GENESYS™ Series

Programmable DC Power Supplies

Half-Rack GH1kW/1.5kW in 1U Height

Full-Rack G1kW/1.7kW/2.7kW/3.4kW/5kW/7.5kW in 1U Height

GSP10kW/15kW in 2U/3U Height

GSPL15kW/22.5kW in 2U/3U Height

GSPS30kW/45kW/60kW/67.5kW/90kW in 20U Height

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 or EtherNet/IP

EtherNet/IP MANUAL

EtherNet/IP ODVA

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 EtherNet/IP option for the ***GENESYS***™ power supply series allows the user to remotely program, measure, and check status of the power supply by EtherNet/IP protocol implementation over the internet. EtherNet/IP is listening on a reserved system port 44818 on the TCP/IP protocol. Refer to ***GENESYS***™ SAFETY & INSTALLATION manual (IA761-04-01_) for information on safety requirements, specifications, and installation. Refer to ***GENESYS***™ USER MANUAL (IA761-04-02_) for information on power supply operation.

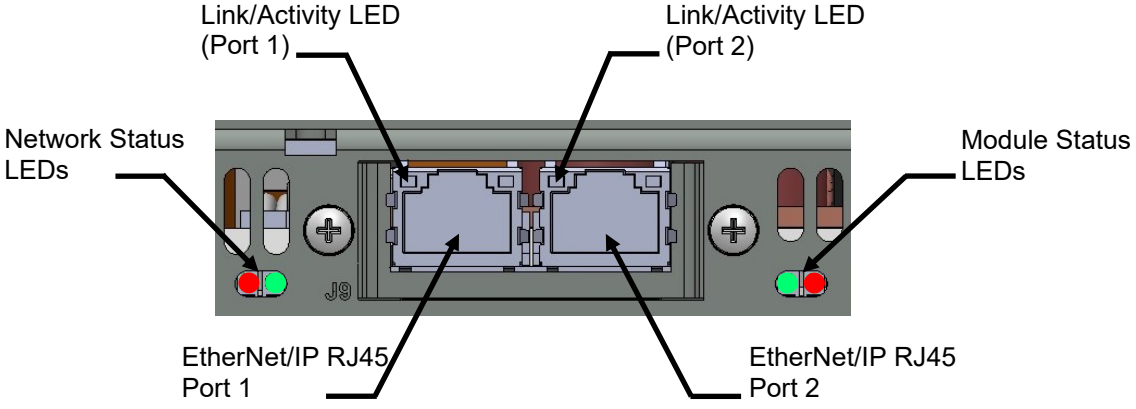

Figure 1–1: Rear Panel EtherNet/IP View

1.2 Feature Summary

A. Communicate over any standard Ethernet network

- LAN (Local Area Network).
- WAN (Wide Area Network).
- Communicate across the world using the Internet.
- 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 EtherNet/IP command language.
- Compatible with ODVA test & measurement utilities.
- TCP sockets which support PLCs and industrial devices supporting EtherNet/IP.
- Multiple and simultaneous (up to 4) sockets connections are allowed due to adherence to the CIP standard by port 44818 to ensure high throughput for I/O and configuration data.
- Provides information about connection status, link quality, and device identification
- Supports EtherNet/IP “List Identity” functionality over UDP port 44818 for device discovery and identification by PLCs and industrial scanners.

D. Front Panel features

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

E. Rear Panel features (2-Port EtherNet/IP)

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

F. RS-485 Multi-drop Chain

- Allow connections of up to 31 power supplies using a simple link cable.
- Supports both single and dual-port Ethernet for daisy-chaining or redundancy.
- One EtherNet/IP IP address shared by all RS-485 power supplies.

NOTE

Only one of the two Ethernet RJ-45 connectors should be connected to a master PC/PLC.

CHAPTER 2: SPECIFICATIONS

2.1 Power Supply Specifications

When using EtherNet/IP, 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 Ethernet/IP 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	EtherNet/IP has a unique MAC address (different from the built-in LAN).
IP Address	View or set from front panel or embedded web page
DHCP	Receive address from network server. Lease service.
Static IP	Any IP fixed by operator
Address Resolution	ARP Protocol
Hostname	DNS protocol. Operator settable hostname.
Subnet Mask	Mask set by DHCP or Static
Default Gateway	Address set by DHCP or Static
DNS Server	Address set by DHCP or Static
PING Server	Verify EtherNet/IP connection to instrument
EtherNet/IP Reset	Reset to default configuration

EtherNet/IP PROTOCOLS

TCP/UDP	EtherNet/IP packets follow Transmission Control Protocol or User Datagram Protocol
IPv4	Internet Protocol version 4
CIP	Common Industrial Protocol ensures device compatibility and data transfer
Encapsulation	Conforms to the EtherNet/IP Encapsulation Specification for message encoding

COMMANDS		
	EtherNet/IP	EtherNet/IP packets follow Transmission Control Protocol or User Datagram Protocol
MULTIPLE CONTROLLERS		
	Multiple Client	Up to 4 concurrent web pages or 4 TCP socket channels
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 EtherNet/IP connection
	EtherNet/IP Remote Control	Supply may be controlled and monitored through EtherNet/IP connection
	RS232/485, USB, or LAN	EtherNet/IP interface can be disabled to use RS232/485, USB, or LAN interfaces
	Analog Control	EtherNet/IP 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 EtherNet/IP port)
	Network Status LED	Indicate no IP address or IP exception, an error, connection timeout, waiting for first EtherNet/IP message, or at least one EtherNet/IP message received
	Module Status LED	Indicates no power, normal operation, fault, or firmware update
SECURITY		
	Block All Protocols	All protocols except EtherNet/IP are blocked
	TCP Sockets	Only TCP sockets (up to 4) can be opened
	Single Port	Only port 44818 is listening
COMPLIANCE		
	UL, IEC, TUV, CE, ROHS, etc.	Conformances that are granted to basic power supply also apply to power supply with EtherNet/IP interface installed
	ODVA	Meets ODVA (Open DeviceNet Vendors Association) EtherNet/IP specifications

2.3 EtherNet/IP Command Speed

The following communication speeds are typical values only. In addition to the variability in the GENESYS™ EtherNet/IP interface, there are timing variations within the controller and the network routing.

Evaluation is done using a single TCP socket application with the power supply set to a static IP address, peer-peer configuration.

NOTE

The following speed specifications are subject to change without notice.

Typical 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:		8 mSec	16 mSec
VOLT nn.nn	VOLT?		
MEAS:VOLT?			
MEAS:CURR?			
MEAS:POW?			
OUTP	OUTP?		
OUTP:MODE?			
VOLT:PROT:LEV	VOLT:PROT:LEV?		
System Queries			
Examples:		6 mSec	11 mSec
*ESR?			
*OPT?			
SYST:TEMP?			
Status Register Settings and Queries			
Examples:		9 mSec	12 mSec
STAT:QUES:COND	STAT:QUES:COND?		
STAT:QUES:ENAB	STAT:QUES:ENAB?		

		90% of Commands in less than:	100% of Commands in less than:
Instrument Select for Multi-Drop			
Example:		8 mSec	9 mSec
INST:NSEL	INST:NSEL?		
Operation Complete			
Example:		8 mSec	8 mSec
*OPC	*OPC?		

NOTES

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

CHAPTER 3: SELECT CONTROL METHOD

3.1 A Variety of Control Methods

The ***GENESYS™*** power supply with EtherNet/IP interface is very flexible. In addition to the EtherNet/IP 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 EtherNet/IP, LAN, LOCAL, Serial, or Analog Control

The ***GENESYS™*** power supply, with EtherNet/IP interface option installed, may be operated through five interfaces. This section describes how to enable each.

	MODE	MODE DESCRIPTION	
1	EtherNet/IP	Control using Ethernet connection by EtherNet/IP registers	EtherNet/IP disables serial and LAN communication ports
2	LAN	Control using Ethernet connection by SCPI commands	EtherNet/IP is disabled if LAN is selected
3	Local	Control using the front panel buttons and encoders	EtherNet/IP can be used to monitor while in local mode
4	Serial	Control using RS232/485 or USB	EtherNet/IP is disabled if Serial is selected
5	Analog	Control using analog signals to the 26 pin ‘J1’ DB26HD connector	EtherNet/IP, 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 EtherNet/IP 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 an EtherNet/IP program is running to change power supply settings/parameters, it will automatically go to remote with every command. Stop EtherNet/IP 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 EtherNet/IP instance 1007 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 EtherNet/IP option is installed. The serial and LAN remote modes are described in the ***GENESYS™*** USER MANUAL (IA761-04-02_). The EtherNet/IP has similar capabilities as the serial and LAN remote modes, but the EtherNet/IP 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 EtherNet/IP Remote Mode

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

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

3.3 EtherNet/IP Interface Option Rear Panel View

The power supply rear panel, with the EtherNet/IP option installed, is shown below:

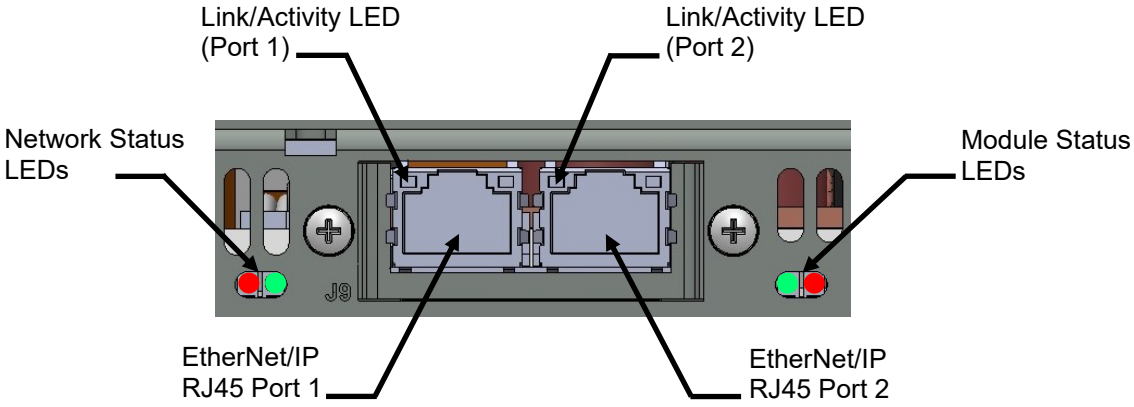

Figure 3–1: Rear Panel EtherNet/IP View

Network Status LEDs	Off – No IP address or in an EXCEPTION state Green – At least one EtherNet/IP message received Green, flashing – Waiting for first EtherNet/IP 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

EtherNet/IP 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 ***GENESYS™*** power supply cannot be used for EtherNet/IP connection.

4.2 Types of Networks

There are two types of networks discussed in this document:

4.2.1 NETWORK WITH A DHCP SERVER

A typical local area network with a server computer and network administrator to keep it operating. The server downloads the IP address and other settings to the power supply.

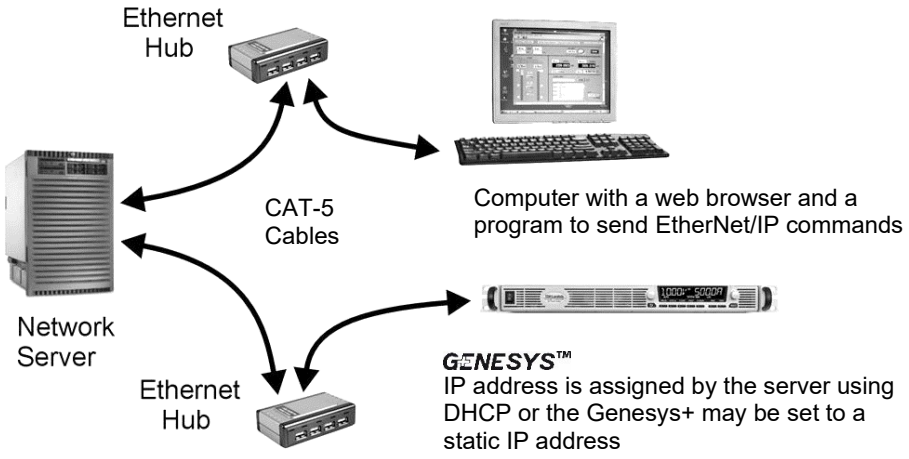

Figure 4–1: Network with a DHCP Server

4.2.2 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.

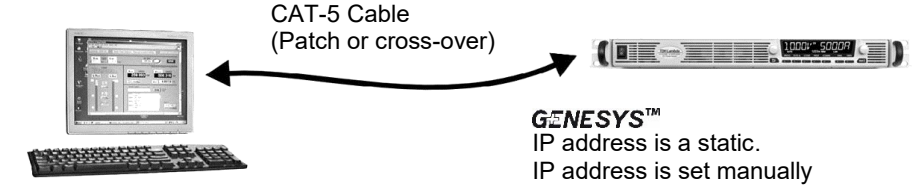

Figure 4–2: Peer-to-Peer Network

4.3 Power-up the EtherNet/IP Power Supply

The power supply EtherNet/IP 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. For a network with a DHCP server, wait about 10 seconds. Module Status LED turns Green.
4. For a peer-to-peer Static IP configuration, 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 in two modes:

	DHCP	Static IP
IP Mode Select	DHCP is default after "EtherNet/IP Reset"	May be set in the web page (6.6) or by setting via the front panel (5.2)
IP Assignment	Assigned by the network server	Assigned in the web page (6.6) or by setting via the front panel (5.2)
IP Range	Any address	Any address
IP Lifetime	Address may change as the DHCP server assigns addresses dynamically to many instruments	Always fixed for the power supply
Duplicate IP Addresses	The DHCP server should prevent duplicate IP addresses	Network Status LED turns Red. IP address is set to 0.0.0.0

NOTE

Auto-IP method is not supported.

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 host name 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`.

EtherNet/IP (OPT) Reset changes the host name to default.

The power supply may be set to one of the two network modes, each with a different way to use the host name. This is shown in the table:

	DHCP	Static IP
Default Hostname	xxxxvvvv-aaaa (Refer to hostname example above)	None, hostname cannot be used
Hostname Protocol	Hostname by DNS	None, hostname cannot be used
Hostname on Web Page	Shows hostname in the Network Configuration page	None, hostname cannot be used

NOTE

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

CHAPTER 5: ETHERNET/IP SETUP

5.1 View the IP and MAC Addresses

When the power supply is operating with the EtherNet/IP 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.
5. To exit the menu, press the COMM button or the BACK button.

NOTES

1. Modifying the IP address via the Front Panel switches to STATIC IP addressing. (DHCP addressing is disabled).
2. 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 EtherNet/IP Reset

To reset EtherNet/IP 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 EtherNet/IP configuration to factory default settings.

Default EtherNet/IP settings are:

- DHCP is enabled.
- If DHCP fails to get a lease, 0.0.0.0 IP setting will be obtained:

IP Address	0.0.0.0.
Subnet Mask	255.255.254.0
Gateway Address	0.0.0.0
Hostname	Refer to Section 4.5
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 *GENESYS™* 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.

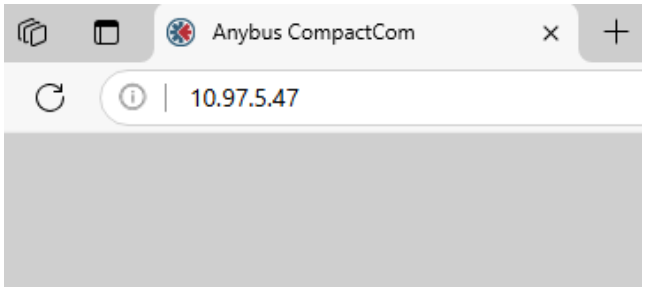

Figure 6–1: IP Main Page

The power supply Overview page appears.

Alternately, the hostname may be used for addressing the web page as shown below (if the power supply is set for DHCP, and if a DNS naming service is running on the computer). Refer to Section 4.5 for a description of the hostname. Refer to the example below.

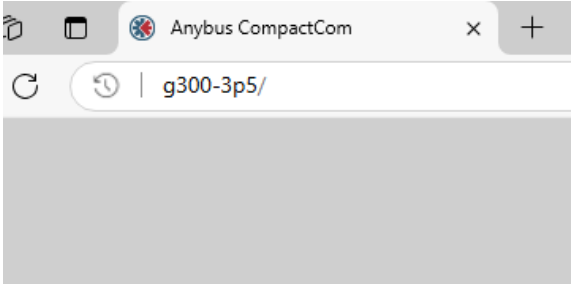

Figure 6–2: Hostname Main Page

6.3 MODULE Overview Page

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

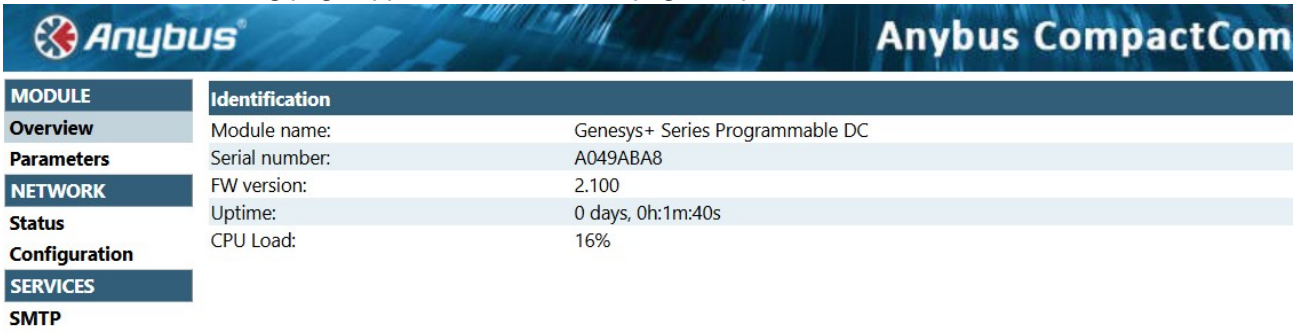

Figure 6–3: *GENESYS*™ Overview Page

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).

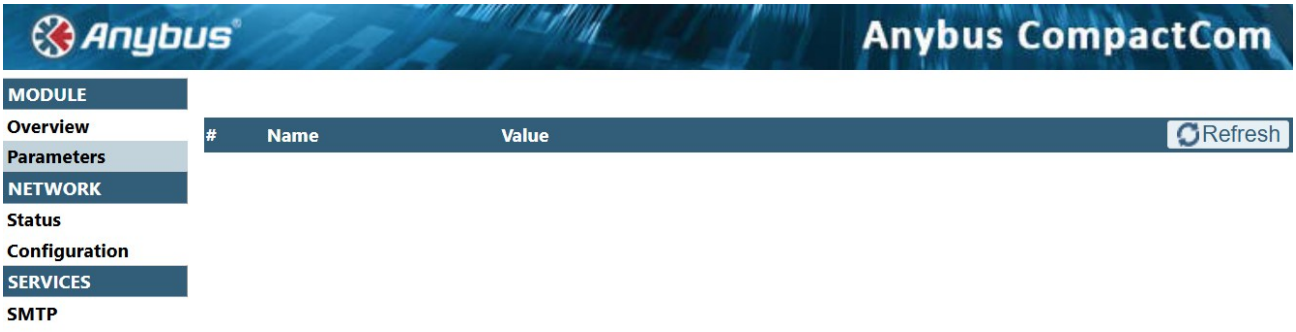

Figure 6–4: *GENESYS*™ Parameters Page

6.5 NETWORK Status Page

The Status contains four categories. General Ethernet Settings and Status view, Interface Counters, Media Counters, and EtherNet/IP 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.

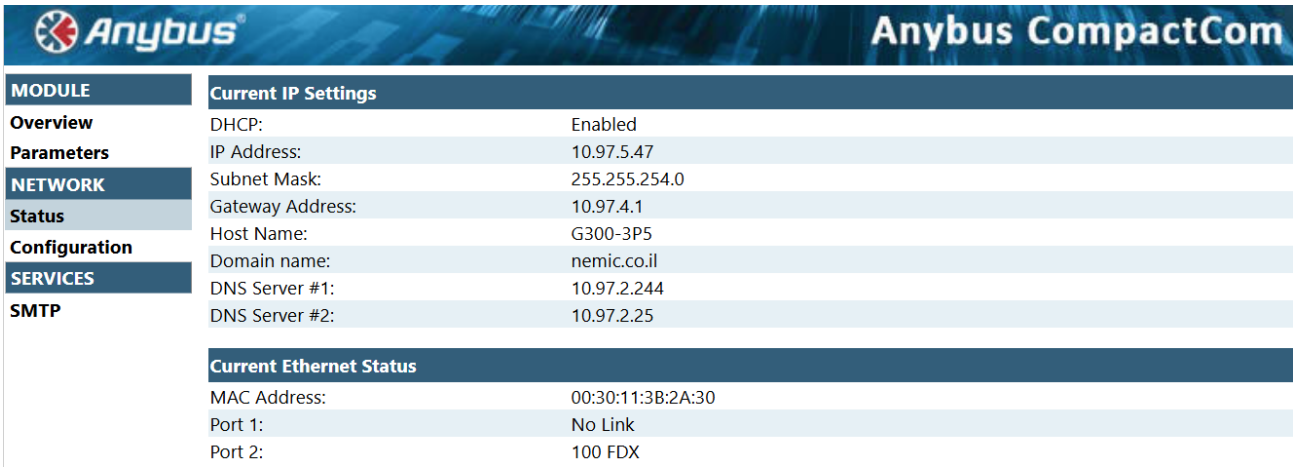

Figure 6–5: *GENESYS*™ Ethernet Settings and Status View

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:	0	1017375	299023	
In Ucast Packets:	0	486	211	
In NUcast Packets:	0	7818	3504	
In Discards:	0	0	0	
In Errors:	0	0	0	
In Unknown Protos:	0	0	0	
Out Octets:	0	216659	218514	
Out Ucast Packets:	0	251	256	
Out NUcast Packets:	0	17	25	
Out Discards:	0	0	0	
Out Errors:	0	0	0	

Figure 6–6: *GENESYS*™ Interface Counters View

6.5.3 Media Counters View

Media Counters view provides general information related to media input output counters. These counters summarize TCP protocol media errors.

Media Counters

	Port 1	Port 2	Refresh
Alignment Errors:	0	0	
FCS Errors:	0	0	
Single Collisions:	0	0	
Multiple Collisions:	0	0	
Late Collisions:	0	0	
Excessive Collisions:	0	0	
SQE Test Errors:	0	0	
Deferred Transmissions:	0	0	
MAC Receive Errors:	0	0	
MAC Transmit Errors:	0	0	
Carrier Sense Errors:	0	0	
Frame Size Too Long:	0	0	

Figure 6–7: *GENESYS*™ Media Counters View

6.5.4 EtherNet/IP Statistics View

EtherNet/IP Statistics view provides general information related to EtherNet/IP packets transfer. These counters summarize EtherNet/IP protocol errors.

EtherNet/IP Statistics

		Refresh
Established Class1 Connections:	0	
Established Class3 Connections:	0	
Connection Open Request:	0	
Connection Open Format Rejects:	0	
Connection Open Resource Rejects:	0	
Connection Open Other Rejects:	0	
Connection Close Requests:	0	
Connection Close Format Rejects:	0	
Connection Other Rejects :	0	
Connection Timeouts :	0	

Figure 6–8: *GENESYS*™ EtherNet/IP Statistics View

6.5.5 NTP Status View

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

NTP Status

		Refresh
Status:	Not configured	
Connection error:	0	
Number of packets sent:	0	
Number of packets received:	0	
Number of discarded packets:	0	

Figure 6–9: *GENESYS*™ NTP Status View

6.6 NETWORK Configuration Page

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

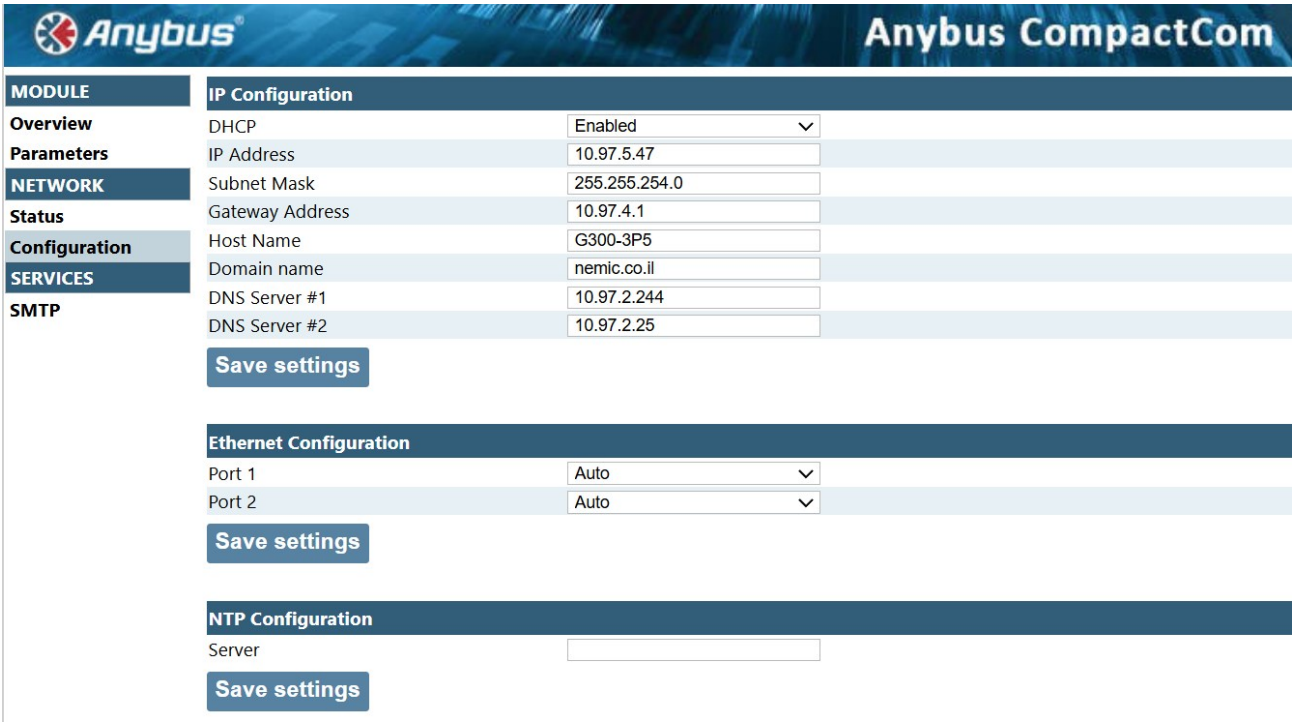

Figure 6–9: *GENESYS*™ Network Configuration View

IP Configuration section provides the ability to Enable/Disable DHCP (Dynamic Host Configuration Protocol). If DHCP is Enabled, IP Address, Subnet Mask, Gateway Address, Domain Name, DNS (Domain Name System) Server #1, and DNS Server #2 are defined automatically by DHCP server. If DHCP server is Disabled, all the above can be set manually.
Hostname may be used instead of the IP address to make a connection if the network supports DNS service for name translation. 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 DHCP Enable, Hostname is set according to Section 4.5 and Port 1 and 2 set to Auto.
2. Any setting change must be acknowledged by Save settings button.

3. Some fields (DHCP setting, 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.

6.7 SERVICES SMTP Page

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

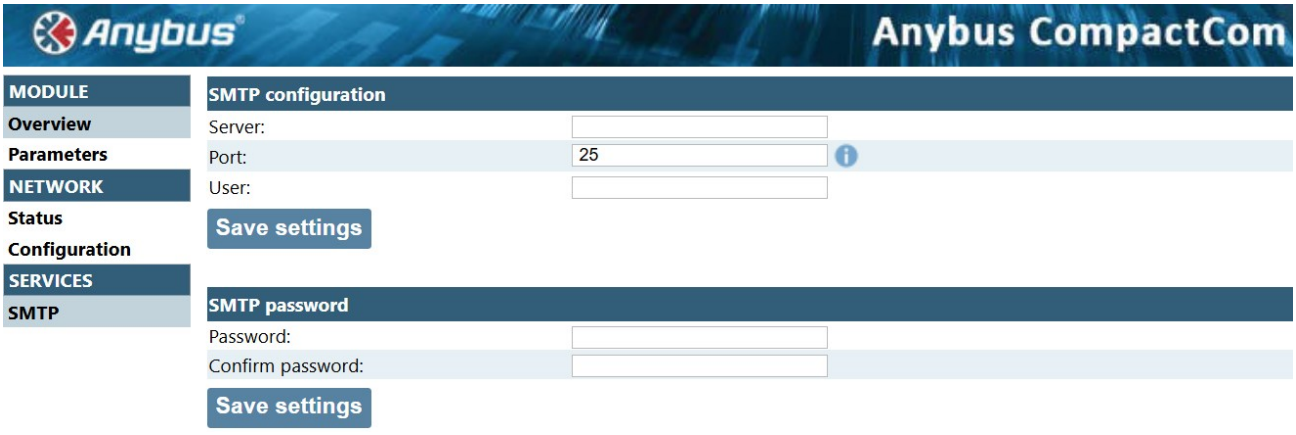

Figure 6–10: *GENESYS*™ Services SMTP View

CHAPTER 7: PROGRAMMING USING SOCKETS

7.1 Socket Description

GENESYS™ EtherNet/IP offers socket connections. Socket is a low-level protocol that is universally available in all operating systems and programming environments.

7.2 Communicating Using Sockets

Communicating through sockets involves opening a socket connection, sending commands (EtherNet/IP instance address, and parameter), and reading the responses. The function by which a programming language manages the socket is the TCP stack.

There is a single socket, TCP protocol, which may be used at port 44818.

7.3 Controller Access

Up to 4 TCP socket connections can be opened at the same time.

NOTES

1. The performance of the GENESYS™ EtherNet/IP interface is impacted as more web pages and sockets are open at the same time.
2. Multi-User control is not allowed in Multi-Drop configuration (power supplies are connected by Daisy-Chain RS485 connection).

7.4 Input Buffer Requirements

With a controller using TCP sockets, the power supply can receive commands much faster than it can process. To make sure the GENESYS™ EtherNet/IP interface is not overloaded, it is required that the controller sometimes sends a query and then waits for the response. The response is the acknowledgement from the power supply that it has finished processing all commands.

It is recommended that your controller routinely sends “SYST:ERR?” query (Instances 936-965).

NOTE

Timeout - If there is no active communication within one minute period, TCP connection is automatically closed. A new socket connection should be established to communicate with the power supply.

CHAPTER 8: CONNECTING OVER WAN

To connect over the Wide Area Network (i.e., the global internet), the following settings must be made in the network server.

8.1 View Web Pages Over WAN

The ***GENESYS™*** power supply EtherNet/IP interface has a server for running the web pages. The web server is listening in Port 80.

The network administrator must obtain and assign a Global IP for the power supply. On the network server, the network administrator also must ensure port 80 is exposed to WAN connectivity.

8.2 Use Sockets Over WAN

The network administrator must obtain and assign a Global IP for the power supply. On the network server, the network administrator also must ensure port 44818 (for TCP sockets) is exposed to WAN connectivity.

CHAPTER 9: ETHERNET/IP DATA STRUCTURE

9.1 Programming / Monitoring Values Translation

EtherNet/IP 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.

9.2 Data Type

EtherNet/IP follows the **CIP (Common Industrial Protocol)**, which organizes data into a structured hierarchy:

1. Objects (Classes) → Groups of related data. Each class has its own ID.
2. Instances → Specific sets of data within an object. Each instance represents a SCPI command / query (or a part of a command / query which its data is being stored in more then one address) and has a unique number.
3. Attributes → Individual data points within an instance. Each attribute represents the value of a SCPI command / query and has a unique number.
4. Services → Commands used to access or modify attributes. Represents Get and Set operations.

NOTE

To communicate with GENESYS+ power supplies via EtherNet/IP interface, based on the SCPI command set, always use “Parameter Object” (Class ID = 15 or 0x0F) and “Parameter Value” (Attribute number 1).

Here are some examples:

SCPI command VOLT nn is represented as follows:

1. Object ID = 15 (Parameter Object)
2. Instance = 905
3. Attribute = 1 (Parameter Value)
4. Service = 10 (Set_Attribute_Single)

SCPI query VOLT? is represented as follows:

1. Object ID = 15 (Parameter Object)
2. Instance = 905
3. Attribute = 1 (Parameter Value)
4. Service = 9 (Get_Attribute_Single)

SCPI query *IDN? is represented as follows:

1. Object ID = 15 (Parameter Object)
2. Instances = 4 to 54 (**see note below**)
3. Attribute = 1 (Parameter Value)
4. Service = 9 (Get_Attribute_Single)

NOTE

Due to limitations imposed by the CIP standard, commands / queries containing multiple elements (i.e. instances) cannot be accessed by accessing only the first instance (then reading all other instances). Each instance is accessed separately.

EtherNet/IP 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-EIP,042B113-0002,G:02.118.

Instance	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	EI	4549
15	P,	502C
16	04	3034
17	2B	3242
18	11	3131
19	3-	332D
20	00	3030
21	02	3032
22	,G	2C47
23	:0	3A30
24	2.	322E
25	11	3131
26	8	380A

NOTES

1. * Last 0 is added as the initial instance value is 0, this value is not part of the *IDN? string.
2. Instances 26–54 contain 0.

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

Register Address	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 (address 998, 4 bytes, 2 instances). 100 hours operation time is represented as:

Register Address	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 (address 196, 400 bytes, 200 instances). One second dwell for a single sequence point is represented as: 0x3F800000. Rest of the cells contain 0 if not used.

Register Address	Decimal value	Hexadecimal Data
196	0	0000
197	16256	3F80

NOTES

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

9.3 Data Access

EtherNet/IP supports three types of data access operations: Read and Write. Query commands (instances) have Read access only.

NOTES

1. Instances 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 instance 936-937 (SYSTem:ERRor? query) to verify no errors.

9.4 Data Length (Number of Instances)

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

NOTE

For commands / queries containing multiple elements (i.e. instances), Read/Write is possible only by accessing each instance separately.

9.5 Parameters Range

Each command (instance) 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 instances 936-937 (SYSTem:ERRor? query).

Some other instances (commands) such as instance 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.

9.6 Read / Write Instances

GENESYS™ EtherNet/IP supports Read and Write operations (services). Each operation is defined per command (per instance or instances range). Operation Function Code defines operation type.

Operation Name	Operation Function Code	Description
Get_Attribute_Single	0x0E	Read single instance
Set_Attribute_Single	0x10	Write single instance

NOTE

Get_Attributes_All (operation function code 0x01) is not implemented. Use Get_Attribure_Single (operation function code 0x0E) for queries.

9.7 Instances Mapping

EtherNet/IP instances are mapped according to the table below. Refer to GENESYS™ USER MANUAL (IA761-04-02_) for information regarding commands functionality.

Instance number	Get_Attribute_Single (0x0E)	Set_Attribute_Single (0x10)	Parameter range	SCPI command	Read / Write	Data type	Number of instances
1		V	0,1	*CLS	W	uint16	1
2	V	V	0–255	*ESE	RW	uint16	1
3	V		0–255	*ESR?	R	uint16	1
4	V		ASCII	*IDN?	R	char	50
54	V	V	0,1	*OPC	RW	uint16	1
55	V		0–255	*OPT?	R	uint16	1
56	V	V	0,1	*PSC	RW	uint16	1
57		V	1–4	*RCL	W	uint16	1
58		V	0,1	*RST	W	uint16	1
59		V	1–4	*SAV	W	uint16	1
60	V	V	0–255	*SRE	RW	uint16	1
61	V		0–255	*STB?	R	uint16	1
62		V	0,1	*TRG	W	uint16	1
63	V		0,1	*TST?	R	uint16	1
64		V	0,1	*WAI	W	uint16	1
65		V	0,1	ABORt	W	uint16	1
66	V	V	0,1	DISPlay[:WINDow]:STATe	RW	uint16	1
67	V	V	0,1	DISPlay[:WINDow]:FLASh	RW	uint16	1
68		V	0,1	DISPlay[:WINDow]:TEST	W	uint16	1
69		V	0,1	INITiate[:IMMediate]	W	uint16	1
70	V	V	0,1	INITiate:CONTinuous	RW	uint16	1
71		V	0,1	INSTrument:COUPle	W	uint16	1
72	V	V	0–31	INSTrument:[N]SELect	RW	uint16	1
73		V	1–4	GLOBal:*RCL	W	uint16	1
74		V	0,1	GLOBal:*RST	W	uint16	1
75		V	1–4	GLOBal:*SAVe	W	uint16	1
76		V	0–53620	GLOBal:CURRent[:AMPLitude]	W	uint16	1
77		V	0,1	GLOBal:OUTPut[:STATe]	W	uint16	1
78		V	0–53620	GLOBal:VOLTage[:AMPLitude]	W	uint16	1
79	V		0–53620	MEASure:VOLTage[:DC]?	R	uint16	1
80	V		0–53620	MEASure:CURRent[:DC]?	R	uint16	1
81	V		0–53620	MEASure:POWer[:DC]?	R	uint16	1
82	V	V	0,1	OUTPut[:STATe]	RW	uint16	1

Instance number	Get_Attribute_Single (0x0E)	Set_Attribute_Single (0x10)	Parameter range	SCPI command	Read / Write	Data type	Number of instances
83	V	V	0,1	OUTPut:ENA[:STATe]	RW	uint16	1
84	V	V	0,1	OUTPut:ENA:POLarity	RW	uint16	1
85	V	V	0,1	OUTPut:ILC[:STATe]	RW	uint16	1
86	V		1–4	OUTPut:MODE?	R	uint16	1
87	V	V	0,1	OUTPut:PON[:STATe]	RW	uint16	1
88		V	0,1	OUTPut:PROTection:CLEar	W	uint16	1
89	V	V	0–2	OUTPut:PROTection:FOLDback[:MODE]	RW	uint16	1
90	V	V	1–255	OUTPut:PROTection:FOLDback:DELay	RW	uint16	1
91	V	V	0,1	OUTPut:RELay1[:STATe]	RW	uint16	1
92	V	V	0,1	OUTPut:RELay2[:STATe]	RW	uint16	1
93	V	V	0–2	OUTPut:TTLTrg:MODE	RW	uint16	1
94	V	V	0,1–9999	[PROGram]:COUNter	RW	uint16	1
95	V	V	0–53620	[PROGram]:LIST:CURRent	RW	uint16	100
195		V	0,1	Upload [PROGram]:LIST:CURRent registers	W	uint16	1
196	V	V	0.001–129600	[PROGram]:LIST:DWELl	RW	float	200
396		V	0,1	Upload [PROGram]:LIST:DWELl registers	W	uint16	1
397	V	V	0–53620	[PROGram]:LIST:VOLTage	RW	uint16	100
497		V	0,1	Upload [PROGram]:LIST:VOLTage registers	W	uint16	1
498	V	V	1–4	[PROGram]:LOAD	RW	uint16	1
499	V	V	0,1	[PROGram]:STEP	RW	uint16	1
500		V	1–4	[PROGram]:STORe	W	uint16	1
501	V	V	0–53620	[PROGram]:WAVE:CURRent	RW	uint16	100
601		V	0,1	Upload [PROGram]:WAVE:CURRent registers	W	uint16	1
602	V	V	0.001–129600	[PROGram]:WAVE:TIME	RW	float	200
802		V	0,1	Upload [PROGram]:WAVE:TIME registers	W	uint16	1
803	V	V	0–53620	[PROGram]:WAVE:VOLTage	RW	uint16	100
903		V	0,1	Upload [PROGram]:WAVE:VOLTage registers	W	uint16	1
904	V	V	0–100	Number of the points	RW	uint16	1
905	V	V	0–53620	[SOURce]:VOLTage[:LEVel][:IMMediate][:AMPLitude]	RW	uint16	1
906	V	V	0–53620	[SOURce]:CURRent[:LEVel][:IMMediate][:AMPLitude]	RW	uint16	1
907	V	V	0–64342	[SOURce]:VOLTage:PROTection:LEVel	RW	uint16	1
908	V	V	1–255	[SOURce]:VOLTage:PROTection:LOW:DELay	RW	uint16	1
909	V	V	0,1	[SOURce]:VOLTage:PROTection:LOW:STATe	RW	uint16	1
910	V	V	0–51065	[SOURce]:VOLTage:PROTection:LOW[:LEVel]	RW	uint16	1
911	V	V	0.0001–999.99	[SOURce]:CURRent:SLEW:DOWN	RW	float	2
913	V	V	0.0001–999.99	[SOURce]:CURRent:SLEW:UP	RW	float	2
915	V	V	0.0001–999.99	[SOURce]:VOLTage:SLEW:DOWN	RW	float	2

Instance number	Get_Attribute_Single (0x0E)	Set_Attribute_Single (0x10)	Parameter range	SCPI command	Read / Write	Data type	Number of instances
917	V	V	0.0001–999.99	[SOURce]:VOLTage:SLEW:UP	RW	float	2
919	V	V	0,1	[SOURce]:POWer:STATe	RW	uint16	1
920	V	V	1–53620	[SOURce]:POWer[:LEVel]	RW	uint16	1
921	V	V	0,1,2	[SOURce]:VOLTage:MODE	RW	uint16	1
922	V	V	0,1,2	[SOURce]:VOLTage:EXTernal:MODE	RW	uint16	1
923	V	V	0,1,2	[SOURce]:CURRent:MODE	RW	uint16	1
924	V	V	0,1,2	[SOURce]:CURRent:EXTernal:MODE	RW	uint16	1
925	V	V	0,1	[SOURce]:CURRent:EXTernal:LIMit[:STATe]	RW	uint16	1
926	V		0–65535	STATus:OPERation[:EVENt]?	R	uint16	1
927	V		0–65535	STATus:OPERation:CONDition?	R	uint16	1
928	V	V	0–65535	STATus:OPERation:ENABle	RW	uint16	1
929	V		0–65535	STATus:QUEStionable[:EVENt]?	R	uint16	1
930	V		0–65535	STATus:QUEStionable:CONDition?	R	uint16	1
931	V	V	0–65535	STATus:QUEStionable:ENABle	RW	uint16	1
932	V	V	0–31	SYSTem[:COMMunicate]:ADDRess	RW	uint16	1
933	V		9600–115200	SYSTem[:COMMunicate]:BAUDrate?	R	uint16	1
934	V	V	0–4	SYSTem[:COMMunicate]:INTerface	RW	uint16	1
935		V	0,1	SYSTem:ERRor:ENABle	W	uint16	1
936	V		ASCII	SYSTem:ERRor?	R	char	30
966		V	1–5	SYSTem:FRST	W	uint16	1
967	V		ASCII	SYSTem:FIRMware[:VERSion]?	R	char	30
997	V		0,1	SYSTem:PANel:LOCK?	R	uint16	1
998	V		0-4294967295	SYSTem:PON:TIME?	R	uint32	2
1000	V		0-4294967295	SYSTem:PON:TIME:AC?	R	uint32	2
1002	V	V	0,1	SYSTem:PRELoad[:STATe]	RW	uint16	1
1003	V	V	0–10000	SYSTem:PSOK:DELay	RW	uint16	1
1004	V	V	0,1	SYSTem:RANGe	RW	uint16	1
1005	V	V	1–1000	SYSTem:RIN[:LEVel]	RW	uint16	1
1006	V	V	0,1	SYSTem:RIN:STATe	RW	uint16	1
1007	V	V	0,1,2	SYSTem:REMote[:STATe]	RW	uint16	1
1008	V	V	0,1	SYSTem:SENSe[:STATe]	RW	uint16	1
1009	V	V	0,1,2	SYSTem:SLEW[:STATe]	RW	uint16	1
1010	V		0–65535	SYSTem:TEMPerature[:AMBient]?	R	uint16	1
1011		V	0,1	TRIGger[:IMMediate]	W	uint16	1
1012	V	V	0–10000	TRIGger:DELay	RW	uint16	1
1013	V	V	0,1	TRIGger:SOURce	RW	uint16	1
1014		V	0,1	SYSTem:PARallel:ACKNowledge	W	uint16	1

Instance number	Get_Attribute_Single (0x0E)	Set_Attribute_Single (0x10)	Parameter range	SCPI command	Read / Write	Data type	Number of instances
1015	V		ASCII	SYSTem:DATE?	R	char	7
1022	V	V	0,1	SYSTem[:COMMunicate]:WATCHdog:STATe	RW	uint16	1
1023	V	V	1–3600	SYSTem[:COMMunicate]:WATCHdog:TIMe	RW	uint16	1
1024	V		ASCII	SYSTem:PARallel?	R	char	6
1030	V	V	0,1	SYSTem:PSINk[:STATe]	RW	uint16	1

NOTES

1. Size of each instance: 2 bytes.
2. An out-of-range parameter might result in an unpredicted behavior of the power supply.
3. Reading (Get_Attribute_Single) an instance 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. Instances 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. Power supply must be addressed to establish communication by INSTrument:[N]SELect command (instance 72). If commands are sent to a non-selected supply, the reply is not predicted. By default, following EtherNet/IP interface selection, power supply is automatically addressed. If power supply address is changed by SYSTem[:COMMunicate]:ADDRess command (instance 932), power supply must be addressed by INSTrument:[N]SELect command (instance 72). Be aware that instance memory is preserved, even if power supply is not selected. It is mandatory to re-send corresponding instance address to ensure accurate contents, following power supply selection. INSTrument:[N]SELect query (instance 72) will always return the last addressed supply, even if a non-existing supply has been addressed (e.g., if power supply with address 10 does not exist as a master or as a daisy-chained supply, a query of INSTrument:[N]SELect will return 10 if INSTrument:[N]SELect 10 was previously sent).
8. Instance address 498 ([PROGram]:LOAD) returns 0 if a program was not previously loaded.

9.8 EtherNet/IP Unique Commands Structure

Some EtherNet/IP commands have unique functionality compared to SCPI commands, due to limited registers operations. These commands are described in this section (All other commands' parameters / return values are according to User Manual. Refer to ***GENESYS***™ 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 4 for EIP 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:COUPle

Parameter	NONE – write 0x0000; ALL - write 0x0001 as parameter.

GLOBAL:*RST

Parameter	To activate, write 0x0001 as parameter.

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 9.9 for an example of Voltage registers.

Upload [PROGram]:LIST:CURRent registers

Specific	EIP specific command used to upload [PROGram]:LIST:CURRent into power supply. Refer to Section 9.9 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 9.9 for an example.

Upload [PROGram]:LIST:DWELl registers

Specific	EIP specific command used to upload [PROGram]:LIST:DWELl into power supply. Refer to Section 9.9 for an example.

[PROGram]:LIST:VOLTage

Parameter	Each value is loaded into a single register. Refer to Section 9.9 for an example.

Upload [PROGram]:LIST:VOLTage registers

Specific	EIP specific command used to upload [PROGram]:LIST:VOLTage into power supply. Refer to Section 9.9 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 9.9 for an example of List Voltage registers.

Upload [PROGram]:WAVE:CURRent registers

Specific	EIP specific command used to upload [PROGram]:WAVE:CURRent into power supply. Refer to Section 9.9 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 9.9 for an example of List Dwell registers.

Upload [PROGram]:WAVE:TIME registers

Specific	EIP specific command used to upload [PROGram]:WAVE:TIME into power supply. Refer to Section 9.9 for an example of List Dwell registers.

[PROGram]:WAVE:VOLTage

Parameter	Each value is loaded into a single register. Refer to Section 9.9 for an example of List Voltage registers.

Upload [PROGram]:WAVE:VOLTage registers

Specific	EIP specific command used to upload [PROGram]:LIST:VOLTage into power supply. Refer to Section 9.9 for an example List Dwell registers.

Number of the points

Parameter	EIP specific command used to set the number of points of a sequence to load into a power supply. Refer to Section 9.9 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 EtherNet/IP interface.
2. SYSTEM[:COMMunicate]:LANGuage command is not available for EtherNet/IP interface.
3. SYSTem:VERSion? command is not available for EtherNet/IP 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.

9.9 Sequencer Activation

This section describes how to activate basic sequencer operation. Refer to GENESYS™ 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:

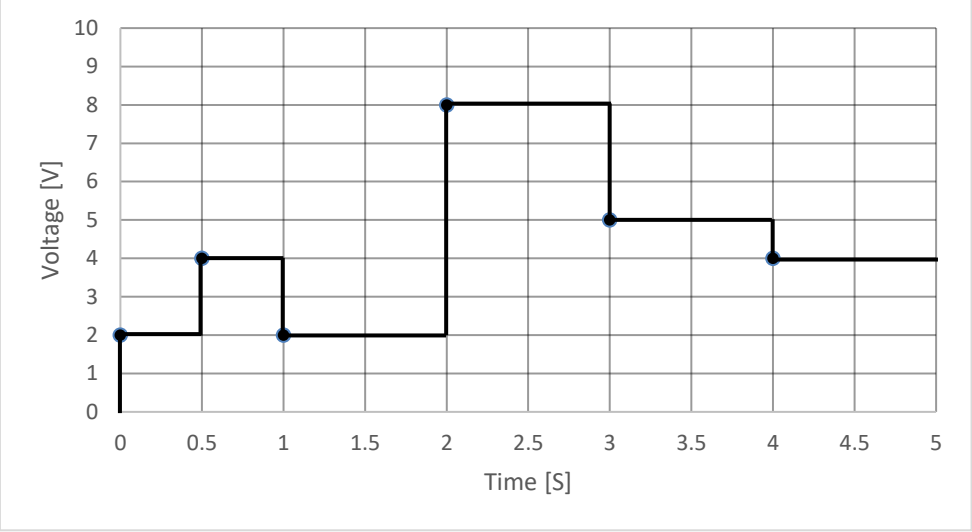

Figure 9–1: LIST Mode Example

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

EtherNet/IP Registers programming:

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

Write 0x0000 to instance 200	Set dwell value 1 Second (low instance)
Write 0x3F80 to instance 201	Set dwell value 1 Second (high instance)
Write 0x0000 to instance 202	Set dwell value 1 Second (low instance)
Write 0x3F80 to instance 203	Set dwell value 1 Second (high instance)
Write 0x0000 to instance 204	Set dwell value 1 Second (low instance)
Write 0x3F80 to instance 205	Set dwell value 1 Second (high instance)
Write 0x0000 to instance 206	Set dwell value 1 Second (low instance)
Write 0x3F80 to instance 207	Set dwell value 1 Second (high instance)
Write 0x0006 to instance 904	Indicates to load 6 points (mutual for Voltage and Dwell)
Write 0x0001 to instance 497	Upload Voltage instances into power supply sequencer
Write 0x0001 to instance 396	Upload Dwell instances into power supply sequencer
Write 0x0001 to instance 499	Set AUTO step execution mode ”AUTO”
Write 0x0001 to instance 94	Set list execution iterations ”1”
Write 0x0000 to instance 1013	Select BUS trigger source via communication interface or front panel
Write 0x0000 to instance 70	Trigger system is enabled for a single trigger action
Write 0x0001 to instance 69	Trigger initialize
Write 0x0001 to instance 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 10: MULTI DROP CONNECTION

One EtherNet/IP Interface can control more than one ***GENESYS™*** power supply. A maximum of 31 units can be connected via RS485 interface to a power supply with the installed EtherNet/IP option.

The power supply connected to a PC via the Ethernet cable must be configured to EtherNet/IP (OPT) communication interface, the other units must be configured to RS485 interface. Each unit must have a unique address, ranging from 0 to 31. EtherNet/IP module automatically receives the address of the unit into which it is installed. For RS485 interface, set Baud rate to “115200" bps and Communication Language to "SCPI". Refer to ***GENESYS™*** USER MANUAL (IA761-04-02_), Multi Power Supply Connection (Daisy-Chain) for instructions regarding system setup.

10.1 Selecting a Single Power Supply in a Multi Drop Chain

All EtherNet/IP commands may be sent to any one of the power supplies in RS485 chain by sending the INSTrument:NSELect <NR1> command (register 71). All commands and queries will then apply only to the selected power supply, until a new INSTrument:NSELect <NR1> command (instance 72) is sent.

At power-up, the EtherNet/IP master power supply is automatically selected.

After sending INSTrument:NSELect <NR1> command (instance 72), it is recommended to verify the command by sending INSTrument:NSELect? (read instance 72), to make sure the following commands are not sent to the wrong power supply.

10.2 Power Supply Configuration

To communicate over the EtherNet/IP interface, power supply must be configured to EtherNet/IP . If EtherNet/IP option is installed, by default, power supply is pre-configured to the EtherNet/IP communication.

If, for any reason, EtherNet/IP communication is not selected, navigate to communication menu and select OPT. Refer to ***GENESYS™*** USER MANUAL (IA761-04-02_) for instructions to set the EtherNet/IP (OPT) communication interface via the Front Panel or SYSTem:[COMMunicate]:INTerface <DSC> command to select communication interface by communication.

NOTE

Multi-User control is not allowed in Multi-Drop configuration (power supplies are connected by Daisy-Chain RS485 connection).

NOTES