AUTOMATIC HVAC SYSTEM FINAL PROJECT REPORT



Prepared for:

Mr. Jamie Douglas

Confederation College

EL-431Automation Control System-I

Prepared By : Arulkumaran Pasupathy

&

Neepkumar Patel

Date Submitted : 2023-04-16

Due Date : 2023-04-17

ARUL & NEEP
Name



Date:__16/04/2023____

EL431 FINAL PROJECT

AUTOMATIC HVAC SYSTEM

TABLE OF CONTENT

4	INTRODUCTION	02
4	PROCEDURES INVOLVED IN DEVELOPING THE PROJECT	03
4	TAG LIST	05
4	LADDER LOGIC	0 7
4	OPERATOR CONSOLE LAYOUT	15
4	P&ID CAD DRAWING	16
4	CPM WIRING SCHEMATIC	17
4	BPM WIRING SCHEMATIC	18
4	CONSOLE INPUT WIRING SCHEMATIC	19
4	CONSOLE OUTPUT WIRING SCHEMATIC	20

INTRODUCTION:

An AHU (Air Handling Unit) in an HVAC (Heating, Ventilation, and Air Conditioning) system is a central component that handles the air and circulates it throughout the building using Return Air Fan (RAF). It is responsible for mixing, heating, cooling, and cleaning the air before it is distributed to various rooms and spaces through ductwork. The AHU consists of an air blower, heating or cooling coil, filters, and control system. AHU and RAF will start only if the Supply Air Damper (SAD) and Return Air Damper (RAD) are open. And based on the temperature selector switch (TSH/TSL) cooling water is supplied from a chiller unit by opening the chiller pump flow valve for the TSH position and hot water is supplied from a boiler unit after opening the boiler pump flow valve for the TSL position of the selector switch. Both the Chiller water pump (CPM) and Boiler water pump (BPM) cannot run at the same time. Once the AHU and RAF stop after a short period of time both the chiller and boiler water pump should stop. In case of emergency if the E_Stop button is pressed then all machines operating should come to a stop immediately.

AHU/Return Air Fan Operation:

The AHU/Return Air FAN will operate in Hand mode or Auto Mode:

In Hand:

- 1. AHU/RAF Cannot start until the CPM/BPN has run for at least 7 seconds (permissive).
- 2. A green indicator light will blink showing a "ready to start" status if permissive (RAD/SAD Open) and interlocks (CPM/BPM) are satisfied.
- 3. AHU/RAF will start if the operator presses Start at this point.
- 4. Upon starting, the same green light will go solid.
- 5. Will stop if the E-stop is pressed or an interlock is lost. (ie CPM/BPM stops)

In Auto:

- 1. The AHU/RAF cannot start until the CPM/BPN has run for at least 7 seconds.
- 2. While CPM/BPM is running from 0-10 seconds a green indicator light will blink indicating AHU/RAF is about to start in auto.
- 3. AHU/RAF run as soon as permissive (RAD/SAD Open) and interlocks (CPM/BPM) are satisfied with an AUTO_START tag.
- 4. Upon starting, the same green light will go solid.
- 5. Will stop if the E-stop is pressed or an interlock is lost. (ie CPM/BPM stops)

Chiller pump (CPM) / Boiler Pump (BPM) Operation:

The CPM/BPM Pump can operate in Hand mode or Auto Mode and dictates if the AHU/RAF is in Hand or Auto. In Hand:

- 1. The CPM/BPM will start to run if the start PB is pressed.
- 2. If CPM is running BPM cannot be started and if BPM is running CPM cannot be started (interlock)
- 3. Upon starting, a red light will go on.
- 4. If the AHU/RAF starts, then stops:
 - a. The red light will begin to blink after 5 seconds of the AHU/RAF stopping.
 - b. Continue to blink until the CPM/BPM is turned off by the OFF on the HOA.

In Auto:

- 1. Once in Auto, the CPB/BPM will start if FV_CPM/FV_BPM (chiller pump/ boiler pump valve) is ON (permissive) and the Operator selects the Temp High/ Low switch.
- 2. Upon starting, a red light will go on.
- 3. Once the AHU/RAF is stopped;
 - a. The CPM/BPM continues to run for 5 seconds and then stops.
 - b. The red light will blink until the CPM/BPM Pump is stopped.

EL 431 Page 2 of 14

PROCEDURES INVOLVED IN DEVELOPING THE PROJECT:

PART A: Creating P&ID

1. With the provided P&ID legend, using all standard ISO symbols of blowers, filters, pumps, damper valves, and flow valves we created an ISO standard P&ID (attached in this report).

PART B: Completing the Schematic:

- 1. Using the PID, we created schematics for CPM, PBM, AHU & RAF and assigned the proper addresses for all equipment involved in the project.
- 2. With the help of the below table created all wiring involved in the project is checked:

EQUIPMENT TAG	IO ADDRESS	WIRE CHECK
AHU 080 FDBK	%Q00013	X
AHU_080_HOA	%I00013	X
AHU_080_RUN_XL	%Q00007	X
AHU_080_START	%I00011	X
AHU 080 STOP	%I00011 %I00015	X
BPM 080 FDBK	%I00019	X
BPM 080 RUN	%Q00020	X
BPM 080 RUN XL	%Q00006	X
BPM_080_START	%I00010	X
BPM_080_STOP	%I00014	X
CPM 080 FDBK	%I00021	X
CPM 080 RUN	%Q00021	X
CPM 080 RUN INDI	%Q00005	X
CPM 080 START	%I00009	X
CPM_080_STOP	%I00013	X
DPSH_083	%I00004	X
DPSHA_080_XL	%Q00004	X
ESTOP	%I00023	X
FV_081_CPM	%100005	X
FV_081_CPM_XL	%Q00009	X
FV_082_BPM	%I00006	X
FV_082_BPM_XL	%Q00010	X
RAD_080_ON	%I00007	X
RAF_080_RUN	%Q00011	X
RAF_080_RUN_XL	%Q00008	X
SAD_080_ON	%I00003	X
SAD_080_XL	%Q00003	X
TSH_080	%I00001	X
TSH_080_XL	%Q00001	X
TSL_080	%I00002	X
TSL_080_XL	%Q00002	X

EL 431 Page 3 of 14

PART C: Developing the Logic:

- 3. Developed 11 Ladder Diagram Blocks as follows,
 - a. CPM_080
 - This routine will contain all rungs for controlling and indicating the CPM pump is running, including permissive, interlocks, and indications.
 - b. BPM 080
 - i. This routine will contain all rungs for controlling and indicating the BPM pump is running, including permissive interlocks and indications.
 - c. AHU_080
 - This routine will contain all rungs for controlling and indicating the AHU Fan is running, including permissive interlocks and indications.
 - d. RAF_080
 - i. This routine will contain all rungs for controlling and indicating the RAF Fan is running.
 - e. DPSH 080
 - i. This routine will contain all rungs for controlling differential pressure switch with a TON timer and indicating the differential pressure high alarm.
 - f. FLASHER
 - i. This routine will contain all rungs for flashing lights to indicate a system is ready.
 - g. FV_CPM_080
 - i. This routine will contain a rung for controlling the FV_CPM switch and an ON indication.
 - h. FV BPM 080
 - i. This routine will contain a rung for controlling the FV_BPM switch and an ON indication.
 - i. SAD 080
 - i. This routine will contain a rung for controlling the Supply air damper switch and an ON indication.
 - j. RAD_080
 - This routine will contain a rung for controlling the Return air damper switch and an ON indication.
 - k. TSH_080
 - This routine will contain two rungs for controlling the Temperature switch high and low an ON indications for both high and low.
- 4. To design the ladder logic in the PLC program to run this schematic.
- 5. To demonstrate the working system.
- 6. To Lockout buckets, unplug all items and clean up the workstation after the demonstration.

EL 431 Page 4 of 14

TAG LIST:

IAG LIST:		T	
Name	DataType	Description	IOAddress
AHU_080_FDBK	BOOL	AHU_080 RUN FDBK	%Q00013
AHU_080_HOA	BOOL	AHU_080 HOA =0	%100018
AHU_080_INTLK	BOOL	AHU_080 RUN INTERLOCK	<symbolic></symbolic>
AHU_080_PERM	BOOL	AHU_080 RUN PERMISSIVE	<symbolic></symbolic>
AHU_080_RUN_XL	BOOL	AHU_080 RUN INDICATION	%Q00007
AHU_080_START	BOOL	AHU_080 START PB	%100011
AHU_080_STOP	BOOL	AHU_080 STOP PB	%100015
BPM_080.BPM_STOP_TMR	TOF		<symbolic></symbolic>
BPM_080.BPM_STOP_TMR.IN	BOOL		<symbolic></symbolic>
BPM_080.BPM_STOP_TMR.PT	DINT		<symbolic></symbolic>
BPM_080.BPM_STOP_TMR.Q	BOOL		<symbolic></symbolic>
BPM_080.BPM_STOP_TMR.ET	DINT		<symbolic></symbolic>
BPM_080.BPM_STOP_TMR.ENO	BOOL		<symbolic></symbolic>
BPM_080.BPM_STOP_TMR.TI	BOOL		<symbolic></symbolic>
BPM_080.BPM_test	TON		<symbolic></symbolic>
BPM_080.BPM_test.IN	BOOL		<symbolic></symbolic>
BPM_080.BPM_test.PT	DINT		<symbolic></symbolic>
BPM_080.BPM_test.Q	BOOL		<symbolic></symbolic>
BPM_080.BPM_test.ET	DINT		<symbolic></symbolic>
BPM_080.BPM_test.ENO	BOOL		<symbolic></symbolic>
BPM_080.BPM_test.TI	BOOL		<symbolic></symbolic>
BPM_080.BPM_TON	TON		<symbolic></symbolic>
BPM_080.BPM_TON.IN	BOOL		<symbolic></symbolic>
BPM_080.BPM_TON.PT	DINT		<symbolic></symbolic>
BPM_080.BPM_TON.Q	BOOL		<symbolic></symbolic>
BPM_080.BPM_TON.ET	DINT		<symbolic></symbolic>
BPM_080.BPM_TON.ENO	BOOL		<symbolic></symbolic>
BPM_080.BPM_TON.TI	BOOL		<symbolic></symbolic>
BPM_080_FDBK	BOOL	BPM_080 RUN FDBK	%100019
BPM_080_INLK	BOOL	BPM_080 RUN INTERLOCK	<symbolic></symbolic>
BPM_080_PERM	BOOL	BPM_080 RUN PERMISSIVE	<symbolic></symbolic>
BPM_080_RUN	BOOL	BPM_080 RUN COMMAND	%Q00020
BPM_080_RUN_XL	BOOL	BPM_080 RUN INDICATION	%Q00006
BPM_080_START	BOOL	BPM_080 START PB	%100010
BPM_080_STOP	BOOL	BPM_080 STOP PB	%I00014
BPM_080_STOP_5s	BOOL	BPM_080 STOP TMR 5s	<symbolic></symbolic>
BPM_080_STOP_7s	BOOL	BPM_080 STOP TMR 7s	<symbolic></symbolic>
BPM_080_XL	BOOL	BPM_080 RUN INDICATION	<symbolic></symbolic>
BPM_STOP_TMR_et	DINT		<symbolic></symbolic>
CPM_080.CPM_TON_TMR	TON		<symbolic></symbolic>
CPM_080.CPM_TON_TMR.IN	BOOL		<symbolic></symbolic>
CPM_080.CPM_TON_TMR.PT	DINT		<symbolic></symbolic>
CPM_080.CPM_TON_TMR.Q	BOOL		<symbolic></symbolic>

EL 431 Page 5 of 14

CDM 000 CDM TON TMD ET	DIME		.C 1 11 .
CPM_080.CPM_TON_TMR.ET	DINT		<symbolic></symbolic>
CPM_080.CPM_TON_TMR.ENO	BOOL		<symbolic></symbolic>
CPM_080.CPM_TON_TMR.TI	BOOL	CDM 000 DVD FEEDD ACW	<symbolic></symbolic>
CPM_080_FDBK	BOOL	CPM_080 RUN FEEDBACK	%100021
CPM_080_INTLK	BOOL	CPM_080 RUN INTERLOCK	<symbolic></symbolic>
CPM_080_PERM	BOOL	CPM_080 RUN PERMISSIVE	<symbolic></symbolic>
CPM_080_RUN	BOOL	CPM_080 RUN COMMAND	%Q00021
CPM_080_RUN_INDI	BOOL	CPM_080 RUN INDICATION	%Q00005
CPM_080_START	BOOL	CPM_080 START PB	%I00009
CPM_080_STOP	BOOL	CPM_080 STOP PB	%I00013
CPM_080_STOP_5s	BOOL	CPM_080 STOP TMR 5s	<symbolic></symbolic>
DPSH_080.TON_DSP	TON		<symbolic></symbolic>
DPSH_080.TON_DSP.IN	BOOL		<symbolic></symbolic>
DPSH_080.TON_DSP.PT	DINT		<symbolic></symbolic>
DPSH_080.TON_DSP.Q	BOOL		<symbolic></symbolic>
DPSH_080.TON_DSP.ET	DINT		<symbolic></symbolic>
DPSH_080.TON_DSP.ENO	BOOL		<symbolic></symbolic>
DPSH_080.TON_DSP.TI	BOOL		<symbolic></symbolic>
DPSH_083	BOOL	DIFF PRESSURE SWITCH	%100004
DPSHA_080_XL	BOOL	DIFF PRESSURE SWITCH ALARM INDICATION	% Q00004
ESTOP	BOOL	EMERGENCY STOP	%100023
FLASH	BOOL	FLASHER BIT	<symbolic></symbolic>
FLASHER.FSH_RESET	TON		<symbolic></symbolic>
FLASHER.FSH_RESET.IN	BOOL		<symbolic></symbolic>
FLASHER.FSH_RESET.PT	DINT		<symbolic></symbolic>
FLASHER.FSH_RESET.Q	BOOL		<symbolic></symbolic>
FLASHER.FSH_RESET.ET	DINT		<symbolic></symbolic>
FLASHER.FSH_RESET.ENO	BOOL		<symbolic></symbolic>
FLASHER.FSH RESET.TI	BOOL		<symbolic></symbolic>
FLASHER.Timer_off	TOF		<symbolic></symbolic>
FLASHER.Timer_off.IN	BOOL		<symbolic></symbolic>
FLASHER.Timer off.PT	DINT		<symbolic></symbolic>
FLASHER.Timer_off.Q	BOOL		<symbolic></symbolic>
FLASHER.Timer_off.ET	DINT		<symbolic></symbolic>
FLASHER.Timer_off.ENO	BOOL		<symbolic></symbolic>
FLASHER.Timer_off.TI	BOOL		<symbolic></symbolic>
FV_081_CPM	BOOL	FV_081 CPM ON SWITCH	%I00005
FV_081_CPM_XL	BOOL	FV_081_CPM ON INDICATION	%Q00009
FV_082_BPM	BOOL	FV_082 BPM ON SWITCH	%I00006
FV_082_BPM_XL	BOOL	FV_082_BPM ON INDICATION	%Q00010
RAD_080_ON	BOOL	RAD_080 ON SWITCH	%I00007
RAF_080_RUN	BOOL	RAF_080 RUN COMMAND	%Q00011
RAF_080_RUN_XL	BOOL	RAF_080_RUN INDICATION	%Q00011 %Q00008
RESET_FLASH	BOOL	RESET FLASHER	<symbolic></symbolic>

EL 431 Page 6 of 14

SAD_080_ON	BOOL	SAD_080 ON SWITCH	%100003
SAD_080_XL	BOOL	SAD_080 ON INDICATION	%Q00003
TSH_080	BOOL	TSH_080 ON SWITCH	%100001
TSH_080_XL	BOOL	TSH_080 ON INDICATION	%Q00001
TSL_080	BOOL	TSL_080 ON SWITCH	%100002
TSL_080_XL	BOOL	TSL_080 ON INDICATION	%Q00002

LADDER LOGIC:

MAIN:

		CALL AHU_080									
1											
			4					4			
		CALL BPM_080									
2											
		CALL CPM_080									
											
3											
		CALL FLASHER									
4											
		CALL RAF_080									
5											
								•			
		CALL FV_080_BPM									
6											
		CALL FV_080_CPM									
7											
				A Committee of the Comm				4			
		CALL DPSH_080									
			_								
8											
							and the second				i e
		CALL SAD_080									
9											
- 1											
		CALLTS_080	•	*	•	•	•	•	•		•
		CWTT 12_080									
			_								
10											
	4		4	A Committee of the Comm	e de la companya de	e de la companya de					
	4		•	•	•	•	•	•	•	.	•
										.	

EL 431 Page 7 of 14

CPM_080_ROUTINE:

ESTOP	CPM_080_STOP		AUL080_HOA	CPM_080_START		CPM_080_INTLK		CPM_080_RU
EMERGENCY STOP	CPM_080 STOP PB		AHU_080 HOA =0	CPM_080 START PB		CPM_080 RUN INTERLOCK		CPM_080 RUN COMM
				CPM_080_FDBK				
				Add1000_M10				
				CPM_080 RUN FEEDBACE				
			AHU_080_HOA	•	CPM_080_PERM			
			AHU_080 HOA =0		CPM_080 RUN PERMISSIV	E		
			-					
FV_081_CPM_XL	TSH_080_XL	•	•				•	CPM_080_PER
FV_081_CPM ON INDICATION	TSH_080 ON INDICATION							CPM_080 RUM PERM
AHU_080_STOP	BPM_080_RUN			•				CPM_080_INT
AHU_080 STOP PB	BPM_080 RUN COMMAND							CPM_080 RUN INTER
AHU_080_HOA	. CPM_080_FDBK							CPM_080_RUN_II
AHU_080 HOA = 0	CPM_080 RUN FEEDBACK							CPM_080 RUN INDIC
	CPM_080_STOP_5s	FLASH		•	•			
	CPM_080 STOPTMR5s	FLASHER BIT						
AHU_080_HOA	CPM_080_FDBK	CPM_080_STOP		•	•		•	•
AHU_080 HOA = 0	CPM_080 RUN FEEDBACK	CPM_080 STOP PB						
	. CPM_080_STOP	Flash		÷				
	CPM_080 STOP PB	FLASHER BIT						
	011/_00010112	THIOLIN DI						
	•		•	•			•	•

EL 431 Page 8 of 14

BPM_080_ROUTINE:

	ESTOP	BPM_080_STOP		AHU_080_HOA	BPM_080_START		BPM_080_INLK		BPM_080_RUN
1	EMERGENCY STOP	BPM_080 STOP PB		AHU_080 HOA =0	BPM_080 START PB		BPM_080 RUN INTERLOCK	•	BPM_080 RUN COMMANI
		•			BPM 080 FDBK	·	•		
					BPM_080 RUN FDBK				
					DIM_000 ROB I DDR				
				AGU_080_UHA	BPM_080_PERM		·		
				AHU_080 HOA =0	BPM_080 RUN PERMISSIV	řE.	-		
	FV_082_BPM_XL	TSL_080_XL							BPM_080_PERM
2	FV_082_BPM ON INDICATION	TSL_080 ON INDICATION							BPM_080 BUN PERMISSIV
	CPM_080_RUN	AHU_080_STOP							BPM_080_INLK
3	CPM_080 RUN COMMANI	AHU_080 STOP PB							BPM_080 RUN INTERLOCI
		BPM_080_FDBK	BPM_080_STOP_5s						BPM_080_RUW_XL
4	O= AOH 080_UHA	BPM_080 RUN FDBK	BPM_080 STOP TMR 5s						BPM_080 BUN INDICATIO
		BPM_080_FDBK	FLASH						
		BPM_080 RUN FDBK	FLASHER BIT						
	AHU_080_HOA	BPM_080_FDBK	BPM_080_STOP			•	•		
	0= AOH 080_UHA	BPM_080 RUN FDBK	BPM_080 STOP PB						
		BPM_080_FDBK	FLASH			•	•		
	!	BPM_080 RUN FDBK	FLASHER BIT						
					•				
					•			•	

EL 431 Page 9 of 14

AHU_080_ROUTINE:

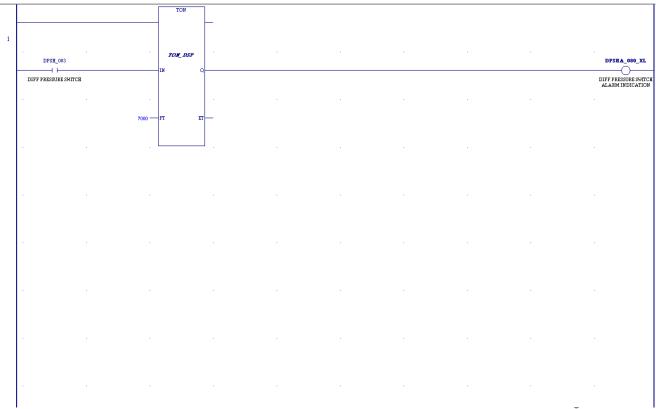
EFM_080_FDEK DFSHA_080_XL AND_080_FDEK DFSHA_080_XL AND_080_FDEK DFF PESSOURS SWITCH ALARM INDICATION AND_080_FDEK AND_080_FDEK AND_080_FDEK AND_080_FDEK AND_080_FDEK AND_080_FDEK AND_080_FDEK AND_080_FDEK AND_080_FDEK		ESTOP	AHU_080_STOP		AHU_080_HOA	AHU_080_START	AHU_080_PERM	AHO_080_INTLK		AHU_080_FDBK
AND SHORE AND SHORE AND SHORE AND SHORE SALES OF PRESENCE SHORE SH	1	EMERGENCY STOP	1				AHU_080 RUN PERMISSIVE	AHU_080 RUN INTERLOCK		AHU_080 RUN FDBK
ARILON REPORTER ARILON REPORTER ARILON REPORTER ARILON REPORTER CPALINN REPORTER ARILON REPORTER		***************************************	***************************************					·		
ARIL ON DOLA - ARIL ON FORE TRANSPORT ARIL ON ON FRANCISCO STATE ARIL ON THE ARIL ON					1					
ARE ONE DATE ARE ONE DATE ARE ONE PERMISSIVE CYM_ONE TITLE ARE ONE PERMISSIVE CYM_ONE TITLE ARE ONE PERMISSIVE CYM_ONE TITLE ARE ONE PERMISSIVE ARE ONE PERMISSIVE CYM_ONE TITLE ARE ONE PERMISSIVE ARE					AHU_080_HOA	AHU_080_PERM				
2 CPM_000 ENN FERDEACH RAD_000 ON SWITCE SAD_000				L		* * * * * * * * * * * * * * * * * * * *				
2 CPM_000 ENN FERDEACH RAD_000 ON SWITCE SAD_000										
2 CPM_000 ENN FERDEACH RAD_000 ON SWITCE SAD_000										
2 CPM_000 ENN FERDEACH RAD_000 ON SWITCE SAD_000										
BFM_000_FIDER DFEAL_000_XX CFM_000_FIDER DFEAL_000_XX CFM_000_FIDER DFFAL_000_XX ABU_000_FIDER		CPM_080_FDBK	RAD_080_ON	SAD_080_OM						AHU_080_INTLK
BPM_000 BON FIDEK CFM_000_FIDEK DFSBA_000_XI CFM_000_FIDEK DFSBA_000_XI ABU_000_FIDEK DFSBA_000_XI ABU_000_BOA ABU_000_FIDEK ABU_000_BOA A	2	CPM_080 RUN FEEDBACK	RAD_080 ON SWITCH	SAD_080 ON SWITCH						AHU_080 RUN INTERLOCE
SEPA_000 EON FDEK CPM_000 FDEK DPSRA_000_XL ARU_000_PDEK CPM_000 EON FEEDBACK DPSRA_000_XL ARU_000 EON FEEDBACK ARU_000 EON FEEDBACK ARU_000 EON FEEDBACK DPSRA_000_XL ARU_000 EON FEEDBACK ARU_			•						•	
ABU_000_BOA AHU_000_FDBK EPM_000_FDBK BPM_000_FDBK ABU_000_BOA AHU_000_FDBK										
AHU_000_HOA AHU_000_STOP FILASH AHU_000_FERM AHU_000_HOA AHU_000_STOP FILASH AHU_000_FERM AHU_000_HOA AHU_000_STOP FILASH AHU_000_FERM AHU_000_HOA AHU_000_STOP FILASH AHU_000_FERM AHU_000_STOP FILASH AHU_000_FERM AHU_000_STOP FILASH AHU_000_STOP FILASH AHU_000_FERM AHU_000_STOP FILASH STOP FILASH AHU_000_STOP FILASH STOP FILASH ST										_
AHU_080_HOA AHU_080_FDBK AHU_080_BOA -0 AHU_080_FDBK AHU_080_BOA -0 AHU_080_FDBK AHU_080_BOA -0 AHU_080_FDBK AHU_080_FDBF FLASH AHU_080_FDBM AHU_080_FDBF FLASH AHU_080_FDBM AHU_080_FDBA AHU_080_STOP AHU_080_FDBM AHU_080_HOA AHU_080_STOP AHU_080_FDBM AHU_080_HOA AHU_080_STOP AHU_080_FDBM AHU_080_HOA AHU_080_STOP FB AHU_080_FDBM	3									AHU_080 RUN PERMISSIV
AHU_000_ROM AHU_000_ROM FDEK AHU_000_EOA -0 AHU_000_STOF FLASH AHU_000_PERM AHU_000_STOF FLASHER BIT AHU_000_BOM FERMISSIVE AHU_000_BOA AHU_000_STOF AHU_000_THILK FLASH AHU_000_BOA AHU_000_STOF BHU_000_BOM FERMISSIVE AHU_000_BOA AHU_000_STOF FLASHER BIT AHU_000_BOA AHU_000_STOF FLASHER BIT AHU_000_BOA AHU_000_STOF BHU_000_BOM INTERLOCK FLASHER BIT		•	-			•			•	•
AHU_000 EDA + 0 AHU_000 STOP FLASH AHU_000 DUN FERMISSIVE AHU_000 STOP PB AHU_000 DOA AHU_000 STOP AHU_000 DUN INTERLOCK FLASHER BIT AHU_000 HOA + 0 AHU_000 STOP PB AHU_000 DOA + 0 AHU_000 STOP PB AHU_000 DOA + 0 AHU_000 STOP PB AHU_000 DOA + 0 AHU_000 DOA + 0 AHU_000 STOP PB AHU_000 DOA + 0 AHU_000 DOA + 0 AHU_000 DOA + 0 AHU_000 STOP PB AHU_000 DOA + 0 AHU_0				BPM_080 RUN FDBK						
AHU_000 ROA - 0 AHU_000 ROM FDEK AHU_000 STOF FLASH AHU_000 ROM FEEM AHU_000 STOP PB FLASHER BIT AHU_000 ROM FEEM AHU_000 BOA AHU_000 STOP AHU_000 LINTLK FLASH AHU_000 HOA - 0 AHU_000 ROM INTERLOCK FLASHER BIT AHU_000 HOA - 0 AHU_000 ROM INTERLOCK FLASHER BIT AHU_000 HOA - 0 AHU_000 ROM INTERLOCK FLASHER BIT					•				•	WHO 080 BON XI
AHU_080_HOA AHU_080_STOF AHU_080_INTLK FLASH AHU_080_HOA AHU_080_STOF AHU_080_INTLK FLASH AHU_080_HOA AHU_080_STOF AHU_080_INTLK FLASH AHU_080_HOA AHU_080_STOFPB AHU_080_RUNINTERLOCK FLASHER BIT AHU_080_HOA AHU_080_FLBEK AHU_080_LINTLK AHU_080_FLBEK	4									AHU_080 RUN INDICATIO
AHU_080 STOP PB FLASHER BIT AHU_080 SUN PERMISSIVE AHU_080_HOA AHU_080_STOP AHU_080_IMILK FLASH AHU_080 HOA *0 AHU_080 STOP PB AHU_080 KUN IMTERLOCK FLASHER BIT AHU_080 HOA *0 AHU_080 STOP PB AHU_080 FUNILK AHU_080_FUNILK AHU_08										
AHU_080 HOA * 0 AHU_080 STOP PB AHU_080 RUN INTERLOCK FLASHER BIT AHU_080_INTLK AHU_080_FDBK				FLASHER BIT	AHU_080 RUN PERMISSIVE					
AHU_000 HOA = 0 AHU_000 STOPFB AHU_000 RUM INTERLOCK FLASHER BIT AHU_000_INTLK AHU_000_FDBK										•
AHU_080 ROWINTERLOCK AHU_080 ROW FDBK			•							•
				AHU_080 RUN INTERLOCK	AHU_080 RUN FDBK					
				•		•			•	•

EL 431 Page 10 of 14

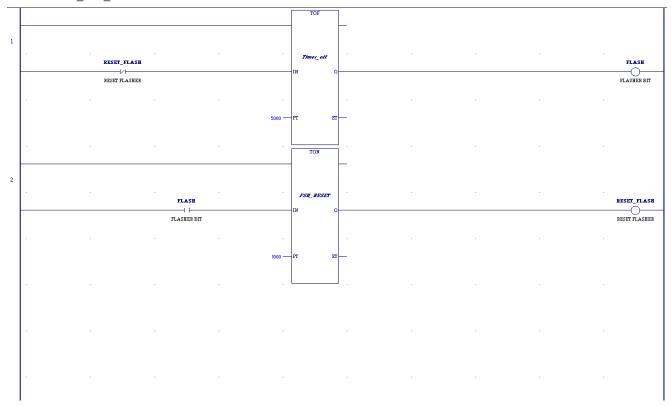
RAF_080_ROUTINE:

AHO_080_FDBK									
						RAF_080_RUN INDICAT			
					4				
•		•	•	•	•	•			
			•						

DPSH_080_ROUTINE:



FLASHER_080_ROUTINE:



FV_CPM_080_ROUTINE:

	FV_08LCPM										
1	FV_08 _CPM										
				•	,	•	•	,	•		

EL 431 Page 12 of 14

FV_BPM_080_ROUTINE:

FV_082_BPM									FV_082_BPM_X
FV_082 BPM ON SWITCE									
					,		,	,	
			•		•		•	•	

SAD_080_ROUTINE:

	SAD_080_OM									SAD_080_XL	
1	SAD_000 ON SHITCE									SAD_080 ON INDICATION	
			·						•		

EL 431 Page 13 of 14

RAD_080_ROUTINE:

RAD_080_0					RAD_080_XL M RAD_080 ON INDICATIO
					·
	·				

TSH_080_ROUTINE:

TSH_080								TSH_080_XL
TSH_080 ON SWITCH								TSH_080 ON INDICA
TSL_080							·	TSL_080_XL
TSL_080 ON SWITCH								TSL_080 ON INDICA
	-					•		-
•								
	•	*	•	*	*	•	•	*

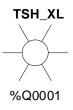
EL 431 Page 14 of 14

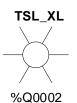
Operator Console Room 229

standard I/O assignments

8 8 8 8

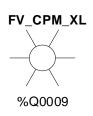


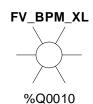


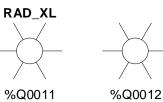




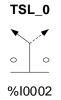






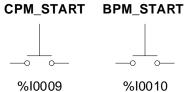


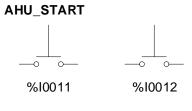


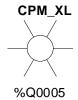






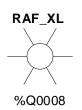
















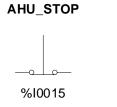




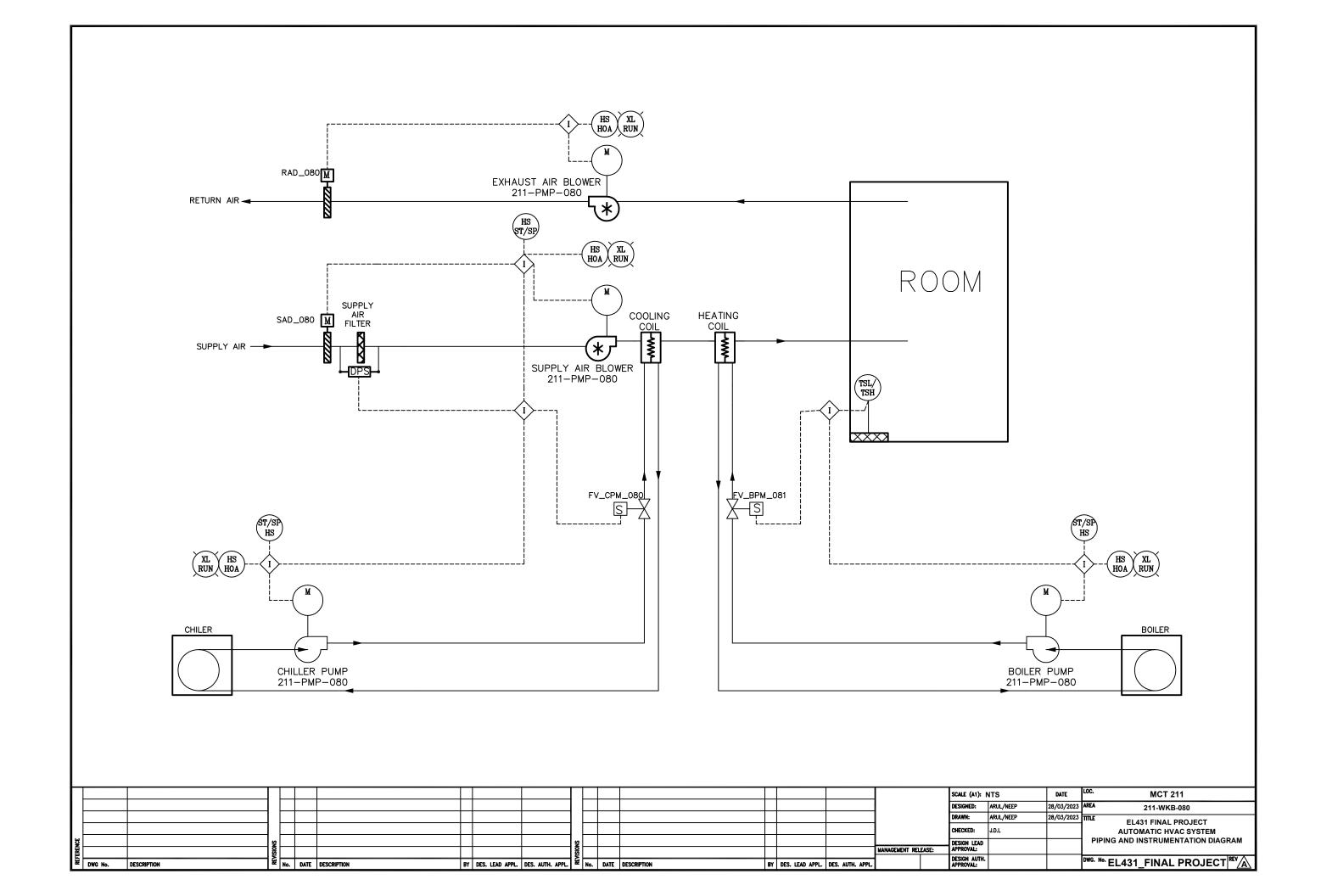


%10005









CPM WIRING SCHEMATIC MCC_080_CPM HS-081.1 E-STOP HS-081.2 MCC-080.2 MCC-080.5 □/L MCC-080.6 MCC-080.1 0VDC H2-083 CPM AUTO ST/SP 24∨DC⊗ ⊗ 0∨DC HS-083,2 PLC DUTPUT ′%Q00021 PLC-081-DD.10 PLC-081-DD.9 24∨DC⊗ \otimes 0 \vee DC CPM HAND/AUTO FDBK PLC-081-DI.17 PLC INPUT 24∨DC⊗ ⊗ o∨bc %I00018 PLC-081-DI,2 CPM STOP/POWER FDBK 24∨DC⊗ \otimes 0 \vee DC PLC-081-DI.7 PLC INPUT %100023 24∨DC⊗ \otimes 0 \vee DC CPM RUN FDBK MCC-080.3 M MCC-080.4 PLC-081-DI.5 PLC INPUT 24∨DC⊗ ⊗ o∨DC 1%100021 24∨DC⊗ ⊗ o∨DC RPM: REFERENCE DWGS: BREAKER HP: FRAME: ---STARTER: ---CONTROL XFMR VA: PROJECT MCT-211 ELECTRICAL LAB SYMBOL LEGEND: Confederation CONTROL CONSOLE COLLEGE TITLE NEAR MOTOR WORKBENCH PANEL 080 SCALE: N.T.S. PLC CABINET J.L.D. 22/09/01 CPM WIRING SCHEMATIC TERMINAL BLOCK IN PLC CK: S.C. 22/09/01 DRAWING STARTER DOOR 22/09/01 APP: T.T. TERMINAL BLOCK IN STARTER A 23/04/14 ISSUED FOR REVIEW DEPARTMENT CLASSIFICATION A.F.E. NO. TERMINALS ON WORKBENCH DWG NO. 211-XXX-XXX REV. DESCRIPTION DWN. CKD. APP. CERT.

BPM WIRING SCHEMATIC BPM_083_CPM HS-081 HS-081.1 E-STOP HS-081.2 MCC-083.1 HS-083 BPM AUTO ST/SP 24∨DC⊗ \otimes 0 \vee DC HS-083.2 PLC DUTPUT %Q00020 PLC-081-DD.7 PLC-081-DD.8 24∨DC⊗ ⊗ 0∨DC BPM HAND/AUTO FDBK PL C-081-DI.17 PLC INPUT 24∨DC⊗ -⊗ o∨bc |%I00018 PLC-081-DI,2 BPM STOP/POWER EDBK 24∨DC⊗ \otimes 0 \vee DC PLC-081-DI.7 PLC INPUT %100023 24∨DC⊗ ⊗ 0∨DC BPM RUN FDBK PLC-081-DI.3 PLC INPUT 24VDC& ⊗ 0∨DC 7%100019 24∨DC⊗ ⊗ 0∨DC REFERENCE DWGS: BREAKER HP: RPM: FRAME: ---STARTER: ---CONTROL XFMR VA: PROJECT MCT-211 ELECTRICAL LAB SYMBOL LEGEND: Confederation CONTROL CONSOLE COLLEGE TITLE NEAR MOTOR WORKBENCH PANEL 080 SCALE: N.T.S. PLC CABINET J.L.D. 22/09/01 BPM WIRING SCHEMATIC TERMINAL BLOCK IN PLC 22/09/01 CK: S.C. DRAWING STARTER DOOR 22/09/01 APP: T.T. TERMINAL BLOCK IN STARTER A 23/04/14 ISSUED FOR REVIEW DEPARTMENT CLASSIFICATION A.F.E. NO. TERMINALS ON WORKBENCH DWG NO. 211-08X-08X REV. DESCRIPTION DWN. CKD. APP. CERT.

