



# CHAPTER 2

## Block

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# **Unit 4 Manual Block**

- **Basic Principle**
- **Controlled Manual Block**
- **Interlocked Manual Block**

# 4.1 Basic Principle

- In a **manual block** system the **clearance** of block sections has to be checked by **local operators** by watching **the rear end train markers**.
  - ◆ The block signals are operated manually.
  - ◆ The block information is **transmitted** by means of **telecommunications**, in its most simple form by telephone (telephone block).
  - ◆ Fig.4.1 shows a typical example of a manual block system that works with telephone messages.

# 4.1 Basic Principle

- ◆ Fig.4.1 shows a typical example of a manual block system that works with telephone messages.

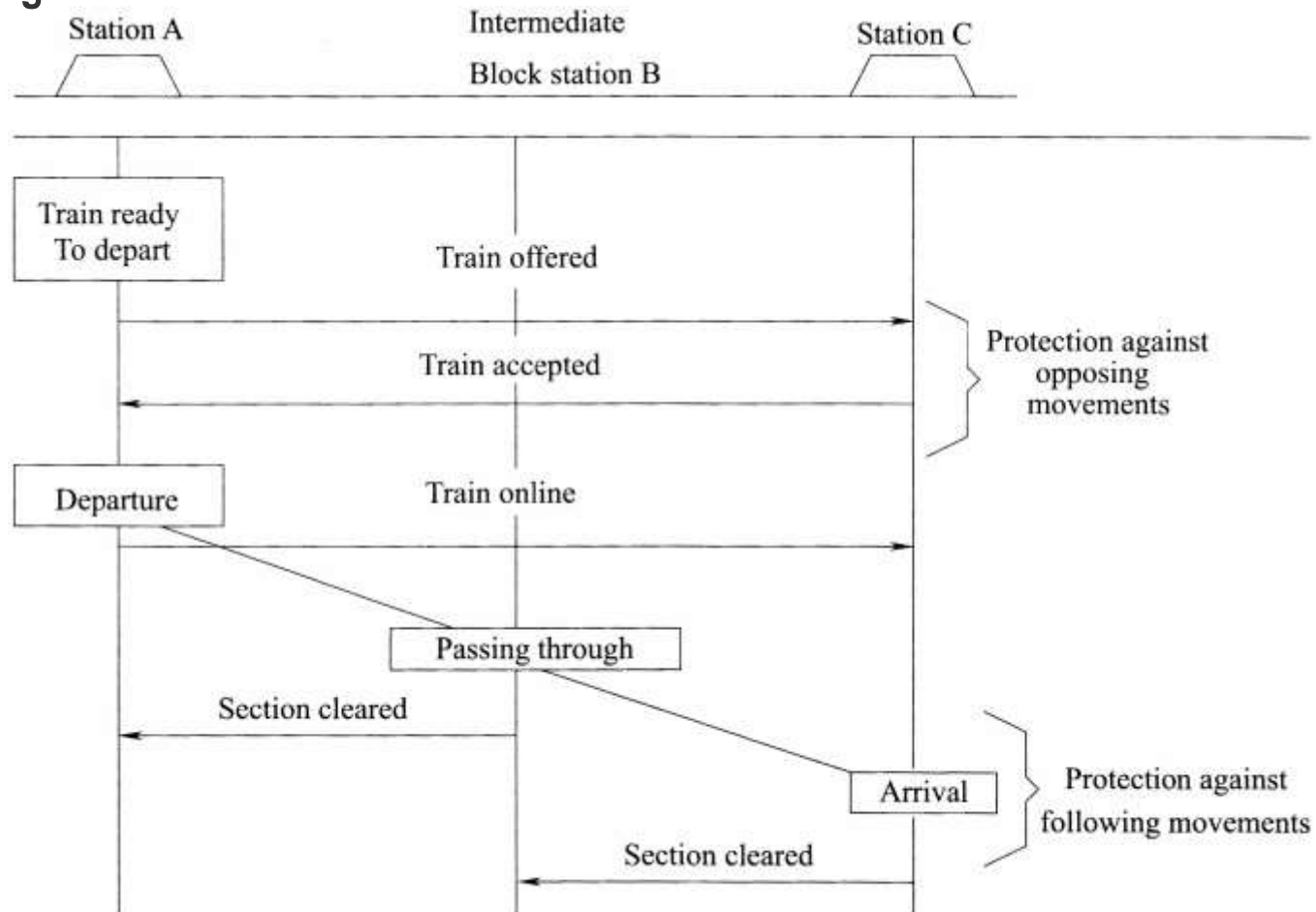


Fig. 4. 1 Example of a telephone block system

# 4.1 Basic Principle

## ■ Single track lines

- ◆ On **single track lines**, a train which is going to leave a station has to **be offered to** the next station where the train sequence may be changed.
- ◆ This **receiving station** can be a junction or a **station with passing tracks**.
- ◆ After this receiving station has accepted the train, all intermediate block sections will **be reserved for** this train.
- ◆ When the train has **departed**, the time of departure is transmitted to the receiving station and also to all intermediate block stations.
- ◆ After the train has cleared a block section and is protected by a stop signal, a clearance message is being sent to the block section in rear.

## ■ Double track lines

- ◆ On double track lines where a **current of traffic** is **in effect**, offering and accepting of trains are only required for **movements against the current of traffic**.

# 4.1 Basic Principle

- All train movements and train messages are recorded by the station operators in a **hand written train record**. This is a **tabular sheet** in which every train movement is recorded with the following data:

- ◆ At the **departure station**

- The train description.
- The time of the train has been accepted from the receiving station.
- The departure time.
- The time of the clearance message station has been received from the next block station.

The time of the clearance message (that departure) station has received from the next block station.

- ◆ At an **intermediate block station**.

- The train description.
- The time of the train has departed from the departure station.
- The time of the train has passed the block station.
- The time of the clearance message (of block) station has been sent to the block station in rear.
- The time of the clearance message (that current) station has received from the next block station.

# 4.1 Basic Principle

- All train movements and train messages are recorded by the station operators in a **hand written train record**. This is a tabular sheet in which every train movement is recorded with the following data:
  - ◆ At the **departure station**
    - The train description.
    - The time of the train has been accepted from the receiving station.
    - The departure time.
    - The time of the clearance message station has been received from the next block station.
  - ◆ At the **receiving station**.
    - The train description.
    - The time of the train has departed from the departure station.
    - The arrival time.
    - The time of the clearance message **(of receiving)** station has been sent to the block station in rear.

## 4.1 Basic Principle

- With little **modification** on the different railways, this kind of a telephone block system is typical for European operating procedures, where train movements are authorized by local operators.
- On North American lines, *where the traffic is always **regulated** by a **dispatcher** who **issues the movement authorities**, train messages for accepting trains between stations *where the train sequence may be changed*, are not required.
  - ◆ There, train messages are only exchanged between **adjacent** block stations.*
- Instead of telephone messages, some railways use special **block instruments** to indicate the state of the line by **lamps** or movable signs.
  - ◆ It helps to reduce the probability of **human errors in comparison to** telephone communication.
  - ◆ Such block instruments are typical for railways which follow British operating procedures.



## 4.2 Controlled Manual Block

- To eliminate the **risk of accident** which may cause by human error in a manual block system, some North American railways introduced *controlled manual block* systems.
  - ◆ In controlled manual block system the signals are still operated manually but are controlled by continuous **track circuits**, requiring **cooperation** between the operators of adjacent block stations.
  - ◆ A signal cannot be cleared when the block section is occupied by a train or when the operator at the adjacent block section has cleared a signal for an **opposing movement**.
  - ◆ Checking the **train integrity** by watching the **rear end train markers** is not necessary.
- Instead of this principle of a safe manual block system, European railways **prefer** an interlocked manual block as described below.

## 4.3 Interlocked Manual Block

- An interlocked manual block system follows the “**block and lock**” principle. That’s why it is also called a “**block and lock**” system.

[ ,æpə'reɪtəs ]

- ◆ The **block instruments** are interlocked with the signals in a **block apparatus**.
- ◆ After a train has entered the block section, the signal is locked by a block instrument in stop position, thus **preventing** the operator **from** clearing the signal again until he has received the clearance information from the operator of the next signal (Fig.4.2).
- ◆ After a signal has been **reset** to stop position it is immediately automatically locked by a **rotation locking device**.
- ◆ This device prevents clearing the signal again if the **electric block instrument fails**.
- ◆ The rotation lock will only **release** after the block instrument has **worked properly**.
- ◆ The train has electrically “block in”. A continuous **track clear detection** for the block section is not required.

# 4.3 Interlocked Manual Block

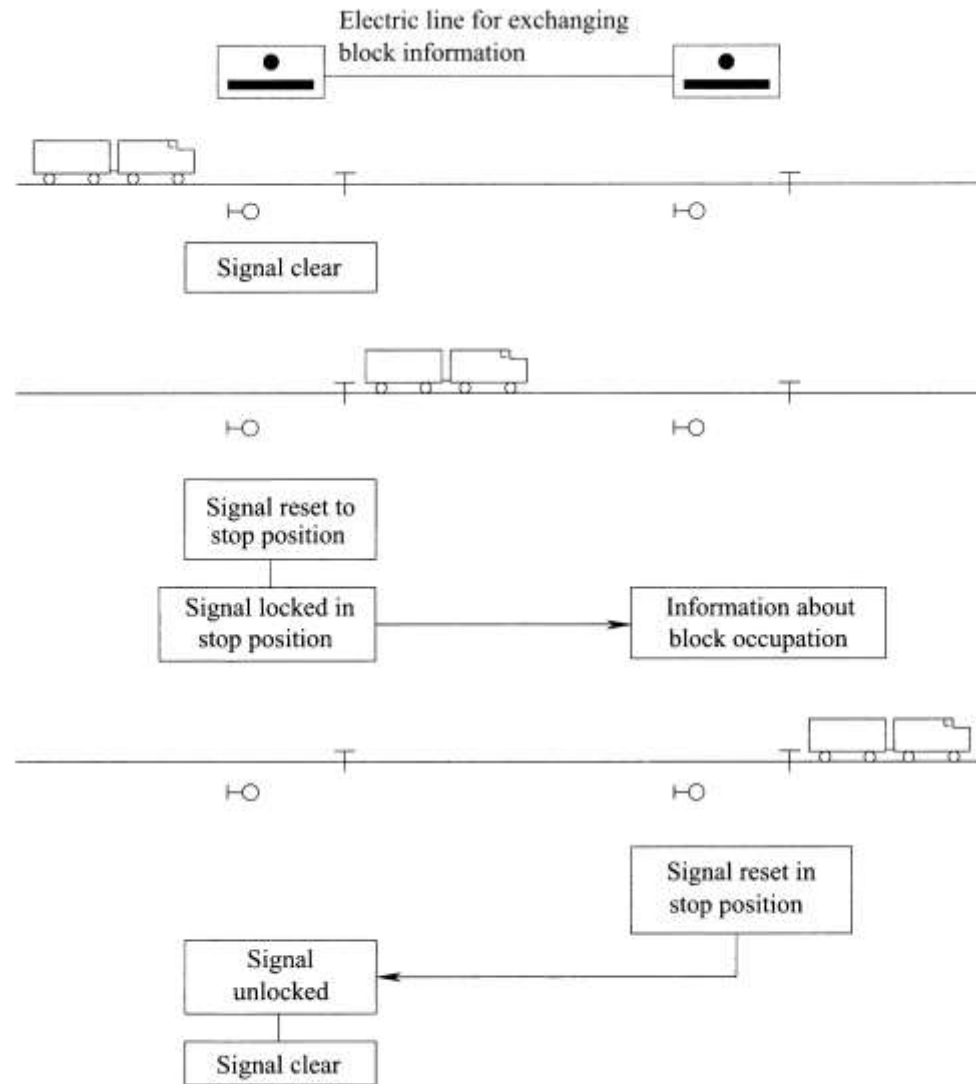


Fig. 4.2 Protecting following movements in the German interlocked block system

## 4.3 Interlocked Manual Block

- ◆ After the train has **cleared the block section** and is protected by a stop signal, the operator may “block out” the train by operating a **release button** that will unlock the signal at the block station in rear.
- ◆ The release button is connected to an **electrical lock** that prevents to block out the train until it has passed a short track circuit at the exit of the block section.
- ◆ Thus, a signal cannot be unlocked before the train has passed the next block station, but the train integrity has still to be checked by watching the rear end marker.
- ◆ This kind of an interlocked block system has been widely **adopted** by railways which follow German operating procedures. [ ,æpə'reɪtəs ]
- ◆ A very common type of **block apparatus** that is used in an interlocked manual block is the German “Blockfeld” and its further developments in **relay logic**.

- The block and lock principle is also used for opposite locking on single track lines.

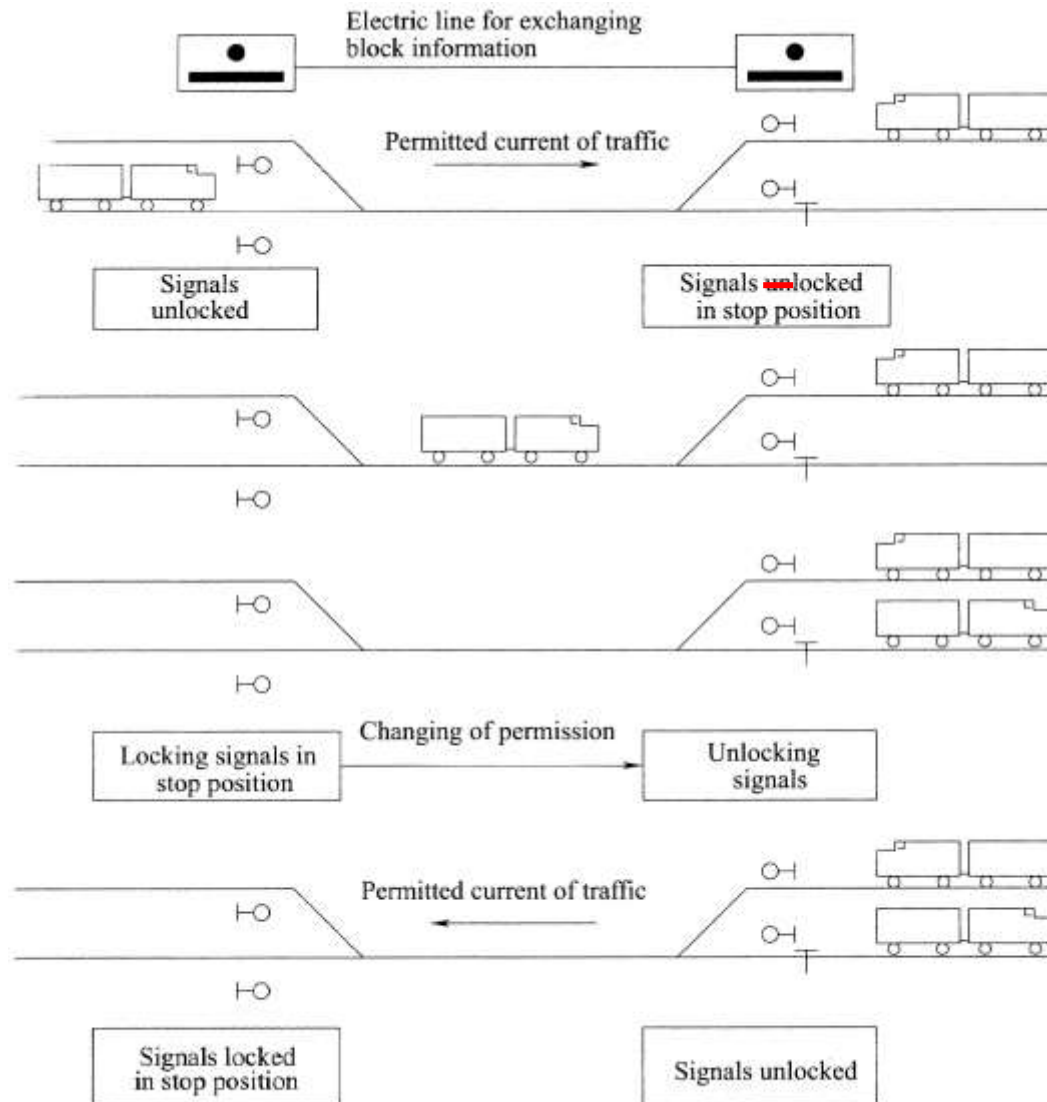


Fig. 4.3 Opposite locking in the German Interlocked Block System

## 4.3 Interlocked Manual Block

- The principle of an interlocked block system cannot be used on track sections inside of **home signal** or **yard limits** where trains may **terminate** or change their direction.
  - ◆ In such cases a train can leave the section without passing the next signal. Thus, the locking of the home signal that has governed the train into the section would never release.
  - ◆ **Train separation** in such sections can only be ensured by line clear detection.
  - ◆ That is the technical reason why on railways where a block system always means an interlocked block system (*especially typical for railways which follow German operating procedures*), these track sections are usually not **regarded as** block sections.

# Homework

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- ◆ 1

- ◆ 2

- ◆ 3: (1)

- ◆ 4: (1), (2)