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INDIAN RAILWAYS TRACK MACHINE TRAINING CENTRE,

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FROM EDITOR'S DESK

Dear Readers,

It is a matter of immense pleasure that IRTMTC has taken initiative to publish the Digest for Track Machine users of Railway after a gap of nearly 15 years. IRTMTC is the knowledge bank and main key for knowledge dissemination to the root level staff of Track Machine. Track Machinemen are having a lot challenges for quick attention of troubles and timely clearance of traffic block. Hope this Digest will be useful to the field staffs who are working on machine. Thanks to those who have provided technical articles. This Digest is before you to update field aspects of maintenance, moreover is expected that more Railway staff will contribute articles to make it epitome. This herculean task in short span of time by IRTMTC staff is appreciable. Helen Keller rightly says that The world is moved along not only by the mighty shoves of its heroes, but also by the aggregate of the tiny pushes of each honest worker. I heartly wish to all readers and hope this Digest will reach out the technical need.

Regards
Sanjay Kumar Asthana
Principal, IRTMTC

The views expressed by the authors of technical papers in this digest are not necessarily the views of IRTMTC or North Central Railways

Various field maintenance aspects of Tamping unit for Trouble free service life

Sanjay Kumar Asthana
Principal, IRTMTC

Tamping units are the fastest moving assembly of a tamping machine hence operating reliability of the tamping units is a major contributor for cost-efficient maintenance of the track. Putting right maintenance input at right stage may lead to prevention of failure and vice versa. Since Tamping units are continuously subjected to the toughest loads; highest stress and fast tamping cycles. This operating condition determines frequent wear behavior or service life. To maintain the required quality of work and trouble free availability of machine, RDSO has documented a comprehensive program for by means of various schedule maintenance. But based on practical experience of field, some additional items are being added for enhancement of service life of Tamping units. Following items are essential to put attention in day to day working of Tamping units. Various key steps in operation of tamping unit are described below for enhancing the life and ensuring trouble free service during use of machine on railway track.

1. Excessive sound

Excessive sound in tamping unit is the pre indication of initiation of metallic failure of components. It may be due to loose components. Prime cause of excessive roaring sound is lack of counter pressure in tamping unit system. Immediate action is to be taken for arresting this sound otherwise tamping unit will convert in beyond repair status. Cause of sound should be attended for in time to prevent propagation. Accumulator pressure, loose Teflon washer, plays in 35mm bore of female squeezing cylinder, restriction in hydraulic supply of tamping unit should be attended and by one to find out the reason for this.

2. Excessive Frequency

Excessive frequency is also one of the main root causes for failure generation and reduction of service life of tamping unit. RPM of tamping unit is to be checked regularly with tachometer as advised in following table for in time attention. Normally tamping units have to run at 2100 rpm or 35 Hzs but it has been noticed that this rated RPM increases due to excessive supply of pressurized fluid to vibration motors. Increase in RPM will initiate excessive wear and tear which in turn will convert tamping unit as beyond repair. Hence in time attention and continuous watch on RPM is the key to prevent damage. A tachometer is to be used to measure the RPM as described in table.

3. Leakage from Radial Seal

Leakage in radial seal is also one of the key elements for premature development of play in tamping arms and further will contribute to reduction in tamping unit life. We should keep watch on this leakage of radial seal. Once leakage initiated, oil will be drained out through it being an easy passage. Lubrication circuit is connected in series and leakage from one radial seal may result in dry running of other Tamping arms. Due to hunger of oil, P.B. Bushes of dry arm assembly will be heated up and leading to wear tears as well as ovality in P.B. Bushes for centre pin assembly. Once play developed in centre arm bush and sleeves, it will create various premature failures of other components of tamping unit due to excessive vibrations and undulations. Filling or topping up of oil is not the solution for this incidence but immediately leakage of radial seal should be attended. If leakage is not able to attend at site, lubrication connection of affected arm should be made parallel to prevent dryness in other arms.

4. Improper clearances

Excessive clearances also contribute in development of unwanted vibrations in assembly. A keen watch in rotating assembly is essential to find out the excessive vibrations if any
Lateral play is to be checked at regular interval as prescribed in following table along with checking of tamping arms.

5. Overheating

Overheating can become a severe problem for tamping unit. Excessive temperatures can damage internal systems and in the most extreme cases resulted in bearing seizure.

If Tamping unit regularly get too hot, inner race over vibration shaft get expanded and rotates over it's own seat. Rotation of inner race creates damage to vibration shaft assembly. Reason of overheating is due to lack of greasing, axial error in assembly or excessive interference between relative components of vibration shaft assembly. Regular check-up of temperature with non contact thermometer is the main key to find out the excessive temperature generation.

6. Wear tear

In a fast moving assembly wear and tear in moving component has adverse affect on trouble free service life. Internal wear is to be identified in time and necessary maintenance input is equally important for prevention of further propagation and major damage. In time attention for replacements of Teflon washers, rubber washer is essential before actual wear tear. Loose components in assembly will create premature were tear in fast moving assembly. Visual examination of all external parts for mutual play, rubbing and leakage etc must be done on daily basis to see the initiation of wear if any.

7. Importance of in time attention

In time maintenance after observation is extremely important. If Tamping unit is kept on working in defective condition or with minor play/were tear it will enhance the defect rapidly and tamping unit may result in beyond repair status. Hence in time attention and observation are equally important. Delay in attention is not acceptable in any case for smooth running of tamping unit.

8. Sound Level

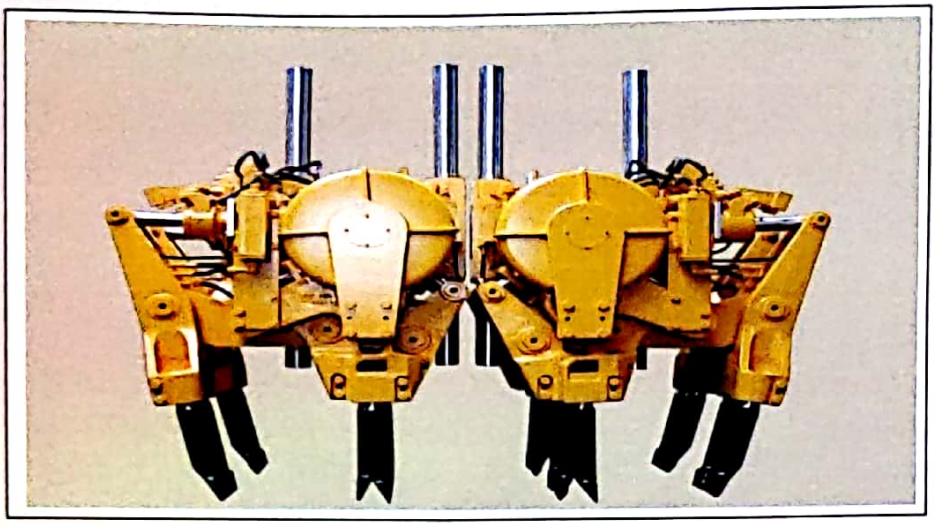
Generation of excessive sound is undesirable and causes premature failure of tamping unit. Even a loose nut may enhance the sound by more than 5 db. Loose washers, nut, bolts etc is to be attended immediately in preventive schedule maintenance. Regular checking of sound level with DB meter at described interval is essential for observation and targeting the defect well in time. We can find out the actual location of defect by measurement of sound over various locations in tamping unit.

If roaring sound is observed, we should immediately check counter pressure of the system followed by gas pressure of accumulator. Dropping of counter pressure will create mechanical vibrations and unwanted excessive sounds over vibration shaft assembly

8. Proper quality of spares.

Quality of spares has major contribution in up gradation of tamping unit life. Items should be manufactured as per metallurgy mentioned in specification along with manufacturing process and heat- treatment. Different components of tamping unit have the requirement of different types of physical and chemical properties including strength against wear and impact. Forged components of high carbon alloy with proper heat treatment cannot be replaced with inferior alloy as per requirement of assembly which are already defined in RDSO specifications. Selective matching of components to achieve residual clearance in rotating vibration shaft assembly should also be ensured during repairs.

For effective maintenance of tamping unit, following items of routine maintenance is tabulated along with RDSO specification. Additional items other than RDSO are included on the basis of practical aspects and criticality of tamping unit for effective monitoring and attention



Daily Maintenance (Schedule-I)

S.N.	Maintenance Instructions
1.	Clean the tamping unit
2.	Check and fill the reservoir for lubrication of tamping arm bearing (55mm pin) up to the mark.
3.	Check and fill the reservoir for lubrication of vibration shaftbearings up to the mark.
4.	Check and top up the wick lubricator for lubrication of guidecolumns.
5.	Greasing of connecting rod bearing (35mm pin) and vibrationshaft bearing is to be done after every 2-3 hours of working.
6.	Check tightness and infringement of tamping tools with one another (LHS).
7.	Check tightness and infringement of tamping tools with oneanother (RHS).
8. **	Oil level in bearing housing should be up to mark i.e. 10to 15 mm below the centre line of motor. If less, top up with appropriate oil up to mark. Do not fill extra oil which may lead to damage of main oil seal.
9. **	Oil level should be monitored for lubrication of radial seals. Top up if required. Breather should also be checked for smooth continuity of oil.
10. **	Check play in Tyflon washers, attend if reqd.
11. **	Check longitudinal play in 35mm bore of female squeezingcylinder, attend if reqd.
12. **	Check any leakage from auto greasing system
13. **	Check any leakage from hydraulic cylinders and system of tamping unit.
14. **	Check play in tamping arm assembly.

50 hrs Maintenance (Schedule-II)

S.N.	Maintenance Instructions
1.	Check tightness of shoe plate bolts of guide column (RHS).
2.	Check tightness of shoe plate bolts of guide column (RHS).
3.	Check squeezing cylinder cover plate bolts for tightness (LHS).
4.	Check squeezing cylinder cover plate bolts for tightness (RHS).
5.	Check tamping unit cylinder holding bracket bolts for tightness (LHS).
6.	Check tamping unit locking device (LHS).
7.	Check tamping unit locking device (RHS).
8.	Check tamping unit cylinder holding bracket bolts for tightness(RHS).
9.	Check the nuts of 55 mm and 35 mm pin for tightness (LHS).
10.	Check the nuts of 55 mm and 35 mm pin for tightness (RHS).
11.**	Check connection of proportional valve connector.
12.**	RPM should be checked by using contact type tachometer. Thisshould be within the range of 2000 to 2100 Rev/min.
13.**	Sound of tamping unit should be recorded. It should be below 100 db. Abnormal sound at various locations should also bechecked for finding the failure initiation in sub assembly/parts.
14.**	Teflon washers should be checked and provided if required.
15.**	P. B. washer should be checked for play, tight the nut, change the washers if required in 60 mm axle bolts of UNIMAT tamping unit.
16.**	Clutch coupling should be checked for any damage of dampingring or development of play between gear ring and part clutch.

17.**	Accumulator for Counter pressure should be checked for its pressure setting by keep watch on pressure dropping afterswitching off the hyd. system.
18.**	Check the stroke of TT cylinder regularly. Adjust the stroke if notfound within limit i.e. 190mm to 200mm.
19.**	Check tightness of guide column plate bolt and apply grease onguide column plate for easy movement.
20.**	Check mounting bolt of vibration motor.
21.**	During tamping, tamping tool should be inserted at the center ofsleeper to avoid hitting of sleepers and tools.
22.**	During locking of tamping unit check pneumatic cylinder for functioning properly.

100 hrs Maintenance (Schedule-III)

S.N.	Maintenance Instructions
1. **	Chord wire of depth transducer should be checked properlywhile maintenance.
2 **	Generally T/U Depth Transducer get damaged during block due to breaking of spring. Hence at least one spare calibrated T/Udepth transducer should be available on machine.
3**	Leakage from Radial seal over centre pin assembly should bechecked and attended.
4**	Vibration shaft assembly should be checked thoroughly for any looseness of cover plate bolts, bearing housing bolts etc.
5**	Rubber washers in tool tilting cylinder of UNIMAT Tamping unitshould be done.

200 hrs Maintenance (IV)

S.N.	Maintenance Instructions
1.	Check calibration of tamping unit depth transducer.
2**	Play in tamping arms should be checked properly and attention on condition basis is to be given
3**	Pressure Checking and refilling of Gas of accumulator is to beensured.
4**	Lateral play over vibration shaft assembly should be checked and attended id required. Noise level, play etc should be checked for need base attention.
5**	Connection of tamping unit up down cylinder and round hard lock nut should be checked by disassembly of cover plates.
6**	Bolts of Counter weight should be replaced if found loose.

1000 hrs Maintenance (Schedule-V)

S.N.	Maintenance Instructions
1.	Change oil of Vibration shaft main bearing.
2.	Inspection of complete Tamping unit for required attention to enhance service life.
3. **	Attention of tamping arm assembly for following work A. Provision of oversize steel sleeve if play is observed in centre pin assembly. Ovality is to be removed by reamer for making the size 70.3 +/-.01 mm. All other parts like Radial seal, pressure disc, connecting rod bolts should be replaced on condition basis. B. Vibration shaft assembly shall be checked and if there is a lateral play between bearings by more than .5 mm, the same should be disassembled and to be reassembled with proper spacer ring to eliminate excessive play. All bolts of cover plates, bearing housing shall also be retightened at rated torque. C. Axle bolts, P.B. Spacer of arm assembly shall be replaced in UNIMAT Tamping unit. D. All other maintenance of spacing, tyflon washer, part clutch, damping ring etc should also be carried outwhile reassembling of vibration shaft assembly. E. Smallest squeezing cylinders in Tamping unit of tamping express are to be dismantled for checking of piston screw. Internal leakage of squeezing cylinders should also be checked before reassembly

Other desirable spares availability for tamping Units

1. Carbidetampingtoolshouldbeprovidedforlifeextensionoftampingunit.
2. Atleastonesparehosesetshouldbeavailableonmachine.
3. Allhoseconnectionsshouldbeproperlytightened.
4. Sparehydraulicmale/femaledummyshouldbeavailableonmachine.

HIGH OUTPUT BALLAST CLEANING MACHINE (RM 900)

Ajay Patel
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CHARACTERISTIC FEATURES OF MACHINE

The Plasser India high output ballast cleaning machine RM 900 is a fourteen axle, diesel-hydraulic, self-propelled auxiliary permanent-way vehicle with hydrostatic drive for plain track with supply of new ballast.
The two-part machine consists of screen wagon & excavation machine.
This machine has been specifically adapted for operation on Indian rail infrastructure.
The RM 900 excavates the ballast bed material from underneath the sleepers by means of a guided scraper chain type excavation unit. This excavation chain is guided under the track skeleton by a rigid cutter bar to provide an exact plain cut.
The material coming from the excavation chain is transferred by several conveyor belts to the screening units positioned on the screen wagon in front of the excavation machine holding the cutter chain. The 2 screening units, consisting of 3 decks of screens each clean the ballast material.
The cleaned material is moved to the ballast distribution unit directly behind the excavation chain by conveyor belts and is inserted into the track. The ballast stones are distributed over the cross section of the track skeleton by swivel type conveyor belts and plough shields. This feature enables to insert cleaned ballast material within the confines of the RM 900 during cleaning operation. Spoil material is transported form the screen car via conveyor belts to the front end of the ballast cleaner.
The design of the RM 900 allows the transfer of spoil material to MFS standing in front of the ballast cleaner.

ADVANTAGES OF RM900

Self-Propelled with High-Speed Cutting Chain

Longer Conveyor & Two Screen Unit for High Output

Track Stabilizer with Lining, Lifting and Ballast Profiling Unit

Individual Hydraulics for Separate parts

Difference from Existing RM80-92U

RM 80-92U	RM900
1. Excavating/Screening Capacity- 550 Cubic Meter/Hr 2. Screening Unit- 1 Nos 3. Conveyors- 4 4. No Track Stabilizer 5. Lifting & Lining Unit- 1 6. Fixed Plough 7. Two Cabin 8. Screen Unit Inclination 9. No Automatic Control of conveyors 10. Single Motor-Powered Chain 11. Two Air Cooled Engine 12.Shovel Size-250mm	1. Excavating/Screening Capacity- 900 Cubic Meter/ Hr 2. Screening Unit- 2 Nos 3. Conveyors- 11 4. Track Stabilizer 5. Lifting & Lining Unit-2 6. Plough Unit with Profiling Unit 7. Four no's of Cabin 8. Complete Frame Inclination 9. Automatic Control of conveyors 10. Dual Motor-Powered Chain 11. Two Water Cooled Engine 12. Shovel Size-350mm

TECHNICAL DATA

GENERAL DATA

Machine Type	RM 900
Outline drawing	RE00.055.01

DIMENSIONS

Overall length	77370 mm
Overall height max.	4255 mm
Overall width	3204 mm

UNDERCARRIAGE

Number of wheel sets	14
Bogie 1 to bogie 2	10500 mm
Bogie 2 to bogie 3	10000 mm
Bogie 3 to bogie 4	5270 mm
Bogie 4 to bogie 5	23800 mm
Bogie 5 to bogie 6	5150 mm
Bogie 6 to bogie 7	16000 mm
Bogie base	1830 mm
Wheel diameter Ø,	new 920 mm
Track gauge	1676 mm

WEIGHTS

Total weight (with fluids) 284 t

FILLING QUANTITIES

Diesel fuel	4500 l (ATW1) + 5220 l (ATW2) = 9720 l
Hydraulic oil	2200 l (SIM) + 2400 l (AHM) = 4600 l

ENGINE

Pieces	2
Make	Caterpillar
Type	C-27/ACERT/OESSE/EL/783KW
Rated power	783 KW at 1900 min-1 each

DRIVING UNITS

Transmission model	Hydrostatic
Drive bogies	Bogies 1, 2, 6, 7

ELECTRICAL POWER SUPPLY

GEN-SET 1 piece CAT 65KVA, 400/230VAC

AIR SYSTEM

Working pressure 8.7-10 bar

Hy. Powered air compressor (SIM) 1 piece, 1795 l/min max

El. powered air compressor (AHM) 1 piece, 1750 l/min max

Air driers 4 pieces 100W each

Total no. of Conveyor belts 11

BRAKES

Direct-acting brake units (STK-749) 3 pieces electro-pneumatic brake actuated via a 5-position tumbler brake pressure 3,8 bar

Indirect-acting brake valves 3 pieces KE

actuated via driver's brake valves in cabins 1 & 4

brake pressure 3,8 bar

BP brake pipe (HL) filling pressure 5 bar

Parking brake acting on bogies 1, 2, 4, 5 via spring-loaded brake cylinders

Emergency brake Pull handles incabins

Brake blocks 1 brake block per wheel

QUANTITIES OF PUMPS AND MOTORS IN RM 900

ATW1 Consists:

One pump drive gear box in which several pumps are attached
Single pump - nil
Double pump – 7 no's
Triple pump – 2 no's
Filtration unit – 1 no's
Emergency pump – 1 no's
Gearbox radiator – 1 no's
Total pumps – 12 no's

ATW2 Consists:

One pump drive gear box in which several pumps are attached
Single pump – 2 no's
Double pump – 5 no's
Triple pump – 3 no's
Gearbox radiator – 1 no's
Emergency pump – 1 no's
Filtration unit -1 no's
Total pumps – 13 no's

MOTORS USED

ATW 1

Belt B2 – 2 no's
Belt b3 – 2 no's
AXLE MOTOR – 4 no's
Pump motor combination – 4 no's
Hydraulic cooler – 1 no's
Emergency pump – 1 no's
Total – 14 no's

SW

SCREEN MOTOR – 2 no's
BELT B1 – 2 no's
BELT C1 L – 1 no's
BELT C1 R – 1 no's
BELT A2 – 2 no's
BELT A3 – 2 no's
Total – 10 no's

AHM

CHAIN TROUGH – 2 no's
CHAIN COOLER MOTOR – 1 no's
Belt A1 – 3 no's
Belt C2 – 2 no's
Belt C3 L – 1 no's
BELT C3 R – 1 no's
Broom unit – 4 no's
DGS unit – 1 no's
Total – 15 no's

ATW2

Axle motor -4 no's
Pump motor combination – 4 no's
Hydraulic cooler -1 no's
Emergency pump -1 no's
Total no's – 10

Engine Specifications (C-27/ACERT/OESSE/EL/783KW)

Power Rating		
MinimumPower	597bkW	800bhp
MaximumPower	783bkW	1050bhp
RatedSpeed	1800rpm	
General		
EngineConfiguration	V-12,4-Stroke-CycleDiesel	
Bore	137.2mm(5.4in)	
Stroke	152.4mm(6in)	
Displacement	27L(1649.5in³)	
Aspiration	TwinTurbocharged-Aftercooled(TTA)	
Firing Order	1-10-9-6-5-12-11-4-3-8-7-2	
CompressionRatio	16.0:1	
CombustionSystem	DirectInjection	
Rotation(fromflywheelend)	Counterclockwise	
CoolingSystemCapacity	67.9L	
LubeSystem(refill)	68L	
EngineDimensions(Approximate.Finaldimensionsdependentonselected options)		
Length	1874mm(73.8in)	
Width	1600mm(63in)	
Height	1370mm(53.9in)	
Weight-NetDry(BasicOperatingEngineWithout Optional Attachments)	3004kg(6625lb)	

MACHINE CONSISTS OF 4 SECTIONS

ATW1 (FRONT POWER WAGON)

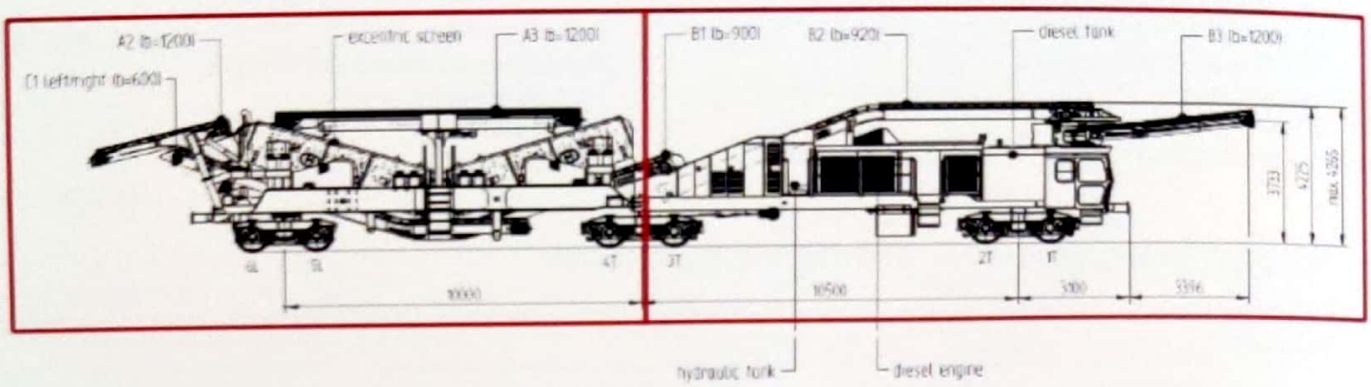
SW (SCREENING WAGON)

AHM (EXCAVATION & BALLAST RETURN UNIT

ATW2 (REAR POWER WAGON & CREW CABIN

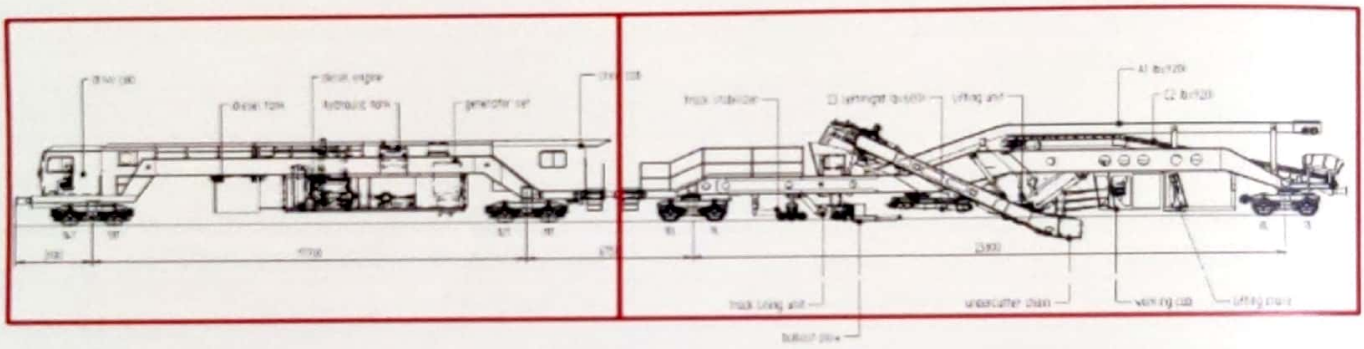
SW: 63

ATW1: 25

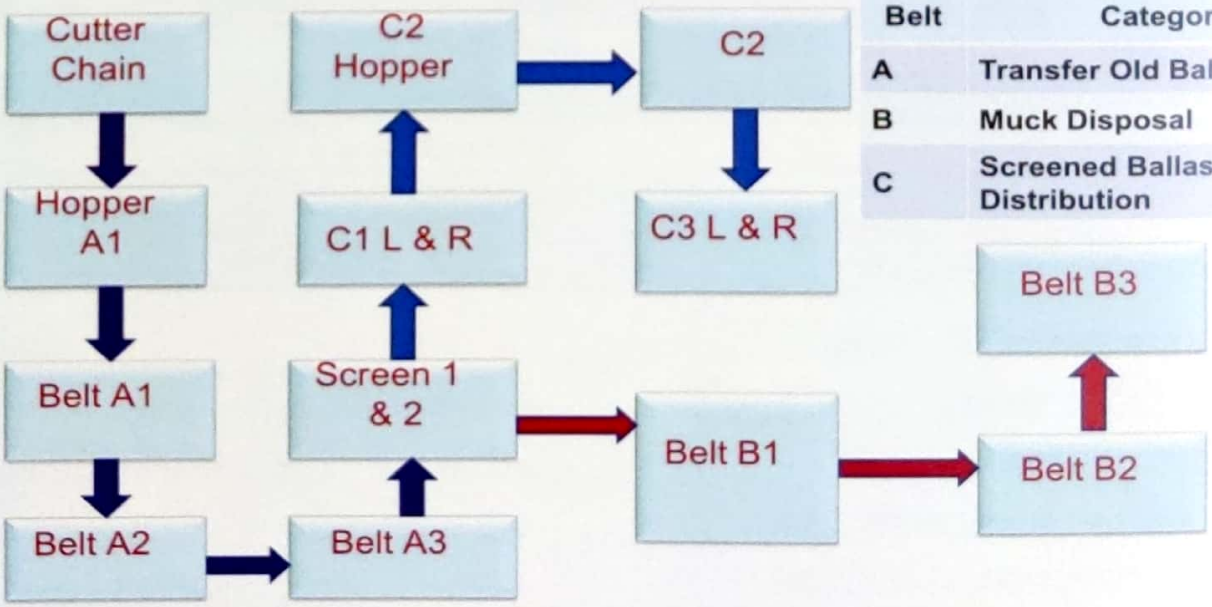


ATW2: 128

AHM: 75



Working Flowchart - Total Cleaning (Mode)



Belt	Category
A	Transfer Old Ballast
B	Muck Disposal
C	Screened Ballast Distribution

COMPUTER MEASUREMENT SYSTEM - CMS

Rajesh Dwivedi
Instructor, IRTMTC

- CMS means **C**omputer **M**easurement**S**ystem.
- It is the digital representation of previous analog system. The analogue measurement system, which was in use up to now in old tamping machines, is now replaced by a new combined digital / analogue system in the new tamping machines like DTE, UNI-4S, and MFI etc.
- Nowadays everything is being digitalized as digital technology is increasingly making machines smarter.
- CMS is a digitalised method of processing data which are received from various inputs.
- In old tamping machines, all the PCBs are anlog type (called as OPAMP based PCBs) but In new Tamping machines these OPAMP based PCBs are now replaced by microcontroler based PCBs.

The main controllers of CMS are as follows –

U Controllerfor pendulum inputs and cross-level tasks.

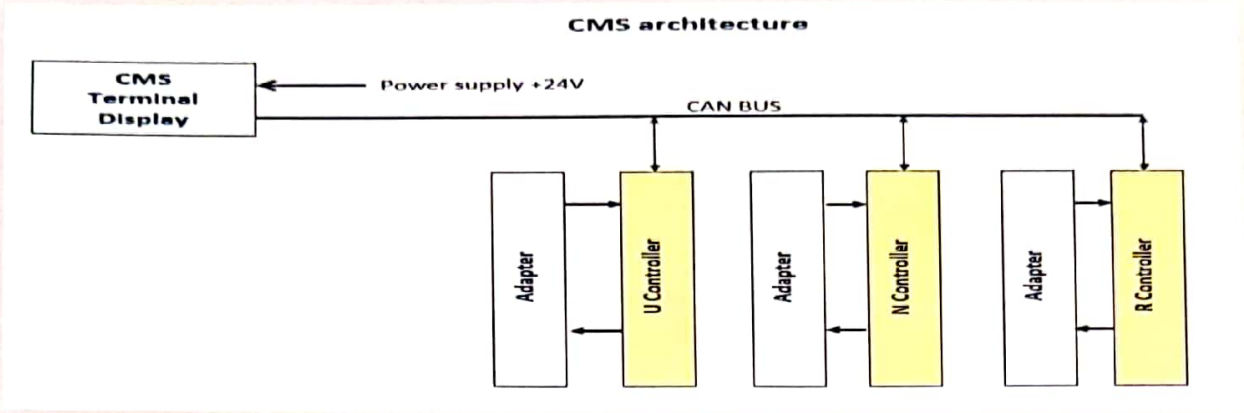
N Controller for levelling system and track lifting control

R Controller for lining system and track alignment control.

- **UController -** for pendulum inputs and cross-level tasks.
- **NController** – for levelling system and track lifting control. The main task of **N-controller** is to operate the servo-valve of levelling system i.e., LH & RH servo valve of levelling control system. It can be treated as the brain for levelling control system i.e. the amount of lift required for both LH & RH rail is decided by this microcontroller.

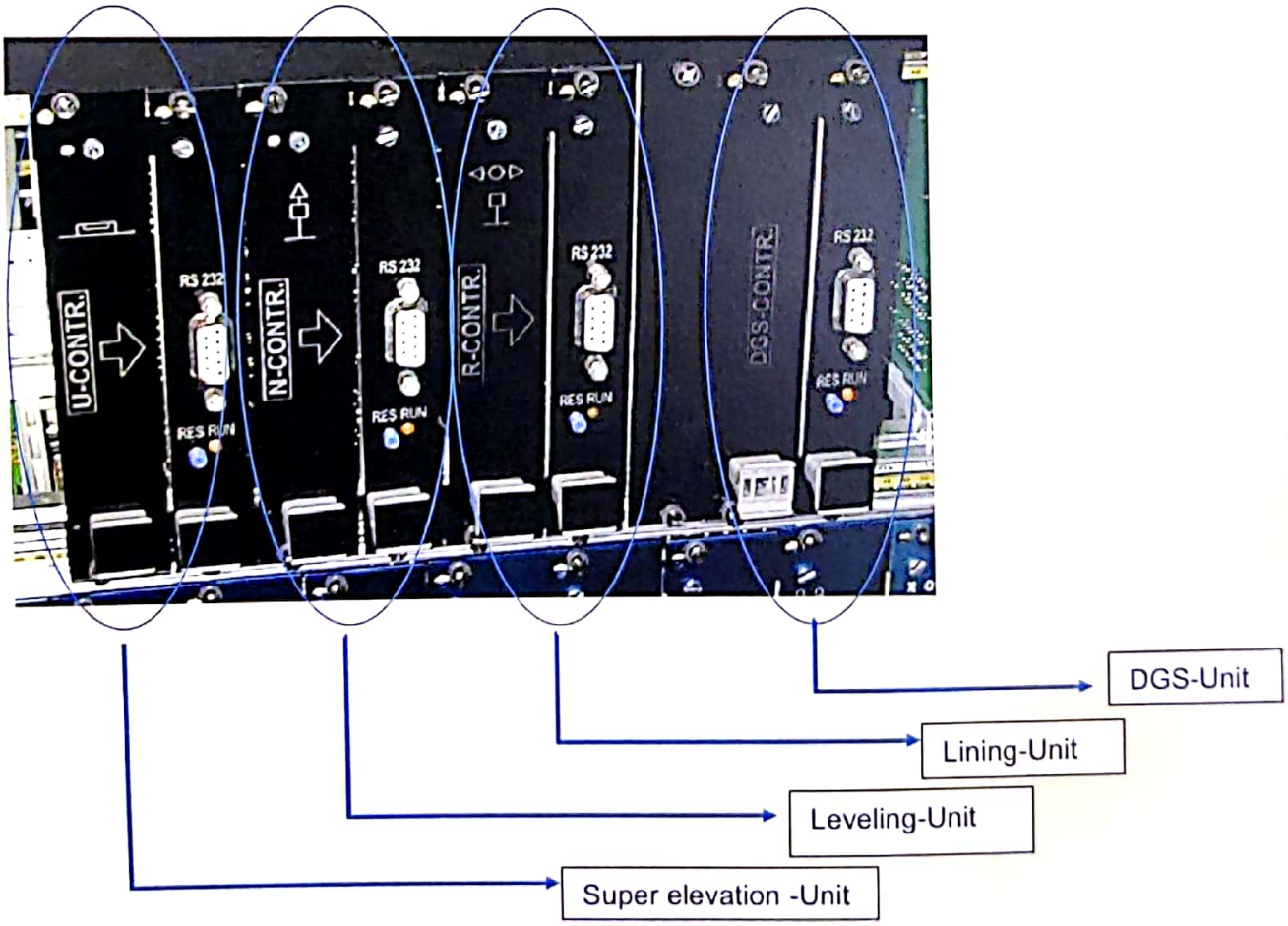
- **RController -** for lining system and track alignment control. The main task of **R-controller** is to operate the servo-valve of lining system. It can be treated as the brain for lining control system i.e. the amount of lining required for the rail is decided by this microcontroller.

- Hence CMS is also called as **Servo control** as it is used to control the servo valve.

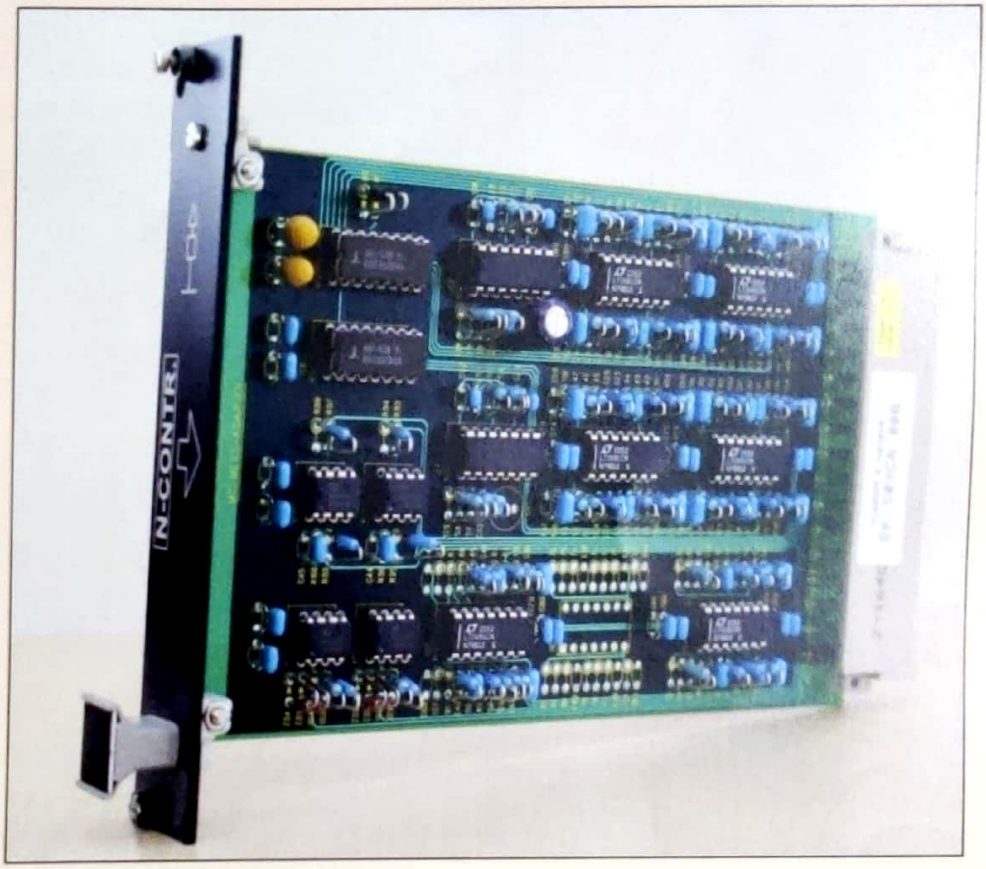


- The CMS-System is installed centrally in the front cabin in the B4. Each measuring system consists of two circuit boards (adapter board & controller board).
- The communication between the boards and the display was done with a Can-Bus.This makes the system immune to interference. All values can be read on a central display.

Structure of the CMS-system

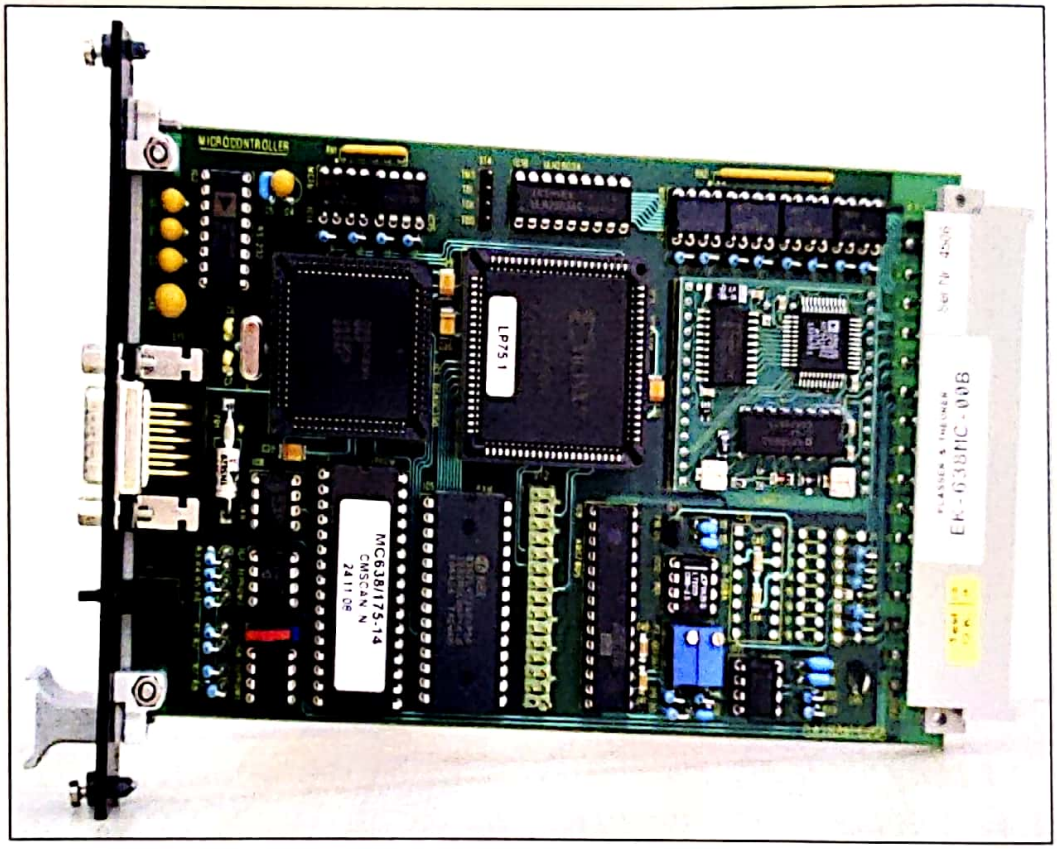


Adapters



- The CMS consist of three analogue adapter boards.
- It amplifies analogue signals received from various analogue inputs & sends to the microcontroller & vice versa.
- Analogue inputs include measuring equipments (Transducers & pendulums), input potentiometers, ALC& correction value potentiometers.
- The level adapter card connects all transducer and potentiometers to the levelling system. the front view and the internal component view of the level adapter card is shown.

Microcontrollers

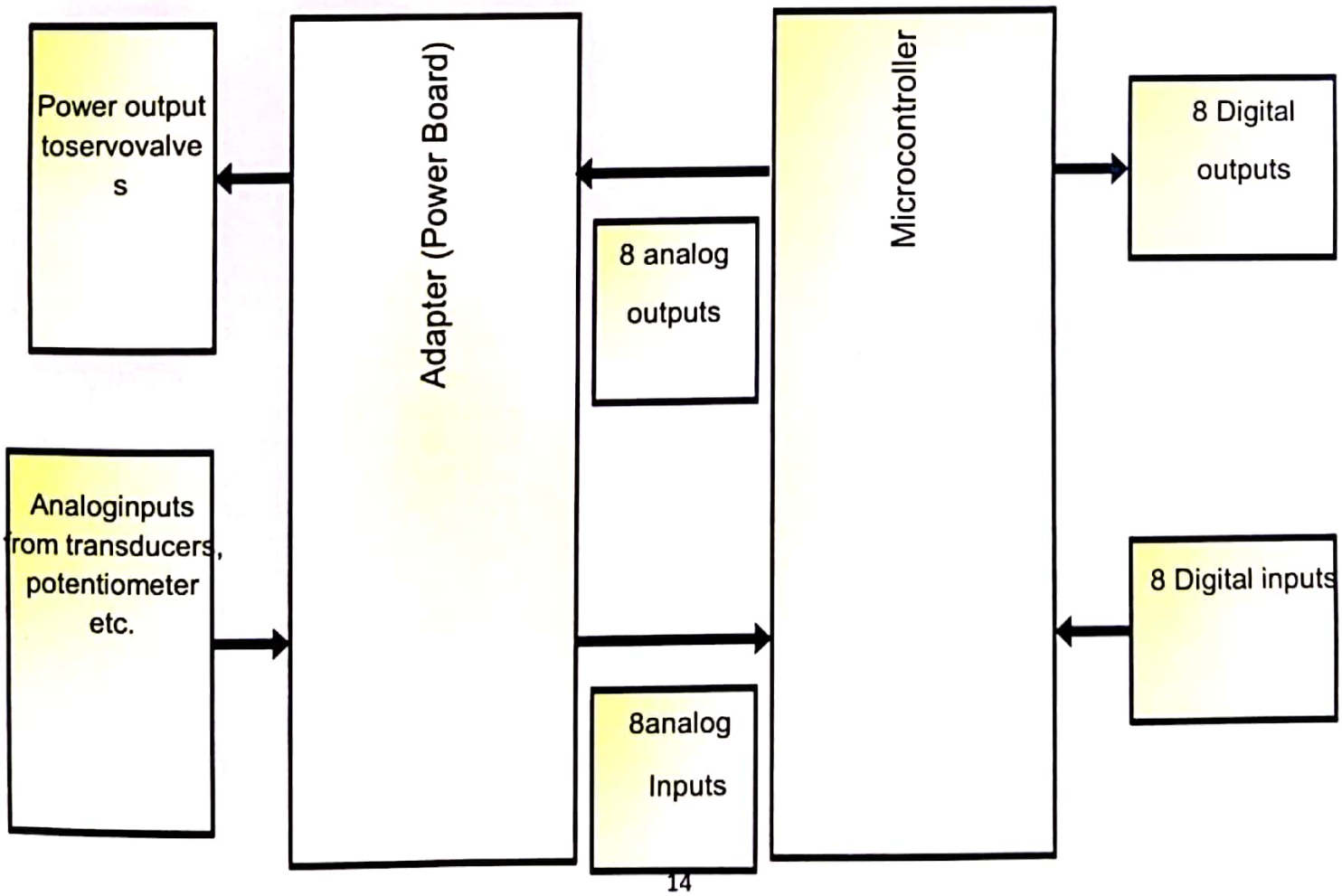


- The CMS consist of three digital microcontroller boards. They can be treated as the brain of respective measuring system i.e. microcontroller board is the head ofthe respective measuring system.
- The analog signal from various tranceducers and potentiometers are first recieved through adapter board (PCB). The adapter board consists of many amplifiers (OPAMP ICs) to amplyfy these incoming anolog signals and filter out the noise and then the signal is directed to microcontroller board.
- The microcontroller board has both ADC & DAC. First the incoming signal of adapter board is converted into digital signal as microcontroller can't understand the analog nature of signal. Once it is converted into digital, now it will be processed by microcontroller digitally and then again converted into analog signal by DAC.
- Now this analog signal will again be given to adapter board. The output analog voltage of the microcontroller is first converted into corresponding impressed current by adapter board

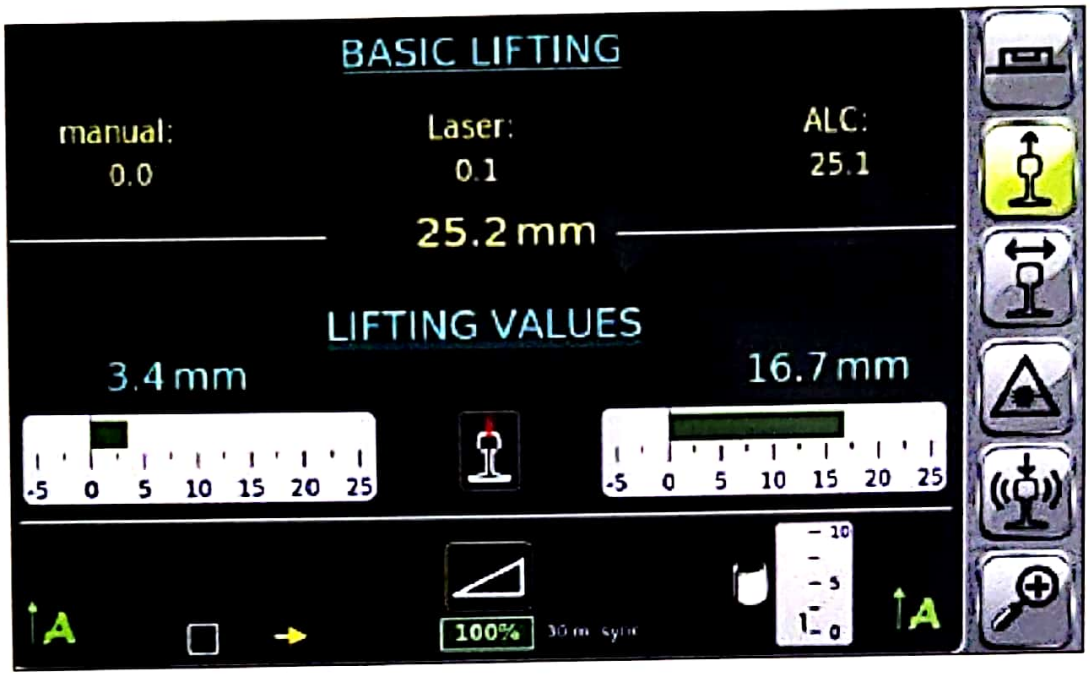
and then used to control associated servo valves.

- Microcontroller board Contains the software which are decisive for entire process.
- Equipped with 8 analogue outputs.
- The processor used works at 40Mhz.
- All MC's are connected to the control terminal & to one another via a CAN bus.
- Only the measurement set-up and distances are entered via the operator's terminal. Reductions of defects, differences in versine etc., are automatically calculated by the respective controllers.
- The microcontroller board is the head of the respective measuring system which is shown.

SIGNAL FLOW DIAGRAM OF CMS



LEVELLING DISPLAY (N- CONTROLLER) GENERAL VIEW:



- In the very first line of the levelling display, basic lifting (General lift) is shown digitally.

- The total basic lifting value consists of the following parts:

  (+=lifting)

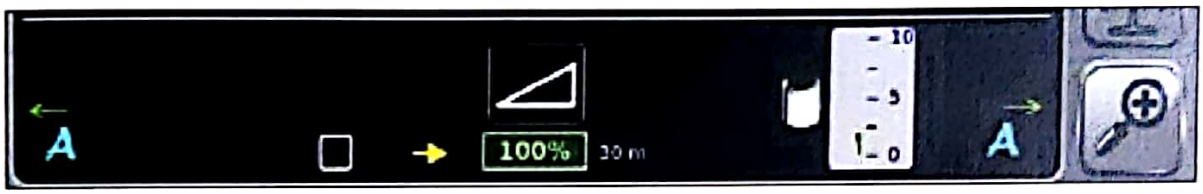
  a) Manual input (pot.) (here 0.0 mm)
  b) Laser controller target value (here 0.1 mm)
  c) ALC target value (here 25.1 mm)

- Total Basic lifting value is sum of Manual, Laser and ALC i.e 0.0 +0.1+25.1 =25.2 mm.
- (The values indicated do not consider the reduction factor for ramps!)
- The availability of a laser and an ALC system can be set in service mode. If both are off, their inputs will not be read and the display shows only the manual-mode basic lifting value.

Then both L. H/R.H lifting values can be seen digitally in the CMS screen as shown above (**3.4 & 16.7mm**).
Both L. H/R.H lifting values are the difference between target lifting value and the leveling transducer value (including manual correction 1) in the working position.

(Except for the ramps, this corresponds to the readings of the l. h. and r. h. leveling instruments.)

The lifting symbol with the central red line indicates that the lifting value limiting system is on. Pressing this symbol turns it off.



Furthermore, the current ramp condition, the set ramp length and the current position within the ramp (in %) are displayed.

The servo amplification potentiometer is displayed to the right of the ramp values. On its left the "levelling system enabling" signal and the running direction are shown.

If "asynchronous" has been set, the own ramp lengths are used. If not, the ramp lengths transferred via CAN bus from the R controller will be used (SYNC).

LINING DISPLAY (R-CONTROLLER) GENERAL VIEW

In the first line of the display, the total value of **Versine, both Manual and ALC value** are indicated at the top in the display of the R-controller as shown above. If a satellite is provided, this sum is always converted to the actual satellite position.

Then in the second line of the display, the front lining adjustment (slew) is indicated, (both Manual and ALC). The **lining displacement values** indicated here are related to front chord end, and therefore have to be internally converted to the position of the lining value transducer.

Then finally total **lining value is** indicated digitally (here 11.1mm) as well as in the scale form. It is calculated from the converted lining displacement value (Σ), the (corrected) target versine, the manual correction value, the super elevation correction in curves and the current value of the lining value transducer. It is valid for the working position (+= r. h. lining: Symbol).

By pressing the limit monitoring icon next to the chart, this feature can be turned off. A green arrow indicates this fact.

The bottom line shows information on the ramp. On the figure shown the ramp length is 30 m long, the machine having covered 100% of the ramp; this means that the lining value is not suppressed.

The **servo amplification potentiometer** is displayed to the

right of the ramp values. On its left the "lining system enabling" signal and the running direction are shown.

The last line of the display indicate For manual-control lining icons . In automatic mode an A is displayed instead of an M.

Cross-level displays (U-Controller) General View

Cross-level displays shows following parameters digitally:-

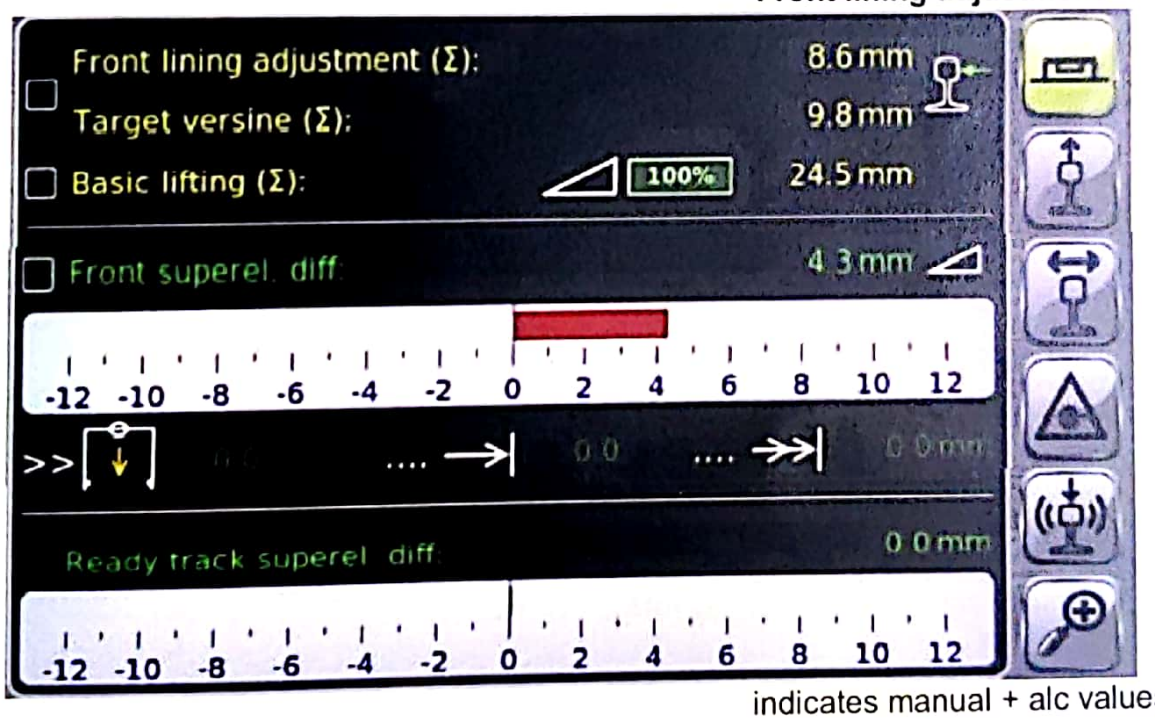
1) Total lining correction value, front (slew value).
2) Total lining versine in the working position.
3) Total basic lifting value, front.
4) Super elevation difference, front.

The difference is also shown for the following positions (delayed by a distance):

a) Working position
b) Rear of the tamping machine
c) If applicable, ready track behind the DTS

5) Super elevation difference behind the tamping machine.

Front lining adjustment



indicates manual + alc values.
Target versine indicates manual + alc values.

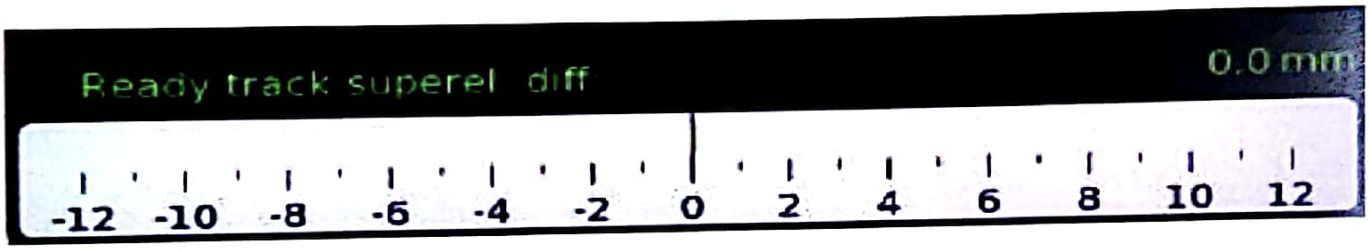
Basic lifting indicates manual + alc values.

The **rail with arrow** indicates the datum rail chosen.
The colour shading indicates the error in track either left or right

(front pendulum).

% indicates the amount of ramp taking place.

Its green up-to 1.5 mm, red from 1.5 to 12 mm, and more than 12mm it changes to pale red. It is also indicated in numerical in the top right corner



The colour shading indicates the error in track either left or right (rear pendulum).

ADVANTAGES OF CMS

The present model is android based and fully touch screen system.

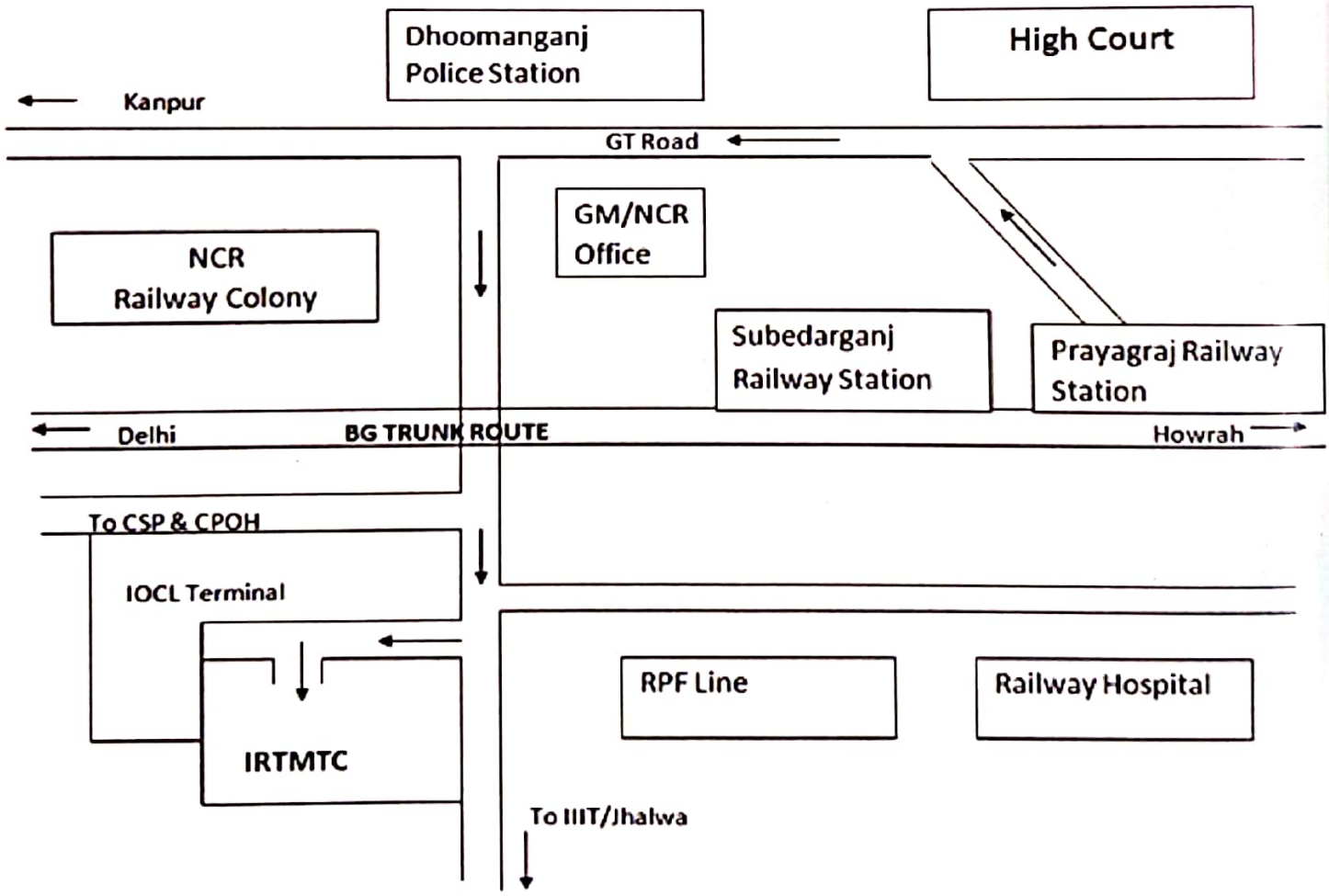
The credibility of this system is very high.

Previous analog plates were prone to problem due to large number of potentiometers used. CMS system indicates to stop work if any input or any measuring device fails. Track is not disturbed. It also indicates which input is malfunctioning.
All the real time track parameters can be seen digitally in the display screen of the CMS.
CMS displays real time track parameter data so that actual correction done can be evaluated which is one of the main advantage of CMS.

Effective Hour Progress of various Track Machine working in Indian Railways

M/c Type	Minimum Block (hr.) (min)	Output / eff. Hr.
DUO	2.50 (150 min)	800 m
CSM	2.50 (150 min)	1200 m
TEX	2.50 (150 min)	1600 m
UNIMAT	2.50* (150 min)	1 turnout
BCM(Plain)	3.00 (180 min)	200 m
BCM (P&C)	4.50 (270 min)	One turnout =750 m track
SBCM	2:30 (150 min)	400 m
TLE	3.00 (180 min)	200 m
TRT	4.00 (240 min)	400 m
RGM	2.00 (120 min)	10 – 12** km
SRGM	2.50 (150 min)	8 km or 1.0 turnout
DTS	2.50 (150 min)	1200 m
MFI	2.50 (150 min)	500 m
BRM/USP	2.50 (150 min)	1400 m
HOBCM	3.00 (180 min)	400 m
UTV/RBMV	3.00 (180 min)	40-45 no. per day
PCTM	2.50 (150 min)	1 turnout

भारतीय रेलवे रेलपथ मशीन प्रशिक्षण केन्द्र
INDIAN RAILWAYS TRACK MACHINES TRAINING CENTRE
पो.: सूबेदारगंज, प्रयागराज P.O.: SUBEDARGANJ, PRAYAGRAJ-211015
E-mail: irtmtc@yahoo.co.in

Indian Railways Track Machines Training Centre, Prayagraj is one of the three training Centres of the world, besides at Linz/Austria & Watford/U.K., imparting training in Track Machine technology. IRTMTC is located approximately 7 Km west of Prayagraj Railway station, adjacent to IOC Terminal in Subedarganj Area. The Training Centre is strategically situated in the vicinity of Central Periodical Overhauling Workshop making it an ideal place for demonstrating all the technicalities of Track Machines. IRTMTC was established to meet the needs of training in all the sub disciplines related to the operation and maintenance of track machines on Indian Railways with the following objectives :

- **To develop skills in specialized high technology fields like Hydraulics, I.C. Engines, Manufacturing process and Electronics of Track Machines.**
- **To study the various Track Machines and develop their operating and maintenance instructions for optimum utilization.**
- **To create a knowledge bank for Track Machines and related technologies on Indian Railways.**