MILLSWOOD engineering

900W PDU

RS232 PROTOCOL

1 Introduction

The 900W PDU has both RS232 and CANbus interfaces that perform essentially the same functions, these being:

- Configuration (of parameters stored in the PDU's non-volatile memory),
- Control (real-time control of the PDU's various features),
- Monitoring (of measured voltages, currents, temperatures, etc), and
- Updating the PDU's firmware.

Once the PDU has been configured, there is no requirement to connect anything to either communications interface – the PDU will operate quite normally with no communications at all.

The RS232 interface operates at 57600 baud, full-duplex, with 8 data bits and no parity (57600 8N1). The RS232 hardware layer is compliant with TIA/EIA-232-F and ITU V.28.

2 Software

A Windows application that provides easy access to most of the 900W PDU's various features may be downloaded from www.millswoodeng.com.au/resources.html

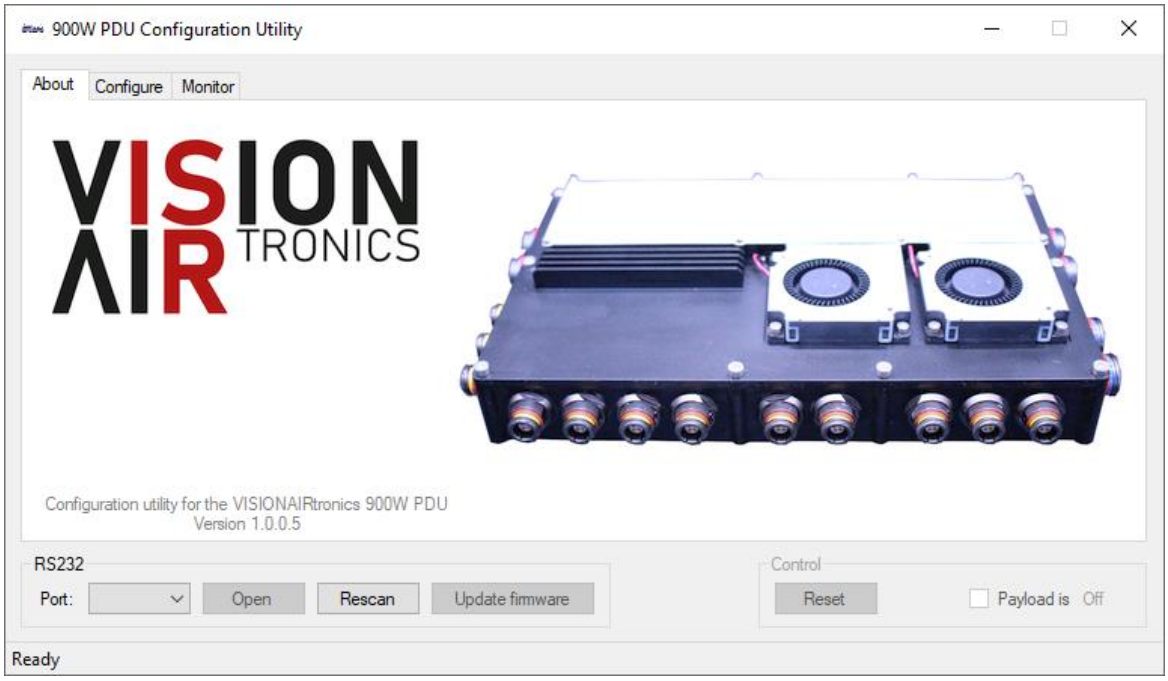

Figure 1 – 900W PDU Configuration Utility

Using the configuration utility relieves the user from the burden of writing software in order to configure and control the PDU. There is no need to read any more of this document if the configuration utility is used – the RS232 protocol is provided solely for the purpose of more tightly integrating the PDU with other hardware and software.

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3 Contents

4 Commands

The PDU supports a number of commands via its RS232 interface. The command processor is not case sensitive, but commands must be entered exactly as shown below, with the correct number of digits and no extraneous spaces. A carriage return or linefeed character is required to terminate each command. A confirmation string is issued if the command is successful.

4.1 Status commands

4.1.1 Show configuration settings

Show Displays the PDU's configuration settings and enabled features.

The first packet returned shows the stored configuration settings and is 108 bytes long (including CR & LF), and is formatted as follows:

C	o	n	f	i	g	u	r	a	t	i	o	n		s	e	t	t	i	n	g	s	:		V	a	=	1	2	.	0	V			V	s	=

0	6	.	0	V			V	p	=	1	5	.	0	V			V	b	=	4	2	.	0	V			P	p	=	0	1	.	0	S		

P	s	=	2	5	5			S	0	=	0	0	0			C	b	r	p	=	0			C	a	=	0	0	0	0	1	CR	LF

The second packet returned shows the enabled features and is 32 bytes long (including CR & LF), and is formatted as follows:

E	n	a	b	l	e	d		f	e	a	t	u	r	e	s	:		P	a	y	:	E	n	a	b	l	e	d		CR	LF

Pay = Payload output

4.2 Configuration commands

The following commands store configuration parameters in non-volatile memory:

4.2.1 Set Avionics voltage

Set Va=XX.X Where XX.X is the desired avionics output voltage in Volts.
V_A may be set to any value from 12.0 to 28.0 inclusive.

4.2.2 Set Servo voltage

Set Vs=XX.X Where XX.X is the desired servo output voltage in Volts.
V_S may be set to any value from 06.0 to 28.0 inclusive.

4.2.3 Set Payload voltage

Set Vp=XX.X Where XX.X is the desired payload output voltage in Volts.
V_P may be set to any value from 12.0 to 28.0 inclusive.

4.2.4 Set Battery voltage

Set Vb=XX.X Where XX.X is the nominal (fully charged) battery voltage in Volts.
V_B may be set to any value from 24.0 to 55.0 inclusive.

4.2.5 Set Packet period

Set Pp=XX.X Sets the packet streaming period. XX.X is the desired interval of time between successive transmissions in seconds.
P_P may be set to any value from 00.1 to 25.5 inclusive.

4.2.6 Set Packets streamed

Set Ps=XXX Sets which packets types are streamed. XXX is a decimal value ranging from 000 to 255 inclusive. Bits have the following significance:

Bit 0: Set to stream packet type 0 (voltages)
Bit 1: Set to stream packet type 1 (currents)
Bit 2: Set to stream packet type 2 (battery statuses)
Bit 3: Set to stream packet type 3 (temperatures)
Bit 4: Set to stream packet type 4 (miscellaneous data)
Bits 5 to 7: Irrelevant

4.2.7 Set Initial state

Set S0=XXX Sets the PDU's initial state. S_0 defines how the PDU's miscellaneous features are configured after power-up or reset. XXX is a decimal value ranging from 000 to 255 inclusive. Bits have the following significance:

Bit 5: Load balancing (1 = enabled)
Bit 6: Keep fans on (1 = enabled)
Bit 7: Payload shedding (1 = enabled)
Bits 0 to 4: Irrelevant

4.2.8 Set CAN Baudrate

Set Cbrp=X Sets the CAN Baudrate according to the following formula:

$$Baudrate\ (kb/s) = \frac{1000}{X+1}$$

Values for X other than 0 (1Mb/s), 1 (500kb/s), 3 (250kb/s) and 7 (125kb/s) have not been tested.

4.2.9 Set CAN address

Set Ca=XXXXX Sets the 16-bit CAN address. XXXXX may be set to any value from 00000 to 65535 inclusive. See the CAN protocol document for further information.

4.3 Control commands

The following commands perform actions (but do not store anything in non-volatile memory):

4.3.1 Payload output

Enable Pay Enables the payload output.

Disable Pay Disables the payload output.

4.3.2 Reset

Reset Restarts the PDU. The battery statuses Eba and Ebb are re-initialised to zero (see packet type 2 below).

5 Monitoring

The PDU measures and reports a number of quantities via its RS232 interface. The measured data is formatted into a human-readable plain text packets that are streamed regularly at a user-defined rate (configured by the Set P_P command). Packet streams may be turned on and off individually using the Set P_S command.

Measurements are fixed width, i.e. leading zeros are always included. Measurements are separated from each other by pairs of spaces, and packets are terminated by both carriage returns and linefeeds.

5.1 Packet type 0 – Voltage

Packet type 0 is 76 bytes (including CR & LF), and is formatted as follows:

V	a	a	=	1	2	.	0	V			V	a	b	=	1	1	.	9	V			V	s	a	=	0	5	.	9	V			V	s	b	=

0	6	.	0	V			V	p	=	2	8	.	0	V			V	b	a	=	4	1	.	7	V			V	b	b	=	4	1	.	4	V

CR	LF

Vaa = Avionics output voltage, A-side power supply
Vab = Avionics output voltage, B-side power supply
Vsa = Servo output voltage, A-side power supply
Vsb = Servo output voltage, B-side power supply
Vp = Payload output voltage
Vba = Battery A voltage
Vbb = Battery B voltage

5.2 Packet type 1 – Current

Packet type 1 is 76 bytes (including CR & LF), and is formatted as follows:

I	a	a	=	1	2	.	0	A			I	a	b	=	1	1	.	9	A			I	s	a	=	0	5	.	9	A			I	s	b	=

0	6	.	0	A			I	p	=	2	8	.	0	A			I	b	a	=	4	1	.	7	A			I	b	b	=	4	1	.	4	A

CR	LF

Iaa = Avionics output current, A-side power supply
Iab = Avionics output current, B-side power supply
Isa = Servo output current, A-side power supply
Isb = Servo output current, B-side power supply
Ip = Payload output current
Iba = Battery A current
Ibb = Battery B current

5.3 Packet type 2 – Battery status

Packet type 2 is 30 bytes (including CR & LF), and is formatted as follows:

E	b	a	=	-	0	0	0	0	0	m	A	H			E	b	b	=	-	0	0	0	0	0	m	A	H	CR	LF

Eba = Battery A energy
Ebb = Battery B energy

Eb is similar to a fuel gauge, except that it represents the change in energy stored (since power-up), rather than the total amount of energy stored. A negative value means that the battery has had a net loss in energy since power-up (i.e. it has been discharged).

5.4 Packet type 3 – Temperature

Packet type 3 is 9 bytes (including CR & LF), and is formatted as follows:

T	=	+	0	3	1	C	CR	LF

5.5 Packet type 4 – Miscellaneous

Packet type 4 is 32 bytes (including CR & LF), and is formatted as follows:

R	0	=	0	0	0			R	1	=	0	0	0			R	2	=	0	0	0			R	3	=	0	0	0	CR	LF

R0 = Flag register 0 – Bit 7: Payload shedding flag (1 = shed)
R1 = Flag register 1 – No bits defined
R2 = Flag register 2 (detailed operational status of A-side power supplies and Battery A)
R3 = Flag register 3 (detailed operational status of B-side power supplies and Battery B)

Bits in R2 and R3 have the following significance:

Bit 0: Avionics voltage flag (1 = within tolerance)
Bit 1: Servo voltage flag (1 = within tolerance)
Bit 2: Payload voltage flag (1 = within tolerance)
Bit 3: Battery voltage flag (1 = within tolerance)
Bit 4: Avionics current flag (1 = below limit)
Bit 5: Servo current flag (1 = below limit)
Bit 6: Payload current flag (1 = below limit)
Bit 7: Battery current flag (1 = below limit)

Note that payload flags in registers 2 and 3 are duplicates of each other (the payload output is not redundantly powered).
Voltage tolerance is +12.5% / -6.25% from configured value.
Current limits are as per product manual.

6 Document version history

6.1 1.0 -> 1.1

- Show command updated to describe enabled features packet.
- Set Power-up states and payload shedding added.
- Enable and disable payload commands added
- Reset command added.

6.2 1.1 -> 1.2

- This section renamed to Document version history.
- Document reformatted to suit printing and binding.
- Packet type 4 – Miscellaneous changed to include more useful information and also allow for better PMU family compatibility.

6.3 1.2 -> 1.3

- Power-up states removed.
- Packet type 4 – Miscellaneous changed.
- Servo voltage range updated.
- Load balancing added.

6.4 1.3 -> 1.4

- Packet type 4 – Miscellaneous changed.
- Default values deleted.

6.5 1.4 -> 1.5

- Added new command to set the CAN address (firmware version 1.05 onwards).
- Added new command to set the CAN Baudrate (firmware version 1.05 onwards).
- Modified Show command to report values of new parameters.

6.6 1.5 -> 1.6

- Screenshot of configuration software on page 1 updated.