Data Aire dap4
LonWorks Interface Instructions

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1. Introduction

The dap4 LonWorks card (Data Aire P/N 160-700-020) is an optional network card which allows the dap4 controller to be connected directly to a LonWorks® network. The use of these boards requires knowledge of and experience with the LonWorks® network installation and maintenance tools. The LonWorks card can be factory installed or field installed. The data points of the dap4 or Mini-dap4 that can be monitored thru the Lon card are listed in section 8- Dap4 LonWorks Point list of this booklet.

2. Physical channels

The LonWorks card uses an Echelon® FTT-10 transceiver, approved for use on the TP/FT-10 channel. This channel has the following main characteristics:
- Allowing the connection of a maximum of 64 nodes for each network segment;
- The nodes can be connected without any restrictions in the topology: that is, star, ring, on one bus only, or with any combination of these.
- Communication speed: 78,125 kbps;
- Maximum distance (Belden 85102 cable): 500m for connections between the nodes with free topology.
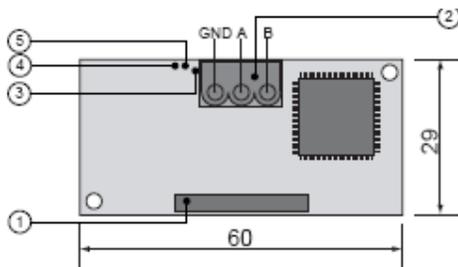
3. Layout of the boards

Fig. 1 – LonWorks card

1. Connector to the dap4 controller BMS card.
2. Terminal block for LonWorks® network (GND, A, B).
3. Service pin.
4. Green *service* LED.
5. Red fault LED.
For details on the activation of the *service pin*, see **Connection to the LonWorks® network**.

4. Meanings of the LEDs
The green *service* LED:
- Signals the status of the node, as per the LonWorks® protocol:
  Hardware fault: always ON or always OFF;
  Node configured (normal operation): ½ second ON, then always OFF;
  Node NOT configured: flashing at ½ Hz;
  Node without software application: 1 second ON, 2 seconds OFF, then always OFF;
  Node in continuous reset: flashing;
- Remains on during the activation of the *service pin*;
- Remains on for one second when receiving a wink command via the network (see **Connection to the LonWorks®network**).

The red fault LED:
- Signals problems in the connection between the board and the dap4 controller. Red LED may be on when unit first starts, this means the Lon card is in the reboot time delay. It should take couple minutes for the card to finish its reboot period then red LED should go off.

WARNING

If the red LED comes on, make sure the instructions described under **Installation** have been carefully followed. Network address must be greater than 1 (Use screw driver and press button next to J3 connector to display the network address) and protocol must be set to Lon on dap4 network config menu.

5. Installation

IMPORTANT WARNINGS: precautions in handling the board. Electrical damage may occur to the electronic components as a result of electrostatic discharges from the operator. Suitable precautions must be therefore be taken when handling these components, specifically:

- Before handling any electronic component or board, touch an earthed object (simply not touching the component is not enough to prevent a spike, as static electricity can produce a 10000V discharge, which can form an arc of about 1cm).
- All materials must be kept inside their original package as long as possible. If necessary, take the controller from its package and place it into antistatic packaging, without touching the back of the board;
- Absolutely avoid non-antistatic plastic bags, polystyrene or sponges;
- Do not pass the electronic components or boards directly to other operators (to prevent electrostatic induction and discharges).

Connect Lonworks card to the dap4 or Mini-dap4

With reference to Figs. 2- 5 below, insert the board in the dap4 or Mini-dap4 as follows:
1. Disconnect the power supply to the controller.
2. Using a screwdriver, remove the BMS card cover (*serial card* cover on Mini-dap4) (see Fig. 2).
3. With cutting nippers, remove the pre-cut plastic part from the cover, thus making the opening for the 3-pin connector (see Fig. 3).
4. Insert the LonWorks card in the corresponding plug-in connector, initially holding it diagonally and then making sure it is properly inserted and pushed up against the two plastic supports on the case of the dap4 (see Fig. 4);
5. Close the cover again, aligning the connector on the card with the hole made in the cover (see Fig. 5).
6. Reconnect the power supply to the controller; if the BMS 1 communication port has been set to use the Lon protocol, the red LED on the board will come on for a few seconds and then will go off immediately, indicating correct operation.
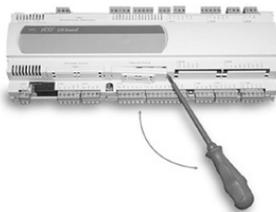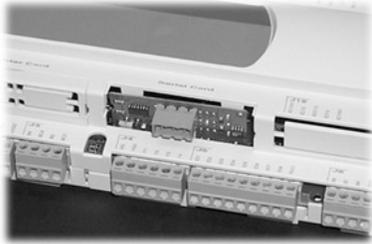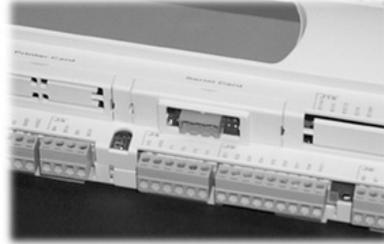

Fig. 2

Fig. 3

Fig. 4

Fig. 5

6. Connection or Commissioning card to the LonWorks® network

The physical connection to the LonWorks® network is performed using the connector with removable terminals fitted on the board, according to the Echelon® instructions and specifications. For further information on installation, maintenance, the cross-section and type of cable, refer to the LonWorks® literature.

Important Note:
Data Aire Dap4 Lon interface uses a Carel Lonworks card; if there is existing equipment provided by others that uses the same Carel Lonworks card then the device interface file (XIF) of dap4 must be manually loaded during the commissioning process otherwise Lon network may use an incorrect device interface template on dap4 that leads to erroneous data.

- **Service pin**

To activate the *service pin*, simply momentarily short-circuit the two *pins* on the board (see Fig. 1 and no.3) with the tip of a screwdriver or a similar tool.
The *service pin* must only be activated during the installation of the node. When the *pin* is activated, the node sends a *broadcast* message over the LonWorks® network, containing the information required for identification. There is sticker on the card to indicate the Lon card neuron ID, this neuron ID can be used to manually commission the card if service pin does not work.

 After you can commission the card and the red LED is lit, reset the dap4 (power off then back on). The Red LED should go off after dap4 starts up. If dap4 does not get reset after commissioning, the erroneous data may appear.

- **WINK event**

A generic supervisor can send the WINK command to a specific node on the LonWorks® network.
This generates an event that the application on the specific node can respond to with any action decided by the programmer.
In this specific case, the service LED on the interface comes on for one second, thus making it possible to check the correct operation of the connection between the interface and LonWorks® network.

7. XIF and NXE file for dap4

  The XIF version 2 and NXE for dap4 can be downloaded from Data Aire website for commissioning a dap4 Lon card. Browse http://www.dataaire.com/dataaire-product-literature/system-controls-literature/data-alarm-processor-iv-product-literature/ go to Protocol Integration Information

8. dap4 LonWorks Point list

Note: Read = NVO, write = NVI, some parameters can be read and written, in this case these parameters have separate NVO point for read (monitor) and NVI point for write a new value. This point list is compatible with XIF template file dap4_Ver2 dated 4/16/14

Description	Read/Write	Variable Name	Data Type	LONworks	SNVT
Temperature of return air	R	Ret_Air_Tmp	A	nvoReturnTemp	105
Maximum Return air temp in last 24hrs	R	Maximum	A	nvoHiTempHistory	105
Minimum Return air temp in last 24hrs	R	Minimum	A	nvoLoTempHistory	105
Temperature setpoint	R/W	Temp_Setpoint	A	nvoTempSetpoint / nviTempSetpoint	105
Temperature of chilled water	R	CW_Tmp	A	nvoWaterTemp	105
Temperature of discharge air	R	Disch_Air_Tmp	A	nvoDischTemp	105
Value of the analog input 1	R	Opt1_Analog	A	nvoOpt1_Analog	8
Value of the analog input 2	R	Opt2_Analog	A	nvoOpt2_Analog	8
Value of the analog input 3	R	Opt3_Analog	A	nvoOpt3_Analog	8
Value of the analog input 4	R	Opt4_Analog	A	nvoOpt4_Analog	8
Lower limit alarm of discharge air temp	Write only	Disch_Air_Lo_SP	I	nviLoDiscLimit	105
Relative humidity displayed as xx%	R	Humidity_dis	I	nvoHumidity	8
Cooling Stages On = Cooling stages are currently on This point applies to DX unit only	R	Stages_On	I	nvoCoolStagesOn	8
Number of heat stages running	R	Heaters_On	I	nvoHeatStagesOn	8
Maximum humidity in last 24hrs	R	Maximum	I	nvoHiHumHistory	8
Minimum humidity in last 24hrs	R	Minumum	I	nvoLoHumHistory	8
Dehumidification is on	R	Dehum_on	I	nvoDehum_on	95
Humidification is on	R	Hum_on	I	nvoHum_on	95
Energy saver mode is on	R	Engy_on	I	nvoEngy_on	95

Description	Read/ Write	Variable Name	Data Type	LONworks	SNVT
Compressor 1 Runtime -This point applies to DX unit with one compressor -high	R	C1_Hours_H	I	nvoC1_Hours_H	8
Compressor 1 Runtime -This point applies to DX unit with one compressor -low	R	C1_Hours_L	I	nvoC1_Hours_L	8
Compressor 2 Runtime -This point applies to DX unit with dual compressor - high	R	C2_Hours_H	I	nvoC2_Hours_H	8
Compressor 2 Runtime -This point applies to DX unit with dual compressor - low	R	C2_Hours_L	I	nvoC2_Hours_L	8
Heater 1 Runtime - high	R	Ht1_Hours_H	I	nvoHt1_Hours_H	8
Heater 1 Runtime - low	R	Ht1_Hours_L	I	nvoHt1_Hours_L	8
Humidity upper limit alarm	Write only	Hum_Hi_SP	I	nviHiHumLimit	8
Upper limit alarm of return air temp	Write only	Ret_Air_Hi_SP	I	nviHiTempLimit	105
Humidity setpoint	R/W	Hum_setpoint	I	nvoHumSetpoint / nviHumSetpoint	8
CW valve open % (0-100% with 10% increment)	R	CW_disp	I	nvoValve	8
Chilled Water Utilization Over Last Hour - This applies to Chilled water or Energy saver units.	R	WtrVlv_duty	I	nvoChillUtlz	8
Humidifier Runtime - high	R	Hum_Hours_H	I	nvoHum_Hours_H	8
Humidifier Runtime - low	R	Hum_Hours_L	I	nvoHum_Hours_L	8
Blower Runtime - high	R	Blower_Hours_H	I	nvoFan_Hours_H	8
Blower Runtime - low	R	Blower_Hours_L	I	nvoFan_Hours_L	8
CW Fan speed (%) sent via BMS	Write only	CW_Fan_Speed_bms	I	nviCW_Fan_Speed	8
DX Fan speed (%) sent via BMS	Write only	DX_Fan_Speed_bms	I	nviDX_Fan_Speed	8
Heater 2 Runtime - high	R	Ht2_Hours_H	I	nvoHt2_Hours_H	8
Heater 2 Runtime - low	R	Ht2_Hours_L	I	nvoHt2_Hours_L	8
Heater 3 Runtime - high	R	Ht3_Hours_H	I	nvoHt3_Hours_H	8
Heater 3 Runtime - low	R	Ht3_Hours_L	I	nvoHt3_Hours_L	8
Chilled Water Runtime - This applies to chilled water units only - high	R	CW_Hours_H	I	nvoCW_Hours_H	8

Description	Read/ Write	Variable Name	Data Type	LONworks	SNVT
Chilled Water Runtime - This applies to chilled water units only - low	R	CW_Hours_L	I	nvoCW_Hours_L	8
Zone Airflow Setpoint kcfm (Enter Total airflow setpoint/100)	Write only	ZM_Airflow_SP	I	nviZone_Air_Setp	8
Water under floor alarm	R	Floor_Wtr_alm	D	Alarm_1 . Bit0	83
No air flow alarm	R	Air_Flow_alm	D	Alarm_1 . Bit1	83
Dirty filter from digital input	R	Filter_alm	D	Alarm_1 . Bit2	83
Alarm from humidifier digital input	R	Humidifier_alm	D	Alarm_1 . Bit3	83
Temperature of return air above firestat alarm set point	R	Firestat_alm	D	Alarm_1 . Bit4	83
One or more comps has short cycled	R	Shortcycle_alm	D	Alarm_1 . Bit5	83
Loss of power requires manual reset of alarm	R	PwrUp_alm	D	Alarm_1 . Bit6	83
Sensor is out of range	R	Humidity_fail	D	Alarm_1 . Bit7	83
Sensor is out of range	R	Ret_Air_fail	D	Alarm_1 . Bit8	83
Maintenance Schedule Due alarm	R	Maint_alm	D	Alarm_1 . Bit9	83
High pressure alarm	R	C1_HP_alm	D	Alarm_1 . Bit10	83
Low pressure alarm	R	C1_LP_alm	D	Alarm_1 . Bit11	83
High pressure alarm	R	C2_HP_alm	D	Alarm_1 . Bit12	83
Low pressure alarm	R	C2_LP_alm	D	Alarm_1 . Bit13	83
Smoke detected from digital input	R	Smoke_alm	D	Alarm_1 . Bit14	83
No water flow alarm	R	Wtr_Flow_alm	D	Alarm_1 . Bit15	83
Sensor is out of range	R	Disch_Air_fail	D	Alarm_2 . Bit0	83
Temperature of return air above alarm set point	R	RA_Tmp_hi_alm	D	Alarm_2 . Bit1	83
Temperature of return air below alarm set point	R	RA_Tmp_lo_alm	D	Alarm_2 . Bit2	83
Humidity above alarm set point	R	Hum_hi_alm	D	Alarm_2 . Bit3	83
Humidity below alarm set point	R	Hum_lo_alm	D	Alarm_2 . Bit4	83
Fan overload	R	Fan_Overload	D	Alarm_2 . Bit5	83
Local alarm #1: See tag inside door =Optional alarm. External alarm input required	R	SeeTag_cust_alm1	D	Alarm_2 . Bit6	83

Description	Read/ Write	Variable Name	Data Type	LONworks	SNVT
Local alarm #2: See tag inside door =Optional alarm. External alarm input required	R	SeeTag_cust_alm2	D	Alarm_2 . Bit7	83
Local alarm #3: See tag inside door =Optional alarm. External alarm input required	R	SeeTag_cust_alm3	D	Alarm_2 . Bit8	83
Local alarm #4: See tag inside door =Optional alarm. External alarm input required	R	SeeTag_cust_alm4	D	Alarm_2 . Bit9	83
Standby pump on: Check primary pump -Optional alarm. Pump failure input signal required	R	Stdby_Pump_On	D	Alarm_2 . Bit10	83
Alarm: UPS power on: Check main power -Optional alarm. External alarm input required	R	Ups_On_alm	D	Alarm_2 . Bit11	83
Custom alarm #1 -Optional alarm. External alarm input required. Factory programmed custom message required	R	Cust_msg_Sw1	D	Alarm_2 . Bit12	83
Custom alarm #2 -Optional alarm. External alarm input required. Factory programmed custom message required	R	Cust_msg_Sw2	D	Alarm_2 . Bit13	83
Custom alarm #3 -Optional alarm. External alarm input required. Factory programmed custom message required	R	Cust_msg_Sw3	D	Alarm_2 . Bit14	83
Custom alarm #4 -Optional alarm. External alarm input required. Factory programmed custom message required	R	Cust_msg_Sw4	D	Alarm_2 . Bit15	83
Humidifier stopped due to custom alarm switch	R	HumSw_Inhibit	D	Alarm_3 . Bit0	83
Heat inhibited due to custom switch alarm condition	R	Heat_inhibit	D	Alarm_3 . Bit1	83
Reheat and humidification inhibited from operation	R	Rht_Hum_inhibit	D	Alarm_3 . Bit2	83
Temperature of discharge air below alarm set point	R	Disch_Tmp_lo_alm	D	Alarm_3 . Bit3	83

Description	Read/Write	Variable Name	Data Type	LONworks	SNVT
Manual override: Check bypass switches - Standard alarm. Manual override switch is on	R	Override_Alm	D	Alarm_3 . Bit4	83
High condensation from digital input	R	Condensation_alm	D	Alarm_3 . Bit5	83
Unit in standby, all functions held off - Optional alarm. Control input signal required Factory setting required	R	Unit_In_Standby	D	Alarm_3 . Bit6	83
Cooling operation inhibited by BMS	R/W	BMS_Cooling_inhibit	D	nvoBMSCool_In / nviBMSCool_In	95
Heat inhibited due to bms	R/W	BMS_Heat_inhibit	D	nvoBMSHeat_In / nviBMSHeat_In	95
Humidifier operation inhibited by BMS	R/W	BMS_Humidifier_inhibit	D	nvoBMSHum_In / nviBMSHum_In	95
Inhibit fan by bms	R/W	Fan_Inhibit_bms	D	nvoBMSFan_In / nviBMSFan_In	95
Supervisor (BMS) On-Off. Show the state OFFbyBMS in main mask (1: Off; 0: On)	R/W	Superv_Off	D	nvoSuperv_Off / nviSuperv_Off	95
BMS-heartbeat is to confirm the communication with BMS. This variable must change at least once every 5 minutes or unit will revert on mode if it is command to off	Write only	BMS_Heartbeat	D	nviBMS_Heartbeat	95

9. Troubleshooting

Problem	Possible Cause	Possible Remedy
- Cannot connect to the Lon card. Red LED may be blinking	- Dap4 does not have power. - Red LED blinking, Lon card is still in the reboot time delay. - Card is not properly inserted into dap4 BMS port. - BMS port 1 is not set to Lon protocol - Bad network wiring. - Service Pin has not been touched to	- Turn on dap4 power - Wait about 3 minutes for Lon card to complete the reboot. - Turn power off and check to make sure card is properly plugged into BMS port. - Check dap4 menu G-Network Config setting to make sure BMS port 1 is set for Lon

Problem	Possible Cause	Possible Remedy
	send Neuron ID to Lon network. - Lon Network BMS does not recognize card Neuron ID automatically	- Check network wiring for damaged or open wiring. - Make sure the Service pin jumper on the card is jumped during commissioning process. Green LED should flash when service pin jumper is connected. - Neuron ID of the Lon card maybe manually entered.
- Connect to card but show erroneous data	- dap4 and Lon card have not been reset after commission. - Did not download and use correct XIF template file from Data aire website. - Card has no application file loaded. Green Led 1 second on then 2 seconds off. - Card is not commission properly or not connected to Lon network	- Restart the dap4 after commission then wait for about 3 minutes for the card to finish its reboot and the red LED is off. - Download XIF template from Data Aire website and use it to recommission the card. - Download application NXE file form Data aire website then upload the application file to the card if possible or contact Data aire technical support for assistance. - See steps above to check network connection.