



G100 Configure GPIO (G100 Only)

Learning Module Objective

At the completion of this module you will be able to identify and recite all concepts presented.

If you are viewing this as part of a structured training program *PLEASE* complete the associated assessment test. You are required to score above 80%.

Here's What is Covered in this Module

Learning & Development Module Objective

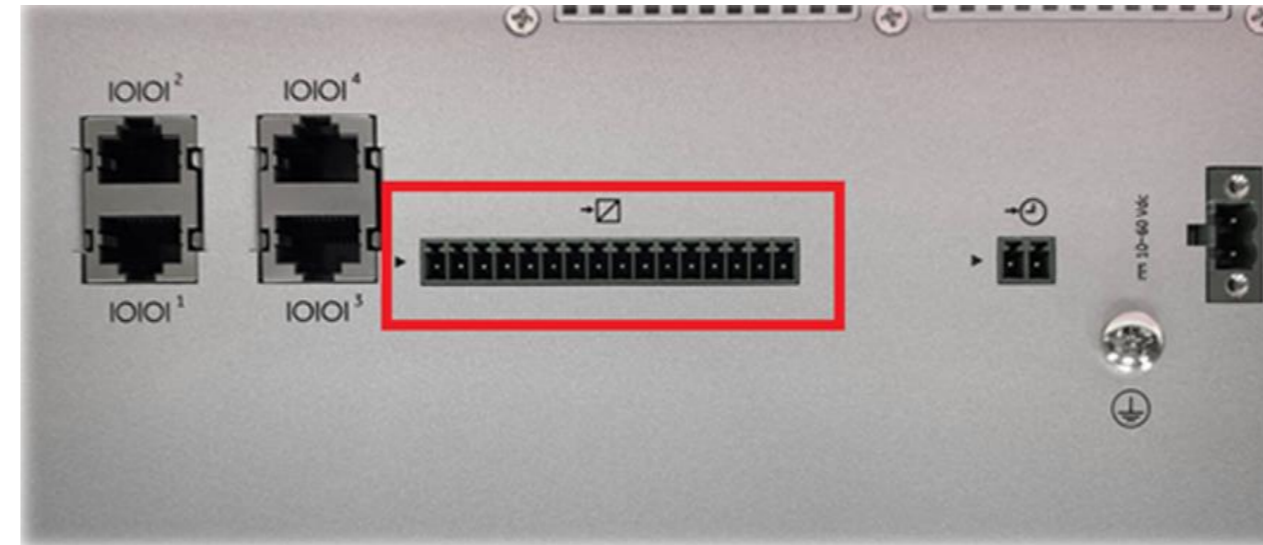
1. G100 General Purpose IO (GPIO)
2. G100 GPIO – Binary Inputs (DI)
3. G100 GPIO – Binary Outputs (DO)
4. G100 GPIO – Analog DC Inputs (AI)
5. GPIO Configuration Steps
6. GPIO Map File – Analog Input Tab
7. GPIO Map File – Digital Input Tab
8. GPIO Map File – Digital Output Tab
10. GPIO Runtime Point Details

G100 General Purpose IO (GPIO)

The G100 device is equipped with a built-in General-Purpose Input/Output (GPIO) interface. The available GPIO signal types are as follows:

Binary Inputs:

- 8 channels
- Wiring is via a pluggable connector, pitch 3.5mm x 16 pins
- Located on the bottom side panel



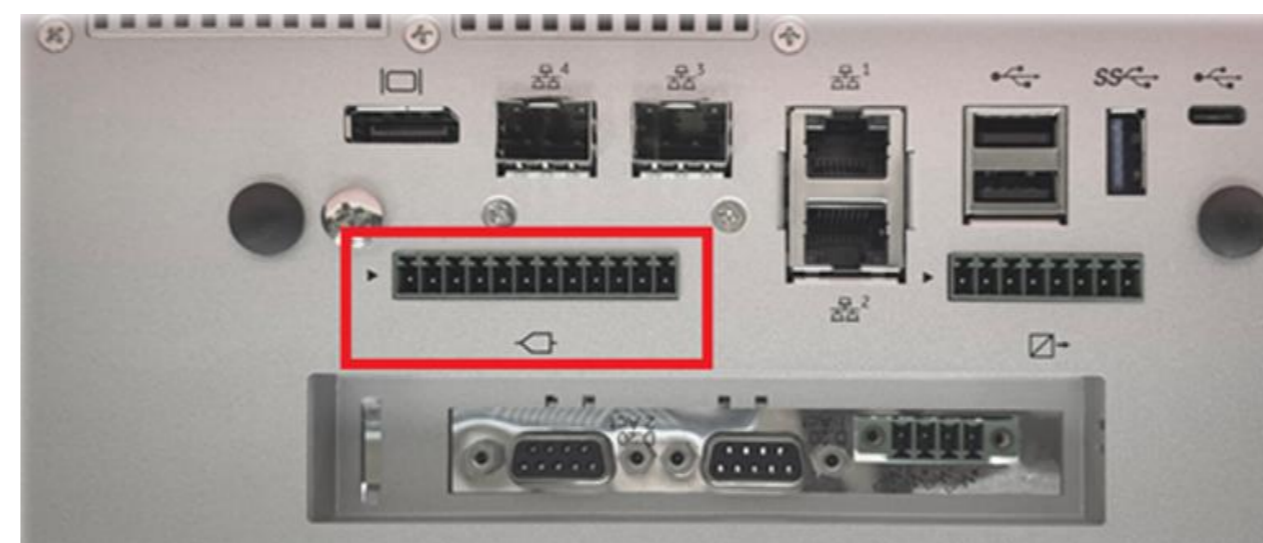
Binary Outputs:

- 4 channels
- Wiring is via a pluggable connector, pitch 3.5mm x 8 pins
- Located on the top side panel



Analog DC Inputs:

- 4 channels
- Wiring is via a pluggable connector, pitch 3.5mm x 12 pins
- Located on the top side panel



For applications and setups requiring only a few I/O points, the G100 comes with built-in general-purpose I/O.

If this is not sufficient, D.20 I/O Modules can easily be configured and connected to the G100 to extend the available physical I/O capabilities

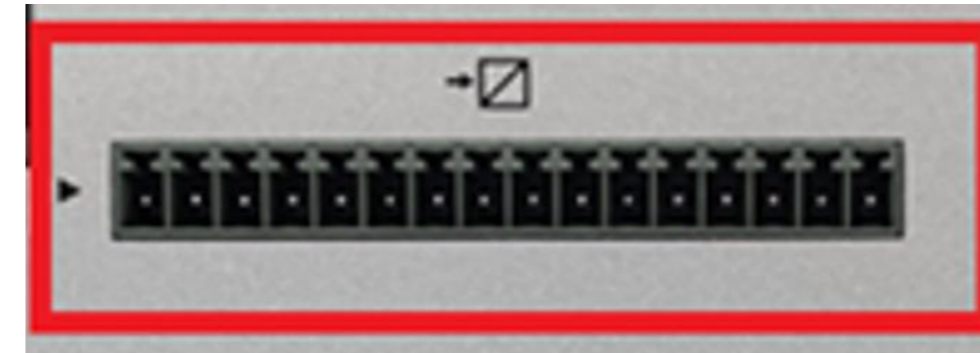
G100 GPIO – Binary Inputs (DI)

All 8 GPIO – Binary Input channels are wetted internally from main power supply circuit using single common.

- Each DI channel can be triggered by N.O. (Normal Open) potential free external contacts, with the wetted positive voltage being switched through the external contacts.
- The DI voltage supply is the same as the G100 Power Supply: 12/24/48 VDC, with each DI channel consuming typically 5mA.

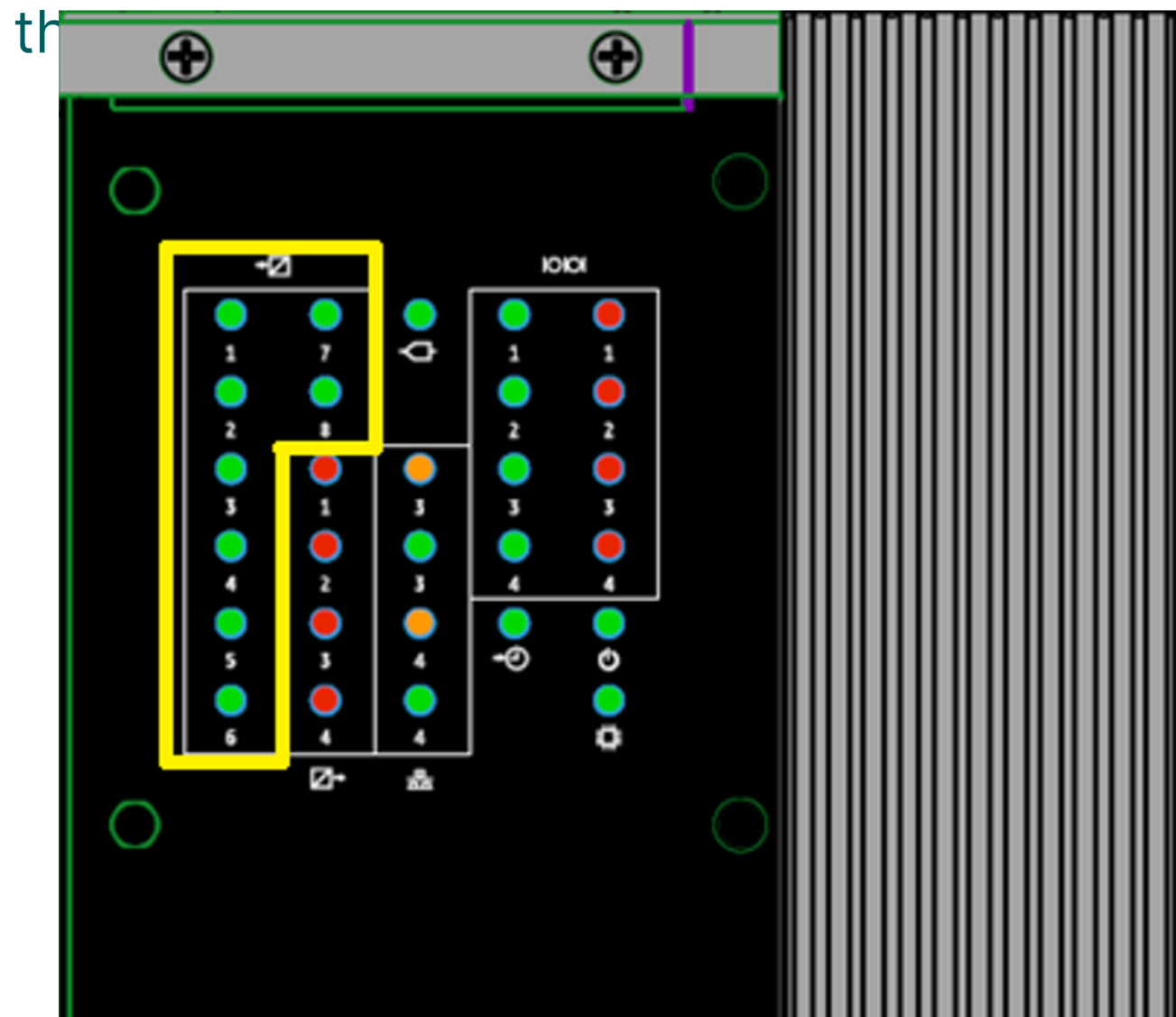
GPIO DI Connector Pin Assignments:

- The small arrow on the left indicates Pin 1



GPIO DI LED indicators:

- Each DI channel is indicated as “input active” (ON) at runtime via a numbered LED located on the front side of the board.



PIN NO.	DESCRIPTION
1 (arrow)	DI_1
2	DI_COM (+)
3	DI_2
4	DI_COM (+)
5	DI_3
6	DI_COM (+)
7	DI_4
8	DI_COM (+)
9	DI_5
10	DI_COM (+)
11	DI_6
12	DI_COM (+)
13	DI_7
14	DI_COM (+)
15	DI_8
16	DI_COM (+)

The DI wetting voltage is protected internally by the main fuse.

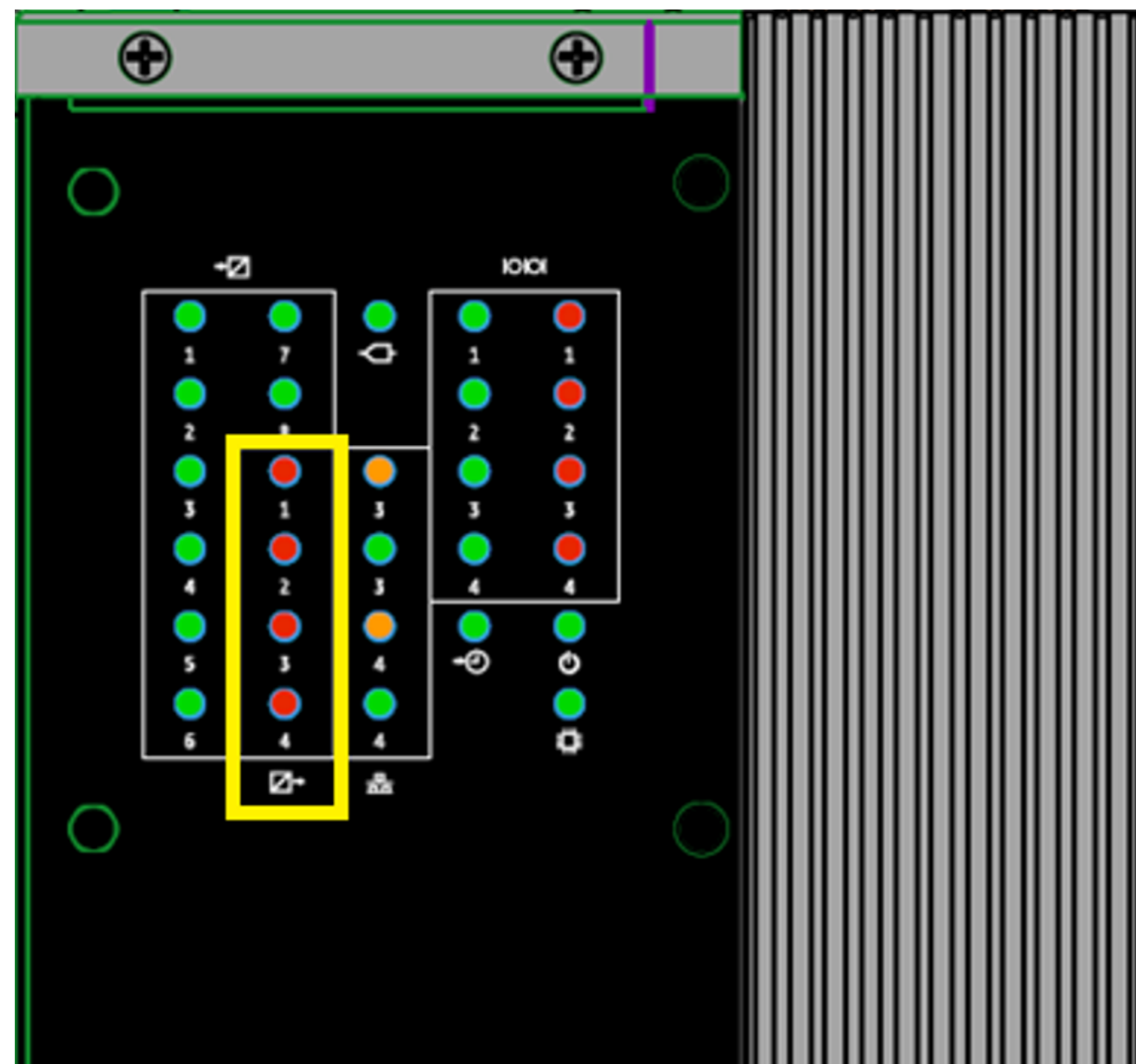
G100 GPIO – Binary Outputs (DO)

The G100 is equipped with 4 GPIO – Binary Output channels:

- Each DO channel is isolated and independent, and provides a N.O. (Normal Open) dry relay single contact, rated at 10 – 60 VDC / 1A (Max.)

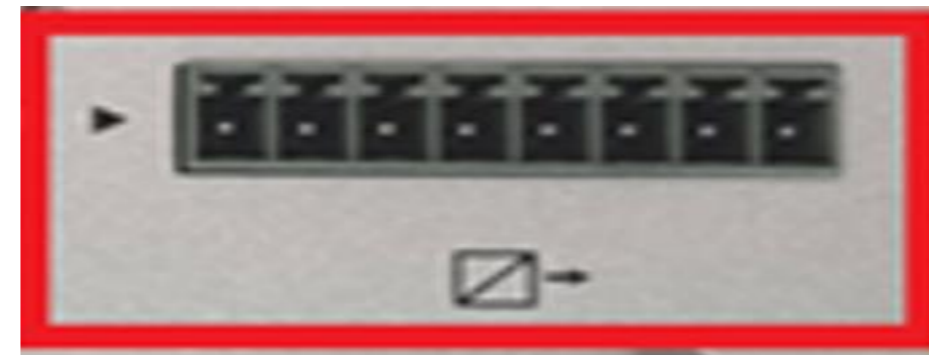
GPIO DO LED indicators:

- Each DO channel is indicated as “active” (ON) at runtime via a numbered LED located on the front side of the G100



GPIO DO Connector Pin Assignments:

- The small arrow on the left indicates PIN 1



PIN NO.	DESCRIPTION
1 (arrow)	RELAY1_NO1
2	RELAY1_COM1
3	RELAY2_NO1
4	RELAY2_COM1
5	RELAY3_NO1
6	RELAY3_COM1
7	RELAY4_NO1
8	RELAY4_COM1

The DO channels are not fused internally.

The DO operation types are PULSE, LATCH_ON and LATCH_OFF.

At runtime, commands received as CLOSE/ON are translated to LATCH_ON, and commands received as TRIP/OFF are translated to LATCH_OFF. The PULSE command types are executed as PULSE, according to their associated count and duration parameters.

G100 GPIO – Analog DC Inputs (AI)

The G100 is equipped with 4 GPIO – Analog DC Input channels. Each AI channel is configurable via internal jumpers as Full Scale either +5 VDC (Default setting) or 20 mA. The resolution is 12-bit plus sign, self-calibrating.

In the pin description, “_CHS” is the shield connection for each AI channel (all CHS are common wired internally).

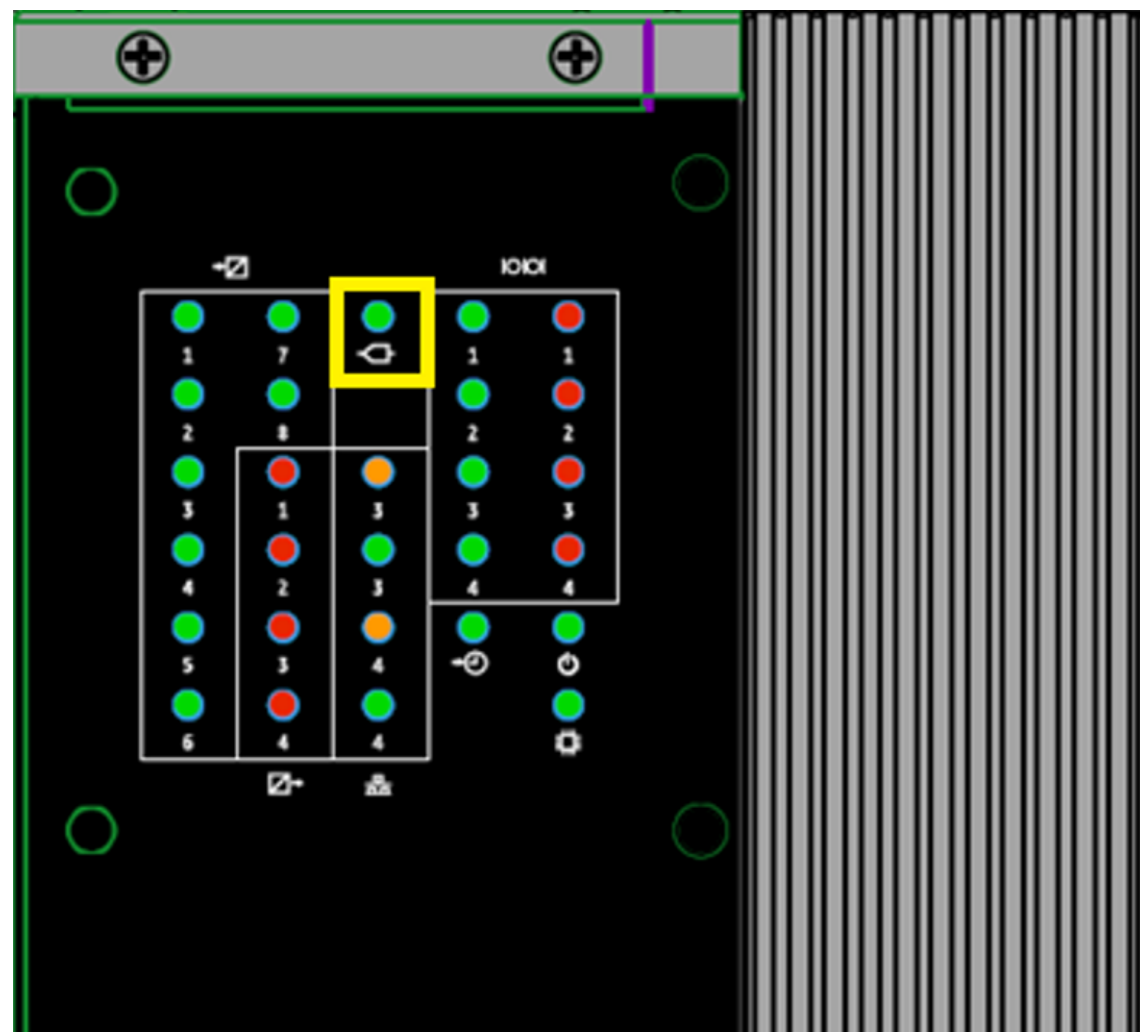
GPIO AI Connector Pin Assignments:

- The small arrow on the left indicates PIN 1



GPIO AI LED indicators:

- AI sampling is indicated at runtime via one LED (for all AI channels) located on the front side of the G100



PIN NO.	DESCRIPTION
1 (arrow)	A_VIN0+ / IIN0 +
2	A_VIN0 -
3	AGND_ISO_CHS
4	A_VIN1+ / IIN1 +
5	A_VIN1 -
6	AGND_ISO_CHS
7	A_VIN2+ / IIN2 +
8	A_VIN2 -
9	AGND_ISO_CHS
10	A_VIN3+ / IIN3 +
11	A_VIN3 -
12	AGND_ISO_CHS

GPIO AI Voltage / Current Selection Jumpers:

- The jumpers (JAI12 – JAI15) for Voltage or Current input selection are located on the GPIO internal board and their settings are:

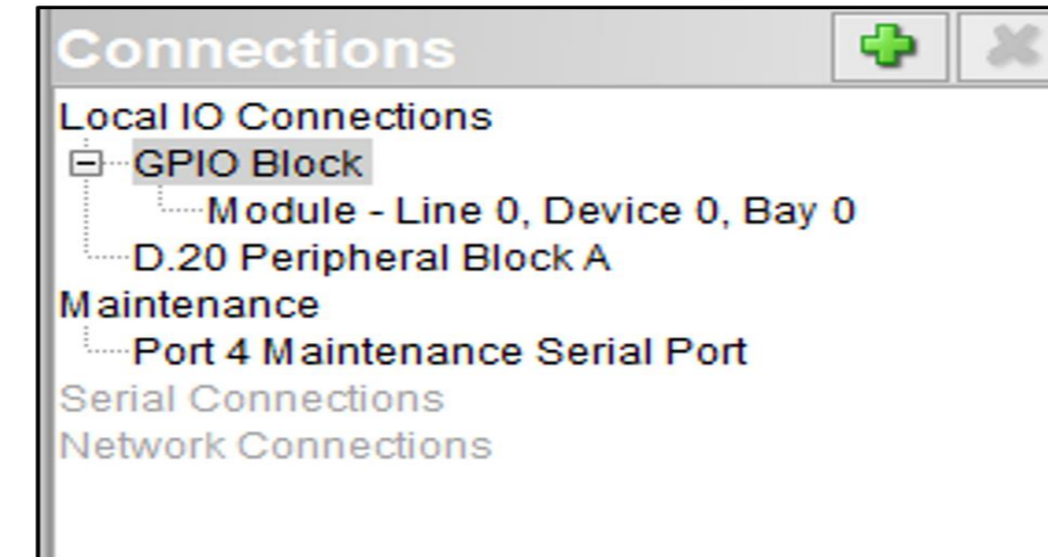
Jumper JAI12~JAI15	
1-2 (Default)	Voltage
2-3	Current



GPIO Configuration Steps

The typical sequence of steps involved in configuring GPIO using DS Agile MCP Studio's configuration tool are as follows:

1. Access the Offline or Online Editor for the G100 device
2. Click on GPIO Block located under Local IO Connections in the Connections tree
3. The Block Settings window on the right pane will display the default Line ID / Bay ID / Device ID for the GPIO, along with the default Map File -



Block Settings

Configuration Parameters

Auto Start-Up

Please specify the GPIO IED you would like to connect

Line ID	Bay ID	Device ID	Map File ▲
Line 0	Bay 0	Device 0	gpio_template.xml

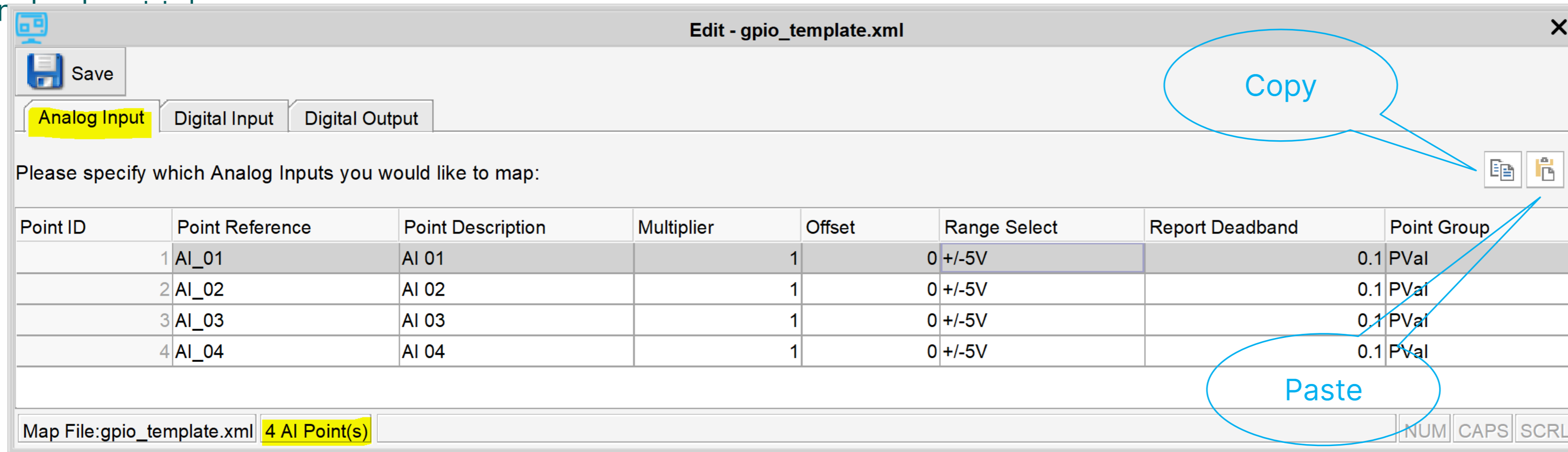
- Auto Start-Up is enabled by default
- The Line/Bay/Device ID can be populated with unique names
- The map file can be edited or changed

4. Select the map file and click Edit button to view and/or modify the map file as desired
5. Once done with the editing, click Save and enter a new name to save the map file

The default 'gpio_template.xml' can be modified but not deleted, in the case an edited map file has been saved; the dropdown menu allows using the default template again along with any modified and saved map files

GPIO Map File – Analog Input Tab

The GPIO map file editing window contains three tabs for editing (Analog Input / Digital Input / Analog Output). Within



While working with the client map file, the user can use the Copy option to copy the point details into the Excel sheet and then use Paste option to import the point details from Excel after modification.

- Number of points – 4 AI points; cannot be changed
- Point ID – Internal point ID; cannot be changed
- Point Reference – A short identifier for the point (Default: AI_0x)
- Point Description – A detailed and localized description for the point (Default: AI 0x)
- Multiplier – Scale factor of the point (m of formula $mx+b$) (Default: 1)
- Offset – Scale factor of the point (b of formula $mx+b$) (Default: 0)
- Range Select – The maximum positive and negative full-scale to be applied to the point (Default: +/- 5V)
- Report Deadband – Used to define the reporting threshold (Default: 0.1)

GPIO Map File – Digital Input Tab

Within Digital Input tab:

The screenshot shows a software window titled "Edit - gpio_template.xml" with a "Save" button and three tabs: "Analog Input", "Digital Input" (selected), and "Digital Output". Below the tabs, a message reads "Please specify which Digital Inputs you would like to map:". A table lists 8 digital input points with columns for Point ID, Point Reference, Point Description, ON State, OFF State, Debounce Filter (ms), and Point Group. The status bar at the bottom indicates "Map File:gpio_template.xml" and "8 DI Point(s)", along with "NUM", "CAPS", and "SCRL" indicators.

Point ID	Point Reference	Point Description	ON State	OFF State	Debounce Filter (ms)	Point Group
5	DI_01	DI 01	ON	OFF		0 PVal
6	DI_02	DI 02	ON	OFF		0 PVal
7	DI_03	DI 03	ON	OFF		0 PVal
8	DI_04	DI 04	ON	OFF		0 PVal
9	DI_05	DI 05	ON	OFF		0 PVal
10	DI_06	DI 06	ON	OFF		0 PVal
11	DI_07	DI 07	ON	OFF		0 PVal
12	DI_08	DI 08	ON	OFF		0 PVal

The constraints on naming convention for text description for ON state and OFF state are the same as existing applications in DSAS's configuration tool.

- Number of points – 8 DI points; cannot be changed
- Point ID – Internal point ID; cannot be changed
- Point Reference – A short identifier for the point (Default: DI_0x)
- Point Description – A detailed and localized description for the point (Default: DI 0x)
- ON State – Text description of the 1 state (Default: ON)
- OFF State – Text description of the 0 state (Default: OFF)
- Debounce Filter (ms) – Length of time used to debounce the noise (Default: 0)
- Point Group – Select the point group to which the point belongs (Default: PVal)

GPIO Map File – Digital Output Tab

Within Digital Output tab:

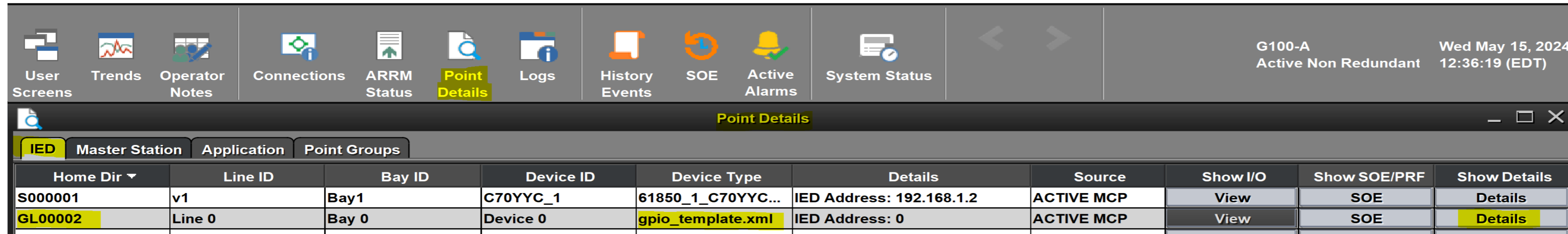
Point ID	Point Reference	Point Description	ON State	OFF State	Pulse Count	Pulse On Duration (ms)	Pulse Off Duration (ms)	Point Group
13	DO_01	DO 01	ON	OFF	1	1,000	1,000	PVal
14	DO_02	DO 02	ON	OFF	1	1,000	1,000	PVal
15	DO_03	DO 03	ON	OFF	1	1,000	1,000	PVal
16	DO_04	DO 04	ON	OFF	1	1,000	1,000	PVal

The Pulse Count / Pulse On Duration / Pulse Off Duration is overwritten by the value entered in the Digital Output Interface window when operating controls using local/remote HMI.

- Number of points – 4 DO points; cannot be changed
- Point ID – Internal point ID; cannot be changed
- Point Reference – A short identifier for the point (Default: DO_0x)
- Point Description – A detailed and localized description for the point (Default: DO 0x)
- ON State – Text description of the 1 state (Default: ON)
- OFF State – Text description of the 0 state (Default: OFF)
- Pulse Count – Determine how many operations are applied when a Pulse control type is operated (Default: 1)
- Pulse On Duration (ms) – Determine the duration the relay remains in the ON position when a Pulse is operated (Default: 1,000)
- Pulse Off Duration (ms) – Determine the duration the relay remains in the OFF position when a Pulse is operated (Default: 1,000)

GPIO Runtime Point Details

GPIO runtime point details can be accessed through the Point Details page of the Local / Remote HMI. To view these



- Click Point Details button on the toolbar once logged into the HMI.
- Click Details button for the selected GPIO device under IED tab. The Point Details page displays.
- Select a Point Type tab or All points tab, the points (real and pseudo) and point details appear.
- To send a control request, right-click the DO point and select Digital Output Interface.

GPIO Pseudo Points (Non-Text)

- DCA Status (DI) – Set to 1 if GPIO device is running normally.
- Control Received (ACC) – The number of control requests received by the DCA via the RTDB that was directed to this Application.
- Control Failed (ACC) – The number of control operation failures detected for this Application.

Point ID	Point Reference	Point Description	Data Type	Point Value
1	AI_01	AI 01	AI	0.001422
2	AI_02	AI 02	AI	954e-6
3	AI_03	AI 03	AI	-0.00219
4	AI_04	AI 04	AI	188e-6
5	DI_01	DI 01	DI	0
6	DI_02	DI 02	DI	0
7	DI_03	DI 03	DI	0
8	DI_04	DI 04	DI	0
9	DI_05	DI 05	DI	0
10	DI_06	DI 06	DI	0
11	DI_07	DI 07	DI	0
12	DI_08	DI 08	DI	0
13	DO_01	DO 01	DO	0
14	DO_02	DO 02	DO	0
15	DO_03	DO 03	DO	0
16	DO_04	DO 04	DO	0
-3	DCA Status	DCA Status	DI	1
-4006	ControlsReceived	ControlsReceived	ACC	0
-4007	ControlsFailed	ControlsFailed	ACC	0
-5000	DeviceInfo_LineID	DeviceInfo_LineID	TEXT	Line 0

-5001	DeviceInfo_DeviceID	DeviceInfo_DeviceID	TEXT	Device 0
-5002	DeviceInfo_DeviceType	DeviceInfo_DeviceType	TEXT	gpio_template.xml
-5004	DeviceInfo_BayID	DeviceInfo_BayID	TEXT	Bay 0

GPIO Pseudo Points – Text:

DeviceInfo_LineID – The Line ID of the device

DeviceInfo_DeviceID – The Device ID of the device

DeviceInfo_BayID – The Bay ID of the device

DeviceInfo_DeviceType – The map file name of the device

Thank You for Watching this Module.

If you are watching this as part of a structured learning program, please don't forget to take the test.

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