GE

Grid Solutions

G100 Firmware Release Notes

Firmware Release Notes

MIS-0115

Version 2.20 Revision 0

GE Information

imagination at work

COPYRIGHT NOTICE

TRADEMARK NOTICES

This printed manual is recyclable.

Please return for recycling where facilities exist.

Contents

About this Document

Purpose

The purpose of this document is to outline features, capabilities and issues known to exist within the G100 Substation Gateway at the time of release.

As part of the MCP Family of Gateway products, G100 applications are shared with the G500 product.

Intended Audience

This document is an external document intended for both GE Staff and Customers. It highlights the features and capabilities of the G100 firmware.

Additional Documentation

For further information about the G100, refer to the following documents:

- *G100 Quick Start Guide (SWM0116)*
- *G100 Substation Gateway Instruction Manual (994-0155)*
- *MCP Software Configuration Guide (SWM0101)*
- *Configuring UEFI Settings on G100 User Guide (SWM0122)*

Product Support

If you need help with any aspect of your GE Grid Solutions product, you can:

- Access the GE Grid Solutions Web site
- Search the GE Technical Support library
- Contact Technical Support

GE Grid Solutions Web Site

The GE Grid Solutions Web site provides fast access to technical information, such as manuals, release notes and knowledge base topics.

Visit us on the Web at: http://www.gegridsolutions.com

GE Technical Support Library

This site serves as a document repository for post-sales requests. To get access to the Technical Support Web site, go to: http://sc.ge.com/*SASTechSupport

Contact Technical Support

For help with any aspect of your GE Grid Solutions product, please contact our support team, 24/7, as follows:

Region	E-mail	Telephone
Global Contact Centre	ga.support@ge.com	+44 1785 250070
Central and East Asia andPacific	ga.supportCEAP@ge.com	+61 414 730 964
India	ga.supportIND@ge.com	+91 44 22648000
Middle East, North Africa andTurkey	ga.supportMENAT@ge.com	+971 42929467
Europe, Russia, CIS and Sub-Saharan Africa	ga.supportERCIS@ge.com	+34 94 4858854
North America	ga.supportNAM@ge.com	+1 877 605 6777
Latin America	ga.supportLAM@ge.com	+55 11 36187308

1. Version 2.20 (19-May-2021)

Software Versions

The first release of the G100 product is based on, and has common features with G500 version 2.10, adapted to the smaller form factor platform.

The following defines the software versions required for interaction with the G100.

Package	Version	Notes
G100 Firmware	2.2.291	G100 Firmware Version.
DS Agile MCP Studio	2.3.0	Supported DS Agile MCP Studio Software.
G100 HMI Viewer	2.2.291	Supported G100 HMI 64-bit Software.

Predix Edge OS and Other Firmware Versions

The following defines the firmware versions supported for Predix Edge Linux OS and UEFI in the G100 v2.2.291.

Package/Firmware	Version	Notes
Predix Edge OS	2.5.0	Supported GE's Secured Linux Operating System Version.
UEFI	FLEBG100A00006T010	Supported UEFI Version of G100.

Key Features

G100 is part of the Multi-Function Controller Platform (MCP) family, together with G500.

The main differences between G500 and G100 are in capability, capacity, redundancy, and time synchronization methods.

G100 is designed to provide a reliable and accurate collection of data (metering, status, events and faults) from serial or LAN based intelligent substation devices to master applications such as SCADA, EMS, DMS or other enterprise applications. With its modern and robust cyber security features, the G100 is designed for smooth integration into NERC CIP and Cyber Security environments while consolidating functions such as ethernet communications, time synchronization, HMI and SCADA applications.

G100 supports the following key features as part of v2.20.

Advanced Gateway : G100 collects operational and non-operational data from substation protection, control, monitoring, RTU, and intelligent devices, pre-processes the data and moves it up to EMS and DMS SCADA systems providing centralized substation management.

Advanced Automation : G100 provides the computing platform necessary to automate substation procedures, such that intricate processes are carried out safely and efficiently by creating advanced custom automation programs using IEC 61131 compliant tools and perform basic math functions on data points using the built-in calculator tool.

Datalogging and Alarm Management : G100 supports logging of analog and binary events, including alarm management. Users have access to view and extract logged data via Runtime HMI corresponding screens (Trending, SOE, Historical Data, Active Alarms).

Automated Records (files) Retrieval and Management (ARRM)	:	G100 supports automated extraction of data files from IEDs, such as digital fault recording (DFR) records, event files, device information files, etc. Acquired files can be securely pushed automatically to remote systems.
Secure Passthrough Remote Access and VPN	:	G100 allows users to securely access substation devices from remote locations through validated interactive sessions hosted by the G500.
User Authentication	:	G100 provides Role Based Access Control (RBAC) with Local Account Authentication.
Runtime HMI	:	G100 provides user interaction with Role Based Access Control via a portable Runtime HMI application that runs in the Local unit KVM interface, as well as Remote in Windows based computers. There is no requirement to install Java/JRE on the Windows computers.
Support for Predix Edge Connectivity	:	G100 uses GE's Hardened *Predix EDGE* Operating System (Linux Yocto based) and supports secured connectivity for enrolling the unit into Predix Edge Manager. Predix Edge Manager is a GE hosted Cloud application that provides asset / fleet management of enrolled devices.

Capability and Capacity

The G100 v2.20 database and connectivity sizes are limited to a maximum of:

- Up to 24,000 total RTDB real data points (not counting pseudo points), originating from:
  - Up to 60 IEDs, and
  - Up to 60 D.20 IO modules
- Up to 4 concurrent Master connections
- Up to 2 Runtime HMI sessions

1.1.1 Standalone (non-redundant)

G100 v2.20 provides the following performance capabilities in Standalone (non-redundant) Mode.

1.1.1.1 Performance Test Levels

The performance of G100 v2.20 is tested under maximum configured system size using the activity levels and disturbance scenarios presented next.

Requirement	**Steady State** **Normal Loading**	**Avalanche** **Heavy Loading**
G100 Hardware (CPU / RAM)	2 core CPU / 8 GB RAM	2 core CPU / 8 GB RAM
Loading Signal changes (continuously/sec)	AI - 1200 DI – 12	All points changing twice in 2 secs
Number of IEDs connected to G100	60 DNP + 60 D.20 Peripherals [11 A cards, 30 C1 cards, 2 C2 cards,	60 DNP + 60 D.20 Peripherals [11 A cards, 30 C1 cards, 2 C2 cards,

	14 S cards, 3 K cards]	14 S cards, 3 K cards]
G100 total RTDB Point count	24000	24000
Points / IED (400 total)	225 - AI, 125 - DI, 20 - DO, 20 - AO, 10 - ACC + D.20 points from 60 peripherals.	225 - AI, 125 - DI, 20 - DO, 20 - AO, 10 - ACC + D.20 points from 60 peripherals.
Total number of Servers & supported points in each Server	4 DI = 1875 i.e. = 125 * 60 /4 AI = 3375 i.e. = 225 * 60 /4 AO = 300 i.e. = 20 * 60 / 4 AO = 300 i.e. = 20 * 60 / 4 ACC = 150 i.e. = 10 * 60/ 4	4 DI = 1875 i.e. = 125 * 60 /4 AI = 3375 i.e. = 225 * 60 /4 AO = 300 i.e. = 20 * 60 / 4 AO = 300 i.e. = 20 * 60 / 4 ACC = 150 i.e. = 10 * 60/ 4
Remote G100 HMI connections	1 connection	1 connection
Local G100 HMI connections	1 connection (single monitor)	1 connection (single monitor)
Datalogger / Periodic reports	120 AI mapped / 12 reports	120 AI mapped / 12 reports
ARRM	5 sessions / IED	5 sessions / IED
Alarms	12 / sec	12 / sec (twice within 2 secs)

1.1.1.2 Performance Test Results

The standalone performance test results are presented below.

Table 1.1: Standalone Performance test results

Activity	Minimum	Median	Maximum
Loading Condition	Steady State Normal Loading		
CPU utilization – (%)	39	69.88	100
Average Memory Usage (GB)	1.32 GB	1.32	1.32
Event latency (msecs)	161	502	2678
Control latency (msecs)	1	25	168

NOTE: Under steady state normal loading conditions, the control latency was measured by simulating one control every 5 seconds continuously from the Master station.

1.1.1.3 HMI Response times

G100 v2.20 HMI response times under steady state normal loading conditions are presented below.

Table 1.2: User Interface Response Time – Steady State Normal Loading

Activity	Minimum (seconds)	Median (seconds)	Maximum (seconds)
Screen Access (Point Summary)	0.7	1.4	2
Screen Access (Comm Summary/Connections Page)	1	2.5	4
System Logs	0.6	2.5	5
Alarm ACK Delay (Single Alarm)	1	1.5	2
DI/AI Update to Point Summary Screen	1	1	1
Datalogger	1	1.6	3

1.1.2 Redundancy

G100 doesn't support system/device redundancy in release v2.20.

Time Sync Accuracy (IRIG-B/NTP)

G100 supports only software based IRIG-B TTL and software based NTP Time Sync.

Time accuracy with IRIG-B TTL input is typically +/- 1ms.

Application List

The following applications are available in this released firmware version.

Application	Support in Standalone
Runtime HMI	✓ Available
One Line Viewer	✓ Available
Config GUI / Schemas	✓ Available
System Library	✓ Available
C++ System Library	✓ Available
Connection Parser	✓ Available
Calculator	✓ Available
Hardware Asset Management Application (HAMA)	✓ Limited points availability (see MCP Software Configuration Guide SWM0101)
PTP Time Sync	× Not Available
IRIG-B/NTP Time Sync (Software based)	✓ Available
D.20 Client	✓ Available

Application	Support in Standalone
GPIO Client	✓ Available
Modbus Client	✓ Available
Modbus-TCP/SSH Client	✓ Available
SEL® Binary Client	✓ Available
Analog Data Logger	✓ Available
Generic ASCII Client	✓ Available
Modbus Server	✓ Available
DNP 3.0 Server	✓ Available
DNP 3.0 Client	✓ Available
Digital Event Manager	✓ Available
Database Server	✓ Available
DNP 3.0 TCP/IP Transport Layer	✓ Available
DNP 3.0 Server Serial Transport Layer	✓ Available
DNP 3.0 DIDO	✓ Available
IEC 60870-5-101/104 Server	✓ Available
IEC 60870-5-103 Client	✓ Available
IEC 61850 Client	✓ Available
IEC 60870-5-101/104 Client	✓ Available
Event Logger	✓ Available
Real-Time Database	✓ Available
LogicLinx IEC 61131-3 Soft Logic	✓ Available
Redundancy Manager	× Not Available (Only Standalone mode is available)
System Point Manager	✓ Available
Load Shedding and Curtailment	✓ Available
Control Lockout Manager	✓ Available
Software Watchdog	✓ Available
Configuration Manager	✓ Available
IP Changer	✓ Available
MD5SUM Builder	✓ Available
System Status Manager	✓ Available
Virtual Serial Ports	✓ Available
SNMP Client	✓ Available
Automated Record Retrieval Manager	✓ Available
Software Licensing Subsystem	✓ Available
Third-party components	✓ Available

Application	Support in Standalone
Terminal Services	✓ Available
mcpcfg utility	✓ Available
E-mail Utility	✓ Available
IO Traffic Monitor	✓ Available
Firewall	✓ Available
Edge OS & Drivers	✓ Available
Secure Enterprise Connectivity	✓ Available
Genconn	✓ Available
HMI Access Manager	✓ Available
Sync Service Library	✓ Available
Sync Server Application	✓ Available
Analog Report Generator	✓ Available
OpenVPN	✓ Available

Known Issues

1.1.3 Cyber Security

GE Internal Reference #	Description
D-08565	If ICMP Echo setting is enabled in G100 and when Ping command from PC is issued to the G100 continuously, then G100 responds to the ping request when G100 is booting. However, this issue comes only in a remote case and other TCP/SCADA connections are not impacted.

1.1.4 Clients

GE Internal Reference #	Description
D-12697	The value of GPIO Digital Point (DO) is always set to '1' even after completion of PULSE command in GPIO client. However, the functionality of DO command in GPIO client is working as per the control configuration i.e. PULSE ON period followed by PULSE OFF period, however the DO value in HMI still set as "1" only.
B-13475 D-09915	SEL Binary Client doesn't support Double Precision Scaling Factors.
D-05002	ARRM file retrieval from SEL 1xx/2xx relays (using GENASCII) is not possible.

1.1.5 Servers

GE Internal Reference #	Description
D-12567	The time sync accuracy of G100 when IEC101 Server (Unbalanced/Balanced) is used as a time sync source is > +/- 4 msec.
B-11967	No support for events in NVRAM in IEC101/104 Server. Events that have not been yet transmitted to Master (Clients) are lost if G100 is power cycled / restarted. However – the integrity polls will continue to provide accurate database representation.
B-11968	No support for events in NVRAM in DNP3 Server. Events that have not been yet transmitted to Master (Clients) are lost if G100 is power cycled / restarted. However – the integrity polls will continue to provide accurate database representation.

1.1.6 Automation

GE Internal Reference #	Description
D-05033	Suppressed quality through Input Point Suppression (IPS) application is not reported to Masters. DNP3 and IEC 101-104 Servers send Online Quality rather than the substituted/last reported quality when points are suppressed.
D-12703	Load Shedding: There is no persistency of zone assignments across power restarts when user sets the zones through Analog Setpoint commands.
B-11969	DEM is responsible for handling alarms. Events/Alarms that have not been yet committed to the SQL database are lost if G500 is power cycled / restarted. However – the integrity polls will continue to provide accurate database representation.
D-12702	The EVE/CEV file retrieval from SEL relays using either SEL Binary/GenASCII client connections is not working when SEL relays are configured with virtual serial ports for communication.
DCSSUP-19948, D-12000	Restore the last value for variables configured in LogicLinx wizard does not work at runtime (defaults to 0 always).

1.1.7 Configuration/Settings

GE Internal Reference #	Description
D-10388	TACACS+ remote authentication can be enabled and activated even if the TACACS+ Server is not available in that moment. This will conduct to a device that can only be accessed using Emergency Access process, as long as TACACS+ server is not available.
D-10825	Online Editor / SNMP Agent Browser is not able to retrieve OID data if gathering data from target device takes more than 60 seconds. Workaround: configure the SNMP client offline, using OID from the end device (e.g. using a 3rd party MIB browser).

1.1.8 HMI

GE Internal Reference #	Description
B-14982	The product references in the Runtime (Local/Remote) HMI logs need to be changed as "MCP".
D-05463	If a used point group is deleted from the systemwide configuration then points belonging to that group are not visible in the point group summary. However, if user changes the point group allocation from the corresponding instantiated client map file(s) then points will be visible in the point group summary.

1.1.9 Pass-through

None.

1.1.10 System

GE Internal Reference #	Description
B-14973	The software licensing application reports core license 012 as "G500 Core", it should be "MCP Core". There is no functional impact.
D-10227	Email does not send messages when an alarm is activated.
D-05714	Update of only Edge OS is not supported. If only Edge OS updates are required, the complete G100 firmware image needs to be updated.

1.1.11 Hardware

None.

MODIFICATION RECORD

VERSION	REV.	DATE	CHANGE DESCRIPTION
1.00	0	19th May, 2021	Created for G100 Firmware Version 2.20