DIN RANGER Manual

The RANGER is a self-contained, device that provides sensor readings over an LTE-M1 or NB-IoTcellular network.

- DIN rail mount
- Powers attached sensors at 13V or 18V
- 3 Analog inputs. One 4-20mA, two selectable 4-20mA or 1-5V inputs
- RS485 Modbus Client port
- Three digital inputs report state, total counts and input frequency. K-Factor configurable for Flow Totalizing
- SPDT Latching relay for on/off control
- Configurable from the SignalFire Cloud website signal-fire.cloud
- SignalFire Cloud allows for data visualization, trending and alarming
- Supports MQTT Sparkplug B communication protocol for connection to other servers
- Compact and simple to install and maintain
- Local configuration and diagnostics available using the micro-USB port and the SignalFire RANGER ToolKit PC software
- Internal backlog of a minimum of 200,000 datapoints in the event of loss of signal. Backlog will be automatically sent when the RANGER reconnects
- GPS for locating assets

Enclosure Size	6" tall × 5.2" deep x 1.6" thick
Power	8-28VDC. Average current < 2.5mA plus sensor current. (Peak TX current is 250mA)
Temperature Rating	-40°C to +85°C
Enclosure	DIN Rail Mount
SIM Card	Internal 4FF Nano SIM card (LTE Cat M SIM and data plan required)
Local config port	Standard micro-USB connector
Analog Inputs	Provides 13/18VDC, (selectable) to attached 4-20mA / 1-5VDC sensors. Three analog inputs built in.
Digital Inputs	Three digital inputs. Dry Contact or 30 Volts Max (push-pull), 2kHz max. Capable of reporting on state change (in application for frequency inputs for flow, pull up resistor is populated and not needed by client).
Relay Output	Latching Relay. 2A @ 30VDC, 0.3A @ 110VDC, 0.5A @ 125VAC
Sensor Power Output	Selectable 13VDC/18VDC. 60mA max power output
Compliance	• Contains FCC ID: 2ANPO00NRF9160 and IC ID: 24529-NRF9160 • PTCRB and Verizon Network Certified
Model Numbers	

Table of Contents

4

[41mm]
1.6in

[152mm]
6.0in

[132mm]
5.2in

Connections and Components

STATUS LED
- The STATUS LED (green) will flash 3 times on a successful data transmission to the server

ERROR LED
- The ERROR LED (red) will blink 3 times to indicate that an attempted data transmission failed, RANGER not connected to the server

Check-in Button
- If this button is pressed the RANGER will blink the green or red status LED 3 times to indicate the status of the last transmission to the server. If the Check-in button is pressed and held for more than 1 second, the RANGER will take readings from the attached sensors and send the readings to the server.
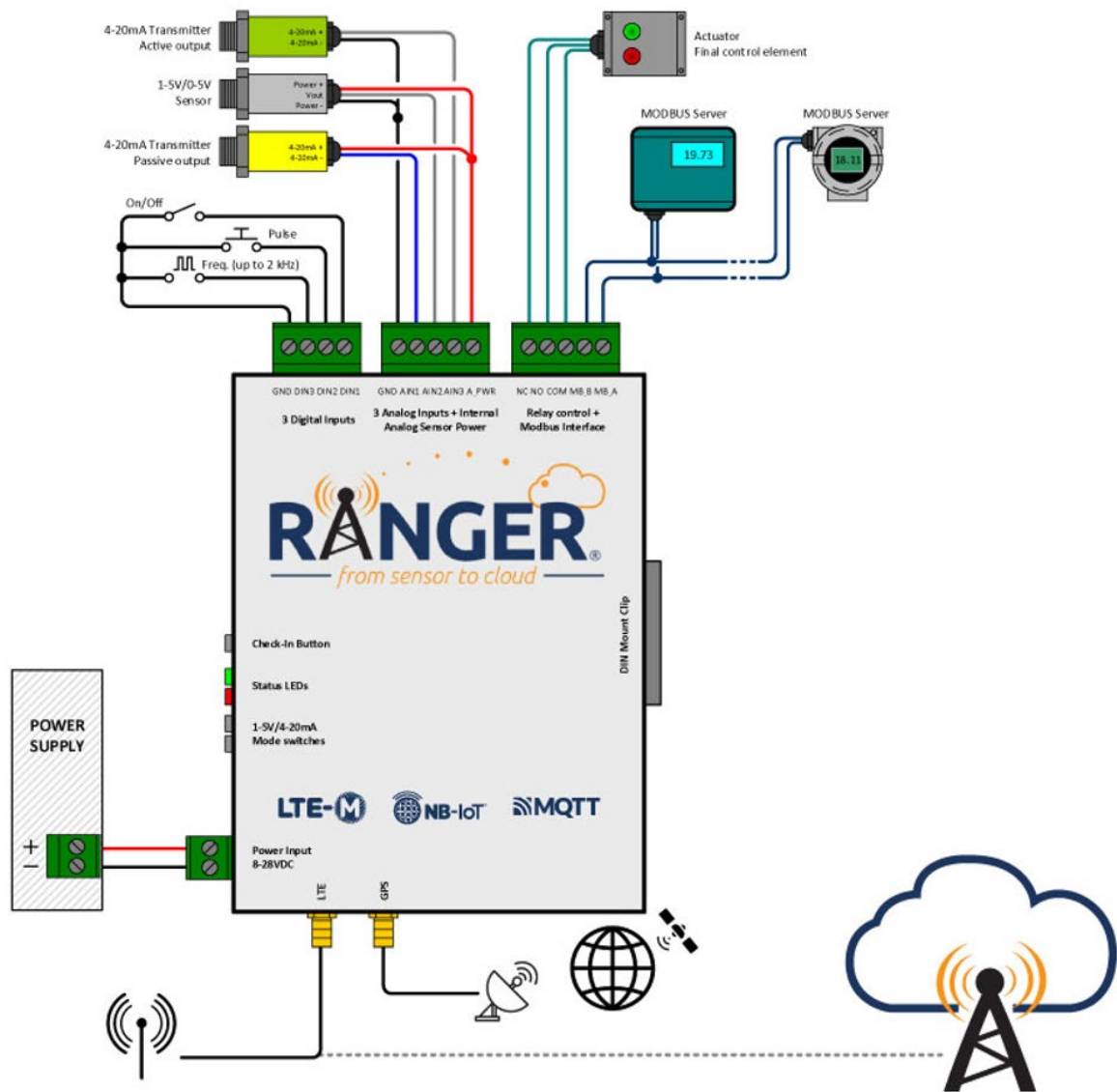

RANGER Internal components

Setup

Devices purchased with the SignalFire Cloud service come with a pre-installed SIM card. Customers will require a login to access the SignalFire Cloud server (signal-fire.cloud). Fill out the request form here: https://signal-fire.com/lte-m1-cellular-products/cloudregister/ to setup your company site.

Adding the RANGER to your SignalFire Cloud Group

1. Apply DC power and wait 1-2 minutes so the RANGER can first connect to the cellular network

2. Verify that the RANGER is connected to the cellular network by pressing the "CHECKIN" button on the device and observe 3 strobes of the green status light.

3. Login to the SignalFire Cloud with your account login/password

4. From the Home page click "Add Device"

5. Enter the RANGER serial number and click "Claim". The serial number is located on the bottom of the RANGER with a format of "RD" followed by 6 numbers. (e.g. RD123456)

6. A message will be sent to the RANGER to claim it to your group account

7. Within approximately one minute the device will connect to your account, and you will be automatically redirected to the device status page

Sensor Connections

Screw Terminal Connections
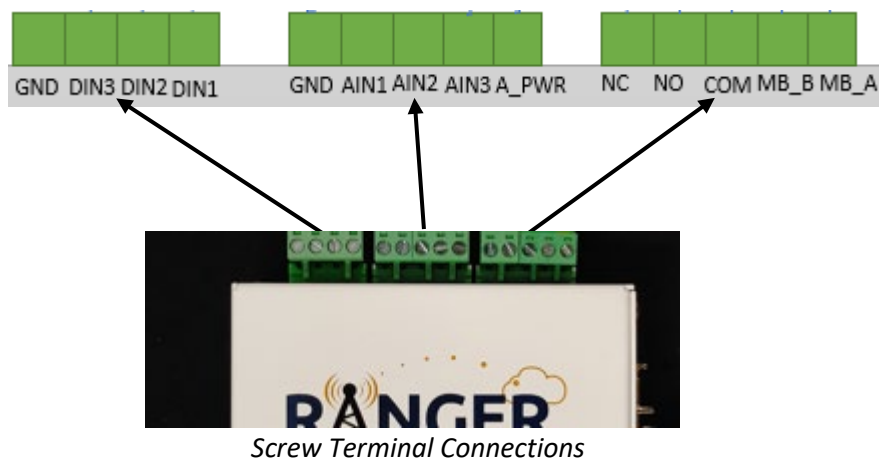
Analog Inputs

The analog inputs provide 13VDC/18VDC (selectable in software) to the attached sensor. The analog inputs, being AIN2 and AIN3, can operate in either current (4-20mA), or voltage (1-5VDC). The input mode must be set by the slide switch. Slide the switch up to **V** for a voltage input, or down to **mA** for a current input. AIN1 is set to a fixed 4-20mA mode operation.

Digital Inputs

The digital inputs (3 total) can be dry contact or voltage (must be push-pull, 30 Volts max). Be sure to connect the ground bus from the module to either the ground of the voltage pulse device or the dry contact.

Relay Output

The RANGER has a single latching SPDT relay which may be controlled remotely from the server or by using the RANGER's internal relay control logic

Modbus RS-485

The Modbus pins MB_A and MB_B provide the RANGER with the ability to read a Modbus sensor over two-wire RS-485. Sensors can be powered off the RANGER's onboard analog sensor power output pin A_PWR or powered externally. Like the analog sensor, its voltage is set in the RANGER configuration tile. The RANGER can provide up to a total of 60mA at 18VDC for all attached sensors. If more power is needed, it is recommended the sensors be powered with an external DC source. Follow the wiring diagram under *Interface Wiring* for integrated and externally powered options.

The attached sensors need to each have a unique Modbus ID.

The RANGER acts as a Modbus Client and polls data from connected Modbus Server(s) attached.

Power
The DIN Mount RANGER requires an 8-28VDC power source. The DIN RANGER requires less than 2mA
of power to operate the cellular modem. The supply must be capable of supplying a peak current of 250mA which is required for cellular transmissions. If the RANGER is configured to power attached sensors, the sensor current is in addition to the RANGER modem current.

Antenna Connections
The RANGER requires that an LTE 4G cellular antenna be connected to the SMA connector labeled LTE-M. SignalFire offers a variety of cellular antennas that can be used with the RANGER.

If the GPS location feature is required a GPS antenna must be connected to the GPS SMA connector. SignalFire offers antenna options. Note that for the GPS to function the antenna need to have clear view of the sky and will not work indoors.

Sim Card Insertion

The DIN Mount RANGER requires a nano SIM card that supports LTE-M or NB-IoT service.
If the RANGER was purchased without the SIM card and data plan offered by SignalFire a compatible SIM card must be installed.

To install a SIM card first remove the four Philips head screws securing the cover. The SIM card is then inserted into the SIM slot located on the underside of the round RANGER PCB.

The image below demonstrates where the SIM card slot is located and in what orientation the sim card should be inserted.

The sim card slot is located on the bottom side of the RANGER in the area indicated by the red highlighted outline. Make sure that, from the top view, the slanted angle of the sim card is on the bottom right-hand corner as it is inserted into the RANGER's SIM card slot and the SIM card contacts are facing up
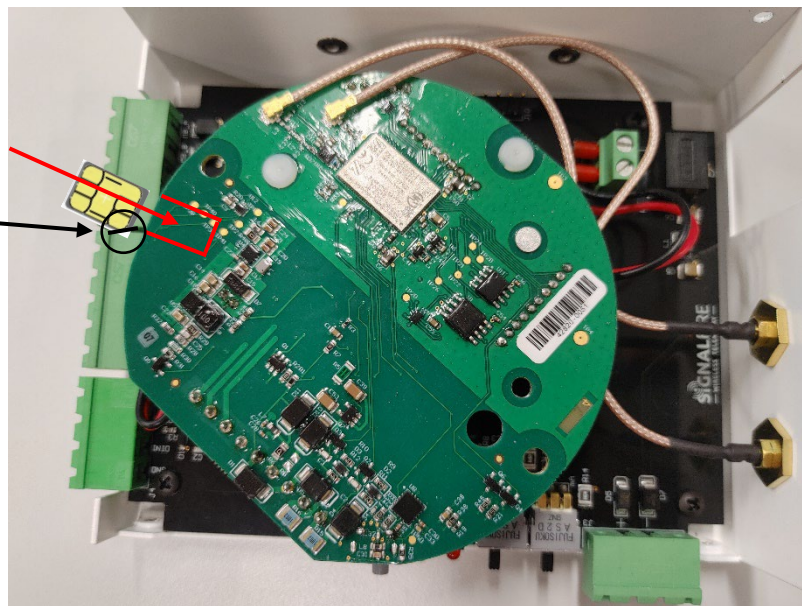
Interface Wiring

The DIN Mount RANGER contains three interfaces. These interfaces are:

Analog (4-20mA or 1-5V)
Discrete Input (on/off or pulse up to 2KHz)
Replay Output
Modbus Serial

All three interfaces require sensors that must connect to the DIN RANGER via the three top terminal sections of the DIN RANGER. The user can either use the DIN RANGER to power the connected sensor or they can be externally supplied. The images below demonstrate how each sensor should be wired if the sensors are supplied by the DIN RANGER or externally supplied.
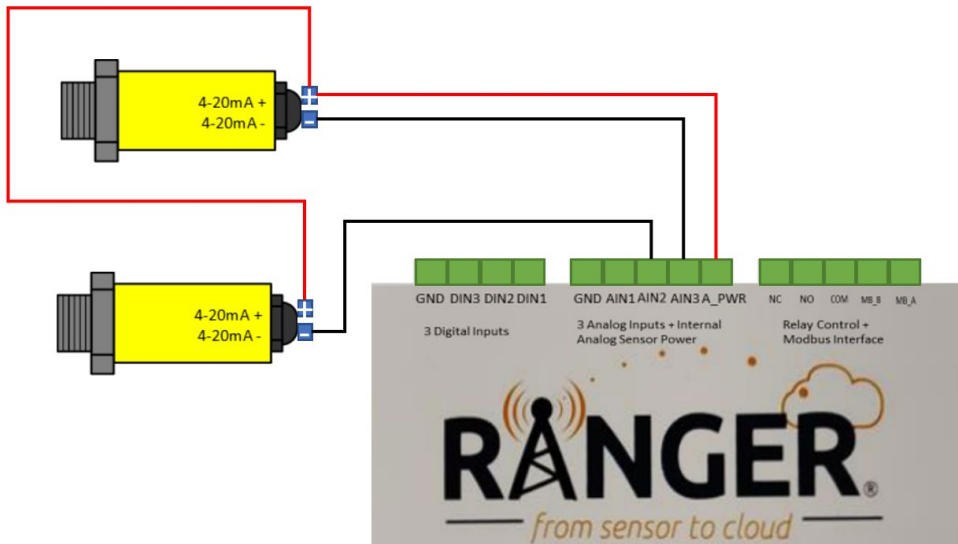
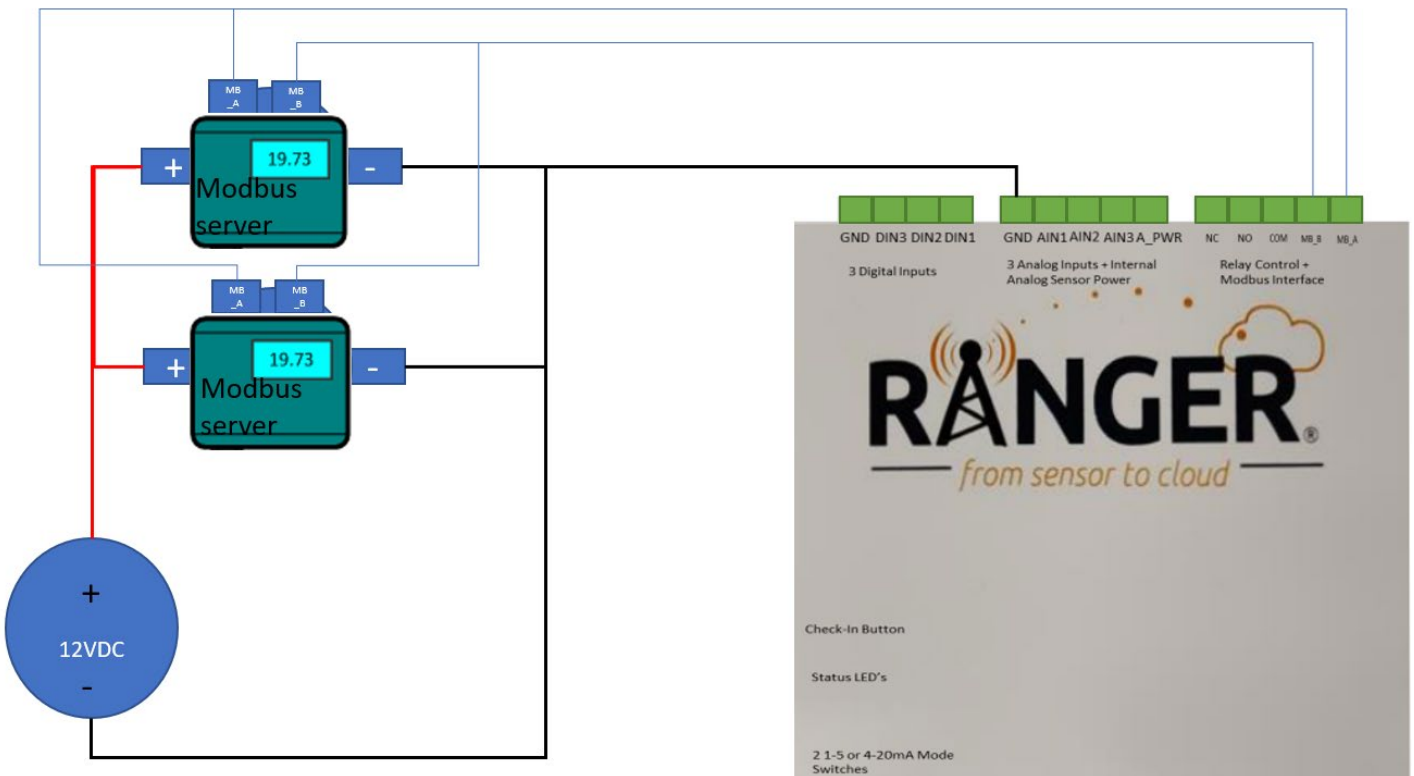*4-20mA Internal Supply Wiring*
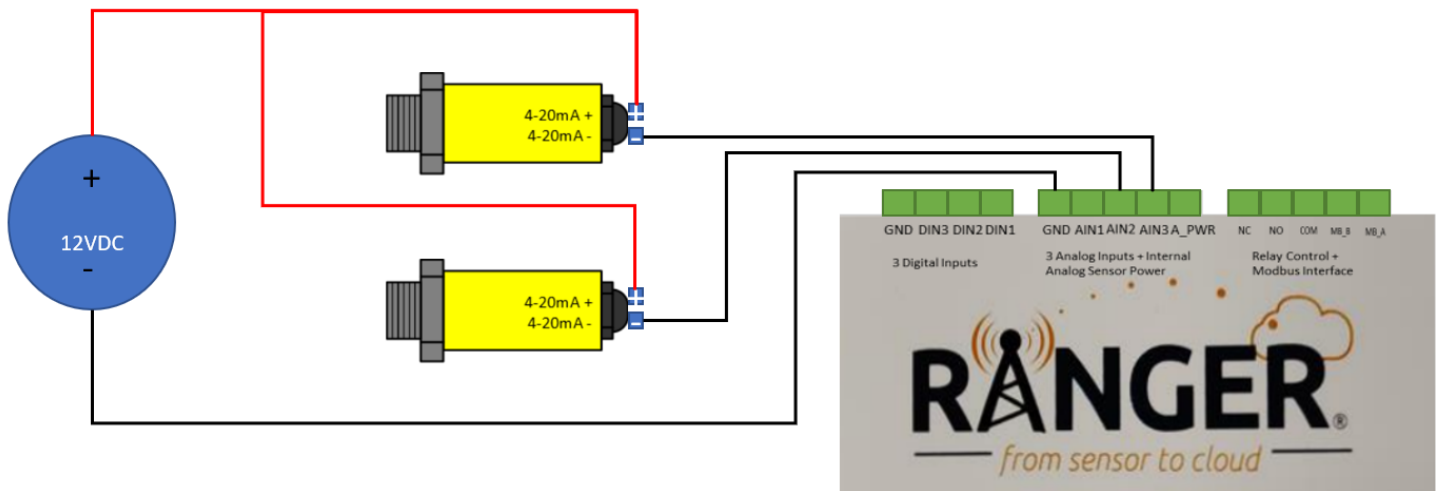
4-20mA External Supply Wiring
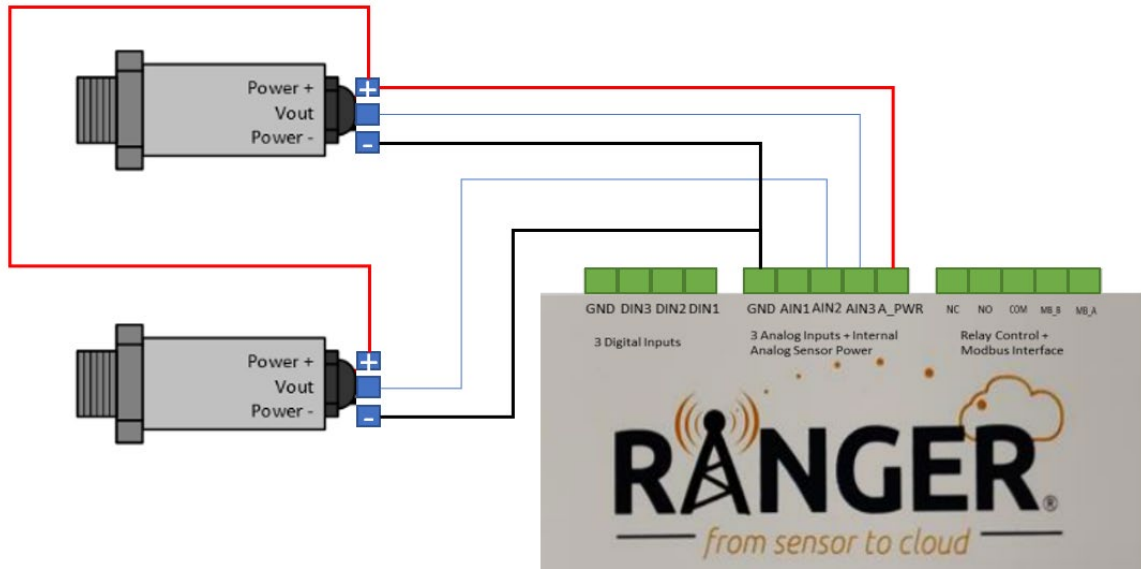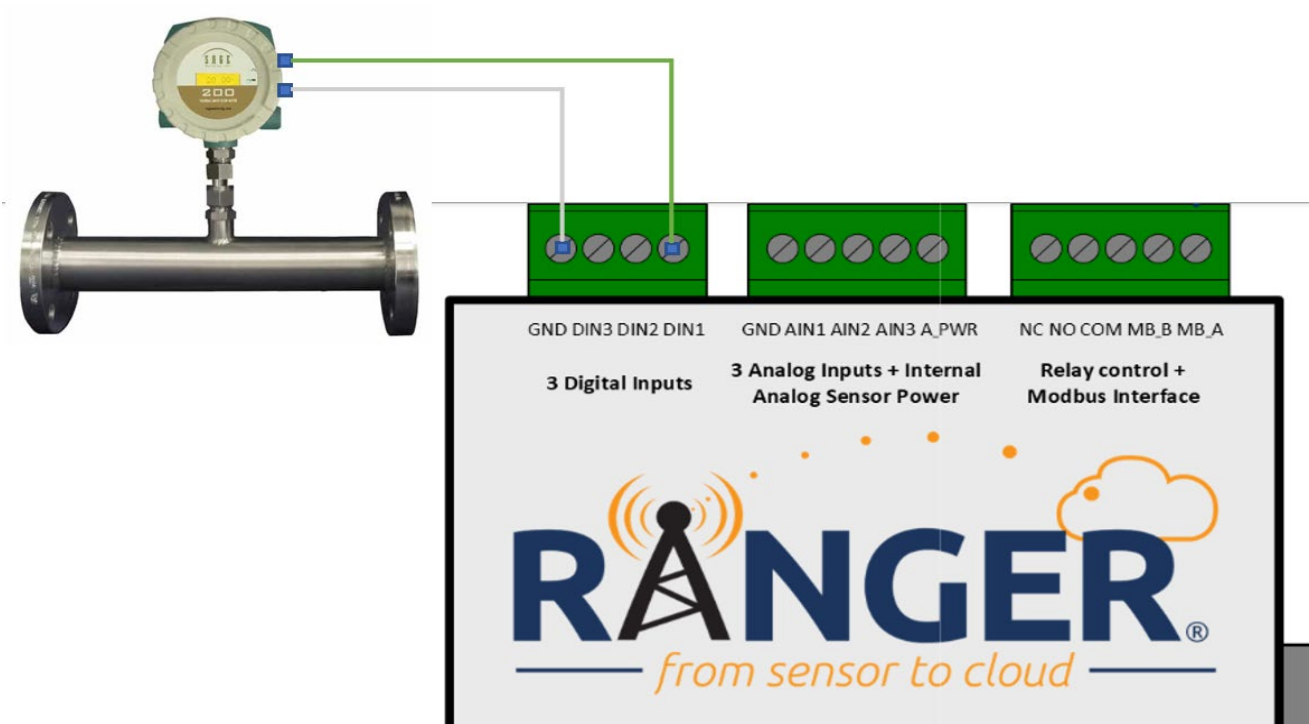

1-5V Internal Supply Wiring
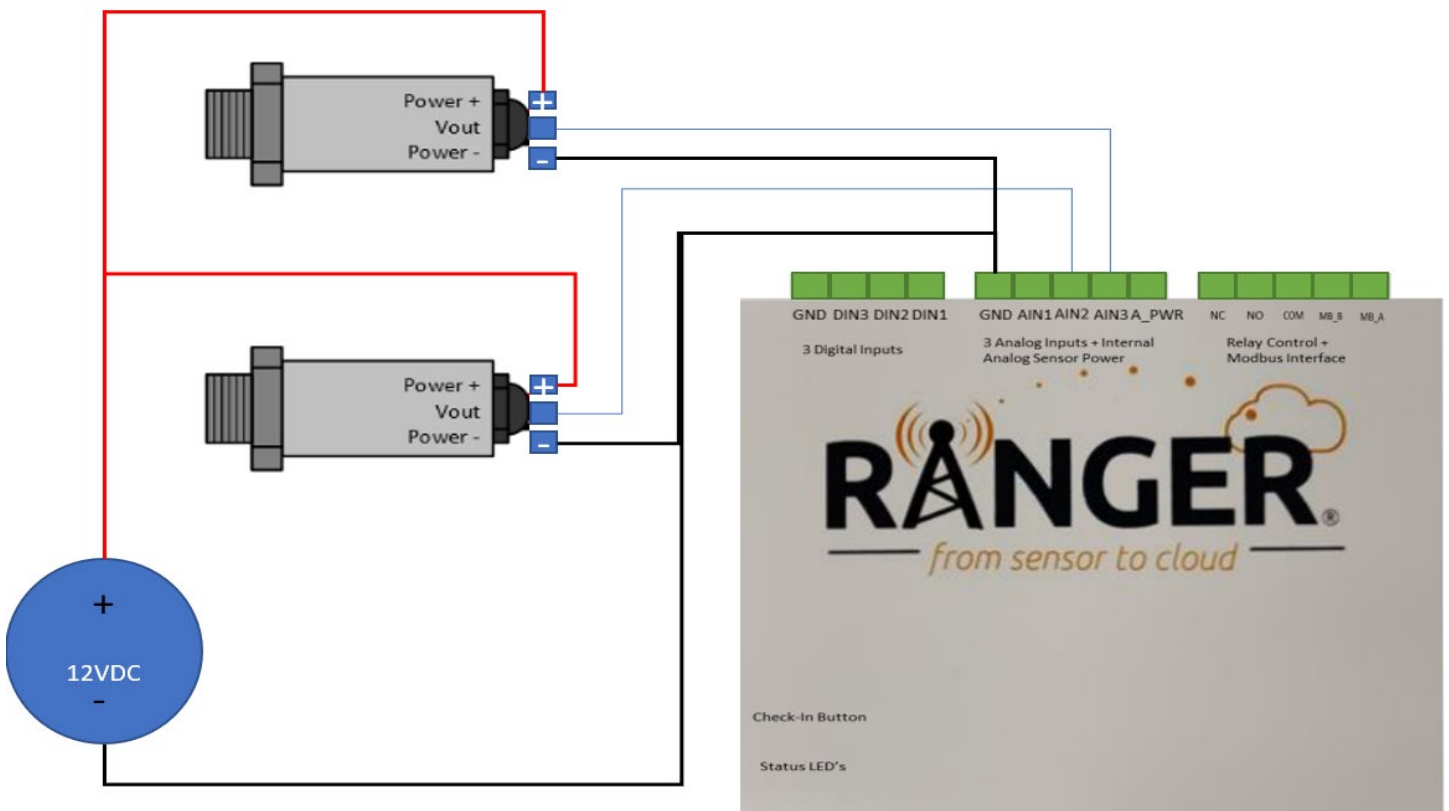
1-5V External Supply Wiring
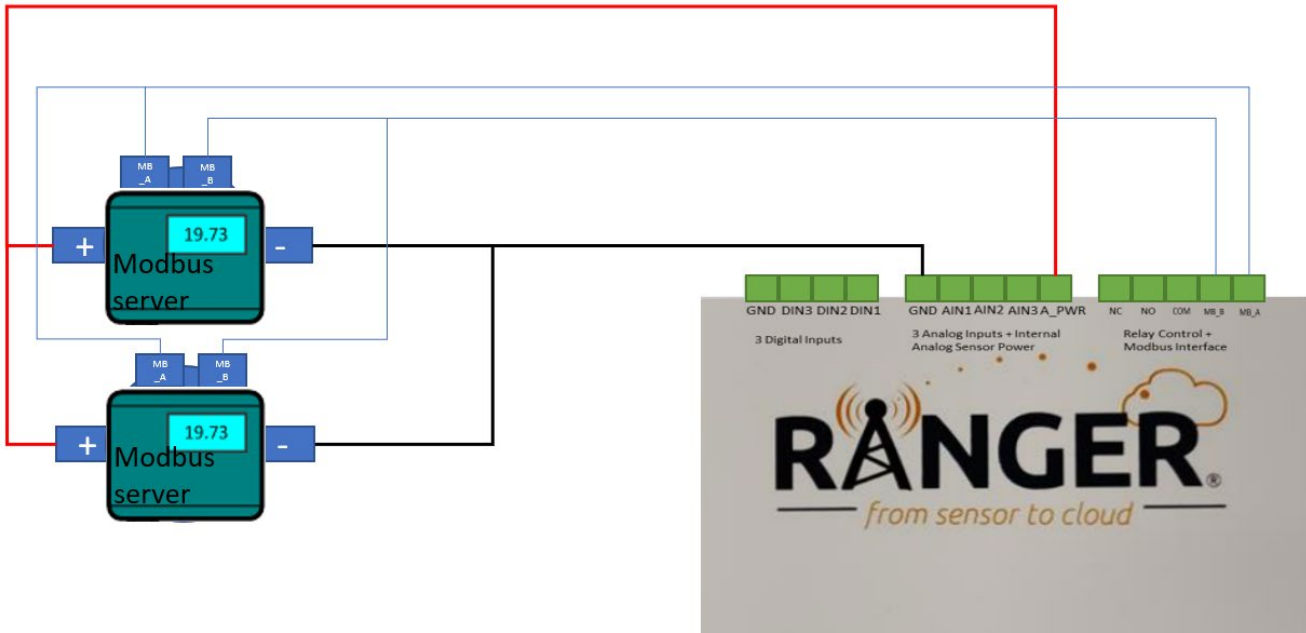
Modbus Internal Supply Wiring

Modbus External Supply Wiring

Flow Meter Wiring Using a Pulse Output into the Digital Input
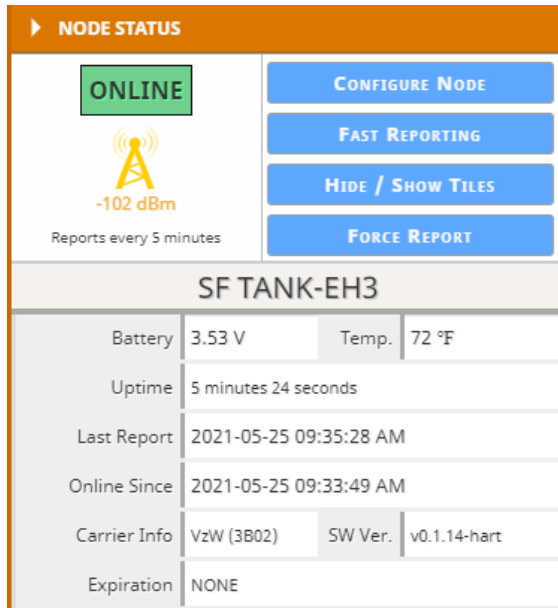
RANGER Configuration

The RANGER can be configured using the RANGER ToolKit software over the micro-USB port, or via the SignalFire Cloud interface.

RANGER Settings from SignalFire Cloud

After the RANGER is added to your cloud group, select a RANGER from the list on the Home tab to see the device status, sensor readings and settings.
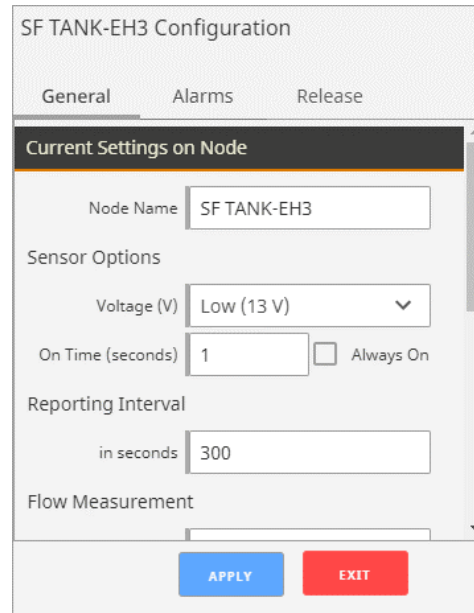
The detail display is organized as a "tile" view with each tile representing a specific input or function.

Each tile with configurable settings has a "Configure" button that will bring up the related settings.

Node Status Tile

The Node status tile contains general information about the RANGER and allows setting the RANGER system parameters.

Configure Node

The "Configure Node" allows for "General" settings, "Alarms" settings, and a "Release" option:
Under General:

Node Name

The Node name is a user configurable string used to easily identify the RANGER.

Sensor Voltage

Sets the output voltage applied to the analog sensor output. It is user configurable to 13V or 18V.

Sensor on Time

Configures the amount of time the Sensor Voltage is applied to the sensor prior to taking the reading. This needs to be long enough for the attached sensor to power on and stabilize, but should be minimized to optimize battery life. **If the RANGER is not powering a sensor or if the sensor is powered externally, set this value to 0. Note: sensors may vary...consult your sensor manufacturer to understand how long it takes to power on or take a measurement.**

Report Interval

The setting controls the interval at which the RANGER will apply power to the attached sensor and forward the sensor readings to the Cloud. Clicking on "Fast Reporting" will open up the Fast Reporting Interval window.

Flow Measurement

By default, the digital inputs report input state (open/closed) and input frequency. Optionally one or both digital inputs can be configured for Flow Measurement Mode. This is used for a connection to a flow meter with a pulse output and allows the user to configure a pulse k-factor and see the instantaneous flow rate, average flow, and total flow in volume units.

The analog inputs can also be used for flow measurement, where a current/voltage corresponds to a flow rate. The RANGER can sample the analog input at the report time only and do a rough approximation of a flow total by assuming that the flow rate stays constant between report samples. Note that there will always be some inaccuracy when using an analog input for flow totalization. A digital pulse it recommended whenever possible for best accuracy and low power operation.

-*Under Alarms:*

Offline Alarm

The RANGER will send an alarm if the device is offline for more than the configured 'Offline Threshold' setting.

Low Battery Alarm

Allows the configuration of a threshold to dictate a low battery alarm.

-*Under Release:*

Release

Offline Alarm Setting under the "Configure Node" option

If the RANGER has been added to the wrong group and needs to be claimed under a different group, the RANGER can be released through the Release tab of the "Configure Node" window.

Fast Reporting

The RANGER can be configured such that if certain inputs cross a threshold, the RANGER will temporarily update at an increased rate. Fast Reporting can trigger when one or all conditions are met and can stay on for the entire time the input(s) are above the threshold, or a set time. In the above example, if Analog Input 1 goes above 8mA, the RANGER would begin reporting its sensor values every 60 seconds, for 3,600 seconds (1 hour).

Hide/Show Tiles

This feature allows the hiding or presence of a data tile on the dashboard menu of a given RANGER node. This is done by selecting the desired data inputs and clicking on either "Hide Selected" or "Show Selected" and then selecting "Apply".

Force Report

Causes the RANGER to take a new sensor reading and send the data to the server on its next "ping" interval. This can take up to 40 seconds.

The Alarm Group ID

Accessible by clicking on the "Edit Alarm Group" option under the "Alarms" setting, this defines which alarm group will receive alarms from this device. Each user configured in the Users tab can be assigned an alarm group number. Any users with a matching alarm group will receive alarms from this RANGER. Multiple alarm groups may be entered separated by a comma and all groups entered will receive alarms.

Analog Input Tile
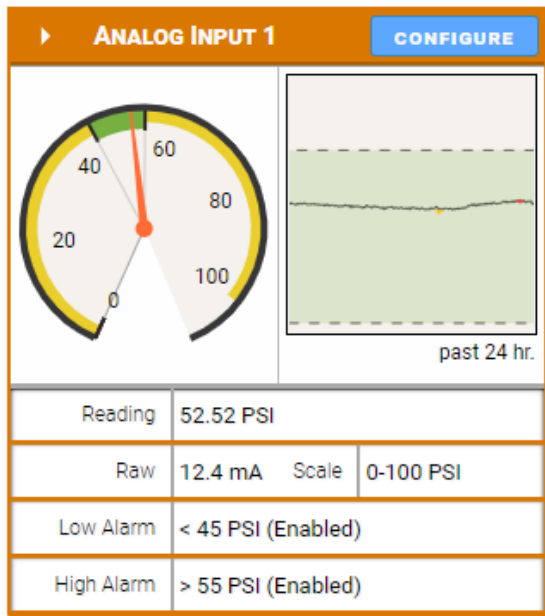
The Analog input tile displays the details for the analog input, including scaling and alarms. Since the DIN RANGER will include 3 analog inputs, each input will appear as their own Analog Input 1, Analog Input 2, and Analog Input 3 tiles, respectively.

Analog Mode

This will display the input mode (4-20mA of 1-5V) that is set by the slide switch on the RANGER.

Scale Units

This is a user definable setting to identify the engineering units.

Scale Low / Scale High

The scaling allows the user to span the analog sensor. The Scale low is the sensor value at 4mA/1V and the Scale High is the sensor value at 20mA/5V.

Alarm Thresholds

The analog input supports a high and/or low alarm threshold. This threshold is configured using the scaled engineering units. If the configured threshold is crossed and the alarm is enabled, a SMS and/or email message will be sent to each user in the alarm group of the RANGER.

Digital Input Tile

There is a Digital Input tile for each of the three digital inputs, Digital Input 1, Digital Input 2, and Digital Input 3 unless they are configured for Flow Mode. If a digital input is configured for Flow Mode, the flow totalizer tile will replace the Digital Input tile. It will appear as Digital Input 3 tile.
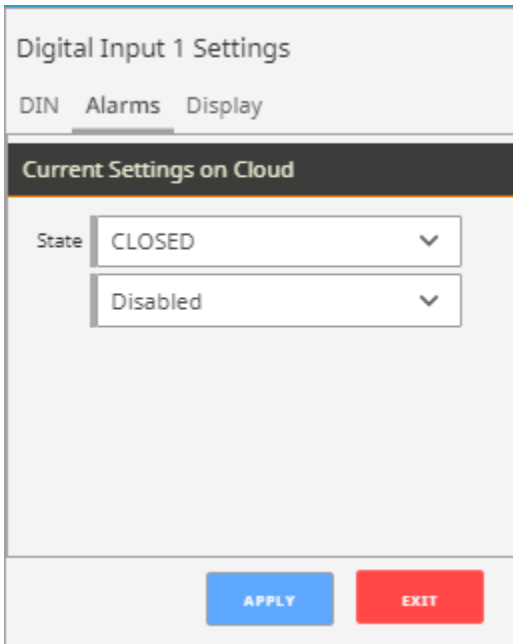
Reset Counter

Selecting this check box and click apply will zero the input cycle count.

Report on Change

If selected, the RANGER will report any changes on state of the input to the Cloud within 2-seconds rather than waiting until its next scheduled report.

DIN Alarm

The RANGER can send an alarm when the DIN opens, closes or on any change.

Digital Input 1 Settings

DIN   Alarms   Display
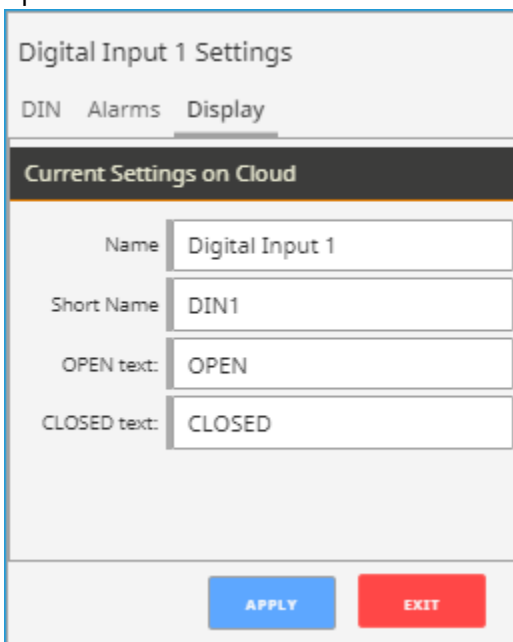
Current Settings on Cloud

State   CLOSED

Disabled

APPLY   EXIT

DIN Display

The DIN "Display" setting presents several configurable settings with respect to the digital input IO's. For instance, the name of the IO, the truncated name, and preferred name changes to when the digital input is open or closed.

Digital Input 1 Settings

DIN   Alarms   Display

Current Settings on Cloud
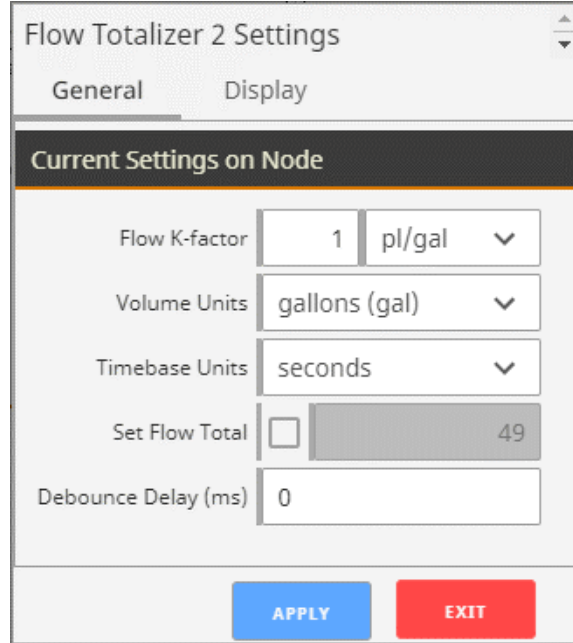
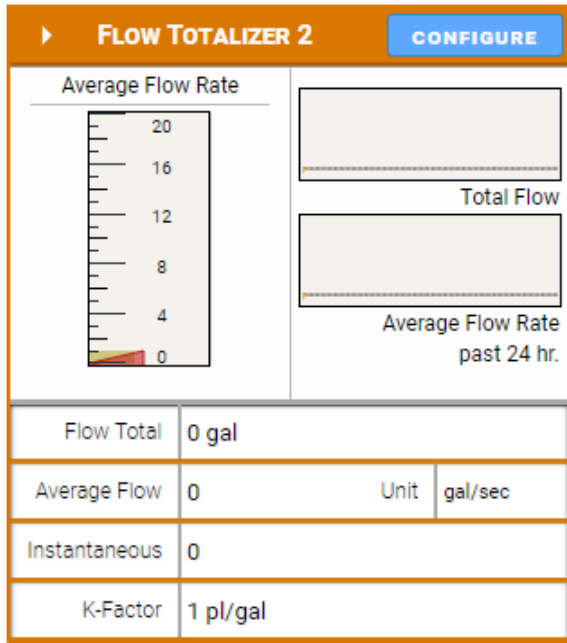Name   Digital Input 1

Short Name   DIN1

OPEN text: OPEN

CLOSED text: CLOSED

APPLY   EXIT

DIN Flow Totalizer Tile

If a digital input is configured for Flow Mode, the flow totalizer tile will replace the default Digital Input tile. As mentioned previously, when in flow mode the RANGER will display the flow rate and total flow volume. The Average Flow is the average flow rate over the configured RANGER Report Interval, while the Instantaneous Flow rate is the flow rate calculated over the 2 seconds immediately before the report.

Flow K-Factor

For the Flow K-Factor, select the desired volume pulse units. Enter the number of pulses per unit volume that the flow meter outputs.

Volume Units

The Volume Units is used to select the volume units needed for the flow rate and total volume calculations.
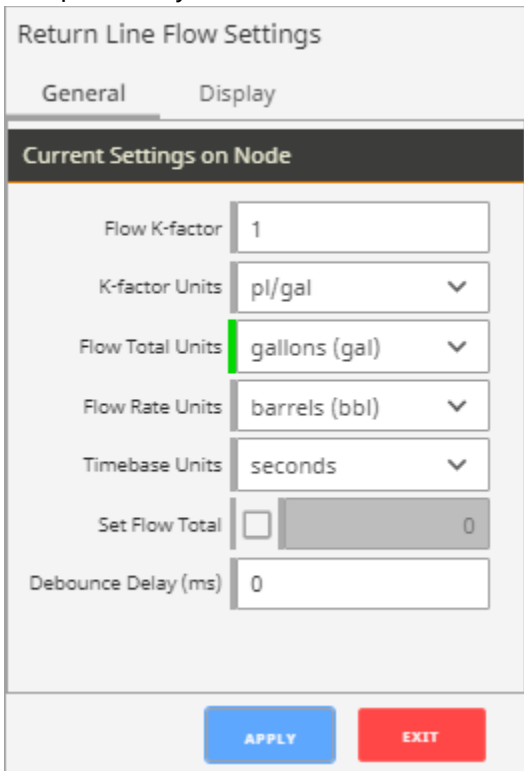
Timebase Units

The Time base units select the time units for the flow rate calculations.

Set Flow Total

This allows the user to set or reset the total volume measured. Click the checkbox then enter the volume.

Total Units VS. Flow Rate Units

When Flow Measurement is enabled, make note that, within the Return Flow Settings, total units can be set independently of the flow rate units:
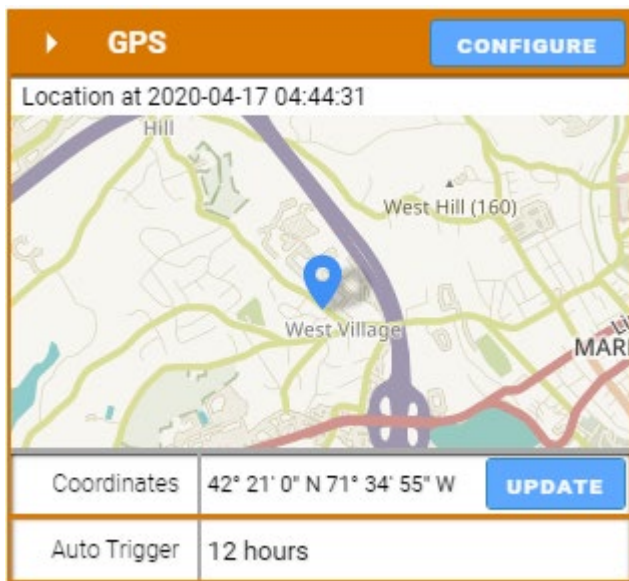
Return Line Flow Settings

General | Display

Current Settings on Node

Flow K-factor	1
K-factor Units	pl/gal ⌄
Flow Total Units	gallons (gal) ⌄
Flow Rate Units	barrels (bbl) ⌄
Timebase Units	seconds ⌄
Set Flow Total	☐ 0
Debounce Delay (ms)	0
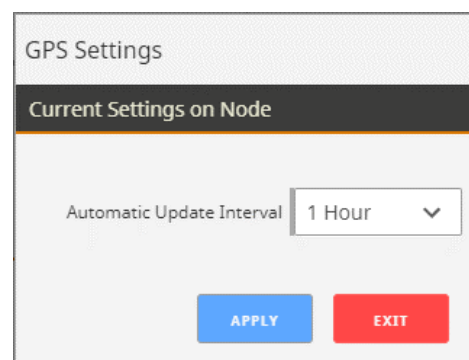
APPLY   EXIT

GPS Tile

GPS   CONFIGURE

Location at 2020-04-17 04:44:31

Coordinates	42° 21' 0" N 71° 34' 55" W	UPDATE
Auto Trigger	12 hours	

GPS Settings

Current Settings on Node

Automatic Update Interval	1 Hour ⌄

APPLY   EXIT

The RANGER has an internal GPS receiver/antenna to provide location data to the server. The RANGER requires a clear view of the sky for the GPS functionally. GPS to function. The GPS will often not work inside even if the RANGER is near a window.

A GPS update may be triggered on demand, or an automatic location update interval between 1 and 12 hours can be configured. For an on-demand location update, click the "UPDATE" button. Note that an initial "cold" GPS fix may take up to 5 minutes.

While the GPS receiver is active commands sent to the RANGER my take up to 80 seconds to be delivered.

Digital Output Tile
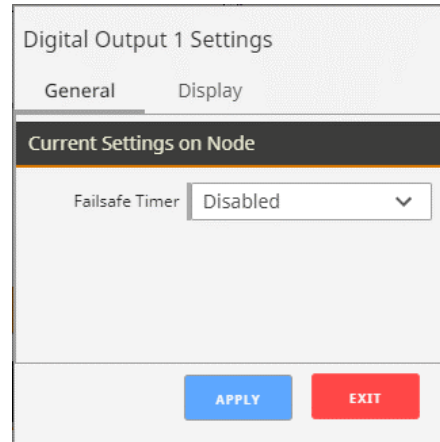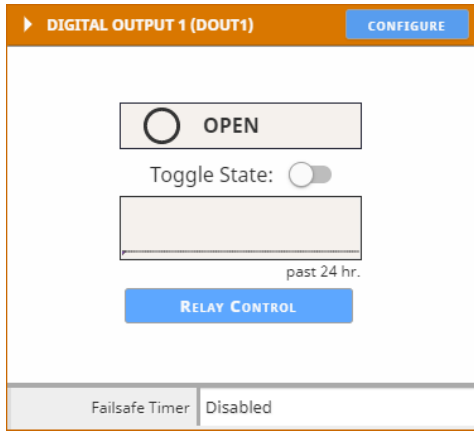
The relay output can be toggled by setting the Toggle State switch. The command will reach the RANGER on its next "ping" interval which can take up to 40 seconds. The Toggle State switch will change to blue and the OPEN/CLOSED indicator will change once the message has reached the RANGER.

The relay output also has an optional failsafe timer. If this is configured, the relay will go to the open (failsafe) state if the RANGER loses connection to the server for the configured time.

Relay Control

The digital output on the RANGER can be configured to energize and de-energize based on its other inputs. This control logic is run locally in the RANGER and does not depend on cellular connectivity. First, the "Relay Control" field should be Enabled. The trigger logic can be entered by specifying which input to control the relay from, and then specifying which values of that input energize and de-energize the relay.

If the relay is being triggered from multiple inputs, the user can select whether all the triggers need to be true (Boolean AND), or any of the triggers need to be true (Boolean OR). The Minimum Energize Time field determines the amount of time the relay, once energized, will stay on even if the de-energize condition becomes true.

RELAY CONTROL TRIGGERS: SF TANK-EH3

Current Settings on Node

Metric	Value	Energize When	Threshold	De-energize When	Threshold
DIN1	0	=	0	=	1
DIN2 Avg Hz	0	>	20	<=	18
None	0	N/A	0		0
None	0	N/A	0		0
None	0	N/A	0		0
None	0	N/A	0		0
None	0	N/A	0		0
None	0	N/A	0		0

RELAY CONTROL SETTINGS

Relay Control is	Enabled	Current State:	Active
Energize Relay when	Any Relay Control triggers are TRUE		
Minimum Energize Time (seconds)	1	Failsafe Enabled (Missing Source data sets trigger to de-energize)	☐
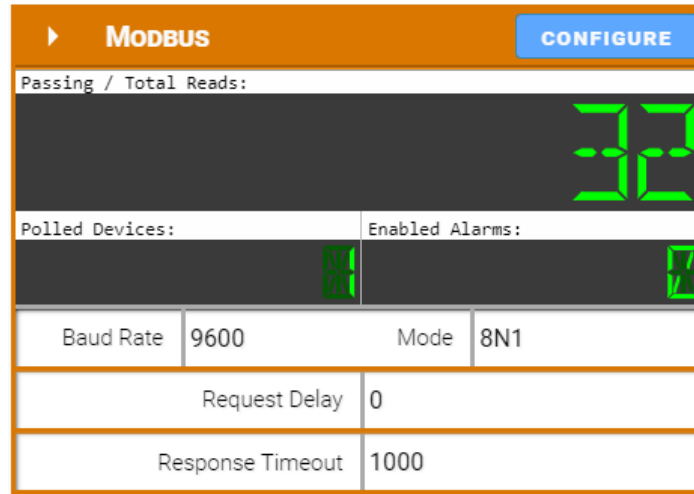
If the RANGER has the Modbus expansion card installed, users can configure the RANGER to read Modbus registers from any attached sensors. To set the RS-485 communication parameters and configure Modbus reads, click on the "Configure" button on the Modbus tile.
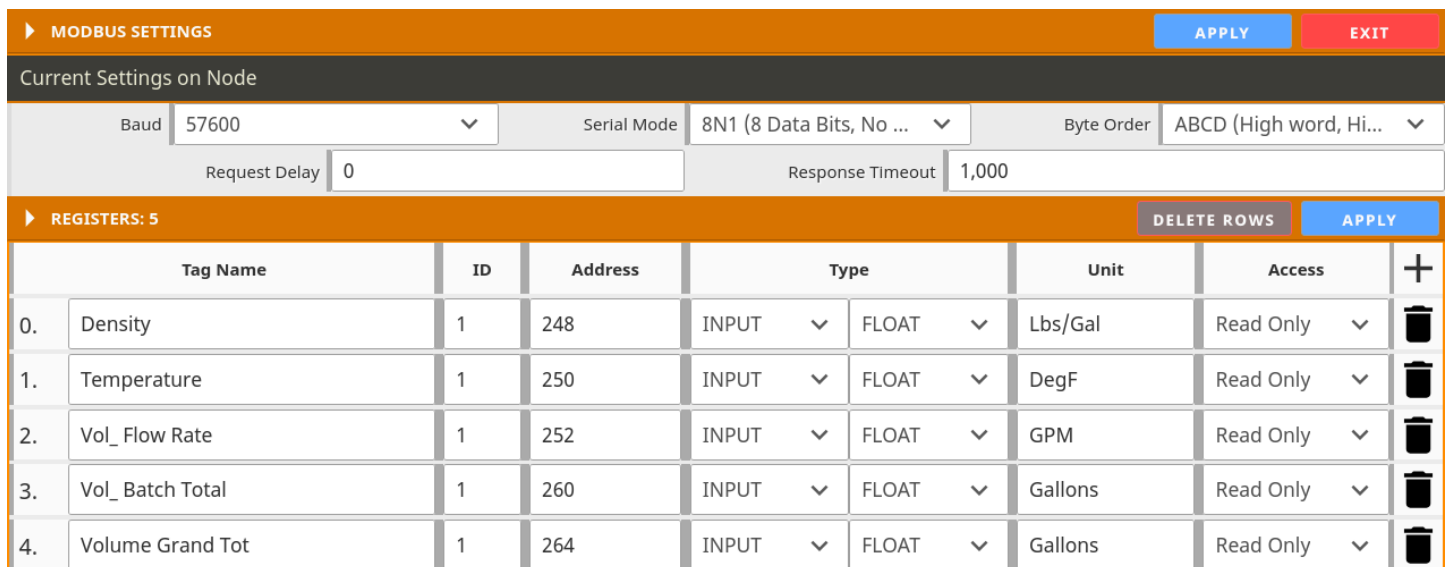
Use the top portion of the menu to configure communication parameters. These settings must match all the sensors on the RS-485 multidrop network. The default configuration is shown in the figure above.

The RANGER can read up to 32 datapoints from up to 8 connected devices. To add a new register read, click on the '+' button. Each line needs to be specified with a Tag Name, and point to a Modbus Slave ID, register type, register address, register data type (INT16, UINT16, INT32, UINT32, INT64, UINT64, FLOAT, DOUBLE, or BIT), and read/write access. The register can also be tagged with units if needed. Click Apply to send the changes to the RANGER.

The RANGER can read individual bits of a 16-bit register. This can be useful for bitmask registers where each bit position represents a flag/status alarm. To select the bit, change the Type to "Bit Pos" and then the bit position number. Bit Pos 0 reads the Least Significant Bit, and Bit Pos 15 reads the Most Significant Bit of a 16-bit register.

To select lines for deletion, click on the trash can icon at the end of each line, and then click on the "Delete Rows" button to delete all the rows selected.

Once the registers have been set up as desired and applied, click "Exit" to return to the RANGER's main page. The registers and their values will appear in a table below, where they can be organized in ascending or descending order by clicking on each header. The Modbus register configuration can also be done locally using the RANGER ToolKit.

MODBUS REGISTERS								CONFIGURE
Tag Name	Value	Units	Status	Alarm Low	Alarm High	Configure	Enable View History	Enable Custom Tile
Density	0.001 Lbs/Gal	Lbs/Gal	✓ Passing	0.0 (DISABLED)	0.0 (DISABLED)	MODIFY	⊘	⊘
Temperature	69.112 DegF	DegF	✓ Passing	0.0 (DISABLED)	0.0 (DISABLED)	MODIFY	●	⊘
Vol_ Batch Total	0 Gallons	Gallons	✓ Passing	0.0 (DISABLED)	0.0 (DISABLED)	MODIFY	⊘	⊘
Vol_ Flow Rate	0 GPM	GPM	✓ Passing	0.0 (DISABLED)	0.0 (DISABLED)	MODIFY	⊘	⊘
Volume Grand Tot	91,164.875 Gallons	Gallons	✓ Passing	0.0 (DISABLED)	0.0 (DISABLED)	MODIFY	⊘	⊘

Clicking on the slider for "Enable View History" will add that register to the historical data view at the bottom of the page. Clicking on "Modify" will bring a pop-up to configure alarms, or to do a register write to set a Modbus value in a register. Every register can be individually set up with Low and High alarm thresholds. Click "Apply" to save alarm settings for each register.

Clicking on the slider for "Enable Custom Tile" will make that metric viewable as a tile similar to the analog and digital inputs.

► FLOAT 1		APPLY
Current Settings on Node		
Register Value	700.553100	
► ALARMS		APPLY
Current Settings on Cloud		
Low Alarm Threshold	0	Disabled ⌄
High Alarm Threshold	0	Disabled ⌄

► MODBUS RPM	CONFIGURE
Reading	1532
Low Alarm	< 0.0 (Disabled)
High Alarm	> 0.0 (Disabled)

► MODBUS TEMP 1	CONFIGURE
Reading	42.1669998169
Low Alarm	< 0.0 (Disabled)
High Alarm	> 0.0 (Disabled)

► MODBUS RUN STATUS	CONFIGURE
CLOSED	
Reading	1
Alarm value	0 (Disabled)

Historical Data View

The server maintains a database containing the historical data view of all reported readings. The data may be viewed as a graph or a table view. Select which data values to display and the time range to view. The selected data for the configured time interval may be exported to a .csv file by clicking the "Export" button.

Default View

A user can configure the default trend view they which to see when they open the view for a RANGER. Simply configure the desired data to display and the desired default time display and click the "Set as Default" button. This view will be saved and be the default view for your account for that RANGER device.

Dashboards

Users can create custom dashboards that can display data from multiple RANGERs on a single dashboard. Within each dashboard users can create groups to logically group data views. To create or edit a dashboard the user must have "Dashboard Admin" rights on their account.

Create Dashboards and Data Groups

1. Select the "Dashboards" menu item, then click "Manage Dashboards" and then click "Add a Dashboard" and enter a name for the custom dashboard and click the "Rename" button to save.
2. Click the "+ Add Data Group" button to create your first data group and click the edit button to edit this group.
3. Name the data group and click the "rename" button to save. Each dashboard can have multiple data groups

Add data points to Data Group

In each data group users can add data points one at a time or in bulk.

To add a single data point, click the "Add Data Point" button. From here select the RANGER, metric and then the display type. The options for display type will vary depending on the metric type. Options include the Device Tile which mirrors the tiles on each RANGER detail page, additionally there are other simple data views like a gauge, tank alarm status icon, or value display.
Each tile will have a title bar indicating the RANGER name along with the RANGER connectivity status.

If you want to add the same data point from multiple RANGERs to a data group, click the "Bulk Add Data Points" button. Select multiple RANGERs in the select device list by holding the Ctrl key. Once one or more RANGERs is selected, a list of common metrics will be displayed in section. Select a metric then select the display type and click Save to Data Group to apply changes.

Example of bulk adding datapoints

Users

A SignalFire Cloud account is necessary to have access to your company's RANGERs. Contact your company's Cloud user admin to set up your account. If your company does not have an account and you are performing first time setup, complete the form at https://signal-fire.com/lte-m1-cellular-products/cloudregister/ to request a new user account group.

User Settings

Once logged in, select your username in the upper right to change your user settings. Enter your contact phone number and/or email address and enable Alarms to have alarm notifications sent to you. Enable billing to receive reports on which RANGERs are about to expire and need to have their Cloud subscription renewed. After making changes (highlighted in yellow), click Save or Undo to apply or revert the changes made.

User Roles

All users in the group can view any RANGER, but their ability to change settings can be restricted by their user roles. There are five user roles: User Admin, Device Admin, Alarm Admin, Alarm Ack, and Report Admin.

User Admin – Can add, edit, and remove users in the user group, including changing other users' permissions. The User Admin cannot view anyone's password, but they may reset the password for a user who forgets theirs. It is recommended to restrict the number of users with this permission to as few people as possible.

Device Admin – Can add, edit, and remove RANGERs in the user group, toggle the relay output and initiate firmware updates. Note that device admins can change any settings in any RANGER without restriction.

Alarm Admin – Can configure just the alarm settings for RANGERs and users.

Alarm Ack – Can acknowledge active alarms.

Report Admin – Can add, edit, and remove automated reports.

Dashboard Admin – Can create and edit custom dashboards. All users can view created dashboards

Power Chart Admin – Can create and edit Power Charts. All users can view Power Charts

User View

A list of users in the group can be viewed by clicking on the Users icon in the top menu. User Admins will be able to edit any user by clicking on the "Edit User" button. This will bring up the same User Settings as shown above, with an additional option to delete the user.
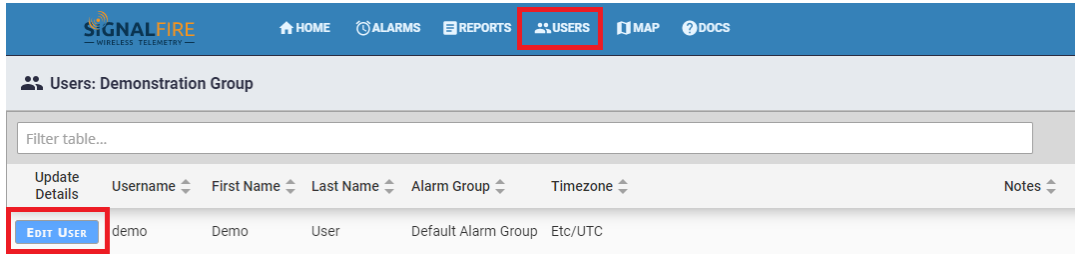
Adding Users

User Admins may add additional users in the User view by clicking Add User in the upper right-hand corner. Fill in the fields, configure permissions, and click "Create". A window will pop up with a temporary password for the new user once complete. It is recommended that an email address is used for the username so it is unique.

Alarms

The SignalFire Cloud provides a robust and flexible system that allows users to be notified by email and/or text message when a specified metric from a RANGER enters and clears an alarm state. The alarms can be set up so only certain users get alarms for certain RANGERs with the alarm group function.

To enable an alarm on an account with the Alarm Admin role, go to the RANGER, click "Configure" on the tile for the metric that you'd like to trigger an alarm on, and set its alarm threshold through the Alarms tab. The screenshot below shows the Configure window for Analog Input 1. If Analog Input 1 goes below 6mA or above 18mA, an alarm notification will go out to every user subscribed to this RANGER's alarms. A user with Alarm Ack permissions may acknowledge the alarm to signal that the alarm and/or its cause have been taken care of. Unacknowledged alarms can be seen accumulated in the upper right-hand corner of the Cloud page.

Alarm Views

Clicking on the Alarms button in the top bar will open a table of all alarm trigger events. The list of events can be sorted in ascending or descending order by any of the display columns by clicking on the column name.

The Alarm Status view contains the current state of the alarm system, while the Alarm Journal contains a history of all alarm events. Both the status and journal alarm tables can be exported to a csv file.

The upper-right hand corner of the table contains a gear ⚙ icon, sort 🔽 icon, and search 🔍 icon that help filter and find alarm triggers. The gear icon is used to enable/disable the display columns used for ascending/descending sort. The sort icon is used to filter alarms by their cleared/acknowledge state. The search icon is used to search alarms by keyword in any of its enabled columns. For example, if there is a RANGER named "Tank 6R" and the name column is enabled, typing in "Tank 6R" will show all alarm events from that RANGER. Hovering the mouse over a line will show a 🗨 icon. Clicking on it will reveal a detailed view for that alarm.

State

RANGER alarms, once triggered, can be in one of four states: "Active, Unacknowledged", "Active, Acknowledged", "Cleared, Unacknowledged", and "Cleared, Acknowledged". Active means that the alarm still

meets the alarm trigger criteria, while Cleared means it no longer does. Unacknowledged means that the alarm has not been dismissed by someone with Alarm Ack privileges, while Acknowledged means a user had seen and acknowledged the alarm.

For example, a digital input set to flow mode may have an alarm set to trigger when the average flow rate goes above 15 gallons/sec. When that threshold is first crossed, the alarm will appear in the Alarms table as "Active, Unacknowledged". If the average flow rate goes down to 12 gallons/sec, the state will change to "Cleared, Unacknowledged". Once an Alarm Ack user acknowledges the alarm, the state will change to "Cleared, Acknowledged". In other words, the inputs control the Active/Clear state, while users control the Unacknowledged/Acknowledged state.

To Acknowledge an alarm, a user with the Alarm Ack user role must click on the alarm and click "Acknowledge" in the bottom right corner. A user may alternatively select "Shelve", which prevents the alarm from triggering for a time period.

Configure Alarms

Users may also edit alarm settings by clicking on "Configure Alarms" in the tab list of the Alarms page. This view shows all possible alarm sources on all possible devices in the user group. The interface on the right side can be used to filter which devices, input types, and alarm groups show up in the table. This interface provides a convenient way of modifying alarms across multiple RANGERs and multiple types of alarms.

For example, clicking on Select Devices will pull up a list of all devices available. Select the RANGERs to filter by and click "Select" to add it to the list. Hold the Ctrl key as you click to select multiple at a time, or the Shift key to select a range. Once you have all the devices you'd like to see on the Included Devices list, click View Selected. Click "Clear Filter" to view all devices again.

To change a field, double click the field, enter the desired value, and then press the Enter key. Fields that have been edited but not set will be highlighted yellow. Clicking cancel will undo the yellow highlighted fields. Once all fields have been edited as needed, click the green Apply button in the upper-right hand corner. The yellow highlighted fields will change to green to indicate the changes have been set.

For a digital input, if the setpoint column is checked off that means the alarm will trigger when that input is Close or logic 1. For analog alarms, it sets the high or low threshold value depending on if it's a High Alarm type or Low Alarm type.

The **Deadband** column changes the Clear threshold for an analog alarm. As an example, if the high alarm level is 4,000, and the deadband is 200, after the analog input has gone above 4,000 and activated the alarm, it will have to go below 3,800 for the alarm to clear. Similarly, if the low alarm is 2,000 and the deadband is 200, the input will have to go above 2,200 to clear an active low alarm. This setting is useful to prevent multiple alarms when a reading is at the alarm threshold.

The **Delay** column adds a countdown timer to the alarm that starts once the threshold has been crossed. If the input stays past the threshold for entire duration of the Delay countdown, the alarm becomes active and alert messages are sent out. However, if the RANGER reports a reading below the threshold during that countdown, the timer is reset, and the threshold must be crossed again for the countdown to start again. **The Delay value should be greater than the RANGER's report interval** so there's at least one new reading before the countdown ends.

The Delay timer takes the Deadband value into consideration. Consider the previous example where the high alarm threshold is 4,000 and the deadband is 200, but now there is a 120 second Delay. Once the RANGER reports a reading above 4,000, a 120 second countdown begins. If the RANGER reports a reading of 3,900 before the timers hits 0, the alarm still activates because it's within the deadband. If it instead goes to 3,700,

the timer is reset and the input has to go back above 4,000 for the Delay timer to count down again.

Alarm Groups

When alarms are triggered, the Cloud sends messages out to users based on alarm groups. Click on the "Configure Groups" button in the upper-right corner of the Alarms tab to edit user and RANGER alarm groups. **Only users with Alarm Admin privileges may edit settings here**.

New users and newly added RANGERs will be assigned to the Default Alarm Group, which cannot be removed or renamed. To add a new group, click on the "+ New" button in the Groups tab, and then rename it in the Name field. To select which RANGERs you'd like to have in the group, click on the Configure button, check off the desired RANGERs, and click Apply.

To add a single RANGER to multiple groups at once, go to the RANGERs tab, click on the RANGER, check off the groups to add it to in the panel on the right, and click Apply. When any of that RANGER's alarms become active or clear, the Cloud will send messages to every user in the groups the RANGER is a part of.

To edit each user's group, click the Configure button to bring up a list of all users. You may then one-by-one edit which single group a user is assigned to. **Users may only be assigned to a single group**.

Reports

The SF Cloud has an automated reporting function that can send either a snapshot of data or a historical csv data dump to a group of recipients on a schedule.
To create a report, go to the Reports tab and then click on the "Add Report +" button and set the report filename and display name. Next select the type of report which can be either a snapshot or history report. The enabled checkbox enables the report to run automatically on the configured schedule.

Snapshot reports can be sent out up to 4 times a day, while history reports support daily or weekly data.

Change Recipients allows you to configure one or more email addressed that the reports will be sent to
Change Columns is only valid for snapshot reports and allows the user to device up to 6 columns of data
Change Devices allows the user to select which set of RANGERs the report could contain.

Report Settings: new_report1

Filename	new_report1
Display Name	Custom Report
Type	snapshot ⌄ Enabled ☐

1 time(s) daily at 12AM (midnight)
Next 5 occurrences:
1. Wed Nov 24, 2021 12:00AM UTC
2. Thu Nov 25, 2021 12:00AM UTC
3. Fri Nov 26, 2021 12:00AM UTC
4. Sat Nov 27, 2021 12:00AM UTC
5. Sun Nov 28, 2021 12:00AM UTC

CHANGE SCHEDULE

Please specify recipients

CHANGE RECIPIENTS

6 columns:
NAME, LASTREPORTED, AIN1, DIN1, DIN2, BATTERY

CHANGE COLUMNS

All group devices

CHANGE DEVICES

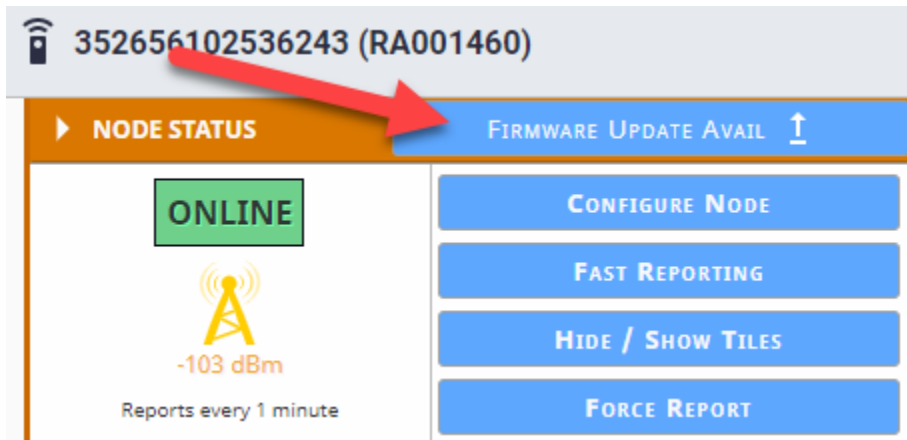PREVIEW   SAVE   CLONE   UNDO   DELETE

Note that history reports generate one .csv file per selected RANGER containing all historical data for that RANGER. If multiple RANGERs are selected one .csv file for each RANGER will be included in a .zip file.

Updating RANGER Firmware

RANGERs support Over the Air (OTA) updating of firmware. The Signal Fire Cloud Platform has tools built in to help you do this.

Single RANGER Firmware Update

On the Node Status of any RANGER, if there is an applicable firmware update available and the RANGER is online, the tile will display a button allowing you to upgrade the RANGER's firmware:
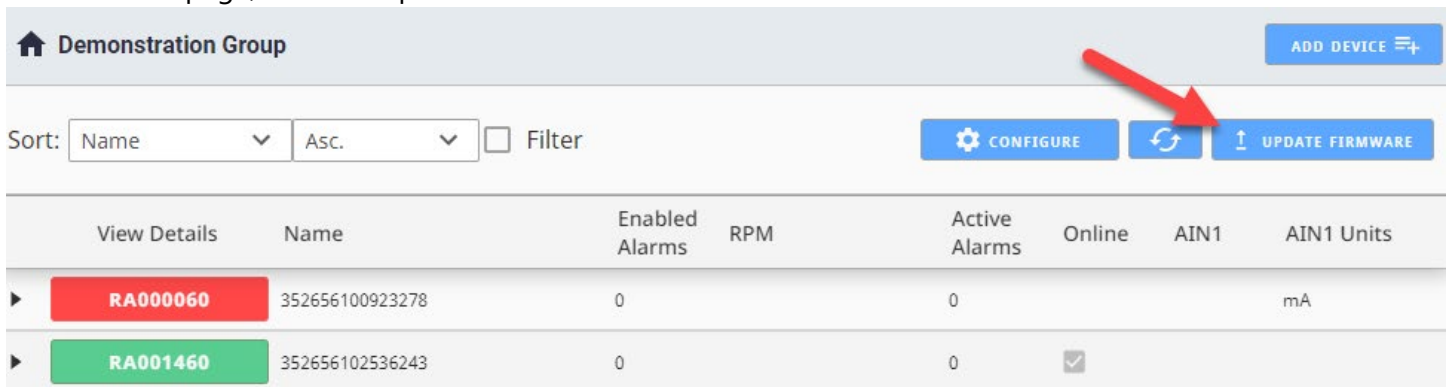

Upon clicking the button, the Bulk Firmware update page will be brought up with the target device preselected for receiving an update. You may review the list of nodes eligible for a firmware update to go through with a bulk firmware update.

Bulk Firmware Update

If you have multiple RANGERs, you can update one or more of them at the same time using the Bulk Firmware Update tool.

On the home page, click the Update Firmware button:

You will see a screen which lists the RANGERs in your group, along with their current firmware version, and any available firmware version. You will also see buttons to review Release Notes for the latest firmware version available.

Available Version ⇅	Release Notes
v0.1.21-v1-A-modbus	VIEW RELEASE NOTES
v0.1.21-v1-A-3v	VIEW RELEASE NOTES

You can select one or more RANGERs to update simultaneously, and then click the Update Selected button to begin the OTA firmware update process.

1 node selected	Update Selected

You will see each step of the firmware update process:

Update Status ⇅	Device ⇅	Current Version ⇅
Downloading Firmware	352656102536243 [RA001460]	v0.1.19-3v (Downloading v0.1.20-v1-3v)

Update Status ⇅	Device ⇅	Current Version ⇅
Rebooting Ranger	352656102536243 [RA001460]	v0.1.19-3v (Downloading v0.1.20-v1-3v)

You will also see the status of recently updated RANGERs:

Update Status ⇅	Device ⇅	Current Version ⇅	Available Version ⇅
Recently Updated	352656102536243 [RA001460]	v0.1.20-v1-3v	v0.1.20-v1-3v

If you trigger a firmware update and it doesn't complete successfully within 10 minutes, you will get a message that the firmware update failed. This can happen if the RANGER loses power during the update or if the download of the firmware software over the air fails. You can try again by selecting the checkbox again. There are many fail-safes in place to ensure that firmware updates will not leave the RANGER in an inoperative state.

If there is more than one person in your organization logged into the Signal Fire Cloud platform, you will be able to see firmware status updates that others perform in real time.

Technical Support and Contact Information

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Revision	Date	Changes/Updates
1.0	05/31/22	Initial release