Relay Interlocking with Push-button Control and Train Describer System at Stockholm Central Station

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This article presents the main features of a new interlocking plant at Stockholm Central Station based on entirely new principles. Among the new features are a train describer system and a keyboard for setting up train routes.

At the end of April 1964 the first part of a new relay interlocking plant at Stockholm Central Station was put into service. When fully installed the plant will be about six times as large as at present and will then control some 100 main-line signals, 250 position-light shunt signals, 225 electrically operated points, 850 train routes and 525 shunting routes. The number of train and shunting movements per day will be about 2000. The controlled area is rather more than 15 kilometres long in a north–south direction.

The signals within the area have so far been controlled from four power-operated lever frames which, after 30 years of hard service, need to be replaced. They will be successively dismantled as each new part of the plant becomes ready for service. The new plant is expected to be completely installed by 1966. It will save manpower and allow more effective traffic routing and a better survey of the traffic situation.

The control office is situated at Stockholm Central Station. The office is on a level with and adjacent to the platform system, so that quick and convenient communications exists between the office, which also serves as train despatcher's room, and the trains and platforms. The arrangement of the control room is shown in fig. 1.

External Plant

In respect of external equipment the plant is constructed in the conventional manner with track circuits, point machines and signals of normal design. A. C. track circuits are used within the central area, while more remote track circuits, which are generally longer, are fed with D. C.

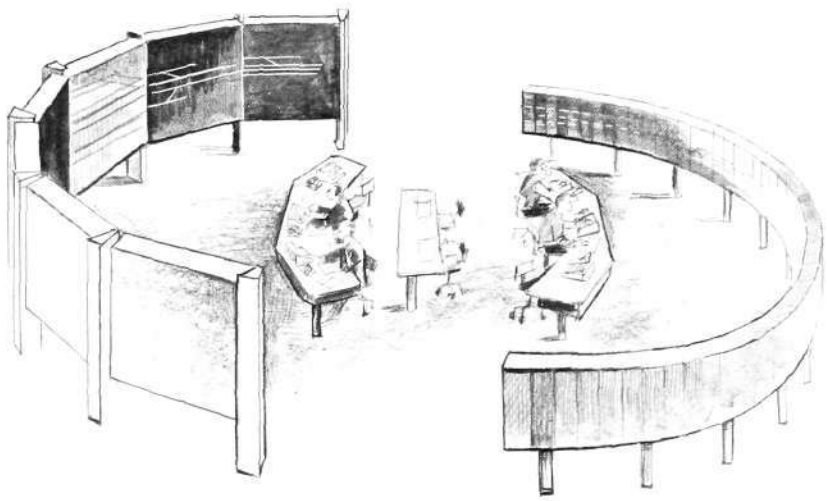

Fig. 1
A drawing showing how the control room will be arranged in future.

In addition to the local interlocking (left), the first part of which has now been commissioned, the room will also house a CTC office (right). The CTC office will remote-control some 70 stations just outside the interlocking area.

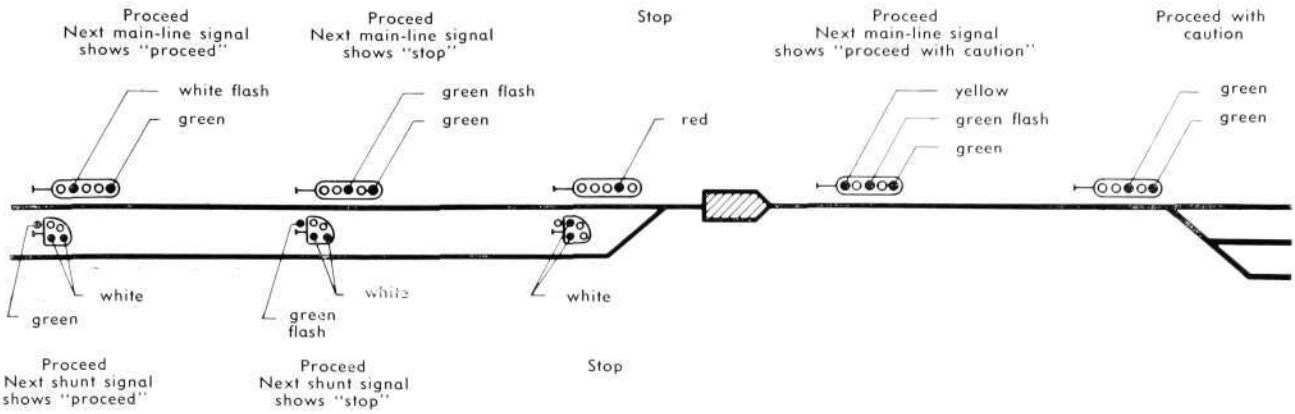

Fig 2

Five-light main-line signals are used on tracks where the speed may not exceed 40 km h, and on other tracks shunt signals supplemented by a green aspect.

In addition to the proceed aspect the signals also show the aspect of the signal ahead.

Train movements on tracks on which speeds of 40 km/hour are allowed will be controlled by main-line signals, other train movements by position-light shunt signals with green light (fig. 2).

Each main-line signal is preceded by a distant signal. In the shunt signals the green light serves also as distant signal for the subsequent main-line or shunt signal (fig. 3).

The platform tracks have special departure signals for passenger trains.

All main-line and shunt signals are operated from the control office, whereas the departure signals are operated by the train guards from switches on the platform. The departure signals are dependent on the other signals and can show the departure aspect only if the corresponding exit signal shows proceed.

Points and derailers, which are to be operated from the control office, have electrical mechanisms. Certain points have local switches. These points can be locally operated by the shunting personnel on permission from the control office. All points can also be manually operated with a crank in the event of power failure or other fault.

Points and derailers which are seldom operated are designed solely for local manual operation and are locked in position by electric locks.

Fig. 3

Position-light shunt signal with four white apertures and one green

Internal Plant

The main parts of the internal equipment are the control apparatus and the illuminated track diagram in the control office (fig. 4). The necessary relays and power supply equipment are placed in relay rooms under the control office.

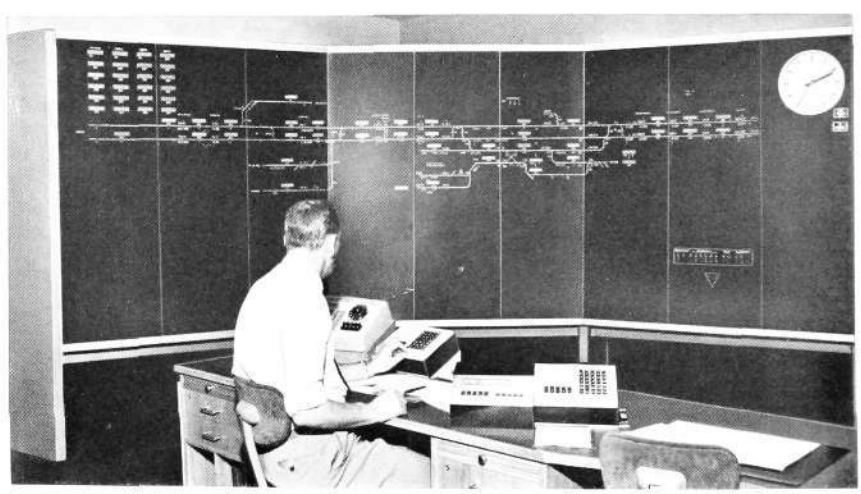

Fig. 4

The control office at Stockholm Central Station

In the background is the indication panel with the track system for the part of the plant at present in use.

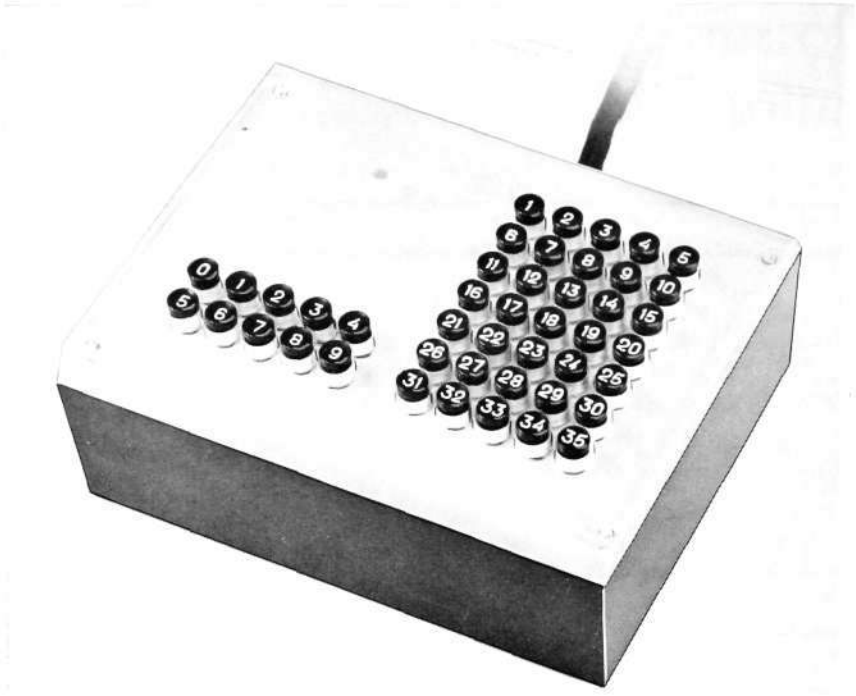

Fig. 5
Keyboard for establishment of train routes

The plant is operated from three keyboards (fig. 5), each of which controls nine sections of the plant in whole or in part. At low traffic periods, therefore, the entire plant can be controlled from a single keyboard. Each keyboard contains 45 keys of which the ten in the bottom left-hand row are numbered 0–9. These are used for selection of signals, points, derailers and track circuits etc., all of which have three-digit numbers between 201 and 999. The 200 lowest numbers are reserved for control of Älvsjö Station south of Stockholm Central Station. The remaining keys on the right are numbered 1–35 and are used for establishment of routes and for switching of points and signals etc.

A route is established by keying the numbers of the signals at the start and end of the route and then pressing an execute button for the route.

The illuminated track diagram is about 1.5 × 10.5 m (fig. 6). The track system is shown on plexiglas sheets. Under the sheets are lamps which lighten or darken in response to the various indications.

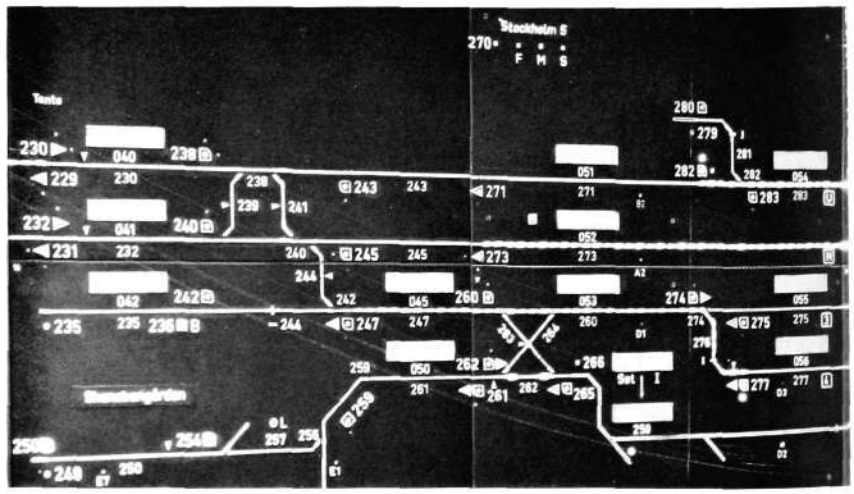

Fig. 6
Detail of indication panel

The track system with text etc. is engraved on black plexiglas, the track system in grey and text in white. The symbols for track circuits are orange-coloured.

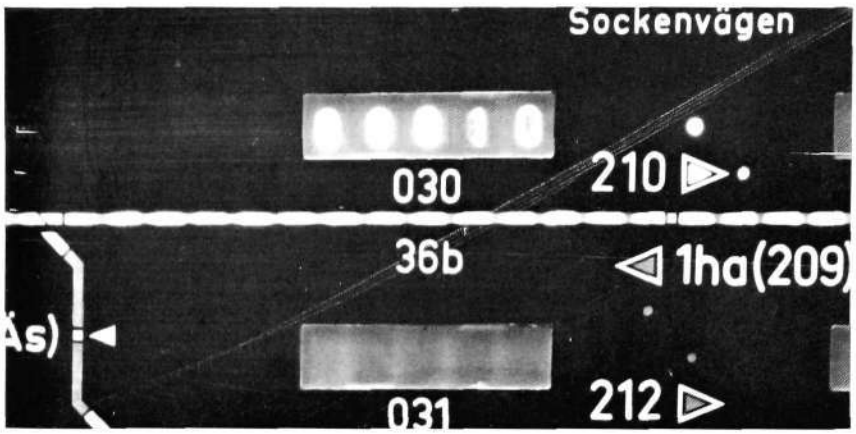

Fig. 7
Train descriptions are set-up in rectangular display units. The picture shows description 00010 in display unit 030.

The indications are displayed in various symbols according to the nature of the indication. The same aperture may show indications in different colours and in steady or flashing light. The indication lamps are normally extinguished and light only when the attention of the control office personnel needs to be summoned or as an acknowledgement of an executed control.

The operation of the plant is facilitated by a train describer system which keeps the control office personnel informed of the descriptions of trains within or approaching the area. The descriptions are set up in rectangular display units over each track or part of a track on the track diagram. When a train is on a track, its description is set up in the relevant display position (fig. 7) and then follows the train as long as it is within the signal-controlled area.

The train describer system is operated from a separate keyboard (fig. 8) from which the descriptions of trains leaving the area are keyed into the system. This keyboard has ten keys numbered 0–9. To set up a train description, the operator first keys the three-digit number of the relevant display unit and then the train description. Destination and description can be checked in the verifying display unit on the keyboard. After this check the description is transferred to the track diagram with the start key *S*. Wrongly keyed numbers can be cancelled both as regards destination and train description.

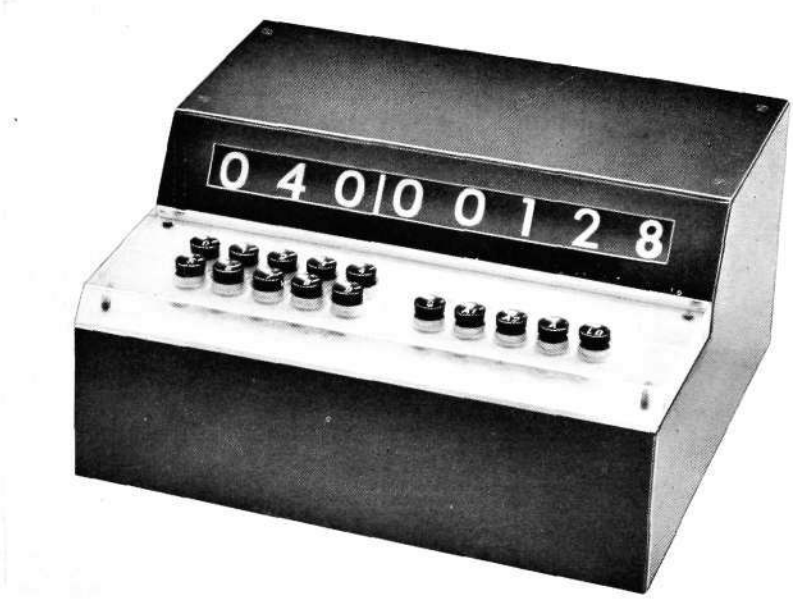

Fig. 8
Keyboard for train describer system

Descriptions of trains entering the area are automatically transmitted to the control office from adjacent stations. They are displayed first in a position corresponding to the transmitting station and are thereafter moved down to the area display positions when the train enters the controlled area. The "remote" display positions are seen at the top left of the track diagram (fig. 4).

The descriptions for departing trains are transferred in the same way under remote control to adjacent stations.

The relay equipment consists of safety relays which ensure the safety of train movements. Telecommunication relays are used in the train describer system and also for repetition of keyset signals and other functions of a non-safety character in the actual signal plant. The telecommunication relays are mounted in relay sets of plug-in type (fig. 9). For the power supply of the plant there are rectifiers for the relays and converters for the A. C. track circuits. A standby unit is automatically switched-on in the event of a fault in the normal supply.

Concluding Remarks

Experience hitherto of the part of the plant that has been in operation has been thoroughly satisfactory both as regards the safety and control and the train describer systems. This bodes well for the future when the plant is fully installed and its many advantages in respect of saving of manpower and improved traffic capacity and supervision can come into their full right.

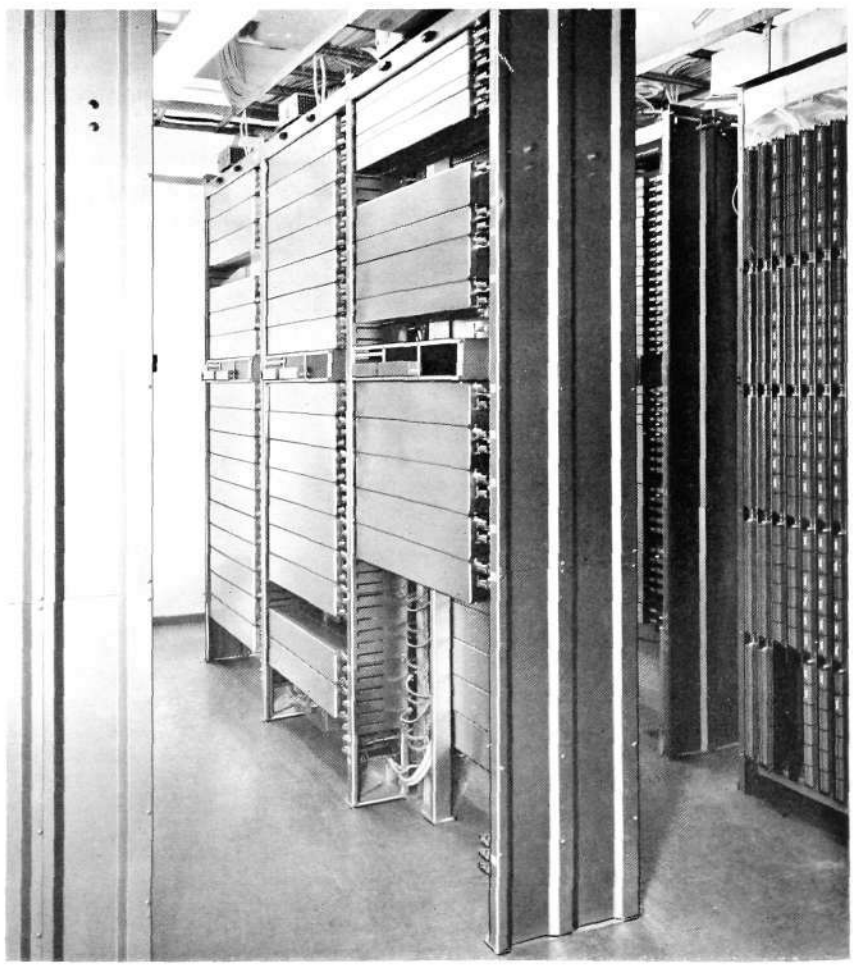

Fig. 9
Telecommunication relay rack