



EN/IEC60870-5-101 Interoperability Document for RTU32 Controller and Telemetry Outstation

This Interoperability takes reference in the EN/IEC60870-5-101 Standard including amendments at the editorial time. RTU32 is able to run as Controlled Station and/or Controlling Station on one or more ports.

The Interoperability list defines RTU32 Compliance when IEC60870 Configurator tool is used for setting up the drivers in RTU32. If EN/IEC60870 Drivers are configured manually, the Integrator is able to define additional functions.

Note:

The Interoperability does define the EN/IEC60870-5-101 supported by the general Link driver in the RTU32. All application layer ASDUs and functions are created in the STRATON application program by the integrator and require extensive protocol knowledge.

The selected parameters are marked in the white boxes as follows:

- Function or ASDU is not used
- Function or ASDU is used as standardized (default)
- R Function or ASDU is used in reverse mode
- B Function or ASDU is used in standard and reverse mode

The possible selection (blank, X, R, or B) is specified for each specific clause or parameter.

Note: In addition, the full specification of a system may require individual selection of certain parameters for certain parts of the system, such as the individual selection of scaling factors for individually addressable measured values.

1. System or device

(system-specific parameter, indicate definition of a system or a device by marking one of the following with 'X')

- System definition
- Controlling station definition (Master)
- Controlled station definition (Slave)

2. Network configuration (network-specific parameter)

(network-specific parameter, all configurations that are used are to be marked "X")

- | | |
|---|---|
| <input checked="" type="checkbox"/> Point to point | <input checked="" type="checkbox"/> Multipoint-party line |
| <input checked="" type="checkbox"/> Multiple point-to-point | <input type="checkbox"/> Multipoint-star |



3. Physical layer (network-specific parameter)

(network-specific parameter, all interfaces and data rates that are used are to be marked "X")

Transmission speed (control direction)

Unbalanced interchange Circuit V.24/V.28 Standard	Unbalanced interchange Circuit V.24/V.28 Recommended if >1 200 bit/s	Balanced interchange Circuit X.24/X.27
<input type="checkbox"/> 100 bit/s	<input checked="" type="checkbox"/> 2 400 bit/s	<input type="checkbox"/> 2 400 bit/s <input type="checkbox"/> 56 000 bit/s
<input type="checkbox"/> 200 bit/s	<input checked="" type="checkbox"/> 4 800 bit/s	<input type="checkbox"/> 4 800 bit/s <input type="checkbox"/> 64 000 bit/s
<input type="checkbox"/> 300 bit/s	<input checked="" type="checkbox"/> 9 600 bit/s	<input type="checkbox"/> 9 600 bit/s
<input type="checkbox"/> 600 bit/s		<input type="checkbox"/> 19 200 bit/s
<input checked="" type="checkbox"/> 1200 bit/s		<input type="checkbox"/> 38 400 bit/s

Transmission speed (monitor direction)

Unbalanced interchange Circuit V.24/V.28 Standard	Unbalanced interchange Circuit V.24/V.28 Recommended if >1 200 bit/s	Balanced interchange Circuit X.24/X.27
<input type="checkbox"/> 100 bit/s	<input checked="" type="checkbox"/> 2 400 bit/s	<input type="checkbox"/> 2 400 bit/s <input type="checkbox"/> 56 000 bit/s
<input type="checkbox"/> 200 bit/s	<input checked="" type="checkbox"/> 4 800 bit/s	<input type="checkbox"/> 4 800 bit/s <input type="checkbox"/> 64 000 bit/s
<input type="checkbox"/> 300 bit/s	<input checked="" type="checkbox"/> 9 600 bit/s	<input type="checkbox"/> 9 600 bit/s
<input type="checkbox"/> 600 bit/s		<input type="checkbox"/> 19 200 bit/s
<input checked="" type="checkbox"/> 1200 bit/s		<input type="checkbox"/> 38 400 bit/s

4. Link layer (network-specific parameter)

Frame format FT 1.2, single character 1 and the fixed time out interval are used exclusively in this companion standard.

Link transmission procedure

- Balanced transmission
 Unbalanced transmission

Frame length

- 255 Maximum length L (control direction)
 255 Maximum length L (monitor direction)

Address field of link

- Not present (balanced transmission only)
 One octet
 Two octets
 Structured
 Unstructured



5. Application layer

5.1 Transmission mode for application data

Mode 1 (Least significant octet first), as defined in clause 4.10 of IEC 60870-5-4, is used exclusively in this companion standard.

5.2 Common address of ASDU

(system-specific parameter, all configurations that are used are to be marked 'X')

One octet Two octets

5.3 Information object address

(system-specific parameter, all configurations that are used are to be marked 'X')

One octet structured
 Two octet unstructured
 Three octets

5.4 Cause of transmission

(system-specific parameter, all configurations that are used are to be marked 'X')

One octet Two octets-(with originator address)
Set to zero in case of no originator address

5.6 Selection of standard ASDUs

5.6.1 Process information in monitor direction

(station-specific parameter, mark each Type ID 'X' if it is only used in the standard direction, 'R' if only used in the reverse direction, and 'B' if used in both directions)

<input type="checkbox"/> <1> := Single-point information	M_SP_NA_1
<input type="checkbox"/> <2> := Single-point information with time tag	M_SP_TA_1
<input type="checkbox"/> <3> := Double-point information	M_DP_NA_1
<input type="checkbox"/> <4> := Double-point information with time tag	M_DP_TA_1
<input type="checkbox"/> <5> := Step position information	M_ST_NA_1
<input type="checkbox"/> <6> := Step position information with time tag	M_ST_TA_1
<input type="checkbox"/> <7> := Bitstring of 32 bit	M_BO_NA_1
<input type="checkbox"/> <8> := Bitstring of 32 bit with time tag	M_BO_TA_1
<input type="checkbox"/> <9> := Measured value, normalized value	M_ME_NA_1
<input type="checkbox"/> <10> := Measured value, normalized value with time tag	M_ME_TA_1



<input type="checkbox"/> R	<11> := Measured value, scaled value	M_ME_NB_1
<input type="checkbox"/> R	<12> := Measured value, scaled value with time tag	M_ME_TB_1
<input type="checkbox"/> B	<13> := Measured value, short floating point value	M_ME_NC_1
<input type="checkbox"/> B	<14> := Measured value, short floating point value with time tag	M_ME_TC_1
<input type="checkbox"/> B	<15> := Integrated totals	M_IT_NA_1
<input type="checkbox"/> B	<16> := Integrated totals with time tag	M_IT_TA_1
<input type="checkbox"/>	<17> := Event of protection equipment with time tag	M_EP_TA_1
<input type="checkbox"/>	<18> := Packed start events of protection equipment with time tag	M_EP_TB_1
<input type="checkbox"/>	<19> := Packed output circuit information of protection equipment with time tag	M_EP_TC_1
<input type="checkbox"/>	<20> := Packed single-point information with status change detection	M_PS_NA_1
<input type="checkbox"/>	<21> := Measured value, normalized value without quality descriptor	M_ME_ND_1
<input type="checkbox"/> B	<30> := Single-point information with time tag CP56Time2a	M_SP_TB_1
<input type="checkbox"/> B	<31> := Double-point information with time tag CP56Time2a	M_DP_TB_1
<input type="checkbox"/> B	<32> := Step position information with time tag CP56Time2a	M_ST_TB_1
<input type="checkbox"/> B	<33> := Bitstring of 32 bit with time tag CP56Time2a	M_BO_TB_1
<input type="checkbox"/> B	<34> := Measured value, normalized value with time tag CP56Time2a	M_ME_TD_1
<input type="checkbox"/> R	<35> := Measured value, scaled value with time tag CP56Time2a	M_ME_TE_1
<input type="checkbox"/> B	<36> := Measured value, short floating point value with time tag CP56Time2a	M_ME_TF_1
<input type="checkbox"/> B	<37> := Integrated totals with time tag CP56Time2a	M_IT_TB_1
<input type="checkbox"/>	<38> := Event of protection equipment with time tag CP56Time2a	M_EP_TD_1
<input type="checkbox"/>	<39> := Packed start events of protection equipment with time tag CP56Time2a	M_EP_TE_1
<input type="checkbox"/>	<40> := Packed output circuit information of protection equipment with time tag CP56Time2a	M_EP_TF_1

The standard specifies that either SDUs of the set <2>, <4>, <6>, <8>, <10>, <12>, <14>, <16>, <17>, <18>, <19> or of the set <30-40> are used. The RTU32 IEC60870 Configurator does not make these constrains, any combination is possible.



5.6.2 Process information in control direction

(station-specific parameter, mark each Type ID 'X' if it is only used in the standard direction, 'R' if only used in the reverse direction, and 'B' if used in both directions)

<input checked="" type="checkbox"/> <45> := Single command	C_SC_NA_1
<input checked="" type="checkbox"/> <46> := Double command	C_DC_NA_1
<input checked="" type="checkbox"/> <47> := Regulating step command	C_RC_NA_1
<input checked="" type="checkbox"/> <48> := Set point command, normalized value	C_SE_NA_1
<input type="checkbox"/> <49> := Set point command, scaled value	C_SE_NB_1
<input checked="" type="checkbox"/> <50> := Set point command, short floating point value	C_SE_NC_1
<input checked="" type="checkbox"/> <51> := Bitstring of 32 bit	C_BO_NA_1

5.6.3 System information in monitor direction

(station-specific parameter, mark with an "X" if it is only used in the standard direction, "R" if only used in the reverse direction, and "B" if used in both directions)

<input type="checkbox"/> <70> := End of initialization	M_EI_NA_1
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5.6.4 System information in control direction

(station-specific parameter, mark each Type ID 'X' if it is only used in the standard direction, 'R' if only used in the reverse direction, and 'B' if used in both directions)

<input type="checkbox"/> <100>:= Interrogation command	C_IC_NA_1
<input type="checkbox"/> <101>:= Counter interrogation command	C_CI_NA_1
<input type="checkbox"/> <102>:= Read command	C_RD_NA_1
<input type="checkbox"/> <103>:= Clock synchronization command	C_CS_NA_1
<input checked="" type="checkbox"/> <104>:= Test command	C_TS_NA_1
<input checked="" type="checkbox"/> <105>:= Reset process command	C_RP_NA_1
<input checked="" type="checkbox"/> <106>:= Delay acquisition command	C_CD_NA_1
<input type="checkbox"/> <107>:= Test command with time tag CP56time2a	C_TS_TA_1



5.6.5 Parameter in control direction

(station-specific parameter, mark each Type ID 'X' if it is only used in the standard direction, 'R' if only used in the reverse direction, and 'B' if used in both directions)

<input checked="" type="checkbox"/> <110>:= Parameter of measured value, normalized value	P_ME_NA_1
<input type="checkbox"/> <111>:= Parameter of measured value, scaled value	P_ME_NB_1
<input checked="" type="checkbox"/> <112>:= Parameter of measured value, short floating point value	P_ME_NC_1
<input type="checkbox"/> <113>:= Parameter activation	P_AC_NA_1

5.6.6 File Transfer

(station-specific parameter, mark each Type ID 'X' if it is only used in the standard direction, 'R' if only used in the reverse direction, and 'B' if used in both directions)

<input type="checkbox"/> <120>:= File ready	F_FR_NA_1
<input type="checkbox"/> <121>:= Section ready	F_SR_NA_1
<input type="checkbox"/> <122>:= Call directory, select file, call file, call section	F_SC_NA_1
<input type="checkbox"/> <123>:= Last section, last segment	F_LS_NA_1
<input type="checkbox"/> <124>:= Ack file, ack section	F_AF_NA_1
<input type="checkbox"/> <125>:= Segment	F_SG_NA_1
<input type="checkbox"/> <126>:= Directory {blank or X, only available in monitor (standard) direction}	F_DR_TA_1



5.6.7 Type Identifier and Cause of Transmission Assignments

(station-specific parameters)

Shaded boxes are not required.

Blank = Function or ASDU is not used.

Mark type identification/cause of transmission combinations:

‘X’ if only used in the standard direction

‘R’ if only used in reverse direction

‘B’ if used in both directions

Type Identification		Cause of transmission																			
		1	2	3	4	5	6	7	8	9	10	11	12	13	20 to 36	37 to 41	44	45	46	47	
<1>	M_SP_NA_1			B											B						
<2>	M_SP_TA_1			B																	
<3>	M_DP_NA_1			B											B						
<4>	M_DP_TA_1			B																	
<5>	M_ST_NA_1			B											B						
<6>	M_ST_TA_1			B																	
<7>	M_BO_NA_1			B											B						
<8>	M_BO_TA_1			B																	
<9>	M_ME_NA_1		B	B											B						
<10>	M_ME_TA_1		B	B																	
<11>	M_ME_NB_1		R	R											R						
<12>	M_ME_TB_1		R	R																	
<13>	M_ME_NC_1		B	B											B						
<14>	M_ME_TC_1		B	B																	
<15>	M_IT_NA_1			B																	
<16>	M_IT_TA_1			B																	
<17>	M_EP_TA_1																				
<18>	M_EP_TB_1																				
<19>	M_EP_TC_1																				
<20>	M_PS_NA_1																				
<21>	M_ME_ND_1																				
<30>	M_SP_TB_1			B																	
<31>	M_DP_TB_1			B																	
<32>	M_ST_TB_1			B																	
<33>	M_BO_TB_1			B																	
<34>	M_ME_TD_1			B																	
<35>	M_ME_TE_1			R																	
<36>	M_ME_TF_1			B																	
<37>	M_IT_TB_1			B																	
<38>	M_EP_TD_1																				
<39>	M_EP_TE_1																				
<40>	M_EP_TF_1																				
<45>	C_SC_NA_1						X	X	X	X	X							X	X	X	X
<46>	C_DC_NA_1						X	X	X	X	X							X	X	X	X



Type Identification		Cause of transmission																		
		1	2	3	4	5	6	7	8	9	10	11	12	13	20 to 36	37 to 41	44	45	46	47
<47>	C_RC_NA_1						X	X			X						X	X	X	X
<48>	C_SE_NA_1						X	X	X	X							X	X	X	X
<49>	C_SE_NB_1																			
<50>	C_SE_NC_1						X	X	X	X							X	X	X	X
<51>	C_BO_NA_1						X	X			X						X	X	X	X
<70>	M_EI_NA_1*				B															
<100>	C_IC_NA_1						B	B			B						B	B	B	B
<101>	C_CI_NA_1																			
<102>	C_RD_NA_1																			
<103>	C_CS_NA_1						B	B									B	B	B	B
<104>	C_TS_NA_1																			
<105>	C_RP_NA_1*)						X	X									X	X	X	X
<106>	C_CD_NA_1			X			X	X									X	X	X	X
<107>	C_TS_TA_1						B	B									B	B	B	B
<110>	P_ME_NA_1						X	X									X	X	X	X
<111>	P_ME_NB_1																			
<112>	P_ME_NC_1						X	X									X	X	X	X
<113>	P_AC_NA_1																			
<120>	F_FR_NA_1																			
<121>	F_SR_NA_1																			
<122>	F_SC_NA_1																			
<123>	F_LS_NA_1																			
<124>	F_AF_NA_1																			
<125>	F_SG_NA_1																			
<126>	F_DR_TA_1*)																			



5.7 Basic application functions

5.7.1 Station initialization

(station-specific parameter, mark 'X' if function is used)

Remote initialization

5.7.2 Cyclic data transmission

(station-specific parameter, mark 'X' if function is only used in the standard direction, 'R' if only used in the reverse direction, and 'B' if used in both directions)

Cyclic data transmission (measured values optional)

5.7.3 Read procedure

(station-specific parameter, mark 'X' if function is only used in the standard direction, 'R' if only used in the reverse direction, and 'B' if used in both directions)

Read procedure

5.7.4 Spontaneous transmission

(station-specific parameter, mark 'X' if function is only used in the standard direction, 'R' if only used in the reverse direction, and 'B' if used in both directions)

Spontaneous transmission

5.7.5 Double transmission of information objects with cause of transmission spontaneous

(station-specific parameter, mark each information type 'X' where both a Type ID without time and corresponding Type ID with time are issued in response to a single spontaneous change of a monitored object).

The following type identifications may be transmitted in succession caused by a single status change of an information object. The particular information object addresses for which double transmission is enabled are defined in a project-specific list.

- Single-point information M_SP_NA_1, M_SP_TA_1, M_SP_TB_1 and M_PS_NA_1
- Double-point information M_DP_NA_1, M_DP_TA_1 and M_DP_TB_1
- Step position information M_ST_NA_1, M_ST_TA_1 and M_ST_TB_1
- Bitstring of 32 bit M_BO_NA_1, M_BO_TA_1 and M_BO_TB_1 (if defined for a specific project)
- Measured value, normalized value M_ME_NA_1, M_ME_TA_1, M_ME_ND_1 and M_ME_TD_1
- Measured value, scaled value M_ME_NB_1, M_ME_TB_1 and M_ME_TE_1
- Measured value, short floating point number M_ME_NC_1, M_ME_TC_1 and M_ME_TF_1



5.7.6 Station interrogation

(station-specific parameter, mark 'X' if function is only used in the standard direction, 'R' if only used in the reverse direction, and 'B' if used in both directions)

global

group 1

group 7

group 13

group 2

group 8

group 14

group 3

group 9

group 15

group 4

group 10

group 16

group 5

group 11

group 6

group 12

5.7.7 Clock synchronization

(station-specific parameter, mark 'X' if function is only used in the standard direction, 'R' if only used in the reverse direction, and 'B' if used in both directions)

Clock synchronization

5.7.8 Command transmission

(object-specific parameter, mark 'X' if function is only used in the standard direction, 'R' if only used in the reverse direction, and 'B' if used in both directions).

Direct command transmission

Direct set point command transmission

Select and execute command

Select and execute set point command

C_SE ACTTERM used

No additional definition

Short pulse duration (duration system wide and/or individual for each command (v.140))

Long pulse duration (duration system wide and/or individual for each command (v.140))

Persistent output

Adjustable

Maximum allowable delay of commands and set point commands





5.7.9 Transmission of integrated totals

(station- or object-specific parameter, mark 'X' if function is only used in the standard direction, 'R' if only used in the reverse direction, and 'B' if used in both directions)

- Mode A: Local freeze with spontaneous transmission
- Mode B: Local freeze with counter interrogation
- Mode C: Freeze and transmit by counter interrogation commands
- Mode D: Freeze by counter interrogation command, frozen values reported spontaneously

- Counter read
- Counter freeze without reset
- Counter freeze with reset
- Counter reset

- General request counter
- Request counter group 1
- Request counter group 2
- Request counter group 3
- Request counter group 4

5.7.10 Parameter loading

(object-specific parameter, mark 'X' if function is only used in the standard direction, 'R' if only used in the reverse direction, and 'B' if used in both directions)

- Threshold value
- Smoothing factor
- Low limit for transmission of measured value
- High limit for transmission of measured value



5.7.11 Parameter activation

(object-specific parameter, mark 'X' if function is only used in the standard direction, 'R' if only used in the reverse direction, and 'B' if used in both directions)

- Act/deact of persistent cyclic or periodic transmission of the addressed object

5.7.12 Test procedure

(object-specific parameter, mark 'X' if function is only used in the standard direction, 'R' if only used in the reverse direction, and 'B' if used in both directions)

- Test procedure

5.7.13 File transfer

(station-specific parameter, mark 'X' if function is used).

File transfer in monitor direction

- Transparent file
- Transmission of disturbance data of protection equipment
- Transmission of sequences of events
- Transmission of sequences of recorded analogue values

File transfer in control direction

- Transparent file

5.7.14 Background scan

(station-specific parameter, mark 'X' if function is only used in the standard direction, 'R' if only used in the reverse direction, and 'B' if used in both directions)

- Background scan

5.7.15 Acquisition of transmission delay

(station-specific parameter, mark 'X' if function is only used in the standard direction, 'R' if only used in the reverse direction, and 'B' if used in both directions)

- Acquisition of transmission delay