

IEC 60870-5-103 Interoperability List for PAC-E100ST

1. Physical layer

1.1 Electrical interface

- EIA RS-485 Number of load for one equipment

* Note : EIA RS-485 standard defines unit loads so that 32 of them can be operated on one line. For detailed information refer to EIA RS-485 standard.

1.2 Optical interface

- Glass fibre Plastic fibre
 F-SMA type connector BFOC/2,5 type connector

1.3 Transmission speed

- 9600 bit/s 19200 bit/s

2. Link layer

There are no choices for the link layer.

3. Application layer

3.1 Transmission mode for application data

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

3.2 Common address of ASDU

- One common address of ASDU (identical with station address)
 More than one common address of ASDU

3.3 Selection of standard information numbers in monitor direction

3.3.1 System functions in monitor direction

- <0> End of general interrogation <3> Reset CU
 <0> Time synchronization <4> Start/restart
 <2> Reset FCB <5> Power on

3.3.2 Status indications in monitor direction

- <16> Auto-recloser active <24> Characteristics 2
 <17> Teleprotection active <25> Characteristics 3
 <18> Protection active <26> Characteristics 4
 <19> LED reset <27> Auxiliary input 1
 <20> Monitor direction blocked <28> Auxiliary input 2
 <21> Test mode <29> Auxiliary input 3
 <22> Local parameter setting <30> Auxiliary input 4
 <23> Characteristics

3.3.3 Supervision indications in monitor direction

- | | |
|---|--|
| <input type="checkbox"/> <32> Measurand supervision I | <input type="checkbox"/> <38> VT fuse failure |
| <input type="checkbox"/> <33> Measurand supervision V | <input type="checkbox"/> <39> Teleprotection disturbed |
| <input type="checkbox"/> <35> Phase sequence supervision | <input type="checkbox"/> <46> Group warning |
| <input checked="" type="checkbox"/> <36> Trip circuit supervision | <input checked="" type="checkbox"/> <47> Group alarm |
| <input type="checkbox"/> <37> I>> back up operation | |

3.3.4 Earth fault indications in monitor direction

- | | |
|--|--|
| <input type="checkbox"/> <48> Earth fault L1 | <input type="checkbox"/> <51> Earth fault forward, i.e. line |
| <input type="checkbox"/> <49> Earth fault L2 | <input type="checkbox"/> <52> Earth fault reverse, i.e. busbar |
| <input type="checkbox"/> <50> Earth fault L3 | |

3.3.5 Fault indications in monitor direction

- | | |
|---|--|
| <input type="checkbox"/> <64> Start / pick-up L1 | <input type="checkbox"/> <79> Zone 2 |
| <input type="checkbox"/> <65> Start / pick-up L2 | <input type="checkbox"/> <80> Zone 3 |
| <input type="checkbox"/> <66> Start / pick-up L,3 | <input type="checkbox"/> <81> Zone 4 |
| <input checked="" type="checkbox"/> <67> Start / pick-up N | <input type="checkbox"/> <82> Zone 5 |
| <input checked="" type="checkbox"/> <68> General trip | <input type="checkbox"/> <83> Zone 6 |
| <input type="checkbox"/> <69> Trip L1 | <input checked="" type="checkbox"/> <84> General start / pick-up |
| <input type="checkbox"/> <70> Trip L2 | <input checked="" type="checkbox"/> <85> Breaker failure |
| <input type="checkbox"/> <71> Trip L3 | <input type="checkbox"/> <86> Trip measuring system L1 |
| <input type="checkbox"/> <72> Trip I>> (back-up protection) | <input type="checkbox"/> <87> Trip measuring system L2 |
| <input type="checkbox"/> <73> Fault location in X ohms | <input type="checkbox"/> <88> Trip measuring system L3 |
| <input type="checkbox"/> <74> Fault forward / line | <input type="checkbox"/> <89> Trip measuring system E |
| <input type="checkbox"/> <75> Fault reverse / busbar | <input checked="" type="checkbox"/> <90> Trip I> |
| <input type="checkbox"/> <76> Teleprotection signal transmitted | <input checked="" type="checkbox"/> <91> Trip I>> |
| <input type="checkbox"/> <77> Teleprotection signal received | <input checked="" type="checkbox"/> <92> Trip IN> |
| <input type="checkbox"/> <78> Zone 1 | <input checked="" type="checkbox"/> <93> Trip IN>> |

3.3.6 Autoreclosure indications in monitor direction

- | | |
|--|---|
| <input type="checkbox"/> <128> CB 'on' by AR | <input type="checkbox"/> <130> AR blocked |
| <input type="checkbox"/> <129> CB 'on' by long-time AR | |

3.3.7 Measurands in monitor direction

- | | |
|---|---|
| <input type="checkbox"/> <144> Measurand I | <input type="checkbox"/> <147> Measurands IN, VEN |
| <input type="checkbox"/> <145> Measurands I,V | <input type="checkbox"/> <148> Measurands IL1,IL2,IL3,VL1,VL2,VL3,P,Q,f |
| <input type="checkbox"/> <146> Measurands I,V,P,Q | |

3.3.8 Generic functions in monitor direction

- | | |
|--|---|
| <input type="checkbox"/> <240> Read headings of all defined groups | <input type="checkbox"/> <243> Read directory of a single entry |
| <input type="checkbox"/> <241> Read values of attr of all entries of one group | <input type="checkbox"/> <244> Read value or attr of a single entry |

- | | |
|---|---|
| <input type="checkbox"/> <245> End of general interrogation of generic data | <input type="checkbox"/> <250> Write entry with execution |
| <input type="checkbox"/> <249> Write entry with confirmation | <input type="checkbox"/> <251> Write entry aborted |

3.4 Selection of standard information numbers in control direction

3.4.1 System functions in control direction

- | | |
|---|--|
| <input checked="" type="checkbox"/> <0> Initiation of general interrogation | <input checked="" type="checkbox"/> <0> Time synchronization |
|---|--|

3.4.2 General commands in control direction

- | | |
|---|--|
| <input type="checkbox"/> <16> Auto-recloser on / off | <input type="checkbox"/> <23> Activate characteristics 1 |
| <input type="checkbox"/> <17> Teleprotection on / off | <input type="checkbox"/> <24> Activate characteristics 2 |
| <input type="checkbox"/> <18> Protection on / off | <input type="checkbox"/> <25> Activate characteristics 3 |
| <input checked="" type="checkbox"/> <19> LED reset | <input type="checkbox"/> <26> Activate characteristics 4 |

3.4.3 Generic functions control direction

- | | |
|--|--|
| <input type="checkbox"/> <240> Read headings of all defined groups | <input type="checkbox"/> <248> Write entry |
| <input type="checkbox"/> <241> Read values of attributes of all entries of one group | |
| <input type="checkbox"/> <243> Read directory of a single entry | <input type="checkbox"/> <249> Write entry with confirmation |
| <input type="checkbox"/> <244> Read value or attributes of a single entry | <input type="checkbox"/> <250> Write entry with execution |
| <input type="checkbox"/> <245> General interrogation of generic data | <input type="checkbox"/> <251> Write entry abort |

3.5 Basic application functions

- | | |
|--|--|
| <input type="checkbox"/> Test mode | <input type="checkbox"/> Generic services |
| <input type="checkbox"/> Blocking of monitor direction | <input checked="" type="checkbox"/> Private data |
| <input type="checkbox"/> Disturbance data | |

3.6 Miscellaneous

Measurands are transmitted with ASDU 9. The maximum MVAL can 2.4 times the rated value.

IEC 60870-5-103 Data Mapping for PAC-E100ST

The Class Polling

Class 1

The class 1 data is always so that the response messages have the highest priority, thereafter the spontaneous events and finally the interrogation events.

Class 2

The measurement values are transported to the control system as a response to a class 2 request. And the class 2 data is always cyclically updated. The measurement values cyclic update period is 500 ms.

Explanations of Table

Code	Description
ST	Status S : IEC 60870-5-103 standard P : private definition
FUN	Function type
INF	Information Number
TYPE	ASDU(Application Service Data Unit) Type
COT	Cause of Transmission 1 : Spontaneous (Not in interrogation) 9 : Interrogated 2 : cyclic (Measurands)

System Functions

Description	ST	FUN	INF	TYPE	COT
Power On	S	255	5	5	6
Reset CU (Communication Unit)	S	255	3	5	4
Reset FCB (Frame Count Bit)	S	255	2	5	3
Synchronization Command	S	255	0	6	8

*) Type 5 (ASDU - Identification message) contain manufacture's name and relay model name : 'PNCTECH_E110'

**) Class polling time out : 20 sec

Status Indications

Description	ST	FUN	INF	TYPE	COT
System Error(Error LED)	P	242	47	1	9
General pickup(pickup LED)	P	242	84	1	9
General trip(trip LED)	P	242	68	1	9
CB Status(Position)	P	242	160	1	9
Trip Circuit Supervision	P	242	36	1	1,9
50_1 Pickup	P	162	97	2	1
50_1 Trip	P	162	99	2	1
50_2 Pickup	P	162	95	2	1
50_2 Trip	S	160	91	2	1

PAC-E100ST (Over Current & Earth Fault Relay)

51 Pickup	S	160	84	2	1
51 Trip	S	160	90	2	1
50N_1 Pickup	P	163	97	2	1
50N_1 Trip	P	163	99	2	1
50N_2 Pickup	P	163	95	2	1
50N_2 Trip	S	160	93	2	1
51N Pickup	S	160	67	2	1
51N Trip	S	160	92	2	1
37 Pickup	P	165	84	2	1
37 Trip	P	165	91	2	1
49 Alarm	P	166	90	2	1
49 Trip	P	166	91	2	1
46 Pickup	P	167	84	2	1
46 Trip	P	167	90	2	1
50BF OP	P	160	85	2	1
COLD LD Pickup	P	169	84	2	1
COLD LD OP	P	169	150	2	1
I2/I1 OP	P	170	84	2	1
79 Start	P	171	100	1	1
79 CB Trip Fail	P	171	121	1	1
79 CB Close Fail	P	171	122	1	1
79 CB Close1	P	171	101	1	1
79 CB Close2	P	171	102	1	1
79 CB Close3	P	171	103	1	1
79 CB Close4	P	171	104	1	1
79 CB Close5	P	171	105	1	1
79 Success	P	171	123	1	1
79 Failure	P	171	124	1	1
Setting Group1 Active	P	242	23	1	1
Setting Group2 Active	P	242	24	1	1
Setting Group3 Active	P	242	25	1	1
Setting Group4 Active	P	242	26	1	1
Contact Input1	P	243	231	1	1,9
Contact Input2	P	243	232	1	1,9
Contact Input3	P	243	233	1	1,9
Contact Input4	P	243	234	1	1,9
Contact Input5	P	243	235	1	1,9
Contact Input6	P	243	236	1	1,9
Contact Input7	P	243	237	1	1,9
Contact Output1	P	244	231	1	1,9
Contact Output2	P	244	232	1	1,9
Contact Output3	P	244	233	1	1,9
Contact Output4	P	244	234	1	1,9
Contact Output5	P	244	235	1	1,9

General Commands

Description	ST	FUN	INF	TYPE	COT
CB Open/Close Control	P	242	161	20	20, 21
Reset Annunciator (LED)	S	242	19	20	20, 21
Setting Group 1 Active	P	242	23	20	20,21
Setting Group 2 Active	P	242	24	20	20,21
Setting Group 3 Active	P	242	25	20	20,21
Setting Group 4 Active	P	242	26	20	20,21

Measurands

Description	ST	FUN	INF	TYPE	COT
Measurands II	P	160	149	9	2

Set No	Item	Description	Reference
1	RMS IA	Phase A Current Magnitude	$4096 = 2.4 * I_N$
2	RMS IB	Phase B Current Magnitude	$4096 = 2.4 * I_N$
3	RMS IC	Phase C Current Magnitude	$4096 = 2.4 * I_N$
4	RMS IN	Ground Current Magnitude	$4096 = 2.4 * I_N$
5	RMS I2fA	Phase A 2 nd harmonic Current Magnitude	$4096 = 2.4 * I_N$
6	RMS I2fB	Phase B 2 nd harmonic Current Magnitude	$4096 = 2.4 * I_N$
7	RMS I2fC	Phase C 2 nd harmonic Current Magnitude	$4096 = 2.4 * I_N$
8	RMS I1	Positive Phase Sequence Current	$4096 = 2.4 * I_N$
9	RMS I2	Negative Phase Sequence Current	$4096 = 2.4 * I_N$
10	Thermal state(%)	Thermal state	$4096 = 240\%$ of Thermal state
11	Phase A CB Monitor Data	CB Monitor A Phase Accumulation	$4096 = 240\%$ of Accumulation
12	Phase B CB Monitor Data	CB Monitor B Phase Accumulation	$4096 = 240\%$ of Accumulation
13	Phase C CB Monitor Data	CB Monitor C Phase Accumulation	$4096 = 240\%$ of Accumulation

*) for $I_N = 5A$, 4096 is 12A ($2.4 * 5A$).