

IEC 60870-5-101 PROTOCOL IMPLEMENTATION REQUIREMENTS

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PURPOSE AND SCOPE

The protocol standard documents IEC 60870-5-1 to IEC 60870-5-6 and companion standard IEC 60870-5-101 define the requirements of the communications protocol.

This document describes the address and configuration requirements of the IEC 60870-5-101 protocol for a slave station application, this is generally a National Grid Substation Automation System (SAS). These address and configuration requirements are essential for the correct working of the SAS to the National Grid UK Transmission iEMS SCADA system, which are outside the scope of the above documents.

Whilst the IEC 60870 series of standards define the technical requirements of the communications protocol, they do not address how to use the protocol in a target SAS. This document describes the detailed addressing requirements for the National Grid specific application of the IEC 60870-5-101 protocol.

1 GUIDANCE

1.1 Link Address

For each individual SAS the preferred Link Addresses allocation is shown below:

- a) iEMS Main DIRECT LINK = LINK ADDRESS 1
- b) iEMS Main ALTERNATE LINK = LINK ADDRESS 2
- c) iEMS DBU DIRECT LINK = LINK ADDRESS 3
- d) iEMS DBU ALTERNATE LINK = LINK ADDRESS 4

1.2 Common Address of ASDU (Station Address)

This shall be unique for each slave outstation and will be allocated by National Grid.

For any slave station, the same Common Address shall be used on each Link.

The range of available addresses is 1 – 65534.

Address 65535 is reserved for use as a Global Address for all slave stations.

1.3 Information Object Address (IOA)

The Information Object Address is made up 3 data octets divided into 2 parts: -

- a) A Node Address.
- b) An Information Item Address (IIA).

The data octets are allocated as follows: -

Octet 1	Node Address
Octet 2	Information Item Address
Octet 3	

1.4 Node Address

Substations will be subdivided into nodes.

1.4.1 Within the SAS configuration, a node will define: -

- a) The whole substation (e.g. KEAD).
- b) Each substation voltage level (e.g. KEAD4).
- c) Each circuit (KEAD 2).
- d) Each leg of any 'teed' circuit (KEAD).

1.4.2 Within the SAS configuration: -

- a) Every node will be allocated a unique address, known as a Node Address.
- b) The Node Address allocation will be sequential starting at 1, up to a maximum of 254.
- c) Node Address 1 will be allocated to the whole substation node.
- d) The number of Node addresses allocated shall be contiguous with the number of Node Addresses minimised in the configuration.

1.5 Information Item Address

1.5.1 Within the SAS configuration: -

- a) Each Plant Item (e.g. X120 cb; SUND 1 feeder; compressor 1) will be associated with a node (e.g. a voltage level, a circuit, etc.).
- b) Each Plant Item will comprise a number of Data Items (e.g. Alarms, Controls, Indications, Analogues).
- c) Consequently each Data Item will be associated with a particular node.

1.5.2 Within a node: -

- a) Each Data Item will be allocated a unique address known as an Information Item Address (IIA).
- b) There are prescribed address ranges for the allocation of Information Item Addresses. These ranges are dependant upon the Data Type; see Table in Section 1.6.
- c) For each Data Type, it is required that the allocation of Information Item Addresses (to Data Items) is consecutive and commence from the lowest available address in the prescribed range.

1.6 Information Item Address Ranges for Data Types

For completeness the table below shows the Information Item Address ranges applicable to all Data Types; however the National Grid implementation does not use every Data Type.

The configuration shall initially use contiguous addresses within each address range for each Data Type.

Spare addresses shall be re used as they become available to avoid gaps appearing in the address space.

Informative: Due master station configuration limitations, the number of Node Addresses is required to be minimised and gaps in the address space for each Data Type shall be avoided.

Data Type	Type ID (ASN.1)	Information Item Address	
		Minimum value	Maximum value
Single point information	M_SP	1	1,999
Double point information	M_DP	2,000	2,999
Step position information	M_ST	3,000	3,999
Bitstring	M_BO	4,000	4,999
Measured value, normalised	M_ME_A	5,000	5,999
Measured value, scaled	M_ME_B	6,000	6,999
Measured value, short float	M_ME_C	7,000	7,999
Integrated totals	M_IT	8,000	8,999
Reserved for further data types		9,000	9,999
Single command	C_SC	10,000	10,999
Double command	C_DC	11,000	11,999
Regulating step command	C_RC	12,000	12,999
Set point command, normalised	C_SE_A	13,000	13,999
Set point command, scaled	C_SE_B	14,000	14,999
Set point command, short float	C_SE_C	15,000	15,999
Bitstring	C_BO	16,000	16,999
Reserved for further data types		17,000	19,999
Parameter of measured value, normalised	P_ME_A	20,000	20,999
Parameter of measured value, scaled	P_ME_B	21,000	21,999
Parameter of measured value, short float	P_ME_C	22,000	22,999
Reserved for further data types		23,000	29,999
File (or directory)	F, D	30,000	30,999
Reserved for further data types		31,000	32,767
Single Point Information (overflow range)		32,768	65,535

1.7 Configuration of IEC 61850

Information: Where the slave station uses IEC 61850 Common Data Class (CDC) data models, National Grid will consider use of the mapping principles defined in IEC 61850-80-1 for future configuration of IEC 60870-5-101 protocol.