WatchMon - Canbus messages

Extended canbus identifiers
Default baud rate : 500kB

Version

1.0 – 15/01/2016 – intial draft
1.2 – 23/03/2016 – revisions to include control logic
1.3 – 24/03/2016 – additional estimated time to Soc% full/empty
1.4 – 25/03/2016 – include capacity to full/empty

Recommended telemetry message payloads to monitor

- 0x00111100 – Pack live statistics - cell voltage limits
- 0x00111200 – Pack live statistics - cell temperature limits
- 0x00111300 – Pack live statistics - bypass limits
- 0x00111500 – Pack live statistics – shunt power monitoring
- 0x00120100 – Control Logic – Critical Warning state
- 0x00120200 – Control Logic – Thermal state
- 0x00120300 – Control Logic – Charging state
- 0x00120400 – Control Logic – Discharging state
- 0x001D1101 to 0x001D11F9 – Cell node - live statistics

Messages - System live telemetry

Live telemetry - cell voltage limits

Identifier: 0x00111100 – Recommended to monitor
Tx Frequency: 100mSec
Data Length: 6

Field	Data Type	Range	Resolution
Min Cell Voltage	Uint16	0 to 6,500 mV	1mV / bit and nil offset
Max Cell Voltage	Uint16	0 to 6,500 mV	1mV / bit and nil offset
Min V @ Cell#	uint8	0 to 250	
Max V @ Cell#	uint8	0 to 250	

Live telemetry - cell temperature limits

Identifier: 0x00111200 – Recommended to monitor
Tx Frequency: 1000mSec
Data Length: 8

Field	Data Type	Range	Resolution
Min Cell Temperature	uint8	-40ºC to 125ºC	1ºC/bit and 40ºC offset
Max Cell Temperature	uint8	-40ºC to 125ºC	1ºC/bit and 40ºC offset
Min T @ cell #	uint8	0 to 250	
Max T @ cell #	uint8	0 to 250	
Min Bypass Temperature	uint8	-40ºC to 125ºC	1ºC/bit and 40ºC offset
Max Bypass Temperature	uint8	-40ºC to 125ºC	1ºC/bit and 40ºC offset
Min BT @ cell #	uint8	0 to 250	
Max BT @ cell #	uint8	0 to 250	

Live telemetry – cell bypass limits

Identifier: 0x00111300 – Recommended to monitor
Tx Frequency: 1000mSec
Data Length: 7

Field	Data Type	Range	Resolution
Min Bypass PWM %	uint8	0 to 100	1%/bit
Max Bypass PWM %	uint8	0 to 100	1%/bit
Min Bypass @ cell #	uint8	0 to 250	
Max Bypass @ cell #	uint8	0 to 250	
Number in Initial Bypass	uint8	0 to 250	
Number in Final Bypass	uint8	0 to 250	
Number in Bypass	uint8	0 to 250	

Consider additional payload with Bypass Amps rather than %

Live telemetry – cell bypass current summary

Identifier: 0x00111400 – Recommended to monitor
Tx Frequency: 1000mSec
Data Length: 6

Field	Data Type	Range	Resolution
Min Bypass mA	Uint16	0 to 2600	1mA/bit
Max Bypass mA	Uint16	0 to 2600	1mA/bit
Min Bypass @ cell #	uint8	0 to 250	
Max Bypass @ cell #	uint8	0 to 250	

Live telemetry – shunt power monitoring

Identifier: 0x00111500 – Recommended to monitor
Tx Frequency: 100mSec
Data Length: 8

Field	Data Type	Range	Resolution
SOC%	uint8	-10% to +110%	0.5% / bit and 10% offset
Shunt Temperature	uint8	-40ºC to 125ºC	1ºC/bit and 40ºC offset
Shunt Voltage	uint16	0 to 650.00 V	10mV / bit and nil offset
Shunt Amperes	float	-365,000.0mA to -365,000.0mA	Reported in mA

Live telemetry - supervisor registers

Identifier: 0x00111600
Tx Frequency: 1000mSec
Data Length 6

Field	Data Type	Range	Resolution
Supply Voltage	uint16	0 to 65.00 V	10mV / bit and nil offset
Ambient Temperature	uint8	-40ºC to 125ºC	1ºC/bit and 40ºC offset
Input control flags	Byte	0 to 255	Bit0: Run evoked Bit1: charging evoked Bit2: Batt contact monitor Bit3: Load contact monitor
Signal Input	uint8	0 to 255	Detect frequency state from external BMS system
Reported Temperature	uint8	-40ºC to 125ºC	1ºC/bit and 40ºC offset

NB: Reported Temperature consolidates all sensor temperatures to a single value for reporting

Live telemetry – Estimated time to Full

Identifier: 0x00111700
Tx Frequency: 10 Seconds
Data Length 6

Field	Data Type	Range	Resolution
Recent Cumulative mAh – Charge	Float		Cumulative mAh for interval
Estimated time to Full	Uint16	0 to 65,000	1min/bit

Live telemetry – Estimated time to Empty

Identifier: 0x00111800
Tx Frequency: 10 Seconds
Data Length 6

Field	Data Type	Range	Resolution
Recent Cumulative mAh - Discharge	Float		Cumulative mAh for interval
Estimated time to Empty	Uint16	0 to 65,000	1min/bit

Live telemetry – Estimated capacity to limit

Identifier: 0x00111900
Tx Frequency: 10 Seconds
Data Length 8

Field	Data Type	Range	Resolution
Cumulative mAh to Full	Float		Required mAh to full battery
Cumulative mAh to Empty	Float		Remaining mAh until empty battery

System control specific canbus packets

Control Logic – Critical Warning state

Identifier: 0x00140100 – Recommended to monitor
Tx Frequency: 1000mSec
Data Length: 8

Field	Data Type	Range	Resolution
Critical Control Mode	uint8	0 to 255	0 = Auto 1 = Manual ON (has timeout limit) 2 = Manual OFF
Critical control flags	Byte	0 to 255	Bit0: OkState (relay state) Bit1: OkCalc (live analysis) Bit2: input run state Bit3: has overdue cell sensor
Critical monitor flags 1	Byte	0 to 255	Bit0: has low cell voltage Bit1: has high cell voltage Bit2: has low cell temperature Bit3: has high cell temperature Bit4: has low supply voltage Bit5: has high supply voltage Bit6: has low ambient temperature Bit7: has high ambient temperature
Critical monitor flags 2	Byte	0 to 255	Bit0: has low shunt voltage Bit1: has high shunt voltage Bit2: has low idle voltage Bit3: has max charging current Bit4: has max discharging current
Warning Control Mode	uint8	0 to 255	0 = Auto 1 = Manual ON 2 = Manual OFF
Warning control flags	Byte	0 to 255	Bit0: OnState (relay state) Bit1: OnCalc (live analysis)
Warning monitor flags 1	Byte	0 to 255	Bit0: has low cell voltage Bit1: has high cell voltage Bit2: has low cell temperature Bit3: has high cell temperature Bit4: has low supply voltage Bit5: has high supply voltage Bit6: has low ambient temperature Bit7: has high ambient temperature
Warning monitor flags 2	Byte	0 to 255	Bit0: has low shunt voltage Bit1: has high shunt voltage Bit2: has low shunt SoC Bit3: has high shunt SoC Bit4: has max charging current Bit5: has max discharging current

Control Logic – Thermal state

Identifier: 0x00140200 – Recommended to monitor
Tx Frequency: 1000mSec
Data Length: 4

Field	Data Type	Range	Resolution
Heat Control Mode	uint8	0 to 255	0 = Auto 1 = Manual ON 2 = Manual OFF
Heat control flags	Byte	0 to 255	Bit0: OnState (relay state) Bit1: OnCalc (live analysis) Bit2: has low cell temperature Bit3: has low ambient temperature
Cool Control Mode	uint8	0 to 255	0 = Auto 1 = Manual ON 2 = Manual OFF
Cool control flags	Byte	0 to 255	Bit0: OnState (relay state) Bit1: OnCalc (live analysis) Bit2: has high cell temperature Bit3: has high ambient temperature Bit4: has cells in bypass

Control Logic – Charging state

Identifier: 0x00140300 – Recommended to monitor
Tx Frequency: 1 Seconds
Data Length: 8

Field	Data Type	Range	Resolution
Charge control mode	uint8	0 to 255	0 = Auto 1 = Manual ON 2 = Manual OFF
Charge control flags	Byte	0 to 255	Bit0: OnState (relay state) Bit1: OnCalc (live analysis) Bit2: low power evoked Bit3: has bypass over heated Bit4: has bypass above Initial Bit5: has bypass above Final Bit6: has cells in bypass Bit7: cells are fully charged
Target Current	Uint16	0 to 65,000	User-defined (i.e. 100mA / bit, 1200 = 120.0A)
Target Power VA	Uint16	0 to 65,000	User-defined (i.e. 1VA / bit, 5000 = 5.00kVA)
Target Voltage	Uint16	0 to 65,000	User-defined (i.e. 10mV / bit, 5400 = 54.00V)

Control Logic – Discharging state

Identifier: 0x00140400 – Recommended to monitor
Tx Frequency: 1 Seconds
Data Length: 6

Field	Data Type	Range	Resolution
Discharge control mode	uint8	0 to 255	0 = Auto 1 = Manual ON 2 = Manual OFF
Discharge control flags	Byte	0 to 255	Bit0: OnState (relay state) Bit1: OnCalc (live analysis) Bit2: low power evoked
Target Current	Uint16	0 to 65,000	User-defined (i.e. 100mA / bit, 1200 = 120.0A)
Target Power VA	Uint16	0 to 65,000	User-defined (i.e. 1VA / bit, 5000 = 5.00kVA)

Control Logic – remote manual override

Identifier: 0x00140500

Data Length: 6

Field	Data Type	Range	Resolution
Critical Control Mode	uint8	0 to 255	0 = Auto 1 = Manual ON 2 = Manual OFF 255 - undefined
Warning Control Mode	uint8	0 to 255	0 = Auto 1 = Manual ON 2 = Manual OFF 255 - undefined
Charging Control Mode	uint8	0 to 255	0 = Auto 1 = Manual ON 2 = Manual OFF 255 - undefined
Discharging Control Mode	uint8	0 to 255	0 = Auto 1 = Manual ON 2 = Manual OFF 255 - undefined
Cool Control Mode	uint8	0 to 255	0 = Auto 1 = Manual ON 2 = Manual OFF 255 - undefined
Heat Control Mode	uint8	0 to 255	0 = Auto 1 = Manual ON 2 = Manual OFF 255 - undefined

NB: Used by remote system to reset / override controls

Critical Control Mode will revert to AUTO after a timeout interval

When set to 255 undefined will not update the current setting

Has not yet been implemented

Daily session summary - cell voltages

Identifier: 0x00161100
Tx Frequency: 10 Seconds
Data Length: 6

Field	Data Type	Range	Resolution
Min Cell Voltage	Uint16	0 to 6,500 mV	1mV / bit and nil offset
Max Cell Voltage	Uint16	0 to 6,500 mV	1mV / bit and nil offset
Min V @ Cell#	uint8	1 to 250	
Max V @ Cell#	uint8	1 to 250	

Daily session summary – temperature limits

Identifier: 0x00161700
Tx Frequency: 10 Seconds
Data Length: 8

Field	Data Type	Range	Resolution
Min Cell Temperature	uint8	-40ºC to 125ºC	1ºC/bit and 40ºC offset
Max Cell Temperature	uint8	-40ºC to 125ºC	1ºC/bit and 40ºC offset
Min T @ cell #	uint8	1 to 250	
Max T @ cell #	uint8	1 to 250	
Min Bypass Temperature	uint8	-40ºC to 125ºC	1ºC/bit and 40ºC offset
Max Bypass Temperature	uint8	-40ºC to 125ºC	1ºC/bit and 40ºC offset
Min BT @ cell #	uint8	0 to 250	
Max BT @ cell #	uint8	0 to 250	

Daily session summary - supervisor limits

Identifier: 0x00161300
Tx Frequency: 10 Seconds
Data Length 8

Field	Data Type	Range	Resolution
Min Supply Voltage	uint16	0 to 65.00 V	10mV / bit and nil offset
Max Supply Voltage	uint16	0 to 65.00 V	10mV / bit and nil offset
Min Ambient Temperature	uint8	-40ºC to 125ºC	1ºC/bit and 40ºC offset
Max Ambient Temperature	uint8	-40ºC to 125ºC	1ºC/bit and 40ºC offset
Min Reported Temperature	uint8	-40ºC to 125ºC	1ºC/bit and 40ºC offset
Max Reported Temperature	uint8	-40ºC to 125ºC	1ºC/bit and 40ºC offset

Daily session summary - temperature elapsed

Identifier: 0x00161800
Tx Frequency: 10 Seconds
Data Length: 8

Field	Data Type	Range	Resolution
Temperature Band A - > 60ºC	uint8	0 to 240	6min/bit
Temperature Band B - > 55ºC	uint8	0 to 240	6min/bit
Temperature Band C - > 41ºC	uint8	0 to 240	6min/bit
Temperature Band D - > 33ºC	uint8	0 to 240	6min/bit
Temperature Band E - > 25ºC	uint8	0 to 240	6min/bit
Temperature Band F - > 15ºC	uint8	0 to 240	6min/bit
Temperature Band G - > 0ºC	uint8	0 to 240	6min/bit
Temperature Band H - > -40ºC	uint8	0 to 240	6min/bit

Daily session summary - shunt voltage

Identifier: 0x00161200
Tx Frequency: 10 Seconds
Data Length: 6

Field	Data Type	Range	Resolution
Min Shunt Voltage	uint16	0 to 650.00 V	10mV / bit and nil offset
Max Shunt Voltage	uint16	0 to 650.00 V	10mV / bit and nil offset
Min Shunt Temperature	uint8	-40ºC to 125ºC	1ºC/bit and 40ºC offset
Max Shunt Temperature	uint8	-40ºC to 125ºC	1ºC/bit and 40ºC offset
Min Shunt SOC%	uint8	-20% to +120%	0.5% / bit and 10% offset
Max Shunt SOC%	uint8	-20% to +120%	0.5% / bit and 10% offset

Daily session summary - shunt current limits

Identifier: 0x00161600
Tx Frequency: 10 Seconds
Data Length: 8

Field	Data Type	Range	Resolution
Max Current – Charge	float	-365,000.0mA to -365,000.0mA	Reported in mA
Max Current – Discharge	float	-365,000.0mA to -365,000.0mA	Reported in mA

Daily session summary - state of charge SoC elapsed

Identifier: 0x00161500
Tx Frequency: 10 Seconds
Data Length: 8

Field	Data Type	Range	Resolution
SOC% Band A - > 87.5%	uint8	0 to 240	6min/bit
SOC% Band B - > 75.0%	uint8	0 to 240	6min/bit
SOC% Band C - > 62.5%	uint8	0 to 240	6min/bit
SOC% Band D - > 50.0%	uint8	0 to 240	6min/bit
SOC% Band E - > 37.5%	uint8	0 to 240	6min/bit
SOC% Band F - > 25.0%	uint8	0 to 240	6min/bit
SOC% Band G - > 12.5%	uint8	0 to 240	6min/bit
SOC% Band H - > 0.0%	uint8	0 to 240	6min/bit

Daily session summary – coloumb counter

Identifier: 0x00161400
Tx Frequency: 10 Seconds
Data Length: 8

Field	Data Type	Range	Resolution
Cumulative mAh - Discharge	Float		Cumulative mAh for interval
Cumulative mAh - Charge	Float		Cumulative mAh for interval

Daily session summary – RTC time clock

Identifier: 0x00161900
Tx Frequency: 10 Seconds
Data Length: 8

Field	Data Type	Range	Resolution
current time now	Datetime	UInt32	1sec/bit since 1.1.1970
Start session time	Datetime	UInt32	1sec/bit since 1.1.1970

NB: has not yet been implemented
time_t now(); // return seconds from 01.01.1970 00:00:00 in uint32

Lifetime specific canbus packets

Lifetime summary – event counters – Critical / Warning control

Identifier: 0x00180100
Tx Frequency: 10 Seconds
Data Length: 8

Field	Data Type	Range	Resolution
Number of Critical Batt OK event	Uint32		1 event ON / bit
Number of Warning ON event	Uint32		1 event ON / bit

Lifetime summary – event counters – Charge / Discharge control

Identifier: 0x00180200
Tx Frequency: 10 Seconds
Data Length: 8

Field	Data Type	Range	Resolution
Number of Charge ON events	Uint32		1 event ON / bit
Number of Discharge ON events	Uint32		1 event ON / bit

Lifetime summary – event counters – Thermal control

Identifier: 0x00180300
Tx Frequency: 10 Seconds
Data Length: 8

Field	Data Type	Range	Resolution
Number of Heat ON events	Uint32		1 event ON / bit
Number of Cool ON events	Uint32		1 event ON / bit

Cellmon specific canbus packets

Cellmon Node - live statistics

Identifier Range: 0x001D1101 to 0x001D11F9 (defined from Base 0x001D1100 + NodeID = 1)
Tx Frequency: 20mSec
Data Length: 8

Field	Data Type	Range	Resolution
Min Cell Voltage	Uint16	0 to 6,500 mV	1mV / bit and nil offset
Max Cell Voltage	Uint16	0 to 6,500 mV	1mV / bit and nil offset
Cell Temperature	uint8	-40ºC to 125ºC	1ºC/bit and 40ºC offset
Bypass Temperature	uint8	-40ºC to 125ºC	1ºC/bit and 40ºC offset
Bypass PWM %	uint8	0 to 100	1%/bit
USN	uint8	1 to 250	