3.1.1	Examine oil level in side bearer oil-bath and oil-filling cap replenish oil if needed.		
3.2	***Primary Suspension***		
3.2.1	Add specified grade of oil in dashpot.		
3.4	Brake rigging		
3.4.1	Check and attend brake block adjuster.		
3.4.2	Examine and attend brake levers.		
3.4.3	Examine and attend floating lever suspension brackets.		
4.0	Seats		
4.1	Disinfect the seats and frames.		
5.0	Lavatory and lavatory fittings		
5.1	Intensive cleaning of lavatory pans and commode with cleaning agent		
	Repairs booked by driver		
	1.		
	2.		
	SSE (ART/ARMV) Name & Sign	SUP Name & Sign	

Note: Appendix-F of Maintenance Manual for ICF BG Coaches may be referred.

Coach body, Underframe, Bogie, Brake rigging etc.

Quarterly Schedule-`B'

(On rake at nominated primary depot)

DPC/DTC/TC No.: Cumulative km.
Date : Cumulative Hrs.

S No.	Details of work to be carried out	Condition/Action	Remarks
1.0	Repeat all items of Weekly & Monthly Schedule		
2.0	**Under frame**		
2.1	Examine trough floor, turn under and other under frame members from underneath for corrosion.		
3.0	**Bogie**		
4.0	Secondary Suspension		
4.1	Check bolsters clearance		
5.0	Lavatory and lavatory fittings		
6.0	Thorough flushing of water tanks		
	Repairs booked by driver		
	1.		
	2.		
	SSE (ART/ARMV) Name & Sign	SUP Name & Sign	

Note: *Appendix-F of Maintenance Manual for ICF BG Coaches may be referred.*

Coach body, Underframe, Bogie, Brake rigging etc.
IOH / Yearly Schedule

(Sick line at nominated primary depot)

DPC/DTC/TC No.: Cumulative km.
Date : Cumulative Hrs.

No.	Details of work to be carried out	Condition/Action	Sign.	Remarks
1.0	Repeat all items of Quarterly Schedule			
2.0	**Shell**			
2.1	Thoroughly clean and remove dust, rust accumulated at pillars through turn under holes with coir brush and compress air.			
2.2	Examine for corrosion of sole bar and other under frame members with torch light or inspection lamp.			
2.3	Touch up damaged paint both inside and outside.			
2.4	Check roof ventilator for damages.			
3.0	**Bogie**			
3.1	Bogie frame			
3.1.1	Examine condition of wearing piece and wearing plate. Thorough inspection of entire bogie frame along with bogie assemblies/sub-assemblies for any crack, damage, rust/ corrosion, loose/ defective fittings and attend as per specified procedures.			
3.2	**Primary Suspension**			
3.2.1	Check and attend axle guide assembly if necessary.			
3.2.2	Check axle box clearance with gauge.			
3.3	**Bogie to be run out during this Schedule and following should be done:**			
3.3.1	Examine and replace all the brake gear components found deficient/worn out.			
3.3.2	Examine and replace primary and secondary suspension components as required.			
3.3.3	Examine wheel profile and thickness and gauge if in case they appear to be near condemning limit.			
3.3.4	**Ultrasonic testing of all axles**			
4.0	**Brake System**			
4.1	Single Car Testing of the coach			
5.0	**Draw gear**			
5.1	Ensure that wear on screw coupling shackle			

No.	Details of work to be carried out	Condition/Action	Sign.	Remarks
	pins, trunion pins, shackle/link holes and draw hook holes should not exceed 3mm.			
5.2	Ensure that wear at any section on draw hook should not exceed 10mm.			
5.3	External condition and appearance of the draft gear rubber springs are to be checked in every every 24 months i.e. in alternate / 2nd Yearly Schedule for aging and should be replaced by new one if found not satisfactory.			
5.4	The rubber parts of the air-pipe coupling (MR & BP) must be replaced irrespective of their conditions as per POH schedule of Schaku Couplers/OCVs in every 24 months i.e. in alternate / 2nd Yearly Schedule			
6.0	**Buffing gear**			
6.1	Ensure that buffer projection should not be less than 600 mm and more than 635 mm.			
6.2	Inspect buffer plunger false plate for wear and profile.			
7.0	*Running gear*			
7.1	Check with wheel distance gauge for loose or tight wheel (IOH).			
8.0	Flooring			
8.1	Inspect and attend torn/damaged/cracked PVC flooring.			
8.2	Examine and attend opened PVC joints.			
8.3	Examine Drain holes in trough floor for accumulation of water due to clogging if noticed. Inspect affected area for corrosion.			
	Repairs booked by driver			
	1.			
	2.			
	SSE (ART/ARMV) Name & Sign	SUP Name & Sign		

Coach body, Under frame, Bogie, Brake rigging etc.)

POH (48 months)

DPC/DTC/TC No.: Cumulative km.
Date: Cumulative Hrs.

No.	Details of work to be carried out	Condition/Action	Remark
	The following sequence of work should be generally followed during POH of coach:		
1.	Verification of deficiencies.		
2.	Pre-inspection and Lifting of coach body		
3.	Stripping		
4.	Body repair.		
5.	Fitting of Water Tank, Plumbing & Leakage testing		
6.	Repair of internal panels		
7.	Fitment of shutters		
8.	Fitment of doors		
9.	Fitment of berths and seats		
10.	Repair, maintenance & fitment of draw and buffing gears		
11.	Painting and finishing		
12.	Repair and maintenance of bogie		
13.	Repair and maintenance of brake system		
14.	Repair and maintenance of rolling gear		
15.	Lowering of coach body on bogies.		
16.	Brake Testing		
17.	Testing of branch wiring		
18.	Testing of electrical equipment		
19.	Final Inspection & Dispatch		
	Repairs advised by Shed in Pre-Shopping report.		

NOTE: POH of coaches to be done as per the details given in latest version of the following Maintenance Manuals:

i) Maintenance Manual for BG coaches of ICF design (2002) issued by IRCAMTECH, Gwalior.

ii) Maintenance Manual for AC/DC EMU & MEMU Bogie and under gear Manual No. CMI-K001 (April, 2000) issued by RDSO, LKO.

iii) CAMTECH maintenance manual [Maintenance practice & Manual for POH of Schaku couplers (CAMTECH/M/PROJ/2019-20 mp8/1.0)] for Schaku coupler.

iv) For maintenance of bio toilets in HS SPART, clause no. 5.6 of chapter 9 of compendium on IR-DRDO bio toilets issued by CAMTECH/GWL may be referred for schedule maintenance of bio toilets

v) CAMTECH/GWL document no. IRCAMTECH/GWL/MECH/ART/1.0 for "Maintenance and operation Manual for 140T CRANES, ARTs & ARMEs" may also be referred.