GOVERNMENT OF INDIA
MINISTRY OF RAILWAYS

Maintenance Instructions for Electric Point Machine

CAMTECH/S/PROJ/2019-20/SP4A
March 2020

Indian Railways
Centre for Advanced Maintenance Technology
Maharajpur, Gwalior (M.P.) - 474005
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Maintenance instructions for Electric Point Machine

1.1 Introduction
An electric point machine is a device, which can perform the function of unlocking and operating the point switches in the desired position and lock them and detect their correct setting with the aid of an electric motor, similar to that performed by an operator through a lever in a mechanical lever frame.

On Indian Railways following types of Electric Point Machines are generally used:

(i) IRS type of electric Point Machine 143 mm stroke (Rotary Type).
(ii) IRS Electric Point Machine 220 mm stroke for Thick Web Switch

Both the above Electric Point Machines conform to Specification No. IRS: S24-2002 Amendment 1.

1.2 Main parts of Electric Point Machine
Both types of point machines consist of following main parts:
(a). DC series split field Motor within built reduction gear unit.
(b). Gear Wheel Transmission assembly consisting of:
   - Main Gear Rim
   - Spring loaded friction clutch
   - Transmission shaft
   - Pinion
   - Rotary type locking segment
   - Drive disc
   - Lift out disc
   - Control disc
(c). Throw rod, lock slides and detection slides.
(d). Detection and control contact switch Assembly.
(e). Cast iron Case with cover.
(f). Crank handle.

The 220 mm stroke point machine for Thick Web Switch is provided with additional arrangement of locking to lock the point in correctly set position which is termed as Clamp type lock. The Clamp type lock consists of following components:

- Locking bar (L.H.)
- Locking bar (R.H)
- Insulating plates
- Locking washers
- Locking arms
- Stopper
- Drive lug
Operating Data as per IRS:S24-2002 Amendment 1

<table>
<thead>
<tr>
<th>Throw of point machine</th>
<th>Time of operation (Max.)</th>
<th>Current consumption</th>
<th>Test voltage</th>
<th>Test load on throw bar</th>
<th>Slipping load</th>
<th>Stalling load (Min.)</th>
</tr>
</thead>
<tbody>
<tr>
<td>143 mm± 2</td>
<td>4.0 sec.</td>
<td>≤4.5 Amp.</td>
<td>110 V DC</td>
<td>450 Kg.</td>
<td>≤580 Kg.</td>
<td>1000 Kg.</td>
</tr>
<tr>
<td>220 mm±4/-1</td>
<td>5.5 sec.</td>
<td>≤5.5 Amp.</td>
<td>110 V DC</td>
<td>450 Kg.</td>
<td>≤580 Kg.</td>
<td>1000 Kg.</td>
</tr>
</tbody>
</table>

1.3 Requirement for maintenance of Point and Electric Point Machine

Electric Point machine is an elecro-mechanical device which can be remotely operated to set the points in required position. For proper working of point machine, prescribed maintenance guidelines have to be followed. In addition to this there are certain other factors which affect the performance of a point machine. Hence maintenance of only point machine is not sufficient, the components which are associated with it directly or indirectly are also to be maintained. The reasons for maintenance of a point and point machine are as given below:

(i) **Power Supply**

Maintenance of Battery Charger/IPS and batteries provided to feed the point motor at site.
Components of point machine
Dirt and deposit of coal dust in various components of point machine is a source of failure. Hence periodical cleaning of various parts of point machine is required. Wear and tear of carbon brushes, finger contacts in contact pedestal, top and bottom rollers result in failure hence required to be checked frequently. Oiling and greasing of all the moving parts to prevent their wear and tear. Periodical topping up of gear oil in Point motor for smooth operation.

Electrical parameters
Voltage and current during normal operation and during obstruction as per specified range.

Cables
Periodical meggering of main and tail cables to minimize cable faults.

Ground connections and fittings
All bolts and nuts including point machine mounting bolts and check nuts are to be checked and adjusted periodically to prevent failure due to point going out of adjustment.

Insulation in point zone
Insulation materials in track circuited point turnout portion for gauge tie plate and point rodding/ground connections are to be checked periodically to prevent track circuit failure and replaced whenever required.

Safety checks
Following tests are to be done periodically to prevent failure of point or point machine on unsafe side:
- Obstruction test
- Track locking
- Emergency point operation

P. Way items
In addition to above, the following P. Way items also contribute to the proper functioning of point machine and are to be maintained in co-ordination with Engg. department:
- Lubrication of slide chairs for smooth operation.
- Maintenance of proper gauge and cross level.
- Condition of tongue rail
- Condition of stock rail
- Opening of Switches
- Condition Stretcher Bar
- Condition of sleepers and their packing.
- Condition of ballast
- Drainage
- Housing of tongue rail with stock rail

The important parameters of Electric Point Machines of 143 mm stroke as well as 220 mm stroke and associated components, their specified range and maintenance guidelines are reviewed in the following sections.
1.4 Ground connections

These provide rigid movable connection between the Throw bar, detection and lock slides in the point machine and each of the switches. The ground connections consist of the following:

(i) Switch extension brackets (P brackets) – 2 Nos.

(ii) Operating or throw rod.

(iii) Lock rod long (far end) – 1 No.
(iv) Lock rod short (near end) – 1 No.

![Fig 5: Lock rod near end (Side view)]

(v) Detector rod long (far end) - 1 No.

![Fig 6: Detector rod far end (Side view)]

(vi) Detector rod short (near end) - 1 No.

![Fig 7: Detector rod near end (Side view)]

(vii) Drive lug – 1 No.

![Fig.8: Drive Lug]

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1.5 Insulation material for point turnouts in track circuited area

<table>
<thead>
<tr>
<th>William stretcher bars</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Nylon Backing plates</td>
<td>2 Nos.</td>
</tr>
<tr>
<td>Nylon bushes for bolts</td>
<td>3 Nos.</td>
</tr>
<tr>
<td>Nylon washers for bolts &amp; nuts</td>
<td>6 Nos.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Gauge tie plates</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Nylon end post with 3 holes</td>
<td>1 Nos.</td>
</tr>
<tr>
<td>Nylon bushes for bolts</td>
<td>3 Nos.</td>
</tr>
<tr>
<td>Nylon washers for bolts &amp; nuts</td>
<td>6 Nos.</td>
</tr>
</tbody>
</table>

**Electrical detectors provided on mechanical points**

<table>
<thead>
<tr>
<th>Between Detector rods and drop links</th>
<th>1 bush &amp; 2 washers per rod</th>
</tr>
</thead>
</table>

**IRS type & Siemens point machine**

<table>
<thead>
<tr>
<th>Between tongue rail and tongue attachment (D bracket)</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Nylon insulation plate RH (RDSO S3265)</td>
<td>1 No.</td>
</tr>
<tr>
<td>Nylon insulation plate LH (RDSO S3266)</td>
<td>1 No.</td>
</tr>
<tr>
<td>Nylon bushes for bolts (RDSO S 23199)</td>
<td>2 Nos. per D bracket</td>
</tr>
<tr>
<td>Nylon washers for nuts (RDSO S 8640)</td>
<td>2 Nos. per D bracket</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Between 1st William stretcher &amp; Drive lug</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Insulating bush (RDSO S 8813 )</td>
<td>2 Nos</td>
</tr>
<tr>
<td>Insulating plate (RDSO S 8804)</td>
<td>1 No.</td>
</tr>
</tbody>
</table>

**220 mm throw point machine with clamp lock**

<table>
<thead>
<tr>
<th>Between tongue rail and tongue attachment (P bracket)</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Nylon insulation plate RH (RDSO S3592)</td>
<td>1 No.</td>
</tr>
<tr>
<td>Nylon insulation plate LH (RDSO S3593)</td>
<td>1 No.</td>
</tr>
<tr>
<td>Nylon bush between lock /detector slide &amp; lock /detector rod lug (RDSO S 23199)</td>
<td>1 No. per detector/lock rod</td>
</tr>
<tr>
<td>Nylon washer between lock /detector slide &amp; lock /detector rod lug (RDSO S8640 )</td>
<td>2 Nos. per detector/lock rod</td>
</tr>
<tr>
<td>Nylon bush between drive bar and drive rod lug (RDSO S 3463)</td>
<td>1 No.</td>
</tr>
</tbody>
</table>

**Roddling passing across the track likely to short the two track rails**

<table>
<thead>
<tr>
<th>Liner plate</th>
<th>1 No.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bushes for bolts</td>
<td>2 Nos</td>
</tr>
<tr>
<td>Washers for bolts &amp; nuts</td>
<td>4 Nos</td>
</tr>
</tbody>
</table>

In addition to above, for 220 mm throw point machine with clamp lock it is to be ensured that

(i) Spring setting device (SSD) is insulated from both the rails.
(ii) Clamp lock assembly is insulated from both the rails
1.6 Periodical Maintenance

Maintenance instructions for point machine and other associated items are given in following sections. The schedule of maintenance to be followed shall be as per zonal railway instructions. The schedule of maintenance as per SEM for some items is summarized in section 1.13.

### 1.6.1 Cleanliness

<table>
<thead>
<tr>
<th>Sr. No.</th>
<th>Maintenance work to be done</th>
<th>Specifications</th>
<th>Reference</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Check the machines are kept free from rust, dirt and fixtures.</td>
<td>Refer ‘(A)’ below</td>
<td>SEM Part II Para 19.119</td>
</tr>
<tr>
<td>2</td>
<td>Check the cleanliness &amp; smoothness of commutators. Clean the commutator with chamois leather until carbon deposits are disappeared.</td>
<td>Refer ‘(B)’ below</td>
<td>SEM Part II Para 19.121 &amp; 19.121.2</td>
</tr>
<tr>
<td>3</td>
<td>Check the contacts in switch pedestal for freedom from pitting.</td>
<td>Refer ‘(C)’ below</td>
<td>SEM Part II Para 19.124</td>
</tr>
<tr>
<td>4</td>
<td>Check for cleanliness of crank handle contacts.</td>
<td>--</td>
<td>--</td>
</tr>
<tr>
<td>5</td>
<td>Check that no dirt or dust is deposited on rollers they move smoothly on the periphery of Control &amp; Lift out disc.</td>
<td>Refer ‘(D)’ below</td>
<td>--</td>
</tr>
</tbody>
</table>

*D-bracket insulation plate RH & LH*

*Drive lug insulation plate*

*Drive lug insulation bush*

*D-bracket insulation washer*

*Fig. 9: Insulation material for point turnout*

_Gauge tie plate insulation_
(A) SEM Part II Para 19.119 Cleanliness :- Machines shall be kept in good condition free from rust, dust and dirt.

(B) SEM Part II Para 19.121.1 - Commutator shall be kept clean, smooth and have bright appearance. Commutator may be cleaned with chamois leather. Under no circumstances, shall emery paper be used.

(ii) SEM Part II Para 19.121.2 - Brushes shall be kept clean and properly bedded on the commutator. Brushes shall have proper pressure and shall be free in brush holders.

(iii) Unserviceable carbon brushes can be replaced. Carbon brushes have a life service of approximately 2000 hours. Insert only such carbon brushes recommended by the Manufacturer for use. (Ref.: M/s Vossloh Cogifer Signalling India Private Ltd.)

(C) SEM Part II Para 19.124 - Contacts shall be clean, free from pitting and in proper adjustment.

(ii) For extensively damaged contact rollers and contacts, springs sets are to be replaced. For the replacement, use only re-adjusted contact spring assembly. (Ref.: M/s Vossloh Cogifer Signalling India Private Ltd.)

(D) If dirt or coal dust is deposited on the rollers, then over a time rollers have a tendency to rub against the periphery of Control and Lift out disc. This results in flattening of roller surface and sticking of roller in the notch of Control/Lift out disc and failure of point. Hence periodical cleaning and lubrication of roller assembly is a must.

Fig. 10(a): Roller in good condition  
Fig.10(b): Worn out roller
1.6.2 Contactor unit, Armature & Carbon brush

<table>
<thead>
<tr>
<th>Sr. No.</th>
<th>Maintenance work to be done</th>
<th>Specifications</th>
<th>Reference</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Check proper adjustment of contacts in contact pedestal.</td>
<td>Refer ‘(E) (ii) &amp; (iii)’ below</td>
<td>SEM Part II Para 19.124 &amp; M/s Signal W/S GKP, NER</td>
</tr>
<tr>
<td>2</td>
<td>Ensure all bridge contacts inside contact pedestal make and break at the same time. Check that the spring contacts press against the fixed contacts with sufficient pressure.</td>
<td>Refer ‘(E) (i)’ below</td>
<td>SEM Part II Para 19.42 &amp; 19.124</td>
</tr>
<tr>
<td>3</td>
<td>Check that the carbon brushes are exerting sufficient pressure on the Commutator.</td>
<td>Refer ‘(E) (iv)’ below</td>
<td>SEM Part II Para 19.121.2</td>
</tr>
</tbody>
</table>

(i) SEM Part II Para 19.42 - Contacts shall be adjusted so that they make or break at the same time. Shunt contacts shall be adjusted so that they do not make before the detector contacts break. In AC traction area shunt contact shall not be used. Care shall be exercised to check that the detection contacts flex a little after they are closed.

(ii) SEM Part II Para 19.124 - Adjustment of Contacts - Contacts shall be clean, free from pitting and in proper adjustment.

(iii) Adjustment of Contactor unit (Ref.: Signal Workshop, NE Rly. Gorakhpur)
When the machine is operated to full normal position without any gap between switch and stock rail and lock pawl fully inside the notches of lock slide and detector slide connected to the closed switch, the notches in the detection sides should align below, the roller B (bottom roller) in the pedestal assembly and the cams in the control & lift out disks should come below the roller A (Top roller) proving correct setting & locking of switches.
Please refer illustration on page nos. 4 & 5.

(iv) SEM Part II Para 19.121.2-Brushes shall be kept clean and properly bedded on the commutator. Brushes shall have proper pressure and shall be free in brush holders.
Fig. 11.: When the machine is operated, the shaft rotates, the lock piece comes out of lock slide notch and point gets unlocked.

Fig. 12: Pinion gets engaged to rack on throw bar, rotary motion is converted to linear motion and point operates.

Fig. 13: On correct setting of tongue rail with the stock rail, the lock segment enters in the notches of lock slides and top roller falls inside notch of control & Lift out disc.

Fig. 14: Lift out Disc

Fig. 15: Control Disc

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Fig. 16: Contact Pedestal with Top and Bottom rollers

Fig. 17: Detection slide notches come under bottom roller in the pedestal assembly and the bottom roller falls in the detection slide notch.

In this condition:
- Normal Control contacts - Break & Reverse Control contacts - Make
- Normal Detection contacts – Make & Reverse Detection contacts – Break

*Vice-versa if machine is operated to full reverse position.*

The above conditions are summarized below:

<table>
<thead>
<tr>
<th>Point position</th>
<th>NC</th>
<th>RC</th>
<th>ND</th>
<th>RD</th>
</tr>
</thead>
<tbody>
<tr>
<td>Point Set &amp; Locked in NORMAL</td>
<td>Break</td>
<td>Make</td>
<td>Make</td>
<td>Break</td>
</tr>
<tr>
<td>Point Set &amp; Locked in REVERSE</td>
<td>Make</td>
<td>Break</td>
<td>Break</td>
<td>Make</td>
</tr>
<tr>
<td>Point unlocked</td>
<td>Make</td>
<td>Make</td>
<td>Break</td>
<td>Break</td>
</tr>
</tbody>
</table>

*Maintenance instructions for Electric Point Machine*  
*March 2020*
1.6.3 Lubrication & Oiling

<table>
<thead>
<tr>
<th>Sr. No.</th>
<th>Maintenance work to be done</th>
<th>Specifications</th>
<th>Reference</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Lubricate all gears and bearings according to manufacturer’s instructions.</td>
<td>Refer ‘(F)’ below</td>
<td>SEM Part II Para 19.120</td>
</tr>
<tr>
<td>2</td>
<td>Lubricate the slides, rollers &amp; pins with axle oil Medium grade to IS:1628. Avoid overflow of oil.</td>
<td>Refer ‘(F)’ below</td>
<td>SEM Part II Para 19.120</td>
</tr>
<tr>
<td>4</td>
<td>Top up motor gearing with oil as per manufacturer’s instructions through oil inlet.</td>
<td>Refer ‘(F)’ below</td>
<td>SEM Part II Para 19.120</td>
</tr>
</tbody>
</table>

(F) Lubrication particulars

(i) SEM Part II Para 19.120 - Lubrication :- All gearing and bearing shall be properly lubricated according to manufacturer's instructions.

(ii) Point Machine 143 mm throw, 110 V rotary locking type

(a) Oiling

Motor transmission

Pour 100 cc lubricating oil SAE 30 or Shell 100X through oil inlet (1) (provided on the reduction gear box) into the oil reservoir as shown below. Allow some time for soaking of oil and pour oil in intervals and in quantities of approx-10 ccm at a time until oil emerges out of overflow tube (2). This way excessive overflow of oil is avoided.

![Fig. 18: Point motor with oil inlet](image)

The periodicity for oiling of motor transmission is as under:

At the time of installation and after 10,000 operations or at 6 month’s interval for less frequently operated point machines or as per manufacture’s specifications/Zonal Railway instructions. The period may be reduced as and when required according to local climatic conditions.
**Throw bar, lock and detection slides**
Pour 10 cc lubricating oil SAE 30 or Shell100X in inlets provided on the cover with felt pad for throw bar, lock and detection slides.

**Contact assembly**
Apply 10 drops of spindle oil on the helical spring guides of contact assembly.

**Miscellaneous**
Apply medium grade lubricating oil on all pin connections, detection slides, chair plates, lug and sleeve assembly on drive rod etc.

**Drainage of excessive oil**
To drain out excessive lubricating oil or water accumulated at the bottom of the point machine casting, unscrew the spring loaded drain outlet and close it afterwards.

**Greasing**
Apply non-corrosive all temperature grease through all the grease nipples by a grease gun, once in 6 months or as local conditions need to the following:
- Bearings of the gear rack.
- Locking bars.
- Detection slides
- External gears of the transmission assembly.
- Contact assembly of lever bearing.

After approximately 100,000 operations or with less frequently used points, once annually, wipe off all superfluous grease from nipples to prevent clogging and lubricate thoroughly all internal and external lubricating points.

**IRS Electric Point Machine non-trailable with 220 mm throw for Thick Web Switch** (Ref: M/s Vossloh Cogifer Signalling India Private Ltd.)
Pour oil – BP Energer SHF 48 or Servo System-32 through the oil inlet as shown in figure on page 6 until oil emerges out of over flow tube before taking the machine into operation.
Pour oil in intervals and in quantities of 20 Cubic Centimeters at a time. In temperature areas ranging from 20 degrees Celsius and less use oil Aero shell fluid.
Spring guides of contact assembly, oiling to be provided 10 drops of spindle oil.

**Periodicity of lubrication**
All external nipples of the machine (approximately 10 strokes of grease gun) for every 10,000 operations or every 6 months, if the frequency is less.
All external and internal lubricating points- approximately for 1,00,000 operations.
Spring guides of contact assembly, oiling to be provided 10 drops of spindle oil.

Lubricate at the following moving parts of the Clamp Lock fortnightly:
(a) Stock rail bracket groove.
(b) Moving Part of tongue rail & lock arm assembly.
(c) Between matching of lock bar & lock arm assembly.
1.6.4 Ballasting, Packing & Housing

<table>
<thead>
<tr>
<th>Sr. No.</th>
<th>Maintenance work to be done</th>
<th>Specifications</th>
<th>Reference</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Check for proper ballasting &amp; packing of sleepers.</td>
<td>Ballast size &gt; 50 mm</td>
<td>Refer Section 1.12.1(f)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Clearance below rail bottom - 50 mm</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>Housing of switch with stock rail.</td>
<td>(i) For 143 mm stroke point machine – not less than 11 sleepers or upto JOH is desirable.</td>
<td>Refer Section 1.12.1(h)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>(ii) For 220 mm stroke point machine with clamp lock for TWS – not less than 13 sleepers or upto JOH is desirable.</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>Check the setting of switches for having required amount of spring action.</td>
<td>Refer ‘(G)’ below</td>
<td>SEM Part II Para 19.35</td>
</tr>
</tbody>
</table>

(G) (i) SEM Part II Para 19.35

Adjustment of Driving Rod

The points shall be adjusted by operating the machine first by hand crank. The insertion of hand crank should disconnect the power supply to the machine. When the machine has been fastened down, the throw bar connections shall be set up and the point machine hand cranked to one end of the stroke positioning the locking blades so as to allow the appropriate locking dog to pass through notches. The closed switch shall be adjusted to just in contact with the stock rail. Then the connections shall be tightened further by 2 mm to 3.5 mm to impart a springing action to the tongue rail. The machine should be hand cranked to the opposite end of the stroke and the setting repeated for the other switch.

Note:
Unless any special instruction are issued by the Railway, adjustment for driving rod and lock rod shall be done for the close switch nearest to the point machine first.

Fig. 19: Housing of switch with stock rail
(ii) SEM Part II Para 19.36 Adjustment of detector contacts
The machine shall be hand cranked to the end of the stroke to close the tongue rail.
Insert 1.6 mm test piece between stock rail and switch rail at 150 mm from toe of the switch and operate the point. Ensure detector contacts just make. A test gauge of 3.25 mm shall be inserted between the switch rail and stock rail at a distance of 150 mm from the toe of the switch. The detector connection of the closed switch shall be adjusted till the appropriate detector contact are just broken. The same shall be repeated at the other end of the stroke. All the relevant nuts shall be tightened.

NOTE: Where lock slide is provided in the machine, during switch detector adjustment the test shall first be done with fictitious locking. After completing the above test, same test be repeated with machine properly locked.

1.6.5 Obstruction Test & Overload Test

<table>
<thead>
<tr>
<th>Sr. No.</th>
<th>Maintenance work to be done</th>
<th>Specifications</th>
<th>Reference</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Conduct obstruction test.</td>
<td>Refer ‘(H)’ below</td>
<td>SEM Part II Para 19.127.1*</td>
</tr>
<tr>
<td>2</td>
<td>Check the functioning of overload arrangement and out of correspondence.</td>
<td>Refer ‘(I)’ below</td>
<td>SEM Part II Para 19.128</td>
</tr>
<tr>
<td>3</td>
<td>Check the tripping at overload of Friction Clutch.</td>
<td>Refer ‘(J)’ below</td>
<td>SEM Part II Para 19.127.4</td>
</tr>
</tbody>
</table>

(H) SEM Part II Para 19.127.1
Obstruction Test
*For 143 mm throw point machine
The point driving rod and the lock connections of the machine must be so adjusted that with 5 mm thick test piece obstruction placed between the switch and the stock rail at 150 mm from the toe of the switch (Please see Fig.20 on next page):

i) the point cannot be locked;

ii) the point detector contacts should not assume the position indicating point closure

iii) Friction clutch should slip.

For 220 mm throw point machine with clamp lock (Ref: Signal Workshop GKP NER)
The detector slides lock slides and drive rod must be so adjusted that with 5 mm thick test piece placed between the switch and gauge face of stock rail at 150 mm from the toe of the point.

(a) Friction clutch de-clutches the motor from mechanism.
(b) The point cannot get locked either by clamp lock or by locking segment inside the point machine.
(c) Lock segment does not enter into the notches of locking slides.
(d) Switch detection contacts do not make.
(I) SEM Part II Para 19.128
For the machines provided with over load current protection, the feed to motor shall be disconnected with current ranging between 1.5 to 2 times its normal operating current. It shall reconnect only when a fresh operation is done.

(J) SEM Part II Para 19.127.4
Friction clutch where provided shall slip at a value not less than one and half and not exceeding twice the normal working current.

Fig. 20: Obstruction test with Test piece

1.6.6 Insulation Test

<table>
<thead>
<tr>
<th>Sr. No.</th>
<th>Maintenance work to be done</th>
<th>Specifications</th>
<th>Reference</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Insulation tests on the point machine to be conducted.</td>
<td>Refer ‘(K)’ below</td>
<td>SEM Part II Para 19.127.7</td>
</tr>
</tbody>
</table>

(K) SEM Part II Para 127.7
Cable and wire insulation and continuity tests shall be done as per Annexure 30.

Check the insulation between the following:
Point machine
Check that point machine is insulated from ground connection

For 220 mm throw point machine with clamp lock (Ref: Signal Workshop GKP NER):

Spring setting device (SSD) - Insulated from both the rails.
Clamp lock assembly - Check that it is insulated from both the rails.
Leading and following stretcher bar (If point is operated without clamp point locking arrangement) - They are insulated from both the rails.
1.6.7 Voltage & Current measurement

<table>
<thead>
<tr>
<th>Sr. No.</th>
<th>Maintenance work to be done</th>
<th>Specifications</th>
<th>Reference</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Measure the voltage &amp; current at Motor terminals for both normal &amp; reverse operations. These should be within the specified limits according to the different types of Point machines.</td>
<td>(i) For 143 mm throw point machine : Voltage 110 V DC Current ≤ 4.5 Amp. (ii) For 220 mm throw point machine : Voltage 110 V DC Current ≤ 5.5 Amp.</td>
<td>SEM Part II Para 19.127.6 &amp; IRS Spec. No.:IRS:S24-2002 Amdt. 1</td>
</tr>
</tbody>
</table>

(L) SEM Part II Para 19.127.6
Voltage and current shall be checked periodically at the motor terminals. This will indicate any undue friction on the points or improperly fastened terminals at cable terminations.

Operating Data as per IRS:S24-2002 Amendment 1

<table>
<thead>
<tr>
<th>Throw of point machine</th>
<th>Time of operation (Max.)</th>
<th>Current consumption</th>
<th>Test voltage</th>
<th>Test load on throw bar</th>
<th>Slipping load</th>
<th>Stalling load (Min.)</th>
</tr>
</thead>
<tbody>
<tr>
<td>143 mm+ 2</td>
<td>4.0 sec.</td>
<td>≤4.5 Amp.</td>
<td>110 V DC</td>
<td>450 Kg.</td>
<td>≤ 580 Kg.</td>
<td>1000 Kg.</td>
</tr>
<tr>
<td>220 mm+4/-1</td>
<td>5.5 sec.</td>
<td>≤5.5 Amp.</td>
<td>110 V DC</td>
<td>450 Kg.</td>
<td>≤ 580 Kg.</td>
<td>1000 Kg.</td>
</tr>
</tbody>
</table>

Measurement of voltage and current of point machine (Ref. STTI Byculla C.Rly. Teaching notes):
1. Voltage is taken on motor terminal
2. Voltage is taken on terminal no. 0 and1 and terminal no.0 and 2, one for normal another for reverse depending upon the point layout. (LH or RH).
3. Obstruction voltage by putting 5mm test piece between stock and tongue rail is also taken and recorded as above.
4. Current is taken in series by inserting and turning CH key and measuring current in between CH1 and CH2 and recorded as:
   a. Initial current or peak current.
   b. Normal working current
   c. Obstruction current.
The above parameters of current and voltage measurement should be taken monthly and recorded as given in following table:

<table>
<thead>
<tr>
<th>Point No.</th>
<th>Without Obstruction</th>
<th>With Obstruction</th>
</tr>
</thead>
<tbody>
<tr>
<td>Voltage</td>
<td>Current</td>
<td>Voltage</td>
</tr>
<tr>
<td>N to R</td>
<td>R to N</td>
<td>N to R</td>
</tr>
<tr>
<td>R to N</td>
<td>N to R</td>
<td>R to N</td>
</tr>
</tbody>
</table>

Measure voltage between
0 & 1 - For operation to one side
0 & 2 - For operation to other side
depending upon the normal & Reverse positions of point

Measure current between
CH 1 & CH2

**Fig. 21: Measurement of Voltage & Current**
1.7 General maintenance items to be checked during every maintenance visit

- All bolts and nuts including point machine mounting bolts and check nuts are tight.
- All pins are tight.
- All split pins are opened correctly.
- Electrical wire connections inside the cable termination box and inside the point machine are tight and the wiring is laced properly. Wires are clear of all moving parts and do not get trapped in the lid when closed.
- Slide chair plates are graphited and lubricated for smooth working of points.
- Gear transmission works smoothly without any crackling sound when machine is operated by power.
- Brass strip between the detection slides is intact.
- The rollers moving over the friction clutch are not worn out and moving freely.
- Pins of switch extension piece have no rib formation or excessive wear.
- Manual operation with the help of crank handle in both directions is working properly.

1.8 Items to be checked before the onset of monsoon

- Testing of all emergency crossovers for their proper working.
- Checking of insulation of point machines.
- Oiling and greasing of the point machines.
- Availability of gasket in housing cover of point machine.
- Lifting of point machines wherever required at identified water logged area.

Fig. 22: Lifting of point machine above sleepers on rail support
• Checking cable entries to ensure that the cable is in a healthy condition physically besides meggering and ELD monitoring.

• Waterproofing of point motors where points are situated in low lying flood prone areas.

• Rodent entry points in the point machine and Cable Termination Box etc. if any are properly plugged.

• Conducting drills for replacement of point motors and detection contact assembly.

• Spare point motors and contact assemblies are kept at stations.

1.9 Replacement
As per IRS:S24 -2002, the life cycle of Electric Point Machine is 10 lakh operations. As per the practice in some railways the point machine should be replaced after

- 7 years - on Sub-urban and Trunk routes.
- 12 years - on other than Sub-urban and trunk routes

OR

- 10 lakh operations whichever is earlier.

1.10 Painting
Check the point machine for rusting. Remove the rust and apply red oxide and paint to repair it.

The point machine shall be painted black, as stipulated in Annexure – 29 of para 19.106, SEM Part – II.

Arrows showing the direction rotation of crank handle for manual operation of point (N and R) should be painted on the cover beside the socket in which the crank handle is inserted.

Fig. 23: Point machine to be painted black
1.11 Installation of point machine in track circuited area to the negative polarity rail side

As we know that track circuit consists of positive and negative polarity rails. The ground connections of point machine pass below one of the rails and are likely to touch the rail bottom. If that rail is carrying positive polarity then there are chances of earthing of positive feed through connected point machine.

Although insulation is provided between tongue rail and D brackets connected to lock rods and detection rods and the stretcher bar connected to throw rod is also insulated, there are likely chances of ground connections touching the rail bottom resulting in track circuit failure as the point machine is partially grounded. Also if any metal piece or aluminium foil is stuck between the rail bottom and ground connections crossing below it, the track circuit may be shorted.

In view of the above, it is recommended that point machine may preferably be installed towards the side of rail carrying negative polarity.

Objects like crushed metal can and aluminium foil can stuck between ground connections and rail bottom and earth the positive polarity rail.

**Fig. 24: Installation of point machine towards negative rail of track circuit**
1.12 Maintenance items to be checked during Joint Inspection of points & crossings with Engg, department

For smooth operation of points & point machine, the following are to be ensured which are covered in joint inspection of points & crossings:

1.12.1 Engineering items

(a) Condition of tongue rail

Tongue rail houses properly against the Stock rail. If tongue rail is chipped, cracked, twisted or bent, get it replaced.

Tongue rails should not be out of square.

Fig. 25: A chipped tongue rail

Fig. 26: Tongue rails in square.

Fig. 27: Tongue rails out of square.
(b). Condition of stock rail
Burrs if any on the stock rail obstructing the housing of switch should be removed.
If stock rail still obstructs the housing of switch, the stock rail should be replaced.

As far as possible the tongue rail and stock rail should be changed together and not separately to avoid bending of tongue rail due to uneven wear of the rail table.

Ensure proper housing of the tongue rail, for both LH and RH switches for the full length of the planning of switch.[317(3) (l) of IRPWM].

(b) Opening of Switches
Minimum clearance between toe of open switch and stock rail
For 143 mm throw point machine - 115 mm
For 220 mm throw point machine with clamp lock for TWS - 160 mm

(c) Stretcher Bar
The clearance between top edge of stretcher bar and bottom of the stock rail shall be at least 1.5mm but not more than 3.0 mm. [Para- 317(3Xk) of IRPWM.

Ensure that 1st ,2nd ,3rd and 4th stretcher bars are fitted in proper place.

Check whether oblong hole is provided on leading stretcher bar.

Fig. 28: Clearance between top edge of stretcher bar and bottom of the stock rail

(e) Condition of sleepers
(i) Ensure that the sleepers are not worn out and in good condition:
   • Two sleepers below machine.
   • Two SRJ sleepers
   • Two heal block sleeper

(ii) Spacing between 3rd & 4th sleepers :
   For 143 mm throw point machine - 685 mm
   (Ref. RDSO drawing no. RDSO/S 3262-63 & SA 9151-52
   
   For 220 mm throw point machine with clamp lock for TWS - 745 mm
   (RDSO drawing no. RDSO/S 3454 ALT - A Ver. 1.0)
(f) **Condition of ballast**  
Check the condition of ballast and ensure that:  
- Ballast size is > 50 mm  
- The ballast is without muck  
- Clearance below rail bottom is 50 mm

(g) **Drainage**  
- Check if there are any cases of water logging in past.  
- Ensure that proper drainage is available for track.

(h) **Housing of tongue rail with stock rail**  
Check that the tongue rail houses properly against stock rail.  
(i) For 143 mm stroke point machine – not less than 11 sleepers or upto JOH is desirable.  
(ii)For 220 mm stroke point machine with clamp lock for TWS– not less than 13 sleepers or upto JOH is desirable.

(j) **Resting of tongue rail on slide chairs**  
Check that the tongue rail is resting properly on slide chairs - upto 6 sleepers is desirable.

(k) **Gauge and cross level**  
The gauge & cross level shall be measured 150 mm ahead of actual toe of switch.

(l) **Packing under switch assembly**  
Ensure that packing of ballast under switch assembly is proper and there is no vertical movement under train.

(m) **Condition of switch fittings**  
Check that Gauge tie plate, Slide chairs, Stretcher bar, Heal block, Nut and bolts are in good condition.

(n) **Spring Setting Device (SSD) for Thick Web Switch**  
Ensure that:  
- Pressure is equal on both sides.  
- Lubrication is proper  
- Insulation is good

*Fig.29: Spring Setting Device (SSD)*
1.12.2 S&T items

(a) **Function of lock detection**
   (i) Without test piece - Set & Locked
   (ii) With 5mm. test piece - Cannot be locked

(b) **Time taken in completing the operation**
   (i) Without test piece - not more than 6 sec.
   (ii) With 5mm. test piece - 10 to 15 sec.

(c) **Ground connections**
   Check whether pins snug fit in D bracket and ground connections without hammering.

(d) **Testing of Track Locking and Emergency Point operation**
   Track locking must be tested quarterly for each track circuit of any point/ cross-over individually. Fail one track circuit with the other track circuit of point/cross-over as pick up.

   It must not be possible to operate the point by WN and WWN buttons (Normal operation).

   Point can be operated only by pressing buttons WN and EWN (Emergency operation).

   Now fail other track circuit with the first track circuit of point /crossover as pick up. It must not be possible to operate the point by WN and WWN buttons. (Normal operation)

   In this case also point/cross-over can be operated only by EWN and WN buttons (Emergency operation).

   Track locking must be tested with each tack circuit of point/cross-over failed one at a time and other as pick up individually for each and every point/cross-over.

   **Pro-forma**

   **TESTING OF TRACK LOCKING**

   Periodicity: Quarterly
   Point No.: ………………
   Track Circuit No……………..

<table>
<thead>
<tr>
<th>Sr. No.</th>
<th>Time tested</th>
<th>Date tested</th>
<th>Name of JE/SE/SSE</th>
<th>Signature</th>
<th>Remarks</th>
</tr>
</thead>
</table>

   **Maintenance instructions for Electric Point Machine**
   **March 2020**
1.13 Schedule of maintenance as per SEM Part II

<table>
<thead>
<tr>
<th>Sr. No.</th>
<th>Maintenance activity</th>
<th>Periodicity</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Signal Maintainer</td>
</tr>
<tr>
<td>1</td>
<td>Checking cleanliness of machine and commutators, condition of contacts.</td>
<td>F</td>
</tr>
<tr>
<td>2</td>
<td>Lubrication of gears &amp; bearings, slides, rollers &amp; pins</td>
<td>F</td>
</tr>
<tr>
<td>3</td>
<td>Checking ballasting &amp; packing of sleepers</td>
<td>F</td>
</tr>
<tr>
<td>4</td>
<td>Tightening all nuts, check nuts &amp; bolts</td>
<td>F</td>
</tr>
<tr>
<td>5</td>
<td>Conducting obstruction test</td>
<td>F</td>
</tr>
<tr>
<td>6</td>
<td>Checking functioning of overload arrangement and out of correspondence</td>
<td>F</td>
</tr>
<tr>
<td>7</td>
<td>Checking the tripping at overload of friction clutch</td>
<td>--</td>
</tr>
<tr>
<td>8</td>
<td>Checking of grease nipples</td>
<td>M</td>
</tr>
<tr>
<td>9</td>
<td>Checking the setting of switches for required amount of springing action</td>
<td>F</td>
</tr>
<tr>
<td>10</td>
<td>Measurement of voltage &amp; current</td>
<td>--</td>
</tr>
</tbody>
</table>
1.14  Do’s & Don’ts

Do’s.

- Get disconnection of point, before carrying out any work.
- Always ensure schedule maintenance.
- Test the working of friction clutch.
- Do ensure that track locking, route locking, crank handle release locking are effective.
- Do test the correspondence of the points with indication at panel or cabin.
- Always use proper lubricant. Wipe away excessive oil or grease.
- Always use proper rating of fuse.

Don’ts.

- Do not operate the point manually except through specific crank handle.
- Forget to exercise safety checks initially, during and after disconnection.
- Forget to carry necessary tools while attending the failure.
- Leave any discrepancies noticed in the point machine.
- Use too much lubricant.
- Allow unsquared notches on slides.
- Do not tamper with the finger contacts inside switch pedestal

Fig. 30: No tampering to be done with the contacts of switch pedestal
1.15 Tools & Spares

Recommended Tools and measuring instruments
Following tools and measuring instruments should be kept in the duty room for installation and maintenance of Electric point machine:

- Spanner set
- 32 mm (1 1/4”) single end spanner
- Adjustable pipe wrench
- Screw driver
- Hammer
- Tommy bar
- Measuring tape
- Test gauge
- Cutting pliers
- Wire cutter
- Insulation peeler
- DC Ammeter with centre ‘0’ incase of Analog (0-30 Amp)
- DC Voltmeter (0-250V)
- Track shunt resistance.
- Grease Gun

Spares and Consumables
Following spares and consumables are necessary for maintenance and inspection.

- SAE 30/SHELL 100 oil
- Grease IS 507/508
- Chamois leather
- Cotton waste grade A
- Carbon brush
- Contact assembly
- MS-pins and split pins
- D-bracket and stretcher bar insulation material sets

Tools and accessories to be supplied with new point machines
The following set of tools in a suitable box shall be supplied along with every set of eight point machines or less:

- Hand operated square drive socket wrenches of 12.5 mm driving square (short type) as per IS: 7381 for M8, M10, M12 & M18 threads. (One 250 mm long 12.5 mm square extension bar as per IS: 7991 alongwith compatible Tee handle Square drive as per IS: 7975 suitable for above socket wrenches.
- Open jaw wrenches (spanners) for M10, M12, M20, M24 & M33 threads as per IS: 2028.
- Adjustable wrench.
- Screw driver 300 mm long
Annexure A - RDSO Drawings for IRS Electric point machine 143 m stroke

**Fig.A1(i):** Drawing No.RDSO/S 3262-63 – General description and references

**Maintenance instructions for Electric Point Machine**

March 2020
Fig. A1(ii): Drawing No. RDSO/S 3262-63 – Throw rod, Lock and detection connections for IRS Electric Point Machine
Fig.A1(iii): Drawing No.RDSO/S 3262-63 – Layout Facing Point B.G. fitted with IRS Electric Point Machine
Annexure B - RDSO Drawings for IRS Electric point machine 220 m stroke with Clamp Lock for Thick Web Switch

Fig.B1(i): Drawing No.RDSO/S 3454 ALT-A Ver.1 – General description and references

Maintenance instructions for Electric Point Machine

March 2020
Fig.B1(ii): Drawing No. RDSO/S 3454 ALT-A Ver.1 – Throw rod, Lock and detection connections for IRS Electric Point Machine
ALT-A - Modifications in previous drawing
In the old drawing, the lock and detection rods are shown connected directly on the foot of tongue rails. (For details of installation, refer CAMTECH's Maintenance Handbook on Electric Point Machine 220 mm throw for TWS).
As per the modified drawing, instead of foot of tongue rails the Normal and Reverse lock and detection rods are connected through switch extension brackets or P brackets which in turn are fixed to the web of tongue rails.

Fig.B1(iii): Drawing No.RDSO/S 3454 – Layout Facing Point B.G. fitted with IRS Electric Point Machine 220 mm stroke with Clamp Lock for TWS
Quality Policy

“We at RDSO Lucknow are committed to maintain and update transparent standards of services to develop safe, modern and cost effective railway technology complying with statutory and regulatory requirements, through excellence in research, designs and standards by setting quality objectives, commitment to satisfy applicable requirements and continual improvements of the quality management system to cater to growing needs, demand and expectations of passenger and freight traffic on the railways through periodic review of quality management systems to achieve continual improvement and customer appreciation. It is communicated and applied within the organization and making it available to all the relevant interested parties.”