



EULYNX Initiative



Europe's Rail Joint Undertaking

Interface specification SCI-IO

Document number: Eu.Doc.46
Version: 4.0 (3.A)

Contents

1	Introduction	1
1.1	Release information	1
1.2	Impressum	1
1.3	Purpose	2
1.4	Applicable standards and regulations	3
1.5	Applicable documents	3
1.6	Appendices	3
1.7	Terms and abbreviations	4
1.8	Variability management	4
1.9	Definition of object types	4
2	General requirements	4
2.1	Version handling	4
2.2	Communication requirements	4
2.3	Functional requirements	4
3	Telegrams SCI-IO.PDI	4
3.1	Telegram structure	5
3.2	Sender and Receiver Identifier	5
3.3	Message and command type overview	5
3.4	Telegram definitions	5
3.4.1	Command "Set Output Channels"	5
3.4.2	Message "State Of Output Channels"	7
3.4.3	Message "State Of Input Channels"	8

ID	Type	Requirement	Func. Pkg.
Eu.SCI-IO.PDI.4	Head	1 Introduction	
Eu.SCI-IO.PDI.5	Head	1.1 Release information	
Eu.SCI-IO.PDI.6	Info	[Eu.Doc.46] Interface specification SCI-IO CENELEC Phase: 5 Version: 4.0 (3.A) Approval date: 29.05.2024	
Eu.SCI-IO.PDI.1	Info	Version history	
Eu.SCI-IO.PDI.231	Info	version number: 4.0 (0.A) date: 16.05.2022 author: Jorge Block review: CCB changes: EUIO-368, EUIO-372	
Eu.SCI-IO.PDI.232	Info	version number: 4.0 (1.A) date: 06.04.2023 author: Jorge Block, Philipp Wolber review: changes: EUIO-377, EUIO-379	
Eu.SCI-IO.PDI.233	Info	version number: 4.0 (2.A) date: 27.06.2023 author: Jorge Block review: TACS Mirror Group changes: EUIO-387, EUIO-389, EUIO-392, EUIO-395	
Eu.SCI-IO.PDI.235	Info	version number: 4.0 (3.A) date: 19.06.2024 author: Jorge Block, Ricky Holz review: TACS Mirror Group changes: EUIO-422, EUIO-433, EUIO-434	
Eu.SCI-IO.PDI.7	Head	1.2 Impressum	

ID	Type	Requirement	Func. Pkg.
Eu.SCI-IO.PDI.8	Info	<p>Publisher:</p> <p>Europe's Rail Joint Undertaking https://rail-research.europa.eu/</p> <p>EULYNX Initiative https://eulynx.eu/</p>	
Eu.SCI-IO.PDI.9	Info	<p>Responsible for this document: EU-Rail System Pillar Trackside Assets Control and Supervision domain</p>	
Eu.SCI-IO.PDI.201	Info	<p>This document is drafted by and belongs to EU Rail.</p> <p>EU Rail encourages the distribution and re-use of this document, the technical specifications and the information it contains. EU Rail holds several intellectual property rights, such as copyright and trade mark rights, which need to be considered when this document is used.</p> <p>EU Rail authorizes you to re-publish, re-use, copy and store this document without changing it, provided that you indicate its source and include the following mention [EU Rail trade mark, title of the document, year of publication, version of document].</p> <p>EU Rail makes no representation or warranty as to the accuracy or completeness of the information contained within these documents. EU Rail shall have no liability to any party as a result of the use of the information contained herein. EU Rail will have no liability whatsoever for any indirect or consequential loss or damage, and any such liability is expressly excluded.</p> <p>You may study, research, implement, adapt, improve and otherwise use the information, the content and the models in this document for your own purposes. If you decide to publish or disclose any adapted, modified or improved version of this document, any amended implementation or derivative work, then you must indicate that you have modified this document, with a reference to the document name and the terms of use of this document. You may not use EU Rail's trade marks or name in any way that may state or suggest, directly or indirectly, that EU Rail is the author of your adaptations. EU Rail cannot be held responsible for your product, even if you have used this document and its content. It is your responsibility to verify the quality, completeness and the accuracy of the information you use, for your own purposes.</p>	
Eu.SCI-IO.PDI.10	Head	1.3 Purpose	
Eu.SCI-IO.PDI.11	Info	<p>This document specifies the application layer of the standardised interface for safe communication between the Subsystem - Electronic Interlocking and Subsystem - Generic IO (SCI-IO).</p>	

ID	Type	Requirement	Func. Pkg.
Eu.SCI-IO.PDI.12	Info	This application layer is designated as SCI-IO.PDI.	
Eu.SCI-IO.PDI.13	Info	This document contains the general requirements for communication and the technical specification (e.g. telegrams) of the SCI-IO.PDI.	
Eu.SCI-IO.PDI.14	Info	This specification does not define the detailed behaviour of the interfacing partners (Subsystem - Electronic Interlocking and Subsystem - Generic IO), nor the situations in which the defined telegrams are sent. This behaviour is the subject of the individual system specifications.	
Eu.SCI-IO.PDI.15	Info	Some items, referring to "interface-related" functionality of the communication partners, have been added to this specification as information, providing an overview only. In any case these are subject to appropriate systems (national) specification.	
Eu.SCI-IO.PDI.16	Info	This document is intended for the following users: <ul style="list-style-type: none"> • safety authorities • infrastructure managers • safety assessors • signalling system suppliers • validators 	
Eu.SCI-IO.PDI.234	Info	This document is applicable for both the EU-Rail System Pillar target architecture and the EULYNX architecture. The document is delivered as a single specification fitting both the System Pillar documentation sets and the EULYNX documentation sets. EU-Rail System Pillar is the technical authority for this document.	
Eu.SCI-IO.PDI.18	Head	1.4 Applicable standards and regulations	
Eu.SCI-IO.PDI.19	Info	The applicable standards and regulations used in EULYNX are listed in the EULYNX Reference Document List [Eu.Doc.12].	
Eu.SCI-IO.PDI.198	Info	The applicability of each reference of this specification is provided by the column "applicability" in the EULYNX Reference Document [Eu.Doc.12], when the value "SCI-IO" is stated.	
Eu.SCI-IO.PDI.20	Head	1.5 Applicable documents	
Eu.SCI-IO.PDI.21	Info	The current versions of documents used as input or related to this document are listed in the EULYNX Documentation Plan [Eu.Doc.11]. The relationships between the documents are displayed in the Appendix A1 Documentation plan and structure [Eu.Doc.11_A1].	
Eu.SCI-IO.PDI.24	Head	1.6 Appendices	
Eu.SCI-IO.PDI.25	Info	- intentionally left blank -	

ID	Type	Requirement	Func. Pkg.
Eu.SCI-IO.PDI.150	Head	1.7 Terms and abbreviations	
Eu.SCI-IO.PDI.151	Info	The terms and abbreviations are listed in the EULYNX Glossary [Eu.Doc.9].	
Eu.SCI-IO.PDI.152	Head	1.8 Variability management	
Eu.SCI-IO.PDI.153	Info	This document describes harmonised requirements. Variability management is not applicable.	
Eu.SCI-IO.PDI.26	Head	1.9 Definition of object types	
Eu.SCI-IO.PDI.27	Info	The following definition for object types is applied in this document:	
Eu.SCI-IO.PDI.28	Info	<ul style="list-style-type: none"> • "Req" - This denotes a mandatory requirement. 	
Eu.SCI-IO.PDI.31	Info	<ul style="list-style-type: none"> • "Info" - This denotes additional information to help understand the specification. These objects do not specify any additional requirements. 	
Eu.SCI-IO.PDI.32	Info	<ul style="list-style-type: none"> • "Head" - This denotes chapter headings. 	
Eu.SCI-IO.PDI.33	Head	2 General requirements	
Eu.SCI-IO.PDI.228	Req	All references to [Eu.Doc.45] refer to Requirements specification for subsystem Generic IO 4.3 (0.A).	
Eu.SCI-IO.PDI.221	Req	All references to [Eu.Doc.93] refer to Interface specification SCI Generic version 3.3 (0.A).	
Eu.SCI-IO.PDI.42	Head	2.1 Version handling	
Eu.SCI-IO.PDI.212	Info	The Version handling is described in [Eu.Doc.93].	
Eu.SCI-IO.PDI.222	Req	The PDI-version of the SCI-IO as described in this document is 0x03.	
Eu.SCI-IO.PDI.49	Head	2.2 Communication requirements	
Eu.SCI-IO.PDI.50	Info	The Communication requirements are described in [Eu.Doc.93].	
Eu.SCI-IO.PDI.229	Head	2.3 Functional requirements	
Eu.SCI-IO.PDI.230	Info	The functional requirements for SCI-IO are described in [Eu.Doc.45].	
Eu.SCI-IO.PDI.54	Head	3 Telegrams SCI-IO.PDI	

ID	Type	Requirement	Func. Pkg.																				
Eu.SCI-IO.PDI.55	Info	This chapter defines the SCI-IO.PDI telegrams.	Basic IO																				
Eu.SCI-IO.PDI.56	Head	3.1 Telegram structure																					
Eu.SCI-IO.PDI.213	Info	The telegram structure is specified in [Eu.Doc.93].	Basic IO																				
Eu.SCI-IO.PDI.64	Head	3.2 Sender and Receiver Identifier																					
Eu.SCI-IO.PDI.214	Info	The identification of communications partners is specified in [Eu.Doc.93].	Basic IO																				
Eu.SCI-IO.PDI.70	Head	3.3 Message and command type overview																					
Eu.SCI-IO.PDI.71	Info	<div><div>The following table shows permitted subsystem specific message types for the SCI-IO.PDI. The permitted generic message types are specified in [Eu.Doc.93].</div><table><tr><th>Message Type</th><th>Value</th><th>Sender</th><th>Receiver</th><th>Purpose</th></tr><tr><td><i>command</i> <i>Set Output Channels</i></td><td>0x0001</td><td>Subsystem – Electronic Interlocking</td><td>Subsystem – Generic IO</td><td>Switching command to set states at the Output Channels</td></tr><tr><td><i>message</i> <i>State Output Channels</i></td><td>0x0002</td><td>Subsystem – Generic IO</td><td>Subsystem – Electronic Interlocking</td><td>The current state of disturbance of the Output Channels</td></tr><tr><td><i>message</i> <i>State Input Channels</i></td><td>0x0003</td><td>Subsystem – Generic IO</td><td>Subsystem – Electronic Interlocking</td><td>The current state of the Input Channels</td></tr></table></div>	Message Type	Value	Sender	Receiver	Purpose	<i>command</i> <i>Set Output Channels</i>	0x0001	Subsystem – Electronic Interlocking	Subsystem – Generic IO	Switching command to set states at the Output Channels	<i>message</i> <i>State Output Channels</i>	0x0002	Subsystem – Generic IO	Subsystem – Electronic Interlocking	The current state of disturbance of the Output Channels	<i>message</i> <i>State Input Channels</i>	0x0003	Subsystem – Generic IO	Subsystem – Electronic Interlocking	The current state of the Input Channels	Basic IO
Message Type	Value	Sender	Receiver	Purpose																			
<i>command</i> <i>Set Output Channels</i>	0x0001	Subsystem – Electronic Interlocking	Subsystem – Generic IO	Switching command to set states at the Output Channels																			
<i>message</i> <i>State Output Channels</i>	0x0002	Subsystem – Generic IO	Subsystem – Electronic Interlocking	The current state of disturbance of the Output Channels																			
<i>message</i> <i>State Input Channels</i>	0x0003	Subsystem – Generic IO	Subsystem – Electronic Interlocking	The current state of the Input Channels																			
Eu.SCI-IO.PDI.72	Head	3.4 Telegram definitions																					
Eu.SCI-IO.PDI.73	Info	In this chapter, specific telegrams for SCI-IO.PDI are defined. The generic telegrams are defined in [Eu.Doc.93].	Basic IO																				
Eu.SCI-IO.PDI.158	Head	3.4.1 Command "Set Output Channels"																					
Eu.SCI-IO.PDI.159	Info	With this telegram the Subsystem - Electronic Interlocking commands the Subsystem - Generic IO to set a given state at the Output Channels. This telegram refines the InformationFlow "Cd_Set_Output_Channels" specified in the requirements specification (ID Eu.IO.7962).	Basic IO																				

ID	Type	Requirement	Func. Pkg.														
Eu.SCI-IO.PDI.161	Info	<div>Telegram definition for command "Set Output Channels"</div> <table><tr><th>Byte-Nr.</th><th>Content</th></tr><tr><td>00</td><td>Protocol Type: 0x90 (1 Byte binary)</td></tr><tr><td>01..02</td><td>Message Type: 0x0001 (2 Bytes binary)</td></tr><tr><td>03..22</td><td>Sender Identifier (20 Bytes ISO IEC 8859-1:1998)</td></tr><tr><td>23..42</td><td>Receiver Identifier (20 Bytes ISO IEC 8859-1:1998)</td></tr><tr><td>43</td><td>Number k of following channels (1 Byte binary)</td></tr><tr><td>44.. 44+k-1</td><td>State of channel n (each 1 Byte binary) (1 <= n <= k)</td></tr></table>	Byte-Nr.	Content	00	Protocol Type: 0x90 (1 Byte binary)	01..02	Message Type: 0x0001 (2 Bytes binary)	03..22	Sender Identifier (20 Bytes ISO IEC 8859-1:1998)	23..42	Receiver Identifier (20 Bytes ISO IEC 8859-1:1998)	43	Number k of following channels (1 Byte binary)	44.. 44+k-1	State of channel n (each 1 Byte binary) (1 <= n <= k)	Basic IO
Byte-Nr.	Content																
00	Protocol Type: 0x90 (1 Byte binary)																
01..02	Message Type: 0x0001 (2 Bytes binary)																
03..22	Sender Identifier (20 Bytes ISO IEC 8859-1:1998)																
23..42	Receiver Identifier (20 Bytes ISO IEC 8859-1:1998)																
43	Number k of following channels (1 Byte binary)																
44.. 44+k-1	State of channel n (each 1 Byte binary) (1 <= n <= k)																
Eu.SCI-IO.PDI.160	Req	Permitted values for command "Set Output Channels":	Basic IO														
Eu.SCI-IO.PDI.162	Req	Message Type The message bytes 1 - 2 shall be set to 0x0001.	Basic IO														
Eu.SCI-IO.PDI.163	Req	Sender Identifier The message bytes 3 - 22 shall contain the technical identifier of the Subsystem - Electronic Interlocking according to ID Eu.SCI-XX.PDI.59 in ISO IEC 8859-1:1998 format.	Basic IO														
Eu.SCI-IO.PDI.165	Req	Receiver Identifier The message bytes 23 - 42 shall contain the operational identifier of the Adjacent IO System according to ID Eu.SCI-XX.PDI.59 in ISO IEC 8859-1:1998 format.	Basic IO														
Eu.SCI-IO.PDI.164	Req	Number k of following channels The message byte 43 contains the number k of below-given statuses for Output Channels, transmitted in single bytes. Maximum, 51 Output Channels can be commanded, therefore, the highest permitted value for byte 43 is 0x33.	Basic IO														
Eu.SCI-IO.PDI.166	Req	State of channel n The message bytes 44..44+k-1 (1 <= n <= k) contain the target states of the particular Output Channel n. Permitted values: <table><tr><td>Value</td><td>meaning</td></tr><tr><td>-----</td><td>-----</td></tr></table>	Value	meaning	-----	-----	Basic IO										
Value	meaning																
-----	-----																
Eu.SCI-IO.PDI.168	Req	<table><tr><td>0x01</td><td>Channel Switched Off</td></tr></table>	0x01	Channel Switched Off	Basic IO												
0x01	Channel Switched Off																

ID	Type	Requirement	Func. Pkg.														
Eu.SCI-IO.PDI.169	Req	0x02 Channel Switched On	Basic IO														
Eu.SCI-IO.PDI.227	Req	0x03 Channel Flashing	Option flashing														
Eu.SCI-IO.PDI.170	Head	3.4.2 Message "State Of Output Channels"															
Eu.SCI-IO.PDI.172	Info	With this telegram the Subsystem - Generic IO reports the status related to disturbance of the Output Channels to the Subsystem - Electronic Interlocking. This telegram refines the InformationFlow "Msg_State_Of_Output_Channels" specified in the requirements specification (ID Eu.IO.7964).	Basic IO														
Eu.SCI-IO.PDI.173	Info	Telegram definition for message "State Of Output Channels" <table><tr><th>Byte-Nr.</th><th>Content</th></tr><tr><td>00</td><td>Protocol Type: 0x90 (1 Byte binary)</td></tr><tr><td>01..02</td><td>Message Type: 0x0002 (2 Bytes binary)</td></tr><tr><td>03..22</td><td>Sender Identifier (20 Bytes ISO IEC 8859-1:1998)</td></tr><tr><td>23..42</td><td>Receiver Identifier (20 Bytes ISO IEC 8859-1:1998)</td></tr><tr><td>43</td><td>Number k of following channels (1 Byte binary)</td></tr><tr><td>44.. 44+k-1</td><td>Disturbance of channel n (each 1 Byte binary) (1 <= n <= k)</td></tr></table>	Byte-Nr.	Content	00	Protocol Type: 0x90 (1 Byte binary)	01..02	Message Type: 0x0002 (2 Bytes binary)	03..22	Sender Identifier (20 Bytes ISO IEC 8859-1:1998)	23..42	Receiver Identifier (20 Bytes ISO IEC 8859-1:1998)	43	Number k of following channels (1 Byte binary)	44.. 44+k-1	Disturbance of channel n (each 1 Byte binary) (1 <= n <= k)	Basic IO
Byte-Nr.	Content																
00	Protocol Type: 0x90 (1 Byte binary)																
01..02	Message Type: 0x0002 (2 Bytes binary)																
03..22	Sender Identifier (20 Bytes ISO IEC 8859-1:1998)																
23..42	Receiver Identifier (20 Bytes ISO IEC 8859-1:1998)																
43	Number k of following channels (1 Byte binary)																
44.. 44+k-1	Disturbance of channel n (each 1 Byte binary) (1 <= n <= k)																
Eu.SCI-IO.PDI.171	Req	Permitted values for message "State Of Output Channels":	Basic IO														
Eu.SCI-IO.PDI.175	Req	Message Type The message bytes 1 - 2 shall be set to 0x0002.	Basic IO														
Eu.SCI-IO.PDI.176	Req	Sender Identifier The message bytes 3 - 22 shall contain the operational identifier of the Adjacent IO System according to ID Eu.SCI-XX.PDI.59 in ISO IEC 8859-1:1998 format.	Basic IO														
Eu.SCI-IO.PDI.177	Req	Receiver Identifier The message bytes 23 - 42 shall contain the technical identifier of the Subsystem - Electronic Interlocking according to ID Eu.SCI-XX.PDI.59 in ISO IEC 8859-1:1998 format.	Basic IO														

ID	Type	Requirement	Func. Pkg.														
Eu.SCI-IO.PDI.178	Req	Number k of following channels The message byte 43 contains the number k of below-given statuses for Output Channels, transmitted in single bytes. Maximum, 51 Output Channels can be commanded, therefore, the highest permitted value for byte 43 is 0x33.	Basic IO														
Eu.SCI-IO.PDI.179	Req	Disturbance of channel n The message bytes 44..44+k-1 (1 <= n <= k) contain the current states of disturbance of the particular Output Channel n. Permitted values: Value meaning ----- -----	Basic IO														
Eu.SCI-IO.PDI.180	Req	0x01 Channel Not Physically Disturbed	Basic IO														
Eu.SCI-IO.PDI.181	Req	0x02 Channel Physically Disturbed	Basic IO														
Eu.SCI-IO.PDI.184	Head	3.4.3 Message "State Of Input Channels"															
Eu.SCI-IO.PDI.186	Info	With this telegram the Subsystem - Generic IO reports the current state of the Input Channels to the Subsystem - Electronic Interlocking. This telegram refines the InformationFlow "Msg_State_Of_Input_Channels" specified in the requirements specification (ID Eu.IO.7963).	Basic IO														
Eu.SCI-IO.PDI.187	Info	Telegram definition for message "State Of Input Channels" <table><tr><th>Byte-Nr.</th><th>Content</th></tr><tr><td>00</td><td>Protocol Type: 0x90 (1 Byte binary)</td></tr><tr><td>01..02</td><td>Message Type: 0x0003 (2 Bytes binary)</td></tr><tr><td>03..22</td><td>Sender Identifier (20 Bytes ISO IEC 8859-1:1998)</td></tr><tr><td>23..42</td><td>Receiver Identifier (20 Bytes ISO IEC 8859-1:1998)</td></tr><tr><td>43</td><td>Number k of following channels (1 Byte binary)</td></tr><tr><td>44.. 44+k-1</td><td>State of channel n (each 1 Byte binary) (1 <= n <= k)</td></tr></table>	Byte-Nr.	Content	00	Protocol Type: 0x90 (1 Byte binary)	01..02	Message Type: 0x0003 (2 Bytes binary)	03..22	Sender Identifier (20 Bytes ISO IEC 8859-1:1998)	23..42	Receiver Identifier (20 Bytes ISO IEC 8859-1:1998)	43	Number k of following channels (1 Byte binary)	44.. 44+k-1	State of channel n (each 1 Byte binary) (1 <= n <= k)	Basic IO
Byte-Nr.	Content																
00	Protocol Type: 0x90 (1 Byte binary)																
01..02	Message Type: 0x0003 (2 Bytes binary)																
03..22	Sender Identifier (20 Bytes ISO IEC 8859-1:1998)																
23..42	Receiver Identifier (20 Bytes ISO IEC 8859-1:1998)																
43	Number k of following channels (1 Byte binary)																
44.. 44+k-1	State of channel n (each 1 Byte binary) (1 <= n <= k)																
Eu.SCI-IO.PDI.188	Req	Permitted values for message "State Of Input Channels":	Basic IO														

ID	Type	Requirement	Func. Pkg.
Eu.SCI-IO.PDI.189	Req	Message Type The message bytes 1 - 2 shall be set to 0x0003.	Basic IO
Eu.SCI-IO.PDI.190	Req	Sender Identifier The message bytes 3 - 22 have to contain the operational identifier of the Adjacent IO System according to ID Eu.SCI-XX.PDI.59 in ISO IEC 8859-1:1998 format.	Basic IO
Eu.SCI-IO.PDI.191	Req	Receiver Identifier The message bytes 23 - 42 shall contain the technical identifier of the Subsystem - Electronic Interlocking according to ID Eu.SCI-XX.PDI.59 in ISO IEC 8859-1:1998 format.	Basic IO
Eu.SCI-IO.PDI.192	Req	Number k of following channels The message byte 43 contains the number k of below-given statuses for Input Channels, transmitted in single bytes. Maximum, 51 Input Channels can be supervised, therefore, the highest permitted value for byte 43 is 0x33.	Basic IO
Eu.SCI-IO.PDI.193	Req	State of channel n The message bytes 44..44+k-1 ($1 \leq n \leq k$) contain the current states of the particular Input Channel n. Permitted values: <div style="display: flex; justify-content: space-between; width: 100%;"> Value meaning </div> <div style="display: flex; justify-content: space-between; width: 100%;"> ----- ----- </div>	Basic IO
Eu.SCI-IO.PDI.195	Req	0x01 Channel Switched Off	Basic IO
Eu.SCI-IO.PDI.196	Req	0x02 Channel Switched On	Basic IO
Eu.SCI-IO.PDI.197	Req	0x03 Channel Disturbed	Basic IO