寶虹電子 PCEC
Power-Con Electronics Corporation

NON ITAR

afaq EN/AS/JISQ 9100 Aéronautique AFNOR CERTIFICATION

Programmable PSPDU **MSM-1K0-28-LB**

1KW Single-Phase AC-DC Programmable Power Supply Power Distribution Unit (PSPDU)

Main Features:

- Input Voltage: Single-phase 220 Vrms ; 50/60 Hz
- Output Voltage: 28VDC
  -Split by 7 Rails of eFuse Programmable Switch On/Off Control and Current Limit
- Power Factor > 0.95
- Environmental: Meet MIL-STD-810H
  EMC: Design to meet MIL-STD-461G with shielded cable
- LAN Control
- Cooling: Conduction by Baseplate
- Environmental & Regulatory Compliance: REACH, RoHS and EC

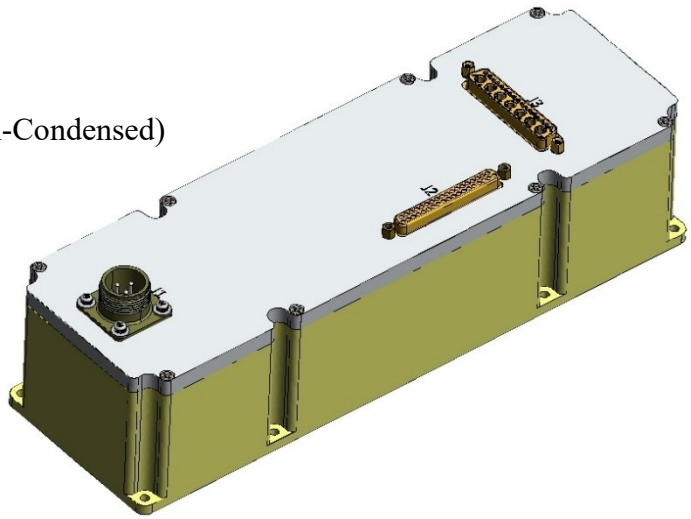
Typical Applications:

- De-Icing System
- Radar System

Main Specification:

- Input Voltage: Single-phase 220 Vrms; 50/60 Hz
- Output Voltage: Per Standard Configuration Table
- Operating Ambient Temperature： -40℃ ~ +55℃
- Operating Base Plate Temperature：+85℃
- Size (L x W x H)：300 x 94.5 x 71 mm
- Operating Relative Humidity：5%~95% (non-Condensed)
- I/O Connector：Use Zinc-Nickel Plating

Reference Photo:



Power-Con Electronics Corp.
Web: www.power-con.com.tw
No. 52, Ln. 334, Sec. 3, Minquan Rd., Zhongli Dist., Taoyuan City 320, Taiwan (R.O.C.)
Tel: +886-3-427-5854
Fax: +886-3-427-5898

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Programmable PSPDU MSM-1K0-28-LB

General specification	
AC Input	
Input Voltage Range	Single-phase 220 ± 10% Vrms (Line-Line); 50/60 Hz
Efficiency	90%, Typical
DC Output	
Output Voltage / Current	See Standard Configuration table below
Line / Load & Temperature Regulation	< ± 2%
Output Voltage (J3)	Refer to Standard Configuration
Current Limit on S1~S7	Programmable; Max 120% of rated current, latch or auto-restart
OVP	Over-Voltage on each output, latch mode
OTP	Shutdown if baseplate temperature exceeds +100°C ± 10 °C; Automatic recovery upon baseplate cooldown to below +80 °C ± 10 °C
Isolation	
Input to Output	1500 V_{DC}
Input to Case	1500 V_{DC}
Output to Case	500 V_{DC}
Interface	
LAN Control & Maintenance Signal	100Base-TX Ethernet RS232 for Maintenance NTC Thermistors (NTCALUGE2C90169)
Environmental	
Operating Temperature	–40°C to +55°C (ambient)
Shock & Vibration	per MIL-STD-810H
EMI-RFI	per MIL-STD-461G
Mechanical	
Size (L x W x H)	300 x 94.5 x 71 mm (I/O Connector not included)
Weight	2 Kg
Cooling	Base plate
Input / Output Connector	Use Zinc-Nickel Plating

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Programmable PSPDU MSM-1K0-28-LB

Output #	Input Voltage (Vrms)	Output Voltage (Vdc)	Output Current (A)	Power (W) (Max)	R&N (mVp-p)
J3	J1 220	28	35.7	1000	280
J2 (LAN)		Programmable LAN Control			

I/O Connector Pin Assignment

Designate	Pin No.	Pin Function	Connector Type
J1	A	L	MS3102A14S-1P or EQUIV.
	B	N	
	C	GND	
J2	1~37 (*)	LAN, Thermistor, Maintenance	M24308/23-4F or EQUIV.
J3	A1	+ 28V (S2)	DDMM24W7S or EQUIV.
	A2	+ 28V (S2 RTN)	
	A3	+ 28V (S3)	
	A4	+ 28V (S3 RTN)	
	A5, A6	+ 28V (S4)	
	A7	+ 28V (S4 RTN)	
	1	+ 28V (S1)	
	2	+ 28V (S1 RTN)	
	3	+ 28V (S5)	
	4	+ 28V (S5 RTN)	
	5	+ 28V (S6)	
	6	+ 28V (S6 RTN)	
	7	+ 28V (S7)	
	8	+ 28V (S7 RTN)	
	9 ~17	N.C	

(*) J2 - P/N: M24308/23-4F or EQUIV.

The following J2 PIN assignment

- 1-8: LAN (to LAN switch)
- 10-16: JTAG (MCU Firmware)
- 19-22: RS232 (maintenance)
- 24-27: I/O RS422 (SPARE)
- 30-37: 4 Thermistors (Temp sensors)

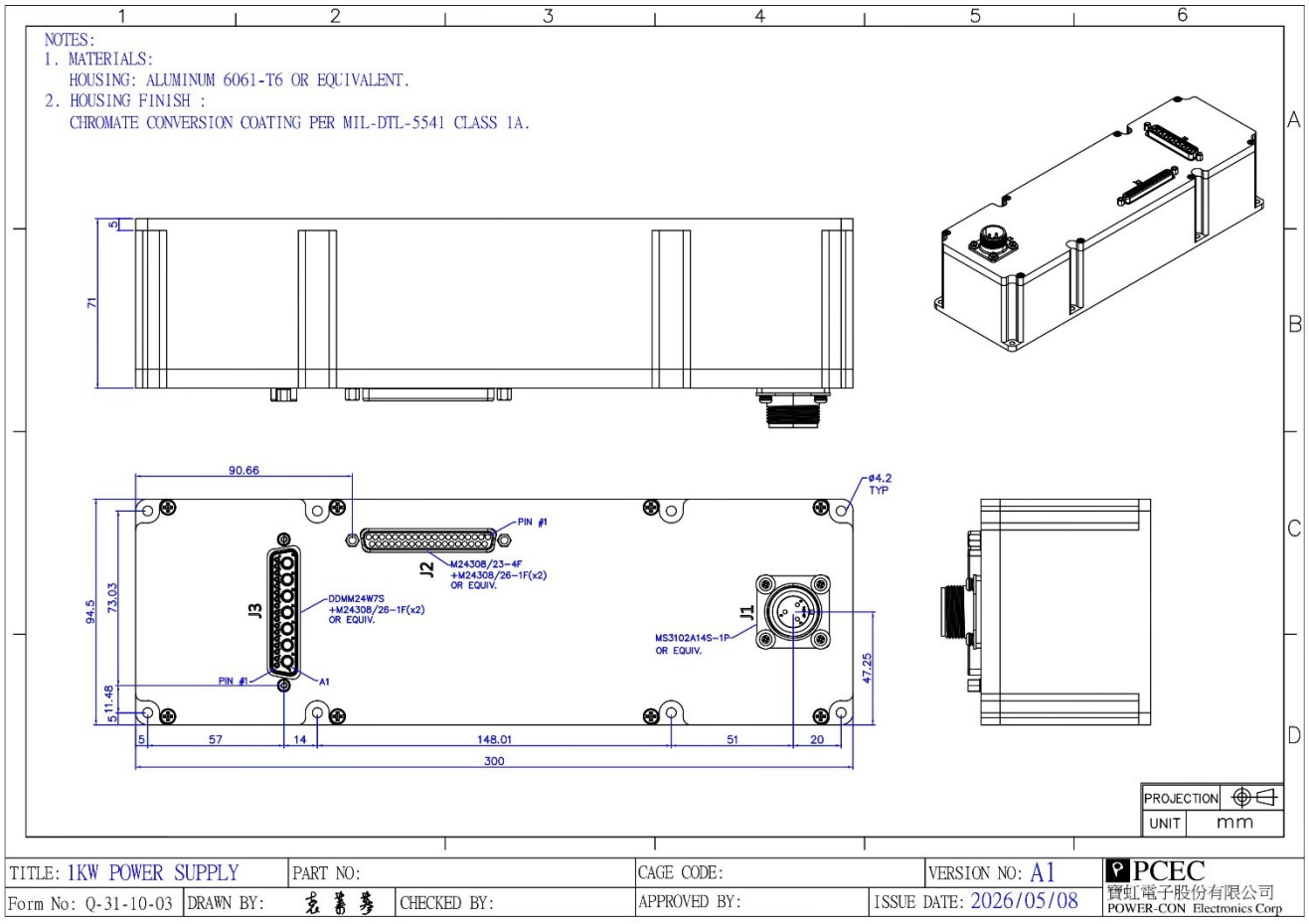
Signal Name	Pin. Num	Signal Type
BI_DA+	1	LAN
BI_DA-	2	LAN
BI_DB+	3	LAN
BI_DC+	4	LAN
BI_DC-	5	LAN
BI_DB-	6	LAN
BD_DD+	7	LAN
BI_DD-	8	LAN
	9	
+3.3V_RTN	10	GND
JTAG_TDO	11	TTL
JTAG_TMS	12	TTL
JTAG_TCK	13	TTL
JTAG_TDI	14	TTL
+3.3V_CON	15	Voltage
NC	16	NC
	17	
GND	18	
RS232 TX	19	
RS232 RX	20	

Signal Name	Pin. Num	Signal Type
GND	21	
DEBAG_ENABLE	22	
	23	
I/O 1 H	24	RS422 TX (+)
I/O 1 L	25	RS422 TX (-)
I/O 2 H	26	RS422 RX (+)
I/O 2 L	27	RS422 RX (-)
GND	28	
	29	
Thermistor 1	30	IN
Thermistor 1	31	IN
Thermistor 2	32	IN
Thermistor 2	33	IN
Thermistor 3	34	IN
Thermistor 3	35	IN
Thermistor 4	36	IN
Thermistor 4	37	IN

Thermal Control

The PSPDU shall enable Power switch ON /OFF according to external temperature sensors.
The PSPDU shall measure MDRP temperature using Thermistor #1 and shall **Switch ON** MDRP FAN when measured temperature is above 15°C and shall **switch OFF** MDRP FAN when measured temperature is below 13°C.
The PSPDU shall measure Chassis temperature using Thermistor #2 and shall **Switch ON** SYS FAN when measured temperature is above 20°C and shall **switch OFF** SYS FAN when measured temperature is below 15°C.
In Case of malfunction in Thermistor or abnormal reading – relevant switch shall be **switch ON**.

Mechanical Outline



Environmental

	Location	Indoor Uncontrolled	
1	High & Low Temp --- 5.1 Requirements	Report:	Operating: -32°C ~ +38°C Storage: -46°C ~ +58°C
		Remarks:	10 cycles 1,5,6,10cycles Hi and Low Temp. Keep 3hr，Other cycles 2hr Total 48Hr 3°C/min
2	Humidity --- Spec M-MMR	Report:	90%
		Remarks:	10 cycles 1cycles 24hr Total 240 hours
3	Altitude --- Spec M-MMR	Report:	10Kft/16.4Kft
		Remarks:	STEP1:3000M (10Kft，-4.81 °C) Keep 1HR STEP2: 5000M (16.4Kft，-17.49 °C) Keep 1HR---END
4	Shock	Report:	20g 11ms
		Remarks:	Total 18 shocks
5	Vibration	Report:	0.03 g2/Hz, 5-500 Hz, 1hr per axis
		Remarks:	
6	Air Transportation (C17, A400) --- C17 requirement 5.1	Report:	5g in all directions MIL-STD-810H 513.8 Proc. I. STRUCTURAL TEST Non-Operating 3-axis 6-direction each direction two minutes after the centrifuge rpm has stabilized. Acceleration: Up/down: 5g; Lateral: 5g; Forward: 5g
		Remarks:	
7	Rail Transportation --- 5.1 requirement: https://www.vrtranspoint.fi/fi/vr-transpoint/asiakkaan-opas/kalusto/rautatiekalusto	Report:	
		Remarks:	
8	Road Transportation --- Qualitative requirement 5.1	Report:	
		Remarks:	
9	Sea Transportation --- Qualitative requirement 5.1	Report:	
		Remarks:	

#	Test	Description	Limits & Comments
1	CE102	Conducted Emission Power leads 10KHz – 10MHz	Figure CE102-1: Basic Curve
2	CS101	Conducted Susceptibility, Power leads 30Hz - 150KHz	Figure CS101-1 Curve#2
3	CS114	Conducted Susceptibility, Bulk cable Injection 10KHz to 200MHz	Figure CS114-1 10KHz – 2MHz @ Curve#3 2MHz – 200MHz @ Curvue#4
4	CS115	Conducted Susceptibility, Bulk cable Injection, Impulse Excitation	Figure CS115-1, Imax=5A
5	CS116	Conducted Susceptibility, Damped Sinusoidal Transients, Cables & Power Leads 10KHz to 100MHz.	Figure CS116-2, Imax=10A
6	CS118	Conducted Susceptibility, Personnel Borne Electrostatic Discharge	FIGURE CS118-1: ESD level 4: Air discharge 15kV & contact discharge 8kV
7	RE102	Radiated Emissions, Electric Field 2MHz – 18GHz	Figure RE102-4 for Ground applications Navy mobile & Army
8	RS103	Radiated Susceptibility, Electric Field 2MHz - 18GHz.	2MHz – 18GHz: 50V/m

PDU Communication Interface

1.1. Description

- The PDU shall support remote control and monitoring via Ethernet using a UDP based protocol.
- The PDU shall use defined messages which each is identified by an operation code (OpCode), and transmit the commands over specific UDP ports.
- 'Alert' messages are sent over the 'Alert IP Address' as set on SET_MULTI_IP Message (OP-Code 0x9E). Alert shall be triggered when ERROR_STAT is not 0x00 (in status message OP-Code 0x75) and is sent one time.
- 'Keepalive' and 'Normal Response' messages are sent over the 'Response IP Address' as set on SET_MULTI_IP Message (OP-Code 0x9E).

1.2. Network Requirements

Network Protocols

The PDU shall support the following UDP protocols:

1. Unicast
2. Multicast

Network Configuration

The PDU shall use the following network configuration:

1. Interface: 100Base-TX Ethernet
2. Network Protocol: UDP
3. IP Modes: Static or Dynamic (DHCP)

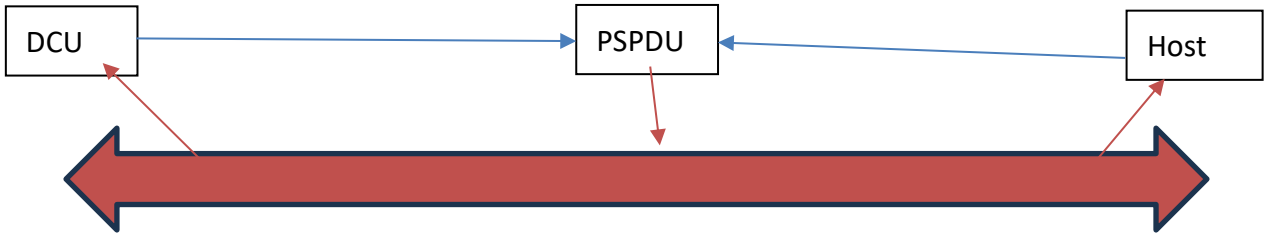
Data Alignment

Header and Body are aligned to 1 Byte

Byte Ordering

Header and Body are in a Big-Endian Byte ordering

Data flow



Blue – Unicast

Red – Multicast

1.3. Defaults

Default Network Settings

- IP Address: 192.168.0.51
- Default Gateway: 192.168.0.254
- Subnet: 255.255.0.0
- IP Mode: Static
- Response IP Address: 239.255.10.10
- Alert IP Address: same as 'Response IP Address'
- Auto Negotiation

Output Settings

See 'Default After Reset' column in Output Switch Connection

Current Thresholds

TBD

Conditions for Sending Alert

TBD

1.4. Message Structure

Header

Name	Description	Type
OpCode	Message ID	UINT8
Length	Total Message Length in bytes (Header + Body)	UINT16

Body

Name	Description	Type
Message Specific Fields	Message Specific Data	UINT8 []

1.5. PDU Commands

Commands List Summary

#	Message	OpCode	Incoming / Outgoing message	Description	When Is Sent?	Sent over UDP port
1	Get status	0x74	Incoming	Requests complete PDU status	According to sender timeline	5000
2	Status	0x75	Outgoing	Full status of PDU	Response to 'get status' command	5010
					Alert	5020
3	Get PDU info	0x76	Incoming	Requests PDU's P/N, S/N, FW version, SW version	According to sender timeline	5000
4	PDU info	0x77	Outgoing	PDU P/N, S/N, FW version, SW version	Response to 'get pdu info' command	5010

#	Message	OpCode	Incoming / Outgoing message	Description	When Is Sent?	Sent over UDP port
5	Set output	0x80	Incoming	Control of switch or group output	According to sender timeline	5000
6	Set output ack	0x81	Outgoing	Ack	Response to 'set output' command	5010
7	Set limit	0x90	Incoming	Set current threshold level	According to sender timeline	5000
8	Set limit ack	0x91	Outgoing	Ack	Response to 'set limit' command	5010
9	Set POR	0x94	Incoming	Set POR values	According to sender timeline	5000
10	Set POR ack	0x95	Outgoing	Ack	Response to 'set por' command	5010
11	Set IP configuration	0x98	Incoming	Set network configuration parameters	According to sender timeline	5000
12	Set IP configuration ack	0x99	Outgoing	Ack	Response to 'set IP configuration' command	5010
13	Get PDU config	0x9A	Incoming	Requests full configuration data from PDU	According to sender timeline	5000

#	Message	OpCode	Incoming / Outgoing message	Description	When Is Sent?	Sent over UDP port
14	PDU config	0x9B	Outgoing	Full configuration data of PDU	Response to 'get pdu config' command	5010
15	Set Response IP	0x9E	Incoming	Set response and alert IP addresses and ports	According to sender timeline	5000
16	Set Response IP ack	0x9F	Outgoing	Ack	Response to 'set Response IP' command	5010
17	Keepalive	0x5A	Outgoing	PDU status report	Sent periodically every 1 second	5010

Commands Details

PDU STATUS

GET_STATUS Message (0x74)

Field	Description	Value	Type	Resolution
OpCode	Message OpCode	0x74	UINT8	1
Length	Total Message Length in bytes (including op-code)	3	UINT16	1

GET_STATUS Response (0x75)

Field	Description	Value	Type	Resolution
OpCode	Message OpCode	0x75	UINT8	1
Length	Total Message Length in bytes (including op-code)	120	UINT16	1

<table>
<tr><th>Field</th><th>Description</th><th>Value</th><th>Type</th><th>Resolution</th></tr>
<tr><td>SW_STATE</td><td>Bitmask reading for each physical state of the switches. If output does not exist then value should be disconnected</td><td>0: switch disconnected
1: switch connected
<table><tr><th>Bit #</th><th>Switch #</th></tr><tr><td>0 (MSB)</td><td>16</td></tr><tr><td>1</td><td>15</td></tr><tr><td>2</td><td>14</td></tr><tr><td>3</td><td>13</td></tr><tr><td>4</td><td>12</td></tr><tr><td>5</td><td>11</td></tr><tr><td>6</td><td>10</td></tr><tr><td>7</td><td>9</td></tr><tr><td>8</td><td>8</td></tr><tr><td>9</td><td>7</td></tr><tr><td>10</td><td>6</td></tr><tr><td>11</td><td>5</td></tr><tr><td>12</td><td>4</td></tr><tr><td>13</td><td>3</td></tr><tr><td>14</td><td>2</td></tr><tr><td>15</td><td>1</td></tr></table></td><td>UINT16</td><td>1</td></tr>
<tr><td>SW_CMD</td><td>Bitmask reading for last command or automatic setting for each of the switches. If output does not exist then value should be off</td><td>0: switch off
1: switch on
<table><tr><th>Bit #</th><th>Switch #</th></tr><tr><td>0 (MSB)</td><td>16</td></tr><tr><td>1</td><td>15</td></tr><tr><td>2</td><td>14</td></tr><tr><td>3</td><td>13</td></tr><tr><td>4</td><td>12</td></tr><tr><td>5</td><td>11</td></tr><tr><td>6</td><td>10</td></tr><tr><td>7</td><td>9</td></tr><tr><td>8</td><td>8</td></tr><tr><td>9</td><td>7</td></tr><tr><td>10</td><td>6</td></tr><tr><td>11</td><td>5</td></tr><tr><td>12</td><td>4</td></tr></table></td><td>UINT16</td><td>1</td></tr>
</table>

<table>
<tr><th>Field</th><th>Description</th><th>Value</th><th>Type</th><th>Resolution</th></tr>
<tr><td></td><td></td><td><table><tr><td>13</td><td>3</td></tr><tr><td>14</td><td>2</td></tr><tr><td>15</td><td>1</td></tr></table></td><td></td><td></td></tr>
<tr><td>TRIP_STAT</td><td>Trip status for each of the outputs.
If output does not exist then value should be 'no error'</td><td>0: no error
1: trip due to overload
2: trip due to short-circuit<table><tr><th>Byte #</th><th>Output #</th></tr><tr><td>0</td><td>1</td></tr><tr><td>1</td><td>2</td></tr><tr><td>2</td><td>3</td></tr><tr><td>3</td><td>4</td></tr><tr><td>4</td><td>5</td></tr><tr><td>5</td><td>6</td></tr><tr><td>6</td><td>7</td></tr><tr><td>7</td><td>8</td></tr><tr><td>8</td><td>9</td></tr><tr><td>9</td><td>10</td></tr><tr><td>10</td><td>11</td></tr><tr><td>11</td><td>12</td></tr><tr><td>12</td><td>13</td></tr><tr><td>13</td><td>14</td></tr><tr><td>14</td><td>15</td></tr><tr><td>15</td><td>16</td></tr></table></td><td>UINT8 [16]</td><td>1</td></tr>
<tr><td>Reserved</td><td>Reserved</td><td>0</td><td>UINT16</td><td>1</td></tr>
<tr><td>BIT</td><td>BIT status for each output.
BIT is engaged when a PDU self-error is occurred such as: switch is off while the output voltage is high.
If output does not exist then value should be 'normal status'</td><td>0: normal status
1: BIT error<table><tr><th>Bit #</th><th>Output #</th></tr><tr><td>0 (MSB)</td><td>16</td></tr><tr><td>1</td><td>15</td></tr><tr><td>2</td><td>14</td></tr><tr><td>3</td><td>13</td></tr><tr><td>4</td><td>12</td></tr><tr><td>5</td><td>11</td></tr><tr><td>6</td><td>10</td></tr><tr><td>7</td><td>9</td></tr></table></td><td>UINT16</td><td>1</td></tr>
</table>

<table>
<tr><th>Field</th><th>Description</th><th>Value</th><th>Type</th><th>Resolution</th></tr>
<tr><td></td><td></td><td>
<table>
<tr><td>8</td><td>8</td></tr>
<tr><td>9</td><td>7</td></tr>
<tr><td>10</td><td>6</td></tr>
<tr><td>11</td><td>5</td></tr>
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<tr><td>13</td><td>3</td></tr>
<tr><td>14</td><td>2</td></tr>
<tr><td>15</td><td>1</td></tr>
</table>
</td><td></td><td></td></tr>
<tr><td>OUT_VOLT</td><td>Output voltage reading for each channel.
If output does not exist then value should be -2048.
Voltage Range: 0-100 Volt</td><td>
<table>
<tr><th>Byte #</th><th>Output #</th></tr>
<tr><td>0, 1</td><td>1</td></tr>
<tr><td>2, 3</td><td>2</td></tr>
<tr><td>4, 5</td><td>3</td></tr>
<tr><td>6, 7</td><td>4</td></tr>
<tr><td>8, 9</td><td>5</td></tr>
<tr><td>10, 11</td><td>6</td></tr>
<tr><td>12, 13</td><td>7</td></tr>
<tr><td>14, 15</td><td>8</td></tr>
<tr><td>16, 17</td><td>9</td></tr>
<tr><td>18, 19</td><td>10</td></tr>
<tr><td>20, 21</td><td>11</td></tr>
<tr><td>22, 23</td><td>12</td></tr>
<tr><td>24, 25</td><td>13</td></tr>
<tr><td>26, 27</td><td>14</td></tr>
<tr><td>28, 29</td><td>15</td></tr>
<tr><td>30, 31</td><td>16</td></tr>
</table>
</td><td>INT16 [16]</td><td>0.0625
Volt</td></tr>
<tr><td>OUT_CURR</td><td>Current reading for each output.
If output does not exist then value should be -2048.
Current Range: 0-50 Ampere</td><td>
<table>
<tr><th>Byte #</th><th>Output #</th></tr>
<tr><td>0, 1</td><td>1</td></tr>
<tr><td>2, 3</td><td>2</td></tr>
<tr><td>4, 5</td><td>3</td></tr>
<tr><td>6, 7</td><td>4</td></tr>
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<tr><td>14, 15</td><td>8</td></tr>
<tr><td>16, 17</td><td>9</td></tr>
</table>
</td><td>INT16 [16]</td><td>0.0625
Ampere</td></tr>
</table>

Field	Description	Value	Type	Resolution
		18, 19 → 10 20, 21 → 11 22, 23 → 12 24, 25 → 13 26, 27 → 14 28, 29 → 15 30, 31 → 16		
RESERVED	Reserved	0	UINT8 [8]	1
INPUT_VOLT	Input voltage reading [0, 300] Volt	**Int #** / **Phase #** 0 → L1 1 → L2 2 → L3	INT16[3]	0.0625 Volt
INPUT_CURR	Input current reading [0, 16] Ampere	**Int #** / **Phase #** 0 → L1 1 → L2 2 → L3	INT16[3]	0.0625 Ampere
Thermistors	Temperature (**two's complement value**) [-60, 100] deg.	**Int #** / **Thermistor #** 0 → 1 1 → 2 2 → 3 3 → 4	INT16[4]	0.0625 °C
ERROR_STAT	Error status for entire device (and LED status if applicable). A combination of errors can occur by summing the values.	0x00: Normal 0x01: Trip fault 0x02: BIT Error 0x04: Temperature warning when baseplate reaches **TBD** 0x08: Failed to save to EEPROM 0x10: **TBD** 0x20: **TBD** 0x40: **TBD** 0x80: **TBD**	UINT8	1

PDU INFO

GET_PDU_INFO Message (0x76)

Field	Description	Value	Type	Resolution
OpCode	Message OpCode	0x76	UINT8	1
Length	Total Message Length in bytes (including op-code)	3	UINT16	1

GET_PDU_INFO Response (0x77)

Field	Description	Value	Type	Resolution
OpCode	Message OpCode	0x77	UINT8	1
Length	Total Message Length in bytes (including op-code)	59	UINT16	1
P/N	Part Number. ASCII format	"XXXXXXXXXXXXXXXX"	CHAR [16]	N/A
S/N	Serial Number decimal ASCII format	“XXXXXXX”	CHAR [8]	N/A
SW version	MCU version number. YYYY – Year MM – Month DD – Day MMM – Major version mmm – Minor version bbb - Build	YYYYMMDD_MMM.mmm.bbb	CHAR [32]	N/A

Set outputs

SET_OUTPUT Message (0x80)

Field	Description	Value	Type	Resolution
OpCode	Message OpCode	0x80	UINT8	1

Field	Description	Value	Type	Resolution
Length	Total Message Length in bytes (including op-code)	5	UINT16	1
OUTPUT	specific output to set on or off	1-16: outputs 1 to 16	UINT8	1
VALUE	Actual required command for selected output	Possible values: 0: Output off 1: Output on	UINT8	1

SET_OUTPUT Response (0x81)

Field	Description	Value	Type	Resolution
OpCode	Message OpCode	0x81	UINT8	1
Length	Total Message Length in bytes (including op-code)	4	UINT16	1
Ack/Nack	Indication whether command succeeded or not	0: Acknowledged 1: Not acknowledged	UINT8	1

Set PDU Outputs Limits

SET_LIMIT Message (0x90)

Field	Description	Value	Type	Resolution
Op-Code	Message op-code	0x90	UINT8	1
Length	Total message length in bytes (including Op-Code)	10	UINT16	1
OUTPUT	Details which specific channels to be affected.	1-16: outputs 1 to 16	UINT8	1
OVERLOAD	Overload current limit setting for selected output. Actual resolution is ~0.5A.	[0, 60] Ampere	INT16	0.0625 Ampere

Field	Description	Value	Type	Resolution
CURR_LIMIT	Short-circuit current limit setting for selected output. Actual resolution is ~0.5A.	[0, 60] Ampere	INT16	0.0625 Ampere
THRM_CONST	Thermal constant for overload fault. Value is the fault time for twice the overload current. If it expires then the output is set to off automatically	[300, 5000] msec	INT16	1 msec

SET_LIMIT Response (0x91)

Field	Description	Value	Type	Resolution
OpCode	Message OpCode	0x91	UINT8	1
Length	Total Message Length in bytes (including op-code)	4	UINT16	1
Ack/Nack	Field	• **0**: Acknowledged • **1**: Illegal value in one or more of the fields • **2**: EEPROM write protected (data will be lost after reset). If failed to save 2 consecutive times then the matching bit in ERROR_STAT of 'GET_STATUS Response' message should be raised	UINT8	1

Set POR

- Default output channels startup sequence of the PSPDU after reset or power up
- 8 groups shall be supported
- Each group is controlled by a bitmap (for enabling or disabling a switch) and a delay between the switches in the group

SET_POR Message (0x94)

<table>
<tr><th>Field</th><th>Description</th><th>Value</th><th>Type</th><th>Resolution</th></tr>
<tr><td>Op-Code</td><td>Message op-code</td><td>0x94</td><td>UINT8</td><td>1</td></tr>
<tr><td>Length</td><td>Total message length in bytes (including Op-Code)</td><td>27</td><td>UINT16</td><td>1</td></tr>
<tr><td>Output Group for Switches On (GROUP_ON)</td><td>Bitmap of groups (of switches) order to enable. If switch is present twice then first appearance will govern.
If switch does not exist then value should be 0</td><td>0: leave current state
1: switch on
<table><tr><th>Bit #</th><th>Switch #</th></tr><tr><td>0</td><td>1</td></tr><tr><td>1</td><td>2</td></tr><tr><td>2</td><td>3</td></tr><tr><td>3</td><td>4</td></tr><tr><td>4</td><td>5</td></tr><tr><td>5</td><td>6</td></tr><tr><td>6</td><td>7</td></tr><tr><td>7</td><td>8</td></tr></table></td><td>UINT8 [8]</td><td>1</td></tr>
<tr><td>Output Group Delay (GROUP_DELAY)</td><td>Delay in milliseconds before each group is enabled. GROUP_DELAY [i] is the delay before GROUP_ON[i] is enabled.
If group does not exist then</td><td>0-5000: time</td><td>UINT16 [8]</td><td>1 msec</td></tr>
</table>

Field	Description	Value	Type	Resolution
	value should be 0			

SET_POR Response (0x95)

Field	Description	Value	Type	Resolution
OpCode	Message OpCode	0x95	UINT8	1
Length	Total Message Length in bytes (including op-code)	4	UINT16	1
Ack/Nack	Field	• **0**: Acknowledged • **1**: Illegal value in one or more of the fields • **2**: EEPROM write protected (data will be lost after reset). If failed to save 2 consecutive times then the matching bit in ERROR_STAT of 'GET_STATUS Response' message should be raised	UINT8	1

Example

What we want		How we set it up	
Group #	Switches In Group	Output Group for Switches On (GROUP_ON)	Output Group Delay (GROUP_DELAY)
1	1, 3, 6	**Bit #** / **Switch #** / **Value For Switch** 0 / 1 / 1 1 / 2 / 0	100

<table>
<tr><th colspan="2">What we want</th><th colspan="2">How we set it up</th></tr>
<tr><th>Group #</th><th>Switches In Group</th><th>Output Group for Switches On (GROUP_ON)</th><th>Output Group Delay (GROUP_DELAY)</th></tr>
<tr><td></td><td></td><td>
<table>
<tr><td>2</td><td>3</td><td>1</td></tr>
<tr><td>3</td><td>4</td><td>0</td></tr>
<tr><td>4</td><td>5</td><td>0</td></tr>
<tr><td>5</td><td>6</td><td>1</td></tr>
<tr><td>6</td><td>7</td><td>0</td></tr>
<tr><td>7</td><td>8</td><td>0</td></tr>
</table>
</td><td></td></tr>
<tr><td>2</td><td>2,4,7</td><td>
<table>
<tr><th>Bit #</th><th>Switch #</th><th>Value For Switch</th></tr>
<tr><td>0</td><td>1</td><td>0</td></tr>
<tr><td>1</td><td>2</td><td>1</td></tr>
<tr><td>2</td><td>3</td><td>0</td></tr>
<tr><td>3</td><td>4</td><td>1</td></tr>
<tr><td>4</td><td>5</td><td>0</td></tr>
<tr><td>5</td><td>6</td><td>0</td></tr>
<tr><td>6</td><td>7</td><td>1</td></tr>
<tr><td>7</td><td>8</td><td>0</td></tr>
</table>
</td><td>1000</td></tr>
</table>

Set Network Settings

SET_IP_CONFIG Message (0x98)

Field	Description	Value	Type	Resolution
Op-Code	Message op-code	0x98	UINT8	1
Length	Total message length in bytes (including Op-Code)	20	UINT16	1
MODE	Selection of static or dynamic IP	0: Dynamic IP 1: Static IP	UINT8	1
IP	*Setting of IP*	Any IP address	UINT32	1

<table>
<tr><th>Field</th><th>Description</th><th>Value</th><th>Type</th><th>Resolution</th></tr>
<tr><td></td><td>
<table>
<tr><th>Octet</th><th>Shift (bits)</th><th>Description</th></tr>
<tr><td>Octet 1 (Most Significant)</td><td>24</td><td>First octet of the IPv4 address (0-255)</td></tr>
<tr><td>Octet 2</td><td>16</td><td>Second octet of the IPv4</td></tr>
<tr><td>Octet 3</td><td>8</td><td>Third octet of the IPv4</td></tr>
<tr><td>Octet 4</td><td>0</td><td>Fourth octet of the IPv4</td></tr>
</table>
</td><td></td><td></td><td></td></tr>
<tr><td>SUBNET</td><td>Subnet Mask for IP address</td><td>Any Mask address</td><td>UINT32</td><td>1</td></tr>
<tr><td>DEFALT GATEWAY</td><td>Default gateway address</td><td>Any IP address</td><td>UINT32</td><td>1</td></tr>
<tr><td>Duplex</td><td>Network card configuration</td><td>0: As described in Default Network Settings
1: 10 Mbps Half-Duplex
2: 10 Mbps Full-Duplex
3: 100 Mbps Half-Duplex
4: 100 Mbps Full-Duplex</td><td>UINT32</td><td>1</td></tr>
</table>

SET_IP_CONFIG Response (0x99)

Field	Description	Value	Type	Resolution
OpCode	Message OpCode	0x99	UINT8	1
Length	Total Message Length in bytes (including op-code)	4	UINT16	1
Ack/Nack	Field	• **0**: Acknowledged • **1**: Illegal value in one or more of the fields • **2**: EEPROM write protected (data will be lost after reset). If failed to save 2 consecutive times then the matching bit in ERROR_STAT of 'GET_STATUS Response' message should be raised	UINT8	1

SET_RESPONSE_IP Message (0x9E)

Field	Description	Value	Type	Resolution
Op-Code	Message op-code	0x9E	UINT8	1
Length	Total message length in bytes (including Op-Code)	9	UINT16	1
Response IP	Setting of response IP	Any IP address (Can be Multicast)	UINT32	1
Response	Setting of response port	1-65535	UINT16	1

Field	Description	Value	Type	Resolution
PORT				
Alert IP	Setting of response IP	Any IP address (Can be Multicast)	UINT32	1
Alert PORT	Setting of response port	1-65535	UINT16	1

SET_RESPONSE_IP Response (0x9F)

Field	Description	Value	Type	Resolution
OpCode	Message OpCode	0x9F	UINT8	1
Length	Total Message Length in bytes (including op-code)	4	UINT16	1
Ack/Nack	Field	• **0**: Acknowledged • **1**: Illegal value in one or more of the fields • **2**: EEPROM write protected (data will be lost after reset). If failed to save 2 consecutive times then the matching bit in ERROR_STAT of 'GET_STATUS Response' message should be raised	UINT8	1

PDU Configuration

GET_CONFIG Message (0x9A)

Field	Description	Value	Type	Resolution
OpCode	Message OpCode	0x9A	UINT8	1
Length	Total Message Length in bytes (including op-code)	3	UINT16	1

GET_CONFIG Response (0x9B)

Field	Description	Value	Type	Resolution
Op-Code	Message op-code	0x9B	UINT8	1
Length	Total message length in bytes (including Op-Code)	157	UINT16	1
Ack/Nack		0: Acknowledged 1: Not acknowledged	UINT8	1
IP	IP Address	Any IP value	UINT32	1
IP Network Mask	Mask for the IP address	Any mask value	UINT32	1
IP Type	Static or Dynamic IP address	0: Dynamic IP 1: Static IP	UINT8	1
Over_Load_Limit	Maximum allowed overload for output. If output does not exist then value should be 2048	**Byte #** / **Output #** 0, 1 / 1 2, 3 / 2 4, 5 / 3 6, 7 / 4 8, 9 / 5 10, 11 / 6 12, 13 / 7 14, 15 / 8 16, 17 / 9 18, 19 / 10 20, 21 / 11 22, 23 / 12 24, 26 / 13 27, 28 / 14 29, 30 / 15 31, 21 / 16	UINT16 [16]	0.0625 Ampere
Current_Limit	Maximum allowed current for output. If output does not exist then value should be 2048	**Byte #** / **Output #** 0, 1 / 1 2, 3 / 2 4, 5 / 3 6, 7 / 4 8, 9 / 5	UINT16 [16]	0.0625 Ampere

<table>
<tr><th>Field</th><th>Description</th><th>Value</th><th>Type</th><th>Resolution</th></tr>
<tr><td></td><td></td><td><table>
<tr><td>10, 11</td><td>6</td></tr>
<tr><td>12, 13</td><td>7</td></tr>
<tr><td>14, 15</td><td>8</td></tr>
<tr><td>16, 17</td><td>9</td></tr>
<tr><td>18, 19</td><td>10</td></tr>
<tr><td>20, 21</td><td>11</td></tr>
<tr><td>22, 23</td><td>12</td></tr>
<tr><td>24, 25</td><td>13</td></tr>
<tr><td>26, 27</td><td>14</td></tr>
<tr><td>28, 29</td><td>15</td></tr>
<tr><td>30, 31</td><td>16</td></tr>
</table></td><td></td><td></td></tr>
<tr><td>THRM_CONST</td><td>Thermal const values.
If output does not exist then value should be 0</td><td><table>
<tr><th>Byte #</th><th>Output #</th></tr>
<tr><td>0, 1</td><td>1</td></tr>
<tr><td>2, 3</td><td>2</td></tr>
<tr><td>4, 5</td><td>3</td></tr>
<tr><td>6, 7</td><td>4</td></tr>
<tr><td>8, 9</td><td>5</td></tr>
<tr><td>10, 11</td><td>6</td></tr>
<tr><td>12, 13</td><td>7</td></tr>
<tr><td>14, 15</td><td>8</td></tr>
<tr><td>16, 17</td><td>9</td></tr>
<tr><td>18, 19</td><td>10</td></tr>
<tr><td>20, 21</td><td>11</td></tr>
<tr><td>22, 23</td><td>12</td></tr>
<tr><td>24, 25</td><td>13</td></tr>
<tr><td>26, 27</td><td>14</td></tr>
<tr><td>28, 29</td><td>15</td></tr>
<tr><td>30, 31</td><td>16</td></tr>
</table></td><td>UINT16 [16]</td><td>1 msec</td></tr>
<tr><td>CH_POR</td><td>Array of channels order to enable. If a channel is present twice in the array, then the first appearance will govern.
If output does not exist then value should be termination</td><td>1-13: output number
0: array termination<table>
<tr><th>Byte #</th><th>Output #</th></tr>
<tr><td>0</td><td>1</td></tr>
<tr><td>1</td><td>2</td></tr>
<tr><td>2</td><td>3</td></tr>
<tr><td>3</td><td>4</td></tr>
</table></td><td>UINT8 [16]</td><td>1</td></tr>
</table>

<table>
<tr><th>Field</th><th>Description</th><th>Value</th><th>Type</th><th>Resolution</th></tr>
<tr><td></td><td></td><td><table>
<tr><td>4</td><td>5</td></tr>
<tr><td>5</td><td>6</td></tr>
<tr><td>6</td><td>7</td></tr>
<tr><td>7</td><td>8</td></tr>
<tr><td>8</td><td>9</td></tr>
<tr><td>9</td><td>10</td></tr>
<tr><td>10</td><td>11</td></tr>
<tr><td>11</td><td>12</td></tr>
<tr><td>12</td><td>13</td></tr>
<tr><td>13</td><td>14</td></tr>
<tr><td>14</td><td>15</td></tr>
<tr><td>15</td><td>16</td></tr>
</table></td><td></td><td></td></tr>
<tr><td>Delay_POR</td><td>Delay in milliseconds before each of the corresponding switch enable.
CHAN_DELAY[i] is the delay before enable of CHAN_ON[i].
If output does not exist then value should be 0</td><td>0-5000: time<table>
<tr><th>Byte #</th><th>Output #</th></tr>
<tr><td>0, 1</td><td>1</td></tr>
<tr><td>2, 3</td><td>2</td></tr>
<tr><td>4, 5</td><td>3</td></tr>
<tr><td>6, 7</td><td>4</td></tr>
<tr><td>8, 9</td><td>5</td></tr>
<tr><td>10, 11</td><td>6</td></tr>
<tr><td>12, 13</td><td>7</td></tr>
<tr><td>14, 15</td><td>8</td></tr>
<tr><td>16, 17</td><td>9</td></tr>
<tr><td>18, 19</td><td>10</td></tr>
<tr><td>20, 21</td><td>11</td></tr>
<tr><td>22, 23</td><td>12</td></tr>
<tr><td>24, 25</td><td>13</td></tr>
<tr><td>26, 27</td><td>14</td></tr>
<tr><td>28, 29</td><td>15</td></tr>
<tr><td>30, 31</td><td>16</td></tr>
</table></td><td>UINT16 [16]</td><td>1 msec</td></tr>
</table>

Keepalive Message

Keepalive (0x5A)

Field	Description	Value	Type	Resolution
OpCode	Message OpCode	0x5A	UINT8	1
Rest of GET_STATUS Response (0x75) Message Fields **AFTER OpCode**				