APPENDIX D

Telecommunication Infrastructure

(Excerpted from Government of Canada Workplace 2.0 Fit-up Standards, Section A4.1)

A4. Special Technical Standards

A4.1 Telecommunications Infrastructure

Overview

The telecommunications infrastructure in an office building is described and specified in "*Commercial Building Standard for Telecommunications Pathways and Spaces*," TIA-569-B. The *Workplace 2.0 Fit-up Standards* apply this standard.

Figure 1 below illustrates the telecommunications infrastructure of spaces and backbone pathways in a typical Crown-owned building, or one where all the space is leased by the Crown. It follows a "holistic" approach to the telecommunications infrastructure design by looking at the building as a single entity, regardless of whether it is occupied by one or several departments, similar to how other utilities are distributed.

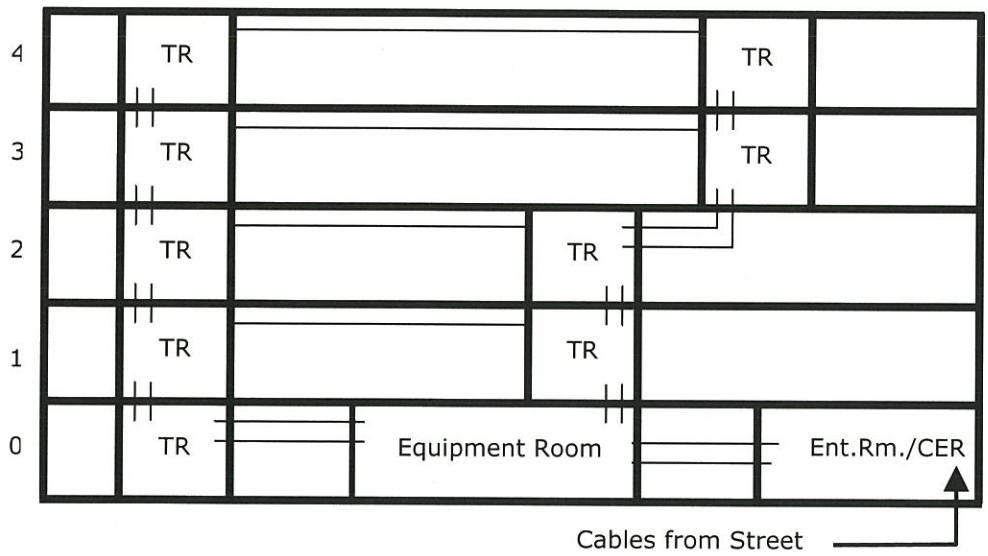

Figure 1: Telecommunications Spaces and Pathways in Crown-owned Building

Ent. Rm: Entrance Room

CER: Common Equipment Room

TR: Telecommunications Room

The infrastructure provided by PWGSC is intended to suit the requirements of both the initial department occupying the space, as well as the requirements of any subsequent occupant. This holistic approach facilitates accommodating changes in space. In buildings with more than one department (multi-department buildings), the telecommunications infrastructure will be shared by these departments and each one will have equal access to the infrastructure serving it.

Telecommunications cables of the various telecommunication carriers such as Bell, Telus, Rogers, etc. enter the building from the street and are routed to an Entrance Room where they terminate. The Entrance Room is usually combined with a Common Equipment Room that houses electronic equipment owned by the telecommunications carriers to deliver services to the occupants. The point of demarcation (similar to a "border") between the facilities owned by the carriers and those owned by the occupants is usually located in this room.

Backbone pathways (e.g. conduit, cable tray) carry cables from the Entrance Room/Common Equipment Room to the Equipment Room. The Equipment Room is the central point for the distribution of telecommunications services within the building. Cables terminate in each of these rooms.

Backbone pathways also carry cables from the Equipment Room to each of the various Telecommunications Rooms located on each floor. The Telecommunications Room is the distribution point of these networks to work areas located in the vicinity. Cables are also terminated in each Telecommunications Room. A backbone pathway and cables link multiple telecommunications rooms on each floor.

Horizontal pathways (not illustrated) typically carry cables from each Telecommunications Room to the vicinity of the work areas being served.

Figure 2 below illustrates the telecommunications infrastructure of spaces and backbone pathways in a typical building where the Crown has leased only some of the available office space. In this example, Government of Canada (GC) space is on floors 3 to 7 inclusive and thick lines are used to separate space occupied by the GC from both space leased to others, as well as the landlord's common spaces.

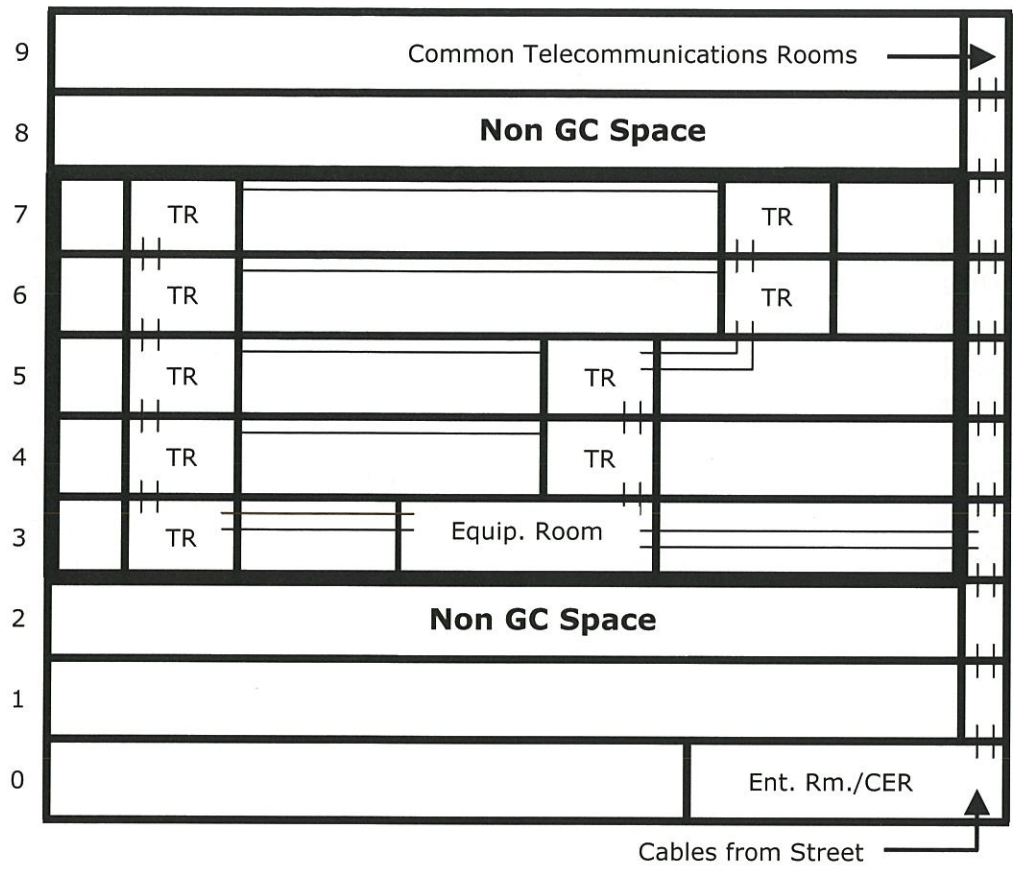

Figure 2: Telecommunications Spaces and Backbone Pathways in Leased Space

Ent. Rm: Entrance Room

CER: Common Equipment Room

TR: Telecommunications Room

As in the typical Crown-owned building (Figure 1: Telecommunications Spaces and Pathways in Crown-owned Building), cables owned by the telecommunications carriers enter from the street and end in an Entrance Room which may also serve as a Common Equipment Room housing electronic equipment owned by the carriers and required by them to deliver their services. Signals of the telecommunications carriers are distributed to the space occupied by each tenant by cables routed through a series of vertically stacked Common Telecommunications Rooms. Note that these rooms are not within the GC leased space.

The construction of telecommunications spaces and backbone pathways within space leased by the GC follows the holistic approach also as shown in Figure 1: Telecommunications Spaces and Pathways in Crown-owned Building. The GC is considered as a single tenant.

Shared Holistic Infrastructure

The holistic (shared) infrastructure of telecommunications spaces and pathways is provided by PWGSC as base-building components. However, this infrastructure is often constructed as part of the fit-up process.

In buildings housing more than one department, the holistic telecommunications infrastructure will be shared by these departments and each one will have equal access to the infrastructure serving it. This access cannot be controlled or hindered by another client department. Although only one department may initially occupy a space, additional departments may occupy it in the future, which requires sharing the infrastructure.

PWGSC considers infrastructure that a department is unwilling to share equally as dedicated to and funded by that department, following approval through the non-compliance process (outlined in A2.3 Process for Approval of Non-compliance).

Telecommunications Rooms

The horizontal and backbone cables end in the Telecommunications Rooms (TR). They also house electronic equipment such as LAN switches required to provide the building's telecommunications networks. While TRs do not normally house LAN servers[1], it may be possible to accommodate a few servers in this space.

Each Telecommunications Room (TR) is to be located as close as possible to the centre of the area being served and preferably in the core area. TRs complying with the requirements of standard TIA-569-B should be sized as follows:

Area Served	Room Size
1,000 m²	3.3 m x 3 m (11′ x 10′)
800 m²	2.8 m x 3 m (9′ x 10′)
500 m²	2.2 m x 3 m (7′ x 10′)

As well, TIA-569-B states that no telecommunications room should serve more than 1,000 m² of floor space.

[1] LAN switches and servers are not the same. A LAN server is a computer that stores and processes information, whereas a LAN switch directs the telecommunications traffic that flows through it.

The use of the non-mandatory word "should" permits some *reasonable* latitude to the knowledgeable designer and is discussed below under some of the sample scenarios. For example, it is most likely that when strategically located, a single Telecommunications Room could serve 1,100 square metres, or possibly somewhat more. As well, the Telecommunications Room may have slightly different dimensions or occupy a floor area that varies somewhat from that specified above.

Equipment Room

The Equipment Room is the central point of telecommunications within the building. Backbone cables terminate here. When sized according to standard TIA-569-B, this room is quite large (0.7% of the floor area served) and should provide ample space to house the servers owned by the client department(s), in addition to the electronic equipment for department's(s') internal telecommunications networks. This electronic equipment could include LAN switches, routers, or a telephone switch (PBX).

The RCMP's Guide G1-031, *Physical Protection of Computer Servers*, supports the shared holistic approach described above and explicitly permits rooms housing servers storing sensitive information (protected or classified) to be shared by different departments. While servers are typically housed in the Equipment Room, it applies to Telecommunications Rooms and any other rooms only if they house servers storing sensitive information.

Note that this Guide G1-031 considers only physical safeguards. Information technology safeguards (such as passwords or encryption) may replace or augment some of these physical safeguards.

Accordingly, no separate server room should be required in situations where the building contains an Equipment Room of adequate size. If the Equipment Room is too small and a server room must be constructed, it will be shared by the departments occupying the space.

Scenarios

Few buildings now contain a standards-compliant infrastructure of telecommunications spaces (e.g. rooms) and pathways (e.g. conduit or cable tray), as specified in Standard TIA-569-B. In Crown-owned buildings as well as in buildings where the Crown has leased all the office space, base-building deficiencies will usually not be corrected until a major re-fit, such as at half-life. In some cases where the Crown has a long-term interest in a substantial portion of the building, it may also be practical to provide this holistic standards-compliant infrastructure during re-fit.

Some reasonable compromises with the Standard TIA-569-B are likely justified in shorter term leases. Accordingly, under this circumstance, the approach to the telecommunications system implementation will vary to suit the particular occupancy where meeting actual current requirements is more important than future-proofing. In general, the degree of compromise will be proportional to the size of the space leased and the occupancy length.

Some examples of possible scenarios and solutions are provided below for clarification. Many other scenarios and solutions are possible. Design decisions must be made by experts in telecommunications infrastructure design.

Scenario 1 – Modernized Crown-owned building or new major lease, multi-department occupancy

This is an example of a shared telecommunications infrastructure (including separate 24/7 air conditioning in the Equipment Room and Telecommunications Rooms[2]) that serves the building as a whole (similar to other utilities) as illustrated in Figure 1: Telecommunications Spaces and Pathways in Crown-owned Building. The construction complies with the mandatory requirements of the TIA standards. Small deviations from the non-mandatory requirements may have been implemented by the knowledgeable telecommunications designer to reflect actual conditions and common sense.

Located on one of the lower levels, the Equipment Room is sized for the Servers which are centralized.

Holistic shared backbone conduits connect the Telecommunications Rooms to the Equipment Room and also connect Telecommunications Rooms located on the same floor, where required. Zone conduits or cable trays are used for the backbone pathways connecting the Equipment Room to the combined Entrance Room/Common Equipment Room. These are also used as horizontal pathways to serve each zone on each floor. Generic backbone cabling is also provided.

Scenario 2 – Four floor occupancy, long term lease, "clean" space

This example provides the same telecommunications infrastructure under Scenario 1 above, but is limited to the four floors of the building leased by PWGSC – see Figure 2: Telecommunications Spaces and Backbone Pathways in Leased Spaces. The Common Equipment Room, Entrance Room, and Common Telecommunications Rooms are located outside of the leased space.

Scenario 3 – Four floor occupancy, long term lease, previously occupied space

This example incorporates the existing infrastructure to the extent that it does not deviate unacceptably from the TIA-569-B requirements.

Each floor is 2,400 m² and is served by two Telecommunications Rooms, one on each side of a central core. One Telecommunications Room on each floor is 8 m² and is determined to be

[2] Under all scenarios, if the clients require this air-conditioning system to be connected to standby power, it will be done at their expense; however, it will not be necessary to follow the non-compliance procedures.

acceptable. The other Telecommunications Room on each floor is only 4 m² and is enlarged to 10 m². The backbone pathways are found to be acceptable.

The Equipment Room is much too small when tested against Standard TIA-569-B and it is not practical to enlarge it. It has also been functioning as a Common Equipment Room and houses a small amount of Bell Canada-owned equipment. The landlord refuses to enlarge the existing Entrance Room so that it can function as a Common Equipment Room and also house Bell's equipment.

As rearranging backbone pathways would be costly, the existing Equipment Room is kept as a room housing the LAN switches and other Crown-owned electronic equipment required for the internal departmental networks. Part of this room is caged off to provide a separate space for Bell's equipment but Bell will not be able to access the remainder of the room. Another larger shared Equipment Room is built elsewhere in the space to house LAN servers of the departments occupying the space.

Generic backbone cabling is also provided.

Scenario 4 – Small (500 m² or less) long-term lease, previously occupied space

In this example, the space is all on the same floor. There is a single room that fulfills all telecommunications functions, but it is too small and is shared with equipment used for the distribution of electrical power. There are no backbones or horizontal pathways.

An existing room is found that is suitable for use as a combined Telecommunications Room and Equipment Room. Backbone pathways are installed connecting this room to a Common Telecommunications Room located outside of the leased space (see Figure 2: Telecommunications Spaces and Backbone Pathways in Leased Spaces). Given the small size of the space, J-hooks are used to support horizontal cable distribution. (Conduit or cable tray could also be used, if warranted by the characteristics of the space.)

Scenario 5 – Short-term lease (6 – 24 months), previously occupied large space

The Telecommunications Rooms are sized to meet the actual requirements of the client and make use of existing conditions wherever possible (i.e. common sense and best value for Canadians). In some cases, existing electrical room(s) may be used. An Equipment Room is sized as required to house network equipment and any departmental servers.

Given the short-term length of the lease, the client decides that separate 24/7 air conditioning is not required in either the Equipment Room or the Telecommunications Rooms. They agree to accept only exhaust fans and door vents in these rooms. They will activate the building's main air conditioning system on those days when the temperature in these rooms becomes excessively high. They agree that this approach reflects common sense and best value for Canadians. J-hooks are used to support horizontal cable distribution.

ESC AUTOMATION

HVAC INTEGRATION ENERGY MANAGEMENT

Harry Steven's Building

DDC Tune-up 2009

Job# 1.08.8478

HVAC Control System Asbuilts

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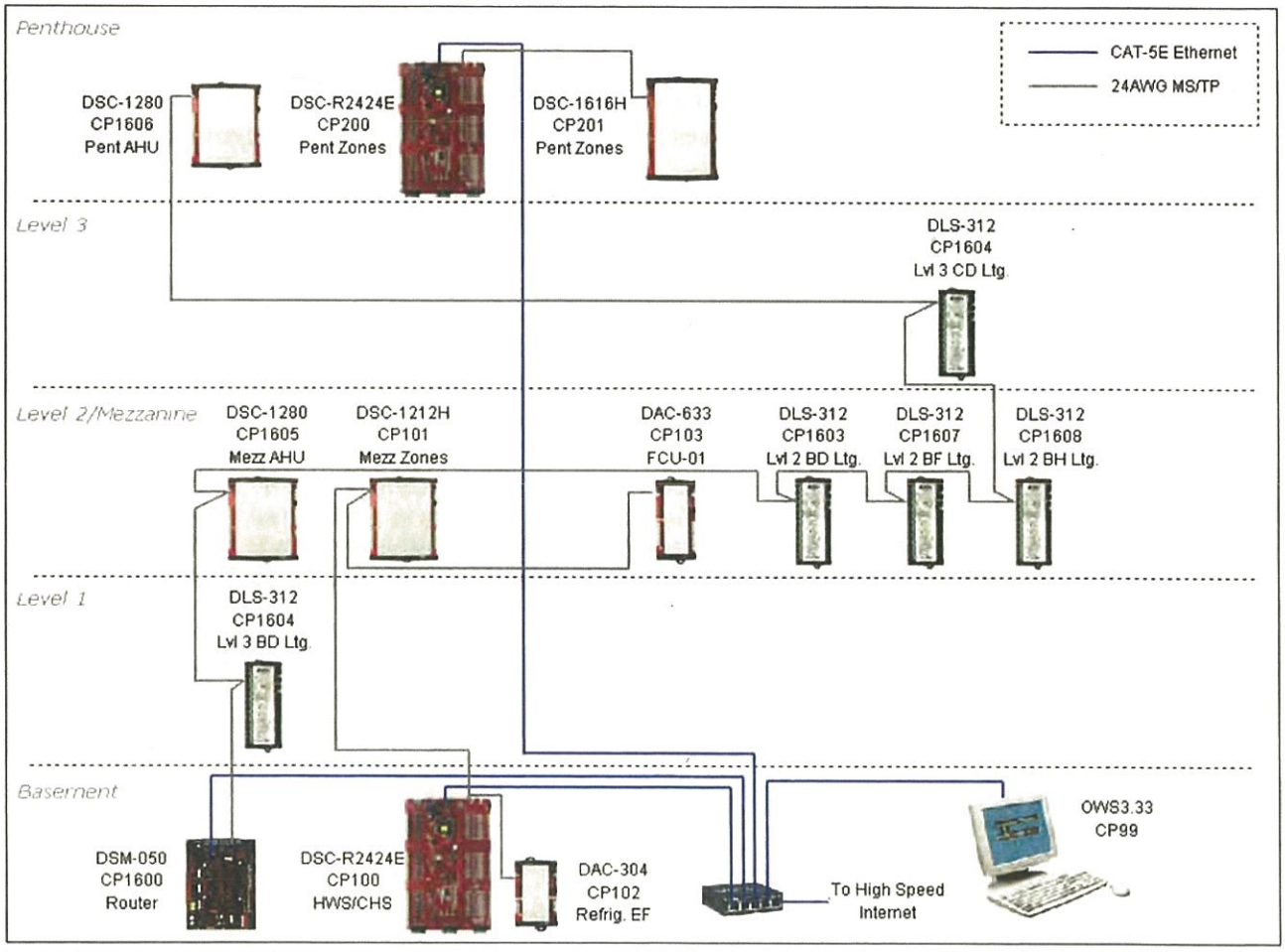
Harry Stevens Building



ESC AUTOMATION

Project: 1088478
Engineer: Vwa

Date 19-Mar-09

A1-1

Delta CONTROLS

Harry Stevens Building

Sequence of Operation

1. **DDC control is used for all aspects of the building mechanical system but not used for the fire/smoke safety operation**
2.
3. **Air Handling Units, Penthouse unit and Mezzanine Unit (Constant Volume Unit)**
4.
5. *Start-up Mode*
6. The return fan starts by weekly schedule, purge mode or by the heating optimum start algorithm:

   Sun. Mon. Tue. Wed. Thur. Fri. Sat.

   on
   off
7. Return fans (RF)starts.
8. Return fan speed is ramped to its controlled position (penthouse unit only).
9. After return fan(RF) has been proven on, supply fans (SF) starts after a software adjustable time delay of 30 seconds.
10. Supply fan speed is ramped to its controlled position (penthouse unit only). Fan speed is modulated to maintain the supply static pressure setpoint.
11.
12. *Morning Warm-up Mode*
13. The unit starts according to the optimal (heating) start algorithm.
14. The unit runs with 100% return air until the return air temperature rises above 20°C at which time the unit goes to normal mode of control.
15.
16. *Normal Mode* (once SF status is proven)
17. Mixed Air Dampers are controlled from the cold deck supply temperature controller. At 0% of controller MAD will be at min position and when controller is equal to or greater then 50% MAD will be at maximum position. MAD will modulate from 0% to 100% between 0% and 50% of controller value. If OAT is greater than 18°C then MAD goes to minimum position regradless of controller value.
18. Mixed Air Dampers are limited between the minimum position and a maximum of 100 %. The minimum position setpoint shall be reset based on the CO2 levels in the space to provide demand control ventilation.
19.
20. *Deck Control*
21. The hot deck supply air temperature setpoint (HD_SAT_SP) is reset from the average damper position(DMP_POS).

    CALCULATE AVERAGE DAMPER POSTION
    DMP_POS=AVG(ZONE1_DMP, ZONE2_DMP, ZONE3_DMP, ...)

    HD_SAT_SP = ((-0.2 *(DMP_POS) + 30)
    HD_SAT_SP = LIMIT(HD_SAT_SP, 20 , 30)
22. Heating Coil Valve (HCV) modulates to maintain hot deck setpoint (HD_SP).
23.
24. The cold deck supply air temperature setpoint (CD_SAT_SP) is reset from the average damper position(DMP_POS).

    CD_SAT_SP = ((-7/50 * (MEZZ_DMP_POS)) + 26)
    CD_SAT_SP = LIMIT (CD_SAT_SP, 12, 19)
25. Cooling Coil Valve (CCV) modulates to maintain cold deck setpoint(CD_SAT_SP) when CD_SAT~CO is greater than 50% (ie free cooling has been used first). Cooling coil valve will modulate from 0% to 100% when between controller value of 50% and 100%.

Hot Deck Coil Pumps

The Hot Deck Coil pump shall be started when the heating coil valve opens more than 5%.

The Hot Deck Coil pump shall run continuously when the outdoor air temperature is below 13°C

Zone Dampers

Individual zone dampers modulate to maintain individual zone temperature setpoints.

Shutdown Mode

Supply Fans (SF) stop.

Return Fans (RF) stop.

Mixed Air Dampers close.

Cooling coil valve is closed.

Heating coil valve modulates to maintain minimum plenum temperature of 10°C.

Hot Water Boilers (B1-B2)

Start-up Mode

When OAT is below setpoint __16__ °C the heating plant shall be enabled. P1 through P6 status will be checked to ensure there is circulation through the heating system before enabling the boilers.

Normal Mode

Boilers shall alternate lead and lag position every week.

The DDC system resets the boiler supply water temperature setpoint (HWS_SP) according to the outdoor air temperature.

HWS_SP=60+((18-OAT)*1.3)

OAT __-12__ °C. HWS_SP __90__ °C.
OAT __15__ °C. HWS_SP __65__ °C.

(HWS_SP has operating range of 65 to 90 °C)

Hot water supply is further reset by the building low variance (LO_VAR) through the boiler offset controller (BLR_OFFSET_CO).

LO_VAR=LSEL(RT1 - SP1,RT2 - SP2.....)

The boiler offset controller operates to maintain the lowest space temperature no less than 1°C below setpoint. The boiler setpoint is ramped up if the controller is less than 35%, and is ramped down if the controller is above 65%. The boiler setpoint bias is limited between 15 and -10°C.

HWS_SP = HWS_SP + HWS_BIAS

Boiler firing rate is modulated to maintain HWS_SP with lead boiler.

Shutdown Mode

Boiler is hard-wired to a low water cut-off, a high limit, a water flow switch to prevent the firing if any alarm condition is detected.

When OAT is above setpoint of __16__ °C the boilers are disabled.

Radiation Loops

When OAT is below setpoint of __15__ °C radiation zone pumps NW_RAD_PUMP_C and SE_RAD_PUMP_C are enabled.

58. The DDC system resets the radiation loop supply water temperature setpoint (RAD_SP) according to the outdoor air temperature.
RAD_SP=50+((18-OAT)*1.3)

OAT __-12__ °C HWS_SP __80__ °C
OAT __15__ °C HWS_SP __40__ °C
(HWS_SP has operating range of 50 to 85 °C)

59. When OAT is above setpoint of __16__ °C radiation zone pumps MEZZ_COIL_PUMP and PENT_COIL_PUMP are disabled.
60. The DDC system modulates the heating valve(RAD_VLV_C) to maintain the temperature setpoint.
61.
62. **Chiller**
63.
64. Chiller pump is enabled when OAT > 15 deg. C and with any air handling unit cooling coil valve more than 30% open.
65. When there is a call for cooling the Condensing Water and Chilled Water Pumps will run for 3 min. before the chiller will be enabled.
66. Both flow switches, one on the Condensing Water, and one on the Chilled Water, must make, before the chiller will come on.
67. The leaving Chilled Water temperature is reset based on the return Chilled Water temperature.
68.
69. **Cooling Tower**
70.
71. *Startup mode:*
72. Cooling tower system is enabled by COND_PUMP_S.
73. Cooling tower will be prevented from operating if the basin heater is enabled or basin level is low.
74.
75. *Cooling mode: (cooling tower)*
76. Cooling tower fan is controlled via Variable Speed Drive.
77. Fan Speed is set by basin water temperature according to the following equation:
Fan_S = 20 * (BWT – 21) + 21
Fan_S = Limit (0 , 100)
At 21°C Fan_S = 0% (runs at minimum of 20%)
At 26°C Fan_S = 100%
BWT < 21°C Fan is OFF
78. Cooling tower fan has minimum runtime of 10 Minutes.
79.
80. **Refrigerant Exhaust System:**
81.
82. Exhaust Fan 1, EF-1, will start whenever the chiller is running, after its corresponding dampers open fully.
83. Exhaust Fan 2, EF-2, will start as soon as a refrigerant leak is detected, after its corresponding dampers open fully.
84. If a refrigerant leak is detected a warning beacon (strobe light) on the outside of the room, will indicate there is a leak inside.
85. A switch located outside the room can be used to manually turn EF-2 on only.
86. The refrigerant monitor, MSA TGM-4-DR, has a capability of up to 4 sensors measuring a minimum of 50PPM (Parts Per Million) each. One sensor is installed on the east side of the room and the other on the west side of the room.
87. There are 2 alarm levels that can be set on the detector. The low alarm is set to 150PPM and the high alarm is set to 950PPM.
88.
89. **Conference Room Fancoil FC1**

90.
91. Supply fan is started and runs continuously during occupied periods.
92. Once fan status has been proven, mixed air dampers, heating coil valve, and cooling coil valve shall operate in sequence to maintain the supply air temperature setpoint.
93. The supply air temperature setpoint is reset based on the room temperature controller.
94. Mixed Air Dampers are limited between a minimum position of __20__ % and a maximum of 100 %.
95. Exhaust fan EF1 shall run whenever FC1 supply fan is running.
96.
97. **Exhaust Fans**
98.
99. Washroom Exhaust fan is enabled by weekly schedule.
100. When Parkade Propane(HAZ_GAS) level attains __25__ %LEL the parkade exhaust fan shall be started.
101.
102. **Lighting**
103.
104. Interior lighting zones are enabled based on the master lighting schedule.
105. Parkade lighting is enabled based on the parkade lighting schedule.
106.
107. **Miscellaneous**
108.
109. *Control Air Pressure*
110. When control air pressure(CONTROL_AIR_PRESS) is greater than ___ PSI an alarm is provided at the B.A.S.
111.
112. *Sump Alarm*
113. Sump alarm contact shall be monitored.

Harry Stevens Building

Control Panel Report

CP Panel: CP100 **LP Panel:** LP **Power Panel #:** **CP Model No** DSC-2424E

Mechanical Dwg: **Enclosure Model #:** **Power Circuit #:** **Exp. Slot #1:**EXP120

Exp. Slot #2:

CP Panel Location: Boiler Room **Exp. Slot #3:**EXP161

Point #	Descriptor	Field Part	Wiring Detail	Point #	Descriptor	Field Part	Wiring Detail
100.IP1	ENTRANCE_PUMP_S	S100-1L	MAG M15_FB	100.OP1	ENTRANCE_PUMP_C	M15MAH12DC	MAG M15_FB
100.IP2	WORKAREA_PUMP_S	S100-1L	MAG M15_FB	100.OP2	WORKAREA_PUMP_C	M15MAH12DC	MAG M15_FB
100.IP3	MEZZ_HCP4_S	S100-1L	MAG M15_FB	100.OP3	MEZZ_HCP4_C	M15MAH12DC	MAG M15_FB
100.IP4	PENT_HCP3_S	S100-1L	MAG M15_FB	100.OP4	PENT_HCP3_C	M15MAH12DC	MAG M15_FB
100.IP5	SE_RAD_P5_S	S100-1L	MAG M15_FB	100.OP5	SE_RAD_P5_C	M15MAH12DC	MAG M15_FB
100.IP6	NW_RAD_P6_S	S100-1L	MAG M15_FB	100.OP6	NW_RAD_P6_C	M15MAH12DC	MAG M15_FB
100.IP7	CLGTWR_FAN_S_old	S100-1L	MAG M15_FB	100.OP7	CLGTWR_FAN_C_old	M15MAH12DC	MAG M15_FB
100.IP8	CHILLER_S	S200-2	FBK CT	100.OP8	CHIL_C	M15MAH12DC	CTL Dry Output
100.IP9	CHIL_CHW_P1S	S100-1L	MAG M15_FB	100.OP9	CHIL_CHW_P1C	M15MAH12DC	MAG M15_FB
100.IP10	CHIL_COND_P2S	S100-1L	MAG M15_FB	100.OP10	CHIL_COND_P2C	M15MAH12DC	MAG M15_FB
100.IP11	MEZZ_SFS	S100-1L	MAG M15_FB	100.OP11	MEZZ_SFC	M15MAH12DC	MAG M15_FB_FZ
100.IP12	MEZZ_RFS	S100-1L	MAG M15_FB	100.OP12	MEZZ_RFC	M15MAH12DC	MAG M15_FB
100.IP13	PENT_SFS	S100-1L	MAG M15_FB	100.OP13	PENT_SF_VSD~PWR	M15MAH12DC	MAG M15_FB
100.IP14	PENT_RFS	S100-1L	MAG M15_FB	100.OP14	PENT_RF_VSD~PWR	M15MAH12DC	MAG M15_FB
100.IP15	HWS_BLR1_SWT	WTS420-1	TMP 10K Device	100.OP15	HWS_BLR1_C	M15MAH12DC	CTL Boiler
100.IP16	HWS_BLR2_SWT	WTS420-1	TMP 10K Device	100.OP16	HWS_BLR2_C	M15MAH12DC	CTL Boiler
100.IP17	HWS_SWT	WTS420-1	TMP 10K Device	100.OP17	HWS_BLR1_FIRE	0-10VDC	CTL Analog Outp
100.IP18	SE_RAD_SWT	WTS420-1	TMP 10K Device	100.OP18	SE_RAD_VLV_C	EPT750	CTL EPT
100.IP19	NW_RAD_SWT	WTS420-1	TMP 10K Device	100.OP19	NW_RAD_VLV_C	EPT750	CTL EPT
100.IP20	PARKADE_HAZ_GAS	0-10VDC	FBK Analog Input	100.OP20	WASHROOM_EF_C	M15MAH12DC	MTR M15_FB
100.IP21	CHIL_COND_IN_T	WTS420-1	TMP 10K Device	100.OP21	PARKADE_EF_C	M15MAH12DC	MAG M15_FB
100.IP22	CONTROL_AIR_PRES	0-5VDC	FBK Analog Input	100.OP22	PARKADE_LIGHTS	M15MAH12DC	CTL Dry Output
100.IP23	SUMP_ALARM	DRY CONTACT	FBK Dry Contact	100.OP23	CHIL_RESET	0-10VDC	CTL Analog Outp
100.IP24	PARKADE_CO	0-10VDC	FBK Analog Input	100.OP24	HWS_BLR2_FIRE	0-10VDC	CTL Analog Outp
100.IP25	CLGTWR_BWT	WTS420-1	TMP 10K Device	100.OP25	SPARE100_OP25		
100.IP26	CLGTWR_LVL	DRY CONTACT	FBK Dry Contact	100.OP26	SPARE100_OP26		
100.IP27	CLGTWR_HTR	S100-1L	FBK CT	100.OP27	MEZZ_ZONE1_RAD	0-10VDC	VLV Bel_MOD
100.IP28	CLGTWR_SPD_FB	0-10VDC	FBK Analog Input	100.OP28	MEZZ_ZONE3_RAD	0-10VDC	VLV Bel_MOD
100.IP29	CLGTWR_FAN_S	S100-1L	MAG M15_FB	100.OP29	MEZZ_ZONE2_RAD	0-10VDC	VLV Bel_MOD
100.IP30	CHIL_CWST	WTS420-1	TMP 10K Device	100.OP30	CLGTWR_SPD_C	0-10VDC	CTL Analog Outp
100.IP31	CHIL_CWRT	WTS420-1	TMP 10K Device	100.OP31	CLGTWR_FAN_C	M15MAH12DC	MAG M15_FB
100.IP32	CHIL_COND_OUT_T	WTS420-1	TMP 10K Device	100.OP32	DHW_RECIRC_PC	M15MAH12DC	MAG M15_FB

Harry Stevens Building

Control Panel Report

CP Panel: CP101 **LP Panel:** LP **Power Panel #:** **CP Model No** DSC-1212H

Mechanical Dwg: **Enclosure Model #:** **Power Circuit #:** **Exp. Slot #1:**

Exp. Slot #2:

CP Panel Location: Mezzanine Mechanical Room **Exp. Slot #3:**

Point #	Descriptor	Field Part	Wiring Detail	Point #	Descriptor	Field Part	Wiring Detail
101.IP1	MEZZ_CDT	DTS410	TMP 10K Device	101.OP1	MEZZ_CCV	EPT750	CTL EPT
101.IP2	MEZZ_HDT	DTS410	TMP 10K Device	101.OP2	MEZZ_HCV	EPT750	CTL EPT
101.IP3	MEZZ_ZONE1_SAT	DTS410	TMP 10K Device	101.OP3	MEZZ_ZONE1_DMP	NM24-SR	ACT Bel_MOD
101.IP4	MEZZ_ZONE1_RT	RTS400	TMP 10K Device	101.OP4	MEZZ_ZONE2_DMP	NM24-SR	ACT Bel_MOD
101.IP5	MEZZ_ZONE2_SAT	DTS410	TMP 10K Device	101.OP5	MEZZ_ZONE3_DMP	NM24-SR	ACT Bel_MOD
101.IP6	MEZZ_ZONE2_RT	RTS400	TMP 10K Device	101.OP6	MEZZ_ZONE4_DMP	NM24-SR	ACT Bel_MOD
101.IP7	MEZZ_ZONE3_SAT	DTS410	TMP 10K Device	101.OP7	MEZZ_ZONE4_RAD	0-10VDC	VLV Bel_MOD
101.IP8	MEZZ_ZONE3_RT	RTS400	TMP 10K Device	101.OP8	SPARE101_OP8		
101.IP9	MEZZ_ZONE4_SAT	DTS410	TMP 10K Device	101.OP9	SPARE101_OP9		
101.IP10	MEZZ_ZONE4_RT	RTS400	TMP 10K Device	101.OP10	SPARE101_OP10		
101.IP11	MEZZ_ZONE2a_RT	RTS400	TMP 10K Device	101.OP11	SPARE101_OP11		
101.IP12	SPARE101_IP12			101.OP12	SPARE101_OP12		

Harry Stevens Building

Control Panel Report

CP Panel: CP102 **LP Panel:** LP **Power Panel #:** **CP Model No** DAC-304

Mechanical Dwg: **Enclosure Model #:** **Power Circuit #:** **Exp. Slot #1:**

Exp. Slot #2:

CP Panel Location: Boiler Room **Exp. Slot #3:**

Point #	Descriptor	Field Part	Wiring Detail
102.IP1	EF1_EFS	DRY CONTACT	FBK Dry Contact
102.IP2	EF2_EFS	DRY CONTACT	FBK Dry Contact
102.IP3	REFRIG_DET	DRY CONTACT	FBK Dry Contact

Point #	Descriptor	Field Part	Wiring Detail
102.OP1	EF1_EAD	LF24-S	MAG_MZP_FB_F
102.OP2	EF2_EAD	LF24-S	MAG_MZP_FB_F
102.OP3	EF_BEACON	TERM PT	CTL LED
102.OP4	SPARE102_OP4		

Harry Stevens Building

Control Panel Report

CP Panel: CP103 **LP Panel:** LP **Power Panel #:** **CP Model No** DAC-633

Mechanical Dwg: **Enclosure Model #:** **Power Circuit #:** **Exp. Slot #1:**

Exp. Slot #2:

CP Panel Location: 2nd Floor Conference Room Fancoil **Exp. Slot #3:**

Point #	Descriptor	Field Part	Wiring Detail	Point #	Descriptor	Field Part	Wiring Detail
103.IP1	FCU1_SAT	DTS410	TMP 10K Device	103.OP1	FCU1_SFC	M15MAH12DC	MAG M15_FB
103.IP2	FCU1_MAT	TSFC204T10	TMP 10K Device	103.OP2	EF1_C	M15MAH12DC	MTR M15_FB
103.IP3	FCU1_RAT	DTS410	TMP 10K Device	103.OP3	SPARE103_OP3		
103.IP4	FCU1_RT	RTS400-1	TMP 10K Device	103.OP4	FCU1_MAD	NF24-SR	ACT Bel_MOD
103.IP5	EF1_S	S100-1L	MTR M15_FB	103.OP5	FCU1_HCV	0-10VDC	VLV Bel_MOD
103.IP6	SPARE103_IP6			103.OP6	FCU1_CCV	0-10VDC	ACT Bel_MOD

Harry Stevens Building

Control Panel Report

CP Panel: CP1605 **LP Panel:** LP **Power Panel #:** **CP Model No** DSC-1280

Mechanical Dwg: **Enclosure Model #:** **Power Circuit #:** **Exp. Slot #1:**

Exp. Slot #2:

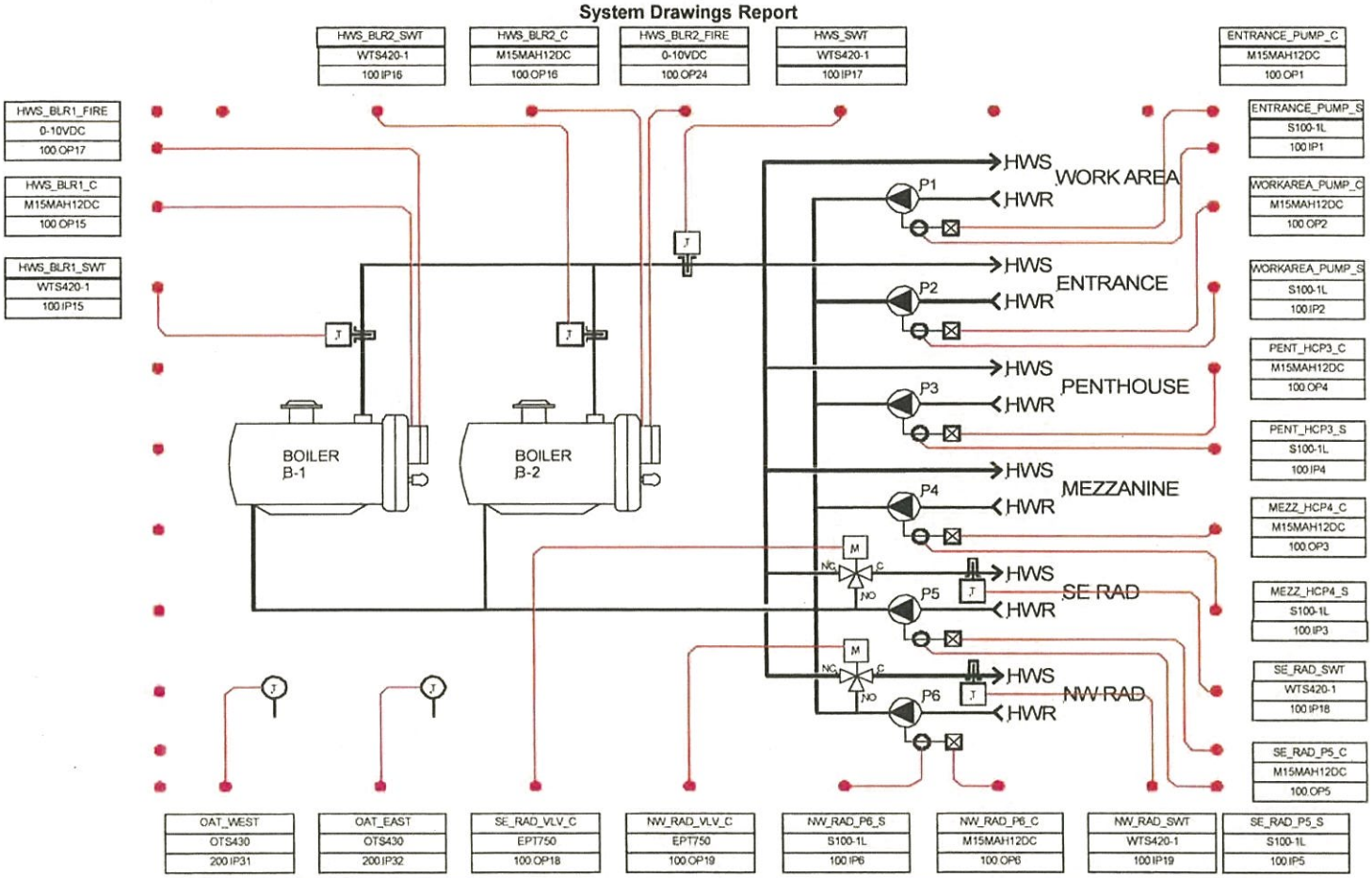
CP Panel Location: Mezzanine Mechanical Room **Exp. Slot #3:**

Point	Descriptor	Field Part	Wiring Detail
1605.IP1	MEZZ_RAT	DTS410	TMP 10K Device
1605.IP2	MEZZ_MAT	TSFC204T10	TMP 10K Device
1605.IP3	MEZZ_MAD_FB	0-10VDC	ACT Bel_MOD_F
1605.IP4	MEZZ_SA~CO2	90-DM3A-D-T	GAS Vulcain
1605.IP5	MEZZ_RA~CO2	90-DM3A-D-T	GAS Vulcain
1605.IP6	MEZZ_NSB_OVR	DRY CONTACT	FBK Dry Contact
1605.IP7	SPARE1605_IP7		
1605.IP8	SPARE1605_IP8		
1605.IP9	SPARE1605_IP9		
1605.IP10	SPARE1605_IP10		
1605.IP11	SPARE1605_IP11		
1605.IP12	SPARE1605_IP12		

Point	Descriptor	Field Part	Wiring Detail
1605.OP1	MEZZ_MAD	EPT750	CTL EPT
1605.OP2	SPARE1605_OP2		
1605.OP3	SPARE1605_OP3		
1605.OP4	SPARE1605_OP4		
1605.OP5	SPARE1605_OP5		
1605.OP6	SPARE1605_OP6		
1605.OP7	SPARE1605_OP7		
1605.OP8	SPARE1605_OP8		

Harry Stevens Building

System Drawings Report



System: HWS **System Description:** Main Heating Plant **Control Panel:** 100

System Location: Boiler Room **Local Panel:**

ESC AUTOMATION

Project: 1088478 Date 19-Mar-09

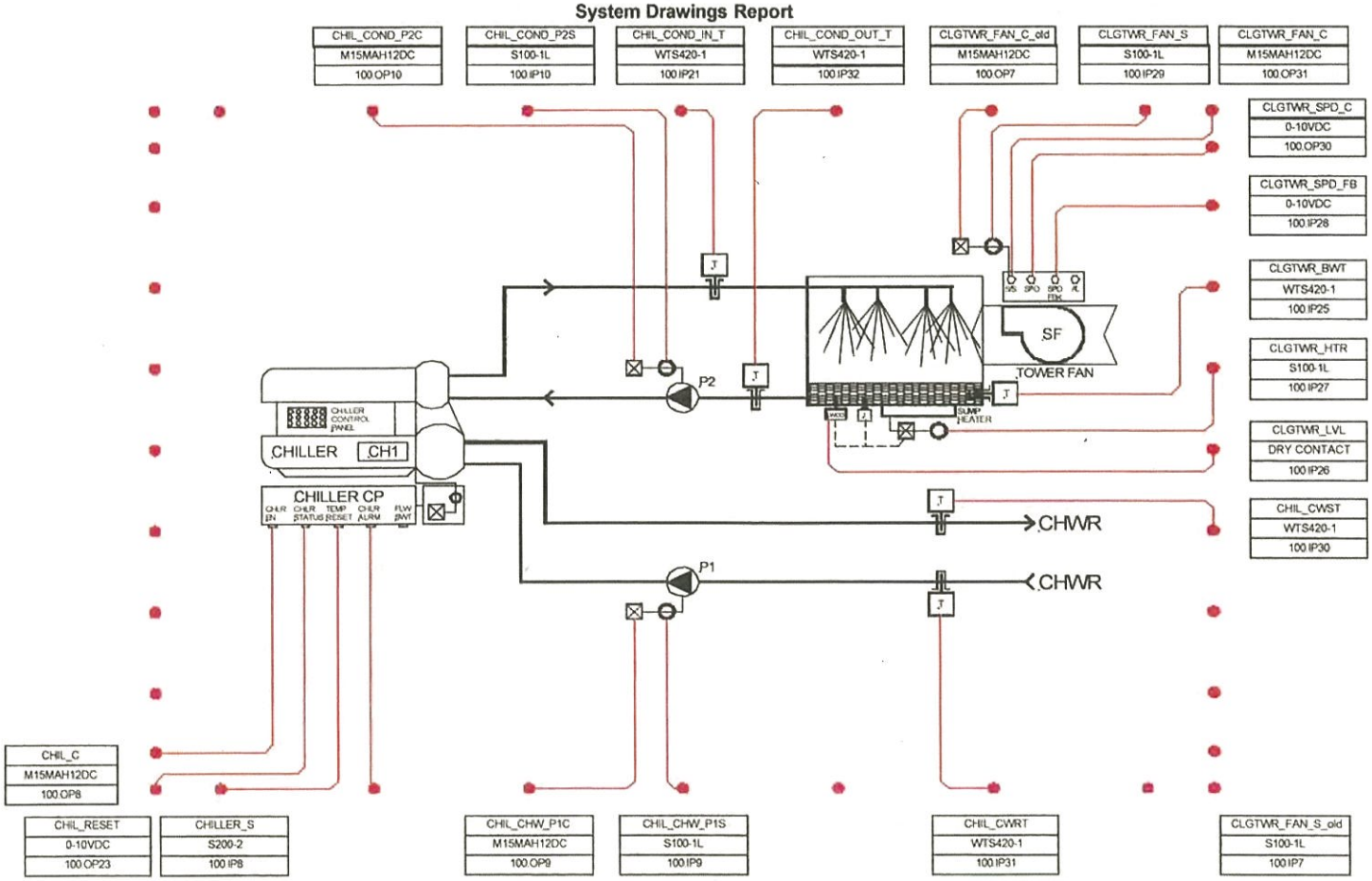
Engineer: VWa Revision:

B2-1

Delta CONTROLS

Harry Stevens Building

System Drawings Report



System: CHS **System Description:** Main Cooling Plant **Control Panel:** 100

System Location: Boiler Room **Local Panel:**

ESC AUTOMATION

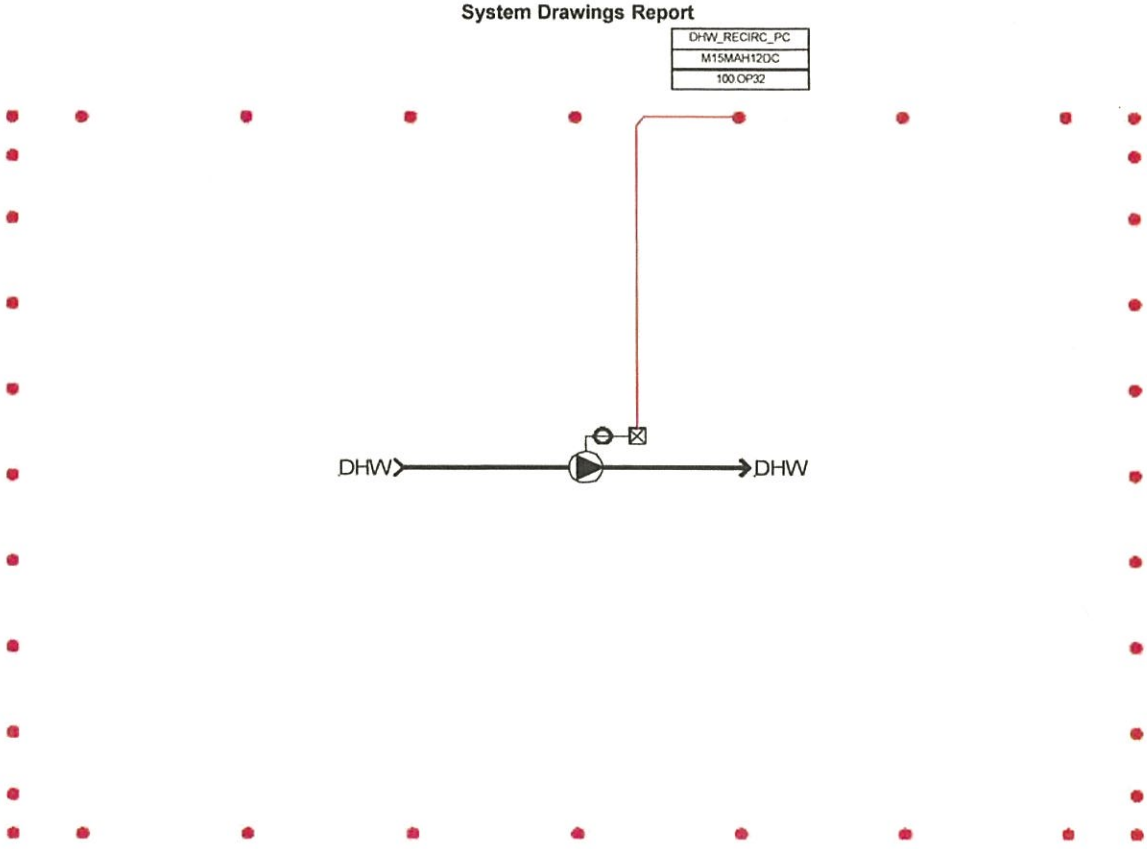
Project: 1088478 Date 19-Mar-09

Engineer: Wa Revision:

Delta CONTROLS

Harry Stevens Building

System Drawings Report



System:	DHW	**System Description:**	Domestic Hot Water System	**Control Panel:**	100
System Location:	Boiler Room			**Local Panel:**	

ESC AUTOMATION

Project: 1088478
Engineer: Wa

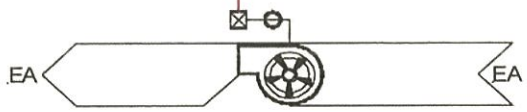
Date 19-Mar-09
Revision:

Delta CONTROLS

Harry Stevens Building

System Drawings Report

WASHROOM_EF_C
M15MAH12DC
100.OP20



System:	WASHROOM_EF	**System Description:**	Exhaust Fan	**Control Panel:**	100
System Location:	Washrooms			**Local Panel:**	

ESC AUTOMATION

Project: 1088478 Date 19-Mar-09

Engineer: We Revision:

Delta CONTROLS

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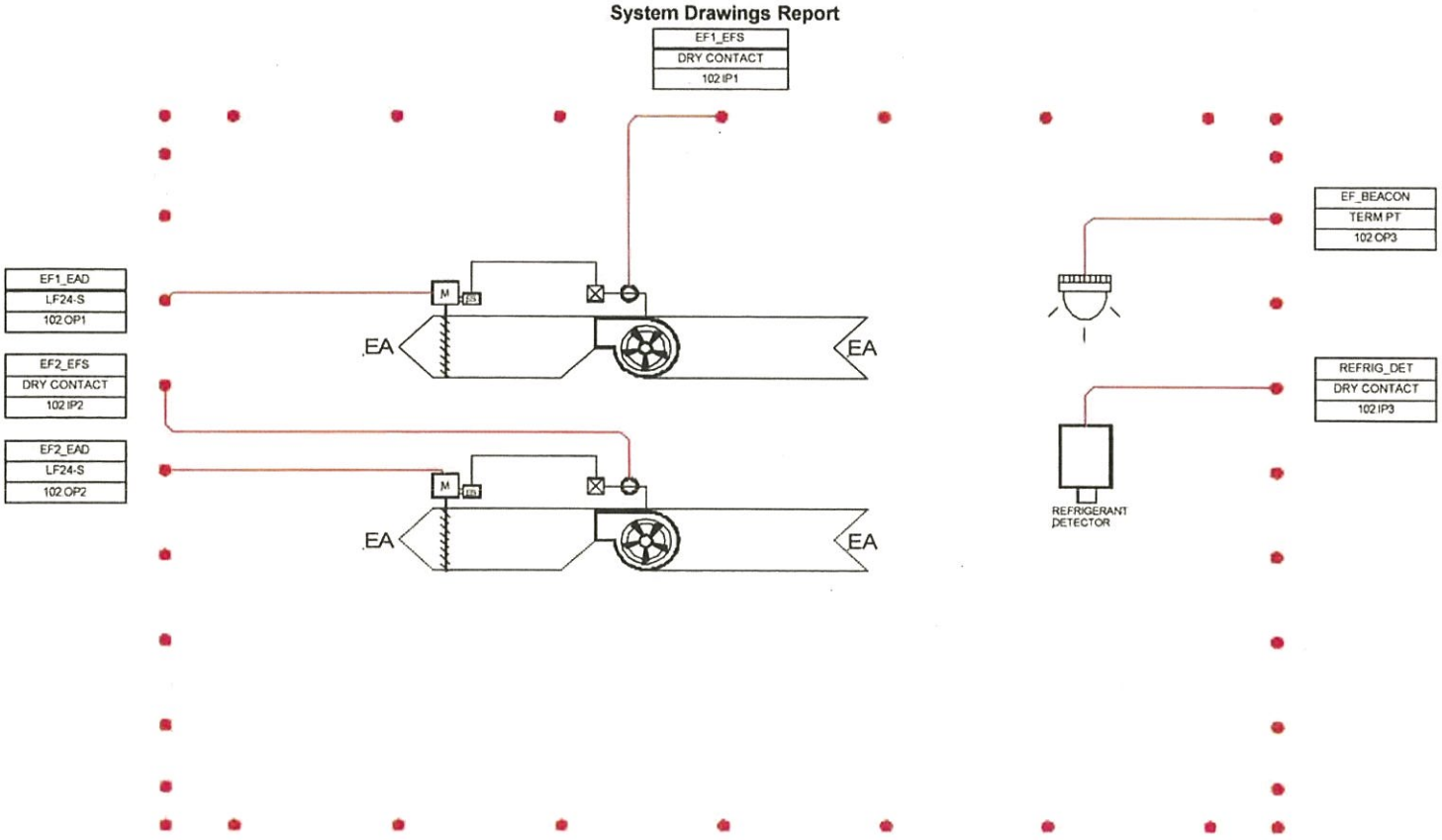
System Drawings Report



System:	REF_EF	**System Description:**	Refrigerant Detection and Exhaust	**Control Panel:**	102
System Location:	Chiller Room			**Local Panel:**	

ESC AUTOMATION

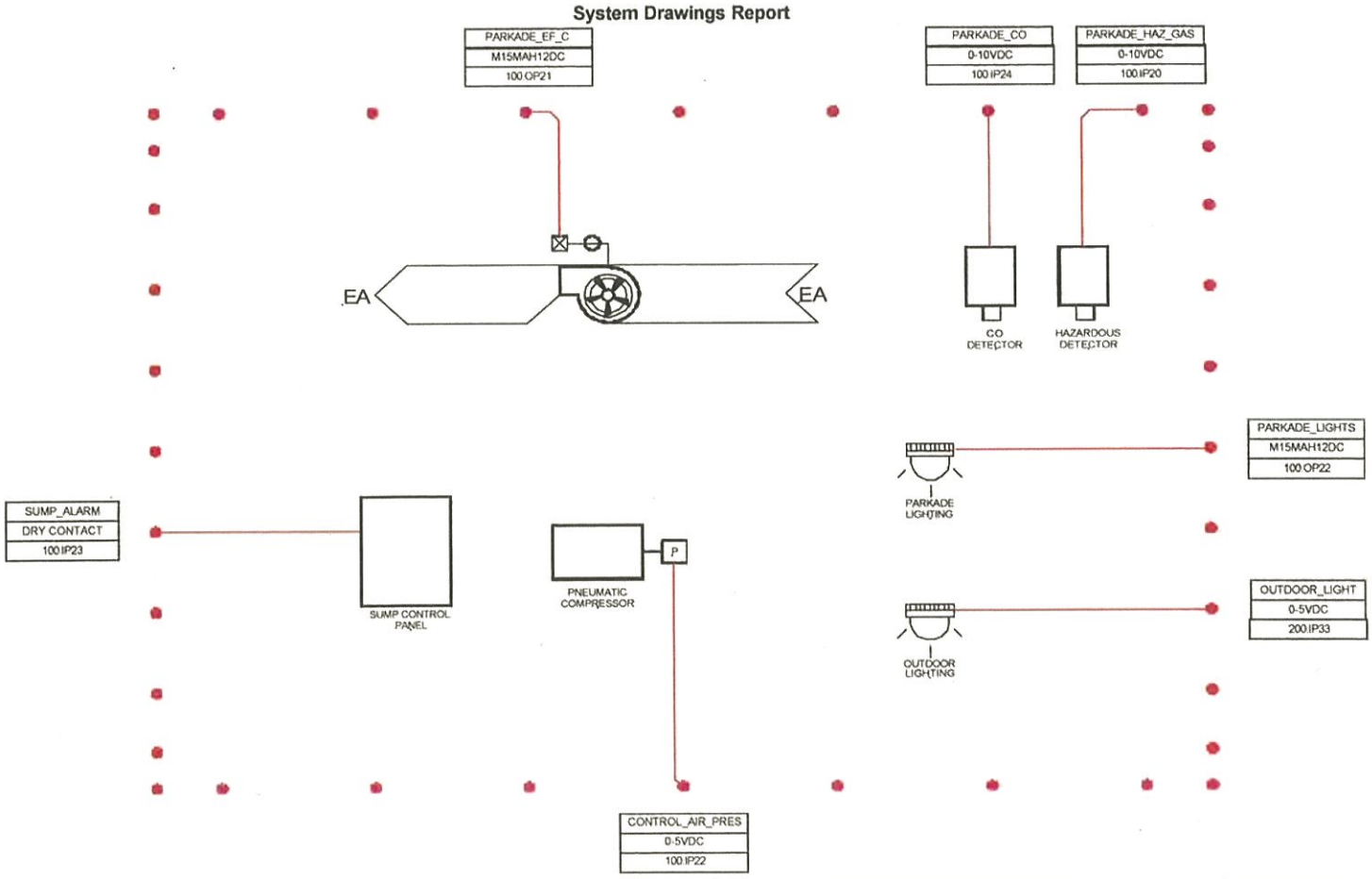
Project: 1088478 Date 19-Mar-09

Engineer: Wa Revision:

Delta CONTROLS

Harry Stevens Building

System Drawings Report



System: PARKADE_EF **System Description:** Exhaust Fan and Gas Detection **Control Panel:** 100

System Location: Parkade **Local Panel:**

ESC AUTOMATION

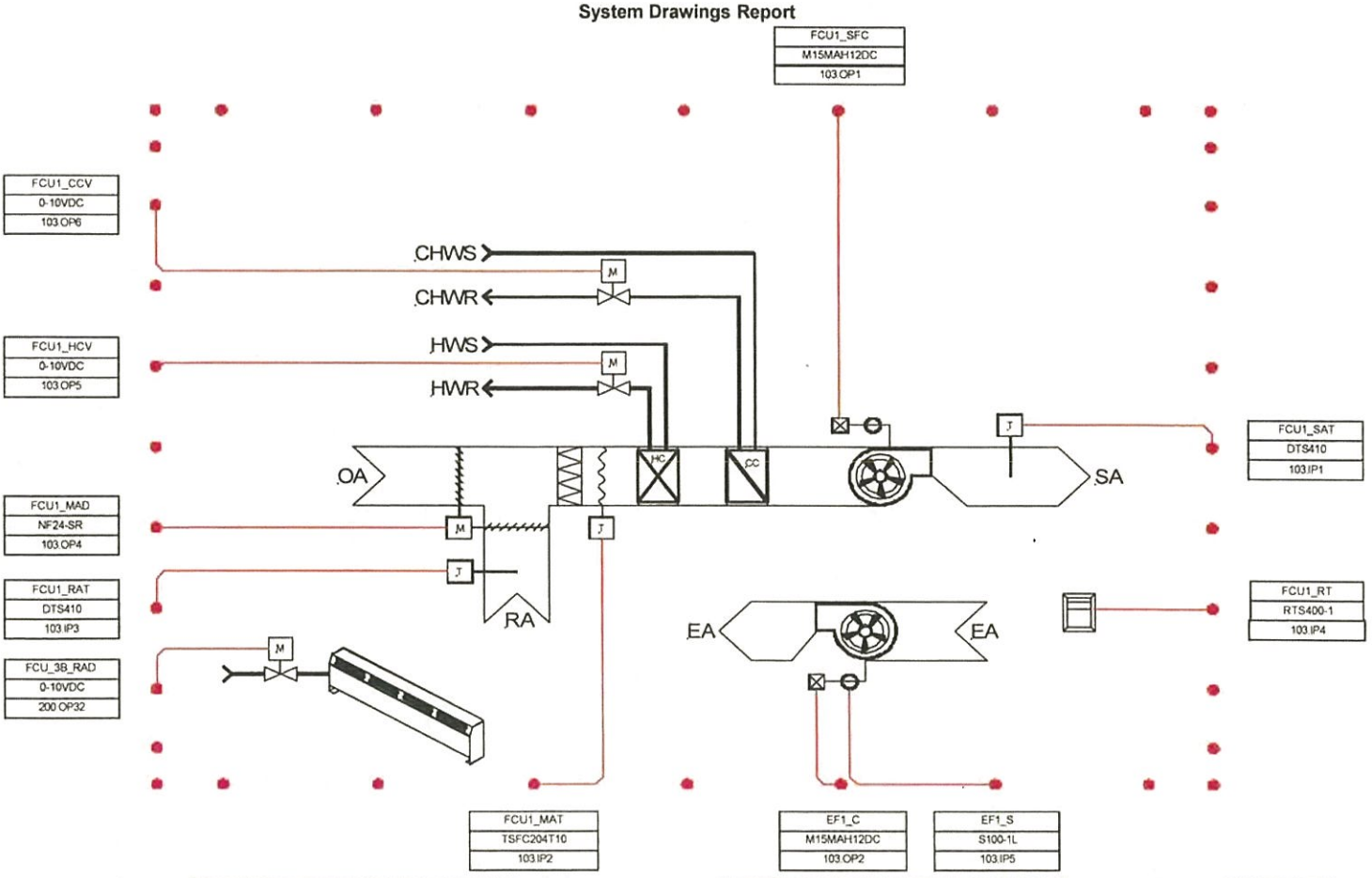
Project: 1088478 Date 19-Mar-09

Engineer: Wa Revision:

Delta CONTROLS

Harry Stevens Building

System Drawings Report



System:	FC	**System Description:**	Fancoil Unit and Exhaust Fan	**Control Panel:**	103
System Location:	Level 2 Conference Room			**Local Panel:**	

ESC AUTOMATION

Project: 1088478 Date 19-Mar-09

Engineer: VWa Revision:

Delta CONTROLS

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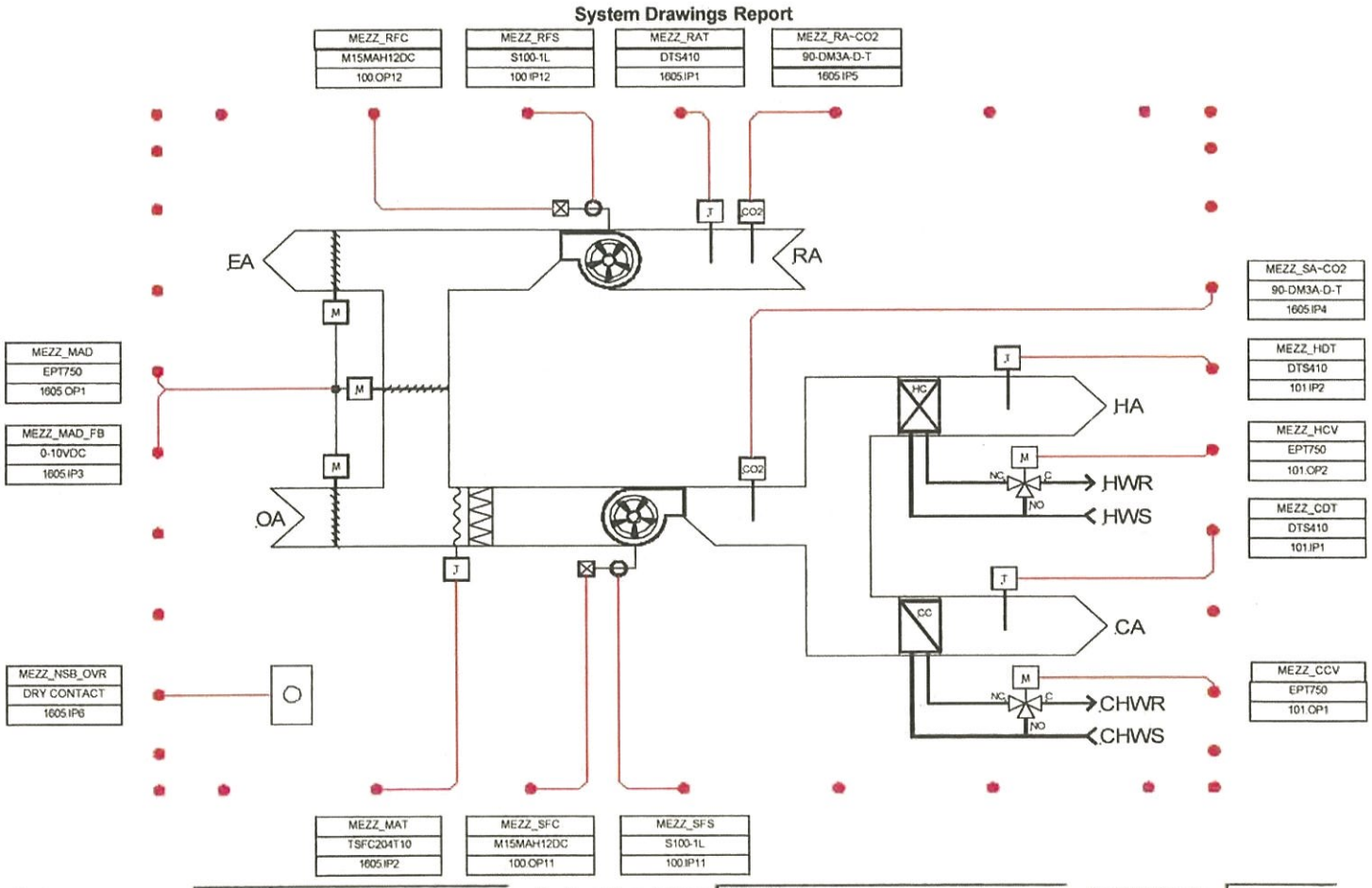
System Drawings Report



System: MEZZ_AHU **System Description:** Mezzanine Dual Deck Air Handling Unit **Control Panel:** 100

System Location: Mezzanine Mechanical Room **Local Panel:**

ESC AUTOMATION

Project: 1088478 Date 19-Mar-09

Engineer: Wa Revision:

Delta CONTROLS

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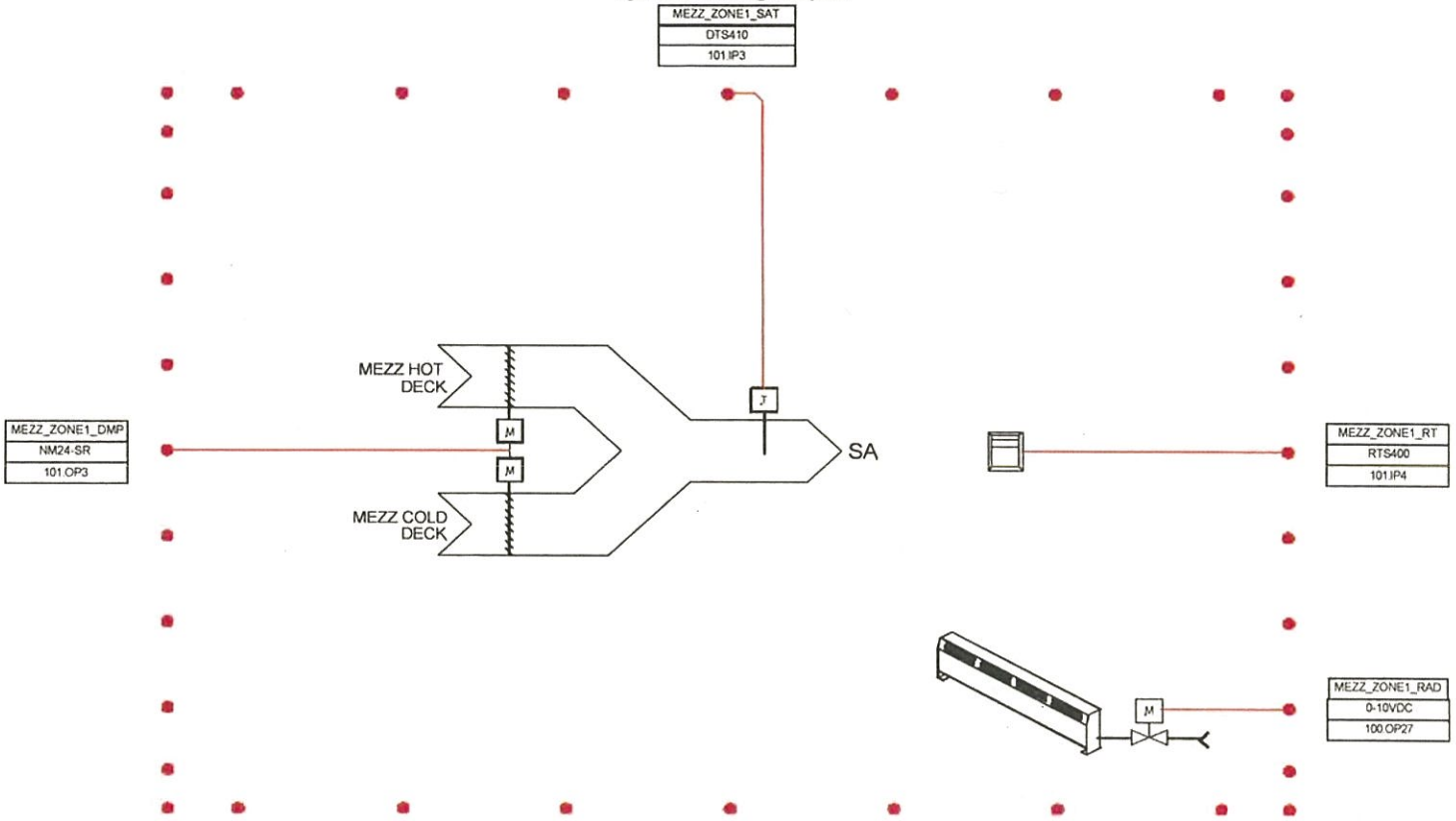
System Drawings Report



System:	**MEZZ_ZONE1**	**System Description:**	Mezzanine Zone 1 Dampers	**Control Panel:**	101
System Location:	Mezzanine Mechanical Room			**Local Panel:**	

ESC AUTOMATION

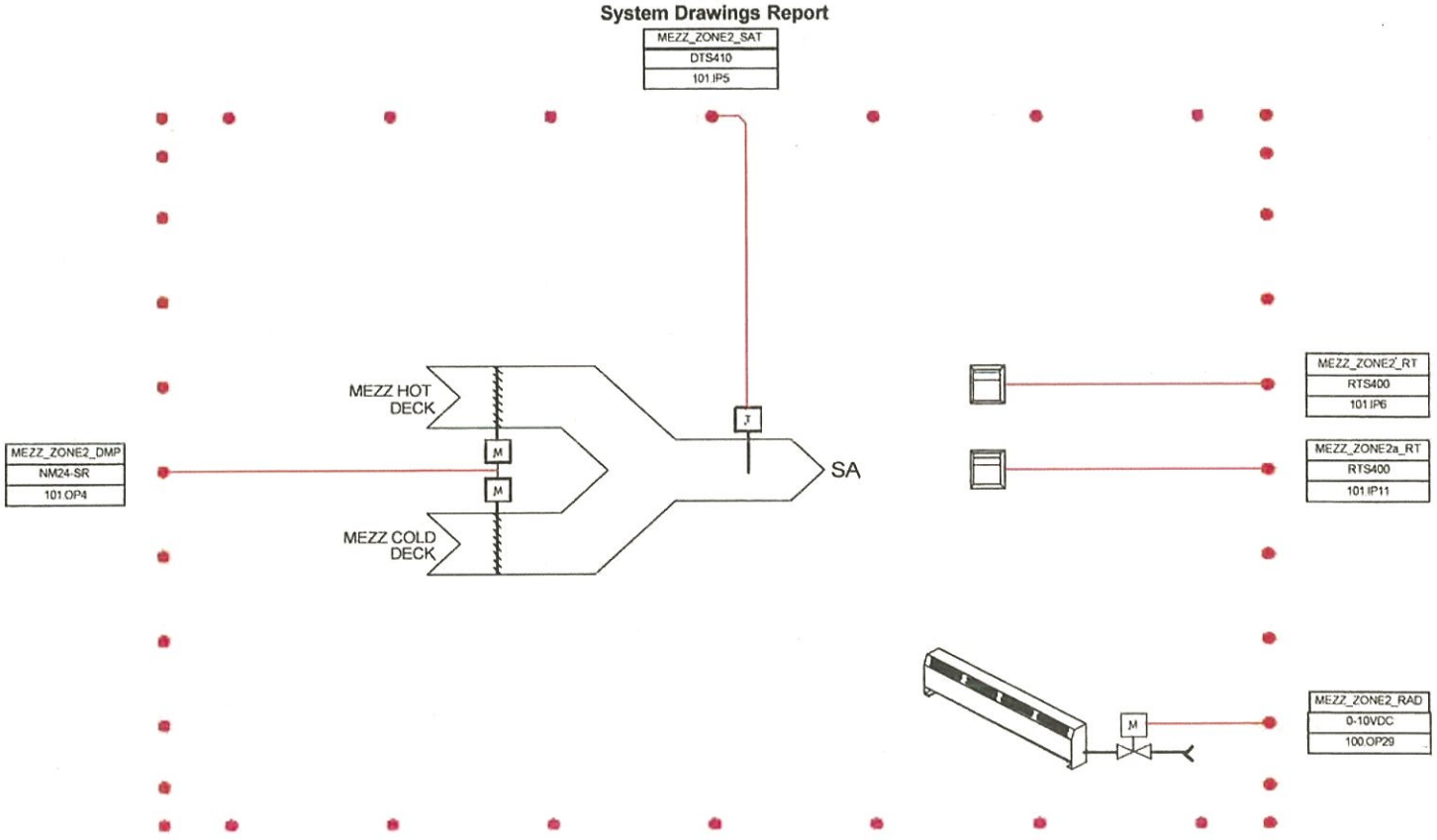
Project: 1088478 Date 19-Mar-09

Engineer: Wa Revision:

Delta CONTROLS

Harry Stevens Building

System Drawings Report



System: MEZZ_ZONE2 **System Description:** Mezzanine Zone 1 Dampers **Control Panel:** 101

System Location: Mezzanine Mechanical Room **Local Panel:**

ESC AUTOMATION

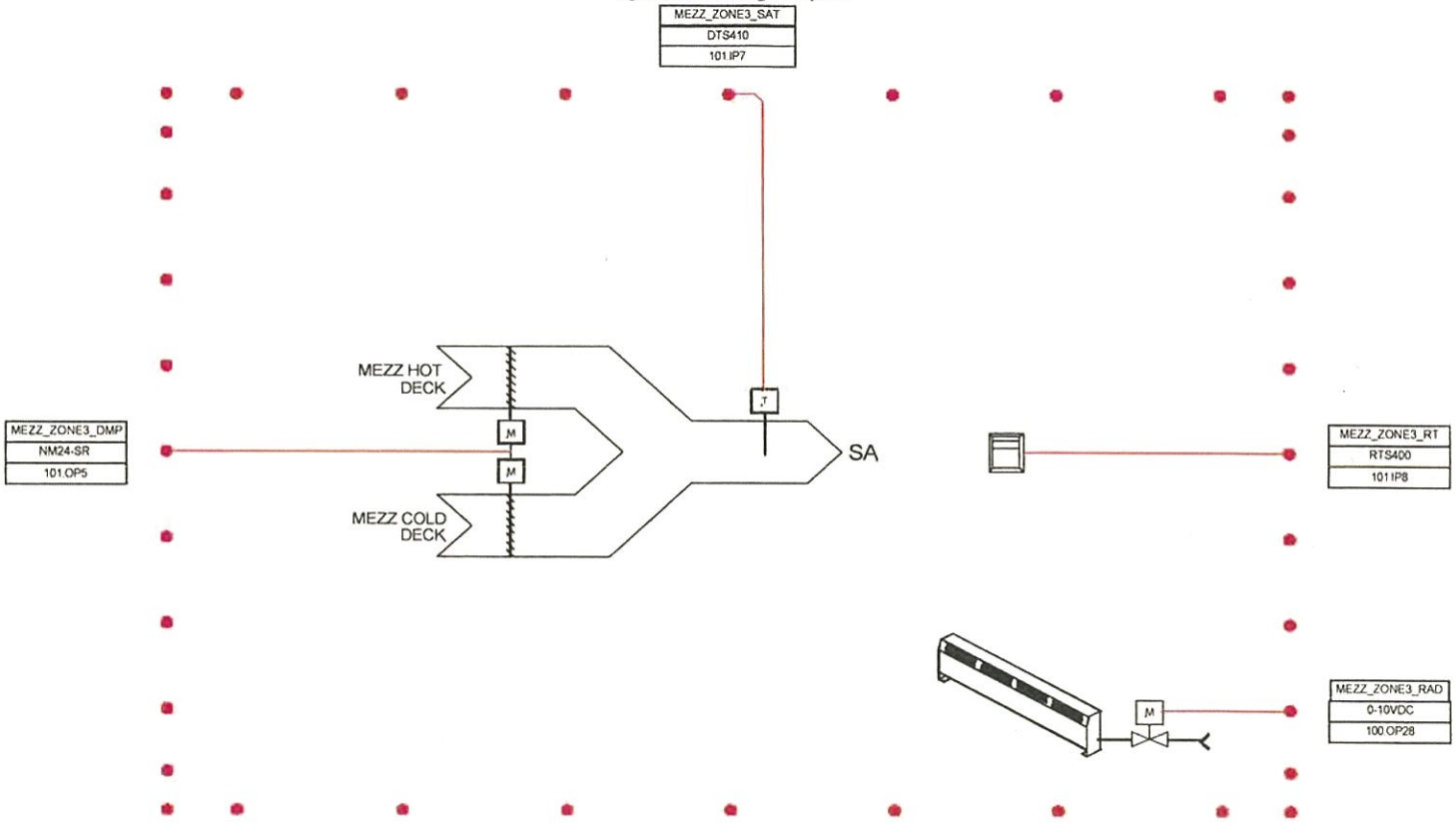
Project: 1088478 Date 19-Mar-09

Engineer: Wa Revision:

Delta CONTROLS

Harry Stevens Building

System Drawings Report



System:	MEZZ_ZONE3	**System Description:**	Mezzanine Zone 1 Dampers	**Control Panel:**	101
System Location:	Mezzanine Mechanical Room			**Local Panel:**	

ESC AUTOMATION

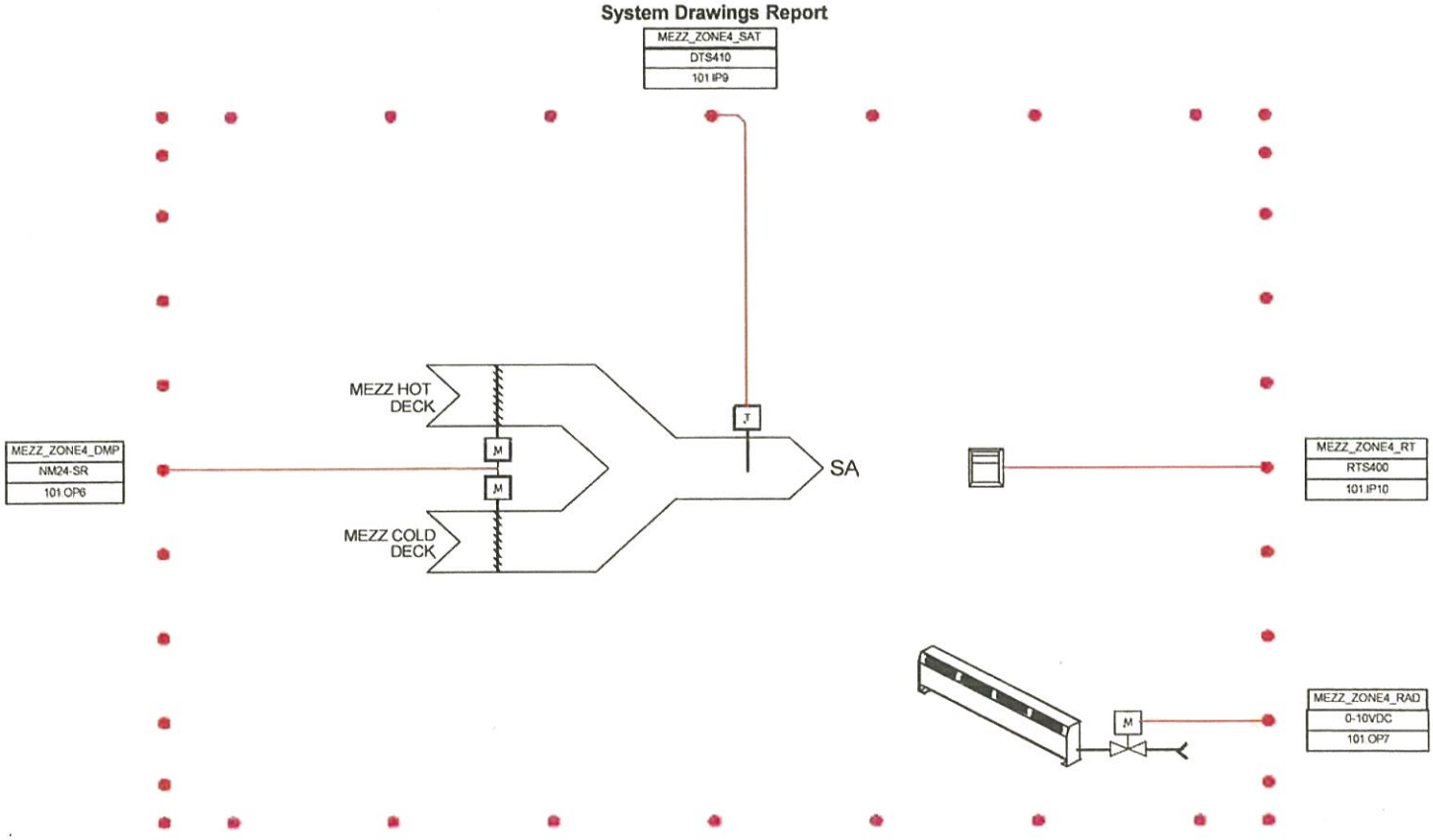
Project: 1088478 Date 19-Mar-09

Engineer: Wa Revision:

Delta CONTROLS

Harry Stevens Building

System Drawings Report



System:	MEZZ_ZONE4	**System Description:**	Mezzanine Zone 1 Dampers	**Control Panel:**	101
System Location:	Mezzanine Mechanical Room			**Local Panel:**	

ESC AUTOMATION

Project: 1088478 Date 19-Mar-09

Engineer: WWe Revision:

Delta CONTROLS

Harry Stevens Building

Control Panel Report

CP Panel: CP200 **LP Panel:** LP **Power Panel #:** **CP Model No** DSC-2424E

Mechanical Dwg: **Enclosure Model #:** **Power Circuit #:** **Exp. Slot #1:**EXP130

Exp. Slot #2:EXP161

CP Panel Location: Penthouse Mechanical Room **Exp. Slot #3:**EXP161

Point #	Descriptor	Field Part	Wiring Detail	Point #	Descriptor	Field Part	Wiring Detail
200.IP1	PENT_HDT	DTS410	TMP 10K Device	200.OP1	SPARE200_OP1		
200.IP2	PENT_ZONE4C_RT	RTS400	TMP 10K Device	200.OP2	PENT_HCV	EPT750	CTL EPT
200.IP3	PENT_ZONE2_CD_FB	0-10VDC	FBK Analog Input	200.OP3	PENT_CCV	EPT750	CTL EPT
200.IP4	PENT_ZONE2_HD_FB	0-10VDC	FBK Analog Input	200.OP4	PENT_ZONE1_DMP	NM24-SR	ACT Bel_MOD
200.IP5	PENT_ZONE1_SAT	DTS410	TMP 10K Device	200.OP5	PENT_ZONE2AB_DMP	NM24-SR	ACT Bel_MOD
200.IP6	PENT_ZONE1_RTS	RTS400	TMP 10K Device	200.OP6	PENT_ZONE3_DMP	NM24-SR	ACT Bel_MOD
200.IP7	PENT_ZONE2AB_SAT	DTS410	TMP 10K Device	200.OP7	SPARE200_OP7		
200.IP8	PENT_ZONE2A_RT	RTS400	TMP 10K Device	200.OP8	PENT_ZONE5_DMP	NM24-SR	ACT Bel_MOD
200.IP9	PENT_ZONE3_SAT	DTS410	TMP 10K Device	200.OP9	PENT_ZONE6AB_DMP	NM24-SR	ACT Bel_MOD
200.IP10	PENT_ZONE3B_RT	RTS400	TMP 10K Device	200.OP10	PENT_ZONE7_DMP	NM24-SR	ACT Bel_MOD
200.IP11	PENT_ZONE4B_CDFB	0-10VDC	FBK Analog Input	200.OP11	PENT_ZONE8AB_DMP	NM24-SR	ACT Bel_MOD
200.IP12	PENT_ZONE4B_HDFB	0-10VDC	FBK Analog Input	200.OP12	SPARE200_OP12		
200.IP13	PENT_ZONE5_SAT	DTS410	TMP 10K Device	200.OP13	PENT_ZONE10_DMP	NM24-SR	ACT Bel_MOD
200.IP14	PENT_ZONE5_RTS	RTS400	TMP 10K Device	200.OP14	PENT_ZONE11_DMP	NM24-SR	ACT Bel_MOD
200.IP15	PENT_ZONE6AB_SAT	DTS410	TMP 10K Device	200.OP15	PENT_ZONE4B_DMP	NM24-SR	ACT Bel_MOD
200.IP16	PENT_ZONE6A_RTS	RTS400	TMP 10K Device	200.OP16	PENT_ZONE4C_DMP	NM24-SR	ACT Bel_MOD
200.IP17	PENT_ZONE7_SAT	DTS410	TMP 10K Device	200.OP17	PENT_ZONE2A_RAD	0-10VDC	VLV Bel_MOD
200.IP18	PENT_ZONE7B_RTS	RTS400	TMP 10K Device	200.OP18	PENT_ZONE2B_RAD	0-10VDC	VLV Bel_MOD
200.IP19	PENT_ZONE8AB_SAT	DTS410	TMP 10K Device	200.OP19	PENT_ZONE3A_RAD	0-10VDC	VLV Bel_MOD
200.IP20	PENT_ZONE8A_RT	RTS400	TMP 10K Device	200.OP20	PENT_ZONE6A_RAD	0-10VDC	VLV Bel_MOD
200.IP21	PENT_ZONE8_CD_FB	0-10VDC	FBK Analog Input	200.OP21	PENT_ZONE8A_RAD	0-10VDC	VLV Bel_MOD
200.IP22	PENT_ZONE8_HD_FB	0-10VDC	FBK Analog Input	200.OP22	PENT_ZONE10_RAD	0-10VDC	VLV Bel_MOD
200.IP23	PENT_ZONE10_SAT	DTS410	TMP 10K Device	200.OP23	PENT_ZONE11_RAD	0-10VDC	VLV Bel_MOD
200.IP24	PENT_ZONE10_RTS	RTS400	TMP 10K Device	200.OP24	PENT_ZONE6A_DMP	NM24-SR	ACT Bel_MOD
200.IP25	PENT_ZONE11_SAT	DTS410	TMP 10K Device	200.OP25	PENT_ZONE6B_DMP	NM24-SR	ACT Bel_MOD
200.IP26	PENT_ZONE11_RTS	RTS400	TMP 10K Device	200.OP26	PENT_ZONE8A_DMP	NM24-SR	ACT Bel_MOD
200.IP27	PENT_ZONE4B_SAT	DTS410	TMP 10K Device	200.OP27	PENT_ZONE8B_DMP	NM24-SR	ACT Bel_MOD
200.IP28	PENT_ZONE4B_RTS	RTS400	TMP 10K Device	200.OP28	PENT_ZONE2A_DMP	NM24-SR	ACT Bel_MOD
200.IP29	PENT_AHU_CO2	90-DM3A-D-T	GAS Vulcain	200.OP29	PENT_ZONE2B_DMP	NM24-SR	ACT Bel_MOD
200.IP30	PENT_ZONE2B_RT	RTS400	TMP 10K Device	200.OP30	PENT_ZONE8B_RAD	0-10VDC	VLV Bel_MOD
200.IP31	OAT_WEST	OTS430	TMP 10K Device	200.OP31	PENT_ZONE3A_DMP	NM24-SR	ACT Bel_MOD
200.IP32	OAT_EAST	OTS430	TMP 10K Device	200.OP32	FCU_3B_RAD	0-10VDC	VLV Bel_MOD
200.IP33	OUTDOOR_LIGHT	0-5VDC	FBK Analog Input	200.OP33	PENT_ZONE10A_DMP	NM24-SR	ACT Bel_MOD
200.IP34	PENT_ZONE4C_SAT	DTS410	TMP 10K Device	200.OP34	PENT_ZONE7_RAD	0-10VDC	VLV Bel_MOD
200.IP35	SPARE200_IP35			200.OP35	PENT_ZONE6B_RAD	0-10VDC	VLV Bel_MOD
200.IP36	PENT_ZONE8B_RT	RTS400	TMP 10K Device	200.OP36	OA_RA_CO2_SEL	M15MAH12DC	CTL Dry Output

Harry Stevens Building

Control Panel Report

CP Panel: CP200 **LP Panel:** LP **Power Panel #:** **CP Model No** DSC-2424E

Mechanical Dwg: **Enclosure Model #:** **Power Circuit #:** **Exp. Slot #1:**EXP130

Exp. Slot #2:EXP161

CP Panel Location: Penthouse Mechanical Room **Exp. Slot #3:**EXP161

200.IP37	PENT_ZONE6B_RTS	RTS400	TMP 10K Device	200.OP37	RAOA_SA_CO2_SEL	M15MAH12DC	CTL Dry Output
200.IP38	PENT_ZONE3A_RT	RTS400	TMP 10K Device	200.OP38	SPARE200_OP38		
200.IP39	PENT_CDT	DTS410	TMP 10K Device	200.OP39	SPARE200_OP39		
200.IP40	PENT_ZONE7_RTS	RTS400	TMP 10K Device	200.OP40	SPARE200_OP40		

Harry Stevens Building

Control Panel Report

CP Panel: CP201 **LP Panel:** LP **Power Panel #:** **CP Model No** DSC-1616H

Mechanical Dwg: **Enclosure Model #:** **Power Circuit #:** **Exp. Slot #1:**

Exp. Slot #2:

CP Panel Location: Penthouse Mechanical Room **Exp. Slot #3:**

Point #	Descriptor	Field Part	Wiring Detail	Point #	Descriptor2	Field Part	Wiring Detail
201.IP1	WORK303_RT	RTS400	TMP 10K Device	201.OP1	WORK303_RAD	0-10VDC	ACT Bel_MOD
201.IP2	WORK303B_RT	RTS400	TMP 10K Device	201.OP2	WORK303_DMP	NM24-SR	ACT Bel_MOD
201.IP3	EAST_SOLAR	0-5VDC		201.OP3	WORK303B_DMP	NM24-SR	ACT Bel_MOD
201.IP4	SOUTH_SOLAR	0-5VDC		201.OP4	OFF310_RAD	0-10VDC	ACT Bel_MOD
201.IP5	WEST_SOLAR	0-5VDC		201.OP5	OFF319_RAD	0-10VDC	ACT Bel_MOD
201.IP6	SE_SOLAR	0-5VDC		201.OP6	PENT_ZONE4A_RAD	0-10VDC	ACT Bel_MOD
201.IP7	SW_SOLAR	0-5VDC		201.OP7	PENT_ZONE4A_DMP	NM24-SR	ACT Bel_MOD
201.IP8	PENT_OA_INTAKE	DTS410	TMP 10K Device	201.OP8	PENT_ZONE4A1_DMP	NM24-SR	ACT Bel_MOD
201.IP9	OFF310_RT	RTS400	TMP 10K Device	201.OP9	PENT_ZONE9_RAD	0-10VDC	VLV Bel_MOD
201.IP10	OFF319_RT	RTS400	TMP 10K Device	201.OP10	PENT_ZONE9_DMP	NM24-SR	ACT Bel_MOD
201.IP11	PENT_ZONE4A_SAT	DTS410	TMP 10K Device	201.OP11	SPARE201_OP11		
201.IP12	PENT_ZONE4A1_RT	RTS400	TMP 10K Device	201.OP12	SPARE201_OP12		
201.IP13	PENT_ZONE9_SAT	DTS410	TMP 10K Device	201.OP13	SPARE201_OP13		
201.IP14	PENT_ZONE9_RT	RTS400	TMP 10K Device	201.OP14	SPARE201_OP14		
201.IP15	PENT_ZONE2A_RTS	RTS400	TMP 10K Device	201.OP15	SPARE201_OP15		
201.IP16	SPARE201_IP16			201.OP16	SPARE201_OP16		

Harry Stevens Building

Control Panel Report

CP Panel: CP1606 **LP Panel:** LP **Power Panel #:** **CP Model No** DSC-1280

Mechanical Dwg: **Enclosure Model #:** **Power Circuit #:** **Exp. Slot #1:**

Exp. Slot #2:

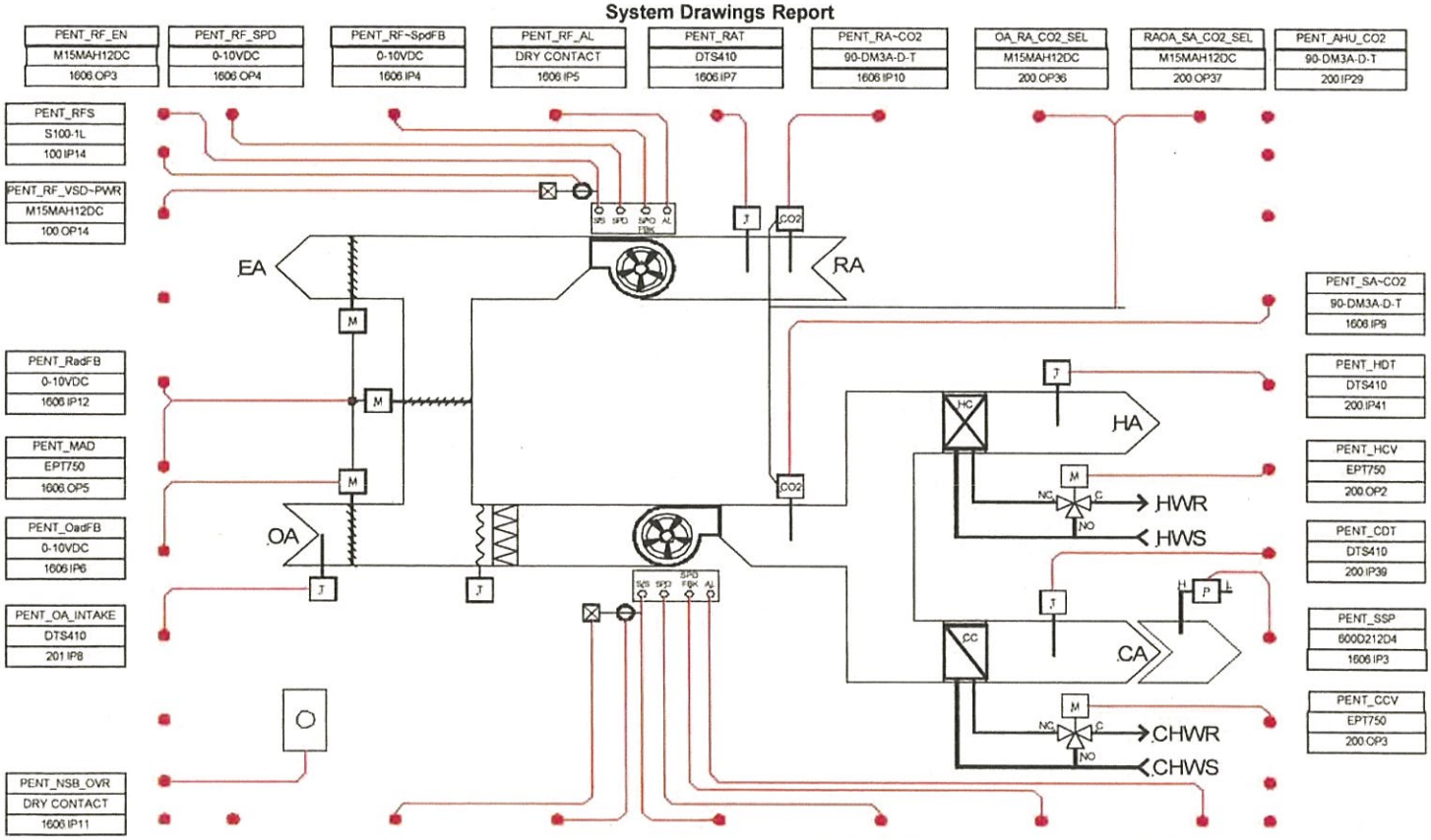
CP Panel Location: Penthouse Mechanical Room **Exp. Slot #3:**

Point #	Description	Field Part	Wiring Detail
1606.IP1	PENT_SF~SpdFB	0-10VDC	CTL VSD
1606.IP2	PENT_SF_AL	DRY CONTACT	CTL VSD
1606.IP3	PENT_SSP	600D212D4	PRE Auto600
1606.IP4	PENT_RF~SpdFB	0-10VDC	CTL VSD
1606.IP5	PENT_RF_AL	DRY CONTACT	CTL VSD
1606.IP6	PENT_OadFB	0-10VDC	ACT Bel_MOD_F
1606.IP7	PENT_RAT	DTS410	TMP 10K Device
1606.IP8	PENT_MAT	TSFC204T10	TMP 10K Device
1606.IP9	PENT_SA~CO2	90-DM3A-D-T	GAS Vulcain
1606.IP10	PENT_RA~CO2	90-DM3A-D-T	GAS Vulcain
1606.IP11	PENT_NSB_OVR	DRY CONTACT	FBK Dry Contact
1606.IP12	PENT_RadFB	0-10VDC	ACT Bel_MOD_F

Point #	Description	Field Part	Wiring Detail
1606.OP1	PENT_SF_EN	M15MAH12DC	CTL VSD
1606.OP2	PENT_SF_SPD	0-10VDC	CTL VSD
1606.OP3	PENT_RF_EN	M15MAH12DC	CTL VSD
1606.OP4	PENT_RF_SPD	0-10VDC	CTL VSD
1606.OP5	PENT_MAD	EPT750	CTL EPT
1606.OP6	SPARE1606_OP6		
1606.OP7	SPARE1606_OP7		
1606.OP8	SPARE1606_OP8		

Harry Stevens Building

System Drawings Report



System: PENT_AHU **System Description:** Penthouse Dual Deck Air Handling Unit **Control Panel:** 200

System Location: Penthouse Mechanical Room **Local Panel:**

ESC AUTOMATION

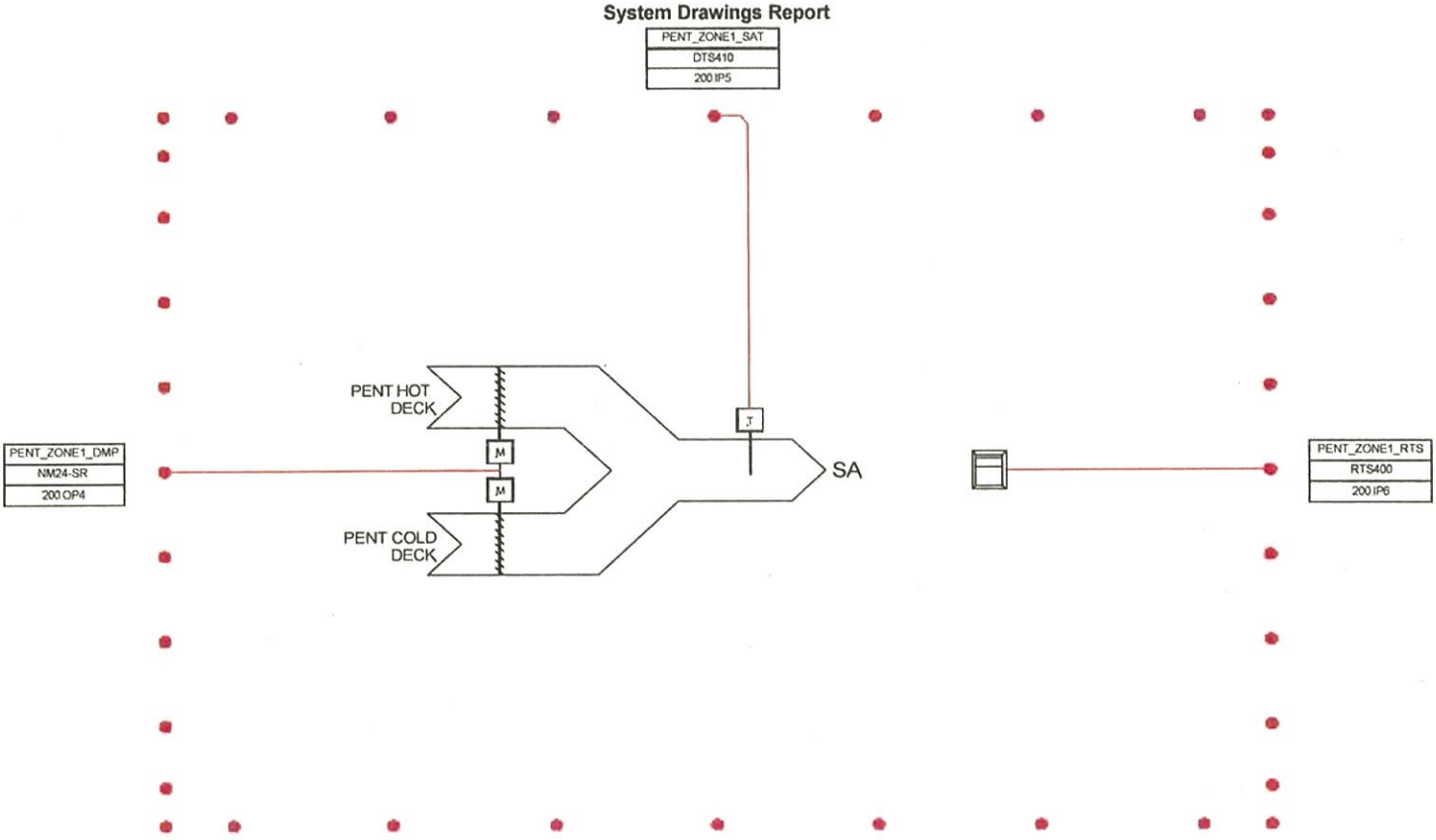
Project: 1088478 Date 19-Mar-09

Engineer: Wa Revision:

Delta CONTROLS

Harry Stevens Building

System Drawings Report



System:	PENT_ZONE1	**System Description:**	Penthouse Zone 1 Dampers	**Control Panel:**	200
System Location:	Penthouse Mechanical Room			**Local Panel:**	

ESC AUTOMATION

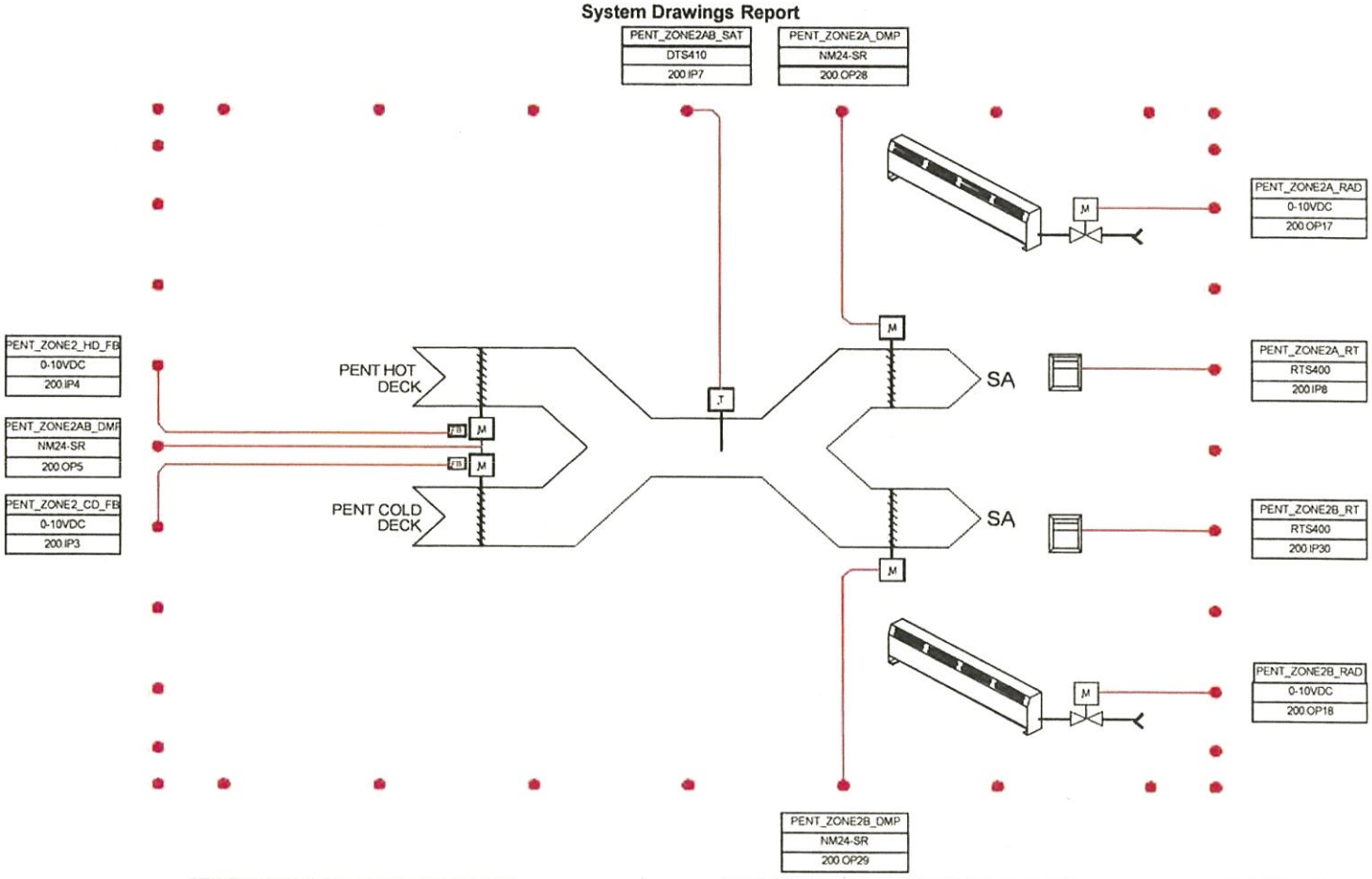
Project: 1088478 Date 19-Mar-09

Engineer: Wa Revision:

Delta CONTROLS

Harry Stevens Building

System Drawings Report



System:	PENT_ZONE2	**System Description:**	Penthouse Zone 2 Dampers	**Control Panel:**	200
System Location:	Penthouse Mechanical Room			**Local Panel:**	

ESC AUTOMATION

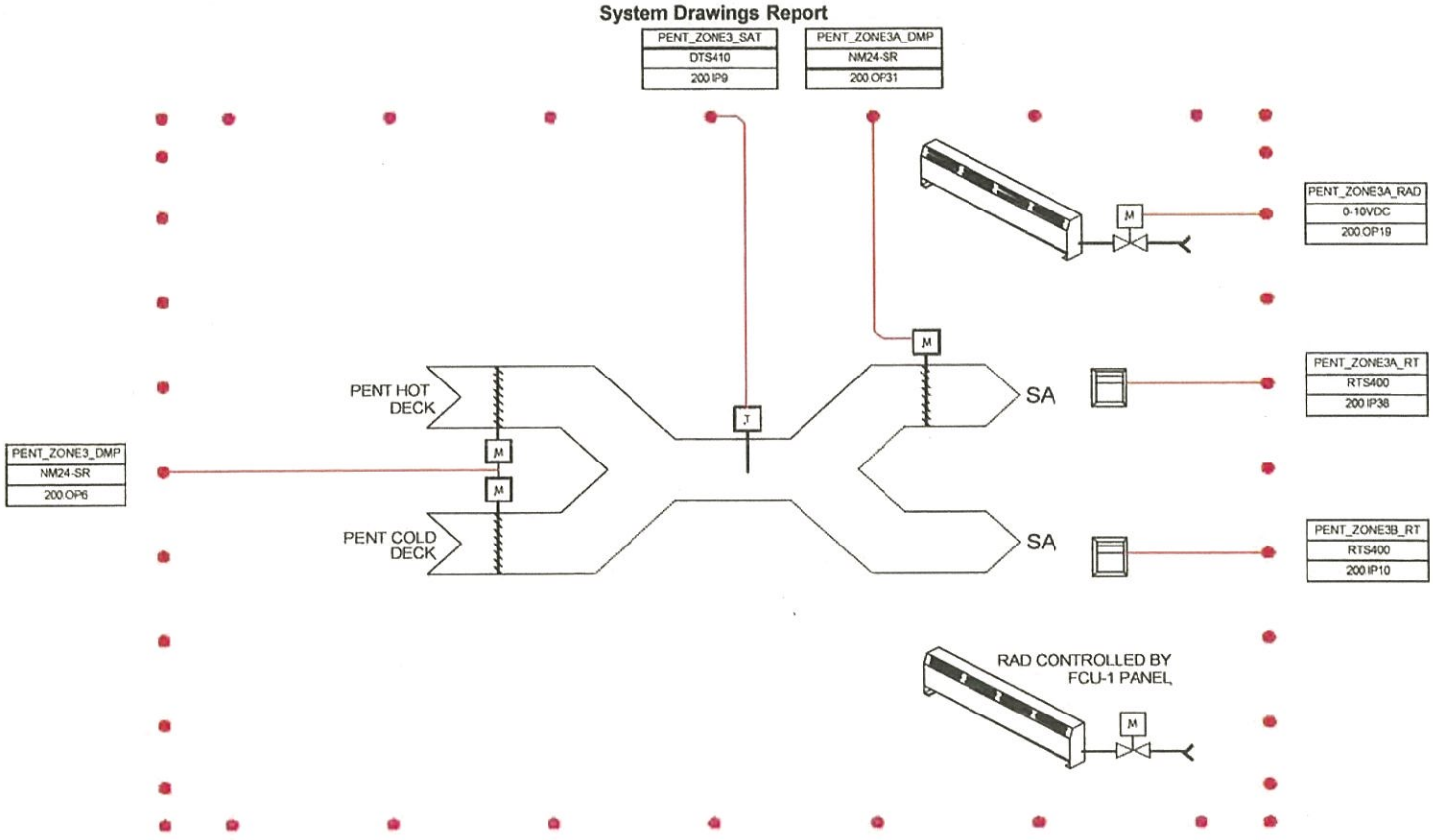
Project: 1088478 Date 19-Mar-09

Engineer: Wa Revision:

Delta CONTROLS

Harry Stevens Building

System Drawings Report



System:	PENT_ZONE3	**System Description:**	Penthouse Zone 3 Dampers	**Control Panel:**	200
System Location:	Penthouse Mechanical Room			**Local Panel:**	

ESC AUTOMATION

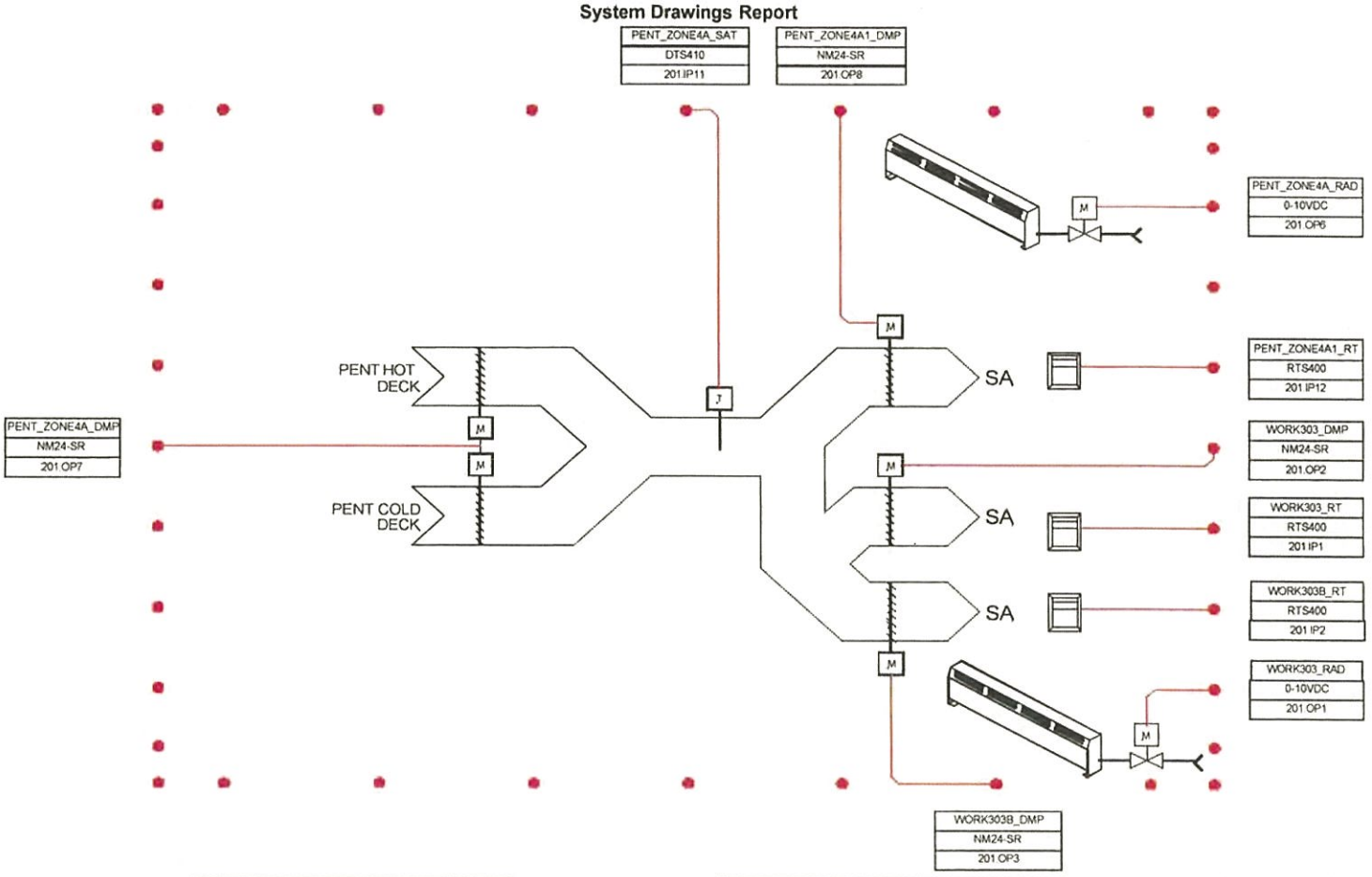
Project: 1088478 Date 19-Mar-09

Engineer: Wa Revision:

Delta CONTROLS

Harry Stevens Building

System Drawings Report



System: PENT_ZONE4A **System Description:** Penthouse Zone 4A Dampers **Control Panel:** 201

System Location: Penthouse Mechanical Room **Local Panel:**

ESC AUTOMATION

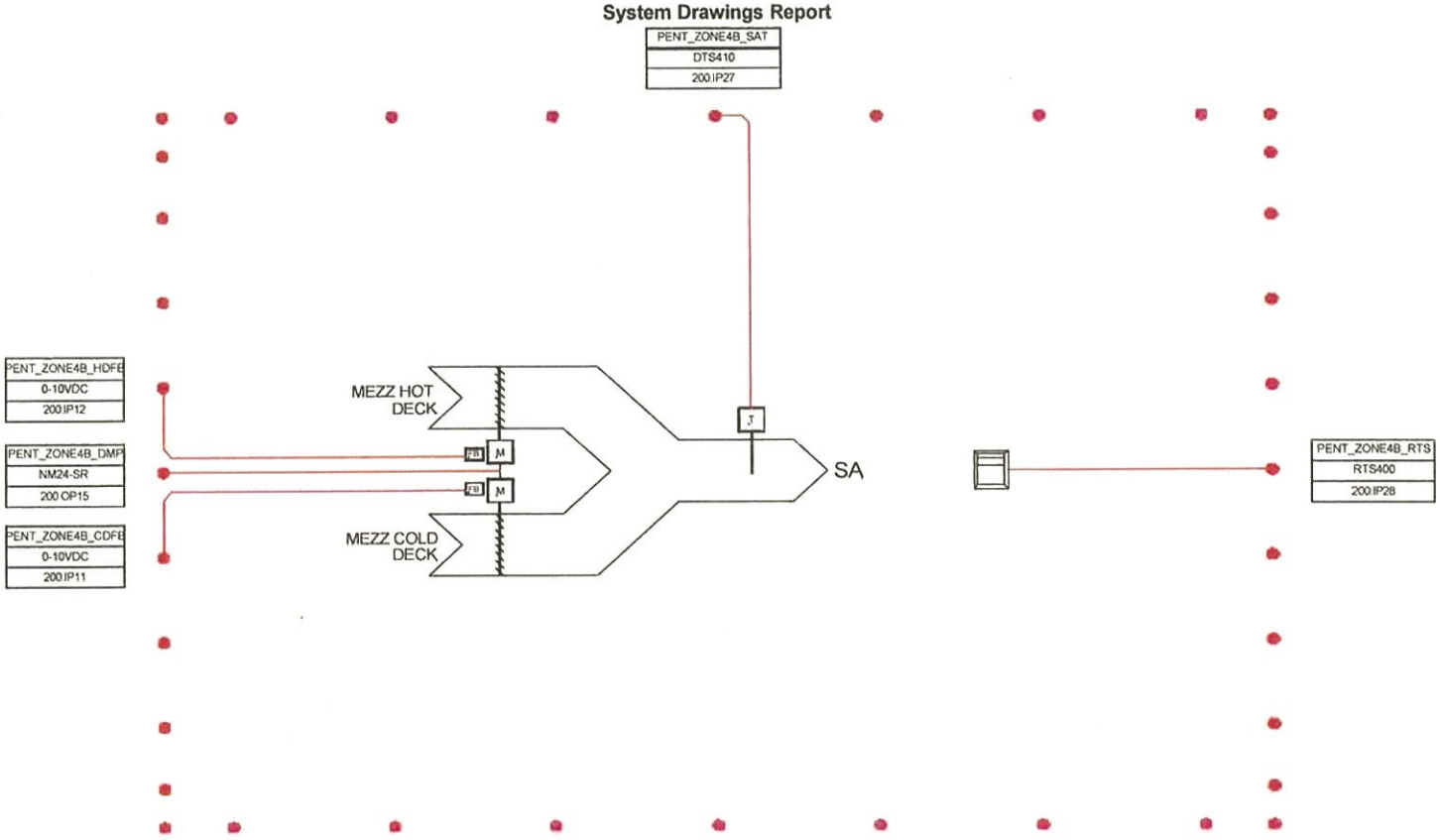
Project: 1088478 Date 19-Mar-09

Engineer: Vwa Revision:

Delta CONTROLS

Harry Stevens Building

System Drawings Report



System:	PENT_ZONE4B	**System Description:**	Penthouse Zone 4B Dampers	**Control Panel:**	200
System Location:	Penthouse Mechanical Room			**Local Panel:**	

ESC AUTOMATION

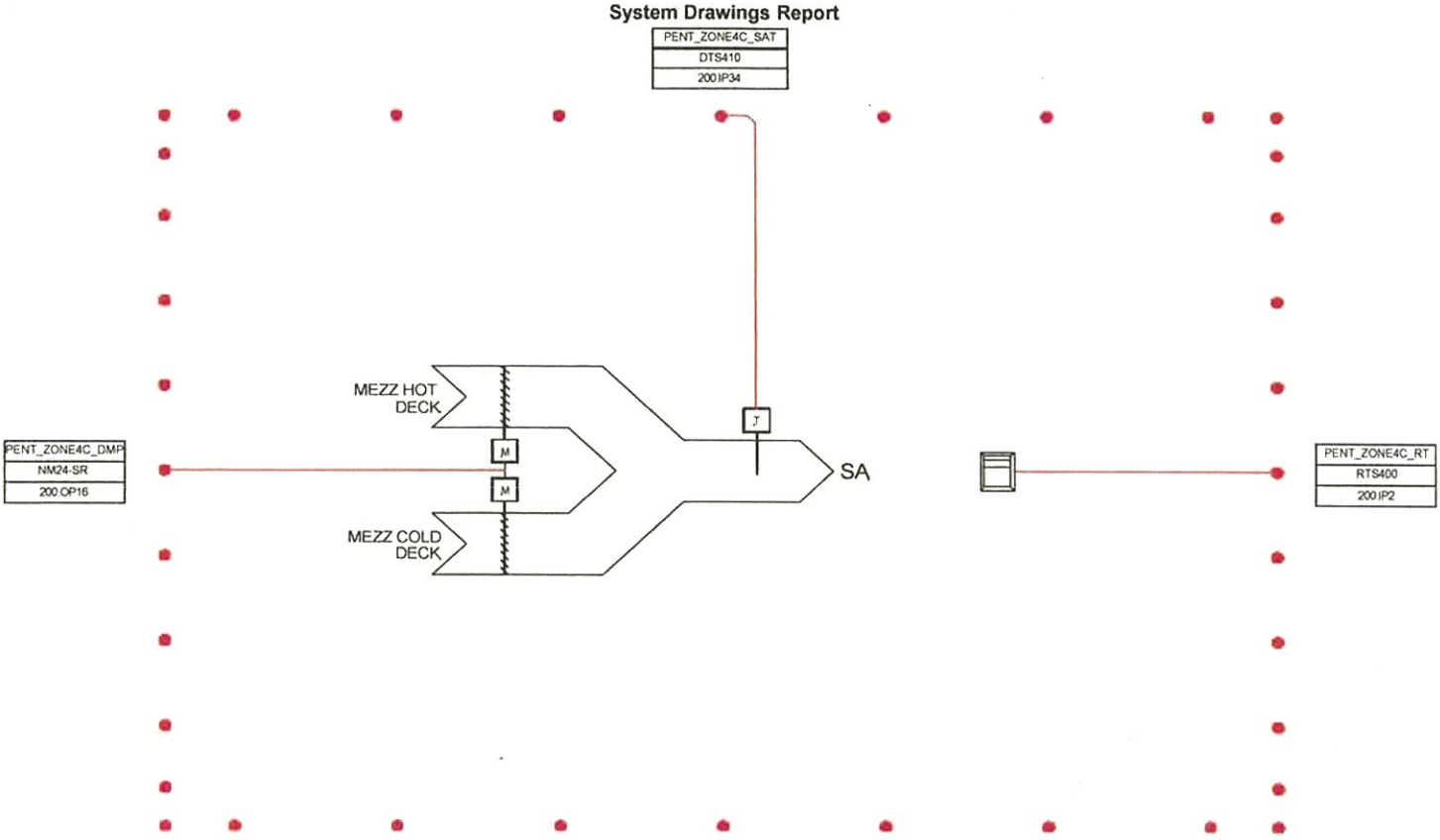
Project: 1088478 Date 19-Mar-09

Engineer: We Revision:

Delta CONTROLS

Harry Stevens Building

System Drawings Report



System:	PENT_ZONE4C	**System Description:**	Penthouse Zone 4C Dampers	**Control Panel:**	200
System Location:	Penthouse Mechanical Room			**Local Panel:**	

ESC AUTOMATION

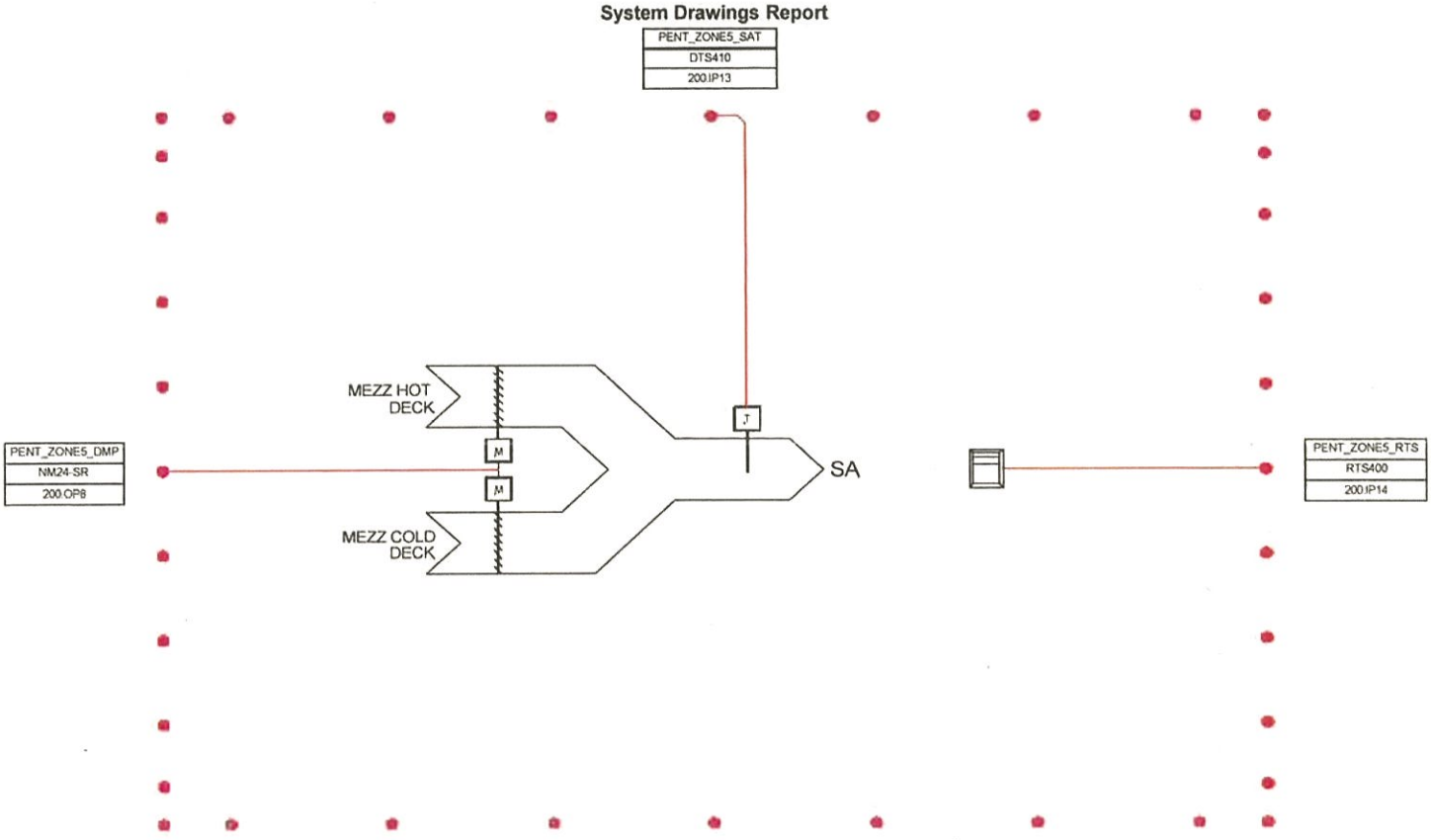
Project: 1088478 Date 19-Mar-09

Engineer: Wa Revision:

Delta controls

Harry Stevens Building

System Drawings Report



System:	PENT_ZONE5	**System Description:**	Penthouse Zone 5 Dampers	**Control Panel:**	200
System Location:	Penthouse Mechanical Room			**Local Panel:**	

ESC AUTOMATION

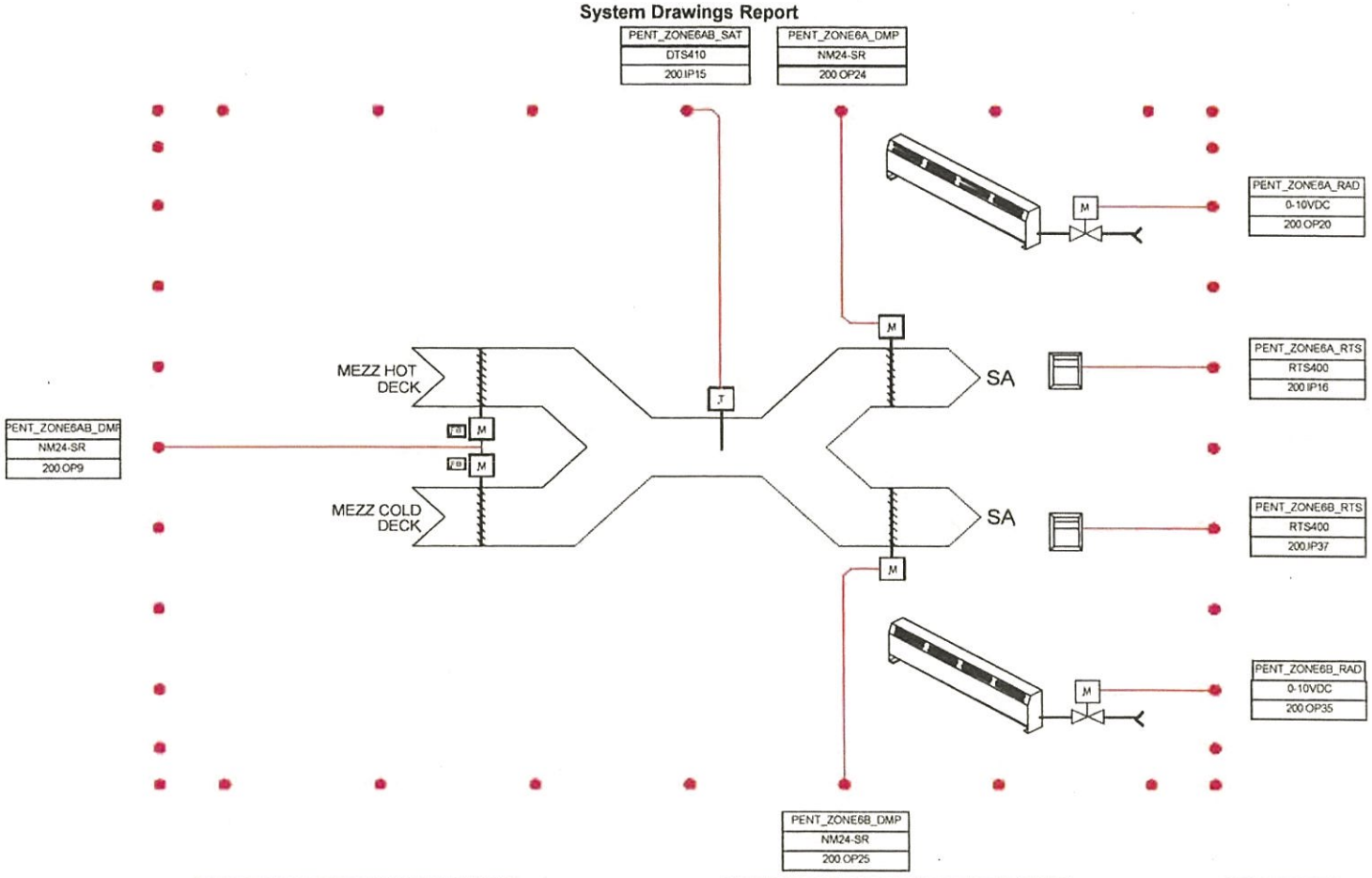
Project: 1088478 Date 19-Mar-09

Engineer: Wa Revision

Delta CONTROLS

Harry Stevens Building

System Drawings Report



System:	PENT_ZONE6	**System Description:**	Penthouse Zone 6 Dampers	**Control Panel:**	200
System Location:	Penthouse Mechanical Room			**Local Panel:**	

ESC AUTOMATION

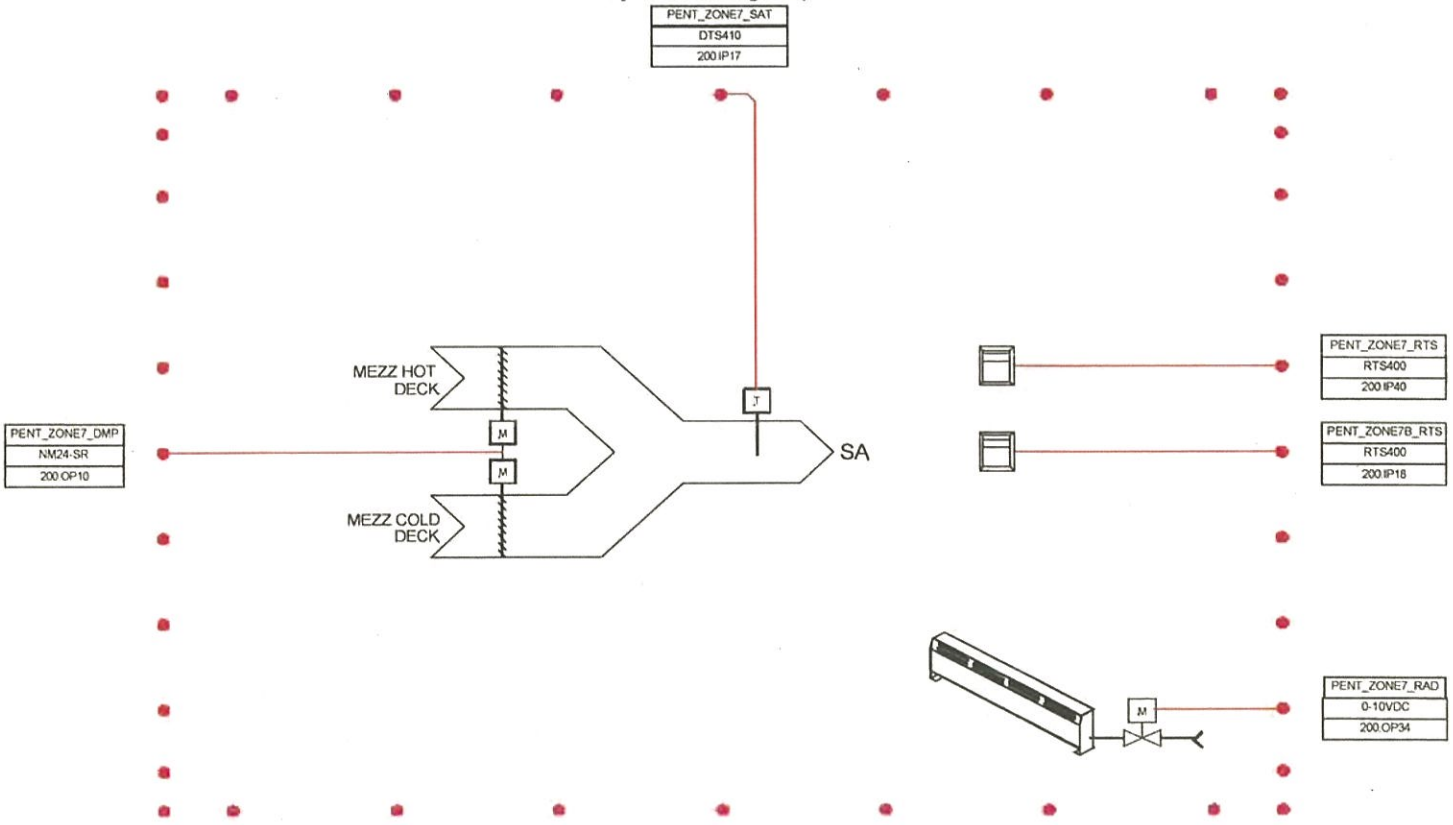
Project: 1088478 Date 19-Mar-09

Engineer: Wa Revision:

Delta CONTROLS

Harry Stevens Building

System Drawings Report



System:	PENT_ZONE7	**System Description:**	Penthouse Zone 7 Dampers	**Control Panel:**	200
System Location:	Penthouse Mechanical Room			**Local Panel:**	

ESC AUTOMATION

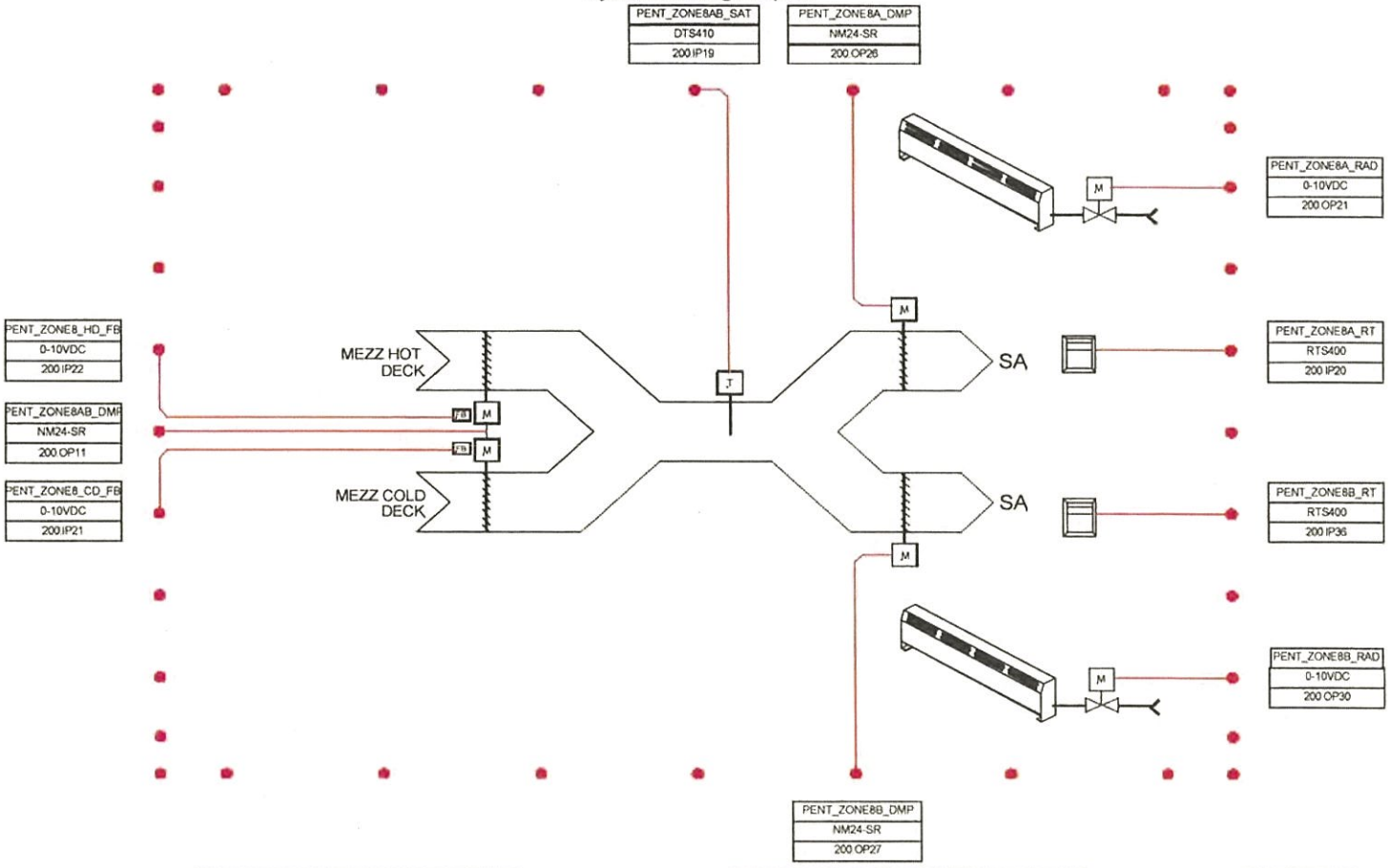
Project: 1088478 Date 19-Mar-09

Engineer: Wa Revision:

Delta CONTROLS

Harry Stevens Building

System Drawings Report



System:	PENT_ZONE8	**System Description:**	Penthouse Zone 8 Dampers	**Control Panel:**	200
System Location:	Penthouse Mechanical Room			**Local Panel:**	

ESC AUTOMATION

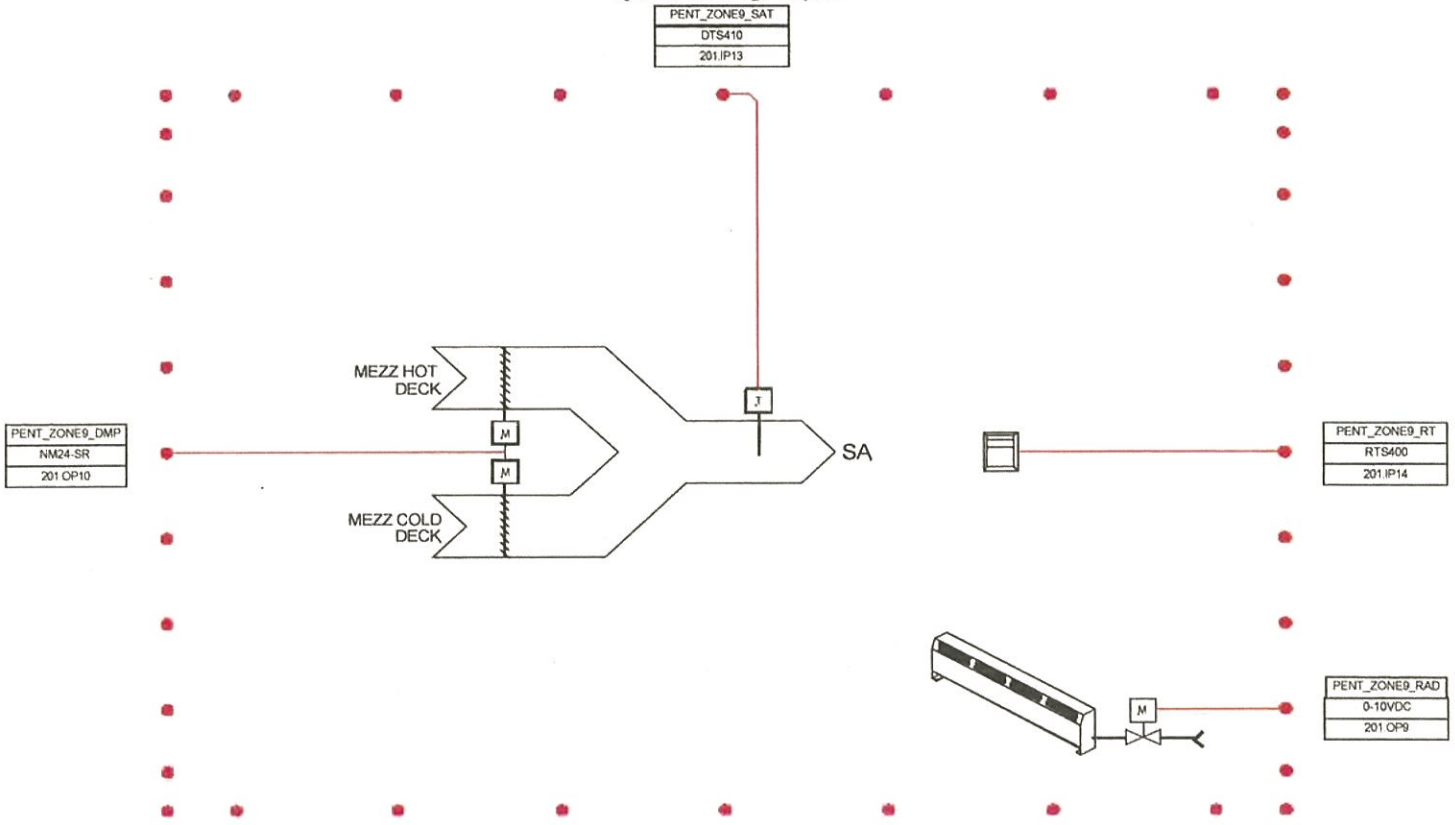
Project: 1088478 Date 19-Mar-09

Engineer: Wa Revision:

Delta controls

Harry Stevens Building

System Drawings Report



System:	PENT_ZONE9	**System Description:**	Penthouse Zone 9 Dampers	**Control Panel:**	201
System Location:	Penthouse Mechanical Room			**Local Panel:**	

ESC AUTOMATION

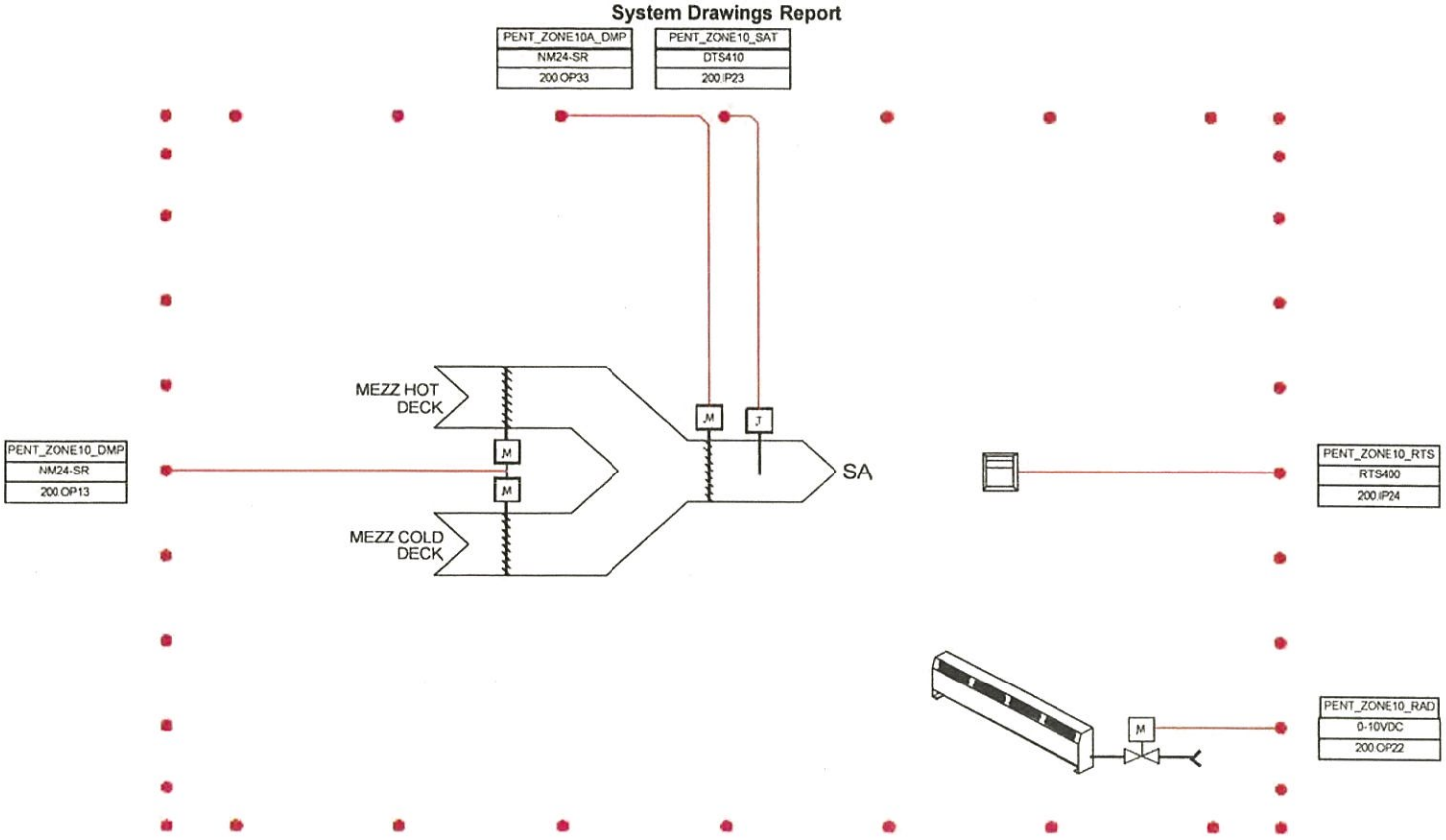
Project: 1088478 Date 19-Mar-09

Engineer: WWa Revision:

Delta CONTROLS

Harry Stevens Building

System Drawings Report



System:	PENT_ZONE10	**System Description:**	Penthouse Zone 10 Dampers	**Control Panel:**	200
System Location:	Penthouse Mechanical Room			**Local Panel:**	

ESC AUTOMATION

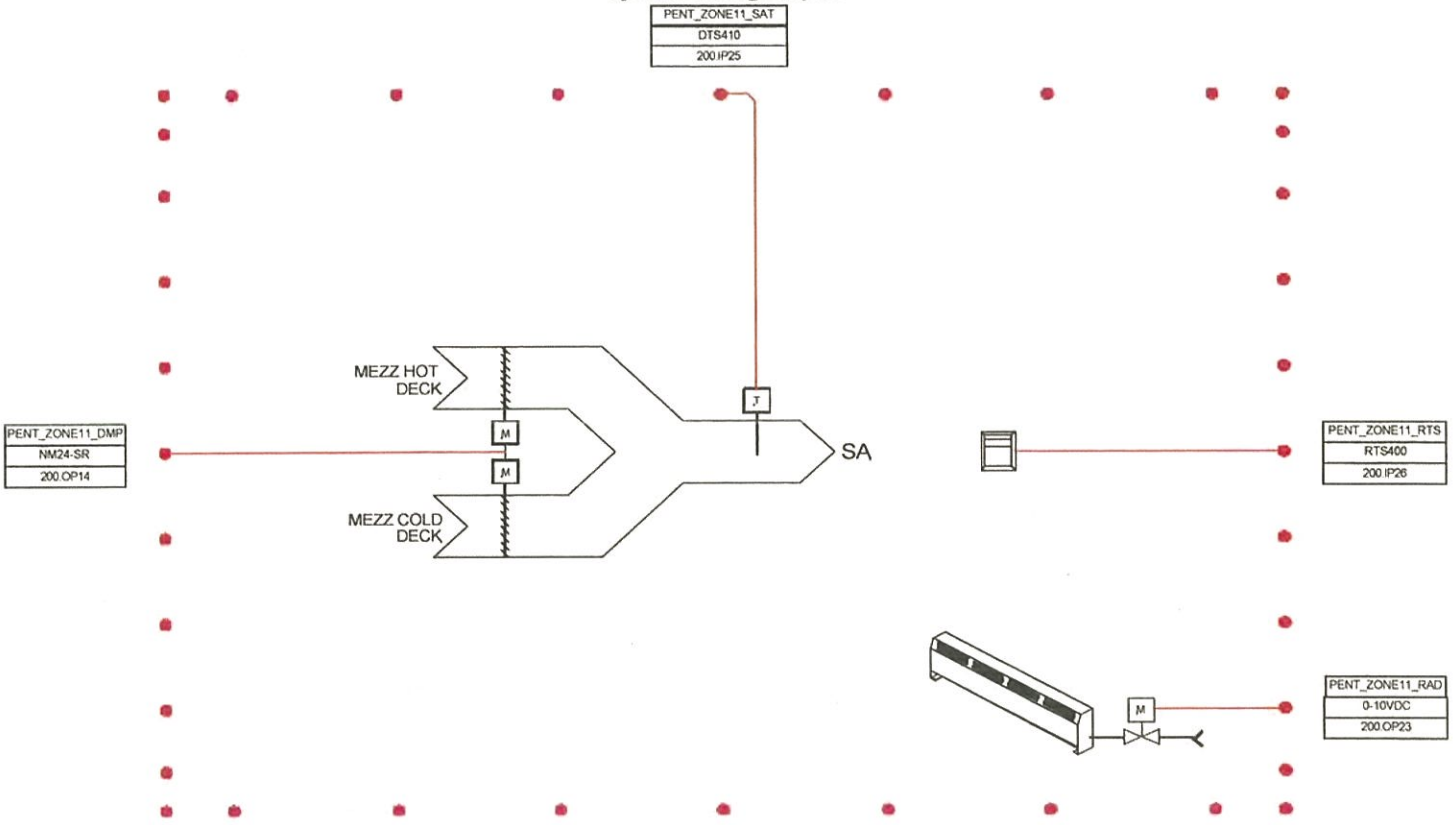
Project: 1088478 Date 19-Mar-09

Engineer: Wa Revision:

Delta CONTROLS

Harry Stevens Building

System Drawings Report



System:	PENT_ZONE11	**System Description:**	Penthouse Zone 11 Dampers	**Control Panel:**	200
System Location:	Penthouse Mechanical Room			**Local Panel:**	

ESC AUTOMATION

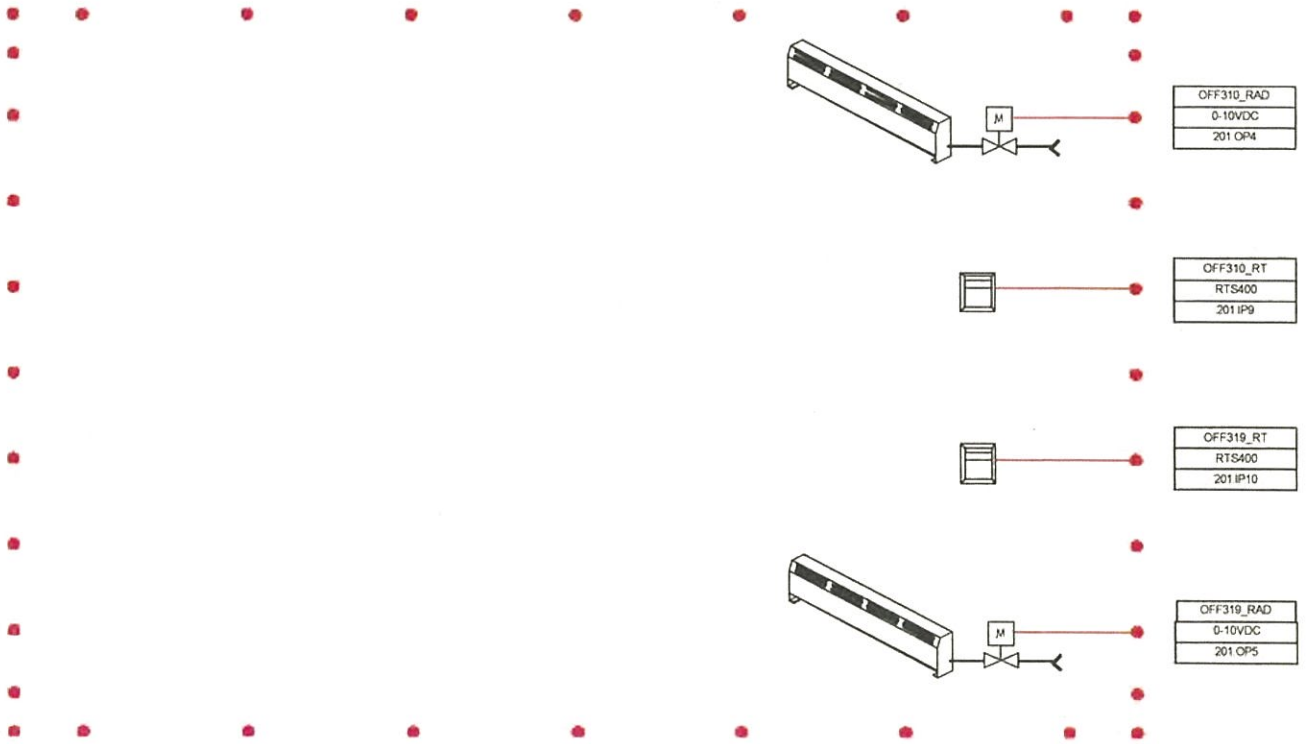
Project: 1088478 Date 19-Mar-09

Engineer: WA Revision:

Delta CONTROLS

Harry Stevens Building

System Drawings Report



System:	OFF_RAD	**System Description:**	Penthouse Zone 4A Dampers	**Control Panel:**	201
System Location:	Offices 310 and 319			**Local Panel:**	

ESC AUTOMATION

Project: 1088478 Date 19-Mar-09

Engineer: Wa Revision:

Delta CONTROLS

Harry Stevens Building

System Drawings Report

System:	SOLAR	**System Description:**	Solar Points	**Control Panel:**	201
System Location:	Penthouse Mechanical Room			**Local Panel:**	

ESC AUTOMATION

Project: 1088478 Date 19-Mar-09

Engineer: Wa Revision:

Delta CONTROLS

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Control Panel Report

CP Panel: CP1602 **LP Panel:** LP **Power Panel #:** **CP Model No** DLC-312

Mechanical Dwg: **Enclosure Model #:** **Power Circuit #:** **Exp. Slot #1:**

Exp. Slot #2:

CP Panel Location: Level 1 Closet West Stair **Exp. Slot #3:**

Point #	Descriptor	Field Part	Wiring Detail
1602.IP1	SPARE1602_AI1		
1602.IP2	SPARE1602_BI2		
1602.IP3	SPARE1602_BI3		
1602.IP4	SPARE1602_BI4		

Point #	Descriptor	Field Part	Wiring Detail
1602.OP1	Floor 1A LTG	TERM PT	LTG_DLC_OP
1602.OP2	Floor 1B LTG	TERM PT	LTG_DLC_OP
1602.OP3	SPARE1602_OP3		
1602.OP4	SPARE1602_OP4		
1602.OP5	SPARE1602_OP5		
1602.OP6	SPARE1602_OP6		
1602.OP7	SPARE1602_OP7		
1602.OP8	SPARE1602_OP8		
1602.OP9	SPARE1602_OP9		
1602.OP10	SPARE1602_OP10		
1602.OP11	SPARE1602_OP11		
1602.OP12	SPARE1602_OP12		

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Control Panel Report

CP Panel: CP1603 **LP Panel:** LP **Power Panel #:** **CP Model No** DLC-312

Mechanical Dwg: **Enclosure Model #:** **Power Circuit #:** **Exp. Slot #1:**

Exp. Slot #2:

CP Panel Location: Level 2 Panel BD Lighting **Exp. Slot #3:**

Point #	Descriptor	Field Part	Wiring Detail
1603.IP1	SPARE1603_AI1		
1603.IP2	SPARE1603_BI2		
1603.IP3	SPARE1603_BI3		
1603.IP4	SPARE1603_BI4		

Point #	Descriptor	Field Part	Wiring Detail
1603.OP1	Floor 2 BD_A Ltg	TERM PT	LTG_DLC_OP
1603.OP2	Floor 2 BD_B Ltg	TERM PT	LTG_DLC_OP
1603.OP3	SPARE1603_OP3		
1603.OP4	SPARE1603_OP4		
1603.OP5	SPARE1603_OP5		
1603.OP6	SPARE1603_OP6		
1603.OP7	SPARE1603_OP7		
1603.OP8	SPARE1603_OP8		
1603.OP9	SPARE1603_OP9		
1603.OP10	SPARE1603_OP10		
1603.OP11	SPARE1603_OP11		
1603.OP12	SPARE1603_OP12		

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Control Panel Report

CP Panel: CP1604 **LP Panel:** LP **Power Panel #:** **CP Model No** DLC-312

Mechanical Dwg: **Enclosure Model #:** **Power Circuit #:** **Exp. Slot #1:**

Exp. Slot #2:

CP Panel Location: Level 3 Panel CD Lighting **Exp. Slot #3:**

Point #	Descriptor	Field Part	Wiring Detail
1604.IP1	SPARE1604_AI1		
1604.IP2	SPARE1604_BI2		
1604.IP3	SPARE1604_BI3		
1604.IP4	SPARE1604_BI4		

Point #	Descriptor	Field Part	Wiring Detail
1604.OP1	Floor 3 CD_A Ltg	TERM PT	LTG_DLC_OP
1604.OP2	Floor 3 CD_B Ltg	TERM PT	LTG_DLC_OP
1604.OP3	Floor 3 CF_A Ltg	TERM PT	LTG_DLC_OP
1604.OP4	Floor 3 CF_B Ltg	TERM PT	LTG_DLC_OP
1604.OP5	Floor 3 CB_A Ltg	TERM PT	LTG_DLC_OP
1604.OP6	Floor 3 CB_B Ltg	TERM PT	LTG_DLC_OP
1604.OP7	SPARE_1604_OP7		
1604.OP8	SPARE_1604_OP8		
1604.OP9	SPARE_1604_OP9		
1604.OP10	SPARE_1604_OP10		
1604.OP11	SPARE_1604_OP11		
1604.OP12	SPARE_1604_OP12		

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Control Panel Report

CP Panel: CP1607 **LP Panel:** LP **Power Panel #:** **CP Model No** DLC-312

Mechanical Dwg: **Enclosure Model #:** **Power Circuit #:** **Exp. Slot #1:**

Exp. Slot #2:

CP Panel Location: Level 2 Panel BF Lighting **Exp. Slot #3:**

Point #	Descriptor	Field Part	Wiring Detail
1607.IP1	SPARE1607_AI1		
1607.IP2	SPARE1607_BI2		
1607.IP3	SPARE1607_BI3		
1607.IP4	SPARE1607_BI4		

Point #	Descriptor	Field Part	Wiring Detail
1607.OP1	Floor 2 BF_A Ltg	TERM PT	LTG_DLC_OP
1607.OP2	Floor 2 BF_B Ltg	TERM PT	LTG_DLC_OP
1607.OP3	SPARE1607_OP3		
1607.OP4	SPARE1607_OP4		
1607.OP5	SPARE1607_OP5		
1607.OP6	SPARE1607_OP6		
1607.OP7	SPARE1607_OP7		
1607.OP8	SPARE1607_OP8		
1607.OP9	SPARE1607_OP9		
1607.OP10	SPARE1607_OP10		
1607.OP11	SPARE1607_OP11		
1607.OP12	SPARE1607_OP12		

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Control Panel Report

CP Panel: CP1608 **LP Panel:** LP **Power Panel #:** **CP Model No** DLC-312

Mechanical Dwg: **Enclosure Model #:** **Power Circuit #:** **Exp. Slot #1:**

Exp. Slot #2:

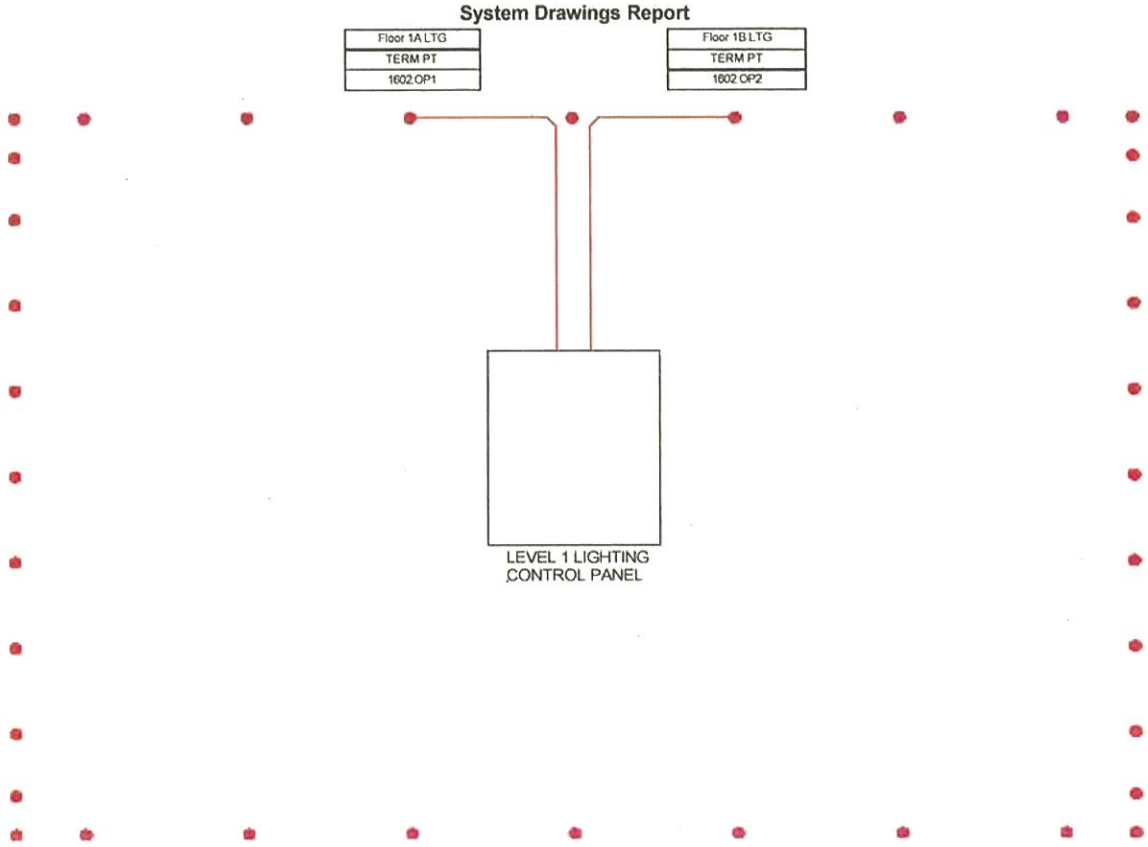
CP Panel Location: Level 2 Panel BH Lighting **Exp. Slot #3:**

Point #	Descriptor	Field Part	Wiring Detail
1608.IP1	SPARE1608_AI1		
1608.IP2	SPARE1608_BI2		
1608.IP3	SPARE1608_BI3		
1608.IP4	SPARE1608_BI4		

Point #	Descriptor	Field Part	Wiring Detail
1608.OP1	Lunch Room Ltg	TERM PT	LTG_DLC_OP
1608.OP2	Floor 2 BH_B Ltg	TERM PT	LTG_DLC_OP
1608.OP3	Locker Room Ltg	TERM PT	LTG_DLC_OP
1608.OP4	Hallway Ltg	TERM PT	LTG_DLC_OP
1608.OP5	SPARE1608_OP5		
1608.OP6	SPARE1608_OP6		
1608.OP7	SPARE1608_OP7		
1608.OP8	SPARE1608_OP8		
1608.OP9	SPARE1608_OP9		
1608.OP10	SPARE1608_OP10		
1608.OP11	SPARE1608_OP11		
1608.OP12	SPARE1608_OP12		

Harry Stevens Building

System Drawings Report



System:	L1_LTG	**System Description:**	Level 1 Lighting Control	**Control Panel:**	1602
System Location:	Level 1			**Local Panel:**	

ESC AUTOMATION

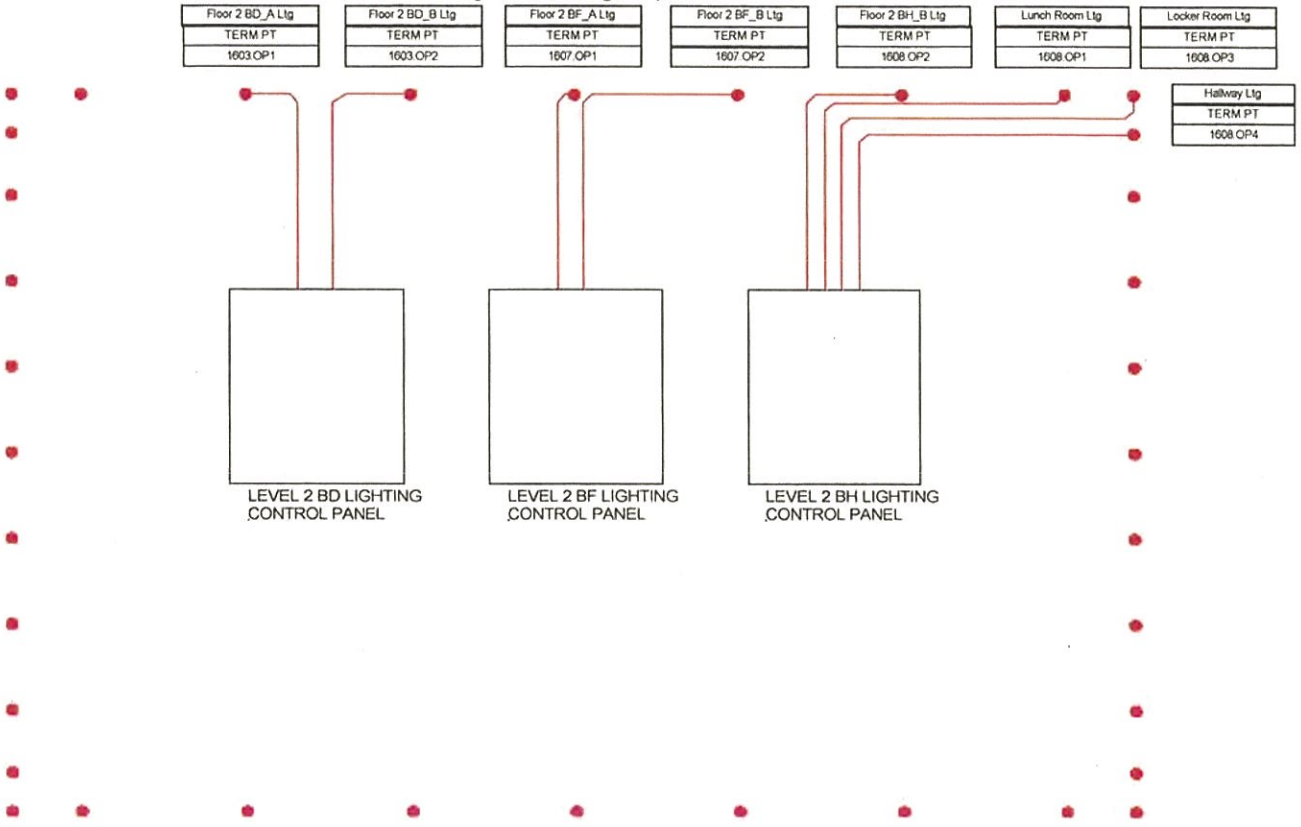
Project: 1088478 Date 19-Mar-09

Engineer: Wa Revision:

Delta CONTROLS

Harry Stevens Building

System Drawings Report



System:	L2_LTG	**System Description:**	Level 2 Lighting Control	**Control Panel:**	1603
System Location:	Level 2			**Local Panel:**	

ESC AUTOMATION

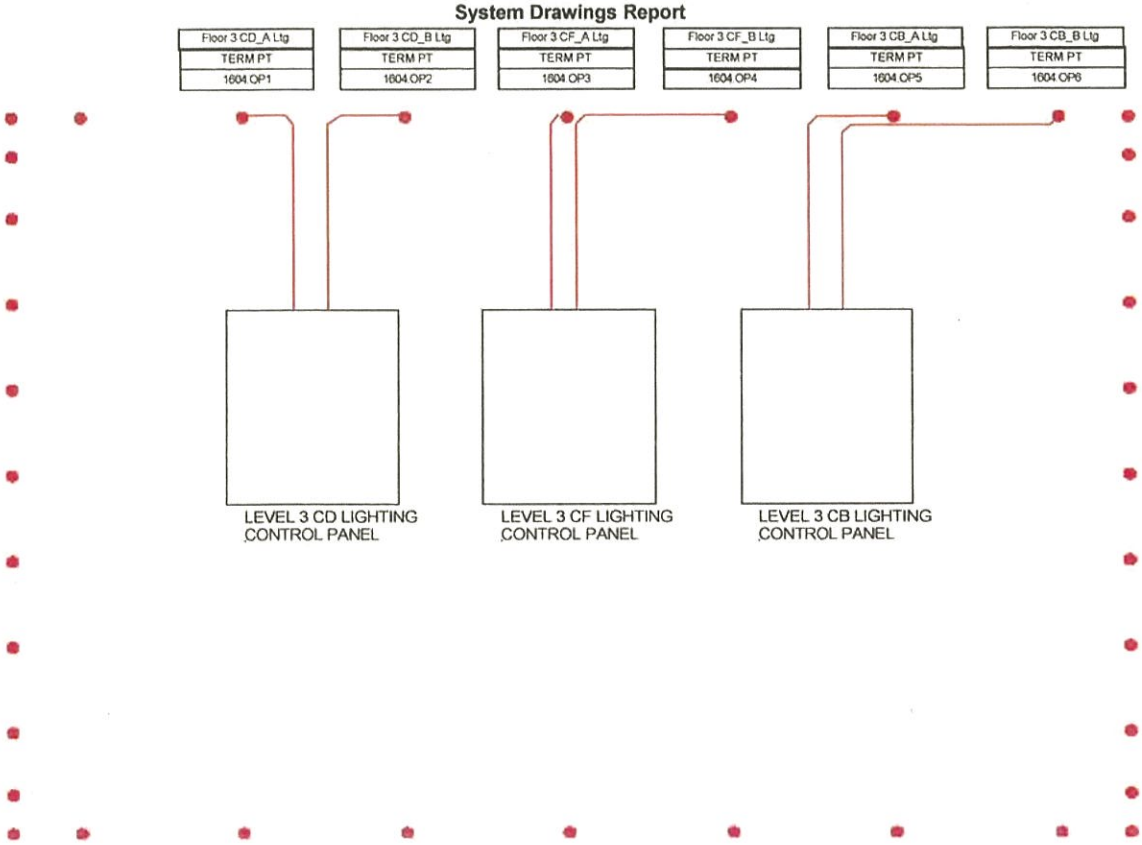
Project: 1088478 Date 19-Mar-09

Engineer: Wa Revision:

Delta CONTROLS

Harry Stevens Building

System Drawings Report



System: L3_LTG **System Description:** Level 3 Lighting Control **Control Panel:** 1604

System Location: Level 3 **Local Panel:**

ESC AUTOMATION

Project: 1088478 Date 19-Mar-09

Engineer: Wa Revision:

Delta CONTROLS

Harry Stevens Building

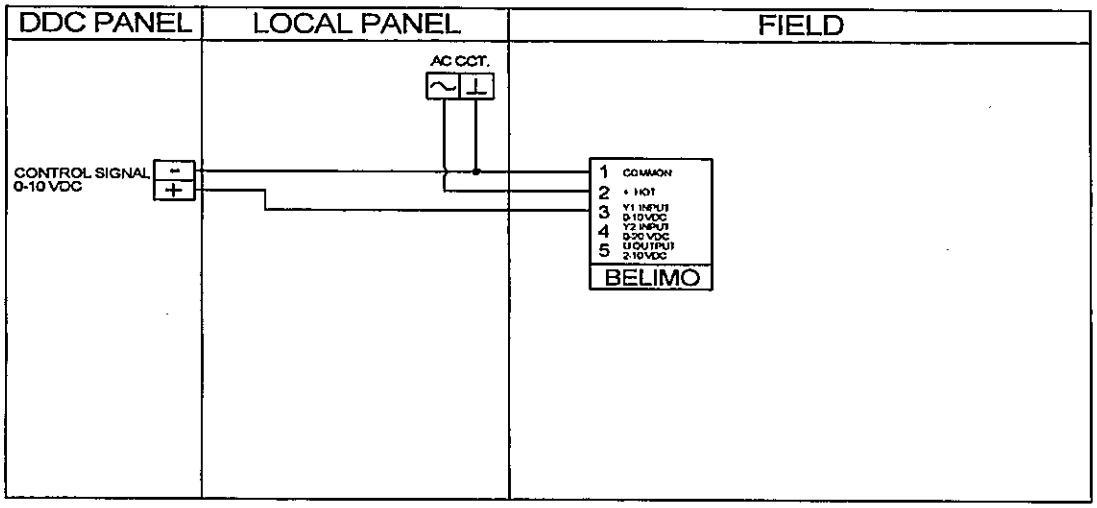
Wiring Details (Single) Report

Wiring Detail:

ACT Bel_MOD

Wiring Detail Description:

Wiring Detail Belimo Actuator Modulating.

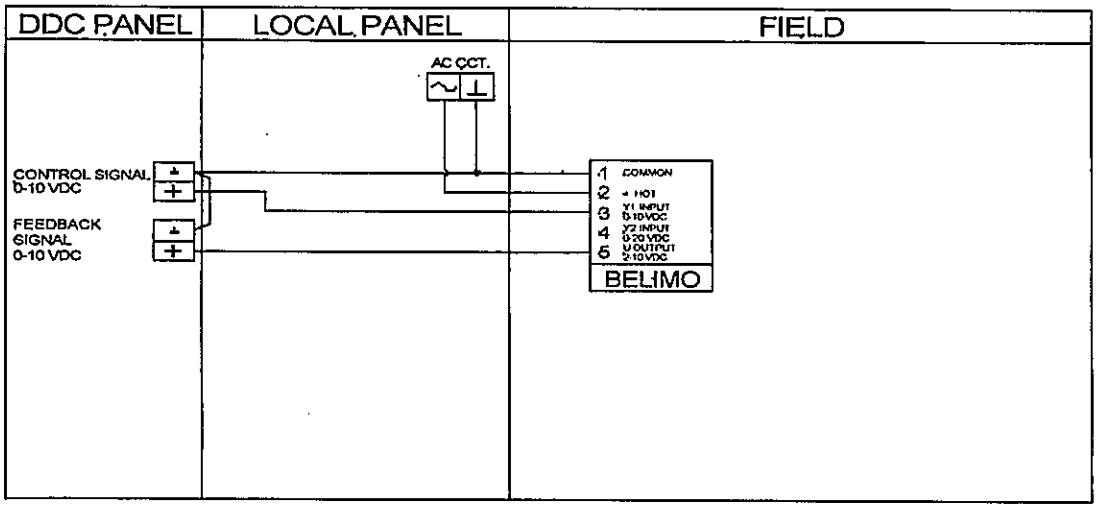


Wiring Detail:

ACT Bel_MOD_FB

Wiring Detail Description:

Wiring Detail Belimo Actuator Modulating with Feedback.

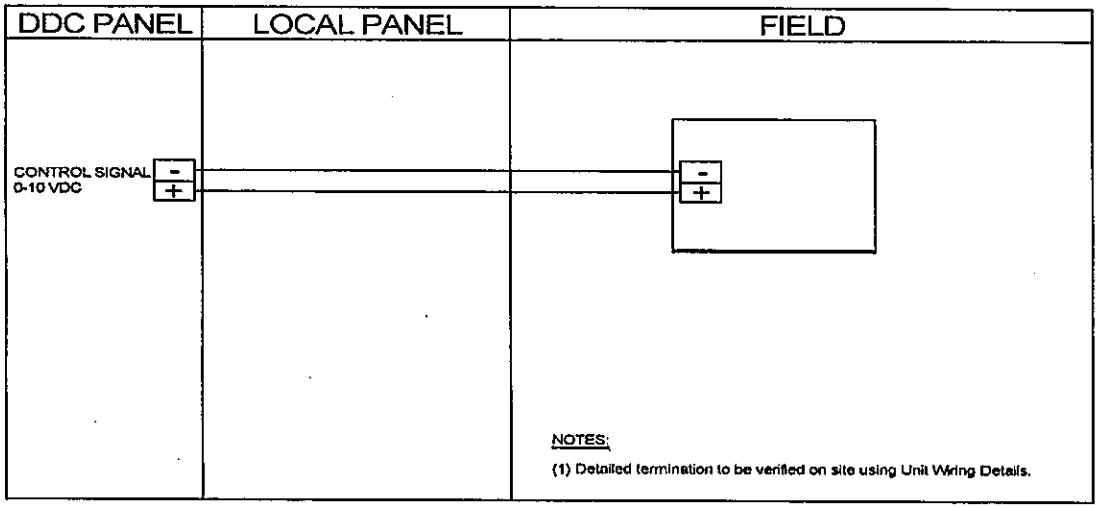


Wiring Detail:

CTL Analog Output

Wiring Detail Description:

Wiring Detail Analog Output.



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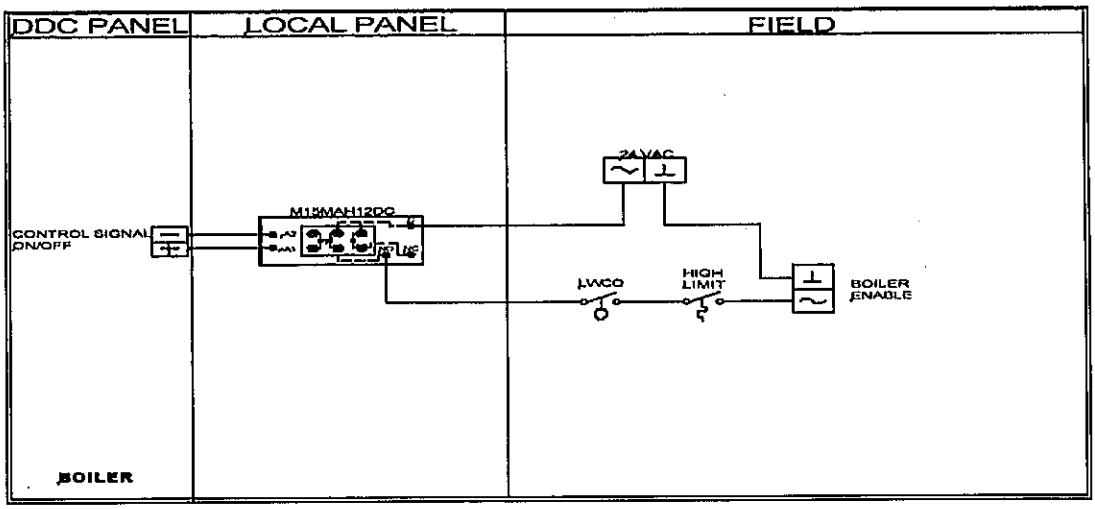
Wiring Details (Single) Report

Wiring Detail:

CTL Boiler

Wiring Detail Description:

Wiring Detail Boiler Enable Controlled by 0-10VDC Output.

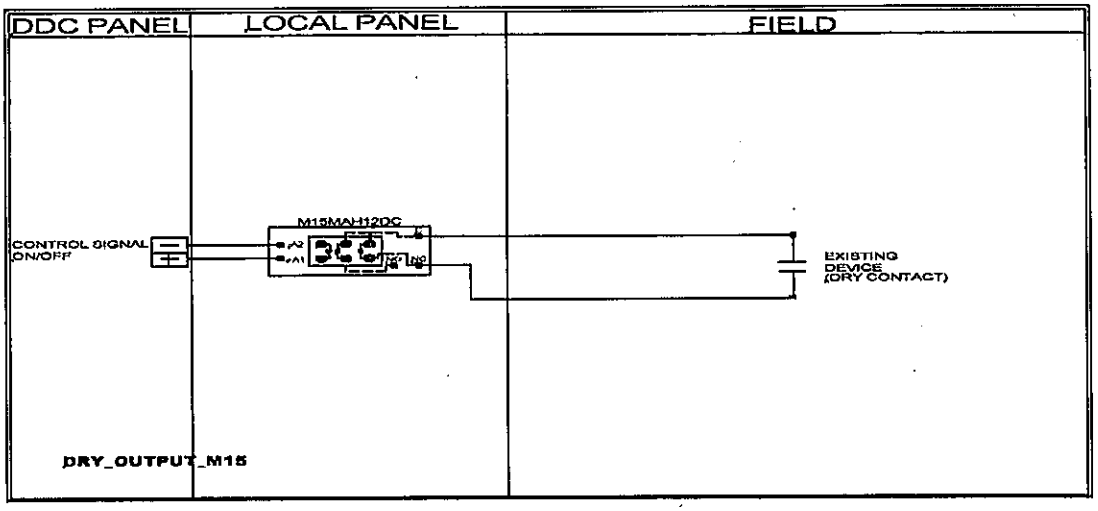


Wiring Detail:

CTL Dry Output

Wiring Detail Description:

Wiring Detail Existing Dry Contact Device controlled by 0-10VDC Output.

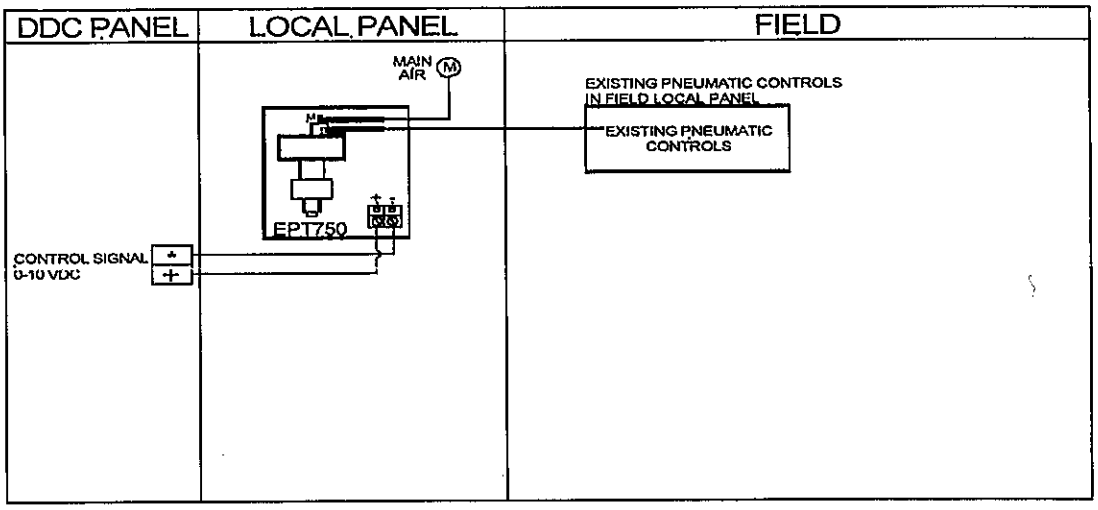


Wiring Detail:

CTL EPT

Wiring Detail Description:

Wiring Detail Electro-Pneumatic Transducer controlled by 0-10VDC Outputs.



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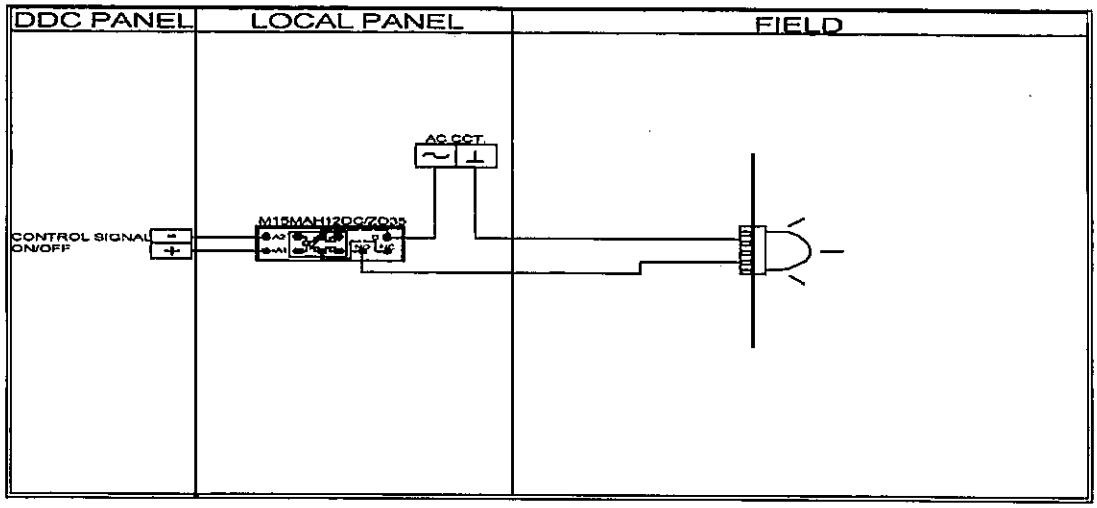
Wiring Details (Single) Report

Wiring Detail:

CTL LED

Wiring Detail Description:

Wiring Detail LED controlled by 0-10VDC output.

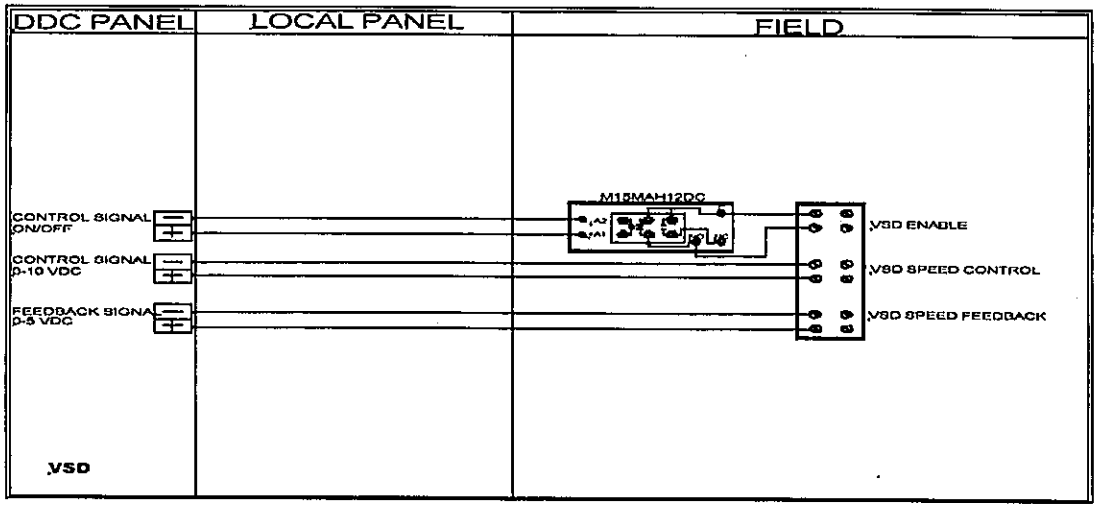


Wiring Detail:

CTL VSD

Wiring Detail Description:

Wiring Detail Variable Spped Drive Interface.

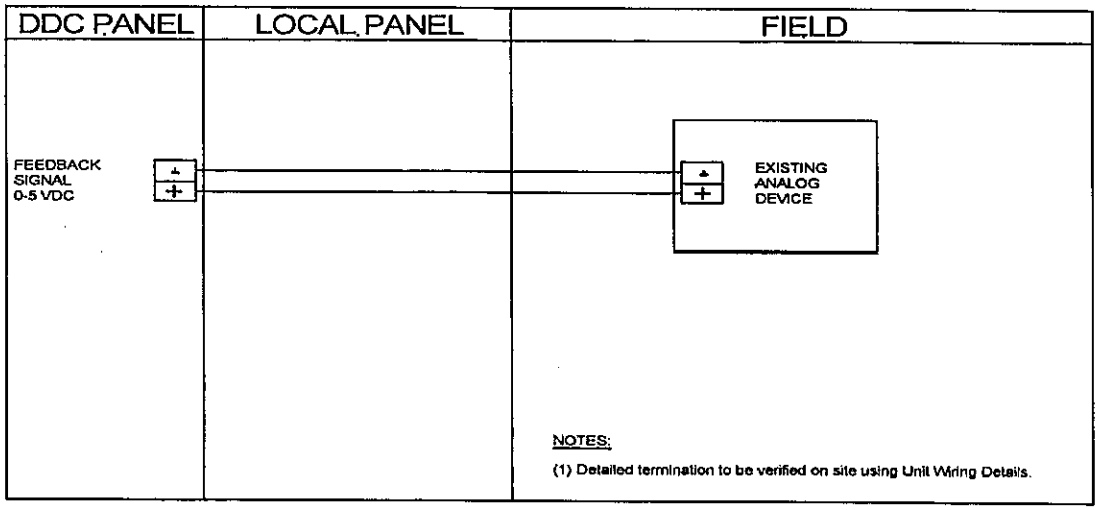


Wiring Detail:

FBK Analog Input

Wiring Detail Description:

Wiring Detail Existing Analog Device.



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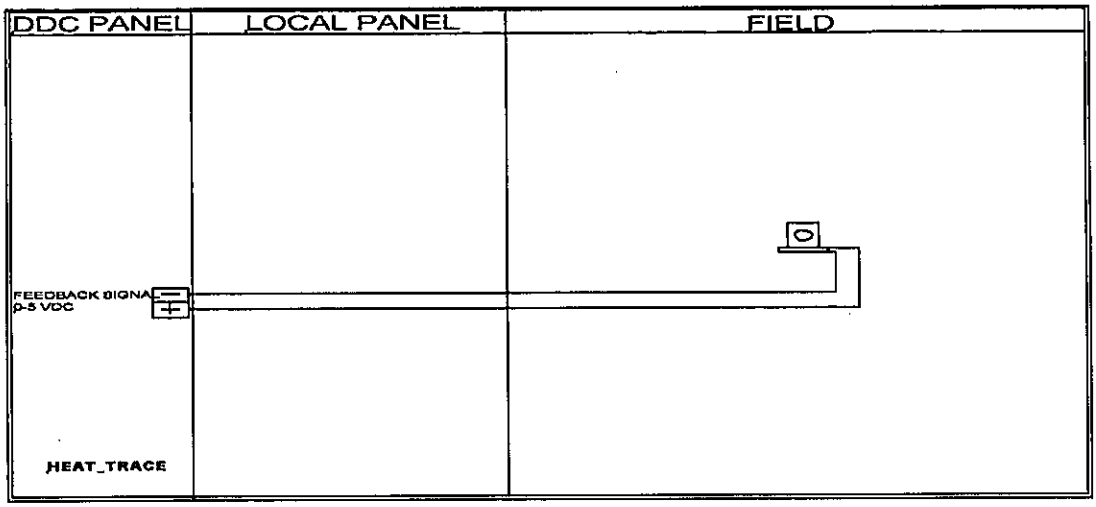
Wiring Details (Single) Report

Wiring Detail:

FBK CT

Wiring Detail Description:

Wirng Detail Current Sensor.

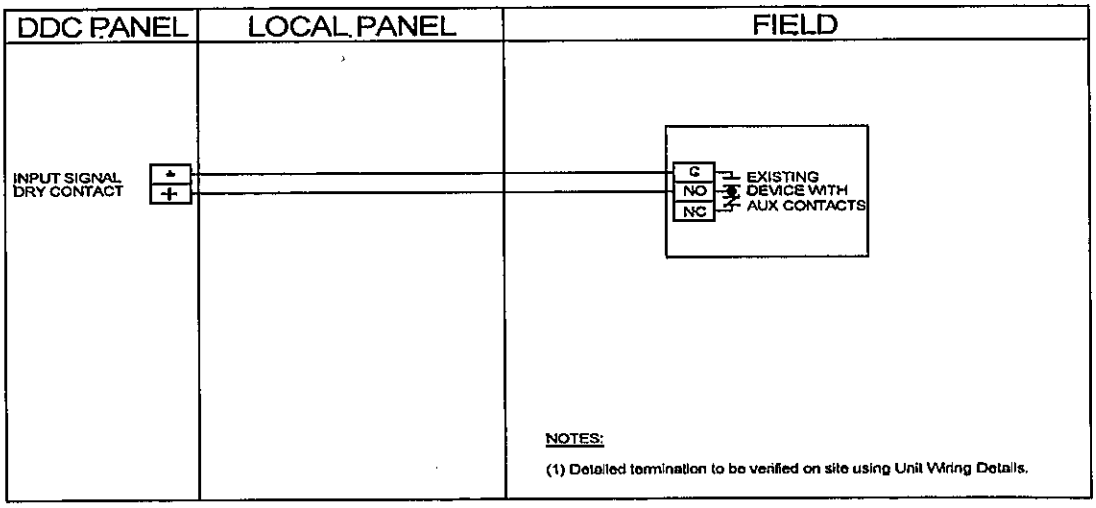


Wiring Detail:

FBK Dry Contact

Wiring Detail Description:

Wiring Detail Dry Contact Input.

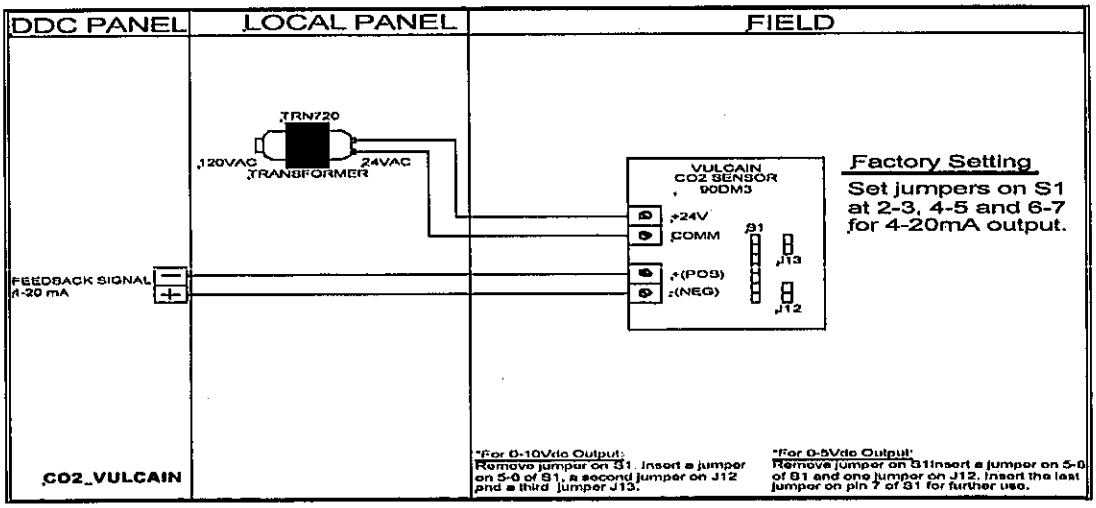


Wiring Detail:

GAS Vulcain

Wiring Detail Description:

Wiring Detail Vulcain 90DM3 Gas Monitoring Sensor.



Harry Stevens Building

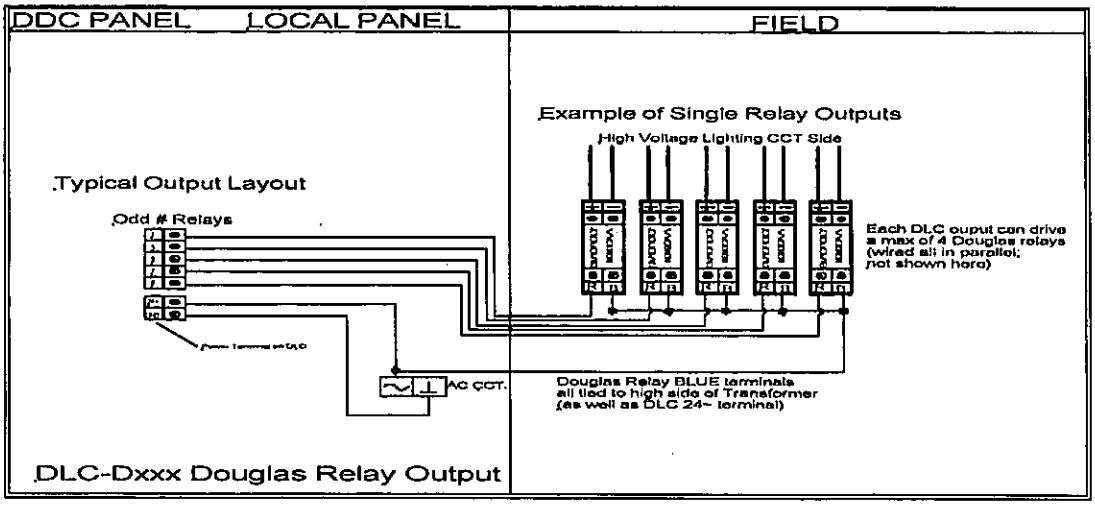
Wiring Details (Single) Report

Wiring Detail:

LTG_DLC_OP

Wiring Detail Description:

Douglas lighting Relay on DLC-Dxxx Output.

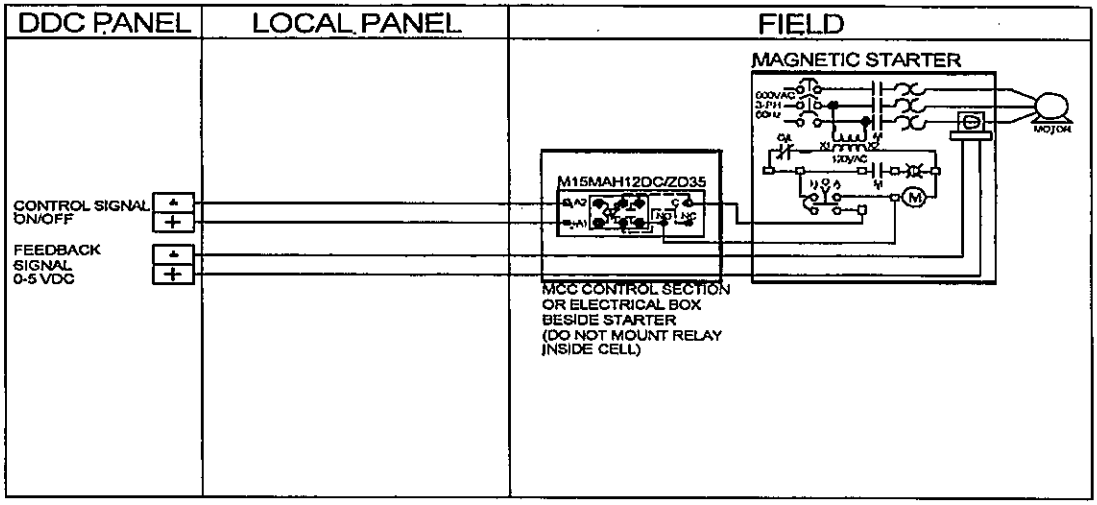


Wiring Detail:

MAG M15_FB

Wiring Detail Description:

Wiring Detail Magnetic Starter controlled by 0-10VDC Output. Status CT.

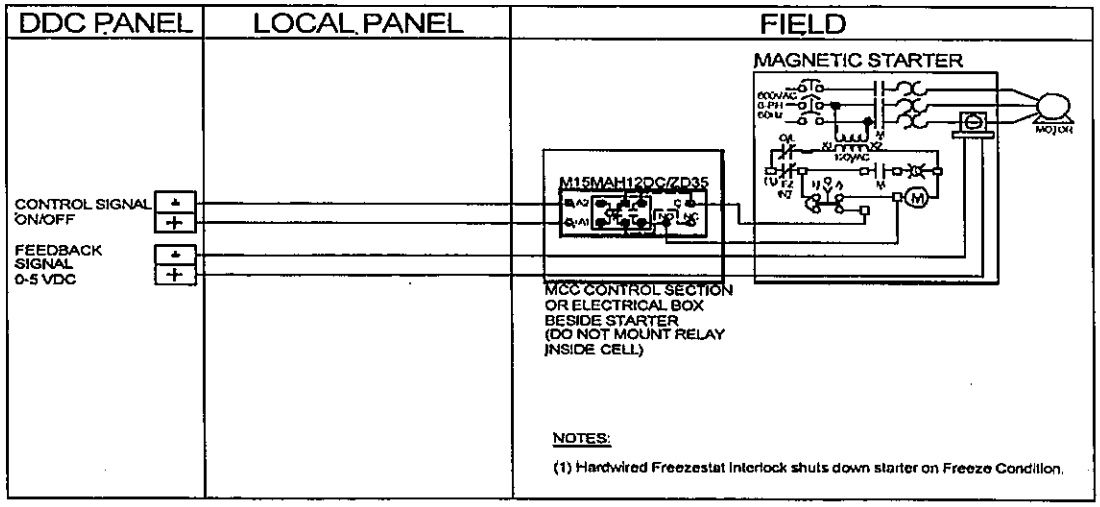


Wiring Detail:

MAG M15_FB_FZ

Wiring Detail Description:

Wiring Detail Magnetic Starter controlled by 0-10VDC Output with Freezestat Interlock. Status CT.



Harry Stevens Building

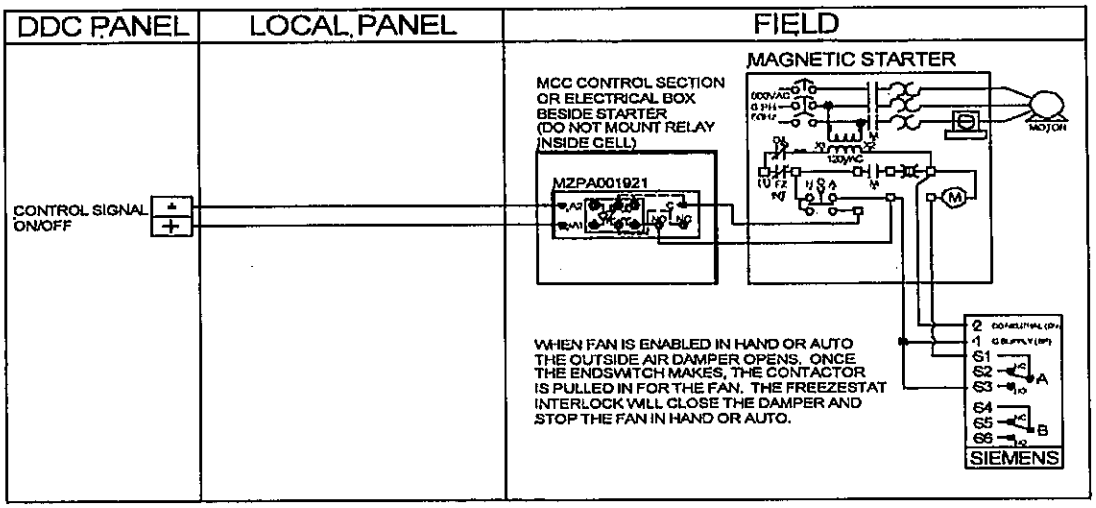
Wiring Details (Single) Report

Wiring Detail:

MAG_MZP_FB_FZ_DMP

Wiring Detail Description:

Wiring Detail Magnetic Starter controlled by 24VAC Output with Freezestat Interlock, 2 position damper, Status CT.

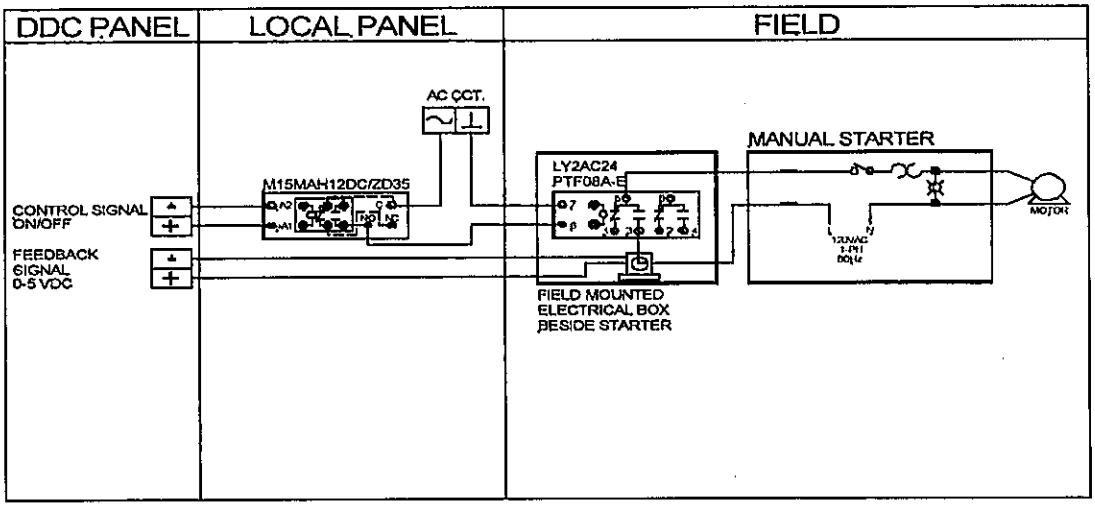


Wiring Detail:

MTR M15_FB

Wiring Detail Description:

Wiring Detail Manual Starter controlled by 0-10VDC Output. Status CT.

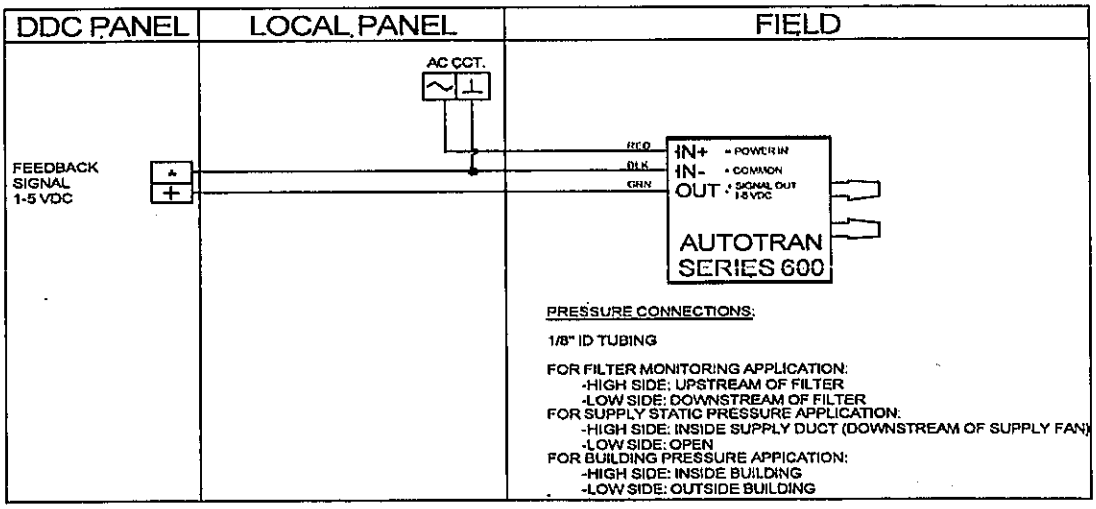


Wiring Detail:

PRE Auto600

Wiring Detail Description:

Wiring Detail AutoTran Series 600 Pressure Sensor.



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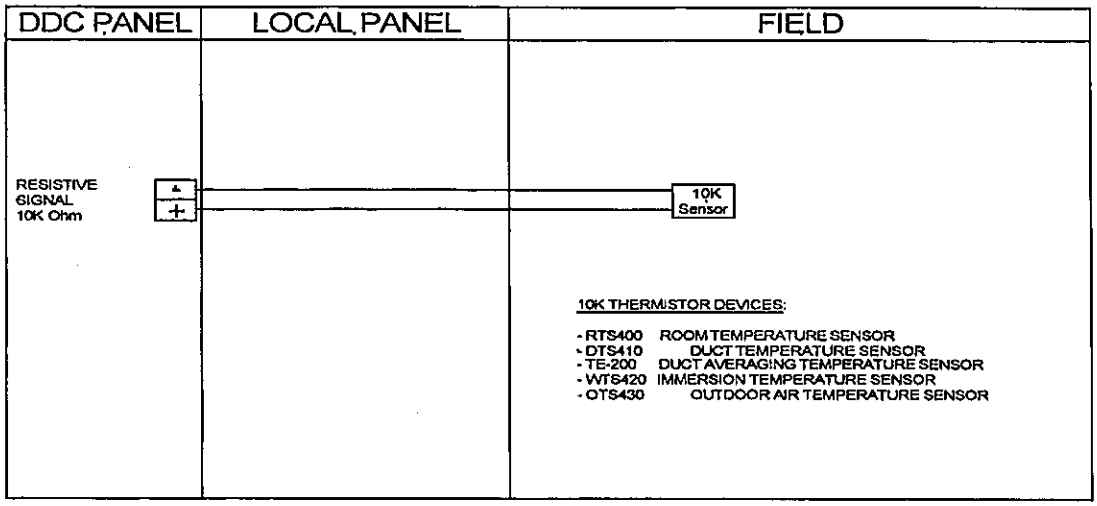
Wiring Details (Single) Report

Wiring Detail:

TMP 10K Device

Wiring Detail Description:

Wiring Detail 10K Thermistor Device

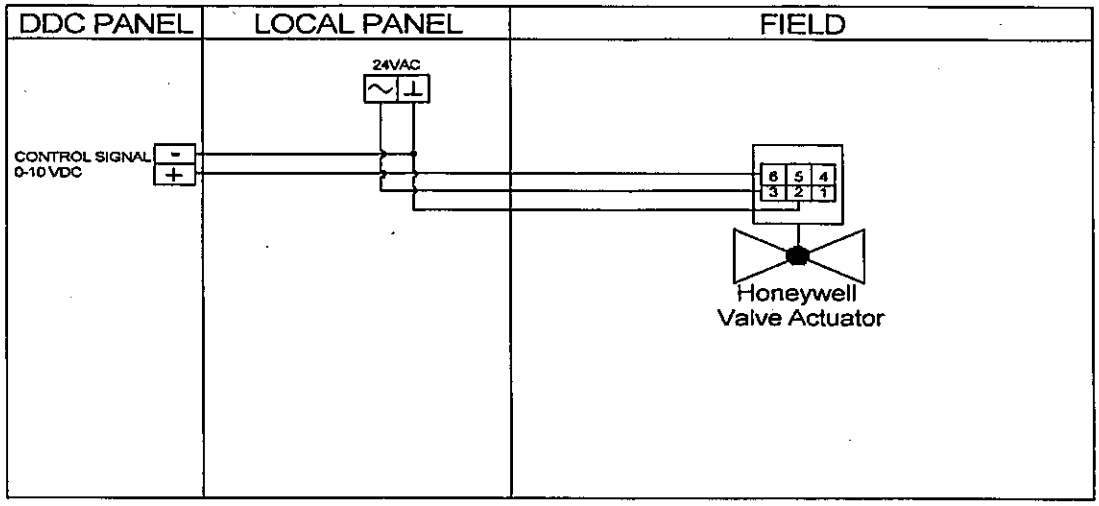


Wiring Detail:

VLV Bel_MOD

Wiring Detail Description:

Wiring Detail Honeywell Modulating Valve Actuator.



Harry Stevens Building

Bill of Material Schedule

Part	Description	Quantity
600D212D4	PRESSURE TRANSDUCER 1-5VDC 2" WC	1
90-DM3A-D-T	SENSOR CO2 DUCT MOUNT	5
DAC-304	Delta Application Controller 3IP/4BO	1
DAC-633	Delta Application Controller 6IP/3BO/3AO	1
DLC-312	Delta Douglas Lighting Controller 12BO	5
DSC-1212H	Delta System Control Enet/HOA 12IP/12AO	1
DSC-1280	Delta System Controller 12IP/8AO	2
DSC-1616H	Delta System Control Enet/HOA 16IP/16AO	1
DSC-2424E	DELTA TURBO REPLACEMENT PANEL	2
DSM-050	INTERNET IP ROUTER PANEL	1
DTS410	SENSOR DUCT TEMPERATURE	26
EPT750	ELECTRONIC TO PNEUMATIC TRANSDUCER	8
EXP120	EXPANSION CARD 8 UNIVERSAL IP	1
EXP130	EXPANSION CARD 16 UNIVERSAL IP	1
EXP161	EXPANSION CARD 8 UNIVERSAL OP	4
LF24-S	ACTUATOR SPRING RETURN 24V	2
M15MAH12DC	RELAY SS 12VDC	27
NF24-SR	ACTUATOR 24VAC 2-10VDC SR 60 IN LB	1
NM24-SR	ACTUATOR AIR DAMPER MODULATING	43
OTS430	OUTDOOR TEMPERATURE SENSOR	2
RTS400	D.C. ROOM TEMPERATURE SENSOR-OLD STYLE B	27
RTS400-1	ROOM TEMPERATURE SENSOR BLANK COVER	1
S100-1L	SENSOR CURRENT AC 0-10,0-20-0-50A 0-5VDC	16
S200-2		1
TSFC204T10	SENSOR DUCT AVERAGING 20'	3
WTS420-1	IMMERSION TEMPERATURE SENSOR	10
ZD35	RELAY BASE FOR: M15MAH001812VDC	27

SERIES 860 PRESSURE TRANSDUCER

Features & Applications

- Available in pressure ranges from 0.25" WC to 0-40 PSI
- Stability of <+/-0.5% F.S.O.!
- Perfect for a variety of applications such as duct static, VAV, fan control, medical applications & more!
- Easy wiring via a pluggable screw terminal block!
- Customizable pressure ranges as well as customizable outputs.
- Able to handle extremely high overpressure!
- Internally conditioned allowing it to automatically accept unregulated 12-24 VDC or 24 VAC power.
- Standard 2–year warranty!

For the Most Recent Product Information Visit Our Website at www.autotraninc.com

Specifications

ISO 9001 CERTIFIED

Accuracy:*	+/- 1% F.S.O.
Stability:	+/-0.5% F.S.O./yr.
Thermal Effects: (zero)	+/-0.075% F.S.O./°C (+/-0.042% F.S.O./°F)
(0.5" Range)	+/-0.150% F.S.O./°C (+/-0.083% F.S.O./°F)
Thermal Effects: (span)	+/-0.005% F.S.O./°C (+/-0.003%F.S.O/°F)
Overpressure:	20PSI or 2X FSP, whichever is greater
Pressure Ranges:	0.25" WC to 40 PSI **For 0.25" specifications consult factory** (Custom & Bi-directional ranges available)
Compensated Range:	10° to 50°C (50° to 122°F)
Media:	Limited only to media that will not attack Polyphenylene Sulfide (PPS), polyetherimide (PEI), silicon, or fluorosilicone, silicone RTV. Note that liquids are allowed in either or both ports.
Operating Humidity:	90% R.H. non-condensing
Operating Temperature:	-25°C to 70°C (-13 to 158°F)
Input Supply:**	12-24 VDC/24VAC**
Supply Current:	<10mA (Voltage Output) <30mA (Current Output)
Load Resistance:	2KΩ minimum on voltage out, 250Ω max loop resistance on 4-20mA (500Ω max loop resistance available upon request**)
Output Signal:	1–5VDC, 1–6VDC, 1-10VDC**, 4–20mA*** (call for custom outputs, most available)
Adjustments:	Offset 60% of F.S.O. minimum
Electrical Connections:	Pluggable Screw Terminal Block
Pressure Connections:	Barbed fitting for 1/8" I.D. tubing
Housing:	Impact Resistant ABS Plastic
Dimensions:	Approx. 3.5" x 2.7" x 1.4" (8.7cm x 6.8cm x 3.5cm) with mounting flanges

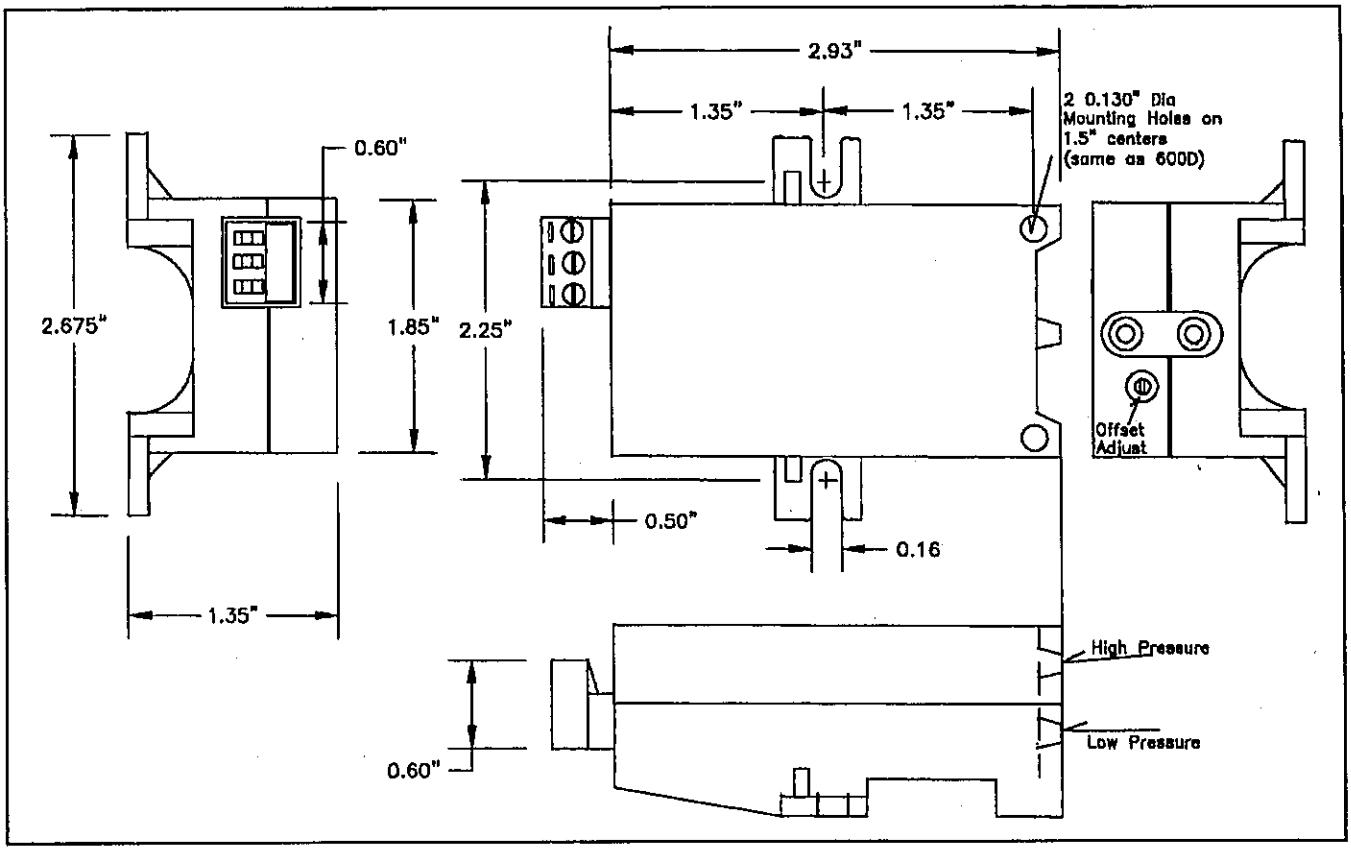
* Includes non-linearity, hysteresis, and non-repeatability at a fixed temperature

** an input of 18-24VDC/AC is required to drive a 500Ω load, the same input is also required for a 1-10 VDC output

*** 3–wire 4-20mA

AUTOTRAN
INCORPORATED

7424 Washington Avenue South • Eden Prairie, MN 55344
(800) 735-8998 • (952) 942-8743 • FAX (952) 942-8753
www.autotraninc.com



How to Order

A typical order number consists of the model number, type, output signal, pressure range, and calibration pressure.

Model	Type
860	D = Differential or Gage**

Output Signal
0.....1 to 5 volts
1.....1 to 6 volts
2.....1 to 10 volts***
3.....4-20mA (250Ω load)
4.....4-20mA (500Ω load)***
5.....Custom Output

Pressure Range*
0.....0.25 to< 5" WC
1.....5" to <13" WC
2.....0.5P to <1P
3.....1P to <5P
4.....5P to <15P
5.....15P to <30P
6.....30P to 40P

* *EXAMPLE: 860D-01 Cal Pressure=6" WC* ***You must indicate exact pressure unit should be calibrated to since "Pressure Range" is not a specific number.*** *(This unit has an output of 1-5 VDC & will be calibrated to 6"WC.) If a custom output is needed the exact output must be specified.*

** *With a gage application, one of the two ports is vented to atmosphere.*

*** *With a 1-10 VDC output as well as with a 4-20 mA output that needs to drive a 500Ω load a 18-24 VDC/24 VAC input is required.*

Optional Items
NEMA 4 enclosure
DIN Rail Mounting Kit

Warranty

Any regular Auto Tran product that proves to be defective in material or workmanship within a warranty period of two (2) years will be repaired or replaced when returned freight prepaid.

Note: Auto Tran reserves the right to change its specifications at any time, without notice. Auto Tran is not expert in the customer's technical field and therefore does not warrant the suitability of its product for the application selected by the customer.

Vulcain

Division of BW Technologies

1 800 563-2967

Infrared CO_2 Gas Monitor

90DM$_3$A

With an unparalleled reputation for product innovation, reliability and excellence, Vulcain Inc. is once again setting industry standards with the latest generation Infrared CO_2 Gas Monitor - the 90DM$_3$A.

The product of the most rigorous research and industrial design, the 90DM$_3$A, incorporates Vulcain's unique infrared sensing technology and state of the art microprocessor controlled digital transmission into a CO_2 gas monitor, offering a level of precision and efficiency second to none.

- Proven infrared technology
- Specific CO_2 monitoring
- Built-in microprocessor
- Optional relay contact closure (fail safe)
- 4-20mA or 0-5 VDC or 0-10 VDC output
- Temperature compensation
- Trouble-free operation
- No moving parts
- Menu driven easy calibration
- Optional 0-5% detection range

Ordering Information

90DM$_3$ASM-1	90DM$_3$A Wall Mount Enclosure, 0-2000 ppm
90DM$_3$ASM-2	90DM$_3$A Wall Mount Enclosure, 0-50000 ppm
90DM$_3$ADT-1	90DM$_3$A Duct Type Enclosure, 0-2000 ppm
90DM$_3$ADT-2	90DM$_3$A Duct Type Enclosure, 0-50000 ppm
90DM$_3$ASMR-1*	90DM$_3$A Network, Wall Mount Enclosure, 0-2000 ppm
90DM$_3$ASMR-2*	90DM$_3$A Network, Wall Mount Enclosure, 0-50000 ppm
90DM$_3$ADTR-1*	90DM$_3$A Network, Duct Type Enclosure, 0-2000 ppm
90DM$_3$ADTR-2*	90DM$_3$A Network, Duct Type Enclosure, 0-50000 ppm
90DM$_3$ASMO3-1	90DM$_3$A Wall Mount Enclosure, Relay, 0-2000 ppm
90DM$_3$ASMO3-2	90DM$_3$A Wall Mount Enclosure, Relay, 0-50000 ppm
90DM$_3$ADTO3-1	90DM$_3$A Duct Type Enclosure, Relay, 0-2000 ppm
90DM$_3$ADTO3-2	90DM$_3$A Duct Type Enclosure, Relay, 0-50000 ppm

*Only Network output comes with these models.

Package:

D3	Display Option for 90DM$_3$A

Protecting your health and your environment.

90DM$_3$A
Infrared CO_2 Gas Monitor

Mounting Made Unique and Easy

To provide maximum versatility, the 90DM$_3$A is available with two different housing configurations, making it ideally suited to virtually any commercial or industrial gas detection application. Both enclosures are made of ABS plastic, offering maximum durability.

Designed to accurately detect the presence of CO_2 in air-handling systems, the DT Model represents a radical innovation in housing design. Unlike other units on the market today, the enclosure is totally airtight, more compact, and extremely lightweight, with a convenient mounting bracket to improve installation. All in all, its superior operational and cost efficiency make the DT Model the only choice for larger-scale CO_2 detection applications.

The SM Model is a wall-mounted unit with a compact and an aesthetically pleasing design which blends perfectly and discretely with any room decor. Easily installed directly onto drywall or other surfaces, the SM Model allows for superior gas circulation and airflow.

Vulcain
Division of BW Technologies
1 800 563-2967
Vulcaininc.com

For further information:

USA
1971 Western Avenue, Unit 1122
Albany, NY
USA 12203

Tel: 1-800-563-2967
Fax: 1-888-967-9938

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344 Edgeley Boulevard, Unit 13
Vaughan, ON
L4K 4B7

Tel: 1-905-660-6544
Fax: 1-905-660-7362

MONTREAL
4005 Matte Boulevard, Unit G
Brossard, QC
J4Y 2P4

Tel: 1-800-563-2967
Fax: 1-888-967-9938

E-mail: sales@vulcaininc.com
www.vulcaininc.com

VN1087-01-01-00-8.25x11-20050218-5717-14

ISO 9001:2000 CERTIFICATION Intertek

90DM$_3$A SPECIFICATIONS

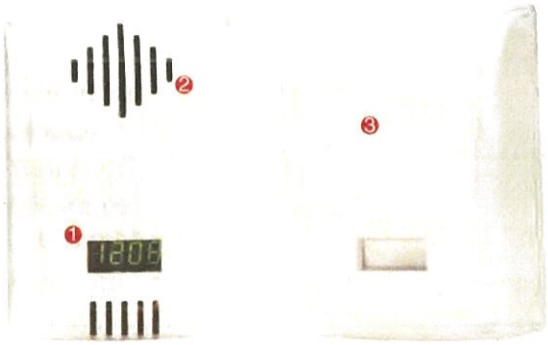
Gas Detected:	CO_2
Detection Range:	0-2000 ppm, *0-5%
Accuracy:	+/- 3%
Response Time:	35 sec. (for 90% of the reading)
Sensor Life Expectancy:	> 10 years
Relay Output Rating:	5A, 30 VDC or 250 VAC (resistive load)
*Display:	LCD
Outputs:	4-20 mA or 0-5 VDC or 0-10 VDC *1 SPDT Relay
Operating Humidity Range:	0-95% RH, Non-condensing
Operating Temperature Range:	32 °F to 100 °F / 0 °C to 40 °C

GENERAL SPECIFICATIONS

Size:	5.25 x 3.5 x 2 in. / 11.5 x 7.5 x 4.4 cm
Weight:	SM: 8.8 oz. / 200g DT: 10.56 oz. / 300 g
Power Requirement:	17-27 VAC or 24-38 VDC, 200 mA
Warranty:	5 Years Limited.

*Option

DUE TO ONGOING RESEARCH AND PRODUCT IMPROVEMENT, SPECIFICATIONS ARE SUBJECT TO CHANGE WITHOUT NOTICE.



1. Optional LCD display
2. Air inlet for surface Mount housing
3. Duct mount housing

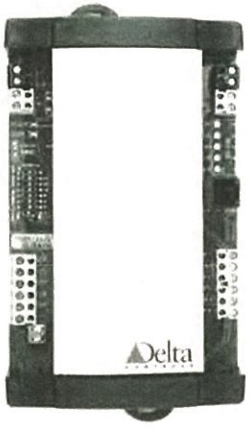
Locally Distributed by:

Application Controllers

DAC-304

Description

The DAC-304 is a fully programmable, Native BACnet™ Advanced Application Controller that communicates on an RS-485 LAN using the BACnet MS/TP protocol. The DAC-304 is designed for a wide-range of applications that have small local I/O requirements. It also supports BACstats and other Delta LINKnet devices.



Application

The DAC-304 is suitable for controlling various packaged units and equipment with small I/O requirements such as Fan Coil units, Unit Ventilators and Heat Pumps.

The fully programmable DAC-304 can be tailored to specific applications by creating and modifying BACnet objects and GCL+ programs.

Features

–Native BACnet™ firmware

–BACnet MS/TP communications

–Supports 4 BACstat network sensors on LINKnet for room sensing and control

–Supports 2 Delta Field Modules on LINKnet for I/O expansion

–Easy to mount housing

–Fully programmable in GCL+

–Application database can be loaded over the network

–Controller firmware can be flash loaded over the network

–Derived Network Addressing (DNA) for simple integration into a standard network architecture

–Service port

Specifications

BACnet Device Profile
BACnet Advanced Application Controller (B-AAC)

Inputs
3 Universal inputs - 10 bit (supporting 0-5v, 0-10V, 10kΩ, 4-20mA)

Outputs
4 Binary triac outputs

Jumper selection for internal or external power on binary outputs

LED status indication of each output

Technology
32-bit processor

512 KB (4 megabit) Flash memory

64 KB SRAM (for database)

CPU Status LED

Device Addressing
Set via DIP switch and jumpers, or software setup

Communications Ports
Main LAN (NET1)
BACnet MS/TP @ 9600, 19200, 38400 or 76800 bps (default)
(maximum of 99 devices per BACnet MS/TP segment)

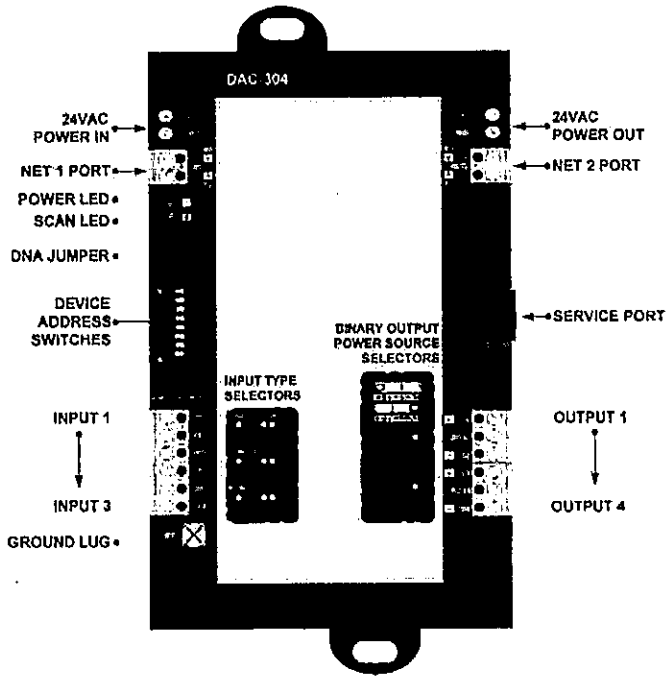
SubLAN (NET2)
Delta LINKnet @ 76800 bps (maximum 4 devices on LINKnet, with no more than 2 DFM/DNT devices)

Document Edition 2.5 July 2005

Do it right. Delta™ CONTROLS

Application Controllers

DAC-304: Board Layout Diagram



Accessories

RPT-768–Delta Network Repeater for BACnet MS/TP

TRM-768–Delta Network Terminator for BACnet MS/TP

CON-768–Delta Network Converter

Ordering

Order the DAC-304 with the desired options according to the following product number:

DAC-304–3 Inputs, 4 BO's (V2* or V3 Firmware)

*Note: Not all features described in this document are available when this option is selected.

Specifications (Continued)

Connectors
Removable screw-type terminal connectors

Wiring Class
Class 2

Power
24 VAC

6VA, 54VA maximum with fully loaded BO's

Ambient
32° to 131°F (0° to 55°C)

10 - 90% RH (non-condensing)

Dimensions
7 5/8 x 4 x 1 7/8 in. (19.2 x 10.2 x 4.8 cm) with housing

0.551 lb. (250 g) with housing

Approvals/Standards
C-UL Listed

UL 916 Listed

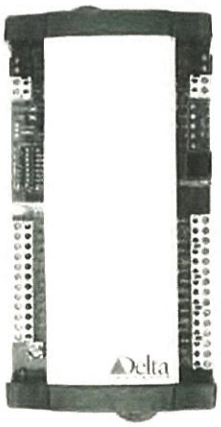
CE

FCC

BTL Listed

Application Controllers
DAC-633

Description
The DAC-633 is a fully programmable, Native BACnet™ Advanced Application Controller that communicates on an RS-485 LAN using the BACnet MS/TP protocol. The DAC-633 is designed for a wide-range of applications that have small local I/O requirements. It also supports BACstats and other Delta LINKnet devices.



Application
The DAC-633 is suitable for controlling various packaged units and equipment with small I/O requirements such as Fan Coil units, Unit Ventilators, Heat Pumps, and small Boilers or Chillers.

The fully programmable DAC-633 can be tailored to specific applications by creating and modifying BACnet objects and GCL+ programs.

Features
–Native BACnet™ firmware

–BACnet MS/TP communications

–Supports 4 BACstat network sensors on LINKnet for room sensing and control

–Supports 2 Delta Field Modules on LINKnet for I/O expansion

–Actuator power terminal (24VAC) for each analog output

–Easy to mount housing

–Fully programmable in GCL+

–Application database can be loaded over the network

–Controller firmware can be flash loaded over the network

–Derived Network Addressing (DNA) for simple integration into a standard network architecture

–Service port

Specifications

BACnet Device Profile
BACnet Advanced Application Controller (B-AAC)

Inputs
6 Universal inputs - 10 bit (supporting 0-5v, 0-10v, 10kΩ, 4-20mA)

Outputs
3 Binary triac outputs

3 Analog outputs (0-10v)

Jumper selection for internal or external power on binary outputs

LED status indication of each output

Technology
32-bit processor

512 KB (4 megabit) Flash memory

64 KB SRAM memory for database

CPU Status LED

Device Addressing
Set via DIP switch and jumpers, or software setup

Communications Ports
Main LAN (NET1)
BACnet MS/TP @ 9600, 19200, 38400 or 76800 bps (default) (maximum of 99 devices per BACnet MS/TP segment)

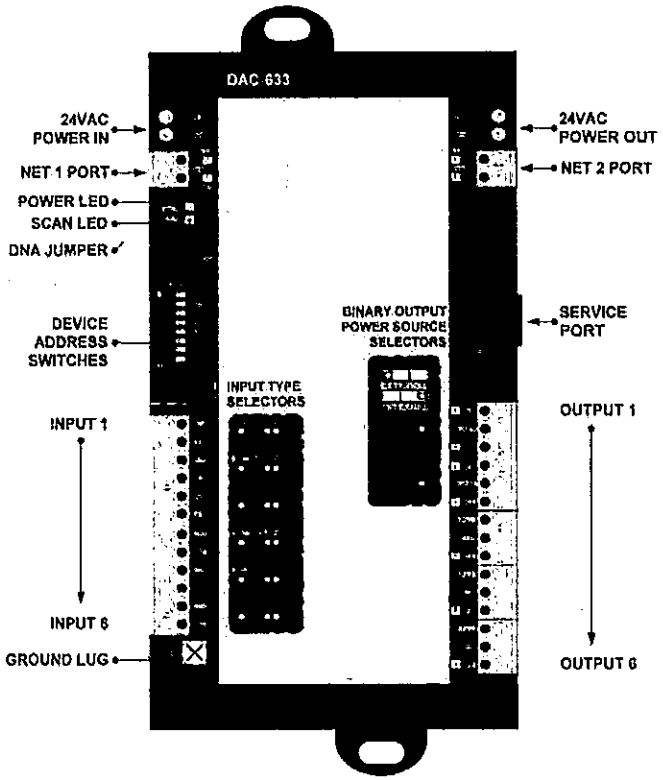
SubLAN (NET2)
Delta LINKnet @ 76800 bps (maximum 4 devices on LINKnet, with no more than 2 DFM/DNT devices)

Document Edition 2.•••• 2005

Do it right. Delta™ CONTROLS

Application Controllers

DAC-633: Board Layout Diagram



Accessories

RPT-768–Delta Network Repeater for BACnet MS/TP

TRM-768–Delta Network Terminator for BACnet MS/TP

CON-768–Delta Network Converter

Ordering

Order the DAC-633 with the desired options according to the following product number:

DAC-633–6 inputs, 3 AO's, 3 BO's (V2* or V3 Firmware)

*Not all features described in this document are available when this option is selected.

Specifications (Continued)

Connectors
Removable screw-type terminal connectors

Wiring Class
Class 2

Power
24 VAC only

12VA, 48VA with BOs fully-loaded

Ambient
32° to 131°F (0° to 55°C)

10 - 90% RH (non-condensing)

Dimensions
8 5/8 x 4 x 1 7/8 in. (21.9 x 10.2 x 4.8 cm) with housing

0.80 lb. (360 g) with housing

Approvals/Standards
C-UL Listed

UL 916 Listed

CE

FCC

BTL Listed

Douglas Lighting Controller
DLC-D312/624/936

Description
The DLC-D312/624/936 is a fully programmable, Native BACnet™ Advanced Application Controller that communicates on a BACnet MS/TP RS-485 LAN. This controller is designed for lighting applications and has 12 to 36 Douglas lighting relay outputs per controller. The controller also supports up to 12 Delta BACstats connected on its LINKnet subnetwork.

Application
The DLC-D312/624/936 is suitable for controlling up to 36 lighting zones, switching a maximum of 144 Douglas lighting relays.

The controller can be mounted in various Douglas relay enclosures for both new and retrofit construction projects.

The DLC-D312/624/936 is fully programmable: GCL+ programs and BACnet objects can be created and or modified for specific lighting applications.

Features
–Native BACnet™ MS/TP firmware

–Supports switching a maximum of 4 Douglas relays per relay output

–Software monitoring of switch activity

–Supports a subnet of up to 12 BACstats

–3, 6 or 9 Douglas relay switches or dry contact master inputs

–1 Analog input

–Individual output status indication via LED

–Supports a master override switch with built-in sequencing

–Fully programmable in GCL+

–Application database can be flash loaded over the network

–Controller firmware can be flash loaded over the network

–Easy-to-mount housing

Specifications

BACnet Device Profile
BACnet Advanced Application Controller (B-AAC)

Inputs
3, 6 or 9 Binary inputs (Douglas 2-wire relay switch or dry contact inputs with status feedback & LED status indication)

1 Analog input, with LED status indication

Outputs
12, 24 or 36 Douglas lighting relays

Outputs (max 4 relays per output)

Uses Douglas™ WR-61xx style relays

Sweeper Ports
Sweeper input port with LED status indication master override or sweeper input port, with command sequencer

Sweeper output port with LED status indication connects to another lighting controller's sweeper input port to continue the sweep sequence

On-board Overrides
ON scan button provides ALL ON override control

OFF scan button provides ALL OFF override control

Communications Ports
Main LAN (NET1) with LED status indication BACnet MS/TP @ 9600, 19200, 38400, 76800 bps (default) (maximum of 99 devices per BACnet MS/TP segment)

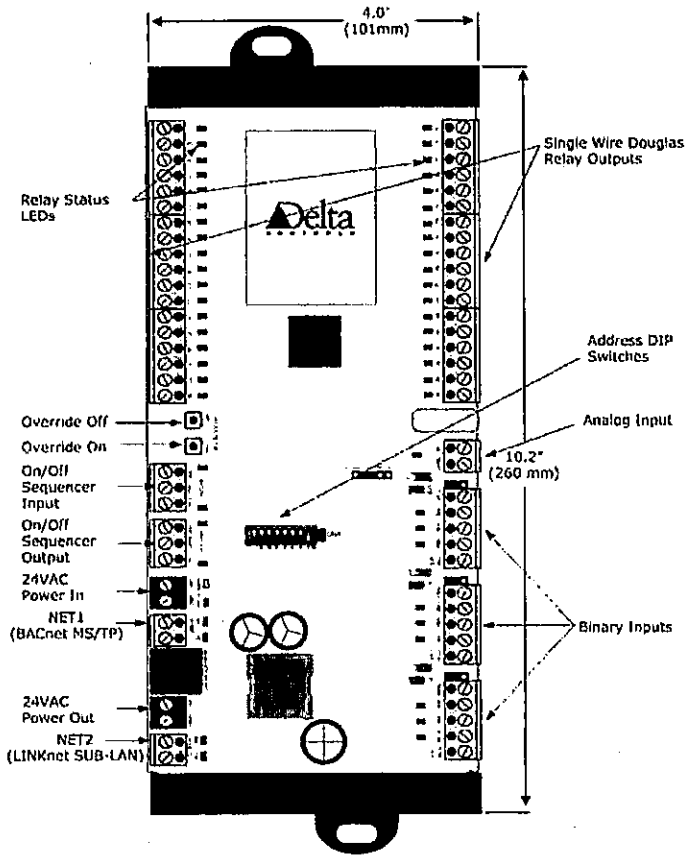
SubLAN (NET2) with LED status indication Delta LinkNet @ 76800 bps (maximum 12 network sensors on LINKnet)

Document Edition 2.0 June 2005

Do it right. Delta™ CONTROLS

Douglas Lighting Controller

DLC-D312/624/936: Board Layout Diagram



Ordering
Order the DLC-D312/624/936 with the desired options according to the following product numbers:

DLC-312—3 Binary Inputs & 12 Relay Outputs

DLC-624—6 Binary Inputs & 24 Relay Outputs

DLC-936—9 Binary Inputs & 36 Relay Outputs

Specifications (Continued)

Connectors
Removable screw-type terminal connectors

Technology
32-bit Processor

2MB (16 megabit) Flash memory

512 KB SRAM memory

Device Address
Set via DIP switch and jumpers or software setup

Wiring Class
Class 2

Power
24 VAC

50 VA (including Douglas relays and switches, 4 per output)

Ambient
32° to 131°F (0° to 55°C)

10 to 90% RH (non-condensing)

Dimensions
11.05 x 4 x 1.9 in. (28.9 x 10 x 4.8 cm) with housing

1.9 lb. (540 g) with housing

Approvals/Standards
UL 916

C-UL Listed

CE

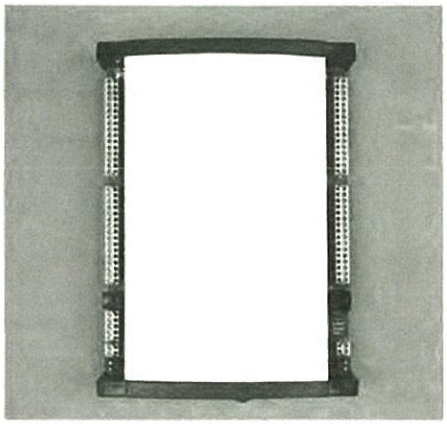
FCC

BTL Listed

System Controllers
DSC-1212

Description
The DSC-1212 is a fully programmable, Native BACnet™ Building Controller that communicates on a Twisted-Pair Ethernet 10-BaseT using BACnet IP and BACnet over Ethernet, or on an RS-485 LAN using the BACnet MS/TP protocol.

The DSC-1212 also supports an additional BACnet MS/TP SubLAN for VAV and other Application Controllers. This controller is designed for a wide-range of applications that have mid-sized I/O requirements. The SubLAN may be configured to support Delta BACstats and other Delta LINKnet I/O devices.



Application
The DSC-1212 is suitable for controlling equipment such as AHUs, Boilers, Chillers and a variety of HVAC control systems.

Because of its programming capability, the DSC-1212 can be used to create or modify GCL+ programs and BACnet objects for specific applications.

Features
–Native BACnet firmware

–BACnet MS/TP communications

–Optional BACnet IP

–Optional BACnet over Ethernet capability

–Integrated housing

–12 Universal inputs and 12 Universal outputs

–Fully programmable in GCL+

–Application database can be flash loaded over the network

–Controller firmware stored in flash memory (can be network loaded)

–Optional Hand/Off/Auto switches with position feedback

–Tri-color LED's to indicate output status

Specifications

BACnet Device Profile
BACnet Building Controller (B-BC)

Inputs
12 Universal inputs - 10 bit
(supporting 0-5v, 0-10v, 10kΩ, 4-20mA)

LED status indication of each input

Outputs
12 Analog outputs - (0-10v), software configured as binary or analog

LED status indication of each output

Technology
32-bit processor

1 MB (8 megabit) Flash memory

127 KB SRAM memory (319 KB with Ethernet option)

Real-time clock with lithium battery & SRAM backup

CPU status LED

Device Type
Configured as either an Area, System or Subnet device

Device Addressing
Set via DIP switch and jumpers, or software setup

Document Edition 2.5 July 2005

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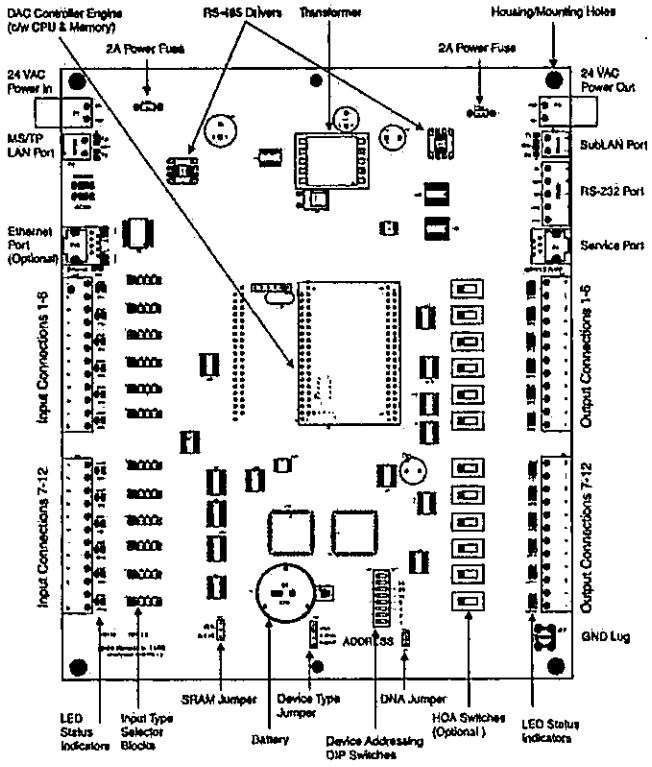
System Controllers

DSC-1212: Board Layout Diagram



Accessories

RPT-768—Delta Network Repeater for BACnet MS/TP

TRM-768—Delta Network Terminator for BACnet MS/TP

CON-768—Delta Network Converter

Ordering

Order the DSC-1212 with the desired options according to the following product numbers:

DSC-1212—Controller & Housing, MS/TP LAN

DSC-1212-V2*—Controller & Housing, *V2 Micro Firmware

DSC-1212H—Controller & Housing, MS/TP LAN, HOA Switches with Feedback

DSC-1212E—Controller & Housing, MS/TP LAN, Ethernet LAN/WAN, HOA Switches with Feedback

*Not all features described in this document are available when this option is selected.

Specifications (Continued)

Communication Ports
Twisted-Pair Ethernet
(10-BaseT) @ 10 MB (optional), BACnet IP, BACnet over Ethernet

Main LAN (NET1)
BACnet MS/TP @ 9600,19200, 38400 or 76800 bps (default) (maximum of 99 devices per BACnet MS/TP segment)

SubLAN (NET2)
BACnet MS/TP (maximum 99 devices) or Delta LINKnet @ 76800 bps (maximum 12 devices on LINKnet, with no more than 4 DFM/DNT devices)

Serial RS-232 BACnet PTP, 9600, 19200 or 38400 bps

Connectors
Removable screw-type terminal connectors

Wiring Class
Class 2

Power
24 VAC

25 VA

Ambient
32° to 131°F (0° to 55°C)

10 - 90% RH (non-condensing)

Dimensions
10 5/8 x 8 1/8 x 2 1/2 in. (27.0 x 20.5 x 6.4 cm) with housing

2.0 lb. (900 g) with housing

Approvals/Standards
UL 916 Listed

CE

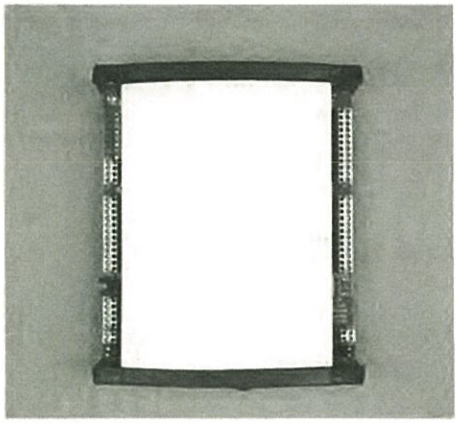
FCC

BTL Listed

System Controllers
DSC-1280

Description
The DSC-1280 is a fully programmable, Native BACnet™ Building Controller that communicates on a Twisted-Pair Ethernet 10-BaseT using BACnet IP and BACnet over Ethernet, or on an RS-485 LAN using the BACnet MS/TP protocol.

The DSC-1280 also supports an additional BACnet MS/TP SubLAN for VAV and other Application Controllers. This controller is designed for a wide-range of applications that have mid-sized I/O requirements. The SubLAN may be configured to support Delta BACstats and other Delta LINKnet I/O devices.



Application
The DSC-1280 is suitable for controlling equipment such as AHUs, Boilers, Chillers and a variety of HVAC control systems.

Because of its programming capability, the DSC-1280 can be used to create or modify GCL+ programs and BACnet objects for specific applications.

Features
–Native BACnet firmware

–BACnet MS/TP communications

–Optional BACnet IP

–Optional BACnet over Ethernet capability

–Integrated housing

–12 Universal inputs and 8 Universal outputs

–Fully programmable in GCL+

–Application database can be flash loaded over the network

–Controller firmware stored in flash memory (can be network loaded)

–Optional Hand/Off/Auto switches with position feedback

–Tri-color LED's to indicate output status

Specifications

BACnet Device Profile
BACnet Building Controller (B-BC)

Inputs
12 Universal inputs - 10 bit
(supporting 0-5v, 0-10v, 10kΩ, 4-20mA)

LED status indication of each input

Outputs
8 Analog outputs - (0-10v), software configured as binary or analog

LED status indication of each output

Technology
32-bit processor

1 MB (8 megabit) Flash memory

256 KB SRAM memory (512 KB with Ethernet option)

Real-time clock with lithium battery & SRAM backup

LED indication of CPU and SCAN status

Device Type
Configured as either an Area, System or Subnet device

Device Addressing
Set via DIP switch and jumpers, or software setup

Document Edition 2.5 July 2005

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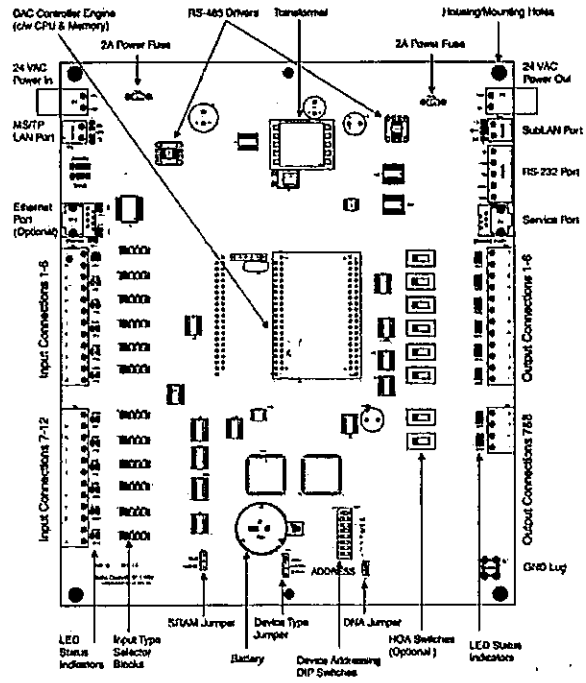
System Controllers

DSC-1280: Board Layout Diagram



Accessories

RPT-768—Delta Network Repeater for BACnet MS/TP

TRM-768—Delta Network Terminator for BACnet MS/TP

CON-768—Delta Network Converter

Ordering

Order the DSC-1280 with the desired options according to the following product numbers:

DSC-1280—Controller & Housing, MS/TP LAN

DSC-1280-V2*—Controller & Housing, *V2 Micro Firmware

DSC-1280H—Controller & Housing, MS/TP LAN, HOA Switches with Feedback

DSC-1280E—Controller & Housing, MS/TP LAN, Ethernet LAN/WAN, HOA Switches w/Feedback

*Not all features described in this document are available when this option is selected.

Specifications (Continued)

Communication Ports
Twisted-Pair Ethernet
(10-BaseT) @ 10 MB (optional), BACnet IP, BACnet over Ethernet

Main LAN (NET1)
BACnet MS/TP @ 9600,19200, 38400 or 76800 bps (default) (maximum of 99 devices per BACnet MS/TP segment)

SubLAN (NET2)
BACnet MS/TP (maximum 99 devices) or Delta LINKnet @ 76800 bps (maximum 12 devices on LINKnet, with no more than 4 DFM/DNT devices)

Serial RS-232 BACnet PTP (RS-232) 9600, 19200 or 38400 bps

Connectors
Removable screw-type terminal connectors

Wiring Class
Class 2

Power
24 VAC

25 VA

Ambient
32° to 131°F (0° to 55°C)

10 - 90% RH (non-condensing)

Dimensions
10 5/8 x 8 1/8 x 2 1/2 in. (27.0 x 20.5 x 6.4 cm) with housing

2.0 lb. (900 g) with housing

Approvals/Standards
UL 916 Listed

CE

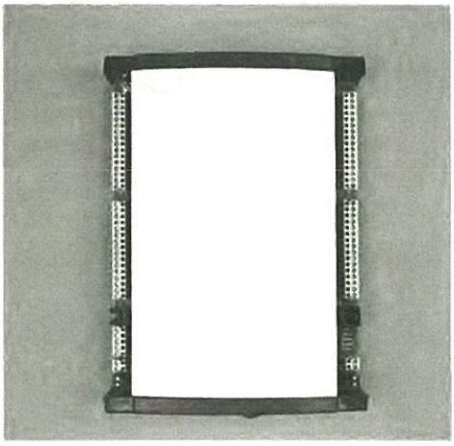
FCC

BTL Listed

System Controllers
DSC-1616

Description
The DSC-1616 is a fully programmable, Native BACnet™ Building Controller that communicates on Twisted-Pair Ethernet 10-BaseT using BACnet IP and BACnet over Ethernet, or on an RS-485 LAN using the BACnet MS/TP protocol.

The DSC-1616 also supports an additional BACnet MS/TP SubLAN for VAV and other Application Controllers. The SubLAN may be configured to support Delta BACstats and other Delta LINKnet I/O devices. This controller is designed for a wide-range of applications that have mid-sized I/O requirements.



Application
The DSC-1616 is suitable for controlling equipment such as AHUs, Boilers, Chillers and a variety of HVAC control systems.

Because of its programming capability, the DSC-1616 can be used to create or modify GCL+ programs and BACnet objects for specific applications.

Features
–Native BACnet firmware

–BACnet MS/TP communications

–Optional BACnet IP

–Optional BACnet over Ethernet capability

–Integrated housing

–16 Universal inputs and 16 analog outputs

–Fully programmable in GCL+

–Application database can be flash loaded over the network

–Controller firmware stored in flash memory (can be network loaded)

–Optional Hand/Off/Auto switches with position feedback

–Tri-color LED's to indicate output status

Specifications

BACnet Device Profile
BACnet Building Controller (B-BC)

Inputs
16 Universal inputs - 10 bit (supporting 0-5v, 0-10v, 10kΩ, 4-20mA)

LED status indication of each input

Outputs
16 Analog outputs - (0-10v), software configured as binary or analog

LED status indication of each output

Technology
32-bit processor

1 MB (8 megabit) Flash memory

127 KB SRAM memory (319 KB with Ethernet option)

Real-time clock with lithium battery & SRAM backup

LED indication of CPU and SCAN status

Device Type
Configured as either an Area, System or Subnet device

Device Addressing
Set via DIP switch and jumpers, or software setup

Document Edition 2.5 July 2005

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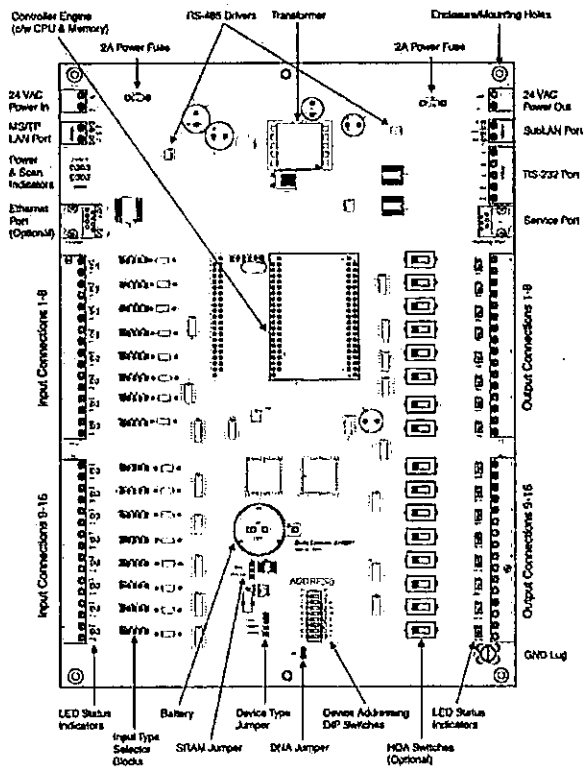
System Controllers

DSC-1616: Board Layout Diagram



Accessories

RPT-768–Delta Network Repeater for BACnet MS/TP

TRM-768–Delta Network Terminator for BACnet MS/TP

CON-768–Delta Network Converter

Ordering

Order the DSC-1616 with the desired options according to the following product numbers:

DSC-1616–Controller & Housing, BACnet MS/TP LAN

DSC-1616H–Controller & Housing, BACnet MS/TP LAN, HOA Switches w/feedback

DSC-1616E–Controller & Housing, BACnet MS/TP LAN, BACnet over Ethernet LAN, HOA Switches with feedback

Specifications (Continued)

Communication Ports
Twisted-Pair Ethernet
(10-BaseT) @ 10 MB (optional), BACnet IP, BACnet over Ethernet

Main LAN (NET1)
BACnet MS/TP @ 9600,19200, 38400 or 76800 bps (default) (maximum of 99 devices per BACnet MS/TP segment)

SubLAN (NET2)
BACnet MS/TP (maximum 99 devices) or Delta LINKnet @ 76800 bps (maximum 12 devices on LINKnet, with no more than 4 DFM/DNT devices)

Serial RS-232 BACnet PTP, 9600, 19200 or 38400 bps

Connectors
Removable screw-type terminal connectors

Wiring Class
Class 2

Power
24 VAC with LED status indication

30 VA

Ambient
32° to 131°F (0° to 55°C)

10 - 90% RH (non-condensing)

Dimensions
12 x 8 1/8 x 2 1/2 in. (30.6 x 20.5 x 6.4 cm) with housing

2.20 lb. (1 kg) with housing

Approvals/Standards
UL 916 Listed

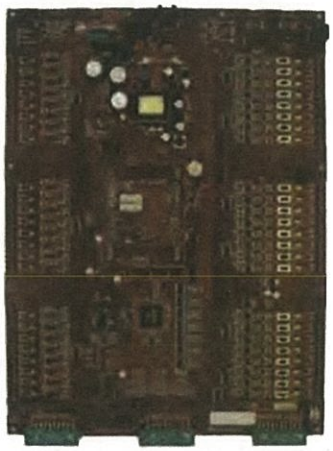
CE

FCC

BTL Listed

System Controllers
DSC-R2424E

Description
The DSC-R2424E is a fully programmable, Native BACnet™ Building Controller replacement for the Intelli-Con Turbo Panel. It communicates using BACnet IP, BACnet over Ethernet or on an RS-485 LAN using the BACnet MS/TP protocol. The DSC-R2424E shares the same physical footprint, I/O expansion cards, and Zone Controller Protocol as the Intelli-Con Turbo.



Application
The DSC-R2424E is suitable for controlling equipment such as AHUs, Boilers, Chillers and a variety of HVAC control systems.

Because of its programming capability, the DSC-R2424E can be used to create or modify GCL+ programs and BACnet objects for specific applications.

Features
—Native BACnet™ firmware

—V2 Intelli-Con Turbo, Intellicon and Intellicon Plus replacement controller

—Flexible input/output configuration using universal I/O points and Intelli-Con expansion cards

—Provides up to 96 I/O points

—V3 Communications: BACnet IP, BACnet over Ethernet, BACnet MS/TP or BACnet PTP

—V2 Communications: Zone Controller Protocol

—Fully programmable in GCL+

—Firmware can be flash loaded over the network

—Hand/Off/Auto switches with position feedback

—Tri-color LED's to indicate output status

Specifications

Inputs
24 Universal inputs - 10 bit (supporting 0-5V, 0-10V, 10KΩ 4-20 mA)

LED status indication per input

Outputs
24 Analog outputs (0-10V) software configured as analog or binary

LED status indication per output

Expansion I/O
3 Expansion slots (8 or 16 I/O points per slot), input or output boards available

Technology
32-bit processor

2 MB (16 megabit) Flash memory

512 KB SRAM memory

Real-time clock

SuperCap backup of clock and SRAM

Communication
Twisted-Pair Ethernet
(10-BaseT) @ 10 MB, BACnet IP, BACnet over Ethernet

V2 Zone Protocol (NET1)
Intelli-Con Zone Protocol 38400 bps (maximum 98 devices)

Main LAN (NET2)
BACnet MS/TP 9600, 19200, 38400 or 76800 bps (default) (maximum 99 devices per BACnet MS/TP segment)

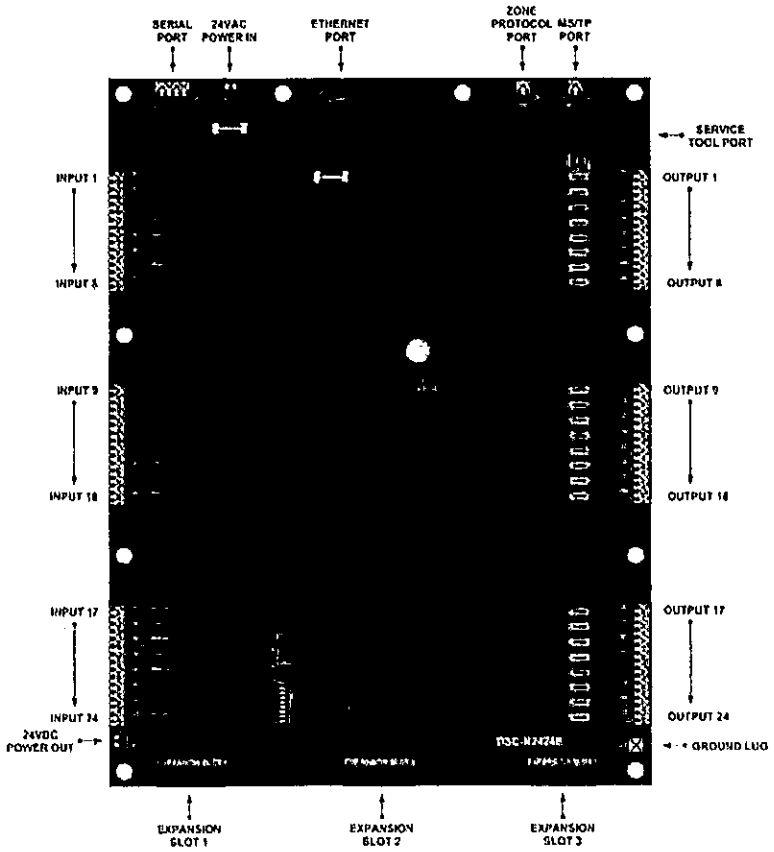
Serial RS-232 BACnet PTP 9600, 19200 or 38400 bps

Document Edition 1.0 November 2006

Do it right. Delta™ CONTROLS

System Controller

DSC-R2424E: Board Layout Diagram



Accessories

RPT-768—Delta Network Repeater for BACnet MS/TP

TRM-768—Delta Network Terminator for BACnet MS/TP

CON-768—Delta Network Converter

Ordering

Order the DSC-R2424E according to the following product numbers:

DSC-R2424E—24 Inputs, 24 Outputs, Intelli-Con Zone Protocol, BACnet over Ethernet, BACnet MS/TP, HOA switches with feedback

Expansion I/O

EXP110—8 Digital Inputs

EXP120—8 Universal Inputs

EXP130—16 Universal Inputs

EXP140—16 Digital Outputs

EXP161—8 Universal Outputs

Specifications (Continued)

Device Type
Configured as either an Area, System or Subnet device

Device Addressing
Set via DIP switch or software setup

Wiring Class
Class 2

Power
24 VAC with LED status indication

50 VA

Ambient
32° to 131°F (0° to 55°C)

10 - 90% RH (non-condensing)

Dimensions
15.1 x 11.1 In. (38.4 x 28.2 x 6.4 cm) with housing

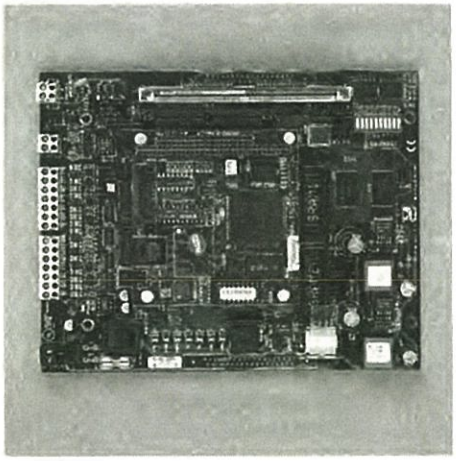
2.20 lb. (1 kg) with housing

Compliance
CE

FCC

System Managers
DSM-050: BACnet Router

Description
The DSM-050 is a fully programmable, Native BACnet™ Building Controller that routes network traffic between BACnet IP, BACnet over Ethernet, BACnet MS/TP, and BACnet PTP. The DSM-050 comes with a 10-BaseT Ethernet network card, one RS-485 Port, two RS-232 ports, real-time clock and battery backup.



Features
—Native BACnet IP, BACnet over Ethernet, BACnet MS/TP, & BACnet PTP

—Controller firmware stored in flash memory for easy upgrade

—Database memory expandable from 256 to 1256 KB (SRAM)

—Derived Network Addressing (DNA) for simple integration into a standard network architecture

Application
The DSM-050 is intended for use as an external point of connection to a building using BACnet IP. It may also be used for interconnecting different BACnet networks within a building.

Specifications

BACnet Device Profile
BACnet Building Controller (B-BC)

Technology
32-bit Processor

1 MB (8 megabit) Flash memory

256 KB SRAM memory (expandable to 1256 KB)

Real-time clock with NiCd battery for clock & SRAM backup

LED status indication of CPU SCAN Status, Network Activity

Device Address
Set via DIP switch, or software setup

DIP switch address range: 0 to 99 per network segment

Software address range: as per the BACnet standard

Supports Delta's derived network addressing (DNA) scheme

Communication Ports
BACnet MS/TP (RS-485) 9600, 19200, 38400 or 76800 bps (default)

BACnet PTP (RS-232) 9600, 19200, 38400 bps

BACnet over Ethernet and/or BACnet IP 10 Mbps

Document Edition 2.0 February 2005

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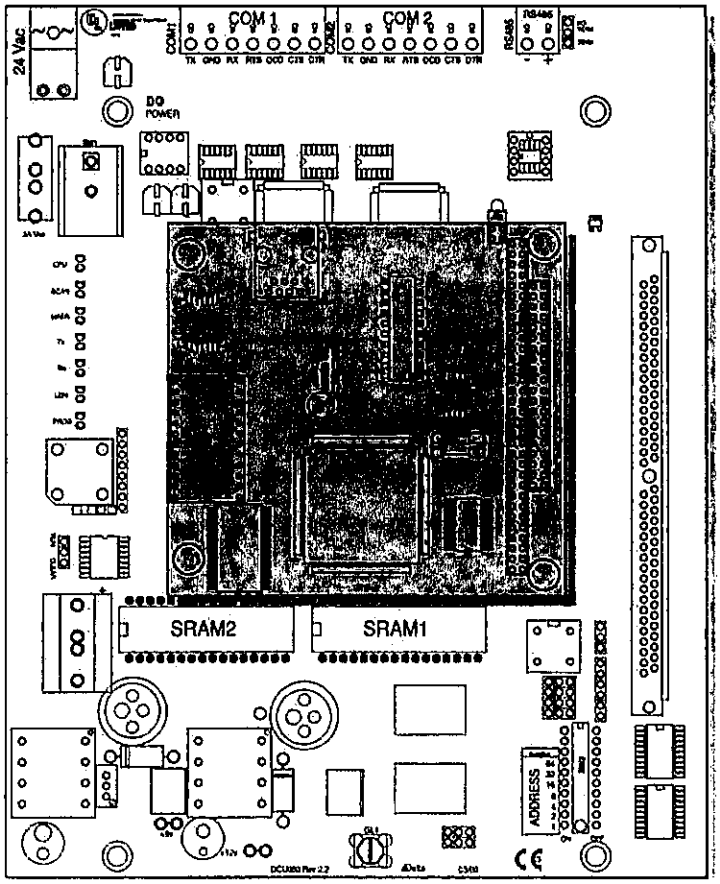
System Managers

DSM-050: Board Layout Diagram



Accessories

RPT-768–Delta Network Repeater for BACnet MS/TP

TRM-768–Delta Network Terminator for BACnet MS/TP

DCK790-2 V3–DCU Expandable SRAM Kit (4 MB)

Ordering

Order the DSM-050 with the desired options according to the following product number: DSM-050

Specifications (Continued)

Memory
Standard SRAM 256 KB

Standard DRAM 4 MB (SIMM Module)

Standard Flash 1 MB

Connectors
Removable screw-type terminal connectors

Wiring Class
Class 2

Power
24 VAC

40 VA with LED status indication

Ambient
32° to 131° F (0° to 55° C)

10 to 90% RH (non-condensing)

Dimensions
6.65 x 8.4 in. (16.9 x 21.1 cm)

0.8 lb. (365 g)

Approvals/Standards
UL 916 Listed

CE

FCC

DUCT AIR TEMPERATURE

- Platinum RTD or Thermistor
- Rugged Construction
- Hinged cover case

Easy to install with hinged cover

We have engineered our duct probe to ensure long life, rapid response and to prevent heat loss from leaks. The sensor is mounted using PC board technology to eliminate strain on the sensor leads, increasing reliability. The standard version is intended for use in non-condensing atmospheres. For applications where condensation is likely to be present ask for our moisture proof version.

Our molded case with hinged cover is easy to install. The cover is fastened with one captive screw. Provision is made for a front identification tag. The back is completely smooth so it fits flush against the mounting surface. Circuit board slots inside are designed to accept a 2-wire transmitter if required.

TECHNICAL DATA

Platinum RTD's are the most stable temperature sensors between -50 and 400C. They show almost no calibration drift with time. Their stability, wide temperature range and almost linear output make them the choice in demanding applications.

Our standard RTD uses a 100 ohm thin film element to DIN 43 760 (IEC 751) with a tolerance of 0.3 deg C. We also supply thin film RTD's with a tolerance of +/- 0.1 C or 0.05 percent in values of 100, 500 and 1000 ohms.

Wire wound ceramic RTD's with accuracies as high as +/- 0.06 degrees Celcius or 0.025 percent are in stock for high precision applications.

NTC Thermistors are the most sensitive sensors known for temperature measurement from -50C to +150C.

The temperature coefficient of thermistors can be as high as several percent per degree C. This means that lead resistance from installation of thermistors in remote areas has minimal effect on system accuracy.

Since thermistors are semiconductors they must not be exposed to temperatures near their maximum operating limits or they can drift out of specified tolerance.

Our standard thermistor has a 10K resistance at 25C and a tolerance of +/- 0.2C. On request other calibrations and accuracies are available.

Operating Temperature The construction of these sensors limits their maximum operating temperature to 105C.

ORDERING DATA

TS - D - ( ) - ( ) - ( )

stem length in inches	sensor type R = RTD T = Thermistor	sensor value 100 = 100 ohms 10K = 10k ohms

e.g. TS-D-12-T-10K Duct sensor, 12" long with 10K thermistor

ENERCORP instruments ltd

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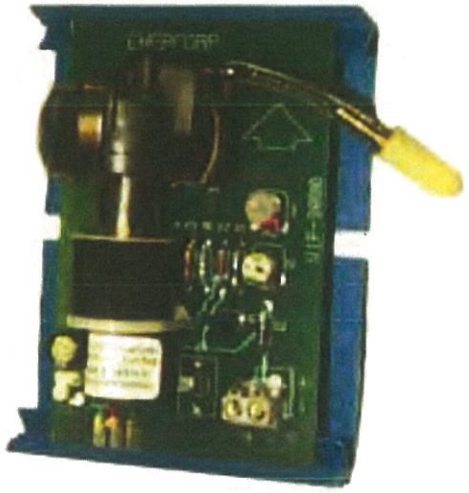
CURRENT TO PRESSURE TRANSMITTER

ESC ENERGRATED SYSTEMS **Part # EPT750**

- **Industry Standard Valve**
- **Updated Electronics**
- **4...20mA or 2...10VDC**



The VIP-9000 is an I/P or V/P transducer for interfacing electronic control panels to pneumatic valves. A 4...20 mA or 2...10 VDC (capable of delivering 20 mA) input signal is converted by the electronics to a 3 to 15 psi pneumatic signal to position dampers and valve actuators.

We have incorporated a very low air consumption industry standard valve with new electronics to provide excellent reliability with flexible voltage or current inputs.

PRESSURE

TECHNICAL DATA

Input Signal 4 ... 20 mA or 2 ... 10 VDC. Voltage signals must be capable of delivering 20 mA.

Input Impedance 500 ohms

Output Signal 3 to 15 psi

Air Supply Required 20 psi nominal, 30 psi maximum, clean, dry, oil free air required. Add in-line filter if necessary.

Air Consumption for Sizing 0.008 scfm at 15 psi

Air Capacity for Air Mains Size 16 scim

Maximum Air Capacity 515 scim at 20 psi supply

Linearity +/- 1% of span

Hysteresis 0.75% of span

Operating/Storage Temperature -29 to 60C / -40 to 71C (-20 to 140F/-40 to 160F)

Humidity 5 to 95% rH, non-condensing

Dimensions 3-7/8"H x 3"W x 2-1/2" D (98x76x67mm)

Connections Screw terminal and barbed fittings for 1/4" OD plastic tubing

Mounting Upright position. Supplied with plastic track for panel mounting

ORDERING DATA

VIP-9000

ACCESSORIES

PRESSURE GAUGE
Size 1 1/2" dia
Mount 1/8" NPT back
Range 0+30psi/0+200kPa
Accuracy 2%
Movement Bourdon tube
ORDER # VIP-PG

MOUNTING "T"
Thread 1/8" NPT female
Hose 1/4" O.D./0.170 I.D.
Material Brass
Mount Through tab holes
ORDER # VIP-T

BETTER INLINE FILTER
This filter is rated at 0.2 microns and changes colour when contaminated by oil. Use to protect VIP-9000.
Hose 1/4" O.D./0.170 I.D.
ORDER # VIP-F02

GOOD INLINE FILTER
This filter is rated at 10 microns. Does not change colour. Use to protect VIP-9000 from dirt particles only.
Hose 1/4" O.D./0.170 I.D.
ORDER # VIP-F10

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BELIMO LF series spring return direct coupled air damper actuator

Submittal **Torque min. 35 in-lb, for damper areas up to 8 ft²***

On-Off Control, 24 VAC/DC Power

☐ **LF24 us**

☐ **LF24-S us** (LF24 us with aux. switch)

On-Off Control, 120 VAC Power

☐ **LF120 us**

☐ **LF120-S us** (LF120 us with aux. switch)

On-Off Control, 230 VAC Power

☐ **LF230 us**

☐ **LF230-S us** (LF230 us with aux. switch)

Floating Control, 24 VAC/DC Power

☐ **LF24-3 us** (LF24 us with floating point control)
Input impedance: 1000 kΩ

☐ **LF24-3(-S) us** (LF230 us with aux. switch)

Proportional Control, 24 VAC/DC Power

☐ **LF24-SR us**
Control signal: 2 to 10 VDC
4 to 20 mA (with 500Ω resistor)
Input impedance: 100 kΩ
Feedback output: 2 to 10 VDC

☐ **LF24-SR-S us** (LF24-SR us with aux. switch)

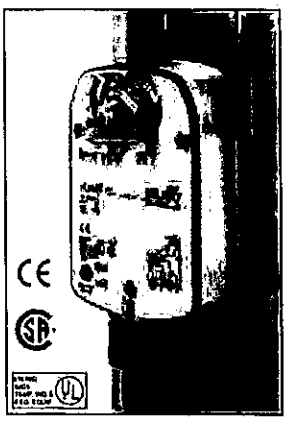
☐ **LF24-SR-MP us**
Control signal: 6 to 9 VDC
Input impedance: 100 kΩ
Auxiliary power output: 20 VDC, 40 mA short circuit protected, to power controller

☐ **LF24-SR-S-MP us** (LF24-SR-MP us with aux. switch)

Common Data

Power consumption:	2.5 to 5.5 W running, 1 to 3.5 W holding (models vary)
Transformer sizing:	7 VA (LF24 us, LF230 us), 7.5 VA (LF120 us), 6 VA (LF24-SR-MP us), 5 VA (LF24-S us, LF24-SR us), class 2 power
Electrical connection:	3 ft, 18 GA appl. cable, 1/2" conduit fit. (plenum LF24-3 us, LF24-SR us)
Electrical protection:	120/230V actuators/aux. switches double insulated
Overload protection:	electronic throughout rotation
Angle of rotation:	95° (adjustable with integral stop)
Direction of rotation:	selected by switch: CW=CW with decrease signal CCW=CCW with decrease signal
Spring return direction:	CW/CCW mounting
Position indication:	visual indicator
Auxiliary switch:	1 x SPDT, 5° to 85° (-S)
Running time:	<40 to 75 sec. (on-off) 150 sec. independent of load (proportional) spring: <25 sec. @-4°F to +122°F [-20°C to +50°C] <60 sec. @-22°F [-30°C]
Ambient temperature:	-22° F to 122° F [-30° C to 50° C]
Housing:	NEMA 2 / IP54
Agency listings:	UL 873, CSA 4813 02, CE
Noise level:	max. 62 dB(A)
Weight:	3.1 lbs to 3.5 lbs (models vary)

Application/Operation



For fail-safe control of dampers in HVAC systems. Actuator sizing should be done in accordance with the damper manufacturer's specifications. Actuator is mounted directly to a 3/8" to 1/2" diameter damper shaft by means of its universal clamp, or up to a 3/4" shaft with the optional K6-1 clamp. A crankarm and several mounting brackets are available for applications where the actuator cannot be direct coupled to the damper shaft.

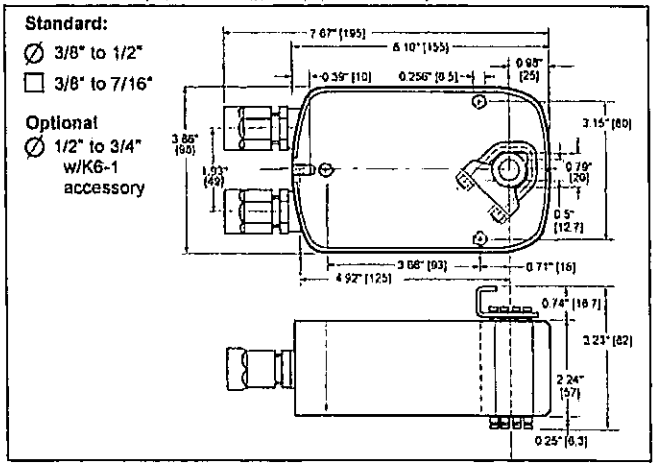
LF24(-S) us, LF120(-S) us and LF230(-S) us control is on-off from an auxiliary contact of a fan motor contactor or a manual switch. The **LF24-SR(-S) us** operates in response to a 2 to 10 VDC, or with the addition of a 500Ω resistor, a 4 to 20 mA control input from an electronic controller or positioner. The **LF24-SR(-S)-MP us** operates in response to a 6 to 9 VDC control signal and includes a 20 VDC, 40 mA auxiliary power output, used to power the controller. The **LF24-3(-S) us** control is 3 wire, floating point from a triac or relay, or on-off. The **LF24-3(-S) us** and **LF24-SR(-S)** use a brushless DC motor which is controlled by an Application Specific Integrated Circuit (ASIC) and a microprocessor. The microprocessor provides the intelligence to the ASIC to provide a constant rotation rate. The ASIC monitors and controls the brushless DC motor's rotation and provides a digital rotation sensing function to prevent damage to the actuator in a stall condition. The actuator may be stalled anywhere in its normal rotation without the need of mechanical end switches. Power consumption is reduced in holding mode.

True spring return operation is provided for reliable fail-safe application and positive close-off on air-tight dampers. Consistent torque is provided to the damper with, and without, power applied to the actuator. The LF series provides 95° of rotation with a graduated position indicator showing 0° to 90°. The actuator may be stalled anywhere in its normal rotation without the need of mechanical end switches. Power consumption is reduced in holding mode.

The (-S) models are provided with 1 built in auxiliary switch. This SPDT switch is provided for safety interfacing or signaling, for example, for fan start-up. The switching function is adjustable between 0° and 95°. 120 and 230 V actuators, and all auxiliary switches are double insulated so an electical ground connection is not necessary.

* Based on 4 in-lb/ft² damper torque loading. Parallel blade. No edge seals.

Dimensions (All numbers in brackets are metric.)

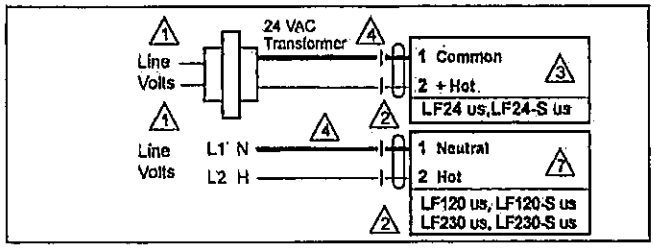


Project _____ **Engineer** _____ **Submittal Date** _____

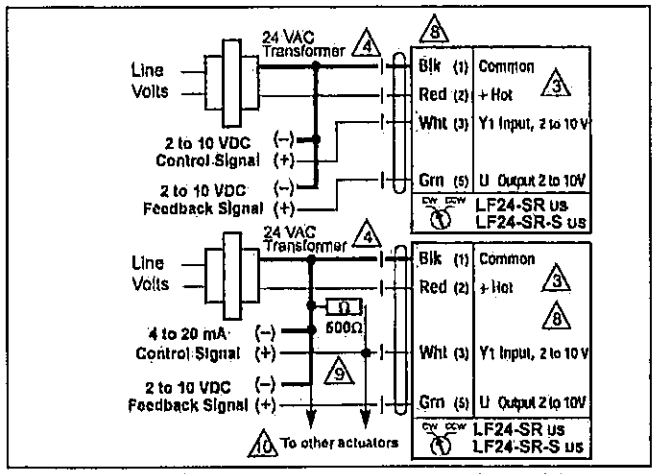
LF series spring return direct coupled air damper actuator

BELIMO

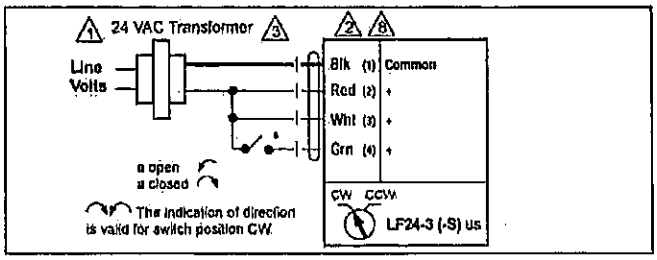
Wiring diagrams



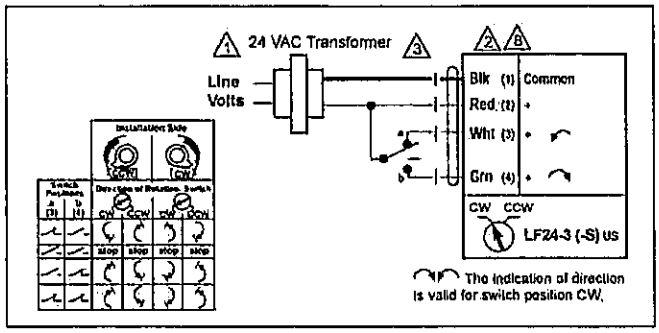
On-off



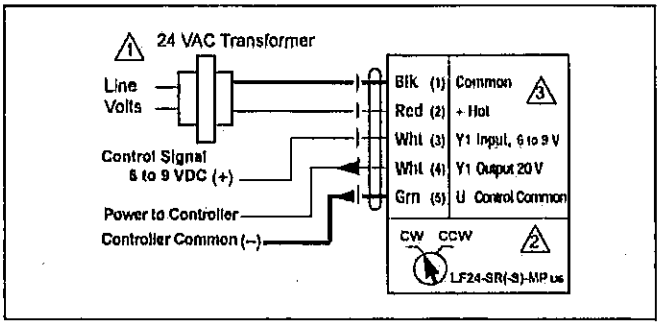
Proportional (2 to 10 VDC, 4 to 20 mA control signals)



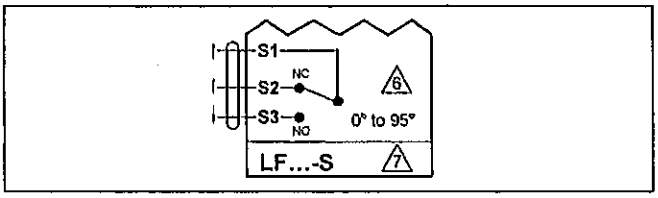
On-Off control of LF24-3 (-S) us



Floating point control of LF24-3 (-S) us



2 to 10 VDC control of LF24-SR(-S)-MP (-S) us



Auxiliary switch models - All LF-series with '-S' suffix

Typical Specification:

LF24/120/230 (-S) us and general
Spring return damper actuators shall be direct coupled type which require no crankarm and linkage, capable of direct mounting to a shaft up to a 3/4" diameter and center on a 1/2" shaft. The actuators must be designed so that they may be used for either clockwise or counterclockwise fail-safe operation. The actuators must be designed so that they may be used for either clockwise or counterclockwise fail-safe operation. Actuators shall be protected from overload at all angles of rotation. If required, 1 SPDT auxiliary switch shall be provided having the capability of being adjustable. Actuators with auxiliary switch, and 120/230 VAC models, must be constructed to meet the requirements for Double Insulation so an electrical ground is not required to meet agency listings. Actuators shall be UL listed and CSA certified, have a 2 year warranty, and be manufactured under ISO 9001 International Quality Control Standards. Actuators shall be as manufactured by Belimo.

LF24-SR (-S) US
The actuator must provide proportional damper control in response to a 2 to 10 VDC, or, with the addition of a 500Ω resistor, a 4 to 20 mA control input from an electronic controller or positioner. Actuators shall use a brushless DC motor controlled by a microprocessor and be protected from overload at all angles of rotation. A 2 to 10 VDC feedback signal shall be provided for position feedback or master-slave applications.

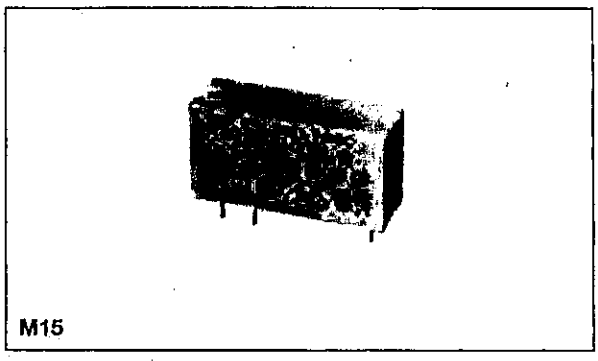
LF24-3(-S) us
Actuator shall offer floating-point type control.

LF24-SR(-S)-MP us
The actuator must provide damper control in response to a 6 to 9 VDC control input from an electronic controller or positioner. A built-in 20 VDC auxiliary power output capable of sourcing up to 40 mA shall be provided to power controllers.

Notes:

1. Provide overload protection and disconnect as required
2. Actuators may be connected in parallel. Power consumption must be observed.
3. May also be powered by 24 VDC.
4. The Common connection from the actuator must be connected to the Hot connection of the controller
5. The actuator Hot must be connected to the control board Common.
6. For end position indication, interlock control, fan startup, etc., '-S' models incorporate one built-in auxiliary switch: 1 x SPDT, 6A (1.5A) @250 VAC, UL listed, adjustable 0° to 95°
7. Meets UL & CSA requirements without the need of an electrical ground connection
8. Actuators with plenum rated cable do not have numbers on wires; use color codes instead
9. The ZG-R01 500Ω resistor converts the 4 to 20 mA control signal to 2 to 10 VDC
10. Up to 4 actuators may be connected in parallel. With 4 actuators wired to one 500Ω resistor, a ±2% shift of control signal may be required. Power consumption must be observed

Miniature Power Relays Series M15
Type M15 . . . 100/001
Monostable



M15

- Miniature size 15 mm high
- PCB mounting
- 4 kV / 8 mm insulation
- Switching capability 8 A / 250 VAC
- DC coils 2 to 147 VDC
- General purpose, industrial electronics
- Sealed according IP 67 standard
- 4 different pin layout configurations
- Low coil power consumption

Product Description

Miniature sealed relay according to IP 67.
Suitable for automatic soldering. Produced on fully automated production line.

Space saving design for compact packages. Very low contact noise due to short bounce time (NO contact)

Ordering Key M15 M A H 001 8 24VDC

Type
Pin layout configuration
Contact material
Version (H=Sealed)
Contact code
Contact rated current
Coil rated voltage

Pin layout configuration
M = 3.5 mm
B = 5.0 mm
F = 2.5 mm
E = 3.2 mm / 5.0 mm

Contact material
A = Ag CdO
B = Ag Ni
C = Ag CdO, Au plated
D = Ag CdO, gilded
E = AgNi, Au plated
F = Ag, gilded
S = Ag SnO_2

Type Selection

Contact configuration		Contact rating	Contact code
1 normally open contact	(SPST-NO (1-form A))	8 A	100
1 change over contact	(SPDT-CO (1-form C))	8 A	001

Coil Characteristics, DC (20 °C)

Rated voltage VDC	Winding resistance Ω ± 10%	Operating range Min. VDC	Operating range Max. VDC	Drop out voltage ≥ VDC
3.0	40	2.00	5.3	0.150
5.0	115	3.40	9.0	0.250
6.0	160	4.00	10.6	0.300
8.0	290	5.40	14.2	0.400
12.0	640	8.40	21.2	0.600
18.0	1450	12.60	31.9	0.900
24.0	2550	16.00	42.2	1.200
48.0	10250	33.50	84.7	2.400
110.0	31000	73.01	147.0	5.500

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Temperature Influence

Operating voltages for step excitation. Minimum operating voltage is referred to +20 °C/+68 °F ambient temperature; maximum operating voltage is referred to +40 °C/+104 °F ambient temperature.

t °C	t °F	K1	K2
0	32	0.92	1.15
10	50	0.96	1.12
20	68	1.00	1.09
30	86	1.04	1.05
40	104	1.08	1.00
50	122	1.12	0.94
60	140	1.16	0.88
70	158	1.20	0.81

Values of minimum and maximum operating voltage in respect to ambient temperature (t) may be obtained applying following formulas:

$$V_{min\ t} = K1 \cdot V_{min\ 20}$$

$$V_{max\ t} = K2 \cdot V_{max\ 40}$$

Contact Characteristics

Rating	8 A
Material (standard version) [1]	Ag CdO
Current (for AC)	
Rated current	8 A
Max. switching current	10 A
Voltage	
Rated voltage	250 VAC - 50 Hz
Max. switching voltage	440 VAC (max 1500 VA)
Max. switching voltage (VDE 0435)	380 VAC
Power	
Max. switch. power with resistive load in AC	2000 VA
Max. switch. power with resistive load in DC	See diagram 1
Min. switchng current [3]	100 mA at 24 VDC
Life	
Expected life at:	
8 A-250 VAC - cos φ = 1	100000 cycles
5 A-250 VAC - cos φ = 0.4	100000 cycles
Mechan. life at max. switching frequency of 18.000 cycles/h	30 x 10^6 cycles

General Data

Operating time at rated voltage	≤ 9 ms
Operating bounce time	≤ 1 ms
Release time	≤ 3 ms
Release bounce time	≤ 3 ms
Ambient temperature [2]	-40 °C to +70 °C
Vibration resistance	2,5 mm p.p. 5 ÷ 45 Hz 10 G, 45 ÷ 100 Hz
Shock resistance	10 G, 11 ms
Inside protection according to IEC 144	IP 67 sealed
Weight	10 g
Working class/type of service	C / Continuous

[1] If required, the contacts can be supplied with flash gilded silver contacts for storage purpose (24 VDC/10mA), as well as with gold plated silver contacts for very low switching levels, in the range of 10 mA and 10 mV.
AgNi contacts for DC loads and $AgSnO_2$ contacts for heavy loads are also available.

[2] Supplying the relay coil at the maximum voltage given in the table "Temperature Influence", the maximum ambient temperature value decreases from 70° to 40°C.

[3] Typical value

Insulation

Insulation Resistance at 500 VDC	2 x 10^7 MΩ
Test voltage(1 min.)	
Open contacts	1000 VAC
Coil/Contacts	4000 VAC
Insulation group according to VDE 0110	
Contact/Coil IGR	C/660
Open/Contact IGR	C/250

Special loads - Motor loads

	AC1	(IEC 947-5)		Motor loads			
		AC 15	DC13	AgCdO		$AgSnO_2$	
	250 VAC	250 VAC	24 VDC	115 VAC	250 VAC	115 VAC	250 VAC
M15 001	8A	2.5A	5A	1/8 HP	1/3 HP	1/3 HP	3/4 HP

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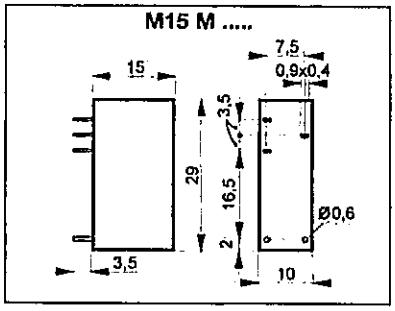
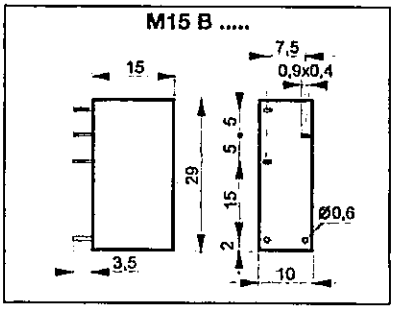
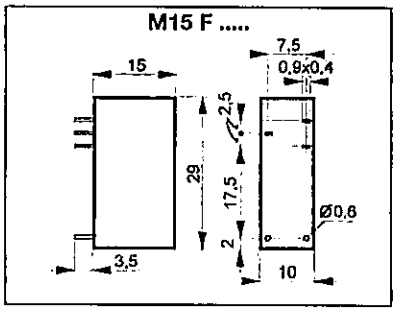
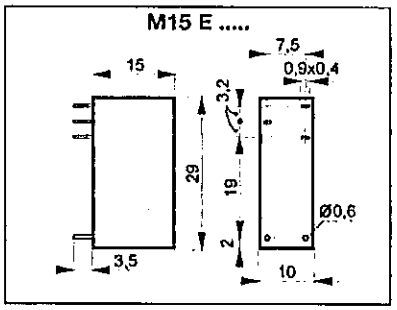
Dimensions

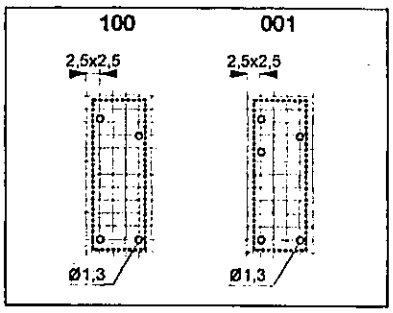


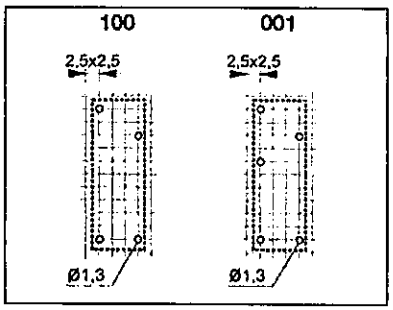


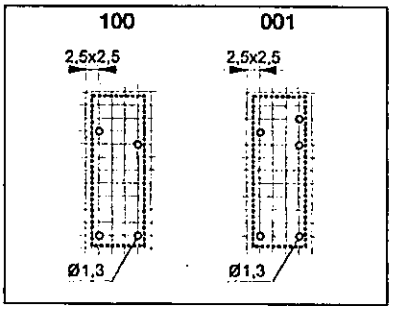


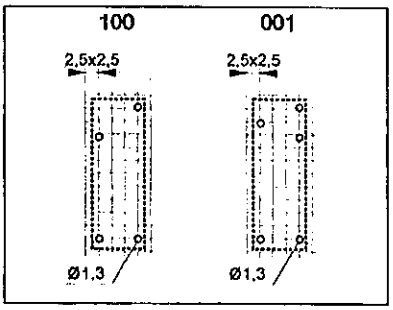


Pin View

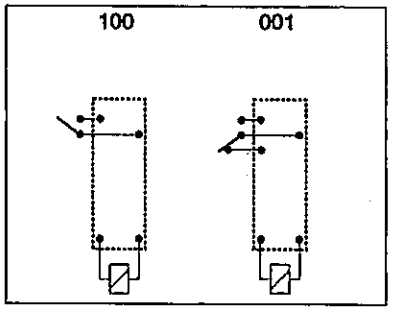


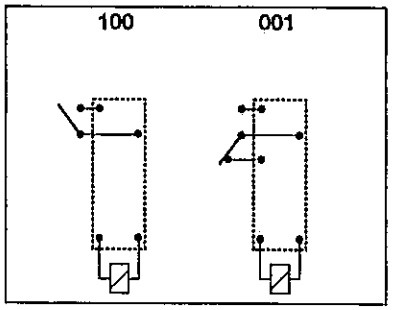


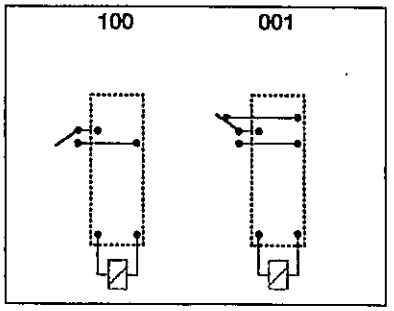


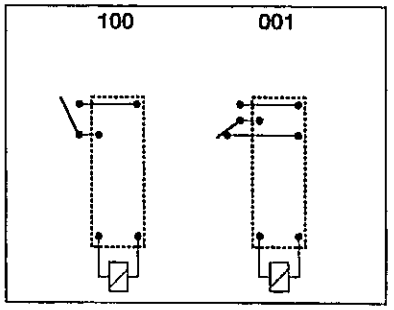


Wiring Diagrams





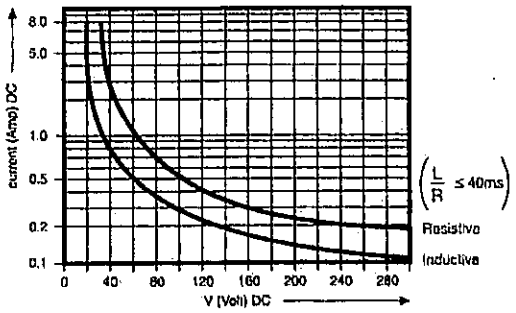




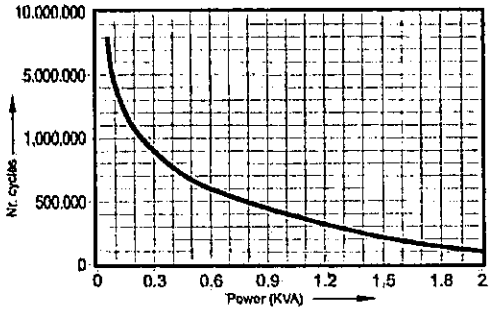
View from solder side.

Diagrams

1 Max. switching power DC



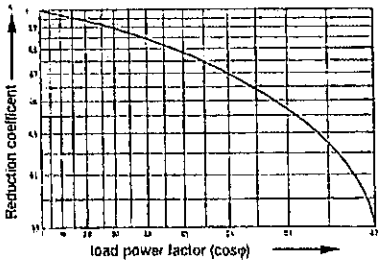
2 Expected switching cycles/switching current at 250 VAC.
For resistive loads and repetition rate 360 cycles/h.



Diagrams

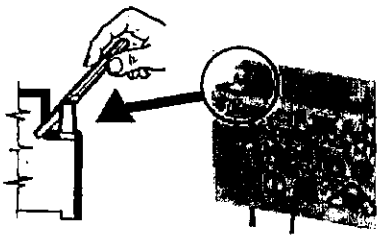
3 Reduction of expected life against load power factor cos φ

For all types



Application Hints

Use of sealed relays
The M15 relay types are completely sealed (according to IEC 68 part 2 - 17 (DIN 40046) QC 2 - test).
They are flux proof and are suited for automated soldering (wave soldering) as well as for immersion washing.
If maximum utilization of the switching capacity is required, it is recommended to open the relay after completion of the soldering/washing process by breaking out the corresponding pin as indicated.



Product safety
Operations outside the stated ratings shown in this catalogue may result in a possible failure or unsafe operating conditions..

Approvals

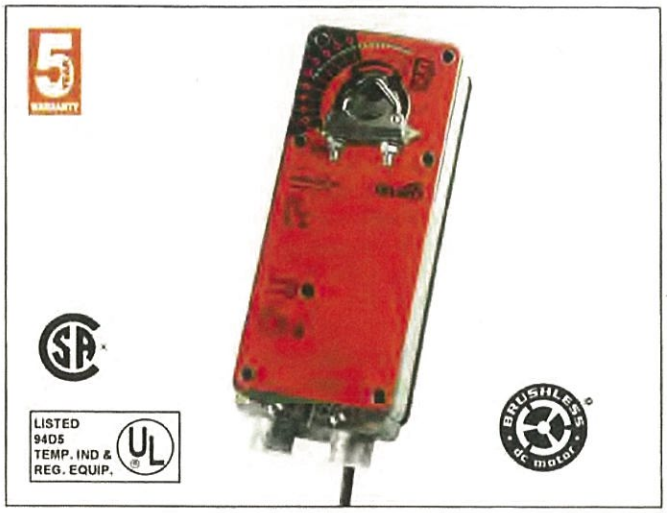
ITALY U.S.A. CANADA GERMANY SWITZERLAND SWEDEN DENMARK NORWAY FINLAND

The approvals are not generally applicable to all relay versions of a particular type.

For further information please apply for relevant data sheets ref. **3.84.00.10.X**

NF24-SR (-S) US

Proportional damper actuator, spring return failsafe, 24 V for 2 to 10 VDC, or 4 to 20 mA control signal. Output signal of 2 to 10 VDC for position indication



Torque min. 60 in-lb, for control of air dampers

Application

For proportional modulation of dampers in HVAC systems. Actuator sizing should be done in accordance with the damper manufacturer's specifications.

The actuator is mounted directly to a damper shaft up to 1.05" in diameter by means of its universal clamp. A crank arm and several mounting brackets are available for applications where the actuator cannot be direct coupled to the damper shaft.

The actuator operates in response to a 2 to 10 VDC, or with the addition of a 500Ω resistor, a 4 to 20 mA control input from an electronic controller or positioner. A 2 to 10 VDC feedback signal is provided for position indication or master-slave applications.

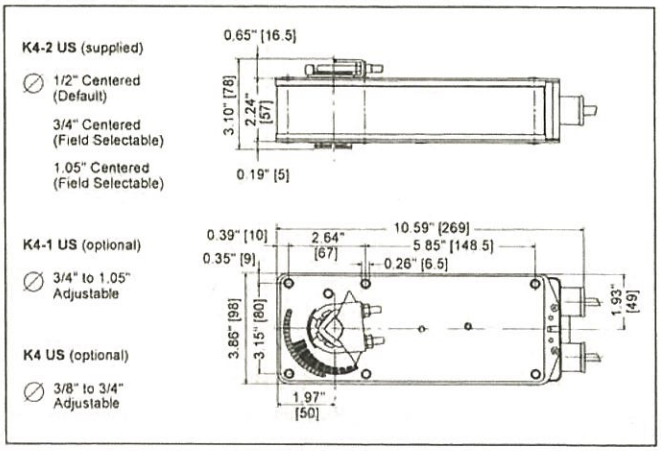
Operation

The NF series actuators provide true spring return operation for reliable fail-safe application and positive close-off on air tight dampers. The spring return system provides constant torque to the damper with, and without, power applied to the actuator. The NF series provides 95° of rotation and is provided with a graduated position indicator showing 0° to 95°.

The NF24-SR US uses a brushless DC motor which is controlled by an Application Specific Integrated Circuit (ASIC) and a microprocessor. The microprocessor provides the intelligence to the ASIC to provide a constant rotation rate and to know the actuator's exact fail-safe position. The ASIC monitors and controls the brushless DC motor's rotation and provides a digital rotation sensing function to prevent damage to the actuator in a stall condition. The actuator may be stalled anywhere in its normal rotation without the need of mechanical end switches.

Technical Data	NF24-SR US
Power supply	24 VAC ± 20% 50/60 Hz 24 VDC ± 10%
Power consumption	running: 3 W; holding: 1 W
Transformer sizing	6 VA (class 2 power source)
Electrical connection	3 ft, 18 GA appliance cable 1/2" conduit connector
Overload protection	Electronic throughout 0 to 95° rotation
Operating range Y	2 to 10 VDC, 4 to 20mA
Input impedance	100 kΩ (0.1 mA), 500Ω
Feedback output U	2 to 10 VDC (max. 0.5 mA) for 95°
Angle of rotation	95°, adjustable 30° to 95° w/accessory
Torque	60 in-lb [7 Nm] constant torque
Direction of rotation	spring: reversible with cw/ccw mounting motor: reversible with built-in switch
Position indication	visual indicator, 0° to 95° (0° is spring return position)
Auxiliary switches (NF24-SR(-S)	1 x SPDT 7A (2.5A) @ 250 VAC, UL listed adjustable 5° to 85°
Running time (nominal)	motor: 150 sec constant, independent of load spring: < 60 sec
Humidity	5 to 95% RH non-condensing
Ambient temperature	-22°F to +122°F [-30°C to +50°C]
Storage temperature	-40°F to +176°F [-40°C to +80°C]
Housing	NEMA type 2 / IP54
Housing material	zinc coated metal
Agency listings	UL 873 listed, CSA C22.2 No.24 certified
Noise level	max. 45 dB (A)
Servicing	maintenance free
Quality standard	ISO 9001
Weight	6.0 lbs (2.7 kg.)

Dimensions [All numbers in brackets are in millimeters.]



Accessories

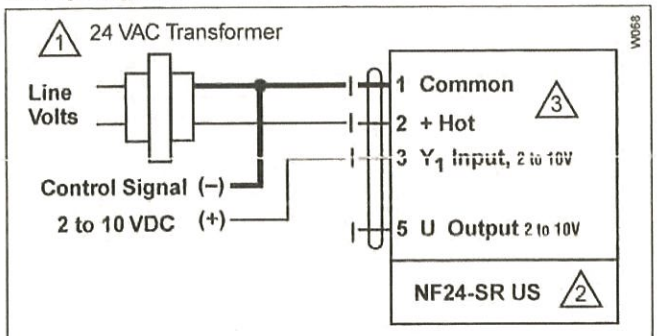
AV 10-18	Shaft extension
IND-AF2	Damper position indicator
K4-1 US	Universal clamp for up to 1.05" dia jackshafts
K4-H	Universal clamp for hexshafts 3/8" to 5/8"
KH-AF	Crankarm for up to 3/4" round shaft
KH-AF-1	Crankarm for up to 1.05" jackshaft
KH-AFV	V-bolt kit for KH-AF and KH-AF-1
PTA-250	Pulse width modulation interface
Tool-06	8mm and 10 mm wrench
SGA24	Min. and/or man. positioner in NEMA 4 housing
SGF24	Min. and/or man. positioner for flush panel mounting
ZG-R01	500Ω resistor for 4 to 20mA control signal
ZG-HTR	Thermostat/Heater Kit
ZDB-AF2	Angle of rotation limiter
ZG-100	Universal mounting bracket
ZG-101	Universal mounting bracket
ZG-102	Multiple actuator mounting bracket
ZG-103	Universal mounting bracket
ZG-104	Universal mounting bracket
ZG-106	Mounting bracket for Honeywell® Mod IV replacement or new crankarm type installations
ZG-107	Mounting bracket for Honeywell® Mod III or Johnson® Series 100 replacement or new crankarm type installations
ZG-108	Mounting bracket for Barber Colman® MA 3../4.., Honeywell® Mod III or IV or Johnson® Series 100 replacement or new crankarm type installations
ZG-AF US	Crankarm adaptor kit for AF/NF
ZG-AF108	Crankarm adaptor kit for AF/NF
ZS-100	Weather shield (metal)
ZS-150	Weather shield (polycarbonate)
ZS-260	Explosion-proof housing
ZS-300	NEMA 4X housing

Note: When using NF24-SR US actuators, only use accessories listed on this page.

NF24-SR US Typical Specification

Spring return control damper actuators shall be direct coupled type which require no crankarm and linkage and be capable of direct mounting to a jackshaft up to a 1.05" diameter. The actuator must provide proportional damper control in response to a 2 to 10 VDC or, with the addition of a 500Ω resistor, a 4 to 20 mA control input from an electronic controller or positioner. The actuators must be designed so that they may be used for either clockwise or counterclockwise fail-safe operation. Actuators shall use a brushless DC motor controlled by a microprocessor and be protected from overload at all angles of rotation. Run time shall be constant, and independent of torque. A 2 to 10 VDC feedback signal shall be provided for position feedback or master-slave applications. Actuators shall be UL listed and CSA certified, have a 5 year warranty, and be manufactured under ISO 9001 International Quality Control Standards. Actuators shall be as manufactured by Belimo.

Wiring diagrams

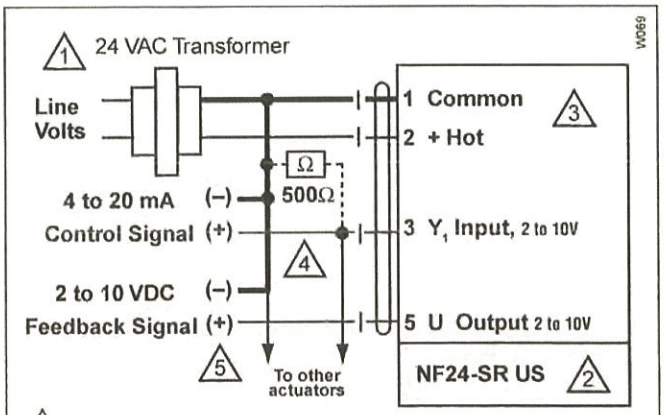


1 Provide overload protection and disconnect as required.

2 Actuators may be connected in parallel. Power consumption and input impedance must be observed.

3 Actuator may also be powered by 24 VDC.

0 to 10 VDC control of NF24-SR US



1 Provide overload protection and disconnect as required.

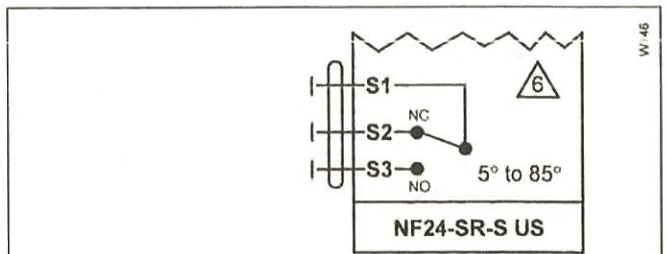
2 Up to 4 actuators may be connected in parallel. With 4 actuators wired to one 500Ω resistor. Power consumption must be observed.

3 Actuator may also be powered by 24 VDC.

4 A 500Ω resistor converts the 4 to 20 mA control signal to 2 to 10 VDC. (ZG-R01)

5 Only connect common to neg. (–) leg of control circuits

4 to 20 mA control of NF24-SR US with 2 to 10 VDC feedback output

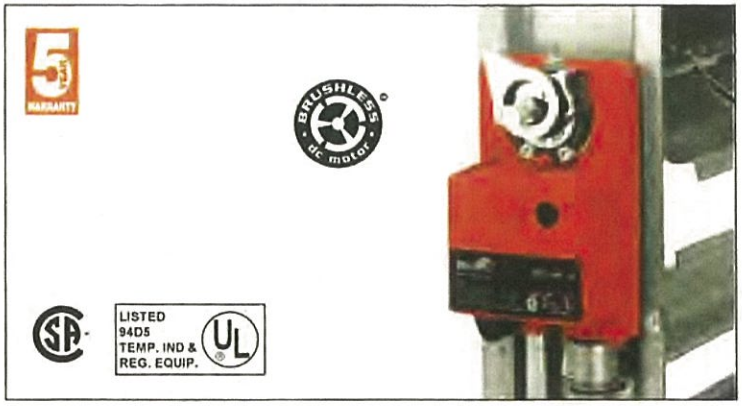


6 For end position indication, interlock control, fan start-up, etc., NF24-SR US incorporates a built-in auxiliary switch: 1 x SPDT, 7A (2.5A) @250 VAC, UL listed, adjustable 5° to 85°.

Auxiliary switch wiring

NM24-SR US

Proportional damper actuator, non-spring return, direct coupled, 24 V, for 2 to 10 VDC and 4 to 20 mA control signal



Torque min. 70 in-lb, for control of air dampers surfaces up to 18 sq. ft.

Technical Data	NM24-SR US
Power supply	24 VAC, ± 20%, 50/60 Hz 24 VDC, ±10%
Power consumption	running: 1.3 W; holding: 0.5W
Transformer sizing	3.5 VA (Class 2 power source)
Operating range Y	2 to 10 VDC, 4 to 20 mA
Input impedance	100kΩ (0.1 mA), 500Ω
Feedback output 'U'	2 to 10 VDC, 0.7 mA max
Electrical connection	3 ft, 18 GA plenum rated (UL CL2P) cable, 1/2" conduit connector
Overload protection	electronic throughout 0 to 95° rotation
Torque (Note 1)	min 70 in-lb (8 Nm)
Damper area (Note 2)	18 sq ft
Direction of rotation	reversible with Switch L/R L = CW with an increase in voltage R = CCW with an increase in voltage
Position indication	clip on indicator
Manual override	button on actuator
Angle of rotation	0 to 95°, adjust with mechanical stops
Running time (35-95°)	150 seconds independent of max. angle of rotation or torque
Running time (0-35°)	0 to 150 seconds proportional to max. angle of rotation (Note 3)
Run time stability	± 5%
Humidity	5 to 95% RH, non-condensing
Ambient temperature	-4 to +122° F (-20 to +50° C)
Storage temperature	-40 to +176° F (-40 to +80° C)
Mounting position	not sensitive to position
Housing	NEMA 2
Housing material	UL 94-5V (flammability rating)
Noise level	less than 35 dB (A)
Agency listings	UL 873 listed, CSA C22.2 No.24 certified, CE
Quality standard	ISO 9001
Servicing	maintenance free
Weight	1.8 lbs. (0.8kg.)

Note 1 Minimum torque is produced at minimum voltage, minimum temperature.

Note 2 Damper area is calculated using approximately 4 in-lb/sq ft of damper area. This is an average torque requirement for good quality dampers operating under a 1" WC pressure drop. Check damper specifications for exact torque requirements.

Note 3 The on board microprocessor measures the actuators full stoke on startup. It then adjusts the actuator speed to ensure 150 second run time for 35°-95°. Below 35° stroke, the speed is constant and run time varies with rotation angle.

Application

For proportional modulation of dampers in HVAC systems. Actual actuator sizing should be done in accordance with the damper manufacturer's specifications. The actuator mounts directly to the damper operating shaft with a universal V-bolt clamp assembly.

Operation

The actuator operates in response to a 2 to 10 VDC, 2 to 10 V phasecut or, with the addition of a 500Ω resistor, a 4 to 20 mA control input from an electronic controller or positioner. A 2 to 10 VDC feedback signal is provided for position indication or master-slave applications.

A built-in microprocessor automatically tests for the amount of rotation required to modulate the damper fully closed to fully open. The actuator will self-adjust to run at a consistent running time of 150 seconds, and rescale the input signal so the entire 8 volt control range is used to provide maximum resolution of the control system.

The microprocessor will also correct for compression of tight close-off gaskets with age, providing the actuator is not on its mechanical stops. A functional test of the actuator-damper assembly may be done by pressing in the manual override button, this will activate the actuators test mode and cycle the actuator fully open and closed.

A 2 to 10 VDC feedback (U) is provided with full 8 volt output range proportional to the operational rotation of the damper.

A digital rotation sensing circuit protects the actuator in a stall anywhere in its 95° working range without the need of limit switches.

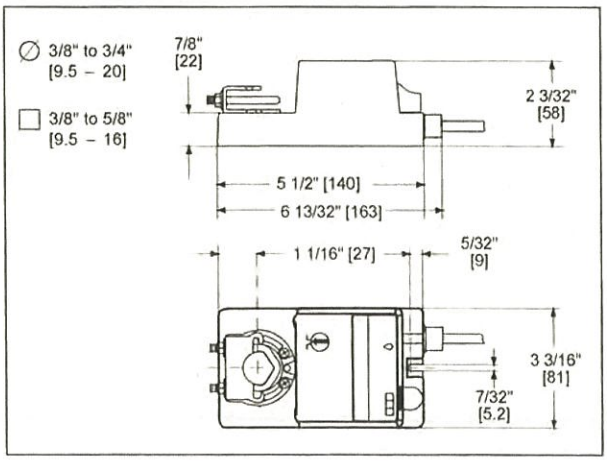
Auxiliary switches are easily fastened directly onto the actuator body for signalling and switching functions.

Accessories

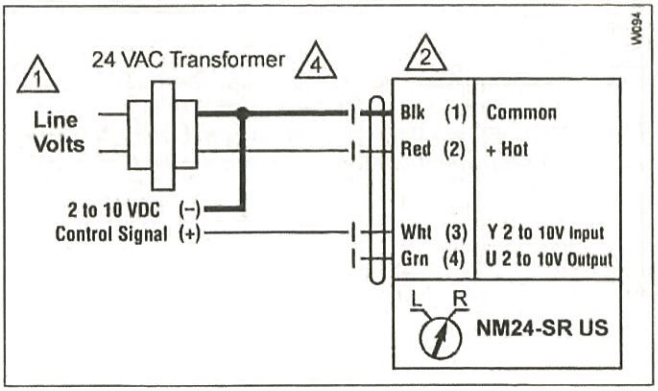
AV 10-18 Damper shaft extension
SN1,SN2 Auxiliary switches
ZG-H2 Actuator operator handle
ZG-NMSA-1 Shaft adaptor for short shafts

Note: When using NM24-SR US actuators, only use accessories listed on this page.

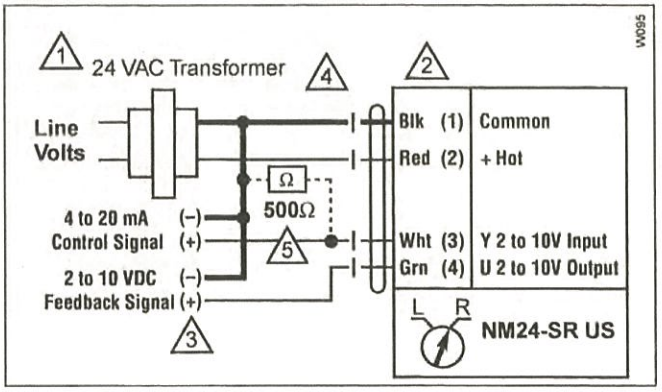
Dimensions [All numbers in brackets are in millimeters.]



Wiring diagrams



2 to 10 VDC control of NM24-SR US



4 to 20 mA control of NM24-SR US with 2 to 10 VDC feedback output

Notes:

1. Provide overload protection and disconnect as required.
2. Actuators are provided with color coded wires. Wire numbers are provided for reference.
3. Connect actuator common (Wire 1) to Negative (–) leg of control circuits only.
4. May also be powered by 24 VDC.
5. The 500Ω resistor converts the 4 to 20 mA control signal to 2 to 10 VDC.

NM

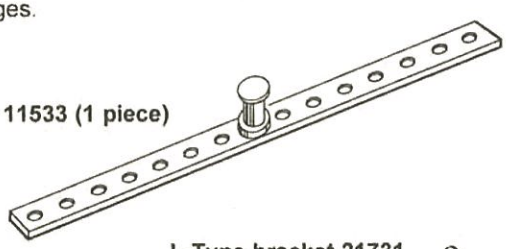
Bulk packaging - NM24-SR.1 US

The bulk packaging option for the NM... series has been discontinued since October 2003

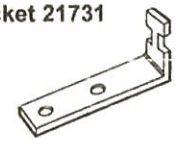
T-Type bracket

These are included in the single-actuator packages.

Part # 11533 (1 piece)



L-Type bracket 21731



Part #: 12503-00001 (24 pieces)
(includes 21731) shipped separately upon request.

Typical Specification:
Control damper actuators shall be electronic direct coupled type which require no crank arm and linkage. Actuators shall be UL and CSA listed, have a 5 year warranty, and be manufactured under ISO 9001 International Quality Control Standards. Actuators shall have reversing switch and gear disengagement button on the cover, and be electronically protected from overload at all angles of rotation. Actuators shall respond to 2 to 10VDC output relative to position regardless of the amount of damper rotation. Actuators shall have brushless DC motor. Run time shall be constant and independent of torque and angular rotation between 35° and 95°. A 2 to 10 VDC feedback signal shall be provided for position indication or master-slave applications. Actuators shall be as manufactured by Belimo.

A56 Outside Air Units

Temperature Sensors

Rev. 02/12/07

Features & Options

- Quick-Response Sensor
- Etched Teflon Leadwires
- Well-Vented, Light-Colored Sensor Guard
- Three Enclosure Styles
- Wide Selection of Temperature Sensing Elements
- Limited Lifetime Warranty

Outside Air Units are designed to be mounted outdoors. The 5¼" UV-resistant plastic shield keeps the sensor out of the sunlight and allows for excellent air circulation. The Outside Air Unit comes standard in a Weather Tight (**EU**) UV-resistant enclosure which carries an IP 66 rating (similar to NEMA 4X) and is light in color to reflect sunlight and minimize reading error. Outside Air Units are also available in a cast aluminum Weatherproof (WP) enclosure which carries a NEMA 3R rating or a BAPI-Box (**BB**) which is made of UV-resistant polycarbonate and carries an IP66 rating. BAPI also offers optional liquid-tight fittings. For a comparison of the enclosure styles, please see the App. Notes section.

All Outside Air Units have etched Teflon leadwires and can withstand high humidity and condensation and perform under real world conditions. This is especially important in an outside air application which can be exposed to rain, snow and large temperature swings.

Sealant Filled Connectors

Twist-on (above)
Crimp-on (below)

Our Sealant Filled Connectors contain a moisture-excluding sealant which encapsulates the electrical connection and adds an extra layer of protection against moisture and oxidation. For more info, see the Accessories Section.

For detailed specs on the individual Sensors & Transmitters, turn to the "Sensors" Section.

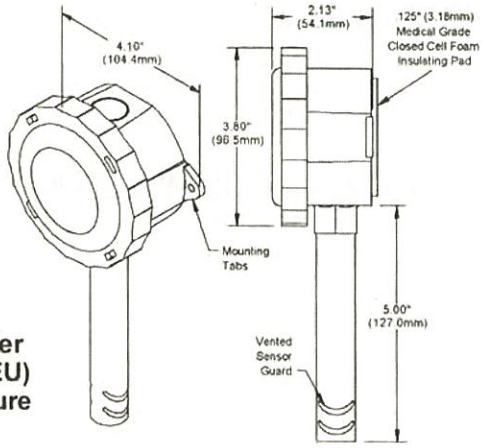
*Some items may not be CE compliant, call BAPI for additional information.

Outside Air Unit with Weather Tight (EU) Enclosure

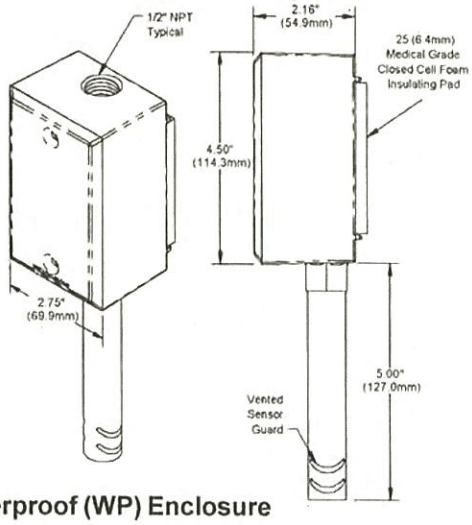
Outside Air Unit with Weatherproof (WP) Enclosure

Outside Air Unit with BAP-Box (BB) Enclosure

Specifications



Weather Tight (EU) Enclosure



Weatherproof (WP) Enclosure

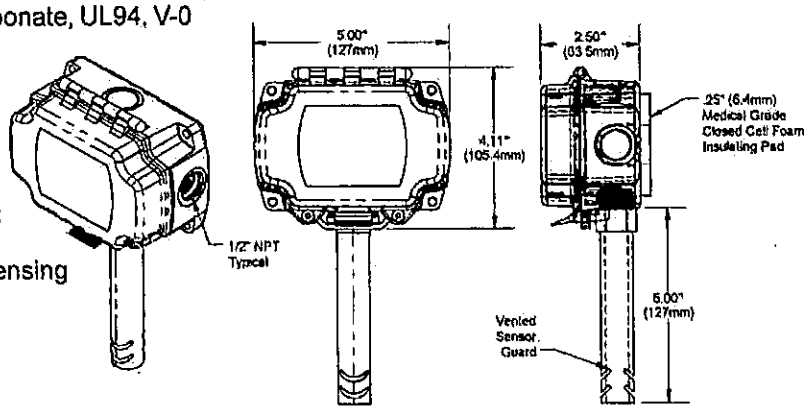
Building Automation Products, Inc., 750 North Royal Avenue, Gays Mills, WI 54631 USA
Tel: +1-608-735-4800 • Fax: +1-608-735-4804 • E-mail:sales@bapihvac.com • Web:www.bapihvac.com

Specifications

Enclosure Material:
EU Model: ABS Plastic, UL94, V-0
BB Model: UV-resistant polycarbonate, UL94, V-0
WP Model: Cast Aluminum

Enclosure Rating:
WP Model: NEMA 3R
EU Model: IP66
BB Model: IP66

Environmental Operation Range:
Temperature: -40 °C to 85 °C
Humidity: 0 to 100%, non-condensing



BAP-Box (BB) Enclosure

Ordering Information — Outside Air Units - Temperature

BA/

Sensor Type — Use the designator number (shown to the left in bold) to indicate the sensor

#		THERMISTORS		RTDs
	1.8K	1.8K Ω @ 25 °C	**100**	100 Ω Platinum @ 0 °C, .385 Ω/°C temp. coeff.
	3K	3K Ω @ 25 °C	**100(3W)**	3 Wire 100 Ω Plat. @ 0 °C, .385 Ω/°C temp. coeff.
	3.3K	3.3K Ω @ 25 °C	**1K(375)**	1K Ω Platinum @ 0 °C, 3.75 Ω/°C temp. coeff.
	10K-2	10K Ω @ 25 °C	**1K(NI)**	1K Ω Nickel @ 21°C, 5 Ω/°C temp. coeff.
	10K-3	10K Ω @ 25 °C	**1K**	1K Ω Platinum @ 0 °C, 3.85 Ω/°C temp. coeff.
	10K-3(11K)	5,238 Ω @ 25 °C	**2K**	2K Ω Silicon @ 20 °C, 8 Ω/°C temp. coeff.
	20K	20K Ω @ 25 °C		
	50K	50K Ω @ 25 °C	**SEMICONDUCTORS**	
	100K	100K Ω @ 25 °C	**334**	LM334 Semiconductor
			592	AD592 Semiconductor, 273 µA @ 0 °C
			592-10K	AD592 Semicond. w/ 10 kΩ shunt resistor, 2.73 V @ 0 °C

TEMPERATURE TRANSMITTERS ***Must include a "range" figure***

T100[range]	100 Platinum RTD, 100 Ω @ 0 °C with 4 to 20 mA Output
T100M[range]	100 Platinum RTD, 100 Ω @ 0 °C with MATCHED* 4 to 20 mA Output
T1K[range]	1K Platinum RTD, 1,000 Ω @ 0 °C with 4 to 20 mA Output
T1KM[range]	1K Platinum RTD, 1,000 Ω @ 0 °C with MATCHED* 4 to 20 mA Output
T10K[range]	10K Thermistor, 10,000 Ω @ 25 °C with 4 to 20 mA Output

TEMPERATURE TRANSMITTER RANGES

Custom temperature transmitter ranges are available. Common ranges are listed below

32 TO 122F	0 TO 50C	-30 TO 140F	-34 TO 60C
20 TO 120F	-7 TO 48C	-22 TO 158F	-30 TO 70C
-20 TO 120F	-29 TO 48C	-52 TO 152F	-47 TO 67C
0 TO 150F	-18 TO 66C		

Configuration

-O-BB	BAPI-Box Enclosure - IP66 rated, UV-resistant polycarbonate
-O-EU	Weather Tight Enclosure - IP 66 UV-resistant enclosure
-O-EUD	Weather Tight Enclosure - IP66 rated UV-resistant enclosure (Probe is attached to the base of the enclosure, similar to a duct sensor)
-O-WP	Weather Proof Enclosure - NEMA 3R rated cast aluminum enclosure

EXAMPLE			
BA/	**10K-2**	**-O-EU**	Outside Air Unit with Weathertight Enclosure and 10K-2 Thermistor
Example Part Number: BA/10K-2-O-EU			
Your Part Number			

Call BAPI if you have questions about the above ordering grid or the configuration of the product you are ordering.

A4 Delta Style Room Units

Temperature Sensors

Features & Options

- Low Profile Enclosure
- Setpoint Adjustment (optional)
- Occupant Override (optional)
- Communication Jack (optional)
- Bi-Metal Indicator (optional)
- Test and Balance Switch (optional)
- Wide Selection of Temperature Sensing Elements
- Limited Lifetime Warranty

Delta Style Enclosure

Setpoint
The optional Setpoint is a linear slidepot adjustment that comes in various ranges, and is available as Reverse or Direct Acting.

Legend
An optional Setpoint Legend can be imprinted on the base of the enclosure. Common Legends include "Cool/Warm", "65 to 80"(°F), "55 to 85"(°F), and "5 to 30"(°C). (See ordering grid.)

Override
The optional Override is a discreet momentary signal that can be configured to be compatible with any controller.

Communication Jack
Available with RJ11 (4 pin), RJ12 (6 pin), RJ45 (8 pin), or 3.5 mm phono plug style jack.

Delta Style Enclosure with Setpoint, Override and Bi-Metal Indicator

Bi-Metal Indicator
An optional Bi-Metal Indicator shows room temperature; accurate to ±1 °F. The display is protected by an acrylic plate and comes with a 50 to 90 °F or 10 to 30 °C legend.

Test and Balance Switch
A three-position slider can be provided on the back of the unit to change the sensor output as follows—the "Low" setting is "Full Cool", "Normal" is the live sensor value, and "High" is "Full Heat".

For detailed specifications on the individual Sensors & Transmitters, turn to Section F.

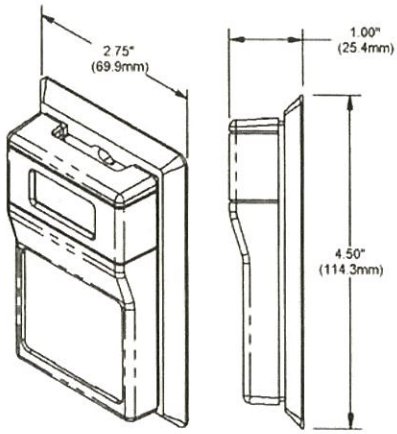
*Some items may not be CE compliant, call BAPI for additional information.

Specifications

Environmental Specifications:
Temperature: 32 to 122 °F (0 to 50 °C)
Humidity: 0 to 95%, non-condensing

Material: ABS Plastic

Rating: UL 94, V-0



Custom Logo Plates

For companies that prefer a personalized look to their Room Units, all of BAPI's Delta Style Enclosures are available with a company's individual logo printed on the front. See pages E4-5 for details. Combination Temp./Humidity options are also available. See pages B4-5.

Building Automation Products, Inc., 750 North Royal Avenue, Gays Mills, WI 54631 USA
Tel: +1-608-735-4800 • Fax: +1-608-735-4804 • E-mail:sales@bapihvac.com • Web:www.bapihvac.com

Ordering Information — Delta Style Room Units - Temperature

BA/

Sensor Type — Use the designator number (shown to the left in bold) to indicate the sensor

#		THERMISTORS		RTDs
	1.8K	1.8K Ω @ 25°C	100	100 Ω Platinum @ 0 °C, .385 Ω/°C temp. coeff.
	2.2K	2.2K Ω @ 25 °C	1K(375)	1K Ω Platinum @ 0 °C, 3.75 Ω/°C temp. coeff.
	3K	3K Ω @ 25 °C	1K	1K Ω Platinum @ 0 °C, 3.85 Ω/°C temp. coeff.
	3.3K	3.3K Ω @ 25 °C	1K(JNI)	1K Ω Nickel @ 70 °F, 3 Ω/°F temp. coeff
	10K-2	10K Ω @ 25 °C	2K	2K Ω Silicon @ 20 °C, 8 Ω/°C temp. coeff.
	10K-3	10KΩ @ 25 °C		
	10K-3(11K)	5,238 Ω @ 25 °C		SEMICONDUCTORS
	20K	20K Ω @ 25 °C	334	LM334 Semiconductor
	47K	47K Ω @ 25 °C	592	AD592 Semiconductor, 273 µA @ 0 °C ‡
	50K	50K Ω @ 25 °C	592-10K	AD592 Semiconductor with a 10 kΩ shunt resistor, 2.73 V @ 0 °C
	100K	100K Ω @ 25 °C		

TEMPERATURE TRANSMITTERS = $90 for T100 & T1K

T100(range)	100 Platinum RTD, 100 Ω @ 0 °C with 4 to 20 mA Output
T100M(range)	100 Platinum RTD, 100 Ω @ 0 °C with MATCHED* 4 to 20 mA Output
T1K(range)	1K Platinum RTD, 1,000 Ω @ 0 °C with 4 to 20 mA Output
T1KM(range)	1K Platinum RTD, 1,000 Ω @ 0 °C with MATCHED* 4 to 20 mA Output

TEMPERATURE TRANSMITTER RANGES

Custom temperature transmitter ranges are available. Common ranges are listed below

65 to 80 F	18 to 27 C	40 to 90 F	4 to 32 C
60 to 80 F	15 to 27 C	45 to 96 F	7 to 35 C
55 to 85 F	13 to 30 C	0 to 100 F	-18 to 38 C
50 to 90 F	10 to 32 C		

Configuration

-R — Delta Style Room Enclosure

Setpoint — *If setpoint is required, must select Range and Legend*

SETPOINT OUTPUT VALUE RANGE = $6 for Setpoint

##	Desired Range	Designator	Desired Range	Designator
	800 to 1200 Ω	25	15 to 5 kΩ	61
	909 to 1309 Ω	26	0 to 20 kΩ	80
	1800 to 2200 Ω	27	4.75 to 24.75 kΩ	81
	0 to 1 kΩ	40	6.19 to 26.19 kΩ	82
	500 to 1500 Ω	41	7.87 to 27.87 kΩ	83
	2 to 3 kΩ	42	10 to 30 kΩ	84
	0 to 10 kΩ	60		

SETPOINT LEGEND (Insert Designator #)

Legend Range	Designator	Legend Range	Designator
5-30 C	L1	68-70-72	L5
55-85 F	L2	COOL/WARM	L6
60-85 F	L3	WARM/COOL	L7
65-80 F	L4		

Override Configuration — *Must select one*

-J	Override as a Separate Input (Not available with transmitter)
-N	Override in Parallel (//) with Sensor
-P	Override in Parallel (//) with Setpoint
-Z	No Override

Communication Jack — *Select one if required, omit if not required*

-C35	3.5 mm Phone Style Jack (Not available with transmitter)
-C11	RJ11 (4 pin) Style Jack* (Not available with transmitter)
-C12	RJ12 (6 pin) Style Jack* (Not available with transmitter)
-C45	RJ45 (8 pin) Style Jack* (Not available with transmitter)

Indicator — *Select one if required, omit if not required*

-BM5090	Bi-Metal Indicator: 50 to 90 °F legend
-BM1030	Bi-Metal Indicator: 10 to 30 °C legend

Optional Test & Balance

-TB	Three Position Switch - "Low" & "High" values vary, "Normal" is live sensor value Call for details.

Connection Configuration — *Must select one*

-CG	Common Ground
-DF	Differential Inputs

EXAMPLE

BA/	10K-2	-R	25L1	-J	-C35	-BM5090	-CG	

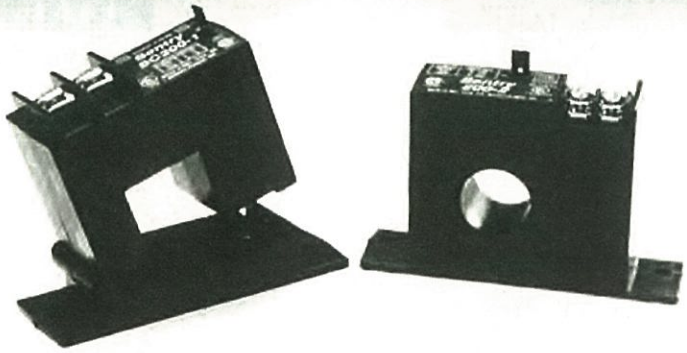
Part Number: BA/10K-2-R25L1-J-C35-BM5090-CG

Call BAPI if you have questions about the above ordering/pricing grid or the configuration of the product you are ordering.

SENTRY 100/200 Series

AC Current Transducers with 0-5/10VDC or 4-20mA Output

The Sentry 100/200 Series AC Current Transducers provide a voltage or current signal proportional to monitored current up to 200A. Available in both solid core and split core configurations.



VFI

Variable Frequency Integration for VFDs

FEATURES

New VFI Technology for VFDs

New Variable Frequency Integration technology uses high speed sampling to provide accurate measurements of current on the load side of VFDs.

Reliability

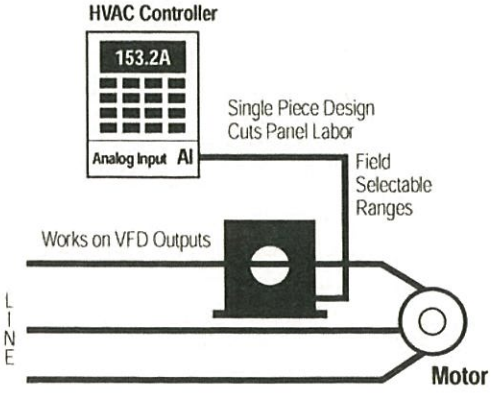
Field-proven in hundreds of thousands of installations since 1982. Solid performance even in rooftop environments. Backed by five-year warranty.

Convenience

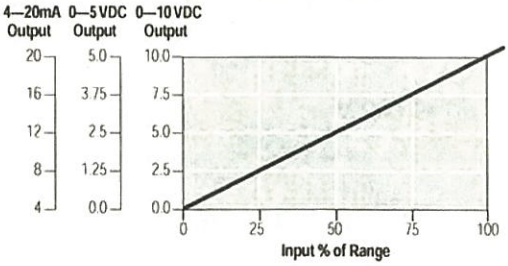
Compact size, integral mounting flange, and two-wire hookup assure an installation that is simple, fast, and secure. You save money and avoid callbacks. The split core version simplifies retrofits.

APPLICATIONS

- **Automation Systems**: Analog current reading for remote monitoring and software alarms
- **Fan/Pump Status**: Electronic proof of flow
- **Sense High Current**: Accurately read the secondary current from high ratio CTs



SIGNAL DIAGRAM

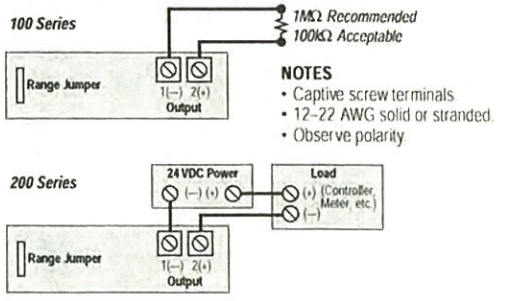


INPUT MAXIMUMS

RANGE	MAXIMUM CONTINUOUS	MAX. 6 SEC.	MAX. 1 SEC
0–2A	40A	60A	100A
0–5A	100A	124A	250A
0–10A	80A	125A	250A
0–20A	110A	150A	300A
0–50A	175A	215A	400A
0–100A	200A	300A	600A
0–150A	300A	450A	800A
0–200A	400A	500A	1,000A

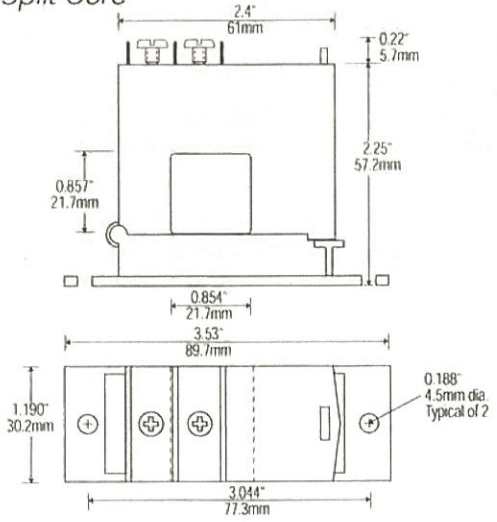
See Ordering Information for models with listed ranges.

CONNECTIONS

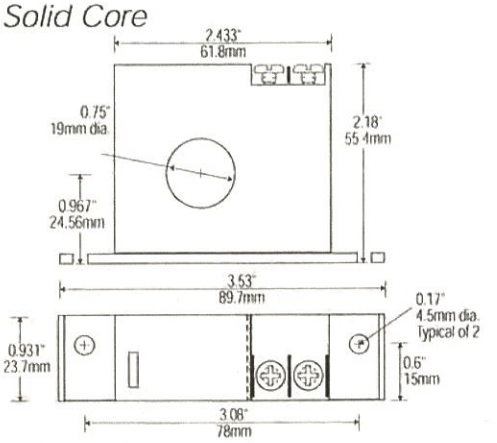


Neilsen-Kuljian, Inc.
(800) 959-4014
www.SentrySensors.com

Split Core



Solid Core



SPECIFICATIONS

Output Signal	0–5VDC, 0–10VDC, 4–20mA (see Ordering Info)
Accuracy	0–5/10VDC: 1% FS over 5–100% of range 4–20mA: 0.5% FS
Response Time, 0-90%	0–5/10VDC: 100 mS 4–20mA: 300 mS
Frequency Range	0–5/10VDC: 50–60Hz 4–20mA w/o VFI: 20–100Hz 4–20mA w/ VFI: 10–400Hz
Power Supply	0–5/10VDC: Self-powered 4–20mA: 12–40VDC, Loop-powered
Output Load, 0–5/10VDC	1 Megohm required for rated accuracy 100K Ohm Load, add 1.3% error
Output Load, 4–20mA	950 ohms max @ 24 VDC Rmax = (Vsupply—5) / 0.020A
Output Signal Limit	2x rated output
Isolation Voltage	UL listed to 1270 VAC, tested to 5kV
Input Ranges	Field Selectable Ranges from 0–200A (see Ordering Info)
Sensing Aperture	Solid core: 0.75" dia. Split core: 0.85" sq.
Case	UL 94V-0 Flammability rated thermoplastic
Environmental	0–5/10VDC: –58/149° (–50/65°C) 4–20mA: –4/122°F (–20/50°C) For all: 0–95% RH, non-condensing
Approvals	UL, ULC, CE

Need an interposing relay? See the new PowerBASE Relay on page 13.

ORDERING INFORMATION

4–20mA Output Models
(Specify VFI when measuring VFD loads)

MODEL	RANGE	VFI	CASE
200-05	0–2, 0–5A	No	Solid Core
200-1	0–10, 0–20, 0–50A	No	Solid Core
200-2	0–100, 0–150, 0–200A	No	Solid Core
SC200-05	0–2, 0–5A	No	Split Core
SC200-1	0–10, 0–20, 0–50A	No	Split Core
SC200-2	0–100, 0–150, 0–200A	No	Split Core
200-05-V	0–2, 0–5A	Yes	Solid Core
200-1-V	0–10, 0–20, 0–50A	Yes	Solid Core
200-2-V	0–100, 0–150, 0–200A	Yes	Solid Core
SC200-05-V	0–2, 0–5A	Yes	Split Core
SC200-1-V	0–10, 0–20, 0–50A	Yes	Split Core
SC200-2-V	0–100, 0–150, 0–200A	Yes	Split Core

VDC Output Models

MODEL	RANGE	OUTPUT	CASE
100-1L	0–10, 0–20, 0–50A	0–5VDC	Solid Core
100-2L	0–100, 0–150, 0–200A	0–5VDC	Solid Core
100-3L	0–10, 0–20, 0–50A	0–10VDC	Solid Core
100-4L	0–100, 0–150, 0–200A	0–10VDC	Solid Core
SC100-1L	0–10, 0–20, 0–50A	0–5VDC	Split Core
SC100-2L	0–100, 0–150, 0–200A	0–5VDC	Split Core
SC100-3L	0–10, 0–20, 0–50A	0–10VDC	Split Core
SC100-4L	0–100, 0–150, 0–200A	0–10VDC	Split Core

Contact Neilsen-Kuljian for availability of the earlier 100 Series products which have a 10% signal offset.

Neilsen-Kuljian, Inc.
(800) 959-4014
sales@SentrySensors.com

FLEX-CABLE PROBE

- Platinum RTD or Thermistor
- Conforms to any duct size
- Very easy to install
- Totally flexible

Easy to install flex-cable

Our probe is constructed using CSA rated FT6 plenum cable. Numerous sensors are encapsulated in 316 s/s sheaths at equal distances along the length of the cable. The complete assembly acts as a single temperature sensor and any temperature change is averaged across the sensors. The probe can easily be strung to fit any size duct.

For lengths up to 12 feet or for most economical applications, we average the readings of four encapsulated sensors. For 24 foot probes and more demanding applications, we use nine sensors spaced along the length of the cable.

Our molded case with hinged cover is easy to install. The cover is fastened with one captive screw. Provision is made for a front identification tag. The back is completely smooth so it fits flush against the mounting surface. Circuit board slots inside are designed to accept a 2-wire transmitter if required.

TECHNICAL DATA

Platinum RTD's are the most stable temperature sensors between -50 and 400C. Their stability, wide temperature range and almost linear output make them the choice in demanding applications.

Our standard RTD's use 100 or 1000 ohm thin film elements to DIN 43 760 (IEC 751) class B with a tolerance of 0.3 deg C. We also supply class A thin film RTD's as well as sensors with wire wound elements in class B, class A and 1/5 DIN tolerances.

NTC Thermistors are the most sensitive sensors known for temperature measurement from -50C to +150C.

The temperature coefficient of thermistors can be as high as several percent per degree C. This means that lead resistance from installation of thermistors in remote areas has minimal effect on system accuracy.

Since they are semiconductors they must not be exposed to temperatures near their maximum operating limits or they can drift out of specified tolerance.

Our standard thermistor has a 10K resistance at 25C and a tolerance of +/- 0.2C. On request other calibrations and accuracies are available.

Operating Temperature The construction of these sensors limits their maximum operating temperature to 105C.

ORDERING DATA

TS - FC - ( ) - ( ) - ( ) - ( )

cable length in feet	no. sensors 4 or 9	sensor type R = RTD T = Thermistor	sensor value 100 = 100 ohms 10K = 10k ohms

e.g. TS-FC-24-9-T-10K Flex-cable averaging sensor 24 feet long with nine 10K thermistors

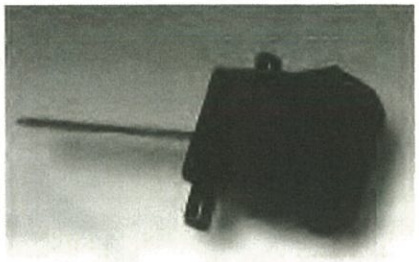
ENERCORP instruments ltd

25 Shorncliffe Rd, Toronto, ON, M9B 3S4 Tel 1(800)ENERCORP or (416)231-5335 Fax 1(877)ENERCORP or (416)231-7662
Visit our on-line catalogue at www.enercorp.com our e-mail address is info@enercorp.com

IMMERSION TEMPERATURE SENSOR WTS420

Application

The Immersion Temperature Sensor provides precise, remote fluid temperature sensing.



Features

- Highly stable, precision thermistor material accurate to within ± 0.36°F.
- Standard brass thermowell, which screws into ½" NPT saddle, or threaded fitting.
- Optional stainless steel thermowell.

Description

The moisture/waterproof sensing element is sealed with a temperature conductive compound in a 4⁷/₈" stainless steel tube with brass fitting, which is removable from the thermowell for replacement without system draindown.

The brass well is the standard thermowell for insertion in non-corrosive liquid lines. Alternatively, a stainless steel well may be implemented for insertion in corrosive liquid pipe lines.

Both wells are designed to withstand a maximum temperature of 250°F and a maximum static pressure of 250 PSIG.

Ordering

To order the Immersion Water Temperature Sensor, specify the following product number with the appropriate extension to indicate options:

WTS 420-***x***, where '***x***' is:

0. No well
1. Brass well
2. Stainless steel well

Specifications

Thermistor

10 kΩ @ 77°F (25°C)

Accuracy

± 0.36°F from 32°–158°F
(± 0.2°C from 0°–70°C)

Stability

0.24°F over 5 years (0.13°C)

Range

10°–230°F (-10°–110°C)

Wiring

Make electrical connections to the sensor in accordance with the site installation wiring diagram and in accordance with national and local electrical codes. Twisted pair wire of at least 22 AWG and crimp-type connectors for wire connections are recommended. The sensor itself does not require shielded cable. However, it is not recommended that wiring be run in the same conduit as line voltage wiring or with wiring used to supply highly inductive loads such as motors, generators and coils.

Size

6³/₈" x 2" (16.1 cm x 5 cm)

Weight

0.28 lb (130 g)

WTS420 IMMERSION TEMPERATURE SENSOR

Provided by your local Delta Controls partner:

420-9803

Delta Controls Inc. 17850 56th Avenue, Surrey, B C Tel (604) 574-9444 Fax (604) 574-7793

Delta CONTROLS

ESC
AUTOMATION

Now Listed

BACnet BTL™ TESTING LABORATORIES

The full-featured Delta Controller Engine (DCE) firmware powers a full range of BACnet devices. With a fully integrated system of Native BACnet controllers for HVAC, Access, and Lighting control it is the world's most comprehensive implementation of BACnet.

For complete details of Delta's BTL listings check:

www.deltacontrols.com
www.bacnetassociation.org

HVAC INTEGRATION ENERGY MANAGEMENT

BACnet

ITEM	ACCEPTABLE PRODUCTS / SUPPLIERS / MANUFACTURERS	SHOP DWG.
	PLUMBING	
FAUCETS	Acorn, Alsons, American Standard, Bradley, Cambridge, Chicago, Crane, Delta, Grohe, Kohler, Moen, Powers, Sloan, Symmons, TOTO , T&S Brass	X
FIXTURES		
stainless steel	Acorn, AMI, Bradley, Franke, KIL, Kindred, Steel Queen	X
vitreous	American Standard, Crane, Kohler, TOTO	X
WASTE FITTINGS	McGuire, OS&B, Teck	X
	HVAC	
ACCESS DOORS		
Building Surfaces	Acudor, Cendrex, E.H. Price, Maxam, Milcor, Mifab, Steel Brothers	X
AIR CONDITIONING UNITS		
Computer Room	Air Technology Systems, Airflow, Edpac, Hiross, Liebert, Data-Aire	X
AIR TERMINALS	E.H. Price, Nailor, Titus	X
CONTROL DAMPERS		
Low Leakage Type	Arrow-Foil PBDAF & OBDAF, Honeywell Moduflow D642 & D643, Johnson Proportion/Aire D-1200 & D-1300, Ruskin CD36, Tamco 1000, Nailor 1010,	X
EXPANSION JOINTS	Flexonics, Hyspan, Uniroyal, Keflex, Mason, Goodall, Victaulic	X
FANS		
Cabinet	Airtex, Cook, Delhi, Greenheck, Lau, Penn	X
In – Line	Loren Cook, Greenheck, Twin City	X
FIRE DAMPERS		
Folding Shutter Type	Controlled Air, Nailor, NCA, Ruskin	X

ITEM	ACCEPTABLE PRODUCTS / SUPPLIERS / MANUFACTURERS	SHOP DWG.
INSULATION - DUCT	Fiberglas, Knauf, Johns-Manville, Atlas, PPG, Manson, Certainteed	X
INSULATION - PIPING	Fiberglas, Knauf, Johns-Manville, Manson, Atlas, PPG, Certainteed	X
LOUVRES	Airolite, Alumavent, Westvent, Ruskin, E.H. PRICE	X

NOTES:

.1 The design is based upon the equipment listed in the equipment schedules and/or underlined in the Plumbing - Equipment Manufacturers Schedules.

.2 X Denotes required submission.

End of Appendix G