Chapter 8:
T A B L E S

Contents

8. TABLES ***3***

8.1 INTRODUCTION 3
8.1.1 Scope 3

8.2 VALID BALISE COMBINATIONS 5
8.2.1 BK-1a: Groups for the present direction, AX = 1...5 5
8.2.2 BK-1b: Groups for present direction, AX = 6-7, 10-11, 13 6
8.2.3 ABK-1b: Groups for present direction, AX = 6-7, 10-11, 13 7
8.2.4 BK-2: Balise groups for the opposite direction 8
8.2.5 ABK-2: Balise groups for the opposite direction 9

8.3 SPEED MESSAGES AT SIGNALS 11
8.3.1 HS, FS: Speed messages at signals, AX = 1 or 4 11
8.3.2 AFY, AFZ: Release group (AX=13, BX=13) 12

8.4 PT: PREFIX BALISES AT BOARDS, PX=8 15
8.4.1 PT.0 -- PT.1: Bit combinations 15
8.4.2 PT.2: Bit patterns for PT restrictions (codes) 16
8.4.3 PT.3: Axle loads 18
8.4.4 PT.4: Entered PT code 18

8.5 ENCODING OF DISTANCE AND GRADIENT 19
8.5.1 DF: Distance in B(9), or B(9) + C(14) balises 19
8.5.2 DP: Extension distance in prefix balises at signal, PX=8 21
8.5.3 DG: Distance information in B(14) balise 22
8.5.4 GR: Gradient information in B(14) or C(14) balise 23

8.6 SPEED MESSAGE AT BOARD 25
8.6.1 HO: speed and warning board with AX = 2, 6 or 7 25
8.6.2 HT: Coding of speed board HT, AX=3 27

8.7 AT: MISCELLANEOUS BOARD, AX=5 29

8.8 RESERVE 30

8.9 RESERVE 30

8.10 NR: SIGNAL NUMBERS 31

8.11 M8: MODIFIED HAMMING CODE M(8,4) 37

8.12 CO: LIST OF STM CONSTANTS 39

8.13 TRAIN PARAMETERS 41
8.13.1 CP: STM configuration parameters 41
8.13.2 BP: Brake percentage and deceleration (brake pos P/R) 43
8.13.3 BPG: Brake percentage and deceleration (brake pos.G) 44
8.13.4 TB: Train length and delay time (brake pos. P/R) 45
8.13.5 TBG: Train length and delay time (brake pos. G) 46

8.14 STM ERROR CODES 47

8.14.1 Reserve 47
8.14.2 TE1/ATE1, TE2: Trackside error codes 47

8.15 CC-FRS INDEX LIST 49
8.15.1 Changes, figures and tables 49

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

8. TABLES

8.1 INTRODUCTION

8.1.1 Scope

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

This chapter contains the ATC-2 balise coding and other tables for the STM.

F8001.52a The functionality of the STM shall be based on the following tables:

a) BK-1a Balise combinations

b) BK-1b Balise combinations

c) BK-2 Balise combinations

d) HS Signal speeds

e) FS Signal speeds

f)-g) Reserve.

h) PT.1 PT codes

i) PT.2 PT codes

j) PT.3 PT codes

k) PT.4 PT codes

l) DF Distances

m) DP Distances

n) DG Distances

o) GR Gradients

p) HO Board speeds

q) HT Board speeds

r) AT Miscellaneous board

s) NR Signal numbers

t) M8 Hamming codes

u) Reserve.

A8001.52a The functionality of the STM shall be based on the following tables:

a)	BK-1a	Balise combinations
b)	ABK-1b	Balise combinations
c)	ABK-2	Balise combinations
d)	HS	Signal speeds
e)	FS	Signal speeds
f)	AFY.	Release group
g)	AFZ.	Release group
h)	PT.1	PT codes
i)	PT.2	PT codes
j)	PT.3	PT codes
k)	PT.4	PT codes
l)	DF	Distances
m)	DP	Distances
n)	DG	Distances
o)	GR	Gradients
p)	HO	Board speeds
q)	HT	Board speeds
r)	AAT	Miscellaneous board
s)	NR	Signal numbers
t)	M8	Hamming codes
u)	Reserve.	

8.2 VALID BALISE COMBINATIONS

8.2.1 BK-1a: Groups for the present direction, AX = 1...5

BK-1a. *Table BK-1a. Groups for the present direction*

	N	P	A			B			C / Popp./ N			N	MEANING
	X	X	X	Y	Z	X	Y	Z	X	Y	Z	X	
a)	(12) 6)	(8)	1	0 (stop)	AZ 2)	9	BY	1-14	(12)	(NYZ)		–	Signal with 10 km/h release speed
b)								0	(14)	(CY)	(CZ)	(12) 6)	
c)				1-14				1-14	(12)	(NYZ)		–	
d)								0	14	1-14	CZ	(12) 6)	
e)	–	–	2	0-8	0-13	MARKER			(12)	(NYZ)		–	Warning board (OT)
f)		8		9-11	0-13 3)								
g)		–		12-14	0-13 1)								
h)				0-8	0-13	9	0-13	0	14	1-14	CZ	(12)	
i)		8		9-11	0-13 3)								
j)		–		12-14	1-13								
k)		(8)		AY	14	MARKER			(12)	(NYZ)		–	Annulled warning board
l)						9	BY	BZ	14	CY	CZ	(12)	
m)	–	–	3	0-8	0-13	3	BY	BZ	–			–	Speed board (HT)
n)						5							
o)						7			(8)	(PYZ)			
p)				9-14	0-13	MARKER			–				
q)				AY	14	3	BY	BZ					Annulled speed board
r)						5							
s)						7			(8)	(PYZ)			
t)						MARKER			–				
u)	(12) 6)	(8)	4	0 (stop)	AZ 2)	9	BY	1-14	(12)	(NYZ)		–	Signal with 40 km/h release speed
v)								0	(14)	(CY)	(CZ)	(12) 6)	
w)				1-14				1-14	(12)	(NYZ)		–	
x)								0	14	1-14	CZ	(12) 6)	
x1)	–	–	5	1	0-13	3/5/7	BY	BZ	–			–	Second.control
y)				2, 4-6	0 4) 1-13	3	BY	BZ	–			–	Miscellaneous board (DT) or speed board (HT)
z)						5							
A)						7			(8)	(PYZ)			
B)						9	0-13	1-14	(12)	(NYZ)		–	SH group (signal increase)
C)								0	14	> 0	CZ	(12)	
D)				8-14	0-13			1-14	– 5)			–	Warning board
E)								0	14	> 0	CZ	– 5)	
F)				AY	14	3	BY	BZ	–			–	Annulled miscellaneous, speed or warning board
G)						5							
H)						7			(8)	(PYZ)			
I)						9			(14)	(CY)	(CZ)	(12)	

1) Z = 0 for AVn, Z > 0 for OTVn. 2) Balise error if BY = 14 in certain cases.
3) Balise error: AY=11, AZ=12 ("OT-SPTS") 4) Reserve.
5) Balise error: an N(12) balise in this position. 6) Balise error if more than one N-balise
7) AZ = 0 or 13 are reserves

8.2.2 BK-1b: Groups for present direction, AX = 6-7, 10-11, 13

BK-1b. *Table BK-1b. Groups for the present direction*

	N	P	A			B			C / Popp./ N			N	MEANING
	X	X	X	Y	Z	X	Y	Z	X	Y	Z	X	
a)	–	–	6	0-8	0-13	9	0-13	1-14	(12)	(NYZ)		–	Warning board
b)						14	1-14	BZ					
c)		8		9-11	0-13 [2]	9	0-13	1-14					
d)						14	1-14	BZ					
e)		–		12-14	1-13	9	0-13	1-14					
f)						14	1-14	BZ					
g)		(8)		AY	14	9	BY	BZ					Annulled warning board
h)						14							
i)	–	–	7	0 [3], 1-8, 12-14	0-13	3	BY	BZ	–			–	Speed board
j)						5							
k)						7			(8)	(PYZ)			
l)		8		9-11	0-13	3	BY	BZ	–				
m)						5							
n)						7			(8)	(PYZ)			
o)		(8)		AY	14	3	BY	BZ	–			–	Annulled speed board
p)						5							
q)						7			(8)	(PYZ)			
r)	(12)	(8)	10	AY	AZ	9	BY	BZ	(14)	(CY)	(CZ)	(12)	Annulled signal or warning board
s)	–	–	10	AY	AZ	10	BY	BZ	–			–	Reserve
t)	–	–	13	AYZ		11	BYZ		–			–	Km board
u)	–	–	–	–	–	–	–	–	–			–	– (spare)
v)	(12)	(8)	13	AY	AZ	+ a combination (not valid in itself) of 8, 9, 12, 13 or 14 [1]							Reserve

1) Balise error if a category 13 balise is found together with balises = 0..7 or 10. More than one category 12 balise is allowed.

2) Balise error if AY = 11 and AZ = 12, "OT-SPTS" [Table HO]

3) *Note*. AX = 7 + AY = 0 causes overlap error in certain instances [3.3.5.6].

8.2.3 ABK-1b: Groups for present direction, AX = 6-7, 10-11, 13

ABK-1b. *A-Table ABK-1b. Groups for the present direction*

	N	P	A			B			C / Popp./ N			N	MEANING
	X	X	X	Y	Z	X	Y	Z	X	Y	Z	X	
a)	–	–	6	0-8	0-13	9	0-13	1-14	(12)	(NYZ)		–	Warning board
b)						14	1-14	BZ					
c)		8		9-11	0-13 [2]	9	0-13	1-14					
d)						14	1-14	BZ					
e)		–		12-14	1-13	9	0-13	1-14					
f)						14	1-14	BZ					
g)		(8)		AY	14	9	BY	BZ					Annulled warning board
h)						14							
i)	–	–	7	0 [3], 1-8, 12-14	0-13	3	BY	BZ	–			–	Speed board
j)						5							
k)						7			(8)	(PYZ)			
l)		8		9-11	0-13	3	BY	BZ	–				
m)						5							
n)						7			(8)	(PYZ)			
o)		(8)		AY	14	3	BY	BZ	–			–	Annulled speed board
p)						5							
q)						7			(8)	(PYZ)			
r)	(12)	(8)	10	AY	AZ	9	BY	BZ	(14)	(CY)	(CZ)	(12)	Annulled signal or warning board
s)	–	–	10	AY	AZ	10	BY	BZ	–			–	Reserve
t)	–	–	13	AYZ		11	BYZ		–			–	Km board
u)	–	–	13	AY	AZ	13	BY	BZ	–			–	Release speed
v)	(12)	(8)	13	AY	AZ	+ a combination (not valid in itself) of 8, 9, 12 or 14 [1]							Reserve

1) Balise error if a category 13 balise is found together with balises = 0..7 or 10. More than one category 12 balise is allowed.

2) Balise error if AY = 11 and AZ = 12, "OT-SPTS" [Table HO]

3) *Note*. AX = 7 + AY = 0 causes overlap error in certain instances [3.3.5.6].

8.2.4 BK-2: Balise groups for the opposite direction

BK-2. *Table BK-2. Groups for the opposite direction*

	D/N	C/P/N			B			A			P	N	MEA-NING
	X	X	Y	Z	X	Y	Z	X	Y	Z	X	X	
a)	–	(12)	(NYZ)		9	BY	BZ	**1**	AY	AZ	(8)	(12)	Signal
b)	(12)	14	CY	CZ									
c)	–	(12)	(NYZ)		MARKER			**2**	AY	AZ	(8)	–	Warning board
d)	(12)	14	CY	CZ	9	BY	BZ						
e)	–	–			MARKER			**3**	9-14	AZ	–	–	Speed board
f)	–	(12)	(NYZ)		9	BY	BZ	**4**	AY	AZ	(8)	(12)	Signal
g)	(12)	14	CY	CZ									
h)	–	(12)	(NYZ)		9	BY	BZ	**5**	AY	AZ	–	–	Warning board
i)	(12)	14	CY	CZ									
j)	–	(12)	(NYZ)		9	BY	BZ	**5**	AY	AZ	–	–	SH group
k)	(12)	14	CY	CZ									
l)	–	(12)	(NYZ)		9	BY	BZ	**6**	AY	AZ	(8)	–	Warning board
m)					14	BY	BZ						
n)	–	(12)	(NYZ)		9	BY	BZ	**10**	AY	AZ	(8)	(12)	Annulled signal or warning board
o)	(12)	14	CY	CZ									
p)	–	–			11	BY	BZ	**13**	AY	AZ	–	–	Km board
q)	+ a combination (not valid in itself) of 8, 9, 12, 13 or 14							**13**	AY	AZ	(8)	(12)	Reserve

Explanations:

- Marker + A(3) shall be permitted only if AY = 9..14!
- Balise group with AX=7 shall never be considered as intended for the opposite direction (always valid for both directions).

8.2.5 ABK-2: Balise groups for the opposite direction

ABK-2. *A-Table ABK-2. Groups for the opposite direction*

	D/N	C/P/N			B			A			P	N	MEA-NING
	X	X	Y	Z	X	Y	Z	X	Y	Z	X	X	
a)	–	(12)	(NYZ)		9	BY	BZ	**1**	AY	AZ	(8)	(12)	Signal
b)	(12)	14	CY	CZ									
c)	–	(12)	(NYZ)		MARKER			**2**	AY	AZ	(8)	–	Warning board
d)	(12)	14	CY	CZ	9	BY	BZ						
e)	–	–			MARKER			**3**	9-14	AZ	–	–	Speed board
f)	–	(12)	(NYZ)		9	BY	BZ	**4**	AY	AZ	(8)	(12)	Signal
g)	(12)	14	CY	CZ									
h)	–	(12)	(NYZ)		9	BY	BZ	**5**	AY	AZ	–	–	Warning board
i)	(12)	14	CY	CZ									
j)	–	(12)	(NYZ)		9	BY	BZ	**5**	AY	AZ	–	–	SH group
k)	(12)	14	CY	CZ									
l)	–	(12)	(NYZ)		9	BY	BZ	**6**	AY	AZ	(8)	–	Warning board
m)					14	BY	BZ						
n)	–	(12)	(NYZ)		9	BY	BZ	**10**	AY	AZ	(8)	(12)	Annulled signal or warning board
o)	(12)	14	CY	CZ									
p)	–	–			11	BY	BZ	**13**	AY	AZ	–	–	Km board
q)	+ a combination (not valid in itself) of 8, 9, 12 or 14							**13**	AY	AZ	(8)	(12)	Reserve

Explanations:

- Marker + A(3) shall be permitted only if AY = 9..14!
- Balise group with AX=7 shall never be considered as intended for the opposite direction (always valid for both directions).

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8.3 SPEED MESSAGES AT SIGNALS

8.3.1 HS, FS: Speed messages at signals, AX = 1 or 4

HS, FS. *Table HS. Main signal.*

	AY	Main signal aspect V_{HSI} (km/h)
a)	**0**	0 [1] (Stop signal)
b)	**1**	40
c)	**2**	50
d)	**3**	60
e)	**4**	70
f)	**5**	80
g)	**6**	90
h)	**7**	100
i)	**8**	130
j)	**9**	160
k)	**10**	190
l)	**11**	220
m)	**12**	270 (L)
n)	**13**	0 [1]
o)	**14**	No main signal information

Table FS.Distant signal.

AZ	Distant signal aspect, V_{FSI} (km/h)			
	Without extended target point	A-extended target point (PY = 2..6)	P-extended target point (PY=7..14)	Preset speed increase if $V_{FSI} > V_{HSI} > 0$ and BY=14
0	0	0 [2]	0 [2]	– [3]
1	40	40	0	– [3]
2	50	50	50	50
3	60	60	60	60
4	70	70	70	70
5	80	80	80	80
6	90	90	90	90
7	100	100	100	100
8	130	130	130	130
9	160	160	160	160
10	190	190	190	190
11	220	220	220	220
12	270 (L)	270 (L) [2]	270 (L) [2]	270 (L)
13	0	0 [2]	0 [2]	– [3]
14	No distant signal information			

Explanations:

1) After passing a stop signal (and during a permitted stop passage), V_{HSI} = 40 km/h
2) Distant signal aspects 0 and L (AZ = 0 or 12) cause extension to be ignored (no target distance extension)
3) Preset speed increase is not possible at these aspects (balise error).

Refer also to [Chapter 3].

8.3.2 AFY, AFZ: Release group (AX=13, BX=13)

This balise group can increase the currently supervised release speed for a distant signal at Expect Stop.

FY, FZ. Reserve.

AFY, AFZ. *A-Table AFY. V_{REL} / Overlap*

	AY	Before the train has stopped. V_{REL} or Overlap [3) 5)]
a)	**0**	Annulled. [7)]
b)	**1**	20 km/h.
c)	**2**	30 km/h.
d)	**3**	40 km/h.
e)	**4**	50 km/h.
f)	**5**	50 m.
g)	**6**	75 m.
h)	**7**	100 m.
i)	**8**	125 m.
j)	**9**	150 m.
k)	**10**	175 m.
l)	**11**	200 m.
m)	**12**	225 m.
n)	**13**	250 m.
o)	**14**	275 m.

A-Table AFZ. V_{REL} / Overlap

AZ	After the train has stopped.[1] Release speed V_{REL} or Distance to DP [3) 5) 6)]
0	Annulled. [7)]
1	40 km/h.
2	50 m.
3	75 m.
4	100 m.
5	125 m.
6	150 m.
7	40 km/h if the train stops according to condition 1) below.[4)] Otherwise 10 km/h.
8	40 km/h if the train stops according to condition 1) below.[4)] Otherwise 25 m.
9	40 km/h if the train stops according to condition 1) below.[4)] Otherwise 50 m.
10	40 km/h if the train stops according to condition 1) below.[4)] Otherwise 75 m.
11	40 km/h if the train stops according to condition 2) below.[4)] Otherwise 10 km/h.
12	40 km/h if the train stops according to condition 2) below.[4)] Otherwise 25 m.
13	40 km/h if the train stops according to condition 2) below.[4)] Otherwise 50 m.
14	40 km/h if the train stops according to condition 2) below.[4)] Otherwise 75 m.

Conditions

1) 40 km/h shall apply if...

   a. The basic target distance to the signal is ≤ 700 m and the train stopped earliest at 38 m before the target point, or

   b. The basic target distance is ≤ 1400 m and the train stopped earliest at 25 m before the target point.

[1] Reserve.

2) 40 km/h shall apply if ...

   a. The basic target distance to the signal is ≤ 700 m and the train stopped earliest at 8 m before the target point, or

   b. The basic target distance is ≤ 1400 m and the train stopped ≥ 5 m after the target point.

3) The computed release speed shall be limited to max 40 km/h.

A-note.

4) Explanations to conditions 1) and 2):

   a. The basic target distance is the same as the linking distance without margin.

   b. These conditions are related to the distance table steps.

   c. For 1a) and 2a), adding 12 m to the train stop distances gives the corresponding maximum distances left to the physical main or combined signal at the target point.

   d. For 1b) and 2b), adding or 25 to the train stop distances gives the corresponding maximum distances left to the physical main or combined signal at the target point.

5) Explanation to condition 3): The lowest main signal speed is – except from stop – 40 km/h, and can be received from the signal group at the target point.

6) Distance to DP is the available distance after the end point (*skyddsavstånd* or *skyddsträcka*).

7) The release group is able to increase an existing release speed from a distant signal, combined signal or linking group(normally 10 km/h). To keep this existing release speed before or after the train has stopped, set AY=0 or AZ=0 respectively.

   a. If AY = 1..14 and AZ = 0, the release speed is only changed before the train has stopped.

   b. If AY = 0 and AZ = 1..14, the release speed is only changed after the train has stopped.

   c. If AY = 0 and AZ = 0, the release speed is not changed at all. Information from any release group (now or earlier) is cancelled.

   d. For a single-directed release group, just set AY=0 and AZ=0 in the opposite-directed balise. For a double-directed release group, set such BY and BZ values that apply for the other direction.

   e. It is possible to have several release groups after each other.

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8.4 PT: PREFIX BALISES AT BOARDS, PX=8

8.4.1 PT.0 -- PT.1: Bit combinations

Note. Available PT bits to be handled:

Table PT.0. PYZ with M(16,11) code

0	i9	i8	i6	i7	i5	i4	c4	i3	i2	i1	0	c3	c2	c1	c0

i = information bit, c = check bit.

Bits i9...i1 = the PT code parameter, 000...777 (octal).

PT.1 *Table PT.1.*

i_n = 0 means that the STM shall assume that the board's speed aspect applies to a train of category Pn.

Table PT.1. The nine PT code bits (i9...i1).

	Bit in PT code	Active value	Octal value	Function/Description
a)	None	None	777	No valid PT bit
b)	i9	0	377	Reserve
c)	i8	0	577	Reserve
d)	i7	0	677	Reserve
e)	i6	0	737	Trains with 20 < axle load ≤ 22.5 tons (Stax D)
f)	i5	0	757	Trains with 22,5 < axle load ≤25,0 tons (Stax 25)
g)	i4	0	767	Trains with axle load > 25 tons (Stax >25)
h)	i3	0	773	Reserve
i)	i2	0	775	Reserve
j)	i1	0	776	Reserve

Note. The most restrictive PT code is 000, i.e. all PT restrictions enabled. The PT code for a less restricted train will contain one or several bits set to one, e.g. "i6" for a train with normal axle loading. The restriction will be ignored by the train in question, even if the equivalent bit in the PT code from the transponder also is set to zero. If a zero is present in the balise *and* the PT code of the train, the restriction will be activated for that train.

Note. The code value is set in the following way:

- Start with a value of 777 (octal).
- Subtract the octal value for the code of current restriction according to the table above (i.e "Trains with Stax D" will give 777 - 40 = 737).
- Take the given value and match it with table PT.2 to get the hexadecimal value for the code of the prefix balise.

8.4.2 PT.2: Bit patterns for PT restrictions (codes)

PT.2 *Table PT.2. Bit patterns for PT restrictions (bits i9...i1)*

+	0	1	2	3	4	5	6	7
000	00/00	00/2B	00/4D	00/66	00/8E	00/A5	00/C3	00/E8
010	03/03	03/28	03/4E	03/65	03/8D	03/A6	03/C0	03/EB
020	05/05	05/2E	05/48	05/63	05/8B	05/A0	05/C6	05/ED
030	06/06	06/2D	06/4B	06/60	06/88	06/A3	06/C5	06/EE
040	11/06	11/2D	11/4B	11/60	11/88	11/A3	11/C5	11/EE
050	12/05	12/2E	12/48	12/63	12/8B	12/A0	12/C6	12/ED
060	14/03	14/28	14/4E	14/65	14/8D	14/A6	14/C0	14/EB
070	17/00	17/2B	17/4D	17/66	17/8E	17/A5	17/C3	17/E8
100	09/09	09/22	09/44	09/6F	09/87	09/AC	09/CA	09/E1
110	0A/0A	0A/21	0A/47	0A/6C	0A/84	0A/AF	0A/C9	0A/E2
120	0C/0C	0C/27	0C/41	0C/6A	0C/82	0C/A9	0C/CF	0C/E4
130	0F/0F	0F/24	0F/42	0F/69	0F/81	0F/AA	0F/CC	0F/E7
140	18/0F	18/24	18/42	18/69	18/81	18/AA	18/CC	18/E7
150	1B/0C	1B/27	1B/41	1B/6A	1B/82	1B/A9	1B/CF	1B/E4
160	1D/0A	1D/21	1D/47	1D/6C	1D/84	1D/AF	1D/C9	1D/E2
170	1E/09	1E/22	1E/44	1E/6F	1E/87	1E/AC	1E/CA	1E/E1
200	21/0A	21/21	21/47	21/6C	21/84	21/AF	21/C9	21/E2
210	22/09	22/22	22/44	22/6F	22/87	22/AC	22/CA	22/E1
220	24/0F	24/24	24/42	24/69	24/81	24/AA	24/CC	24/E7
230	27/0C	27/27	27/41	27/6A	27/82	27/A9	27/CF	27/E4
240	30/0C	30/27	30/41	30/6A	30/82	30/A9	30/CF	30/E4
250	33/0F	33/24	33/42	33/69	33/81	33/AA	33/CC	33/E7
260	35/09	35/22	35/44	35/6F	35/87	35/AC	35/CA	35/E1
270	36/0A	36/21	36/47	36/6C	36/84	36/AF	36/C9	36/E2
300	28/03	28/28	28/4E	28/65	28/8D	28/A6	28/C0	28/EB
310	2B/00	2B/2B	2B/4D	2B/66	2B/8E	2B/A5	2B/C3	2B/E8
320	2D/06	2D/2D	2D/4B	2D/60	2D/88	2D/A3	2D/C5	2D/EE
330	2E/05	2E/2E	2E/48	2E/63	2E/8B	2E/A0	2E/C6	2E/ED
340	39/05	39/2E	39/48	39/63	39/8B	39/A0	39/C6	39/ED
350	3A/06	3A/2D	3A/4B	3A/60	3A/88	3A/A3	3A/C5	3A/EE
360	3C/00	3C/2B	3C/4D	3C/66	3C/8E	3C/A5	3C/C3	3C/E8
370	3F/03	3F/28	3F/4E	3F/65	3F/8D	3F/A6	3F/C0	3F/EB
400	41/0C	41/27	41/41	41/6A	41/82	41/A9	41/CF	41/E4
410	42/0F	42/24	42/42	42/69	42/81	42/AA	42/CC	42/E7
420	44/09	44/22	44/44	44/6F	44/87	44/AC	44/CA	44/E1
430	47/0A	47/21	47/47	47/6C	47/84	47/AF	47/C9	47/E2
440	50/0A	50/21	50/47	50/6C	50/84	50/AF	50/C9	50/E2
450	53/09	53/22	53/44	53/6F	53/87	53/AC	53/CA	53/E1
460	55/0F	55/24	55/42	55/69	55/81	55/AA	55/CC	55/E7
470	56/0C	56/27	56/41	56/6A	56/82	56/A9	56/CF	56/E4

+	0	1	2	3	4	5	6	7
500	48/05	48/2E	48/48	48/63	48/8B	48/A0	48/C6	48/ED
510	4B/06	4B/2D	4B/4B	4B/60	4B/88	4B/A3	4B/C5	4B/EE
520	4D/00	4D/2B	4D/4D	4D/66	4D/8E	4D/A5	4D/C3	4D/E8
530	4E/03	4E/28	4E/4E	4E/65	4E/8D	4E/A6	4E/C0	4E/EB
540	59/03	59/28	59/4E	59/65	59/8D	59/A6	59/C0	59/EB
550	5A/00	5A/2B	5A/4D	5A/66	5A/8E	5A/A5	5A/C3	5A/E8
560	5C/06	5C/2D	5C/4B	5C/60	5C/88	5C/A3	5C/C5	5C/EE
570	5F/05	5F/2E	5F/48	5F/63	5F/8B	5F/A0	5F/C6	5F/ED
600	60/06	60/2D	60/4B	60/60	60/88	60/A3	60/C5	60/EE
610	63/05	63/2E	63/48	63/63	63/8B	63/A0	63/C6	63/ED
620	65/03	65/28	65/4E	65/65	65/8D	65/A6	65/C0	65/EB
630	66/00	66/2B	66/4D	66/66	66/8E	66/A5	66/C3	66/E8
640	71/00	71/2B	71/4D	71/66	71/8E	71/A5	71/C3	71/E8
650	72/03	72/28	72/4E	72/65	72/8D	72/A6	72/C0	72/EB
660	74/05	74/2E	74/48	74/63	74/8B	74/A0	74/C6	74/ED
670	77/06	77/2D	77/4B	77/60	77/88	77/A3	77/C5	77/EE
700	69/0F	69/24	69/42	69/69	69/81	69/AA	69/CC	69/E7
710	6A/0C	6A/27	6A/41	6A/6A	6A/82	6A/A9	6A/CF	6A/E4
720	6C/0A	6C/21	6C/47	6C/6C	6C/84	6C/AF	6C/C9	6C/E2
730	6F/09	6F/22	6F/44	6F/6F	6F/87	6F/AC	6F/CA	6F/E1
740	78/09	78/22	78/44	78/6F	78/87	78/AC	78/CA	78/E1
750	7B/0A	7B/21	7B/47	7B/6C	7B/84	7B/AF	7B/C9	7B/E2
760	7D/0C	7D/27	7D/41	7D/6A	7D/82	7D/A9	7D/CF	7D/E4
770	7E/0F	7E/24	7E/42	7E/69	7E/81	7E/AA	7E/CC	7E/E7

Note. This table converts codes (Y/Z) between the octal and hexadecimal forms for the various PT bit combinations.

Note. The PT bits are given in octal form, where the three digits in the number are equivalent to the 9 variable bits i9..i1 in the prefix balise. The bits are read as the left column + the value in the top row, e.g. 513 (= 510 + 3) indicates codes 4B/60.

Note. The PT bits are set according to the combination input by the driver, but with the value 2 subtracted from each digit, e.g. 513 is input but the driver as 735.

Note. In an SPTS group, the bits are set to zero for those restrictions that are still to apply after the SPTS.

8.4.3 PT.3: Axle loads

This table shall be used by the STM as an input to the calculation of the PT code parameter [4.2].

PT.3 *Table PT.3. Axle load categories from the ETCS*

	Values	Axle load categories	tons	Computed PT code. Related PT bits under-lined (binary, octal)
a)	0	A	16	111 111 111
b)	1	HS17	17	111 111 111
c)	2	B1	18	111 111 111
d)	3	B2	18	111 111 111
e)	4	C2	20	111 111 111
f)	5	C3	20	111 111 111
g)	6	C4	20	111 111 111
h)	7	D2	22,5	111 011 111
i)	8	D3	22,5	111 011 111
j)	9	D4	22,5	111 011 111
k)	10	D4XL	22,5	111 011 111
l)	11	E4	25	111 001 111
m)	12	E5	25	111 001 111
n)	13-127	Spares	–	–

[ESRS – 7.5.1.62]

8.4.4 PT.4: Entered PT code

These are the PT codes that the STM shall receive when entered by the driver (or preset in the computer memory) as an STM train parameter [4.2].

PT.4 *Table PT.4. Coding of the PT bits (bits i9...i1)*

	1	2	3	4	5
	Axle Load (tons)	**Related PT bits underlined (binary, octal)**	**Results after AND-ing with the default PT code 076 (octal)**	**Set PT Code**	**Comment**
a)	0,0 < AL.≤ 20,0	111 111 111	076	298	–
b)	20,0 < AL ≤ 22,5	111 011 111	036	258	Stax D
c)	22,5 < AL.≤ 25,0	111 001 111	016	238	Stax 25
d)	> 25,0 or unknown	111 000 111	006	228	Stax > 25

8.5 ENCODING OF DISTANCE AND GRADIENT

8.5.1 DF: Distance in B(9), or B(9) + C(14) balises

About the distance table below:

- This table applies to signals, linking groups and warning boards where BX = 9 and possibly CX = 14.
- Y=14: Distance to the preset point of speed increase at a combined signal.
- Y=0..13: Distance to a restrictive target point, but also distance for linking between signals or certain types of boards.

DF. *Table DF. Basic distance in meters from a B(9) balise*

BZ or CY		BY:0	1	2	3	4	5	6	7	8	9	10	11	12	13	14
a)	**0**	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
b)	**1**	12,5	187,5	362,5	537,5	725	1075	1450	2200	3600	5000	6400	7800	9200	10600	700
c)	**2**	25,0	200,0	375,0	550,0	750	1100	1500	2300	3700	5100	6500	7900	9300	10700	650
d)	**3**	37,5	212,5	387,5	562,5	775	1125	1550	2400	3800	5200	6600	8000	9400	10800	600
e)	**4**	50,0	225,0	400,0	575,0	800	1150	1600	2500	3900	5300	6700	8100	9500	10900	550
f)	**5**	62,5	237,5	412,5	587,5	825	1175	1650	2600	4000	5400	6800	8200	9600	11000	500
g)	**6**	75,0	250,0	425,0	600,0	850	1200	1700	2700	4100	5500	6900	8300	9700	11100	450
h)	**7**	87,5	262,5	437,5	612,5	875	1225	1750	2800	4200	5600	7000	8400	9800	11200	400
i)	**8**	100,0	275,0	450,0	625,0	900	1250	1800	2900	4300	5700	7100	8500	9900	11300	350
j)	**9**	112,5	287,5	462,5	637,5	925	1275	1850	3000	4400	5800	7200	8600	10000	11400	300
k)	**10**	125,0	300,0	475,0	650,0	950	1300	1900	3100	4500	5900	7300	8700	10100	11500	250
l)	**11**	137,5	312,5	487,5	662,5	975	1325	1950	3200	4600	6000	7400	8800	10200	11600	200
m)	**12**	150,0	325,0	500,0	675,0	1000	1350	2000	3300	4700	6100	7500	8900	10300	11700	150
n)	**13**	162,5	337,5	512,5	687,5	1025	1375	2050	3400	4800	6200	7600	9000	10400	11800	100
o)	**14**	175,0	350,0	525,0	700,0	1050	1400	2100	3500	4900	6300	7700	9100	10500	11900	50
p)		12,5 m steps				25 m steps		50 m steps	100 m steps							-50 m steps

Explanations.

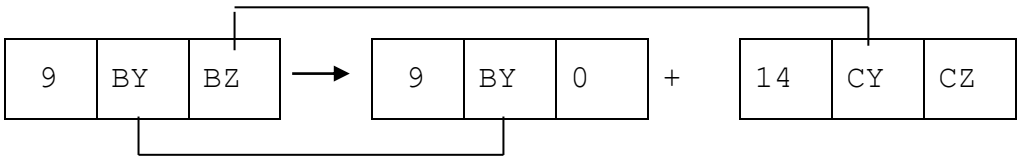
NA = Not Applicable, i.e. no legal distance. The value BZ=0 is however legal if a C(14) balise follows or if an associated signal gives a stop aspect.

Note. For track projecting purposes: the actual distance is rounded down to the nearest table value if the signal aspect is restrictive. With a preset speed increase the distance is rounded up.

Note. Balise error causes [3.3]:

- Distance message = 0 m gives a balise error alarm, except at a stop signal (if AY=0).
- BY = 14 may only be used at a combined signal where $V_{fsi} > V_{hsi}$. Else BY=14 will give a balise error alarm.
- Combinations in shaded fields may not be used (balise error) except at stop signals, or in a B-balise that links to a C(14) balise [3.6.1.5]. Combinations with CY = 0 will always cause balise error except for stop signals.

Note. If a C(14)-balise exists, BZ = 0 whereas the BZ code of the table is shifted to the C balise as Y word. Gradient to the target point is given in CZ:



8.5.2 DP: Extension distance in prefix balises at signal, PX=8

This table is used for distant signals or combined signals with an extended target distance.

DP. *Table DP. Extension distance in meters*

	PZ	PY:0	1	2	3	4	5	6	7	8	9	10	11	12	13	14
a)	**0**	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
b)	**1**	0	0	25	375	725	1075	1450	50	800	2200	3600	5000	6400	7800	9200
c)	**2**	0	0	50	400	750	1100	1500	100	900	2300	3700	5100	6500	7900	9300
d)	**3**	0	0	75	425	775	1125	1550	150	1000	2400	3800	5200	6600	8000	9400
e)	**4**	0	0	100	450	800	1150	1600	200	1100	2500	3900	5300	6700	8100	9500
f)	**5**	0	0	125	475	825	1175	1650	250	1200	2600	4000	5400	6800	8200	9600
g)	**6**	0	0	150	500	850	1200	1700	300	1300	2700	4100	5500	6900	8300	9700
h)	**7**	0	0	175	525	875	1225	1750	350	1400	2800	4200	5600	7000	8400	9800
i)	**8**	0	0	200	550	900	1250	1800	400	1500	2900	4300	5700	7100	8500	9900
j)	**9**	0	0	225	575	925	1275	1850	450	1600	3000	4400	5800	7200	8600	10000
k)	**10**	0	0	250	600	950	1300	1900	500	1700	3100	4500	5900	7300	8700	10100
l)	**11**	0	0	275	625	975	1325	1950	550	1800	3200	4600	6000	7400	8800	10200
m)	**12**	0	0	300	650	1000	1350	2000	600	1900	3300	4700	6100	7500	8900	10300
n)	**13**	0	0	325	675	1025	1375	2050	650	2000	3400	4800	6200	7600	9000	10400
o)	**14**	0	0	350	700	1050	1400	2100	700	2100	3500	4900	6300	7700	9100	10500
p)		No ex-ten-sion	Re-ser-ve	25 m steps				50m	50 m	100 m steps						
q)				A-extension (usuallly towards a switchpoint)					P-extension (usually at multi-aspect signalling). Extended Expect Stop is given with AZ = 1							

Note. If PZ = 0 or PY = 0 or 1, no extension is given.

8.5.3 DG: Distance information in B(14) balise

Target distance given in a B(14) balise of a warning board of category 6.

DG. *Table DG. Distance from warning board A(6)+B(14)*

	BY	Target distance in meters
a)	0	Not used. Balise error
b)	1	200
c)	2	400
d)	3	600
e)	4	800
f)	5	1000
g)	6	1200
h)	7	1400
i)	8	1600
j)	9	1800
k)	10	2000
l)	11	2200
m)	12	2400
n)	13	2600
o)	14	2800

8.5.4 GR: Gradient information in B(14) or C(14) balise

GR is the gradient information in B(14) balise at a warning board or in C(14) balise at a signal or in B(14) or C(14) at a warning board.

GR. *Table GR. Information about gradient in B/C(14)*

	BZ / CZ	Gradient GR (‰) 1)
a)	0	-40
b)	1	-35
c)	2	-30
d)	3	-25
e)	4	-20
f)	5	-15
g)	6	-10
h)	7	-5
i)	8	0
j)	9	+5
k)	10	+10
l)	11	+15
m)	12	+20
n)	13	+25
o)	14	+30

Explanation:

1) The value that shall be used by the ATC2-STM in the deceleration supervision.

(blank)

8.6 SPEED MESSAGE AT BOARD

8.6.1 HO: speed and warning board with AX = 2, 6 or 7

The HO table gives the target speed in km/h for warning boards, or the maximum speed in km/h for speed boards.

A speed board message of 0 km/h is not interpreted as correct [3.3].

HO. *Table HO. Speed and warning board*

		OT: AX = 2 or 6. HT: AX = 7												OT:AX = 2 or 6			HT: AX = 7		
	AZ	**AY: 0**	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**	**12**	**13**	**14**
a)	**0**	–	70	140	–	70	140	–	70	140	–	70	140	AV1	AV2	AV3	HT*V1	HT*V2	HT*V3
b)	**1**	5	75	150	5	75	150	5	75	150	5	75	150	30	30	30	30	30	30
c)	**2**	10	80	160	10	80	160	10	80	160	10	80	160	40	40	40	40	40	40
d)	**3**	15	85	170	15	85	170	15	85	170	15	85	170	50	50	50	50	50	50
e)	**4**	20	90	180	20	90	180	20	90	180	20	90	180	60	60	60	60	60	60
f)	**5**	25	95	190	25	95	190	25	95	190	25	95	190	70	70	70	70	70	70
g)	**6**	30	100	200	30	100	200	30	100	200	30	100	200	80	80	80	80	80	80
h)	**7**	35	105	210	35	105	210	35	105	210	35	105	210	90	90	90	90	90	90
i)	**8**	40	110	220	40	110	220	40	110	220	40	110	220	100	100	100	100	100	100
j)	**9**	45	115	230	45	115	230	45	115	230	45	115	230	110	110	110	110	110	110
k)	**10**	50	120	240	50	120	240	50	120	240	50	120	240	120	120	120	120	120	120
l)	**11**	55	125	250	55	125	250	55	125	250	55	125	250	130	130	130	130	130	130
m)	**12**	60	130	260	60	130	260	60	130	260	60	130	SPTS	140	140	140	140	140	140
n)	**13**	65	135	270	65	135	270	65	135	270	65	135	PTNA	V1A	V2A	V3A	V1A	V2A	V3A
o)	**14**	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A
p)		**T**			**K1**			**K2**			**PT**			**V1**	**V2**	**V3**	**V1**	**V2**	**V3**

Explanations

"–" = Balise error (incorrect combination) and "A" = Annulled group

AV1/2/3 Only with A(2) B(M), otherwise balise error.

SPTS Only with HT, otherwise balise error.

T No PT or K restrictions overlap. Ends K1, K2 and PT.

AY=0 Causes balise error if there are any K or PT restrictions to terminate.

Note. More explanations follows on the next page.

Abbreviation		Explanation
A	=	Balise group annulled for the present direction.
AV1- AV3	=	Notification balise for OT-Vn, warning board for level crossing. Always A(2) + B(Marker)
K1	=	Speed message for normal curve, may be exceeded by the percentage set with train data.
K2	=	Speed message at curve with abnormal transition curve or ramp, may be exceeded by 50% of the K1 value.
PT	=	Train dependent speed restriction with a prefix balise P(8).
PTNA	=	Annulled restriction with a prefix balise (OT or HT). Can terminate a braking curve but not a current restriction.
SPTS	=	Selective end of restriction with prefix balise (HT only)
T	=	Line speed restriction (the maximum speed limit for a track section). No PT or curve restrictions overlap (any such restriction is terminated). A category T warning board with AY=0 may not be located where a PT or K restriction exists (causes balise error). This is because a low PT or K restriction might be erroneously terminated by AY=0 which is a possible failure mode. [3.3].
V1, V2, V3	=	Release speed at level crossings. The target speed is always 0 km/h. Can be increased without train length delay.
V1A- V3A	=	Level crossing secured, no braking curve established, or an already established braking curve annulled.
HT*Vn	=	Beginning of balise protected level crossing. Assumes the braking curve's release speed as maximum speed.
"–"	=	Erroneous combination.

Note. Warning boards of categories T, K1, K2 and PT cannot be notified.

8.6.2 HT: Coding of speed board HT, AX=3

This table gives the maximum line speed V_{LINE} of category T in km/h for speed boards. A speed board message of 0 km/h causes a balise error alarm.

HT. *Table HT. Speed board of category 3*

		HT-T with A(3)+B(3), A(3)+ B(5), A(3)+B(7)									HT-T with A(3)+B(M)					
	AZ	**AY: 0**	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**
a)	**0**	–	70	140	–	70	140	–	70	140	–	70	140	–	70	140
b)	**1**	5	75	150	5	75	150	5	75	150	5	75	150	5	75	150
c)	**2**	10	80	160	10	80	160	10	80	160	10	80	160	10	80	160
d)	**3**	15	85	170	15	85	170	15	85	170	15	85	170	15	85	170
e)	**4**	20	90	180	20	90	180	20	90	180	20	90	180	20	90	180
f)	**5**	25	95	190	25	95	190	25	95	190	25	95	190	25	95	190
g)	**6**	30	100	200	30	100	200	30	100	200	30	100	200	30	100	200
h)	**7**	35	105	210	35	105	210	35	105	210	35	105	210	35	105	210
i)	**8**	40	110	220	40	110	220	40	110	220	40	110	220	40	110	220
j)	**9**	45	115	230	45	115	230	45	115	230	45	115	230	45	115	230
k)	**10**	50	120	240	50	120	240	50	120	240	50	120	240	50	120	240
l)	**11**	55	125	250	55	125	250	55	125	250	55	125	250	55	125	250
m)	**12**	60	130	260	60	130	260	60	130	260	60	130	260	60	130	260
n)	**13**	65	135	270	65	135	270	65	135	270	65	135	270	65	135	270
o)	**14**	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A
p)		PT and K-restrictions overlap			PT restriction overlaps. Ends K1, K2			K restriction overlaps. Ends PT			No PT or K restrictions overlap. Ends K1, K2, PT					
q)		Stored V_{HSI} is not affected												Stored V_{HSI} increased to L (270)		

Explanations

"–" = Balise error (incorrect combination)

A = Balise group annulled for this direction of travel.

K = Curve related max speed of category K1 or K2 [Table HO]

PT = Train dependent max speed for 1-9 different sub-categories, given by a prefix balise P(8)

T = Line speed.

Note. HT with AX=3 can be used in the following four cases:

- Instead of HT with AX=7 where a restriction of another category overlaps.
- If the B-balise can be a marker.
- If an increase of stored V_{HSI} is desired.
- If termination of a K1, K2 or PT restriction is wanted at a category T speed board with a speed ≤ 65 km/h (AY = 0), this must be performed with a category 3 balise in order to avoid balise error [8.6.1, under Explanations].

(blank)

8.7 AT: MISCELLANEOUS BOARD, AX=5

AT. *Table AT. Miscellaneous board or warning board with AX = 5*

		Miscellaneous board or speed board							**SH group or warning board**							
		Applies with A(5)+B(3), A(5)+ B(5) and A(5)+B(7) [+P(8)]							**Applies with A(5)+B(9) (+N(12)) and A(5)+B(9)+C(14) (+N(12))** 1)							
a)	**AZ**	**AY: 0**	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**
b)	**0**	–	S0	0	R	AFSK	BSK	30	R	0	0	0	140	0	140	FSK
c)	**1**	–	S1	10	R	SK1	BSKA	40	SH*	10	10	10	150	10	150	10
d)	**2**	–	S2	20	R	SK2	R	50	50	20	20	20	160	20	160	20
e)	**3**	–	S3	30	R	SPTT	R	60	60	30	30	30	170	30	170	30
f)	**4**	–	S4	40	R	SV1	R	70	70	40	40	40	180	40	180	40
g)	**5**	–	S5	50	R	SV2	R	80	80	50	50	50	190	50	190	50
h)	**6**	–	S6	60	R	SV3	R	90	90	60	60	60	200	60	200	60
i)	**7**	–	S7	70	R	GMO	SSK	100	100	70	70	70	210	70	210	70
j)	**8**	–	S8	80	R	DK 2)	R	110	130	80	80	80	220	80	220	80
k)	**9**	–	S9	90	R	R	R	120	160	90	90	90	230	90	230	90
l)	**10**	–	S10	100	R	ET140	SET	130	190	100	100	100	240	100	240	100
m)	**11**	–	S11	110	R	BU	SU	140	220	110	110	110	250	110	250	110
n)	**12**	–	S12	120	R	BMK2)	SMK2)	150	270	120	120	120	260	120	260	120
o)	**13**	–	S13	130	R	BHT2)	SHT2)	160	R	130	130	130	270	130	270	FSKA
p)	**14**	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A
q)		Not used, balise error (–)	Secon-dary control outputs	HT-ET 0-130 (km/h)	Re-ser-ves (R)	- Beginnings or Ends. - Borders. - HT-ET 140. - Reserves.		GMD (km/h)	SH, increase main signal speed	ET – Route dependent restriction						OTG, before border balise group (km/h)
r)										ETG Diverging		ETR Straight route				
s)										Fsi con-trols	Hsi con-trols	Fsi controls		Hsi controls		

Explanations

"A" = Annulled group and "R" = Reserve.

1) Number balise can be used for SH group only. If AY= 8...14 and a number balise (12) is detected, balise error BF1 shall be given.

2) Not used by the STM. Reserved for [ATC2].

Note. Reserve.

AAT. *A-Table AAT. Reserve.*

Note. More explanations follows on the next page.

Abbreviation		Meaning
–	=	Illegal combination (Balise error).
A	=	Annulled balise group (applies to the present direction).
AFSK	=	Notification of landslide warning board, FSK within 150 m.
BSK	=	Start of landslide warning.
BSKA	=	Start of landslide warning, annulled.
BU/SU	=	Start/End of Installation Area
ETG, ETR	=	Warning board for a route dependent restriction
FSK	=	Landslide warning board (“distant signal”)
FSKA	=	Annulled landslide warning board.
GMD	=	Border with Partially Equipped Area.
GMO	=	Border with Non-Equipped Area.
HT-ET	=	Speed board for ET restriction.
OTG	=	Area warning board. Determines line speed after border.
R	=	Reserve balise (ignored, no balise error)
SET	=	End of ET restriction.
SH	=	Signal increase, of stored main signal speed V_{HSI}. Updates distant signal and linking information.
SH*	=	Increase V_{HSI} to the level of latest received distant signal speed.
SK1, SK2	=	End of curve dependent restriction.
Sn	=	Secondary control output no n. Not used by the STM (but by [ATC2]).
SPTT	=	End of all PT restrictions.
SSK	=	End of landslide warning.
SV1-SV3	=	End of speed restriction at level crossing.

8.8 RESERVE

RO. Reserve.

8.9 RESERVE

RK. Reserve.

8.10 NR: SIGNAL NUMBERS

Numbers for signal groups or warning boards. Reserve information when used at signals (former radio function), but affects the repetition of warning boards.

NR. *Table NR. Signal numbers in M(16,11) code*

MODIFIED HAMMING CODE M(16,11) FOR Y/Z IN BALISES, NX=12

+	0	1	2	3	4	5	6	7	8	9
0	**00/00**	**00/17**	**00/2B**	**00/3C**	**00/4D**	**00/5A**	**00/66**	**00/71**	**00/8E**	**00/99**
10	**00/A5**	**00/B2**	**00/C3**	**00/D4**	**00/E8**	[00/FF]	03/03	03/14	03/28	03/3F
20	03/4E	03/59	03/65	03/72	03/8D	03/9A	03/A6	03/B1	03/C0	03/D7
30	03/EB	03/FC	05/05	05/12	05/2E	05/39	05/48	05/5F	05/63	05/74
40	05/8B	05/9C	05/A0	05/B7	05/C6	05/D1	05/ED	05/FA	06/06	06/11
50	06/2D	06/3A	06/4B	06/5C	06/60	06/77	06/88	06/9F	06/A3	06/B4
60	06/C5	06/D2	06/EE	06/F9	11/06	11/11	11/2D	11/3A	11/4B	11/5C
70	11/60	11/77	11/88	11/9F	11/A3	11/B4	11/C5	11/D2	11/EE	11/F9
80	12/05	12/12	12/2E	12/39	12/48	12/5F	12/63	12/74	12/8B	12/9C
90	12/A0	12/B7	12/C6	12/D1	12/ED	12/FA	14/03	14/14	14/28	14/3F
100	14/4E	14/59	14/65	14/72	14/8D	14/9A	14/A6	14/B1	14/C0	14/D7
110	14/EB	14/FC	**17/00**	**17/17**	**17/2B**	**17/3C**	**17/4D**	**17/5A**	**17/66**	**17/71**
120	**17/8E**	**17/99**	**17/A5**	**17/B2**	**17/C3**	**17/D4**	**17/E8**	[17/FF]	09/09	09/1E
130	09/22	09/35	09/44	09/53	09/6F	09/78	09/87	09/90	09/AC	09/BB
140	09/CA	09/DD	09/E1	09/F6	0A/0A	0A/1D	0A/21	0A/36	0A/47	0A/50
150	0A/6C	0A/7B	0A/84	0A/93	0A/AF	0A/B8	0A/C9	0A/DE	0A/E2	0A/F5
160	0C/0C	0C/1B	0C/27	0C/30	0C/41	0C/56	0C/6A	0C/7D	0C/82	0C/95
170	0C/A9	0C/BE	0C/CF	0C/D8	0C/E4	0C/F3	0F/0F	0F/18	0F/24	0F/33
180	0F/42	0F/55	0F/69	0F/7E	0F/81	0F/96	0F/AA	0F/BD	0F/CC	0F/DB
190	0F/E7	0F/F0	18/0F	18/18	18/24	18/33	18/42	18/55	18/69	18/7E
200	18/81	18/96	18/AA	18/BD	18/CC	18/DB	18/E7	18/F0	1B/0C	1B/1B
210	1B/27	1B/30	1B/41	1B/56	1B/6A	1B/7D	1B/82	1B/95	1B/A9	1B/BE
220	1B/CF	1B/D8	1B/E4	1B/F3	1D/0A	1D/1D	1D/21	1D/36	1D/47	1D/50
230	1D/6C	1D/7B	1D/84	1D/93	1D/AF	1D/B8	1D/C9	1D/DE	1D/E2	1D/F5
240	1E/09	1E/1E	1E/22	1E/35	1E/44	1E/53	1E/6F	1E/78	1E/87	1E/90
250	1E/AC	1E/BB	1E/CA	1E/DD	1E/E1	1E/F6	21/0A	21/1D	21/21	21/36
260	21/47	21/50	21/6C	21/7B	21/84	21/93	21/AF	21/B8	21/C9	21/DE
270	21/E2	21/F5	22/09	22/1E	22/22	22/35	22/44	22/53	22/6F	22/78
280	22/87	22/90	22/AC	22/BB	22/CA	22/DD	22/E1	22/F6	24/0F	24/18
290	24/24	24/33	24/42	24/55	24/69	24/7E	24/81	24/96	24/AA	24/BD
300	24/CC	24/DB	24/E7	24/F0	27/0C	27/1B	27/27	27/30	27/41	27/56
310	27/6A	27/7D	27/82	27/95	27/A9	27/BE	27/CF	27/D8	27/E4	27/F3
320	30/0C	30/1B	30/27	30/30	30/41	30/56	30/6A	30/7D	30/82	30/95
330	30/A9	30/BE	30/CF	30/D8	30/E4	30/F3	33/0F	33/18	33/24	33/33
340	33/42	33/55	33/69	33/7E	33/81	33/96	33/AA	33/BD	33/CC	33/DB
350	33/E7	33/F0	35/09	35/1E	35/22	35/35	35/44	35/53	35/6F	35/78
360	35/87	35/90	35/AC	35/BB	35/CA	35/DD	35/E1	35/F6	36/0A	36/1D
370	36/21	36/36	36/47	36/50	36/6C	36/7B	36/84	36/93	36/AF	36/B8
380	36/C9	36/DE	36/E2	36/F5	28/03	28/14	28/28	28/3F	28/4E	28/59
390	28/65	28/72	28/8D	28/9A	28/A6	28/B1	28/C0	28/D7	28/EB	28/FC
400	**2B/00**	**2B/17**	**2B/2B**	**2B/3C**	**2B/4D**	**2B/5A**	**2B/66**	**2B/71**	**2B/8E**	**2B/99**
410	**2B/A5**	**2B/B2**	**2B/C3**	**2B/D4**	**2B/E8**	[2B/FF]	2D/06	2D/11	2D/2D	2D/3A
420	2D/4B	2D/5C	2D/60	2D/77	2D/88	2D/9F	2D/A3	2D/B4	2D/C5	2D/D2
430	2D/EE	2D/F9	2E/05	2E/12	2E/2E	2E/39	2E/48	2E/5F	2E/63	2E/74
440	2E/8B	2E/9C	2E/A0	2E/B7	2E/C6	2E/D1	2E/ED	2E/FA	39/05	39/12
450	39/2E	39/39	39/48	39/5F	39/63	39/74	39/8B	39/9C	39/A0	39/B7

MODIFIED HAMMING CODE M(16,11) FOR Y/Z IN BALISES, NX=12

+	0	1	2	3	4	5	6	7	8	9
460	39/C6	39/D1	39/ED	39/FA	3A/06	3A/11	3A/2D	3A/3A	3A/4B	3A/5C
470	3A/60	3A/77	3A/88	3A/9F	3A/A3	3A/B4	3A/C5	3A/D2	3A/EE	3A/F9
480	**3C/00**	**3C/17**	**3C/2B**	**3C/3C**	**3C/4D**	**3C/5A**	**3C/66**	**3C/71**	**3C/8E**	**3C/99**
490	**3C/A5**	**3C/B2**	**3C/C3**	**3C/D4**	**3C/E8**	[3C/FF]	3F/03	3F/14	3F/28	3F/3F
500	3F/4E	3F/59	3F/65	3F/72	3F/8D	3F/9A	3F/A6	3F/B1	3F/C0	3F/D7
510	3F/EB	3F/FC	41/0C	41/1B	41/27	41/30	41/41	41/56	41/6A	41/7D
520	41/82	41/95	41/A9	41/BE	41/CF	41/D8	41/E4	41/F3	42/0F	42/18
530	42/24	42/33	42/42	42/55	42/69	42/7E	42/81	42/96	42/AA	42/BD
540	42/CC	42/DB	42/E7	42/F0	44/09	44/1E	44/22	44/35	44/44	44/53
550	44/6F	44/78	44/87	44/90	44/AC	44/BB	44/CA	44/DD	44/E1	44/F6
560	47/0A	47/1D	47/21	47/36	47/47	47/50	47/6C	47/7B	47/84	47/93
570	47/AF	47/B8	47/C9	47/DE	47/E2	47/F5	50/0A	50/1D	50/21	50/36
580	50/47	50/50	50/6C	50/7B	50/84	50/93	50/AF	50/B8	50/C9	50/DE
590	50/E2	50/F5	53/09	53/1E	53/22	53/35	53/44	53/53	53/6F	53/78
600	53/87	53/90	53/AC	53/BB	53/CA	53/DD	53/E1	53/F6	55/0F	55/18
610	55/24	55/33	55/42	55/55	55/69	55/7E	55/81	55/96	55/AA	55/BD
620	55/CC	55/DB	55/E7	55/F0	56/0C	56/1B	56/27	56/30	56/41	56/56
630	56/6A	56/7D	56/82	56/95	56/A9	56/BE	56/CF	56/D8	56/E4	56/F3
640	48/05	48/12	48/2E	48/39	48/48	48/5F	48/63	48/74	48/8B	48/9C
650	48/A0	48/B7	48/C6	48/D1	48/ED	48/FA	4B/06	4B/11	4B/2D	4B/3A
660	4B/4B	4B/5C	4B/60	4B/77	4B/88	4B/9F	4B/A3	4B/B4	4B/C5	4B/D2
670	4B/EE	4B/F9	**4D/00**	**4D/17**	**4D/2B**	**4D/3C**	**4D/4D**	**4D/5A**	**4D/66**	**4D/71**
680	**4D/8E**	**4D/99**	**4D/A5**	**4D/B2**	**4D/C3**	**4D/D4**	**4D/E8**	[4D/FF]	4E/03	4E/14
690	4E/28	4E/3F	4E/4E	4E/59	4E/65	4E/72	4E/8D	4E/9A	4E/A6	4E/B1
700	4E/C0	4E/D7	4E/EB	4E/FC	59/03	59/14	59/28	59/3F	59/4E	59/59
710	59/65	59/72	59/8D	59/9A	59/A6	59/B1	59/C0	59/D7	59/EB	59/FC
720	**5A/00**	**5A/17**	**5A/2B**	**5A/3C**	**5A/4D**	**5A/5A**	**5A/66**	**5A/71**	**5A/8E**	**5A/99**
730	**5A/A5**	**5A/B2**	**5A/C3**	**5A/D4**	**5A/E8**	[5A/FF]	5C/06	5C/11	5C/2D	5C/3A
740	5C/4B	5C/5C	5C/60	5C/77	5C/88	5C/9F	5C/A3	5C/B4	5C/C5	5C/D2
750	5C/EE	5C/F9	5F/05	5F/12	5F/2E	5F/39	5F/48	5F/5F	5F/63	5F/74
760	5F/8B	5F/9C	5F/A0	5F/B7	5F/C6	5F/D1	5F/ED	5F/FA	60/06	60/11
770	60/2D	60/3A	60/4B	60/5C	60/60	60/77	60/88	60/9F	60/A3	60/B4
780	60/C5	60/D2	60/EE	60/F9	63/05	63/12	63/2E	63/39	63/48	63/5F
790	63/63	63/74	63/8B	63/9C	63/A0	63/B7	63/C6	63/D1	63/ED	63/FA
800	65/03	65/14	65/28	65/3F	65/4E	65/59	65/65	65/72	65/8D	65/9A
810	65/A6	65/B1	65/C0	65/D7	65/EB	65/FC	**66/00**	**66/17**	**66/2B**	**66/3C**
820	**66/4D**	**66/5A**	**66/66**	**66/71**	**66/8E**	**66/99**	**66/A5**	**66/B2**	**66/C3**	**66/D4**
830	**66/E8**	**[66/FF]**	**71/00**	**71/17**	**71/2B**	**71/3C**	**71/4D**	**71/5A**	**71/66**	**71/71**
840	**71/8E**	**71/99**	**71/A5**	**71/B2**	**71/C3**	**71/D4**	**71/E8**	[71/FF]	72/03	72/14
850	72/28	72/3F	72/4E	72/59	72/65	72/72	72/8D	72/9A	72/A6	72/B1
860	72/C0	72/D7	72/EB	72/FC	74/05	74/12	74/2E	74/39	74/48	74/5F
870	74/63	74/74	74/8B	74/9C	74/A0	74/B7	74/C6	74/D1	74/ED	74/FA
880	77/06	77/11	77/2D	77/3A	77/4B	77/5C	77/60	77/77	77/88	77/9F
890	77/A3	77/B4	77/C5	77/D2	77/EE	77/F9	69/0F	69/18	69/24	69/33
900	69/42	69/55	69/69	69/7E	69/81	69/96	69/AA	69/BD	69/CC	69/DB
910	69/E7	69/F0	6A/0C	6A/1B	6A/27	6A/30	6A/41	6A/56	6A/6A	6A/7D
920	6A/82	6A/95	6A/A9	6A/BE	6A/CF	6A/D8	6A/E4	6A/F3	6C/0A	6C/1D
930	6C/21	6C/36	6C/47	6C/50	6C/6C	6C/7B	6C/84	6C/93	6C/AF	6C/B8
940	6C/C9	6C/DE	6C/E2	6C/F5	6F/09	6F/1E	6F/22	6F/35	6F/44	6F/53
950	6F/6F	6F/78	6F/87	6F/90	6F/AC	6F/BB	6F/CA	6F/DD	6F/E1	6F/F6
960	78/09	78/1E	78/22	78/35	78/44	78/53	78/6F	78/78	78/87	78/90
970	78/AC	78/BB	78/CA	78/DD	78/E1	78/F6	7B/0A	7B/1D	7B/21	7B/36
980	7B/47	7B/50	7B/6C	7B/7B	7B/84	7B/93	7B/AF	7B/B8	7B/C9	7B/DE

MODIFIED HAMMING CODE M(16,11) FOR Y/Z IN BALISES, NX=12

+	0	1	2	3	4	5	6	7	8	9
990	7B/E2	7B/F5	7D/0C	7D/1B	7D/27	7D/30	7D/41	7D/56	7D/6A	7D/7D
1000	7D/82	7D/95	7D/A9	7D/BE	7D/CF	7D/D8	7D/E4	7D/F3	7E/0F	7E/18
1010	7E/24	7E/33	7E/42	7E/55	7E/69	7E/7E	7E/81	7E/96	7E/AA	7E/BD
1020	7E/CC	7E/DB	7E/E7	7E/F0	81/0F	81/18	81/24	81/33	81/42	81/55
1030	81/69	81/7E	81/81	81/96	81/AA	81/BD	81/CC	81/DB	81/E7	81/F0
1040	82/0C	82/1B	82/27	82/30	82/41	82/56	82/6A	82/7D	82/82	82/95
1050	82/A9	82/BE	82/CF	82/D8	82/E4	82/F3	84/0A	84/1D	84/21	84/36
1060	84/47	84/50	84/6C	84/7B	84/84	84/93	84/AF	84/B8	84/C9	84/DE
1070	84/E2	84/F5	87/09	87/1E	87/22	87/35	87/44	87/53	87/6F	87/78
1080	87/87	87/90	87/AC	87/BB	87/CA	87/DD	87/E1	87/F6	90/09	90/1E
1090	90/22	90/35	90/44	90/53	90/6F	90/78	90/87	90/90	90/AC	90/BB
1100	90/CA	90/DD	90/E1	90/F6	93/0A	93/1D	93/21	93/36	93/47	93/50
1110	93/6C	93/7B	93/84	93/93	93/AF	93/B8	93/C9	93/DE	93/E2	93/F5
1120	95/0C	95/1B	95/27	95/30	95/41	95/56	95/6A	95/7D	95/82	95/95
1130	95/A9	95/BE	95/CF	95/D8	95/E4	95/F3	96/0F	96/18	96/24	96/33
1140	96/42	96/55	96/69	96/7E	96/81	96/96	96/AA	96/BD	96/CC	96/DB
1150	96/E7	96/F0	88/06	88/11	88/2D	88/3A	88/4B	88/5C	88/60	88/77
1160	88/88	88/9F	88/A3	88/B4	88/C5	88/D2	88/EE	88/F9	8B/05	8B/12
1170	8B/2E	8B/39	8B/48	8B/5F	8B/63	8B/74	8B/8B	8B/9C	8B/A0	8B/B7
1180	8B/C6	8B/D1	8B/ED	8B/FA	8D/03	8D/14	8D/28	8D/3F	8D/4E	8D/59
1190	8D/65	8D/72	8D/8D	8D/9A	8D/A6	8D/B1	8D/C0	8D/D7	8D/EB	8D/FC
1200	**8E/00**	**8E/17**	**8E/2B**	**8E/3C**	**8E/4D**	**8E/5A**	**8E/66**	**8E/71**	**8E/8E**	**8E/99**
1210	**8E/A5**	**8E/B2**	**8E/C3**	**8E/D4**	**8E/E8**	**[8E/FF]**	**99/00**	**99/17**	**99/2B**	**99/3C**
1220	**99/4D**	**99/5A**	**99/66**	**99/71**	**99/8E**	**99/99**	**99/A5**	**99/B2**	**99/C3**	**99/D4**
1230	**99/E8**	[99/FF]	9A/03	9A/14	9A/28	9A/3F	9A/4E	9A/59	9A/65	9A/72
1240	9A/8D	9A/9A	9A/A6	9A/B1	9A/C0	9A/D7	9A/EB	9A/FC	9C/05	9C/12
1250	9C/2E	9C/39	9C/48	9C/5F	9C/63	9C/74	9C/8B	9C/9C	9C/A0	9C/B7
1260	9C/C6	9C/D1	9C/ED	9C/FA	9F/06	9F/11	9F/2D	9F/3A	9F/4B	9F/5C
1270	9F/60	9F/77	9F/88	9F/9F	9F/A3	9F/B4	9F/C5	9F/D2	9F/EE	9F/F9
1280	A0/05	A0/12	A0/2E	A0/39	A0/48	A0/5F	A0/63	A0/74	A0/8B	A0/9C
1290	A0/A0	A0/B7	A0/C6	A0/D1	A0/ED	A0/FA	A3/06	A3/11	A3/2D	A3/3A
1300	A3/4B	A3/5C	A3/60	A3/77	A3/88	A3/9F	A3/A3	A3/B4	A3/C5	A3/D2
1310	A3/EE	A3/F9	**A5/00**	**A5/17**	**A5/2B**	**A5/3C**	**A5/4D**	**A5/5A**	**A5/66**	**A5/71**
1320	**A5/8E**	**A5/99**	**A5/A5**	**A5/B2**	**A5/C3**	**A5/D4**	**A5/E8**	[A5/FF]	A6/03	A6/14
1330	A6/28	A6/3F	A6/4E	A6/59	A6/65	A6/72	A6/8D	A6/9A	A6/A6	A6/B1
1340	A6/C0	A6/D7	A6/EB	A6/FC	B1/03	B1/14	B1/28	B1/3F	B1/4E	B1/59
1350	B1/65	B1/72	B1/8D	B1/9A	B1/A6	B1/B1	B1/C0	B1/D7	B1/EB	B1/FC
1360	**B2/00**	**B2/17**	**B2/2B**	**B2/3C**	**B2/4D**	**B2/5A**	**B2/66**	**B2/71**	**B2/8E**	**B2/99**
1370	**B2/A5**	**B2/B2**	**B2/C3**	**B2/D4**	**B2/E8**	[B2/FF]	B4/06	B4/11	B4/2D	B4/3A
1380	B4/4B	B4/5C	B4/60	B4/77	B4/88	B4/9F	B4/A3	B4/B4	B4/C5	B4/D2
1390	B4/EE	B4/F9	B7/05	B7/12	B7/2E	B7/39	B7/48	B7/5F	B7/63	B7/74
1400	B7/8B	B7/9C	B7/A0	B7/B7	B7/C6	B7/D1	B7/ED	B7/FA	A9/0C	A9/1B
1410	A9/27	A9/30	A9/41	A9/56	A9/6A	A9/7D	A9/82	A9/95	A9/A9	A9/BE
1420	A9/CF	A9/D8	A9/E4	A9/F3	AA/0F	AA/18	AA/24	AA/33	AA/42	AA/55
1430	AA/69	AA/7E	AA/81	AA/96	AA/AA	AA/BD	AA/CC	AA/DB	AA/E7	AA/F0
1440	AC/09	AC/1E	AC/22	AC/35	AC/44	AC/53	AC/6F	AC/78	AC/87	AC/90
1450	AC/AC	AC/BB	AC/CA	AC/DD	AC/E1	AC/F6	AF/0A	AF/1D	AF/21	AF/36
1460	AF/47	AF/50	AF/6C	AF/7B	AF/84	AF/93	AF/AF	AF/B8	AF/C9	AF/DE
1470	AF/E2	AF/F5	B8/0A	B8/1D	B8/21	B8/36	B8/47	B8/50	B8/6C	B8/7B
1480	B8/84	B8/93	B8/AF	B8/B8	B8/C9	B8/DE	B8/E2	B8/F5	BB/09	BB/1E
1490	BB/22	BB/35	BB/44	BB/53	BB/6F	BB/78	BB/87	BB/90	BB/AC	BB/BB
1500	BB/CA	BB/DD	BB/E1	BB/F6	BD/0F	BD/18	BD/24	BD/33	BD/42	BD/55
1510	BD/69	BD/7E	BD/81	BD/96	BD/AA	BD/BD	BD/CC	BD/DB	BD/E7	BD/F0

MODIFIED HAMMING CODE M(16,11) FOR Y/Z IN BALISES, NX=12

+	0	1	2	3	4	5	6	7	8	9
1520	BE/0C	BE/1B	BE/27	BE/30	BE/41	BE/56	BE/6A	BE/7D	BE/82	BE/95
1530	BE/A9	BE/BE	BE/CF	BE/D8	BE/E4	BE/F3	C0/03	C0/14	C0/28	C0/3F
1540	C0/4E	C0/59	C0/65	C0/72	C0/8D	C0/9A	C0/A6	C0/B1	C0/C0	C0/D7
1550	C0/EB	C0/FC	C3/00	C3/17	C3/2B	C3/3C	C3/4D	C3/5A	C3/66	C3/71
1560	C3/8E	C3/99	C3/A5	C3/B2	C3/C3	C3/D4	C3/E8	[C3/FF]	C5/06	C5/11
1570	C5/2D	C5/3A	C5/4B	C5/5C	C5/60	C5/77	C5/88	C5/9F	C5/A3	C5/B4
1580	C5/C5	C5/D2	C5/EE	C5/F9	C6/05	C6/12	C6/2E	C6/39	C6/48	C6/5F
1590	C6/63	C6/74	C6/8B	C6/9C	C6/A0	C6/B7	C6/C6	C6/D1	C6/ED	C6/FA
1600	D1/05	D1/12	D1/2E	D1/39	D1/48	D1/5F	D1/63	D1/74	D1/8B	D1/9C
1610	D1/A0	D1/B7	D1/C6	D1/D1	D1/ED	D1/FA	D2/06	D2/11	D2/2D	D2/3A
1620	D2/4B	D2/5C	D2/60	D2/77	D2/88	D2/9F	D2/A3	D2/B4	D2/C5	D2/D2
1630	D2/EE	D2/F9	**D4/00**	**D4/17**	**D4/2B**	**D4/3C**	**D4/4D**	**D4/5A**	**D4/66**	**D4/71**
1640	**D4/8E**	**D4/99**	**D4/A5**	**D4/B2**	**D4/C3**	**D4/D4**	**D4/E8**	[D4/FF]	D7/03	D7/14
1650	D7/28	D7/3F	D7/4E	D7/59	D7/65	D7/72	D7/8D	D7/9A	D7/A6	D7/B1
1660	D7/C0	D7/D7	D7/EB	D7/FC	C9/0A	C9/1D	C9/21	C9/36	C9/47	C9/50
1670	C9/6C	C9/7B	C9/84	C9/93	C9/AF	C9/B8	C9/C9	C9/DE	C9/E2	C9/F5
1680	CA/09	CA/1E	CA/22	CA/35	CA/44	CA/53	CA/6F	CA/78	CA/87	CA/90
1690	CA/AC	CA/BB	CA/CA	CA/DD	CA/E1	CA/F6	CC/0F	CC/18	CC/24	CC/33
1700	CC/42	CC/55	CC/69	CC/7E	CC/81	CC/96	CC/AA	CC/BD	CC/CC	CC/DB
1710	CC/E7	CC/F0	CF/0C	CF/1B	CF/27	CF/30	CF/41	CF/56	CF/6A	CF/7D
1720	CF/82	CF/95	CF/A9	CF/BE	CF/CF	CF/D8	CF/E4	CF/F3	D8/0C	D8/1B
1730	D8/27	D8/30	D8/41	D8/56	D8/6A	D8/7D	D8/82	D8/95	D8/A9	D8/BE
1740	D8/CF	D8/D8	D8/E4	D8/F3	DB/0F	DB/18	DB/24	DB/33	DB/42	DB/55
1750	DB/69	DB/7E	DB/81	DB/96	DB/AA	DB/BD	DB/CC	DB/DB	DB/E7	DB/F0
1760	DD/09	DD/1E	DD/22	DD/35	DD/44	DD/53	DD/6F	DD/78	DD/87	DD/90
1770	DD/AC	DD/BB	DD/CA	DD/DD	DD/E1	DD/F6	DE/0A	DE/1D	DE/21	DE/36
1780	DE/47	DE/50	DE/6C	DE/7B	DE/84	DE/93	DE/AF	DE/B8	DE/C9	DE/DE
1790	DE/E2	DE/F5	E1/09	E1/1E	E1/22	E1/35	E1/44	E1/53	E1/6F	E1/78
1800	E1/87	E1/90	E1/AC	E1/BB	E1/CA	E1/DD	E1/E1	E1/F6	E2/0A	E2/1D
1810	E2/21	E2/36	E2/47	E2/50	E2/6C	E2/7B	E2/84	E2/93	E2/AF	E2/B8
1820	E2/C9	E2/DE	E2/E2	E2/F5	E4/0C	E4/1B	E4/27	E4/30	E4/41	E4/56
1830	E4/6A	E4/7D	E4/82	E4/95	E4/A9	E4/BE	E4/CF	E4/D8	E4/E4	E4/F3
1840	E7/0F	E7/18	E7/24	E7/33	E7/42	E7/55	E7/69	E7/7E	E7/81	E7/96
1850	E7/AA	E7/BD	E7/CC	E7/DB	E7/E7	E7/F0	F0/0F	F0/18	F0/24	F0/33
1860	F0/42	F0/55	F0/69	F0/7E	F0/81	F0/96	F0/AA	F0/BD	F0/CC	F0/DB
1870	F0/E7	F0/F0	F3/0C	F3/1B	F3/27	F3/30	F3/41	F3/56	F3/6A	F3/7D
1880	F3/82	F3/95	F3/A9	F3/BE	F3/CF	F3/D8	F3/E4	F3/F3	F5/0A	F5/1D
1890	F5/21	F5/36	F5/47	F5/50	F5/6C	F5/7B	F5/84	F5/93	F5/AF	F5/B8
1900	F5/C9	F5/DE	F5/E2	F5/F5	F6/09	F6/1E	F6/22	F6/35	F6/44	F6/53
1910	F6/6F	F6/78	F6/87	F6/90	F6/AC	F6/BB	F6/CA	F6/DD	F6/E1	F6/F6
1920	**E8/00**	**E8/17**	**E8/2B**	**E8/3C**	**E8/4D**	**E8/5A**	**E8/66**	**E8/71**	**E8/8E**	**E8/99**
1930	**E8/A5**	**E8/B2**	**E8/C3**	**E8/D4**	**E8/E8**	[E8/FF]	EB/03	EB/14	EB/28	EB/3F
1940	EB/4E	EB/59	EB/65	EB/72	EB/8D	EB/9A	EB/A6	EB/B1	EB/C0	EB/D7
1950	EB/EB	EB/FC	ED/05	ED/12	ED/2E	ED/39	ED/48	ED/5F	ED/63	ED/74
1960	ED/8B	ED/9C	ED/A0	ED/B7	ED/C6	ED/D1	ED/ED	ED/FA	EE/06	EE/11
1970	EE/2D	EE/3A	EE/4B	EE/5C	EE/60	EE/77	EE/88	EE/9F	EE/A3	EE/B4
1980	EE/C5	EE/D2	EE/EE	EE/F9	F9/06	F9/11	F9/2D	F9/3A	F9/4B	F9/5C
1990	F9/60	F9/77	F9/88	F9/9F	F9/A3	F9/B4	F9/C5	F9/D2	F9/EE	F9/F9
2000	FA/05	FA/12	FA/2E	FA/39	FA/48	FA/5F	FA/63	FA/74	FA/8B	FA/9C
2010	FA/A0	FA/B7	FA/C6	FA/D1	FA/ED	FA/FA	FC/03	FC/14	FC/28	FC/3F
2020	FC/4E	FC/59	FC/65	FC/72	FC/8D	FC/9A	FC/A6	FC/B1	FC/C0	FC/D7
2030	FC/EB	FC/FC	[FF/00]	[FF/17]	[FF/2B]	[FF/3C]	[FF/4D]	[FF/5A]	[FF/66]	[FF/71]
2040	[FF/8E]	[FF/99]	[FF/A5]	[FF/B2]	[FF/C3]	[FF/D4]	[FF/E8]	[FF/FF]		

Explanations:

[..] = Contains at least one word where all bits = "1". Shall not be interpreted as correct.

Bold numbers consist of two in itself correct M(8,4) code words.

H16. Reserve

(blank)

8.11 M8: MODIFIED HAMMING CODE M(8,4)

This code is used in all cases where an 8 bit Hamming code is required. Modified means that the original bits 3 and 4 exchange each other. The original (unmodified) 8 bit code is not used with the STM.

M8. *Table M8. Modified Hamming code M(8,4)*

	Code word	Encoding (hexadecimal)
a)	**0**	00
b)	**1**	17
c)	**2**	2B
d)	**3**	3C
e)	**4**	4D
f)	**5**	5A
g)	**6**	66
h)	**7**	71
i)	**8**	8E
j)	**9**	99
k)	**10**	A5
l)	**11**	B2
m)	**12**	C3
n)	**13**	D4
o)	**14**	E8
p)	**15** 1)	FF

1) Not used (balise error)

(blank)

8.12 CO: LIST OF STM CONSTANTS

Table CO.

Constant	Default Value	Explanation
D_{HTE}	0 m	Distance before conversion to semi-equipped restriction after balise error [3.3.5.3]
D_{WINLOW}	± 12 m	Lower limit of the target window [3.3.3]
Sig_link1	120 %	Signal linking distance adjustment [3.3.2.2]
Sig_link2	100 m	Signal linking distance margin [3.3.2.2]
T_{EP}	5 s	Full service brake delay time when EP brake is active
TBD	–	Other constants (to be defined by Banverket)
TBD	–	Optional constants, added by supplier

(blank)

8.13 TRAIN PARAMETERS

8.13.1 CP: STM configuration parameters

F8002.60c The STM configuration parameters shall be stored in a separate memory unit (an "STM data plug" or similar).

CP. *Table CP. Data in the STM memory unit*

	TYPE	NAME	CONFIGURATION PARAMETER x)	CONTENTS y) z)
a)	Reserve	–	–	–
b)		–	–	–
c)	BP "λ"	BP_{CON}	Default brake percentage (%) *(bromstal)*	30...170
d)	EP	EPX	EP brake existence	1: No EP 2: Pure EP 3: Mixed EP Interface 4: Mixed EP Manual
e)		EPT	EP brake delay time Tf (s)	4...18
f)	PT	PT_{ENT}	STM data entry of PT code	1: Yes 2: No
g)	Brake	P_{FEED}	Brake feedback	1: Main pipe pressure 2: Cylinder pressure
g1)	Brake	P_{FULL}	Cylinder brake pressure at full braking	100...500 kPa
h)	DMI	T_{DMI}	DMI reaction time (s)	0.1 ... 5.0 s
i)	STM STH	STM-STH_{CON}	Default STM max speed	0...270 km/h
j)	K1	$K1_{CON}$	Default K1 exceeding	0...45 %
k)	Reserve	–	–	–
l)	Brake	EB_{DIRECT}	Direct emergency brake interface	1: Yes 2: No
m)	Brake	T_{EBCHK}	Emergency brake check time	1.00 … 5.00 s
n)	Brake	SB_{TEST}	Approved ETCS service brake test method	1: Yes 2: No
o)	Brake	T_{SBACK}	Service brake acknow-ledgement time	0.5 … 5.0 s
p)	Brake	SB_{DIRECT}	Direct service brake interface	1: Yes 2: No
q)	Brake	SB_{SOFT}	Soft service brake intervention	1: Yes 2: No
r)	BP	Decel-Meas	Deceleration Measurement method	1: Function disabled 2: Function enabled and update of BP handled also at speed 3: Function enabled and update of BP handled only at standstill x)

s1)	Brake	A_P	Parameter in T_B calculation for BG = P/R	z1
s2)	Brake	B_P	Parameter in T_B calculation for BG = P/R	z1
s3)	Brake	C_P	Parameter in T_B calculation for BG = P/R	z1
s4)	Brake	A_G	Parameter in T_B calculation for BG = G	z1
s5)	Brake	B_G	Parameter in T_B calculation for BG = G	z1
s6)	Brake	C_G	Parameter in T_B calculation for BG = G	z1
s7)	Brake	D_P	Parameter in B_F calculation for BG = P/R	z1
s8)	Brake	E_P	Parameter in B_F calculation for BG = P/R	z1
s9)	Brake	D_G	Parameter in B_F calculation for BG = G	z1
s10)	Brake	E_G	Parameter in B_F calculation for BG = G	z1
t)	--	Other installation characteristics as needed [w]		--

w) *Note*. E.g. if the STM has its own antenna and/or own emergency brake output.

x) *Note*. Update of BP is handled via the ordinary train data procedure in this case

y) *Note*. A safety code protects this data (Hamming code, CRC code or similar)

z) *Note*. A faulty memory unit is not accepted by the STM.

z1) Note. The parameters can be tailored for different types of vehicles. The parameter values derived from the Swedish conversion tables for ATC2 where the maximum length is 730m for brake position P/R and 800m for brake position G. Therefore these parameters are not validated for longer train lengths:

$A_P = 4.58$
$B_P = 0.0049$
$C_P = 1.0 \cdot 10^{-5}$
$A_G = 16.95$
$B_G = -0.01$
$C_G = 2.2 \cdot 10^{-5}$
$D_P = 14.05$
$E_P = 146.90$
$D_G = 26.10$
$E_G = 165.20$

8.13.2 BP: Brake percentage and deceleration (brake pos P/R)

Note.

Table BP. Brake percentage and computed deceleration values for brake positions P/R (full service brake) according to values derived from the Swedish conversion table for ATC2 [Table CP].

Brake percent.	Decel. Bf (m/s²)	Brake percent.	Decel. Bf (m/s²)	Brake percent.	Decel. Bf (m/s²)	Brake percent.	Decel. Bf (m/s²)
30	0.29	66	0.54	102	0.78	138	1.03
31	0.30	67	0.55	103	0.79	139	1.04
32	0.31	68	0.55	104	0.80	140	1.04
33	0.32	69	0.56	105	0.81	141	1.05
34	0.32	70	0.57	106	0.81	142	1.06
35	0.33	71	0.57	107	0.82	143	1.06
36	0.34	72	0.58	108	0.83	144	1.07
37	0.34	73	0.59	109	0.83	145	1.08
38	0.35	74	0.59	110	0.84	146	1.08
39	0.36	75	0.60	111	0.85	147	1.09
40	0.36	76	0.61	112	0.85	148	1.10
41	0.37	77	0.61	113	0.86	149	1.10
42	0.38	78	0.62	114	0.87	150	1.11
43	0.38	79	0.63	115	0.87	151	1.12
44	0.39	80	0.64	116	0.88	152	1.13
45	0.40	81	0.64	117	0.89	153	1.13
46	0.40	82	0.65	118	0.89	154	1.14
47	0.41	83	0.66	119	0.90	155	1.15
48	0.42	84	0.66	120	0.91	156	1.15
49	0.42	85	0.67	121	0.91	157	1.16
50	0.43	86	0.68	122	0.92	158	1.17
51	0.44	87	0.68	123	0.93	159	1.17
52	0.44	88	0.69	124	0.93	160	1.18
53	0.45	89	0.70	125	0.94	161	1.19
54	0.46	90	0.70	126	0.95	162	1.19
55	0.47	91	0.71	127	0.96	163	1.20
56	0.47	92	0.72	128	0.96	164	1.21
57	0.48	93	0.72	129	0.97	165	1.21
58	0.49	94	0.73	130	0.98	166	1.22
59	0.49	95	0.74	131	0.98	167	1.23
60	0.50	96	0.74	132	0.99	168	1.23
61	0.51	97	0.75	133	1.00	169	1.24
62	0.51	98	0.76	134	1.00	170	1.25
63	0.52	99	0.76	135	1.01		
64	0.53	100	0.77	136	1.02		
65	0.53	101	0.78	137	1.02		

Note. This table does not apply to the brake percentage calculation in [5.7.2].

8.13.3 BPG: Brake percentage and deceleration (brake pos.G)

Note.

Table BPG. Brake percentage and computed deceleration values for brake position G (full service brake) according to values derived from the Swedish conversion table for ATC2 [Table CP].

Brake percent.	Decel. Bf (m/s²)	Brake percent.	Decel. Bf (m/s²)
30	0.33	66	0.55
31	0.34	67	0.56
32	0.35	68	0.56
33	0.35	69	0.57
34	0.36	70	0.58
35	0.36	71	0.58
36	0.37	72	0.59
37	0.38	73	0.59
38	0.38	74	0.60
39	0.39	75	0.61
40	0.40	76	0.61
41	0.40	77	0.62
42	0.41	78	0.63
43	0.41	79	0.63
44	0.42	80	0.64
45	0.43	81	0.64
46	0.43	82	0.65
47	0.44	83	0.66
48	0.44	84	0.66
49	0.45	85	0.67
50	0.46	86	0.67
51	0.46	87	0.68
52	0.47	88	0.69
53	0.47	89	0.69
54	0.48	90	0.70
55	0.49	91	0.70
56	0.49	92	0.71
57	0.50	93	0.72
58	0.50	94	0.72
59	0.51	95	0.73
60	0.52	96	0.73
61	0.52	97	0.74
62	0.53	98	0.75
63	0.53	99	0.75
64	0.54		
65	0.55		

Note. This table does not apply to the brake percentage calculation in [5.7.2].

8.13.4 TB: Train length and delay time (brake pos. P/R)

Note.

Table TB. Train length and computed delay time values for brake positions P/R (service brake) according to values derived from the Swedish conversion table for ATC2 [Table CP].

Train Length (m)	T_B (s)	Train Length (m)	T_B (s)	Train Length (m)	T_B (s)	Train Length (m)	T_B (s)
0	4.6	250	6.4	500	9.5	750	13.9
10	4.6	260	6.5	510	9.7	760	14.1
20	4.7	270	6.6	520	9.8	770	14.3
30	4.7	280	6.7	530	10.0	780	14.5
40	4.8	290	6.8	540	10.1	790	14.7
50	4.8	300	6.9	550	10.3	800	14.9
60	4.9	310	7.1	560	10.5	810	15.1
70	5.0	320	7.2	570	10.6	820	15.3
80	5.0	330	7.3	580	10.8	830	15.5
90	5.1	340	7.4	590	11.0	840	15.8
100	5.2	350	7.5	600	11.1	850	16.0
110	5.2	360	7.6	610	11.3	860	16.2
120	5.3	370	7.8	620	11.5	870	16.4
130	5.4	380	7.9	630	11.6	880	16.6
140	5.5	390	8.0	640	11.8	890	16.9
150	5.5	400	8.1	650	12.0	900	17.1
160	5.6	410	8.3	660	12.2	...	...
170	5.7	420	8.4	670	12.4	...	...
180	5.8	430	8.5	680	12.5	...	...
190	5.9	440	8.7	690	12.7	...	...
200	6.0	450	8.8	700	12.9	...	...
210	6.0	460	8.9	710	13.1	...	...
220	6.1	470	9.1	720	13.3	...	...
230	6.2	480	9.2	730	13.5	...	...
240	6.3	490	9.4	740	13.7	...	60.0

8.13.5 TBG: Train length and delay time (brake pos. G)

Note.

Table TBG. Train length and computed delay time values for brake position G (service brake) according to values derived from the Swedish conversion table for ATC2 [Table CP].

Train Length (m)	T_B (s)	Train Length (m)	T_B (s)	Train Length (m)	T_B (s)	Train Length (m)	T_B (s)
0	16.9	250	15.8	500	17.4	750	21.8
10	16.9	260	15.8	510	17.6	760	22.1
20	16.8	270	15.9	520	17.7	770	22.3
30	16.7	280	15.9	530	17.8	780	22.5
40	16.6	290	15.9	540	18.0	790	22.8
50	16.5	300	15.9	550	18.1	800	23.0
60	16.4	310	16.0	560	18.2	810	23.3
70	16.4	320	16.0	570	18.4	820	23.5
80	16.3	330	16.0	580	18.6	830	23.8
90	16.2	340	16.1	590	18.7	840	24.1
100	16.2	350	16.1	600	18.9	850	24.3
110	16.1	360	16.2	610	19.0	860	24.6
120	16.1	370	16.3	620	19.2	870	24.9
130	16.0	380	16.3	630	19.4	880	25.2
140	16.0	390	16.4	640	19.6	890	25.5
150	15.9	400	16.5	650	19.7	900	25.8
160	15.9	410	16.5	660	19.9	...	...
170	15.9	420	16.6	670	20.1	...	...
180	15.9	430	16.7	680	20.3	...	...
190	15.8	440	16.8	690	20.5	...	...
200	15.8	450	16.9	700	20.7	...	...
210	15.8	460	17.0	710	20.9	...	...
220	15.8	470	17.1	720	21.2	...	...
230	15.8	480	17.2	730	21.4	...	...
240	15.8	490	17.3	740	21.6	...	60.0

8.14 STM ERROR CODES

8.14.1 Reserve

8.14.2 TE1/ATE1, TE2: Trackside error codes

Table TE1. Note. The first two letters of the trackside error code

F2→	0	1	2	3	4	5	6	7	8	9	A	C	E	F	H	L	P	U
F1 ↓	1X	1Y	1Z	2X	2Y	2Z	3X	3Y	3Z	4X	4Y	4Z	5X	5Y	5Z	No M	With M	Ot-her
0	Faulty balise combination – Km marker																	
1	Faulty balise combination – Signal A(1)																	
2	Faulty balise combination – Warning board A(2) or A(6)																	
3	Faulty balise combination – Speed board A(3) or A(7)																	
4	Faulty balise combination – Signal A(4)																	
5	Faulty balise combination – Miscellaneous board A(5) + B(3), B(5) or B(7)																	
6	Faulty balise combination – OT or SH group A(5) B(9) + possible C(14)																	
7	Linking error for signal – Missing signal group																	
8	Linking error for board – Missing board group (also FSK)																	
9	Faulty balise combination – Annulled or Reserve group A(10) or Km marker B(11)																	
A	Faulty balise combination – Unidentified group																	
C	Faulty balise combination – Opposite-directed unidentified group																	
E	Faulty balise combination – Opposite-directed warning board or SH group																	
F	Faulty balise combination – Opposite-directed speed board																	
H	Faulty balise combination – Opposite-directed signal																	
L	Faulty balise combination – Opposite-directed miscellaneous board																	
P	Overflow – Too many boards or distant signals																	
U	Ghost balise/s – Single marker/s																	

Explanations:

nm = Erroneous m-word of the nth balise
No M = Erroneous combination without marker
With M= Erroneous combination with marker
Other = Other Error

A-Table ATE1. A-note. The first two letters of the trackside error code

F2→	0	1	2	3	4	5	6	7	8	9	A	C	E	F	H	L	P	U
F1 ↓	1X	1Y	1Z	2X	2Y	2Z	3X	3Y	3Z	4X	4Y	4Z	5X	5Y	5Z	No M	With M	Ot-her
0	Faulty balise combination – Km marker or Release group A(13)																	
1	Faulty balise combination – Signal A(1)																	
2	Faulty balise combination – Warning board A(2) or A(6)																	
3	Faulty balise combination – Speed board A(3) or A(7)																	
4	Faulty balise combination – Signal A(4)																	
5	Faulty balise combination – Miscellaneous board A(5) + B(3), B(5) or B(7)																	
6	Faulty balise combination – OT or SH group A(5) B(9) + possible C(14)																	
7	Linking error for signal – Missing signal group																	
8	Linking error for board – Missing board group (also FSK)																	
9	Faulty balise combination – Annulled or Reserve group A(10) or Km marker B(11)																	
A	Faulty balise combination – Unidentified group																	
C	Faulty balise combination – Opposite-directed unidentified group																	
E	Faulty balise combination – Opposite-directed warning board or SH group																	
F	Faulty balise combination – Opposite-directed speed board																	
H	Faulty balise combination – Opposite-directed signal																	
L	Faulty balise combination – Opposite-directed miscellaneous board																	
P	Overflow – Too many boards or distant signals																	
U	Ghost balise/s – Single marker/s																	

Explanations:

nm = Erroneous m-word of the nth balise
No M = Erroneous combination without marker
With M= Erroneous combination with marker
Other = Other Error

Table TE2. Note. The third letter of the trackside error code

F3	**Erroneous bit or other error**
0...7	Number of faulty bit
8	More than one bit faulty, or all bits = 1
9	Bit error in more than one code word
A	Too few telegrams (1..3)
C	Ghost balise (marker ≤ 40 cm long)
U	Other error

8.15 CC-FRS INDEX LIST

8.15.1 Changes, figures and tables

8.13.2 BP
(brake pos P/R), 43
8.13.3 BPG
(brake pos G), 44
8.13.4 TB
(brake pos P/R), 45
8.13.5 TBG
(brake pos G), 46
F8002.60c, 41