

GIM400 User Manual

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Chapter 1: Overview



Warnings



Do not allow any type of liquid to come into contact with any part of the module.



Insert all fittings fully into their mating receptacles. Failure to do so could result in injury.



Do not fold, bend or apply excessive force to any cable or fitting.

Cautions

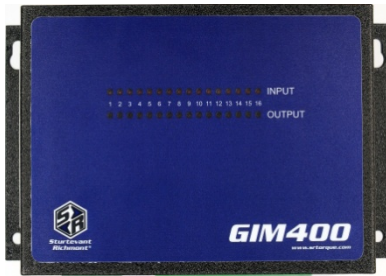
Please use caution when handling this or any other electrical appliance.

- Avoid placing or storing this module in a location where it may become wet or dust covered.
- Do not place or mount this module in an unstable area.
- Dropping this module may result in personal injury or damage to the module.
- Before performing any maintenance on the module, make sure to turn it off and remove the power plugs.
- There are no user serviceable parts inside the main enclosure of the module.

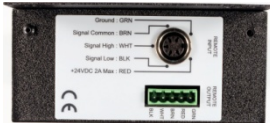
Module Overview

The GIM400 is an expansion module for the Global 400 that provides discrete I/O functions. It provides 16 user-assignable inputs with a single common reference point and 16 user-assignable outputs with a single common reference point. The outputs may be configured to be wet or dry based on how the module is wired. Up to four GIM400 modules may be chained from a single Global 400 if additional inputs or outputs are needed.

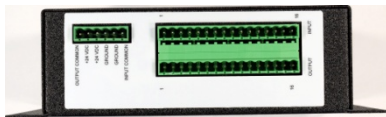
The GIM400 provides no functionality unless attached to a correctly configured Global 400.



The front of the GIM400 shows the current status of the inputs and outputs for the module or an error code if the module has detected a communications error.



The side of the GIM400 has the connectors for the communications link between the GIM400 and the Global 400 and any additional chained GIM400 modules. The greenie is used for the upstream connection to the Global 400 or the previous GIM400 in the chain. The round connector is used for the downstream connection.



The bottom of the GIM400 has the I/O signal and power connectors. The power connectors provide the input and output commons, the reference voltages, and loopback points to make the outputs wet.

The GIM400 comes with a 25 foot cable (7.6 m) to connect to the Global 400 or previous GIM400 and a terminator plug. The terminator plug should be left in the round side connector of the last GIM400 in the chain and is not needed for the other modules in the chain.

Power Up

When the module powers up, it will sweep the output LEDs and show the module address by lighting the input LED of the number matching the module address. The address will remain showing for several seconds while the module connects to the Global 400.



Chapter 2: Product Specifications



Physical Dimensions

	English		Metric	
	Value	Unit	Value	Unit
Height	5.5	in	14	cm
Width	9.0	in	22.8	cm
Depth	2.5625	in	6.5	cm

Electrical Specifications

Opto-Isolated Inputs

Item	Value			Unit
	min	typ	max	
Voltage	3.3	24	24	V DC
Current		20	60	mA
Impedance		1.5		K Ω

Relay Outputs

Item	Value	Unit
Dry contact	Voltage	24
	Current (each)	2
Wet contact	Voltage	24
	Current (each)	2
	Current (total) ¹	2

¹ Since the GIM400 is powered by the Global 400, this total is based on the maximum current available from the Global 400. When chaining multiple GIM400 modules, the current used by each module counts toward to overall 2 A maximum total current.



Chapter 3: I/O Functions



Assigning I/O Functions

The inputs and outputs must be configured before use. By default, the Global 400 does not ship with any relay configuration. To configure the inputs and outputs, you will need to use the Global Manager PC software application.

Inputs

The inputs of the GIM400 take 3.3-24VDC and have low current drain. There is a single common pin for all inputs and a signal pin for each input. The inputs can be used to select an item to run, control the qualifier, or to verify certain conditions before running an operation.

The selection inputs should not be used when the Global 400 is being controlled by a network protocol, as this will generally result in unexpected behavior. Some control inputs, notably the suspend input, may also cause unexpected behavior when used along with a network.

The inputs of the GIM400 are all edge-triggered, instead of level-triggered. For selection inputs, this means that the inputs only need to be activated momentarily. If multiple selections are active at the same time, the last one activated will take precedence. Similarly, if the network or faceplate is used to make selections as well, the most recently performed selection (network command to start an operation, button press on the Global 400 to start an operation, input activated to start an operation) will take precedence.

Selection inputs

Select Parameter #X

Inputs used: 1 per parameter

This input selects a parameter when activated. One version of this input exists for each of the 100 available parameters (eg: Select Parameter 1, Select Parameter 2, etc.). If the parameter is not configured with a valid tool, activating an assigned input will do nothing. Deactivating the input does not stop the parameter. The parameter will remain selected until the parameter is stopped or another parameter, group, or job is selected.

Select Group #X

Inputs used: 1 per group

This input selects a group when activated. One version of this input exists for each of the 100 available group (eg: Select Group 1, Select Group 2, etc.). If the group is not configured with one or more valid parameters, activating an assigned input will do nothing. Deactivating the input does not stop the group. The group will remain selected until the group is stopped or another parameter, group, or job is selected.

Select Job #X

Inputs used: 1 per job



This input selects a job when activated. One version of this input exists for each of the 100 available jobs (eg: Select Job 1, Select Job 2, etc.). If the job is not configured, activating an assigned input will do nothing. Deactivating the input does not stop the job. The parameter will remain selected until the job is stopped or another parameter, group, or job is selected.

Select Parameter (binary)

Inputs used: 2 to 7

This group of inputs is used together to select a parameter. The inputs are read together as a binary number to determine which parameter to activate. The current parameter will remain selected until the inputs correspond to another configured parameter, the parameter is stopped, or another parameter, group, or job is selected by other means.

The number of required inputs depends on the maximum parameter that will be selected. See the *Binary selection of operations and tools* section below for more details about how to assign and wire this field.

Select Group (binary)

Inputs used: 2 to 7

This group of inputs is used together to select a group. The inputs are read together as a binary number to determine which parameter to activate. The current group will remain selected until the inputs correspond to another configured group, the group is stopped, or another parameter, group, or job is selected by other means.

The number of required inputs depends on the maximum group that will be selected. See the *Binary selection of operations and tools* section below for more details about how to assign and wire this field.

Select Job (binary)

Inputs used: 2 to 7

This group of inputs is used together to select a job. The inputs are read together as a binary number to determine which job to activate. The current job will remain selected until the inputs correspond to another configured job, the job is stopped, or another parameter, group, or job is selected by other means.

The number of required inputs depends on the maximum parameter that will be selected. See the *Binary selection of operations and tools* section below for more details about how to assign and wire this field.

Stop Operation

Inputs used: 1

This input is used to stop the currently running operation when activated. While this input remains active, no parameters, groups, or jobs can be started. This input is similar to Suspend



Qualifier, except that the running operation does not automatically resume when this input is deactivated.

Control Inputs

Suspend Qualifier

Inputs used: 1

This input is used to suspend the qualifier. When this input is activated, all tools will be disabled and no results will be accepted. This input is similar to Stop Operation, except that the running operation will be resumed when this input is deactivated with the counts it had when the input was activated. While this input remains active, parameters, groups, or jobs can be started, but the associated tools will not be enabled until this input is deactivated.

Batch Reset

Inputs used: 1

This input is used to reset the batch of the running operation. If the current operation is a group, the batch count for all parameters in the group will be reset. If the current operation is a job, the batch count for the current step in the job will be reset, but the job itself will not be restarted.

Operation Reset

Inputs used: 1

This input is used to reset the running operation. This input is the same as Batch Reset, except when running a job. When a job is running, activating this input will restart the entire job at the first step.

Clear VIN

Inputs used: 1

This input is used to clear the VIN from the qualifier. This input will clear the VIN regardless of the source that initially provided it (barcode or Ethernet).

Clear ID Part 2

Inputs used: 1

This input is used to clear the ID Part 2 field from the qualifier. This input will clear the ID Part 2 regardless of the source that initially provided it (barcode or Ethernet).

Clear ID Part 3

Inputs used: 1

This input is used to clear the ID Part 3 field from the qualifier. This input will clear the ID Part 3 regardless of the source that initially provided it (barcode or Ethernet).



Clear ID Part 4

Inputs used: 1

This input is used to clear the ID Part 4 field from the qualifier. This input will clear the ID Part 4 regardless of the source that initially provided it (barcode or Ethernet).

Clear All Identifiers

Inputs used: 1

This input is used to clear the VIN and ID Parts 2-4 fields from the qualifier. This input will clear the identifiers regardless of the source(s) that initially provided them (barcode or Ethernet).

Bypass VIN

Inputs used: 1

This input is used to bypass the requirement to have a VIN entered to perform an operation. While this input is active, the “Require VIN to run” qualifier setting is ignored. If this input is deactivated during an operation while the Require VIN setting is set to Yes and no VIN is entered, the Global 400 will be suspended.

Verification Inputs

Verify Tool #X

Inputs used: 1 per tool

This input is used to indicate that a tool has been picked up by an operator. One copy of this field exists for each of the 16 available tools. The input should be inactive when the tool is returned to the tool tray or storage location. When these inputs are defined, the qualifier will automatically suspend if an incorrect combination of tools has been picked up by the operator.

Verify Holding Tool #X

Inputs used: 1 per tool

This input is used to indicate that a holding tool has been picked up by an operator. One copy of this field exists for each of the 8 available holding tools. The input should be inactive when the holding tool is returned to the tool tray or storage location. When these inputs are defined, the qualifier will automatically suspend if an incorrect combination of holding tools has been picked up by the operator.

Verify Socket #X

Inputs used: 1 per socket

This input is used to indicate that a socket or bit has been picked up by an operator. One copy of this field exists for each of the 100 available sockets. Parameters must be configured to indicate which socket(s) should be active for the parameter to run. When configured, the qualifier will automatically suspend if an incorrect combination of socket inputs are activated.



Up to 100 sockets may be defined.

While the primary use case of these inputs is to be used with a socket or bit tray, any source, such as a PLC output, may be used.

Verify Tool (binary)

Inputs used: 2-5

This group of inputs is used together to indicate which tool has been picked up by an operator. The inputs are read together as a binary number to determine which tool, if any, is picked up. When no tools or multiple tools are picked up, this group of inputs should be 0. When these inputs are defined, the qualifier will automatically suspend if an incorrect tool has been picked up by the operator.

The number of required inputs depends on the maximum tool number that will be indicated. See the *Binary selection of operations and tools* section below for more details about how to assign and wire this field.

Verify Holding Tool (binary)

Inputs used: 2-4

This group of inputs is used together to indicate which holding tool has been picked up by an operator. The inputs are read together as a binary number to determine which holding tool, if any, is picked up. When no holding tools or multiple holding tools are picked up, this group of inputs should be 0. When these inputs are defined, the qualifier will automatically suspend if an incorrect holding tool has been picked up by the operator.

The number of required inputs depends on the maximum holding tool number that will be indicated. See the *Binary selection of operations and tools* section below for more details about how to assign and wire this field.

Verify Socket (binary)

Inputs used: 2-7

This group of inputs is used together to indicate which socket or bit has been picked up by an operator. The inputs are read together as a binary number along with an offset to determine which socket or bit, if any, is picked up. When no sockets or multiple sockets in the range are picked up, this group of inputs should read as 0. When these inputs are defined, the qualifier will automatically suspend if an incorrect socket has been picked up by the operator.

Unlike other fields, this field may have an offset applied to allow multiple instances of this field when multiple socket trays with binary interfaces are used with a single Global 400. The offset is added to the binary value represented in this field to generate the actual socket number in the Global 400. See *Chapter 5: Binary Socket Trays* for more details.

Bypass Verify Inputs

Inputs used: 1



This input is used to bypass the Verify Tool, Verify Holding Tool, and Verify Socket input requirements to perform an operation. If this input is deactivated during an operation and the correct Verify inputs are not activated, the Global 400 will be suspended.

Binary selection of operations and tools

The binary selection inputs, Select Parameter (binary), Select Group (binary), Select Job (binary) Verify Tool (binary) and Verify Holding Tool (binary), allow you to select the number of inputs to use. The more inputs that are used, the more items you can select.

Number of Inputs	Number of Selectable Items
2	3
3	7
4	15
5	31
6	63
7	100

The number of selectable items is also the maximum item number selectable for the number of inputs. For example, with 3 inputs, you can only select parameters 1-7, not any combination of 7 parameters.

Outputs

The outputs of the GIM400 are 24VDC relays that can provide a total of 2A across all outputs of all attached modules if configured with wet outputs. The GIM400 has a single common pin for the high side of all relays and a signal pin for each output. If you want the outputs to operate wet, connect the +24VDC to the relay common pin. The outputs can be used to report the status of the qualifier.

Parameter #X Active

Outputs used: 1 per parameter

This output indicates when a parameter is active, either because it was selected directly or as part of a group or job. One copy of this field exists for each of the 100 available parameters. The output will remain active while the Global 400 is suspended if the associated parameter is selected.

Group #X Active

Outputs used: 1 per group

This output indicates when a group is active, either because it was selected directly or as part of a job. One copy of this field exists for each of the 100 available groups. The output will remain active while the Global 400 is suspended if the associated group is selected.

Job #X Active

Outputs used: 1 per job



This output indicates when a job is active. One copy of this field exists for each of the 100 available jobs. The output will remain active while the Global 400 is suspended if the associated job is selected.

Parameter Active (binary)

Outputs used: 2 to 7

This group of outputs is used together to indicate the number of the currently selected parameter. The outputs are read together as a binary number to determine which parameter, if selected, is active. This field will only have a value if a parameter was selected directly and will not indicate parameters activated as part of a group or job. When a parameter is not selected directly, this output group will read as 0. The value of this field will not be cleared during suspend.

The number of required outputs depends on the maximum parameter that will be indicated. See the *Binary representation of active operations and tools* section below for more details about how to assign and wire this field.

Group Active (binary)

Outputs used: 2 to 7

This group of outputs is used together to indicate the number of the currently selected group. The outputs are read together as a binary number to determine which group, if any, is selected. This field will only have a value if a group was selected directly and will not indicate groups activated as part of a job. When a group is not selected directly, this group of outputs will read as 0. The value of this field will not be cleared during suspend.

The number of required outputs depends on the maximum group that will be indicated. See the *Binary representation of active operations and tools* section below for more details about how to assign and wire this field.

Job Active (binary)

Outputs used: 2 to 7

This group of outputs is used together to indicate the number of the currently selected job. The outputs are read together as a binary number to determine which job, if any, is selected. When a job is not selected, this group of outputs will read as 0. The value of this field will not be cleared during suspend.

The number of required outputs depends on the maximum job that will be indicated. See the *Binary representation of active operations and tools* section below for more details about how to assign and wire this field.

Tool #X Active

Outputs used: 1 per tool

This output indicates when a tool is active. A tool is active whenever a parameter that uses it is active, either because the parameter was selected directly or as part of a group or job. One copy



of this output exists for each of the 16 available tools. The output will remain active while the Global 400 is suspended if the associated tool was in use at the time of suspend.

Holding Tool #X Active

Outputs used: 1 per tool

This output indicates when a holding tool is active. A holding tool is active whenever a parameter that uses it is active, either because the parameter was selected directly or as part of a group or job. One copy of this output exists for each of the 8 available holding tools. The output will remain active while the Global 400 is suspended if the associated holding tool was in use at the time of suspend.

Socket #X Active

Outputs used: 1 per socket

This output indicates when a socket is active. A socket is active whenever a parameter that uses it is active, either because the parameter was selected directly or as part of a group or job. The output will remain active while the Global 400 is suspended if the associated socket was in use at the time of suspend.

Tool Active (binary)

Outputs used: 2-5

This group of outputs is used together to indicate which tool is currently active. The outputs are read together as a binary number to determine which tool, if any, is active. When no tools are active or multiple tools are active, this group of outputs will read as 0. The value of this field will not be cleared during suspend.

The number of required outputs depends on the maximum tool number that will be indicated. See the *Binary representation of active operations and tools* section below for more details about how to assign and wire this field.

Holding Tool Active (binary)

Outputs used: 2-4

This group of outputs is used together to indicate which holding tool is currently active. The outputs are read together as a binary number to determine which holding tool, if any, is active. When no holding tools are active or multiple holding tools are active, this group of outputs will read as 0. The value of this field will not be cleared during suspend.

The number of required outputs depends on the maximum holding tool number that will be indicated. See the *Binary representation of active operations and tools* section below for more details about how to assign and wire this field.

Socket Active (binary)

Outputs used: 2-7



This group of outputs is used together to indicate which socket is currently active. The outputs are read together as a binary number along with an offset to determine which socket, if any, is active. When no sockets in the range are active or multiple sockets in the range are active, this group of outputs will read as 0. The value of this field will not be cleared during suspend.

Unlike other fields, this field may have an offset applied to allow multiple instances of this field when multiple socket trays with binary interfaces are used with a single Global 400. The offset is subtracted from the actual socket number in the Global 400 to generate the binary value represented in this field. See *Chapter 5: Binary Socket Trays* for more details.

Qualifier Suspended

Outputs used: 1

This output indicates if the qualifier is currently suspended.

Operation Complete

Outputs used: 1

This output will be activated every time an operation is completed. If a single parameter is running, this will be when a batch is completed. If a group is running, this will be when all parameters in the group have completed a single batch. If a job is running, this will be when the last step in the job is completed.

This output is momentary or latching based on the Batch Timeout setting on the Global 400. If the Batch Timeout is set to 0, this output will be latched until another tightening occurs, another operation is started, or the operation is stopped. If the Batch Timeout is non-zero, the output will have a momentary duration matching the Batch Timeout.

Cycle

Outputs used: 1

This output will be activated every time an accepted tightening occurs. This output will also trigger for the last cycle in a batch.

This output is momentary or latching based on the Cycle Timeout setting on the Global 400. If the Cycle Timeout is set to 0, this output will be latched until another tightening is performed or a parameter is started or stopped. If the Cycle Timeout is non-zero, the output will have a momentary duration matching the Cycle Timeout.

Reject

Outputs used: 1

This output will be activated every time a rejected tightening occurs.

This output is momentary or latching based on the Reject Timeout setting on the Global 400. If the Reject Timeout is set to 0, this output will be latched until another tightening is performed or a parameter is started or stopped. If the Reject Timeout is non-zero, the output will have a momentary duration matching the Reject Timeout.



Batch

Outputs used: 1

This output will be activated every time a batch is completed.

This output is momentary or latching based on the Batch Timeout setting on the Global 400. If the Batch Timeout is set to 0, this output will be latched until another tightening is performed or a parameter is started or stopped. If the Batch Timeout is non-zero, the output will have a momentary duration matching the Batch Timeout.

Tool #X Cycle

Outputs used: 1 per tool

This output will be activated every time the tool performs an accepted tightening. This output will also trigger for the last cycle in a batch.

This output is momentary or latching based on the Cycle Timeout setting on the Global 400. If the Cycle Timeout is set to 0, this output will be latched until another tightening is performed by the tool or the tool is disabled. If the Cycle Timeout is non-zero, the output will have a momentary duration matching the Cycle Timeout.

Tool #X Reject

Outputs used: 1 per tool

This output will be activated every time the tool performs a rejected tightening.

This output is momentary or latching based on the Reject Timeout setting on the Global 400. If the Reject Timeout is set to 0, this output will be latched until another tightening is performed by the tool or the tool is disabled. If the Reject Timeout is non-zero, the output will have a momentary duration matching the Reject Timeout.

Tool #X Batch

Outputs used: 1 per tool

This output will be activated every time the tool completes a batch.

This output is momentary or latching based on the Batch Timeout setting on the Global 400. If the Batch Timeout is set to 0, this output will be latched until another tightening is performed by the tool or the tool is disabled. If the Batch Timeout is non-zero, the output will have a momentary duration matching the Batch Timeout.

Parameter #X Cycle

Outputs used: 1 per parameter

This output will be activated every time an accepted tightening occurs for a parameter. This output will also trigger for the last cycle in a batch.

This output is momentary or latching based on the Cycle Timeout setting on the Global 400. If the Cycle Timeout is set to 0, this output will be latched until another tightening is performed for



the parameter or the parameter is stopped. If the Cycle Timeout is non-zero, the output will have a momentary duration matching the Cycle Timeout.

Parameter #X Reject

Outputs used: 1 per parameter

This output will be activated every time the tool a rejected tightening occurs for a parameter.

This output is momentary or latching based on the Reject Timeout setting on the Global 400. If the Reject Timeout is set to 0, this output will be latched until another tightening is performed for the parameter or the parameter is stopped. If the Reject Timeout is non-zero, the output will have a momentary duration matching the Reject Timeout.

Parameter #X Batch

Outputs used: 1 per parameter

This output will be activated every time a batch is completed for a parameter.

This output is momentary or latching based on the Batch Timeout setting on the Global 400. If the Batch Timeout is set to 0, this output will be latched until another tightening is performed for the parameter or the parameter is stopped. If the Batch Timeout is non-zero, the output will have a momentary duration matching the Batch Timeout.

Binary representation of active operations and tools

The binary outputs, Parameter Active (binary), Group Active (binary), Job Active (binary), Tool Active (binary), and Holding Tool Active (binary) allow you to select the number of outputs to use. The more outputs that are used, the more items you can represent.

Number of Outputs	Number of Items
2	3
3	7
4	15
5	31
6	63
7	100

The number of representable items is also the maximum item number representable for the number of outputs. For example, with 3 outputs, you can only represent parameters 1-7, not any combination of 7 parameters. If an item past the maximum number of items is active, the outputs will show 0.



Chapter 4: Configuring the module



Assigning I/O Functions

The GIM400 does not assign any meaning to its own inputs and outputs. The meaning of the inputs and outputs is determined by the Global 400 to which the module is attached. This means that the same output that was used to indicate Operation Complete when attached to one Global 400 could mean something entirely different, such as Qualifier Suspended, when attached to a different Global 400. Be sure to note the I/O configuration of the new Global 400 if moving a GIM400 between Global 400 units.

The I/O settings of the Global 400 must be configured by using the Global Manager PC application.

Module Addressing

When using multiple GIM400 modules with a single Global 400, the modules must be addressed to determine which module is providing which inputs and outputs. The addressing is indicated by the three position switch inside the module. GIM400 modules are set to address 1 when shipped from the factory. The address is read on power up and changes to the address do not apply until the module is powered down. The addresses are:

Switch 1	Switch 2	Switch 3	Address
On	Off	Off	1
Don't Care	On	Off	2
Don't Care	Don't Care	On	3
Off	Off	Off	4

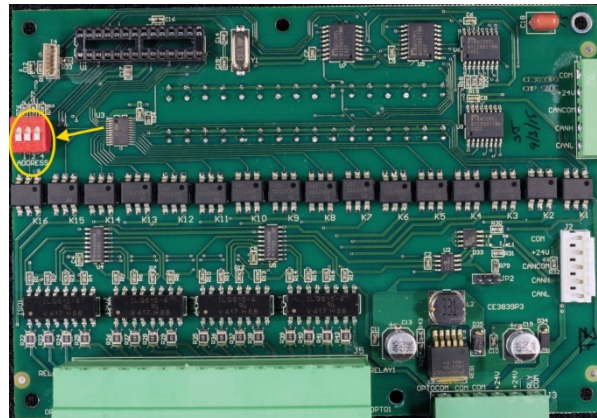


Figure 1: GIM400 internal board with address switch highlighted

The address of the module will show on powerup.



Error Status Display

The GIM400 identifies a few error conditions and will show them on the LEDs. When an error condition is encountered, the LEDs for the Input row will sweep back and forth and the Output row will show the active error.

Output	Error	Resolution
1	Communication link is broken	Ensure cable to Global 400 is attached and not broken, especially the signal lines (BRN, WHT, BLK). Ensure the link terminator is installed in the final GIM400.
2	No communication with Global 400. This could be a broken link between the GIM400 and the Global 400 if there are multiple GIM400 modules or if the Global 400 is not configured to use the module.	Ensure the Global 400 is configured to use a module at the selected address.
3	Duplicate address detected. Multiple GIM400 modules are configured with the same address.	Change the address of or disconnect one of the GIM400 modules.

Chapter 5: Binary Socket Trays

Binary selection and representation

As with the other binary inputs and outputs, you may select the number of inputs or outputs to use. The more that are used, the more sockets you can represent.

Number of I/O	Number of Sockets
2	3
3	7
4	15
5	31
6	63
7	100

Offset

In order to allow multiple binary socket trays to be used with a single Global 400, the binary socket fields have an additional offset value. This offset is combined with the binary value on the inputs or outputs to each socket tray to represent a different range of sockets in the Global 400. Note that an offset is required for multiple trays, even if they are connected to different GIM400 modules.

Example

Suppose you have 2 socket trays with 20 positions each. To represent the sockets on a tray, each will need 5 inputs and 5 outputs. The first tray may be attached with an offset of 0 and will then represent sockets 1-20 to the Global 400. The second tray must then be attached with an offset of at least 31, because the Global 400 only knows that the tray uses 5 inputs, which could allow 31 sockets, and not that the tray only has 20 sockets. If you assigned the offset of the second tray to be 40, it would represent sockets 41-60 to the Global 400.

In this configuration, the Global 400 would be able to indicate when a single socket in the 1-20 range and a single socket in the 41-60 range are active at the same time but would not be able to represent multiple sockets in the 1-20 range or multiple sockets in the 41-60 range active at the same time. Some example sockets and which value is sent to which tray are shown below:

Socket Number	Tray Number	Binary Value ²
No sockets	Both	0
1	1	1
7	1	7
20	1	20
31 ³	1	31
33	Neither	
40	Neither	
41	2	1
50	2	10
60	2	20
68 ³	2	28

² This column shows the binary value input to a Verify Socket (binary) field or the binary value output to a Socket Active (binary) field.

³ Although the tray does not have a physical slot for this socket, the Global 400 will send a value if this socket is selected in a parameter, because the value is representable in the number of outputs.