ABS CAN ICD

8800-00015

Release 1.1.0

Bloomy Controls, Inc.

Dec 04, 2024

Contents:

1 Revision History

Rev	Date	Author	Reviewer	Description
1.0.0	2024-10-22	WE	GG	Initial release.
1.1.0	2024-12-04	WE	GG	More consistent naming and indexing; new frames for cell enable, range, and model control.

2 Introduction

This document describes the CAN bus messages and signals used to communicate with the Bloomy Advanced Battery Simulator (ABS). It is intended to supplement the CAN database (DBC) for the ABS, but does not require use thereof.

2.1 Bus Characteristics

The ABS uses a 1 Mbit/s CAN 2.0A (Standard CAN, 11-bit ID) bus.

2.2 Device Addressing

Multiple units on the same bus are addressed using the least-significant 4 bits of the message ID. All addresses described in this document, with the exception of global messages (which are always received by all units), implicitly address unit 0. Additionally, any message sent to address 15 (`0xF`) will be received by all units. This can be used to send one frame to control all devices at once.

As the DIP switches on the unit allow for up to 32 addresses and CAN uses only 4 bits (0-15), the 4 least-significant bits of the device's ID are used for CAN. Address 15 (`0xF`) is special: all units will receive messages sent to this address. As a result, if a device's DIP switches are setup such that it would have address 15, it will be unable to send or receive CAN frames to avoid confusing other units on the bus. However, due to the load on the bus, the practical limit to the number of devices usable on one bus is closer to 8-10.

The only global frames are the global model data frames, as the intent of these frames is to be able to command multiple units with the same data at the same time. As such, these do not use the last 4 bits for addressing, and those 4 bits should always be 0 or 15.

Addressing Example

Given a bus with 4 ABSes with addresses 0-3, the message *CellReadback_1* would be present 4 times on the bus with different IDs: `0x270`, `0x271`, `0x272`, and `0x273`. The last 4 bits correspond directly to the units' addresses.

To set all cells on unit 5 to the same voltage, you would send the *SetAllCellV* message with ID `0x35`. If you wanted to set all cells on all units to the same voltage, however, you could instead send the message with ID `0x3F`.

3 How to Read This Document

Each message on the bus is listed in its own section in this document. The names of messages and signals are identical to the CAN database (DBC) distributed with the ABS. However, this database is not necessary—any CAN-capable device which can meet the requirements of the bus as described in *Bus Characteristics* can be used with this document to communicate with the ABS. This includes, but is not limited to, microcontrollers and USB CAN devices.

3.1 Message Types

For each message, there are two types of messages:

1. **Cyclic** messages sent **from** the ABS at a defined interval, and;
2. **Event** messages sent **to** the ABS only as needed.

For example, the cell readback message *CellReadback_1* is sent from the ABS cyclically at 100Hz. *UnitControl* is an event message, sent to the ABS as necessary by the client.

3.2 Endianness

All signals in this document are little-endian. This is often referred to as ”Intel” byte order. As such, multi-byte signals will be transmitted LSB-first. Bit offsets within frames are always relative to the least significant bit (bit 0) of the first (least significant) byte in the frame. Byte 0 contains bits 0-7, byte 1 contains bits 8-15, and so on.

4 Messages

4.1 `0x0` - UnitControl

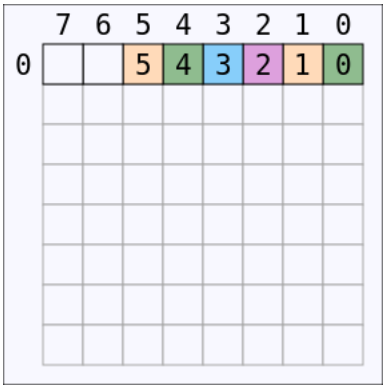
Controls various features and settings of the unit.

ID:
`0x0` (decimal: 0)

Length:
1 byte

Send type:
Event

Signals



Bit	Signal
0	*Reset*
1	*Clear_Alarm*
2	*Noise_Filter*
3	*Soft_Interlock*
4	*Cell_I_Read_Mode*
5	*Cell_V_Read_Mode*

Reset

Reboots the unit.

Bit	Type	Min	Max
0	Boolean	0	1

Clear_Alarm

Clear any recoverable alarms currently triggered on the unit

Bit	Type	Min	Max
1	Boolean	0	1

Noise_Filter

Control cell noise filter (not available during modeling).
0 = Filter disabled (1kHz control; modeling enabled)
1 = Noise filtering enabled (10Hz control, no modeling)

Bit	Type	Min	Max
2	Enum	0	1

Soft_Interlock

Raise a recoverable alarm equivalent to asserting the interlock input.

Bit	Type	Min	Max
3	Boolean	0	1

Cell_I_Read_Mode

Changes the CAN reporting mode for cell current measurements.
0 = 10ms average (default)
1 = Instantaneous value

Bit	Type	Min	Max
4	Enum	0	1

Cell_V_Read_Mode

Changes the CAN reporting mode for cell voltage measurements.
0 = 10ms average (default)
1 = Instantaneous value

Bit	Type	Min	Max
5	Enum	0	1

4.2 `0x10` - EnableCells

Enables or disables cells individually.

ID:

`0x10` (decimal: 16)

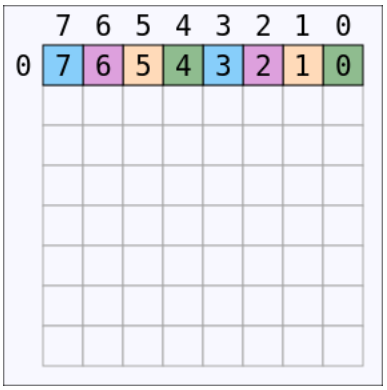
Length:

1 byte

Send type:

Event

Signals



Bit	Signal
0	*Enable_Cell_1*
1	*Enable_Cell_2*
2	*Enable_Cell_3*
3	*Enable_Cell_4*
4	*Enable_Cell_5*
5	*Enable_Cell_6*
6	*Enable_Cell_7*
7	*Enable_Cell_8*

Enable_Cell_1

Enable/disable cell 1.

Bit	Type	Min	Max
0	Boolean	0	1

Enable_Cell_2

Enable/disable cell 2.

Bit	Type	Min	Max
1	Boolean	0	1

Enable_Cell_3

Enable/disable cell 3.

Bit	Type	Min	Max
2	Boolean	0	1

Enable_Cell_4

Enable/disable cell 4.

Bit	Type	Min	Max
3	Boolean	0	1

Enable_Cell_5

Enable/disable cell 5.

Bit	Type	Min	Max
4	Boolean	0	1

Enable_Cell_6

Enable/disable cell 6.

Bit	Type	Min	Max
5	Boolean	0	1

Enable_Cell_7

Enable/disable cell 7.

Bit	Type	Min	Max
6	Boolean	0	1

Enable_Cell_8

Enable/disable cell 8.

Bit	Type	Min	Max
7	Boolean	0	1

4.3 `0x20` - EnableAllCells

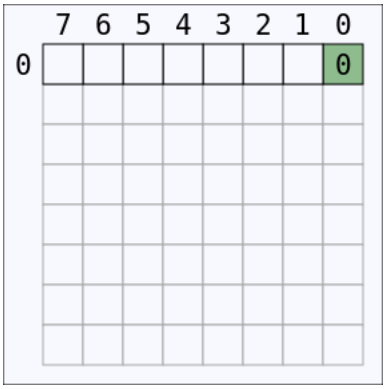
Enables or disables all cells at once.

ID:
`0x20` (decimal: 32)

Length:
1 byte

Send type:
Event

Signals



Bit	Signal
0	*State*

State

Enable state for all cells.

Bit	Type	Min	Max
0	Boolean	0	1

4.4 `0x30` - SetAllCellV

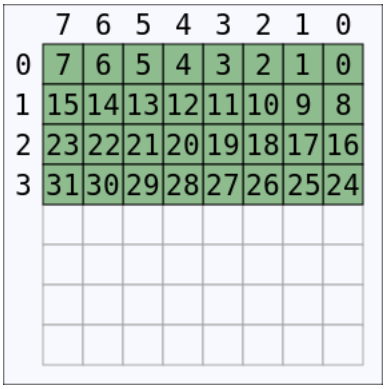
Sets all cells to the same voltage.

ID:
`0x30` (decimal: 48)

Length:
4 bytes

Send type:
Event

Signals



Bits	Signal
0:31	*Voltage*

Voltage

Voltage to apply to all cells.

Bits	Type	Min	Max	Unit
0:31	IEEE Float	0	5	V

4.5 `0x40` - SetCellVoltage_1

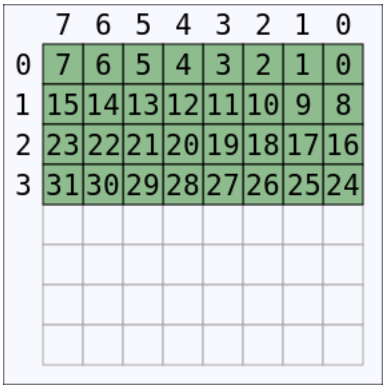
Sets the voltage level for cell 1.

ID:
`0x40` (decimal: 64)

Length:
4 bytes

Send type:
Event

Signals



Bits	Signal
0:31	*Voltage*

Voltage

Voltage to apply to cell 1.

Bits	Type	Min	Max	Unit
0:31	IEEE Float	0	5	V

4.6 `0x50` - SetCellVoltage_2

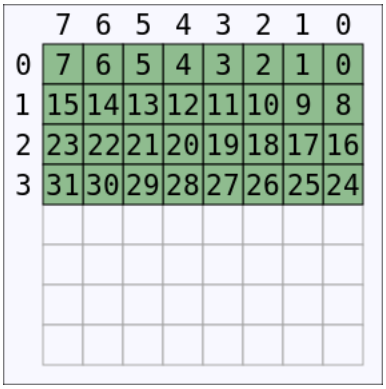
Sets the voltage level for cell 2.

ID:
`0x50` (decimal: 80)

Length:
4 bytes

Send type:
Event

Signals



Bits	Signal
0:31	*Voltage*

Voltage

Voltage to apply to cell 2.

Bits	Type	Min	Max	Unit
0:31	IEEE Float	0	5	V

4.7 `0x60` - SetCellVoltage_3

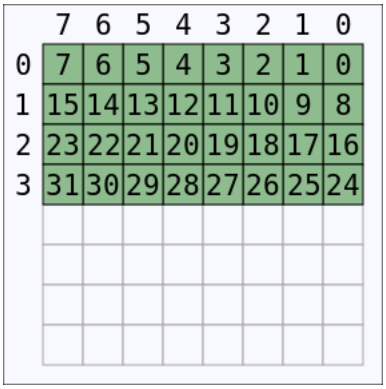
Sets the voltage level for cell 3.

ID:
`0x60` (decimal: 96)

Length:
4 bytes

Send type:
Event

Signals



Bits	Signal
0:31	*Voltage*

Voltage

Voltage to apply to cell 3.

Bits	Type	Min	Max	Unit
0:31	IEEE Float	0	5	V

4.8 `0x70` - SetCellVoltage_4

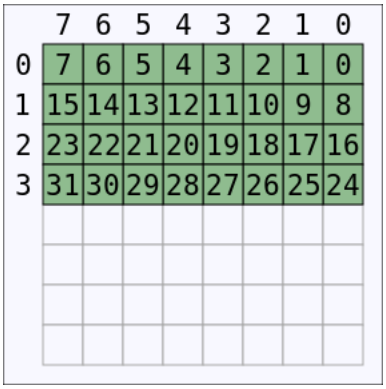
Sets the voltage level for cell 4.

ID:
`0x70` (decimal: 112)

Length:
4 bytes

Send type:
Event

Signals



Bits	Signal
0:31	*Voltage*

Voltage

Voltage to apply to cell 4.

Bits	Type	Min	Max	Unit
0:31	IEEE Float	0	5	V

4.9 `0x80` - SetCellVoltage_5

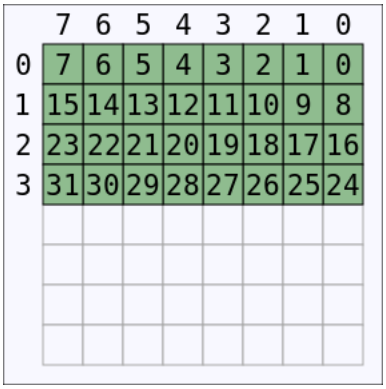
Sets the voltage level for cell 5.

ID:
`0x80` (decimal: 128)

Length:
4 bytes

Send type:
Event

Signals



Bits	Signal
0:31	*Voltage*

Voltage

Voltage to apply to cell 5.

Bits	Type	Min	Max	Unit
0:31	IEEE Float	0	5	V

4.10 `0x90` - SetCellVoltage_6

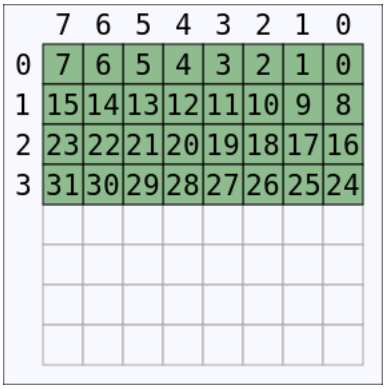
Sets the voltage level for cell 6.

ID:
`0x90` (decimal: 144)

Length:
4 bytes

Send type:
Event

Signals



Bits	Signal
0:31	*Voltage*

Voltage

Voltage to apply to cell 6.

Bits	Type	Min	Max	Unit
0:31	IEEE Float	0	5	V

4.11 `0xA0` - SetCellVoltage_7

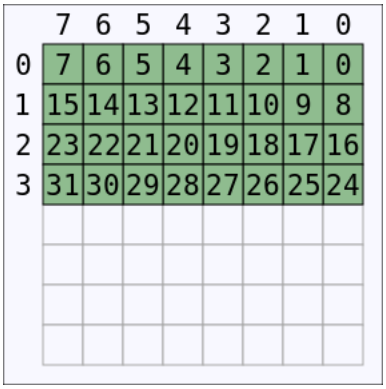
Sets the voltage level for cell 7.

ID:
`0xA0` (decimal: 160)

Length:
4 bytes

Send type:
Event

Signals



Bits	Signal
0:31	*Voltage*

Voltage

Voltage to apply to cell 7.

Bits	Type	Min	Max	Unit
0:31	IEEE Float	0	5	V

4.12 `0xB0` - SetCellVoltage_8

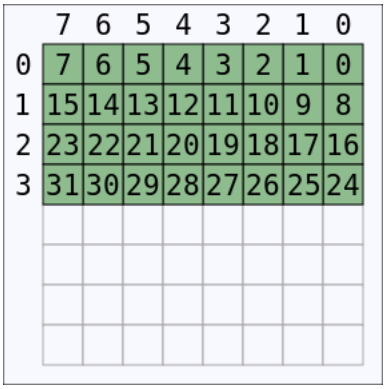
Sets the voltage level for cell 8.

ID:
`0xB0` (decimal: 176)

Length:
4 bytes

Send type:
Event

Signals



Bits	Signal
0:31	*Voltage*

Voltage

Voltage to apply to cell 8.

Bits	Type	Min	Max	Unit
0:31	IEEE Float	0	5	V

4.13 `0xC0` - SetAllSinking

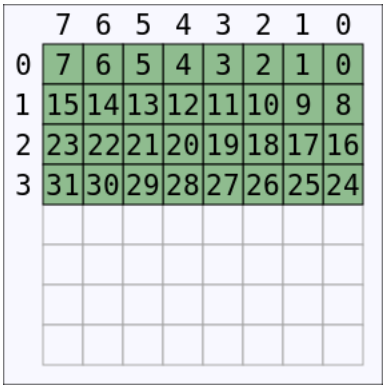
Sets all cell sinking limits to the same value.

ID:
`0xC0` (decimal: 192)

Length:
4 bytes

Send type:
Event

Signals



Bits	Signal
0:31	*Current_Limit*

Current_Limit

Sinking limit to apply to all cells.

Bits	Type	Min	Max	Unit
0:31	IEEE Float	0	5	A

4.14 0xD0 - SetAllSourcing

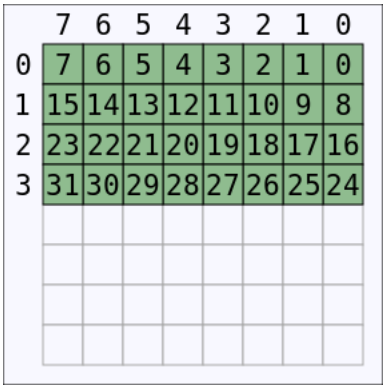
Sets all cell sourcing limits to the same value.

ID:
`0xD0` (decimal: 208)

Length:
4 bytes

Send type:
Event

Signals



Bits	Signal
0:31	*Current_Limit*

Current_Limit

Sourcing limit to apply to all cells.

Bits	Type	Min	Max	Unit
0:31	IEEE Float	0	5	A

4.15 0xE0 - SetCellCurrent_1

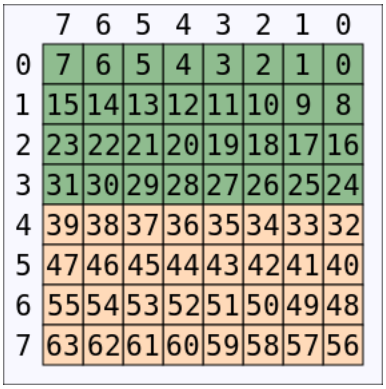
Sets the sinking and sourcing current limits for cell 1.

ID:
`0xE0` (decimal: 224)

Length:
8 bytes

Send type:
Event

Signals



	7	6	5	4	3	2	1	0
0	7	6	5	4	3	2	1	0
1	15	14	13	12	11	10	9	8
2	23	22	21	20	19	18	17	16
3	31	30	29	28	27	26	25	24
4	39	38	37	36	35	34	33	32
5	47	46	45	44	43	42	41	40
6	55	54	53	52	51	50	49	48
7	63	62	61	60	59	58	57	56

Bits	Signal
0:31	*Sinking_Limit*
32:63	*Sourcing_Limit*

Sinking_Limit

Cell 1 sinking limit.

Bits	Type	Min	Max	Unit
0:31	IEEE Float	0	5	A

Sourcing_Limit

Cell 1 sourcing limit.

Bits	Type	Min	Max	Unit
32:63	IEEE Float	0	5	A

4.16 `0xF0` - SetCellCurrent_2

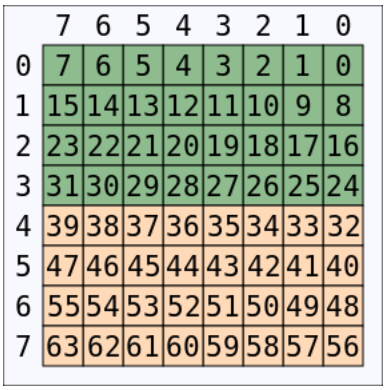
Sets the sinking and sourcing current limits for cell 2.

ID:
`0xF0` (decimal: 240)

Length:
8 bytes

Send type:
Event

Signals



	7	6	5	4	3	2	1	0
0	7	6	5	4	3	2	1	0
1	15	14	13	12	11	10	9	8
2	23	22	21	20	19	18	17	16
3	31	30	29	28	27	26	25	24
4	39	38	37	36	35	34	33	32
5	47	46	45	44	43	42	41	40
6	55	54	53	52	51	50	49	48
7	63	62	61	60	59	58	57	56

Bits	Signal
0:31	*Sinking_Limit*
32:63	*Sourcing_Limit*

Sinking_Limit

Cell 2 sinking limit.

Bits	Type	Min	Max	Unit
0:31	IEEE Float	0	5	A

Sourcing_Limit

Cell 2 sourcing limit.

Bits	Type	Min	Max	Unit
32:63	IEEE Float	0	5	A

4.17 0x100 - SetCellCurrent_3

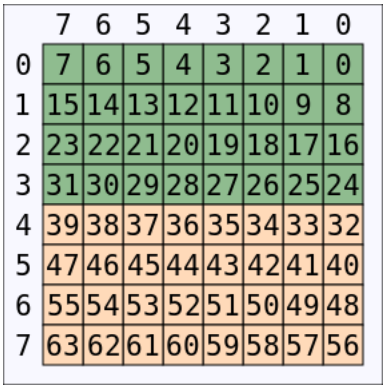
Sets the sinking and sourcing current limits for cell 3.

ID:
`0x100` (decimal: 256)

Length:
8 bytes

Send type:
Event

Signals



	7	6	5	4	3	2	1	0
0	7	6	5	4	3	2	1	0
1	15	14	13	12	11	10	9	8
2	23	22	21	20	19	18	17	16
3	31	30	29	28	27	26	25	24
4	39	38	37	36	35	34	33	32
5	47	46	45	44	43	42	41	40
6	55	54	53	52	51	50	49	48
7	63	62	61	60	59	58	57	56

Bits	Signal
0:31	*Sinking_Limit*
32:63	*Sourcing_Limit*

Sinking_Limit

Cell 3 sinking limit.

Bits	Type	Min	Max	Unit
0:31	IEEE Float	0	5	A

Sourcing_Limit

Cell 3 sourcing limit.

Bits	Type	Min	Max	Unit
32:63	IEEE Float	0	5	A

4.18 `0x110` - SetCellCurrent_4

Sets the sinking and sourcing current limits for cell 4.

ID:
`0x110` (decimal: 272)

Length:
8 bytes

Send type:
Event

Signals

	7	6	5	4	3	2	1	0
0	7	6	5	4	3	2	1	0
1	15	14	13	12	11	10	9	8
2	23	22	21	20	19	18	17	16
3	31	30	29	28	27	26	25	24
4	39	38	37	36	35	34	33	32
5	47	46	45	44	43	42	41	40
6	55	54	53	52	51	50	49	48
7	63	62	61	60	59	58	57	56

Bits	Signal
0:31	*Sinking_Limit*
32:63	*Sourcing_Limit*

Sinking_Limit

Cell 4 sinking limit.

Bits	Type	Min	Max	Unit
0:31	IEEE Float	0	5	A

Sourcing_Limit

Cell 4 sourcing limit.

Bits	Type	Min	Max	Unit
32:63	IEEE Float	0	5	A

4.19 `0x120` - SetCellCurrent_5

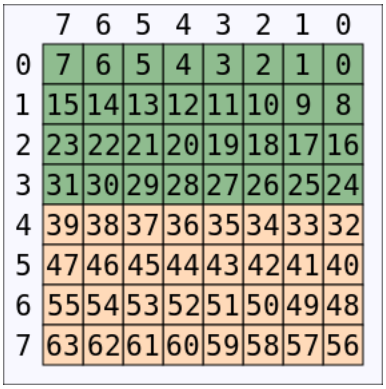
Sets the sinking and sourcing current limits for cell 5.

ID:
`0x120` (decimal: 288)

Length:
8 bytes

Send type:
Event

Signals



	7	6	5	4	3	2	1	0
0	7	6	5	4	3	2	1	0
1	15	14	13	12	11	10	9	8
2	23	22	21	20	19	18	17	16
3	31	30	29	28	27	26	25	24
4	39	38	37	36	35	34	33	32
5	47	46	45	44	43	42	41	40
6	55	54	53	52	51	50	49	48
7	63	62	61	60	59	58	57	56

Bits	Signal
0:31	*Sinking_Limit*
32:63	*Sourcing_Limit*

Sinking_Limit

Cell 5 sinking limit.

Bits	Type	Min	Max	Unit
0:31	IEEE Float	0	5	A

Sourcing_Limit

Cell 5 sourcing limit.

Bits	Type	Min	Max	Unit
32:63	IEEE Float	0	5	A

4.20 0x130 - SetCellCurrent_6

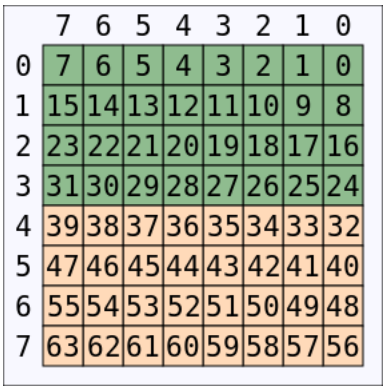
Sets the sinking and sourcing current limits for cell 6.

ID:
`0x130` (decimal: 304)

Length:
8 bytes

Send type:
Event

Signals



	7	6	5	4	3	2	1	0
0	7	6	5	4	3	2	1	0
1	15	14	13	12	11	10	9	8
2	23	22	21	20	19	18	17	16
3	31	30	29	28	27	26	25	24
4	39	38	37	36	35	34	33	32
5	47	46	45	44	43	42	41	40
6	55	54	53	52	51	50	49	48
7	63	62	61	60	59	58	57	56

Bits	Signal
0:31	*Sinking_Limit*
32:63	*Sourcing_Limit*

Sinking_Limit

Cell 6 sinking limit.

Bits	Type	Min	Max	Unit
0:31	IEEE Float	0	5	A

Sourcing_Limit

Cell 6 sourcing limit.

Bits	Type	Min	Max	Unit
32:63	IEEE Float	0	5	A

4.21 0x140 - SetCellCurrent_7

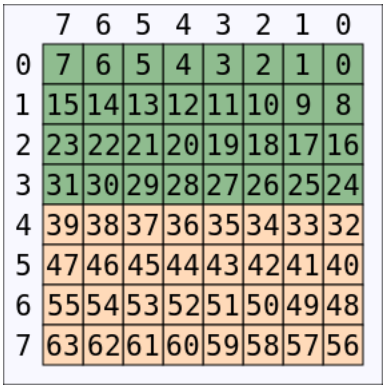
Sets the sinking and sourcing current limits for cell 7.

ID:
`0x140` (decimal: 320)

Length:
8 bytes

Send type:
Event

Signals



	7	6	5	4	3	2	1	0
0	7	6	5	4	3	2	1	0
1	15	14	13	12	11	10	9	8
2	23	22	21	20	19	18	17	16
3	31	30	29	28	27	26	25	24
4	39	38	37	36	35	34	33	32
5	47	46	45	44	43	42	41	40
6	55	54	53	52	51	50	49	48
7	63	62	61	60	59	58	57	56

Bits	Signal
0:31	*Sinking_Limit*
32:63	*Sourcing_Limit*

Sinking_Limit

Cell 7 sinking limit.

Bits	Type	Min	Max	Unit
0:31	IEEE Float	0	5	A

Sourcing_Limit

Cell 7 sourcing limit.

Bits	Type	Min	Max	Unit
32:63	IEEE Float	0	5	A

4.22 `0x150` - SetCellCurrent_8

Sets the sinking and sourcing current limits for cell 8.

ID:
`0x150` (decimal: 336)

Length:
8 bytes

Send type:
Event

Signals

	7	6	5	4	3	2	1	0
0	7	6	5	4	3	2	1	0
1	15	14	13	12	11	10	9	8
2	23	22	21	20	19	18	17	16
3	31	30	29	28	27	26	25	24
4	39	38	37	36	35	34	33	32
5	47	46	45	44	43	42	41	40
6	55	54	53	52	51	50	49	48
7	63	62	61	60	59	58	57	56

Bits	Signal
0:31	*Sinking_Limit*
32:63	*Sourcing_Limit*

Sinking_Limit

Cell 8 sinking limit.

Bits	Type	Min	Max	Unit
0:31	IEEE Float	0	5	A

Sourcing_Limit

Cell 8 sourcing limit.

Bits	Type	Min	Max	Unit
32:63	IEEE Float	0	5	A

4.23 `0x160` - SetCellFaults

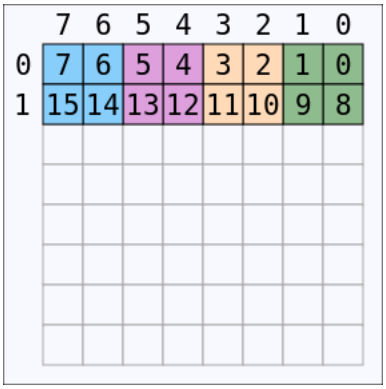
Controls individual cell fault states.

ID:
`0x160` (decimal: 352)

Length:
2 bytes

Send type:
Event

Signals



Bits	Signal
0:1	*Cell_1_Fault*
2:3	*Cell_2_Fault*
4:5	*Cell_3_Fault*
6:7	*Cell_4_Fault*
8:9	*Cell_5_Fault*
10:11	*Cell_6_Fault*
12:13	*Cell_7_Fault*
14:15	*Cell_8_Fault*

Cell_1_Fault

Cell 1 fault state.
0 = No fault
1 = Open circuit
2 = Short circuit
3 = Reverse polarity

Bits	Type	Min	Max
0:1	Enum	0	3

Cell_2_Fault

Cell 2 fault state.
0 = No fault
1 = Open circuit
2 = Short circuit
3 = Reverse polarity

Bits	Type	Min	Max
2:3	Enum	0	3

Cell_3_Fault

Cell 3 fault state.
0 = No fault
1 = Open circuit
2 = Short circuit
3 = Reverse polarity

Bits	Type	Min	Max
4:5	Enum	0	3

Cell_4_Fault

Cell 4 fault state.
0 = No fault
1 = Open circuit
2 = Short circuit
3 = Reverse polarity

Bits	Type	Min	Max
6:7	Enum	0	3

Cell_5_Fault

Cell 5 fault state.
0 = No fault
1 = Open circuit
2 = Short circuit
3 = Reverse polarity

Bits	Type	Min	Max
8:9	Enum	0	3

Cell_6_Fault

Cell 6 fault state.
0 = No fault
1 = Open circuit
2 = Short circuit
3 = Reverse polarity

Bits	Type	Min	Max
10:11	Enum	0	3

Cell_7_Fault

Cell 7 fault state.
0 = No fault
1 = Open circuit
2 = Short circuit
3 = Reverse polarity

Bits	Type	Min	Max
12:13	Enum	0	3

Cell_8_Fault

Cell 8 fault state.
0 = No fault
1 = Open circuit
2 = Short circuit
3 = Reverse polarity

Bits	Type	Min	Max
14:15	Enum	0	3

4.24 `0x170` - SetAllCellFaults

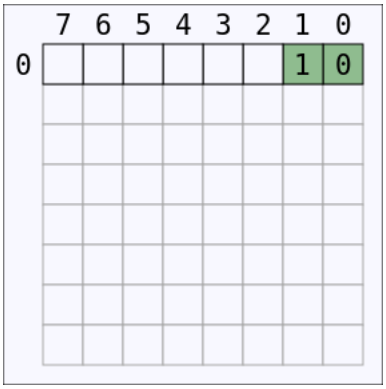
Controls the fault state of all cells at once.

ID:
`0x170` (decimal: 368)

Length:
1 byte

Send type:
Event

Signals



Bits	Signal
0:1	*Fault*

Fault

Fault state to apply to all cells.
0 = No fault
1 = Open circuit
2 = Short circuit
3 = Reverse polarity

Bits	Type	Min	Max
0:1	Enum	0	3

4.25 `0x180` - SetCellSenseRanges

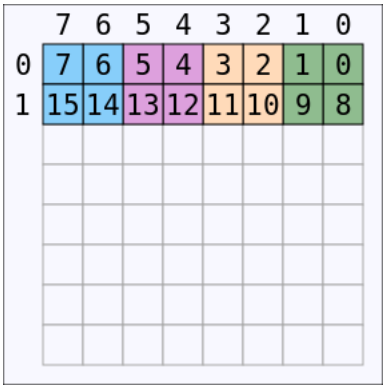
Controls the current sense range of each cell.

ID:
`0x180` (decimal: 384)

Length:
2 bytes

Send type:
Event

Signals



Bits	Signal
0:1	*Cell_1_Range*
2:3	*Cell_2_Range*
4:5	*Cell_3_Range*
6:7	*Cell_4_Range*
8:9	*Cell_5_Range*
10:11	*Cell_6_Range*
12:13	*Cell_7_Range*
14:15	*Cell_8_Range*

Cell_1_Range

Cell 1 current sense range.
0 = Auto (default, recommended)
1 = Low range (1A)
2 = High range (5A)

Bits	Type	Min	Max
0:1	Enum	0	2

Cell_2_Range

Cell 2 current sense range.
0 = Auto (default, recommended)
1 = Low range (1A)
2 = High range (5A)

Bits	Type	Min	Max
2:3	Enum	0	2

Cell_3_Range

Cell 3 current sense range.
0 = Auto (default, recommended)
1 = Low range (1A)
2 = High range (5A)

Bits	Type	Min	Max
4:5	Enum	0	2

Cell_4_Range

Cell 4 current sense range.
0 = Auto (default, recommended)
1 = Low range (1A)
2 = High range (5A)

Bits	Type	Min	Max
6:7	Enum	0	2

Cell_5_Range

Cell 5 current sense range.
0 = Auto (default, recommended)
1 = Low range (1A)
2 = High range (5A)

Bits	Type	Min	Max
8:9	Enum	0	2

Cell_6_Range

Cell 6 current sense range.
0 = Auto (default, recommended)
1 = Low range (1A)
2 = High range (5A)

Bits	Type	Min	Max
10:11	Enum	0	2

Cell_7_Range

Cell 7 current sense range.
0 = Auto (default, recommended)
1 = Low range (1A)
2 = High range (5A)

Bits	Type	Min	Max
12:13	Enum	0	2

Cell_8_Range

Cell 8 current sense range.
0 = Auto (default, recommended)
1 = Low range (1A)
2 = High range (5A)

Bits	Type	Min	Max
14:15	Enum	0	2

4.26 `0x190` - SetAllCellSenseRange

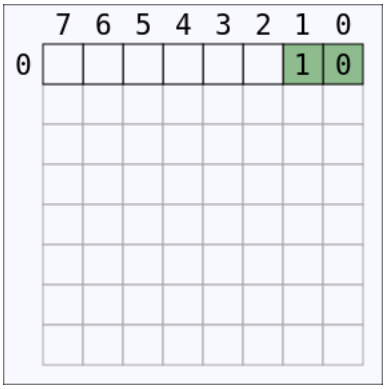
Controls the current sense range of all cells at once.

ID:
`0x190` (decimal: 400)

Length:
1 byte

Send type:
Event

Signals



Bits	Signal
0:1	*Range*

Range

Current sense range to apply to all cells.
0 = Auto (default, recommended)
1 = Low range (1A)
2 = High range (5A)

Bits	Type	Min	Max
0:1	Enum	0	2

4.27 `0x1A0` - SetAnalogOut_1_2

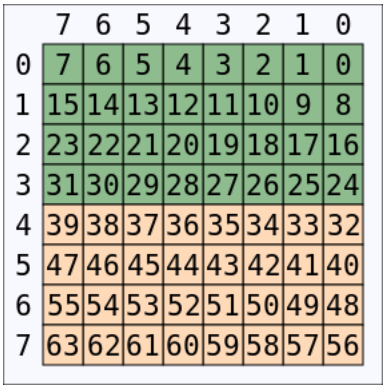
Sets the target voltage for analog outputs 1 and 2.

ID:
`0x1A0` (decimal: 416)

Length:
8 bytes

Send type:
Event

Signals



	7	6	5	4	3	2	1	0
0	7	6	5	4	3	2	1	0
1	15	14	13	12	11	10	9	8
2	23	22	21	20	19	18	17	16
3	31	30	29	28	27	26	25	24
4	39	38	37	36	35	34	33	32
5	47	46	45	44	43	42	41	40
6	55	54	53	52	51	50	49	48
7	63	62	61	60	59	58	57	56

Bits	Signal
0:31	*AO_1_Voltage*
32:63	*AO_2_Voltage*

AO_1_Voltage

Analog output 1 voltage.

Bits	Type	Min	Max	Unit
0:31	IEEE Float	-10	10	V

AO_2_Voltage

Analog output 2 voltage.

Bits	Type	Min	Max	Unit
32:63	IEEE Float	-10	10	V

4.28 0x1B0 - SetAnalogOut_3_4

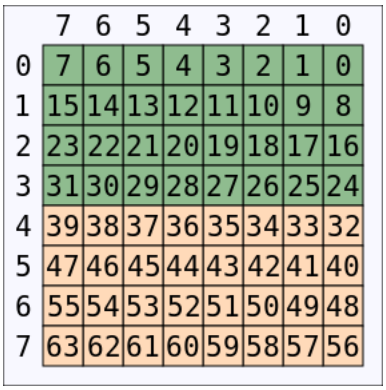
Sets the target voltage for analog outputs 3 and 4.

ID:
`0x1B0` (decimal: 432)

Length:
8 bytes

Send type:
Event

Signals



	7	6	5	4	3	2	1	0
0	7	6	5	4	3	2	1	0
1	15	14	13	12	11	10	9	8
2	23	22	21	20	19	18	17	16
3	31	30	29	28	27	26	25	24
4	39	38	37	36	35	34	33	32
5	47	46	45	44	43	42	41	40
6	55	54	53	52	51	50	49	48
7	63	62	61	60	59	58	57	56

Bits	Signal
0:31	*AO_3_Voltage*
32:63	*AO_4_Voltage*

AO_3_Voltage

Analog output 3 voltage.

Bits	Type	Min	Max	Unit
0:31	IEEE Float	-10	10	V

AO_4_Voltage

Analog output 4 voltage.

Bits	Type	Min	Max	Unit
32:63	IEEE Float	-10	10	V

4.29 0x1C0 - SetAnalogOut_5_6

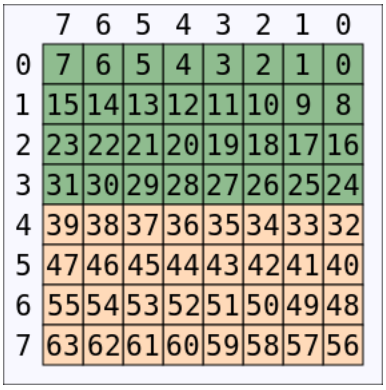
Sets the target voltage for analog outputs 5 and 6.

ID:
`0x1C0` (decimal: 448)

Length:
8 bytes

Send type:
Event

Signals



	7	6	5	4	3	2	1	0
0	7	6	5	4	3	2	1	0
1	15	14	13	12	11	10	9	8
2	23	22	21	20	19	18	17	16
3	31	30	29	28	27	26	25	24
4	39	38	37	36	35	34	33	32
5	47	46	45	44	43	42	41	40
6	55	54	53	52	51	50	49	48
7	63	62	61	60	59	58	57	56

Bits	Signal
0:31	*AO_5_Voltage*
32:63	*AO_6_Voltage*

AO_5_Voltage

Analog output 5 voltage.

Bits	Type	Min	Max	Unit
0:31	IEEE Float	-10	10	V

AO_6_Voltage

Analog output 6 voltage.

Bits	Type	Min	Max	Unit
32:63	IEEE Float	-10	10	V

4.30 0x1D0 - SetAnalogOut_7_8

Sets the target voltage for analog outputs 7 and 8.

ID:
`0x1D0` (decimal: 464)

Length:
8 bytes

Send type:
Event

Signals

	7	6	5	4	3	2	1	0
0	7	6	5	4	3	2	1	0
1	15	14	13	12	11	10	9	8
2	23	22	21	20	19	18	17	16
3	31	30	29	28	27	26	25	24
4	39	38	37	36	35	34	33	32
5	47	46	45	44	43	42	41	40
6	55	54	53	52	51	50	49	48
7	63	62	61	60	59	58	57	56

Bits	Signal
0:31	*AO_7_Voltage*
32:63	*AO_8_Voltage*

AO_7_Voltage

Analog output 7 voltage.

Bits	Type	Min	Max	Unit
0:31	IEEE Float	-10	10	V

AO_8_Voltage

Analog output 8 voltage.

Bits	Type	Min	Max	Unit
32:63	IEEE Float	-10	10	V

4.31 `0x1E0` - SetDigitalOutputs

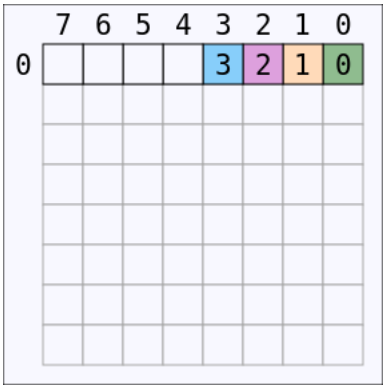
Controls the states of the auxiliary digital outputs.

ID:
`0x1E0` (decimal: 480)

Length:
1 byte

Send type:
Event

Signals



Bit	Signal
0	*DO_1_State*
1	*DO_2_State*
2	*DO_3_State*
3	*DO_4_State*

DO_1_State

Digital output 1 state.

Bit	Type	Min	Max
0	Boolean	0	1

DO_2_State

Digital output 2 state.

Bit	Type	Min	Max
1	Boolean	0	1

DO_3_State

Digital output 3 state.

Bit	Type	Min	Max
2	Boolean	0	1

DO_4_State

Digital output 4 state.

Bit	Type	Min	Max
3	Boolean	0	1

4.32 0x1F0 - GlobalModelInputData_1_2

Global model input values 1 and 2. All units will receive these values and the address field of the frame ID should be 0 or 15.

ID:
`0x1F0` (decimal: 496)

Length:
8 bytes

Send type:
Event

Signals

	7	6	5	4	3	2	1	0
0	7	6	5	4	3	2	1	0
1	15	14	13	12	11	10	9	8
2	23	22	21	20	19	18	17	16
3	31	30	29	28	27	26	25	24
4	39	38	37	36	35	34	33	32
5	47	46	45	44	43	42	41	40
6	55	54	53	52	51	50	49	48
7	63	62	61	60	59	58	57	56

Bits	Signal
0:31	*Global_Model_Input_1*
32:63	*Global_Model_Input_2*

Global_Model_Input_1

Global model input 1.

Bits	Type
0:31	IEEE Float

Global_Model_Input_2

Global model input 2.

Bits	Type
32:63	IEEE Float

4.33 0x200 - GlobalModelInputData_3_4

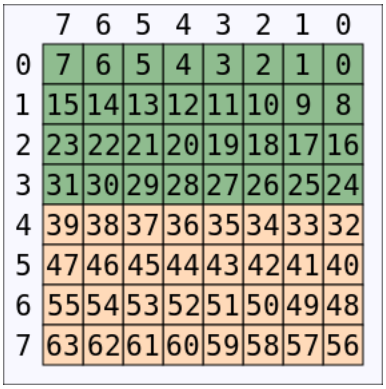
Global model input values 3 and 4. All units will receive these values and the address field of the frame ID should be 0 or 15.

ID:
`0x200` (decimal: 512)

Length:
8 bytes

Send type:
Event

Signals



	7	6	5	4	3	2	1	0
0	7	6	5	4	3	2	1	0
1	15	14	13	12	11	10	9	8
2	23	22	21	20	19	18	17	16
3	31	30	29	28	27	26	25	24
4	39	38	37	36	35	34	33	32
5	47	46	45	44	43	42	41	40
6	55	54	53	52	51	50	49	48
7	63	62	61	60	59	58	57	56

Bits	Signal
0:31	*Global_Model_Input_3*
32:63	*Global_Model_Input_4*

Global_Model_Input_3

Global model input 3.

Bits	Type
0:31	IEEE Float

Global_Model_Input_4

Global model input 4.

Bits	Type
32:63	IEEE Float

4.34 0x210 - GlobalModelInputData_5_6

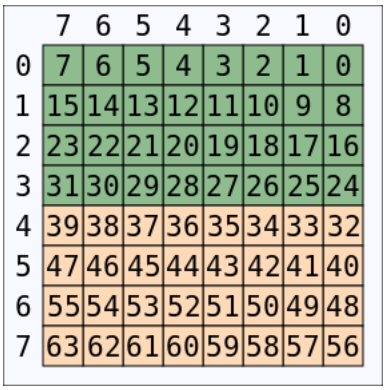
Global model input values 5 and 6. All units will receive these values and the address field of the frame ID should be 0 or 15.

ID:
`0x210` (decimal: 528)

Length:
8 bytes

Send type:
Event

Signals



	7	6	5	4	3	2	1	0
0	7	6	5	4	3	2	1	0
1	15	14	13	12	11	10	9	8
2	23	22	21	20	19	18	17	16
3	31	30	29	28	27	26	25	24
4	39	38	37	36	35	34	33	32
5	47	46	45	44	43	42	41	40
6	55	54	53	52	51	50	49	48
7	63	62	61	60	59	58	57	56

Bits	Signal
0:31	*Global_Model_Input_5*
32:63	*Global_Model_Input_6*

Global_Model_Input_5

Global model input 5.

Bits	Type
0:31	IEEE Float

Global_Model_Input_6

Global model input 6.

Bits	Type
32:63	IEEE Float

4.35 0x220 - GlobalModelInputData_7_8

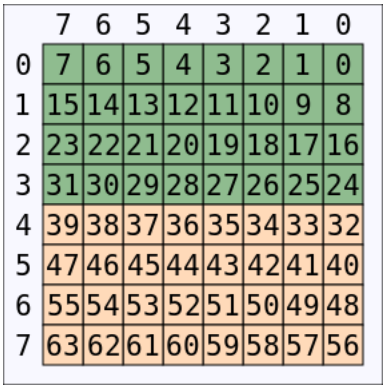
Global model input values 7 and 8. All units will receive these values and the address field of the frame ID should be 0 or 15.

ID:
`0x220` (decimal: 544)

Length:
8 bytes

Send type:
Event

Signals



	7	6	5	4	3	2	1	0
0	7	6	5	4	3	2	1	0
1	15	14	13	12	11	10	9	8
2	23	22	21	20	19	18	17	16
3	31	30	29	28	27	26	25	24
4	39	38	37	36	35	34	33	32
5	47	46	45	44	43	42	41	40
6	55	54	53	52	51	50	49	48
7	63	62	61	60	59	58	57	56

Bits	Signal
0:31	*Global_Model_Input_7*
32:63	*Global_Model_Input_8*

Global_Model_Input_7

Global model input 7.

Bits	Type
0:31	IEEE Float

Global_Model_Input_8

Global model input 8.

Bits	Type
32:63	IEEE Float

4.36 0x230 - LocalModelInputData_1_2

Local model input values 1 and 2.

ID:
`0x230` (decimal: 560)

Length:
8 bytes

Send type:
Event

Signals

	7	6	5	4	3	2	1	0
0	7	6	5	4	3	2	1	0
1	15	14	13	12	11	10	9	8
2	23	22	21	20	19	18	17	16
3	31	30	29	28	27	26	25	24
4	39	38	37	36	35	34	33	32
5	47	46	45	44	43	42	41	40
6	55	54	53	52	51	50	49	48
7	63	62	61	60	59	58	57	56

Bits	Signal
0:31	*Local_Model_Input_1*
32:63	*Local_Model_Input_2*

Local_Model_Input_1

Local model input 1.

Bits	Type
0:31	IEEE Float

Local_Model_Input_2

Local model input 2.

Bits	Type
32:63	IEEE Float

4.37 0x240 - LocalModelInputData_3_4

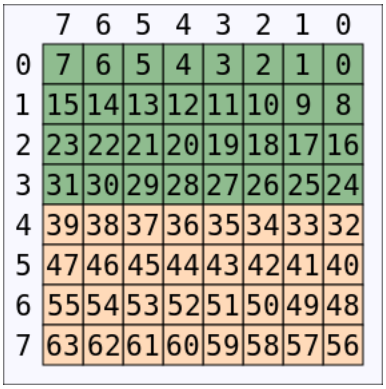
Local model input values 3 and 4.

ID:
`0x240` (decimal: 576)

Length:
8 bytes

Send type:
Event

Signals



	7	6	5	4	3	2	1	0
0	7	6	5	4	3	2	1	0
1	15	14	13	12	11	10	9	8
2	23	22	21	20	19	18	17	16
3	31	30	29	28	27	26	25	24
4	39	38	37	36	35	34	33	32
5	47	46	45	44	43	42	41	40
6	55	54	53	52	51	50	49	48
7	63	62	61	60	59	58	57	56

Bits	Signal
0:31	*Local_Model_Input_3*
32:63	*Local_Model_Input_4*

Local_Model_Input_3

Local model input 3.

Bits	Type
0:31	IEEE Float

Local_Model_Input_4

Local model input 4.

Bits	Type
32:63	IEEE Float

4.38 0x250 - LocalModelInputData_5_6

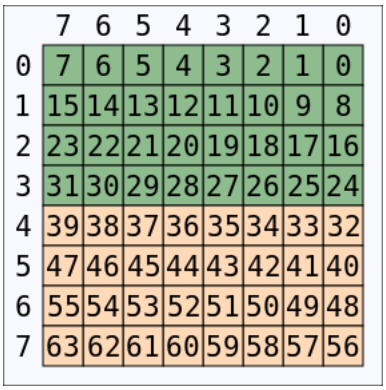
Local model input values 5 and 6.

ID:
`0x250` (decimal: 592)

Length:
8 bytes

Send type:
Event

Signals



	7	6	5	4	3	2	1	0
0	7	6	5	4	3	2	1	0
1	15	14	13	12	11	10	9	8
2	23	22	21	20	19	18	17	16
3	31	30	29	28	27	26	25	24
4	39	38	37	36	35	34	33	32
5	47	46	45	44	43	42	41	40
6	55	54	53	52	51	50	49	48
7	63	62	61	60	59	58	57	56

Bits	Signal
0:31	*Local_Model_Input_5*
32:63	*Local_Model_Input_6*

Local_Model_Input_5

Local model input 5.

Bits	Type
0:31	IEEE Float

Local_Model_Input_6

Local model input 6.

Bits	Type
32:63	IEEE Float

4.39 0x260 - LocalModelInputData_7_8

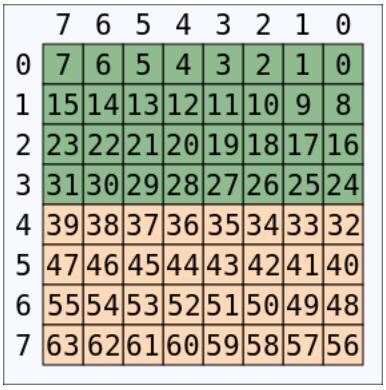
Local model input values 7 and 8.

ID:
`0x260` (decimal: 608)

Length:
8 bytes

Send type:
Event

Signals



	7	6	5	4	3	2	1	0
0	7	6	5	4	3	2	1	0
1	15	14	13	12	11	10	9	8
2	23	22	21	20	19	18	17	16
3	31	30	29	28	27	26	25	24
4	39	38	37	36	35	34	33	32
5	47	46	45	44	43	42	41	40
6	55	54	53	52	51	50	49	48
7	63	62	61	60	59	58	57	56

Bits	Signal
0:31	*Local_Model_Input_7*
32:63	*Local_Model_Input_8*

Local_Model_Input_7

Local model input 7.

Bits	Type
0:31	IEEE Float

Local_Model_Input_8

Local model input 8.

Bits	Type
32:63	IEEE Float

4.40 0x270 - CellReadback_1

Contains the readback voltage and current for cell 1.

ID:
`0x270` (decimal: 624)

Length:
8 bytes

Send type:
Cyclic

Rate:
100Hz

Signals

	7	6	5	4	3	2	1	0
0	7	6	5	4	3	2	1	0
1	15	14	13	12	11	10	9	8
2	23	22	21	20	19	18	17	16
3	31	30	29	28	27	26	25	24
4	39	38	37	36	35	34	33	32
5	47	46	45	44	43	42	41	40
6	55	54	53	52	51	50	49	48
7	63	62	61	60	59	58	57	56

Bits	Signal
0:31	*Voltage*
32:63	*Current*

Voltage

Cell 1 measured voltage.

Bits	Type	Min	Max	Unit
0:31	IEEE Float	0	5	V

Current

Cell 1 measured current.

Bits	Type	Min	Max	Unit
32:63	IEEE Float	-5	5	A

4.41 `0x280` - CellReadback_2

Contains the readback voltage and current for cell 2.

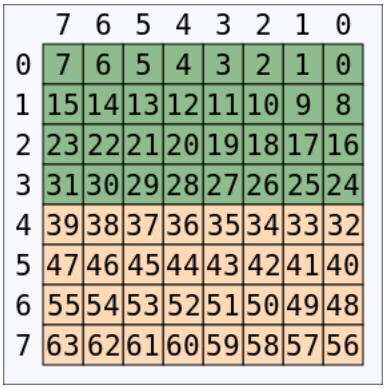
ID:
`0x280` (decimal: 640)

Length:
8 bytes

Send type:
Cyclic

Rate:
100Hz

Signals



	7	6	5	4	3	2	1	0
0	7	6	5	4	3	2	1	0
1	15	14	13	12	11	10	9	8
2	23	22	21	20	19	18	17	16
3	31	30	29	28	27	26	25	24
4	39	38	37	36	35	34	33	32
5	47	46	45	44	43	42	41	40
6	55	54	53	52	51	50	49	48
7	63	62	61	60	59	58	57	56

Bits	Signal
0:31	*Voltage*
32:63	*Current*

Voltage

Cell 2 measured voltage.

Bits	Type	Min	Max	Unit
0:31	IEEE Float	0	5	V

Current

Cell 2 measured current.

Bits	Type	Min	Max	Unit
32:63	IEEE Float	-5	5	A

4.42 `0x290` - CellReadback_3

Contains the readback voltage and current for cell 3.

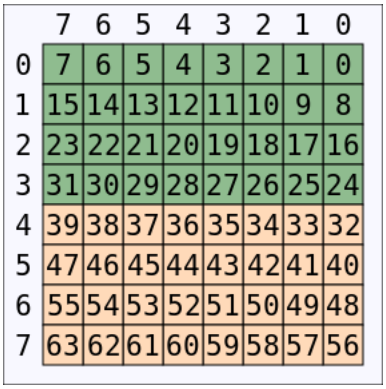
ID:
`0x290` (decimal: 656)

Length:
8 bytes

Send type:
Cyclic

Rate:
100Hz

Signals



	7	6	5	4	3	2	1	0
0	7	6	5	4	3	2	1	0
1	15	14	13	12	11	10	9	8
2	23	22	21	20	19	18	17	16
3	31	30	29	28	27	26	25	24
4	39	38	37	36	35	34	33	32
5	47	46	45	44	43	42	41	40
6	55	54	53	52	51	50	49	48
7	63	62	61	60	59	58	57	56

Bits	Signal
0:31	*Voltage*
32:63	*Current*

Voltage

Cell 3 measured voltage.

Bits	Type	Min	Max	Unit
0:31	IEEE Float	0	5	V

Current

Cell 3 measured current.

Bits	Type	Min	Max	Unit
32:63	IEEE Float	-5	5	A

4.43 `0x2A0` - CellReadback_4

Contains the readback voltage and current for cell 4.

ID:
`0x2A0` (decimal: 672)

Length:
8 bytes

Send type:
Cyclic

Rate:
100Hz

Signals

	7	6	5	4	3	2	1	0
0	7	6	5	4	3	2	1	0
1	15	14	13	12	11	10	9	8
2	23	22	21	20	19	18	17	16
3	31	30	29	28	27	26	25	24
4	39	38	37	36	35	34	33	32
5	47	46	45	44	43	42	41	40
6	55	54	53	52	51	50	49	48
7	63	62	61	60	59	58	57	56

Bits	Signal
0:31	*Voltage*
32:63	*Current*

Voltage

Cell 4 measured voltage.

Bits	Type	Min	Max	Unit
0:31	IEEE Float	0	5	V

Current

Cell 4 measured current.

Bits	Type	Min	Max	Unit
32:63	IEEE Float	-5	5	A

4.44 `0x2B0` - CellReadback_5

Contains the readback voltage and current for cell 5.

ID:
`0x2B0` (decimal: 688)

Length:
8 bytes

Send type:
Cyclic

Rate:
100Hz

Signals

	7	6	5	4	3	2	1	0
0	7	6	5	4	3	2	1	0
1	15	14	13	12	11	10	9	8
2	23	22	21	20	19	18	17	16
3	31	30	29	28	27	26	25	24
4	39	38	37	36	35	34	33	32
5	47	46	45	44	43	42	41	40
6	55	54	53	52	51	50	49	48
7	63	62	61	60	59	58	57	56

Bits	Signal
0:31	*Voltage*
32:63	*Current*

Voltage

Cell 5 measured voltage.

Bits	Type	Min	Max	Unit
0:31	IEEE Float	0	5	V

Current

Cell 5 measured current.

Bits	Type	Min	Max	Unit
32:63	IEEE Float	-5	5	A

4.45 `0x2C0` - CellReadback_6

Contains the readback voltage and current for cell 6.

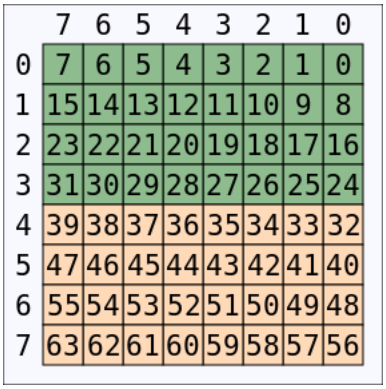
ID:
`0x2C0` (decimal: 704)

Length:
8 bytes

Send type:
Cyclic

Rate:
100Hz

Signals



	7	6	5	4	3	2	1	0
0	7	6	5	4	3	2	1	0
1	15	14	13	12	11	10	9	8
2	23	22	21	20	19	18	17	16
3	31	30	29	28	27	26	25	24
4	39	38	37	36	35	34	33	32
5	47	46	45	44	43	42	41	40
6	55	54	53	52	51	50	49	48
7	63	62	61	60	59	58	57	56

Bits	Signal
0:31	*Voltage*
32:63	*Current*

Voltage

Cell 6 measured voltage.

Bits	Type	Min	Max	Unit
0:31	IEEE Float	0	5	V

Current

Cell 6 measured current.

Bits	Type	Min	Max	Unit
32:63	IEEE Float	-5	5	A

4.46 `0x2D0` - CellReadback_7

Contains the readback voltage and current for cell 7.

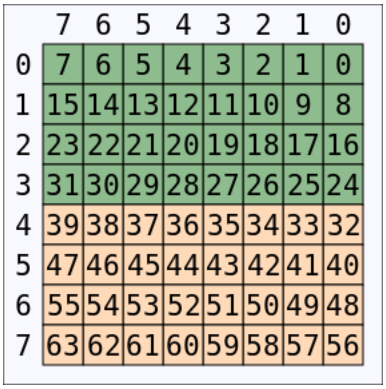
ID:
`0x2D0` (decimal: 720)

Length:
8 bytes

Send type:
Cyclic

Rate:
100Hz

Signals



	7	6	5	4	3	2	1	0
0	7	6	5	4	3	2	1	0
1	15	14	13	12	11	10	9	8
2	23	22	21	20	19	18	17	16
3	31	30	29	28	27	26	25	24
4	39	38	37	36	35	34	33	32
5	47	46	45	44	43	42	41	40
6	55	54	53	52	51	50	49	48
7	63	62	61	60	59	58	57	56

Bits	Signal
0:31	*Voltage*
32:63	*Current*

Voltage

Cell 7 measured voltage.

Bits	Type	Min	Max	Unit
0:31	IEEE Float	0	5	V

Current

Cell 7 measured current.

Bits	Type	Min	Max	Unit
32:63	IEEE Float	-5	5	A

4.47 `0x2E0` - CellReadback_8

Contains the readback voltage and current for cell 8.

ID:
`0x2E0` (decimal: 736)

Length:
8 bytes

Send type:
Cyclic

Rate:
100Hz

Signals

	7	6	5	4	3	2	1	0
0	7	6	5	4	3	2	1	0
1	15	14	13	12	11	10	9	8
2	23	22	21	20	19	18	17	16
3	31	30	29	28	27	26	25	24
4	39	38	37	36	35	34	33	32
5	47	46	45	44	43	42	41	40
6	55	54	53	52	51	50	49	48
7	63	62	61	60	59	58	57	56

Bits	Signal
0:31	*Voltage*
32:63	*Current*

Voltage

Cell 8 measured voltage.

Bits	Type	Min	Max	Unit
0:31	IEEE Float	0	5	V

Current

Cell 8 measured current.

Bits	Type	Min	Max	Unit
32:63	IEEE Float	-5	5	A

4.48 `0x2F0` - ReadCellFaultStates

Readback of cell fault states.

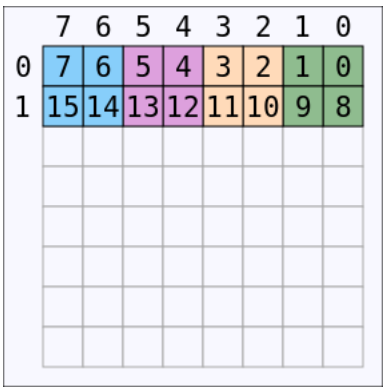
ID:
`0x2F0` (decimal: 752)

Length:
2 bytes

Send type:
Cyclic

Rate:
1Hz

Signals



Bits	Signal
0:1	*Cell_1_Fault*
2:3	*Cell_2_Fault*
4:5	*Cell_3_Fault*
6:7	*Cell_4_Fault*
8:9	*Cell_5_Fault*
10:11	*Cell_6_Fault*
12:13	*Cell_7_Fault*
14:15	*Cell_8_Fault*

Cell_1_Fault

Cell 1 fault state.
0 = No fault
1 = Open circuit
2 = Short circuit
3 = Reverse polarity

Bits	Type	Min	Max
0:1	Enum	0	3

Cell_2_Fault

Cell 2 fault state.
0 = No fault
1 = Open circuit
2 = Short circuit
3 = Reverse polarity

Bits	Type	Min	Max
2:3	Enum	0	3

Cell_3_Fault

Cell 3 fault state.
0 = No fault
1 = Open circuit
2 = Short circuit
3 = Reverse polarity

Bits	Type	Min	Max
4:5	Enum	0	3

Cell_4_Fault

Cell 4 fault state.
0 = No fault
1 = Open circuit
2 = Short circuit
3 = Reverse polarity

Bits	Type	Min	Max
6:7	Enum	0	3

Cell_5_Fault

Cell 5 fault state.
0 = No fault
1 = Open circuit
2 = Short circuit
3 = Reverse polarity

Bits	Type	Min	Max
8:9	Enum	0	3

Cell_6_Fault

Cell 6 fault state.
0 = No fault
1 = Open circuit
2 = Short circuit
3 = Reverse polarity

Bits	Type	Min	Max
10:11	Enum	0	3

Cell_7_Fault

Cell 7 fault state.
0 = No fault
1 = Open circuit
2 = Short circuit
3 = Reverse polarity

Bits	Type	Min	Max
12:13	Enum	0	3

Cell_8_Fault

Cell 8 fault state.
0 = No fault
1 = Open circuit
2 = Short circuit
3 = Reverse polarity

Bits	Type	Min	Max
14:15	Enum	0	3

4.49 `0x300` - ReadAnalogInputs_1_2

Analog inputs 1 and 2.

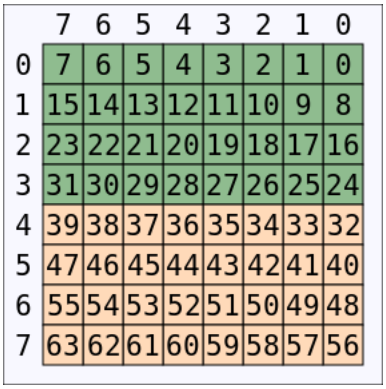
ID:
`0x300` (decimal: 768)

Length:
8 bytes

Send type:
Cyclic

Rate:
10Hz

Signals



	7	6	5	4	3	2	1	0
0	7	6	5	4	3	2	1	0
1	15	14	13	12	11	10	9	8
2	23	22	21	20	19	18	17	16
3	31	30	29	28	27	26	25	24
4	39	38	37	36	35	34	33	32
5	47	46	45	44	43	42	41	40
6	55	54	53	52	51	50	49	48
7	63	62	61	60	59	58	57	56

Bits	Signal
0:31	*AI_1_Voltage*
32:63	*AI_2_Voltage*

AI_1_Voltage

Analog input 1 measured voltage.

Bits	Type	Min	Max	Unit
0:31	IEEE Float	-10	10	V

AI_2_Voltage

Analog input 2 measured voltage.

Bits	Type	Min	Max	Unit
32:63	IEEE Float	-10	10	V

4.50 0x310 - ReadAnalogInputs_3_4

Analog inputs 3 and 4.

ID:
`0x310` (decimal: 784)

Length:
8 bytes

Send type:
Cyclic

Rate:
10Hz

Signals

	7	6	5	4	3	2	1	0
0	7	6	5	4	3	2	1	0
1	15	14	13	12	11	10	9	8
2	23	22	21	20	19	18	17	16
3	31	30	29	28	27	26	25	24
4	39	38	37	36	35	34	33	32
5	47	46	45	44	43	42	41	40
6	55	54	53	52	51	50	49	48
7	63	62	61	60	59	58	57	56

Bits	Signal
0:31	*AI_3_Voltage*
32:63	*AI_4_Voltage*

AI_3_Voltage

Analog input 3 measured voltage.

Bits	Type	Min	Max	Unit
0:31	IEEE Float	-10	10	V

AI_4_Voltage

Analog input 4 measured voltage.

Bits	Type	Min	Max	Unit
32:63	IEEE Float	-10	10	V

4.51 0x320 - ReadAnalogInputs_5_6

Analog inputs 5 and 6.

ID:
`0x320` (decimal: 800)

Length:
8 bytes

Send type:
Cyclic

Rate:
10Hz

Signals

	7	6	5	4	3	2	1	0
0	7	6	5	4	3	2	1	0
1	15	14	13	12	11	10	9	8
2	23	22	21	20	19	18	17	16
3	31	30	29	28	27	26	25	24
4	39	38	37	36	35	34	33	32
5	47	46	45	44	43	42	41	40
6	55	54	53	52	51	50	49	48
7	63	62	61	60	59	58	57	56

Bits	Signal
0:31	*AI_5_Voltage*
32:63	*AI_6_Voltage*

AI_5_Voltage

Analog input 5 measured voltage.

Bits	Type	Min	Max	Unit
0:31	IEEE Float	-10	10	V

AI_6_Voltage

Analog input 6 measured voltage.

Bits	Type	Min	Max	Unit
32:63	IEEE Float	-10	10	V

4.52 `0x330` - ReadAnalogInputs_7_8

Analog inputs 7 and 8.

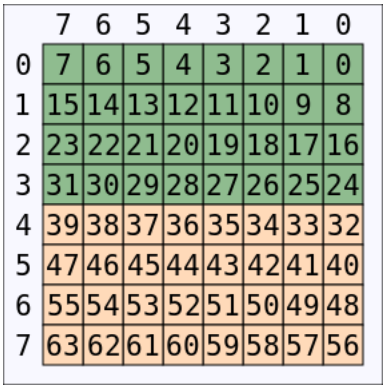
ID:
`0x330` (decimal: 816)

Length:
8 bytes

Send type:
Cyclic

Rate:
10Hz

Signals



	7	6	5	4	3	2	1	0
0	7	6	5	4	3	2	1	0
1	15	14	13	12	11	10	9	8
2	23	22	21	20	19	18	17	16
3	31	30	29	28	27	26	25	24
4	39	38	37	36	35	34	33	32
5	47	46	45	44	43	42	41	40
6	55	54	53	52	51	50	49	48
7	63	62	61	60	59	58	57	56

Bits	Signal
0:31	*AI_7_Voltage*
32:63	*AI_8_Voltage*

AI_7_Voltage

Analog input 7 measured voltage.

Bits	Type	Min	Max	Unit
0:31	IEEE Float	-10	10	V

AI_8_Voltage

Analog input 8 measured voltage.

Bits	Type	Min	Max	Unit
32:63	IEEE Float	-10	10	V

4.53 `0x340` - ReadDigitalInputs

Digital input states (including interlock).

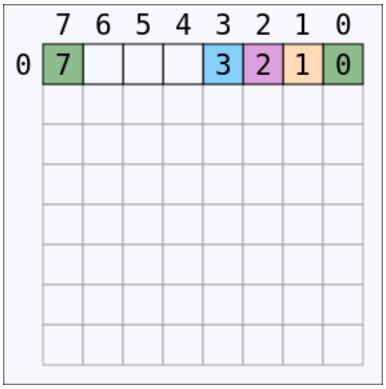
ID:
`0x340` (decimal: 832)

Length:
1 byte

Send type:
Cyclic

Rate:
10Hz

Signals



Bit	Signal
0	*DI_1_State*
1	*DI_2_State*
2	*DI_3_State*
3	*DI_4_State*
7	*Inhibit_State*

DI_1_State

Digital input 1 state.

Bit	Type	Min	Max
0	Boolean	0	1

DI_2_State

Digital input 2 state.

Bit	Type	Min	Max
1	Boolean	0	1

DI_3_State

Digital input 3 state.

Bit	Type	Min	Max
2	Boolean	0	1

DI_4_State

Digital input 4 state.

Bit	Type	Min	Max
3	Boolean	0	1

Inhibit_State

Whether interlock is asserted.

Bit	Type	Min	Max
7	Boolean	0	1

4.54 `0x350` - ReadUnitStatus

System status reporting.

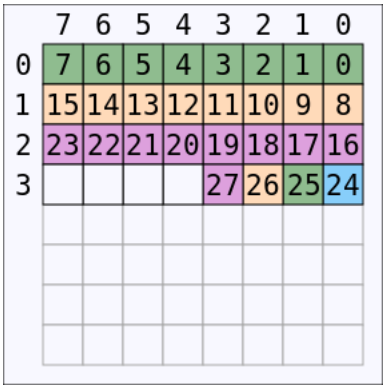
ID:
`0x350` (decimal: 848)

Length:
4 bytes

Send type:
Cyclic

Rate:
1Hz

Signals



Bits	Signal
0:7	*Alarm_Fatal*
8:15	*Alarm_Critical*
16:23	*Alarm_Recoverable*
24	*Model_Loaded*
25	*Model_Running*
26	*Model_Errored*
27	*Noise_Filter*

Alarm_Fatal

Mask of fatal alarms.

Bits	Type	Min	Max
0:7	u8	0	255

Alarm_Critical

Mask of critical alarms.

Bits	Type	Min	Max
8:15	u8	0	255

Alarm_Recoverable

Mask of recoverable alarms.

Bits	Type	Min	Max
16:23	u8	0	255

Model_Loaded

Whether or not a model is loaded.

Bit	Type	Min	Max
24	Boolean	0	1

Model_Running

Whether or not a model is currently running.

Bit	Type	Min	Max
25	Boolean	0	1

Model_Errored

Whether or not an error occurred during modeling.

Bit	Type	Min	Max
26	Boolean	0	1

Noise_Filter

Cell noise filter state.
0 = Filter disabled (1kHz control; modeling enabled)
1 = Noise filtering enabled (10Hz control, no modeling)

Bit	Type	Min	Max
27	Enum	0	1

4.55 `0x360` - ControlModel

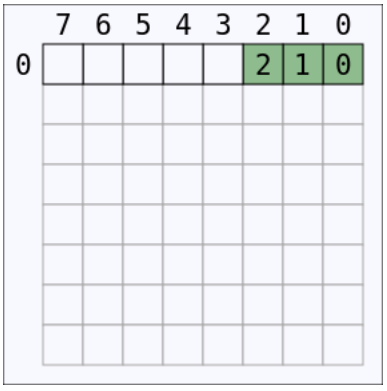
Controls on-board modeling.

ID:
`0x360` (decimal: 864)

Length:
1 byte

Send type:
Event

Signals



Bits	Signal
0:2	*Model_Command*

Model_Command

0 = No-op
1 = Load model
2 = Start model
3 = Stop model
4 = Unload model

Bits	Type	Min	Max
0:2	Enum	0	4

4.56 `0x370` - ModelOutputs_1_2

Model output values 1 and 2.

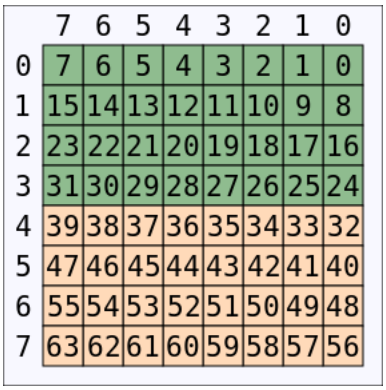
ID:
`0x370` (decimal: 880)

Length:
8 bytes

Send type:
Cyclic

Rate:
100Hz

Signals



	7	6	5	4	3	2	1	0
0	7	6	5	4	3	2	1	0
1	15	14	13	12	11	10	9	8
2	23	22	21	20	19	18	17	16
3	31	30	29	28	27	26	25	24
4	39	38	37	36	35	34	33	32
5	47	46	45	44	43	42	41	40
6	55	54	53	52	51	50	49	48
7	63	62	61	60	59	58	57	56

Bits	Signal
0:31	*Model_Output_1*
32:63	*Model_Output_2*

Model_Output_1

Model output 1.

Bits	Type
0:31	IEEE Float

Model_Output_2

Model output 2.

Bits	Type
32:63	IEEE Float

4.57 0x380 - ModelOutputs_3_4

Model output values 3 and 4.

ID:
`0x380` (decimal: 896)

Length:
8 bytes

Send type:
Cyclic

Rate:
100Hz

Signals

	7	6	5	4	3	2	1	0
0	7	6	5	4	3	2	1	0
1	15	14	13	12	11	10	9	8
2	23	22	21	20	19	18	17	16
3	31	30	29	28	27	26	25	24
4	39	38	37	36	35	34	33	32
5	47	46	45	44	43	42	41	40
6	55	54	53	52	51	50	49	48
7	63	62	61	60	59	58	57	56

Bits	Signal
0:31	*Model_Output_3*
32:63	*Model_Output_4*

Model_Output_3

Model output 3.

Bits	Type
0:31	IEEE Float

Model_Output_4

Model output 4.

Bits	Type
32:63	IEEE Float

4.58 0x390 - ModelOutputs_5_6

Model output values 5 and 6.

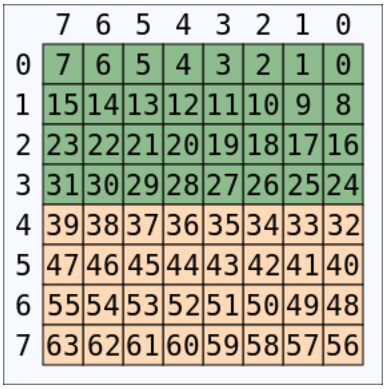
ID:
`0x390` (decimal: 912)

Length:
8 bytes

Send type:
Cyclic

Rate:
100Hz

Signals



	7	6	5	4	3	2	1	0
0	7	6	5	4	3	2	1	0
1	15	14	13	12	11	10	9	8
2	23	22	21	20	19	18	17	16
3	31	30	29	28	27	26	25	24
4	39	38	37	36	35	34	33	32
5	47	46	45	44	43	42	41	40
6	55	54	53	52	51	50	49	48
7	63	62	61	60	59	58	57	56

Bits	Signal
0:31	*Model_Output_5*
32:63	*Model_Output_6*

Model_Output_5

Model output 5.

Bits	Type
0:31	IEEE Float

Model_Output_6

Model output 6.

Bits	Type
32:63	IEEE Float

4.59 0x3A0 - ModelOutputs_7_8

Model output values 7 and 8.

ID:
0x3A0 (decimal: 928)

Length:
8 bytes

Send type:
Cyclic

Rate:
100Hz

Signals

	7	6	5	4	3	2	1	0
0	7	6	5	4	3	2	1	0
1	15	14	13	12	11	10	9	8
2	23	22	21	20	19	18	17	16
3	31	30	29	28	27	26	25	24
4	39	38	37	36	35	34	33	32
5	47	46	45	44	43	42	41	40
6	55	54	53	52	51	50	49	48
7	63	62	61	60	59	58	57	56

Bits	Signal
0:31	*Model_Output_7*
32:63	*Model_Output_8*

Model_Output_7

Model output 7.

Bits	Type
0:31	IEEE Float

Model_Output_8

Model output 8.

Bits	Type
32:63	IEEE Float

4.60 0x3B0 - ModelOutputs_9_10

Model output values 9 and 10.

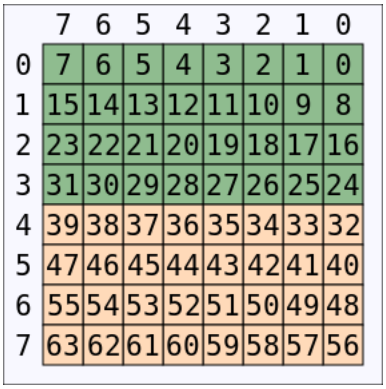
ID:
`0x3B0` (decimal: 944)

Length:
8 bytes

Send type:
Cyclic

Rate:
100Hz

Signals



	7	6	5	4	3	2	1	0
0	7	6	5	4	3	2	1	0
1	15	14	13	12	11	10	9	8
2	23	22	21	20	19	18	17	16
3	31	30	29	28	27	26	25	24
4	39	38	37	36	35	34	33	32
5	47	46	45	44	43	42	41	40
6	55	54	53	52	51	50	49	48
7	63	62	61	60	59	58	57	56

Bits	Signal
0:31	*Model_Output_9*
32:63	*Model_Output_10*

Model_Output_9

Model output 9.

Bits	Type
0:31	IEEE Float

Model_Output_10

Model output 10.

Bits	Type
32:63	IEEE Float

4.61 0x3C0 - ModelOutputs_11_12

Model output values 11 and 12.

ID:
`0x3C0` (decimal: 960)

Length:
8 bytes

Send type:
Cyclic

Rate:
100Hz

Signals

	7	6	5	4	3	2	1	0
0	7	6	5	4	3	2	1	0
1	15	14	13	12	11	10	9	8
2	23	22	21	20	19	18	17	16
3	31	30	29	28	27	26	25	24
4	39	38	37	36	35	34	33	32
5	47	46	45	44	43	42	41	40
6	55	54	53	52	51	50	49	48
7	63	62	61	60	59	58	57	56

Bits	Signal
0:31	*Model_Output_11*
32:63	*Model_Output_12*

Model_Output_11

Model output 11.

Bits	Type
0:31	IEEE Float

Model_Output_12

Model output 12.

Bits	Type
32:63	IEEE Float

4.62 0x3D0 - ModelOutputs_13_14

Model output values 13 and 14.

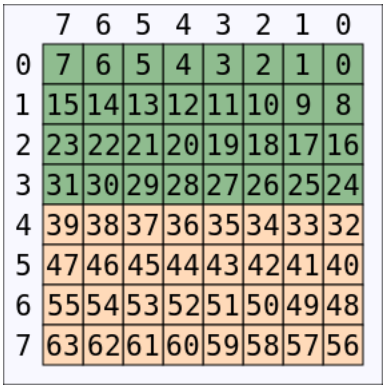
ID:
`0x3D0` (decimal: 976)

Length:
8 bytes

Send type:
Cyclic

Rate:
100Hz

Signals



	7	6	5	4	3	2	1	0
0	7	6	5	4	3	2	1	0
1	15	14	13	12	11	10	9	8
2	23	22	21	20	19	18	17	16
3	31	30	29	28	27	26	25	24
4	39	38	37	36	35	34	33	32
5	47	46	45	44	43	42	41	40
6	55	54	53	52	51	50	49	48
7	63	62	61	60	59	58	57	56

Bits	Signal
0:31	*Model_Output_13*
32:63	*Model_Output_14*

Model_Output_13

Model output 13.

Bits	Type
0:31	IEEE Float

Model_Output_14

Model output 14.

Bits	Type
32:63	IEEE Float

4.63 0x3E0 - ModelOutputs_15_16

Model output values 15 and 16.

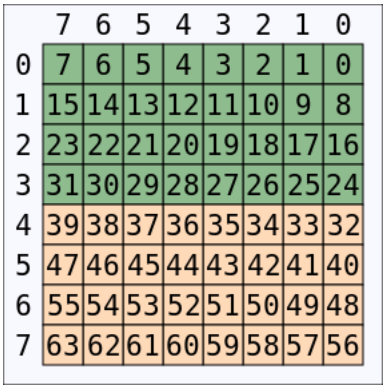
ID:
`0x3E0` (decimal: 992)

Length:
8 bytes

Send type:
Cyclic

Rate:
100Hz

Signals



	7	6	5	4	3	2	1	0
0	7	6	5	4	3	2	1	0
1	15	14	13	12	11	10	9	8
2	23	22	21	20	19	18	17	16
3	31	30	29	28	27	26	25	24
4	39	38	37	36	35	34	33	32
5	47	46	45	44	43	42	41	40
6	55	54	53	52	51	50	49	48
7	63	62	61	60	59	58	57	56

Bits	Signal
0:31	*Model_Output_15*
32:63	*Model_Output_16*

Model_Output_15

Model output 15.

Bits	Type
0:31	IEEE Float

Model_Output_16

Model output 16.

Bits	Type
32:63	IEEE Float

4.64 0x3F0 - ModelOutputs_17_18

Model output values 17 and 18.

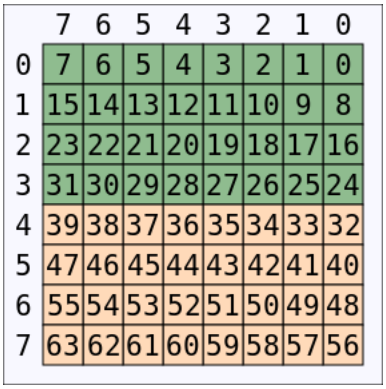
ID:
`0x3F0` (decimal: 1008)

Length:
8 bytes

Send type:
Cyclic

Rate:
100Hz

Signals



	7	6	5	4	3	2	1	0
0	7	6	5	4	3	2	1	0
1	15	14	13	12	11	10	9	8
2	23	22	21	20	19	18	17	16
3	31	30	29	28	27	26	25	24
4	39	38	37	36	35	34	33	32
5	47	46	45	44	43	42	41	40
6	55	54	53	52	51	50	49	48
7	63	62	61	60	59	58	57	56

Bits	Signal
0:31	*Model_Output_17*
32:63	*Model_Output_18*

Model_Output_17

Model output 17.

Bits	Type
0:31	IEEE Float

Model_Output_18

Model output 18.

Bits	Type
32:63	IEEE Float

4.65 0x400 - ModelOutputs_19_20

Model output values 19 and 20.

ID:
`0x400` (decimal: 1024)

Length:
8 bytes

Send type:
Cyclic

Rate:
100Hz

Signals

	7	6	5	4	3	2	1	0
0	7	6	5	4	3	2	1	0
1	15	14	13	12	11	10	9	8
2	23	22	21	20	19	18	17	16
3	31	30	29	28	27	26	25	24
4	39	38	37	36	35	34	33	32
5	47	46	45	44	43	42	41	40
6	55	54	53	52	51	50	49	48
7	63	62	61	60	59	58	57	56

Bits	Signal
0:31	*Model_Output_19*
32:63	*Model_Output_20*

Model_Output_19

Model output 19.

Bits	Type
0:31	IEEE Float

Model_Output_20

Model output 20.

Bits	Type
32:63	IEEE Float

4.66 0x410 - ModelOutputs_21_22

Model output values 21 and 22.

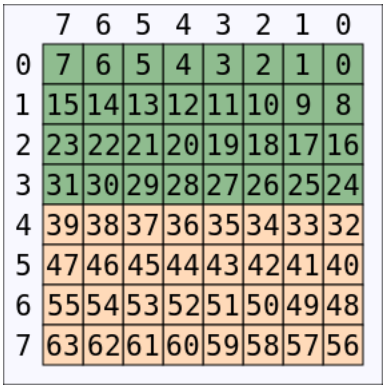
ID:
`0x410` (decimal: 1040)

Length:
8 bytes

Send type:
Cyclic

Rate:
100Hz

Signals



	7	6	5	4	3	2	1	0
0	7	6	5	4	3	2	1	0
1	15	14	13	12	11	10	9	8
2	23	22	21	20	19	18	17	16
3	31	30	29	28	27	26	25	24
4	39	38	37	36	35	34	33	32
5	47	46	45	44	43	42	41	40
6	55	54	53	52	51	50	49	48
7	63	62	61	60	59	58	57	56

Bits	Signal
0:31	*Model_Output_21*
32:63	*Model_Output_22*

Model_Output_21

Model output 21.

Bits	Type
0:31	IEEE Float

Model_Output_22

Model output 22.

Bits	Type
32:63	IEEE Float

4.67 0x420 - ModelOutputs_23_24

Model output values 23 and 24.

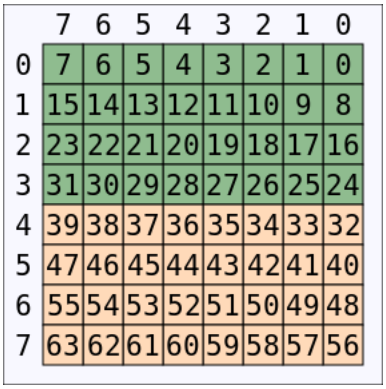
ID:
`0x420` (decimal: 1056)

Length:
8 bytes

Send type:
Cyclic

Rate:
100Hz

Signals



	7	6	5	4	3	2	1	0
0	7	6	5	4	3	2	1	0
1	15	14	13	12	11	10	9	8
2	23	22	21	20	19	18	17	16
3	31	30	29	28	27	26	25	24
4	39	38	37	36	35	34	33	32
5	47	46	45	44	43	42	41	40
6	55	54	53	52	51	50	49	48
7	63	62	61	60	59	58	57	56

Bits	Signal
0:31	*Model_Output_23*
32:63	*Model_Output_24*

Model_Output_23

Model output 23.

Bits	Type
0:31	IEEE Float

Model_Output_24

Model output 24.

Bits	Type
32:63	IEEE Float

4.68 0x430 - ModelOutputs_25_26

Model output values 25 and 26.

ID:
`0x430` (decimal: 1072)

Length:
8 bytes

Send type:
Cyclic

Rate:
100Hz

Signals

	7	6	5	4	3	2	1	0
0	7	6	5	4	3	2	1	0
1	15	14	13	12	11	10	9	8
2	23	22	21	20	19	18	17	16
3	31	30	29	28	27	26	25	24
4	39	38	37	36	35	34	33	32
5	47	46	45	44	43	42	41	40
6	55	54	53	52	51	50	49	48
7	63	62	61	60	59	58	57	56

Bits	Signal
0:31	*Model_Output_25*
32:63	*Model_Output_26*

Model_Output_25

Model output 25.

Bits	Type
0:31	IEEE Float

Model_Output_26

Model output 26.

Bits	Type
32:63	IEEE Float

4.69 0x440 - ModelOutputs_27_28

Model output values 27 and 28.

ID:
`0x440` (decimal: 1088)

Length:
8 bytes

Send type:
Cyclic

Rate:
100Hz

Signals

	7	6	5	4	3	2	1	0
0	7	6	5	4	3	2	1	0
1	15	14	13	12	11	10	9	8
2	23	22	21	20	19	18	17	16
3	31	30	29	28	27	26	25	24
4	39	38	37	36	35	34	33	32
5	47	46	45	44	43	42	41	40
6	55	54	53	52	51	50	49	48
7	63	62	61	60	59	58	57	56

Bits	Signal
0:31	*Model_Output_27*
32:63	*Model_Output_28*

Model_Output_27

Model output 27.

Bits	Type
0:31	IEEE Float

Model_Output_28

Model output 28.

Bits	Type
32:63	IEEE Float

4.70 0x450 - ModelOutputs_29_30

Model output values 29 and 30.

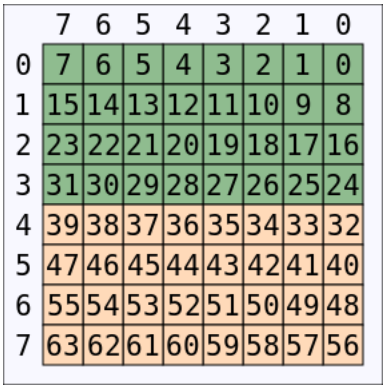
ID:
`0x450` (decimal: 1104)

Length:
8 bytes

Send type:
Cyclic

Rate:
100Hz

Signals



	7	6	5	4	3	2	1	0
0	7	6	5	4	3	2	1	0
1	15	14	13	12	11	10	9	8
2	23	22	21	20	19	18	17	16
3	31	30	29	28	27	26	25	24
4	39	38	37	36	35	34	33	32
5	47	46	45	44	43	42	41	40
6	55	54	53	52	51	50	49	48
7	63	62	61	60	59	58	57	56

Bits	Signal
0:31	*Model_Output_29*
32:63	*Model_Output_30*

Model_Output_29

Model output 29.

Bits	Type
0:31	IEEE Float

Model_Output_30

Model output 30.

Bits	Type
32:63	IEEE Float

4.71 `0x460` - ModelOutputs_31_32

Model output values 31 and 32.

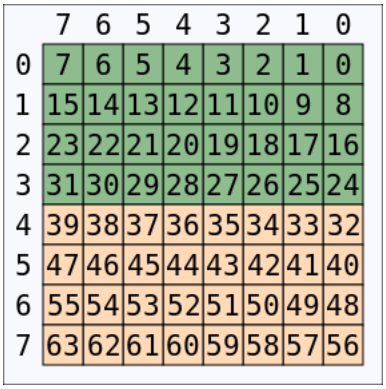
ID:
`0x460` (decimal: 1120)

Length:
8 bytes

Send type:
Cyclic

Rate:
100Hz

Signals



	7	6	5	4	3	2	1	0
0	7	6	5	4	3	2	1	0
1	15	14	13	12	11	10	9	8
2	23	22	21	20	19	18	17	16
3	31	30	29	28	27	26	25	24
4	39	38	37	36	35	34	33	32
5	47	46	45	44	43	42	41	40
6	55	54	53	52	51	50	49	48
7	63	62	61	60	59	58	57	56

Bits	Signal
0:31	*Model_Output_31*
32:63	*Model_Output_32*

Model_Output_31

Model output 31.

Bits	Type
0:31	IEEE Float

Model_Output_32

Model output 32.

Bits	Type
32:63	IEEE Float

4.72 0x470 - ModelOutputs_33_34

Model output values 33 and 34.

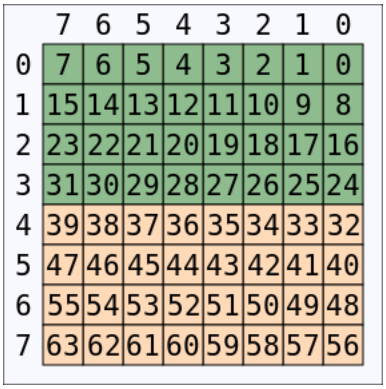
ID:
`0x470` (decimal: 1136)

Length:
8 bytes

Send type:
Cyclic

Rate:
100Hz

Signals



	7	6	5	4	3	2	1	0
0	7	6	5	4	3	2	1	0
1	15	14	13	12	11	10	9	8
2	23	22	21	20	19	18	17	16
3	31	30	29	28	27	26	25	24
4	39	38	37	36	35	34	33	32
5	47	46	45	44	43	42	41	40
6	55	54	53	52	51	50	49	48
7	63	62	61	60	59	58	57	56

Bits	Signal
0:31	*Model_Output_33*
32:63	*Model_Output_34*

Model_Output_33

Model output 33.

Bits	Type
0:31	IEEE Float

Model_Output_34

Model output 34.

Bits	Type
32:63	IEEE Float

4.73 0x480 - ModelOutputs_35_36

Model output values 35 and 36.

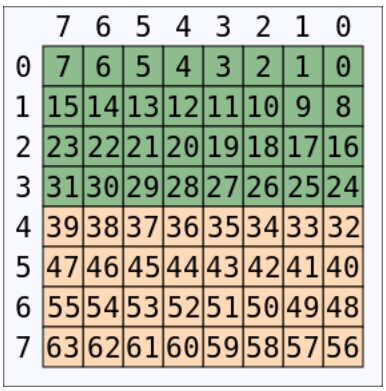
ID:
`0x480` (decimal: 1152)

Length:
8 bytes

Send type:
Cyclic

Rate:
100Hz

Signals



	7	6	5	4	3	2	1	0
0	7	6	5	4	3	2	1	0
1	15	14	13	12	11	10	9	8
2	23	22	21	20	19	18	17	16
3	31	30	29	28	27	26	25	24
4	39	38	37	36	35	34	33	32
5	47	46	45	44	43	42	41	40
6	55	54	53	52	51	50	49	48
7	63	62	61	60	59	58	57	56

Bits	Signal
0:31	*Model_Output_35*
32:63	*Model_Output_36*

Model_Output_35

Model output 35.

Bits	Type
0:31	IEEE Float

Model_Output_36

Model output 36.

Bits	Type
32:63	IEEE Float