# Chapter 3:
# INFORMATION FLOW TRACK - TRAIN

*Contents*

*Contents lists of figures and tables: refer to the final chapter.*

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# 3.    INFORMATION FLOW TRACK - TRAIN

## 3.1    INTRODUCTION

### 3.1.1    Scope

For an overview of the whole document, see the introduction [Chapter 1].

This chapter specifies the information transfer from the balises on the track  to the ATC2-STM, when passing different types of signals and board groups. It also specifies in what way the STM is affected by the received trackside information.


*Note.* The functions which are specified here are:

- Balise reading and error handling
- Passage of main signal
- Passage of distant signal
- Passage of combined signal
- Reserve
- Passage of linking balises
- Passage of speed board
- Passage of warning board
- Passage of miscellaneous board and SH group
- Passage of kilometre marker
- Passage of reserve balise group


*A-Note.* The functions which are specified here are:

- Balise reading and error handling
- Passage of main signal
- Passage of distant signal
- Passage of combined signal
- Passage of release group
- Passage of linking balises
- Passage of speed board
- Passage of warning board
- Passage of miscellaneous board and SH group
- Passage of kilometre marker
- Passage of reserve balise group

This document specifies also in what way the ATC2-STM interprets the received information, and how it acts in case of erroneous or missing information.

## 3.2 INFORMATION FLOW TRACK - TRAIN

### 3.2.1 Balise reading

#### 3.2.1.1 Conditions for balise detect

One fundamental principle for the safe operation of an ATC-2 compatible system is the safe detection of all balises.

This must be based on the number of zeroes detected in the received data. Several schemes exist for this detection, one scheme is as follows:

a) $\geq 8$ zeroes in the latest received 16 bits - balise detect.

b) $\leq 4$ zeroes in the latest received 16 bits - end of balise.

#### 3.2.1.2 Criteria for telegram synchronization

The STM must be able to correctly handle telegrams according to the requirements in this section, and also in the following sections.

F3001.    The STM shall manage that:

a) Each received telegram consists of 24 data bits plus 8 synchronization bits, totally 32 bits.

b) With the used clock frequency 50 kHz (period time 20 us), the transmission time per telegram will be 640 μs.

F3002.    The STM shall manage that the the 8-bit synchronization words are inverted, except for one bit.

*Note.* See the figure below, where the telegrams are sent from the left to the right.

F3003.    The STM shall manage this: Synchronization is obtained if S is present in one synchronization word and S* in the other, irrespective of the order of S and S*.

*Note.* In other words, every second telegram is followed by S, and every second by S*. Observe that if a synchronization word is corrupt, two telegrams are lost, since the synchronization word is needed for both the preceding and the following telegram.

### 3.2.1.3    Arrangement of telegram bits

F3004.    The STM shall manage the following telegram layout.

*Figure 3.2-1. Telegram layout*
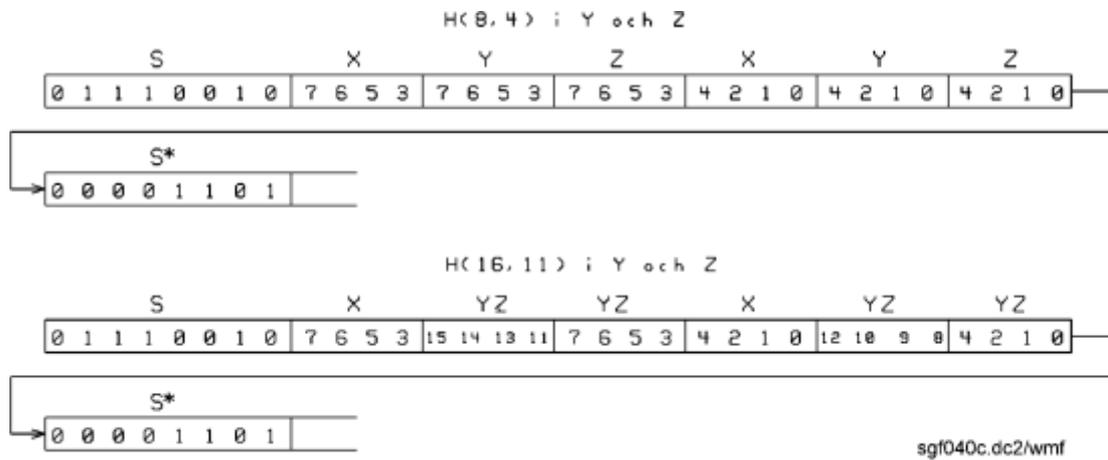


Note. The figure above shows how respective code word and bits are distributed in the telegrams. The applied bit numbering is according to [Table 3.2-1] below.

F3005.    The STM shall manage this: Telegram transmission is performed from the left to the right, with the most significant bits first.

*Note.* Observe that if you imagine the telegram being input to a shift register, the shifting is performed from the right to the left.

*Note.* Furthermore, it can be noted that the bits 12 and 11 have exchanged places in H(16,11). This is performed in order to allow a retransmitted code (to the STM recorder) to be compatible between H(8,4) and H(16,11). By shifting bit 3 and 4 (11 and 12) in all code words, the original Hamming code can be retrieved.

## 3.2.2    Hamming Codes

Hamming codes are characterized by the fact that all bits having position numbers that are positive whole number exponents of 2, i.e. bit position numbers 1, 2, 4, ..., $2^m$, are check bits which verify the other bits against a specific pattern.

The purpose of this verification is to give the check bit in position number $2^k$ even parity with all bits having a position number, written in binary form, where there is a "1" in position k.

In addition to this, the codes H(8,4) and H(16,11) include an universal check bit in position number 0.

F3006.    In order to transfer information from the balises to the STM, the following Hamming codes shall be handled by the STM.

a) 8 bit words (X, Y and Z words) with a modified H(8,4) Hamming code, called M(8,4) [Table M8], or

b) 16 bit words (Y and Z words combined) with a modified Hamming code M(16,11).

*Note*: Used in some instances such as signal numbers and type of speed restriction [Table NR], or as PT code for train dependent speed restrictions [Table PT.2]

*Note.* Both these codes are safety codes with a Hamming distance of 4, which means that at least 4 bits in the code must be changed to form another valid code word. The codes contain 4 and 5 check bits respectively.

F3007.    The following table illustrates the parity check that shall be used for H(16,11) and H(8,4), where H(8,4) is a partial set (bits 0..7). The digit "1" indicates that the bit shall be included in the corresponding parity check.

*Table 3.2-1. Parity check for H(8,4) / H(16,11), bits 0...7 / 0...15*

| 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 | Check bit No. |
|----|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 0 |
| 1 | 0 | 1 | 0 | 1 | 0 | 1 | 0 | 1 | 0 | 1 | 0 | 1 | 0 | 1 | 0 | 1 |
| 1 | 1 | 0 | 0 | 1 | 1 | 0 | 0 | 1 | 1 | 0 | 0 | 1 | 1 | 0 | 0 | 2 |
| 1 | 1 | 1 | 1 | 0 | 0 | 0 | 0 | 1 | 1 | 1 | 1 | 0 | 0 | 0 | 0 | 4 |
| 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 8 |

*Note.* The check bits are underlined.

*Note.* The number of each code word is related to the contents of the information bits, e.g: H(8,4):

**0 1 0** 1 **1** 0 1 0 = 5.

*Note.* The bits in the code can be referred to by their function as either

− **i**nformation bits, or

− **c**heck bits.

*Table 3.2-2. H(16,11) code*

H(16,11)
⟵-----------------------------------------------------------------⟶
H(8,4)
⟵-------------------------⟶

| 15 14 13 12 11 10  9  8 | 7  6  5  4  3  2  1  0 |
|-------------------------|------------------------|
| i10 i9 i8 i7 i6 i5 i4 c4 | i3 i2 i1 c3 i0 c2 c1 c0 |
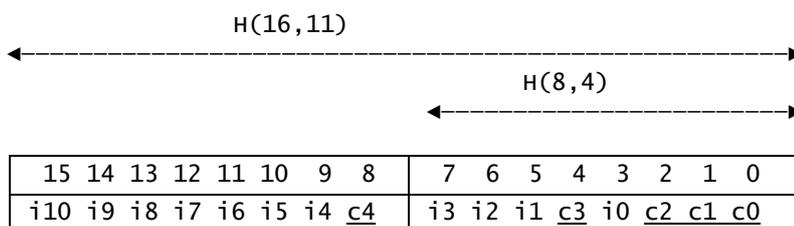
## 3.2.3    Disposition of bits in the telegram

For information integrity, the information words in the telegram are organized so that the information bits are sent first followed by the check bits. This results in the information and redundancy bits in the words being placed in different registers.

However, for M(16,11) code, this is not fully possible - 3 information bits have to be placed among the check bits. Note that bits 11 and 12 in M(16,11) are switched, so that they will be correctly placed when used later on for output (to the STM recorder).

The codes thus built up are referred to as M(8,4) and M(16,11) respectively, where M stands for "Modified".

F3008.    The STM shall manage that the bits are transferred in the telegram as follows.

*Table 3.2-3. Input telegram bits*

| X | Y | Z | X | Y | Z | Y and Z |
|---|---|---|---|---|---|---|
| 7 6 5 3 | 7 6 5 3 | 7 6 5 3 | 4 2 1 0 | 4 2 1 0 | 4 2 1 0 | in M(8,4) |

Information bits ◄──────────────► Check bits

| X | YZ | X | YZ | YZ in |
|---|---|---|---|---|
| 7 6 5 3 | 15 14 13 11 7 6 5 3 | 4 2 1 0 | 12 10 9 8 4 2 1 0 | M(16,11) |
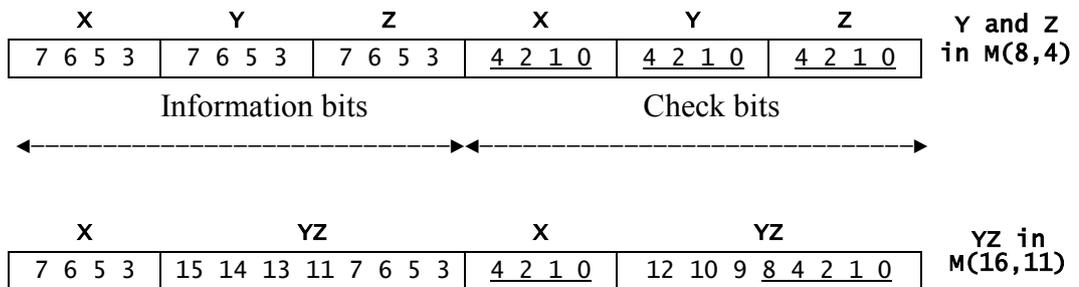
Note. The bits are transferred in order from left to right which means that the most significant bit shall be transferred first.

Re-creating the original Hamming code

*Note.* **Combining each group of 8 bits results in:**

*Table 3.2-4. Combining each group of 8 bits*

| X | Y | Z | Y and Z in |
|---|---|---|---|
| 7 6 5 3 4 2 1 0 | 7 6 5 3 4 2 1 0 | 7 6 5 3 4 2 1 0 | M(8,4) |

| X | YZ | YZ in |
|---|---|---|
| 7 6 5 3 4 2 1 0 | 15 14 13 11 12 10 9 8 7 6 5 3 4 2 1 0 | M(16,11) |
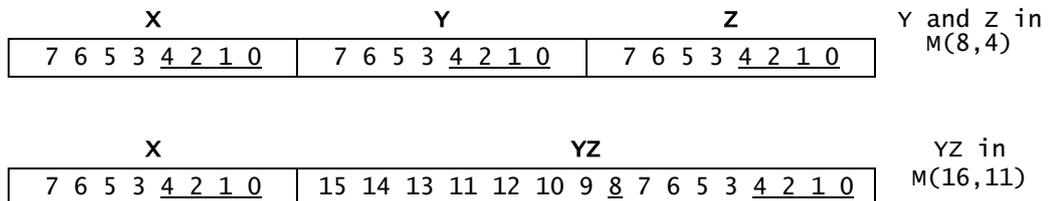
*Note.* Here the information and check bits are grouped within each code word, however, the grouping is not complete in the 16 bit codes.

*Note.* **Switching the middle bits in each group results in:**

*Table 3.2-5. Switching the middle bits in each group*

| X | Y | Z | Y and Z in H(8,4) |
|---|---|---|---|
| 7 6 5 4 3 2 1 0 | 7 6 5 4 3 2 1 0 | 7 6 5 4 3 2 1 0 | |

| X | YZ | YZ in H(16,11) |
|---|---|---|
| 7 6 5 4 3 2 1 0 | 15 14 13 12 11 10 9 8 7 6 5 4 3 2 1 0 | |

*Note.* This means that the original Hamming codes H(8,4) and H(16,11) have been re-created.

## 3.2.4  Code verification

F3009.    Every balise, irrespective of which direction it is intended for, shall be verified as follows:

a) None of the X, Y or Z words shall consist entirely of "ones" ($FF_{HEX}$ = code word 15).

b) All Hamming coded words shall be correct when verified. Error correction is not permitted.

  *Note.* Exception: Receiving AX = 1 or 4 at a preliminary stop signal [3.4.4].

c)  If these conditions are not fulfilled a balise error alarm shall be generated [3.3].

d) Exceptions to a-c: The Y and Z words shall *not* be verified if they belong to a reserve balise group, or to an annulled balise or balise group [3.3.1.13].

F3010.     The following table shows which coding of the Y and Z words, that shall be verified and interpreted for various balise categories.[1]

*Table 3.2-6. Coding of Y and Z words*

|  | Category (X word) | Code in Y and Z words | Code table |
|---|---|---|---|
| a) | 0 | None. This category is not permitted | – |
| b) | 1 | | |
| c) | 2 | | |
| d) | 3 | | |
| e) | 4 | M(8,4) | [Table M8] |
| f) | 5 | | |
| g) | 6 | | |

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[1] AX = 11 or = 13 differs from [ATC2]

| | Category (X word) | Code in Y and Z words | Code table |
|---|---|---|---|
| h) | **7** | | |
| i) | **8** | M(8,4) at signal (AX = 1/4) | [Table M8] |
| j) | | M(16,11) at board (AX = 2/6/7) [1] | [Table NR] |
| k) | **9** | M(8,4) | [Table M8] |
| l) | **10** | | |
| m) | **11** | Unknown (Km boards are not decoded) | – |
| n) | **12** | M(16,11) | [Table NR] |
| o) | **13** | Unknown (not decoded) | – |
| p) | **14** | M(8,4) | [Table M8] |
| q) | **15** | None. This category is not permitted | – |

1) The PT code in PYZ shall be checked according to [Table PT], and if not correct, BF1 shall be given. – *Note.* This gives a certain protection for a PT balise being mixed-up with a number balise.

A3010.    The following table shows which coding of the Y and Z words, that shall be verified and interpreted for various balise categories.[2]

*Table 3.2-7. Coding of Y and Z words*

| | Category (X word) | Code in Y and Z words | Code table |
|---|---|---|---|
| a) | **0** | None. This category is not permitted | – |
| b) | **1** | M(8,4) | [Table M8] |
| c) | **2** | | |
| d) | **3** | | |
| e) | **4** | | |
| f) | **5** | | |
| g) | **6** | | |
| h) | **7** | | |
| i) | **8** | M(8,4) at signal (AX = 1/4) | [Table M8] |
| j) | | M(16,11) at board (AX = 2/6/7) [1] | [Table NR] |
| k) | **9** | M(8,4) | [Table M8] |
| l) | **10** | | |
| m) | **11** | Unknown (Km boards are not decoded) | – |
| n) | **12** | M(16,11) | [Table NR] |
| o) | **13** | M(8,4) at release group, else unknown | [Table M8] |
| p) | **14** | M(8,4) | [Table M8] |
| q) | **15** | None. This category is not permitted | – |

1) The PT code in PYZ shall be checked according to [Table PT], and if not correct, BF1 shall be given. – *Note.* This gives a certain protection for a PT balise being mixed-up with a number balise.

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[2] AX = 11 or = 13 differs from [ATC2]

### 3.2.4.1  Signal number or PT code

F3011.    All M(16,11) code combinations containing $FF_{HEX}$ in one or two bytes shall generate balise error.

Signal number

*Note.* Combinations containing either FF or 00 are a total of 60 combinations. Certain errors in balises can cause half a code word (8 bits) to appear as FF or 00. Combinations containing 00 ought not to be used, although they do not generate balise errors. See the signal number table [Table NR].

*Note.* These signal numbers are not used at signals anymore[3], but can – if used – affect the repetition of a warning board.

## 3.2.5    Balise grouping

### 3.2.5.1    Placing of balises

An information point can consist of 2...5 balises. At least two balises are required when safety information shall be transmitted. An information point can be relevant for one or both directions, depending on function.

−    Balises belonging to the same information point (balise group) are placed on a center distance of 2,3...3,5 m.

−    Balises belonging to two different information points are placed at a center distance of at least 10.5 m.

*Figure 3.2-1. Distances between balises and balise groups*



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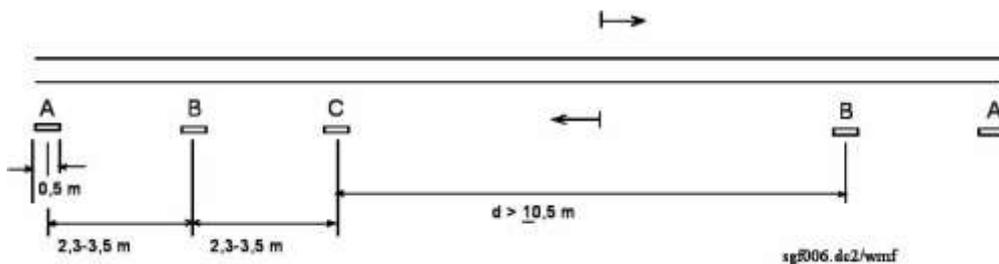
[3] Radio functions are not used anymore

F3012.    Balise density: The STM shall manage that at least 1...4 balise groups (regardless of direction) are placed within a distance that is travelled by the train during 1 second.

F3013.    Reserve.

*Note.* Distance measurement (e.g. for braking curves, linking or train length delays) starts at the A-balise [3.2.5.3].

### 3.2.5.2    Passage of information point

*Note.* The STM considers a balise group as completely passed a short distance after the last balise. This function may depend on train speed and odometer accuracy. See the following three requirements.

F3014.    a)  Balise information shall not be evaluated until the whole group has been passed ("end of group").

b)  The information at a group of balises (point of information) shall be regarded as completely received when the train has travelled $\geq 9$ m[4] without detecting another balise.

*Note.* Exception to a-b: When parts of a signal balise group for the present direction (either increasing a previously received distant signal aspect, or giving a Stop aspect) are passed, some evaluation will take place directly after the A-, B- or C-balise [3.4.2/4, 3.5.3, 3.6.2].

F3015.    If the train has moved $\leq 4$ m since the last balise was passed, the whole group shall not be regarded as passed.

*Note.* The interval between 4 and 9 m is undefined, and any new group of balises detected within this interval may either be intermixed with the first group, or defined as a new group of its own, depending on if the previous group was considered as completely received or not.

F3016.    When a balise group is regarded as completely received, the information transferred shall be immediately evaluated, also if the train has travelled less than 9 m since the last balise.

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[4] But may preferrably be detected after 5-6 m

### 3.2.5.3    Reference for measuring of distance

F3017.    Determination of the location of a point of information (the balise positions) shall be independent of the train speed and the processing time of the computers.

F3018.51a  Any necessary measurement of distance (e.g. for braking curves):

a)  Shall begin from the first balise in the group, and

b)  With a measurement tolerance of ± 10 m for the starting point.

*Note.* Odometer resolution in cm (as received from the ETCS) [ESTMA].

A3018.51n  Any necessary measurement of distance (e.g. for braking curves):

a)  Shall begin from the A-balise in the group, and

b)  With a measurement tolerance of ± 10 m for the starting point.

*A-Note.* Odometer resolution in cm (as received from the ETCS) [ESTMA].

F3019.    Reserve.
F3020.    Reserve.
F3021.    Reserve.
F3022.    Reserve.
F3023.    Reserve.
F3024.    Reserve.
F3025.    Reserve.
F3026.    Reserve.
F3027.    Reserve.
F3028.    Reserve.
F3029.    Reserve.

## 3.2.6    Limitations in interpretation and error handling

### 3.2.6.1    Reserve group or Km board

F3030.51c  If a balise in the A position (in either direction) at an information point is of category 13:

a)  The STM shall take no action (except for output to the STM recorder).

b)  A balise error alarm shall, however, be given if:

1.  Bit error is detected in the X word, or

2.  A single category 13 balise is passed, or

3.  A category A(13) balise is detected together with another balise, not listed in [3.2.9] as correct for a balise group.

A3030.51o  If a balise in the A position (in either direction) at an information point is of category 13, and the B balise is ≠ 13:

  a)  The STM shall take no action (except for output to the STM recorder).

  b)  A balise error alarm shall, however, be given if:

    1.  Bit error is detected in the X word, or

    2.  A single category 13 balise is passed, or

    3.  A category A(13) balise is detected together with another balise, not listed in [3.2.9] as correct for a balise group.

### 3.2.6.2    Annulled balise group

F3031.    A group of balises shall be considered being annulled if:

  a)  It consists of a signal balise group (or a warning board balise group with B(9) balise) where AX = 10, or

  b)  It consists of a group of board balises where AZ = 14. In this case groups can be annulled selectively for each travel direction.

F3032.    Annulment means that:

  a)  Balise information shall not be acted upon.

  b)  Previously received balise information shall be retained.

  c)  Configuration of balises depending of Y or Z words shall not be verified.

  d)  Groups of annulled balises with AX = 10 at signals (or warning boards) shall not be checked for bit errors in the Y or Z words.

### 3.2.6.3    Balise group for the opposite direction

Balises or balise groups can be intended for the present and/or the opposite direction of movement. In requirements regarding balises, it is implied that the balise information is always relevant for the present direction, unless anything else is stated.

F3033.51a Reserve.

> *Note.* Balise group exclusively for the opposite direction according to [Table BK-2] will not generate any balise error alarm:[5]
>
> a)-d)     Reserve.

A3033.51n Balise group exclusively for the opposite direction according to [Table ABK-2] shall only generate balise error alarm BF1 in these cases: [6]

> a) Bit errors are detected in the Y and/or Z words.
>
> b) At faulty balise configuration caused by the Y and/or Z words.
>
> c) Exception to b: The faulty Y- or Z-word = 0.
>
> d) Exception to a-b: Board group intended for both directions (AX = 3, 5 or  7), where the opposite-directed part is annulled (BZ = 14), shall not generate any balise error alarm for faulty P(8) balise configuration in the opposite direction, caused by the BY word in the annulled balise.

> *A-Note.* For A(M) + B(3, Y, Z), BY must be 9..14 to make the group accepted as related to the opposite direction [Table ABK-2]. Otherwise for instance an A(3) balise, which erroneously is received as a marker, would not activate any other error indication than BF1.

### 3.2.6.4   States and areas

ATC-2 balises can be read, handled and supervised in the STM states Hot Standby and Data Available [4.3].

Exceptions:

– Hot Standby: Passed balises are read and memorized but not supervised in this state.

– Data Available: In an Installation area the equipment will remain passive and shall not react to groups of balises containing speed information, whether or not they are correct, except for the combination which indicates End of installation area.

– Data Available: After the first 50 m of shunting, all balise groups will be ignored with a few exceptions, see the section about the STM Shunting state [4.3.9].

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[5] Reserve.
[6] Differs from [ATC2]

### 3.2.6.5    Stopping within a group of balises

F3034.    If the train has stopped within a group of signal balises, after the STM has finished reading any category 1 or 4 balise completely, but before the whole group has been passed, the signal information shall be set to a safe value as follows:[7]

a) The received main signal information AY = 1..12 shall be supervised as if the train already has passed a signal at stop.

b) But no emergency brake application shall be activated.

*Note.* If the main signal information already is 0 or 13 (stop), emergency brake is given after the A- or B-balise [3.4.4].

## 3.2.7    Incorrect information point

F3035.51a    If a detected group of balises is not recognized, a balise error alarm shall be generated. The following conditions shall be fulfilled to make a balise group recognized:

a) The group of balises comprises a recognized combination for

1.  The present direction of movement [Table BK-1a/b], or

2.  The opposite direction of movement [Table BK-2].

b) Reserve.

*Note.* The balise group must fulfil the conditions specified for being correct [3.2].

c) Reserve.

*Note.* Exceptions to a-b: During Shunting, or in Installation area, most balise errors are ignored [Chapter 4].

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[7] Covers the case where the signal changes to stop while the train is still-standing

## 3.2.8    Positioning errors - groups too close to each other

F3036.    If two groups of balises are positioned closer together than 9 m, there is a risk that they shall be interpreted as a single group. In this case a balise error alarm shall be generated for one of the following reasons:

a)  The group contains > 5 balises.

b)  The groups taken together form a group which is not recognized according to [Tables BK-1 or BK-2].

c)  The group seems correct but contains other errors (e.g. code errors or configuration errors).

## 3.2.9    Correct information point

The following table provides a review of all valid balise combinations of the ATC2-STM system, and their contents. The balise group categories or AX words indicate the internal table order.

For detailed information on the composition of various balise combinations, also regarding the dependency of the combinations of Y/Z words: [Tables BK-1/2].

F3037.    More or fewer balises in a group shall generate balise error alarm [Table 3.2-8].

### 3.2.9.1    Balise groups for the present direction, overview

F3038.    The following groups shall be accepted as valid for the present travel direction.

*Table 3.2-8. Balise groups for the present direction*

| | Balise group | N | N/P | A | B | C/N/P$_{OPP}$ | D/N |
|---|---|---|---|---|---|---|---|
| a) | Signal | (12) | (8) | **1 / 4 / 10\*)** | 9 | (12) | |
| b) | Signal | (12) | (8) | **1 / 4 / 10\*)** | 9 | 14 | (12) |
| c) | OT, warning board | | (8) | **2** | M | (12) | |
| d) | OT, warning board | | (8) | **2 / 10 \*)** | 9 | 14 | (12) |
| e) | HT, speed board | | | **3** | 3 | | |
| f) | HT, speed board | | | **3** | 5 | | |
| g) | HT, speed board | | | **3** | 7 | (8) | |
| h) | HT, speed board | | | **3** | M | | |
| i) | DT, miscellaneous board | | | **5** | 3 | | |
| j) | DT, miscellaneous board | | | **5** | 5 | | |
| k) | DT, miscellaneous board | | | **5** | 7 | (8) | |
| l) | SH, signal increasing, or OT | | | **5 / 10\*)** | 9 | (12) | |
| m) | SH, signal increasing, or OT | | | **5 / 10\*)** | 9 | 14 | (12) |
| n) | OT, warning board | | (8) | **6 / 10\*)** | 9 | (12) | |
| o) | OT, warning board | | (8) | **6** | 14 | (12) | |
| p) | HT, speed board | | (8) | **7** | 3 | | |
| q) | HT, speed board | | (8) | **7** | 5 | | |
| r) | HT, speed board | | (8) | **7** | 7 | (8) | |
| s) | Reserve [8] | | | **10** | 10 | | |
| t) | Km mark | | | **13** | 11 | | |
| u) | -- (spare) | | | **--** | -- | | |
| v) | Reserve | | | **13** + a combination of 8, 9, 12, 13 or 14, of which 8 and 12 may occur at the "prefix position", that is ahead of A(13). Compare to 1/4/10 above. | | | |

*Note.* Explanations:

| | | |
|---|---|---|
| \*) | = | Balise group annulled with AX = 10. |
| (X) | = | Balise X may occur in the group (optional). Only one N-balise in each group. |
| 1/4/10 | = | Signal: 10 km/h release speed / 40 km/h release speed / Annulled. |
| A, B, ... | = | Basic balises. |
| N | = | Number balise, either first or last in a signal group, always last with OT. |
| M | = | Marker. |
| P | = | Prefix balise, placed after any number balise but before the A-balise. |
| P$_{OPP}$ | = | Prefix balise for the opposite direction. |

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[8] Former radio group, categories 10 or 11 [ATC2]

*Note.* The combinations of the balises are in some cases dependent on the Y and/or Z words [Tables BK-1/2].

A3038.     The following groups shall be accepted as valid for the present travel direction.

*A-Table 3.2-9. Balise groups for the present direction*

|    | **Balise group** | **N** | **N/P** | **3.2.9.2** | **B** | **C/N/P$_{OPP}$** | **D/N** |
|----|------------------|-------|---------|-------------|-------|-------------------|---------|
| a) | Signal | (12) | (8) | **1 / 4 / 10*)** | 9 | (12) | |
| b) | | (12) | (8) | **1 / 4 / 10*)** | 9 | 14 | (12) |
| c) | OT, warning board | | (8) | **2** | M | (12) | |
| d) | | | (8) | **2 / 10 *)** | 9 | 14 | (12) |
| e) | HT, speed board | | | **3** | 3 | | |
| f) | | | | **3** | 5 | | |
| g) | | | | **3** | 7 | (8) | |
| h) | | | | **3** | M | | |
| i) | DT, miscellaneous board | | | **5** | 3 | | |
| j) | | | | **5** | 5 | | |
| k) | | | | **5** | 7 | (8) | |
| l) | SH, signal increasing, or OT | | | **5 / 10*)** | 9 | (12) | |
| m) | | | | **5 / 10*)** | 9 | 14 | (12) |
| n) | OT, warning board | | (8) | **6 / 10*)** | 9 | (12) | |
| o) | | | (8) | **6** | 14 | (12) | |
| p) | HT, speed board | | (8) | **7** | 3 | | |
| q) | | | (8) | **7** | 5 | | |
| r) | | | (8) | **7** | 7 | (8) | |
| s) | Reserve [9] | | | **10** | 10 | | |
| t) | Km mark | | | **13** | 11 | | |
| u) | Release speed [10] | | | **13** | 13 | | |
| v) | Reserve | | | **13** + a combination of 8, 9, 12 or 14, of which 8 and 12 may occur at the "prefix position", that is ahead of A(13). Compare to 1/4/10 above. | | | |

*Note.* Explanations, see under the previous table.

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[9] Former radio group, categories 10 or 11 [ATC2]

[10] Not available in [ATC2]

(blank)

## 3.3 BALISE ERROR ALARMS

### 3.3.1 Causes of balise error alarms

F3039. Balise error alarm shall be given according to the following requirements.

a) With exception for trains in Installation area or when shunting, balise error alarm shall be generated in the cases below [3.3.1.1 - 11].

b) Reserve.

*Note.* Exceptions, see [3.3.1.13].

#### 3.3.1.1 Less than 4 identical telegrams

F3040. a) Balise error alarm shall be generated if less than 4 identical telegrams (not necessarily consecutively) have been received from a balise which has been passed. Such a balise shall be handled as a category 15 balise, which shall generate a configuration error [3.3.5.2 or 3.3.5.3].

b) Exception: Genuine markers (which give no telegrams) shall be accepted.

#### 3.3.1.2 Bit error or parity error

F3041. Balise error alarm shall be generated when bit error or parity error is detected [3.2.4].

a) Balises with a bit error in the X word shall be handled as category 15 balises (configuration error).

b) Special rules apply for bit errors in Y or Z words [3.3.1.13].

#### 3.3.1.3 An X, Y or Z word contains only "ones"

F3042. Balise error alarm shall be generated if an X, Y or Z word contains only "ones" [3.2.4]:

a) Balises with all "ones" in the X word, shall be handled as category 15 balises (configuration error).

b) All "ones" in Y or Z shall be handled as bit errors [3.3.1.13, 3.3.5.4].

#### 3.3.1.4 Linking or notification distance has been exceeded

F3043. a) Balise error alarm shall be generated if a linking or notification distance has been exceeded [3.3.2 - 3].

b) The balise error alarm shall be classified as an incorrect relation between groups [3.3.5.6].

### 3.3.1.5    Configuration error

F3044.51b   Reserve.

*Note.* The following applies upon detection of a configuration error.

−   Balise error alarm is generated if a group of balises does not fulfill the conditions stated for a correct balise group [3.2.6 - 3.2.9].

−   The balise error alarm is handled in accordance with [3.3.5.1 – 3.3.5.3].

### 3.3.1.6    Missing speed or distance information

F3045.    The following balise error alarms shall be handled as errors within a balise group [3.3.5.5]:

a)   Balise error alarm shall be generated if the target distance from a signal or warning board = 0 m (with the exception of a stop signal).

b)   A speed board with the max speed = 0 (except for BSK and HT-ET).

c)   A warning board with the target speed = 0 (except for FSK and OT-ET).

### 3.3.1.7    A group with more than 5 balises

F3046.51a   After passing a group with more than 5 balises:

a)   Balise error alarm BF3 shall be generated.

b)   All balise information shall be erased according to [3.3.5.6].

### 3.3.1.8    Insufficient spacing of balise groups

F3047.51a a)   Balise error alarm shall be generated if more groups of balises than the STM can manage, have been passed within a limited time [3.2.5.1].

b)   The error shall be handled in accordance with [3.3.5.6 ].

### 3.3.1.9    Overflow

F3048.51a   Balise error alarm shall be generated for overflow of the STM data storage capacity:

a)   Overflow with BF3 alarm shall occur if the STM needs to store and handle more balise data than there is place for in the STM memory.

b) The STM shall be able to store and handle at least the same amount of supervision objects as specified in [ATC2].[11]

*Note.* Reserve.

c) Overflow shall also occur if there are more than two distant signal braking curve objects.

*Note.* Overflow will never occur in normal operation, provided that the track layout is correct. Exception: if the driver neglects the removing of semi-equipped restrictions by pressing the button HÖJNING (or if the button stops working).

*Note.* The error code 'PUU' is indicated. See also [Table 3.3.5.6].

A3048.51n  Balise error alarm shall be generated for overflow of the STM data storage capacity:

a) Overflow with BF3 alarm shall occur if the STM needs to store and handle more balise data than there is place for in the STM memory.

b) Overflow shall not occur for less than 100 occupied supervision objects. [12]

*A-Note.* Explanation: A supervision object is a set of related data that keeps account of a max speed, a target speed, a semi-equipped restriction or a train length delay, each of its own speed category (T, K1, K2 and so on).

c) Overflow shall also occur if there are more than two distant signal braking curve objects.

*A-Note.* Overflow will never occur in normal operation, provided that the track layout is correct. Exception: if the driver neglects the removing of semi-equipped restrictions by pressing the button HÖJNING (or if the button stops working).

*A-Note.* The error code 'PUU' is indicated. See also [Table 3.3.5.6].

### 3.3.1.10  Errors at boards

F3049.51c  Balise error alarm shall be generated at

a) Reserve.

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[11] Reserve.

[12] This is more than twice the corresponding memory capacity of [ATC2] which can take 25 max speeds of different types, 2 target speeds from distant signals, 8 target speeds from warning boards, 5 train length delays, 5 semi-equipped restrictions (≈ 45 objects).

*Note.* Errors in the group of balises [3.3.5.5].

b) Reserve.

*Note.* Incorrect relation between groups of balises [3.3.5.6].

c) Zero in certain Y or Z code words at balise categories 2, 3, 5, 6, 7 [Tables in Chapter 8]:

1. Shall be handled as a bit error in accordance with the table for such errors [3.3.5.4].

2. If the error, however, is defined in the table for errors within balise groups [3.3.5.5], this measure shall have priority.


### 3.3.1.11 Errors at signals

F3050. Balise error alarm shall be generated when BY = 14, but information about preset speed increase from distant signal is not provided.

F3051. Reserve.


### 3.3.1.12 Reserve

### 3.3.1.13 Exceptions

F3052. No balise error alarms shall be given for erroneous Y or Z words (with bit error or incorrect value) if they...

a) Belong to a reserve or kilometre mark balise group, or

b) Are located in an annulled balise group, or

c) Are located in an annulled balise, belonging to a group intended for both directions. [13]


F3053.51a Balise error alarm shall not be given for erroneous Y or Z words (with bit error or causing incorrect balise configuration) if they:

a) Belong to a group that is only relevant for the opposite direction,[14] or

b) Reserve. [15]

*Note*. For more details, refer to [3.2.6.3].

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[13] [ATC2] difference
[14] Reserve.
[15] Reserve.

A3053.51n Balise error alarm BF1 without any erasing shall be given for erroneous Y or Z words (with bit error or causing incorrect balise configuration) if they:[16]

a) Belong to a group that is only relevant for the opposite direction, or

b) Are located in a balise for the opposite direction, but belong to a group relevant for both directions.

*A-Note.* For more details, refer to [3.2.6.3].

### 3.3.2    Linking between signals

#### 3.3.2.1    Linking

Linking is a function which ensures that the distance travelled between two consecutive information points for signals is not too long. This is a safeguard against missing balise groups.

#### 3.3.2.2    Signal point without preset speed increase

F3054.    Passing a signal group with main and/or distant signal information (without preset speed increase).

a)  The signal linking distance shall be calculated as follows:

$$D_{LINK} = 1.20 \cdot D_{TARG} + 100 \quad (m),$$

where $D_{TARG}$ is the basic distance (target distance)  from the balise group, and the values 1.20 (120%) and 100 m are STM constants.

b) Both the basic and the linking distances shall be stored in such a way that the system can determine when each of them has expired (first the basic distance $D_{TARG}$ and then the linking distance $D_{LINK}$).

c) The existence of distant signal information (or not) shall be stored until passing the next signal group with main and/or distant signal information (no linking or SH group).

*Note.* This means that if a signal group gives only main signal information, the information "distant signal exists" becomes false, but if a signal group contains distant signal information, it will become true. A linking group or SH group will never affect this data. The information is used when linking or SH groups are passed as described below.

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[16] Differs from [ATC2], lacking there

F3055.     The linking shall be terminated when a stop signal with AY = 0 or 13 is passed.

### 3.3.2.3    Signal group with preset speed increase

F3056.     a) With a preset speed increase (distant signal with BY = 14), the linking distance shall be calculated from an assumed target distance of 800 m from the point of preset speed increase without any tolerance:

$$D_{LINK} = D_{TARG} + 800 \ (m)$$

b) The linking distance shall be stored in such a way that the system can determine when it has expired.

c) The existence of a preset speed increase (or not) shall be stored until passing the next signal group with main and/or distant signal information (no linking or SH group).

*Note*. This is from the linking point of view; no other function is affected.

### 3.3.2.4    Linking and signal increasing (SH) balises

F3057.     a) Linking and SH balises shall never update a linking distance provided at preset speed increase, irrespective of the positions of the balises.

b) Linking and SH balises shall never affect data that tells about the existence of distant signal information or preset speed increase.

Passing an SH group

F3058.51a  When passing an SH group, the signal linking distance shall be updated in the following cases.

a) The linking function is active, and the SH balises are detected before passing the whole basic distance.

1. Exception: when the linking distance was given by a signal with preset speed increase.

b) Reserve.

c) The SH group shall update the linking regardless of present STM area.

1. Exceptions: Non-equipped area, HT area or Installation area.[17]

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[17] Differs from [ATC2] when passed after a linking group, otherwise not.

*Note*. If the basic distance has been exceeded, no SH balises will update the linking distance. This prevents the loss of a signal from being hidden by a following SH group.

A3058.51n  When passing an SH group, the signal linking distance shall be updated in the following cases.

    a)  The linking function is active, and the SH balises are detected before passing the whole basic distance.

        1. Exception: when the linking distance was given by a signal with preset speed increase.

    b)  The linking function is not active (never started, or stopped after a previous linking error or other event).

    c)  The SH group shall update the linking regardless of present STM area.

        1. Exception: Installation area.

*A-Note*. If the basic distance has been exceeded, no SH balises will update the linking distance. This prevents the loss of a signal from being hidden by a following SH group.

F3059.51a  Actions that shall be taken when passing an SH group which updates the linking distance.

    a)  The linking distance shall be calculated in the same way as for signals without a preset speed increase [3.3.2.2].

    b)  The SH group shall also update the basic distance.

    c)  Reserve.

### Passing a linking group

F3060.51b  When passing a linking group, the signal linking distance shall be updated in the following cases:

    a)  Linking is active, and there is no distant signal or preset speed increase information (from the latest passed signal group).

        *Note*. This update takes place regardless of linking group position.

    b)  Linking is active, except when given from a signal with preset speed increase, and the linking group is detected before passing the whole basic distance.

    c)  Reserve.

d)      The linking group shall activate linking regardless of present STM area.

    1. Exceptions: Non-equipped area, HT area or Installation area.[18]

*Note.* If distant signal information was given in the last signal group and the basic distance was exceeded when passing a linking group (alone or in a series of linking groups), no more updating of this linking distance can take place. This prevents the loss of a signal group from being hidden by a subsequent linking group.

A3060.51o  When passing a linking group, the signal linking distance shall be updated in the following cases:

a) Linking is active, and there is no distant signal or preset speed increase information (from the latest passed signal group).

    *A-Note.* This update takes place regardless of linking group position.

b) Linking is active, except when given from a signal with preset speed increase, and the linking group is detected before passing the whole basic distance.

c) The linking function is not active (never started, or stopped after a previous linking error or other event).

d) The linking group shall activate linking regardless of present STM area.

    1. Exception: Installation area.

*A-note.* If distant signal information was given in the last signal group and the basic distance was exceeded when passing a linking group (alone or in a series of linking groups), no more updating of this linking distance can take place. This prevents the loss of a signal group from being hidden by a subsequent linking group.

F3061.51a  Actions that shall be taken when passing a linking group which updates the linking distance.

a) The linking distance shall be calculated in the same way as for signals without a preset speed increase [3.3.2.2].

b) Every linking group that affects the linking distance, shall also update the basic distance.

c) Reserve.

*Note.* A linking or SH group which affects the linking distance, will also update the basic distance and the target distance of an existing distant signal braking

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[18] Differs from [ATC2]

curve. For example, the linking distance can be extended by a chain of linking groups as long as each group is detected before passing the basic distance of the previous group. If no distant signal information was received from the latest signal, then linking groups found after the basic distance has elapsed will also update the linking.

F3062.    Reserve.

### 3.3.2.5    Train travelling the entire linking distance

The linking distance ($D_{LINK}$) expires as soon as its end point is reached by the train.

F3063.    If the train has passed the entire linking distance without detecting a new signal balise group, or when permitted, an updating linking group or SH group, a balise error alarm shall be activated, according to [Table 3.3-6].

### 3.3.2.6    Stopping within the linking distance

F3064.    Stored linking distance shall not be affected if the train stops.

## 3.3.3    Linking between boards

F3064A.51n  For linking and supervision, the STM shall use the following data.

a)  A target window, defined as 80 - 120 % of the target distance.

b)  Reserve.

*Note.* Reserve. [19].

A3064A.51n  For linking and supervision, the STM shall use the following data.

a)  A target window, defined as 80 - 120 % of the target distance, with

b)  A lower limit $D_{WINLOW}$ of ±12 m from the target point (an STM constant).

---

[19] Reserve.

### 3.3.3.1    Linking to category PT speed boards

PT category speed restrictions (with prefix balises) require balises both at the warning board and at the speed board. Semi-equipped speed restrictions are not used.

To make the linking valid, the speed board balises must be located within the target window, which covers 80 - 120 % of the target distance.

The linking supervision applies regardless of the number of active PT bits in the PT balise groups.

F3065.    If balises are not found at the PT speed board:

a)  Supervision of the braking curve shall continue until the target distance + 20% has been travelled.

b)  A balise error alarm shall then be generated, and

c)  HT information shall be deleted [Table 3.3-6].

F3066.    Special PT boards:

a)  Linking to the speed board shall take place also if the warning board is coded PTNA.

b)  SPTS and SPTT shall *not* be interpreted as speed boards which can satisfy the linking requirement.

c)  A speed board coded with PTNA shall terminate linking.

### 3.3.3.2    Notification of category V warning board

The first (and therefore not repeating) warning board of category V1, V2 or V3 before a level crossing must always be preceded by a notification balise group of the same category.

The notification balise group must be physically located within 100 m before the warning board (the STM requires "within 150 m").

F3067.    The notification balise group and the warning board (category OT) balise group shall check each other mutually. Balise error alarm shall be generated if:

a)  An OT balise group is not detected within 150 m from a notification balise group, or

b)  The first OT balise group lacks a prior notification balise group within 150 m.

*Note.* [Table 3.3-6]

F3068.    For two notification balise groups of the same category without an intermediate warning board (OT) balise group in between, the STM shall generate a balise error alarm.

*Note.* The reason for this rule is that otherwise an erroneous warning board group could be mistaken for a notification balise group.

*Note.* Notification balises can also be located at repeater warning boards (OT-V), but are not checked.

F3069.    Balise error shall be generated if a repeater OT balise group is not detected within 150 m from a notification balise group.

*Note.* Only at a correct repeating OT-V, meaning where both category, speed and target are correct, the system accepts that there are no notification balises.

### 3.3.3.3    Distant signal landslide warning and linking to BSK/SSK

Landslide warning boards[20] – FSK/FSKA with A(5, 14, 0/13) – require notification balises (AFSK), coded A(5,4,0).

A repeater for landslide warning requires also a notification balise group.

F3070.    Balise error alarm shall be activated if:

a)  FSK or FSKA is not detected within 150 m after AFSK, or

b)  FSK or FSKA is not within 150 m preceded by AFSK.

*Note.* [Table 3.3-6]

F3071.    a)  After passing an FSK or an FSKA, a balise error shall be generated if no BSK or BSKA (beginning of landslide warning) is detected:

    1.  Before SSK, and

    2.  Before leaving the target window (when passing 120 % of the original target distance).

b)  Near the target point, after entering the target window (after 80 % of the original target distance), the linking shall cease:

    1.  At BSK, or

    2.  At BSKA.

c)  Near the target point, after entering the target window (after 80 % of the original target distance), the linking shall cease and balise error shall be given:

    1.  At SSK, or

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[20] Landslide warning distant signals

2. When leaving the target window (when 120 % of the distance  has elapsed).

*Note.* This balise error is handled differently, depending on if (and where) an SSK is detected or not [Table 3.3-6].

### 3.3.3.4    Linking to border balises GMO, GMD or BU

F3072.    An OTG category warning board, A(5,14,Z), shall be valid as a warning board for the following border balises to areas with supervised line speed:

a)  GMO, border to Non-Equipped Area.

b)  GMD, border to Partially Equipped Area.

c)  BU, border to Installation area.

F3073.    If none of the above border balises are detected within the target window (80...120 % of the target distance):

a)  The target speed given by the warning board balises shall be supervised (category G line speed).

b)  Balise error shall be generated [Table 3.3-6].

c)  Existing braking curves shall still apply.

### 3.3.3.5    Proving of beginning balise for level crossing protection

F3074.    a)  If an SVn, end of level crossing number n, is detected without a corresponding beginning balise, balise error shall be generated [Table 3.3-6].

b)  Valid beginning balises shall be HT-Vn (also HT*Vn) or HT-VnA.

### 3.3.3.6    Warning board repeater check

F3075.    Reserve.

## 3.3.4    Actions at balise error

### 3.3.4.1    General

The actions required when balise errors are detected, depend on what information can be assumed to be lost:

−  Stored balise information may be erased completely, partially or not at all [3.3.5].

−  Area category and speed display can be affected. If speed board or signal information is erased, the area category is adjusted accordingly, which means that display of the maximum permitted speed and target speed can change or cease, and supervision of the maximum permitted speed can cease. Of remai-

ning information, the most restrictive shall be supervised as maximum speed [3.3.5], [4.4.3 - 5].

To facilitate decisions on the necessary action in a given situation, balise error alarms are divided into three classes, BF1, BF2 and BF3. The tables in sub-section [3.3.5] state which class applies for each type of error.

BF1, Balise error alarm without brake application

Balise errors without brake application (BF1) are handled in the following ways:

a) No maximum speed information is erased.

b) Existing braking curves are not affected.

c) The speed bars are not affected.

d) No brake application.

e) An audible warning is activated [3.3.4.3].

f) The indicator BALISFEL 1 is displayed [3.3.4.3].

g) Error information is shown, including the three-character balise error code [3.3.8].

h) The speed indicators are not affected.

i) Remaining information (unaffected by the BF1 error) from a balise group can often be used [3.3.6]. Example: N-balise with bit errors, belonging to a signal group.

BF2, Balise error alarm with brake application

Balise errors with brake application (BF2) are handled in the following ways:

a) Maximum speed information (HT or signal speed) is generally erased [3.3.5].

b) Existing braking curves are kept, but might be affected [3.3.4.4].

c) 80 km/h supervision (with braking) is activated [3.3.4.2].

d) The MAIN INDICATOR shows 'FEL' in rapid flashing, together with a blanked PRE INDICATOR. This will last until the conditions for STM braking do not apply anymore [3.3.4.2].

e) Speed indicators and speed bars can be extinguished or not in accordance with remaining information [3.3.4.3]:

– Speed indicators: When the 'FEL' indication disappears, previously shown digits will remain, become extinguished or change to dashes. Example: at max speeds ≤ 70 km/h, the digits may remain if only HT information was lost.

– Speed bars can be extinguished or not.

f) An audible warning is activated [3.3.4.3].

g) The indicator BALISFEL 2 is displayed [3.3.4.3].

h) Error information is shown, including the three-character balise error code [3.3.8].

i) Area information is displayed according to the possibly changed STM area [4.4.2 - 5]. What STM area that the train will enter after a balise error depends on what data that was lost. For example, in Fully equipped area:

  – Losing signal data means changing to HT area,

  – Losing speed board information means changing to Partially equipped area,

  – Losing both means changing to HT area or Non-equipped area.

j) No information from a faulty balise group is used, except from possible preliminary signal information [3.3.6].

<u>BF3, Balise error with braking and extinguished display</u>

This balise error type is used unless proved that the error did *not* occur at a faulty warning board balise group.

Balise error alarm with brake application and long blanking of information in the indicators (BF3) is handled in the following way:

a) Maximum speed information (HT or signal speed) is generally erased [3.3.5].

b) Existing braking curves are kept, but might be affected [3.3.4.4].

c) 80 km/h supervision (with braking) is activated [3.3.4.2].

d) The MAIN INDICATOR shows 'FEL' in rapid flashing, together with a blanked PRE INDICATOR. This will last until the conditions for STM braking does not apply anymore [3.3.4.2].

e) Speed indicators and speed bars are extinguished and will not re-appear until the whole blanking distance (usually 3,8 km + train length) has been travelled:

– The speed indicators are blanked after the 'FEL' indication, except during supervision of Stop or Expect Stop [3.3.4.3]

f) After passing the whole blanking distance, speed indications will re-appear in accordance with remaining information:

– The speed indicators can remain, become blanked or change to dashes

– The speed bars can remain extinguished or not.

g) An audible warning is activated [3.3.4.3].

h) The indicator BALISFEL 3 is displayed [3.3.4.3].

i) Error information is shown, including the three-character balise error code [3.3.8].

j) The indicator 'TÅGÖVERVAKNING' is displayed until the whole blanking distance has been passed. After that, area information is displayed as usual.

k) No information from a faulty balise group is used, except from possible preliminary signal information [3.3.6].

What STM area that the train is in depends on what data that was lost at the balise error, and on what balise messages that has recently been received during the past kilometres. For more information about the areas and their indications, refer to [4.4.2 - 5].

Priority of balise errors

F3076.  a) If two or more balise errors need to be supervised at the same time, the most restrictive supervision shall apply.

b) Deletion of information shall however take place for every balise error, independently from the rest.

*Note.* In some situations, the STM quits searching for more balise errors in a balise group. This may happen after detecting an error which is so severe, so that it would not be possible to detect anything "worse" in the one and same group. Refer to [3.3.5] for more information.

### 3.3.4.2   80 km/h supervision after BF2 or BF3

Starting the 80 km/h supervision

The 80 km/h supervision is activated if it cannot be ruled out that the lost balise information emanates from a group of balises with safety information pertaining to the direction of travel. This applies for balise error types BF2 and BF3.

The 80 km/h supervision can either imply a supervision of the deceleration to 80 km/h (applies if the speed when the balise failure occurs is > 80 km/h) or, if the speed already is maximum 80 km/h, a supervision of 80 km/h as maximum speed.

The train is running above 80 km/h when the error occurs

F3077.51b  If the train is running above 80 km/h when a BF2 or BF3 balise failure occurs:

    a)  A "soft" braking curve shall be set up according to sub-section [4.6.13].

    b)  This shall be based upon the braking capacity of the train [4.2].

    c)  Five (5) seconds after the balise failure (regardless of train speed), full or soft service brake application (depending on $SB_{SOFT}$ [Table CP]) shall be activated, unless the brake pipe pressure at any time during the 5 sec period has been reduced with at least 60 kPa.

*Note.* Reserve.

*Note.* When the speed has been brought down to 80 km/h, brake release is permitted and the system switches over to supervision of this speed as maximum speed ($V_{ERR}$).

The train is running at 80 km/h or below

F3078.51a  If the train is running at 80 km/h or below when a BF2 or BF3 balise failure occurs[21]:

    a)  Five (5) seconds after the balise failure, full or soft service brake application[22] (depending on $SB_{SOFT}$ [Table CP]) shall be activated, unless the brake pipe pressure at any time during the 5 sec period has been reduced with at least 60 kPa.

    b)  If at least two (2) seconds has elapsed after the service brake was applied, the brake shall be released when the driver presses the LOSS button.

    c)  The STM shall supervise $V_{ERR}$ = 80 km/h as a maximum speed.

'FEL' indication

F3079.51a  a)  When a BF2 or BF3 balise error occurs, the message **'FEL'** with a rapid flashing (0,3/0,3 s) shall appear on the MAIN INDICATOR, and the PRE INDICATOR shall be blanked.

    b)  This indication shall last until the condition for STM braking does not apply anymore (the train has slowed down to 80 km/h and the required five seconds have passed).

    *Note.* The STM returns to normal indication (or, if information was lost, reduced indication or none at all).

---

[21] Or has slowed down since the error occurred
[22] [ATC2] difference

Special rule for the dark speed

F3080.     After a BF2 or BF3 balise error that occurred while $V_{TRAIN} > 80$, and at which main signal and/or full HT information was lost, the max speed $V_{DARK}$ shall not apply until the train has slowed down to 80 km/h.[23] [4.3.8.3]

*Note.* This is to avoid STM braking before the five seconds have passed.

*Note.* Otherwise $V_{DARK}$ would become supervised at once with the following complications: If $V_{TRAIN} \geq V_{DARK} + 10$ km/h at the balise error, this would cause immediate service braking. If $V_{TRAIN} \geq V_{DARK} + 15$ km/h, this would cause unwanted emergency braking.

Terminating the 80 km/h supervision

F3081.     If a signal with distant signal information is passed when supervision of maximum speed 80 km/h is active, the 80 km/h max speed shall immediately be erased.

F3082.     If a signal with distant signal information is passed during the STM braking curve supervision down to 80 km/h, this shall continue until the speed has been brought down to 80 km/h, at which time the 80 km/h supervision immediately shall cease (the 80 km/h maximum speed shall not be supervised).

### 3.3.4.3  Indications after balise error

For the **'FEL'** indication, see above.

Indication of supervised speed after BF2 or BF3

F3083.     For BF2 balise errors, the speed indicators and speed bars shall be extinguished or not in accordance with remaining information, following the rules for Non-equipped area, HT Area, Partially Equipped Area or Fully Equipped Area [4.4.2 to 4.4.5].

*Note.* Exception: Supervision of Stop or Expect Stop may activate the digital speed indicators temporarily, according to normal area rules.

F3084.51b  a) For BF3 balise errors the speed indicators and speed bars shall remain ex-tinguished during the blanking distance, which is 3.8 km + the length of the train.

---

[23] [ATC2] difference

Exceptions:

b) Reserve.[24]

c) Supervision of Stop or Expect Stop shall activate the digital speed indicators temporarily.

*Note.* This means that steady or slow-flashing zeroes will appear in the PRE INDICATOR and flashing zeroes in the MAIN INDICATOR according to normal deceleration supervision rules [Chapter 4]. This will last until the braking curve is terminated.

*Note.* The distance 3,8 km is chosen to prevent that a too high speed is indicated after erroneous balise group at warning board associated with a semi-equipped speed restriction.

*Note.* Balise reading, speed supervision and deceleration supervision is carried out as normal. This applies also with balise errors caused by overflow.

A3084.51n a) For BF3 balise errors the speed indicators and speed bars shall remain extinguished during the blanking distance, which is 3.8 km + the length of the train.

Exceptions:

b) After a balise error caused by a single marker, the speed indications shall be restored already after 1,0 km.[25]

c) Supervision of Stop or Expect Stop shall activate the digital speed indicators temporarily.

*A-Note.* This means that steady or slow-flashing zeroes will appear in the PRE INDICATOR and flashing zeroes in the MAIN INDICATOR according to normal deceleration supervision rules [Chapter 4]. This will last until the braking curve is terminated.

*A-Note.* Balise reading, speed supervision and deceleration supervision is carried out as normal. This applies also with balise errors caused by overflow.

F3085.    Speed indicators that were blanked or changed to dashes or speed bars that were extinguished after balise error BF2 or BF3 shall be restored in line with the function in Partially Equipped Area [4.4.3] or Fully Equipped Area [4.4.5] respectively.

---

[24] Reserve.
[25] Differs from [ATC2], lacking there

F3086.    The indicator 'TÅGÖVERVAKNING' shall be displayed until the whole blanking distance has been  passed after BF3.[26]

*Note.* In all other cases, area information is displayed as usual [4.4.2 - 5].


<u>Audible signals f2 after BF1, BF2 or BF3</u>

F3087.    Audible signals f2 shall be given, 2 sec in duration repeated 3 times with a cycle of 3 sec.


<u>The BALISFEL indicators</u>

F3088.    The BALISFEL 1, BALISFEL 2 or BALISFEL 3 indicator (depending on the balise error type) shall be displayed[27] until:

a)  At least 10 seconds has elapsed after the balise error, and the next main signal for the present direction is passed, or

b)  60 seconds has elapsed after a balise error that occurred in Non-equipped area (e.g. linking error).

*Note.* Exception: A balise error that occurred right before passing GMO or BU is erased 5 s after this border group [4.4.2, 4.4.6]


<u>Balise error message</u>

F3089.51b   Balise error information shall be displayed on the DMI,

a)   Showing the balise error code in three characters, F1, F2 and F3 [3.3.8].


A3089.51n   Balise error information shall be displayed on the DMI,

a)   Showing the balise error cause and the error code in three characters, F1, F2 and F3 [3.3.8].[28]


## 3.3.4.4    Handling of braking curves after balise error

F3090.    All previously calculated braking curves shall be retained, and their supervision shall continue.

---

[26] Differs from [ATC2], lacking there
[27] Differs from [ATC2], lacking there
[28] Differs from [ATC2]

Distant signal information

F3091.51a a) If main signal information was deleted in conjunction with the balise error and no new signal has been passed, this shall apply:

    1. An existing braking curve from distant signal shall be terminated as soon as the target point is reached.

    2. The target speed of this braking curve shall not be converted to a maximum speed.

b) Reserve. [29]

    1-2. Reserve.

*Note.* Reserve.


A3091.51n a) If main signal information was deleted in conjunction with the balise error and no new signal has been passed, this shall apply:

    1. An existing braking curve from distant signal shall be terminated as soon as the target point is reached.

    2. The target speed of this braking curve shall not be converted to a maximum speed.

b) Exception. With category A-extension (unlocked or locked[30]):

    1. The STM shall change to supervision of the A-extended maximum speed at the extended target point.

    2. This shall not affect the present STM area, i.e. no signal information shall be considered to exist.

*A-Note.* For the unlocked A-extension, the locking main signal was probably faulty or missing.


Distant signal Expect Stop

F3092. If a balise error occurs after Expect Stop information has been received, then supervision to $V_{REL} = 10$ km/h shall be performed with the target point retained, if the erroneous group could have been a repeater distant signal indicating Expect Stop with 10-supervision (AX = 1 or unidentified).


Distant signal Expect Proceed

---

[29] Reserve.
[30] Differs from [ATC2], lacking there

F3093.    a) The system shall change to supervision of Expect Stop, if:

    1. The train stopped after receiving a balise error where SIG was deleted, and

    2. A distant signal with Expect Proceed is stored.

    b) The release speed shall be set to 10 km/h.

    c) Exception to b. The supervision shall follow AX, if:[31]

    1. The error occurred because of a faulty signal group, and

    2. The system has received $AX = 4$, and

    3. There is a B(9) or C(14) balise after the A-balise (the faulty signal is proved  to apply for the present direction).

    *Note*. This is not possible for two groups which are incorrectly interpreted as one.

Warning board information

*Note.* Warning board braking curves are not affected by deleting of HT information in conjunction with a balise error. Should the speed board at the target point be faulty or missing, the related OT braking curve will react like this:

| | |
|---|---|
| OT-T, -K, -ET: | Change to a semi-equipped restriction at the target point. |
| OT-V: | Terminated at the target point. |
| OT-PT, -SK: | Changed to max speed supervision at the target point. This and the braking curve are terminated when the linking error occurs. |
| OT-G: | Changed to max speed supervision at the target point. The braking curve (but not $V_{HT-G}$) is terminated when the linking error occurs. |

### 3.3.5    Deleting information at balise error

If a balise group is erroneous and does not fulfil the requirements [3.3.1], certain information must be deleted for reasons of safety. In some cases this applies to incorrect relations between balise groups (one of two or more related balise groups is not provided). The following actions are taken in order to find out what information that must be erased.

---

[31] Differs from [ATC2], lacking there

F3094.     When a balise error has been detected, the STM shall take the following actions, one by one:

| | | |
|---|---|---|
| a) | Check if two correct balise groups have been combined to form one incorrect group. | [3.3.5.1] |
| b) | Find out if the balise group can be positively identified as applying to the opposite direction. | [3.3.5.2] |
| c) | Attempt to place the erroneous group in a particular category. | [3.3.5.3] |
| d) | Detect bit errors or other errors in Y and Z words from a balise. | [3.3.5.4] |
| e) | Detect particular errors within a balise group. | [3.3.5.5] |
| f) | Detect incorrect connections between balise groups, linking errors or data overflow. | [3.3.5.6] |

*Note.* Existing information pertaining to semi-equipped speed restrictions, braking curves and train length delays is not deleted by the STM at balise error. Exception: when passing a braking curve target point [3.3.4.4].

F3094A.51a  Reserve. [32]

*Note.* Reserve.

A3094A.51n

a) The STM shall start a train length delay for every erased max speed after a balise error, if the max speed is of a type that normally uses train length delays.[33]

b) Existing train length delays shall be retained.

*A-Note.* ET max speeds are not erased but changed to semi-equipped restrictions [3.3.5.3].

F3094B.51a  Reserve.

a)-d)     Reserve.

*Note.* Reserve.

---

[32] Reserve.
[33] Differs from [ATC2], lacking there

A3094B.51o  If a preliminary stop signal message [§3.4.4.1] was detected in the group of bali-ses, but also a balise error [§3.3.5.1 -- §3.3.5.5], the following rules shall apply:

a)  The balise error shall be classified as usual (BF1, BF2 or BF3).

b)  The preliminary stop signal information shall not be erased.[34]

*A-Note*. This means that the preliminary stop signal information is kept in SIG [§3.3.5.3].

c)  The preliminary stop shall satisfy the linking function in the same way as a correct stop signal.

*A-Note*. An expired signal linking distance (from a previous signal group) should not erase the preliminary stop.

d)  For BF2 or BF3, there shall be no further handling of this faulty balise group (i.e. not treated as a definitive stop signal).

*A-Note*. Otherwise a balise failure in the group could erase SIG, which means that the stop signal information disappears.

*A-Note*. This means that supervision and indication after stop will be retained until passing the next main signal group.


### 3.3.5.1    Balise group incorrectly composed of two groups

When two balise groups are placed too close together, or in extreme cases of train wheel sliding, there is a risk that the two balise groups are interpreted as only one.


F3095.51a  Balise error shall be indicated if the group contains more than one category A-- balise according to the table below.

---

[34] Differs from [ATC2]

*Table 3.3-1. Two balise groups incorrectly interpreted as one group*

|  | **A1** | A2 | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
|  |  | **1** | **2** | **3** | **4** | **5** | **6** | **7** | **10** | **11** | **13** | **M** |
| a) | **1** | X | X | X | X | X | X | X | X | X | X | – |
| b) | **2** | X | X | X | X | X | X | X | X | X | X | – |
| c) | **3** | X | X | – | X | – | X | – | X | X | X | – |
| d) | **4** | X | X | X | X | X | X | X | X | X | X | – |
| e) | **5** | X | X | – | X | – | X | – | X | X | X | – |
| f) | **6** | X | X | X | X | X | X | X | X | X | X | – |
| g) | **7** | X | X | – | X | – | X | – | X | X | X | – |
| h) | **10** | X | X | X | X | X | X | X | – | – | X | – |
| i) | Reserve | – | – | – | – | – | – | – | – | – | – | – |
| j) | **13** | X | X | X | X | X | X | X | X | – | – | – |
| k) | **M** [35] | – | – | – | – | – | – | – | – | – | – | – |

*Note.* Explanation:

The first category A balise detected determines the row (A1). If any other balise in the group is of a category marked with an "**X**" in this row, then this shall be interpreted as two groups being combined.

F3096.    Actions when a configuration error according to [Table 3.3-1] is detected:

a)  Balise error alarm BF3 shall be generated.

b)  All information in the balise group shall be ignored.

c)  Deletion of HT, HTE[36] and SIG. See the explanations [3.3.5.3].

*Note.* An already existing distant signal braking curve with a stored release speed of > 10 km/h will always change its release speed to 10 km/h [3.3.4.4].

### 3.3.5.2    Identification of erroneous group for opposite direction

F3097.    Correct balise groups for the opposite direction shall be defined according to [Table BK-2].

*Note.* Balise error alarm BF1 without any erasing is given for erroneous Y or Z words of an opposite-directed group, if they contain bit error/s or unreasonable values (Y/Z dependent configuration error) [3.3.1.13].

---

[35] Differs from [ATCH] but not [ATC2]. Reason: Otherwise a faulty information balise in a normal group could be interpreted as if the group was incorrectly composed as two groups.
[36] Differs from [ATC2]

F3098.    a) An incorrect balise group shall be identified as relevant for the opposite direction, if it corresponds to any of the rows in the following table.

b) If the balise group is classified as pertaining to the opposite direction a balise error alarm shall be generated without braking, i.e. BF1 in all cases.

c) Error code display shall be determined by the first suitable combination detected in the table.

*Table 3.3-2. Identification of erroneous balise groups.*

| | Erroneous balise groups shall be classified as for the opposite direction if.... | | |
| --- | --- | --- | --- |
| | ... the STM first finds this balise (ie. balise category = X word)... | ...and after that finds this balise within the balise group: | F1 error code display: |
| a) | 1 | 8 | H |
| b) | 2 | 8 | E |
| c) | 4 | 8 | H |
| d) | 6 | 8 | E |
| e) | 9 | 1, 4 | H |
| f) | 9 | 2, 5, 6 | E |
| g) | 9 | 10 | – [2] |
| h) | 9 | 8 | C [1] |
| i) | 10 | 8 | – [2] |
| j) | 12 | 2, 5, 6 | E |
| k) | 14 | 1, 4 | H |
| l) | 14 | 2, 5, 6 | E |
| m) | 14 | 10 | – [2] |
| n) | 14 | 8, 9 | C [1] |

*Note.* Explanations:
1)  These combinations can also appear at a reserve balise group.
2)  Balise error is not indicated (annulled signal)
F1 is the left-hand position of the error code [Table 3.3-7].
"**–**" in column F1 means "no balise error",  i.e. the group shall be ignored.

F3099.51a   Reserve.

a)-b)   Reserve.

*Note.* Reserve.

A3099.51n   Special case, exception from the previous requirement [Table 3.3-2]: If there is an incorrect layout where the number balise is placed in the beginning of an OT

(which in itself is intended for the present direction):[37]

a) The group shall be handled as relevant for the present direction, and

b) BF3 shall be activated [3.3.5.3].

*A-Note*. Example. This serves to detect the incorrect combination N(12) A(2) B(9/M), which later on may change to N(12) A(2) if the B-balise dies (which means that the remaining balises are interpreted as intended for the opposite direction).

### 3.3.5.3 Erroneous group that may apply to the present direction

This section describes handling of groups of balises with an error in configuration, when it cannot be positively determined that the group pertains to the opposite direction.

Explanations to the following tables.

F3099A.51b    The following information shall be erased:

| | | |
|---|---|---|
| a) | HT | Erased speed board information, which includes:<br>1)    Max speeds from speed boards (no semi-equipped max speeds) of the following categories: T, G, Kn, PT, and Vn (for ET and SK, see below).<br>2)    Collected information for full HT [3.9.5]. |
| b) | HTE [38] | Erased HT-ET and BSK information:<br>1)    Route-dependent ET max speeds shall be erased .<br>2)    Landslide max speed (after passing BSK) shall be erased.<br>*Note.* See also the requirements below. |
| c) | SIG | Erased signal information, which includes<br>1)    Max speed $V_{HSI}$ from main signal (also from stop signal, unless the faulty group itself was a stop signal)<br>2)    Linking distance<br>3)    Preset distant signal increase<br>4)    Distant signal release speed/s shall be changed to 10 km/h if AX is unreadable in a faulty signal group<br>5)    Distant signal information  shall be erased when passing the target point (A-extension shall not update $V_{HSI}$ first)<br>6)    Reserve. |

---

[37] As [ATC2A]
[38] Reserve.

| | | |
|---|---|---|
| d) | – | Erasing a max speed means that this speed shall be set to a passive value. Train length delay applies if this is common for the speed restriction in question. |

| | | |
|---|---|---|
| e) | – | Erasing a linking distance means that linking shall cease until a new distance has been received. |

A3099A.51c  The following information shall be erased:

| | | |
|---|---|---|
| a) | HT | Erased speed board information, which includes:<br>1)  Max speeds from speed boards (no semi-equipped max speeds) of the following categories: T, Kn, PT, and Vn (for ET and SK, see below).<br>2)  Collected information for full HT [3.9.5]. |

| | | |
|---|---|---|
| b) | HTE [39] | Erased HT-ET and BSK information:<br>1)  Route-dependent ET max speeds shall be converted to semi-equipped restrictions.<br>2)  Landslide max speed (after passing BSK) shall be erased.<br>*A-Note.* See also the requirements below. |

| | | |
|---|---|---|
| c) | SIG | Erased signal information, which includes<br>1)  Max speed $V_{HSI}$ from main signal (also from stop signal, unless the faulty group itself was a stop signal)<br>2)  Linking distance<br>3)  Preset distant signal increase<br>4)  Distant signal release speed/s shall be changed to 10 km/h if AX is unreadable in a faulty signal group<br>5)  Distant signal information shall be erased when passing the target point (A-extension shall update $V_{HSI}$ first)<br>6)  Information from previously passed release groups. |

| | | |
|---|---|---|
| d) | – | Erasing a max speed means that this speed shall be set to a passive value. Train length delay applies if this is common for the speed restriction in question. |

| | | |
|---|---|---|
| e) | – | Erasing a linking distance means that linking shall cease until a new distance has been received. |

---

[39] Differs from [ATC2]

Explanations to [Table 3.3-3]

F3100.   The rows in [Table 3.3-3] below, which correspond to balise categories in the group, shall be scanned. The following actions shall be taken:

a) If a dash "–" appears in any of the relevant rows, the equivalent information shall be saved.

b) Error code display shall be determined by the first row in the table which matches a balise category in the balise group.

F3101.   The error type shall be determined according to [Table 3.3-3]:

a) If a dash "–" appears in any of the relevant rows of the "display off" column:

  1. The speed indicators and speed bars shall be retained in accordance with available information, i.e. at most BF2 shall be generated (no blanking distance).

  2. Otherwise, BF3 shall be generated.

b) For board balises with $X = 2, 3, 5, 6$ or $7$ and $Z = 14$:

  1. Only BF2 shall be generated (no blanking distance).

  2. HT shall be erased for category 3, 5 and 7 (the $Z = 14$ could be intended for the opposite direction).

c) BF1 shall be generated (which means that the speed indications shall be retained and the brakes not applied) in this case:

  1. If neither HT nor SIG are deleted, and

  2. The speed indications are kept – no blanking.

  *Note*. Only categories 10, 11 or 13 balises were detected.

F3102.51a   Handling of max speed of category HT-ET at balise error[40]:

a) Reserve.

  1-2. Reserve.

    *Note*. Reserve.

b) **HTE**[41]**:** At every HT-erasing balise error:

  1. HT-ET shall be erased, and

  2. A possible landslide restriction after passing BSK shall be erased.

---

[40] Reserve.
[41] Reserve.

A3102.51n  Handling of max speed of category HT-ET at balise error[42]:

a) **No HTE:** HT-ET and BSK shall be saved at HT-erasing balise error, according to any of these conditions.

   1. If the first balise is P(8) or A(3) and there is at least one more balise.

   *A-Note*. For example, P(8) A(M) B(7) or A(3) B(5).

   2. The first balise is A(7) and there is at least one or more following balise/s, of which the first one is *not* a prefix balise (X ≠ 8).

   *A-Note*. For example, A(7) B(M).

b) **HTE**[43]**:** At other HT-erasing balise error than the one specified above:

   1. HT-ET shall be converted to a semi-equipped speed restriction immediately (i.e. after the distance 0 m, an STM constant), and

   2. A possible landslide restriction after passing BSK shall be erased.

---

[42] Differs from [ATC2]

[43] This *could* be a faulty End of ET restriction (SET) board.

F3103.51a  The following table shall apply. [44]

*Table 3.3-3. Erroneous balise group that may apply to the present direction*

| | Balise category | Information marked "–" shall not be erased: | | Display off for 3.8 km + train length (BF3 blanking) | F1 error code |
|---|---|---|---|---|---|
| | | HT [3] | SIG | | |
| a) | **1** | – | X | – | 1 |
| b) | **2** [1] | – | – | X | 2 |
| c) | **3** [1] | X | – | – | 3 |
| d) | **4** | – | X | – | 4 |
| e) | **5** [1] | X | – | X | 5 |
| f) | **6** [1] | – | – | X | 2 |
| g) | **7** [1] | X | – | – | 3 |
| h) | **8** | X | X | X | A |
| i) | **9** | – | X | X | A |
| j) | **10** | – | – | – | 9 |
| k) | – (reserve) | – | – | – | – |
| l) | **12** | – | X | X | A |
| m) | **13** | – | – | – | 0 |
| n) | **14** | – | X | X | A |
| o) | **0** | X | X | X | 0 |
| p) | **Marker** | X | X | X [2] | U |
| q) | **15** | X | X | X | A |
| r) | **11** | – | – | – | 9 |

Explanations:

1) For balises with X = 2, 3, 5, 6 or 7, only BF2 shall be generated if Z = 14, but HT must still be erased for category 3, 5 and 7 (the Z = 14 could be intended for the opposite direction).

2) Reserve.

3) This may also include HTE according to previous requirements

"**–**" If found in at least *one* relevant row: this information shall be saved (or this action shall not be performed).

"X" if found in *all* relevant rows: this information shall be deleted (or this action shall be performed).

_____

[44] Reserve.

*Note.* Refer also to the preceeding requirements.

A3103.51n  The following table shall apply. [45]

*A-Table 3.3-3. Erroneous balise group that may apply to the present direction*

|  | Balise category | Information marked "–" shall not be erased: | | Display off for 3.8 km + train length | F1 error |
|---|---|---|---|---|---|
|  |  | HT [3] | SIG | (BF3 blanking) | code |
| a) | **1** | – | X | – | 1 |
| b) | **2** [1] | – | – | X | 2 |
| c) | **3** [1] | X | – | – | 3 |
| d) | **4** | – | X | – | 4 |
| e) | **5** [1] | X | – | X | 5 |
| f) | **6** [1] | – | – | X | 2 |
| g) | **7** [1] | X | – | – | 3 |
| h) | **8** | X | X | X | A |
| i) | **9** | – | X | X | A |
| j) | **10** | – | – | – | 9 |
| k) | – (reserve) | – | – | – | – |
| l) | **12** | – | X | X | A |
| m) | **13** | – | – | – | 0 |
| n) | **14** | – | X | X | A |
| o) | **0** | X | X | X | 0 |
| p) | **Marker** | X | X | X [2] | U |
| q) | **15** | X | X | X | A |
| r) | **11** | – | – | – | 9 |

*Explanations:*

1) For balises with X = 2, 3, 5, 6 or 7, only BF2 shall be generated if Z = 14, but HT must still be erased for category 3, 5 and 7 (the Z = 14 could be intended for the opposite direction).

2) For a single marker: Display off for 1,0 km only

3) This may also include HTE according to previous requirements

"**–**" If found in at least *one* relevant row: this information shall be saved (or this action shall not be performed).

"X" if found in *all* relevant rows: this information shall be deleted (or this action shall be performed).

*A-Note.* Refer also to the preceeding requirements.

_____

[45] Differs from [ATC2]

### 3.3.5.4    Y/Z error in balise groups for the present direction

F3104.51a    The following errors in a balise group for the present direction shall be handled in accordance with [Table 3.3-4] below:

a) Bit error in any Y or Z word.

b) Any Y or Z word = 15 when decoded.

c) AY = 0 in A(5).

1. Exception: If AZ = 14 (the group annulled), no balise error shall be activated [Table BK-1a].

d) CY = 0 in C(14).

1. Exceptions: at stop signal with AY = 0 or annulled warning board [Table BK-1a].[46]

e) BY = 0 in B(14).

1. Exceptions: at annulled warning board [Table BK-1a].

*Note.* Reserve.

F3105.    Exceptions to the list of requirements above:

a) The requirements above shall *not* apply to bit errors in the YZ word of prefix balises and/or signal number balises [3.3.5.5].

b) See also the general exceptions [3.3.1.13].

F3106.    For a balise group intended for both directions, which is faulty only in the opposite direction, BF1 shall be given.[47]

F3107.    The following table[48] shall be scanned from the top down, and the first combination encountered shall be used.

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[46] Covers the case where a signal changes to stop while the train is still-standing
[47] Differs from [ATC2]
[48] Differs from [ATC2]

*Table 3.3-4. Y/Z error in balise group for the present direction*

| | Balise Category | Information marked "x" shall be erased: | | Error class | F1 Error Code |
|---|---|---|---|---|---|
| | | HT [4] | SIG | | |
| a) | **1** | – | X | BF2 | 1 |
| b) | **2** [2] | – | – | BF3 | 2 |
| c) | **3** [2] | X | – | BF2 | 3 |
| d) | **4** | – | X | BF2 | 4 |
| e) | **5 + 3/5/7** [1] [2] | X | – | BF2 | 5 |
| f) | **5 + 9** [1] [2] | – | – | BF3 | 6 |
| g) | **6** [2] | – | – | BF3 | 2 |
| h) | **7** [2] | X | – | BF2 | 3 |
| i) | **-- (reserve)** | – | – | -- | -- |

1) The equivalent shall also apply to an erroneous balise group configuration with a faulty AY word.
2) Exceptions according to [3.3.1.13].
3) Reserve.
4) HTE shall apply according to the rules under [3.3.5.3].

*Note.* It is not for sure that the *first* balise in the group is pointed out!

A3107.    The following table[49] shall be scanned from the top down, and the first combination encountered shall be used.

*A-Table 3.3-5. Y/Z error in balise group for the present direction*

| | Balise Category | Information marked "x" shall be erased: | | Error class | F1 Error Code |
|---|---|---|---|---|---|
| | | HT [4] | SIG | | |
| a) | **1** | – | X | BF2 | 1 |
| b) | **2** [2] | – | – | BF3 | 2 |
| c) | **3** [2] | X | – | BF2 | 3 |
| d) | **4** | – | X | BF2 | 4 |
| e) | **5 + 3/5/7** [1] [2] | X | – | BF2 | 5 |
| f) | **5 + 9** [1] [2] | – | – | BF3 | 6 |
| g) | **6** [2] | – | – | BF3 | 2 |
| h) | **7** [2] | X | – | BF2 | 3 |
| i) | **13** [3] | – | – | BF1 | 0 |

1) The equivalent shall also apply to an erroneous balise group configuration with a faulty AY word.
2) Exceptions according to [3.3.1.13].

---

[49] Differs from [ATC2]

3) Release group with Y/Z error.

4) HTE shall apply according to the rules under [3.3.5.3].

### 3.3.5.5   Errors within balise groups

This sub-section deals with balise groups containing errors that require special treatment.

F3108.51a   The STM shall handle errors within balise groups according to the following table.[50]

*Table 3.3-6. Errors within balise groups*

| | AX | Cause of error | Action that shall be performed | Error | Error code (F1) |
|---|---|---|---|---|---|
| a) | **1 / 4** | BY=14 at signals where $V_{FSI} \leq V_{HSI}$ or any of these messages are missing | Deletion of SIG | BF2 | 1 / 4 |
| b) | **1 / 4** | Target distance 0 m at signal where ~~$V_{HSI}$~~AY > 0 | Deletion of SIG | BF2 | 1 / 4 |
| c) | **2 / 5 / 6** | Target distance 0 m at warning board | – | BF3 | 2 / 6 |
| d) | **1 / 4** | Bit error in P(8)-balise at signal | No deletion. The rest of the group handled as if without P(8): no extension | BF1 | 1 / 4 |
| e) | **1 / 4 / 5** | Bit error in N(12) balise at signal or SH group | No deletion. The rest of the group handled as if without number balise. | BF1 | 1 / 4 / 6 |
| f) | **1 / 4** | Unreadable balise in an otherwise correct group of signal balises [1] | No deletion. The rest of the group handled as usual. | BF1 | 1 / 4 |
| g) | **2 / 6** | Bit error in N(12) balise at OT | No deletion. The group handled as if without N(12) | BF1 | 2 |
| h) | **2 / 6** | Prefix balise lacking or with bit error, at PTNA or OT with PT category. | No deletion. PT-bits i1-i9 set to the bit pattern of the train, and the group handled accordingly. | BF1 | 2 |
| i) | **7** | Prefix balise lacking or with bit error at PTNA, SPTS or HT with PT category | Deletion of HT | BF2 | 3 |
| j) | **3 / 7** | HT gives 0 km/h (”-”) [2] | Deletion of HT | BF2 | 3 |
| k) | **2 / 6** | OT gives "expect 0" (”–”) [2] | – | BF3 | 2 |
| l) | **2 / 6** | OT coded ”SPTS” [2] | – | BF3 | 2 |
| m) | **2 / 6** | OT with category V gives AZ=0 (AVn) but the B-balise is not a marker or AX ≠ 2 | No deletion. Interpreted as OT-V with $V_{REL}$=30 km/h. | BF1 | 2 |

1) *Note.* This means that the balise group has A(1/4) + B(9) + possible C(14)-balise. It is supposed that the unreadable balise has X=8 or X=12 and it shall therefore be handled as a faulty balise of both these categories. An unreadable balise is received as a balise...

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[50] Differs from [ATC2]

– With a faulty X word (code error or all bits set), or
– With too few telegrams (1...3), or
– Without any telegrams (marker).

2) *Note.* This information is not permitted according to chapter 8 [Table HT or HO].

*Note.* See also the general exceptions [3.3.1.13].

*Note.* Stop and Expect Stop can be indicated after BF2 or BF3, when the speed bars normally should have been extinguished [3.3.4.3].

### 3.3.5.6 Incorrect relation between balise groups

F3109.51c   The following table shall apply.[51]

*Table 3.3-7. Interaction problems between balise groups*

| | Cause of error | Shall be performed | Error | F1 |
|---|---|---|---|---|
| a) | Signal linking error | Deletion of SIG | BF2 | 7 |
| b) | SH-balises or signal increasing balises with AX=3 detected between signal with BY=14 and preset point of speed increase | Deletion of SIG | BF2 | P |
| c) | New main signal passed while locked A- extension is supervised | Braking curve termination. $V_{HSI}$ valid immediately. | BF1 | 7 |
| d) | Linking error at OT for level crossing: <br> - AVn missing before the first OT-Vn | | BF1 | |
| e) | - OT-Vn missing after AVn | – | BF3 | 8 |
| f) | - AVn follows after AVn  [1] | | BF3 | |
| g) | SVn passed but no related HT-V with AZ=0-13 | – | BF1 | 8 |
| h) | Overlap: HT with AX=7, AY=0 detected where K or PT speed restriction is active | Deletion of HT | BF2 | 3 |
| i) | HT-PT (≠SPTS) missing after OT with AY =9-11 (within 80-120% of target distance) | Deletion of HT [3/3.3.3.1]. | BF2 | 3 |
| j) | Overflow: Too many supervision objects. More than the same amount of supervision objects as defined in [ATCH]. [2] | Deletion of SIG if distant signal overflow. [3]  At overflow of semi-equipped speed limits, ignore the last one. | BF3 if OT overflow, else BF2 | P |
| k) | Overflow: Too many groups of balises in a short time or > 5 balises in a group | Deletion of HT + HTE + SIG [3] | BF3 | P |
| l) | -- (reserve). | – | – | – |

---

[51] According to [ATCB]

| | Cause of error | Shall be performed | Error | F1 |
|---|---|---|---|---|
| m) | Two OT of the same category aiming at the same target. Only one with N-balise | Handled as two different speed restrictions | BF1 | 2 |
| n) | Landslide warning notification:<br>- FSK/FSKA missing after AFSK | _ | BF3 | 8 |
| o) | - AFSK missing before FSK/FSKA | | BF1 | |
| p) | BSK/BSKA missing at the beginning of a landslide warning section:<br>- The linking distance has run out (120% of target distance) and no SSK was detected within 100-120% of the target distance. | Linking and braking curve shall be terminated | BF3 | 8 |
| q) | - SSK detected within 100-120% of the target distance | Linking and braking curve shall be terminated | BF1 | |
| r) | - SSK has been detected within 80-100% of the target distance | – | BF1 | |
| s) | Border balise not provided after OTG | Deletion of HT + SIG. OTG speed changed to max speed. | BF3 | 8 |

1)  *Note.* AVn with the same n.
2)  *Note.* See overflow explanation [3.3.1.9].
3)  *Note.* Other actions, like ignoring of new information, might cause unforeseen complications

A3109.51o  The following table shall apply.[52]

*Table 3.3-7. Interaction problems between balise groups*

| | Cause of error | Shall be performed | Error | F1 |
|---|---|---|---|---|
| a) | Signal linking error | Deletion of SIG | BF2 | 7 |
| b) | SH-balises or signal increasing balises with AX=3 detected between signal with BY=14 and preset point of speed increase | Deletion of SIG | BF2 | P |
| c) | New main signal passed while locked A- extension is supervised | Braking curve termination. $V_{HSI}$ valid immediately. | BF1 | 7 |
| d) | Linking error at OT for level crossing:<br>- AVn missing before the first OT-Vn | | BF1 | |
| e) | - OT-Vn missing after AVn | – | BF3 | 8 |
| f) | - AVn follows after AVn [1)] | | BF3 | |
| g) | SVn passed but no related HT-V with AZ=0-13 | – | BF1 | 8 |
| h) | Overlap: HT with AX=7, AY=0 detected where K or PT speed restriction is active | Deletion of HT | BF2 | 3 |

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[52] According to ATCA

| | Cause of error | Shall be performed | Error | F1 |
|---|---|---|---|---|
| i) | HT-PT ($\neq$SPTS) missing after OT with AY =9-11 (within 80-120% of target distance) | Deletion of HT [3/3.3.3.1]. | BF2 | 3 |
| j) | Overflow: Too many supervision objects. (memory capacity exceeded or too many distant signal objects). [2] | Deletion of HT + HTE + SIG [3] | BF3 | P |
| k) | Overflow: Too many groups of balises in a short time or > 5 balises in a group | Deletion of HT + HTE + SIG [3] | BF3 | P |
| l) | -- (reserve). | – | – | – |
| m) | Two OT of the same category aiming at the same target. Only one with N-balise | Handled as two different speed restrictions | BF1 | 2 |
| n) | Landslide warning notification:<br>- FSK/FSKA missing after AFSK | – | BF3 | 8 |
| o) | - AFSK missing before FSK/FSKA | | BF1 | |
| p) | BSK/BSKA missing at the beginning of a landslide warning section:<br>- The linking distance has run out (120% of target distance) and no SSK was detected within 100-120% of the target distance. | Linking and braking curve shall be terminated | BF3 | 8 |
| q) | - SSK detected within 100-120% of the target distance | Linking and braking curve shall be terminated | BF1 | |
| r) | - SSK has been detected within 80-100% of the target distance | – | BF1 | |
| s) | Border balise not provided after OTG | Deletion of HT + SIG. OTG speed changed to max speed. | BF3 | 8 |

1) *Note.* AVn with the same n.

2) *Note.* See overflow explanation [3.3.1.9].

3) *Note.* Other actions, like ignoring of new information, might cause unforeseen complications

## 3.3.6    Information from erroneous balise groups

F3110.51b  Information from erroneous information points shall only be handled in the following cases:

a)  When receiving a stop signal message from a group (or part of a group) that is intended for the present direction.

   *Note.* If the A-balise is of category 1 or 4, and the Y word = 0 or 13, the balise group will be handled as a signal at stop [3.4.4, 3.6.4].

b)  When there is a bit error in YZ of a number balise or prefix balise at a signal or warning board [3.3.5.5].

c)  When it is for certain that a prefix balise is lacking at a warning board [3.3.5.5.].

d)  When a balise with B(9,0,0) but without preceding A-balise is found near the target point of an existing Expect Stop distant signal  (a suspected stop signal) [3.4.4, 3.6.4].

e) Unreadable balise on a place where you expect to find a prefix or number balise (X = 8 or 12 according to [Table BK-1]), in an otherwise correct signal group (BF1) [3.3.5.5].

f) A faulty layout of an AVn group [3.3.5.5].

*Note.* Number balises are always optional. The STM cannot find out if a number balise is lacking or not, except when there is an OT *with* an N-balise and a following, presumed repeater *without* [3.3.5.6].

## 3.3.7    Reserve

F3111.    Reserve

F3112.    Reserve

## 3.3.8    Balise error message

### 3.3.8.1    General

F3113.51b   Every balise error shall be indicated by a text message of the following contents:

a) Balise error code of three characters, F1, F2 and F3

b) Reserve.[53]

*Note.* The error type is displayed by a separate indicator, BALISFEL 1, 2 or 3.

*Note.* Example:    '08:23:26   **7UU'**

See the following tables.

A3113.51n   Every balise error shall be indicated by a text message of the following contents:

a) Balise error code of three characters, F1, F2 and F3

b) A suitable error explanation.[54]

*A-Note.* The error type is displayed by a separate indicator, BALISFEL 1, 2 or 3.

*A-Note.* Example:       '08:23:26   **7UU   Signal saknas'**

See the following tables.

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[53] Reserve.

[54] Differs from [ATC2], lacking there

### 3.3.8.2 Composition of the error code, F1, F2 and F3

When a balise error has occurred, an error message is shown in the form of an error code containing letters and digits. This information is shown together with an explaining error message.

The error code is divided up as follows [Table 3.3-7]:

| | |
|---|---|
| F1 | Erroneous group. Shows the type of balise group, and whether or not it applies to the present direction. Can also indicate indeterminable balise group, linking error or overflow. |
| F2 | Erroneous balise. Indicates (if possible) where in the group the error is - balise A, B, C, N or P, and code word X, Y or Z. |
| F3 | Erroneous bit. States which erroneous bit/s that has been detected. |

F3114.    F2 and F3 shall not be detailed when it can be established that the group is applicable only for the opposite direction.

F3115.    a)  When several different errors occur in the same group, only one error shall be shown.

b)  These errors shall have the highest priorities:

1.  Too few telegrams.

2.  Bit errors.

F1, F2 and F3

F3116.51c  When the balise error code is shown, all three characters (F1, F2 and F3) shall be displayed (no blanks), according to the following table.[55]

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[55] As [ATC2B]

*Table 3.3-8. Balise error codes with F1, F2 and F3.*

| | F1 | Erroneous balise group | F2 | First erroneous code word or other error [1] | F3 | Erroneous bit or other error |
|---|---|---|---|---|---|---|
| a) | 0 | Km marker | 0 | X word of the first balise | | Bit 0 |
| b) | 1 | Signal A(1) | 1 | Y word of the first balise | | Bit 1 |
| c) | 2 | Warning board A(2) or A(6) | | Z word of the first balise | | Bit 2 |
| d) | 3 | Speed board A(3) or A(7) | 3 | X word of the second balise | | Bit 3 |
| e) | 4 | Signal A(4) | 4 | Y word of the second balise | | Bit 4 |
| f) | 5 | Miscellaneous board A(5) + B(3)/(5)/(7) | | Z word of the second balise | 9 | Bit 5 |
| g) | 6 | OT or SH group A(5)B(9) [+ C(14)] | 6 | X word of the third balise | | Bit 6 |
| h) | 7 | Linking error for signal | 7 | Y word of the third balise | | Bit 7 |
| i) | 8 | Linking error for board (also FSK) | | Z word of the third balise | | More than one or all bits = 1 |
| j) | 9 | Annulled or Reserve group A(10) or Km marker B(11) | 9 | X word of the fourth balise | | Bit error in > 1 code words |
| k) | A | Other error, unidentified group | A | Y word of the fourth balise | A | Too few (1..3) telegrams |
| l) | C | Opposite direction, unidentified group | | Z word of the fourth balise | C | Marker ≤ 40 cm long |
| m) | E | Opposite direction, warning board or SH group | E | X word of the fifth balise | (off) | Reserve |
| n) | F | Opposite direction, speed board | F | Y word of the fifth balise | (off) | Reserve |
| o) | H | Opposite direction, signal | | Z word of the fifth balise | (off) | Reserve |
| p) | L | Opposite direction, miscellaneous board | L | Illegal combination without marker | (off) | Reserve |
| q) | P | Overflow (too many boards or distant signals) | P | Illegal combination with marker | (off) | Reserve |
| r) | U | Single marker(s) | U | Other error | U | Other error |

1)  If more than one code word is faulty, one of these shall be pointed out

2)  *Note.* Reserve.

A3116.51c  When the balise error code is shown, all three characters (F1, F2 and F3) shall be displayed (no blanks), according to the following table.[56]

*A-Table 3.3-9. Balise error codes with F1, F2 and F3.*

| | F1 | Erroneous balise group | F2 | First erroneous code word or other error [1] | F3 | Erroneous bit or other error |
|---|---|---|---|---|---|---|
| a) | 0 | Km marker or Release group A(13) | 0 | X word of the first balise | 0 | Bit 0 |
| b) | 1 | Signal A(1) | 1 | Y word of the first balise | 1 | Bit 1 |
| c) | 2 | Warning board A(2) or A(6) | 2 | Z word of the first balise | 2 | Bit 2 |
| d) | 3 | Speed board A(3) or A(7) | 3 | X word of the second balise | 3 | Bit 3 |
| e) | 4 | Signal A(4) | 4 | Y word of the second balise | 4 | Bit 4 |
| f) | 5 | Miscellaneous board A(5) + B(3)/(5)/(7) | 5 | Z word of the second balise | 5 | Bit 5 |
| g) | 6 | OT or SH group A(5)B(9) [+ C(14)] | 6 | X word of the third balise | 6 | Bit 6 |
| h) | 7 | Linking error for signal | 7 | Y word of the third balise | 7 | Bit 7 |
| i) | 8 | Linking error for board (also FSK) | 8 | Z word of the third balise | 8 | More than one or all bits = 1 |
| j) | 9 | Annulled or Reserve group A(10) or Km marker B(11) | 9 | X word of the fourth balise | 9 | Bit error in > 1 code words |
| k) | A | Other error, unidentified group | A | Y word of the fourth balise | A | Too few (1..3) telegrams |
| l) | C | Opposite direction, unidentified group | C | Z word of the fourth balise | C | Marker ≤ 40 cm long [2] |
| m) | E | Opposite direction, warning board or SH group | E | X word of the fifth balise | E | Reserve |
| n) | F | Opposite direction, speed board | F | Y word of the fifth balise | F | Reserve |
| o) | H | Opposite direction, signal | H | Z word of the fifth balise | H | Reserve |
| p) | L | Opposite direction, miscellaneous board | L | Illegal combination without marker | L | Reserve |
| q) | P | Overflow (too many boards or distant signals) | P | Illegal combination with marker | P | Reserve |
| r) | U | Single marker(s) | U | Other error | U | Other error |

1)  If more than one code word is faulty, one of these shall be pointed out

2)  *A-Note.* This could be a disturbance, especially if the train speed is low

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[56] Differs from [ATC2]

*Note.* Reserve.

### 3.3.8.3 Balise error text messages

Balise errors are indicated by text messages. One part of this text gives error type and error code as specified above.

F3117.51b  Reserve. [57] [58]

*Table 3.3-10. Reserve.*

*Note.* Reserve.

A3117.51p  The informative part of the balise error message shall give an explanation to the error, according to the table below.[59]

*A-Table 3.3-10. Balise error messages*

| No. | In Swedish<br>Message,max 20 chars<br>12345678901234567890 | In Norwegian<br>Message,max 20 chars<br>12345678901234567890 | Cause |
|---|---|---|---|
| 1 | Motriktad grupp | Motrettet bal.gruppe | Erroneous group for the opposite direction |
| 2 | Medriktad grupp | Medrettet bal.gruppe | Erroneous group for the present direction |
| 3 | Signal | Signalbalisegruppe | Erroneous signal |
| 4 | Huvudsignal | Hovedsignal | Erroneous main signal |
| 5 | Försignal | Forsignal | Erroneous distant signal |
| 6 | Kombinerad signal | Kombinert signal | Erroneous combined signal |
| 7 | Tavla | Hastighetsignal | Erroneous board |
| 8 | Ensam markör | Markør | Single marker (could be a disturbance) |
| 9 | Signal saknas | Signalbal.gr.mangler | Linking: Missing signal balise group |
| 10 | Tavla saknas | Hast.signal mangler | Linking: Missing board balise group |
| 11 | Avisering saknas | Avisering mangler | Missing notification group |
| 12 | -- | -- | (Reserve) |
| 13 | Felplacerad grupp | Feilplassert bal.gr. | Balise group with faulty relation to other groups |
| 14 | För många baliser | For mange baliser | Overflow: too many balises |

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[57] Reserve.

[58] Reserve.

[59] Differs from [ATC2], lacking there

| 15 | För många nedsättn. | For mange nedsettn. | Overflow: too many signal and/or board groups |
|---|---|---|---|
| 16 | Annat fel | Annen feil | Other error |

*Note.* "Erroneous" means normally balise configuration errors or bit error/s.

(blank)

## 3.4    PASSING A MAIN SIGNAL

This section covers the passing of a stand-alone main signal (an Hsi), i.e. where no distant signal information is provided from the group of balises.

### 3.4.1    Information at main signal

#### 3.4.1.1    General

F3118.    The maximum permitted speed and basic distance (linking distance) shall be received from a main signal.

*Note.* If the main signal is combined with a distant signal, the same information point also transfers distant signal information.

F3119.    The following combinations shall be handled (optional balises within parentheses):

*Table 3.4-1. Stand-alone main signal balise groups*

| N | P | A | | | B | | | C / $P_{OPP}$ / N | | | N | Meaning |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| X | X | X | Y | Z | X | Y | Z | X | Y | Z | X | |
| (12) | (8) 1) | 1 / 4 2) | 0 | 14 3) | 9 | 0..13 | 1..14 | (12) | (NYZ) | | **–** | Stand-alone main signal |
| | | | | | | | 0 | (14) | (CY) | (CZ) | (12) | |
| | | | 1..13 | | | | 1..14 | (12) | (NYZ) | | **–** | |
| | | | | | | | 0 | **14** | 1..14 | CZ | (12) | |

*Note.*

"**–**" indicates forbidden balise position (leads to balise error alarm).

1)  The prefix balise P(8) is neglected (no distant signal information).

2)  The category is also ignored. AX affects only the release speed for a distant signal or combined signal with Expect Stop (gives a release speed of 10 or 40 km/h.

3)  AZ is always = 14 which means "No distant signal information".

*Note.* Target distance = 0 is not permitted, except when passing a signal at stop (AY = 0).

*Note.* If a number balise (X = 12) is used, it must be placed either first or last in the balise group. The signal number balise has no function[60] but the NYZ code is checked by the STM.

Refer to the balise error handling [3.3].

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[60] Radio function in [ATC2]

### 3.4.1.2 Reserve

F3120.     Reserve.

### 3.4.1.3 Speed information from main signal (code word AY)

*Table 3.4-2. Speed information from main signal*

| AX | AY | Main signal information | Notes |
|---|---|---|---|
| 1 / 4 | 0 | $V_{HSI}$ = 0 km/h (Stop) | $V_{HSI}$ states the maximum permitted speed as indicated by the main signal information. |
| | 1..12 | $V_{HSI}$ as defined in [Table HS] (Proceed) | |
| | 13 | $V_{HSI}$ = 0 km/h (Stop) | |

There is a copy of this table in the section about combined signals [3.6].

Stop (AY = 0 or 13): After passing a stop signal, 40 km/h is supervised.

−   AY = 0: Target distance = 0 is allowed (no balise error). Terminates signal linking and may affect a previously passed OT-ET.

−   AY = 13: Target distance = 0 is not allowed (balise error). Will neither terminate signal linking nor affect a previously passed OT-ET. [61]

### 3.4.1.4 Distance information

The basic "target" distance is coded as defined below.

*Table 3.4-3. Distance information at main signal*

| BX | BY | BZ | CX | CY | $D_{TARG}$ (m) |
|---|---|---|---|---|---|
| 9 | 0..14 | 1..14 [1)] | – | – | Depending on BY and BZ as defined in [Table DF] |
| | | 0 | 14 | 1..14 [2)] | Depending on BY and CY as defined in [Table DF] |

*Note.* This table is (almost) identical to tables for distant or combined signals [3.5 + 3.6].
*Note.*
1) No C(14) balise. BZ can be 0 at stop signal (AY = 0).
2) There is a C(14) balise. CY can be 0 at stop signal (AY = 0).

*Note.* The distance is in this case only used for updating of the linking distance. It contains usually the distance to next signal location or other signal linking group of balises [3.3.2].

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[61] Former surrogate signal [ATC2]

## 3.4.2    Updating or finishing braking curve at main signal

### 3.4.2.1    Preliminary updating of braking curve

F3121.    Reserve.

A3121.51a  An existing distant signal braking curve shall be updated, so that the target speed is changed to $V_{NEW}$ km/h within 0.5 s after passing two balises, if all these conditions are fulfilled:[62]

a)  There is an Expect Stop distant signal braking curve (without distance extension).

b)  The target point is passed or there is $\leq$ 20 m left to it.

c)  The train has passed the balises A(1/4) + B(9) or the balises P(8) + A(1/4).

d)  Reserve.

e)  The A-balise gives the main signal information "Proceed at $V_{NEW}$ km/h".

f)  $V_{NEW} > V_{REL}$ (the existing release speed).[63]

*A-note.* The braking curve will then be properly updated or finished when the whole balise group has been passed, see below.

### 3.4.2.2    Final updating or termination of braking curve

These functions are performed after passing the whole balise group, as usual.

F3122.    For braking curves that are not terminated (A- or P-extended, see the table below), release speed and gradient[64] shall not be updated.

*Note.* There is no need for updating the release speed. This is normally updated at a following distant signal.

Not extended target distance

F3123.    If there is no active extension, a distant signal braking curve shall be completely terminated when a main signal is passed.

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[62] Differs from [ATC2], lacking there

[63] Explanation: To compare the new signal speed with the existing target speed (instead of the existing release speed) is not so useful. Reason: Possible release speeds = 10...50 km/h (could be changed later on) and possible signal speeds are 0 or 40...270 km/h, which means that a signal speed of 40 might be *more restrictive* than a release speed of 50 km/h.

[64] In Sweden there are very few main signals with gradient information (2006).

Extended target distance

When using an extended target point, implementation of the information from the main signal can be delayed, i.e. made valid on passing the extended point of target [4.6.4].

F3124.51a   If there is a braking curve with active extension, the following table shall apply.

*Table 3.4-4. Extended target point at main signal*

| | New information | Braking curve with A-extension | | | Braking curve with P-extension |
|---|---|---|---|---|---|
| | | Unlocked $V_{FSI} > V_{HSI}$ | Unlocked $V_{FSI} \leq V_{HSI}$ | Locked | |
| a) | Main signal information $V_{HSI}$ = Proceed | $V_{HSI}$ shall be used as the new $V_{FSI}$, then used as a new maximum speed after the target point. | $V_{HSI}$ shall not be used as the new $V_{FSI}$, but only as a new maximum speed after the target point. | $V_{HSI}$ shall immediately apply. | $V_{HSI}$ shall be immediately applicable. |
| b) | | The braking curve shall be fixed [2] and locked, and it shall remain until passing its target point | | The braking curve shall be terminated. Balise error BF1. [1] | The braking curve shall be fixed [2] (unless it already is), and shall remain. [3] |
| c) | Main signal information $V_{HSI}$ = Stop | The stop signal shall immediately apply ($V_{HSI}$). The braking curve shall be terminated. | | | |

1) Locked category A extension shall lead to balise error BF1 when passing a main signal [3.3].

2) Remaining target distance shall be set equal to the extension distance, with the main signal as starting point.

3) *Note.* The P-extension is removed at the target point [4.6.4.3]. The braking curve can then be terminated as usual by a main signal, as specified above.

A3124.51n If there is a braking curve with active extension, the following table shall apply.

*A-Table 3.4-4. Extended target point at main signal*

| | New information | Braking curve with A-extension | | Braking curve with P-extension |
|---|---|---|---|---|
| | | **Unlocked** | **Locked** | |
| a) | Main signal information | $V_{HSI}$ shall be used as the new $V_{FSI}$, then used as a new maximum speed after the target point. | $V_{HSI}$ shall immediately apply. | $V_{HSI}$ shall be immediately applicable. |
| b) | $V_{HSI}$ = Proceed | The braking curve shall be fixed [2] and locked, and it shall remain until passing its target point | The braking curve shall be terminated. Balise error BF1. [1] | The braking curve shall be fixed [2] (unless it already is), and shall remain. [3] |
| c) | Main signal information $V_{HSI}$ = Stop | The stop signal shall immediately apply ($V_{HSI}$). The braking curve shall be terminated. | | |

1) Locked category A-extension shall lead to balise error BF1 when passing a main signal [3.3].
2) Remaining target distance shall be set equal to the extension distance, with the main signal as starting point.
3) *A-Note*. The P-extension is removed at the target point [4.6.4.3]. The braking curve can then be terminated as usual by a main signal, as specified above.

F3125. The STM shall react on a main signal at stop even if there is an extended target point.

### 3.4.3 New speed from main signal

F3126. a) If the new main signal speed is *lower* than the previous one, supervision in accordance with the new information shall begin immediately [4.5].

b) Exception to a: At A-extension, a new, lower main signal speed shall be delayed and becomes active first when passing the target point [3.4.2.2].

*Note*. If the new main signal speed is *higher* than the previous one, it will not apply until after the train length delay.

*Note*. Special case: 40 km/h is used as main signal speed after passing a stop signal. This supervision will continue during the train length after passing the first signal indicating a less restrictive aspect.

### 3.4.4 Passing a stop signal

#### 3.4.4.1 Preliminary (or complete) detection of stop signal

Emergency braking must be ordered as soon as possible upon detection of a stop signal, unless the driver has received a permission to pass. This means that every signal must be classified as a stop signal or not as early as possible.

STM actions caused by preliminary stop signal information are continued and finished after passing the whole balise group. A specific stop signal should not initiate STM emergency braking more than once.

Example: If the train passes stop preliminarily at low speed, and is braked to a halt before passing the complete group, there will be no more STM braking when reaching the end of the group.

Preliminary stop signal information

F3127.51b  For unpermitted stop passage, STM emergency brake shall be given within 0.5 s[65], together with an ETCS brake[66] within the same time limit, as soon as the following balise combination is detected (before or at the end of the group):[67]

*Note.* See also [GRS §2.5].

a)  Balises A(1/4, 0/13, AZ) + B(9).

*Note.* Preceding or succeeding balise/s, or balise/s between A and B/C, are accepted.

b)-c) Reserve. [68]

d)-f) Reserve.

*Note.* The following requirement must also be fulfilled.

A3127.51n  For unpermitted stop passage, STM emergency brake shall be given within 0.5 s[69], together with an ETCS brake within the same time limit, as soon as *one* of the following balise combinations is detected (before or at the end of the group):[70]

*A-Note.* See also [GRS §2.5].

a)  Balises A(1/4, 0/13, AZ) + B(9) or C(14).

*A-Note.* Preceding or succeeding balise/s, or balise/s between A and B/C, are accepted.

b)  Balises P(8) + A(1/4, 0/13, AZ).

*A-Note.* Preceding balise/s are accepted.

c)  Balise A(1/4, 0/13, AZ), and:

---

[65] Will probably take effect much faster than the ETCS emergency brake order
[66] Reserve.
[67] Reserve.
[68] Reserve.
[69] Will probably take effect much faster than the ETCS emergency brake order
[70] Differs from [ATC2]

1. AX shall be correct or with a single bit error, and

2. The A-balise shall *not* be preceded by a B(9) or C(14) balise[71] in any position, and

3. The balises shall be aimed at by a non-extended Expect Stop distant signal.

*A-Note*. Other preceding balise/s than B(9) or C(14) are accepted.

d) Balises B(9,0,0) + other balise, and:

1. The other balise shall be C(14, 0, Z), N-balise, marker or unreadable.

2. Preceding balise/s N, P, Marker (or balise with unreadable X-word) shall be accepted.

3. The balises shall be aimed at by a non-extended Expect Stop distant signal.

e) Balise B(9,0,0) + no other balise, and:

1. The end of the group shall be passed [3.2.5.2].

2. Preceding balise/s N, P, Marker (or balise with unreadable X-word) shall be accepted.

3. The balise/s shall be aimed at by a non-extended Expect Stop distant signal.

f) For c-e, the balise/s shall only be regarded as "aimed at" if these conditions are fulfilled too:

1. The balise/s shall not be passed before reaching the position $D_{TARG} - 100$ m (100 m before the target point), and

2. The balise/s shall be passed before the braking curve has been terminated.

*A-Note*. This is at the latest when linking error occurs.

*A-Note*. The following requirement must also be fulfilled.

Preliminary or complete stop signal information

F3128.    a) If the A-balise contains AY = 0 or 13, the balise/s shall be regarded and supervised as a stop signal if:

1. There is preliminary stop signal information (the previous requirement is fulfilled), or

2. A signal group is passed completely (the end of the group is reached).

b) This applies even if there are other errors (than those mentioned previously) in the stop signal balises.

---

[71] This proves that the group was intended for the opposite direction.

*Note*. Example: A bit error in CZ, which is not discovered until the complete balise group is passed.

### 3.4.4.2   Unpermitted stop signal passage

F3129.   The following shall be performed at stop passage without permission:

   a) The STM shall immediately emergency brake if the stop signal was preceded by:

   1. An Expect Stop distant signal, or

   2. No distant signal at all, or

   3. An Expect Proceed distant signal, which was combined with Stop.

   b) Releasing shall not be allowed before the train has stopped.

   c) The emergency brake shall be released as soon as the driver presses the LOSS (release) button.


F3130.   Reserve.

F3131.   Reserve.


F3132.   The following shall be performed at stop passage without permission, when the signal at stop was preceded by a distant signal or combined signal (not combined with Stop) indicating either Expect Proceed or an extended Expect Stop aiming further away than this stop signal:

   a) Emergency braking (together with full service braking) shall be immediately ordered by the STM.

   b) The STM emergency brake (but not the full service brake) application shall be released when the LOSS button is pressed, provided that the train deceleration is $\geq 0.7 \cdot B_F$, where $B_F$ is the full service brake deceleration parameter (m/s$^2$).

   c) The STM brake application, both emergency braking (if any) and full service braking, shall be released when the driver presses the LOSS button once more, provided that the train speed = 0 km/h.


### 3.4.4.3   Continue after an unpermitted stop signal passage

F3133.   When the brakes have been released after passing stop.

   a) If the driver acknowledges the text message *"Bekräfta passera stopp"*, it shall be possible to continue driving.

   *Note*. This acknowledgement may take place before or after the brake release. The text message appears as soon as the train stops.

   b) If the driver does not acknowledge this text message and still tries to continue driving (after a stand-still), the roll-away protection shall become strict.

c) This strict roll-away protection shall intervene with emergency braking as soon as the train moves more than 1 m. [5.6.6]

*Note*. Why give emergency braking instead of service braking? The reason for this is that the stop signal passage may have occured because the previous service braking did not work as well as expected. Since the train is now in a forbidden zone, you must ensure that it slows down and stops.

*Note*. Why intervene as early as after 1 m? Because the train is not supposed to move until the Train Location Center (TLC) allows this!

F3134.    The PASSERA STOPP indicator.

a) While passing a stop signal, the indicator shall start flashing rapidly in red (0.3 / 0.3 s).

b) As soon as the driver has acknowledged the text message, the indicator shall change to a red steady light.

### 3.4.4.4    Permitted stop signal passage

F3135.51a   If the following conditions are fulfilled, the STM shall not emergency brake when passing a stop signal (permission to pass stop):[72]

a) If the stop passage permission is active , and

b) Reserve.

c) The train speed does not exceed 40 km/h while passing the balises.

d) Reserve.

F3135A.51o   The stop passage permission shall be activated in the following cases:

a) The PASSERA STOPP button is pressed while the train speed is equal to or under 40 km/h, or

b) ETCS override is received.

F3136.    The PASSERA STOPP indicator.

a) While the permission timer is running, the indicator shall flash slowly in red.

b) After passing the signal, the indicator shall appear fixed in red all the way until the next main signal.

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[72] Differs from [ATC2]

F3137. Reserve.

F3138.51a The stop passage permission shall be revoked:

    a) After passing a main signal (regardless of aspect), or

    b) Permission time-out: 60 s has elapsed since the stop passage permission was activated or restarted.[73]

F3139.     a) The PASSERA STOPP indicator shall be slowly flashing as long as the stop passage permission is valid.[74]

    b) It shall start flashing rapidly 10 seconds before the permission expires because of time-out.

*Note*. About the PASSERA STOPP indicator:

– After an authorized or unauthorized stop passage, or after driver acknowledgement performed after an unauthorized stop passage, the PASSERA STOPP indicator changes to a "more restrictive" mode (from flashing red to fixed red).

– After an unauthorized stop passage, the indicator will start flashing rapidly again and the STM waits for driver acknowledgement.

Refer to supplier specification for more information.

F3140.51b The 60 s permission timer shall be restarted upon following conditions:

    a) An ETCS override is received in STM state not equal to DA, or

    b) The PASSERA STOPP is pressed or an ETCS override is received, and

        1. STM state is equal to DA, and

        2. The train speed is 40 km/h or below.

    c) Reserve.

F3141. If not all conditions for a permission to pass stop are fulfilled, there shall instead be an unpermitted stop signal passage as specified above [3.4.4.1-3].

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[73] Differs from [ATC2]
[74] Differs from [ATC2], lacking there

### 3.4.4.5    Supervision and indication after passing stop

F3142.    After passing a stop signal, the speed limit $V_{HSI}$ = 40 km/h shall be supervised.

*Note*. This applies also while the train is braked down to stand-still after an un-permitted stop passage.

After unpermitted passing of stop [3.4.4.2-3]:

– Unexpected stop signal. Emergency braking can in some cases be released even at speeds above 55 (40 + 15) km/h.

– Other stop signal. The STM will emergency brake until the train stops.


F3143.51a   a) A P-extension received before the stop signal shall be terminated.

b) An A-extension received before the stop signal shall be terminated.


F3144.    After passing a stop signal, a new main signal aspect shall only be accepted from a new main signal group.

*Note.* This means that the signal speed will not be affected by any preset speed increase or speed increase at SH balises or at HT category 3.


F3145.51a   After passing a signal at stop:[75]

a) The PASSERA STOPP indicator shall be displayed until a new Proceed main signal has been passed.

b) The brake intervention colour (red) shall be used.


F3146.    After passing a signal at stop:

a) The PRE INDICATOR shall be extinguished and the MAIN INDICATOR shall display ' 00'.

1. Exception for the PRE INDICATOR: If there is a restrictive target speed, lower than the maximum speed after passing signal at stop.

2. Exception for the MAIN INDICATOR: when approaching a level crossing (' 0H').

3. The exceptions shall not be applied while the train is braked down after an unpermitted stop passage.

---

[75] Differs from [ATC2]

b) The TARGET SPEED BAR shall be extinguished and the MAX SPEED BAR shall display 0 km/h (stop).[76]

F3147.    If a preliminary stop signal message is detected and there is no permission to pass [3.4.4.1], the STM shall send a TRIP message according to [ESTMA §7.2.10 Packet STM-18].

F3148.    Reserve.


## 3.4.5    Establishing linking

The linking distance will be updated [3.3.2].


## 3.4.6    Effects on supervision mode and start restriction

Passing a main signal for the present direction of travel can cause changes in the area category and display. The system can transit from Non-Equipped Area to Partially Equipped Area, or from HT area to a Fully Equipped Area [4.4].

An active 40 km/h start restriction ($V_{START}$) will be terminated [4.3.8].


## 3.4.7    Reserve

F3149.    Reserve.

F3150.    Reserve.

F3151.    Reserve.

F3152.    Reserve.

F3153.    Reserve.


## 3.4.8    Main signal influence on ET speed restrictions

"x" in ETxH or ETxF means "R" (straight route) or "G" (diverging route).


Indefinite OT-ETxH.

F3154.    If there was a warning board of category ETRH/ETGH before the main signal,

---

[76] Differs from [ATC2], lacking there

a) Its still indefinite OT-ET record shall either become a definite braking curve, or deleted, when passing the main signal, according to the table below.

b) ETxH with a controlling main signal (within 100 m) shall sometimes repeat a previously received OT-ET.

   1. Repetition occurs if there are matching routes and target windows.

   2. Exception: the new ETxH is erased by the controlling signal.

   *Note*. This is done in the same way as with a combined signal [3.6.12].

### Preliminary OT-ETxF.

F3155. An already stored ETxF braking curve which is preliminary-passive or preliminary-active shall be updated by the main signal according to the table below, regardless of if there is a new OT-ET before the signal or not.

*Note.* It can subsequently not be affected by a new distant signal, or by a new ETxF at the combined signal. See also the table below.

### Indefinite OT-ETxF.

*Note.* An indefinite OT-ETxF that is placed shortly before the signal in question (i.e. it is under preparation), will never be updated by the main signal.

### Other OT-ET.

*Note.* No other ET braking curves (than those mentioned above) will be affected (although an old ET might be repeated when passing an OT-ETxH together with a main signal).

F3156. Indefinite ETxH and preliminary-passive/active ETxF shall be updated according to the following table, when passing a main signal.

*Table 3.4-5. The effect of a main signal for ETxy restrictions*

| | OT restriction category | Route | Main signal information (AY) | The speed restriction shall become: | Comment |
|---|---|---|---|---|---|
| a) | Indefinite ETRH [1] or preliminary ETRF | Straight | **0** | Definite-active | Stop signal |
| b) | | | **1..7** | Deleted | < 130 km/h |
| c) | | | **8..12** | Definite-active | ≥ 130 km/h |
| d) | | | 13 | No change | |
| e) | Indefinite ETGH [1] or preliminary ETGF | Diverging | **0..7** | Definite-active | < 130 km/h |
| f) | | | **8..12** | Deleted | ≥ 130 km/h |
| g) | | | 13 | No change | |

1) Within 100 m before the main signal

(blank)

(blank)

# 3.5    PASSING A DISTANT SIGNAL

This section handles the passing of a stand-alone distant signal (an "Fsi"), which means that no main signal information is provided in the group of balises.

## 3.5.1    Information from distant signal balise group

### 3.5.1.1    General

F3157.    At distant signal, this information shall be received:

a) Target speed $V_{FSI}$ and release speed $V_{REL}$ shall always be received,

b) As well as basic target distance, which shall be interpreted into linking distance and target distance ($D_{TARG}$).

c) Supplementary information shall be gradient (GR), extension distance and signal number.

*Note.* The following combinations exist (optional balises within parentheses):

*Table 3.5-1. Stand-alone distant signal balise groups.*

| N | P | A | | | B | | | C/P_OPP/N | | | D/N | Meaning |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| X | X | X | Y | Z | X | Y | Z | X | Y | Z | X | |
| (12) | (8) | **1 / 4** | 14 3) | 0..13 2) | 9 | **BY** | 1..14 | (12) | (NYZ) | | – 1) | A distant signal, where AX gives a release speed |
| | | | | | | | 0 | **14** | 1..14 | CZ | (12) | 10 or 40 km/h |

1) "**–**" indicates an incorrect balise position - results in balise error alarm [3.3].

2) AZ gives target speed. Expect Stop is coded as AZ = 0 or 13, at P-extension as AZ = 1.

3) AY is always = 14 which means "No main signal information".

*Note.* Target distance = 0 is never permitted at distant signal (balise error)  [3.3].

*Note.* Number balise (X = 12) must be placed either first or last in the group of balises. The signal number balise has no function[77] but the NYZ code is checked by the STM.

### 3.5.1.2    Reserve

F3158.    Reserve.

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[77] Radio function in [ATC2]

### 3.5.1.3    Target speed from distant signal (AZ)

The target speed is set to Expect Stop or Expect Proceed according to the following table.

*Table 3.5-2. Target speed from distant signal (AZ)*

| AX | AZ | Distant signal aspect | Meaning |
|---|---|---|---|
| 1 / 4 | 0 | $V_{FSI}$ = 0 km/h (without extension) | $V_{FSI}$ is the target speed given by the distant signal [Table FS] |
| | 1 | $V_{FSI}$ = 0 km/h with P-extension (PY = 7..14) $V_{FSI}$ = 40 km/h without P-extension | |
| | 2..11 | $V_{FSI}$ = 50...220 km/h (with/without extension) | |
| | 12 | $V_{FSI}$ = 270 km/h (without extension) | |
| | 13 | $V_{FSI}$ = 0 km/h (without extension) [78] | |

There is an identical table in the section about combined signals [3.6].

Expect Stop with AZ = 13 does not affect OT-ET but Expect Stop with AZ = 0 does.

### 3.5.1.4    Target distance information from distant signal

*Table 3.5-3. Basic target distance from distant signal*

| BX | BY | BZ | CX | CY | $D_{TARG}$ (m) |
|---|---|---|---|---|---|
| 9 | 0..13 | 1..14 [1)] | – | – | Depending on BY and BZ as defined in [Table DF] |
| | | 0 | 14 | 1..14 [2)] | Depending on BY and CY as defined in [Table DF] |

1)  No C(14)-balise. BZ is not allowed to be 0.
2)  C(14)-balise exists. CY is not allowed to be 0.

Basic target distance = 0, or BZ or CY = 0 when not allowed, leads to balise error alarm [3.3].

### 3.5.1.5    Gradient information

F3159.    If there is a C(14) balise:

a)  The gradient (GR) shall be set according to its Z-word [Table GR],

b)  Otherwise  GR = 0 ‰.

---

[78] Formerly used as Expect R0 in radio block [ATC2]

F3160.  At a repeater distant signal with no information of gradient, the previously received information of gradient shall be retained [3.5.3.2].

### 3.5.1.6  Extension distance

It is possible to extend the target distance following a distant signal with an arbitrary value, aiming at a set of switchpoints or to a subsequently following signal, so that the braking curve is set up with a target point located beyond the indicated main signal.

The extension of the target distance is established by a prefix balise of category 8, coded as defined in the following table.

*Table 3.5-4. Extension distance from distant signal*

| PX | PY | PZ | Extension of $D_{TARG}$ (m) | Meaning | Validity [1] |
|----|----|----|------|---------|----------|
| 8 | 0..1 | 1..14 | 0 | Reserve | – |
| | **2..6** | **1..14** | Depending on PY and PZ as defined in [Table DP] | A-extension (lockable) | $V_{FSI}$ = 40..220 |
| | **7..14** | | | P-extension (not lockable) | $V_{FSI}$ = 0 or 50..220 |
| | 2..14 | 0 | 0 | No extension | – |

1)  See also the distant signal speed table [Table FS].
This table is identical to another one in the section about combined signals.

F3161.  The prefix balise shall be annulled, and the distant signal shall be handled as if it had no prefix balise (no extension), in these cases:

a)  If PZ = 0.

b)  If PY = 0 or =1.

c)  When there is a balise error at the prefix balise.

F3162.  The information of a prefix balise with extension (PY = 2...14) shall be regarded only:

a)  When expecting 0...220 km/h (AZ = 1...11), and

b)  If the signal is not at stop (AY = 1..12 or =14).

## 3.5.2  Establishing a new braking curve

See also the sections about handling of braking curves [4.6, 4.9].

### 3.5.2.1  General

The new signal will establish a new braking curve or be regarded as a repeater according to the table below.

*Table 3.5-5. Overview: Stand-alone distant signal handling*

|  | Stored distant signal infor-mation | Handling of stored distant signal infor-mation | Handling of new distant signal infor-mation | Referen-ces |
|---|---|---|---|---|
| a) | None | – | A new braking curve shall be established | [3.5.2.2, 3] |
| b) | Preset speed increase | Shall be kept separately | A new braking curve shall be established | [3.5.2.2, 3] |
| c) | Braking curve without extension [1] | Shall be updated | Shall be entered into the updated braking curve | [3.5.3] |
| d) | Braking curve with A/P-extension | Shall be updated, not affected or erased | Shall be entered into the updated braking curve, or a new one shall be established | [3.5.2.2, 3] [3.5.3] |

1) Including former preset speed increase (that has changed to Expect Stop).

In certain cases when an extension is active, a new braking curve may need to be established apart from the existing.

### 3.5.2.2    Identifying previous distant signal

F3163.    If there is no distant signal information stored, the new information from a distant signal shall always be established as a new braking curve.

F3164.    If there is a stored distant signal representing an active preset speed increase:

a)  A new separate braking curve shall be established, and

b)  The preset speed increase shall remain unaffected.

### 3.5.2.3    Storing information in a new braking curve

F3165.    The following information from balise group and train data shall be stored in the braking curve data record:[79]

a)  Target speed (0..270 km/h)

b)  Category (1/4). The updating of the categories shall lead to updating of release speed at Expect Stop:

　1.  $V_{REL} = 10$ km/h if AX = 1.

　2.  $V_{REL} = 40$ km/h if AX = 4.

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[79] Differs from [ATC2]

    c) Basic target distance (with starting point at the category A balise).

    d) Extension distance from prefix balise P(8) (if existing).

    e) Total target distance $D_{TARG}$ shall be set to Basic target distance + Extension distance, if target distance extension is applied (may reach totally 22400 m).

    f) Information on gradient:

       1. New gradient updates GR.

       2. Otherwise GR is set = 0 ‰.

    g) Brake percentage (train parameter).

    h) Adhesion (train parameter).

A3165.    The following information from balise group and train data shall be stored in the braking curve data record:[80]

    a) Target speed (0..270 km/h)

    b) Category (1/4). The updating of the categories shall lead to updating of release speed at Expect Stop (unless altered by a later release group):

       1. $V_{REL} = 10$ km/h if AX = 1.

       2. $V_{REL} = 40$ km/h if AX = 4.

    c) Basic target distance (with starting point at the category A balise).

    d) Extension distance from prefix balise P(8) (if existing).

    e) Total target distance $D_{TARG}$ shall be set to Basic target distance + Extension distance, if target distance extension is applied (may reach totally 22400 m).

    f) Information on gradient:

       1. New gradient updates GR.

       2. Otherwise GR is set = 0 ‰.

    g) Brake percentage (train parameter).

    h) Adhesion (train parameter).

---

[80] Differs from [ATC2]

### 3.5.3    Updating or finishing of braking curve at repeater

This section refers to passing a distant signal when there already is an existing braking curve. See also the section about handling of braking curves [4.6].

F3166.    If more than one distant signal braking curve is stored, each braking curve shall be updated separately in accordance with rules applying to *one* braking curve.

*Note.* Normally, there is only one or two.

#### 3.5.3.1    Preliminary updating of existing braking curve

F3167.    Reserve.

A3167.    An existing distant signal braking curve shall be updated, so that the target speed is changed to $V_{NEW}$ km/h within 0.5 s after passing two balises, if all these conditions are fulfilled:[81]

a)  There is an Expect Stop distant signal braking curve (without distance extension).

b)  Reserve.

c)  The train has passed the balises A(1/4) + B(9) or the balises P(8) + A(1/4)

d)  Reserve.

e)  The A-balise gives the distant signal information Expect $V_{NEW}$ km/h

f)  $V_{NEW} > V_{REL}$ (the existing release speed). [82]

*A-note.* The braking curve will then be properly updated or finished when the whole balise group has been passed, see below.

#### 3.5.3.2    Final updating or termination of existing braking curve

These functions are performed after passing the whole balise group (as usual).

Old distant signal without extension

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[81] Differs from [ATC2], lacking there

[82] To compare the new signal speed with the existing target speed (instead of the existing release speed) is not so useful. Reason: Possible release speeds = 10...50 km/h (could be changed later on) and possible signal speeds are 0 or 40...270 km/h, which means that a signal speed of 40 might be *more restrictive* than a release speed of 50 km/h.

F3168.  a) A braking curve without any distance extension shall always be updated when passing a repeating signal, provided that there is no other, extended distant signal braking curve.

b) The updating shall also imply extension of the braking curve (if the group of repeating balises includes prefix balise).

c) Exception to a-b:

   If the stored distant signal represents an active preset speed increase.

*Note.*

*Table 3.5-6. Non-extended distant signal + repeater*

|   | New distant signal | 1 | 2 |
|---|---|---|---|
|   |   | **Existing distant signal information** | |
|   |   | **(e1): Non-extended + No other** | **(e2): Preset speed increase + No/any other** |
| A | **(na): A-extension** | (na) updates (e1) to A-extension | (e2) not updated |
|   |   |   | (na) added |
| B | **(nb): P-extension** | (nb) updates (e1) to P-extension | (e2) not updated |
|   |   |   | (nb) added |
| C | **(nc): No extension** | (nc) updates (e1) | (e2) not updated |
|   |   |   | (nc) added |

Old distant signal with extension

F3169.  If an already existing braking curve includes distance extension, and there is no other distant signal braking curve, the rules of the following table shall apply.

*Table 3.5-7. Update a braking curve with extension at repeater signal*

|   | New distant signal | 1 | 2 | 3 |
|---|---|---|---|---|
|   |   | **Existing distant signal information OLD DISTANT SIGNAL BRAKING CURVE** | | |
|   |   | **(e1): Unlocked A-extension** | **(e2): Locked A-extension** | **(e3): P-extension** |
| a | **(na): A-extension** | (na) updates (e1) | (e2) unchanged | (na) updates (e3) to A-ext. |
|   |   |   | (na) added |   |
| b | **(nb): P-extension** | (nb) updates (e1) to P-extension. | (e2) unchanged | (nb) updates (e3) |
|   |   |   | (nb) added |   |
| c | **(nc): No extension. [3] Aims short of the target point of the existing braking curve** | (e1) erased | (e2) unchanged | (e3) unchanged |
|   |   | (nc) added | (nc) added | (nc) added [1] |
| d | **(nd): No extension. [3] Aims at or beyond the target point of the existing braking curve** | (e1) erased | (e2) unchanged | (e3) erased |
|   |   | (nd) added | (nd) added | (nd) added |

*Note.*

1) This means that a repeater signal inside a station will not disturb a braking curve that is overbridging the station.
2) Reserve.
3) Any of these conditions means that no target distance extension is given from the combined signal:
   - If there is no P-balise, or PY = 0..1 or PZ = 0, or
   - $V_{FSI}$ = Expect Stop, or $V_{FSI}$ = max value (270 km/h), or
   - there is a preset speed increase.

F3169A.    If an already existing braking curve includes distance extension, and there is another distant signal braking curve, the rules of the following table shall apply.

*Table 3.5-8.  Updating two braking curves at repeater signal*

| | New distant signal | 1 | 2 | 3 | 4 |
|---|---|---|---|---|---|
| | | **Existing distant signal information** | | | |
| a | | **(e1a): Locked A-extension** | **(e2a): Locked A-extension** | **(e3a): Locked A-extension** | **(e4a): P-extension** |
| b | | **(e1b): Non-extension** | **(e2b):  Unlocked A** | **(e3b): P-extension** | **(e4b): Non-extension** |
| c | **(nc): A-extension.** | (e1a) unchanged | (e2a) unchanged | (e3a) unchanged | (nc) updates the "nearest" of (e4a) and (e4b) to A-ext. |
| | | (nc) updates (e1b) to A-ext. | (nc) updates (e2b) | (nc) updates (e3b)  to A-ext | The "farthest" one of (e4a) and (e4b) erased |
| d | **(nd): P-extension.** | (e1a) unchanged | (e2a) unchanged | (e3a) unchanged | (nd) updates the "nearest" of (e4a) or (e4b) to P-ext. |
| | | (nd) updates (e1b)  to P-ext. | (nd) updates (e2b) to P-ext | (nd) updates (e3b) | The "farthest" one of (e4a) or (e4b) erased |
| e | **(ne): Non-extension. Aims short of Tp** | (e1a) unchanged | (e2a unchanged | (e3a) unchanged | (e4a) unchanged |
| | | (ne) updates (e1b) | (e2b) erased | (e3b) unchanged | (ne) updates (e4b) |
| | | -- | (ne) added | (ne) skipped BF3, erase SIG | -- |
| f | **(nf): Non-extension. Aims at or beyond Tp** | (e1a) unchanged | (e2a) unchanged | (e3a) unchanged | (e4a) erased |
| | | (nf) updates (e1b) | (e2b) erased | (e3b) erased | (nf) updates (e4b) |
| | | -- | (nf) added | (nf) added | -- |

*Note.* Explanations.
-- Tp = the target point of an existing, P-extended braking curve, if there is any. If not, use row e or f (identical results).
-- "Nearest" = The distant signal braking curve which is nearest to STM-braking.

Rules for updating of existing braking curve

F3170.    When information from a signal is interpreted as a repeating signal (see below), the existing braking curve shall be updated with the following data:

a) Target speed $V_{FSI}$.

b) Target distance $D_{TARG}$.

c) Category (1/4), which shall lead to updating of release speed at Expect Stop:

    1. $V_{REL} = 10$ km/h if AX = 1.

    2. $V_{REL} = 40$ km/h if AX = 4.

d) Gradient information:

    1. Gradient information provided in a C(14) balise updates GR.

    2. Otherwise GR is retained.

A3170.    When information from a signal is interpreted as a repeating signal (see below), the existing braking curve shall be updated with the following data:

a) Target speed $V_{FSI}$.

b) Target distance $D_{TARG}$.

c) Category (1/4), which shall lead to updating of release speed at Expect Stop (unless a release group has been passed since the last main signal):

    1. $V_{REL} = 10$ km/h if AX = 1.

    2. $V_{REL} = 40$ km/h if AX = 4.

d) Gradient information:

    1. Gradient information provided in a C(14) balise updates GR.

    2. Otherwise GR is retained.

F3171.    The two parts of the target distance, basic distance and extension distance, shall be updated separately.

F3172.    If there is a prefix balise at a repeating signal, the information from the prefix balise shall be included in the updated braking curve.

*Note.* This means that an existing distant signal braking curve without extension can change to one *with* extension.

## 3.5.4    Reserve

F3173.    Reserve.

F3174.    Reserve.

F3175.    Reserve.

F3176.    Reserve.

F3177.    Reserve.

### 3.5.5    Braking curve handling

Distant signal braking curves are handled according to the sections about deceleration supervision, [4.6 + 4.9].


### 3.5.6    Establishing linking

Linking distance is set up according to the linking sub-section [3.3.2].


### 3.5.7    Effects on area category and start restriction

Passing a distant signal may cause changes in area category and indication [4.4].

A possible start restriction is terminated [4.3.8].


### 3.5.8    Distant signal influence on ET speed restrictions

ETxF speed restrictions can be affected by stand-alone distant signals, but ETxH restrictions cannot.

"x" = "R", straight route or = "G", diverging route.

"H" is a main signal controlled and "F" is a distant signal controlled restriction.


#### 3.5.8.1    Classification of indefinite ETxF

If there is a warning board of class ETRF/ETGF prior to a signal (within 100 m), this speed restriction will become preliminary-active or preliminary-passive when passing the signal.

F3178.51b  An indefinite ETRF or an ETGF restriction, received within 100 m before an Expect Proceed distant signal, shall change from a preparatory state (indefinite) to a braking curve according to [3.5.8.3] below.


Expect Stop

F3179.51b  If $V_{FSI}$ = 0 km/h (AZ = 0), a preceding (within 100 m), indefinite ETRF or ETGF shall become preliminary-active, according to [3.5.8.3] below.

F3180.    Reserve.

*Note*. A preliminary-passive ETxF braking curve will also be changed to preliminary-active if $V_{FSI}$ changes from Expect Proceed to Expect Stop when the train stops between a distant signal and the next main signal [§4.6.8.5].

### 3.5.8.2 Updating of preliminary classed ETxF

F3181. A preliminary-active or preliminary-passive ETxF braking curve shall be control-led by a new distant signal, even if there is no warning board right before the signal (not within 100 m), according to the following table.

*Note.* Primarily, this is of interest when the previous distant signal (located within 100 m beyond the warning board) indicated Expect Stop.

### 3.5.8.3 Summary

F3182. The following table shall apply.

*Table 3.5-9. Updating of indefinite or preliminary OT-ETxF at single Fsi*

| | ET-restriction | Route | Distant signal information (AZ) | Extension | ETxF becomes: | Meaning of distant signal information |
|---|---|---|---|---|---|---|
| a) | | | 0 | NA | Preliminary active | Expect Stop, not extended |
| b) | Indefinite / preliminary ETRF | Straight | 1..7 | A | Preliminary passive | Extended Expect Stop or Expect 40..100 km/h |
| c) | | | | P / None | Preliminary active | |
| d) | | | 8..12 | NA | | Expect ≥ 130 km/h |
| e) | | | 13 | | – | Expect Stop, not extended |
| f) | | | 0 | NA | Preliminary active | Expect Stop, not extended |
| g) | Indefinite / preliminary ETGF | Diverging | 1..7 | A / None | | Extended Expect Stop or Expect 40..100 km/h |
| h) | | | | P | Preliminary passive | |
| i) | | | 8..12 | NA | | Expect ≥ 130 km/h |
| j) | | | 13 | | – | Expect Stop, not extended |

Explanations:

"**–**"   = Not affected

"NA" = Not Applicable.

(blank)

## 3.6    PASSING A COMBINED SIGNAL

This section deals with the passing of a signal giving both main and distant signal information (Hsi + Fsi).

### 3.6.1    Information at combined signal

#### 3.6.1.1    General

At combined signal the following information shall be received:

a) Maximum speed ($V_{HSI}$),

b) Target speed ($V_{FSI}$) and release speed ($V_{REL}$),

c) Basic target distance (and linking distance).

Supplementary information is:

d) Gradient (GR),

e) Extension distance,

f) Signal number.

The total target distance $D_{TARG}$ contains Basic target distance + possible Extension distance.

The following combinations are handled (optional balises within parentheses):

*Table 3.6-1. Combined signal balise groups*

| N | P | A | | | B | | | C / $P_{OPP}$ / N | | | D/N | Meaning |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| X | X | X | Y [2] | Z [2] | X | Y | Z | X | Y | Z | X | |
| (12) | (8) [1] | **1 / 4** | 0 | 0..13 | **9** | BY | 1..14 | (12) | (NYZ) | | – | Combined signal, where AX gives release speed (10 or 40 km/h) |
| | | | | | | | 0 | (14) | (CY) | (CZ) | (12) | |
| | | | 1..13 | | | BY | 1..14 | (12) | (NYZ) | | – | |
| | | | | | | | 0 | **14** | 1..14 | CZ | (12) | |

1) When preset speed increase is used, the prefix balise is neglected and the distance information is received in the normal way from the B/C balise.

2) AY/AZ = 14 is not used at combined signal (means "no Hsi/Fsi information")

"–" means: Not permitted position of balise (leads to balise error alarm).

The following combinations cause balise error [3.3]:

a)  Target distance = 0 except when passing a stop signal (AY = 0)

b)  If BY = 14 (preset speed increase) but the distant signal target speed is not higher than the main signal speed.

c)  An optional number balise (X = 12) which is *not* positioned either first or last in the group of balises.

A signal number balise has no function[83] but the NYZ code is checked by the STM.

### 3.6.1.2    Reserve

F3183.    Reserve.

F3184.    Reserve.

### 3.6.1.3    Speed information from the main signal part (AY)

*Table 3.6-2. Main signal speed from a combined signal*

| AX | AY | Main signal information | Notes |
|---|---|---|---|
| 1 / 4 | 0 | $V_{HSI}$ = 0 km/h (Stop) [1)] | $V_{HSI}$ states the maximum permitted speed as indicated by the main signal information. |
|  | 1..12 | $V_{HSI}$ as defined in [Table HS] (Proceed) |  |
|  | 13 | $V_{HSI}$ = 0 km/h (Stop) [1) 2)] |  |

This table is identical to another one in the section about main signals [3.4].

1)  AY = 0 or 13: After passing a stop signal, 40 km/h is supervised.

2)  AY = 13: Target distance = 0 is not allowed. Does neither terminate signal linking nor affect OT-ET.[84]

---

[83] Radio function in [ATC2]

[84] Former surrogate signal [ATC2]

### 3.6.1.4 Target speed from the distant signal part (AY)

*Table 3.6-3. Target speed from a combined signal*

| AX AX | AZ | Distant signal aspect, $V_{FSI}$ | Meaning |
|---|---|---|---|
| 1 / 4 | 0 | 0 km/h (without extension) | $V_{FSI}$ is the target speed given by the distant signal information [Table FS] |
| | 1 | 0 km/h with P-extension (PY = 7..14) 40 km/h without P-extension | |
| | 2..11 | 50...220 km/h (with/without extension) | |
| | 12 | 270 km/h (without extension) | |
| | 13 | 0 km/h (without extension) [85] | |

This table is identical to another one in the distant signal section [3.5].

Expect Stop with AZ = 13 does not affect OT-ET but Expect Stop with AZ = 0 does.

### 3.6.1.5 Target distance

The basic target distance (usually the distance to next signal or other signal linking balise group) is defined both according to the table below, and according to the general target distance table [Table DF].

*Table 3.6-4. Basic target distance from a combined signal*

| BX | BY | BZ | CX | CY | $D_{TARG}$ (m) |
|---|---|---|---|---|---|
| 9 | 0..14 | 1..14 [1)] | – | – | Depending on BY and BZ in [Table DF] |
| | | 0 | 14 | 1..14 [2)] | Depending on BY and CY in [Table DF] |

Similar tables are also included in the main and distant signal sections.
1) C(14) balise is not provided. BZ may be 0 only for signal at stop (AY = 0).
2) C(14) balise exists. CY may be 0 only for signal at stop (AY = 0).

The basic target distance is used for updating of the linking distance [3.3.2].

### 3.6.1.6 Gradient information

F3185.   The gradient (GR) shall be set:

a)  If there is a C(14) balise, according to its Z word [Table GR].

b)  Otherwise GR = 0 shall be set.

---

[85] Formerly used as Expect R0 on radio block [ATC2]

### 3.6.1.7    Extension distance

It is possible to extend the target distance following a combined signal with an arbitrary value (to a set of switchpoints or to a subsequently following signal), so that the braking curve aims at a location beyond the indicated main signal.

The extension of the target distance shall be established by a prefix balise of category 8, coded as defined in the following table.

*Table 3.6-5. Extension distance from a combined signal*

| PX | PY | PZ | Extension of $D_{TARG}$ (m) | Designation | Validity |
|---|---|---|---|---|---|
| 8 | 0..1 | 1..14 | 0 | Reserve | – |
| | 2..6 | 1..14 | Depending on PY and PZ as described in [Table DP] | A extension (lockable) | $V_{FSI}$ = 40..220 km/h |
| | 7..14 | | | P extension (not lockable) | $V_{FSI}$ = 0 or 50..220 km/h |
| | 2..14 | 0 | 0 | No extension | – |

This table is identical to another one in the distant signal section [3.4].

F3186.    The prefix balise shall be cancelled and the distant signal shall be handled as if it had no prefix balise (no extension) in these cases:

a)  If PZ = 0.

b)  If PY = 0 or 1

c)  If there is an error in the prefix balise.

F3187.    The information of a prefix balise shall be regarded only if:

a)  AZ = 1..11 and

b)  The associated main signal information gives a Proceed message (AY = 1..12).

*Figure 3.6-1. Example of a P-extension*
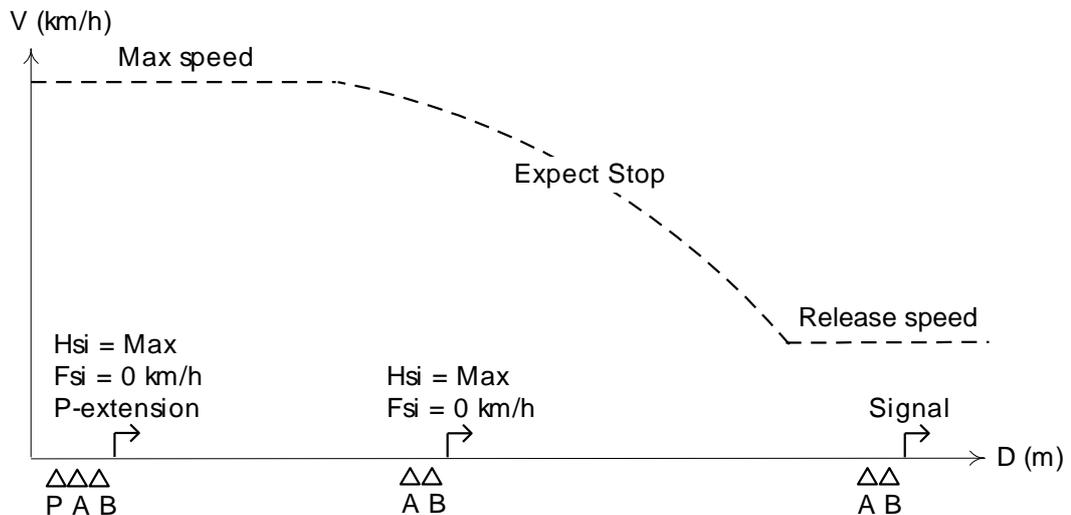


p-ext.vsd/wmf 16 Jun, 2002

*Figure 3.6-2. Example of an A-extension*



a-ext.vsd/wmf 16 Jun, 2002
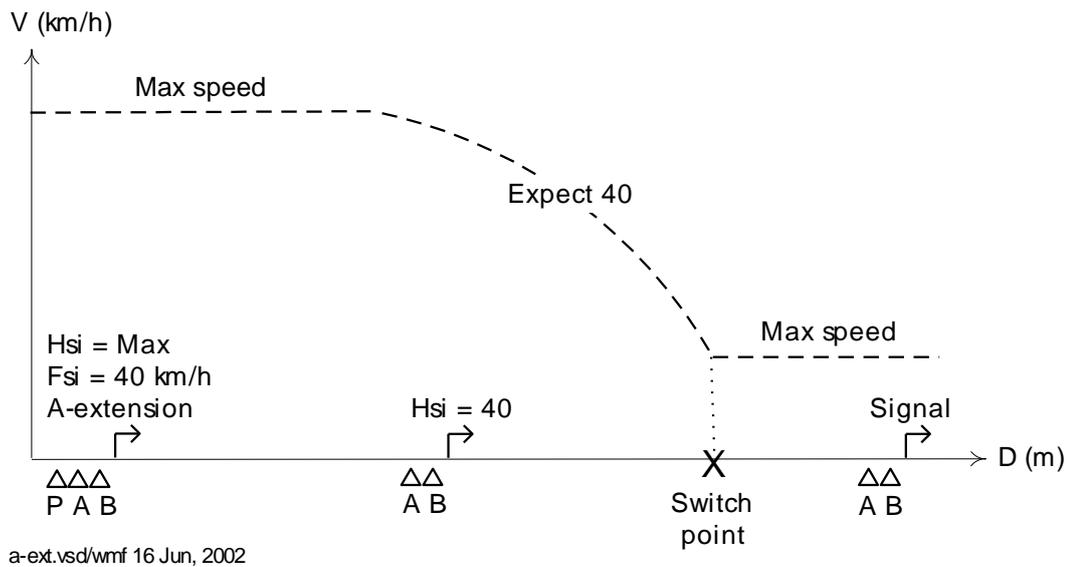
### 3.6.1.8    Handling of the information

F3188.    The main signal functions (finishing braking curve, new maximum speed, etc.) shall always be handled by the STM *before* the distant signal information is handled.

*Note.* This means that no old, impressionable distant signal braking curves shall exist when the new distant signal information ($V_{FSI}$) is handled. The distant signal information will therefore normally be the origin of a new braking curve.

## 3.6.2    Updating or finishing of braking curve at combined signal

These functions are dependent on the new main signal information in the combined signal.

### 3.6.2.1    Preliminary updating of braking curve

F3189.    Reserve.

A3189.    The braking curve shall be updated so that the target speed is changed to $V_{NEW}$ km/h within 0.5 s after passing two balises, if all these conditions are fulfilled :[86]

a)  There is an Expect Stop distant signal braking curve (without distance extension).

b)  The target point is passed or there is $\leq$ 20 m left to it.

c)  The train has passed the balises A(1/4) + B(9) or the balises P(8) + A(1/4).

d)  Reserve.

e)  The A-balise gives the main signal information Proceed at $V_{NEW}$ km/h.

f)  $V_{NEW} > V_{REL}$ (the existing release speed).[87]

*A-note.* The braking curve will then be properly updated or finished as soon as the whole balise group has been passed, see below.


### 3.6.2.2    Final updating or termination of braking curve

#### 3.6.2.2.1    General

These functions are performed after passing the whole balise group (as usual).


F3190.    Braking curves with no extension, as well as with category P extension, shall be terminated at a signal which provides both main and distant signal information.


F3191.    For braking curves that are not terminated (i.e. A-extended ones), the gradient and the release speed shall not be updated.


#### 3.6.2.2.2    Old A-extension

F3192.    An already locked A-extension shall lead to balise error of class BF1, and the braking curve shall be erased.

*Note.* This will only happen at a faulty track layout.

---

[86] Differs from [ATC2], lacking there

[87] To compare the new signal speed with the existing target speed (instead of the existing release speed) is not so useful. Reason: Possible release speeds = 10...50 km/h (could be changed later on) and possible signal speeds are 0 or 40...270 km/h, which means that a signal speed of 40 might be *more restrictive* than a release speed of 50 km/h.

F3193.51a  If there is an existing, unlocked A-extension, the following shall apply:[88]

    a) The valid main signal speed shall not be changed.

    b) 1. If the new $V_{HSI} \leq$ the extended $V_{FSI}$, the new main signal speed shall become the new target speed of the A-extension.

       2. If the new $V_{HSI} >$ the extended $V_{FSI}$, it shall not apply until the target point is passed.

      *Note.* The figure below is not valid for this function.

    c) The A-extension shall be locked, and it shall continue to be valid to its target point [3.4.2.2].

    d) A new braking curve shall be established, according to the new distant signal information [3.5.2.3].

A3193.51n  If there is an existing, unlocked A-extension, the following shall apply:[89]

    a) The valid main signal speed shall not be changed.

    b) The new main signal speed shall become the new target speed of the A-extension.

    c) The A-extension shall be locked, and it shall continue to be valid to its target point [3.4.2.2].

    d) A new braking curve shall be established, according to the new distant signal information [3.5.2.3].

---

[88] Reserve.

[89] Differs to [ATC2]

*A-Figure 3.6-3. Passage of combined signal during category A extension*
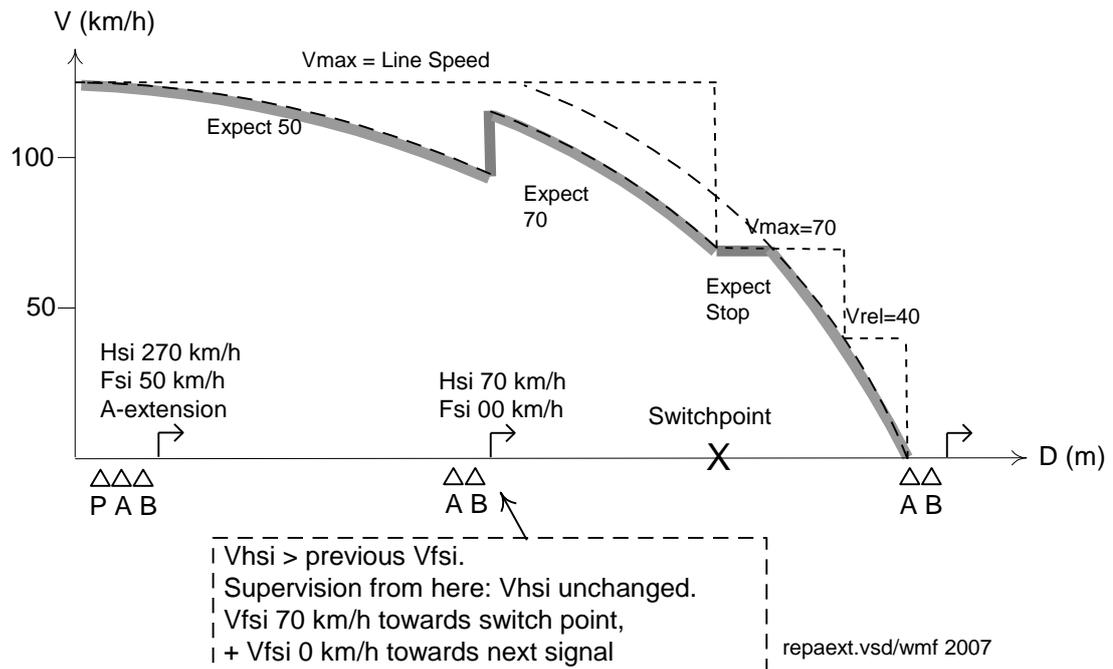


*A-Note.* The first signal indicates the most restrictive of all possible routes. This is updated at the second signal.

### 3.6.3 New maximum speed from combined signal

F3194. When updating $V_{HSI}$, the same rules shall apply as when passing a stand-alone main signal without target speed information [3.4.3].

### 3.6.4 Passing a combined signal at Stop

F3195. A combined signal at Stop shall be handled in the same way as when passing a stand-alone main signal at Stop [3.4.4].

F3196. Distant signal information in conjunction with stop signal shall be ignored (no braking curve shall be established).

### 3.6.5 Establishing linking

Linking distance is established [3.3.2].

### 3.6.6 Effects on area category and start-up restriction

A signal with both $V_{HSI}$ and $V_{FSI}$ information for the present direction, has the same effect upon area category and indications as a signal without any target speed information [4.4].

A possible start restriction is always terminated [4.3.8].

## 3.6.7 Establishing a new braking curve

### 3.6.7.1 Identifying distant signal

F3197.  The new distant signal information shall be established as a new braking curve (also if it contains a new A-extension) under the conditions below:

a)  If there is no distant signal information stored (as when the main signal in the same group of balises already has terminated previous braking curve), or

b)  If there is an existing braking curve with A-extension that has been locked by this combined signal balise group.

c)  Exception to a-b: If the distant signal information is combined with stop signal information, it will be ignored.

### 3.6.7.2 Storing information in a braking curve

F3198.  Information shall be stored in the braking curve in the same way as for a stand-alone distant signal [3.5.2.3].

## 3.6.8 Reserve

F3199.  Reserve.

## 3.6.9 Braking curve handling

The braking curve is handled according to the sections about deceleration supervision [4.6 + 4.9].

## 3.6.10 Extension of target point

See also the previous section about establishing a new braking curve [3.6.7].

### 3.6.10.1 Conflict between A-extension and preset speed increase

F3200.  a)  When passing a signal with preset speed increase (BY = 14), during supervision of a category A-extension braking curve, the extended braking curve shall be deleted if the increasing point is situated short of the extended target point.

b)  If there are more than one extension, this rule shall be valid for all the extensions, independent of each other.

## 3.6.11 Supervision of preset speed increase (BY = 14)

A location where the main signal speed is to be increased can be indicated by a specially coded signal balise group placed 50...700 m before the speed increase point, namely a combined signal indicating preset speed increase. No balises are thus required at the actual point of speed increase.

### 3.6.11.1 Combined signal with non-restrictive distant signal information

Preset speed increase

F3201.    The $V_{FSI}$ information shall be used as a preset speed increase if these conditions apply for the one and same balise group:

a)  $V_{FSI} > V_{HSI} > 0$ km/h, and

b)  BY = 14, .

*Note.* Distant signal information in combination with stop signal information cannot allow a speed increase.

F3202.    a)  The distance (from the combined signal that gives a preset speed increase) to the actual point of speed increase, is given by the target distance $D_{TARG}$.

b)  At the point of speed increase, the stored main signal aspect shall be replaced by the preset aspect, $V_{HSI}$ shall be set = $V_{FSI}$.

*Note.* The speed increase will then take place after the normal train length delay.

*Figure 3.6-4. Preset speed increase*
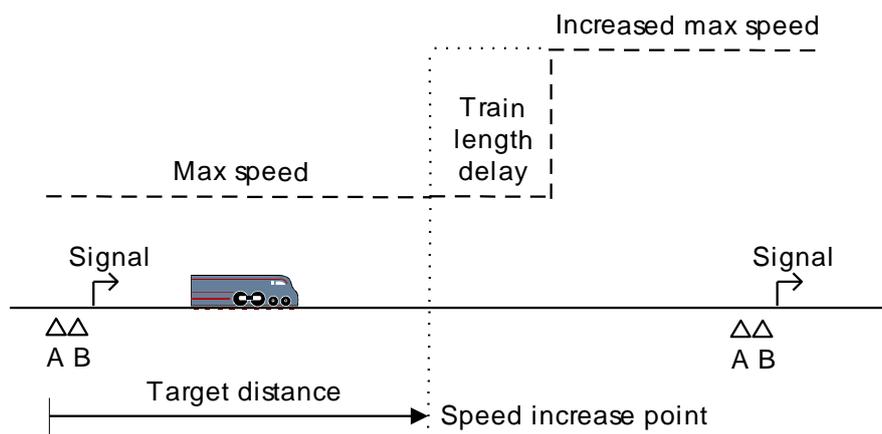


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*Note.* If BY = 14 but the distant signal aspect or main signal aspect is not provided, or the distant signal aspect is restrictive ($V_{FSI} \le V_{HSI}$), a balise error alarm is generated [3.3].

Non-restrictive distant signal (BY ≠ 14)

F3203.    If, within the same balise group, $V_{FSI} \geq V_{HSI} > 0$ km/h, and BY = 0..13, the following shall apply:

a) The distant signal shall be regarded as a normal distant signal (even if $V_{FSI} > V_{HSI}$), and a normal data record shall be established (non-restrictive "braking curve").

b) If the distant signal speed $V_{FSI}$ becomes restrictive later on (e.g. after the train has stopped), it shall be supervised in the usual manner for distant signal braking curves.

### 3.6.11.2  Supervision of preset speed increase

As long as the train is running

F3204.51a  If a new main signal is passed:

a) A preset speed increase under way shall be cancelled.

1. Exception: If the new main signal is passed during the train length delay and the new Vhsi ≥ the preset $V_{HSI.}$

b) The  preset speed increase data record shall be erased.

c) The new main signal information shall apply as usual.

*Note.* If SH-balises or a signal speed increasing board (AX = 3, AY = 12..14) are detected before the speed increase point, a balise error is generated [3.3]. This is done to detect track layout errors which might otherwise allow excessive speed on certain routes.

F3205.    If a new distant signal is discovered during supervision of a preset speed increase (before or after the preset speed increase point):

a) This new distant signal shall be handled separately (a new braking curve shall be established).

b) The preset speed increase shall not be affected by the new distant signal as long as the train is running.

F3206.    Distance and other information from a linking group A(1/4, 14, 14) which is passed before or after the speed increase point, shall not update the preset speed increase.

*Note*. Special rules apply after stopping [3.7.6]. See also below.

After the train has stopped [90]

F3207.51a  If the train has stopped after a combined signal that gives a preset speed increase, the following shall apply:

a)  If the train stopped before the point of speed increase,

1. Expect Stop shall be stored, containing the point of speed increase as the target point.

2. The coming speed increase shall be inhibited.

b)  If the train stopped before passing the train length after the point of speed increase:

1. Expect Stop shall be stored with target distance 0 (zero), and

2. The coming speed increase shall be inhibited.

c)  If the train stopped after passing the point of speed increase plus train length:

1. Expect Stop shall be stored with target distance 0 (zero).

*Note*. The recently performed speed increase will still apply.

After the train has stopped [91]

A3207.51n  If the train has stopped after a combined signal that gives a preset speed increase, the following shall apply:

a)  If the train stopped before the point of speed increase,

1. Expect Stop shall be stored, containing the point of speed increase as the target point.

2. The coming speed increase shall be inhibited.

b)  If the train stopped before passing the train length after the point of speed increase:

1. Expect Stop shall be stored with target distance 0 (zero), and

2. The coming speed increase shall be performed as usual after the train length delay.

c)  If the train stopped after passing the point of speed increase plus train length:

---

[90] Reserve.

[91] Differs to [ATCH].

1. Expect Stop shall be stored with target distance 0 (zero).

   *A-Note*. The recently performed speed increase will still apply.

F3208.51a  If the train stops after a preset speed increase signal and then starts running again, the following shall apply:[92]

a)  If the system detects a linking group or SH group after the point of speed increase, the target distance for Expect Stop shall be set from this point equal to the distance provided from the detected balises.

b)  A new stand-alone distant signal shall always repeat the former "preset speed increase" distant signal, regardless of train stopping position.

   *Note*. See also the previous requirements.

*Note*. The level of supervision (release speed) will in all cases be defined by the AX word in the last detected signal or linking point.

*A-note*. The level of supervision (release speed) will in all cases be defined by the AX word in the last detected signal or linking point (unless there is valid data from a release group).

### 3.6.11.3  Linking at preset speed increase

It is assumed that a new signal point shall be detected within 800 m beyond the indicated point of speed increase (without tolerance). Otherwise balise error is activated. Linking group or SH-balises are not considered as signal groups in this respect [3.3.2.3 – 3.3.2.4].

## 3.6.12  Combined signal influence on ET speed restrictions

### 3.6.12.1  OT-ET + combined signal

Indefinite OT-ETxF

F3209.  If there is a warning board of class ETRF/ETGF prior to a combined signal (within 100 m), the status of this restriction shall change from indefinite to preliminary-active or preliminary-passive according to the distant signal information, i.e. it shall change to a braking curve in the same way as for a stand-alone distant signal [3.5.8 + Table 3.10-9].

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[92]  Differs to [ATC2]

Preliminary OT-ETxF

F3210. The main signal speed of a combined signal shall affect a previously received, preliminary OT-ETxF (which was made preliminary by a matching signal before this one) [Table 3.10-9].

Any OT-ETxF

F3211. Speed increasing target speed information shall not be considered as distant signal with regards to controlling OT-ET. An ETxF before a distant signal with preset speed increase therefore shall become Locked (after 100 m).

Indefinite OT-ETxH

F3212. If there is a warning board of class ETRH/ETGH prior to a combined signal, the main signal shall be controlling in the same way as for a stand-alone main signal [3.4.8].

### 3.6.12.2 OT-ET + new signal with another OT-ET

Indefinite OT-ETxF

F3213. ETxF before a combined signal (within 100 m) shall not repeat a previously received (more than 100 m earlier) OT-ET, even if they were to aim at the same target point. This means that such an ETxF never shall be a repeating OT.

Indefinite OT-ETxH

F3214. ETxH before a combined signal (within 100 m) shall affect (and possibly repeat) a previously received OT-ET in the same way as for a stand-alone main signal [3.4.8].

# 3.7 PASSING A LINKING GROUP

## 3.7.1 Information at linking balises

A linking balise group is equivalent to a group of signal balises with neither main nor distant signal information.

When passing linking balises, a target distance shall be transferred. A-balise category (for release speed), gradient (GR) and signal number is used as supplementary information.

*Table 3.7-1. Linking balise groups*

| N | P | A | | | B | | | C / $P_{OPP}$ / N | | | D/N | RELEASE SPEED |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| X | X | X | Y | Z | X | Y | Z | X | Y | Z | X | |
| (12) | (8) [1] | **1 / 4** | 14 | 14 | **9** | 0..13 | 1..14 | (12) | (NYZ) | | – | 10 or 40 km/h |
| | | | | | | | 0 | **14** | 1..14 | CZ | (12) | |

1) Optional prefix balise with extension distance shall be ignored.
"-" = Not permitted position of balise (leads to balise error alarm).

If a number balise (reserve information in this case[93]) is used (X = 12) it must be placed either first or last in the group of balises, otherwise balise error will occur [3.3].

### 3.7.1.1 Target distance

The basic target distance (usually the distance to next signal or other signal linking group of balises) is stated according to the table below and [Table DF].

*Table 3.7-2. Target distance from linking group*

| BX | BY | BZ | CX | CY | $D_{TARG}$ (m) |
|---|---|---|---|---|---|
| 9 | 0..13 | **1..14** [1] | – | – | Depending on BY and BZ as defined in [Table DF] |
| | | **0** | 14 | **1..14** [2] | Depending on BY and CY as defined in [Table DF] |

1) No C(14) balise. BZ is not allowed to be 0.
2) C(14) balise exists. CY is not allowed to be 0.
This table is identical to another one in the distant signal section [3.5].

---

[93] Former radio function [ATC2]

The target distance is also used in the updating of linking distance [3.3.2].

Extension distance from a possible P-balise is ignored.

Target distance = 0 m, or BY = 14 (preset speed increase) leads to balise error alarm [3.3].

### 3.7.1.2 Gradient information

F3215. The gradient (GR) shall be set:

   a) If there is a C(14) balise: according to its Z word [Table GR].

   b) Reserve.

F3216. At linking balises with no information about gradient, previously received information about gradient shall be retained.

## 3.7.2 Establishing of linking

Linking distance will be established [3.3.2].

## 3.7.3 Effects on type of area and start restriction

There is no effect on STM area and start restriction when passing linking balises. [4.3.8.2, 4.4.2-6]

F3217. Reserve.

## 3.7.4 Updating braking curves at linking group

### 3.7.4.1 General

This sub-section is applicable when passing linking balises when a distant signal braking curve already is stored.

F3218. If more than one distant signal braking curve is stored, each braking curve shall be updated separately in accordance with rules applying to *one* braking curve.

### 3.7.4.2 Updating a braking curve

F3219. The distant signal braking curve shall be updated as follows:

   a) Category according to AX (1/4) of the linking balise. This shall result in updating the release speed at Expect Stop.

      1. $V_{REL} = 10$ if AX = 1.

      2. $V_{REL} = 40$ if AX = 4.

      3. Reserve.

    b) If a linking point is passed before the basic target distance has been travelled, the target distance shall be updated.

    c) Information about gradient:

        1. If the linking group provides information about gradient, this shall be updated in the braking curve.

        2. Otherwise the old gradient information shall be retained.

A3219.    The distant signal braking curve shall be updated as follows:

    a) Category according to AX (1/4) of the linking balise. This shall result in updating the release speed at Expect Stop.

        1. $V_{REL} = 10$ if AX = 1.

        2. $V_{REL} = 40$ if AX = 4.

        3. Exception to 1-2: if a release group was passed since the last main signal.[94]

    b) If a linking point is passed before the basic target distance has been travelled, the target distance shall be updated.

    c) Information about gradient:

        1. If the linking group provides information about gradient, this shall be updated in the braking curve.

        2. Otherwise the old gradient information shall be retained.

*Note.* The extension distance can never be updated at linking balises, regardless of if these includes prefix balise or not. Already stored extension distance is however retained.

### 3.7.5 Reserve

F3220.    Reserve.

F3221.    Reserve.

F3222.    Reserve.

F3223.    Reserve.

F3224.    Reserve.

---

[94] Differs from [ATC2], lacking there

## 3.7.6 Influence on preset speed increase (BY=14)

### 3.7.6.1 Supervison

F3225. If the train has stopped beyond a signal with preset speed increase information (which is then changed to Expect Stop), and after that detects a linking group which is located after the (original) point of speed increase, the following shall apply:

a) The target distance (for Expect Stop) shall be set equal to the distance provided from the group of linking balises.

b) The release speed shall in that respect be set by AX at the linking point:

1. $V_{REL} = 10$ if $AX = 1$.

2. $V_{REL} = 40$ if $AX = 4$.

A3225. If the train has stopped beyond a signal with preset speed increase information (which is then changed to Expect Stop), and after that detects a linking group which is located after the (original) point of speed increase, the following shall apply:

a) The target distance (for Expect Stop) shall be set equal to the distance provided from the group of linking balises.

b) The release speed shall in that respect be set by AX at the linking point (unless there is valid data from a release group):

1. $V_{REL} = 10$ if $AX = 1$.

2. $V_{REL} = 40$ if $AX = 4$.

*Note.* The speed increase point referred to is the target point for the speed increase, not the point where the train length is passed.

### 3.7.6.2 Linking

F3226. A linking group shall not extend the linking distance, when preset speed increase is used [3.6.11.3].

## 3.8 PASSING A RELEASE GROUP

### 3.8.1 Information at release group

*A-note.* The STM can handle the following release group combination.[95]

*Table 3.8-1. Release group*

| N | P | A | | | B | | | C/P$_{OPP}$/N | D/N | MEANING |
|---|---|---|---|---|---|---|---|---|---|---|
| X | X | X | Y | Z | X | Y | Z | X | X | |
| – | – | **13** | 0..14 | 0..14 | **13** | 0..14 | 0..14 | – | – | Release group |

F3227.     Reserve.

### 3.8.2 Updating release speed or overlap distance

F3228.     Reserve.

A3228.51b The existing distant signal braking curve/s shall be updated when passing a release group:[96]

a) Release speed as given in km/h, or computed according to the given release distance (the overlap), according to [Table AFY][97] before the train has stopped.

b) Release speed as given in km/h, or computed according to the given release distance (distance to danger point), according to [Table FZ] after the train has stopped.

   1. [Table AFZ] shall apply when stopping after the previous main or combined signal, regardless of if the stop was before or after the release group itself.[98]

---

[95] Release groups are planned to be used in both Sweden and Norway

[96] Differs from [ATC2], lacking there

[97] Reserve.

[98] If the train has come to a halt on the signal block section (regardless of where), the train route could have been released. This makes it impossible to continue using the "pre-halt" signal message (could be higher than the "after halt" signal message).

If the train was still-standing just for a short while before the release group, it would in most cases not be dangerous to use the "after halt" message, even if the train route is still there when the mission continues.

-- AZ = 1 could be dangerous to use in this case. But the use of AZ = 1 can probably be limited with help by engineering rules.

-- AZ = 2...6 gives the distance that applies when the train route is released. This is probably never longer than the distance that you have while the train route is still there. AZ = 7...14 gives a restrictive message if the train comes to a halt at a long distance before the signal.

Exceptions to a-b:

c) AY = 0 or AZ = 0.

    1. Respective information shall not be updated.

    2. Respective already existing information (from a previous release group)) shall be deleted.

*A-note.* AY = 0 or AZ = 0 will also annull respective, earlier received release group information.

d) Distant signal braking curve/s with target distance extension shall not be updated.

e) Information that was originally received from a combined signal with preset speed increase (BY= 14 and Vfsi > Vhsi > 0) shall not be updated.

*A-note.* This exception applies also if the preset increase was changed to a braking curve later on.

F3228A.    Reserve.

A3228A.51c  Reserve.[99]

F3228B.    Reserve.

A3228B.    Information from a release group shall be ignored or inhibited if one of the following conditions applies to the previous signal group with main signal information (main signal or combined signal).

a) This signal was at stop (AY = 0 or 13).

b) A BF2 or BF3 balise error was detected in this signal.

c) A BF2 or BF3 balise error was detected after this signal.

F3229.    Reserve.

*A-note.* The release speed that will be used is the highest of the following two:

---

-- AZ = 7...14 gives a restrictive message if the train comes to a halt at a long distance before the signal.

[99] Reserve.

> -- The one that was received from the latest signal (with distant signal information).
>
> -- The one that was received from the latest release group on the signal block section.

A3229. The data from the release group...

a) Shall be valid until the braking curve is terminated or a main signal is passed, and

b) Shall override (increase or decrease) the release speed from a preceeding release group (but not below the latest received signal information).

*A-note*. This applies regardless of if AY or AZ in one of multiple groups is annulled or not.

c) Shall increase any release speed given by a preceding repeater distant signal, combined signal or linking group (with 10- or 40-supervision).

d) Shall be overridden by a higher release speed from a succeeding distant signal or linking group.

*A-note*. A decreasing release speed from such a succeeding group is ignored.

*A-note*. If only an overlap or distance to DP is given, the release speed is calculated according to this. The computed release speed must not exceed the maximum value indicated in [Table FY or FZ]. Refer to the section about Expect Stop braking curves, [4.6.2.3].

(blank)

# 3.9 PASSING A SPEED BOARD

## 3.9.1 Information from speed board balise groups

### 3.9.1.1 General

A new maximum speed with its associated speed category is transmitted at each speed board. Information about the end of a speed restriction can also be transferred.

The following combinations are handled:

*Table 3.9-1. Speed board combinations, AX = 3/5/7*

| | P | A | | | B | | | $P_{OPP}$ | | | MEANING |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | X | X | Y | Z [1] | X | Y | Z [2] | X | Y | Z | |
| a) | | | | | 3 | | | | | | |
| b) | – | 3 | 0..8 | 0..13 | 5 | 0..14 | 0..14 | | – | | Speed board for category T with overlap or signal increase |
| c) | | | | | 7 | | | (8) | (PYZ) | | |
| d) | | | 9..14 | 0..13 | **M A R K E R** | | | | – | | |
| e) | | | | | 3 | | | | | | |
| f) | – | 5 | 2 / 4 | 0..13 [4] | 5 | 0..14 | 0..14 | | – | | Speed board for category ET |
| g) | | | | | 7 | | | (8) | (PYZ) | | |
| h) | | | | | 3 | | | | | | |
| i) | – | | 0 [3] / 1..8 / 12..14 | 0..13 | 5 | 0..14 | 0..14 | | – | | |
| j) | | 7 | | | 7 | | | (8) | (PYZ) | | Speed board for category T, K1, K2, PT or Vn |
| l) | | | | | 3 | | | | | | |
| m) | 8 | | 9..11 | 0..13 | 5 | 0..14 | 0..14 | | – | | |
| n) | | | | | 7 | | | (8) | (PYZ) | | |

1) If AZ = 14, the balise group is annulled for the present direction.
2) If BZ = 14, the balise group is annulled for the opposite direction.
3) AX = 7 + AY = 0 causes overlap error in certain instances [3.3.5.6].
4) Only AZ = 10 is allowed when AY = 4 (ET140).
"**–**" indicates illegal balise position (generates balise error alarm)

F3230.   Reserve.

### 3.9.1.2 Speed categories

Speeds of various categories can be provided by speed boards, depending on the nature and reason for the speed restriction. The following categories are available:

| | | |
|---|---|---|
| T | Line speed restriction (compulsory). |
| K1 | Curve with normal transition curves and ramps. The speed restriction received from the balises can be exceeded by a percentage value based on train data (exceed level K1). |
| K2 | Curve with abnormal transition curves and ramps. The speed restriction received from the balises can be exceeded by 50% of the K1 value. |
| PT | Train dependent speed restriction with prefix balise, which defines which of 9 different track characteristics shall be the reason for the speed restriction. |
| Vn | Level crossing, n = 1...3. Speed restriction that terminates without train length delay. If semi-equipped, the restriction terminates directly beyond the target point. |
| ET | Route dependent speed restriction (ET means "Extra Compulsory"). |

### 3.9.1.3 The significance of the Y and Z words for category 7

*Table 3.9-2. HT information from Y and Z words, category 7*

| AX | AY | AZ | Shall be updated | Other restrictions | Speed category |
|---|---|---|---|---|---|
| 7 | 0 | 0..13 | HT max speed according to [Table HO] | Balise error if K or PT restriction exists [3.3.5.6] | T = Line speed [1] |
| | 1..2 | | HT max speed according to [Table HO] | K and PT restrictions are terminated | |
| | 3..5 | 0..13 | HT max speed according to [Table HO] | K2 restriction is terminated | K1 = Curve 1 |
| | 6..8 | | HT max speed according to [Table HO] | K1 restriction is terminated | K2 = Curve 2 |
| | 9..10 | 0..13 | HT max speed according to [Table HO] | No termination | PT = Train dependent [2] |
| | 11 | 0..11 | | | |
| | | 12 | Selective end for PT restriction (SPTS) | | |
| | | 13 | PT restriction annulled (PTNA) | | |
| | 12 | 0 | HT max speed according to stored braking curve for respective category | No termination | HT*V1 |
| | 13 | | | | HT*V2 |
| | 14 | | | | HT*V3 |
| | 12 | 1..12 | HT max speed according to [Table HO] | No termination | V1 = Route 1 |
| | 13 | | | | V2 = Route 2 |
| | 14 | | | | V3 = Route 3 |
| | 12..14 | 13 | Restriction annulled (VnA) | | V1A / V2A / V3A |

1) Line speed with AX = 7 also means, "No PT or K restriction overlap".
2) There are 9 separate PT speed registers, one for each track characteristic.

Exceeded speed will be added to K1 and K2 [4.2.1.2].

### 3.9.1.4   The significance of the Y and Z words for category 3

Speed information of category 3 is always of type T (compulsory line speed). However, category 3 has some effect on curve and PT category restrictions. It can even affect the main signal aspect.

*Table 3.9-3. HT and signal information from Y and Z words, category 3*

| AX | AY | AZ | Other restrictions | HT-T max speed |
|----|----|----|----|----|
| 3 | 0..2 | 0..13 | PT and K restrictions overlap | Line speed of category T (dependent on the AY and AZ words) shall be updated according to [Table HT]. |
|  | 3..5 |  | PT restriction overlaps, terminate any K restriction |  |
|  | 6..8 |  | K restriction overlaps, terminate any PT restriction |  |
|  | 9..11 |  | No overlap, terminate any PT and K restriction |  |
|  | 12..14 |  | No overlap, terminate any PT and K restrictions. Increase main signal aspect to 270 km/h [3.9.7]. |  |

### 3.9.1.5   The significance of the Y and Z words for category 5

Speed information of category 5 is used for HT-ET, route-dependent speed restriction.

*Table 3.9-4. HT information from AY and AZ, category 5*

| AX | AY | AZ | Function | HT-ET max speed |
|----|----|----|----|----|
| 5 | 2 | 0..13 | HT-ET max speed shall be updated according to [Table AT] | 0 [100]..130 km/h |
|  | 4 | 10 |  | 140 km/h |

## 3.9.2   Termination of braking curve

A speed board can terminate every braking curve, if there should be more than one matching OT.[101]

F3231.   A stored warning board (braking curve) of category T, K, PT, V or ET shall be terminated at a speed board if these conditions are fulfilled:

a)   The speed board is coded:

---

[100] This is not supervised as a stop signal but as a normal max speed of zero km/h
[101] Differs from [ATC2].

    1. With a max speed, or

    2. With HT*Vn, HT-VnA or HT-PTNA.

b) The speed categories agree.

    1. For PT restriction: The PT bit patterns (octal 000...777) shall be identical.

    2. Exception for ET: sub-categories (ETGF/H and ETRF/H) shall be ignored.

c) The train has entered the target window:

    1. The train has reached the first half of the target window (travelled at least 80% but not 100% of the target distance).

    *Note.* For the case when the train has travelled 100-120% of the target distance, see the sub-section below [3.9.3] and [4.6.5.3].

    2. Exception for PT: anywhere inside the target window (80 - 120%).

    *Note*. This is because a PT restriction cannot be semi-equipped.

d) The target speed shall agree with the speed board aspect.

    1. Exception for V: HT*Vn or  HT-VnA (n = 1...3).

    2. Exception for PT: HT-PTNA.

    *Note*. No max speed is given by these speed boards.

e) An OT-ET shall not be indefinite:

    1. The train has travelled 100 m after OT-ET, or

    2. An ET controlling signal has been passed.

*Note*. For termination of OT-V braking curves, see also [4.6.5.3].

*Note.* If any of the conditions are not fulfilled for category PT, which means that the OT-PT braking curve is not terminated, a balise error alarm is generated when the train has travelled 120% of the target distance [3.3.3.1].

## 3.9.3    Termination of semi-equipped speed restriction

*Note*. For a braking curve of category T, K or ET, supervision of a semi-equipped speed restriction will always commence when the target distance from the warning board is passed. This is performed irrespective of whether a speed board balise group follows immediately afterwards or not. [4.6.5.3,  4.6.8.7]

F3232.   A recently started semi-equipped supervision of category T, K or ET shall cease at the speed board balise group, and supervision for fully equipped speed restriction shall start (the speed value for each speed category shall be updated) if:

a)  Speed categories agree, and

b)  The train has entered the last half of the target window, i.e. travelled at least 100 % but not 120 % of the target distance from the warning board [102], and

c)  Speed levels agree.

## 3.9.4    Alteration of speed value

F3233.   a)  The speed board category and max speed information shall be stored when passing the board, and then supervised.

*Note.* Refer to the previous tables [Tables 3.9-2...4].

*Note.* Exception: Train length delay may apply to some categories of speed boards, when the max speed is increased [4.5.5].

b)  A new G line speed shall replace an existing T line speed, and vice versa.

*Note.* A speed board of a certain category cannot (normally) alter the numeric value of another category (e.g. an HT-K1 can not set the HT-T speed, whether it is already stored or not).

F3234.   K1 and K2 max speeds shall be increased by an exceed level [4.2.1.2].

F3235.   a)  PT speed restrictions shall be altered selectively for the sub-category or sub-categories whose bits are set to zero in both the prefix balise and the PT code parameter of the STM.

b)-c)   Reserve.

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[102] Before 100 % of the target distance has been passed, the speed restriction shall still be handled as a braking curve

A3235. a) PT speed restrictions shall be altered selectively for the sub-category or sub-categories whose bits are set to zero in both the prefix balise and the PT code parameter of the STM.

b) The others shall also be kept, just in case.

c) Some of these restrictions shall be activated or passivated later, if a new, changed PT-code is entered by the driver.

F3236. a) For HT*Vn, the speed value for each category shall be set to the release speed provided by the braking curve.

b) If there is no braking curve the group shall be ignored, but satisfy checking for the existence of a beginning balise [3.3.3.5].

*Note.* A level crossing max speed can be updated also if the speed becomes less restrictive.

F3237. If several braking curves with the same V category but different supervision speed aims at the same point (withing the target window), the HT*Vn shall be handled with the most restrictive of these braking curves, i.e. the one that has the lowest release speed.

F3238. HT-VnA at level crossing protection shall not initiate a new maximum speed supervision (speed restriction annulled).

*Note.* A possible category Vn braking curve can be terminated, see above. Refer also to the section about increased max speed and train length delay [4.5.4].

## 3.9.5 Change of STM area – collecting full HT information

Passing speed board balise groups can cause changes in area and display, depending on the previous HT information stored in the system and the contents of the balise group.

In certain cases several HT category balise groups must be passed before supervision changes to HT Area (full HT information needed) or Fully Equipped Area (main signal and full HT information needed).

F3239. Reserve.

*Note.*The basic conditions for full HT information are:

a) Category T speed from HT-T is valid.

b) One of these category K informations is valid:

   1. Curve speed from HT-Kn, or

   2. It is obvious that there is no K speed restriction (no K1/K2 overlap), or

     3. SK1/SK2.

  c) One of these category PT informations is valid:

     1. Max speed from HT-PT, or

     2. SPTT or HT-PTNA, or

       *Note.* HT-SPTS has no effect.

     3. It is obvious that there is no PT speed restriction (no PT overlap).

*Note.* HT-ET and HT-V boards have no effect on area type.

F3240.   The composite data from different groups of balises shall result in fulfilment of the conditions for full HT information.

*Note.* Some groups of balises (e.g. in HT with AX = 3) require some other restriction/s to be stored (overlapped), without the information being provided in the current group of balises.

F3241.   If full HT information is provided, possibly consisting of only category T speed, and the STM suddenly discovers a group of balises that require category K or PT information, the STM shall not longer assume that there is full HT information.

*Note.* This means that a Fully Equipped Area will be changed to a Partially Equipped Area (after a delay of 50 m) with related indications [4.4.3 to 4.4.5].

F3242.   The effect different balise groups shall have on available HT information is determined by the following table.[103]

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[103] In order to give a total view, the end functions of the miscellaneous board are included in the table.

*Table 3.9-5. Collecting full HT information*

| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 |
|---|---|---|---|---|---|---|---|---|---|
| | AX | AY | AZ | Control columns T [6] | K | PT | *Note.* Information [4] | *Note.* K / PT overlap [5] | *Note.* Function |
| a) | 7 | 0..2 [1] | 0..13 | 1 0 | 0 1 | 0 1 | T | None | HT-T |
| b) | | 3..8 | | – – | 1 0 | – – | K1/K2 | K1 / K2 [3] | HT-Kn |
| c) | | 9..10 | | | | | PT | PT [3] | HT-PT |
| d) | | 11 | 0..11 | – – | – – | 1 0 | PT | | |
| e) | | | 13 | | | | (PT) | | HT-PTNA [2] |
| f) | | | 12 | – – | – – | – 0 | (PT) | PT | HT-SPTS [2] |
| g) | | – | – | – – | – – | – – | – | – | (reserve) |
| h) | 3 | 0..2 | 0..13 | 1 0 | – 0 | – 0 | T | K+PT | HT-T |
| i) | | 3..5 | | 1 0 | 0 1 | – 0 | | PT | |
| j) | | 6..8 | | 1 0 | – 0 | 0 1 | | K | |
| k) | | 9..14 | | 1 0 | 0 1 | 0 1 | | None | |
| l) | 5 | 4 | 1..2 | – – | 0 1 | – – | (K) | No K | SK1/SK2 |
| m) | | | 3 | – – | – – | 0 1 | (PT) | No PT | SPTT |

*Note.*

1) Special rules applies for AY = 0 [Table HO + note].
2) Columns 7..9 applies regardless of the number of active PT bits.
3) For K1/K2 or PT, a group that both gives information and requires overlap.
4) Information from this group. Tells whether this category of speed limit does or does not exist.

   X = X added

   (X) = X terminated or passivated

   – = No information
5) Overlap required by this group. Tells whether this category of speed limit must or must not exist to satisfy the Full HT information

   X = Overlap for X

   – = No information
6) An existing line speed (T) is always required for Full HT

*Note.* Explanations to the table:

The three columns to the left, AX - AZ, indicate possible balises which can effect available and necessary HT information. The control columns, T, K and PT, indicate how the balises affect different types of speed restrictions. Within each control column there are two sub-columns with the following meaning:

*Table 3.9-6. Explanations to the previous table*

| | Control column [3] [4] [5] "Change" | "Need" | Changed speed limit [1] | Needed speed limit [2] (overlap) |
|---|---|---|---|---|
| a) | – | – | No change | No change |
| b) | – | 0 | No change | Needed |
| c) | 0 | 1 | Deleted | Not needed |
| d) | 1 | 0 | Added | Needed |

*Note.*

1. "Change" means that it is known whether the speed limit in question exists (1) or not (0).

2. "Need" means that without this speed limit, "Full HT" applies (1) or not (0)..

3. Dash (--) means "not affected".

4. In each pair of control columns, there must be at least one set bit (1) to be counted as "this information (T, K or PT) exists or is not needed (sufficient for Full HT)".

5. Every new bit (0 or 1) that is received from a balise group replaces its previous, corresponding bit value (the latest received information applies).

F3243.    a) Information from the various sub-columns shall be accumulated into the system, when different groups of balises are passed.

1. Initial value after start or a HT-erasing balise error = 0.

b) To make sure that full HT information is received:

1. The STM shall collect a "one" in each of the three pairs of control columns,

2. either in the left or in the right sub-column.

c) For each HT category shall apply:

1. That information either must be available, or

2. The STM shall be sure that the information is not necessary.

## 3.9.6  Termination (or updating) of speed restriction

Termination of speed restriction means that the equivalent register will hold no speed information.

At balise error that erases HT information, all fully equipped speed restrictions of categories T, Kn, PT, Vn and SK (no G restrictions, braking curves or semi-equipped restrictions) will be terminated, but ET restrictions will be handled in a special way [3.3.5].

### 3.9.6.1  Line speed restriction

A category T speed restriction is altered, but not terminated, by a new HT-T speed board.

### 3.9.6.2 PT speed restriction

SPTS, selective termination of a PT restriction

F3244. Selective termination of a PT speed restriction shall occur at a speed board with SPTS and prefix balise:[104]

a) For all PT bits = 0 from an SPTS group, the corresponding PT speed restrictions, shall still apply after SPTS.

b)-c) Reserve.

A3244. Selective termination of a PT speed restriction shall occur at a speed board with SPTS and prefix balise:[105]

a) For all PT bits = 0 from an SPTS group, the corresponding PT speed restrictions, shall still apply after SPTS.

b) Speed restrictions that shall be disabled by the SPTS (whose bits are not zero) shall also be kept, just in case.

c) Some of these restrictions shall be activated or passivated later, if a new PT-code is entered by the driver.

F3245. Reserve.

*Note.* The following applies regardless of the number of active PT-bits.

– For HT-PT and HT-PTNA boards, PT information is received (which also satisfies the overlap required)

– For HT-PT and HT-PTNA boards, PT overlap is required. This is only of academic interest since it is not possible to remove the information without removing the overlap

– For HT-SPTS board, PT overlap is required.

See also [Table 3.9-5].

HT-PT, speed board with PT information

F3246. If the balises provide a speed value instead of SPTS, the speed memories whose corresponding PT bits are zero in the prefix balise, shall be updated.

---

[104] Differs to [ATC2]
[105] Differs to [ATC2]

F3247. HT-PTNA shall not terminate an already initialized speed restriction [Table HO].

F3248. PT speed restriction/s shall be terminated completely when passing:

a) A speed board of category 3, containing a T speed which finishes PT (AY = 6...14),

b) A speed board of category 7, containing a T speed (AY = 1...2).

*Note.* See the speed board tables [Tables HT and HO].

### 3.9.6.3 K, V and ET speed restrictions

Curve speed restrictions (K), speed restrictions for level crossings (V) and ET restrictions are altered, but not terminated, by a new speed board of the same category (AX = 5 or 7).

F3249. Termination of a speed restriction (of a corresponding category) shall occur with the following miscellaneous board information [3.11.3]:

a) Code SKn (n is not checked),

b) SVn.

c) Reserve.

*Note.* Also when passing SET, see [3.11.3.8].

F3250. A curve speed restriction (K1 or K2) shall be terminated by a balise group of category 3, containing a line speed that finishes curve restrictions (AY = 3...5 or 9...14) [Table HT].

F3251. Speed restrictions of category K1 or K2 shall be terminated by a line speed board with AX = 7 (AY = 1..2) [Table HO].

F3252. a) A speed board of category K2 shall terminate a speed restriction of category K1.

b) A speed board of category K1 shall terminate a speed restriction of category K2.

*Note.* For HT-K1 and HT-K2, the following applies.

– K1/K2 information is received, which satisfies the overlap required.

– K1/K2 overlap is required. This is only of academic interest since it is not possible to remove the information without removing the overlap.

See also [Table 3.9-5].

### 3.9.7 Speed increase after switch point

F3253.  The signal speed shall be affected when passing a line speed board with AX = 3 and AY = 12...14:

a)  If the last main signal passed gave a Proceed aspect ($V_{HSI}$ > 0 km/h) then the main signal speed shall be changed to the maximum speed 270 km/h.

b)  If there is a locked A-extension, this shall be updated with 270 km/h at the extended target point.

*Note.* Speed increase takes place after train length delay in the usual manner.

F3254.  Any distant signal information shall be retained and supervised as usual, also after the speed increase.

## 3.10 PASSING A WARNING BOARD

Warning board groups are normally static, but are in this section also equivalent to dynamic functions, such as warning for level crossing or landslide.

### 3.10.1 Information from warning board balise group

#### 3.10.1.1 General

Generally, target speed $V_{TARG}$ and speed category are transferred when passing warning boards. Target distance ($D_{TARG}$), gradient (GR) and "signal number" are supplementary information. Notification balises do not provide information of target speed and distance.

These warning board combinations are handled by the STM (optional balises within parentheses), see the following table.

*Table 3.10-1. Warning board balise groups*

| | P | A | | | B | | | C / N | | | N | MEANING |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | X | X | Y | Z | X | Y | Z | X | Y | Z | X | |
| a) | – | 2 | 0..8 | 0..13 | M A R K E R | | | (12) | (NYZ) | | – | OT-T / K |
| b) | 8 | | 9..11 | 0..13¹⁾ | | | | | | | | OT-PT |
| c) | – | | 12..14 | 0 | | | | | | | | Notification AVn |
| d) | – | | | 1..13 | | | | | | | | OT-V |
| e) | (8) | | AY | 14 | | | | | | | | Annulled OT |
| f) | – | 2 | 0..8 | 0..13 | 9 | 0..13 | 0 | 14 | 1..14 | CZ | (12) | OT-T / K |
| g) | 8 | | 9..11 | 0..13¹⁾ | | | | | | | | OT-PT |
| h) | – | | 12..14 | 1..13²⁾ | | | | | | | | OT-V |
| i) | (8) | | AY | 14 | | BY | BZ | | CY | CZ | (12) | Annulled OT |
| j) | – | 5 | 8..14 | 0..13 | 9 | 0..13 | 1..14 | –³⁾ | | | –³⁾ | OT-G / ET / SK |
| k) | | | | | | | 0 | 14 | 1..14 | CZ | | |
| l) | | | | 14 | | BY | BZ | (14) | (CY) | (CZ) | (12) | Annulled OT |
| m) | – | 6 | 0..8 | 0..13 | 9 | 0..13 | 1..14 | (12) | (NYZ) | | – | OT-T / K |
| n) | 8 | | 9..11 | 0..13¹⁾ | | | | | | | | OT-PT |
| o) | – | | 12..14 | 1..13²⁾ | | | | | | | | OT-V |
| p) | (8) | | AY | 14 | | BY | BZ | | | | | Annulled OT |
| q) | – | | 0..8 | 0..13 | 14 | 1..14 | BZ | (12) | (NYZ) | | – | OT-T / K |
| r) | 8 | | 9..11 | 0..13¹⁾ | | | | | | | | OT-PT |
| s) | – | | 12..14 | 1..13²⁾ | | | | | | | | OT-V |
| t) | (8) | | AY | 14 | | BY | | | | | | Annulled OT |

1) AY = 11 and AZ = 12 ("OT-SPTS") is an illegal code (shall cause balise error, compare to HT-SPTS).

2) AZ = 0 refers to AVn, and causes balise error in this combination (the B-balise is not a marker).

3) Balise error BF1 is given for an N(12) balise in this position.

"**–**" States prohibited position of balises (leads to balise error).

Balise error causes [3.3]:

a)  Speed information = 0 km/h is accepted if AX = 5 (ET and SK speed category), but leads to balise error if AX = 2 or 6 [3.10.3.5].

b)  Target distance = 0 m may not be used.

The number balise has no function[106], except for connecting a warning board with a repeater warning board. The NYZ code is checked by the STM. NYZ = 0 should not be used, but does not cause balise error.

Recommendations:

−  For permanent speed restrictions, OT with AX = 2 or 6 are normally used.

−  For temporary speed restrictions, primarily OT-ET is used (AX = 5, together with AY = 8..13).

−  As advance warning for area border, an OTG is used (AX = 5 together with AY = 14).

F3255.  Annulment with AZ = 14 means that the group of balises shall not be handled at all.

*Note.* This annulment cannot, therefore, have any effect on previously received information.

F3256.  Reserve.

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[106] Former radio function [ATC2]

### 3.10.1.2 Speed categories

Warning boards can give different speed categories in the same way as speed boards. The following speed categories are used at warning boards:

*Table 3.10-2. Warning board speed categories*

| Cat. | Explanation |
|------|-------------|
| T | Line speed restriction (compulsory). Replaces line speed of category G and vice versa. |
| G | Area line speed, set at GMO, GMD or BU. An OTG warning board provides advance information to an area border, where the area has a specified maximum speed [3.10.2.6]. |
| K1 | Curve with normal transition curves and ramps. The speed restriction received from the balises can be exceeded by a percentage value based on train data (exceed level K1). |
| K2 | Curve with abnormal transition curves and ramps. The speed restriction received from the balises can be exceeded by 50 % of the percentage based on train data (exceed level K2). |
| PT | Train dependent speed restriction with prefix balise, which defines which of 9 different track characteristics shall be the reason for the speed restriction. |
| Vn | Level crossing, n = 1...3. Speed restriction that terminates without train length delay. If semi-equipped, the restriction terminates directly beyond the target point. AVn: Notification before warning board for level crossing protection. |
| ET | Route dependent speed restriction (ET means "extra compulsory") on main or diverging route. A signal following within 100 m after the warning board determines whether the speed restriction will apply or not. There are four different types of ET restrictions [3.10.2.4], [4.6.8]. |
| SK | Landslide warning (FSK = Distant signal for landslide warning). AFSK: Notification of landslide warning distant signal, FSK within 150 m. FSK: Distant signal for landslide warning. FSKA: Annulled distant signal for landslide warning. |

### 3.10.1.3 T, K, V or PT target speed when AX = 2 or 6

F3257.    T, K, V or PT target speed information (AX = 2 or 6): The target speed for respective category and sub-category shall be set according to [Table HO].

*Note.* The K1 or K2 speed restriction values can be exceeded by percentage values based on train data. The other target speeds are compulsory.

### 3.10.1.4  Target distance when BX = 9 or marker

F3257A.51a    A warning board with A(2) B(M) shall use a target distance of 1000 m.

*Note*. For other target distances, see the following table.

*Table 3.10-3. Target distance at OT when BX = 9 or M*

| AX | BX | BY | BZ | CX | CY | $D_{TARG}$ (m) | Note |
|---|---|---|---|---|---|---|---|
| 2 | **Marker** | | | (12) | (CY) | 1000 m | Default value |
| 2 or 5 | 9 | **0..13** | **0** | 14 | **1..14** | Distance in BY and CY as defined in [Table DF] | A target distance of 0 m is not permitted - causes balise error. |
| | | **14** | | | | – [1] | |
| 6 or 5 | 9 | **0..13** | **1..14** | (12) | (CY) | Distance in BY and BZ as defined in [Table DF] | |
| | | **14** | | | | – [1] | |

1)  BY = 14 may be used at signals with preset signal increase but causes balise error alarm here.

### 3.10.1.5  Gradient information when BX or CX = 14

*Table 3.10-4. Gradient information at OT cat. 2, 5 or 6*

| AX | BX | BZ | CZ | Gradient G (‰) |
|---|---|---|---|---|
| 2 or 5 | 9 | 0 | **0..14** | Gradient according to CZ, as defined in [Table GR] |
| 6 | 14 | **0..14** | – | Gradient according to BZ, as defined in [Table GR] |

### 3.10.1.6  Target distance when BX = 14

*Table 3.10-5. Target distance at OT cat. 6 when BX = 14*

| AX | BX | BY | Target distance $D_{TARG}$ (m) |
|---|---|---|---|
| 6 | 14 | **0..14** | Distance according to BY, as defined in [Table DG] |

### 3.10.1.7  Notification balise AVn for level crossing warning board

*Table 3.10-6. Notification balise AVn*

| AX | AY | AZ | B-balise | Meaning |
|---|---|---|---|---|
| 2 | **12** | **0** | MARKER | Notification balise for OT category V1 |
| | **13** | | | Notification balise for OT category V2 |
| | **14** | | | Notification balise for OT category V3 |

Notification balises are always A(2) B(M), otherwise there will be a balise error alarm.

### 3.10.1.8   ET, G and SK target speed when AX = 5

*Table 3.10-7. OT cat. 5 target speed*

| AX | AY | AZ | Target speed | Category |
|----|----|----|----|----|
| 5 | 8 | 0..13 | 0...130 km/h [Table AT] | ETGF (GF = Diverging route, Fsi controlled) |
| | 9 | | | ETGH (GH = Diverging route, Hsi controlled) |
| | 10 | | 0...270 km/h [Table AT] | ETRF (RF = Straight route, Fsi controlled) |
| | 11 | | | |
| | 12 | | | ETRH (RH = Straight route, Hsi controlled) |
| | 13 | | | |
| | 14 | 1..12 | 10..120 km/h [Table AT] | OTG with line speed for area border |
| | 14 | 0 | 0 (FSK) | SK, landslide warning board ("distant signal") |
| | | 13 | Proceed (FSKA, annulled FSK) | |

The speed aspects are compulsory for these warning boards, if the corresponding braking curve is activated (may depend on route).

## 3.10.2   Handling of the various speed categories

### 3.10.2.1   Warning board of category T, K1 or K2

F3258.    Category T shall provide a compulsory target speed aspect while the K1 and K2 target speeds shall be increased by an exceed level [3.9.1.2], [4.2.1.2].

*Note.* Braking curves for categories T, K1 or K2 are supervised as normal [3.10.3], [4.6, 4.9].

*Note.* The braking curve can be terminated by a speed board or changed to a semi-equipped speed restriction [3.9.2].

### 3.10.2.2   PT warning board with prefix balise P(8)

By setting bits in the combined YZ word to zero in the prefix balise, it is specified what characteristic of the track is the reason for the speed restriction.

F3259.    When passing a warning board, the bit pattern in the prefix balise shall be compared to the PT parameter of the train.

a)  If a bit is zero in the bit pattern of the balise and the same bit is zero in the STM train data, the information in the warning board shall be used for an active braking curve.

b)  Reserve.

A3259. When passing a warning board, the bit pattern in the prefix balise shall be compared to the PT parameter of the train.

    a) If a bit is zero in the bit pattern of the balise and the same bit is zero in the STM train data, the information in the warning board shall be used for an active braking curve.

    b) Otherwise the braking curve shall be saved in a passive state.

    *A-note.* In case the driver enters different PT bits, a PT braking curve is able to change status from active to passive or vice versa [4.6.9].

F3260. An OT-PT braking curve shall be terminated by PTNA together with a prefix balise at a repeater warning board, provided that:

    a) The PT bit patterns are agreed, and

    b) Both target distances aim at the target window (within 80...120% of the original target distance).

    *Note.* This is handled in a similar manner as annulment of braking curves towards V speed restrictions. Linking is also retained in this instance [3.3.3].

    *Note.* If the prefix balise belonging to an OT-PT warning board is not provided, or has an invalid code word, a balise error alarm is generated [3.3.5.5].

    *Note.* Category PT requires that balises are located at the speed board.

F3261. a) Semi-equipped speed restrictions of category PT shall not be allowed.

    b) Reserve.

    *Note.* If a PT speed board is not provided within the target window (within 80...120 % of the original target distance) an error alarm will be given [3.3.5.6].

F3262. a) A warning board with prefix balise can be repeated or updated by a new group of warning board balises which are:

      1. Aiming at the same target window, and

      2. Gives the same PT bit pattern.

    b) If the target window or the bit pattern is different, a separate braking curve shall be established.

    *Note.* The target speeds must also agree [3.10.3.3].

    *Note.* If there is an error in the track layout, balise error is activated by the OT-PT braking curve which can not find "its" speed board.

### 3.10.2.3  Warning boards at level crossings, V1, V2 and V3

The first warning board at a level crossing is normally preceded by a notification balise group of the same category placed not more than 100 m before (physically, that is, the STM limit is "within 150 m").

The notification balises are handled in the following way [3.3.3.2]:

a) If the OT-V is not detected by the STM within 150 m from the notification balise, a balise error alarm is generated.

b) The same applies if the first OT-V lacks a preceding notification balise (within 150 m).

c) Possible repeating OT-V balise groups are not checked with regard to notification balise groups. If a new notification balise group is detected, however, there must be a related OT-V.

F3263.  The speed information provided at the warning board shall not be the target speed, but the release speed, i.e. the speed where supervision of the braking curve ceases.

F3264.  The target speed for an OT-V which has not been annulled shall always be = 0 km/h (Expect Stop) [4.6.6].[107]

F3265.  Reserve.

F3266.  a) A new braking curve for a level crossing shall not be started when receiving OT-VnA (annullation with AZ = 13).

b) This shall also annul any previous speed restriction of the same category, aiming at the same target window.

*Note*. For additional rules, refer to [4.6.6.1].

F3267.  If there is no previous braking curve, then no new braking curve shall be established when AZ = 13.

F3268.  If the balise group is annulled (AZ = 14), it shall not affect already existing braking curves.

*Note.* This means that an annulled group of balises can not terminate the notification distance after a group of notification balises. Hence balise error alarm is activated if the first OT group after a group of notification balises is annulled.

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[107] OT-V 140 km/h is also supervised as a release speed, in the same way as other OT-V. To supervise OT-V 140 as a target speed would affect the existing ATC-2 track layout too much

*Note.* When the OT-V braking curve is supervised, and the train has come close enough to the level crossing, the release speed will appear on the MAIN INDI-CATOR together with the letter 'H' (provided that the release speed is below 140 km/h or the STM max speed is above 140 km/h). For more information, refer to [4.6.6].

### 3.10.2.4 Route dependent speed restrictions, category ET

These speed restrictions are used as semi-equipped speed restrictions ("push-button restrictions"), or as fully equipped speed restrictions with a speed board and an end board at the start and end of the speed restriction.

Category ET allows a speed restriction to be made dependent of which track is chosen, e.g. at entrance route to station.

The STM is able to handle several different ET speed restrictions at the same time. The different boards can be located in arbitrary order.

F3269.    Reserve.

F3270.    The STM shall handle OT-ET of four different categories. The designation is systematical, in the way that all are named ETxy, where:

a) x states which category of route the OT primarily applies for (R for straight route, G for diverging route), and

b) y states which signal primarily is controlling the OT (F for distant signal, H for main signal).

*Note.* For more information, see other sub-sections about OT-ET [3.10.3.2, 3.10.3.4, 3.10.5], [4.6.8].

### 3.10.2.5 Landslide warning board, category SK

A landslide beginning board (also called Landslide warning signal) is pre-signalled with an FSK warning board (also called Landslide warning distant signal), A(5,14,0) Expect Stop, which can be changed to FSKA, A(5,14,13) Expect Proceed.

F3271.    An Expect Stop speed restriction (FSK) shall be annulled if:

a) It is followed by an Expect Proceed aspect (FSKA),

b) which is aiming at the same target window (80...120%).

*Note.* Refer also to the sub-section about braking curve handling [4.6.7].

*Note.* Distant signals for landslide warning are equipped with notification balises, AFSK, coded A(5,4,0). Should either group not be provided within a distance of

150 m, then a balise error alarm is generated [3.3.3.3]. Repeater groups does also require a preceding AFSK.

F3272.    A landslide warning board (FSK) shall be repeated if:

a)  There is a sub-sequent FSK group,

b)  aiming at the same target window.

F3273.    Reserve

At the beginning of a landslide warning section:

−   An A-balise coded A(5,5,0) is interpreted as BSK (Stop), if a landslide warning is detected.

−   On the other hand A(5,5,1) is interpreted as BSKA (Proceed), if no landslide warning is detected .

*Note*. After passing FSK but before SSK, either BSK or BSKA must be detected before leaving the target window (within 120 % of the original target distance), otherwise a balise error alarm is generated.[3.3.5.6]

*Note*. After the target point, the braking curve is finished at BSK/A, SSK or when 120% of the distance has elapsed [3.11].

### 3.10.2.6  Warning board before area border, category G

F3274.    An OTG, a category G warning board with A(5, 14, 1..12), i.e. an OT for border to Non-Equipped Area, Partially Equipped Area or Installation area, shall function as warning board for the following border balises:

a)  GMD at border to Partially Equipped Area.

1.  The braking curve of the warning board shall be supervised, but the target speed shall not be translated to the category G maximum speed for the area.

2.  The category G line speed of the area shall be obtained from the border balises instead ($V_{LINE}$ set to $V_{GMD}$).

b)  GMO at border to Non-Equipped Area.

1.  The STM shall handle the speed coded in the warning board as a category G line speed in the Non-quipped area ($V_{LINE}$ set to $V_{OTG}$).

c)  BU at border to Installation area.

1.  The target speed of the warning board shall be supervised as a category G line speed in the area ($V_{LINE}$ set to $V_{OTG}$).

*Note*. An increased line speed can also be used (increasing OTG or GMD).

F3275.    Reserve.

*Note*. If none of the above border balises are detected before leaving the target window (within 120 % of the original target distance), the speed of the OTG will

be supervised as a maximum line speed. Balise error alarm is also activated.[3.3.3.4]

## 3.10.3 Establishing braking curves

### 3.10.3.1 Information

F3276. The information for all categories of speed from the warning board, with the exception of ETxy, shall be transferred directly to a braking curve.

*Note.* Supervision then begins as specified in sections [4.6] and [4.9].

F3277.51b The following information shall be stored in the braking curve record:

a) Speed category and possible sub-category.

b) Target speed and possible release speed.

   *Note.* The target speed can be increased if the category is K1 or K2.

c) Target distance, the distance received by the balise group, with the starting point at the A-balise (also for OT-ET).

d1) Gradient information where applicable, otherwise the gradient shall be set to 0 ‰.

d2) Possible PT bits.

e) Additional information: Signal number.[108]

f) Brake percentage (train parameter).

g) Adhesion (train parameter).

### 3.10.3.2 Preparation of OT-ET

*Note.* The starting point of the given target distance is always located at the A-balise of an OT-ET balise group.

F3278. Reserve.

*Note.*

a) An OT-ET will not be evaluated until either 100 m of travel beyond the OT, or a controlling signal has been passed.

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[108] Identity number

b) During this distance the OT will be considered as being indefinite and shall be passive.

c) Once either 100 m has been travelled, or a controlling signal has been passed, then the OT will be put into one of the conditions indicated in the signal passage sections [3.4, 3.5, 3.6].

Refer also to [4.6.8.2].

*Table 3.10-8. Note. Preparation of OT-ET.*

|  | Category | Passed signal | Condition | Function |
|---|---|---|---|---|
| a) | Indefinite ETxH | Hsi for route ≠ x | Terminated | None (deleted) |
| b) | | Hsi for route = x | Definite active | Supervised to the target point. Affected by repeater-OT |
| c) | Indefinite ETxF | Fsi for route ≠ x | Preliminary passive | Not supervised,             but can be activated |
| d) | | Fsi for route = x | Preliminary active | Supervised, but can be interrupted |
| e) | All | None within 100 m | Locked | Supervised to the target point. Unaffected by repeater OT |

Explanation:

x = R or G.

*Note.*This table gives only a brief overview and is not complete. A similar table is available in section [4.6].

*Note.* All conditions (rows) except the first one in the table above, will result in a braking curve being established (or in some cases a previous braking curve to be repeated, since repetition cannot occur as long as the OT-ET is indefinite).

F3279.    a) There shall be place for a number of indefinite OT-ET records.

b) Each of these OT-ET shall be temporarily stored until they have been classified, which can take up to 100 m of travelling.

*Note*. There is place for at least 100 data records in total, refer to [3.3.1.9].

*Note.* For OT-ET braking curves, refer to sub-section [4.6.8].

### 3.10.3.3 Repeater warning board in general

If a braking curve of the same speed category already exists, then in some instances the old braking curve will be replaced (updated [109]) or annulled.

No warning board braking curve may be annulled with AZ=14 in a new warning board balise group.

A repeater without gradient information does not erase previously received gradient information.

Repetition, both OT without signal number

F3280. The old, existing braking curve shall be replaced by the new OT information, or – in some cases – annulled, if:

a) Target speed:

1. Both warning boards give the same target speed, or

2. The new one initiates annullation.

b) The new target distance aims at a location within the target window (80...120% of the old target distance).

c) For OT-PT : prefix balises have the same bit pattern.

*Note.* Exceptions for OT-ET, see below. For annullation, see OT-PTNA, VnA and FSKA. No braking curve may be annulled by an OT with AZ = 14.

Repetition, both OT with signal number

Repetition takes place irrespective of almost all other conditions in the event that the signal numbers correspond.

F3281. The old braking curve shall be replaced by the new OT information, or - in some cases - annulled, if:

a) The new warning board has the same signal number as the old braking curve, and

b) The warning board belongs to the same speed category.

*Note.* Exceptions for OT-ET, see below. For annullation, see OT-PTNA, VnA and FSKA. No braking curve may be annulled by an OT with AZ = 14.

---

[109] Repeating of OT works usually as with [ATC2].

OT with signal number + OT without signal number

F3282.    A warning board without a signal number shall never repeat a board which has a signal number and vice versa.


Updating of the braking curve when replaced or annulled

F3283.    A "repeated" braking curve shall be updated in all instances:

a)  Speed information or annullation.

b)  Target distance.

c)  Gradient, when available.

d)  Sub-category (in special cases).


### 3.10.3.4  Repeating of OT-ET

In general terms the braking curve from OT-ET, in addition to braking curves from other warning boards, can be updated by repeater warning boards.

However certain important differences are present. One is that signal numbers are not allowed at OT-ET. Another is that the target speeds do not necessarily have to match for repetition.


Repetition of a preliminary or definite OT-ET

F3284.    OT-ET repetition shall be performed if the following conditions are fulfilled:

a)  The braking curve is not locked.

b)  The repeater warning board for ET is followed by a matching (controlling) signal, in order to be classified as either passive or active (but not deleted or locked).

c)  The categories need to agree according to the following rules:

1.  ETRF shall be repeated by ETRF and ETRH,

2.  ETGF shall be repeated by ETGF and ETGH,

3.  ETRH shall be repeated by a new ETRH,

4.  ETGH shall be repeated by a new ETGH.

d)  The target points shall match. The new target distance shall aim at a location that is placed within the old target window (80...120% of the old target distance).

e)  Exception to a-d: At combined signal together with a new ETxF [3.6.12].


*Note.* Consequently, ETRH which is main signal controlled, can repeat ETRF which is distant signal controlled, and ETGH can repeat ETGF, but the reverse does not apply. This allows a supervision which is defined by a warning board combined with a distant signal, to be repeated or changed by a warning board at the following main signal, provided that the target points correspond.

*Note.* If the conditions do not match, the two OT-ET speed restrictions will be supervised independently of each other.

Repetition of indefinite OT-ET at the same signal

F3285. A new OT-ET, at the same signal point as an old one (both OT within 100 m before the same controlling signal), shall repeat the old, still indefinite OT-ET restriction provided that they:

   a) Are of exactly the same category (ETGF-ETGF, ETRF-ETRF, or ETGH-ETGH, ETRH-ETRH).

   b) The target points match – the new target distance aims at a location that is placed within the old target window (80...120% of the old target distance).

   c) Have the same target speed.

*Note.* The actual repetition takes place at the signal passage, when both OT's have been classified. If the conditions do not match, the two OT-ET speed restrictions will be supervised independently of each other. See also the braking curve handling section [4.6.8].

### 3.10.3.5 Warning board with Expect Stop

F3286. a) Target speed information = 0 km/h shall be accepted for:

   1. Speed categories ET and SK (AX = 5).

   2. Speed category Vn (AX = 2 or 6).

   b) Reserve.

*Note.* No braking curve will be established for other speed categories (balise error alarm).

## 3.10.4 Supervision of braking curve

The braking curves are handled according to sections [4.6] and [4.9].

## 3.10.5   Summary of balise passages for OT-ET

### 3.10.5.1   Signal with one preceding OT-ET board

This table shows the effect that a possibly passed signal or train stop has upon a stored OT-ET restriction.

*Table 3.10-9. OT-ET + Signal*

| | Stored OT-ET Status | | 1) | 2) | 3) | 4) | 5) | 6) | 7) | 8) | 9) | 10) | 11) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | **Signal group after OT-ET** | | | | | | | | | **After OT-ET** | |
| | | | **Distant signal Fsi** | | | | | **Main signal Hsi** | | | **Combined signal** | **No matching signal within 100 m** | **Train speed = 0 and $V_{FSI} = 0$** |
| | | | **AZ = 0** | **AZ = 1-7** | | | **AZ = 8-12** | **AY = 0** | **AY= 1-7** | **AY= 8-12** | | | |
| | | | | **A-ext.** | **No ext.** | **P-ext.** | | | | | | | |
| a) | E T R F | **Indefinite** | Prel active | Prel passive | Prel active | Prel active | Prel active | NA | NA | NA | Handled as Fsi 1) | Locked | NA |
| b) | | **Prelimin. Passive** | Prel active | Prel passive | Prel active | Prel active | Prel active | Def active | Erased | Def active | Handled as Hsi | NA | Prel active |
| c) | | **Prel active** | Prel active | Prel passive | Prel active | Prel active | Prel active | Def active | Erased | Def active | Handled as Hsi | NA | NA |
| d) | | Def active | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| e) | | Locked | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| f) | E T G F | **Indefinite** | Prel active | Prel active | Prel active | Prel passive | Prel passive | NA | NA | NA | Handled as Fsi 1) | Locked | NA |
| g) | | **Prelimin. Passive** | Prel active | Prel active | Prel active | Prel passive | Prel passive | Def active | Def active | Erased | Handled as Hsi | NA | Prel active |
| h) | | **Prel active** | Prel active | Prel active | Prel active | Prel passive | Prel passive | Def active | Def active | Erased | Handled as Hsi | NA | NA |
| i) | | Def active | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| j) | | Locked | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| k) | E T R H | **Indefinite** | NA | NA | NA | NA | NA | Def active | Erased | Def active | Handled as Hsi | Locked | NA |
| l) | | Def active | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| m) | | Locked | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| n) | E T G H | **Indefinite** | NA | NA | NA | NA | NA | Def active | Def active | Erased | Handled as Hsi | Locked | NA |
| o) | | Def active | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| p) | | Locked | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |

Explanations:

– NA = old restriction Not Affected.

– A signal with AY or AZ = 13 shall not affect ET restrictions.

1) Exception: Preset speed increase shall be interpreted as "NA"

### 3.10.5.2 Signal with two preceding OT-ET boards

The following table shows the effect on an already stored OT-ET restriction, when a new OT-ET + signal is passed.

It is assumed that both OT-ET:s are *first* updated according to the previous table, before a possible repetition takes place.

Sequence of events:

1. Passing the first OT-ET, with or without a controlling signal.

2. Passing the next OT-ET, with or without a controlling signal.

3. Repetition may occur or not according to the table.

*Table 3.10-10. Old OT-ET + New OT-ET + Signal*

| | New OT-ET → / Old OT-ET ↓ | 1) Indefinite OT-ETxF + Fsi | 2) Indefinite OT-ETxF + Hsi | 3) Indefinite OT-ETxF + Combined signal | 4) Indefinite OT-ETxH + Fsi | 5) Indefinite OT-ETxH + Hsi | 6) Indefinite OT-ETxH + Combined signal | 7) Indefinite OT-ETxy + No signal within 100 m |
|---|---|---|---|---|---|---|---|---|
| a) | Indefinite | OF+NF, RI / NEW | OU+NU | OF+NF, RI / NEW | OF+NU | OU+NH, NEW | OF+NH, NEW | OU+NU, NEW 1) |
| b) | ETxF — Prelimin. passive | OF+NF, RC / NEW | OH+NU | OH+NF, NEW | OF+NU | OH+NH, RC / NEW | | OU+NU, NEW 1) |
| c) | ETxF — Prelimin active | OF+NF, RC / NEW | OH+NU | OH+NF, NEW | OF+NU | OH+NH, RC / NEW | | OU+NU, NEW 1) |
| d) | ETxF — Definite active | OU+NF, NEW | OU+NU | OU+NF, NEW | OU+NU | OU+NH, RC/NEW | | OU+NU, NEW 1) |
| e) | ETxF — Locked | OU+NF, NEW | OU+NU | OU+NF, NEW | OU+NU | OU+NH, NEW | | OU+NU, NEW 1) |
| f) | ETxH — Indefinite | OU+NF, NEW | OH+NU | OU+NF, NEW | OU+NU | OH+NH, RI / NEW | | OU+NU, NEW 1) |
| g) | ETxH — Definite active | OU+NF, NEW | OU+NU | OU+NF, NEW | OU+NU | OU+NH, RC / NEW | | OU+NU, NEW 1) |
| h) | ETxH — Locked | OU+NF, NEW | OU+NU | OU+NF, NEW | OU+NU | OU+NH, NEW | | OU+NU, NEW 1) |

Explanations:

OF/NF — Old/New restriction affected by Fsi (see the "OT-ET + Signal" table above)

OH/NH — Old/New restriction affected by Hsi (see the "OT-ET + Signal" table above)

OU/NU — Old/New restriction Unchanged (see the "OT-ET + Signal" table above)

NEW — New braking curve established (unless repeating the old OT-ET, or erased according to the "OT-ET + Signal" table above)

RC — Repetition in some Cases. If matching target points and identical routes, the old restriction is repeated (unless erased according to the "OT-ET + Signal" table) [3.10.3.4].

RI — Repetition if Identical. Repeating can take place if categories, target speeds and target points are matching or identical [3.10.3.4].

1) — Repeating will not occur. E.g. two identical OT-ET within 100 m not followed by a signal means that two locked braking curves will be established.

# 3.11 PASSING A MISCELLANEOUS BOARD OR SH GROUP (AX = 5)

## 3.11.1 Information at miscellaneous board and SH group

The following functions are dealt with in this section:

- Start and end of speed restrictions (beginning and end boards).
- Speed increase after switch point (SH groups).
- Transition between STM areas or similar (border groups).

Other functions regarding AX = 5 that have been dealt with in the previous sections:

- Start and end of landslide warning areas, speed category SK.
- Route-dependent speed restrictions, speed category ET.
- Area dependent speed restrictions, speed category G.

The following combinations exist (optional balises within parentheses):

*Table 3.11-1. Miscellaneous board and SH group*

| A | | | B | | | C/P$_{OPP}$[1]/N | | | N | IDENTIFICATION |
|---|---|---|---|---|---|---|---|---|---|---|
| X | Y | Z | X | Y | Z | X | Y | Z | X | |
| 5 | 1 | 0..13 | **3/ 5/ 7** | BY | BZ [2] | – | | | – | Secondary control |
| | 4..6 [3] | 0..13 [4] | **3** | BY | BZ [2] | – | | | – | Miscellaneous board |
| | | | **5** | | | | | | | |
| | | | **7** | | | (8) | (PYZ) | | | |
| | | 14 | **3/ 5/ 7** | BY | BZ | (As above) | | | | Annulled misc. board |
| | 7 | 1..12 | **9** | 0..13 | 1..14 | (12) | (NYZ) | | – | SH group (increase after switch point) |
| | | | | | 0 | **14** | 1..14 | CZ | (12) | |
| | | 14 | **9** | BY | BZ | (As above) | | | | Annulled SH group |

1) P-balise for the opposite direction.
2) If BZ = 14, the balise group is annulled for the opposite direction.
3) If Y = 3: Z = 1..13.
4) Reserve.
"–" Indicates illegal balise position (causes a balise error alarm)

The number balise has no function[110] but the NYZ code is checked by the STM.

F3287. Reserve.

## 3.11.2 Secondary control outputs

F3288. The balise information shall allow future control of 14 individual outputs (each of which is intended to be a contact closure), as shown in the following table.

*Table 3.11-2. Secondary control outputs*

| AX | AY | AZ | MEANING |
|----|----|------|---------|
| 5 | 1 | 0..13 | Secondary control outputs S0...S13 for future usage |

*Note.* These codes are accepted by the STM but there is no associated function.

## 3.11.3 Beginning and end balises for speed restrictions

### 3.11.3.1 General

A line speed restriction of speed category T or G, can not be terminated, only replaced by a new T or G board, except for category T which can be erased at balise error or when passing a border and for category G which is erased at SU border.

Speed restrictions of categories K, PT, V, ET and SK can be terminated as follows:

– With an end board SKn, SPT(T), SVn, SET as in the table below,

– With SSK or BSKA when the speed restriction is started with BSK.

Ende boards

F3289. a) End boards (Sxx) without previous beginning balises shall be ignored.

b) Exception: balise error at SVn [3.3.3].

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[110] Former radio function in [ATC2]

*Note.* The following functions exist:

*Table 3.11-3. Beginning and end balises for speed restrictions*

| AX | AY | AZ | Name | Meaning |
|----|----|----|------|---------|
| 5 | 4 | 1 | SK1 | End of curve restriction 1 (and 2) |
|   |   | 2 | SK2 | End of curve restriction 2 (and 1) |
|   |   | 3 | SPTT | End of all PT restrictions |
|   |   | 4 | SV1 | End of restriction at level crossing 1 |
|   |   | 5 | SV2 | End of restriction at level crossing 2 |
|   |   | 6 | SV3 | End of restriction at level crossing 3 |
|   | 5 | 0 | BSK | Start of landslide warning (Stop) |
|   |   | 1 | BSKA | Start of landslide warning, annulled |
|   |   | 7 | SSK | End of landslide warning |
|   |   | 10 | SET | End of ET restriction |

### 3.11.3.2  Passing SK1 or SK2, End of curve restriction

F3290.51a  When passing SK1 or SK2, its related max speed register shall be erased, HT-K1 or HT-K2.[111]

A3290.51n  When passing SK1 or SK2, both max speed registers shall be erased, HT-K1 and HT-K2.

### 3.11.3.3  Passing SV1, SV2 or SV3, End of level crossing restriction

F3291.    a)  When passing SV1, SV2 or SV3 the equivalent maximum speed of category V shall be erased, without train length delay (HT-V1, HT-V2 or HT-V3).

b)  Speed boards in which the function has been annulled by HT-VnA (AZ = 13) shall also function as beginning balises.

*Note.* The absence of a previous HT-Vn beginning balise will result in a balise error alarm being generated [3.3.3].

### 3.11.3.4  Passing BSK, Beginning of landslide warning (Stop)

Passage of BSK[112] is handled in a similar way as passage of stop signal, but with full service braking instead of emergency braking. BSK is usually located at the target point of an FSK Expect Stop braking curve.

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[111] As [ATC2B]

At the beginning of a landslide warning section, Stop (BSK) will be received if a landslide warning is detected by the trackside system, otherwise Proceed (BSKA) will be received.

A landslide beginning board (BSK) can terminate every landslide braking curve, if there should be more than one that is matching.[113]

Permitted BSK passage

F3292.    Permission to pass BSK without STM braking shall be given if these conditions are fulfilled:[114]

a)  The driver pressed the PASSERA SKRED button before the BSK passage, and

b)  This was done while the train was still-standing, and

c)  The train speed is 40 km/h or less during the BSK passage, and

d)  Less than 60 seconds have elapsed since the button was pressed (permission timer).

F3293.    The permission to pass BSK shall be removed when:

a)  A speed board with BSK, BSKA or SSK is passed, or

b)  Permission time-out: 60 s have elapsed since the PASSERA SKRED button was pressed.

F3294.    a)  The PASSERA SKRED indicator shall be slowly flashing as long as the BSK passage permission is valid.[115]

b)  It shall start flashing rapidly 10 seconds before the permission expires because of time-out.

*Note.* For indicator colours, refer to supplier specification.

F3295.    The 60 s permission timer shall be restarted upon following conditions:

a)  50...59 s have elapsed (rapidly flashing indicator), and

b)  The PASSERA SKRED button is pressed again, and

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[112] Also called Landslide warning signal

[113] As with [ATC2]

[114] Differs to [ATC2]

[115] Differs to [ATC2]

c) The train speed is 40 km/h or below.


Unpermitted BSK passage

F3296.  If no permission to pass BSK is given, the STM shall order full service braking.


F3297.  a) The full service braking shall be released when

1. The train has stopped, and

2. The driver has pressed the LOSS button.

b) The STM shall allow the mission to be continued when the driver also has acknowledged the "Passera skred" message.

c) If the driver does not acknowledge the "Passera skred" message, the roll-away check shall become active in the same way as after passing a stop signal [3.4.4].


Supervision and indication after BSK passage

F3298.  The indications shall be the following:

a) The MAIN INDICATOR shall display ' 00' and the PRE INDICATOR shall be blanked.

1. Exception for the PRE INDICATOR: when there is a more restrictive braking curve ($V_{TARG} < 40$ km/h).

2. Exception for the MAIN INDICATOR: when approaching a level crossing (' 0H').

3. The exceptions shall not be applied while the train is braked down after an unpermitted BSK passage.

b) The MAX SPEED BAR shall indicate 0 km/h (stop) and the TARGET SPEED BAR shall be extinguished.

c) A max speed of 40 km/h shall be supervised.

d) The PASSERA SKRED indicator shall be lit.[116]

*Note*. This applies also while the train is braked down to stand-still after an unpermitted BSK passage.

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[116] Differs from [ATC2], lacking there

F3299. When passing BSK within the target window (80 ... 120% of the original target distance), the braking curve provided by FSK shall be terminated.

*Note.* Linking provided by FSK/FSKA is also terminated.

*Note.* The BSK supervision is terminated when the train has passed the other end of the landslide area which shall be indicated by an SSK balise, see below.

F3299A. If a BSK board is passed and there is no pemission to pass (see above), the STM shall send a TRIP message according to [ESTMA §7.2.10 Packet STM-18].

### 3.11.3.5 Passing BSKA, Annulled start of landslide warning

F3300. When passing BSKA within the target window (80 ... 120% of the original target distance), any supervision from FSK or a previous BSK shall be terminated.

*Note.* The linking from FSK or FSKA is also terminated.

### 3.11.3.6 Passing SSK, End of landslide warning

F3301. a) When passing SSK after BSK, the STM shall finish the supervision and indication caused by BSK passage.

b) The 40 km/h max speed shall be increased without any train length delay.

### 3.11.3.7 Passing SPTT, End of all PT restrictions

F3302. When passing SPTT all maximum speeds of category PT, no. 1..9, shall be erased.

### 3.11.3.8 Passing SET, End of ET restriction

F3303. When passing SET, possible maximum speed from HT-ET shall be erased.

## 3.11.4 Borders - transitions between different areas

The following functions exist:

*Table 3.11-4. Border balises (AX = 5)*

| AX | AY | AZ | Name | Meaning |
|----|----|----|------|---------|
| 5 | 4 | 7 | GMO | Border to Unequpped Area |
| | | 11 | BU | Border to Installation area |
| | 5 | 8 | -- | -- (reserve) |
| | | 11 | SU | End of Installation area |
| | 6 | 0..13 | GMD | Border to Partially Equipped Area with category G line speed information |

*A-note*. The following functions exist:

*A-Table 3.11-5. Border balises (AX = 5)*

| AX | AY | AZ | Name | Meaning |
|----|----|-----|------|---------|
| 5 | 4 | 7 | GMO | Border to Unequpped Area |
| | | 11 | BU | Border to Installation area |
| | 5 | 8 | SX | End of Shunting |
| | | 11 | SU | End of Installation area |
| | 6 | 0..13 | GMD | Border to Partially Equipped Area with category G line speed information |

A category G line speed – which can be used after an area border – is never erased by a BU or GMO balise, or at balise error. This line speed can be removed (replaced) by the line speed from a new HT-T speed board or GMD border group and erased by an SU group.

If the new line speed becomes higher than the old one (area line speed G > mandatory line speed T) at the border, the speed increase will take place after train length delay.

A border group (GMO, BU, GMD) can terminate every braking curve, if there should be more than one matching OT.[117]


### 3.11.4.1 GMO, Border to Non-Equipped Area

F3304.     a) When passing GMO, a continuous audible signal of 5 seconds duration, f2, shall be activated.

b) Current supervision and indication (speed bars etc) shall continue during this period.


F3305.51a  Reserve.

a)-b)   Reserve.


F3306.     If a warning board of category G, A(5,14,1..12), aims at GMO:

a) The target speed supervision shall be terminated.

b) The information of the warning board shall be set as the line speed of the Non-Equipped Area.

*Note.* This will also apply if the information represents a speed increase.

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[117] Differs from [ATC2]

*Note.* For the case when more than one OT aims at the border group, refer to [4.6.5.3]

F3307.     Five (5) seconds after passing GMO, the following shall occur:

    a) All balise information as maximum speed, braking curve information and balise error alarm, shall be erased (and therefore not supervised anymore).

      1. Exception: a previously received, still valid speed category G line speed.[118]

    b) The speed indications (speed bars and speed indicators) shall be extinguished.

*Note.* If no category G warning board was aiming at the GMO (and there is no previously received, still valid category G speed), the train speed will be limited to the dark speed 130 km/h in Non-Equipped Area [4.3.8.2].

### 3.11.4.2 BU, Beginning of Installation area

F3308.     a) When passing BU a continuous audible signal of 5 seconds duration, f2, shall be activated.

    b) Current supervision and currently indicated speed bars shall continue during this period.

F3309.51a   Reserve.

    a)-b)   Reserve.

F3310.     Five (5) s after passing BU, this shall occur:

    a) All balise information as maximum speed, braking curve information and balise error alarm shall be erased (and therefore not supervised anymore).

      1. Exception: a previously received, still valid speed category G line speed.[119]

    b) The speed indications (speed bars and speed indicators) shall be extinguished.

*Note.* Subsequently the system will become passive and balise error alarms will not be generated. Balise administration will cease with the exception of SU balises.

---

[118] This speed can only be erased by a new HT-T speed board
[119] This speed can only be erased by a new HT-T speed board

F3311.     a) If a warning board of category G, A(5,14,1..12), aims at BU, the information of this OT shall be set as a line speed of the Installation Area.

b) This shall also apply if the information represents a speed increase.

*Note.* If no category G warning board is aiming at the GMO (and there is no previously received, still valid category G speed), the train speed will be limited to the dark speed 130 km/h in Installation Area [4.3.8.2].

*Note.* For the case when more than one OT aims at the border group, refer to [4.6.5.3]

### 3.11.4.3  End of Installation area

F3312.51a  Reserve.

a) Reserve.
b) Reserve.[120]

A3312.51n  When passing SU:

a) Reserve.

*A-Note.* The passive state as defined above, will be terminated.

b) The category G line speed shall be erased.[121]

*A-Note.* This could otherwise be unnecessary restricting after leaving Installation area with an old area line speed below 130 km/h.

### 3.11.4.4  GMD, Border to Partially Equipped Area

F3313.51b  When passing GMD, and there is HT information:

a) All speed board memories shall be deleted.

b) Exceptions:

1. The line speed given by the GMD.

2. Reserve.

*Note.* Any consequent increase in speed will not have any effect until the train length has been travelled after passing the GMD balise group.

---

[120] Reserve.
[121] Differs from [ATC2]

A3313.51n When passing GMD, and there is HT information:

    a) All speed board memories shall be deleted.

    b) Exceptions:

        1. The line speed given by the GMD.

        2. BSK, beginning of landslide warning.

*A-Note.* Any consequent increase in speed will not have any effect until the train length has been travelled after passing the GMD balise group.

F3314. The information in the category A balise shall be used as the new line speed, $V_{LINE}$ [Table AT, column 6].

If the maximum speed exceeds 70 km/h in Partially Equipped Area, the speed bars will be extinguished, and the driver is informed by three dashes "− − −" according to certain rules [4.4.3].

F3315. If the train is already in Partially Equipped or Non-equipped area (where there is no HT information), only the line speed $V_{LINE}$ shall be changed when passing GMD (category G).

F3316.     a) Braking curves of category G shall be terminated by GMD if passed within the target window (80...120% of the original target distance).

    b) Other braking curves and semi-equipped speed restrictions in progress, shall not be affected by GMD.

*Note.* The target speed of the braking curve shall not be used as a new line speed, since this is given by the GMD.

### 3.11.4.5 Passing SX, End of Shunting State

F3317. Reserve.

A3317. The SX balise shall stop the train if it passes out of permitted shunting area during STM Shunting.[122]

    a) The STM shall emergency brake until the train stops.

    b) The braking shall be released after driver acknowledgement.

    c) Reserve.

---

[122] Differs from [ATC2], lacking there

*Note*. The max speed is 0 km/h to begin with. After entering new train data, the max speed will be increased to 40 km/h [4.3.8].

*A-note*. Shunting is also finished.

## 3.11.5    Notification balise group, AFSK

A landslide warning board (distant signal) FSK or FSKA requires a notification balise group, AFSK with A(5,4,0).

Linking starts on passing an AFSK notification group which can be terminated by either FSK or FSKA. Balise error alarm is generated if such a group is not detected within a distance of 150 m [3.3.3.3].

## 3.11.6    Speed increase with SH balises after switch point

### 3.11.6.1    General

The following functions exist:

*Table 3.11-6. SH-group*

| AX | AY | AZ | Meaning |
|----|----|----|---------|
|    |    | 1 | Increase to latest distant signal aspect |
| 5 | 7 | 2..12 | Increase to value from [Table AT] |
|    |    | 14 | Balise group annulled |

F3318.    If AY = 7 (SH group), and the previous main signal did not provide a Stop aspect when passed, then under certain conditions the stored main signal speed shall be increased:

a)    The last passed main signal must have had a Proceed aspect (not a stop signal).

b)    If there is no main signal speed ($V_{HSI}$) stored, no increase shall take place.

c)    The speed increase shall take place after train length delay.

*Note*. If the previous main signal was at Stop when passed, then the SH group will not have any effect and the supervision mode defined by the stop signal shall remain in effect until the next main signal is passed.

*Note*. A decreasing SH speed is ignored.

F3319.    An SH group shall not only have a direct effect on the main signal speed register, but shall also affect a possible category A extension.

a)    This means that the SH group shall become valid at the A-extended target point (without train length delay).

b)    This applies only if the A-extension is locked.

*Note*. See also the sub-section about termination of extended braking curves [4.6.3.2].

### 3.11.6.2  SH group with 50..270 km/h, AZ = 2..12

F3320.  a) The stored value for $V_{HSI}$ shall be increased to the value specified by the SH group.

b) The speed value shall not be changed if the SH group gives a lower speed value than that stored for $V_{HSI}$.

*Note.* The rest of the information is used for updating of existing distant signal information, see below.

### 3.11.6.3  SH* group, AZ = 1

F3321.  The stored value for $V_{HSI}$ shall be increased to the value provided from the latest distant signal aspect in the event that this is greater than the value of the main signal.

F3322.  If there is no distant signal information or it is lower than the current $V_{HSI}$, no speed change shall take place.

*Note.* The rest of the information is used for updating of existing distant signal information, see below.

### 3.11.6.4  Updating of braking curves

F3323.51a  a) Any braking curve from a distant signal shall be retained, but shall be updated with target distance and possible gradient.

b) If there are more than one braking curve, they shall be updated individually.

Exceptions to a-b:

c) If the SH group is detected after the basic target point (other than preset speed increase), the target distance shall not be extended.

d) If the SH group lacks gradient information, the old gradient information shall be retained.

e) With extension, the target distance shall not be updated once the braking curve has been fixed.

### 3.11.6.5  Updating linking distance

Linking distance is updated according to the section about linking at signals [3.3.2.4].

### 3.11.6.6  Preset speed increase

If SH-balises are detected after passing a signal indicating an increase (BY=14), and before the point of increase, then a balise error is generated [3.3]. This allows

track layout errors to be detected, which otherwise might permit excessive speed on certain routes.

F3324.    Reserve.

F3325.    Reserve.

F3326.    Reserve.

## 3.12    RESERVE

[123]

F3327.    Reserve.

F3328.    Reserve.

F3329.    Reserve.

F3330.    Reserve.

F3331.    Reserve.

F3332.    Reserve.

F3333.    Reserve.

---

[123] Removed section about radio balise groups. Was used in [ATC2]

## 3.13 PASSING A KILOMETRE BOARD

The km number and route identity shall be received at kilometer boards. Only one combination exists:

*Table 3.13-1. Kilometre board*

| N | P | A | | | B | | | C/P$_{OPP}$/N | | | D/N | MEANING |
|---|---|---|---|---|---|---|---|---|---|---|---|---------|
| X | X | X | Y | Z | X | Y | Z | X | Y | Z | X | |
| – | – | **13** | AYZ | | **11** | BYZ | | | -- | | – | Km board |

Coding:

- − AYZ is coded in M(16,11) but no code check is required.

- − BYZ can be coded in M(16,11) but no code check is performed.


Usage:

- − AYZ is intended to provide a reference point along the route (primarily equivalent to the kilometre boards).

- − BYZ is intended to identify the routes and possibly the track, which enables correct positioning to be determined.


F3334. The STM shall only perform the usual checking of codes and transmission of information to the STM recorder.

## 3.14    PASSING A RESERVE BALISE GROUP

The following balise combinations, not specifically defined, shall be handled as reserve balise groups.

*Table 3.14-1. Reserve balise groups*

| N | P | A | | | B | | | C/P$_{OPP}$/N | | | D/N | MEANING |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| X | X | X | Y | Z | X | Y | Z | X | Y | Z | X | |
| (12) | (8) | **13** | AY | AZ | **+ a not in itself valid combination of balises of categories 8, 9, 12, or 14** | | | | | | | Reserve |

F3335.   a) The STM shall check that the X-words in the balises are correctly coded

   b) The STM shall check that the configuration of the balise group is as defined in the table.

   c) The information shall be transmitted to the STM recorder in a similar manner as for other balise groups.

F3336.   Reserve balise groups shall not be handled in any other way by the STM.

*Note.* Reserve balise groups may contain arbitrary information which does not affect safety.

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## 3.15    INDEX

### 3.15.1    Changes, figures and tables