S-1 SEQUENCE OF OPERATION

GENERAL:

The AHU is a mixed air variable volume system with a supply fan S-1, an exhaust/return fan ER-1, a chilled water coil, and a hot water preheat coil. S-1 is equipped with a variable frequency drive (VFD) for speed control of the fan.

START/STOP CONTROL:

The BAS starts ER-1 through an optimal start program for morning warm-up based on building occupation time, earliest and latest start times, outside air and space temperatures. When ER-1 is proven to be running via current sensing relay CSR-2, S-1 starts and ramps up to minimum speed. S-1 proof is accomplished via current sensing relay CSR-1. When building occupation time is reached, the outside and exhaust air dampers open, and the return air damper closes to their respective minimum positions. When the system goes into unoccupied mode, fans S-1 and ER-1 are stopped and the dampers go to their normal positions.

STATIC PRESSURE CONTROL:

Supply static pressure sensed by PTE-1 is reset from PTE-2 located 2/3 downstream of the supply. The S-1 VFD is modulated, controlling fan speed to maintain the supply static pressure setpoint of 2"W.C. (adj). A signal returns from the VFD to indicate fan speed for *which* monitoring purposes. PTE-3 sensing supply air flow is used for *one* monitoring purposes only. Hi fan static or suction sensed by DPS-1 or DPS-2 will shut down S-1 on such a condition. The fan is not allowed to start until the switch is reset.

DISCHARGE CONTROL:

The cooling value V-1, the heating value V-2, and the O.A./R.A./E.A. dampers are modulated in sequence to maintain the discharge air temperature setpoint of 55 degrees F (adj) sensed by TTE-1. The discharge humidifier is controlled from space humidity sensor at 30% RH (adj). Humidity hi limit H-1 shall override and control duct humidity at 85% RH (adj).

MIXED AIR CONTROL:

When the mixed air temperature sensed by TTE-2 falls below the setpoint of 55 degrees F (adj), the 0.A./R.A./E.A. dampers are modulated closed to minimum position reducing the outside air intake and increasing the return air. Mixed air control shall be locked out and the 0.A./R.A./E.A. dampers go to minimum position when the outside air temperature sensed by TTE-3 rises above 60 degrees F (adj). If a low temperature of 35 degrees F is sensed by LTDE-1 at the coils, S-1 will shut down and the 0.A./R.A./E.A. dampers until the switch is reset.

NIGHT OVERRIDE:

During unoccupied mode, the system can be manually overrided into occupied mode for an extended period of one hour (adj) when the remote switch SW-1 is depressed. SW-1 has no effect during occupied mode.

S-1) SEQUENCE OF OPERATION

GENERAL:

The AHU is a mixed air variable volume system with a supply fan S-1, an exhaust/return fan ER-1, a chilled water coil, and a hot water preheat coil. S-1 is equipped with a variable frequency drive (VFD) for speed control of the fan.

START/STOP CONTROL:

The BAS starts ER-1 through an optimal start program for morning warm-up based on building occupation time, earliest and latest start times, outside air and space temperatures. When ER-1 is proven to be running via current sensing relay CSR-2, S-1 starts and ramps up to minimum speed. S-1 proof is accomplished via current sensing relay CSR-1. When building occupation time is reached, the outside and exhaust air dampers open, and the return air damper closes to their respective minimum positions. When the system goes into unoccupied mode, fans S-1 and ER-1 are stopped and the dampers go to their normal positions.

STATIC_PRESSURE CONTROL:

Supply static pressure sensed by PTE-1 is reset from PTE-2 located 2/3 downstream of the supply. The S-1 VFD is modulated, controlling fan speed to maintain the supply static pressure setpoint of 2"W.C. (adj). A signal returns from the VFD to indicate fan speed for monitoring purposes. PTE-3 sensing supply air flow is used for monitoring purposes only. Hi fan static or suction sensed by DPS-1 or DPS-2 will shut down S-1 on such a condition. The fan is not allowed to start until the switch is reset.

DISCHARGE CONTROL:

The cooling value V-1, the heating value V-2, and the O.A./R.A./E.A. dampers are modulated in sequence to maintain the discharge air temperature setpoint of 55 degrees F (adj) sensed by TTE-1. The discharge humidifier is controlled from space humidity sensor at 30% RH (adj). Humidity hi limit H-1 shall override and control duct humidity at 85% RH (adj).

MIXED AIR CONTROL:

When the mixed air temperature sensed by TTE-2 falls below the setpoint of 55 degrees F (adj), the O.A./R.A./E.A. dampers are modulated closed to minimum position reducing the outside air intake and increasing the return air. Mixed air control shall be locked out and the O.A./R.A./E.A. dampers go to minimum position when the outside air temperature sensed by TTE-3 rises above 60 degrees F (adj). If a low temperature of 35 degrees F is sensed by LTDE-1 at the coils, S-1 will shut down and the O.A./R.A./E.A. dampers will close. The fan shall not be allowed to start again until the switch is reset.

NIGHT OVERRIDE:

During unoccupied mode, the system can be manually overrided into occupied mode for an extended period of one hour (adj) when the remote switch SW-1 is depressed. SW-1 has no effect during occupied mode.

GENERAL:

The AHU is a mixed air variable volume system with a supply fan S-3. an exhaust/return fan ER-3, a chilled water coil, and a hot water preheat coil. S-3 and ER-3 are equipped with a variable frequency drives (VFD) for speed control of the fans.

START/STOP CONTROL:

The BAS starts ER-3 and ramps up to minimum speed through an optimal start program for morning warm-up based on building occupation time, earliest and latest start times, outside air and space temperatures. When ER-3 is proven to be running via current sensing relay CSR-2, S-3 starts and ramps up to minimum speed. S-3 proof is accomplished via current sensing relay CSR-1. When building occupation time is reached, the outside and exhaust air dampers open, and the return air damper closes to their respective minimum positions. When the system goes into unoccupied mode, fans S-3 and ER-3 are stopped and the dampers go to their normal positions.

STATIC PRESSURE CONTROL:

Supply static pressure sensed by PTE-1 is reset from PTE-2 located 2/3 downstream of the supply. The S-3 and ER-3 VFD's are modulated together, controlling fan speed to maintain the supply static pressure setpoint of 2"W.C. (adj). A signal returns from the VFD's to indicate fan speed for monitoring purposes. PTE-3 and PTE-4 sensing supply and return air flow are used for monitoring purposes only. Hi fan static or suction sensed by DPS-1, DPS-2, or DPS-3 will shut down the respective fan on such a condition. The fan is not allowed/to start until the switch is reset.

DISCHARGE CONTROL:

The cooling valve V-1, and the O.A./R.A./E.A. dampers are modulated in sequence to maintain the discharge air temperature setpoint of 55 degrees F (adj) sensed by TTE-1. The discharge humidifier is controlled from space humidity sensor at 30% RH (adj). Humidity hi limit H-1 shall override and control duct humidity at 85% RH (adj).

MIXED AIR CONTROL:

When the mixed air temperature sensed by TTE-2 falls below the setpoint of 55 degrees F (adj), the D.A./R.A./E.A. dampers are modulated closed to minimum position reducing the outside air intake and increasing the return air. Mixed air control shall be locked out and the D.A./R.A./E.A. dampers go to minimum position when the outside air temperature sensed by TTE-3 rises above 60 degrees F (adj). If a low temperature of 35 degrees F is sensed by LTDE-1 at the coils, S-3 will shut down and the D.A./R.A./E.A. dampers until the switch is reset.

NIGHT OVERRIDE:

During unoccupied mode, the system can be manually overrided into occupied mode for an extended period of one hour (adj) when the remote switch SW-1 is depressed. SW-1 has no effect during occupied mode.

VAV BOX CONTROL

GENERAL:

The system consists of a VAV or CAV box with hot water reheat coil.

SPACE CONTROL:

Pneumatic thermostat T-1 modulates the VAV box damper and reheat coil valve in sequence to maintain a space temperature setpoint of 72 degrees F (adj). Below setpoint, air flow will be at minimum and the reheat valve V-1 is modulated open. Above setpoint, the valve is closed and the box damper is modulated open to provide cooling.

HOT WATER SUPPLY SYSTEM CONTROL

GENERAL:

The system consists of 2 boilers and associated pumps.

HOT WATER SUPPLY CONTROL:

Control of the HWS is internal thru boiler controls.

HOT WATER BYPASS CONTROL :

When the differential pressure sensed by DPR-1 across the HW pumps . becomes excessive, valve V-1 is modulated to reduce pressure.

TERMINAL REHEAT HOT WATER BYPASS CONTROL:

When the differential pressure sensed by DPR-2 across the TRW pump becomes excessive, valve V-2 is modulated to reduce pressure.

TRW LOCKOUT:

When the outside air temperature rises above 60 degrees F (adj), the BAS closes valve V-3 restricting the flow of HWS to the VAV boxes.

BOILER COMBUSTION DAMPER CONTROL: When either boiler is on, the interlocked combustion damper will open. Status of the boilers is monitored thru the BAS.

HOT WATER PUMP CONTROL:

Pumps are started and stopped thru the BAS based on occupancy. Status of the pumps is via current sensing relay.

GENERAL:

The system consists of a lab containing 2 fume hoods and a VAV box supplying the lab.

FUME HOOD START/STOP AND CONTROL:

A fume hood is started and stopped thru the operator panel. When the BAS receives a signal that any fume hood has been started, fume hood exhaust fan E-1 is started. If none of the hoods are in operation, E-1 is off. The fume hood controller FHC-1 maintains a, constant air velocity of 100 fpm (adj) thru the fume hood sash based on the sash position and the air flow thru the fume hood exhaust duct, by modulating the fume hood exhaust damper.

PERCHLORIC FUME HOOD START/STOP CONTROL:

The perchloric fume hood exhaust fan E-3 is started directly thru the fume hood switch provided by others. Current sensing relay CSR-1 is for monitor only.

VAV BOX CONTROL:

8 111 B 48 B

Room sensor TTE-1, thru the BAS, modulates the VAV box damper and reheat coil valve in sequence to maintain a space temperature setpoint of 72 degrees F (adj). Below setpoint, air flow is at minimum and the reheat valve V-1 is modulated open. Above setpoint, the valve is losed and the box damper is modulated open to provide cooling.

LAB CONTROL:

The BAS monitors the supply air flow to the lab at the VAV box, the room exhaust air flow, and the fume hood exhaust air flow thru respective velocity sensors. Control of space temperature is thru the VAV box controls as supply air volume to the room is varied. Depending on how much air is supplied thru the VAV box and how much air is exhausted thru the fume hoods, the BAS modulates the room exhaust damper to maintain a CFM differential setpoint of 200 CFM. (adj) total exhaust (room exhaust + fume hood exhaust + perchloric fume hood exhaust) air flow greater than room supply air flow, keeping the lab at a negative pressure.

If the CFM setpoint cannot be maintained as the differential rises above setpoint (supply too low or exhaust too high), the VAV box damper will be overridden to modulate open providing more supply CFM to the room, while the reheat valve will be modulated open attempting to maintain space temperature setpoint.

GENERAL :

The system consists of a lab containing 2 fume hoods and a VAV box supplying the lab.

FUME HOOD START/STOP AND CONTROL:

A fume hood is started and stopped thru the operator panel. When the BAS receives a signal that any fume hood has been started, fume hood exhaust fan E-1 is started. If none of the hoods are in operation, E-1 is off. The fume hood controller FHC-1 or FHC-2 maintains a constant air velocity of 100 fpm (adj) thru the fume hood sash based on the sash position and the air flow thru the fume hood exhaust duct or by sensing wall air velocity, by modulating the fume hood exhaust damper.

VAV BOX CONTROL:

Room sensor TTE-1, thru the BAS, modulates the VAV box damper and reheat coil value in sequence to maintain a space temperature setpoint of 72 degrees F (adj). Below setpoint, air flow is at minimum and the reheat value V-1 is modulated open. Above setpoint, the value is closed and the box damper is modulated open to provide cooling.

LAB CONTROL:

The BAS monitors the supply air flow to the lab at the VAV box, the one exhaust air flow, and the fume hood exhaust air flow thru

spective velocity sensors. Control of space temperature is thru the VAV box controls as supply air volume to the room is varied. Depending on how much air is supplied thru the VAV box and how much air is exhausted thru the fume hoods, the BAS modulates the room exhaust damper to maintain a CFM differential setpoint of 200 CFM (adj) total exhaust (room exhaust + fume hood exhaust) air flow greater than room supply air flow, keeping the lab at a negative pressure.

If the CFM setpoint cannot be maintained as the differential rises above setpoint (supply too low or exhaust too high), the VAV box damper will be overridden to modulate open providing more supply CFM. to the room, while the reheat valve will be modulated open attempting to maintain space temperature setpoint.

The system consists of a lab containing 2 fume hoods and a VAV box supplying the lab.

FUME HOOD START/STOP AND CONTROL:

A fume hood is started and stopped thru the operator panel. When the BAS receives a signal that any fume hood has been started, fume hood exhaust fan E-1 is started. If none of the hoods are in operation, E-1 is off. The fume hood controller FHC-1 or FHC-2 maintains a constant air velocity of 100 fpm (adj) thru the fume hood sash based on the sash position and the air flow thru the fume hood exhaust duct, by modulating the fume hood exhaust damper.

VAV BOX CONTROL:

Room sensor TTE-1, thru the BAS, modulates the VAV box damper and reheat coil valve in sequence to maintain a space temperature setpoint of 72 degrees F (adj). Below setpoint, air flow is at minimum and the reheat valve V-1 is modulated open. Above setpoint, the valve is closed and the box damper is modulated open to provide cooling.

LAB CONTROL:

The BAS monitors the supply air flow to the lab at the VAV box, the room exhaust air flow, and the fume hood exhaust air flow thru respective velocity sensors. Control of space temperature is thru the 'V box controls as supply air volume to the room is varied. pending on how much air is supplied thru the VAV box and how much air is exhausted thru the fume hoods, the BAS modulates the room exhaust damper to maintain a CFM differential setpoint of 200 CFM (adj) total exhaust (room exhaust + fume hood exhaust) air flow greater than room supply air flow, keeping the lab at a negative

If the CFM setpoint cannot be maintained as the differential rises above setpoint (supply too low or exhaust too high), the VAV box damper will be overridden to modulate open providing more supply CFM to the room, while the reheat valve will be modulated open attempting to maintain space temperature setpoint.

GENERAL:

The system consists of a lab containing 2 fume hoods and a VAV box supplying the lab.

FUME HOOD START/STOP AND CONTROL:

A fume hood is started and stopped thru the operator panel. When the BAS receives a signal that any fume hood has been started, fume hood exhaust fan E-1 is started. If none of the hoods are in operation, E-1 is off. The fume hood controller FHC-1 or FHC-2 maintains a constant air velocity of 100 fpm (adj) thru the fume hood sash based on sensing wall air velocity, by modulating the fume hood exhaust damper.

VAV BOX CONTROL:

Room sensor TTE-1, thru the BAS, modulates the VAV box damper and reheat coil valve in sequence to maintain a space temperature setpoin of 72 degrees F (adj). Below setpoint, air flow is at minimum and the reheat valve V-1 is modulated open. Above setpoint, the valve is closed and the box damper is modulated open to provide cooling.

LAB CONTROL;

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The BAS monitors the supply air flow to the lab at the VAV box, the room exhaust air flow, and the fume hood exhaust air flow thru respective velocity sensors. Control of space temperature is thru the /AV box controls as supply air volume to the room is varied. Depending on how much air is supplied thru the VAV box and how much air is exhausted thru the fume hoods, the BAS modulates the room exhaust damper to maintain a CFM differential setpoint of 200 CFM (adj) total exhaust (room exhaust + fume hood exhaust) air flow greater than room supply air flow, keeping the lab at a negative pressure.

If the CFM setpoint cannot be maintained as the differential rises above setpoint (supply too low or exhaust too high), the VAV box damper will be overridden to modulate open providing more supply CFM to the room, while the reheat valve will be modulated open attempting to maintain space temperature setpoint.

GENERAL:

The system consists of a lab containing 1 fume hood and a VAV box supplying the lab.

FUME HOOD START/STOP AND CONTROL:

A fume hood is <u>started and stopped</u> thru the operator panel. When the BAS receives a signal that any fume hood has been started, fume hood exhaust fan E-1 is started. If none of the hoods are in operation, E-1 is off. The fume hood controller FHC-1 maintains a constant air velocity of 100 fpm (adj) thru the fume hood sash based on the sash position and the air flow thru the fume hood exhaust duct, by modulating the fume hood exhaust damper.

VAV BOX CONTROL:

Room sensor TTE-1, thru the BAS, modulates the VAV box damper and reheat coil valve in sequence to maintain a space temperature setpoint of 72 degrees F (adj). Below setpoint, air flow is at minimum and the reheat valve V-1 is modulated open. Above setpoint, the valve is closed and the box damper is modulated open to provide cooling.

LAB CONTROL:

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The BAS monitors the supply air flow to the lab at the VAV box, the room exhaust air flow, and the fume hood exhaust air flow thru spective velocity sensors. Control of space temperature is thru the VAV box controls as supply air volume to the room is varied. Depending on how much air is supplied thru the VAV box and how much air is exhausted thru the fume hood, the BAS modulates the room exhaust damper to maintain a CFM differential setpoint of 200 CFM (adj) total exhaust (room exhaust + fume hood exhaust) air flow greater than room supply air flow, keeping the lab at a negative pressure.

If the CFM setpoint cannot be maintained as the differential rises above setpoint (supply too low or exhaust too high), the VAV box damper will be overridden to modulate open providing more supply CFM to the room, while the reheat valve will be modulated open attempting to maintain space temperature setpoint.

EXHAUST FAN E-1 CONTROL:

Fume hood exhaust fan E-1 is started and stooped based on fume ho operation. The VFD is modulated to maintain a total suction static pressure setpoint of 1"W.C. (adj) in the fume hood exhaust. Suction static is sensed by PTE-1 & PTE-2 and is controlled by selecting the lower one requiring the greater suction.

EXHAUST FAN E-2 CONTROL:

Storage room exhaust fan E-2 is started and stopped based on occupancy. Current sensing relay CSR-2 indicates fan status. Retur air temperature sensor TTE-1 is for monitor only. SUMP LEVEL STATUS:

1.12

The BAS monitors any sump basin high water level.

UNIT HEATER CONTROL:

The unit heater is cycled on if space temperature sensed by TE-1 goes below setpoint.

FLOOR TEMPERATURE/HUMIDITY MONITOR:

TTE-1 & 2 and HTE-1 & 2 are used for monitoring floor temperaturand humidity only.

LAB PRESSURIZATION MONITOR:

PTE-1 & PTE-2 are used for monitoring lab pressurization compared to hallway only.

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PTE	2	1	ASH-XLDP-300	ASHCROFT		ASHCROFT	DIFF. PRESS.	XHTR. 0-3.0 "WC
PTE	3	1	ASH-XLDP-025	ASHCROFT		ASHCROFT	DIFF. PRESS.	XHTR 0/0.25 "WC
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TTE	2	<u>,</u> 1	533 380	LANDIS & GYR		SE 1903-1	D/AV TEHP 20/	120F SENSOR PLAT
TTE	3	_1	533 381	LANDIS & GYR		SE 1905-1	0/A TEHP -58/	122F SENSOR PLAT

NOTE: SEE VALVE SCHEDULE FOR VALVE INFORMATION. SEE DAMPER SCHEDULE FOR DAMPER INFORMATION.

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			4-4	KU 186-1	DUCT HYGROS	TAT, 55/952RH, RA	
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1	ASH-XLDP-500	ASHCROFT			1	5.0	
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		LANDIS & GYR		SE 1902-3	D/PT TEMP 4	0/150F THERMISTOR	
				SE 1903-1	D/AV TEMP 2	0/120F SENSOR PLAT	
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NOTE: SEE VALVE SCHEDULE FOR VALVE INFORMATION. SEE DAMPER SCHEDULE FOR DAMPER INFORMATION.

1 850-128 CSR-1

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AP	1-2	2	332 2973	LANDIS & GYR	12-2	PH 331-10	#4 PNEU ACT,	B-13PSI,UN MT,PO
CSR	1.8.3	33	850 124 🗸	CYHATICS		CYMATICS	CURRENT SENS	ING RELAY, 2/12A
DPS	1-3	3	AFS 460	CLEVELAND		SW141-1	DIFF PRESS SU	J, 1-12"WC MAN RES
EP	1	ș 1	265 1001	LANDIS & GYR	17-2	VE 265-2	EP265 3W AIR	VLV 24VAC, 60HZ
H	1	1	186 0090	LANDIS & GYR	4-4	HU 186-1	DUCT HYGROSTA	T, 55/952RH, RA
LTDE	1	1	134 1504	LANDIS & GYR	4-2	ET 134-22	LOW TEHP STAT	, 15/55, 1HO1NC, MAN
PTE	1	1	ASH-XLDP-500	ASHCROFT		ASHCROFT	DIFF. PRESS.	XHTR. 0-5.0 "WC
PTE	2	1	ASH-XLDP-300	ASHCROFT		ASHCROFT	DIFF. PRESS.	XHTR. 0-3.0 "WC
PTE	3-4	- 2	ASH-XLDP-025	ASHCROFT	10	ASHCROFT	DIFF. PRESS.	XHTR 0/0.25 "WC
SW - 5	1	1	NAR-6A	AIPHONE		8	HOH. CONTACT	WALL SWITCH/PLATE
TE	1	1	535 741	LANDIS & GYR		SE 1902-3	D/PT TEMP 40/	150F THERMISTOR
TE	2	3 1	533 380	LANDIS & GYR		SE 1903-1	D/AV TEMP 20/	120F SENSOR PLAT

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NOTE: SEE VALVE SCHEDULE FOR VALVE INFORMATION. SEE DAMPER SCHEDULE FOR DAMPER INFORMATION.

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LANDIS & C	YR PO	WERS, INC. KEYSH	EET			Revision Date :
Job Name:	CLEAN	AIR ENGINEERING				Submittal Date: 09/27/90
Job Number	: 220	•E •5178-00	•		1	Eng: EUT Page:
Mechanical	Syst	em: VAV CONTROL	i i		5.8 N S S	
Control Device	Qty	Product Number	Hanufacturer	SD Num	Technical Ref Num	Description
Field Mour	ited D	evices	· · · · · · · · · · · · · · · · · · ·			
т 1	40	192 202	LANDIS & GYR	1-1	TH 192-1	RM STAT SSP 45/85F 2P DA
	46	192 256	LANDIS & GYR		TH 192-2	T'STAT CVR, CON/CON/CON, LOGO

NOTE: SEE VALVE SCHEDULE FOR VALVE INFORMATION. SEE DAMPER SCHEDULE FOR DAMPER INFORMATION.

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LANDIS &	GYR I	POWERS, INC. KEYS	неет		<u></u>	
		W AIR ENGINEERIN				Revision Date :
	_		· · · · · · · · · · · · · · · · · · ·			Submittal Date: 09/27/90
		0-E -5178-00		8		Eng: Ej? Page:
	Sys	tem: HOT WATER SU	JPPLY SYSTEM			
Control Device	Qt	y Product Number	Hanufacturer	SD Num	Technical Ref Num	Description
Field Houn	ted [Devices				
AP 1-2	2	331 2973	LANDIS & GYR	12-2	PH 331-10	#4 PNEU ACT, 8-13PST, UNIV MT
CSR 1-3	3	850 124 .	CYHATICS		CYHATICS	CURRENT SENSING RELAY, 2/12A
DPR 1-2	<u> </u>	378 1000	LANDIS & GYR	6-2	PR 378-1	DIFFER PRESSURE REGULATOR, DA
EP 1-3	3	265 1002	LANDIS & GYR	17-2	VE 265-2	EP265 3W AIR VLV 120 VAC,60HZ
RP 1-2	ି 2	243 0009	LANDIS & GYR	14-2		MINI RELAY, MULTI-PURPOSE

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NOTE: SEE VALVE SCHEDULE FOR VALVE INFORMATION. SEE DAMPER SCHEDULE FOR DAMPER INFORMATION.

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LAND	IS & GY	R PO	WERS, INC. KEYSH	IEET			Revision Date :
Job N	lame: (LEAN	AIR ENGINEERING	3			Submittal Date: 09/27/90
Job . H	lumber:	: 220	-E -5178-00			Ð.	Eng: ESP Page:
Hecha	nical	Syst	em: LAB 2 CONTRO)L			
Contr Devic		Qty	Product Number	Hanufacturer	SD Num	Technical Ref Num	Description
Field	i Hount	ed D	evices				- 20
AP	1-2	2	331 3048	LANDIS & GYR	12-1	PH 331-9	#3 PNU ACT, 8-13PS1, 7/8"SFT, U-H
CSR	1	1	850 124	CYHATICS	80	CYHATICS	CURRENT SENSING RELAY, 2/12A
FHC	1	1	537 725	LANDIS & GYR			FUME HOOD CONTROLLER BOARD
	107	1	537 752	LANDIS & GYR			FUME HOOD CONTROLLER ENCLOSURE
OP .	1	1	537 720	LANDIS & GYR			FUHE HOOD CTLR OPERATER PANEL
PSE	1	1	537 811	LANDIS & GYR			FUHE HOOD VERT SASH SENSOR 36"
PT	1-2	2	VOLU-PROBE/1	AIR MONITOR			FUNE HOOD AIR VELOCITY SENSOR
PTE	1-2	2	ASH-XLOP-050 ~	ASHCROFT		ASHCROFT	DIFF. PRESS. XHTR 0/0.5 "WC
PTE	4	1	ÅSH-XLDP-025	ASHCROFT		ASHCROFT	DIFF. PRESS. XHTR 0/0.25 "WC
ITE.	1 📄	1	536 195 🗸	LANDIS & GYR		SE 1901-3	ROOH SENS THERMISTOR 40/120F
COR	1	1	537 789	LANDIS & GYR			LAB AO-P HOOULE
DR :	3-4	2	PXP7	ACT		ACT	I/P TRANSDUCER 4-20MA/3-15PSI

NOTE: SEE VALVE SCHEDULE FOR VALVE INFORMATION. SEE DAMPER SCHEDULE FOR DAMPER INFORMATION.

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LAN	DIS & GY	R PC	WERS, INC. KEYS	HEET			Revision Date :
Job	Name: C	LEAN	AIR ENGINEERIN	G			Submittal Date: 09/27/90
Job	Number:	220	-E -5178-00	•		2	Eng: Ej() Page:
Nect	nanical	Syst	em: LAB 3 CONTRO	DL	3		
Cont Devi	trol ice	Qty	Product Number	Hanufacturer	SD Num	Technical Ref Num	Description
Fiel	d Kount	ed D	evices		e		
AP	1-3	3	331 3048	LANDIS & GYR	12-1	PH 331-9	#3 PNU ACT, 8-13PSI, 7/8"SFT, U-H
FHC	1-2	2	537 725	LANDIS & GYR		1	FUHE HOOD CONTROLLER BOARD
		2	537 752	LANDIS & GYR		1	FUNE HOOD CONTROLLER ENCLOSURE
ÓP	1-2 *	2	537 720	LANDIS & GYR			FUHE HOOD CTLR OPERATER PANEL
PSE	-1	1	537 811	LANDIS & GYR		-	FUHE HOOD VERT SASH SENSOR 36"
۶T	≈ 1-3 ∞	3	VOLU-PROBE/1	AIR MONITOR			FUHE HOOD ATR VELOCITY SENSOR
STE	1-3	3	ASH-XLDP-050	ASHCROFT		ASHCROFT	DIFF. PRESS. XHTR 0/0.5 "WC
TE	4 **	1	ASH-XLDP-025	ASHC <u>R</u> OFT		ASHCROFT	DIFF. PRESS. XHTR 0/0.25 "WC
TE	1	1	536 195 🗸	LANDIS & GYR		SE 1901-3	ROOM SENS THERMISTOR 40/120F
TE	1 - 8	1	537 79X	LANDIS & GYR			FUME HOOD WALL VELOCITY SENSOR
DR	1-2	2	537 789	LANDIS & GYR			LAB AO-P HODULE
DR	3-4 💮	2	PXP7 J	ACT		ACT	I/P TRANSDUCER 4-20HA/3-15PS1

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NOTE: SEE VALVE SCHEDULE FOR VALVE INFORMATION. SEE DAMPER SCHEDULE FOR DAMPER INFORMATION.

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			POWERS, INC. KEY	10		22	Revision Da	te:
Job	Name:	CLE	AN AIR ENGINEERI	10			Submittal D	ate: 09/27/90
Job	Number	: 22	20-E -5178-00	······			Eng: CUV2	Page:
Meci	hanical	Sys	tem: LAB 6 CONTR	OL			C)/	rage:
Coni Devi	trol ice	Qt	y Product Number	Manufacturer	SD Num	Technical Ref Num	Description	
Fiel	ld Houn	ted	Devices		35		_1	
AP	1-3		3 331 3048	LANDIS & GYR	12-1	PH 331-9	#3 PNU ACT A	-13PSI,7/8"SFT,U-H
FHC	1-2		2 537 725	LANDIS & GYR				NTROLLER BOARD
3			537 752	LANDIS & GYR				NTROLLER ENCLOSURE
)P	1-2	2	537 720	LANDIS & GYR				LR OPERATER PANEL
SE	1-2	2	537 811	LANDIS & GYR				RT SASH SENSOR 36"
۲	1-3	3	VOLU-PROBE/1	AIR MONITOR	8			VELOCITY SENSOR
TE	1-3 👘	3	ASH-XLDP-050	ASHCROFT		ASHCROFT		XHTR 0/0.5 "WC
TE	4	1	ASH-XLDP-025 ~	ASHCROFT		ASHCROFT		XMTR 0/0.25 "WC
TE	1	1	536 195 🏑	LANDIS & GYR		SE 1901-3		RHISTOR 40/120F
R	1-2	2	537 789	LANDIS & GYR			LAB AO-P HOOU	70
R 3	3-4	2	PXP7 J	ACT				R 4-20MA/3-15PS1

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NOTE: SEE VALVE SCHEDULE FOR VALVE INFORMATION. SEE DAMPER SCHEDULE FOR DAMPER INFORMATION.

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LANDIS & C	YR PC	WERS, INC. KEYS	HEET			Revision Da	te :
Job Name:	CLEAN	AIR ENGINEERIN	G				ate: 09/27/90
Job Number	: 220	E -5178-00	· · ·	<u> </u>		دېري :Eng	Page:
Mechanical	Syst	em: LAB 7 CONTRO	DL				<u>_1</u>
Control Device	aty	Product Number	Hanufacturer	SD Num	Technical Ref Num	Description	
Field Houn	ted D	evices	_•	···		· · ·	·
AP 1-4	4	331 3048	LANDIS & GYR	12-1	PH 331-9	#3 PNU ACT,8	3-13PSI,7/8"SFT,U-X
FHC 1-2	2	537 725	LANDIS & GYR			FUHE HOOD CO	NTROLLER BOARD
	2	537 752	LANDIS & GYR			FUHE HOOD CO	NTROLLER ENCLOSURE
OP 1-2	2	537 720	LANDIS & GYR			FUHE HOOD CT	LR OPERATER PANEL
PT 1-3	3	VOLU-PROBE/1	AIR MONITOR			FUHE HOOD AT	R VELOCITY SENSOR
PTE 1-3	3	ASH-XLDP-050	ASHCROFT		ASHCROFT	DIFF. PRESS.	XMTR 0/0.5 "WC
PTE 4	1	ASH-XLDP-025	ASHCROFT	8	ASHCROFT	DIFF. PRESS.	XHTR 0/0.25 "WC
TTE 1	1	536 195 🗸	LANDIS & GYR		SE 1901-3	ROON SENS TH	ERHISTOR 40/120F
/TE 1-2	2	537 79X	LANDIS & GYR		1	FUHE HOOD WAL	LL VELOCITY SENSOR
(DR 1-2	2	537 789	LANDIS & GYR			LAB AO-P HOOL	JLE
OR 3-4	2	PXP7 /	ACT		ACT	I/P TRANSDUCE	R 4-20HA/3-15PSI

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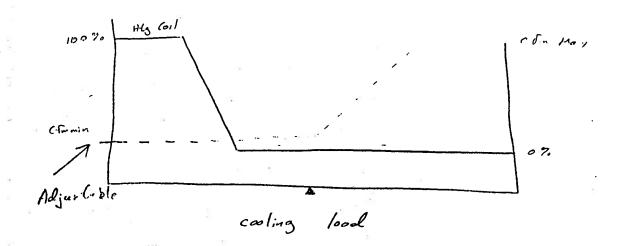
NOTE: SEE VALVE SCHEDULE FOR VALVE INFORMATION. " SEE DAMPER SCHEDULE FOR DAMPER INFORMATION.

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LAN	DIS & G	YR PC	WERS, INC. KEYS	HEET			Revision Date :
Job	Name:	CLEAN	AIR ENGINEERIN	<u> </u>			Submittal Date: 09/27/90
Job	Number	: 220	-Е -5178-00	•	÷		Eng: CSP Page:
Mec	hanical	Syst	em: LAB 8 CONTRO	DL.	·····	<u>.</u>	÷ l
	trol ice	Qty	Product Number	Hanufacturer	SD Num	Technical Ref Num	Description
Fie	ld Hount	ed D	evices		8	·····	****
AP	1-2 🐇	2	331 3048	LANDIS & GYR	12-1	PH 331-9	#3 PNU ACT, 8-13PSI, 7/8"SFT, U-H
FHC	1	1	537 725	LANDIS & GYR			FUME HOOD CONTROLLER BOARD
17		1	537 752	LANDIS & GYR			FUHE HOOD CONTROLLER ENCLOSURE
OP	1	1	537 720	LANDIS & GYR			FUME HOOD CTLR OPERATER PANEL
PSE	1	1	537 811	LANDIS & GYR			FUHE HOOD VERT SASH SENSOR 36"
PT	1-2	2	VOLU-PROBE/1	AIR HONITOR		:	FUHE HOOD AIR VELOCITY SENSOR
PTE	1-2	2	ASH-XLDP-050	ASHCROFT		ASHCROFT	DIFF. PRESS. XMTR 0/0.5 "WC
PTE	4	1	ASH-XLDP-025	ASHCROFT		ASHCROFT	DIFF. PRESS. XMTR 0/0.25 "WC
TE	1 😥	1	536 195 🦨	LANDIS & GYR	े ्य	SE 1901-3	ROOM SENS THERMISTOR 40/120F
(DR	1	1	537 789	LANDIS & GYR	-		LAB AO-P HOOULE
DR	3-4	2	PXP7 J	ACT		ACT	I/P TRANSDUCER 4-20HA/3-15PSI

NOTE: SEE VALVE SCHEDULE FOR VALVE INFORMATION. SEE DAMPER SCHEDULE FOR DAMPER INFORMATION.



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Jop	Name;	CLEAI	AIR ENGINEERIN	G		9	Submittal Date: 09/27/90
Jop	Number	: 220)-Е -5178-00	2			Eng: 1 Jegel Page:
Heck	anical	Syst	em: MISC. EXHAU	ST FAN DETAILS			
Cont Devi		Qty	Product Number	Manufacturer	SD Num	Technical Ref Num	Description
Fiel	d Hount	ted D	evices		I		8
CSR	1-2	13	850 124 🗸	CYNATICS		CYHATICS	CURRENT SENSING RELAY, 2/12A
DPS	1	1	AFS-460	CLEVLAND	16-3	SW141-1	DIFF PRESS SW, 1-12"WG MAN RES
PTE	1-2	2	ASH-XLDP-300	ASHCROFT			DIFF. PRESS. XHTR. 0-3.0 "WC
TE	1	1	535 741	LANDIS & GYR			D/PT TEMP 40/150F THERMISTOR

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NOTE: SEE VALVE SCHEDULE FOR VALVE INFORMATION. SEE DAMPER SCHEDULE FOR DAMPER INFORMATION.

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Job Name:	CLEAN AIR ENGINEER				Revision Date :
	220-E -5178-00	1NG		en o ²¹	Submittal Date: 09/27/90
and the second	System: MISC. DET/				Eng: Lead Page:
Control Device	Qty Product Numbe		SD Num	Technical Ref Num	Description
Field Moun	ted Devices		8		
TE 1-2	2 536 296	LANDIS & GYR 536-298	12-2	PH 331-10	#4 PNEU ACT,8-13PSI,UNIV MT
TE 1-2	2 ASH-XLDP-010	ASHCROFT		ASHCROFT	
1 E 1-2	4 134 1085 2 536 195	LANDIS & GYR	2-4	·	DIFF. PRESS. XHTR 0/0.1 "WC T'STAT,H/C,LINE VOLT,HVY DUTY
- · ·	2 201 05 1	LANDIS & GYR			ROOM SENS THERMISTOR 40/120F

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NOTE: SEE VALVE SCHEDULE FOR VALVE INFORMATION. SEE DAMPER SCHEDULE FOR DAMPER INFORMATION.

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