

Access Improvement

Train Master - Transmission Based Train Control Module



Learning information booklet

Issue 1

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1 Introduction

The module will train an individual certificated as a Train Master (TM) in:

- the basic understanding of the Transmission Based Train Control (TBTC) signalling system
- setting up and working within a Specified Area (SA) on lines fitted with the TBTC signalling system
- liaising with the Vehicle Control Centre (VCC) operator for route locking points
- the process of re-entering onto the TBTC signalling system within a SA and possession worksites
- giving up the SA on lines fitted with the TBTC signalling system
- dealing with unexpected complications when re-entering onto the TBTC signalling system.



This course does not cover Engineer's Current Areas.

Individuals who meet the required standard will be awarded a track safety certificate endorsed TBTC module.

2 Roles and responsibilities

2.1 Train Master

The train master is responsible for:

supervising and controlling an engineer's train, test train, mechanised vehicle and on track plant working within a possession worksite or SA

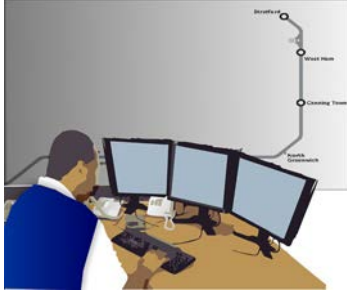
the safety of personnel needing to work on or about the track within a possession worksite or SA.

All personnel working on or about the track when trains and mechanised vehicles are moving or if the traction current is on, must as a minimum, hold Basic Track Awareness (BTA) or Track Accustomed (TA) certification.

2.2 Engineer's Train Operator

A person, certificated by London Underground (LU), to drive an electric, battery or diesel train or locomotive.

2.3 Vehicle Control Centre Operator



Monitors, controls and maintains the VCC.

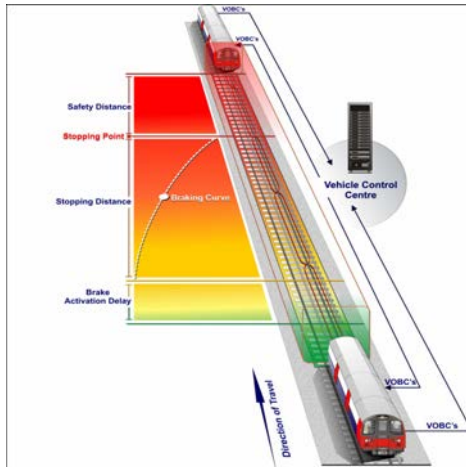


The VCC operator is not a signaller and does not authorise train movements.

2.4 Possession Master

A person certificated by LU to take control of a possession. A Possession Master (POM) can be identified with a 'Possession Master' armband worn on the left arm above the elbow.

3 Transmission Based Train Control overview



TBTC is a computer based signalling system that is different to the normal conventional system as it does not have:

- fixed lineside signals
- associated track circuits.

TBTC is based on the moving block principle, allowing more trains to safely occupy the same amount of track.

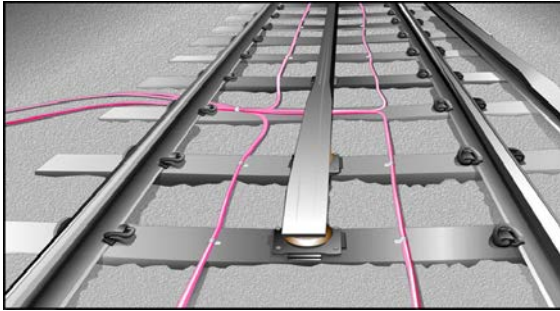
The VCC can calculate the braking distance required, relative to the speed of the train at any specific time. This allows a following train that is slowing down, to approach and stop behind the train in front more closely.

The VCCs are centralised computers, located at the Neasden Service Control Centre (SCC) which communicate with the train's on board computer equipment and keep the trains a safe distance apart.

3.1 TBTC associated equipment

There are several different pieces of equipment on and around the track used for the TBTC signalling system.

3.1.1 Induction loop

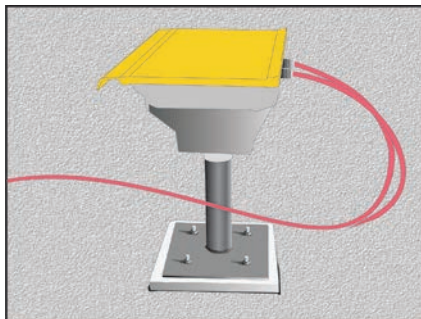


Transmits information between the train and the VCC.



You must not touch or disturb the induction loop, any damage or suspected damage to the loop must be reported immediately.

3.1.2 Remote loop box



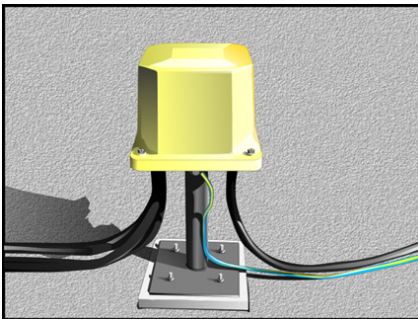
The inductive loops are fitted to the remote loop box via a feed in device that transmits information back to the VCC.

3.1.3 Axle counter



Detects the passing of a train using a counting head (detection point) installed at each end of a section. As each axle passes the head at the start of the section, a counter counts in the axle. A detection point comprises of two independent sensors; therefore the device can detect the direction of a train by the order in which the sensors are passed. When the train passes a similar counting head at the end of the section, the axles are counted out.

3.1.4 Axle counter head communication

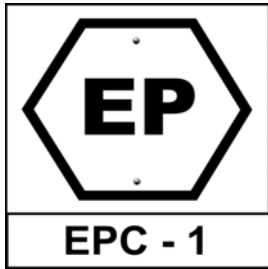


Sends information from the axle counter head to the VCC.

3.2 TBTC track signs

The following are types of TBTC track signs that a TM will see or use during work.

3.2.1 Entry Point (EP)



This sign marks the location of the boundary between two TBTC loops. Trains re-entering the TBTC signalling system must ensure that their Vehicle on Board Controllers (VOBC) are reset before passing this sign.



3.2.2 Clearance Point (EPX)

This point is where trains may re-enter the TBTC signalling system after both VOBCs have passed a loop boundary. This point is located after an entry point, approximately one train length (130 metres) after a loop boundary. Trains will be authorised to this sign when re-entering the TBTC signalling system, this is so that both VOBCs are on the new loop.

3.2.3 Restrictive Manual (RM) hold



These signs indicate the locations where trains in RM mode (outside of a possession or SA) must stop and gain authorisation to proceed. RM hold signs may be used as a designated entry point in place of Entry Point signs.

The sign with the yellow border is a repeater.

4 Planning possession worksites and specified areas

When planning possession worksites and SAs on TBTC lines the following must be taken into consideration:

- platforms used for re-coupling are of sufficient length to accommodate the entire train
- there are appropriate Entry Points (EP) and Clearance Points (EPX) within the possession worksite or SA
- wherever possible a minimum of two entry points should be designed into the re-entry path of the engineer's train (re-entry path will be within the limits of the possession / SA)
- the engineer's train will run to site in Protected Manual (PM) (this will mean the train will operate to normal signalled moves under Traffic Hours conditions)
- the possession / SA must be published in the Nightly Engineering Protection Arrangements and Engineering Notice.

At locations where points cannot be secured using the TBTC route locking procedure, they must be secured using a scotch and clip.



When an engineer's train is scheduled to uncouple and both portions are scheduled to work independently, there is a requirement for both portions to have a TM, one for each portion.

5 Specified areas on TBTC lines

Engineer's trains will be routed to site in accordance with the published path.

When the engineer's train has arrived at the designated platform the TM will:

- book on with the Track Access Controller (TAC) if they have not already done so
- tell the Engineers Train Operator (ETO) to switch to battery power (if applicable)
- contact the controller to request that traction current be switched off from the relevant section(s) and confirm with a Current Rail Indicator Device or Permanent – Current Rail Indicator Device
- tell the limit definers to define the limits of the SA and confirm when this is done
- tell the VCC operator to set and lock points as per the TBTC route locking procedure and receive confirmation
- confirm and inform the Site Person in Charge (SPC) that the SA has been defined.



If the engineer's train is not scheduled to uncouple then the VCC operator does not need to be contacted when setting up the SA. However the VCC operator will need to be told when giving up the SA.

Specified areas on Transmission Based Train Control lines

5.1 Commencing work

Once the SA has been set up and the work group have been briefed, the TM informs the SPC that the SA has been defined and work can commence.



It is the responsibility of the TM to ensure that all protection arrangements are in place before the train starts working.

The TM tells the ETO to uncouple the train and confirm when this is done.

When confirmed, the TM tells the SPC that work can start.

The SPC tells the TM to work the engineer's train as required.

The TM tells the ETO to move the engineer's train as required.

5.2 On completion of the work

On completion of the work, the SPC will tell the TM that the work is complete and the SA can be given up.

TM tells the ETO to move both portions of the engineer's train to the designated station platform, to re-couple the train and confirm when done.

TM confirms with the VCC operator that the train has re-coupled and is ready to re-enter the TBTC signalling system and can now be routed to the designated exit platform.

When the route is set and area cleared the VCC operator will tell the TM that the train can be moved to the designated Entry Point (EP).

TM tells the ETO to move the train to the designated Entry Point in Restricted Manual mode (RM).



Moving a train in RM mode limits the speed of the engineer's train at 17.5 kph.

On arrival at the designated sign, the TM will tell the VCC operator and request the clearance of any further issues and wait for confirmation.

TM tells the ETO to reset both VOBCs.

When the ETO confirms, tell the VCC operator that the VOBCs are reset and the train is ready for re-entry.

TM authorises ETO to proceed to designated Clearance Point (EPX) and wait for the system to start communicating.

Once confirmed, the TM authorises the ETO to proceed to the designated exit platform in RM.

TM tells the VCC operator that the train has fully berthed at the designated exit platform and requests for any other issues to be cleared up.

VCC operator confirms that all remaining issues have been resolved.

5.3 Giving up the specified area

Once the engineer's train has fully re-entered the TBTC signalling system and all issues have been resolved, the SPC will authorise the TM to give up the SA. The TM will:

- request the VCC operator to remove any route locking on points within the SA
- tell the limit definers to remove the limits of the SA and confirm when done
- book off with the TAC followed by the limit definers
- tell the ETO to proceed to booked stabling point when traction current is switched on.

6 Possession worksites on TBTC lines

Once the possession has been set up, the POM will tell the Protection Support Manager (POSM) to set up the worksite(s) and give the SPC permission to commence work.

TM will tell the ETO to switch to battery power before any train movements (only applicable if battery locomotives are used).

TM tells the VCC operator to set and lock points as per the TBTC route locking procedure and receive confirmation.

TM tells the ETO to uncouple the train and when confirmed, the TM informs the SPC.

6.1 Commencing work

Once the worksite has been set up and the work group have been briefed, the SPC tells the TM that the work can commence.

The TM tells the ETO to uncouple the train and confirm when this is done.

When confirmed, the TM tells the SPC that work can start.

The SPC tells the TM to work the engineer's train as required.

The TM instructs the ETO to move the engineer's train as required.

6.2 On completion of the work

On completion of the work the SPC will tell the TM that the work is complete.

TM tells the ETO to move both portions of the engineer's train to the designated station platform to re-couple the train and confirm when done.

TM tells the VCC operator that the train has re-coupled and is ready to re-enter the TBTC signalling system and can now be routed to the designated exit platform.

When the route is set and area cleared, the VCC operator will tell the TM that the train can be moved to the designated Entry Point (EP).

TM tells the ETO to move the train to the designated Entry Point in RM mode.

On arrival at the designated sign, the TM will tell the VCC operator and request the clearance of any further issues and waits for confirmation.

TM instructs the ETO to reset both VOBCs.

When confirmed tell the VCC operator that the VOBCs are reset and the train is ready for re-entry.

TM authorises ETO to proceed to designated Clearance Point (EPX) and waits for the system to start communicating.

Once confirmed, the TM authorises the ETO to proceed to the designated exit platform in RM.

TM tells the VCC operator that the train has fully berthed at the designated exit platform and requests for any other issues to be cleared up.

VCC operator confirms that all remaining issues have been resolved.

Once confirmed, TM tells the SPC, who gives up the worksite with the POSM.

6.3 Movements outside the possession worksite

All train movements outside a possession worksite must be controlled by the POSM. The POSM will instruct the ETOs via the connect radio system to move the engineer's train.



As a TM you are not responsible for the movements outside the possession worksite.

7 Communications

A	Alpha			Q	Qubec
B	Bravo			R	Romeo
C	Charlie			S	Sierra
D	Delta			T	Tango
E	Echo	K	Kilo	U	Uniform
F	Foxtrot	L	Lima	V	Victor
G	Golf	M	Mike	W	Whiskey
H	Hotel	N	November	X	X-ray
I	India	O	Oscar	Y	Yankee
J	Juliet	P	Papa	Z	Zulu

Communication is a vital part of rail safety, and at the heart of what we all do day-to-day.

Our own safety, and that of those working with us, will often depend on knowing what each other is doing – where, why and when. Many of the systems we have in place are based on this understanding. And if something does go wrong with a procedure, or there's an unforeseen hazard, your team may have to rely on communication to prevent the danger.

The following rules must be carried out when giving or receiving messages.

Make sure:

- you are talking to the right person and that person knows who you are
- your message is clear, accurate, and to the point
- you understand the information and any action that is required
- that you know how to make contact again (if required)
- you record details in the logbook or your notebook (where applicable).

The message must start by:

- stating who you are
- asking who you are talking to
- stating where you are
- stating why you are calling.

Ask delegates:

- what they know of safety critical communications
- if they know the phonetic alphabet
- to read out the name of the person next to them phonetically
- to explain the use of numbers.

7.1 Using numbers

If you are using numbers 10 and over in your message, you must say them one at a time.

For example, 'Train 123' must be spoken as 'Train one two three' not 'Train one hundred and twenty three'.

You must also say the number '0' as 'zero'.

When signals, points, train descriptions or locations have similar names or numbers (for example, signals A 114 and A 314 on adjacent lines), you must take great care not to cause confusion.

You do not need to quote numbers separately when you refer to time, for example, the time 13.17 hours should be stated as 'thirteen seventeen'.

8 Dealing with incidents and emergencies

If the engineer's train cannot re-enter the TBTC signalling system whilst within a possession worksite or SA, the TM must at the first instance tell the VCC operator.

8.1 What would you do if the VCC operator cannot clear all issues relating to the engineer's train?

If the VCC operator cannot clear all issues relating to the engineer's train whilst within a SA the TM must tell the TAC and controller.

If the VCC operator cannot resolve the issues relating to the engineer's train whilst within a possession worksite the TM must tell the POSM.



It is not the responsibility of the TM to resolve any issues relating to re-entering the TBTC signalling system. They are to act on the advice given by the VCC operator.

9 References

- Rule Book 01 Communications
- Rule Book 03 Traction current and high voltage supply
- Rule Book 16 Going on the track in Engineering Hours
- Rule Book 18 Engineer's trains, vehicles and trolleys
- Jubilee Line Appendix to the Rule Books
- OSP – (TLL-J001-N395-HSE-PLN-00025) Jubilee Line engineering vehicle re-entering a TBTC system – possession / specified area arrangements.

