



Lincoln L70 BMS Interface BACnet Protocol

Rev. 1 - 07062023

Contents

BACnet Settings.....	4
BACnet Standard Objects.....	5
Lincoln BMS Interface Variables	8
ch_dhw_priority (R/W)	8
ch_mode_select (R/W)	8
ch_4to20_lower_threshold (R/W).....	9
ch_4to20_upper_threshold (R/W)	9
ch_min_flow_temp (R/W)	9
ch_max_flow_temp (R/W).....	9
ch_0to10_lower_threshold (R/W).....	10
ch_0to10_upper_threshold (R/W)	10
ch_bms_demand (R/W).....	10
ch_master_flow_SP (R/W).....	10
enable_weather_compensation (R/W)	10
min_air_temp_weather_comp (R/W)	11
max_air_temp_weather_comp (R/W).....	11
ambient_temp_select (R/W)	11
ch_supp_mode (R/W).....	12
ch_buffer_supp_SP (R/W)	12
ch_buffer_supp_DIFF (R/W)	12
ch_low_ambient_SP (R/W).....	12
ch_manual_supp_on_demand (R/W).....	12
ch_manual_supp_force (R/W).....	12
ch_supp_on_alarm (R/W).....	12
dhw_mode_select (R/W)	12
dhw_flow_SP (R/W).....	14
dhw_tank_SP (R/W).....	14
dhw_tank_DIFF (R/W).....	14
dhw_master_tank_temp_selection (R/W)	14
dhw_bms_demand (R/W).....	14
dhw_supp_mode (R/W).....	14
dhw_supp_diff (R/W).....	14
dhw_low_ambient_SP (R/W).....	14
dhw_manual_supp_on_demand (R/W)	14
dhw_manual_supp_force (R/W).....	14
dhw_supp_on_alarm (R/W).....	14

ges_major_fault (R).....	15
ges_minor_fault (R)	15
ch_flow_SP (R)	15
dhw_master_tank_temp (R).....	15
ch_demand (R).....	15
dhw_demand (R).....	15
master_on_off (R).....	15
Lincoln BMS Interface IO Variables.....	16
Analog Inputs	16
AI_Input_0_10V (R).....	16
AI_dhw_tank_probe_1 (R).....	16
AI_dhw_tank_probe_2 (R).....	16
AI_ambient_temp (R).....	16
AI_Input_4_20mA (R).....	16
AI_ch_buffer_temp (R)	16
Digital Inputs.....	17
DI_ch_ext_control (R)	17
DI_dhw_ext_control (R).....	17
Digital Outputs	18
DO_output_minor_faults (R)	18
DO_output_major_faults (R)	18
DO_global_supplementary (R).....	18
DO_ch_dhw_valve_demand (R)	18
DO_hx_pump_run (R)	18
DO_ch_pump_run (R)	18
DO_ch_supplementary (R).....	18
DO_dhw_supplementary (R)	18
Lincoln Parameters	19
lincoln_device_minor_alarm[*] (R).....	19
lincoln_device_major_alarm[*] (R).....	19
lincoln_variables_OUT[*].T01_inlet_water_temp (R)	19
lincoln_variables_OUT[*].T02_outlet_water_temp (R)	19
lincoln_variables_OUT[*].T04_ambient_temp (R)	19
lincoln_variables_OUT[*].system1_compressor_status (R)	19
lincoln_variables_OUT[*].system2_compressor_status (R)	19
power_meter_variables_OUT_global[*].Direct_Positive_Energy.....	19

BACnet Settings

BACnet Type: MSTP over serial

Item	Variable	Value
Device Instance	bacnet_device_instance	Default: 1
BACnet Baudrate	bacnet_baudrate	Default: 9600 (Acceptable values – 1200, 2400, 4800, 9600, 19200, 38400, 57600, 76800, 115200, 375000)
Reboot Device	Reboot_UPC	1 - Reboot

Note: Unit must be rebooted for changes to take effect.

Connections to the BACnet must be made to BMS2/Fieldbus 2.

BACnet Standard Objects

Object Instance	Variable	Type	Read/Write Mode
1	AI_Input_0_10V	AnalogInput	ReadCOV_NoWrite
2	AI_Input_4_20mA	AnalogInput	ReadCOV_NoWrite
3	AI_ambient_temp	AnalogInput	ReadCOV_NoWrite
4	AI_ch_buffer_temp	AnalogInput	ReadCOV_NoWrite
5	AI_dhw_tank_probe_1	AnalogInput	ReadCOV_NoWrite
6	AI_dhw_tank_probe_2	AnalogInput	ReadCOV_NoWrite
7	ch_0to10_lower_threshold	AnalogValue	ReadCOV_Writeable
8	ch_0to10_upper_threshold	AnalogValue	ReadCOV_Writeable
9	ch_4to20_lower_threshold	AnalogValue	ReadCOV_Writeable
10	ch_4to20_upper_threshold	AnalogValue	ReadCOV_Writeable
11	ch_buffer_supp_DIFF	AnalogValue	ReadCOV_Writeable
12	ch_buffer_supp_SP	AnalogValue	ReadCOV_Writeable
13	ch_flow_SP	AnalogInput	Read_NoWrite
14	ch_low_ambient_SP	AnalogValue	ReadCOV_Writeable
15	ch_master_flow_SP	AnalogValue	ReadCOV_Writeable
16	ch_max_flow_temp	AnalogValue	ReadCOV_Writeable
17	ch_min_flow_temp	AnalogValue	ReadCOV_Writeable
18	dhw_flow_SP	AnalogValue	ReadCOV_Writeable
19	dhw_low_ambient_SP	AnalogValue	ReadCOV_Writeable
20	dhw_master_tank_temp	AnalogInput	ReadCOV_NoWrite
21	dhw_supp_diff	AnalogValue	ReadCOV_Writeable
22	dhw_tank_DIFF	AnalogValue	ReadCOV_Writeable
23	dhw_tank_SP	AnalogValue	ReadCOV_Writeable
24	min_air_temp_weather_comp	AnalogValue	ReadCOV_Writeable
25	max_air_temp_weather_comp	AnalogValue	ReadCOV_Writeable
26	DI_ch_ext_control	BinaryInput	Read_NoWrite
27	DI_dhw_ext_control	BinaryInput	Read_NoWrite
28	DO_ch_dhw_valve_demand	BinaryInput	Read_NoWrite
29	DO_ch_pump_run	BinaryInput	Read_NoWrite
30	DO_ch_supplementary	BinaryInput	Read_NoWrite
31	DO_dhw_supplementary	BinaryInput	Read_NoWrite
32	DO_global_supplementary	BinaryInput	Read_NoWrite
33	DO_hx_pump_run	BinaryInput	Read_NoWrite
34	DO_output_major_faults	BinaryInput	Read_NoWrite
35	DO_output_minor_faults	BinaryInput	Read_NoWrite
36	ch_bms_demand	BinaryValue	ReadCOV_Writeable
37	ch_demand	BinaryInput	Read_NoWrite
38	dhw_demand	BinaryInput	Read_NoWrite
39	ges_major_fault	BinaryInput	Read_NoWrite
40	ges_minor_fault	BinaryInput	Read_NoWrite
41	ch_dhw_priority	BinaryValue	ReadCOV_Writeable
42	ch_manual_supp_force	BinaryValue	ReadCOV_Writeable
43	ch_manual_supp_on_demand	BinaryValue	ReadCOV_Writeable

Object Instance	Variable	Type	Read/Write Mode
44	dhw_bms_demand	BinaryValue	ReadCOV_Writeable
45	dhw_manual_supp_force	BinaryValue	ReadCOV_Writeable
46	dhw_manual_supp_on_demand	BinaryValue	ReadCOV_Writeable
47	enable_weather_compensation	BinaryValue	ReadCOV_Writeable
48	ambient_temp_select	IntegerValue	ReadCOV_Writeable
49	ch_mode_select	IntegerValue	ReadCOV_Writeable
50	ch_supp_mode	IntegerValue	ReadCOV_Writeable
51	ch_supp_on_alarm	IntegerValue	ReadCOV_Writeable
52	dhw_master_tank_temp_selection	IntegerValue	ReadCOV_Writeable
53	dhw_mode_select	IntegerValue	ReadCOV_Writeable
54	dhw_supp_mode	IntegerValue	ReadCOV_Writeable
55	dhw_supp_on_alarm	IntegerValue	ReadCOV_Writeable
56	lincoln_device_major_alarm[1]	BinaryInput	Read_NoWrite
57	lincoln_device_minor_alarm[1]	BinaryInput	Read_NoWrite
58	lincoln_variables_OUT[1].T01_inlet_water_temp	AnalogInput	Read_NoWrite
59	lincoln_variables_OUT[1].T02_outlet_water_temp	AnalogInput	Read_NoWrite
60	lincoln_variables_OUT[1].T04_ambient_temp	AnalogInput	Read_NoWrite
61	lincoln_variables_OUT[1].system1_compressor_status	BinaryInput	Read_NoWrite
62	lincoln_variables_OUT[1].system2_compressor_staus	BinaryInput	Read_NoWrite
63	power_meter_variables_OUT_global[1].Direct_Positive_Energy	AnalogInput	Read_NoWrite
64	lincoln_variables_OUT[2].T01_inlet_water_temp	AnalogInput	Read_NoWrite
65	lincoln_variables_OUT[2].T02_outlet_water_temp	AnalogInput	Read_NoWrite
66	lincoln_variables_OUT[2].T04_ambient_temp	AnalogInput	Read_NoWrite
67	lincoln_variables_OUT[2].system1_compressor_status	BinaryInput	Read_NoWrite
68	lincoln_variables_OUT[2].system2_compressor_staus	BinaryInput	Read_NoWrite
69	power_meter_variables_OUT_global[2].Direct_Positive_Energy	AnalogInput	Read_NoWrite
70	lincoln_variables_OUT[3].T01_inlet_water_temp	AnalogInput	Read_NoWrite
71	lincoln_variables_OUT[3].T02_outlet_water_temp	AnalogInput	Read_NoWrite
72	lincoln_variables_OUT[3].T04_ambient_temp	AnalogInput	Read_NoWrite
73	lincoln_variables_OUT[3].system1_compressor_status	BinaryInput	Read_NoWrite
74	lincoln_variables_OUT[3].system2_compressor_staus	BinaryInput	Read_NoWrite
75	power_meter_variables_OUT_global[3].Direct_Positive_Energy	AnalogInput	Read_NoWrite
76	lincoln_variables_OUT[4].T01_inlet_water_temp	AnalogInput	Read_NoWrite
77	lincoln_variables_OUT[4].T02_outlet_water_temp	AnalogInput	Read_NoWrite
78	lincoln_variables_OUT[4].T04_ambient_temp	AnalogInput	Read_NoWrite
79	lincoln_variables_OUT[4].system1_compressor_status	BinaryInput	Read_NoWrite
80	lincoln_variables_OUT[4].system2_compressor_staus	BinaryInput	Read_NoWrite
81	power_meter_variables_OUT_global[4].Direct_Positive_Energy	AnalogInput	Read_NoWrite
82	lincoln_variables_OUT[5].T01_inlet_water_temp	AnalogInput	Read_NoWrite
83	lincoln_variables_OUT[5].T02_outlet_water_temp	AnalogInput	Read_NoWrite
84	lincoln_variables_OUT[5].T04_ambient_temp	AnalogInput	Read_NoWrite
85	lincoln_variables_OUT[5].system1_compressor_status	BinaryInput	Read_NoWrite
86	lincoln_variables_OUT[5].system2_compressor_staus	BinaryInput	Read_NoWrite
87	power_meter_variables_OUT_global[5].Direct_Positive_Energy	AnalogInput	Read_NoWrite

Object Instance	Variable	Type	Read/Write Mode
88	lincoln_variables_OUT[6].T01_inlet_water_temp	AnalogInput	Read_NoWrite
89	lincoln_variables_OUT[6].T02_outlet_water_temp	AnalogInput	Read_NoWrite
90	lincoln_variables_OUT[6].T04_ambient_temp	AnalogInput	Read_NoWrite
91	lincoln_variables_OUT[6].system1_compressor_status	BinaryInput	Read_NoWrite
92	lincoln_variables_OUT[6].system2_compressor_staus	BinaryInput	Read_NoWrite
93	power_meter_variables_OUT_global[6].Direct_Positive_Energy	AnalogInput	Read_NoWrite
94	lincoln_variables_OUT[7].T01_inlet_water_temp	AnalogInput	Read_NoWrite
95	lincoln_variables_OUT[7].T02_outlet_water_temp	AnalogInput	Read_NoWrite
96	lincoln_variables_OUT[7].T04_ambient_temp	AnalogInput	Read_NoWrite
97	lincoln_variables_OUT[7].system1_compressor_status	BinaryInput	Read_NoWrite
98	lincoln_variables_OUT[7].system2_compressor_staus	BinaryInput	Read_NoWrite
99	power_meter_variables_OUT_global[7].Direct_Positive_Energy	AnalogInput	Read_NoWrite
100	lincoln_variables_OUT[8].T01_inlet_water_temp	AnalogInput	Read_NoWrite
101	lincoln_variables_OUT[8].T02_outlet_water_temp	AnalogInput	Read_NoWrite
102	lincoln_variables_OUT[8].T04_ambient_temp	AnalogInput	Read_NoWrite
103	lincoln_variables_OUT[8].system1_compressor_status	BinaryInput	Read_NoWrite
104	lincoln_variables_OUT[8].system2_compressor_staus	BinaryInput	Read_NoWrite
105	power_meter_variables_OUT_global[8].Direct_Positive_Energy	AnalogInput	Read_NoWrite
106	lincoln_variables_OUT[9].T01_inlet_water_temp	AnalogInput	Read_NoWrite
107	lincoln_variables_OUT[9].T02_outlet_water_temp	AnalogInput	Read_NoWrite
108	lincoln_variables_OUT[9].T04_ambient_temp	AnalogInput	Read_NoWrite
109	lincoln_variables_OUT[9].system1_compressor_status	BinaryInput	Read_NoWrite
110	lincoln_variables_OUT[9].system2_compressor_staus	BinaryInput	Read_NoWrite
111	power_meter_variables_OUT_global[9].Direct_Positive_Energy	AnalogInput	Read_NoWrite
112	lincoln_variables_OUT[10].T01_inlet_water_temp	AnalogInput	Read_NoWrite
113	lincoln_variables_OUT[10].T02_outlet_water_temp	AnalogInput	Read_NoWrite
114	lincoln_variables_OUT[10].T04_ambient_temp	AnalogInput	Read_NoWrite
115	lincoln_variables_OUT[10].system1_compressor_status	BinaryInput	Read_NoWrite
116	lincoln_variables_OUT[10].system2_compressor_staus	BinaryInput	Read_NoWrite
117	power_meter_variables_OUT_global[10].Direct_Positive_Energy	AnalogInput	Read_NoWrite
118	bacnet_device_instance	PositiveIntegerValue	Read_Write
119	bacnet_baudrate	PositiveIntegerValue	Read_Write
120	Reboot_UPC	BinaryValue	Read_Write

Lincoln BMS Interface Variables

ch_dhw_priority (R/W)

When CH and DHW are in use the priority can be controlled using 'ch_dhw_priority'.

Var. Name	Description	Default
ch_dhw_priority	0-DHW priority, 1- CH priority	0

ch_mode_select (R/W)

ch_mode_select is used to select between the central heating operating mode for the Lincoln control. Modes are as follows:

Value	Mode
0	None
1	4-20mA
2	0-10v
3	Digital Input
4	BMS Control

0. None: Lincoln is not controlled from the extension board and all control is left to the Lincolns own controller if no DHW control is selected.

1. 4-20mA: Control of the Lincoln is done via the 4-20mA input. The unit is turned on once the lower threshold has been met and will adjust the flow temperature proportionally between a minimum flow setpoint and maximum setpoint.

Signal (mA)	Function	Variable
6.0 (lower threshold)	Unit ON	ch_4to20_lower_threshold
20.0 (upper threshold)	Max flow threshold	ch_4to20_upper_threshold
40	Flow Setpoint set to minimum	ch_min_flow_temp
55	Flow setpoint set to maximum	ch_max_flow_temp

Analog Inputs	Type	Name	Description
B5	4-20mA	AI_Input_4_20mA	4-20mA CH Control

2. 0-10V: Control of the Lincoln is done via the 0-10V input. The unit is turned on once the lower threshold has been met and will adjust the flow temperature proportionally between a minimum flow setpoint and maximum setpoint.

Signal (V)	Function	Variable
2.0 (lower threshold)	Unit ON	ch_0to10_lower_threshold
10.0 (upper threshold)	Max flow threshold	ch_0to10_upper_threshold
2.0	Flow Setpoint set to minimum	ch_min_flow_temp
10.0	Flow setpoint set to maximum	ch_max_flow_temp

Analog Inputs	Type	Name	Description
B1	0-10V	AI_Input_0_10V	0-10V CH Control

3. Digital Input: Control of the Lincoln turning on and off is done via the digital input. Flow temperature control is done via 'ch_master_flow_SP' or weather compensation if activated.

Var. Name	Description	Default
ch_master_flow_SP	CH Flow setpoint if in DI mode and weather compensation has not been selected, deg.C	35

Digital Inputs	Type	Name	Description
ID1	Digital	DI_ch_ext_control	Digital Input CH Control

4. BMS Control: CH control is via the BMS over modbus. 1-ON,2-OFF. This controls to the CH setpoint "ch_master_flow_SP".

Var. Name
ch_bms_demand

ch_4to20_lower_threshold (R/W)

For use when ch_mode_select is set to 1 (4-20mA). This sets the lower threshold at which the 4-20mA input sets the flow temperature to ch_min_flow_temp. Additionally controls on/off of units; when 4-20mA input is below ch_4to20_lower_threshold the unit off, above it is on and the flow temperature is controlled proportionally.

ch_4to20_upper_threshold (R/W)

For use when ch_mode_select is set to 1 (4-20mA). This sets the upper threshold at which the 4 to 20mA input signal sets the flow temperature setpoint to ch_max_flow_temp.

ch_min_flow_temp (R/W)

Minimum flow temperature set point for use when:

- ch_mode_select is set to 1 (4-20mA) or 2(0-10v)
- or, enable_weather_compensation is active

ch_max_flow_temp (R/W)

Maximum flow temperature set point for use when:

- ch_mode_select is set to 1 (4-20mA) or 2(0-10v)
- or, enable_weather_compensation is active

ch_0to10_lower_threshold (R/W)

For use when ch_mode_select is set to 2 (0-10V). This sets the lower threshold at which the 0-10V input sets the flow temperature to ch_min_flow_temp. Additionally controls on/off of units; when 0-10V input is below ch_0to10_lower_threshold the unit off, above it is on and the flow temperature is controlled proportionally.

ch_0to10_upper_threshold (R/W)

For use when ch_mode_select is set to 2 (0-10V). This sets the upper threshold at which the 0 to 10V input signal sets the flow temperature setpoint to ch_max_flow_temp.

ch_bms_demand (R/W)

Use to toggle CH demand via BMS. 0- CH Demand inactive, 1- CH Demand Active

ch_master_flow_SP (R/W)

CH Flow setpoint if ch_mode_select is set to 3(Digital Input) or 4(BMS Control) and weather compensation has not been selected, deg.C

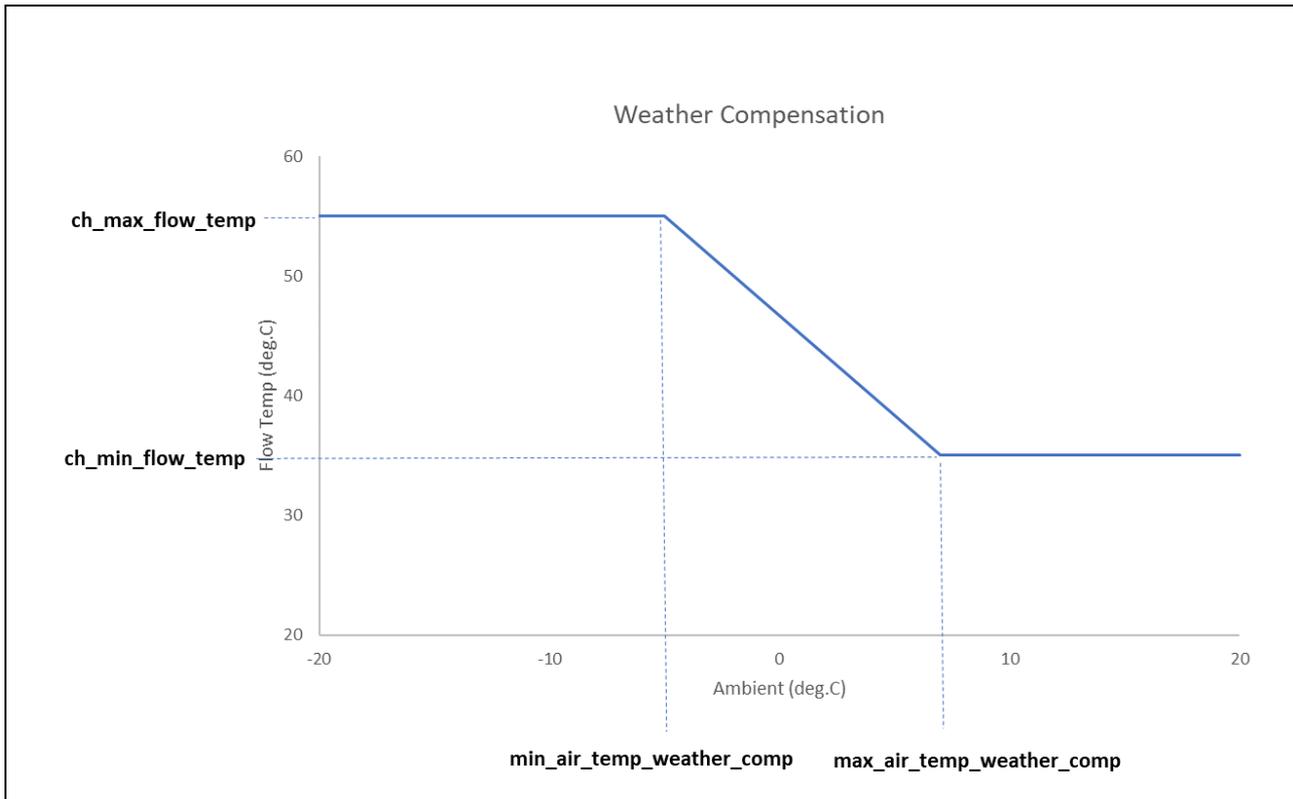
enable_weather_compensation (R/W)

Weather compensation can be used to control the flow setpoint based on the outside ambient air temperature. 0 – off, 1 – enabled. Weather compensation relies on the following variables:

Var. Name	Description	Default
ch_min_flow_temp	Flow temp. at	30
ch_max_flow_temp	Flow temp. at	55
min_air_temp_weather_comp	Lower air temp bound - Air temp at which max flow temp is used	0
max_air_temp_weather_comp	Upper air temp bound - Air temp at which min flow temp is used	7

The unit will control proportionally the flow temp between the ch_min_flow_temp and ch_max_flow_temp based on ambient temperature (See ambient temperature section to select location it is pulled from). Note weather compensation will not be used if 4-20mA or 0-10V modes are active.

Following pictures depict variable operation.



`min_air_temp_weather_comp` (R/W)

Sets the ambient air temperature at which the `ch_max_flow_temp` is used.

`max_air_temp_weather_comp` (R/W)

Sets the ambient air temperature at which the `ch_min_flow_temp` is used.

`ambient_temp_select` (R/W)

The ambient temperature to control weather compensation and low ambient can be configured to be populated in 3 ways. This is controlled using variable 'ambient_temp_select'. (Note. Defaults to mode 0)

Value	Mode
0	Average temperature of all active Lincolns temperature probes from 'T04_ambient_temp'
1	Lincoln device 1 temperature probe only from 'T04_ambient_temp'
2	Temperature probe wired into extension board

ch_supp_mode (R/W)

If the tank falls below the 'ch_buffer_supp_SP' then the CH supplementary output is activated until the 'ch_buffer_supp_SP' plus 'ch_buffer_supp_DIFF' is reached. Turns on Buffer tank temperature supplementary control,0-OFF,1-Buffer tank temp supplementary ON

ch_buffer_supp_SP (R/W)

Activates CH supplementary heating upon buffer tank temperature falling below this setpoint

ch_buffer_supp_DIFF (R/W)

Differential by which the buffer tank must be increased above set point for CH supplementary to be turn off

ch_low_ambient_SP (R/W)

Low ambient mode brings on the CH supplementary upon the air temperature falling below 'ch_low_ambient_SP' and turns off once ambient temperature raises 1deg.C above the set point.

ch_manual_supp_on_demand (R/W)

If this mode is activated it brings on the CH supplementary whenever there is a demand for CH. Activates CH supplementary upon CH demand,0-OFF,1-ON

ch_manual_supp_force (R/W)

Forces the CH supplementary output on constantly regardless of CH demand. Activates CH supplementary constantly,0-OFF,1-ON

ch_supp_on_alarm (R/W)

The CH supplementary heating can be triggered upon a major alarm ('ges_major_fault'). The CH supplementary can either become active when there is a major alarm and CH demand or regardless of CH demand. 0- OFF, 1- supplementary active when 'ges_major_fault' AND 'ch_demand' are ON,2- supplementary active when 'ges_major_fault' only.

dhw_mode_select (R/W)

dhw_mode_select is used to select between the DHW operating mode for the Lincoln control. Modes are as follows:

Value	Mode
0	None
1	Digital Input
2	Tank Probe
3	BMS Control

0. None: Lincoln is not controlled from the extension board and all control is left to the Lincolns own controller if no DHW control is selected.

1. Digital Input: Control of the Lincoln turning on and off is done via the digital input. Flow temperature set point is selected in variable 'dhw_flow_SP'; defaulted to 60deg.C.

Digital Inputs	Type	Name	Description
ID2	Digital	DI_dhw_ext_control	Digital Input DHW Control

2.Tank Probe: The tank is controlled using tank probes wired into the extension board. Tank setpoint is controlled 'dhw_tank_SP'.

Var. Name	Description	Default
dhw_tank_SP	DHW Tank Set point	50
dhw_tank_DIFF	DHW tank differential for DHW demand to be activated	5

There is the ability to wire and control the DHW tank temperature using 2 probes as follows:

Var. Name
AI_dhw_tank_probe_1
AI_dhw_tank_probe_2

Analog Inputs	Type	Name	Description
B2	NTC	AI_dhw_tank_probe_1	DHW Tank Probe 1
B3	NTC	AI_dhw_tank_probe_2	DHW Tank Probe 2

This mode can be selected to control from the tank probes in 3 ways controlled by variable 'dhw_master_tank_temp_selection'. (Note: default is mode 0)

Value	Mode
0	Average temperature of AI_dhw_tank_probe_1 & AI_dhw_tank_probe_2
1	AI_dhw_tank_probe_1
2	AI_dhw_tank_probe_2

3. BMS Control – Control is via BMS over modbus. 0- no DHW demand, 1- DHW demand. Controls to DHW setpoint "dhw_flow_SP".

Var. Name
dhw_bms_demand

[dhw_flow_SP \(R/W\)](#)

Flow setpoint used for DHW mode.

[dhw_tank_SP \(R/W\)](#)

DHW Tank Set point

[dhw_tank_DIFF \(R/W\)](#)

DHW tank differential for DHW demand to be activated

[dhw_master_tank_temp_selection \(R/W\)](#)

This variable allows selection of how the DHW demand is controlled when dhw_mode_select is set to control using tank probes (mode 2.) The following modes are available:

Value	Mode
0	Average temperature of AI_dhw_tank_probe_1 & AI_dhw_tank_probe_2
1	AI_dhw_tank_probe_1
2	AI_dhw_tank_probe_2

[dhw_bms_demand \(R/W\)](#)

Control of DHW demand via BMS. 0- no DHW demand, 1- DHW demand.

[dhw_supp_mode \(R/W\)](#)

Selects Tank Temp supplementary mode. 0-off, 1- tank temp supplementary mode ON. If mode 2 is selected then if the tank falls below the 'dhw_tank_SP' minus 'dhw_supp_diff' then the DHW supplementary output is activated until the 'dhw_tank_SP' is reached.

[dhw_supp_diff \(R/W\)](#)

Differential from tank set point where DHW supplementary is activated

[dhw_low_ambient_SP \(R/W\)](#)

Low ambient mode brings on the DHW supplementary upon the air temperature falling below 'dhw_low_ambient_SP' and turns off once ambient temperature raises 1deg.C above the set point.

[dhw_manual_supp_on_demand \(R/W\)](#)

If this mode is activated it brings on the DHW supplementary whenever there is a demand for DHW.

[dhw_manual_supp_force \(R/W\)](#)

Forces the DHW supplementary output on constantly regardless of DHW demand. Activates DHW supplementary constantly,0-OFF,1-ON

[dhw_supp_on_alarm \(R/W\)](#)

The DHW supplementary heating can be triggered upon a major alarm ('ges_major_fault'). The DHW supplementary can either become active when there is a major alarm and DHW demand or regardless of DHW demand. Activates

DHW supplementary upon alarm. 0- OFF, 1- DHW supplementary active upon ges_major_fault' AND 'dhw_demand' are ON,2- DHW supplementary active upon ges_major_fault' .

ges_major_fault (R)

Active upon any Lincoln device raising a major fault.

ges_minor_fault (R)

Active upon any Lincoln device raising a minor fault.

ch_flow_SP (R)

Flow setpoint of the system.

dhw_master_tank_temp (R)

DHW tank temperature used for control of DHW demand. Determined based on 'dhw_master_tank_temp_selection'.

ch_demand (R)

CH demand status. 0- Not active, 1- Active

dhw_demand (R)

DHW demand status. 0- Not active, 1- Active

master_on_off (R)

Status sent to Lincoln device, 0- Off, 1- On (CH or DHW demand)

Lincoln BMS Interface IO Variables

Analog Inputs

Analog Inputs	Type	Name	Description
B1	0-10V	AI_Input_0_10V	0-10V CH Control
B2	NTC	AI_dhw_tank_probe_1	DHW Tank Probe 1
B3	NTC	AI_dhw_tank_probe_2	DHW Tank Probe 2
B4	NTC	AI_ambient_temp	Ambient Temperature Probe
B5	4-20mA	AI_Input_4_20mA	4-20mA CH Control
B6	NTC	AI_ch_buffer_temp	Buffer Tank Probe

AI_Input_0_10V (R)

Read only status of 0-10V input on B1.

AI_dhw_tank_probe_1 (R)

Read only status of DHW tank probe 1 on B2.

AI_dhw_tank_probe_2 (R)

Read only status of DHW tank probe 2 on B3.

AI_ambient_temp (R)

Read only status of ambient temperature probe on B4.

AI_Input_4_20mA (R)

Read only status of 4-20mA input on B5.

AI_ch_buffer_temp (R)

Read status of buffer tank probe input on B6.

Digital Inputs

Digital Inputs	Type	Name	Description
ID1	Digital	DI_ch_ext_control	Digital Input CH Control
ID2	Digital	DI_dhw_ext_control	Digital Input DHW Control

DI_ch_ext_control (R)

Read only status of CH Demand on digital input on ID1.

DI_dhw_ext_control (R)

Read only status of DHW Demand on digital input on ID2.

Digital Outputs

Digital Outputs	Type	Name	Description
NO1	Digital	DO_output_minor_faults	Minor Fault
NO2	Digital	DO_output_major_faults	Major Fault
NO3	Digital	DO_global_supplementary	Supplementary - Combined
NO4	Digital	DO_ch_dhw_valve_demand	3-port Valve 0-CH,1-DHW
NO5	Digital	DO_hx_pump_run	Heat Exchanger Pump
NO6	Digital	DO_ch_pump_run	Central Heating Pump
NO7	Digital	DO_ch_supplementary	CH Supplementary Only
NO8	Digital	DO_dhw_supplementary	DHW Supplementary Only

DO_output_minor_faults (R)

Minor faults do not interfere with the Lincolns operation but if raised then minor faults output is activated. See digital outputs for details.

DO_output_major_faults (R)

Major faults will shut down the unit. Major faults will activate the major faults output. See digital outputs for details.

DO_global_supplementary (R)

Upon a call for supplementary heating from CH or DHW this variable is activated. Set-up of DHW and CH supplementary heating can be found in relevant sections.

DO_ch_dhw_valve_demand (R)

Provides output to signal for a valve to direct between CH or DHW mode. 0- CH mode, 1-DHW mode.

DO_hx_pump_run (R)

Heat exchanger pump is active if there is either CH or DHW demand or if activated Lincolns provides a pump request via modbus.

DO_ch_pump_run (R)

Central heating pump is active when there is a CH demand

DO_ch_supplementary (R)

Active when CH supplementary is called for. See CH sections on details of activation.

DO_dhw_supplementary (R)

Active when DHW supplementary is called for. See DHW sections on details of activation.

Lincoln Parameters

Note: In variables where * is shown. This relates to the Lincoln Device number, either 1,2,3,4,5,6,7,8,9 or 10.

lincoln_device_minor_alarm[*] (R)

Active when device * is in minor alarm state.

lincoln_device_major_alarm[*] (R)

Active when device * is in major alarm state.

lincoln_variables_OUT[*].T01_inlet_water_temp (R)

Inlet water temperature at Lincoln device *.

lincoln_variables_OUT[*].T02_outlet_water_temp (R)

Outlet water temperature at Lincoln device *.

lincoln_variables_OUT[*].T04_ambient_temp (R)

Inlet water temperature at Lincoln device *.

lincoln_variables_OUT[*].system1_compressor_status (R)

Compressor 1 status at Lincoln device *.

lincoln_variables_OUT[*].system2_compressor_status (R)

Compressor 2 status at Lincoln device *.

power_meter_variables_OUT_global[*].Direct_Positive_Energy

Cumulative energy usage of Lincoln device *.