DDC Controls for:

NASA Infrared Telescope Facility

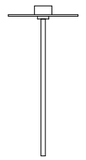
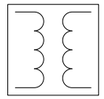
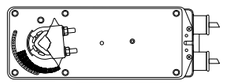
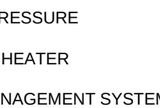
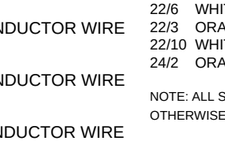
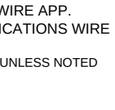
Mauna Kea, HI

Designed and installed by:

BIAC

73-5620 Kauhul St. Unit#6
Kailua Kona, HI 96740

CONTROLS LEGEND

GENERAL SENSORS	 DUCT	TRANSFORMER		DAMPER ACTUATORS		CURENT SENSORS	
DIFFERENTIAL PRESSURE	 MONITOR	CONTROL RELAYS	 PAM / RIB	VALVE ACTUATORS	 **BALL**	WATER AND STEAM FLOW	 MONITOR
POWER MONITORS		WALL MOUNTED THERMOSTATS		DUCT SMOKE DETECTOR		TEMPERATURE SENSORS	 IMMERSION

ABBREVIATIONS

ADD	ADDRESS
AHU	AIR HANDLER
AI	ANALOG INPUT
AO	ANALOG OUTPUT
AV	ANALOG VARIABLE
BAS	BUILDING AUTOMATION SYSTEM
BMS	BUILDING MANAGEMENT SYSTEM
BV	BINARY VALUE
CH	CHILLER
CLG	COOLING
COMP	COMPRESSOR
CP	CONDENSER PUMP
CT	COOLING TOWER
CU	COMMAND UNIT
CUH	CABINET UNIT HEATER
CLG	COOLING
CMD	COMMAND
COND	CONDENSER
CV	CONSTANT VOLUME
CWS/R	COLD WATER SUPPLY / RETURN
DAT	DISCHARGE AIR TEMP
DDC	DIRECT DIGITAL CONTROLS
DI	DIGITAL INPUT
DMPR	DAMPER
DP	DIFFERENTIAL PRESSURE
EA	EXHAUST AIR
EDH	ELECTRIC DUCT HEATER
EF	EXHAUST FAN
EMS	EMERGENCY MANAGEMENT SYSTEM
FACP	FIRE ALARM CONTROL PANEL
FLT	FILTER
FSD	FIRE SMOKE DAMPER
HE	HEAT EXCHANGER
HOA	HAND-OFF-AUTO
HP	HEAT PUMP
HPS	HIGH PRESSURE STEAM
HTG	HEATING
HWS/R	HOT WATER SUPPLY / RETURN
IW	ICE WAGON
LPC	LOW PRESSURE CONDENSATE
LPS	LOW PRESSURE STEAM
MS/TP	MASTER SLAVE TOKEN PASSING
OSA	OUTSIDE AIR TEMP
OVRD	OVERRIDE
PRESS	PRESSURE
RAT	RETURN AIR TEMP
RM	ROOM
RF	RETURN FAN
RW	RETURN WATER
SA	SUPPLY AIR
SF	SUPPLY FAN
SMK	SMOKE
SP	SET POINT
SPD	SPEED
STS	STATUS
SW	SUPPLY WATER
TCP	TEMPERATURE CONTROL PANEL
TCV	TEMPERATURE CONTROL VALVE
TYP	TYPICAL
TU	TERMINAL UNIT
VAV	VARIABLE AIR VOLUME
VLV	VALVE
VP	VELOCITY PRESSURE
XP	TRANSFORMER PANEL

WIRING STANDARDS

L — WIRE BACK TO TRANSFORMER LIVE

N — WIRE BACK TO TRANSFORMER NEUTRAL

WIRE NUT CONNECTION

TERMINAL STRIP CONNECTION

120 VOLT

24 VAC

NEUTRAL

COMMUNICATIONS

SENSOR

OUTPUT/COMMAND

2 CONDUCTOR WIRE

3 CONDUCTOR WIRE

4 CONDUCTOR WIRE

6 CONDUCTOR WIRE

10 CONDUCTOR WIRE

SHIELDED WIRE

GROUND

WIRE		APPLICATION
22/2	ORANGE STRIPE	INPUT/SENSOR APP.
22/2	PURPLE WIRE SHLD.	24VAC POWER
22/2	BLUE STRIPE	24VAC POWER
22/4	BLUE STRIPE	OUTPUT/COMMAND APP.
22/4	WHITE JACKET	MISC. 4 WIRE APP.
22/6	WHITE JACKET	MISC. 6 WIRE APP.
22/3	ORANGE STRIPE	MISC. 3 WIRE APP.
22/10	WHITE JACKET	MISC. 10 WIRE APP.
24/2	ORANGE WIRE SHLD.	COMMUNICATIONS WIRE

NOTE: ALL STRIPED WIRE HAVE WHITE JACKET UNLESS NOTED OTHERWISE.

DRAWING INDEX

GENERAL NOTES

1. All communication wire must be Andover Control specified wire.
2. Current Andover Control Literature is to be used as a supplement to information contained herein.
3. Electronic devices used for control may not operate correctly when influenced by high noise areas, such as petra-chemical installations, electronic rooms and near hospital NMR or X-ray rooms.

As Built

BIAC

HVAC/Controls
Security/Access Controls
Service and Monitoring

Schneider Electric

PROJECT: NASA INFRARED TELESCOPE FACILITY

DRAWING TITLE: CONTROLS LEGEND

REVISIONS:

DRAWN BY: AG

ENG. BY: JL

CHK'D BY: JL

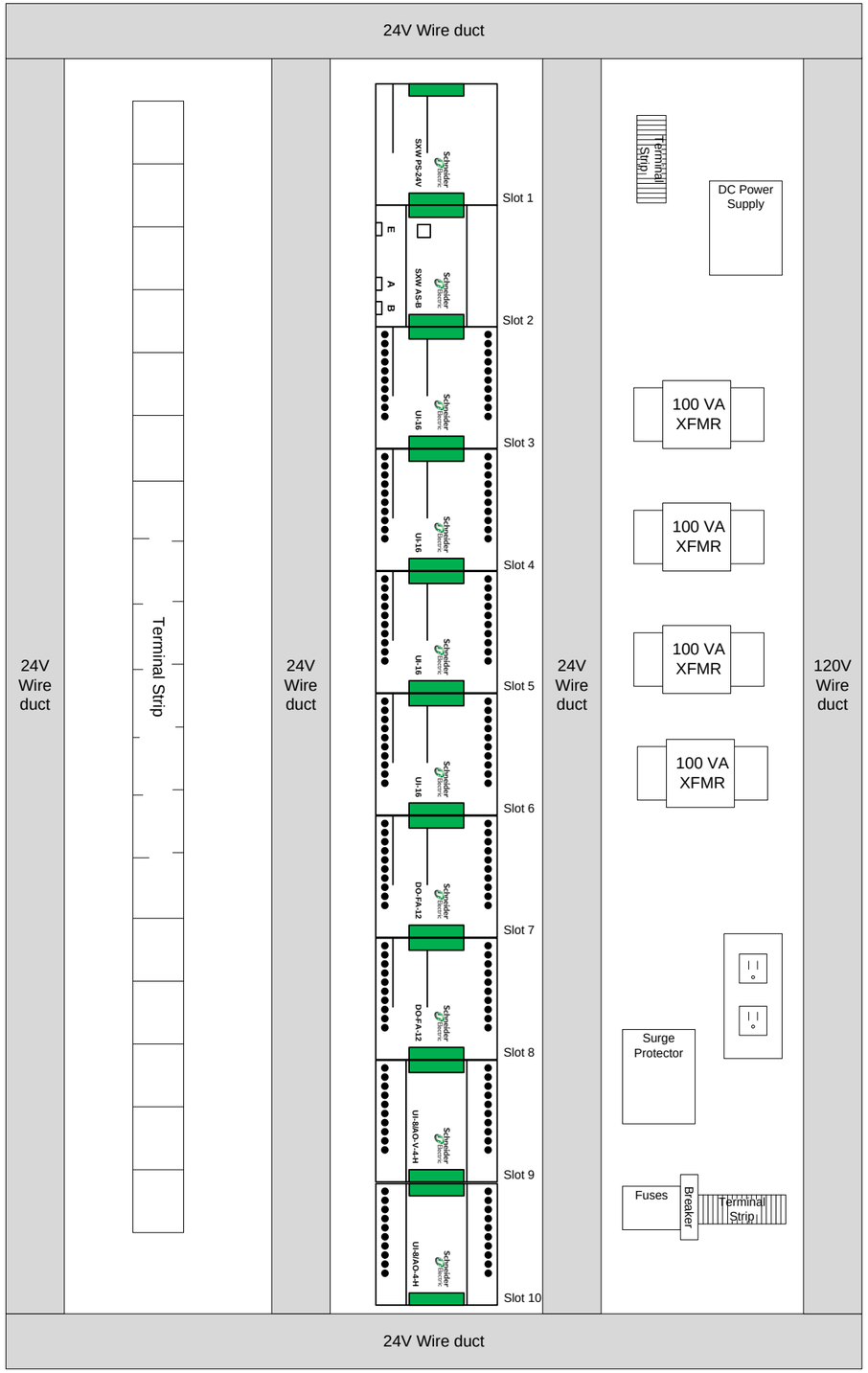
DATE: 8-13-13

JOB NO.

DWG NO. TC-2 of 14

ATC-1

Located in Mach RM 109



Bill of Materials

Manufacturer	Description	Part Number	Quantity
Kele	Wet Differential Pressure Sensor	PSS2-100	6
Mamac	Immersion Temperature Probe	TE-703-C-7-A-1	4
Veris	75VA Transformer	X075CBA	1
Veris	96VA Transformer	X100CBA	1
Veris	Current Sensor	VER-H300	4
Schneider Electric	Power Supply	SXW-PS-24V	1
Schneider Electric	Automation Servers	SXW AS-B	1
Schneider Electric	Input Module	SXW UI-16	1
APAC	Duct Smoke Detector	L-364-P	4
Mamac	Duct Temperature Sensor	TE-702-B-7-D	5
Mamac	Immersion Temperature Probe	TE-703-C-7-A-1	6
MAMAC	Duct Temperature Sensor	TE-702-B-7-D	2
TAC	Room Temperature Sensor	ETR503	8
TAC	Wet Differential Pressure Sensor	EPP102-LCD	6
Veris	96VA Transformer	X100CBA	2
Veris	Current Sensor	VER-H300	9
Schneider Electric	Input Module	SXW UI-16	3
APAC	SPDT Relay	P-PAM-1	9
Schneider Electric	Dry Differential Pressure Sensor	EPP 102	1
TAC	Damper Actuator	MA40-7043	2
TAC	Valve Actuator	BB3N06+M113A00	1
Veris	96VA Transformer	X100CBA	1
Veris	SPDT Relay	V100	7
Schneider Electric	Output Module	SXW DO-FA-12	1
Schneider Electric	Output Module	SXW DO-FC-8	1
Schneider Electric	Output/Input Module	SXW UI-8/AO-4	1
Schneider Electric	Outside Air Temp	EH0110-500-1	1

As Built

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HVAC/Controls
Security/Access Controls
Service and Monitoring

Schneider Electric

PROJECT: NASA INFRARED TELESCOPE FACILITY

DRAWING TITLE: ATC PANEL LAYOUT

REVISIONS:

DRAWN BY: AG

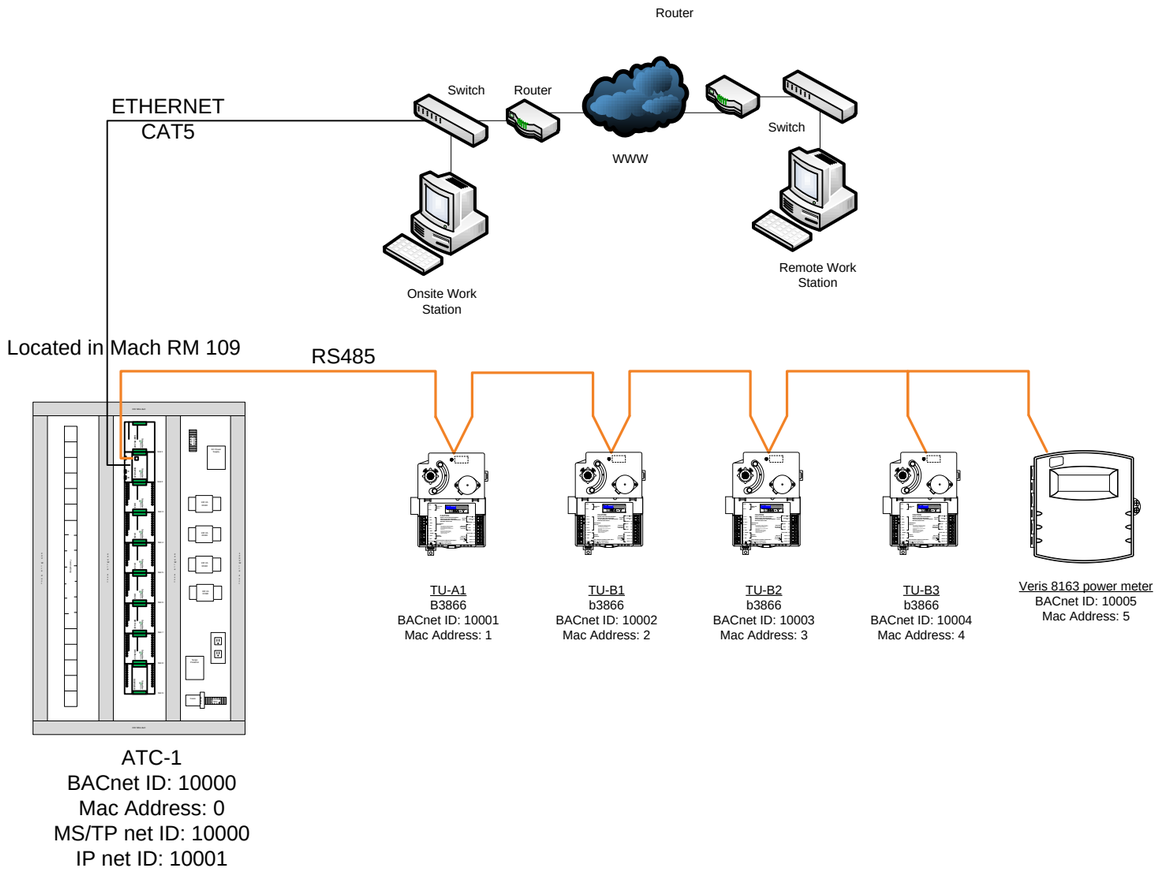
ENG. BY: JL

CHK'D BY: JL

DATE: 8-13-13

JOB NO.

DWG NO. TC-3 of 14



Bill of Materials

Manufacturer	Description	Part Number	Quantity
Schneider Electric	Power Supply	SXW PS-24V	1
Schneider Electric	Automation Servers	SXW AS-B	1
Schneider Electric	Input Module	SXW UI-16	2
Schneider Electric	Output Module	SXW DO-FA-12	1
Schneider Electric	Output Module	SXW DO-FC-8	1
Schneider Electric	Output/Input Module	SXW UI-8/AO-4	1
Andover	TU Controller	b3866-V	4

As Built

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Security/Access Controls
Service and Monitoring

Schneider Electric

PROJECT: NASA INFRARED TELESCOPE FACILITY

DRAWING TITLE: SYSTEM ARCHITECTURE

REVISIONS:

DRAWN BY: AG

ENG. BY: JL

CHK'D BY: JL

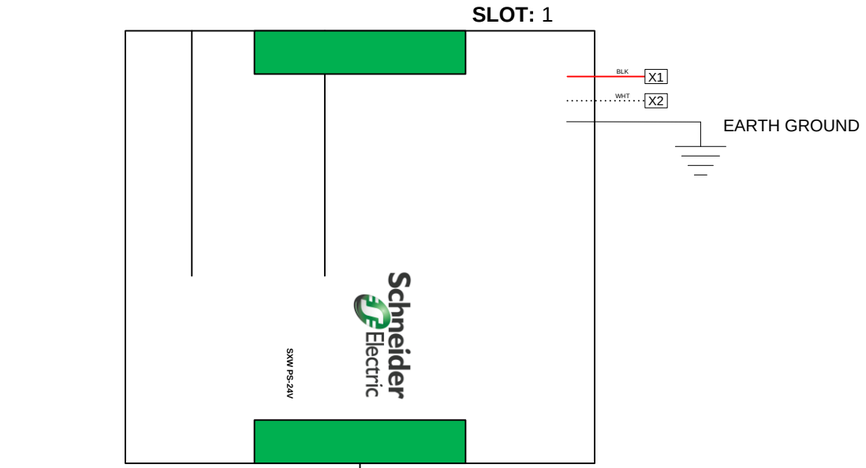
DATE: 8-13-13

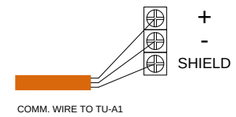
JOB NO.

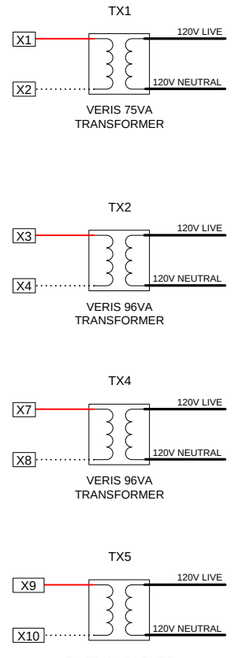
DWG NO. TC-4 of 14

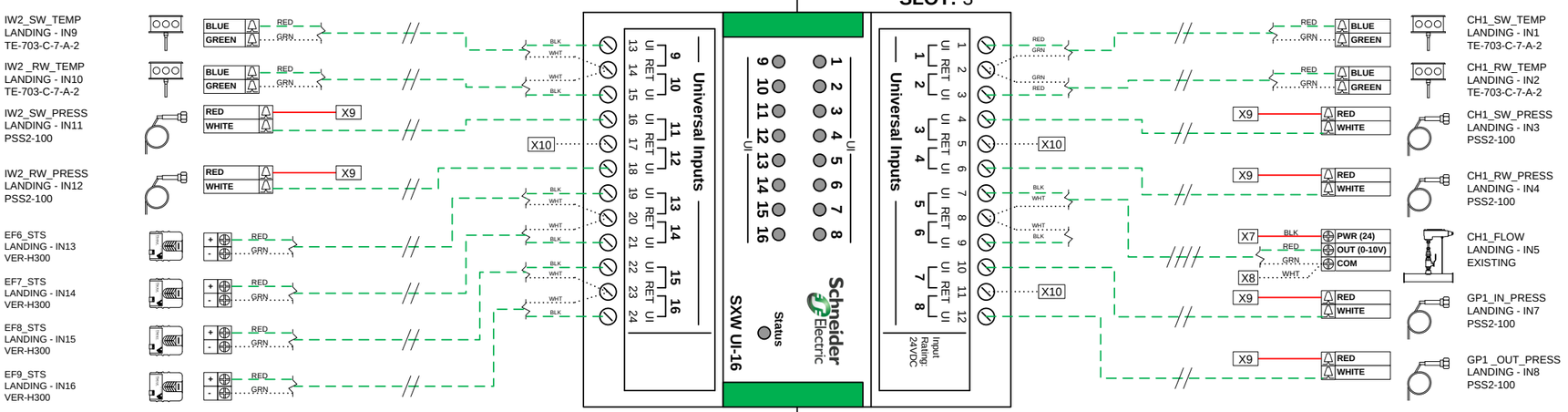
Bill of Materials

Manufacturer	Description	Part Number	Quantity
Kele	Wet Differential Pressure Sensor	PSS2-100	6
Mamac	Immersion Temperature Probe	TE-703-C-7-A-2	4
Veris	75VA Transformer	X075CBA	1
Veris	96VA Transformer	X100CBA	1
Veris	Current Sensor	VER-H300	4
Schneider Electric	Power Supply	SXW-PS-24V	1
Schneider Electric	Automation Servers	SXW AS-B	1
Schneider Electric	Input Module	SXW UI-16	1









Continued on page TC-6

As Built

BIAC
HVAC/Controls
Security/Access Controls
Service and Monitoring

Schneider Electric

PROJECT: NASA INFRARED TELESCOPE FACILITY

DRAWING TITLE: ATC SLOTS 1-3

REVISIONS:

DRAWN BY: AG

ENG. BY: JL

CHK'D BY: JL

DATE: 8-13-13

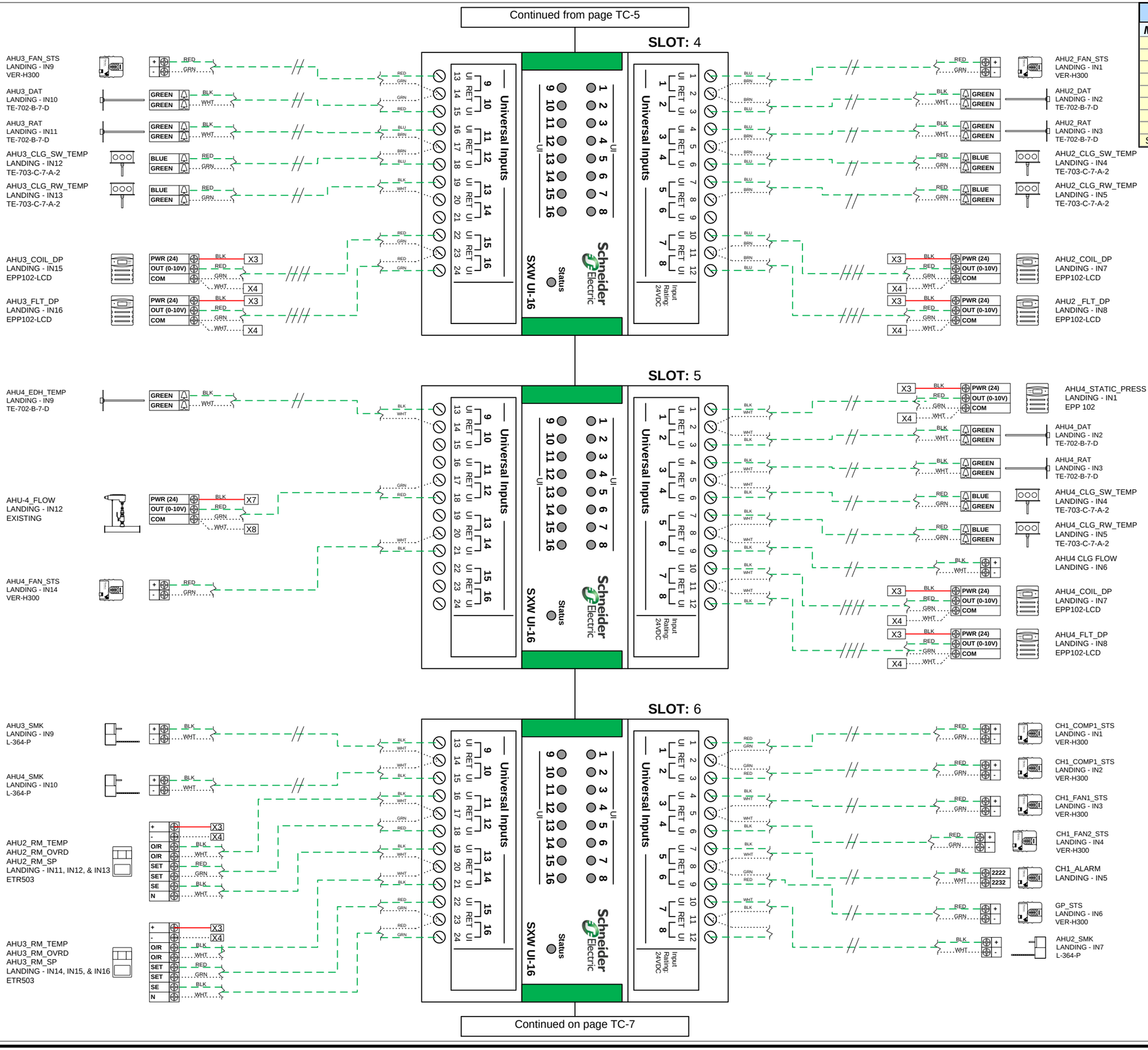
JOB NO.

DWG NO. TC-5 of 14

Continued from page TC-5

Bill of Materials

Manufacturer	Description	Part Number	Quantity
APAC	Duct Smoke Detector	L-364-P	4
Mamac	Duct Temperature Sensor	TE-702-B-7-D	5
Mamac	Immersion Temperature Probe	TE-703-C-7-A-2	6
MAMAC	Duct Temperature Sensor	TE-702-B-7-D	2
TAC	Room Temperature Sensor	ETR503	3
TAC	Wet Differential Pressure Sensor	EPP102-LCD	6
Veris	96VA Transformer	X100CBA	2
Veris	Current Sensor	VER-H300	7
Schneider Electric	Input Module	SXW UI-16	3



Continued on page TC-7

As Built

BIAC

HVAC/Controls
Security/Access Controls
Service and Monitoring

Schneider Electric

PROJECT: NASA INFRARED TELESCOPE FACILITY

DRAWING TITLE: ATC SLOTS 4-6

REVISIONS:

DRAWN BY: AG

ENG. BY: JL

CHK'D BY: JL

DATE: 8-13-13

JOB NO.

DWG NO. TC-6 of 14

Continued from page TC-6

Bill of Materials

Manufacturer	Description	Part Number	Quantity
APAC	SPDT Relay	P-PAM-1	9
Schneider Electric	Dry Differential Pressure Sensor	EPP 102	1
TAC	Damper Actuator	MA40-7043	2
TAC	Valve Actuator	VBB3N06+M113A00	1
Veris	96VA Transformer	X100CBA	1
Veris	Room Temperature Sensor	ETR503	1
Veris	SPDT Relay	V100	7
Schneider Electric	Output Module	SXW DO-FA-12	1
Schneider Electric	Output Module	SXW DO-FC-8	1
Schneider Electric	Output/Input Module	SXW UI-8/AO-4	1
Schneider Electric	Outside Air Temp Sensor	EH0110-500-1	1

SLOT: 7

SXW DO-FA-12

AHU4_FAN_CMD
LANDING - OUT7

EF6_CMD
LANDING - OUT1

EF7_CMD
LANDING - OUT2

EF8_CMD
LANDING - OUT3

EF9_CMD
LANDING - OUT4

AHU4_EDH_STG1_CMD
LANDING - OUT5
V100

AHU4_EDH_STG2_CMD
LANDING - OUT6
V100

SLOT: 8

SXW DO-FC-8

AHU4_RA_DMPR
LANDING - OUT5
MA40-7043

AHU4_DEFROST_DMPR
LANDING - OUT6
MA40-7043

AHU4_SA_DMPR
LANDING - OUT7
MA40-7043

EARTH GROUND

CH1_CMD
LANDING - OUT1

GP1_CMD
LANDING - OUT2

AHU2_FAN_CMD
LANDING - OUT3

AHU3_FAN_CMD
LANDING - OUT4

SLOT: 9

SXW UI-8/AO-4

OSA_TEMP
LANDING - IN1
EH0110-500

AHU4_RM_TEMP
AHU4_RM_OVRD
AHU4_RM_SP
LANDING - IN2, IN3 & IN4
ETR503

IW1_STS
LANDING - IN7
VER-H300

IW2_STS
LANDING - IN8
VER-H300

AHU4_CLG_VLV
LANDING - OUT3
VBB3N07+M113A00

TX2
120V LIVE
120V NEUTRAL
VERIS 96VA
TRANSFORMER

Continued on page TC-8

As Built

BIAC
HVAC/Controls
Security/Access Controls
Service and Monitoring

Schneider Electric

PROJECT: NASA INFRARED TELESCOPE FACILITY

DRAWING TITLE: ATC SLOTS 7-9

REVISIONS:

DRAWN BY: AG

ENG. BY: JL

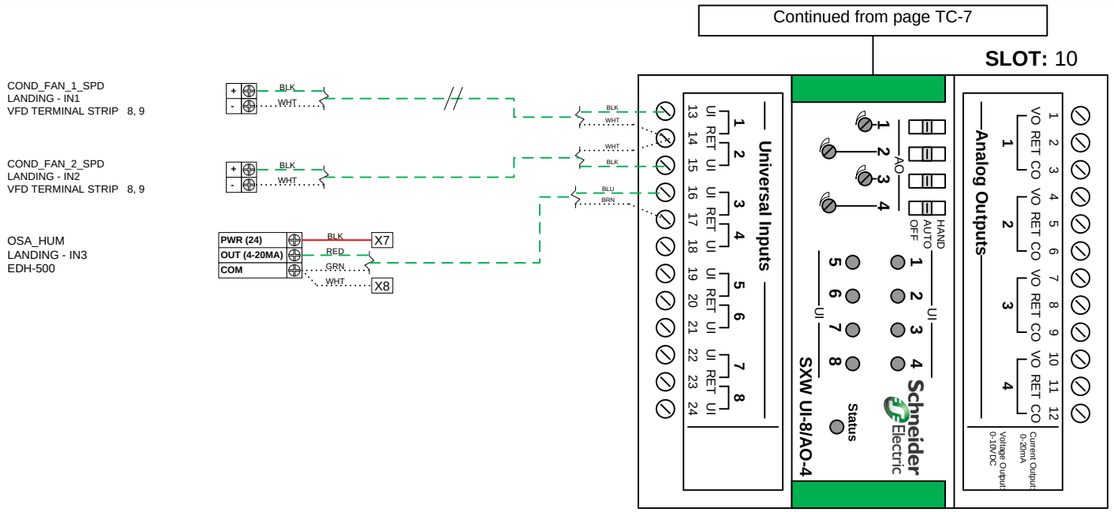
CHK'D BY: JL

DATE: 8-13-13

JOB NO.

DWG NO. TC-7 of 14

Continued from page TC-7



Bill of Materials

Manufacturer	Description	Part Number	Quantity
Schneider Electric	IO Module	UI-8/AO-4	1

As Built

BIAC

HVAC/Controls
Security/Access Controls
Service and Monitoring

Schneider Electric

PROJECT: NASA INFRARED TELESCOPE FACILITY

DRAWING TITLE: ATC SLOT 10

REVISIONS:

DRAWN BY: AG

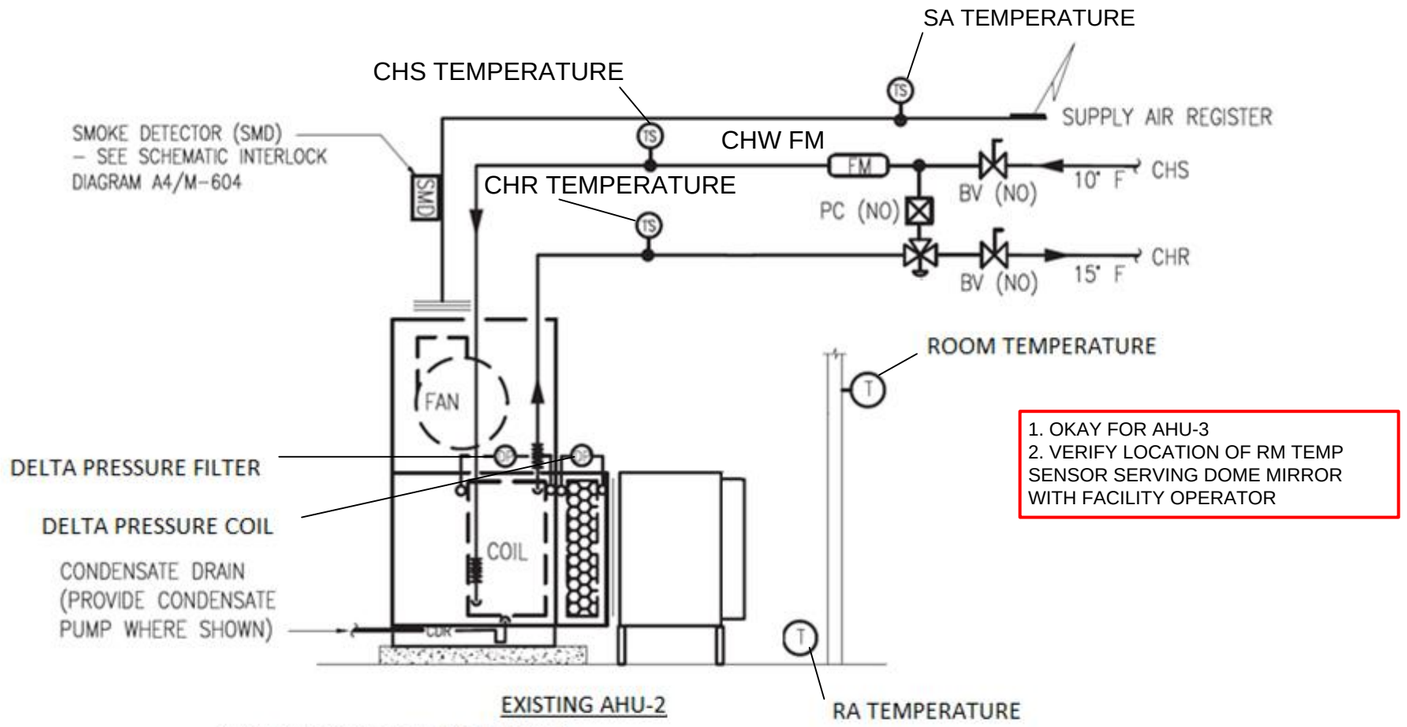
ENG. BY: JL

CHK'D BY: JL

DATE: 8-13-13

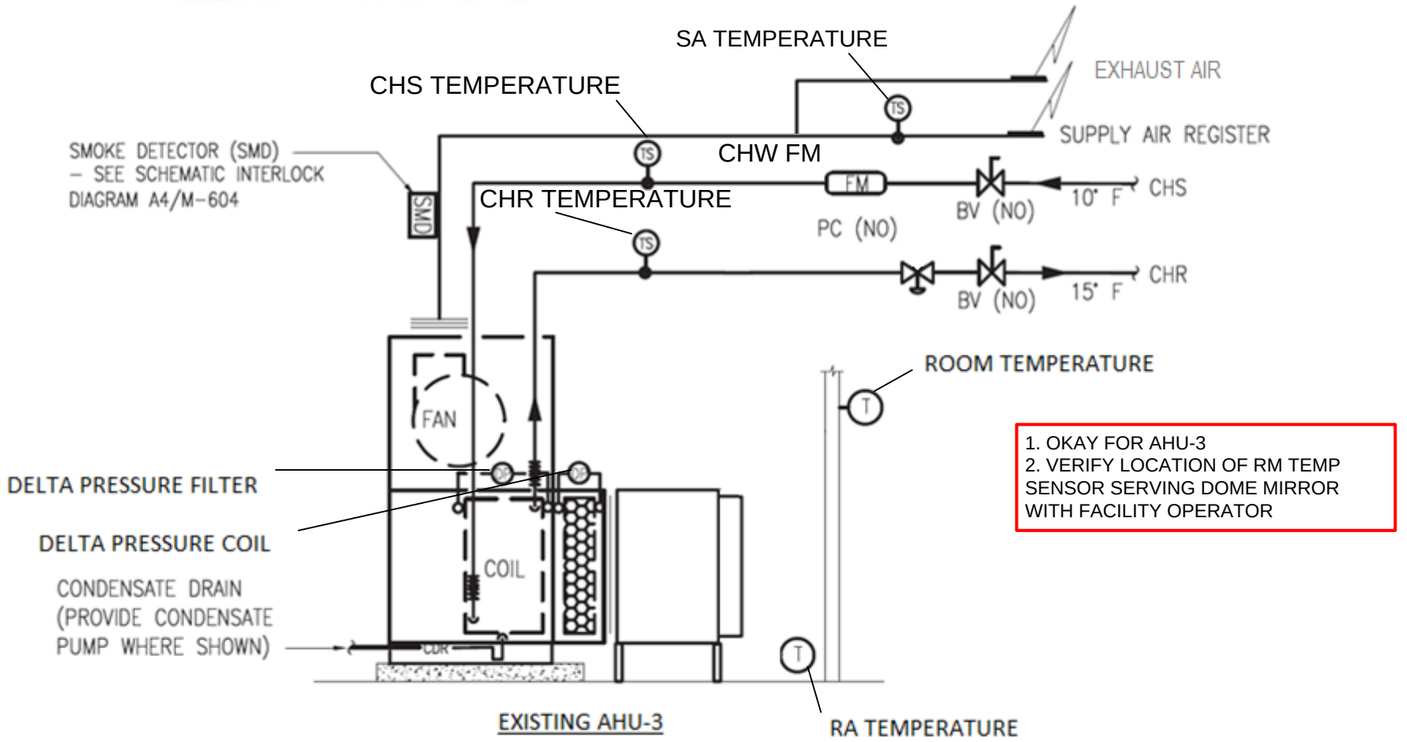
JOB NO.

DWG NO. TC-8 of 14



EXISTING AHU-2

(E) AHU-2 SERVES DOME MIRROR



EXISTING AHU-3

(E) AHU-3 SERVES DOME

As Built

BIAC

HVAC/Controls
Security/Access Controls
Service and Monitoring

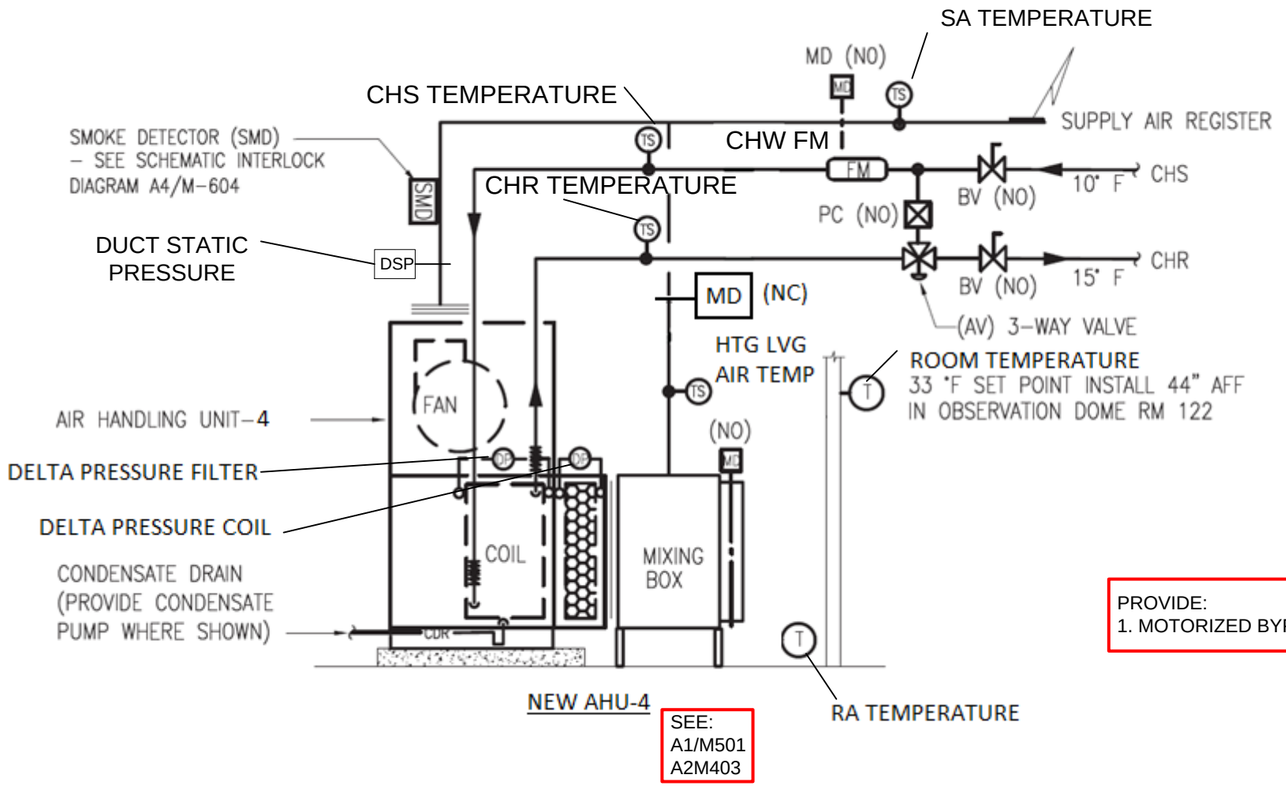
Schneider Electric

PROJECT: NASA INFRARED TELESCOPE FACILITY

DRAWING TITLE: ATC EQUIPMENT A

REVISIONS:

DRAWN BY:	AG
ENG. BY:	JL
CHK'D BY:	JL
DATE:	8-13-13
JOB NO.	
DWG NO.	TC-9 of 14



PROVIDE:
1. MOTORIZED BYPASS DAMPER

As Built

BIAC
HVAC/Controls
Security/Access Controls
Service and Monitoring

Schneider Electric

PROJECT: NASA INFRARED TELESCOPE FACILITY

DRAWING TITLE: ATC EQUIPMENT B

REVISIONS:

DRAWN BY: AG

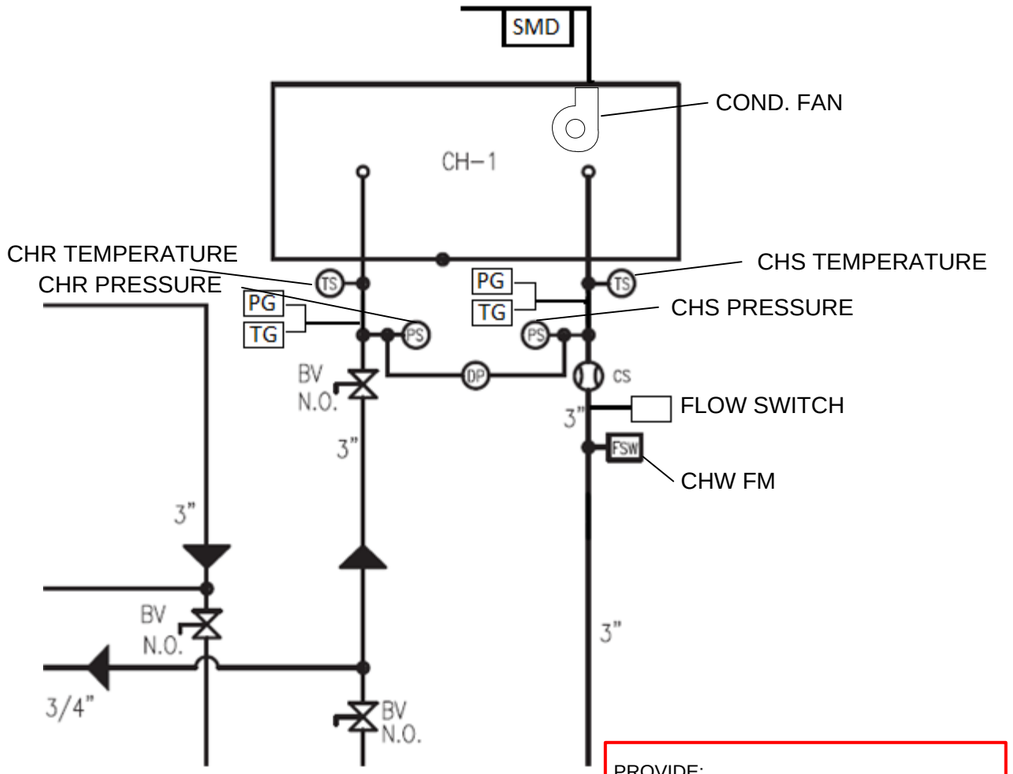
ENG. BY: JL

CHK'D BY: JL

DATE: 8-13-13

JOB NO.

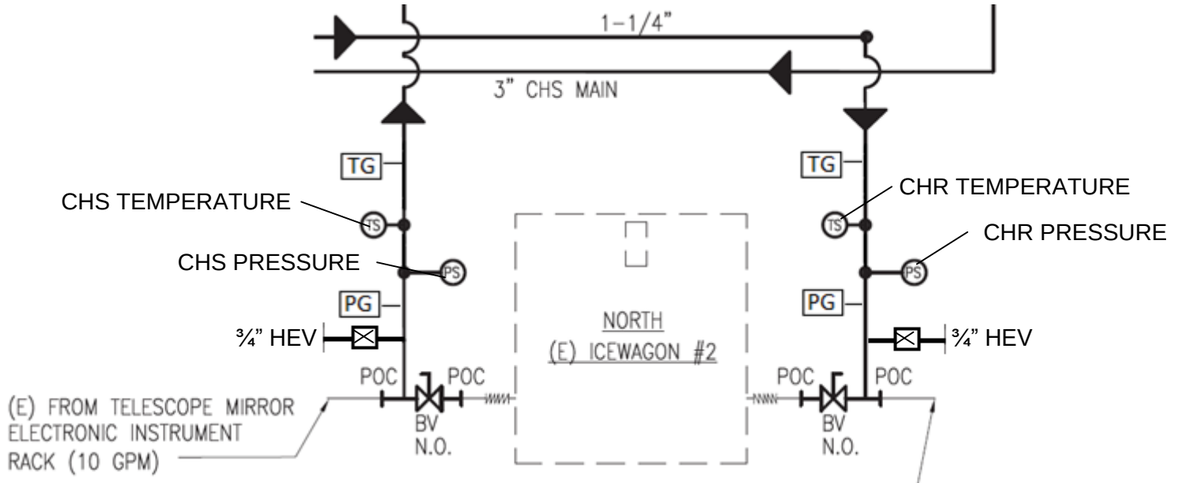
DWG NO. TC-10 of 14



CH-1

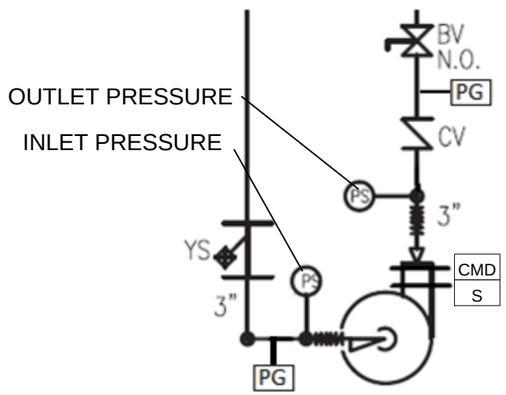
SEE:
A1/M604
B4/M501

PROVIDE:
1. CHS TEMP RESET



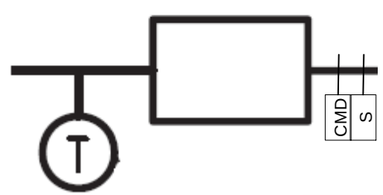
ICE WAGON-2

SEE:
A1/M604
A2/M603



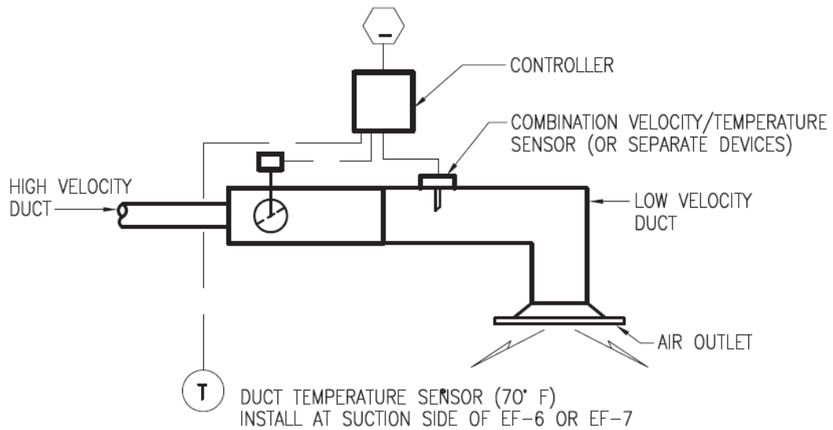
GP-1

SEE:
A1/M604
A2/M603



EF-6, 7, 8, 9

PROVIDE
1. MOTORIZED DAMPERS FOR EF-9
SEE A2/M402, A4/M604, C3/M301



TU-A1, B1, B2, B3

As Built

BIAC
HVAC/Controls
Security/Access Controls
Service and Monitoring

Schneider Electric

PROJECT: NASA INFRARED TELESCOPE FACILITY

DRAWING TITLE: ATC EQUIPMENT C

REVISIONS:

DRAWN BY: AG

ENG. BY: JL

CHK'D BY: JL

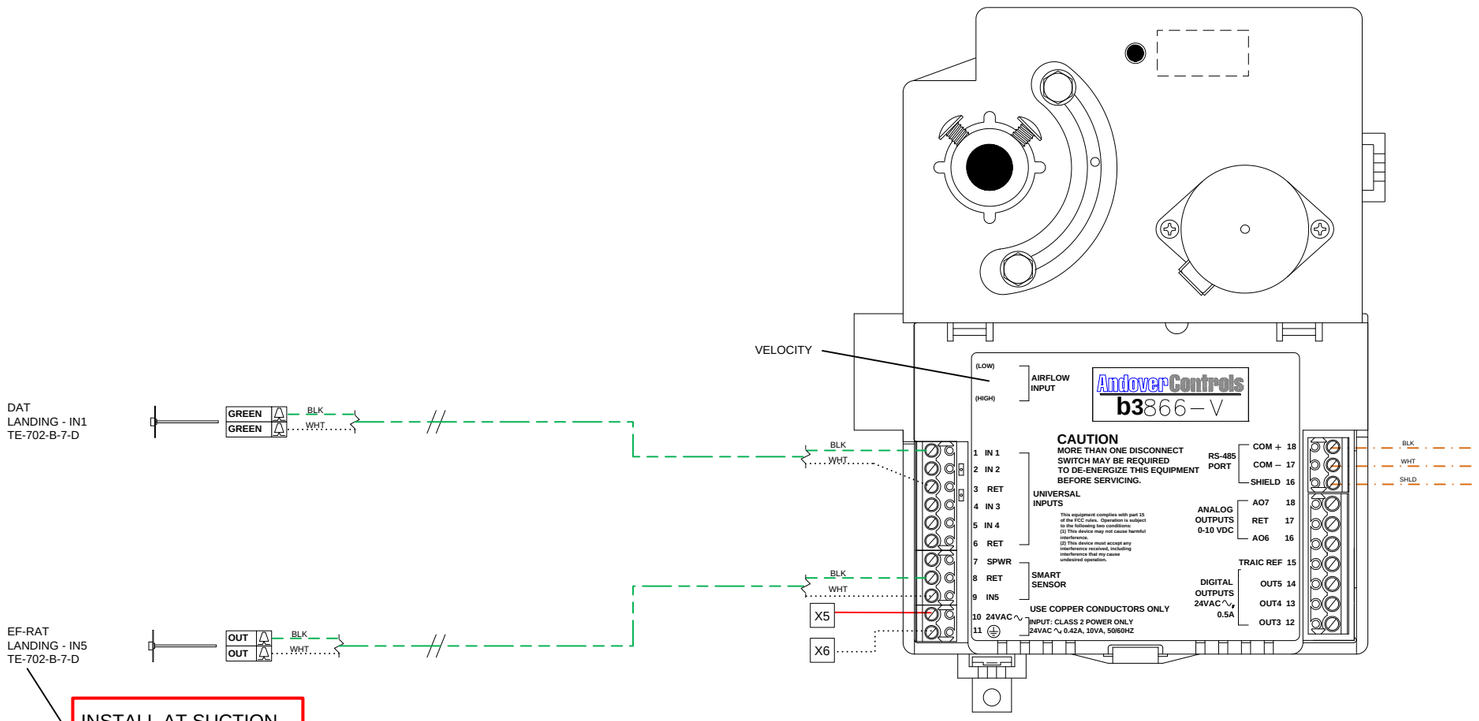
DATE: 8-13-13

JOB NO.

DWG NO. TC-11 of 14

Bill of Materials

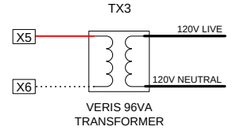
Manufacturer	Description	Part Number	Quantity
Andover	Controller	b3866-V	1
MAMAC	Duct Temperature Sensor	TE-702-B-7-D	2
Veris	96VA Transformer	X100CAB	1



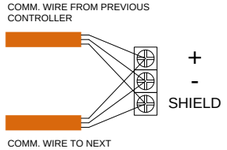
INSTALL AT SUCTION SIDE OF EF-6 & EF-7 SET @ 70°

TU-B2 & TU-B3
TO BE CONTROLLED BY DDC AS LONG AS CHILLER IS ENABLED. DDC TO MONITOR AND TOTALIZE TU-B2 &TU-B3 CFM AND DEDUCT CHILLER-1 AND DISCHARGE EXCESS AIR THRU EXISTING LOUVER VIA TU-B2 & TU-B3

TU-B2 & TU-B3
SEE A4/M602 PROVIDE
1. CONTROLLER INFORMATION TO DDC #1-6
2. COMMANDS ACCEPTED FROM DDC #1-3
3. THE MIN CFM FOR TU-A1 & TU-B1 TO BE SET @ 30% OF DESIGN CFM



VERIS 96VA TRANSFORMER



As Built

BIAC
HVAC/Controls
Security/Access Controls
Service and Monitoring

Schneider Electric

PROJECT: NASA INFRARED TELESCOPE FACILITY

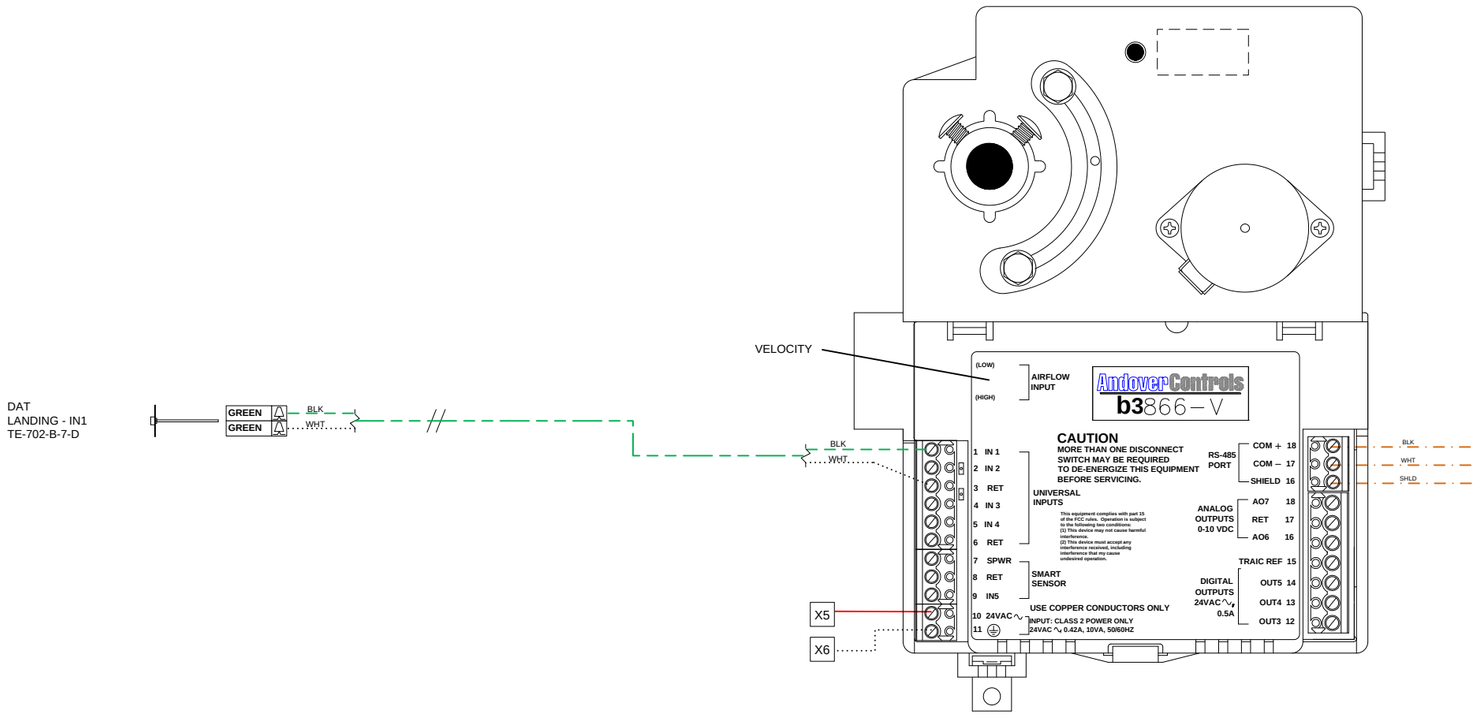
DRAWING TITLE: TU-A1 & TU-B1

REVISIONS:

DRAWN BY:	AG
ENG. BY:	JL
CHK'D BY:	JL
DATE:	8-13-13
JOB NO.	
DWG NO.	TC-12 of 14

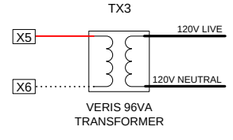
Bill of Materials

Manufacturer	Description	Part Number	Quantity
Andover	Controller	b3866-V	1
MAMAC	Duct Temperature Sensor	TE-702-B-7-D	2
Veris	96VA Transformer	X100CAB	1

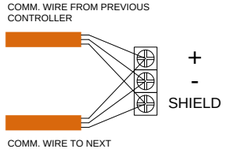


TU-B2 & TU-B3
TO BE CONTROLLED BY DDC AS LONG AS CHILLER IS ENABLED. DDC TO MONITOR AND TOTALIZE TU-B2 &TU-B3 CFM AND DEDUCT CHILLER-1 AND DISCHARGE EXCESS AIR THRU EXISTING LOUVER VIA TU-B2 & TU-B3

TU-B2 & TU-B3
SEE A4/M602 PROVIDE
1. CONTROLLER INFORMATION TO DDC #1-6
2. COMMANDS ACCEPTED FROM DDC #1-3
3. THE MIN CFM FOR TU-A1 & TU-B1 TO BE SET @ 30% OF DESIGN CFM



VERIS 96VA TRANSFORMER



As Built

BIAC
HVAC/Controls
Security/Access Controls
Service and Monitoring

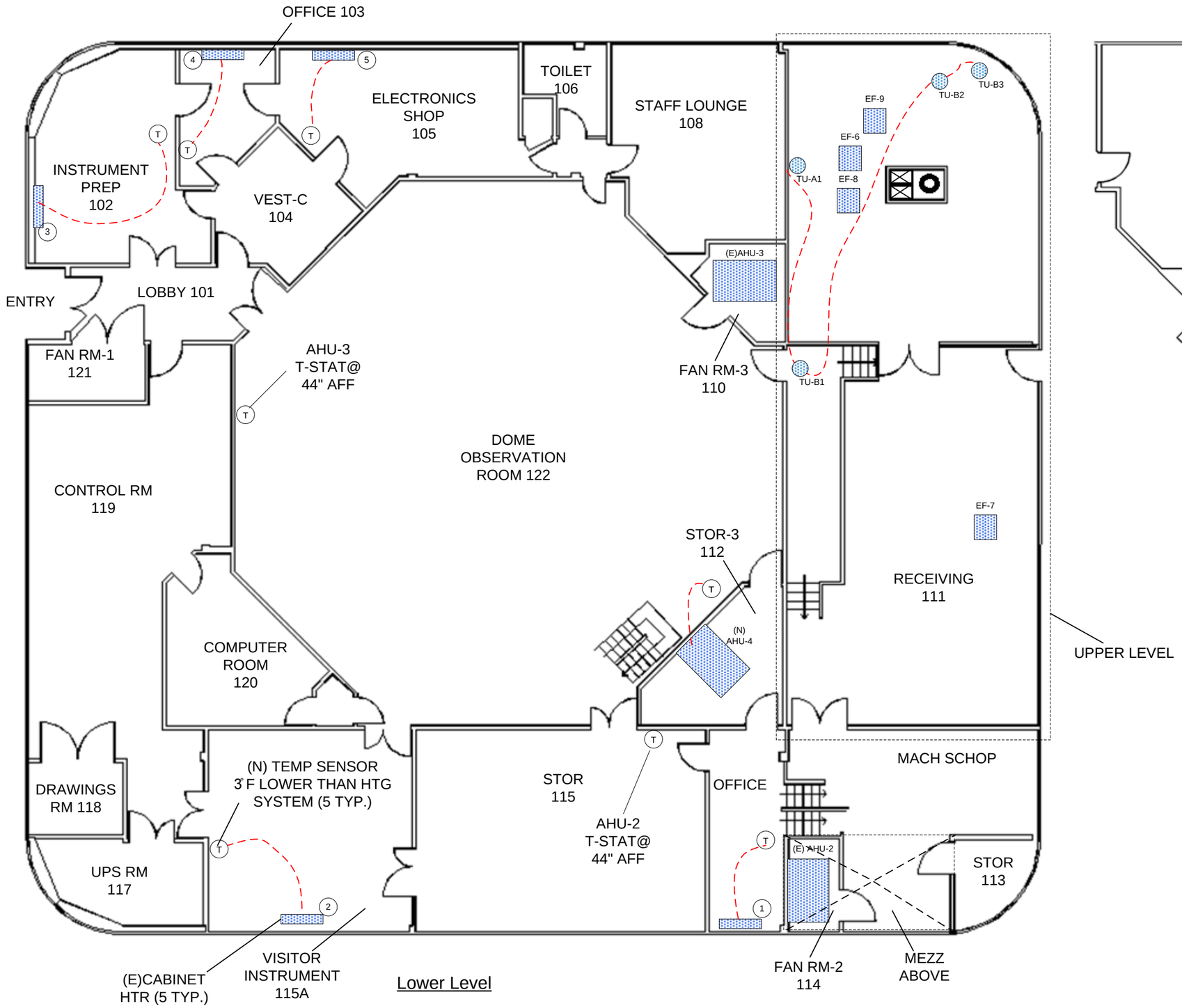
Schneider Electric

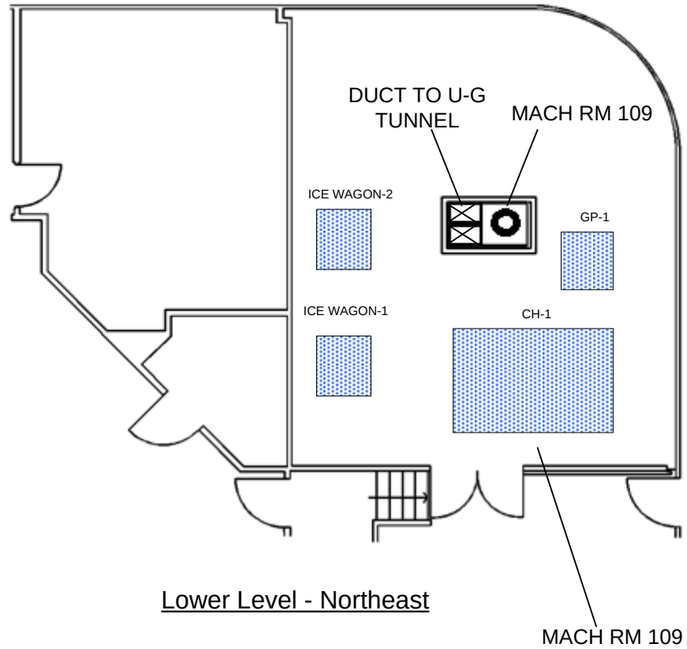
PROJECT: NASA INFRARED TELESCOPE FACILITY

DRAWING TITLE: TU-B2 & TU-B3

REVISIONS:

DRAWN BY: AG
ENG. BY: JL
CHK'D BY: JL
DATE: 8-13-13
JOB NO.
DWG NO. TC-13 of 14





Lower Level - Northeast

N
W E
S

As Built

BIAC

HVAC/Controls
Security/Access Controls
Service and Monitoring

Schneider Electric

PROJECT: NASA INFRARED TELESCOPE FACILITY

DRAWING TITLE: FLOOR PLAN

REVISIONS:

DRAWN BY:	AG
ENG. BY:	JL
CHK'D BY:	JL
DATE:	8-13-13
JOB NO.	
DWG NO.	TC-14 of 14