



Dolphin PCI Express PXH810 Adapter

PXH810 NTB Adapter users guide

Version 1.04

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DISCLAIMER

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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/px.

Quick Install Guide



The PXH810 card is shipped in an anti-static bag to prevent static electricity damage. The card should only be removed from the bag after ensuring that anti-static precautions are taken.

The PXH810 card can be installed in any PCI Express compliant x8 or x16, Gen1, Gen2 or Gen3 slot. Electrically, the PXH810 supports PCIe Gen1, Gen2 and Gen3 speeds and x1, x2, x4, and x8 link-widths.

The card will operate at the highest common speed shared between the slot and the card (Gen3) and the widest common link-width (x8).

For best performance, we recommend a PCI Express Gen3 x8 or Gen3 x16 slot.

All DIP switches should normally be left in the factory default setting. More details on DIP switch settings can be found on page 10 in this document.

PXH810 Operating Modes

The Dolphin PCI Express PXH810 card is a PCIe NTB (Non-Transparent Bridge) adapter card. The card functionality is controlled by the MODE SELECT DIP switch labeled SW1 that can be found close to the upper edge of the board. The main configuration options are found in the table below. The default DIP switch setting will be appropriate for most uses. One exception is that when a fiber is in use, one card needs to have the TARGET-DIP set and needs to be connected correctly to the corresponding end of the fiber.



Note: *Static electricity from your clothes or work environment can damage your PCI Express adapter card or your PC. Always wear a grounded anti-static wrist strap while opening the PC and when the card is removed from the anti-static bag.*

Picture 1: DIP Switch Location

Configuration PXH810	DIP switch view	NTB LED Color
NTB mode (Shipping default)		Green
NTB TARGET mode (fiber usage)		Green
NTB mode (long cable tuning)		Green

Table 1: PXH810 SW1 Configuration Settings

Cable Connections

The PXH810 requires an x8 iPass™ or standard PCI Express cable. A single x8 cable is used to connect to another PC with a PXH810 card or an IXS600 8 port switch.

To install the cable, match the x8 cable with the connector on the PXH810 adapter card. Use even pressure to insert the connector until it is secure. Adhere to ESD guidelines when installing the cable to ensure you don't damage the board. The PXH810 supports both copper and active fiber cables. Details can be found in the table below.

Connections	PXH810	IXS600
Speed	x8 Gen3	x8 Gen3
PXH810	Max 5 meter copper or 100 meter fiber	Max 2 meter copper. Contact Dolpin for information on longer cables.

Using the PXH810 with Optical Fibers

The PXH810 card is compliant with active fiber optic cables from Samtec. On the fibers, the iPass-housing on one end is marked HOST, and the other end is marked TARGET. Please set the TARGET-DIP on the PXH810 to ON on the card connected to the TARGET end of the fiber.

Dolphin Software

The Dolphin Express PXH810 adapter card is compliant with Dolphin's extensive software package for the PX product line. Please visit <http://dolpinics.com/px> to download the latest documentation and software.

Dolphin provides software and documentation for several product families; **please remember to select the PX product family before downloading.**

The software download requires a password to log in. The password will automatically be emailed to you if you follow the instructions found on the getting started guide bundled with the adapter card.

Overview

This document describes the Dolphin PCI Express IX and PX interconnect family and the PXH810 PCI Express Gen3 adapter card.

The Dolphin Express IX and PX product family consists of the following products:

- PXH810 PCI Express Gen3 x8 NTB x8 iPass cable adapter
- PXH812 PCI Express Gen3 x8 Transparent Host and Target x8 iPass cable adapter
- IXH610 PCI Express Gen2 x8 NTB and Transparent Host adapter x8 iPass cable
- IXH611 PCI Express Gen2 x8 Transparent Host and Target adapter x8 iPass cable adapter
- IXS620 XMC PCI Express Gen2 NTB and Transparent Host and Target XMC adapter x8 iPass cable adapter
- IXS600 PCI Express Gen3 8 port rack mount x8 iPass cable switch
- IXE60X PCI Express expansion products (contact Dolphin for details)
- IXC1M 1 meter PCIe Gen3 iPass copper cable
- IXC2M 2 meter PCIe Gen3 iPass copper cable
- IXC5M 5 meter PCIe Gen3 iPass copper cable
- IXC7M 7 meter PCIe Gen2 iPass copper cable
- IXC448-2M 2 meter x8 to x4 transition PCIe Gen3 iPass copper cable

Please note that mixing IXH6xx and PXH810 cards in NTB mode is not yet supported by Dolphin software due to implementation differences between the Avago and IDT NTB features. The PXH812 can connect to the IXH620 XMC card for transparent operation.

The PXH810 adapter supports the complete suite of Dolphin NTB software including Dolphin SuperSockets™, optimized TCP/IP drivers, and SISI embedded software.

Dolphin SuperSockets™ is a Berkeley compliant Sockets library, which provides socket latency below 1 microsecond and close to the wire speed streaming bandwidth for networked applications. SuperSockets™ is currently available on Linux and Windows. It is a 100% transparent plug and play solutions for commercial and embedded applications. More on SuperSockets™ can be found at <http://www.dolphinics.com/products/dolphin-supersockets.html>

Dolphin's optimized TCP/IP driver enables PCI Express to be used as a traditional 10G Ethernet / 40G Ethernet replacement for things such as NFS sharing and legacy networking that does not need the low latency provided by SuperSockets. The TCP/IP driver supports gateway functionality.

The SISI software provides a well-defined, easy-to-use shared memory / reflective memory programming API for PCI Express over cable. More on SISI can be found at <http://www.dolphinics.com/products/embedded-sisci-developers-kit.html>

More information about the software provided for the Dolphin PXH810 adapter cards can be found on <http://www.dolphinics.com/software>

Dolphin Express Adapter Card - PXH810

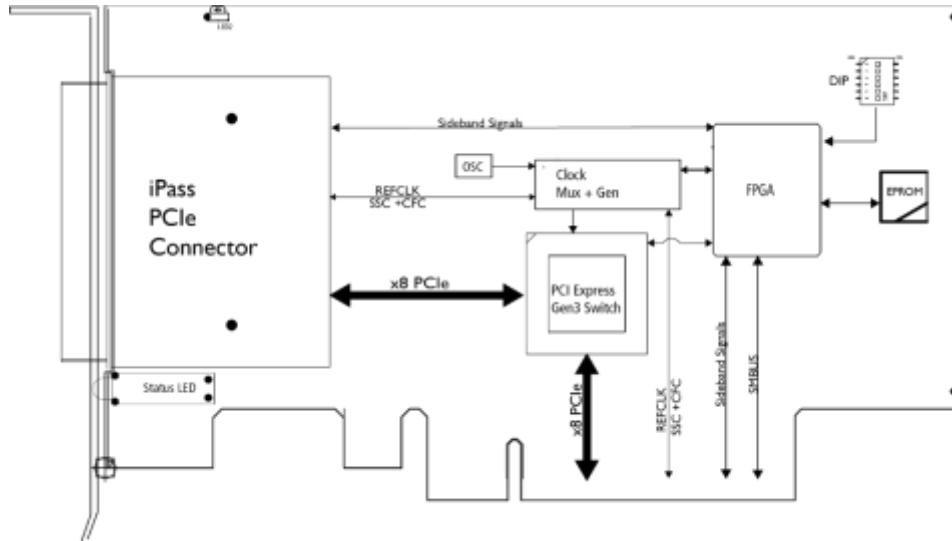


Figure 1: PXH810 Schematics

The PXH810 is a PCI Express Gen3 x8 adapter card available from Dolphin providing an easy-to-use, multi-functional solution.

PXH810 high level specification

- PCI Express Gen3 8.0 Gbps per lane signaling – 64 Gbps total signaling.
- PCI Express Gen3 x8 edge connector. The card installs in any PCI Express slot that has a physical x8 or x16 connector.
- Compliant with PCI Express Gen1 through Gen3 computers and IO systems, auto detection.
- The PXH810 supports NTB connections to other hosts.
- The PXH812 supports transparent connections to IO systems (host and target operation).
- PCI Express Base Specification, Rev. 3.0.
- PCI Express External Cabling Specification, Rev. 1.0.
- One PCI Express Gen3 x8 iPass cable connection.
- PEX8717 PCI Express Gen3 chipset.
- 138 nanosecond cut-through latency port to port.
- Support for copper cables up to 5 meters (between PXH810 cards).
- Support for active optical fibers up to 100 meters.
- Low profile - PCI Express Electromechanical Specification, Rev 2.0.
 - Dimensions 120 mm x 68.9 mm
- Comes with both low profile and standard profile PCI Express bracket.
- PIO and Direct DMA capabilities.
- Host clock isolation. Automatic support for host running CFC or SSC mode.
- Generates high quality, low jitter CFC REFCLK.
- Support for hot plugging of the PCI Express cable (NTB mode, SISI and SuperSockets™).
- Quad 64 KB EEPROM for boot up configuration data.
- EEPROM recovery option.
- Optional software utility for reprogramming of EEPROM content.
- No PCI Express power domain isolation.
- Supports Dolphin SuperSockets™, TCP/IP driver and SISI software. Linux, VxWorks, RTX and Windows support.

- Power consumption: 12 Volt: Max 12 Watt, typical 8 Watt.
- Operating temperature 0°C to 55°C.
- Relative humidity 5% - 95% non-condensing.
- CE
 - Compliant to EN-55022 (2010), EN 55024 (2010), EN 61000-6-2 (2005).
 - RoHS compliant.
- FCC Class B.

LEDs

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

Name	Dark	Yellow	Green	Blinking
Link	Power off or failure	Power on, Link down	Power on, Link up in Gen3	Fast green/yellow: Link is at Gen2 Slow green/yellow: Link is at Gen1
NTB	NA (valid for PXH812)	NA (valid for PXH812)	NTB mode (SISCI/SuperSockets™/T CP/IP mode)	NA

Table 2: LED overview

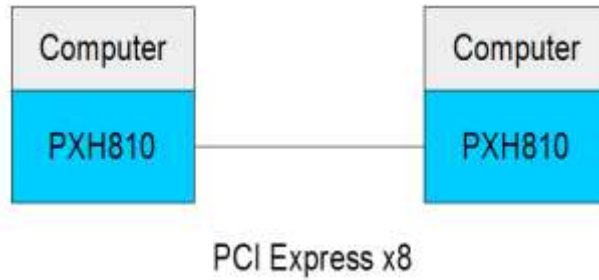
The NTB link LED is controlled by software. An incorrect EEPROM can cause dark LEDs. DIP switch SAFE in position ON will cause all LEDs to be dark.

Use Cases

The PXH810 card may be used in the following use cases. The use cases are summarized in Table 3: Adapter Use Cases on page 12.

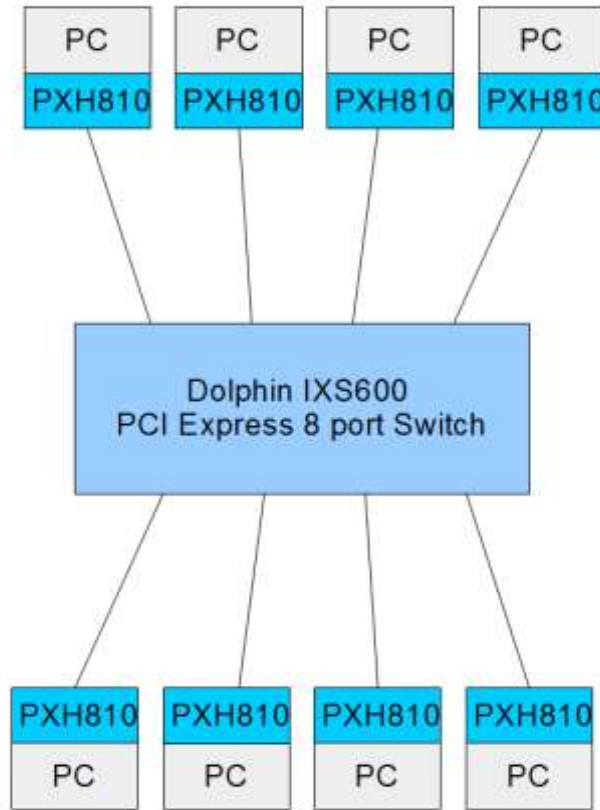
Use Case A - 2 Node Configuration – NTB Mode (Balanced)

Each node has a PXH810 adapter and a direct iPass cable connection to the other system. This configuration is fully supported by all Dolphin software. Both PXH810 adapter cards operate in NTB mode.



Use Case B - Switch Configuration

Each node has a PXH810 adapter card. Up to 8 systems can be connected to the Dolphin IXS600 8 port PCI Express Gen3 switch. All PXH810 adapter cards operate in NTB mode.

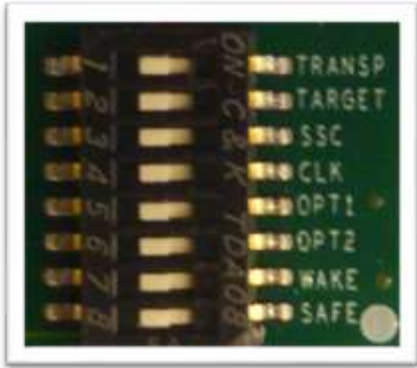


Configuration and DIP Switches

The PXH810 has one bank of 8 DIP switches. The default factory setting for the PXH810 is NTB mode, short cable.

The PXH810 has DIP switches for setting special modes or operations. Please carefully read the documentation before modifying any DIP switch settings. Please pay close attention to ON and OFF positions written on the DIP switch.

DIP Switch Bank - Configuration



The DIP switch on the PXH810 is used to configure the adapter card. Please leave all undocumented DIP switches in the default position.

Picture 2: DIP Switch

DIP no.	Name	Description	ON	OFF	Default
1	TRANSP	PXH810: Used to select NTB or limited TRANSPARENT operations	PXH810 will operate in limited TRANSPARENT mode. Contact Dolphin support	PXH810: NTB mode	OFF
2	TARGET	Enable Target or Host operation. This should be off for all NTB uses cases except when using fiber optics.	Card operates in Target mode	Card operates in Host mode	OFF
3	SSC	Not in use. The card will automatically support hosts using both SSC and CFC			OFF
4	CLK	Not in use. Leave off.			OFF
5	OPT1	Not in use. Leave off.			OFF
6	OPT2	Cable tuning. Leave off for short cables.	Recommended for 3-5 meter copper cables or fiber optics	Recommended for 0.5 – 2 meter copper cables or fiber optics	OFF
7	WAKE	Not supported. Leave off			OFF
8	SAFE	Enables the card to boot if the EEPROM has been corrupted			OFF

Note: Some DIP switch configuration options may be removed in the future versions. Please always consult the user guide for details.

Use Cases Summary and Settings

The table below gives an overview of the various use cases, settings and limitations.

Use case	Description	NTB	DIP switch setting	Cable pull	Power sequence requirements	Software/Driver
A	Dolphin Host – Host. Both connected systems have PXH810 installed.	yes	TRANSP OFF	Fully supported	No limitations	Dolphin SISCi, SuperSockets™, TCP/IP
B	Dolphin Switch configuration. All connected hosts have PXH810 installed	yes	TRANSP OFF	Fully supported	No limitations	Dolphin SISCi, SuperSockets™, TCP/IP

Table 3: Adapter Use Cases

Installation



Static electricity from your clothes or work environment can damage your PCI Express adapter card or your PC. Always wear a grounded anti-static wrist strap while opening the PC and when the PXH810 is removed from the anti-static bag.

Changing the PCI Express Bracket

The PXH810 package includes a standard and low-profile PCI Express bracket. By default, the standard height bracket is installed on the board. If you need to replace the mounted bracket with a low-profile bracket, carefully unscrew the two mounting screws to remove the full height bracket. Save the two mounting screws and replace the bracket with the low-profile bracket. Use the two mounting screws to install the low-profile bracket. The screws should be carefully tightened but be careful not to over-tighten. Make sure you are properly grounded to avoid static discharges that may destroy the adapter card before performing this procedure.

Installing the Adapter Card



Before installing the adapter card, make sure you are properly grounded to avoid static discharges that may destroy your computer or the adapter card. Ensure you are properly grounded before opening your computer or the anti-static bag containing the PXH810. Please follow your computer's manual on how to install a PCI Express card.

The PXH810 Adapter card can be installed into any PCI Express x8 or x16 slot. The PXH810 supports PCI Express Gen1, Gen2 and Gen3 signaling. *NOTE: A Gen3 slot is recommended as it typically doubles the performance compared to a Gen2 slot.* The PXH810 is an x8 card, so no additional performance can be obtained by using an x16 slot.

The PXH810 supports hosts using either spread spectrum or constant frequency clocking. The card implements clock isolation and will provide a high-quality CFC CREFCLK signal on the cable.

Installing and Removing the Cable

The PXH810 supports PCI Express x8 Gen3 cables. Installing and removing cables should be done with both upstream and downstream device powered off. The Dolphin SuperSockets™, TCP/IP drivers and SISI fully support hot plugging (*i.e. installation and removal of cables while the system is running*). Standard PCI Express cables are not designed for a high number of installations and removals. Please contact your Dolphin representative if you intend to continuously connect and disconnect the PCI Express cables.

Connecting the Cable

Please carefully install the PCI Express cable connector into the connector housing on the PXH810 adapter card or IXS600 Switch box. Computer cables should always use strain relief to protect the connected equipment from excessive force on the cable. This is especially important for cables between racks.

Disconnecting the Cable

Please carefully pull back the thumb tab to release the cable from the connector house and pull back the cable.

EEPROM Programming

Dolphin may from time to time publish updated firmware. Current firmware is normally included in the Dolphin software distribution and published on the web at www.dolphinics.com/px. Please consult the software documentation for information on firmware upgrades or contact Dolphin support if assistance is required.

Software Installation

More information on installing Dolphin's SuperSockets™, SISI or TCP/IP driver software can be found at <http://www.dolphinics.com/px>

Identifying the Card

The card has a label-sticker with the serial number in the format 'PXHXXX-YY-ZZZZZ', where XXX denotes the card-type (e.g. 810), YY denotes the card revision (e.g. CC) and ZZZZZ denotes the serialized production number (e.g. 012345) – this whole string makes up the serial number of the card (i.e. PXH810-CC-012345).

With the DIS software installed and loaded, you can get this serial number with the `dis_diag` command:

The top of this output will show information about the card (example from a PXH810-card);

```
Adapter 0 > Type                : PXH810
             NodeId              : 4
             Serial number        : PXH810-CC-000024
             PXH chipId           : 0x87b010b5
             PXH chip revision    : 0xCA
             EEPROM version NTB mode : 0010
             Card revision        : CC
             Topology type        : Switch
             Topology Autodetect   : No
             Number of enabled links : 1
             PCIe slot state       : x8, Gen3 (8 GT/s)
             Clock mode slot       : Port
             Clock mode link       : Global
             Max payload size (MPS) : 128
             Multicast group size  : 2 MB
             Prefetchable memory size : 256 MB (BAR2)
             Non-prefetchable size : 64 KB (BAR4)
```

Here you will see the whole serial number string, as well as the decoded card-type and card-revision identifiers. The 'EEPROM version NTB mode' may be of interest – this shows the firmware-version of the card.

You can also get this information without `dis_iag` (for instance when the drivers are not loaded or the card is in transparent mode), using `lspci` in Linux:

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

```
02:00.0 PCI bridge: PLX Technology, Inc. PEX 8717 16-lane, 8-Port PCI Express Gen 3
(8.0 GT/s) Switch with DMA (rev ca)
02:00.1 System peripheral: PLX Technology, Inc. Device 87d0 (rev ca)
02:00.2 System peripheral: PLX Technology, Inc. Device 87d0 (rev ca)
03:00.0 PCI bridge: PLX Technology, Inc. PEX 8717 16-lane, 8-Port PCI Express Gen 3
(8.0 GT/s) Switch with DMA (rev ca)
04:00.0 Bridge: PLX Technology, Inc. PEX 8732 32-lane, 8-Port PCI Express Gen 3
(8.0 GT/s) Switch (rev ca)
```

Second, do an `lspci -vvv -s <device>` , and look for the 'Serial' -string

```
# lspci -s 02:00.0 -vvv | grep Serial
Capabilities: [180 v1] Device Serial Number 00-00-44-45-00-00-05-48
```

This shows the card as revision 0x4445 (*hexadecimal values of the 'DE' letters in the ASCII table*), with the production number 0x00000548 (*001352 in decimal*).

Support

More information about the product, support and software download can be found at <http://www.dolphinics.com> . Please email pci-support@dolphinics.com if you have any questions.

Technical Information

PCI-Express 8x Finger Connector Pin-Out

The PXH812 Edge connector follows PCI Express CEM Specification, Rev. 3.0 section 6 – Card Connector Specification

PCIe iPass Cable Connector Pin-Out

The PXH812 Edge connector follows PCI Express External Cabling Specification, Rev. 2.0

Cable Sideband signals

The PXH810 will generate a high precision CFC 100 MHz reference clock on the cable if the device on the other side of the cable signals CPRESNT#

The PXH810 will signal CPRESNT# if the TARGET DIP is set. For normal NTB use, the TARGET DIP only needs to be set if fiber cables are used.

Compliance and Regulatory Testing

EMC Compliance

The Dolphin PCI Express PXH810 adapter has been tested to the following relevant test standards for PCI Express cards, telecommunication and industry equipment installed in a standard PC:



EN 55022 (2010) , Class B
EN 55024 (2010) , Class A
EN 61000-6-2 (2005)

This does not ensure that it will comply with these standards in any random PC. It is the responsibility of the integrator to ensure that their products are compliant with all regulations where their product will be used.

RoHS Compliance

The Dolphin PXH810 is RoHS compliant. A Compliance certificate issued by the manufacturer is available upon request.



FCC Class B

This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:



- Reorient or relocate the receiving antenna.
- Increase the separation between the equipment and receiver.
- Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.
- Consult the dealer or an experienced radio/TV technician for help.

Limited Warranty

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

Warranty Period

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

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, high voltage surges, shipping or abnormal working conditions.
- Damages caused by acts of nature, e.g. floods, storms, fire, 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.

Service Procedure

In the event that the product proves defective during the Warranty Period, you should contact the seller that supplied you with the product, or if you purchased it directly from Dolphin, email returnrequests@dolphinics.com to obtain a valid RMA number and instructions. Products returned to Dolphin without a proper RMA number will not be serviced under this warranty.

Limitations

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 DOLPHIN'S PRODUCTS, SOFTWARE OR SERVICE PROVIDED. DOLPHIN'S MAXIMUM LIABILITY WILL NOT EXCEED THE TOTAL AMOUNT PAID FOR THE PRODUCT BY THE PURCHASER.