GENESYS™ DC

Programmable DC Power Supplies

Built in LXI compliant LAN, USB, RS-232 & RS-485 Interface

Built in Remote Isolated Analog Program/Monitor/Control Interface

Optional Interface: IS420, IEEE488.2 (GPIB), MODBUS TCP, EtherCAT, EtherNet/IP or PROFINET IRT

PROFINET IRT MANUAL

Manual Supplements

The full user manual is available on TDK-Lambda website or can be ordered, refer to User manual IA761-04-02_.

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GENERAL INFORMATION

Documentation (including this Manual) is subject to change without notice. Refer to TDK-Lambda Product Center for an up-to-date documentation:
https://product.tdk.com/en/search/power/switching-power/prg-power/tec_data/ps_system_genesys_plus

Drivers and GUIs are updated periodically to support new features. Refer to TDK-Lambda Product Center for up-to-date drivers and GUIs:

https://product.tdk.com/en/products/power/switching-power/prg-power/designtool/software_vcp.html

CHAPTER 1: INTRODUCTION

1.1 Introduction

The PROFINET option allows the user to remotely program, measure, and check status of the power supply by PROFINET protocol implementation over the internet.
PROFINET is an industrial Ethernet protocol designed for real-time I/O (PROFINET IO) and uses Ethernet frames and defined protocols for device discovery, I/O data exchange and alarms. Refer to SAFETY & INSTALLATION manual (IA761-04-01_) for information on safety requirements, specifications, and installation. Refer to USER MANUAL (IA761-04-02_) for information on power supply operation.

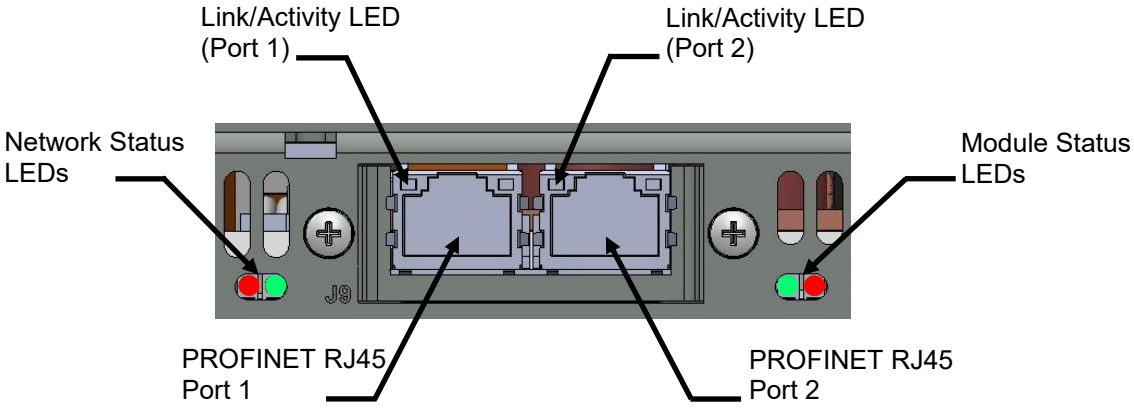

Figure 1–1: Rear Panel PROFINET View

1.2 Feature Summary

A. Communicate over any standard Ethernet network
   - LAN (Local Area Network).
   - Provides support for industrial protocols, including PING functionality.
   - Utilizes standard Ethernet infrastructure for connectivity.
   - Reliable timeout mechanism: Connections are automatically closed after inactivity (configurable).

B. Web page viewable with any web page browser
   - Configure network connection settings.
   - Interface / Media counters monitoring.

C. Full remote programming and monitoring functions
   - Uses the PROFINET IO protocol.

- Compatible with PROFINET engineering tools and device description (GSDML) based integration.
- Supports PROFINET cyclic I/O and acyclic services for communication with PLCs and controllers.
- Provides information about connection status, link quality, and device identification
- Supports PROFINET device discovery and basic configuration via DCP and device identification via LLDP.

D. Front Panel features
- View IP and MAC addresses.
- Set a complete IP address.
- PROFINET (OPT) reset.
- Remote “Blink” identity function to locate the power supply in a rack.

E. Rear Panel features (2-Port PROFINET)
- Two Ethernet RJ-45 connectors (standard 8 pin jack).
- Allow connection of multiple PROFINET power supplies directly.
- Each power supply receives its own IP address.
- Network status, module status, and two ports link/activity indicators.

CHAPTER 2: SPECIFICATIONS

2.1 Power Supply Specifications

When using PROFINET, power supply ratings and accuracies are the same as for digital remote programming and monitoring using RS-232/485, USB, or LAN. Refer to USER MANUAL (IA761-04-02_) for those specifications.

2.2 PROFINET Specifications

ELECTRICAL

ETHERNET	Meets IEEE 802.3u specifications
Auto-MDIX	Accepts patch or cross-over cable connection
Auto-Negotiate	Selects fastest of 10Base-T or 100Base-T networks (10 or 100 Megabits per second (Half or Full Duplex)

NETWORK CONFIGURATION

MAC Address	PROFINET has a unique MAC address (different from the built-in LAN)
IP Address	View or set from front panel or embedded web page
Static IP	Any IP fixed by operator
Address Resolution	ARP Protocol
Hostname	DNS protocol. Operator settable hostname.
Subnet Mask	Mask is Static
Default Gateway	Address is Static
DNS Server	Address is Static
PING Server	Verify PROFINET connection to instrument
PROFINET Reset	Reset to default configuration

PROFINET PROTOCOLS

PROFINET IO	Device implements PROFINET IO Device role for real-time cyclic I/O and acyclic services
IPv4	Internet Protocol version 4
DCP & LLDP	Discovery and Basic Configuration and LLDP for device identification and naming
Encapsulation	Conforms to the PROFINET Encapsulation Specification for message encoding

COMMANDS

PROFINET	Cyclic I/O, acyclic read/write, alarms/diagnostics, and device configuration via engineering tools and GSDML device description

WEB PAGE		
	Multiple Users	Multiple web pages (up to 4) can be opened at the same time
	LAN Configuration	View and set LAN configuration
SUPPLY CONFIGURATIONS		
	Local Control	Supply may be controlled from the front panel even if operator is monitoring via PROFINET connection
	PROFINET Remote Control	Supply may be controlled and monitored through PROFINET connection
	RS232/485, USB, or LAN	PROFINET interface can be disabled to use RS232/485, USB, or LAN interfaces
	Analog Control	PROFINET can monitor power supply while analog control is used
INDICATORS		
	IP & MAC Addresses	View addresses on front panel
	Multi-Drop Address	View RS485 address on front panel
	Link & Activity LEDs	Indicate Ethernet cable connected at both ends, defines connection speed and LAN packets detected (LED per PROFINET port)
	Network Status LED	Indicate no IP address or IP exception, an error, connection timeout, waiting for first PROFINET message, or at least one PROFINET message received
	Module Status LED	Indicates no power, normal operation, fault, or firmware update
SECURITY		
	Block All Protocols	All protocols except PROFINET are blocked
		PROFINET uses Ethernet frame based real-time traffic; appropriate network segmentation and standard industrial security practices are recommended
COMPLIANCE		
	UL, IEC, TUV, CE, ROHS, etc.	Conformances that are granted to basic power supply also apply to power supply with PROFINET interface installed
	PI	Certified by PI (PROFIBUS & PROFINET International) according to PROFINET specifications

2.3 PROFINET Command Speed

The following communication speeds are typical values only. In addition to the variability in the PROFINET interface, there are timing variations within the controller and the network routing. Evaluation is done using PROFINET IO cyclic data exchange with a single IO-Controller configuration, the power supply set to a static IP address and a direct device connection.

NOTE

The following speed specifications are subject to change without notice.

Typical cyclic IO cycle is about 20 mSec. (for all elements).

Typical acyclic command or query speeds (including commands not listed below):

		90% of Commands in less than:	100% of Commands in less than:
Basic Settings and Measurements			
Examples:		9 mSec.	9 mSec.
VOLT nn.nn	VOLT?		
MEAS:VOLT?			
MEAS:CURR?			
MEAS:POW?			
OUTP	OUTP?		
OUTP:MODE?			
VOLT:PROT:LEV	VOLT:PROT:LEV?		
System Queries			
Examples:		9 mSec.	9 mSec.
*ESR?			
*OPT?			
Status Register Settings and Queries			
Examples:		12 mSec.	12 mSec.
STAT:QUES:COND	STAT:QUES:COND?		
STAT:QUES:ENAB	STAT:QUES:ENAB?		
Operation Complete			
Example:		9 mSec.	9 mSec.
*OPC	*OPC?		

NOTES

1. Data is shown as SCPI commands. Actual tests are performed on PROFINET elements.
2. Commands which are longer than a single element might require additional execution time.
3. Sequencer commands depend on the number of elements being read/written.

CHAPTER 3: SELECT CONTROL METHOD

3.1 A Variety of Control Methods

The power supply with PROFINET interface is very flexible. In addition to the PROFINET interface, there are other ways the supply can be used.

Refer to USER MANUAL (IA761-04-02_) for more details on the local operation mode (Front Panel), Serial operation mode (RS232/485 or USB), LAN operation mode (Ethernet), or Analog (Via J1, DB26HD).

3.2 PROFINET, LAN, LOCAL, Serial, or Analog Control

The power supply with PROFINET interface option installed may be operated through five interfaces. This section describes how to enable each.

	MODE	MODE DESCRIPTION	
1	PROFINET	Control using Ethernet connection by PROFINET elements	PROFINET disables serial and LAN communication ports
2	LAN	Control using Ethernet connection by SCPI commands	PROFINET is disabled if LAN is selected
3	Local	Control using the front panel buttons and encoders	PROFINET can be used to monitor while in local mode
4	Serial	Control using RS232/485 or USB	PROFINET is disabled if Serial is selected
5	Analog	Control using analog signals to the 26 pin ‘J1’ DB26HD connector	PROFINET, LAN, Local, or Serial can be used to monitor and set protections

3.2.1 Select Local (Front Panel) Mode

The supply may be operated in the local (or front panel) mode, even when a computer is using the PROFINET connection.

If the supply is in remote mode, the front panel REM indicator is ON. The supply may be returned to local by pressing SYST / Lock Front Panel button and acknowledged by clicking the Current encoder button.

If the power supply does not switch into local mode, then:

- If a PROFINET program is running to change power supply settings/parameters, it will automatically go to remote with every command. Stop PROFINET program and then return the supply to local mode by pressing SYST / Lock Front Panel button and acknowledge by clicking the Current encoder button.
- The supply may be set to Local Lockout. Use PROFINET index 1007 (acyclic service 9199) to read or write power supply remote state, or turn the supply AC off and back on, and then press SYST / Lock Front Panel button and acknowledge by clicking the Current encoder button.

3.2.2 Select RS232/485, USB (Serial), or LAN Remote Mode

The serial (RS232/485 & USB) and LAN remote control may be selected even if PROFINET option is installed. The serial and LAN remote modes are described in the USER MANUAL (IA761-04-02_). The

PROFINET has similar capabilities as the serial and LAN remote modes, but the PROFINET programming language is not compatible with the serial or LAN languages (GEN or SCPI).

To select RS232/485, USB, or LAN mode:

1. Press the COMM button.

COMM LED illuminates. INTFC message appears on the Voltage display.

2. Rotate the Current encoder to select the required communication interface.
3. Press the Current encoder to accept parameter.

When the parameter is accepted, the display blinks once.

4. To exit the menu, press the COMM button or the BACK button.

3.2.3 Select PROFINET Remote Mode

Selecting the PROFINET mode allows programming over the Ethernet cable. Any setting and measurement may be done from a remote computer using PROFINET communication. Network configuration settings can be done via built-in web pages.

To select PROFINET mode:

1. Press the COMM button.

COMM LED illuminates. INTFC message appears on the Voltage display.

2. Rotate the Current encoder to select the OPT communication interface.
3. Press the Current encoder to accept parameter.

When the parameter is accepted, the display blinks once.

4. To exit the menu, press the COMM button or the BACK button.

NOTE

Refer to USER MANUAL (IA761-04-02_), SYSTem[:COMMunicate]:INTerface <DSC> command to select PROFINET (OPT) communication interface via communication (via RS232/485, USB, or LAN).

3.3 PROFINET Interface Option Rear Panel View

The power supply rear panel, with the PROFINET option installed, is shown below:

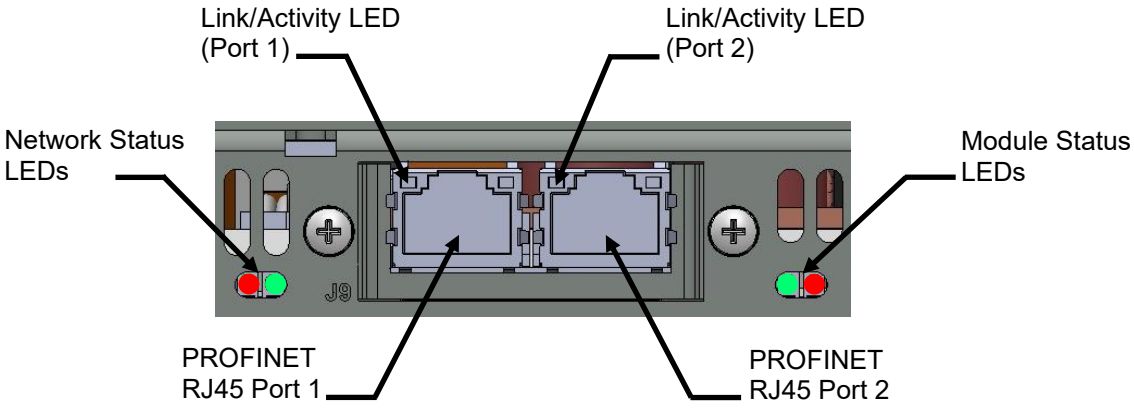

Figure 3–1: Rear Panel PROFINET View

Network Status LEDs	Off – No IP address or in an EXCEPTION state Green – At least one PROFINET message received Green, flashing – Waiting for first PROFINET message Red – Duplicate IP
Module Status LEDs	Off – No power Green – Normal operation Red – Major fault (including Anybus exception) Red, flashing – Minor fault Alternating Red / Green – Firmware update from file system in progress
Link / Activity LED	Off – No link, no activity Green – Link (100 Mbps) established Green, flickering – Activity (100Mbps) Yellow – Link (10 Mbps) established Yellow, flickering – Activity (10 Mbps)

NOTE

PROFINET interface supply is ready for communication as soon as Network Status LEDs turn Green or flashing Green. If communication is established before the interface is ready, communication interruptions may occur.

CHAPTER 4: CONNECT TO NETWORK

4.1 Ethernet Cable

The Ethernet cable must be supplied by the customer. It may be a standard straight “patch” CAT-5 (or better) network cable or a “crossover” cable. Cable type is auto detected by the power supply.

NOTE

The serial link (RS-485) cable (0.5 meters long) provided with the power supply cannot be used for PROFINET connection.

4.2 Types of Networks

4.2.1 PEER-TO-PEER NETWORK

In this type of configuration, the power supply is connected directly to a computer that is not a network server. The power supply configures its own IP address and other settings.

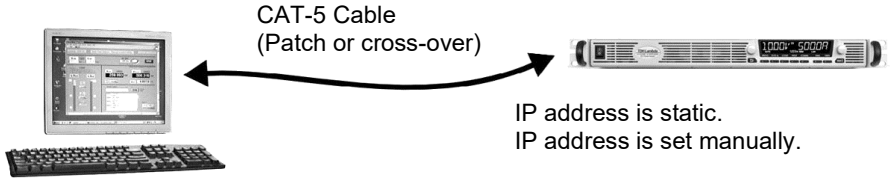

Figure 4–1: Peer-to-Peer Network

4.3 Power-up the PROFINET Power Supply

The power supply PROFINET option automatically detects if it is connected or disconnected from a network. It automatically searches for a network server and receives or creates an IP address (set manually). It will also broadcast its IP address and hostname to all other devices on the network.

1. Apply the AC power and switch ON the power supply.
2. Connect the Ethernet cable before or after the power supply is switched ON.
3. Set Static IP and wait about 10 seconds. Module Status LED turns ON. The computer screen may show LAN notification, "This connection has limited or no connectivity".

NOTE

Power supply IP address can be viewed via the Front Panel.

4.4 IP Addresses

The simplest and most reliable way to open a network connection is via the power supply's IP address, which is represented by a group of four numbers separated by periods (e.g., 10.1.15.123).
The power supply can receive an IP address only by setting Static IP.

IP Assignment	Can be assigned in the web page (6.6), in the Virtual Control Panel application (using the DCP module) or by setting via the front panel (5.2)
IP Range	Any address
IP Lifetime	Always fixed for the power supply
Duplicate IP Addresses	Network Status LED turns Red. IP address is set to 0.0.0.0

4.4.1 Discovery and Configuration Protocol

PROFINET uses DCP (Discovery and Basic Configuration Protocol) for device identification and IP address assignment. DCP protocol allows PROFINET engineering tools to discover devices on the network, assign device names (Station Name), and configure IP addresses. DCP is controlled by the PROFINET IO Controller or engineering station.

4.5 Hostname

The hostname is an address in the form of name instead of IP address (e.g., G10-170). This address mode is less common than the IP address because the hostname cannot be viewed from the front panel, and because a naming service (such as NetBIOS or DNS) must be running on the network or the host PC.
The default hostname has the following format:
< Product Series Name > < Voltage rating > – < Current rating >.
If default power supply rating has decimal point, it is represented as "P".
For example:

Model	Default Hostname
G10-500	G10-500
G600-2.8	G600-2P8

A custom hostname can be created through the web pages (refer to Section 6.6).
For example, host name can be set to `TDK`. In this case, the control program can send commands to `TDK`.
PROFINET (OPT) Reset changes the host name to default.

NOTE

There is no mechanism to detect duplicate hostnames. Avoid setting of a hostname which is already available in the network.

CHAPTER 5: PROFINET SETUP

5.1 View the IP and MAC Addresses

When the power supply is operating with the PROFINET enabled, IP and MAC addresses may be viewed on the front panel. To view the IP and MAC addresses, perform the following steps:

To view the IP address:

1. Press COMM button.
2. Rotate Voltage encoder until IP appears on the Voltage display, 1 appears on the Current display.
3. Press Current encoder to enter IP configuration. Rotate Voltage encoder to view the IP address.

   The voltage display shows IP1-IP4 by rotating Voltage encoder. The current display shows the corresponding IP field.
4. To exit the menu, press the COMM button or the BACK button.

To view the MAC address:

1. Press COMM button.
2. Rotate Voltage encoder until MAC appears on the Voltage display, 1 appears on the Current display.
3. Press Current encoder to enter MAC configuration. Rotate Voltage encoder to view the MAC address.

   The voltage display shows MAC1-MAC6 by rotating Voltage encoder. The current display shows the corresponding MAC field.
4. To exit the menu, press the COMM button or the BACK button.

5.2 Change the IP Address

The power supply allows changing all four numbers (octets) of the IP address via the front panel.
The IP address has four numbers (e.g., 10.97.4.4). Each number may be set to any value from 0 to 255.

NOTE

Some restrictions may apply due to subnet settings restrictions.

To change the IP address:

1. Press COMM button. Rotate Voltage encoder until IP appears on the Voltage display, 1 appears on the Current display.
2. Press Current encoder to enter IP configuration. Rotate Voltage encoder to view the IP address. Voltage display shows IP1-IP4 by rotating Voltage encoder. The Current display shows the corresponding IP address.
3. Rotate Current encoder to change the IP address. Set IP1, IP2, IP3, and IP4 fields. Press Current encoder to acknowledge new IP address (Current encoder should be pressed after all four IP fields are set).
4. If another device is using the same address, Network Status LED turns Red.

   To exit the menu, press the COMM button or the BACK button.

NOTES

1. If power supply is turned on (AC or power switch) with a duplicate IP (same IP address is already available in the network), IP address setting is 0.0.0.0.

5.3 PROFINET Reset

To reset PROFINET settings to its factory settings, perform the following steps:

1. Press the COMM button.
2. Rotate Voltage encoder until OPT appears on the Voltage display, RESET appears on the Current display. Press Current encoder.
3. SURE appears on the Voltage display, NO appears on the Current display. Rotate current encoder one click clockwise. YES appears on the Current display.
4. Press Current encoder to reset PROFINET configuration to factory default settings.

Default PROFINET settings are:

- Static IP setting will be obtained:

IP Address	0.0.0.0
Subnet Mask	0.0.0.0
Gateway Address	0.0.0.0
Hostname	Refer to Section 4.4.1
Domain Name	Empty
DNS Server #1	0.0.0.0
DNS Server #2	0.0.0.0
Ethernet Configuration Port 1	Auto
Ethernet Configuration Port 2	Auto

CHAPTER 6: WEB PAGES

6.1 Benefits of Web Pages

The web pages are useful for:

- Reading Ethernet configuration, reading statistics, and verifying communication with the power supply.
- Configuring the LAN connection.

6.2 Opening the Overview Page

Once the rear Module Status LED turns Green and Network Status LED turns Green or Flashing Green (refer to Section 3.3 for LEDs overview), the web page is accessible.

1. Read the IP address from the front panel (refer to Section 5.1).
2. Open a web page browser program. Enter power supply's IP address as shown below.
3. Press the Enter key.

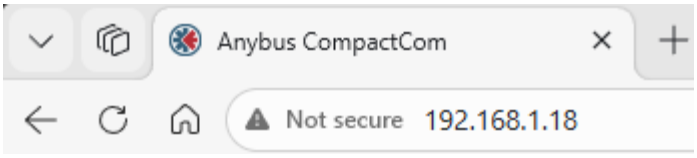

Figure 6–1: IP Main Page

The power supply Overview page appears.

6.3 MODULE Overview Page

The following page appears when the web page is opened for the first time or when it is refreshed:

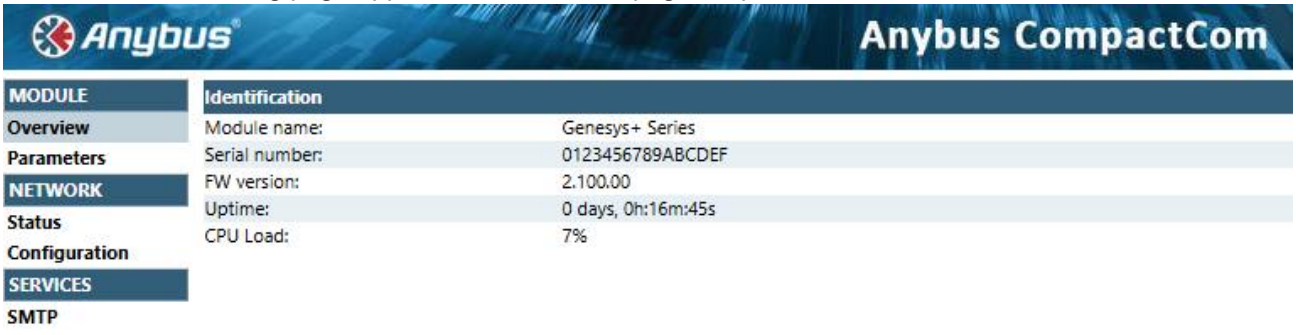

Figure 6–2: Overview Page

The overview page contains basic information related to the optional module name (communication type), serial number, FW (firmware) revision, operation time since last communication enable (uptime), and internal (optional card only) CPU load.

6.4 MODULE Parameters Page

When the Parameters page is selected, the following web page opens. This page is not in use, it contains no data (page is kept as optional).

Figure 6–3: Parameters Page

6.5 NETWORK Status Page

The Status contains four categories. General Ethernet Settings and Status view, Interface Counters, Media Counters, and PROFINET Statistics.

6.5.1 General Ethernet Settings and Status View

General Ethernet Settings and Status view provides Ethernet configuration info. The info includes DHCP status, MAC address, IP address, hostname, subnet mask, gateway, DNS, domain name, and Ports (Port 1 and port 2) link status.

Figure 6–4: Ethernet Settings and Status View

6.5.2 Interface Counters View

Interface Counters view provides general information related to internal input output counters.

Interface Counters

	Port 1	Port 2	Internal	Refresh
In Octets:	3891628	161184	2014492	
In Ucast Packets:	257	538	542	
In NUcast Packets:	39062	695	28166	
In Discards:	0	0	0	
In Errors:	0	0	0	
In Unknown Protos:	0	0	535	
Out Octets:	50882082	42383299	610926	
Out Ucast Packets:	0	881	632	
Out NUcast Packets:	1180	39095	1197	
Out Discards:	0	0	0	
Out Errors:	0	0	0	

Figure 6–5: Interface Counters View

6.5.3 Media Counters View

Media Counters view provides general information related to media input/output counters. These counters summarize Ethernet (MAC/PHY) media errors.

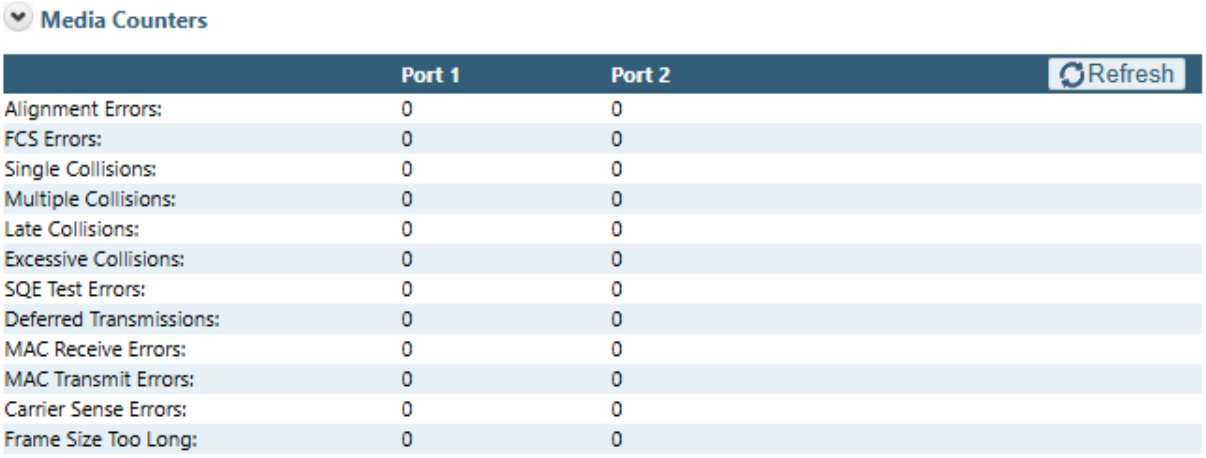

Figure 6–6: Media Counters View

6.5.4 NTP Status View

NTP Status View provides general information related to Network Time Protocol synchronization status, which helps maintain accurate time on the device.

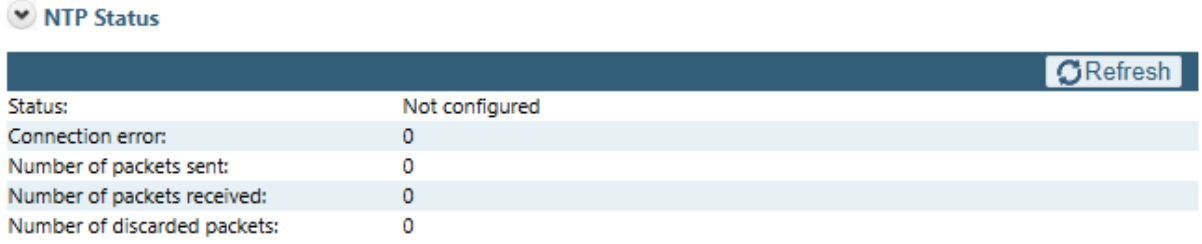

Figure 6–7: NTP Status View

6.6 NETWORK Configuration Page

The Configuration page provides the ability to modify Ethernet configuration parameters.

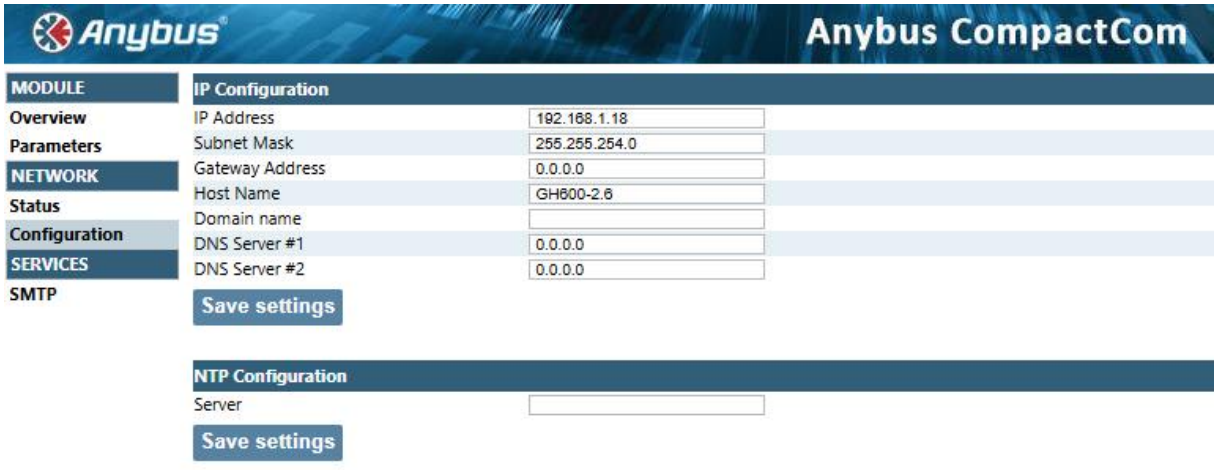

Figure 6–8: Network Configuration View

IP Configuration section provides the ability to configure network settings. For PROFINET, IP address and station name are typically configured using DCP (Discovery and Basic Configuration Protocol) via PROFINET engineering tools (such as TIA Portal, HMS Simulator or PRONETA). Alternatively, IP Address, Subnet Mask, Gateway Address, Domain Name, DNS (Domain Name System) Server #1, and DNS Server #2 can be set manually through the web page.
Hostname may be used instead of the IP address to make a connection when configured via the webpage. You may enter a custom name that describes the power supply in a meaningful way.
Ethernet Configuration section provides the ability to configure Port 1 and Port 2 with the following options:

- Auto – Auto Negotiation enabled. Speed and duplex are configured automatically according to the network the power supply is connected to.
- 10 HDX – 10Mbps, Half Duplex configuration.
- 10 FDX – 10Mbps, Full Duplex configuration.
- 100 HDX – 100Mbps, Half Duplex configuration.
- 100 FDX – 100Mbps, Full Duplex configuration.

NOTES

1. Default settings after reset are IP Address 0.0.0.0, Hostname is set according to Section 4.4.1 and Port 1 and 2 set to Auto.
2. Any setting change must be acknowledged by Save settings button.
3. Some fields (IP address setting, etc.) require AC power recycle if modified. It is mandatory to follow the instructions displayed on-screen following Save settings button press. It is recommended to recycle power supply AC power following any change.
4. If a parameter has been changed, it is recommended to wait for 5 to 10 seconds following a press on Save settings button to ensure parameters have been accepted by the power supply (on-screen instructions might not appear).
5. Some IP addresses might be blocked by the web page. In such case, set IP address through power supply front panel (there are no restrictions if an IP address is set through power supply front panel). Refer to Section 5.2.
6. IP address and Station Name can also be configured remotely using DCP via PROFINET engineering tools.

6.7 SERVICES SMTP Page

The SMTP page provides the ability to set Simple Mail Transfer Protocol, this service is not implemented.

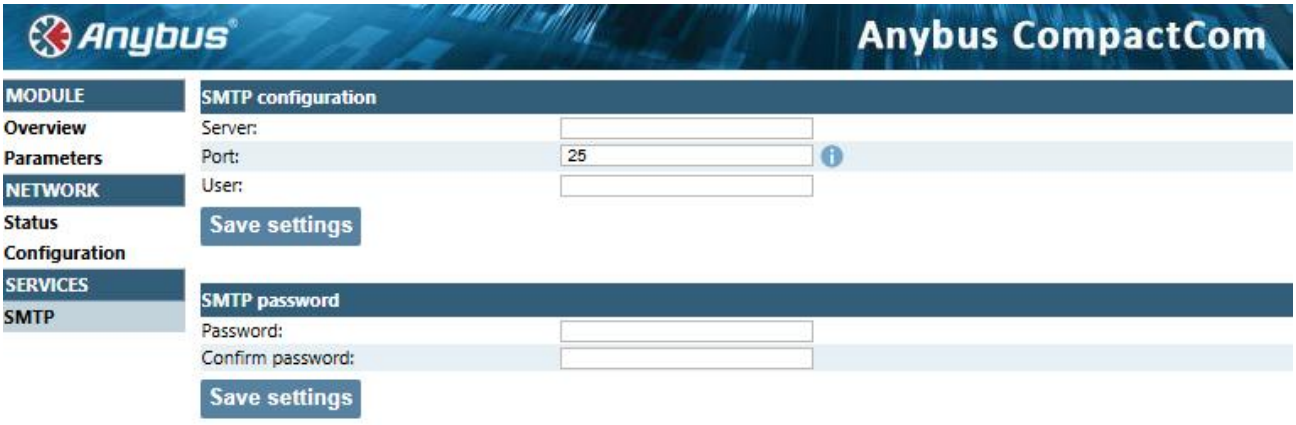

Figure 6–8: Services SMTP View

CHAPTER 7: PROFINET DATA STRUCTURE

7.1 Programming / Monitoring Values Translation

PROFINET communication interface preserves power supply resolution and accuracy, according to specifications.

Programming / Monitoring values are represented in a form of 16 bits unsigned integer value. Rated Voltage, Current, and Power (nominal values) are represented as 53620 in a decimal base or 0xD174 in a hexadecimal base.

For example, 10 Volts, 500 Amperes, 5000 Watts power supply programming and monitoring values are represented as follows: 10 Volts = 53620, 2 volts = 10724 = 0x29E4

500 Amperes = 53620, 400 Amperes = 42896 = 0xA790

5000 Watts = 53620, 2500 Watts = 26810 = 0x68BA

600 Volts, 2.8 Amperes, 1680 Watts power supply programming and monitoring values are represented as follows: 600 Volts = 53620, 100 Volts = 8937 = 0x22E9

2.8 Amperes = 53620, 2 Amperes = 38300 = 0x959C

1680 Watts = 53620, 680 Watts = 21703 = 0x54C7

Voltage, Current, and Power values are limited to 105% (0xDBED) programming range. Protection functions such as OVP are model dependent, ranging from 110% (0xE666) up to 120% (0xFB58) according to model specifications (refer to power supply Instruction Manual).

NOTE

Values translation from real number (voltage, current, power, etc.) into unsigned 16 bits integer (hexadecimal) representation may require rounding. Round naturally to the nearest unsigned 16 bits representation.

Translation formula from actual value to programming / monitoring hexadecimal value is as follows:

$$hexadecimal\ value = \frac{actual\ programming\ or\ monitoring\ value}{rated\ (nominal)\ value} * 53620$$

Translation formula from programming / monitoring hexadecimal value to actual value is as follows:

$$actual\ programming\ or\ monitoring\ value = \frac{hexadecimal\ value}{53620} * rated(nominal)value$$

NOTE

Decimal 53620 value is represented as 0xD174 hexadecimal value. Formulas above are shown in Decimal base. Power supply operates with hexadecimal values.

7.2 Data Type

PROFINET communication interface utilizes uint16 data type.

Each cyclic IO / acyclic Service holds 16 bits of data (2 bytes).

Data is organized in a slot and sub-slot and/or indexes hierarchy:

1. Services / Connections → Two communication types: (a) cyclic IO for mapped real-time data exchange (per-submodule IO mapped as uint16 words), and (b) acyclic services for configuration and parameterization (read/write records). Logical channels are managed by Application Relations and IO-Connections.
2. Modules (Slots) → Logical groups of functionalities in the device. Each module is identified by a slot number and a module ID (described in the device GSDML) used for cyclic IO only.
3. Submodules (Sub slots) → Specific functional units within a module. Each submodule has a sub-slot number and defines its IO data size and direction; IO data is mapped at the submodule level in 16-bit (uint16) words used for cyclic IO only.
4. Records / Properties → Parameter, diagnostic or configuration entries associated with a submodule. These are accessed via PROFINET acyclic services (read/write record) and are identified by record/index identifiers in the GSDML. Multi-word values span consecutive uint16 words.
5. Index → Each cyclic IO / acyclic service can be interpreted to an Index according to its location in the IO Mapping.

Examples:

acyclic IO → SCPI command VOLT nn is represented as follows:

1. Index = 905

acyclic IO → SCPI query *IDN? is represented as follows:

1. Index = 4 – 54

cyclic IO → SCPI command OUTPut[:STATe] is represented as follows:

1. Slot = 1
2. Sub-slot = 1
3. Index = 1108

cyclic IO → SCPI query OUTPut[:STATe]? is represented as follows:

1. Slot = 15
2. Sub-slot = 1
3. Index = 1115

NOTE

Cyclic IOs are represented as [Slot | Sub-slot | Index] while acyclic services are represented as [index].
If the GSDML defines any process-data (cyclic IO) mappings, those objects are managed cyclically by the controller. As a result, acyclic services write accesses to these objects will be prevented. To permit unrestricted acyclic services read/write access to all objects, the GSDML must not contain any cyclic IO mappings (should be deleted manually from the GSDML file). Refer to Cyclic IO Mapping to see all cyclic IOs. Please note that all cyclic IOs can be accessed as acyclic services as well.

PROFINET communication interface utilizes several data types such as: uint8, uint16, uint32.

Uint16 data type is the most common type used for most of the functions. Size of uint16 is 2 bytes.

The response to *IDN? query for 300 Volts, 3.5 Amperes power supply:

TDK-LAMBDA,G300-3.5-PROFINET,042B113-0002,G:02.120.

Element Index	ASCII Characters	Hexadecimal Data
4	TD	5444
5	K-	4B2D
6	LA	4C41
7	MB	4D42
8	DA	4441
9	,G	2C47
10	30	3330
11	0-	302D
12	3.	332E
13	5-	352D
14	PR	5052
15	OF	4F46
16	IN	494E
17	ET	4554
18	,0	2C30
19	42	3432
20	B1	4231
21	13	3133
22	-0	2D30
23	00	3030
24	2,	322C
25	G:	473A
26	02	3032
27	.1	2E31
28	20	3230

NOTES

1. * Last 0 is added as the initial index value is 0, this value is not part of the *IDN? string.
2. Element in indexes 29–54 contain 0.

Uint16 data type example – MEASure:VOLTage[:DC]? query (index 79, 2 bytes, 1 element) for 100 Volts actual output value in a 100 Volts (nominal) power supply: 53620 = 0xD174

Element Index	Decimal value	Hexadecimal Data
79	53620	D174

Uint32 data type is used to query power supply operation time. Size of uint32 is 4 bytes.

Uint32 data type example – SYSTem:PON:TIME? query (index 998, 4 bytes, 2 elements). 100 hours operation time is represented as:

Element Index	Decimal value	Hexadecimal Data
998	100	0064
999	0	0000

Float data type is used for sequencer time / dwell programming and voltage / current slew rate control. Size of float is 4 bytes, represented according to IEEE 754 standard.
Float data type example – [PROGram]:LIST:DWELl? query (index 196, 400 bytes, 200 elements). One second dwell for a single sequence point is represented as: 0x3F800000. Rest of the cells contain 0 if not used.

Element Index	Decimal value	Hexadecimal Data
196	0	0000
197	16256	3F80

NOTES

1. For commands / queries containing multiple elements (i.e. addresses), Read/Write is possible only by accessing each element separately. For example for [PROGram]:LIST:DWELl? query, each of the 200 elements needs to be accessed directly to read its value.
2. First sequencer point always starts at the first element address.

7.3 Data Access

PROFIENT supports three types of data access operations: Read and Write. Query elements have Read access only.

NOTES

1. Elements which don't have Read access return 0.
2. Write of an out-of-range value results in an error. It is recommended to read elements in indexes 936-937 (SYSTem:ERRor? query) to verify no errors.

7.4 Data Length (Number of Elements)

Each element length is 2 bytes. Read/Write of multiple elements result in Read/Write of a set of bytes multiplied by two. For example, *IDN? query start from index no.4, its length is 50 elements, 100 bytes.

NOTE

For commands / queries containing multiple elements, Read/Write is possible only by accessing each element separately.

7.5 Parameters Range

Each command (element) has a specified data range. It is mandatory to preserve data range to avoid data overrun. For example, voltage setting range is 0 up to 105% of rated (nominal) value, translated to 0x0000 up to 0xDBED. An out-of-range parameter generates an error, which can be read by reading elements in indexes 936-937 (SYSTem:ERRor? query).
Some other elements (commands) such as element in index 1 (*ESE command), are limited to a specific range, 0 up to 255. A value out of the specified range might result in an unexpected setting value.

NOTE

It is recommended to follow parameters range specification to avoid unexpected behavior of a power supply.

7.6 Read / Write Elements

PROFINET supports Read and Write operations: Read single element and Write single element. Each operation is defined per command (per element or range of elements).

7.7 Cyclic IO Mapping

PROFINET cyclic IO elements are mapped according to the table below. Refer to USER MANUAL (IA761-04-02_) for information regarding commands functionality.

Element range	SCPI command	Read / Write	Data type	Number of Elements
0,1	OUTPut[:STATe]	W	uint16	1
0,1	[SOURce]:POWer:STATe	W	uint16	1
0,1	SYSTem:RIN:STATe	W	uint16	1
0–53620	[SOURce]:VOLTage[:LEVel][:IMMediate][:AMPLitude]	W	uint16	1
0–53620	[SOURce]:CURRent[:LEVel][:IMMediate][:AMPLitude]	W	uint16	1
0–53620	[SOURce]:POWer[:LEVel]	W	uint16	1
1–1000	SYSTem:RIN[:LEVel]	W	uint16	1
0,1	OUTPut[:STATe]?	R	uint16	1
0,1	[SOURce]:POWer:STATe?	R	uint16	1
0,1	SYSTem:RIN:STATe?	R	uint16	1
0–53620	[SOURce]:VOLTage[:LEVel][:IMMediate][:AMPLitude]?	R	uint16	1
0–53620	[SOURce]:CURRent[:LEVel][:IMMediate][:AMPLitude]?	R	uint16	1
0–53620	[SOURce]:POWer[:LEVel]?	R	uint16	1
1–1000	SYSTem:RIN[:LEVel]?	R	uint16	1
0,1	Power Supply Output (actual status)	R	uint16	1
0–53620	MEASure:VOLTage[:DC]?	R	uint16	1
0–53620	MEASure:CURRent[:DC]?	R	uint16	1
0–53620	MEASure:POWer[:DC]?	R	uint16	1
0–65535	SYSTem:TEMPerature[:AMBient]?	R	uint16	1
0–65535	STATus:QUEStionable:CONDition?	R	uint16	1
0–65535	STATus:OPERation:CONDition?	R	uint16	1

7.8 Acyclic Parameters Mapping

PROFINET acyclic elements are mapped according to the table below. Refer to USER MANUAL (IA761-04-02_) for information regarding commands functionality.

Element number	Element range	SCPI command	Read / Write	Data type	Number of Elements
1	0,1	*CLS	W	uint16	1
2	0–255	*ESE	RW	uint16	1
3	0–255	*ESR?	R	uint16	1
4	ASCII	*IDN?	R	char	50
54	0,1	*OPC	RW	uint16	1
55	0–255	*OPT?	R	uint16	1
56	0,1	*PSC	RW	uint16	1
57	1–4	*RCL	W	uint16	1
58	0,1	*RST	W	uint16	1
59	1–4	*SAV	W	uint16	1
60	0–255	*SRE	RW	uint16	1
61	0–255	*STB?	R	uint16	1
62	0,1	*TRG	W	uint16	1
63	0,1	*TST?	R	uint16	1
64	0,1	*WAI	W	uint16	1
65	0,1	ABORt	W	uint16	1
66	0,1	DISPlay[:WINDow]:STATe	RW	uint16	1
67	0,1	DISPlay[:WINDow]:FLASh	RW	uint16	1
68	0,1	DISPlay[:WINDow]:TEST	W	uint16	1
69	0,1	INITiate[:IMMediate]	W	uint16	1
70	0,1	INITiate:CONTinuous	RW	uint16	1
71	0,1	Reserved		uint16	1
72	0–31	INSTrument:[N]SELect	R	uint16	1
73		Reserved		uint16	1
74		Reserved		uint16	1
75		Reserved		uint16	1
76		Reserved		uint16	1
77		Reserved		uint16	1
78		Reserved		uint16	1
79	0–53620	MEASure:VOLTage[:DC]?	R	uint16	1
80	0–53620	MEASure:CURRent[:DC]?	R	uint16	1
81	0–53620	MEASure:POWer[:DC]?	R	uint16	1

Element number	Element range	SCPI command	Read / Write	Data type	Number of Elements
82	0,1	OUTPut[:STATe]	RW	uint16	1
83	0,1	OUTPut:ENA[:STATe]	RW	uint16	1
84	0,1	OUTPut:ENA:POLarity	RW	uint16	1
85	0,1	OUTPut:ILC[:STATe]	RW	uint16	1
86	1–4	OUTPut:MODE?	R	uint16	1
87	0,1	OUTPut:PON[:STATe]	RW	uint16	1
88	0,1	OUTPut:PROTection:CLEar	W	uint16	1
89	0–2	OUTPut:PROTection:FOLDback[:MODE]	RW	uint16	1
90	1–255	OUTPut:PROTection:FOLDback:DELay	RW	uint16	1
91	0,1	OUTPut:RELay1[:STATe]	RW	uint16	1
92	0,1	OUTPut:RELay2[:STATe]	RW	uint16	1
93	0–2	OUTPut:TTLTrg:MODE	RW	uint16	1
94	0,1–9999	[PROGram]:COUNter	RW	uint16	1
95	0–53620	[PROGram]:LIST:CURRent	RW	uint16	100
195	0,1	Upload [PROGram]:LIST:CURRent registers	W	uint16	1
196	0.001–129600	[PROGram]:LIST:DWELl	RW	float	200
396	0,1	Upload [PROGram]:LIST:DWELl registers	W	uint16	1
397	0–53620	[PROGram]:LIST:VOLTage	RW	uint16	100
497	0,1	Upload [PROGram]:LIST:VOLTage registers	W	uint16	1
498	1–4	[PROGram]:LOAD	RW	uint16	1
499	0,1	[PROGram]:STEP	RW	uint16	1
500	1–4	[PROGram]:STORe	W	uint16	1
501	0–53620	[PROGram]:WAVE:CURRent	RW	uint16	100
601	0,1	Upload [PROGram]:WAVE:CURRent registers	W	uint16	1
602	0.001–129600	[PROGram]:WAVE:TIME	RW	float	200
802	0,1	Upload [PROGram]:WAVE:TIME registers	W	uint16	1
803	0–53620	[PROGram]:WAVE:VOLTage	RW	uint16	100
903	0,1	Upload [PROGram]:WAVE:VOLTage registers	W	uint16	1
904	0–100	Number of the points	RW	uint16	1
905	0–53620	[SOURce]:VOLTage[:LEVel][:IMMediate][:AMPLitude]	RW	uint16	1
906	0–53620	[SOURce]:CURRent[:LEVel][:IMMediate][:AMPLitude]	RW	uint16	1
907	0–64342	[SOURce]:VOLTage:PROTection:LEVel	RW	uint16	1
908	1–255	[SOURce]:VOLTage:PROTection:LOW:DELay	RW	uint16	1
909	0,1	[SOURce]:VOLTage:PROTection:LOW:STATe	RW	uint16	1
910	0–51065	[SOURce]:VOLTage:PROTection:LOW[:LEVel]	RW	uint16	1
911	0.0001–999.99	[SOURce]:CURRent:SLEW:DOWN	RW	float	2
913	0.0001–999.99	[SOURce]:CURRent:SLEW:UP	RW	float	2

Element number	Element range	SCPI command	Read / Write	Data type	Number of Elements
915	0.0001–999.99	[SOURce]:VOLTage:SLEW:DOWN	RW	float	2
917	0.0001–999.99	[SOURce]:VOLTage:SLEW:UP	RW	float	2
919	0,1	[SOURce]:POWer:STATe	RW	uint16	1
920	1–53620	[SOURce]:POWer[:LEVel]	RW	uint16	1
921	0,1,2	[SOURce]:VOLTage:MODE	RW	uint16	1
922	0,1,2	[SOURce]:VOLTage:EXTernal:MODE	RW	uint16	1
923	0,1,2	[SOURce]:CURRent:MODE	RW	uint16	1
924	0,1,2	[SOURce]:CURRent:EXTernal:MODE	RW	uint16	1
925	0,1	[SOURce]:CURRent:EXTernal:LIMit[:STATe]	RW	uint16	1
926	0–65535	STATus:OPERation[:EVENt]?	R	uint16	1
927	0–65535	STATus:OPERation:CONDition?	R	uint16	1
928	0–65535	STATus:OPERation:ENABle	RW	uint16	1
929	0–65535	STATus:QUEStionable[:EVENt]?	R	uint16	1
930	0–65535	STATus:QUEStionable:CONDition?	R	uint16	1
931	0–65535	STATus:QUEStionable:ENABle	RW	uint16	1
932	0–31	SYSTem[:COMMunicate]:ADDRess	RW	uint16	1
933	9600–115200	SYSTem[:COMMunicate]:BAUDrate?	R	uint16	1
934	0–4	SYSTem[:COMMunicate]:INTerface	RW	uint16	1
935	0,1	SYSTem:ERRor:ENABle	W	uint16	1
936	ASCII	SYSTem:ERRor?	R	char	30
966	1–5	SYSTem:FRST	W	uint16	1
967	ASCII	SYSTem:FIRMware[:VERSion]?	R	char	30
997	0,1	SYSTem:PANel:LOCK?	R	uint16	1
998	0-4294967295	SYSTem:PON:TIME?	R	uint32	2
1000	0-4294967295	SYSTem:PON:TIME:AC?	R	uint32	2
1002	0,1	SYSTem:PRELoad[:STATe]	RW	uint16	1
1003	0–10000	SYSTem:PSOK:DELay	RW	uint16	1
1004	0,1	SYSTem:RANGe	RW	uint16	1
1005	1–1000	SYSTem:RIN[:LEVel]	RW	uint16	1
1006	0,1	SYSTem:RIN:STATe	RW	uint16	1
1007	0,1,2	SYSTem:REMote[:STATe]	RW	uint16	1
1008	0,1	SYSTem:SENSe[:STATe]	RW	uint16	1
1009	0,1,2	SYSTem:SLEW[:STATe]	RW	uint16	1
1010	0–65535	SYSTem:TEMPerature[:AMBient]?	R	uint16	1
1011	0,1	TRIGger[:IMMediate]	W	uint16	1
1012	0–10000	TRIGger:DELay	RW	uint16	1
1013	0,1	TRIGger:SOURce	RW	uint16	1

Element number	Element range	SCPI command	Read / Write	Data type	Number of Elements
1014	0,1	SYSTem:PARallel:ACKNowledge	W	uint16	1
1015	ASCII	SYSTem:DATE?	R	char	7
1022	0,1	SYSTem[:COMMunicate]:WATCHdog:STATe	RW	uint16	1
1023	1–3600	SYSTem[:COMMunicate]:WATCHdog:TIMe	RW	uint16	1
1024	ASCII	SYSTem:PARallel?	R	char	6
1030	0,1	SYSTem:PSINk[:STATe]	RW	uint16	1

NOTES

1. Size of each element: 2 bytes.
2. An out-of-range element might result in an unpredicted behavior of the power supply.
3. Reading elements which have no Read access return 0.
4. Some special functions commands are available in SCPI only, therefore not mapped in the table above.
5. Elements which accept parameters in the range of 0,1, accept 0 as logical 0, while any number above 0 accepted as logical 1 (acts as Boolean parameter).
6. Loading a value above uint16 (above 65535) loads only 16 LSB of the value.
7. Acyclic element in index 498 ([PROGram]:LOAD) returns 0 if a program was not previously loaded.

7.9 PROFINET Unique Commands Structure

Some PROFINET commands have unique functionality compared to SCPI commands, due to limited elements operations. These commands are described in this section (All other commands' parameters / return values are according to User Manual. Refer to USER MANUAL (IA761-04-02_), SCPI commands for functionality explanation.

***CLS**

Parameter	To activate, write 0x0001 as parameter.

***OPC**

Parameter	To activate, write 0x0001 as parameter.

***OPT?**

Returns	Returns 5 for PROFINET interface.

***RST**

Parameter	To activate, write 0x0001 as parameter.

***TRG**

Parameter	To activate, write 0x0001 as parameter.

***WAI**

Parameter	To activate, write 0x0001 as parameter.

ABORt

Parameter	To activate, write 0x0001 as parameter.

INITiate[:IMMediate]

Parameter	To activate, write 0x0001 as parameter.

INSTrument:[N]SELect?

Parameter	Only Read (query) operation is supported.

OUTPut:ENA:POLarity

Parameter	REV - 0x0000; NORM – 0x0001 as return value.

OUTPut:MODE?

Return	OFF - 0x0001; CV – 0x0002; CC - 0x0003; CP – 0x0004 as return value.

OUTPut:PON[:STATe]

Parameter	SAFE - 0x0000; AUTO – 0x0001 as return value.

OUTPut:PROTection:CLEar

Parameter	To activate, write 0x0001 as parameter.

OUTPut:PROTection:FOLDback[:MODE]

Parameter	OFF - 0x0000; CC – 0x0001; CV - 0x0002 as return value.

OUTPut:PROTection:FOLDback:DELay

Unit	100mSec. Multiply register value by 100mSec. For example: 1 equals 100mSec; 5 equals 500mSec.

OUTPut:TTLTrg:MODE

Parameter	OFF - 0x0000; FSTR – 0x0001; TRIG - 0x0002 as return value.

[PROGram]:COUNter

Parameter	INFinity – write 0x0000; Number of iterations - write 1–9999 as parameter. Any value above 9999 results in INFinity.

[PROGram]:LIST:CURRent

Parameter	Each value is loaded into a single register. Refer to Section 7.10 for an example of Voltage registers.

Upload [PROGram]:LIST:CURRent registers

Specific	PROFINET specific command used to upload [PROGram]:LIST:CURRent into power supply. Refer to Section 7.10 for an example of Voltage registers.

[PROGram]:LIST:DWELl

Parameter	Each value is loaded into a pair of registers. Low address value holds the least significant part. Refer to Section 7.10 for an example.

Upload [PROGram]:LIST:DWELl registers

Specific	PROFINET specific command used to upload [PROGram]:LIST:DWELl into power supply. Refer to Section 7.10 for an example.

[PROGram]:LIST:VOLTage

Parameter	Each value is loaded into a single register. Refer to Section 7.10 for an example.

Upload [PROGram]:LIST:VOLTage registers

Specific	PROFINET specific command used to upload [PROGram]:LIST:VOLTage into power supply. Refer to Section 7.10 for an example.

[PROGram]:STEP

Parameter	ONCE – write 0x0000; AUTO - write 0x0001 as parameter.

[PROGram]:WAVE:CURRent

Parameter	Each value is loaded into a single register. Refer to Section 7.10 for an example of List Voltage registers.

Upload [PROGram]:WAVE:CURRent registers

Specific	PROFINET specific command used to upload [PROGram]:WAVE:CURRent into power supply. Refer to Section 7.10 for an example of LIST Voltage registers.

[PROGram]:WAVE:TIME

Parameter	Each value is loaded into a pair of registers. Low address value holds the least significant part. Refer to Section 7.10 for an example of List Dwell registers.

Upload [PROGram]:WAVE:TIME registers

Specific	PROFINET specific command used to upload [PROGram]:WAVE:TIME into power supply. Refer to Section 7.10 for an example of List Dwell registers.

[PROGram]:WAVE:VOLTage

Parameter	Each value is loaded into a single register. Refer to Section 7.10 for an example of List Voltage registers.

Upload [PROGram]:WAVE:VOLTage registers

Specific	PROFINET specific command used to upload [PROGram]:LIST:VOLTage into power supply. Refer to Section 7.10 for an example List Dwell registers.

Number of the points

Parameter	PROFINET specific command used to set the number of points of a sequence to load into a power supply. Refer to Section 7.10 for an example.

[SOURce]:VOLTage:PROTection:LOW:DELay

Unit	100mSec. Multiply register value by 100mSec. For example: 1 equals 100mSec; 5 equals 500mSec.

[SOURce]:CURRent:SLEW:DOWN

Parameter	Each value is loaded into a pair of registers. Low address value holds the least significant part.

[SOURce]:CURRent:SLEW:UP

Parameter	Each value is loaded into a pair of registers. Low address value holds the least significant part.

[SOURce]:VOLTage:SLEW:DOWN

Parameter	Each value is loaded into a pair of registers. Low address value holds the least significant part.

[SOURce]:VOLTage:SLEW:UP

Parameter	Each value is loaded into a pair of registers. Low address value holds the least significant part.

[SOURce]:VOLTage:MODE

Parameter	NONE - 0x0000; LIST - 0x0001; WAVE - 0x0002 as return value.

[SOURce]:VOLTage:EXTernal:MODE

Parameter	DIG - 0x0000; VOL - 0x0001; RES - 0x0002 as return value.

[SOURce]:CURRent:MODE

Parameter	NONE - 0x0000; LIST - 0x0001; WAVE - 0x0002 as return value.

[SOURce]:CURRent:EXTernal:MODE

Parameter	DIG - 0x0000; VOL - 0x0001; RES - 0x0002 as return value.

SYSTem[:COMMunicate]:BAUDrate?

Return	9600 - 0x0000; 19200 - 0x0001; 38400 - 0x0002; 57600 - 0x0003; 115200 - 0x0004 as return value.

SYSTem[:COMMunicate]:INTerface

Parameter	RS232 - 0x0000; RS485 - 0x0001; LAN - 0x0002; USB - 0x0003; OPT - 0x0004.

SYSTem:ERRor:ENABle

Parameter	To activate, write 0x0001 as parameter.

SYSTem:FRST

Parameter	USB - 0x0001; RS232 - 0x0002; RS485 - 0x0003; LAN - 0x0004; OPT - 0x0005.

SYSTem:PSOK:DELay

Unit	mSec. Data is represented in milliseconds. For example: 1 equals 1mSec; 1000 equals 1Sec.

SYSTem:RANGe

Parameter	5 Volts range - 0x0000; 10 Volts range – 0x0001 as return value.

SYSTem:RIN[:LEVel]

Unit	mOhms. Data is represented in milliohms. For example: 1 equals 1mohm; 1000 equals 1ohm.

SYSTem:REMote[:STATe]

Parameter	LOC - 0x0000; REM - 0x0001; LLO - 0x0002 as return value.

SYSTem:SENSe[:STATe]

Parameter	LOC - 0x0000; REM - 0x0001 as return value.

SYSTem:SLEW[:STATe]

Parameter	OFF - 0x0000; VOLT - 0x0001; CURR - 0x0002 as return value.

TRIGger[:IMMediate]

Parameter	To activate, write 0x0001 as parameter.

TRIGger:DELay

Unit	mSec. Data is represented in milliseconds. For example: 1 equals 1mSec; 1000 equals 1Sec.

TRIGger:SOURce

Parameter	BUS - 0x0000; EXT - 0x0001 as return value.

SYSTem:PARallel:ACKNowledge

Parameter	To activate, write 0x0001 as parameter.

NOTES

1. LAN specific commands are not available for PROFINET interface.
2. SYSTEM[:COMMunicate]:LANGuage command is not available for PROFINET interface.
3. SYSTem:VERSion? command is not available for PROFINET interface.
4. Read/Write commands (defined as RW) have the same set of Return and Parameter values, although defined as Parameter in the table above.

7.10 Sequencer Activation

This section describes how to activate basic sequencer operation. Refer to USER MANUAL (IA761-04-02_) for general information regarding sequencer functionality combined with the trigger system.

For example, the following sequence should be programmed as follows:

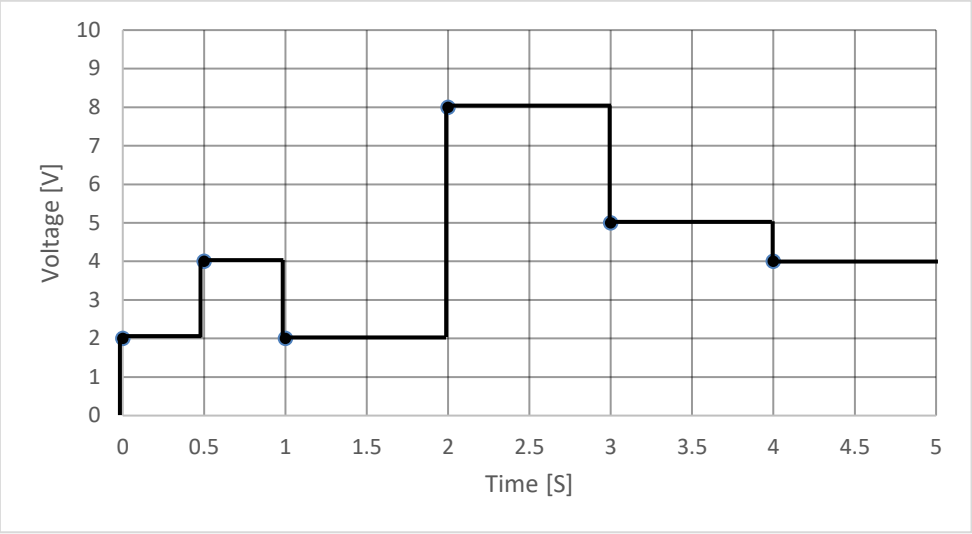

Figure 7–1: LIST Mode Example

SCPI programming language:

VOLT:MODE LIST	Select LIST Mode Sequence
LIST:VOLT 2,4,2,8,5,4	Set voltage values ”2,4,2,8,5,4” Volts
LIST:DWEL 0.5,0.5,1,1,1,1	Set dwell values ”0.5,0.5,1,1,1,1” Seconds
STEP AUTO	Set AUTO step execution mode ”AUTO”
COUN 1	Set list execution iterations ”1”
TRIG:SOUR BUS	Select BUS trigger source via communication interface or front panel
INIT:CONT OFF	Trigger system is enabled for a single trigger action
INIT	Trigger initialize
*TRG	Trigger command

PROFINET Elements programming:

Write 0x0001 to index 921	Select LIST Mode Sequence
Write 0x29E4 to index 397	Set voltage value 2 Volts
Write 0x53C8 to index 398	Set voltage value 4 Volts
Write 0x29E4 to index 399	Set voltage value 2 Volts
Write 0xA790 to index 400	Set voltage value 8 Volts
Write 0x68BA to index 401	Set voltage value 5 Volts
Write 0x53C8 to index 402	Set voltage value 4 Volts
Write 0x0000 to index 196	Set dwell value 0.5 Second (low index)
Write 0x3F00 to index 197	Set dwell value 0.5 Second (high index)
Write 0x0000 to index 198	Set dwell value 0.5 Second (low index)
Write 0x3F00 to index 199	Set dwell value 0.5 Second (high index)
Write 0x0000 to index 200	Set dwell value 1 Second (low index)
Write 0x3F80 to index 201	Set dwell value 1 Second (high index)

Write 0x0000 to index 202	Set dwell value 1 Second (low index)
Write 0x3F80 to index 203	Set dwell value 1 Second (high index)
Write 0x0000 to index 204	Set dwell value 1 Second (low index)
Write 0x3F80 to index 205	Set dwell value 1 Second (high index)
Write 0x0000 to index 206	Set dwell value 1 Second (low index)
Write 0x3F80 to index 207	Set dwell value 1 Second (high index)
Write 0x0006 to index 904	Indicates to load 6 points (mutual for Voltage and Dwell)
Write 0x0001 to index 497	Upload Voltage elements into power supply sequencer
Write 0x0001 to index 396	Upload Dwell elements into power supply sequencer
Write 0x0001 to index 499	Set AUTO step execution mode ”AUTO”
Write 0x0001 to index 94	Set list execution iterations ”1”
Write 0x0000 to index 1013	Select BUS trigger source via communication interface or front panel
Write 0x0000 to index 70	Trigger system is enabled for a single trigger action
Write 0x0001 to index 69	Trigger initialize
Write 0x0001 to index 62	Trigger command

NOTES

1. Start condition: Assume power supply output is on; Initial voltage point is 0 Volts.
2. The example above demonstrates values for a 10 Volts rated power supply.

CHAPTER 8: MULTI POWER SUPPLY CONNECTION

8.1 Introduction

Multiple power supplies could be connected to a single PROFINET controller (PC, PLC, etc.).
Each power supply equipped with an PROFINET optional communication interface has an IN Port and an OUT Port (refer to Figure 8–1: Rear Panel PROFINET View below).

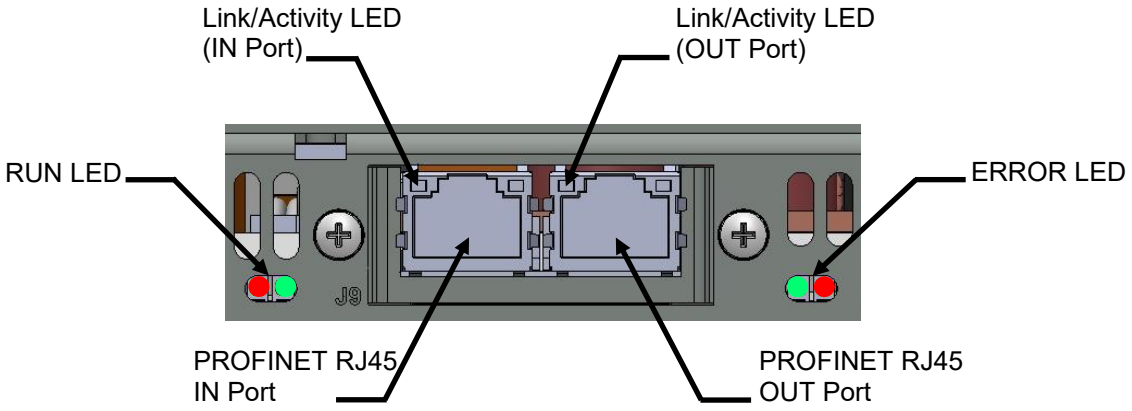

Figure 8–1: Rear Panel PROFINET View

NOTES

1. Multi PROFINET Power Supply Connection is available for power supplies equipped with PROFINET optional communication interface. RS485 Daisy-Chain is not supported for PROFINET communication interface.
2. Each power supply must have an PROFINET optional communication interface module installed.

8.2 Connection and Setup

First unit connection: First unit could be connected directly to a PROFINET controller (PC, PLC, etc.) or to an OUT Port of an existing PROFINET equipment (OUT Port notation could differ according to equipment manufacturer). Select PROFINET (OPT) communication interface, refer to Section 3.2.3.

Other units' connection: The other units are connected OUT Port to an IN Port. OUT Port of the current power supply is connected to the IN Port of the next power supply, and so forth. Select PROFINET (OPT) communication interface, refer to Section 3.2.3.

Using PROFINET cable, connect each unit's OUT Port to the next unit's IN Port.

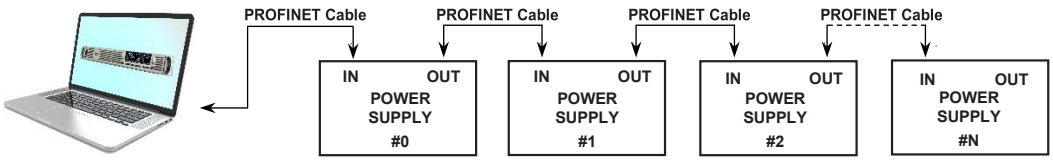

Figure 8–2: Multiple PROFINET Power Supplies Connection

NOTES

1. Refer to Section 4.1 for PROFINET cable definition.
2. Each PROFINET power supply is automatically addressed by the PROFINET controller.

8.3 Parallel Connection

Power supplies connected in parallel (refer to User Manual IA761-04-02_, Advanced Parallel Section) do not require PROFINET communication interface in each unit. Only the **Master** unit must be equipped with an PROFINET optional communication interface. Slave units are controlled by the Master, thus they **do not** require PROFINET optional communication interface. Refer to Figure 8–3 as an example.

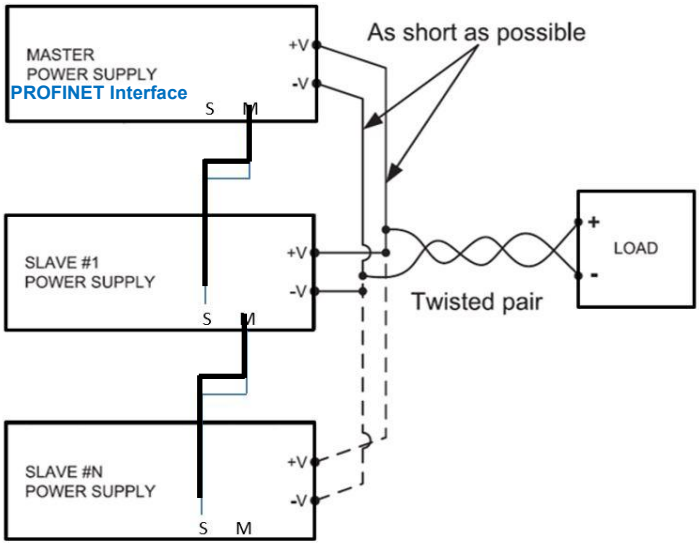

Figure 8–3: Parallel Connection

NOTES

1. MASTER POWER SUPPLY (Figure 8–3) covers all power supply models.
2. GSP/GBSP power supply is referred as a single power supply, which could be a MASTER POWER SUPPLY, or a SLAVE POWER SUPPLY, depending on advanced parallel connection.
3. GSP/GBSP MASTER POWER SUPPLY must be equipped with a PROFINET communication optional interface. SLAVE POWER SUPPLIES are controlled by the MASTER POWER SUPPLY.

NOTES