


Wiring Diagrams

Drawing	Date	Revision
Cover Page	1/1/2001	
Room Layout 1 through	1/1/2001	
Room Layout 179	1/1/2001	
Wire Detail 1 through	1/1/2001	
Wire Detail 8	1/1/2001	
Network Riser 1	1/1/2001	
VNTG_CABLE1	1/1/2001	
VNTG_CABLE2	1/1/2001	
All Room Layouts	1/1/2001	
All Network Risers	1/1/2001	

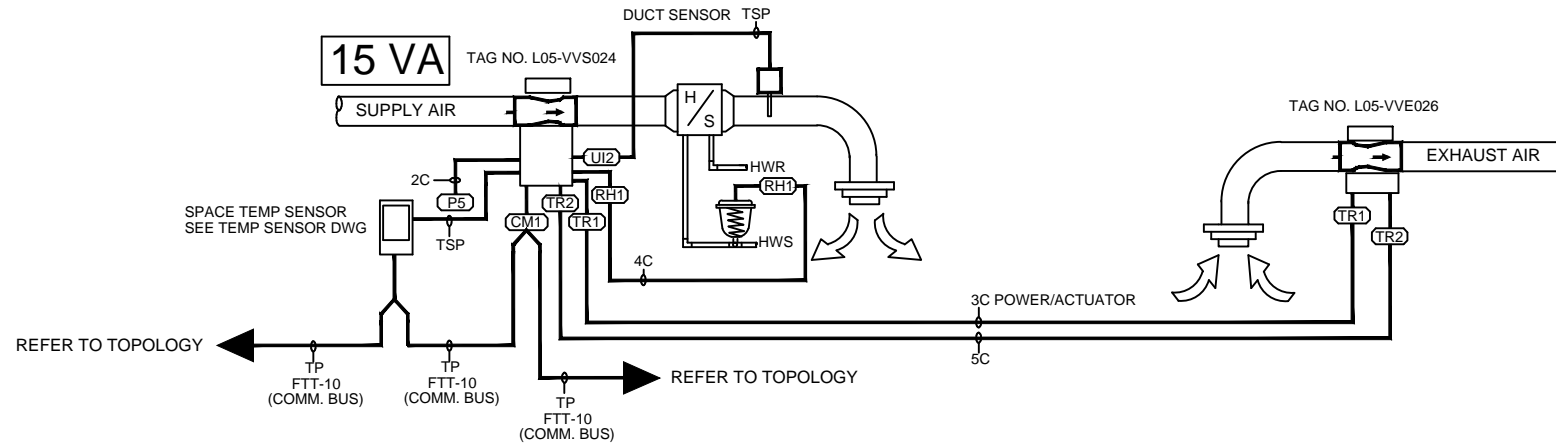
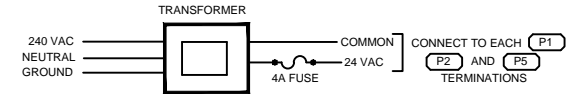
Phoenix Controls System Details and Wiring Diagrams for:

Job Name

ACKNOWLEDGEMENTS				Phoenix Controls 	75 Discovery Way Acton, MA 01720 Ph +1 978-795-1285 Level 9, 316 Adelaide St Brisbane City, QLD, 4000 Ph 07 3831 8641
REVISIONS			DATE: 01/01/2001		
SYM	DATE	APP'D	DRAWN BY:		
			John Penny		
			APPROVED BY:		
SCALE: NONE			Job Name		
				DWG.:	Cover Page

ROOM(S): 5-39

All valves require 150 - 750 Pa of differential pressure to operate



SYMBOL KEY / WIRING LEGEND

WIRE COLOR	PIN NO.
WHITE	1
ORANGE	2
BLACK	3
RED	4
GREEN	5
YELLOW	6
BLUE	7
BROWN	8

REQUIRED COLOR CODE

ROOM LEVEL NOTES:

1. All valves are medium pressure and require a minimum of 150 Pa of differential pressure
2. Time of day changeover will be through through a time of day signal sent by the BMS
3. Refer to the Room Schedule Sheet (RSS) for airflows and valve orientation
4. Refer to C2 Cable and Transformer sheet for specifications and alternates
5. Refer to Wiring and Fume Hood Detail sheets for wiring terminations

ACKNOWLEDGEMENTS

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PHX. TOOLS REV 6			

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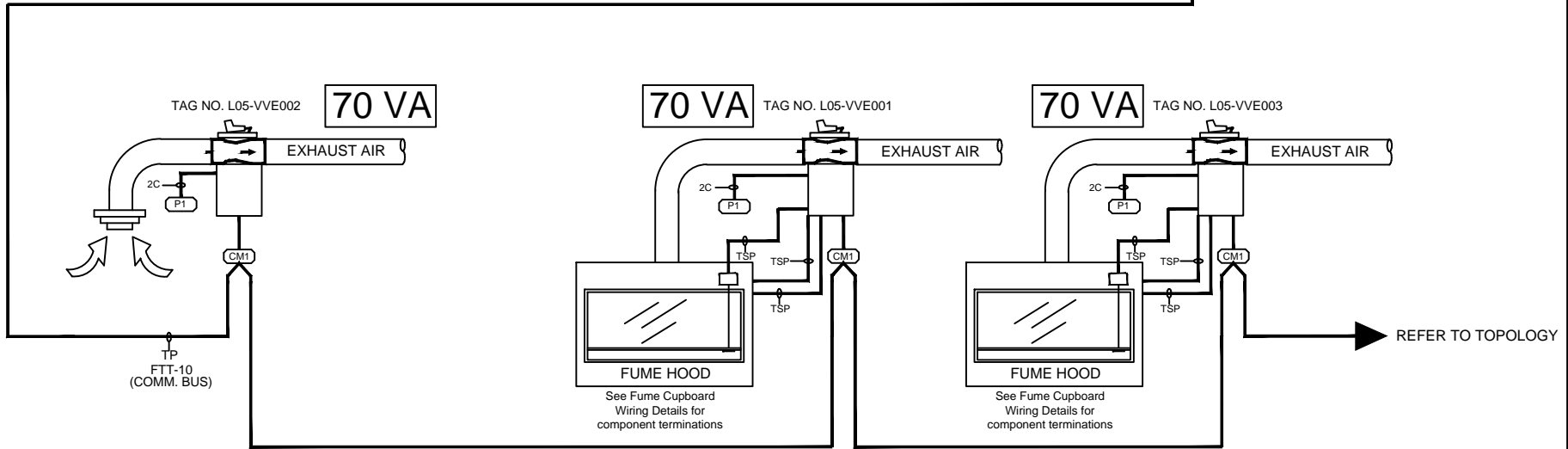
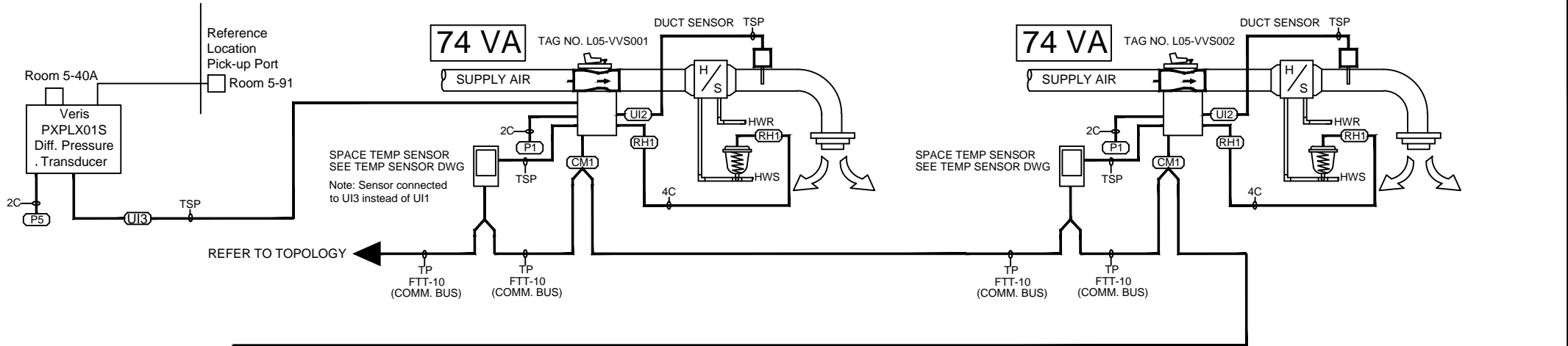
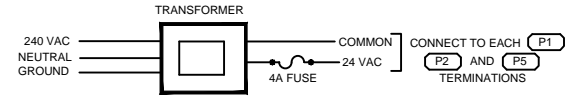
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DWG.:
Room Layout 1

= CABLE PROVIDED BY FACTORY
 = CABLE PROVIDED BY OTHERS
 x = # OF CONDUCTORS

ROOM(S): 5-40A

All valves require 150 - 750 Pa of differential pressure to operate



SYMBOL KEY / WIRING LEGEND

WIRE COLOR	PIN NO.
WHITE	1
ORANGE	2
BLACK	3
RED	4
GREEN	5
YELLOW	6
BLUE	7
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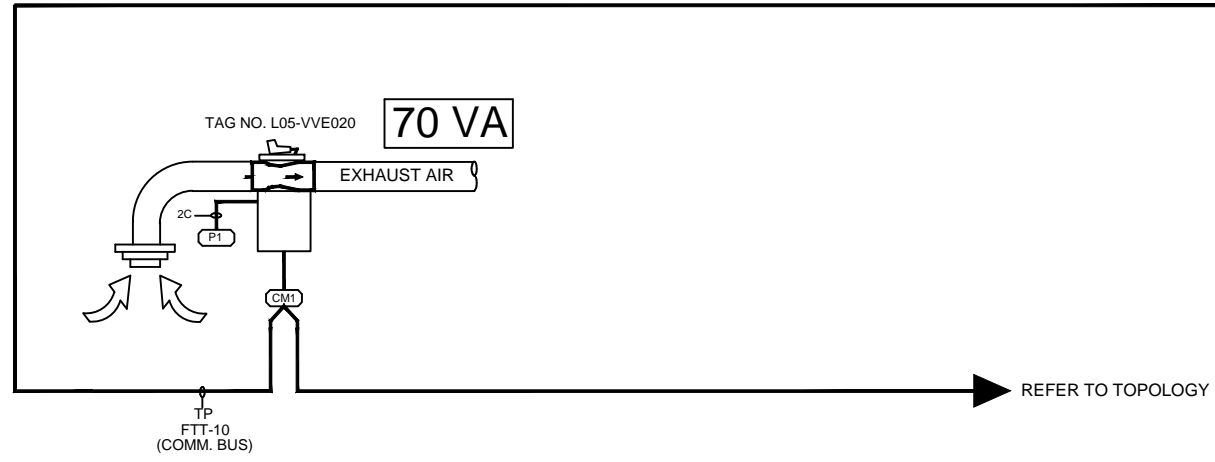
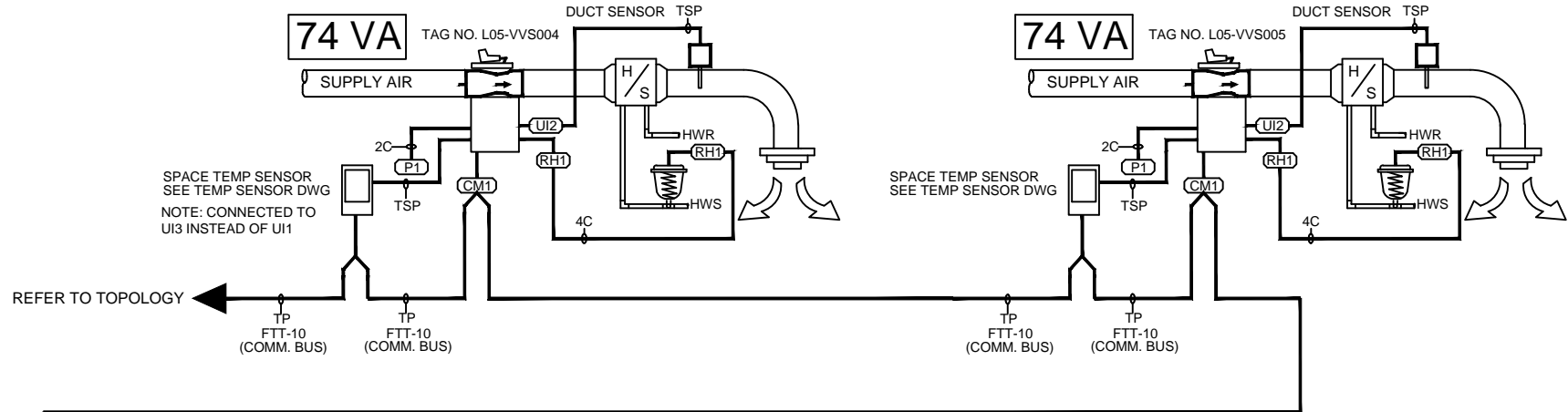
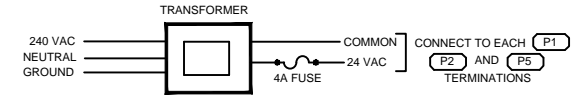
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Job Name

DWG.:
Room Layout 2.1

ROOM(S): 5-40A (continued)

All valves require 150 - 750 Pa of differential pressure to operate



SYMBOL KEY / WIRING LEGEND

WIRE COLOR	PIN NO.
WHITE	1
ORANGE	2
BLACK	3
RED	4
GREEN	5
YELLOW	6
BLUE	7
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REQUIRED COLOR CODE

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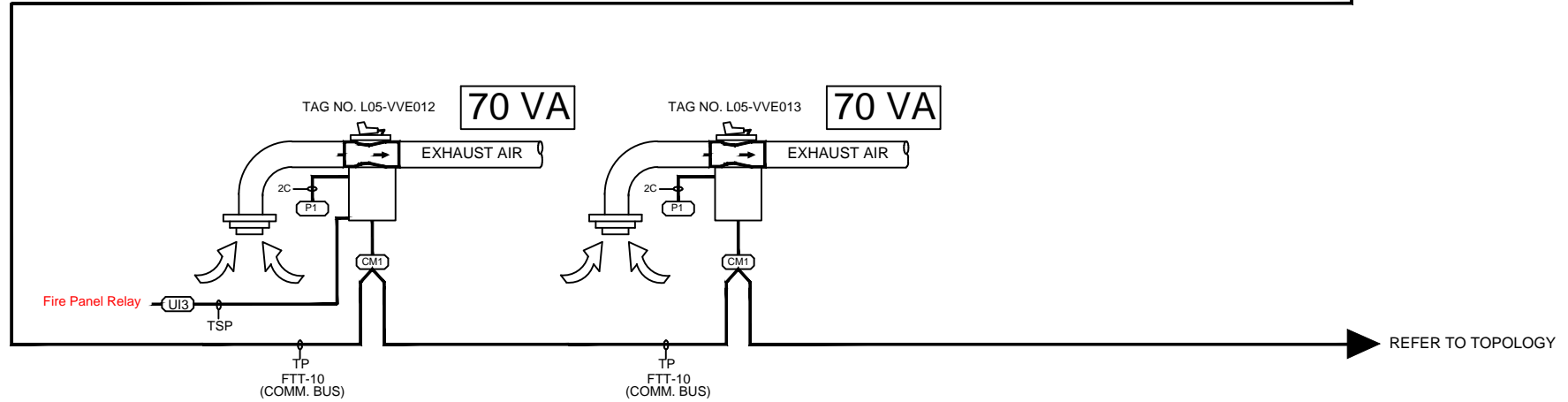
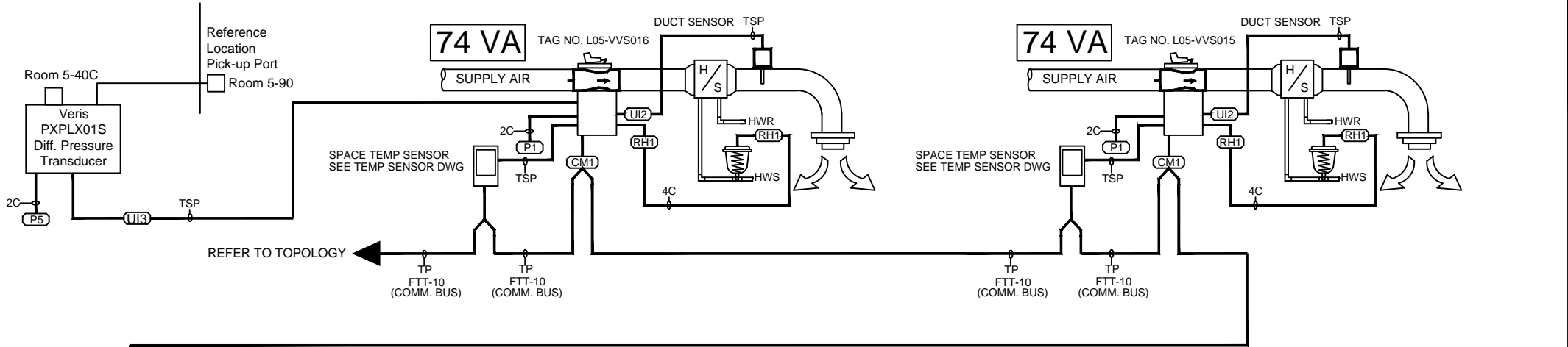
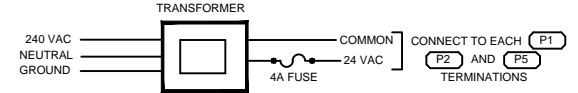
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DWG.:
Room Layout 2.2

ROOM(S): 5-40B/5-40C/5-53

All valves require 150 - 750 Pa of differential pressure to operate



SYMBOL KEY / WIRING LEGEND

ROOM LEVEL NOTES:

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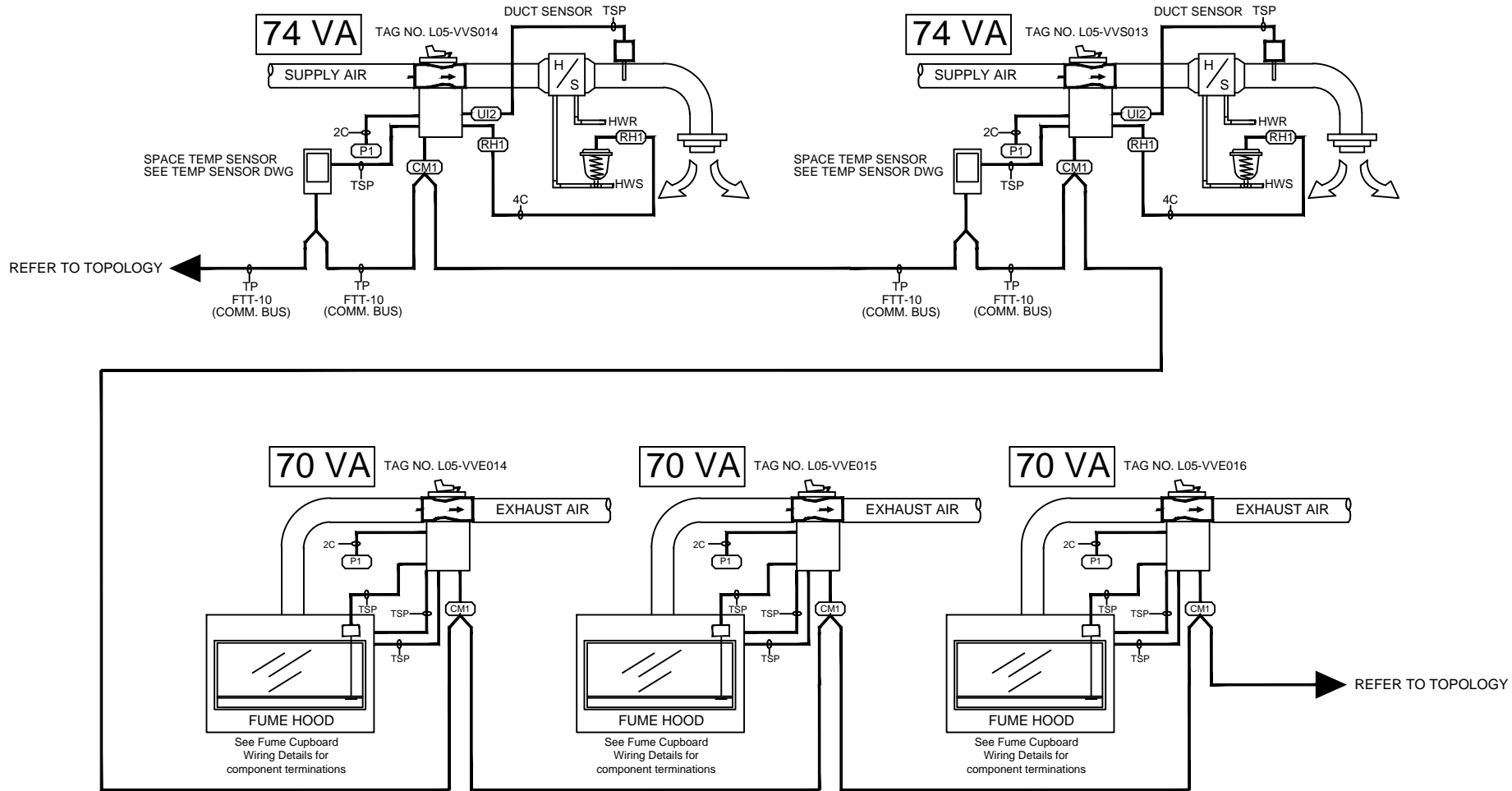
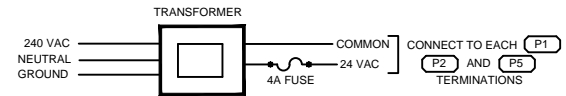
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Job Name

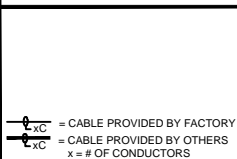
DWG.:
Room Layout 3.1

ROOM(S): 5-40B/5-40C/5-53 (continued)

All valves require 150 - 750 Pa of differential pressure to operate



SYMBOL KEY / WIRING LEGEND



WIRE COLOR	PIN NO.
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SCALE: NONE			Job Name
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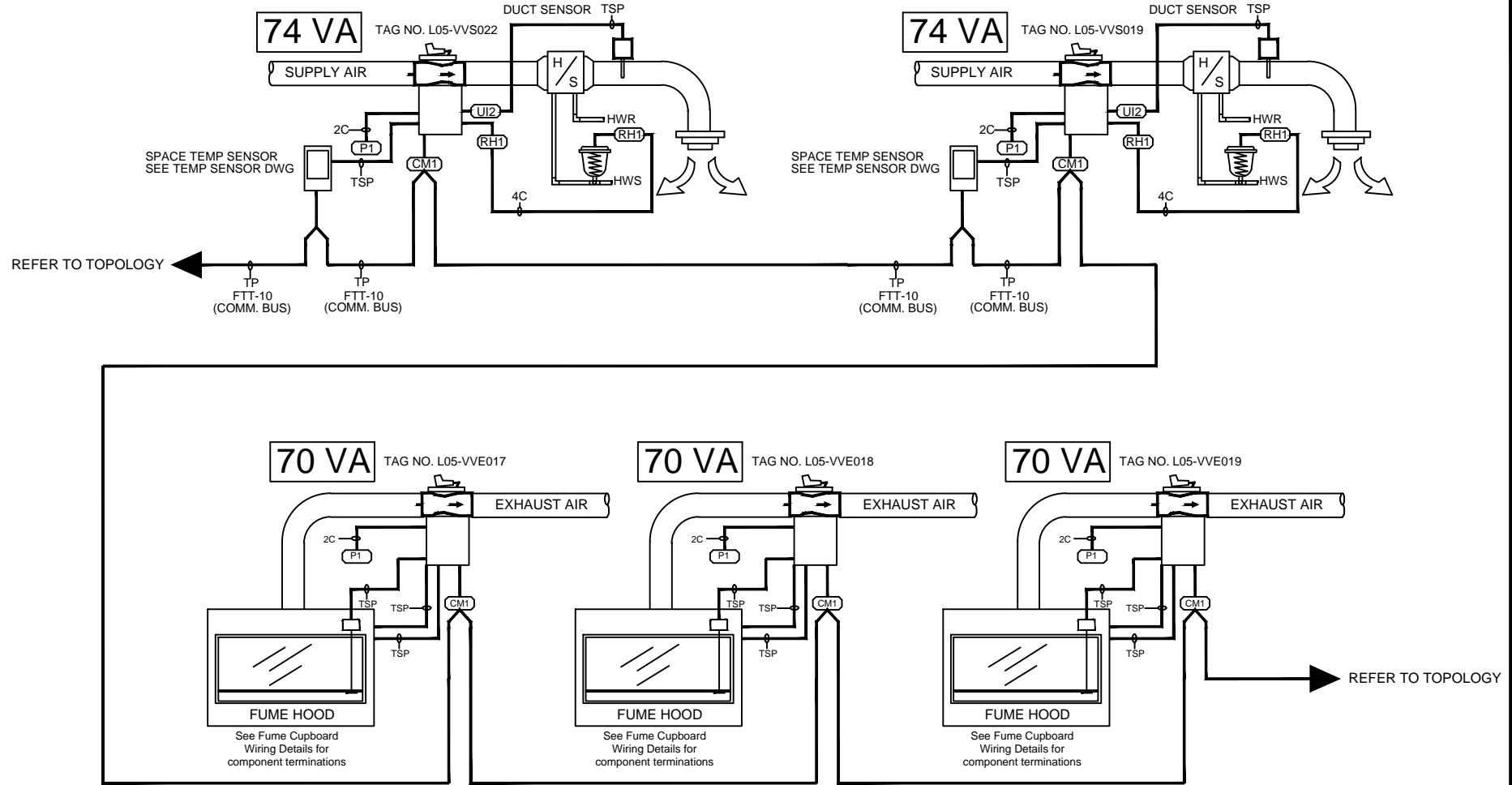
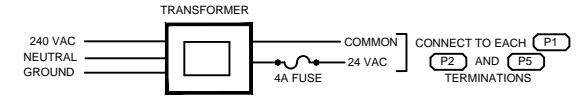
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DWG.:
Room Layout 3.2

ROOM(S): 5-40B/5-40C/5-53 (continued)

All valves require 150 - 750 Pa of differential pressure to operate



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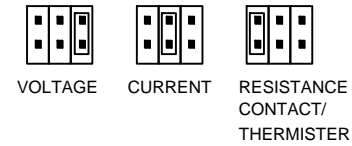
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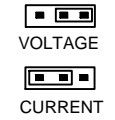
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Job Name _____ DWG.: Room Layout 3.3

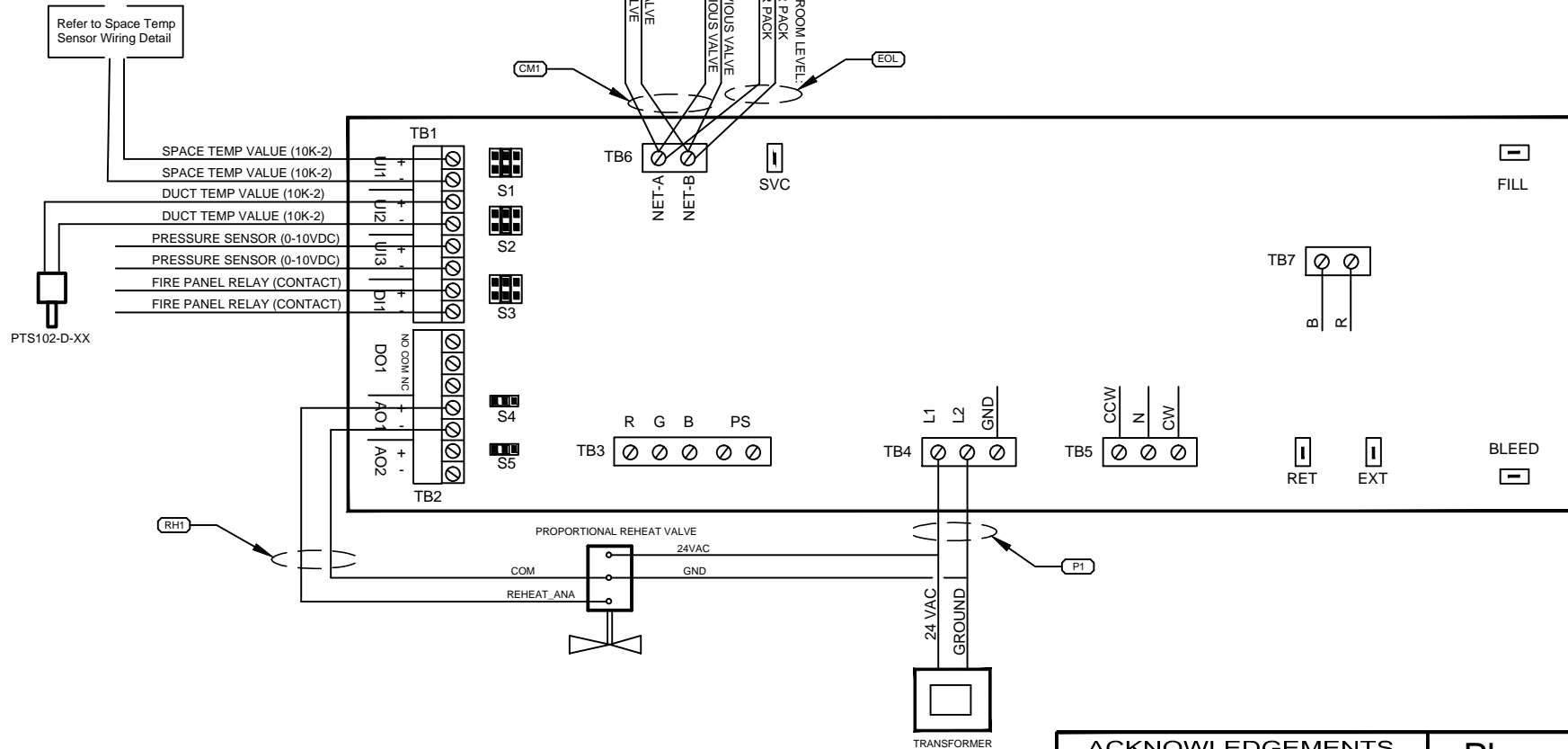
JUMPER CONFIGURATION FOR UI 1, 2 AND 3



JUMPER CONFIGURATION FOR AO1 AND AO2



SUPPLY VALVES ONLY:
MOVE JUMPERS S1 & S2 TO
POSITION CLOSEST TO TB1



* Not all valves will require the
Inputs/Outputs shown. See Room
Layouts for actual equipment.

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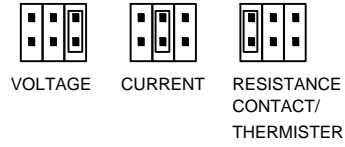
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PHX. TOOLS REV 6

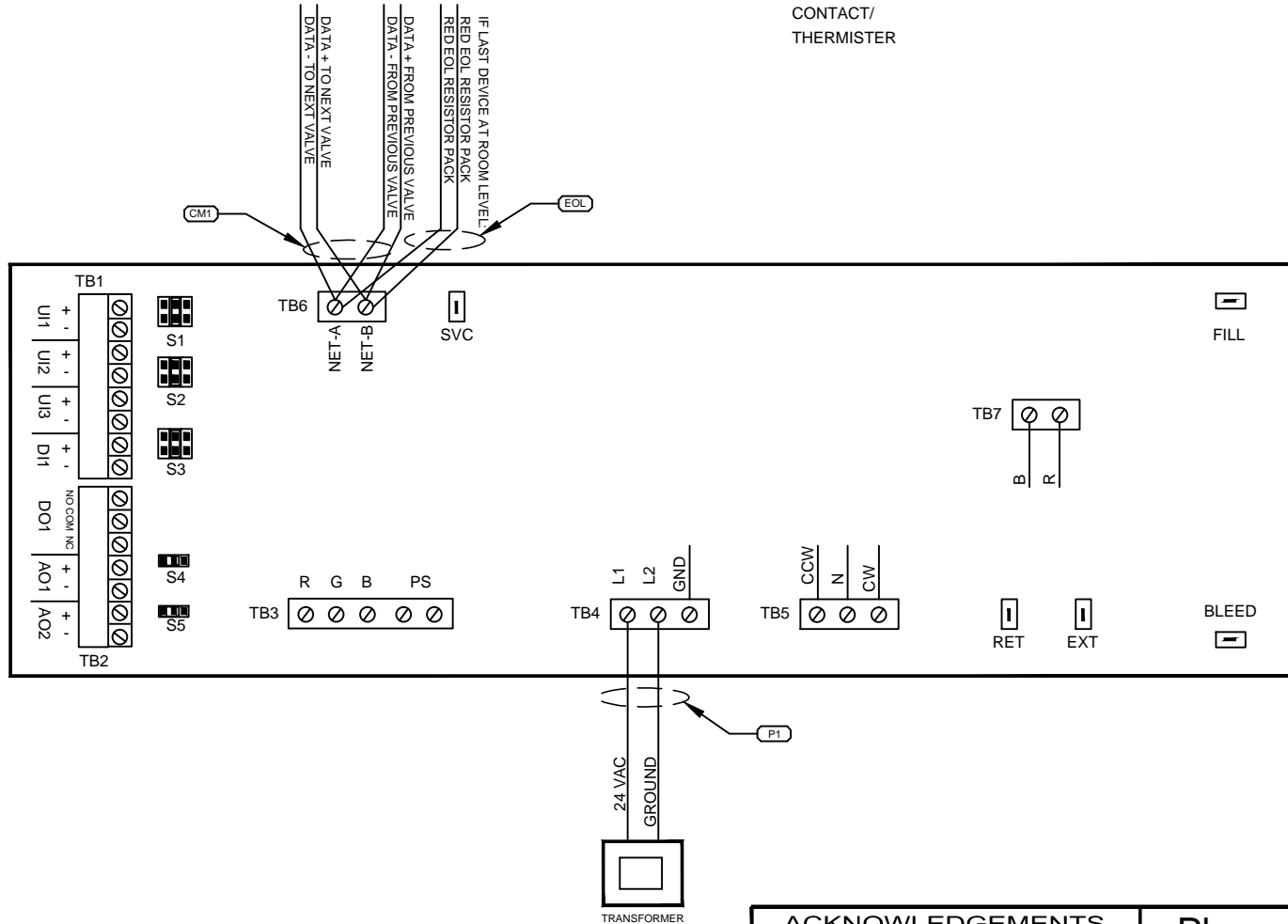
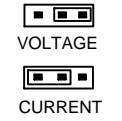
C2 SUPPLY CONTROLLER BOARD

DWG.:
Wire Detail 1

JUMPER CONFIGURATION FOR UI 1, 2 AND 3



JUMPER CONFIGURATION FOR AO1 AND AO2



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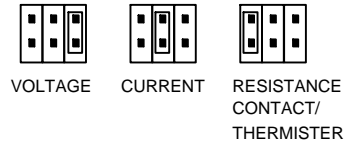
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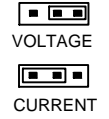
SCALE: NONE
PHX. TOOLS REV 6 **C2 GEX CONTROLLER BOARD**

DWG.:
Wire Detail 2

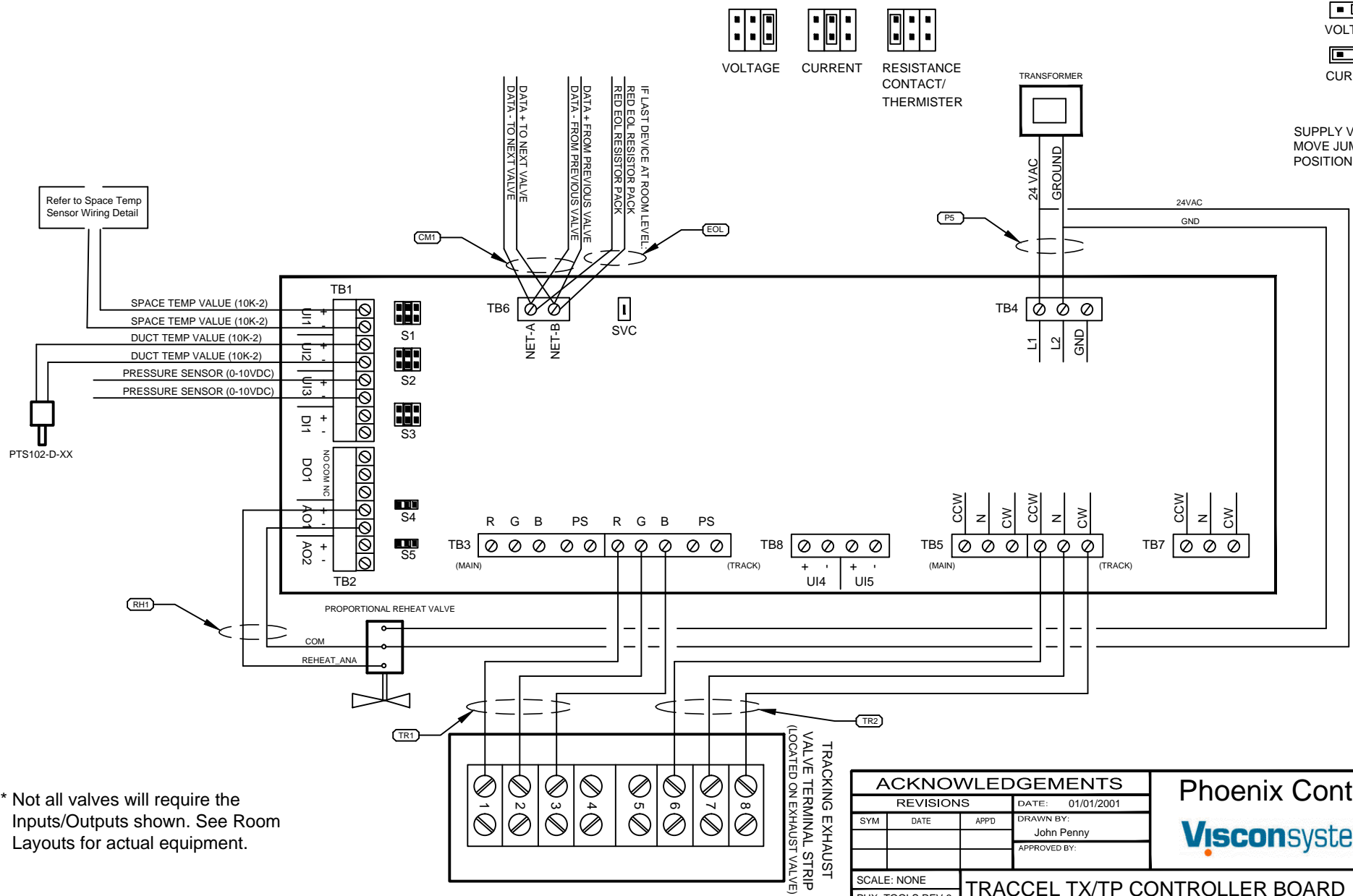
JUMPER CONFIGURATION FOR UI 1, 2 AND 3



JUMPER CONFIGURATION FOR AO1 AND AO2



SUPPLY VALVES ONLY:
MOVE JUMPERS S1 & S2 TO
POSITION CLOSEST TO TB1



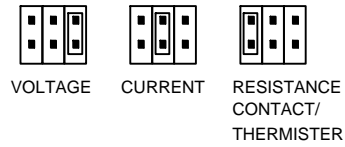
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			APPROVED BY:
SCALE: NONE		TRACCEL TX/TP CONTROLLER BOARD	
PHX. TOOLS REV 6		DWG.: Wire Detail 3	

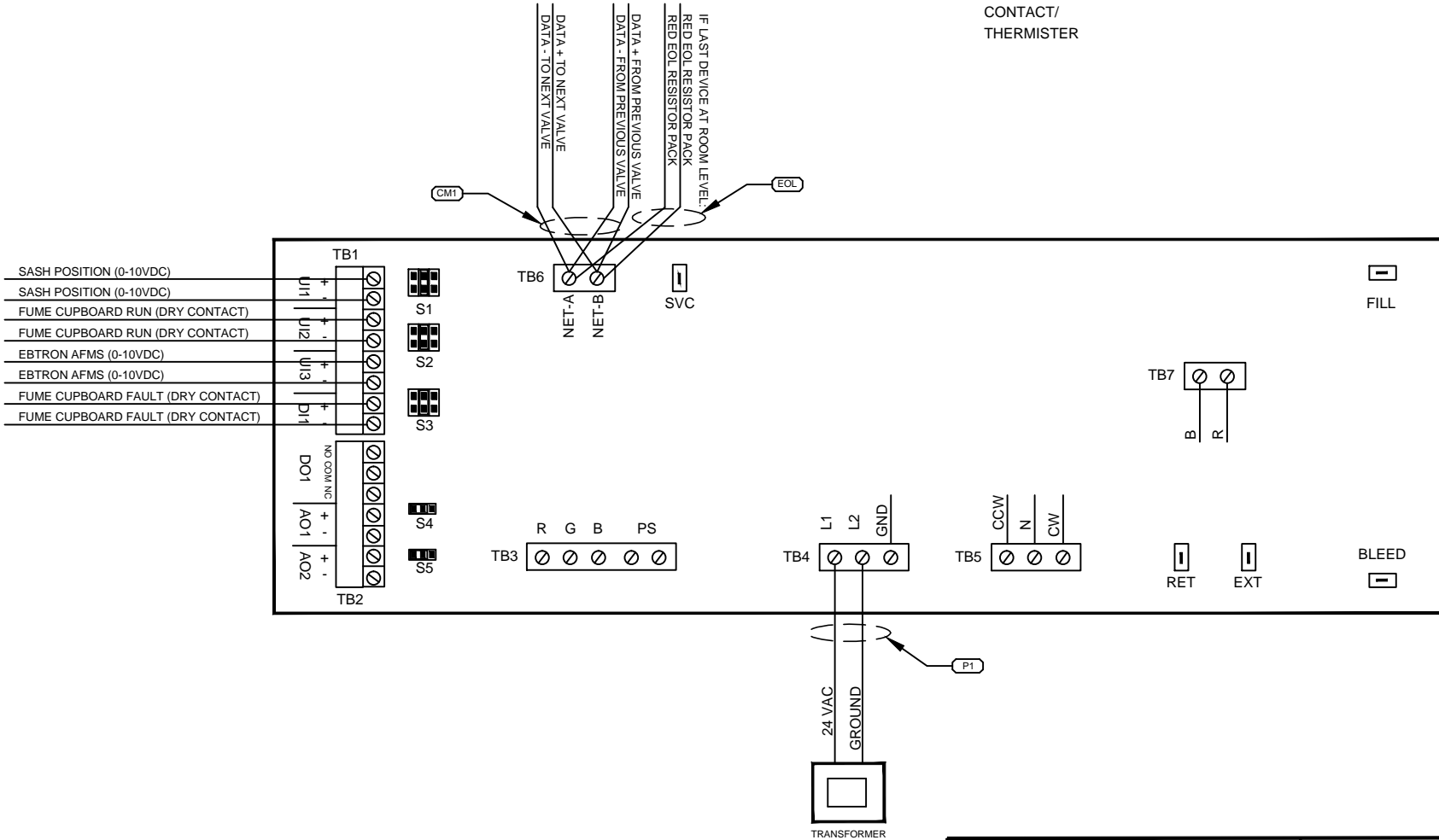
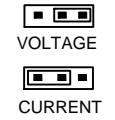
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JUMPER CONFIGURATION FOR UI 1, 2 AND 3



JUMPER CONFIGURATION FOR AO1 AND AO2



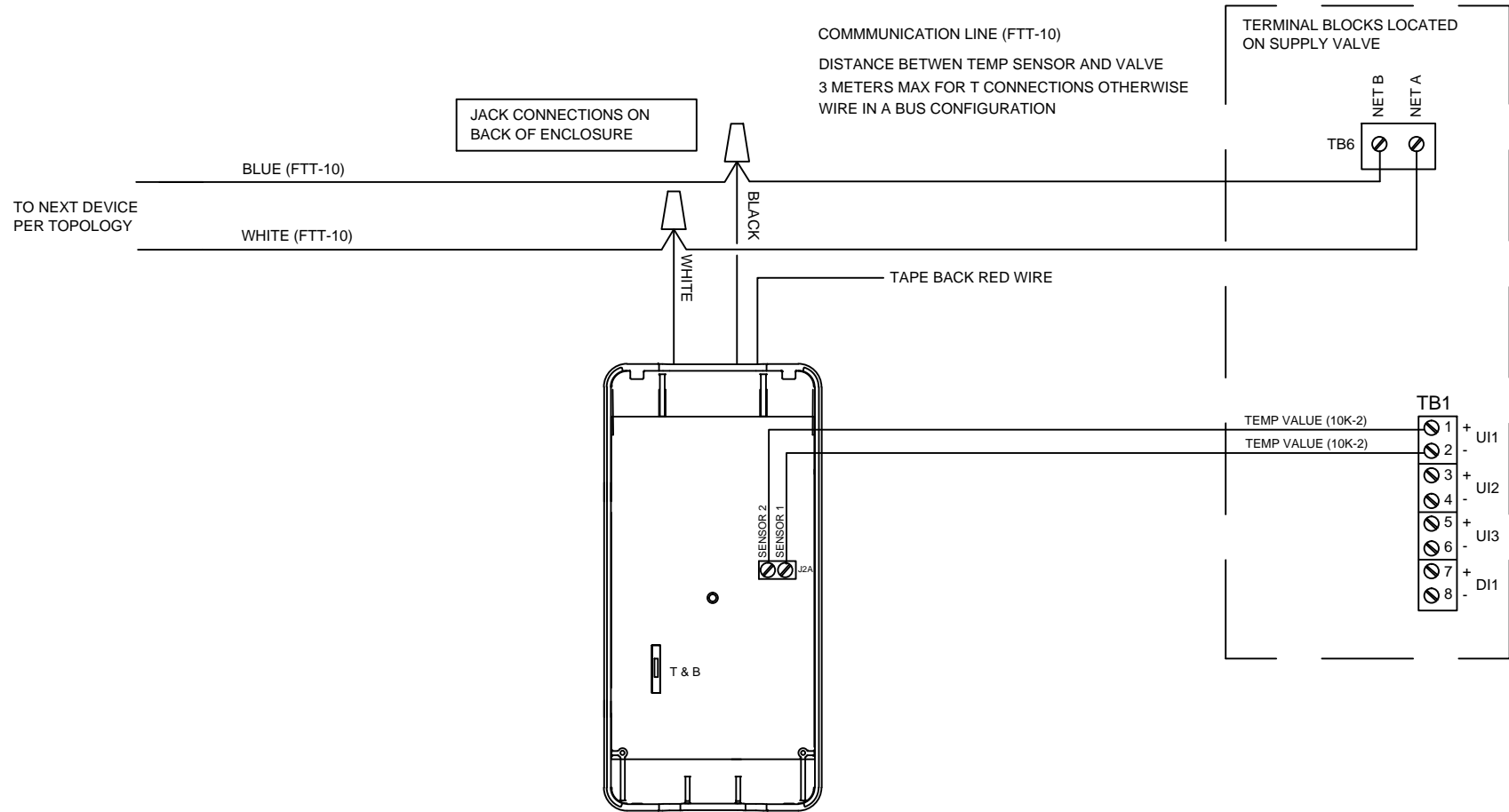
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			APPROVED BY:
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PHX. TOOLS REV 6			

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DWG.:
Wire Detail 4



PTS300-P

1. PHOENIX CONTROLS DOES NOT RECOMMEND WIRING THE SENSOR WITH POWER APPLIED AS ACCIDENTAL ARCING
MAY DAMAGE THE PRODUCT AND WILL VOID THE WARRANTY.

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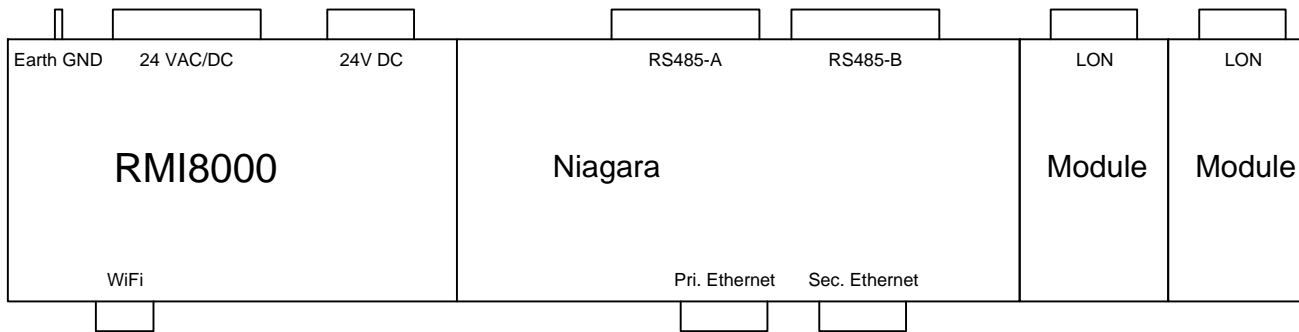
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SCALE: NONE
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Room Temperature Sensor

DWG.:
Wire Detail 5

Phoenix Controls Room Integrator



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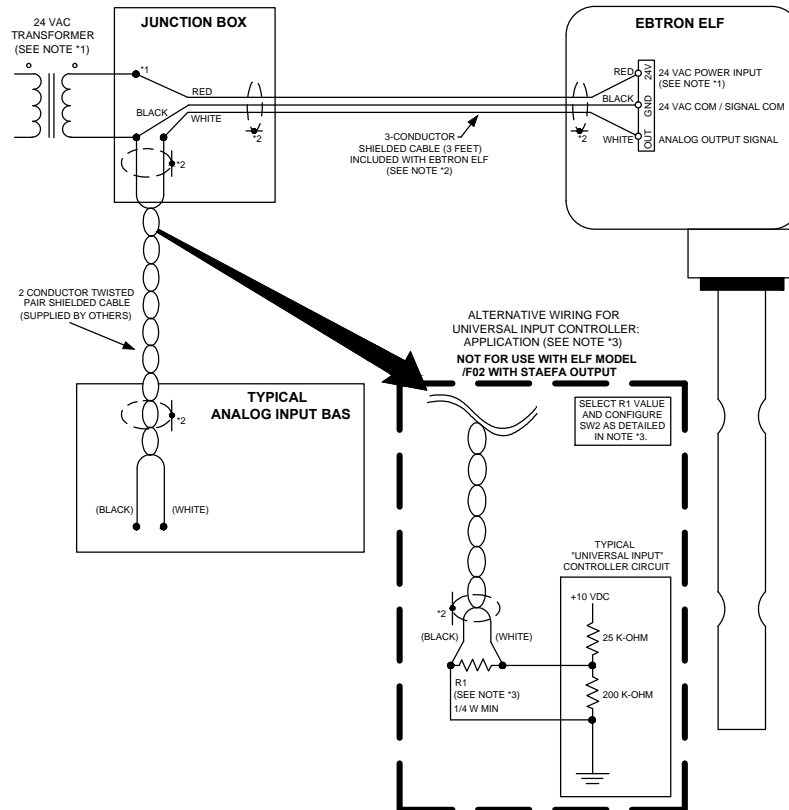
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SCALE: NONE
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Room Integrator

DWG.:
 Wire Detail 6

ELF STANDARD SINGLE ANALOG OUTPUT(F SERIES) Power and Signal Wiring Interconnections



*** NOTES:**

- *1. THE 24 VAC COMMON AND ELF ANALOG OUTPUT SIGNAL COMMON ARE SHARED. THEREFORE, ON MULTIPLE ELF INSTALLATIONS, ENSURE THAT ALL TRANSMITTERS ARE WIRED TO THE SAME TERMINALS ON THE 24 VAC POWER SOURCE.
- *2. CONNECT CABLE DRAINS TO EARTH GROUND AT ONE END OF EACH CABLE ONLY.
- *3. FOR ELF STANDARD MODELS WITH /F00, /F01, /F03 and /F04 SUFFIX (NOT FOR /F02) UNIVERSAL INPUT CONTROLLER APPLICATIONS WITH PULL-UP RESISTORS, RESISTOR R1 MUST BE CONNECTED ACROSS THE CONTROLLER'S ANALOG INPUTS AS SHOWN. SELECT R1 VALUE AS FOLLOWS:
**FOR STANDARD ELF /F00 AND /F03 VERSIONS, SET SW2 ON (FOR 2-10VDC OUTPUT), AND SELECT R1=500 OHMS.
 FOR ELF /F01 AND /F04 VERSIONS, SET SW2 ON (FOR 1-5VDC OUTPUT) AND SELECT R1=250 OHMS.**



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 TEL: 843 756-1828 FAX: (843)756-1838 www.ebtron.com

ACKNOWLEDGEMENTS			
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DWG.:
 Wire Detail 7

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TABLE 1: CABLE SPECIFICATIONS & ALTERNATES

CABLE TYPE	PLENUM RATED	FUNCTION	WIRE GAUGE (AWG)	VENDOR & PART NUMBER		COLOR CODE (n = CONDUCTOR / PAIR #)	NOTES
				PRIMARY	ALTERNATE		
2C ROUND (NON-SHIELDED)	NO	24 VAC POWER (110 FT MAX)	14 ^A	BELDEN 9411		1: RED 2: BLACK	MUST BE STRANDED
			18 ^B	BELDEN 9409			
TSP ROUND	YES	CONTROL	22	BELDEN 9501		1: RED 2: BLACK	MUST BE STRANDED
3C ROUND (NON-SHIELDED)	NO	CONTROL	22	BELDEN 8443		1: RED 3: GREEN 2: BLACK	MUST BE STRANDED
3C ROUND (NON-SHIELDED)	YES	CONTROL	22	BELDEN 88444	WINDY CITY 004380	1: RED 3: GREEN 2: BLACK	MUST BE STRANDED
4C ROUND (NON-SHIELDED)	NO	CONTROL	22	BELDEN 8444	MANHATTAN MI3304	1: WHITE 3: BLACK 2: GREEN 4: RED	MUST BE STRANDED
5C ROUND (NON-SHIELDED)	NO	CONTROL	22	BELDEN 8445	MANHATTAN MI3305	1: WHITE 4: RED 2: BROWN 5: GREEN 3: BLACK	MUST BE STRANDED
8C ROUND (NON-SHIELDED)	NO	CONTROL	22	BELDEN 9421	MANHATTAN MI3308	1: WHITE 5: GREEN 2: ORANGE 6: YELLOW 3: BLACK 7: BLUE 4: RED 8: BROWN	NO SUBSTITUTES
8C ROUND (NON-SHIELDED)	YES	CONTROL	22	COMTRAN 4956		1: WHITE 5: GREEN 2: ORANGE 6: YELLOW 3: BLACK 7: BLUE 4: RED 8: BROWN	NO SUBSTITUTES
CAT 5/5E/6/6A (8C IP NON-SHIELDED, TYPICAL, OR SHIELDED)	YES/NO	BACNET IP / ETHERNET (328 FT MAX)	C 23	SEE CAT 5, 5E, 6 OR 6A CABLE REQUIREMENTS (ANSI/TIA-568-C)		PAIR 1: GREEN WHITE/GREEN PAIR 2: ORANGE WHITE/ORANGE PAIR 3: BLUE WHITE/BLUE PAIR 4: BROWN WHITE/BROWN	THE USE OF NON-PLENUM RATED CABLE MAY REQUIRE CONDUIT. CONSULT LOCAL CODES.
TP (NON-SHIELDED)	NO	FTT-10 (4,500 FT MAX)	22	WINDY CITY 107500 SMARTWIRE.COM		1: WHITE W/BBLUE STRIPE 2: BLUE W/WHITE STRIPE	FOR ALTERNATES SEE: www.echelon.com
		FTT-10 (8,800 FT MAX)	16	WINDY CITY 109600 SMARTWIRE.COM			
TP (NON-SHIELDED)	YES	FTT-10 (4,500 FT MAX)	22	WINDY CITY 105500-S= SPOOL OR B=BOX	CONNECT AIR W221P-2001B	1: WHITE W/BBLUE STRIPE 2: BLUE W/WHITE STRIPE	
		FTT-10 (8,800 FT MAX)	16	WINDY CITY 109500 SMARTWIRE.COM			

- [A] HIGH-SPEED ELECTRIC VALVE POWER:
 (1) MUST BE WIRED IN A HOME-RUN CONFIGURATION.
 (2) FOR LOADS UP TO 96 VA USE A DEDICATED 14 AWG CABLE WITH A MAXIMUM LENGTH OF 110 FT (33m) BETWEEN THE TRANSFORMER AND THE VALVE.
 (3) NO OTHER VALVES CAN BE DAISY-CHAINED FROM THIS POWER; BUS CONFIGURATIONS ARE NOT ALLOWED BETWEEN HIGH-SPEED VALVES.
- [B] LOW-SPEED ELECTRIC & PNEUMATIC VALVE POWER AND ALL OTHER PHOENIX CONTROLS 24 VAC DEVICES:
 (1) CAN BE WIRED IN A BUS CONFIGURATION, EXCEPT FOR DEVICES THAT REQUIRE A DEDICATED TRANSFORMER (SEE TABLE 2).
 (2) FOR LOADS UP TO 96 VA USE 18 AWG CABLE WITH A MAXIMUM LENGTH OF 110 FT (33m) BETWEEN THE TRANSFORMER AND THE LAST DAISY-CHAINED DEVICE.
- [C] CAT 5/5E/6:
 (1) CABLES CAN BE ORDERED BY SPECIFIC LENGTH COMPLETE WITH THE RJ45 CONNECTOR ALREADY INSTALLED
 (2) CABLES CAN ALSO BE PURCHASED ON A ROLL; FIELD INSTALLATION OF THE RJ45 CONNECTOR IS THEN REQUIRED.
- [D] MS/TP BACnet CABLE SPECIFICATIONS FOR ALTERNATE SOLUTIONS
 (1) AN MS/TP EIA-485 NETWORK SHALL USE SHIELDED, 3 CONDUCTOR CABLE WITH CHARACTERISTIC IMPEDENCE BETWEEN 100 AND 130 OHMS.
 (2) DISTRIBUTED CAPACITANCE BETWEEN CONDUCTORS SHALL BE LESS THAN 100pF PER METER (30pF PER FOOT).
 (3) DISTRIBUTED CAPACITANCE BETWEEN CONDUCTORS AND SHIELD SHALL BE LESS THAN 200pF PER METER (60pF PER FOOT).
 (4) FOIL OR BRAIDED SHIELDS ARE ACCEPTABLE. THE MAXIMUM RECOMMENDED LENGTH OF AN MS/TP SEGMENT IS 4000 FT (1200 M) WITH AWG 18 CABLE.
 (5) THE USE OF GREATER DISTANCES AND/OR DIFFERENT WIRE GAUGES SHALL COMPLY WITH THE ELECTRICAL SPECIFICATIONS OF EIA-485 MS/TP CABLE REQUIREMENTS.

24VAC POWER RULES:

- 1) SIZE THE TRANSFORMER FOR THE NUMBER AND TYPE OF EQUIPMENT IT WILL SERVE BASED ON VA RATINGS IN TABLE 2.
- 2) PRIMARY POWER WIRING TO BE PERFORMED BY LOCAL ELECTRICIAN AND MEET LOCAL ELECTRICAL CODES.
- 3) DEDICATED PRIMARY CIRCUIT OR SECONDARY CIRCUIT DISCONNECT REQUIRED FOR:
 - * EACH HIGH-SPEED (ELECTRIC/PNEUMATIC) PRESSURIZATION ZONE
 - * MULTIPLE LOW-SPEED (ELECTRIC) PRESSURIZATION ZONES
- 4) SECONDARY POWER SHALL BE INTERNALLY THERMAL PROTECTED OR EXTERNALLY FUSED WITH A 4A SLOW BLOW FUSE IN ACCORDANCE WITH NEC CLASS 2 POWER REQUIREMENTS (SEE FIGURES 1 & 2).
- 5) GROUNDING:
 - * SEE "TRANSFORMER SECONDARY" COLUMN IN TABLE 2
 - * FOR BACNET VALVES AND PCMXXX: EARTH GROUND SECONDARY OF TRANSFORMER (SEE FIGURE 1)
 - * FOR ALL OTHER PHOENIX DEVICES: DO NOT EARTH GROUND SECONDARY OF TRANSFORMER (SEE FIGURE 2)
- 6) MAXIMUM CABLE LENGTH FOR 96 VA LOAD = 110 FT (33M):
 - * HIGH-SPEED VALVES: USE 14 AWG CABLE
 - * PNEUMATIC AND LOW-SPEED ELECTRIC VALVES: USE 18 AWG CABLE MINIMUM
 - * ALL OTHER PHOENIX CONTROLS DEVICES: USE 18 AWG CABLE MINIMUM
- 7) IF POWERING OTHER DEVICES OFF SAME TRANSFORMER SERVING THE VALVE CONTROLLER, POLARITY MUST BE OBSERVED.
- 8) ADDITIONAL REQUIREMENTS FOR PHOENIX PRODUCTS THAT REQUIRE DEDICATED TRANSFORMERS:
 - * SEE "DEDICATED TRANSFORMER" COLUMN IN TABLE 2
- 9) ADDITIONAL BACNET MS/TP REQUIREMENTS:
 - * FULL WAVE DEVICES CANNOT BE MIXED ON SAME TRANSFORMER AS THE HALF WAVE BACNET VALVE CONTROLLERS (BVC)
 - * SEE TABLE 2 ON VANTAGE SPECS SHEET 2 OF 2 FOR A LIST OF HALF WAVE (HW) AND FULL WAVE (FW) DEVICES.

25 & 75 VA MAX PER XFMR

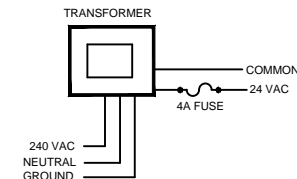


FIGURE 2: ALL OTHER PHOENIX DEVICES

FOLLOW GOOD WIRING PRACTICES:

- 10) DO NOT RUN SIGNAL OR COMMUNICATIONS CABLE IN THE SAME CONDUIT OR WIREWAY AS POWER CABLES.
- 11) IF SIGNAL CABLES MUST CROSS POWER CABLES, IT IS BEST TO DO SO AT A 90 DEGREE ANGLE.



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SCALE: NONE			VANTAGE SPECS - 1 OF 2: CABLE & POWER		DWG.: VNTG_CABLE1
PHX. TOOLS REV 6					

TABLE 2: POWER REQUIREMENTS, BACNET RATINGS AND LON NODES

CATALOG NUMBER	DESCRIPTION	AC POWER RATING (VA)	DEDICATED TRANSFORMER	TRANSFORMER SECONDARY	DC POWER RATING (WATTS)	BACNET POWER TYPE ^A	BACNET COMMUNICATION ^F	BACNET UNIT LOAD	COUNTS AS LON NODE (20 MAX PER CANNEL)	COUNTS AS LON DEVICE (30 MAX PER CANNEL)
APM2XX-ENG-BAC	BACNET: ADVANCED PRESSURE MONITOR	9.60	---	DO NOT GROUND (SEE FIGURE 2 ^E)	---	FW	ISOLATED	1.00	---	---
EXV WITH CONTROL TYPE: M	LON LVC: C2 HIGH-SPEED ELECTRIC	70.00	TO EACH VALVE CONTROLLER ^G	DO NOT GROUND (SEE FIGURE 2 ^E)	---	---	---	---	Y	Y
MAV WITH CONTROL TYPE: M	LON LVC: C2 HIGH-SPEED ELECTRIC	70.00	TO EACH VALVE CONTROLLER ^G	DO NOT GROUND (SEE FIGURE 2 ^E)	---	---	---	---	Y	Y
PHS220-X/PHS300-X	ANALOG: HUMIDITY SENSOR	1.10	---	DO NOT GROUND (SEE FIGURE 2 ^E)	---	---	---	---	---	---
PTS102-D-0X-TV	ANALOG: DUCT TEMP SENSOR	---	---	---	---	---	---	---	---	---
PTS102-X-D / PTS300-X-D	ANALOG: ROOM TEMP SENSOR WITH DISPLAY	0.20	---	DO NOT GROUND (SEE FIGURE 2 ^E)	0.14	---	---	---	---	---
RMI300	LON: ROOM INTEGRATOR LON CARDS	15.00	TO EACH RMI	DO NOT GROUND (SEE FIGURE 2 ^E)	---	---	---	---	N	N
TDU007-ENG-BAC	BACNET: VIEW TOUCH-DISPLAY-UNIT	10.00	---	DO NOT GROUND (SEE FIGURE 2 ^E)	---	FW	NON-ISOLATED	1.00	---	---
TXV WITH VALVE CONTROLLER DESIGNATION: E / X	LON LVC: TP / TX	12.00 B ²	---	DO NOT GROUND (SEE FIGURE 2 ^E)	---	---	---	---	Y	Y

UPPER LEVEL NETWORK RULES

- 1) SHARED, MULTIPLE IP, BMS BACNET IP OR ETHERNET NETWORK. WITHOUT VANTAGE PORTAL (PTL), ROOM MANAGER (RMM) OR SUPERVISOR (SUP)
- 2) CONNECTION TO BMS NETWORK VIA STANDARD NETWORK INTERFACES (SWITCHES, HUBS, ROUTERS).
 - * NON-PHOENIX PRODUCT, TYPICALLY PROVIDED BY BMS
- 3) DEVICE RECOMENDATIONS: UP TO 100 TOTAL ROOM INTEGRATOR (RMI)/ROOM CONTROLLER (RMC)
 - * MORE MAY AFFECT NETWORK PERFORMANCE.
- 4) CABLING:
 - * CAT 5/5E/6/6A CABLE
 - * LIMITED TO 328 FT (100 M) PER SEGMENT.
- 5) TOPOLOGY:
 - * HOME RUNS REQUIRED FROM EACH RMI/RMC TO BMS NETWORK INTERFACE.

RMI / RMC RULES

- 6) UPPER LEVEL CHANNEL: BACNET IP OR ETHERNET
- 7) LOWER LEVEL CHANNEL LIMITS:
 - * PER RMI: TWO LON AND ONE BACNET MS/TP
 - * PER RMC: UP TO TWO LON OR FIVE BACNET MS/TP
- 8) ~~(P2)~~ POWER: DEDICATED UL LISTED 24 VAC CLASS 2 TRANSFORMER PER RMI/RMC TO REDUCE NOISE.

LOWER LEVEL "ROOM" NETWORK RULES

- 9) RMI DEVICE LIMITS: 40 MAXIMUM, INCLUDES BOTH LON AND BACNET
- 10) LON NODE LIMITS:
 - * 20 NODES PER CHANNEL MAXIMUM (RMI/RMC DOES NOT COUNT).
- 11) LON CABLING:
 - * FTT-10 CABLE (22 AWG) LIMITED TO 4,500 FT (1,370 M) WITH NO REPEATERS WIRED IN BUS TOPOLOGY.
 - * REFER TO VANTAGE SPECS: TABLE 1
- 12) BACNET MS/TP LIMITS:
 - * SMALLER OF 32 UNIT LOADS OR 50 DEVICES PER NETWORK SEGMENT.
 - * REFER TO VANTAGE SPECS: TABLE 2
- 13) BACNET MS/TP CABLING:
 - * 3-CONDUCTOR, SHIELDED 22 AWG CABLE LIMITED TO 4,000 FT (1,219 M) WITHOUT REPEATERS WIRED IN BUS TOPOLOGY
 - * REFER TO VANTAGE SPECS: TABLE 1 AND BACNET MS/TP WIRING.

[A] FW = FULL WAVE AND HW = HALF WAVE

[B] VA RATINGS OF NON-PHOENIX PRODUCT (PROVIDED BY OTHERS) CONTROLLED BY OUR OUTPUTS MUST BE FACTORED IN SEPARATELY; SOME EXAMPLES ARE:

(1) PROPORTIONAL REHEAT ACTUATORS USED IN LON & BACNET SYSTEMS.

(2) FLOATING POINT REHEAT ACTUATORS USED IN TRACCEL AND THERIS (LON AND BACNET) SYSTEMS.

[C] VA RATINGS FOR EXTERNAL DC LOADS MUST BE FACTORED IN SEPARATELY.

[D] 90-263 VAC INPUT TO PORTAL'S POWER MODULE

[E] IN 24VAC POWER RULES SECTION ON VANTAGE SPECS - 1 OF 2

[F] REFER TO DRAWING "BACNET MS/TP WIRING"

[G] AND ITS ANCILLARY DEVICES (NOT TO EXCEED 96 VA)

[H] MAY SERVE MULTIPLE IF (TOTAL VA OF PCMS & EXTERNAL LOADS) X 1.3 IS LESS

THAN 96 VA.

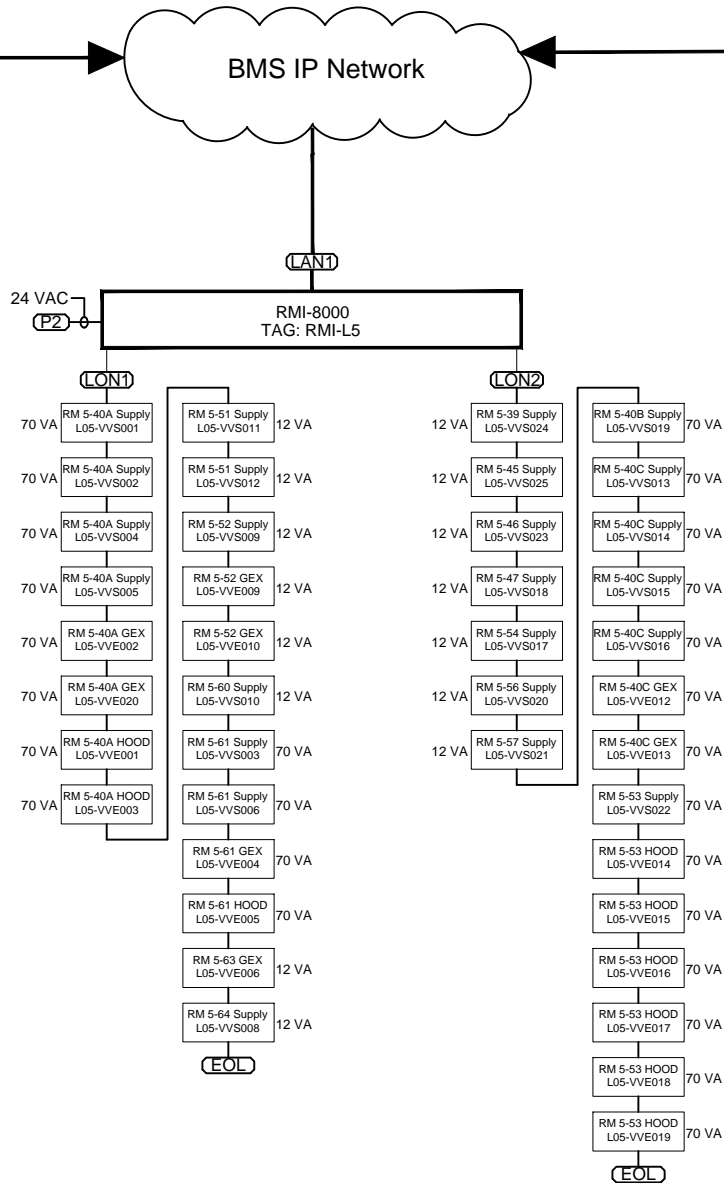
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Aircuity DCV System [BACnet over IP]



*VA ratings are for Phoenix Controls valves only
*Order of valves on each RMI does not matter

CABLE LEGEND

———— BMS BACNET IP/ETHERNET NETWORK: CAT 5/5E/6/6A
———— ROOM LEVEL

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