

Chapter E Special and More Complex Features

1 Special and More Complex Features

Features in this Chapter complement Chapter C Section 1 and Chapter D Section 1, and include:

- Routes that require flank points in another Central Interlocking (Section 1.1)
- Routes that cross two Central Interlocking boundaries (Section 1.2)
- Routes that cross one SSI Central Interlocking boundary but need to access a third Central Interlocking (Section 1.3)
- Routes crossing castellated boundaries (Section 1.4)

1.1 Flank Points in Another Interlocking

A route wholly within one Interlocking may require points in an adjacent Interlocking as flank protection. In such cases, the route must be treated similarly to a cross-boundary route, i.e. with a request to the adjacent Interlocking to test that the points are free, and an acknowledgement back if the points have been called and locked.

A special sub-route is required in the adjacent Interlocking in order to lock the flank points, with an associated sub-route-releasing latch in the first Interlocking. They are named after the sub-route(s) in the first Interlocking which would have been used to lock the points in the absence of the boundary, typically UZCD-AB and LUZCD-AB (or UZCD-AB/BA and LUZCD-AB/BA).

The special sub-route is locked by the route setting request(s) in the adjacent Interlocking and the latch is unconditionally unset by the acknowledgement(s), i.e. in a manner similar to that in Chapter D Section 1.5. The special sub-route is freed and the latch set by the standard request/acknowledgement sequence shown in Chapter D Section 1.8 when the sub-route(s) in the first Interlocking all become free. Typical request names are QUZCD-AB-RQ and QUZCD-AB-AK (or QUZCD-AB/BA-RQ and QUZCD-AB/BA-AK).

Note that when the flank points are called they must be route-locked at the same time by locking the special sub-route. It is not acceptable to delay the locking of the special sub-route until after route setting is completed by simply updating the state of the special sub-route, via an IDL telegram bit, to that of the associated sub-route(s) in the Non-controlling Interlocking.

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In a manner similar to that illustrated in Chapter D Section 1.1, a duplicate identity for the points is required, in the first Interlocking, in order to receive point control and, if required, detection. A latch identity is also required in the first Interlocking for receiving proof from the adjacent Interlocking that the special sub-route is locked. Nomenclature of the latch takes the form of L<special sub-route>(L).

The aspect controls of the routes requiring the flank points are to include proof that the flank points are controlled (and detected, if needed) in the required position and that they are locked by the appropriate special sub-route. This is done by appropriate tests on the duplicate points memory and on this latch set.

1.2 Route across Two Boundaries

This Section covers routes that cross two different boundaries thus involving three Interlockings. These three Interlockings are known below as the first, second and third Interlockings in that order from route entrance to exit.

All communications must pass via the second Interlocking, and not direct between first and third Interlockings. This allows the use of existing standard data methods in Chapter C Section 1, extrapolated where necessary, that will cope with such situations where other routes from the same signal finish in the second Interlocking, and where other routes sharing the same exit start in the second Interlocking.

Identities are allocated as specified in Chapter C Section 1.9 in all of the three Interlockings that they apply to. The second Interlocking is considered as an Exit Interlocking for the first boundary, and as an Entrance Interlocking for the second boundary, with the identities specified in this Section allocated on this basis. Extra route memories allocated for divergence reasons in the second Interlocking will be required for all exits irrespective of whether the routes diverge in the second or third Interlockings.

An example of route setting data, extrapolated from Chapter C Section 1.2, is shown in Figure E1. The first, second and third Interlockings are represented by WEST, MID and EAST respectively. The initial route setting request is processed in the first Interlocking, and if the route is available in this Interlocking, any points are called and an internal request sent to the second Interlocking. If, on processing this request the route is available in the second Interlocking, any points are called and a second internal request is sent to the third Interlocking. If, on processing this request the route is available in the third Interlocking, any points are called and an acknowledgement passed to the second Interlocking.

This acknowledgement is processed, and if, in the second Interlocking, the route is still available and the points still controlled in the required position, the route in this Interlocking is set and a second acknowledgement sent to the first Interlocking. On processing this, if, in this Interlocking, the route is still available and the points still controlled in the required position, the route in this

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Interlocking is set, thus completing the setting of the route in all three Interlockings.

Extra time must be allowed between the first Interlocking sending the first internal request and the first Interlocking receiving the resulting second acknowledgement. This is achieved by using a telegram timer latch which when set automatically adds an extra seven seconds to the eleven seconds normally allowed. (This allows eighteen seconds for a worst case situation - normally the time taken will be around six seconds.) This latch is set whenever the telegram timer for the first boundary is started by requests for the setting of routes that cross two boundaries. The standard data in the FOP file in Chapter C Section 1.2.5, for stopping the telegram timer when it reaches eleven seconds, is expanded to provide the extra seven seconds and unset the telegram timer latch, as follows:

```
if LEG64 s , EG64 > 7 then LEG64 xs , EG64 = 0 \
if EG64 > 11 then EG64 stopped \
if EG64 stopped then LEG64 xs \ .
```

The last conditional statement unsets the latch in the event of the request acknowledgement being received before the latch is unset after the first seven seconds. As in Chapter C Section 1.2.4, an acknowledgement latch and telegram acknowledgement timer is provided to suppress any repeat acknowledgement requests in the first and second Interlockings (the alternative method in Chapter C Section 1.2.7(ii) may be used).

Aspect controls and aspect sequence information (Chapter C Sections 1.5 & 1.7) is passed from the third Interlocking to the second and stored in a signal memory. This is then combined with the aspect control information in the second Interlocking and passed to the first Interlocking. Thus in Figure E1 aspect controls and aspect sequence information will be passed from EAST to MID and stored in signal memory SAE>AF. This information, combined with "TAD c , TAE c , P222 cdn", is then passed from MID to WEST and stored in signal memory SAC>AD for use in aspect control and sequencing for signal 33.

MAP search information (Chapter C Section 1.5) is passed in a similar manner via track circuit memories in the second Interlocking. Route-released information for overlap releasing (Chapter C Section 1.4) is also passed from the first to the third Interlocking via a route memory in the second Interlocking. A data example is given in Figure E2.

Route step-up requests and acknowledgements (Chapter C Section 1.6) are the one exception to the above rule that all communications pass via the second Interlocking, as requests can be passed direct from the first to the third Interlockings, but the acknowledgements must return via the second Interlocking in order to update the route memories in this Interlocking.

Sub-route releasing (Chapter C Section 1.3) and start-up conditions (Chapter C Section 1.8) are done on a per boundary basis and are thus standard.

1.3 Route across One Boundary Involved with Third Interlocking

Instances of this are:

- (a) A route crossing a boundary from one (Entrance) Interlocking to a second (Exit) Interlocking but, whilst in either Interlocking, running parallel to a boundary with a third Interlocking and going through one end of a crossover across the latter boundary. The crossover points are controlled by the third Interlocking.
- (b) A route crossing a boundary from one (Entrance) Interlocking to a second (Exit) Interlocking but, whilst in either Interlocking, requiring flank points in a third Interlocking.

If the third Interlocking is accessed via the Exit Interlocking, then the appropriate principles of route setting in Chapter C Section 1, Chapter D Section 1 and Section 1.1 in this Chapter apply, combined appropriately with the route setting request order and the timer extension method shown in Section 1.2 "Route across Two Boundaries" in this Chapter.

If the third Interlocking is accessed via the Entrance Interlocking, then the principles of route setting in Chapter C Section 1, Chapter D Section 1 and Section 1.1 in this Chapter apply, combined appropriately in the following order:

- (i) The availability of the route in the Entrance Interlocking is checked and if the route is available any points entirely within this Interlocking are called and a request (RQ1) is sent to the third Interlocking.
- (ii) This request (RQ1) is processed by the third Interlocking in the standard manner and if availability tests are satisfactory, this Interlocking calls and locks (by a special sub-route) the crossover/flank points and sends an acknowledgement request (AK1) to the Entrance Interlocking.
- (iii) In the Entrance Interlocking this acknowledgement request (AK1) unconditionally unsets the sub-route-releasing latch associated with the above special sub-route, i.e. in the standard manner. Request AK1 re-tests route availability, checking that all of the called points are still controlled to the correct position. It also tests the telegram timers associated with the communications with both of the other Interlockings in the standard manner.

If any of these tests fail, route setting stops and the sub-route releasing latch initiates the freeing of the special sub-route.

If all these tests pass, a request (RQ2) is sent to the Exit Interlocking and a request-sent latch is set. As route locking has not yet been applied in the Entrance Interlocking, this latch being set inhibits the premature sending of a request to free the special sub-route. The latch is named after the sub-route-releasing latch with a suffix "-RQ2".

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- (iv) This request (RQ2) is processed by the Exit Interlocking in the standard manner and if availability tests are satisfactory an acknowledgement request (AK2) is sent to Entrance Interlocking.
- (v) In the Entrance Interlocking this acknowledgement request (AK2) tests the appropriate telegram timer and re-tests route availability, checking that all of the called points are still controlled to the correct position. If these tests pass the route is set. The request-sent latch is unconditionally unset. If acknowledgement request (AK2) fails to be received by the Entrance Interlocking (because route setting has failed in the Exit Interlocking) then when the appropriate telegram timer times out, the request-sent latch is unset which initiates the freeing of the special sub-route.

An example of case (a) follows, using route 56A in Chapter D Figure D1, but with an extra connection 1004 required normal in this route in South Interlocking and signal 54 being in Exit Interlocking "West" as shown in Figure E3. The data in the first part of Chapter D Section 1.5 then becomes:

/ SOUTH Interlocking - PRR file data

*QR56A

```

if R56A a
    R131 xs , UGG-BA f , OGD-BA f
    P1004 cnf
    EG70 stopped
then P1004 cn
    EG70 = 0 , G70 = 3          / =QR56A-RQ1 to NORTH
\ .

```

/ NORTH Interlocking - PRR file data

*QR56A-RQ1

```

if P1003 cnf
    EG70 stopped
then P1003 cn
    UZGF-AB/BA 1
    EG70 = 9 , G70 = 3          / =QR56A-AK1 to SOUTH
\ .

```

/ SOUTH Interlocking - PRR file data

*QR56A-AK1

```

if LR56-AK1 xs
then if R56A a
    R131 xs , UGG-BA f , OGD-BA f
    P1004 cn
    EG70 < 11 , EG74 stopped
then LUZGF-AB/BA-RQ2 s
    EG74 = 0 , G74 = 4          / =QR56A-RQ2 to WEST
\
    LUZGF-AB/BA xs , EG70 stopped , LR56-AK1 s
\
EG70AK = 0 .

```

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/ WEST Interlocking - PRR file data

```
*QR56A-RQ2
  if OGD-BA f , UGC-BA f
    EG74 stopped
  then RGE>GD s , UGE>GD l , UGD-AB l , OGC-AB l
    EG74 = 9 , G74 = 4 / =QR56A-AK2 to SOUTH
  \ .
```

/ SOUTH Interlocking - PRR file data

```
*QR56A-AK2
  if LR56A-AK2 xs
  then if R56A a
    R131 xs , UGG-BA f , OGD-BA f
    P1004 cn
    EG74 < 11
  then R56A s
    UGG-AB l , UGF-AB l , UGE-AC l
    S56 clear bpull
  \
  LUGE>GD xs , EG74 stopped , LR56A-AK2 s
  LUZGF-AB/BA-RQ2 xs
  \
  EG74AK = 0 .
```

As in Chapter C Section 1.2.4, acknowledgement latches and telegram acknowledgement timers are provided to suppress any repeat acknowledgement requests (the alternative method in Chapter C Section 1.2.7(ii) may be used).

/ SOUTH Interlocking - FOP data

```
if EG70 > 11 then EG70 stopped \ .

if EG74 > 11 then EG74 stopped , LUZGF-AB/BA-RQ2 xs \ .
```

The request-sent latch is also unset at power-up of the Interlocking.

1.4 Routes Crossing Castellated Boundaries

Routes are considered to be crossing castellated boundaries when two or more of the boundaries crossed are between the same two Interlockings. Such occurrences result from the way that the boundaries are drawn, the dividing line appearing castellated. Such boundaries often result from attempts to avoid horizontal boundaries. Castellated boundaries are undesirable because of the data complications that they produce and thus they must be avoided wherever possible. If they have to be used then the following data principles must be adhered to. Both two boundary and three boundary routes are covered.