



2.5" SATA III SLC SSD
Supports Fast & Secure Erase
BON-III Series

Product Specification

INDUSTRIAL

APRO RUGGED METAL 2.5" SATA III SLC SSD

SUPPORTS FAST / SECURE ERASE

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Revision History

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1. Introduction

APRO industrial rugged metal 2.5” SATA III SLC SSD – BON-III series provides high capacity flash memory Solid State Drive (SSD) that electrically complies with Serial ATA 3.0 (SATA) standard. APRO Rugged Metal 2.5” SATA III SLC SSD – BON-III series support SATA Gen-III (6.0 GB/s) with high performance. The main used flash memories are SLC-NAND type flash memory chips. The available disk capacities are 16GB, 32GB, 64GB, 128GB and 256GB.

The operating temperature grade is optional for Standard grade 0°C ~ 70°C and wide temp grade supports -40°C ~ +85°C. The data transfer performance by sequential read is up to 173.4 MB/sec, and sequential write is up to 165.8 MB/sec.

APRO Rugged Metal 2.5” SATA III SLC SSD – BON-III series supports Fast Erase/Secure Erase which initiates by hardware design and software vendor commands. Fast Erase Procedure is one of the defaults sanitizing procedure in BON-III series. Fast Erase enables users to erase entire disk contents within seconds; 16GB SSD needs about 17.5 seconds, and 256GB needs about 60 seconds to run the fast erase procedure for whole disk completely.

APRO Rugged Metal 2.5” SATA III SLC SSD built-in DDRIII 4Gbits SDRAM products provide a high level interface to the host computer. This interface allows a host computer to issue commands to the Rugged Metal 2.5” SATA III SLC SSD to read or write blocks of memory. Hardware BCH ECC capable of correcting errors up to 66-bit/1KB (ECC). APRO Rugged Metal 2.5” SATA III SLC SSD BON-III series intelligent controller manages interface protocols, data storage and retrieval as well as ECC, defect handling and diagnostics, power management and clock control.

Figure 1 shows a block diagram of the used high tech Rugged Metal 2.5” SATA III SLC SSD controller.

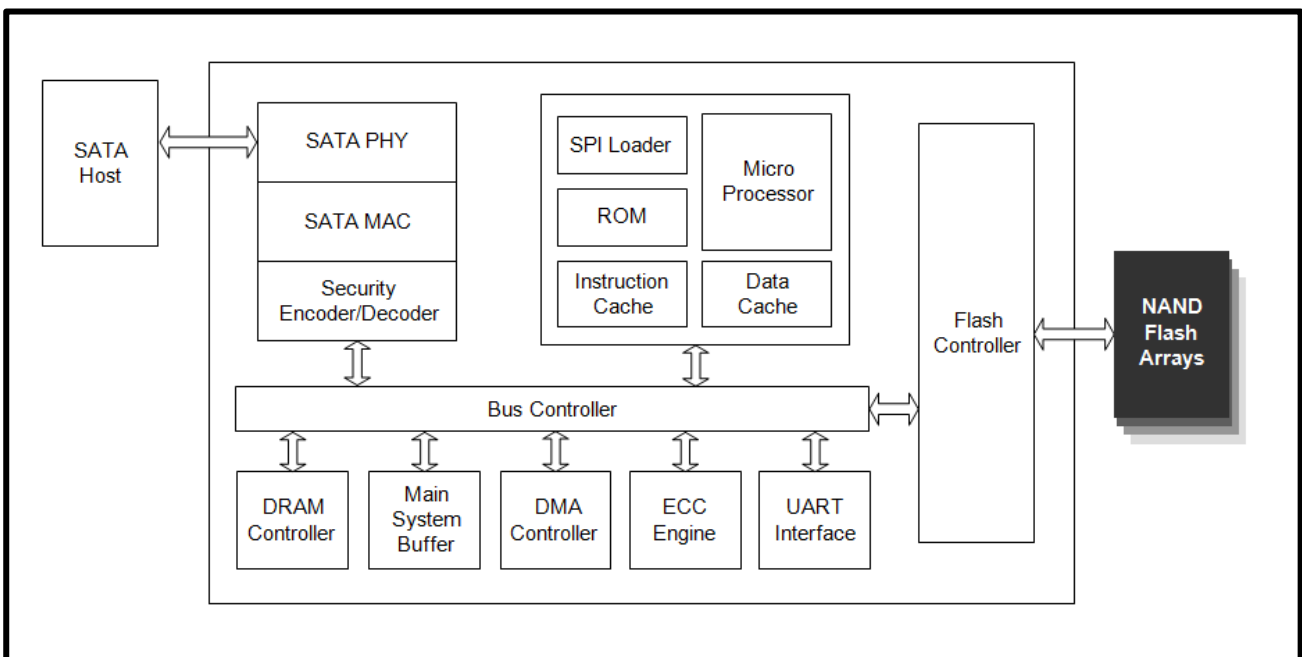


Figure 1: APRO Rugged Metal 2.5” SATA III SLC SSD BON-III series controller block diagram

1.1. *Scope*

This document describes features, specifications and installation guide of APRO's Rugged Metal 2.5" SATA III SLC SSDs BON-III series. In the appendix, there provides order information, warranty policy, RMA/DOA procedure for the most convenient reference.

1.2. *System Features*

- SLC-NAND type flash technology.
- Standard 2.5" SATA Flash Disk form-factor (9.2mm height).
- SATA 7-pin (data) + 15-pin (power connector) SATA Interface.
- Extremely Rugged Metal casing to endure harsh environments.
- Power interrupts data protection technology by Tantalum Capacitors.
- Fast Erase by Hardware jumper setting by JP1+JP2, which located on the front side of SSD.
- Secure Erase by Hardware jumper setting by JP3+JP4, which located on the front side of SSD.
- Compliance with Existing Sanitize (Purge) Standards by software vendor commands.
- Supports hardware jumper setting by JP5+JP6 for Write Protect function.
- SATA 1.0a, SATA 2.6 and SATA 3.0 specification compliance.
- SMART (Self-Monitoring, Analysis and Reporting Technology) function supported.
- Supports Window-7 TRIM Command.
- Non-volatile memory and no moving parts.
- SLC Flash SSD standard grade capacity from 16GB up to 256GB.
- Supports 4GBits DDRIII SDRAM Cache
- Sequential read performance up to 173.4 MB/sec.
- Sequential write performance up to 165.8 MB/sec.
- Hardware BCH ECC capable of correcting errors up to 66-bit/1KB (ECC).
- +5 V $\pm 5\%$ operation.
- Shock: 0.5ms, 1500 G, 3 axes.
- Vibration: 7 Hz to 2K Hz, 20G, 3 axes.
- Very high performance, very low power consumption.

1.3. *Flash Management Technology - Global Wear Leveling*

In order to gain the best management for flash memory, APRO's Rugged Metal 2.5" SATA III SLC SSDs BON-III series applies Global Wear-leveling technology to manage the Flash system. The life of flash memory is limited; the management is to increase the life of the flash product. The objective of global wear leveling is to prevent any frequently updated data from staying at the static area so that wear leveling could be evenly applied to all blocks. Static areas contain any data that does not change, and are ignored by dynamic wear leveling. Such static data may include operating system files, table look-ups, executable files, and etc. Global wear leveling frequently replaces blocks in this area with block in the hot area, and thus each block in all areas has the same probability to be used.

Wear-leveling algorithm evenly distributes data over an entire Flash cell array and searches for the least used physical blocks. The identified low cycled sectors are used to write the data to those locations. If blocks are empty, the write occurs normally. If blocks

contain data, it moves that data to a more heavily used location before it moves the newly written data. Wear leveling maximizes effective endurance Flash array compared to no wear leveling products.

1.4. DRAM Buffer

SSDs designed with a DDRIII SDRAM buffer which is support high transfer rate as a data buffer for the SSD; SSD with SDRAM buffer is able to deliver excellent random data transfer speed.

1.5. Power Interrupt Data Protection Technology

In the event of an unstable power supply, SSD loses power before it can finish programming process from host to flash, this may cause data being written to the incorrect block and further leads to data corruption.

Power Interrupt Data Protection Technology is applied with several tantalum capacitors to provide power buffering after host power interruption. The Data Protection Technology provides enough time for the SSD controller can write all DRAM buffer data to flash, all data will be protected and without data loss.

The ability of Power Interrupt Data Protection Technology is able to write 1.28MB of data within 60ms.

This ensures all data in the DRAM buffer can be successfully written into flash.

Traditionally, super capacitors were applied in most SSD products, the advantages of tantalum capacitors over super capacitors are:

➤ **Tantalum capacitors are electrolyte free.**

It is able to maintain its designed capacitance for several years when used within design limits.

➤ **Wide operating temperature range.**

Tantalum capacitors can operate from temperature range of -55C to +125C, which is very suitable for industrial and military usage.

➤ **Tantalum capacitors have an ultimate high volumetric efficiency (CV/cc).**

For example, a 50-microfarad tantalum capacitor can be equal and to properly replace a 500-microfarad aluminum capacitor.

2. Product Specifications

For all the following specifications, values are defined at ambient temperature and nominal supply voltage unless otherwise stated.

2.1. System Environmental Specifications

Table 1: Environmental Specification

APRO Rugged Metal 2.5" SATA III SLC SSD		Standard Grade	Industrial Grade
BON-III series		SR2SRxxxG-MSCTC-UFE(USE)	WR2SRxxxG-MSITI-UFE(USE)
Temperature	Operating:	0°C ~ +70°C	-40°C ~ +85°C
	Non-operating:	-20°C ~ +80°C	-50°C ~ +95°C
Humidity	Operating & Non-operating:	10% ~ 95% non-condensing	
Vibration	Operating & Non-operating:	7 Hz to 2K Hz, 20G, 3 axes	
Shock	Operating & Non-operating:	0.5ms, 1500 G, 3 axes	

2.2. System Power Requirements

Table 2: Power Requirement

APRO Rugged Metal 2.5" SATA III SLC SSD BON-III series		
DC Input Voltage (VCC)		5V±5%
+5V Current (Maximum average value)	Reading Mode :	350mA. (max.)
	Writing Mode :	420mA. (max.)
	During FE/SE :	330mA. (max.)
	Idle Mode :	120mA. (max.)

2.3. System Performance

Table 3: System Performances

Data Transfer Mode supporting		Serial ATA Gen-III (6.0Gb/s = 768MB/s)				
Average Access Time		0.1 ms (estimated)				
Maximum Performance	Capacity	16GB	32GB	64GB	128GB	256GB
	Sequential Read (MB/s)	159.1	173.3	173.2	173.4	173.4
	Sequential Write(MB/s)	82.1	161.3	162.0	165.9	165.8

Note:

(1). All values quoted are typically at 25 °C and nominal supply voltage.

(2). Testing base on CrystalDiskMark 3.01 with file size 1000MB

2.4. System Reliability

Table 4: System Reliability

Wear-leveling Algorithms	Global wear leveling algorithm evens program/erase count and maximizes SSD lifespan
Bad Blocks Management	Supportive
ECC Technology	Hardware BCH ECC capable of correcting errors up to 66-bit/1KB (ECC).
Endurance	Un-limited Read Cycles Endurance Management enables five years minimal useful life

2.5. Physical Specifications

Refer to Table 5 and see Figure 2 for Rugged Metal 2.5" SATA III SLC SSD BON-III series physical specifications and dimensions.

Table 5: Physical Specifications

Length:	100.0 mm / 3.93 in
Width:	70.00 mm / 2.75 in
Thickness:	9.20 mm / 0.36 in
Net Weight:	95.00 g / 3.35 oz

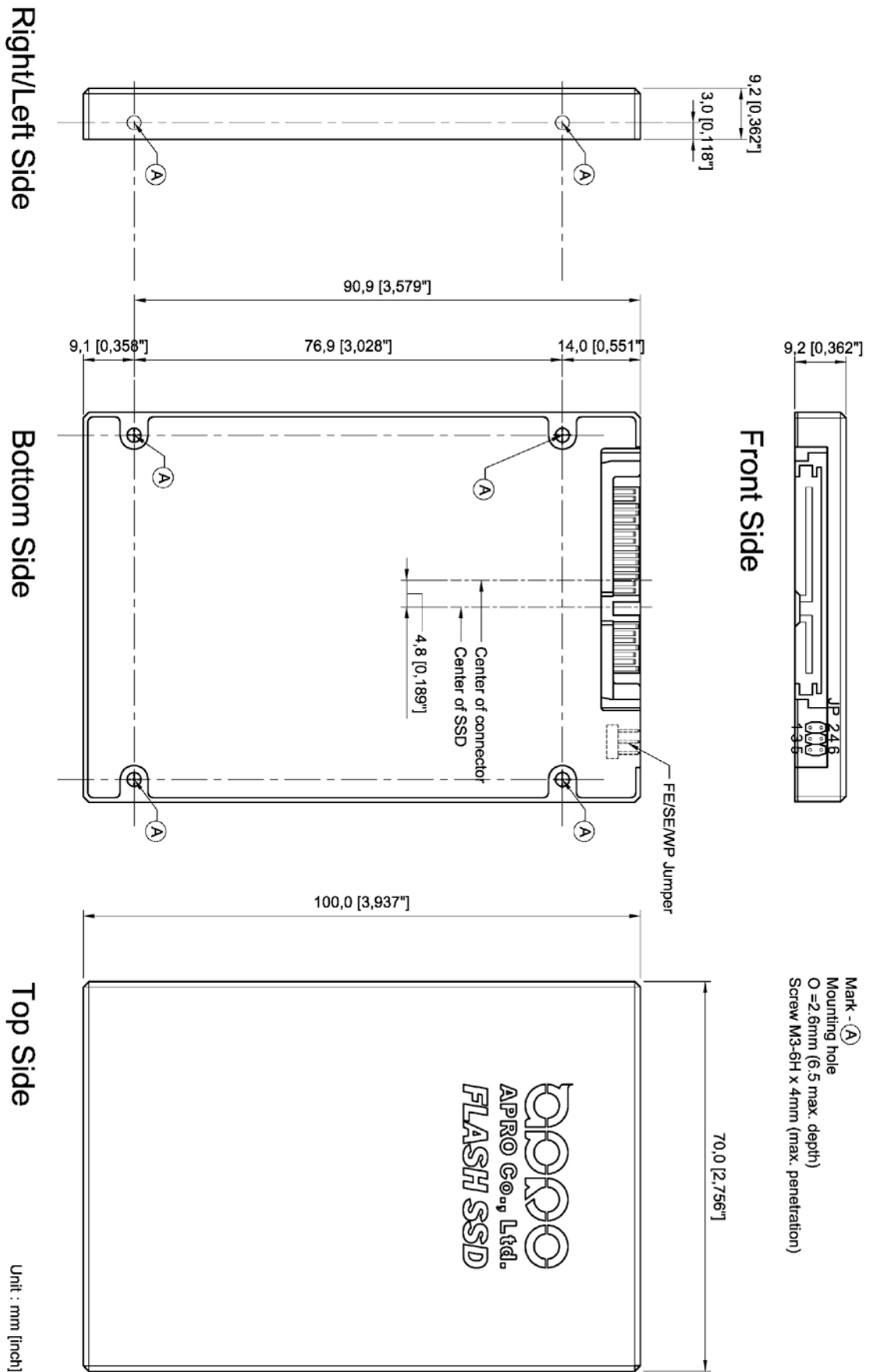


Figure 2: APRO Rugged Metal 2.5" SATA III SLC SSD Dimension

2.5.1. Conformal coating

Conformal coating is a protective, dielectric coating designed to conform to the surface of an assembled printed circuit board. Commonly used conformal coatings include silicone, acrylic, urethane and epoxy. APRO applies only silicone on APRO storages products upon requested especially by customers. The type of silicone coating features good thermal shock resistance due to flexibility. It is also easy to apply and repair.

Conformal coating offers protection of circuitry from moisture, fungus, dust and corrosion caused by extreme environments. It also prevents damage from those Flash storages handling during construction, installation and use, and reduces mechanical stress on components and protects from thermal shock. The greatest advantage of conformal coating is to allow greater component density due to increased dielectric strength between conductors.

APRO uses MIL-I-46058C silicon conformal coating

3. Interface Description

3.1. APRO Rugged Metal 2.5" SATA III SLC SSD interface

APRO Rugged Metal 2.5" SATA III SLC SSD is equipped with standard 7 pins + 15 pins Serial ATA connector.

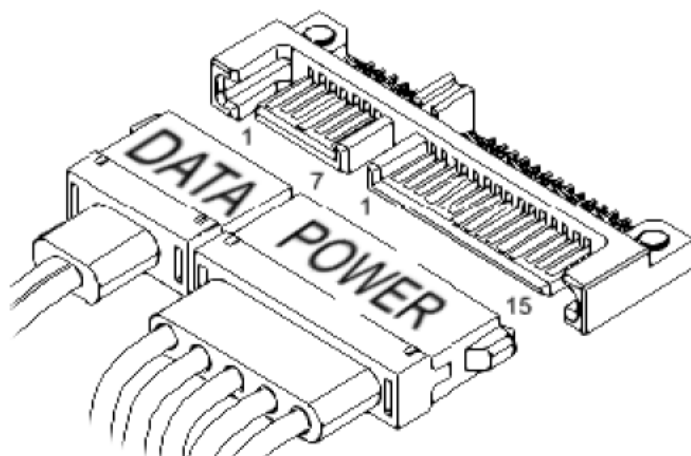


Figure 3 : The connectors of 2.5" SATA III SLC SSD

3.2. Pin Assignments

There are total of 7 pins in the signal segment and 15 pins in the power segment. The pin assignments are listed in below table 6.

Table 6 - Pin Assignments

Name	Type	Description
S1	GND	NA
S2	A+	Differential Signal Pair A
S3	A-	
S4	GND	NA
S5	B-	Differential Signal Pair B
S6	B+	
S7	GND	NA

Key and Spacing separate signal and power segments		
P1	NC	NA
P2	NC	NA
P3	NC	NA
P4	GND	NA
P5	GND	NA
P6	GND	NA
P7	V5	5V Power, Pre-Charge
P8	V5	5V Power
P9	V5	5V Power
P10	GND	NA
P11	DAS/DSS	Device Activity Signal / Disable Staggered Spin up
P12	GND	NA
P13	NC	NA
P14	NC	NA
P15	NC	NA

Notes:

1. All pins are in a signal row with a 1.27 mm (0.050" pitch).
2. The commands on the mating sequence in forward table apply to the case of backplane blind mate connector only. In this case, the mating sequences are:
 - (1) The pre-charge power pins and other ground pins.
 - (2) The signal pins and the rest of the power pins.

4. Configuration of BON-III series 2.5" SATA III SLC SSD

4.1. Fast / Secure Erase Jumper

BON-III series 2.5" SATA III SSD has several security features, such as fast erase, secure erase and a newly added write-protect function. These functions can be triggered by different hardware jumper settings or by ATA commands.

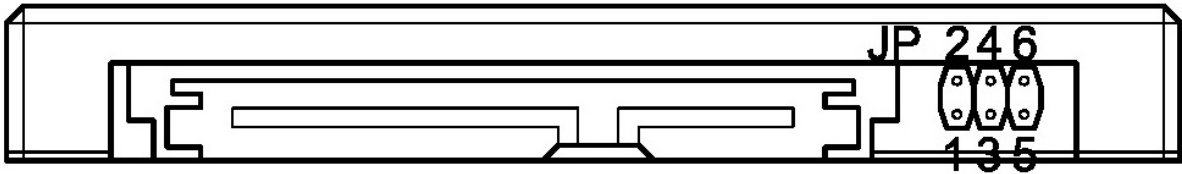


Figure 4 : The jumper configuration of 2.5" SATA III SLC SSD

4.1.1. Default Setting

When security function is not required, jumper head placed on Pin-3 and Pin-5 for spare part, SSD will not take any actions, it can be used as a normal storage device.

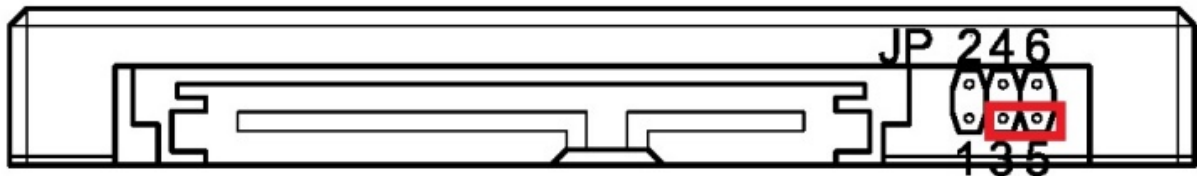


Figure 5 : Default Setting

4.1.2. Write Protect Function

Write-Protect function can be enabled by setting the jumper head on Pin-5 and Pin-6, once it's enabled, it will abort any writing commands sent to the SSD. At this stage, SSD will become Read-Only and user will not be able to write or delete any data on the SSD.

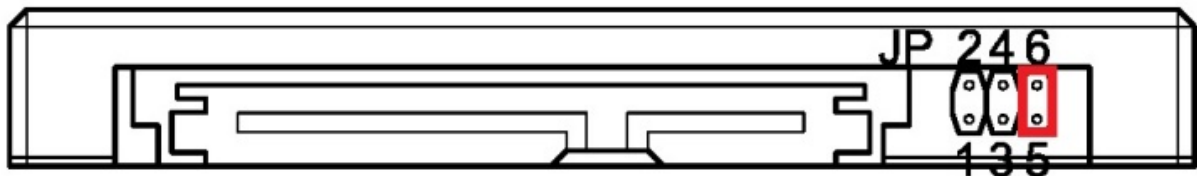


Figure 6 : Write-Protect Function Jumper Setting

4.1.3. Fast Erase

Fast Erase Procedure is one of the default sanitizing procedure in APRO Secure Erase SSD Series, it is trigger by placing jumper head on Pin-1 and Pin-2, SSD will be then become fully erased and filled with 0xFF and random data.

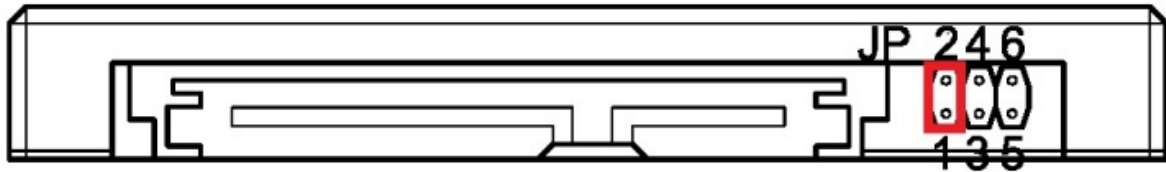


Figure 7 : Fast Erase Jumper Setting

4.1.4. Secure Erase

To execute Secure Erase function, jumper must be set on Pin-3 and Pin-4. APRO provide varieties of Secure Erase standard as options, customer may choose whichever is suitable for their application.

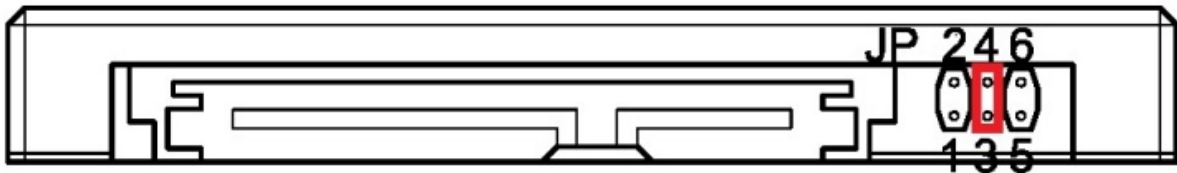


Figure 8 : Secure Erase Jumper Setting

4.1.5. Hardware for triggering the Secure Erase Standards

Table 7 – Secure Erase Procedures

Standard	Description
Fast Erase	<ol style="list-style-type: none"> Erase all media fill with 0xFF.
NSA Manual 130-2	<ol style="list-style-type: none"> Erase the media Overwrite with random data twice Erase again Overwrite with 0x55
USA-AF AFSSI 5020	<ol style="list-style-type: none"> Erase the media Overwrite with random data
DoD 5220.22-M	<ol style="list-style-type: none"> Erase the media Overwrite with single character erase again
IRIG 106	<ol style="list-style-type: none"> Erase the media Overwrite with 0x55 Erase Overwrite with 0xAA, erase
USA Navy NAVSO P-5239-26	<ol style="list-style-type: none"> Erase the media Overwrite with random data Erase again
USA-Army 380-19	<ol style="list-style-type: none"> Erase the media Overwrite with random data Fill with 0x55 Overwrite again with 0xAA
NISPOMSUP Chap 8, Sect. 8-501	<ol style="list-style-type: none"> Filled with 0x55 Overwrite with 0Xaa Overwrite again with random data
NSA Manual 9-12	<ol style="list-style-type: none"> Erase the media Overwrite with unclassified pattern

Note:

- The jumper head should not remove till the next system reboot.
- A complete implementation of the standard procedure means “One power cycle should be trigger one time only.”

4.2. Auto-Resume Features

APRO industrial rugged metal 2.5” SATA III SSD – BON-III series supports auto-resume features. When encounter power interruption during sanitizing procedure, it will automatically resume sanitizing at the next power-on until the whole procedure is finished.

4.3. Random Data Written During the Sanitize Procedure

The random data used to overwrite user data is a digest of pseudo-random generation and real random data. The pseudo-random generation is seeded in such a manner that even if the SSD launches the Sanitize command under identical external conditions (for example, if the unit is powered on with Sanitize Interrupt active), it will produce different seeds and different pseudo-random data.

4.4. Protection Mechanism

The protection mechanism only allows customer to activate Fast Erase and Secure Erase once for each power-on cycle.

This is to protect APRO’s SSD from being erased continuously and can indirectly extend the lifetime of flash. If user wishes to activate erase function again, power must be disconnect and then reconnect again.

4.5. Using the SSD After Sanitizing Procedure

After Fast Erase or Secure Erase is finished, storage must be reinitialized and partition should be rebuilt in order to be used again.

4.6. Required Time for Secure Erase Function

Table 8 – Erase time for all standard and capacities

Standard	16GB	32GB	64GB	128GB	256GB
Fast Erase	17.5 secs	22.6 secs	22.5 secs	29.9 secs	59.1 secs

Note: Erase time by other Secure Erase Standard must test by customer's own system.

5. Software Commands

The interface specified in **Table 8** enables defining a wide range of Sanitize procedures.

Table 8 – Command Set of Secure Erase Procedures

Standard	Description	Command (Register: Command)	Master Command (Register: Sector count)
Fast Erase	1. Erase all media 2. fill with 0xFF	82h	00h
NSA Manual 130-2	1. Erase the media 2. Overwrite with random data twice 3. Erase again 4. Overwrite with 0x55	82h	81h
USA-AF AFSSI 5020	1. Erase the media 2. Overwrite with random data	82h	41h
DoD 5220.22-M	1. Erase the media 2. Overwrite with single character 3. erase again	82h	84h
IRIG 106	1. Erase the media 2. Overwrite with 0x55 3. Erase 4. Overwrite with 0xAA, erase	82h	D0h
USA Navy NAVSO P-5239-26	1. Erase the media 2. Overwrite with random data 3. Erase again	82h	85h
USA-Army 380-19	1. Erase the media 2. Overwrite with random data 3. Fill with 0x55 4. Overwrite again with 0xAA	82h	C1h
NISPOMSUP Chap 8, Sect. 8-501	1. Filled with 0x55 2. Overwrite with 0Xaa 3. Overwrite again with random data	82h	D1h

5.1. Fast Erase

Below states the procedures of Fast Erase function.

- Erase all media.
- Fill with 0xFF.

5.1.1. Inputs for Enabling Fast Erase

Table 9 – Input Fast Erase Command Code (Enable)

Register	7	6	5	4	3	2	1	0
Features	NA							
Sector count	00h							
LBA Low	NA							
LBA Mid	NA							
LBA High	NA							
Device	1	1	1	0	NA			
Command	82h							

5.1.2. Outputs for Enabling Fast Erase

Table 10 – Output Fast Erase Command Code (Enable)

Register	7	6	5	4	3	2	1	0
Error	NA							
Sector count	NA							
LBA Low	NA							
LBA Mid	NA							
LBA High	NA							
Device	obs	NA	obs	DEV	NA	NA	NA	NA
	1	1	1	0				
Status	BSY	DRDY	DF	NA	DRQ	NA	NA	ERR
	0	1	0	1	0	0	0	0

Device register

DEV - shall specify the selected device.

Status register

BSY - will be cleared to zero indicating command completion

DRDY - will be set to one.

DF (Device Fault) - will be cleared to zero.

DRQ - will be cleared to zero.

ERR - will be cleared to zero.

5.2. NSA Manual 130-2

Below lists the Secure Erase procedures of NSA Manual 130-2.

- Erase all media.
- Fill with random data twice.
- Erase all media.
- Fill with 0x55

5.2.1. Inputs for Enabling NSA Manual 130-2

Table 11 – Input NSA Manual 130-2 Command Code (Enable)

Register	7	6	5	4	3	2	1	0
Features	NA							
Sector count	81h							
LBA Low	NA							
LBA Mid	NA							
LBA High	NA							
Device	1	1	1	0	NA			
Command	82h							

5.2.2. Outputs for Enabling NSA Manual 130-2

Table 12 – Output NSA Manual 130-2 Command Code (Enable)

Register	7	6	5	4	3	2	1	0
Error	NA							
Sector count	NA							
LBA Low	NA							
LBA Mid	NA							
LBA High	NA							
Device	obs	NA	obs	DEV	NA	NA	NA	NA
	1	1	1	0				
Status	BSY	DRDY	DF	NA	DRQ	NA	NA	ERR
	0	1	0	1	0	0	0	0

Device register

DEV - shall specify the selected device.

Status register

BSY - will be cleared to zero indicating command completion

DRDY - will be set to one.

DF (Device Fault) - will be cleared to zero.

DRQ - will be cleared to zero.

ERR - will be cleared to zero.

5.3. USA-AF AFFSI 5020

Below lists the Secure Erase procedures of USA-AF AFFSI 5020.

- Erase all media.
- Fill with random data.

5.3.1. Inputs for Enabling USA-AF AFFSI 5020

Table 13 – Input USA-AF AFFSI 5020 Command Code (Enable)

Register	7	6	5	4	3	2	1	0
Features	NA							
Sector count	41h							
LBA Low	NA							
LBA Mid	NA							
LBA High	NA							
Device	1	1	1	0	NA			
Command	82h							

5.3.2. Outputs for Enabling USA-AF AFFSI 5020

Table 14 – Output USA-AF AFFSI 5020 Command Code (Enable)

Register	7	6	5	4	3	2	1	0
Error	NA							
Sector count	NA							
LBA Low	NA							
LBA Mid	NA							
LBA High	NA							
Device	obs	NA	obs	DEV	NA	NA	NA	NA
	1	1	1	0				
Status	BSY	DRDY	DF	NA	DRQ	NA	NA	ERR
	0	1	0	1	0	0	0	0

Device register

DEV - shall specify the selected device.

Status register

BSY - will be cleared to zero indicating command completion

DRDY - will be set to one.

DF (Device Fault) - will be cleared to zero.

DRQ - will be cleared to zero.

ERR - will be cleared to zero.

5.4. DoD 5220.22-M

Below lists the Secure Erase procedures of DoD 5220.22-M.

- Erase all media.
- Overwrite with random character.
- Erase all media.

5.4.1. Inputs for Enabling DoD 5220.22-M

Table 15 – Input DoD 5220.22-M Command Code (Enable)

Register	7	6	5	4	3	2	1	0
Features	NA							
Sector count	84h							
LBA Low	NA							
LBA Mid	NA							
LBA High	NA							
Device	1	1	1	0	NA			
Command	82h							

5.4.2. Outputs for Enabling DoD 5220.22-M

Table 16 – Output DoD 5220.22-M Command Code (Enable)

Register	7	6	5	4	3	2	1	0
Error	NA							
Sector count	NA							
LBA Low	NA							
LBA Mid	NA							
LBA High	NA							
Device	obs	NA	obs	DEV	NA	NA	NA	NA
	1	1	1	0				
Status	BSY	DRDY	DF	NA	DRQ	NA	NA	ERR
	0	1	0	1	0	0	0	0

Device register

DEV - shall specify the selected device.

Status register

BSY - will be cleared to zero indicating command completion

DRDY - will be set to one.

DF (Device Fault) - will be cleared to zero.

DRQ - will be cleared to zero.

ERR - will be cleared to zero.

5.5. IRIG 106

Below lists the Secure Erase procedures of IRIG 106.

- Erase all media.
- Fill with 0x55.
- Erase all media.
- Fill with 0xAA.

- Erase all media.

5.5.1. Inputs for Enabling IRIG 106

Table 17 – Input IRIG 106 Command Code (Enable)

Register	7	6	5	4	3	2	1	0
Features	NA							
Sector count	D0h							
LBA Low	NA							
LBA Mid	NA							
LBA High	NA							
Device	1	1	1	0	NA			
Command	82h							

5.5.2. Outputs for Enabling IRIG 106

Table 18 – Output IRIG 106 Command Code (Enable)

Register	7	6	5	4	3	2	1	0
Error	NA							
Sector count	NA							
LBA Low	NA							
LBA Mid	NA							
LBA High	NA							
Device	obs	NA	obs	DEV	NA	NA	NA	NA
	1	1	1	0				
Status	BSY	DRDY	DF	NA	DRQ	NA	NA	ERR
	0	1	0	1	0	0	0	0

Device register

DEV - shall specify the selected device.

Status register

BSY - will be cleared to zero indicating command completion

DRDY - will be set to one.

DF (Device Fault) - will be cleared to zero.

DRQ - will be cleared to zero.

ERR - will be cleared to zero.

Sector Count - The number of Erase Failure Block

5.6. USA Navy NAVSO P-5239-26

Below lists the Secure Erase procedures of USA Navy NAVSO P-5239-26.

1. Erase all media.
2. Overwrite with random data.
3. Erase all media.

5.6.1. Inputs for Enabling USA Navy NAVSO P-5239-26

Table 19 – Input USA Navy NAVSO P-5239-26 Command Code (Enable)

Register	7	6	5	4	3	2	1	0
Features	NA							
Sector count	85h							
LBA Low	NA							
LBA Mid	NA							
LBA High	NA							
Device	1	1	1	0	NA			
Command	82h							

5.6.2. Outputs for Enabling USA Navy NAVSO P-5239-26

Table 20 – Output USA Navy NAVSO P-5239-26 Command Code (Enable)

Register	7	6	5	4	3	2	1	0
Error	NA							
Sector count	NA							
LBA Low	NA							
LBA Mid	NA							
LBA High	NA							
Device	obs	NA	obs	DEV	NA	NA	NA	NA
	1	1	1	0				
Status	BSY	DRDY	DF	NA	DRQ	NA	NA	ERR
	0	1	0	1	0	0	0	0

Device register

DEV - shall specify the selected device.

Status register

BSY - will be cleared to zero indicating command completion

DRDY - will be set to one.

DF (Device Fault) - will be cleared to zero.

DRQ - will be cleared to zero.

ERR - will be cleared to zero.

5.7. USA-Army 380-19

Below lists the Secure Erase procedures of USA-Army 380-19.

1. Erase all media.
2. Overwrite with random data.
3. Fill with 0x55.
4. Fill with 0xAA

5.7.1. Inputs for Enabling USA-Army 380-19

Table 21 – Input USA-Army 380-19 Command Code (Enable)

Register	7	6	5	4	3	2	1	0
Features	NA							
Sector count	C1h							
LBA Low	NA							
LBA Mid	NA							
LBA High	NA							
Device	1	1	1	0	NA			
Command	82h							

5.7.2. Outputs for Enabling USA-Army 380-19

Table 22 – Output USA-Army 380-19 Command Code (Enable)

Register	7	6	5	4	3	2	1	0
Error	NA							
Sector count	NA							
LBA Low	NA							
LBA Mid	NA							
LBA High	NA							
Device	obs	NA	obs	DEV	NA	NA	NA	NA
	1	1	1	0				
Status	BSY	DRDY	DF	NA	DRQ	NA	NA	ERR
	0	1	0	1	0	0	0	0

Device register

DEV - shall specify the selected device.

Status register

BSY - will be cleared to zero indicating command completion

DRDY - will be set to one.

DF (Device Fault) - will be cleared to zero.

DRQ - will be cleared to zero.

ERR - will be cleared to zero.

5.8. NISPOMSUP Chap 8, Sect. 8-501

Below lists the Secure Erase procedures of NISPOMSUP Chap 8, Sect. 8-501.

1. Fill with 0x55.
2. Overwrite with 0xAA.
3. Overwrite with random data.

5.8.1. Inputs for Enabling NISPOMSUP Chap 8, Sect. 8-501

Table 23 – Input NISPOMSUP Chap 8, Sect. 8-501 Command Code (Enable)

Register	7	6	5	4	3	2	1	0
Features	NA							
Sector count	D1h							
LBA Low	NA							
LBA Mid	NA							
LBA High	NA							
Device	1	1	1	0	NA			
Command	82h							

5.8.2. Outputs for Enabling NISPOMSUP Chap 8, Sect. 8-501

Table 24 – Output NISPOMSUP Chap 8, Sect. 8-501 Command Code (Enable)

Register	7	6	5	4	3	2	1	0
Error	NA							
Sector count	NA							
LBA Low	NA							
LBA Mid	NA							
LBA High	NA							
Device	obs	NA	obs	DEV	NA	NA	NA	NA
	1	1	1	0				
Status	BSY	DRDY	DF	NA	DRQ	NA	NA	ERR
	0	1	0	1	0	0	0	0

Device register

DEV - shall specify the selected device.

Status register

BSY - will be cleared to zero indicating command completion

DRDY - will be set to one.

DF (Device Fault) - will be cleared to zero.


DRQ - will be cleared to zero.

ERR - will be cleared to zero.

Appendix A: Ordering Information

1. Part Number List

◆ **APRO Rugged Metal 2.5" SATA III SLC SSD – BON-III series**

Product Picture	Grade	Standard grade (0°C ~ 70°C)	Industrial Grade (-40°C ~ +85°C)
	16GB	SR2SR016G-MSCTC-UFE(USE)	WR2SR016G-MSITI-UFE(USE)
	32GB	SR2SR032G-MSCTC-UFE(USE)	WR2SR032G-MSITI-UFE(USE)
	64GB	SR2SR064G-MSCTC-UFE(USE)	WR2SR064G-MSITI-UFE(USE)
	128GB	SR2SR128G-MSCTC-UFE(USE)	WR2SR128G-MSITI-UFE(USE)
	256GB	SR2SR256G-MSCTC-UFE(USE)	WR2SR256G-MSITI-UFE(USE)

2. Part Number Decoder:

X1 X2 X3 X4 X5 X6 X7 X8 X9 – X11 X12 X13 X14 X15 – X16 X17 X18 C

X1 : Grade

S: Standard Grade – operating temp. 0° C ~ 70 ° C

W: Industrial Grade- operating temp. -40° C ~ +85 ° C

X2 : The material of case

R : 2.5" Rugged Metal Casing

X3 X4 X5 : Product category

2SR : 2.5" SATA SSD w/SDRAM cache

X6 X7 X8 X9 : Capacity

016G: 16GB **128G:** 128GB
032G: 32GB **256G:** 256GB
064G: 64GB

X11 : Controller

M : BON-III Series

X12 : Controller version

A, B, C.....

X13 : Controller Grade

C : Commercial grade

I : Industrial grade

X14 : Flash IC

T : Toshiba SLC-NAND Flash IC

X15 : Flash IC grade / Type

C : Commercial grade

I : Industrial grade

X16 X17 X18 : Special function

UFE : Fast Erase function only

USE: Secure Erase function (supported by special firmware) & Fast Erase function

C : Reserved for specific requirement

C : Conformal-coating

Appendix B: Limited Warranty

APRO warrants your Rugged Metal 2.5" SATA III SLC SSD against defects in material and workmanship for the life of the drive. The warranty is void in the case of misuse, accident, alteration, improper installation, misapplication or the result of unauthorized service or repair. The implied warranties of merchantability and fitness for a particular purpose, and all other warranties, expressed or implied, except as set forth in this warranty, shall not apply to the products delivered. In no event shall APRO be liable for any lost profits, lost savings or other incidental or consequential damages arising out of the use of, or inability to use, this product.

BEFORE RETURNING PRODUCT, A RETURN MATERIAL AUTHORIZATION (RMA) MUST BE OBTAINED FROM APRO.

Product shall be returned to APRO with shipping prepaid. If the product fails to conform based on customers' purchasing orders, APRO will reimburse customers for the transportation charges incurred.

WARRANTY PERIOD:

- **SLC STD. Grade** **3 years / Within 60K Erasing Counts**
- **SLC IND. Grade** **5 years / Within 60K Erasing Counts**

The warranty period is able to extend. Please contact APRO and/or Your APRO distributors for more information.