EMERSON™

Uninterruptible Power Systems
Instruction Manual

SDU AC - A SERIES COMM CARDS

Active Card

Passive Card

SOLAHD™

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CONTENTS

FIGURES

TABLES

1.0 Introduction

The new SDU AC - A Series UPS has added capability to communicate to systems or networks through modular COMM CARDS.

1.1 Active Cards
Plug-in modules that provide the SDU AC - A Series UPS network flexibility and a modular solution. It is especially suitable for both general purpose and for high-end applications with large I/O data transfer, fast network cycles and synchronization demands. Utilizing a common Ethernet module that allows your chosen Ethernet protocol in a specific communications module to be chosen for your application.

1.1.1 SDUENETIPCARD

The COMM CARD for EtherNet/IP™ is a complete module which enables your products to communicate on an EtherNet/IP™ network. The module supports fast communication speeds, making it suitable also for high-end industrial devices. The EtherNet/IP™ SDUENETIPCARD has been tested and approved for conformance by the ODVA. More information about EtherNet/IP™ and the ODVA can be obtained from the following website: www.odva.org.

1.1.2 Other Industrial Protocols

Modules that support fast Industrial Internet communication speeds with other networks are being developed.

Contact your SolaHD representative for availability.

SDUMBUSCARD - Modbus TCP 2-port, COMM CARD which enables your products to communicate on a Modbus TCP network

SDUPNETCARD - Profinet IRT 2-port, COMM CARD which enables your products to communicate on a Profinet network

SDUECATCARD - EtherCAT 2-port, COMM CARD which enables your products to communicate on an EtherCAT network

1.2 Passive Card

The SDUCFRELAYCARD supports digital I/O processing applications and is equipped with LED diagnostics. The SDUCFRELAYCARD is a communication module used to control two 1-form-c SPDT relays (N.O.). Each relay contact side, N.O., C and N.C., is connected to three pins of an 8-pin push-in connector. An optional external momentary switch can be connected to the remaining two interface pins 7-8 for remote standby mode operation.

The SDUCFRELAYCARD is a Safety Extra Low Voltage (SELV) circuit and acts as an interface between the UPS and the end user system.

2.0 Installation

Only qualified personnel should install or service the card. Electrical safety precautions must be followed when installing or servicing the SDUCFRELAYCARD. To prevent risk of electric shock, turn OFF and lock out all power sources to the UPS before making electrical connections.

Remove the SDUCOMMCVR (COMM PORT COVER) from the UPS then slide the SDUCFRELAYCARD into the slot.

For proper COMM CARD installation instructions, please refer to the SolaHD YouTube video: https://youtu.be/1wYElxdjL50.

1) When securing the module into the SDU, ensure that the card module is properly aligned into the Compact Flash socket inside the UPS prior to applying any force. The card hook should be aligned with the PCB.

2) Turn the screws in a clockwise direction until flush. DO NOT OVER TORQUE. Recommended screw tightening torque is 0.25 N.m (0.18 lbf.ft).

3) As the screws tighten, a fastening mechanism will lock on the PCB.

Figure1: Installing Communication Card to UPS

Ground Pin
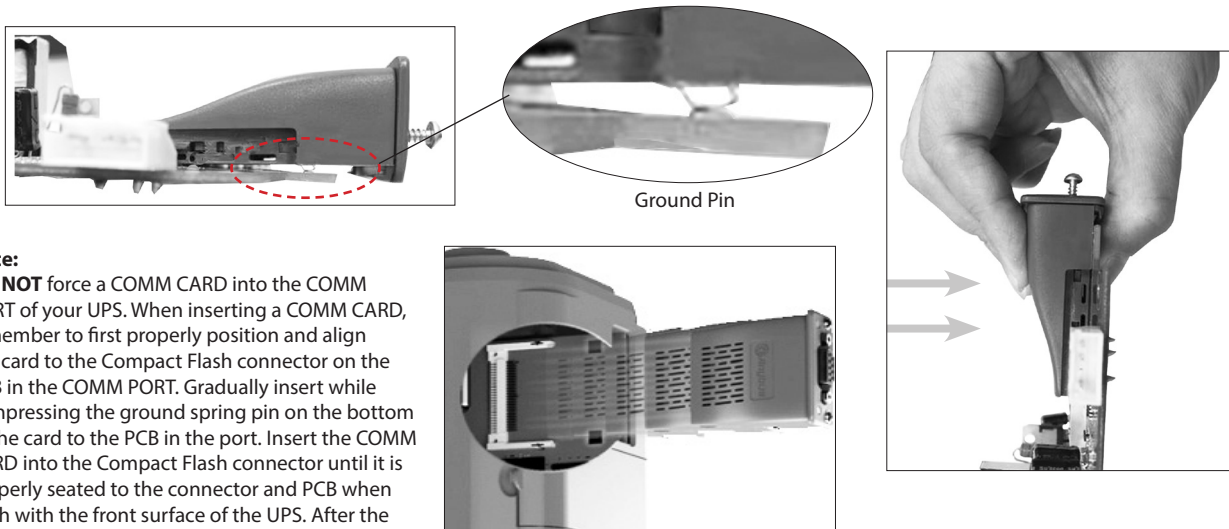
Note:

DO NOT force a COMM CARD into the COMM PORT of your UPS. When inserting a COMM CARD, remember to first properly position and align the card to the Compact Flash connector on the PCB in the COMM PORT. Gradually insert while compressing the ground spring pin on the bottom of the card to the PCB in the port. Insert the COMM CARD into the Compact Flash connector until it is properly seated to the connector and PCB when flush with the front surface of the UPS. After the card is properly seated & positioned, tighten down the card screws to properly secure the card.

Figure 2: Installing Communication Card to UPS; Special Instruction

3.0 System Features and General Description
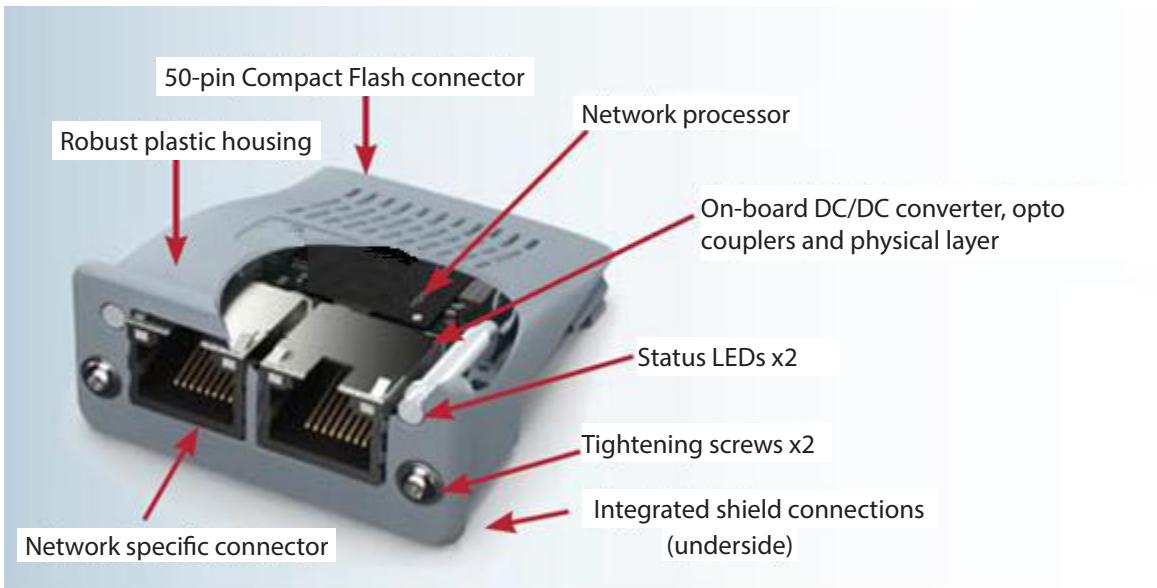
Figure 3: SDUENETIPCARD Construction

#	Item	Connector	
1	Network Status LED		
2	Model Status LED	Ethernet, RJ45	
3	Link/Activity LED (port 1)		
4	Link/Activity LED (port 2)		

Test sequences are performed on the Network and Module Status LEDs during startup.

Figure 4 : Front View - SDUENETIPCARD Details

LED State	Description
Network Status LED	
Off	No power or no IP address
Green	Online, one or more connections established (CIP Class 1 or 3)
Green, flashing	Online, no connections established
Red	Duplicate IP address, FATAL error
Red, flashing	One or more connections timed out (CIP Class 1 or 3)
Module Status LED	
Off	No power
Green	Controlled by a Scanner in Run state
Green, flashing	Not configured, or Scanner in Idle state
Red	Major fault (EXCEPTION-state, FATAL error etc.)
Red, flashing	Recoverable fault(s). Module is configured, but stored parameters differ from currently used parameters.
LINK/Activity LED 3/4	
Off	No link, no activity
Green	Link (100 Mbit/s) established
Green, flickering	Activity (100 Mbit/s)
Yellow	Link (10 Mbit/s) established
Yellow, flickering	Activity (10 Mbit/s)

Table 1: LED Status for SDUENETIPCARD

#	Item
1	RUN LED
2	ERROR LED
3	EtherCAT (IN port)
4	EtherCAT (OUT port)
5	Link/Activity (IN port)
6	Link/Activity (OUT port)

Figure 5 : Front View - SDUECATCARD Details
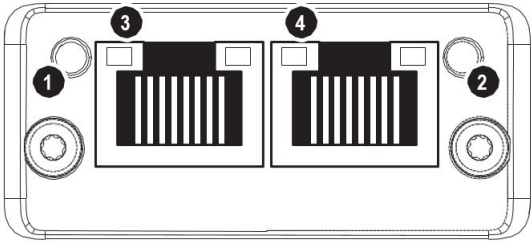
LED State	Indication	Description
RUN LED		
Off	INIT	EtherCAT device in 'INIT'-state (or no power)
Green	OPERATIONAL	EtherCAT device in 'OPERATIONAL'-state
Green, blinking	PRE-OPERATIONAL	EtherCAT device in 'PRE-OPERATIONAL'-state
Green, single flash	SAFE-OPERATIONAL	EtherCAT device in 'SAFE-OPERATIONAL'-state
Flickering	BOOT	The EtherCAT device is in 'BOOT ' state
Red	(Fatal Event)	If RUN and ERR turn red, this indicates a fatal event, forcing the bus interface to a physically passive state. Contact HMS technical support
ERR LED		
Off	No error	No error (or no power)
Red, blinking	Invalid configuration	State change received from master is not possible due to invalid register or object settings.
Red, single flash	Unsolicited state change	Slave device application has changed the EtherCAT state autonomously.
Red, double flash	Sync Manager watchdog timeout	Watchdog Functionality.
Red	Application controller failure	If RUN and ERR turn red, this indicates a fatal event, forcing the bus interface to a physically passive state.
Flickering	Booting error detected	E.g. due to firmware download failure.
LINK/Activity LED		
Off	No link	Link not sensed (or no power)
Green	Link sensed, no activity	Link sensed, no traffic detected
Green, flickering	Link sensed, activity	Link sensed, traffic detected

Table 2. LED Status for SDUECATCARD

Pin #	Signal	Notes
1	Tx+	-
2	Tx-	-
3	Rx+	-
4	-	Normally left unused; to ensure signal integrity, these pins are tied together and terminated to PE via a filter circuit in the module.
5	-	
6	Rx-	-
7	-	Normally left unused; to ensure signal integrity, these pins are tied together and terminated to PE via a filter circuit in the module.
8	-	

Table 3. Ethernet Interface (RJ45 Connectors) for SDUECATCARD

#	Item	Connector	
1	Network Status LED		
2	Module Status LED		
3	Link/Activity LED (port 1)	Ethernet, 45	
4	Link/Activity LED (port 2)		
Test sequences are performed on the Network and Module Status LEDs during startup.			

Figure 6: Front View - SDUMBUSCARD Details

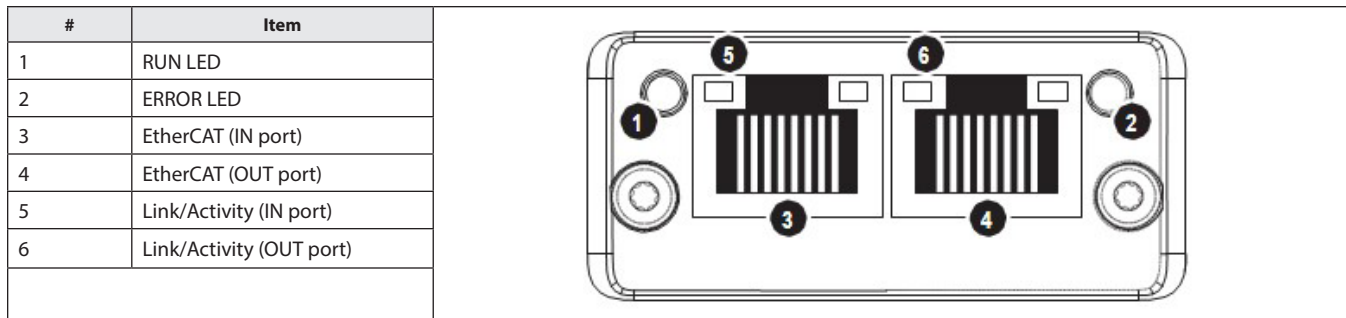| LED State	Descruotuib
Network Status LED	
Off	No IP address or in state EXCEPTION
Green	At least one Modbus message received
Green, flashing	Waiting for first Modbus message
Red	IP address conflict detected, FATAL ERROR
Red, flashing	Connection timeout. No Modbus message has been received within the configured "process active timeout" time
Module Status LED	
Off	No power
Green	Normal operation
Red	Major fault, FATAL
Red, flashing	Minor fault
Alternating red/green	Firmware update from file system in progress
LINK/Activity LED 3/4	
Off	No link, no activity
Green	Link (100 Mbit/s) established
Green, flickering	Activity (100 Mbit/s)
Yellow	Link (10 Mbit/s) established
Yellow, flickering	Activity (10 Mbit/s)

Table 4. LED Status for SDUMBUSCARD

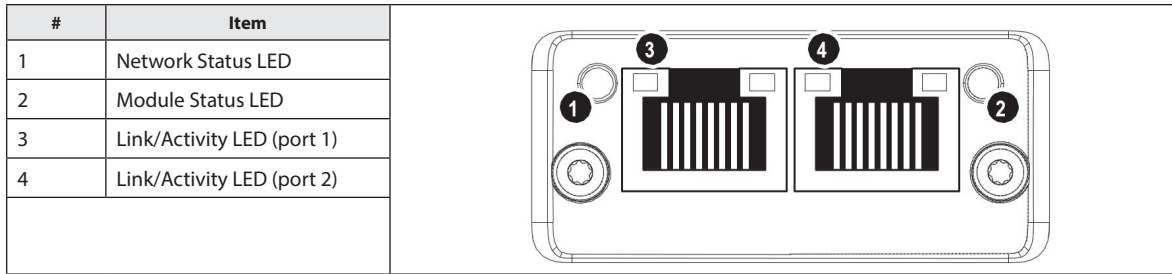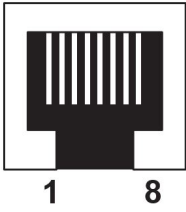| #	Item
1	Network Status LED
2	Module Status LED
3	Link/Activity LED (port 1)
4	Link/Activity LED (port 2)

Test sequences are performed on the Network and Module Status LEDs during startup.

Figure 7: Front View - SDUPNETCARD Details

LED State	Description	Comments
Network Status LED		
Off	Offline	No power No connection with IO Controller
Green	Online (RUN)	Connection with IO Controller established IO Controller in RUN state
Green, 1 flash	Online (STOP)	Connection with IO Controller established IO Controller in STOP state or IO data bad IRT synchronization not finished
Green, blinking	Blink	Used by engineering tools to identify the node on the network
Red	Fatal event	Major internal error (this indication is combined with a red module status LED)
Red, 1 flash	Station Name error	Station Name not set
Red, 2 flashes	IP address error	IP address not set
Red, 3 flashes	Configuration error	Expected Identification differs from Real Identification
Module Status LED		
Off	Not Initialized	No power OR Module in SET UP or NW_INIT state.
Green	Normal Operation	Module has shifted from the NW_INIT state.
Green, 1 flash	Diagnostic Event(s)	Diagnostic event(s) present
Red	Exception error	Device in state EXCEPTION.
	Fatal event	Major internal error (this indication is combined with a red network status LED)
Alternating Red/Green	Firmware update	Do NOT power off the module. Turning the module off during this phase could cause permanent damage.
LINK/Activity LED		
Off	No Link	No link, no communication present
Green	Link	Ethernet link established, no communication present
Green, flickering	Activity	Ethernet link established, communication present

Table 5. LED Status for SDUPNETCARD

Pin #	Signal
1, 2, 4, 5	Connected to chassis ground over serial RC circuit
3	RD-
6	RD+
7	TD-
8	TD+
Housing	Cable Shield

The Ethernet interface operates at 100 Mbit, full duplex, as required by PROFINET

Table 6. Ethernet Interface (RJ45 Connectors) for SDUPNETCARD

3.1 Identification

Each Protocol has different parameters for identifying the SDU on the network. The following section will specify how the SDU will be identified on each network. It is organized by the instance attribute number of the corresponding Host object. The SDU must respond to requests with highlighted values. For default value it will suffice for response with error response - indicated by Respond with Error. For Respond with Error, it is not required to specify type.

Attr #	Name	Datatype Response	Response Value
EtherNet/IP - SDUENETIPCARD (object 0xF8)			
1	Vendor ID (from ODVA)	UINT16	1181
2	Device Type	UINT16	Respond with Error
3	Product Code	UINT16	2
4	Software Revision	Struct of {UIN8, UINT8}	1.03
5	Serial Number	UINT32	Respond with Error
6	Product Name	Array of CHAR	SDU Industrial UPS
EtherCAT - SDUECATCARD (object 0xF5)			
1	Vendor ID (from ET G*)	UINT32	0x00000906
2	Product Code	UINT32	1F4
3	Major Rev	UINT16	1
4	Minor Rev	UINT16	03
5	Serial Number	UINT32	Respond with Error
6	MFG Device Name	Array of CHAR (max 64)	SDU Industrial UPS
PROFINET - SDUPNETCARD (object 0xF6)			
1	Device ID**	UINT16	1F4
2	Vendor ID (from PNO*)**	UINT16	Respond with Error
3	Station Type**	Array of CHAR	SDU Industrial UPS
8	I&M Order**	Array of CHAR	SDU Industrial UPS
9	I&M Serial Number	Array of CHAR	Respond with Error
19	System Description	Array of CHAR	SDU Industrial UPS
Modbus Host (object 0xFA)			
1	Vendor Name	Array of CHAR	SOLA HD
2	Product Code***	Array of CHAR	SDU Industrial UPS
3	Major Minor Rev***	Array of CHAR	1.03
4	Vendor URL	Array of CHAR	www.solaHD.com
5	Product Name	Array of CHAR	SDU Industrial UPS
6	Model Name	Array of CHAR	SDU Industrial UPS
7	User Application Name	Array of CHAR	Respond with Error

*PNO = PROFINET User Organization
** Entries must match the information located in the GSDML Device File
*** Used IPCONFIG tool.

Table 7. Network Identifications

**Bi-Color LED
RED/GREEN**

(8-Pin) PUSH-IN Type
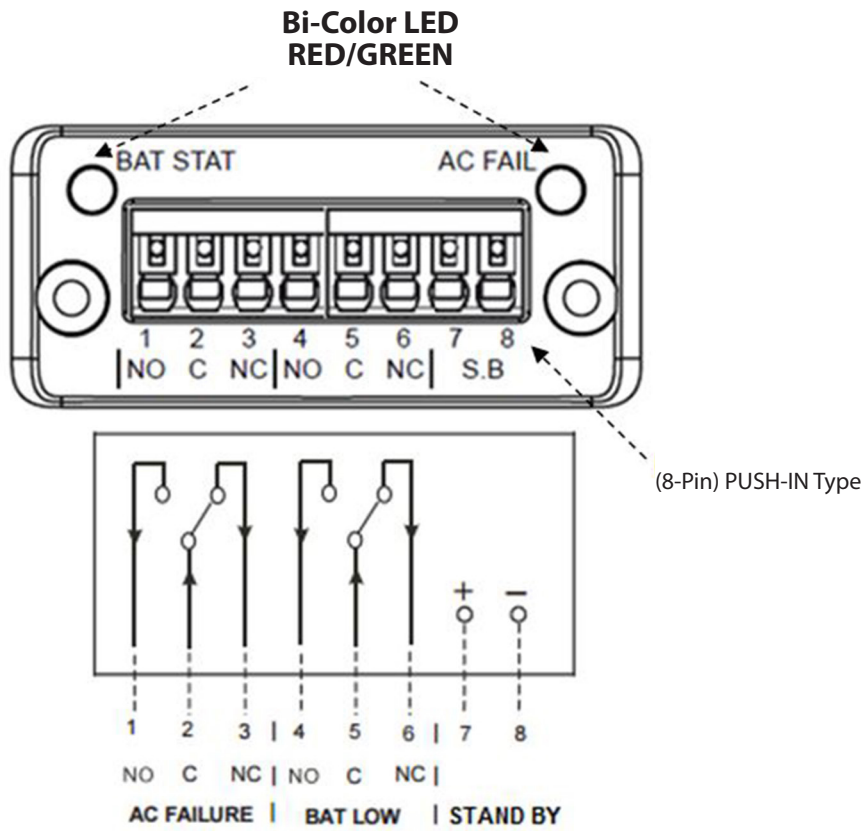
Figure 8: SDUCFRELAYCARD Front Face and Designations

The SDUCFRELAYCARD contains the following:

1. Switching logic through pins 1-6, as a signal for the UPS condition relays.

2. Non-polarized ports, pins 7-8 enable remote signaling and allow the UPS to go on STANDBY mode during BACK-UP MODE only. When in STANDBY MODE, the UPS begins a 3 minute counter (maximum or set by user in UPSMON) that starts once STANDBY MODE is activated by a momentary normally open switch or signal (minimum 1 second) before UPS will enter STANDBY mode.

3. A Bi-Color LED to represent UPS condition.

Condition	Signal State (T-True)			LED Status		Relay Logic			
				AC OK	Battery Status	Connector Relay Pins (x-closed)			
	AC Failure	BAT Low	STANDBY			Pin 1-2	Pin 2-3	Pin 4-5	Pin 5-6
No Fault				GREEN	GREEN		x		x
AC Fault UPS is on Back-Up Mode	T			RED	GREEN	x			x
On Back-Up Mode - Battery is Low	T	T		RED	RED	x		x	
Standby/Inverter is OFF			T	OFF	OFF		x		x

Table 8. SDUCFRELAYCARD Relay Logic and LED State
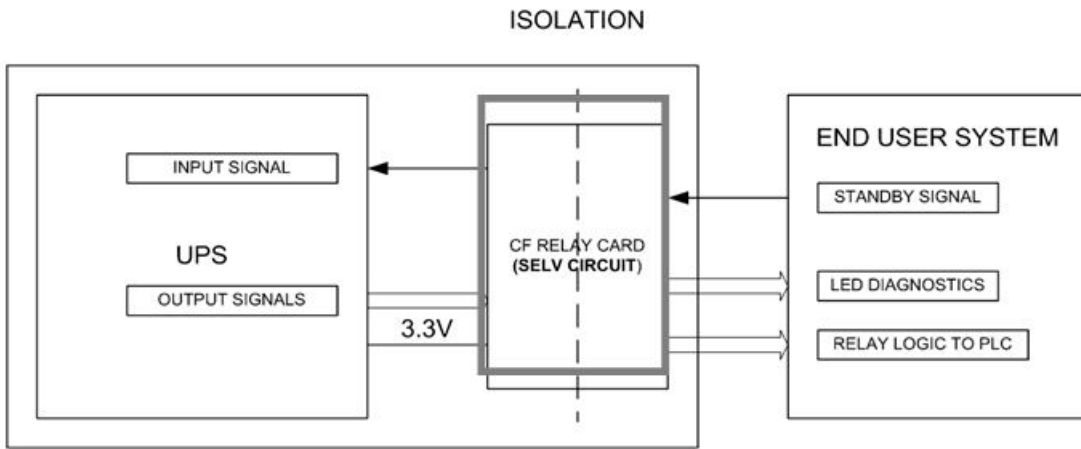
Figure 9: SDUCFRELAYCARD Application Block Diagram

4.0 Interface and Mechanical Description

4.1 SDU COMM CARD Interface TO UPS

The UPS COMM PORT is designed with a 50-pin Compact Flash connector as application connector. The UPS offers a host connector, that is designed to simplify the mounting and to meet the demands for a secure and stable connection of the communication modules.
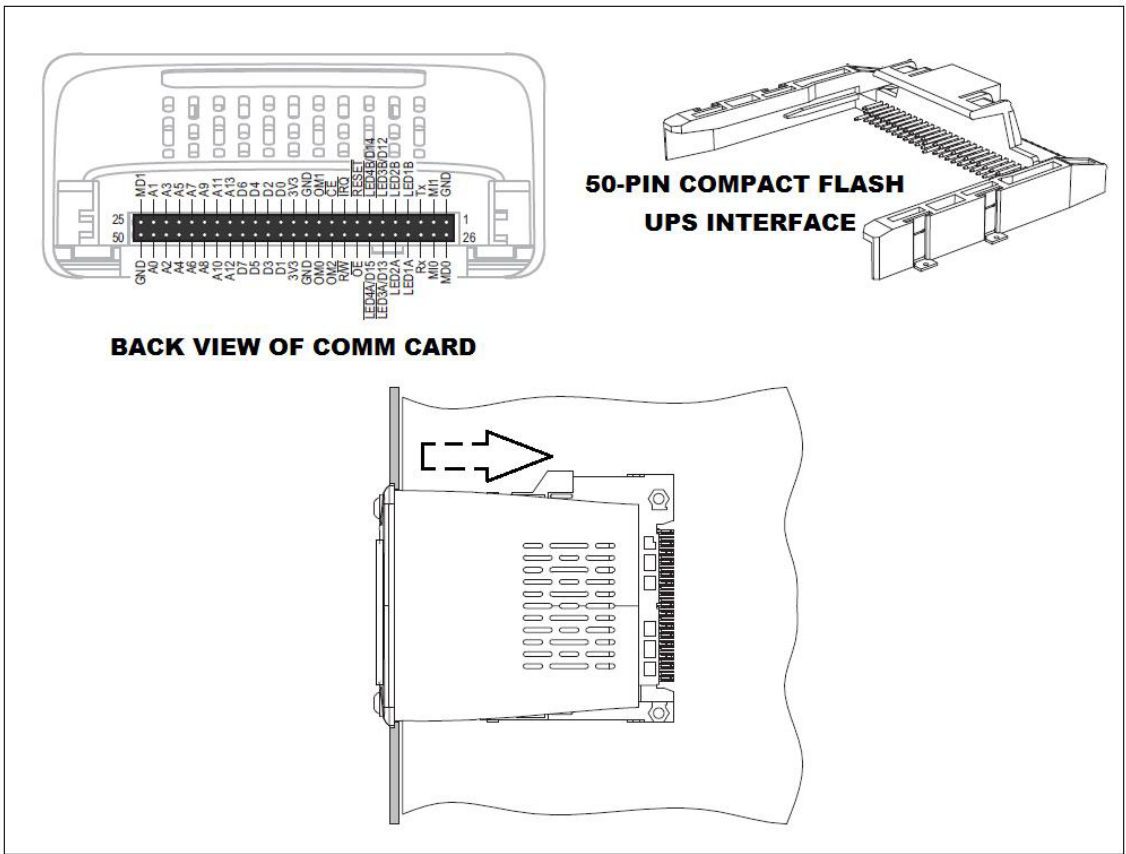

Figure 10: SDU COMM CARD Interface to UPS

NOTICE:

UPS should be turned OFF (powered down) when COMM CARD modules are installed or removed. Failure to observe this practice may cause damage to the UPS or to the COMM CARD.

4.2 SDU COMM CARD Interface to UPSk

4.2.1 The SDUENETIPCARD uses 2-port high speed RJ45 connectors for network interface.
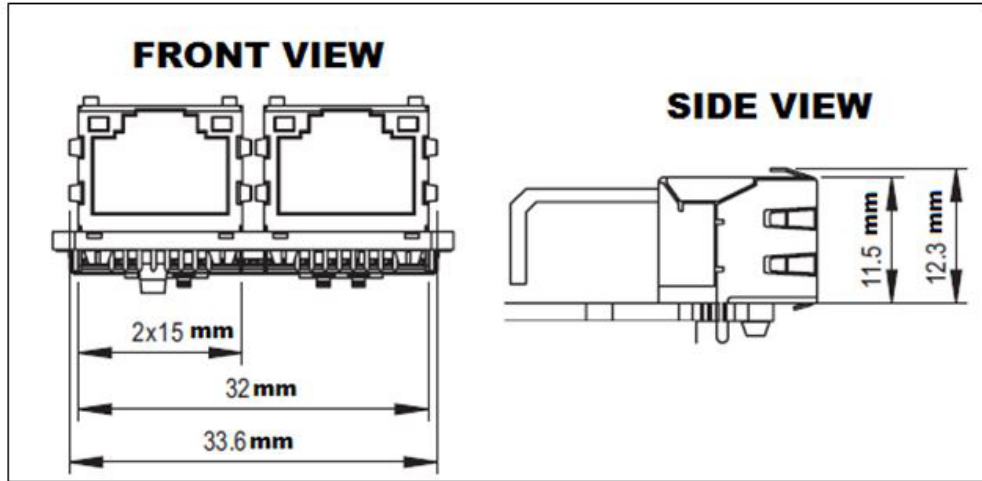
Figure 11: RJ45 Connector For Ethernet Style Card

4.2.2 SDUCFRELAYCARD Interface

The SDUCFRELAYCARD has a 1x8 Push-In style connector. Push the plastic pin and insert the wire into the hole then release to lock it in place. Each terminal position can accommodate $0.2 – 1.5$ mm^2 (AWG 24 – AWG 16) wire. The maximum force that should be applied on the connector mechanism is 40 N (9lbs.).

The SDUCFRELAYCARD is designed for Safety Extra Low Voltage (SELV) circuit applications only.
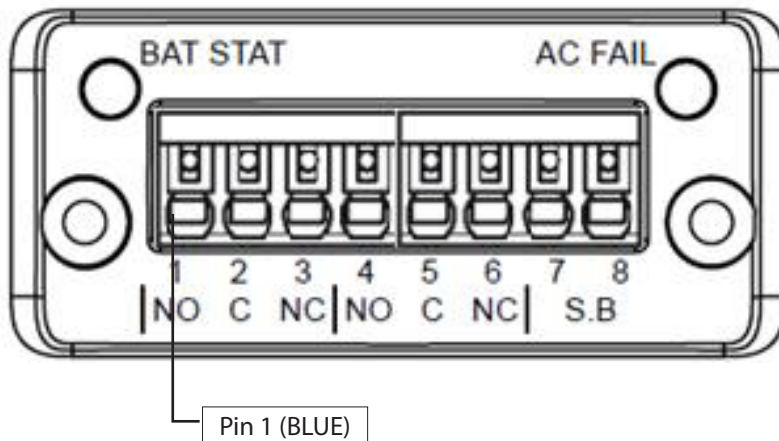
Figure 12: SDUCFRELAYCARD Front Face

PIN CONFIGURATION

Pin #	Designation	Description	Comment
1 (BLUE)	N.O.	Normally Open	AC Failure
2	C	COM	
3	N.C.	Normally Closed	
4	N.O.	Normally Open	Battery Low
5	C	COM	
6	N.C.	Normally Closed	
7	BLANK	Input	Standby (triggered by external N.O. momentary switch)
8	BLANK	Output	

Table 9. SDUCFRELAYCARD PIN Configuration

Pins 1-6: Relay Switch

An SPDT relay is used as switching relay on the Relay Interface. This should be able to break 30VRMS, 42.4VPEAK or 60VDC @ 1A. The maximum current on the relay contact side is 1A limited by the allowable trace width.

The STANDBY input is shown by the schematic. The TX signal going to the UPS is normally HIGH unless the UPS goes to BACK-UP Mode and the STANDBY switch is pressed (minimum of 2 seconds). It requires a momentary, N.O. type switch to be connected on pins 7 and 8. Upon pressing the external switch (or simulating closure of pins 7 and 8 for a minimum of 2 seconds), the UPS will go into STANDBY MODE in approximately 3 minutes. ONLY in STANDBY MODE will the UPS auto recover once AC is restored.
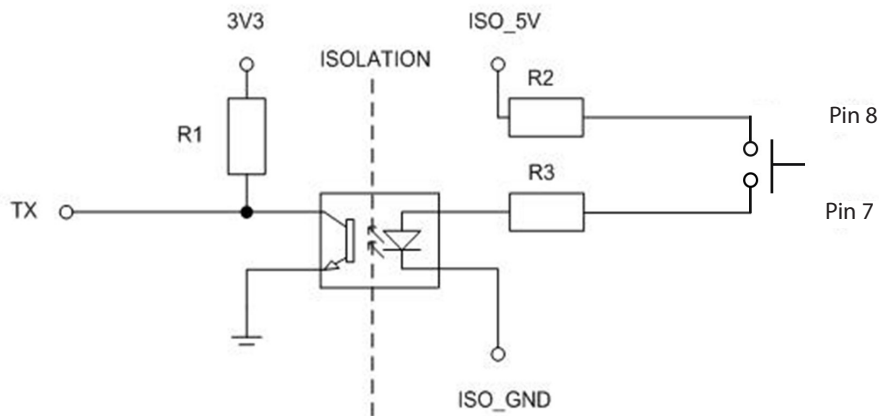
Figure 13: SDUCFRELAYCARD PIN Standby Circuit

5.0 Specifications

Description	Catalog Number	
	Passive Card (SDUCFRELAYCARD)	Active Cards ① (SDUENETIPCARD, SDUMBUSCARD, SDUPNETCARD, SDUECATCARD)
Input		
Nominal Voltage	+3.3 V ±5 %	
Standby signal	Active low via normally open momentary switch	
Frequency	50/60 Hz	
Output		
LED Diagnostics	Refer to Figure 8	Refer to Figure 8 NS = Network Status, MS=Module Status
Relay Logic Signals	Refer to Figure 8	—
Relay Contact Ratings	60V peak, 1A	—
Case/Enclosure Material	Housing: LCP (Liquid Crystal Polymer) Color: Natural, Thermoplastic,UL 94 V-0	
Weight & Dimensions		
H x W x D, in. (mm)	0.91 x 2.0 x 2.2 (23 x 50 x 55) approximate	
Net Weight, oz. (g)	1.0 (28.4) approximate	
EMC		
Immunity/Emissions	Emission EN 61000-6-4 EN55016-2-3 Radiated emission EN55022 Conducted emission Immunity EN 61000-6-2 EN61000-4-2 Electrostatic discharge, EN61000-4-3 Radiated immunity. EN61000-4-4 Fast transients/burst, EN61000-4-6 Conducted immunity	
Approvals ①	EN/IEC 60950-1 ; UL/CSA 60950-1 Pollution Degree 3 ; UL 508 Pollution Degree 3 CSA 107.1; EU ROHS2, China RoHS2	
Temperature °F (°C)	Storage: -40 to +185 (-40 to +85) Operating: -40 to +158 (-40 to +70) Convection cooling; no forced air required.	
Vibration	Operating: IEC60068-2-6, Sine Wave: 10Hz to 500Hz @19.6m/S², displacement of 0.35mm, 60 min per axis for all X, Y, Z direction. Non-Operating: IEC60068-2-6, Random : 5hz to 500Hz (2.09Grms); 20 min per axis for all X,Y,Z direction.	
Shock	Operating: IEC60068-2-27, Half Sine Wave: 10G for a duration of 11ms, shock for 1 direction (X axis). Non-Operating: IEC60068-2-27, Half Sine Wave : 50G for duration of 11ms, 3 shocks for each 3 directions.	
Humidity	1% to 90% RH, noncondensing; IEC 68-2-2, 68-2-3	
Warranty	2 Years	
MTBF (bellcore)	1,968,800 Hours	
General Protection/ Safety	Protected against Continuous short -circuit, Continuous overload, Continuous open circuit. Galvanic Isolation: I/P to O/P: 3KVac, I/P to GND: 1.5KVac, O/P to GND: 0.5KVac Protection class 1 (IEC536), degree of protection IP20 (IEC 529) Safe low voltage: SELV (acc. EN60950); RoHS	

① Approvals apply for Active Cards. Contact Technical support for Passive Cards.

Table 10. Specifications

6.0 Data Exchange

6.1 Network Data Access

Access to SDU variables is provided by six monitoring instances, and one instance for control. The instance numbers and access means are unique to each network type.

ADI Inst #	DataType	Name	Get/Set	Process Data Exchange
101	CHAR	Company	01 (Get access)	
102	CHAR	UPS Model	01 (Get access)	
103	CHAR	FW Ver.	01 (Get access)	
104	CHAR	Rating	01 (Get access)	
105	UINT 8	Load Level(%)	09(Get access) (Write Process Data)	BYTE0
106	UINT 8	Batt. Level(%)	09(Get access) (Write Process Data)	BYTE1
107	UINT 16	Input Vol.(V)	09(Get access) (Write Process Data)	BYTE 2,3
108	UINT 16	Output Vol.(V)	09(Get access) (Write Process Data)	BYTE 4,5
109	UINT 8	Input Freq(Hz)	09(Get access) (Write Process Data)	BYTE6
110	UINT 8	Output Freq(Hz)	09(Get access) (Write Process Data)	BYTE7
111	UINT 8	UPS Status-1	09(Get access) (Write Process Data)	BYTE8
112	UINT 8	UPS Status-2	09(Get access) (Write Process Data)	BYTE9
113	UINT 8	Model Num.	09(Get access) (Write Process Data)	BYTE10
114	UINT 8	PRE-SD min Time	09(Get access) (Write Process Data)	BYTE11
115	UINT 8	PRE-SD sec Time	09(Get access) (Write Process Data)	BYTE12
116	UINT 16	PRE-On min Time	09(Get access) (Write Process Data)	BYTE 13,14
117	UINT 8	UPS FW Ver.	09(Get access) (Write Process Data)	BYTE15
118	UINT 8	Command	11H(Get access) (Read Process Data)	

UINT: Unassigned **INT**eger)

Table 11. Variables Exchange On The Network

6.2 Process Data Exchange

The following lists the instances that are to mapped to process data exchange.

Input (16 Bytes):
BYTE0   Load Level(%)
> Example: Byte0=60 the load level is 60%

BYTE1   Battery Level(%)
> Example: Byte1=60 the battery level is 60%

BYTE2,3 Input voltage
> Example: Byte2,3 =120 the input voltage is 120V

BYTE4,5 Output voltage
> Example: Byte4,5=120 the output voltage is 120V

BYTE6   Input frequency
> Example: Byte6=60 the input frequency is 60Hz

BYTE7   Output frequency
> Example: Byte7=60 the output frequency is 60Hz

BYTE8   bit 0 XX
> bit 1 BAT STATUS(1 = BAD, 0 = NORMAL)
> bit 2 TEST MODE (1 = TEST, 0, NORMAL)
> bit 3 Buzzer silence on/off (1=SILENCE)
>> Buzzer silence off = Alarm Enabled
>> Buzzer silence on = Alarm Disabled
> bit 4 PRE-SD COUNT MODE (1 = ACTIVE)
> bit 5 SCHEDULE COUNT MODE (1 = ACTIVE)
> bit 6 DISBLE NO LOAD SHUTDOWN (1 = ACTIVE)
> bit 7 XX

BYTE9   bit 0 is line fail (1 = INV, 0 = LINE)
> bit 1 is low battery (1 = BAT LOW, 0 = NORMAL)
> bit 2 XX
> bit 3 AVR (1 = AVR, 0 = NO AVR)
> bit 4 AVR MODE (1 = BOOST, 0 = BUCK)
> bit 5 LOAD STATUS(1 = OVER LOAD, 0 = NORMAL)
> bit 6 XX
> bit 7 SD MODE DISPLAY

BYTE10   UPS model number
> 32H =500VA 120V
> 39H =500VA 230V
> 52H =850VA 120V
> 59H =850VA 230V

BYTE11   UPS PRE-SD COUNT TIME MIN
BYTE12   UPS PRE-SD COUNT TIME SEC
BYTE13,14   UPS PRE-ON COUNT TIME
BYTE15   UPS FIRMWARE Ver
Output (8 Bytes):
The command Instance is mapped to output message structure is the same as outlined in the command instance chapter.

6.3 Web Server

SDU device has a web server that can be accessed via most browsers that can be used to both monitor and configure the UPS.

>Instructions:
>To use the web server, enter the IP address in your URL bar.

Figure 14. Web Server Window Example

7.0 Operating and Storage Temperature

Storage Conditions

Store the COMM CARD covered and upright in a cool, dry location.

The COMM CARDs can be operated and stored at -40 to +70 °C (-40 to +158 °F).

Humidity is 5-95 % non-condensing

8.0 Warranty

Warranty Information

Please see "Terms and Conditions of Sale".

Visit the Technical Support section of our Web site at: www.solahd.com

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SolaHD is our premium line of power conversion and power quality solutions products under Appleton Group, a business unit of Emerson.

Emerson brings integrated manufacturing solutions to diverse industries worldwide. Our comprehensive product line, extensive experience, world-class engineering and global presence enable us to implement solutions that give our customers the competitive edge.

For over 150 years, our electrical product brands have been providing a rich tradition of long-term, practical, high quality solutions with applications ranging from the construction and safe operation of petrochemical and process plants to providing quality power that precisely controls automotive robotic production.

Engineers, distributors, contractors, electricians and site maintenance professionals around the world trust Emerson brands to make electrical installations safer, more productive and more reliable.

Appleton Group is organized into three focused businesses that provide distributors and end-users expert knowledge and excellent service.

Electrical Construction Materials

This group is made up of the Appleton and O-Z/Gedney brands. They manufacture a broad range of electrical products including conduit and cable fittings, plugs and receptacles, enclosures and controls, conduit bodies and industrial and hazardous lighting. Whether the application is hazardous location, industrial or commercial, the electrical construction materials group has the products to meet your needs.

Power Quality Solutions

The SolaHD brand offers the broadest power quality line, including uninterruptible power supplies, power conditioners, voltage regulators, shielded transformers, surge protection devices and power supplies.

Heating Cable Systems

This group is made up of the EasyHeat and Nelson brands. They offer a broad range of electrical heating cable products for residential, commercial and industrial applications.

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China
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