

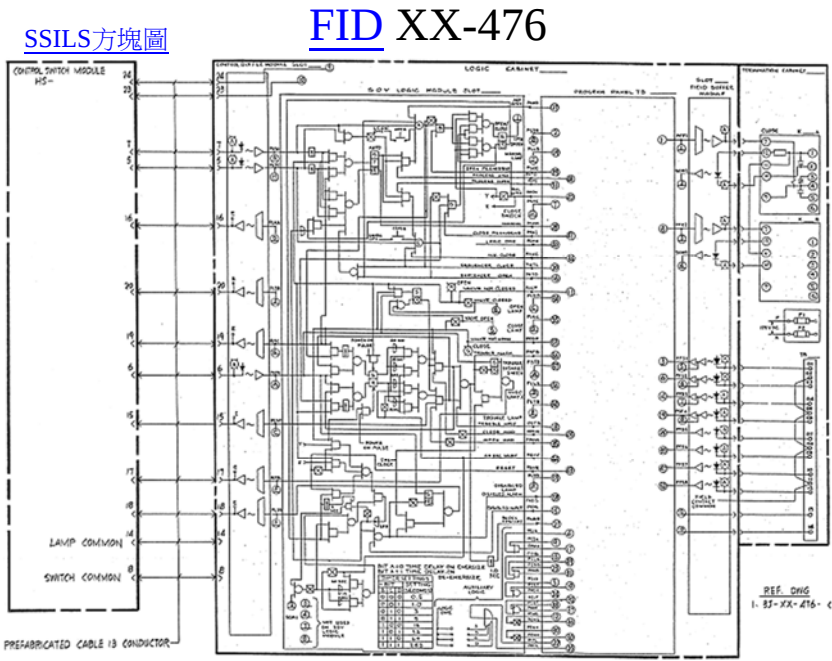
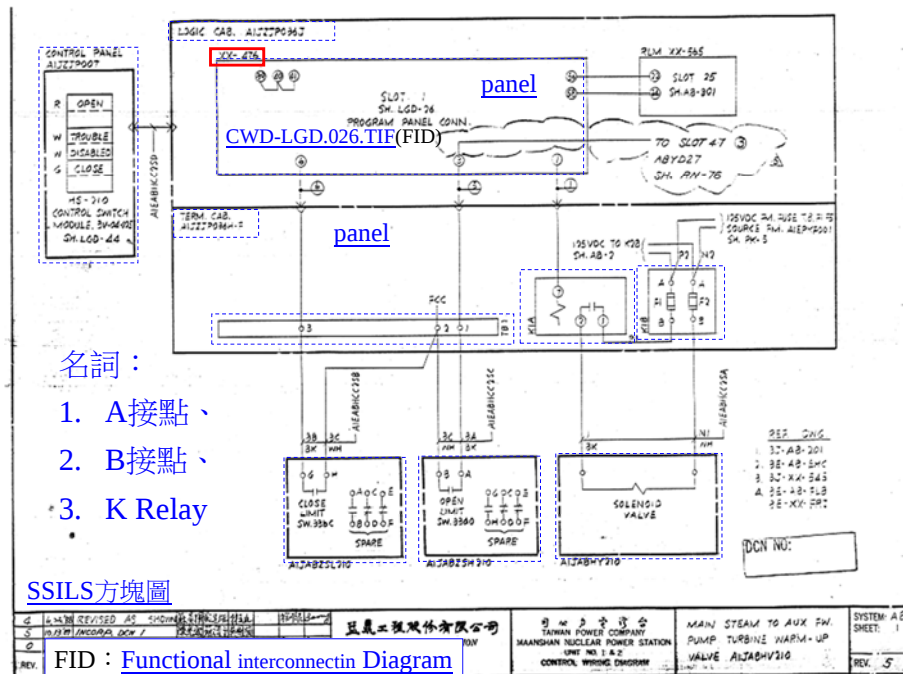
固態邏輯界面控制系統(SSILS)是一種控制系統，為本廠之設備程序遙控之用途。(例如管閥、電路斷路器、馬達等等)固態邏輯控制界面系統之設計及生產是由Condec Corporation 之子公司Consolidated Controls Corporation (簡稱CCC)，Bethel Connecticut USA設計之產品。

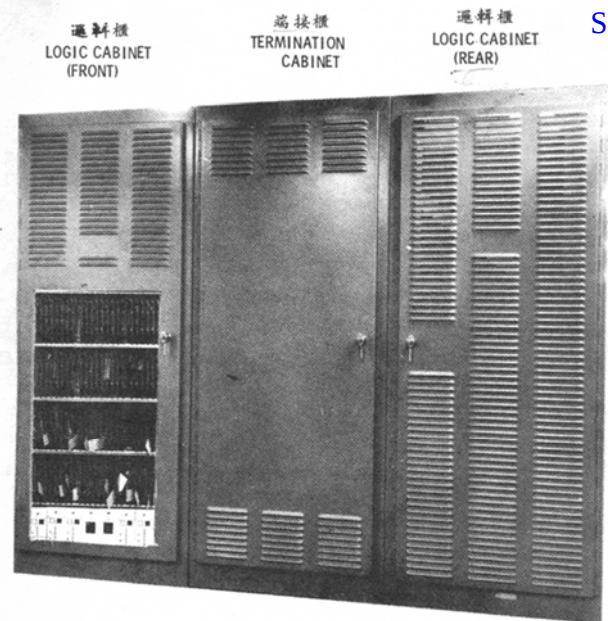
固態邏輯界面控制系統之設計符合核能電廠之規範。該系統包含10項主要元件，SSILS主要功能為控制程序設備外，還提供設備狀態(status)之指示(Start or Stop, Open or Close)。同時還包括不正常操作的指示.及警報(Trouble or Disable)

控制接線圖 Cnotrol Wiring Diagram

設備相關儀電元件之整體接線配置流程圖，不含卡片細部，單一設備可能包含於多張CWD圖中。圖例符號類似前述之單線圖。

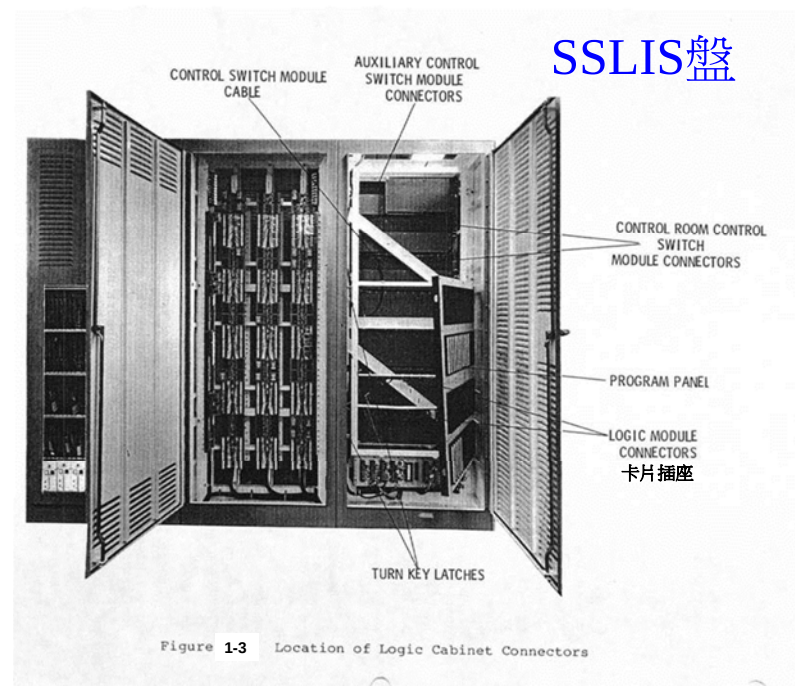
- 系統設備：依系統區分(AB~SQ)
 - 一般設備：編號小於300，如：[CWD-AB-052.010.TIF](#)。
 - 警報：編號3xx，如：[CWD-AB-302.005.TIF](#)
 - 儀器：編號4xx，如：[CWD-AB-401.007.TIF](#)
- LGD：BKR、SSILS...(011~048)，如：[CWD-LGD.011.TIF](#)
- 特定CWD：3-J-XX-201~404(分項如上述)。





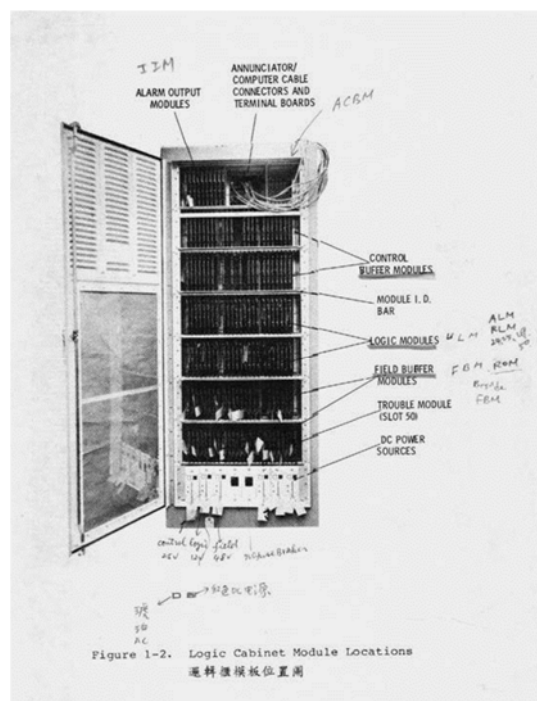
SSLIS盤

9



SSLIS盤

Figure 1-3 Location of Logic Cabinet Connectors



SSLIS盤

11



功能連接圖 (Functional interconnectin Diagram) FUNCTIONAL INTERCONNECTING DIAGRAMS

AIR CIRCUIT BKR. MED. VOLT.-	3-J-XX-471
AIR CIRCUIT BKR. 480 V. LC.-	3-J-XX-472
NON-REVERSING STARTER	3-J-XX-473
REVERSING STARTER	3-J-XX-474
REVERSING 120 V. DAMPER	3-J-XX-475
SOLENOID OPERATED VALVE	3-J-XX-476
REFLASH LOGIC MODULE	3-J-XX-477
AUXILIARY LOGIC MODULE	3-J-XX-478
MSIV/FWIV LOGIC MODULE	3-J-XX-479
BOPEFAS LOGIC MODULE	3-J-XX-480
IE ANNUNCIATOR LOGIC MODULE	3-J-XX-481
LOAD SEQUENCER LOGIC MODULE	3-J-XX-482

返回



Functional interconnectin Diagram

CBM	— CONTROL BUFFER MODULE
ACS CBM	— AUX. CONTROL STATION CONTROL BUFFER MODULE
ULM	— UNIVERSAL LOGIC MODULE
ALM	— AUXILIARY LOGIC MODULE
RLM	— REFLASH LOGIC MODULE
FBM	— FIELD BUFFER MODULE
ROM	— RELAY OUTPUT MODULE
AOM	— ALARM OUTPUT MODULE
TB	— TERMINAL BLOCK
(39)	— PROGRAM PANEL TERMINAL NUMBER
05	— SLOT LOCATION NUMBER
4	— TERMINATION CABINET TERMINAL NUMBER

13



儀控迴路圖(Loop Diagram)

SYMBOL	DEFINITION
	ELECTRICAL SIGNAL WIRE
	ELECTRICAL SHIELD
	PNEUMATIC SIGNAL
	HYDRAULIC SIGNAL
	CAPILLARY TUBING (FILLED SYSTEM)
	20 PSIG INSTR. AIR SUPPLY
	GROUND TO EQUIPMENT GROUND BUS
	GROUND TO INSTRUMENT GROUND BUS
	PLUG CONNECTOR USED WITH PREFABRICATED CABLES
	ELECTRICAL SIGNAL CABLE WITH SHIELD CUT BACK AND TAPED.



圖 1-1

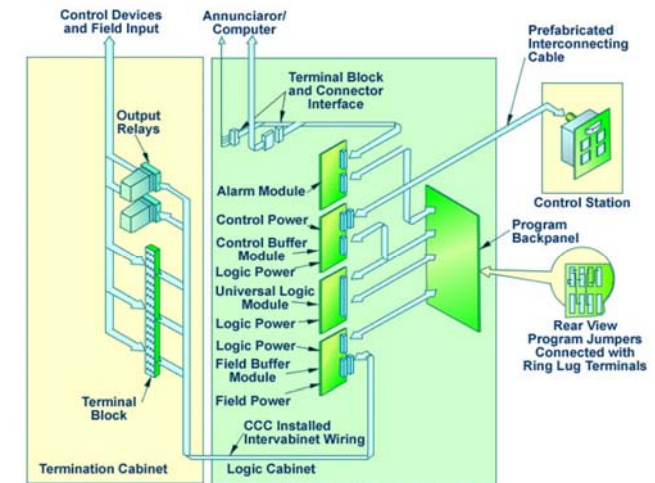
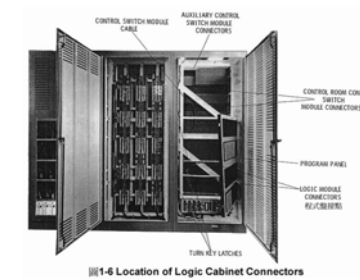
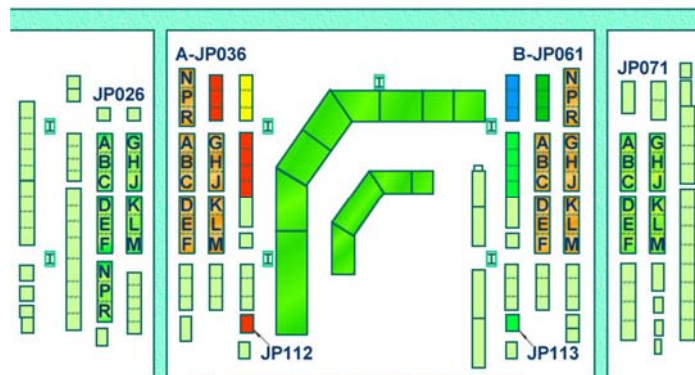
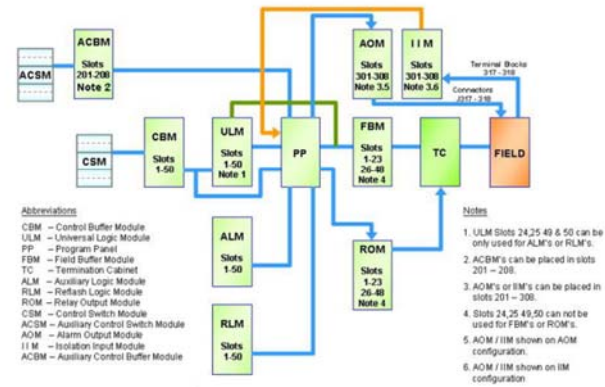


圖 1-2 SSILS BLOCK DIAGRAM

下圖為 SSILS 各模組之間的關聯示意圖：



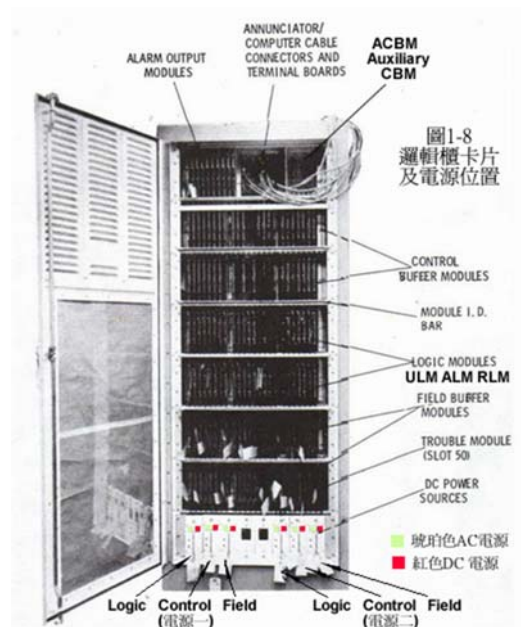


圖1-8
邏輯櫃卡片
及電源位置



圖1-9 控制室邏輯櫃卡片

圖1-10 控制開關



機組使用之SSILS控制系統，安裝在控制室126呎，

盤面編號分別如下：(圖1-3, 1-4)

JP026-A,B,C,D,E,F,G,H,J,K,L,M,N,P,R

JP036-A,B,C,D,E,F,G,H,J,K,L,M,N,P,R

JP061-A,B,C,D,E,F,G,H,J,K,L,M,N,P,R

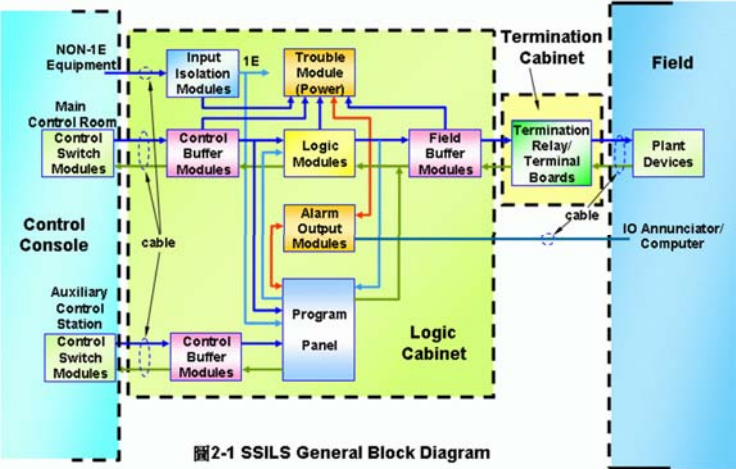
JP071-A,B,C,D,E,F,G,H,J,K,L,M

萬用邏輯板：
萬用邏輯板(ULM) 之卡片功能為接受設備輸入信號而轉換為可控制設備啟動/停止之功能，原廠家設計萬用邏輯板依設備需求不同可讓維護人員/設計人員從程式接線盤增加設備所需控制功能，請參考FID標準圖。
本廠1、2號機使用之萬用邏輯板依卡片功能說明如下：

ULM型式	程序設備
ACB	空氣斷路器
MOV	馬達操作閥(Reversing Starter Motor)
NRS	不可反轉式的馬達啟動器(Non-reversing Starter Moter)
SOV	電磁操作閥(Solenoid Operated Valve)
MSIV/FWIV	主蒸汽隔離閥/飼水隔離閥(Main Steam Isolation Valve / Feedwater Isolation Valve)
BOP/ESF	BOP/特殊安全設施制動系統(Balance of Plant / Engineered Safety Features Actuation System)

輔助/警報...功能卡片
除上述所列的萬用邏輯板外尚有其他種類的邏輯板，使SSILS更富有彈性：

輔助邏輯板	(Auxiliary Logic Module ALM) 包含很多邏輯元件，在輔助萬用邏輯板上的邏輯不夠使用。
輸入隔離板	(Input Isolation Module IIM)提供10組電源驅動電驛式隔離
警報輸出板	(Alarm Output Module AOM)提供10組信號驅動電驛式隔離
再閃爍邏輯板	當警示器的警報被確認後，可允許第二個警報出現時在重新閃爍警報器
電驛輸出板	(Relay Output Module ROM) 提供6組接點及兩組電驛式輸出
序向器邏輯板	(Sequencer Logic Module)當外部電源喪失，或是特殊安全設施致動系統動作，設備經卸載後，可選擇性依序起動設備。
故障模板	監視電源故障及卡片非預期移除提供警報



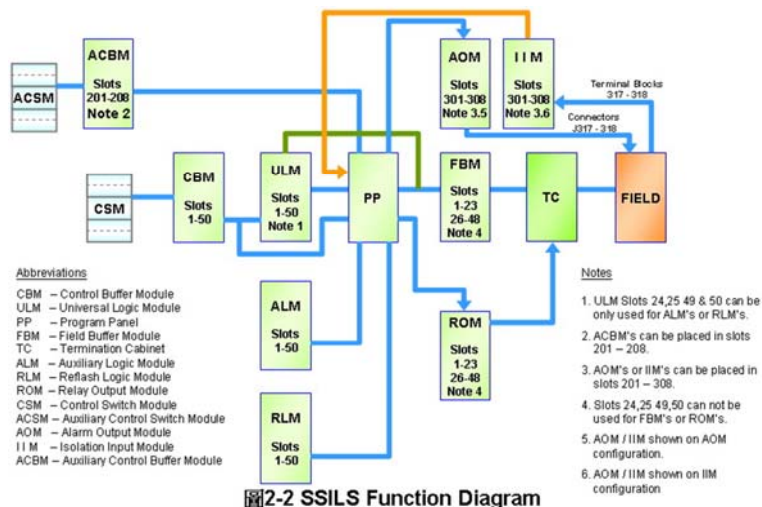


圖2-2 SSILS Function Diagram

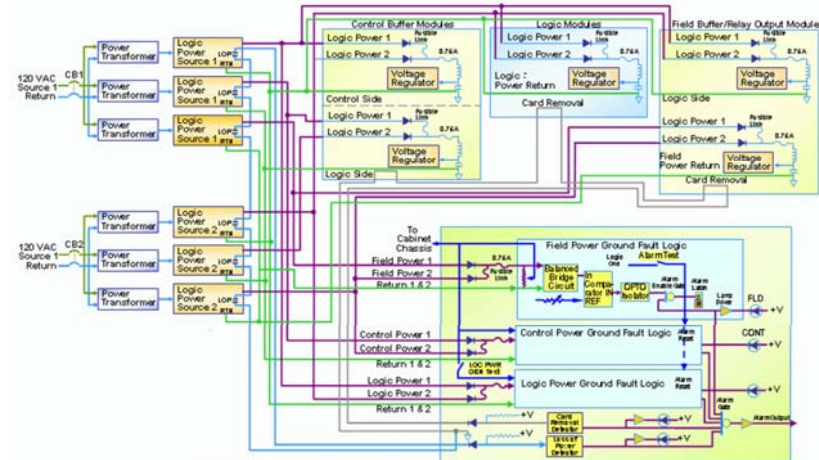
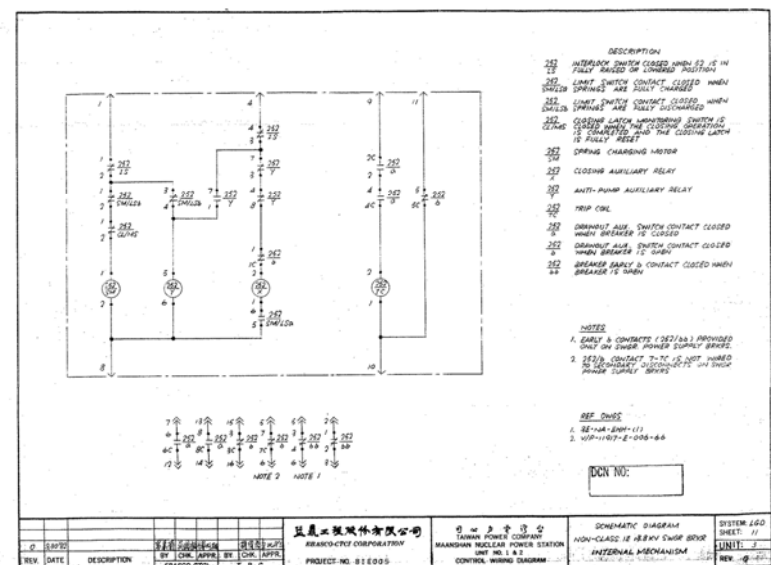


圖3-1 Power Distribution and Trouble Module Logic Diagram

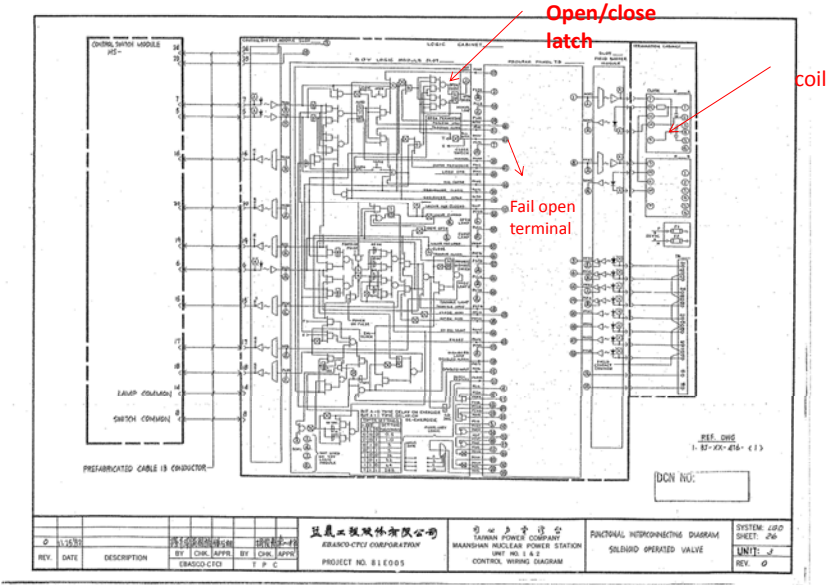
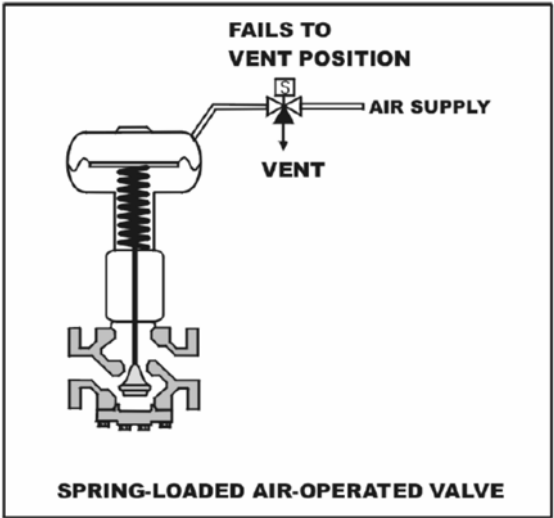
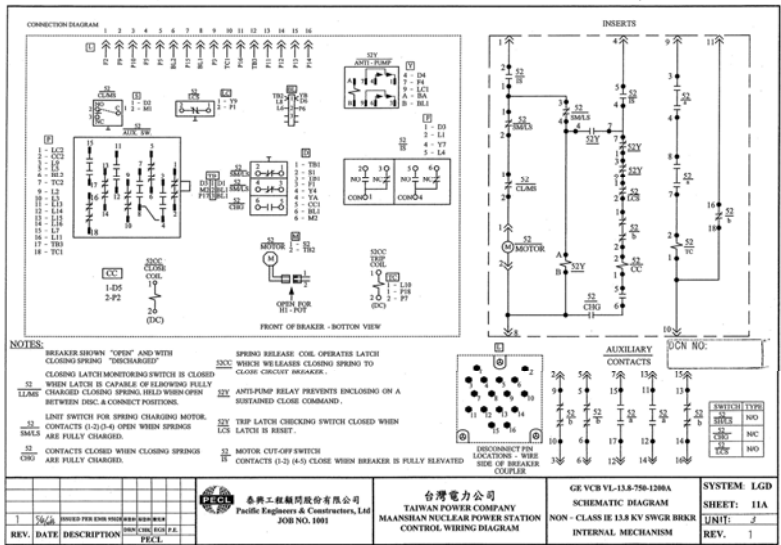
Air circuit breaker

- 125Vdc加入開關箱,電源及直接加到close機構,charging(compressing)彈簧。在此狀況下a接點開;b接點閉,盤的綠燈亮。
- 當ACB邏輯模組產生一close command, close 電驛的接點關閉,提供125Vdc到關閉機構的第二個I/P,釋放(discharging)彈簧,因此關閉斷路器,b接點開啟,a接點閉合,開關箱前盤的紅燈亮。close command 被移除,但close機構內的Latch保持斷路器在關閉位置,而且彈簧再被壓縮,已準備下一回的關閉。
- 如果有跳脫訊號,125Vdc將經由關閉的跳脫電驛的接點供給跳脫線圈(Trip coil)電力。



Start command

- =start command select(OR) gate (27=aux start or 控制開關手動 or start auto mode gate (auto+ sync permissive+不在sync)or logic module 手動) + permissive 39+no stop command(3) + no breaker closed(5)

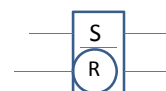


SOLENOID OPERATED VALVE(sov)slot

- May be energized to open or close
- Fail-closed valve:當閥故障(失效)自動關閉, energized to open
- Fail-opened valve:當閥故障(失效)自動開啟, energized to close
- CWD LGD 26(functional interconnecting diagram SOLENOID OPERATED VALVE)
- 從program panel 上的fail open terminal(PFOV,) 42

SOLENOID OPERATED VALVE(sov)slot

- 當一邏輯0(+12v)加在=fail open端接點;則fail open energize gate&fail open deenergize gate 二者被禁制(inhibited),因此對閥的動作沒有作用。
- 42=0經反向後,至fail close energize gate&fail close deenergize gate,則分別來自open command gate 或 close command gate的第二個信號就會使能此二閘。



- SET=1, eneralize sol; SET=0, deeneralize sol

SOLENOID OPERATED VALVE(sov)slot

- 如果 42 =1則fail close energize gate&fail close deenergize gate二者被禁制(inhibited), 因此對閥的動作沒有作用。
- fail open energize gate&fail open deenergize gate,則分別來自open command gate 或close command gate的第二個信號就會使能此二閘。

Fail close modulating valve/Fail open modulating valve

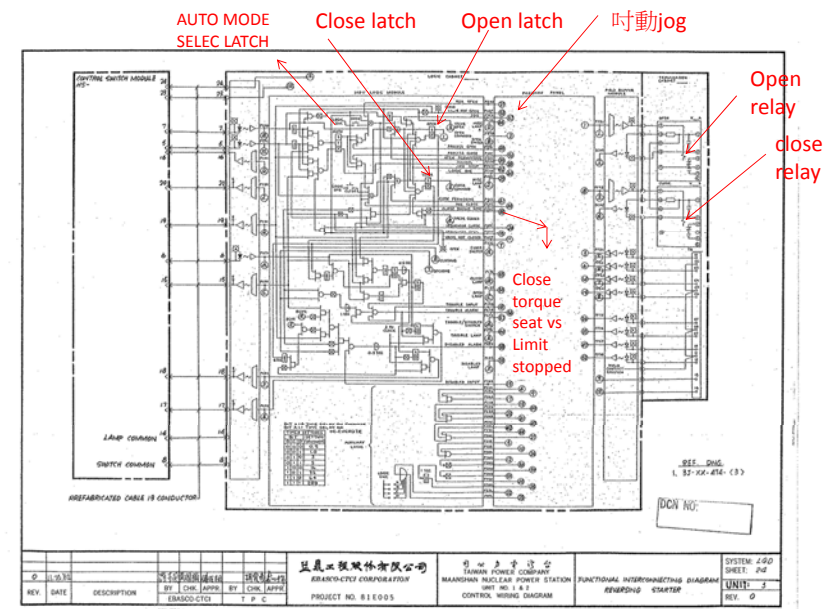
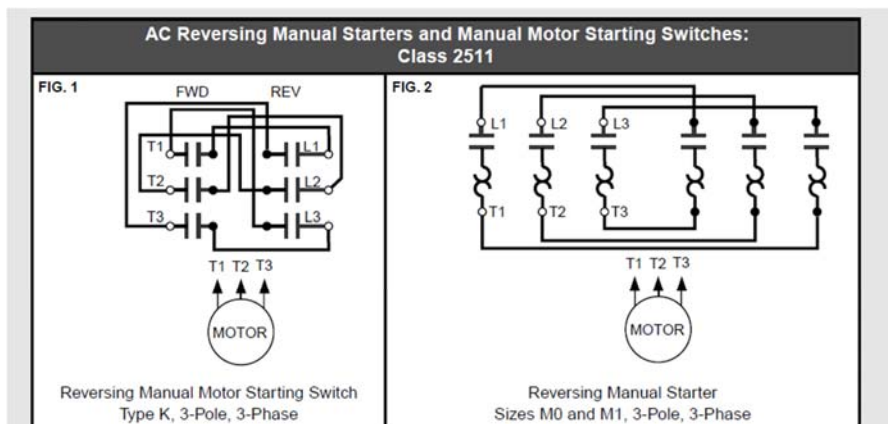
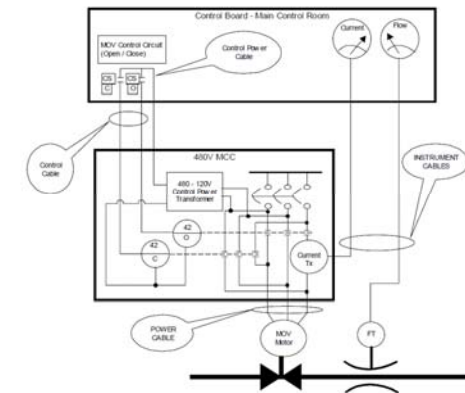
- Open-modulate fail-close valve
- Open-modulate fail-open valve
- Modulate-close fail-close valve
- Modulate-close fail-open valve

Sol valve Protection restart logic

- Fail close 或fail open 的閥當發生異常使其自動fail closed 或opened,會從trouble邏輯送一秒的閉鎖在啟動信號到program panel,這樣最後一個command信號不會在malfunction被corrected後使閥自動開或關。
- 使用auxiliary close(the last command open), or auxiliary open(the last command close)到 open/close latch。

MOV

- 由reversing motor starter控制



MOV auto and manual的切換

THE AUTO MODE SELEC LATCH is toggled by the operation of the OPEN pushbutton when the valve is fully opened, or by the operation of the Close pushbutton when the valve is fully closed. The latch is always reset to manual mode during a sequencer operation (LOV shedding後EDG啟動並聯供電之依時序啟動加載) or by the operation of the OPEN PB when the valve is not fully open, or by the operation of the CLOSEW PB when the valve is not fully closed.

- When the open command gate is enabled, setting the open latch, the enabled O/P of the gate also reset the close latch. Similarly, an enabled close command gate sets the close latch and resets the open latch. This cross-coupling ensures that the valve will react instantly to a change in direction. A programmed auxiliary stop signal (logic 1) may be applied to the reset gate of both latches, resetting both latches, thus removing any drive commands to the valve and the valve stops moving.

標準的非-扭力極限停止型(standard non-torque limit stopped) 關到甚麼程度?

Close torque seat I/P接邏輯0,反向後+valve closed(fully closed after a close command)

經close reset gate去reset close latch。

因為open latch早先已被close command 賦歸掉,所以open relay close relay皆失能,馬達電力就被移除了。

閥已不在
open

5

反向後去點亮邏輯模組和控制開乖模組的close燈。

可逆轉馬達啟動線路內的各級線開關的狀況是:開啟扭力安全開關,關閉極限開關,和過載(OL)開關閉合,關閉扭力安全開關是閉合的,開啟極限開關是不通的。

標準的非-扭力極限停止型(standard non-torque limit stopped) 開啟過程

- 當產生一閥開啟的信號,關閉門被hold在reset,而開啟門被設立(set),因此120vac跨經開啟線圈,經由閉合的關閉極限開關和過載的接點,閥開始開啟而且電源經閉合的開啟扭力安全開關維持住。
- 因為開啟和關閉極限開關接點都是開啟(辦開關),如同 SOV閥在Transient一樣。
- 當閥被完全開啟,開啟極限開關的接點閉合,產生閥OPEN信號去復歸開啟門,使開啟電驛失能,此閥OPEN經反向後,點滅CLOSE指示燈。

Torque seat 閥之操作-----關

- 一些馬達閥需要額外的力道to allow proper seating of the valve to insure a proper seal 。
- 所以其關閉線圈必須在閥關閉且關閉極限開關閉合後仍保持一段時間繼續賦能,亦即 valve close gate不送信號去復歸關閉門,取而代之是由torque closed gate送信號。
- torque closed gate是及閘,I/P是閥關閉和 closing  之反向 (TQ動作使42c失能)

Torque seat 閥之操作-----開

- 當要開這種扭力關閉閥,an excessive force is required to unseat the valve before it can be open.因此當有OPEN 信號產生,開啟扭力安全極限開關接點開啟。
- 但是關閉極限開關接點是閉合的,使關閉線圈賦能,啟動馬達來開閥。當需要開閥的扭力在安全限值內時(設計在閥實際開啟前即會發生),主扭力安全開關閉合,在關閉極限開關接點開啟之後,維持到開啟線圈的電力不致中斷。

Torque seat 閥之操作-----開

- Open seat limit switch “a” provides a valve opening signal to the trouble/disabled logic indicating that the valve is in the progress of being opened, as does the valve closing signal indicate that the valve is in the process of being closed.

Disabled indicator flash

- Sol: valve cannot be operated due to a defective sol valve circuit or the absence of programmed permissive signals. Any programmed mechanical protection signal that would prohibit operation of the valve would also cause the DISABLED indicators lamp to flash.
- ACB:A circuit breaker cannot be operated (close coil circuit or trip coil circuit becomes open), programmed disable I/P(通常是機械保護信號,或喪失允許信號),switchgear 在“TEST”。

冷凝水泵

- AD sh1如果運轉中發生低電壓則後續為何?

Civil
Drawing

儀器位置圖

Cable
Tray連接
圖

P&ID

管路圖

ISO Drawing

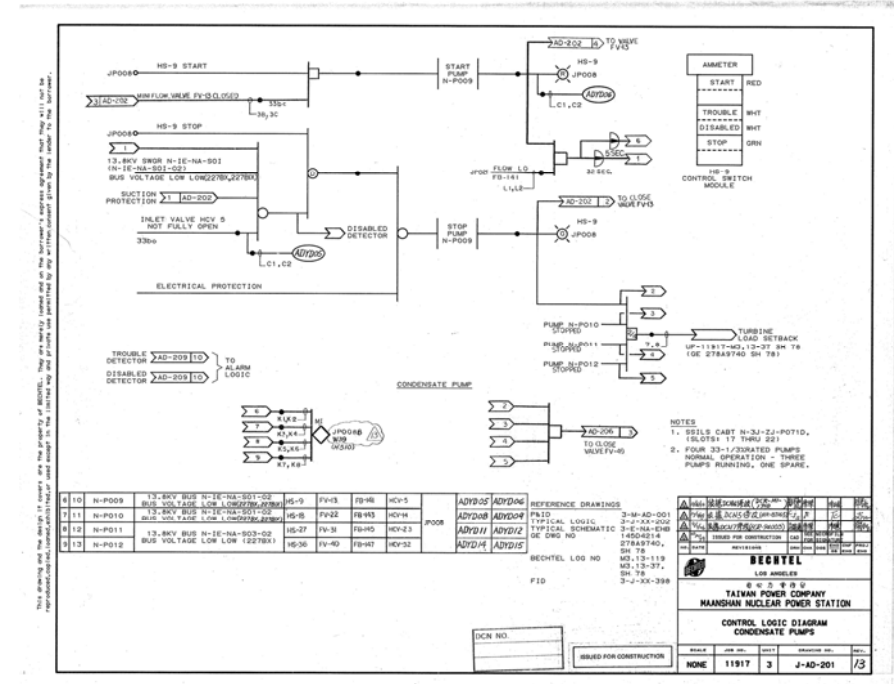
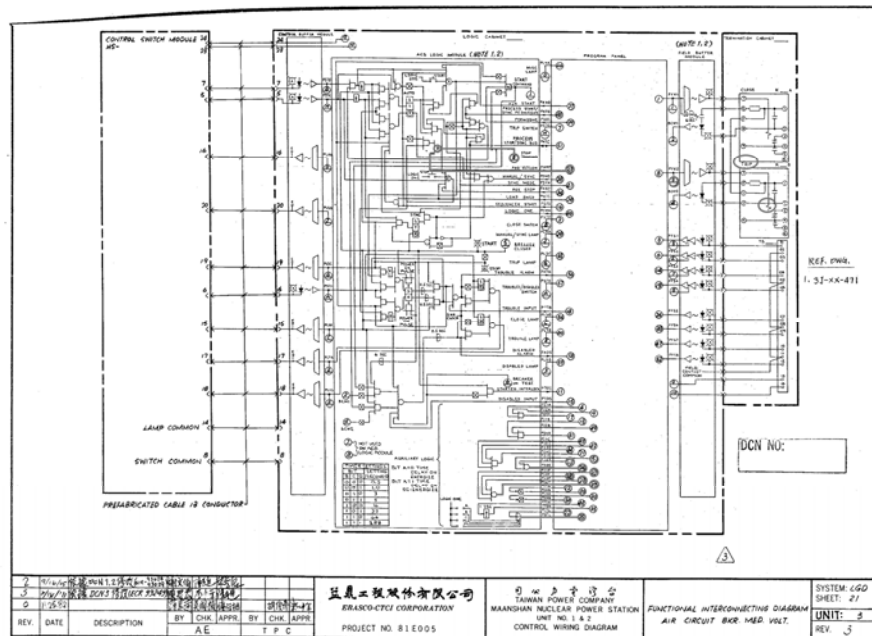
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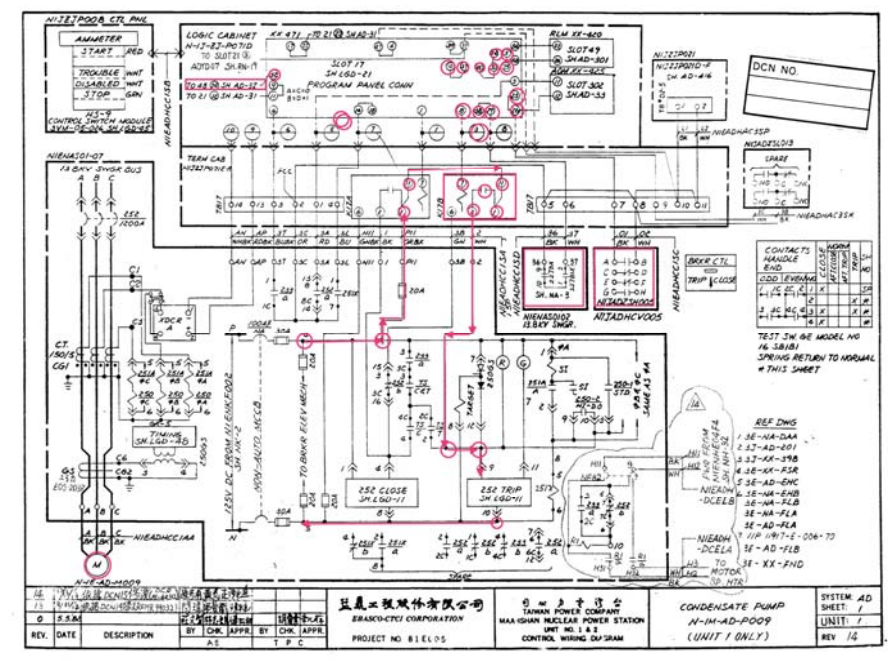
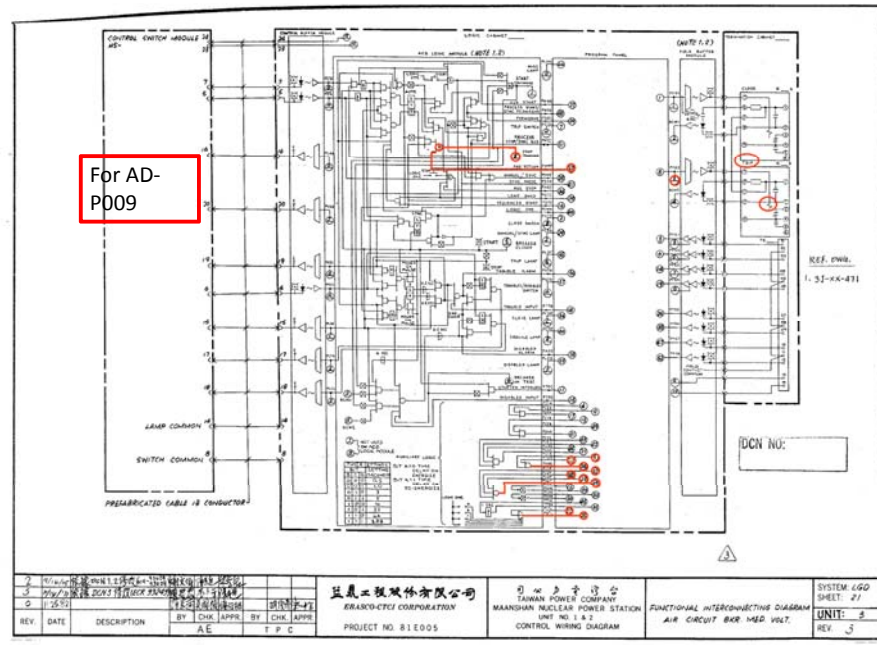
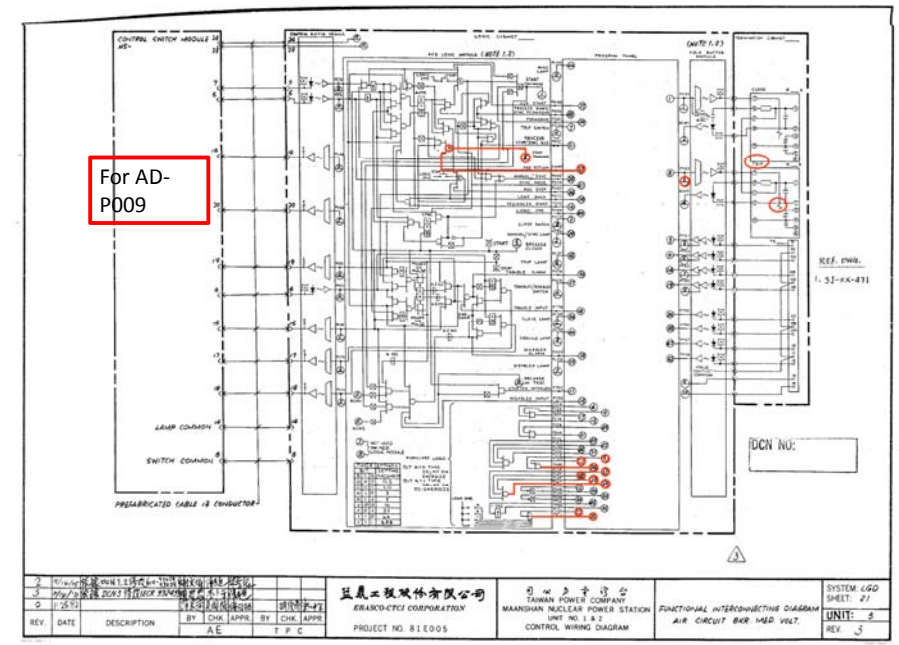
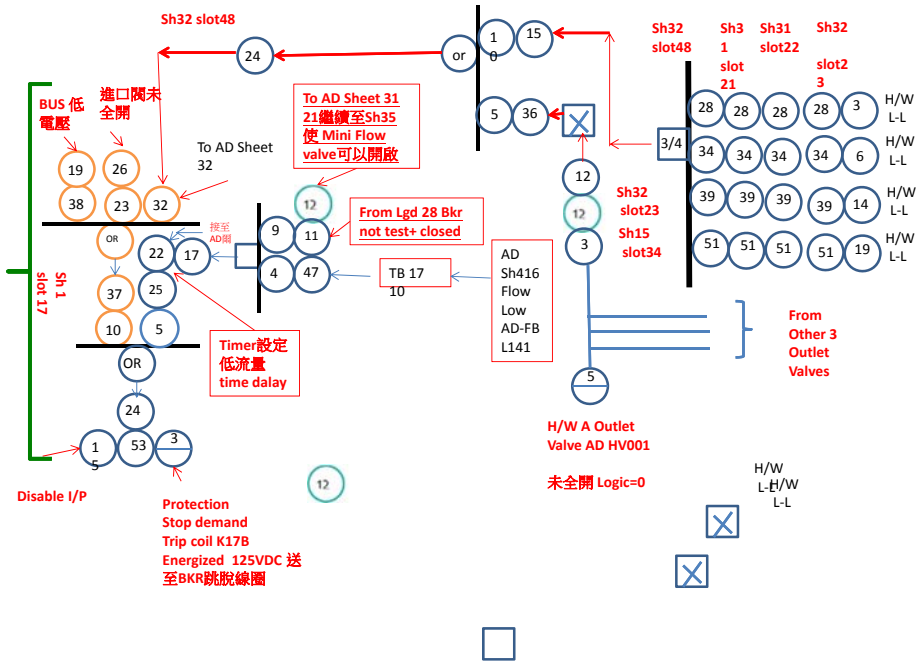
CWD

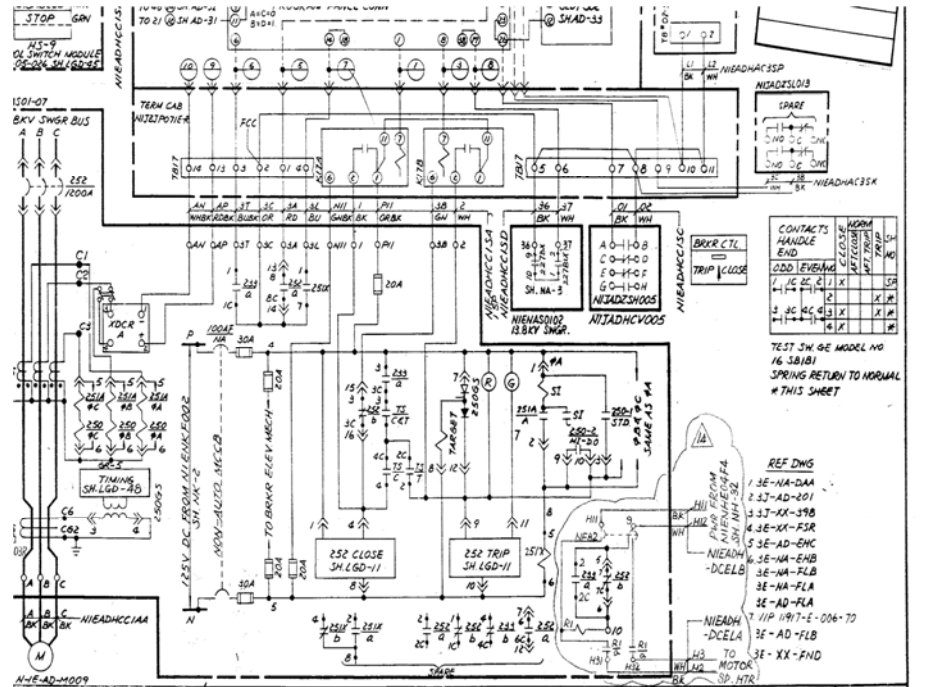
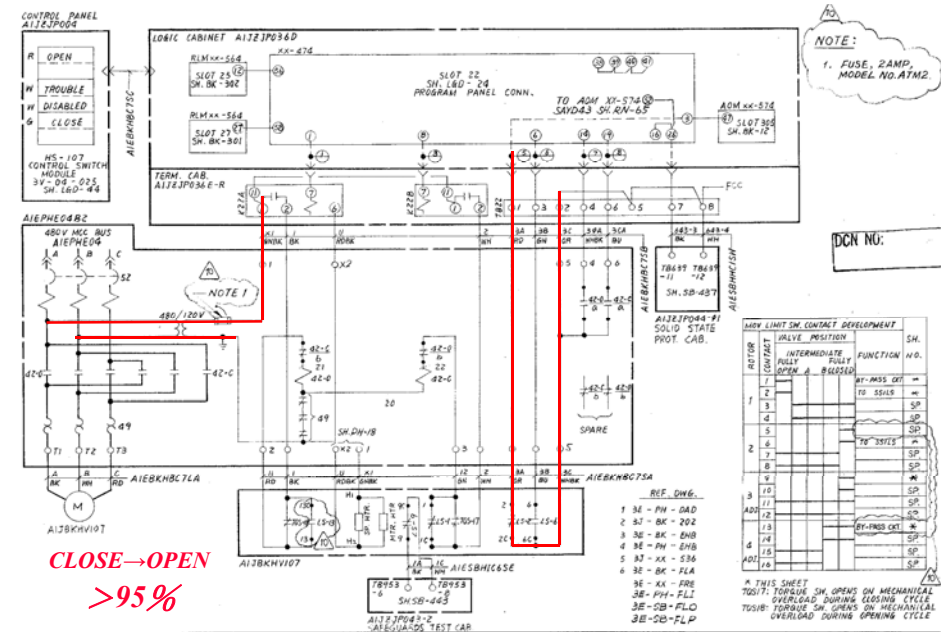
E DRAWING(cable tray)

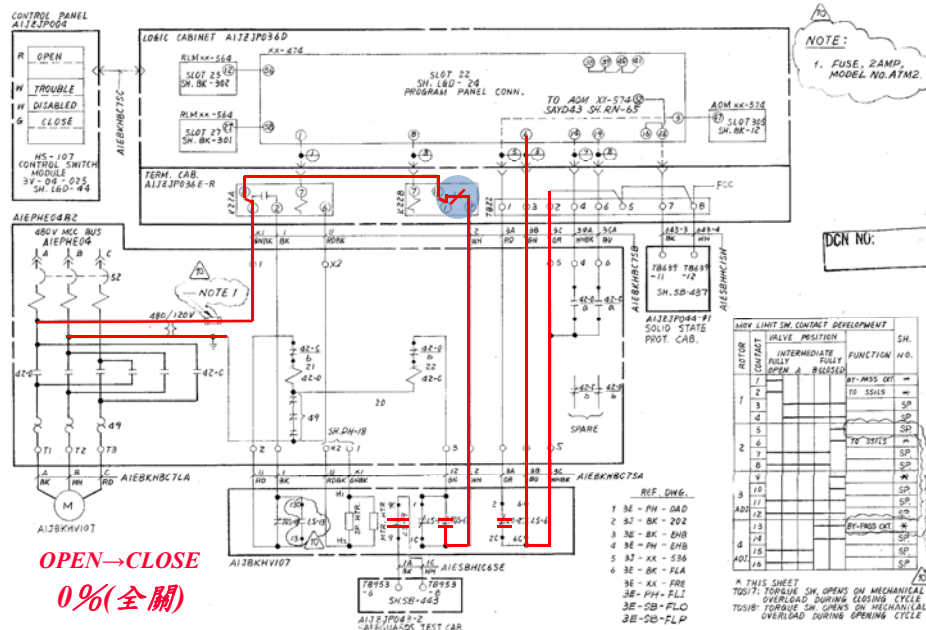
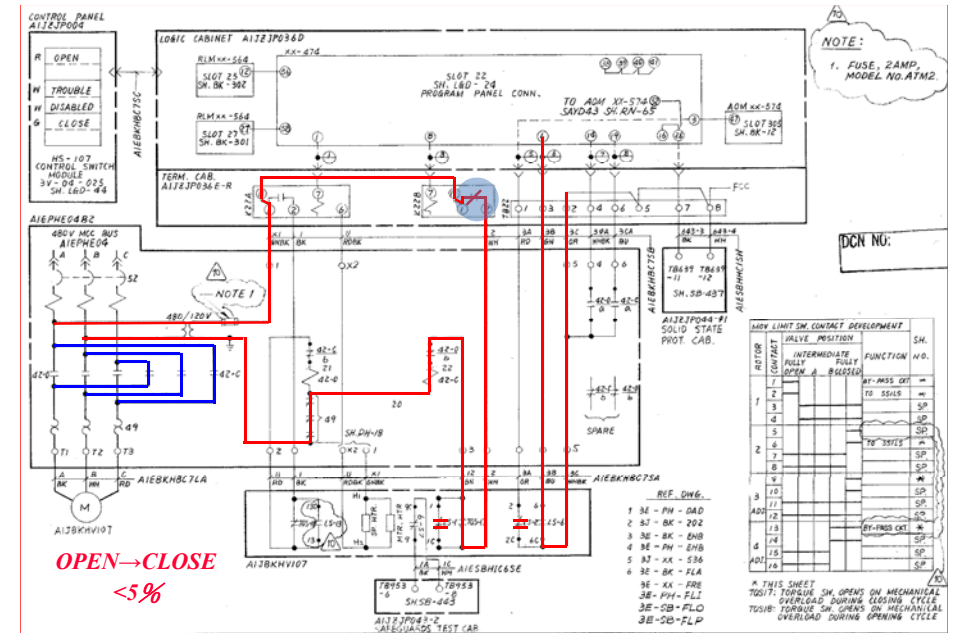
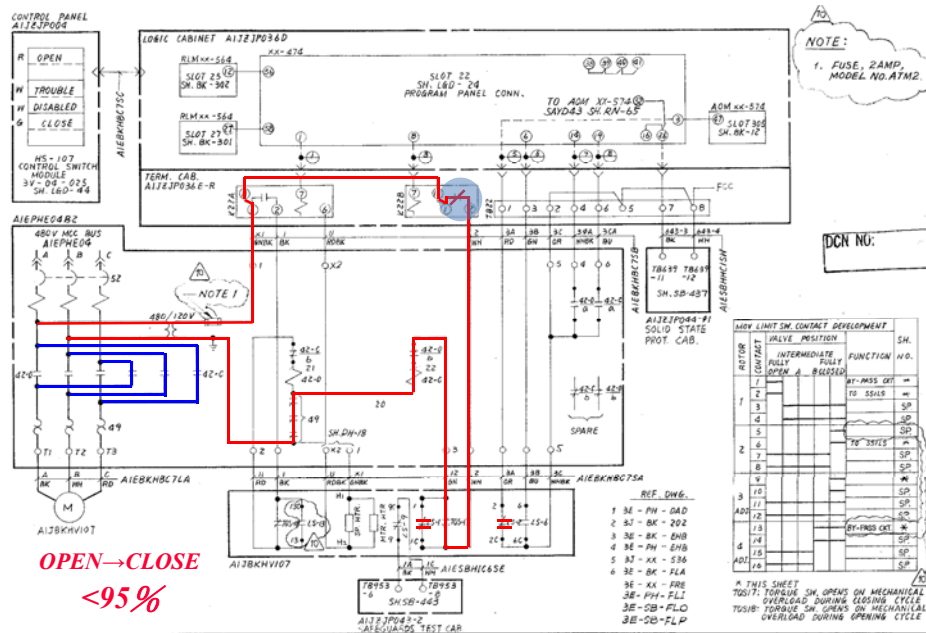
Single Line

Schematic
Drawing









RPC 匯流排低頻跳脫其 Isolation Breaker, 還會跳脫汽機廠房的 Breaker。

從 SSPS A, B 之 BUS 281F 低頻電驛 2/3 通過送信號至 Isolation Breaker BB-sh2 separation A, sh3 separation B, 要來賦能 Trip coil A, B。

其迴路是分別賦能 286A, 286B, 使接點 286A/a, 286B/a 閉合來達成的。

另外 251A (A, B, C) 三相及 250GS 亦輸入閉鎖電驛 286A。286A (or B) 動作需清除後, Isolation Breaker 始能再投入。

現場 HS-A 轉至 Trip 使 286A 失能, 接點 286A/a 開啟。

解釋差動電驛 (BB sh1 & 2)

