

ELECTRIC KEY TRANSMITTER

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STUDY OF ELECTRIC KEY TRANSMITTER (**Rotary key transmitter**)

Introduction :- EKT is combination of E-Type Lock and an electromagnet.

When key of E-Type lock is inserted in EKT and turned then the key get locked

The locked key can only be released when Electromagnet in side EKT is energized. EKT is Electro magnet based equipment in which a key of 'E' type lock is in locked condition and can be released only when Electro magnet is energised. It is used to transfer the key electrically from a centralized place to other location and also to prove that gear/equipment attached to EKT key(Crank handle) is in locked condition. This Electrical transmission of key over comes the problem with physical transmission of the key.

The simplest way of controlling a signal, point, or level crossing gate is that the SM shall retain the key of the controlled apparatus (which is normally locked) and issue the key for releasing the apparatus when required.

When signalling gear is controlled through key interlocking then transfer of key from SM/ Cabin to signalling gear is required. As the physical transmission of the key to the controlled spot causes delay, Electrical Key Transmitters are used. The key is normally kept locked in Transmitter (EKT) at site and a similar key Transmitter (EKT) is fixed in stationmaster's room / cabin. They are electrically (cable) interconnected. The instruments have indicator to indicate visually (that a key is transmitted' and EKT is ready for extraction of key), for calling attention either a bell or phone connection provided between the ends.

The Electric key Transmitters are of robust construction and are normally fixed close to the appliances, which is to be unlocked by the key locked in EKT. EKTs are designed to accommodate the key of a particular ward & feather combination so that key controlling/interlocked one signaling gear, does not enter any other EKT controlling other signaling gear of its kind to ensure safety. They are provided with locking or sealing arrangements for security reasons.

EKTs are used in pair OR in single when controlled from panel

Application of EKT

- L.C. Gate and Station Master/ Cabin
- Locally operated siding point
- Crank handle locking
- Locking of key (used for shunting) electrically attached to Block instrument
- Along with token key exchanger at intermediate sidings

WORKING PRINCIPLE

RKT contain one drum which accommodates all the tumblers spring and operating piece and has notch on it's periphery. Realising OR locking of key depends open rotation of drum but rotation of drum is locked if a plunger attached to an armature of an electromagnet is inside the notch on periphery of drum. When feed is extended to electromagnet, the armature get attracted and plunger attached to it comes out of notch on periphery of drum now drum can rotate and key can be extracted.

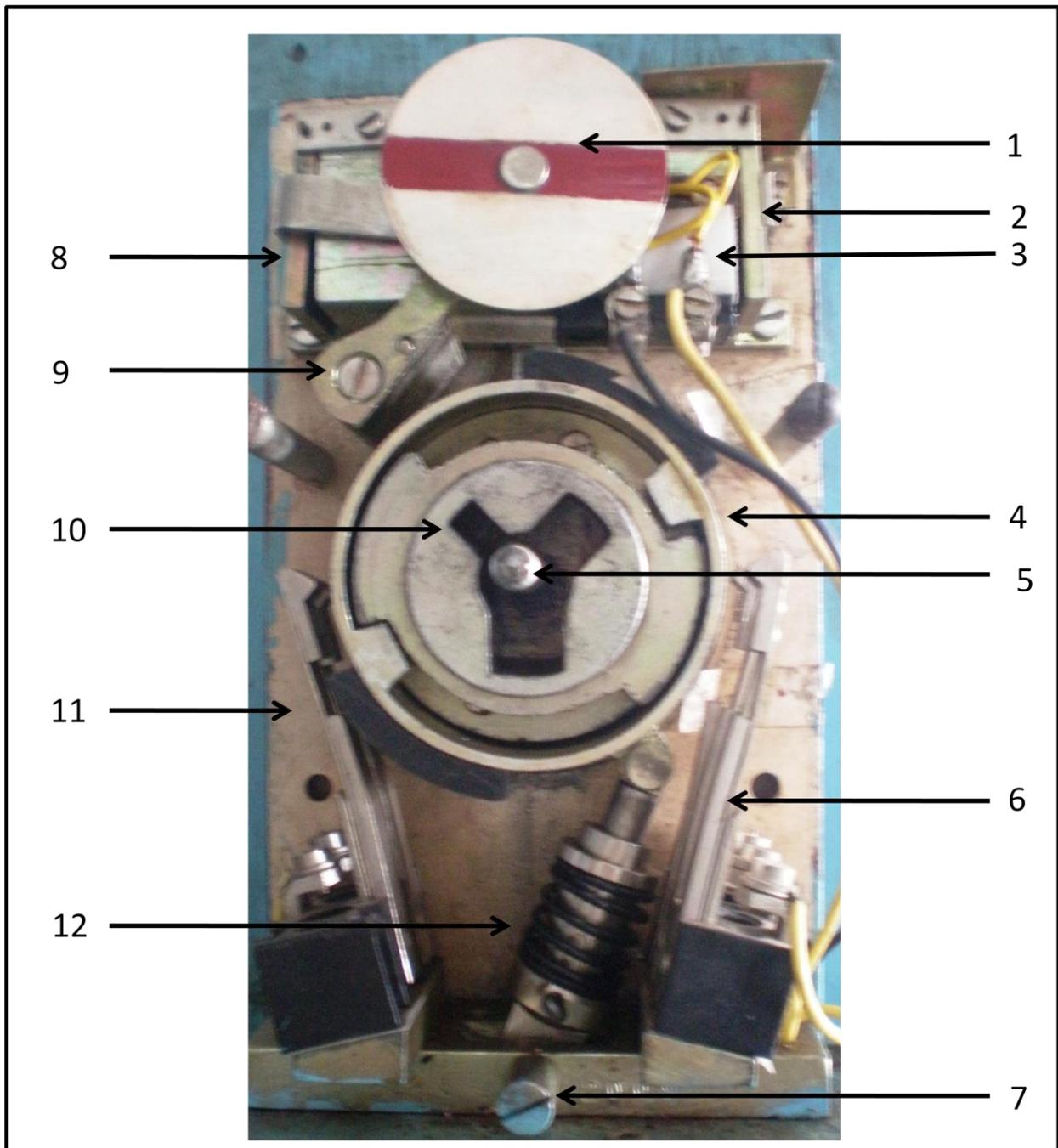
Exercise 1

Description of the instrument and exercise:

1. The Electrical key transmitter consists of _____ (two) parts.
 - a) The back portion
 - b) The front portion
 - c) The front portion or cover having _____ (a hole) for the insertion of key and a small disc type _____ (indicator) to indicate the incoming and outgoing currents and calling attention of operator that EKT is ready for extraction.
2. The back portion of base consists of three parts
 - a) Electro – magnet
 - b) Contact arrangement unit and.
 - c) Locking unit.
 - d) Force drop arrangement

Exercise 2

3. **Electro – Magnet:** The Electro – magnet occupies the upper portion of the case having a coil resistance of _____ (12.5Ω). The minimum voltage required to operate the magnet is 3.75V DC and working voltage is _____ (5V) DC and current _____ (350)mA as per specification No.S 21 of 1.3.71 (Correction slip). The Magnet has two pole faces. The main pole faces attracts the armature, which in turn releases _____ (locking) plunger which allows extraction of key from RKT The auxiliary pole pulls the link placed behind and attach to the _____ (Visual indication) and deflects the indicator towards _____ (Right side) as soon as the coil becomes energized.
4. **Contact unit:** The contact unit consists of _____ (5) contacts insulated from each other contact numbers _____ (1 & 2 and 3 & 4) normally remain in make condition when key is in transmitter and lock condition whereas at the contact numbers _____ (1 & 2 and 3 & 5) are make when the key is turn forcefully to right hand side for transmitting the key to other end to energies the electromagnet
5. **Force drop arrangement:** Force drop arrangement provided on the armature of the electro-magnet to avoid the effects of _____ (residual magnetism). normally this gear is hold up word against gravity and restrict upward movement of lock plunger In case, lock plunger remain outside notch on drum due to any reason it push the lock plunger inside the notch due to its weight. then ensure that the lock plunger is properly locked before transmitting to release other end instrument key, otherwise both keys may be simultaneously release. The electrical lock shall be of gravity type and provided with an efficient forced-drop arrangement.



RKT with cover open

- | | |
|-----------------------------------------|----------------------------------------------|
| 1. INDICATOR | 7. THUMB SCREW METALLIC BASE |
| 2. ELECTRO MAGNET MAIN POLE (ARMATURE) | 8. ELECTRO MAGNET AUXILIARY POLE (ARMATURE) |
| 3. ELECTRO MAGNET | 9. FORCE DROP GEAR |
| 4. DRUM | 10. OPERATING PIECE |
| 5. KEY STUD | 11. BASE |
| 6. SPRING ASSEMBLY (FINGER CONTACTS) | 12. QUICK RETURN GEAR |

Exercise 3:- Identify the various parts in table model opened RKT with the help of shown picture above

Exercise 4:-**Observe the contacts in RKT with respect to position of KEY and fills up the table**

S.No	Operation	Indication Deflected/ steady		Contacts make / break		Coils energized/ de-energized		Key can remained be extracted.
		X	Y	X	Y	X	Y	
1.	The key at "X" is out							
2.	"X" inserts the key, turns it round to the right and holds it there.							"Y" hears bell sound
3.	"y" Extracts his key. Key is out at "y"							
4.	"X" releases the hold on the key.							

STUDY OF E.K.T WIRING DIAGRAM IN RE-AREA

Electrical Key Transmitter instrument in RE AREA: The wiring of the instrument (EKT) in 25KV AC Traction Area is as shown below and direct feeding to RKT coil through line is avoided to overcome inadequate AC immunity of electromagnet coil, it is fed through AC immunized line relay.

In general 12 / 24 volts power supply is used for RKT and to transfer the Key the key transmission relay KTR (R1/R3) is used. As relay and RKT control circuit is common but their operating voltages or different, a limiting resistance is used RKT coil path to drop the voltage to required level.

Key Transmitter relay (R1/R3) (when shelf type relay is used) is 250Ohm instead of 1000 Ohms because, internal/ local voltage require to energies EKT coil and indication is 4V only. In case plug in type relay is to be used then KTR (R1/R3) shall be QS3 relay and (R2/R4) shall be QNA1 relay

Line relay voltage can be 12/24 volt DC and LR (R2/R4) shall be AC immunized

Electrical Key Transmitter instrument working in RE area: The working of the instrument in RE area as follows:

ELECTRICAL POINT AND LOCK DETECTOR (EPD)

नाम

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IRS ELECTRICAL POINT AND LOCK DETECTOR (EPD)

Electrical point and lock detector is used to prove correct setting and locking of switches in required position and generally placed by the side of point on the long extended sleeper No 2 & 3 of point layout. It is generally fixed on normal switch rail side of point. The following three arrangements of IRS design (Roller actuated) EPDs are available:

1. EPD for a single pair of points fitted with lock with "IN & OUT" (IRS Drg.SA23331 & RDSO Drg.S/9301-03);
2. EPD for single pair of points and lock with "STRAIGHT THROUGH" lock movement (IRS Drg.SA23332 & RDSO Drg.S/9302-03); and
3. For Double Slip Points (IRS Drg.SA23332).

The main components of the detector unit are:

1. Cast iron base, frame and cover
2. Contact operating mechanism FIX plat, Yoke and helical spring
3. Contact Block
4. Detector & lock slides for point

The cast iron base provides housing for four switch detection slide or three switch detection slide and a lock detection slides. The cover is detachable and have latch for locking arrangement. It also has cable entry on two side of it.

A fixed plate screwed to the frame above on one side and a yoke provided below it. The yoke is hinged at one end and is forced down by the springs. A crank is attached to the other end of the yoke by means of a pin. An insulating block with three bridge contacts is fixed to the crank on top. Two sets of rollers with a stagger in between are mounted on crank at the bottom. These sets of rollers ride over the detection slides as they move. The nominated set of rollers drop in proper depressions (notches) on these slides if the points are correctly set and locked, Dropping of roller causes the trolley with bridge contacts to swing over a pin and close three pairs of normal or reverse springs on either side.

There are two contact blocks in a detector. One is screwed to the fixed plate on one side while the other is screwed to the projected frame casting on the other side. Each block consists of –

1. A fixed contact spring;
2. Six detection contact springs; and

3. A movable shunt

Switch detection slide

These slides are rectangular flat iron bars with a screw & Cast iron lugs end on one side for connectivity to point switch rail. Each bar has two 7 mm deep under & half cuts (notches) on its surface, one short and the other long on each slide. Locating marks are provided on the top surface of the slides which coincide exactly with a finished surface of cast iron frame when point is set and lock correctly.

There are four types of switch detection slides out which only C slid & D slides are normally used.

1. switch detection slide A
2. switch detection slide B
3. switch detection slide C
4. switch detection slide D

'C' type Switch Detection Slide (S-233377): It has smaller notch and locating mark nearer to the threaded portion AND always connected to the nearest closed switch.

'D' type Switch Detection Slide (S-23378): It has longer notch nearer to the threaded portion of the locating mark is away from the threaded portion of the slide.

Lock Detection Slides

The lock slide is also a rectangular flat bar of the same dimension as that of point detection slides with screw-end, check-nuts and lug on one side. These slides, either has half cut staggered notches on both upper & lower side surface of slide or a full cut notch on only one side surface of slid and connected to Facing Point Lock to prove locking of switches

A' type Lock Detection Slides (S-23370):

It has half cut notches and locating marks on both upper and lower side surface of the slide. There are two types of locating marks provided on both upper and lower side surface of the slide at the distance of 10 mm. and 42 mm. from the end of the slide. **This slide is used in "IN & OUT" type of locking**". If lock rod moves away from point/ track during unlocking of point then 42 mm locating mark shall be on top and If lock rod moves towards the point/ track during unlocking of point then 10 mm locating mark shall be on top.

B' type Lock Detection Slide (S-23380):

It has single notch and two locating marks on the same side surface of the slide. Locating marks are provided at distance of 10 mm. and 42 mm. from the end of the slide. 'B' type lock detection slide is used in the case of "Straight through Locking". When EPD is placed on RH side and nearest switch is closed and locked then 42 mm shall alignment with the surface of the body. When EPD is placed on LH side and nearest switch is closed and locked then 10 mm shall alignment with the surface of the body.

When EPD is fixed on a double slip point all four switch slides each connected to a tongue rail and operate the detector contacts through its trolley subject to condition point is correctly set. When EPD is fixed on a single pair of points, two switch detection slides and a lock slid are connected to tongue rails & Facing point lock plunger (FPL) through their detector connecting rods. When only three slides are used then, one spacer each is fixed in between two slides on either side of detector frame. A screw stud fixed beneath each holds the spacers in place

Detection contacts

There are total four contacts on either side of contact block (three detection and one shunt). These contacts are called as Normal / reverse detection and Normal / reverse shunt

contact. These contacts make when point is set & lock correctly in required position, subject to correct adjustment of slides.

Sr NO	POSITION OF POINT	ND	RD	NORMAL SHUNT	REVERSE SHUNT
1.	POINT NOT SET &/OR NOT LOCKED	OPEN	OPEN	MAKE	MAKE
2.	POINT SET & LOCKED IN NORMAL	MAKE	OPEN	MAKE	OPEN
3.	POINT SET &/ LOCKED IN REVERSE	OPEN	MAKE	OPEN	MAKE

Testing of point

1. Set and lock the point in normal and disconnect the lock detection rod keeping lock slide in its operated condition and now unlock the point .
2. Place a 3.25mm. obstruction test piece between the reverse switch rail at 150mm. from and operate the points to reverse .
3. Check whether the reverse detection contacts are not closed. If closed adjust the position of reverse switch slide to open them sufficiently.
4. Repeat the procedure for normal tongue rail also
5. Place a 5 mm. obstruction test piece between the reverse switch rail at 150mm. from and operate the points to reverse.
6. Observe that point could not get locked if get locked adjust split stretcher bar.
7. Repeat the procedure for normal tongue rail also

Study the working of detector and fill in the blanks below:

1. Trolley rollers are _____ in position to prevent point detection with a _____ notch of slide beneath the rollers if a switch detection rod is _____.
2. The swing of bridge contact block is limited by the _____ on the fixed plate.
3. The movement of detection contact springs is limited within _____ mm.
4. The opening of shunt contacts is limited to _____.
5. Shunt contacts are opened or closed by the _____ or bridge contact block.

Study the various detection slides and their connection to fill in the blanks below:

1. The movement of switch slides is _____ mm.
2. The movement of lock slide is _____ mm.
3. _____ type switch slide is offset to the left from its threaded end and _____ type switch slide is offset to the right from its threaded end.
4. _____ notch is close to the threaded end in A&B type switch slides.
5. The short notch is close to the threaded end in a _____ type straight switch slide and it is away from the threaded end in a _____ type switch slide.
6. The short notch on switch slides is for the detection of _____ tongue rail and the long notch is for the detection of _____ tongue rail.
7. _____ type lock slide is used with "IN and OUT" type locking on points and _____ type is used with "STRAIGHT THROUGH" type locking on points.

8. _____ type lock slide has two notches one on each of its faces.
9. _____ type lock slide has only one notch on one of its faces.
10. _____ type lock slide has a locating mark on each of its two faces, one at _____ mm. and the other at _____ mm. from the end.
11. _____ type lock slide has two locating marks on the same face, one at _____ mm. and the other at _____ mm. from the end.
12. In IRS design layout, for a single pair of points, one _____ type switch slide is connected to the nearest switch rail and one _____ type switch slide is connected to the farthest switch rail, on whichever side of the points (LH or RH) the detector is fixed.
13. In RDSO design layout, two _____ type switch slides are connected with their threaded ends operated to each other.
14. With IN and OUT type locking on points:
 - a) if the lock slide moves towards the track during unlocking of points, keep _____ mm.
15. "Left in right out" principle is followed for locking economically operated points. With these, the direction of movement of switches to reverse is always _____ that of lock slide.
16. The disadvantage of _____ layout is that if slides of open and closed switches are interchanged by mistake, gap in points may not be detected which is unsafe.

INSTALLATION AND ADJUSTMENT OF DETECTOR

1. Fix the detector on 4250mm. long sleepers as per layout drawing No.S-9301/03 with its closer edge at a minimum distance of 1676mm. in BG and 1370mm. in MG from the track centre.
2. Fix the spacers in vacant slide position of the detector.
3. Keep the points locked in normal.
4. Place the switch and lock slides in the detector so that –
 - a) the shorter notch of closed switch slide;
 - b) the longer notch of open switch slide; and
 - c) the lock slide notch let one set of trolley rollers to drop in them. Also see that locating marks on all three slides coincide with the finished surface of detector frame.
5. Connect the detection rods with their respective slides in position and see that normal detection contacts make after the reverse shunt contact opened.
6. Now, operate and lock the points in reverse.