THE FOLLOWING ADDENDUM SUPERCEDES INFORMATION CONTAINED IN DRAWINGS AND SPECIFICATIONS ISSUED FOR THE PROJECT TO THE EXTENT REFERENCED. THIS ADDENDUM FORMS PART OF THE TENDER DOCUMENTS AND IS SUBJECT TO ALL OF THE CONDITIONS SET OUT IN THE CONTRACT CONDITIONS.

1. ARCHITECTURAL SPECIFICATIONS

.1 Appendix 6 – Site Photos of existing Condition of Excavated Area (3 pages)
Add site photos of site visit from April 29, 2019.

.2 Appendix 7 – Geotechnical Memo (3 pages)
Add Geotechnical Memo dated May 2, 2019 – Contractor to provide compacted structural fill from 0.15m to 0.6m, and to provide lean concrete for fill deeper than 0.6m under foundation.

.3 Appendix 8 – Existing Control Information (139 pages)

2. ARCHITECTURAL DRAWING REVISIONS

.1 Drawing WA03 Existing Site Plan
Delete the pre-excavation site profile and show current spot elevations more clearly, added notes as clouded.

.2 Drawing SA03 Existing Site Plan
Delete the pre-excavation site profile and show current spot elevations more clearly, added notes as clouded.

3. MECHANICAL ADDENDUM

.1 Refer to Mechanical Addendum No. 1 (18 pages).

4. ELECTRICAL ADDENDUM

.1 Refer to Electrical Addendum No. 1 (1 page).

.2 Refer to Electrical Addendum No. 2 (2 pages).

.3 Refer to Electrical Addendum No. 3 (1 page)

5. QUESTIONS AND ANSWERS

Q1. Provide specification for waterproofing membrane for floor type F1.
A1. Delete waterproofing membrane for floor type F1.

Q2. Provide specification of stair noising for stair #1.
A2. Provide score lines and paint contrasting color for 75mm wide noising.

Q3. Can you please provide the existing site controls shop drawings for our review/use?
A3. Appendix 8 : Existing controls Information attached.

END OF ADDENDUM NO. 2

NRC HERZBERG ASTRONOMY & ASTROPHYSICS

ATP INTEGRATION FACILITY

VICTORIA, BRITISH COLUMBIA

Project No: R. 077596.001

APPENDIX 6

SITE PHOTOS OF EXISTING CONDITION OF EXCAVATED AREA

26

27

28

29

NRC HERZBERG ASTRONOMY & ASTROPHYSICS

ATP INTEGRATION FACILITY

VICTORIA, BRITISH COLUMBIA

Project No: R. 077596.001

APPENDIX 7

GEOTECHNICAL MEMO

GOLDER

TECHNICAL MEMORANDUM

DATE 2 May 2019

Reference No. 1314490497-100-TM-Rev0

TO Patrick Truong, PEng
Public Services and Procurement Canada

CC Tony Yip (Chernoff Thompson Architects)

FROM Sarah Morse, PEng, PMP

EMAIL smorse@golder.com

SETTLEMENT REVIEW, NRC ATP INTEGRATION FACILITY
HERZBERG INSTITUTE OF ASTROPHISICS
VICTORIA, BC

Golder has been engaged by Public Services and Procurement Canada (PSPC) to provide geotechnical engineering services for the proposed new building for the NRC ATP Integration Facility at the Herzberg Institute of Astrophysics in Victoria, BC (the Site). Our services are being carried out under the Terms and Conditions of Standing Offer Agreement No. EZ899-141238/001/TPV.

Golder was requested by Chernoff Thompson Architects (CTA), the project coordinating professional, to review the potential for differential settlements for the NRC ATP foundation, specifically regarding concerns related to potential differential settlements that could impact the proposed crane rail system. Based on information provided in the PowerPoint presentation "Rail System for HAA INT Facility" provided to Golder in the e-mail "Re: NRC ATP - Project Update (NFIRAOS loading & differential settlement)" dated 16 January 2019, we understand the maximum tolerance for differential settlements for the rail system is 5 mm. Based on the Issued for Tender drawings, dated 27 March 2018, and recommendations in Golder's Supplemental Geotechnical Investigation Report[1], the NRC ATP foundation is designed to incorporate a minimum of 150 mm compacted structural fill over bedrock under the concrete foundation elements. Depending on the proximity of bedrock to the foundation elements, the settlement would be expected to vary according to the degree of uniformity of structural fill compaction. It is anticipated that settlement under these conditions will be less than the 5 mm tolerance of the rails described in the document provided.

[1] Golder Associates Ltd. "Supplemental Geotechnical Investigation Report, Proposed ATP Integration Facility, Herzberg Institute of Astrophysics, 5071 West Saanich Road, Victoria BC," dated 16 March 2018, Golder Reference 1314470497-087-R-Rev0.

Golder Associates Ltd.
2nd floor, 3795 Carey Road Victoria, British Columbia, V8Z 6T8 Canada

T: +1 250 881 7372 +1 250 881 7470

Given the low tolerance for settlement for this project, any foundation areas where the depth of structural fill over bedrock will be in excess of 0.6 m, must be reviewed by the project team. In such instances, consideration should be given to incorporation of controlled density fill (lean concrete) to limit potential for differential settlement.

Golder Associates Ltd.

2 May 2019

Sarah Morse, PEng, PMP
Senior Geotechnical Engineer

Jeff Fillipone, PGeo, PhD
Principal, Senior Geologist

SEM/JAF/lmk

n:\final\2013\1447\13-1447-0497 pwgsc wood creek quarry\1314470497-100-tm-rev0\1314470497-100-tm-rev0-settlement comments-02may_19.docx

NRC HERZBERG ASTRONOMY & ASTROPHYSICS

ATP INTEGRATION FACILITY

VICTORIA, BRITISH COLUMBIA

Project No: R. 077596.001

APPENDIX 8

EXISTING CONTROLS INFORMATION

Intelligent Building Controls Ltd.

Johnson Controls Authorized Building Control Specialist

1107 Nicholson St., Victoria, B.C.
V8X - 3L5

Phone: 250-216-0665 FAX: 250-727-2113

email: rls@direct.ca

DATE: May 23, 2000 **Total pages including this one:** 1

TO: Roy Heppner

COMPANY: **NRC**

FAX #: 363-8193

FROM: Robin Smith

SUBJECT: **METASYS Temperature Sensors**

Good Morning !

In response to your inquiry, METASYS controllers accept analog input signals from the following list of industry standard devices:

- 1000 Ohm Nickel RTD (currently proposed, standard Johnson device used on all projects)
- 1000 Ohm Silicon RTD (utilized by some manufacturers, including PENN)
- 1000 Ohm Platinum RTD (higher accuracy and cost then nickel)
- 0 – 10 VDC transmitters & transducers (many Johnson and other manufacturer's devices)
- 4 – 20 mA transmitters & transducers (many Johnson and other manufacturer's devices)
- 2000 Ohm potentiometers (common signal for actuator feedback)

The nickel RTD devices are more than accurate for use in control loops for building temperature control. They are available from numerous manufacturers and distributors, and are always in stock. All input and output devices are calibrated following installation as part of our standard commissioning procedures.

The 10,000 Ohm sensors that you inquired about are not compatible with METASYS hardware, unless an interfacing transmitter is utilized. We would not recommend this solution as the extra transmitter decreases the accuracy and reliability of the signal.

Please let me know if you require any further information at this time.

1330
24/05/2000

Intelligent Building Controls Ltd.

Johnson Controls Authorized Building Control Specialist

1107 Nicholson St., Victoria, B.C.
V8X - 3L5

Phone: 250-216-0665 FAX: 250-727-2113

email: RLS@direct.ca

CONTROL SHOP DRAWING SUBMITTAL #2

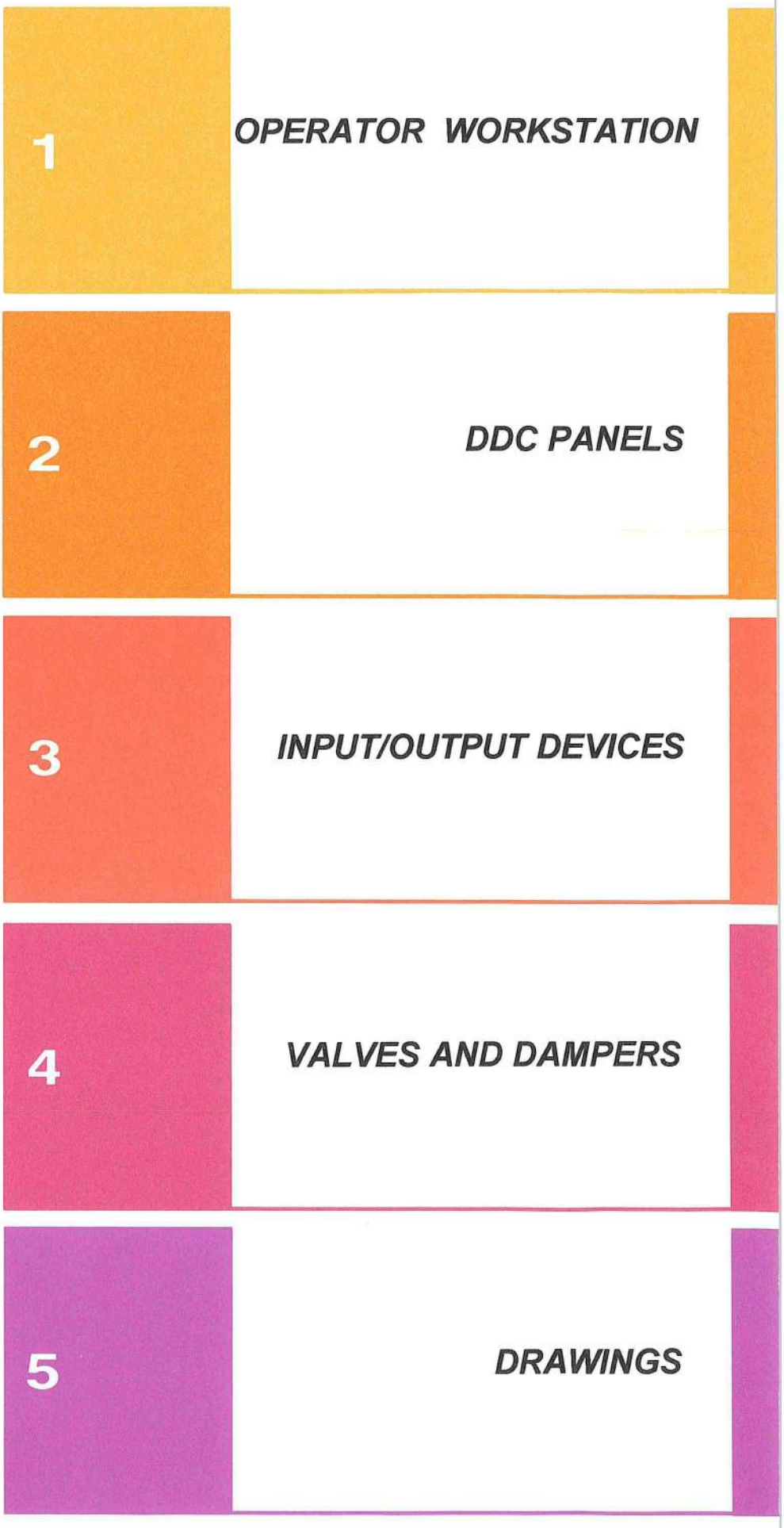
Complete Shop Drawings for Review

13.8.41

PROJECT:	Herzberg Institute of Astrophysics
DATE:	April 20, 2000
MECHANICAL CONSULTANT:	Reid Crowther & Partners Ltd.
MECHANICAL CONTRACTOR:	Strathcona Mechanical Ltd.
Drawings Prepared By:	Robin Smith, P.Eng.

~~Wtg~~
RC contacted JBCL on Demo of Rev. Con (BCAC)

01/05/2000.
10/05/2000
17/05/2000


1
OPERATOR WORKSTATION
2
DDC PANELS
3
INPUT/OUTPUT DEVICES
4
VALVES AND DAMPERS
5
DRAWINGS

JOHNSON CONTROLS

M5 Workstation

Comprehensive networked information management. That's how the M5 Workstation assists you in managing your enterprise. Leveraging the power and flexibility of the Metasys® integrating architecture, the M5 Workstation provides a personal command center to easily manage the most diverse and demanding facility management system. Through its high performance graphical interface, operator interactions to manage environmental comfort, energy usage, lighting control, respond to emergency conditions, optimize control strategies and more can be done quickly and easily. To further enhance the wealth of information, integration of third-party software applications such as spreadsheets, word processing, and engineering packages can easily be accommodated in accessible, organized interactive user displays. The M5 Workstation enhances user productivity, maximizes your facility management investment and is adaptable to address the dynamic management needs of your enterprise.

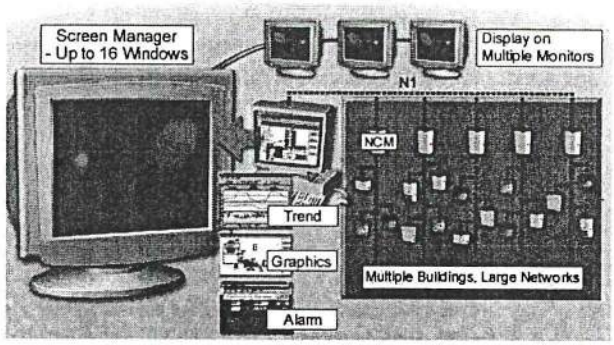


Figure 1: M5 Workstation

Features and Benefits

❑ **Standard Based Architecture**	Incorporates current and leading technology standards for compatibility and growth
❑ **Scalable Workstation Architecture**	Runs on standard Personal Computer (PC) and supports Windows® 95, Windows 98, and Windows NT®
❑ **Personalized Graphical Interface**	Easy to use, flexible screen layout, versatile navigation, accommodates operator instructions
❑ **Consistent Interface to Integrated Systems**	Easy to learn, common presentation format, application integration
❑ **World Class Dynamic Color Graphics**	Quickly view operations through information based on displays
❑ **Versatile Trend Sampling, Storage and Analysis**	Accommodates effective decision making
❑ **Focus Windows, Summaries and Reports**	Provides tools for powerful analysis
❑ **Advanced Alarm Management**	Reduces maintenance expenditures

Flexible Connectivity

The M5 Workstation provides the flexibility to interface to your Metasys enterprise facility management system through multiple connectivity options. M5 Workstations can communicate over a Local Area Network (LAN), which may be Ethernet TCP/IP based or ARCNET based. Remote connections can be either through dedicated lines or through dial-up communication links using standard RS-232 connections. Each Metasys Network can accommodate multiple M5 Workstations simultaneously accessing information. In fact, a single M5 Workstation can be configured to simultaneously communicate with up to five separate Metasys Networks using a combination of LAN, direct, or dial-up connections.

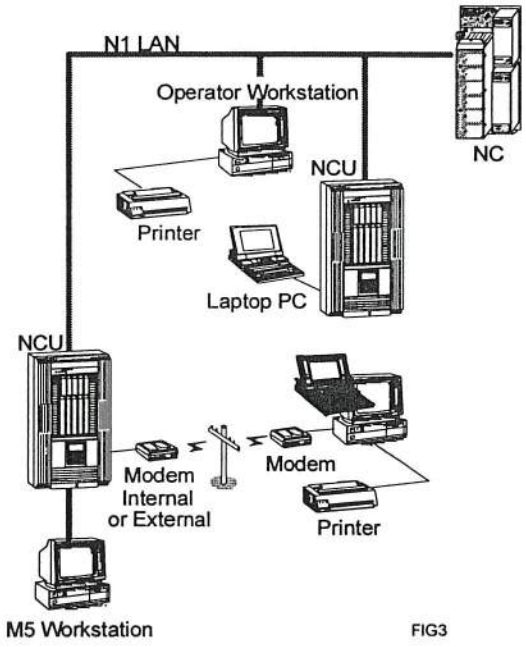


Figure 2: N1 Network

Multiple connections are especially useful when controlling a large campus, office complex, or a diverse enterprise with several remote locations. This centralized monitoring, control, and reporting capability not only maximizes your investment, it also facilitates the productivity of your employees.

Regardless of how the M5 Workstation is connected to your Metasys Network, your operators have full and total access to all system information, restricted only by their password rights.

Workstation Platform

The M5 Workstation runs on a standard personal computer utilizing the Microsoft® Windows 95, Windows 98, or Windows NT operating system. By focussing on prevalent business world standards, the M5 Workstation offers superior performance and future adaptability to advances in the microcomputer industry.

Each workstation also accommodates various printers to log alarms and for hardcopy recording of information based reports and summaries. Please consult with your authorized Johnson Controls representative regarding recommended platform configuration details.

Intuitive Interface

Designed to be easy to learn and use while still providing advanced capabilities, the M5 Workstation provides users with a personal command center. Through dynamic graphical displays of your facility's various areas and integrated systems, your operators will easily and confidently be able to access and review the current operational conditions of your entire enterprise.

Graphical mouse-driven navigation allows operators to move smoothly through its intuitive design. Using interface concepts such as toolbars, "point and click" and "drag and drop," minimize an operator's need to memorize and type command formats, letting them focus on pertinent facility operations. Since selections are processed rapidly, access and retrieval of information gets done with minimal effort. Even detailed information such as trend graphs, focus windows, schedules, trend logs, sequence of operation, diagnostic instructions, and more are all just a few clicks away. The M5 Workstation's simple, quick navigation delivers smooth transitions between and within applications. Plus, a convenient alarm dialog box provides a dedicated area to display messages that require immediate user attention.

Your operations staff will find the M5 Workstation even more powerful as they utilize its full capabilities. The understandable format requires no special programming skills, reducing operator training needs. It encourages system utilization and productivity, lowering overall operational costs. And since your operators interact with your entire dynamic, integrated network, its the natural edge to greatly enhance the performance of your enterprise.

Managing Perspective

Within the M5 Workstation resides the ability to customize the look and feel of the user's interface. Through a dynamic runtime Screen Manager, users can quickly and easily create, modify, or recall multiple screen layouts with a few simple operations. Through user populated templates, you can simultaneously display multiple aspects of your enterprise. For example, your staff could concurrently view and interact with a central chiller plant graphic, the supply system graphic with integral trending, a focal VAV graphic, and the trended environmental conditions of leased space to address a tenant's complaint. This multitasking information composite increases your staff's productivity by reducing search time for pertinent displays, reduces the learning time for new staff, and enhances the analysis of operational conditions – simply, accurately, and effectively.

Not only can you view more information on a screen, you can also integrate additional popular third-party software applications to enhance your managing perspective. Since each panel of a Screen Manager template is an ActiveX™ Document container, third-party applications such as spreadsheets, word processing, and engineering related software packages can be dynamically integrated, offering an unparalleled degree of personal command center flexibility. This multitasking integration is further enhanced since these third-party software applications can access realtime and historical information from the Metasys Network such as point values, trend, and totalization data. This means you can prepare custom energy usage reports that contain up-to-the-minute consumption and operating costs and display them with the related enterprise equipment.

For those instances when a single, larger monitor is just not enough, the M5 Workstation Screen Manager encapsulates multiple monitors into a single, manageable entity. Therefore, if the workstation operating system supports multiple monitors, the M5 Workstation Screen Manager templates are applied as if all monitors were one.

Your facility operators will quickly master the M5 Workstation, making full use of its unparalleled capabilities. This means that your enterprise will realize the full benefits of the Metasys promise – comfort and safety for your occupants, higher productivity from your staff, and lower operating costs for your facility.

Logical Architecture

The Metasys Network uses an object-oriented software architecture distributed throughout the network. This allows an operator at an M5 Workstation to simultaneously gather information from anywhere on the network and consolidate it into facility-wide reports for realtime viewing. All of your facility's equipment is logically organized and displayed in dynamic graphical displays. These displays can be textual based, animated graphics, operational trend perspectives, and other visually orientated displays to name a few. Information is right where you would expect to find it. Sensor data is grouped by logical systems so there is never a need for an operator to remember where sensors are physically wired into the Metasys Network. Software feature information is shown with its associated points, facilitating the analysis of operational conditions. Plus, the object-oriented software architecture and various applications easily allow an operator to create special logical associations to view information from the appropriate perspective.

Network Map

Navigating anywhere in the Metasys Network is easy. And figuring out how to get there is even easier, thanks to the Metasys Network Map, a hierarchical representation of the entire integrated system. The Network Map presents a perspective on how everything is laid out, in a format similar to a family tree. Operators can see the entire facility management system at a glance – which systems serve which buildings and floors, which zones are served by different mechanical systems, how third-party subsystems are integrated, etc.

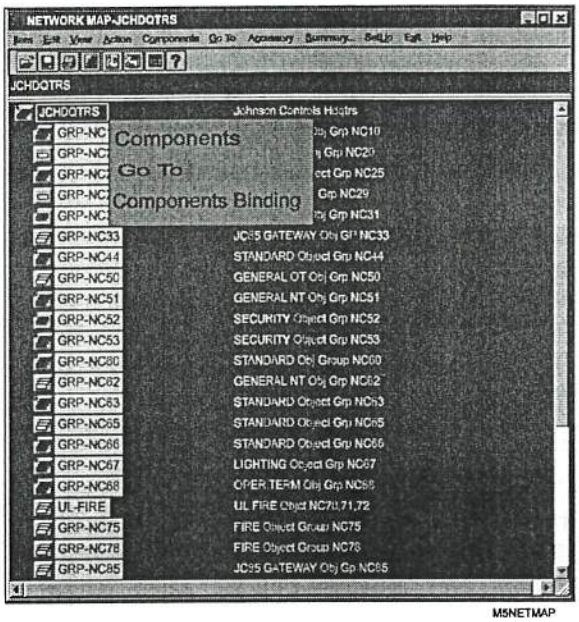


Figure 3: Network Map

Finding your way to the desired information is simply a matter of using the mouse to point to a particular area, floor or piece of equipment and clicking the button. Besides accessing information within the Metasys system, users have the ability to quickly access other components, such as M-Graphics, M-Trend, Screen Manager, and other data visualization applications directly from the Metasys Network Map. It is not necessary to "drive" through a time-consuming series of screens to view the desired information, because any level of information is easily accessible from this single graphical display. Simple "point and click" using drop down menus, toolbar icons, right mouse context sensitive menus or "double click" for quick, detailed penetration. The Metasys Network Map is one of the powerful tools provided through the personal command center.

M-Graphical Advantage

Through the world class dynamic, animated color M-Graphics component, your operators can easily glide through your entire networked enterprise. Through simple, quick "point and click" actions, navigation between buildings, floors, animated HVAC or other integrated systems, and related areas is simple and quick. For example, using these high-resolution dynamic color graphics, an operator may view the digital photographic image of the outside of a building, click on the identified problem area to quickly penetrate to the particular floor to view all current information.

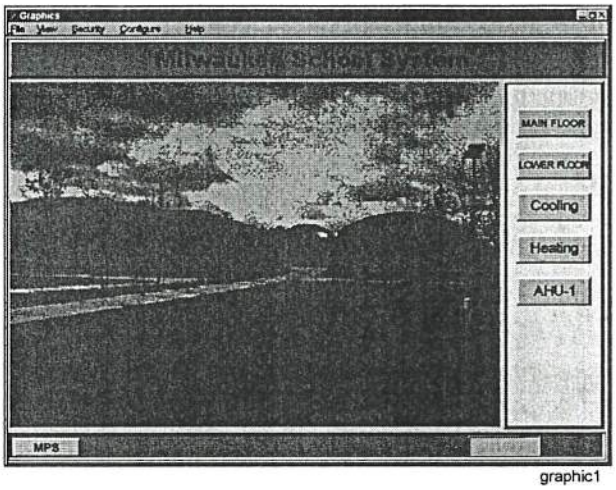


Figure 4: Outside Building

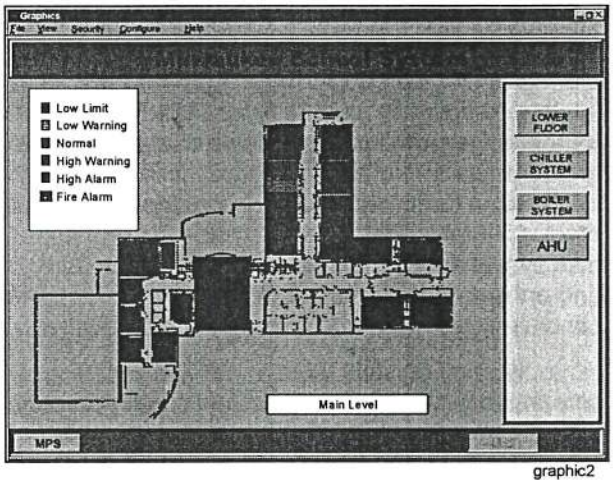


Figure 5: Floor Plan

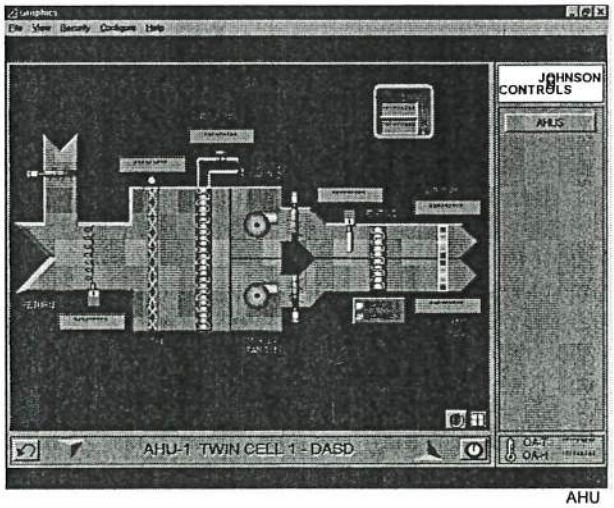
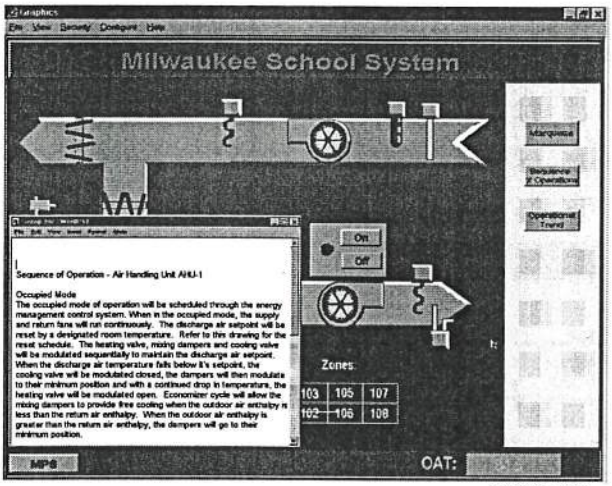


Figure 6: AHU

Once the operator has analyzed the situation, the operator can strategically interact with the graphic display to make any necessary adjustments to resolve the problem and restore optimal operational performance.

Yet, the M-Graphics advantage strives beyond its dynamic, high-resolution animated color displays. Its advantage resides in performance integration. Besides the ability to navigate to anywhere, your users can command the status and value of objects, launch detailed focus windows, access an object's schedules, view totalization records, and other application parameters. Graphics can have realtime trending embedded, integrating a powerful analysis tool. Furthermore, reviewing a system's sequence of operation, diagnostic guidelines or a detailed equipment drawing can all just be a click away.



M5thirdparty2

Figure 7: Third Party Application

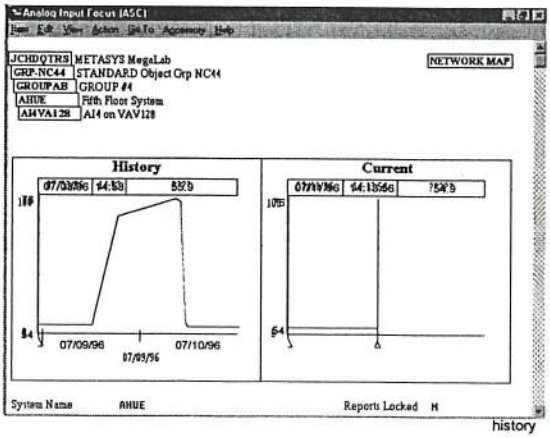
Your M-Graphics performance integration can be extended to launch popular third-party software applications; such as a spreadsheet calculating energy consumption and efficiency reports, trigger a Visual Basic® application to initiate a custom control strategy and much more. Performance integration – limited only by your creativity.

A Focussed Perspective

While the operation of your facility is usually reviewed through various graphical displays that represent groups of points, such as floor plans or mechanical systems, it is sometimes necessary to focus in on a single piece of equipment or a single sensor. That is where the Metasys Point Focus Window and associated Point History feature comes into play.

Through the Metasys Point Focus Window, an operator can "zoom" in on specific information related to any point in the network. This dynamic information includes current realtime value, associated setpoint and deadband, current alarm status, and other associated operational parameters. In addition, the Point Focus Window displays a point's value as a dynamic current trend graph, providing another perspective on actual performance.

Reinforcing the performance perspective, the Metasys Network has been designed to offer not only instantaneous access to current conditions, but also a historical perspective. Through the Metasys Point History feature, the network can automatically collect a historical trend for every point in the system, without any special programming or setup. Point History continuously records the values of the previous 24 hours, sampled every 30 minutes, for all analog input points. For binary input, binary output and analog output points, the last ten status changes are saved, including information regarding operator or feature issued changes. This information not only assists in fine tuning a system, but is also a valuable resource to identify potential problems before they occur. If a problem does occur, Point History can assist in analyzing the conditions that led up to the situation.

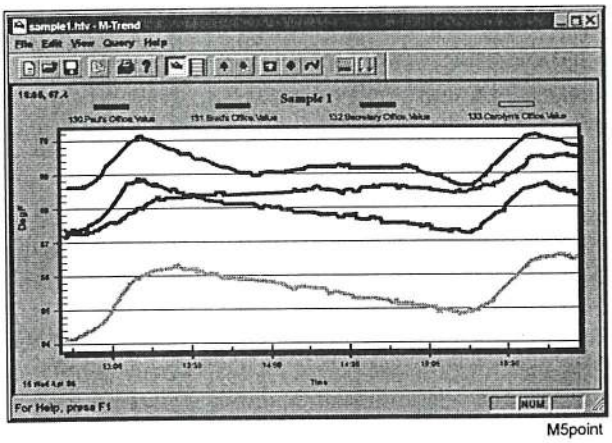


history

Figure 8: M-Trend Graphical Format

Advanced Trend Analysis

Through the M-Trend component, trend views provide a powerful management tool to analyze a breadth of historical operational characteristics of a facility. Through tabular or graphical trend views, a user can review any combination of data sources from an integrated database. Graphical displays can be single or stacked graphs with selectable display characteristics. Plus, operators have quick access to detailed trend source focus window information and zooming of any graphical display for precise analysis.



M5point

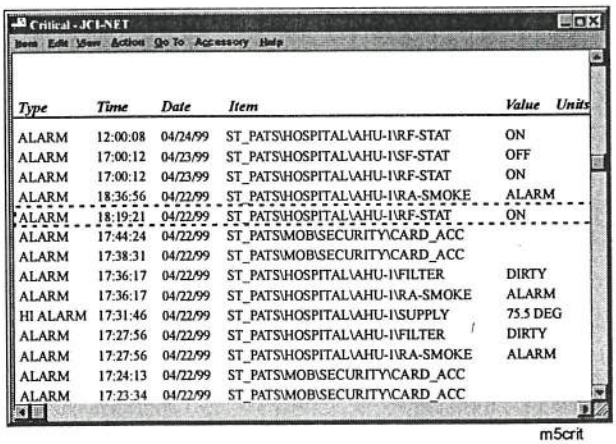
Figure 9: Point History

The Metasys Network manages the collection and archiving of the trend source data. Trend sources can be from objects monitored by the Metasys Trend feature and Metasys Point History data samples. For those sources that use Point History data samples, an alternative Fast-scan mode is provided for populating the database. Fast-scan sampling will occur whenever designated Point History data sources go into an alarm state. During Fast-scan, sampling is done at the uses specified scan interval. The user can also specify the maximum number of sources that may be in the Fast-scan mode at any one time. Not only can your operators view conditions leading up to the alarm state, they can also view operational characteristics at an increased rate during this critical condition keeping them informed of critical operations.

Sophisticated Alarm Management

Because all alarms that occur in a facility don't deserve the same attention, the Metasys Network handles each point in a different way. Some alarms are more important than others, so through priority, the system displays the most important ones first. And since different types of alarms are only important to certain operators, the Metasys Network can selectively direct various alarms to different workstations anywhere on the network – even to those remotely connected via a dial-up modem.

When critical alarm conditions occur, the M5 Workstation provides the operator with immediate notification. In addition to acknowledging the alarm, the operator has the option of placing the alarm record into either a reminder file (notify the operator again that the alarm condition still exists) or a follow-up file (that tracks the alarm report and any follow-up activities that are being used to rectify the situation). This prevents the danger that an alarm condition may be forgotten altogether. Non-critical alarms are saved in the workstation where they may be dealt with at the operator's convenience.



Type	Time	Date	Item	Value	Units
ALARM	12:00:08	04/24/99	ST_PATS\HOSPITAL\AHU-1\RF-STAT	ON	
ALARM	17:00:12	04/23/99	ST_PATS\HOSPITAL\AHU-1\SF-STAT	OFF	
ALARM	17:00:12	04/23/99	ST_PATS\HOSPITAL\AHU-1\RF-STAT	ON	
ALARM	18:36:56	04/22/99	ST_PATS\HOSPITAL\AHU-1\RA-SMOKE	ALARM	
ALARM	18:19:21	04/22/99	ST_PATS\HOSPITAL\AHU-1\RF-STAT	ON	
ALARM	17:44:24	04/22/99	ST_PATS\MOB\SECURITY\CARD_ACC		
ALARM	17:38:31	04/22/99	ST_PATS\MOB\SECURITY\CARD_ACC		
ALARM	17:36:17	04/22/99	ST_PATS\HOSPITAL\AHU-1\FILTER	DIRTY	
ALARM	17:36:17	04/22/99	ST_PATS\HOSPITAL\AHU-1\RA-SMOKE	ALARM	
HI ALARM	17:31:46	04/22/99	ST_PATS\HOSPITAL\AHU-1\SUPPLY	75.5 DEG	
ALARM	17:27:56	04/22/99	ST_PATS\HOSPITAL\AHU-1\FILTER	DIRTY	
ALARM	17:27:56	04/22/99	ST_PATS\HOSPITAL\AHU-1\RA-SMOKE	ALARM	
ALARM	17:24:13	04/22/99	ST_PATS\MOB\SECURITY\CARD_ACC		
ALARM	17:23:34	04/22/99	ST_PATS\MOB\SECURITY\CARD_ACC		

m5crit

Figure 10: Critical Alarm Summary

Alarm management is further enhanced through annotation. The operator may attach notes to each alarm stored in the follow-up file. These reminders can inform appropriate staff of what is being done to rectify the situation. This feature helps eliminates handwritten notes or verbal conversations that may get lost or forgotten.

You can quickly distinguish between the various types of Change-of-State (COS) messages with the workstation's multimedia capabilities. The enhanced audio tone/sound feature allows you to differentiate between alarm levels using distinct and recognizable tones/sounds. You can customize sound selections for each alarm type to provide faster comprehension of system COS messages. Likewise, expanding printing capabilities provide bold, italic, and color printing options. Tailor your COS messages with colors that are easily associated with critical summaries and reports.

Full Complement of Summaries

Keeping track of a facility's operations encompasses more than just monitoring alarm conditions. Through the M5 Workstation, a comprehensive complement of summaries and reports are automatically provided to assist in managing your operations. Summaries that focus on particular areas or equipment, those related to specific status conditions (alarm, off normal, lockout, disabled, etc.), feature associated (Password, Scheduling, etc.) and various archive summaries are quickly and easily available.

System Programming

The operator can use the M5 Workstation to prepare applications and define databases for any part of the Metasys Network. Hardware devices, network configuration, point addition, control loop definition, application parameter setting and more may all be performed online using simple fill-in-the-blank templates. In addition, several programming tools are available to define energy management control strategies and controller application configuration.

Controller programs can be downloaded throughout the network. Workstations are also used to archive the programs to handle automatic download in special circumstances. Various parameters and controller databases may also be uploaded for archiving too.

Password Protection

To minimize the chance of unauthorized use of the M5 Workstation, network security is provided though a multilevel password access feature. Based on the clearance level assigned by the building manager or owner, each user has a personal profile on how they can interact with the integrated network system. This profile determines what building equipment, points and commands they can interact with. And because the operator only sees those items and commands to which they have access to, Password actually adds to the simplicity of the interface as well as ensures its security.

The Metasys Network can also provide valuable documentation regarding operator activity. By saving all transactions in the workstation, the system allows managers and users access to a quick and convenient review of how equipment was controlled, when alarms were acknowledged, when setpoints were changed, etc.

Password access is consistent across the entire Metasys Network. Operators use the same password and have the same clearance regardless of which workstation they are using to access the network. To ensure this consistent level of protection and operator convenience, Dynamic Data Access networking software distributes and keeps up-to-date password information at every workstation and network supervisory controller.

Conclusion

The M5 Workstation combines the best industry standard hardware and software with Johnson Controls 100-plus years of control experience to create an easy-to-learn and use, yet powerful interface to the Metasys Network. With all of these advantages, your decision couldn't be simpler – the M5 Workstation and the integrating Metasys Network are the perfect solution to assist you in managing the needs of your dynamic enterprise.

Specifications

Product	M5 Workstation MW-M5WHCI1-0, includes M-Trend Viewer
Power Requirements	Pentium® class, minimum 166 MHz, recommended 200 MHz or higher
Memory	Requires a minimum of 32 Mb, 64 Mb recommended, for Windows 95/Windows 98 64 Mb, 128 Mb recommended for Windows NT.
Hard Disk	Minimum 2 GB
Floppy Disk Drive	3.5 in. 1.44 Mb disk drive
CD-ROM	Minimum 4x for loading software
Monitor	Recommended 17 in. monitor with 1024 x 768 minimum resolution
Video Memory	Minimum 2 Mb VRAM
Software	Windows 95, Windows 98 or Windows NT 4.0
Workstation Modem for Remote Panel Unit Communications	Hayes® Accura 2400 baud or Hayes Smartmodem™ OPTIMA® 9600 baud
Agency Compliance	FCC Part 15, Subpart J, Class A UL 916 CSA C22.2 No. 205
Agency Listings	UL Listed and CSA Certified

The performance specifications are nominal and conform to acceptable industry standards. For application at conditions beyond these specifications, consult the local Johnson Controls office. Johnson Controls, Inc. shall not be liable for damages resulting from misapplication or misuse of its products.

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P.O. Box 423
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FAN 641
M-Series Workstation Sales Resource Manual
Printed in U.S.A

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M-Graphics

Unparalleled ease, speed and power. It's all at your fingertips with M-Graphics, the premier dynamic graphical interface in the facility management industry. Just imagine your facility operators gliding through animated graphic displays, selecting operating strategies to fine tune your enterprise's operations, launch third-party software applications to access pertinent energy consumption information, review sequence of operations or diagnostic guides, or request comprehensive management reports as quickly as they can move their hand. Then consider extending that sphere of influence by integrating diverse subsystems, active custom control strategies, embed ActiveX™ controls to view realtime trends and full motion video. You can enjoy all this advanced capability and more through M-Graphics—a powerful management tool that delivers confidence to your staff.

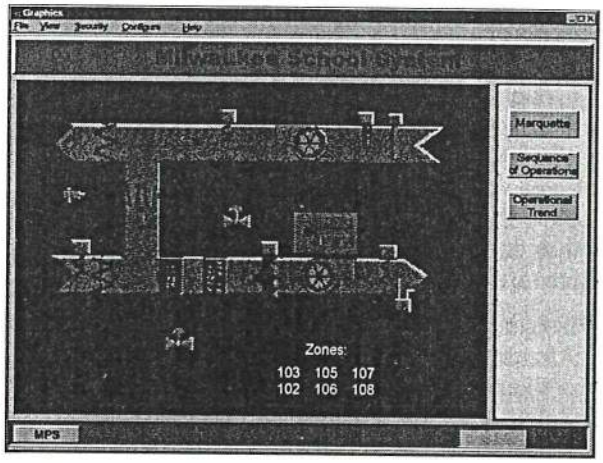


Figure 1: M-Graphics

Features and Benefits

❑ **Fully OLE for Process Control (OPC) Compliant**	Accesses data via OPC data servers, an industry standard, open architecture interface
❑ **ActiveX Compliant**	Provides universal standard for sharing and integrating data. Provides means to launch compliant applications from graphical displays. Allows display/embedding of ActiveX controls within graphical displays.
❑ **Comprehensive Library with Prebound Tags**	Easy to engineer. Library provides symbols, subsystems, and complete HVAC systems
❑ **Dynamic Animated Displays**	Easy to visualize operational conditions
❑ **Full Feature Online Editor**	Provides built-in editor to quickly handle desired modifications
❑ **Multifaceted Zooming on any Portion of Graphical Display**	Provides detailed focus to assist analysis
❑ **Versatile Import Capabilities**	Allows use of various formats and applications for graphic development

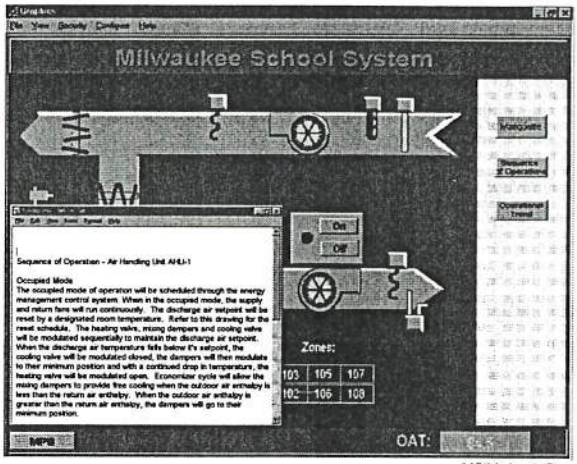
Intuitive Navigation

Whether your facility is large or small, single or multi-site, basic or complex, you require a flexible facility management solution to help you manage it efficiently. Your staff needs the ability to quickly and confidently navigate from one area to another. You want them to make informed, up-to-the-second decisions regarding comfort and operating efficiency. Plus, you need a simple, intuitive design.

Through M-Graphics your staff can easily and intuitively glide throughout your entire networked enterprise by way of graphical displays. Using simple, quick point and click actions, navigation between buildings, floors, animated HVAC or other integrated systems, and related third-party software applications is simple and quick.

For example, using these high-resolution dynamic color graphics, an operator may view the digital photographic image of the outside of a building, click on the identified problem area to quickly penetrate to the particular floor to view all current information. Once the operator has analyzed the situation, the operator can strategically interact with the graphic display to make any necessary adjustments to resolve the problem and restore optimal operational performance.

This simplicity truly maximizes an operator's efficiency. All pertinent information is easily accessible, letting them focus on facility operations. There is no need to memorize or type command formats, or use special key combinations. M-Graphics will encourage system utilization, enhances productivity and lowers overall operating costs. It's a natural edge to bring performance navigation to your facility.



M5thirdparty2

Figure 2: Example of M-Graphics Navigation

Performance Integration

M-Graphics enhances your perspective of facility operations. Not only can you see more pertinent information on your screen, you have access to a wider variety of ways to access and manipulate it.

Besides having the ability to navigate and visually view information anywhere in your facility, your users have access to other integrated facility management functions. Depending on subsystem capabilities, users can easily command the status and value of objects, launch detailed focus windows, access an object's schedules, view totalization records, and other application parameters all in a familiar format. Graphical displays can have realtime and historical trend graphs embedded, integrating a powerful analysis tool. Furthermore, reviewing a system's sequence of operation, diagnostic guidelines or a detailed equipment drawing can all just be a click away.

Your M-Graphics performance integration can be extended to launch popular third-party software applications; such as a spreadsheet calculating energy consumption and efficiency reports, trigger a Visual Basic® application to initiate a custom control strategy and much more. Performance integration—limited only by your creativity.

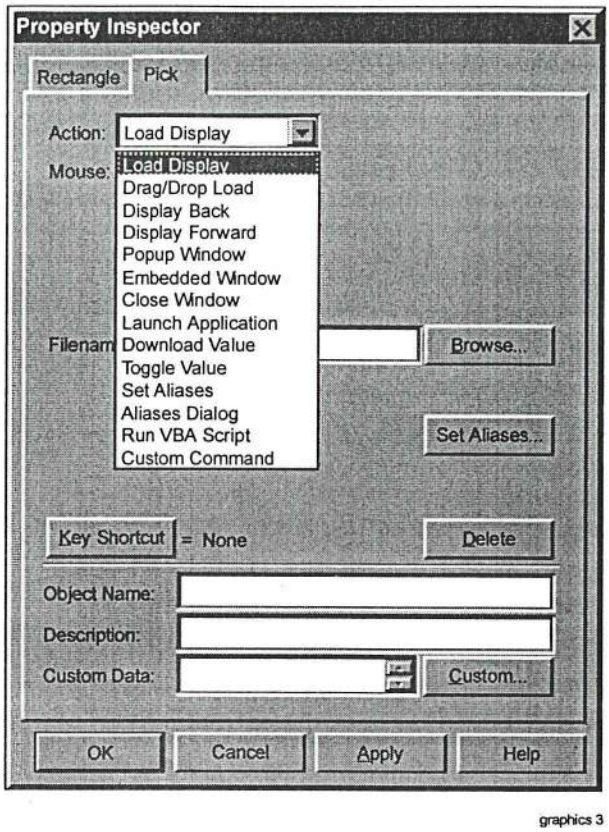


Figure 3: Pick Action Dynamics

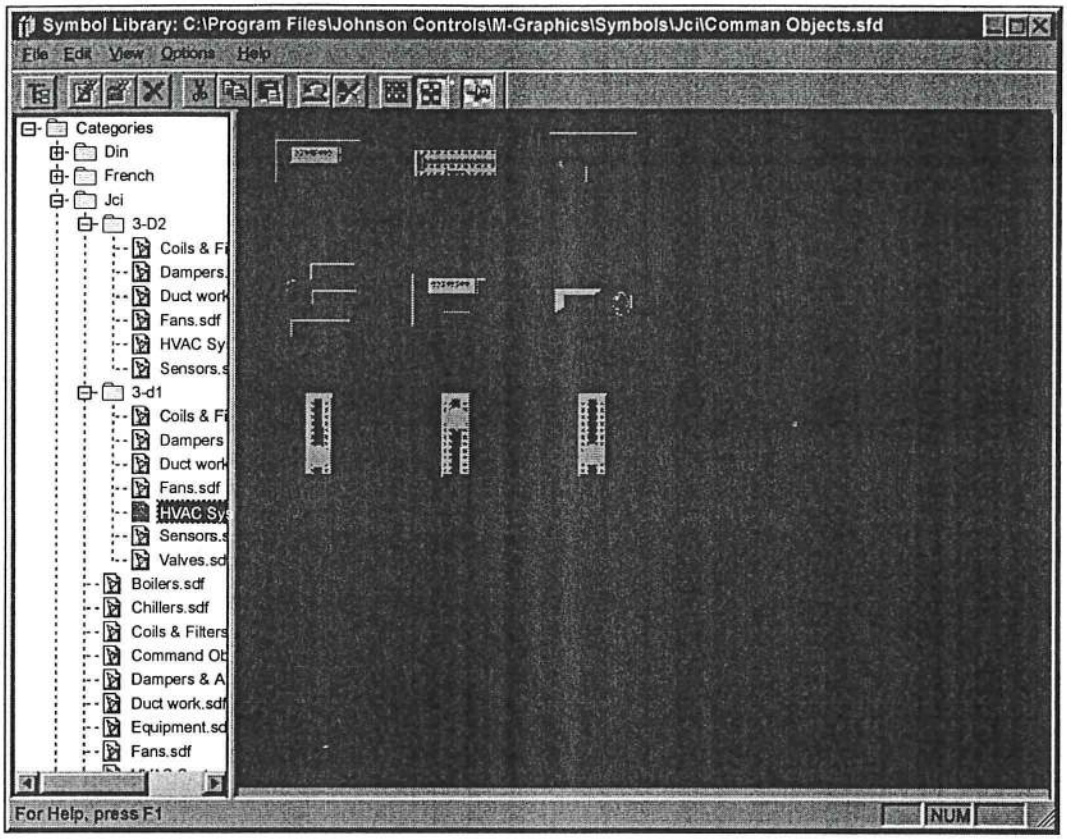
Visual Dynamics

M-Graphics brings a dynamic, visual perspective to your facility through a combination of industry leading characteristics. Backgrounds and static elements can easily be draw, scanned, or imported. Runtime dynamics include;

- Changing the size and/or location of an object such as the volume level in a tank based on a realtime value
- Rotating the position of an object such as door or damper based on an object's realtime value
- Hiding drawing components such as special messages based on associated logic condition
- Change display color distinctly or by color gradient such as floor room temperatures based on an object's realtime value
- Blink/flash a drawing component on/off or between two colors such as for emergency conditions based on associated logic condition
- Select which object of a group is displayed such as maximum load value based on realtime value of an analog object
- Animate the operation objects such as pumps, fans, dampers, fluid flows, humidifying vapor sprays, and valves
- Zoom any portion of a graphical display by fixed/custom percentages or by flexible box (rubber banding) and much more

Any display can be further enhanced using pushbuttons, check boxes, sliders and radio buttons. Time and date can be added in a variety of formats. Add realtime data values from any number of OPC data servers. Plus, display values can be the result of custom created expressions; such as: arithmetic, relational, logic, bitwise/Boolean, or functions, providing a unique level of flexibility.

Your creativity is the cornerstone to the dynamic visual impact that is provided with M-Graphics. It opens up new dynamic opportunities for managing your facility's operations.



graphics 10

Figure 4: Example of Command Bars and Sliders

On Call Editing

One thing we can count on is change. Even when we think a graphic is complete, something can come along to require changes.

M-Graphics addresses these real life occurrences by providing a full featured, online graphics editor. There is no need to use or purchase a separate software package; this editor is always available.

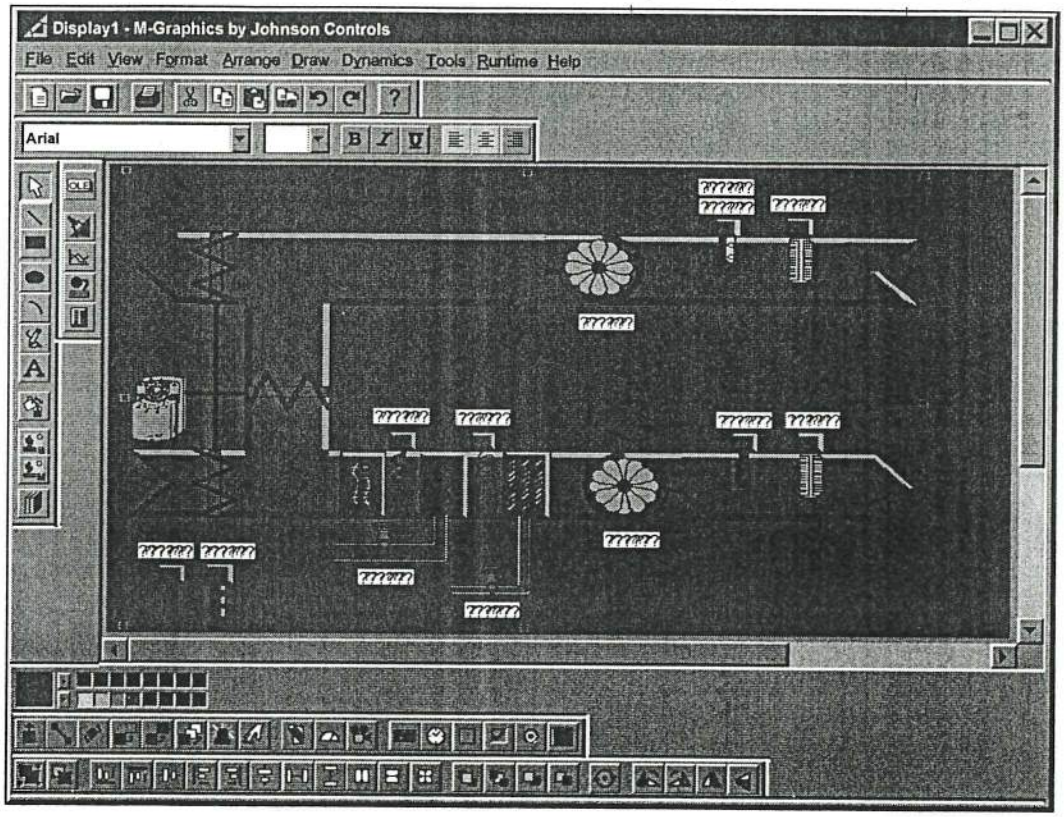
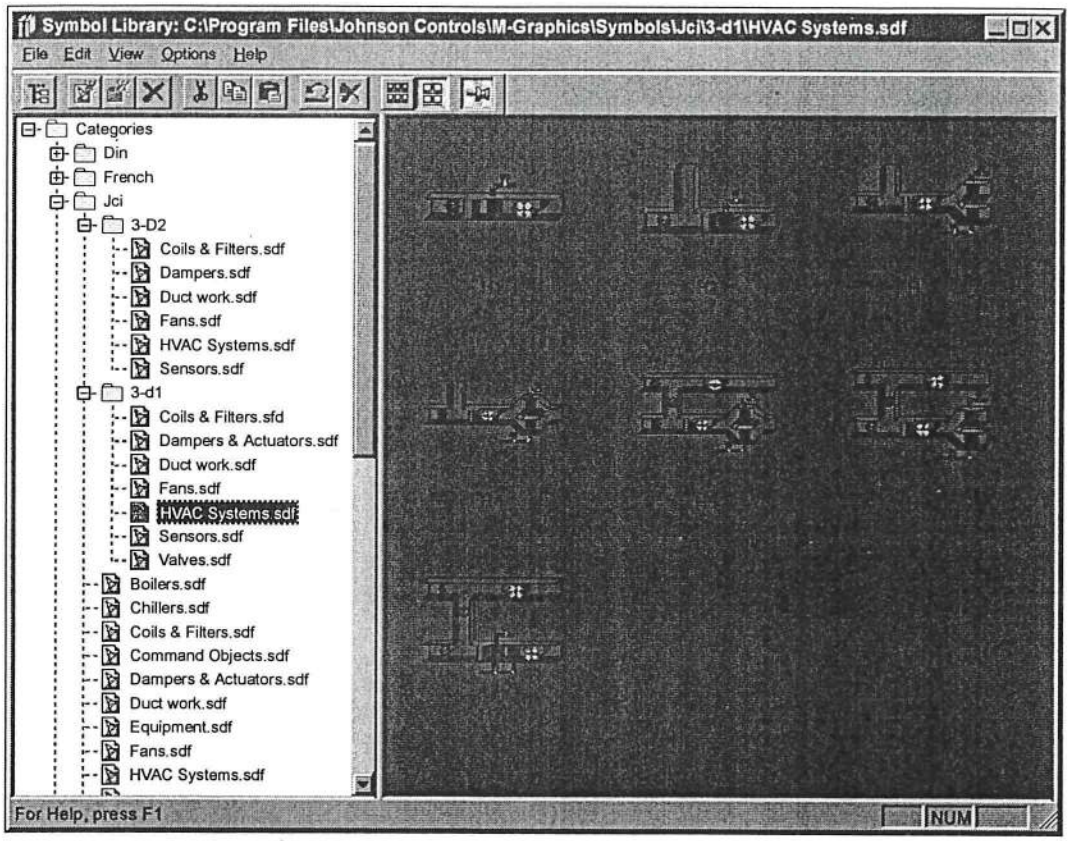


Figure 5: M-Graphics Configure Mode

The M-Graphics online editor provides a full range of functions including:

- Drawing tools for lines, segmented lines, arcs, rectangles and ellipses with the ability to apply color, style and width characteristics
- Text tools for inserting text with effects such as color, shadows, patterns, font, size and style
- A full color palette with custom color creation and an eyedropper option to distinctly select a color and apply it.
- Aligning, arranging, and grouping functions
- Importing of bitmaps and metafile formats
- Templates to easily apply standard formats and much more

To assist in graphics creation, M-Graphics includes a comprehensive symbol library in 2D and 3D formats. Symbols include boilers, chillers, coils, dampers, actuators, duct work, fans, filters, meters, piping, tanks, controls, motors, pumps, and complete HVAC systems to mention a few. Plus, each library symbol is associated with a prebound tag to aid in the creation of facility drawings



graphics 4

Figure 6: M-Graphics Symbol Library

M-Graphics object binding is so quick, fast, and simple—you'll enjoy it. Since M-Graphics is an OPC compliant application, tag browsing and binding is just point and click. Users have the flexibility to select which OPC data server, object and attribute to bind within a graphic display. Plus there is no physical limit to the number of bindings associated with a graphic or restriction of data source. Therefore, you can easily intermix data from a variety of systems, subsystems and OPC data servers.

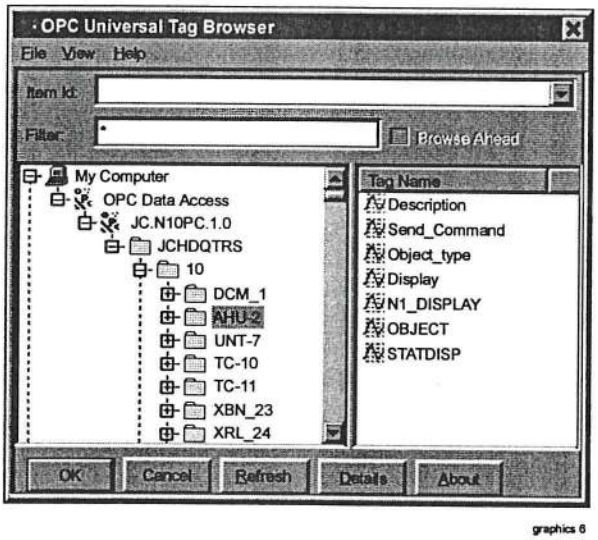


Figure 7: OPC Tag Browser

Active Ingredients

As versatile as M-Graphics is, it provides additional industry leading benefits.

- Besides distinct data source tags, a display can use local variables and Runtime aliasing that automatically loads the appropriate data sources upon display. For example, create only one detailed VAV box graphic and through Runtime aliasing, apply it to every VAV box in your facility. Plus, aliasing can be specified within each individual M-Graphics display or be sourced from an external tab-delimited text file.
- Through ActiveX controls, M-Graphic displays can be embedded in other ActiveX control containers such as Visual Basic forms and HTML pages.
- M-Graphics fully supports Visual Basic for Applications, an industry standard and powerful programming environment to create and customize Microsoft® Windows® applications. This high-level application programmability features cross-platform support for ActiveX technology and is identical with VBA in Microsoft Office applications and those of third-party products.

Conclusion

Unparalleled ease, speed and power. With all the versatility and advantages of M-Graphics, your decision couldn't be simpler. We think you'll agree that M-Graphics is perfect for you. Why not make it an integral part of your team to assist in the management and optimization of your enterprise's operations.

Specifications

Product M-Graphics (MW-MGRAPH-0)

The performance specifications are nominal and conform to acceptable industry standards. For application at conditions beyond these specifications, consult the local Johnson Controls office. Johnson Controls, Inc. shall not be liable for damages resulting from misapplication or misuse of its products.

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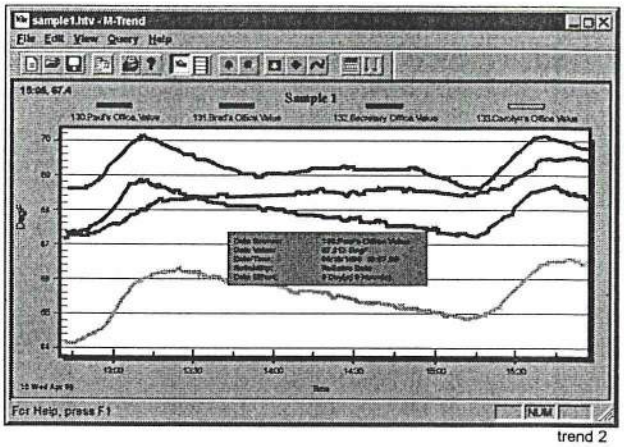
M-Trend and M-Historian

Versatile, comprehensive and concise. That's how the M-Trend and the associated M-Historian components assist you in reviewing and analyzing the historical operational characteristics of your enterprise. Through tabular or graphical views, M-Trend allows a user to simultaneously view any combination of point values periodically collected and stored in an associated M-Historian database. Through the use of M-Trend, a user can analyze operational trends to optimize energy consumption, diagnose potential problems before they occur, reduce maintenance and downtime costs. The result—a proactive, powerful management tool that enhances staff productivity and optimizes operational expenditures.



trend 2

Figure 1: M-Trend

Features and Benefits

❑ **Standards Based Architecture**	Allows data retrieval via ODBC (Open Database Connectivity), a standard application programming interface
❑ **Supports Microsoft Access**	Provides universal relational database format
❑ **Supports AspenTech® OEM Historian**	Provides high performance relational database with automatic file management and statistical data aggregation functions
❑ **Versatile Trend Collection and Archiving**	Provides simultaneous collection from multiple subsystem networks. Supports archiving to single or multiple locations.
❑ **Graphical and Tabular Displays with Data Source Focus Window**	Easy to analyze operational trends to optimize equipment performance
❑ **Single or Stacked Graphics with User Defined Ranging**	Facilitates comparison of a variety of operational characteristics to make effective decisions
❑ **Selectable Display Variables**	Allows users to customize display
❑ **Unlimited Graphical Zooming with Automatic Axis Scaling**	Provides detailed focus to assist analysis
❑ **ActiveX™ control compliant**	Allows display/embedding of M-Trend documents in other ActiveX compliant software applications

Flexible Trend Collection and Archiving

Through the combination M-Trend views and M-Historian archiving capabilities, a user has access to a powerful management analysis tool. Each subsystem within a facility, such as a Metasys® N1 Network or a BACnet® network, has trend collecting applications. These applications routinely sample point values (data sources) that are stored/buffered within a local network controller. Periodically, the subsystem trend collector transmits the buffered data for archiving to an M-Historian database, which is accessible to users through various client applications.

M-Historian databases may be distinct for each subsystem or may be integrated to provide a consolidated archive for an entire enterprise. The archived data may reside on a single server or be dispersed over multiple servers. The M-Historian database format can be either Microsoft® Access or the AspenTech OEM Historian. Depending on the database format selected, M-Historian can reside within a Windows® 95, Windows 98, or Windows NT® environment. One or both of these database formats may simultaneously exist within an enterprise. If both exist, the user has the ability to individually direct each subsystem's trend collector archiving to either or both of these M-Historian database formats.

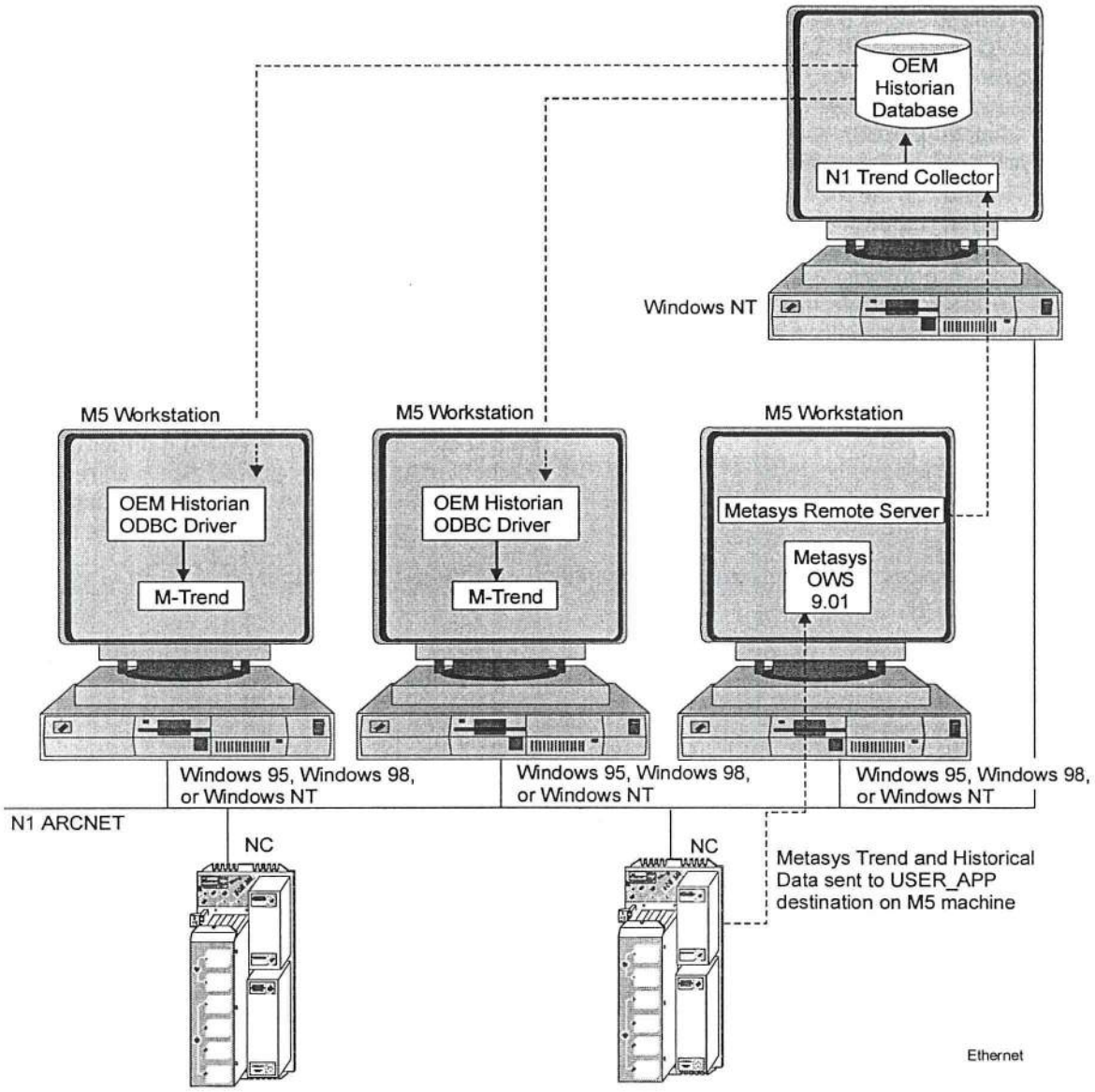


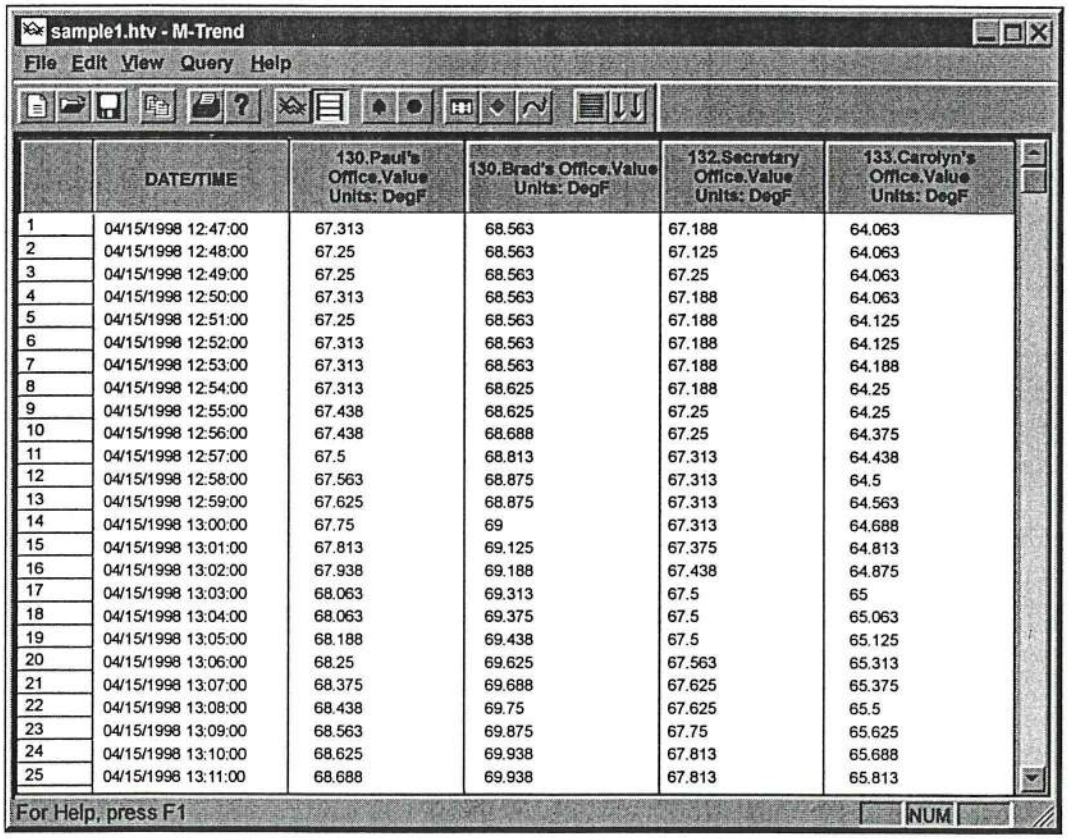
Figure 2: Example Network with M-Historian

Standardized Client Application Access

M-Historian's archived trend data is accessed by client applications, such as M-Trend as well as many third-party spreadsheets and database viewers. Access is provided through Open Database Connectivity (ODBC) interface—a standard Application Programming Interface (API) for accessing data from relational databases. Client applications can reside within a Windows 95, Windows 98, or Windows NT environment.

Versatile Trend Viewing

Through M-Trend, a user has access to a powerful management tool to analyze a breadth of historical operational characteristics archived by M-Historian. Users can create an unlimited number of customized M-Trend views to analyze each accessible M-Historian database. Each M-trend view can be comprised of up to 32 data sources displayed in a tabular or graphical format. While data sources may reside in diverse subsystems, have distinct sampling rates and unique engineering units/ranges, all data sources within the same M-Historian database are available for comparison viewing. A data source may be selected to be in an unlimited number of views. Even if a data source is associated with multiple trend views, only one set of data is maintained in the M-Historian database to optimize storage resources.



	DATE/TIME	130.Paul's Office.Value Units: DegF	130.Brad's Office.Value Units: DegF	132.Secretary Office.Value Units: DegF	133.Carolyn's Office.Value Units: DegF
1	04/15/1998 12:47:00	67.313	68.563	67.188	64.063
2	04/15/1998 12:48:00	67.25	68.563	67.125	64.063
3	04/15/1998 12:49:00	67.25	68.563	67.25	64.063
4	04/15/1998 12:50:00	67.313	68.563	67.188	64.063
5	04/15/1998 12:51:00	67.25	68.563	67.188	64.125
6	04/15/1998 12:52:00	67.313	68.563	67.188	64.125
7	04/15/1998 12:53:00	67.313	68.563	67.188	64.188
8	04/15/1998 12:54:00	67.313	68.625	67.188	64.25
9	04/15/1998 12:55:00	67.438	68.625	67.25	64.25
10	04/15/1998 12:56:00	67.438	68.688	67.25	64.375
11	04/15/1998 12:57:00	67.5	68.813	67.313	64.438
12	04/15/1998 12:58:00	67.563	68.875	67.313	64.5
13	04/15/1998 12:59:00	67.625	68.875	67.313	64.563
14	04/15/1998 13:00:00	67.75	69	67.313	64.688
15	04/15/1998 13:01:00	67.813	69.125	67.375	64.813
16	04/15/1998 13:02:00	67.938	69.188	67.438	64.875
17	04/15/1998 13:03:00	68.063	69.313	67.5	65
18	04/15/1998 13:04:00	68.063	69.375	67.5	65.063
19	04/15/1998 13:05:00	68.188	69.438	67.5	65.125
20	04/15/1998 13:06:00	68.25	69.625	67.563	65.313
21	04/15/1998 13:07:00	68.375	69.688	67.625	65.375
22	04/15/1998 13:08:00	68.438	69.75	67.625	65.5
23	04/15/1998 13:09:00	68.563	69.875	67.75	65.625
24	04/15/1998 13:10:00	68.625	69.938	67.813	65.688
25	04/15/1998 13:11:00	68.688	69.938	67.813	65.813

Figure 3: M-Trend Tabular Format

Each individual data source may also have a time offset applied to assist in a user's analysis. The offset visually shifts the data being displayed to allow a user to concurrently view information without having to scroll the display. This offset is very beneficial when comparing the effectiveness of control strategy modifications from one time period to another or a system's operation under lead/lag conditions. Plus, operators have rapid access to individual data source focus windows by simply clicking on the respective display value.

Graphical displays can be single or stacked graphs with online selectable display characteristics, such as ranging, color and plot style. Stacked graphs are extremely beneficial when comparing data sources of different ranges or engineering units (i.e., temperature, pressure, and flow). Up to six data sources within each M-trend view are automatically available for graphing on a single display. Through a simple online edit procedure, a user can select which of the data sources within a view should be able to be graphed. Furthermore, M-Trend provides unlimited on screen zooming with automatic axis scaling to provide enhanced detailed viewing of any graphical display.

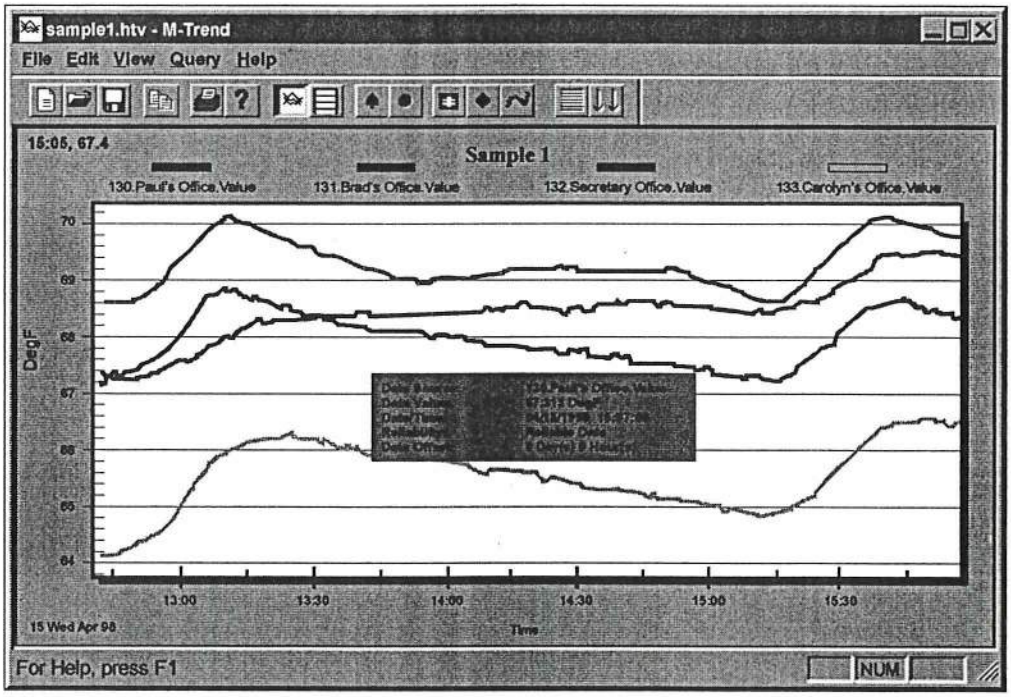


Figure 4: M-Trend Graphical Format

Sophisticated Database Management

For those installations that require a high performance M-Historian database with advanced features, the AspenTech OEM Historian provides a sophisticated option. Depending on individual storage requirements, the OEM Historian can manage up to 50,000 data sources through a Windows NT environment.

Besides managing the storage of data, the OEM Historian also provides numerous features to automatically or manually coordinate database file management. Database parameters include number and location of filesets, the amount of data per file, time range of each file set, time duration of keeping each file set online, and other associated parameters. For example, if you desire to maintain energy consumption data on a monthly basis with the ability to do a previous month/year comparison, the OEM Historian can automatically address your needs. This will allow your staff to focus on the pertinent operations of your facility and not be concerned with file management requirements.

With the OEM Historian deployed in your enterprise, M-Trend users have access to a variety of data aggregate functions to enhance information analysis. These functions allow users to perform various statistical functions on the M-Historian database without having to design special queries. Once a user specifies the desired data interval, aggregate functions provided include all data, average—arithmetic mean, maximum value, minimum value, range—difference between minimum and maximum values, standard deviation, sum of all values, and variance. And like other aspects of M-Trend, switching and selection of the desired aggregate function is done online.

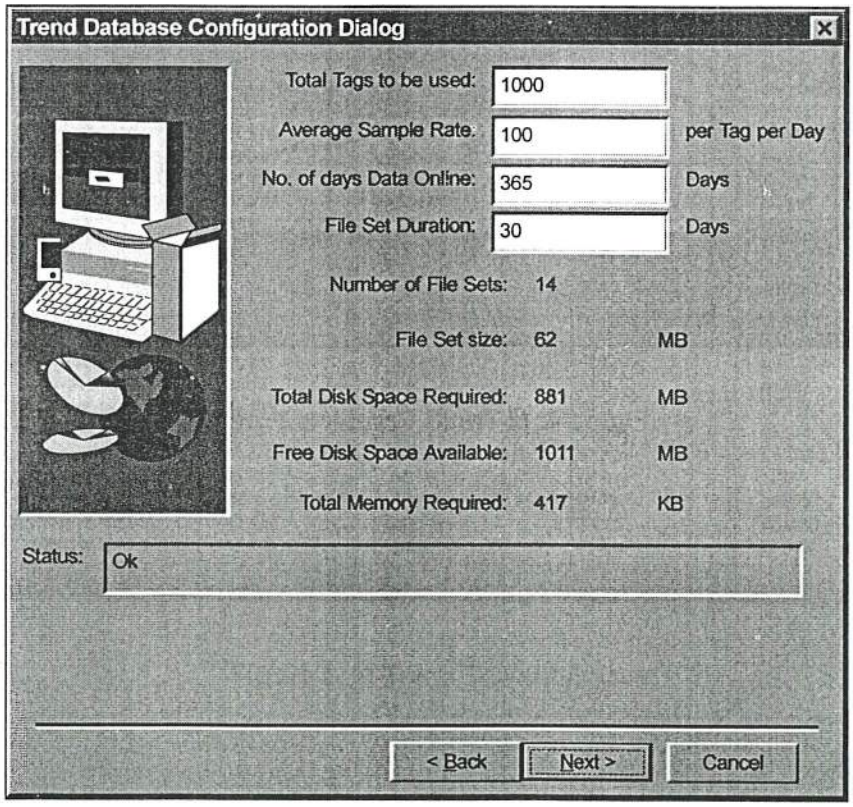


Figure 5: OEM Historian Trend Database Configuration Dialog Box

An Active Ingredient

As versatile as M-Trend is, it provides users additional benefits by being an ActiveX control. This enables any M-Trend view to be displayed or embedded in other ActiveX compliant applications. For example, a user can easily display an M-Trend view in an M-Graphics display of a central chiller plant, providing additional information on the plant's historical operational performance. Similarly, M-Trend views could be included in special reports needed to validate the environmental conditions during the production process of sensitive products.

Conclusion

Versatile, comprehensive, and concise. With all the advantages of M-Trend and M-Historian, your choice is even easier. Why not place them on your team to assist in the management and optimization of your enterprise's expenditures.

Specifications

Product	M-Trend (Packaged with Workstation HCI)	
	M-Historian – Access Historian packaged with Workstation HCI	
	AspenTech OEM Historian	(MW-OEMHST01-0 for 1,000 Tags)
		(MW-OEMHST10-0 for 10,000 Tags)
		(MW-OEMHST50-0 for 50,000 Tags)

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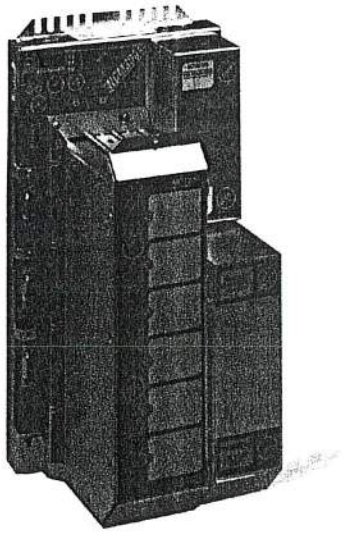
Controls Group 507 E. Michigan Street
P.O. Box 423, Milwaukee, WI 53202
Code No. Lit-1928020

Network Control Module

NCM200 (installs into base frame)



Standalone NCM300

Description

The Network Control Module (NCM) is the main processor in the NCU. Fully user-programmable, it is responsible for supervisory control activities for the points and control loops connected to the NCU and all NEUs and application specific controllers with which it communicates on its local buses.

You choose your NCM's configuration, whether as a standalone controller, a node on the N1 LAN working in concert with other NCMs, or as a connectivity device. In this connectivity application, the NCM can bring other, non-Johnson Controls systems under Metasys control or interface Metasys to a host system. The battery-backed memory of the NCM stores application programs, user data bases, and point histories. The NCM includes features to coordinate system-wide efficiency, keeping you informed and in control while ensuring occupant safety and comfort.

The NCM comes in two different packages: a plug-in module or a standalone unit. As a module, it plugs into either a 1-slot, 2-slot, or 5-slot base frame mounted in an enclosure. As a standalone unit, the NCM mounts directly into an enclosure. Both NCMs support ASCs and NEUs.

Features

- fast, efficient communication between other NCMs and the Operator Workstation to provide for point sharing and building-wide interlocks
- modular design that provides for easy and quick installation
- battery-backed memory that saves the NCM's programming in case of power outage
- collects and stores data on historical trends, equipment runtime, and energy consumption, making this information immediately accessible to an operator at the workstation
- LED indicators on front of panel supply evidence of the module's condition and help determine if the module is functioning properly
- NCM200/300 can support connection to an ARCNET N1 LAN
- NCM350 can support connection to an ETHERNET N1 LAN

To Order

Contact your local Johnson Controls Representative.

Accessories

Code Number	Description
NCM200	
NU-NIM206-1	Network Identity Module 206
NU-L2B101-0	L2 Submodule
NU-COM101-0	RS-232 Submodule
NU-PWR101-0	Power Supply Module
NU-BAT101-0	Battery Submodule
NU-CBL101-0	RS-232 Cable 35 ft., DB25 (right angle with narrow profile)
MHK-101-0	Male Hood Kit for NU-CBL101-0, DB25
FHK-101-0	Female Hood Kit for NU-CBL101-0, DB25
NU-MDM-101-0	JCI Modem Submodule
NCM300/350	
NU-NET101-0	N1 ARCNET LAN Card for NCM300/350
NU-NET301-0	N1 ETHERNET LAN Card for NCM350
MM-CVT101-0	RS-232 to RS-485 Converter
NCM200 and NCM300/350	
TTM101-0	Table Top Modem (JCI Proprietary Line)
TTM102-0	Table Top Modem (Leased Line)
TTM103-0	Table Top Modem (JC/LINK Generic Bridge)

Selection Chart

Code Number	Description
NU-NCM201-1	Network Control Module 200
NU-NCM300-1	Network Control Module 300
NU-NCM350-1	Network Control Module 350
NU-NCM350-8	Network Control Module 350 with 8 MEG Memory

Repair Parts

Code Number	Description
NCM200 and NCM300	
NU-NCM201-701	Repair part for NCM200
NU-NCM300-701	Repair part for NCM300
NU-NCM350-701	Repair part for NCM350-1
NU-NCM350-708	Repair part for NCM350-8
NU-PWR300-0	Replacement Power Supply, NCM300/350
NU-BAT300-0	Replacement Battery Pack, NCM300/350

Controls Group 507 E. Michigan Street
P.O. Box 423, Milwaukee, WI 53202
Code No. Lit-1928020

Network Control Module (Continued)

Specifications

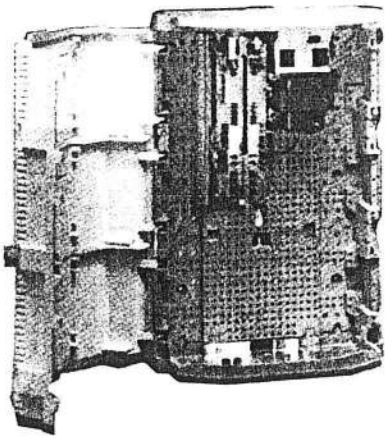
	NCM200	NCM300/350
Power Requirements	85-264 VAC at 50/60 Hz	90 to 240 VAC, 670 to 250 mA, 50/60 Hz
Power Consumption	Power is from the power module (NU-PWR101-0)	60 VA (maximum), 25 VA (typical) at 50/60 Hz
Memory Options	4 Mb standard	2 Mb standard (4, 6, or 10 Mb optional); 8 Mb standard with NCM350-8
Dimensions	14 in. H x 2.25 in. W x 7.0 in. D (35.5 x 5.7 x 17.8 cm)	12.4 in. H x 6.0 in. W x 5.5 in. D (32 x 15 x 14 cm)
Shipping Weight	5 lb (2.25 kg)	4.2 lb (1.9 kg)
Ambient Operating Conditions	32 to 122°F (0 to 50°C) 10 to 90% RH	32 to 122°F (0 to 50°C) 10 to 90% RH
Ambient Storage Conditions	-40 to 158°F (-40 to 70°C) 5 to 95% RH	32 to 122°F (0 to 50°C) 10 to 90% RH
Agency Compliance	FCC Part 15 Class A	FCC Part 15 Class A
Agency Listing	UL 916 Listed CSA C22.2 No. 205 Certified UL-864	UL 916 Listed CSA C22.2 Certified Meets EMC directive 89/336/EEC UL 864 Listing in process CUL 527 Listing in process

JOHNSON CONTROLS

Controls Group
507 E. Michigan Street
P.O. Box 423
Milwaukee, WI 53208
Code No. LIT-1928130

AHU Series

Air Handling Unit Controller



Description

The Air Handling Unit (AHU) Controller is a complete digital control system for most common air handling configurations, including single zone, variable air volume, multi-zone, and dual duct. The AHU Controller is designed to reduce energy expenses while keeping occupant comfort its top priority in both new construction and retrofit applications. It can also be configured as a generic loop controller for unique applications. Perfect for standalone operation, the AHU controller can also communicate on the Metasys N2 Bus, seamlessly providing all point and control information to the rest of the network.

AHU Controller features a family of compatible components that make it ideal for field installation. Base module mounts easily using either a DIN rail or direct mount and provides screw terminations for inputs and outputs. All electronics are on a separate circuit board, which plugs into the base for protection during installation and easy servicing. Additional components can be added as needed.

Function Module Kit: attaches to DIN rail; houses two to four function modules for direct connection to pneumatic actuators, includes differential pressure inputs and pressure transmitters.

A Line Voltage Relay Kit added to the DIN rail provides pilot duty switched outputs. Each Relay Module contains two or four SPDT relays, each controlled by any of the AHU Controller's binary output points.

A user-to-controller interface called the Zone Terminal (ZT) can also be used for easy controller adjustment and indication. The ZT also offers standalone weekly and holiday scheduling, as well as password protection for the AHU Controller.

Features

- standalone control of each air handling unit provides system reliability
- network communications over N2 Bus provide facility-wide control efficiencies and cost effective sensor sharing
- complete line of compatible sensors, actuators, and accessories for a total system solution
- interfaces to both pneumatic and electric actuators for low cost installation for both construction and retrofit applications
- multiple packaging options for both field and factory installations provide low cost and flexible installation
- built-in control program library within HVAC PRO Software Tool allows easy configuration
- rugged, locking enclosure
- 100 VA split-bobbin transformer

To Order

See the selection chart on the next page.

Specifications

	AHU Controller
Product	AS-AHU103-300
Power Requirements	24 VAC, 50/60 Hz at 100 VA (from XFR100-1 Module)
Ambient Operating Conditions	32° to 122°F (0° to 50°C) 10 to 90% RH
Ambient Storage Conditions	-40° to 158°F (-40° to 70°C) 10 to 90% RH
N2 Bus	Isolated
Zone Bus	6- and 8-Pin Phone Jacks or Terminal Block on Controller
Dimensions (H x W x D)	13.3 in. x 7.9 in. x 6.9 in. (33.8 cm x 20.0 cm x 17.4 cm)
Shipping Weight	4.13 lbs (1.87 kg)
Agency Compliance	FCC Part 15, Subpart J, Class A UL916, UL864 CSA C22.2-205
Agency Listings	UL Listed and CSA Certified as part of the Network

Air Handling Unit Controller (Continued)

Selection Chart

Code Number	Analog Inputs	Binary Inputs	Analog Outputs	Binary Outputs
AS-AHU103-300 *	8 Jumper Selectable • RTD Temp. Elem. (NI, SI, or PT) • 0-10VDC Transmitter • 4-20 mA Transmitter	8 • Dry Contacts	6 • 0 to 20 mA • 0-10VDC using 499 ohm Resistors • Zone Bus Motors	10 • 24 VAC Triacs at 0.5 amps

* Includes AS-AHU100-0 AHU controller termination board AS-AHU102-0, AHU controller motherboard, EN-EWC35-0 with special UPM door, AS-XFR100-1 100VA split bobbin transformer and power box with on/off power switch and two (2) utility outlets

Options

Application Options	Software Options
Primary Equipment Types	Mixed air single path
	Mixed air dual path
	100% outside air single path
	100% outside air dual path
Primary Control Strategies	Room control
	Room control of cooling / room reset of heating
	Return/exhaust air control
	Constant discharge air control
	Supply air reset from zone temperature
	Supply air reset from return temperature
	Hot/cold deck reset from coldest/warmest zone
Economizer Strategies	Dry bulb
	Enthalpy comparison
	Outside air enthalpy
	Differential outside/return air temperature
	Binary input from external economizer
	Vent and purge operation
Minimum Outside Air Strategies	Single damper with minimum position
	Separate damper–2-position
	Separate damper–minimum air flow station
Air Quality	Minimum position or min. flow reset by CO2 sensor
Dehumidification	High signal select with cooling command
	Addition of dehumidification and cooling commands
Humidification	Modulated steam valve
	Staged 2-position valves

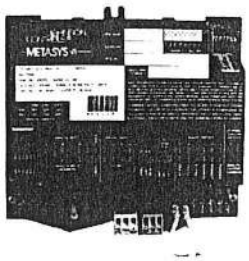
Application Options	Software Options
Preheat Configurations	2-position
	Face and bypass damper with valve control
	Modulated single coil
	Staged electric heat or 2-position valves
	Circulating pump on/off logic
	Preheat lockout logic
Heating/Cooling Configurations	2-position valves with face and bypass damper control
	Modulated single coil
	Staged electric heat, DX cooling,
	or 2-position valves
	Modulated common heating/cooling coil
	Circulating pump on/off logic
	Heating/Cooling lockout logic
Fan Start/Stop	Supply fan only
	Supply fan and return fan
Static Pressure Control	Single supply fan (VSD, inlet vanes or bypass dampers)
	Two speed fan
Fan Volume Matching	Single supply and single return fan, differential CFM
Unused Input/Output Loops or Sixteen Generic Input/Output Control Loops	Analog input to analog output
	Analog input to binary output
	Binary input to analog output
	Binary input to binary output
Unoccupied Control	Setup and setback (room control) set points
	Intermittent night cycle operation
	Morning warmup and cooldown

JOHNSON CONTROLS

Controls Group
507 E. Michigan Street
P.O. Box 423
Milwaukee, WI 53208
Code No. LIT-1928145

UNT Series

Unitary Controller



Unitary Controller

Description

The Unitary (UNT) Controller is an electronic device for digital control of packaged air handling units, unit ventilators, fan coils, heat pumps, and other terminal units serving a single zone or room. It can also be configured as a generic input/output device for basic point monitoring applications when used within a Metasys Network.

You can easily configure point inputs and outputs and software features to control a wide variety of HVAC equipment applications. You may use the UNT as a standalone controller or connected to the Metasys Network through a Network Control Module (NCM) or Companion.

Features

- Standalone control enhances system reliability
- Network communications over N2 bus provides facility-wide control efficiencies and cost effective sensor sharing
- Multiple modes of operation for various occupancy conditions provide comfort with economy
- Built-in control program library within HVAC PRO software tool allows easy configuration
- Multiple Packaging Options for Both Field and Factory Installations allow for installation flexibility
- Isolated N2 Circuitry for more reliable operation
- Removable N2 and 24 VAC Power Plugs Allow disconnection of an individual controller without disrupting other controller connections
- LED Indicator for Power/Zone Bus provides visual indication of proper system function
- Screw Terminals for I/O connections available in some models; "Quick Connect" lugs and crimping tool not required

To Order

See the selection chart on the next page.

Options

Application Options	Software Options
Primary Equipment Types	Unit Vents ASHRAE Cycle 1 ASHRAE Cycle 2 ASHRAE Cycle 3 ASHRAE Cycle W Heat Pumps Water to Air Air to Air Packaged Rooftops Fan Coils
Primary Control Strategies	Room/zone control
Economizer Changeover Strategies	- Dry bulb - Outside air enthalpy - Differential outside/return air temperature - Binary input from external economizer - Supervisory network command
Mixed Air Control Strategies	Proportional output to OA/RA damper actuator Binary output to economizer actuator
Heating/Cooling Configuration	Modulated single coil Staged (2-stage max) Modulated common heating/cooling coil Reversing valve logic
Fan Start/Stop	Continuous Operation Cycled with call for heating/cooling
Lighting Control	On and off outputs to lighting relay in conjunction with Occ/Unocc mode.
Unoccupied Control	Setup and setback, morning warmup and cooldown

Specifications

Unitary Controllers		
Product Codes		AS-UNT110-1 / AS-UNT111-1 Spade Quick Connects
	Ambient Operating Conditions	32° to 140°F (0° to 60°C) and 10 to 90% RH
	Dimensions (H x W x D)	6.5 in. x 6.4 in. x 2.2 in. (165 x 163 x 56 mm) without enclosure 6.8 in. x 7.3 in. x 4.7 in. (173 x 185 x 119 mm) with enclosure
Product Codes		AS-UNT120-1 / AS-UNT121-1 Spade Quick Connects
	Ambient Operating Conditions	-40° to 140°F (-40° to 60°C) 10 to 90% RH
	Dimensions (H x W x D)	6.5 in. x 6.4 in. x 2.2 in. (165 mm x 163 mm x 56 mm) without enclosure 10.2 in. x 9.8 in. x 3 in. (259 mm x 248 mm x 76 mm) with enclosure
Product Codes		AS-UNT140-1 / AS-UNT141-1 Screw Terminal Block
	Ambient Operating Conditions	32° to 140°F (0° to 60°C) and 10 to 90% RH
	Dimensions (H x W x D)	6.5 in. x 6.4 in. x 2.2 in. (165 mm x 163 mm x 56 mm) without enclosure
Ambient Storage Conditions		-40° to 158°F (-40° to 70°C) 10 to 90% RH
Power Requirements		24 VAC, 50/60 Hz at 40 VA (per typical system)
N2 Bus		Isolated
Zone Bus		8-Pin Phone Jack or Terminal Block on Controller
Shipping Weight		1.4 lbs (0.64 kg)
Agency Compliance		CSA C22.2 No. 205, FCC Part 15, Subpart J, Class A, IEEE 446, IEEE 472, IEEE 518, IEEE 587 Category A, UL 916, UL 864 NEMA ICS 2, Part 2-230, VDE 0871 Class B
Agency Listings		UL Listed and CSA Certified as part of the Metasys Network

Unitary Controller (Continued)

Selection Chart

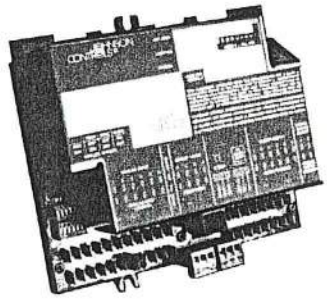
Code Number	Terminal Type	Analog Inputs	Binary Inputs	Analog Outputs	Binary Outputs
AS-UNT110-1	Spade Lug	6 • RTD Temp. Elem. (NI, SI or PT) • 0-10 VDC Trans. • 2K ohm Setpoint Potentiometers	4 • 4-Dry Contacts • 1-Momentary Push Button at Zone Sensor • BI4-Accum. Input	0	8 • 24 VAC Triacs at 0.5 amps • Low or High Side Common Selectable
AS-UNT111-1				2 • 0 to 10 VDC at 10 mA	6 (same as above)
AS-UNT120-1	Spade Lug	6 • RTD Temp. Elem. (NI, SI or PT.) • 0-10 VDC Trans. • 2K ohm Setpoint Potentiometers	4 • 4-Dry Contacts • 1-Momentary Push Button at Zone Sensor • BI4-Accum. Input	0	8 • 24 VAC Triacs at 0.5 amps • Low or High Side Common Selectable
AS-UNT121-1				2 • 0 to 10 VDC at 10 mA	6 (same as above)
AS-UNT140-1	Screw Terminal	6 • RTD Temp. Elem. (NI, SI or PT.) • 0-10 VDC Trans. • 2K ohm Setpoint Potentiometers	4 • 4-Dry Contacts • 1-Momentary Push Button at Zone Sensor • BI4-Accum. Input	0	8 • 24 VAC Triacs at 0.5 amps • Low or High Side Common Selectable
AS-UNT141-1				2 • 0 to 10 VDC at 10 mA	6 (same as above)

JOHNSON CONTROLS

Controls Group
507 E. Michigan Street
P.O. Box 423
Milwaukee, WI 53208
Code No. LIT-1928150

VAV Series

Variable Air Volume Box Controller



Description

The Variable Air Volume Box (VAV) Controller is specifically designed for digital control of single duct, dual duct, fan powered, and supply/exhaust VAV box configurations. Along with the capability of standalone control of the VAV box, the controller can also integrate the control of the room or zone baseboard heat and lighting logic. A user-to-controller interface, called the Zone Terminal (ZT), can also be used for easy controller adjustment and indication. The ZT also offers standalone weekly and holiday scheduling, as well as password protection for the VAV Controller.

Feature

- Multiple modes of operation for various occupancy conditions provide comfort with economy
- Built-in control program library and HVAC PRO software configuration tool provides minimal programming and easy configuration
- Standalone control provides system reliability
- N2 bus communications and networking software capabilities provide facility-wide control efficiencies and cost effective information sharing
- Multiple packaging options for both field and factory installations provide low cost and flexible installation
- Interfaces to both electric and pneumatic actuators to provide low cost installation for both new construction and retrofit applications
- HVAC PRO automated flow testing documents system performance and speeds commissioning, quickly locating boxes needing attention and highlighting air distribution problems.
- Controller resident performance calculations helps fine tune building operation and locates box problems as they occur
- Side loop support integrates additional control loop for cost savings

To Order

See the selection chart on the next page.

Options

Application Options	Software Options
Primary Equipment Types	VAV Box: Single Duct Dual Duct Fan Powered or Assisted Supply/Exhaust
Primary Control Strategies	Pressure Dependent Pressure Independent Constant Volume
Box Heat Configuration	Incremental, Proportional, or Two-Position (N.O. or N.C.) Valves; 1-, 2-, or 3-Stage Electric
Baseboard Heat Configuration	Incremental, Two-Position (N.O. or N.C.) Valves Single Stage Electric
Cooling Configuration	Incremental Output to Damper Actuator
Fan Configuration	Parallel, Temperature Set Point Parallel, CFM set point Series, On-Off Control Series, Proportional Control
Lighting Control	On and Off Outputs to Lighting Relay in Conjunction with Occ/Unocc Mode.
Unoccupied Control	Setup, Setback, or Shutdown Morning Warmup and Cooldown

Specifications

Variable Air Volume Box Controller	
Product	AS-VAV110-1 / AS-VAV111-1 Spade Connector AS-VAV140-1 / AS-VAV141-1 Screw Terminal Block
Ambient Operating Conditions	32° to 140°F (0° to 60°C) 10 to 90% RH
Dimensions (H x W x D)	6.5 in. x 6.4 in. x 2.0 in. (165 x 163 x 51 mm) without enclosure 6.8 in. x 7.3 in. x 4.7 in. (173 x 185 x 119 mm) with enclosure
N2 Bus	Isolated
Zone AS-VAV110-1 / 111-1 Bus AS-VAV140-1 / 141-1	8-Pin Phone Jack on Controller 8-Pin and 6-Pin Phone Jack on Controller
Ambient Storage Conditions	-40° to 158°F (-40° to 70°C) 10 to 90% RH
Power Requirements	24 VAC, 50/60 Hz, 10 VA Plus Binary Output Loads
Shipping Weight	1.4 lbs (0.64 kg)
Agency Compliance	CSA C22.2 No. 205, FCC Part 15, Subpart J, Class A, IEEE 446, IEEE 472, IEEE 518, IEEE 587 Category A, UL 916, UL 864 NEMA ICS 2, Part 2-230, VDE 0871 Class B
Ambient Storage Conditions	-40° to 158°F (-40° to 70°C) 10 to 90% RH
Power Requirements	24 VAC, 50/60 Hz, 10 VA Plus Binary Output Loads
Shipping Weight	1.4 lbs (0.64 kg)
Agency Compliance	CSA C22.2 No. 205, FCC Part 15, Subpart J, Class A, IEEE 446, IEEE 472, IEEE 518, IEEE 587 Category A, UL 916, UL 864 NEMA ICS 2, Part 2-230, VDE 0871 Class B
Agency Listings	UL Listed and CSA Certified as part of the Metasys Network

Variable Air Volume Box Controller (Continued)

Selection Chart

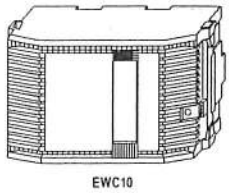
Code Number	Termination Type	Analog Inputs	Binary Inputs	Analog Outputs	Binary Outputs	Factory Installed Accessories
AS-VAV110-1	Spade Lug	6 • RTD Temperature Element (1000 ohm NI, SI or PT.) • 0-10 VDC Transmitter • 2K ohm Setpoint Potentiometer	4 • 4-Dry Contacts • 1 Momentary Push Button from Zone Sensor	0	8 • 24 VAC Triacs at 0.5 amps or 0.8 amps if total power is limited	None
AS-VAV111-1				2 • 0 to 10 VDC at 10 mA	6 (same as above)	
AS-VAV140-1	Screw Terminal	6 • RTD Temperature Element (1000 ohm NI, SI or PT.) • 0-10 VDC Transmitter • 2K ohm Setpoint Potentiometer	4 • 4-Dry Contacts • 1 Momentary Push Button from Zone Sensor	0	8 • 24 VAC Triacs at 0.5 amps or 0.8 amps if total power is limited	None
AS-VAV141-1				2 • 0 to 10 VDC at 10 mA	6 (same as above)	
AS-VAVDPT1-1	Spade Lug	6 • RTD Temperature Element (NI, SI or PT.) • 0-10 VDC Transmitter • 1.5K ohm Setpoint Potentiometer	4 • 4-Dry Contacts • 1 Momentary Push Button from Zone Sensor	0	8 • 24 VAC Triacs at 0.5 amps	(1) DPT-2015-0 Diff. Press. Sensor
AS-VAVDPT2-1				2 • 0 to 10 VDC at 10 mA	6 (same as above)	

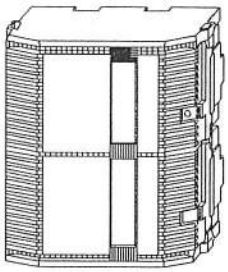
JOHNSON CONTROLS

Controls Group 507 E. Michigan Street
P.O. Box 423, Milwaukee, WI 53202
Code No. Lit-1929015

NEW

Universal Packaging Module


EWC10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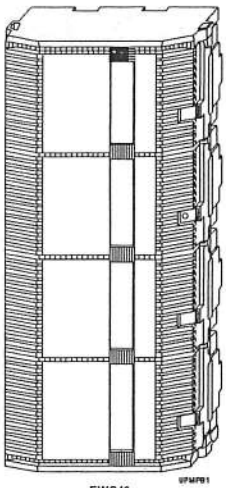
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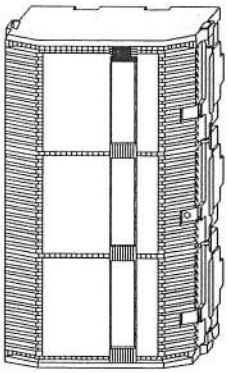

EWC30

Description

The Universal Packaging Modules (UPMs) are an expandable enclosure system, which house a wide range of controllers and accessories. Rugged and lockable, the enclosures also provide a wealth of built-in features to reduce installation time. These features include separate line- and low-voltage wiring toughs, preformed holes to eliminate drilling, wall thicknesses to accommodate standard conduit fasteners, easily accessible grounding, and a removable door.

If you need additional space, the UPM's modular construction lets you increase the unit's capacity without having to unwire and rewire the controls.

The power option provides an integrated 50 VA or 100 VA transformer and two utility outlets inside a metal power entrance box. A switch activates the transformer. This single unit, which is faster, easier to install, and less expensive allows you to eliminate a separate transformer, controller, and auxiliary gear enclosures.

A full window option allows you to monitor equipment such as gauges and LEDs while keeping the equipment securely locked away from unauthorized users.

Features

- lockable enclosures provide security against system tampering
- multiple sizes accommodate system requirements with tiered, modular construction. Flexibility to expand without rewiring, while maintaining lightweight, durable structure
- removable door allows full access for wiring during installation
- built-in power integrates two utility outlets and a switched transformer (50 VA or 100 VA) for easier, less expensive installation
- ground bonding plane simplifies grounding of incoming conduit to eliminate ground loop problems
- window allows easy viewing of internal equipment

To Order

Specify the code number from the following selection chart.

Selection Chart

Code Number	Description	Interior Dimensions	Exterior Dimensions	Power Requirements
EN-EWC10-0	Single Unit	7 x 13 x 6 in. (18 x 33 x 15 cm)	9 x 16 x 7.5 in. (23 x 41 x 19 cm)	120 VAC at 60 Hz
EN-EWC12-0	Single Unit and Power Box			
EN-EWC13-0	Single Unit with 50 VA XFR and Mounting Bracket			
EN-EWC15-0	Single Unit with 50 VA XFR and Power Box			
EN-EWC20-0	Double Unit	14 x 13 x 6 in. (36 x 33 x 15 cm)	16 x 16 x 7.5 in. (41 x 41 x 19 cm)	
EN-EWC22-0	Double Unit and Power Box			
EN-EWC25-0	Double Unit with 50 VA XFR and Power Box			
EN-EWC26-0	Double Unit with 50 VA XFR and Two Mounting Brackets			
EN-EWC30-0	Triple Unit	21 x 13 x 6 in. (53 x 33 x 15 cm)	23 x 16 x 7.5 in. (59 x 41 x 19 cm)	
EN-EWC35-0	Triple Unit with 100 VA XFR and Power Box			
EN-EWC40-0	Quad Unit	28 x 13 x 6 in. (71 x 33 x 15 cm)	30 x 16 x 7.5 in. (77 x 41 x 19 cm)	
EN-EWC45-0	Quad Unit with 100 VA XFR and Power Box			
EN-EXP101-0	Expansion cover and backbone kit [a]	—		
EN-WIN101-0	Window cover and backbone kit [a]			

(a) Endcaps not included

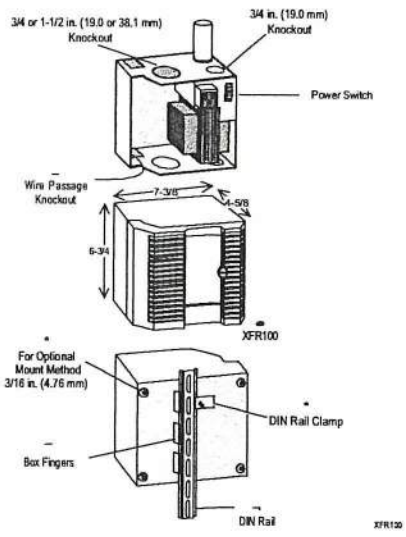
Transformer and Power Box Dimensions	50 VA Transformer	3.875 x 3.25 in. (9.6 x 8.3 cm)
	100 VA Transformer	3.75 x 3.625 in. (9.5 x 9.2 cm)
	Power Box	4 x 3.75 in. (10.2 x 9.5 cm)

JOHNSON CONTROLS

Controls Group 507 E. Michigan Street
P.O. Box 423, Milwaukee, WI 53202
Code No. Lit-1928250

AS-XFR Series

Transformer Module



AS-XFR Transformer Module

Description

The Transformer module provides 120 VAC to 24 VAC isolation. It is a UL Class 2 device used to power digital controllers and input/output loads. Three different models are available. All models include a split-bobbin for added noise immunity and a manually resetable breaker on the secondary connection. On all models, the secondary connection includes a modular connector for use with AHU controller and Companion products. Ground wires are electrically and mechanically connected to the transformer frame.

The XFR100 is a 100 VA transformer that is pre-mounted in an EN-ENC100 enclosure, it includes a power switch and a utility outlet. The enclosure can be mounted with a vertically mounted DIN rail or directly mounted to a wall. The enclosure supports multiple 3/4 in. and 1 1/2 in. conduit connections.

The XFR010 is a 100 VA transformer without an enclosure. It can be used in any appropriate UL listed enclosure and is used as a replacement transformer for the XFR100 or in EWC35/45 Series Enclosures.

The XFR050 is a 50 VA transformer without an enclosure. It can be used in any appropriate UL listed enclosure and is used as a replacement transformer for the EWC15/25 Series Enclosures.

Features

- choice of 50 VA or 100 VA power rating
- color coded wires leads for simple installation
- split bobbin design for better noise immunity
- resetable breaker on the secondary that will trip on shorts or overloads

Applications

XFR Series Transformers are used to power digital controllers and input/output loads, see mounting and wiring instructions for individual controllers to determine correct transformer for application.

To Order

Specify the code number from the following selection chart.

Selection Chart

Code Number	Power Rating	Primary		Secondary		Enclosure
		Voltage	Electrical Connection	Voltage	Electrical Connection	
AS-XFR100-1	100 VA	120	18 awg, 12 in., Black, White, Green/yellow, Stripped 3/8 in.	24	16 awg, 20 in., brown, orange, MOLEX connector	EN-ENC100
AS-XFR010-1	100 VA				18 awg, 20 in., brown, orange, green/yellow, MOLEX connector	None
AS-XFR050-0	50 VA					

Specifications

AS-XFR Series Transformer Module		
Electrical Rating		100 VA, primary, 120 VAC/60 Hz secondary, 24 VAC/60 Hz
Operating Conditions		32 to 120°F (0 to 50°C)
Agency Compliance		UL 864/916 and CSA C22.2 No. 205
Agency Listings		UL Listed and CSA Certified
Dimensions HxWxD	**AS-XFR100-1**	6-3/4 in. x 7-3/8 in. x 4-5/8 in.
	AS-XFR010-1	3.75 in. x 3.75 in. x 3.50 in.
	AS-XFR050-0	2.80 in. x 4.50 in. x 3.25 in.
Shipping Weight	**AS-XFR100-1**	6.7lbs. / 3.05 kg
	AS-XFR010-1	4.7 lbs. / 2.15 kg
	AS-XFR050-0	2.6 lbs / 1.2 kg

Master Catalog 125
Temperature Controls Section A
Product Bulletin A19D
Issue Date 0988

A19D Series Surface Mounted Strap-on Temperature Control

Application

This control has a single-pole, double-throw contact mechanism and is designed for surface mounting to either horizontal or vertical pipes. Some typical applications are:

- Boiler application as a high temperature detection control.
- Unit heater control as a low temperature detection control.
- Miscellaneous applications where a strap-on control is desirable.

All Series A19 temperature controls are designed for use *only* as operating controls. Where an operating control failure would result in personal injury and/or loss of property, it is the responsibility of the installer to add devices (safety, limit controls) or systems (alarm, supervisory systems) that protect against, or warn of, control failure.

Features

- SPDT contact action for either high or low temperature detection application.
- Insulation attached to rear of control to minimize effects of ambient temperature on control setting.
- Sealed dust protected switch.

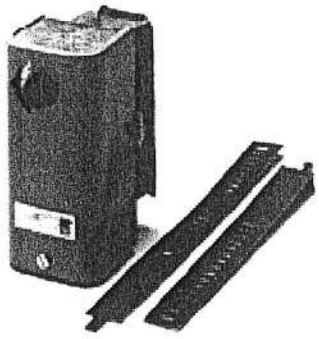


Fig. 1 – Surface mounted temperature control with screwdriver slot adjustment.

General Description

The switch has color coded terminals for ease of wiring. As a high temperature detection control (open "High" action) use red and blue terminals. As a low temperature detection control (open "Low" action) use red and yellow terminals. The control can be mounted in any position.

The sensing element has a liquid charge and provides fast response to a change in temperature.

Knob range adjustment and visible scale are standard. Models are available with a knob for field convertible adjustment. These models are supplied with a snap-in plug in the cover for concealed screwdriver slot adjustment.

Specifications

Type Number	**A19DAC**	SPDT, Standard Differential
	A19DAF	SPDT, Close Differential
Range		100 to 240°F (40 to 116°C)
Differential (Fixed)	**A19DAC**	10F° (5.6C°)
	A19DAF	5F° (2.8C°)
Maximum Temperature	**At Case**	140°F (60°C)
	At Bulb	290°F (143°C)
Contact Action		Red to Yellow Closes on Temperature Rise Red to Blue Opens on Temperature Rise
Switch		Snap Acting, Enclosed Dust Protected Pennswitch
Terminal Screws		No. 8–32 x 1/4" Binder Head with Cup Washers
Enclosure		NEMA Type 1 General Purpose
Material	**Case**	.062" (1.57 mm) Cold Rolled Steel
	Cover	.025" (0.64 mm) Cold Rolled Steel
Conduit Opening		One 7/8" (22 mm) Diameter Hole for 1/2" Conduit
Finish		Gray Baked Enamel
Mounting		Clamp-On (Strap Included)
Shipping Weight	**Individual Pack**	1.2 lb (.54 kg)
	Overpack of 50 Units	62.0 lb (28 kg)

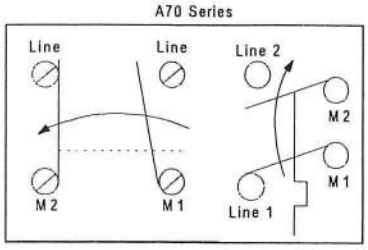
Code No. LIT-125070

JOHNSON CONTROLS

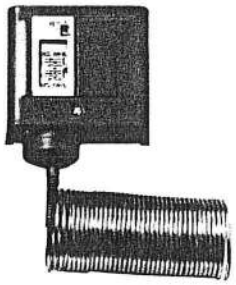
Controls Group 507 E. Michigan Street
P.O. Box 423, Milwaukee, WI 53202
Code No. Lit-1927140

A70 Series

Four Wire, Two Circuit Temperature Control



Action on Increase of Temperature



A70GA-1

Features

- long-life, snap-acting contacts
- automatic or manual reset models

Applications

Typical applications would include energizing an indicator light upon low temperature cutout on a ventilating system.

Replacement Parts

Code Number	Description
CVR17A-620R	Automatic reset
CVR17A-621R	Manual reset

Description

The A70 Series are heavy duty temperature controls that incorporate a vapor charged sensing element. The A70G, A70H, and A70K have a 4-wire, 2-circuit contact block that contains two isolated sets of contacts.

The contacts are designed so that when the main contact opens, the auxiliary contact closes.

To Order

Specify the code number from the following selection chart.

Selection Chart

Code Number	Switch Action		Range °F (°C)	Diff F° (C°)	Bulb and Capillary	Max Bulb Temp °F (°C)	Range Adjuster
	Main Contacts	Auxiliary Contacts					
A70GA-1C[a]	Open Low	Close Low	15 to 55 (-10 to 15)	5 (2.8)	20 ft of 1/8 in. O.D. Tubing	400 (260)	Screwdriver Slot
A70GA-2C			35 to 80 (0 to 25)	3 to 30 Set at 12	3/8 in. x 3 in. 6 ft Cap.	250 (121)	Screwdriver Slot
A70HA-1C[a]			15 to 55 (-10 to 15)	Manual Reset	20 ft of 1/8 in. O.D. Tubing	400 (260)	Screwdrive rSlot
A70HA-2C			35 to 80 (0 to 25)	Manual Reset	3/8 in. x 3 in. 6 ft Cap.	250 (121)	Screwdriver Slot
A70KA-1C	Open High	Close High	100 to 170 (38 to 77)	Manual Reset	3/8 in. x 10 in. 6 ft Cap.	240 (116)	Screwdriver Slot

(a) Low cutout stop is set and sealed at 35°F (1.6°C). Control responds only to the lowest temperature along any one ft. of entire 20 ft. element or bellows cup.

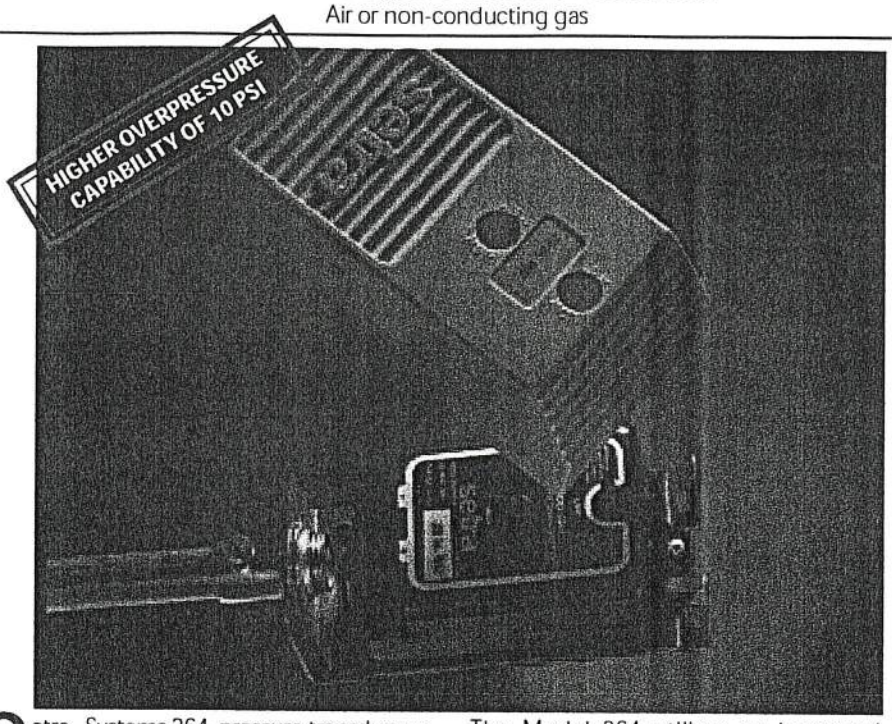
Electrical Ratings

Pole Number	LINE-M2 (Main)				LINE-M1 (Auxiliary)			
Motor Ratings VAC	120	208	240	277	120	208	240	277
AC Full Load Amp	16.0	9.2	8.0	–	6.0	3.3	3.0	–
AC Locked Rotor Amp	96.0	55.2	48.0	–	36.0	19.8	18.0	–
AC Non-Inductive Amp	16.0	9.2	8.0	7.2	6.0	6.0	6.0	6.0
Pilot Duty – Both Poles	125 VA, 24 to 600 VAC							
	57.5 VA, 120 to 300 VDC							

Model 264

Very Low Differential Pressure Transducer

Unidirectional Ranges: 0-0.1 to 0-100 in. W.C.
Bidirectional Ranges: 0 - ±0.1 to 0 - ±50 in. W.C.
Air or non-conducting gas



Setra Systems 264 pressure transducers sense differential or gauge (static) pressure and convert this pressure difference to a proportional electrical output for either unidirectional or bidirectional pressure ranges. The 264 Series is offered with a high level analog 0 to 5 VDC or 4 to 20 mA output.

Used in Building Energy Management Systems, these transducers are capable of measuring pressures and flows with the accuracy necessary for proper building pressurization and air flow control.

The 264 Series transducers are available for air pressure ranges as low as 0.1 in. W.C. full scale to 100 in. W.C. full scale. Static standard accuracy is ±1.0% full scale in normal ambient temperature environments, but higher accuracies are available. The units are temperature compensated to 0.033% FS/°F thermal error over the temperature range of 0°F to +150°F.

Guaranteed 3 day delivery for standard parts (less than 10 pieces)

3-year unconditional warranty

The Model 264 utilizes an improved all stainless steel micro-tig welded sensor. The tensioned stainless steel diaphragm and insulated stainless steel electrode, positioned close to the diaphragm, form a variable capacitor. Positive pressure moves the diaphragm toward the electrode, increasing the capacitance. A decrease in pressure moves the diaphragm away from the electrode, decreasing the capacitance. The change in capacitance is detected and converted to a linear DC electrical signal by Setra's unique electronic circuit.

The tensioned sensor allows up to 10 PSI overpressure (in either direction) with no damage to the unit. In addition, the parts that make up the sensor have thermally matched coefficients, which promote improved temperature performance and excellent long term stability.

When it comes to a product to rely on - choose the Model 264. When it comes to a company to trust - choose Setra, an ESOP (Employee-Owned) company.

NOTE: Setra quality standards are based on ANSI-Z540-1. The calibration of this product is NIST traceable.

U.S. Patent nos. 4093915, 4358814; 4434203

159 Swanson Rd., Boxborough, MA 01719/Telephone: 978-263-1400/Fax: 978-264-0292

Applications

- Heating, Ventilating and Air Conditioning (HVAC)
- Energy Management Systems
- Variable Air Volume and Fan Control (VAV)
- Environmental Pollution Control
- Lab and Fume Hood Control
- Oven Pressurization and Furnace Draft Controls

Benefits

- 10 PSI Overpressure on All Ranges.
- Installation Time Minimized with Snap Track Mounting and Easy- To-Access Pressure Ports and Electrical Connections.
- 0 to 5 VDC or 2-wire 4 to 20 mA Analog Outputs Are Compatible with Energy Management Systems.
- Reverse Wiring Protection.
- Internal Regulation Permits Use with Un-regulated DC Power Supplies.

ISO 9001 Certified

Visit Setra Online:
http://www.setra.com

setra

800-257-3872

Model 264 Specifications

Performance Data

Accuracy* RSS(at constant temp)	±1.0% FS**
Non-Linearity, BFSL	±0.96% FS
Hysteresis	0.2% FS
Non-Repeatability	0.1% FS

Thermal Effects

Compensated Range °F(°C)	0 to +150 (-18 to +65)
Zero/Span Shift %FS/°F(°C)	0.033 (0.06)
Maximum Line Pressure	10 psi
Overpressure	10 psi in Positive or Negative Direction.

Position Effect	Range	Zero Offset (%FS/G)
(Unit is factory calibrated at 0g effect in the vertical position.)	0 to 0.1 in. WC	2.1
	0 to 1.0 in.WC	.22
	0 to 5 in.WC	.14
	0 to 10 in. WC	.12

* RSS of Non-Linearity, Hysteresis, and Non-Repeatability.

**Note: See ordering information below for optional accuracies.

Specifications subject to change without notice.

Environmental Data

Temperature	
Operating* °F (°C)	0 to +175 (-18 to +79)
Storage °F (°C)	-65 to +250 (-54 to +121)

* Operating temperature limits of the electronics only. Pressure media temperatures may be considerably higher.

Physical Description

Case	Fire-Retardant Glass Filled Polyester
Mounting	Four screw holes on removable zinc plated steel base. Designed for 2.75" snap track.
Electrical Connection	Screw Terminal Strip
Pressure Fittings	3/16" O.D. barbed brass pressure fitting for 1/4" push-on tubing.
Zero and Span Adjustments	Accessible on top of case
Weight (approx.)	10 ounces

Pressure Media

Typically air or similar non-conducting gases.

Electrical Data (Voltage)

Circuit	3-Wire (Com, Exc, Out)
Excitation	9 to 30 VDC
Output*	0 to 5 VDC**
Bidirectional output at zero pressure:	2.5 VDC**
Output Impedance	100 Ohms

*Calibrated into a 50K ohm load, operable into a 5000 ohm load or greater.
**Zero output factory set to within ±50mV.
**Span (Full Scale) output factory set to within ±50mV.

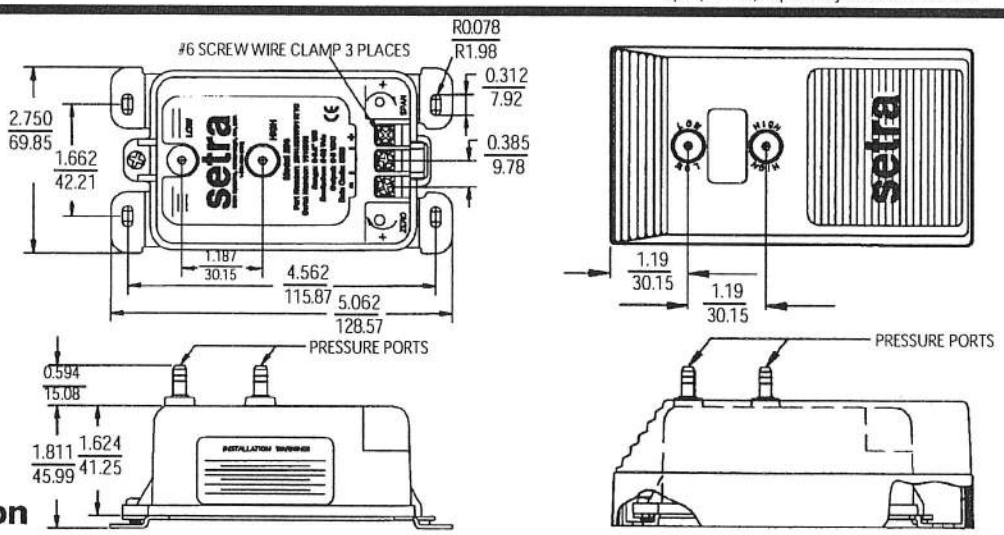
Electrical Data (Current)

Circuit	2-Wire
Output*	4 to 20mA**
Bidirectional output at zero pressure:	12mA**
External Load	0 to 800 ohms

Minimum supply voltage (VDC) = 9+ 0.02 x (Resistance of receiver plus line).
Maximum supply voltage (VDC) = 30+ 0.004 x (Resistance of receiver plus line).

*Calibrated at factory with a 24 VDC loop supply voltage and a 250 ohm load.
**Zero output factory set to within ±0.16mA.
**Span (Full Scale) output factory set to wtihin ±0.16mA.

Outline Drawings



Ordering Information

Input Range (Inches of WC)	Product Codes for ±0.5% Accuracy		Input Range (Inches of WC)	Product Codes for ±0.25% Accuracy	
	0 to 5 VDC Output	4 to 20 mA Output		0 to 5 VDC Output	4 to 20 mA Output
0 to 0.1	DPT2640-0R1D	DPT2641-0R1D	0 to 0.1	DPT2640-0R1D-A	DPT2641-0R1D-A
0 to 0.25	DPT2640-R25D	DPT2641-R25D	0 to 0.25	DPT2640-R25D-A	DPT2641-R25D-A
0 to 0.5	DPT2640-0R5D	DPT2641-0R5D	0 to 0.5	DPT2640-0R5D-A	DPT2641-0R5D-A
0 to 1	DPT2640-001D	DPT2641-001D	0 to 1	DPT2640-001D-A	DPT2641-001D-A
0 to 2.5	DPT2640-2R5D	DPT2641-2R5D	0 to 2.5	DPT2640-2R5D-A	DPT2641-2R5D-A
0 to 5	DPT2640-005D	DPT2641-005D	0 to 5	DPT2640-005D-A	DPT2641-005D-A
0 to 10	DPT2640-010D	DPT2641-010D	0 to 10	DPT2640-010D-A	DPT2641-010D-A
0 to 25	DPT2640-025D	DPT2641-025D	0 to 25	DPT2640-025D-A	DPT2641-025D-A
0 to 50	DPT2640-050D	DPT2641-050D	0 to 50	DPT2640-050D-A	DPT2641-050D-A
0 to 100	DPT2640-100D	DPT2641-100D	0 to 100	DPT2640-100D-A	DPT2641-100D-A
-0.1 to 0.1	DPT2640-0R1B	DPT2641-0R1B	-0.1 to 0.1	DPT2640-0R1B-A	DPT2641-0R1B-A
-0.25 to 0.25	DPT2640-R25B	DPT2641-R25B	-0.25 to 0.25	DPT2640-R25B-A	DPT2641-R25B-A
-0.5 to 0.5	DPT2640-0R5B	DPT2641-0R5B	-0.5 to 0.5	DPT2640-0R5B-A	DPT2641-0R5B-A
-1 to 1	DPT2640-001B	DPT2641-001B	-1 to 1	DPT2640-001B-A	DPT2641-001B-A
-2.5 to 2.5	DPT2640-2R5B	DPT2641-2R5B	-2.5 to 2.5	DPT2640-2R5B-A	DPT2641-2R5B-A
-5 to 5	DPT2640-005B	DPT2641-005B	-5 to 5	DPT2640-005B-A	DPT2641-005B-A
Add DPT-CAL-CERT for Calibration Certificate			Note: All units provided with a Calibration Certificate		

159 Swanson Road, Boxborough, MA 01719/Tel: 978-263-1400;
Toll Free: 800-257-3872; Fax: 978-264-0292; email: sales@setra.com

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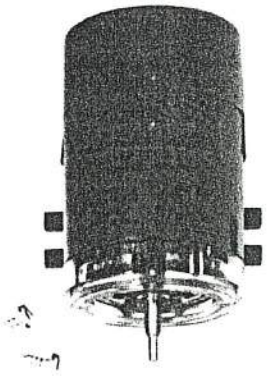
JOHNSON CONTROLS

Controls Group 507 E. Michigan Street
P.O. Box 423, Milwaukee, WI 53202
Code No. Lit-1922495

EP-8000 Series

Electro-Pneumatic Transducer



EP-8000

Description

The EP-8000 Electro-Pneumatic Transducer converts a 0 to 10 VDC or 4 to 20 mA signal from an electric controller into a proportional pneumatic output pressure signal. Four models are available, which are grouped into two basic versions: low-volume output units (non-relay) and high-volume output units (relay).

Features

- hypodermic needle test point allows easy output pressure signal measurement
- barbed air connections for 5/32 or 1/4 in. O.D. polytubing
- compact, simple design for ease of installation on a wide range of mounting surfaces, including direct mounting on pneumatic valve actuators
- factory set, fully adjustable zero and span facilitates field calibration

Applications

- typically used with pneumatic valve or damper actuators
- sequencing can be provided through a Johnson Controls V-9502 Valve Actuator Positioner or D-9502 Damper Actuator Positioner

Repair Parts

Replace unit.

To Order

Specify the code number from the following selection chart.

Selection Chart

Code Number	Description			
	Output	Input	Input Range	Factory Output Range psig (kPa)
EP-8000-1	Low Volume (Non-Relay)	Voltage	0.5 to 9 VDC	1 to 18 (7 to 126)
EP-8000-2	High Volume (Relay)	Voltage	0.25 to 9.5 VDC	0.5 to 19 (3.5 to 133)
EP-8000-3	Low Volume (Non-Relay)	Current	4 to 20 mA DC	3 to 15 (21 to 105)
EP-8000-4	High Volume (Relay)	Current	4 to 20 mA DC	3 to 15 (21 to 105)

Accessories

Code Number	Description
R-3710 Series	0.007 in. Restrictor (Required for Low-Volume Models)
EP-8000-101	Electro-Pneumatic Transducer Mounting Kit (For Mounting the EP-8000 to a Pneumatic Valve Actuator)
A-4000-137	In-line Filter (Required for All Models)
A-4000-1037	In-line Filter (Required for all Models; package of 5)
JC-5361	Hypodermic Needle Test Probe Assembly
G-2010 Series	0 to 30 psig (0 to 210 kPa) gauge

Note: Low-volume models are one-pipe instruments requiring a 0.007 in. (0.017 mm) R-3710 Series restrictor, ordered separately.

Specifications

EP-8000 Electro-Pneumatic Transducer		
Action		Proportional — Direct Acting
Supply Pressure		18 to 25 psig (126 to 175 kPa); nominal 20 psig (140 kPa); air supply must be clean, dry, and oil free
Supply Pressure Sensitivity		0.3 psig/psig (0.3 kPa/kPa)
Adjustments	**Voltage Models**	20 VDC maximum input; span adjustable from 7.5 VDC to 15 VDC; factory set at approximately 10 VDC
	Current Models	30 mA DC maximum input; span adjustable from 10 to 20 mA DC; factory set at approximately 16 mA DC
	All Models	Output can be shifted ±9 psig (±63 kPa) using zero adjustment screw
Linearity		5% maximum of output span between 3 to 15 psig (21 to 103 kPa)
Hysteresis		0.5 psig (1.4 kPa) typical
Temperature Coefficient		0.05 psig/°F (0.64 kPa/°C)
Input Impedance	**Voltage Models**	1000 ohms minimum
	Current Models	350 ohms maximum
Air Flow Capacity at 20 psig Supply	**Low Volume Models**	45 SCIM (12.3 mL/s) maximum[(a)]
	High Volume Models	1600 SCIM (437 mL/s) maximum
Air Consumption	**Low Volume Models**	45 SCIM (12.3 mL/s) maximum[(a)]
	High Volume Models	45 SCIM (12.3 mL/s) maximum
Electrical Connections		2-wire terminal block for 18 AWG stranded wire
Air Connections		Barbed fittings for 5/32 or 1/4 in. O.D. polytubing
Materials	**Body**	polysulphone
	Case & Cover	UL 94 V-O rated ABS/Polycarbonate
	Enclosure Protection	IP 42 according to DIN 40 050 and IEC 144
	Air Connections	Brass
Ambient Operating Limits	**Temperature**	41 to 122°F (5 to 50°C)
	Humidity	10 to 90% RH, non-condensing
Ambient Storage Temperature Limits		-4 to 140°F (-20 to 60°C)
Mounting		Surface mounted or installed on pneumatic valve or damper actuator using accessory mounting kit

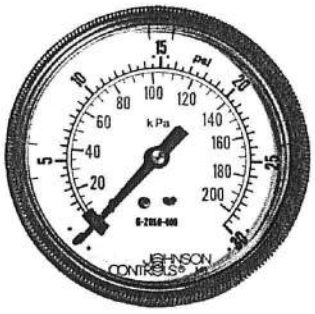
(a) This value is specified for dead-ended loads or with controlled devices/applications with a maximum air consumption of 10 SCIM (2.7 mL/s).

JOHNSON CONTROLS

Controls Group 507 E. Michigan Street
P.O. Box 423, Milwaukee, WI 53202
Code No. Lit-1921235

G-2010

Air Pressure Gauge



Description

The G-2010 Air Pressure Gauge provides continuous indication of air pressure or On-Off status in pneumatic control systems.

Features

- available with analog pressure readout or On-Off indicator
- available in 1-1/2 to 3-1/2 in. sizes
- removable clear plastic lens cover for easy cleaning
- easy readability, black printing on white background with equivalent metric scale in blue
- On-Off indicator changes from red to green as the pressure changes. Usable with 0 to 15 or 0 to 20 psig supply systems.
- mounts flush on panels 1/16 to 3/4 in. thick, with provided U-clamps, or on surface

Repair Parts

If the product fails to operate within its specifications, unit replacement is required.

To Order

Specify the code number from the following selection chart.

Specifications

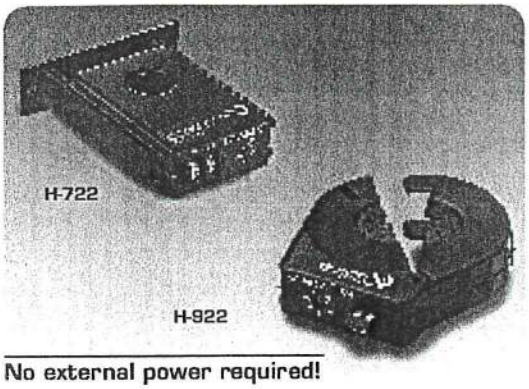
G-2010 Air Pressure Gauge	
Accuracy	3-2-3% of Full Range per ANSI Spec. B40.1M
Ambient Temp. Limits	-20 to 150°F (-29 to 66°CC)

Selection Chart

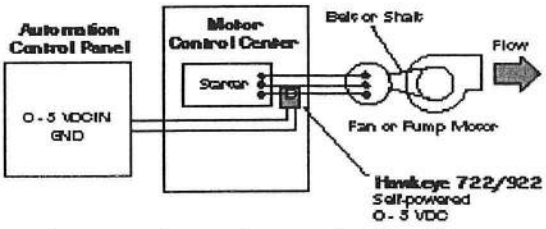
Code Number	Item			
	Gauge Size (in.)	Range (psig/kPa)	Mounting	
			Flush or Surface	Stem
G-2010-5 (a)	1-1/2	0 to 30/0 to 200		■
G-2010-1 (a)		On/Off Indicator	■	
G-2010-11 (a)	2	0 to 30/0 to 200		■
G-2010-101 (a)		0 to 30/0 to 200	■	
G-2010-23 (a)		0 to 100/0 to 700		■
G-2010-16 (b)		0 to 160/0 to 1100		■
G-2010-24 (a)		0 to 160/0 to 1100		■
G-2010-300 (a)	2-1/2	0 to 30/0 to 200	■	
G-2010-302 (a)		0 to 100/0 to 700	■	
G-2010-400 (a)	3-1/2	0 to 30/0 to 200	■	
G-2010-403 (a)		0 to 160/0 to 1100	■	

(a) All connections 1/8 in. NPT center back
(b) Connection 1/4 in. NPT center bottom

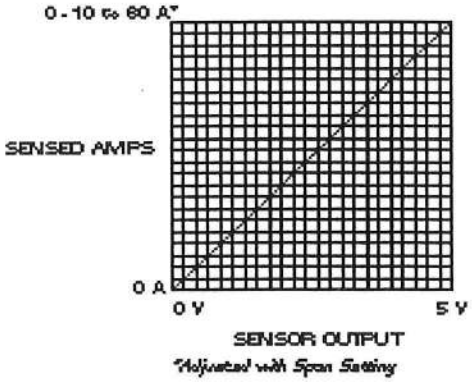
Self-powered 0–5 VDC Output



No external power required!



■ *These sensors need no external power supply. Adjustable span gives you best resolution.*



■ *H-722 & H-922 require 1 A & 3 A monitored current for turn-on, respectively. Wrap conductor if lower turn on is required. 2% accuracy is achieved when monitored current exceeds 10% of scale selected.*

Self-powered analogs in split-core or solid core models

- Split-core design is ideal for retrofits...no need to remove conductor
- Self-gripping split-core grips on conductor...no drill mounting
- Economical solid-core features adjustable bracket for easy alignment
- No jumpers on unit...less installation error
- Made in USA; 5 year limited warranty

Span adjustment improves resolution

- Scales sensor range 0 - 10 to 60 A for best resolution and accurate readings
- 0 - 10 A setting accepts external 0 - 5 A CTs often found on large motors (eg., wrap conductor 2x from 500:5 CT)
- Improved resolution over fixed range sensors

SPECIFICATIONS

Amperage Ratings	see ordering table
Isolation	600 VAC rms
Frequency Range	60 Hz nominal
Accuracy	2.0% all scales
Temperature Range	-15 - 60° C
Humidity Range	0 - 95% non-condensing
Solid-core 722 Dimensions	
L x W X H	3.125" x 2.15" x 1.00"
Sensor Hole Size	0.75"
Split-core 922 Dimensions	
L x W X H	3.63" x 2.75" x .88"
Sensor Hole Size	0.75"

ANALOG CURRENT SENSORS

Ordering **INFORMATION**

	MODEL	AMPERAGE RANGE	OUTPUT TYPE	UL	cUL
	H-722	0 - 10 to 60 A	0 - 5 VDC	●	●
	H-922	0 - 10 to 60 A	0 - 5 VDC	●	●

Consult factory for higher amperages. Custom calibration available upon request. CE

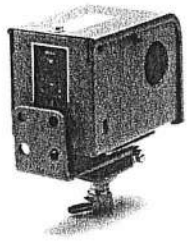
Hawkeye®

JOHNSON CONTROLS

Controls Group 507 E. Michigan Street
P.O. Box 423, Milwaukee, WI 53202
Code No. Lit-1927175

P10 Series

Low Pressure Control (Single or 2-Stage)



P10BC-7
(With Bracket No. BKT16A-600R)

Description

These pressure controls open or close electrical circuits from a change in operating air pressure. R to Y terminals make (cut-in) on pressure rise.

Features

- visible calibrated adjustable range scale
- snap-acting switch in a dust protected enclosure
- easily accessible wiring terminals

Accessories

- A universal mounting bracket No. BKT16A-600R as well as a barbed fitting is supplied as standard.
- Model P10FC-4 has a jumper installed on the common terminals.

Applications

- pneumatic systems
- control of pumps or small air compressors

Specifications

- model P10BJ-1 is rated for 24 amp non-inductive when used as an SPST (R-Y). (See *Electrical Ratings.*)
- maximum allowable pressure is 150 psig (1034 kPa).
- maximum ambient temperature is 140°F (60°C)

To Order

Specify the code number from the following selection chart.

Selection Chart

Code Number	No. of Stages	Contact Action	Range psig (kPa)	Factory Setting				Pressure Connector
				psig (kPa)		Switch Diff psi (kPa)		
P10BC-7C	1	SPDT	3 to 20 (21 to 138)	12 (R to Y Cut-in)		2		Barbed Fitting
P10BG-3C	1	SPDT	2 to 20 (15 to 138)	12 (R to Y Cut-in)		0.2		1/8 in. Female NPSF
P10BJ-1C	1	SPDT	3 to 20 (21 to 138)	12 (R to Y Cut-in)		2		1/8 in. Female NPSF
P10FC-4C	2	SPDT	3 to 20 (21 to 138)	(R-Y Cutout) Low Stage	(R-Y Cut-in) High Stage	Low Stage	High Stage	1/8 in. Barbed Fitting
				8 (55)	12 (82)	2 (14)	2 (14)	
P10PA-11C	3	SPST	3 to 20 (21 to 138)	Stage 1 Open High	Stages 2 & 3 Open High	Stage 1	Stages 2 & 3	1/8 in. Barbed Fitting
				6 (41)	18 (120)	3 (21)	0.4 (3)	

Electrical Ratings

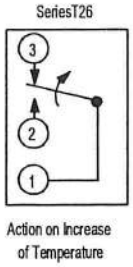
Motor Ratings VAC		120	208	240	277	600
P10BC-7						
AC Full Load Amp		16.0	9.2	8.0	7.0	–
AC Locked Rotor Amp		96.0	55.2	48.0	42.0	–
Non-Inductive Amp		16.0	9.2	8.0	7.2	–
Pilot Duty – 125 VA at 24 to 277 VAC						
P10BG-3						
AC Full Load Amp		6.0	3.4	3.0	–	–
AC Locked Rotor Amp		36.0	20.4	18.0	–	–
Non-Inductive Amp		6.0	3.4	3.0	2.6	–
Pilot Duty – 125 VA at 24 to 277 VAC						
P10BJ-1						
AC Full Load Amp		16.0	9.2	8.0	7	–
AC Locked Rotor Amp		96.0	55.2	48.0	42	–
Non-Ind. Amp	Double Throw	16.0	16.0	16.0	16.0	16.0
	Single Throw	24.0	24.0	24.0	24.0	24.0
Pilot Duty – 125 VA at 24 to 600 VAC						
P10FC-4						
AC Full Load Amp		16.0	9.2	8.0	7.0	–
AC Locked Rotor Amp		96.0	55.2	48.0	42.0	–
Non-Inductive Amp		16.0	9.2	8.0	7.2	–
Pilot Duty – 125 VA at 24 to 277 VAC On 2- and 3-stage models, the maximum connected load shall not exceed 2000 VA						
P10PA-11						
AC Full Load Amp		6.0	3.4	3.0	–	–
AC Locked Rotor Amp		36.0	20.4	18.0	–	–
Non-Inductive Amp		6.0	3.4	3.0	–	–
Pilot Duty – 125 VA at 24 to 277 VAC On 2- and 3-stage models, maximum connected load shall not exceed 2000 VA						

JOHNSON CONTROLS

Controls Group
507 E. Michigan Street
P.O. Box 423
Milwaukee, WI 53208
Code No. LIT-1922255

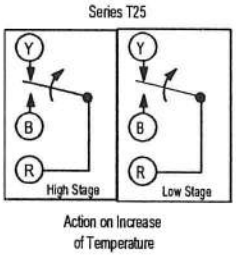
T22 / T25 / T26 Series

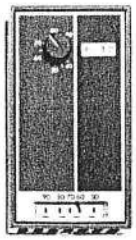
Line Voltage Wall Thermostat (Heating, Cooling, or Heating and Cooling)



T26

T22





T25

Description

For line voltage control of residential, commercial, or industrial heating or year round air conditioning. Heat or cold anticipators not required. Liquid charged temperature sensing element and highly efficient diaphragm and leverage provides close temperature control.

Features

- attractive, beige colored, high-impact plastic enclosure (T26 Series)
- close differential without the need for anticipators
- bi-metal thermometer supplied as standard except where indicated
- equipped with adjustable dial stops (T26 Series)

Accessories

- replacement knobs and faceplates
- for double trim plate for mounting two T22s or T26s, specify Part No. PLT-231-1R.

Applications

- line voltage control of heating and cooling equipment

Specifications

Temperature range is 40 to 90°F (5 to 30°C), except energy conservation models.

To Order

- Specify code number from the selection chart.
- For thermostat guard, refer to G Series Thermostat and Humidistat Guards Data Sheet.

Selection Chart

Code Number	Type of Adjustment	Application	Selector Switch	Differential Approximately F° (C°)Heating		Ship Wt. Lb.
				Heating	Cooling	
HEATING						
T22AAA-1	Knob	SPST	"Off-Auto"	1 3/4 (1)	–	1.3
T22ABC-1	Knob	SPST	"Auto-Off-Fan"	1 3/4 (1)	–	1.3
★ T22ABC-3	Concealed					
★ T22BBC-1	Knob	SPST, Medium Duty	"Auto-Off-Fan"	3 (1.7)	–	1.3
★ T22BBC-3	Concealed					
★ T22CBC-1	Knob	SPST, Heavy Duty	"Auto-Off-Fan"	3 (1.7)	–	1.3
T22CBC-3	Concealed					
T26A-14 (No Thermometer)	Knob	SPST, Energy Conservation Heating model, max setting 75°F (24°C)	None	2 (1.1)	–	1.0
T26A-15 (No Thermometer)	Knob	SPST, Energy Conservation Heating model, max setting 65°F (18°C)	None	2 (1.1)	–	1.0
COOLING						
T22JAA-1	Knob	SPST	"Off-Auto"	–	2 1/4 (1.3)	1.3
T22JCC-1	Knob	SPST	"Auto-Off-Fan"	–	2 1/4 (1.3)	1.3
T26J-7 (No Thermometer)	Knob	SPST, Energy Conservation Cooling model, min setting 75°F (24°C)	None	–	2 (1.1)	1.0
T26J-9	Knob	SPST, Energy Conservation Cooling model, min setting 78°F (26°C)	None	–	2 (1.1)	1.0

JOHNSON CONTROLS

Controls Group
507 E. Michigan Street
P.O. Box 423
Milwaukee, WI 53208
Code No. LIT-1922255

T26 Series Line Voltage Wall Thermostat (Heating, Cooling or Heating and Cooling

Selection Chart (Continued)

Code Number	Type of Adjustment	Application	Selector Switch	Differential Approximately F° (C°)Heating		Ship Wt. Lb.
				Heating	Cooling	
HEATING AND COOLING						
★ T22SDA-1	Knob	SPDT, permits shutdown of system at the thermostat	"Off-Auto"	1 3/4 (1)	2 1/4 (1.3)	1.3
T22SEB-1	Knob	SPDT, used when same device controls heating and cooling	"Heat-Off-Cool"	1 3/4 (1)	2 1/4 (1.3)	1.3
T22SFB-1 (1)	Knob	SPDT, used to control separate loads on heating and cooling	"Heat-Off-Cool"	1 3/4 (1)	2 1/4 (1.3)	1.3
T22TFB-1 (1)	Knob	SPDT, heavy duty. Used to control separate loads on heating and cooling	"Heat-Off-Cool"	3 (1.7)	3 to 4 (1.7 to 2.2)	1.3
T26S-18 (2)	Knob	SPDT	None	1 3/4 (1)	2 1/4 (1.3)	1.0
T26T-3 (2)	Knob	SPDT, Heavy Duty	None	3 (1.7)	3 to 4 (1.7 to 2.2)	1.0
TWO-STAGE						
T25A-1	Knob	2 SPDT switches 2-stage heating, cooling or one stage heating and one stage cooling	None	1 3/4 (1)	2 1/4 (1.3)	1.5
T25A-16	Concealed			3 between stages (1.7)		

Note 1: Can also be used where one unit provides both heating and cooling by adding a jumper between terminals 2 and 3 (see below).

Note 2: Includes faceplate for horizontal mounting. The plate is for "on-the-job" installation over vertical plate. Can field convert to other configurations.

The T26S-18 is a universal replacement for Honeywell T451A, -B, T651A; White Rodgers 179-1, 180-1, 181-1, 182-101, -102; Robertshaw TA500, TH71, -72, -79, -500, TX550.

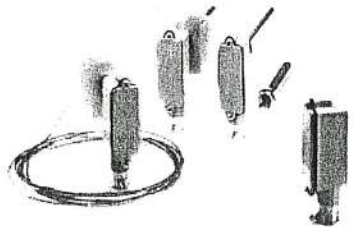
T26T-3 replaces: Honeywell T4051A, -B, T6051A; White-Rodgers 151-6, 152-9, 159-3, -5.

JOHNSON CONTROLS

Controls Group 507 E. Michigan Street
P.O. Box 423, Milwaukee, WI 53202
Code No. Lit-1922240

TE-6300 Series

Temperature Sensor



TE-6300 Series Temperature Sensors

Description

The TE-6300 Temperature Sensor line offers an economical solution for a wide variety of temperature sensing needs--including wall mount, outdoor air, duct, well, or duct averaging applications. Sensors are available in the following types: 1000 ohm thin-film nickel, 1000 ohm nickel averaging, 1000 ohm thin-film platinum, 2.2K ohm thermistor, and 1000 and 100 ohm platinum equivalent averaging. Each sensor is packaged with the necessary mounting accessories, maximizing ordering and installation ease, and therefore reducing both commissioning time and cost.

Features

- full line of sensors
- inexpensively priced
- single assembly ordering
- conduit-friendly mounting
- standard PVC enclosures
- stainless steel sensor probe

Applications

See Selection Chart/Sensor Application Matrix on the next page.

To Order

Specify the code number from the Selection Chart on the following page.

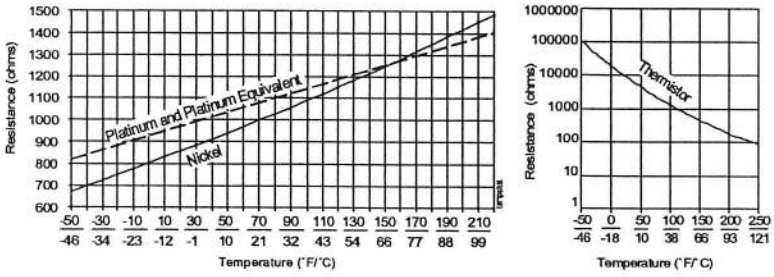
Nominal Temperature vs Resistance for Nickel, Platinum (and Platinum Equivalent)*, and Thermistor Sensors

Temperature		Resistance (Ohms)		
°F	°C	Nickel	Platinum	Thermistor
-50	-46	674	821	109872
-40	-40	699	843	75466
-30	-34	725	865	52571
-20	-29	751	887	37116
-10	-23	777	908	26539
0	-18	803	930	19208
10	-12	830	952	14062
20	-7	858	974	10408
30	-1	885	996	7784
40	4	914	1017	5880
50	10	942	1039	4484
60	16	971	1061	3450
70	21	1000	1082	2678
80	27	1030	1104	2095

Temperature		Resistance (Ohms)		
°F	°C	Nickel	Platinum	Thermistor
90	32	1060	1125	1652
100	38	1090	1147	1313
110	43	1121	1168	1051
120	49	1152	1190	847
130	54	1184	1211	687
140	60	1216	1232	561
150	66	1248	1254	461
160	71	1281	1257	380
170	77	1314	1296	316
180	82	1348	1317	264
190	88	1382	1339	221
200	93	1417	1360	187
210	99	1452	1381	158
220	104	1487	1402	135

Specifications

TE-6300 Series Temperature Sensor	
Accuracy	
Nickel	±0.34°F @ 70°F (±0.18°C @ 21°C)
Nickel Averaging	±3.0°F @ 70°F (±1.67°C @ 21°C)
Platinum	±0.65°F @ 70°F (±0.36°C @ 21°C) DIN Class B
Platinum Equivalent	Approximately ±1.08°F @ 70°F (±0.56°C @ 21°C)
Thermistor	±0.36°F (±0.2°C) in the range of 32 to 158°F (0 to 70°C)
Temperature Limits	Probe Assembly: -50 to 220°F (-46 to 82°C); Conduit Box: -50 to 122°F (-46 to 50°C)



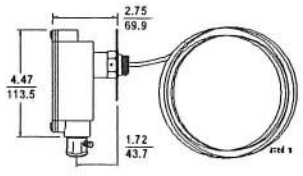
Temperature vs Resistance for the Nickel, Platinum, Platinum Equivalent *, and Thermistor Sensors

* For 100 ohm platinum equivalent sensors, divide the resistance values for the 1000 ohm platinum sensors by 10

Product Overview

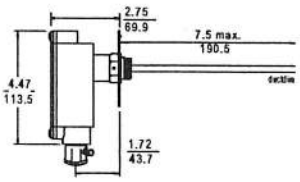
Duct averaging sensor includes:

- 8 or 17 ft nickel, or 10 or 20 ft platinum sensor
- quick mount sensor holder
- metal mounting plate with screws (4) and locknut
- conduit enclosure with cover
- 1/2 in. EMT conduit connector
- wire nuts (2)



Duct probe sensor includes:

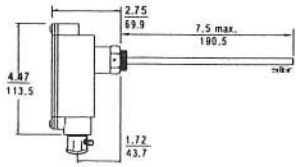
- 8 in. nickel, platinum, or thermistor sensor
- quick mount sensor holder
- metal mounting plate with screws (4) and locknut
- conduit enclosure with cover
- 1/2 in. EMT conduit adapter
- wire nuts (2)



TE-6300 Series Temperature Sensor (Continued)

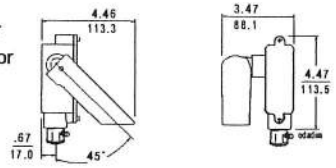
Well insertion sensor includes:

- 6 in. or 8 in. nickel or platinum, 8 in. thermistor
- quick mount sensor holder
- conduit enclosure with cover
- 1/2 in. EMT conduit connector
- wire nuts (2)



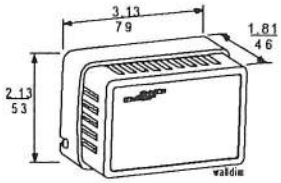
Outdoor air sensor includes:

- 3 in. nickel, platinum, or thermistor sensor
- outdoor air shield
- conduit enclosure with cover
- 1/2 in. EMT conduit connector
- wire nuts (2)



Wall mount sensor includes:

- nickel, platinum, or thermistor sensor
- white T-4000 style cover and base with silver faceplate and horizontal logo
- mounting screws (2)
- wall anchors (2)
- wire nuts (2)



Dimensions are given as in./mm

Repair Parts

Code No.	Description
TE-6300-601	8 in. nickel probe
TE-6300-602	8 in. platinum probe
TE-6300-603	3 in. nickel probe
TE-6300-604	3 in. platinum probe
TE-6300-605	Quick-mount sensor holder (pkg. of 10)
TE-6300-606	8 in. thermistor probe
TE-6300-607	3 in. thermistor probe
TE-6300-609	Threadless sensor holder (pkg. of 10)
ADP11A-600R	EMT conduit adapter (pkg. of 10)
T-4000-3139 (a)	White Thermostat Cover

(a) Refer to *T-4000 Series Accessories.*

Accessories (Optional)

Code No.	Description
ADP11A-601R	BX adapter (pkg. 10)
TE-6001-8	Element holder for mounting an averaging sensor (pkg. 10)
TE-1800-9600	Mounting hardware for mounting wall mount unit to a handi box
TE-6300-101	12 in. nickel probe that can be cut to an appropriate length
TE-6300-104	12 in. thermistor probe that can be cut to an appropriate length
TE-6300-102	12 in. platinum probe that can be cut to an appropriate length
TQ-6000-1	4-20 mA output transmitter for use with the 100 ohm platinum sensor
WZ-1000-2	6-1/2 in. length, stainless steel well, thermal compound included
WZ-1000-4	6-1/2 in. length, stainless steel well
WZ-1000-5 (a)	4-11/16 in. length, brass well (for TE-631AP-1 and TE-632AP-1 only)

(a) Use the TE-631AP-1 or TE-632AP-1 with these wells.

Selection Chart

Application	Suggested Sensor	Description	Application Notes
Wall Mount	TE-6314P-1 TE-6324P-1 TE-6344P-1	Nickel sensor Platinum sensor 2.2k ohm thermistor	• 2-screw wall plate provided for surface mounting. • White cover provided. (See Table 7 for additional covers available.)
Outdoor Air	TE-6313P-1 TE-6323P-1 TE-6343P-1	Nickel, 3 in. probe Platinum, 3 in. probe 2.2k ohm thermistor, 3 in. probe	• Used to sense outside ambient temperature to determine efficient heating and cooling strategies.
Duct Probe	TE-6311P-1 TE-6321P-1 TE-6341P-1	Nickel, 8 in. probe Platinum, 8 in. probe 2.2k ohm thermistor, 8 in. probe	• 4-screw mounting plate provided for duct mounting. • Can also be used for plenums. • Ideal in freezer lockers or where sensor mounting should be located outside of the sensed area. • 12 in. probe is available for use in larger ducts.
Duct Averaging	TE-6315P-1 TE-6316P-1 TE-6327P-1 TE-6328P-1 TE-6337P-1 TE-6338P-1	Nickel, 8 ft averaging element Nickel, 17 ft averaging element Platinum, 1k ohm, 10 ft avg. element Platinum, 1k ohm, 20 ft avg. element Platinum, 100 ohm, 10 ft avg. element Platinum, 100 ohm, 20 ft avg. element	• 4-screw mounting plate provided for duct mounting. • Used in duct where average temperature is needed. • Approximately 1 ft of sensor is recommended for each sq ft of duct cross section. • TE-6001-8 element holder is recommended when installing an averaging sensor in a duct.
Well Insertion	TE-6312P-1 TE-6322P-1 TE-6342P-1 TE-631AP-1 TE-632AP-1	Nickel, 8 in. probe, threaded holder Platinum, 8 in. probe, threaded holder 2.2k ohm thermistor, 8 in. probe, threaded holder Note: The 8 in. probes are to be used **only** with the WZ-1000-2 and WZ-1000-4. Nickel, 6 in. probe, threadless holder Platinum, 6 in. probe, threadless holder Note: The 6 in. probes are to be used only with the WZ-1000-5.	• Threaded sensor holder has 1/2 in. NPT threads; threadless holder accommodates set screws. • Thermal well should be mounted at an angle so condensation will run out of the well. If not possible, seal the sensor holder and the wiring end of the sensor probe with RTV silicone rubber. • 12 in. probe is available for use in longer wells. • Compatible Johnson Controls thermal wells are listed in *Table 4: Optional Accessories* of the *Repair and Replacement* section.

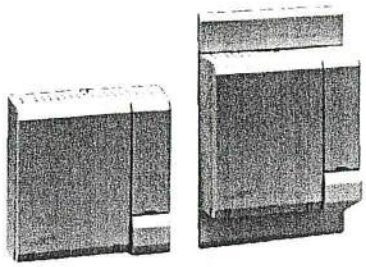
Note: Well sensor probe lengths are longer than accessory well lengths because part of the probe is in the conduit box and sensor holder.

JOHNSON CONTROLS

Controls Group 507 E. Michigan Street
P.O. Box 423, Milwaukee, WI 53202
Code No. Lit-1922245

TE-6400 Series

Temperature Sensor



TE-6400

Description

TE-6400 Series Temperature Sensors are an attractive and affordable means of sensing space temperature. Options for choosing sensing element, setpoint, indication, mounting, and wiring type are completely unbundled — allowing the sensor to be customized for each application.

Sensors with phone jack style wiring are available for use with Johnson Controls digital controllers. For universal application, versions with terminal block connections are available.

TE-6400 sensors utilize a 1000 ohm JCI nickel or 1000 ohm Class B platinum temperature sensing element. An optional override button overrides the controller's time-of-day scheduling and allows for control of space temperature on demand--ideal for facilities that are occupied after hours or on weekends.

All TE-6400 Series Temperature Sensors feature a quick-mount design that saves time and simplifies installation. The base mounts directly to a surface or wall box using screws and spring clips provided. The cover, which contains the sensor's functional parts, is held in place with a smaller (hex-head) screw.

A latching mechanism on the door protects against unauthorized access. When released, the door swings down to reveal the zone bus connector and optional temperature indicator and setpoint adjustments.

Features

- single or dual setpoint adjustment with choice of warmer/cooler or graduated scales in C° or F°
- choice of thin-film nickel or thin-film platinum sensing elements maximizes application flexibilty
- liquid bulb thermometer indication
- momentary override button
- quick-mount, 2-screw installation for wallbox or surface mounting
- zone bus jack for HVAC PRO or ZT connection
- choice of phone jack or terminal block wiring

Applications

The TE-6400 Sensor Series is used in a wide variety of applications requiring sensing and control of space temperature.

Replacement Parts and Accessories

Code Number	Description
TE-6400-601	Door Replacement Kit (10/box)
TE-6400W-600	U.S. Wallbox Mounting Base
T-4000-119	Stat Adjustment Tool
ACC-DWCLIP-0	Drywall Clip Mounting Kit (10/bag)
ACC-INSL-0	Metastat Wallbox Mounting Pad [a] (10/bag)
ACC-INSL-1	Metastat Surface Mounting Pad [a] (10/bag)

(a) These foam pads will make installation easier when mounting a sensor on an uneven surface.

To Order

Specify the code number from the following selection chart.

Selection Chart

TE – 64 □ □ □ – □ □ □ 0

Temperature Sensing

Sensor Type
1 1000 ohm Thin-Film Nickel
2 1000 ohm Platinum

Setpoint, Scale Type
0 None *
1 Single, Warmer/Cooler
3 Single, Scaled (65-85˚F)
4 Dual, Scaled (65-85˚F)
5 Single, Scaled (19-29˚C)

Wiring Connection
1 Phone Jack
2 Terminal Block

Mounting Style
S Surface Mount
W Wall Box Mount

Override Type
0 None *
1 Pushbutton

Indication Type
0 None
1 Liquid Bulb Thermometer

With JCI Logo

* If zero was chosen for the setpoint scale type, then zero (none) must also be selected for indication type. No indication is not available with any other configuration.

* The AHU and LCP do not support the temporary override feature, so (none) should be entered for override type in these applications.

Example 1: To order a nickel sensor with a single, warmer/cooler setpoint for surface mounting (a direct replacement for TE-6100-12), specify Product Code Number: TE-6411S-1010.

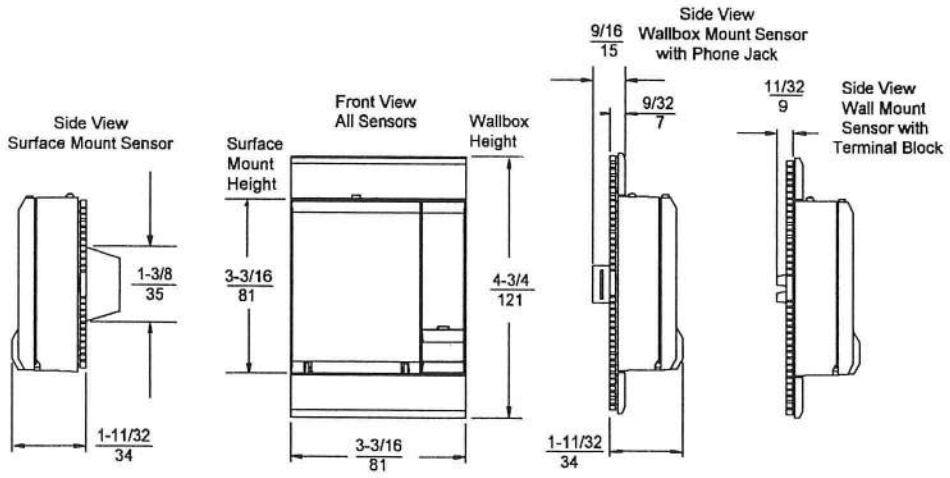
Example 2: To order a platinum sensor with Celsius setpoint and indicator with pushbutton override and terminal block wiring style for mounting on a U.S. standard wall box, specify Product Code Number: TE-6425W-2110.

TE-6400 Series Temperature Sensor (Continued)

Specifications

TE-6400 Series Temperature Sensor			
Nickel Sensor		**Temperature Element**	1000 ohm Thin-film Nickel
		Temperature Coefficient	Approximately 3 ohms per F° (5.4 ohms per C°)
		Reference Resistance	1000 ohms at 70°F (21°C)
		Accuracy	±0.34F° at 70F° (±0.18°C at 21C°)
Platinum Sensor		**Temperature Element**	1000 ohm thin-film platinum
		Temperature Coefficient	Approximately 2 ohms per °F (3.9 ohms per °C)
		Reference Resistance	1000 ohms @ 32°F (0°C)
		Accuracy	±0.65F° @ 70°F (±0.36°C @ 21°C)
Indicator	**Type**		Liquid filled bulb thermometer
	Range		40 to 90°F or 5 to 30°C
	Resolution		Scales are graduated at 10F° or 5C° intervals
Setpoint	**Type**		Single or dual adjustment
	Range	**Single Adjustment**	Warmer/cooler, red/blue visual scale
		Dual Adjustment	Heating and cooling, graduated scale 65 to 85°F (18 to 30°C)
	Resolution		Scales are graduated at 5F° or 2C° intervals
	Resistance		Nominal 1.5k ohms range
Field Connections		**Phone Jack**	8-pin connector for 8 conductor 24 AWG phone cable
		Terminal Block	Screw-type terminals for number 18 to 24 AWG wire
Diagnostics			6-pin connector with front access for HVAC PRO for Windows or a Zone Terminal (ZT); 24 VAC power supply must be used with this feature
Optional Override			Integral momentary pushbutton
Ambient Operating Conditions			32 to 131°F (0 to 55°C) 0 to 100% RH, non-condensing; 85°F (29°C) maximum dew point
Ambient Storage Conditions			-40 to 160°F (-40 to 71°C) 0 to 100% RH, non-condensing; 85°F (29°C) maximum dew point
Mounting Style			TE-6400S series with standard base for surface mounting TE-6400W series with wallplate base for mounting to a U.S. standard wall box
Materials			White plastic case with dark grey plastic mounting base
Dimensions (H x W x D)			3.2 x 3.2 x 1.4 in. (81 x 81 x 34 mm)
Shipping Weight			1 lb (0.5 kg)

Dimensions (in./mm)



JOHNSON CONTROLS

Controls Group 507 E. Michigan Street
P.O. Box 423, Milwaukee, WI 53202
Code No. Lit-1922135

Bulb Wells

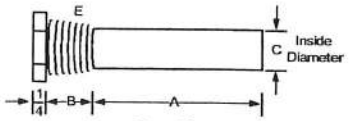


Figure 1*

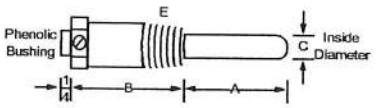


Figure 2**

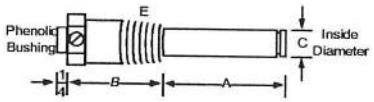
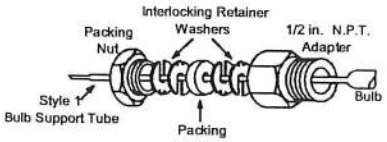


Figure 3**



Code No. FTG13A-600R packing nut assembly. For application where the temperature does not fall below -35°F (-37°C). Maximum liquid pressure limit is 150 PSIG (1034 kPa). Use with Style 1, 3/8 in. diameter bulb for direct immersion application. A19s require models with support tube; A70, A72s do not need support tube.

Description

Bulb Wells are used in conjunction with Remote Bulb Temperature Controls where bulb insertion into a vessel or container to sense temperature is required. WZ Series Wells are used with TE-6000 and TE-6300 sensors.

A variety of shapes, sizes, and materials are available for a wide range of applications. Refer to the appropriate temperature control for the exact bulb well required.

To Order

Specify code number for your application from the selection charts below.

Selection Chart (WEL Series Bulb Wells)

Code Number	See Figure	Dimension In.			Pipe Thread In.		Material		Maximum Temp °F	Maximum Pressure PSIG	Type of Solder Joint	Plating	See Note
		A	B	C	Inside D	Outside E	Connector	Tube					
WEL11A-601R	2	2-3/8	2-5/16	.299	–	1/2	Brass	Copper	250	300	Soft	–	1
WZ-1000-2	1	5-1/4	1-1/4	.500	1/2	1/2	Stainless Steel	Stainless Steel	300	400	–	–	3
WZ-1000-4	1	5-1/4	1-1/4	.500	1/2	1/2	Stainless Steel	Stainless Steel	600	400	–	–	–
WZ-1000-5	2	2-3/8	2-5/16	.299	–	1/2	Malleable	Brass	250	300	–	–	3
WEL14A-600R [a]	3	4-3/4	1-13/16	.444	–	1/2	Monel	Monel	700	1000	TIG Weld	–	2
WEL14A-601R [a]	3	7-9/16	1-13/16	.430	–	1/2	Brass	Copper	250	300	Silver	Brite-Dip	2
WEL14A-602R [a]	3	4-15/16	1-13/16	.430	–	1/2	Brass	Copper	250	300	Silver	Brite-Dip	2
WEL14A-603R [a]	3	5 13/16	1 13/16	.430	–	1/2	Brass	Copper	250	300	Silver	Brite-Dip	2
WEL16A-600R	2	2-3/8	1-5/16	.299	–	1/2	Brass	Copper	250	300	Soft	–	1
WEL16A-601R	2	2-13/16	1-13/16	.375	–	1/2	Brass	Copper	250	300	Soft	–	2
WEL17A-600R[b]	1	10-7/16	3/4	.763	1/2	3/4	Malleable	Copper	250	250	Silver	Tin	–
WEL17A-601R[b]	1	8-11/16	3/4	.763	1/2	3/4	Malleable	Copper	250	250	Silver	Tin	–
WEL17A-602R[b]	1	10-7/16	3/4	.753	1/2	3/4	Malleable	Steel	250	540	Silver	Tin	–
WEL17A-603R[b]	1	10-7/16	3/4	.753	1/2	3/4	Monel	Monel	700	1000	TIG Weld	–	–
WEL17A-604R[b]	1	14-13/32	3/4	.763	1/2	3/4	Malleable	Copper	250	250	Silver	Tin	–
WEL17A-606R[b]	1	8-11/16	1-3/32	.755	1/2	3/4	Monel	Monel	700	1000	TIG Weld	–	–
WEL18A-600R[b]	1	3-1/2	3/4	.773	1/2	3/4	Malleable	Steel	250	150	Silver	Tin	–
WEL18A-601R [b]	1	3-1/2	3/4	.773	1/2	3/4	Monel	Monel	700	1000	TIG Weld	–	–
WEL18A-602R[b]	1	3-1/2	3/4	.773	1/2	3/4	Malleable	Brass	250	150	Silver	Tin	–

(a) For 3/8 in. style 1 bulbs.

(b) For 11/16 in. diameter style 4 bulbs. Style 1 may be used, but is not fastened into well

Note 1: With phenolic bushing; .093 in. slot.
Note 2: With phenolic bushing; .125 in. slot.
Note 3: Includes thermal compound.

Selection Chart (T-800 Wells)

Code Number	Description
T-800-1605	Brass Well, 6-1/2 inch
T-800-1606	Stainless Steel Well, 5-1/4 inch
T-800-1618	Brass Well, 9-1/2 inch

Code Number	Description
T-800-1605	Brass Well, 6-1/2 inch
T-800-1620	Brass Well, 9-1/2 inch
T-800-1624	Dual Brass Well, 9-1/2 inch

N-VIRO AIR CORPORATION

Shop Drawing Submittal Sheet

Contractor:	Intelligent Building Controls Ltd.
Engineer:	Reid Crowther
Project:	Dominion Astrophysical Observatory

REQUEST APPROVAL ON:
Manufacturer

OXYGEN DEFICIENCY DETECTOR

CET

SCP - Panel
c/w (2) AST O_2 Transmitter

ENGINEERING SPECIFICATION SAMPLE # 7M

Commercial Gas Detection System

OXYGEN MONITORING SYSTEM

Oxygen Measurement 0 – 100% Volume

Provide one central wall mount controller panel, with NEMA-4X polycarbonate enclosure, capable of handling up to two remote sensors. Controller shall provide scrolling LED digital display indicating percent volume Oxygen for each remote sensor, common LED (red) alarm light indicators, power LED (green) indicator and audible alarm with silence button. Controller power is 120 VAC. Wiring to remote sensors is low voltage (24 VDC) and is supplied from the control panel. **Model SCP-24.**

Provide two remote mount 4-20 mA analog sensor-transmitter / alarm units with NEMA-4X polycarbonate enclosures. The sensors shall be long life (10 years) Galvanic Oxygen with a measurement range of 0 – 100% Volume Oxygen. Each unit shall have a top mounted strobe light (3" diameter - red) and a loud audible alarm (90 dB at 10'). Model **AST-GO2-HLW.**

Normal Oxygen content in ambient air is 20.9% Volume. At a reading of 19.0% Volume, the control panel shall indicate a stage-1 alarm on the digital display (one red LED illuminated) and activate the strobe light on the Oxygen unit that is in alarm. At a reading of 17.0% Volume, the control panel shall indicate a stage-2 alarm on the digital display (two red LED's illuminated) and activate the audible alarm on the Oxygen unit that is in alarm. When any alarm condition has recovered, the alarms will automatically reset. Wiring requirement is 5 low voltage wires to each Oxygen sensor from the control panel.

In the event of a fault condition, the control panel shall indicate "FAU" on the digital display for the channel that is in fault and all remote visual and audible alarms will be activated. The audible on the front door of the controller will also be activated. This one can be silenced by pushing the silence button below it.

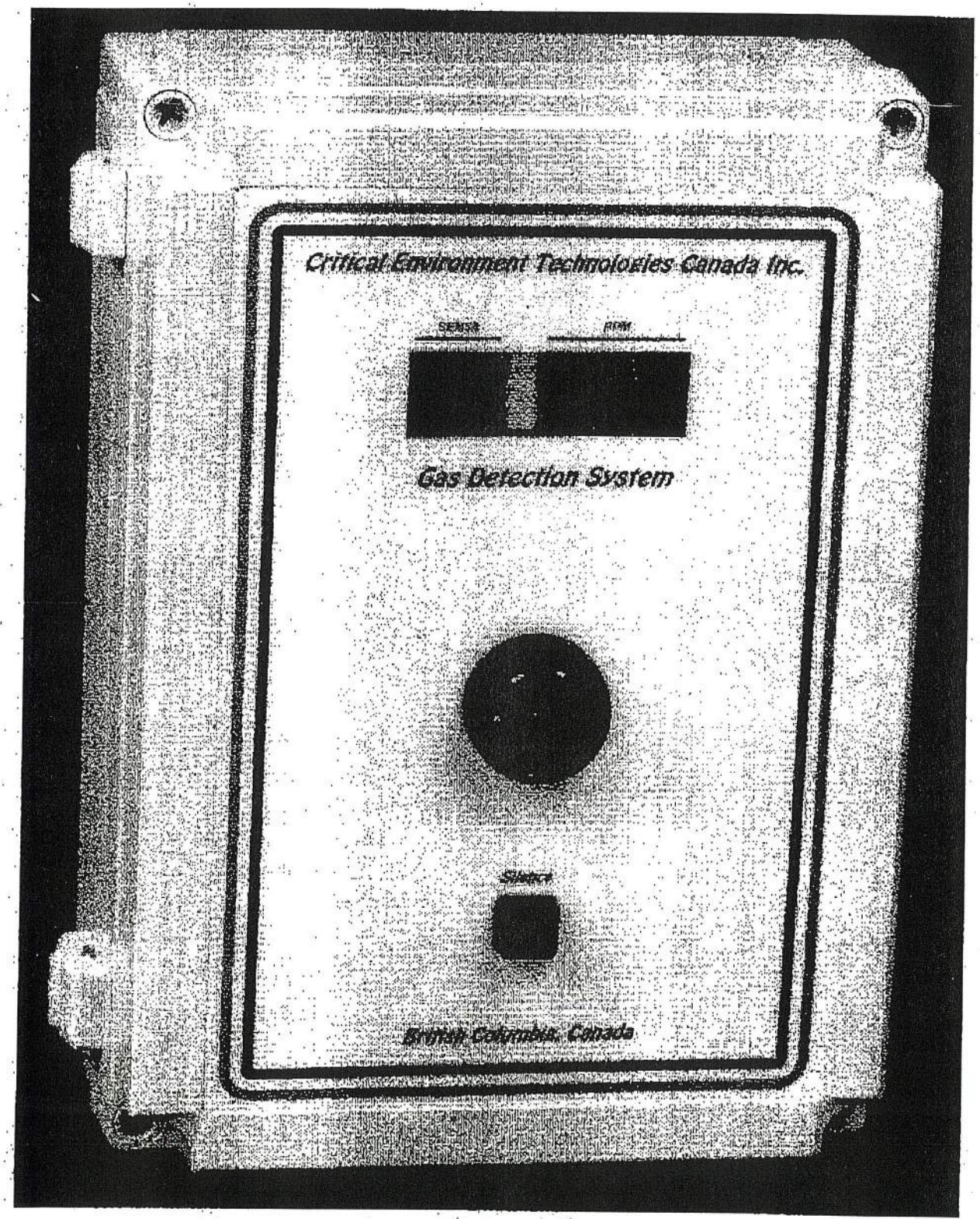
The contractor shall provide all required wiring, conduit and interconnection required for a successful installation.

Approved manufacturer:

Critical Environment Technologies Canada Inc.
145 – 7391 Vantage Way
Delta, BC Canada V4G 1M3

Critical Environment Technologies Canada Inc.

Unit 145, 7391 Vantagw Way Delta, B.C., V4G 1M3 Canada
Ph: 604-940-8741 Fx: 604-940-8745 www.critical-environment.com e-mail: sales@cetcl.com



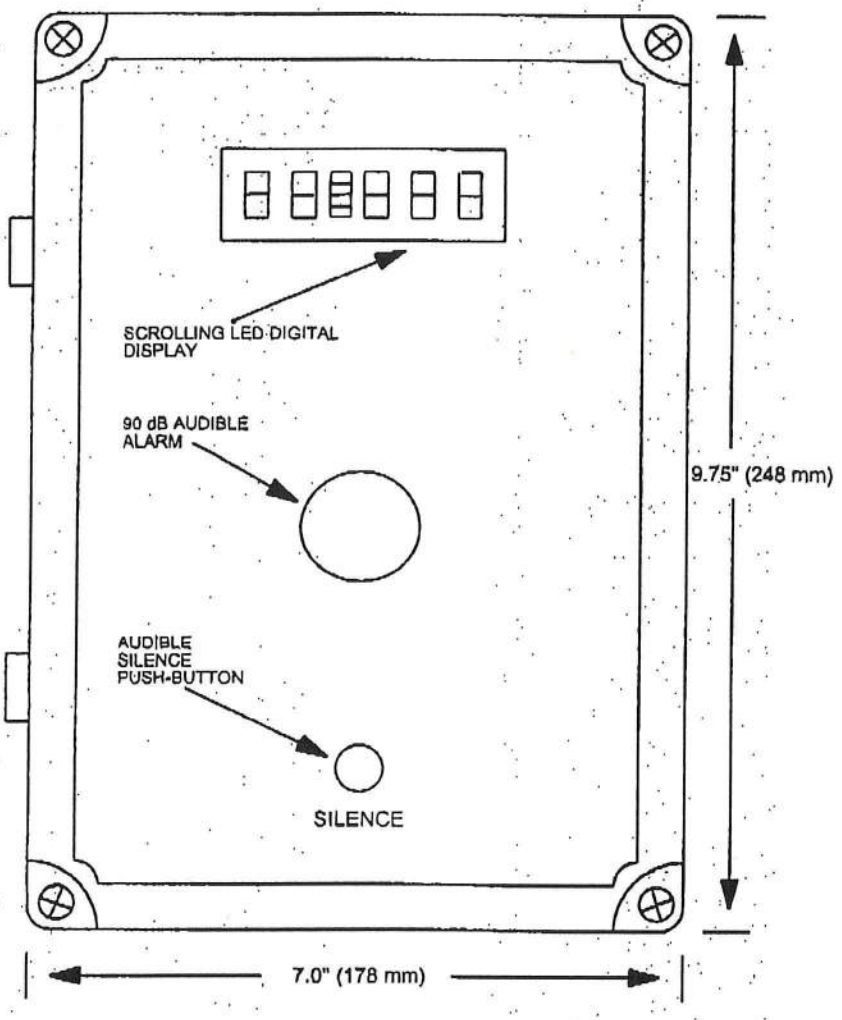
SCP SERIES 1 TO 4 CHANNEL PROGRAMMABLE CONTROL PANEL

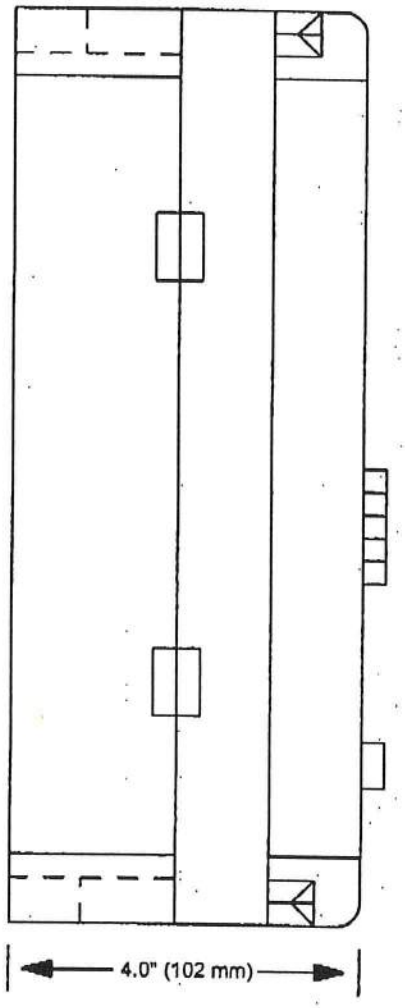
Critical Environment Technologies Canada Inc.

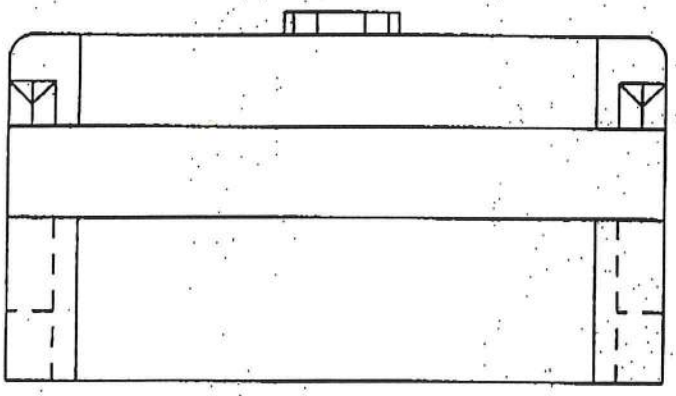
SCP SERIES SYSTEM CONTROLLER SPECIFICATIONS AND OPERATION

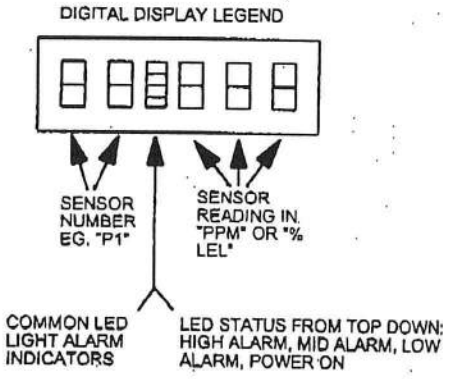
* SYSTEM POWER:	110 / 240 VAC, 50 / 60 HTZ. (HARD WIRED) – OPTIONAL LOW VOLTAGE DC
* SYSTEM ENCLOSURE:	RUGGED WALL MOUNT NEMA-4X RATED POLYCARBONATE WITH HINGED, SECURED DOOR AND LEXAN DOOR LABEL
* ENCLOSURE SIZE:	9 3/4" X 7" X 4"
* SYSTEM CIRCUIT:	PROGRAMMABLE MICROPROCESSOR (ENCLOSURE CIRCUIT BOARD) LED DIGITAL DISPLAY DRIVER (DOOR CIRCUIT BOARD)
* SYSTEM INPUTS:	MAXIMUM OF FOUR PROGRAMMABLE ANALOG 4 – 20 MA SIGNAL INPUTS
* SYSTEM OUTPUTS:	MAXIMUM OF FOUR PROGRAMMABLE ALARM RELAYS S.P.D.T. 5 AMP. DOOR MOUNTED AUDIBLE ALARM (90 dB @ 10") WITH SILENCE BUTTON SCROLLING LED DIGITAL DISPLAY. RESOLUTION: 0.1 PPM (IF DECIMAL IS PROGRAMMED). 1 PPM IF DECIMAL IS NOT PROGRAMMED). LED ALARM LIGHT INDICATORS
* ALARM SET POINTS:	USER SETTABLE FROM PUSH BUTTONS LOCATED INSIDE OF DOOR. CAN BE SET FROM 5% TO 95% OF SENSOR RANGE. PROPERLY SEQUENCED.
* FAIL-SAFES:	SYSTEM RELAYS ARE NORMALLY PROGRAMMED FAIL-SAFE. RELAYS ARE NORMALLY ENERGIZED IN NON-ALARM STATE. IF FAULT CONDITION OCCURS, RELAY CONTROLLED DEVICES OPERATE CONTINUOUSLY UNTIL FAULT CONDITION IS CORRECTED.
* FAULT MONITOR:	SYSTEM MICROPROCESSOR ASSUMES FAULT CONDITION AT 2.5 mA
* OPERATION:	a) SYSTEM CONTROLLER PROVIDES REGULATED 24 VDC TO REMOTE TRANSMITTERS b) REMOTE TRANSMITTERS SEND 4-20 mA SIGNAL TO CONTROLLER, REPRESENTING GAS LEVELS MEASURED c) SYSTEM PROCESSES SIGNAL AND SELECTS APPROPRIATE ALARMS, IF REQUIRED d) SYSTEM PROVIDES TWO OR THREE LEVELS OF ALARM. LOW & HIGH OR LOW, MID & HIGH & FAULT (PROGRAMMING DEPENDENT) e) BOTTOM LED (GREEN) ILLUMINATES WHEN POWER IS APPLIED AND SYSTEM IS IN NON-ALARM STATE f) LED (RED) SECOND FROM THE BOTTOM REPRESENTS LOW ALARM g) LED (RED) THIRD FROM THE BOTTOM REPRESENTS MID ALARM h) LED (RED) FOURTH FROM THE BOTTOM REPRESENTS HIGH ALARM i) AUDIBLE ALARM NORMALLY ACTIVATES WITH HIGH ALARM, BUT CAN BE PROGRAMMED TO ACTIVATE WITH LOW, MID OR FAULT ALARMS j) A CERTAIN AMOUNT OF ZONE CONTROL FOR ALARM RELAYS IS ALSO AVAILABLE THROUGH PROGRAMMING
* PROGRAMMING:	PROGRAMMING IS ACHIEVED WITH A COMPUTER. NOTEBOOK / LAPTOP FOR FIELD PROGRAMMING. SOFTWARE, INTERCONNECT & OPERATION INSTRUCTIONS CAN BE PURCHASED FROM C.E.T.C.I. PROGRAM IS VERY EASY TO USE. ALL SYSTEMS ARE PROGRAMMED TO CUSTOMER SPECIFICATIONS PRIOR TO BEING SHIPPED FROM PLANT. ALL TRANSMITTERS ARE CALIBRATED, TWICE BEFORE BEING SHIPPED FROM PLANT.

Unit 145, 7391 Vantage Way Delta, B.C. V4G 1M3 Canada
Phone: 604-940-8741 Fax: 604-940-8745
REV: "B" Jan-4-2000









Critical Environment Technologies Canada Inc. Delta, B.C. Canada	
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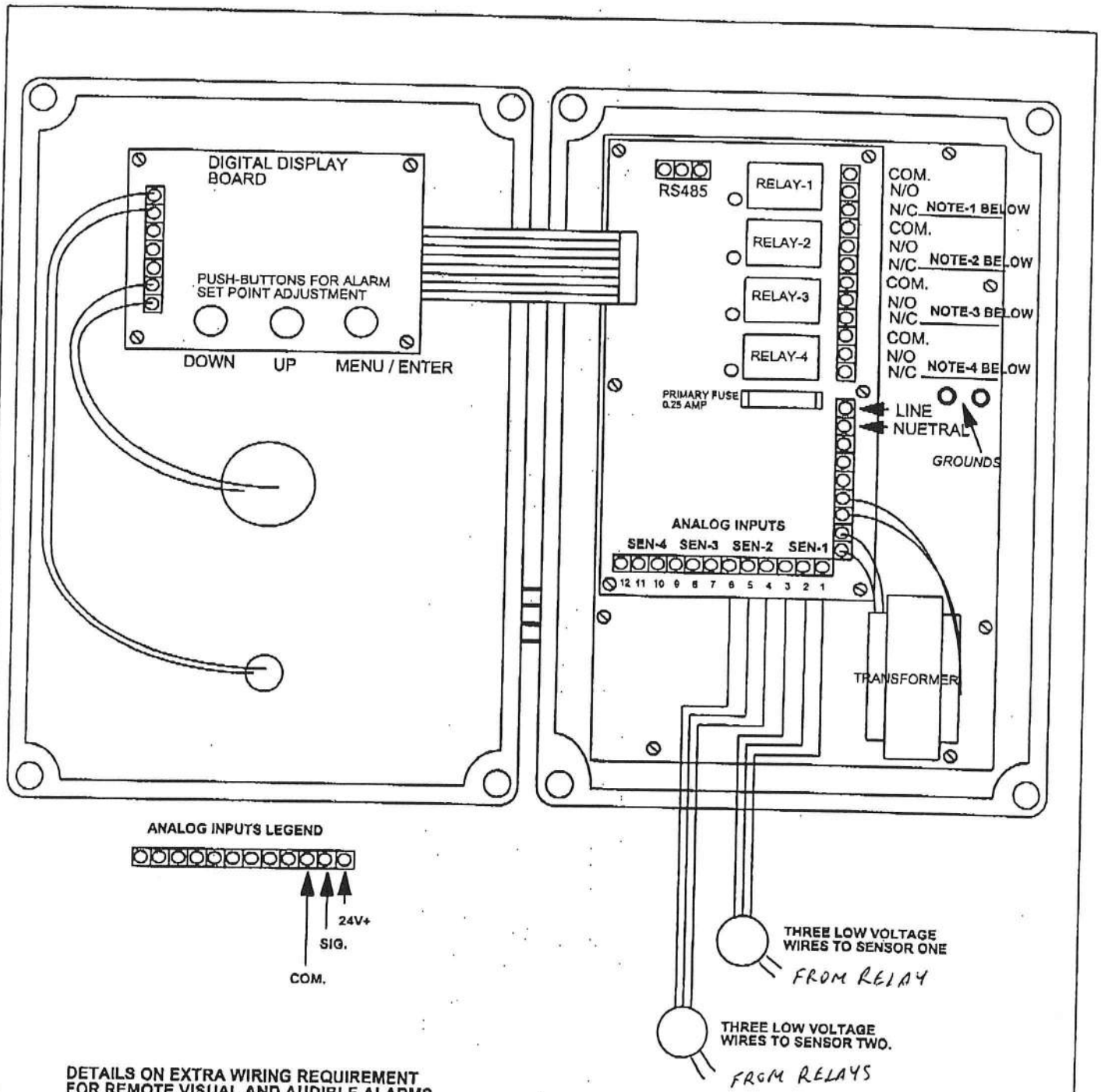
DRAWING NUMBER: SCP-001	REV: C JAN-4-2000
DRAWN BY: F.B.	SCALE: 50%



DETAILS ON EXTRA WIRING REQUIREMENT FOR REMOTE VISUAL AND AUDIBLE ALARMS FOR SENSORS

NOTE-1: THIS LOW VOLTAGE WIRE RUNS TO SENSOR-1 STOBE LIGHT CONNECTION.

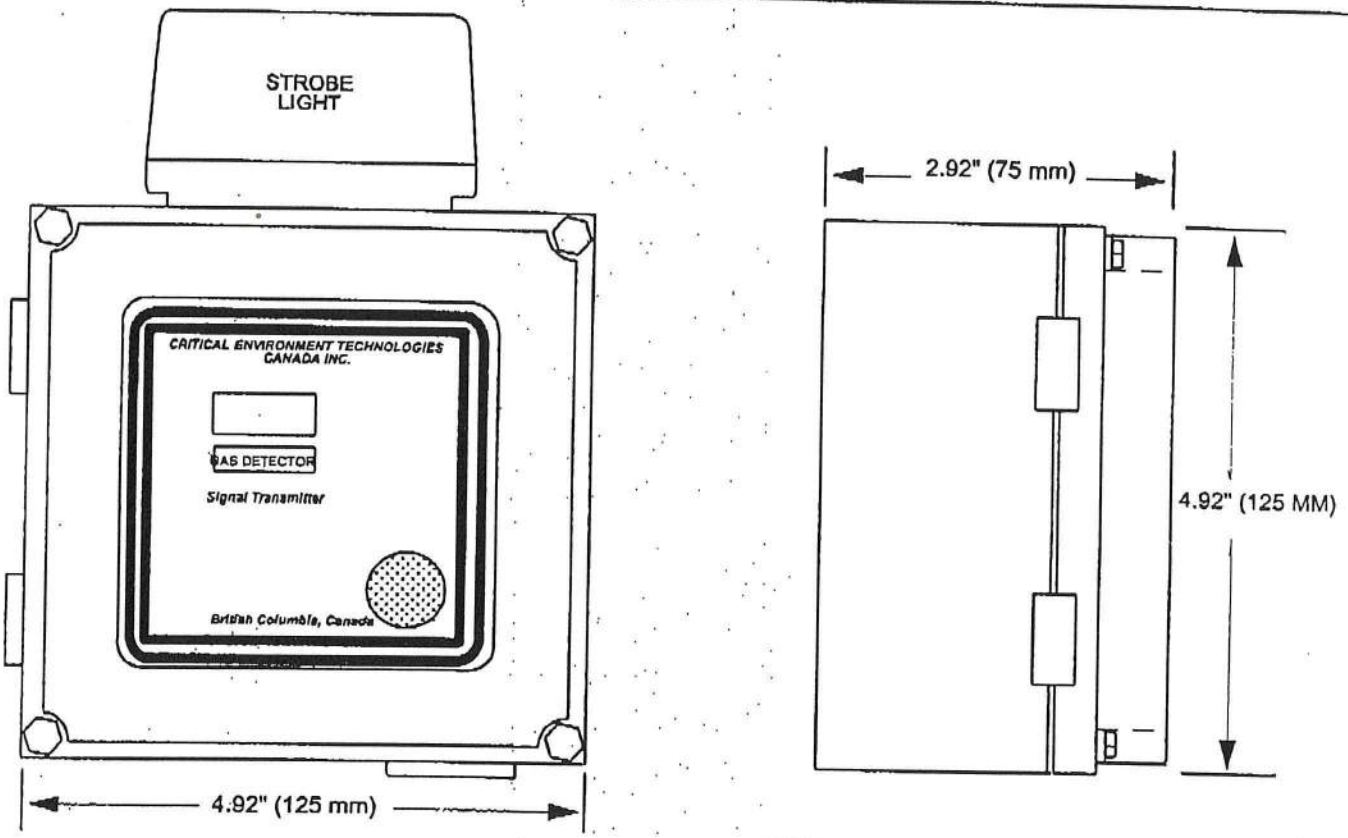
NOTE-2: THIS LOW VOLTAGE WIRE RUNS TO SENSOR-1 AUDIBLE ALARM CONNECTION.

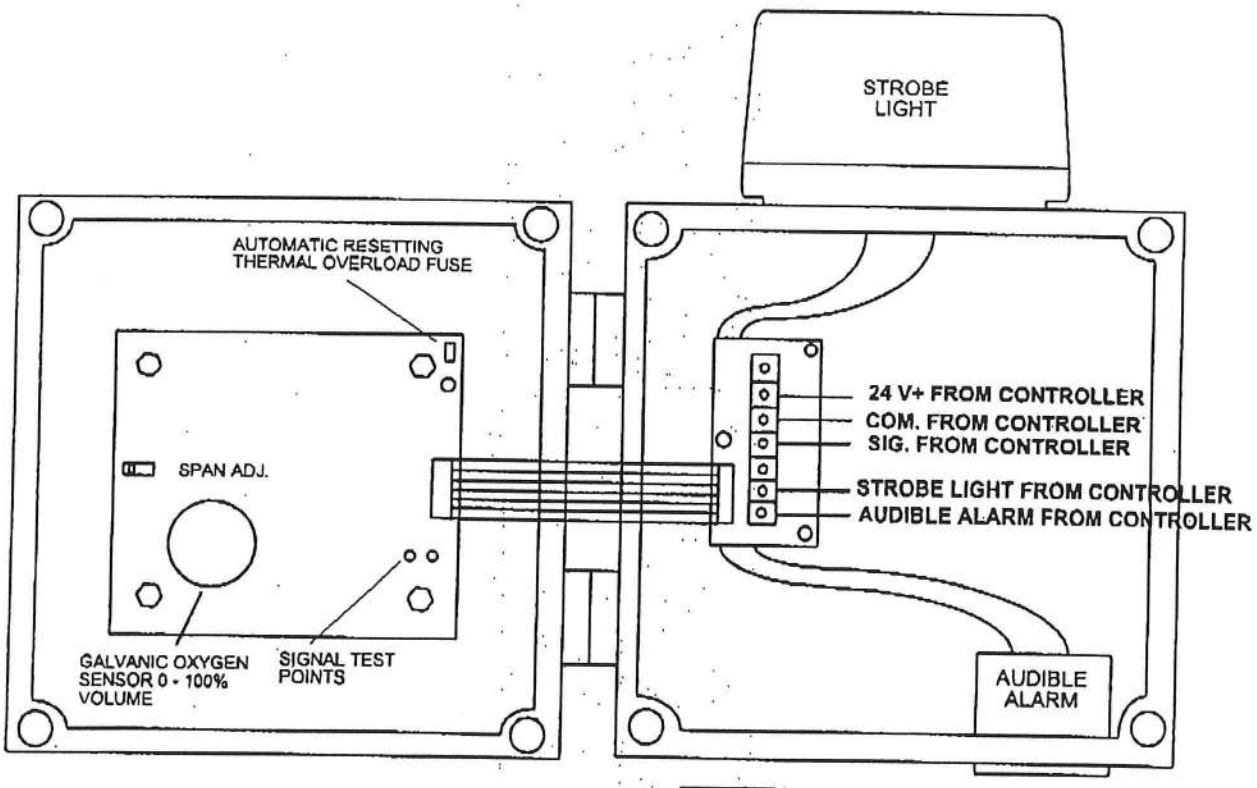
NOTE-3: THIS LOW VOLTAGE WIRE RUNS TO SENSOR-2 STROBE LIGHT CONNECTION

NOTE-4: THIS LOW VOLTAGE WIRE RUNS TO SENSOR-2 AUDIBLE ALARM CONNECTION.

NOTE: 5 WIRES FROM SENSOR TO PANEL

Critical Environment Technologies Canada Inc. Delta, B.C. Canada	
TITLE: SCP SERIES NEMA-4X RATED CONTROL ENCLOSURE AND EXTRA WIRING FOR REMOTE SENSOR ALARMS	
DRAWING NUMBER: SCP-005	REV: D APR-8-2000
DRAWN BY: F.B.	SCALE: 50%





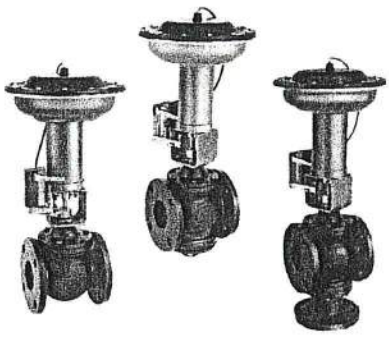
CRITICAL ENVIRONMENT TECHNOLOGIES CANADA INC. BRITISH COLUMBIA, CANADA	
TITLE: GALVANIC OXYGEN ANALOG TRANSMITTER C/W LOCAL STROBE LIGHT & AUDIBLE ALARM	
DRAWING NUMBER: AST-895S	REV-A: APR-8-2000
DRAWN BY: F.B.	ENGINEER: R. BENTLEY

JOHNSON CONTROLS

Controls Group 507 E. Michigan Street
P.O. Box 423, Milwaukee, WI 53202
Code No. Lit-1924135

V-5252, V-5462, V-5842

Cast Iron Pneumatic Flanged Globe Valves, 2 1/2 Through 4 in., Two-Way and Three-Way



Description

The 2-1/2 in. through 6 in. Cast Iron Flanged Globe Valves accurately regulate the flow of steam or hot and cold water through all types of coils or heat exchangers.

Features

- rugged top and bottom stem guiding for stable operation and long life
- uses standard Johnson Controls non-adjustable ring pack packings for proven reliability and long life
- replaceable composition PTFE disc especially compounded for steam and water service
- available with size 4R, 5R, or 8R pneumatic spring and diaphragm actuators
- factory mounted V-9502 Valve Positioner is available
- optional electro-pneumatic positioner (EPP-1000)

To Order

Specify the code number in the selection charts on the following pages. For available combinations, refer to *Pneumatic Valve and Actuator Selection Charts*.

Accessories

Refer to *EPP-1000 Electro-Pneumatic PositionerEPP-1000 Electro-Pneumatic Positioner* on Page 5-65, *V-9000-500 PositionerV-9000-500 Positioner* on Page 5-65, and *V-9502 Pneumatic Valve Actuator PositionerV-9502 Pneumatic Valve Actuator Positioner* on Page 5-66.

Repair Parts

Refer to *Valve Repair Parts*.

Specifications

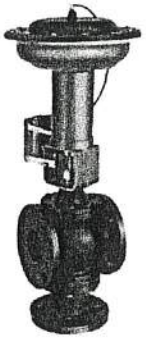
Cast Iron Pneumatic Flanged Globe Valves, 2 1/2 Through 4 in., Two-Way and Three-Way					
Service			Steam or Hot and Cold Water		
Control Air Connection			1/8 in. NPT Barbed Fitting for 1/4 in. O.D. Polytubing		
Valve Body Pressure / Temperature Rating			Meets Requirements for ANSI B16.1, Class 125		
Maximum Allowable Pressure / Temperature			175 psi (1225 kPa) up to 150°F (66°C) Decreasing to 125 psi (875 kPa) at 281°F (138°C)		
Maximum Recommended Operating Differential Pressure for Valve Sizing			35 psi (245 kPa)		
Maximum Closeoff Pressure			Refer to *Pneumatic Valve and Actuator Selection Charts*		
Maximum Control Pressure			25 psi		
Ambient Temperature Limit			-10 to 150°F (-23 to 66°C)		
Fluid Operating Temperature Limit			35 to 281°F (2 to 138°C)		
Materials		**Stem**	Stainless Steel		
		Body	Cast Iron with Black Lacquer Finish		
		Plug	Brass		
		Actuator	Yoke and Diaphragm Casings: Cast Aluminum		
		Packing	Non-Adjustable EPR (Ethylene Propylene Rubber) Ring Packs		
		Diaphragm	Molded Reinforced Synthetic Rubber		
Dimensions (in.)	**Valve Size**	**End-to-End (in.)**	**Pipe Centerline to Top of Actuator**		
			4R	**5R**	**8R**
	2-1/2	7-1/4	13-7/8	20-3/4	—
	3	8-5/8	14-1/2	20-13/16	25-1/16
	4	10-1/2	21-13/16	26-1/16	25-3/4
	5	12-1/2	—		26-5/8
	6	14-1/2	—	—	27-15/16

The performance specifications are nominal and conform to acceptable industry standards. For applications at conditions beyond these specifications, consult the local Johnson Controls office. Johnson Controls, Inc. shall not be liable for damages resulting from misapplication or misuse of its products.

V-5252, V-5462, V-5842 Cast Iron Pneumatic Flanged Globe Valves, 2 1/2 Through 4 in., Two-Way and Three-Way (Continued)

V-5842

2-1/2 to 6 in., Three-Way, Mixing Cast Iron Flanged Globe Valves



Selection Chart

Code Number		Valve Size (in.)	Max Cv (kv)	Spring Range (psig)	Actuator Size	Valve Stroke Length (Travel) in.
Without Positioner	With Positioner					
V-5842-7	V-5842-8	2-1/2	54 (46)	9 to 13	5R	3/4
V-5842-9	~~V-5842-10~~	3	80 (69)	9 to 13	5R	1-1/8
V-5842-17	V-5842-18				8R	1-1/8
V-5842-11	V-5842-12	4	157 (135)	9 to 13	8R	1-1/8
V-5842-13	V-5842-14	5	238 (203)	9 to 13	8R	1-3/8
V-5842-15	V-5842-16	6	347 (297)	9 to 13	8R	1-1/2

Note: Refer to *Valve Repair Parts* for repair information.

VA-7450 Electronic Valve Actuator

The VA-7450 Electronic Valve Actuator Series provides on/off, floating, or proportional control in HVAC (Heating, Ventilating, and Air Conditioning) applications. The compact design of this actuator makes it suitable for installation in confined spaces, such as fan coil applications.

The VA-7450 series actuator is designed for field mounting onto VG5000 forged brass valves. Refer to the VG5000 Series Forged Brass Valves 1/2 Through 1 in., Two-Way Normally Closed and Three-Way Product/Technical Bulletin *(FAN 977, 125, or 1628.3) for specific information.*

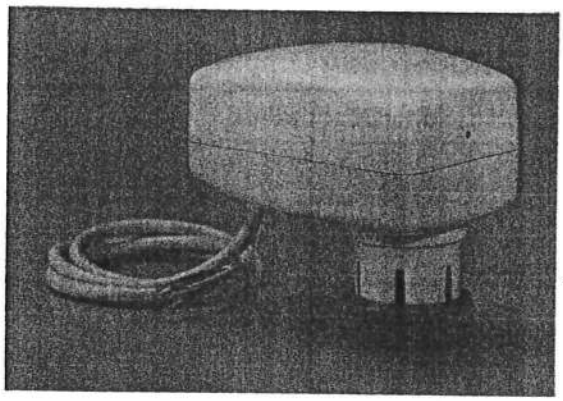


Figure 1: VA-7450 Electronic Valve Actuator

Features and Benefits

❑ **Automatic Calibration**	Simplifies installation; requires no calibration
❑ **Compact Design**	Allows installation in confined spaces (fan coils, etc.)
❑ **Can Be Mounted after Valve Body is Installed**	Simplifies installation; allows application flexibility
❑ **Can Be Rotated after Mounting**	Provides easier wiring by locating the wiring entry in any direction
❑ **Light-Emitting Diode (LED) Operating Status Display**	Reduces commissioning time and displays operating status
❑ **Motor Time-out Feature**	Provides higher reliability by deactivating the actuator motor at ends of stroke

Part No. 34-636-771, Rev. —
Code No. LIT-977324

Operation

To ensure good system performance, the use of a Proportional plus Integral (PI) controller, such as a Johnson Controls Application Specific Controller (ASC), is required. The software requirement for the ASC is HVAC PRO for Windows™, Release 7.01 or later.

The VA-7450 has a Light Emitting Diode (LED) display to indicate the actuator's operating mode. (See Table 1.)

Table 1: Operating Display

LED Indication		Description
On	☼	Power line present, motor not running
Single Blinking	◑	Motor running
Double Blinking	◑◑	End-of-stroke confirmation cycle or anti-sticking cycle
Off	●	Power line not present

On/Off or Floating Control (VA-7450-10011)

When the signal is applied to the Common and Down wires, the actuator motor drives the gear assembly, and pushes down on the valve stem against the force of the valve return spring. When the signal is removed, the actuator remains in position.

When the signal is applied to the Common and Up wires, the actuator retracts and allows the valve return spring to move the valve stem up, in the direction of its normal position. When the signal is removed, the actuator remains in position.

If the signal remains applied to the Up or Down wire, the actuator will time out and shut off the motor after approximately 80 seconds.

End of Stroke Confirmation: When the signal is applied continuously in the same direction, the actuator turns on every 2 hours and drives in the signal direction for approximately 80 seconds to confirm the end-of-stroke position.

Note: Johnson Controls ASCs do not continuously power the floating outputs. (See FAN 636.3 or 1628.2 for additional information.)

Proportional Control (VA-7452-90011)

When the signal increases in Direct Action (DA) configuration or decreases in Reverse Action (RA) configuration, the actuator motor drives the gear assembly, and pushes down on the valve stem against the force of the valve return spring.

When the signal decreases in DA configuration or increases in RA configuration, the actuator retracts and allows the valve return spring to move the valve stem in the direction of its normal position or up.

End of Stroke Confirmation: When the input signal is at 0 or 100% continuously, the actuator turns on every 2 hours and drives in the signal direction for approximately 80 seconds to confirm the end-of-stroke position.

Auto-Zero Calibration: When power is applied, the actuator self-calibrates to the full stroke end position by performing a complete cycle. The actuator drives in the stem down direction for approximately 80 seconds, then drives to the input signal command position.

Anti-Sticking Cycle: When the anti-sticking cycle is enabled (On), the actuator performs one complete cycle every 24 hours to clear possible accumulation of impurities from the valve plug and seat. The anti-sticking feature is jumper selectable.

IMPORTANT:	The time of day that the anti-sticking cycle is performed cannot be controlled. Do not select this feature if unscheduled cycling of the valve is undesirable for the application.

Note: The actuator will not respond to input signal commands while performing an end-of-stroke, auto-zero, or anti-sticking cycle. The actuator will drive to the commanded position when the cycle is complete.

Valve Selection: The actuator is factory set for use with 2-way, Normally Open (N.O.) Push Down to Close (PDTC) VG5000 valves. For 2-way, Normally Closed (N.C.) Push Down To Open (PDTO) VG5000 valve applications, change the valve normal position jumper to PDTO. For 3-way VG5000 valve applications, set the valve body type jumper to 3-way and set the valve normal position jumper to correspond to the service port of the valve. (See Figure 2.)

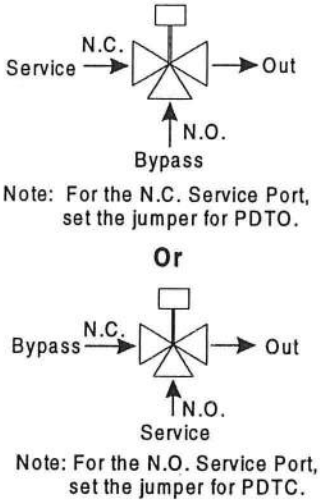


Figure 2: Setting the Valve Normal Position Jumper

Manual Override

The VA-7450-8900 Manual Override Ring Accessory is used to manually open N.C. valves or the N.C. port of 3-way valves. (See Figure 3.) It is assembled between the valve and the actuator.

Note: The manual override ring will not fully close N.O. valves or the N.O. port of 3-way valves.

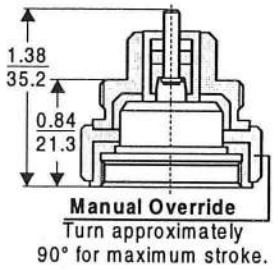


Figure 3: Manual Override Ring, in. (mm)

VA-7450 (Floating)

Use the manual override ring for N.C. 2-way valves and the N.C. port of 3-way valves.

VA-7452 (Proportional)

If a 24 VAC power supply is not available, use the manual override ring.

If a 24 VAC power supply is available with no controller signal, set Jumper 5's action to direct to drive the actuator to the fully up position, or reverse to drive the actuator to the fully down position. (See Table 2.)

Dimensions

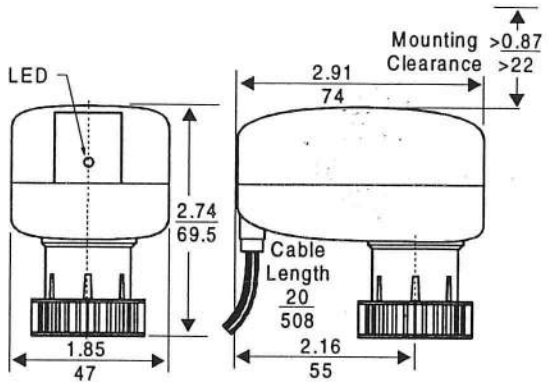


Figure 4: VA-7450 Actuator Dimensions, in. (mm)

Installation

Parts Included

- VA-7450 actuator with coupling
- three spare jumpers (VA-7452 only)

Tools Needed

- small flat-blade screwdriver
- needle-nose pliers

Mounting

The actuator is shipped in the fully up position. When mounting the actuator, follow the recommendations below:

- Be sure to return the actuator to the fully up position before mounting if the actuator is powered when it is not mounted on the valve.
- Make sure the actuator is free of thermal insulation material.
- Leave at least 7/8 in. (22 mm) clearance above the actuator for mounting purposes. (Refer to the *Dimensions* section.)

Note: Never use the actuator as a lever to thread the valve body onto the piping.

CAUTION: **Equipment Damage Hazard.** Mount only on a valve that is piped within 90° of the vertical position, so it is free of dripping water, which could enter the housing and damage the mechanism and motor. (See Figure 5.)

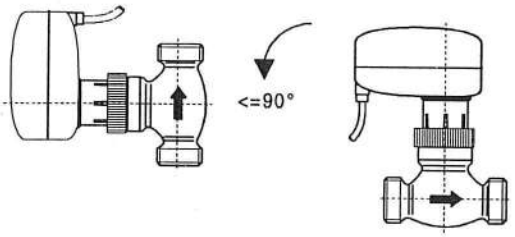


Figure 5: VA-7450 Mounting Positions

Mount the VG5000 valve first. To mount the actuator on a VG5000 valve, place the threaded coupling over the valve stem and the bonnet. Rotate the actuator to the desired position, and hand-tighten the coupling securely. Do **not** use a wrench. (See Figure 6.)

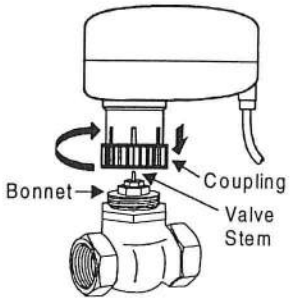


Figure 6: Mounting the VA-7450 onto a VG5000 Valve

Wiring

CAUTION: **Equipment Damage Hazard.** Disconnect all power supplies before wiring connections are made or prior to performing maintenance. Check all wiring connections before applying power to the system. Short-circuited or improperly connected wires will result in permanent damage to the equipment.

IMPORTANT: Make all wiring connections in accordance with the National Electrical Code and all local regulations.

To wire the actuator, refer to the appropriate wiring diagram in Figure 7.

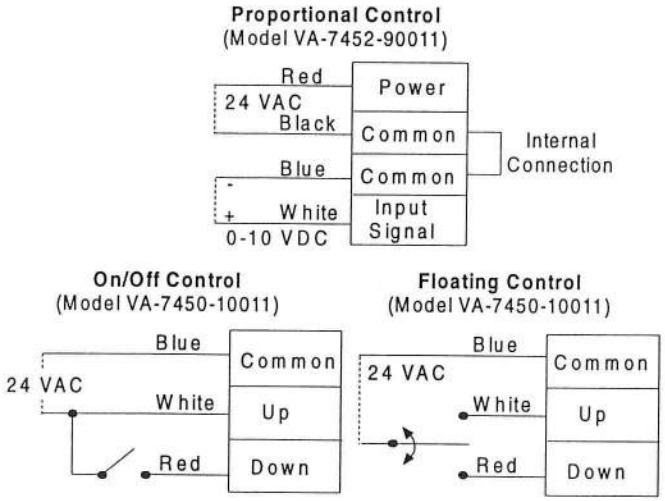


Figure 7: VA-7450 Wiring Diagrams

Jumpers (VA-7452 only)

Jumpers need to be set for the proportional model only. To set the jumpers, proceed as follows:

1. Open the jumper access door, using a fingernail or the tip of a small flat-blade screwdriver, by carefully lifting up on the door. (See Figure 8.)

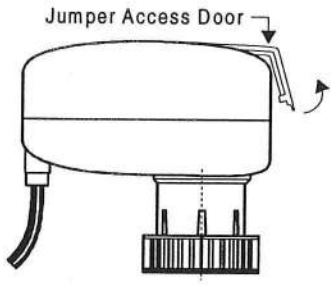


Figure 8: Opening the Jumper Access Door

2. Refer to Table 2 for the various jumper settings.

Table 2: Jumper Settings

Jumper	Jumper Function Jumper IN ●● Jumper OUT ○○	Factory Setting
1	Anti-Sticking Cycle On ●● Off ○○	Off
2 3	Input Signal Range (VDC) 0-10 ●● ●● 5-10 ○○ ○○ 0-5	0-10
4	Valve Body Type 3-Way ●● 2-Way ○○	2-Way
5	Action Direct (DA) ●● Reverse (RA) ○○	DA
6	Valve Normal Position PDTO (N.C.) ●● PDTC (N.O.) ○○	PDTC

3. Use a small needle-nose pliers to remove or add jumpers. (Refer to Figure 9 for jumper locations and factory settings.)

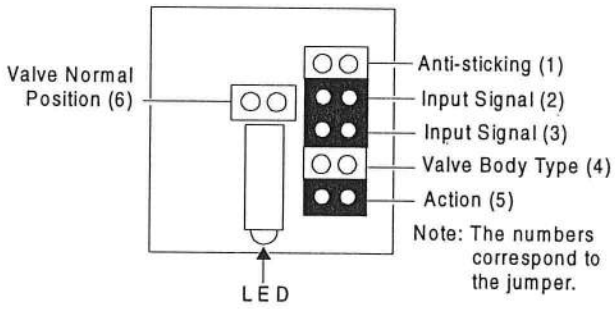


Figure 9: Jumper Locations and Factory Settings

4. Replace the top edge of the door first, and press firmly on the front of the door until it snaps into place.

Ordering Information

Table 3: Models Available

Code Number	Description
VA-7450-10011	On/Off or Floating Control Actuator, 24 VAC
VA-7452-90011	Proportional Actuator, 0-10 VDC

Table 4: Accessories

Code Number	Description
VA-7450-8900	Manual Override Ring Accessory for Use with VG5000 Valve Bodies

Actuator Combinations

VA-7450 Series Electronic Valve Actuators are designed to be used with the VG5000 valve series. Refer to the VG5000 Series Forged Brass Valves Product/Technical Bulletin (LIT-977135) for complete ordering information. The VA-7450 series is not available factory assembled to the VG5000 valve.

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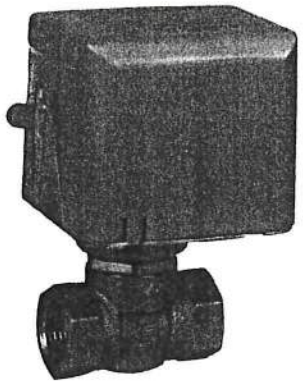
Controls Group 507 E. Michigan Street
P.O. Box 423, Milwaukee, WI 53202
Code No. Lit-1924510

NEW

VG5000 Series

Electric Zone Valves



VG5000 with VA-7010 Electric Actuator

Description

The VG5000 Series Electric Zone Valves are primarily designed to regulate the flow of water in response to the demand of a controller in zone and fan coil applications. These valves are available in two-way Normally Open (N.O.), Normally Closed (N.C.), or three-way configurations, with threaded (NPT) or sweat end connections. VG5000 Series Valves can be used in combination with the VA-7010 Series Electric On/Off Actuators for two-position control and VA-745x Series Electric Actuators for modulating control; valve bodies and actuators must be ordered separately.

Features

- two-way N.O. and N.C. and three-way configurations allow flexible applications
- forged brass body with stainless steel stem and spring are long-lasting and compact
- rubber compound plug for bubble free shutoff provides maximum energy savings
- Kv (Cv) adjustable on site for two-way bodies and Kv (Cv) factory set at maximum value allows for stock reduction and flexibility
- actuator can be installed after piping, making it easier to install in confined spaces
- easily field replaceable packing provides easy serviceability
- built-in return spring means valve returns to normal position (closed for N.C. valves and open for N.O. valves) when actuator is de-energized or removed

Accessories

Refer to the *Accessories* chart on the following page.

Repair Parts

If the VG5000 Valve fails to operate within its specifications, unit replacement is required.

To Order

Specify the code number from the following selection chart.

Selection Chart

VG5☐☐0☐C

Body Code	Size	Cv (Kv) Factor					
		NPT			Sweat		
		Two-Way		Three-Way	Two-Way		Three-Way
		N.O.	N.C.	MX	N.O.	N.C.	MX
E	1/2 in.	1.9 (a)	1.9 (a)	1.9	1.9 (a)	1.7 (a)	1.7
K	3/4 in.	4.1	4.1 (a)	4.1	4.1	3.7 (a)	3.7
M	1 in.	6.4	6.4 (a)	6.4	6.4	5.8 (a)	5.8

End Connections			
4	Threaded (NPT)	7	Sweat

Body Style			
2	Two-Way N.O.	8	Three-Way Mixing
4	Two-Way N.C.	—	

(a) Adjustable Cv, value shown is factory setting maximum

VG5000 Series Electric Zone Valves (Continued)

Accessories

Code Number	Description
VA-7010-8001	24 VAC Electric On/Off Actuator
VA-7010-8002	120 VAC Electric On/Off Actuator
VA-7010-8003	230 VAC Electric On/Off Actuator
VA-7010-8006	208 VAC Electric On/Off Actuator
VA-7010-8007	277 VAC Electric On/Off Actuator
VA-7450-10011	24 VAC Floating Electric Actuator
VA-7452-90011	0-10 VDC Proportional Electric Actuator
VA-7450-8900	Manual Override Ring
VG5000-1	Replacement Packing

Specifications

VG5000 Series Electric Zone Valves		
Models	VG52xx Series	Two-Way Normally Open
	VG54xx Series	Two-Way Normally Closed
	VG58xx Series	Three-Way Mixing
Body Size		1/2 in. (DN15)
		3/4 in. (DN20)
		1 in. (DN25)
Body Rating		PN16 Maximum Pressure: 300 psig
Maximum Pressure Drop	1/2 in. (DN15)	30 psig (200 kPa)
	3/4 in. (DN20)	14.5 psig (100 kPa)
	1 in. (DN25)	9 psig (62 kPa)
Medium [a]		Hot and Cold Water for HVAC Systems
Maximum Closeoff Pressure [b]	1/2 in. (DN15)	30 psig (200 kPa)
	3/4 in. (DN20)	14.5 psig (100 kPa)
	1 in. (DN25)	9 psig (62 kPa)
Leakage		0.01% of Maximum Flow, 100% Production Tested
Body Connections		NPT (American Standard Pipe Thread)
		Sweat
Nominal Stroke		0.12 in. (3 mm.)
Materials	Body, Packing Nut, Cage	Brass
	Stem	Stainless Steel
	Spring	Stainless Steel
	Plug	Rubber EPT
	Packing	O-Ring EPT (Two)
Fluid Temperature Limits		35 to 203°F (2 to 95°C)
Ambient Temperature Limits		35 to 122°F (2 to 50°C)
Shipping Weight	Two-Way Models	1/2 in. (DN15): 0.57 lb (0.26 kg)
		3/4 in. (DN20): 0.93 lb (0.42 kg)
		1 in. (DN25): 1.48 lb (0.67)
	Three-Way Models	1/2 in. (DN15): 0.68 lb (0.31 kg)
		3/4 in. (DN20): 1.06 lb (0.48 kg)
		1 in. (DN25): 1.76 lb (0.8 kg)

(a) Proper water treatment is recommended; refer to VDI 2035 Standard.

(b) Closeoff pressures apply to both normally open and normally closed ports in two-way and three-way valve models.

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Issue Date 0299

Technical Data Sheet for Two-Way N.O. and N.C., and Three-Way Mixing VG5000 Series Electric Zone Valves

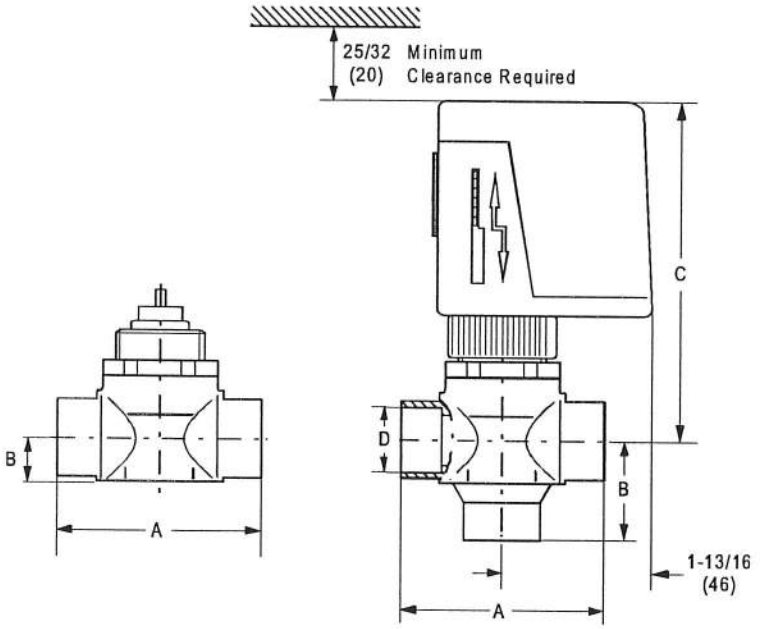

Figure 1: Dimensions for VG5000 Series Electric Zone Valves Featuring Sweat End Connections, in. (mm) (Refer to Table 1.)

Table 1: Dimensions, in. (mm)

Dimensions in. (mm)	Two-Way N.O. and N.C. Valves			Three-Way Mixing Valves		
	1/2 in. (DN15)	3/4 in. (DN20)	1 in. (DN25)	1/2 in. (DN15)	3/4 in. (DN20)	1 in. (DN25)
A	2-13/32 (61)	3-1/16 (78)	3-3/4 (95)	2-13/32 (61)	3-1/16 (78)	3-3/4 (95)
B	1/2 (13)	21/32 (17)	21/32 (17)	1-7/32 (31)	1-17/32 (39)	1-29/32(48)
C	3-15/16 (100)	4-1/16 (103)	4-3/16 (106)	3-15/16 (100)	4-3/32 (104)	4-1/4 (108)
D	5/8 (16)	7/8 (22)	1-1/8 (29)	5/8 (16)	7/8 (22)	1-1/8 (29)

Code No. LIT-10000028

Table 2: Ordering Data VG5240CC+7452G

V G		Valve Global	
1 2	5	Product Family	5 = Electric Zone Valve
3	2	Body Type	2 = Two-Way N.O. (PDTC) 4 = Two-Way N.C. (PDTO) 8 = Three-Way Mixing
4	4	End Connections	4 = Threaded (NPT) 7 = Sweat Ends
5	0	Trim	0 = Stainless Steel Stem, Rubber EPT Plug, Flat Disk
6	E C	Size and Maximum Cv (Kv = CV x 0.857)	BC = 1/2 in. (DN15) CC = 1/2 in. (DN15) DC = 1/2 in. (DN15) EC = 1/2 in. (DN15) HC = 3/4 in. (DN20) JC = 3/4 in. (DN20) KC = 3/4 in. (DN20) FC = 1 in. (DN25) LC = 1 in. (DN25) MC = 1 in. (DN25)
7 8	+	Actuator Mounting	+ = Factory-Mounted Actuator *(Leave fields 9 through 14 blank for valve without factory-mounted actuator.)*
9	7 0 1 0	Actuator Style	7010 = VA-7010 Two-Position *(Avail. on All Valve Body Types)* 7450 = VA-7450 Incremental *(Avail. on N.O. and Three-Way Mixing Valve Body Types Only)* 7452 = VA-7452 Proportional
10 11 12 13	G	Supply Voltage	A = 120 VAC D = 230 VAC G = 24 VAC F = 208 VAC S = 277 VAC
14			

Threaded (NPT)			Sweat Ends		
N.O.	N.C.	Mix	N.O.	N.C.	Mix
—	—	—	0.46	—	—
0.74	0.74	0.74	0.74	0.74	—
1.17	1.17	1.17	1.17	1.17	—
1.9	1.9	1.9	1.9	1.7	1.7
—	1.9	—	—	1.9	—
3.0	3.0	3.0	3.0	3.0	—
4.1	4.1	4.1	4.1	3.7	3.7
—	3.0	—	—	3.0	—
—	4.7	—	4.7	4.7	—
6.4	6.4	6.4	6.4	5.8	5.8

VA-7010	VA-7450	VA-7452
-8002	—	—
-8003	—	—
-8001	-10011	-90011
-8006	—	—
-8007	—	—

1	2	3	4	5	6	7	8	9	10	11	12	13	14 = Field
V	G	5	2	4	0	E	C	+	7	0	1	0	G
Valve								+	*Actuator*				

Example: Electric zone valve, two-way N.O. (PDTC), threaded (NPT) end connections, stainless steel stem, rubber EPT plug, flat disk, 1/2 in. (DN15), 1.9 Cv, factory-mounted VA-7010-8001 Electric Actuator, 24 VAC supply.

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Issue Date 0299

Technical Data Sheet for VG7000 Series Bronze Control Valves

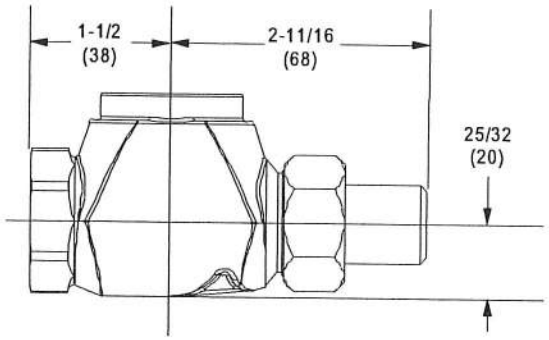


Figure 1: 1/2 in. Normally Open Union Globe VG7000 Series Bronze Control Valve Dimensions, in. (mm)

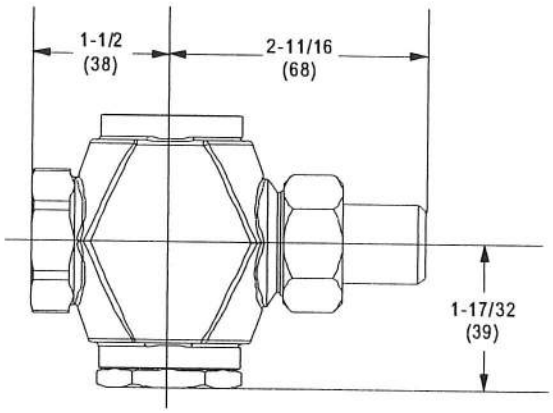


Figure 2: 1/2 in. Normally Closed Union Globe VG7000 Series Bronze Control Valve Dimensions, in. (mm)

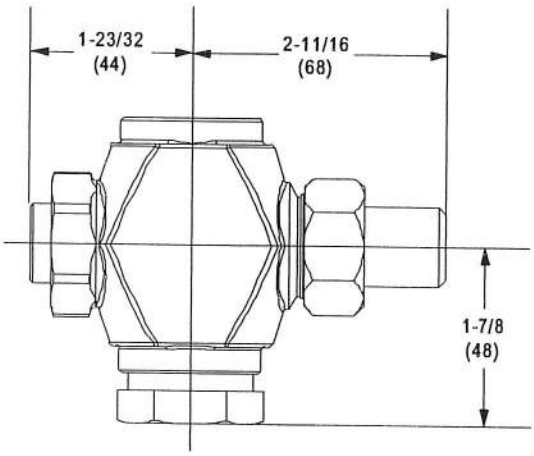


Figure 3: 1/2 in. Normally Open Union Angle VG7000 Series Bronze Control Valve Dimensions, in. (mm)

Code No. LIT-10000029

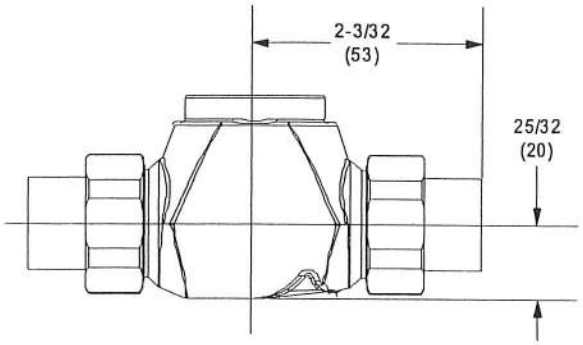


**Figure 4: 1/2 in. Normally Open
Union Sweat VG7000 Series Bronze Control Valve
Dimensions, in. (mm)**

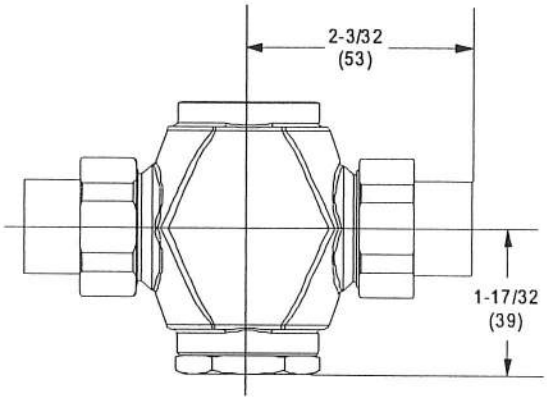


**Figure 5: 1/2 in. Normally Closed
Union Sweat VG7000 Series Bronze Control Valve
Dimensions, in. (mm)**

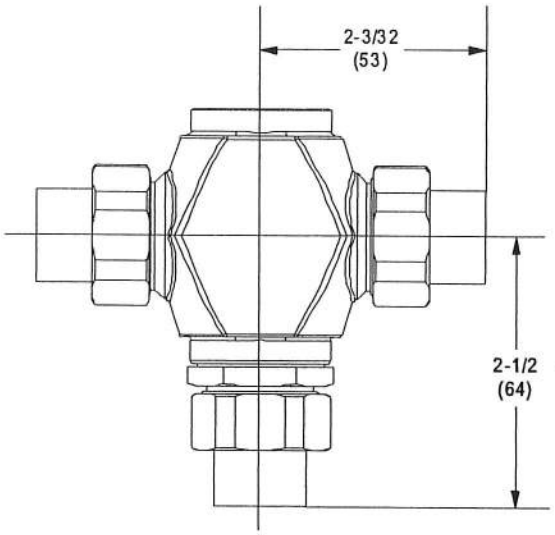


**Figure 6: 1/2 in. Three-Way Mixing
Union Sweat VG7000 Series Bronze Control Valve
Dimensions, in. (mm)**

Table 1: Ordering Data – VG7000 Series Bronze Control Valves

VG (1 2)	Valve Global	
7 (3)	Product Family	7 = Cast Bronze
2 (4)	Body Type	2 = Two-Way, Normally Open/Push-Down-To-Close 4 = Two-Way, Normally Closed/Push-Down-To-Open 5 = Two-Way Angle, Normally Open/Push-Down-To-Close 8 = Three-Way Mixing
4 (5)	End Connections	4 =Threaded (NPT) 5 = Union Globe / Union Angle 7 = Union Sweat, 3/8 in. I.D. (1/2 in. Body Size Only) 8 = Union Sweat, 1/2 in. I.D. (1/2 in. Body Size Only) 9 = Union Sweat, 3/4 in. I.D. (1/2 in. Body Size Only)
1 (6)	Trim and Flow Characteristic	1 = Brass Equal Percentage (All Two-Way and 1/2 in. Three-Way) 2 = Brass Linear (Two-Way Union Angle and All Three-Way) 3 = Stainless Steel Equal Percentage (Two-Way Only) 4 = Stainless Steel Linear (Three-Way Only)
L (7)	Size and Cv (Kv)	C = 1/2 in., 0.73 Cv (0.63 Kv) E = 1/2 in., 1.8 Cv (1.6 Kv) G = 1/2 in., 4.6 Cv (4.0 Kv) L = 3/4 in., 7.3 Cv (6.3 Kv) N = 1 in., 11.6 Cv (10.0 Kv) P = 1-1/4 in., 18.5 Cv (16.0 Kv) R = 1-1/2 in., 28.9 Cv (25.0 Kv) S = 2 in., 46.2 Cv (40.0 Kv)
T (8)	Stem Type	T = Standard Threaded Stem (All Except V-3801 and V-500) S = Slotted Stem and Small Bonnet (Factory-Mounted V-3801 Only) L = Large Threaded Stem (Factory-Mounted V-500 Only)
+ (9)	Actuator Mounting	+ = Factory-Mounted Actuator (See Tables 2 and 3.) *(Leave fields 9 through 15 blank for valve without factory-mounted actuator.* *Valve without factory-mounted actuator is available with standard threaded stem only.)*

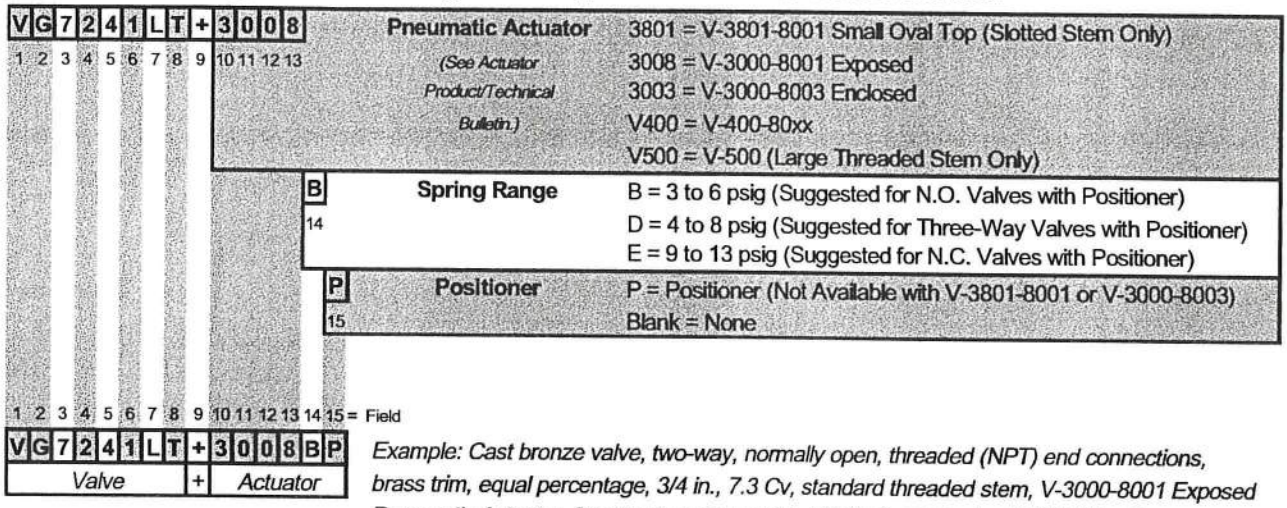
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 = Field

V	G	7	2	4	1	L	T	+						
Valve								+	Actuator					

Example: Cast bronze valve, two-way, normally open/push-down-to-close, threaded (NPT) end connections, brass trim, equal percentage, 3/4 in., 7.3 Cv, standard threaded stem.

Note: Refer to Table 2 when adding a factory-mounted pneumatic actuator to a valve body. Refer to Table 3 when adding a factory-mounted electric actuator to a valve body.

Table 2: Ordering Data – Adding a Factory-Mounted Pneumatic Actuator



Example: Cast bronze valve, two-way, normally open, threaded (NPT) end connections, brass trim, equal percentage, 3/4 in., 7.3 Cv, standard threaded stem, V-3000-8001 Exposed Pneumatic Actuator, 3 to 6 psig spring range, with factory-mounted V-9502 Positioner.

Note: Refer to Table 1 when ordering a valve body only. Refer to Table 3 when adding a factory-mounted electric actuator to a valve body.

Table 3: Ordering Data – Adding a Factory-Mounted Electric Actuator

V G 7 2 4 1 L T + 7 1 5 0 1 2 3 4 5 6 7 8 9 10 11 12 13	**VA-7150/VA-7200 Electric Actuator** *(See Actuator Product/Technical Bulletin.)*	7150 = VA-7150-1001 On/Off (Incremental/Floating) 7152 = VA-7152-1001 Proportional, 0-10 VDC 7153 = VA-7153-1001 On/Off (Incr./Fltng), Feedback 7200 = VA-7200-1001 On/Off (Incremental/Floating) 7202 = VA-7202-1001 Proportional, 0-10 VDC 7203 = VA-7203-1001 On/Off (Incr./Fltng), Feedback	*(Avail. for PDTC Two-Way and Three-Way Body Styles Only)*
G 14	**Voltage (VA-7150/VA-7200)**	G = 24 VAC	
 15	**Accessories (VA-7150/VA-7200)**	Blank = None	
9 2 6 10 11 12	**M9100/M9200 Electric Actuator** *(See Actuator Product/Technical Bulletin.)*	**Double Acting** 916 = M9116-xxx-2, 24 VAC/VDC **Spring Return** 926 = M9216-xxx-2, Spring-to-Open (Up), 24 VAC/VDC 946 = M9216-xxx-2, Spring-to-Close (Down), 24 VAC/VDC	*(Available for PDTC Two-Way and Three-Way Body Styles Only)*
A G A 13 14 15	**Features (M9100/M9200)**	AGA = On/Off (Incremental/Floating) AGC = On/Off (Incremental/Floating), 2 Aux. GGA = Prop., 0-10 VDC, Feedback GGC = Prop., 0-10 VDC, Feedback, 2 Aux. Sw. HGA = Prop., 0-10 VDC, Feedback HGC = Prop., 0-10 VDC, Feedback, 2 Aux. Sw.	*(M9116 Only)* *(M9216 Only)*
3 U 10 11	**M100 Series Electric Actuator** *(See Actuator Product/Technical Bulletin.)*	**Double Acting** 5U = M150xxx **Spring Return** 3U = M130xxx, Spring-to-Open (Up) 3D = M130xxx, Spring-to-Close (Down)	*(Available for PDTC Two-Way and Three-Way Body Styles Only)*
A G A 12 13 14	**Features (M100 Series)**	AGA = On/Off (Incremental/Floating), 24 VAC CGA = Proportional, Digital Input, 24 VAC GGA = Proportional, 0-10 VDC, 24 VAC JGA = Proportional, Slide-Wire, 24 VAC	
A 15	**Accessories (M100 Series)**	A = Y68AA-1 Transformer, 120 VAC D = Y68DA-1 Transformer, 240 VAC H = Y68HA-1 Transformer, 24 VAC Blank = None Required	*(Not Available for CGA Models)*
8 0 2 0 10 11 12 13	**VA-8020/VA-8050 Electric Actuator** *(See Actuator Product/Technical Bulletin.)*	8020 = VA-8020-1, On/Off (Incr./Floating) 8022 = VA-8022-1, Proportional 8050 = VA-8050-1, On/Off (Incr./Floating) 8051 = VA-8051-1, On/Off (Incr./Fltng), Feedback 8052 = VA-8052-1, Proportional	*(Available for PDTC Two-Way and Three-Way Body Styles Only)* *(Avail. for All Body Styles)*
G 14	**Voltage (VA-8020/VA-8050)**	G = 24 VAC	
 15	**Accessories (VA-8020/VA-8050)**	Blank = None	

1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 = Field

V G 7 2 4 1 L T	+	8 0 2 0 G
Valve	+	*Actuator*

Example: Cast bronze valve, two-way, push-down-to-close, threaded (NPT) end connections, brass trim, equal percentage, 3/4 in., 7.3 Cv, standard threaded stem, VA-8020-1 On/Off (Incremental/Floating) Electric Actuator, 24 VAC supply.

Note: Refer to Table 1 when ordering a valve body only. Refer to Table 2 when adding a factory-mounted pneumatic actuator to a valve body.

JOHNSON CONTROLS

Controls Group 507 E. Michigan Street
P.O. Box 423, Milwaukee, WI 53202
Code No. Lit-1924175

VA-715x Series

Electric Valve Actuator

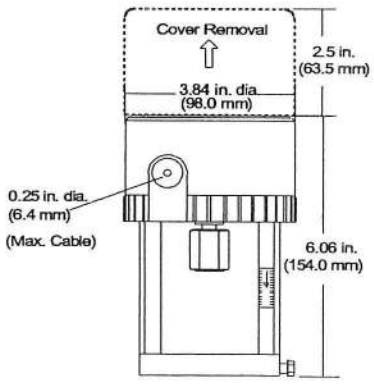
VA-715x Electric Valve Actuator

Description

The VA-715x Series synchronous, motor-driven actuator provides incremental (three-wire), incremental with feedback, or proportional control of valves with up to 3/4 in. stroke in heating, ventilating, and air conditioning applications.

This compact, non-spring return actuator has a 90 lb (400 N) force minimum, and responds to a variety of input signals.

The VA-715x Series can be easily field mounted or ordered factory coupled to VG7000 Series Bronze Control Valves. In addition, the VA-715x Series can be field mounted to VB-3766, 3966, and 4332 bronze flare valve bodies.



Dimensions in. (mm)

Features

- magnetic clutch provides constant output force for positive closeoff of valves, and protects motor in stall conditions
- selectable direct and reverse action eases setup and installation
- durable construction provides longer cycle life
- compact unit provides 90 lb force output covering a wide range of applications with just one actuator
- unique yoke design enables easy field mounting to valves, reducing installation and stroke adjustment time

Applications

The VA-715x Series Actuator is used in conjunction with VG7000 Series Valves for hot water and chilled water systems.

Repair Parts

Unit replacement only.

To Order

Refer to the selection chart below for ordering information.

Selection Chart

Code Number	Description
VA-7150-1001	Three-Wire Incremental
VA-7153-1001	Three-Wire Incremental with Position Feedback
VA-7152-1001	Proportional, 0 to 10 VDC

Accessories

Code Number	Description
V-9999-670	Bonnet Adaptor (Used for Field Mounting to VT Series Valve Body with Threaded Stem)
Y20EBE-2	Adaptor Kit (Used for Field Mounting to VT Series Valve Body with Slotted Stem)
VA-7150-1900	Conduit Adaptor Kit
V-9999-HW1	Mounting Kit to Mount VA-715x or VA-720x Series Electric Actuators to Honeywell® V75011A, F, G, 1/2 Through 3 in. Single-Seated and V5013F Three-Way Valves
V-9999-BC1	Mounting Kit to Mount VA-715x or VA-720x Series Electric Actuators to Barber-Colman® 1/2 Through 1-1/4 in. VB-9xxx Valve Bodies

Specifications

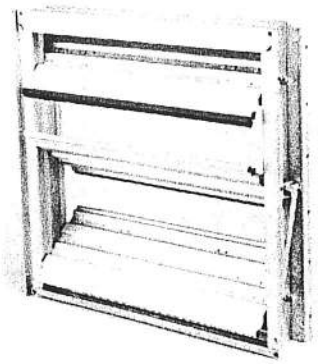
VA-715x Series Electric Valve Actuator	
Power Requirements	24 VAC (20 to 30 VAC), 50/60 Hz
Input Signal	Incremental: 24 VAC, 50/60 Hz Incremental with Position Feedback: 24 VAC, 50/60 Hz Proportional: 0 to 10 VDC
Input Signal Adjustments (Proportional)	Input Signal: 0 to 5, 5 to 10, 0 to 10 VDC (Jumper Selectable) Action: Drive Up (RA) or Drive Down (DA) on Signal Increase (Jumper Selectable) Factory Setting: 0 to 10 VDC Over 3/4 in. (19 mm) Stroke, DA
Input Impedance (Proportional)	100,000 Ohms
Feedback Signal	Proportional: 0 to 2000 Ohm ±25%, 1/4 Watt, Over 3/4 in. (19 mm) Stroke
Mechanical Output	90 lb Force (400 N) Minimum
Stroke Range	5/16 to 25/32 in. (8 to 20 mm)
Nominal Stroke Timing	50 Hz: 85 Seconds 5/16 in. (8 mm) Stroke 135 Seconds 1/2 in. (13 mm) Stroke 200 Seconds 3/4 in. (19 mm) Stroke 60 Hz: 70 Seconds 5/16 in. (8 mm) Stroke 110 Seconds 1/2 in. (13 mm) Stroke 165 Seconds 3/4 in. (19 mm) Stroke
Media Temperature	280°F (138°C) Maximum
Electrical Connection	Screw Terminals for 16 AWG Maximum
Mechanical Connection	For 1/4 - 28 UNF Valve Stem
Enclosure	NEMA 2, IP42
Ambient Conditions	Operating: 0 to 140°F (-18 to 60°C); 10 to 90% RH Non-Condensing 86°F (30°C) Maximum Dew Point Storage: -4 to 150°F (-20 to 65°C); 5 to 90% RH, 86°F (30°C) Maximum Dew Point
Agency Listings	UL 873 Listed, File E27734 CSA C22.2 No. 139 Certified, File LR85083

JOHNSON CONTROLS

Controls Group 507 E. Michigan Street
P.O. Box 423, Milwaukee, WI 53202
Code No. Lit-1923135

CD-1330

Class II Control Damper



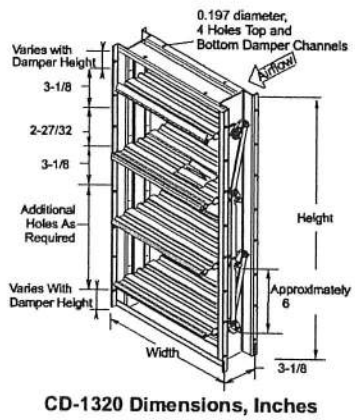
CD-1320 Control Damper

Description

The CD-1320 Control damper is designed to control the flow of air in heating, ventilating, and air conditioning systems. The CD-1320 is a Class II leakage rated damper available in 1 inch increments.

Construction

Part	Construction
Frame	13-gauge galvanized steel, mechanically joined
Blades	Double-piece, 22-gauge galvanized steel, 6 inch nominal width, 8 inch maximum width
Linkage	1/8 inch rolled steel, zinc plated, concealed in end channel of frame
Blade Pin	3/8 inch square steel, zinc plated
Bearings	Self-lubricating acetal or bronze
Side Seal	Self-compensating stainless steel
Blade Seal	Santoprene or Silicone



CD-1320 Dimensions, Inches

CD-1320 standard dampers are available in one inch increments. To find actual damper size, multiply the nominal size by 0.99479. All Johnson Controls damper dimensions are from the outside edges of the damper frame.

The rigid frames are constructed of formed 13-gauge galvanized sheet steel, mechanically joined with linkage concealed in the side channel to eliminate noise and friction. Compressible spring stainless steel side seals, and self-lubricating bearings are standard.

Johnson Controls CD-1320 dampers have no components that require routine scheduled maintenance.

Features

- dual linkage standard for ease of installation and no hassle actuator mounting.
- three working day standard shipping, next working day shipping available at a cost premium
- three year warranty on materials and workmanship
- tested to over 100,000 full stroke cycles

Accessories

Refer to *Damper Accessory Kits* and *Damper Replacement Parts.*

Applications

- tight shut off in supply and return air applications.
- volume and pressure control

Options

A = field-installed jackshaft

F = 1.5 inch L flanging air entering side (Cannot be used with Option "G"

G = 1.5 inch L flanging air leaving side (Cannot be used with Option "F"

To Order

Select Class II control dampers using *Damper System Building Blocks* as detailed in the Selection Chart.

Selection Chart

CPPBS -

	Application	**C = Control**
	Blade Operation	**O = Opposed** **P = Parallel**
	Blade Type	**P = Double-piece**
	Bearing Type	**A = Acetal** **B = Bronze**
	Seal Type	**H = Silicone** **S = Santoprene**
	Width Dimensions	**08 to 96 in.**
	Height Dimensions	**06 to 76 in.**
	Options as required	**Limit 2 from *Options* list**
- 0 x 0	**Ordering Code Number**	

Specifications

CD-1330 Class II Control Damper

Leakage Resistance - Fully Closed	Any given size shall not exceed: 10 cfm per square foot at a 1 inch pressure differential 20 cfm per square foot at a 4 inch pressure differential 28 cfm per square foot at an 8 inch pressure differential				
Pressure Drop (in. WG) - Fully Open		**1000 fpm**	**2000 fpm**	**3000 fpm**	**4000 fpm**
	24 x 24 in.	0.05	0.20	0.42	0.77
	48 x 48 in.	0.03	0.10	0.25	0.45
Operating Torque					
0.5 in. static pressure and 100 fpm fully open approach velocity	4.5 in-lb/sq ft				
1 in. static pressure and 1000 fpm fully open approach velocity	5.5 in-lb/sq ft				
Velocity and Pressure limits recommended to meet other performance specifications (not structural limits):	**12 in. wide damper** 8000 fpm at 8 in. static **24 in. wide damper** 6000 fpm at 8 in. static **36 in. wide damper** 4000 fpm at 6 in. static **48 in. wide damper** 2000 fpm at 8 in. static				
Temperature Rating	**Normal** -40°F to 200°F (-40°C to 93°C) **Extended** -40°F to 250°F (-40°C to 121°C)				
Approximate Weight	**Minimum 8 x 6 in.** 5 lb (2.27 kg) **Maximum 48 x 76 in.** 108 lb (48.99 kg)				

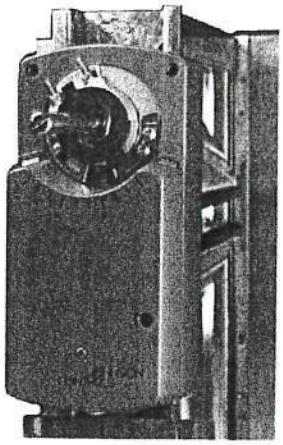
Note: The above data was compiled from test data, corrected to standard temperature and pressure conditions, determined using instrumentation and procedures in accordance with AMCA Standard for Test Methods for Louvers, Dampers, and Shutters No. 500.

JOHNSON CONTROLS

Controls Group 507 E. Michigan Street
P.O. Box 423, Milwaukee, WI 53202
Code No. Lit-1922035

M9200 Series

Electric Motor Actuator



M9200

Description

The M9200 Series is a direct-mount, spring return line of motor actuators that operates on 24 VAC or VDC power and is available for use with on/off, floating, proportional, or resistive controllers. These bi-directional actuators require no linkages and are easily installed on round damper shafts up to 3/4 inch (20 mm) diameter or square shafts up to 5/8 inch (16 mm).

The M9200 model delivers up to 140 lb-in (16 Nm) of torque. The angle of rotation is mechanically adjustable from 0 to 90°. Integral auxiliary switches are available for indicating end stop position or to perform switching functions at any angle within the selected rotation range. Position feedback is available through switches, a potentiometer, or a 0 to 10 VDC signal.

Features

- bi-directional fail-safe spring return allows user selectable rotation/spring return direction which simplifies installation
- integral zero and span adjustment allows sequential operation of dampers from a single input signal of 0 (2) to 10 VDC or 0 to 20 mA
- manual override allows manual positioning when the actuator is not powered and simplifies setup and field adjustments
- electronic stall detection provides higher reliability by deactivating actuator motor when a stall condition is detected
- output position feedback (standard on proportional and resistive models and optional on floating models) provides simple closed-loop control with accurate position sensing
- calibration output increases speed and accuracy of zero and span adjustments over entire range without waiting for mechanical rotation
- wide range resistive input interfaces to 3-wire resistive controllers from 100 to 10k ohms
- NPT conduit adaptor (included) meets electrical code requirements

Applications

The M9200 Series is designed to position air dampers and valves in HVAC systems. Typical applications include:

- positioning of return air, exhaust, or outdoor air dampers
- controlling face and bypass dampers
- positioning blades for variable volume fans
- positioning valves when used with the M9000-500 Valve Linkage

To Order

Specify the code number from the following selection chart.

Selection Chart

	Application	**M92 = Spring Return**
	Running Torque	**16 = 140 lb-in (16 N²n)**
	Control Signal	**A = 24 VAC/VDC, Floating** **B = On/Off** **H = VDC and mA with Zero and Span** **J = Resistive**
	Power Source	**G = 24 VAC**
	Feedback	**A = None (proportional models have 0 - 10 VDC Standard)** **C = 2 Auxiliary Switches** **D = 135 ohm Potentiometer (use with Floating only)** **E = 1000 ohm Potentiometer (use with Floating only)**
		2 = US Version
M 9 2 1 6 - G - 2	**Ordering Code**	

Accessories

Code Number	Description
DMPR-KR003	Sleeve Pin Kit (for RD-2000 round dampers with a 5/16 in. shaft) [a]
DMPR-KC003	Blade Pin Extension without Bracket (for CD-1300 direct mount applications)
DMPR-KC254	M9000 Inside Frame Mounting Kit
M9000-100	Conduit Adaptor Kit
M9000-151	Base Mount Linkage Kit
M9000-153	Crank Arm Kit
M9000-154	1 in. Jackshaft Coupler
M9000-200	Commissioning Tool
M9000-500	Valve Linkage

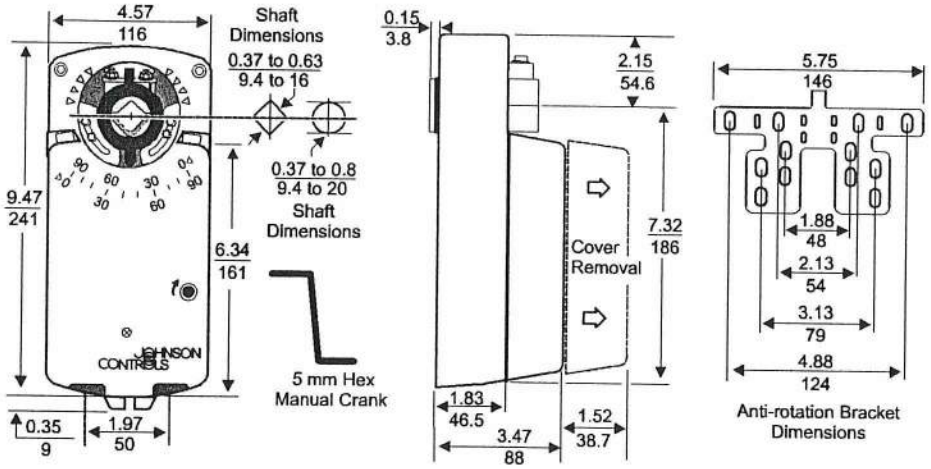
(a) Furnished with the damper and can be ordered separately.

JOHNSON CONTROLS

Controls Group 507 E. Michigan Street
P.O. Box 423, Milwaukee, WI 53202
Code No. Lit-1922035

M9200 Series Electric Motor Actuator (Continued)

Dimensions in. (mm)



Specifications

M9200 Series Electric Motor Spring Return Actuator	
Power Requirements	20 to 30 VAC at 50/60 Hz or 24 VDC ±10%; 12 VA supply, minimum; Class 2 (10 VA supply, minimum for On/Off models only)
Input Signal	Floating (Axx Models): 24 VAC at 50/60 Hz or 24 VDC, 4.8 mA (on/off mode, 500 mA maximum) On/Off (Bxx Models): 24 VAC at 50/60 Hz or 24 VDC, 420 mA maximum Proportional: 0 to (2)10 VDC or 0 (4) to 20 mA Resistive: 100 to 10,000 ohms
Input Signal Adjustments	Floating Factory Setting: Terminals 1 and 3, CW rotation; Terminals 1 and 4, CCW rotation On/Off Factory Setting: Terminals 1 and 2, CW rotation Proportional (Voltage Input or Current Input): Jumper selectable, Fixed: 0 (2) to 10 VDC or 0 (4) to 20 mA Adjustable:Zero, 0 to 6V (0 to 12 mA); Span, 2 to 10V (4 to 20 mA) Factory Setting: 0 to 10 VDC, 0 to 20 mA, CW rotation with signal increase Proportional and Resistive: Action is jumper selectable Direct (CW) or Reverse (CCW) with signal increase.
Input Impedance	Proportional: Voltage Input, 100,000 ohms; Current Input, 500 ohms Resistive: 1.8 Megohms
Feedback Signal	Floating: 1,000 ohms or 135 ohms (models with feedback potentiometer) Proportional: 0 to 10 VDC or 2 to 10 VDC for 90° (1 mA at 10 VDC) (Corresponds to input signal span selection and also rotation limits) Resistive: 0 to 10 VDC for 90° (1 mA at 10 VDC)
Switch Contact Rating	Two SPDT rated at 24 VAC 1.5A inductive, 3A resistive, 35 VA maximum per switch
Spring Return	Factory Setting: CCW (Direction is selectable with the coupler.)
Mechanical Output	running torque: 140 lb-in (16 Nm)
Rotation Range	Adjustable from 30 to 90°, mechanically limited to 93°
Rotation Timing	70 to 130 seconds for 0 to 140 lb-in (16 Nm); 90 seconds nominal at 50% rated load (Powered rotation is faster in the spring return direction than in the spring winding direction; power failed spring return is less than 15 seconds.)
Cycle Life	65,000 full stroke cycles
Electrical Connection	Screw terminals for 22 to 14 AWG (Insert a maximum of two 18, 20, or 22 AWG per terminal.)
Mechanical Connection	3/8 to 3/4 in. (10 to 20 mm) diameter round shaft 3/8 to 5/8 in. (10 to 16 mm) square shaft
Enclosure	NEMA 2, IP42 (Not for outdoor use without a protective cover.)
Ambient Conditions	Operating: -4 to 122°F (-20 to 50°C); 0 to 95% RH, non-condensing Storage: -40 to 186°F (-40 to 86°C); 0 to 95% RH, non-condensing
Dimensions (H x W x D)	9.82 x 4.57 x 3.62 in. (249.4 x 116 x 91.9 mm)
Shipping Weight	6.4 lb (2.9 kg)
Agency Compliance	UL 873 Listed, File E27734, Guide XAPX; CSA C22.2 No. 139 Certified, File LR85083, Class 3221 02 CE Directive 89/336/EEC

HVAC Control Shop Drawings

TABLE OF CONTENTS

Intelligent Building Controls Ltd.

Johnson Controls Authorized Building Control Specialist

- [x] Environmental Control System
- [x] Building Automation System
- [ ] Fire Management System
- [ ] Security System
- [ ] Lighting Services
- [ ] Telecommunication System
- [ ] Integrated Motor Control Center
- [ ] Air and Water Systems Balancing
- [ ] Instrumentation System Installation
- [ ] Building Operations Management
- [ ] Energy Conservation Control
- [ ] Custom Programmed Maintenance :

Automatic Temperature Controls
Direct Digital Control Systems
Security and Card Access Systems
Lighting Control Systems
Integration of Building Systems

Intelligent Building Controls Ltd.
1107 Nicholson St.
Victoria, BC V8X-3L5
Phone: (250) 216-0665 FAX: (250) 727-2113

PROJECT

Herzberg Institute of Astrophysics

ARCHITECT	ENGINEER
Cohos Evamy Interplan	Reid Crowther & Partners Ltd.
USER DEFINED	CONTRACTOR: Strathcona Mechanical Ltd.

REFERENCE DRAWING	NO.	REVISION-LOCATION	PCN	DATE	BY

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DATE: 3/31/00
TIME: 10:26 AM
FILE NAME:

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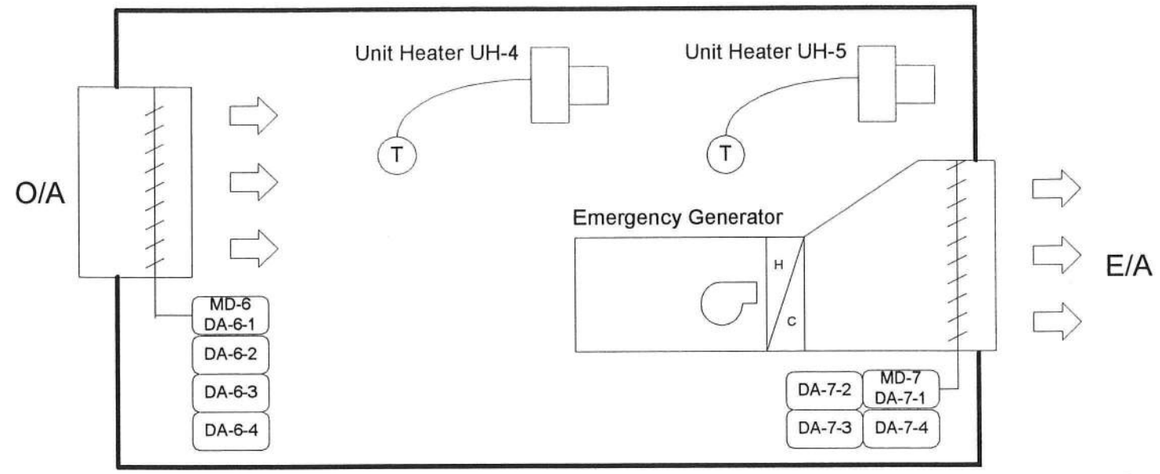
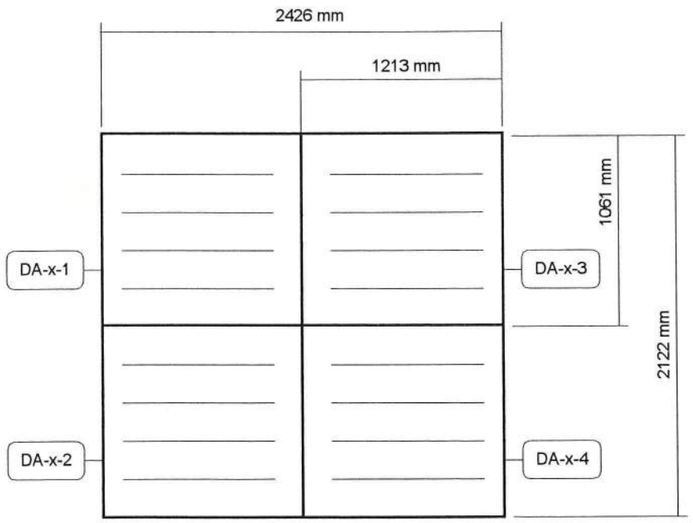


Fire Pump Station HVAC



Detail C:
Exhaust Air Damper MD-6
& MD-7 Installation

DAMPER INSTALLATION NOTES

1. All dampers are shown as viewed with the air blowing in your face.
2. Damper is labelled with the air leaving side and the preferred damper drive blade.
3. The damper must be driven from the linkage side.

Bill Of Material

Code	Qty	Model	Description
MD-6, 7	2	CPPBS-xxx	Refer to Damper Schedule
DA-6-1,2,3,4	4	M9216-BGA-2	Refer to Damper Schedule
DA-7,1,2,3,4	4	M9216-BGA-2	Refer to Damper Schedule
XFMR-1	1	AS-XFR100-0	100 VA, 120/24 VAC Transformer w/brkr

Sequence of Operation

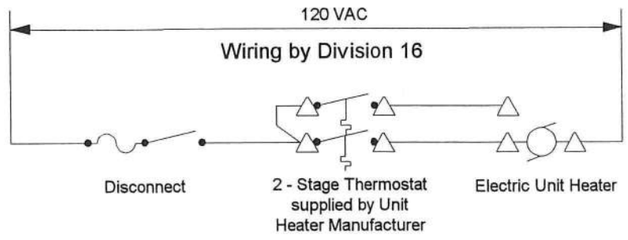
Emergency Generator Cooling

When the generator is not running, the outdoor air intake damper MD-6 and the exhaust air damper MD-7 shall both spring return to the closed position.

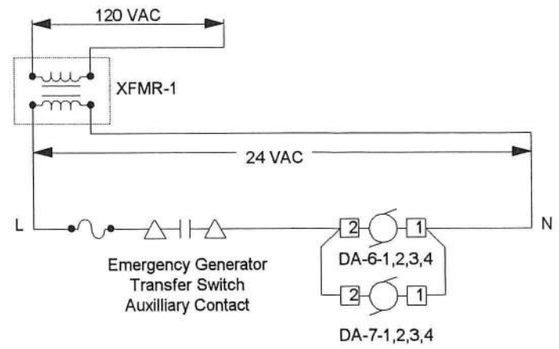
When the generator starts, the transfer switch auxiliary contact shall energize a 24 VAC circuit and drive both dampers fully open.

Unit Heater UH-4,5 Operation

The electric unit heater shall be cycled by the room thermostat as required to maintain room temperature at setpoint.



Unit Heater UH-4, 5 Wiring



Damper Actuator Wiring

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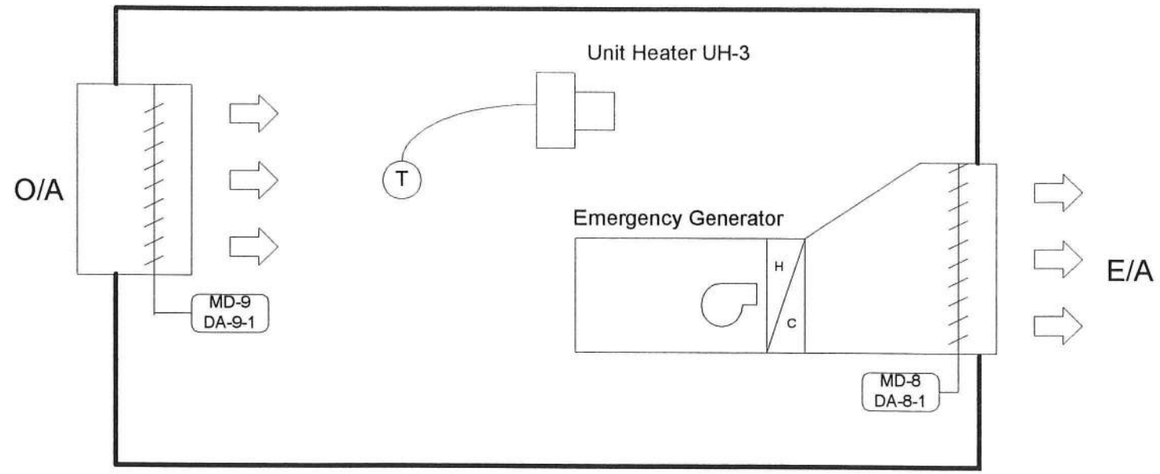
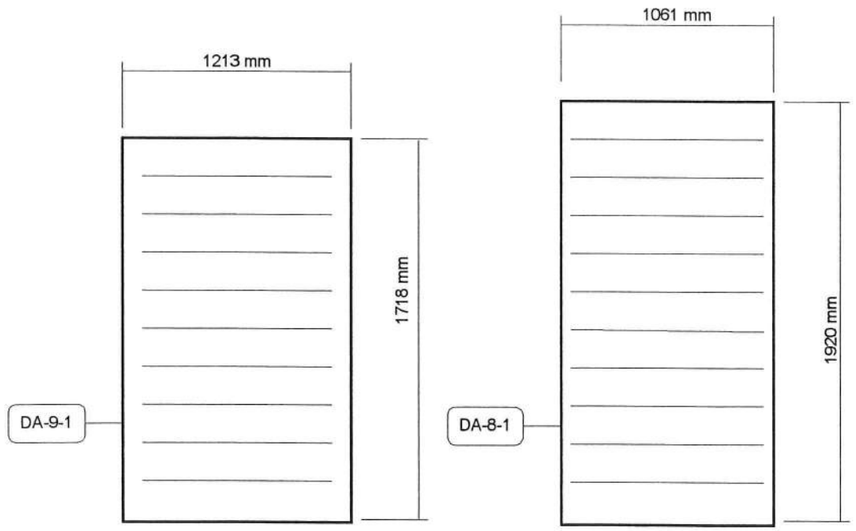
TIME 02:02 PM		NO	REVISION-LOCATION	ECN	DATE	BY
	PROJECT TITLE	Sales Engineer RLS	Project Manager RLS	Designer RLS	DRAWN BY RLS DATE 02/01/00	APPROVED BY DATE
FILE NAME FPStation.vsd	**HERZBERG INSTITUTE OF ASTROPHYSICS Project #1973**	Intelligent Building Controls Ltd.	Branch Information: 1107 Nicholson St. Victoria, BC V8X - 3L6 Phone:(250) 216-0665 FAX: (250) 727-2113 e-mail: rls@direct.ca		CONTRACT NUMBER 99-0012	DRAWING NUMBER 1



Booster Pumphouse HVAC



Detail A:
Exhaust Air Damper MD-9
Installation

Detail B:
Outdoor Air Damper MD-8
Installation

DAMPER INSTALLATION NOTES

1. All dampers are shown as viewed with the air blowing in your face.
2. Damper is labelled with the air leaving side and the preferred damper drive blade.
3. The damper must be driven from the linkage side.

Bill Of Material

Code	Qty	Model	Description
MD-8, 9	2	CPPBS-xxx	Refer to Damper Schedule
DA-8-1, 9-1	2	M9216-BGA-2	Refer to Damper Schedule
XFMR-1	1	AS-XFR050-0	120/24 VAC Transformer w/brkr
	1	AS-ENC100-0	Metal Enclosure

Sequence of Operation

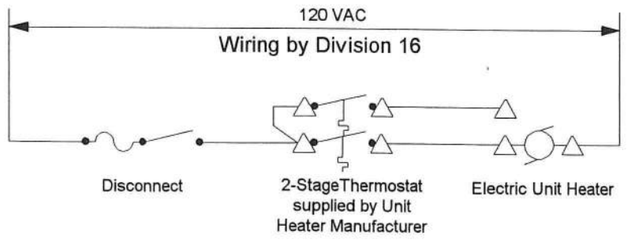
Emergency Generator Cooling

When the generator is not running, the outdoor air intake damper MD-8 and the exhaust air damper MD-9 shall both spring return to the closed position.

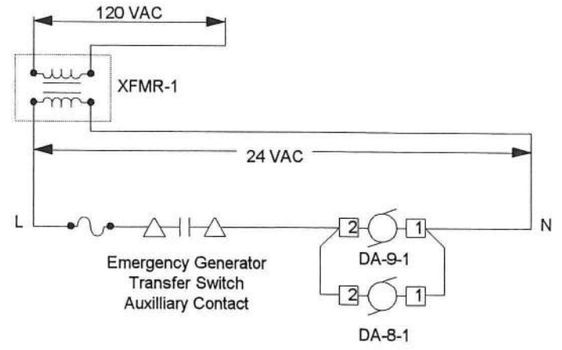
When the generator starts, the transfer switch auxiliary contact shall energize a 24 VAC circuit and drive both dampers fully open.

Unit Heater UH-3 Operation

The electric unit heater shall be cycled by the room thermostat as required to maintain room temperature at setpoint.



Unit Heater UH-3 Wiring



Damper Actuator Wiring

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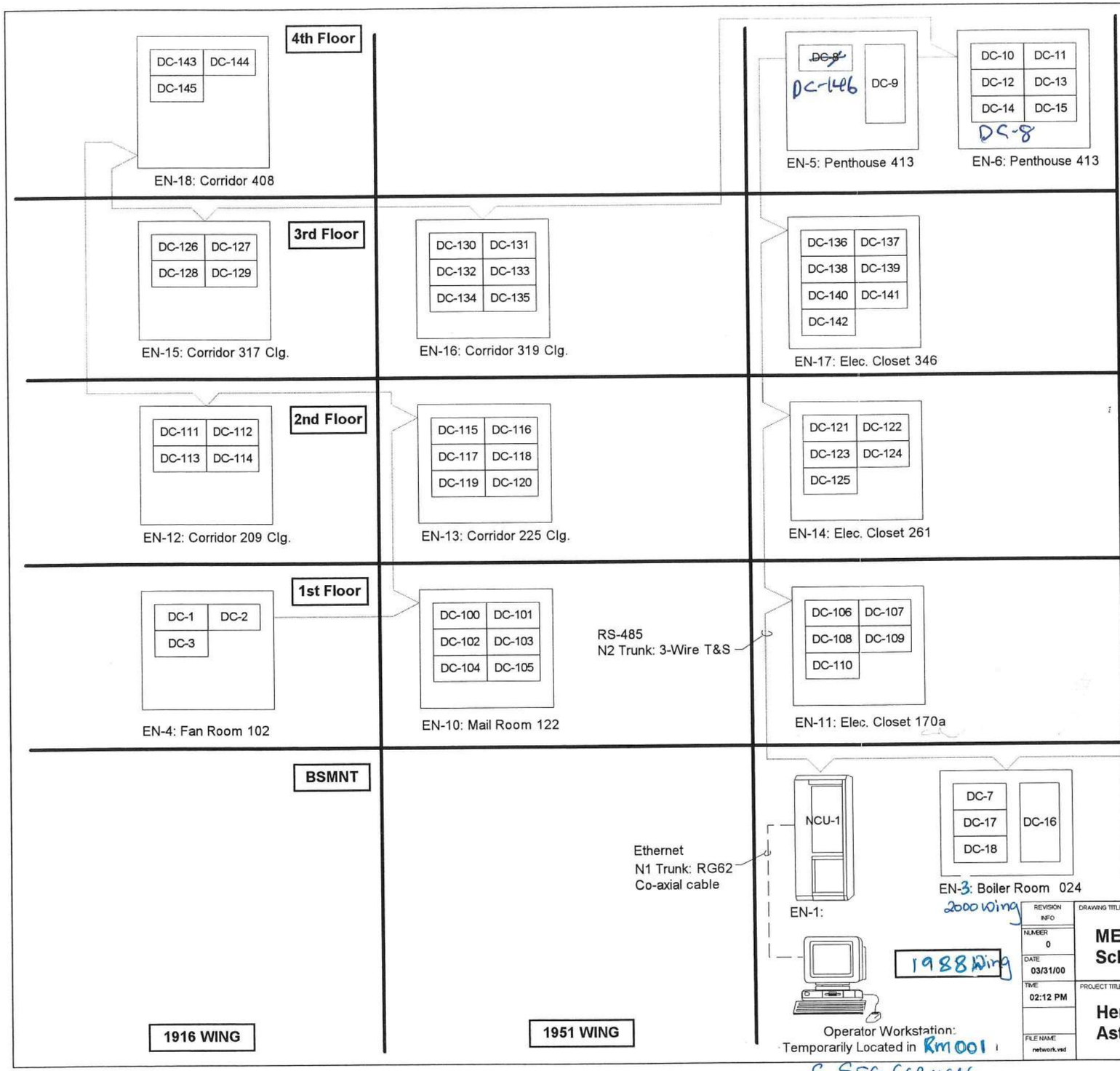
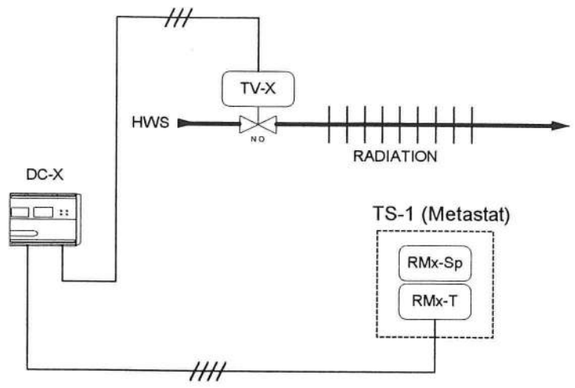
FILE NAME: FireBooster.vsd	Intelligent Building Controls Ltd.	Branch Information: **1107 Nicholson St. Victoria, BC V8X - 3L6 Phone:(260) 216-0666 FAX: (260) 727-2113 e-mail: ris@direct.ca**			CONTRACT NUMBER: **99-0012**		
					DRAWING NUMBER: **2**		



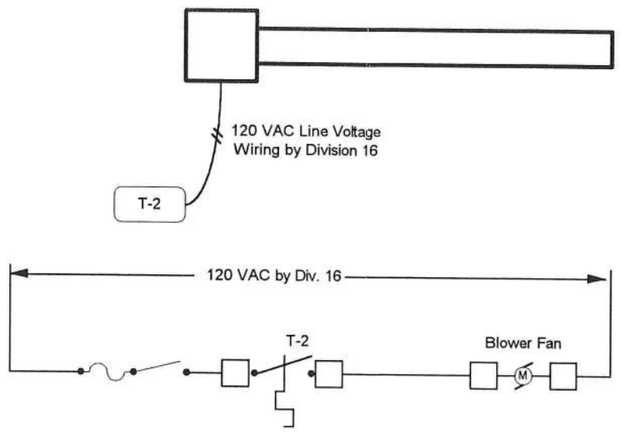
Bill Of Material

Code	Qty	Model	Description
EN-1	1	EN-EWC22-0	NCU Enclosure c/w power entry box
EN-2, 5	2	EN-EWC35-0	3-Tier Enclosure c/w 100 VA Transf.
EN-3,4	2		Existing Control Cabinets
EN-6 to 18	9		Sheet Metal Electrical Enclosure
NCU-1	1	NU-NCM350	Network Control Unit
	1	NU-NET301-0	Ethernet card
DC-5,9,16	3	AS-AHU100-0	AHU Termination Board
	3	AS-AHU102-0	Air Handling Unit Logic Board
DC-1,2,3,4, 7,8	6	AS-UNT111-1	Unitary Equipment Logic Board
DC-6,10,11, 12,13,14,15, 17,18,1xx	55	AS-VAV111-1	Generic Logic Board
OWS	1		Operator Workstation PC
		Minimum Hardware:	HP or Compaq 450MHz CPU - 96 Mb RAM - 1.44 Mb 3.5" Floppy Disk Drive - 8 Gb Fixed Disk Drive - 8x CD ROM - 19" SVGA monitor c/w graphics card - 16 bit sound card c/w speakers - keyboard - 56 Kb modem - dot matrix tractor alarm printer - ethernet card
		Minimum Software	METASYS M5 Workstation Software MGRAPH, MTREND WINDOWS NT – Current Version 4.0 pcANYWHERE32

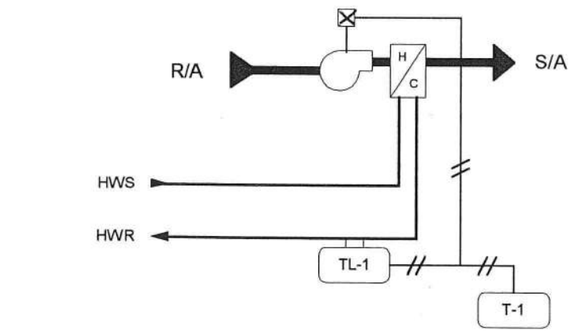
REVISION INFO		DRAWING TITLE				
NUMBER	0	**METASYS Network Schematic**				
DATE	03/31/00					
TIME	02:12 PM	PROJECT TITLE				
FILE NAME	network.vsd	**Herzberg Institute of Astrophysics**				
REFERENCE DRAWING		NO	REVISION-LOCATION	ECN	DATE	BY
Sales Engineer: RLS	Project Manager: RLS	Designer: RLS	DRAWN: BY RLS DATE 03/31/00	APPROVED: BY	DATE	
Intelligent Building Controls Ltd.			Branch Information: 1107 Nicholson St. Victoria, BC V8X - 3L5 Phone:(250) 216-0665 FAX: (250) 727-2113 e-mail: rls@direct.ca	CONTRACT NUMBER: 99-0012		
				DRAWING NUMBER: 3		

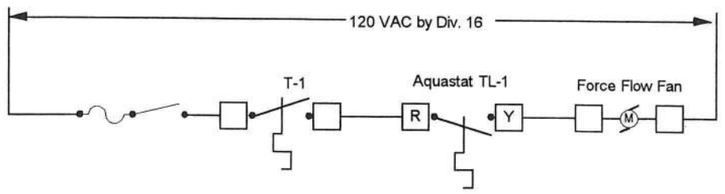


RADIANT PANEL CONTROL (Typical of 111 Valves)

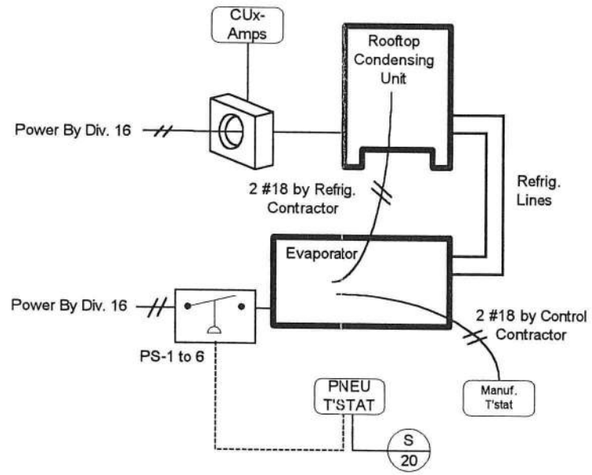


INFRA-RED HEATERS IR-1,2,3





Cabinet & Unit Heater Control
FF-1, FF-2, FF-3, FF-4, UH-1



Note 1: Pressure switches as shown are required for 6 new evaporators located in the 1988 Wing. Pressure switches are piped to existing pneumatic thermostats as shown.

Note 2: Mount and wire evaporator thermostats when shown remotely on floorplans.

Ductless Split Air Conditioning Systems

BILL OF MATERIALS

Code	Qty	Model#	Description
TV-x	111		Refer to Valve Schedule VS-1
DC-x	46	AS-VAV111-1	Application Specific Controller
RMx-T	92	TE-6415S-2110	Room Sensor c/w setpoint, thermometer, and override pushbutton
T-1, 2	8	T26S-22	Line Voltage Thermostat
TL-1	5	A19DAC-9C	Strap-on Low Limit Line Voltage Aquastat
PS-1 to 6	6	P10BC-7C	Pressure to Electric Switch 0 – 20 PSI
CUx-Amps	23	H722	Veris Current Transducer

SEQUENCE OF OPERATION

Radiant Panel Control

.1 In the new addition, 1916 wing, and 1951 wing, a new METASTAT will be wall-mounted in each zone, allowing the occupant visual temperature indication, set-point adjustment, and override of unoccupied mode. The system shall maintain each zone temperature at setpoint by modulating the associated normally open radiant panel control valve(s).

.2 In the 1988 wing, existing pneumatic thermostats shall maintain room temperature at setpoint by modulating radiant panel control valves and/or variable air volume boxes.

Cabinet and Unit Heaters (FF-1, FF-2, FF-3, FF-4, and UH-1)

.1 Line voltage thermostat T-1 shall cycle the fan motor as required to maintain the zone temperature at set-point. Aquastat TL-1 strapped on to the return water line shall prevent the fan from operating on sensing a temperature below 30 Deg. C.

Infra-Red Heaters IR-1, 2, and 3

.1 Line voltage thermostat T-2 shall cycle the blower motor and enable burner controls as required to maintain the zone temperature at set-point.

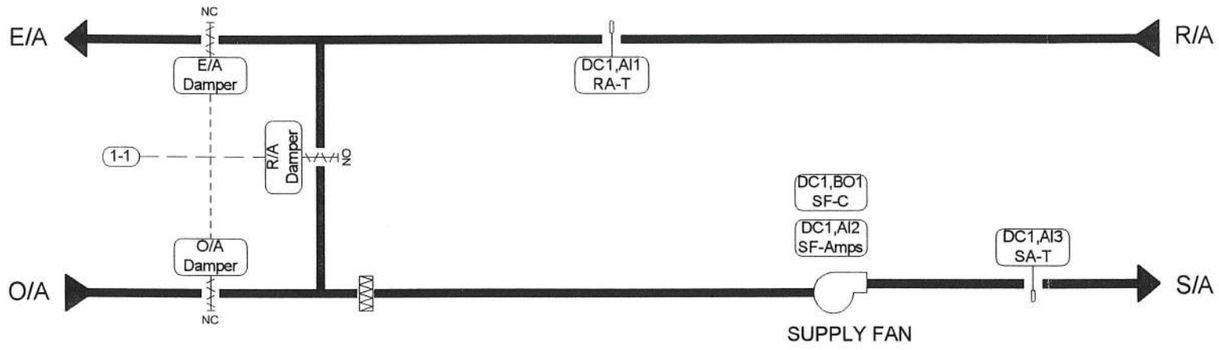
Ductless Split Air Conditioning Systems

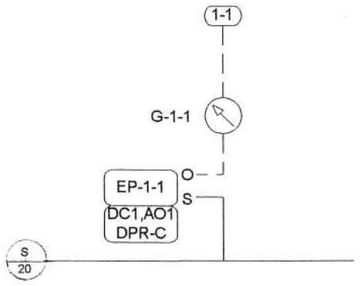
.1 Each split A/C evaporator unit is supplied with a remote control for local operator adjustment.

.2 In the new addition, where a radiant panel is in the same room as the evaporator, the METASYS network shall monitor the status of the condensing unit, and shall close the associated radiant panel control valve when the condensing unit is running.

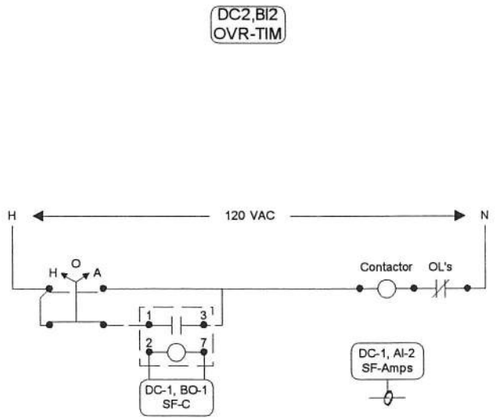
.3 In the 1988 wing, where a radiant panel is in the same room as the evaporator, the evaporator shall be locked out via a pressure switch until the deviation from set-point indicates that the VAV box cannot maintain the room temperature at set-point. When evaporator operation is enabled, the occupant can control the operation of the A/C system via the remote controller, and the condensing unit status will be monitored by the METASYS network.

REVISION INFO	DRAWING TITLE: Zone Temperature Controls									
NUMBER 0										
DATE 03/31/00	REFERENCE DRAWING		NO.	REVISION-LOCATION			ECN	DATE	BY	
TIME 02:17 PM	Sales Engineer RLS	Project Manager RLS	Designer RLS	DRAWN BY RLS DATE 03/31/00				APPROVED BY	DATE	
	PROJECT TITLE: HERZBERG INSTITUTE OF ASTROPHYSICS Project #1973	Intelligent Building Controls Ltd.	Branch Information: 1107 Nicholson St. Victoria, BC V8X - 3L5 Phone:(250) 216-0665 FAX: (250) 727-2113 e-mail: rls@direct.ca	CONTRACT NUMBER: 99-0012						
FILE NAME Hotwatr.vsd				DRAWING NUMBER: 4						





Panel EN-1 Pneumatic Connections



Supply Fan Wiring

BILL OF MATERIALS

Code	*Qty*	*Model#*	*Description*
DC-1	1	AS-UNT111-1	Application Specific Controller
EP-1-1	1	EP-8000-2	Elec. to Pressure Transducer 0 – 10 VDC
G-1-1	1		Existing pressure gauge
RA-T, SA-T	2	TE-6311P-1	Duct Probe Temperature Sensor
SF-C	1	LY2US AC24	Omron DPDT Relay
	1	PTF08A	8 Pin Base
SF-Amps	1	H722	Veris Current Transducer (0 – 5 VDC)
OVR-TIM	1		Existing Manual Override Timer

SEQUENCE OF OPERATION

.1 System operation shall be controlled by the operation of a timer switch located in the conference room or from a programmed occupancy schedule entered by the building operator.

.2 In unoccupied mode, the supply fan shall be off, and all dampers shall be in their fail-safe positions.

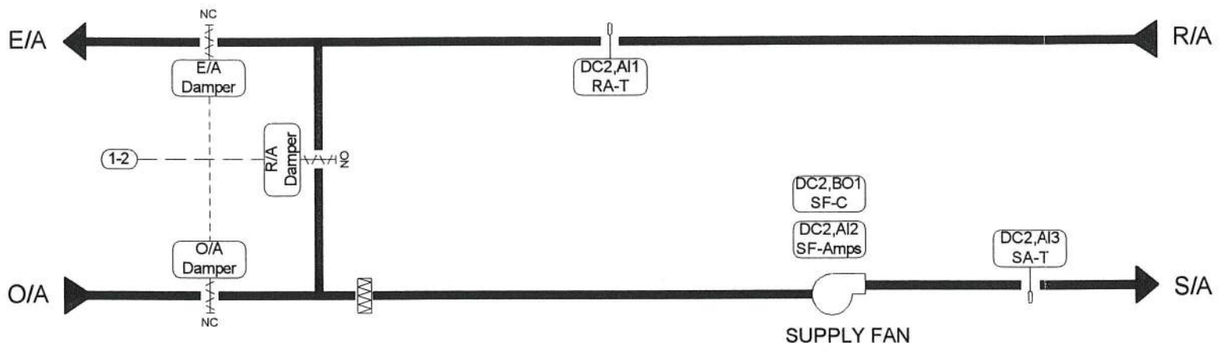
.3 At the initiation of occupied mode, provide a morning warm-up cycle to prevent the mixing dampers from opening until the return air temperature rises above 20 Degrees C. After this condition has been met, the mixing dampers shall open to the minimum position of 25% outdoor air.

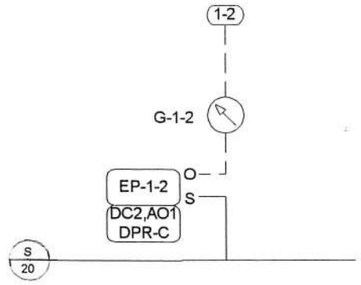
.4 In occupied mode, the mixing dampers shall modulate to maintain the supply air temperature at setpoint. The supply air setpoint shall be reset according to the room temperature as follows (operator adjustable):

Room Temp	Supply Air Setpoint
21 Deg C	21 Deg C
23	13

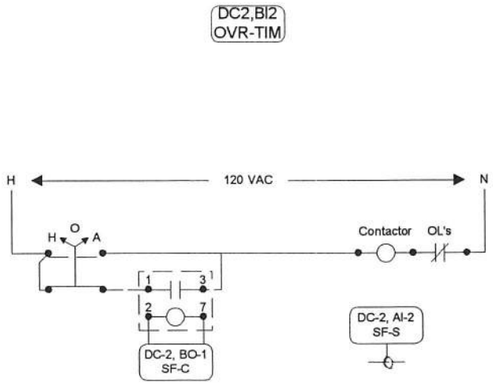
.5 In occupied mode, the supply fan status shall be monitored by a current sensor. Should the fan fail, an alarm shall be inititated and the system shall revert to unoccupied mode. Alarms shall also be initiated on low and high room temperature, and low supply air temperature.

REVISION INFO	DRAWING TITLE: 1916 Building AH-1 Control							
NUMBER: 0								
DATE: 03/31/00								
		REFERENCE DRAWING	NO	REVISION-LOCATION	ECN	DATE	BY
		Sales Engineer: RLS	Project Manager: RLS	Designer: RLS	DRAWN: BY RLS DATE 3/31/00	APPROVED: BY DATE		
TIME: 02:29 PM	PROJECT TITLE: Herzberg Institute of Astrophysics	Intelligent Building Controls Ltd.	Branch Information: 1107 Nicholson St. Victoria, BC V8X - 3L5 Phone:(250) 216-0665 FAX: (250) 727-2113 e-mail: rls@direct.ca		CONTRACT NUMBER: 99-0012			
FILE NAME: AH-1.vsd					DRAWING NUMBER: 5			





Panel EN-1 Pneumatic Connections



Supply Fan Wiring

BILL OF MATERIALS

Code	*Qty*	*Model#*	*Description*
DC-2	1	AS-UNT111-1	Application Specific Controller
EP-1-2	1	EP-8000-2	Elec. to Pressure Transducer 0 – 10 VDC
G-1-2	1		Existing pressure gauge
RA-T, SA-T	2	TE-6311P-1	Duct Probe Temperature Sensor
SF-C	1	LY2US AC24	Omron DPDT Relay
	1	PTF08A	8 Pin Base
SF-Amps	1	H722	Veris Current Transducer (0 – 5 VDC)
OVR-TIM	1		Existing Manual Override Timer

SEQUENCE OF OPERATION

.1 System operation shall be controlled by the operation of a timer switch located in the conference room or from a programmed occupancy schedule entered by the building operator.

.2 In unoccupied mode, the supply fan shall be off, and all dampers shall be in their fail-safe positions.

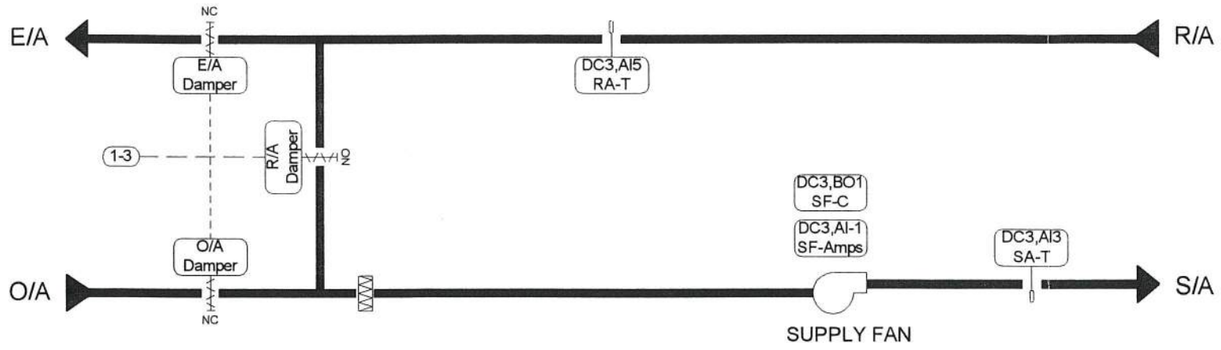
.3 At the initiation of occupied mode, provide a morning warm-up cycle to prevent the mixing dampers from opening until the return air temperature rises above 20 Degrees C. After this condition has been met, the mixing dampers shall open to the minimum position of 25% outdoor air.

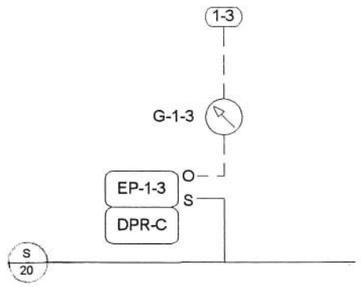
.4 In occupied mode, the mixing dampers shall modulate to maintain the supply air temperature at set-point. The supply air set-point shall be reset according to the room temperature as follows (operator adjustable):

Room Temp	Supply Air Setpoint
21 Deg C	21 Deg C
23	13

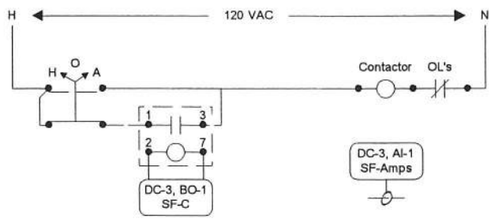
.5 In occupied mode, the supply fan status shall be monitored by a current sensor. Should the fan fail, an alarm shall be inititated and the system shall revert to unoccupied mode. Alarms shall also be initiated on low and high room temperature, and low supply air temperature.

REVISION INFO	DRAWING TITLE: 1916 Building AH-2 Control							
NUMBER 0								
DATE 03/31/00								
TIME 02:37 PM	PROJECT TITLE: Herzberg Institute of Astrophysics							
FILE NAME AH-2.vsd								
	REFERENCE DRAWING	NO.	REVISION-LOCATION			ECN	DATE	BY
	Sales Engineer: RLS	Project Manager: RLS	Designer: RLS	DRAWN: BY RLS DATE 3/31/00		APPROVED: BY	DATE	
	Intelligent Building Controls Ltd.			Branch Information: 1107 Nicholson St. Victoria, BC V8X - 3L5 Phone:(250) 216-0665 FAX: (250) 727-2113 e-mail: rls@direct.ca		CONTRACT NUMBER: 99-0012		
						DRAWING NUMBER: 6		





Panel EN-1 Pneumatic Connections



Supply Fan Wiring

BILL OF MATERIALS

Code	*Qty*	*Model#*	*Description*
DC-3	1	AS-UNT111-1	Application Specific Controller
EP-1-3	1	EP-8000-2	Elec. to Pressure Transducer 0 – 10 VDC
G-1-3	1		Existing pressure gauge
RA-T, SA-T	2	TE-6311P-1	Duct Probe Temperature Sensor
SF-C	1	LY2US AC24	Omron DPDT Relay
	1	PTF08A	8 Pin Base
SF-Amps	1	H722	Veris Current Transducer (0 – 5 VDC)

SEQUENCE OF OPERATION

.1 System operation shall be controlled by the programmed occupancy schedule entered by the building operator.

.2 In unoccupied mode, the supply fan shall be off, and all dampers shall be in their fail-safe positions.

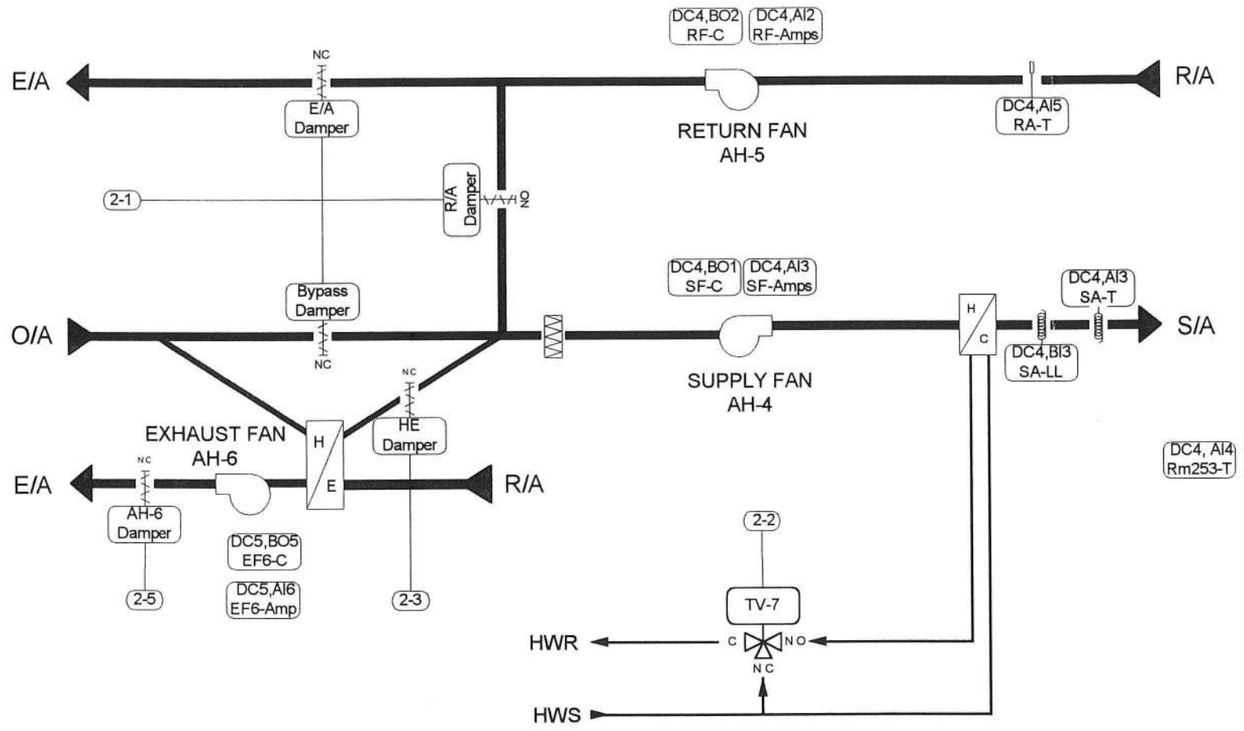
.3 At the initiation of occupied mode, provide a morning warm-up cycle to prevent the mixing dampers from opening until the return air temperature rises above 20 Degrees C. After this condition has been met, the dampers shall open to the minimum position of 25% outside air.

.4 In occupied mode, the mixing dampers shall modulate to maintain the supply air temperature at setpoint. The supply air setpoint shall be reset according to the return air temperature as follows (operator adjustable):

Return Air Temp	Supply Air Setpoint
20 Deg C	20 Deg C
23	13

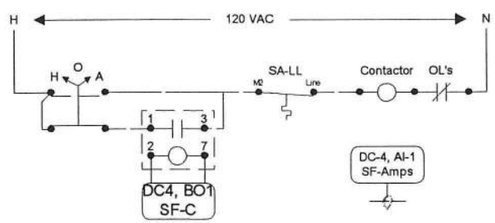
.5 In occupied mode, the supply fan status shall be monitored by a current sensor. Should the fan fail, an alarm shall be inititated and the system shall revert to unoccupied mode. Alarms shall also be initiated on low and high room temperature, and low supply air temperature.

REVISION INFO	DRAWING TITLE: 1951 Building General Supply AH-3 Control									
NUMBER 0										
DATE 03/31/00										
TIME 02:43 PM		REFERENCE DRAWING	NO	REVISION-LOCATION		ECN	DATE	BY		
		Sales Engineer RLS	Project Manager RLS	Designer RLS	DRAWN BY RLS DATE 3/31/00		APPROVED BY	DATE		
FILE NAME AH-3.vsd	PROJECT TITLE: Herzberg Institute of Astrophysics	Intelligent Building Controls Ltd.	Branch Information: 1107 Nicholson St. Victoria, BC V8X - 3L5 Phone:(250) 216-0665 FAX: (250) 727-2113 e-mail: rls@direct.ca		CONTRACT NUMBER: 99-0012					
					DRAWING NUMBER: 7					

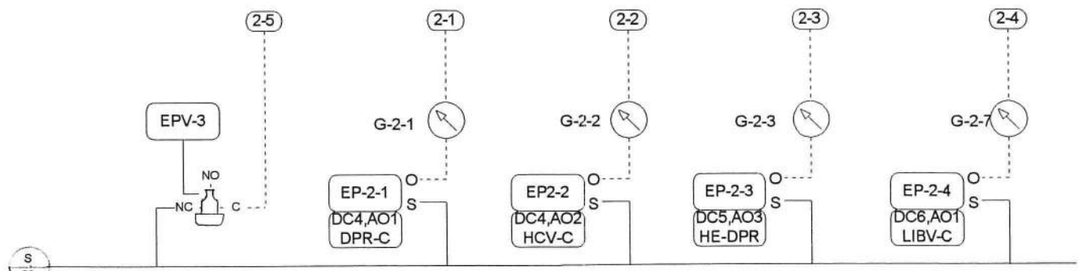


BILL OF MATERIALS

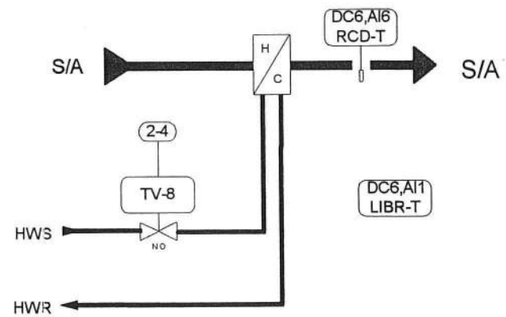
Code	*Qty*	*Model#*	*Description*
TV-7, 8	2		Existing Pneumatic Control Valves
Dampers	5		Existing Dampers c/w Pneumatic Actuators
DC-4	1	AS-UNT111-1	Application Specific Controller
DC-6	1	AS-VAV111-1	Application Specific Controller
EN-2	1		Existing 1988 Fan Room Enclosure
EP-2-1,2,3,4	4	EP-8000-2	Elec. to Pressure Transducer
EPV-3	1		Existing E/P Solenoid Valve
G-2-1,2,3,4	4		Existing Pressure Gauge
SA-LL	1		Existing Low Limit Thermostat
RA-T, RCD-T	2	TE-6311P-1	Duct Probe Temperature Sensor
SA-T	1	TE-6315P-1	Duct Avg. Temperature Sensor
SF-C, RF-C EF6-C	3	LY2US AC24	Omron DPDT Relay
	3	PTF08A	8 Pin Base
SF,RF, EF6-Amps	3	H722	Veris Current Transducer (0 – 5 VDC)
Rm253-T, LIBR-T	2	TE-6314P-1	Room Temperature Sensor



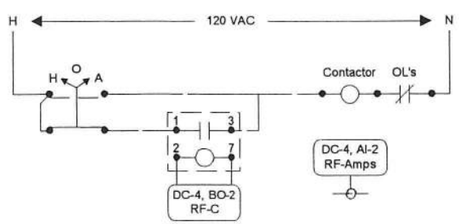
Supply Fan AH-4 Wiring



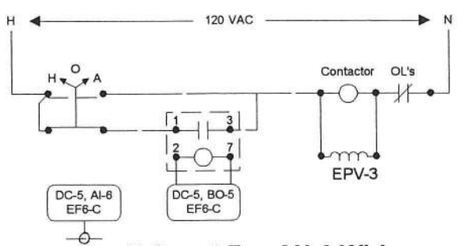
Panel EN-2 Pneumatics



LIbrary Reheat Coil Control



Return Fan AH-5 Wiring



Exhaust Fan AH-6 Wiring

REVISION INFO	DRAWING TITLE						
NUMBER 0	**1988 Building General Supply AH-456**						
DATE 03/31/00		REFERENCE DRAWING	NO	REVISION-LOCATION	ECN	DATE	BY
TIME 03:36 PM	PROJECT TITLE	Sales Engineer RLS / Project Manager RLS / Designer RLS		DRAWN BY RLS DATE 03/31/00		APPROVED BY DATE	
FILE NAME AH-456.vwd	**Herzberg Institute of Astrophysics**	Intelligent Building Controls Ltd.		Branch Information: 1107 Nicholson St Victoria, BC V8X - 3L5 Phone:(250) 216-0665 FAX: (250) 727-2113 e-mail: rls@direct.ca		CONTRACT NUMBER **99-0012**	
						DRAWING NUMBER **8A of B**	

SEQUENCE OF OPERATION

.1 System operation shall be determined by the programmed building occupancy schedule.

.2 During unoccupied hours the supply fan shall be off, dampers shall be in their fail-safe positions, and the heating coil valve shall control the supply duct temperature at setpoint. The system shall only run if a room temperature sensor registers a temperature below 15 deg C. (differential of 2 deg C.) When the system runs for unoccupied heating, the outdoor, exhaust, and reheat dampers shall remain fully closed, the return damper shall remain fully open, AH-4,5 shall run, AH-6 shall remain off, and the heating coil valve shall operate according to the occupied sequence.

.3 When occupied mode is initiated, the return fan shall start, first, followed by the supply fan in 5 seconds, and the exhaust fan in a further 5 seconds. A morning warm-up cycle shall prevent the mixing dampers and exhaust fan from operating until the return air temperature rises above 20 Deg C.

.4 The mixing dampers, heat exchanger damper, and and preheat control valve shall modulate in sequence to maintain the supply air temperature at setpoint. The supply air setpoint shall be reset according to the temperature of Room 253 as follows:

Room 253 Temp	Supply Air Setpoint
20 Deg C	30 Deg C
23	13

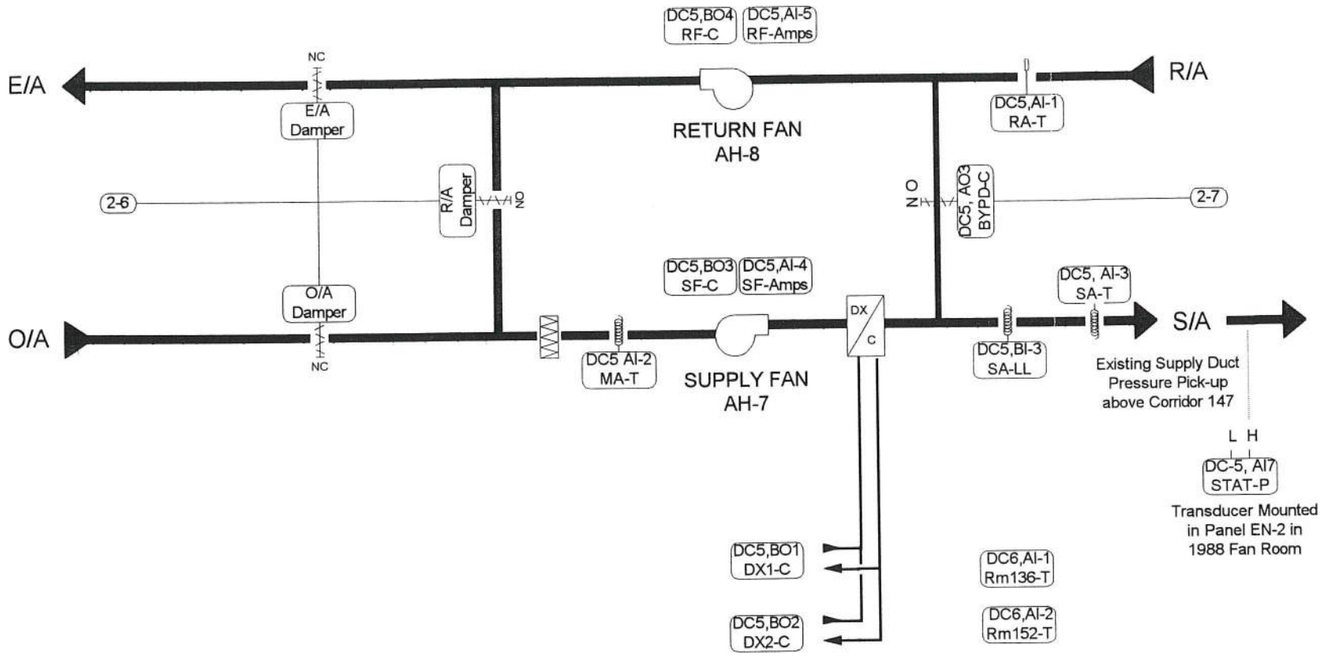
.5 During high heating demand periods the R/A damper shall be fully open, the E/A damper and the bypass damper shall be fully closed, and the heat exchanger damper shall open to the minimum O/A position. The heating coil control valve shall modulate as required to maintain the supply air temperature at setpoint. As the heating demand decreases the R/A damper modulates closed, and the E/A and bypass dampers modulate proportionally open. The heating coil control valve continues to modulate as required.

.6 When the mixing damper command exceeds the minimum O/A position, the heat exchanger damper closes.

.7 The existing low temperature thermostat shall remain and shall also provide an alarm signal to the METASYS system. In the event that the heat recovery exhaust fan fails the METASYS system shall modulate the return/exhaust/bypass dampers as a typical economizer, with the heat exchanger damper closed.

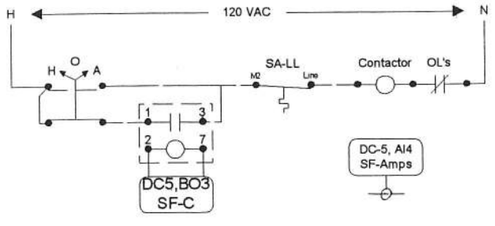
.8 The existing pneumatic library reheat control valve shall be modulated to control the reheat coil discharge air temperature at set-point. This set-point shall be reset according to the deviation from set-point of the library room temperature sensor.

REVISION INFO	DRAWING TITLE: 1988 Building General Supply AH-456							
NUMBER: 0								
DATE: 03/31/00		REFERENCE DRAWING	NO	REVISION-LOCATION	ECN	DATE	BY	
TIME: 03:46 PM		Sales Engineer: RLS / Project Manager: RLS / Designer: RLS		DRAWN: BY RLS DATE 03/31/00		APPROVED: BY DATE		
FILE NAME: AH-456b.vsd	PROJECT TITLE: Herzberg Institute of Astrophysics	Intelligent Building Controls Ltd.		Branch Information: 1107 Nicholson St. Victoria, BC V8X - 3L5 Phone:(250) 216-0665 FAX: (250) 727-2113 e-mail: ris@direct.ca		CONTRACT NUMBER: 99-0012		
						DRAWING NUMBER: 8B of B		

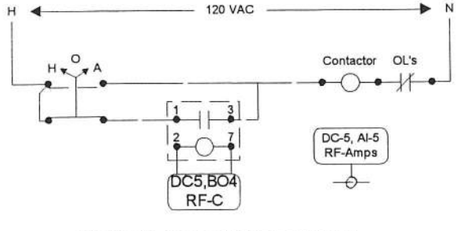


BILL OF MATERIALS

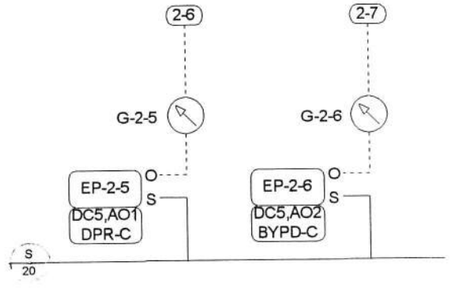
Code	*Qty*	*Model#*	*Description*
Dampers	5		Existing Dampers c/w Pneumatic Actuators
DC-5	1	AS-AHU100-0	AHU Controller Termination Board
	1	AS-AHU102-0	AHU Controller Logic Board
EN-2	1		Existing 1988 Fan Room Enclosure
EP-2-5,6	2	EP-8000-2	Elec. to Pressure Transducer
G-2-5,6	2		Existing Pressure Gauge
SA-LL	1		Existing Low Limit Thermostat
RA-T	1	TE-6311P-1	Duct Probe Temperature Sensor
SA-T	1	TE-6315P-1	Duct Avg. Temperature Sensor
MA-T	1	TE-6315P-1	Duct Avg. Temperature Sensor
SF-C, RF-C			
DX1-C, DX2-C	4	LY2US AC24	Omron DPDT Relay
	4	PTF08A	8 Pin Base
SF,RF -Amps	2	H722	Veris Current Transducer (0 – 5 VDC)
Rm136-T	1	TE-6314P-1	Room Temperature Sensor
Rm152-T	1	TE-6314P-1	Room Temperature Sensor
STAT-P	1	DPT2640-2R5D	Diff. Press. Transducer 0 – 2.5"wc, 0-5 VDC



Supply Fan AH-7 Wiring



Return Fan AH-8 Wiring



Panel EN-2 Pneumatics

REVISION INFO	DRAWING TITLE									
NUMBER 0	**1988 Building Computer Auxilliaries AH-78**									
DATE 03/31/00		REFERENCE DRAWING	NO.	REVISION-LOCATION		ECN	DATE	BY		
TIME 03:54 PM	PROJECT TITLE	Sales Engineer RLS	Project Manager RLS	Designer RLS	DRAWN BY RLS DATE 03/31/00		APPROVED BY	DATE		
	Herzberg Institute of Astrophysics	Intelligent Building Controls Ltd.			Branch Information 1107 Nicholson St. Victoria, BC V8X - 3L5 Phone:(250) 216-0665 FAX: (250) 727-2113 e-mail: rls@direct.ca		CONTRACT NUMBER 99-0012			
FILE NAME AH-78.vsd							DRAWING NUMBER 9A of B			

SEQUENCE OF OPERATION

.1 System operation shall be determined by the programmed building occupancy schedule.

.2 During unoccupied hours the supply fan shall be off, and all dampers shall be in their fail-safe positions.

.3 When occupied mode is initiated, the return fan shall start, first, followed by the supply fan in 5 seconds. A morning warm-up cycle shall prevent the mixing dampers and exhaust fan from operating until the return air temperature rises above 20 Deg C. Following morning warm-up, the mixing dampers shall maintain a minimum percentage of outdoor air for the remainder of the occupancy period.

.4 When the outdoor air temperature falls below 13 Deg C (2 Deg differential) (operator adjustable), the mixing dampers shall be controlled to maintain the supply air temperature at setpoint. The supply air setpoint shall be reset according to the greatest demand for cooling in Rooms 138 and 156.

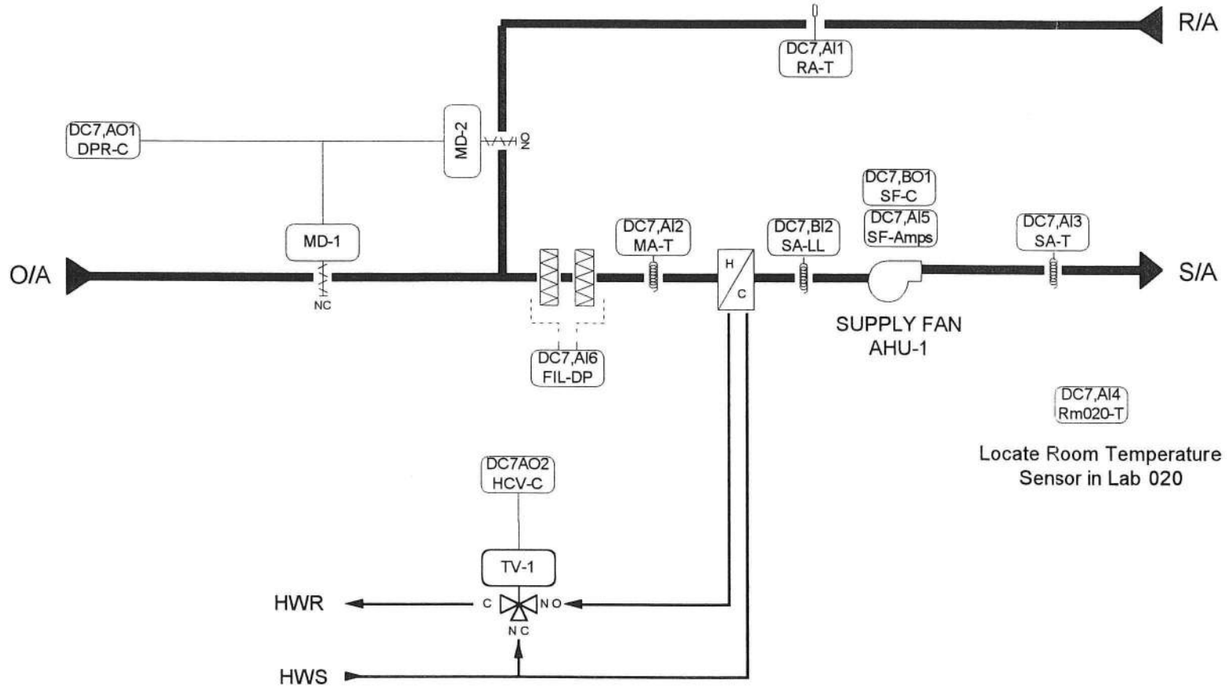
Greatest Deviation From Setpoint	Supply Air Setpoint
0 Deg C	18 Deg C
1	13

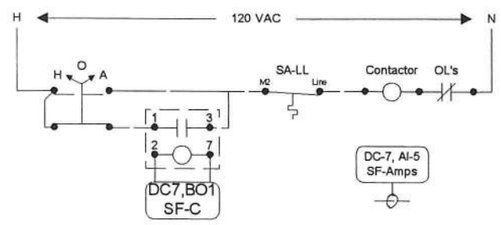
.5 The mixed air sensor shall override supply air control of the mixing dampers to maintain a minimum mixed air temperature of 10 Deg C.

.6 When the outdoor air temperature rises above 15 Deg C, and the return air temperature is above 24 Deg C (2 Deg diff.), the mixing dampers shall revert to minimum position, and mechanical cooling shall be enabled. Two stages of DX cooling shall by cycled to maintain the hottest of rooms 138 and 156 at set-point). Minimum and maximum on, off times, and minimum inter-stage on, off times shall be provided.

.7 The existing low temperature thermostat shall remain and shall also provide an alarm signal to the METASYS system.

REVISION INFO	DRAWING TITLE: 1988 Building Computer Auxilliaries AH-78									
NUMBER: 0		REFERENCE DRAWING		NO	REVISION-LOCATION			ECN	DATE	BY
DATE: 03/31/00		Sales Engineer: RLS	Project Manager: RLS	Designer: RLS	DRAWN: BY RLS DATE 03/31/00			APPROVED: BY	DATE	
TIME: 04:02 PM	PROJECT TITLE: Herzberg Institute of Astrophysics	Intelligent Building Controls Ltd.			Branch Information: 1107 Nicholson St. Victoria, BC V8X - 3L5 Phone:(250) 216-0685 FAX: (250) 727-2113 e-mail: ris@direct.ca			CONTRACT NUMBER: 99-0012		
FILE NAME: AH-76b.vsd								DRAWING NUMBER: 9B of B		





Supply Fan AHU-1 Wiring

BILL OF MATERIALS

Code	*Qty*	*Model#*	*Description*
TV-1	1		Refer to Valve Schedule VS-1
MD-1, MD-2	2		Refer to Damper Schedule DS-1
DC-7	1	AS-UNT111-1	Application Specific Controller
SA-LL	1	A70HA-1C	Low Limit T'stat, 20' Element, Man. Reset
	1	FTG13A-600R	Capillary Flange
RA-T	1	TE-6311P-1	Duct Probe Temperature Sensor
SA-T, MA-T	2	TE-6315P-1	Duct Avg. Temperature Sensor
SF-C	1	LY2US AC24	Omron DPDT Relay
	1	PTF08A	8 Pin Base
SF-Amps	1	H722	Veris Current Transducer (0 – 5 VDC)
LAB020-T	1	TE-6314P-1	Room Temperature Sensor
FIL-DP 1	DPT2640-2R5D Diff. Press. Trans. 0 – 2.5" WC, 0-5 VDC		
	1	FTG18A-600R	Remote pressure pick-up

SEQUENCE OF OPERATION

.1 System operation shall be determined by the programmed building occupancy schedule.

.2 During unoccupied hours the supply fan shall normally be off, and all dampers shall be in their fail-safe positions. The fan shall cycle on as required to maintain the space temperature above the unoccupied setpoint, initially set at 15 Deg C. (2 Deg C diff.)

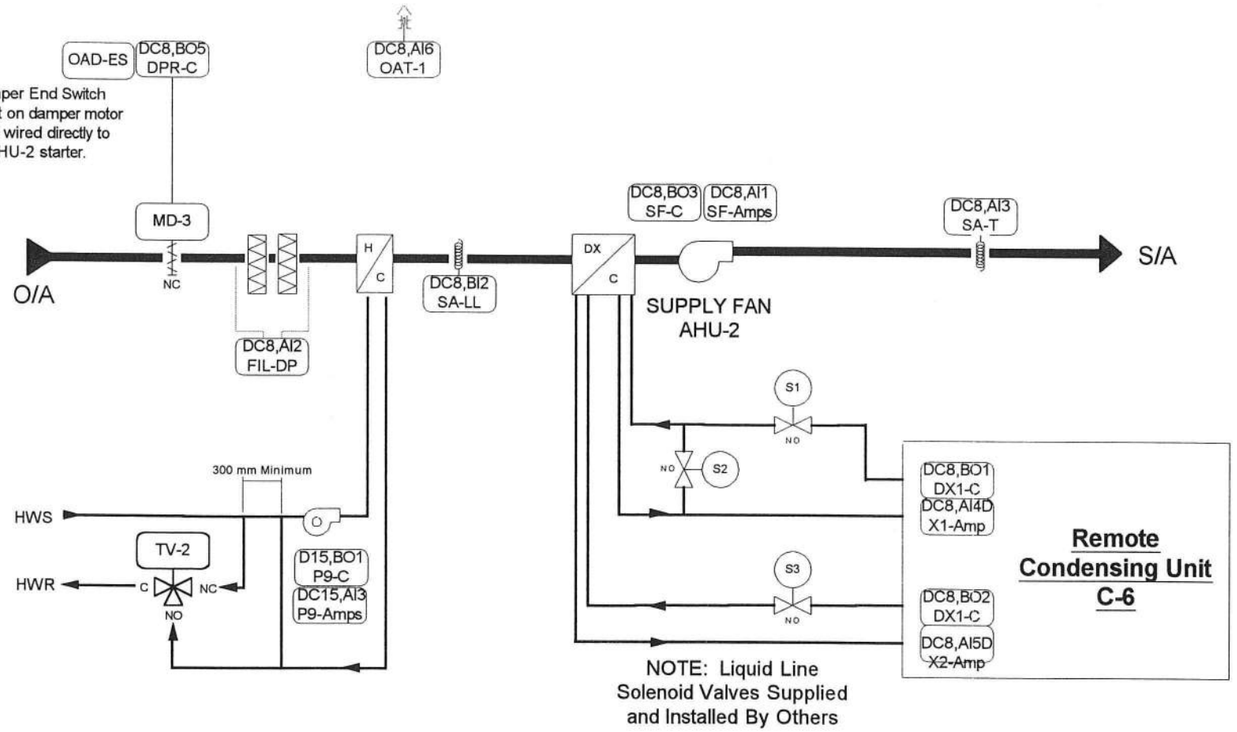
.3 An optimal start program shall determine the start-up time required to warm up or cool down the space so that the required room temperature setpoint is achieved just prior to the onset of the occupied period. A morning warm-up cycle shall prevent the mixing dampers from operating until the return air temperature rises above 20 Deg C. Following morning warm-up, the mixing dampers shall maintain a minimum percentage of outdoor air for the remainder of the occupancy period.

.4 During occupancy hours, the mixing dampers and heating coil control valve shall be modulated in sequence to maintain the supply air temperature at set-point. This set-point shall be reset as required to control the room temperature of Lab 020 at set-point

.5 When the outdoor air temperature exceeds the return air temperature, the mixing dampers shall revert to minimum position.

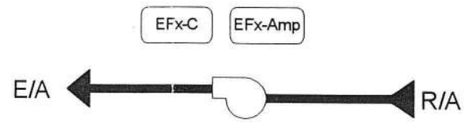
.6 A supply air low limit thermostat shall shut down the supply fan and revert the mixing dampers to their fail-safe positions on sensing a supply air temperature below 2 Deg C. This control shall require manual reset.

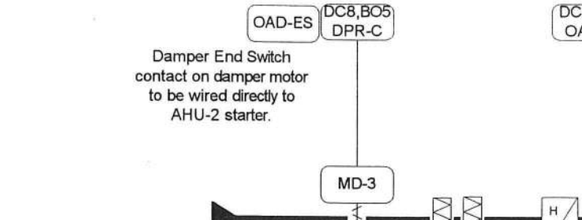
REVISION INFO	DRAWING TITLE									
NUMBER 0	**Basement Addition Air Handling Unit AHU-1**									
DATE 03/31/00		REFERENCE DRAWING		NO	REVISION-LOCATION		ECN	DATE	BY	
TIME 08:42 AM		Sales Engineer RLS	Project Manager RLS	Designer RLS	DRAWN BY RLS DATE 03/31/00		APPROVED BY	DATE		
FILE NAME AHU-1.vsd	PROJECT TITLE **Herzberg Institute of Astrophysics**	Intelligent Building Controls Ltd.			Branch Information 1107 Nicholson St. Victoria, BC V8X - 3L5 Phone:(250) 216-0865 FAX: (250) 727-2113 e-mail: rls@direct.ca		CONTRACT NUMBER 99-0012			
							DRAWING NUMBER 10			



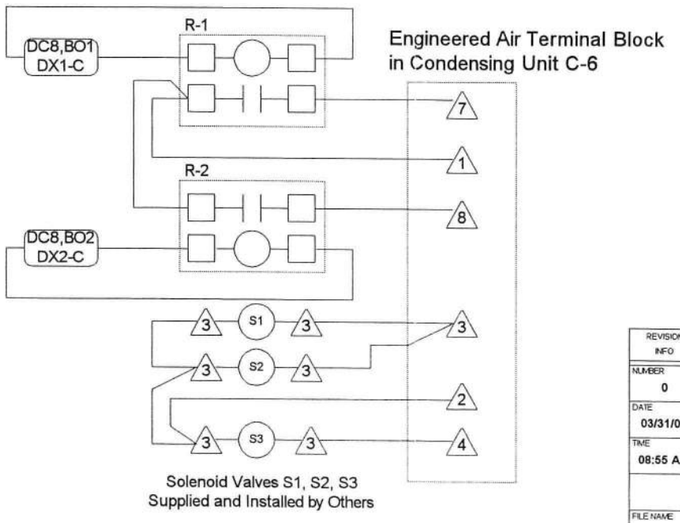
BILL OF MATERIALS

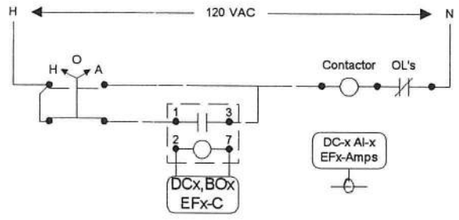
Code	Qty	Model#	Description
TV-2	1		Refer to Valve Schedule VS-1
MD-3	1		C/W Unit, refer to Damper Schedule DS-1
DC-8	1	AS-UNT111-1	Application Specific Controller
SA-LL	1	A70GA-1C	Low Limit T'stat, 20' Element, Man.Reset
SA-T	1	TE-6316P-1	Duct Avg. Temperature Sensor
SF-C, SF-LLC DX1-C, DX2-C EFx-C, P9-C	12	LY2US AC24	Omron DPDT Relay
	12	PTF08A	8 Pin Base
P9, EFx SF, DX1, DX2- Amps	11	H722	Veris Current Transducer (0 – 5 VDC)
FIL-DP	1	DPT2640-2R5D	Diff. Press. Transducer 0 – 2.5"wc, 0-5 VDC
	1	FTG18A-600R	Remote Pressure Pick-up
OAT-1	1	TE-6313P-1	Outdoor Air Temperature Sensor





Supply Fan AHU-2 Wiring





EF-1, 2, 3, 4, 5, 6, 8 Control

REVISION INFO	DRAWING TITLE: 2000 Building 1st, 2nd, 3rd Floors AHU-2							
NUMBER: 0								
DATE: 03/31/00								
TIME: 08:55 AM								
	PROJECT TITLE: Herzberg Institute of Astrophysics	REFERENCE DRAWING	NO.	REVISION-LOCATION	ECN	DATE	BY
FILE NAME: AHU-2.vsd		Sales Engineer: RLS; Project Manager: RLS; Designer: RLS; DRAWN: BY RLS DATE 03/31/00; APPROVED: BY DATE					
		Intelligent Building Controls Ltd.	Branch Information: 1107 Nicholson St, Victoria, BC, V8X - 3L5, Phone:(250) 216-0665, FAX: (250) 727-2113, e-mail: rls@direct.ca		CONTRACT NUMBER: 99-0012			
					DRAWING NUMBER: 11A of B			

SEQUENCE OF OPERATION

.1 System operation shall be determined by the programmed building occupancy schedule.

.2 During unoccupied hours the supply fan shall normally be off, all dampers shall be in their fail-safe positions and the heating coil control valve shall be controlled to maintain the duct temperature at set-point.

.3 An optimal start program shall determine the start-up time required to warm up or cool down the space so that the required room temperature set-point is achieved just prior to the onset of the occupied period. When the unit is started, the outdoor air damper shall open first. The supply fan shall start after the hard-wired damper end switch contact is made. Exhaust fans EF-1, 2, 3, 4, 5, 6, and 8 shall all be interlocked to run whenever the AHU-2 supply fan is running.

.4 During occupancy hours, the heating coil control valve shall be modulated, and two stages of DX cooling shall be cycled in sequence to maintain the supply air temperature at set-point. The supply air set-point shall be reset according to the average deviation from set-point of the five hottest rooms, as follows:

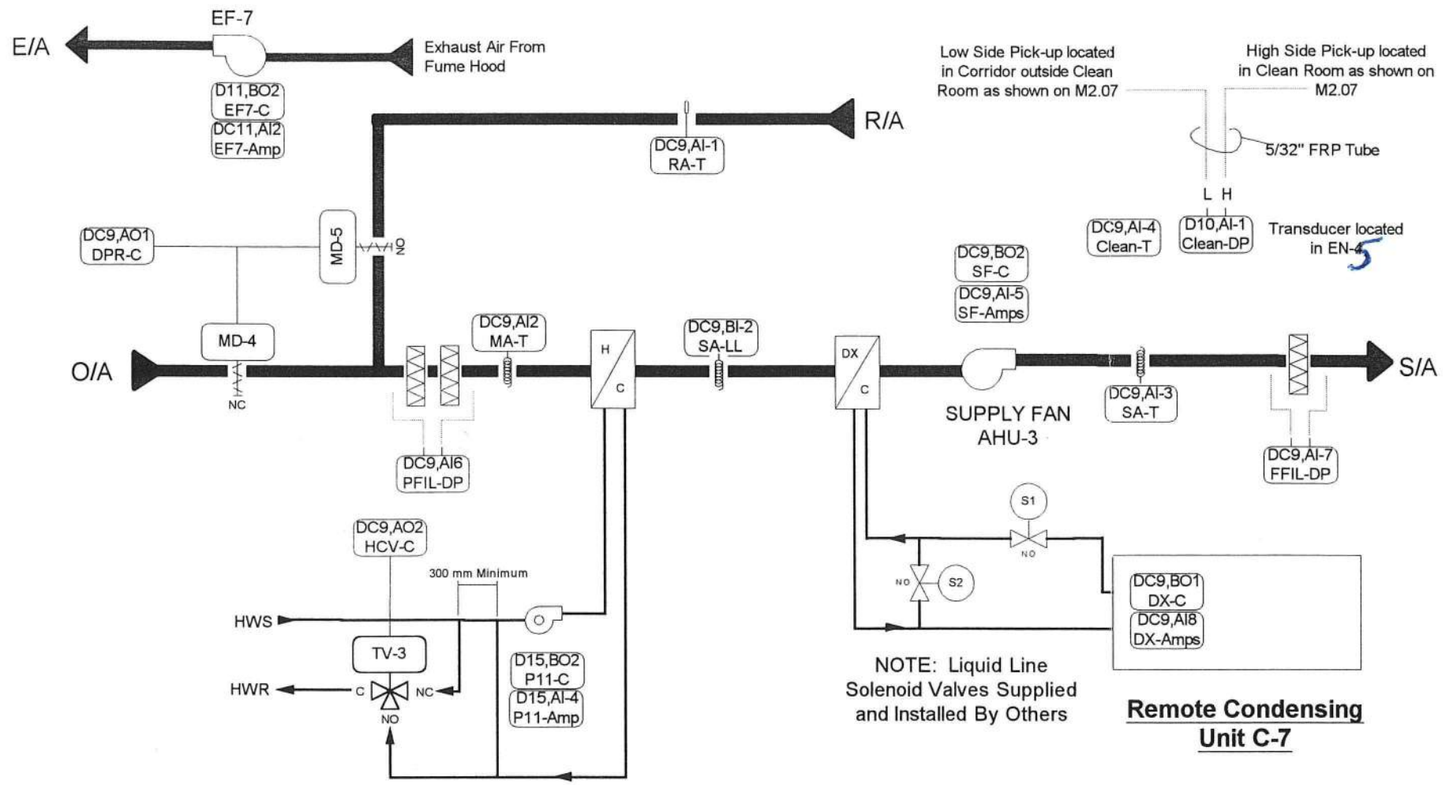
Deviation From Setpoint	Supply Air Setpoint
0 Deg C	17 Deg C
+1	12

.5 Mechanical cooling shall be locked out until the outdoor air temperature rises above 15 Deg C (2 Deg differential). Minimum on times, off times, and inter-stage delays shall be provided for each stage of cooling.

.6 A supply air low limit thermostat shall shut down the supply fan and close the outdoor air damper on sensing a supply air temperature below 2 Deg C. This control shall be disabled from shutting down the system for a 20 second delay following start-up. The control shall be equipped with automatic reset, however following a low limit shutdown, a latching software point must be manually reset by the operator before AHU-2 can be re-started.

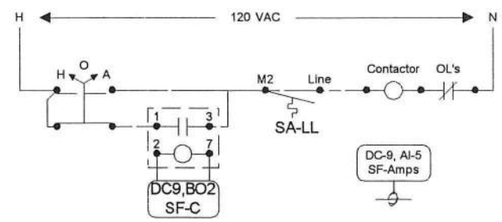
.7 Heating coil circulation pump P-9 shall start whenever the outdoor air temperature falls below 10 Deg C (2 Deg C differential), or whenever the heating coil control valve modulates beyond the 25% open position (22 % differential).

REVISION INFO	DRAWING TITLE									
NUMBER 0	2000 Building General Supply AHU-2									
DATE 03/31/00		REFERENCE DRAWING		NO.	REVISION-LOCATION			ECN	DATE	BY
TIME 09:02 AM		Sales Engineer RLS	Project Manager RLS	Designer RLS	DRAWN BY RLS DATE 03/31/00			APPROVED BY	DATE	
	PROJECT TITLE				Branch Information			CONTRACT NUMBER		
FILE NAME AHU-2b.vsd	Herzberg Institute of Astrophysics	Intelligent Building Controls Ltd.			1107 Nicholson St. Victoria, BC V8X - 3L5 Phone:(250) 216-0665 FAX: (250) 727-2113 e-mail: rls@direct.ca			99-0012		
								DRAWING NUMBER 11B of B		

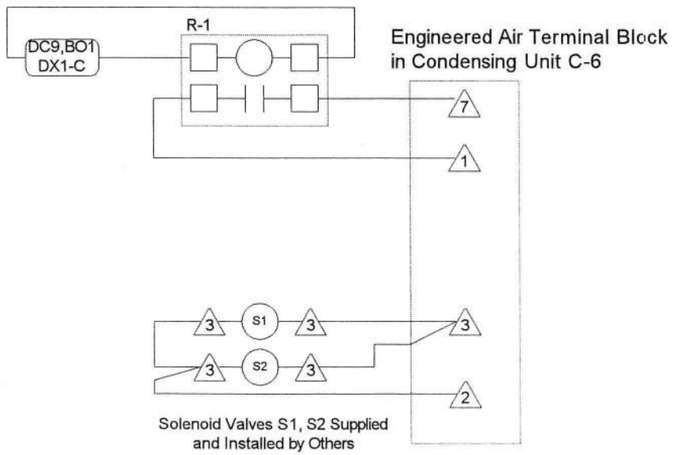


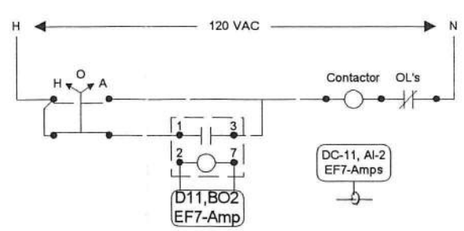
BILL OF MATERIALS

Code	*Qty*	*Model#*	*Description*
TV-3	1		Refer to Valve Schedule VS-1
MD-4, 5	2		C/W Unit, refer to Damper Schedule DS-1
DC-9	1	AS-AHU100-0	AHU Controller Termination Board
	1	AS-AHU102-0	AHU Controller Logic Board
SA-LL	1	A70HA-1C	Low Limit T'stat, 20" Element, Man. Reset
RA-T	1	TE-6311P-1	Duct Probe Temperature Sensor
SA-T, MA-T SF-C, EF7-C	2	TE-6315P-1	Duct Avg. Temperature Sensor
DX-C, P11-C	4	LY2US AC24	Omron DPDT Relay
	4	PTF08A	8 Pin Base
SF, EF7, DX, P11-Amps	4	H722	Veris Current Transducer (0 – 5 VDC)
Clean-T	1	TE-6314P-1	Room Temperature Sensor
PFIL, FFIL-DP	2	DPT2640-2R5D	Diff. Press. Trans. 0 to 2.5" WC, 0-5 VDC
Clean-DP	1	DPT2640-OR5B	Diff. Press. Trans. -.5 to 0.5"WC, 0-5 VDC



Supply Fan AHU-3 Wiring





Exhaust Fan EF-7 Wiring

REVISION INFO	DRAWING TITLE: 2000 Building Clean Room AHU-3							
NUMBER: 0								
DATE: 03/31/00								
	REFERENCE DRAWING	NO	REVISION-LOCATION			ECN	DATE	BY
TIME: 10:34 AM	Sales Engineer: RLS	Project Manager: RLS	Designer: RLS	DRAWN: BY RLS DATE 03/31/00		APPROVED: BY	DATE	
	PROJECT TITLE: Herzberg Institute of Astrophysics	Intelligent Building Controls Ltd.		Branch Information: 1107 Nicholson St. Victoria, BC V8X - 3L5 Phone:(250) 216-0665 FAX: (250) 727-2113 e-mail: rls@direct.ca		CONTRACT NUMBER: 99-0012		
FILE NAME: AHU-3.vsd						DRAWING NUMBER: 12A of B		

SEQUENCE OF OPERATION

.1 System operation shall be determined by the programmed building occupancy schedule. In addition, the system shall run whenever fume hood exhaust fan EF-7 is running.

.2 During unoccupied hours the supply fan shall normally be off, and all dampers shall be in their fail-safe positions and the heating coil control valve shall be controlled to maintain the duct temperature at set-point.

.3 An optimal start program shall determine the start-up time required to warm up or cool down the space so that the required room temperature set-point is achieved just prior to the onset of the occupied period. A morning warm-up cycle shall prevent the mixing dampers from operating until the return air temperature rises above 20 Deg C. Following morning warm-up, the mixing dampers shall maintain a minimum percentage of outdoor air for the remainder of the occupancy period. When EF-7 is running, the minimum percentage shall be increased to a setting determined by the Air Balancer during the commissioning period.

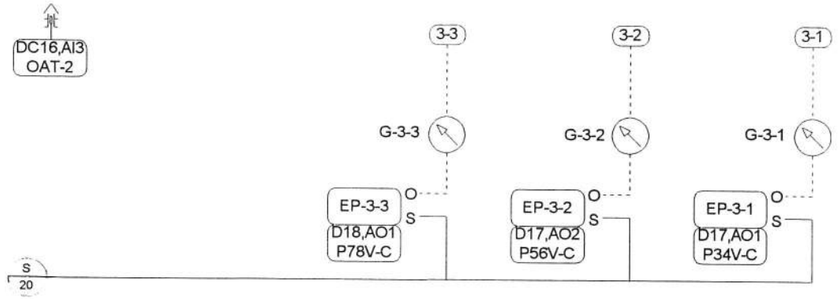
.4 During occupancy hours, the heating coil control valve and mixing dampers shall be modulated to maintain the supply air temperature at set-point. This set-point shall be reset as required to maintain the Clean Room temperature at set-point.

.5 Mechanical cooling shall be locked out until the outdoor air temperature rises above 15 Deg C (2 Deg differential). When enabled, mechanical cooling shall be cycled on as required to maintain the Clean Room temperature at set-point. When the compressor is running, the dampers shall revert to the minimum outdoor air position. Minimum on time and off time shall be provided for the single stage of DX cooling.

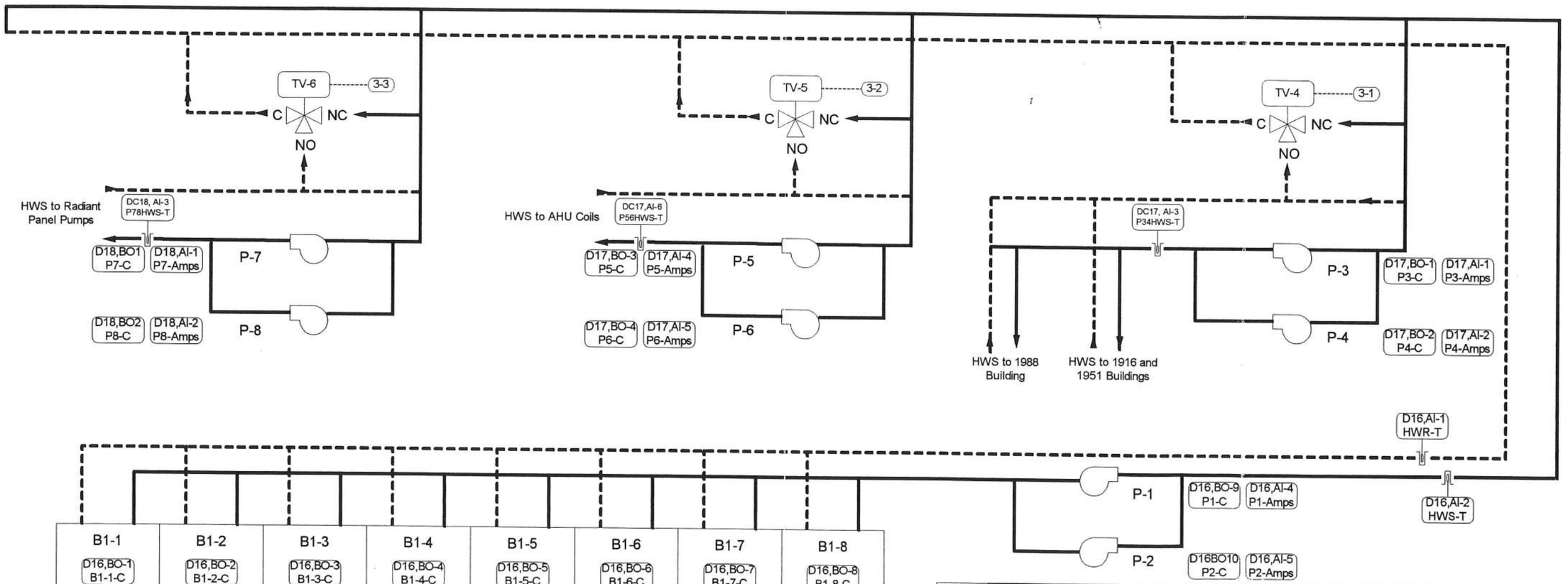
.6 A supply air low limit thermostat shall shut down the supply fan and revert the mixing dampers to their failsafe positions on sensing a supply air temperature below 2 Deg C. This control shall require manual reset.

.7 Heating coil circulation pump P-11 shall start whenever the outdoor air temperature falls below 10 Deg C (2 Deg C differential), or whenever the heating coil control valve modulates beyond the 25% open position (22 % differential).

REVISION INFO	DRAWING TITLE: 2000 Building Clean Room AHU-3									
NUMBER: 0										
DATE: 03/31/00										
TIME: 09:30 AM		REFERENCE DRAWING	NO.	REVISION-LOCATION			ECN	DATE	BY	
		Sales Engineer: RLS	Project Manager: RLS	Designer: RLS	DRAWN: BY RLS DATE 03/31/00		APPROVED: BY	DATE		
FILE NAME: AHU-3b.vsd	PROJECT TITLE: Herzberg Institute of Astrophysics	Intelligent Building Controls Ltd.	Branch Information: 1107 Nicholson St. Victoria, BC V8X - 3L5 Phone:(250) 216-0665 FAX: (250) 727-2113 e-mail: ris@direct.ca		CONTRACT NUMBER: 99-0012					
					DRAWING NUMBER: 12B of B					



Panel EN-3 Pneumatics



REVISION INFO	DRAWING TITLE								
NUMBER 0	**Hot Water Heating**								
DATE 03/31/00		REFERENCE DRAWING	NO.	REVISION/LOCATION		ECN	DATE	BY	
TIME 10:01 AM	PROJECT TITLE	Sales Engineer RLS	Project Manager RLS	Designer RLS	DRAWN BY RLS DATE 03/31/00		APPROVED BY	DATE	
FILE NAME Boilers.vsd	**Herzberg Institute of Astrophysics**	Intelligent Building Controls Ltd.	Branch Information 1107 Nicholson St. Victoria, BC V8X - 3L5 Phone:(250) 216-0665 FAX: (250) 727-2113 e-mail: rls@direct.ca			CONTRACT NUMBER 99-0012			
						DRAWING NUMBER 13A of B			

SEQUENCE OF OPERATION

Boilers & Primary Circulation Pumps P-1 and P-2

.1 Primary loop circulation pumps P-1 and P-2 are sized for 50% of full system capacity, and run continuously under normal conditions. The boiler control sequence shall be enabled whenever P-1 and P-2 are both running.

.2 The METASYS controller shall cycle the 8 boiler modules in sequence as required to maintain the primary hot water supply temperature at set-point. This set-point shall be equal to the highest of the three secondary loop set-points plus 5Deg C, while remaining between a low limit of 60 Deg C and a high limit of 93 Deg C.

.3 Each boiler module is supplied with a temperature controller to maintain a supply temperature of 93 Deg C when activated.

1916/1951/1988 Building Heating Loops & Pumps P-3, P-4

.4 Pumps P-3 and P-4 are each sized for 50% of full capacity. Whenever the outdoor air temperature falls below 18 Deg C (3 Deg C Diff.), the lead pump shall start and run continuously. Should the outdoor air temperature fall below 0 Deg. C (3 Deg C Diff.), then the second pump shall start. The lead pump shall be alternated every time both pumps are off, and a failsafe sequence will bring on the lag pump automatically on failure of the lead pump.

.5 The loop supply temperature shall be reset by the outdoor air temperature according to the following schedule:

O/A Temp	HWS Supply Setpoint
-10 Deg C or less	90 Deg C
+18	45

New Addition Air Handling Unit Coil Supply Loop & Pumps P-5, P-6

.6 Pumps P-5 and P-6 are each sized for 50% of full capacity. Whenever the outdoor air temperature falls below 18 Deg C (3 Deg C Diff.), the lead pump shall start and run continuously. Should the outdoor air temperature fall below 0 Deg. C (3 Deg C Diff.), then the second pump shall start. The lead pump shall be alternated every time both pumps are off, and a failsafe sequence will bring on the lag pump automatically on failure of the lead pump.

.7 The METASYS network shall monitor the position of each heating coil control valve served by this loop, and shall reset the loop temperature set-point as required to maintain the valve calling for the most heat at the 75% open position. The set-point shall be reset between 45 Deg C and 90 Deg C.

New Addition Radiant Panel Loop & Pumps P-7, P-8

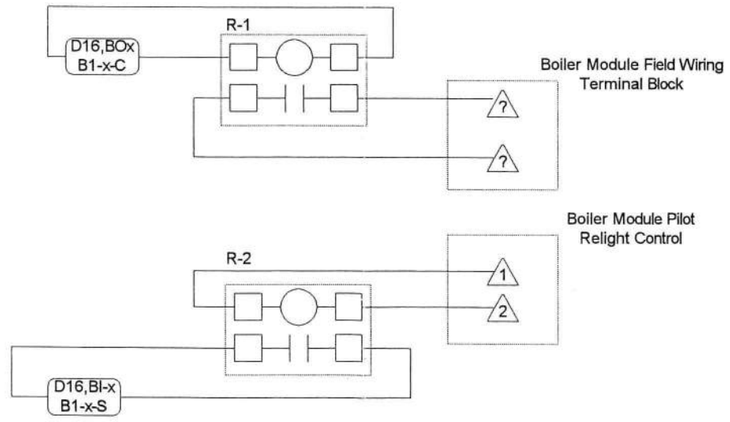
.8 Pumps P-7 and P-8 are each sized for 50% of full capacity. Whenever the outdoor air temperature falls below 18 Deg C (3 Deg C Diff.), the lead pump shall start and run continuously. Should the outdoor air temperature fall below 9 Deg. C (3 Deg C Diff.), then the second pump shall start. The lead pump shall be alternated every time both pumps are off, and a failsafe sequence will bring on the lag pump automatically on failure of the lead pump.

.9 The loop supply temperature shall be reset by the outdoor air temperature according to the following schedule:

O/A Temp	HWS Supply Setpoint
-10 Deg C or less	90 Deg C
+18	45

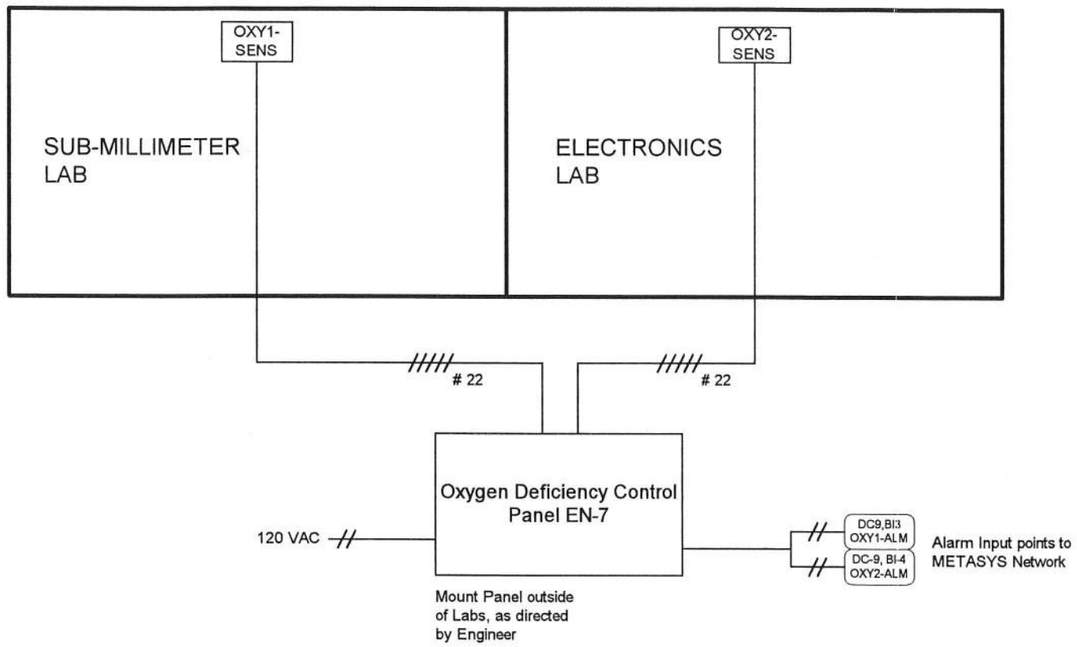
BILL OF MATERIALS

Code	*Qty*	*Model#*	*Description*
TV-4,5,6	3		Refer to Valve Schedule VS-1
DC-16	1	AS-AHU100-0	AHU Controller Termination Board
	1	AS-AHU102-0	AHU Controller Logic Board
DC-17	1	AS-VAV111-1	Application Specific Controller
EP-3-1,2,3	3	EP-8000-2	Elec. to Pressure Transducer
G-1,2,3	3	G-2010-5	0 – 30 PSI 1.5" Gauge
B1-x-C, Px-C			
B1-x-S	24	LY2US AC24	Omron DPDT Relay
	24	PTF08A	8 Pin Base
Px-Amps	8	H722	Veris Current Transducer (0 – 5 VDC)
HWS-T,HWR-T, P34HWS-T, P56HWS-T, P78HWS-T	5	TE-631AP-1	6" Pipe Mount Temp Sensor
	5	WZ1000-5	Well
OAT-2	1	TE-6313P-1	Outdoor Air Temperature Sensor



Typical Boiler Module Field Wiring

REVISION INFO	DRAWING TITLE									
NUMBER 0	**Hot Water Heating**									
DATE 03/31/00		REFERENCE DRAWING		NO.	REVISION-LOCATION		ECN	DATE	BY	
TIME 09:46 AM		Sales Engineer RLS	Project Manager RLS	Designer RLS	DRAWN BY RLS DATE 03/31/00	APPROVED BY	DATE			
	PROJECT TITLE **Herzberg Institute of Astrophysics**	Intelligent Building Controls Ltd.			Branch Information 1107 Nicholson St. Victoria, BC V8X - 3L5 Phone:(250) 216-0665 FAX: (250) 727-2113 e-mail: ris@direct.ca		CONTRACT NUMBER **99-0012**			
FILE NAME Boiler-b.vsd							DRAWING NUMBER **13B of B**			



Bill Of Material

Code	*Qty*	*Model*	*Description*
EN-7	1	SCP	CET 2 Channel Programmable Gas Detection Panel
OXY1-SENS, OXY2-SENS	2	AST-895S	CET Galvanic Oxygen Transmitter c/w local strobe light and audible alarm

Sequence of Operation

.1 An oxygen sensor/transmitter will be mounted on the ceiling in a central location over benches in each of the Submillimeter Lab and the Electronics Lab. Each unit will be equipped with a red strobe light and audible alarm horn.

.2 The sensors shall be wired to a remote control panel programmed to monitor oxygen levels in the two labs, and to trigger alarm annunciation on detecting a low level. This panel includes a continuous LED read-out of oxygen levels in the two labs, and an alarm/silence pushbutton on the panel face.

.3 On sensing an oxygen level below 19%, the strobe light in the affected lab shall be activated. On sensing an oxygen level below 17%, the audible alarm in the affected lab shall be activated, and an alarm shall be initiated to the METASYS network. The audible alarm can be silenced by actuating the alarm silence switch on the remote control panel, however the strobe light in the affected lab shall remain activated until the alarm condition has been corrected.

REVISION INFO
NUMBER 0
DATE 03/31/00
TIME 10:06 AM
FILE NAME Oxygen.vsd

DRAWING TITLE
Laboratory Oxygen Deficiency Alarm System

PROJECT TITLE
Herzberg Institute of Astrophysics

REFERENCE DRAWING	NO.	REVISION-LOCATION	ECN	DATE	BY

Sales Engineer	Project Manager	Designer	DRAWN	APPROVED
RLS	RLS	RLS	BY RLS DATE 03/31/00	BY DATE

Intelligent Building Controls Ltd.

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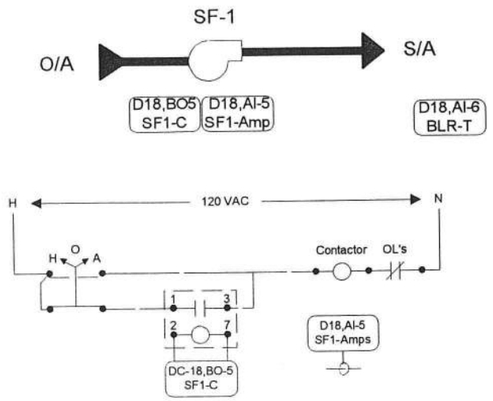
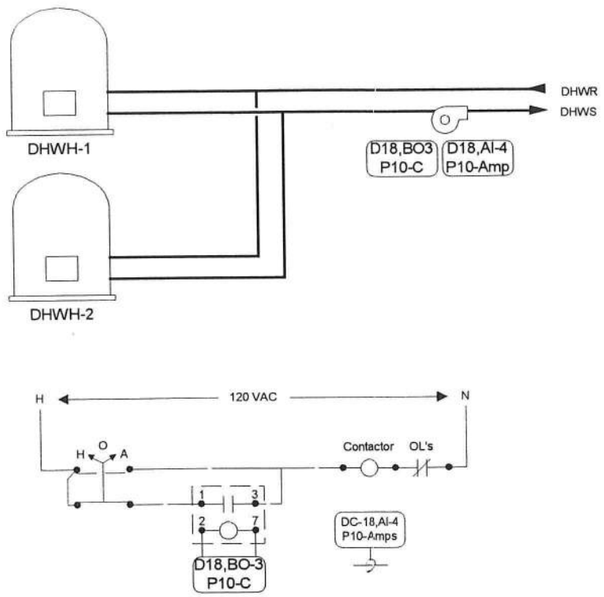
CONTRACT NUMBER **99-0012**

DRAWING NUMBER **14**

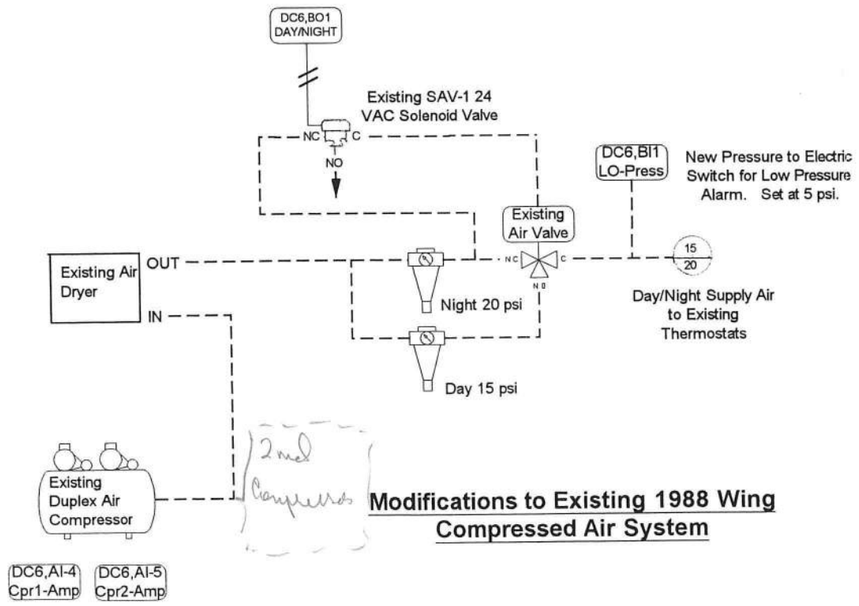
NO



Boiler Room Ventilation Unit SF-1



Domestic Hot Water Pump P-10 Control



Modifications to Existing 1988 Wing Compressed Air System

Bill Of Material

Code	*Qty*	*Model*	*Description*
SF1-C,P10-C	2	LY2US-AC24	Omron DPDT 24VAC Relay
	2	PTF08A	Omron 8-Pin Base
BLR-T	1	TE-6314P-1	RTD Room Sensor
SF1, P10, AIRC1, AIRC2-Amps	4	H-722	Veris Current Transducer
LO-PRESS	1	P10BC-7C	Pressure to Electric Switch

Sequence of Operation

Boiler Room Ventilation Unit SF-1

.1 The METASYS system shall cycle Supply Fan SF-1 as required to maintain boiler room temperature at setpoint.

Domestic Hot Water Pump P10 Control

.1 During occupied hours, domestic hot water recirculation pump P10 shall be continuously cycled on for 10 minutes and then off for 20 minutes.

.2 During unoccupied hours, the pump shall be turned off.

.3 Each domestic hot water heater shall maintain its tank temperature at setpoint via integral controls.

Modifications to Existing 1988 Compressed Control Air System

.1 The METASYS system shall switch the thermostat supply air pressure between night and day settings based on an occupied schedule entered by the system operator.

.2 The METASYS system shall monitor the status of each of the two compressors, and shall store the accumulated run time of each compressor.

.3 A new pressure to electric switch shall initiate an alarm to the METASYS network.

Storm Sump Pump Alarm Monitoring

.1 The Storm Sump Pump alarm panel shall be monitored by the METASYS network, and shall initiate an alarm should the panel indicate a high level condition in the storm sump.

REVISION: INFO	DRAWING TITLE: Miscellaneous Control Systems									
NUMBER: 0										
DATE: 03/31/00										
TIME: 12:09 PM										
FILE NAME: Misc.vsd										
		REFERENCE DRAWING		NO	REVISION-LOCATION			ECN	DATE	BY
		Sales Engineer: RLS	Project Manager: RLS	Designer: RLS	DRAWN: BY RLS DATE 03/31/00			APPROVED: BY	DATE	
	PROJECT TITLE: Herzberg Institute of Astrophysics	Intelligent Building Controls Ltd.			Branch Information: 1107 Nicholson St. Victoria, BC V8X - 3L5 Phone:(250) 216-0665 FAX: (250) 727-2113 e-mail: rls@direct.ca			CONTRACT NUMBER: 99-0012		
								DRAWING NUMBER: 15		

Project Name: Herzberg Institute
Project Number: 99-0012

Damper Schedule

Tag				Damper Information													Actuator Information								
												Duct Size		Damper Size										
Item	System	Service	Ref. Dwg.	Qty.	Code No.	Fail Pos.	Dmpr. Oper.	Dmpr. Type	Blade Type	Bear. Type	Seals	W (mm)	H (mm)	W (mm)	H (mm)	Area (m2)	Qty.	Code No.	Power	Spring Return	Control Signal	Mtg.	Detail	Comments
MD-1	AHU-1	O/A	M5.01	1	CPPBS-160X160	N.C.	Control	Parallel	Double	Bronze	Standard	400	400	404	404	0.16	1	M9216-HGA-2	24 VAC	S.R.	0 - 10VDC	Drive Shaft		
MD-2	AHU-1	R/A	M5.01	1	CPPBS-320X280	N.O.	Control	Parallel	Double	Bronze	Standard	800	700	809	707	0.57	1	M9216-HGA-2	24 VAC	S.R.	0 - 10VDC	Drive Shaft		
MD-3	AHU-2	O/A	M5.01	1	By AHU Manuf.	N.C.	Control	Parallel				1250	600				1	M9216-BGC-2	24 VAC	S.R.	On/Off	Drive Shaft		End Switch
MD-4	AHU-3	O/A	M5.01	1	By AHU Manuf.	N.C.	Control	Parallel				500	350				1	M9216-HGA-2	24 VAC	S.R.	0 - 10VDC	Drive Shaft		
MD-5	AHU-3	R/A	M5.01	1	By AHU Manuf.	N.O.	Control	Parallel				400	200				1	M9216-HGA-2	24 VAC	S.R.	0 - 10VDC	Drive Shaft		
MD-6	Emergency Gen.	O/A	1	4	CPPBS-480X420	N.C.	Control	Parallel	Double	Bronze	Standard	2440	2130	1213	1061	1.29	4	M9216-BGA-2	24VAC	S.R.	On/Off	Drive Shaft		Fire Pump Station
MD-7	Emergency Gen.	E/A	1	4	CPPBS-480X420	N.C.	Control	Parallel	Double	Bronze	Standard	2440	2130	1213	1061	1.29	4	M9216-BGA-2	24VAC	S.R.	On/Off	Drive Shaft		Fire Pump Station
MD-8	Emergency Gen.	O/A	2	1	CPPBS-420X760	N.C.	Control	Parallel	Double	Bronze	Standard	1065	1935	1061	1920	2.04	1	M9216-BGA-2	24VAC	S.R.	On/Off	Drive Shaft		Booster Pumphouse
MD-9	Emergency Gen.	E/A	2	1	CPPBS-480X680	N.C.	Control	Parallel	Double	Bronze	Standard	1220	1700	1213	1718	2.08	1	M9216-BGA-2	24VAC	S.R.	On/Off	Drive Shaft		Booster Pumphouse

Project Name: Herzberg Institute
Project Number: 99-0012

Valve Schedule

Room/Controller				Valve Information																	Actuator Information			
Encl. #	Encl. Location	Digital Contr. Address	Sensor Point Name	Valve Point Name	Room Designation	Service	Ref Drawing	Output kW	Code Number	Cfg.	Fail Pos.	Pipe Size (mm)	Valve Size (mm)	Body Cfg.	Valve Max Close Off (Kpa)	Selected Valve Kv	Design Kv	Design Flow Litre/s	Design Delta P (kPa)	Selected Valve Delta P (kPa)	Code No.	Supply Voltage	Type	Control Signal
1	Fan Room 102	DC-1	Rm101-T	TV-101	Office 101	Radiant Panel	M6.01 D2	2.1	VG5240CC+7452G	2-Way	Open	20	13	NPT	207	0.63	0.22	0.045	52.0	6.5	VA-7452-90011	24 VAC	Mod. S.R.	0 - 10 VDC
10	Mail Room 122	DC-100	Rm103-T	TV-103	Office 103	Radiant Panel	M6.01 D2	1.3	VG5240CC+7452G	2-Way	Open	20	13	NPT	207	0.63	0.14	0.028	52.0	2.5	VA-7452-90011	24 VAC	Mod. S.R.	0 - 10 VDC
10	Mail Room 122	DC-100	Rm104-T	TV-104	Office 104	Radiant Panel	M6.01 D2	0.85	VG5240CC+7452G	2-Way	Open	20	13	NPT	207	0.63	0.09	0.018	52.0	1.1	VA-7452-90011	24 VAC	Mod. S.R.	0 - 10 VDC
1	Fan Room 102	DC-2	Rm106-T	TV-106	Office 106	Radiant Panel	M6.01 D2	1.7	VG5240CC+7452G	2-Way	Open	20	13	NPT	207	0.63	0.18	0.037	52.0	4.2	VA-7452-90011	24 VAC	Mod. S.R.	0 - 10 VDC
1	Fan Room 102	DC-3	Rm107-T	TV-107	Office 107	Radiant Panel	M6.01 D2	0.65	VG5240CC+7452G	2-Way	Open	20	13	NPT	207	0.63	0.07	0.014	52.0	0.6	VA-7452-90011	24 VAC	Mod. S.R.	0 - 10 VDC
10	Mail Room 122	DC-101	Rm109-T	TV-109	Office 109	Radiant Panel	M6.01 D2	1.1	VG5240CC+7452G	2-Way	Open	20	13	NPT	207	0.63	0.12	0.024	52.0	1.8	VA-7452-90011	24 VAC	Mod. S.R.	0 - 10 VDC
10	Mail Room 122	DC-101	Rm110-T	TV-110	Office 110	Radiant Panel	M6.01 D2	1.1	VG5240CC+7452G	2-Way	Open	20	13	NPT	207	0.63	0.12	0.024	52.0	1.8	VA-7452-90011	24 VAC	Mod. S.R.	0 - 10 VDC
10	Mail Room 122	DC-102	Rm111-T	TV-111	Sky Survey 111	Radiant Panel	M6.01 D2	1.6	VG5240CC+7452G	2-Way	Open	20	13	NPT	207	0.63	0.17	0.034	52.0	3.8	VA-7452-90011	24 VAC	Mod. S.R.	0 - 10 VDC
10	Mail Room 122	DC-102	Rm114-T	TV-114	Office 114/115	Radiant Panel	M6.01 D2	2.5	VG5240CC+7452G	2-Way	Open	20	13	NPT	207	0.63	0.27	0.054	52.0	9.2	VA-7452-90011	24 VAC	Mod. S.R.	0 - 10 VDC
10	Mail Room 122	DC-103	Rm116-T	TV-116	Office 116	Radiant Panel	M6.01 D2	1.1	VG5240CC+7452G	2-Way	Open	20	13	NPT	207	0.63	0.12	0.024	52.0	1.8	VA-7452-90011	24 VAC	Mod. S.R.	0 - 10 VDC
10	Mail Room 122	DC-103	Rm117-T	TV-117	Office 117	Radiant Panel	M6.01 D2	1.4	VG5240CC+7452G	2-Way	Open	20	13	NPT	207	0.63	0.15	0.030	52.0	2.9	VA-7452-90011	24 VAC	Mod. S.R.	0 - 10 VDC
10	Mail Room 122	DC-104	Rm118-T	TV-118	Office 118	Radiant Panel	M6.01 D2	1.4	VG5240CC+7452G	2-Way	Open	20	13	NPT	207	0.63	0.15	0.030	52.0	2.9	VA-7452-90011	24 VAC	Mod. S.R.	0 - 10 VDC
10	Mail Room 122	DC-104	Rm123-T	TV-123	Office 123	Radiant Panel	M6.01 D2	1.1	VG5240CC+7452G	2-Way	Open	20	13	NPT	207	0.63	0.12	0.024	52.0	1.8	VA-7452-90011	24 VAC	Mod. S.R.	0 - 10 VDC
10	Mail Room 122	DC-105	Rm124-T	TV-124	Office 124	Radiant Panel	M6.01 D2	1.6	VG5240CC+7452G	2-Way	Open	20	13	NPT	207	0.63	0.17	0.034	52.0	3.8	VA-7452-90011	24 VAC	Mod. S.R.	0 - 10 VDC
10	Mail Room 122	DC-105	Rm125-T	TV-125	Office 125	Radiant Panel	M6.01 D2	1.3	VG5240CC+7452G	2-Way	Open	20	13	NPT	207	0.63	0.14	0.028	52.0	2.5	VA-7452-90011	24 VAC	Mod. S.R.	0 - 10 VDC
11	Elec. Closet 170a	DC-106	Rm167-T	TV-167	Bridge 167	Radiant Panel	M6.01 D2	1.4	VG5240CC+7452G	2-Way	Open	20	13	NPT	207	0.63	0.15	0.030	52.0	2.9	VA-7452-90011	24 VAC	Mod. S.R.	0 - 10 VDC
11	Elec. Closet 170a	DC-107	Rm170E-T	TV-170E	Lunchrm 170E.	Radiant Panel	M6.01 D2	2.6	VG5240CC+7452G	2-Way	Open	20	13	NPT	207	0.63	0.28	0.0561	52.0	9.9	VA-7452-90011	24 VAC	Mod. S.R.	0 - 10 VDC
11	Elec. Closet 170a	DC-106	Rm170W-T	TV-170W1	Lunchrm 170W1.	Radiant Panel	M6.01 D2	1.2	VG5240CC+7452G	2-Way	Open	20	13	NPT	207	0.63	0.13	0.0259	52.0	2.1	VA-7452-90011	24 VAC	Mod. S.R.	0 - 10 VDC
11	Elec. Closet 170a	DC-106		TV-170W2	Lunchrm 170W2.	Radiant Panel	M6.01 D2	1.5	VG5240CC+7452G	2-Way	Open	20	13	NPT	207	0.63	0.16	0.0323	52.0	3.3	VA-7452-90011	24 VAC	Mod. S.R.	0 - 10 VDC
11	Elec. Closet 170a	DC-107	Rm172W-T	TV-172W1	Corridor 172W1	Radiant Panel	M6.01 D2	0.44	VG5240CC+7452G	2-Way	Open	20	13	NPT	207	0.63	0.05	0.0095	52.0	0.3	VA-7452-90011	24 VAC	Mod. S.R.	0 - 10 VDC
11	Elec. Closet 170a	DC-107		TV-172W2	Corridor 172W2	Radiant Panel	M6.01 D2	1.8	VG5240CC+7452G	2-Way	Open	20	13	NPT	207	0.63	0.19	0.0388	52.0	4.8	VA-7452-90011	24 VAC	Mod. S.R.	0 - 10 VDC
11	Elec. Closet 170a	DC-107		TV-172W3	Corridor 172W3	Radiant Panel	M6.01 D2	1.6	VG5240CC+7452G	2-Way	Open	20	13	NPT	207	0.63	0.17	0.0345	52.0	3.8	VA-7452-90011	24 VAC	Mod. S.R.	0 - 10 VDC
11	Elec. Closet 170a	DC-107		TV-172W4	Corridor 172W4	Radiant Panel	M6.01 D2	1.6	VG5240CC+7452G	2-Way	Open	20	13	NPT	207	0.63	0.17	0.0345	52.0	3.8	VA-7452-90011	24 VAC	Mod. S.R.	0 - 10 VDC
11	Elec. Closet 170a	DC-108	Rm172E-T	TV-172E1	Corridor 172E1	Radiant Panel	M6.01 D2	1.6	VG5240CC+7452G	2-Way	Open	20	13	NPT	207	0.63	0.17	0.0345	52.0	3.8	VA-7452-90011	24 VAC	Mod. S.R.	0 - 10 VDC
11	Elec. Closet 170a	DC-108		TV-172E2	Corridor 172E2	Radiant Panel	M6.01 D2	1.6	VG5240CC+7452G	2-Way	Open	20	13	NPT	207	0.63	0.17	0.0345	52.0	3.8	VA-7452-90011	24 VAC	Mod. S.R.	0 - 10 VDC
11	Elec. Closet 170a	DC-108	Rm173-T	TV-173E	Conference 173E	Radiant Panel	M6.01 D2	1.5	VG5240CC+7452G	2-Way	Open	20	13	NPT	207	0.63	0.16	0.0323	52.0	3.3	VA-7452-90011	24 VAC	Mod. S.R.	0 - 10 VDC
11	Elec. Closet 170a	DC-108		TV-173W	Conference 173W	Radiant Panel	M6.01 D2	1.5	VG5240CC+7452G	2-Way	Open	20	13	NPT	207	0.63	0.16	0.0323	52.0	3.3	VA-7452-90011	24 VAC	Mod. S.R.	0 - 10 VDC
11	Elec. Closet 170a	DC-109	Rm174-T	TV-174	Storage 174	Radiant Panel	M6.01 D2	1.7	VG5240CC+7452G	2-Way	Open	20	13	NPT	207	0.63	0.18	0.0367	52.0	4.2	VA-7452-90011	24 VAC	Mod. S.R.	0 - 10 VDC
11	Elec. Closet 170a	DC-109	Rm178-T	TV-178	Women's WR178	Radiant Panel	M6.01 D2	0.56	VG5240CC+7452G	2-Way	Open	20	13	NPT	207	0.63	0.06	0.0121	52.0	0.5	VA-7452-90011	24 VAC	Mod. S.R.	0 - 10 VDC
11	Elec. Closet 170a	DC-110	Rm180-T	TV-180	Men's WR180	Radiant Panel	M6.01 D2	0.56	VG5240CC+7452G	2-Way	Open	20	13	NPT	207	0.63	0.06	0.0121	52.0	0.5	VA-7452-90011	24 VAC	Mod. S.R.	0 - 10 VDC
12	Corridor 209 Ceiling	DC-111	Rm201-T	TV-201	Office 201	Radiant Panel	M6.01 D2	2.1	VG5240CC+7452G	2-Way	Open	20	13	NPT	207	0.63	0.22	0.0453	52.0	6.5	VA-7452-90011	24 VAC	Mod. S.R.	0 - 10 VDC
12	Corridor 209 Ceiling	DC-111	Rm202-T	TV-202	Office 202	Radiant Panel	M6.01 D2	0.91	VG5240CC+7452G	2-Way	Open	20	13	NPT	207	0.63	0.10	0.0196	52.0	1.2	VA-7452-90011	24 VAC	Mod. S.R.	0 - 10 VDC
12	Corridor 209 Ceiling	DC-112	Rm203-T	TV-203	Office 203	Radiant Panel	M6.01 D2	1.3	VG5240CC+7452G	2-Way	Open	20	13	NPT	207	0.63	0.14	0.028	52.0	2.5	VA-7452-90011	24 VAC	Mod. S.R.	0 - 10 VDC
12	Corridor 209 Ceiling	DC-112	Rm204-T	TV-204	Office 204	Radiant Panel	M6.01 D2	0.85	VG5240CC+7452G	2-Way	Open	20	13	NPT	207	0.63	0.09	0.0183	52.0	1.1	VA-7452-90011	24 VAC	Mod. S.R.	0 - 10 VDC
12	Corridor 209 Ceiling	DC-113	Rm205-T	TV-205	Office 205	Radiant Panel	M6.01 D2	2.1	VG5240CC+7452G	2-Way	Open	20	13	NPT	207	0.63	0.22	0.0453	52.0	6.5	VA-7452-90011	24 VAC	Mod. S.R.	0 - 10 VDC
12	Corridor 209 Ceiling	DC-113	Rm206-T	TV-206	Office 206	Radiant Panel	M6.01 D2	0.91	VG5240CC+7452G	2-Way	Open	20	13	NPT	207	0.63	0.10	0.0196	52.0	1.2	VA-7452-90011	24 VAC	Mod. S.R.	0 - 10 VDC
12	Corridor 209 Ceiling	DC-114	Rm207-T	TV-207	Office 207	Radiant Panel	M6.01 D2	0.9	VG5240CC+7452G	2-Way	Open	20	13	NPT	207	0.63	0.10	0.0194	52.0	1.2	VA-7452-90011	24 VAC	Mod. S.R.	0 - 10 VDC
12	Corridor 209 Ceiling	DC-114	Rm208-T	TV-208	Office 208	Radiant Panel	M6.01 D2	1.2	VG5240CC+7452G	2-Way	Open	20	13	NPT	207	0.63	0.13	0.0259	52.0	2.1	VA-7452-90011	24 VAC	Mod. S.R.	0 - 10 VDC
13	Corridor 225 Ceiling	DC-115	Rm210-T	TV-210	Office 210	Radiant Panel	M6.01 D2	1.5	VG5240CC+7452G	2-Way	Open	20	13	NPT	207	0.63	0.16	0.0323	52.0	3.3	VA-7452-90011	24 VAC	Mod. S.R.	0 - 10 VDC
13	Corridor 225 Ceiling	DC-115	Rm211-T	TV-211	Office 211	Radiant Panel	M6.01 D2	3.1	VG5240CC+7452G	2-Way	Open	20	13	NPT	207	0.63	0.33	0.0668	52.0	14.1	VA-7452-90011	24 VAC	Mod. S.R.	0 - 10 VDC
13	Corridor 225 Ceiling	DC-116	Rm213-T	TV-213	Office 213	Radiant Panel	M6.01 D2	1.3	VG5240CC+7452G	2-Way	Open	20	13	NPT	207	0.63	0.14	0.028	52.0	2.5	VA-7452-90011	24 VAC	Mod. S.R.	0 - 10 VDC
13	Corridor 225 Ceiling	DC-116	Rm214-T	TV-214	Office 214	Radiant Panel	M6.01 D2	1.2	VG5240CC+7452G	2-Way	Open	20	13	NPT	207	0.63	0.13	0.0259	52.0	2.1	VA-7452-90011	24 VAC	Mod. S.R.	0 - 10 VDC
13	Corridor 225 Ceiling	DC-117	Rm215-T	TV-215	Office 215	Radiant Panel	M6.01 D2	1.2	VG5240CC+7452G	2-Way	Open	20	13	NPT	207	0.63	0.13	0.0259	52.0	2.1	VA-7452-90011	24 VAC	Mod. S.R.	0 - 10 VDC
13	Corridor 225 Ceiling	DC-117	Rm216-T	TV-216	Office 216	Radiant Panel	M6.01 D2	1.2	VG5240CC+7452G	2-Way	Open	20	13	NPT	207	0.63	0.13	0.0259	52.0	2.1	VA-7452-90011	24 VAC	Mod. S.R.	0 - 10 VDC
13	Corridor 225 Ceiling	DC-118	Rm217-T	TV-217	Office 217	Radiant Panel	M6.01 D2	1.2	VG5240CC+7452G	2-Way	Open	20	13	NPT	207	0.63	0.13	0.0259	52.0	2.1	VA-7452-90011	24 VAC	Mod. S.R.	0 - 10 VDC
13	Corridor 225 Ceiling	DC-118	Rm218-T	TV-218	Office 218	Radiant Panel	M6.01 D2	1.4	VG5240CC+7452G	2-Way	Open	20	13	NPT	207	0.63	0.15	0.0302	52.0	2.9	VA-7452-90011	24 VAC	Mod. S.R.	0 - 10 VDC
13	Corridor 225 Ceiling	DC-119	Rm220-T	TV-220	Office 220	Radiant Panel	M6.01 D2	1.3	VG5240CC+7452G	2-Way	Open	20	13	NPT	207	0.63	0.14	0.028	52.0	2.5	VA-7452-90011	24 VAC	Mod. S.R.	0 - 10 VDC
13	Corridor 225 Ceiling	DC-119	Rm221-T	TV-221	Office 221	Radiant Panel	M6.01 D2	1.23	VG5240CC+7452G	2-Way	Open	20	13	NPT	207	0.63	0.13	0.0265	52.0	2.2	VA-7452-90011	24 VAC	Mod. S.R.	0 - 10 VDC
13	Corridor 225 Ceiling	DC-120	Rm222-T	TV-222	Office 222	Radiant Panel	M6.01 D2	0.77	VG5240CC+7452G	2-Way	Open	20	13	NPT	207	0.63	0.08	0.0166	52.0	0.9	VA-7452-90011	24 VAC	Mod. S.R.	0 - 10 VDC
13	Corridor 225 Ceiling	DC-120	Rm223-T	TV-223	Office 223	Radiant Panel	M6.01 D2	1	VG5240CC+7452G	2-Way	Open	20	13	NPT	207	0.63	0.11	0.0216	52.0	1.5	VA-7452-90011	24 VAC	Mod. S.R.	0 - 10 VDC
14	Elec. Closet 261	DC-121	Rm257-T	TV-257	Bridge 257	Radiant Panel	M6.01 D2	1.4	VG5240CC+7452G	2-Way	Open	20	13	NPT	207	0.63	0.15	0.0302	52.0	2.9	VA-7452-90011	24 VAC	Mod. S.R.	0 - 10 VDC
14	Elec. Closet 261	DC-121	Rm260E-T	TV-260E1	Electr. Lab 260E	Radiant Panel	M6.01 D2	2.3	VG5240CC+7452G	2-Way	Open	20	13	NPT	207	0.63	0.25	0.0496	52.0	7.8	VA-7452-90011	24 VAC	Mod. S.R.	0 - 10 VDC
14	Elec. Closet 261	DC-121		TV-260E2	Electr. Lab 260E	Radiant Panel	M6.01 D2	0.9	VG5240CC+7452G	2-Way	Open	20	13	NPT	207	0.63	0.10	0.0194	52.0	1.2	VA-7452-90011	24 VAC	Mod. S.R.	0 - 10 VDC
14	Elec. Closet 261	DC-122	Rm260W-T	TV-260W1	Electr. Lab 260W	Radiant Panel	M6.01 D2	1.1	VG5240CC+7452G	2-Way	Open	20	13	NPT	207	0.63	0.12	0.0237	52.0	1.8	VA-7452-90011	24 VAC	Mod. S.R.	0 - 10 VDC
14	Elec. Closet 261	DC-122		TV-260W2	Electr. Lab 260W	Radiant Panel	M6.01 D2	1.1	VG5240CC+7452G	2-Way	Open	20	13	NPT	207	0.63	0.12	0.0237	52.0	1.8	VA-7452-90011	24 VAC	Mod. S.R.	0 - 10 VDC
14	Elec. Closet 261	DC-122	Rm266-T	TV-266	Bridge 266	Radiant Panel	M6.01 D2	2	VG5240CC+7452G	2-Way	Open	20	13	NPT	207	0.63	0.21	0.0431	52.0	5.9	VA-7452-90011	24 VAC	Mod. S.R.	0 - 10 VDC
14	Elec. Closet 261	DC-122		TV-262W1	Corridor 262W.	Radiant Panel	M6.01 D2	0.44	VG5240CC+7452G	2-Way	Open	20	13	NPT	207	0.63	0.05	0.0095	52.0	0.3	VA-7452-90011	24 VAC	Mod. S.R.	0 - 10 VDC
14	Elec. Closet 261	DC-123	Rm262W-T	TV-262W2	Corridor 262W	Radiant Panel	M6.01 D2	1.8	VG5240CC+7452G	2-Way	Open	20	13	NPT	207	0.63	0.19	0.0388	52.0	4.8	VA-7452-90011	24 VAC	Mod. S.R.	0 - 10 VDC

Project Name: Herzberg Institute
Project Number: 99-0012

Valve Schedule

Room/Controller				Valve Information																	Actuator Information			
Encl. #	Encl. Location	Digital Contr. Address	Sensor Point Name	Valve Point Name	Room Designation	Service	Ref Drawing	Output kW	Code Number	Cfg.	Fail Pos.	Pipe Size (mm)	Valve Size (mm)	Body Cfg.	Valve Max Close Off (Kpa)	Selected Valve Kv	Design Kv	Design Flow Litre/s	Design Delta P (kPa)	Selected Valve Delta P (kPa)	Code No.	Supply Voltage	Type	Control Signal
14	Elec. Closet 261	DC-123		TV-262W3	Corridor 262W	Radiant Panel	M6.01 D2	1.6	VG5240CC+7452G	2-Way	Open	20	13	NPT	207	0.63	0.17	0.0345	52.0	3.8	VA-7452-90011	24 VAC	Mod. S.R.	0 - 10 VDC
14	Elec. Closet 261	DC-123		TV-262W4	Corridor 262W	Radiant Panel	M6.01 D2	1.6	VG5240CC+7452G	2-Way	Open	20	13	NPT	207	0.63	0.17	0.0345	52.0	3.8	VA-7452-90011	24 VAC	Mod. S.R.	0 - 10 VDC
14	Elec. Closet 261	DC-123	Rm262E-T	TV-262E1	Corridor 262E	Radiant Panel	M6.01 D2	1.6	VG5240CC+7452G	2-Way	Open	20	13	NPT	207	0.63	0.17	0.0345	52.0	3.8	VA-7452-90011	24 VAC	Mod. S.R.	0 - 10 VDC
14	Elec. Closet 261	DC-123		TV-262E2	Corridor 262E	Radiant Panel	M6.01 D2	1.6	VG5240CC+7452G	2-Way	Open	20	13	NPT	207	0.63	0.17	0.0345	52.0	3.8	VA-7452-90011	24 VAC	Mod. S.R.	0 - 10 VDC
14	Elec. Closet 261	DC-124	Rm265-T	TV-265E	Submill 265E.	Radiant Panel	M6.01 D2	1.1	VG5240CC+7452G	2-Way	Open	20	13	NPT	207	0.63	0.12	0.0237	52.0	1.8	VA-7452-90011	24 VAC	Mod. S.R.	0 - 10 VDC
14	Elec. Closet 261	DC-124		TV-265W	Submill 265W.	Radiant Panel	M6.01 D2	1.3	VG5240CC+7452G	2-Way	Open	20	13	NPT	207	0.63	0.14	0.028	52.0	2.5	VA-7452-90011	24 VAC	Mod. S.R.	0 - 10 VDC
14	Elec. Closet 261	DC-124	Rm269-T	TV-269	Women's WR 269	Radiant Panel	M6.01 D2	0.56	VG5240CC+7452G	2-Way	Open	20	13	NPT	207	0.63	0.06	0.0121	52.0	0.5	VA-7452-90011	24 VAC	Mod. S.R.	0 - 10 VDC
14	Elec. Closet 261	DC-125	Rm271-T	TV-271	Men's WR 271	Radiant Panel	M6.01 D2	0.56	VG5240CC+7452G	2-Way	Open	20	13	NPT	207	0.63	0.06	0.0121	52.0	0.5	VA-7452-90011	24 VAC	Mod. S.R.	0 - 10 VDC
15	Corridor 317 Clg.	DC-126	Rm301-T	TV-301	Office 301	Radiant Panel	M6.01 D2	2.2	VG5240CC+7452G	2-Way	Open	20	13	NPT	207	0.63	0.23	0.0474	52.0	7.1	VA-7452-90011	24 VAC	Mod. S.R.	0 - 10 VDC
15	Corridor 317 Clg.	DC-126	Rm302-T	TV-302	Office 302	Radiant Panel	M6.01 D2	1.1	VG5240CC+7452G	2-Way	Open	20	13	NPT	207	0.63	0.12	0.0237	52.0	1.8	VA-7452-90011	24 VAC	Mod. S.R.	0 - 10 VDC
15	Corridor 317 Clg.	DC-127	Rm303-T	TV-303	Office 303	Radiant Panel	M6.01 D2	1.4	VG5240CC+7452G	2-Way	Open	20	13	NPT	207	0.63	0.15	0.0302	52.0	2.9	VA-7452-90011	24 VAC	Mod. S.R.	0 - 10 VDC
15	Corridor 317 Clg.	DC-127	Rm304-T	TV-304	Office 304	Radiant Panel	M6.01 D2	0.86	VG5240CC+7452G	2-Way	Open	20	13	NPT	207	0.63	0.09	0.0185	52.0	1.1	VA-7452-90011	24 VAC	Mod. S.R.	0 - 10 VDC
16	Corridor 319 Clg	DC-130	Rm305-T	TV-305	Office 305	Radiant Panel	M6.01 D2	2.3	VG5240CC+7452G	2-Way	Open	20	13	NPT	207	0.63	0.25	0.0496	52.0	7.8	VA-7452-90011	24 VAC	Mod. S.R.	0 - 10 VDC
16	Corridor 319 Clg.	DC-130	Rm306-T	TV-306	Office 306	Radiant Panel	M6.01 D2	3.7	VG5240CC+7452G	2-Way	Open	20	13	NPT	207	0.63	0.39	0.0798	52.0	20.1	VA-7452-90011	24 VAC	Mod. S.R.	0 - 10 VDC
16	Corridor 319 Clg.	DC-131	Rm307-T	TV-307	Office 307	Radiant Panel	M6.01 D2	1.4	VG5240CC+7452G	2-Way	Open	20	13	NPT	207	0.63	0.15	0.0302	52.0	2.9	VA-7452-90011	24 VAC	Mod. S.R.	0 - 10 VDC
16	Corridor 319 Clg.	DC-131	Rm308-T	TV-308	Office 308	Radiant Panel	M6.01 D2	1.1	VG5240CC+7452G	2-Way	Open	20	13	NPT	207	0.63	0.12	0.0237	52.0	1.8	VA-7452-90011	24 VAC	Mod. S.R.	0 - 10 VDC
16	Corridor 319 Clg.	DC-132	Rm309-T	TV-309	Office 309	Radiant Panel	M6.01 D2	1.1	VG5240CC+7452G	2-Way	Open	20	13	NPT	207	0.63	0.12	0.0237	52.0	1.8	VA-7452-90011	24 VAC	Mod. S.R.	0 - 10 VDC
16	Corridor 319 Clg.	DC-132	Rm310-T	TV-310	Office 310	Radiant Panel	M6.01 D2	1.1	VG5240CC+7452G	2-Way	Open	20	13	NPT	207	0.63	0.12	0.0237	52.0	1.8	VA-7452-90011	24 VAC	Mod. S.R.	0 - 10 VDC
16	Corridor 319 Clg.	DC-133	Rm311-T	TV-311	Office 311	Radiant Panel	M6.01 D2	1.4	VG5240CC+7452G	2-Way	Open	20	13	NPT	207	0.63	0.15	0.0302	52.0	2.9	VA-7452-90011	24 VAC	Mod. S.R.	0 - 10 VDC
16	Corridor 319 Clg.	DC-133	Rm312-T	TV-312	Office 312	Radiant Panel	M6.01 D2	1.4	VG5240CC+7452G	2-Way	Open	20	13	NPT	207	0.63	0.15	0.0302	52.0	2.9	VA-7452-90011	24 VAC	Mod. S.R.	0 - 10 VDC
15	Corridor 317 Clg.	DC-128	Rm313-T	TV-313	Office 313	Radiant Panel	M6.01 D2	2.35	VG5240CC+7452G	2-Way	Open	20	13	NPT	207	0.63	0.25	0.0507	52.0	8.1	VA-7452-90011	24 VAC	Mod. S.R.	0 - 10 VDC
15	Corridor 317 Clg.	DC-128	Rm314-T	TV-314	Office 314	Radiant Panel	M6.01 D2	0.95	VG5240CC+7452G	2-Way	Open	20	13	NPT	207	0.63	0.10	0.0205	52.0	1.3	VA-7452-90011	24 VAC	Mod. S.R.	0 - 10 VDC
15	Corridor 317 Clg.	DC-129	Rm315-T	TV-315	Office 315	Radiant Panel	M6.01 D2	0.86	VG5240CC+7452G	2-Way	Open	20	13	NPT	207	0.63	0.09	0.0185	52.0	1.1	VA-7452-90011	24 VAC	Mod. S.R.	0 - 10 VDC
15	Corridor 317 Clg.	DC-129	Rm316-T	TV-316	Office 316	Radiant Panel	M6.01 D2	1.3	VG5240CC+7452G	2-Way	Open	20	13	NPT	207	0.63	0.14	0.028	52.0	2.5	VA-7452-90011	24 VAC	Mod. S.R.	0 - 10 VDC
16	Corridor 319 Clg.	DC-134	Rm321-T	TV-321	Office 321	Radiant Panel	M6.01 D2	0.57	VG5240CC+7452G	2-Way	Open	20	13	NPT	207	0.63	0.06	0.0123	52.0	0.5	VA-7452-90011	24 VAC	Mod. S.R.	0 - 10 VDC
16	Corridor 319 Clg.	DC-134	Rm322-T	TV-322	Office 322	Radiant Panel	M6.01 D2	1.1	VG5240CC+7452G	2-Way	Open	20	13	NPT	207	0.63	0.12	0.0237	52.0	1.8	VA-7452-90011	24 VAC	Mod. S.R.	0 - 10 VDC
16	Corridor 319 Clg.	DC-135	Rm323-T	TV-323	Office 323	Radiant Panel	M6.01 D2	1	VG5240CC+7452G	2-Way	Open	20	13	NPT	207	0.63	0.11	0.0216	52.0	1.5	VA-7452-90011	24 VAC	Mod. S.R.	0 - 10 VDC
16	Corridor 319 Clg.	DC-135	Rm324-T	TV-324	Office 324	Radiant Panel	M6.01 D2	1.6	VG5240CC+7452G	2-Way	Open	20	13	NPT	207	0.63	0.17	0.0345	52.0	3.8	VA-7452-90011	24 VAC	Mod. S.R.	0 - 10 VDC
17	Elec Closet 346	DC-136	Rm341-T	TV-341	Bridge 341	Radiant Panel	M6.01 D2	1.4	VG5240CC+7452G	2-Way	Open	20	13	NPT	207	0.63	0.15	0.0302	52.0	2.9	VA-7452-90011	24 VAC	Mod. S.R.	0 - 10 VDC
17	Elec Closet 346	DC-136	Rm373-T	TV-373	Bridge 373	Radiant Panel	M6.01 D2	2	VG5240CC+7452G	2-Way	Open	20	13	NPT	207	0.63	0.21	0.0431	52.0	5.9	VA-7452-90011	24 VAC	Mod. S.R.	0 - 10 VDC
17	Elec Closet 346	DC-136		TV-344W1	Corridor 344W	Radiant Panel	M6.01 D2	0.45	VG5240CC+7452G	2-Way	Open	20	13	NPT	207	0.63	0.05	0.0097	52.0	0.3	VA-7452-90011	24 VAC	Mod. S.R.	0 - 10 VDC
17	Elec Closet 346	DC-136		TV-344W2	Corridor 344W	Radiant Panel	M6.01 D2	1.8	VG5240CC+7452G	2-Way	Open	20	13	NPT	207	0.63	0.19	0.0388	52.0	4.8	VA-7452-90011	24 VAC	Mod. S.R.	0 - 10 VDC
17	Elec Closet 346	DC-137	Rm344W-T	TV-344W3	Corridor 344W	Radiant Panel	M6.01 D2	1.6	VG5240CC+7452G	2-Way	Open	20	13	NPT	207	0.63	0.17	0.0345	52.0	3.8	VA-7452-90011	24 VAC	Mod. S.R.	0 - 10 VDC
17	Elec Closet 346	DC-137		TV-344W4	Corridor 344W	Radiant Panel	M6.01 D2	1.6	VG5240CC+7452G	2-Way	Open	20	13	NPT	207	0.63	0.17	0.0345	52.0	3.8	VA-7452-90011	24 VAC	Mod. S.R.	0 - 10 VDC
17	Elec Closet 346	DC-137	Rm344E-T	TV-344E	Corridor 344E	Radiant Panel	M6.01 D2	1.6	VG5240CC+7452G	2-Way	Open	20	13	NPT	207	0.63	0.17	0.0345	52.0	3.8	VA-7452-90011	24 VAC	Mod. S.R.	0 - 10 VDC
17	Elec Closet 346	DC-137		TV-344F	Corridor 344E	Radiant Panel	M6.01 D2	1.6	VG5240CC+7452G	2-Way	Open	20	13	NPT	207	0.63	0.17	0.0345	52.0	3.8	VA-7452-90011	24 VAC	Mod. S.R.	0 - 10 VDC
17	Elec Closet 346	DC-138	Rm345E-T	TV-345E	Incubator 345E	Radiant Panel	M6.01 D2	2.4	VG5240CC+7452G	2-Way	Open	20	13	NPT	207	0.63	0.26	0.0517	52.0	8.5	VA-7452-90011	24 VAC	Mod. S.R.	0 - 10 VDC
17	Elec Closet 346	DC-138	Rm345W-T	TV-345W1	Incubator 345W	Radiant Panel	M6.01 D2	1.5	VG5240CC+7452G	2-Way	Open	20	13	NPT	207	0.63	0.16	0.0323	52.0	3.3	VA-7452-90011	24 VAC	Mod. S.R.	0 - 10 VDC
17	Elec Closet 346	DC-138		TV-345W2	Incubator 345W	Radiant Panel	M6.01 D2	2	VG5240CC+7452G	2-Way	Open	20	13	NPT	207	0.63	0.21	0.0431	52.0	5.9	VA-7452-90011	24 VAC	Mod. S.R.	0 - 10 VDC
17	Elec Closet 346	DC-138		TV-345W3	Incubator 345W	Radiant Panel	M6.01 D2	2	VG5240CC+7452G	2-Way	Open	20	13	NPT	207	0.63	0.21	0.0431	52.0	5.9	VA-7452-90011	24 VAC	Mod. S.R.	0 - 10 VDC
17	Elec Closet 346	DC-139	Rm363-T	TV-363	Office 363	Radiant Panel	M6.01 D2	0.91	VG5240CC+7452G	2-Way	Open	20	13	NPT	207	0.63	0.10	0.0196	52.0	1.2	VA-7452-90011	24 VAC	Mod. S.R.	0 - 10 VDC
17	Elec Closet 346	DC-139	Rm364-T	TV-364	Office 364	Radiant Panel	M6.01 D2	0.91	VG5240CC+7452G	2-Way	Open	20	13	NPT	207	0.63	0.10	0.0196	52.0	1.2	VA-7452-90011	24 VAC	Mod. S.R.	0 - 10 VDC
17	Elec Closet 346	DC-140	Rm365-T	TV-365	Office 365	Radiant Panel	M6.01 D2	0.91	VG5240CC+7452G	2-Way	Open	20	13	NPT	207	0.63	0.10	0.0196	52.0	1.2	VA-7452-90011	24 VAC	Mod. S.R.	0 - 10 VDC
17	Elec Closet 346	DC-140	Rm366-T	TV-366	Office 366	Radiant Panel	M6.01 D2	0.91	VG5240CC+7452G	2-Way	Open	20	13	NPT	207	0.63	0.10	0.0196	52.0	1.2	VA-7452-90011	24 VAC	Mod. S.R.	0 - 10 VDC
17	Elec Closet 346	DC-141	Rm367-T	TV-367	Office 367	Radiant Panel	M6.01 D2	0.91	VG5240CC+7452G	2-Way	Open	20	13	NPT	207	0.63	0.10	0.0196	52.0	1.2	VA-7452-90011	24 VAC	Mod. S.R.	0 - 10 VDC
17	Elec Closet 346	DC-141	Rm370-T	TV-370	Women's WR	Radiant Panel	M6.01 D2	0.56	VG5240CC+7452G	2-Way	Open	20	13	NPT	207	0.63	0.06	0.0121	52.0	0.5	VA-7452-90011	24 VAC	Mod. S.R.	0 - 10 VDC
17	Elec Closet 346	DC-142	Rm372-T	TV-372	Men's WR	Radiant Panel	M6.01 D2	0.56	VG5240CC+7452G	2-Way	Open	20	13	NPT	207	0.63	0.06	0.0121	52.0	0.5	VA-7452-90011	24 VAC	Mod. S.R.	0 - 10 VDC
18	Corridor 408 Clg.	DC-143	Rm401-T	TV-401	Office 401	Baseboard	M6.01 D2	2.5	VG5240CC+7452G	2-Way	Open	20	13	NPT	207	0.63	0.27	0.0539	52.0	9.2	VA-7452-90011	24 VAC	Mod. S.R.	0 - 10 VDC
18	Corridor 408 Clg.	DC-143	Rm402-T	TV-402	Office 402	Baseboard	M6.01 D2	3.1	VG5240CC+7452G	2-Way	Open	20	13	NPT	207	0.63	0.33	0.0668	52.0	14.1	VA-7452-90011	24 VAC	Mod. S.R.	0 - 10 VDC
18	Corridor 408 Clg.	DC-144	Rm403-T	TV-403	Office 403	Baseboard	M6.01 D2	3.1	VG5240CC+7452G	2-Way	Open	20	13	NPT	207	0.63	0.33	0.0668	52.0	14.1	VA-7452-90011	24 VAC	Mod. S.R.	0 - 10 VDC
18	Corridor 408 Clg.	DC-144	Rm404-T	TV-404	Office 404	Baseboard	M6.01 D2	3.1	VG5240CC+7452G	2-Way	Open	20	13	NPT	207	0.63	0.33	0.0668	52.0	14.1	VA-7452-90011	24 VAC	Mod. S.R.	0 - 10 VDC
18	Corridor 408 Clg.	DC-145	Rm405-T	TV-405	Office 405	Baseboard	M6.01 D2	3.1	VG5240CC+7452G	2-Way	Open	20	13	NPT	207	0.63	0.33	0.0668	52.0	14.1	VA-7452-90011	24 VAC	Mod. S.R.	0 - 10 VDC
18	Corridor 408 Clg.	DC-145	Rm406-T	TV-406	Office 406	Baseboard	M6.01 D2	2.5	VG5240CC+7452G	2-Way	Open	20	13	NPT	207	0.63	0.27	0.0539	52.0	9.2	VA-7452-90011	24 VAC	Mod. S.R.	0 - 10 VDC

Project Name: Herzberg Institute
Project Number: 99-0012

Valve Schedule

Tag				Valve Information													Actuator Information						
Item	System	Service	Ref Drawing	Output kW	Code Number	Cfg.	Fail Pos.	Pipe Size (mm)	Valve Size (mm)	Body Cfg.	Valve Max Close Off (Kpa)	Selected Valve Kv	Design Kv	Design Flow Litre/s	Design Delta P (kPa)	Selected Valve Delta P (kPa)	Code No.	Supply Voltage	Type	Control Signal	Piping Detail	Comments
TV-1	AHU-1	HC-1	M5.04 D2		VG7842LT+7152G	3-Way	N/A		19	NPT	1055	6.30	5.70	0.940	34.6	28.7	VA-7152-1001	24 VAC	Modulating	0 - 10 VDC		
TV-2	AHU-2	HC-2, P-9	M5.04 D1		VG7842RT+926HGA	3-Way	N/A	65	38	NPT	310	25.00	20.60	4.400	58.0	40.1	M9216-HGA-2	24 VAC	Mod. S.R.	0 - 10 VDC		
TV-3	AHU-3	HC-3, P-11	M5.04 D1		VG7842ET+7152G	3-Way	N/A	20	13	NPT	2124	1.60	1.04	0.130	20.0	9.0	VA-7152-1001	24 VAC	Modulating	0 - 10 VDC		
TV-4	Extg Htg Loops	P-3, P-4	M5.02		V-5842-9	3-Way	To loop	100	76	Flange	462	68.60	59.60	8.190	24.0	18.1	V-500, 5R	Pneumatic	Mod. S.R.	0 - 20 PSI		
TV-5	AHU Htg Coils	P-5, P-6	M5.02		VG7842ST+V400E	3-Way	To loop	75	51	NPT	297	40.00	41.20	5.670	24.0	26.1	V-400, 4R	Pneumatic	Mod. S.R.	0 -20 PSI		
TV-6	Rad Pnl Htg	P-7, P-8	M5.02		VG7842PT+V400E	3-Way	To loop	50	32	NPT	772	16.00	16.00	2.200	24.0	24.5	V-400, 4R	Pneumatic	Mod. S.R.	0 - 20 PSI		
TV-7	1988 AHU-4	Htg Coil			Existing	3-Way	To Coil											Pneumatic		0 - 20 PSI		
TV-8	1988 Library	Reheat Coil			Existing	2-Way	To Coil											Pneumatic		0 - 20 PSI		

Project Name: Herzberg Institute
Project Number: 99-0012

Hardware Points List

4/18/00

	Point Information					Controller Information												Field Device				
Point Type	System Name	Object Name	Expanded ID	Units		Controller Details	Trunk Addr.	Termination Out	Panel	Panel Location	Ref Drawing	Wiring /Tubing	Termination In	Device	Termination Out	Location	Wiring /Tubing	Termination In	Device	Location	Comment
	AH-1					UNT 111			EN-1	1916 Fan Room	5										Power to Controller
	AH-1					UNT 111	1		EN-1	1916 Fan Room	5										N2 Trunk
AI-1	AH-1	RA-T	Return Air Temperature	Deg C		UNT 111	1	AI#, AI Common	EN-1	1916 Fan Room	5						2 #22	2-Wire	TE-6311P-1	AH-1	
AI-2	AH-1	SF-Amps	Supply Fan Current	Amps		UNT 111	1	AI#, AI Common	EN-1	1916 Fan Room	5	2 #22	2-Wire	H-722	Motor Power Lead	Starter		Motor Power Lead	Starter	1916 Fan Room	
AI-3	AH-1	SA-T	Supply Air Temp	Deg C		UNT 111	1	AI#, AI Common	EN-1	1916 Fan Room	5						2 #22	2-Wire	TE-6311P-1	AH-1	
AI-4	AH-1					UNT 111	1		EN-1	1916 Fan Room	5										
AI-5	AH-1					UNT 111	1		EN-1	1916 Fan Room	5										
AI-6	AH-1					UNT 111	1		EN-1	1916 Fan Room	5										
BI-1	AH-1	SF-S	Supply Fan Status	Off	On	UNT 111	1	Data Point	EN-1	1916 Fan Room	5										
BI-2	AH-1	OVR-TIM	Override Timer	Unocc	Override	UNT 111	1	BI#, BI Common	EN-1	1916 Fan Room	5						2 #22	2-Wire	Existing Timer	1916 Wing	Wires available in panel
BI-3	AH-1					UNT 111	1		EN-1	1916 Fan Room	5										
BI-4	AH-1					UNT 111	1		EN-1	1916 Fan Room	5										
BO-1	AH-1	SF-C	Supply Fan Command	Stop	Start	UNT 111	1	BO#, 24 VAC	EN-1	1916 Fan Room	5	2 #18	2-Wire	Omron LY2USAC24	N.O. Contact	EN-1	Existing	Coil	Starter	1916 Fan Room	
BO-2	AH-1					UNT 111	1		EN-1	1916 Fan Room	5										
BO-3	AH-1					UNT 111	1		EN-1	1916 Fan Room	5										
BO-4	AH-1					UNT 111	1		EN-1	1916 Fan Room	5										
BO-5	AH-1					UNT 111	1		EN-1	1916 Fan Room	5										
BO-6	AH-1					UNT 111	1		EN-1	1916 Fan Room	5										
AO-1	AH-1	DPR-C	Damper Command	% Open		UNT 111	1	AO#, AO Common	EN-1	1916 Fan Room	5	2 #22	2-Wire	EP-8000-2	Existing Tube	EN-1	Existing Tube		Existing Actuators	AH-1	
AO-2	AH-1					UNT 111	1		EN-1	1916 Fan Room	5										
	AH-2					UNT 111			EN-1	1916 Fan Room	6										Power to Controller
	AH-2					UNT 111	2		EN-1	1916 Fan Room	6										N2 Trunk
AI-1	AH-2	RA-T	Return Air Temperature	Deg C		UNT 111	2	AI#, AI Common	EN-1	1916 Fan Room	6						2 #22	2-Wire	TE-6311P-1	AH-2	
AI-2	AH-2	SF-Amps	Supply Fan Current	Amps		UNT 111	2	AI#, AI Common	EN-1	1916 Fan Room	6	2 #22	2-Wire	H-722	Motor Power Lead	Starter		Motor Power Lead	Starter	1916 Fan Room	
AI-3	AH-2	SA-T	Supply Air Temp	Deg C		UNT 111	2	AI#, AI Common	EN-1	1916 Fan Room	6						2 #22	2-Wire	TE-6311P-1	AH-2	
AI-4	AH-2					UNT 111	2		EN-1	1916 Fan Room	6										
AI-5	AH-2					UNT 111	2		EN-1	1916 Fan Room	6										
AI-6	AH-2					UNT 111	2		EN-1	1916 Fan Room	6										
BI-1	AH-2	SF-S	Supply Fan Status	Off	On	UNT 111	2	Data Point	EN-1	1916 Fan Room	6										
BI-2	AH-2	OVR-TIM	Override Timer	Unocc	Override	UNT 111	2	BI#, BI Common	EN-1	1916 Fan Room	6						2 #22	2-Wire	Existing Timer	1916 Wing	Wires available in panel
BI-3	AH-2					UNT 111	2		EN-1	1916 Fan Room	6										
BI-4	AH-2					UNT 111	2		EN-1	1916 Fan Room	6										
BO-1	AH-2	SF-C	Supply Fan Command	Stop	Start	UNT 111	2	BO#, 24 VAC	EN-1	1916 Fan Room	6	2 #18	2-Wire	Omron LY2USAC24	N.O. Contact	EN-1	Existing	Coil	Starter	1916 Fan Room	
BO-2	AH-2					UNT 111	2		EN-1	1916 Fan Room	6										
BO-3	AH-2					UNT 111	2		EN-1	1916 Fan Room	6										
BO-4	AH-2					UNT 111	2		EN-1	1916 Fan Room	6										
BO-5	AH-2					UNT 111	2		EN-1	1916 Fan Room	6										
BO-6	AH-2					UNT 111	2		EN-1	1916 Fan Room	6										
AO-1	AH-2	DPR-C	Damper Command	% Open		UNT 111	2	AO#, AO Common	EN-1	1916 Fan Room	6	2 #22	2-Wire	EP-8000-2	Existing Tube	EN-1	Existing Tube		Existing Actuators	AH-2	
AO-2	AH-2					UNT 111	2		EN-1	1916 Fan Room	6										
	AH-3					UNT 111			EN-1	1916 Fan Room	7										Power to Controller
	AH-3					UNT 111	3		EN-1	1916 Fan Room	7										N2 Trunk
AI-1	AH-3	SF-Amps	Supply Fan Current	Amps		UNT 111	3	AI#, AI Common	EN-1	1916 Fan Room	7	2 #22	2-Wire	H-722	Motor Power Lead	Starter		Motor Power Lead	Starter	1916 Fan Room	
AI-2	AH-3					UNT 111	3		EN-1	1916 Fan Room	7										
AI-3	AH-3	SA-T	Supply Air Temp	Deg C		UNT 111	3	AI#, AI Common	EN-1	1916 Fan Room	7						2 #22	2-Wire	TE-6311P-1	AH-3	
AI-4	AH-3					UNT 111	3		EN-1	1916 Fan Room	7										
AI-5	AH-3	RA-T	Return Air Temp	Deg C		UNT 111	3	AI#, AI Common	EN-1	1916 Fan Room	7						2 #22	2-Wire	TE-6311P-1	AH-3	
AI-6	AH-3					UNT 111	3		EN-1	1916 Fan Room	7										
BI-1	AH-3	SF-S	Supply Fan Status	Off	On	UNT 111	3	Data Point	EN-1	1916 Fan Room	7										
BI-2	AH-3					UNT 111	3		EN-1	1916 Fan Room	7										
BI-3	AH-3					UNT 111	3		EN-1	1916 Fan Room	7										
BI-4	AH-3					UNT 111	3		EN-1	1916 Fan Room	7										
BO-1	AH-3	SF-C	Supply Fan Command	Stop	Start	UNT 111	3	BO#, 24 VAC	EN-1	1916 Fan Room	7	2 #18	2-Wire	Omron LY2USAC24	N.O. Contact	EN-1	Existing	Coil	Starter	1916 Fan Room	
BO-2	AH-3					UNT 111	3		EN-1	1916 Fan Room	7										
BO-3	AH-3					UNT 111	3		EN-1	1916 Fan Room	7										
BO-4	AH-3					UNT 111	3		EN-1	1916 Fan Room	7										
BO-5	AH-3					UNT 111	3		EN-1	1916 Fan Room	7										
BO-6	AH-3					UNT 111	3		EN-1	1916 Fan Room	7										
AO-1	AH-3	DPR-C	Damper Command	% Open		UNT 111	3	AO#, AO Common	EN-1	1916 Fan Room	7	2 #22	2-Wire	EP-8000-2	Existing Tube	EN-1	Existing Tube		Existing Actuators	AH-3	
AO-2	AH-3					UNT 111	3		EN-1	1916 Fan Room	7										

Project Name: Herzberg Institute
Project Number: 99-0012

Hardware Points List

4/19/00

	Point Information					Controller Information											Field Device				
Point Type	System Name	Object Name	Expanded ID	Units		Controller Details	Trunk Addr.	Termination Out	Panel	Panel Location	Ref Drawing	Wiring /Tubing	Termination In	Device	Termination Out	Location	Wiring /Tubing	Termination In	Device	Location	Comment
	AH-456					UNT 111			EN-2	1988 Fan Room	8										Power to Controller
	AH-456					UNT 111	4		EN-2	1988 Fan Room	8										N2 Trunk
AI-1	AH-456	SF-Amps	Supply Fan Current	Amps		UNT 111	4	AI#, AI Common	EN-2	1988 Fan Room	8	2 #22	2-Wire	H-722	Motor Power Lead	Starter		Motor Power Lead	Starter	MCC	
AI-2	AH-456	RF-Amps	Return Fan Current	Amps		UNT 111	4	AI#, AI Common	EN-2	1988 Fan Room	8	2 #22	2-Wire	H-722	Motor Power Lead	Starter		Motor Power Lead	Starter	MCC	
AI-3	AH-456	SA-T	Supply Air Temp	Deg C		UNT 111	4	AI#, AI Common	EN-2	1988 Fan Room	8						2 #22	2-Wire	TE-6315P-1	AH-456	
AI-4	AH-456	Rm253-T	Room 253 Temp	Deg C		UNT 111	4	AI#, AI Common	EN-2	1988 Fan Room	8						2 #18	2-Wire	TE-6314P-1	Room 253	
AI-5	AH-456	RA-T	Return Air Temperature	Deg C		UNT 111	4	AI#, AI Common	EN-2	1988 Fan Room	8						2 #22	2-Wire	TE-6311P-1	AH-456	
AI-6	AH-456					UNT 111	4		EN-2	1988 Fan Room	8										
BI-1	AH-456	SF-S	Supply Fan Status	Off	On	UNT 111	4	Data Point	EN-2	1988 Fan Room	8										
BI-2	AH-456	RF-S	Return Fan Status	Off	On	UNT 111	4	Data Point	EN-2	1988 Fan Room	8										
BI-3	AH-456	SA-LL	Supply Air Low Limit	Normal	Alarm	UNT 111	4	BI#, BI Common	EN-2	1988 Fan Room	8	2 #22	Existing	Existing Low Limit	Existing	AH-456	2 #14	2-Wire	Starter	MCC	
BI-4	AH-456					UNT 111	4		EN-2	1988 Fan Room	8										
BO-1	AH-456	SF-C	Supply Fan	Stop	Start	UNT 111	4	BO#, 24 VAC	EN-2	1988 Fan Room	8	2 #18	2-Wire	Omron LY2USAC24	N.O. Contact	EN-2	Existing	Coil	Starter	MCC	
BO-2	AH-456	RF-C	Return Fan	Stop	Start	UNT 111	4	BO#, 24 VAC	EN-2	1988 Fan Room	8	2 #18	2-Wire	Omron LY2USAC24	N.O. Contact	EN-2	Existing	Coil	Starter	MCC	
BO-3	AH-456					UNT 111	4		EN-2	1988 Fan Room	8										
BO-4	AH-456					UNT 111	4		EN-2	1988 Fan Room	8										
BO-5	AH-456					UNT 111	4		EN-2	1988 Fan Room	8										
BO-6	AH-456					UNT 111	4		EN-2	1988 Fan Room	8										
AO-1	AH-456	DPR-C	Damper Command	% Open		UNT 111	4	AO#, AO Common	EN-2	1988 Fan Room	8	2 #22	2-Wire	EP-8000-2	Existing Tube	EN-2	Existing Tube		Existing Actuators	AH-456	
AO-2	AH-456	HCV-C	Htg Coil Valve Command	% Htg		UNT 111	4	AO#, AO Common	EN-2	1988 Fan Room	8	2 #22	2-Wire	EP-8000-2	Existing Tube	EN-2	Existing Tube		Existing Valve	AH-456	
	AH-78					AHU 100			EN-2	1988 Fan Room	9										Power to Controller
	AH-78					AHU 100	5		EN-2	1988 Fan Room	9										N2 Trunk
BO-1	AH-78	DX1-C	Cooling Stage 1	Stop	Start	AHU 100	5	BO#, 24 VAC	EN-2	1988 Fan Room	9	2 #18	2-Wire	Omron LY2USAC24	N.O. Contact	EN-2	Existing	Coil	Contactor	Existing Cond.	
BO-2	AH-78	DX2-C	Cooling Stage 2	Stop	Start	AHU 100	5	BO#, 24 VAC	EN-2	1988 Fan Room	9	2 #18	2-Wire	Omron LY2USAC24	N.O. Contact	EN-2	Existing	Coil	Contactor	Existing Cond.	
BO-3	AH-78	SF-C	Supply Fan Command	Stop	Start	AHU 100	5	BO#, 24 VAC	EN-2	1988 Fan Room	9	2 #18	2-Wire	Omron LY2USAC24	N.O. Contact	EN-2	Existing	Coil	Starter	MCC	
BO-4	AH-78	RF-C	Return Fan Command	Stop	Start	AHU 100	5	BO#, 24 VAC	EN-2	1988 Fan Room	9	2 #18	2-Wire	Omron LY2USAC24	N.O. Contact	EN-2	Existing	Coil	Starter	MCC	
BO-5	AH-456	AH6-C	Exhaust Fan AH-6 Command	Stop	Start	AHU 100	5	BO#, 24 VAC	EN-2	1988 Fan Room	9	2 #18	2-Wire	Omron LY2USAC24	N.O. Contact	EN-2	Existing	Coil	Starter	1988 Fan Room	
BO-6	AH-78					AHU 100	5		EN-2	1988 Fan Room	9										
BO-7	AH-78					AHU 100	5		EN-2	1988 Fan Room	9										
BO-8	AH-78					AHU 100	5		EN-2	1988 Fan Room	9										
BO-9	AH-78					AHU 100	5		EN-2	1988 Fan Room	9										
BO-10	AH-78					AHU 100	5		EN-2	1988 Fan Room	9										
AO-1	AH-78	DPR-C	Damper Command	% Open		AHU 100	5	AO#, AO Common	EN-2	1988 Fan Room	9	2 #22	2-Wire	EP-8000-2	Existing Tube	EN-2	Existing Tube		Existing Actuators	AH-78	
AO-2	AH-78	BYPD-C	Pressure Bypass Damper	% Bypass		AHU 100	5	AO#, AO Common	EN-2	1988 Fan Room	9	2 #22	2-Wire	EP-8000-2	Existing Tube	EN-2	Existing Tube		Existing Actuators	AH-78	
AO-3	AH-456	HED-C	AH-456 H/E Damper	% Open		AHU 100	5	AO#, AO Common	EN-2	1988 Fan Room	9	2 #22	2-Wire	EP-8000-2	Existing Tube	EN-2	Existing Tube		Existing Actuators	AH-78	
AO-4	AH-78					AHU 100	5		EN-2	1988 Fan Room	9										
AO-5	AH-78					AHU 100	5		EN-2	1988 Fan Room	9										
AO-6	AH-78					AHU 100	5		EN-2	1988 Fan Room	9										
BI-1	AH-78	SF-S	Supply Fan Status	Off	On	AHU 100	5	Data Point	EN-2	1988 Fan Room	9										
BI-2	AH-78	RF-S	Return Fan Status	Off	On	AHU 100	5	Data Point	EN-2	1988 Fan Room	9										
BI-3	AH-78	SA-LL	Supply Air Low Limit	Normal	Alarm	AHU 100	5	BI#, BI Common	EN-2	1988 Fan Room	9	2 #22	Existing	Existing Low Limit	Existing	AH-78	2 #14	2-Wire	Starter	MCC	
BI-4	AH-78					AHU 100	5		EN-2	1988 Fan Room	9										
BI-5	AH-78					AHU 100	5		EN-2	1988 Fan Room	9										
BI-6	AH-78					AHU 100	5		EN-2	1988 Fan Room	9										
BI-7	AH-78					AHU 100	5		EN-2	1988 Fan Room	9										
BI-8	AH-78					AHU 100	5		EN-2	1988 Fan Room	9										
AI-1	AH-78	RA-T	Return Air Temperature	Deg C		AHU 100	5	AI#, AI Common	EN-2	1988 Fan Room	9						2 #22	2-Wire	TE-6311P-1	AH-78	
AI-2	AH-78	MA-T	Mixed Air Temp	Deg C		AHU 100	5	AI#, AI Common	EN-2	1988 Fan Room	9						2 #22	2-Wire	TE-6315P-1	AH-78	
AI-3	AH-78	SA-T	Supply Air Temperature	Deg C		AHU 100	5	AI#, AI Common	EN-2	1988 Fan Room	9						2 #22	2-Wire	TE-6315P-1	AH-78	
AI-4	AH-78	SF-Amps	Supply Fan Current	Amps		AHU 100	5	AI#, AI Common	EN-2	1988 Fan Room	9	2 #22	2-Wire	H-722	Motor Power Lead	Starter		Motor Power Lead	MCC	1988 Fan Room	
AI-5	AH-78	RF-Amps	Return Fan Current	Amps		AHU 100	5	AI#, AI Common	EN-2	1988 Fan Room	9	2 #22	2-Wire	H-722	Motor Power Lead	Starter		Motor Power Lead	Starter	1988 Fan Room	
AI-6	AH-456	AH6-Amps	Exhaust Fan AH-6 Current	Amps		AHU 100	5	AI#, AI Common	EN-2	1988 Fan Room	9	2 #22	2-Wire	H-722	Motor Power Lead	Starter		Motor Power Lead	Starter	1988 Fan Room	
AI-7	AH-78	S-SP	Static Press	Pa		AHU 100	5	15VDC,AI#,AI Comm	EN-2	1988 Fan Room	9	3 #22	EXC, OUT, COM	DPT2640-2R5B	HI, Lo	EN-2	Existing		Static Pick-ups In Rm	1988 Wing	
AI-8	AH-78					AHU 100	5		EN-2	1988 Fan Room	9										

Hardware Points List

	Point Information					Controller Information											Field Device				
Point Type	System Name	Object Name	Expanded ID	Units		Controller Details	Trunk Addr.	Termination Out	Panel	Panel Location	Ref Drawing	Wiring /Tubing	Termination In	Device	Termination Out	Location	Wiring /Tubing	Termination In	Device	Location	Comment
	AH-78					VAV 111			EN-2	1988 Fan Room	9										Power to Controller
	AH-78					VAV 111	6		EN-2	1988 Fan Room	9										N2 Trunk
AI-1	LIB-REH	LIB-T	Library Temp	Deg C		VAV 111	6	AI#, AI Common	EN-2	1988 Fan Room	9						2 #18	2-Wire	TE-6314P-1	1988 Library	
AI-2	AH-78	Rm136-T	Room 138 Temp	Deg C		VAV 111	6	AI#, AI Common	EN-2	1988 Fan Room	9						2 #22	2-Wire	TE-6314P-1	Room 138	
AI-3	AH-78	Rm152-T	Room 156 Temp	Deg C		VAV 111	6	AI#, AI Common	EN-2	1988 Fan Room	9						2 #22	2-Wire	TE-6314P-1	Room 156	
AI-4	MISC	CPR1-Amp	Compressor #1 Amps	Amps		VAV 111	6	AI#, AI Common	EN-2	1988 Fan Room	9	2 #22	2-Wire	H-722	Motor Power Lead	Starter		Motor Power Lead	Starter	1988 Fan Room	
AI-5	MISC	CPR2-Amp	Compressor #2 Amps	Amps		VAV 111	6	AI#, AI Common	EN-2	1988 Fan Room	9	2 #22	2-Wire	H-722	Motor Power Lead	Starter		Motor Power Lead	Starter	1988 Fan Room	
AI-6	LIB-REH	RCD-T	Reheat Coil Discharge Temp	Deg C		VAV 111	6	AI#, AI Common	EN-2	1988 Fan Room	9						2 #18	2-Wire	TE-6311P-1	1988 Library	
BI-1	MISC	LOW-PRES	Low Pressure Alarm	Normal	Low	VAV 111	6	BI#, BI Common	EN-2	1988 Fan Room	9	2 #22	2-Wire	P10BC-7C	R, Y	EN-2	3/8" Tube	Compressed Air Supply		1988 Fan Room	
BI-2	AH-78					VAV 111	6		EN-2	1988 Fan Room	9										
BI-3	AH-78					VAV 111	6		EN-2	1988 Fan Room	9										
BI-4	AH-78					VAV 111	6		EN-2	1988 Fan Room	9										
BO-1	MISC	DAY-NIGHT	Day/Night Switch	Day	Night	VAV 111	6	BO#, 24 VAC	EN-2	1988 Fan Room	9	2 #18	2-Wire	Existing Solenoid	Existing	EN-2	Existing		Pneumatic Air Valve	1988 Fan Room	
BO-2	AH-78					VAV 111	6		EN-2	1988 Fan Room	9										
BO-3	AH-78					VAV 111	6		EN-2	1988 Fan Room	9										
BO-4	AH-78					VAV 111	6		EN-2	1988 Fan Room	9										
BO-5	AH-78					VAV 111	6		EN-2	1988 Fan Room	9										
BO-6	AH-78					VAV 111	6		EN-2	1988 Fan Room	9										
AO-1	LIB-REH	LIB-V	Library Reheat Coil	% Htg		VAV 111	6	AO#, AO Common	EN-2	1988 Fan Room	9	2 #22	2-Wire	EP-8000-2	5/32" Tube	EN-2	5/32" Tube		Existing Pneu. Valve	1988 Library	
AO-2	AH-78					VAV 111	6		EN-2	1988 Fan Room	9										
	AHU-1					UNT 111			EN-3	New Boiler Rm	10										Power to Controller
	AHU-1					UNT 111	7		EN-3	New Boiler Rm	10										N2 Trunk
AI-1	AHU-1	RA-T	Return Air Temperature	Deg C		UNT 111	7	AI#, AI Common	EN-3	New Boiler Rm	10						2 #22	2-Wire	TE-6311P-1	AHU-1	
AI-2	AHU-1	MA-T	Mixed Air Temp	Deg C		UNT 111	7	AI#, AI Common	EN-3	New Boiler Rm	10						2 #22	2-Wire	TE-6315P-1	AHU-1	
AI-3	AHU-1	SA-T	Supply Air Temp	Deg C		UNT 111	7	AI#, AI Common	EN-3	New Boiler Rm	10						2 #22	2-Wire	TE-6315P-1	AHU-1	
AI-4	AHU-1	LAB020-T	Lab 020 Room Temp	Deg C		UNT 111	7	AI#, AI Common	EN-3	New Boiler Rm	10						2 #18	2-Wire	TE-6314P-1	Lab 020	
AI-5	AHU-1	SF-Amps	Supply Fan Current	Amps		UNT 111	7	AI#, AI Common	EN-3	New Boiler Rm	10	2 #22	2-Wire	H-722	Motor Power Lead	Starter		Motor Power Lead	Starter	Boiler Room	
AI-6	AHU-1	FIL-DP	Filter Diff Pressure	Pa		UNT 111	7	15VDC,AI#,AI Comm	EN-3	New Boiler Rm	10	3 #22	EXC, OUT, COM	DPT2640-2R5D	HI, Lo	EN-3	2-5/32" Tubes		FTG18A-600R	AHU-1	
BI-1	AHU-1	SF-S	Supply Fan Status	Off	On	UNT 111	7	Data Point	EN-3	New Boiler Rm	10										
BI-2	AHU-1	SA-LL	Supply Air Low Limit	Normal	Alarm	UNT 111	7	BI#, BI Common	EN-3	New Boiler Rm	10	2 #22	M1, L	A70HA-2C	M2, L	AHU-1	2 #14	2-Wire	Starter	Boiler Room	
BI-3						UNT 111	7		EN-3	New Boiler Rm	10										
BI-4						UNT 111	7		EN-3	New Boiler Rm	10										
BO-1	AHU-1	SF-C	Supply Fan Command	Stop	Start	UNT 111	7	BO#, 24 VAC	EN-3	New Boiler Rm	10	2 #22	Coil	LY2USAC24	N.O. Contact	Starter	2 #14	Coil	Starter	Boiler Room	
BO-2	AHU-1					UNT 111	7		EN-3	New Boiler Rm	10										
BO-3	AHU-1					UNT 111	7		EN-3	New Boiler Rm	10										
BO-4	AHU-1					UNT 111	7		EN-3	New Boiler Rm	10										
BO-5	AHU-1					UNT 111	7		EN-3	New Boiler Rm	10										
BO-6	AHU-1					UNT 111	7		EN-3	New Boiler Rm	10										
AO-1	AHU-1	DPR-C	Damper Command	% Open		UNT 111	7	AO#,AO Com,24VAC	EN-3	New Boiler Rm	10						3 #18	1, 2, 3	M9216-HGA-2	AHU-1	
AO-2	AHU-1	HCV-C	Heating Valve Command	% Htg		UNT 111	7	AO#,AO Com,24VAC	EN-3	New Boiler Rm	10						3 #18	1, 2/3, 4	VA-7152-1001	AHU-1	
	AHU-2					UNT 111			EN-4	New Penthouse	11										Power to Controller
	AHU-2					UNT 111	8		EN-4	New Penthouse	11										N2 Trunk
AI-1	AHU-2	SF-Amps	Supply Fan Current	Amps		UNT 111	8	AI#, AI Common	EN-4	New Penthouse	11	2 #22	2-Wire	H-722	Motor Power Lead	Starter		Motor Power Lead	Starter	New Penthouse	
AI-2	AHU-2	FIL-DP	Filter Diff Pressure	Pa		UNT 111	8	15VDC,AI#,AI Comm	EN-4	New Penthouse	11	3 #22	EXC, OUT, COM	DPT2640-2R5D	Hi Low	EN-4	2-5/32" Tubes		FTG18A-600R	AHU-2	
AI-3	AHU-2	SA-T	Supply Air Temp	Deg C		UNT 111	8	AI#, AI Common	EN-4	New Penthouse	11						2 #22	2-Wire	TE-6316P-1	AHU-2	
AI-4	AHU-2	DX1-Amps	Cond C-6 Stage 1 Current	Amps		UNT 111	8	AI#, AI Common	EN-4	New Penthouse	11	2 #22	2-Wire	H-722	Motor Power Lead	Starter		Motor Power Lead	Panel NG	New Penthouse	
AI-5	AHU-2	DX2-Amps	Cond C-6 Stage 2 Current	Amps		UNT 111	8	AI#, AI Common	EN-4	New Penthouse	11	2 #22	2-Wire	H-722	Motor Power Lead	Starter		Motor Power Lead	Panel NG	New Penthouse	
AI-6	AHU-2	OAT-1	Outdoor Air Temp	Deg C		UNT 111	8	AI#, AI Common	EN-4	New Penthouse	11						2 #22	2-Wire	TE-6316P-1	New Penthouse	
BI-1	AHU-2	SF-S	Supply Airflow	Off	On	UNT 111	8	Data Point	EN-4	New Penthouse	11										
BI-2	AHU-2	SA-LL	Supply Air Low Limit	Normal	Alarm	UNT 111	8	BI#, BI Common	EN-4	New Penthouse	11						2 #22	M1, L	A70GA-1C	AHU-2	
BI-3	AHU-2					UNT 111	8		EN-4	New Penthouse	11										
BI-4	AHU-2					UNT 111	8		EN-4	New Penthouse	11										
BO-1	AHU-2	DX1-C	Cooling Stage 1	Stop	Start	UNT 111	8	BO#, 24 VAC	EN-4	New Penthouse	11	2 #18	Coil	LY2USAC24	N.O. Contact	Cond Unit C6	2 #18	Coil	Contactor	Cond Unit C-6	
BO-2	AHU-2	DX2-C	Cooling Stage 2	Stop	Start	UNT 111	8	BO#, 24 VAC	EN-4	New Penthouse	11	2 #18	Coil	LY2USAC24	N.O. Contact	Cond Unit C6	2 #18	Coil	Contactor	Cond Unit C-6	
BO-3	AHU-2	SF-C	Supply Fan Command	Stop	Start	UNT 111	8	BO#, 24 VAC	EN-4	New Penthouse	11	2 #18	Coil	LY2USAC24	N.O. Contact	Starter	2 #18	Coil	Starter	New Penthouse	
BO-4	AHU-2	SF-LLC	Low Limit Shutdown Commd.	Normal	Alarm	UNT 111	8	BO#, 24 VAC	EN-4	New Penthouse	11	2 #18	Coil	LY2USAC24	N.C. Contact	Starter	2 #18	Coil	Starter	New Penthouse	
BO-5	AHU-2	DPR-C	O/A Damper Command	Close	Open	UNT 111	8	BO#, 24 VAC	EN-4	New Penthouse	11	2 #18	1, 2	M9216BGC-2	24, 26	AHU-2	2 #18	Coil	Starter	New Penthouse	
BO-6	AHU-2					UNT 111	8		EN-4	New Penthouse	11										
AO-1	AHU-2	HCV-C	Heating Valve Command	% Htg		UNT 111	8	AO#,AO Com,24VAC	EN-4	New Penthouse	11						3 #18	1, 2, 3	M9216-HGA-2	AHU-2	
AO-2	AHU-2					UNT 111	8		EN-4	New Penthouse	11										

Project Name: Herzberg Institute
Project Number: 99-0012

Hardware Points List

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	Point Information					Controller Information											Field Device				
Point Type	System Name	Object Name	Expanded ID	Units		Controller Details	Trunk Addr.	Termination Out	Panel	Panel Location	Ref Drawing	Wiring /Tubing	Termination In	Device	Termination Out	Location	Wiring /Tubing	Termination In	Device	Location	Comment
	AHU-3					AHU 100			EN-4	New Penthouse	12										Power to Controller
	AHU-3					AHU 100	9		EN-4	New Penthouse	12										N2 Trunk
BO-1	AHU-3	DX1-C	Cooling Stage 1	Stop	Start	AHU 100	9	BO#, 24 VAC	EN-4	New Penthouse	12	2 #18	Coil	LY2USAC24	N.O. Contact	Cond Unit C7	2 #18	Coil	Contactor	Cond Unit C-7	
BO-2	AHU-3	SF-C	Supply Fan	Stop	Start	AHU 100	9	BO#, 24 VAC	EN-4	New Penthouse	12	2 #18	Coil	LY2USAC24	N.O. Contact	Starter	2 #18	Coil	Starter	New Penthouse	
BO-3	AHU-3					AHU 100	9		EN-4	New Penthouse	12										
BO-4	AHU-3					AHU 100	9		EN-4	New Penthouse	12										
BO-5	AHU-3					AHU 100	9		EN-4	New Penthouse	12										
BO-6	AHU-3					AHU 100	9		EN-4	New Penthouse	12										
BO-7	AHU-3					AHU 100	9		EN-4	New Penthouse	12										
BO-8	AHU-3					AHU 100	9		EN-4	New Penthouse	12										
BO-9	AHU-3					AHU 100	9		EN-4	New Penthouse	12										
BO-10	AHU-3					AHU 100	9		EN-4	New Penthouse	12										
AO-1	AHU-3	DPR-C	Damper Command	% Open		AHU 100	9	AO#,AO Com,24VAC	EN-4	New Penthouse	12						3 #18	1, 2, 3	M9216-HGA-2	AHU-3	
AO-2	AHU-3	HCV-C	Heating Valve Command	% Htg		AHU 100	9	AO#,AO Com,24VAC	EN-4	New Penthouse	12						3 #18	1, 2, 3	M9216-HGA-2	AHU-3	
AO-3	AHU-3					AHU 100	9		EN-4	New Penthouse	12										
AO-4	AHU-3					AHU 100	9		EN-4	New Penthouse	12										
AO-5	AHU-3					AHU 100	9		EN-4	New Penthouse	12										
AO-6	AHU-3					AHU 100	9		EN-4	New Penthouse	12										
BI-1	AHU-3	SF-S	Supply Airflow	Off	On	AHU 100	9	Data Point	EN-4	New Penthouse	12										
BI-2	AHU-3	SA-LL	Supply Air Low Limit	Normal	Alarm	AHU 100	9	BI#, BI Common	EN-4	New Penthouse	12	2 #22	M1, L	A70HA-2C	M2, L	AHU-1	2 #14	2-Wire	Starter	Boiler Room	
BI-3	AHU-3	OXY1-ALM	Oxygen Def Alarm - Submill.	Normal	Low Oxy	AHU 100	9	BI#, BI Common	EN-4	New Penthouse	12	2 #18	C, NC	CET SCP Panel	refer to specs	Outside Labs	5 #22	refer to specs	AST-895S	Sub-Millimeter	
BI-4	AHU-3	OXY2-ALM	Oxygen Def Alarm - Electronic	Normal	Low Oxy	AHU 100	9	BI#, BI Common	EN-4	New Penthouse	12	2 #18	C, NC	CET SCP Panel	refer to specs	Outside Labs	5 #22	refer to specs	AST-895S	Electronics Lab	
BI-5	AHU-3					AHU 100	9		EN-4	New Penthouse	12										
BI-6	AHU-3					AHU 100	9		EN-4	New Penthouse	12										
BI-7	AHU-3					AHU 100	9		EN-4	New Penthouse	12										
BI-8	AHU-3					AHU 100	9		EN-4	New Penthouse	12										
AI-1	AHU-3	RA-T	Return Air Temperature	Deg C		AHU 100	9	AI#, AI Common	EN-4	New Penthouse	12						2 #22	2-Wire	TE-6311P-1	AHU-3	
AI-2	AHU-3	MA-T	Mixed Air Temp	Deg C		AHU 100	9	AI#, AI Common	EN-4	New Penthouse	12						2 #22	2-Wire	TE-6315P-1	AHU-3	
AI-3	AHU-3	SA-T	Supply Air Temp	Deg C		AHU 100	9	AI#, AI Common	EN-4	New Penthouse	12						2 #22	2-Wire	TE-6315P-1	AHU-3	
AI-4	AHU-3	Clean-T	Clean Room Temp	Deg C		AHU 100	9	AI#, AI Common	EN-4	New Penthouse	12						2 #18	2-Wire	TE-6314P-1	Clean Room	
AI-5	AHU-3	SF-AMps	Supply Fan Current	Amps		AHU 100	9	AI#, AI Common	EN-4	New Penthouse	12	2 #22	2-Wire	H-722	Motor Power Lead	Starter		Motor Power Lead	Starter	New Penthouse	
AI-6	AHU-3	PFIL-DP	Pre-Filter Diff Press	Pa		AHU 100	9	15VDC,AI#,AI Comm	EN-4	New Penthouse	12	3 #22	EXC, OUT, COM	DPT2640-2R5D	HI Low	EN-5	2-5/32" Tubes		FTG18A-600R	AHU-3	
AI-7	AHU-3	FFIL-DP	Final Filter Diff Press	Pa		AHU 100	9	15VDC,AI#,AI Comm	EN-4	New Penthouse	12	3 #22	EXC, OUT, COM	DPT2640-2R5D	HI Low	EN-5	2-5/32" Tubes		FTG18A-600R	AHU-3	
AI-8	AHU-3	DX-Amps	Condensing Unit C-7 Current	Amps		AHU 100	9	AI#, AI Common	EN-4	New Penthouse	12	2 #22	2-Wire	H-722	Motor Power Lead	Starter		Motor Power Lead	Panel NG	New Penthouse	
	AHU-3					VAV 111			EN-4	New Penthouse	11										Power to Controller
	AHU-3					VAV 111	10		EN-4	New Penthouse	11										N2 Trunk
AI-1	AHU-3	CLEAN-DP	Clean Rm Diff Press.	Pa		VAV 111	10	15VDC,AI#,AI Comm	EN-4	New Penthouse	11	3 #22	EXC, OUT, COM	DPT2640-OR5B	HI, Low	EN-5	2 5/32" Tubes		FTG18A-600R	AHU-3	
AI-2	AHU-2	EF1-Amps	Exhaust Fan EF-1 Current	Amps		VAV 111	10	AI#, AI Common	EN-4	New Penthouse	11	2 #22	2-Wire	H-722	Motor Power Lead	Starter		Motor Power Lead	Starter	New Penthouse	
AI-3	AHU-2	EF2-C	Exhaust Fan EF-2 Current	Amps		VAV 111	10	AI#, AI Common	EN-4	New Penthouse	11	2 #22	2-Wire	H-722	Motor Power Lead	Starter		Motor Power Lead	Starter	New Penthouse	
AI-4	AHU-2	EF3-Amps	Exhaust Fan EF-3 Current	Amps		VAV 111	10	AI#, AI Common	EN-4	New Penthouse	11	2 #22	2-Wire	H-722	Motor Power Lead	Starter		Motor Power Lead	Starter	New Penthouse	
AI-5	AHU-2	EF4-Amps	Exhaust Fan EF-4 Current	Amps		VAV 111	10	AI#, AI Common	EN-4	New Penthouse	11	2 #22	2-Wire	H-722	Motor Power Lead	Starter		Motor Power Lead	Starter	New Penthouse	
AI-6	AHU-2	EF5-Amps	Exhaust Fan EF-5 Current	Amps		VAV 111	10	AI#, AI Common	EN-4	New Penthouse	11	2 #22	2-Wire	H-722	Motor Power Lead	Starter		Motor Power Lead	Starter	New Penthouse	
BI-1	AHU-2					VAV 111	10		EN-4	New Penthouse	11										
BI-2	AHU-2					VAV 111	10		EN-4	New Penthouse	11										
BI-3	AHU-2					VAV 111	10		EN-4	New Penthouse	11										
BI-4	AHU-2					VAV 111	10		EN-4	New Penthouse	11										
BO-1	AHU-2	EF1-C	Exhaust Fan EF-1 Command	Stop	Start	VAV 111	10	BO#, 24 VAC	EN-4	New Penthouse	11	2 #18	Coil	LY2USAC24	N.O. Contact	Starter	2 #18	Coil	Starter	New Penthouse	
BO-2	AHU-2	EF2-C	Exhaust Fan EF-2 Command	Stop	Start	VAV 111	10	BO#, 24 VAC	EN-4	New Penthouse	11	2 #18	Coil	LY2USAC24	N.O. Contact	Starter	2 #18	Coil	Starter	New Penthouse	
BO-3	AHU-2	EF3-C	Exhaust Fan EF-3 Command	Stop	Start	VAV 111	10	BO#, 24 VAC	EN-4	New Penthouse	11	2 #18	Coil	LY2USAC24	N.O. Contact	Starter	2 #18	Coil	Starter	New Penthouse	
BO-4	AHU-2	EF4-C	Exhaust Fan EF-4 Command	Stop	Start	VAV 111	10	BO#, 24 VAC	EN-4	New Penthouse	11	2 #18	Coil	LY2USAC24	N.O. Contact	Starter	2 #18	Coil	Starter	New Penthouse	
BO-5	AHU-2	EF5-C	Exhaust Fan EF-5 Command	Stop	Start	VAV 111	10	BO#, 24 VAC	EN-4	New Penthouse	11	2 #18	Coil	LY2USAC24	N.O. Contact	Starter	2 #18	Coil	Starter	New Penthouse	
BO-6	AHU-2					VAV 111	10		EN-4	New Penthouse	11										
AO-1	AHU-2					VAV 111	10		EN-4	New Penthouse	11										
AO-2	AHU-2					VAV 111	10		EN-4	New Penthouse	11										

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Hardware Points List

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	Point Information					Controller Information											Field Device				
Point Type	System Name	Object Name	Expanded ID	Units		Controller Details	Trunk Addr.	Termination Out	Panel	Panel Location	Ref Drawing	Wiring /Tubing	Termination In	Device	Termination Out	Location	Wiring /Tubing	Termination In	Device	Location	Comment
	MISC					VAV 111			EN-5	New Penthouse	15										Power to Controller
	MISC					VAV 111	11		EN-5	New Penthouse	15										N2 Trunk
AI-1	MISC	EF6-Amps	Exhaust Fan EF-6 Current	Amps		VAV 111	11	AI#, AI Common	EN-5	New Penthouse	15	2 #22	2-Wire	H-722	Motor Power Lead	Starter		Motor Power Lead	Starter	New Penthouse	
AI-2	MISC	EF7-Amps	Exhaust Fan EF-7 Current	Amps		VAV 111	11	AI#, AI Common	EN-5	New Penthouse	15	2 #22	2-Wire	H-722	Motor Power Lead	Starter		Motor Power Lead	Starter	New Penthouse	
AI-3	MISC	EF8-Amps	Exhaust Fan EF-8 Current	Amps		VAV 111	11	AI#, AI Common	EN-5	New Penthouse	15	2 #22	2-Wire	H-722	Motor Power Lead	Starter		Motor Power Lead	Starter	New Penthouse	
AI-4	MISC	CU1-Amps	CU-1 Current	Amps		VAV 111	11	AI#, AI Common	EN-5	New Penthouse	15	2 #22	2-Wire	H-722	Motor Power Lead	Starter		Motor Power Lead	Panel NG	New Penthouse	
AI-5	MISC	CU2-Amps	CU-2 Current	Amps		VAV 111	11	AI#, AI Common	EN-5	New Penthouse	15	2 #22	2-Wire	H-722	Motor Power Lead	Starter		Motor Power Lead	Panel NG	New Penthouse	
AI-6	MISC	CU3-Amps	CU-3 Current	Amps		VAV 111	11	AI#, AI Common	EN-5	New Penthouse	15	2 #22	2-Wire	H-722	Motor Power Lead	Starter		Motor Power Lead	Panel NG	New Penthouse	
BI-1	MISC					VAV 111	11		EN-5	New Penthouse	15										
BI-2	MISC					VAV 111	11		EN-5	New Penthouse	15										
BI-3	MISC					VAV 111	11		EN-5	New Penthouse	15										
BI-4	MISC					VAV 111	11		EN-5	New Penthouse	15										
BO-1	MISC	EF6-C	Exhaust Fan EF-6 Command	Stop	Start	VAV 111	11	BO#, 24 VAC	EN-5	New Penthouse	15	2 #18	Coil	LY2USAC24	N.O. Contact	Starter	2 #18	Coil	Starter	New Penthouse	
BO-2	MISC	EF7-C	Exhaust Fan EF-7 Command	Stop	Start	VAV 111	11	BO#, 24 VAC	EN-5	New Penthouse	15	2 #18	Coil	LY2USAC24	N.O. Contact	Starter	2 #18	Coil	Starter	New Penthouse	
BO-3	MISC	EF8-C	Exhaust Fan EF-8 Command	Stop	Start	VAV 111	11	BO#, 24 VAC	EN-5	New Penthouse	15	2 #18	Coil	LY2USAC24	N.O. Contact	Starter	2 #18	Coil	Starter	New Penthouse	
BO-4	MISC					VAV 111	11		EN-5	New Penthouse	15										
BO-5	MISC					VAV 111	11		EN-5	New Penthouse	15										
BO-6	MISC					VAV 111	11		EN-5	New Penthouse	15										
AO-1	MISC					VAV 111	11		EN-5	New Penthouse	15										
AO-2	MISC					VAV 111	11		EN-5	New Penthouse	15										
	MISC					VAV 111			EN-5	New Penthouse	15										Power to Controller
	MISC					VAV 111	12		EN-5	New Penthouse	15										N2 Trunk
AI-1	MISC	CU4-Amp	CU-4 Current	Amps		VAV 111	12	AI#, AI Common	EN-5	New Penthouse	15	2 #22	2-Wire	H-722	Motor Power Lead	Starter		Motor Power Lead	Panel NG	New Penthouse	
AI-2	MISC	CU5-Amp	CU-5 Current	Amps		VAV 111	12	AI#, AI Common	EN-5	New Penthouse	15	2 #22	2-Wire	H-722	Motor Power Lead	Starter		Motor Power Lead	Panel NG	New Penthouse	
AI-3	MISC	CU6-Amp	CU-6 Current	Amps		VAV 111	12	AI#, AI Common	EN-5	New Penthouse	15	2 #22	2-Wire	H-722	Motor Power Lead	Starter		Motor Power Lead	Panel NG	New Penthouse	
AI-4	MISC	CU7-Amp	CU-7 Current	Amps		VAV 111	12	AI#, AI Common	EN-5	New Penthouse	15	2 #22	2-Wire	H-722	Motor Power Lead	Starter		Motor Power Lead	Panel NG	New Penthouse	
AI-5	MISC	CU8-Amp	CU-8 Current	Amps		VAV 111	12	AI#, AI Common	EN-5	New Penthouse	15	2 #22	2-Wire	H-722	Motor Power Lead	Starter		Motor Power Lead	Panel NG	New Penthouse	
AI-6	MISC	CU9-Amp	CU-9 Current	Amps		VAV 111	12	AI#, AI Common	EN-5	New Penthouse	15	2 #22	2-Wire	H-722	Motor Power Lead	Starter		Motor Power Lead	Panel NG	New Penthouse	
BI-1	MISC					VAV 111	12		EN-5	New Penthouse	15										
BI-2	MISC					VAV 111	12		EN-5	New Penthouse	15										
BI-3	MISC					VAV 111	12		EN-5	New Penthouse	15										
BI-4	MISC					VAV 111	12		EN-5	New Penthouse	15										
BO-1	MISC					VAV 111	12		EN-5	New Penthouse	15										
BO-2	MISC					VAV 111	12		EN-5	New Penthouse	15										
BO-3	MISC					VAV 111	12		EN-5	New Penthouse	15										
BO-4	MISC					VAV 111	12		EN-5	New Penthouse	15										
BO-5	MISC					VAV 111	12		EN-5	New Penthouse	15										
BO-6	MISC					VAV 111	12		EN-5	New Penthouse	15										
AO-1	MISC					VAV 111	12		EN-5	New Penthouse	15										
AO-2	MISC					VAV 111	12		EN-5	New Penthouse	15										
	MISC					VAV 111			EN-5	New Penthouse	15										Power to Controller
	MISC					VAV 111	13		EN-5	New Penthouse	15										N2 Trunk
AI-1	MISC	CU10-Amp	CU-10 Current	Amps		VAV 111	13	AI#, AI Common	EN-5	New Penthouse	15	2 #22	2-Wire	H-722	Motor Power Lead	Starter		Motor Power Lead	Panel NG	New Penthouse	
AI-2	MISC	CU11-Amp	CU-11 Current	Amps		VAV 111	13	AI#, AI Common	EN-5	New Penthouse	15	2 #22	2-Wire	H-722	Motor Power Lead	Starter		Motor Power Lead	Panel NG	New Penthouse	
AI-3	MISC	CU12-Amp	CU-12 Current	Amps		VAV 111	13	AI#, AI Common	EN-5	New Penthouse	15	2 #22	2-Wire	H-722	Motor Power Lead	Starter		Motor Power Lead	Panel NG	New Penthouse	
AI-4	MISC	CU13-Amp	CU-13 Current	Amps		VAV 111	13	AI#, AI Common	EN-5	New Penthouse	15	2 #22	2-Wire	H-722	Motor Power Lead	Starter		Motor Power Lead	Panel NG	New Penthouse	
AI-5	MISC	CU14-Amp	CU-14 Current	Amps		VAV 111	13	AI#, AI Common	EN-5	New Penthouse	15	2 #22	2-Wire	H-722	Motor Power Lead	Starter		Motor Power Lead	Panel NG	New Penthouse	
AI-6	MISC	CU15-Amp	CU-15 Current	Amps		VAV 111	13	AI#, AI Common	EN-5	New Penthouse	15	2 #22	2-Wire	H-722	Motor Power Lead	Starter		Motor Power Lead	Panel NG	New Penthouse	
BI-1	MISC					VAV 111	13		EN-5	New Penthouse	15										
BI-2	MISC					VAV 111	13		EN-5	New Penthouse	15										
BI-3	MISC					VAV 111	13		EN-5	New Penthouse	15										
BI-4	MISC					VAV 111	13		EN-5	New Penthouse	15										
BO-1	MISC					VAV 111	13		EN-5	New Penthouse	15										
BO-2	MISC					VAV 111	13		EN-5	New Penthouse	15										
BO-3	MISC					VAV 111	13		EN-5	New Penthouse	15										
BO-4	MISC					VAV 111	13		EN-5	New Penthouse	15										
BO-5	MISC					VAV 111	13		EN-5	New Penthouse	15										
BO-6	MISC					VAV 111	13		EN-5	New Penthouse	15										
AO-1	MISC					VAV 111	13		EN-5	New Penthouse	15										
AO-2	MISC					VAV 111	13		EN-5	New Penthouse	15										

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Hardware Points List

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	Point Information					Controller Information											Field Device				
Point Type	System Name	Object Name	Expanded ID	Units		Controller Details	Trunk Addr.	Termination Out	Panel	Panel Location	Ref Drawing	Wiring /Tubing	Termination In	Device	Termination Out	Location	Wiring /Tubing	Termination In	Device	Location	Comment
	MISC					VAV 111			EN-5	New Penthouse	15										Power to Controller
	MISC					VAV 111	14		EN-5	New Penthouse	15										N2 Trunk
AI-1	MISC	CU16-Amp	CU-16 Current	Amps		VAV 111	14	AI#, AI Common	EN-5	New Penthouse	15	2 #22	2-Wire	H-722	Motor Power Lead	Starter		Motor Power Lead	Panel NG	New Penthouse	
AI-2	MISC	CU17-Amp	CU-17 Current	Amps		VAV 111	14	AI#, AI Common	EN-5	New Penthouse	15	2 #22	2-Wire	H-722	Motor Power Lead	Starter		Motor Power Lead	Panel NG	New Penthouse	
AI-3	MISC	CU18-Amp	CU-18 Current	Amps		VAV 111	14	AI#, AI Common	EN-5	New Penthouse	15	2 #22	2-Wire	H-722	Motor Power Lead	Starter		Motor Power Lead	Panel NG1	New Penthouse	
AI-4	MISC	CU19-Amp	CU-19 Current	Amps		VAV 111	14	AI#, AI Common	EN-5	New Penthouse	15	2 #22	2-Wire	H-722	Motor Power Lead	Starter		Motor Power Lead	Panel NG1	New Penthouse	
AI-5	MISC	CU20-Amp	CU-20 Current	Amps		VAV 111	14	AI#, AI Common	EN-5	New Penthouse	15	2 #22	2-Wire	H-722	Motor Power Lead	Starter		Motor Power Lead	Panel NG1	New Penthouse	
AI-6	MISC	CU21-Amp	CU-21 Current	Amps		VAV 111	14	AI#, AI Common	EN-5	New Penthouse	15	2 #22	2-Wire	H-722	Motor Power Lead	Starter		Motor Power Lead	Panel NG1	New Penthouse	
BI-1	MISC					VAV 111	14		EN-5	New Penthouse	15										
BI-2	MISC					VAV 111	14		EN-5	New Penthouse	15										
BI-3	MISC					VAV 111	14		EN-5	New Penthouse	15										
BI-4	MISC					VAV 111	14		EN-5	New Penthouse	15										
BO-1	MISC					VAV 111	14		EN-5	New Penthouse	15										
BO-2	MISC					VAV 111	14		EN-5	New Penthouse	15										
BO-3	MISC					VAV 111	14		EN-5	New Penthouse	15										
BO-4	MISC					VAV 111	14		EN-5	New Penthouse	15										
BO-5	MISC					VAV 111	14		EN-5	New Penthouse	15										
BO-6	MISC					VAV 111	14		EN-5	New Penthouse	15										
AO-1	MISC					VAV 111	14		EN-5	New Penthouse	15										
AO-2	MISC					VAV 111	14		EN-5	New Penthouse	15										
	MISC					VAV 111			EN-5	New Penthouse	15										Power to Controller
	MISC					VAV 111	15		EN-5	New Penthouse	15										N2 Trunk
AI-1	MISC	CU22-Amp	CU-22 Current	Amps		VAV 111	15	AI#, AI Common	EN-5	New Penthouse	15	2 #22	2-Wire	H-722	Motor Power Lead	Starter		Motor Power Lead	Panel NG1	New Penthouse	
AI-2	MISC	CU23-Amp	CU-23 Current	Amps		VAV 111	15	AI#, AI Common	EN-5	New Penthouse	15	2 #22	2-Wire	H-722	Motor Power Lead	Starter		Motor Power Lead	Panel NG1	New Penthouse	
AI-3	AHU-2	P9-Amps	Pump P-9 Current	Amps		VAV 111	15	AI#, AI Common	EN-5	New Penthouse	15	2 #22	2-Wire	H-722	Motor Power Lead	Starter		Motor Power Lead	Starter	New Penthouse	
AI-4	AHU-3	P11-Amps	Pump P-11 Current	Amps		VAV 111	15	AI#, AI Common	EN-5	New Penthouse	15	2 #22	2-Wire	H-722	Motor Power Lead	Starter		Motor Power Lead	Starter	New Penthouse	
AI-5	MISC					VAV 111	15		EN-5	New Penthouse	15										
AI-6	MISC					VAV 111	15		EN-5	New Penthouse	15										
BI-1	MISC					VAV 111	15		EN-5	New Penthouse	15										
BI-2	MISC					VAV 111	15		EN-5	New Penthouse	15										
BI-3	MISC					VAV 111	15		EN-5	New Penthouse	15										
BI-4	MISC					VAV 111	15		EN-5	New Penthouse	15										
BO-1	AHU-2	P9-C	Pump P-9 Command	Stop	Start	VAV 111	15	BO#, 24 VAC	EN-5	New Penthouse	15	2 #18	Coil	LY2USAC24	N.O. Contact	Starter	2 #18	Coil	Starter	New Penthouse	
BO-2	AHU-3	P11-C	Pump P-11 Command	Stop	Start	VAV 111	15	BO#, 24 VAC	EN-5	New Penthouse	15	2 #18	Coil	LY2USAC24	N.O. Contact	Starter	2 #18	Coil	Starter	New Penthouse	
BO-3	MISC					VAV 111	15		EN-5	New Penthouse	15										
BO-4	MISC					VAV 111	15		EN-5	New Penthouse	15										
BO-5	MISC					VAV 111	15		EN-5	New Penthouse	15										
BO-6	MISC					VAV 111	15		EN-5	New Penthouse	15										
AO-1	MISC					VAV 111	15		EN-5	New Penthouse	15										
AO-2	MISC					VAV 111	15		EN-5	New Penthouse	15										
	HTG					AHU 100			EN-3	New Boiler Room	13										Power to Controller
	HTG					AHU 100	16		EN-3	New Boiler Room	13										N2 Trunk
BO-1	HTG	B1-1-C	Boiler 1-1	Stop	Start	AHU 100	16	BO#, 24 VAC	EN-3	New Boiler Room	13	2 #18	Coil	LY2USAC24	N.O. Contact	Boiler	2 #18	Module Terminal Block	Gas Train	Boiler Room	
BO-2	HTG	B1-2-C	Boiler 1-2	Stop	Start	AHU 100	16	BO#, 24 VAC	EN-3	New Boiler Room	13	2 #18	Coil	LY2USAC24	N.O. Contact	Boiler	2 #18	Module Terminal Block	Gas Train	Boiler Room	
BO-3	HTG	B1-3-C	Boiler 1-3	Stop	Start	AHU 100	16	BO#, 24 VAC	EN-3	New Boiler Room	13	2 #18	Coil	LY2USAC24	N.O. Contact	Boiler	2 #18	Module Terminal Block	Gas Train	Boiler Room	
BO-4	HTG	B1-4-C	Boiler 1-4	Stop	Start	AHU 100	16	BO#, 24 VAC	EN-3	New Boiler Room	13	2 #18	Coil	LY2USAC24	N.O. Contact	Boiler	2 #18	Module Terminal Block	Gas Train	Boiler Room	
BO-5	HTG	B1-5-C	Boiler 1-5	Stop	Start	AHU 100	16	BO#, 24 VAC	EN-3	New Boiler Room	13	2 #18	Coil	LY2USAC24	N.O. Contact	Boiler	2 #18	Module Terminal Block	Gas Train	Boiler Room	
BO-6	HTG	B1-6--C	Boiler 1-6	Stop	Start	AHU 100	16	BO#, 24 VAC	EN-3	New Boiler Room	13	2 #18	Coil	LY2USAC24	N.O. Contact	Boiler	2 #18	Module Terminal Block	Gas Train	Boiler Room	
BO-7	HTG	B1-7-C	Boiler 1-7	Stop	Start	AHU 100	16	BO#, 24 VAC	EN-3	New Boiler Room	13	2 #18	Coil	LY2USAC24	N.O. Contact	Boiler	2 #18	Module Terminal Block	Gas Train	Boiler Room	
BO-8	HTG	B1-8-C	Boiler 1-8	Stop	Start	AHU 100	16	BO#, 24 VAC	EN-3	New Boiler Room	13	2 #18	Coil	LY2USAC24	N.O. Contact	Boiler	2 #18	Module Terminal Block	Gas Train	Boiler Room	
BO-9	HTG	P1-C	Prim Circ P-1 Command	Stop	Start	AHU 100	16	BO#, 24 VAC	EN-3	New Boiler Room	13	2 #18	Coil	LY2USAC24	N.O. Contact	Starter	2 #18	Coil	Starter	Boiler Room	
BO-10	HTG	P2-C	Prim Circ P-2 Command	Stop	Start	AHU 100	16	BO#, 24 VAC	EN-3	New Boiler Room	13	2 #18	Coil	LY2USAC24	N.O. Contact	Starter	2 #18	Coil	Starter	Boiler Room	
AO-1	HTG					AHU 100	16		EN-3	New Boiler Room	13										
AO-2	HTG					AHU 100	16		EN-3	New Boiler Room	13										
AO-3	HTG					AHU 100	16		EN-3	New Boiler Room	13										
AO-4	HTG					AHU 100	16		EN-3	New Boiler Room	13										
AO-5	HTG					AHU 100	16		EN-3	New Boiler Room	13										
AO-6	HTG					AHU 100	16		EN-3	New Boiler Room	13										
BI-1	HTG	B1-1-S	B1-1 Status	Off	On	AHU 100	16	BI#, BI Common	EN-3	New Boiler Room	13	2 #18	N.O. Contact	LY2USAC24	Coil	Boiler	2 #18	1, 2	Pilot Relight Control	Boiler Module	
BI-2	HTG	B1-2-S	B1-2 Status	Off	On	AHU 100	16	BI#, BI Common	EN-3	New Boiler Room	13	2 #18	N.O. Contact	LY2USAC24	Coil	Boiler	2 #18	1, 2	Pilot Relight Control	Boiler Module	
BI-3	HTG	B1-3-S	B1-3 Status	Off	On	AHU 100	16	BI#, BI Common	EN-3	New Boiler Room	13	2 #18	N.O. Contact	LY2USAC24	Coil	Boiler	2 #18	1, 2	Pilot Relight Control	Boiler Module	
BI-4	HTG	B1-4-S	B1-4 Status	Off	On	AHU 100	16	BI#, BI Common	EN-3	New Boiler Room	13	2 #18	N.O. Contact	LY2USAC24	Coil	Boiler	2 #18	1, 2	Pilot Relight Control	Boiler Module	
BI-5	HTG	B1-5-S	B1-5 Status	Off	On	AHU 100	16	BI#, BI Common	EN-3	New Boiler Room	13	2 #18	N.O. Contact	LY2USAC24	Coil	Boiler	2 #18	1, 2	Pilot Relight Control	Boiler Module	
BI-6	HTG	B1-6-S	B1-6 Status	Off	On	AHU 100	16	BI#, BI Common	EN-3	New Boiler Room	13	2 #18	N.O. Contact	LY2USAC24	Coil	Boiler	2 #18	1, 2	Pilot Relight Control	Boiler Module	
BI-7	HTG	B1-7-S	B1-7 Status	Off	On	AHU 100	16	BI#, BI Common	EN-3	New Boiler Room	13	2 #18	N.O. Contact	LY2USAC24	Coil	Boiler	2 #18	1, 2	Pilot Relight Control	Boiler Module	
BI-8	HTG	B1-8-S	B1-8 Status	Off	On	AHU 100	16	BI#, BI Common	EN-3	New Boiler Room	13	2 #18	N.O. Contact	LY2USAC24	Coil	Boiler	2 #18	1, 2	Pilot Relight Control	Boiler Module	
AI-1	HTG	HWS Temp	Primary HWS Temp	Deg C		AHU 100	16	AI#, AI Common	EN-3	New Boiler Room	13						2 #22	2-Wire	TE-631AP-1	Boiler Room	
AI-2	HTG	HWR-T	Primary HWR Temp	Deg C		AHU 100	16	AI#, AI Common	EN-3	New Boiler Room	13						2 #22	2-Wire	TE-631AP-1	Boiler Room	
AI-3	HTG	OA-T	Outdoor Air Temp	Deg C		AHU 100	16	AI#, AI Common	EN-3	New Boiler Room	13						2 #22	2-Wire	TE-6313P-1	North Ext Wall	
AI-4	HTG	P1-Amps	Prim Circ P-1 Current	Amps		AHU 100	16	AI#, AI Common	EN-3	New Boiler Room	13	2 #22	2-Wire	H-722	Motor Power Lead	Starter		Motor Power Lead	Starter	New Boiler Room	
AI-5	HTG	P2-Amps	Prim Circ P-2 Current	Amps		AHU 100	16	AI#, AI Common	EN-3	New Boiler Room	13	2 #22	2-Wire	H-722	Motor Power Lead	Starter		Motor Power Lead	Starter	New Boiler Room	
AI-6	MISC					AHU 100	16		EN-3	New Boiler Room	13										
AI-7	MISC					AHU 100	16		EN-3	New Boiler Room	13										
AI-8	MISC					AHU 100	16		EN-3	New Boiler Room	13										

Project Name: Herzberg Institute
Project Number: 99-0012

Hardware Points List

4/18/00

	Point Information					Controller Information												Field Device				
Point Type	System Name	Object Name	Expanded ID	Units		Controller Details	Trunk Addr.	Termination Out	Panel	Panel Location	Ref Drawing	Wiring /Tubing	Termination In	Device	Termination Out	Location	Wiring /Tubing	Termination In	Device	Location	Comment
	HTG					VAV 111			EN-3	New Boiler Room	13										Power to Controller
	HTG					VAV 111	17		EN-3	New Boiler Room	13										N2 Trunk
AI-1	HTG	P3-Amps	P-3 Current	Amps		VAV 111	17	AI#, AI Common	EN-3	New Boiler Room	13	2 #22	2-Wire	H-722	Motor Power Lead	Starter		Motor Power Lead	Starter	New Boiler Room	
AI-2	HTG	P4-Amps	P-4 Current	Amps		VAV 111	17	AI#, AI Common	EN-3	New Boiler Room	13	2 #22	2-Wire	H-722	Motor Power Lead	Starter		Motor Power Lead	Starter	New Boiler Room	
AI-3	HTG	P34HWS-T	P-3/P-4 HWS Temp	Deg C		VAV 111	17	AI#, AI Common	EN-3	New Boiler Room	13						2 #22	2-Wire	TE-631AP-1	New Boiler Room	
AI-4	HTG	P5-Amps	P-5 Current	Amps		VAV 111	17	AI#, AI Common	EN-3	New Boiler Room	13	2 #22	2-Wire	H-722	Motor Power Lead	Starter		Motor Power Lead	Starter	New Boiler Room	
AI-5	HTG	P6-Amps	P-6 Current	Amps		VAV 111	17	AI#, AI Common	EN-3	New Boiler Room	13	2 #22	2-Wire	H-722	Motor Power Lead	Starter		Motor Power Lead	Starter	New Boiler Room	
AI-6	HTG	P56HWS-T	P-5/P-6 HWS Temp	Deg C		VAV 111	17	AI#, AI Common	EN-3	New Boiler Room	13						2 #22	2-Wire	TE-631AP-1	New Boiler Room	
BI-1	HTG					VAV 111	17		EN-3	New Boiler Room	13										
BI-2	HTG					VAV 111	17		EN-3	New Boiler Room	13										
BI-3	HTG					VAV 111	17		EN-3	New Boiler Room	13										
BI-4	HTG					VAV 111	17		EN-3	New Boiler Room	13										
BO-1	HTG	P3-C	P-3 Command	Stop	Start	VAV 111	17	BO#, 24 VAC	EN-3	New Boiler Room	13	2 #18	Coil	LY2USAC24	N.O. Contact	Starter	2 #18	Coil	Starter	Boiler Room	
BO-2	HTG	P4-C	P-4 Command	Stop	Start	VAV 111	17	BO#, 24 VAC	EN-3	New Boiler Room	13	2 #18	Coil	LY2USAC24	N.O. Contact	Starter	2 #18	Coil	Starter	Boiler Room	
BO-3	HTG	P5-C	P-5 Command	Stop	Start	VAV 111	17	BO#, 24 VAC	EN-3	New Boiler Room	13	2 #18	Coil	LY2USAC24	N.O. Contact	Starter	2 #18	Coil	Starter	Boiler Room	
BO-4	HTG	P6-C	P-6 Command	Stop	Start	VAV 111	17	BO#, 24 VAC	EN-3	New Boiler Room	13	2 #18	Coil	LY2USAC24	N.O. Contact	Starter	2 #18	Coil	Starter	Boiler Room	
BO-5	HTG					VAV 111	17		EN-3	New Boiler Room	13										
BO-6	HTG					VAV 111	17		EN-3	New Boiler Room	13										
AO-1	HTG	P34V-C	P-3/P-4 Valve Command	% Htg		VAV 111	17	AO#, AO Common	EN-3	New Boiler Room	13	2 #22	2-Wire	EP-8000-2	1/4" Tube	EN-3	1/4" Tube		TV-4	New Boiler Room	
AO-2	HTG	P34V-C	P-4/P-4 Valve Command	% Htg		VAV 111	17	AO#, AO Common	EN-3	New Boiler Room	13	2 #22	2-Wire	EP-8000-2	1/4" Tube	EN-3	1/4" Tube		TV-5	New Boiler Room	
	SF-1					VAV 111			EN-3	New Boiler Room	15										Power to Controller
	SF-1					VAV 111	18		EN-3	New Boiler Room	15										N2 Trunk
AI-1	SF-1	P7-Amps	P-7 Current	Amps		VAV 111	18	AI#, AI Common	EN-3	New Boiler Room	15	2 #22	2-Wire	H-722	Motor Power Lead	Starter		Motor Power Lead	Starter	New Boiler Room	
AI-2	SF-1	P8-Amps	P-8 Current	Amps		VAV 111	18	AI#, AI Common	EN-3	New Boiler Room	15	2 #22	2-Wire	H-722	Motor Power Lead	Starter		Motor Power Lead	Starter	New Boiler Room	
AI-3	SF-1	P78HWS-T	P-7/P-8 HWS Temp	Deg C		VAV 111	18	AI#, AI Common	EN-3	New Boiler Room	15						2 #22	2-Wire	TE-631AP-1	New Boiler Room	
AI-4	SF-1	P10-Amps	P-10 Current	Amps		VAV 111	18	AI#, AI Common	EN-3	New Boiler Room	15	2 #22	2-Wire	H-722	Motor Power Lead	Starter		Motor Power Lead	Starter	New Boiler Room	
AI-5	SF-1	SF1-Amps	SF-1 Current	Amps		VAV 111	18	AI#, AI Common	EN-3	New Boiler Room	15	2 #22	2-Wire	H-722	Motor Power Lead	Starter		Motor Power Lead	Starter	New Boiler Room	
AI-6	SF-1	BLR-T	Boiler Room Temp	Deg C		VAV 111	18	AI#, AI Common	EN-3	New Boiler Room	15						2 #22	2-Wire	TE-6314P-1	New Boiler Room	
BI-1	SF-1					VAV 111	18		EN-3	New Boiler Room	15										
BI-2	SF-1					VAV 111	18		EN-3	New Boiler Room	15										
BI-3	SF-1					VAV 111	18		EN-3	New Boiler Room	15										
BI-4	SF-1					VAV 111	18		EN-3	New Boiler Room	15										
BO-1	SF-1	P7-C	P-7 Command	Stop	Start	VAV 111	18	BO#, 24 VAC	EN-3	New Boiler Room	15	2 #18	Coil	LY2USAC24	N.O. Contact	Starter	2 #18	Coil	Starter	Boiler Room	
BO-2	SF-1	P8-C	P-8 Command	Stop	Start	VAV 111	18	BO#, 24 VAC	EN-3	New Boiler Room	15	2 #18	Coil	LY2USAC24	N.O. Contact	Starter	2 #18	Coil	Starter	Boiler Room	
BO-3	SF-1	P10-C	P-10 Command	Stop	Start	VAV 111	18	BO#, 24 VAC	EN-3	New Boiler Room	15	2 #18	Coil	LY2USAC24	N.O. Contact	Starter	2 #18	Coil	Starter	Boiler Room	
BO-4	SF-1					VAV 111	18		EN-3	New Boiler Room	15										
BO-5	SF-1	SF1-C	SF-1 Command	Stop	Start	VAV 111	18	BO#, 24 VAC	EN-3	New Boiler Room	15	2 #18	Coil	LY2USAC24	N.O. Contact	Starter	2 #18	Coil	Starter	Boiler Room	
BO-6	SF-1					VAV 111	18		EN-3	New Boiler Room	15										
AO-1	SF-1	P78V-C	P-7/P-8 Valve Command	% Htg		VAV 111	18	AO#, AO Common	EN-3	New Boiler Room	15	2 #22	2-Wire	EP-8000-2	1/4" Tube	EN-3	1/4" Tube		TV-6	New Boiler Room	
AO-2	SF-1					VAV 111	18		EN-3	New Boiler Room	15										
			TYPICAL RADIANT PANEL CONTROLLER POINT LAY-OUT																		
	RADIANT					VAV 111			EN-x	Various	4										Power to Controller
	RADIANT					VAV 111	100		EN-x	Various	4										N2 Trunk
AI-1	RADIANT	RMxxx-T	Room Temperature	Deg C		VAV 111	100	AI#, AI Common	EN-x	Various	4						2 #18	1, 2	TE-6415S-210	Various	
AI-2	RADIANT	RMxxx-Sp	Room Temp Setpoint	Deg C		VAV 111	100	AI#, AI Common	EN-x	Various	4						2 #18	3, 4	"	Various	
AI-3	RADIANT	RMxxx-T	Room Temperature	Deg C		VAV 111	100	AI#, AI Common	EN-x	Various	4						2 #18	1, 2	TE-6415S-210	Various	
AI-4	RADIANT	RMxxx-Sp	Room Temp Setpoint	Deg C		VAV 111	100	AI#, AI Common	EN-x	Various	4						2 #18	3, 4	"	Various	
AI-5	RADIANT					VAV 111	100		EN-x	Various	4										
AI-6	RADIANT					VAV 111	100		EN-x	Various	4										
BI-1	RADIANT					VAV 111	100		EN-x	Various	4										
BI-2	RADIANT					VAV 111	100		EN-x	Various	4										
BI-3	RADIANT					VAV 111	100		EN-x	Various	4										
BI-4	RADIANT					VAV 111	100		EN-x	Various	4										
BO-1	RADIANT					VAV 111	100		EN-x	Various	4										
BO-2	RADIANT					VAV 111	100		EN-x	Various	4										
BO-3	RADIANT					VAV 111	100		EN-x	Various	4										
BO-4	RADIANT					VAV 111	100		EN-x	Various	4										
BO-5	RADIANT					VAV 111	100		EN-x	Various	4										
BO-6	RADIANT					VAV 111	100		EN-x	Various	4										
AO-1	RADIANT	TVxxx-C	Rad Pnl Ctrl Valve Command	% Htg		VAV 111	100	AO#,AO Com,24VAC	EN-x	Various	4						3 #18	Red, Blk, Wht	VA-7452-90011	Ceiling Space	
AO-2	RADIANT	TVxxx-C	Rad Pnl Ctrl Valve Command	% Htg		VAV 111	100	AO#,AO Com,24VAC	EN-x	Various	4						3 #18	Red, Blk, Wht	VA-7452-90011	Ceiling Space	

TABLE OF CONTENTS

Meric Controls

- [x] Automatic Temperature Controls
- [x] Direct Digital Environment Control System
- [x] Energy Conservation Control
- [ ] Card Access Security System
- [ ] Lighting Control System
- [ ] Fire Management System
- [ ] Integrated Building Automation System
- [ ] Custom Programmed Maintenance System

514 27th Avenue South
Cranbrook, BC
V1C 3J5

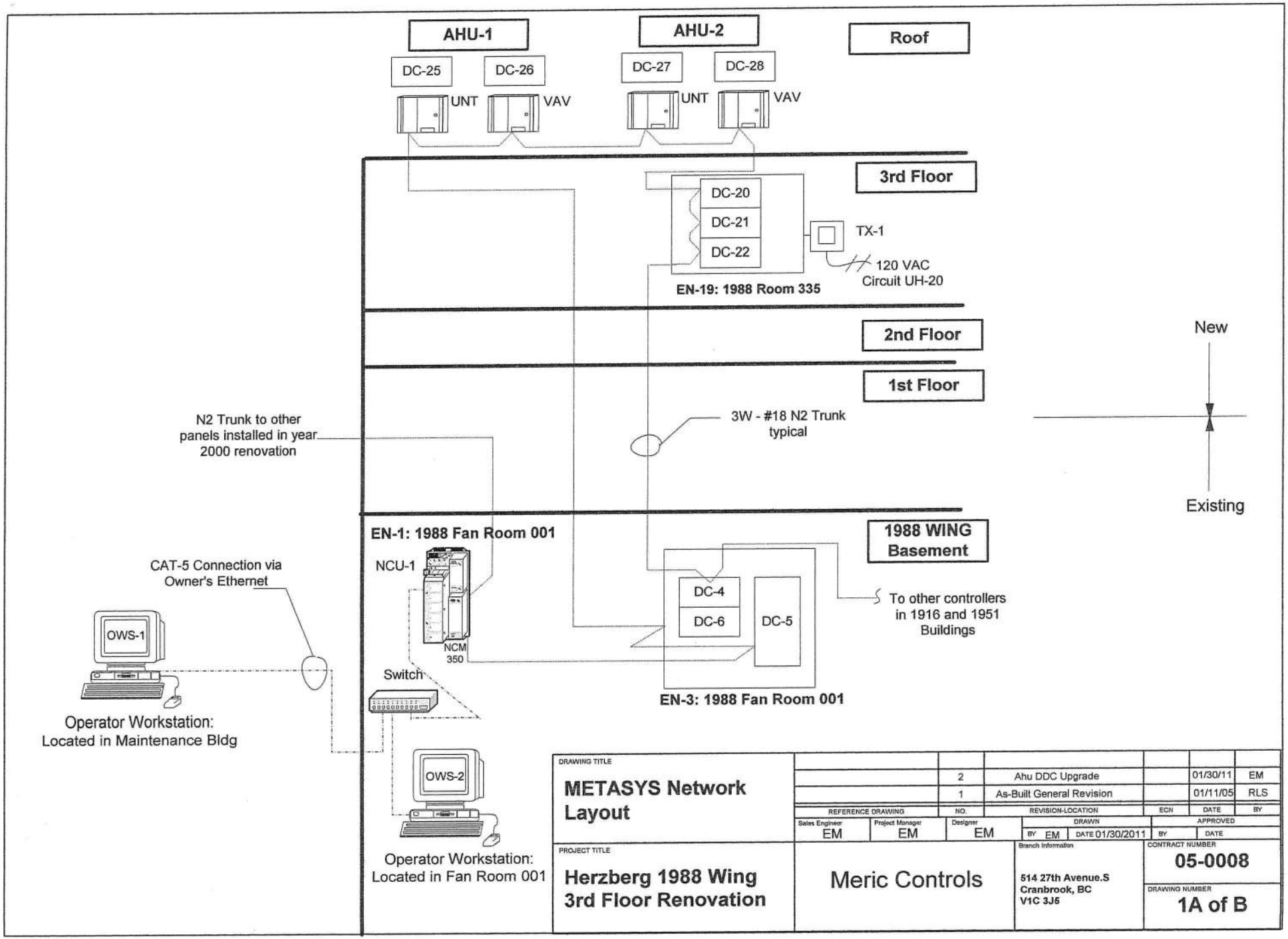
PROJECT

Herzberg 1988 Wing
3rd Floor Renovation

ARCHITECT	ENGINEER
National Research Council	National Research Council
ELECTRICALCONTRACTOR	**MECHANICAL CONTRACTOR**
Henneberry Electric Ltd.	Oceanview Mechanical Ltd.

REFERENCE DRAWING	NO.	REVISION-LOCATION	PCN	DATE	BY
	2	Ahu DDC Upgrade		01/30/11	EM
	1	As-Built General Revision		01/11/05	RLS

SALES ENGINEER	PROJECT MGR	DESIGNER	DATE	CONTRACT NUMBER
EM	EM	EM	01/30/2011	05-0008



DRAWING TITLE

METASYS Network Layout

NO.	REVISION-LOCATION	ECN	DATE	BY
2	Ahu DDC Upgrade		01/30/11	EM
1	As-Built General Revision		01/11/05	RLS

Sales Engineer	Project Manager	Designer	DRAWN	APPROVED
EM	EM	EM	BY EM DATE 01/30/2011	BY DATE

PROJECT TITLE

Herzberg 1988 Wing 3rd Floor Renovation

Meric Controls

Branch Information

514 27th Avenue.S
Cranbrook, BC
V1C 3J5

CONTRACT NUMBER

05-0008

DRAWING NUMBER

1A of B

Code	Qty	Model #	Description
DC-20	1	DX-9100-8454	METASYS Logic Controller
	1	DX-9100-8990	DX-9100 Mounting Base
DC-20-XT23,24	2	XT-9100-8304	DX expansion module
DC-20-XP-1 to 4	4	XP-9104-8304	DX input/output module
DC-21, 22	2	AS-UNT110-1	METASYS Unitary Controller
EN-19	1	AE1097.500	Rittal Enclosure, 30"W x 35.5"H x12"D
TX-1	1	Y64T22-0	120/24 VAC Transformer 92 VA
DC-25, 27	2	AS-UNT111-1	METASYS Unitary Controller
DC-26, 28	2	AS-VAV111-1	METASYS Vav Controller

DRAWING TITLE

METASYS Network

REFERENCE DRAWING	NO.	REVISION-LOCATION	ECN	DATE	BY
	2	Ahu DDC Upgrade		01/30/11	EM
	1	As-Built General Revision		01/11/05	RLS

Sales Engineer	Project Manager	Designer	DRAWN	APPROVED
EM	EM	EM	BY EM DATE 01/30/2011	BY DATE

PROJECT TITLE

Herzberg 1988 Wing
3rd Floor Renovation

Meric Controls

Branch Information

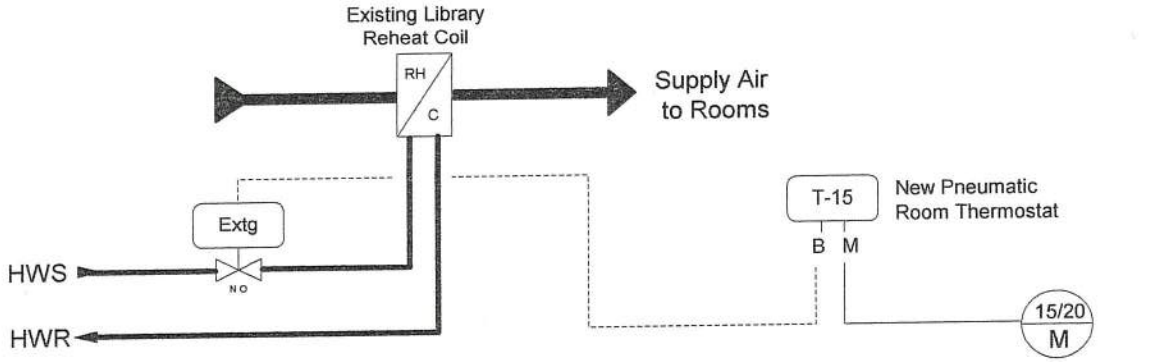
514 27th Avenue.S
Cranbrook, BC
V1C 3J5

CONTRACT NUMBER

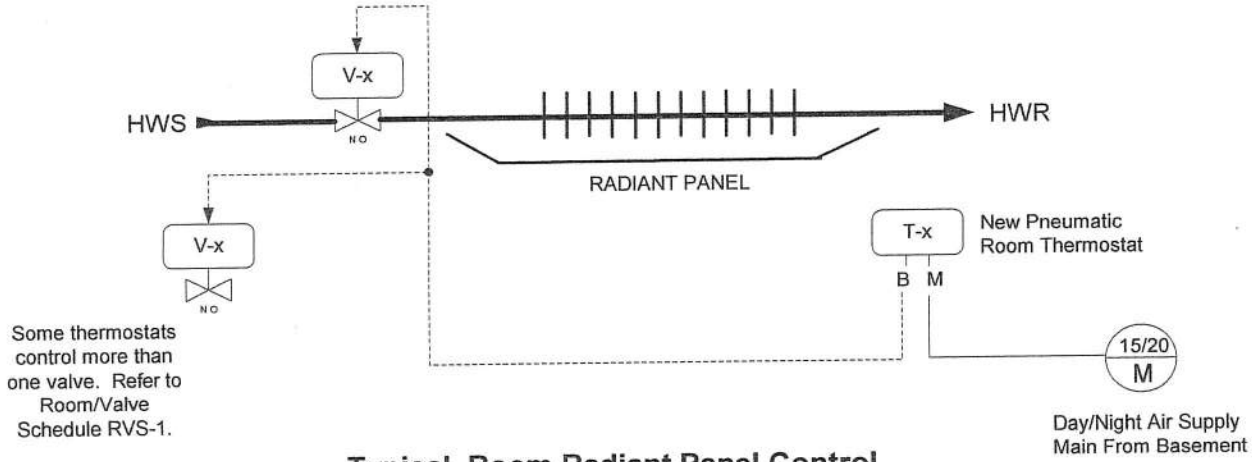
05-0008

DRAWING NUMBER

1B of B



Existing Reheat Coil Control



Typical Room Radiant Panel Control

DRAWING TITLE: **Room Heating Control**								
	REFERENCE DRAWING	NO.	REVISION-LOCATION			ECN	DATE	BY
	Sales Engineer: EM	Project Manager: EM	Designer: EM	DRAWN: BY EM DATE 08/03/05		APPROVED: BY	DATE	
PROJECT TITLE: **Herzberg 1988 Wing 3rd Floor Renovation**		Meric Controls		Branch Information: **514 27th Avenue.S Cranbrook, BC V1C 3J5**		CONTRACT NUMBER: **05-0008**		
						DRAWING NUMBER: **2A of B**		

BILL OF MATERIALS

Code	Qty	Model #	Description
V-xx	19		Refer to Room/Valve Schedule RVS-1
T-1 to 15	15	T-4506-9007	Day/Night T'stat, Horizontal, Adjustable 12 - 30 Deg C
	15	T-4756-1738	Cover, Horiz, Thermometer, 2 Windows
	15	T-4002-124	Thermostat mounting base
	15	T-4002-5012	Thermostat Adjustment Knobs

Sequence of Operation

1. ***Existing Library Reheat Coil Control:*** The new day/night pneumatic thermostat shall modulate the existing reheat coil control valve to maintain corridor temperature at set-point. When the air supply is switched centrally to the night-time (higher) pressure, the thermostat will control to the night set-back set-point of 15 Deg C.

2. ***Radiant Panel Control:*** Each new day/night pneumatic thermostat shall maintain its room temperature at set-point by modulating one or more pneumatic control valves controlling hot water flow to the radiant panels. When the air supply is switched centrally to the night-time (higher) pressure, the thermostat will control to the night set-back set-point of 15 Deg C.

DRAWING TITLE

Room Heating Control

NO.	REVISION-LOCATION	ECN	DATE	BY
1	As-Built General Revision		01/11/05	RLS

REFERENCE DRAWING

Sales Engineer	Project Manager	Designer	DRAWN	APPROVED
EM	EM	EM	BY EM DATE 08/03/05	BY DATE

PROJECT TITLE

Herzberg 1988 Wing
3rd Floor Renovation

Meric Controls

Branch Information

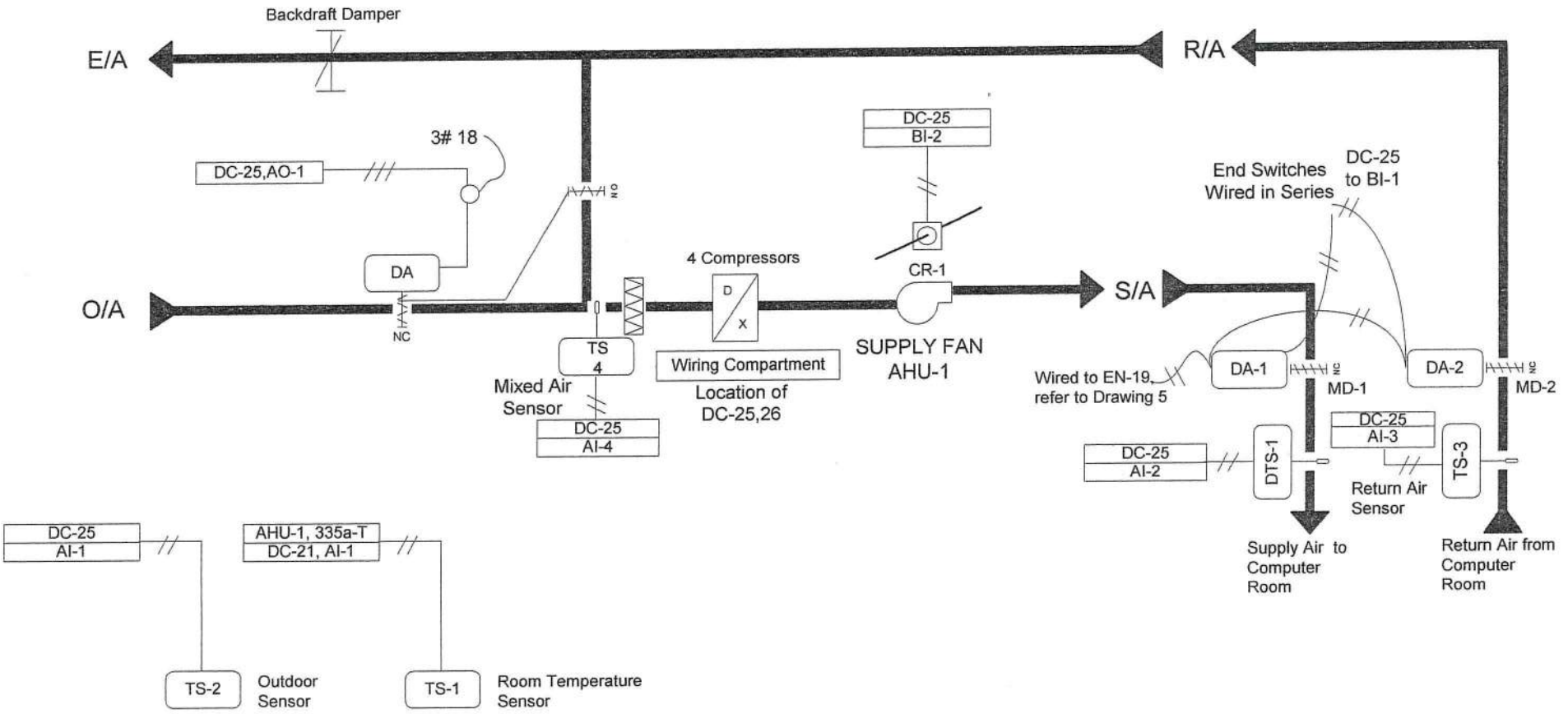
514 27th Avenue.S
Cranbrook, BC
V1C 3J5

CONTRACT NUMBER

05-0008

DRAWING NUMBER

2B of B



	2	As Built Ac Unit		01/30/10	EM
	1	As-Built General Revision		01/11/05	RLS
REFERENCE DRAWING	NO.	REVISION-LOCATION	ECN	DATE	BY

DRAWING TITLE

Rooftop Air Handling Units AHU-1

Sales Engineer	Project Manager	Designer	DRAWN	APPROVED
EM	EM	EM	BY EM DATE 01/30/11	BY DATE

PROJECT TITLE

Herzberg 1988 Wing 3rd Floor Renovation

Meric Controls

Branch Information

514 27th Avenue.S
Cranbrook, BC
V1C 3J5

CONTRACT NUMBER

05-0008

DRAWING NUMBER

3A of E

BILL OF MATERIALS

Code	Qty	Model #	Description
CR-2	1	CS-410	Greystone Current Relay
DA-3, 4	2	M9216-BGC-2	24 VAC 2-Position Damper Actuator with End Switch
DTS-2	1	TE-6311P-1	8" Duct Probe RTD Sensor
TS-1	1	TE-6314P-1	Room Temp Sensor, Nickel, blank cover
MD-3	1	1000	Tamco 1000 parallel blade damper: 20"W x 50"H
MD-4	1	1000	Tamco 1000 parallel blade damper: 20"W x 48"H
TS-4	1	TE-6315P-1	Average Duct Temp Sensor, Nickel
TS-3	1	TE-6311P-1	8" Duct Probe RTD Sensor
TS-2	1	TE-6313P-1	Outside Air Temp Sensor, Nickel, Mounted
CT 1-5	5	CS-410	Current Sensor
TDR-1	1		Time Delay Relay and Base - 24 VAC
R-1	1		DPDT Relay and Base - 208 VAC
S/S - FAN	1		DPDT Relay and Base - 24 VAC
S/S-COMP 1	1		DPDT Relay and Base - 24 VAC
S/S-COMP 2	1		DPDT Relay and Base - 24 VAC
S/S-COMP 3	1		DPDT Relay and Base - 24 VAC
S/S-COMP 4	1		DPDT Relay and Base - 24 VAC
A/C Status	1		DPDT Relay and Base - 200 VAC
A/C Status	1		DPDT Relay and Base - 200 VAC
A/C Status	1		DPDT Relay and Base - 200 VAC

Sequence of Operation

1. Operation of this rooftop air handling unit shall be automatic via the METASYS network, with local override operation available at panel EN-19.

2. When the air handling unit switches on the face of EN-19 are in the 'AUTO' position, AHU-1 and AHU-2 shall be operated as a lead/lag pair by the METASYS network. The lead AHU shall be rotated automatically every month. In addition, the lead shall be rotated automatically on failure of the lead AHU, or on sensing a high computer room temperature.

3. When AHU-2 is designated as the lag AHU, and the AHU-1 manual switch on the face of EN-19 is in the 'AUTO' position, then the AHU-2 supply fan shall remain off, compressors shall be locked out, the outdoor inlet damper shall be fully closed, supply damper MD-3 shall be driven closed, and return damper MD-4 shall be driven closed.

4. When AHU-2 is rotated to the lead AHU position, or if the AHU-2 manual switch on the face of EN-19 is switched to the 'HAND' position, and if AHU-1 is not running, supply damper MD-3 and return damper MD-4 shall spring return to their normally open positions. When both damper actuator end switches confirm the dampers are open, then the AHU-2 supply fan shall start and run continuously.

5. When AHU-2 is operating, the two stages of mechanical cooling shall be cycled as required to maintain the computer room temperature at set-point.

6. An alarm shall be initiated at EN-19 and on the METASYS network on failure of the supply fan fail to run, high or low supply air temperature, high or low computer room temperature.

DRAWING TITLE
Rooftop Air Handling Unit AHU-1

	1	Ahu DDC Upgrade		01/30/11	EM
REFERENCE DRAWING	NO.	REVISION-LOCATION		ECN	DATE	BY

Sales Engineer	Project Manager	Designer	DRAWN	APPROVED
EM	EM	EM	BY EM DATE 01/30/2011	BY DATE

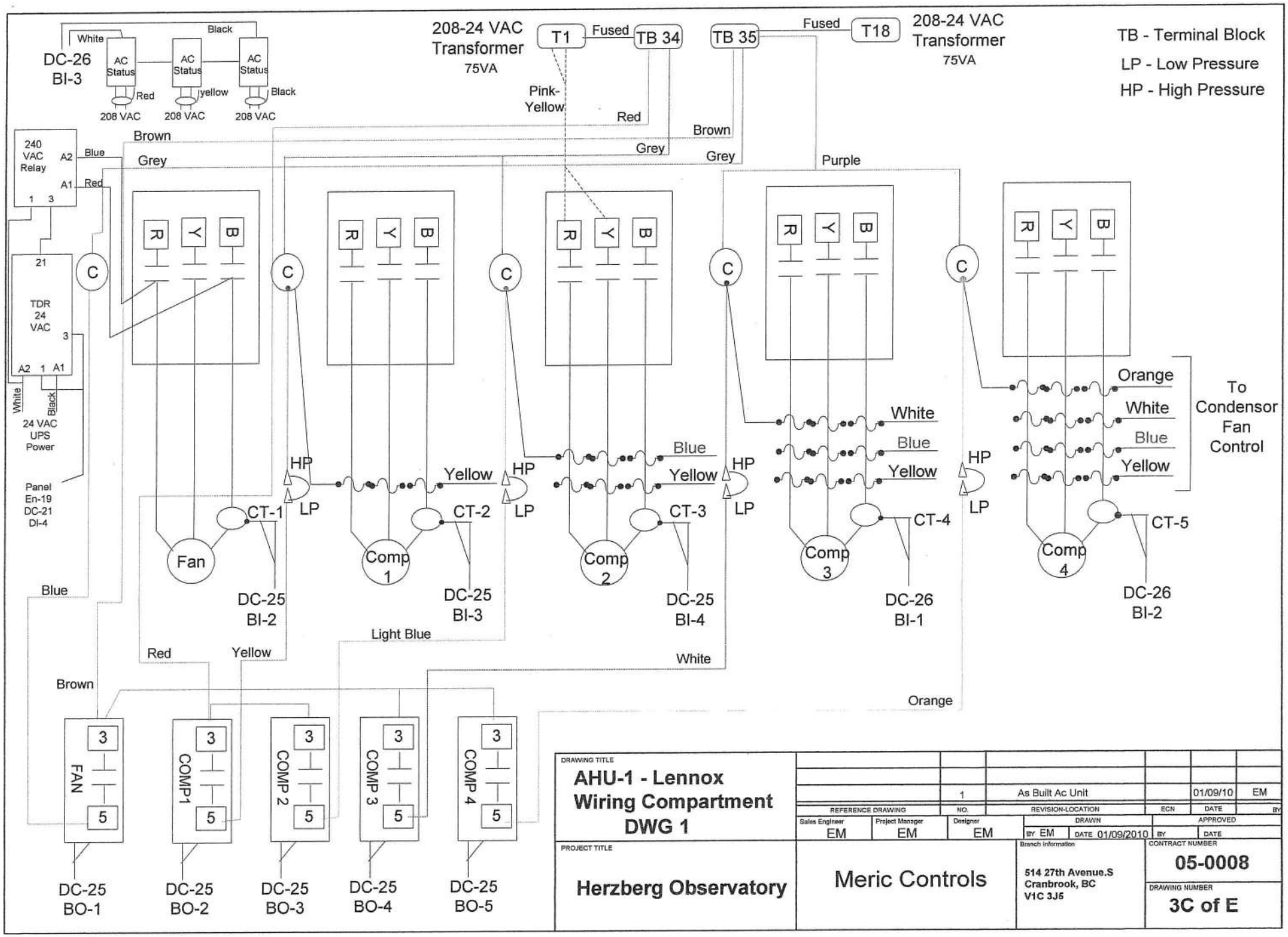
PROJECT TITLE
Herzberg 1988 Wing 3rd Floor Renovation

Meric Controls

Branch Information
514 27th Avenue.S
Cranbrook, BC
V1C 3J5

CONTRACT NUMBER
05-0008

DRAWING NUMBER
3B of E



DRAWING TITLE

AHU-1 - Lennox Wiring Compartment DWG 1

NO.	REVISION-LOCATION	ECN	DATE	BY
1	As Built Ac Unit		01/09/10	EM

REFERENCE DRAWING			DRAWN		APPROVED	
Sales Engineer	Project Manager	Designer	BY	DATE	BY	DATE
EM	EM	EM	EM	01/09/2010		

PROJECT TITLE

Herzberg Observatory

Meric Controls

Branch Information

514 27th Avenue.S
Cranbrook, BC
V1C 3J5

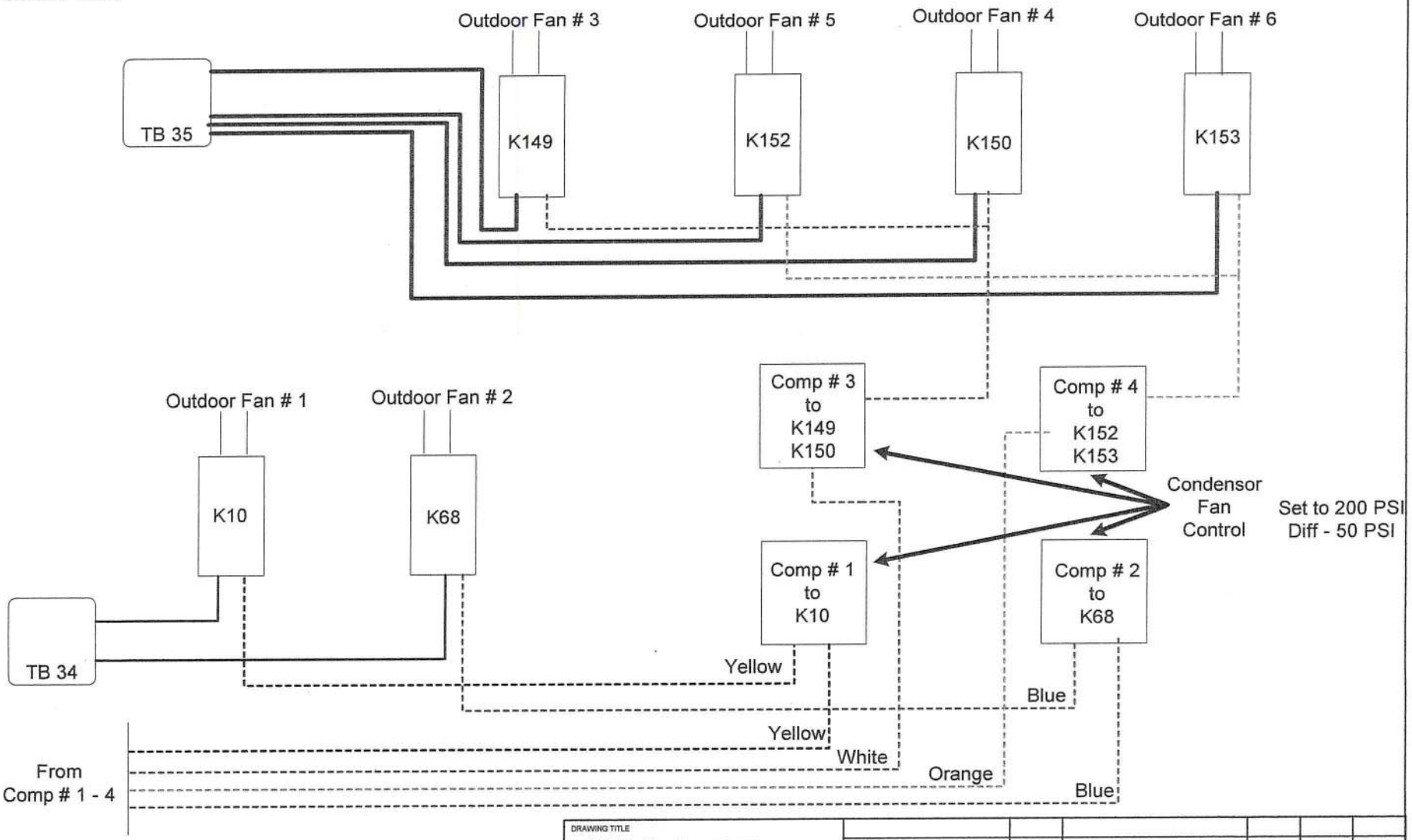
CONTRACT NUMBER

05-0008

DRAWING NUMBER

3C of E

TB - Terminal Block



DRAWING TITLE: **AHU-1 - Lennox Wiring Compartment DWG 2**						
	1	As Built Ac Unit		01/09/10	EM	
REFERENCE DRAWING	NO.	REVISION-LOCATION	ECN	DATE	BY	
Sales Engineer: EM	Project Manager: EM	Designer: EM	DRAWN: BY EM DATE 01/09/2010	APPROVED: BY	DATE	
PROJECT TITLE: **Herzberg Observatory**	Meric Controls	Branch Information: **514 27th Avenue.S Cranbrook, BC V1C 3J5**	CONTRACT NUMBER: **05-0008**			
			DRAWING NUMBER: **3D of E**			

Point List			
			Description
Analog Inputs		**AS-UNT111-1**	**DC-25**
AI - 1		TS-2	Outside Air Temperature
AI - 2		DTS-1	Supply Air Temperature
AI - 3		TS-3	Return Air Temperature
AI - 4		TS-4	Mixed Air Temperature
Binary Inputs			
BI - 1		DA-1/2	Isolation Dampers End Switch (Open/Close)
BI - 2		CR-1	Fan Status (On/Off)
BI - 3			Compressor # 1 Status (On/Off)
BI - 4			Compressor # 1 Status (On/Off)
Binary Outputs			
BO - 1			Fan Start / Stop
BO - 2			Compressor # 1 Start / Stop
BO - 3			Compressor # 2 Start / Stop
BO - 4			Compressor # 3 Start / Stop
BO - 5			Compressor # 4 Start / Stop
BO - 6			Spare
Analog Outputs			
AO - 1			Mixing Dampers (2 - 10 VDC)
AO - 2			Spare
		AS-VAV111-1	**DC-26**
Binary Inputs			
BI - 1			Compressor # 3 Status (On/Off)
BI - 2			Compressor # 4 Status (On/Off)
BI - 3			Loss Of Power (Open/Close)

DRAWING TITLE

Rooftop Air Handling
Unit AHU-1 - Point List

	1	Ahu DDC Upgrade		01/30/11	EM
REFERENCE DRAWING	NO.	REVISION-LOCATION	ECN	DATE	BY

Sales Engineer	Project Manager	Designer	DRAWN	APPROVED
EM	EM	EM	BY EM DATE 01/30/2011	BY DATE

PROJECT TITLE

Herzberg 1988 Wing
3rd Floor Renovation

Meric Controls

Branch Information

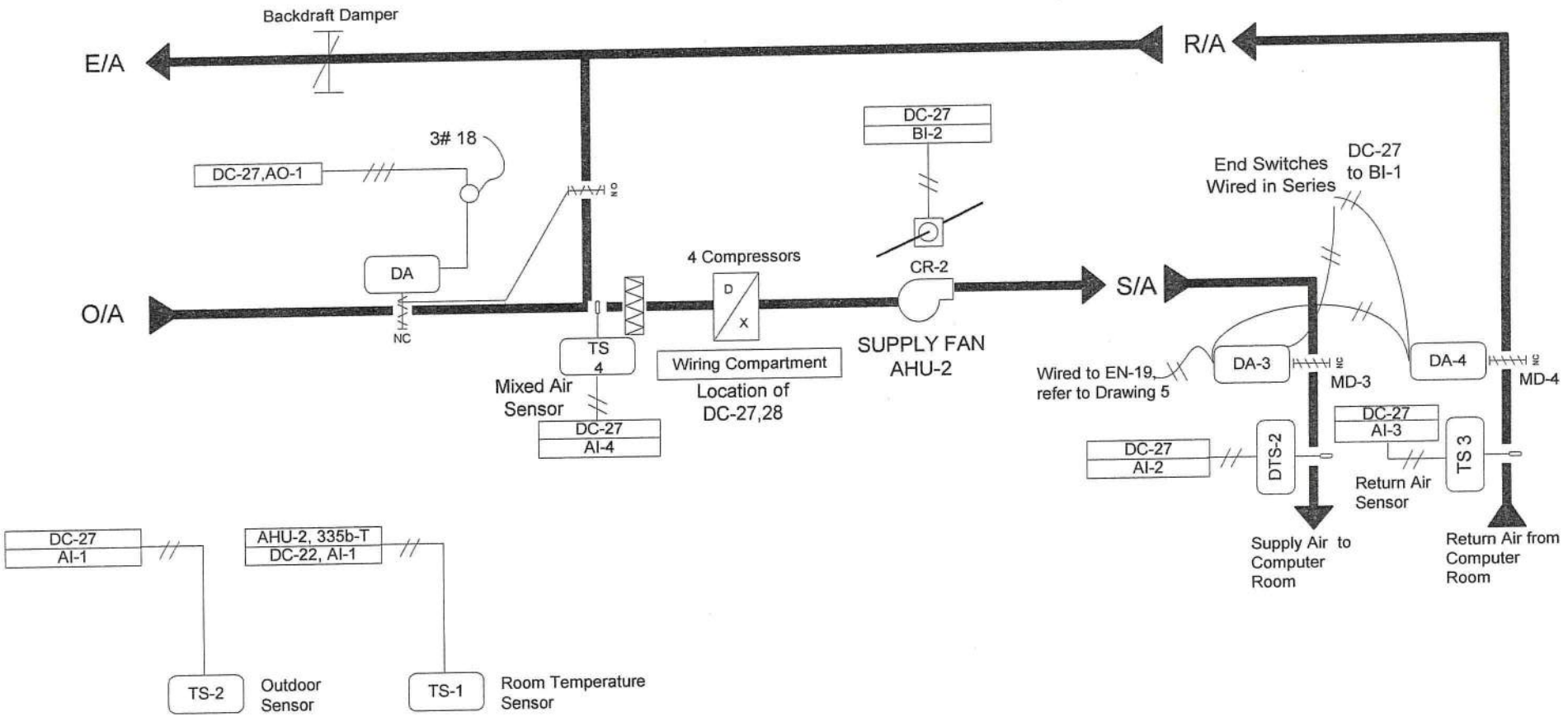
514 27th Avenue.S
Cranbrook, BC
V1C 3J5

CONTRACT NUMBER

05-0008

DRAWING NUMBER

3E of E



DRAWING TITLE: **Rooftop Air Handling Units AHU-2**		2	As Built Ac Unit	01/30/10	EM
		1	As-Built General Revision	01/11/05	RLS
	REFERENCE DRAWING	NO.	REVISION-LOCATION	ECN / DATE / BY	
	Sales Engineer: EM; Project Manager: EM; Designer: EM		DRAWN BY EM DATE 01/30/11	APPROVED BY / DATE	
PROJECT TITLE: **Herzberg 1988 Wing 3rd Floor Renovation**	Meric Controls		Branch Information: **514 27th Avenue.S Cranbrook, BC V1C 3J5**	CONTRACT NUMBER: **05-0008**	
				DRAWING NUMBER: **4A of E**	

BILL OF MATERIALS

Code	Qty	Model #	Description
CR-2	1	CS-410	Greystone Current Relay
DA-3, 4	2	M9216-BGC-2	24 VAC 2-Position Damper Actuator with End Switch
DTS-2	1	TE-6311P-1	8" Duct Probe RTD Sensor
TS-1	1	TE-6314P-1	Room Temp Sensor, Nickel, blank cover
MD-3	1	1000	Tamco 1000 parallel blade damper: 20"W x 50"H
MD-4	1	1000	Tamco 1000 parallel blade damper: 20"W x 48"H
TS-4	1	TE-6315P-1	Average Duct Temp Sensor, Nickel
TS-3	1	TE-6311P-1	8" Duct Probe RTD Sensor
TS-2	1	TE-6313P-1	Outside Air Temp Sensor, Nickel, Mounted
CT 1-5	5	CS-410	Current Sensor
TDR-1	1		Time Delay Relay and Base - 24 VAC
R-1	1		DPDT Relay and Base - 208 VAC
S/S - FAN	1		DPDT Relay and Base - 24 VAC
S/S-COMP 1	1		DPDT Relay and Base - 24 VAC
S/S-COMP 2	1		DPDT Relay and Base - 24 VAC
S/S-COMP 3	1		DPDT Relay and Base - 24 VAC
S/S-COMP 4	1		DPDT Relay and Base - 24 VAC
A/C Status	1		DPDT Relay and Base - 200 VAC
A/C Status	1		DPDT Relay and Base - 200 VAC
A/C Status	1		DPDT Relay and Base - 200 VAC

Sequence of Operation

1. Operation of this rooftop air handling unit shall be automatic via the METASYS network, with local override operation available at panel EN-19.

2. When the air handling unit switches on the face of EN-19 are in the 'AUTO' position, AHU-1 and AHU-2 shall be operated as a lead/lag pair by the METASYS network. The lead AHU shall be rotated automatically every month. In addition, the lead shall be rotated automatically on failure of the lead AHU, or on sensing a high computer room temperature.

3. When AHU-2 is designated as the lag AHU, and the AHU-1 manual switch on the face of EN-19 is in the 'AUTO' position, then the AHU-2 supply fan shall remain off, compressors shall be locked out, the outdoor inlet damper shall be fully closed, supply damper MD-3 shall be driven closed, and return damper MD-4 shall be driven closed.

4. When AHU-2 is rotated to the lead AHU position, or if the AHU-2 manual switch on the face of EN-19 is switched to the 'HAND' position, and if AHU-1 is not running, supply damper MD-3 and return damper MD-4 shall spring return to their normally open positions. When both damper actuator end switches confirm the dampers are open, then the AHU-2 supply fan shall start and run continuously.

5. When AHU-2 is operating, the two stages of mechanical cooling shall be cycled as required to maintain the computer room temperature at set-point.

6. An alarm shall be initiated at EN-19 and on the METASYS network on failure of the supply fan fail to run, high or low supply air temperature, high or low computer room temperature.

DRAWING TITLE

Rooftop Air Handling Unit AHU-2

	1	Ahu DDC Upgrade		01/30/11	EM
REFERENCE DRAWING	NO.	REVISION-LOCATION		ECN	DATE	BY

Sales Engineer	Project Manager	Designer	DRAWN	APPROVED
EM	EM	EM	BY EM DATE 01/30/2011	BY DATE

PROJECT TITLE

Herzberg 1988 Wing 3rd Floor Renovation

Meric Controls

Branch Information

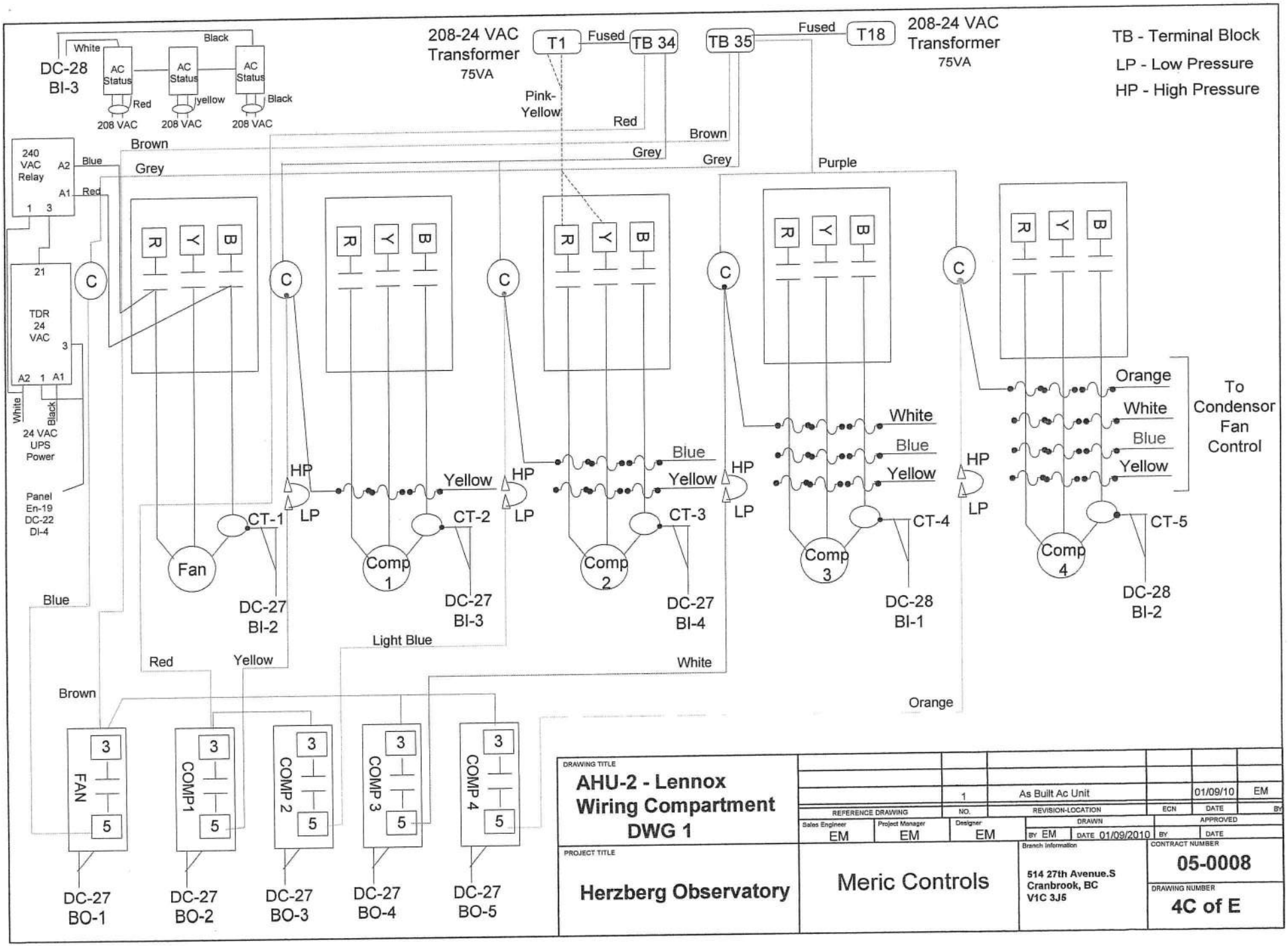
514 27th Avenue.S
Cranbrook, BC
V1C 3J5

CONTRACT NUMBER

05-0008

DRAWING NUMBER

4B of E



DRAWING TITLE

AHU-2 - Lennox Wiring Compartment DWG 1

REFERENCE DRAWING	NO.	REVISION-LOCATION	ECN	DATE	BY
	1	As Built Ac Unit		01/09/10	EM

Sales Engineer	Project Manager	Designer	DRAWN	APPROVED
EM	EM	EM	BY EM DATE 01/09/2010	BY DATE

PROJECT TITLE

Herzberg Observatory

Meric Controls

Branch Information

514 27th Avenue.S
Cranbrook, BC
V1C 3J5

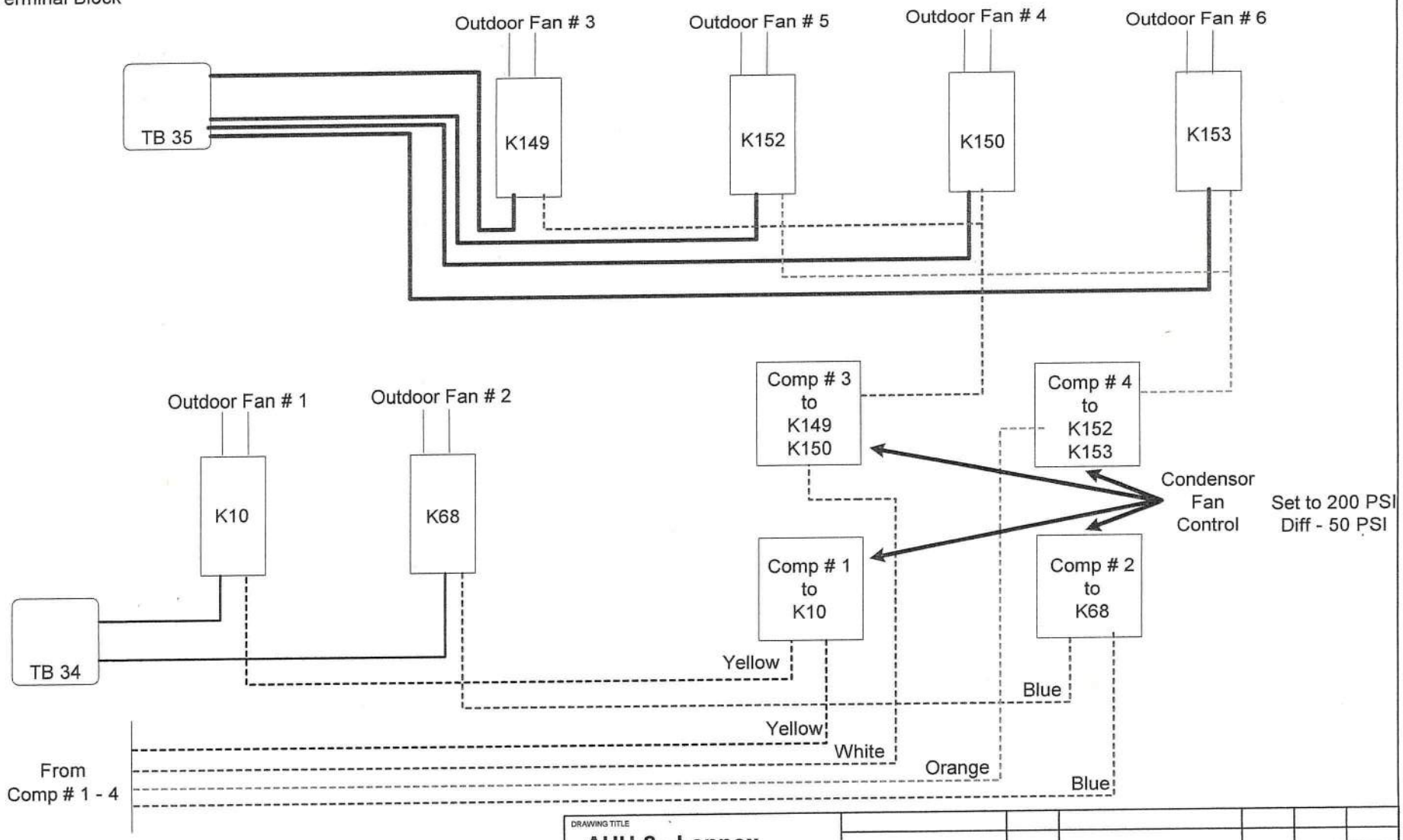
CONTRACT NUMBER

05-0008

DRAWING NUMBER

4C of E

TB - Terminal Block



	1	As Built Ac Unit		01/09/10	EM	
REFERENCE DRAWING	NO.	REVISION-LOCATION	ECN	DATE	BY	

DRAWING TITLE
AHU-2 - Lennox Wiring Compartment DWG 2

Sales Engineer	Project Manager	Designer	DRAWN	APPROVED
EM	EM	EM	BY EM DATE 01/09/2010	BY DATE

PROJECT TITLE
Herzberg Observatory

Meric Controls

Branch Information
514 27th Avenue.S
Cranbrook, BC
V1C 3J5

CONTRACT NUMBER
05-0008

DRAWING NUMBER
4D of E

Point List

			Description
Analog Inputs		**AS-UNT111-1**	**DC-27**
AI - 1		TS-2	Outside Air Temperature
AI - 2		DTS-2	Supply Air Temperature
AI - 3		TS-3	Return Air Temperature
AI - 4		TS-4	Mixed Air Temperature
Binary Inputs			
BI - 1		DA-3/4	Isolation Dampers End Switch (Open/Close)
BI - 2		CR-2	Fan Status (On/Off)
BI - 3			Compressor # 1 Status (On/Off)
BI - 4			Compressor # 1 Status (On/Off)
Binary Outputs			
BO - 1			Fan Start / Stop
BO - 2			Compressor # 1 Start / Stop
BO - 3			Compressor # 2 Start / Stop
BO - 4			Compressor # 3 Start / Stop
BO - 5			Compressor # 4 Start / Stop
BO - 6			Spare
Analog Outputs			
AO - 1			Mixing Dampers (2 - 10 VDC)
AO - 2			Spare
		AS-VAV111-1	**DC-28**
Binary Inputs			
BI - 1			Compressor # 3 Status (On/Off)
BI - 2			Compressor # 4 Status (On/Off)
BI - 3			Loss Of Power (Open/Close)

DRAWING TITLE

Rooftop Air Handling Unit AHU-2 - Point List

NO.	REVISION-LOCATION	ECN	DATE	BY
1	Ahu DDC Upgrade		01/30/11	EM

REFERENCE DRAWING			DRAWN		APPROVED	
Sales Engineer	Project Manager	Designer	BY	DATE	BY	DATE
EM	EM	EM	EM	01/30/2011		

PROJECT TITLE

Herzberg 1988 Wing 3rd Floor Renovation

Meric Controls

Branch Information

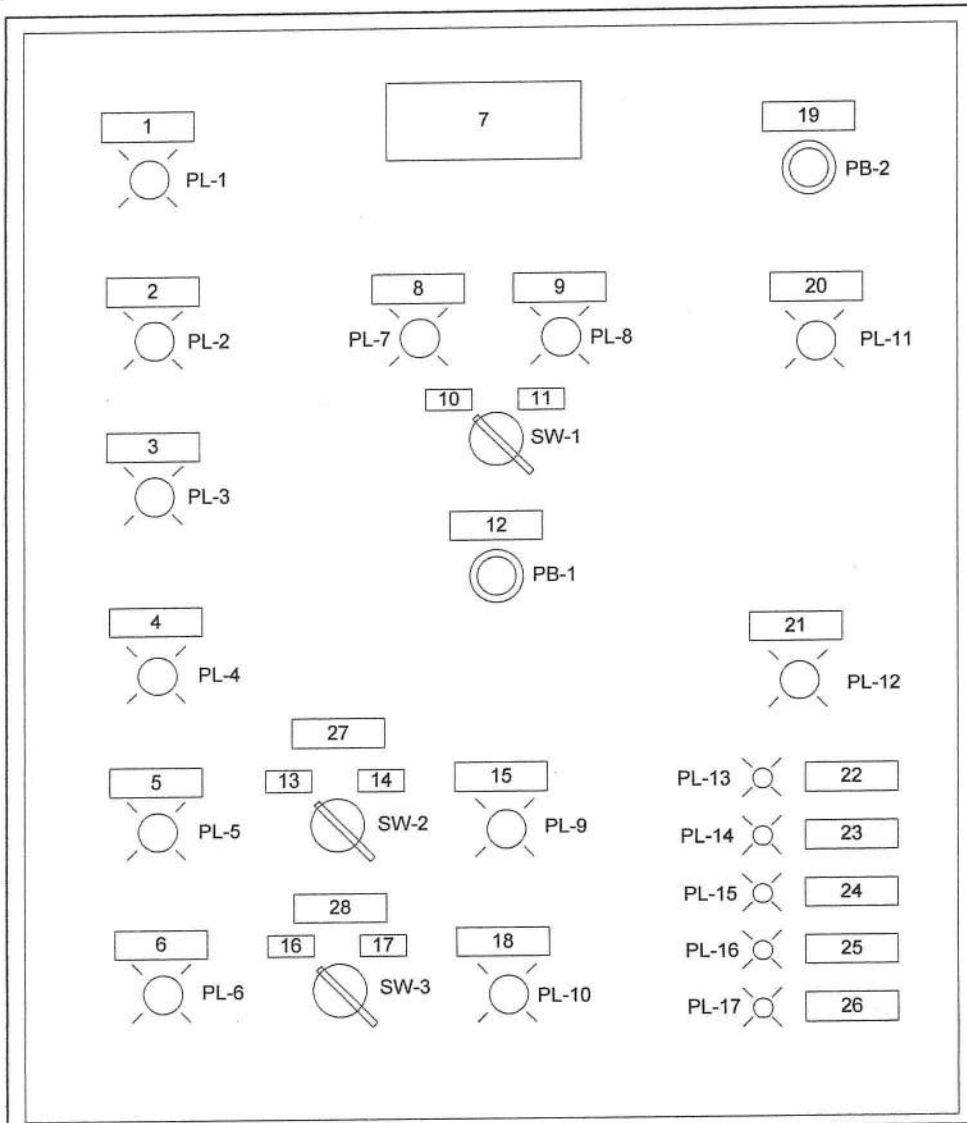
514 27th Avenue.S
Cranbrook, BC
V1C 3J5

CONTRACT NUMBER

05-0008

DRAWING NUMBER

4E of E



Emergency Shutdown Control Panel
EN-19

Panel Tag Schedule

All tags to be lamicoid, ¼" white letters on black background.

Item	Tag Size	Text
1	1" x 3"	Power On
2	1" x 3"	Alarm Condition
3	1" x 3"	Emergency Stop
4	1" x 3"	Fire Alarm
5	1" x 3"	AHU-1 Fault
6	1" x 3"	AHU-2 Fault
7	2" x 5"	Emergency Stop Controls For Computer Room 335 Fed From Circuit UH-20
8	1" x 3"	Unarmed
9	1" x 3"	Armed
10	.75" x 1.5"	Unarm
11	.75" x 1.5"	Arm
12	1" x 4"	System Reset – Close Contactors
13	.75" x 1.5"	Auto
14	.75" x 1.5"	Hand
15	1" x 3"	AHU-1 Running
16	.75" x 1.5"	Auto
17	.75" x 1.5"	Hand
18	1" x 3"	AHU-2 Running
19	1" x 3"	Pilot Light Test
20	1" x 3"	Room Temp High
21	1" x 3"	Panel Trip
22	.75" x 3"	Panel L Tripped
23	.75" x 3"	Panel UF Tripped
24	.75" x 3"	Panel UG Tripped
25	.75" x 3"	Panel UJ Tripped
26	.75" x 3"	Panel UK Tripped
27	.75" x 3"	AHU-1 Control
28	.75" x3"	AHU-2 Control

DRAWING TITLE
Emergency Shutdown Panel

NO.	REVISION-LOCATION	ECN	DATE	BY
2	Ahu DDC Upgrade		01/09/11	EM
1	As-Built General Revision		01/11/05	RLS

Sales Engineer	Project Manager	Designer	DRAWN	APPROVED
EM	EM	EM	BY EM DATE 01/09/2011	BY DATE

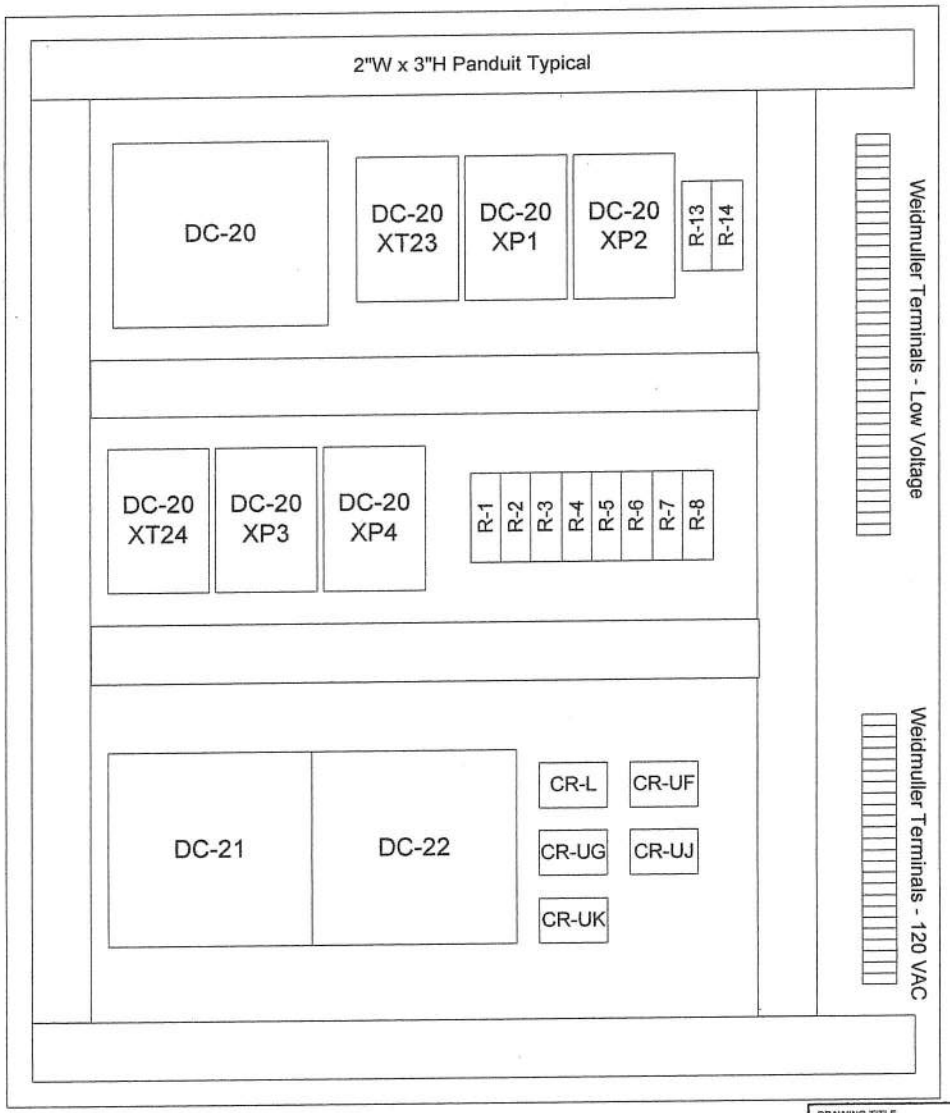
PROJECT TITLE
Herzberg 1988 Wing 3rd Floor Renovation

Meric Controls

Branch Information
514 27th Avenue.S
Cranbrook, BC
V1C 3J5

CONTRACT NUMBER
05-0008

DRAWING NUMBER
5A of N



Emergency Shutdown Control Panel
EN-19 (Interior)

DRAWING TITLE
Emergency Shutdown Panel

	2	Ahu DDC Upgrade	01/30/11	EM
	1	As-Built General Revision	01/11/05	RLS
REFERENCE DRAWING	NO.	REVISION-LOCATION	ECN DATE	BY

Sales Engineer	Project Manager	Designer	DRAWN	APPROVED
EM	EM	EM	BY EM DATE 01/30/11	BY DATE

PROJECT TITLE
Herzberg 1988 Wing 3rd Floor Renovation

Meric Controls

Branch Information
514 27th Avenue.S
Cranbrook, BC
V1C 3J5

CONTRACT NUMBER
05-0008

DRAWING NUMBER
5B of N

Code	Qty	Model #	Description
CR-1,2,3	3	CS-410	Greystone Current Relay
CR-L to UK	5		Monitoring Relays by Division 16
DA-1 to 4	4	M9216-BGC-2	24 VAC 2-Position Damper Actuator with End Switch
DC-xx	9		Refer to Metasys Network Layout, Drawing 1
DTS-1,2	2	TE-6311P-1	8" Duct Probe RTD Sensor
EN-19	1	AE1097.500	Rittal Enclosure, hinged door, 30"W x 35.5"H x 12"D
PB-1,2	2	52PX8	Siemens Momentary 2-Pos Switch, Black
	2	52BAK	Siemens NO Contact Block
PL-1,8,9,10	4	557-1605-203	Dialight 1" LED Green Pilot Light, 24V, 1 Watt
PL-2 to 6	5		Dialight 1" LED Red Pilot Light, 24V, 1 Watt
PL-7,11,12	3		Dialight 1" LED Red Pilot Light, 24V, 1 Watt
PL-13 to 17	5	109IMS-24Red	1/2" LED Red Pilot light, 24V, 1/2 Watt
R-1 to 3	3	LY2N120VAC	120 VAC Relay, DPDT, 'ON' LED, 10 Amps
	3	PTF08A-E	8 Pin Relay Base
R-4 to 14	11	LY2N24VAC	24 VAC Relay, DPDT, 'ON' LED, 10 Amps
	11	PTF08A-E	8 Pin Relay Base
SW-1 to 3	3	52SX2AAB	Siemens Maintained 2-Pos Switch, Cam Sort Lever
	4	52BAK	Siemens NO Contact Block
TS-1,2	2	TE-6314P-1	Room Temp Sensor, Nickel, blank cover

Sequence of Operation

1. Emergency Shutdown Panel EN-19 contains METASYS controllers responsible for:
   a. Temperature control of the computer room by sequencing of rooftop air handling units AHU-1 and AHU-2.
   b. Monitoring and emergency shutdown of power panels CL, CUF, CUG, CUJ, and CUK.

2. Although the controllers in EN-19 are stand-alone, they are also connected to the existing building METASYS network for monitoring, trending, alarm notifications, and remote operator control.

3. The following automatic sequences are programmed into EN-19 controllers:
   a. AHU-1 and AHU-2 are sequenced to maintain the computer room temperature at set-point. For more detailed information, refer to the sequences of operation contained on drawings 3b and 4b.
   b. When SW-1 (Arm/Unarm) is in the 'Armed' position, panels CL, CUF, CUG, CUJ and CUK, and both AHU-1 and AHU-2 will be shut down automatically in 3 stages on actuation of either Emergency Shutdown pushbutton, or on the occurrence of a fire alarm, as transmitted from the fire alarm system. When SW-1 is in the 'Unarmed position, alarms will be annunciated, however the shutdown function shall be disabled.
   c. The Emergency Shutdown status described above can be cleared by manual actuation of PB-1.

DRAWING TITLE

Emergency Shutdown Panel

	NO.	REVISION-LOCATION	ECN	DATE	BY
	2	Ahu DDC Upgrade		01/30/11	EM
	1	As-Built General Revision		01/11/05	RLS

REFERENCE DRAWING

Sales Engineer	Project Manager	Designer	DRAWN	APPROVED
EM	EM	EM	BY EM DATE 01/30/11	BY DATE

PROJECT TITLE

Herzberg 1988 Wing 3rd Floor Renovation

Meric Controls

Branch Information

514 27th Avenue.S
Cranbrook, BC
V1C 3J5

CONTRACT NUMBER

05-0008

DRAWING NUMBER

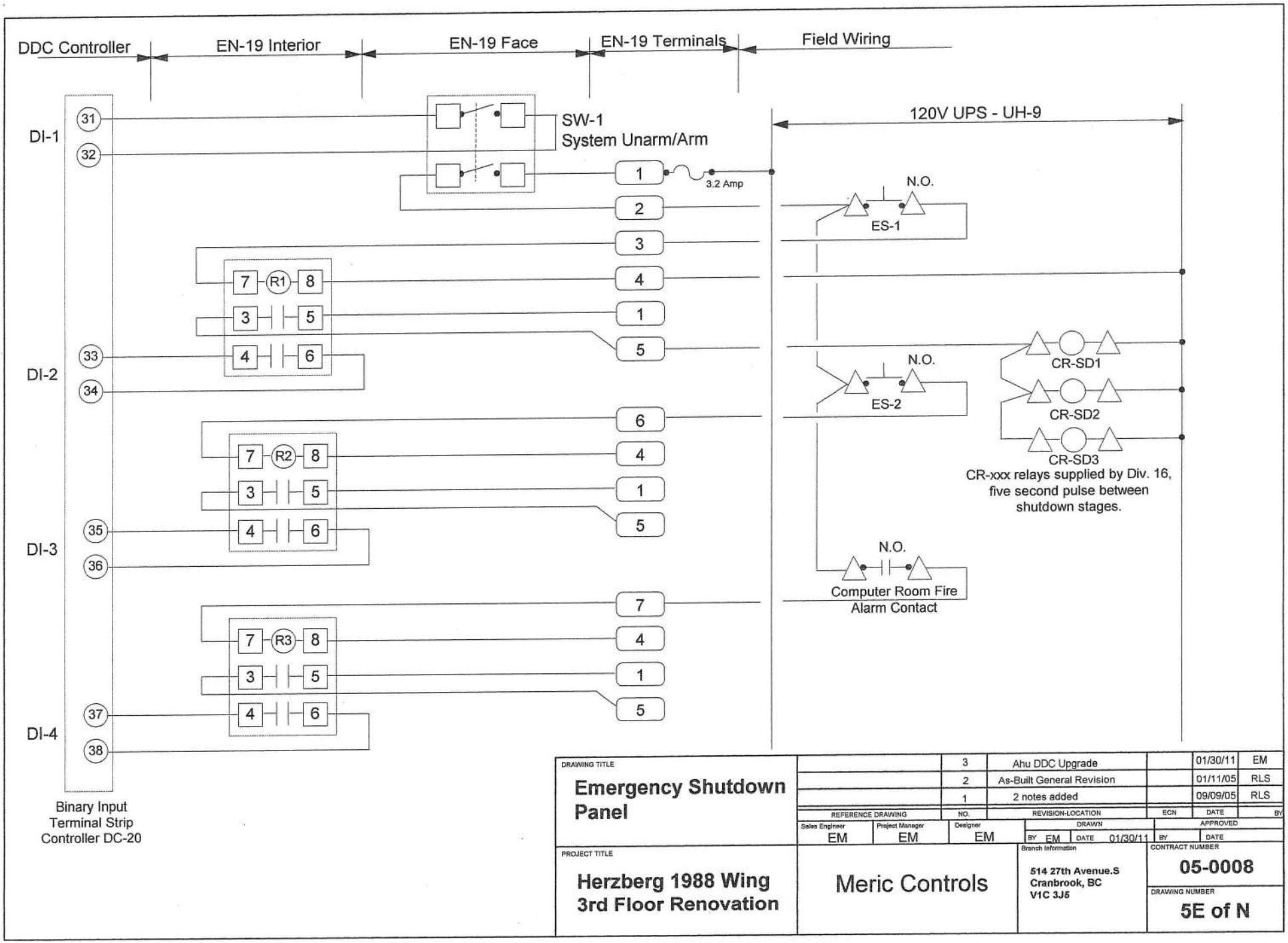
5C of N

Sequence of Operation Cont'd..

4. The switches and lights located on the face of panel EN-19 shall indicate current system operational status to building operators, and allow local operator override. Following is a description of the operation of each device mounted on the panel face:

   a. Pilot Light PL-1 (Power On): Lights whenever power is applied to EN-19 from UPS circuit UH-20, AND when the METASYS controls are operational.
   b. Pilot Light PL-2 (Alarm Condition): Lights whenever an alarm condition exists, including Emergency Stop, Fire Alarm, AHU-1,2 Fault, High Room Temp, panel trip. Relay R4 also transfers on any of these conditions, for future alarm company monitoring.
   c. Pilot Light PL-3(Emergency Stop): Lights whenever an Emergency Stop button has been pushed, and stays lit until the 'System Reset' pushbutton has been actuated.
   d. Pilot Light PL-4 (Fire Alarm): Lights whenever a Fire Alarm condition is communicated from the fire alarm panel, and stays lit until the 'System Reset' pushbutton has been actuated.
   e. Pilot Light PL-5 (AHU-1 Fault): Lights whenever AHU-1 fan fails to run (as determined by motor current draw), or if the lead AHU is switched due to failure to maintain computer room temperature at setpoint.
   f. Pilot Light PL-6 (AHU-2 Fault): Lights whenever AHU-2 fan fails to run (as determined by motor current draw), or if the lead AHU is switched due to failure to maintain computer room temperature at setpoint.
   g. Pilot Light PL-7 (Armed): Lights whenever SW-1 (Arm/Unarm) is in the 'Armed' position.
   h. Pilot Light PL-8 (Unarmed): Lights whenever SW-1 (Arm/Unarm) is in the 'Unarmed' position.
   i. Pilot Light PL-9 (AHU-1 Running): Lights whenever AHU-1 supply fan is proven running (as determined by motor current draw).
   j. Pilot Light PL-10 (AHU-2 Running): Lights whenever AHU-2 supply fan is proven to be running (as determined by motor current draw).
   k. Pilot Light PL-11 (Room High Temp): Lights whenever the computer room temperature rises over 2 Deg C above set-point.
   l. Pilot Light PL-12(Panel Trip): Lights whenever any of the five power panels lose power (as sensed by voltage monitoring relays).
   m. Pilot Lights PL-13 to 17 (Individual Panel Trip): Lights whenever the associated power panel loses power (as sensed by voltage monitoring relays).
   n. Two-position Manual Switch SW-1 (Arm/Unarm): Used by the operator to 'Arm' or 'Disarm' the automatic shutdown function of Emergency Shutdown Panel EN-19.
   o. Two-position Manual Switch SW-2 (AHU-1 Hand/Auto): Switched by the operator to the 'HAND' position to override automatic and shutdown sequences for AHU-1, send a run command to AHU-1, and send a stop command to AHU-2.
   p. Two-position Manual Switch SW-3 (AHU-2 Hand/Auto): Switched by the operator to the 'HAND' position to override automatic and shutdown sequences for AHU-2, send a run command to AHU-2, and send a stop command to AHU-1.
   q. Momentary pushbutton PB-1 (System Reset): Clears pilot lights associated with alarm conditions no longer in effect, and enables start-up of the five power panels.
   r. Momentary pushbutton PB-2 (Pilot Light Test): Used by the operator to test light every pilot light on the panel face. Any lights that do not come on should be replaced.

DRAWING TITLE: **Emergency Shutdown Panel**		2	Ahu DDC Upgrade	01/30/11	EM
		1	As-Built General Revision	01/11/05	RLS
	REFERENCE DRAWING	NO.	REVISION-LOCATION	ECN / DATE / BY	
	Sales Engineer: EM / Project Manager: EM / Designer: EM		DRAWN: BY EM DATE 01/30/11	APPROVED: BY / DATE	
PROJECT TITLE: **Herzberg 1988 Wing 3rd Floor Renovation**	Meric Controls		Branch Information: 514 27th Avenue.S Cranbrook, BC V1C 3J5	CONTRACT NUMBER: 05-0008	
				DRAWING NUMBER: 5D of N	



	3	Ahu DDC Upgrade		01/30/11	EM
	2	As-Built General Revision		01/11/05	RLS
	1	2 notes added		09/09/05	RLS
REFERENCE DRAWING	NO.	REVISION-LOCATION	ECN	DATE	BY

DRAWING TITLE

Emergency Shutdown Panel

Sales Engineer	Project Manager	Designer	DRAWN	APPROVED
EM	EM	EM	BY EM DATE 01/30/11	BY DATE

PROJECT TITLE

Herzberg 1988 Wing 3rd Floor Renovation

Meric Controls

Branch Information

514 27th Avenue.S
Cranbrook, BC
V1C 3J5

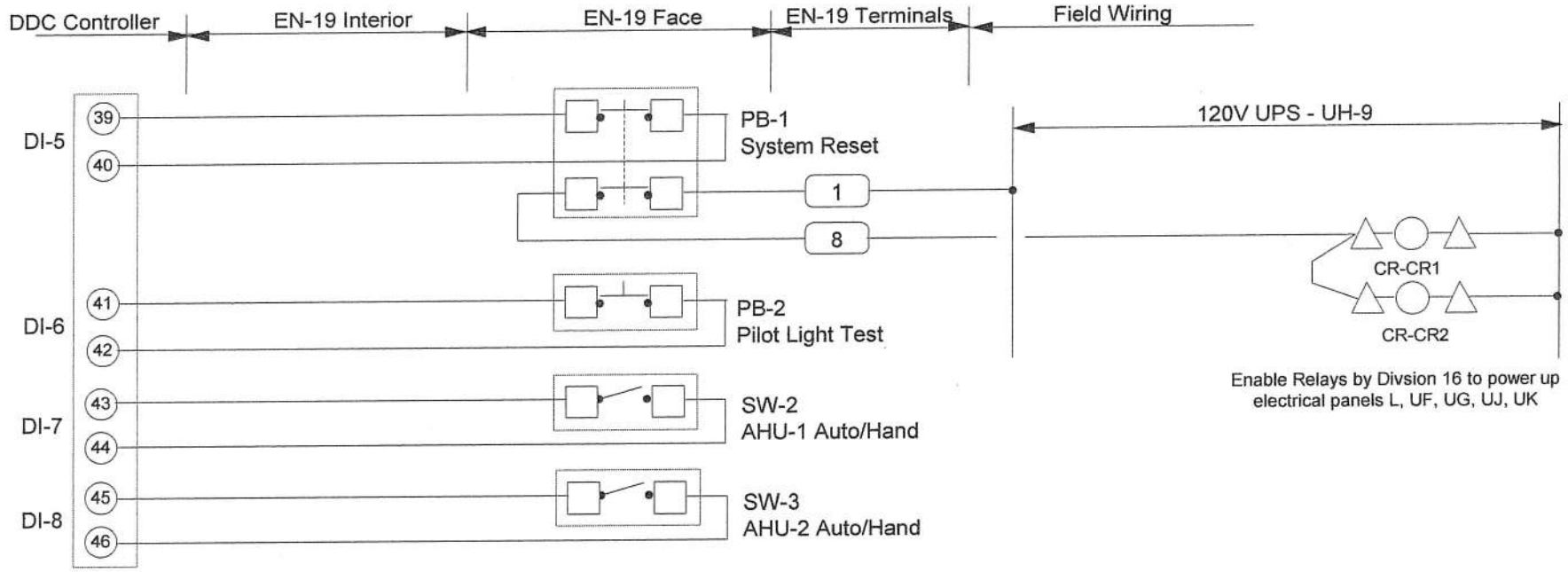
CONTRACT NUMBER

05-0008

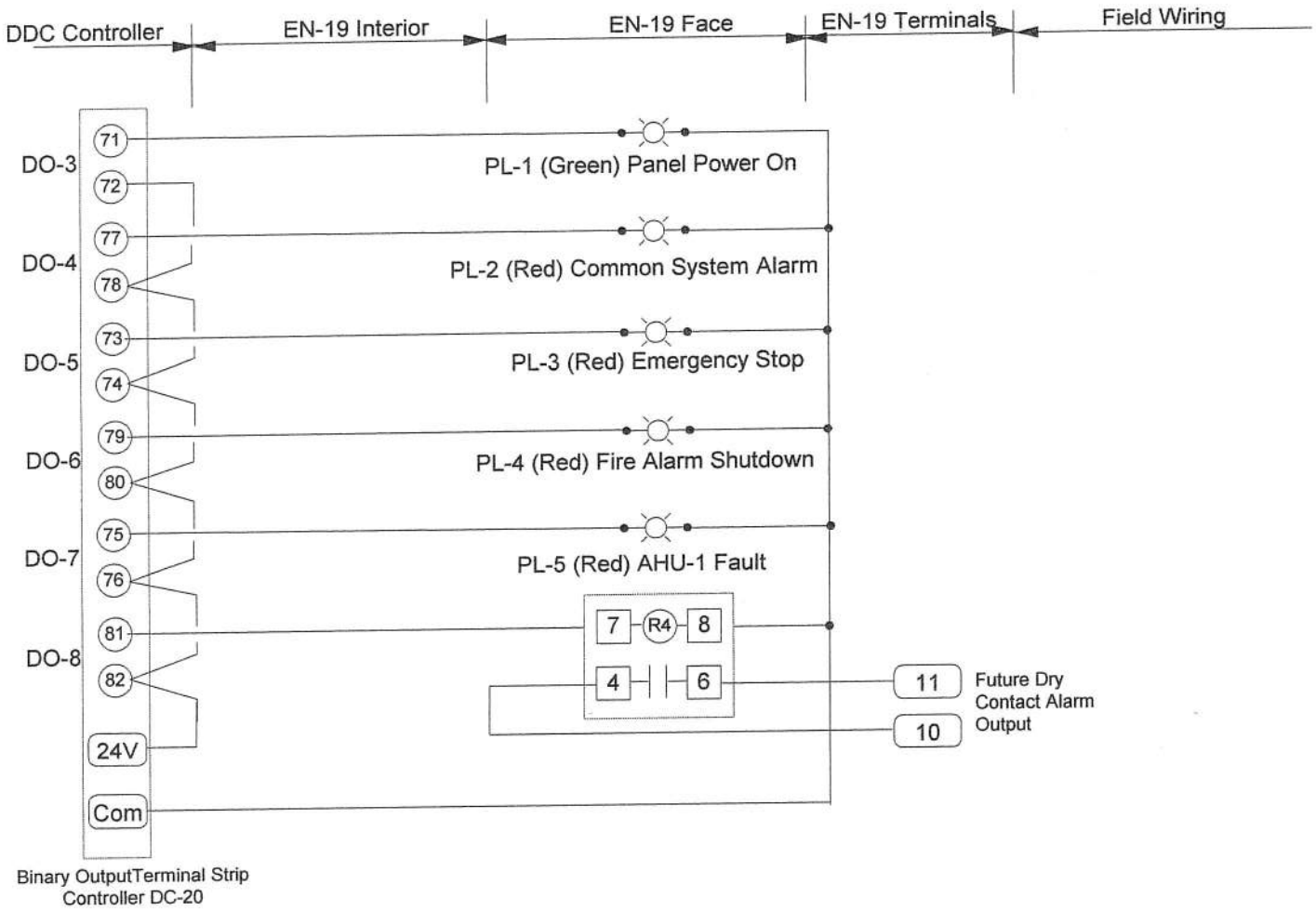
DRAWING NUMBER

5E of N

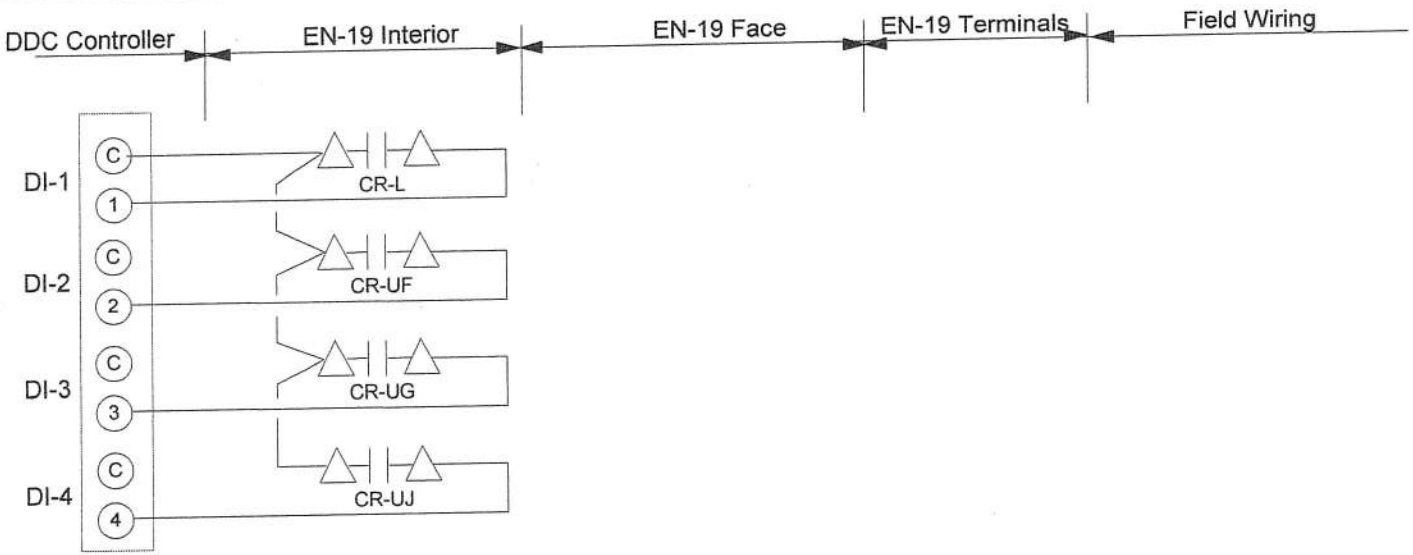
System Reset



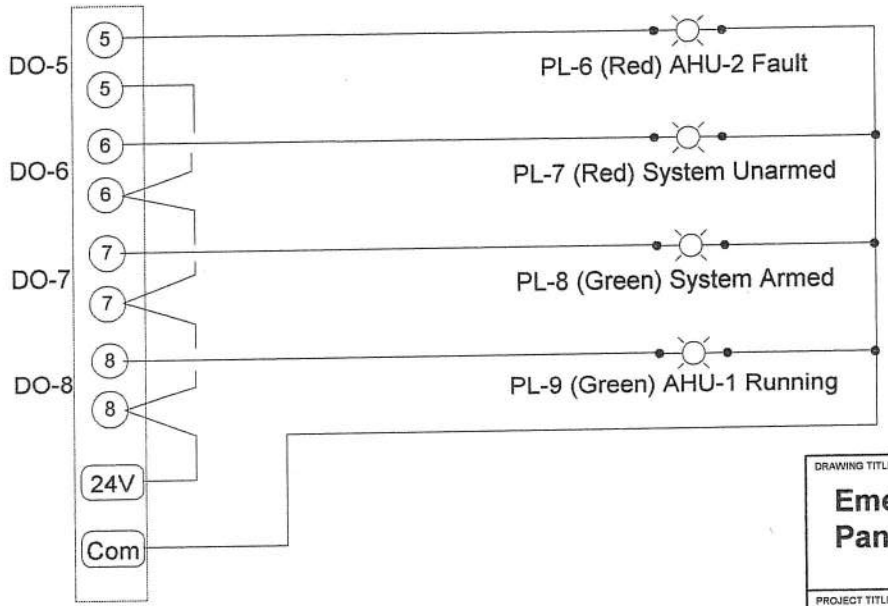
DRAWING TITLE: **Emergency Shutdown Panel**		2	Ahu DDC Upgrade	01/30/11	EM
		1	As-Built General Revision	01/11/05	RLS
	REFERENCE DRAWING	NO.	REVISION-LOCATION	ECN / DATE / BY	
	Sales Engineer: EM; Project Manager: EM; Designer: EM; DRAWN BY EM DATE 01/30/11; APPROVED BY DATE				
PROJECT TITLE: **Herzberg 1988 Wing 3rd Floor Renovation**	Meric Controls	Branch Information: 514 27th Avenue.S, Cranbrook, BC, V1C 3J5		CONTRACT NUMBER: 05-0008	
				DRAWING NUMBER: 5F of N	



DRAWING TITLE: **Emergency Shutdown Panel**						
		2	Ahu DDC Upgrade		01/30/11	EM
		1	As-Built General Revision		01/11/05	RLS
REFERENCE DRAWING		NO.	REVISION-LOCATION	ECN	DATE	BY
Sales Engineer: EM	Project Manager: EM	Designer: EM	DRAWN: BY EM DATE 01/30/11		APPROVED: BY DATE	
PROJECT TITLE: **Herzberg 1988 Wing 3rd Floor Renovation**	Meric Controls	Branch Information: **514 27th Avenue.S Cranbrook, BC V1C 3J5**		CONTRACT NUMBER: **05-0008**		
				DRAWING NUMBER: **5G of N**		

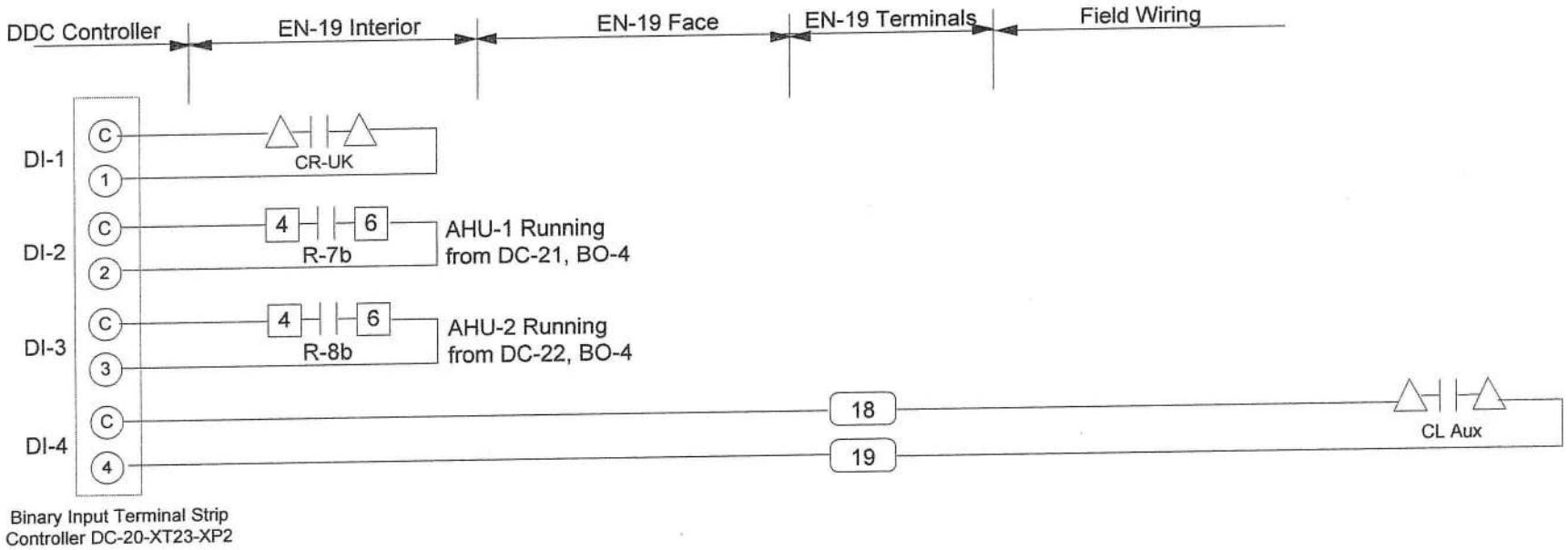


Binary Input Terminal Strip
Controller DC-20-XT23-XP1

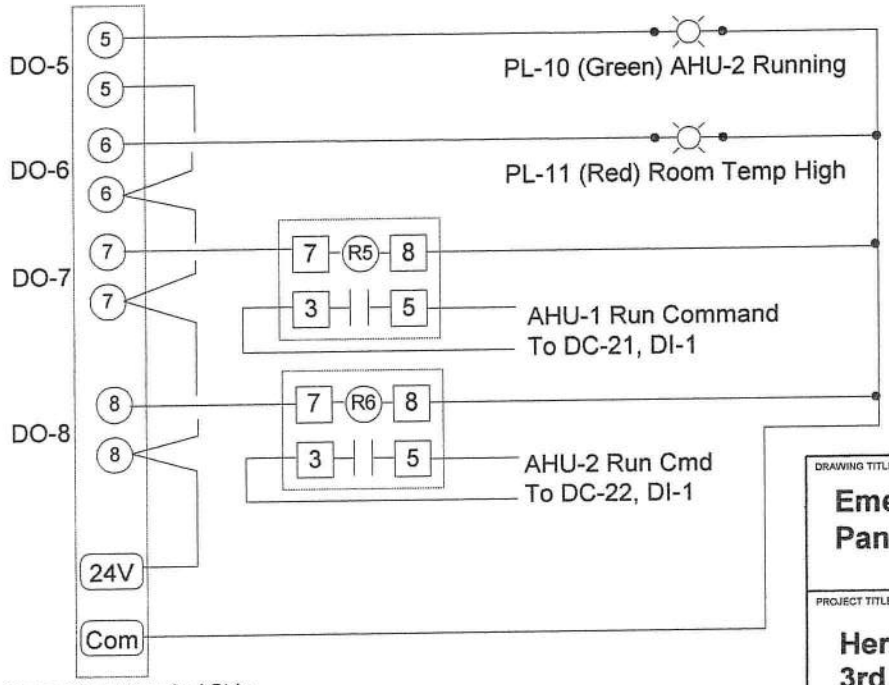


Binary OutputTerminal Strip
Controller DC-20-XT23-XP1

DRAWING TITLE: **Emergency Shutdown Panel**					
	2	Ahu DDC Upgrade		01/30/11	EM
	1	As-Built General Revision		01/11/05	RLS
REFERENCE DRAWING	NO.	REVISION-LOCATION	ECN	DATE	BY
Sales Engineer: EM / Project Manager: EM / Designer: EM	DRAWN BY EM DATE 01/30/11		APPROVED BY	DATE	
PROJECT TITLE: **Herzberg 1988 Wing 3rd Floor Renovation**	Meric Controls	Branch Information: 514 27th Avenue.S Cranbrook, BC V1C 3J5	CONTRACT NUMBER: 05-0008		
			DRAWING NUMBER: 5H of N		



Binary Input Terminal Strip
Controller DC-20-XT23-XP2



Binary OutputTerminal Strip
Controller DC-20-XT23-XP2

DRAWING TITLE

Emergency Shutdown Panel

	2	Ahu DDC Upgrade		01/30/11	EM
	1	As-Built General Revision		01/11/05	RLS
REFERENCE DRAWING	NO.	REVISION-LOCATION	ECN	DATE	BY

Sales Engineer	Project Manager	Designer	DRAWN	APPROVED
EM	EM	EM	BY EM DATE 01/30/11	BY DATE

PROJECT TITLE

Herzberg 1988 Wing 3rd Floor Renovation

Meric Controls

Branch Information

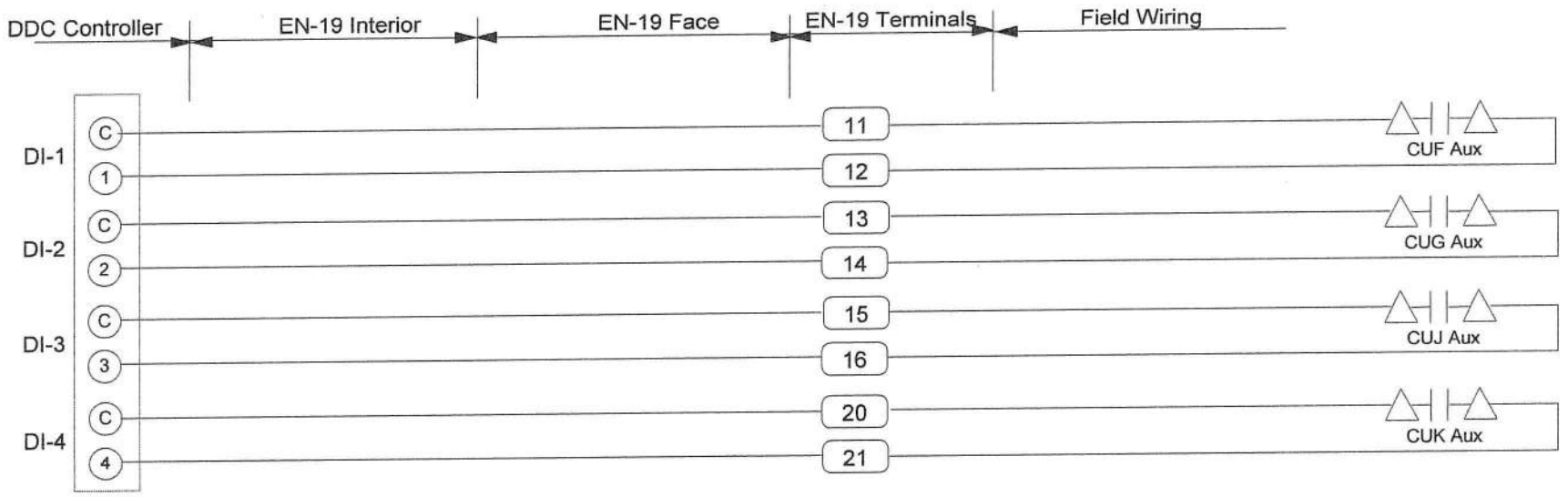
514 27th Avenue.S
Cranbrook, BC
V1C 3J5

CONTRACT NUMBER

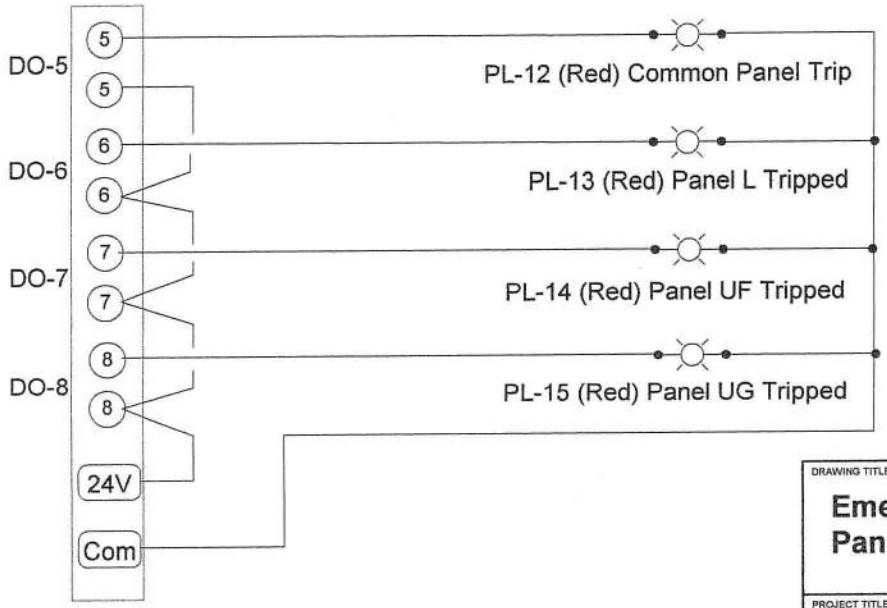
05-0008

DRAWING NUMBER

5 i of N

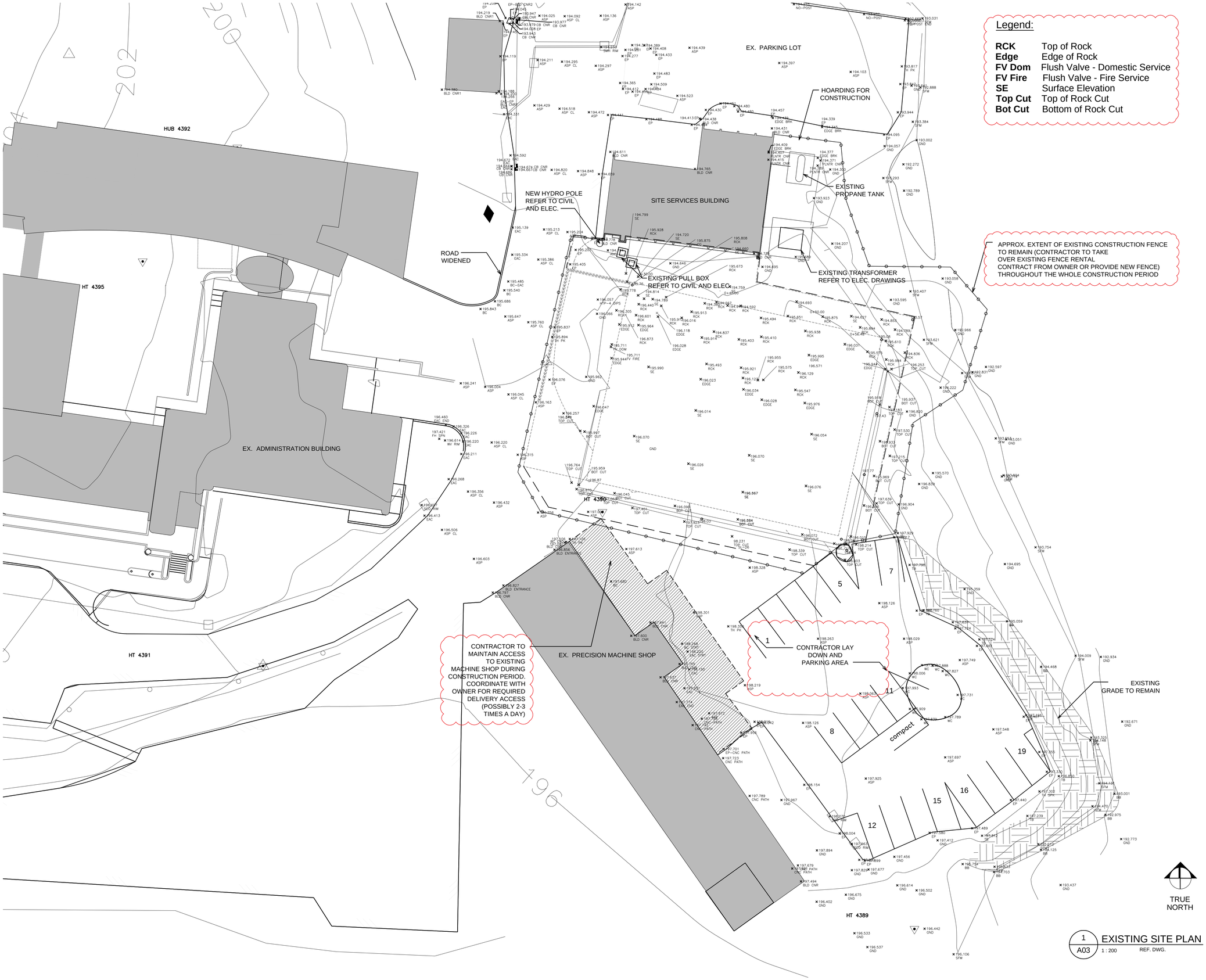


Binary Input Terminal Strip
Controller DC-20-XT24-XP3



Binary OutputTerminal Strip
Controller DC-20-XT24-XP3

DRAWING TITLE: **Emergency Shutdown Panel**						
	2	Ahu DDC Upgrade		01/30/11	EM
	1	As-Built General Revision		01/11/05	RLS
REFERENCE DRAWING	NO.	REVISION-LOCATION	ECN	DATE	BY
Sales Engineer: EM / Project Manager: EM / Designer: EM	DRAWN BY EM DATE 01/30/11		APPROVED BY	DATE	
PROJECT TITLE: **Herzberg 1988 Wing 3rd Floor Renovation**	Meric Controls	Branch Information: 514 27th Avenue.S Cranbrook, BC V1C 3J5	CONTRACT NUMBER: 05-0008		
			DRAWING NUMBER: 5J of N		



Legend:

RCK	Top of Rock
Edge	Edge of Rock
FV Dom	Flush Valve - Domestic Service
FV Fire	Flush Valve - Fire Service
SE	Surface Elevation
Top Cut	Top of Rock Cut
Bot Cut	Bottom of Rock Cut

APPROX. EXTENT OF EXISTING CONSTRUCTION FENCE TO REMAIN (CONTRACTOR TO TAKE OVER EXISTING FENCE RENTAL CONTRACT FROM OWNER OR PROVIDE NEW FENCE) THROUGHOUT THE WHOLE CONSTRUCTION PERIOD

1 A03 EXISTING SITE PLAN
1 : 200 REF. DWG.

0 10 20 30 40 50 60 70 80 90 100mm

PWGSC – A1 – 841X594

DM5XXXXXX

Public Works and Government Services Canada
Travaux publics et Services gouvernementaux Canada

REAL PROPERTY SERVICES
Pacific Region
SERVICES IMMOBILIERS
Région de Pacifique

CHERNOFF THOMPSON ARCHITECTS

Revision/ Revision	Description/Description	Date/Date
9	ISSUED FOR ADDENDUM 1	2019,05,10
8	ISSUED FOR TENDER	2019,03,08
7	ISSUED FOR TENDER	2018,03,27
6	ISSUED FOR 100% CD	2016,09,29
5	ISSUED FOR 99% CD REVIEW	2016,07,08
4	ISSUED FOR 66% CD REVIEW	2016,05,04
3	ISSUED FOR 33% CD REVIEW	2016,02,19
2	DESIGN DEVELOPMENT	2016.01.27
1	ISSUED FOR PHASE ONE 66% REVIEW	2016,01,16
0	Schematic Design	2015,12,07

Client/client

Project title/Titre du projet
5071 WEST SAANICH ROAD
VICTORIA, BC, CANADA

NRC HERZBERG
ASTRONOMY AND ATROPHYSICS
ATP INTEGRATION FACILITY

Consultant Signature Only

Designed by/Concept par
T.Y.

Drawn by/Dessine par
S.K.

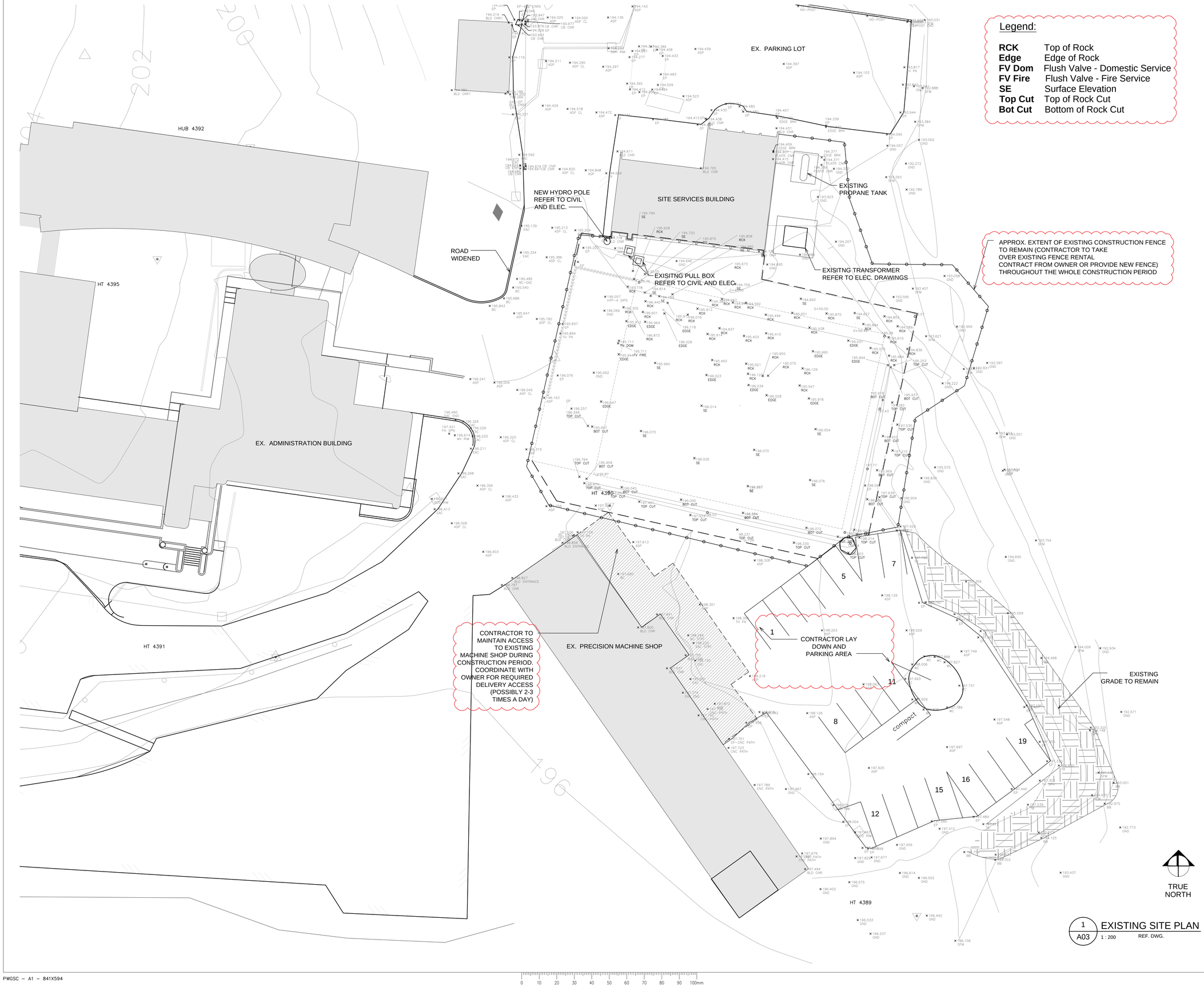
PWGSC Project Manager/Administrateur de Projets TPSGC
PATRICK TRUONG

Regional Manager, Architectural and Engineering Services
Gestionnaire régionale, Services d'architectural et de génie, TPSGC
PAUL PREETIPAL

Drawing title/Titre du dessin

EXISTING SITE PLAN

Project No./No. du projet	Sheet/Feuille	Revision no./ La Révision no.
R.077596.001	SA03 OF 22	9



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Public Works and Government Services Canada
Travaux publics et Services gouvernementaux Canada

REAL PROPERTY SERVICES
Pacific Region
SERVICES IMMOBILIERS
Région de Pacifique

CHERNOFF THOMPSON ARCHITECTS

Revision/ Revision	Description/Description	Date/Date
4	ISSUED FOR ADDENDUM 1	2019,05,10
3	ISSUED FOR TENDER	2019,03,08
2	ISSUED FOR TENDER	2018,03,27
1	ISSUED FOR 100% CD REVIEW	2018,03,14

Client/client

Project title/Titre du projet
5071 WEST SAANICH ROAD
VICTORIA, BC, CANADA

NRC HERZBERG
ASTRONOMY AND ASTROPHYSICS
ATP INTEGRATION FACILITY

Consultant Signature Only

Designed by/Concept par
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Drawn by/Dessine par
P.M.

PWGSC Project Manager/Administrateur de Projets TPSGC
PATRICK TRUONG

Regional Manager, Architectural and Engineering Services
Gestionnaire régionale, Services d'architectural et de génie, TPSGC
PAUL PREETIPAL

Drawing title/Titre du dessin

EXISTING SITE PLAN

Project No./No. du projet	Sheet/Feuille	Revision no./ La Révision no.
R.077596.001	WA03 OF 22	4

PWGSC – A1 – 841X594

0 10 20 30 40 50 60 70 80 90 100mm

DM5XXXXXX

The following addendum supersedes information contained in drawings and specifications issued for the project to the extent referenced. This Addendum forms part of the Tender Documents and is subject to all of the conditions set out in the contract conditions.

1. DRAWINGS – MECHANICAL

1.1 Drawing No.: SM02, SM05, SM11, WM02, WM05 & WM11

.1 Add:

.1 Compressed system air system added. Compressed air system shall be packaged (compressor, air receiver, and dryer) and installed in the mechanical room. Run a 40mm compressed air main along the exterior wall of the building with 3 pressure zones complete with condensate reservoir, isolation valve and combination filer/pressure regulator. Provide 15mm Ø compressed air connections complete with isolation valve and quick disconnects at indicated locations. See attached drawings and specification for details.

2. SPECIFICATIONS – MECHANICAL

2.1 Section: 22 15 00 GENERAL SERVICE COMPRESSED AIR SYSTEMS

.1 Item No.:

.1 Add:

.1 New mechanical specification section added for general service compressed air systems. See attached specification section 22 15 10 for details.

END OF MECHANICAL ADDENDUM NO. 1

MECHANICAL MOTORLIST

				EQUIPMENT							DISCONNECT				STARTER					CONTROL				
EQUIP. TAG	QUANTITY	EQUIPMENT DESCRIPTION	LOCATION	SUPPLIED	KW	MCA	FLA	A	VOLTAGE	PHASE	SUPPLIED	INSTALLED	WIRED	LOCATION	TYPE	SUPPLIED	INSTALLED	WIRED	LOCATION	TYPE	SUPPLIED	INSTALLED	WIRED	NOTES
		AIR CURTAINS																						
ACH-1	4	AIR CURTAIN	GROUND FLOOR	MECH	0.87	5	–	–	230	1	ELEC	ELEC	ELEC	1	INT	MECH	MECH	MECH	1	I	MECH	MECH	MECH	1,2,6
ACH-2	4	AIR CURTAIN	GROUND FLOOR	MECH	0.87	5	–	–	230	1	ELEC	ELEC	ELEC	1	INT	MECH	MECH	MECH	1	I	MECH	MECH	MECH	1,2,6
		AIR CONDITIONING UNIT																						
AC-1	1	SPLIT DX AIR CONDITIONING UNIT - INDOOR UNIT	ELECTRICAL ROOM	MECH	–	1	–	–	208	1	ELEC	ELEC	ELEC	1	INT	MECH	MECH	ELEC	1	T	MECH	MECH	MECH	1,2
CU-1	1	SPLIT DX AIR CONDITIONING UNIT - OUTDOOR UNIT	OUTSIDE	MECH	–	18	–	–	208	1	ELEC	ELEC	ELEC	1	INT	MECH	MECH	ELEC	1	T	MECH	MECH	MECH	1,2
		AIR HANDLING UNITS																						
AHU-1	1	NRC AIR HANDLER	GROUND FLOOR	MECH	0.75	28.2	–	–	208	3	ELEC	ELEC	ELEC	1	INT	MECH	MECH	ELEC	1	T	MECH	MECH	MECH	1,2
AHU-2	1	NRC AIR HANDLER	GROUND FLOOR	MECH	0.75	28.2	–	–	208	3	ELEC	ELEC	ELEC	1	INT	MECH	MECH	ELEC	1	T	MECH	MECH	MECH	1,2
AHU-3	1	NRC AIR HANDLER	GROUND FLOOR	MECH	0.75	28.2	–	–	208	3	ELEC	ELEC	ELEC	1	INT	MECH	MECH	ELEC	1	T	MECH	MECH	MECH	1,2
		GAS FIRED DOMESTIC HOT WATER TANK																						
DHWT-1	1	GAS FIRED DOMESTIC HOT WATER TANK	REFER TO DRAWINGS	MECH	–	–	–	5	120	1	ELEC	ELEC	ELEC	1	–	–	–	–	–	T	MECH	MECH	MECH	1,2
		ELECTRIC BASEBOARD HEATERS																						
EBB-1	1	WASHROOM ELECTRIC BASEBOARD HEATER	UNIVERSAL W/R	MECH	0.5	–	–	–	120	1	ELEC	ELEC	ELEC	1	–	–	–	–	–	ET	ELEC	ELEC	ELEC	
EBB-2	1	WASHROOM ELECTRIC BASEBOARD HEATER	W/R	MECH	0.5	–	–	–	120	1	ELEC	ELEC	ELEC	1	–	–	–	–	–	ET	ELEC	ELEC	ELEC	
EBB-3	1	MECHANICAL ROOM ELECTRIC BASEBOARD HEATER	MECHANICAL ROOM 106	MECH	1.5	–	–	–	120	1	ELEC	ELEC	ELEC	1	–	–	–	–	–	ET	ELEC	ELEC	ELEC	
		FANS																						
EF-1	1	WASHROOM EXHAUST FAN	UNIVERSAL W/R	MECH	0.0176	–	–	–	120	1	ELEC	ELEC	ELEC	1	INT	MECH	MECH	ELEC	1	WS	MECH	MECH	MECH	1,2,3
EF-2	1	WASHROOM EXHAUST FAN	W/R	MECH	0.0176	–	–	–	120	1	ELEC	ELEC	ELEC	1	INT	MECH	MECH	ELEC	1	WS	MECH	MECH	MECH	1,2,3
CF-1	8	CEILING FAN	INTEGRATION AREA CEILING	MECH	0.75	–	–	–	208	3	ELEC	ELEC	ELEC	1	INT	MECH	MECH	ELEC	1	WS	MECH	MECH	MECH	1,2
		PUMPS																						
P-1	1	DOMESTIC RECIRCULATION PUMP	REFER TO DRAWINGS	MECH	0.115	–	–	–	120	1	ELEC	ELEC	ELEC	1	INT	MECH	MECH	ELEC	1	AQ	MECH	MECH	MECH	1,2
		MISC EQUIPMENT																						
		CIRCUIT FOR NEW CONTROLS	MECHANICAL ROOM 106	MECH	–	–	–	–	120	1	–	–	–	–	–	–	–	–	–	–	–	–	–	
		MOTORIZED DAMPERS	REFER TO DRAWINGS	MECH	–	–	–	–	120	1	–	–	–	–	–	–	–	–	–	–	–	–	–	
C-1	1	AIR COMPRESSOR (7.5 HP)	MECHANICAL ROOM 106	MECH	–	–	–	–	208	3	ELEC	ELEC	ELEC	1	INT	MECH	MECH	ELEC	1	INT	MECH	MECH	MECH	1,2
DAD-1	1	AIR DRYER	MECHANICAL ROOM 106	MECH	–	–	–	–	120	1	ELEC	ELEC	ELEC	1	INT	MECH	MECH	ELEC	1	INT	MECH	MECH	MECH	1,2
		FIRE PROTECTION																						
		SPRINKLER ZONE VALVES	MECHANICAL ROOM 106	MECH	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	
		SPRINKLER TAMPER SWITCHES	MECHANICAL ROOM 106	MECH	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	
		SPRINKLER FLOW SWITCHES	MECHANICAL ROOM 106	MECH	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	
		MISC PLUMBING																						
		ELECTRONIC SENSOR FAUCETS	REFER TO DRAWINGS	MECH	–	–	–	–	120	1	–	–	–	–	–	–	–	–	–	–	–	–	–	5
		ELECTRONIC SENSOR FLUSH VALVES	REFER TO DRAWINGS	MECH	–	–	–	–	120	1	–	–	–	–	–	–	–	–	–	–	–	–	–	5

SUPPLIER / INSTALL / WIRE CODES:
M = MECHANICAL
E = ELECTRICAL
G = GENERAL CONTRACTOR

STARTER CODES:
MAN = MANUAL STARTER
MAG = MAGNETIC STARTER W/ HOA
SWITCH W/ AUX. CONTACTS
MRR = MOTOR RATED RELAY, 24 VAC COIL
& MOTOR PROTECTION SWITCH
PCS = PACKAGED CONTROL SYSTEM
VSD = VARIABLE SPEED DRIVE
RVS = REDUCED VOLTAGE STARTER
WS = WALL SWITCH
CP = CONTROL PANEL
INT = CONTROL IS INTEGRAL TO UNIT (BY MANUFACTURER)

CONTROL DEVICE CODES:
BMS = BLDG MANAGEMENT SYSTEM
ES = END SWITCH
ET = LINE VOLTAGE T'STAT
FA = FIRE ALARM
FS = FLOW SWITCH
GS = GAS SENSOR
I = INTERLOCK, SEE NOTES
LS = LEVEL SWITCH
PS = PRESSURE SWITCH
TC = TIME CLOCK
T = LOW VOLTAGE T'STAT OR SENSOR
TS = TAMPER SWITCH
VS = VARIABLE SPEED SWITCH
WS = WALL SWITCH
FAP = FIRE ALARM PANEL
AQ = AQUASTAT
INT = INTEGRATED CONTROL SYSTEM

LOCATION CODES:
1 = AT OR NEAR MOTOR
2 = MOTOR CONTROL CENTRE
3 = EQUIPMENT ROOM
4 = ELECTRICAL ROOM
5 = AS SHOWN ON DRAWINGS

MISCELLANEOUS CODES:
FFCP = FIRE FIGHTERS CONTROL PANEL

GENERAL NOTES:
1. ALL FIRE ALARM DEVICES WIRED BY ELECTRICAL
2. PCS EQUIPMENT REQUIRES SINGLE SOURCE POWER CONNECTION, UNLESS NOTED OTHERWISE
3. CP, VSD EQUIPMENT REQUIRES POWER WIRING TO AND FROM CONTROL PANEL TO CONTROLLED EQUIPMENT - ALL WIRED BY ELECTRICAL

NOTES:
1. ALL DISCONNECTS ARE TO S, I AND C BY ELECTRICAL
2. SINGLE POINT CONNECTION UNIT
3. INTERLOCK WITH WASHROOM LIGHTING
4. UNIT C/W VFD TO BE SUPPLIED WITH A MANUAL BYPASS.
5. 120V POWER SUPPLY TO CONNECT TO LOW VOLTAGE TRANSFORMER PROVIDED BY DIV. 15.
6. INTERLOCK UNIT TO OPERATE WHEN DOOR OPENS

Public Works and Government Services Canada / Travaux publics et Services gouvernementaux Canada
REAL PROPERTY SERVICES
Pacific Region
SERVICES IMMOBILIERS
Région de Pacifique

AMEGroup
consulting mechanical engineers

Revision / Revision	Description / Description	Date / Date
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5071 WEST SAANICH ROAD
VICTORIA, BC, CANADA

NRC HERZBERG
ASTRONOMY AND ASTROPHYSICS
ATP INTEGRATION FACILITY

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PWGSC Project Manager / Administrateur de Projets TPSGC
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PREETIPAL PAUL

Drawing title / Titre du dessin
MECHANICAL MOTOR LIST

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PWGSC – A1 – 841X594

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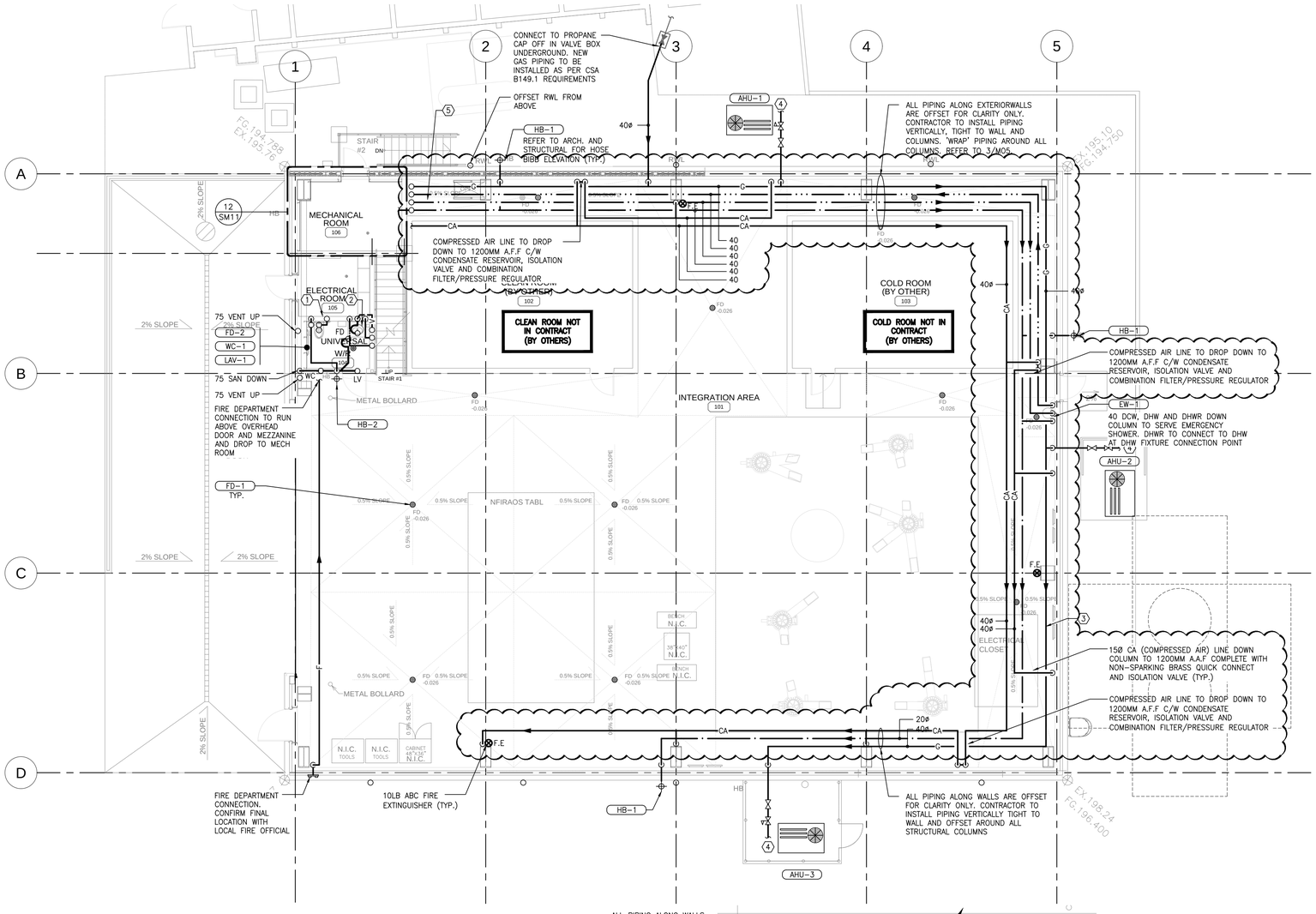
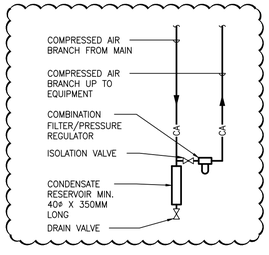
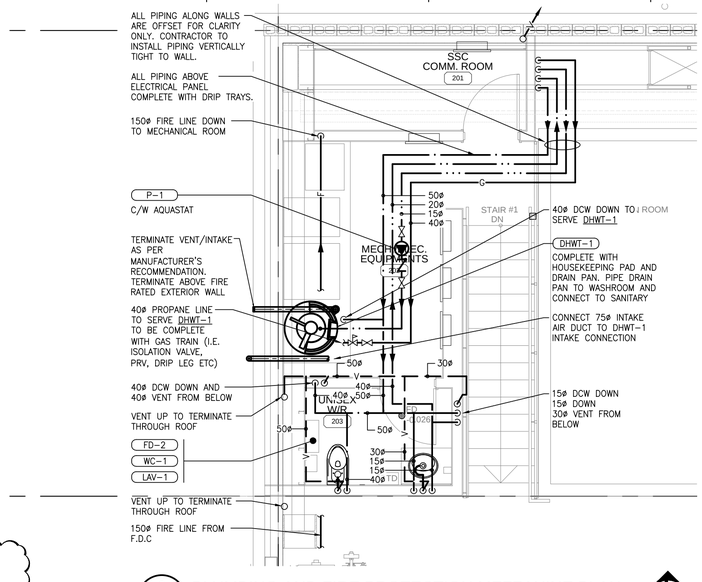


1 SM05 PLUMBING AND FIRE PROTECTION PLAN
1 : 100

PROJECT NORTH

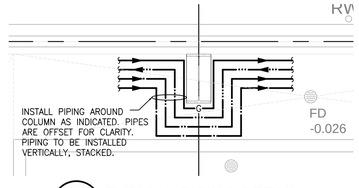


4 SM05 COMPRESSED AIR PRESSURE ZONE DETAIL
N.T.S



2 SM05 PLUMBING AND FIRE PROTECTION MEZZANINE PLAN
1 : 50

PROJECT NORTH



3 SM05 TYPICAL PIPING DETAIL
N.T.S

0 10 20 30 40 50 60 70 80 90 100mm

PLUMBING GENERAL NOTES:

1. REFER TO CIVIL DRAWINGS FOR ALL CONNECTION POINTS FOR MECHANICAL SERVICES. THIS CONTRACTOR SHALL MAKE ALL REQUIRED CONNECTIONS.
2. CONFIRM ALL INVERTS FOR SERVICES PRIOR TO LAY-OUT OF THE SERVICE ROUTING. ADJUST AS REQUIRED.
3. PROVIDE TRAP PRIMERS FOR FLOOR DRAINS.
4. COORDINATE EXACT MOUNTING HEIGHTS AND LOCATIONS OF ALL PLUMBING FIXTURES WITH THE CASEWORK AND ARCHITECTURAL DRAWINGS.
5. ALL PIPING SHALL BE INSTALLED ON THE WARM SIDE OF THE BUILDING INSULATION, UNLESS OTHERWISE NOTED ON THE DRAWING.
6. PROVIDE VENTS FROM ALL PROPANE GAS REGULATORS TO THE EXTERIOR OF THE BUILDING IN COPPER PIPING.
7. PROVIDE MAIN ISOLATION VALVES INTO ALL WASHROOMS, AND DISTINCT FIXTURE AREAS AND AS SHOWN ON THE PLANS.
8. FLOOR DRAINS QUANTITIES AND LOCATIONS TO BE COORDINATED WITH ARCHITECTS.

FIRE PROTECTION NOTES:

1. THIS BUILDING IS TO BE FULLY SPRINKLERED TO MEET NFPA 13 REQUIREMENTS. ALL AREAS TO BE SPRINKLERED.
2. FIRE SUPPRESSION SYSTEM INFORMATION SHOWN ON THESE PLAN ARE FOR GENERAL SCOPE OF WORK AND COORDINATION DURING DESIGN.
3. THE SYSTEM IS A DESIGN BUILD CONTRACT AS OUTLINED HERE AND IN THE SPECIFICATION. ALL SPRINKLER DESIGN AND WORK TO BE IN ACCORDANCE WITH NFPA-13 REQUIREMENT.
4. THE DESIGN BUILD CONTRACTOR SHALL RETAIN ON BEHALF OF THE OWNER A REGISTERED PROFESSIONAL ENGINEER IN THE PROVINCE OF BRITISH COLUMBIA, FOR THE COMPLETE DESIGN IN ACCORDANCE WITH ALL CODES AND STANDARDS. THE CONTRACTOR'S ENGINEER SHALL BE THE "REGISTERED PROFESSIONAL OF RECORD" FOR THE FIRE SUPPRESSION SYSTEMS (PART 5 OF THE LETTERS OF ASSURANCE.)
5. THE BUILDING CODE REPORT FORMS AN INTEGRAL PART OF THE FIRE SUPPRESSION SYSTEM AND SHALL FORM PART OF THIS CONTRACTOR'S SCOPE OF WORK RELATED TO THE FIRE SUPPRESSION.
6. SPRINKLER HEADS ARE TO BE COORDINATED WITH LIGHTING. PROVIDE SHOP DRAWINGS FOR ACCESS PANELS INCLUDING LOCATION WITH RESPECT TO SPRINKLERS, LIGHTING AND DIFFUSER/GRILLES.
7. PROVIDE ALL ANCILLARY DEVICES AND BAFFLES REQUIRED TO MEET NFPA STANDARDS. EXPOSED PIPING WILL BE MADE READY FOR PAINTING AS SPECIFIED IN THE PAINTING SPECIFICATIONS.
8. CONTRACTOR TO PROVIDE FIRE EXTINGUISHERS TO MEET NFPA 10 REQUIREMENTS UNLESS OTHERWISE DIRECTED BY THE AUTHORITIES HAVING JURISDICTION.

DRAWING NOTES:

1. 40ø DCW FROM ABOVE AND 40ø VENT TO ABOVE SERVING WATER CLOSET.
2. 15ø DCW & 15 DHW FROM ABOVE. 30 SAN DOWN AND 30 VENT UP.
3. PROVIDE DRIP TRAYS FOR PIPING RUNNING ABOVE ELECTRICAL PANELS. PIPE DRIP TRAY TO FLOOR.
4. CONNECT PROPANE LINE TO AIR HANDLER C/W ISOLATION VALVE, DRIP LEG, PRESSURE REGULATOR VALVE AND SEISMIC GAS SHUT OFF VALVE
5. 40ø PROPANE UP, 50ø DCW UP, 20 DHW FROM ABOVE AND 15 DHWR TO ABOVE

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PLUMBING AND FIRE PROTECTION PLAN

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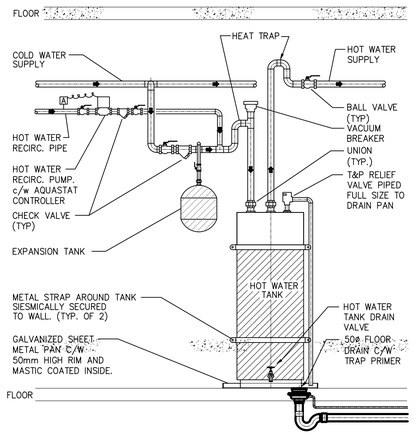
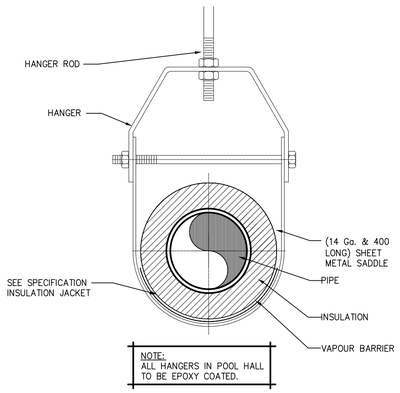
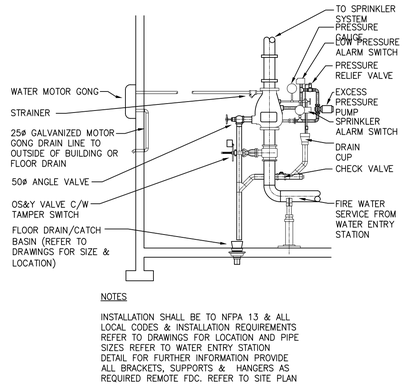


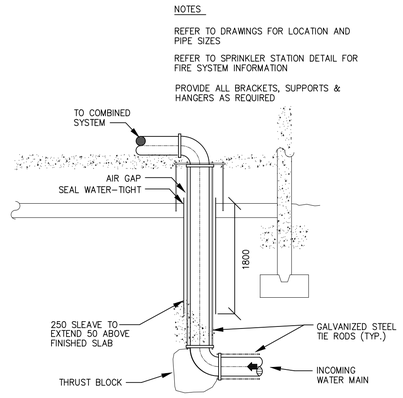
1 SM11 DOMESTIC HOT WATER TANK DETAIL
N.T.S



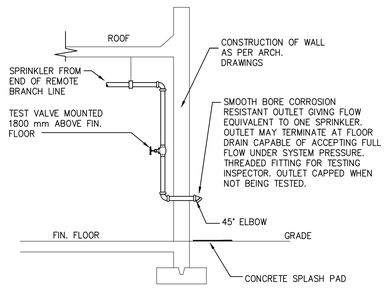
2 SM11 INSULATED PIPE HANGER DETAIL
N.T.S



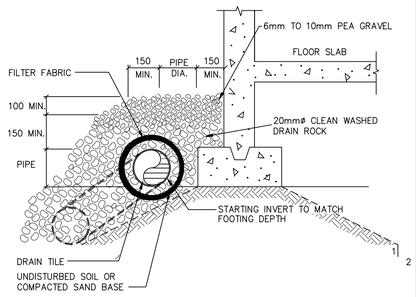
3 SM11 WET SPRINKLER ALARM STATION
N.T.S



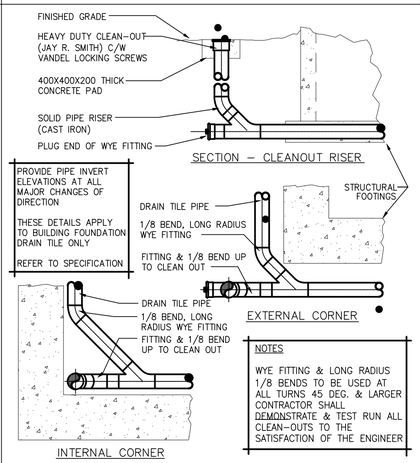
4 SM11 WATER ENTRY PIPE DETAIL
N.T.S



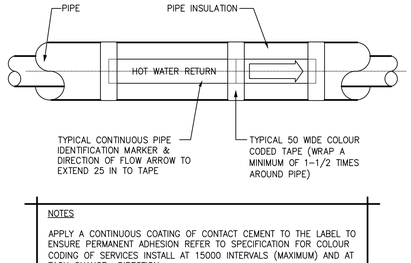
5 SM11 SPRINKLER TEST DRAIN DETAIL
N.T.S



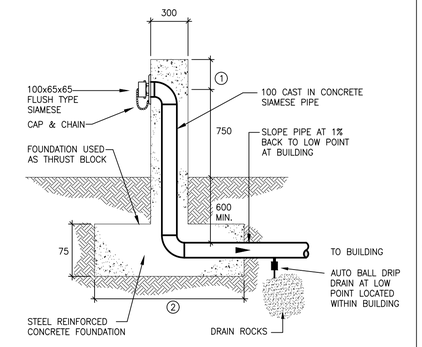
6 SM11 DRAIN TILE DETAIL
N.T.S



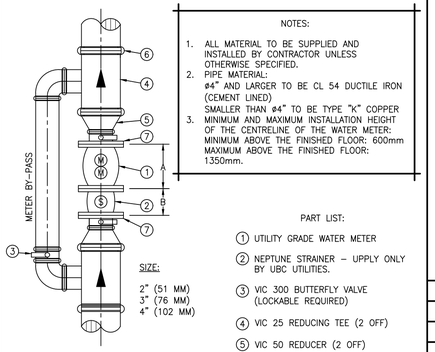
7 SM11 EXTERIOR CLEANOUT DETAIL
N.T.S



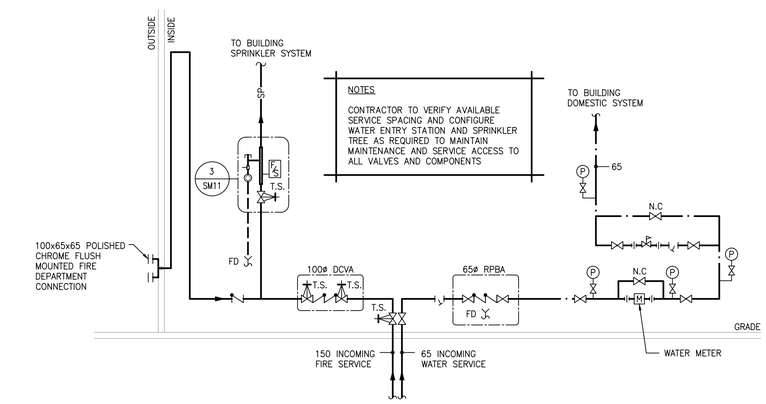
8 SM11 PIPE IDENTIFICATION DETAIL
N.T.S



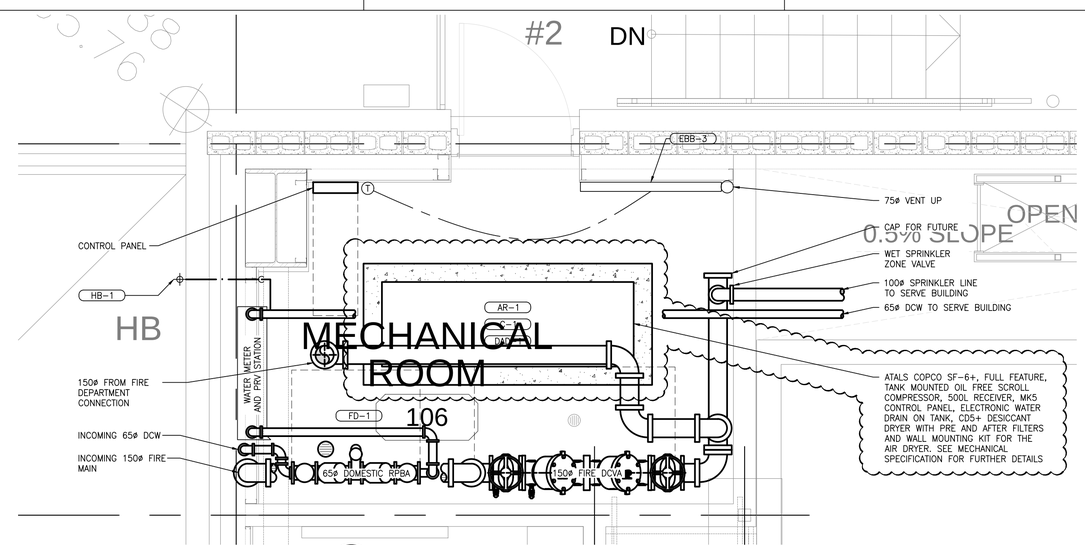
9 SM11 FLUSH F.D.C DETAIL
N.T.S



10 SM11 METER INSTALLATION DETAIL
N.T.S



11 SM11 DOMESTIC WATER AND FIRE PROTECTION SCHEMATIC
N.T.S



12 SM11 MECHANICAL ROOM DETAIL
1:25

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0 10 20 30 40 50 60 70 80 90 100mm

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MECHANICAL DETAILS

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MECHANICAL MOTORLIST

EQUIP. TAG	QUANTITY	EQUIPMENT DESCRIPTION	LOCATION	EQUIPMENT							DISCONNECT				STARTER					CONTROL				
				SUPPLIED	KW	MCA	FLA	A	VOLTAGE	PHASE	SUPPLIED	INSTALLED	WIRED	LOCATION	TYPE	SUPPLIED	INSTALLED	WIRED	LOCATION	TYPE	SUPPLIED	INSTALLED	WIRED	NOTES
		AIR CURTAINS																						
ACH-1	4	AIR CURTAIN	GROUND FLOOR	MECH	0.87	5	–	–	230	1	ELEC	ELEC	ELEC	1	INT	MECH	MECH	MECH	1	I	MECH	MECH	MECH	1,2,6
ACH-2	4	AIR CURTAIN	GROUND FLOOR	MECH	0.87	5	–	–	230	1	ELEC	ELEC	ELEC	1	INT	MECH	MECH	MECH	1	I	MECH	MECH	MECH	1,2,6
		AIR CONDITIONING UNIT																						
AC-1	1	SPLIT DX AIR CONDITIONING UNIT - INDOOR UNIT	ELECTRICAL ROOM	MECH	–	1	–	–	208	1	ELEC	ELEC	ELEC	1	INT	MECH	MECH	ELEC	1	T	MECH	MECH	MECH	1,2
CU-1	1	SPLIT DX AIR CONDITIONING UNIT - OUTDOOR UNIT	OUTSIDE	MECH	–	18	–	–	208	1	ELEC	ELEC	ELEC	1	INT	MECH	MECH	ELEC	1	T	MECH	MECH	MECH	1,2
		AIR HANDLING UNITS																						
AHU-1	1	NRC AIR HANDLER	GROUND FLOOR	MECH	0.75	28.2	–	–	208	3	ELEC	ELEC	ELEC	1	INT	MECH	MECH	ELEC	1	T	MECH	MECH	MECH	1,2
AHU-2	1	NRC AIR HANDLER	GROUND FLOOR	MECH	0.75	28.2	–	–	208	3	ELEC	ELEC	ELEC	1	INT	MECH	MECH	ELEC	1	T	MECH	MECH	MECH	1,2
AHU-3	1	NRC AIR HANDLER	GROUND FLOOR	MECH	0.75	28.2	–	–	208	3	ELEC	ELEC	ELEC	1	INT	MECH	MECH	ELEC	1	T	MECH	MECH	MECH	1,2
		GAS FIRED DOMESTIC HOT WATER TANK																						
DHWT-1	1	GAS FIRED DOMESTIC HOT WATER TANK	REFER TO DRAWINGS	MECH	–	–	–	5	120	1	ELEC	ELEC	ELEC	1	–	–	–	–	–	T	MECH	MECH	MECH	1,2
		ELECTRIC BASEBOARD HEATERS																						
EBB-1	1	WASHROOM ELECTRIC BASEBOARD HEATER	UNIVERSAL W/R	MECH	0.5	–	–	–	120	1	ELEC	ELEC	ELEC	1	–	–	–	–	–	ET	ELEC	ELEC	ELEC	
EBB-2	1	WASHROOM ELECTRIC BASEBOARD HEATER	W/R	MECH	0.5	–	–	–	120	1	ELEC	ELEC	ELEC	1	–	–	–	–	–	ET	ELEC	ELEC	ELEC	
EBB-3	1	MECHANICAL ROOM ELECTRIC BASEBOARD HEATER	MECHANICAL ROOM 106	MECH	1.5	–	–	–	120	1	ELEC	ELEC	ELEC	1	–	–	–	–	–	ET	ELEC	ELEC	ELEC	
		FANS																						
EF-1	1	WASHROOM EXHAUST FAN	UNIVERSAL W/R	MECH	0.0176	–	–	–	120	1	ELEC	ELEC	ELEC	1	INT	MECH	MECH	ELEC	1	WS	MECH	MECH	MECH	1,2,3
EF-2	1	WASHROOM EXHAUST FAN	W/R	MECH	0.0176	–	–	–	120	1	ELEC	ELEC	ELEC	1	INT	MECH	MECH	ELEC	1	WS	MECH	MECH	MECH	1,2,3
CF-1	8	CEILING FAN	INTEGRATION AREA CEILING	MECH	0.75	–	–	–	208	3	ELEC	ELEC	ELEC	1	INT	MECH	MECH	ELEC	1	WS	MECH	MECH	MECH	1,2
		PUMPS																						
P-1	1	DOMESTIC RECIRCULATION PUMP	REFER TO DRAWINGS	MECH	0.115	–	–	–	120	1	ELEC	ELEC	ELEC	1	INT	MECH	MECH	ELEC	1	AQ	MECH	MECH	MECH	1,2
		MISC EQUIPMENT																						
		CIRCUIT FOR NEW CONTROLS	MECHANICAL ROOM 106	MECH	–	–	–	–	120	1	–	–	–	–	–	–	–	–	–	–	–	–	–	
		MOTORIZED DAMPERS	REFER TO DRAWINGS	MECH	–	–	–	–	120	1	–	–	–	–	–	–	–	–	–	–	–	–	–	
C-1	1	AIR COMPRESSOR (7.5 HP)	MECHANICAL ROOM 106	MECH	–	–	–	–	208	3	ELEC	ELEC	ELEC	1	INT	MECH	MECH	ELEC	1	INT	MECH	MECH	MECH	1,2
DAD-1	1	AIR DRYER	MECHANICAL ROOM 106	MECH	–	–	–	–	120	1	ELEC	ELEC	ELEC	1	INT	MECH	MECH	ELEC	1	INT	MECH	MECH	MECH	1,2
		FIRE PROTECTION																						
		SPRINKLER ZONE VALVES	MECHANICAL ROOM 106	MECH	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	
		SPRINKLER TAMPER SWITCHES	MECHANICAL ROOM 106	MECH	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	
		SPRINKLER FLOW SWITCHES	MECHANICAL ROOM 106	MECH	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	
		MISC PLUMBING																						
		ELECTRONIC SENSOR FAUCETS	REFER TO DRAWINGS	MECH	–	–	–	–	120	1	–	–	–	–	–	–	–	–	–	–	–	–	–	5
		ELECTRONIC SENSOR FLUSH VALVES	REFER TO DRAWINGS	MECH	–	–	–	–	120	1	–	–	–	–	–	–	–	–	–	–	–	–	–	5

SUPPLIER / INSTALL / WIRE CODES:
M = MECHANICAL
E = ELECTRICAL
G = GENERAL CONTRACTOR

STARTER CODES:
MAN = MANUAL STARTER
MAG = MAGNETIC STARTER W/ HOA
SWITCH W/ AUX. CONTACTS
MRR = MOTOR RATED RELAY, 24 VAC COIL
& MOTOR PROTECTION SWITCH
PCS = PACKAGED CONTROL SYSTEM
VSD = VARIABLE SPEED DRIVE
RVS = REDUCED VOLTAGE STARTER
WS = WALL SWITCH
CP = CONTROL PANEL
INT = CONTROL IS INTEGRAL TO UNIT (BY MANUFACTURER)

CONTROL DEVICE CODES:
BMS = BLDG MANAGEMENT SYSTEM
ES = END SWITCH
ET = LINE VOLTAGE T'STAT
FA = FIRE ALARM
FS = FLOW SWITCH
GS = GAS SENSOR
I = INTERLOCK, SEE NOTES
LS = LEVEL SWITCH
PS = PRESSURE SWITCH
TC = TIME CLOCK
T = LOW VOLTAGE T'STAT OR SENSOR
TS = TAMPER SWITCH
VS = VARIABLE SPEED SWITCH
WS = WALL SWITCH
FAP = FIRE ALARM PANEL
AQ = AQUASTAT
INT = INTEGRATED CONTROL SYSTEM

LOCATION CODES:
1 = AT OR NEAR MOTOR
2 = MOTOR CONTROL CENTRE
3 = EQUIPMENT ROOM
4 = ELECTRICAL ROOM
5 = AS SHOWN ON DRAWINGS

MISCELLANEOUS CODES:
FFCP = FIRE FIGHTERS CONTROL PANEL

GENERAL NOTES:
1. ALL FIRE ALARM DEVICES WIRED BY ELECTRICAL
2. PCS EQUIPMENT REQUIRES SINGLE SOURCE POWER CONNECTION, UNLESS NOTED OTHERWISE
3. CP, VSD EQUIPMENT REQUIRES POWER WIRING TO AND FROM CONTROL PANEL TO CONTROLLED EQUIPMENT - ALL WIRED BY ELECTRICAL

NOTES:
1. ALL DISCONNECTS ARE TO S, I AND C BY ELECTRICAL
2. SINGLE POINT CONNECTION UNIT
3. INTERLOCK WITH WASHROOM LIGHTING
4. UNIT C/W VFD TO BE SUPPLIED WITH A MANUAL BYPASS.
5. 120V POWER SUPPLY TO CONNECT TO LOW VOLTAGE TRANSFORMER PROVIDED BY DIV. 15.
6. INTERLOCK UNIT TO OPERATE WHEN DOOR OPENS

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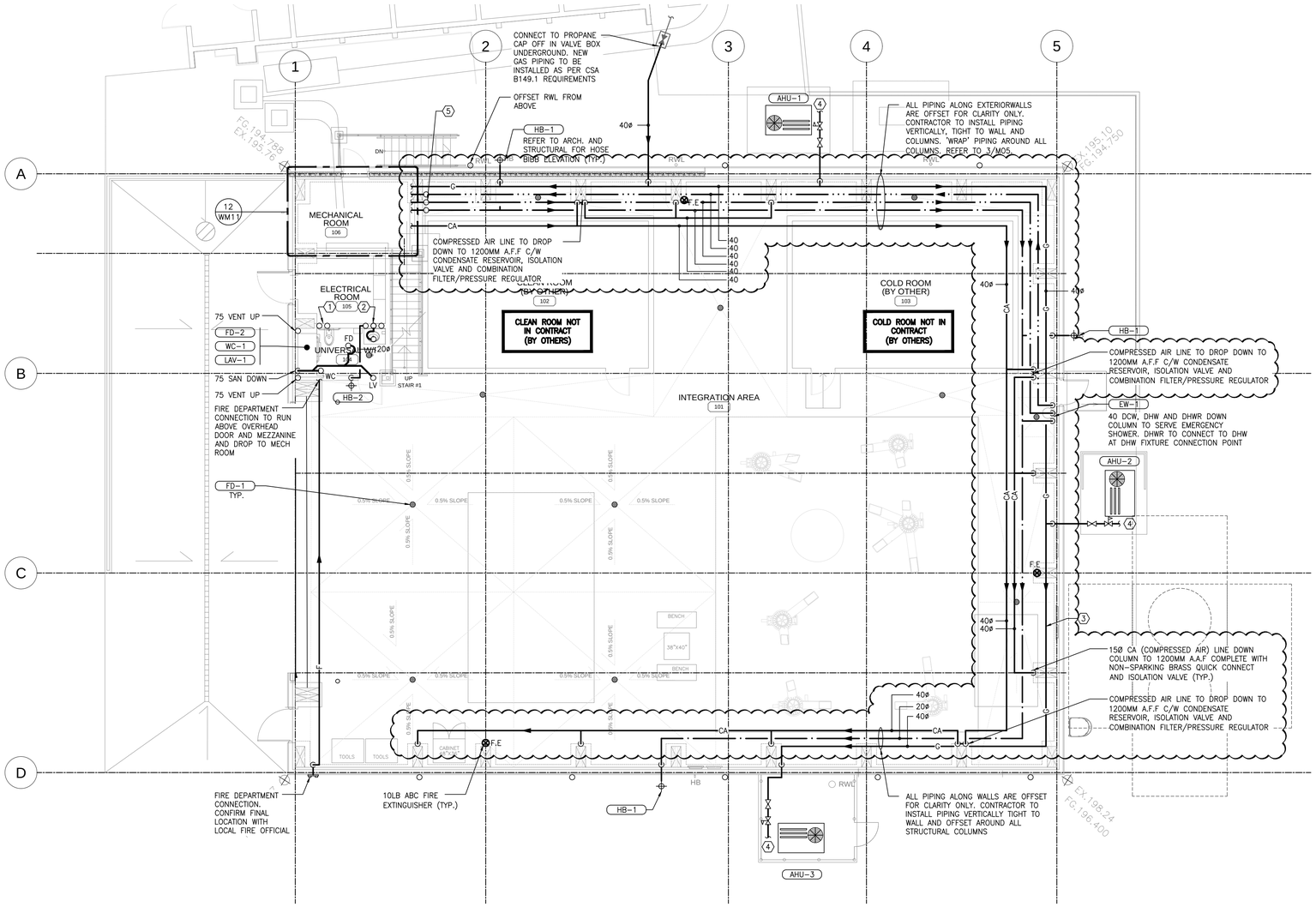
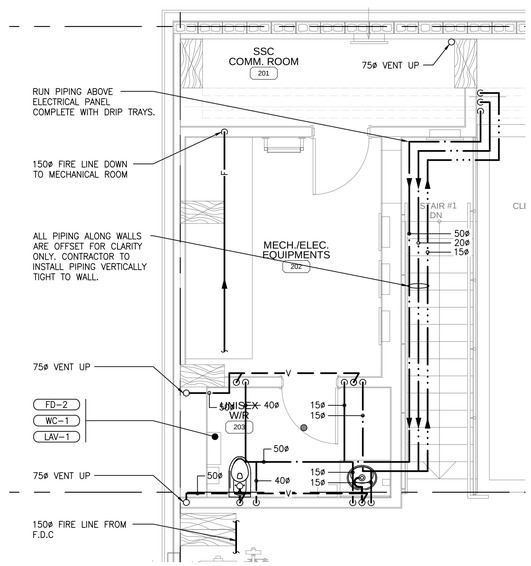


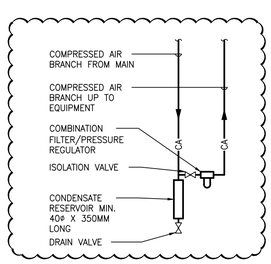
1 PLUMBING AND FIRE PROTECTION PLAN
WM05 — 1 : 100

PROJECT NORTH

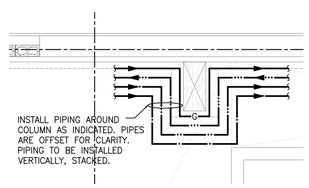


2 PLUMBING AND FIRE PROTECTION MEZZANINE PLAN
WM05 — 1 : 50

PROJECT NORTH



4 COMPRESSED AIR PRESSURE ZONE DETAIL
WM05 — N.T.S



3 TYPICAL PIPING DETAIL
WM05 — N.T.S

0 10 20 30 40 50 60 70 80 90 100mm

PLUMBING GENERAL NOTES:

1. REFER TO CIVIL DRAWINGS FOR ALL CONNECTION POINTS FOR MECHANICAL SERVICES. THIS CONTRACTOR SHALL MAKE ALL REQUIRED CONNECTIONS.
2. CONFIRM ALL INVERTS FOR SERVICES PRIOR TO LAY–OUT OF THE SERVICE ROUTING. ADJUST AS REQUIRED.
3. PROVIDE TRAP PRIMERS FOR FLOOR DRAINS.
4. COORDINATE EXACT MOUNTING HEIGHTS AND LOCATIONS OF ALL PLUMBING FIXTURES WITH THE CASEWORK AND ARCHITECTURAL DRAWINGS.
5. ALL PIPING SHALL BE INSTALLED ON THE WARM SIDE OF THE BUILDING INSULATION, UNLESS OTHERWISE NOTED ON THE DRAWING.
6. PROVIDE VENTS FROM ALL PROPANE GAS REGULATORS TO THE EXTERIOR OF THE BUILDING IN COPPER PIPING.
7. PROVIDE MAIN ISOLATION VALVES INTO ALL WASHROOMS, AND DISTINCT FIXTURE AREAS AND AS SHOWN ON THE PLANS.
8. FLOOR DRAINS QUANTITIES AND LOCATIONS TO BE COORDINATED WITH ARCHITECTS.

FIRE PROTECTION NOTES:

1. THIS BUILDING IS TO BE FULLY SPRINKLERED TO MEET NFPA 13 REQUIREMENTS. ALL AREAS TO BE SPRINKLERED.
2. FIRE SUPPRESSION SYSTEM INFORMATION SHOWN ON THESE PLAN ARE FOR GENERAL SCOPE OF WORK AND COORDINATION DURING DESIGN.
3. THE SYSTEM IS A DESIGN BUILD CONTRACT AS OUTLINED HERE AND IN THE SPECIFICATION. ALL SPRINKLER DESIGN AND WORK TO BE IN ACCORDANCE WITH NFPA–13 REQUIREMENT.
4. THE DESIGN BUILD CONTRACTOR SHALL RETAIN ON BEHALF OF THE OWNER A REGISTERED PROFESSIONAL ENGINEER IN THE PROVINCE OF BRITISH COLUMBIA, FOR THE COMPLETE DESIGN IN ACCORDANCE WITH ALL CODES AND STANDARDS. THE CONTRACTOR'S ENGINEER SHALL BE THE "REGISTERED PROFESSIONAL OF RECORD" FOR THE FIRE SUPPRESSION SYSTEMS (PART 5 OF THE LETTERS OF ASSURANCE.)
5. THE BUILDING CODE REPORT FORMS AN INTEGRAL PART OF THE FIRE SUPPRESSION SYSTEM AND SHALL FORM PART OF THIS CONTRACTOR'S SCOPE OF WORK RELATED TO THE FIRE SUPPRESSION.
6. SPRINKLER HEADS ARE TO BE COORDINATED WITH LIGHTING. PROVIDE SHOP DRAWINGS FOR ACCESS PANELS INCLUDING LOCATION WITH RESPECT TO SPRINKLERS, LIGHTING AND DIFFUSER/GRILLES.
7. PROVIDE ALL ANCILLARY DEVICES AND BAFFLES REQUIRED TO MEET NFPA STANDARDS. EXPOSED PIPING WILL BE MADE READY FOR PAINTING AS SPECIFIED IN THE PAINTING SPECIFICATIONS.
8. CONTRACTOR TO PROVIDE FIRE EXTINGUISHERS TO MEET NFPA 10 REQUIREMENTS UNLESS OTHERWISE DIRECTED BY THE AUTHORITIES HAVING JURISDICTION.

DRAWING NOTES:

1. 40ø DCW FROM ABOVE AND 40ø VENT TO ABOVE SERVING WATER CLOSET.
2. 20ø DCW & 15 DHW FROM ABOVE. 30 SAN DOWN AND 30 VENT UP.
3. PROVIDE DRIP TRAYS FOR PIPING RUNNING ABOVE ELECTRICAL PANELS. PIPE DRIP TRAY TO FLOOR.
4. CONNECT PROPANE LINE TO AIR HANDLER C/W ISOLATION VALVE, DRIP LEG, PRESSURE REGULATOR VALVE AND SEISMIC GAS SHUT OFF VALVE
5. 50ø DCW UP, 20 DHW UP AND 15 DHWR FROM ABOVE

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Pacific Region
SERVICES IMMOBILIERS
Région de Pacifique
AME Group consulting mechanical engineers

Revision / Revision	Description / Description	Date / Date
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2	ISSUED FOR 100% CD REVIEW	2018.03.14
1	ISSUED FOR 90% CD REVIEW	2018.02.22

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5071 WEST SAANICH ROAD
VICTORIA, BC, CANADA

NRC HERZBERG
ASTRONOMY AND ASTROPHYSICS
ATP INTEGRATION FACILITY

Consultant Signature Only

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A.O.

Drawn by / Dessine par
N.Y.

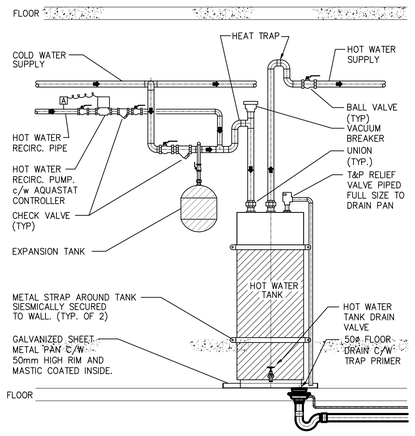
PWGSC Project Manager / Administrateur de Projets TPSGC
PATRICK TROUNG

Regional Manager, Architectural and Engineering Services / Gestionnaire régional, Services d'architectural et de génie, TPSGC
PREETIPAL PAUL

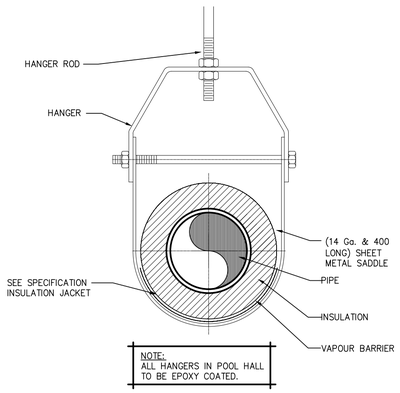
Drawing title / Titre du dessin

PLUMBING AND FIRE PROTECTION PLAN

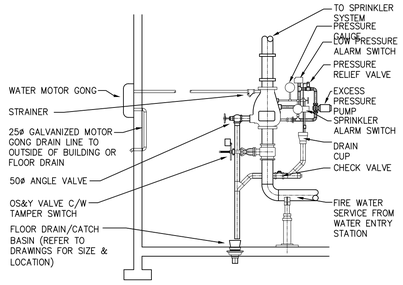
Project No. / No. du projet	Sheet / Feuille	Revision no. / La Révision no.
R.077596.001	WM05 OF 11	3



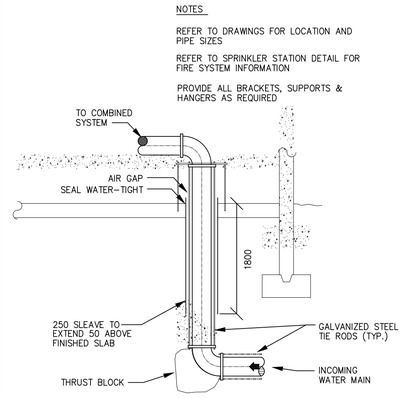
1 WM11 DOMESTIC HOT WATER TANK DETAIL
N.T.S



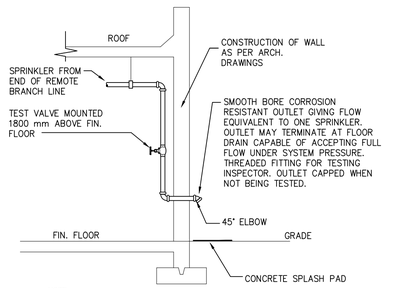
2 WM11 INSULATED PIPE HANGER DETAIL
N.T.S



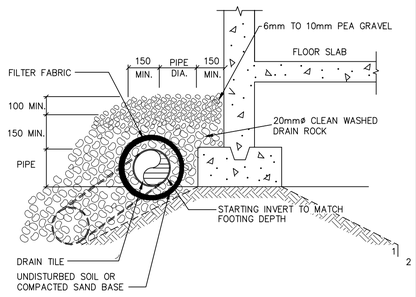
3 WM11 WET SPRINKLER ALARM STATION
N.T.S



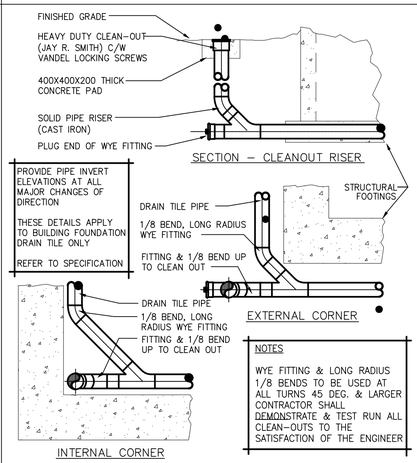
4 WM11 WATER ENTRY PIPE DETAIL
N.T.S



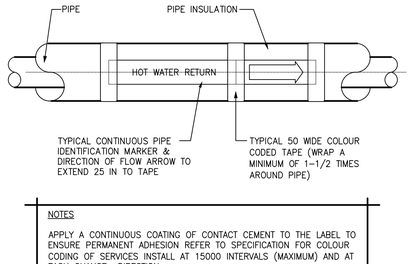
5 WM11 SPRINKLER TEST DRAIN DETAIL
N.T.S



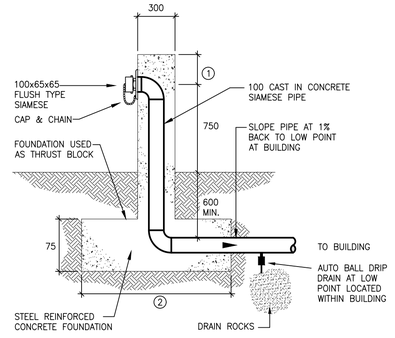
6 WM11 DRAIN TILE DETAIL
N.T.S



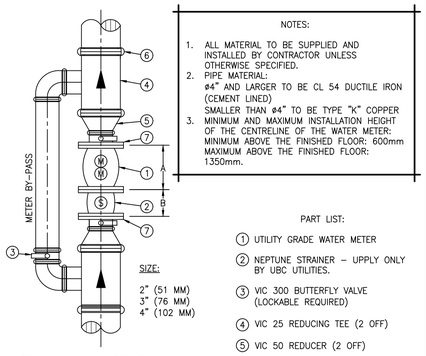
7 WM11 EXTERIOR CLEANOUT DETAIL
N.T.S



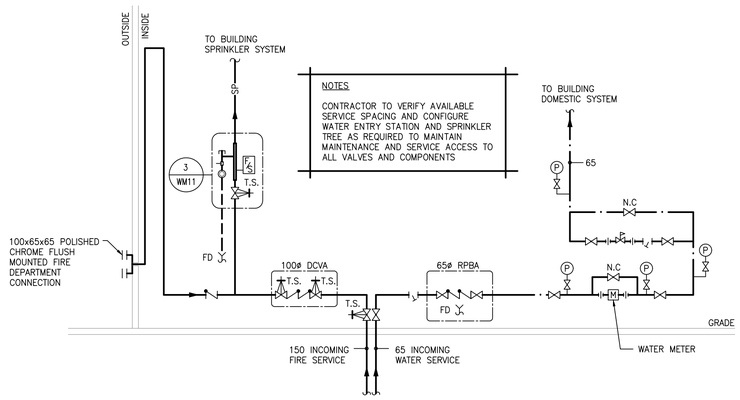
8 WM11 PIPE IDENTIFICATION DETAIL
N.T.S



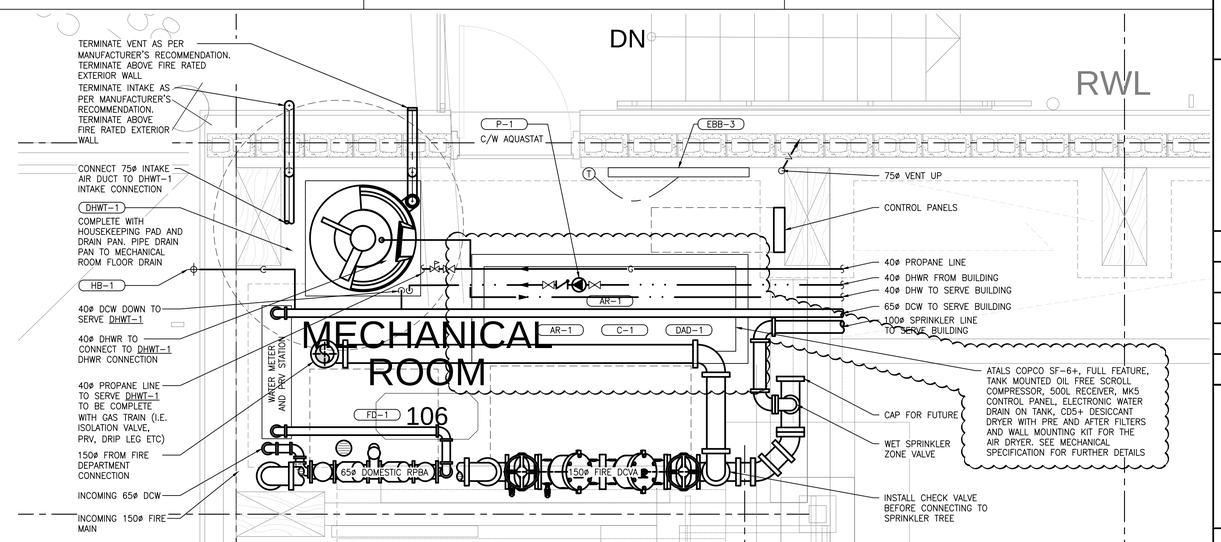
9 WM11 FLUSH F.D.C DETAIL
N.T.S



10 WM11 METER INSTALLATION DETAIL
N.T.S



11 WM11 DOMESTIC WATER AND FIRE PROTECTION SCHEMATIC
N.T.S



12 WM11 MECHANICAL ROOM DETAIL
1:25

0 10 20 30 40 50 60 70 80 90 100mm

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Public Works and Government Services Canada
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REAL PROPERTY SERVICES
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SERVICES IMMOBILIERS
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consulting mechanical engineers

4	ISSUED FOR TENDER	2019.03.14
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MECHANICAL DETAILS

Project No. / No. du projet	Sheet / Feuille	Revision no. / La Révision no.
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DM5XXXXXX

1. GENERAL

1.1 Section Includes

.1 Materials and installation requirements for piping, fittings, and equipment used in general service compressed air systems.

1.2 Related Sections

.1 This section of the specification forms part of the Contract Documents and is to be read, interpreted, and coordinated with all other parts of the Contract Documents.

.2 Section 01 33 00 - Submittal Procedures.

.3 Section 01 74 19 - Waste Management and Disposal.

.4 Section 01 78 00 - Closeout Submittals.

.5 Section 21 05 01 – Common Work Results for Mechanical.

.6 Section 23 05 01 – Acceptable Manufacturers.

.7 Section 23 05 16 - Expansion Fittings and Loops for Mechanical Piping.

1.3 References

.1 American Society of Mechanical Engineers (ASME)

.1 ASME Boiler and Pressure Vessel Code Section VIII Pressure Vessels.

.2 ASME B16.5-2013, Pipe Flanges, and Flanged Fittings.

.3 ASME B16.11-2011, Forged Fittings, Socket-Welding and Threaded.

.4 ASME B31.1-12-Power Piping.

.2 American Society for Testing and Materials International (ASTM)

.1 ASTM A53/A53M-12, Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated Welded and Seamless.

.2 ASTM A181/A181M-14, Standard Specification for Carbon Steel Forgings for General Purpose Piping.

.3 Canadian Standards Association (CSA International)

.1 CSA B51-2014, Boiler, Pressure Vessel, and Pressure Piping Code.

1.4 Submittals

.1 Submittals in accordance with Section 01 33 00 - Submittal Procedures.

.2 Shop Drawings:

.1 Submit shop drawings to indicate project layout including layout, dimensions, and extent of piping system.

.1 Include:

.1 Air compressors

.2 Air driers

.3 Filters

.4 Lubricators

.5 Pressure regulators

.6 Oil-water separator

.7 Compressed air outlets

.8 Air receivers

.9 Controls

.10 Valves

.2 Instructions: submit manufacturer's installation instructions.

.3 Closeout Submittals: submit maintenance and engineering data for incorporation into manual specified in Section 01 78 00 - Closeout Submittals.

1.5 Delivery, Storage and Handling

.1 Waste Management and Disposal:

.1 Separate waste materials for reuse and recycling in accordance with Section 01 74 19 - Waste Management and Disposal.

2. PRODUCTS

2.1 Air Compressors

.1 Rotary Scroll Air Compressor (C-1)

.1 General

.1 Air compressor shall produce compressed air for general compressed air.

.2 Air-cooled, silenced, variable speed rotary scroll compressor.

.3 Compressor package completely wired and equipped with all interconnecting pipe work and fittings. Include a direct driven state of the art compressor element, a totally enclosed fan-cooled electric motor, together with lubrication, cooling and regulation systems.

.4 Compressor enclosed in a sound-insulated bodywork. Front panel comprised of an electronic control module including the start and stop buttons.

.5 Compressor size and configuration. Space for installation of the new compressor is limited. Ensure that the selected compressor can be installed in the allocated space, with all manufacturer recommended maintenance clearances. Coordinate with all other mechanical and electrical equipment and panels shown for the space.

.6 Provide an emergency stop button.

.7 Variable speed converter to vary the airflow.

.8 Designed to operate continuously in the most extreme running conditions. All rotating components are totally enclosed and protected against contamination to ensure long and reliable operation.

.9 The compressor cooling system sized to run perfectly in ambient temperatures up to 46°C.

.10 Two (2) sets of auxiliary alarm contacts.

.11 Complete with vibration isolators for mounting on housekeeping pad.

.2 Unit capacity:

.1 Nominal 7.5 HP capacity.

.2 Motor: 208v/3ph/60Hz

.3 Air output: 9.8 l/s (20.8 CFM) at a discharge pressure of 1000 kPa (145 psi).

.3 Air system.

.1 Air intake filter.

.1 Heavy duty, dry type air inlet filter.

.2 Premium filtration efficiency: 99.9% for particles above 3 micron.

.2 Air intake valve.

.1 Aluminum check valve that closes the inlet when the compressor stops.

.3 Compression element.

.1 State of the art compression element using the high efficiency rotor profiles.

.4 Non return valve.

.1 Cast iron check valve to prevent back flow into the compression element.

.5 Air/oil separator vessel.

.1 Cast iron vessel aerodynamically optimized to maximize the pre-separation.

.2 Ultra fine oil separator filter to limit the oil consumption and increase the running time.

.6 Minimum pressure valve.

.1 Cast iron check valve that opens at 4 bar to prevent blow back into the oil vessel and maintain oil pressure.

.7 After cooler.

.1 Aluminum block type air after cooler to cool the compressed air and condensate discharge.

.8 Water separator (integrated in the after cooler).

.1 The water separator integrated in the after cooler, to assure immediate removal of 100% of the condensate to electronic no loss drains.

.4 Lubrication system:

.1 Lube oil.

.1 Lube oils tested for extreme conditions and qualified for high performance and long lifetime expectations.

.2 Oil cooler.

.1 Aluminum block type air - oil cooler to remove heat generated in the oil during compression and to optimize the element temperature for efficient operation.

.3 Thermostatic bypass valve.

.1 A cast iron valve integrated in the oil filter housing to ensure the compressor reaches its optimal temperature immediately after start-up.

.4 Oil filter.

.1 A metal free oil filter built into the oil vessel housing to ensure extremely high filtration efficiency (12 micron) to protect the lubrication quality and health of the rotating components.

.5 Oil stop valve.

.1 Cast iron oil stop valve, integrated with the compression element check valve to protect the compression element from oil flood when the compressor is stopped.

.5 Drive system.

.1 Compressor to be driven by squirrel cage induction motor. The motor boosts the efficiency of the compressor package are rated according to the NEMA Epact standard (60Hz).

.2 Inverter on compressor, for variable speed operation.

.6 Cooling Fan Arrangement.

.1 Radial cooling fan, rotating at low speed.

.7 Control system.

.1 Equipped with a control cubicle containing:

.1 Fan motor overload relay(s).

.2 Motor star-delta starter with overload relay and frequency inverter.

.3 Transformers.

.4 Plexiglass screen protection (in case copper bars are exposed).

.5 Start-stop button and isolator switch.

.6 Electronic control, regulation, safety, and indication panel.

.7 All wiring.

.2 Regulation System.

.1 Air Compressor:

.1 Equipped with the automatic full-load / no-load regulation system.

.2 Electronic regulation equipped with a delayed second stop feature for the main motor to reduce energy costs.

.3 Electronic regulator module.

.1 Regulating system to regulate, control and monitor compressor operation. Control module to display and monitor the following:

.1 Compressor Status Indication.

.1 Voltage on.

.2 Automatic operation.

.3 Compressor loaded.

.4 Compressor unloaded.

.5 Compressor maximum allowed unloading pressure.

.2 Temperature, numerical readouts.

.1 Delivery air.

.2 Ambient air temperature.

.3 Pressure, numerical readouts.

.1 Delivery air.

.2 Oil separator differential pressure.

.4 Compressor Control.

.1 Start / Stop.

.2 Load / unload.

.3 Emergency stop.

.4 Reset / Test.

.5 Hour meters.

.1 Total running hours.

.2 Total loading hours.

.6 Timer

.1 Programming compressor time-based start/stop commands

.7 Service requirement indications

.1 Air filter

.2 Oil filter

.3 Oil lifetime

.4 Oil separator

.8 Compressor safety - warning indications

.1 High element outlet temperature.

.2 Electronic drain operation

.3 Sensor error

.4 Pressure drop over oil coalescing/particulate filters (optionally)

.9 Compressor safety - shutdown indications

.1 High element outlet temperature.

.2 Drive motor/fan motor overload

.3 Emergency stop

.10 Digital output relays for remote monitoring (voltage free)

.1 Automatic operation / Manual operation

.2 General warning

.3 General shutdown

.8 Compressor Controller

.1 General Description

.1 Control system to monitor the air net pressure and control the variable speed drive (VSD) to control the unit for system pressure control, thereby increasing air net pressure stability, and reducing electrical power consumption.

.2 Safety Features

.1 Sequential starting to eliminate electrical power peaks.

.2 Automatic isolation of compressor from sequence on compressor failure.

.3 Automatic systems check on start up. Operation automatically reverts to local compressor control in the event of control system failure.

.4 Auto start of sequence on restoration of power following a voltage failure. This feature can be activated or deactivated on commissioning according to the users requirements.

2.2 Air Receiver (AR-1)

.1 Compressed air tank certified for use in compressed air system.

.2 Vertical or horizontal tank with floor mount attachments or

.3 Inlet and outlet pipe connections.

.4 Accessories:

.1 Adjustable pressure regulator.

.2 Safety valve.

.3 125 mm diameter gauge with pressure range of 0 to 1500 kPa.

.4 Drain cock.

.5 Automatic electric condensate drain valve (for 115/1/60 wall outlet plug-in).

.5 Provincial inspector's certificate and CRN certification.

.6 Finish: shop primed, ready for field painting.

.7 Air Receiver:

.1 To CSA B51, ASME Section VIII and provincial regulations, for working gauge pressure of 2000 kPa. Capacity: 500 L.

.2 Tank manufacturer’s support system for floor mounting on housekeeping pad. Provide all anchors as required.

2.3 Desiccant Air Dryer (DAD-1)

.1 General

.1 Desiccant air dryer DAD-1 shall be used for conditioning the air used for the compressed air system.

.2 Twin tower, heatless, absorption compressed air filter/dryer.

.3 Dryer’s offline tower shall be purged of moisture and readied for use.

.4 Operational Drying capacity: 4.2 l/s (20.8 SCFM) continuous outlet flow at 1,208 kPa for -65°C dewpoint, with 38°C inlet temperature.

.5 Complete with vibration isolators for mounting on housekeeping pad.

.6 Two year parts and labour warranty.

.2 Construction

.1 Two carbon steel ASME receivers with Activated Alumina (-40C dew point) or Molecular Sieves (-70C dew point).

.2 Industrial steel base frame with lifting eyes and forklift slots.

.3 Integral factory mounted particle pre-filters, general filter (1 micron) and high efficiency filter (0.01 micron).

.1 Each filter provided with bypass pipe, complete with normally closed ball valve.

.2 Each filter with automatic drain.

.4 Integrated and mounted after-filter for particle removal.

.5 Stainless steel inlet valve.

.6 Stainless steel check valves.

.7 Safety valves.

.8 High efficiency silencers.

.9 Self cleaning purge nozzle.

.10 Pressure differential sensors.

.11 Pressure transmitters.

.12 Pneumatic actuator.

.13 Inlet and Outlet pipes that can be swiveled to provide maximum installation flexibility.

.14 By-pass piping.

.3 Controls and Instrumentation

.1 Unit fitted with electronic control system that includes dewpoint dependent purge control, which enables the average amount of purge air to be more efficiently regulated, resulting in reduced running costs. Minimum features include:

.1 Adjustable electronic controls.

.2 High duty cycle process valves.

.3 Manifolded solenoid control valves.

.4 Complete annunciation of the dryer and tower cycle status.

.5 Automatic fault diagnosis, including service alarms.

.6 Readout of dew point, inlet pressure, vessel pressure, cycle status, pdp setting, etc.

.7 Required PDP setting.

.8 Digital input commands of start / programmed stop and emergency stop.

.9 Pre and after filters service indication.

.10 Adjustable purge flow.

.11 ASME pressure relief valves.

.12 OSHA approved mufflers.

.13 Power loss fail-safe no flow interruption.

.14 Complete with remote monitoring interface, for connection to the building EMCS DDC control system.

.15 CSA / ULC approved control panel with NEMA enclosure.

.4 Pre and Post Filtration

.1 Two coalescing pre-filters and one post filter, mounted on dryer skid.

.2 Pre-filtration: to 0.01 ppm liquid water and oil aerosol, particles to 0.01 micron.

.3 Post particle filtration: to 1 micron.

.4

2.4 Oil-Water Separator (OWS-1)

.1 Single piece unit.

.2 Robust, corrosion resistant, polyethylene construction.

.3 Large centrifugal inlet chamber for venting of compressed air energy.

.4 Large, easily cleaned primary settlement chamber for the accumulation and removal of dirt particles.

.5 Large main tank to maximize settlement time and reduce oil carryover to carbon filter stage.

.6 Large internal galleries to reduce risk of an internal blockage and simplify maintenance.

.7 Oil absorbing pre-filter(s) to protect carbon stage from bulk contamination.

.8 Large carbon stage to maximize contact time to improve water quality and extend carbon life.

.9 High specification carbon for improved service intervals.

.10 Adjustable oil outlet funnel for efficient removal of separated oil.

.11 Sealed external oil container for easy oil disposal.

.12 Sample tap removes need to disconnect outlet piping when obtaining a test sample.

.13 Capacity:

.1 Size for operation of compressor, filters, dryers, etc.

.2 Submit shop drawings of proposed unit based on connections to selected equipment.

2.5 General Service Compressed Air Piping

.1 Type ' K' or 'L' hard drawn seamless copper tubing to ASTM B88.

.1 860 kPa [125 psi] rating.

.2 Wrought copper fittings to ANSI B16.22.

.3 All joints shall be brazed.

.2 Schedule 80-seamless black steel to ASTM A53/A53M.

.1 Fittings:

.1 NPS2 and smaller: to ASME B16.11, schedule 80 steel, extra heavy malleable.

.2 NPS2 1/2 and larger: to ASME B16.11, schedule 80 steel, butt, or socket welded.

.3 Couplings: to ASME B16.11, socket welded or threaded half-coupling type.

.4 Unions: 1034 kPa malleable iron with brass-to-iron ground seat.

.5 Dissimilar metal junctions: use dielectric unions.

.2 Joints:

.1 NPS2 and smaller: threaded.

.2 NPS2 1/2 and larger: butt welded.

.3 Flanges:

.1 Schedule 80 steel pipe NPS2 and smaller: to ASME B16.5, forged steel, raised face and socket welded.

.2 Schedule 80 steel pipe NPS2 1/2 and larger: to ASME B16.5, forged steel, raised face and slip-on or weld neck.

.3 Copper pipe: All copper to iron and flanges shall be brass.

.4 Flexible underground piping up to and including 25mm diameter: Coiled piping in compliance with ANSI/ASTM F1282 and CSA B137.9 with inner and outer walls of HDPE over an aluminum core suitable for direct bury installation. Fittings used for joining of piping shall be nickel plated brass. Fittings shall be protected with a corrosion resistant plating and include double o ring seals. Direct buried fittings shall have a protective heat shrink sleeve to protect the fittings. Protective sleeves shall be used where pipe passes through concrete.

2.6 Ball Valves

.1 50 mm and smaller: Two piece forged brass body with chrome plated forged brass ball, carbon steel handle, 1380 kPa, threaded, full flow design suitable for compressed air application.

.2 65mm and larger: Three piece design or top entry for ease of in-line maintenance.

.1 To ASTM A181/A181M, Class 70, carbon steel body, socket welded or screwed ends, carbon steel ball, and associated trim suitable for compressed air application.

.2 To withstand 1380 kPa maximum pressure.

2.7 Solenoid Valves

.1 Slow closing solenoid valve, forged brass body, Buna "N" disc, stainless steel parts, enclosure to suit environmental conditions, UL and CSA approved, 120 volt. Valve shall be suitable for compressed air use. Low pressure drop for open/close operation.

2.8 Compressed Air Inline Filters and Pressure Regulators

.1 Filters:

.1 Polycarbonate bowl with steel guard, semi-automatic drain, maximum working pressure 1035 kPa. Size to suit piping.

.2 Pressure Regulators:

.1 Compact size with pressure gauge, accurate pressure control with little drift and removable locking push/pull adjusting knob. Maximum working pressure 1035 kPa.

.3 Lubricators:

.1 Polycarbonate bowl with steel guard, mist type, precise oil feed adjustment

.4 Provide all compressed air piping between filter, pressure regulator and lubricator as necessary and all wall mounting brackets as recommended by the manufacturer.

.5 Provide a shut off ball valve upstream of devices.

2.9 Compressed Air Outlets

.1 General:

.1 Body size of all outlets shall be compatible with existing air tools and hoses.

.2 Industrial grade, full bore, quick disconnect type.

.3 Non sparking brass body, brass sleeve, hardened stainless steel balls for locking device, zinc plated steel internal valve, and nitrite (buna N) seal.

.4 Rated for 2067 kPa (300 psi).

.5 Rated for temperature range of –40°C to 120°C.

.6 Submit sample of outlet for review and approval by DCC Representative, before ordering or installation to ensure compatibility, size, and fitting type with existing air tools and hoses.

.2 CA-1:

.1 Wall mounted single non sparking brass quick connect coupler with hardened steel balls, stainless steel springs and Buna-N seals, maximum working pressure 2070 kPa complete with upstream ball valve shut off. Provide drip leg below level of quick connect coupler.

3. EXECUTION

3.1 Manufacturer's Instructions

.1 Compliance: comply with manufacturer's written recommendations or specifications, including product technical bulletins, handling, storage and installation instructions, and datasheet.

3.2 Compressed Air Equipment

.1 Install on vibration isolators on housekeeping pad.

3.3 Oil-Water Separator

.1 Install oil-water separator on housekeeping pad.

.2 Provide drain piping from compressor unit, filters, and air receiver to oil separator.

3.4 Compressed Air Outlets

.1 Provide shut off ball valve for each outlet, unless shown otherwise.

.2 Provide drip legs with shut off valve for each pipe serving outlets that are piped from above outlet level, unless shown otherwise.

3.5 Compressed Air Piping Connections and Installation

.1 Install flexible connection in accordance with Section 23 05 16 - Expansion Fittings and Loops for Mechanical Piping.

.2 Install shut-off ball valves at outlets, major branch lines and in locations as indicated.

.3 Install unions to permit removal or replacement of equipment.

.4 Install tees in lieu of elbows at changes in direction of piping. Install plug in open ends of tees.

.5 Grade piping at 1% slope minimum.

.6 Make branch connections from top of main.

.7 Install compressed air trap at bottom of risers and at all low points in piping. Distance between drain points to be 30m maximum.

3.6 Filters and Inline Desiccant Dryers

.1 Mount on wall in accessible location.

.2 Provide upstream shut off ball valve.

3.7 Field Quality Control

.1 Compressed air system:

.1 Site Tests/Inspection:

.1 Test air outlets to verify that a minimum outlet pressure of 689 kPa (100 psi) can be produced at the most remote outlets.

.2 Test piping for 4 h minimum, to 1100 kPa, with outlets closed and with compressor isolated from system. Pressure drop not to exceed 10 kPa, over test period.

.3 Submit copy of test results to consultant.

.2 Manufacturer's Field Services:

.1 Have manufacturer of products supplied under this Section review work involved in handling, installation/application, protection and cleaning of its product(s), and submit written reports, in acceptable format, to verify compliance of work with Contract.

.2 Provide manufacturer's field services, consisting of product use recommendations and periodic site visits for inspection of product installation, in accordance with manufacturer's instructions.

3.8 Site Commissioning

.1 Provide qualified technical service representatives as necessary to commission the air compressor and system for active service.

.2 Provide all necessary test equipment and materials required to commission the equipment.

.3 Coordinate commissioning and testing services to suit the overall project schedule.

.4 Coordinate and conduct site acceptance testing.

3.9 Cleaning

.1 Cleaning: blow out piping to clean interior thoroughly of oil and foreign matter.

.2 Check entire installation is approved by authority having jurisdiction.

.3 Upon completion and verification of performance of installation, remove surplus materials, excess materials, rubbish, tools, and equipment.

END OF SECTION

THE FOLLOWING ADDENDUM SUPERCEDES INFORMATION CONTAINED IN DRAWINGS AND SPECIFICATIONS ISSUED FOR THE PROJECT TO THE EXTENT REFERENCED. THIS ADDENDUM FORMS PART OF THE TENDER DOCUMENTS AND IS SUBJECT TO ALL OF THE CONDITIONS SET OUT IN THE CONTRACT CONDITIONS.

This electrical addendum contains one (1) page.

Part 1 Specifications

1.1 SECTION 26 05 00 – COMMON WORK RESULTS – ELECTRICAL

.1 Section 1.4.4.12 shall read "Data/Communications systems and Equipment (testing and terminations by Shared Services Canada representative)"

.1 Section 1.5.2 shall read "Termination and testing of communications cables, including supply and installation of accessories not noted in these specifications."

1.2 SECTION 27 05 14 – COMMUNICATIONS CABLES INSIDE BUILDING

.1 Section 1.2.1 shall read: " Supply and installation of a data/communication cabling system, complete with complete with provision and placing of cables. Termination and testing of communication cables will be by Shared Services Canada representative/contractor. Coordinate installation of all cabling with proposed schedule for building occupancy and presence on site by Shared Services Canada representative/contractor. "

.2 Delete section 1.2.3 and 1.2.4.

.3 Section 1.4.2 shall read: " Installed in physical star configuration with separate horizontal and backbone sub-systems. Horizontal cables link work areas to telecommunications closet located on same floor."

.4 Section 2.1.5 shall read:" UTP cabling indicated for telephone shall be Cat *6 rated*. "

.5 Delete section 2.4

.6 Delete section 2.5.

.7 Section 2.8.1 shall read:" The complete end-to-end installation of cables shall meet the industry standard performance parameters for enhanced Category 6 as recommended by CAN/CSA-T529, latest revision. Test parameters shall include: Attenuation, Return Loss, NEXT, Power Sum NEXT, ELNEXT, Power Sum NEXT, ELFEXT, ACR, Power Sum ACR, Propagation Delay, and Delay Skew."

.8 Delete section 2.9.5, 2.9,6 and 2.9.7.

.9 Section 3.1.2 shall read:" Wires and cable shall be as short as practical except that sufficient slack shall be provided to:

.1 Prevent undue stress on cable forms, wires, and connections.

.2 Enable network components to be removed and replaced during servicing without disconnecting other parts.

.3 Facilitate movement of equipment for maintenance purposes."

.10 Section 3.3.2 shall read:" Test communication cables for continuity and accurately label end-to-end."

.11 Delete sections 3.3.3, 3.3.4, 3.3.5, 3.3.6, 3.3.7, 3.3.8, 3.3.9, 3.3.10 and 3.3.11.

END OF ELECTRICAL ADDENDUM NO. 01

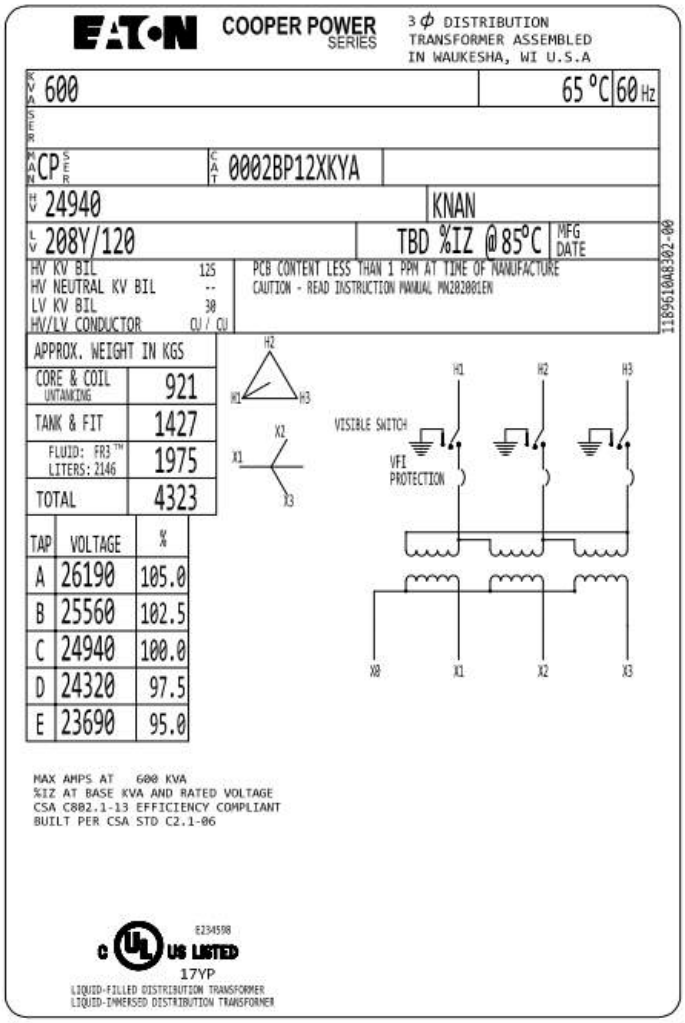
THE FOLLOWING ADDENDUM SUPERCEDES INFORMATION CONTAINED IN DRAWINGS AND SPECIFICATIONS ISSUED FOR THE PROJECT TO THE EXTENT REFERENCED. THIS ADDENDUM FORMS PART OF THE TENDER DOCUMENTS AND IS SUBJECT TO ALL OF THE CONDITIONS SET OUT IN THE CONTRACT CONDITIONS.

This electrical addendum contains one (1) page.

Part 1 Question and Answer

1.1 SECTION 26 05 00 – COMMON WORK RESULTS – ELECTRICAL

.1 Please provide the nameplate information or photo of the nameplate for the existing 25KV PMT

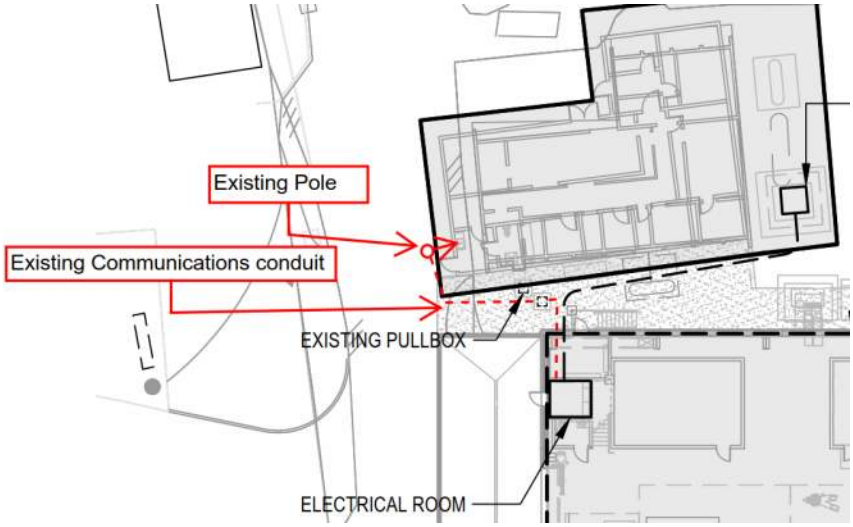


AES Response: See above.

.2 The Fire Alarm connection to the new building is noted as routing through existing ductwork. This location is not shown on the new building plans. It is assumed this conduit has been extended to the location below the fire alarm panel. Please clarify if otherwise.

AES Response: There is communication conduit stubbed to the building location as shown in the drawings. This goes to an existing pullbox and then and existing pole adjacent the Site Services Building. Contractor shall place the fire alarm cabling on this route including up the pole (in existing conduit) and overhead to the Site Services Building. See sketch below. New conduit and cabling is required within the Site Services Building per detail

2/E3.0.



.3 The Cold Room Condensing Unit, Dry Air Compressor & Clean Room air Circulation are not identified on the equipment schedule and noted to 'coordinate requirements during construction'. It is interpreted this equipment will required electrical disconnect and connections, but the control of these units will be by others. Please clarify if otherwise.

AES Response: Control is by others and will be coordinated during construction as required. Provide power connection and disconnects as shown.

END OF ELECTRICAL ADDENDUM NO. 2

THE FOLLOWING ADDENDUM SUPERCEDES INFORMATION CONTAINED IN DRAWINGS AND SPECIFICATIONS ISSUED FOR THE PROJECT TO THE EXTENT REFERENCED. THIS ADDENDUM FORMS PART OF THE TENDER DOCUMENTS AND IS SUBJECT TO ALL OF THE CONDITIONS SET OUT IN THE CONTRACT CONDITIONS.

This electrical addendum contains four (4) pages.

Part 1 Drawings

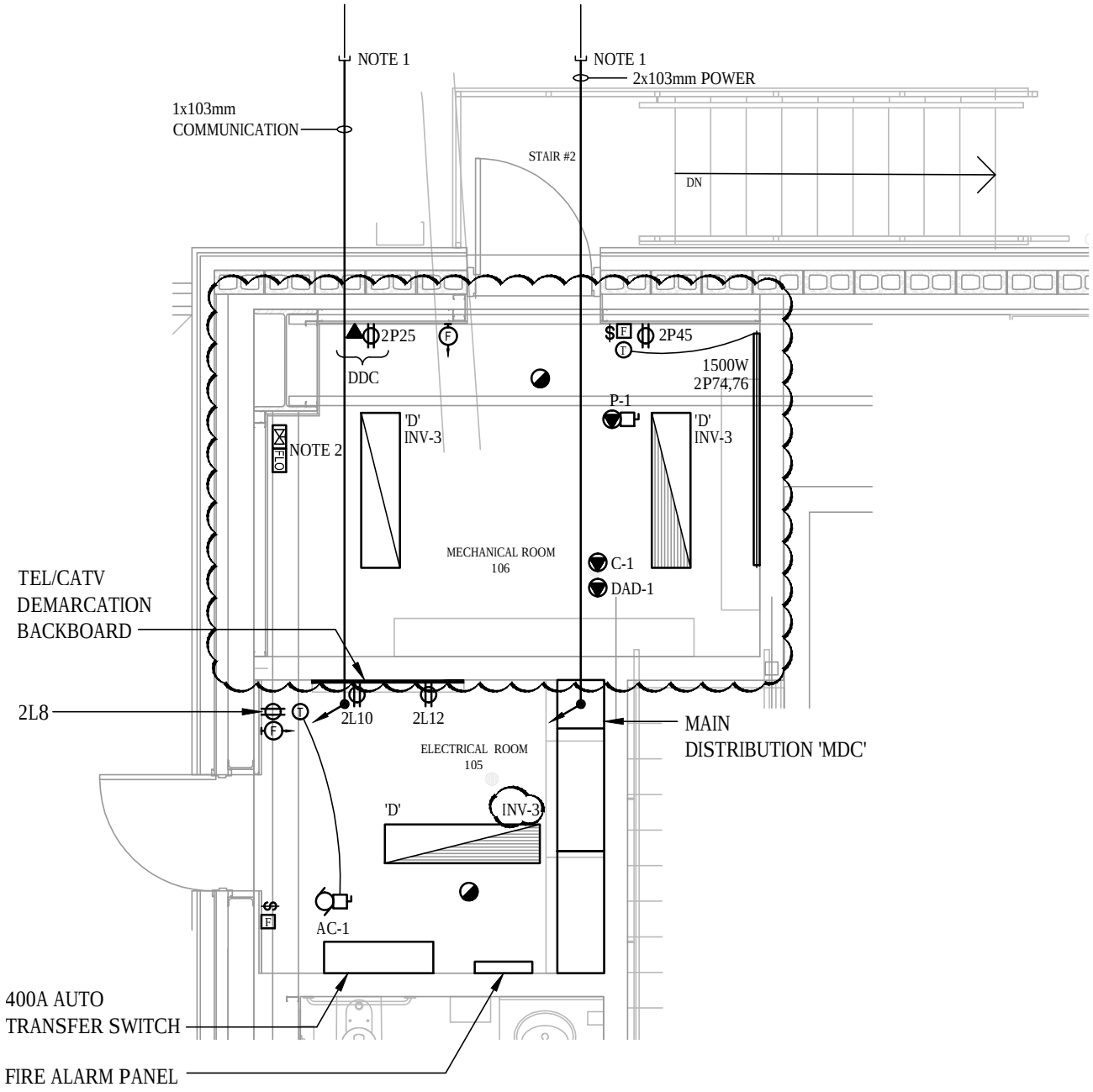
1.1 ALL DRAWING CHANGES NOTED BELOW ARE RELEVANT TO STEEL AND WOOD DESIGNS

.1 Modify Mechanical Room Layout 2/E1.0 as noted in attached ESK-01

.2 Modify Mechanical Equipment Schedule as attached in ESK-02.

.3 Modify Single Line Diagram 1/E3.0 as noted in attached ESK-03

END OF ELECTRICAL ADDENDUM NO. 3



NOTES:

1. EXTEND EXISTING COMMUNICATIONS AND POWER CONDUIT STUBS TO LOCATIONS SHOWN. COORDINATE LOCATIONS ON SITE AND WITH SWITCHBOARD LAYOUTS.

2. CONFIRM LOCATION, QUANTITY AND TYPE OF SPRINKLER DEVICES WITH MECHANICAL DESIGN AND SHOP DRAWINGS. COORDINATE AS REQUIRED.

3. BOND ALL METALLIC PIPING SYSTEMS.

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project

NRC HERZBERG - ASTRONOMY AND ASTROPHYSICS ATP INTEGRATION

drawing title

ELECTRICAL ROOM LAYOUT

designed: IB	scale: 1:50	date: 05/13/2019
drawn: TS	project no.: 1-15-160	
checked: IB	drawing no.: ESK-01	rev.
approved: IB		

MECHANICAL EQUIPMENT SCHEDULE

⏀#	DESCRIPTION	EQUIPMENT LOCATION	LOAD			VOLTS	PHASE	UNIT			STARTER				DISC.			CONTROL					SUPPLY PANEL					WIRE & CONDUIT				NOTE
			MCA	KW	HP			SUPPLY	MOUNT	CONNECT	SUPPLY	MOUNT	CONNECT	TYPE	SUPPLY	MOUNT	CONNECT	SUPPLY	MOUNT	CONNECT	TYPE	FIRE ALARM	PANEL #	PANEL LOCATION	BREAKER AMPS	BREAKER P	BREAKER CCT NO'S	WIRE SIZE	NO.	CONDUIT SIZE (mm)	TOTAL AMPS	
ACH 1a,1b,1c,1d	AIR CURTAIN	OVERHEAD DOOR		0.87		208	1	M	M	E	M	M	E	INT	E	E	E	M	M	M	DDC	N	2P	MEZZANINE	15	2	see schedule	12	2	19	1	4
ACH 2a,2b,2c,2d	AIR CURTAIN	OVERHEAD DOOR		0.87		208	1	M	M	E	M	M	E	INT	E	E	E	M	M	M	DDC	N	2P	MEZZANINE	15	2	see schedule	12	2	19	1	4
AC-1	AIR CONDITIONING INDOOR UNIT	ELECTRICAL ROOM	1.0			208	1	M	M	E	M	M	E	INT	E	E	E	M	M	M	INT	N				2		12	2	19	1	2
CU-1	AIR CONDITIONING OUTDOOR UNIT	EXTERIOR	18.0			208	1	M	M	E	M	M	E	INT	E	E	E	M	M	M	INT	N	2P	MEZZANINE	30	2	9,11	10	2	19	13	2
AHU-1	AIR HANDLING UNIT	MECHANICAL ROOM	29.0			208	3	M	M	E	M	M	E	INT	E	E	E	M	M	M	DDC	N	MDC	ELECTRICAL ROOM	40	3	-	6	4	27	30	
AHU-2	AIR HANDLING UNIT	MECHANICAL ROOM	29.0			208	3	M	M	E	M	M	E	INT	E	E	E	M	M	M	DDC	N	MDC	ELECTRICAL ROOM	40	3	-	6	4	27	30	
AHU-3	AIR HANDLING UNIT	MECHANICAL ROOM	29.0			208	3	M	M	E	M	M	E	INT	E	E	E	M	M	M	DDC	N	MDC	ELECTRICAL ROOM	40	3	-	6	4	27	30	
DHWT-1	DOMESTIC HOT WATER TANK	W/C ROOF			FR	120	1	M	M	E	M	M	E	INT	E	E	E	M	M	M	INT	N	2P	MEZZANINE	15	1	19	12	2	19	5	
EF-1	EXHAUST FAN	W/C			FR	120	1	M	M	E	E	E	E	TS	E	E	E	M	M	M	SW	N	2P	MEZZANINE	15	1	13	12	2	19	2	6
EF-2	EXHAUST FAN	W/C			FR	120	1	M	M	E	E	E	E	TS	E	E	E	M	M	M	SW	N	2P	MEZZANINE	15	1	13	12	2	19	2	6
CF-1-8	CEILING FAN	OVERHEAD			1.0	208	3	M	M	E	M	M	E	VFD	E	E	E	M	M	M	DDC	N	2PA	MEZZANINE	15	3	see schedule	12	3	19	-	3
P-1	DOMESTIC RECIRCULATION PUMP	MECHANICAL ROOM		0.12		120	1	M	M	E	M	M	E	INT	E	E	E	M	M	M	INT	N	2P	MEZZANINE	15	1	66	12	2	19	2	
C-1	AIR COMPRESSOR	MECHANICAL ROOM			7.5	208	3	M	M	E	M	M	E	INT	E	E	E	M	M	M	INT	N	MDC	ELECTRICAL ROOM	50	3	-	6	4	53	30	7
DAD-1	AIR DRYER	MECHANICAL ROOM	12			120	1	M	M	E	M	M	E	INT	E	E	E	M	M	M	INT	N	MDC	ELECTRICAL ROOM	20	1	-	12	2	19	12	7

LEGEND

M	=	DENOTES BY MECHANICAL CONTRACTOR	DDC	=	CONTROLLED BY DDC SYSTEM
E	=	DENOTES BY ELECTRICAL CONTRACTOR	VFD	=	VARIABLE FREQUENCY DRIVE
N	=	NO	SW	=	H.P. RATED SWITCH
TS	=	TIMER SWITCH	PS	=	PRESSURE SWITCH
HOA	=	MAGNETIC STARTER WITH HAND-OFF-AUTO SELECTOR	INT	=	INTEGRAL WITH UNIT

NOTES

1. PROVIDE FULL SIZE, DEDICATED COPPER GROUND TO VFD.
2. CONTROL INTERCONNECTION BY MECHANICAL.
3. ALL CF FAN CONTROLLED BY COMMON CONTROLS FROM MECHANICAL (8 IN TOTAL)
4. INTERLOCK WITH OVERHEAD DOORS. QUANTITY OF FOUR UNITS.
5. INCLUDE MECHANICAL DRAWINGS, AND ANY WORK CALLED FOR BY ELECTRICAL, IN THIS CONTRACTS SCOPE OF WORK.
6. INTERLOCK WITH WASHROOM LIGHT.
7. CONFIRM ACTUAL BREAKER AND CONDUCTOR SIZING WITH SHOP DRAWINGS AND ADJUST SIZING AS REQUIRED.

seal

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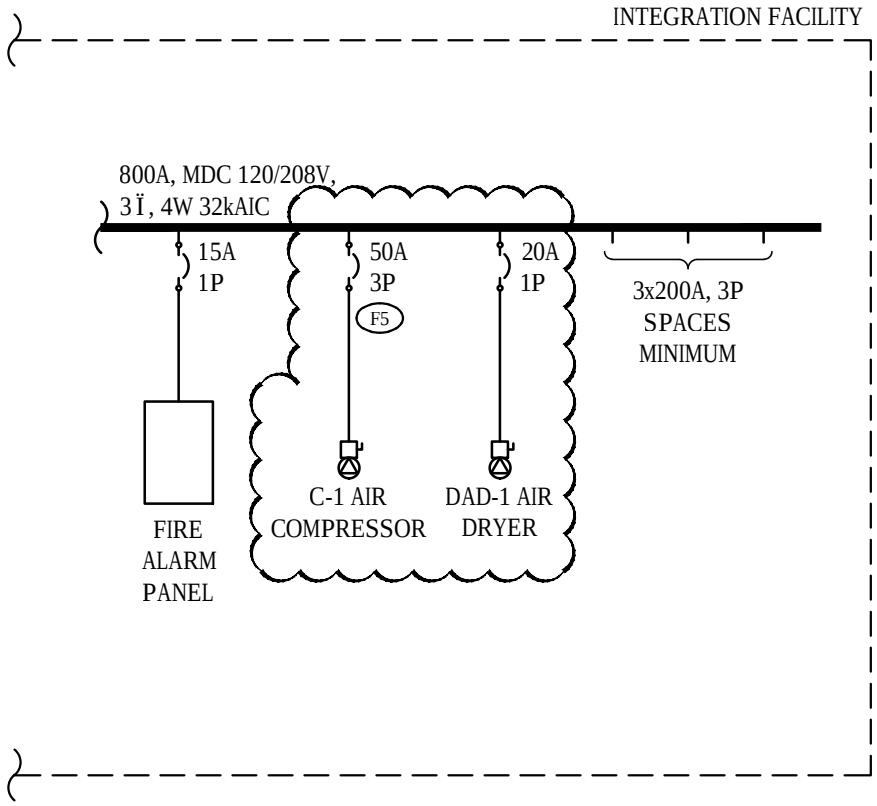
project

NRC HERZBERG - ASTRONOMY AND ASTROPHYSICS ATP INTEGRATION

drawing title

MECHANICAL SCHEDULE

designed IB	scale AS NOTED	date 05/13/2019
drawn TS	project no. 1-15-160	
checked IB	drawing no. ESK-02	rev.
approved		



FEEDER SCHEDULE

F5 4 x #2Cu. + GND IN 53mm C.

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drawing title
PARTIAL SINGLE LINE DIAGRAM

designed IB	scale 1:50	date 05/13/2019	
drawn TS	project no. 1-15-160		
checked IB	drawing no. ESK-03		rev.
approved IB			