FXM-HP
RUGGED UPS MODULE
CUSTOM DATA & USER ALARMS

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CUSTOM DATA AND USER ALARMS

The FXM-HP UPS module has a Custom Data feature that allows the user flexible ways to control and monitor the system. The user can control dry contact relays, trigger custom actions/datalogging/counters/timers, and create custom conditions for user alarms. This is done by creating equations that monitor system variables that you assign. In this document we will go over setting up variables and writing equations. User Alarms are also powerful in that you can monitor a value or state and it will activate the alarm if the condition you are looking for is true. See the end of the document for a Glossary of terms.

CUSTOM DATA

For an example of how to use Custom Data, let's create a low battery relay that will not operate if within the preset Time Of Day (TOD) Time Span(s). For instance, if you have a traffic intersection that you don't want to go to flash if you are in inverter mode and have reached the low battery threshold, and it's during rush hour. This would be a good option to avoid backing up traffic for miles at some intersections. Here's a partial truth table for our scenario:

UPS Mode	In Time Span?	Battery %	Relay Status	Traffic Signal
Inverter	No	>40%	De-energized	Full Operation
Inverter	No	40% or less	Energized	Flash
Inverter	Yes	>40%	De-energized	Full Operation
Inverter	Yes	40% or less	De-energized	Full Operation

To make the "TOD Low Battery No Line" to work as above, there are some steps that need to be taken:

1. Create and set the Time Span(s)

2. Add Custom Data & Variables

3. Add a Custom Data equation for TOD Low Battery(LB) + No Line(NL) (TOD LBNL)

4. Assign dry contact relay to be driven by the equation

CREATING AND SETTING THE TIME SPAN(S)

In the search box of the web page, type "create time" and then enter. Select the "Create Time Span" wizard. The wizard will appear with the following options:

- Name – Enter "Morning Rush"

- Choose Days To Run – Select "Weekdays"

- Start Time – Enter the start time of the rush hour

- End Time – Enter the end time of the rush hour. Click "Next" and review your settings. Click "Next" if it looks good or "Previous" to edit. Click "Done"

- Repeat the above and create and "Evening Rush" Time Span

Scheduled Time Spans					
✎ Create Time Span					
Name ⇕	**Within Time Span** ⇕	**Days** ⇕	**Start Time** ⇕	**End Time** ⇕	**Actions**
Morning Rush (Time Span/43)	False	Weekdays	6:00 AM	9:00 AM	− Remove ⬈
Evening Rush (Time Span/823)	False	Weekdays	4:00 PM	7:00 PM	− Remove ⬈

CUSTOM DATA – ADDING CUSTOM DATA & VARIABLES

Navigate to Controller/Advanced Functions/Custom Data. Click "+ Add Custom Data" and a new line will appear. Click the arrow to get more details and change settings.

- Change the name to "TOD & LBNL"

- Click "+ Add State Variable" four times to add four variables

- Click the arrow of the first variable to get more details and edit it to make it look like below. This variable monitors whether the current date/time is within the window you had specified. Make the name exactly as below. Do not have any spaces in the variable name. For the "Field", click edit and select the "Morning Rush" time span you had just created. Be sure to edit the "True If" to be "True."

MorningRush (State Variable/981)		
— Remove		
Name ⇕	**Value** ⇕	**Actions**
Name	MorningRush	✎
Description	---	✎
Field	Morning Rush (Time Span/43): Within Time Span	✎
Field Value	False	ⓘ
True If	True	✎

- Next is to edit the second variable you created. This variable also monitors whether the current date/time is within the window you had specified. Make the name exactly as below. For the "Field", click edit and look for "Evening Rush" time span you had just created. Be sure to edit the "True If" to be "True."

EveningRush (State Variable/881)		
— Remove		
Name ⇕	**Value** ⇕	**Actions**
Name	EveningRush	✎
Description	---	✎
Field	Evening Rush (Time Span/823): Within Time Span	✎
Field Value	False	ⓘ
True If	True	✎

- Next is to edit the third variable you created. This one will monitor the mode of the UPS. Make the name exactly as below. For the "Field", click edit and look for "FXM-HP xxx," select and scroll to "System Mode" and select. Be sure to edit the "True If" to be "Inverter."

Inverter (State Variable/53)		
— Remove		
Name ⇕	**Value** ⇕	**Actions**
Name	Inverter	✎
Description	---	✎
Field	FXM-HP 120V-48V/854: System Mode	✎
Field Value	Line	ⓘ
True If	Inverter	✎

- Next is to edit the fourth variable you created. This one monitors the UPS to see if the UPS battery has reached the low battery threshold and that the AC line is not present. Make the name exactly as below. For the "Field", click edit and look for "FXM-HP xxx," select and scroll to "Low Battery + No Line Status" and select. Be sure to edit the "True If" to be "True."

LBNL (State Variable/344)

− Remove

Name	Value	Actions
Name	LBNL	✎
Description	---	✎
Field	FXM-HP 120V-48V/854: Low Battery + No Line Status	✎
Field Value	False	ℹ
True If	True	✎

ADDING THE EQUATION

The equation will use the four variables you configured to decide if the condition is true

> TOD is outside the set Morning Rush Time Span **AND** TOD is outside the set Evening Rush Time Span **AND** the UPS is in Inverter mode **AND** the Low Battery No Line Status is True

If this statement is true it will energize the relay we will configure in the next section. In the configuration window, click to edit the equation. Then copy and paste this text exactly

`(MorningRush=False)&(EveningRush=False)&(Inverter=True)&(LBNL=True)`

The Custom Data Status will tell you if the formula you entered is valid – be sure to check!

Configuration		
➖ Remove		
Name ⇕	**Value** ⇕	**Actions**
Name	TOD LBNL	🖊️
Description	---	🖊️
Equation	(MorningRush=False)&(EveningRush=False)&(Inverter=True)&(LBNL=True)	🖊️
Custom Data Status	Valid	ℹ️
Error Position	---	ℹ️
Error Token	---	ℹ️
Expected Token	---	ℹ️
Result as Numeric	0.000000	ℹ️
Result as Boolean	False	ℹ️

DRIVING A DRY CONTACT RELAY

To drive a dry contact relay with the results of our equation there are two steps:

- Remove any existing triggers from the relay you wish to use

- Add a Change Relay Action

REMOVING RELAY TRIGGERS:

Navigate to System/FXM-HP xxx/Status, scroll to the Relays section. Decide which relay you will use and select the arrow (typically C2 or C3). Look at the "Is Driven By" window. This window lists all the things that will change the state of this relay. Select the arrow of each and on the Relay line, select edit and choose "––" and save.

ADD A CHANGE RELAY ACTION:

Search "change relay" and select "Go to View" in the Actions section. Scroll to "Change Relay and Change Field to Constant Actions". Click "+ Add Change Relay Action". A relay action will add to the list, select the arrow.

- Change the name to "TOD LBNL"

- Change "Relay To Change" to the relay you selected.

NOTE – If you did not remove all items that previously drove that relay it will not show up in the list as an option

NOTE – Don't select C6 as this is reserved to power the cabinet fan

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- Select the "Condition" to be "TOD LBNL" (Custom Data)/Result as Boolean

WRITING EQUATIONS

Equations are used to test the conditions of the variables we set, which then decides if the custom data is true. To understand how to write equations we first must know what the available operators are:

Add "+"	Multiply "*"	Less than "<"	Parenthesis "(" and ")"
Subtract "-"	AND "&"	Greater than ">"	Unary minus "-"
Divide "/"	OR "|"	Equal "="	

Acceptable number formats are:

Decimal: "10.33" or "- 4.7" or "0.45" or ".45"

Integer: "10" or "-4"

Write the equation to test the state of the variable(s) you have identified. The formula then decides whether the Custom Data is True or False (1 or 0).

Don't use an equal sign to start the equation as that is assumed. Start with a parenthesis to work with your first variable, as in our example, "(MorningRush=False)" and if you are going to use another variable you will need to connect them with an operator. Be sure to check Custom Data Status to verify your formula is Valid after you have completed it.

USER ALARMS

THRESHOLD USER ALARM

For this example, let's say you wanted to create an alarm when the inverter count is unusually high and drive a dry contact relay. We will need to create a Threshold User Alarm to accomplish this. Type "add thresh" in the search bar and then Enter. Select "+ Add Threshold User Alarm" as shown below:
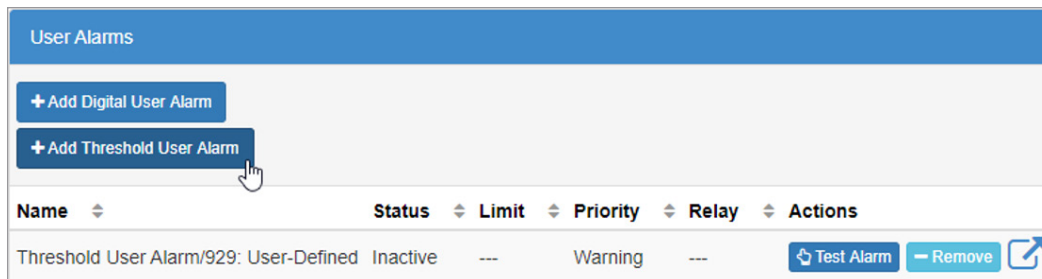
Select the arrow to take you to the settings. Then make the following setting changes as shown below:

- User Alarm section

  - Name – "High Inverter Count"
  - Source – Select "FXM-HP: Inverter Count"
  - Alarm When Value – "Above" since we are waiting for the inverter count to be above a set value

- User-Defined section

  - Alarm Processing - "Enabled"
  - Priority – It will default at Warning, change as you would like
  - Relay – If you would like to drive a relay with this alarm edit to select one
  - Limit – "500" Choose a value that is much greater than your typical outage counts and for as often as you reset the counters. The alarm will be Active when the count goes above this point.

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DIGITAL ALARM

Digital alarms monitor the state of items like Custom Data, Time Spans, Interval Timers, Counters, and FXM-HP UPS module conditions. When the condition becomes true an alarm is generated. To set a Digital Alarm type "add digital" in the search bar, then enter. The below example was set to be triggered based on our first example of TOD LBNL and the alarm will be active when the Custom Data is True.

GLOSSARY

Equation - Uses variables and operators to test if a condition is True or False

Operator - A symbol that shows the operation to be performed

Numeric Variable - A variable that has a number value that the formula will measure against

State Variable - A variable that has either a Boolean value (True or False) or logical value (1 or 0)

Counters - Will count the amount of times the monitored event occurs

Delay Timer - Timer produces a programmable delay when a certain event happens

Interval Timer - Timer measures the time between two events

Change Relay Action – Relay can be programmed to change state based on a Boolean field

Change Field to Constant Action - Changes the value of a field based on specific situations

Change Field to Variable Action - Changes the value of a field to the value of a Custom Data

Digital User Alarm - A user alarm that monitors the state of a selected condition and is active when the condition is True

Threshold User Alarm - A user alarm that monitors a selected value and is active when that value goes above or below the user set threshold

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For assistance, contact Alpha Technical Support:

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