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Space data and information transfer systems - SpaceFibre data bus communication protocol on spacecraft

空间数据与信息传输系统 航天器SpaceFibre总线通信协议

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1 Scope

The document lays down the services, the data formats, the physical layer protocol, the data link layer protocol, the network layer protocol, the management information base and the reliability design of the SpaceFibre bus communication protocol for spacecraft.

It applies to the development and the use of the SpaceFibre bus and of the related equipment inside a spacecraft.

2 Normative references

The content of the following document constitutes, through normative reference in the text,

indispensable provisions of this document. For dated references, only the edition corresponding to that date applies; for undated references, the latest edition, including all amendments, applies.

GB/T 42041 Aerospace terminology - Space data and information transfer.

3 Terms and definitions

The terms and definitions given in GB/T 42041, together with the following, apply to the document.

3.1 active lane: a unidirectional lane or a bidirectional lane that is in the activated state.

3.2 asymmetric link: a link containing several lanes in which one or more lanes are unidirectional lanes.

3.3 available bandwidth: the number of data words and control words sent by all the virtual channels on the link within the period running from the last bandwidth credit update to the present moment.

3.4 bandwidth utilisation: the proportion of the bandwidth allocated to a given virtual channel that has been used within the most recent period. Note: when the bandwidth credit of a virtual channel reaches the upper or the lower threshold, bandwidth utilisation does not have to be calculated for a short time.

3.5 bi-directional lane: an active lane that carries information in both directions on a link.

3.6 broadcast message: eight bytes of application data sent to every node on the network, together with an 8-bit broadcast type identifier that expresses the meaning of that application data.

3.7 broadcast frame: the frame obtained by encapsulating a broadcast message, with start of broadcast frame (SBF) placed before it and end of broadcast frame (EBF) placed after it.

3.8 D-code: in the 8B/10B coded transmission scheme used, a coding in which an 8-bit data character is first represented by a 9-bit coded value made up of one D/K flag bit set to 0 and the 8-bit data character.

3.9 K-code: in the 8B/10B coded transmission scheme used, a coding in which an 8-bit control character is first represented by a 9-bit coded value made up of one D/K flag bit set to 1 and the 8-bit control character, the 8-bit control character being allowed to take only one of twelve valid values.

3.10 comma: a special dedicated control symbol used on a SpaceFibre link. Note: its value is K28.5 or K28.7.

3.11 control word: a character used to carry out SpaceFibre protocol control. Note: control words include the comma, and also end of broadcast frame (EBF), end of data frame

(EDF), flow control token (FCT) and receive error control word (RXERR), each made up of a K-code followed by three data characters or fill characters.

3.12 disparity: the difference between the number of ones and the number of zeros in a code stream.

3.13 current running disparity: the disparity accumulated in a serial code stream from the start of transmission up to the present moment. Note: when the code stream carries more ones than zeros the disparity is positive, and the reverse gives a negative value.

3.14 data word: a word made up of four SpaceFibre standard characters or fill characters.

3.15 data segment: a group made up of at most N times 64 consecutive data words taken from one or more packets. Note: N is an integer less than or equal to the control parameter for the maximum number of data transmitting lanes.

3.16 end of packet marker: the standard character that indicates the end of a packet.

3.17 end-point: the single interface between the network and the host system that gives access to the network.

3.18 end-pointerror end of packet marker: the standard character that indicates the end of a packet in which an error has occurred. The English term is reported here exactly as printed on the document.

3.19 flow control token: the data flow control word used to manage the M times 64 data words that may be exchanged on the link. Note: M is an integer between 1 and 8.

3.20 hot redundant lane: a lane that is not sending data at present but is already in the active state, and can at any moment replace a faulty lane whose data transmission enable is set.

3.21 invalid symbol: a symbol that is not in the 8B/10B decoding table of the SpaceFibre communication protocol, that is, an anomalous symbol outside the range of valid D-code or K-code symbols.

3.22 lane: a physical connection running the SpaceFibre communication protocol between two devices. Note: a lane can be realised through a cable medium or a fibre medium, and can carry bidirectional or unidirectional transmission.

3.23 line driver: the circuit unit that drives the signal through a given transmission medium.

3.24 line receiver: the circuit unit that receives the signal arriving through a given transmission medium.

3.25 link: the bidirectional connection between two SpaceFibre ports, used to transfer packets and broadcast messages between those two ports. Note: one link contains one or more lanes.