

RJ224-09 SAS4 BACKPLANE

USER'S MANUAL

P/N : 2RAKVI018001

Model : RJ224-09 JBOD SAS4 BACKPLANE

Version : 1.0

Revision History

Version	Changes	Date
V1.0	Official Release	2026/2/12

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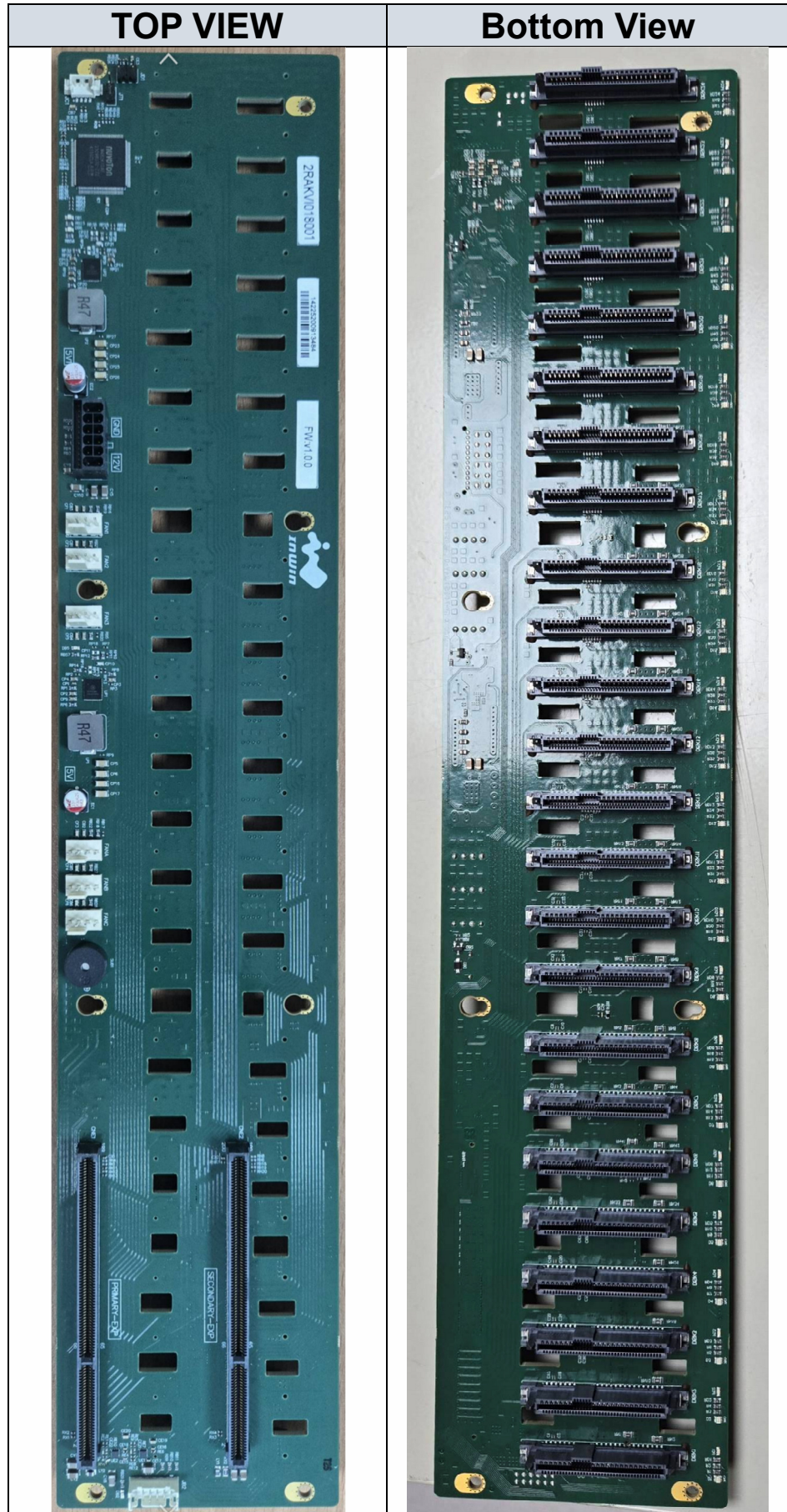
Overview

InWin backplanes offer a high-performance, cost-effective solution supporting up to 24 SAS4 drive bays.

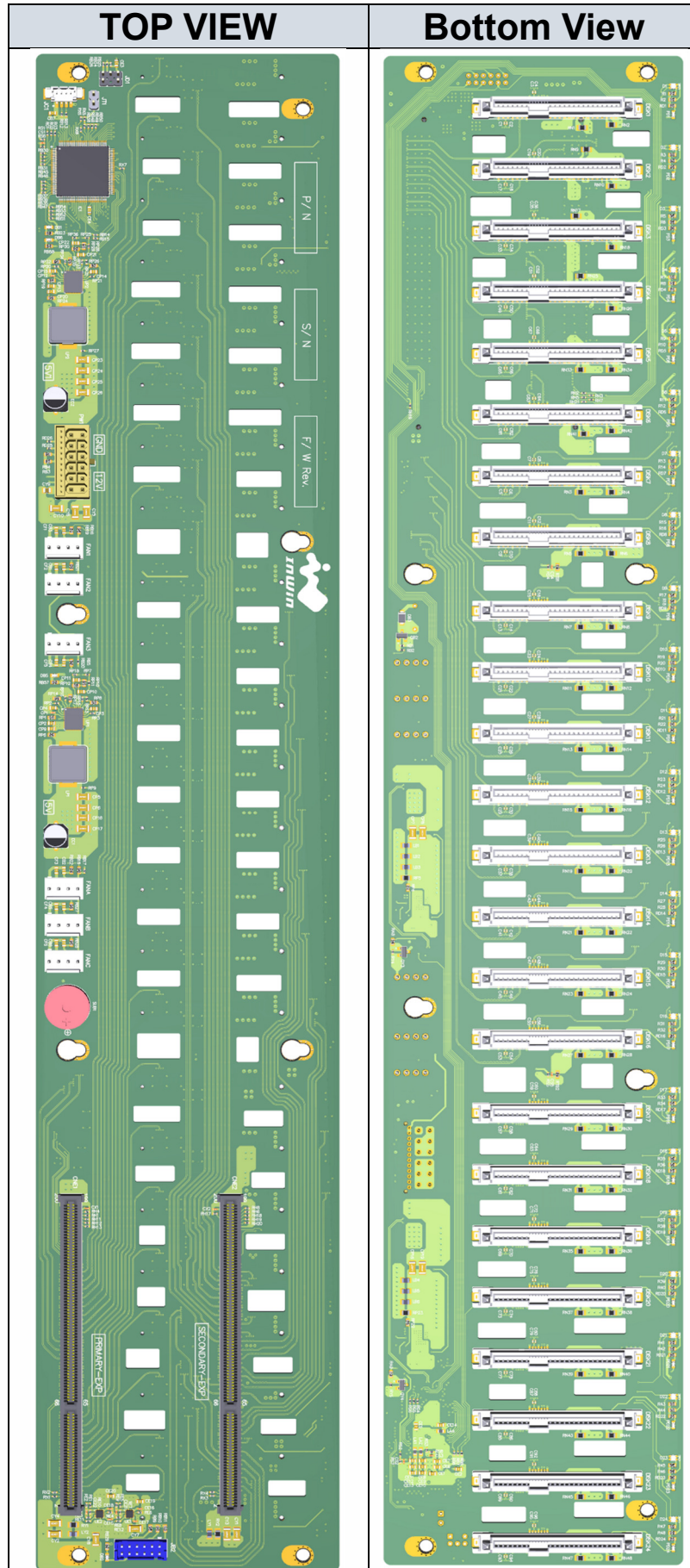
These backplanes are designed for state-of-the-art SAS4 22.5Gbps SSDs while maintaining backward compatibility with SAS3 (12Gbps), SAS (6Gbps), and SATA (6Gbps/3Gbps) HDD/SSDs. For redundant mission-critical applications, the JBOD configuration supports dual-domain functionality.

To ensure reliable power delivery under full-load conditions, the backplane features a high-current 12V power connector (P/N: 70368-1225). This 12S/12P hybrid connector utilizes a dual-pitch design (1.5mm & 3.0mm) to provide a robust 68A current capacity, satisfying the rigorous power requirements of up to 24 high-performance drives.

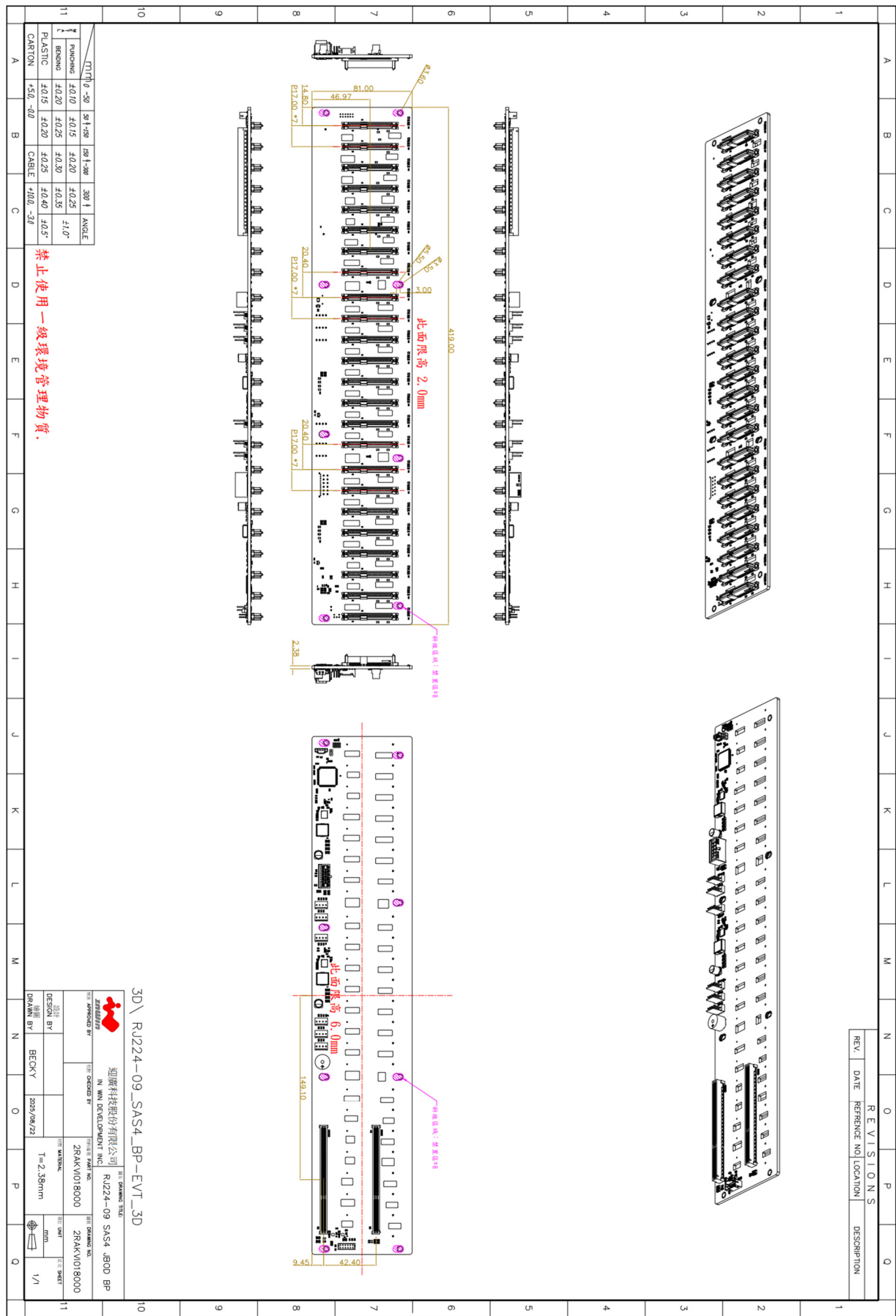
Physical Outlook



Diagram



Mechanical

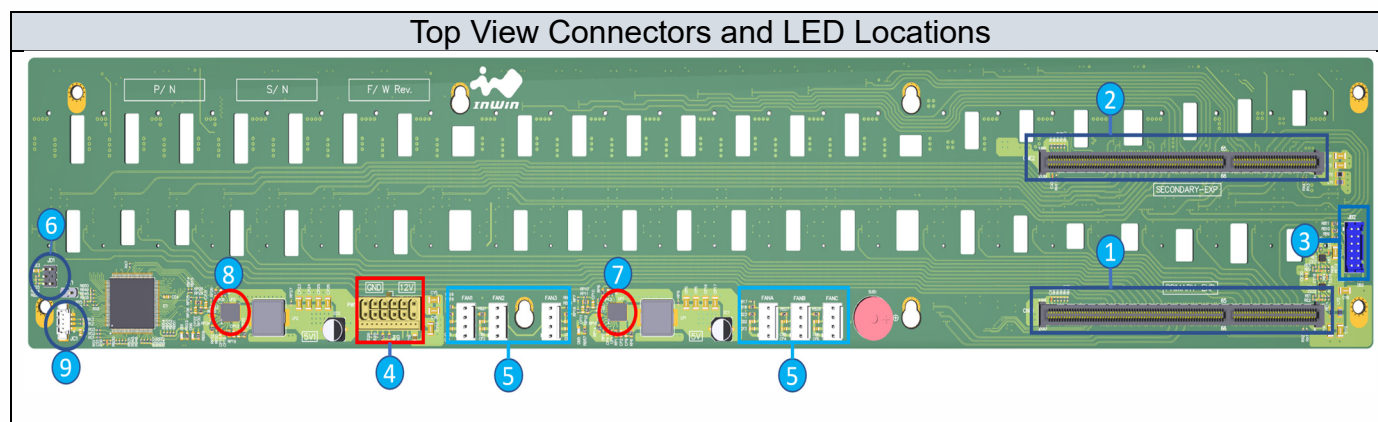


Hardware Specification

- HOST Interface : SAMTEC 2*100P Connector *2 (CNE1/ CNE2 for Primary/Secondary)
- Hard Disk/SSD (DISK) Interface : SATA/SAS3/SAS4
- Indicator:
 - Power LED *24 (PD1~PD24): Steady Blue (When HDD is present)
 - Dual color(Green/Red) LED *24 (D1~D24) for HDD Status (Activity/Fail/Locate)
 - ◆ Activity LED: Blinking Green (When HDD is Access)
 - ◆ Locate LED: Blinking Red (When HDD Fail or Locate)
 - ◆ Fail LED: Steady Red (When HDD Fail or Locate)
- Environment Control :
 - PWM FAN Connector (FAN1~FAN3 & FAN1~FANC) for Cooling system.
 - Temperature Sensor (RTB1/RTB2) monitor HDD bay inside temperature.
- High Speed Connector:
 - CNE1/CNE2: P0.8 High-speed edge card connector (2*100P). Connects the Primary/Secondary Expander boards to the Backplane.
 - DISK01~24: SFF-8681 SAS4 29-pin Receptacle. Fully compatible with SATA, SAS3, and SAS4 drives.
- Power/Signal Connector:
 - PW1: High-current 12S/12P hybrid connector (P/N: 70368-1225). Features a dual-pitch design (1.5mm/3.0mm) and straight DIP configuration; delivers up to 68A at 12V (816W).
 - JD1: Header for MCU firmware programming.
 - JC1: Primary I2C Control Header. Provides the primary I2C path from the host (via CNE1) to the onboard Expander. This 4-pin wafer (P1.25mm) enables system management and communication between the controller and the Expander IC.
 - JB2: Front Panel Header. Provides a connection interface to the system Front Panel Board for managing chassis-level signals (such as Power/Reset buttons and system status LEDs).

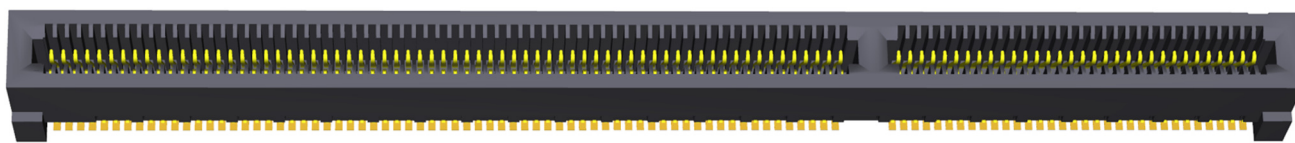
Connectors and Components

Connector and Component Locations



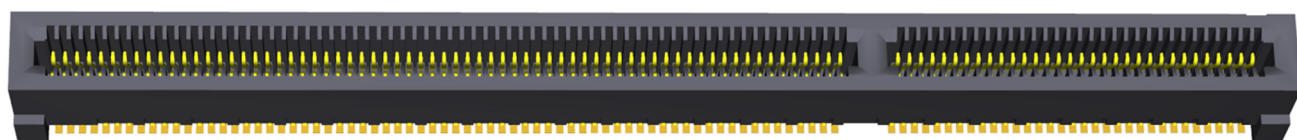
No	Description
1	Host facing interface Samtec HSEC8-1100-01-L-DV-A-K: CNE1 for Primary Expander
2	Host facing interface Samtec HSEC8-1100-01-L-DV-A-K: CNE2 for Secondary Expander
3	Front Panel SW/LED Connector: JB2
4	Main Power & Signal Connector: PW1
5	System FAN Connector: FAN1~FAN3 & FANA~FANC
6	Firmware Programming Header: JD1
7	12V to 5V VRM: 5V/25A for Disk01~Disk12
8	12V to 5V VRM: 5V/25A for Disk13~Disk24
9	Primary I2C Control Header: JC1

Connector Pin Definitions.

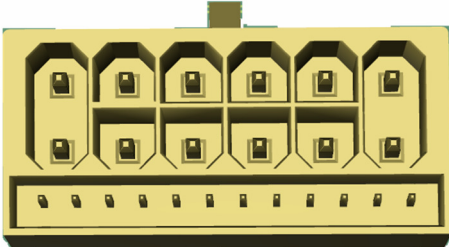


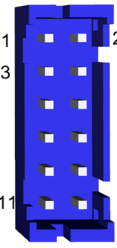
RJ224-09 BACKPLANE BOARD CNE1 INTER CONNECTION TABLE

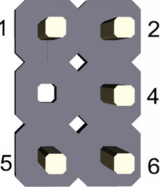
1	+12V	2	+12V	65	GND	66	GND	133	P-SAS_TX_P[20]	134	P-SAS_RX_P[20]
3	+12V	4	+12V	67	P-SAS_TX_P[09]	68	P-SAS_RX_P[09]	135	P-SAS_TX_N[20]	136	P-SAS_RX_N[20]
5	P_PW_CTL	6	P_PW_CTL	69	P-SAS_TX_N[09]	70	P-SAS_RX_N[09]	137	GND	138	GND
7	GND(P_EXP_INS)	8	GND(P_EXP_INS)	71	GND	72	GND	139	P-SAS_TX_P[21]	140	P-SAS_RX_P[21]
9	GND	10	GND	73	P-SAS_TX_P[10]	74	P-SAS_RX_P[10]	141	P-SAS_TX_N[21]	142	P-SAS_RX_N[21]
11	P-SAS_TX_P[00]	12	P-SAS_RX_P[00]	75	P-SAS_TX_N[10]	76	P-SAS_RX_N[10]	143	GND	144	GND
13	P-SAS_TX_N[00]	14	P-SAS_RX_N[00]	77	GND	78	GND	145	P-SAS_TX_P[22]	146	P-SAS_RX_P[22]
15	GND	16	GND	79	P-SAS_TX_P[11]	80	P-SAS_RX_P[11]	147	P-SAS_TX_N[22]	148	P-SAS_RX_N[22]
17	P-SAS_TX_P[01]	18	P-SAS_RX_P[01]	81	P-SAS_TX_N[11]	82	P-SAS_RX_N[11]	149	GND	150	GND
19	P-SAS_TX_N[01]	20	P-SAS_RX_N[01]	83	GND	84	GND	151	P-SAS_TX_P[23]	152	P-SAS_RX_P[23]
21	GND	22	GND	85	P-SAS_TX_P[12]	86	P-SAS_RX_P[12]	153	P-SAS_TX_N[23]	154	P-SAS_RX_N[23]
23	P-SAS_TX_P[02]	24	P-SAS_RX_P[02]	87	P-SAS_TX_N[12]	88	P-SAS_RX_N[12]	155	GND	156	GND
25	P-SAS_TX_N[02]	26	P-SAS_RX_N[02]	89	GND	90	GND	157	GND	158	GND
27	GND	28	GND	91	P-SAS_TX_P[13]	92	P-SAS_RX_P[13]	159		160	
29	P-SAS_TX_P[03]	30	P-SAS_RX_P[03]	93	P-SAS_TX_N[13]	94	P-SAS_RX_N[13]	161		162	
31	P-SAS_TX_N[03]	32	P-SAS_RX_N[03]	95	GND	96	GND	163	P_ID_LED	164	P_IIC_SCL_E2
33	GND	34	GND	97	P-SAS_TX_P[14]	98	P-SAS_RX_P[14]	165		166	P_IIC_SDA_E2
35	P-SAS_TX_P[04]	36	P-SAS_RX_P[04]	99	P-SAS_TX_N[14]	100	P-SAS_RX_N[14]	167		168	P_SIO_CLK_E1
37	P-SAS_TX_N[04]	38	P-SAS_RX_N[04]	101	GND	102	GND	169		170	P_SIO_DO_E1
39	GND	40	GND	103	P-SAS_TX_P[15]	104	P-SAS_RX_P[15]	171		172	P_SIO_LD_E1
41	P-SAS_TX_P[05]	42	P-SAS_RX_P[05]	105	P-SAS_TX_N[15]	106	P-SAS_RX_N[15]	173	GND	174	GND
43	P-SAS_TX_N[05]	44	P-SAS_RX_N[05]	107	GND	108	GND	175		176	P_IIC_SCL_EXP1
45	GND	46	GND	109	P-SAS_TX_P[16]	110	P-SAS_RX_P[16]	177		178	P_IIC_SDA_EXP1
47	P-SAS_TX_P[06]	48	P-SAS_RX_P[06]	111	P-SAS_TX_N[16]	112	P-SAS_RX_N[16]	179		180	P_IIC_SCL_EXP2
49	P-SAS_TX_N[06]	50	P-SAS_RX_N[06]	113	GND	114	GND	181	ID_SW	182	P_IIC_SDA_EXP2
51	GND	52	GND	115	P-SAS_TX_P[17]	116	P-SAS_RX_P[17]	183	GND	184	GND
53	P-SAS_TX_P[07]	54	P-SAS_RX_P[07]	117	P-SAS_TX_N[17]	118	P-SAS_RX_N[17]	185	P_HM_SEL0	186	P_PS_COMM_1
55	P-SAS_TX_N[07]	56	P-SAS_RX_N[07]	119	GND	120	GND	187	P_HM_SEL1	188	
57	GND	58	GND	121	P-SAS_TX_P[18]	122	P-SAS_RX_P[18]	189	P_HM_SEL2	190	P_P/S_SEL
59	P-SAS_TX_P[08]	60	P-SAS_RX_P[08]	123	P-SAS_TX_N[18]	124	P-SAS_RX_N[18]	191	P_HW_LOC_0	192	
61	P-SAS_TX_N[08]	62	P-SAS_RX_N[08]	125	GND	126	GND	193	P_HW_LOC_1	194	
63	GND	64	GND	127	P-SAS_TX_P[19]	128	P-SAS_RX_P[19]	195	+1.8V1	196	+1.8V1
				129	P-SAS_TX_N[19]	130	P-SAS_RX_N[19]	197	GND	198	GND
				131	GND	132	GND	199	GND	200	GND


RJ224-09 BACKPLANE BORAD CNE2 INTER CONNECTION TABLE

1	+12V_S	2	+12V_S	65	GND	66	GND	133	S-SAS_TX_P[20]	134	S-SAS_RX_P[20]
3	+12V_S	4	+12V_S	67	S-SAS_TX_P[09]	68	S-SAS_RX_P[09]	135	S-SAS_TX_N[20]	136	S-SAS_RX_N[20]
5	S_PW_CTL_R	6	S_PW_CTL_R	69	S-SAS_TX_N[09]	70	S-SAS_RX_N[09]	137	GND	138	GND
7	S_EXP_INS_R	8	S_EXP_INS_R	71	GND	72	GND	139	S-SAS_TX_P[21]	140	S-SAS_RX_P[21]
9	GND	10	GND	73	S-SAS_TX_P[10]	74	S-SAS_RX_P[10]	141	S-SAS_TX_N[21]	142	S-SAS_RX_N[21]
11	S-SAS_TX_P[00]	12	S-SAS_RX_P[00]	75	S-SAS_TX_N[10]	76	S-SAS_RX_N[10]	143	GND	144	GND
13	S-SAS_TX_N[00]	14	S-SAS_RX_N[00]	77	GND	78	GND	145	S-SAS_TX_P[22]	146	S-SAS_RX_P[22]
15	GND	16	GND	79	S-SAS_TX_P[11]	80	S-SAS_RX_P[11]	147	S-SAS_TX_N[22]	148	S-SAS_RX_N[22]
17	S-SAS_TX_P[01]	18	S-SAS_RX_P[01]	81	S-SAS_TX_N[11]	82	S-SAS_RX_N[11]	149	GND	150	GND
19	S-SAS_TX_N[01]	20	S-SAS_RX_N[01]	83	GND	84	GND	151	S-SAS_TX_P[23]	152	S-SAS_RX_P[23]
21	GND	22	GND	85	S-SAS_TX_P[12]	86	S-SAS_RX_P[12]	153	S-SAS_TX_N[23]	154	S-SAS_RX_N[23]
23	S-SAS_TX_P[02]	24	S-SAS_RX_P[02]	87	S-SAS_TX_N[12]	88	S-SAS_RX_N[12]	155	GND	156	GND
25	S-SAS_TX_N[02]	26	S-SAS_RX_N[02]	89	GND	90	GND	157	GND	158	GND
27	GND	28	GND	91	S-SAS_TX_P[13]	92	S-SAS_RX_P[13]	159		160	
29	S-SAS_TX_P[03]	30	S-SAS_RX_P[03]	93	S-SAS_TX_N[13]	94	S-SAS_RX_N[13]	161		162	
31	S-SAS_TX_N[03]	32	S-SAS_RX_N[03]	95	GND	96	GND	163	S_ID_LED	164	S_IIC_SCL_E2
33	GND	34	GND	97	S-SAS_TX_P[14]	98	S-SAS_RX_P[14]	165		166	S_IIC_SDA_E2
35	S-SAS_TX_P[04]	36	S-SAS_RX_P[04]	99	S-SAS_TX_N[14]	100	S-SAS_RX_N[14]	167		168	S_SIO_CLK_E1
37	S-SAS_TX_N[04]	38	S-SAS_RX_N[04]	101	GND	102	GND	169		170	S_SIO_DO_E1
39	GND	40	GND	103	S-SAS_TX_P[15]	104	S-SAS_RX_P[15]	171		172	S_SIO_LD_E1
41	S-SAS_TX_P[05]	42	S-SAS_RX_P[05]	105	S-SAS_TX_N[15]	106	S-SAS_RX_N[15]	173	GND	174	GND
43	S-SAS_TX_N[05]	44	S-SAS_RX_N[05]	107	GND	108	GND	175		176	S_IIC_SCL_EXP1
45	GND	46	GND	109	S-SAS_TX_P[16]	110	S-SAS_RX_P[16]	177		178	S_IIC_SDA_EXP1
47	S-SAS_TX_P[06]	48	S-SAS_RX_P[06]	111	S-SAS_TX_N[16]	112	S-SAS_RX_N[16]	179		180	S_IIC_SCL_EXP2
49	S-SAS_TX_N[06]	50	S-SAS_RX_N[06]	113	GND	114	GND	181	ID_SW	182	S_IIC_SDA_EXP2
51	GND	52	GND	115	S-SAS_TX_P[17]	116	S-SAS_RX_P[17]	183	GND	184	GND
53	S-SAS_TX_P[07]	54	S-SAS_RX_P[07]	117	S-SAS_TX_N[17]	118	S-SAS_RX_N[17]	185	S_HM_SEL0	186	S_PS_COMM_1
55	S-SAS_TX_N[07]	56	S-SAS_RX_N[07]	119	GND	120	GND	187	S_HM_SEL1	188	
57	GND	58	GND	121	S-SAS_TX_P[18]	122	S-SAS_RX_P[18]	189	S_HM_SEL2	190	S_P/S_SEL
59	S-SAS_TX_P[08]	60	S-SAS_RX_P[08]	123	S-SAS_TX_N[18]	124	S-SAS_RX_N[18]	191	S_HW_LOC_0	192	
61	S-SAS_TX_N[08]	62	S-SAS_RX_N[08]	125	GND	126	GND	193	S_HW_LOC_1	194	
63	GND	64	GND	127	S-SAS_TX_P[19]	128	S-SAS_RX_P[19]	195	+1.8V	196	+1.8V
				129	S-SAS_TX_N[19]	130	S-SAS_RX_N[19]	197	GND	198	GND
				131	GND	132	GND	199	GND	200	GND

PW1		TO PDB CONNECTOR			
		OUTPUT PIN ASSIGNMENT			
		PIN	SIGNAL NAME	PIN	SIGNAL NAME
		1	+12VSB	S1	+3.3VSB
		2	+12V	S2	+3.3VSB
		3	+12V	S3	PSON_CRPS1
		4	GND	S4	PSON_CRPS2
		5	GND	S5	ALERT_CRPS1
		6	GND	S6	ALERT_CRPS2
		7	+12V	S7	PWOK_CRPS1
		8	+12V	S8	PWOK_CRPS2
		9	+12V	S9	INS_CRPS1
		10	GND	S10	INS_CRPS2
		11	GND	S11	PMBUS_SCL
		12	GND	S12	PMBUS_SDA

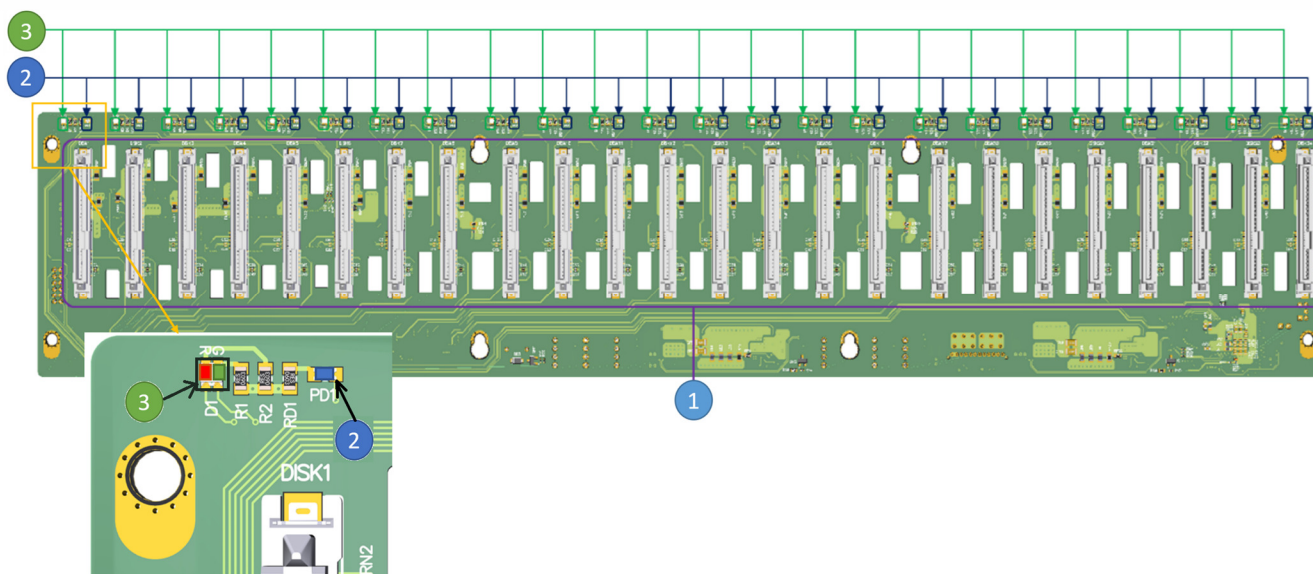
JB2		OUTPUT PIN ASSIGNMENT			
		PIN	SIGNAL NAME	PIN	SIGNAL NAME
		1	ID_LED_+	2	ID_LED_-
		3	ID_SW_+	4	ID_SW_-
		5	POWER_LED_+	6	POWER_LED_-
		7	POWER_SW_+	8	POWER_SW_-
		9	SYSERR_LED_+	10	SYSERR_LED_-
		11	MUTE_SW_+	12	MUTE_SW_-

JD1		OUTPUT PIN ASSIGNMENT			
		PIN	SIGNAL NAME	PIN	SIGNAL NAME
		1	+3.3VSB	2	ICE_CLK
		3	KEY	4	ICE_DAT
		5	GND	6	nReset

FAN1~FAN3 / FANA~FANC		OUTPUT PIN ASSIGNMENT	
		PIN	SIGNAL NAME
		1	GND
		2	+12V
		3	Tachometer
		4	PWM Output

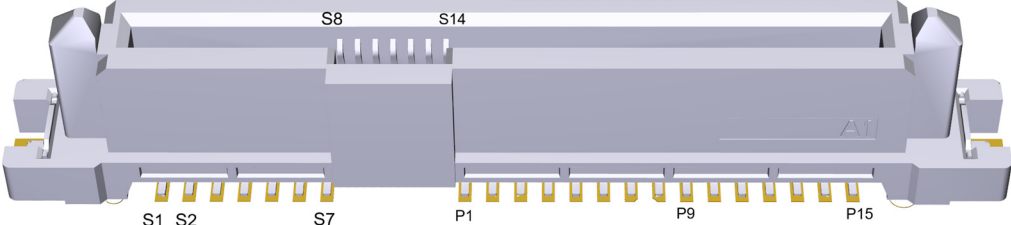
Connector Locations and LED Indicators

Bottom View Connector and LED Locations



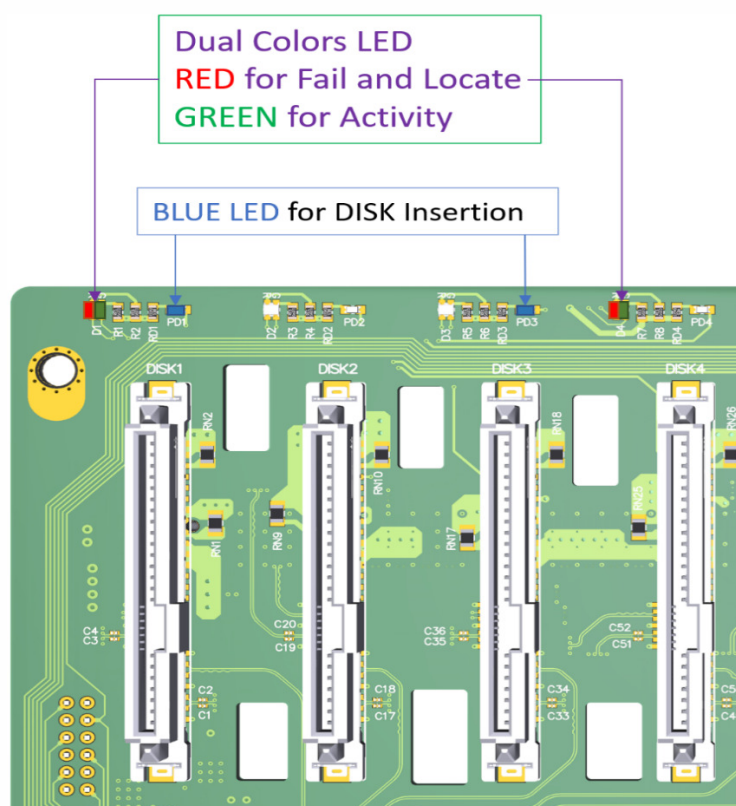
No	Location	Description
1	DISK01~ DISK24	SATA/SAS Disk01~ Disk24
2	PD1~PD24	Blue LED *24 for Disk Insertion
3	D1~D24	Dual color LED *24 (Green: Activity / Red: Fail or Locate)

DISK01~DISK24

DISK01~DISK24			
			
PIN	Signal Name (From Expander)	PIN	Signal Name
S1	GND	P1	NC_(+3.3V)
S2	P-SAS_TX_P	P2	NC_(+3.3V)
S3	P-SAS_TX_N	P3	NC_(+3.3V-Precharge)
S4	GND	P4	GND
S5	P-SAS_RX_P	P5	GND
S6	P-SAS_RX_N	P6	GND
S7	GND	P7	+5V-Precharge
S8	GND	P8	+5V
S9	S-SAS_TX_P	P9	+5V
S10	S-SAS_TX_N	P10	GND
S11	GND	P11	NC_(READ-LED)
S12	S-SAS_RX_P	P12	HDD-LED_(GND)
S13	S-SAS_RX_N	P13	+12V-Precharge
S14	GND	P14	+12V
		P15	+12V

LED Behavior

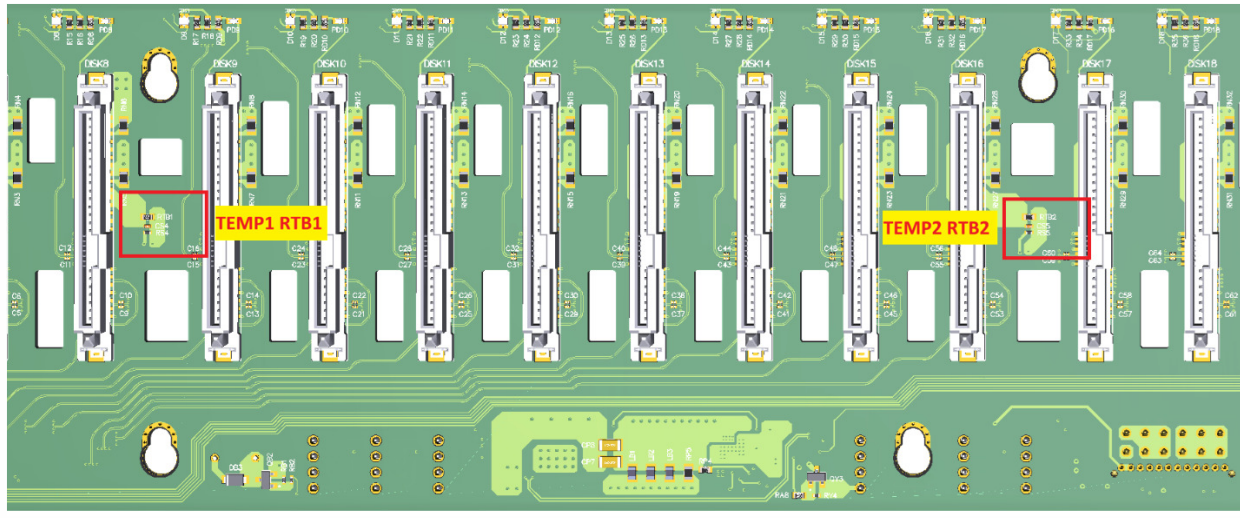
Disk Bay LED



LED Color	Function	Behavior
Blue	Disk Insertion	Solid On: Disk drive is properly installed.
Green	Activity	Blinking (8 Hz): Disk drive is being accessed.
Red	Fail & Locate	Solid On: Disk failure occurs. Blinking (1 Hz): Locating, RAID rebuild, or consistency check.

Smart Fan Control

IN-WIN's Backplane implement Smart Fan Control feature by automatically detecting the presence of the Fan Modules and intelligently controlling the Fan RPM according to the system temperature detected by two thermal sensors (RTB1/RTB2) on the backplane.



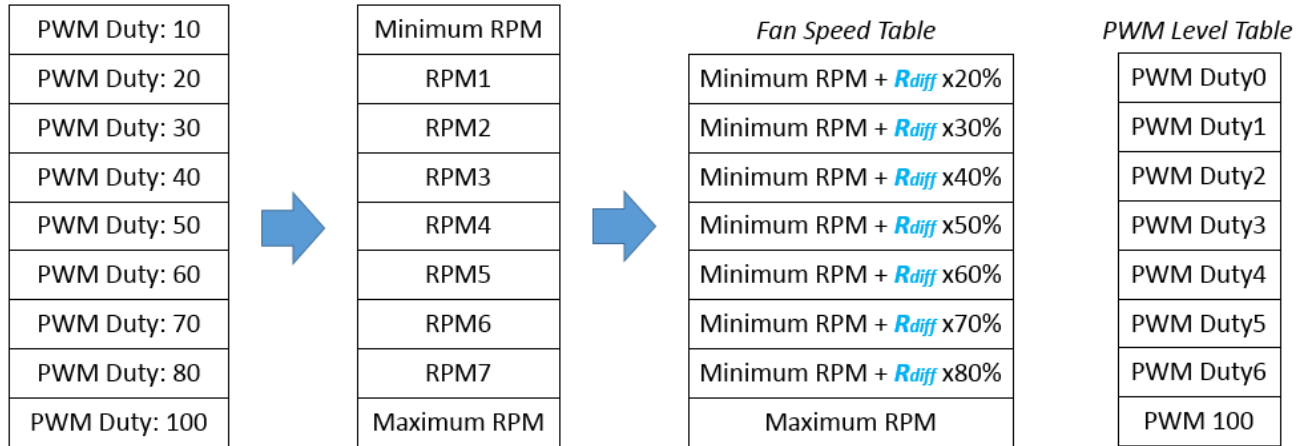
Thanks to Smart Fan Control feature, the Fan connectors (FAN1~FAN12) on backplane support a wide variety of PWM driven Fan modules used in the enclosure.

How it works?

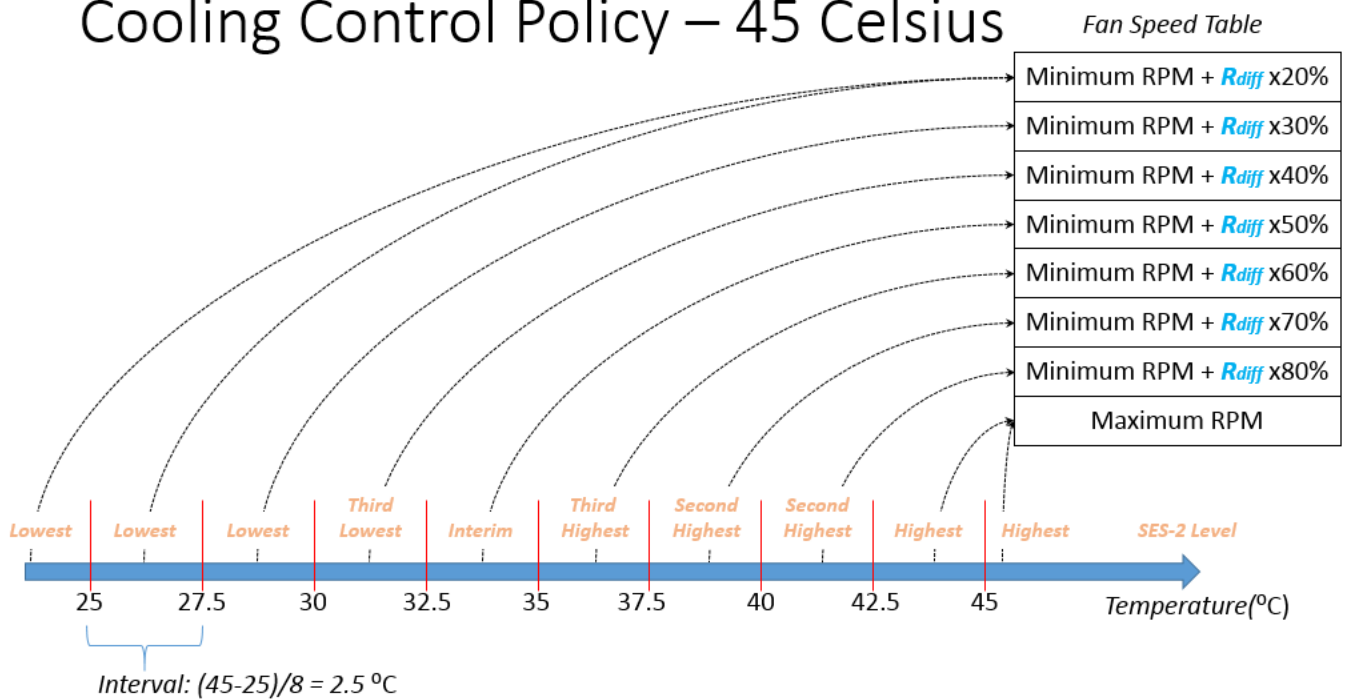
1. Fan module auto-calibration is triggered upon every system boot. The thermal profile would then be recorded and used until next reboot.
2. Backplane starts fan calibration and calculates the corresponding PWM duty cycle for each level. There are totally 8 speed levels to be sensed and used until next system boot.
3. The 8 fan speed levels are mapped to the temperature readings detected by thermistor spreading from 25 to 45°C in 3.75°C steps.
4. In normal operation, when the system temperature changes to next level, the fan module would change speed accordingly. The Fan failure alarm would be triggered when the RPM of the Fan module is dropped lower than 75% of its expected speed.
5. The fan module calibration and thermal profile are as below.
6. When an external PWM source joins, the output PWM duty is determined by comparing the internal calculated PWM and external PWM and then selecting whichever is higher as the output PWM to the fan modules.

Fan Speed Measurement

$$R_{diff} = \text{Maximum RPM} - \text{Minimum RPM}$$



Cooling Control Policy – 45 Celsius



Firmware Upgrade

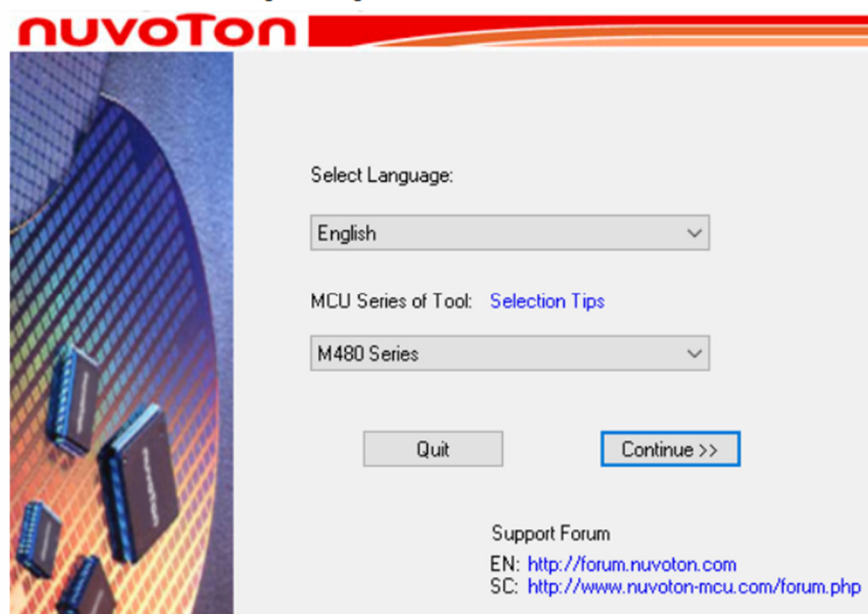
The passive backplanes are equipped with Nuvoton M482 series MCUs for managing disk LED indication, Fan speed control and system fail alarm. These MCUs are pre-programmed in manufacturing. In most cases, the MCUs are not required to reprogram unless there is issue needed to fix.

How to upgrade firmware?

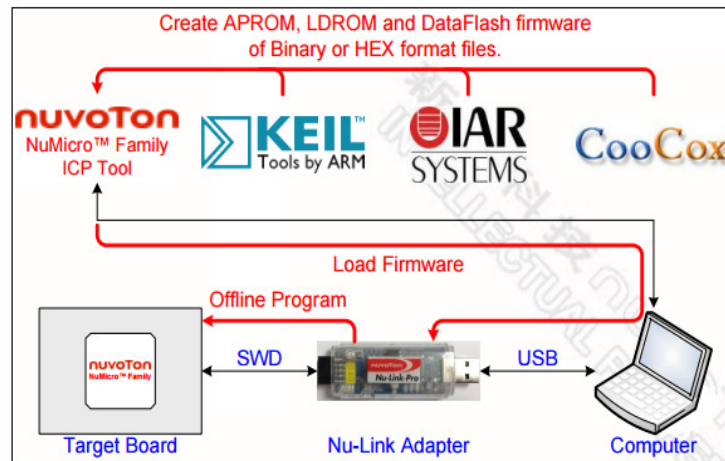
1. You will need a Nuvoton ARM Cortex-M0 programming tool. Nu-Me or Nu-Link and must install Nuvoton ICP Programming tool software.



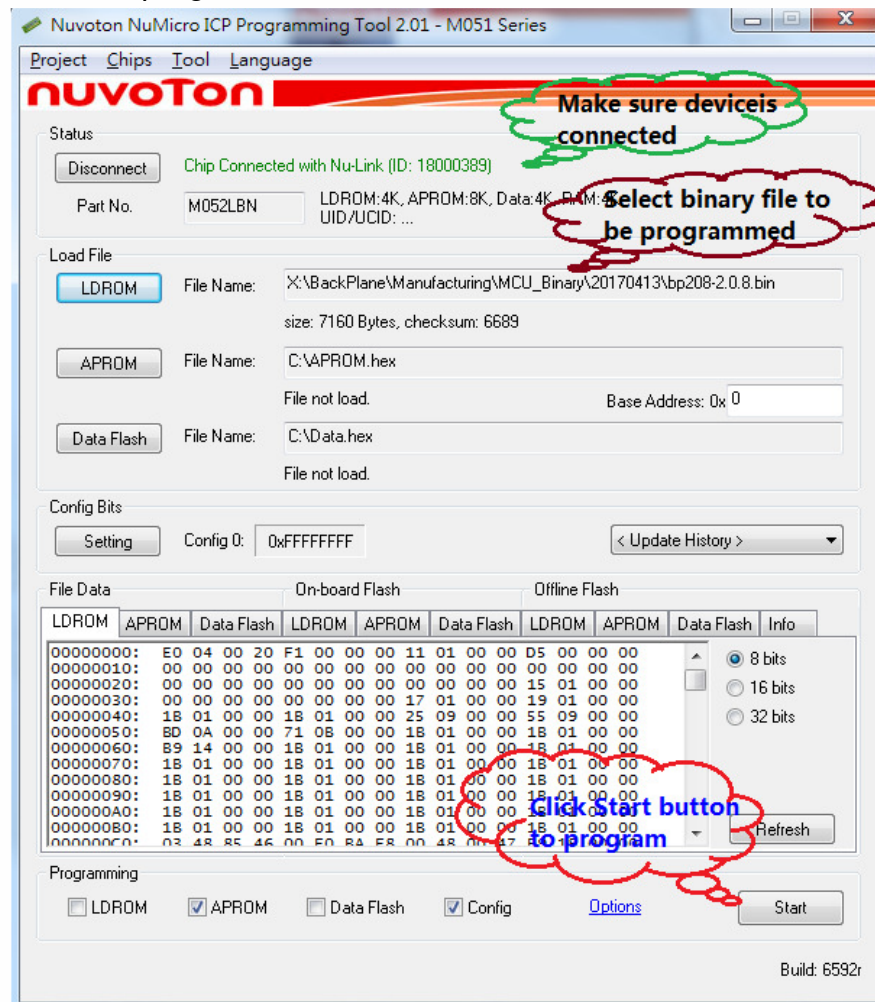
Nuvoton NuMicro ICP Programming Tool 3.09



2. Connect Nu-Link USB end to a host and the SWD end to the Backplane ICE connector for each MCU.



3. Make sure device is connected and select the binary file to be programmed, and then click on Start button to program firmware.



4. Please refer to http://www.nuvoton.com/resource-files/NuLink_Adapter_User_Manual_EN_V1.01.pdf for more details.