IRS POINT MACHINE FOR THICK WEB SWITCH

1. Introduction

Increased speed limits on the Indian rails have lead to use of heavier 60 Kg and 52 Kg rails section with thick web. The conventional point machine with the throw of 143 mm proves inept for the operation of these thick web switches so IRS point machine throw of 220 mm has been developed. The present hand book covers the IRS point machine for operation on thick web switch (TWS) along with clamp point lock arrangement.

2. Working of Point Machine

The machine is involved in doing the following:

- Throwing the points.
- Independent switch locking with clamp point lock.
- Retaining the tongues in end positions.
- Providing possible protection against trailing point.
- Detection of end position of the tongues.

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3. Technical specifications of the point machine.

- **Motor**: 110V DC, 0.44 KW
- **Throw**: 220 mm
- **Max. Thrust**: 450 kg
- **Max. operating current**: 5.5 Amps.
- **Weight of machine**: 210 kg
- **Slipping load**: 700 Kg

The machine is similar in construction to the conventional machine. The addition being that the clamp locking is also achieved by the operating rod itself.

4. Clamp locking with thick web switch

4.1 Clamp point locking

(RDSO Drawing No. RDSO/S-3454 for 60 kg rail and RDSO/S-3455 for 52 Kg rail)

- Provides direct locking between tongue rail and stock rail in closed position.
- Firmly holds the tongue rail in the open position.
- Checks any relative movements between tongue and stock rail.

*IRS Point Machine for Thick Web Switch*
It ensures and proves the proper setting of switch and stock rail.

No stretcher bar is used and hence switches are able to move independently.

A spring setting device (SSD) is provided at JOH, in lieu of stretcher bars, to assist in proper setting of switch upto junction of Rail head (JOH).

The outer side of the switch and the inside of the stock has complementary slight tapers. Therefore, the toe of switch fits inside and under the stock rail so that the flange of wheel engages the switch rail much after 6" beyond the toe.

Adjustment of locking is done by means of packing shims between switch rail and stock rail bracket. Three each of 1 mm and one of 0.5 mm shims are provided for each switch.

### 4.2 Salient features of point machine

- The point machine has a throw of 220 mm with independent lock and deduction slides.
- The switch opening is 160 mm.
- There are two levels of locking provided:
  - Indirect method as use in conventional machines.
• Clamp locking which is direct locking of switch.

- 220 mm throw of point machine is used for the following.

<table>
<thead>
<tr>
<th>SR</th>
<th>Throw</th>
<th>Use</th>
</tr>
</thead>
</table>
| 1. | 1st 60mm throw for point machine. | i) Use of unlocking of lock switch  
ii) Open switch moves 60 mm towards its stock rail |
| 2. | Next 100 mm throw | Both tongue rail moves together by 100 mm  
- The tongue rail of open switch has completed its 160mm movement and is now closed. |
| 3. | Next 60 mm throw | • Closed switch gets locked.  
• Open switch completes its movement remaining 60-mm and open by 160 mm. |
4.3 Advantage.

- It ensures and proves the proper setting of both stock and switch rails.

- Due to the 160mm opening of thick web switch (TWS) at toe the clearance at junction of rail head (JOH) is 60mm. This prevents the repeated striking of the open switch at junction of rail head (JOH) by inner side of the wheel, which in conventional switches leads to chances of under wheel flashing.

- Clamp locking of the switch prevents vibration caused in the switch due to train movement affecting the friction clutch directly. In conventional switches this leads to reduction in efficacy of the friction clutch.

- In a TWS in case of obstructions like stone pieces coming between switch and stock rail, the chances of obstruction clearing by falling down are more as compared to conventional points in which the obstruction can get lodged in because of small space between switch and stock rail.

- Due to complementary tapers in switch and stock rail, the switch rail toe fits underside the stock and therefore the wheel of the train engages the switch rail well after 6" from toe. Therefore, damage and wear and tear of the switch is prevented.
5 Installation.

- Bring the toe 32mm in advance of center line of sleeper No.3 and the distance between sleeper No.3 and 4 to 745mm (From center line to center line)
- Ensure that insulated gauge tie plate is provided on sleeper No.-3
- Remove all leading and following stretcher bars.
- Provide spring setting device of “approved design” at junction of rail head (JOH).
- Maintain gap at junction of rail head (JOH) not less than 57mm for every flange way clearance

5.1 Sequence of connection for Clamp Point locks

For connecting the clamp lock sequence of action shall be as below.

A. Marking holes for clamp lock assembly.

- Stock rail

- For marking holes in stock rails mark centerline on the web of stock rail at the height of 76 mm from bottom of stock rail up to the length of 550 mm from toe.
Mark center punch to the length of 450 mm for 1st hole and 530 mm for 2nd hole from the edge of the tongue rail toe.

Ensure that there is a gap of 80 mm between both the holes (Centerline to Centerline of the holes) as shown in figure given below.
- Drill two holes of 22mm dia in the web of both stock rails for fixing stock rail brackets.

- **Tongue rail**

- For marking in tongue rails, mark centerline on web of the tongue rail at the height of 55 mm from bottom of tongue rail up to the length of 500 mm.

- Mark center punch to the length of 428 mm for first hole and 498 mm for second hole from toe.
- Ensure that there is a gap of 70 mm between both holes (Centerline to centerline of the holes) as shown in figure below.
■ Drill two holes of 22mm dia in the web of the tongue rail for fixing switch rail bracket.

B Marking holes for ground connection.

i) If point machine is connected to left hand-side.

■ First make the centerline in the flange of both tongue rails up to 350mm length from toe.

■ Mark punch up to the length of 148mm for first hole and 328mm for second hole from toe in LH tongue rail.
Mark center punch up to the length of 200mm for first hole and 272mm for second hole from the toe in the RH tongue rail as shown in figure below.
ii) If point machine is connected to right hand-side.

- First make the centerline in the flange of both tongue rails up to 350mm length from toe.
- Mark punch up to the length of 200mm for first hole and 272mm for second hole from toe in LH tongue rail.
- Mark center punch up to the length of 148mm for first hole and 328mm for second hole from the toe in the RH tongue rail as shown in figure.
Connection for Clamp Point locks

- Drill two holes of 24mm dia in the foot of the switch rail for connecting lock rod and detector rods.

- Connect the stock rail bracket to the stock rail as in Fig.

- Assemble the RH and LH lock arm assemblies.

- Now fix tongue rail bracket with the lock arm assembly as in Fig.
- Remove both the stoppers from the locking bar assembly.

- Lock slides of the locking bar assembly are then inserted into the groove of the stock rail bracket (under the rail) through the guide of the lock arm. Fish tailed end of the lock arm should be housed in the notch of the lock slide while inserting the lock slide in the stock rail bracket, as shown in the Fig.
- The tongue rail brackets are then bolted to the web of the switch rail.

- Fix the stopper of both locking bar assembly. Bend longer end of the lock washer on the side of the stopper end on to the nut as shown in Fig.

- The two lock bar assemblies are then bolted together with lug as in Fig.
5.2 Connection of drive rod

- Connect drive rod lug to the throw slide (Driving rack) of point machine.
Connect the drive rod between the drive rod lug and end of locking bar assembly.

- Adjusting screw of the drive rod should be adjusted for 160 mm opening of the switch.

- Keeping the drive rod vertical to track; fix the point machine on the extended sleepers on gauge tie plate.

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5.3 **Connection of the Lock rods and Detector rods.**

- Lock and detector rods are to be assembled at site by inserting drop lug in the threaded portion of the rods. The drop lugs can be suitably turned to suit LH/RH mounting.

- Put tapered washer on the foot of the switch rail such that the thicker portion of the washer is towards the edge of the rail.

- Now connect jaw of the detector/lock rods with the foot of the tongue rail and drop lug with the detector/lock slide of the point machine.
6 Adjustment.

♦ Lubricate all the moving parts the clamp lock assembly.
♦ Put grease on the bronze brush in the lock arm assembly.
♦ Put grease on the notches of the lock slide and fishtail portion of the lock arm.
♦ Loosen the nuts of stock rail bracket so that it can be move freely in its oblong holes and takes its own portion.
♦ Operate the machine with crank handle and adjust the lock and detector slides usually (Near end first)
♦ If clamp lock is not locking point then do the following.
  • For proper locking on both sides additional numbers of packing shims have been provided between switch rail and tongue rail bracket.
  • Required no of shims will be put out side the tongue rail bracket to facilitate locking on either side .
  • Six numbers of packing shims are provided with each clamp point assembly.
♦ Now tighten the nuts of the stock rail bracket.
7 Testing

After installation the following test should be carried out.

7.1 Obstruction test.

The detector slides lock slides and drive rod must be so adjusted that with 5mm thick test piece placed between the switch and gauge face of stock rail at 150mm from the toe of the point.

♦ Friction clutch de-clutches the motor from mechanism.
♦ The point can not get locked either by clamp lock or in the point machine.
♦ Lock segment does not enter into the notches of locking slides.
♦ Switch detection contacts do not make.
♦ The slipping current is not exceeding twice of the normal working current.

7.2 Insulation test.

Check the insulation between the following.

- Point machine
  Check that point machine is insulated from ground connection.
Spring setting device

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.

8. Maintenance

8.1 Points

♦ Ensure graphiting or lubricating of slide chairs at every week.

♦ Ensure that all nuts and bolts are tight and split pins are opened properly.

♦ Lubricate at the following moving parts of the clamp lock fortnightly.

i) Stock rail bracket groove.

ii) Moving part of tongue rail and lock arm assembly.

iii) Between machine of lock bar and lock arm assembly.
- Ensure that the rodding and other connections are tight.
- Check that the point area is well ballast, packed and free from vegetation.
- Check that water does not stagnate in the vicinity of points.
- Ensure information to engineering department regarding to avoid any emergency failure.

8.2 Point Machine

- Ensure that wire connections of the machine are tight and laced properly.
- Ensure that the locking segment enters freely into the notches on the lock slides and with a little pressure in the notch of drive rod.
- Ensure the point machine fittings are tight.
- Check all parts for any crack or breakage etc. and replace immediately if any defect is found.
- Ensure smooth working of the gears without any cracking noise.
- The slipping of friction clutch during obstruction shall be ensured and slipping current shall not exceed twice the normal working current.

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♦ Ensure that the carbon brushes are exerting sufficient pressure on commutator. Clean the commutator properly by using chamoise leather.

♦ Ensure that all moving parts are free from dust and are well lubricated.

♦ Ensure that gauge tie plate is properly insulated.

♦ Ensure that the roller rolls freely on the periphery of the control and lift out disc.

♦ Check that the contact pressure of control and detection contact is adequate.

♦ Apply non-corrosive all temperature grease (IS-507/508) through the entire grease nipple by a grease gun, after 8,000 operations or six months which is earlier or as per instructions issued by the railway.

♦ After every six months or as per instructions issued by the railway pour lubricating oil, SAE-30/SHELL 100, through inlet in to the oil reservoir for lubricating gearbox of the motor.

♦ Pour lubricating oil, SAE-30 on the periphery of control and lift out disk and felt pad provided over the driver rod and the lock slides.

♦ Check the overload current.

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8.3 Track Locking

♦ Check track locking once in six months or as per instructions issued by the railway.

8.4 Workshop Overhaul

♦ After 4,00,000 operations or five years for bigger yard or seven years whichever is earlier. The point machine should be taken out and should receive a general overhaul and thorough cleaning in an authorized workshop.

8.5 Insulation Testing

♦ Check insulation once in six months or as per instructions issued by the railway.
## 9.0 Troubleshooting

<table>
<thead>
<tr>
<th>Sr. No</th>
<th>Nature of Failure</th>
<th>Cause</th>
<th>Remedy</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Tongue rail not housing up to 13th sleepers or tongue rail housing one side properly but not housing another side at adequate distance.</td>
<td>Spring setting device not adjusted properly</td>
<td>Arrange P-Way staff for proper adjustment of spring setting device.</td>
</tr>
<tr>
<td>2</td>
<td>Clamp lock not locking point on either side.</td>
<td>Packing shims between stock rail and tongue rail bracket or outside the tongue rail are to be adjusted.</td>
<td>Adjust the numbers of packing shims of tongue rail bracket.</td>
</tr>
<tr>
<td>Sr. No</td>
<td>Nature of Failure</td>
<td>Cause</td>
<td>Remedy</td>
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<tr>
<td>3.</td>
<td>Point machine does not start.</td>
<td>Fuse blown Off.</td>
<td>Replace with same.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Feed is not coming out from relay room.</td>
<td>Check the circuit and rectified</td>
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<td></td>
<td></td>
<td>Cable conductor becomes faulty</td>
<td>Megger the conductor, replace if faulty.</td>
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<tr>
<td></td>
<td></td>
<td>Motor winding got low insulation.</td>
<td>Replace the motor.</td>
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<tr>
<td></td>
<td></td>
<td>While starting control contacts are not making.</td>
<td>Adjust the control contact.</td>
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<tr>
<td>4</td>
<td>Point is showing gap and motor rotates continuously</td>
<td>Obstruction in between stock and tongue rail.</td>
<td>Remove the obstruction.</td>
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<tr>
<td></td>
<td></td>
<td>In friction due to improper cleaning and oiling of points.</td>
<td>Clean and check oiling of point.</td>
</tr>
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<td></td>
<td></td>
<td>Wrong adjustment of point throws rod.</td>
<td>Adjust point through rod.</td>
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<tr>
<td></td>
<td></td>
<td>Defects with P-Way fitting.</td>
<td>Attend with P.Way staff.</td>
</tr>
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</tr>
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<tr>
<td>5</td>
<td>Point is properly set, but motor continuously rotates.</td>
<td>Respective detection contacts are not making (Point may lock)</td>
<td>Adjust detection contact.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Adjustment required in lock rod, if point is not locked.</td>
<td>Adjust lock rod for proper locking.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>The respective detection terminal loose or broken in point machine.</td>
<td>Attend respective detection contact.</td>
</tr>
<tr>
<td>6</td>
<td>First point is correctly set, locked and detection contacts are making, but feed not extended to IIInd point machine.</td>
<td>Feed not coming to IIInd point machine due to cable between the machine defective.</td>
<td>Check cable conductor between point machine, replace if defective or low insulation.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Crank handle contact of IIInd point machine not making.</td>
<td>Adjust crank handle contact.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Respective terminal loose or broken in IIInd point machine.</td>
<td>Tighten terminal or replace broken terminal.</td>
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<tr>
<td>7</td>
<td>While operating the points the motor rotates in just reverse direction.</td>
<td>Any wire interchanged. In point junction box cable interchanged.</td>
<td>Check wiring and rectified. Check wiring at junction box and rectified.</td>
</tr>
<tr>
<td>8</td>
<td>First point is correctly set, locked and detection made but the motor do not stop even after starting of 11nd point machine.</td>
<td>Short circuit faults in the terminals in point junction box.</td>
<td>Check wiring at junction box and rectified the short circuit faults.</td>
</tr>
<tr>
<td>9</td>
<td>Out of correspondence between point and relay group.</td>
<td>Cable inters changed in point junction box. Wiring inters changed in crank handle box terminal.</td>
<td>Check and rectified. Check and rectified.</td>
</tr>
</tbody>
</table>
10. Do’s and Dont’s.

10.1 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.

10.2 Dont’s.

♦ 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.

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