

ERTMS/ETCS

System Requirements Specification

Chapter 8

Messages

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8.3 Introduction

8.3.1 Scope and Purpose

8.3.1.1 This chapter defines the format and content of messages necessary for ERTMS/ETCS functions.

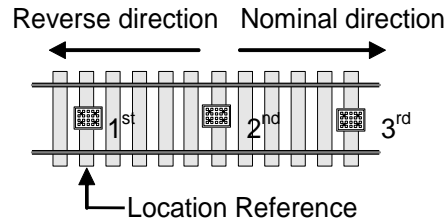
8.3.1.2 Concerning the transmission media, this chapter does not cover considerations such as medium-specific use constraints (e.g. distance between track-circuit and balise...), as well as functions (e.g. detection of balise reference, time and location stamp, identifying type of receiving balise, Key Management, Releasing/maintaining a radio connection...) and performance of the transmission media.

8.3.2 Definitions

8.3.2.1 Transmission media considered hereafter are standard ERTMS/ETCS transmission media used for ETCS (Eurobalise, Euroradio and Euroloop).

8.3.2.2 A message includes user data (application level) and protocol data (depending on the transmission medium).

8.3.2.3 A Eurobalise message is the information sent by a balise group (i.e. the message is composed of one or several telegrams, sorted by balise number in the group (telegram from balise number 1 first), each telegram is transmitted by a Eurobalise). A Eurobalise telegram contains one header and an identified and coherent set of Packets.



Composition of message when passing the balise group in nominal direction:

Balise telegrams read:

1 st

2 nd

3 rd

Balise message composed:

1 st	2 nd	3 rd
-----------------	-----------------	-----------------

Composition of message when passing the balise group in reverse direction:

Balise telegrams read:

3 rd

2 nd

1 st

Balise message composed:

1 st	2 nd	3 rd
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Figure 1: Composition of a balise group message

8.3.2.4 A Euroradio message contains one header and an identified and coherent set of variables (if needed) and Packets.

8.3.2.5 A Euroloop message contains one header and an identified and coherent set of Packets.

8.4 Rules

8.4.1 Common Rules

- 8.4.1.1 A message (Euroradio/Euroloop) or telegram (Eurobalise) is composed of
1. One Header,
 2. When needed, a predefined set of variables (only for Radio),
 3. When needed, a predefined set of Packets (only for Radio),
 4. Optional Packets as needed by application.
- 8.4.1.2 The transmission order shall respect the order of data elements listed in the message format (from top to bottom).
- 8.4.1.3 The behaviour of the receiver shall not depend on the sequence of the Packets given by the message.
- 8.4.1.3.1 Exception for Infill information: The locations given in the packets following packet 136 (Infill Location Reference) shall be referred to the balise group indicated in such packet.
- 8.4.1.3.2 Note: orientations are in any case always referred to the directionality of balise group (balise transmission), directionality of loop (Euroloop transmission) or directionality of LRBG (radio transmission).
- 8.4.1.4 A track-to-train message shall contain at most one instance of the same packet type for the same direction.
- 8.4.1.4.1 Exception 1: A message can contain several packets 44 (Data used by applications outside the ERTMS/ETCS system).
- 8.4.1.4.2 Exception 2: A message can contain several packets 65 (Temporary Speed Restriction). In case of revocable TSRs, the identities of the corresponding temporary speed restrictions (variable NID_TSR) transmitted in the same message shall be different.
- 8.4.1.4.3 Exception 3: A message can contain several packets 66 (TSR Revocation). The identities of the corresponding temporary speed restrictions (variable NID_TSR) transmitted in the same message shall be different.
- 8.4.1.4.4 Exception 4: A message transmitted by a balise group can contain one packet 136 per balise telegram per direction. Each packet 136 indicates which part of that telegram is to be considered as part of the infill information. Multiple packets 136 in balises of a balise group shall have identical content per direction.

- 8.4.1.4.5 Exception 5: A message can contain several packets 88 (Level Crossing information). The identities of the corresponding Level Crossings (variable NID_LX) transmitted in the same message shall be different.
- 8.4.1.4.6 Exception 6: A message transmitted by a balise group can contain several packets 254 (default balise, loop or RIU information).
- 8.4.1.4.7 Exception 7: A message transmitted by a balise group can contain several packets 145 (Inhibition of balise group message consistency reaction).
- 8.4.1.4.8 Exception 8: A message transmitted by a balise group can contain several packets 0 (Virtual Balise Cover marker).
- 8.4.1.4.9 Exception 9: A message transmitted by a balise group can contain several packets 6 (Virtual Balise Cover order). The identities (pairs of variables NID_VBCMK and NID_C) of the corresponding VBC transmitted in the same message shall be different.
- 8.4.1.5 A train-to-track message shall contain at most one instance of the same packet type.
- 8.4.1.5.1 Exception: A message can contain several packets 44 (Data used by applications outside the ERTMS/ETCS system).
- 8.4.1.6 Note: For the purposes of clause 8.4.1.4, when the same packet is transmitted by duplicated balises, this is considered to be only a single instance of the packet within the message. Justification: The on-board equipment will only use one of these duplicated telegrams (and therefore only one set of duplicated packets) to compose the balise group message (see 3.16.2.4.8.2).

8.4.2 Rules for Eurobalise telegrams

8.4.2.1 The format of the telegram to be transmitted by each balise is as follows:

General Format of Balise Telegram			
Field No.	VARIABLE	Length (bits)	Remarks
1	Q_UPDOWN	1	Defines the direction of the information: Down-link telegram (train to track) (0) Up-link telegram (track to train) (1)
2	M_VERSION	7	Version of the ERTMS/ETCS system.
3	Q_MEDIA	1	Defines the type of media: Balise (0)
4	N_PIG	3	Position in the group. Defines the position of the balise in the balise group.
5	N_TOTAL	3	Total number of balises in the balise group
6	M_DUP	2	Used to indicate whether the information of the balise is a duplicate of the balise before or after this one.
7	M_MCOUNT	8	Message counter (M_MCOUNT) - 8 bits. To enable detection of a change of balise group message during passage of the balise group.
8	NID_C	10	Country or region.
9	NID_BG	14	Identity of the balise group.
10	Q_LINK	1	Marks the balise group as linked (Q_LINK = 1) or unlinked (Q_LINK = 0)
	Packet 0 (optional)	14	Virtual Balise Cover marker
	Information	Variable	This information is composed according to the rules applicable for packets.
	Packet 255	8	Finishing flag of the telegram

Number of bits in balise header: 50

8.4.2.2 The user information transmitted by a balise shall contain complete packets, i.e. splitting a packet between two balises is forbidden.

8.4.2.3 When used, the packet 0 shall be transmitted as the first packet of the telegram (i.e. it is appended to the header).

8.4.3 Rules for Euroloop messages

8.4.3.1 The format of the message to be transmitted by each loop is as follows:

General Format of Loop Message			
Field No.	VARIABLE	Length (bits)	Remarks
1	Q_UPDOWN	1	Defines the direction of the information: Down-link message (train to track) (0) Up-link message (track to train) (1)
2	M_VERSION	7	Version of the ERTMS/ETCS system.
3	Q_MEDIA	1	Defines the type of media: Loop (1)
4	NID_C	10	Country or region.
5	NID_LOOP	14	Identity of Euroloop.
	Information	Variable	This information is composed according to the rules applicable for packets.
	Packet 255	8	Finishing flag of the message

Number of bits in loop header: 33

8.4.3.2 Intentionally deleted.

8.4.4 Rules for Euroradio messages

8.4.4.1 The message identifier is unique (variable NID_MESSAGE).

8.4.4.1.1 All currently not defined message identifiers are reserved for future use and shall be considered as invalid values (i.e. like spare values) when received by the on-board equipment. Exception: reception of information only differing by Y with regards to the highest system version number X supported by on-board (refer to section 3.17.3.11 b)).

8.4.4.2 Each message shall indicate its own length through the use of the variable L_MESSAGE.

8.4.4.2.1 If the computed length of the message is not equal to the length given by L_MESSAGE, the entire message shall be rejected.

8.4.4.3 The messages shall be composed of predefined variables and packets.

8.4.4.4 For some messages, it shall be possible to add optional packets at the end of the message.

8.4.4.4.1 The track to train messages possibly including optional packets are listed hereafter:

Track to Train message	Mess. ID	Optional packets
SR Authorisation	2	63
Movement Authority	3	21, 27, 49, 80, plus common optional packets
Request To Shorten MA	9	49, 80
General Message	24	From RBC: 21, 27, plus common optional packets From RIU: 44, 45, 143, 180, 254
SH authorised	28	3, 44, 49
MA with Shifted Location Reference	33	21, 27, 49, 80, plus common optional packets
Infill MA	37	5, 21, 27, 39, 40, 41, 44, 49, 51, 52, 65, 66, 68, 69, 70, 71, 80, 88, 138, 139

8.4.4.4.1.1 The common optional packets are the following ones:

Common optional packets
3, 5, 39, 40, 51, 41, 42, 44, 45, 52, 57, 58, 64, 65, 66, 68, 69, 70, 71, 72, 76, 79, 88, 131, 138, 139, 140, 180

- 8.4.4.4.2 The train to track message 136 (Train Position Report) and 157 (SoM Position Report) may optionally include the following packets:
- a) Packet 4 (Error Reporting),
 - b) Packet 5 (Train running number),
 - c) Packet 44 (Data used by applications outside the ERTMS/ETCS system).
- 8.4.4.4.3 Intentionally deleted.
- 8.4.4.4.4 The train to track message 132 (MA request) may optionally include the following packet:
- a) Packet 9 (Level 2/3 transition information)
- 8.4.4.5 If needed to obtain an integer number of bytes, padding shall be added at the end of the message.

8.4.4.6 Standard format of a radio message from track to train :

8.4.4.6.1 Format:

Field No.	VARIABLE	Remarks
1	NID_MESSAGE	Message Identification Number
2	L_MESSAGE	Message length including everything (from field 1 to padding inclusive).
3	T_TRAIN	Time Stamp from RBC (see sections 3.16.3.2 & 3.16.3.3).
4	M_ACK	Indicates whether the message must be acknowledged (or not) by the on-board equipment (message n° 146).
5	NID_LRBG	Identification Number of LRBG.
...	variables as required by NID_MESSAGE	If needed for this message. Used when sending variables which are not included in a packet.
...	packets as required by NID_MESSAGE	If needed for this message.
	Optional packets	Refer to section 8.4.4.4 of this document.
	Padding	If required.

8.4.4.6.2 Note: In section 8.7 giving the contents of the messages, the padding information is intentionally omitted.

8.4.4.6.3 The track to train message 39 (Acknowledgement of termination of a communication session) shall include the variable M_ACK set to 0. Justification: see 3.5.5.3.

8.4.4.7 Standard format of a radio message from train to track:

8.4.4.7.1 Format:

Field No.	VARIABLE	Remarks
1	NID_MESSAGE	Message Identification Number
2	L_MESSAGE	Message length including everything (from field 1 to padding inclusive).
3	T_TRAIN	Time Stamp from Train (see chapter 3 – Data Consistency).
4	NID_ENGINE	Identity of the train.
5	variables as required by NID_MESSAGE	If needed for this message. Used when sending variables which are not included in a packet.
6	Packet 0 or 1	Train-to-track packet type 0 – Position report, or packet type 1 - Position report based on two balise groups. Not included in messages 146, 154, 155, 156 and 159.
7	Other Packets as required by NID_MESSAGE	
8	Optional packets	
	Padding	If required.

8.4.4.7.2 Exception: The position report (packet 0 or packet 1) is not included in the following messages:

- a) Message 146 (Acknowledgement),
- b) Message 154 (No compatible version supported),
- c) Message 155 (Initiation of a communication session),
- d) Message 156 (Termination of a communication session),
- e) Intentionally deleted
- f) Message 159 (Session Established).

8.4.4.7.3 Note: In section 8.6 giving the contents of the messages, the padding information is intentionally omitted.

8.5 List of radio Messages

8.5.1 Introduction

8.5.1.1 This section identifies the radio messages with corresponding Message Identifier (“Mes. Id.”) and Message Name. It also gives a list of the version-invariant messages.

8.5.1.2 “Type” defines whether a message is to be sent as normal priority (N) or as high priority data (E), as defined in Euroradio specifications.

8.5.2 Train to Track radio messages

Mes. Id.	Message Name	Type	Invariant	Transmitted to
129	Validated Train Data	N	No	RBC
130	Request for Shunting	N	No	RBC
132	MA Request	N	No	RBC
136	Train Position Report	N	No	RBC, RIU
137	Request to shorten MA is granted	N	No	RBC
138	Request to shorten MA is rejected	N	No	RBC
146	Acknowledgement	N	No	RBC, RIU
147	Acknowledgement of Emergency Stop	N	No	RBC
149	Track Ahead Free Granted	N	No	RBC
150	End of Mission	N	No	RBC
153	Radio infill request	N	No	RIU
154	No compatible version supported	N	Yes	RBC, RIU
155	Initiation of a communication session	N	Yes	RBC, RIU
156	Termination of a communication session	N	Yes	RBC, RIU
157	SoM Position Report	N	No	RBC
158	Text message acknowledged by driver	N	No	RBC
159	Session Established	N	No	RBC, RIU

8.5.3 Track to Train radio messages

Mes. Id.	Message Name	Type	Invariant	Transmitted by
2	SR Authorisation	N	No	RBC
3	Movement Authority	N	No	RBC
6	Recognition of exit from TRIP mode	N	No	RBC
8	Acknowledgement of Train Data	N	No	RBC
9	Request to Shorten MA	N	No	RBC
15	Conditional Emergency Stop	E or N	No	RBC
16	Unconditional Emergency Stop	E or N	No	RBC
18	Revocation of Emergency Stop	N	No	RBC
24	General message	N	No	RBC, RIU
27	SH Refused	N	No	RBC
28	SH Authorised	N	No	RBC
33	MA with Shifted Location Reference	N	No	RBC
34	Track Ahead Free Request	N	No	RBC
37	Infill MA	N	No	RIU
40	Train Rejected	N	No	RBC
32	RBC/RIU System Version	N	Yes	RBC, RIU
39	Acknowledgement of termination of a communication session	N	Yes	RBC, RIU
41	Train Accepted	N	No	RBC
43	SoM position report confirmed by RBC	N	No	RBC
45	Assignment of coordinate system	N	No	RBC

8.6 Definition of Radio Messages from Train to Track

8.6.1 Message 129: Validated Train Data

Field No.	VARIABLE/ PACKET	Remarks
1	NID_MESSAGE	
2	L_MESSAGE	
3	T_TRAIN	
4	NID_ENGINE	
5	Packet 0 or 1	
6	Train data	Train - track packet type 11.

8.6.2 Message 130: Request for Shunting

Field No.	VARIABLE/ PACKET	Remarks
1	NID_MESSAGE	
2	L_MESSAGE	
3	T_TRAIN	
4	NID_ENGINE	
5	Packet 0 or 1	

8.6.3 Message 132: MA Request

Field No.	VARIABLE/ PACKET	Remarks
1	NID_MESSAGE	
2	L_MESSAGE	
3	T_TRAIN	
4	NID_ENGINE	
5	Q_MARQSTREAS ON	
6	Packet 0 or 1	
7	Optional packets	

8.6.4 Message 136: Train Position Report

Field No.	VARIABLE/ PACKET	Remarks
1	NID_MESSAGE	
2	L_MESSAGE	
3	T_TRAIN	
4	NID_ENGINE	
5	Packet 0 or 1	
6	Optional packets	

8.6.5 Message 137: Request to Shorten MA is granted

Field No.	VARIABLE/ PACKET	Remarks
1	NID_MESSAGE	
2	L_MESSAGE	
3	T_TRAIN	
4	NID_ENGINE	
5	T_TRAIN	Time stamp contained in the request.
6	Packet 0 or 1	

8.6.6 Message 138: Request to Shorten MA is rejected

Field No.	VARIABLE/ PACKET	Remarks
1	NID_MESSAGE	
2	L_MESSAGE	
3	T_TRAIN	
4	NID_ENGINE	
5	T_TRAIN	Time stamp contained in the request.
6	Packet 0 or 1	

8.6.7 Message 146: Acknowledgement

Field No.	VARIABLE	Remarks
1	NID_MESSAGE	
2	L_MESSAGE	
3	T_TRAIN	
4	NID_ENGINE	
5	T_TRAIN	Time stamp contained in the message that is acknowledged.

8.6.8 Message 147: Acknowledgement of Emergency Stop

Field No.	VARIABLE	Remarks
1	NID_MESSAGE	
2	L_MESSAGE	
3	T_TRAIN	
4	NID_ENGINE	
5	NID_EM	Identification Number of the acknowledged Emergency Message.
6	Q_EMERGENCY STOP	
7	Packet 0 or 1	

8.6.9 Message 149: Track Ahead Free Granted

Field No.	VARIABLE/ PACKET	Remarks
1	NID_MESSAGE	
2	L_MESSAGE	
3	T_TRAIN	
4	NID_ENGINE	
5	Packet 0 or 1	

8.6.10 Message 150: End of Mission

Field No.	VARIABLE/ PACKET	Remarks
1	NID_MESSAGE	
2	L_MESSAGE	
3	T_TRAIN	
4	NID_ENGINE	
5	Packet 0 or 1	

8.6.11 Message 153: Radio infill request

Field No.	VARIABLE	Remarks
1	NID_MESSAGE	
2	L_MESSAGE	
3	T_TRAIN	
4	NID_ENGINE	
5	NID_C	identity of the country of the "target" main balise group
6	NID_BG	identity of the "target" main balise group
7	Q_INFILL	start; end of infill
8	Packet 0 or 1	

8.6.12 Message 154: No compatible version supported

Field No.	VARIABLE/ PACKET	Remarks
1	NID_MESSAGE	
2	L_MESSAGE	
3	T_TRAIN	
4	NID_ENGINE	

8.6.13 Message 155: Initiation of a communication session

Field No.	VARIABLE/ PACKET	Remarks
1	NID_MESSAGE	
2	L_MESSAGE	
3	T_TRAIN	
4	NID_ENGINE	

8.6.14 Message 156: Termination of a communication session

Field No.	VARIABLE/ PACKET	Remarks
1	NID_MESSAGE	
2	L_MESSAGE	
3	T_TRAIN	
4	NID_ENGINE	

8.6.15 Message 157: SoM Position Report

Field No.	VARIABLE/ PACKET	Remarks
1	NID_MESSAGE	
2	L_MESSAGE	
3	T_TRAIN	
4	NID_ENGINE	

5	Q_STATUS
6	Packet 0 or 1
7	Optional packets

8.6.16 Message 158: Text Message Acknowledged by Driver

Field No.	VARIABLE/ PACKET	Remarks
1	NID_MESSAGE	
2	L_MESSAGE	
3	T_TRAIN	
4	NID_ENGINE	
5	NID_TEXTMESSAGE	Identity of the text message that the driver has acknowledged.
6	Packet 0 or 1	

8.6.17 Message 159: Session established

Field No.	VARIABLE/ PACKET	Remarks
1	NID_MESSAGE	
2	L_MESSAGE	
3	T_TRAIN	
4	NID_ENGINE	
5	Packet 2	

8.7 Definition of Radio Messages from Track to Train

8.7.1 Message 2: SR Authorisation

Field No.	VARIABLE	Remarks
1	NID_MESSAGE	
2	L_MESSAGE	
3	T_TRAIN	
4	M_ACK	
5	NID_LRBG	
6	Q_SCALE	
7	D_SR	
8	Optional packets	

8.7.2 Message 3: Movement Authority

Field No.	VARIABLE	Remarks
1	NID_MESSAGE	
2	L_MESSAGE	
3	T_TRAIN	
4	M_ACK	
5	NID_LRBG	
6	Level 2/3 Movement Authority	Packet 15
7	Optional packets	

8.7.3 Message 6: Recognition of exit from TRIP mode

Field No.	VARIABLE	Remarks
1	NID_MESSAGE	
2	L_MESSAGE	
3	T_TRAIN	
4	M_ACK	
5	NID_LRBG	

8.7.4 Message 8: Acknowledgement of Train Data

Field No.	VARIABLE	Remarks
1	NID_MESSAGE	
2	L_MESSAGE	
3	T_TRAIN	
4	M_ACK	
5	NID_LRBG	
6	T_TRAIN	Reference to received train data message

8.7.5 Message 9: Request to Shorten MA

Field No.	VARIABLE	Remarks
1	NID_MESSAGE	
2	L_MESSAGE	
3	T_TRAIN	
4	M_ACK	
5	NID_LRBG	
6	Level 2/3 Movement Authority	Packet 15
7	Optional packets	

8.7.6 Message 15: Conditional Emergency Stop

Field No.	VARIABLE	Remarks
1	NID_MESSAGE	
2	L_MESSAGE	
3	T_TRAIN	
4	M_ACK	
5	NID_LRBG	
6	NID_EM	Identification Number of the Emergency Stop Message.
7	Q_SCALE	
8	D_REF	
9	Q_DIR	
10	D_EMERGENCYSTOP	

8.7.7 Message 16: Unconditional Emergency Stop

Field No.	VARIABLE	Remarks
1	NID_MESSAGE	
2	L_MESSAGE	
3	T_TRAIN	
4	M_ACK	
5	NID_LRBG	
6	NID_EM	Identification Number of the Emergency Stop Message.

8.7.8 Message 18: Revocation of Emergency Stop

Field No.	VARIABLE	Remarks
1	NID_MESSAGE	
2	L_MESSAGE	
3	T_TRAIN	
4	M_ACK	
5	NID_LRBG	
6	NID_EM	Identification Number of the Emergency Stop Message.

8.7.9 Message 24: General message

Field No.	VARIABLE	Remarks
1	NID_MESSAGE	
2	L_MESSAGE	
3	T_TRAIN	
4	M_ACK	
5	NID_LRBG	
6	Optional packets	

8.7.10 Message 27: SH Refused

Field No.	VARIABLE	Remarks
1	NID_MESSAGE	
2	L_MESSAGE	
3	T_TRAIN	
4	M_ACK	
5	NID_LRBG	
6	T_TRAIN	Time stamp of the shunting request.

8.7.11 Message 28: SH Authorised

Field No.	VARIABLE	Remarks
1	NID_MESSAGE	
2	L_MESSAGE	
3	T_TRAIN	
4	M_ACK	
5	NID_LRBG	
6	T_TRAIN	Time stamp of the shunting request.
7	Optional packets	

8.7.12 Message 32: RBC/RIU System Version

Field No.	VARIABLE	Remarks
1	NID_MESSAGE	
2	L_MESSAGE	
3	T_TRAIN	
4	M_ACK	
5	NID_LRBG	
6	M_VERSION	Version of the ERTMS/ETCS system.

8.7.13 Message 33: MA with Shifted Location Reference

Field No.	VARIABLE	Remarks
1	NID_MESSAGE	
2	L_MESSAGE	
3	T_TRAIN	
4	M_ACK	
5	NID_LRBG	
6	Q_SCALE	
7	D_REF	Reference Distance
8	Level 2/3 Movement Authority	Packet 15
9	Optional packets	

8.7.14 Message 34: Track Ahead Free Request

Field No.	VARIABLE	Remarks
1	NID_MESSAGE	
2	L_MESSAGE	
3	T_TRAIN	
4	M_ACK	
5	NID_LRBG	
6	Q_SCALE	
7	D_REF	
8	Q_DIR	
9	D_TAFDISPLAY	
10	L_TAFDISPLAY	

8.7.15 Message 37: Infill MA

Field No.	VARIABLE	Remarks
1	NID_MESSAGE	
2	L_MESSAGE	
3	T_TRAIN	
4	M_ACK	
5	NID_LRBG	
6	Infill Location Reference	Packet 136
7	Level 1 Movement Authority	Packet 12
8	Optional packets	

8.7.16 Intentionally deleted

8.7.17 Message 39: Acknowledgement of termination of a communication session

Field No.	VARIABLE	Remarks
1	NID_MESSAGE	
2	L_MESSAGE	
3	T_TRAIN	
4	M_ACK	always set to 0
5	NID_LRBG	

8.7.18 Message 40: Train Rejected

Field No.	VARIABLE	Remarks
1	NID_MESSAGE	
2	L_MESSAGE	
3	T_TRAIN	
4	M_ACK	
5	NID_LRBG	

8.7.19 Message 41: Train Accepted

Field No.	VARIABLE	Remarks
1	NID_MESSAGE	
2	L_MESSAGE	
3	T_TRAIN	
4	M_ACK	
5	NID_LRBG	

8.7.20 Intentionally deleted**8.7.21 Message 43: SoM position report confirmed by RBC**

Field No.	VARIABLE	Remarks
1	NID_MESSAGE	
2	L_MESSAGE	
3	T_TRAIN	
4	M_ACK	
5	NID_LRBG	

8.7.22 Message 45: Assignment of coordinate system

Field No.	VARIABLE	Remarks
1	NID_MESSAGE	
2	L_MESSAGE	
3	T_TRAIN	
4	M_ACK	
5	NID_LRBG	
6	Q_ORIENTATION	