

DXM Configuration Tool

Instruction Manual

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1 DXM Configuration Tool

Configure the DXM Controller using the DXM Configuration Tool. The DXM Configuration Tool can be used stand-alone or connected to the controller using USB or Ethernet. The tool creates an XML file defined for the DXM Controller and can be used at the website level for configuration.

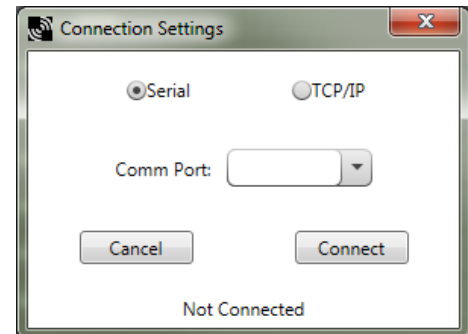
The top menu provide basic input and output to the program. The File menu provides the ability to load or save configuration files. Connection settings, XML file upload, XML file download and reboot is on the Device menu. The bottom window bar provides status of the connection, application status, busy, active XML file, and the tool version information.

The DXM Configuration Tool restricts the naming of registers and rules to characters a-z, A-Z, 0-9, # \$ _ - () space.

1.1 Using the DXM Configuration Tool

Use the DXM Configuration Tool either while connected to a DXM Controller or as a standalone configuration software.

Connect to the DXM Controller by selecting Connection Settings under the Device menu. The connection can be accomplished by USB or by Ethernet. Before attempting an Ethernet connection, first connect using USB so you can configure the Ethernet parameters before you connect to a live network.



1.2 Basic Use

There are two top-level menus similar to other Windows programs: File and Device.

- Use the File menu to manage the loading and saving of the XML configuration file created by the DXM Configuration Tool.
- Use the Device menu to handle the connection settings to the DXM Controller as well as the upload or download of the XML configuration files. Also part of the Device menu is the communications tools used to view data traffic on the serial bus, useful in ScriptBasic programming.

When the DXM Controller connects to a specific COMM port, Windows allocates that port to the DXM Configuration Tool. Do not disconnect the USB cable or power off the device with the DXM Configuration Tool connected because this creates problems with Windows, resulting in having to close the program and disconnect the USB cable. Always disconnect the COMM port through the Device menu before turning off power or disconnecting the USB cable. Use Device > Reboot to restart the DXM Controller if needed; the tool automatically disconnects the COMM port, then reconnect it again.

For a simple tutorial using the DXM Configuration Tool see the *DXM Controller Configuration Quick Start Guide*.

2 Software Screens

The following sections explain the function of each screen.

2.1 Action Rules

Action rules allow for simple logic functions and simple manipulation of local register data. The processing of an action rule is autonomous from other local register functions. Threshold rules provide the mechanism to create event-driven conditions, such as events to the cloud, local logs, or an email address. There are three groups that make up action rules.

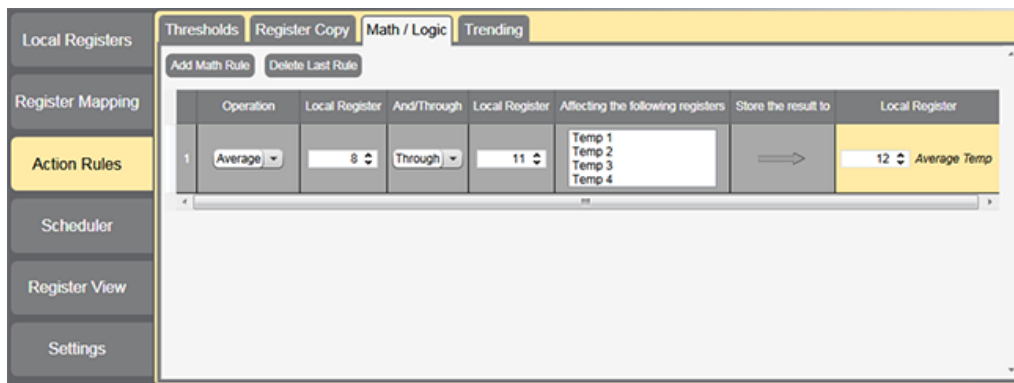
Read rules are executed first, beginning with the first rule defined. The read rules execute in the order they were entered into the DXM Configuration Tool. After all read rules execute, the write rules are processed, in order. After the write rules are processed, the system begins again with the read rules.

Processing the read/write rules takes a long time to complete, not because they take a lot of processing power, but because each rule has a lengthy overall communication time relative to the processor execution cycle time. So, in parallel, action rules are solved. Each action rule is processed in order, similar to the read/write rules. The groups of action rules are solved in this specific order:

1. Constants are applied first, cancelling any changes that may have occurred from other sources
2. Calculate (Math) rules are next, continually processed
3. Copy rules, processed only when a change of state is detected on the source register
4. Threshold rules, continually processed

2.1.1 Math and Logic

Use the Math/Logic Rules screen to define simple operations using local registers.

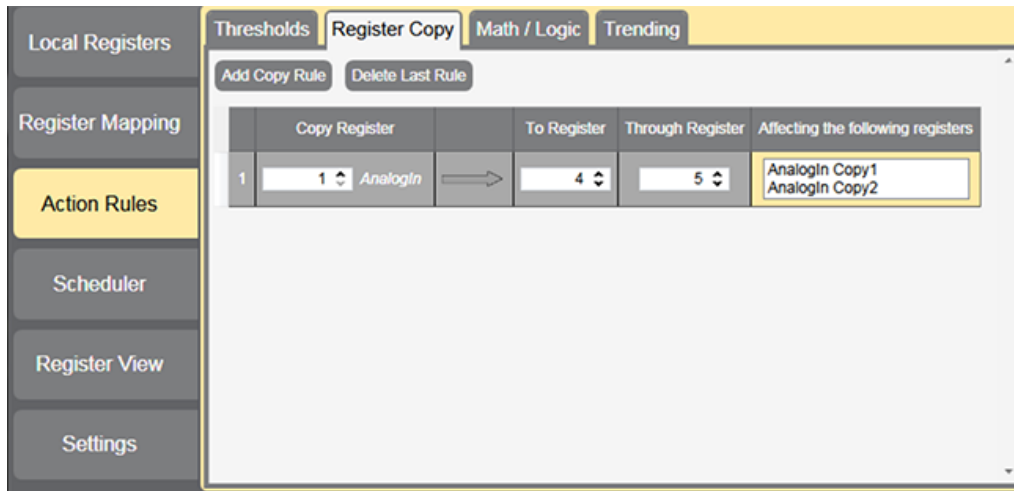


Some operations are valid for ranges of registers. Select And or Thru to select two registers or multiple registers in a range. Average, Sum, and Logic Operations are valid for ranges of multiple registers. The local registers are unsigned 32-bit integers. All math and logic functions can operate on all 32-bits. The local register operations are:

- Add—Adds two local registers and stores the result in a local register.
- Average—Averages the values of multiple registers and stores the result.
- Divide—Divides local register 1 by local register 2 and stores the result. Dividing by zero results in a zero.
- Logic NOT—Performs a bit-wise one's complement on a local register and stores the result.
- Logic OR, AND, NOR, NAND, XOR—Performs bit-wise logic function on multiple registers and stores the result. Bit-wise logic functions operate on all 32-bits of the Local Registers.
- Multiply—Multiplies one local register by another and stores the result.
- Sum—Adds multiple contiguous local registers and stores the result in a local register.
- Subtract—Subtracts local register 2 from local register 1 and stores the result. For negative numbers, the results are in two's complement form.

2.1.2 Register Copy

Use the Register Copy screen to copy a local register into another local register or range of registers.



To create a new rule:

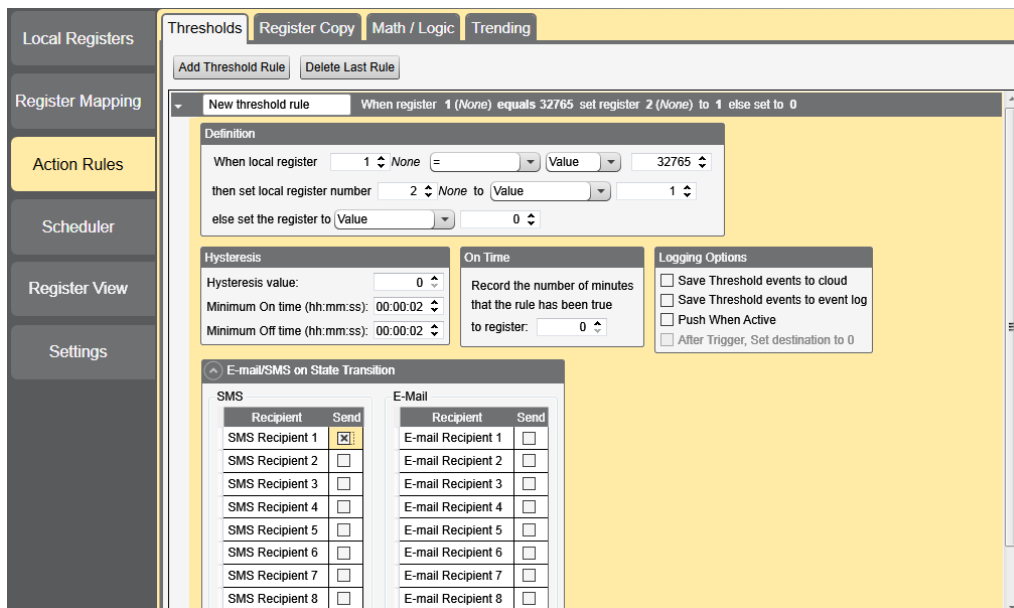
1. Click the Add New Rule link.
2. Enter the Copy Register, To Register, and Through Register. If you are copying the contents of one register, enter the same register number into the To and Through Register fields. If you are copying a range of registers, the range is defined by the To Register and Through Register. The Copy Register is the starting register of the source range.

2.1.3 Thresholds

A Threshold Rule triggers event messages sent to the cloud (event-driven push), triggers events to be stored to the local event log, and creates a standard push message to the cloud with all defined registers being sent.

A Threshold rule creates a simple IF-THEN-ELSE comparison for a register to determine its value and set another register to indicate if the rule is true or false. The definition section of the threshold rule sets the comparison and values. The definitions of the threshold rules can further be defined by the optional parameters, Hysteresis, On Time, E-mail/SMS and Logging options.

The local register value is the raw register value. The display scaling and offset are not applied for these comparisons.



Create threshold rules to compare register values using mathematical functions.

Changed By—Local register value was changed by a defined value or local register value. The minimum On Time can be applied to define a time period at which the rate of change can be applied. This special treatment of the On Time parameter only applies to the Changed By comparison.

E-Mail/SMS—When a Threshold rule becomes active or inactive the controller can send an E-Mail or SMS message. Select which recipient should be notified when this rule is changes state. SMS messages can only be sent when cellular is selected as the network interface. (Settings > Cloud Services).

Equal To—Local register value is equal to a defined value or local register value.

Greater Than—Local register value is greater than a defined value or local register value.

Greater or Equal To—Local register value is greater than or equal to a defined value or local register value.

Hysteresis—Optional parameter that is enabled only when vales are nonzero. How hysteresis is applied depends on the comparison. For a test that becomes true 'if greater than,' the test will not return to false until the local register is less than the test value by a margin of at least this hysteresis value. If a test becomes true 'if less than,' it will not return to false until the local register is greater than the test value by a margin of at least this hysteresis value. Minimum On Time and Minimum Off Time are time-based parameters that govern how long a statement must be true or false to activate the output register.

Less Than—Local register value is less than a defined value or local register value.

Less Than or Equal To—Local register value is less than or equal to a defined value or local register value.

Logging Options—Threshold rules create events. These events can cause certain actions to occur, such as:

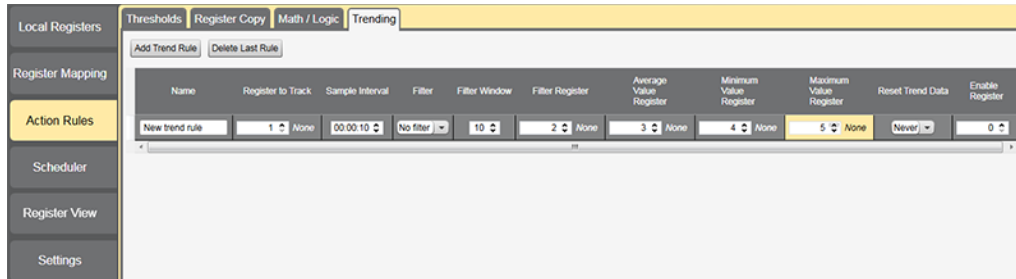
- Sending threshold events to the cloud. An immediate push with the threshold register states is sent to the webserver when this rule becomes active.
- Saving the state to an internal event log. Go to Settings > Logging to set up the event log.
- Pushing data to the cloud when the threshold rule becomes active. All local registers with the Cloud Reporting parameter ON will push to the cloud. (Local Registers > Local Register Configuration)

Not Equal To—The local register value is not equal to a defined value or local register value.

On Time—Stores in a local register how long (in minutes) the Threshold rule has been true.

2.1.4 Trending

The Trending action rule creates a maximum, minimum, and average of a register over a period of time. Define a local register to trend, then specify up to three local registers to save the maximum, minimum, and average data of the trended register.



Enable Register—If a local register is defined for this parameter, then the local register value greater than 0.5 turns on the trending function. A value less than 0.5 turns off the trending function.

Filter—Select the type of filter.

Filter Slices—Define how many filter entries to use for the calculations.

Reset Trend Data—The minimum, maximum, and average registers start over in accumulating data, starting with the first Sample Interval. The reset interval is based on the RTC (real time clock) or the actual time of day instead of the number of samples taken that day.

Sample Interval—Defines how often to capture data. The local register defined as the trending register is read at this interval and the data examined for maximum or minimum values. The average register is also updated to form the new resulting average.

Table 1: Example of Data Trending

Sample Interval	Trending Value	On Register Value	Average Value	Minimum Value	Maximum Value
N	10	0	0	0	0
N+1	20	0	0	0	0
N+2	30	1	30	30	30

Sample Interval	Trending Value	On Register Value	Average Value	Minimum Value	Maximum Value
N+3	40	1	35	30	40
N+4	50	1	40	30	50
N+5	60	1	45	30	60
N+6	70	1	50	30	70
N+7	80	1	55	30	80
N+8	90	1	60	30	90
N+9	100	1	65	30	100
N+10	110	0	65	30	100
N+11	15	0	65	30	100
N+12	5	0	65	30	100
N+13	0	0	65	30	100

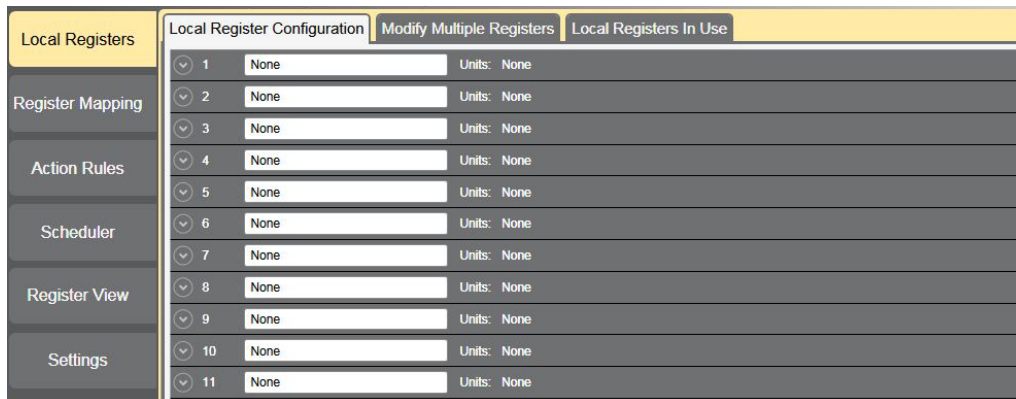
2.2 Local Registers

The main storage elements for the DXM Controller are its local registers. The local registers store up to 4-byte values that result from register mapping, action rules, or ScriptBasic. Since a Modbus register is only 16-bits, all transactions with Modbus devices use the lower 2-bytes (16-bits) of the local registers.

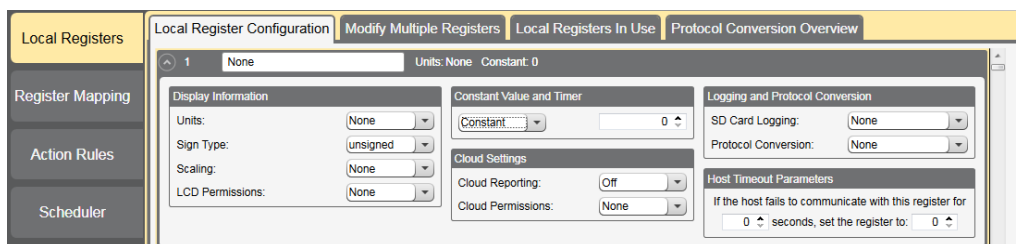
The local register characteristics are defined on the Local Registers tab of the DXM Configuration Tool.

- Local registers 1-845 are 32-bit unsigned integer based registers.
- Local registers 846-850 are special function registers that can be constants, timers, or reset registers.
- Local registers 851-900 are non-volatile registers with limited write capability for permanent data storage.
- Local registers 1001-1900 are 32-bit IEEE 754 floating point registers.

2.2.1 Local Register Configuration



Click on the arrow of the local register to expand the window to show all characteristics that can be configured with the tool.



The configurable characteristics are:

Cloud—Enables the cyclical reporting of this register value to the web site. The rate of the cyclical push of data is defined under the Settings > Cloud Services tab. The Cloud Permissions flag defines how the local register is displayed and controlled at the web server.

Constant—Forces the local register to be set to a user-specified value. This can be useful to compare values when using action rules.

Display Information—Units, Sign Type, Scaling and LCD Permissions define the display characteristics for the web site and DXM LCD registers menu.

Host Timeout Parameters—Provides a safety net mechanism for failed communications situations between a host system and the DXM Controller. If a host system fails to interact with this register for a user defined time, the register will be set to a user defined value.

Logging and Protocol Conversion—Defines the onboard micro SD card storage of this local register based on a cyclical rate or an event change. Up to three different log files can be stored on the micro SD card, each with different logging definitions. The micro SD card logs are set up under the Settings > Logging tab. The Protocol Conversion section defines this local register to be an input or output when used with the different protocols enabled on this device. Ethernet/IP and PROFINET use this register definition.

Reset—Local Registers 846–850 are reset registers. These registers reset a processor if the register is not written to within a specified time. The Reset register is typically used with ScriptBasic to detect if the program is in a bad state. Within the time is specified, the DXM Controller must be programmed to write to this register before this time limit is reached or the processor is reset.

Timer—A Local Register defined as a Timer increments every 100 ms, or 1 second. Write to the Local Register to start the timer at a specific value.

2.2.2 Local Registers in Use

Use the Local Registers in Use tab to view a list of all the local registers used by your device.

#	Register Name	Units	Signed	Constant of Timer	Cloud Reporting	LCD	Web	Protocol Conversion	Log Files	Read Rules	Write Rules	Threshold Rules	Copy Rules
1	None	None	<input type="checkbox"/>	Constant 0	Off	None	None	None	None			New threshold rule	New copy rule
2	None	None	<input type="checkbox"/>	None	Off	None	None	None	None			New threshold rule	
5	None	None	<input type="checkbox"/>	None	Off	None	None	None	None				
8	None	None	<input type="checkbox"/>	None	Off	None	None	None	None				
9	None	None	<input type="checkbox"/>	None	Off	None	None	None	None				
10	None	None	<input type="checkbox"/>	None	Off	None	None	None	None				
11	None	None	<input type="checkbox"/>	None	Off	None	None	None	None				
12	None	None	<input type="checkbox"/>	None	Off	None	None	None	None				

2.2.3 Modify Multiple Registers

To change multiple registers at once, use the Modify Multiple Registers tab.

1. Enter the starting and ending registers.
2. Select the value to change using the drop-down list next to each value.
3. Enter the new value.
4. Click Change Registers.

2.2.4 Protocol Conversion Overview

This screen displays a list of the EtherNet/IP (EIP) Inputs and Outputs associated with DXM Controller registers.

Define the Local Registers to be EtherNet/IP registers on the Local Registers > Local Register Configuration screen.

2.3 Register Mapping

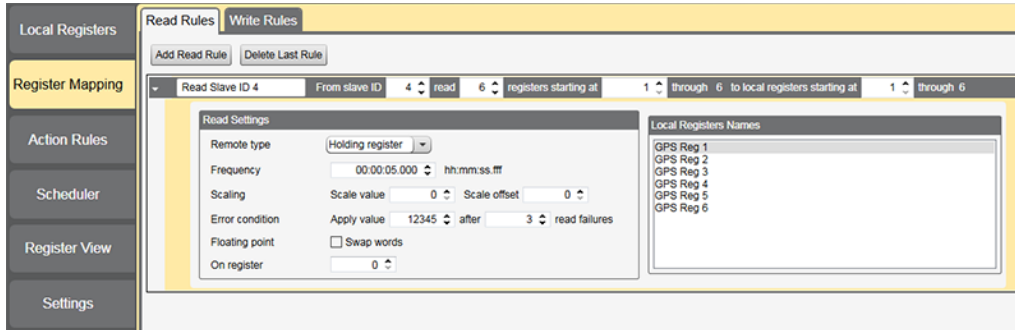
The Register Mapping function has two main components, a read rule and a write rule. As the name implies, the rules allow the user to program the ability to read or write information from internal or external Modbus slaves to/from the local registers. On the DXM Controller, use the read/write rules to access the Modbus registers of the LCD display, I/O base board, and the internal ISM radio.

DXM Configuration Tool allows the user to create Write/Read rules that in turn create Modbus messages to external devices. How the user enters rules affects how a Modbus message is formed. If the user creates three individual read or write rules, those rules create three individual Modbus messages that will be sent out the RS-485 master port. If the user creates one read or write rule that spans multiple registers, the result is one Modbus message.

Click on the arrow of the read or write rules to show all the parameters for that rule.

2.3.1 Read Rules

Each read rule defines a Modbus slave ID and register range to read and then store in the local registers. The local register names shown are the registers that are being used by the read rule.



To create a new read rule:

1. Click Add Read Rule.
2. Click the arrow next to the first rule to view the parameters.
3. Type in the rule's name in the 'none' field.
4. Select slave ID of the source device.
5. Select the number of registers to read from the source device.
6. Select the starting register of the source device.
7. Select the starting register of the local/target device.
8. Set the desired parameters.

The user defines parameters that can be applied to each read rule.

Error Conditions—Applies a default value to the local register after a user-defined number of Modbus register read fails.

Floating Point - Swap Words—A floating point value is a 32-bit value requiring two consecutive Modbus register reads or writes. The DXM Controller expects the most significant part of the floating point value to be first (lowest address) followed by the least significant part. If a Modbus slave device sends the least significant part first, select Swap Words to align the words correctly.

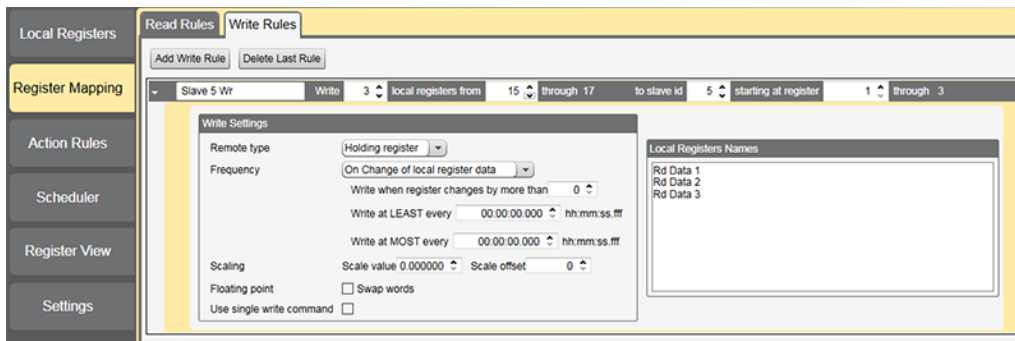
Frequency—Defines the cyclical rate at which the register is read.

Offset and Scaling—Adjusts the read value by multiplying the scale value and then adding the offset value. The result is held in the local register.

Remote Type—Select the register type from the drop-down list.

2.3.2 Write Rules

The write rules write local register data to the defined Modbus slave ID and registers. The local register names shown are the registers used by the write rule.



To create a new write rule:

1. Click Add Write Rule.
2. Click the arrow next to the first rule to view the parameters.
3. Type in the rule's name in the 'none' field.

4. Select the number of registers to write to the target device.
5. Select the starting register of the local/source device.
6. Select slave ID of the target device.
7. Select the starting register of the target device.
8. Set the desired parameters.

The user defines parameters that can be applied to each read rule.

Floating Point - Swap Words—A floating point value is a 32-bit value requiring two consecutive Modbus register reads or writes. The DXM Controller expects the most significant part of the floating point value to be first (lowest address) followed by the least significant part. If a Modbus slave device sends the least significant part first, select Swap Words to align the words correctly.

Frequency—Defines how often to write the local register to the Modbus slave device in one of two ways:

Cyclical—Causes a Modbus write based on a timing interval, as fast as possible or a specified time interval.

On Change of Local Register Data—Allows the user to specify a certain criteria when to write to a Modbus slave device. For example, if the local register changes by a user-specified amount, the write occurs. If the user wants to write the local register to the Modbus slave at a minimum interval, use the write AT LEAST time setting. Use the write AT MOST time interval to minimize the write cycles for local registers that change frequently.

Offset and Scaling—Adjusts the local register write value by multiplying the scale value, adding the offset value, then writing to the Modbus slave device.

2.3.3 Processing the Rules

Rules and functions are evaluated by the DXM Controller in a specific order.

1. The read rules are executed first, beginning with the first rule defined and continuing in the order the rules were entered into the DXM Configuration Tool.
2. After the read rules are executed, the write rules are processed, in the same order.
3. After the write rules are processed, the DXM Configuration Tool starts over with processing the read rules.

The read/write rules take time to complete, not because they require processing power, but because each rule has a lengthy overall communication time relative to the processor execution cycle time. So, in parallel, the action rules are also solved.

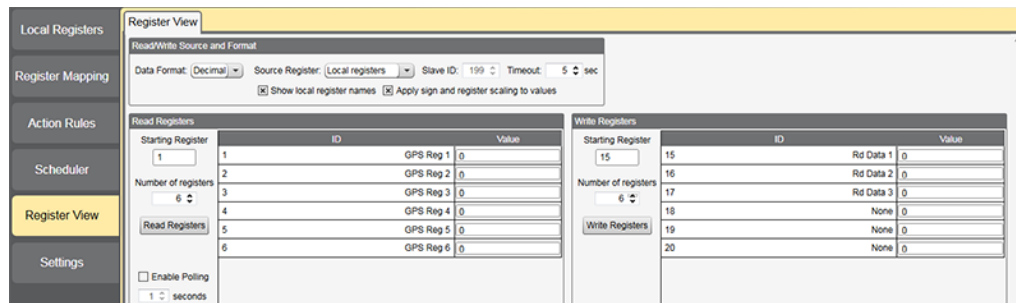
Each action rule is processed in order, similar to the read/write rules. The groups of action rules are solved in this specific order:

1. Constants are applied first, cancelling any changes that may have occurred from other sources.
2. Calculate (Math) rules are next, continually processed.
3. Copy rules, processed only when a change of state is detected on the source register.
4. Threshold rules, continually processed.
5. Trending, continually processed.

2.4 Register View

Use the Register View screen to read or write local registers within the DXM Controller or Modbus Slave devices connected to the DXM Controller.

The data format can be decimal or hexadecimal selected by the radio button at the upper left of the page. The selection of using local registers (DXM Controller) or a Modbus Slave ID is found at the upper right of the page. Connect the DXM Controller using USB or Ethernet.



Data Format—Use the radio button in the upper left to select between the decimal or hexadecimal data format.

Read Registers—To read the contents of a specific register or range of registers, select the starting register and the number of registers to read from. Select how often to read the registers by selecting Enable Polling and entering the time. Click Read Registers to view the register values as they display just below the Read Registers section.

Source Register—Use the radio button in the upper right to select between using the local registers or the Modbus Registers of a specific Modbus Slave.

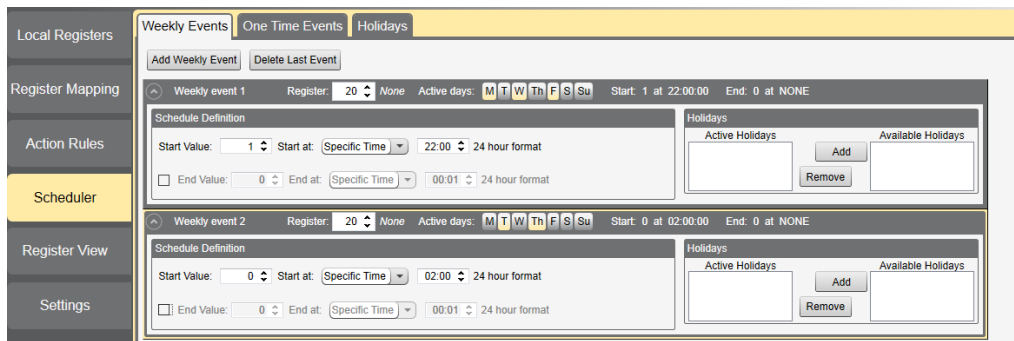
Write Registers—To write values to a specific register or range of registers, select the starting register and the number of registers to write to. Enter the value to write to these registers and click Write Registers to send these defined values to the selected registers.

2.5 Scheduler

Use the Scheduler screen to create a calendar schedule for local register changes, including defining the days of the week, start time, stop time, and register values. Schedules are stored in the XML configuration file, which is loaded to the DXM Controller. Reboot the DXM Controller to activate a new schedule.

2.5.1 Creating a Weekly Schedule

Use the Weekly Events screen to define weekly events.



To create a new rule:

1. Click Add New Rule.
2. Click on the arrow to the left of the new rule to expand the parameters into view.
3. Enter the local register.
4. Select the days of the week this rule applies to.
5. Use the drop-down list to select the type of Start At time: a specific time or a relative time.
6. Enter the starting time.
7. Enter the starting value for the local register.
8. Enter the end time and end value for the local register.

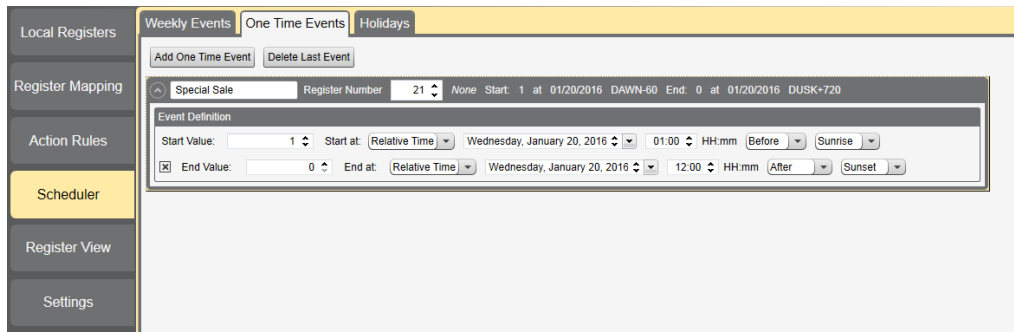
Register updates can be changed up to two times per day for each rule. Each rule can be set for any number of days in the week by clicking the buttons M, T, W, Th, F, S, or Su.

If two register changes are defined for a day, define the start time to be before the end time. Select End Value to enable the second event in a 24 hour period. To span across two days (crossing the midnight boundary), set the start value in the first day, without selecting End Value. Use the next day to create the final register state.

Start and end times can be specified relative to sunrise and sunset, or set to a specific time within a 24 hour period. When using sunrise or sunset times, set the GPS coordinates on the device so it can calculate sunrise and sunset.

2.5.2 Defining One-Time Events

Define one-time events to update registers at any time within a calendar year. Similar to Weekly events, the times can be specific or relative to sunrise or sunset. Define one-time events using the one-time events screen.

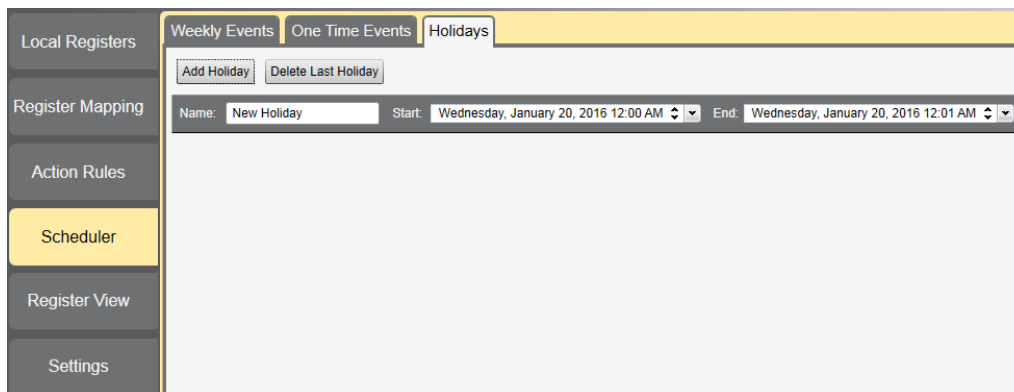


To create a one-time event rule:

1. Click on Add One Time Event.
2. Name your one-time event by clicking on the name link and entering a name.
3. Click on the arrow to expand the parameters into view.
4. Enter the local register.
5. Enter the starting time, date, and starting value for the local register.
6. Enter the ending time, date, and ending value for the local register.

2.5.3 Creating a Holiday Schedule

Use the Create Holidays screen to create exception conditions that alter the standard scheduled register changes.



To create a holiday:

1. Click on Add New Rule.
2. Name your new holiday by clicking on the name link and entering a name.
3. Select the start date and time for the new holiday.
4. Select the stop date and time for the new holiday.

2.5.4 Cycling Power During Schedules

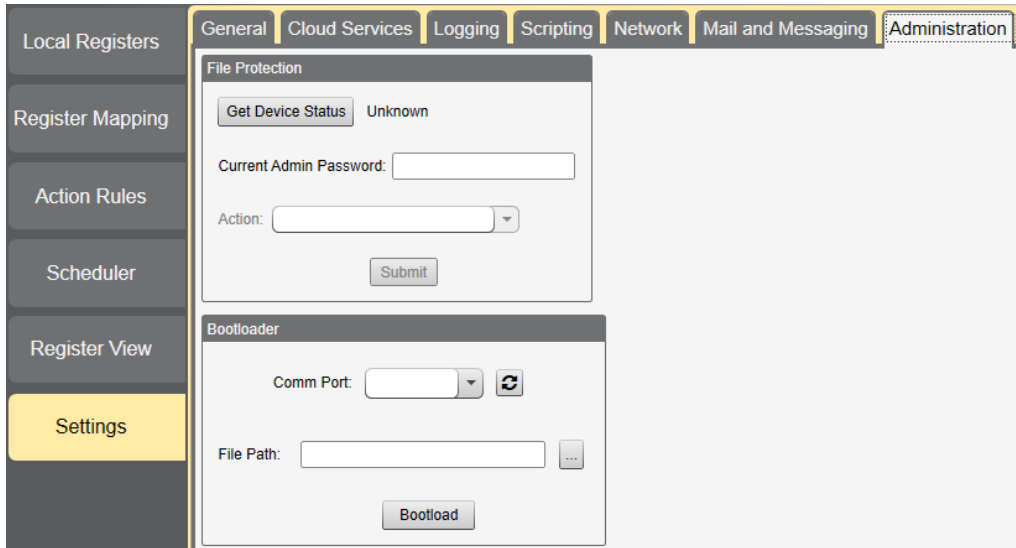
If power is cycled to the DXM Controller in the middle of a schedule, the DXM Controller looks at all events scheduled that day and processes the last event before the current time.

2.6 Settings

The settings tab defines general parameters, cloud services settings, logging parameters, Script Basic settings, networking and e-mail/SMS messages settings.

2.6.1 Administration

Use the Administration to set a password on the DXM Controller. Setting a password requires a user to enter a password before a configuration file or ScriptBasic file is loaded.



1. With the device connected, click on Get Device Status.
2. The device reports back if it is locked or unlocked.
3. To change, set, or clear a password select the appropriate action, fill in the required fields then click Submit.

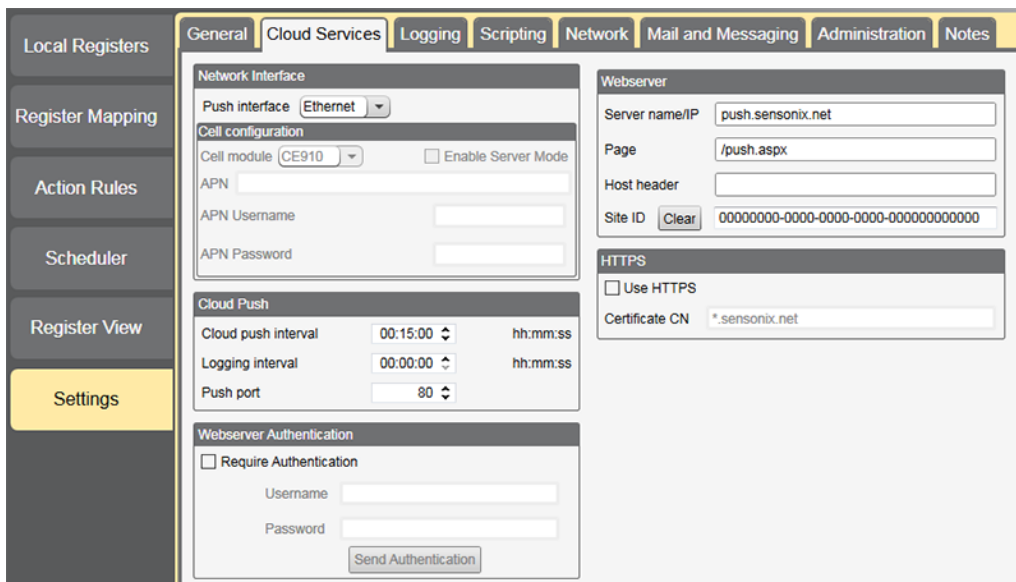
Reset the Controller if the Password is Lost

If the device is locked and the password is lost, go to the DXM Controller to clear the password. Clearing the password from the controller also erases the configuration file and all ScriptBasic programs. To clear the password:

1. Power down the device
2. Set DIP switch 4 to the ON position.
3. Hold down the reset button on the processor board and power up the device. After a few seconds the LEDs flash on the processor board, indicating the configuration is erased.
4. Power down the device.
5. Set DIP switch 4 to the OFF position.
6. Power the device up. This erases all files from the device.
7. Reload your configuration files.

2.6.2 Cloud Services

Use Cloud Services to define the parameters to send register data to the website.



Authentication

Authentication defines a username and password to be sent to the webserver with every push data set to validate the sending device before storing any data in the database. If the webserver is expecting login credentials, the DXM Controller must be programmed with the username and password. This only provides login credentials for authentication to the server; this does not secure the data payload.

The DXM Controller must be connected to the computer. Select Require Authentication, then enter a username and password. Select Send Authentication to send the username and password to the DXM Controller to be stored in non-volatile memory. Manually cycle power to the DXM Controller after the username and password are written to it. The credentials cannot be read from the DXM Controller.

Cloud Push

The Cloud Push Interval defines the time interval for cyclical data pushes sent to a webserver or host system. Setting the Cloud Push Interval to zero disables all push messages.

When using pushes created by a threshold rule, the Cloud Push Interval cannot be set to zero. When using a cellular interface, more frequent pushes may result in higher plan costs. Use the Logging Interval to store cyclical data pushes at a faster rate. At the Cloud push interval, the device sends all stored data.

The Logging Interval defines the rate at which the data to be sent to the Cloud is stored on the local SD card. At the Cloud push interval time, saved data logs stored on the local SD card are sent to the Cloud. The typical setting is zero.

For example, the Cloud Push Interval is set to push to the Cloud every one hour, but the logging interval could be set to five minutes. Every hour the actual push to the Cloud occurs and the pushed data includes the stored log files that are created every five minutes.

The Push Port defines the HTTP push data port on the web server. The factory default setting is port 80.

HTTPS

A Certificate CN is required to be associated with one or more domain names, called common name (CN). A single name Certificate CN is typically `www.yoursite.com`. A wildcard certificate includes single level sub-domains. The Sensonix certificate CN is a wildcard certificate; `*.sensonix.net`. If nothing is entered into this field, the Sensonix CN will be used; `*.sensonix.net`.

Selecting HTTPS indicates to the DXM Controller to use TLS (Transport Layer Security) as a sub-layer under regular HTTP application layering. HTTPS encrypts and decrypts user data to and from the web server. The webserver is required to carry a certificate. Select Use HTTPS to enable TLS services. Not all servers/communication networks support TLS.

Network Interface

The DXM Controller uses this setting to determine where to send cyclic report data, alert messages, or log files. Selecting Ethernet or Cell also requires setting up the parameters under the Settings > Network tab.

When Cellular is selected, the optional VPN (Virtual Private Network) is available. This requires the private cellular plan and allows for direct point-to-point communication between the DXM Controller and host system. Enabling VPN forces the DXM Controller to constantly listen for messages from a host system.

Webserver

A Host Header allows for multiple domains to reside at the same server address. Similar to how many people can share one phone number, dialing one number connects you to the phone but to talk to someone specific you need another piece of information. This is where the Host Header field is used. An IP address can get you to a server and the Host Header field allows for multiple domains residing at that server. An example of a host header is: `a4528495-3576-4c7c-9cdc-7a8dacd2e3f6`. Not all servers require this field, when left blank the intended target of the push message will be the server name. The Sensonix website does not require this field.

Page—Directs incoming data at the webserver. (`/push.aspx`)

Protocol Type—Select which data format to use when pushing data to the website. Use the Sensonix protocol when pushing data to the Sensonix website.

Server Name/IP—Webserver address used by the DXM Controller when pushing data to the cloud. Enter the domain name, `push.sensonix.net` or the IP address `54.218.39.109` for the Sensonix website. The DXM Controller defaults to using a public DNS (domain name server) to resolve domain names. To use a specific DNS enter the IP address under the Settings > Network tab.

Site ID—Unique site string that is defined by the webserver when a site is created. The Site ID is like an address where the webserver stores all the site information and push data. Copy the string from the website into this field in the DXM configuration tool.

2.6.3 General

Use Settings > General to define the time zone, Modbus Master serial interface, Modbus Slave serial interface parameters, and to manually enter your GPS coordinates.

Device Time—Sets the time zone offset and displays the current time on the device or sync time with the PC.

GPS Location—Defines the latitude and longitude for the device. The GPS data can be entered manually for fixed assets or by defining an external GPS unit connected to the master Modbus RS485 bus. Select **Send Location to Cloud** to report this information to the Web site.

Modbus Master Communications—Defines the Modbus Master serial port settings on the device (main RS-485 port). The default communications settings are 19200 baud, no parity, RS485. When changing the communications settings on the DXM Controller, any devices attached to the bus also need to be changed, including the internal ISM radio. The ISM radio communication parameters should be changed first using the User Configuration Tool for DX80/Performance radios or the MultiHop Configuration Tool for MultiHop radios.

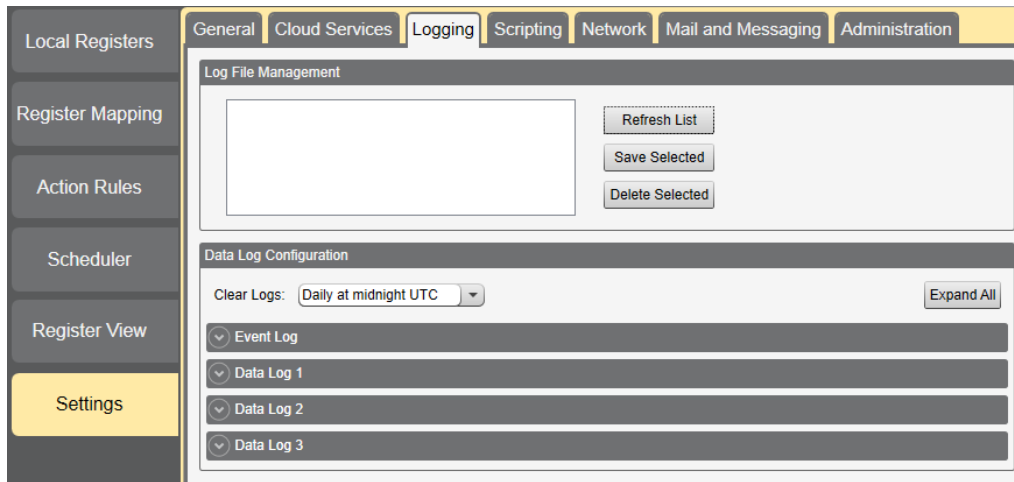
- The **Communication timeout** field defines the length of time (hours:minutes:seconds) reserved for each Modbus master command to complete. The factory default of 5 seconds should be adequate for most Modbus slave devices and DX80 star wireless networks. This may need to be lengthened for MultiHop networks with battery powered devices or networks with many chained repeaters.
- The **Maximum polling rate** field defines the time interval (hours:minutes:seconds) between Modbus messages. The default is set to 50 milliseconds. Some Modbus devices cannot communicate at this rate and may require greater than 50 milliseconds.
- Enabling **DX80 polling** automatically defines DXM Local Registers to be allocated as the DX80 Modbus registers. The DXM Controller runs a routine to request only changes that the Gateway has received from the Nodes in the system. Any input changes are saved in the corresponding DXM Local Registers. To write DXM Local Register data to the Gateway radio, create **Write Rules**.

The Gateway uses local registers 1 through 16 and Node 1 uses local registers 17 through 32, etc.

Modbus Slave Communications—Defines the Modbus Slave communications parameters and Modbus Slave ID when the RS-232 flow control signals are configured as a secondary Modbus serial port. Select **Wireless Modbus Backbone** to enable the Modbus slave port to come through a MultiHop HE5 module plugged into the SAM4 processor board (DXM150-S1R2P model only).

2.6.4 Logging

Use **Logging** to define the local logging setup for the on-board SD card of the DXM Controller. Up to three cyclical logs and one event log can be defined for threshold events. Click on the arrow to the left to expand the log configuration parameters.



The data log configuration parameters define the log file name, size, and what to do when the size is exceeded. Files can be sent via email when full.

Log file Management—Files stored on the micro SD card can be viewed, saved or deleted in this section. The DXM Controller needs to be connected to a PC for these features to operate.

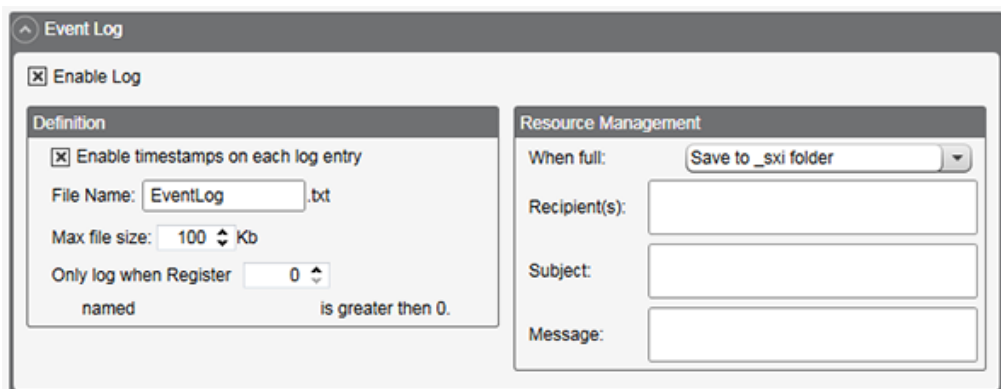
HTTP Log

HTTP log files are saved to the SD card to save data when the connection is down and the DXM Controller cannot connect to the webserver. If Enable Log is not selected, the DXM Controller will not save any data in failed transmissions. By default, Clear HTTP Logs is set to erase the HTTP log files daily to limit the number of log files saved to the SD card.



Event Log

Use the Event Log to track data only when the contents of the specified registers reaches the defined value.



Define the Email Parameters for sending a log file when the log file is full.

Select Enable Log to enable the log file creation. The register data to be saved in the log is defined under the Local Registers tab.

Select Enable timestamps on each log entry to date/time stamp each log entry.

A date/time stamp is added to the end of the user-defined File Name then stored on the Micro SD card. New files will be created with a new date/time stamp.

For cyclical log files (log1-log3), specify the Log Rate.

Set the Maximum File Size before the DXM Controller creates a new file. When emailing log files, keep the file sizes below 50 KB.

Select Only log when Register is greater than zero to start and stop saving data to a log file. When a defined register is greater than zero, data is saved to the log file based on the log rate. When the register is zero, the data is not saved to the log file.

Enter the Recipient email address, Subject, and Message for the log file.

After a log file reaches the maximum size, the user chooses to stop logging or to start a new log file and continue logging by selecting an action from the When Full drop-down list.

Data Log File 1 through 3

The Data Log Files record the contents of the register select at the defined rate.

The screenshot shows the 'Data Log 1' configuration window. At the top, there is a title bar with an up arrow and the text 'Data Log 1'. Below the title bar is a checkbox labeled 'Enable Log' which is checked. The window is split into two panels. The left panel, titled 'Definition', contains: a checked checkbox 'Enable timestamps on each log entry'; a text input field 'File Name' containing 'LogFile1' followed by '.txt'; a spinner control 'Log Rate' set to '00:00:30'; a dropdown menu 'Log file header style' set to 'Text'; a spinner control 'Max file size' set to '15' followed by 'Kb'; and a spinner control 'Only log when Register' set to '0'. Below this spinner is the text 'named' and 'is greater than 0.'. The right panel, titled 'Resource Management', contains: a dropdown menu 'When full:' set to 'Continue logging, discard oldest'; a text input field 'Recipient(s):' containing 'myemail@sensonix.com'; a text input field 'Subject:' containing 'DXM Log File'; and an empty text input field 'Message:'.

2.6.5 Mail and Messaging

The DXM Controller can email alarm conditions using Threshold rules and can email internal log files when the log files are full. The DXM Controller must have an Ethernet or cellular network connection for e-mail alarm conditions.

E-Mail Recipients—Enter the list of email addresses to send message and alerts to. Include the subject line and message.

Mail Server Settings—The server settings specify a SMTP (Simple Mail Transfer Protocol) server as well as provide the login credentials to the SMTP mail server. The SMTP server port defines where to send the e-mail message for submission. Port 25 or 587 is for typical sending e-mail. Some servers are set up to reject all messaging on port 25, but valid users authenticating on port 587 are allowed to relay mail to any valid address. The user can define three email recipients. For mailing larger groups, create groups on the mail server.

SMS Recipients—Enter the list of people to send text messages to. Note that each cell phone server provider may have a slightly different address to send text messages to. Enter the message.

2.6.6 Network

Use the Network screen to define the Ethernet connectivity settings, Cellular firewall settings (for VPN), and DNS settings.

Cellular Configuration

The Cellular Configuration parameters define the cellular modem type (CDMA, GSM), connection type (Device-Initiated or Host -Initiated) and the associated connection parameters.

Cell Module—defines the type of internal cellular modem in the DXM controller.

- CE910 - CDMA Verizon based cellular modem. Requires a cellular wireless plan from Verizon and then to Provision the cellular modem on the network.
- HE910 - GSM (GPRS), World-wide cellular modem. This network requires a SIM card from a wireless provider and to enter the APN, Username and Password fields. Network providers will provide these parameter settings.

Enable Server Mode—Server Mode turns on the cellular modem continuously to allow for connections from a host system to the DXM controller. This is defined as a Host-Initiated (Mobile Terminated) connection. The DXM controller should not be configured to send push data automatically in Server Mode.

APN—Access Point Name supplied by the wireless provider, only required when using a GSM cellular modem.

APN Username—The APN username to login to the defined APN; supplied by the wireless provider.

APN Password—The APN password to login to the defined APN; supplied by the wireless provider.

Cellular Firewall Settings

The cellular modem has a built-in firewall to restrict which host(s) communicates with the DXM Controller using a private network. Define an IP address for a single host connection or use the netmask to create multiple IP connections (0.0.0.0 is open to any IP address).

Select Open Software Firewall to accept incoming messages on a cellular connection. If Open Software Firewall is selected and there are no entries present, the software firewall allows all traffic. Entries within the firewall settings will only allow the devices specified to communicate with the DXM Controller.

Current Device IP Settings

The current IP address (when connected via Ethernet) can be read from the device or by using the LCD menu on the DXM Controller. Click Get Settings From Device when the device is connected via the USB port.

DNS Setting

The DXM Controller defaults to using a public DNS service to resolve domain names. Enter the IP address of a primary and secondary DNS server to select a particular DNS server.

The DXM Controller defaults to using the carrier DNS service. To redirect the DXS requests to a different DNS service, enter a primary and secondary cell DNS.

IP Address Settings

Select a static IP address or select the automatic assignment of an IP address by selecting DHCP from the drop-down menu. If Static IP is selected, enter the IP and subnet addresses.

You can also enter static IP addresses using the DXM Controller's LCD menu system. Entering IP Addresses using the menu system overrides the IP addresses in the XML configuration files. Clear the IP addresses in the menu system to use the IP address in the XML configuration file.

Network Parameters

The Network Parameters define certain aspects of the user selected network, cellular or Ethernet, within the DXM Controller. In most cases, the factory default parameters are sufficient for typical applications and do not need to be changed.

Ethernet

- Retry—Defines how many attempts are made to connect to a webserver using an Ethernet connection. This only applies to HTTP push packets from the DXM controller. The factory default is disabled (0). Only use this parameter with DXM Controller firmware later than version 1.0. Typical settings of 0-5.
- Retry Wait—Defines the amount of time to wait between connection attempts to a webserver. The factory default is disabled (0). Only use with DXM Controller firmware later than version 1.0. Typical settings of 0-5 seconds.

Cellular

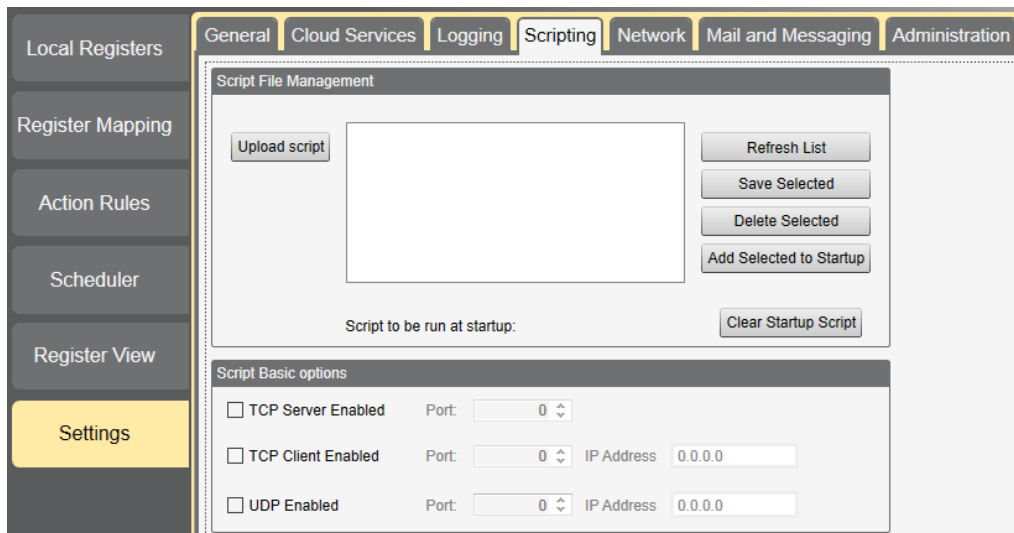
- Retry—Defines how many attempts are made to connect to a webserver using a cellular connection. This only applies to HTTP push packets from the DXM Controller. The factory default is disabled (0). Only use this parameter with DXM Controller firmware later than version 1.0. Typical settings of 0-5.
- Retry Wait—Defines the amount of time to wait between connection attempts to a webserver. The factory default is disabled (0). Only use with DXM Controller firmware later than version 1.0. Typical settings of 0-10.

The following Cellular Server Mode parameters only apply to DXM Controllers using a cellular network connection in Server Mode. Server Mode turns on the cellular modem continuously to allow for connections from a host system to the DXM Controller. Do not configure the DXM Controller to send push data automatically in Server Mode.

- **Activity Timeout**—An internal setting on the cellular modem that watches the incoming activity. If there isn't activity coming into the cellular modem for the specified amount of time, the connection closes and the device returns to listening mode. This catches the issue with the host system dropping a connection but the cell modem not aware of the dropped connection. Always set the Activity Timeout parameter to a time longer than the expected polling rate. If the polling rate is 1 hour this setting should be greater than 1 hour (e.g. 4000 seconds). The factory default setting is disabled (0).
- **Watchdog Timeout**—Used in an application routine running in the DXM processor. If there is no incoming cellular traffic within the watchdog time period, the cell modem resets. The Watchdog Timeout should be greater than the Activity Timeout; the watchdog routine is a failsafe mechanism to detect if the cellular modem is left in a bad state from the wireless network. The factory default setting is disabled (0).

2.6.7 Scripting

The DXM Controller can run one ScriptBasic program.



Under the Scripting tab, save, load or delete script files on the DXM Controller. Select a ScriptBasic file from the current ScriptBasic files window and select Add Selected to Startup Scripts to define which program should be run at boot time. Save the XML configuration file before loading to the device. A reboot is required to start a new script program.

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