ARMSTRONG

OPTI-VISOR™

Ultra-efficient chiller plant automation
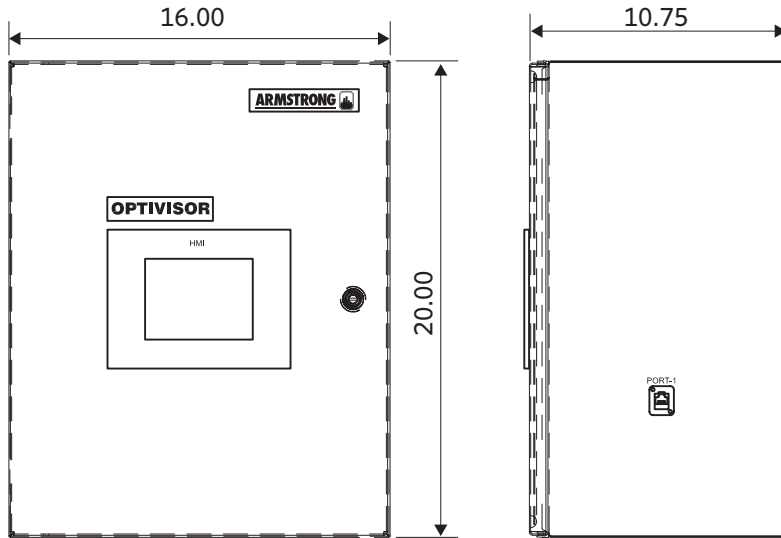
Sequence of operation

VARIABLE PRIMARY CHILLED WATER OPERATION

GENERAL REQUIREMENTS

- All Sequencing shall be by the BAS.

- The BAS will be responsible for calculating and adjusting speed of chilled water pumps in response to the building requirement and min/max flow of the chillers.

- The BAS will manage the staging and rotation of equipment.

- At any time, the BAS shall have the ability to override OPTI-VISOR™ recommendations.

- The OPTI-VISOR™ shall provide recommended operating points as outlined in the points list including CHWST set point.

- The OPTI-VISOR™ will provide a recommendation of the number of chillers and cooling towers to run including number of pumps to match chiller and tower requirements.

- The OPTI-VISOR™ will provide a recommended speed for condenser water pumps and cooling tower fans.
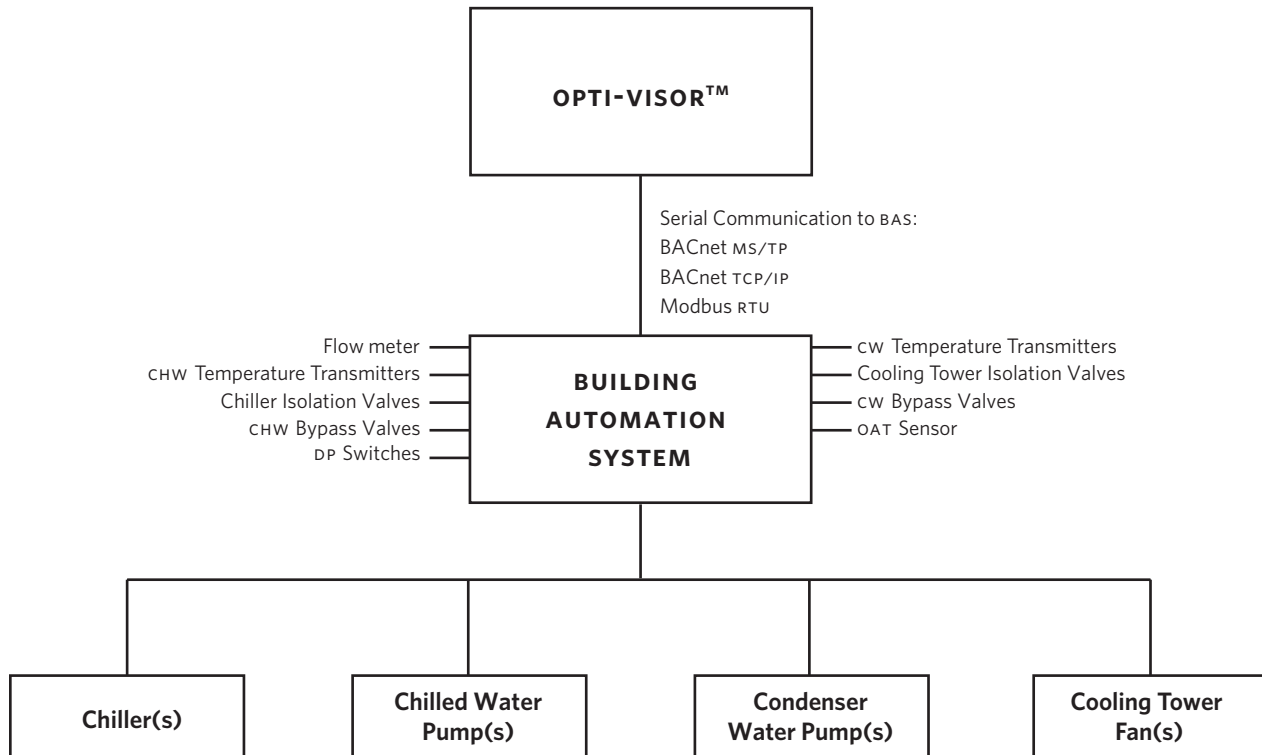
NORMAL OPERATION

1 The OPTI-VISOR™ is always enabled.

2 The plant start-up and shutdown sequence is as per the BAS internal sequence of operation and independent to the OPTI-VISOR™.

3 The OPTI-VISOR™ will recommend a number of chillers/cooling towers to run.

4 The BAS will enable the required number of chillers/cooling towers.

5 The BAS will start the primary chilled water pumps and condenser pumps associated with active chiller/tower.

6 The BAS will confirm minimum-flow is met before starting the associated chiller/s.

7 The BAS shall calculate the speed of the chilled water pumps.

8 The BAS shall adjust the chilled water pump speed to:
   - Maintain the **active** DP zone at set point.
   - Maintain the minimum flow required by the active chillers
     Where;
     A A change in CHWP speed in the down direction shall have a 60 second delay.
     B The up speed change shall occur only after the flow difference is 3% or more.

9 The BAS shall maintain all primary chilled water pumps at the same speed.

10 The BAS shall restrict primary chilled water pump speed to match chiller minimum flow and chiller maximum flow settings as determined during commissioning.

11 The BAS shall modulate the CHW bypass valve to maintain minimum flow through the active chillers.

12 The OPTI-VISOR™ will recommend condenser pump speed, and cooling tower fan speed.

13 The BAS will adjust the condenser pump and cooling tower fan speed based on OPTI-VISOR™ recommendations; and can over-ride recommendations at any time.

14 The BAS shall communicate operating data to the OPTI-VISOR™ as per the attached points list.

GENERAL ASSEMBLY DRAWING

16.00

ARMSTRONG

OPTIVISOR

HMI

20.00

10.75

PORT-1

SYSTEM ARCHITECTURE

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                    OPTI-VISOR™
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Serial Communication to BAS:
BACnet MS/TP
BACnet TCP/IP
Modbus RTU

Flow meter
CHW Temperature Transmitters
Chiller Isolation Valves
CHW Bypass Valves
DP Switches

**BUILDING
AUTOMATION
SYSTEM**

CW Temperature Transmitters
Cooling Tower Isolation Valves
CW Bypass Valves
OAT Sensor

| **Chiller(s)** | **Chilled Water Pump(s)** | **Condenser Water Pump(s)** | **Cooling Tower Fan(s)** |

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DATA POINTSLIST

#	VARIABLE NAME	DESCRIPTION
1	Primary Flow	Gallons per Minute, 0 decimals
2	CHWST	Fahrenheit, 1 decimal
3	CHWRT	Fahrenheit, 1 decimal
4	LCWT	Fahrenheit, 1 decimal
5	ECWT	Fahrenheit, 1 decimal
6	Chiller 1 Status	0=N/A, 1=STOP, 2=RUNNING, 3=ALARM
7	Chiller 2 Status	0=N/A, 1=STOP, 2=RUNNING, 3=ALARM
8	Chiller 3 Status	0=N/A, 1=STOP, 2=RUNNING, 3=ALARM
9	Chiller 4 Status	0=N/A, 1=STOP, 2=RUNNING, 3=ALARM
10	Chiller 5 Status	0=N/A, 1=STOP, 2=RUNNING, 3=ALARM
11	CHWP 1 Status	0=N/A, 1=STOP, 2=RUNNING, 3=ALARM
12	CHWP 2 Status	0=N/A, 1=STOP, 2=RUNNING, 3=ALARM
13	CHWP 3 Status	0=N/A, 1=STOP, 2=RUNNING, 3=ALARM
14	CHWP 4 Status	0=N/A, 1=STOP, 2=RUNNING, 3=ALARM
15	CHWP 5 Status	0=N/A, 1=STOP, 2=RUNNING, 3=ALARM
16	CWP 1 Status	0=N/A, 1=STOP, 2=RUNNING, 3=ALARM
17	CWP 2 Status	0=N/A, 1=STOP, 2=RUNNING, 3=ALARM
18	CWP 3 Status	0=N/A, 1=STOP, 2=RUNNING, 3=ALARM
19	CWP 4 Status	0=N/A, 1=STOP, 2=RUNNING, 3=ALARM
20	CWP 5 Status	0=N/A, 1=STOP, 2=RUNNING, 3=ALARM
21	CT 1 Status	0=N/A, 1=STOP, 2=RUNNING, 3=ALARM
22	CT 2 Status	0=N/A, 1=STOP, 2=RUNNING, 3=ALARM
23	CT 3 Status	0=N/A, 1=STOP, 2=RUNNING, 3=ALARM
24	CT 4 Status	0=N/A, 1=STOP, 2=RUNNING, 3=ALARM
25	CT 5 Status	0=N/A, 1=STOP, 2=RUNNING, 3=ALARM
26	Chiller 1 kW	kilowatt, 1 decimal
27	Chiller 2 kW	kilowatt, 1 decimal
28	Chiller 3 kW	kilowatt, 1 decimal
29	Chiller 4 kW	kilowatt, 1 decimal
30	Chiller 5 kW	kilowatt, 1 decimal
31	CHWP 1 kW	kilowatt, 1 decimal
32	CHWP 2 kW	kilowatt, 1 decimal
33	CHWP 3 kW	kilowatt, 1 decimal
34	CHWP 4 kW	kilowatt, 1 decimal
35	CHWP 5 kW	kilowatt, 1 decimal
36	CWP 1 kW	kilowatt, 1 decimal
37	CWP 2 kW	kilowatt, 1 decimal
38	CWP 3 kW	kilowatt, 1 decimal
39	CWP 4 kW	kilowatt, 1 decimal

#	VARIABLE NAME	DESCRIPTION
40	CWP 5 kW	kilowatt, 1 decimal
41	CT 1 kW	kilowatt, 1 decimal
42	CT 2 kW	kilowatt, 1 decimal
43	CT 3 kW	kilowatt, 1 decimal
44	CT 4 kW	kilowatt, 1 decimal
45	CT 5 kW	kilowatt, 1 decimal
46	CHWP 1 Speed	Percent, 1 decimal
47	CHWP 2 Speed	Percent, 1 decimal
48	CHWP 3 Speed	Percent, 1 decimal
49	CHWP 4 Speed	Percent, 1 decimal
50	CHWP 5 Speed	Percent, 1 decimal
51	CWP 1 Speed	Percent, 1 decimal
52	CWP 2 Speed	Percent, 1 decimal
53	CWP 3 Speed	Percent, 1 decimal
54	CWP 4 Speed	Percent, 1 decimal
55	CWP 5 Speed	Percent, 1 decimal
56	CTF 1 Speed	Percent, 1 decimal
57	CTF 2 Speed	Percent, 1 decimal
58	CTF 3 Speed	Percent, 1 decimal
59	CTF 4 Speed	Percent, 1 decimal
60	CTF 5 Speed	Percent, 1 decimal
61	(Optional) CHW Bypass Valve Position	Percent, 1 decimal
62	(Optional) CDW Bypass Valve Position	Percent, 1 decimal
63	(Optional) Most Open Cooling Valve Position	Percent, 1 decimal
64	(Optional) Dry Bulb Temperature	Fahrenheit, 1 decimal
65	(Optional) Wet Bulb Temperature	Fahrenheit, 1 decimal
66	Number of Chillers Demand	Integer
67	Number of Condenser Water Pumps Demand	Integer
68	Condenser Water Pumps Speed	Percent, 1 decimal
69	Number of Cooling Towers Demand	Integer
70	Cooling Tower Fan Speed	Percent, 1 decimal
71	CHWS Temperature Setpoint (Optivisor)	Fahrenheit, 1 decimal
72	Watchdog	Integer, Increments by 1 every 5 seconds, rollsover at 100
73	BAS Non-Compliance Alarm	TRUE = Non-Compliance, FALSE = Compliance

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