HORNER
APG

User Manual for the
HE660CGMx24

Gateway Module
Programmable in C

Second Edition
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MAN0025-02

PREFACE

This manual explains how to use the Horner APG Gateway Module programmable in C (CGM) for use with the GE Fanuc Genius I/O network and CEGELEC Alspa 8000 family of Programmable Logic Controllers.

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To obtain warranty service, return the product to your distributor with a description of the problem, proof of purchase, post paid, insured and in a suitable package.

ABOUT PROGRAMMING EXAMPLES

Any example programs and program segments in this manual or provided on accompanying diskettes are included solely for illustrative purposes. Due to the many variables and requirements associated with any particular installation, Horner APG cannot assume responsibility or liability for actual use based on the examples and diagrams. It is the sole responsibility of the system designer utilizing Gateway Module to appropriately design the end system, to appropriately integrate the Gateway Module and to make safety provisions for the end equipment as is usual and customary in industrial applications as defined in any codes or standards which apply.

Note: The programming examples shown in this manual are for illustrative purposes only. Proper machine operation is the sole responsibility of the system integrator.

Revisions to This Manual

This version (MAN0025-02) of the **Gateway Module Programmable in C User Manual** contains the following revisions, additions and deletions:

1. Converted manual into Word format.

2. Changed company name from Horner Electric, Inc. to Horner APG, LLC.

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CHAPTER 1: INTRODUCTION

Congratulations on your purchase of the Horner APG Gateway Module! This module may be used in any GE Fanuc Genius system. The Gateway Module provides the system designer with the ability to monitor and/or control Genius I/O.   Many applications where the module will be used as a stand-alone microcomputer or where information will be passed between the PLC or Genius and the module will allow more flexibility to the system designer.

1.1   What You Have

1.   Stand-alone CGM in a backplate mountable aluminum enclosure.

2.   This manual.

1.2   Gateway Module features

1.   Programmed via the C programming language, very versatile instruction set.

2.   Integrated Genius network Interface board (GENI) for communications on GE Fanuc's Genius Distributed I/O Network.

3.   Primary RS232C communication port for connection to a "dumb" terminal or host computer for program development.

4.   Optional auxiliary RS232C, RS485, or Modem communication port for connection to an operator interface terminal, printer, etc.

5.   Asynchronous program execution.

6.   Genius Hand Held Monitor (HHM) port for convenient network configuration.

1.3   Hardware description

The Gateway Module (HE660CGM) consists of three main components, and one optional component. They are:

A)   Metal Enclosure (2 pieces).

B)   Main Circuit Board.

C)   Genius Network Interface (GENI) Board.

E)   (Optional) Auxiliary Serial Board. (HE-BUS architecture).

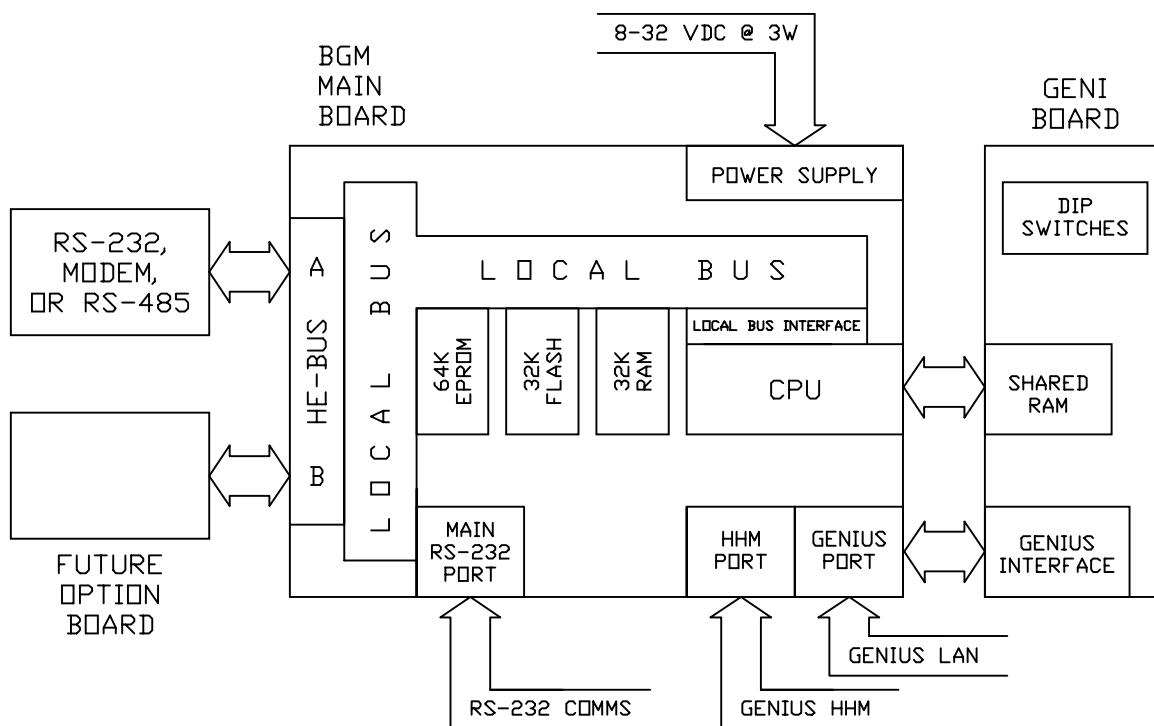The block diagram of the CGM is illustrated in **Figure 1.1**.

```
                                          ┌─ 8-32 VDC @ 3W ─┐
          BGM
          MAIN                                                              GENI
          BOARD                          ┌─────────────────┐               BOARD
                                         │  POWER SUPPLY   │
                             ┌───┬───┬───┴─────────────────┴───┐    ┌──────────────────┐
                             │   │ S │                         │    │   ┌──────────┐   │
   ┌──────────────┐       ┌──┤ A │ U │  L O C A L   B U S      │    │   │   DIP    │   │
   │   RS-232,     │  <──> │  │   │ B │                         │    │   │ SWITCHES │   │
   │   MODEM,      │       │HE│───│   │  ┌────────────────────┐ │    │   └──────────┘   │
   │  OR RS-485    │       │- │   │ L │  │ LOCAL BUS INTERFACE│ │    │                  │
   └──────────────┘       │BUS│  │ O │  ├──────┬─────┬───────┤ │    │   ┌──────────┐   │
                          │  │ │ │ C │  │ 64K  │ 32K │ 32K   │ │    │   │  SHARED  │   │
                          │  │ │ │ A │  │EPROM │FLASH│ RAM   │ │ <──>│   │   RAM    │   │
   ┌──────────────┐       │  │ B │ L │  │      │     │       │ │    │   └──────────┘   │
   │              │  <──> │  │   │   │  └──────┴─────┴──┬─────┘ │    │                  │
   │              │       └──┴───┴───┘   ┌─────┐  ┌─────┴─────┐ │    │   ┌──────────┐   │
   └──────────────┘                      │ MAIN│  │HHM │GENIUS│ │<──>│   │  GENIUS  │   │
      FUTURE                             │RS-232  │PORT│ PORT │ │    │   │INTERFACE │   │
      OPTION                             │ PORT│  └─────┴─────┘ │    │   └──────────┘   │
      BOARD                              └─────┘               │    └──────────────────┘
                                            ↑        ↑    ↑
                                            │        │    └── GENIUS LAN
                                            │        │
                                      RS-232 COMMS  GENIUS HHM
```

Figure 1.1 – CGM Block Diagram

1.3.1   Microprocessor

At the heart of the Gateway Module lies the Intel 80C152 microprocessor running at 11.0592 Megahertz. This configuration yields an instruction execution time of slightly less than one million instructions per second (at the assembly level). Internal to this chip is 256 bytes of user memory. The 80C152 can address up to 64 Kilobytes of external CODE memory (this is where the firmware resides), and up to 64 Kilobytes of external DATA memory.

1.3.2   Module Reset Options

The 80C152 microprocessor is equipped with a RESET signal that, when active, inhibits all processing activity. This RESET signal is generated for a short time immediately following power-up.

1.3.3   Primary Serial Port

The PRIMARY port located on the front of the Gateway Module incorporates a 9-pin "D" type connector for standard cable interface.

1.3.4   Flexible Memory Configuration

As stated before, the 80C152 can address up to 128 Kilobytes of external memory. This memory is divided among 3 devices, and is configured at the factory.

1.3.5   Firmware Memory

The firmware site consists of a 32 or 64 Kilobyte EPROM mapped to the 80C152's CODE space. The software in this site is a "miniature operating system", controlling user program input and execution. The upper 32 Kilobytes of CODE space can be used if the user's program exceeds 32K.

1.3.6   Data Memory

The DATA site is equipped with a 32K static ram device. This socket also contains the real-time clock hardware. The remaining DATA memory is used for all variable storage.

1.3.7   User Program Memory (Downloadable)

The PROGRAM site can be equipped with a 32K Flash EPROM or a 32K EEPROM.

1.3.8   Genius Interface

The GE Fanuc GENI board is used to interface the Gateway Module with the Genius Network.

1.3.9   Auxiliary Serial Port

The Gateway Module can optionally be equipped with a second serial port. This port is implemented as a factory installed "plug-in" option. At the time of this publication, three interfaces are available, other interfaces are currently under design.

The three interfaces currently available for the auxiliary serial port are the high performance RS232 interface, an RS485/422 interface, and the 1200-baud Hayes compatible smart-modem. If the module that you have received is equipped with the modem option, it is documented in a separate publication. The commands, statements and operators described in this manual that are used to manipulate the auxiliary serial port will affect the RS232 serial port, the RS485/422 serial port and the modem in exactly the same manner.

1.4   Specifications

Table 1.1 - Specifications	
Mounting Requirements	Backplate Mountable (no NEMA rating)
Dimensions	10.25"H x 4"H x 5.25"D
Genius Communications	Genius Network Interface (GENI)
Serial Communications	RS-232 (up to 19.2k baud) RS-422/485 (up to 19.2k baud) 1200 Baud Hayes Compatible Modem
Power Requirements	8-32 VDC, 3W
Operating Environment	0 to 60°C (32 to 140°F) 0 to 95% Relative Humidity (non-condensing)
Non-volatile Memory	32K Flash EPROM (Atmel AT29256)

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CHAPTER 2: INSTALLATION

2.1   Mounting Requirements

The CGM is designed for permanent backplate mounting. To install the CGM:

   A.   Drill four starter holes in the mounting surface (backplate) as located from the drawing in
            Appendix A.

   B.   Secure the CGM to the backplate with four #8-32 screws.

2.2   Power Requirements

The CGM requires a DC supply voltage between 8 and 32 volts. A maximum of 3W will be drawn by the
CGM. The CGM power connector is a removable, three-position screw connector. The pinout for the
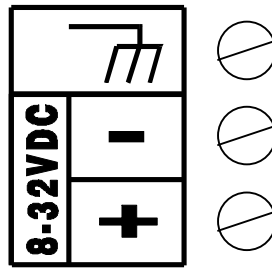connector is drawn on the cover of the CGM, and is recreated in **Figure 2.1**.

Figure 2.1 – Power Connector Pinout

2.3   Genius Network Connection

The CGM connects to the Genius LAN as a typical Genius I/O block would. The connection is drawn on
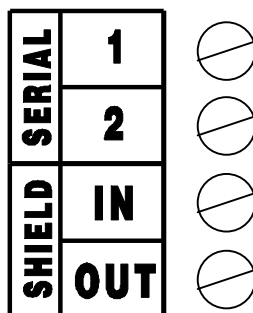the front of the CGM, and is reproduced in **Figure 2.2**.

Figure 2.2 – Genius Connector Pinout

2.4   Main RS-232 Connector

The Main RS-232 port on the CGM is the programming port. The pinout for the 9-pin "D" connector is illustrated in **Table 2.1**.

Table 2.1 – Main RS-232 Port Pinout	
Pin	**Signal**
1	DCD
2	TXD
3	RXD
4	DTR
5	GND
6	DSR
7	CTS
8	RTS
9	RI

2.5   GENI Configuration

The CGM's integrated GENI board is equipped with a bank of 8 "DIP" switches. These dip switches are exposed on the left side of the CGM.   These switches are used to configure the Genius "bus" address or "Device Number" for the CGM, and to set the Genius baud rate.

Each device on the Genius network must have a unique "Device Number" (0 to 31). The CGM may be configured for any device number. When shipped from the factory, the CGM dip switches are configured for device number 29, and for communication baud rate of 153.6K standard. Available dip switch settings are illustrated on the CGM itself, and in **Figure 2.4** below.
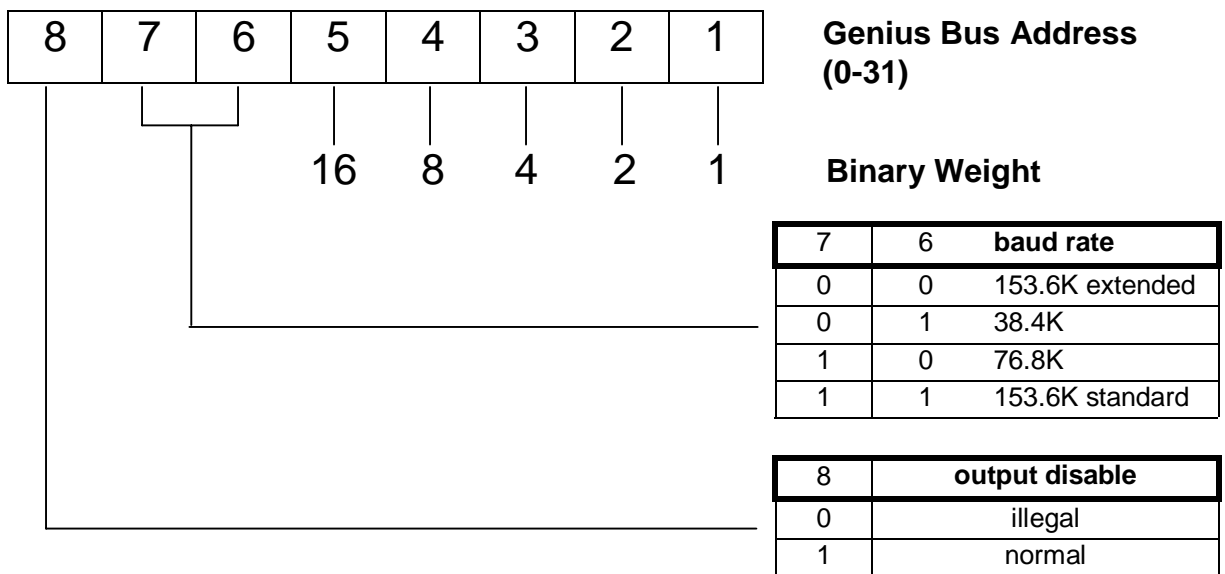

7	6	**baud rate**
0	0	153.6K extended
0	1	38.4K
1	0	76.8K
1	1	153.6K standard

8	**output disable**
0	illegal
1	normal

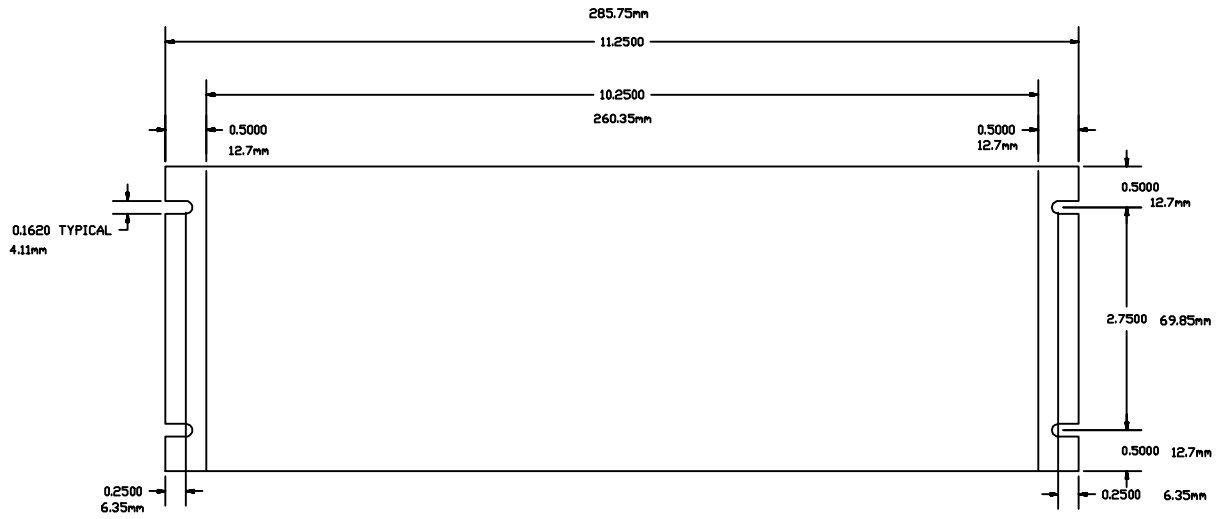**Figure 2.4 – GENI DIP Switch Assignments**

APPENDIX A: PANEL CUTOUT

Figure A.1 – Mounting Diagram

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