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GEC GEM80 Interface Reference

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Planning considerations for installing and configuring GEC GEM80 controllers

This reference provides the information you need to set up, configure, and test GEC GEM80 controllers.

Revision history

Revision	Date	Description
A	February 2015	Initial release of document.

How to use this guide

Steps for connecting and configuring a GEC GEM80 controller. Complete each step before commencing the next step.

Step	Go to
Set up controller in accordance with supplied documentation	
Set communications parameters	Communication settings for GEC GEM80
Use Quick Builder to define channels	<ul style="list-style-type: none">GEC GEM80 channel and controller reference"Build channels" topic in the <i>Quick Builder User's Guide</i>
Use Quick Builder to define controllers	<ul style="list-style-type: none">GEC GEM80 channel and controller reference"Build controllers" topic in the <i>Quick Builder User's Guide</i>
Download channel and controller definitions to the server	"Downloading items" topic in the <i>Quick Builder User's Guide</i>
Use Quick Builder to define points	Defining a GEC GEM80 address for a point parameter

Related topics

"Devices supported by the GEC GEM80 interface" on page 6

"Other documentation for GEC GEM80" on page 7

"Architectures for GEC GEM80" on page 8

"Communication settings for GEC GEM80" on page 10

"Ladder logic requirements for GEC GEM80" on page 11

"GEC GEM80 channel and controller reference" on page 13

"Defining a GEC GEM80 address for a point parameter" on page 22

Devices supported by the GEC GEM80 interface

The server supports GEC GEM80 controllers via RS-232, RS-422, and RS-485 serial links.

Other documentation for GEC GEM80

The following GEC documents contain more information.

- *GEM80 Serial Communications Manual* (GEC document T457, issue 3, February 1991)
- *GEM80/310 Series Technical Manual* (GEC document T1438, issue 2, June 1991)
- *GEM80/400 Series Technical Manual* (GEC document T1614, issue 1)

Architectures for GEC GEM80

GEM80 controllers connect to the server via an RS-232, an RS-422, or an RS-485 serial link using the standard GEM80 Extended Simple Protocol (ESP). The server supports up to seven GEM80 controllers per channel.

The following figures show typical architectures.

Point-to-point architecture

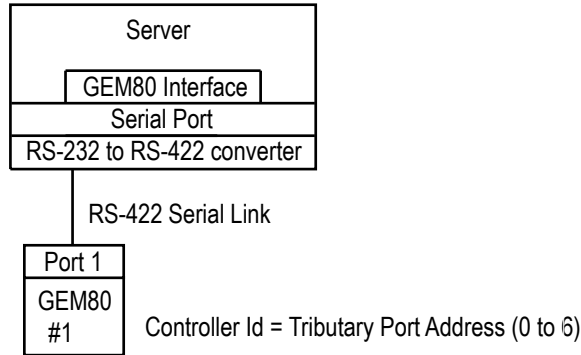


Figure 1: Point-to-point architecture

Multi-drop architecture for 310 series controllers

In a multi-drop configuration, the 310 Series controllers use current loop cabling.

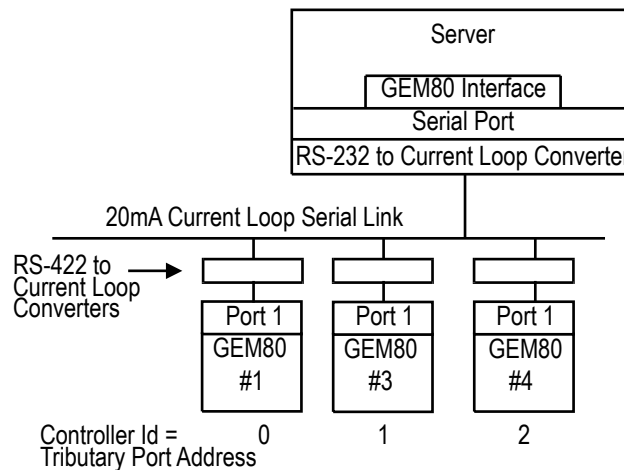


Figure 2: Multi-drop architecture for 310 series controllers

Multi-drop architecture for 400 series controllers

In a multi-drop configuration, 400 Series controllers use RS-485 cabling, not current loop.

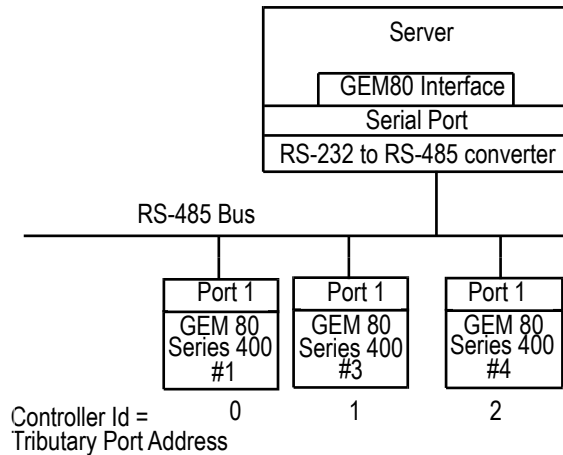


Figure 3: Multi-drop architecture for 400 series controllers

Protocols for GEC GEM80

The ESP Protocol is described in the *GEM80 Serial Communications Manual*.

Cabling for GEC GEM80

The cabling requirements vary according to architecture and controller model.

310 series controllers

Point-to-point operation:

1. Connect an RS-422 ribbon cable from Port 1 of the GEC GEM80 controller to an RS-422-to-RS-232 converter.
2. Connect the converter to an RS-232 port in the server.

Multi-drop operation:

1. Connect an RS-422 ribbon cable from Port 1 of the GEC GEM80 controller to an RS-422-to-20 mA current loop converter.
2. Connect the converter to a 20 mA current loop-to-RS-232 converter.
3. Connect the RS-232 converter to an RS-232 port in the server.
4. Connect the other controllers onto the 20 mA current loop highway.

400 series controllers

Point-to-point operation:

1. Connect an RS-232 serial cable from Port 1 of the GEC GEM80 controller to an RS-232 port in the server.
2. Swap TX and RX.
3. Feed 0V straight through.

Multi-drop operation:

1. Connect all the controllers together via an RS-485 cable connected to Port 1 of each controller.
2. Connect the RS-485 cable to an RS-485-to-RS-232 converter.
3. Connect the RS-232 converter to the RS-232 Port of the server.

Communication settings for GEC GEM80

Set up the controller's P table as follows:

310 Series	400 Series	Description
P(3)	P(10)	The baud (for example: <i>19,200</i>).
P(4)	P(11)	Set to <i>1</i> to indicate it is a tributary port.
P(5)	P(12)	Set to <i>0</i> to be a free running port.
P(6)	P(13)	The tributary address, which must be unique on a link and is between <i>0</i> and <i>6</i> . (Equivalent to the controller's ID .)
P(7)	P(14)	The block size, which you set to <i>32</i> .



Attention

400 Series controllers can have a tributary address up to 14, and a block size up to 128. However, to be consistent with earlier models, you can only use the specified ranges.

Related topics

“Main properties for a GEC GEM80 controller” on page 18

Ladder logic requirements for GEC GEM80

All read and write requests are initiated by the server, which acts as the only control port on the current loop highway. Therefore, you must set up all controllers as tributary ports.

The server communicates by writing 32 words into the controller's J table. The ladder in the controller interprets the data and takes the appropriate action, including writing any necessary response into the K table. The server then reads 32 words from the K table and processes the response.

The first two words in the message are reserved for header information, as follows:

```
J0 = ControlFlag 0 x 100 + SequenceNumber
J1 = 0 x 2000 (indicating 32 words required) + BlockNumber
K0 = Error * 0 x 200 + J0
K1 = J1
```

Where:

- *ControlFlag* is 0 for reads and 1 for writes.
- *SequenceNumber* is a number from 0 to 255, which the Server increments after each request to the controller. The ladder should reply with an error if this doesn't occur.
- *BlockNumber* is from 0 to 31.
- *Error* returned by the controller:
 - 0 = No error
 - 1 = Invalid sequence number during GEM80 I/O
 - 2 = GEM80 Reports controller error
 - 3 = GEM80 Reports block number invalid

Data reads

The server writes to J0 & J1 as described above, with the control flag reset. J2 to J31 are ignored. The server reads the 32 elements of the K table immediately and throws away the results. The server makes the read request for a second time, this time the K table contains the response from the ladder and it is processed.

The ladder gathers data of the specified size (30 words) from the specified block (block number) and writes it to the K table from locations K2 to K31. Any errors are written into K0 as specified above. The second "dummy" request is ignored.

Data writes

The Server performs a data read as described above to get a copy of the block into its memory.

It then modifies just the element of the block being controlled and writes it out to the J table from J2 to J31. Elements J0 and J1 are as specified above, except that the control flag is set. The server reads the 32 elements of the K table immediately but ignores them, including errors.

The ladder perform the data read as described above.

When the control request is sent (control flag is set), the ladder reads the contents of the J table (J2 to J31) and writes it to the specified block number in the controller.

GEC GEM80 channel and controller reference

This section describes the configuration and addressing information specific to GEC GEM80 channels and controllers.

In addition to the information contained in this reference, and for help to build channels and controllers, see the section titled "Building controllers or channels" in the *Quick Builder User's Guide*.

Related topics

"Main properties for a GEC GEM80 channel" on page 14

"Port properties for a GEC GEM80 channel" on page 16

"Main properties for a GEC GEM80 controller" on page 18

"Optimizing GEC GEM80 scanning performance" on page 19

"Planning considerations for installing and configuring GEC GEM80 controllers" on page 5

Main properties for a GEC GEM80 channel

The Main tab defines the basic properties for a GEC GEM80 channel.

For information about how to create a channel, see the topic titled "Building controllers and channels" in the *Quick Builder User's Guide*.

Property	Description
Name	The unique name of the channel. A maximum of <i>10</i> alphanumeric characters (no spaces or double quotes). Note: In Station displays, underscore characters (<i>_</i>) appear as spaces.
Description	(Optional) A description of the channel. A maximum of <i>132</i> alphanumeric characters, including spaces.
Associated Asset	The Tag Name of the Asset to be associated with the alarm group.
Marginal Alarm Limit	<p>The communications alarm marginal limit at which the channel is declared to be marginal. When this limit is reached, a high priority alarm is generated. To change the priority of the alarm system wide, see the topic titled "Configuring system alarm priorities" in the <i>Server and Client Configuration Guide</i>. To change the priority of the alarm for one channel, see the topic titled "About configuring custom system alarm priorities for an individual channel or controller" in the <i>Server and Client Configuration Guide</i>.</p> <p>A channel barometer monitors the total number of requests and the number of times the controller did not respond or response was incorrect. The barometer increments by two or more, depending on the error, and decrements for each good call.</p> <p>To calculate an acceptable marginal alarm limit, use the formula: Square root of the number of controllers on the channel \times Marginal Alarm Limit defined on those controllers (Normally, you specify the same value for all controllers on a channel).</p> <p>For example, if there are 9 controllers on the channel and their Marginal Alarm Limit is set to 25, the value would be 3 (which is the square root of 9) \times 25 = 75.</p>
Fail Alarm Limit	<p>The communications alarm fail limit at which the channel is declared to have failed. When this barometer limit is reached, an urgent alarm is generated. To change the priority of the alarm system wide, see the topic titled "Configuring system alarm priorities" in the <i>Server and Client Configuration Guide</i>. To change the priority of the alarm for one channel, see the topic titled "About configuring custom system alarm priorities for an individual channel or controller" in the <i>Server and Client Configuration Guide</i>.</p> <p>Set this to double the value specified for the channel Marginal Alarm Limit.</p>
Connect Timeout	<p>The length of time that the server attempts to connect to the controller. The server will stop trying to connect to the controller once the timeout period passes. The default value <i>10</i> seconds.</p> <p>Use the default value unless the communications line has a high error rate, or unless you are using modems.</p>
Read Timeout	<p>The length of time that the server will wait for a reply from the controller. The server will stop waiting once the timeout period passes. The default value is 2 seconds.</p> <p>Use the default value unless the communications line has a high error rate, or unless you are using modems.</p>
Item Type	The type of channel specified when this item was created.
Last Modified	The date and time the channel properties were modified.
Last Downloaded	The date and time the channel was last downloaded to the server.

Property	Description
Item Number	<p>The unique item number currently assigned to this channel, in the format <i>CHNCC</i>, where <i>cc</i> is the channel number.</p> <p>You can change the item number if you need to match your current server database configuration. The number must be between <i>01</i> and the maximum number of channels allowed for your system. For more information about setting the maximum value, see the topic titled "Adjusting sizing of non-licensed items" in the <i>Supplementary Installation Tasks Guide</i>.</p>

Port properties for a GEC GEM80 channel

The Port tab defines the communication-related properties for a channel. The properties vary according to the selected **Port Type**:

- *Serial*. Select this if you are using a Stallion EasyConnection adapter.
- *TerminalServer*. Select this if you want to connect the GEC GEM80 to the server via a LAN.
- *LANVendor*. Not applicable to GEC GEM80 controllers.

Serial port properties

Property	Description
Serial Port Name	The device name of the serial port.
Baud	The number of data bits per second. The default is <i>9600</i> .
Number of Data Bits	Set this to <i>7</i> .
Stop Bits	The number of stop bits used for transmission The default is <i>1</i> .
Parity	Set this to <i>ODD</i> .
Checksum	Set this to <i>none</i> .
XON/XOFF	The type of XON/XOFF software flow control used to stop a receiver from being overrun with messages from a sender. The types are: <ul style="list-style-type: none"> • <i>Input</i> (use XON/XOFF to control the flow of data on the receive line) • <i>none</i> (default) • <i>output</i> (use XON/XOFF to control the flow of data on the transmit line)
RS-232	Only applicable for a an RS-232 link. (The RS-232 and RS-485 settings are mutually exclusive.) Enable RTS/CTS flow control. Select this if you want to use RTS/CTS for flow control to stop a receiver from being overrun with messages from a sender. Detect DCD. Select this if the Data Carrier Detect communication status line of the COM port requires monitoring (usually when using modem or microwave linking). When selected, the communications fails if the desired COM status line is not high—for example, on a dial-up link connection for a modem. Detect DSR. Select this if the Data Set Ready communication status line of the COM port requires monitoring (usually when using modem or microwave linking). When selected, the communications fails if the desired COM status is not achieved.
RS-485	Only applicable for a an RS-485 link. (The RS-485 and RS-232 settings are mutually exclusive.) Select Enable Stallion RS-485 Half Duplex and Echo . (Echo indicates that the server expects messages it sends to the port on the transmit line to be echoed back on the receive line.)

Terminal server port properties

Property	Description
Terminal Server TCP Host Name	The name and port number of terminal server to which the channel is connected.
Terminal Server TCP Port No	You can specify either a TCP host name or an IP address, but it must match the TCP host name used when you installed and internally configured the terminal server.

Property	Description
Terminal Server TCP Port No	You can specify either a TCP host name or an IP address, but it must match the TCP host name used when you installed and internally configured the terminal server.
Idle Timeout	The time, in seconds, the channel waits for a successful connection to the server before closing the connection. A value of 0 indicates that the connection is never closed.
Checksum	The type of checksum error detection used for the port. Not applicable for this channel. Select <i>NONE</i> .

Main properties for a GEC GEM80 controller

The **Main** tab defines the basic properties for a GEC GEM80 controller.

For information about how to create a controller, see the topic titled "Building controllers and channels" in the *Quick Builder User's Guide*.

Property	Description
Name	The unique name of the controller. A maximum of <i>10</i> alphanumeric characters (no spaces or double quotes). Note: In Station displays, underscore characters (<i>_</i>) appear as spaces.
Description	(Optional) A description of the controller. A maximum of <i>132</i> alphanumeric characters, including spaces.
Associated Asset	The Tag Name of the Asset to be associated with the alarm group.
Channel Name	The name of the channel on which the controller communicates with the server. (You must have already defined a channel for it to appear in this list.)
Marginal Alarm Limit	The communications alarm marginal limit at which the controller is declared to be marginal. When this limit is reached, a high priority alarm is generated. To change the priority of the alarm system wide, see the topic titled "Configuring system alarm priorities" in the <i>Server and Client Configuration Guide</i> . To change the priority of the alarm for one controller, see the topic titled "About configuring custom system alarm priorities for an individual channel or controller" in the <i>Server and Client Configuration Guide</i> . A controller barometer monitors the total number of requests and the number of times the controller did not respond or response was incorrect. The barometer increments by two or more, depending on the error, and decrements for each good call. The default value is <i>25</i> .
Fail Alarm Limit	The communications alarm fail limit at which the controller is declared to have failed. When this barometer limit is reached, an urgent alarm is generated. To change the priority of the alarm system wide, see the topic titled "Configuring system alarm priorities" in the <i>Server and Client Configuration Guide</i> . To change the priority of the alarm for one controller, see the topic titled "About configuring custom system alarm priorities for an individual channel or controller" in the <i>Server and Client Configuration Guide</i> . Set this to double the value specified for the controller Marginal Alarm Limit. The default is <i>50</i> .
Controller ID	ID of the controller, which is between <i>0</i> and <i>6</i> and is unique on the channel. This must be the same as the controller's tributary address. For more information about tributary addresses, see the topic "Communication settings for GEC GEM80."
Item Type	The type of controller specified when this item was created.
Last Modified	The date and time the controller properties were modified.
Last Downloaded	The date and time the controller was last downloaded to the server.
Item Number	The unique item number currently assigned to this controller, in the format <i>RTUnnnnn</i> . You can change the item number if you need to match your current server database configuration. The number must be between <i>01</i> and the maximum number of controllers allowed for your system. For more information about setting the maximum value, see the topic titled "Adjusting sizing of non-licensed items" in the <i>Supplementary Installation Tasks Guide</i> .

Related topics

"Communication settings for GEC GEM80" on page 10

Optimizing GEC GEM80 scanning performance

Two types of scan packets are built for GEC GEM80 controllers:

- **Hardware diagnostic scan.** One scan per controller every 60 seconds is initiated automatically by the server to verify communications integrity with the controller. One hardware diagnostic scan is automatically created per scan packet.
- **Periodic data acquisition scan.** On demand, the server acquires a value from a controller and processes the value as a point parameter.

For each source address scanned, a scan period can be specified. The period specified depends on the nature of the parameter. A fast changing or critical parameter uses a fast rate; an infrequent or non-critical parameter (for example, SP) should use a slower rate.

Tips

- All external I/O board values can be written to data area registers and thus reduce the number of scan packets.
- External remote I/O board values can also be written to data area registers reducing the number of controllers.
- Closely blocking the scanned registers will minimize the scanning of registers not being used by the system.
- Ensure that all points within a scanning block have the same scanning period.

GEC GEM80 points reference

This section describes how to configure points for a GEC GEM80 controller using Quick Builder.

In addition to the information contained in this reference, and for help to build points, see the section titled "Building and configuring points" in the *Quick Builder User's Guide*.

Related topics


"Defining a GEC GEM80 address for a point parameter" on page 22

Defining a GEC GEM80 address for a point parameter

For **PV Source Address**, **Source Address**, and **Destination Address** the format for a GEC GEM80 controller address is:

ControllerName Address

Part	Description
<i>ControllerName</i>	The name of the GEC GEM80 controller.
<i>Address</i>	The address within the controller where the value is stored. See the section below titled "Address syntax."

If you would like help when defining an address, click  next to **Address** to display Address Builder.

Address syntax

The format for the address is:

BB WW bb DataFormat

Part	Description
<i>BB</i>	The block number, between 0 and 31.
<i>WW</i>	The word number, between 2 and 31.
<i>bb</i>	The bit number, between 0 and 15.
<i>DataFormat</i>	The data format, which can only be used for analog point parameters. See the section below titled "Data formats."

Data formats

The data format is only valid for analog point parameters. The formats are shown in the following table.

Data Format	Description	Counts	Scaled
S16B	16-bit, signed	–32767–32768	Yes
U16B	16-bit, unsigned	0–65535	Yes
U1023	10-bit, unsigned	0–1023	Yes
U4095	12-bit, unsigned	0–4095	Yes

'S' and 'U' range format types are scaled by the 0% and 100% of the HOST range values.

Related topics

“Planning considerations for installing and configuring GEC GEM80 controllers” on page 5

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- Send an email to security@honeywell.com.
- or
- Contact your local Honeywell Process Solutions Customer Contact Center (CCC) or Honeywell Technical Assistance Center (TAC) listed in the “Support and other contacts” section of this document.

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Training classes

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