



Dolphin PCI Express MXH912 Adapter

MXH912 Transparent Host Adapter Users Guide
Version 1.0

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Table of Contents

1. DISCLAIMER	4
2. TERMS AND ACRONYMS	5
3. TECHNICAL INFORMATION	5
3.1 BOARD REVISION HISTORY	5
3.2 HIGH-LEVEL SPECIFICATION	6
3.3 SIMPLIFIED SCHEMATICS	7
3.4 PCIe SLOT DETERMINATION	7
3.5 AIRFLOW - OPERATING ENVIRONMENT	7
4 INSTALLATION	8
4.1 BOARD UNPACKING	8
4.2 CHANGE PCIe BRACKET	8
4.3 CONFIGURE THE BOARD	9
4.4 INSTALL THE ADAPTER CARD	9
4.5 INSTALLING AND REMOVING THE CABLE	9
4.5.1 <i>Connecting the Cable</i>	9
4.5.2 <i>Cable strain relief</i>	9
4.5.3 <i>Disconnecting the Cable</i>	9
4.6 INSTALLING THE DOLPHIN BOARD MANAGEMENT SOFTWARE	10
4.7 VERIFY INSTALLATION & LEDs	10
5 OPERATION	11
5.1 CONFIGURATION AND DIP SWITCH	11
5.2 DIP SWITCH TRANSPARENT SETTINGS	11
5.3 USE CASE -TRANSPARENT HOST MODE	12
5.4 FIRMWARE UPGRADE	12
5.5 IDENTIFYING THE CARD	12
6 PCIe CABLE PORT	14
6.1 PCIe CABLE SIGNALS	14
6.2 PCIe CABLE CONNECTOR X8 PIN-OUT	15
7 COMPLIANCE AND REGULATORY TESTING	15
7.1 EMC COMPLIANCE	15
7.2 FCC CLASS A	15
7.3 ROHS COMPLIANCE	16
7.4 WEEE NOTICE	16
8 LIMITED WARRANTY	16
8.1 WARRANTY PERIOD	16
8.2 COVERAGE	16
8.3 SERVICE PROCEDURE	16

Figure 1: MXH912 Simplified Schematics	7
Figure 2: Full length PCIe bracket	8
Figure 3: DIP Switch (Shipping Default)	11
Figure 4: Transparent topology	12
Table 1: Revision History	5
Table 2: MXH912 Product High-Level Specifications	6
Table 3: LED behaviors	10
Table 4: DIP Switch Transparent settings for MXH912	11
Table 5: PCIe Cable Port Signals	14
Table 6: External PCIe x8 cable pin-out	15

1. DISCLAIMER

DOLPHIN INTERCONNECT SOLUTIONS RESERVES THE RIGHT TO MAKE CHANGES WITHOUT FURTHER NOTICE TO ANY OF ITS PRODUCTS TO IMPROVE RELIABILITY, FUNCTION, OR DESIGN.

DO NOT USE THE INFORMATION IN THIS GUIDE TO DESIGN YOUR PCI-SIG-COMPLIANT PRODUCT; ALWAYS REFERENCE THE ORIGINAL PCI-SIG SPECIFICATION FOR DETAILS.

TO THE FULLEST EXTENT PERMITTED BY LAW, DOLPHIN WILL NOT BE LIABLE FOR ANY INDIRECT, INCIDENTAL, SPECIAL OR CONSEQUENTIAL DAMAGES (INCLUDING LOST PROFITS, LOST DATA, OR LOSS OF USE) ARISING OUT OF ANY USE OF DOLPHIN'S PRODUCTS, SOFTWARE OR SERVICE PROVIDED. DOLPHIN'S MAXIMUM LIABILITY WILL NOT EXCEED THE TOTAL AMOUNT PAID FOR THE PRODUCT BY THE PURCHASER.

LIFE SUPPORT POLICY

DOLPHIN INTERCONNECT SOLUTIONS' PRODUCTS ARE NOT AUTHORIZED FOR USE AS CRITICAL COMPONENTS IN LIFE SUPPORT DEVICES.

ENVIRONMENTAL POLICY

Dolphin is minimizing the amount of printed documentation and software CDs in its shipments; please download additional documentation and software from www.dolphinics.com.

2. Terms and acronyms

The following are Essential terms and acronyms used in this manual.

eXpressWare	Dolphin's software stack for PCIe clustering and IO. Please visit www.dolphinics.com/software for more information.
Host mode	The card installs in a root complex / Host PC.
Lane	One PCI Express Lane contains a differential pair for transmission and a differential pair for reception.
Link	A collection of one or more PCI Express Lanes provides the communication path between an Upstream and Downstream Port.
Port	PCIe Cable port. The MXH912 x8 iPass™ or standard PCI Express cable.

3. Technical Information

3.1 Board revision history

The following table gives a general overview of the hardware revision history. Please consult the MXH912 PCN available from Dolphin for details.

Adapter card revision	Capabilities
MXH912-BC	<ul style="list-style-type: none">Initial product version

Table 1:Revision History

3.2 High-Level Specification

The table presented below provides an overview of the high-level specifications.

Form Factor	PCIe Half-Length, Half-Height		
Dimension	116.23mm (4.57 inches) x 68.90 mm (2.731 inches).		
Configuration	Transparent MXH912 as Host		
Link To	PXH812 and customer target device		
Storage Temperature	Storage Temperature: -40°C to 70°C (-40°F to 158°F)		
PCI Express®	Base Specification 3.0 Card Electromechanical Specification 3.0 External Cabling Specification Spec 2.0		
Operating Temperature	0°C to 55°C (32°F - 131°F)		
Airflow	350 LFM		
Operating Humidity	Relative humidity 5% - 95% non-condensing		
Switch	PM40028B Switchtec PCI Express		
Max operating altitude	2000m		
Power	Power Rail	Typical Current	Maximum Current
	+3.3V	0A	0A
	+3.3VAux	1 mA	30 mA
	+12V	900 mA	2000 mA
Cable CREFCLK	Constant Frequency Clock (CFC) generated by the MXH912 card. Spread Spectrum Clock (SSC) is optional.		
Flash	for boot-up configuration data		
SEEPROM	Card-specific information (serial number, etc.)		
Host Clock	Host clock isolation supporting Constant Frequency Clock (CFC) or Spread Spectrum Clock (SSC) for EDGE reference clock.		
Brackets	High profile mounted on the board and low profile available in the shipping package		
Compliance	<ul style="list-style-type: none"> • RoHS • REACH • FCC Class B • CE (EN-55022 (2010), EN 55024 (2010), EN 61000-6-2 (2005). 		
Supporting Speed and Width Edge	PCIe Gen1.0, Gen2.0, and Gen3.0 x1, x2, x4, x8 link widths x8, x16 Slot-widths		
PCI Express Gen 3.0	8.0 GT/s per lane signaling – 64 GT/s total signaling.		
Cable Connection	<ul style="list-style-type: none"> • One PCI Express Gen3.0 x8 iPass cable connection • Support for iPass copper cables up to 5 meters. 		

Table 2:MXH912 Product High-Level Specifications

3.3 Simplified schematics

The figure below shows the MXH912 simplified schematics with main functions.

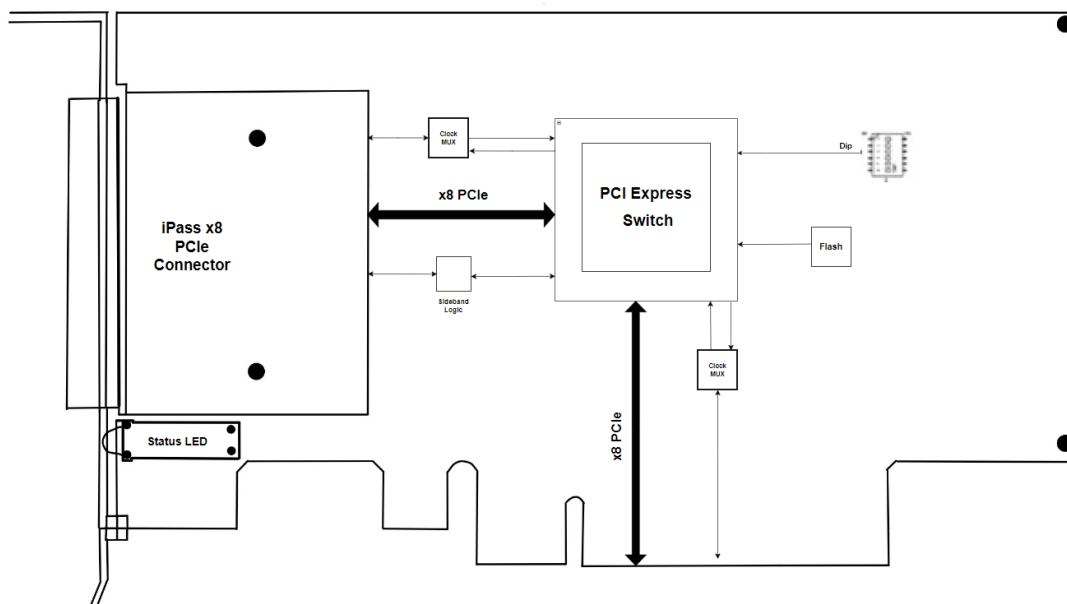


Figure 1: MXH912 Simplified Schematics

3.4 PCIe Slot Determination

The MXH912 supports PCIe Gen1.0, Gen2.0, Gen3.0 speeds and x1, x2, x4 and x8 slot edge link-widths. The slot width and speed will affect the performance of the card. The card can be installed in an x8 or x16 connector. The card will auto-configure the slot speed and width.

- Install the board in a slot connecting directly to the CPU for optimal shared memory performance.

3.5 Airflow - Operating Environment

To maximize the product's lifetime and maintain the warranty, specify the operating temperature, and ensure the specified airflow is present. Consider Special care when using MXH912 in office-type cabinets with poor cooling in combination with other high energy-consuming PCIe devices, e.g., not active cooled GPUs:

- Operating Temperature: 0°C - 55°C (32°F - 131°F),
- Airflow: 350 LFM

TIP: Please use the `dis_diag` tool immediately after software installation to verify the temperature. If the chip temperature reported by `dis_diag` exceeds 95°C, it recommends improving the airflow.

4 Installation

For installation, follow these steps from 4.1 to 4.7 sequentially.

4.1 Board Unpacking

The MXH912 includes the following components.

- MXH912 Adapter Board with high profile PCIe bracket mounted.
- Low profile PCIe bracket.
- Anti-static bag.
- Get started guide with serial number for quick Dolphins eXpressWare PCIe software download.

The MXH912 card is delivered in an anti-static bag to avoid any potential damage from static electricity. It is crucial to exercise anti-static precautions before removing the card from the packaging. Clothing or the surrounding work environment can generate static electricity, which may harm the PCI Express adapter card or the PC. Wearing a grounded anti-static wrist strap when opening the PC and handling the MXH912 after taking it out of the anti-static bag is recommended. Pre-Installation Questions



Before installing the MXH912, it is essential to identify the necessary configuration requirements through specific steps.

- Which system and PCIe slot are suitable for installing the card?
- What is the speed and link width of the selected slot?
- What are the environmental conditions where the card will be installed?
- What type and length of cables will be used?
- How to ensure adequate operational conditions, including temperature and airflow

4.2 Change PCIe Bracket

The MXH912 package comes with both standard and low-profile PCI Express brackets. The board is initially installed with a standard bracket. To switch to the low-profile bracket, carefully unscrew the two mounting screws to remove the full-height bracket. Remember to save the screws and replace the bracket with the low-profile one.

Before proceeding with the installation process, ensure you are correctly grounded to prevent static discharges that can damage the adapter card. Use the two mounting screws to install the low-profile bracket and be cautious not to overtighten them. Tighten the screws carefully while ensuring that they are appropriately secured.

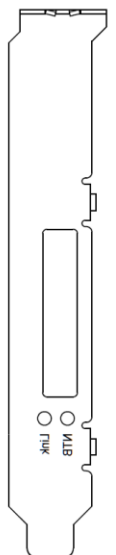


Figure 2: Full length PCIe bracket

4.3 Configure the Board

Set the DIP switch settings for proper operation depending on the firmware. Please refer to the section Configuration and DIP Switch on page 11 for details.

4.4 Install the Adapter Card



Before installing the adapter card, ensure you are properly grounded to avoid static discharges that may destroy your computer or the adapter card. Ensure you are grounded before opening your computer or the anti-static bag containing the MXH912. Please follow your computers or expansion chassis manual on installing a PCI Express card.

The MXH912 Adapter card can be installed into any PCI Express x8 and x16 slot. The MXH912 supports PCI Express Gen1.0, Gen2.0, and Gen3.0 signaling.

NOTE: The MXH912 requires complete electrical x8 signaling from the slot to achieve maximum performance since it is an x8 card.

4.5 Installing and Removing the Cable

Installing and removing cables should be done with the host and expansion system powered off. Please contact the Dolphin representative if you intend to connect and disconnect the PCI Express cables continuously.

4.5.1 Connecting the Cable

Please carefully install the cable connector into the connector housing on the MXH912 adapter card. To install the iPass cable, match the cable house with the connector on the MXH912 adapter card. Use even pressure to insert the connector until it is secure. Adhere to ESD guidelines when installing the cables to ensure you don't damage the board.

4.5.2 Cable strain relief

It is crucial to provide strain relief for the PCIe cables to prevent fatigue loading and damage to the card. The cables should be mechanically secured to the rack or cabinet, particularly for long and heavy cables and those between cabinets and racks.

4.5.3 Disconnecting the Cable

Please carefully pull the release tab to release the cable from the locking latches and gently pull the cable out of the connector guides.

4.6 Installing the Dolphin Board Management Software

The MXH912 adapter card is supported by Dolphins Board Manament Software – a part of s with Dolphin’s eXpressWare software package for the MX product line. Please visit. Register and download the latest documentation and software. Following the quick installation guide on the web page above, installing the software for your operating system is recommended.

<http://www.dolphinics.com/mx>

TIP: Dolphin provides software and documentation for several product families; **please remember to select the MX product family before downloading.** The MXH912 requires Dolphin software version DIS 5.22.0 or higher to operate. The software download requires a password to log in. **If you follow the instructions on the getting started document bundled with the adapter card, the password will automatically be emailed to you.** If you fail to provide the correct software serial number on the getting started document, your request will be managed manually.

Note: Please consult the eXpressWare release note for detailed information on available software functionality. Please get in touch with Dolphin for more information.

4.7 Verify Installation & LEDs

The MXH912 has two bi-color LEDs visible through the PCI Express bracket.

The LEDs are visible through cut-outs in the PCIe bracket on each side of the cable connector block.

	Dark	Yellow	Green
Link	Power off, No Cable installed	Power on, No Link	Power on, cable installed; Link operational
NTB	Transparent Host	NA	NA

Table 3: LED behaviors

5 Operation

5.1 Configuration and DIP Switch

The MXH912 has one bank of 4 DIP switches. The default factory setting for the MXH912 is an x8 Transparent link connection suitable for a two-node configuration.

The MXH912 has DIP switches for setting unique modes or operations; the meaning of each DIP switch depends on the loaded firmware. Please carefully read the documentation shipping with the card before modifying any DIP switch settings. Please pay close attention to the ON and OFF positions on the DIP switch.

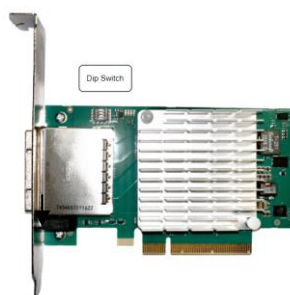


Figure 3: DIP Switch (Shipping Default)

Figure 3 displays the DIP switch utilized by the MXH912 adapter card for configuration purposes. It is required to keep all unlisted DIP switches in their default positions. For a comprehensive overview of the DIP switch configurations for the MXH912, please refer to Table 4: DIP Switch Settings, which outlines the different transparent settings available.

5.2 DIP switch Transparent Settings

These are configurations available for MXH912. Please consult the Firmware Release Note for details.

MXH912	Shipping default
DIP settings	
1 x8 port Set	1 OFF 2 OFF 3 OFF 4 OFF Config#0

Table 4: DIP Switch Transparent settings for MXH912.

5.3 Use Case -Transparent Host Mode

The Host computer is equipped with an MXH912 adapter and connected to an expansion system using an iPass cable. The MXH912 adapter card operates in Transparent mode, and you should set the dip switches according to the instructions provided in Table 7.

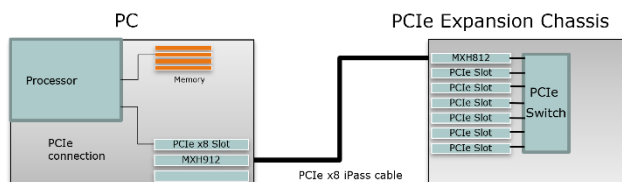


Figure 4:Transparent topology

5.4 Firmware Upgrade

Periodically, Dolphin might release upgraded firmware accessed through the web or incorporated into the Dolphin software distribution at www.dolphinics.com/mx.

Please consult the MXH912 Firmware Release Note for information on firmware upgrades.

5.5 Identifying the Card

The card has a label sticker with the serial number in the format 'MXH912-YY-ZZZZZZ', where YY denotes the card revision (e.g., BB) and ZZZZZZ denotes the serialised production number (e.g., 012345). This whole string makes up the card's serial number (*i.e.*, MXH912-BC-012345).

You can also get this information using `lspci` in Linux:

First, identify the devices for the Dolphin Host card. Then, run the `lspci` and identify the card.

```
#lspci | grep "Device 4028"
09:00.0 PCI bridge: PMC-Sierra Inc. Device 4028
09:00.1 Memory controller: PMC-Sierra Inc. Device 4028
0a:00.0 PCI bridge: PMC-Sierra Inc. Device 4028
```

Then, run the `lspci` and identify the card. It will show up as something like

```
#lspci -s 09:00.0 -v
09:00.0 PCI bridge: PMC-Sierra Inc. Device 4028 (prog-if 00 [Normal decode])
  Flags: bus master, fast devsel, latency 0, IRQ 40
  Bus: primary=09, secondary=0a, subordinate=0f, sec-latency=0
  I/O behind bridge: 00001000-00002fff [size=8K]
  Memory behind bridge: e8000000-ecffffff [size=80M]
  Prefetchable memory behind bridge: 00000000c0000000-00000000cfffffff
[size=256M]
  Capabilities: [40] Express Upstream Port, MSI 00
  Capabilities: [7c] MSI: Enable+ Count=1/8 Maskable- 64bit+
  Capabilities: [8c] Power Management version 3
  Capabilities: [94] Subsystem: Dolphin Interconnect Solutions AS Device 0912
  Capabilities: [100] Advanced Error Reporting
  Capabilities: [148] Power Budgeting <?>
  Capabilities: [158] Multicast
  Capabilities: [188] Secondary PCI Express
  Capabilities: [1b4] Device Serial Number 00-00-42-42-00-00-00-19
  Capabilities: [1c0] Latency Tolerance Reporting
  Capabilities: [1c8] Access Control Services
  Capabilities: [1f0] Data Link Feature <?>
  Capabilities: [1fc] Physical Layer 16.0 GT/s <?>
  Capabilities: [23c] Lane Margining at the Receiver <?>
  Capabilities: [7f8] Vendor Specific Information: ID=ffff Rev=1 Len=808 <?>
  Kernel driver in use: dis-mx-p2p
#lspci -s 09:00.0 -v | grep -E "Subsystem|Serial"
  Capabilities: [94] Subsystem: Dolphin Interconnect Solutions AS Device 0912
  Capabilities: [1b4] Device Serial Number 00-00-42-42-00-00-00-19
```

This shows the card as revision 0x4243 (hexadecimal values of the 'BC' letters in the ASCII table), with the production number 0x00000019 (0000025 in decimal)

6 PCIe Cable Port

6.1 PCIe Cable Signals

The external PCI Express cable connector supports the following signals:

Signal Type	Description
PETpN/PETnN	PCI Express Transmitter pairs labelled where N is the Lane number (starting with 0); “p” is the actual signal, while “n” is the complement signal.
PERpN/PERnN	PCI Express Receiver pairs labelled where N is the Lane number (starting with 0); “p” is the actual signal, while “n” is the complement signal.
CREFLKp/ CREFLKn	Low Voltage Differential 100 MHz Cable Reference Clock, “p” is the actual signal/Low Voltage Differential 100 MHz Cable Reference Clock, “n” is the actual signal.
CPRSNT#	The cable present detects an active-low signal provided by a Downstream Subsystem to indicate that it’s both present and its power is “good” (within tolerance)
CPOWERON	Cable Power On, an active-high signal provided by an Upstream Subsystem to notify slave-type Downstream Subsystems to turn their main power on or off, They are used, for example, to put a slave Subsystem into the S3 power management state.
CWAKE#	Cable Wake is an active-low signal that a Downstream Subsystem drives to re-activate the PCI Express hierarchy’s main power rails and reference clocks. Although optional for Upstream and Downstream Subsystems, all cable assemblies shall include CWAKE#
CPERST#	Cable PERST#, an active-low signal, logically equivalent to system PERST# (platform reset), driven by the Upstream subsystem.
CMISDA	The management interface data line is used for initial link setup and sideband messages when used with CMI-compliant cables.
CMISCL	Management interface clock line. Used for both initial link setup and sideband messages when used with CMI-compliant cables
PWR	+3.3 V Power (optional for connector): Power provisioning to the connector backshell allows active signal conditioning components in the cable assembly. Within the cable, a wire should not be provided.
PWR_RTN	Return for +3.3 V Power (optional for connector). Return path optional for +3.3 V power provisioning.
SB_RTN	SideBand Return provides a return current path for all single-ended sideband signals, allowing for power domain isolation between Subsystems.
GND	Ground Reference for PCI Express Transmitter, Receiver Lanes and Cable Reference Clock.

Table 5:PCIe Cable Port Signals

6.2 PCIe Cable Connector x8 Pin-Out

	A	B		A	B
1	GND	GND	18	CMISDA	PWR_RTN
2	PETp0	PERp0	19	SB_RTN	PWR_RTN
3	PETn0	PERn0	20	CPRSNT#	CWAKE#
4	GND	GND	21	CPWRON	CPERST#
5	PETp1	PERp1	22	GND	GND
6	PETn1	PERn1	23	PETp4	PERp4
7	GND	GND	24	PETn4	PERn4
8	PETp2	PERp2	25	GND	GND
9	PETn2	PERn2	26	PETp5	PERp5
10	GND	GND	27	PETn5	PERn5
11	PETp3	PERp3	28	GND	GND
12	PETn3	PERn3	29	PETp6	PERp6
13	GND	GND	30	PETn6	PERn6
14	CREFCLKp	PWR	31	GND	GND
15	CREFCLKn	PWR	32	PETp7	PERp7
16	GND	PWR	33	PETn7	PERn7
17	CMISCL	PWR_RTN	34	GND	GND

Table 6: External PCIe x8 cable pin-out

7 Compliance and Regulatory Testing

7.1 EMC Compliance

The Dolphin PCI Express MXH912 adapter is tested to PASS the following relevant test standards for PCI Express cards, telecommunication and industry equipment installed in a standard PC:



- EN 55032:2012,
- EN 55035:2017,
- EN 61000-3-2:2014,
- EN 61000-3-3:2013
- 47 CFR Part 15, Subpart B (Clause 15.107 and 15.109) in conjunction with ANSI C63.4:2014
- CISPR 35:2016 Edition 1.0 (CISPR/I/412/CDV) Korean Harmonized standard, KN 35

This does not ensure that it will comply with these standards in any random PC. The integrator is responsible for ensuring that their products comply with all regulations where their product will be used.

7.2 FCC Class A

After conducting tests, this device has been determined to conform to the Class A digital device regulations specified in part 15 of the FCC Rules.

7.3 RoHS Compliance

The Dolphin MXH912 is RoHS compliant. A Compliance certificate issued by the manufacturer is available upon request.



7.4 WEEE Notice

The adapter card bears the label following European Directive 2002/96/EC, which pertains to waste electrical and electronic equipment (WEEE). This directive outlines the guidelines for properly disposing and recycling used appliances within the European Union. The presence of this label on the product signifies that it should not be discarded but returned to an approved local WEEE waste collector.



8 Limited Warranty

Dolphin Interconnect Solutions warrants this product to be free from manufacturing defects under the following terms:

8.1 Warranty Period

Dolphin warrants the product for one (1) year from the date of purchase. Extended warranties are available.

8.2 Coverage

To the extent permitted by applicable law, this warranty does not apply to:

- Damages caused by operator error or non-compliance with instructions available for the product.
- Use or attempt to use or program firmware not approved by Dolphin.
- Damage which results from accident, abuse, misuse, neglected improper handling or improper installation; moisture, corrosive environments, missing cable strain-relief, high voltage surges, shipping, or abnormal working conditions.
- Damages result from violating the specified operating or storage temperatures and airflow.
- Damage is caused by acts of nature, e.g., floods, storms, fires, or earthquakes.
- Damage caused by any power source out of range or not provided with the product.
- Normal wear and tear.
- Attempts to repair, modify, open, or upgrade the product by personnel or agents not authorized by Dolphin.
- Products that have had the product serial number tampered with or removed.
- Damage to the product caused by products not supplied by Dolphin.

8.3 Service Procedure

Suppose the product proves defective during the Warranty Period. In that case, you should contact the seller that supplied you with the product, or if you purchased it directly from Dolphin, please check www.dolphinics.com/support to obtain a valid RMA number and instructions. Products returned to Dolphin without a valid RMA number will not be serviced under this warranty.