IO 交握流程規範

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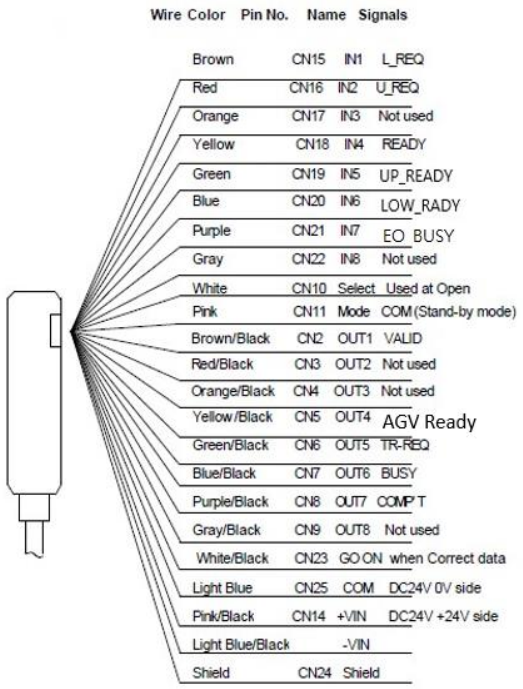
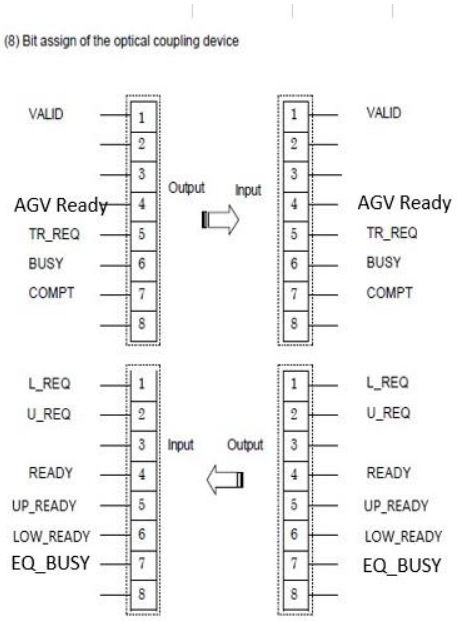
1. Introduction

此份文件主要針對 AGV 與設定進行 Load/Unload 傳輸動作過程中制訂 DIO 和 PIO 交握流程規範，本規範主要針對 AGV 進入後由設備進行升降取放貨動作(ex: Tray 搬運設備)流程進行說明。

2. 交握訊號定義

2.1 PIO訊號定義





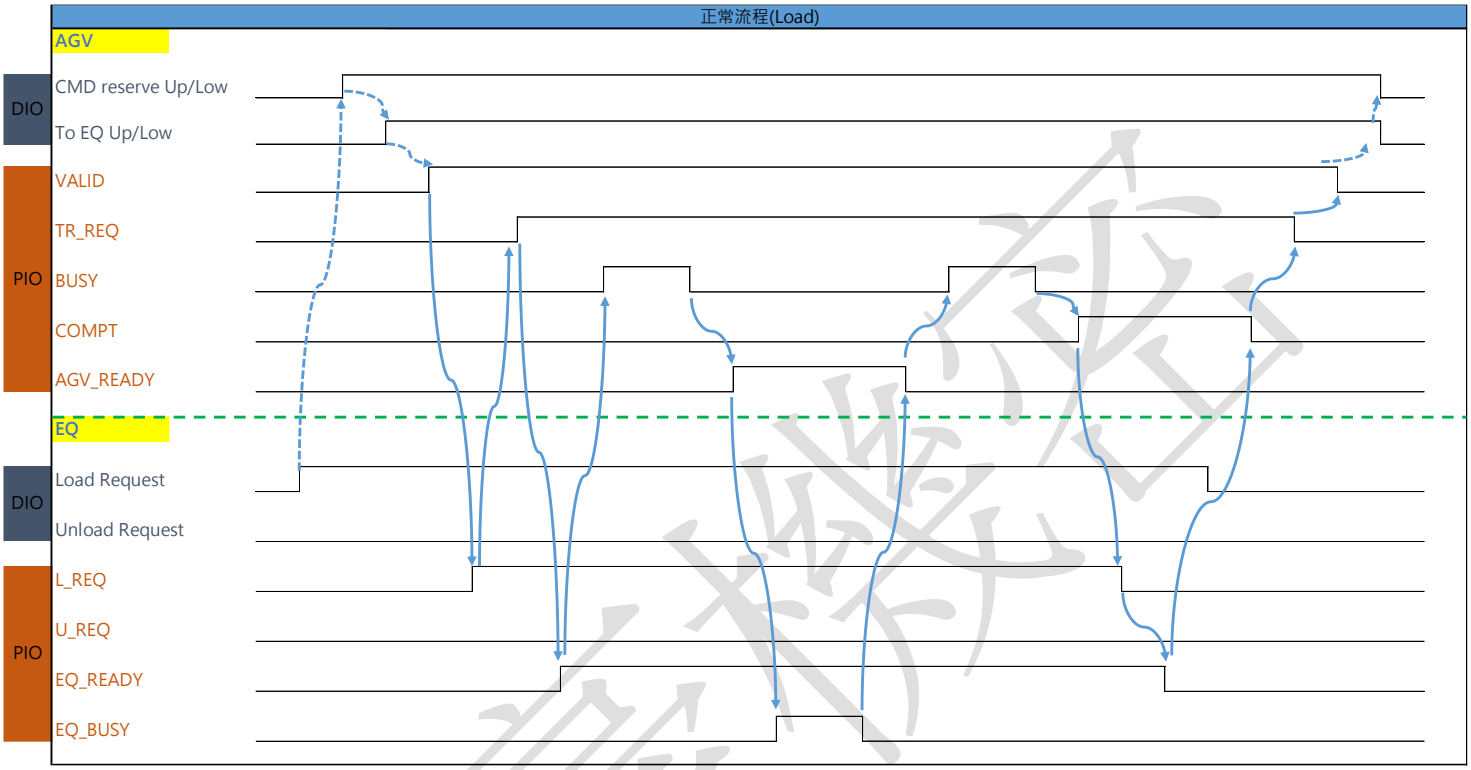
Signal Name	AGV/Equipment	Description
VALID	AGV --> Equipment	When this signal is high (ON), the data of CS becomes valid. When this signal is low (OFF), the data of CS is not valid. This signal goes low (OFF) when the COMPT signal goes low (OFF). It's turned OFF by abnormal status (trouble).
TR-REQ	AGV --> Equipment	This signal will go high (ON) when the AGV is trying to access the corresponding CS for transfer operation. This signal will go low (OFF) after the BUSY signal goes low (OFF). Once the READY signal from the process equipment is high (ON), the AGV will turn the BUSY signal high (ON) and begin transfer operation.
BUSY	AGV --> Equipment	When the process equipment's READY signal is high (ON), the AGV will turn the BUSY signal high (ON) when it attempts to start transfer operation. When the AGV finished with transfer operation, it will turn the BUSY signal low (OFF).
COMPT	AGV --> Equipment	This signal will go (ON) when the AGV has completed the transfer operation. This signal will go low (OFF) once the process equipment must not perform any mechanical action in the interactive zoon until it has confirmed that the COMPT signal is high (ON).
AGV_READY	AGV --> Equipment	※AGV侵入設備後，動作完成需TurnOn此訊號告知設備，AGV已完成動作
L_REQ	Equipment --> AGV	This signal will go high (ON) when corresponding CS doesn't have a cassette and is ready to receive a cassette. When cassette is detected on the CS, this signal will go low (OFF). Besides, it turns OFF when any abnormal status happened before "READY" ON.
U_REQ	Equipment --> AGV	This signal will go high (ON) when corresponding CS has a cassette and is ready to be unload When the cassette is no longer detected on the CS, this signal will go low (OFF). Besides, It turns OFF when any abnormal status happened before "READY" ON
READY	Equipment --> AGV	This signal will go high (ON) when the corresponding CS has received the TR_REQ signal from the AGV and the corresponding CS is ready to transfer operations by the AGV. This signal will go low (OFF) after the COMPT signal goes high (ON). The process equipment must leave the READY signal high (ON) when waiting for the COMPT to go high (ON). If the CS has shutter, "READY" signal should be ON after shutter open. When abnormal status happened during AGV accessing, it turns OFF.
EQ_BUSY	Equipment --> AGV	※設備進行動作中需Turn On

2.2 DIO訊號定義

For EQP		
IO	訊號名稱	說明
DO0	Load Request	設備可供載入需求時(Unload Request訊號ON時，不可ON)
DO1	Unload Request	設備可供載出需求時(Load Request訊號ON時，不可ON)
DO2	Port Exist	設備貨物在席訊號
DO3	UP_POS	頂升機構上定位(LDOWN_POS訊號ON時，不可ON)
DO4	DOWN_POS	頂升機構下定位(UP_POS訊號ON時，不可ON)
DO5	EQP Status Down	設備狀態為Down(常ON,Down時為OFF)
For AGV		
IO	訊號名稱	說明
DI0	To EQ Up	預計與EQ上層進行PIO取放訊號(To EQ Low ON時，不可ON)
DI1	To EQ Low	預計與EQ下層進行PIO取放訊號(To EQ Up ON時，不可ON)
DI2	CMD reservr Up	AGVC 命令預約，通知EQ即將執行任務訊號(上層)
DI3	CMD reservr Low	AGVC 命令預約，通知EQ即將執行任務訊號(下層)
備註：如EQP無上下層，則僅使用DI0,DI2		

3. 交握流程

3.1 正常流程(Load)



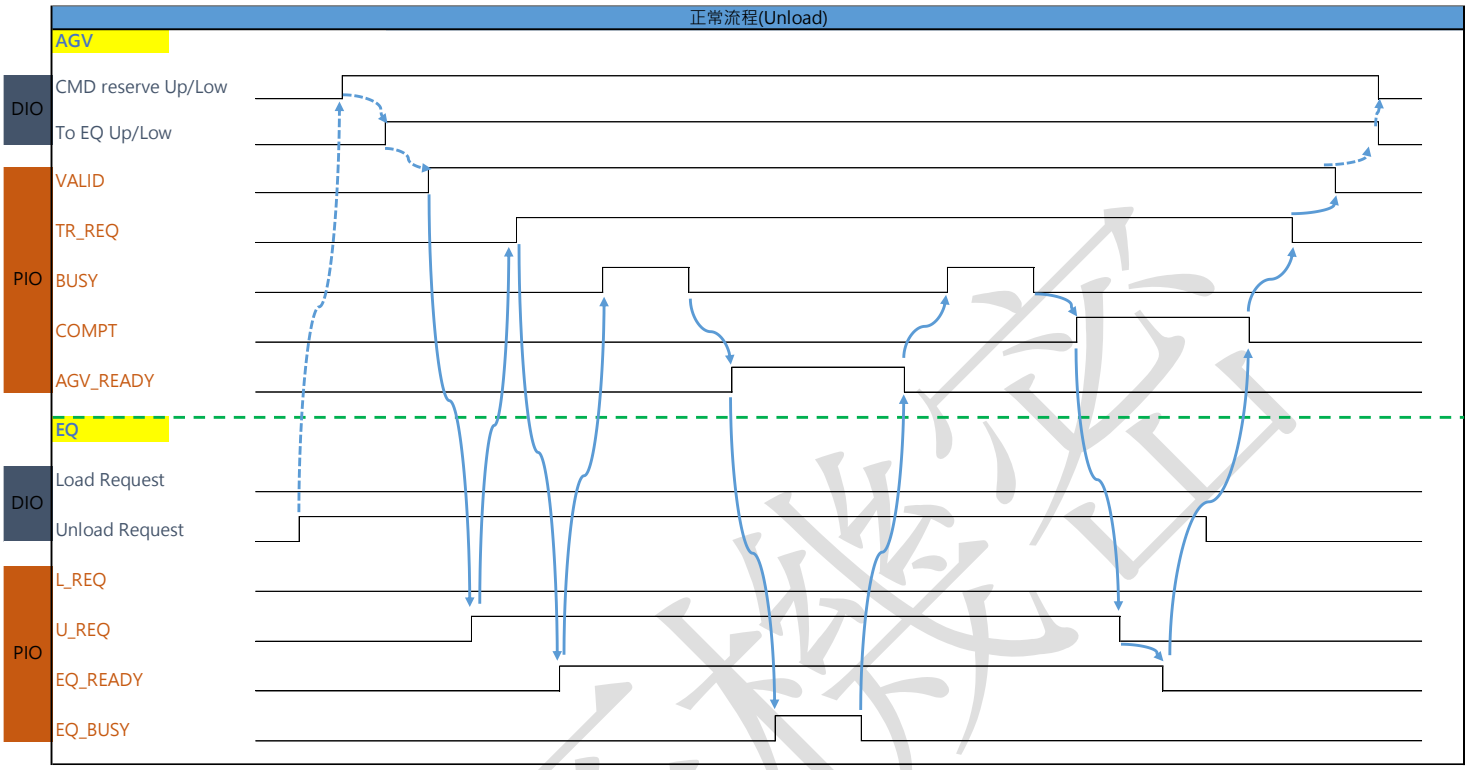
CMD reserve Up/Low 訊號:

a. 設備如無上下層，統一 Turn On CMD reserve UP
b. 此訊號主要派車下達任務，針對該設備進行命令預約信號

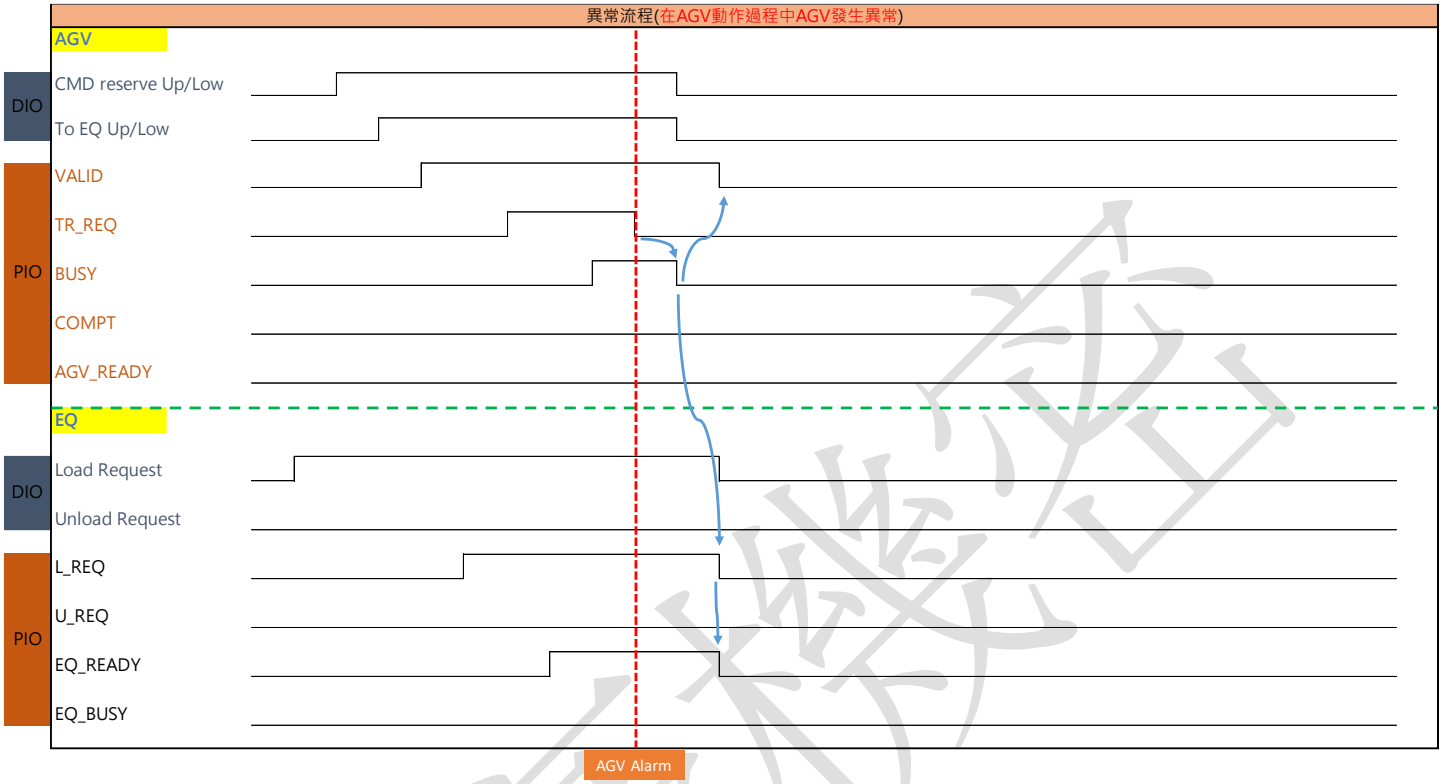
To EQ Up/Low 訊號:

c. 設備如無上下層，統一 Turn On To EQ UP
d. 此訊號主要 AGV 要開始進行 PIO 交握信號

3.2 正常流程(Unload)



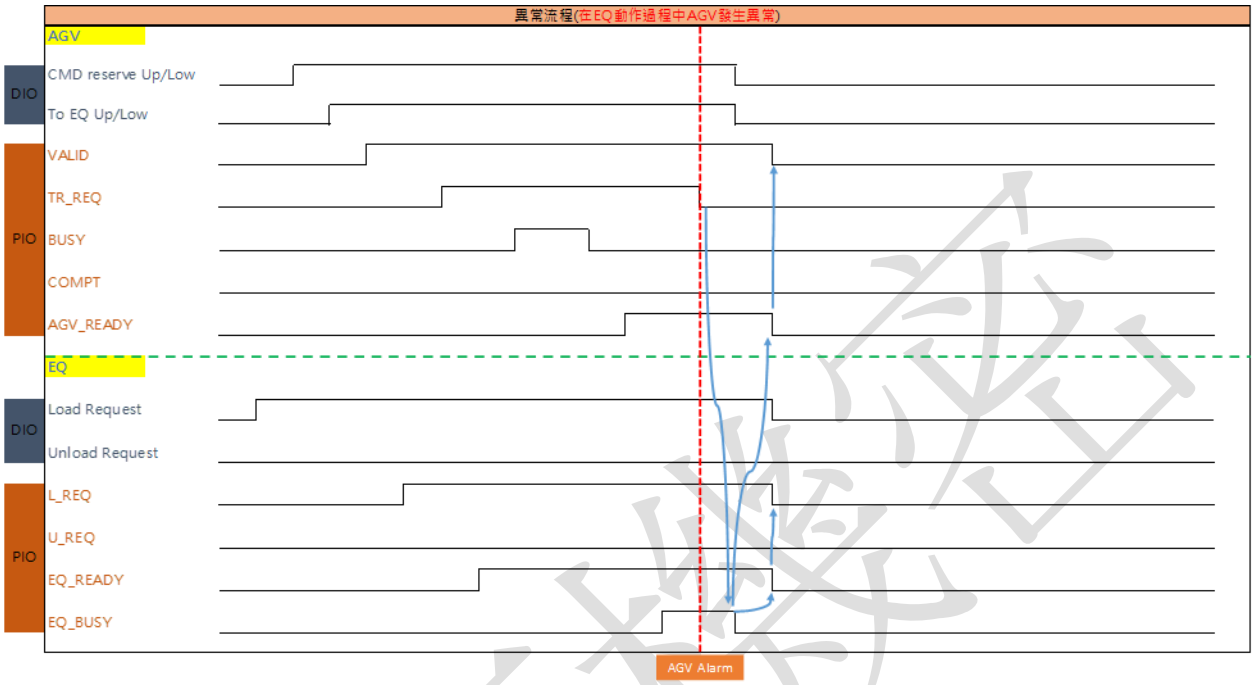
3.3 異常流程(AGV動作過程中AGV發生異常)



1. AGV 將 TR_REQ Off 通知設備端目前 AGV 發生異常
2. AGV 進行復歸後才可將 BUSY Off
3. 此時 EQ 確認 AGV 已退出設備，才可進行復歸動作
4. 各別交握狀態復歸可進行新一次交握狀態

※CMD reserve Up/Low，當發生異常派車將此筆任務取消時，會將此訊號 Off
※To EQ Up/Low，當發生異常派車將此筆任務取消時，會將此訊號 Off

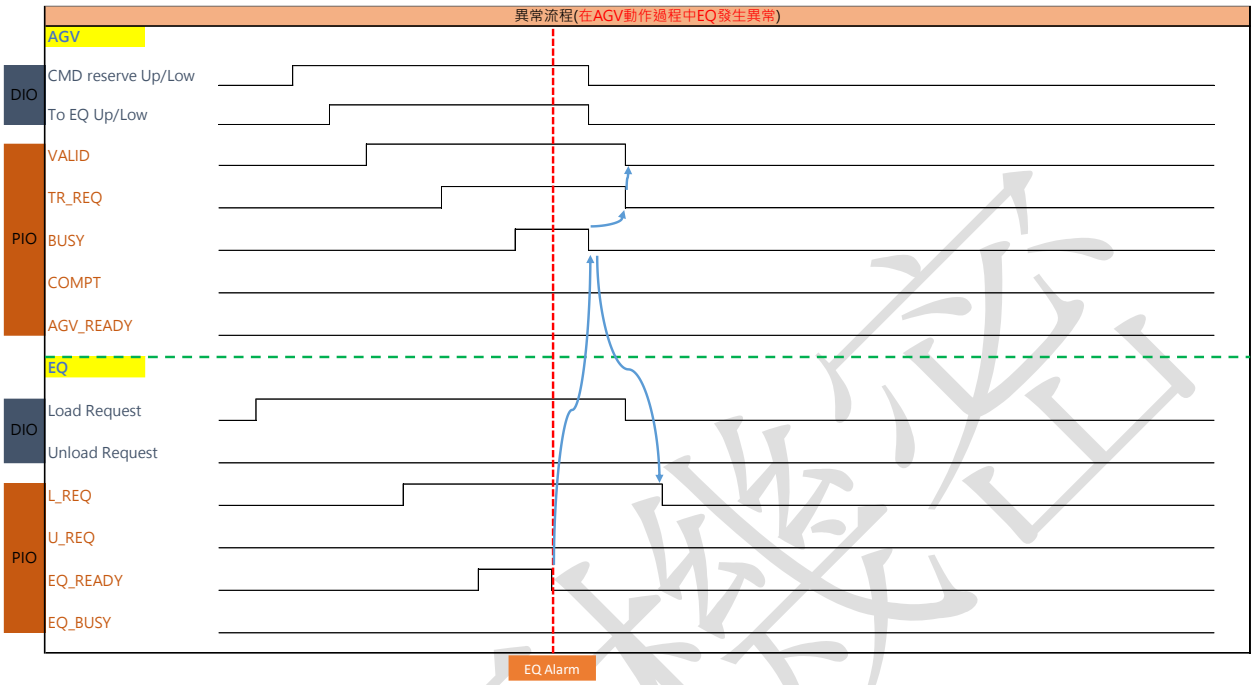
3.4 異常流程(EQ動作過程中AGV發生異常)



1. AGV 將 TR_REQ Off 通知設備端目前 AGV 發生異常
2. EQ 進行復歸後才可將 EQ_BUSY Off
3. 此時 AGV 才可進行復歸動作
4. 各別交握狀態復歸可進行新一次交握狀態

※CMD reserve Up/Low，當發生異常派車將此筆任務取消時，會將此訊號 Off
※To EQ Up/Low，當發生異常派車將此筆任務取消時，會將此訊號 Off

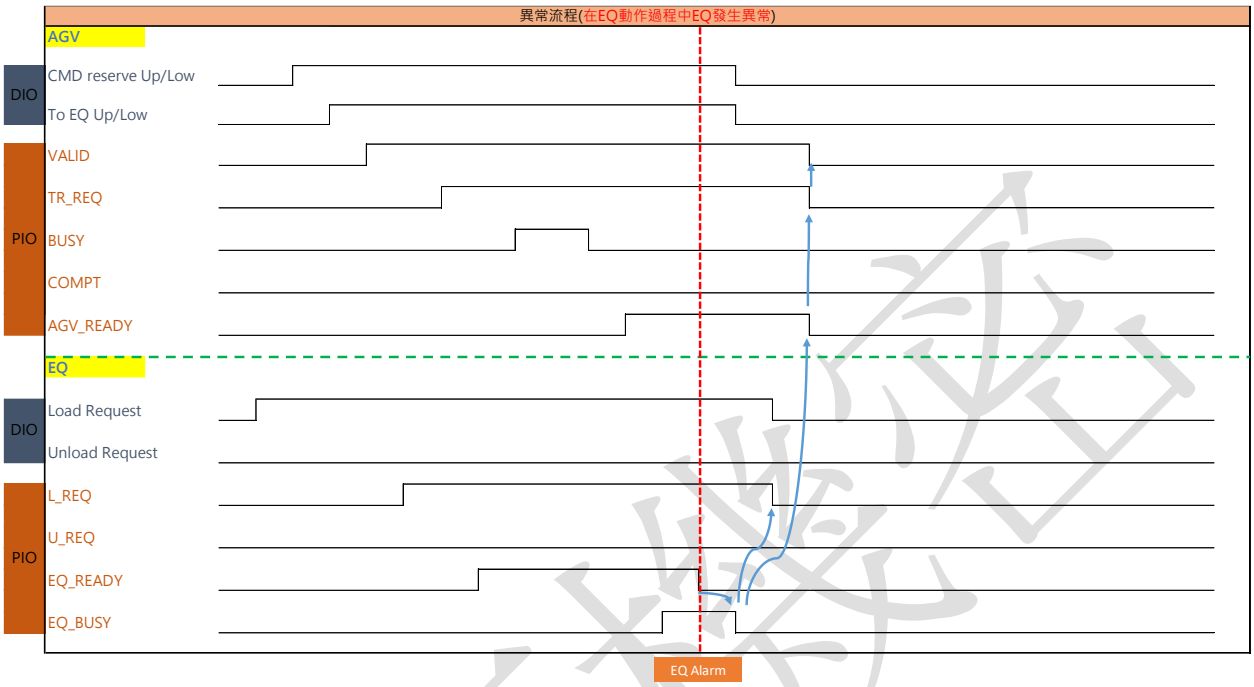
3.5 異常流程(AGV動作過程中EQ發生異常)



1. EQ 將 EQ_READY Off 通知 AGV 目前設備端發生異常
2. AGV 進行復歸後才可將 BUSY Off
3. 此時 EQ 確認 AGV 已退出設備，才可進行復歸動作
4. 各別交握狀態復歸可進行新一次交握狀態

※CMD reserve Up/Low，當發生異常派車將此筆任務取消時，會將此訊號 Off
※To EQ Up/Low，當發生異常派車將此筆任務取消時，會將此訊號 Off

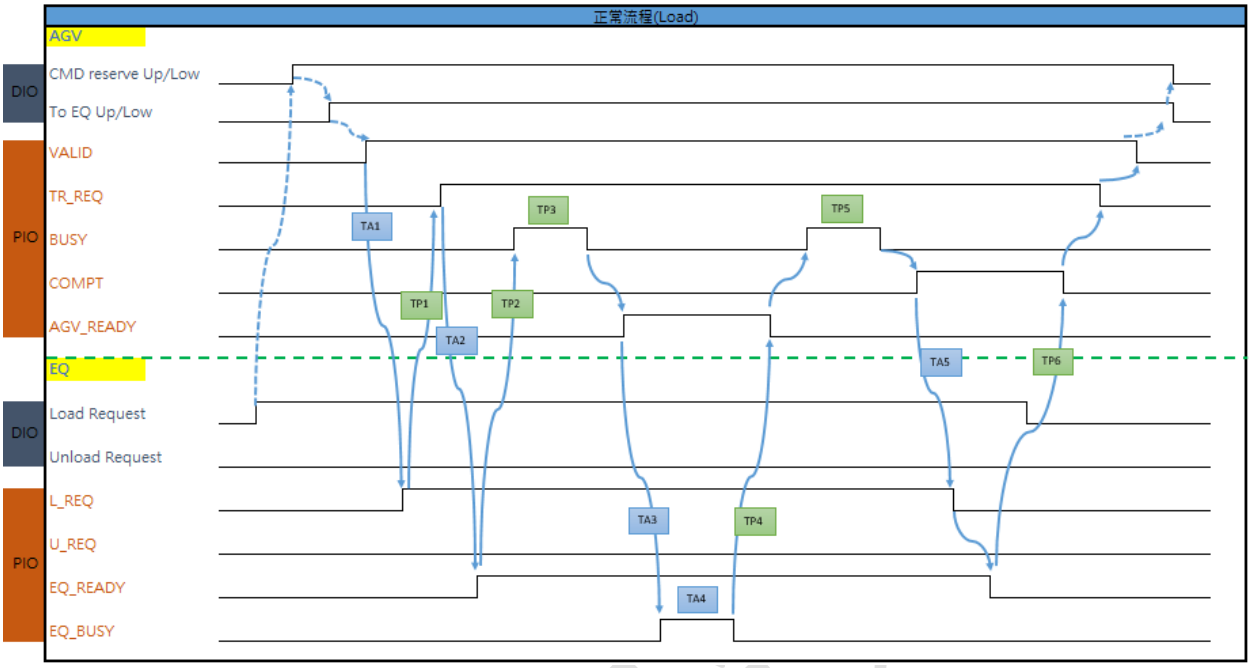
3.6 異常流程(EQ動作過程中EQ發生異常)



1. EQ 將 EQ_READY Off 通知設備端目前 AGV 發生異常
2. EQ 進行復歸後才可將 EQ_BUSY Off
3. 此時 AGV 才可進行復歸動作
4. 各別交握狀態復歸可進行新一次交握狀態

※CMD reserve Up/Low，當發生異常派車將此筆任務取消時，會將此訊號 Off
※To EQ Up/Low，當發生異常派車將此筆任務取消時，會將此訊號 Off

3.7 交握Timeout 時間說明



No	Timer Name	Rang	Value(Sec)
1	TA1	1~999	5
2	TA2	1~999	5
3	TA3	1~999	5
4	TA4	1~999	90
5	TA5	1~999	5
6	TP1	1~999	5
7	TP2	1~999	5
8	TP3	1~999	90
9	TP4	1~999	5
10	TP5	1~999	90
11	TP6	1~999	5

※Timeout 時間需可設定調整
※當 PIO 交握過程中斷訊 Alarm 偵測時間設定功能

TA: AGV 偵測 EQ 訊號 Timeout
TP: EQ 偵測 AGV 訊號 Timeout

Release Note/History

Note History

Date	Description	Author	Version
2023/03/16	Document Release	王晧吉	1.00
2023/03/20	修正 LD_POS, ULD_POS, EQP Status_Down 位置順序	王晧吉	1.10
2023/04/07	修改 TimeChart Timeout(TA 以及 TP 定義說明)	王晧吉	1.20