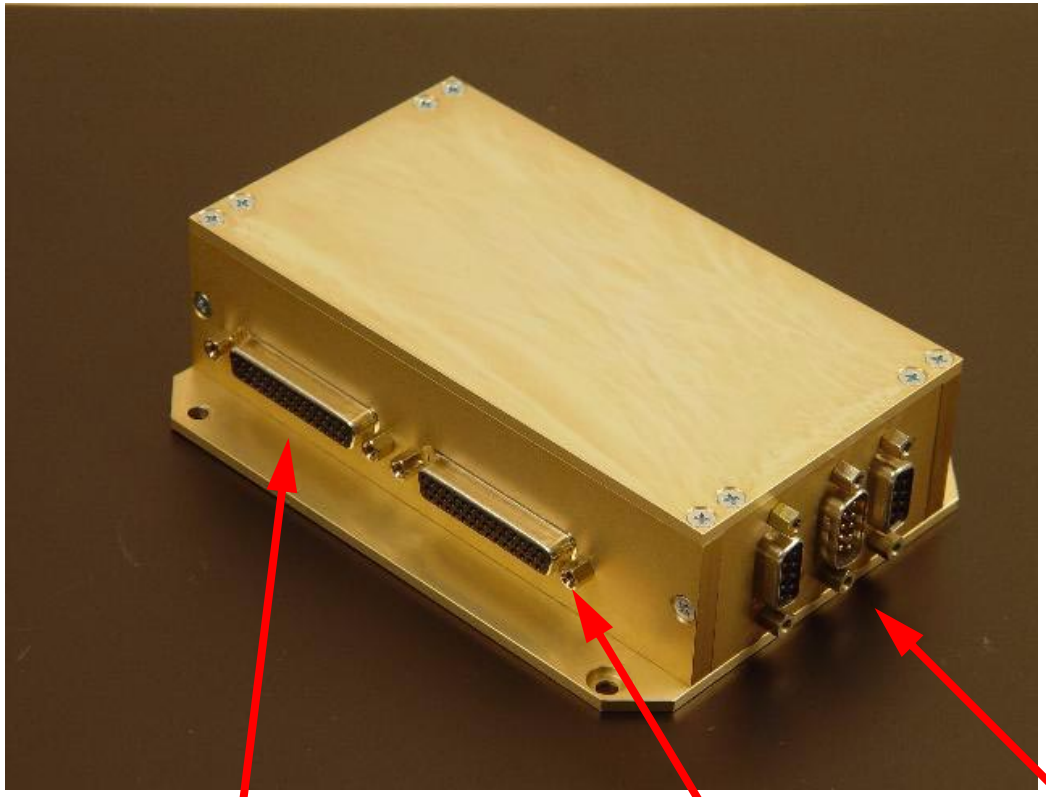
NECScompact CANaerospace Interface Definition

NECScompact Overview



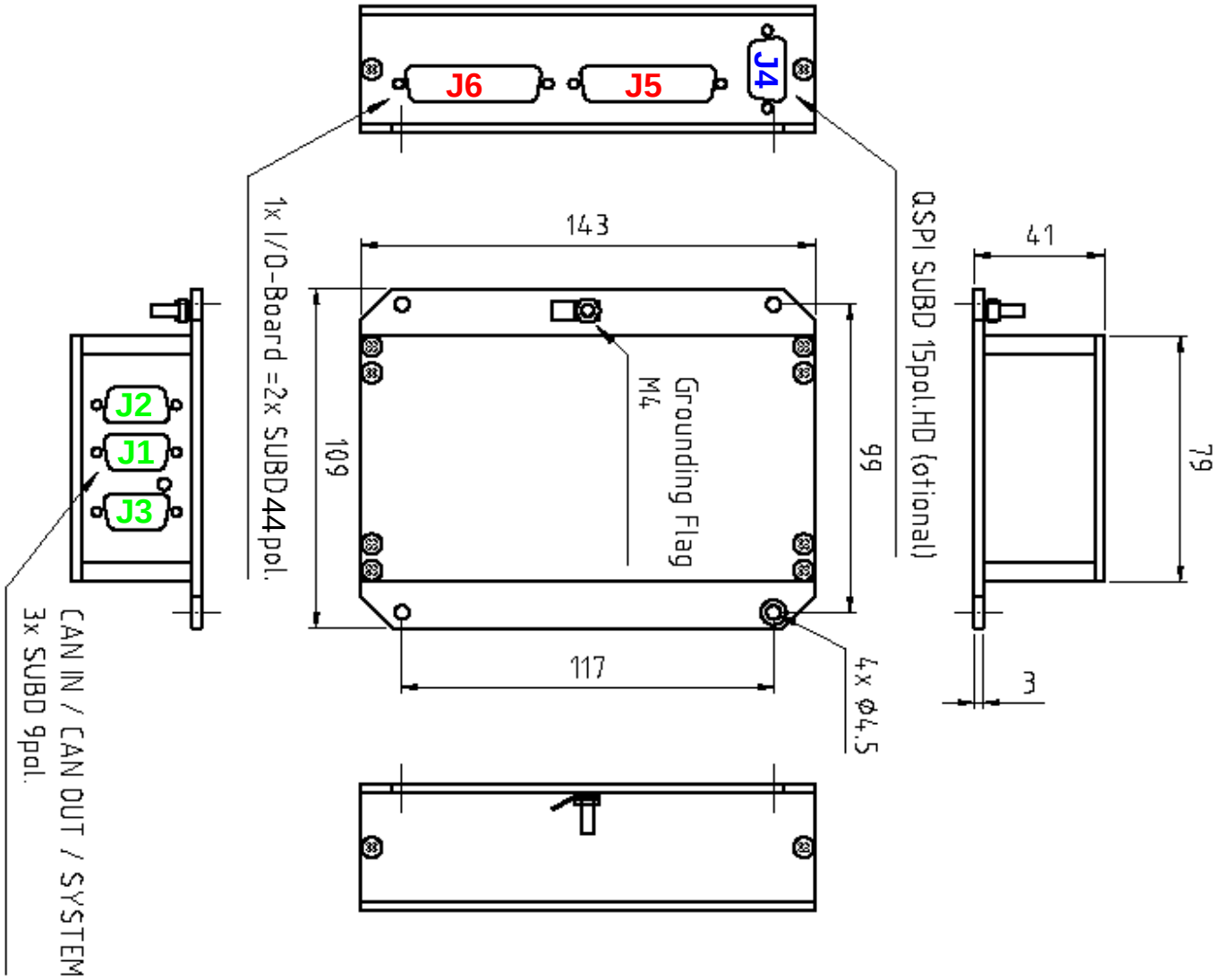
- 28VDC power supply according to EN2282
- 20MHz 68376 processor
- CAN 2.0B interface
- 24 x TTL inputs
- 16 x 5-28VDC outputs
- 16-channel Time Processor Unit (TPU) with TTL-I/O
- 16 x analog inputs (10 bit resolution A/D converter)
- 4 x analog outputs (12 bit resolution D/A converter)
- EMC-sealed aluminum housing
- Dimensions: 143x109x41mm
- Weight < 0.5kg

I/O connector J6

I/O connector J5

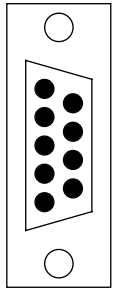
CANaerospace interface connectors

NECScompact Dimensions

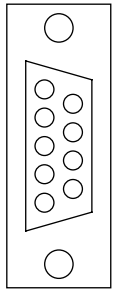


NECScompact
CANaerospace Interface Connector Pinout

CAN IN/OUT

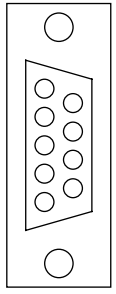


Power Ground	5	9	**Not connected, reserved for future use**
Not connected, reserved for future use	4	8	**Not connected, reserved for future use**
Not connected, reserved for future use	3	7	**CAN High**
CAN Low	2	6	**Not connected, reserved for future use**
Power +28VDC	1		



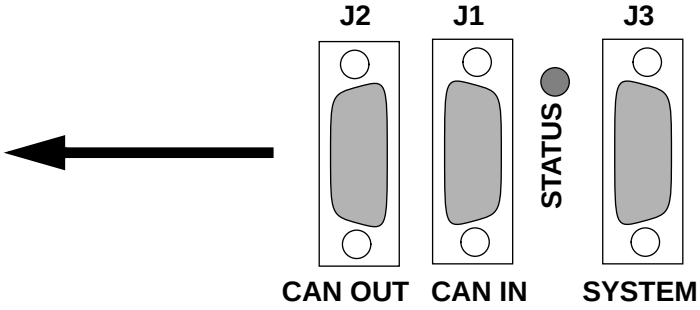
Power +28VDC	1	6	**Not connected, reserved for future use**
CAN Low	2	7	**CAN High**
Not connected, reserved for future use	3	8	**Not connected, reserved for future use**
Not connected, reserved for future use	4	9	**Not connected, reserved for future use**
Power Ground	5		

SYSTEM

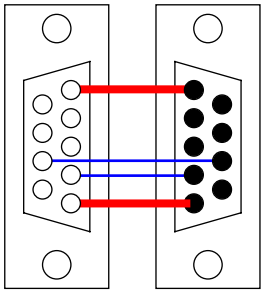


System Vcc	1	6	**System Vcc**
RS-232 RxD	2	7	**Debug Input**
RS-232 TxD	3	8	**System RESET**
System Ground	4	9	**System Ground**
System Ground	5		

During normal operation, the STATUS LED flashes at 0.5 Hz

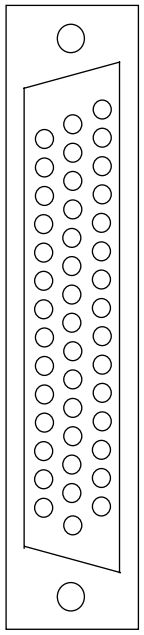


SYSTEM connector used for factory test only (do not connect)



Internal CAN IN/OUT connections

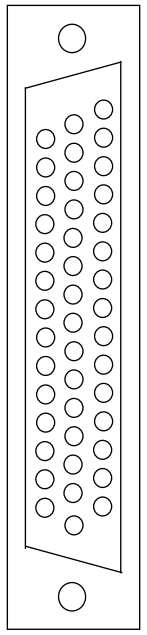
NECScompact
Input/Output Interface Connector Pinout



Signal Ground	**44**	**15**	5-28VDC Output 14
Signal Ground	**43**	**14**	5-28VDC Output 13
5VDC Supply Output (100mA)	**42**	**13**	5-28VDC Output 12
Reserved	**41**	**12**	5-28VDC Output 11
TTL Input 23	**40**	**11**	5-28VDC Output 10
TTL Input 22	**39**	**10**	5-28VDC Output 9
TTL Input 21	**38**	**9**	5-28VDC Output 8
TTL Input 20	**37**	**8**	5-28VDC Output 7
TTL Input 19	**36**	**7**	5-28VDC Output 6
TTL Input 18	**35**	**6**	5-28VDC Output 5
TTL Input 17	**34**	**5**	5-28VDC Output 4
TTL Input 16	**33**	**4**	5-28VDC Output 3
TTL Input 15	**32**	**3**	5-28VDC Output 2
TTL Input 14	**31**	**2**	5-28VDC Output 1
		1	5-28VDC Output 0

TTL Input 13	**30**	**16**	5-28VDC Output 15
TTL Input 12	**29**	**17**	TTL Input 0
TTL Input 11	**28**	**18**	TTL Input 1
TTL Input 10	**27**	**19**	TTL Input 2
TTL Input 9	**26**	**20**	TTL Input 3
TTL Input 8	**25**	**21**	TTL Input 4
TTL Input 7	**24**	**22**	TTL Input 5
TTL Input 6	**23**	**23**	TTL Input 6
TTL Input 5	**22**	**24**	TTL Input 7
TTL Input 4	**21**	**25**	TTL Input 8
TTL Input 3	**20**	**26**	TTL Input 9
TTL Input 2	**19**	**27**	TTL Input 10
TTL Input 1	**18**	**28**	TTL Input 11
TTL Input 0	**17**	**29**	TTL Input 12
5-28VDC Output 15	**16**	**30**	TTL Input 13

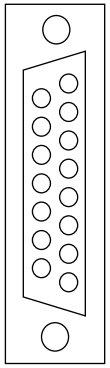
J5



Signal Ground	**44**	**15**	TTL PWM Output 14
Signal Ground	**43**	**14**	TTL PWM Output 13
5VDC Analog Output Reference Supply	**42**	**13**	TTL PWM Output 12
15VDC Analog Output Supply Input	**41**	**12**	TTL PWM Output 11
15VDC Analog Output SupplyGround	**40**	**11**	TTL PWM Output 10
Reserved	**39**	**10**	TTL PWM Output 9
Reserved	**38**	**9**	TTL PWM Output 8
Reserved	**37**	**8**	TTL PWM Output 7
0-10V Analog Output 3	**36**	**7**	TTL PWM Output 6
0-10V Analog Output 2	**35**	**6**	TTL PWM Output 5
0-10V Analog Output 1	**34**	**5**	TTL PWM Output 4
0-10V Analog Output 0	**33**	**4**	TTL PWM Output 3
0-5V Analog Input 15	**32**	**3**	TTL PWM Output 2
0-5V Analog Input 14	**31**	**2**	TTL PWM Output 1
		1	TTL PWM Output 0

0-5V Analog Input 13	**30**	**16**	TTL PWM Output 15
0-5V Analog Input 12	**29**	**17**	0-5V Analog Input 0
0-5V Analog Input 11	**28**	**18**	0-5V Analog Input 1
0-5V Analog Input 10	**27**	**19**	0-5V Analog Input 2
0-5V Analog Input 9	**26**	**20**	0-5V Analog Input 3
0-5V Analog Input 8	**25**	**21**	0-5V Analog Input 4
0-5V Analog Input 7	**24**	**22**	0-5V Analog Input 5
0-5V Analog Input 6	**23**	**23**	0-5V Analog Input 6
0-5V Analog Input 5	**22**	**24**	0-5V Analog Input 7
0-5V Analog Input 4	**21**	**25**	0-5V Analog Input 8
0-5V Analog Input 3	**20**	**26**	0-5V Analog Input 9
0-5V Analog Input 2	**19**	**27**	0-5V Analog Input 10
0-5V Analog Input 1	**18**	**28**	0-5V Analog Input 11
0-5V Analog Input 0	**17**	**29**	0-5V Analog Input 12
TTL PWM Output 15	**16**	**30**	0-5V Analog Input 13

J6

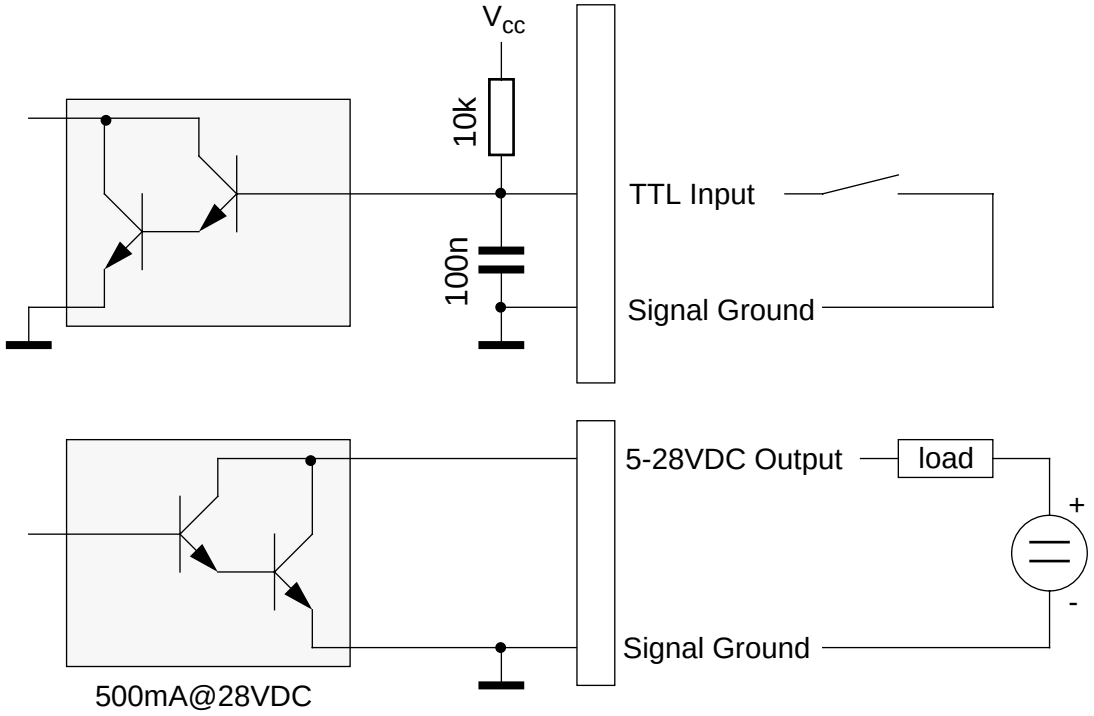


n.c.	**15**	**8**	GND
n.c.	**14**	**7**	PCS0
n.c.	**13**	**6**	PCS3
n.c.	**12**	**5**	SCK
n.c.	**11**	**4**	Vcc
GND	**10**	**3**	MISO
PCS1	**9**	**2**	PCS2
		1	MOSI

J4

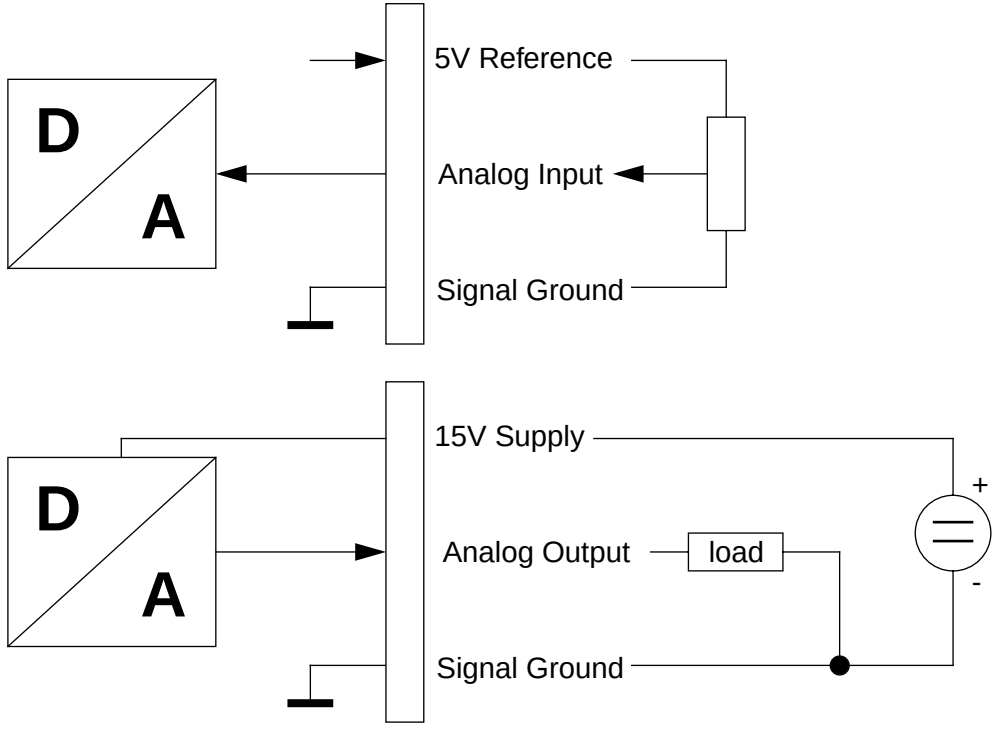
NECScompact Discrete Input/Output Connection

- 5-28VDC outputs can drive 500mA (resistive load only).
- TTL pulse width modulation outputs (PWM) have a fan-out of 1 (no protection against short-circuit). PWM duty cycle range is 0 to 100%.



NECScompact Analog Input/Output Connection

- A/D converter input voltage is 0-5V (no protection against over/ undervoltage).
- D/A converter output voltage is 0-10V (no protection against short-circuit). 15VDC power has to be supplied via J6, pins 40/41.



NECScompact CANaerospace Data (1)

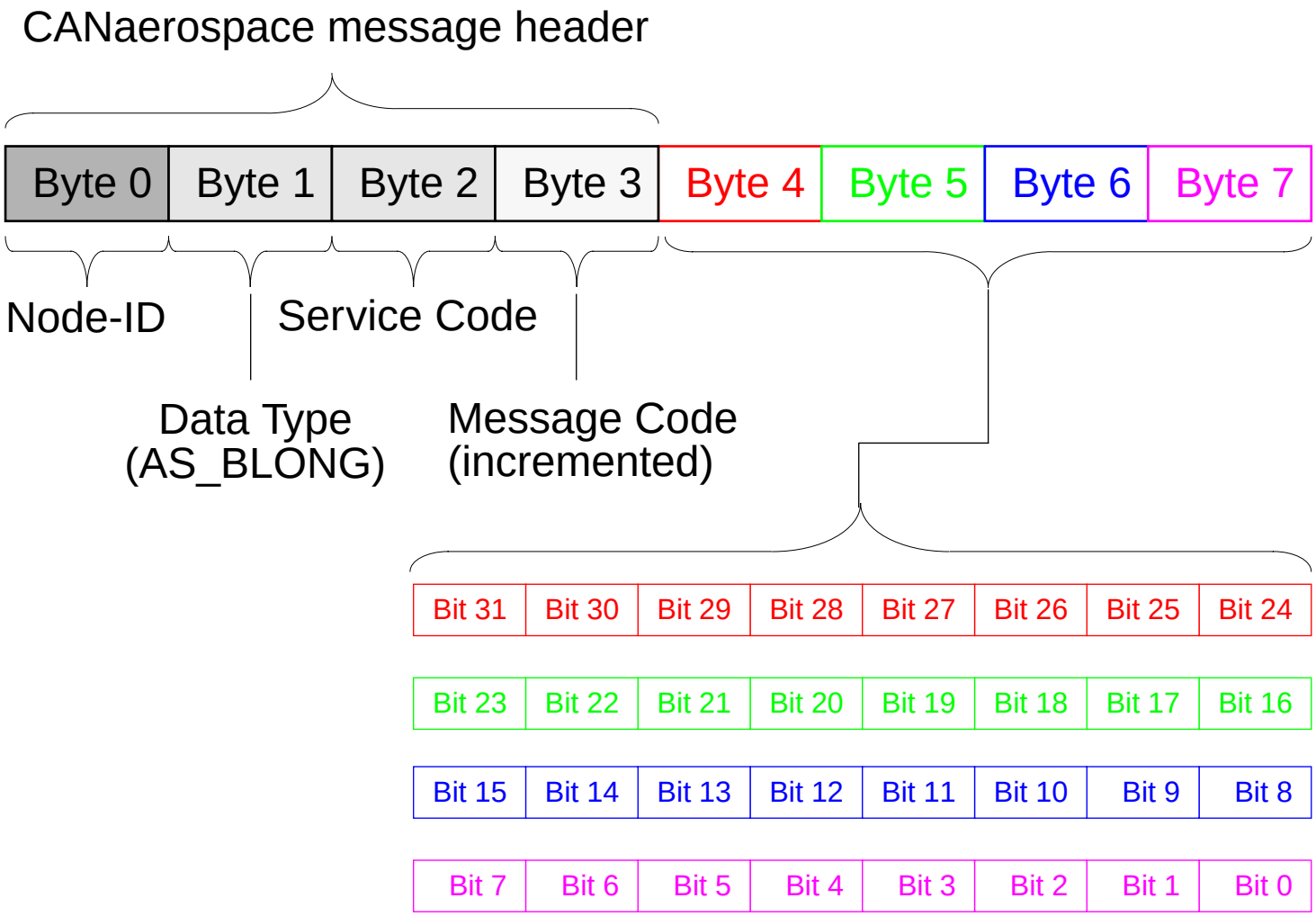
Signal Description	Signal Number (for CSS)	Direction (as seen from NECScompact)	CANaerospace Identifier	Node-ID	Data Type	Service Code
A/D Converter Channels	0-15	Transmit	CANaerospace-ID for A/D Converter Channels 0-15 defined through CSS (factory setting: 1500-1515)	SysNodeID as specified through NIS (factory setting: 1)	AS_FLOAT	0
D/A Converter Channels	16-19	Receive	CANaerospace-ID for D/A Converter Channels 0-3 defined through CSS (factory setting: 1516-1519)	Any	AS_FLOAT	0
PWM Output Channels	20-35	Receive	CANaerospace-ID for PWM Channels 0-15 defined through CSS (factory setting: 1520-1535)	Any	AS_FLOAT	0

NECScompact CANaerospace Data (2)

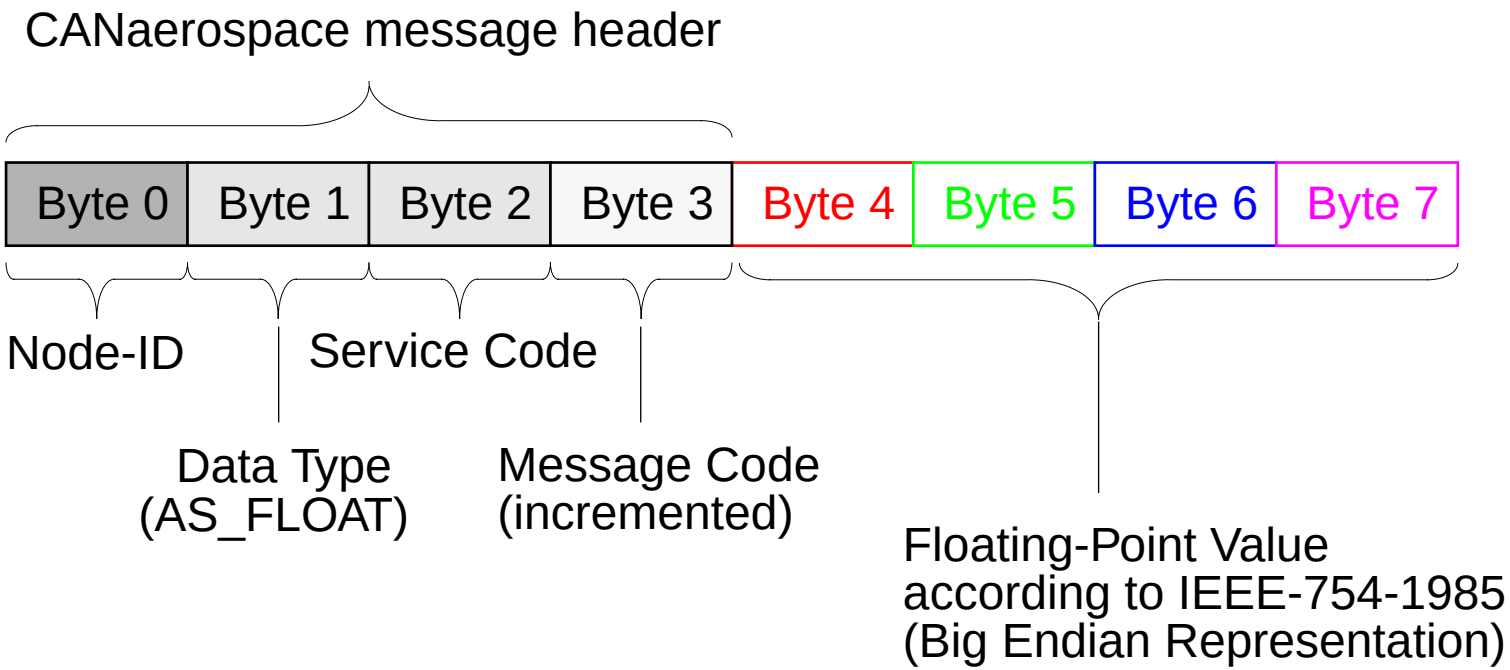
Signal Description	Signal Number (for CSS)	Direction (as seen from NECScompact)	CANaerospace Identifier	Node-ID	Data Type	Service Code
Discrete Inputs	36	Transmit	CANaerospace-ID for Discrete inputs defined through CSS (factory set-ting: 1536)	SysNodeID as specified through NIS (factory setting: 1)	AS_BLONG	0
Discrete Outputs	37	Receive	CANaerospace-ID for Discrete inputs defined through CSS (factory set-ting: 1537)	Any	AS_BLONG	0

- Analog data transmission interval: 50ms (default value, individually configurable via CANaerospace Node Service Request).
- Discrete data transmission interval: State change (low-to-high or high-to-low transition).
- NECScompact System Node-ID (SysNodeID) configurable via CANaerospace Node Service Request.

CANaerospace Discrete Message Encoding



CANaerospace Analog Message Encoding



NECScompact
Node Service Request Interface (1)

- Identification Service (IDS):

CANaerospace Data Field Description	Node Service Request	Node Service Response	Remarks
Node-ID	<SysNodeID>	<SysNodeID>	1 <= SysNodeID <= 199
Data Type	AS_NODATA (0)	AS_UCHAR_4 (16)	See CANaerospace specification for data type description
Service Code	IDS (0)	IDS (0)	Identification Service code = 0
Message Code	Standard Information Request (0)	NS_OK (0) or NS_INVALID_MODE (-3)	NS_INVALID_MODE is returned if request type is not Standard Information
Data Bytes	n.a.	Byte 0= H/W Rev. Byte 1= S/W Rev. Byte 2= 0 Byte 3 = 0	Hardware Revision (i.e. $12 = V1.2) Software Revision (i.e. $3B = V3.11) Identifier Distribution (0 = Default) Header Type (0 = Standard)

- Node Service Channel: 0 (Request CAN-ID = 128, Response CAN-ID = 129)

NECScompact
Node Service Request Interface (2)

- Transmission Interval Service (TIS):

CANaerospace Data Field Description	Node Service Request	Node Service Response	Remarks
Node-ID	<SysNodeID>	<SysNodeID>	1 <= SysNodeID <= 199
Data Type	AS_UCHAR (10)	AS_NODATA (0)	See CANaerospace specification for data type description
Service Code	TIS (5)	TIS (5)	Transmission Interval Service code = 5
Message Code	Analog channel number (0-15)	NS_OK (0) or NS_INVALID_CHAN (-4)	NS_INVALID_CHAN is returned if the analog channel number is out of range 0-15
Data Bytes	Byte 0: Transmission Interval Unit: 12.5ms Range: 0 - 255 (0 = Channel turned off)	n.a.	This service allows to set the transmission interval for each analog channel to a value between 0 (never transmitted) and 255 (transmission interval 3.19s)

- Node Service Channel: 0 (Request CAN-ID = 128, Response CAN-ID = 129)

NECScompact
Node Service Request Interface (3)

- FLASH Programming Service (FPS):

CANaerospace Data Field Description	Node Service Request	Node Service Response	Remarks
Node-ID	<SysNodeID>	<SysNodeID>	1 <= SysNodeID <= 199
Data Type	AS_NODATA (0)	AS_NODATA (0)	See CANaerospace specification for data type description
Service Code	FPS (6)	FPS (6)	FLASH Programming Service code = 6
Message Code	FLASH security code (123)	NS_OK (0) or NS_INVALID_MODE (-3)	NS_INVALID_MODE is returned if the FLASH security code is not 123
Data Bytes	n.a.	n.a.	This service permanently stores the changes made through TIS, NIS, FSS and BSS in non-volatile memory.

- Node Service Channel: 0 (Request CAN-ID = 128, Response CAN-ID = 129)

NECScompact
Node Service Request Interface (4)

- Current State Transmission Service (STS):

CANaerospace Data Field Description	Node Service Request	Node Service Response	Remarks
Node-ID	<SysNodeID>	<SysNodeID>	1 <= SysNodeID <= 199
Data Type	AS_NODATA (0)	n.a.	See CANaerospace specification for data type description
Service Code	STS (7)	n.a.	Current StateTransmission Service code = 7
Message Code	0	n.a.	
Data Bytes	n.a.	n.a.	This service causes all event-driven values of the referred node to be transmitted once

- Node Service Channel: 0 (Request CAN-ID = 128, Response CAN-ID = 129)

NECScompact
Node Service Request Interface (5)

- Filter Setting Service (FSS):

CANaerospace Data Field Description	Node Service Request	Node Service Response	Remarks
Node-ID	<SysNodeID>	<SysNodeID>	1 <= SysNodeID <= 199
Data Type	AS_UCHAR (10)	AS_NODATA (0)	See CANaerospace specification for data type description
Service Code	FSS (8)	FSS (8)	Filter Setting Service code = 8
Message Code	Analog channel number (0-15)	NS_OK (0) or NS_UNKNOWN_CODE (-3) or NS_INVALID_CHAN (-4)	NS_UNKNOWN_CODE is returned if the filter cutoff frequency is not 0, 1, 2 or 3 NS_INVALID_CHAN is returned if the analog channel number is out of range 0-15
Data Bytes	Byte 0: Filter Cutoff Frequency 0 = Filter turned off 1 = 5.0 Hz 2 = 1.0 Hz 3 = 0.1 Hz	n.a.	This service allows to set the first order low-pass filter cutoff frequency for the analog channel referred to.

- Node Service Channel: 0 (Request CAN-ID = 128, Response CAN-ID = 129)

NECScompact
Node Service Request Interface (6)

- Baudrate Setting Service (BSS):

CANaerospace Data Field Description	Node Service Request	Node Service Response	Remarks
Node-ID	<SysNodeID>	<SysNodeID>	1 <= SysNodeID <= 199
Data Type	AS_UCHAR (10)	AS_NODATA (0)	See CANaerospace specification for data type description
Service Code	BSS (10)	BSS (10)	Baudrate Setting Service code = 10
Message Code	0	NS_OK (0) or NS_UNKNOWN_CODE (-3)	NS_UNKNOWN_CODE is returned if the CAN baudrate is not 0, 1, 2 or 3
Data Bytes	Byte 0: CAN baudrate 0 = 1 MBit/s 1 = 500 kBit/s 2 = 250 kBit/s 3 = 125 kBit/s	n.a.	This service allows to set the CAN baudrate of the unit referred to. Note that changes will become effective immediately after the Node Service Response has been sent! The default (factory) setting is 1MBit/s.

- Node Service Channel: 0 (Request CAN-ID = 128, Response CAN-ID = 129)

NECScompact
Node Service Request Interface (7)

- Node-ID Setting Service (NIS):

CANaerospace Data Field Description	Node Service Request	Node Service Response	Remarks
Node-ID	<SysNodeID>	<SysNodeID>	1 <= SysNodeID <= 199
Data Type	AS_NODATA (0)	AS_NODATA (0)	See CANaerospace specification for data type description
Service Code	NIS (11)	NIS (11)	Node-ID Setting Service code = 11
Message Code	1-199 = SysNodeID	NS_OK (0) or NS_OUT_OF_RANGE (-6)	NS_OUT_OF_RANGE is returned if the Node-ID is out of range <1-199>
Data Bytes	n.a.	n.a.	This service allows to set the System Node-ID of the unit referred to. Note that this will change CAN identifiers and the System Node-ID used for Node Service Requests!

- Node Service Channel: 0 (Request CAN-ID = 128, Response CAN-ID 129)

NECScompact
Node Service Request Interface (8)

- CAN Identifier Setting Service (CSS):

CANaerospace Data Field Description	Node Service Request	Node Service Response	Remarks
Node-ID	<SysNodeID>	<SysNodeID>	1 <= SysNodeID <= 199
Data Type	AS_SHORT_2 (12)	AS_NODATA (0)	See CANaerospace specification for data type description
Service Code	CSS (14)	CSS (14)	CAN Identifier Setting Service code = 14
Message Code	0	NS_OK (0) or NS_OUT_OF_RANGE (-6)	NS_OUT_OF_RANGE is returned if the signal number is out of the range <0-38> or the CANaerospace identifier is out of the range of <200 - 1899>
Data Bytes	Byte 0/1 (signed short) Number of selected Signal Byte 2/3 (signed short) CANaerospace Identifier to be assigned to this signal	n.a.	This service assigns the CANaerospace identifier used for CAN messages address-ing the specified signal number.

- Node Service Channel: 0 (Request CAN-ID = 128, Response CAN-ID = 129)

NECScompact
Node Service Request Interface (9)

- CAN-Identifier Distribution Setting Service (DSS):

CANaerospace Data Field Description	Node Service Request	Node Service Response	Remarks
Node-ID	<SysNodeID>	<SysNodeID>	1 <= SysNodeID <= 199
Data Type	AS_NODATA (0)	AS_NODATA (0)	See CANaerospace specification for data type description
Service Code	DSS (15)	DSS (15)	CAN-Identifier Distribution Setting Service code = 15
Message Code	0 = Default CANaerospace identifier distribution code 1 - 240 = User-defined identifier distribution code	NS_OK (0) or NS_OUT_OF_RANGE (-6)	NS_OUT_OF_RANGE is returned if the identifier distribution code is out of range of <0-240>
Data Bytes	n.a.	n.a.	This service configures the identifier distribution code which is returned through the IDS service. This code should be set to a user-defined value if the standard CANaerospace identifier distribution is not used.

- Node Service Channel: 0 (Request CAN-ID = 128, Response CAN-ID = 129)

NECScompact
Node Service Request Interface (10)

- Analog Threshold Service (ATS):

CANaerospace Data Field Description	Node Service Request	Node Service Response	Remarks
Node-ID	<SysNodeID>	<SysNodeID>	1 <= SysNodeID <= 199
Data Type	AS_USHORT (7)	AS_NODATA (0)	See CANaerospace specification for data type description
Service Code	ATS (101)	ATS (101)	Analog Threshold Service code = 101
Message Code	Analog channel number (0-15)	NS_OK (0) or NS_INVALID_CHAN (-4) or NS_OUT_OF_RANGE (-6)	NS_INVALID_CHAN is returned if the analog channel number is out of range 0-15 NS_OUT_OF_RANGE is returned if the threshold value is out of range 0-512
Data Bytes	Byte 0/1 (unsigned short) Analog threshold (0%-50% equals 0-512)	n.a.	This service allows to prevent analog messages from being transmitted if there is no change in value. The message for the analog channel referred to is transmitted only if the difference between two subsequently converted analog values exceeds the threshold.

- Node Service Channel: 0 (Request CAN-ID = 128, Response CAN-ID = 129)

NECScompact
Node Service Request Interface (11)

- Discrete Polarity Service (DPS):

CANaerospace Data Field Description	Node Service Request	Node Service Response	Remarks
Node-ID	<SysNodeID>	<SysNodeID>	1 <= SysNodeID <= 199
Data Type	AS_NODATA (0)	AS_NODATA (0)	See CANaerospace specification for data type description
Service Code	DPS (102)	DPS (102)	Discrete Polarity Service code = 102
Message Code	0 = Normal Polarity 1 = Inverse Polarity	NS_OK (0) or NS_OUT_OF_RANGE (-6)	NS_OUT_OF_RANGE is returned if the Polarity is out of range <0-1>
Data Bytes	n.a.	n.a.	This service allows to set the polarity of the discrete inputs accordingly.

- Node Service Channel: 0 (Request CAN-ID = 128, Response CAN-ID 129)