

ARKANSAS STATE UNIVERSITY BIOSCIENCE / BIOTECHNOLOGY BUILDING JONESBORO, AR

AS-BUILT

DRAWING INDEX:

DRAWING #	DRAWING NAME	DRAWING DISCRPTION
INDEX	TITLEPAGE.DWG	PROJECT TITLE PAGE, DRAWING LIST
INDEX_1	HVAC_ABBREV.DWG	HVAC TERM ABBREVIATION LIST
1	COMRISER.DWG	COMMUNICATIONS RISER WIRING DIAGRAM
2	CHILLERPLANT.DWG	CHILLED WATER SYSTEM LAYOUT DIAGRAM
3	CHILLERPOINT.DWG	CHILLED WATER POINT LIST
4	CHILLERSEQ.DWG	CHILLED WATER SYSTEM SEQUENCE OF OPERATION
5	CP-VENT.DWG	CENTRAL PLANT VENTILATION SYSTEM LAYOUT DIAGRAM
6	BOILERPLANT.DWG	HOT WATER SYSTEM LAYOUT DIAGRAM
7	DOMHW_GAS.DWG	DOMESTIC HOT WATER AND GAS UTILITY SYSTEM DIAGRAM
8	EF.DWG	EXHAUST FAN INTERCONNECT LAYOUT DIAGRAM
9	ERAHU.DWG	ENERGY RECOVERY AIR HANDLER UNIT
10	ERAHUPOINT.DWG	ENERGY RECOVERY AIR HANDLER UNIT POINT LIST
11	ERAHUSEQ.DWG	ERAHU SEQUENCE OF OPERATION
12	FCU.DWG	STAND-ALONE FAN COIL UNIT SYSTEM LAYOUT DIAGRAM
13	FCU1.DWG	STAND-ALONE FAN COIL UNIT SYSTEM LAYOUT DIAGRAM COOLING ONLY
14	ET_FIRSTFLOOR.DWG	FIRST FLOOR NON-LAB EXHAUST TERMINAL UNIT
15	ET_SECONDFOOR.DWG	SECOND FLOOR NON-LAB EXHAUST TERMINAL UNIT
16	ET_THIRDFLOOR.DWG	THIRD FLOOR NON-LAB EXHAUST TERMINAL UNIT
17	ET_FOURTHFLOOR.DWG	FOURTH FLOOR NON-LAB EXHAUST TERMINAL UNIT
18	ST_NONLAB_SCHEDULE.DWG	SUPPLY TERMINAL SCHEDULE FOR NON-LAB USE
19	ST_CAV_CORR.DWG	SUPPLY TERMINAL, CONSTANT VOLUME, CORRIDOR UNIT
20	ST_CAV_LF.DWG	SUPPLY TERMINAL, CONSTANT VOLUME, NON-LAB UNIT WITH LARGE FLOW REHEAT VALVE
21	ST_CAV_NONLAB.DWG	SUPPLY TERMINAL, CONSTANT VOLUME, NON-LAB UNIT
22	ST_VAV_CORR.DWG	SUPPLY TERMINAL, VARIABLE VOLUME, CORRIDOR UNIT
23	ST_VAV_NONLAB.DWG	SUPPLY TERMINAL, VARIABLE VOLUME, NON-LAB UNIT
24	ST_VAV_NONLAB_3WAY.DWG	SUPPLY TERMINAL, VARIABLE VOLUME, NON-LAB UNIT WITH 3-WAY VALVE
25	ST_VAV_2-WAY_VDIFF.DWG	SUPPLY TERMINAL, VARIABLE VOLUME, NON-LAB UNIT 2-WAY VALVE, WITH THERMOSTATIC DIFFUSERS
26	ST_VAV_3-WAY_VDIFF.DWG	SUPPLY TERMINAL, VARIABLE VOLUME, NON-LAB UNIT 3-WAY VALVE, WITH THERMOSTATIC DIFFUSERS
27	LAB_CONTROL_SCHEDULE.DWG	LAB EXHAUST/SUPPLY/FUMEHOOD SCHEDULES
28	LAB_CONTROL.DWG	LAB EXHAUST/SUPPLY/FUMEHOOD UNIT DIAGRAM
29	LAB_CONTROL_PESTICIDE.DWG	LAB EXHAUST/SUPPLY/FUMEHOOD UNIT DIAGRAM PESTICIDE PREP 405 FOURTH FLOOR
30	LAB_CONTROL_PESTICIDE_POINTLIST.DWG	PESTICIDE LAB POINT LIST
31	LAB_CONTROL_PERCHLORIC.DWG	LAB EXHAUST FAN/SUPPLY/FUMEHOOD UNIT DIAGRAM MISC. SUPPORT 359 THIRD FLOOR; EF-5
32	LAB_CONTROL_SPECTRUM.DWG	LAB EXHAUST/SUPPLY/FUMEHOOD UNIT DIAGRAM WITH MASS SPECTROMETER EQUIPMENT EXHAUST
33	LAB_CONTROL_SPECT_PNT.DWG	LAB SPECTROMETER EQUIPMENT POINT LIST
34	UH_STAIRWELL.DWG	STAIRWELL UNIT HEATER SYSTEM LAYOUT DIAGRAM
35	CWDETAIL.DWG	COMPONENT WIRING DETAIL DIAGRAMS
36	CWDETAIL1.DWG	COMPONENT WIRING DETAIL DIAGRAMS
37	CWDETAIL2.DWG	COMPONENT WIRING DETAIL DIAGRAMS
38	CWDETAIL3.DWG	COMPONENT WIRING DETAIL DIAGRAMS

COMMON SYMBOL LEDGEND

COMMON SYMBOL LEDGEND

1/0 TYPE
 DI - DIGITAL INPUT
 DO - DIGITAL OUTPUT
 AI - ANALOG INPUT
 AO - ANALOG OUTPUT

CABLE ID
 I/O NUMBER
 I/O TYPE
 PANEL OR UNIT NUMBER
 PANEL OR UNIT DESIGNATOR

THE I/O NUMBER IN SEQUENCE OF THE I/O COUNT OF THAT TYPE OF I/O

BLDG. PRESSURE
 DPT: DIFFERENTIAL PRESSURE TRANSDUCER

FAN
 EXHAUST FAN
 PUMP

TEMPERATURE PROBE
 DTS: TEMPERATURE PROBE
 DHS: HUMIDITY PROBE
 ITS: IMMERSION WELL TEMPERATURE PROBE

OUTSIDE AIR TEMPERATURE
 OSA: MOUNTED ON NORTH WALL OF NORTH SIDE OF BUILDING
 OTS

AIR FLOW STATION
DUCT SMOKE DETECTOR

AVERAGING TEMPERATURE SENSOR
 ATS

FREEZE STAT
 LOW LIMIT

DAMPER ACTUATOR

VARIABLE FREQUENCY DRIVE CONTROL PANEL

DIFFERENTIAL PRESSURE SWITCH
PNEUMATIC GAUGE
TRANSFORMER

LADDER LOGIC SYMBOLS
 R: RELAY COIL
 NO: NORMALLY OPEN CONTACT
 NC: NORMALLY CLOSED CONTACT
 C: CONTACTOR COIL
 L#: PANEL LAMP
 M: MOTOR
 Ms: MOTOR STARTER
 T: THERMOSTAT
 TCF: THERMOSTAT CLOSE ON FALL
 TCR: THERMOSTAT CLOSE ON RISE
 TOF: THERMOSTAT OPEN ON FALL
 TOR: THERMOSTAT OPEN ON RISE
 S: SWITCH
 SNO: SWITCH NORMALLY OPEN
 SNC: SWITCH NORMALLY CLOSED
 P: PUSHBUTTON
 PNO: PUSHBUTTON NORMALLY CLOSED
 PNO: PUSHBUTTON NORMALLY OPEN
 TT: TWIST TIMER
 TTO: TWIST TIMER NORMALLY OPEN

WATER (HOT/COLD) DX : STEAM
 TEMPERATURE INTERFACE COIL

VALVE BODIES
 2-WAY
 3-WAY

FAIL TO COIL PIPING CONFIGURATION MIXING VALVES TYPICAL FOR HEATING

FAIL TO BYPASS PIPING CONFIGURATION MIXING VALVES TYPICAL FOR COOLING

DUCT CONTINUATION
DUCT AND AIR HANDLER CASING

TERMINAL BLOCK COMPONENT SYMBOLS
 SS: SPECIALTY SENSOR (ie. PRESSURE)
 TS: TEMPERATURE SENSOR
 V+: VOLTAGE INPUT/OUTPUT ANALOG VALUE
 HS: SPECIALTY SENSOR (ie. HUMIDITY)
 CS: CONTACT (SWITCH) INPUT/OUTPUT DIGITAL VALUE

LOGIC SYMBOLS
 OM: OUTPUT MODULE
 CM: COMPARATOR MODULE
 SM: SWITCH MODULE
 LAM: LOGIC 'AND' MODULE
 LOR: LOGIC 'OR' MODULE
 LEX: LOGIC 'EXCLUSIVE OR' MODULE
 INI: LOGIC 'NOT' INVERTER MODULE
 ESM: EXCLUSIVE 2 STAGE SEQUENCE MODULE
 LAM: LOGIC 'AND' MULTI-INPUT MODULE
 CMO: COMMAND MODULE WITH COMPARATOR AND OVERRIDE

RELAY TYPES
 12 VDC 10 AMP CONTACT
 12 VDC 1 AMP TRIAC
 10 AMP CONTACT DOUBLE POLE / DOUBLE THROW
 10 AMP CONTACT SINGLE POLE / DOUBLE THROW

NOTE: NOT ALL SYMBOLS USED. LEDGEND IS FOR REFERENCE.

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Drawing Title		ENGINEER COMMENTS & CHANGE ORDER MODIFICATION		A	7/31/03	JS
PROJECT TITLE PAGE		AS-BUILT MODIFICATION		B	12/17/04	JNS
Reference Drawing	NO	Revision	ECN	Date	By	Approved
Filename: TITLEPAGE.DWG	Sales: TLL/ GH	Project Manager: BP	Applications Engineer: JS	By: JS	Date: 5/23/03	Approved
Project Title: ASU BIOSCIENCE & BIOTECHNOLOGY BLDG JONESBORO, AR	Office Information: TL Services, Inc. 4733 Kibier Rd. Van Buren, AR 72956 PH: 479-474-7222 FX: 479-471-7964		Contract Number: 03-C005		Drawing Number: INDEX	


ABBREVIATIONS AND DEFINITIONS

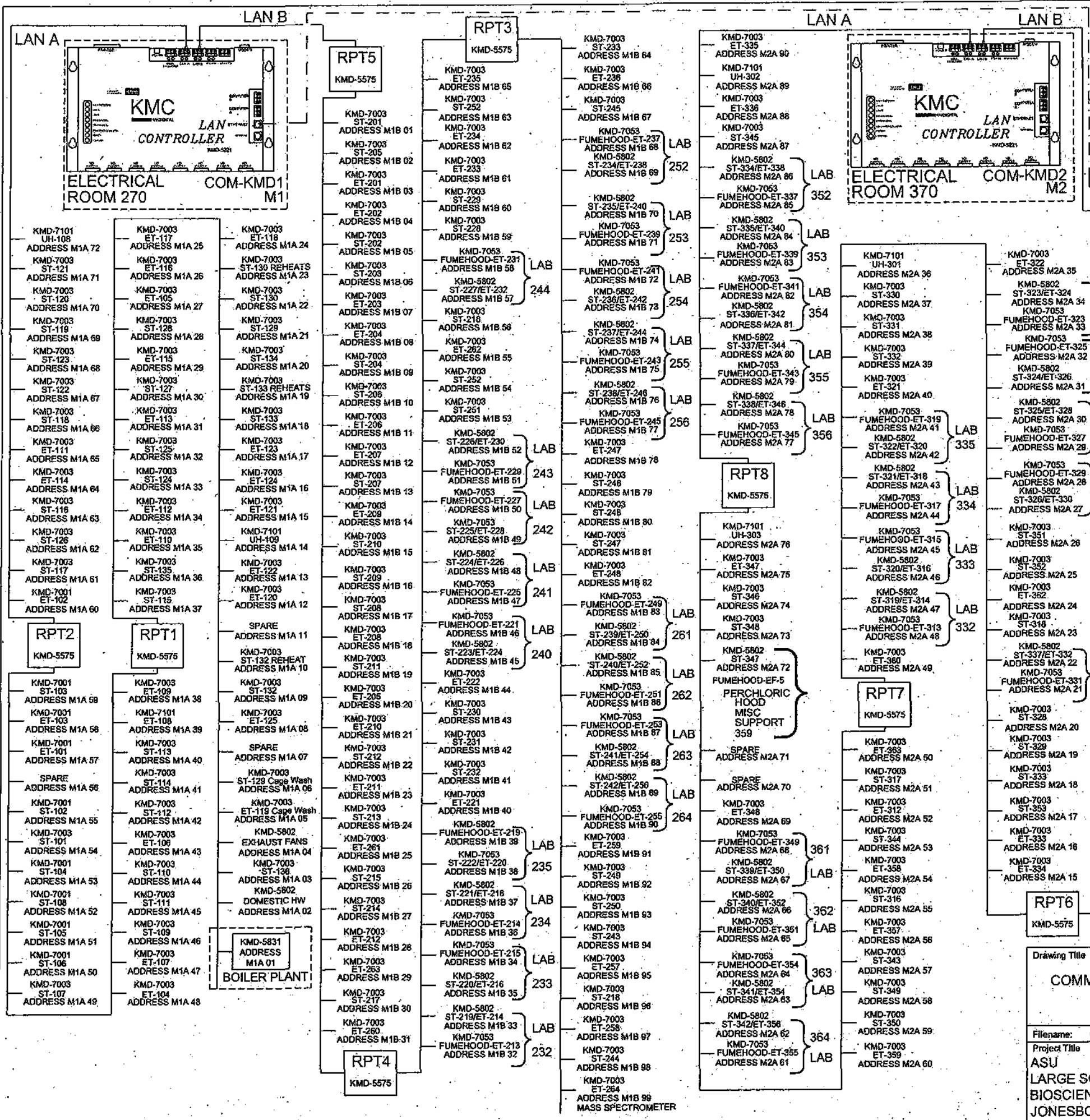
AFS	AIR FLOW STATION
AHU	AIR HANDLER UNIT
AI	ANALOG INPUT
ALR / ALRM	ALARM
AO	ANALOG OUTPUT
ATS	AVERAGING TEMPERATURE SENSOR
AUX	AUXILIARY
AUX-FLOW	AUXILIARY FLOW
AVG	AVERAGE / AVERAGING
BCU	BLOWER COIL UNIT
BLDG	BUILDING
BLR	BOILER
BLDSP	BUILDING STATIC PRESSURE
BLDSP-SP	BUILDING STATIC PRESSURE SETPOINT
CAV	CONSTANT AIR VOLUME
CBL	CABLE
CCWCLOSE	COUNTER CLOCK WISE TO CLOSE
CH / CLR	CHILLER
CHWP	CHILLED WATER PUMP
CHWR	CHILLED WATER RETURN
CHWS	CHILLED WATER SUPPLY
CLG	COOLING
CMR	CURRENT TRANSDUCER SWITCH RELAY W/ COMMAND RELAY
COM / COMM	COMMUNICATION
COMP	COMPUTER
COMP / CMP	COMPRESSOR
COND	CONDENSER
CO	CARBON MONOXIDE
CO2	CARBON DIOXIDE
COOL	COOLING
COOLSTG#	COOLING STAGE (# - PARTICULAR STAGE NUMBER)
COOL\$SPT	ACTIVE COOLING SETPOINT (CALCULATED)
COOL-SP	COOLING SETPOINT
CP	CENTRAL PLANT
CR	CONTROL RELAY
CSR	CURRENT TRANSDUCER SWITCH RELAY
CT	COOLING TOWER
CT	CURRENT TRANSDUCER
CWP	CONDENSER WATER PUMP
CWR	CONDENSER WATER RETURN
CWS	CONDENSER WATER SUPPLY
CW-CLOSE	CLOCK WISE TO CLOSE
C\$SETBK	COOLING SET BACK SETPOINT
DB	DEADBAND OR DRY BULB
DAH	DISCHARGE AIR HUMIDITY
DAT	DISCHARGE AIR TEMPERATURE
DD	DUAL DUCT
DHS	DISCHARGE AIR HUMIDITY SENSOR
DHT	DUCT HUMIDITY/TEMPERATURE SENSOR
DI	DIGITAL INPUT
DMP/DMPR	DAMPER OR DAMPER ACTUATOR (OR BOTH)
DMPR-POS	DAMPER POSITION
DN	DOWN
DO	DIGITAL OUTPUT
DOM	DOMESTIC
DPS	DIFFERENTIAL PRESSURE SWITCH
DPT	DIFFERENTIAL PRESSURE TRANSDUCER
DRV-TIME	ACTUATOR DRIVE TIME
DSP	DISCHARGE STATIC PRESSURE
DTS	DISCHARGE TEMPERATURE SENSOR

EF	EXHAUST FAN
EH	ELECTRIC HEAT
EP	ELECTRIC TO PNEUMATIC RELAY
ERU	ENERGY RECOVERY UNIT
ES	END SWITCH
ET	EXHAUST AIR TERMINAL UNIT
FCU	FAN COIL UNIT
FH	FUME HOOD
FLW	FLOW
FP-VAV	FAN POWERED VARIABLE AIR VOLUME
FPP-VAV	PARALLEL FAN POWERED VARIABLE AIR VOLUME
FPS-VAV	SERIAL FAN POWERED VARIABLE AIR VOLUME
FS	FIRESTAT
FTH	FIN TUBE HEATER
H/C-MODE	HEATING OR COOLING MODE
HEAT	HEATING
HEATSTG#	HEATING STAGE (# - PARTICULAR STAGE NUMBER)
HEAT\$SPT	ACTIVE HEATING SETPOINT (CALCULATED)
HL	HIGH LIMIT
HLS	HIGH LIMIT SWITCH
HOA	HAND-OFF-AUTO SWITCH
HRU	HEAT RECOVERY UNIT
HUM	HUMIDITY / HUMIDIFIER
HW	HOT WATER
HX	HEAT EXCHANGER
H\$SETBK	HEATING SET BACK SETPOINT
INT	INTERFACE
IRH	INFRARED HEATER
ISO	ISOLATE / ISOLATION
ITS	IMMERSION TEMPERATURE SENSOR
LAN	LOCAL AREA NETWORK
LCA	LOW CONTROL AIR
LD	LOAD
LDDR	LADDER
LL	LOW LIMIT
LLS	LOW LIMIT SWITCH THERMOSTAT (FREEZESTAT)
LS	LIGHT SWITCH / LIGHT SENSOR
MAG	MAGNETIC GAUGE
MAT	MIXED AIR TEMPERATURE
MAU	MAKE UP AIR UNIT
MAX	MAXIMUM
MID	MIDDLE / MIDPOINT
MIN	MINIMUM
MON	MONITOR
MZ	MULTI-ZONE
OA / OSA	OUTSIDE AIR
OAT	OUTSIDE AIR TEMPERATURE
OAU	OUTSIDE AIR UNIT
OR	OPERATING ROOM (TYPICALLY)
OTS	OUTSIDE AIR TEMPERATURE SENSOR
PCHP	PRIMARY CHILLED WATER PUMP
PE	PNEUMATIC TO ELECTRIC RELAY
PGS	PROPYLENE GLYCOL SOLUTION
PHC	PREHEAT COIL
PID	PROPORTIONAL, INTEGRAL, DERIVATIVE LOOP
PMP	PUMP
PNEU	PNEUMATIC
PNL	PANEL
PRS	PRESSURE

R	RELAY
RAH	RETURN AIR HUMIDITY
RAT	RETURN AIR TEMPERATURE
RFRG	REFRIGERANT
RH	ROOM HUMIDITY
%RH	PERCENT OF RELATIVE HUMIDITY
RHC	REHEAT COIL
RH-SP	ROOM HUMIDITY SETPOINT
RM	ROOM
RPT	REPEATER
RT-SP	ROOM TEMPERATURE SETPOINT
RTS	RETURN AIR TEMPERATURE SENSOR
SAT	SUPPLY AIR TEMPERATURE
SCH / SCHED	SCHEDULE
SCHP	SECONDARY CHILLED WATER PUMP
SD / SMK	SMOKE DETECTOR
SF	SUPPLY FAN
SFT	STEAM FLOW TRANSDUCER
SP	SETPOINT
SPL	SPLIT
ST	SUPPLY AIR TERMINAL UNIT
STM	STEAM
STS	SPACE TEMPERATURE SENSOR
SZ	SINGLE ZONE
TEMP / TMP	TEMPERATURE
TOX	TOXIC
STAT	THERMOSTAT
TT	TEMPERATURE TRANSMITTER
TWR	TOWER
UH	UNIT HEATER
UNC	UNITARY CONTROLLER
UNT	UNITARY
VAV	VARIABLE AIR VOLUME
VENT	VENTILATION / VENTILATOR
VFD	VARIABLE FREQUENCY DRIVE
VLV ; V	VALVE
WAN	WIDE AREA NETWORK
WTF	WATER FLOW TRANSDUCER
XFR	TRANSFORMER
ZH	ZONE HUMIDITY
ZHS	ZONE HUMIDITY SENSOR
ZH-SP	ZONE HUMIDITY SETPOINT
ZT	ZONE TEMPERATURE
ZTS	ZONE TEMPERATURE SENSOR
ZT-SP	ZONE TEMPERATURE SETPOINT

ABBREVIATIONS LIST
TO BE AMENDED
AS NECESSARY

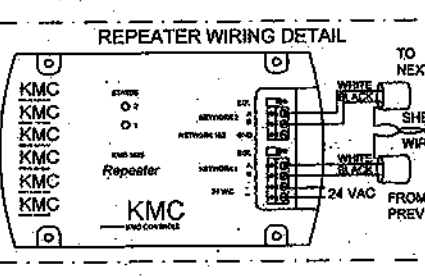
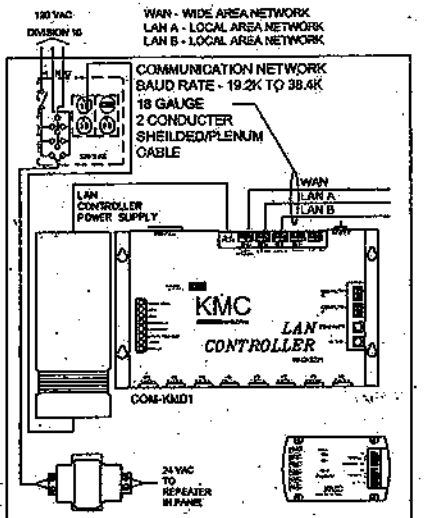
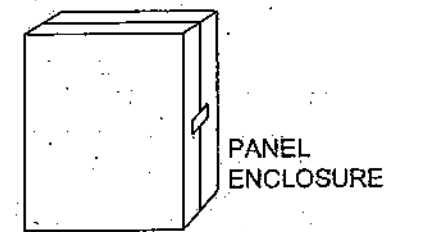
Drawing Title ABBREVIATION LIST FOR LABELS AND DISCRIPTORS		AS-BUILT MODIFICATION	A	10/11/14	JS
Reference Drawing	NO	Revision	ECN	Date	By
Filename: HVAC_ABBREV.DWG	TL/ GH	BP	JS	By JS Date: 5/23/03	Approved
Project Title ASU BIOSCIENCE & BIOTECHNOLOGY BLDG JONESBORO, AR			Office Information: TL Services, Inc. 4733 Kibler Rd. Van Buren, AR 72956 PH: 479-474-7222 FX: 479-471-7984		Contract Number: 03-C005 Drawing Number: INDEX_1



BILL OF MATERIALS

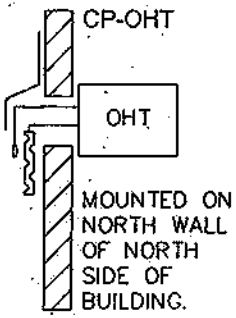
SYM	QTY	PART#	MEG	DESCRIPTION
COM-KMD1,2,3	3	KMD-5230	KMC	DDC LAN Com Panel
KMD-5230 includes the following:				
	1	KMD-5210	KMC	DDC LAN Controller
	1	KMD-5563	KMC	LAN Controller Power Supply
	1	HCO-1035	KMC	NEMA 1 Enclosure, 20"x24"x6"
RPT#	6	KMD-5575	KMC	Optical Isolator/Repeater

- COMPUTER WORKSTATION
- Pentium IV 600 Mhz MMX or better
 - 128 MB RAM or better
 - 10 GIG Hard Drive or better
 - 3.5" Floppy
 - 101 Key Enhanced Keyboard
 - Bus Mouse
 - 1 Parallel & 2 Serial Ports
 - 32X CD ROM drive
 - 56K V.90 Modem
 - Windows
 - BAS Software
 - Sound Card & Speakers
 - 17" Color Monitor



Drawing Title		AS-BUILT MODIFICATION		A	10/11/14	JS
COMMUNICATIONS TRUNK						
Reference Drawing		NO		Revision		ECN
Sales: Project Manager		Applications Engineer		Drawn		Approved
Filename: COMRISER.DWG	TL/ GH	BP	JS	By: JS	Date: 6/20/03	By: Date:
Project Title		Office Information:		Contract Number:		
ASU		TL Services, Inc.		03-C005		
LARGE SCALE CULTURE FACILITY		4733 Kibler Rd.		Drawing Number:		
BIOSCIENCE & BIOTECH BLDG		Van Buren, AR 72956		1		
JONESBORO, AR		PH: 479-474-7222				
		FX: 479-471-7964				

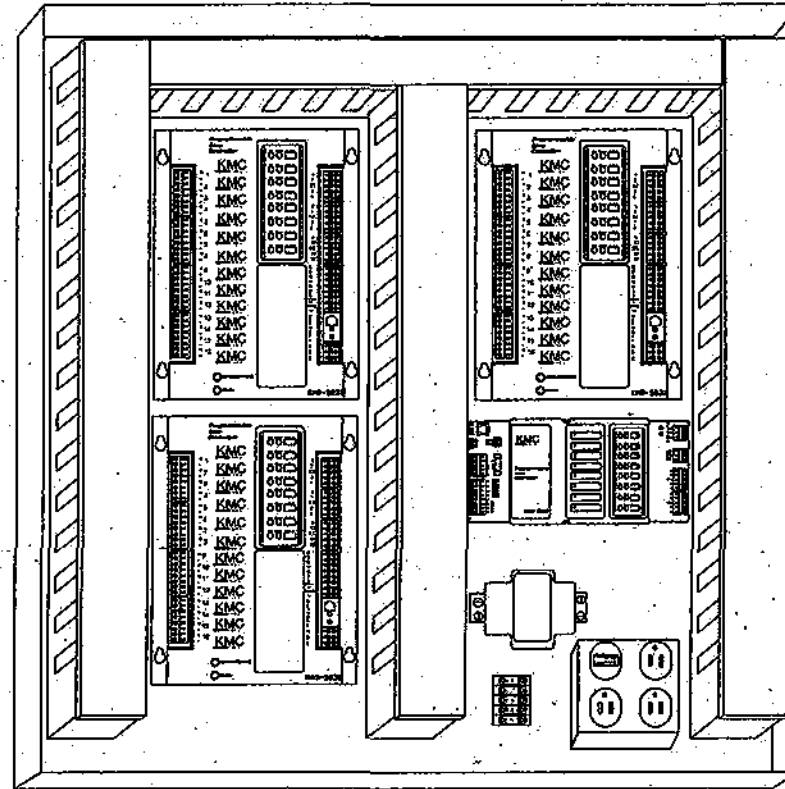
CENTRAL PLANT CHILLED WATER SYSTEM



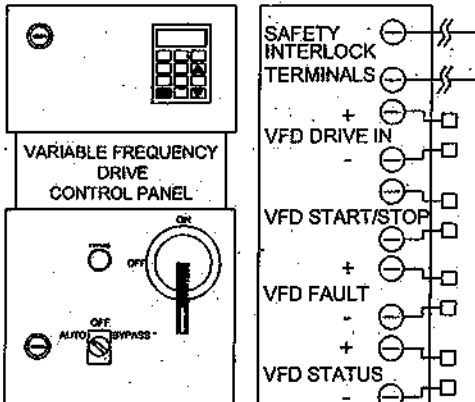
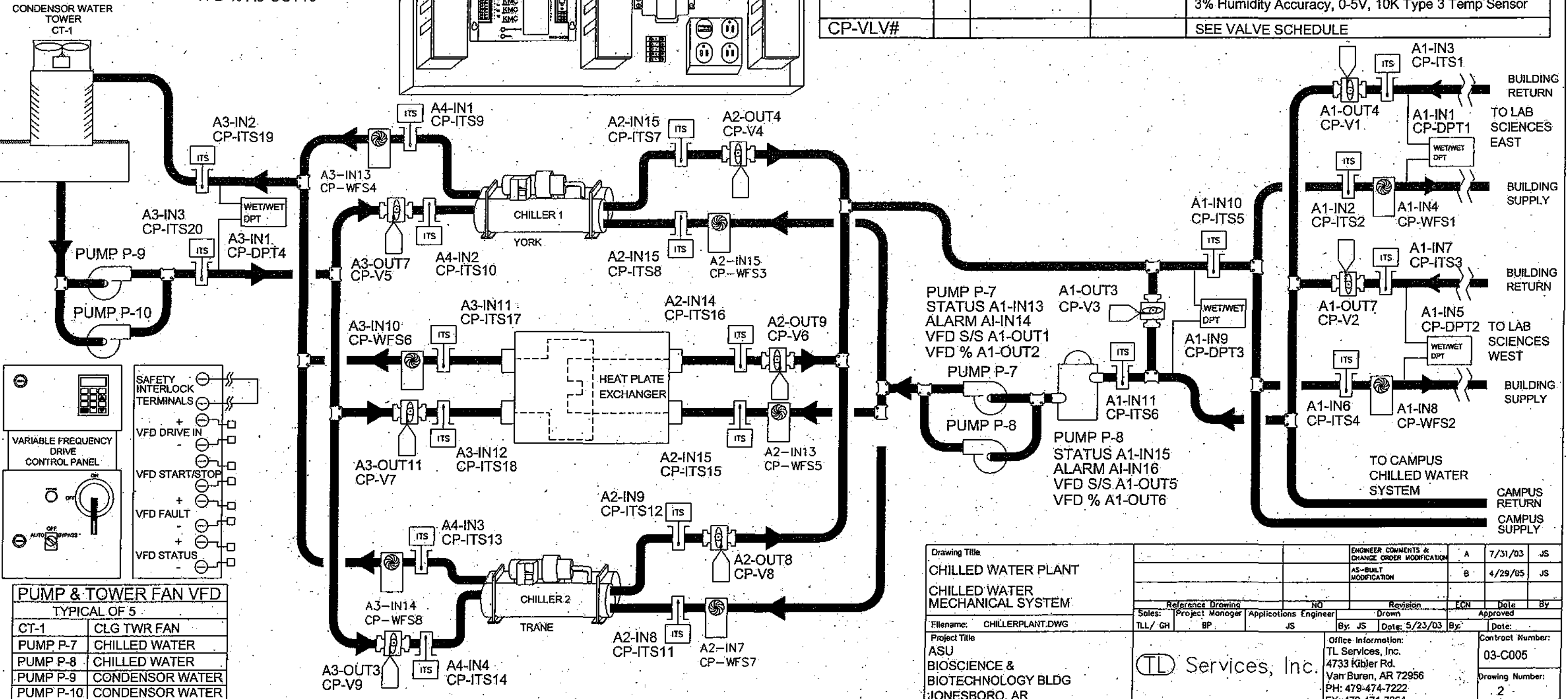
PUMP P-9
STATUS A3-IN6
ALARM A3-IN7
VFD S/S A3-OUT5
VFD % A3-OUT6

PUMP P-10
STATUS A3-IN8
ALARM A3-IN9
VFD S/S A3-OUT9
VFD % A3-OUT10

CONDENSOR WATER TOWER CT-1



BILL OF MATERIALS				
PART ID	QTY	PART #	MFG	DESCRIPTION
CP-ITS#	20	STE-1421	KMC	Immersion Sensor; 10K
	20	HMO-4533	KMC	Immersion Sensor Well
CP-WFS#	8	3100-0#	FLUIDYNE	Flow Meter; Immersed Vortex Shedding Meter Pipe sizes to be field determined.
CP-DPT#	4	TPE-1482	KMC	Differential Pressure Wet-Wet Transducer Pressure Range to be Determined
CP-PNL	1	HCO-1036	KMC	NEMA1 Enclosure, 24"X36"X6"
	3	KMD-5831	KMC	DDC Controller; 16 Inputs/12 Outputs
	1	KMD-5802	KMC	DDC Controller; 8 Inputs/8 Outputs
	18	HPO-6702	KMC	HOA Relay Module; Analog 0-10VDC
	7	HPO-6703	KMC	HOA Relay Module; Digital Dry Contact N/O Relay
	6	HPO-6802	KMC	HOA Relay Module Cover
	1	XEE-6111-100	KMC	100 VA Transformer; 120/24 V
CP-OHT	1	RH300A03D	KMC	Outside Air Temperature/Humidity Sensor Transmitter 3% Humidity Accuracy, 0-5V, 10K Type 3 Temp Sensor
CP-VLV#				SEE VALVE SCHEDULE



PUMP & TOWER FAN VFD TYPICAL OF 5	
CT-1	CLG TWR FAN
PUMP P-7	CHILLED WATER
PUMP P-8	CHILLED WATER
PUMP P-9	CONDENSOR WATER
PUMP P-10	CONDENSOR WATER

Drawing Title		ENGINEER COMMENTS & CHANGE ORDER MODIFICATION		A	7/31/03	JS
CHILLED WATER PLANT		AS-BUILT MODIFICATION		B	4/29/05	JS
CHILLED WATER MECHANICAL SYSTEM		Revision		ECN	Date	By
Filename: CHILLERPLANT.DWG	Project Manager	Applications Engineer	Drawn	Approved		
TL/ GH	BP	JS	By JS	Date: 5/23/03	By	Date:
Project Title		Office Information:		Contract Number:		
ASU BIOSCIENCE & BIOTECHNOLOGY BLDG JONESBORO, AR		TL Services, Inc. 4733 Kibler Rd. Van Buren, AR 72956 PH: 479-474-7222 FX: 479-471-7964		03-C005		
				Drawing Number: 2		

CENTRAL PLANT CHILLED WATER SYSTEM

SEQUENCE OF OPERATION

CHILLER SEQUENCING: THE INSTANTANEOUS CHILLED WATER PLANT LOAD SHALL BE CALCULATED BASED UPON THE TOTAL PLANT CHILLED WATER FLOW AND TEMPERATURE DIFFERENCE. THE AVERAGED PLANT LOAD SHALL BE THE AVERAGE PLANT CHILLED WATER LOAD FOR THE PREVIOUS 30 MINUTES (ADJUSTABLE). WATER CHILLERS SHALL BE SEQUENCED IN A LEAD - LAG MANNER BASED UPON THE AVERAGED PLANT LOAD. THE LEAD CHILLER SHALL TYPICALLY BE THE NEW CHILLER. THE LEAD CHILLER SHALL TYPICALLY BE OPERATED AT ALL TIMES (EXCEPT WHEN THE HYDRONIC FREE COOLING SYSTEM IS IN OPERATION AS HEREINAFTER DISCUSSED). IN THE EVENT THAT THE AVERAGED PLANT LOAD EXCEEDS 400 TONS (ADJUSTABLE) FOR MORE THAN 5 MINUTES (ADJUSTABLE), THE LAG CHILLER SHALL BE STARTED. IN THE EVENT THAT THE AVERAGED PLANT LOAD DECREASES BELOW 300 TONS (ADJUSTABLE) FOR MORE THAN 5 MINUTES (ADJUSTABLE), THE LAG CHILLER SHALL BE STOPPED. IN THE EVENT THAT A WATER CHILLER FAILS TO START OR FAILS DURING OPERATION, THE SEQUENCING PROGRAM SHALL STOP THE CHILLER THAT HAS FAILED AND START THE LAG WATER CHILLER. THE SEQUENCING PROGRAM SHALL PROVIDE FOR THE REGULAR EXERCISE (A MINIMUM OF 2 HOURS EACH WEEK) OF EACH WATER CHILLER. IN THE EVENT THAT THE CHILLED WATER SUPPLY TEMPERATURE IS MORE THAN 4 DEG. F (ADJUSTABLE) ABOVE THE CHILLED WATER SUPPLY TEMPERATURE SETPOINT FOR MORE THAN 15 MINUTES (ADJUSTABLE), THE SEQUENCING PROGRAM SHALL BE OVERRIDDEN AND THE LAG WATER CHILLER SHALL BE STARTED. CHANGES IN WATER CHILLER SEQUENCING SHALL NOT OCCUR MORE THAN ONCE EACH HOUR (ADJUSTABLE). WHEN A CHILLER HAS BEEN STARTED, IT SHALL REMAIN IN OPERATION A MINIMUM OF 30 MINUTES (ADJUSTABLE) BEFORE IT IS STOPPED. THE SEQUENCING PROGRAM SHALL BE STRUCTURED SUCH THAT IT CAN BE DISABLED AND ENABLED BASED UPON OPERATOR COMMAND. WHEN THE SEQUENCING PROGRAM IS DISABLED, THE WATER CHILLERS SHALL BE SEQUENCED BASED UPON OPERATOR COMMAND.

CHILLED WATER SUPPLY TEMPERATURE RESET: THE CHILLED WATER SUPPLY TEMPERATURE SETPOINT SHALL BE RESET BY THE DDC PANEL FROM A MINIMUM OF 42 DEG. F (ADJUSTABLE) AT AN OUTSIDE AIR TEMPERATURE OF 70 DEG. F (ADJUSTABLE) AND ABOVE TO A MAXIMUM OF 48 DEG. F (ADJUSTABLE) AT AN OUTSIDE AIR TEMPERATURE OF 50 DEG. F (ADJUSTABLE) AND BELOW.

TOWER WATER SUPPLY TEMPERATURE RESET: THE TOWER WATER SUPPLY TEMPERATURE SETPOINT SHALL BE RESET BY THE DDC PANEL FROM A MINIMUM OF 55 DEG. F (ADJUSTABLE) AT AN OUTSIDE AIR WET BULB TEMPERATURE OF 45 DEG. F (ADJUSTABLE) AND BELOW TO A MAXIMUM OF 85 DEG. F (ADJUSTABLE) AT AN OUTSIDE AIR WET BULB TEMPERATURE OF 80 DEG. F (ADJUSTABLE) AND ABOVE. WHEN THE HYDRONIC FREE COOLING SYSTEM IS ENABLED, THE TOWER WATER SUPPLY TEMPERATURE SETPOINT SHALL BE RESET TO 45 DEG. F (ADJUSTABLE).

TOWER WATER PUMP SEQUENCING: THE TOWER WATER PUMPS SHALL BE SEQUENCED IN A LEAD - STANDBY ARRANGEMENT BY THE DDC PANEL. THE LEAD AND STANDBY PUMPS SHALL BE ALTERNATED ON A REGULAR BASIS TO EQUALIZE WEAR. THE LEAD PUMP SHALL TYPICALLY BE OPERATED AT ALL TIMES.

CHILLED WATER PUMP SEQUENCING: THE CHILLED WATER PUMPS SHALL BE SEQUENCED IN A LEAD - STANDBY ARRANGEMENT BY THE DDC PANEL. THE LEAD AND STANDBY PUMPS SHALL BE ALTERNATED ON A REGULAR BASIS TO EQUALIZE WEAR. THE LEAD PUMP SHALL TYPICALLY BE OPERATED AT ALL TIMES.

HYDRONIC FREE COOLING SEQUENCING: WHEN THE OUTSIDE AIR WET BULB TEMPERATURE DECREASES BELOW 40 DEG. F (ADJUSTABLE) FOR MORE THAN 15 MINUTES, THE HYDRONIC FREE COOLING SYSTEM SHALL BE ENABLED AND THE WATER CHILLERS SHALL BE STOPPED. WHEN THE OUTSIDE AIR WET BULB TEMPERATURE INCREASES ABOVE 42 DEG. F (ADJUSTABLE) FOR MORE THAN 15 MINUTES, THE HYDRONIC FREE COOLING SYSTEM SHALL BE DISABLED AND THE LEAD WATER CHILLER SHALL BE STARTED.

TOWER WATER PUMPS: TOWER WATER PUMPS SHALL BE STARTED AND STOPPED BASED UPON SEQUENCING PROGRAM OR OPERATOR COMMAND. THE SPEED OF THE OPERATING PUMP SHALL BE MODULATED AS REQUIRED TO MAINTAIN THE TOWER WATER DIFFERENTIAL PRESSURE AT SETPOINT. SETPOINT SHALL BE RESET FROM A MINIMUM OF 5 PSIG (ADJUSTABLE) TO A MAXIMUM OF 10 PSIG (ADJUSTABLE) BASED UPON THE POSITION OF THE CHILLER AND HX TW CONTROL VALVES. IF THE MOST OPEN VALVE IS MORE THAN 95% OPEN (ADJUSTABLE), THE SETPOINT SHALL BE INCREASED. IF THE MOST OPEN VALVE IS LESS THAN 80% OPEN (ADJUSTABLE), THE SETPOINT SHALL BE DECREASED.

CHILLED WATER PUMPS: CHILLED WATER PUMPS SHALL BE STARTED AND STOPPED BASED UPON SEQUENCING PROGRAM OR OPERATOR COMMAND. THE SPEED OF THE PUMPS SHALL BE MODULATED AS REQUIRED TO MAINTAIN THE PLANT DIFFERENTIAL PRESSURE AT SETPOINT. SETPOINT SHALL BE RESET FROM A MINIMUM OF 15 PSIG (ADJUSTABLE) TO A MAXIMUM OF 30 PSIG (ADJUSTABLE) AS REQUIRED TO MAINTAIN THE LOWEST BUILDING CHILLED WATER DIFFERENTIAL PRESSURE AT SETPOINT OF 10 PSIG (ADJUSTABLE).

TOWER, CHILLER, AND HX TW CONTROL VALVES: TW CONTROL VALVES AT THE COOLING TOWERS, CHILLERS, AND HEAT EXCHANGER SHALL BE OPENED AND CLOSED VERY SLOWLY. THE TIME REQUIRED TO FULLY OPEN OR FULLY CLOSE THE VALVES SHALL BE NOT LESS THAN 120 SECONDS (ADJUSTABLE).

CHILLER AND HX CHW CONTROL VALVES: CHW CONTROL VALVES AT THE CHILLERS AND HEAT EXCHANGER SHALL BE OPENED AND CLOSED VERY SLOWLY. THE TIME REQUIRED TO FULLY OPEN OR FULLY CLOSE THE VALVES SHALL BE NOT LESS THAN 120 SECONDS (ADJUSTABLE).

COOLING TOWER: THE SPEED OF THE TOWER FAN SHALL BE MODULATED AS REQUIRED TO MAINTAIN THE TOWER WATER SUPPLY TEMPERATURE AT SETPOINT.

HYDRONIC FREE COOLING SYSTEM: WHEN THE HYDRONIC FREE COOLING SYSTEM IS ENABLED, THE DDC PANEL SHALL RESET THE TOWER WATER SUPPLY TEMPERATURE TO 40 DEG. F (ADJUSTABLE). WHEN THE TOWER WATER SUPPLY TEMPERATURE HAS DECREASED BELOW 50 DEG. F, THE HX CHW CONTROL VALVE SHALL BE FULLY OPENED AND THE HX TW CONTROL VALVE SHALL BE MODULATED AS REQUIRED TO MAINTAIN THE PLANT CHILLED WATER SUPPLY TEMPERATURE AT SETPOINT OF 48 DEG. F (ADJUSTABLE). WHEN THE HX TW AND CHW CONTROL VALVES HAVE BEEN OPEN FOR FIVE (5) MINUTES (ADJUSTABLE), THE OPERATING WATER CHILLER (OR CHILLERS) SHALL BE STOPPED. WHEN THE HYDRONIC FREE COOLING SYSTEM IS DISABLED, THE DDC PANEL SHALL IMMEDIATELY START THE LEAD WATER CHILLER. WHEN THE LEAD CHILLER HAS BEEN IN OPERATION FOR 5 MINUTES (ADJUSTABLE), THE HX TW AND CHW CONTROL VALVES SHALL BE CLOSED.

WATER CHILLERS: WHEN A WATER CHILLER IS ENABLED AND THE CONTROL PANEL REQUESTS CHILLED WATER AND TOWER WATER FLOW, THE ASSOCIATED CHW AND TW CONTROL VALVES SHALL BE OPENED. AFTER THE CHILLED WATER AND TOWER WATER FLOWS ARE PROVEN (FLOWS EXCEED THE MINIMUM SETPOINT), THE WATER CHILLER SHALL BE STARTED. THE CHILLER SHALL BE LOADED AND UNLOADED BY CHILLER CONTROL PANEL AS REQUIRED TO MAINTAIN THE CHILLED WATER SUPPLY TEMPERATURE AT SETPOINT. THE CHILLER CHW CONTROL VALVE SHALL BE MODULATED AS REQUIRED TO PREVENT THE CHILLED WATER FLOW FROM EXCEEDING THE MAXIMUM FLOW SETPOINT. THE CHILLER TW CONTROL VALVE SHALL BE MODULATED AS REQUIRED TO MAINTAIN THE REFRIGERANT LIFT AT SETPOINT (SETPOINT SHALL BE ADJUSTABLE AND COORDINATED WITH THE WATER CHILLER MANUFACTURER). VALVE CONTROL SHALL BE OVERRIDDEN AS REQUIRED TO PREVENT THE TOWER WATER FLOW FROM EXCEEDING THE MAXIMUM FLOW SETPOINT OR DECREASING BELOW THE MINIMUM FLOW SETPOINT. FLOW SETPOINTS SHALL BE COORDINATED WITH THE CHILLER MANUFACTURER. WHEN THE WATER CHILLER IS DISABLED, THE DDC PANEL SHALL IMMEDIATELY STOP THE WATER CHILLER. WHEN CHILLED WATER FLOW IS NO LONGER REQUESTED BY THE CHILLER CONTROL PANEL, THE CHILLER CHW CONTROL VALVE SHALL BE CLOSED. WHEN TOWER WATER FLOW IS NO LONGER REQUESTED BY THE CHILLER CONTROL PANEL THE CHILLER TW CONTROL VALVE SHALL BE CLOSED.

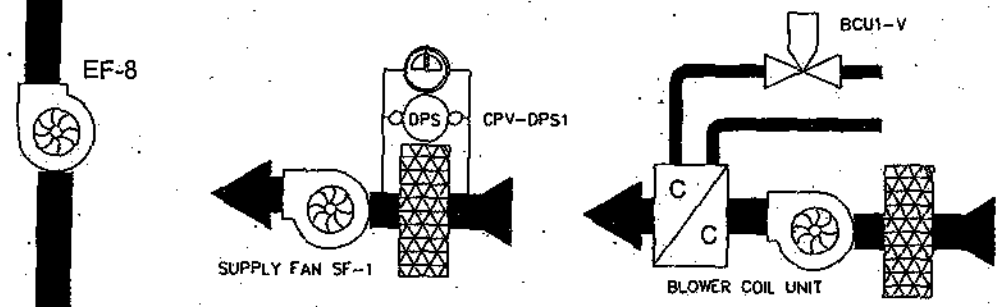
CHILLED WATER BYPASS VALVE: CHILLED WATER BYPASS VALVE SHALL BE MODULATED AS REQUIRED TO PREVENT THE CHILLED WATER FLOWS AT EACH OPERATING CHILLER FROM DECREASING BELOW THE MINIMUM CHILLED WATER FLOW SETPOINT.

LAB SCIENCES EAST CHILLED WATER SYSTEM SEQUENCE OF OPERATION: THE BUILDING CHILLED WATER CONTROL VALVE SHALL BE MODULATED AS REQUIRED TO LIMIT THE BUILDING CHILLED WATER FLOW TO A MAXIMUM OF 750 GPM (ADJUSTABLE) AND AS REQUIRED TO PREVENT THE BUILDING CHILLED WATER DIFFERENTIAL PRESSURE FROM EXCEEDING 30 PSIG (ADJUSTABLE). DDC PANEL SHALL MONITOR THE BUILDING CHILLED WATER SUPPLY AND RETURN TEMPERATURES. DDC PANEL SHALL CALCULATE THE INSTANTANEOUS BUILDING CHILLED WATER LOAD (BASED UPON THE FLOW THE TEMPERATURE DIFFERENCE). THE DDC PANEL SHALL ALSO TOTALIZE THE BUILDING CHILLED WATER LOAD (TON-HOURS).

LAB SCIENCES WEST CHILLED WATER SYSTEM SEQUENCE OF OPERATION: THE BUILDING CHILLED WATER CONTROL VALVE SHALL BE MODULATED AS REQUIRED TO LIMIT THE BUILDING CHILLED WATER FLOW TO A MAXIMUM OF 750 GPM (ADJUSTABLE) AND AS REQUIRED TO PREVENT THE BUILDING CHILLED WATER DIFFERENTIAL PRESSURE FROM EXCEEDING 30 PSIG (ADJUSTABLE). DDC PANEL SHALL MONITOR THE BUILDING CHILLED WATER SUPPLY AND RETURN TEMPERATURES. DDC PANEL SHALL CALCULATE THE INSTANTANEOUS BUILDING CHILLED WATER LOAD (BASED UPON THE FLOW THE TEMPERATURE DIFFERENCE). THE DDC PANEL SHALL ALSO TOTALIZE THE BUILDING CHILLED WATER LOAD (TON-HOURS).

Drawing Title		ENGINEER COMMENTS & CHANGE ORDER MODIFICATION		A	7/31/03	JS
CHILLED WATER PLANT		AS-BUILT MODIFICATION		B	10/11/14	JS
CHILLED WATER SEQUENCE OF OPERATION		Reference Drawing		NO	Revision	ECN
Filename: CHILLERSEQ.DWG		Sales: TLL/ GH	Project Manager: BP	Applications Engineer: JS	Drawn: JS	Date: 5/23/03
Project Title: ASU BIOSCIENCE & BIOTECHNOLOGY BLDG JONESBORO, AR		Office Information: TL Services, Inc. 4733 Kibler Rd. Van Buren, AR 72956 PH: 479-474-7222 FX: 479-471-7964		Contract Number: 03-C005		Drawing Number: 4

CENTRAL PLANT VENTILATION SYSTEM



SEQUENCE OF OPERATION:

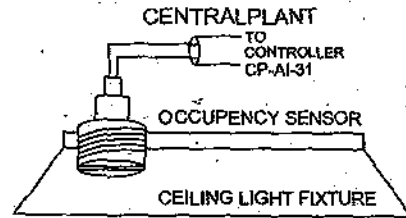
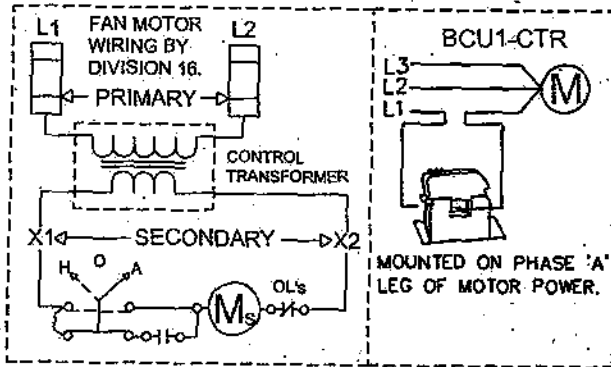
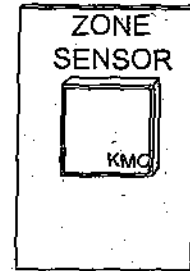
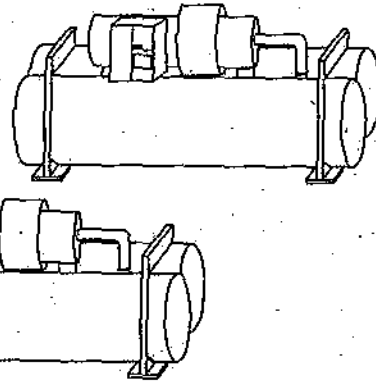
OPERATING MODE: Ventilation system Operating Mode shall be either Occupied or Unoccupied. When the room lights are on, Operating Mode shall be "Occupied". When the lights are off, the Operating Mode shall be "Unoccupied".

EXHAUST FAN AND SUPPLY FAN: If an unsafe refrigerant level is detected (in either the "Occupied" or "Unoccupied" Mode), the exhaust fan (EF-8, CPV-DO-1) and the supply fan (SF-1, CPV-DO-2) shall be started and operated at high speed (refrigerant exhaust level per ASHRAE Standard 15). If the Mode of Operation is "Occupied" and an unsafe refrigerant level is not detected, the exhaust and supply fans shall be started and operated at low speed (0.5 CFM/SF) per ASHRAE Standard 15. If the Mode of Operation is "Unoccupied" and an unsafe refrigerant level is not detected, the supply and exhaust fans are off. DDC Panel shall monitor supply fan filter loading using a differential air pressure switch and digital input (CPV-DI-8)

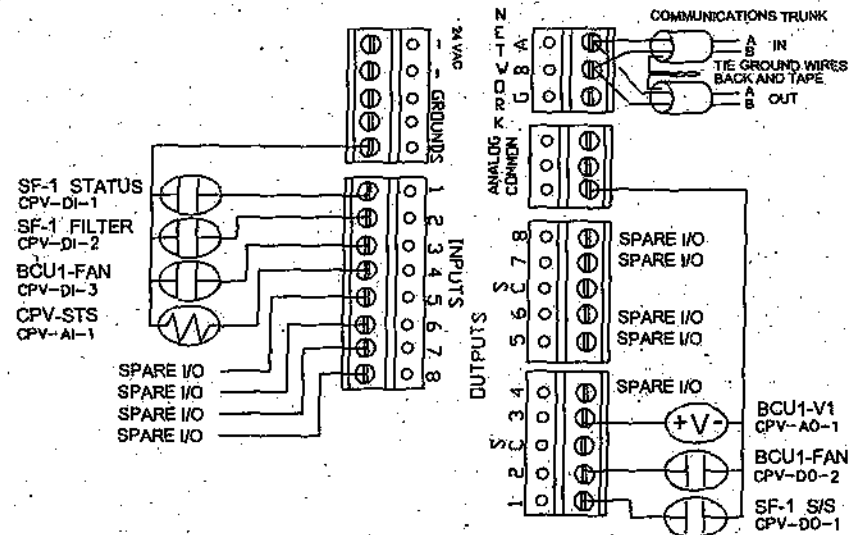
REFRIGERANT MONITOR: In the event that an unsafe refrigerant level is detected by the refrigerant monitor, an audible alarm shall be activated by DDC Panel digital output (CPV-DO-4). The alarm shall sound until silenced at the alarm or acknowledged at the Operator's Workstation.

BLOWER COIL UNIT (BCU-1): DDC Panel shall sequence the BCU-1 fan and modulate the chilled water valve (BCU1-V; CPV-AO-3) as required to prevent the space temperature from exceeding 90°F (adjustable)

REFRIGERANT MONITOR SUPPLIED WITH CHILLERS

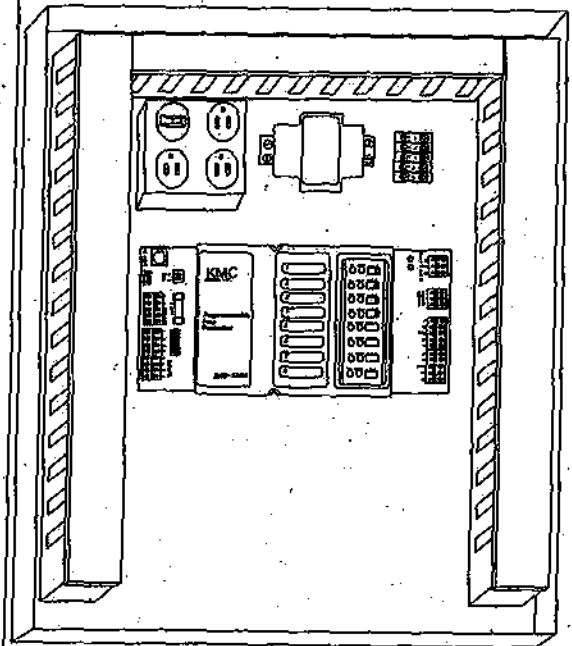


TERMINAL BLOCK WIRING DIAGRAM CPV-KMD1

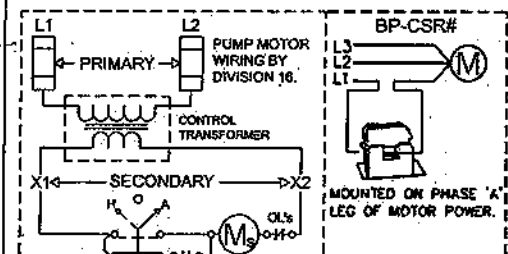
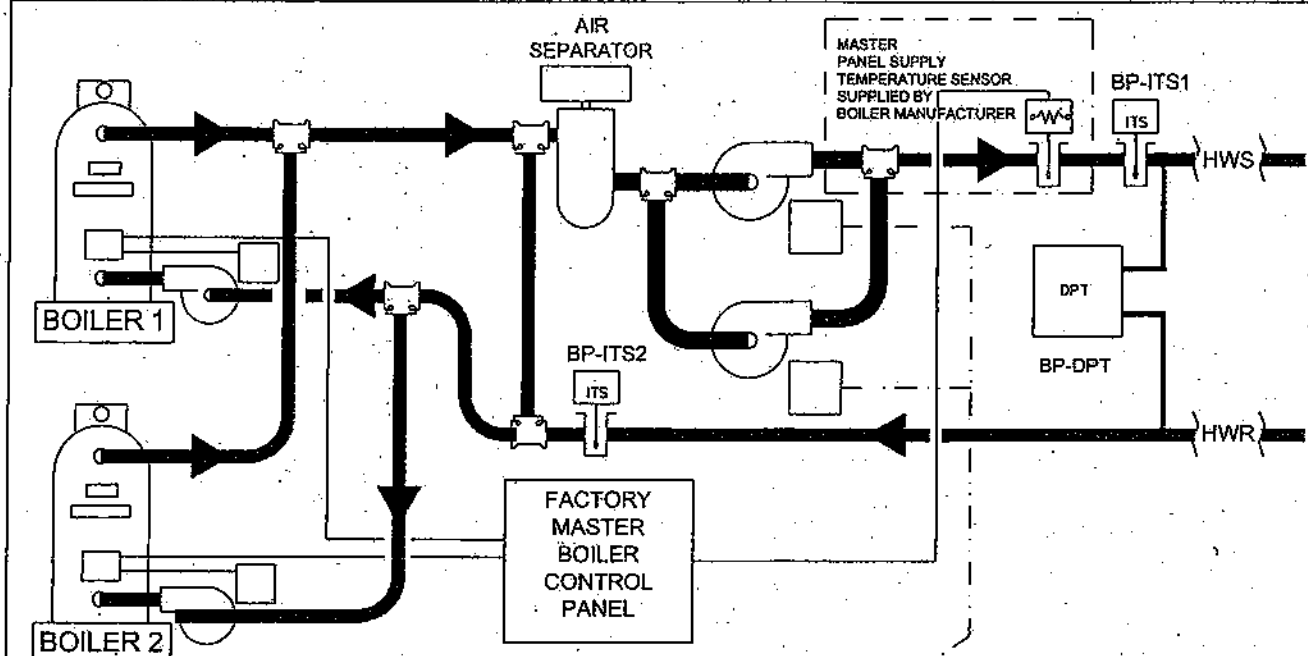


BILL OF MATERIALS:				
DEVICE ID	QTY	PART NUMBER	MFG	DESCRIPTION
CPV-ST5	1	STE-5011-10	KMC	Space Temperature Sensor
	1	HMO-5036	KMC	Space Sensor Mounting Plate
CPV-LS	1	PSR1	KELE	Ambient Light Sensor
BCU1-CTR	1	H932	KMC	Current Transducer Switch
SF1-DPS	1	CSE-1102	KMC	Differential Pressure Switch
CPV-PNL	1	HCO-1034	KMC	Enclosure 16"X18"X6", NEMA 1
CPV-KMD1	1	KMD-5802	KMC	DDC Controller
	1	HPO-6702	KMC	DDC Relay Module; Analog 0-10 VDC
	3	HPO-6703	KMC	DDC Relay Module; N/O Dry Contact
	1	HPO-6802	KMC	DDC Relay Module Cover
CPV-XFR1	1	XEE-6111-040	KMC	40 VA Transformer, 120/24V
BCU1-V	1			See Valve Schedule

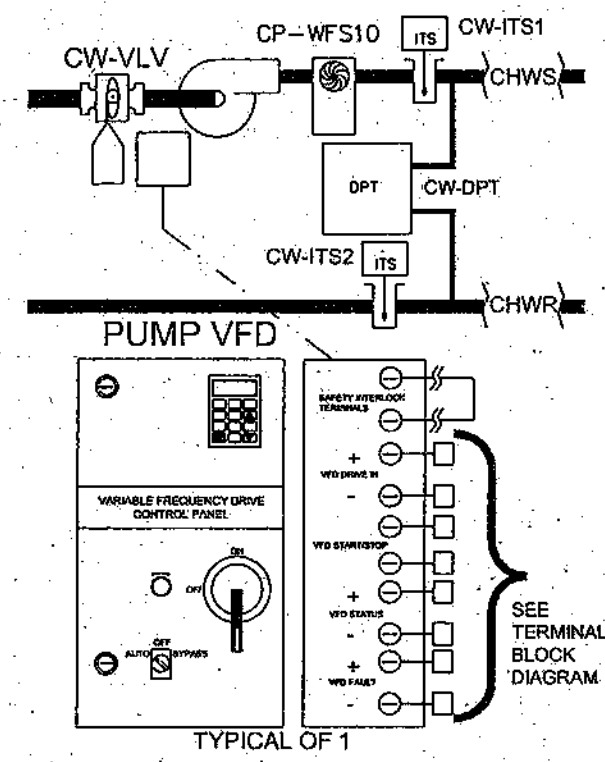
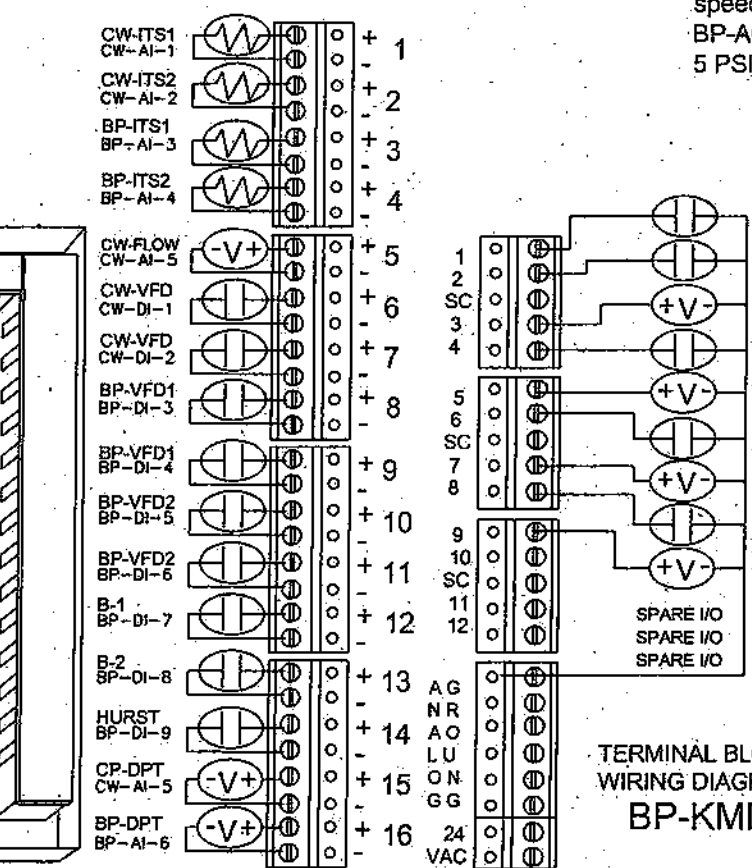
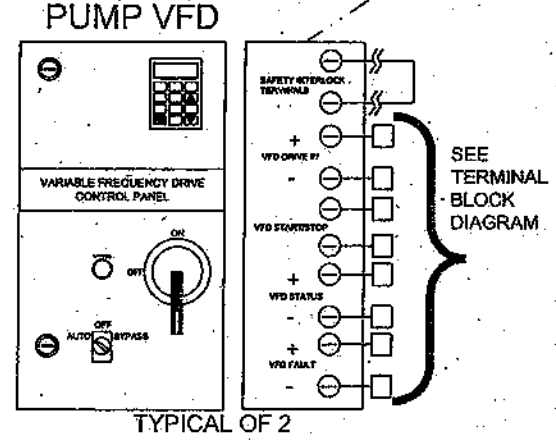
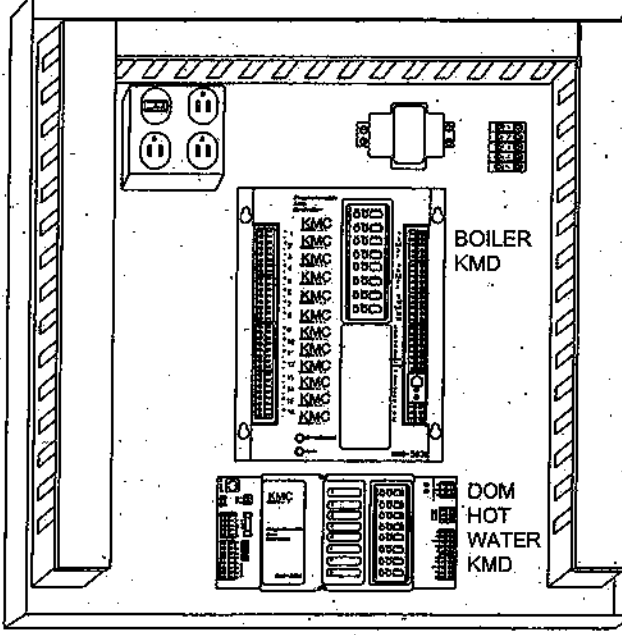
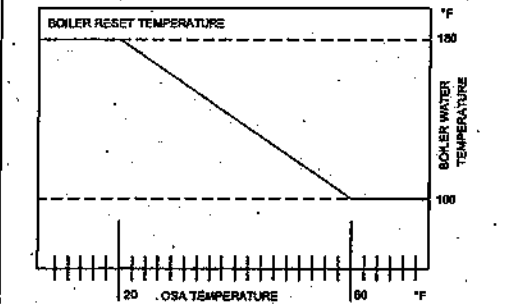
CONTROLLER		8X8	KMD-5802	ADDRESS 8:		
INPUTS						
TRM #	#	DEVICE ID	POINT DESCRIPTION	CABLE ID	DETAIL DWG	CABLE #
1,GND	1	CPV-CSR1	SF-1 FAN STATUS	CPV-DI-1	CWDETAIL-1	A-1 1
2,GND	2	CPV-DPS	SF-1 FILTER STATUS	CPV-DI-2	CWDETAIL-3	A-1 2
3,GND	3	CPV-CSR2	BCU-1 FAN STATUS	CPV-DI-3	CWDETAIL-1	A-1 3
4,GND	4	CPV-ST5	CHILLER ROOM TEMP	CPV-AI-1	CWDETAIL-2	A-1 4
5,GND	5		SPARE I/O			
6,GND	6		SPARE I/O			
7,GND	7		SPARE I/O			
8,GND	8		SPARE I/O			
OUTPUTS						
TRM #	#	DEVICE ID	POINT DESCRIPTION	CABLE ID	DETAIL DWG	CABLE #
1,GND	1		SF-1 FAN STATUS	CPV-DO-1	CWDETAIL3-6	A-1 5
2,GND	2		BCU-1 FAN STATUS	CPV-DO-2	CWDETAIL3-6	A-1 6
3,GND	3	BCU1-V	BCU-1 VALVE	CPV-AO-1	CWDETAIL-4	A-2 7
	4		SPARE I/O			
	5		SPARE I/O			
	6		SPARE I/O			
	7		SPARE I/O			
	8		SPARE I/O			



Drawing Title		CENTRAL PLANT VENTILATION		AS-BUILT MODIFICATION	A	12-27-04	JNS
Filename:	CP_VENT.DWG	Project Manager:	BP	Applications Engineer:	JS	Drawn:	JS
Project Title:	ASU BIOSCIENCE & BIOTECHNOLOGY BLDG JONESBORO, AR	Reference Drawing:	NO	Revision:	NO	ECN:	NO
Office Information:		TL Services, Inc.		4733 Kibler Rd.		Van Buren, AR 72956	
Contract Number:		03-C005		Drawing Number:		5	



CIRCULATING PUMPS ARE INTERLOCKED WITH THEIR RESPECTIVE BOILERS THROUGH FACTORY SUPPLIED RELAYS. DDC PANEL TO MONITOR PUMP STATUS.



SEQUENCE OF OPERATION HEATING WATER SYSTEM

HEATING WATER PUMPS: Heating water pumps (P-2, P-3) shall be started and stopped by DDC Panel digital outputs (BP-DO-1, BP-DO-2). DDC Panel shall monitor VFD alarm and pump status. Pumps shall be alternated in a Lead/Stand-by arrangement. Lead and stand-by pumps shall be automatically alternated for equalized wear. In the event that the lead pump fails, the stand-by pump shall be automatically started. Pump speeds shall be modulated by DDC Panel analog output (BP-AO-1, BP-AO-2) to maintain system differential pressure (BP-AI-1) at setpoint of 5 PSIG (adjustable).

BOILERS: Boiler operation shall be enabled and disabled by DDC Panel digital output (BP-DO-3) through the Master Boiler Control Panel. Master boiler control panel shall sequence the boilers as required to maintain the heating water supply temperature at setpoint. DDC Panel shall automatically reset the heating water supply temperature setpoint from 180°F at 20°F Outside Air (OSA) temperature and below to 100°F at 60°F OSA temperature and above. Master boiler control panel shall automatically alternate boilers to equalize wear.

CHILLED WATER PUMP: Chilled water pump VFD shall be enabled and disabled by DDC Panel digital output (CW-DO-2) and Panel shall monitor VFD alarm and status. The pump speed shall be modulated by DDC Panel analog output (CW-AO-1) to maintain system differential pressure setpoint. Building Chilled Water Isolation Valve (CW-VLV; CW-DO-1) shall be opened anytime the building pump is on.

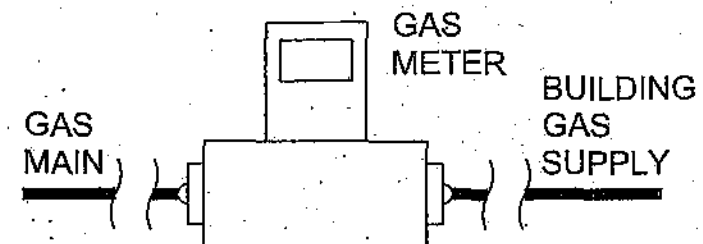
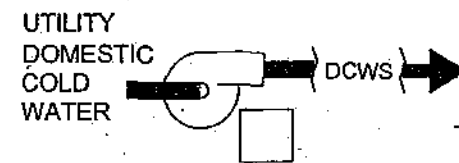
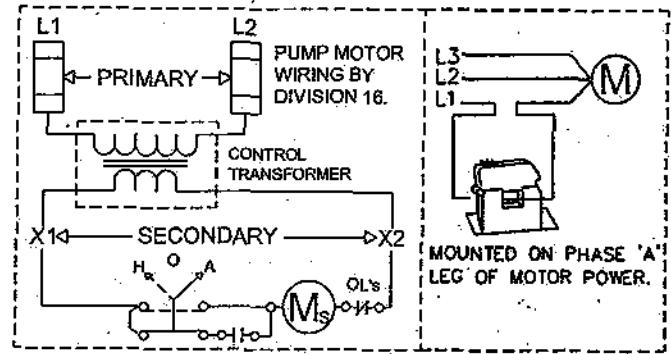
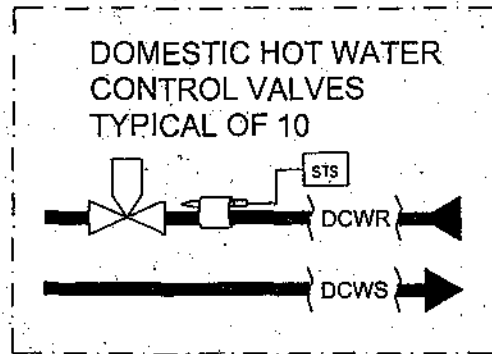
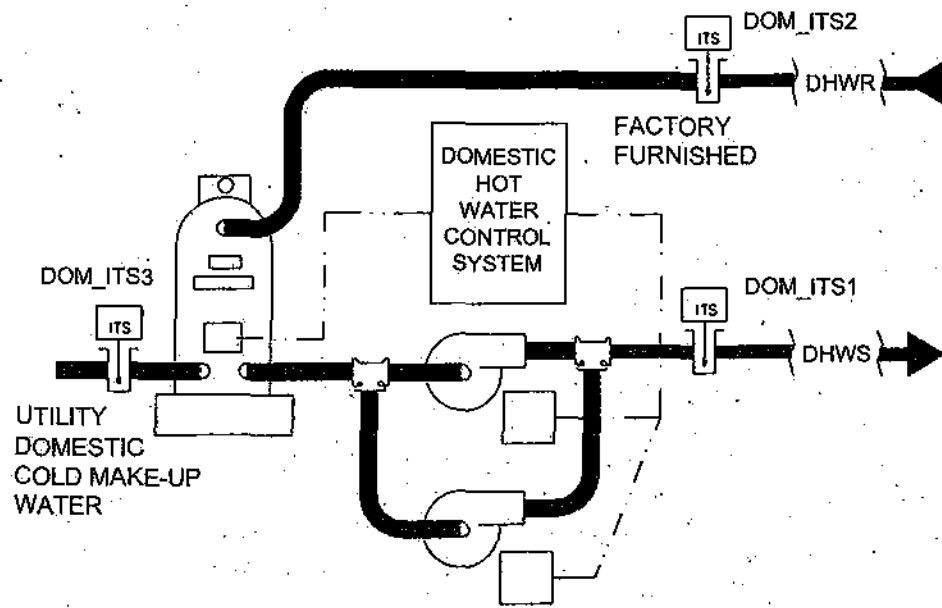
BILL OF MATERIALS:				
DEVICE ID	QTY	PART NUMBER	MFG	DESCRIPTION
BP-ITS1,2	4	STE-1421	KMC	Immersion Temp Sensor
CW-ITS1,2	4	HMO-4533	KMC	Immersion Well, 4" Brass
CP-WFS10	1	3100-0#	FLUIDYNE	Flow Meter; Immersed Vortex Shedding Meter Pipe sizes to be field determined.
BP-DPT CW-DPT	2	TPE-1482-1	KMC	Differential Pressure Transducer Wet-to-Wet, 0-20 PSI
BP-PNL	1	HCO-1034	KMC	Enclosure 16"X18"X6", NEMA 1
BP-KMD1	1	KMD-5831	KMC	DDC Controller
	3	HPO-6702	KMC	DDC Relay Module; Analog 0-10 VDC
	3	HPO-6703	KMC	DDC Relay Module; N/O Dry Contact
	1	HPO-6802	KMC	DDC Relay Module Cover
BP-XFR1	1	XEE-6111-040	KMC	40 VA Transformer, 120/24V

CONTROLLER		16X12	KMD-5831	ADDRESS 4			
INPUTS							
TRM #	#	DEVICE ID	POINT DESCRIPTION	CABLE ID	DETAIL DWG	CABLE TYPE	CABLE #
1 +/-	1	CW-ITS1	BLDG CHW SUPPLY TEMP	CW-AI-1	CWDETAIL-2	A-1	1
2 +/-	2	CW-ITS2	BLDG CHW RETURN TEMP	CW-AI-2	CWDETAIL-2	A-1	2
3 +/-	3	BP-ITS1	HW SUPPLY TEMP	BP-AI-3	CWDETAIL-2	A-1	3
4 +/-	4	BP-ITS2	HW RETURN TEMP	BP-AI-4	CWDETAIL-2	A-1	4
5 +/-	5	CW-FLOW	BLDG CW FLOW	CW-AI-5	CWDETAIL3-8	A-2	5
6 +/-	6	CW-VFD	BLDG CW PUMP VFD STATUS	CW-DI-1	CWDETAIL3-9	A-3	6
7 +/-	7	CW-VFD	BLDG CW PUMP VFD ALARM	CW-DI-2	CWDETAIL3-9	A-3	6
8 +/-	8	BP-VFD1	P-2 VFD STATUS	BP-DI-3	CWDETAIL3-9	A-3	7
9 +/-	9	BP-VFD1	P-2 VFD ALARM	BP-DI-4	CWDETAIL3-9	A-3	7
10 +/-	10	BP-VFD2	P-3 VFD STATUS	BP-DI-5	CWDETAIL3-9	A-3	8
11 +/-	11	BP-VFD2	P-3 VFD ALARM	BP-DI-6	CWDETAIL3-9	A-3	8
12 +/-	12	B-1	BOILER 1 ALARM	BP-DI-7	CWDETAIL3-9	A-1	9
13 +/-	13	B-2	BOILER 2 ALARM	BP-DI-8	CWDETAIL3-9	A-2	10
14 +/-	14	HURST	HURST-BOILER STATUS	BP-DI-9	CWDETAIL3-9	A-2	11
15 +/-	15	CP-DPT	CW DIFF PRESS	CW-AI-5	CWDETAIL2-2	A-2	12
16 +/-	16	BP-DPT	HW DIFF PRESS	BP-AI-6	CWDETAIL2-2	A-2	13

OUTPUTS							
TRM #	#	DEVICE ID	POINT DESCRIPTION	CABLE ID	DETAIL DWG	CABLE TYPE	CABLE #
1,GND	1	CW-VLV	P-2 VFD S/S	CW-DO-1	CWDETAIL3-6	A-2	14
2,GND	2	CW-VFD	CW PUMP VFD S/S	CW-DO-2	CWDETAIL3-6	A-3	6
3,GND	3	CW-VFD	CW PUMP VFD SPEED	CW-AO-1	CWDETAIL3-7	A-3	6
4,GND	4	BP-VFD1	P-2 VFD S/S	BP-DO-3	CWDETAIL3-6	A-3	7
5,GND	5	BP-VFD1	P-2 VFD SPEED	BP-AO-2	CWDETAIL3-7	A-3	7
6,GND	6	BP-VFD2	P-3 VFD S/S	BP-DO-4	CWDETAIL3-6	A-3	8
7,GND	7	BP-VFD2	P-3 VFD SPEED	BP-AO-3	CWDETAIL3-7	A-3	8
8,GND	8	BP-ENA	BOILER ENABLE	BP-DO-5	CWDETAIL3-6	A-1	15
9,GND	9	BOILER	BOILER TEMP RESET	BP-AO-4	CWDETAIL3-7	A-1	16
10,GND	10		SPARE I/O				
11,GND	11		SPARE I/O				
12,GND	12		SPARE I/O				

Drawing Title		AS-BUILT MODIFICATION		A	10/11/14	JS
HOT WATER SYSTEM BOILER PLANT						
Reference Drawing		NO		Revision		ECN
Sales: Project Manager		Applications Engineer		Drawn		Approved
TL/ GH		BP		JS		
By: JS		Date: 5/23/03		By:		Date:
Project Title		Office Information:		Contract Number:		
BIOSCIENCE & BIOTECHNOLOGY BLDG		TL Services, Inc.		03-C005		
JONESBORO, AR		4733 Kibler Rd.		Drawing Number:		
		Van Buren, AR 72956		6		
		PH: 479-474-7222				
		FX: 479-471-7964				

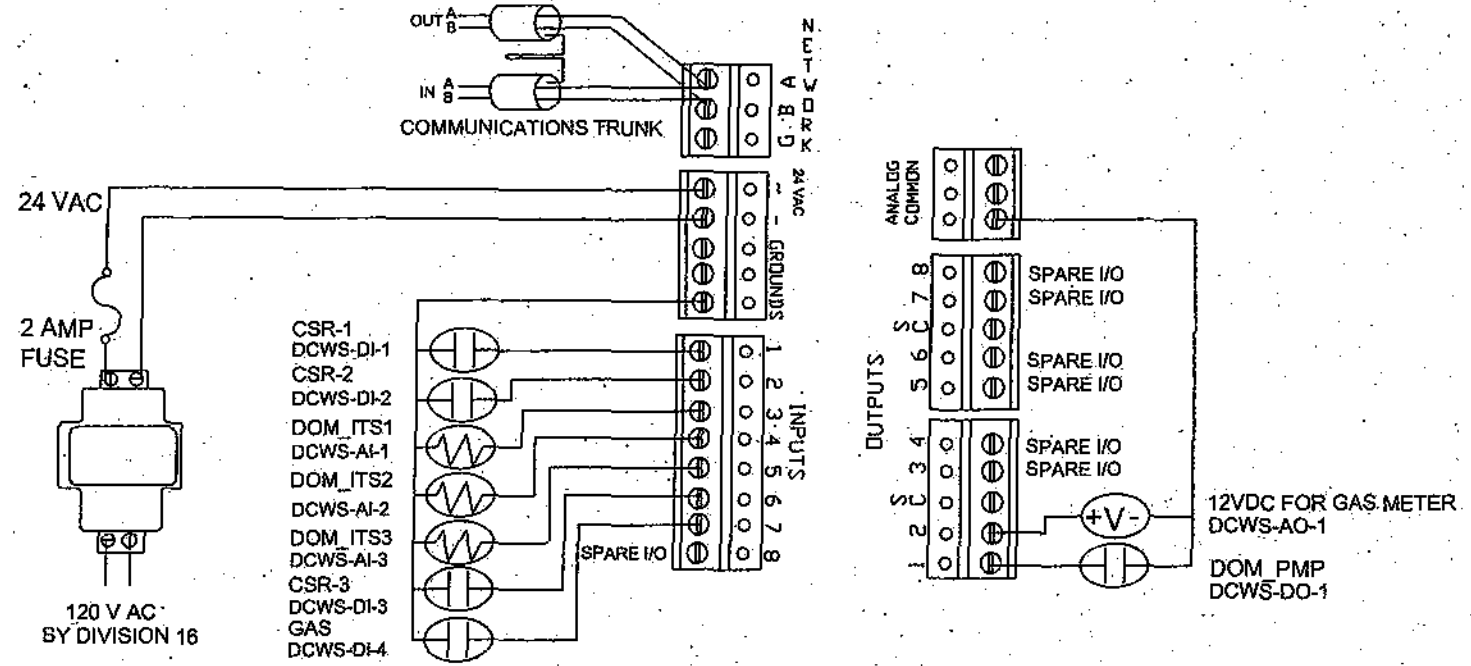
DOMESTIC HOT WATER SYSTEM



FLOOR	LOCATION	CONTROLLER	ADDRESS
FIRST	SIMINAR	ST-402	M2A6
FIRST	SIMINAR	ST-402	M2A6
THIRD	LAB	ST-402	M2A6
THIRD	LAB	ST-402	M2A6
THIRD	LAB	ST-402	M2A6
THIRD	LAB	ST-402	M2A6
THIRD	LAB	ST-402	M2A6
THIRD	LAB	ST-402	M2A6
THIRD	LAB	ST-402	M2A6
THIRD	LAB	ST-402	M2A6
THIRD	LAB	ST-402	M2A6
FOURTH	PESTICIDE PREP RM 405	ST-402	M2A6

BILL OF MATERIALS				
PART ID	QTY	PART #	MFG	DESCRIPTION
KMD1	1	KMD-7301	KMC	DDC LOCAL CONTROLLER
XFR	1	XEE-6111-040	KMC	40 VA TRANSFORMER, 120/24V
CSR1,2,3	2	H900	KMC	Current Transducer Switch

CONTROLLER		16X12	KMD-5802	ADDRESS M1A2			
INPUTS							
TRM #	#	DEVICE ID	POINT DESCRIPTION	CABLE ID	DETAIL DWG	CABLE TYPE	CABLE #
1,GND	1	CSR-1	BOILER PUMP 4 STATUS	DCWS-DI-1	CWDETAIL-1	A-1	
2,GND	2	CSR-2	BOILER PUMP 5 STATUS	DCWS-DI-2	CWDETAIL-1	A-1	
3,GND	3	DOM_ITS1	DOM WTR SUPPLY TMP	DCWS-AI-1	CWDETAIL-2	A-1	
4,GND	4	DOM_ITS2	DOM WTR SUPPLY TMP	DCWS-AI-2	CWDETAIL-2	A-1	
5,GND	5	DOM_ITS3	DOM MAKE-UP WTR TMP	DCWS-AI-3	CWDETAIL3-8	A-1	
6,GND	6	CSR-3	DOM PUMP STAT	DCWS-DI-3	CWDETAIL-1	A-1	
7,GND	7	GAS	UTILITY GAS METER TOTALIZER	DCWS-AI-4	CWDETAIL3-8	A-1	
8,GND	8		SPARE I/O				
OUTPUTS							
TRM #	#	DEVICE ID	POINT DESCRIPTION	CABLE ID	DETAIL DWG	CABLE TYPE	CABLE #
1,GND	1	DOM_PMP	DOMESTIC PUMP S/S	DCWS-DO-1	CWDETAIL3-6	A-1	
2,GND	2		12VDC FOR GAS METER	DCWS-AO-1	CWDETAIL3-8	A-1	
3,GND	3		SPARE I/O				
4,GND	4		SPARE I/O				
5,GND	5		SPARE I/O				
6,GND	6		SPARE I/O				
7,GND	7		SPARE I/O				
8,GND	8		SPARE I/O				

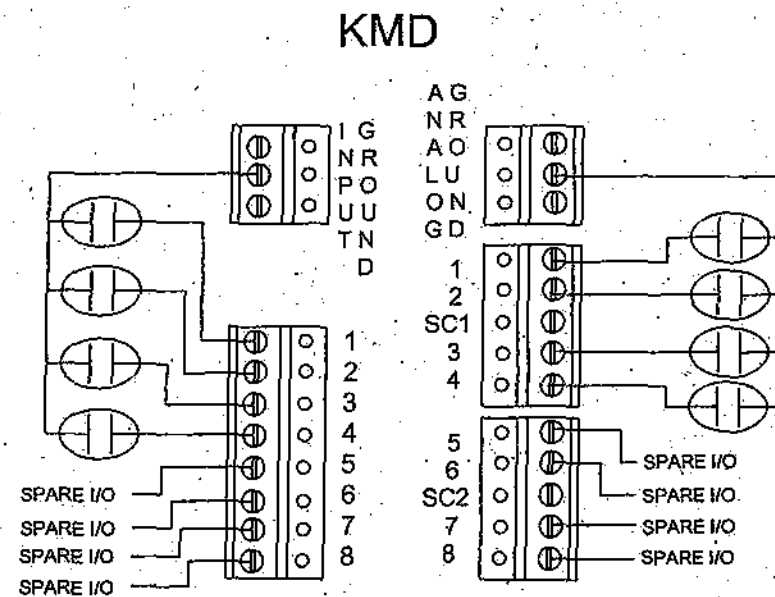
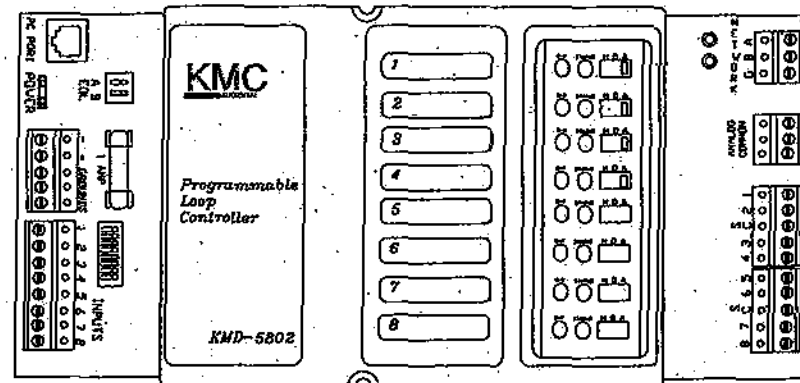
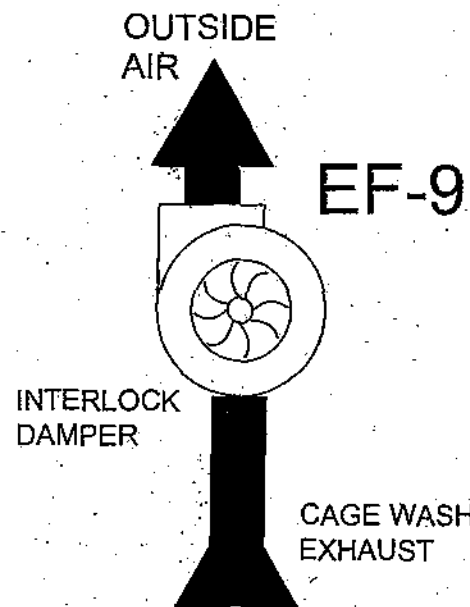
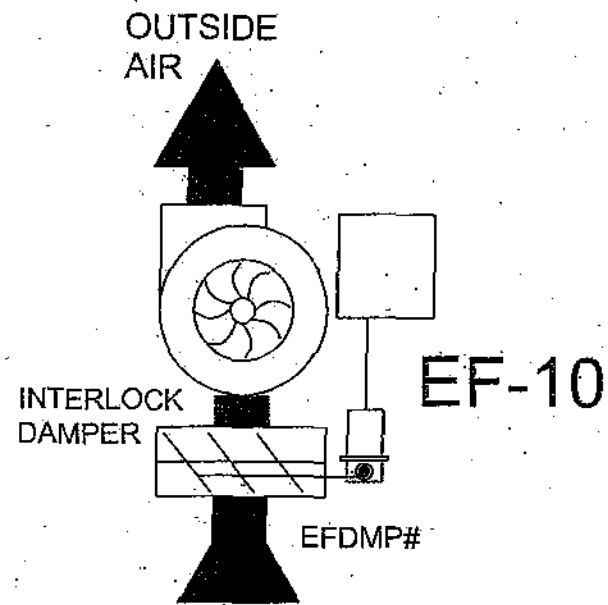
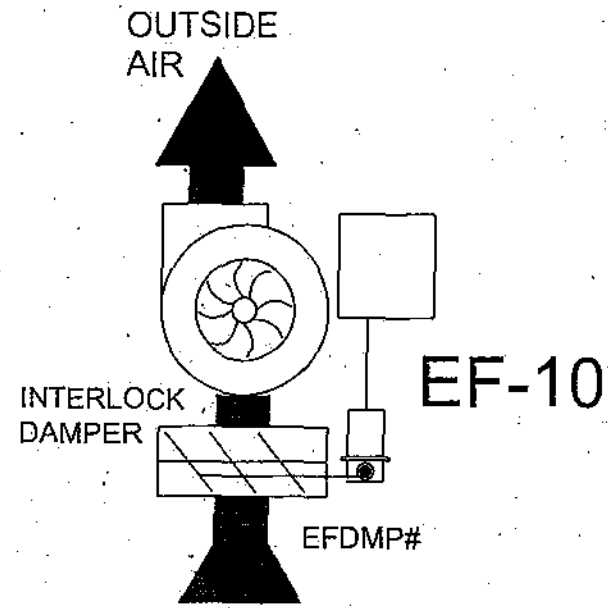


SEQUENCE OF OPERATION:
HOUSE PUMP OPERATION: house pumps are sequenced by control panel furnished with House Pumping System. DDC Panel shall monitor status of each pump and the building cold water system pressure.

SEQUENCE OF OPERATION:
 DDC Panel monitors and totalizes the gas flow of the building gas supply.
 Flow - CF/HR
 Total - MCF

Drawing Title		ENGINEER COMMENTS & CHANGE ORDER MODIFICATION		A	7/31/03	JS
DOMESTIC COLD WATER SYSTEM		AS-BUILT MODIFICATION		B	12/17/04	JNS
Reference Drawing		Revision		ECN	Date	By
Filename: DCWS.DWG		Sales: Project Manager Applications Engineer		Drawn		Approved
Project Title		By: JS Date: 5/23/03		Date:		
ASU		Office Information:		Contract Number:		
BOISCIENCE & BIOTECHNOLOGY BLDG		TL Services, Inc.		03-C005		
JONESBORO, AR		4733 Kibler Rd.		Drawing Number:		
		Van Buren, AR 72956		7		
		PH: 479-474-7222				
		FX: 479-471-7964				

ROOF EXHAUST FAN



BILL OF MATERIALS				
PART ID	QTY	PART #	MFG	DESCRIPTION
EFKMD1	1	KMD-5802	KMC	DDC Local Controller
EFXFR	1	XEE-6111-040	KMC	40 VA Transformer; 120/24 V
EFCMR#	2	H958	KMC	Current Transducer Switch with Command Relay
EFCSR#	2	H900	KMC	Current Transducer Switch
EFDMP#	2	MEP-425300	KMC	Damper Actuator; 2 Position 120 VAC
	2	HCO-1152	KMC	NEMA 3R Damper Actuator Cover

CONTROLLER		8X8	KMD-5802	ROOF FANS			
INPUTS							
TRM #	#	DEVICE ID	POINT DESCRIPTION	CABLE ID	DETAIL DWG	CABLE TYPE	CABLE #
1, GND	1	EFCSR1	EF-9 STATUS	EF-DI-1	CWDETAIL-1	A-2	1
2, GND	2	EFCMR1	EF-10 STATUS	EF-DI-2	CWDETAIL-1	A-3	2
3, GND	3	EFCMR2	EF-11 STATUS	EF-DI-3	CWDETAIL-1	A-3	3
4, GND	4	EFCSR2	CAGE WASH STATUS	EF-DI-4	CWDETAIL-1	A-2	4
5, GND	5		SPARE I/O				
6, GND	6		SPARE I/O				
	7		SPARE I/O				
	8		SPARE I/O				
OUTPUTS							
TRM #	#	DEVICE ID	POINT DESCRIPTION	CABLE ID	DETAIL DWG	CABLE TYPE	CABLE #
1, GND	1		CAGE WASH FAN S/S	EF-DO-1	CWDETAIL3-6	A-2	4
2, GND	2	EFCMR1	EF-10 S/S	EF-DO-2	CWDETAIL-1	A-3	2
3, GND	3	EF10DMP	EF-10 DAMPER OPEN/CLOSE	EF-DO-3	CWDETAIL3-6	A-3	2
4, GND	4	EF11DMP	EF-11 DAMPER OPEN/CLOSE	EF-DO-4	CWDETAIL3-6	A-3	3
5, GND	5	EFCMR2	EF-11 S/S	EF-DO-5	CWDETAIL-1	A-3	3
	6		SPARE I/O				
	7		SPARE I/O				
	8		SPARE I/O				

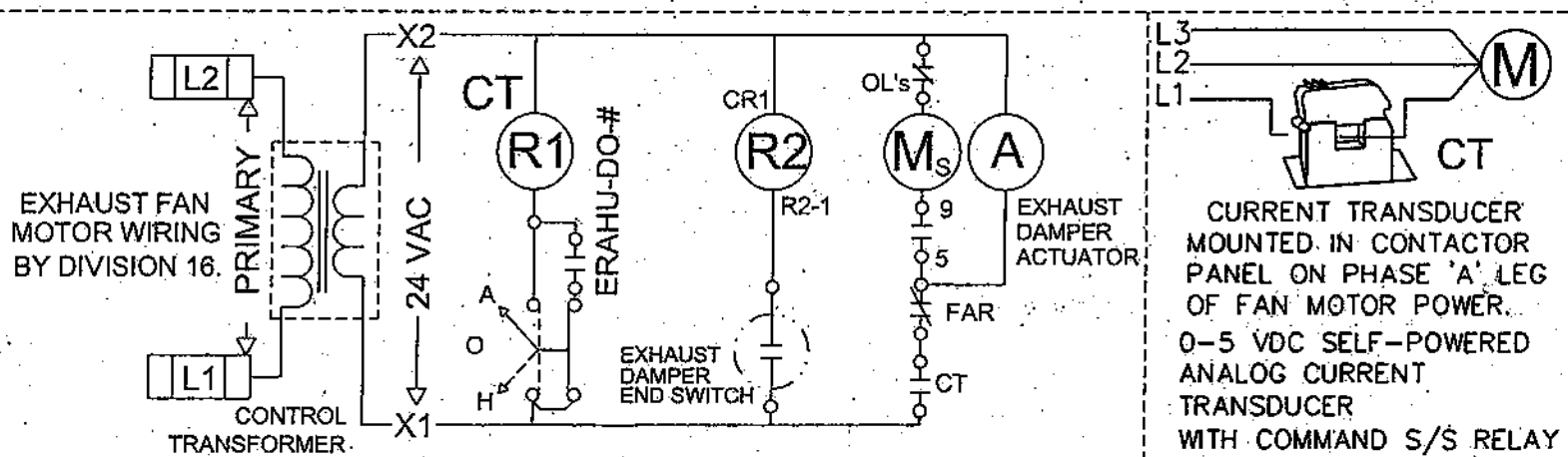
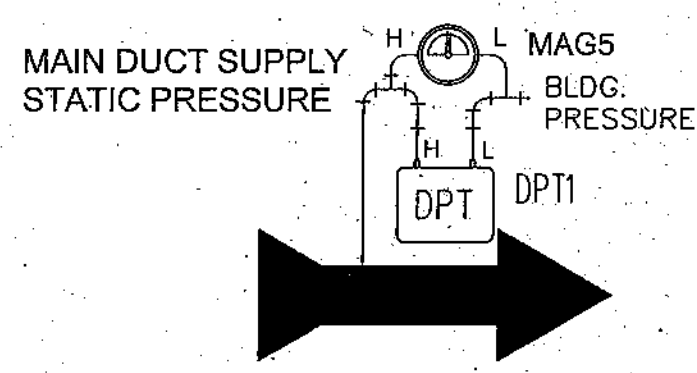
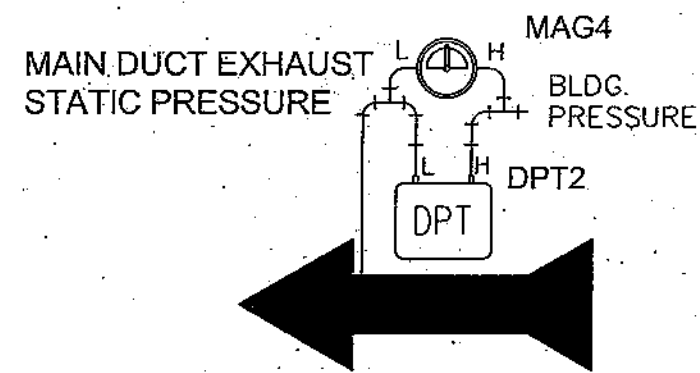
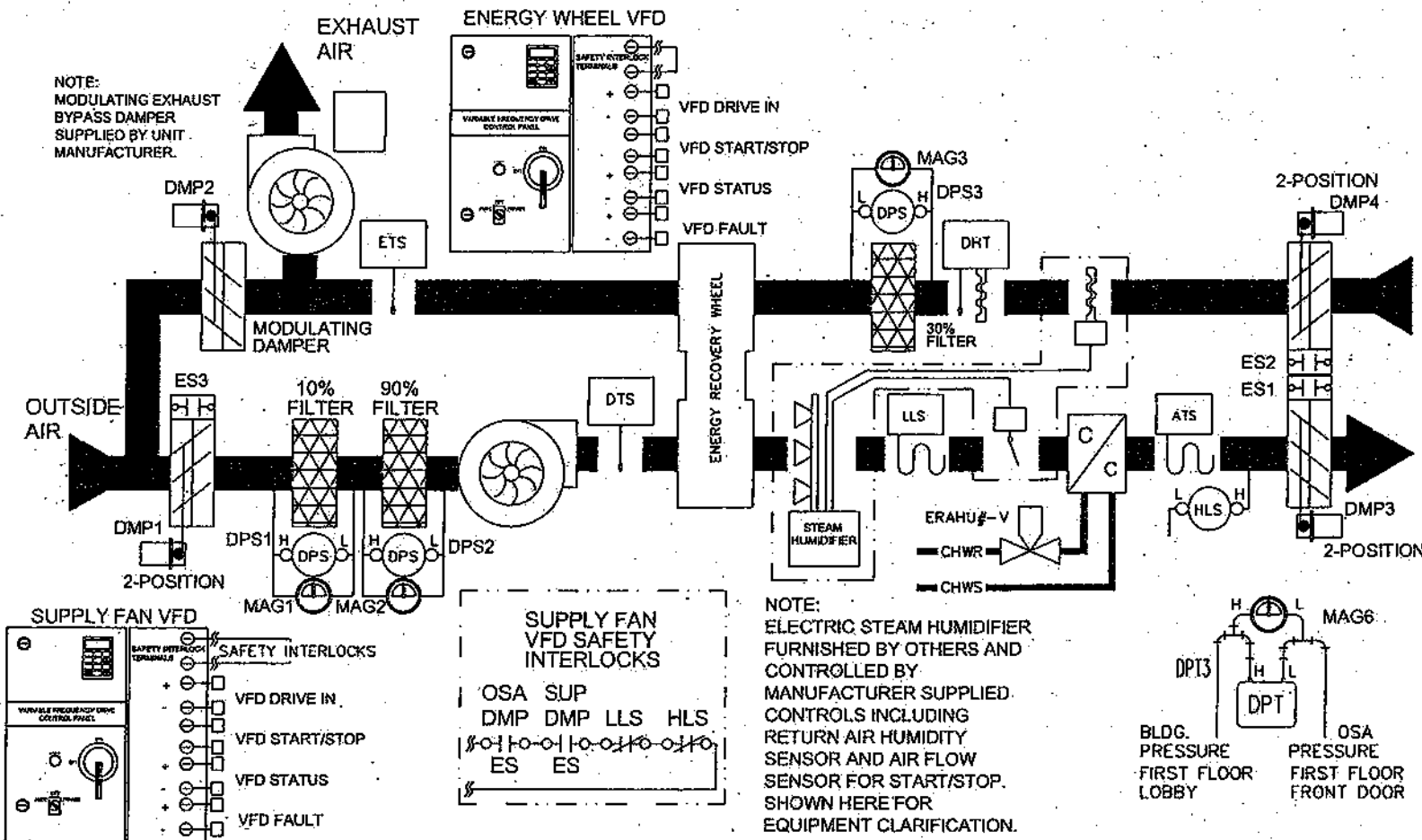
SEQUENCE OF OPERATION:

Exhaust fan (EF-10, EF-11) shall be started and stopped by DDC Controller digital output (EF-DO-#) based upon weekly schedule or operator command. DDC Controller shall monitor the status of the exhaust fan by digital input (EF-DI-#). Exhaust fan dampers shall be opened upon call for fan by digital output (EF-DO-#).

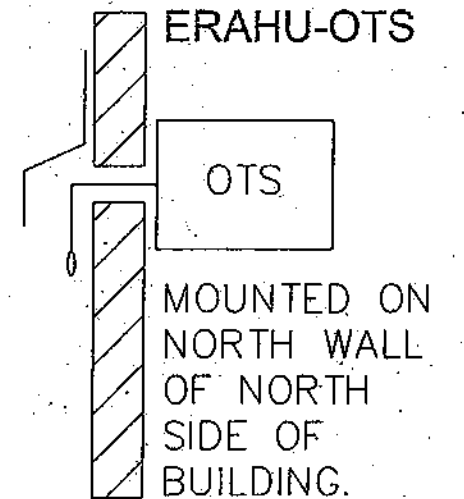
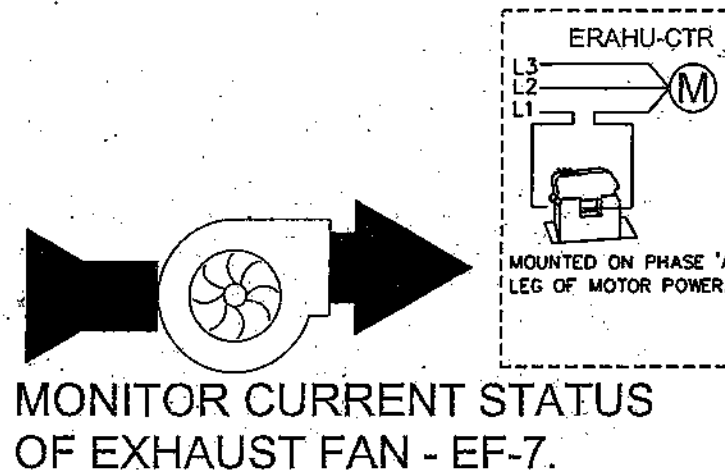
Cage Wash exhaust fan EF-9 shall be started upon a call for the Cage Wash. When the station switch is put in the "ON" position, EF-9 shall start. When the station switch is put in the "OFF" position, EF-9 shall stop.

Drawing Title		AS-BUILT MODIFICATION		A	10/11/14	JNS
ROOF EXHAUST FANS						
Reference Drawing		ND		Revision	ECN	Date
File Name: EF.DWG	Sales: TLL/ GH	Project Manager: BP	Applications Engineer: JS	Drawn: JS	Date: 2/25/04	By: JS
Project Title		ASU LARGE SCALE CULTURE FACILITY BIOSCIENCE & BIOTECH BLDG JONESBORO, AR		Office Information: TL Services, Inc. 4733 Kibler Rd. Van Buren, AR 72956 PH: 479-474-7222 FX: 479-471-7864		Contract Number: 03-C005
		Drawing Number: 8				

ENERGY RECOVERY UNIT



BILL OF MATERIALS				
PART ID	QTY	PART #	MFG	DESCRIPTION
DTS	3	STE-1404	KMC	10K Duct Temperature Sensor
ETS	3	STE-1404	KMC	10K Duct Temperature Sensor
DMP2	3	MEP-1272	KMC	Damper Acuator
CT	3	H932	VERIS	Current Transducer w/Command Relay
CR-1	3	RH1BUAC24	IDEC	SPDT Relay, 24 VAC w/SH1B-05 Base
ATS	3	TE200-DM7H3	GREYSTONE	10K Duct Averaging Temperature Sensor
OTS	1	STE-1451	KMC	10K OSA Temperature Sensor
DPS#	9	CSE-1102	KMC	Differential Pressure Switch
MAG1,2,3	9	2001	DWYER	0-1"W.C. Magnehelic Differential Air Gauge.
DPT1,2	1	TPE-1475-3	KMC	Differential Pressure Transducer (0-5"WC)
MAG4,5	6	2005	DWYER	0-5"W.C. Magnehelic Differential Air Gauge
DPT3	1	TPE-1475-1	KMC	Differential Pressure Transducer (0-0.1"WC)
MAG6	1	2300-0	DWYER	0.25-0- (-0.25)"W.C. Magnehelic Differential Air Gauge
LLS	1	L482A1004	HONEYWELL	Low Limit Switch (Freezestat)
PNL	1	HCO-1036	KMC	NEMA 1 Enclosure; 24"X36"X6"
KMD1,2,3	3	KMD-5831	KMC	DDC Controller (16 Inputs X 12 Outputs)
KMD4	1	KMD-5802	KMC	DDC Controller (8 Inputs X 8 Outputs)
	12	HPO-6702	KMC	HOA Relay Module; Analog 0-10VDC
	12	HPO-6703	KMC	HOA Relay Module; Digital N/O Relay (Dry Contact)
	6	HPO-6802	KMC	HOA Relay Module Cover
XFR	1	XEE-6111-150	KMC	150 VA Transformer; 120/24 VAC
ERAHU-CTR	1	H922	HAWKEYE	Current Transducer Monitor 0-30 Amp (Selectable), 0-5VDC Out
ERAHU#-V			KMC	See Valve Schedule



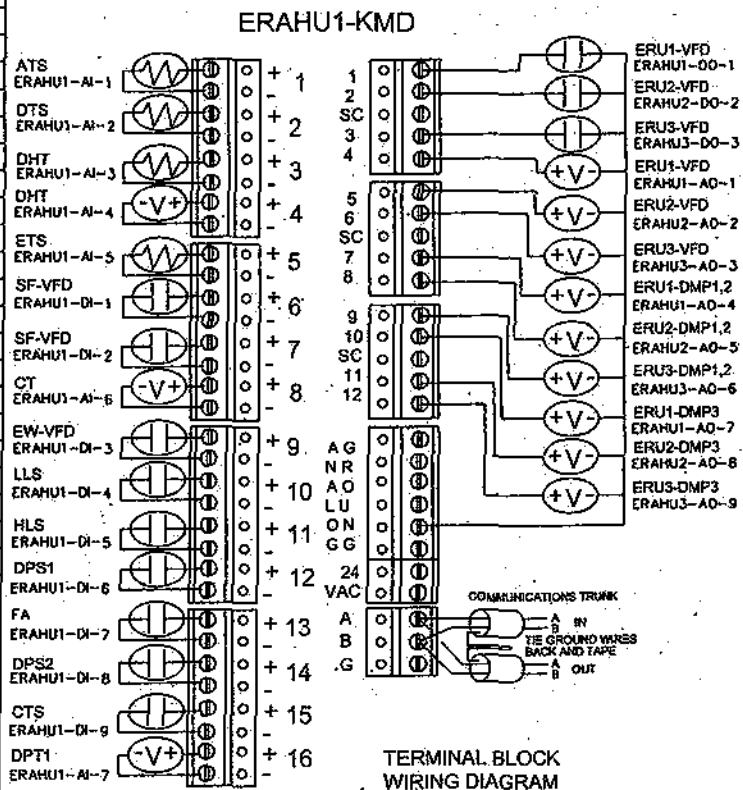
Drawing Title		NO		Revision		ECN		Date		By	
ENERGY RECOVERY AIR HANDLER UNIT											
Sales:		Project Manager		Applications Engineer		Drawn		Approved			
Filename: ERAHU.DWG		TLL/ GH		BP		JS		By: JS		Date: 5/23/03	
Project Title		ASU		BIOSCIENCE & BIOTECHNOLOGY BLDG		JONESBORO, AR		Office Information:		Contract Number:	
								TL Services, Inc.		03-C005	
								4733 Kibier Rd.		Drawing Number:	
								Van Buren, AR 72956		9	
								PH: 479-474-7222			
								FX: 479-471-7954			

ENERGY RECOVERY UNIT

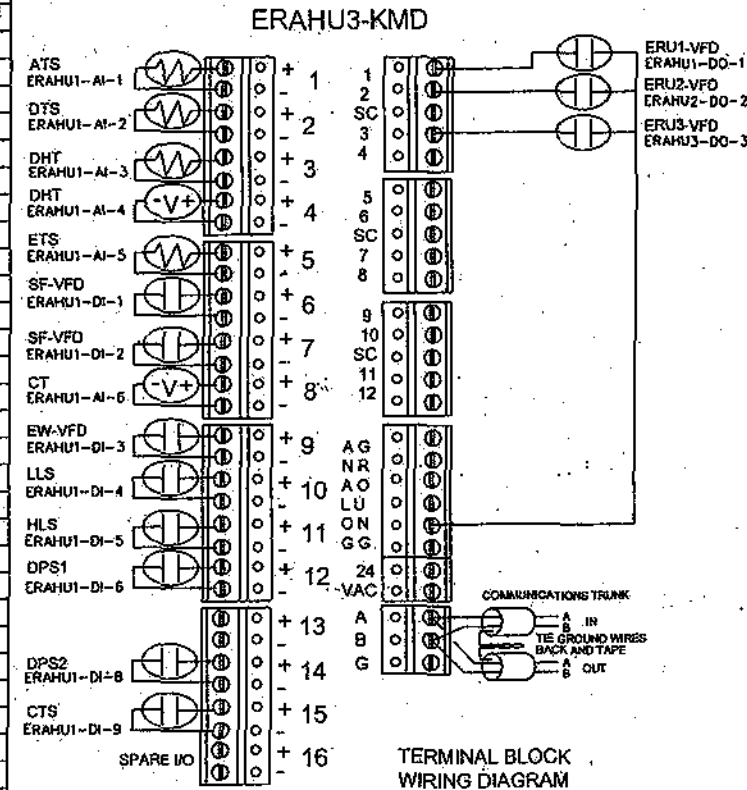
POINT CHART & TERMINAL BLOCK LAYOUT

(ERAHU-1, ERAHU-2, ERAHU-3)

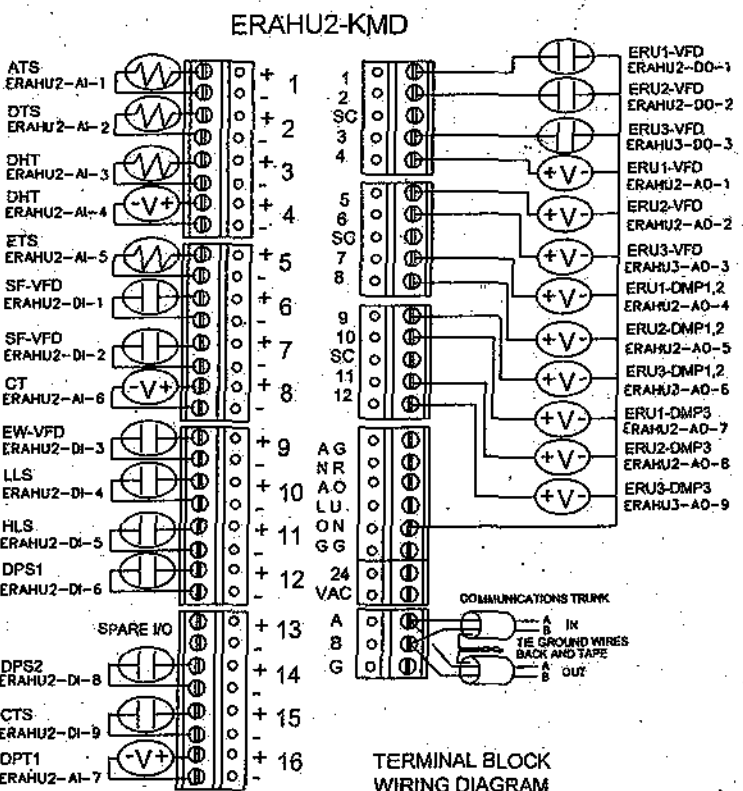
CONTROLLER		16X12	KMD-5831	ADDRESS M2A1		
INPUTS						
TRM #	#	DEVICE ID	POINT DESCRIPTION	CABLE ID	DETAIL DWG	CABLE #
1+*	1	ATS	ERU-1 SUPPLY AIR TEMP	ERAHU1-AI-1	CWDETAIL3-8	A-2 1
2+*	2	DTS	ERU-1 DAT	ERAHU1-AI-2	CWDETAIL-2	A-1 2
3+*	3	DHT	ERU-1 RAT	ERAHU1-AI-3	CWDETAIL-2	A-1 3
4+*	4	DHT	ERU-1 HUMIDITY	ERAHU1-AI-4	CWDETAIL3-8	A-2 3
5+*	5	ETS	ERU-1 EAT	ERAHU1-AI-5	CWDETAIL3-8	A-2 4
6+*	6	SF-VFD	ERU-1 SUPPLY FAN STATUS	ERAHU1-DI-1	CWDETAIL-2	A-1 5
7+*	7	SF-VFD	ERU-1 SUPPLY FAN ALARM	ERAHU1-DI-2	CWDETAIL-2	A-1 5
8+*	8	CT	ERU-1 WHEEL STATUS	ERAHU1-AI-6	CWDETAIL3-8	A-2 6
9+*	9	EW-VFD	ERU-1 WHEEL ALARM	ERAHU1-DI-3	CWDETAIL3-8	A-2 7
10+*	10	LLS	ERU-1 LOW LIMIT	ERAHU1-DI-4	CWDETAIL-6	A-1 D-1 8
11+*	11	HLS	ERU-1 HIGH STATIC	ERAHU1-DI-5	CWDETAIL-3A	A-1 D-1 9
12+*	12	DPS1	ERU-1 PRI & HEPA FILTER	ERAHU1-DI-6	CWDETAIL-3	A-1 10
13+*	13		FIRE ALARM	ERAHU1-DI-7	CWDETAIL-3-9	A-1 11
14+*	14	DPS2	ERU-1 EXHAUST FILTER	ERAHU1-DI-8	CWDETAIL-3	A-1 12
15+*	15	CTS	EXH FAN 1 STATUS	ERAHU1-DI-9	CWDETAIL3-8	A-1 13
16+*	16	DPT1	SUPPLY DUCT STATIC	ERAHU1-AI-7	CWDETAIL3-8	A-2 14
OUTPUTS						
TRM #	#	DEVICE ID	POINT DESCRIPTION	CABLE ID	DETAIL DWG	CABLE #
1.GND	1	ERU1-VFD	SUPPLY FAN VFD ENABLE	ERAHU1-DO-1	CWDETAIL3-6	A-3 5
2.GND	2	ERU2-VFD	SUPPLY FAN VFD ENABLE	ERAHU2-DO-2	CWDETAIL3-7	A-3 25
3.GND	3	ERU3-VFD	SUPPLY FAN VFD ENABLE	ERAHU3-DO-3	CWDETAIL-4	A-2 44
4.GND	4	ERU1-VFD	SUPPLY FAN VFD SPEED	ERAHU1-AD-1	CWDETAIL3-7	A-3 5
5.GND	5	ERU2-VFD	SUPPLY FAN VFD SPEED	ERAHU2-AD-2	CWDETAIL3-6	A-3 25
6.GND	6	ERU3-VFD	SUPPLY FAN VFD SPEED	ERAHU3-AD-3	CWDETAIL-4	A-2 44
7.GND	7	ERU1-DMP1,4	OSASUP AIR ISO DAMPER	ERAHU1-AO-4	CWDETAIL-4	A-2 15
8.GND	8	ERU2-DMP1,4	OSASUP AIR ISO DAMPER	ERAHU2-AO-5	CWDETAIL-4	A-2 16
9.GND	9	ERU3-DMP1,4	OSASUP AIR ISO DAMPER	ERAHU3-AO-6	CWDETAIL-4	A-2 17
10.GND	10	ERU1-DMP3	EXHAUST AIR ISO DAMPER	ERAHU1-AO-7	CWDETAIL-4	A-2 18
11.GND	11	ERU2-DMP3	EXHAUST AIR ISO DAMPER	ERAHU2-AO-8	CWDETAIL-4	A-2 18
12.GND	12	ERU3-DMP3	EXHAUST AIR ISO DAMPER	ERAHU3-AO-9	CWDETAIL-4	A-2 20



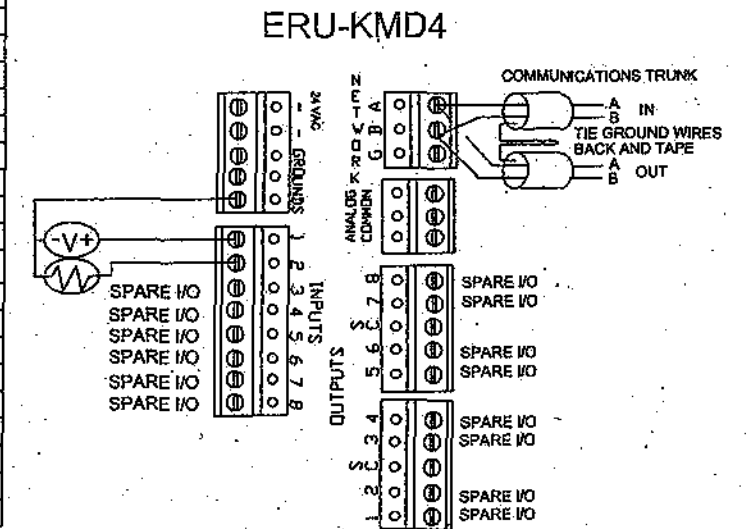
CONTROLLER		16X12	KMD-5831	ADDRESS M2A3		
INPUTS						
TRM #	#	DEVICE ID	POINT DESCRIPTION	CABLE ID	DETAIL DWG	CABLE #
1+*	1	ATS	ERU-3 SUPPLY AIR TEMP	ERAHU3-AI-15	CWDETAIL3-8	A-2 40
2+*	2	DTS	ERU-3 DAT	ERAHU3-AI-16	CWDETAIL-2	A-1 41
3+*	3	DHT	ERU-3 RAT	ERAHU3-AI-17	CWDETAIL-2	A-1 42
4+*	4	DHT	ERU-3 HUMIDITY	ERAHU3-AI-18	CWDETAIL3-8	A-2 42
5+*	5	ETS	ERU-3 EAT	ERAHU3-AI-19	CWDETAIL3-8	A-2 43
6+*	6	SF-VFD	ERU-3 SUPPLY FAN STATUS	ERAHU3-DI-17	CWDETAIL-2	A-3 44
7+*	7	SF-VFD	ERU-3 SUPPLY FAN ALARM	ERAHU3-DI-18	CWDETAIL-2	A-3 44
8+*	8	CT	ERU-3 WHEEL STATUS	ERAHU3-AI-20	CWDETAIL3-8	A-2 45
9+*	9	EW-VFD	ERU-3 WHEEL ALARM	ERAHU3-DI-19	CWDETAIL3-8	A-3 46
10+*	10	LLS	ERU-3 LOW LIMIT	ERAHU3-DI-20	CWDETAIL-6	A-1 D-1 40
11+*	11	HLS	ERU-3 HIGH STATIC	ERAHU3-DI-21	CWDETAIL-3A	A-1 D-1 41
12+*	12	DPS1	ERU-3 PRI & HEPA FILTER	ERAHU3-DI-22	CWDETAIL-3	A-2 42
13+*	13		SPARE I/O			
14+*	14	DPS2	ERU-3 EXHAUST FILTER	ERAHU3-DI-23	CWDETAIL-3	A-1 43
15+*	15	CTS	EXH FAN 2 STATUS	ERAHU3-DI-24	CWDETAIL3-9	A-1 44
16+*	16		SPARE I/O			
OUTPUTS						
TRM #	#	DEVICE ID	POINT DESCRIPTION	CABLE ID	DETAIL DWG	CABLE #
1.GND	1	ERU1-EXF	EXHAUST FAN ENABLE	ERAHU1-DO-7	CWDETAIL3-6	A-1 45
2.GND	2	ERU2-EXF	EXHAUST FAN ENABLE	ERAHU2-DO-8	CWDETAIL3-6	A-1 46
3.GND	3	ERU3-EXF	EXHAUST FAN ENABLE	ERAHU3-DO-9	CWDETAIL3-6	A-1 47
4.GND	4		SPARE I/O			
5.GND	5		SPARE I/O			
6.GND	6		SPARE I/O			
7.GND	7		SPARE I/O			
8.GND	8		SPARE I/O			
9.GND	9		SPARE I/O			
10.GND	10		SPARE I/O			
11.GND	11		SPARE I/O			
12.GND	12		SPARE I/O			



CONTROLLER		16X12	KMD-5831	ADDRESS M2A2		
INPUTS						
TRM #	#	DEVICE ID	POINT DESCRIPTION	CABLE ID	DETAIL DWG	CABLE #
1+*	1	ATS	ERU-2 SUPPLY AIR TEMP	ERAHU2-AI-8	CWDETAIL3-8	A-2 21
2+*	2	DTS	ERU-2 DAT	ERAHU2-AI-9	CWDETAIL-2	A-1 22
3+*	3	DHT	ERU-2 RAT	ERAHU2-AI-10	CWDETAIL-2	A-1 23
4+*	4	DHT	ERU-2 HUMIDITY	ERAHU2-AI-11	CWDETAIL3-8	A-2 23
5+*	5	ETS	ERU-2 EAT	ERAHU2-AI-12	CWDETAIL3-8	A-2 24
6+*	6	SF-VFD	ERU-2 SUPPLY FAN STATUS	ERAHU2-DI-9	CWDETAIL-2	A-3 25
7+*	7	SF-VFD	ERU-2 SUPPLY FAN ALARM	ERAHU2-DI-10	CWDETAIL-2	A-3 25
8+*	8	CT	ERU-2 WHEEL STATUS	ERAHU2-AI-13	CWDETAIL3-8	A-2 26
9+*	9	EW-VFD	ERU-2 WHEEL ALARM	ERAHU2-DI-11	CWDETAIL3-6	A-3 27
10+*	10	LLS	ERU-2 LOW LIMIT	ERAHU2-DI-12	CWDETAIL-6	A-3 D-1 28
11+*	11	HLS	ERU-2 HIGH STATIC	ERAHU2-DI-13	CWDETAIL-3A	A-1 D-1 28
12+*	12	DPS1	ERU-2 PRI & HEPA FILTER	ERAHU2-DI-14	CWDETAIL-3	A-2 30
13+*	13		SPARE I/O			
14+*	14	DPS2	ERU-2 EXHAUST FILTER	ERAHU2-DI-15	CWDETAIL-3	A-1 31
15+*	15	CTS	EXH FAN 2 STATUS	ERAHU2-DI-16	CWDETAIL3-9	A-1 32
16+*	16	DPT2	EXHAUST DUCT STATIC	ERAHU2-AI-14	CWDETAIL3-9	A-2 33
OUTPUTS						
TRM #	#	DEVICE ID	POINT DESCRIPTION	CABLE ID	DETAIL DWG	CABLE #
1.GND	1	ERU1-WVFD	HEATWHEEL FAN VFD ENABLE	ERAHU1-DO-4	CWDETAIL3-6	A-3 6
2.GND	2	ERU2-WVFD	HEATWHEEL FAN VFD ENABLE	ERAHU2-DO-5	CWDETAIL3-7	A-3 27
3.GND	3	ERU3-WVFD	HEATWHEEL FAN VFD ENABLE	ERAHU3-DO-6	CWDETAIL-4	A-3 46
4.GND	4	ERU1-WVFD	HEATWHEEL FAN VFD SPEED	ERAHU1-AD-10	CWDETAIL3-7	A-3 6
5.GND	5	ERU2-WVFD	HEATWHEEL FAN VFD SPEED	ERAHU2-AD-11	CWDETAIL3-6	A-3 27
6.GND	6	ERU3-WVFD	HEATWHEEL FAN VFD SPEED	ERAHU3-AD-12	CWDETAIL-4	A-3 46
7.GND	7	ERAHU1-V	CHILLED WATER VALVE	ERAHU1-AO-13	CWDETAIL-4	A-2 34
8.GND	8	ERAHU2-V	CHILLED WATER VALVE	ERAHU2-AO-14	CWDETAIL-4	A-2 35
9.GND	9	ERAHU3-V	CHILLED WATER VALVE	ERAHU3-AO-15	CWDETAIL-4	A-2 36
10.GND	10	ERU1-DMP2	EXHAUST AIR ISO DAMPER	ERAHU1-AO-16	CWDETAIL-4	A-2 37
11.GND	11	ERU2-DMP2	EXHAUST AIR ISO DAMPER	ERAHU2-AO-17	CWDETAIL-4	A-2 38
12.GND	12	ERU3-DMP2	EXHAUST AIR ISO DAMPER	ERAHU3-AO-18	CWDETAIL-4	A-2 39



CONTROLLER		8X8	KMD-5892	ADDRESS M2A4		
INPUTS						
TRM #	#	DEVICE ID	POINT DESCRIPTION	CABLE ID	DETAIL DWG	CABLE #
1.GND	1	DPT3	BUILDING STATIC	ERAHU-AI-1	CWDETAIL3-9	A-2 48
2.GND	2	OTS	OUTSIDE AIR TEMP	ERAHU-AI-2	CWDETAIL-2	A-1 48
3.GND	3		SPARE I/O			
4.GND	4		SPARE I/O			
5.GND	5		SPARE I/O			
6.GND	6		SPARE I/O			
7.GND	7		SPARE I/O			
8.GND	8		SPARE I/O			
OUTPUTS						
TRM #	#	DEVICE ID	POINT DESCRIPTION	CABLE ID	DETAIL DWG	CABLE #
	1		SPARE I/O			
	2		SPARE I/O			
	3		SPARE I/O			
	4		SPARE I/O			
	5		SPARE I/O			
	6		SPARE I/O			
	7		SPARE I/O			
	8		SPARE I/O			



Drawing Title ENERGY RECOVERY AIR HANDLER UNIT POINT LIST AND TERMINATION		AS-BUILT MODIFICATION		A	12/17/04	JNS.
Reference Drawing		NO		Revision		ECN
Project Manager		BP		Date		By
Applications Engineer		JS		Date		By
Sales		TLL/ GH		Date		By
Project Title		ASU		Office Information:		Contract Number:
BIOSCIENCE & BIOTECHNOLOGY BLDG		JONESBORO, AR		TL Services, Inc.		03-C005
				4733 Kibler Rd.		
				Van Buren, AR 72956		
				PH: 479-474-7222		
				FX: 479-471-7964		
				Drawing Number:		10

ENERGY RECOVERY AIR HANDLING UNIT SEQUENCE OF OPERATION:

SUPPLY FAN:

SUPPLY FAN IS STARTED AND STOPPED BY HOA SWITCH AT VFD. WHEN SWITCH IS IN THE "HAND" POSITION, FAN IS STARTED AND STOPPED AND FAN SPEED IS CONTROLLED BY VFD KEYPAD. WHEN SWITCH IS IN THE "AUTO" POSITION, FAN IS STARTED AND STOPPED BY DDC PANEL DIGITAL OUTPUT (ERAHU#-DO-1) AND FAN SPEED IS CONTROLLED BY DDC PANEL THROUGH EMS INTERFACE (ERAHU#-AO-1). FAN SHALL TYPICALLY BE OPERATED CONTINUOUSLY. FAN SHALL BE AUTOMATICALLY STOPPED BY FIRE ALARM PANEL, LOW LIMIT SWITCH (ERAHU#-DI-5), AND HIGH STATIC SWITCH(ERAHU#-DI-6) IN THE EVENT OF AN ALARM CONDITION. OUTSIDE AIR DAMPER AND SUPPLY AIR DAMPER (ERAHU#-DO-4) SHALL BE AUTOMATICALLY OPENED WHENEVER THE SUPPLY FAN IS IN OPERATION. DAMPER OPENING SHALL BE DELAYED ON START-UP BY A TIME DELAY RELAY UNTIL THE FAN SPEED IS AT 10% (TO PREVENT REVERSE ROTATION OF THE FAN). DAMPERS SHALL BE AUTOMATICALLY CLOSED WHEN THE FAN IS NOT IN OPERATION. FAN SPEED SHALL BE MODULATED AS REQUIRED TO MAINTAIN THE SUPPLY AIR DUCT STATIC PRESSURE (ERAHU-AI-1) AT SETPOINT OF 1.5 INCHES W.G. (ADJUSTABLE). ALL SUPPLY FANS SHALL BE OPERATED AT THE SAME SPEED. IF THE OUTSIDE AIR DAMPER AND THE SUPPLY AIR DAMPER ARE NOT FULLY OPEN (AS INDICATED BY DAMPER END SWITCHES), THE FAN SPEED SHALL BE LIMITED TO A MAXIMUM OF 10% (ADJUSTABLE).

EXHAUST FAN:

EXHAUST FAN IS STARTED AND STOPPED BY HOA SWITCH AT MOTOR STARTER. WHEN SWITCH IS IN THE AUTO POSITION, FAN IS STARTED AND STOPPED BY DDC PANEL DIGITAL OUTPUT. FAN SHALL TYPICALLY BE OPERATED CONTINUOUSLY. FAN SHALL BE AUTOMATICALLY STOPPED BY FIRE ALARM PANEL IN THE EVENT OF AN ALARM CONDITION. EXHAUST DAMPER SHALL BE AUTOMATICALLY OPENED WHENEVER THE EXHAUST FAN IS IN OPERATION. DAMPER SHALL BE AUTOMATICALLY CLOSED WHEN THE FAN IS NOT IN OPERATION. FAN SHALL BE OPERATED AT CONSTANT SPEED.

EXHAUST BYPASS DAMPER:

WHEN EXHAUST FAN IS IN OPERATION (ERAHU#-DO-3), BYPASS DAMPER (ERAHU#-AO-3) SHALL BE MODULATED AS REQUIRED TO MAINTAIN THE EXHAUST DUCT STATIC PRESSURE (ERAHU-AI-2) AT SETPOINT OF NEGATIVE 1.5 INCHES W.G. (ADJUSTABLE). WHEN EXHAUST FAN IS NOT IN OPERATION, BYPASS DAMPER SHALL BE CLOSED.

ENERGY WHEEL:

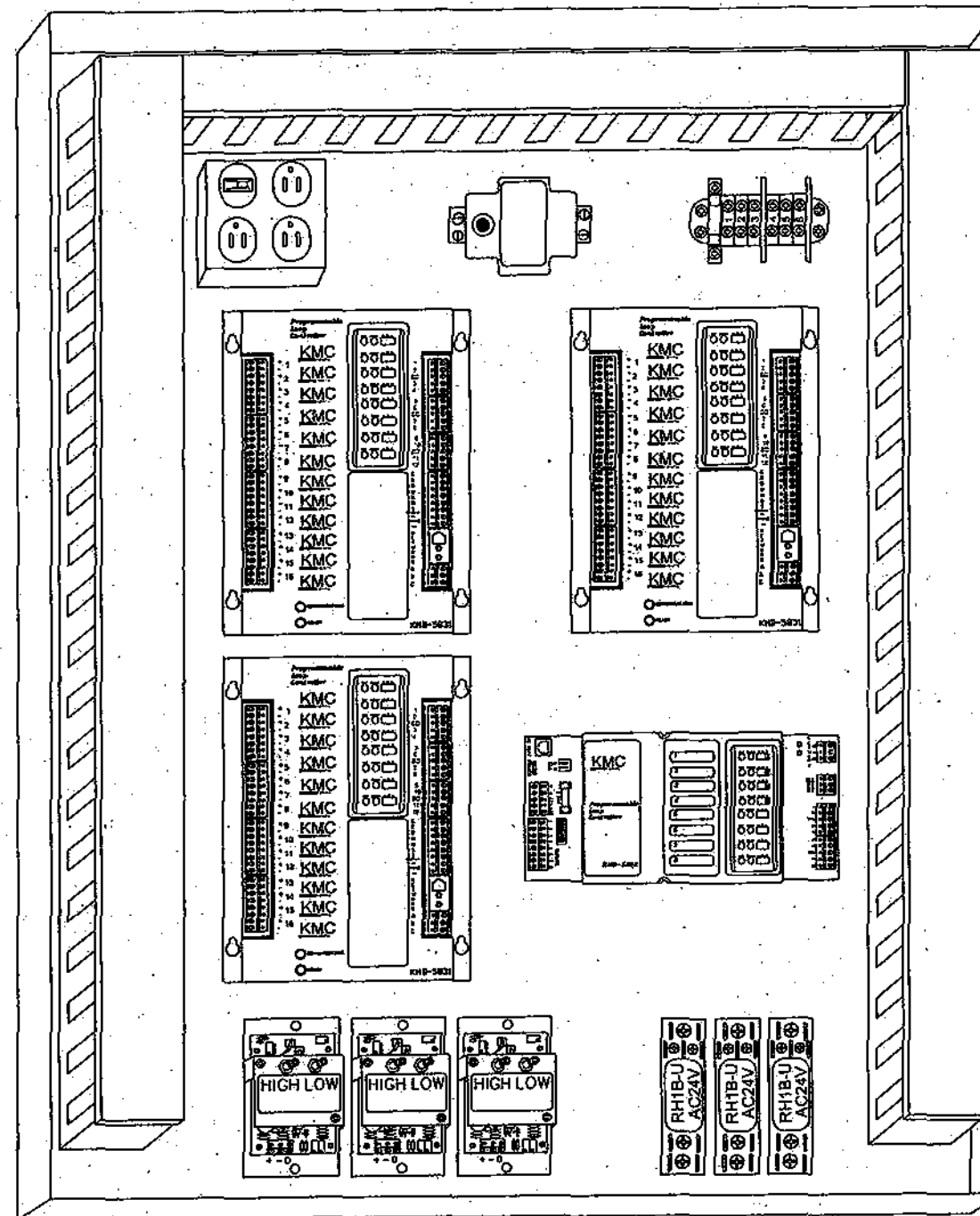
THE SPEED OF THE ENERGY WHEEL (ERAHU#-DO-2) SHALL BE MODULATED BY DDC PANEL ANALOG OUTPUT (ERAHU#-AO-2). WHEN THE OUTSIDE AIR TEMPERATURE (ERAHU-AI-4) IS ABOVE 80 DEG. F, THE WHEEL SHALL BE OPERATED AT FULL SPEED. WHEN THE OUTSIDE AIR TEMPERATURE IS ABOVE 50 DEG. F AND BELOW 80 DEG. F, THE WHEEL SHALL BE OPERATED AT MINIMUM SPEED (AS REQUIRED FOR CLEANING). WHEN THE OUTSIDE AIR TEMPERATURE IS BELOW 50 DEG. F AND ABOVE 30 DEG. F, THE WHEEL SPEED SHALL BE MODULATED AS REQUIRED TO MAINTAIN THE SUPPLY AIR TEMPERATURE AT SETPOINT OF 55 DEG. F. WHEN THE OUTSIDE AIR TEMPERATURE IS BELOW 30 DEG. F, THE WHEEL SPEED SHALL BE OPERATED AT FULL SPEED. WHEEL SPEED CONTROL, HOWEVER, SHALL BE OVERRIDDEN AS REQUIRED TO PREVENT THE LEAVING EXHAUST AIR TEMPERATURE FROM DECREASING BELOW 35 DEG. F (FROST CONTROL).

HUMIDIFIER:

HUMIDIFIER CAPACITY SHALL BE MODULATED BY CONTROL PANEL FURNISHED WITH HUMIDIFIER. HUMIDIFIER CAPACITY SHALL BE MODULATED AS REQUIRED TO MAINTAIN THE EXHAUST AIR RELATIVE HUMIDITY AT SETPOINT OF 35% RH (ADJUSTABLE AT HUMIDIFIER CONTROL PANEL).

CHILLED WATER CONTROL VALVE:

CHILLED WATER CONTROL VALVE SHALL BE MODULATED BY DDC PANEL ANALOG OUTPUT (ERAHU#-AO-) AS REQUIRED TO MAINTAIN THE SUPPLY AIR TEMPERATURE AT SETPOINT OF 55 DEG. F (ADJUSTABLE).



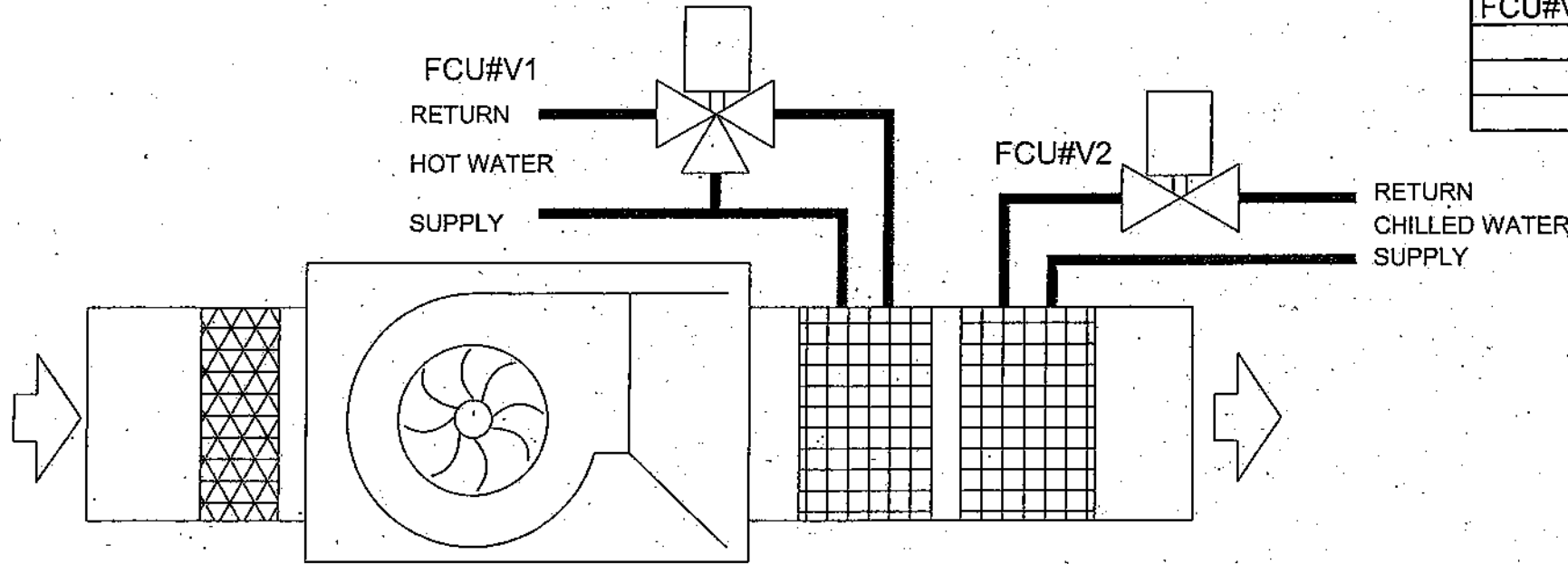
Drawing Title:		AS-BUILT MODIFICATION		A	12/17/04	JNS
ENERGY RECOVERY AIR HANDLER UNIT SEQUENCE OF OPERATION						
Reference Drawing:		NO		Revision	ECN	Date
Sales:		Project Manager		Drawn		Approved
TL/ GH		BP		JS		By JS
Date: 5/23/03		By:		Date:		
Project Title:		Office Information:		Contract Number:		
ASU BIOSCIENCE & BIOTECHNOLOGY BLDG JONESBORO, AR		TL Services, Inc. TL Services, Inc. 4733 Kibler Rd. Van Buren, AR 72956 PH: 479-474-7222 FX: 479-471-7964		03-C005		Drawing Number: 11

FAN COIL UNIT

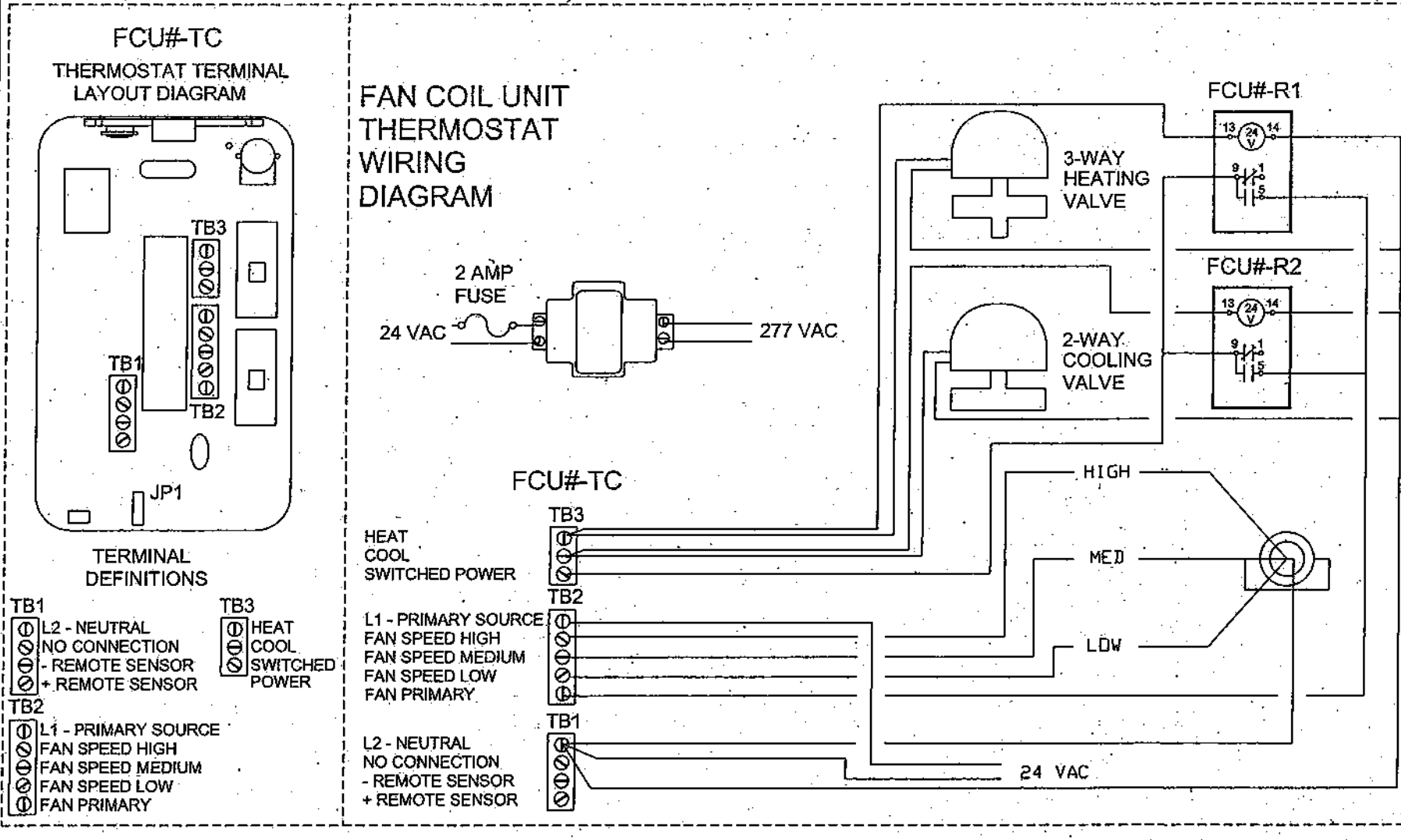
STAND-ALONE APPLICATION

HEATING & COOLING

BILL OF MATERIALS				
PART ID	QTY	PART #	MFG	DESCRIPTION
FCU#-TC	11	TB155-010	EIRE	THERMOSTAT CONTROLLER
FCU#-R1,2	22	RH1BUAC24	IDEC	SPDT 120V RELAY W/SH1B-05 BASE
FCU#XFR	11	XEE-6211-050	KMC	50 VA TRANSFORMER, 277/24V
FCU#V1,2			EIRE	SEE VALVE SCHEDULE



4-PIPE COOLING & HEATING FAN COIL UNITS	
UNIT	AREA SERVED
FCU-106	MECHANICAL ROOM 145
FCU-107	RECEIVING 141
FCU-110	LOBBY 132
FCU-203	COMPUTER ROOM 221
FCU-303	COMPUTER ROOM 321
FCU-401	CORRIDOR 400
FCU-402	CORRIDOR 402
FCU-403	CORRIDOR 409
FCU-404	ELECTRICAL ROOM 412
FCU-405	MECHANICAL ROOM 410
FCU-406	MECHANICAL ROOM 410



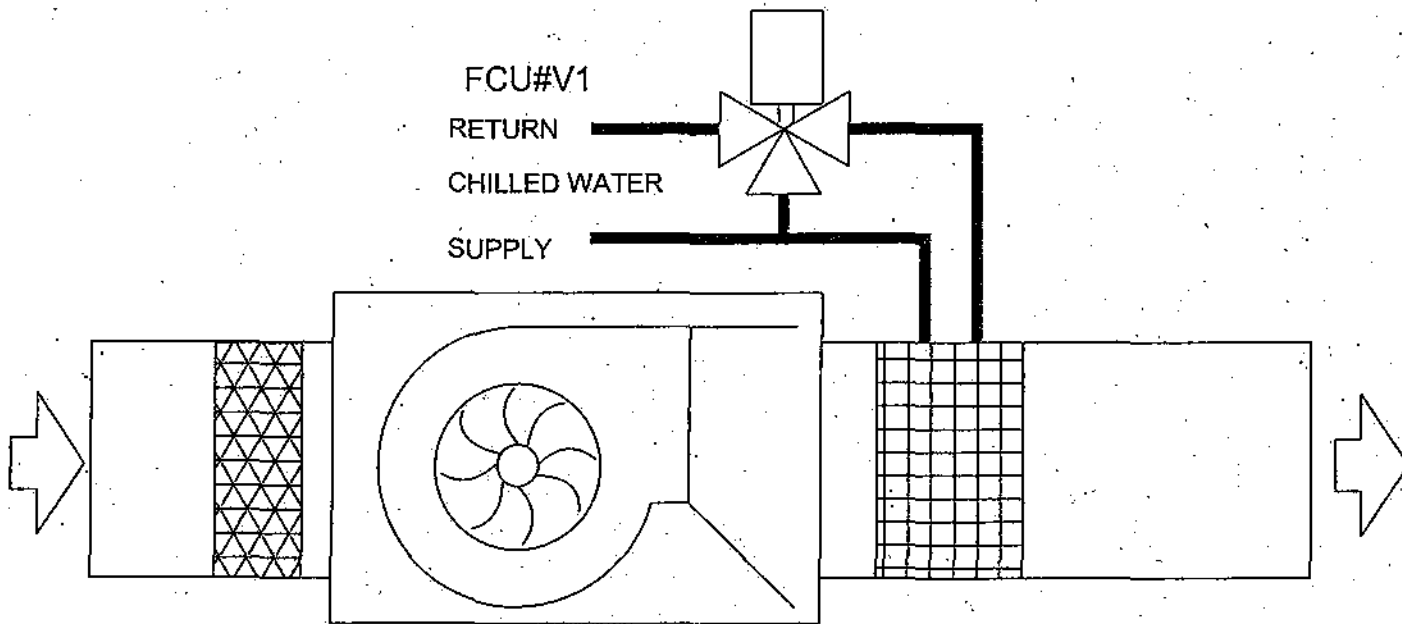
SEQUENCE OF OPERATION:
 The controller shall sequence the fan speed (Off, Low, Medium, and High) and modulate the chilled water and heating water valves in sequence as required to maintain the space temperature at setpoint.

Drawing Title		SUBMITTAL CORRECTION		A	7/21/03	JS
FAN COIL UNIT STAND-ALONE APPLICATION		AS-BUILT MODIFICATION		B	12/17/14	JNS
Filename: FCU.DWG	Project Manager: BP	Applications Engineer: JS	Drawn: JS	Date: 6/20/03	By: JS	Date:
Project Title: ASU BIOSCIENCE & BIOTECHNOLOGY BLDG JONESBORO, AR	Office Information: TL Services, Inc. 4733 Kibler Rd. Van Buren, AR 72956 PH: 479-474-7222 FX: 479-471-7964		Contract Number: 03-C005		Drawing Number: 12	

FAN COIL UNIT

STAND-ALONE APPLICATION

COOLING ONLY



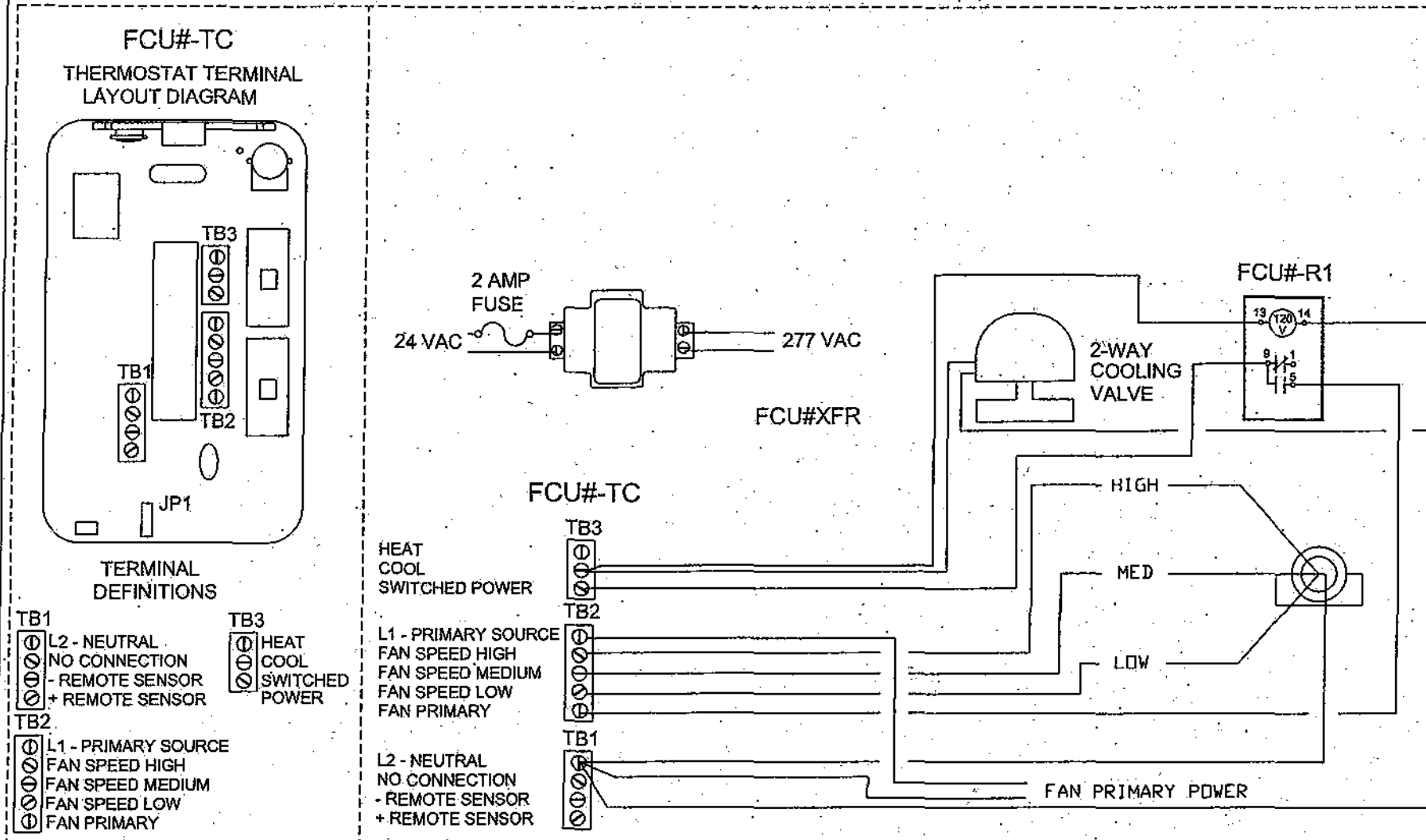
BILL OF MATERIALS				
PART ID	QTY	PART #	MFG	DESCRIPTION
FCU#-TC	9	TB155-010	EIRE	THERMOSTAT CONTROLLER
FCU#-R1	9	RH1BUAC120	IDEC	SPDT 120V RELAY W/SH1B-05 BASE
FCU#XFR	9	XEE-6211-050	KMC	50 VA TRANSFORMER, 277/24V
FCU#V1,2			EIRE	SEE VALVE SCHEDULE

2-PIPE COOLING ONLY FAN COIL UNITS

UNIT	AREA SERVED
FCU-101	ELEVATOR EQUIPMENT 131
FCU-102	ELECTRICAL 129A
FCU-103	DATA ROOM 128
FCU-104	ELEVATOR EQUIPMENT 127
FCU-105	ELEVATOR EQUIPMENT 147
FCU-201	ELEVATOR EQUIPMENT 270
FCU-202	TELE/DATA 271
FCU-301	ELEVATOR EQUIPMENT 370
FCU-302	TELE/DATA 371

SEQUENCE OF OPERATION:

The controller shall sequence the fan speed (Off, Low, Medium, and High) and modulate the heating water valve in sequence as required to maintain the space temperature at setpoint.



Drawing Title FAN COIL UNIT STAND-ALONE APPLICATION COOLING ONLY		SUBMITTAL CORRECTION		A	7/21/03	JS
Filename: FCU1.DWG		AS-BUILT MODIFICATION		B	12/17/14	JNS
Project Title ASU BIOSCIENCE & BIOTECHNOLOGY BLDG JONESBORO, AR		Reference Drawing NO		Revision	ECN	Date
Office Information: TL Services, Inc. 4733 Kibler Rd. Van Buren, AR 72956 PH: 479-474-7222 FX: 479-471-7964		Scales: Project Manager Applications Engineer TL/ GH BP JS		By: JS	Date: 6/20/03	By: Approved
Contract Number: 03-C005		Drawing Number: 13				

NON-LAB EXHAUST AIR TERMINAL FIRST FLOOR TERMINALS

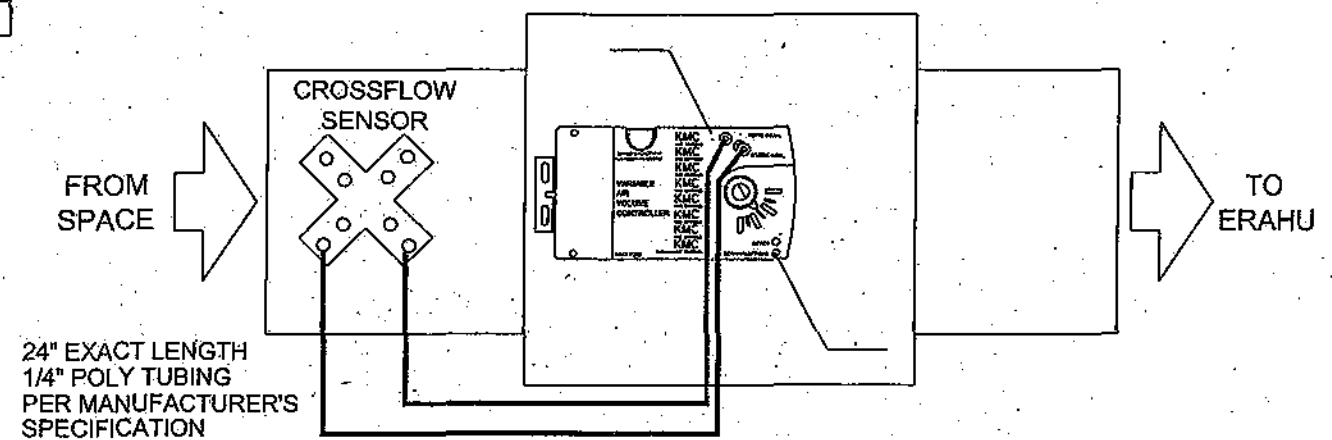
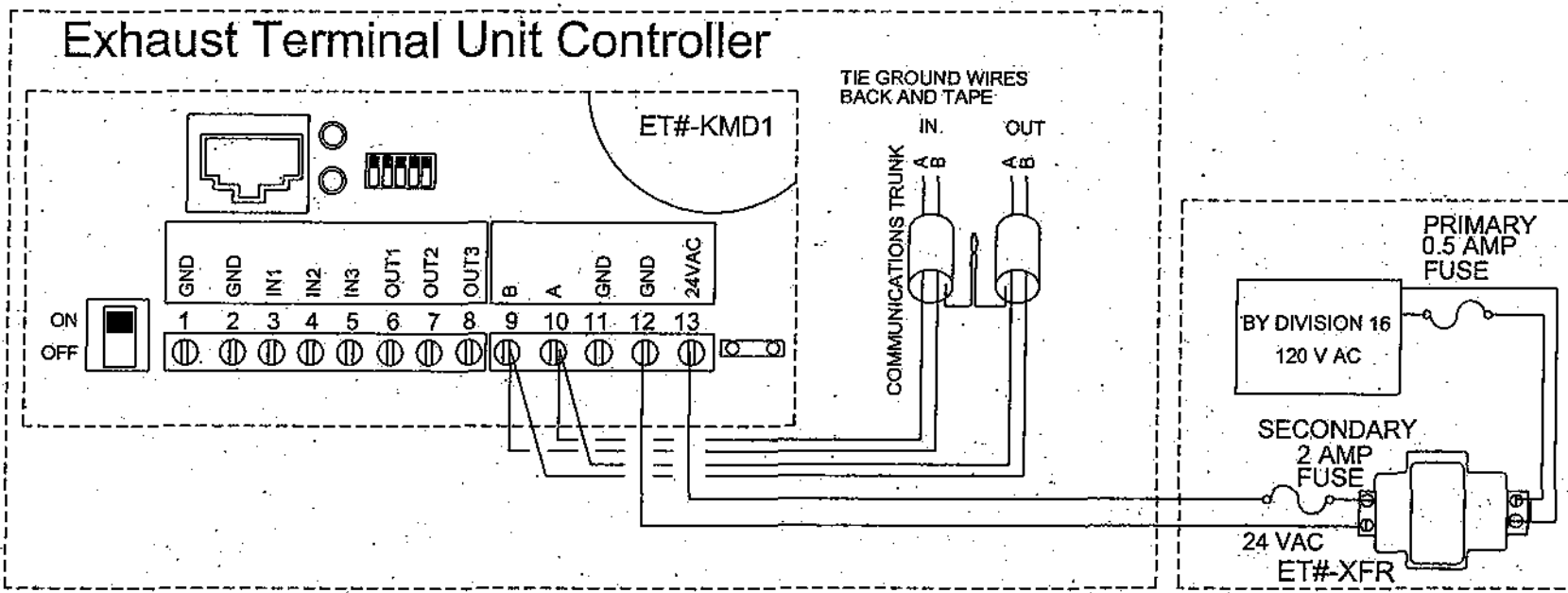
NON-LAB EXHAUST TERMINAL SCHEDULE						
UNIT	AREA SERVED	ASSOCIATED TERMINALS	MAX CFM	MIN CFM	UNOCC CFM	PRESSURE BIAS
ET-101	DIRECTOR 102,103,104	ST-101	1175	600	0	NEUTRAL
ET-102	ADMIN SUPPORT 101, 101A	ST-102	900	450	0	NEUTRAL
ET-103	GREENHOUSE MANAGER 105,106	ST-103	475	250	0	NEUTRAL
ET-104	SEMINAR 107,107A,107B	ST-106,107	1875	950	0	NEUTRAL
ET-105	LOBBY 100,108	ST-104,105	1075	550	0	NEUTRAL
ET-106	RECEPTION 113,114,115	ST-110,111,112	975	500	0	NEUTRAL
ET-107	RESTROOMS 109,110,111,144	ST-109	900	900	650	NEGATIVE
ET-108	ACCOUNT. 119,121,123,125	ST-113,114	1825	950	0	NEUTRAL CFM CHANGE
ET-109	WORK/STOR 113A,116,118,120,122	ST-115	1025	550	0	NEUTRAL CFM CHANGE
ET-110	STORAGE 129,135	ST-118,123	1050	600	100	NEUTRAL
ET-111	AUTOCLAVE 142	ST-116	1600	900	100	NEGATIVE
ET-112	GROWTH CHAMBER 140	ST-124	1450	750	200	NEGATIVE
ET-113	GROWTH CHAMBER 140	ST-125	1450	750	200	NEGATIVE
ET-114	EQUIP ACCESS 143	ST-126	1100	600	250	NEUTRAL
ET-115	DIRECTOR'S OFFICE 149,148	ST-127,128	800	400	0	NEUTRAL NEW-TERMINAL
ET-116	GROWTH CHAMBER 140	ST-134	1450	750	200	NEGATIVE
ET-117	GROWTH CHAMBER 140	ST-135	1450	750	200	NEGATIVE
ET-118	GOWNING ROOM A101, A102	ST-131	250	250	250	NEUTRAL
ET-119	EQUIPMENT ROOM A106	ST-129	1575	1175	1175	NEGATIVE
ET-120	SURGERY A112,A110,A107,A104,A105	ST-130	900	900	900	NEUTRAL
ET-121	HOLDING ROOM A116, A117, A118	ST-132	970	640	970	NEGATIVE
ET-122	PROCEDURE RM A116	ST-132	330	0	0	NEGATIVE
ET-123	HOLDING ROOM A114, A115	ST-133	1025	1025	1025	NEUTRAL
ET-124	PROCEDURE RM A113	ST-133	475	145	475	NEGATIVE
ET-125	BIO SAFETY CABINET A113	ST-133	330	0	0	NEGATIVE

BILL OF MATERIALS				
PART ID	QTY	PART #	MFG	DESCRIPTION
ET#KMD1	25	KMD-7001	KMC	DDC LOCAL CONTROLLER
ET#XFR	25	XEE-6111-040	KMC	40 VA TRANSFORMER; 120/24 V

CONTROLLER 4X4 KMD-7001 SUPPLY AIR TERMINAL UNITS						
INPUTS						
TRM #	#	DEVICE ID	POINT DESCRIPTION	CABLE ID	DETAIL DWG	CABLE #
3,1	1		SPARE I/O			
4,1	2		SPARE I/O			
5,1	3		SPARE I/O			
	4	FLOW SENSOR (APPLICATION DEDICATED INPUT)				
NETSENSOR MAPPED I/O POINTS						
OUTPUTS						
TRM #	#	DEVICE ID	POINT DESCRIPTION	CABLE ID	DETAIL DWG	CABLE #
6,2	1		SPARE I/O			
7,8	2		SPARE I/O			
9,10	3		SPARE I/O			
	4	DAMPER ACTUATOR (APPLICATION DEDICATED OUTPUT)				

SEQUENCE OF OPERATION:

The controller shall modulate the terminal damper as required to maintain the exhaust air flow at setpoint. The setpoint shall be equal to the supply air flow rate to area served less the offset. The offset shall be 0 CFM for neutral pressure relationship (Offices) and 100 CFM per door for negative pressure relationship (Toilets).



Drawing Title		EXHAUST AIR TERMINAL		ENGINEER COMMENTS & CHANGE ORDER MODIFICATION		A		7/31/03		JS	
Filename: ET_FIRSTFLOOR.DWG		Project Title: ASU		Project Manager: TLL/ GH		Applications Engineer: JS		By: JS		Date: 6/20/03	
Project Title: ASU		BIOSCIENCE & BIOTECHNOLOGY BLDG		JONESBORO, AR		Office Information: TL Services, Inc. 4733 Kibler Rd. Van Buren, AR 72956		PH: 479-474-7222		FX: 479-471-7964	
Contract Number: 03-C005		Drawing Number: 14		Revision: 6		Date: 12/17/14		By: JNS		Date:	

NON-LAB EXHAUST AIR TERMINAL SECOND FLOOR

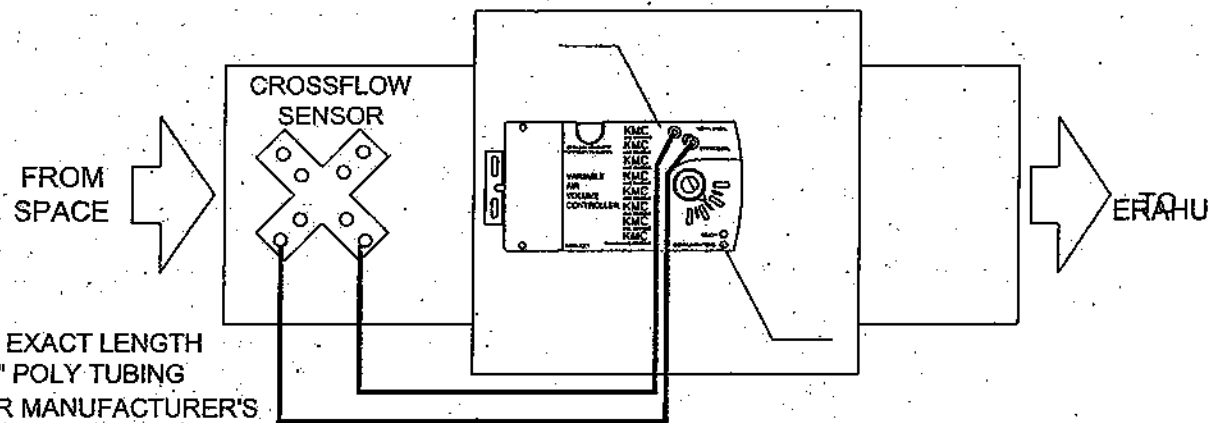
NON-LAB EXHAUST TERMINAL SCHEDULE						
UNIT	AREA SERVED	ASSOCIATED TERMINALS	MAX CFM	MIN CFM	UNOCC CFM	PRESSURE BIAS
ET-201	P.I. OFFICE 201,202	ST-201	425	225	0	NEUTRAL
ET-202	P.I. OFFICE 203,204	ST-202	500	250	0	NEUTRAL
ET-203	P.I. OFFICE 205,206,207	ST-203	1100	575	0	NEUTRAL
ET-204	P.I. OFFICE 208,209	ST-204	750	400	0	NEUTRAL
ET-205	ADMIN SUPPORT 200	ST-205,208	1175	600	0	NEUTRAL
ET-206	P.I. OFFICE 210,211	ST-206	750	400	0	NEUTRAL
ET-207	P.I. OFFICE 212,213,214	ST-207	1025	550	0	NEUTRAL
ET-208	P.I. OFFICE 217,218	ST-209	425	225	0	NEUTRAL
ET-209	P.I. OFFICE 215,216	ST-210	550	275	0	NEUTRAL
ET-210	WORK/COPY 200A	ST-211	250	125	0	NEUTRAL
ET-211	CONFERENCE ROOM 220	ST-212	925	475	0	NEUTRAL
ET-212	RESTROOMS 223, 224,227	ST-214	800	800	350	NEGATIVE
ET-221	MISCELLANEOUS SUPPORT 237	ST-232	600	350	150	NEUTRAL
ET-222	EQUIPMENT 238	ST-230	650	400	100	NEUTRAL
ET-233	MISCELLANEOUS SUPPORT 247	ST-228	575	350	150	NEUTRAL
ET-234	TISSURE CULTURE 246	ST-229	300	250	100	NEGATIVE
ET-235	TISSURE CULTURE 251	ST-233	300	250	100	NEGATIVE
ET-236	MISCELLANEOUS SUPPORT 250	ST-245	575	350	150	NEUTRAL
ET-247	EQUIPMENT 258	ST-246	750	500	200	NEUTRAL
ET-248	MISCELLANEOUS SUPPORT 259	ST-247	575	350	150	NEUTRAL
ET-257	TISSURE CULTURE 266	ST-243	250	250	100	NEGATIVE
ET-258	SEMINAR 269	ST-216	500	125	0	NEUTRAL
ET-259	POST DOC/GRAD STUDENT 260	ST-249,250	1400	250	0	NEUTRAL
ET-260	POST DOC/GRAD STUDENT 239	ST-251,252	1400	250	0	NEUTRAL
ET-261	BREAKROOM 222	ST-215	1150	575	0	NEUTRAL
ET-262	TISSURE CULTURE 266	ST-218	425	275	100	NEGATIVE
ET-263	SEMINAR 229	ST-217	525	275	0	NEUTRAL

BILL OF MATERIALS				
PART ID	QTY	PART #	MFG	DESCRIPTION
ET#KMD1	27	KMD-7001	KMC	DDC LOCAL CONTROLLER
ET#XFR	27	XEE-6111-040	KMC	40 VA TRANSFORMER; 120/24 V

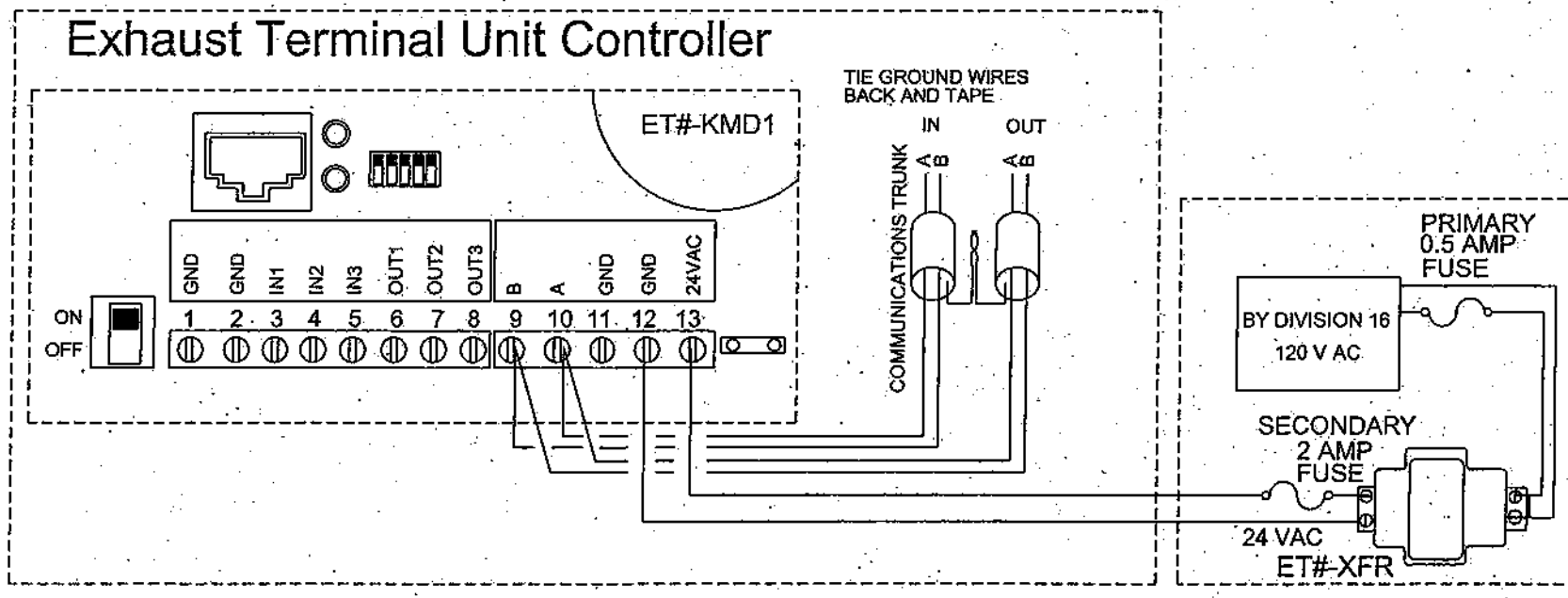
CONTROLLER 4X4 KMD-7001 SUPPLY AIR TERMINAL UNITS							
INPUTS							
TRM #	#	DEVICE ID	POINT DESCRIPTION	CABLE ID	DETAIL DWG	CABLE TYPE	CABLE #
3,1	1		SPARE I/O				
4,1	2		SPARE I/O				
5,1	3		SPARE I/O				
	4		FLOW SENSOR (APPLICAITON DEDICATED INPUT)				
NETSENSOR MAPPED I/O POINTS							
OUTPUTS							
TRM #	#	DEVICE ID	POINT DESCRIPTION	CABLE ID	DETAIL DWG	CABLE TYPE	CABLE #
6,2	1		SPARE I/O				
7,8	2		SPARE I/O				
9,10	3		SPARE I/O				
	4		DAMPER ACTUATOR (APPLICAITON DEDICATED OUTPUT)				

SEQUENCE OF OPERATION:

The controller shall modulate the terminal damper as required to maintain the exhaust air flow at setpoint. The setpoint shall be equal to the supply air flow rate to area served less the offset. The offset shall be 0 CFM for neutral pressure relationship (Offices) and 100 CFM per door for negative pressure relationship (Toilets).



24" EXACT LENGTH
1/4" POLY TUBING
PER MANUFACTURER'S
SPECIFICATION



Drawing Title: EXHAUST AIR TERMINAL		ENGINEER COMMENTS & CHANGE ORDER MODIFICATION		A	7/31/03	JS
AS-BUILT MODIFICATION		AS-BUILT MODIFICATION		B	12/17/14	JNS
Reference Drawing: RD		Revision		ECN	Date	By
Sales: Project Manager Applications Engineer		Drawn		Approved		
Filename: ET_SECOND FLOOR.DWG	TL/ GH	BP	JS	By: JS	Date: 6/20/03	By: Date:
Project Title: ASU BIOSCIENCE & BIOTECHNOLOGY BLDG JONESBORO, AR		Office Information: TL Services, Inc. 4733 Kibler Rd. Van Buren, AR 72956 PH: 479-474-7222 FX: 479-471-7984		Contract Number: 03-C005		
		Drawing Number:		15		

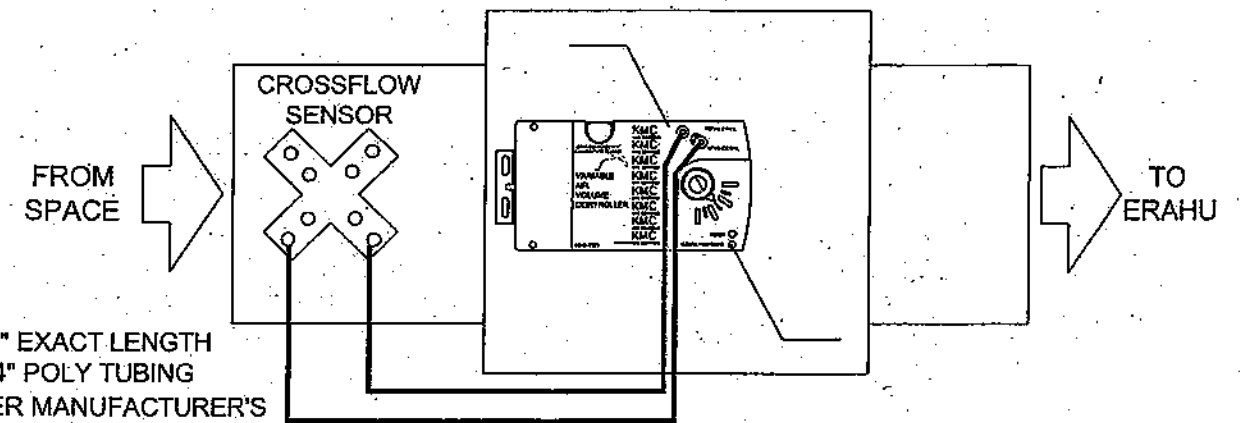
NON-LAB EXHAUST AIR TERMINAL THIRD FLOOR

BILL OF MATERIALS				
PART ID	QTY	PART #	MFG	DESCRIPTION
ET#KMD1	26	KMD-7001	KMC	DDC LOCAL CONTROLLER
ET#XFR	26	XEE-6111-040	KMC	40 VA TRANSFORMER; 120/24 V

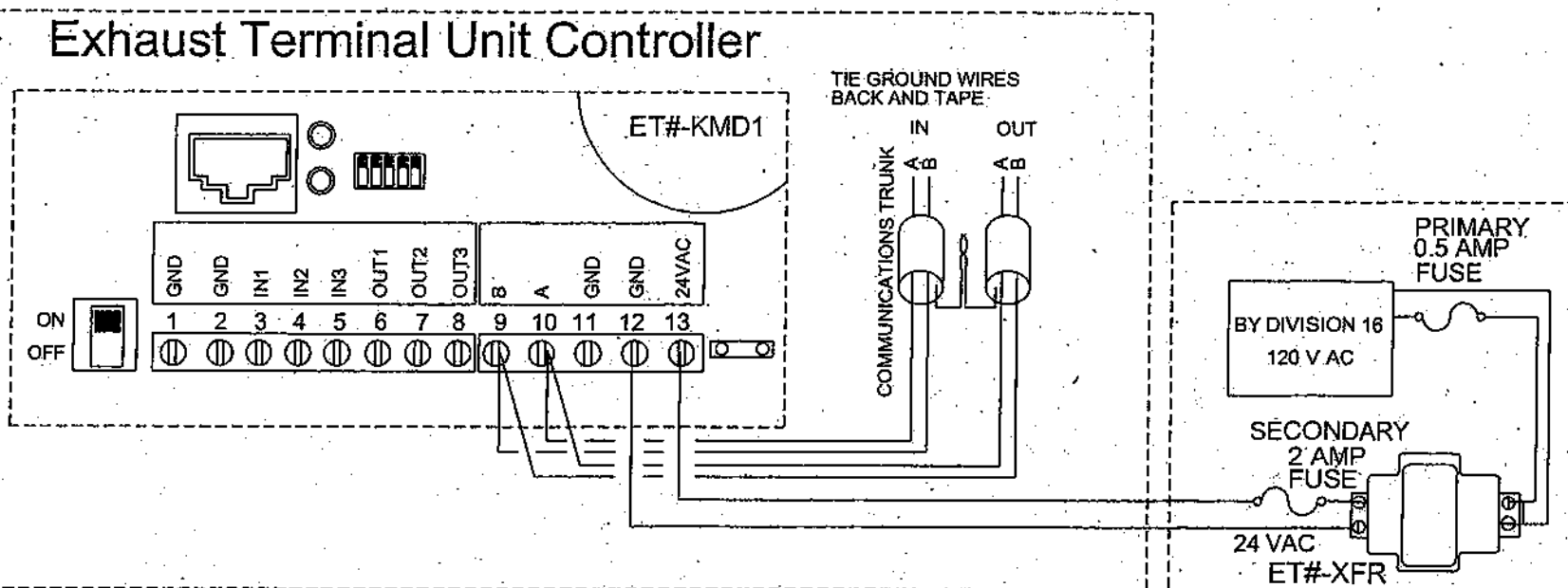
CONTROLLER		4X4 KMD-7001		SUPPLY AIR TERMINAL UNITS			
INPUTS							
TRM #	#	DEVICE ID	POINT DESCRIPTION	CABLE ID	DETAIL DWG	CABLE TYPE	CABLE #
3,1	1		SPARE I/O				
4,1	2		SPARE I/O				
5,1	3		SPARE I/O				
	4		FLOW SENSOR (APPLICAITON DEDICATED INPUT)				
NETSENSOR MAPPED I/O POINTS							
OUTPUTS							
TRM #	#	DEVICE ID	POINT DESCRIPTION	CABLE ID	DETAIL DWG	CABLE TYPE	CABLE #
6,2	1		SPARE I/O				
7,8	2		SPARE I/O				
9,10	3		SPARE I/O				
	4		DAMPER ACTUATOR (APPLICAITON DEDICATED OUTPUT)				

SEQUENCE OF OPERATION:

The controller shall modulate the terminal damper as required to maintain the exhaust air flow at setpoint. The setpoint shall be equal to the supply air flow rate to area served less the offset. The offset shall be 0 CFM for neutral pressure relationship (Offices) and 100 CFM per door for negative pressure relationship (Toilets).



NON-LAB EXHAUST TERMINAL SCHEDULE						
UNIT	AREA SERVED	ASSOCIATED TERMINALS	MAX CFM	MIN CFM	UNOCC CFM	PRESSURE BIAS
ET-301	P.I. OFFICE 301,302	ST-301	425	225	0	NEUTRAL
ET-302	P.I. OFFICE 303,304	ST-302	500	250	0	NEUTRAL
ET-303	P.I. OFFICE 305,306,307	ST-303	1100	575	0	NEUTRAL
ET-304	P.I. OFFICE 308,309	ST-304	750	400	0	NEUTRAL
ET-305	ADMIN SUPPORT 300	ST-305,308	1175	650	0	NEUTRAL
ET-306	P.I. OFFICE 310,311	ST-306	750	400	0	NEUTRAL
ET-307	P.I. OFFICE 312,313,314	ST-307	1025	550	0	NEUTRAL
ET-308	P.I. OFFICE 317,318	ST-309	425	225	0	NEUTRAL
ET-309	P.I. OFFICE 315,316	ST-310	475	250	0	NEUTRAL
ET-310	WORK/COPY 300A	ST-311	250	125	0	NEUTRAL
ET-311	CONFERENCE ROOM 320	ST-312	925	475	0	NEUTRAL
ET-312	RESTROOMS 323, 324,327	ST-314	800	800	300	NEGATIVE
ET-321	MISCELLANEOUS SUPPORT 337	ST-332	600	350	150	NEUTRAL
ET-322	EQUIPMENT 338	ST-330	750	500	200	NEUTRAL
ET-333	MISCELLANEOUS SUPPORT 347	ST-328	575	350	150	NEUTRAL
ET-334	TISSURE CULTURE 346	ST-329	300	250	100	NEGATIVE
ET-335	TISSURE CULTURE 351	ST-333	300	250	100	NEGATIVE
ET-336	MISCELLANEOUS SUPPORT 350	ST-345	575	350	150	NEUTRAL
ET-347	EQUIPMENT 358	ST-346	725	500	200	NEUTRAL
ET-357	TISSURE CULTURE 366	ST-343	250	250	100	NEGATIVE
ET-358	SEMINAR 369	ST-316	500	125	0	NEUTRAL
ET-359	POST DOC/GRAD STUDENT 360	ST-349,350	1400	250	0	NEUTRAL
ET-360	POST DOC/GRAD STUDENT 339	ST-351,352	1400	250	0	NEUTRAL
ET-361	BREAKROOM 322	ST-315	1150	575	0	NEUTRAL
ET-362	TISSURE CULTURE 366	ST-318	425	275	100	NEGATIVE
ET-363	SEMINAR 329	ST-317	525	275	0	NEUTRAL



Drawing Title EXHAUST AIR TERMINAL		ENGINEER COMMENTS & CHANGE ORDER MODIFICATION		A	7/31/03	JS
AS-BUILT MODIFICATION		Revision		B	12/17/14	JNS
Reference Drawing		NO		ECN	Date	BY
Filename: ET_THIRDFLOOR.DWG	Sales: TLL/ GH	Project Manager: BP	Applications Engineer: JS	Drawn: JS	Date: 6/20/03	By: JS
Project Title: ASU	Office Information: TL Services, Inc. 4733 Kibler Rd. Van Buren, AR 72956 PH: 479-474-7222 FX: 479-471-7964			Contract Number: 03-C005		Drawing Number: 16
BIOSCIENCE & BIOTECHNOLOGY BLDG JONESBORO, AR		TL Services, Inc.				

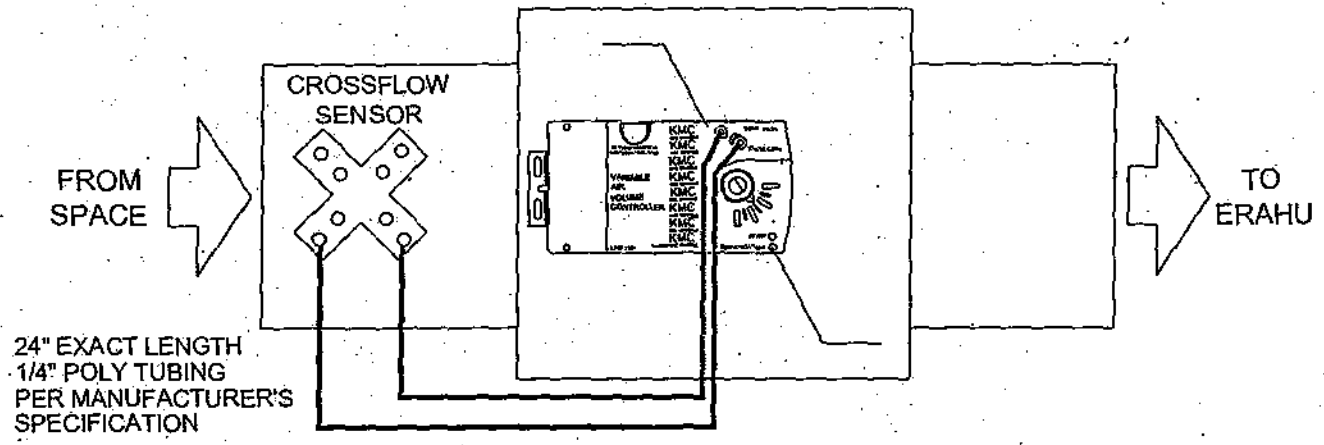
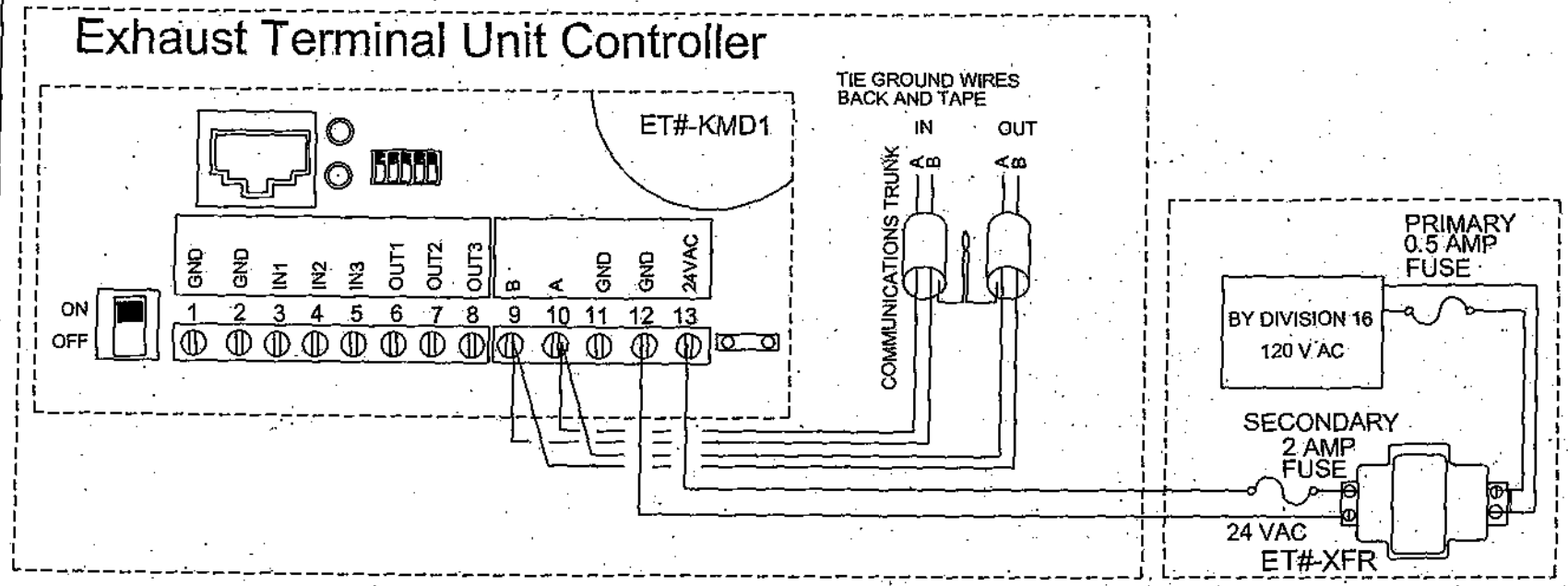
NON-LAB EXHAUST AIR TERMINAL FOURTH FLOOR TERMINALS

BILL OF MATERIALS							
PART ID	QTY	PART #	MFG	DESCRIPTION			
ET#KMD1	2	KMD-7001	KMC	DDC LOCAL CONTROLLER			
ET#XFR	2	XEE-6111-040	KMC	40 VA TRANSFORMER; 120/24 V			
<hr/>							
CONTROLLER		4X4	KMD-7001	SUPPLY AIR TERMINAL UNITS			
INPUTS							
TRM #	#	DEVICE ID	POINT DESCRIPTION	CABLE ID	DETAIL DWG	CABLE TYPE	CABLE #
3,1	1		SPARE I/O				
4,1	2		SPARE I/O				
5,1	3		SPARE I/O				
	4	FLOW SENSOR (APPLICAITON DEDICATED INPUT)					
NETSENSOR MAPPED I/O POINTS							
<hr/>							
OUTPUTS							
TRM #	#	DEVICE ID	POINT DESCRIPTION	CABLE ID	DETAIL DWG	CABLE TYPE	CABLE #
6,2	1		SPARE I/O				
7,8	2		SPARE I/O				
9,10	3		SPARE I/O				
	4	DAMPER ACTUATOR (APPLICAITON DEDICATED OUTPUT)					

NON-LAB EXHAUST TERMINAL SCHEDULE						
UNIT	AREA SERVED	ASSOCIATED TERMINALS	MAX CFM	MIN CFM	UNOCC CFM	PRESSURE BIAS
ET-401	HEAD HOUSE 403	ST-401	2925	2925	1175	NEUTRAL
ET-403	TOILET/LOCKERS 401,406,406B, 407, 407B, 408	ST-403	800	800	175	NEGATIVE

SEQUENCE OF OPERATION:

The controller shall modulate the terminal damper as required to maintain the exhaust air flow at setpoint. The setpoint shall be equal to the supply air flow rate to area served less the offset. The offset shall be 0 CFM for neutral pressure relationship (Offices) and 100 CFM per door for negative pressure relationship (Toilets).



Drawing Title		AS-BUILT MODIFICATION		A		12/17/14		JNS	
EXHAUST AIR TERMINAL		Reference Drawing		NO		Revision		ECN	
Sales: Project Manager		Applications Engineer		Drawn		Approved		By	
Filename: ET_FOURTHFLOOR.DWG		TL/ GH BP		JS		By: JS Date: 6/20/03		By: Date:	
Project Title		Office Information		Contract Number:		Drawing Number:			
ASU		TL Services, Inc.		03-C005		17			
BIOSCIENCE & BIOTECHNOLOGY BLDG		4733 Kibler Rd.		Van Buren, AR 72956					
JONESBORO, AR		PH: 479-474-7222		FX: 479-471-7964					

TERMINAL UNITS WITH 2-WAY VALVE REHEAT VARIABLE VOLUME SUPPLY TERMINAL SCHEDULE NON-LAB

FIRST FLOOR

SECOND FLOOR

THIRD FLOOR

SUPPLY TERMINAL SCHEDULE				
UNIT	AREA	MAX CFM	MIN CFM	UNOCC CFM
ST-102	ADMIN SUPPORT 101, 101A	900	450	0
ST-104	LOBBY 100	300	150	0
ST-105	LOBBY 100, 100A	775	400	0
ST-106	SIMINAR 107	825	475	0
ST-107	SIMINAR 107, 107A, 107B	1050	525	0
ST-110	DIRECTOR 115	375	200	0
ST-111	CONFERENCE 114	200	100	0
ST-112	RECEPTION 113	400	200	0
ST-113	ACCOUNTANT 119, 121	850	450	0
ST-114	ACCOUNTANT 123,124,125	1175	600	0
ST-115	WORK-STOR 113A,116,118,120,122	1025	550	0
ST-116	AUTOCLAVE 142	1500	800	0
ST-118	STORAGE 129	675	350	0
ST-119	CHEMICAL STORAGE 136	275	250	50
ST-121	SAMPLE QUARANTINE 138	450	400	50
ST-123	STORAGE 135	275	150	0
ST-124	GROWTH CHAMBER 140	1400	700	150
ST-125	GROWTH CHAMBER 140	1400	700	150
ST-126	EQUIPMENT ACCESS 143	1000	500	150
ST-127	DIRECTOR'S OFFICE 149	500	250	0
ST-128	SENIOR ACCOUNTANT OFFICE 148	300	150	0
ST-129	CL GAGE WASH A103,A105,A109	1500	1500	1500
ST-130	HOLD. RM. A112, A110, A107, A104	775	775	775
ST-131	CORR A100, A101, A102, A108, A111	1050	1050	1050
ST-132	PROCEDURE RM A116, A117, A118	670	670	670
ST-133	PROCEDURE RM A113, A114, A115	1200	1200	1200
ST-134	GROWTH CHAMBER 140	1400	1400	1400
ST-135	GROWTH CHAMBER 140	1400	1400	1400

SUPPLY TERMINAL SCHEDULE				
UNIT	AREA	MAX CFM	MIN CFM	UNOCC CFM
ST-205	ADMIN SUPPORT 200	600	100	0
ST-208	ADMIN SUPPORT 200	600	100	0
ST-211	WORK/COPY 200A	250	125	0
ST-212	CONFERENCE ROOM 220	925	250	0
ST-215	BREAKROOM 222	1150	575	0
ST-216	SEMINAR 269	500	125	0
ST-217	SEMINAR 229	525	125	0
ST-218	TISSUE CULTURE 231	325	0	0
ST-228	MISC. SUPPORT 247	475	250	50
ST-230	EQUIPMENT 238	650	400	100
ST-232	MISC. SUPPORT 237	500	250	0
ST-233	TISSUE CULTURE 251	200	150	0
ST-243	TISSUE CULTURE 266	200	150	0
ST-245	MISC. SUPPORT 250	475	250	50
ST-246	EQUIPMENT 258	650	400	100
ST-249	POST DOC / GRAD STU 260	1300	650	500
ST-250	POST DOC / GRAD STU 260	1000	500	400
ST-251	POST DOC / GRAD STU 239	1300	650	500
ST-252	POST DOC / GRAD STU 239	1000	500	400

SUPPLY TERMINAL SCHEDULE				
UNIT	AREA	MAX CFM	MIN CFM	UNOCC CFM
ST-305	ADMIN SUPPORT 300	600	100	0
ST-308	ADMIN SUPPORT 300	600	100	0
ST-311	WORK/COPY 300A	250	125	0
ST-312	CONFERENCE ROOM 320	925	475	0
ST-315	BREAKROOM 322	1150	575	0
ST-316	SEMINAR 369	500	125	0
ST-317	SEMINAR 329	525	125	0
ST-318	TISSUE CULTURE 331	325	0	0
ST-328	MISC. SUPPORT 347	475	250	50
ST-330	EQUIPMENT 338	650	400	100
ST-333	TISSUE CULTURE 351	200	150	0
ST-343	TISSUE CULTURE 366	200	150	0
ST-345	MISC. SUPPORT 350	475	250	50
ST-346	EQUIPMENT 358	650	400	100
ST-349	POST DOC / GRAD STU 360	1300	650	500
ST-350	POST DOC / GRAD STU 360	1000	500	400
ST-351	POST DOC / GRAD STU 339	1300	650	500
ST-352	POST DOC / GRAD STU 339	1000	500	400

Drawing Title SUPPLY TERMINAL SCHEDULE OF CFM SETPOINTS		ENGINEER COMMENTS & CHANGE ORDER MODIFICATION		A	7/31/03	JS
For Supply Terminal information not listed on drawings.		AS-BUILT MODIFICATION		B	12/17/04	JNS
Reference Drawing		NO		Revision		ECN
Sales: TLL / GH		Project Manager: BP		Applications Engineer: JS		Drawn: JS
Project Title: ASU BIOSCIENCE & BIOTECHNOLOGY BLDG JONESBORO, AR		By: JS		Date: 6/20/03		Approved: JS
Office Information: TL Services, Inc. 4733 Kibler Rd. Van Buren, AR 72956 PH: 479-474-7222 FX: 479-471-7964		Contract Number: 03-C005		Drawing Number: 18		

TERMINAL UNITS WITH 2-WAY VALVE REHEAT VARIABLE VOLUME SUPPLY TERMINAL SCHEDULE NON-LAB

FIRST FLOOR

SECOND FLOOR

THIRD FLOOR

SUPPLY TERMINAL SCHEDULE				
UNIT	AREA	MAX CFM	MIN CFM	UNOCC CFM
ST-102	ADMIN SUPPORT 101, 101A	900	450	0
ST-104	LOBBY 100	300	150	0
ST-105	LOBBY 100, 100A	775	400	0
ST-106	SIMINAR 107	825	475	0
ST-107	SIMINAR 107, 107A, 107B	1050	525	0
ST-110	DIRECTOR 115	375	200	0
ST-111	CONFERENCE 114	200	100	0
ST-112	RECEPTION 113	400	200	0
ST-113	ACCOUNTANT 119, 121	850	450	0
ST-114	ACCOUNTANT 123, 124, 125	1175	600	0
ST-115	WORK-STOR 113A, 116, 118, 120, 122	1025	550	0
ST-116	AUTOCLAVE 142	1500	800	0
ST-118	STORAGE 129	675	350	0
ST-119	CHEMICAL STORAGE 136	275	250	50
ST-121	SAMPLE QUARANTINE 138	450	400	50
ST-123	STORAGE 135	275	150	0
ST-124	GROWTH CHAMBER 140	1400	700	150
ST-125	GROWTH CHAMBER 140	1400	700	150
ST-126	EQUIPMENT ACCESS 143	1000	500	150
ST-127	DIRECTOR'S OFFICE 149	500	250	0
ST-128	SENIOR ACCOUNTANT OFFICE 148	300	150	0
ST-129	CL GAGE WASH A103, A105, A109	1500	1500	1500
ST-130	HOLD. RM. A112, A110, A107, A104	775	775	775
ST-131	CORR A100, A101, A102, A108, A111	1050	1050	1050
ST-132	PROCEDURE RM A116, A117, A118	670	670	670
ST-133	PROCEDURE RM A113, A114, A115	1200	1200	1200
ST-134	GROWTH CHAMBER 140	1400	1400	1400
ST-135	GROWTH CHAMBER 140	1400	1400	1400

SUPPLY TERMINAL SCHEDULE				
UNIT	AREA	MAX CFM	MIN CFM	UNOCC CFM
ST-205	ADMIN SUPPORT 200	600	100	0
ST-208	ADMIN SUPPORT 200	600	100	0
ST-211	WORK/COPY 200A	250	125	0
ST-212	CONFERENCE ROOM 220	925	250	0
ST-215	BREAKROOM 222	1150	575	0
ST-216	SEMINAR 269	500	125	0
ST-217	SEMINAR 229	525	125	0
ST-218	TISSUE CULTURE 231	325	0	0
ST-228	MISC. SUPPORT 247	475	250	50
ST-230	EQUIPMENT 238	650	400	100
ST-232	MISC. SUPPORT 237	500	250	0
ST-233	TISSUE CULTURE 251	200	150	0
ST-243	TISSUE CULTURE 266	200	150	0
ST-245	MISC. SUPPORT 250	475	250	50
ST-246	EQUIPMENT 258	650	400	100
ST-249	POST DOC / GRAD STU 260	1300	650	500
ST-250	POST DOC / GRAD STU 260	1000	500	400
ST-251	POST DOC / GRAD STU 239	1300	650	500
ST-252	POST DOC / GRAD STU 239	1000	500	400

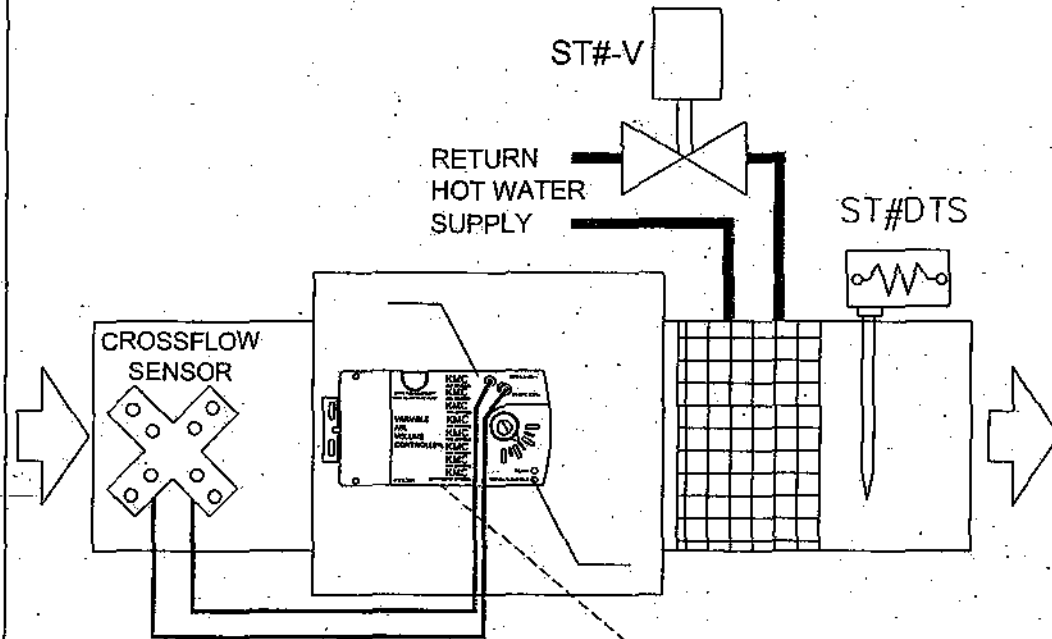
SUPPLY TERMINAL SCHEDULE				
UNIT	AREA	MAX CFM	MIN CFM	UNOCC CFM
ST-305	ADMIN SUPPORT 300	600	100	0
ST-308	ADMIN SUPPORT 300	600	100	0
ST-311	WORK/COPY 300A	250	125	0
ST-312	CONFERENCE ROOM 320	925	475	0
ST-315	BREAKROOM 322	1150	575	0
ST-316	SEMINAR 369	500	125	0
ST-317	SEMINAR 329	525	125	0
ST-318	TISSUE CULTURE 331	325	0	0
ST-328	MISC. SUPPORT 347	475	250	50
ST-330	EQUIPMENT 338	650	400	100
ST-333	TISSUE CULTURE 351	200	150	0
ST-343	TISSUE CULTURE 366	200	150	0
ST-345	MISC. SUPPORT 350	475	250	50
ST-346	EQUIPMENT 358	650	400	100
ST-349	POST DOC / GRAD STU 360	1300	650	500
ST-350	POST DOC / GRAD STU 360	1000	500	400
ST-351	POST DOC / GRAD STU 339	1300	650	500
ST-352	POST DOC / GRAD STU 339	1000	500	400

Drawing Title SUPPLY TERMINAL SCHEDULE OF CFM SETPOINTS For Supply Terminal information not listed on drawings.		ENGINEER COMMENTS & CHANGE ORDER MODIFICATION		A	7/31/03	JS
		AS-BUILT MODIFICATION		B	12/17/04	JNS
Reference Drawing		Revision		ECN	Date	By
Sales: TLL/ GH	Project Manager: BP	Applications Engineer: JS	Drawn: JS	Approved: JS	Date: 6/20/03	By: JS
Filename: ST_NONLAB_SCHEDULE.DWG		Project Title: ASU BIOSCIENCE & BIOTECHNOLOGY BLDG JONESBORO, AR		Office Information: TL Services, Inc. 4733 Kibier Rd. Van Buren, AR 72956 PH: 479-474-7222 FX: 479-471-7964		Contract Number: 03-C005 Drawing Number: 18

TERMINAL UNITS WITH 2-WAY VALVE REHEAT CONSTANT VOLUME

SUPPLY TERMINAL SCHEDULE		
UNIT	AREA	CFM
ST-244	CORRIDOR 268	150
ST-248	CORRIDOR 257	350
ST-253	CORRIDOR 248	300
ST-313	CORRIDOR 319	300
ST-344	CORRIDOR 368	150
ST-348	CORRIDOR 357	350
ST-353	CORRIDOR 348	300

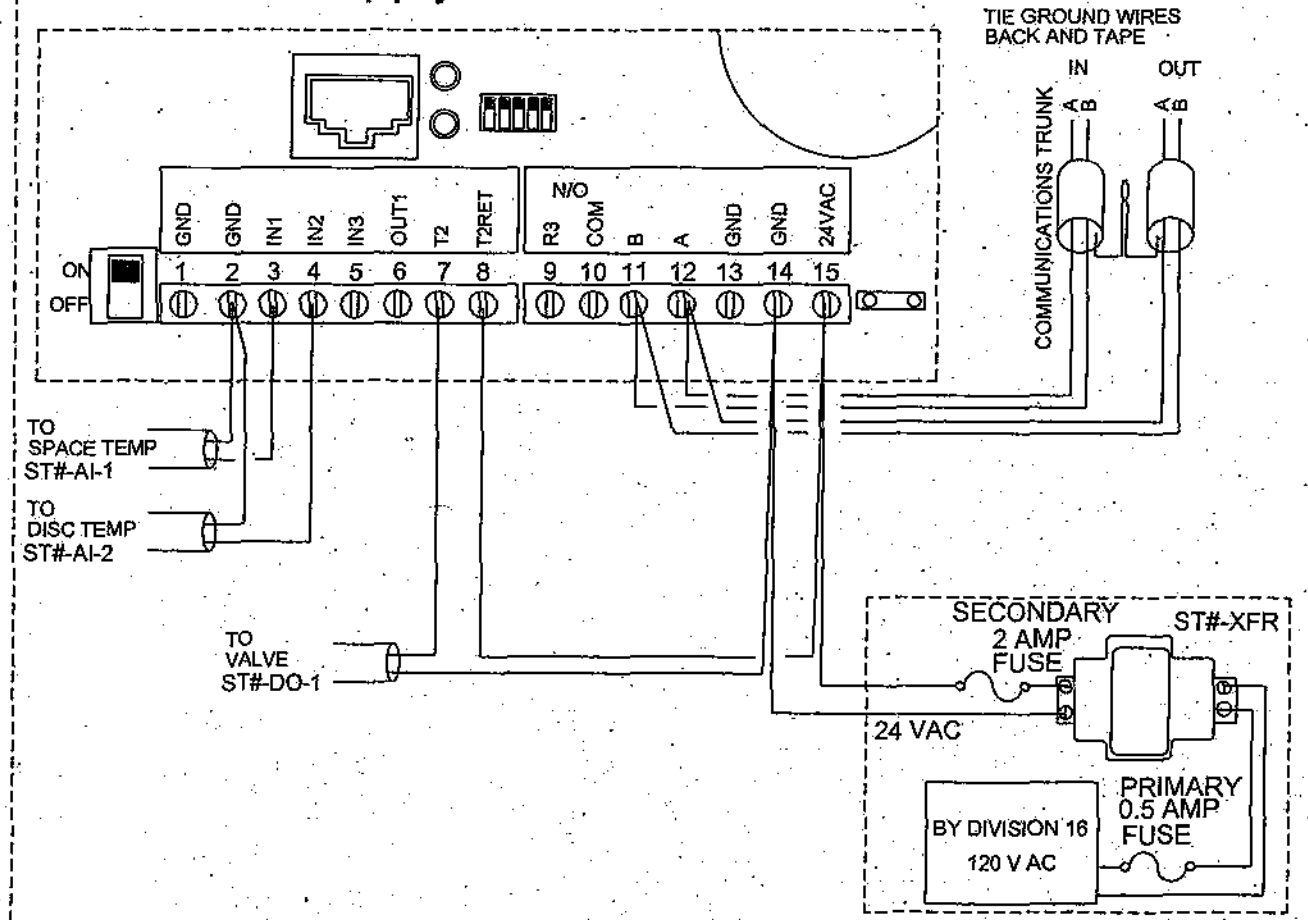
BILL OF MATERIALS				
PART ID	QTY	PART #	MFG	DESCRIPTION
ST#-KMD1	7	KMD-7003	KMC	DDC LOCAL CONTROLLER
ST#DTS	7	STE-1402	KMC	DUCT DISCHARGE TEMP SENSOR
ST#STS	7	STE-5011-10	KMC	SPACE TEMP SENSOR
	7	HMO-5036	KMC	2"X4" MOUNTING PLATE
ST#-XFR	7	XEE-6111-040	KMC	40 VA TRANSFORMER; 120/24 V
ST#-V			KMC	SEE VALVE SCHEDULE



24" EXACT LENGTH
1/4" POLY TUBING
PER MANUFACTURER'S
SPECIFICATION

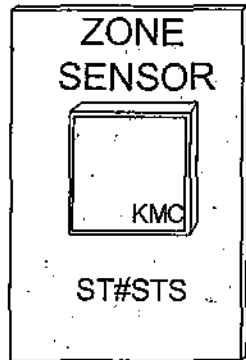
CONTROLLER		4X4	KMD-7003	SUPPLY AIR TERMINAL UNITS		
INPUTS						
TRM #	#	DEVICE ID	POINT DESCRIPTION	CABLE ID	DETAIL DWG	CABLE TYPE
3,1	1	ST#STS	SPACE TEMP	ST#-AI-1	CWDETAIL-8	A-1
4,1	2	ST#DTS	DISCHARGE TEMP	ST#-AI-2	CWDETAIL-2	A-1
5,1	3		SPARE I/O			
	4		FLOW SENSOR (APPLICATION DEDICATED INPUT)			
NETSENSOR MAPPED I/O POINTS						
			NOT USED			C-1
			NOT USED			C-1
			NOT USED			C-1
OUTPUTS						
TRM #	#	DEVICE ID	POINT DESCRIPTION	CABLE ID	DETAIL DWG	CABLE TYPE
6,2	1		SPARE I/O			
7,8	2	ST#-V	REHEAT VALVE	ST#-DO-2		A-1
9,10	3		SPARE I/O			
	4		DAMPER ACTUATOR (APPLICATION DEDICATED OUTPUT)			

Supply Terminal Unit Controller

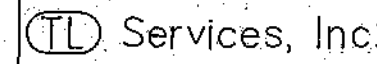


Corridor Supply Air Terminal Sequence of Operation:

The controller shall operate continuously and modulate the terminal damper as required to maintain the air flow at setpoint (constant volume). The controller shall modulate the heating water control valve as required to maintain the space temperature at setpoint of 72°F (adjustable).

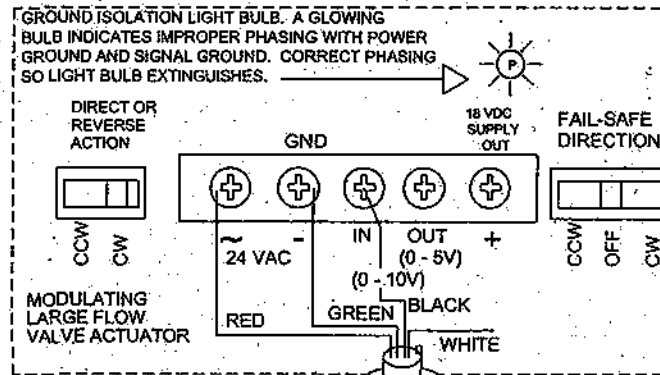
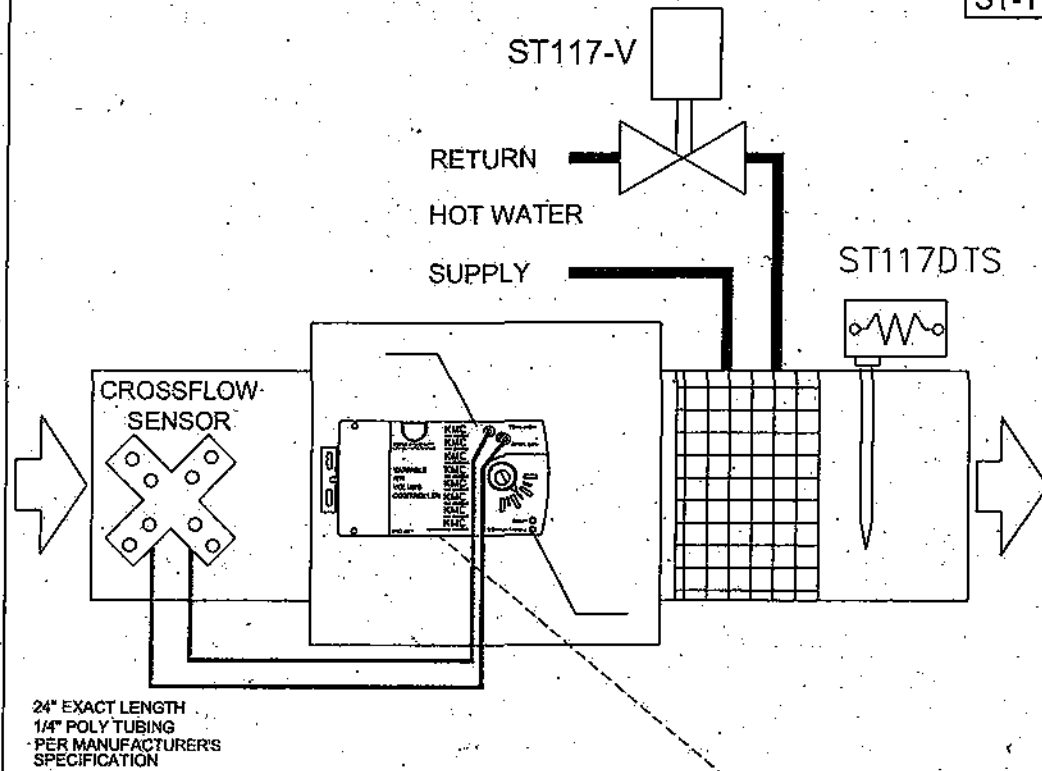


Drawing Title SUPPLY TERMINAL CONSTANT AIR VOLUME CORRIDOR TERMINAL UNITS 2-WAY REHEAT VALVE		ENGINEER COMMENTS & CHANGE ORDER MODIFICATION		A	7/31/03	JS
Reference Drawing NO		Revision		ECN	Date	By
Filename: ST_CAV_CORR.DWG	Sales: TLL/GH	Project Manager: BP	Applications Engineer: JS	Drawn: JS	Date: 6/20/03	By: JS
Project Title ASU BIOSCIENCE & BIOTECHNOLOGY BLDG JONESBORO, AR		Office Information: TL Services, Inc. 4733 Kibler Rd. Van Buren, AR 72956 PH: 479-474-7222 FX: 479-471-7964		Contract Number: 03-C005		Drawing Number: 19



TERMINAL UNITS WITH 2-WAY LARGE FLOW VALVE REHEAT CONSTANT VOLUME

SUPPLY TERMINAL SCHEDULE			
UNIT	AREA	MAX CFM	UNOCC CFM
ST-117	RECEIVING 141	1575	0



CABLE IS PUSHED THROUGH SHUTTER BUSHING OR THROUGH FLEX CONDUIT. WHITE SIGNAL RETURN WIRE IS NOT USED. THE CONTROLLER USES THE 24 VAC RETURN (COMMON) AS COMMON NEUTRAL.

BILL OF MATERIALS				
PART ID	QTY	PART-117	MFG	DESCRIPTION
ST117-KMD1	1	KMD-7003	KMC	DDC LOCAL CONTROLLER
ST117-KMD2	1	KMD-1151	KMC	ROOM SENSOR/ADJ SETPOINT
ST117DTS	1	STE-1402	KMC	DUCT DISCHARGE TEMP SENSOR
ST117-XFR	1	XEE-6111-040	KMC	40 VA TRANSFORMER; 120/24 V
ST117-LS	1	PSR-1	KELE	PHOTO SENSOR
ST117-V	1		KMC	SEE VALVE SCHEDULE

CONTROLLER		4X4	KMD-7003	SUPPLY AIR TERMINAL UNITS			
INPUTS							
TRM #	#	DEVICE ID	POINT DESCRIPTION	CABLE ID	DETAIL DWG	CABLE TYPE	CABLE #
3,1	1	ST117DTS	DISCHARGE TEMP	ST117-AI-1	CWDETAIL-2	A-1	
4,1	2	ST117-LS	OCC LIGHT SENSOR	ST117-AI-2		A-1	
5,1	3		SPARE I/O				
	4		FLOW SENSOR (APPLICAITON DEDICATED INPUT)				
NETSENSOR MAPPED I/O POINTS							
		ST117-KMD2	SPACE TEMPERATURE	ST117-AI-3		C-1	
		ST117-KMD2	SPACE SETPOINT	ST117-AI-4		C-1	
		ST117-KMD2	OVERRIDE	ST117-DI-1		C-1	
OUTPUTS							
TRM #	#	DEVICE ID	POINT DESCRIPTION	CABLE ID	DETAIL DWG	CABLE TYPE	CABLE #
6,2	1	ST117-V	REHEAT VALVE	ST117-AO-1	CWDETAIL-4	A-1	
7,8	2		SPARE I/O				
9,10	3		SPARE I/O				
	4		DAMPER ACTUATOR (APPLICAITON DEDICATED OUTPUT)				

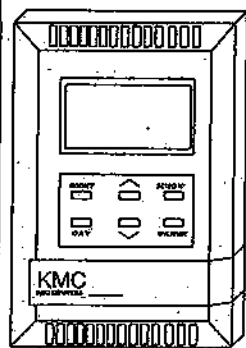
Supply Air Terminal Sequence of Operation:

Air terminal mode of operation is either "Occupied" or "Unoccupied" based upon status of room lighting. ("Occupied" when lights are "ON" and "Unoccupied" when lights are "OFF"). The controller will modulate the terminal damper and the heating water control valve as required to maintain the space temperature at setpoint.

During the "Occupied" mode of operation, the setpoint shall be adjustable by the occupant at the thermostat between a minimum of 68 deg. f and a maximum of 75°F. On a call for cooling, the terminal damper shall be modulated between the cooling minimum and the cooling maximum air flow rates scheduled. On a call for heating, the terminal damper shall be modulated between the heating minimum and the heating maximum air flow rates scheduled. During the "Unoccupied" mode of operation, the heating setpoint shall be 60°F and the cooling setpoint shall be 80°F. On a call for cooling, the terminal damper shall be modulated from fully closed (0 cfm) to the maximum cooling air flow rate scheduled. On a call for heating, the terminal damper shall be modulated from fully closed (0 cfm) to the maximum heating air flow rate scheduled.

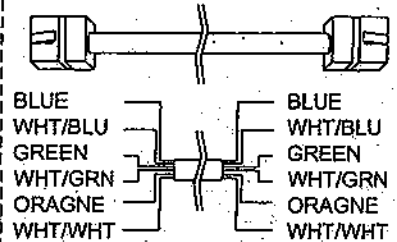
ST117-KMD2

6 CONDUCTOR FROM CONTROLLER TO NETSENSOR MOUNTING BOX. KEEP WITHIN 75' OF CONTROLLER.

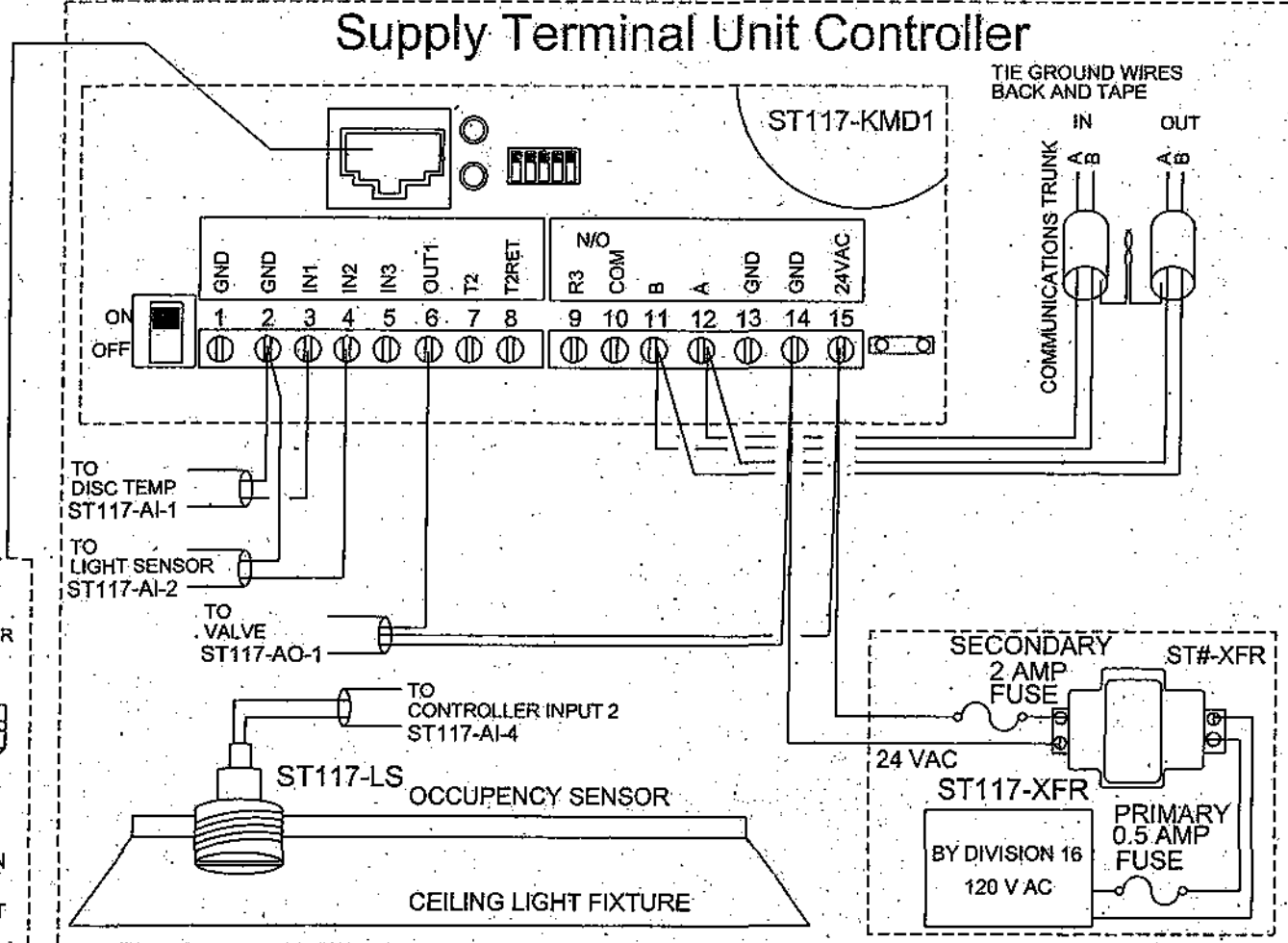


ST117-AI-3
ST117-AI-4
ST117-DI-1

CABLE CONSTRUCTION FOR NETSENSOR
LENGTH UP TO 75 FEET



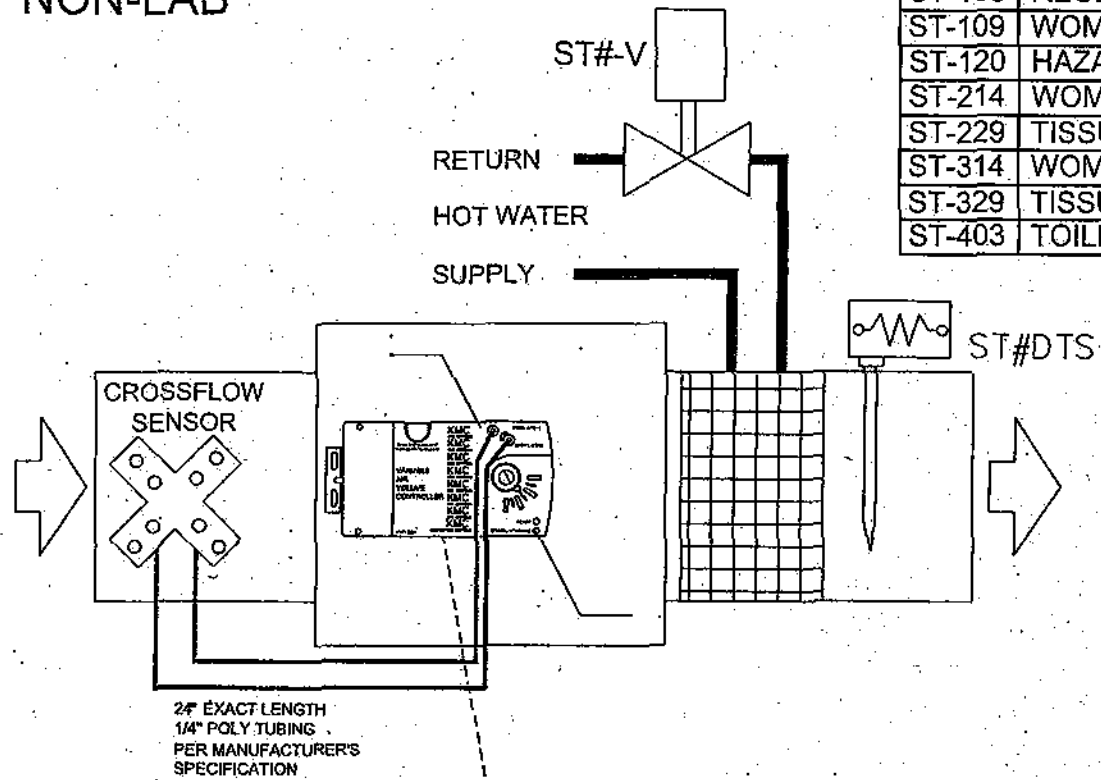
Supply Terminal Unit Controller



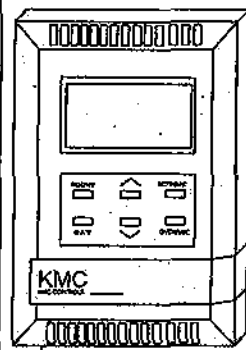
Drawing Title		Reference Drawing		NO	Revision	ECN	Date	By
SUPPLY TERMINAL CONSTANT AIR VOLUME 2-WAY REHEAT LARGE FLOW VALVE								
Filename:	ST_CAV_LF_NONLAB.DWG	Sales:	Project Manager	Applications Engineer:	Drawn	Approved		
Project Title	ASU BIOSCIENCE & BIOTECHNOLOGY BLDG - JONESBORO, AR	TLL/ GH	BP	JS	By: JS	Date: 6/20/03	By:	Date:
		Office Information:		Contract Number:				
		TL Services, Inc.		03-C005				
		4733 Kibier Rd.		Drawing Number:				
		Van Buren, AR 72956		20				
		PH: 479-474-7222						
		FX: 479-471-7964						

TERMINAL UNITS WITH 2-WAY VALVE REHEAT CONSTANT VOLUME NON-LAB

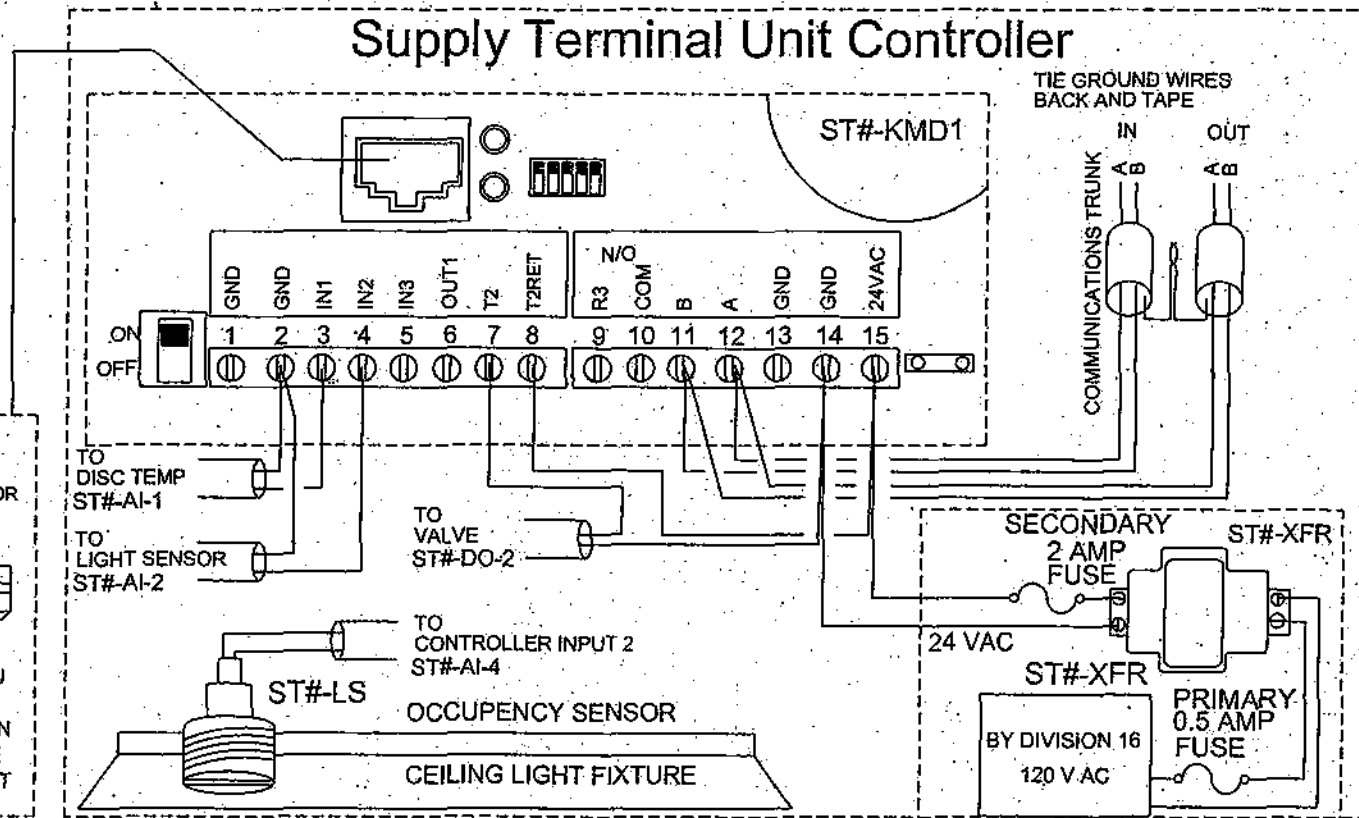
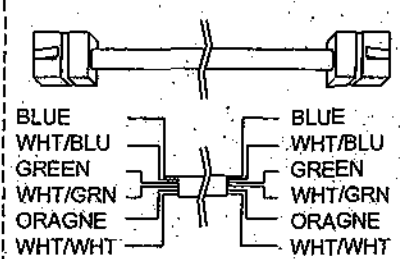
SUPPLY TERMINAL SCHEDULE			
UNIT	AREA	CFM	UNOCC CFM
ST-108	RECEPTION 100, 100A	200	0
ST-109	WOMEN 111, 110	700	450
ST-120	HAZARDOUS STORAGE 137	300	75
ST-214	WOMEN 223, MEN 224, CUST 227	500	50
ST-229	TISSUE CULTURE 246	150	0
ST-314	WOMEN 323, MEN 324, CUST 327	500	50
ST-329	TISSUE CULTURE 346	150	0
ST-403	TOILET/LOCKERS 401 - 408	800	800



ST#-KMD2
6 CONDUCTOR
FROM CONTROLLER
TO NETSENSOR
MOUNTING BOX.
KEEP WITHIN 75'
OF CONTROLLER.



CABLE CONSTRUCTION FOR NETSENSOR
LENGTH UP TO 75 FEET



BILL OF MATERIALS				
PART ID	QTY	PART #	MFG	DESCRIPTION
ST#-KMD1	8	KMD-7003	KMC	DDC LOCAL CONTROLLER
ST#-KMD2	8	KMD-1151	KMC	ROOM SENSOR/ADJ SETPOINT
ST#DTS	8	STE-1402	KMC	DUCT DISCHARGE TEMP SENSOR
ST#-XFR	8	XEE-6111-040	KMC	40 VA TRANSFORMER; 120/24 V
ST#-LS	8	PSR-1	KELE	PHOTO SENSOR
ST#-V			KMC	SEE VALVE SCHEDULE

CONTROLLER		4X4	KMD-7003	SUPPLY AIR TERMINAL UNITS			
INPUTS							
TRM #	#	DEVICE ID	POINT DESCRIPTION	CABLE ID	DETAIL DWG	CABLE TYPE	CABLE #
3,1	1	ST#DTS	DISCHARGE TEMP	ST#-AI-1	CWDETAIL-2	A-1	
4,1	2	ST#-LS	OCC LIGHT SENSOR	ST#-AI-2		A-1	
5,1	3		SPARE I/O				
	4	FLOW SENSOR (APPLICATION DEDICATED INPUT)					
NETSENSOR MAPPED I/O POINTS							
		ST#-KMD2	SPACE TEMPERATURE	ST#-AI-3		C-1	
		ST#-KMD2	SPACE SETPOINT	ST#-AI-4		C-1	
		ST#-KMD2	OVERRIDE	ST#-DI-1		C-1	
OUTPUTS							
TRM #	#	DEVICE ID	POINT DESCRIPTION	CABLE ID	DETAIL DWG	CABLE TYPE	CABLE #
6,2	1		SPARE I/O				
7,8	2	ST#-V	REHEAT VALVE	ST#-DO-2	CWDETAIL-4	A-1	
9,10	3		SPARE I/O				
	4	DAMPER ACTUATOR (APPLICATION DEDICATED OUTPUT)					

Supply Air Terminal Sequence of Operation:

Air terminal mode of operation is either "Occupied" or "Unoccupied" based upon status of room lighting. ("Occupied" when lights are "ON" and "Unoccupied" when lights are "OFF"). The controller will modulate the terminal damper and the heating water control valve as required to maintain the space temperature at setpoint.

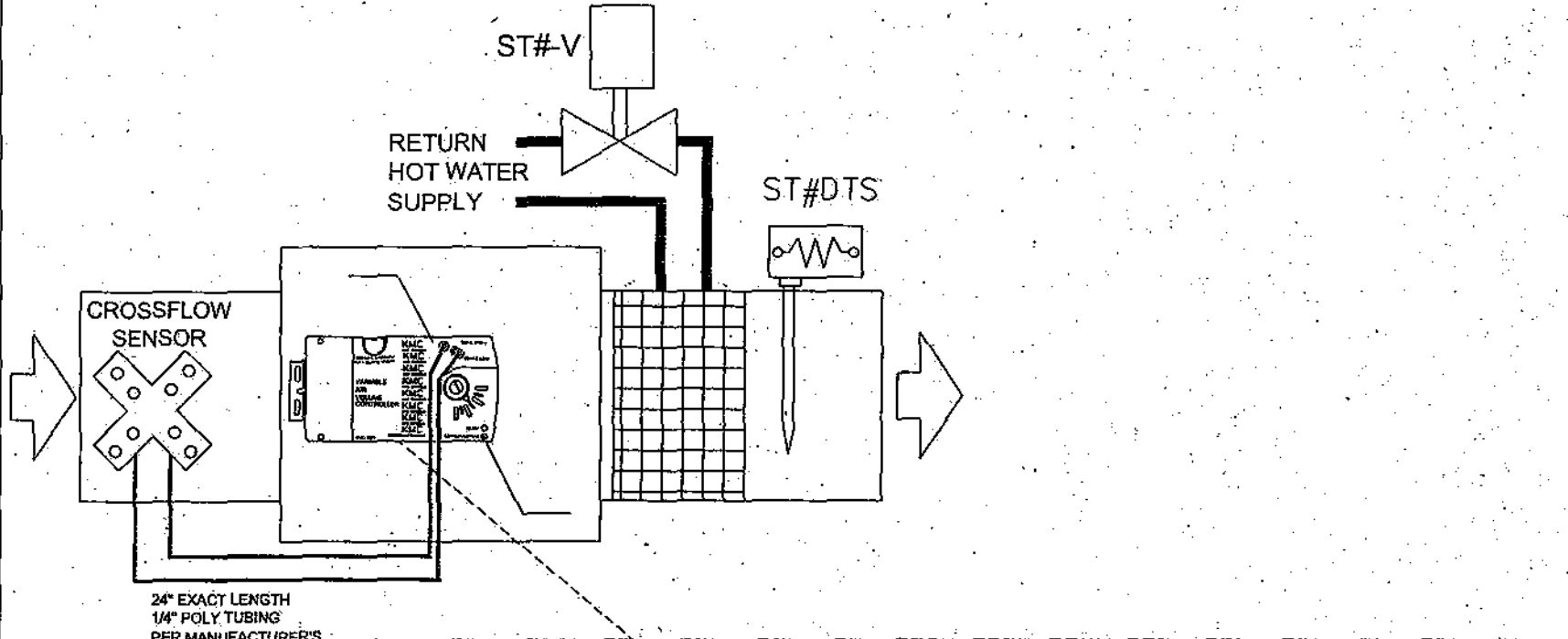
During the "Occupied" mode of operation, the setpoint shall be adjustable by the occupant at the thermostat between a minimum of 68°F and a maximum of 75°F. On a call for cooling, the terminal damper shall be modulated between the cooling minimum and the cooling maximum air flow rates scheduled. On a call for heating, the terminal damper shall be modulated between the heating minimum and the heating maximum air flow rates scheduled. During the "Unoccupied" mode of operation, the heating setpoint shall be 60°F and the cooling setpoint shall be 80°F. On a call for cooling, the terminal damper shall be modulated from Unoccupied flow setpoint to the maximum cooling air flow rate scheduled. On a call for heating, the terminal damper shall be modulated from Unoccupied flow setpoint to the maximum heating air flow rate scheduled.

Drawing Title		ENGINEER COMMENTS & CHANGE ORDER MODIFICATION		A	7/31/03	JS
SUPPLY TERMINAL CONSTANT AIR VOLUME 2-WAY REHEAT VALVE						
Reference Drawing		NO		Revision		ECN
Sales: Project Manager		Applications Engineer		Drawn		Approved
Filename: ST_CAV_NONLAB.DWG		TL/ GH		By: JS		Date: 6/20/03
Project Title		BP		JS		Date:
ASU		BY DIVISION 16		120 V AC		Contract Number:
BIOSCIENCE & BIOTECHNOLOGY BLDG		PRIMARY 0.5 AMP FUSE		24 VAC		03-C005
JONESBORO, AR		SECONDARY 2 AMP FUSE		ST#-XFR		Drawing Number:
TL Services, Inc.		Office Information:		TL Services, Inc.		21
		4733 Kibler Rd.		Van Buren, AR 72956		
		PH: 479-474-7222		FX: 479-471-7964		

TERMINAL UNITS 2-WAY VALVE REHEAT VARIABLE VOLUME

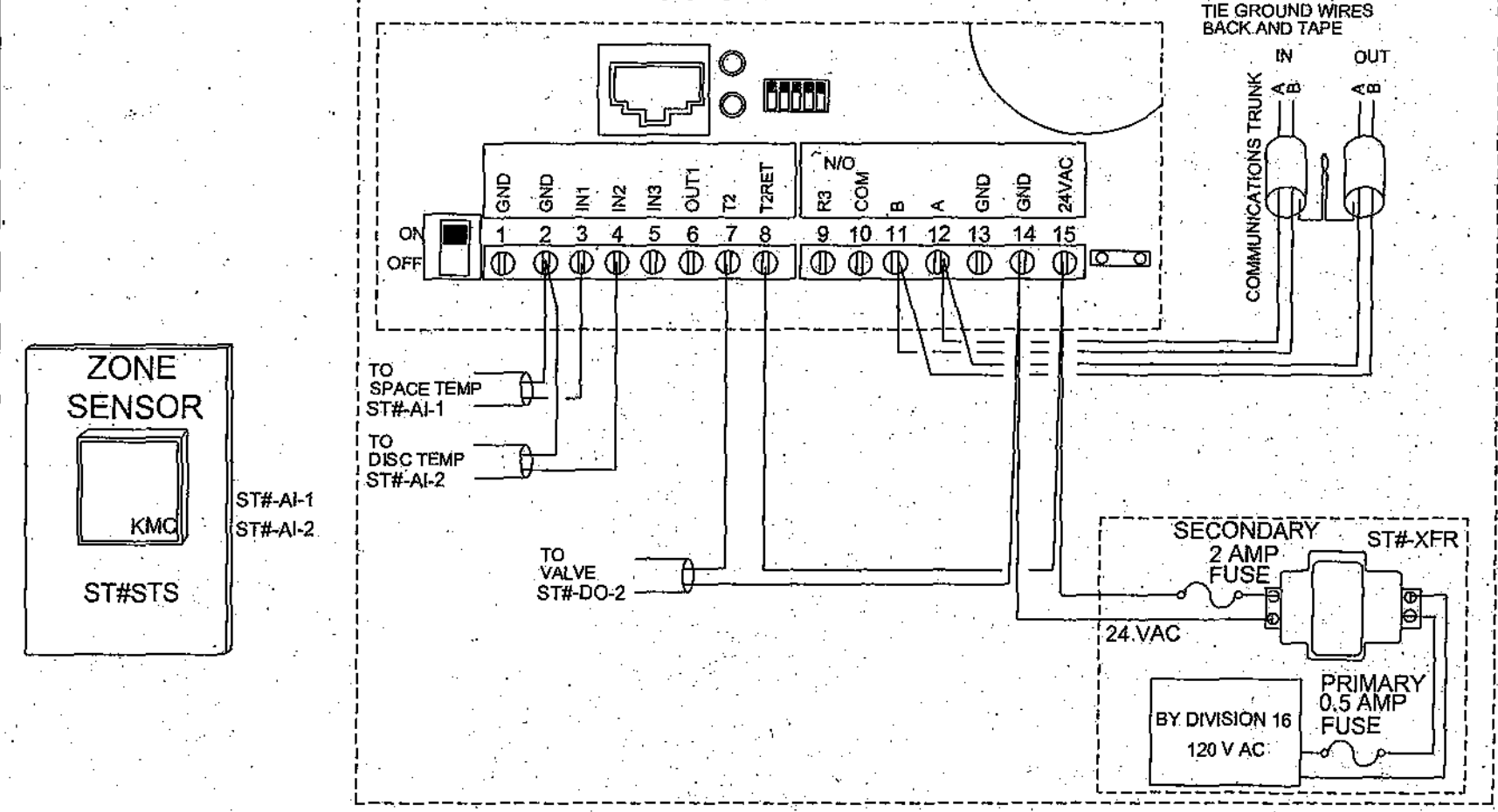
SUPPLY TERMINAL SCHEDULE				
UNIT	AREA	MAX CFM	MIN CFM	UNOCC CFM
ST-122	CORRIDOR 130	250	125	0
ST-213	CORRIDOR 219	125	50	100
ST-231	CORRIDOR 236	350	25	350
ST-313	CORRIDOR 319	125	50	100
ST-331	CORRIDOR 336	350	25	350

BILL OF MATERIALS				
PART ID	QTY	PART #	MFG	DESCRIPTION
ST#-KMD1	5	KMD-7003	KMC	DDC LOCAL CONTROLLER
ST#DTS	5	STE-1402	KMC	DUCT DISCHARGE TEMP SENSOR
ST#STS	5	STE-5011-10	KMC	SPACE TEMP SENSOR
	5	HMO-5036	KMC	2"X4" MOUNTING PLATE
ST#-XFR	5	XEE-6111-040	KMC	40 VA TRANSFORMER; 120/24 V
ST#-V			KMC	SEE VALVE SCHEDULE



CONTROLLER 4X4 KMD-7003 SUPPLY AIR TERMINAL UNITS						
INPUTS						
TRM #	#	DEVICE ID	POINT DESCRIPTION	CABLE ID	DETAIL DWG.	CABLE #
3,1	1	ST#STS	SPACE TEMP	ST#-AI-1	CWDETAIL-8	A-1
4,1	2	ST#DTS	DISCHARGE TEMP	ST#-AI-2	CWDETAIL-2	A-1
5,1	3		SPARE I/O			
	4		FLOW SENSOR (APPLICATION DEDICATED INPUT)			
NETSENSOR MAPPED I/O POINTS						
			NOT USED			C-1
			NOT USED			C-1
			NOT USED			C-1
OUTPUTS						
TRM #	#	DEVICE ID	POINT DESCRIPTION	CABLE ID	DETAIL DWG.	CABLE #
6,2	1		SPARE I/O			
7,8	2	ST#-V	REHEAT VALVE	ST#-DO-2		A-1
9,10	3		SPARE I/O			
	4		DAMPER ACTUATOR (APPLICATION DEDICATED OUTPUT)			

Supply Terminal Unit Controller

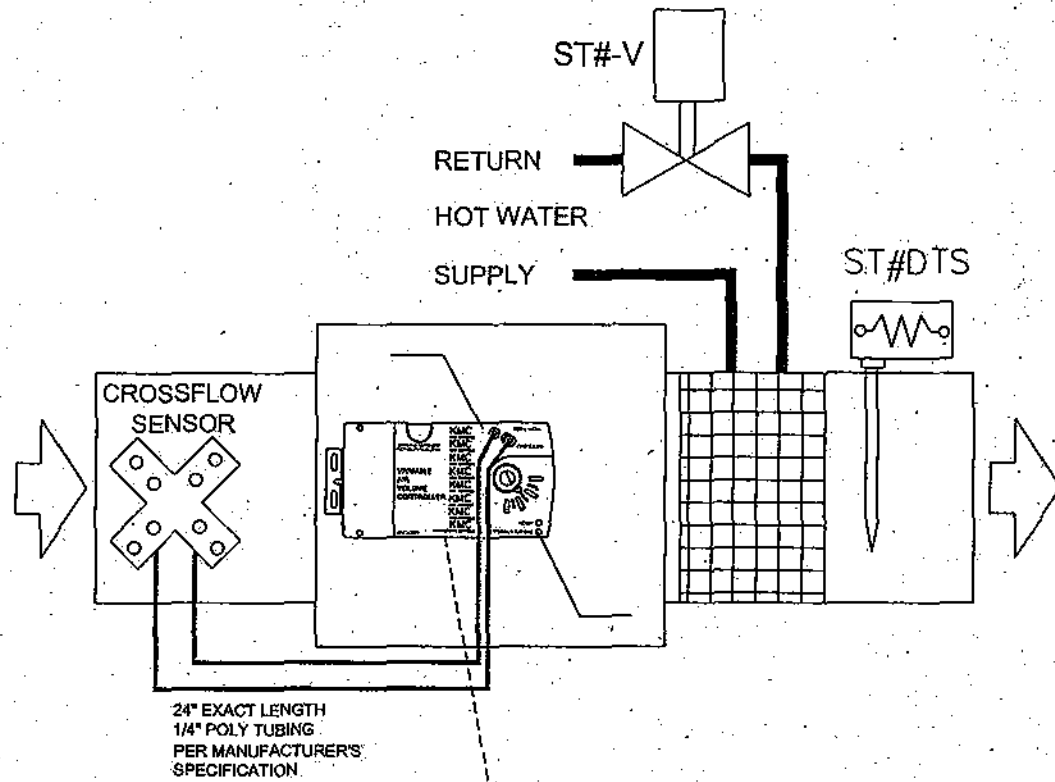


Corridor Supply Air Terminal Sequence of Operation:

Occupied mode shall be determined by Operator based upon a weekly schedule. The controller will modulate the terminal damper and reheat valve as required to maintain the space temperature at setpoint 72°F (adjustable). On a call for cooling, the terminal damper shall be modulated between the cooling minimum and the cooling maximum air flow rates scheduled. On a call for heating, the terminal damper shall be modulated to the minimum damper position and the reheat valve shall be modulated to maintain space setpoint. During Unoccupied mode, the controller will modulate the terminal damper to Unoccupied Mode flow setpoint.

Drawing Title SUPPLY TERMINAL CONSTANT AIR VOLUME CORRIDOR TERMINAL UNITS 2-WAY REHEAT VALVE		ENGINEER COMMENTS & CHANGE ORDER MODIFICATION		A	7/31/03	JS
Filename: ST_VAV_CORR.DWG		AS-BUILT MODIFICATION		B	12/17/04	JWS
Project Title ASU BIOSCIENCE & BIOTECHNOLOGY BLDG JONESBORO, AR		Reference Drawing NO		Revision	ECN	Date
By: JS Date: 5/20/03		Drawn		Approved		
Office Information: TL Services, Inc. 4733 Kibler Rd. Van Buren, AR 72956 PH: 479-474-7222 FX: 479-471-7964		Contract Number: 03-C005		Drawing Number: 22		

TERMINAL UNITS WITH 2-WAY VALVE REHEAT VARIABLE VOLUME NON-LAB

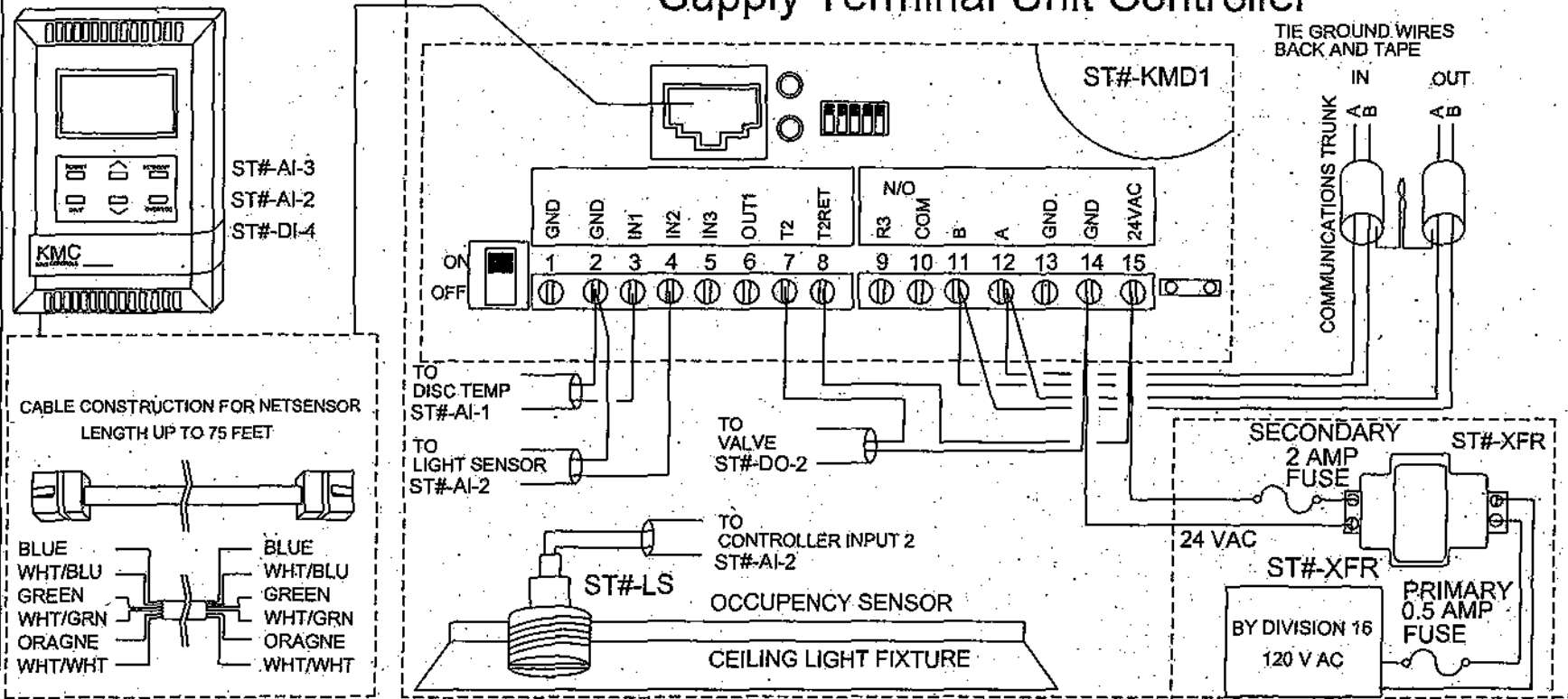


24" EXACT LENGTH
1/4" POLY TUBING
PER MANUFACTURER'S
SPECIFICATION

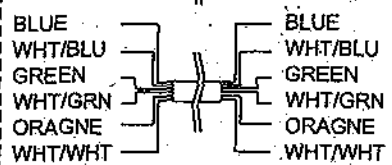
ST#-KMD2
6 CONDUCTOR
FROM CONTROLLER
TO NETSENSOR
MOUNTING BOX.
KEEP WITHIN 75'
OF CONTROLLER.

REFERENCE DRAWING ST_NONLAB_SCHEDULE.DWG
(SHEET NUMBER ##) FOR SCHEDULE OF SUPPLY
TERMINAL VAV BOXES.

Supply Terminal Unit Controller



CABLE CONSTRUCTION FOR NETSENSOR
LENGTH UP TO 75 FEET



BILL OF MATERIALS				
PART ID	QTY	PART #	MFG	DESCRIPTION
ST#-KMD1	51	KMD-7003	KMC	DDC LOCAL CONTROLLER
ST#-KMD2	51	KMD-1151	KMC	ROOM SENSOR/ADJ SETPOINT
ST#DTS	51	STE-1402	KMC	DUCT DISCHARGE TEMP SENSOR
ST#-XFR	51	XEE-6111-040	KMC	40 VA TRANSFORMER, 120/24 V
ST#-LS	51	PSR-1	KELE	PHOTO SENSOR
ST#-V			KMC	SEE VALVE SCHEDULE

CONTROLLER		4X4	KMD-7003	SUPPLY AIR TERMINAL UNITS			
INPUTS							
TRM #	#	DEVICE ID	POINT DESCRIPTION	CABLE ID	DETAIL DWG	CABLE TYPE	CABLE #
3,1	1	ST#DTS	DISCHARGE TEMP	ST#-AI-1	CWDETAIL-2	A-1	
4,1	2	ST#-LS	OCC LIGHT SENSOR	ST#-AI-2		A-1	
5,1	3		SPARE I/O				
	4		FLOW SENSOR (APPLICAITON DEDICATED INPUT)				
NETSENSOR MAPPED I/O POINTS							
		ST#-KMD2	SPACE TEMPERATURE	ST#-AI-3		C-1	
		ST#-KMD2	SPACE SETPOINT	ST#-AI-2		C-1	
		ST#-KMD2	OVERRIDE	ST#-DI-4		C-1	
OUTPUTS							
TRM #	#	DEVICE ID	POINT DESCRIPTION	CABLE ID	DETAIL DWG	CABLE TYPE	CABLE #
6,2	1		SPARE I/O				
7,8	2	ST#-V	REHEAT VALVE	ST#-DO-2		A-1	
9,10	3		SPARE I/O				
	4		DAMPER ACTUATOR (APPLICAITON DEDICATED OUTPUT)				

Supply Air Terminal Sequence of Operation:

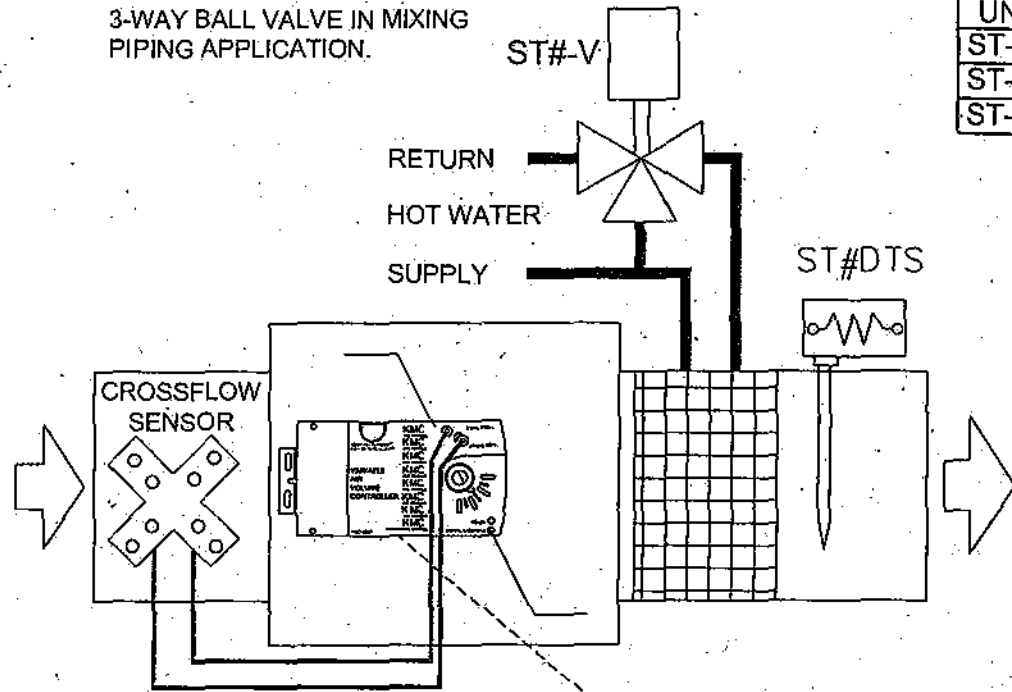
Air terminal mode of operation is either "Occupied" or "Unoccupied" based upon status of room lighting. ("Occupied" when lights are "ON" and "Unoccupied" when lights are "OFF"). The controller will modulate the terminal damper and the heating water control valve as required to maintain the space temperature at setpoint.

During the "Occupied" mode of operation, the setpoint shall be adjustable by the occupant at the thermostat between a minimum of 68°F and a maximum of 75°F. On a call for cooling, the terminal damper shall be modulated between the cooling minimum and the cooling maximum air flow rates scheduled. On a call for heating, the terminal damper shall be modulated between the heating minimum and the heating maximum air flow rates scheduled. During the "Unoccupied" mode of operation, the heating setpoint shall be 60°F and the cooling setpoint shall be 80°F. On a call for cooling, the terminal damper shall be modulated from fully closed (0 cfm) to the maximum cooling air flow rate scheduled. On a call for heating, the terminal damper shall be modulated from fully closed (0 cfm) to the maximum heating air flow rate scheduled.

Drawing Title		AS-BUILT MODIFICATION		A	12/17/04	JNS
SUPPLY TERMINAL VARIABLE AIR VOLUME 2-WAY REHEAT VALVE						
Reference Drawing		NO		Revision	ECN	Date
Sole: Project Manager		Applications Engineer		Drawn		Approved
Filename: ST_VAV_NONLAB.DWG		TLL/ GH		By: JS	Date: 6/20/03	By: Date:
Project Title		ASU		Office Information:		Contract Number:
BIOSCIENCE & BIOTECHNOLOGY BLDG		JONESBORO, AR		TL Services, Inc.		03-C005
				4733 Kibler Rd. Van Buren, AR 72956 PH: 479-474-7222 FX: 479-474-7222		Drawing Number:
						23

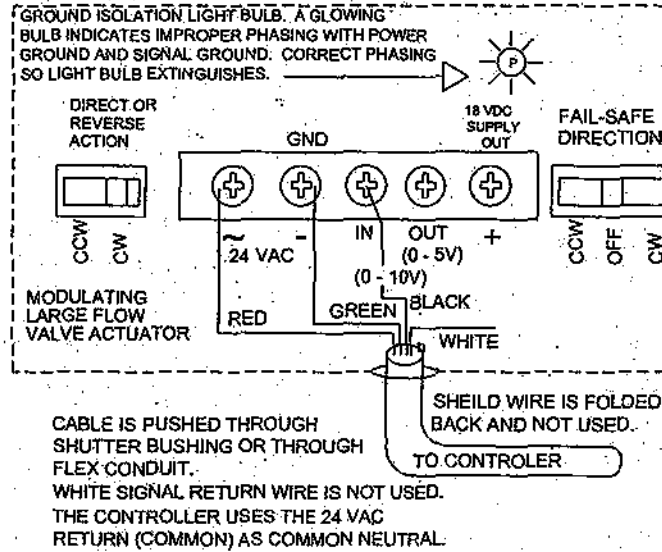
TERMINAL UNITS WITH 3-WAY VALVE REHEAT VARIABLE VOLUME

3-WAY BALL VALVE IN MIXING PIPING APPLICATION.



24" EXACT LENGTH
1/4" POLY TUBING
PER MANUFACTURER'S SPECIFICATION

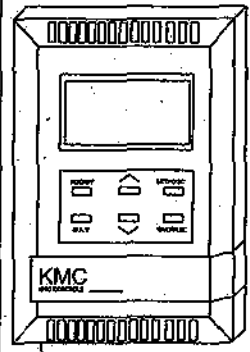
SUPPLY TERMINAL SCHEDULE				
UNIT	AREA	MAX CFM	MIN CFM	UNOCC CFM
ST-232	MISC SUPPORT 237	500	250	50
ST-247	MISC SUPPORT 259	475	250	50
ST-332	MISC SUPPORT 332	500	250	50



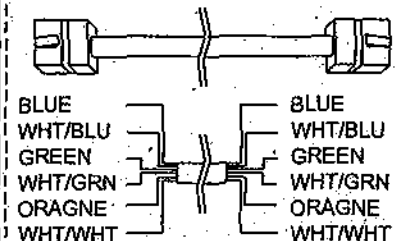
CABLE IS PUSHED THROUGH SHUTTER BUSHING OR THROUGH FLEX CONDUIT. WHITE SIGNAL RETURN WIRE IS NOT USED. THE CONTROLLER USES THE 24 VAC RETURN (COMMON) AS COMMON NEUTRAL.

SHEILD WIRE IS FOLDED BACK AND NOT USED.
TO CONTROLLER.

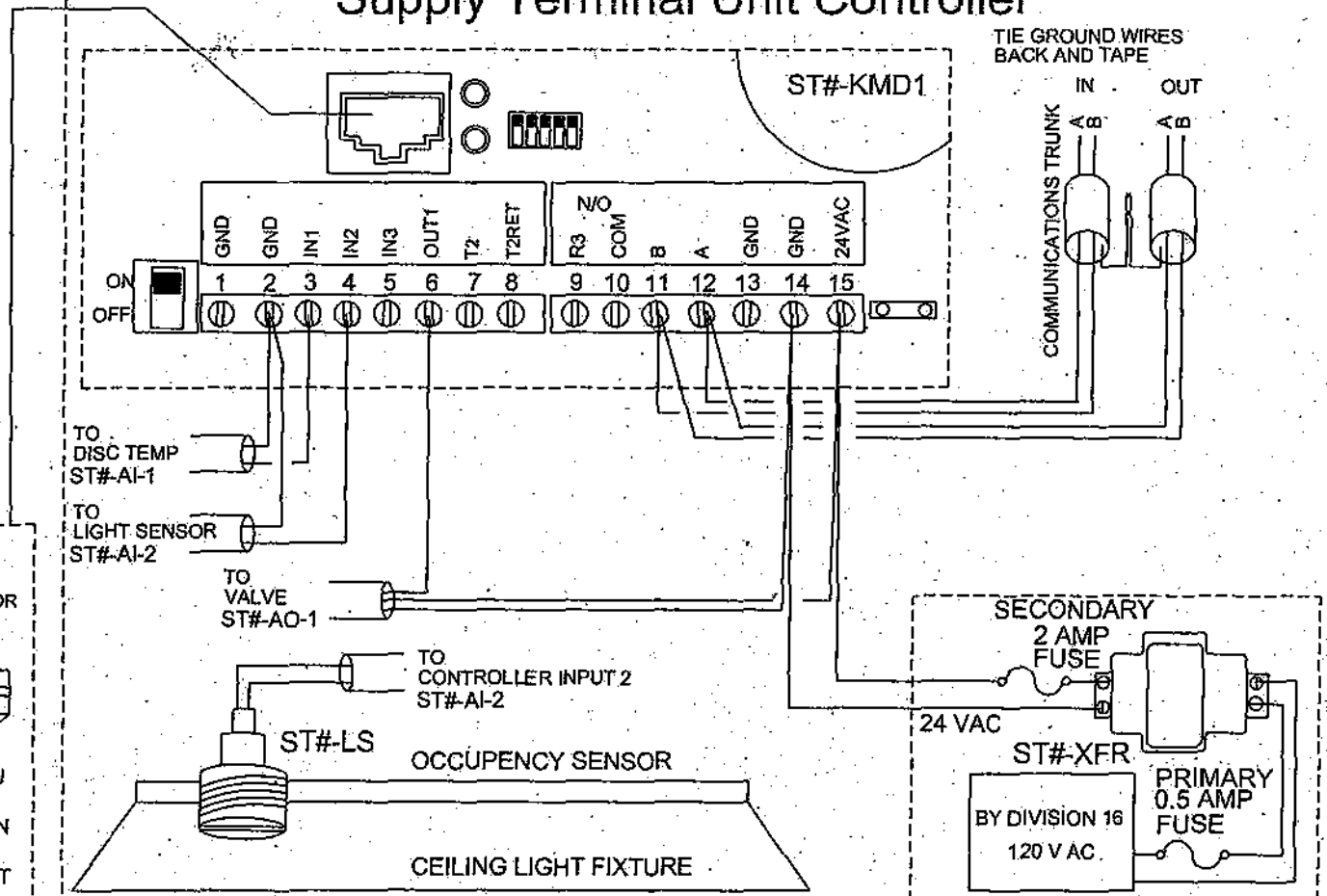
ST#-KMD2
6 CONDUCTOR FROM CONTROLLER TO NETSENSOR MOUNTING BOX. KEEP WITHIN 75' OF CONTROLLER.



CABLE CONSTRUCTION FOR NETSENSOR
LENGTH UP TO 75 FEET



Supply Terminal Unit Controller



BILL OF MATERIALS

PART ID	QTY	PART #	MFG	DESCRIPTION
ST#-KMD1	3	KMD-7003	KMC	DDC LOCAL CONTROLLER
ST#-KMD2	3	KMD-1151	KMC	ROOM SENSOR/ADJ SETPOINT
ST#DTS	3	STE-1402	KMC	DUCT DISCHARGE TEMP SENSOR
ST#-XFR	3	XEE-6111-040	KMC	40 VA TRANSFORMER; 120/24 V
ST#-LS	3	PSR-1	KELE	PHOTO SENSOR
ST#-V			KMC	SEE VALVE SCHEDULE

CONTROLLER 4X4 KMD-7003 SUPPLY AIR TERMINAL UNITS

INPUTS

TRM #	#	DEVICE ID	POINT DESCRIPTION	CABLE ID	DETAIL DWG	CABLE TYPE	CABLE #
3,1	1	ST#DTS	DISCHARGE TEMP	ST#-AI-1	CWDETAIL-2	A-1	
4,1	2	ST#-LS	OCC LIGHT SENSOR	ST#-AI-2		A-1	
5,1	3		SPARE I/O				
	4		FLOW SENSOR (APPLICATION DEDICATED INPUT)				

NETSENSOR MAPPED I/O POINTS

ST#-KMD2	POINT DESCRIPTION	ST#-AI-3	C-1
ST#-KMD2	SPACE TEMPERATURE	ST#-AI-3	C-1
ST#-KMD2	SPACE SETPOINT	ST#-AI-4	C-1
ST#-KMD2	OVERRIDE	ST#-DI-1	C-1

OUTPUTS

TRM #	#	DEVICE ID	POINT DESCRIPTION	CABLE ID	DETAIL DWG	CABLE TYPE	CABLE #
6,2	1	ST#-V	REHEAT VALVE	ST#-AO-1	CWDETAIL-4	A-1	
7,8	2		SPARE I/O				
9,10	3		SPARE I/O				
	4		DAMPER ACTUATOR (APPLICATION DEDICATED OUTPUT)				

Supply Air Terminal Sequence of Operation:

Air terminal mode of operation is either "Occupied" or "Unoccupied" based upon status of room lighting. ("Occupied" when lights are "ON" and "Unoccupied" when lights are "OFF"). The controller will modulate the terminal damper and the heating water control valve as required to maintain the space temperature at setpoint.

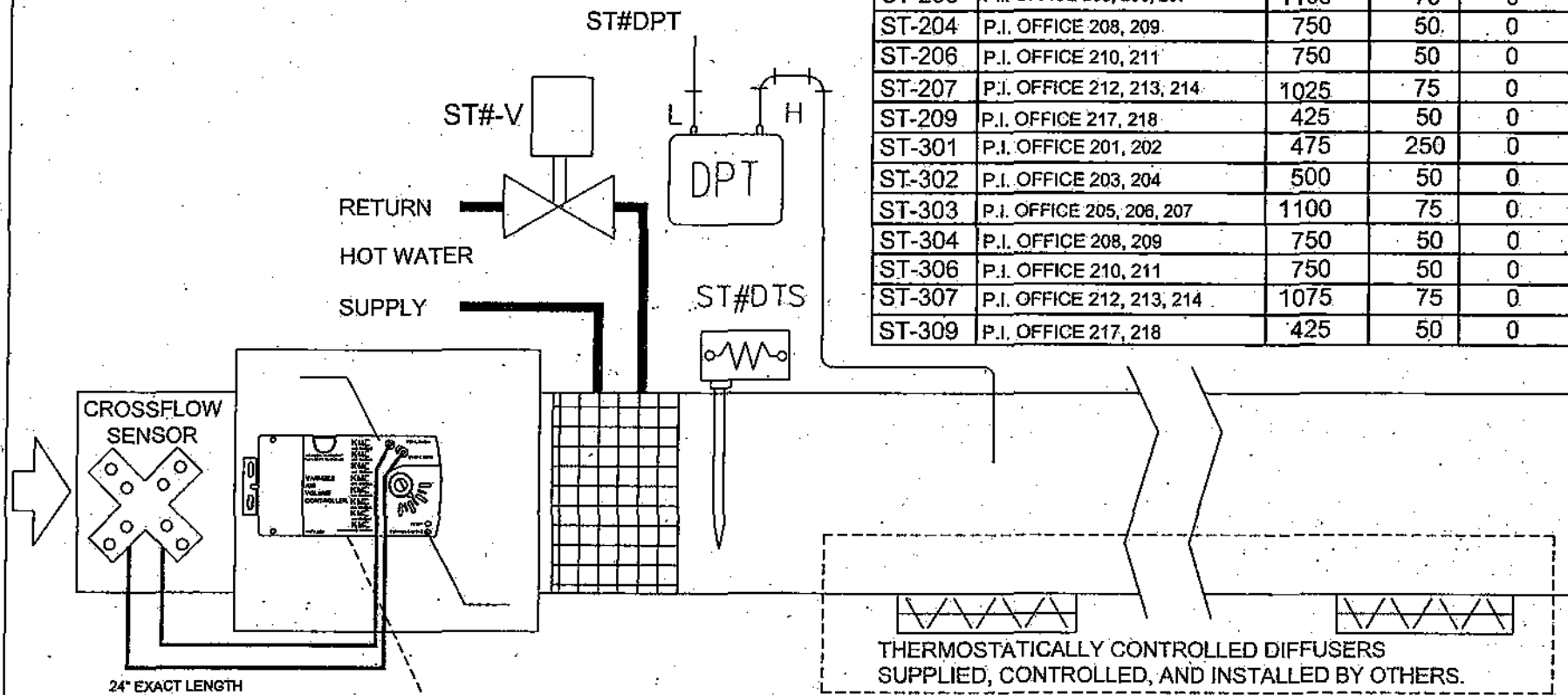
During the "Occupied" mode of operation, the setpoint shall be adjustable by the occupant at the thermostat between a minimum of 68°F and a maximum of 75°F. On a call for cooling, the terminal damper shall be modulated between the cooling minimum and the cooling maximum air flow rates scheduled. On a call for heating, the terminal damper shall be modulated between the heating minimum and the heating maximum air flow rates scheduled. During the "Unoccupied" mode of operation, the heating setpoint shall be 60°F and the cooling setpoint shall be 80°F. On a call for cooling, the terminal damper shall be modulated from Unoccupied flow setpoint to the maximum cooling air flow rate scheduled. On a call for heating, the terminal damper shall be modulated from Unoccupied flow setpoint to the maximum heating air flow rate scheduled.

Drawing Title SUPPLY TERMINAL VARIABLE AIR VOLUME 3-WAY REHEAT VALVE		AS-BUILT MODIFICATION		A	12/17/04	JNS
Reference Drawing NO	Revision NO	ECN	Date	By	Approved	
Filename: ST_VAV_NONLAB_3WAY.DWG	TLL/ GH	BP	JS	By: JS	Date: 6/20/03	By: [Signature]
Project Title ASU BIOSCIENCE & BIOTECHNOLOGY BLDG JONESBORO, AR		Office Information: TL Services, Inc. 4733 Kibler Rd. Van Buren, AR 72956 PH: 479-474-7222 FX: 479-471-7864		Contract Number: 03-C005		Drawing Number: 24

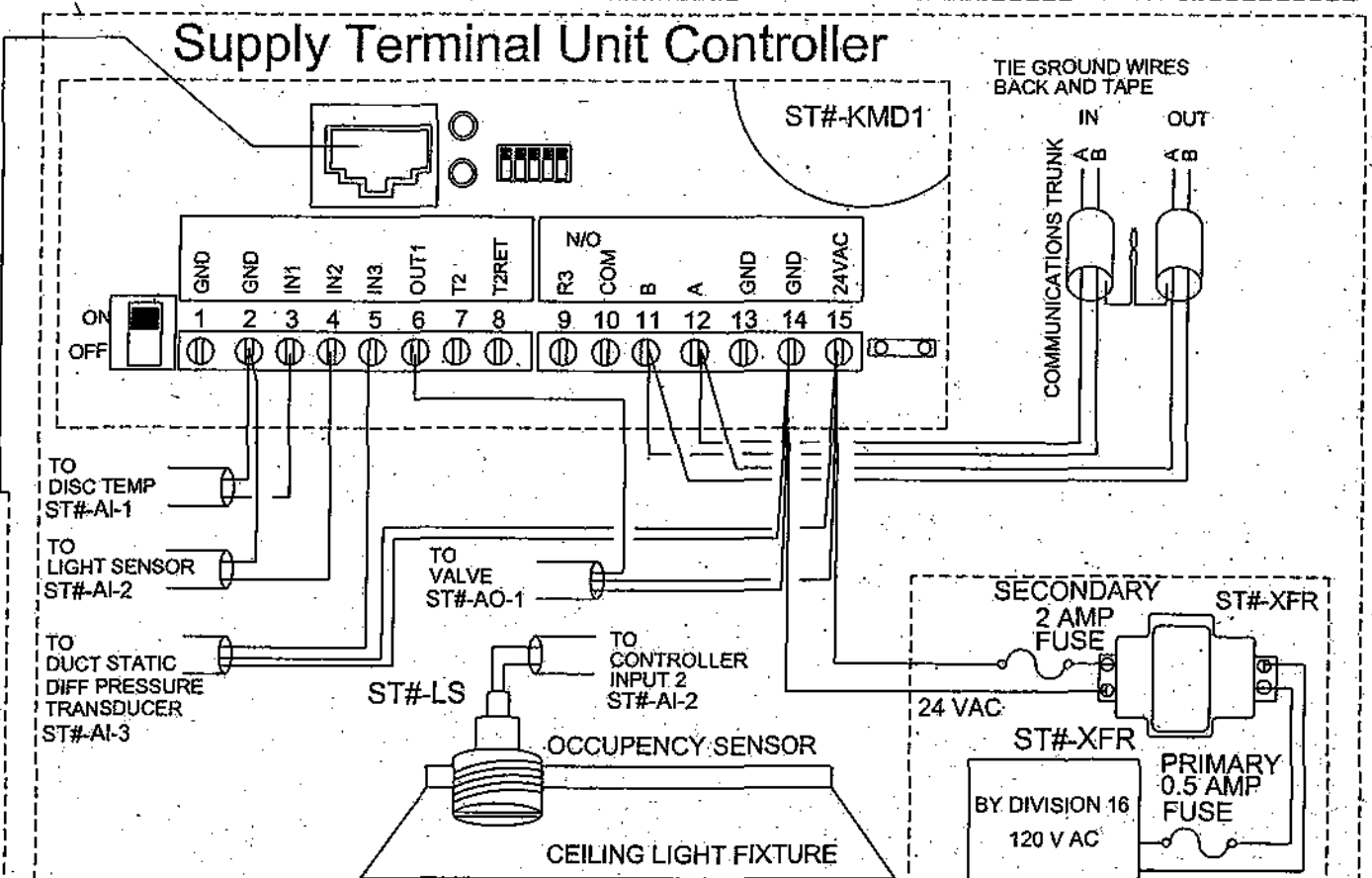
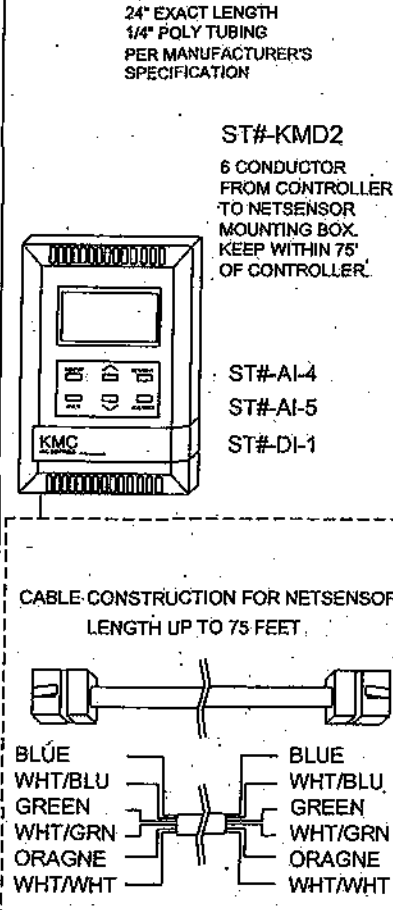
TERMINAL UNITS WITH 2-WAY VALVE REHEAT VARIABLE VOLUME W/VARI-DIFFUSERS

SUPPLY TERMINAL SCHEDULE					
UNIT	AREA	MAX CFM	MIN CFM	UNOCC CFM	
ST-101	ASSOC DIRECTOR 102, 103, 104	1175	600	0	
ST-103	GREENHOUSE MANAGER 105,106	475	250	0	
ST-201	P.I. OFFICE 201, 202	450	50	0	
ST-202	P.I. OFFICE 203, 204	500	50	0	
ST-203	P.I. OFFICE 205, 206, 207	1100	75	0	
ST-204	P.I. OFFICE 208, 209	750	50	0	
ST-206	P.I. OFFICE 210, 211	750	50	0	
ST-207	P.I. OFFICE 212, 213, 214	1025	75	0	
ST-209	P.I. OFFICE 217, 218	425	50	0	
ST-301	P.I. OFFICE 201, 202	475	250	0	
ST-302	P.I. OFFICE 203, 204	500	50	0	
ST-303	P.I. OFFICE 205, 206, 207	1100	75	0	
ST-304	P.I. OFFICE 208, 209	750	50	0	
ST-306	P.I. OFFICE 210, 211	750	50	0	
ST-307	P.I. OFFICE 212, 213, 214	1075	75	0	
ST-309	P.I. OFFICE 217, 218	425	50	0	

BILL OF MATERIALS				
PART ID	QTY	PART #	MFG	DESCRIPTION
ST#-KMD1	16	KMD-7003	KMC	DDC LOCAL CONTROLLER
ST#-KMD2	16	KMD-1151	KMC	ROOM SENSOR/ADJ SETPOINT
ST#DTS	16	STE-1402	KMC	DUCT DISCHARGE TEMP SENSOR
ST#-XFR	16	XEE-6111-040	KMC	40 VA TRANSFORMER; 120/24 V
ST#-LS	16	PSR-1	KELE	PHOTO SENSOR
ST#-V			KMC	SEE VALVE SCHEDULE
ST#DPT	16	TPE-1475-2	KMC	DIFFERENTIAL PRESSURE TRANSDUCER



CONTROLLER 4X4 KMD-7003 SUPPLY AIR TERMINAL UNITS							
INPUTS							
TRM #	#	DEVICE ID	POINT DESCRIPTION	CABLE ID	DETAIL DWG	CABLE #	
3,1	1	ST#DTS	DISCHARGE TEMP	ST#-AI-1	CWDETAIL-2	A-1	
4,1	2	ST#LS	OCC LIGHT SENSOR	ST#-AI-2		A-1	
5,1	3	ST#DPT	DUCT STATIC PRESS	ST#-AI-3	CWDETAIL2-2	A-2	
	4	FLOW SENSOR (APPLICATION DEDICATED INPUT)					
NETSENSOR MAPPED I/O POINTS							
		ST#-KMD2	SPACE TEMPERATURE	ST#-AI-4		C-1	
		ST#-KMD2	SPACE SETPOINT	ST#-AI-5		C-1	
		ST#-KMD2	OVERRIDE	ST#-DI-1		C-1	
OUTPUTS							
TRM #	#	DEVICE ID	POINT DESCRIPTION	CABLE ID	DETAIL DWG	CABLE #	
6,2	1	ST#-VLV	REHEAT VALVE	ST#-AO-1	CWDETAIL-4	A-1	
7,8	2		SPARE I/O				
9,10	3		SPARE I/O				
	4	DAMPER ACTUATOR (APPLICATION DEDICATED OUTPUT)					



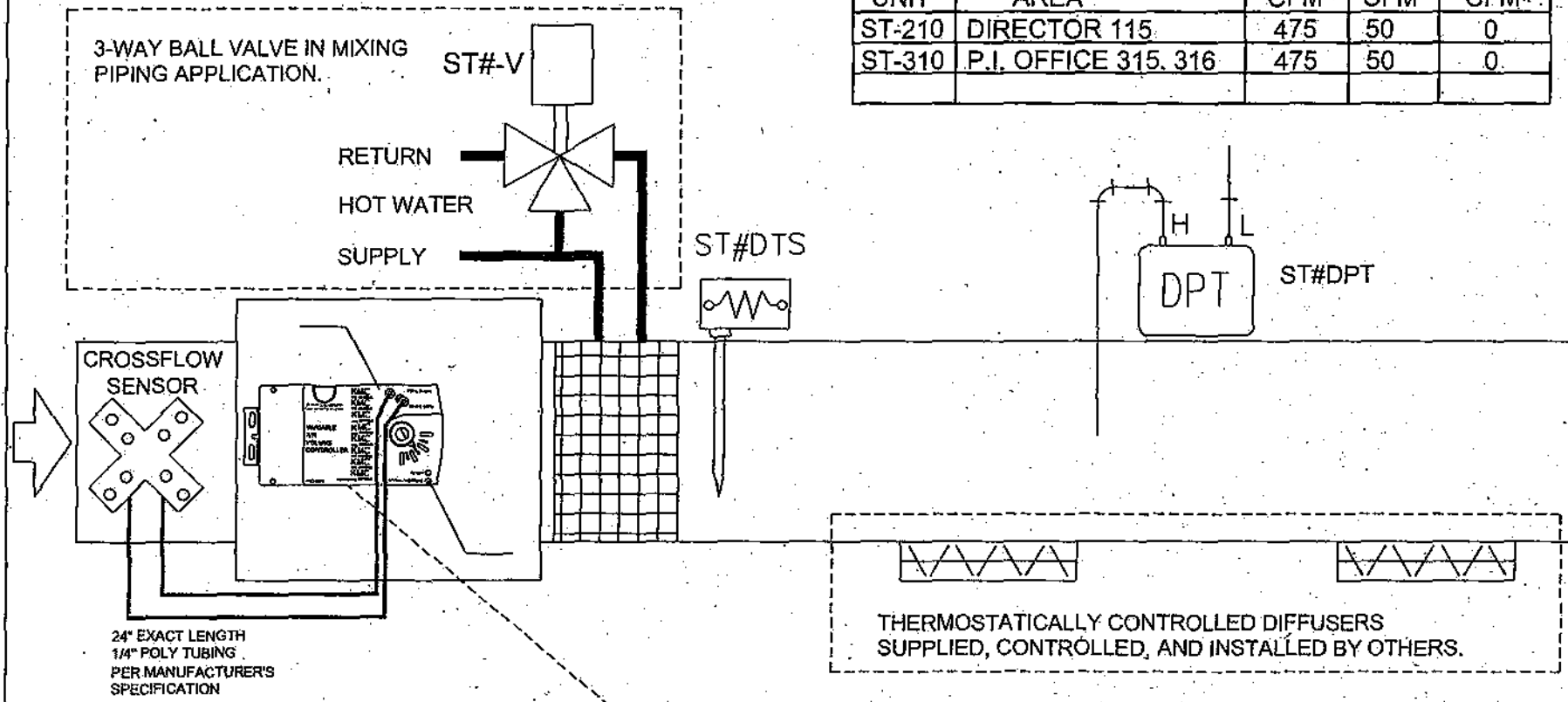
Supply Air Terminal Sequence of Operation:

Air terminal mode of operation is either "Occupied" or "Unoccupied" based upon status of room lighting. ("Occupied" when lights are "ON" and "Unoccupied" when lights are "OFF"). The controller shall sequence the terminal damper between the minimum and maximum air flows scheduled as required to maintain the duct static pressure at setpoint of 0.75" W.G. (adjustable). The controller will modulate the heating water control valve as required to maintain the space temperature at setpoint during the Occupied Mode of operation. The setpoint shall be adjustable by the occupant at the thermostat between a minimum of 68°F and 75°F. During the Unoccupied Mode, the heating setpoint shall be 60°F and the cooling setpoint shall be 80°F. Thermostats furnished with the Thermostatically Controlled Diffusers shall modulate diffusers as required to maintain individual room temperatures at setpoint.

Drawing Title SUPPLY TERMINAL VARIABLE AIR VOLUME 2-WAY REHEAT VALVE WITH VARIABLE DIFFUSERS		ENGINEER COMMENTS & CHANGE ORDER MODIFICATION		A	7/31/03	JS
Sales: Project Manager Applications Engineer		AS-BUILT MODIFICATION		B	12/17/04	JNS
Filename: ST_VAV_2WAY_VOIFF.DWG	TL/ GH	BP	JS	By: JS	Date: 6/20/03	By: Date:
Project Title ASU BIOSCIENCE & BIOTECHNOLOGY BLDG JONESBORO, AR		Office Information: TL Services, Inc. 4733 Kibler Rd. Van Buren, AR 72956 PH: 479-474-7222 FX: 479-471-7064		Contract Number: 03-C005		Drawing Number: 25

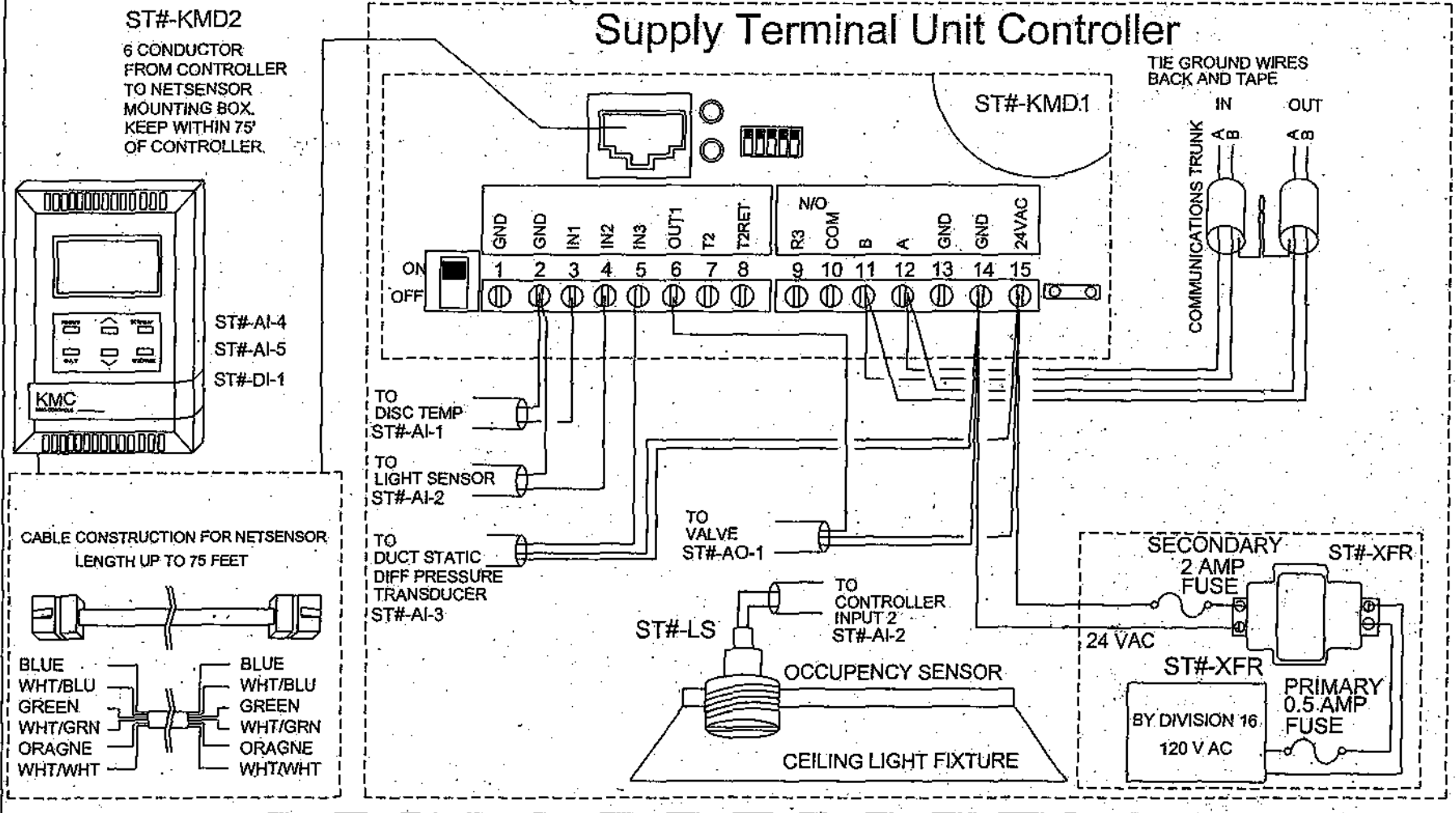
TERMINAL UNITS WITH 3-WAY VALVE REHEAT VARIABLE VOLUME

SUPPLY TERMINAL SCHEDULE				
UNIT	AREA	MAX CFM	MIN CFM	UNOCC CFM
ST-210	DIRECTOR 115	475	50	0
ST-310	P.I. OFFICE 315. 316	475	50	0



BILL OF MATERIALS				
PART ID	QTY	PART #	MFG	DESCRIPTION
ST#-KMD1	2	KMD-7003	KMC	DDC LOCAL CONTROLLER
ST#-KMD2	2	KMD-1151	KMC	ROOM SENSOR/ADJ SETPOINT
ST#DTS	2	STE-1402	KMC	DUCT DISCHARGE TEMP SENSOR
ST#-XFR	2	XEE-6111-040	KMC	40 VA TRANSFORMER; 120/24 V
ST#-LS	2	PSR-1	KELE	PHOTO SENSOR
ST#-V			KMC	SEE VALVE SCHEDULE
ST#DPT	2	TPE-1475-2	KMC	DIFFERENTIAL PRESSURE TRANSDUCER

CONTROLLER 4X4 KMD-7003 SUPPLY AIR TERMINAL UNITS						
INPUTS						
TRM #	#	DEVICE ID	POINT DESCRIPTION	CABLE ID	DETAIL DWG	CABLE TYPE
3,1	1	ST#DTS	DISCHARGE TEMP	ST#-AI-1	CWDETAIL-2	A-1
4,1	2	ST#LS	OCC LIGHT SENSOR	ST#-AI-2		A-1
5,1	3	ST#DPT	DUCT STATIC PRESS	ST#-AI-3	CWDETAIL2-2	A-2
	4		FLOW SENSOR (APPLICATION DEDICATED INPUT)			
NETSENSOR MAPPED I/O POINTS						
		ST#-KMD2	SPACE TEMPERATURE	ST#-AI-4		C-1
		ST#-KMD2	SPACE SETPOINT	ST#-AI-5		C-1
		ST#-KMD2	OVERRIDE	ST#-DI-1		C-1
OUTPUTS						
TRM #	#	DEVICE ID	POINT DESCRIPTION	CABLE ID	DETAIL DWG	CABLE TYPE
6,2	1	ST#-VLV	REHEAT VALVE	ST#-AO-1	CWDETAIL-4	A-1
7,8	2		SPARE I/O			
9,10	3		SPARE I/O			
	4		DAMPER ACTUATOR (APPLICATION DEDICATED OUTPUT)			



Supply Air Terminal Sequence of Operation:

Air terminal mode of operation is either "Occupied" or "Unoccupied" based upon status of room lighting. ("Occupied" when lights are "ON" and "Unoccupied" when lights are "OFF"). The controller shall sequence the terminal damper between the minimum and maximum air flows scheduled as required to maintain the duct static pressure at setpoint of 0.75" W.G. (adjustable). The controller will modulate the heating water control valve as required to maintain the space temperature at setpoint during the Occupied Mode of operation. The setpoint shall be adjustable by the occupant at the thermostat between a minimum of 68°F and 75°F. During the Unoccupied Mode, the heating setpoint shall be 60°F and the cooling setpoint shall be 80°F. Thermostats furnished with the Thermostatically Controlled Diffusers shall modulate diffusers as required to maintain individual room temperatures at setpoint.

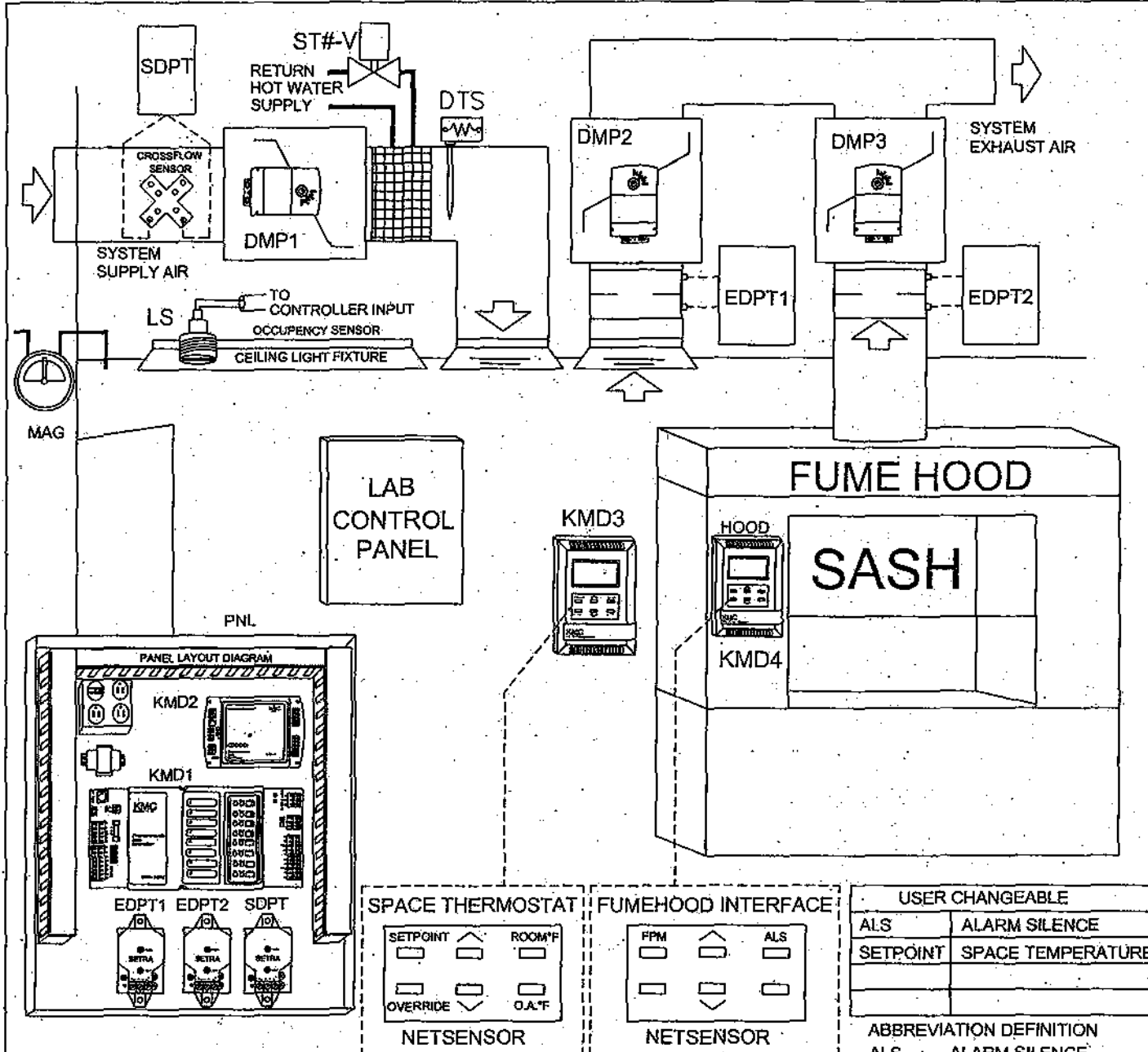
Drawing Title SUPPLY TERMINAL VARIABLE AIR VOLUME 3-WAY REHEAT VALVE WITH VARIABLE DIFFUSERS		ENGINEER COMMENTS & CHANGE ORDER MODIFICATION		A	7/31/03	JS	
Reference Drawing Sales: Project Manager Applications Engineer		AS-BUILT MODIFICATION		B	12/17/04	JNS	
Revision Drawn		EON		Date	By		
By: JS Date: 6/20/03		By: JS Date: 6/20/03		By: JS Date: 6/20/03		By: JS Date: 6/20/03	
Project Title ASU BIOSCIENCE & BIOTECHNOLOGY BLDG JONESBORO, AR		Office Information: TL Services, Inc. 4733 Kibler Rd. Van Buren, AR 72956 PH: 479-474-7222 EV: 479-474-7222		Contract Number: .03-C005		Drawing Number: 26	

TL Services, Inc.

LAB FUMEHOOD
EXHAUST
CONTROL UNIT
SCHEDULE

AREA	SUPPLY TERMINAL					HOOD EXHAUST TERMINAL					HOOD EXHAUST TERMINAL				
	UNIT	MAX CFM	MIN CFM	UNOCC CFM	INLET SIZE Ø"	UNIT	MAX CFM	MIN CFM	UNOCC CFM	INLET SIZE Ø"	UNIT	MAX CFM	MIN CFM	UNOCC CFM	INLET SIZE Ø"
RESEARCH LAB 232	ST-219	950	950	325	10	ET-213	785	200	200	10	ET-214	850	265	225	10
RESEARCH LAB 233	ST-220	975	900	300	10	ET-215	785	200	200	10	ET-216	875	290	200	10
RESEARCH LAB 234	ST-221	975	900	300	10	ET-217	785	200	200	10	ET-218	875	290	200	10
RESEARCH LAB 235	ST-222	875	850	250	10	ET-219	785	200	200	10	ET-220	825	240	200	10
RESEARCH LAB 240	ST-223	875	800	200	10	ET-223	785	200	200	10	ET-224	875	290	200	10
RESEARCH LAB 241	ST-224	900	900	300	10	ET-225	785	200	200	10	ET-226	800	215	200	10
RESEARCH LAB 242	ST-225	900	900	300	10	ET-227	785	200	200	10	ET-228	800	215	200	10
RESEARCH LAB 243	ST-226	900	900	300	10	ET-229	785	200	200	10	ET-230	800	215	200	10
RESEARCH LAB 244	ST-227	900	900	300	10	ET-231	785	200	200	10	ET-232	800	215	200	10
RESEARCH LAB 252	ST-234	950	950	325	10	ET-237	785	200	200	10	ET-238	850	265	225	10
RESEARCH LAB 253	ST-235	900	900	300	10	ET-239	785	200	200	10	ET-240	800	215	200	10
RESEARCH LAB 254	ST-236	900	900	300	10	ET-241	785	200	200	10	ET-242	800	215	200	10
RESEARCH LAB 255	ST-237	1150	800	200	10	ET-243	785	200	200	10	ET-244	1150	565	200	10
RESEARCH LAB 256	ST-238	900	900	300	10	ET-245	785	200	200	10	ET-246	800	215	200	10
RESEARCH LAB 261	ST-239	875	850	250	10	ET-249	785	200	200	10	ET-250	825	240	200	10
RESEARCH LAB 262	ST-240	975	900	300	10	ET-251	785	200	200	10	ET-252	875	290	200	10
RESEARCH LAB 263	ST-241	975	900	300	10	ET-253	785	200	200	10	ET-254	875	290	200	10
RESEARCH LAB 264	ST-242	975	900	300	10	ET-255	785	200	200	10	ET-256	875	215	200	10
RESEARCH LAB 332	ST-319	950	950	325	10	ET-313	785	200	200	10	ET-314	850	265	225	10
RESEARCH LAB 333	ST-320	975	900	300	10	ET-315	785	200	200	10	ET-316	875	290	200	10
RESEARCH LAB 334	ST-321	975	900	300	10	ET-317	785	200	200	10	ET-318	875	290	200	10
RESEARCH LAB 335	ST-322	875	850	250	10	ET-319	785	200	200	10	ET-320	825	240	200	10
RESEARCH LAB 340	ST-323	875	800	200	10	ET-323	785	200	200	10	ET-324	950	365	300	10
RESEARCH LAB 341	ST-324	900	900	300	10	ET-325	785	200	200	10	ET-326	875	290	200	10
RESEARCH LAB 342	ST-325	900	900	300	10	ET-327	785	200	200	10	ET-328	825	240	200	10
RESEARCH LAB 343	ST-326	900	900	300	10	ET-329	785	200	200	10	ET-330	825	240	200	10
RESEARCH LAB 344	ST-327	900	900	300	10	ET-331	785	200	200	10	ET-332	800	215	200	10
RESEARCH LAB 352	ST-334	950	950	325	10	ET-337	785	200	200	10	ET-338	850	265	225	10
RESEARCH LAB 353	ST-335	925	925	300	10	ET-339	785	200	200	10	ET-340	800	215	200	10
RESEARCH LAB 354	ST-336	975	900	300	10	ET-341	785	200	200	10	ET-342	800	215	200	10
RESEARCH LAB 355	ST-337	1225	900	300	12	ET-343	785	200	200	10	ET-344	900	315	200	10
RESEARCH LAB 356	ST-338	900	900	300	10	ET-345	785	200	200	10	ET-346	800	215	200	10
RESEARCH LAB 361	ST-339	950	900	300	10	ET-349	785	200	200	10	ET-350	825	215	200	10
RESEARCH LAB 362	ST-340	1000	900	300	10	ET-351	785	200	200	10	ET-352	875	215	200	10
RESEARCH LAB 363	ST-341	950	900	300	10	ET-353	785	200	200	10	ET-354	875	215	200	10
RESEARCH LAB 364	ST-342	975	900	300	10	ET-355	785	200	200	10	ET-356	875	215	200	10

Drawing Title		LAB EXHAUST/SUPPLY & FUMEHOOD CONTROL UNIT SCHEDULES		ENGINEER COMMENTS & CHANGE ORDER MODIFICATION		A	7/31/03	JS
Reference Drawing		NO		AS-BUILT MODIFICATION		B	12/17/14	JNS
Filename:	LAB_CONTROL_SCHEDULE.DWG	Sales:	RH / GH	Project Manager:	BP	Applications Engineer:	JS	By: JS Date: 5/23/03
Project Title:	ASU BIOSCIENCE & BIOTECHNOLOGY BLDG JONESBORO, AR	Office Information:		TL Services, Inc.		Contract Number:		03-C005
				4733 Kibler Rd. Van Buren, AR 72956 PH: 479-474-7222 FX: 479-471-7964		Drawing Number:		27



LAB FUMEHOOD EXHAUST CONTROL

SEQUENCE OF OPERATION:
 Mode of Operation - Laboratory mode of operation shall be either "Occupied" or "Unoccupied" based upon the status of the room lights as indicated by light sensor. (Occupied mode when lights are on, and Unoccupied mode when lights are off.)

Fume Hood Exhaust Terminal - Fume hood exhaust terminal damper shall be modulated by fumehood Controller as required to maintain the fumehood face velocity at setpoint. Setpoint shall be 100 ft/min during Occupied Mode and 60 ft/min during Unoccupied Mode.

Room Exhaust Terminal - Room Exhaust terminal damper shall be modulated by the laboratory controller as required to maintain the total laboratory exhaust air flow at setpoint. During Occupied periods, the total exhaust air flow setpoint shall be 10 air changes per hour (adjustable up to 15 air changes per hour). During Unoccupied periods, the setpoint shall be 4 air changes per hour.

Supply Air Terminal - Supply air terminal damper shall be modulated between the minimum and maximum air flows scheduled by the laboratory controller as required to maintain the supply air flow at setpoint. Supply air flow setpoint shall be equal to the total laboratory exhaust air flow adjusted by the offset (100 CFM Negative Bias). Heating water control valve shall be modulated by the DDC Panel output as required to maintain the space temperature at thermostat setpoint. During Occupied periods, the setpoint shall be adjustable by the user from a minimum of 68°F to a maximum of 75°F. During Unoccupied periods, the heating setpoint shall be 60°F and the cooling setpoint shall be 80°F.

BILL OF MATERIALS:				
DEVICE ID	QTY	PART NUMBER	MFG	DESCRIPTION
DTS	35	STE-1402	KMC	Duct Discharge Temp Sensor
LS	35	PSR-1	KELE	PHOTO SENSOR
SDPT	105	2651R25WDABT1C	SETRA	Differential Pressure Sensor, 0-0.25"W.C.
EDPT1,2	105	BBMFF2000.NA	NEBTRONIC	Fast Acting Damper Actuator
PNL	35	HCO-1035	KMC	Enclosure 20"x24"x6", NEMA 1
KMD1	35	KMD-5802	KMC	DDC Controller
	70	HPO-6702	KMC	DDC Relay Module; Analog 0-10 VDC
	35	HPO-6703	KMC	DDC Relay Module; N/O Dry Contact
	35	HPO-6802	KMC	DDC Relay Module Cover
KMD2	35	KMD-7301	KMC	DDC AHU Controller
KMD3	35	KMD-1151	KMC	DDC Space Thermostat "Netsensor"
KMD4	35	KMD-1151	KMC	DDC "Netsensor" Fumehood Interface
MAG	35	2300-0	DWYER	Magnehelic, -0.25-0-0.25 "WC
XFR1,2	35	XEE-6211-050	KMC	40 VA Transformer, 120/24V

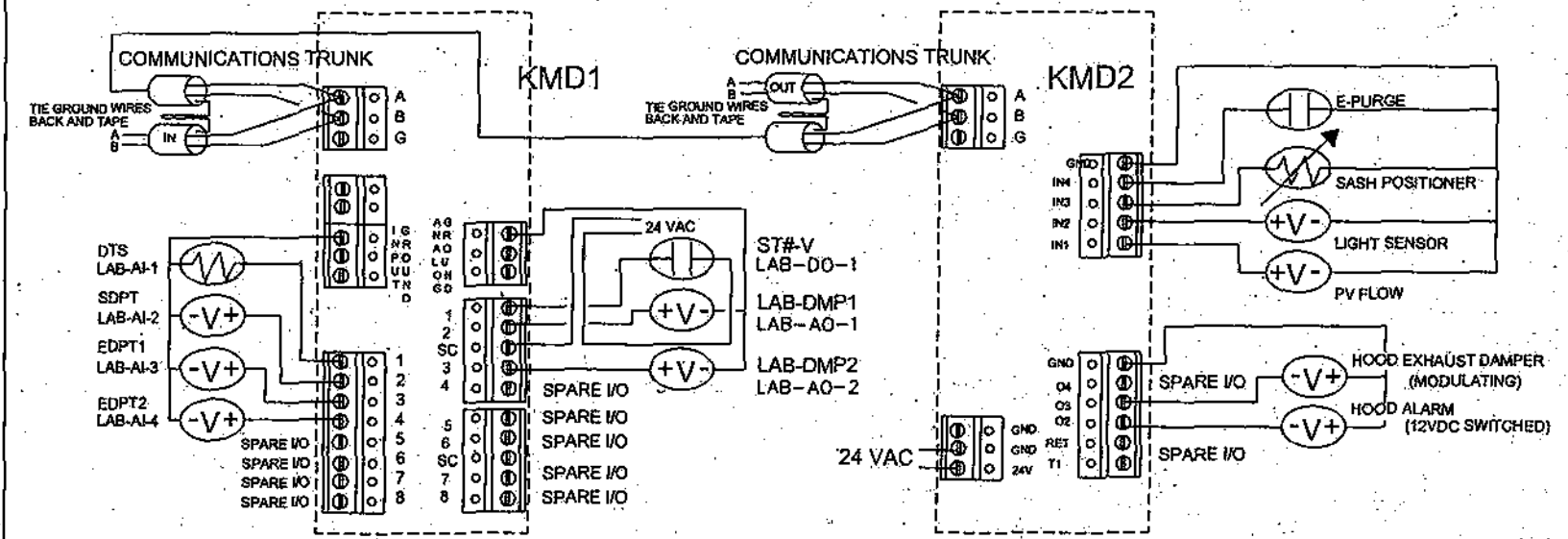
CONTROLLER		8X8		KMD-5802			
INPUTS							
TRM #	#	DEVICE ID	POINT DESCRIPTION	CABLE ID	DETAIL DWG	CABLE TYPE	CABLE #
1,GND	1	DTS	ST DISCHARGE AIR TMP	LAB-AI-1	CWDETAIL-2	A-1	1
2,GND	2	SDPT	ST AIR FLOW	LAB-AI-2	CWDETAIL-2-2	A-2	2
3,GND	3	EDPT1	EX AIR FLOW	LAB-AI-3	CWDETAIL-2-2	A-2	3
4,GND	4	EDPT2	HOOD AIR FLOW	LAB-AI-4	CWDETAIL-2-2	A-2	4
5,GND	5						
6,GND	6		SPARE I/O				
7,GND	7		SPARE I/O				
8,GND	8		SPARE I/O				
NETSENSOR MAPPED I/O POINTS							
		KMD3	SPACE TEMPERATURE	LAB-AI-5	CWDETAIL-2-8	C-1	5
		KMD3	SPACE SETPOINT	LAB-AI-6	CWDETAIL-2-8	C-1	5
		KMD3	OVERRIDE	LAB-DI-1	CWDETAIL-2-8	C-1	5

OUTPUTS							
TRM #	#	DEVICE ID	POINT DESCRIPTION	CABLE ID	DETAIL DWG	CABLE TYPE	CABLE #
1, SC1	1	DMP1	SUP TERM DAMPER	LAB-AO-1	CWDETAIL-4	A-2	6
2, GND	2	ST#-V	REHEAT VALVE	LAB-DO-1	CWDETAIL-3-8	A-1	7
3, GND	3	DMP2	EX TERM DAMPER	LAB-AO-2	CWDETAIL-4	A-2	8
	4		SPARE I/O				
	5		SPARE I/O				
	6		SPARE I/O				
	7		SPARE I/O				
	8		SPARE I/O				

CONTROLLER		4X4		KMD-7301			
INPUTS							
TRM #	#	DEVICE ID	POINT DESCRIPTION	CABLE ID	DETAIL DWG	CABLE TYPE	CABLE #
1,GND	1	PV	PV FLOW	LAB-AI-7	CWDETAIL-3-8	A-1	9
2,GND	2	LS	LIGHT SENSOR	LAB-AI-8	CWDETAIL-3-8	A-1	10
3,GND	3	SP	SASH POSITION	LAB-AI-9	CWDETAIL-3-8	A-1	11
4,GND	4		E-PURGE	LAB-DI-2			12
NETSENSOR MAPPED I/O POINTS							
		KMD4	FACE VELOCITY FPM	LAB-AI-10	CWDETAIL-2-8	C-1	13
		KMD4	ALARM SILENCE	LAB-DI-3	CWDETAIL-2-8	C-1	13

OUTPUTS							
TRM #	#	DEVICE ID	POINT DESCRIPTION	CABLE ID	DETAIL DWG	CABLE TYPE	CABLE #
1, SC1	1		SPARE I/O				
2, GND	2	DMP3	FUME HOOD DAMPER	LAB-AO-3	CWDETAIL-4	A-2	14
3, GND	3	DMP2	HOOD ALARM	LAB-DO-2	CWDETAIL-3-8	A-1	15
	4		SPARE I/O				

TERMINAL BLOCK WIRING DIAGRAMS



Drawing Title
LAB EXHAUST/SUPPLY & FUMEHOOD CONTROL

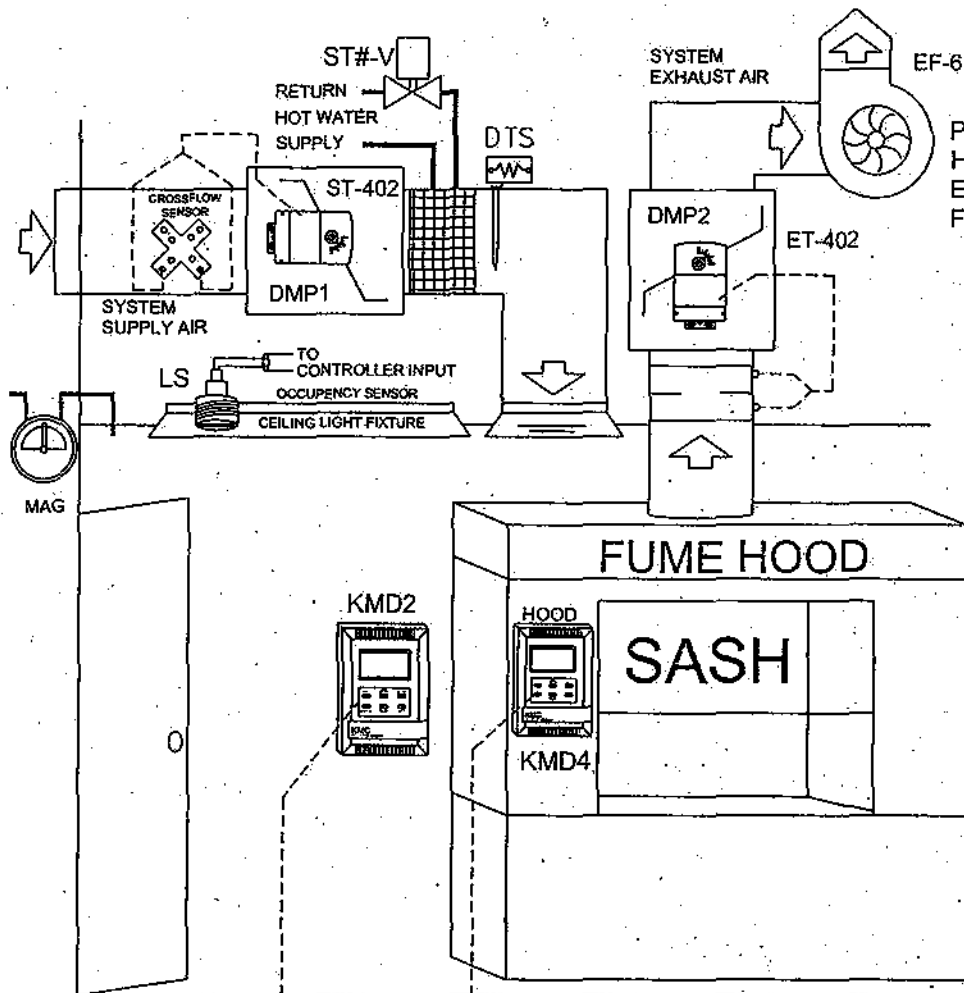
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Project Title
 ASU
 BIOSCIENCE &
 BIOTECHNOLOGY BLDG
 JONESBORO, AR

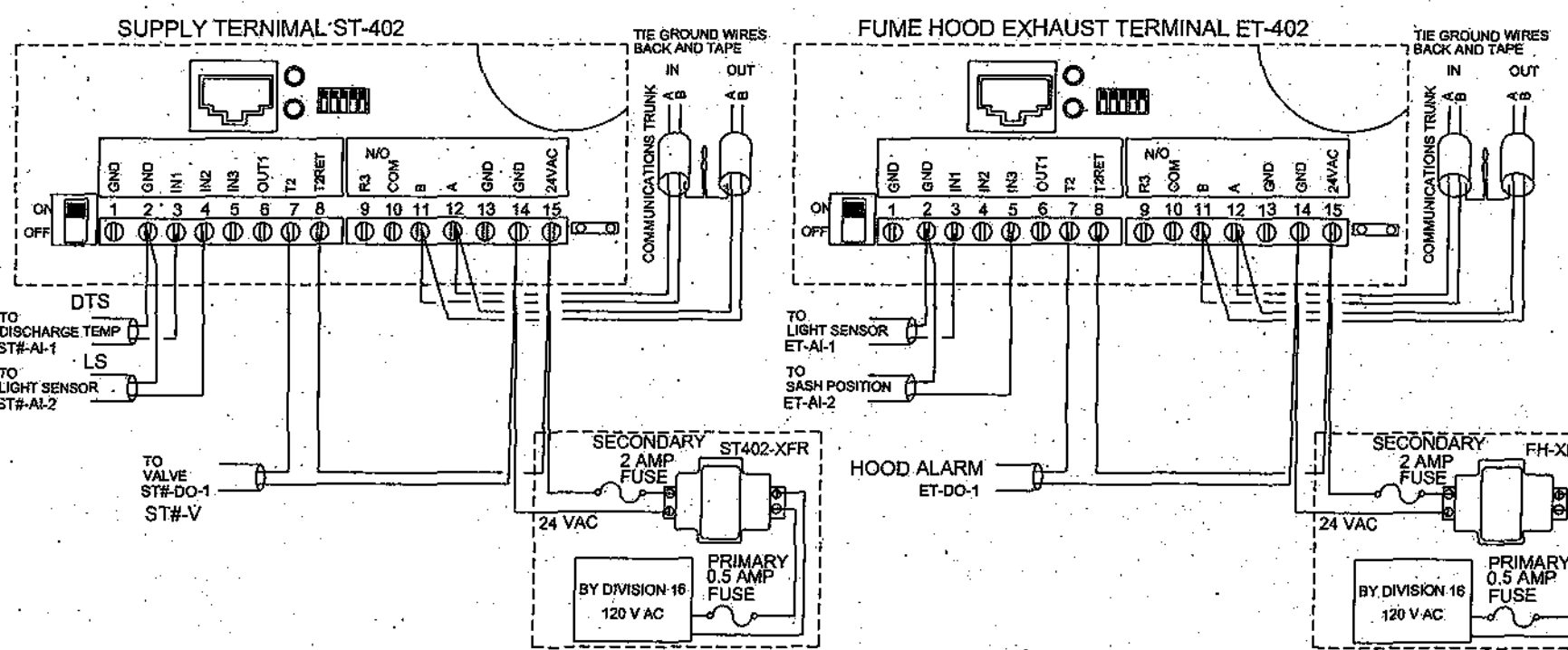
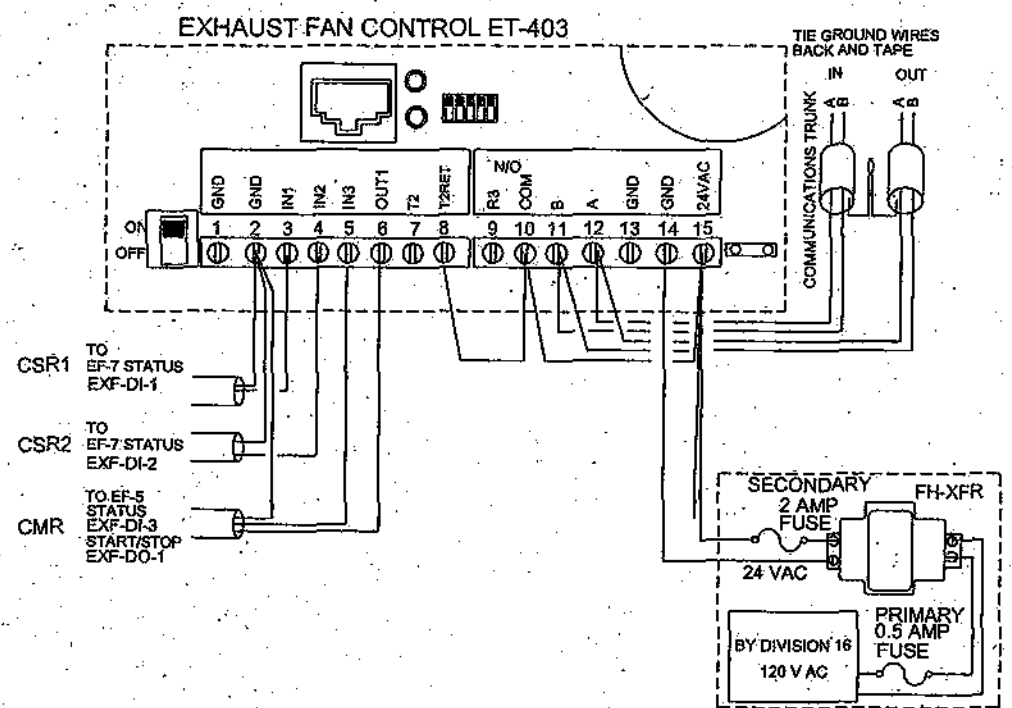
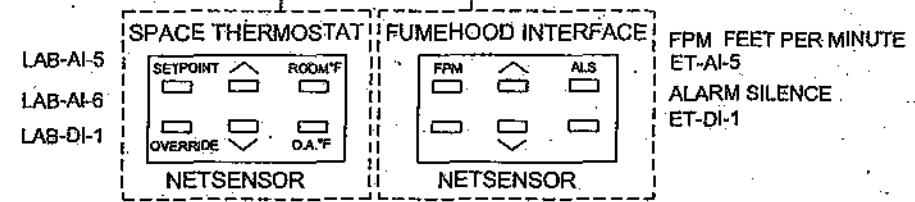
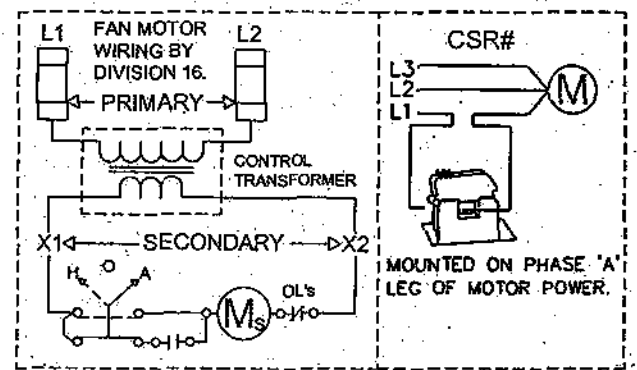
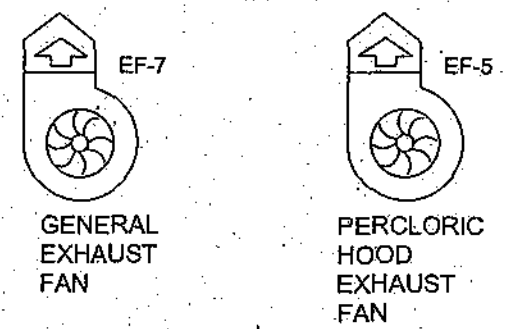
ENGINEER COMMENTS & CHANGE ORDER MODIFICATION		A	7/31/03	JS
AS-BUILT MODIFICATION		B	10/11/14	JNS
Reference Drawing	NO	Revision	EON	Date
Sales: TLL/GH	Project Manager: BP	Applications Engineer: JS	Drawn: JS	Approved: JS
By: JS		Date: 6/20/03	By: JS	
Office Information: TL Services, Inc. 4733 Kibler Rd. Van Buren, AR 72956 PH: 479-474-7222 FX: 479-471-7964		Contract Number: 03-C005		
Drawing Number: 28				

4TH FLOOR PESTICIDE PREP LAB FUMEHOOD EXHAUST CONTROL

BILL OF MATERIALS:				
DEVICE ID	QTY	PART NUMBER	MFG	DESCRIPTION
DTS	1	STE-1402	KMC	Duct Discharge Temp Sensor
LS	1	PSR-1	KELE	PHOTO SENSOR
KMD1,2,3	1	KMD-7003	KMC	DDC Controller Application Specific VAV
KMD4,5	2	KMD-1151	KMC	DDC Thermostat "Netsensor"
XFR1,2,3	3	XEE-6111-040	KMC	40 VA Transformer, 120/24V
REE	1	REE-3112	KMC	12VDC SPDT Relay
CSR#	2	H900	VERIS	Current Transducer Switch
CMR	1	H950	VERIS	Current Transducer Switch with Start/Stop Command Relay



EF-6 & EF7
RUN
CONTINUOUSLY



AREA	SUPPLY TERMINAL			HOOD EXHAUST TERMINAL				
	UNIT	MAX CFM	MIN CFM	UNOCC CFM	UNIT	MAX CFM	MIN CFM	UNOCC CFM
PESTICIDE PREP 405,405A,405B	ST-402	1300	650	100	ET-402	785	350	200

Drawing Title: LAB EXHAUST/SUPPLY & FUMEHOOD CONTROL 4TH FLOOR PESTICIDE PREP

Project Title: ASU BIOSCIENCE & BIOTECHNOLOGY BLDG JONESBORO, AR

Reference Drawing: NO

Revision: ECV

Date: 7/31/03

By: JS

Checked: JNS

Date: 12/17/04

By: JS

Date: 6/20/03

By: JS

Date: 8/20/03

By: JS

Date: 8/20/03

Contract Number: 03-C005

Drawing Number: 29

Office Information: TL Services, Inc. 4733 Kibler Rd. Van Buren, AR 72956 PH: 478-474-7222 FX: 478-474-7084

CONTROLLER		4X4	KMD-7053	SUPPLY AIR TERMINAL UNITS		M2A6 ST-402	
INPUTS							
TRM #	#	DEVICE ID	POINT DESCRIPTION	CABLE ID	DETAIL DWG	CABLE TYPE	CABLE #
3,1	1	DTS	SPACE TEMP	ST#-AI-1		A-1	
4,1	2	LS	OCC LIGHT SENSOR	ST#-AI-2		A-1	
5,1	3		SPARE I/O				
	4	FLOW SENSOR (APPLICAITON DEDICATED INPUT)					
NETSENSOR MAPPED I/O POINTS							
		LAB-KMD2	SPACE TEMPERATURE	LAB-AI-5	CWDETAIL2-8	C-1	
		LAB-KMD2	SPACE SETPOINT	LAB-AI-6	CWDETAIL2-8	C-1	
		LAB-KMD2	OVERRIDE	LAB-DI-1	CWDETAIL2-8	C-1	
OUTPUTS							
TRM #	#	DEVICE ID	POINT DESCRIPTION	CABLE ID	DETAIL DWG	CABLE TYPE	CABLE #
6,2	1		SPARE I/O				
7,8	2	ST#-V	REHEAT VALVE	ST#-DO-1		A-1	
9,10	3		SPARE I/O				
	4	DAMPER ACTUATOR (APPLICAITON DEDICATED OUTPUT)					

CONTROLLER		4X4	KMD-7053	FUME HOOD CONTROL		M2A14 ET-402	
INPUTS							
TRM #	#	DEVICE ID	POINT DESCRIPTION	CABLE ID	DETAIL DWG	CABLE TYPE	CABLE #
3,1	1		LIGHT SENSOR	FH-AI-1		A-1	
4,1	2		SPARE I/O				
5,1	3		SASH POSITION	FH-AI-2		A-1	
	4	FLOW SENSOR (APPLICAITON DEDICATED INPUT)					
NETSENSOR MAPPED I/O POINTS							
		LAB-KMD5	FPM FEET PER MINUTE	FH-AI-5	CWDETAIL2-8	C-1	
		LAB-KMD5	ALARM SILENCE	FH-DI-1	CWDETAIL2-8	C-1	
OUTPUTS							
TRM #	#	DEVICE ID	POINT DESCRIPTION	CABLE ID	DETAIL DWG	CABLE TYPE	CABLE #
6,2	1		HOOD ALARM	FH-DO-1		A-1	
7,8	2		SPARE I/O				
9,10	3		SPARE I/O				
	4	DAMPER ACTUATOR (APPLICAITON DEDICATED OUTPUT)					

CONTROLLER		4X4	KMD-7001	EXHAUST FAN CONTROL		M2A8 ET-403	
INPUTS							
TRM #	#	DEVICE ID	POINT DESCRIPTION	CABLE ID	DETAIL DWG	CABLE TYPE	CABLE #
3,1	1	CSR1	EX FAN 6 STATUS	EF6-DI-1	CWDETAIL-1	A-1	
4,1	2	CSR2	EX FAN 7 STATUS	EF7-DI-2	CWDETAIL-1	A-1	
5,1	3	CMR	EX FAN 5 STATUS	EF5-DI-3	CWDETAIL-1	A-1	
	4	FLOW SENSOR (APPLICAITON DEDICATED INPUT)					
NETSENSOR MAPPED I/O POINTS							
			NOT USED				
			NOT USED				
			NOT USED				
OUTPUTS							
TRM #	#	DEVICE ID	POINT DESCRIPTION	CABLE ID	DETAIL DWG	CABLE TYPE	CABLE #
6,2	1	CMR	EX FAN 5 START/STOP	EF5-DO-1	CWDETAIL-1	A-1	
7,8	2		SPARE I/O			A-1	
9,10	3		SPARE I/O			A-1	
	4	DAMPER ACTUATOR (APPLICAITON DEDICATED OUTPUT)					

SEQUENCE OF OPERATION:

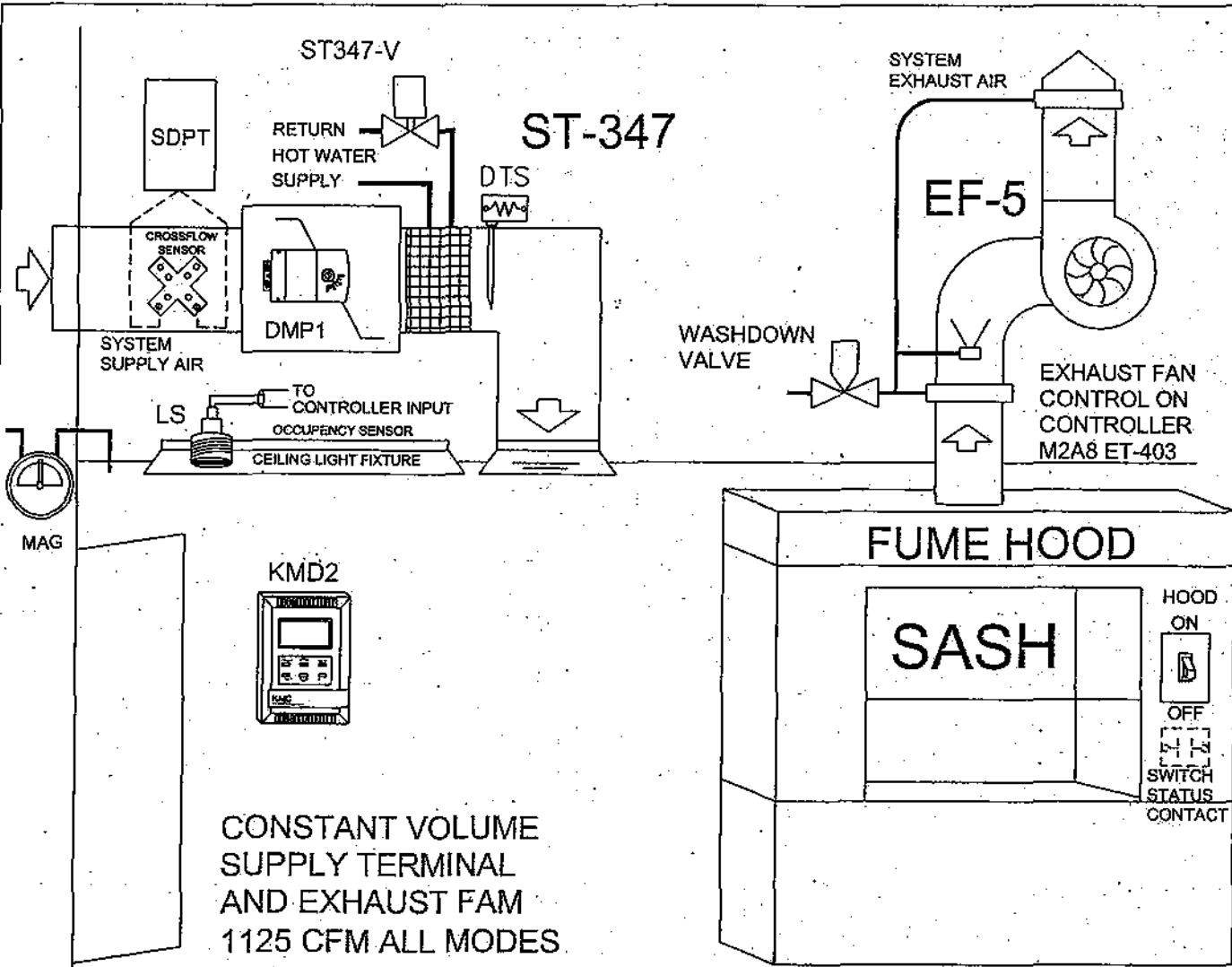
Mode of Operation - Laboratory mode of operation shall be either "Occupied" or "Unoccupied" based upon the status of the room lights as indicated by light sensor. (Occupied mode when lights are on, and Unoccupied mode when lights are off.)

Fume Hood Exhaust Terminal - Fume hood exhaust terminal damper shall be modulated by fumehood Controller as required to maintain the fumehood face velocity at setpoint. Setpoint shall be 100 ft/min during Occupied Mode and 60 ft/min during Unoccupied Mode.

Supply Air Terminal - Supply air terminal damper shall be modulated between the minimum and maximum air flows scheduled by the laboratory controller as required to maintain the supply air flow at setpoint. Supply air flow setpoint shall be equal to the total laboratory exhaust air flow adjusted by the offset (100 CFM Negative Bias). Heating water control valve shall be modulated by the DDC Panel output as required to maintain the space temperature at thermostat setpoint. During Occupied periods, the setpoint shall be adjustable by the user from a minimum of 68°F to a maximum of 75°F. During Unoccupied periods, the heating setpoint shall be 60°F and the cooling setpoint shall be 80°F.

AREA	SUPPLY TERMINAL				HOOD EXHAUST TERMINAL			
	UNIT	MAX CFM	MIN CFM	UNOCC CFM	UNIT	MAX CFM	MIN CFM	UNOCC CFM
PESTICIDE PREP 405,405A,405B	ST-402	1300	650	100	ET-402	785	350	200

Drawing Title LAB EXHAUST/SUPPLY & FUMEHOOD CONTROL 4TH FLOOR PESTICIDE PREP POINT LIST		ENGINEER COMMENTS & CHANGE ORDER MODIFICATION		A	7/31/03	JS
		AS-BUILT MODIFICATION		B	12/17/04	JNS
Reference Drawing		NO		Revision		ECN
Sole: Project Manager		Applications Engineer		Drawn		Approved
Filename: LAB_CONTROL_Pesticide_POINTLIST.DWG	TLL/ GH	BP	JS	By: JS	Date: 6/20/03	By: Date:
Project Title ASU BIOSCIENCE & BIOTECHNOLOGY BLDG JONESBORO, AR		Office Information: TL Services, Inc. 4733 Kibler Rd. Van Buren, AR 72956 PH: 479-474-7222 FX: 479-471-7964		Contract Number: 03-C005		Drawing Number: 30



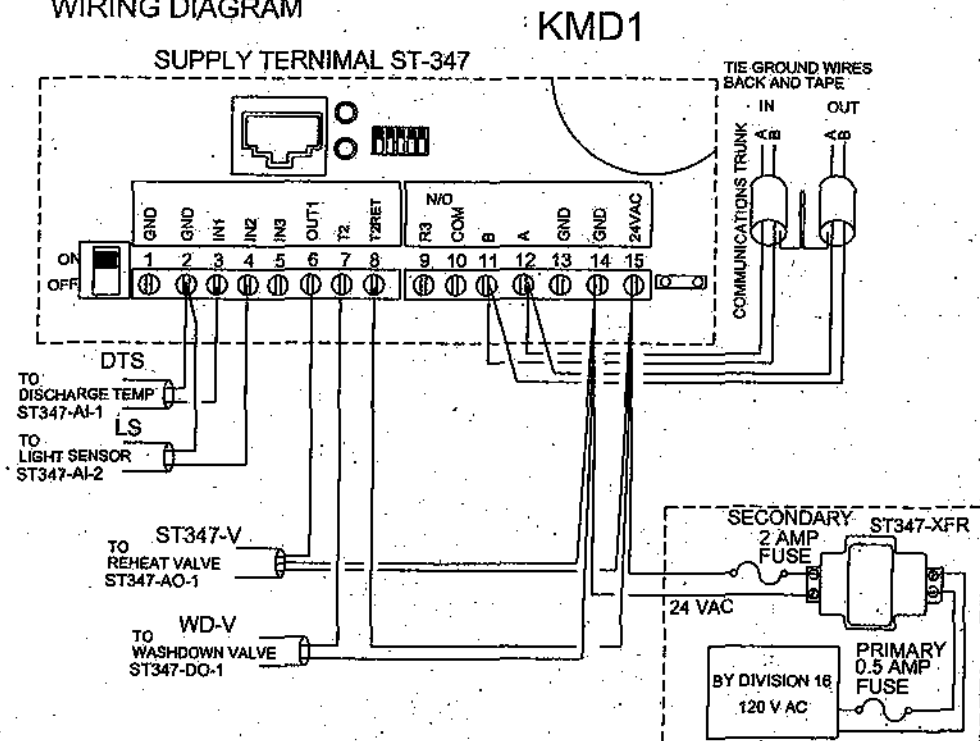
PERCHLORIC ACID LAB FUMEHOOD EXHAUST CONTROL

SUPPLY TERMINAL SCHEDULE		
UNIT	AREA	CFM
ST-347	PERCHLORIC ACID LAB	1125

BILL OF MATERIALS:				
DEVICE ID	QTY	PART NUMBER	MFG.	DESCRIPTION
DTS	1	STE-1402	KMC	Duct Discharge Temp Sensor
LS	1	PSR-1	KELE	PHOTO SENSOR
KMD1	1	KMD-7003	KMC	DDC Controller
KMD2	1	KMD-1151	KMC	DDC Thermostat "Netsensor"
XFR1	1	XEE-6111-040	KMC	40 VA Transformer, 120/24V
MAG	1	2300-0	DWYER	Magnehelic, -0.25-0-0.25 "WC
WD-V	1	2300-0	DWYER	Washdown Valve
	1	2300-0	DWYER	& 24 VAC Solenoid Operator

CONTROLLER 4X4 KMD-7053 SUPPLY AIR TERMINAL UNITS						
INPUTS						
TRM #	#	DEVICE ID	POINT DESCRIPTION	CABLE ID	DETAIL DWG	CABLE TYPE
3,1	1	DTS	DISCHARGE TEMP	ST347-AI-1		A-1
4,1	2	LS	OCC. LIGHT SENSOR	ST347-AI-2		A-1
5,1	3	LS	PERCHLORIC HOOD SWITCH	ST347-DI-1		A-1
	4		FLOW SENSOR (APPLICATION DEDICATED INPUT)			
NETSENSOR MAPPED I/O POINTS						
		LAB-KMD2	SPACE TEMPERATURE	LAB-AI-5	CWDETAIL2-8	C-1
		LAB-KMD2	SPACE SETPOINT	LAB-AI-6	CWDETAIL2-8	C-1
		LAB-KMD2	OVERRIDE	LAB-DI-2	CWDETAIL2-8	C-1
OUTPUTS						
TRM #	#	DEVICE ID	POINT DESCRIPTION	CABLE ID	DETAIL DWG	CABLE TYPE
6,2	1	ST347-V	REHEAT VALVE	ST347-AO-1		A-2
7,8	2	WD-V	WASHDOWN SOLENOID VALVE	ST347-DO-1		A-1
8,10	3		SPARE I/O			
	4		DAMPER ACTUATOR (APPLICATION DEDICATED OUTPUT)			

TERMINAL BLOCK
WIRING DIAGRAM



SEQUENCE OF OPERATION:

Mode of Operation - Laboratory mode of operation shall be either "Occupied" or "Unoccupied" based upon the status of the room lights as indicated by light sensor. (Occupied mode when lights are on, and Unoccupied mode when lights are off.)

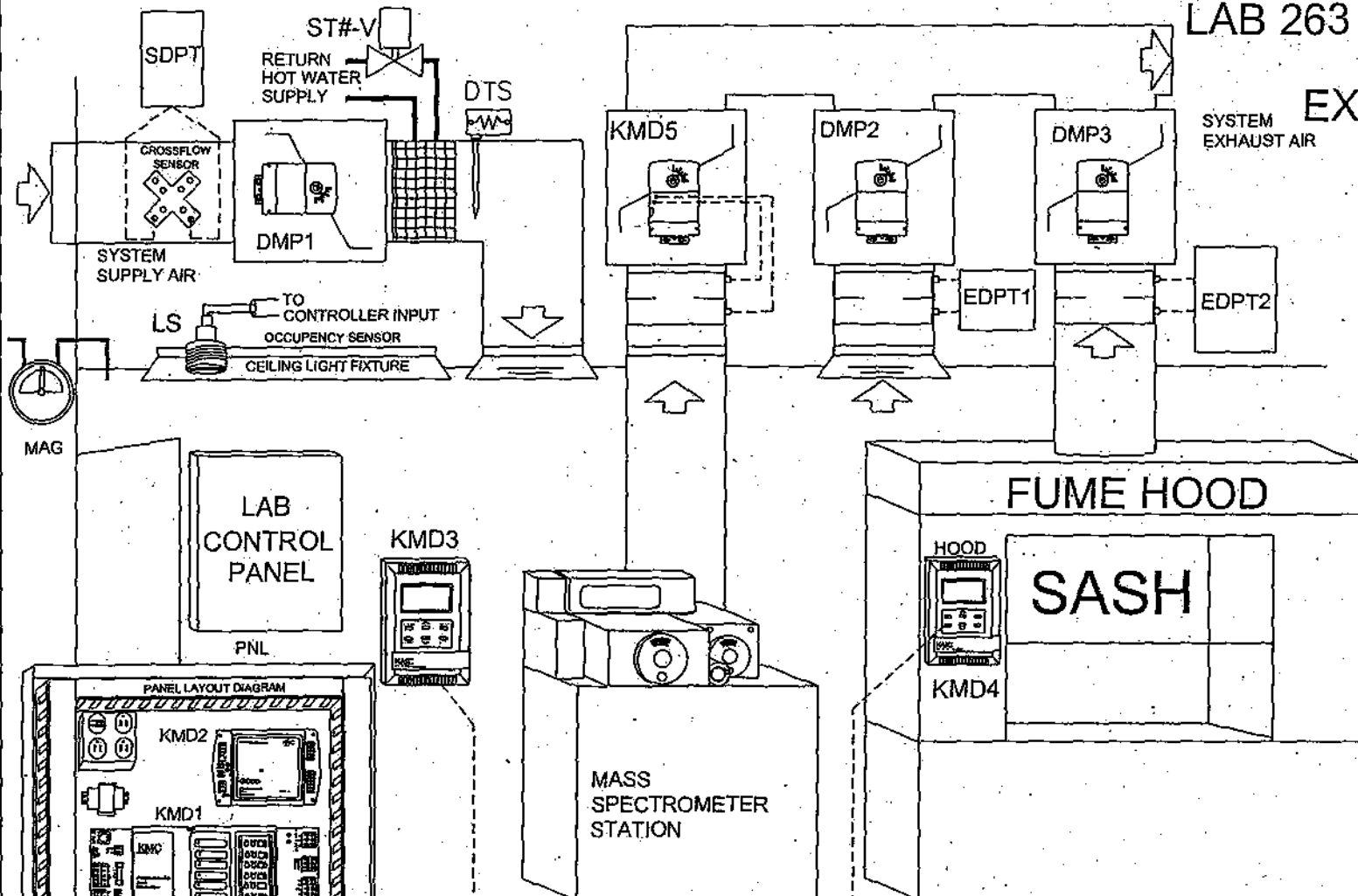
Fume Hood Exhaust - Upon the Fume Hood "ON/OFF" switch being switched to "ON", the exhaust fan (EF-5) shall be signaled to start. Exhaust fan shall be signaled to stop when the switch for the hood is switched to the "OFF" position.

Supply Air Terminal - Supply air terminal damper shall be modulated between the minimum and maximum air-flows scheduled by the laboratory controller as required to maintain the supply air flow at setpoint. Supply air flow setpoint shall be equal to the total laboratory exhaust air flow adjusted by the offset (100 CFM Negative Bias). Heating water control valve shall be modulated by the DDC Panel output as required to maintain the space temperature at thermostat setpoint. During Occupied periods, the setpoint shall be adjustable by the user from a minimum of 68°F to a maximum of 75°F. During Unoccupied periods, the heating setpoint shall be 60°F and the cooling setpoint shall be 80°F.

Washdown Cycle - Upon the "OFF" signal from the fume hood switch, a 2 minute (adjustable) time delay shall start. After the 2 minute delay, the wash down valve solenoid shall be opened. Wash down cycle shall last for 5 minutes (adjustable). After the 5 minute timer elapses, the wash down valve solenoid shall close the valve. The wash down cycle shall be performed after each use.

Drawing Title: LAB EXHAUST/SUPPLY & FUMEHOOD CONTROL 3TH FLOOR MISC. SUPPORT 359 PERCHLORIC ACID EF-5		ENGINEER COMMENTS & CHANGE ORDER MODIFICATION		A	7/31/03	JS
Reference Drawing: NO		Revision		ECN	Date	By
Notes: Project Manager Applications Engineer		Drawn		Approved		
Filename: LAB_CONTROL_Perchloric.DWG		By: JS		Date: 6/20/03		By:
Project Title: ASU BIOSCIENCE & BIOTECHNOLOGY BLDG JONESBORO, AR		Office Information: TL Services, Inc. 4733 Kibler Rd. Van Buren, AR 72956 PH: 479-474-7222 FX: 479-474-7054		Contract Number: 03-C005 Drawing Number: 31		

LAB 263 MASS SPECTROMETER FUMEHOOD EXHAUST CONTROL



BILL OF MATERIALS:				
DEVICE ID	QTY	PART NUMBER	MFG	DESCRIPTION
DTS	1	STE-1402	KMC	Duct Discharge Temp Sensor
LS	1	PSR-1	KELE	PHOTO SENSOR
SDPT	3	2651R25WDABTTC	SETRA	Differential Pressure Sensor 0-0.25"W.C.
DMP1,2,3	3	BBMFF2000 NA	NEBTRONIC	Fast Acting Damper Actuator
PNL	1	HCC-1035	KMC	Enclosure 20"X24"X6", NEMA 1
KMD1	1	KMD-5802	KMC	DDC Controller
	3	HPO-6702	KMC	DDC Relay Module; Analog 0-10 VDC
	1	HPO-6703	KMC	DDC Relay Module; N/O Dry Contact
	1	HPO-6802	KMC	DDC Relay Module Cover
KMD2	1	KMD-7301	KMC	DDC AHU Controller
KMD5	1	KMD-7003	KMC	DDC VAV Controller
KMD3	1	KMD-1151	KMC	DDC Space Thermostat "Netsensor"
KMD4	1	KMD-1151	KMC	DDC "Netsensor" Fumehood Interface
MAG	1	2300-0	DWYER	Magnehelic -0.25-0-0.25 "W.C.
XFR1,2	1	XEE-6211-050	KMC	40 VA Transformer, 120/24V

USER CHANGEABLE	
ALS	ALARM SILENCE
SETPOINT	SPACE TEMPERATURE

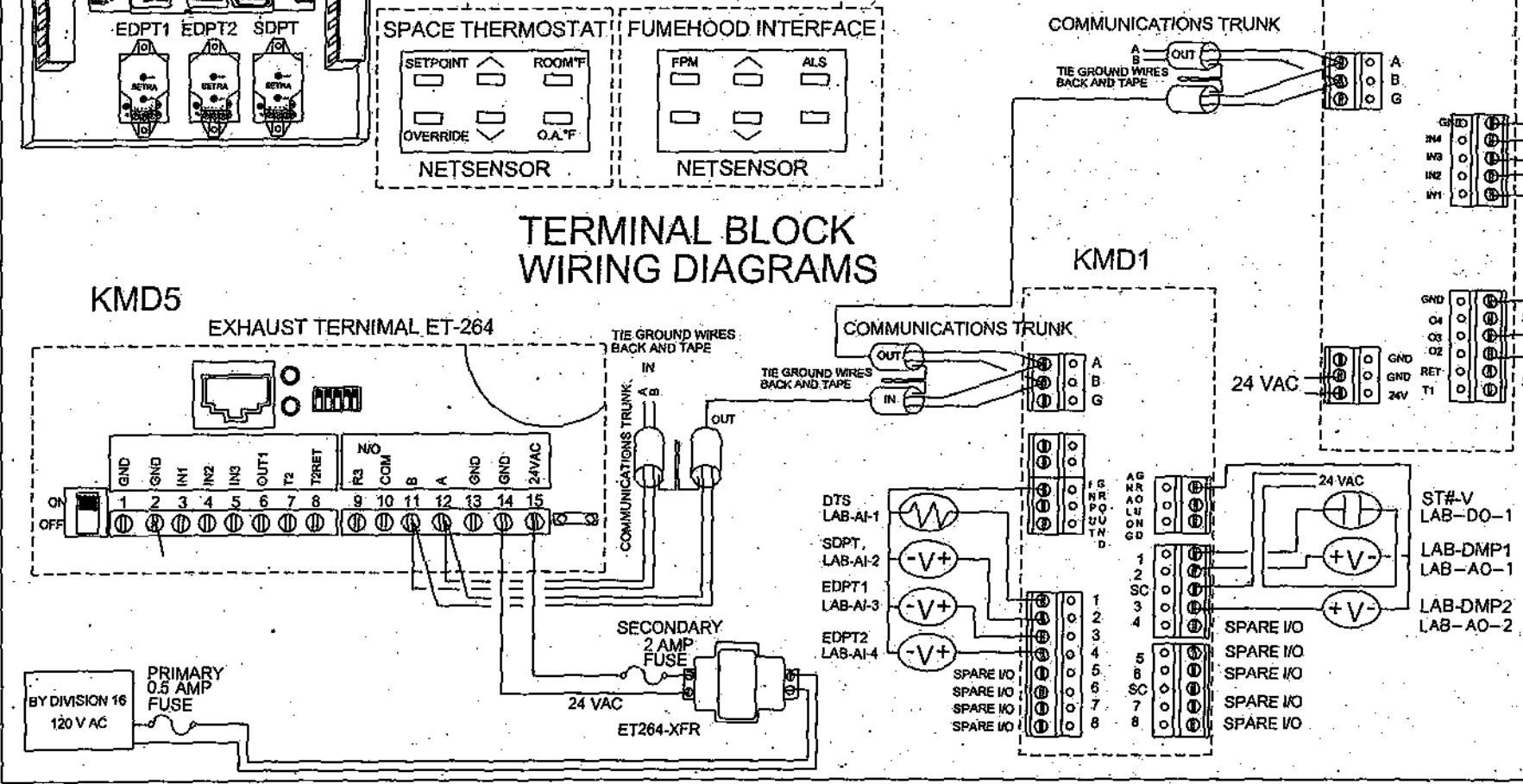
ABBREVIATION DEFINITION
 ALS - ALARM SILENCE
 FPM - FEET PER MINUET

SEQUENCE OF OPERATION:
 Mode of Operation - Laboratory mode of operation shall be either "Occupied" or "Unoccupied" based upon the status of the room lights as indicated by light sensor. (Occupied mode when lights are on, and Unoccupied mode when lights are off.)

Fume Hood Exhaust Terminal - Fume hood exhaust terminal damper shall be modulated by fumehood Controller as required to maintain the fumehood face velocity at setpoint. Setpoint shall be 100 ft/min during Occupied Mode and 60 ft/min during Unoccupied Mode.

Room Exhaust Terminal - Room Exhaust terminal damper shall be modulated by the laboratory controller as required to maintain the total laboratory exhaust air flow at setpoint. During Occupied periods, the total exhaust air flow setpoint shall be 10 air changes per hour (adjustable up to 15 air changes per hour). During Unoccupied periods, the setpoint shall be 4 air changes per hour.

Supply Air Terminal - Supply air terminal damper shall be modulated between the minimum and maximum air flows scheduled by the laboratory controller as required to maintain the supply air flow at setpoint. Supply air flow setpoint shall be equal to the total laboratory exhaust air flow adjusted by the offset (100 CFM Negative Bias). Heating water control valve shall be modulated by the DDC Panel output as required to maintain the space temperature at thermostat setpoint. During Occupied periods, the setpoint shall be adjustable by the user from a minimum of 68°F to a maximum of 75°F. During Unoccupied periods, the heating setpoint shall be 60°F and the cooling setpoint shall be 80°F.



Drawing Title		ENGINEER COMMENTS & CHANGE ORDER MODIFICATION		A	7/31/03	JS
LAB EXHAUST/SUPPLY & FUMEHOOD CONTROL		AS-BUILT MODIFICATION		B	10/11/14	JNS
Sales: Project Manager Applications Engineer		Revision		NO	ECN	Date
TL/ GH BP JS		Drawn		By: JS	Date: 6/20/03	By:
Project Title		Office Information:		Contract Number:		
ASU		TL Services, Inc.		03-C005		
BIOSCIENCE & BIOTECHNOLOGY BLDG		4733 Kibler Rd.		Drawing Number:		
JONESBORO, AR		Van Buren, AR 72956		32		
		PH: 479-474-7222				
		FX: 479-471-7964				

LAB 263 MASS SPECTROMETER FUMEHOOD EXHAUST CONTROL

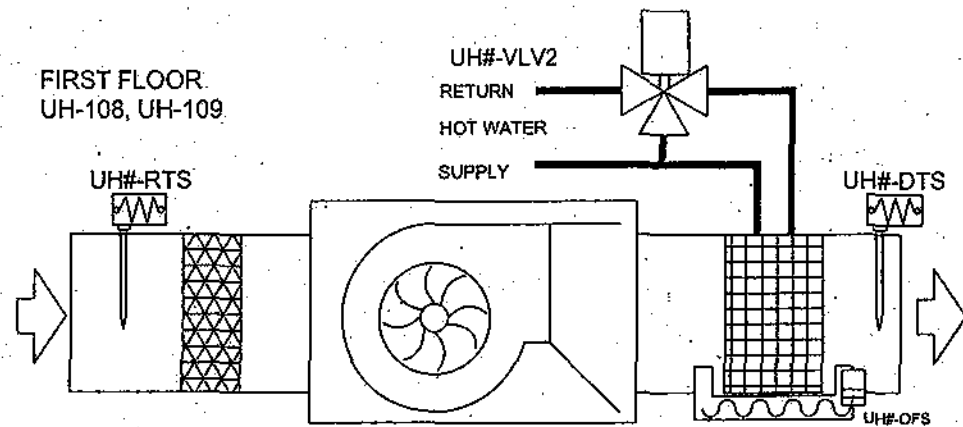
CONTROLLER		4X4		KMD-7301			
INPUTS							
TRM #	#	DEVICE ID	POINT DESCRIPTION	CABLE ID	DETAIL DWG	CABLE TYPE	CABLE #
1,GND	1	PV	PV FLOW	LAB-AI-7	CWDETAIL3-8	A-1	9
2,GND	2	LS	LIGHT SENSOR	LAB-AI-8	CWDETAIL3-8	A-1	10
3,GND	3	SP	SASH POSITION	LAB-AI-9	CWDETAIL3-8	A-1	11
4,GND	4		E-PURGE	LAB-DI-2			12
NETSENSOR MAPPED I/O POINTS							
		KMD4	FACE VELOCITY FPM	LAB-AI-10	CWDETAIL2-8	C-1	13
		KMD4	ALARM SILENCE	LAB-DI-3	CWDETAIL2-8	C-1	13
OUTPUTS							
TRM #	#	DEVICE ID	POINT DESCRIPTION	CABLE ID	DETAIL DWG	CABLE TYPE	CABLE #
1, SC1	1		SPARE I/O				
2, GND	2	DMP3	FUME HOOD DAMPER	LAB-AO-3	CWDETAIL-4	A-2	14
3, GND	3	DMP2	HOOD ALARM	LAB-DO-2	CWDETAIL3-9	A-1	15
	4		SPARE I/O				

CONTROLLER		4X4		KMD-7003				EQUIPMENT EXHAUST	
INPUTS									
TRM #	#	DEVICE ID	POINT DESCRIPTION	CABLE ID	DETAIL DWG	CABLE TYPE	CABLE #		
3,1	1		SPARE I/O						
4,1	2		SPARE I/O						
5,1	3		SPARE I/O						
	4		FLOW SENSOR (APPLICATION DEDICATED INPUT)						
NETSENSOR MAPPED I/O POINTS									
			NOT USED						
			NOT USED						
			NOT USED						
OUTPUTS									
TRM #	#	DEVICE ID	POINT DESCRIPTION	CABLE ID	DETAIL DWG	CABLE TYPE	CABLE #		
6,2	1		SPARE I/O						
7,8	2		SPARE I/O						
9,10	3		SPARE I/O						
	4		DAMPER ACTUATOR (APPLICATION DEDICATED OUTPUT)						

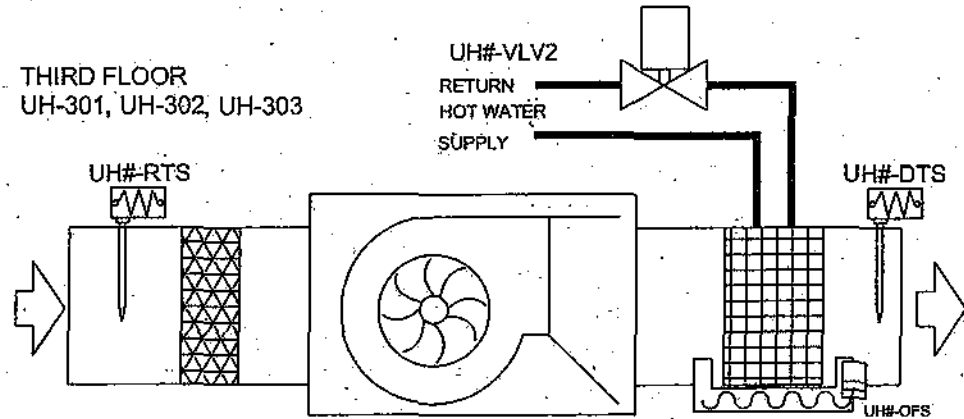
CONTROLLER		8X8		KMD-5802			
INPUTS							
TRM #	#	DEVICE ID	POINT DESCRIPTION	CABLE ID	DETAIL DWG	CABLE TYPE	CABLE #
1,GND	1	DTS	ST DISCHARGE AIR TMP	LAB-AI-1	CWDETAIL-2	A-1	1
2,GND	2	SDPT	ST AIR FLOW	LAB-AI-2	CWDETAIL2-2	A-2	2
3,GND	3	EDPT1	EX AIR FLOW	LAB-AI-3	CWDETAIL2-2	A-2	3
4,GND	4	EDPT2	HOOD AIR FLOW	LAB-AI-4	CWDETAIL2-2	A-2	4
5,GND	5						
6,GND	6		SPARE I/O				
7,GND	7		SPARE I/O				
8,GND	8		SPARE I/O				
NETSENSOR MAPPED I/O POINTS							
		KMD3	SPACE TEMPERATURE	LAB-AI-5	CWDETAIL2-8	C-1	5
		KMD3	SPACE SETPOINT	LAB-AI-6	CWDETAIL2-8	C-1	5
		KMD3	OVERRIDE	LAB-DI-1	CWDETAIL2-8	C-1	5
OUTPUTS							
TRM #	#	DEVICE ID	POINT DESCRIPTION	CABLE ID	DETAIL DWG	CABLE TYPE	CABLE #
1, SC1	1	DMP1	SUP TERM DAMPER	LAB-AO-1	CWDETAIL-4	A-2	6
2, GND	2	ST#-V	REHEAT VALVE	LAB-DO-1	CWDETAIL3-8	A-1	7
3, GND	3	DMP2	EX TERM DAMPER	LAB-AO-2	CWDETAIL-4	A-2	8
	4		SPARE I/O				
	5		SPARE I/O				
	6		SPARE I/O				
	7		SPARE I/O				
	8		SPARE I/O				

Drawing Title		ENGINEER COMMENTS & CHANGE ORDER MODIFICATION		A	7/31/03	JS
LAB EXHAUST/SUPPLY & FUMEHOOD CONTROL W/ MASS SPECTROMETER POINT LIST		AS-BUILT MODIFICATION		B	10/11/14	JNS
		NO				
Reference Drawing		Revision		ECN	Date	By
Sales: Project Manager		Applications Engineer		Approved		
Filename: LAB_CONTROL_SPECTRUM_PNTLIST.DWG		TLL/GH	BP	JS	By JS	Date: 6/20/03
Project Title:		Office Information:		Contract Number:		
ASU		TL Services, Inc.		03-C005		
BIOSCIENCE & BIOTECHNOLOGY BLDG		4733 Kibler Rd.		Drawing Number:		
JONESBORO, AR		Van Buren, AR 72956		33		
		PH: 479-474-7222				
		FX: 479-471-7864				

HOT WATER UNIT HEATER STARIWELL UNITS



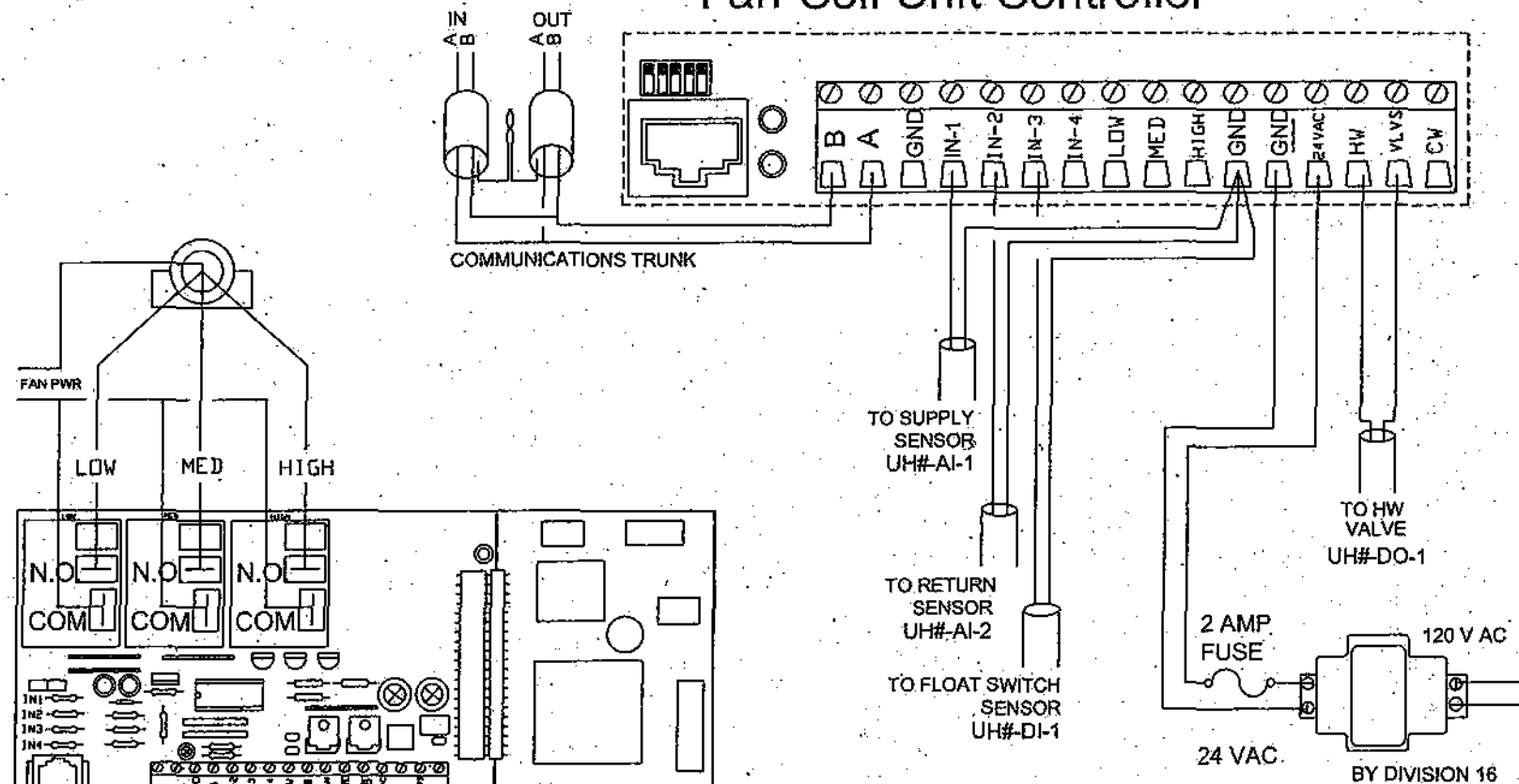
STAIRWELL UNIT HEATER SCHEDULE	
UNIT	AREA
UH-108	FIRST FLOOR STAIRWELL B
UH-109	FIRST FLOOR STAIRWELL D
UH-301	THIRD FLOOR STAIRWELL B
UH-302	THIRD FLOOR STAIRWELL C
UH-303	THIRD FLOOR STAIRWELL D



BILL OF MATERIALS				
PART ID	QTY	PART #	MFG	DESCRIPTION
UH#-KMD1	5	KMD-7101	KMC	DDC LOCAL CONTROLLER
UH#-DTS	5	STE-1402	KMC	DUCT TEMP PROBE SENSOR
UH#-RTS	5	STE-1402	KMC	DUCT TEMP PROBE SENSOR
UH#-OFS	5	WD-1B-T10	KELE	MOISTURE DETECTOR, TAPE STYLE
UH#-VLV#			KMC	SEE VALVE SCHEDULE

CONTROLLER FAN COIL UNIT CONTROLLER							
INPUTS							
#	POINT ID	POINT DESCRIPTION	CABLE ID	CABLE TYPE	CABLE #	TRM #	DETAIL DWG
1	UH#-DTS	DISCHARGE AIR TEMPERATURE	UH#-AI-3	A-1		3	CWDETAIL-2
2	UH#-RTS	RETURN AIR TEMPERATURE	UH#-AI-4	A-1		4	CWDETAIL-2
3	UH#-OFS	OVERFLOW ALARM	UH#-DI-2	A-1		5	CWDETAIL4-7
4		SPARE I/O					
NETSENSOR POINTS							
		NOT USED					
		NOT USED					
		NOT USED					
OUTPUTS							
#	POINT ID	POINT DESCRIPTION	CABLE ID	CABLE TYPE	CABLE #	TRM #	DETAIL DWG
1	UH#-KMD1	FAN SPEED LOW	UH#-DO-1	D-1			
2	UH#-KMD1	FAN SPEED MED	UH#-DO-2	D-2			
3	UH#-KMD1	FAN SPEED HIGH	UH#-DO-3	D-3			
4	UH#-KMD1	HOT WATER VALVE	UH#-DO-4	A-1		6	
5		SPARE I/O					

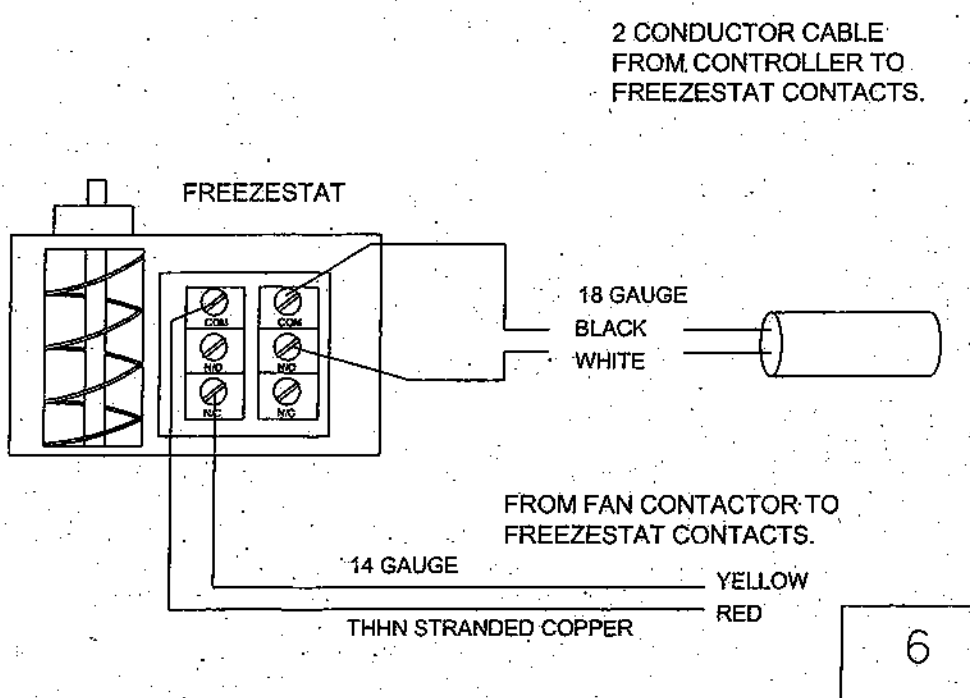
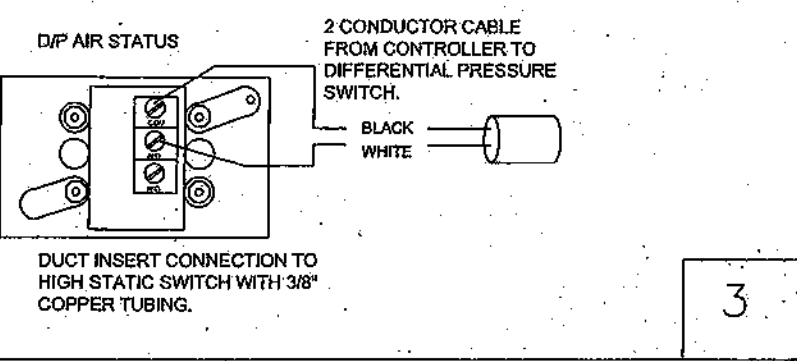
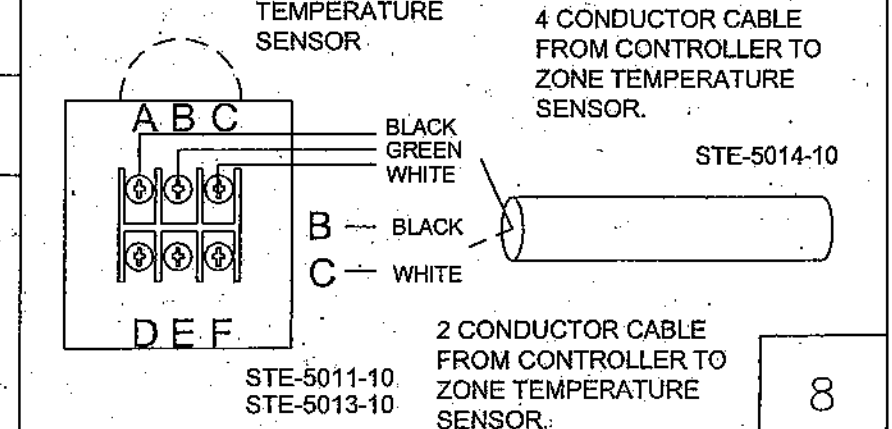
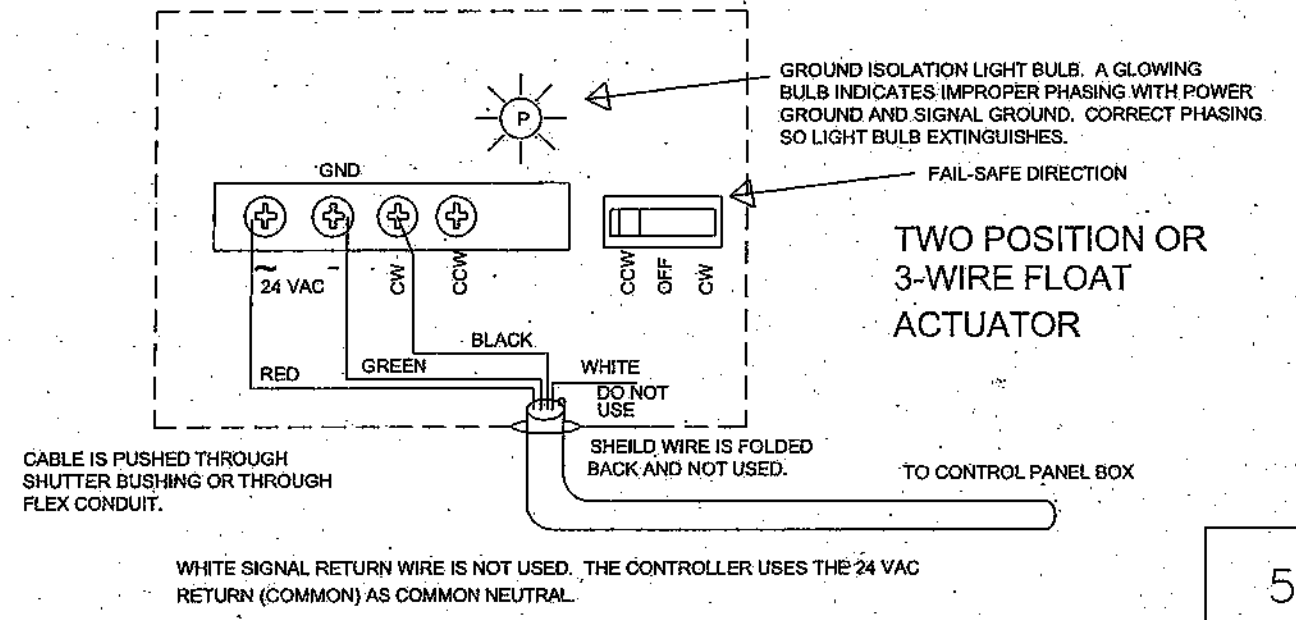
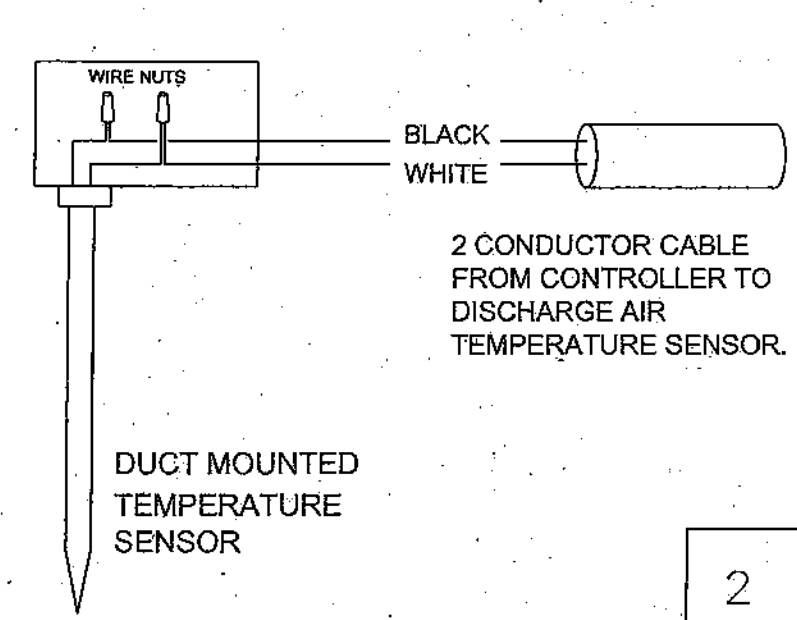
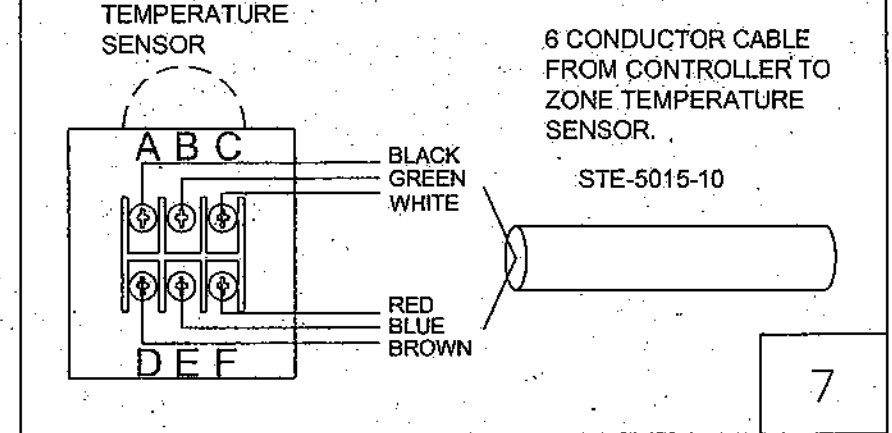
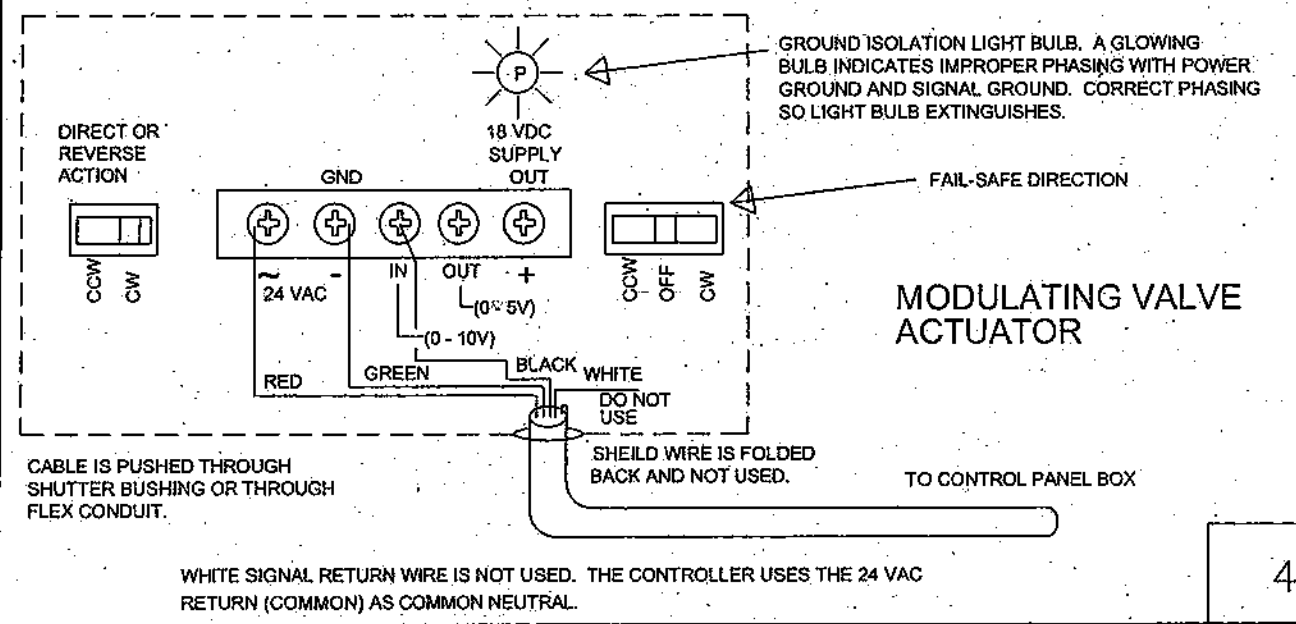
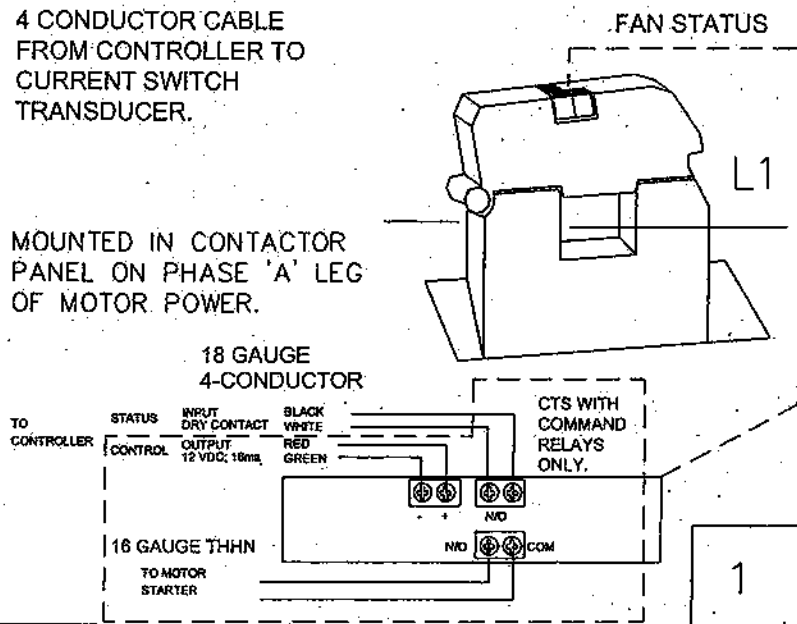
Fan Coil Unit Controller



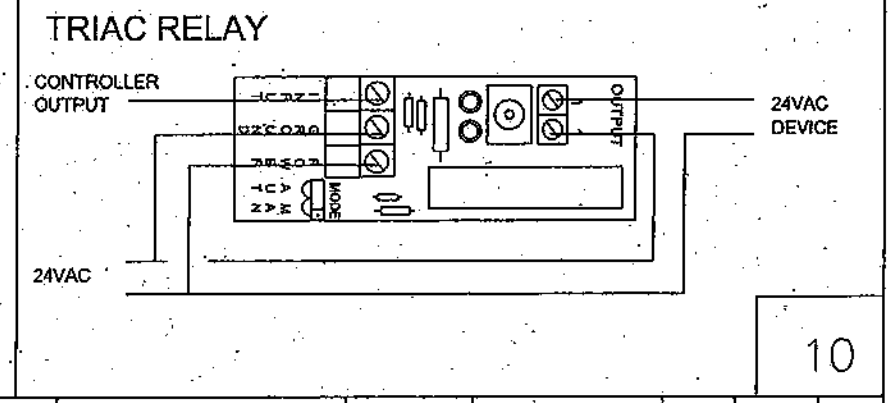
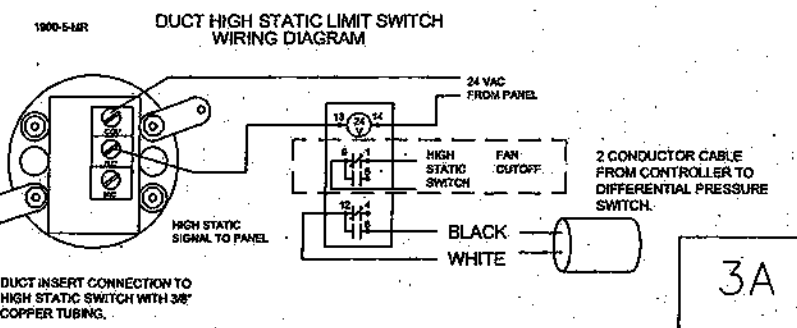
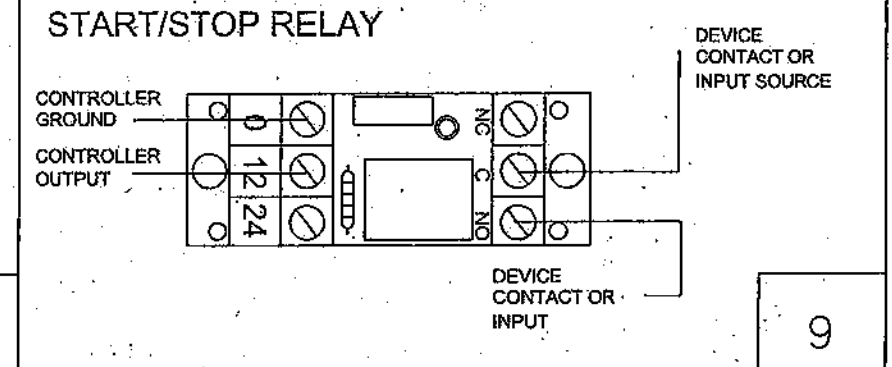
SEQUENCE OF OPERATION:

The controller shall sequence the fan speed (OFF, LOW, MEDIUM, AND HIGH) and modulate the heating water valve as required to maintain the return air temperature at setpoint (adjustable). Sensor in auxiliary drain pan shall activate an alarm when moisture is detected.

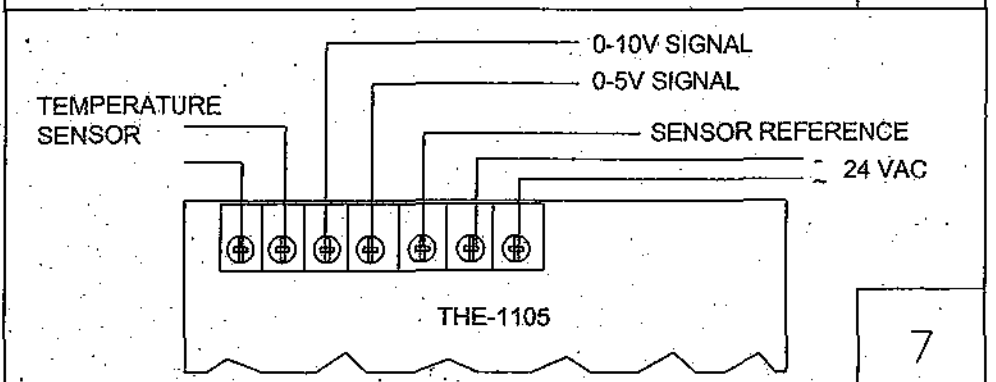
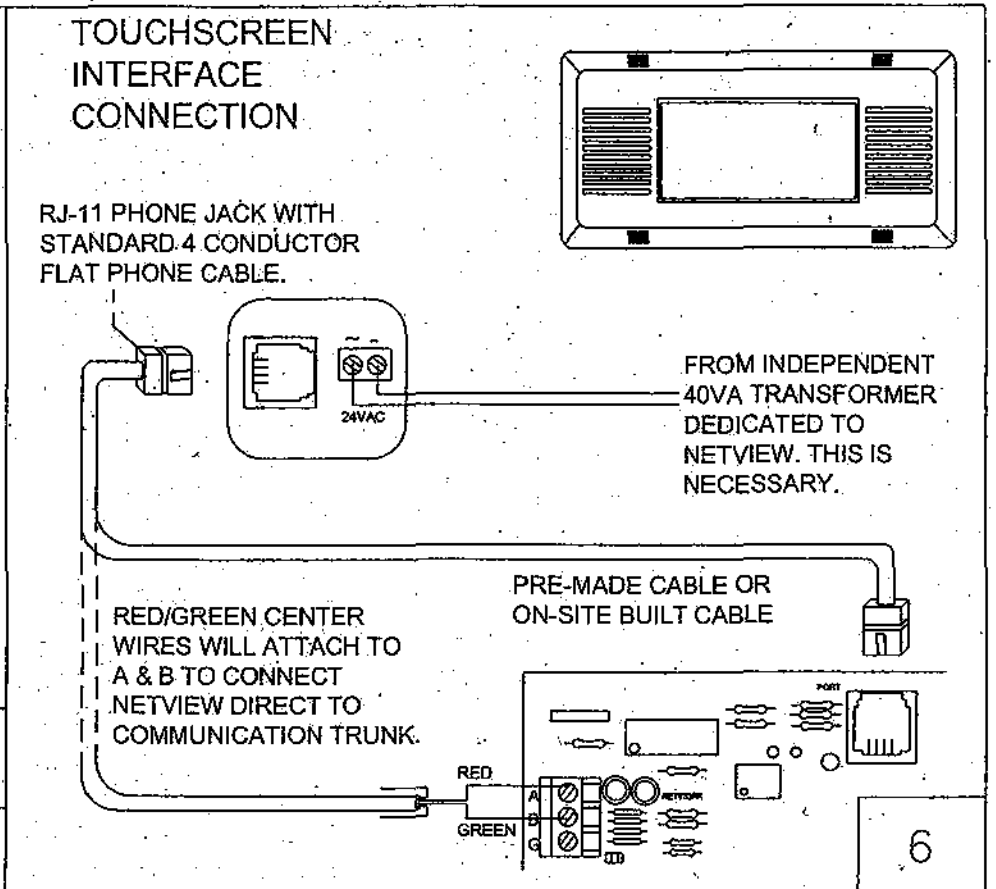
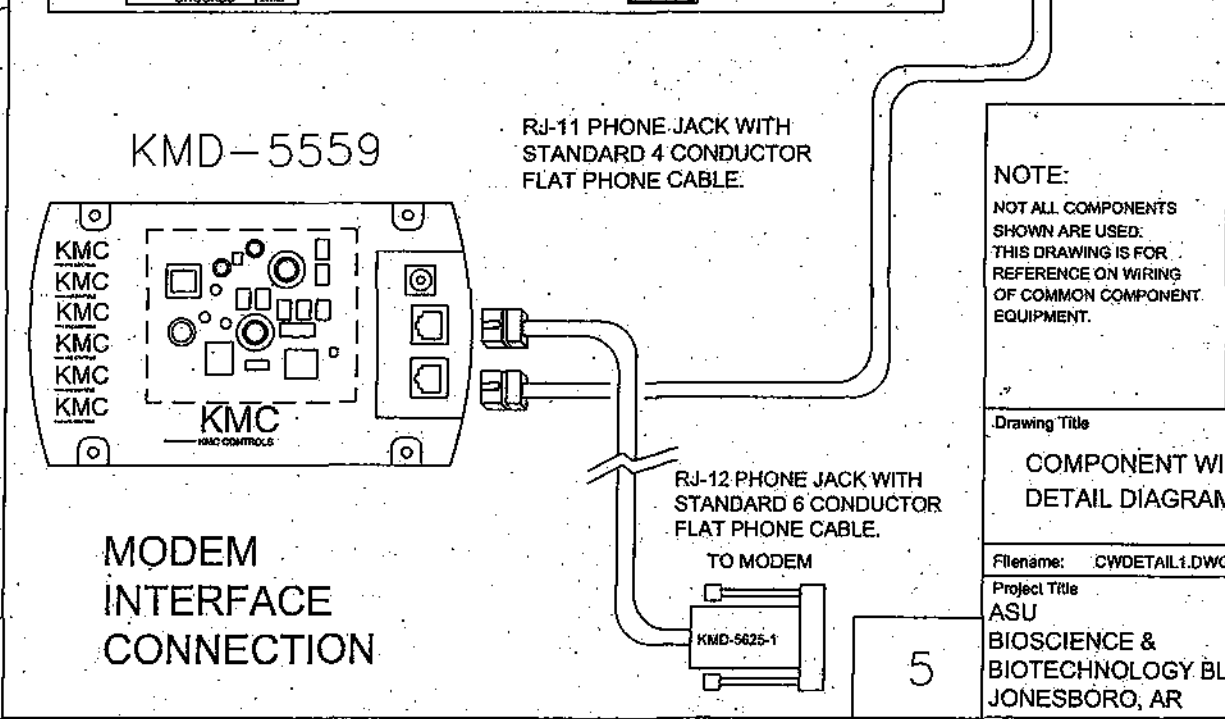
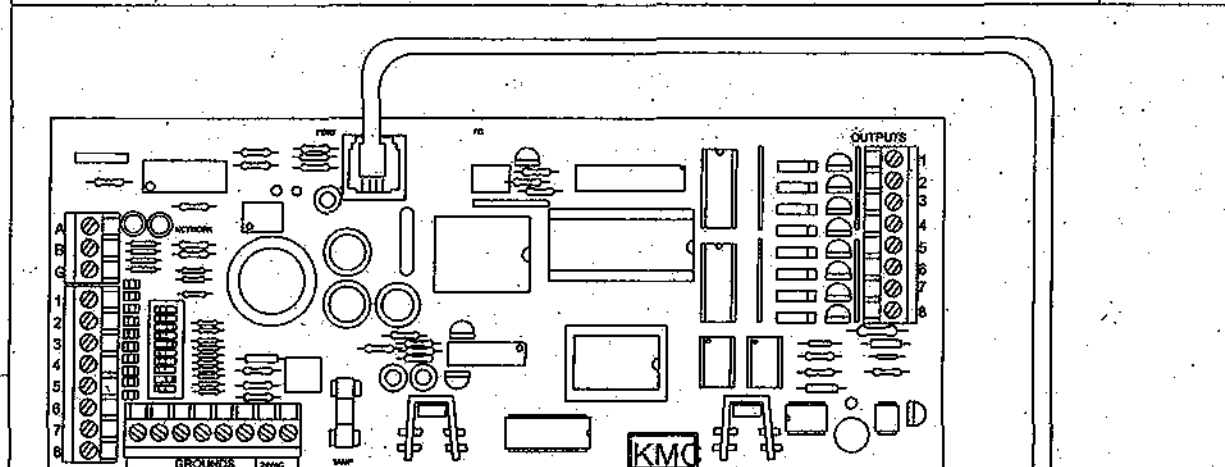
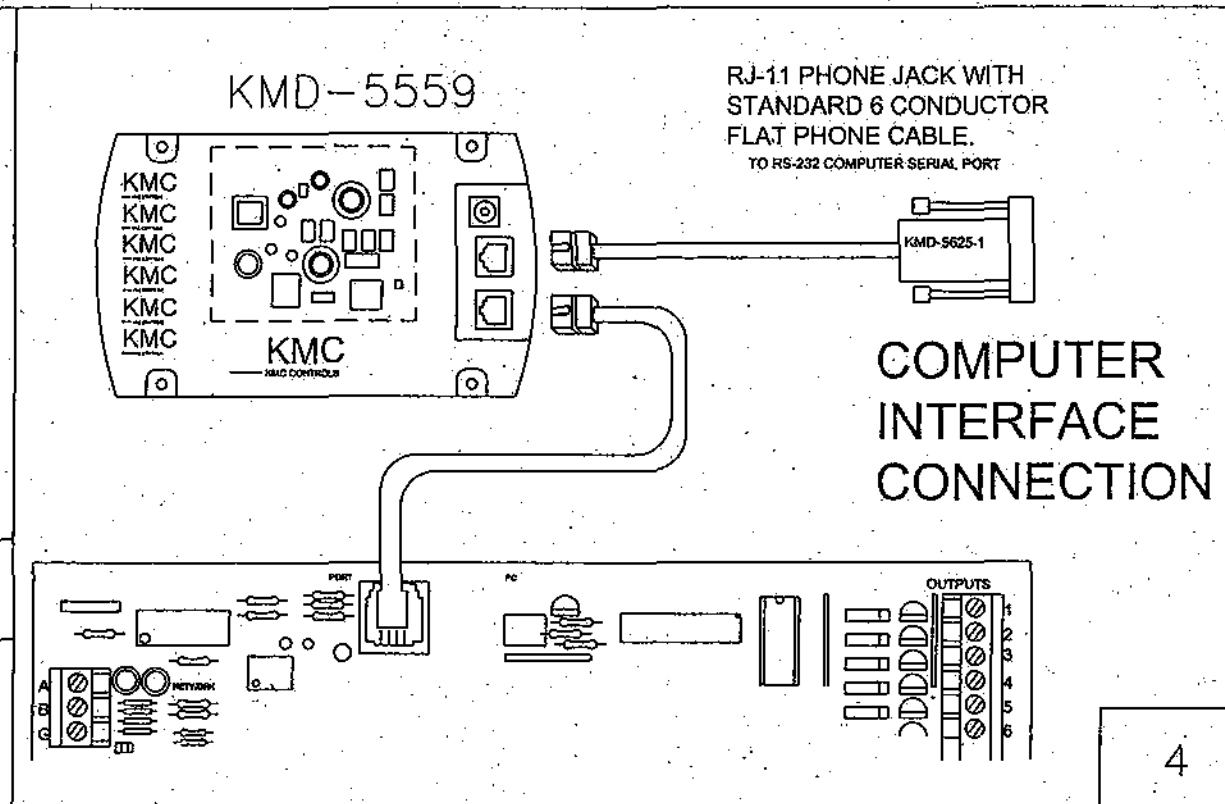
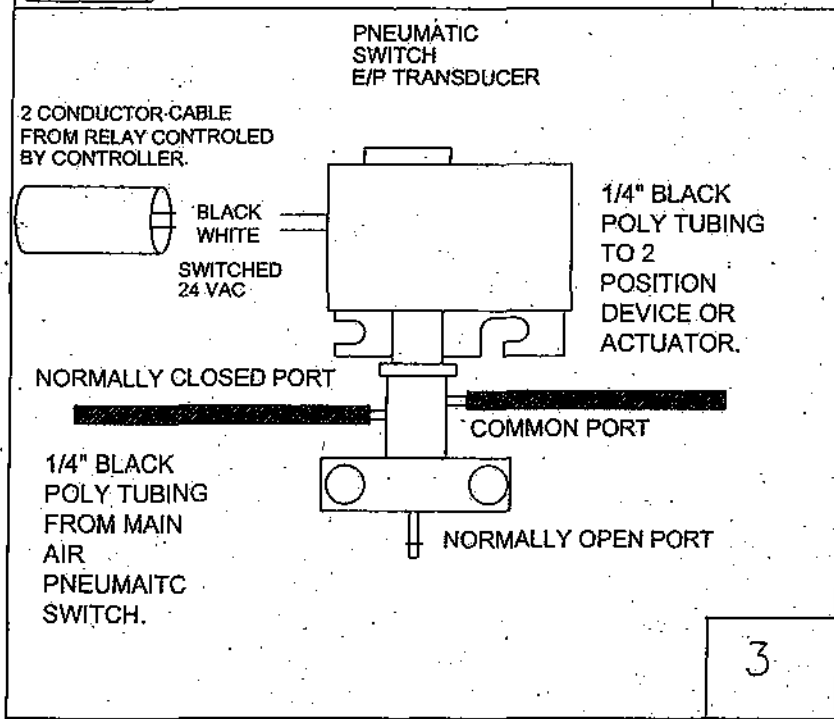
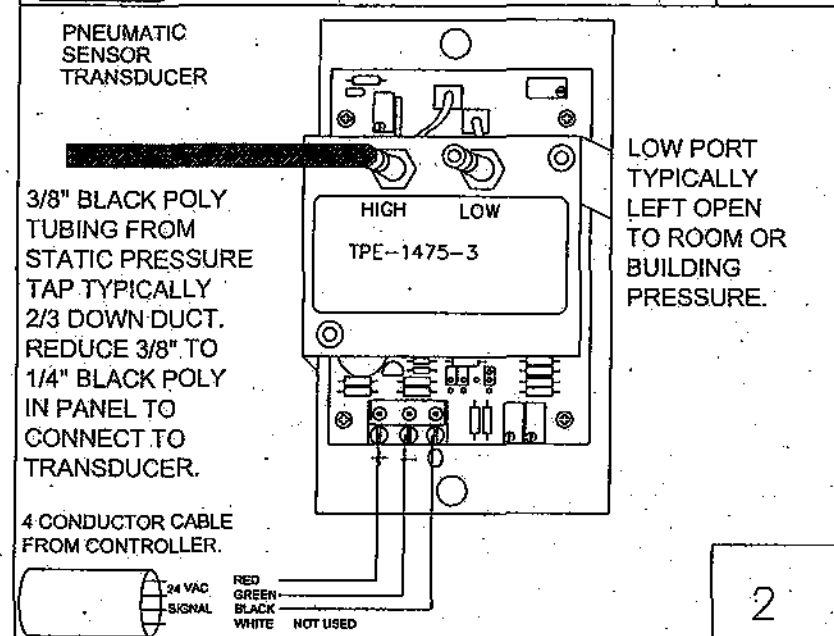
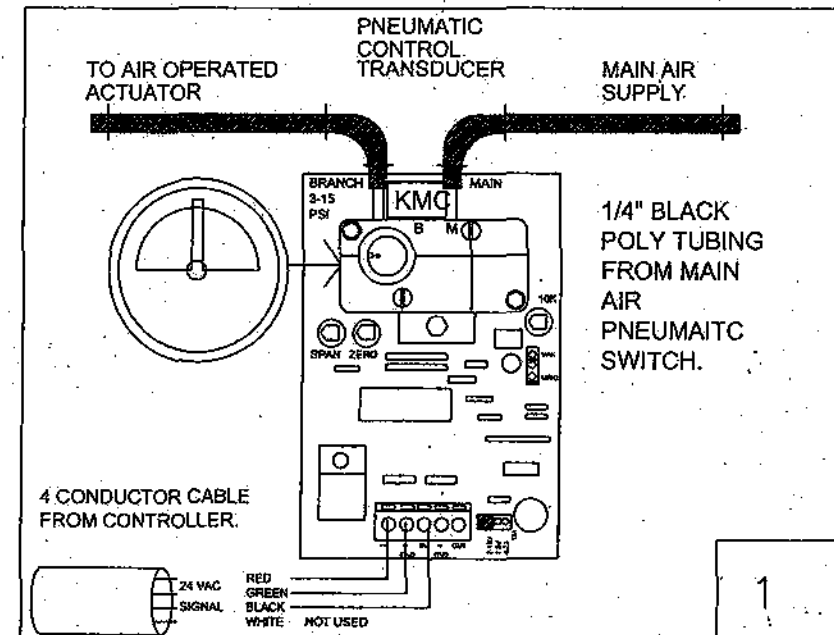
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Reference Drawing	NO			Revision	ECN	Date	By
Filename: UH_STAIRWELL.DWG	Soles: ILL/GH	Project Manager: BP	Applications Engineer: JS	Drawn: JS	Date: 5/23/03	By:	Approved:
Project Title	ASU BIOSCIENCE & BIOTECHNOLOGY BLDG JONESBORO, AR			Office Information:	TL Services, Inc. 4733 Kibler Rd. Van Buren, AR 72956 PH: 479-474-7222 FX: 479-471-7964		Contract Number: 03-C005
							Drawing Number: 34



NOTE:
NOT ALL COMPONENTS SHOWN ARE USED. THIS DRAWING IS FOR REFERENCE ON WIRING OF COMMON COMPONENT EQUIPMENT.

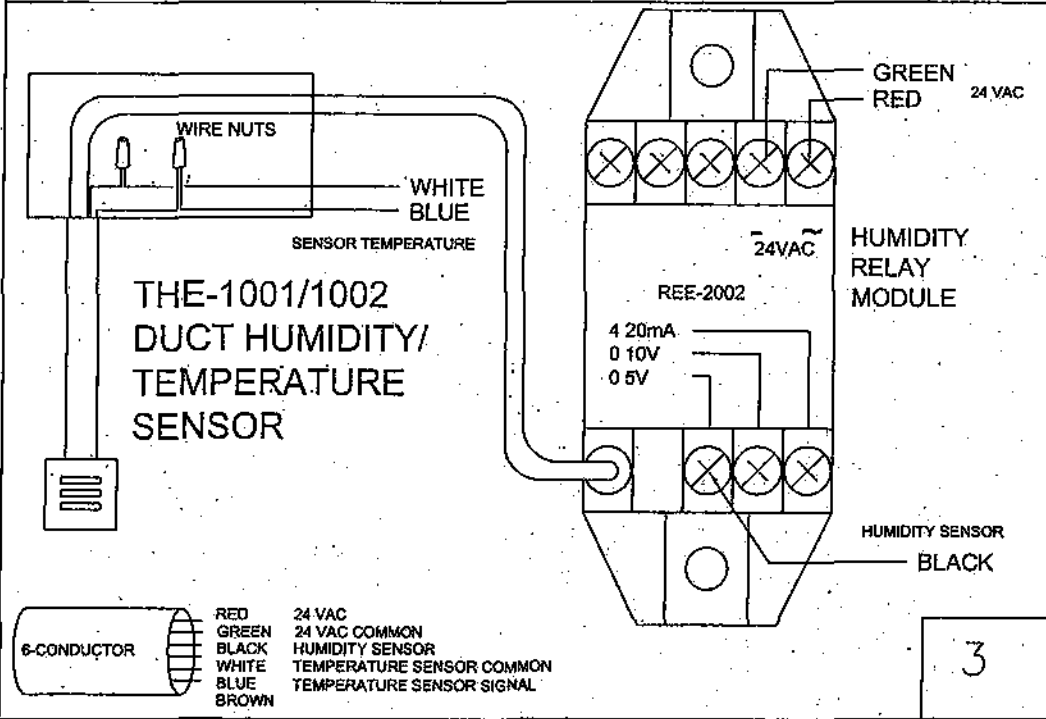
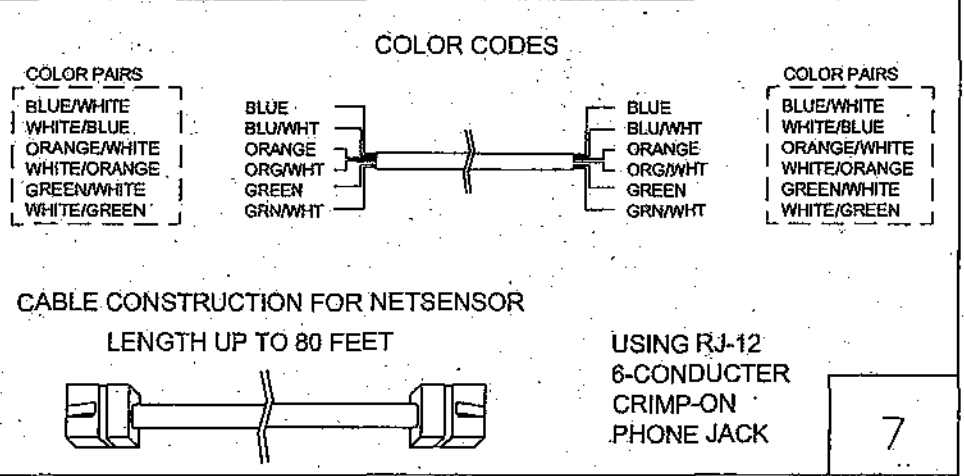
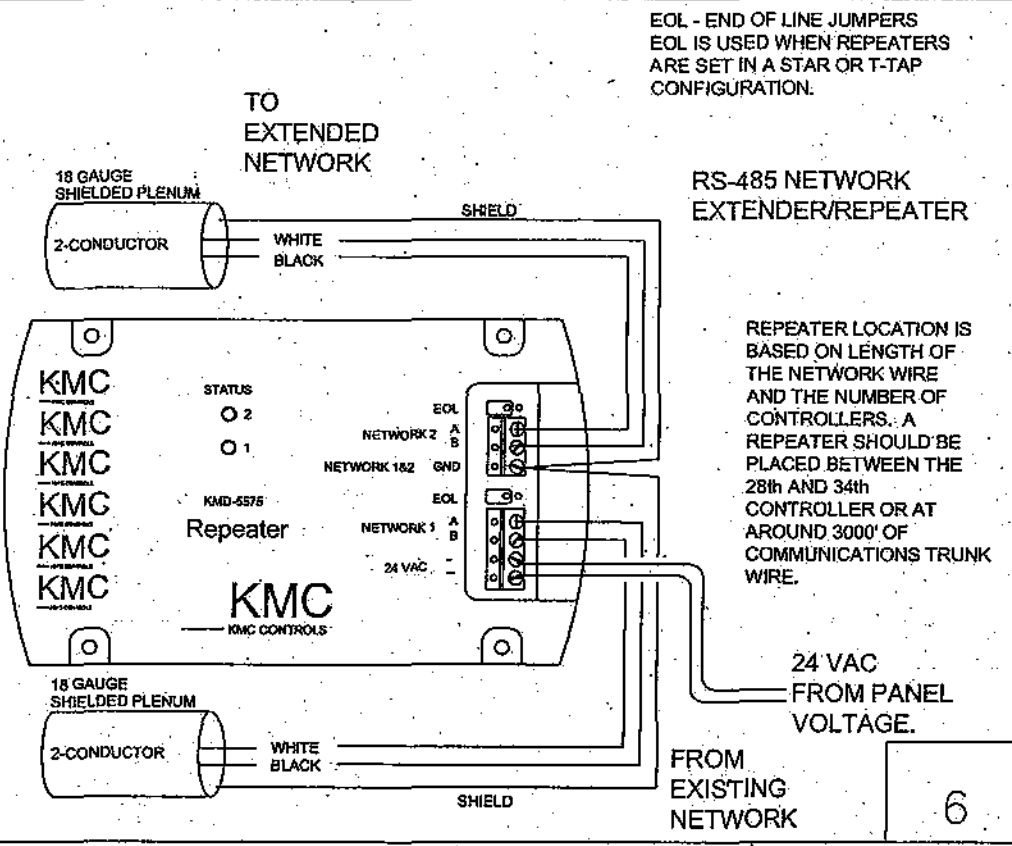
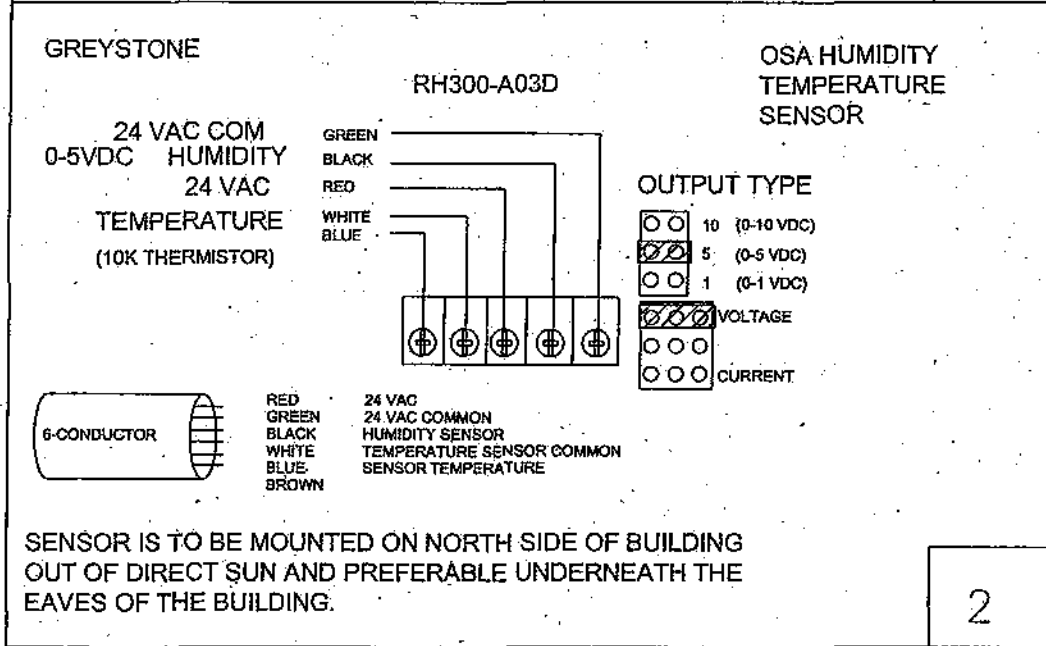
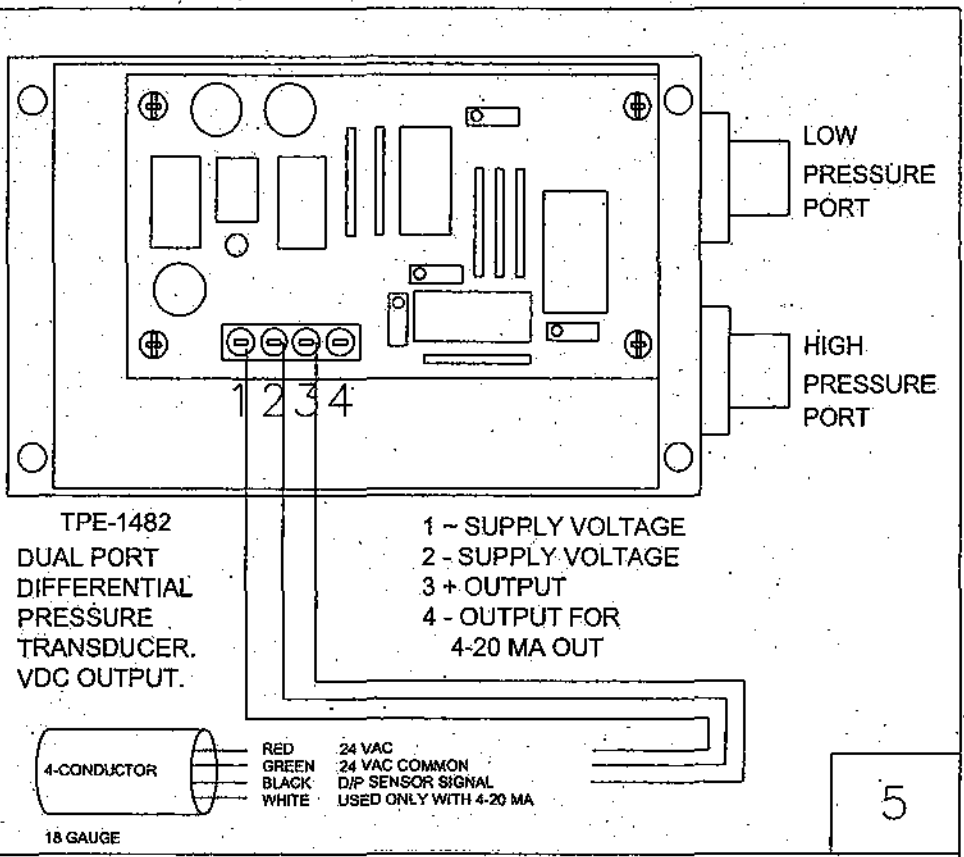
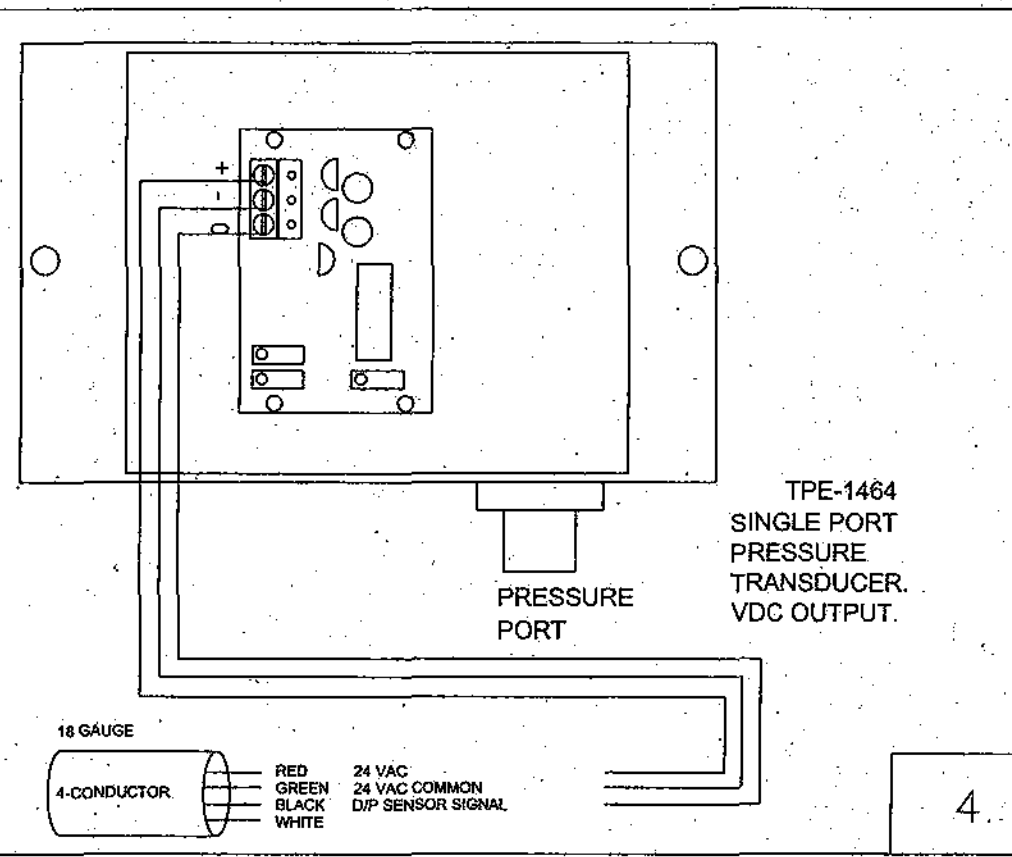
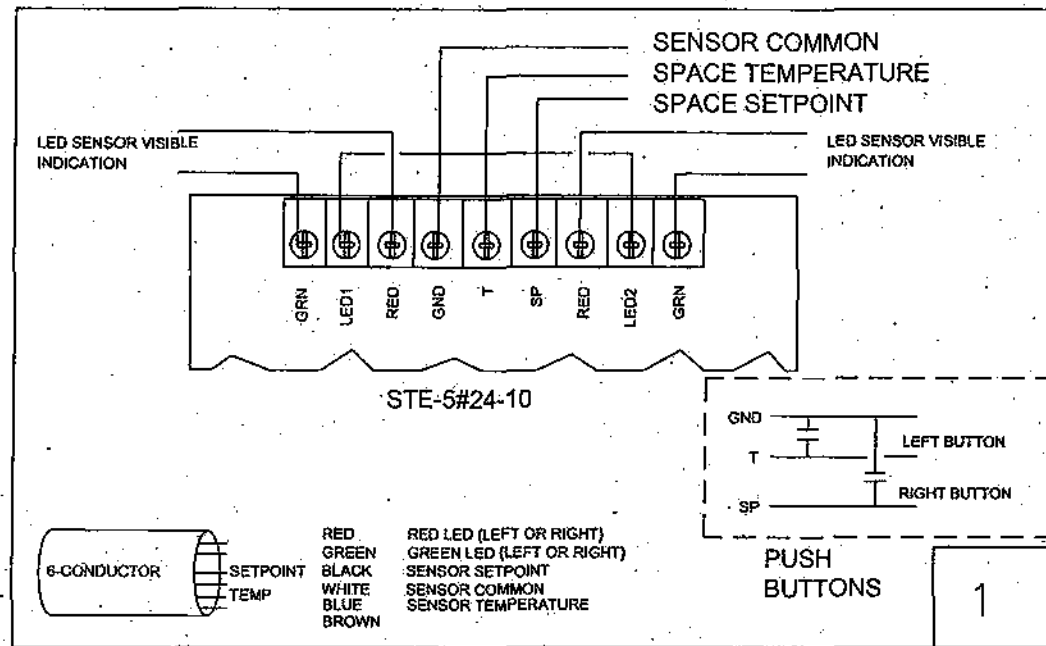


Drawing Title		AS-BUILT MODIFICATION		A	12/17/04	JNS
COMPONENT WIRING DETAIL DIAGRAMS						
Reference Drawing	NO	Revision	ECN	Date	By	
Sales: Project Manager	Applications Engineer	Drawn	Approved			
TL/ CH: BP	JS	By: JS	Date: 6/20/03	By:	Date:	
Project Title	Office Information:		Contract Number:			
ASU	TL Services, Inc.		03-C005			
BIOSCIENCE & BIOTECHNOLOGY BLDG	4733 Kibler Rd.					
JONESBORO, AR	Van Buren, AR 72956					
	PH: 501-474-7222					
	FX: 501-471-7964					
	Drawing Number:		35			

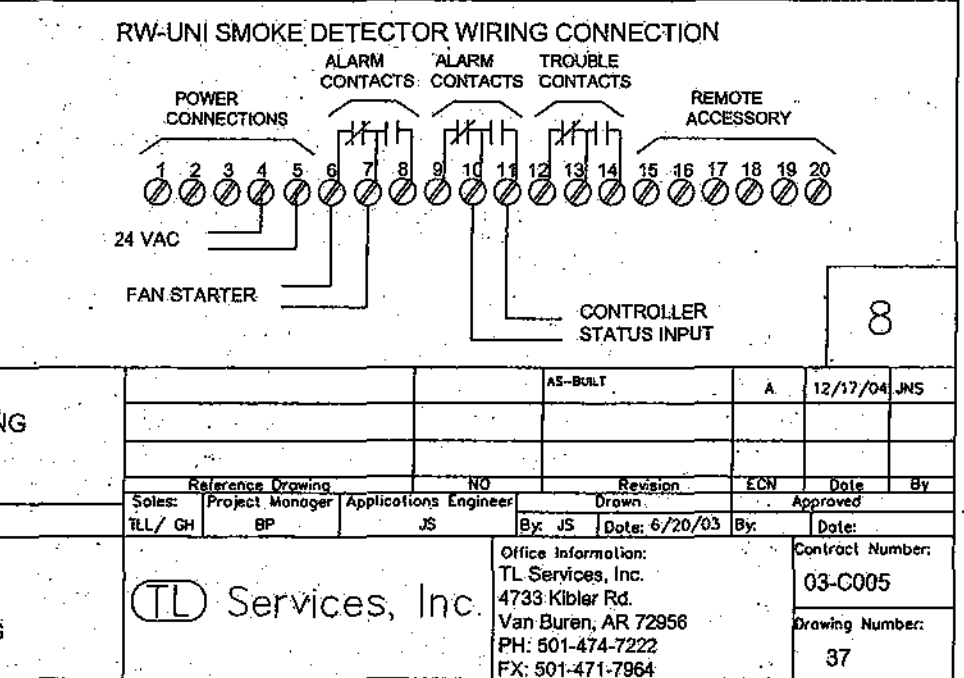


NOTE:
NOT ALL COMPONENTS SHOWN ARE USED. THIS DRAWING IS FOR REFERENCE ON WIRING OF COMMON COMPONENT EQUIPMENT.

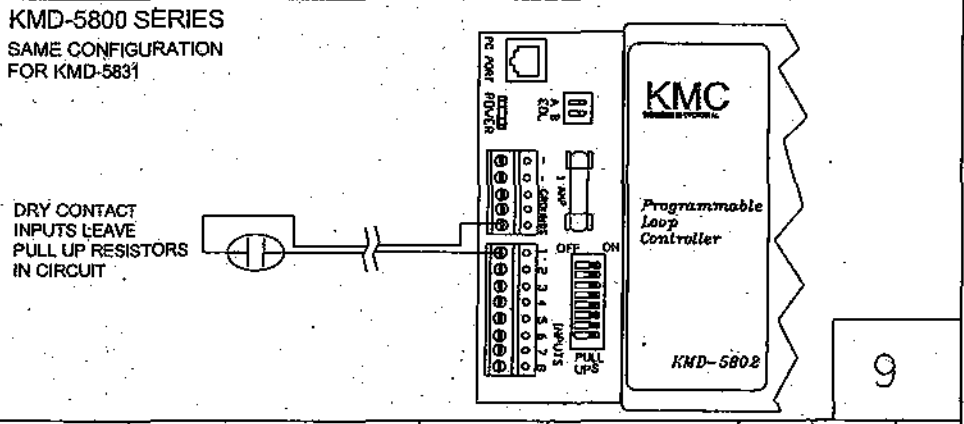
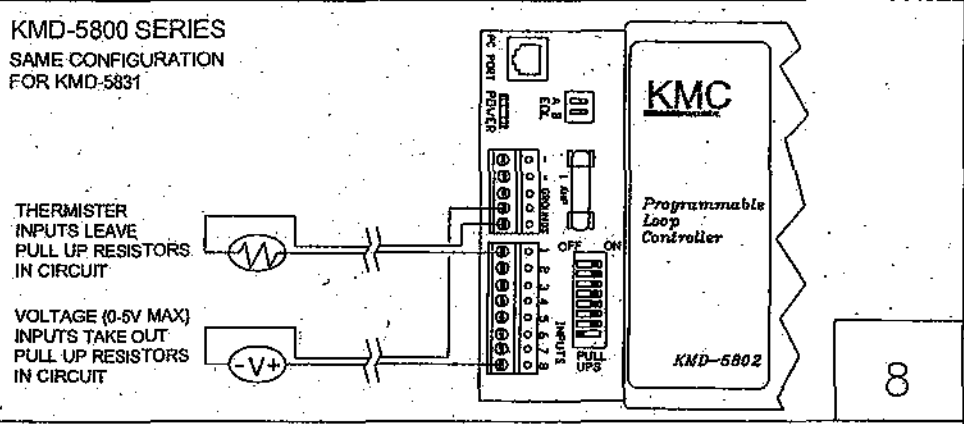
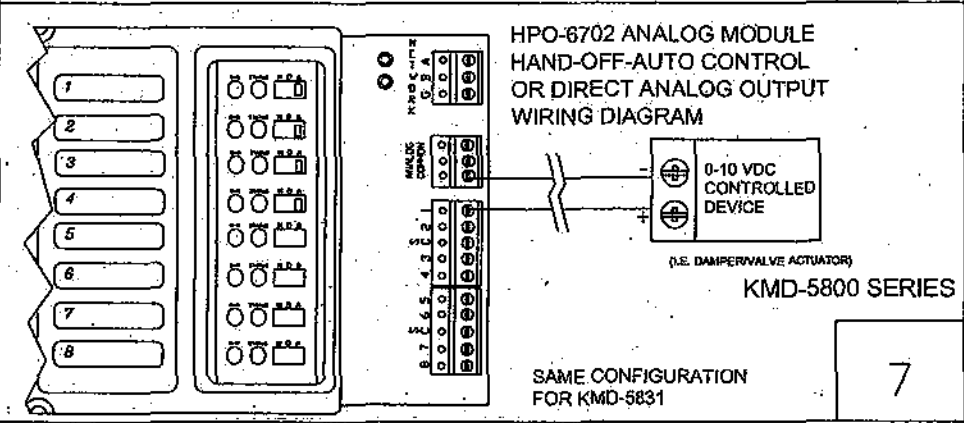
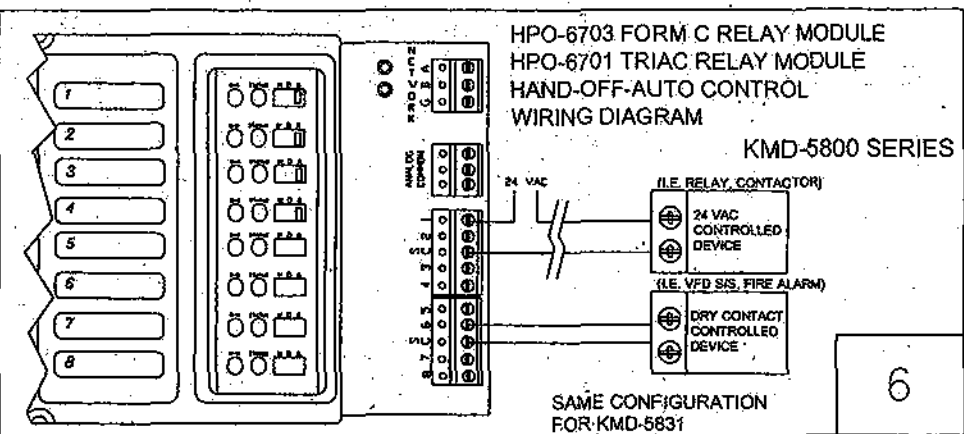
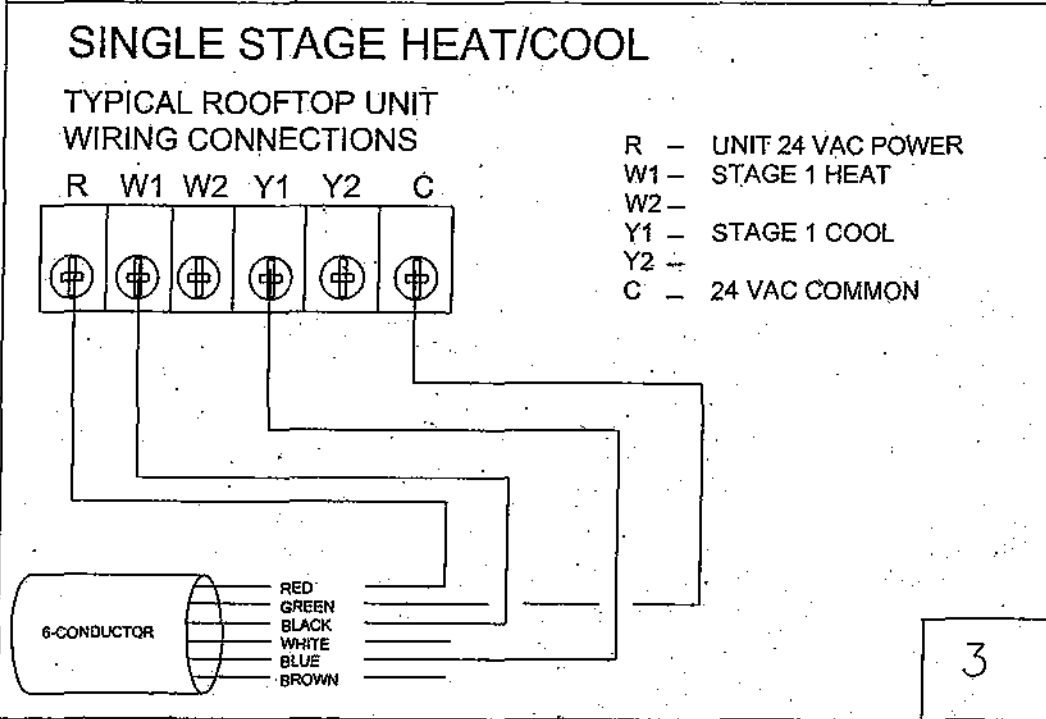
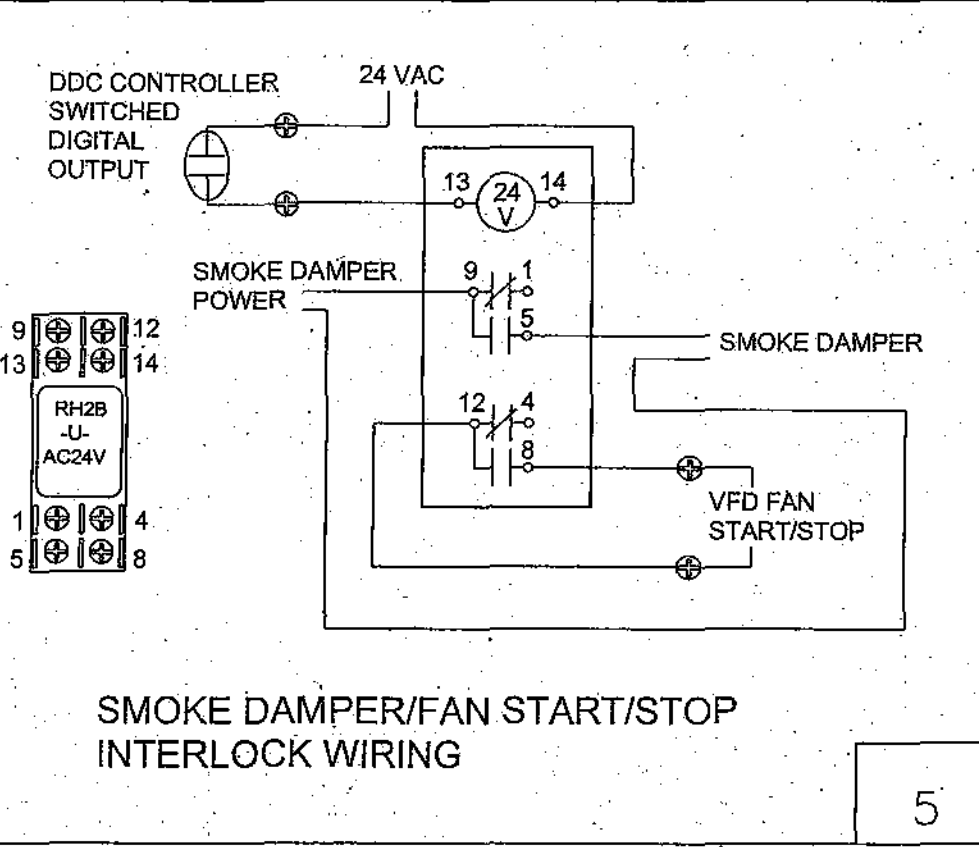
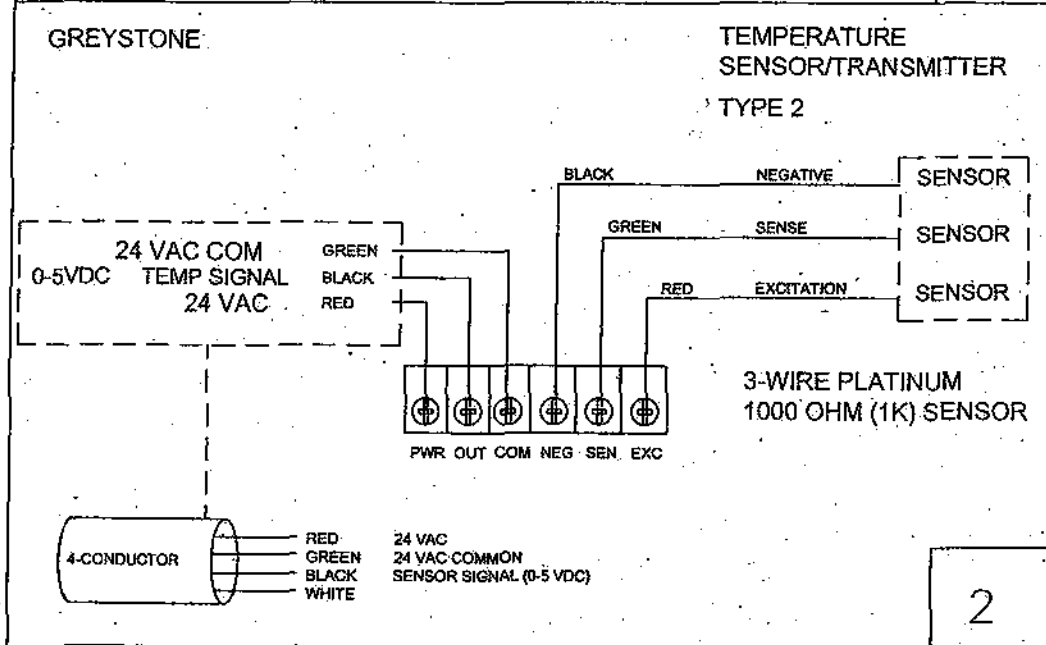
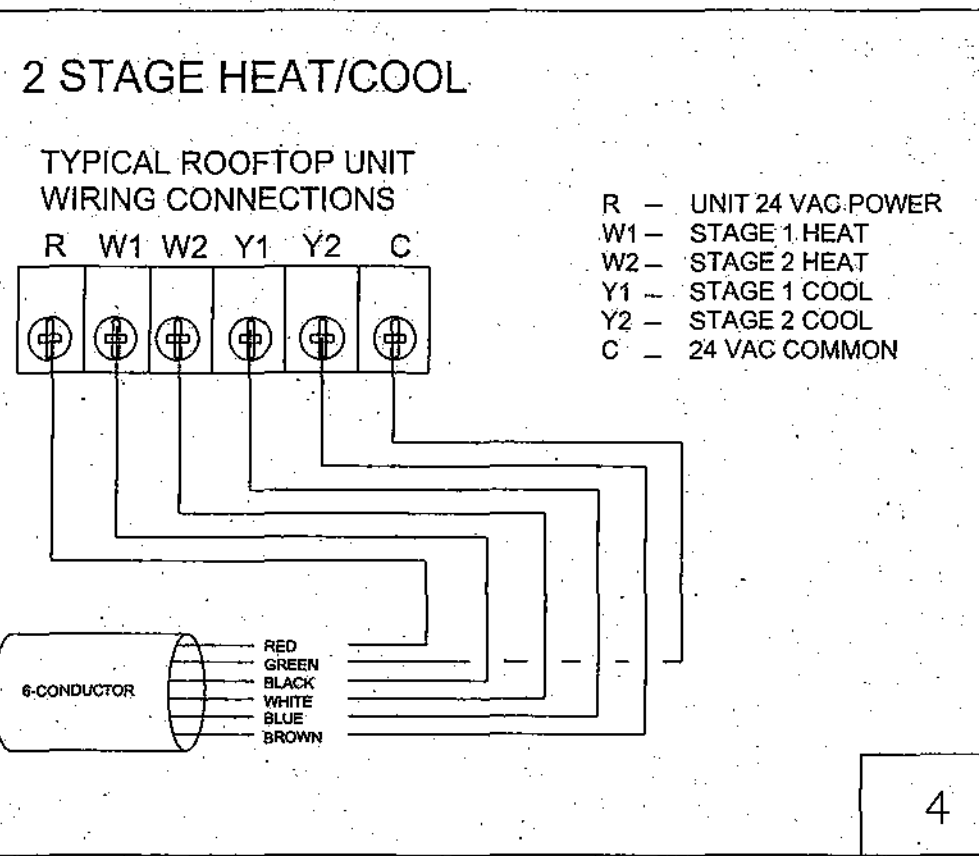
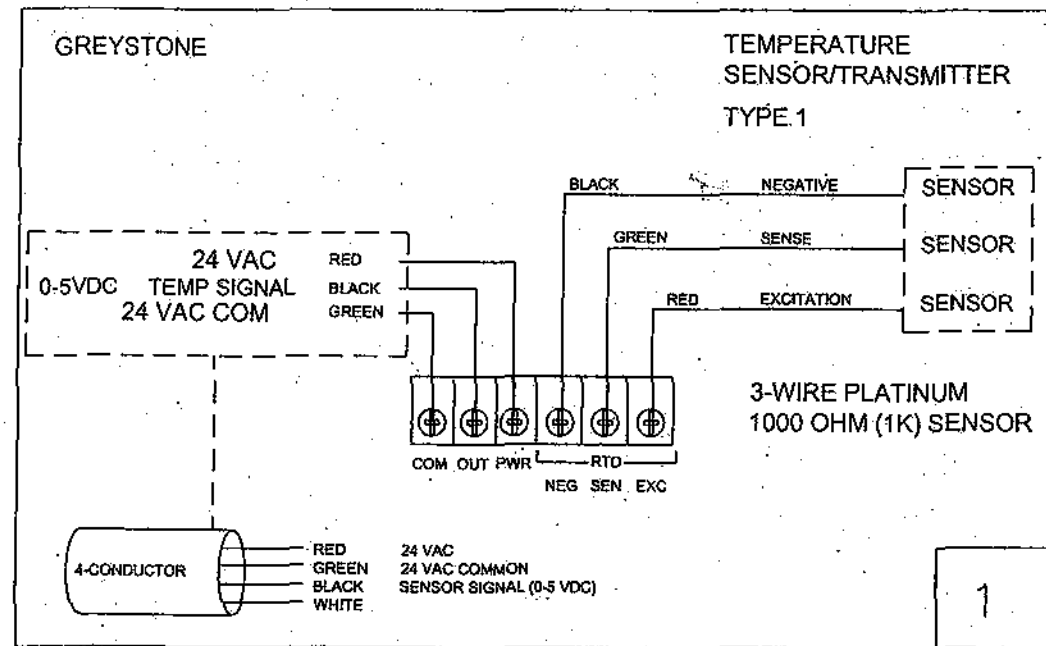
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COMPONENT WIRING DETAIL DIAGRAMS							
Filename: CWDDETAIL1.DWG	Sales: TL/ GH	Project Manager: BP	Applications Engineer: JS	By: JS	Date: 6/20/03	By:	Date:
Project Title: ASU BIOSCIENCE & BIOTECHNOLOGY BLDG JONESBORO, AR		Office Information: TL Services, Inc. 4733 Kibler Rd. Van Buren, AR 72956 PH: 501-474-7222 FX: 501-471-7964		Contract Number: 03-C005		Drawing Number: 36	



NOTE:
NOT ALL COMPONENTS SHOWN ARE USED. THIS DRAWING IS FOR REFERENCE ON WIRING OF COMMON COMPONENT EQUIPMENT.



Drawing Title		AS-BUILT		A		12/17/04		JNS	
COMPONENT WIRING DETAIL DIAGRAMS									
Reference Drawing		NO		Revision		ECN		Date	
Sole: Project Manager		Applications Engineer		Drawn		Approved			
Filename: CWDDETAIL2.DWG		TLL/ GH		BP		JS		By: JS Date: 6/20/03	
Project Title		ASU		BIOSCIENCE & BIOTECHNOLOGY BLDG		JONESBORO, AR		Contract Number: 03-C005	
Office Information:		TL Services, Inc.		4733 Kibler Rd.		Van Buren, AR 72956		Drawing Number: 37	
PH: 601-474-7222		FX: 501-471-7964							



NOTE:
NOT ALL COMPONENTS SHOWN ARE USED. THIS DRAWING IS FOR REFERENCE ON WIRING OF COMMON COMPONENT EQUIPMENT.

Drawing Title		AS-BUILT		A		12/17/04		JNS	
COMPUTER WIRING DETAIL DIAGRAMS									
Reference Drawing		NO		Revision		ECN		Date	
Scales: Project Manager		Applications Engineer		Drawn		Approved			
Filename: CWDETAIL3.DWG		TL/ GH		BP		JS		By: JS Date: 6/20/03	
Project Title		ASU		BIOSCIENCE & BIOTECHNOLOGY BLDG		JONESBORO, AR		Office Information:	
ASU		BIOSCIENCE & BIOTECHNOLOGY BLDG		JONESBORO, AR		Office Information:		TL Services, Inc.	
BIOSCIENCE & BIOTECHNOLOGY BLDG		JONESBORO, AR		Office Information:		TL Services, Inc.		4733 Kibler Rd.	
JONESBORO, AR		Office Information:		TL Services, Inc.		4733 Kibler Rd.		Van Buren, AR 72956	
Office Information:		TL Services, Inc.		4733 Kibler Rd.		Van Buren, AR 72956		PH: 501-474-7222	
TL Services, Inc.		4733 Kibler Rd.		Van Buren, AR 72956		PH: 501-474-7222		FX: 501-471-7964	
Contract Number:		03-C005		Drawing Number:		38			