



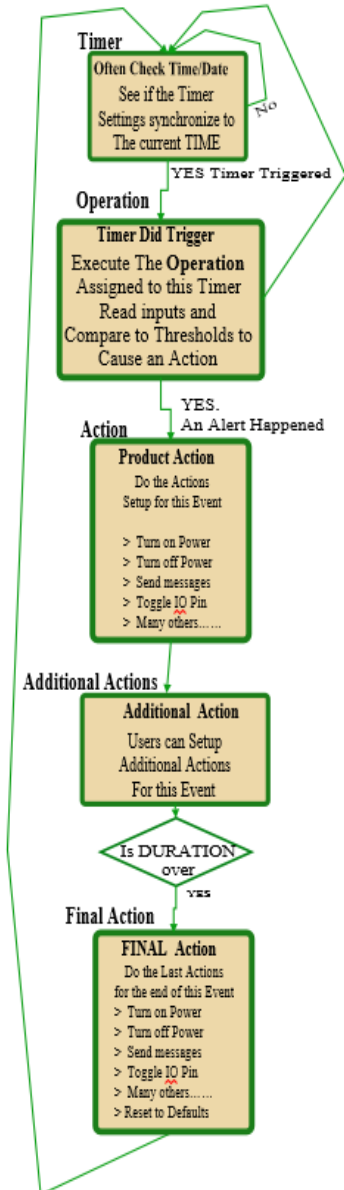
Timer Operations Actions and Alerts (TOAA) Examples

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This TOAA technology in the Autonomous RAZN is to safely Autonomously do anything to make sure the system is save, or to run in low-power modes to have a Timer wake up the RAZN and monitor and control what every you want.

Overview

TOAA Event Logic



In the Remote Autonomous Zone Note (**RAZN**), the **TOAA Events** are setup with three parameters (*Timer, Operation, and Action*) and an **Alert** can be triggered in Actions also. The timer specify as precisely at a day, hour, minute, and second to activate. It can create a New Alarm Event with TOAA technology using MODBUS commands. Timer Operation Actions can be setup in any way you would like, with an APP or with Configuration Commands.

Timer Operation Actions can be setup in any way you would like, with an APP or with Commands. The TOAA smart timer technology in the RAZN can be used to do what you want at a specific *time*.

- A. The *TOAA timer* in the RAZN that triggers time can be set to:
 - a. A specific month, and date, and time
 - b. All months on a specific date.
 - c. All weeks on a specific day or any specified days of the week.
 - d. Every day, at a certain time (Hour, minute, and second)
 - e. Every hour at a certain second do something.
 - f. Every few days, hours, minutes, or seconds as you setup, it will do what you want.
- B. When the Timer triggers, you specify the *Operation* this Remote Zone Node (RAZN) should perform. The *Operation* is setup to read inputs, and registers, which for you can read:
 - a. Switches, digital inputs,
 - b. Voltage inputs
 - c. 4-20mA current inputs.
 - d. Location, angle, temperature, and vibration
 - e. And many other things to read
- C. When the *Operation* reads what you want, it will trigger an *Action* based on your desires. If the Operation reading did not cause an Alert, then nothing else will happen.
- D. If the *Operation* caused an *Action* to take place, the actin that takes place is setup by you. The RAZN can perform many different Actions

- a. Send a Test Message that you want based on the Operation that happened.
- b. Send a MODBUS message as needed.

Output some serial port text data or TCP/IP text data to a

TOAA Examples

The Timer, Operations, Actins and Alerts feature can be configured in so many different ways, so this application note explains many methods so it is clear for someone to see how to setup a TOAA feature.

There are many different RAZN versions with many IO options and some have configurable General Purpose I/O (GPIO) terminals. When this Action takes place on an output, the output state will be the way you want it to be. And the state can be passed over communications so out can monitor the state or other RAZNs can monitor and display the output state.

In these example, the index code (X) for the TOAA is set as 1, but in multiple TOAA features set it differently in each different TOAA. Each **TOAA** can have 1 to 4 **Actions** assigned to it.

Turn a valve off if RAZN Temperature is too High

First: Preset the TOA (Timer, Operation Action) parameters to be put into your TOAA

AUTM A 2 0/0/30 [Trigger *Timer* every 30 seconds, to run the *Operation*]
AUOP G 9 5002 40 [*Operation* if 5002(*local Temperature*) is 9(*more than*) 40C degrees Celsius]
AUAK 1 H5,9,1 [*Action* to take place. Hardware action 5(*Set coil/bit output*) 9(IO# 9) to 1(ON)]

Once 3 TOA parameters are setup, specify them into the 4 TOAA feature.

TOAA 1 TA OG A1 [TOAA run Timer *A* Operation *G* Action *1*]

When the temperature shown in register 5002 exceeds 40 degrees, output terminal #9 will be turned on. The RAZN used for this should have output terminals in the way you want to control things. In H5, the output pin that is turned on will stay ON. It will not turn off until another command, SCADA command, or TOAA action turns it off.

Register 6063 is ADS temp sensor 16bit.

Turn on a valve if Temperature is too High as measured by a Thermocouple

A thermocouple can be connected to the RAZN, voltage measured, and the RAZN can compute the temperature and is stores these parameters in registers. Monitor the registers and set outputs the way you want.

First: Preset the TOA (Timer, Operation Action) parameters to be put into your TOAA

AUTM A 2 0/0/30 [Trigger *Timer* every 30 seconds, to run the *Operation*]
AUOP H 9 6063 90.6 [*Operation* if 5002(*local Temperature*) is 9(*more than*) 90.6C degrees Celsius]
AUAK 2 H5,10,1 [*Action* to take place. Hardware action 5(*Set coil/bit output*) 9(IO# 9) to 1(ON)]

Once TOA parameters are setup, specify them into a TOAA feature.

TOAA 2 TA OH A2 [TOAA run Timer *A* Operation *G* Action *1*]

To turn on the output terminal for a specific amount of time, setup the AUAK command with a duration:

Reduce Current Consumption over Time, and WAKE UP when Needed.

Inside the RAZN is a small battery that keeps the Real Time Clock (RTC) running, when powered down. Each **TOAA** can have 1 to 4 **Actions** assigned to it. Set the Timer action time as long as you want. And 4 Actions can take place. To run in low-power modes, the actions can be:

1. Turn on the Power and Run the RAZN's TOAA actions.
2. Read the sensors the way you want, and store the sensor data.
3. Listen for messages, or automatically send messages based on the data and sensors you want.
4. When all 3 above are done, in xx number of mS, turn the device off again.

These 4 actions will take place whenever you want to do that. Every minute, hour, 8 hours, days, weeks, or whatever TOAA rate you want. When the RAZN powers off, current consumption will be lower than 0.1mA. If this is done every 4 hours, the average daily current draw will be lower than 0.2mA.

Temporarily Set an Output Pin if a Thermocouple Temperature is High

A thermocouple can be connected to the RAZN, voltage measured, and the RAZN can compute the temperature and it stores these parameters in registers. Monitor the registers and set outputs the way you want and then after an action duration, the output will be reset back.

First: Preset the TOA (Timer, Operation Action) parameters to be put into your TOAA

AUTM A 2 0/0/30 [Trigger *Timer* every 30 seconds, to run the *Operation*]
AUOP H 9 6063 90.6 [*Operation* if 5002(*local Temperature*) is 9(*more than*) 90.6C degrees Celsius]
AUAK 2 H3,10,1 0/6/30/0 [*Action* to take place. Hardware action 3(Temporary *Set coil/bit output*) 9(IO# 9) to 1(ON) for 6.5minutes, and put IO#9 off after ON for 6.5minutes]

Once TOA parameters are setup, specify them into a TOAA feature.

TOAA 2 TA OH A2 [TOAA run Timer *A* Operation *G* Action *1*]

To turn on the output terminal *Action* for a specific amount of time, setup the AUAK command with a duration. The duration is set in Hours(H), Minutes(M), Seconds(S), and milliseconds(m) H/M/S/m. In this example, **0/6/30/0** is set to 6 minutes and 30 seconds which is 6.5 minutes.

TOAA Configuration and Commands

The RAZN can be setup with a variety of TOAA events. All TOAA events have 3 or more parameters in them. Every TOAA event has at least 3 parameters specified.

Parameter 1 is the *Timer*. Parameter 2 is the *Operation*, Parameter 3 is the *Action*. Any additional parameters are additional Actions.

Setup your TOAA events. You can setup at least 10 TOAA events in the RAZN. Use the TOAA command to setup a TOAA event or use the software APP to easily setup the RAZN and its TOAA autonomous events. The TOAA command structure is:

TOAA Command	Description of Parameters
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TOAA X TN ON AN AN	<p>Setup or read a TOAA. To read TOAA list, type TOAA <enter> with no parameters, or enter a single X value to read the TOAA with ID X.</p> <p>X = Designate a unique ID decimal number for this TOAA. X is 1, 2, 3... to specify the ID# of TOAA your edit, read, or add. Maximum number is 10.</p> <p>TN: is the Timer Trigger number designator. N varies by Timer Trigger code. AUTM command sets up the Timer Trigger.</p> <p>ON: is the Operation Analysis alert number designator. N varies by Operation Analysis.</p> <p>AN: is the Action number designator. N varies by Action. Enter one AN action number or also add a second AN action to execute also.</p>
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When Timers, Operation, or Actions are configured, the N value assigned to them can be set to 1-9, or A-Z, whichever way users prefer to designate these TOAA parameters

Event #	Timer	Operation	Action1	Action2
1	TN	ON	AN	AN
2	TN	ON	AN	AN
3	TN	ON	AN	AN
4	TN	ON	AN	AN

Within the RAZN, the user can create a variety of parameters, and then configure the Operation list to utilize the parameters that are configured.

Each Timer, each Event Operation, and each Action is assigned an identification code so that the Timer Operation feature can be setup to watch various timers that trigger, execute the assigned Event function, and then execute the assigned Action as desired.

For example, to use your Timer setting #4, triggering Operation #5 and taking actions #6 and #7, the command to set that up is: **TOAA 1 T4 O5 A6 A7**.

AUTM Timer Command

The command to set the *Timer* is: **AUTM N F M/D/W H/M/S**

Timer Parameters and Features to execute **AUTM** used to Cause a Timer Trigger are:

Feature Name	Parameter Description	Value Information
Code	N Timer Code assigned to reference this timer in other commands and features.	0-9, A-Z NULL: Ignore ASCII character assigned.
Form	F The Timer Form to use this specified timer in.	0: Disabled, 1: Real Time Clock (See <i>NOTE1</i>) 2: Repetitive H/M/S (see <i>NOTE2</i>)
Month	M The month of the year this Time Trigger will trigger on.	0: ignore to use all months. The parameter is the Bit Mask of 12 bits for

		12 months. Bit 0 is January, bit 1 us February... ...
Date	D The Date of the Month this will trigger on. All months if Month is set to 0.	1-31 0:ignore
Weekday	W Binary bit mask indicating which days of the week to trigger on.	0:ignore, 1-127 Bit0: Sunday Bit1: Monday Bit2: Tuesday...
Hour	H Hour of the day to trigger. See NOTE2	0-23
Minute	M Minute of the hour to trigger.	0-59
Second	S Seconds of the minute to trigger.	0-59

NOTE1: If **Form** is **1**: The timer H/M/S will be set to the exact time that the event will trigger. For example, set H/M/S to 6/30/15 to cause a trigger to occur at 15 seconds after 6:30.

NOTE2: If **Form** is **2**(repetitive) The H/M/S are repetitive values to use. Set M/D/W to 0/0/0 in **Form 2**. Set H/M/S from 1-99 to repetitively trigger based on hours/Minutes/seconds, or set any of the **Hour/Min/Sec** parameter 0 to ignore the parameter. For example: set H/M/S to 1/20/0 to trigger every one hour and 20 minutes (80 minutes) or set to 0/1/30 to trigger every 90 seconds, or 0/0/20 to trigger every 20 seconds. This is only when **Form** is set to **2**.

Use Raveon's *RadioManager* App to setup your RAZN's TOAA Timer, or enter the **AUTM** command to setup the Autonomous Timer Trigger time information. See Timer Parameters above for parameter information. The **AUTM** command is:

AUTM Command	Description of Parameters to Setup the Timer
AUTM <i>N</i> F M/D/W H/M/S	Setup a TOAA Timer trigger parameters. N = Timer code number to designate to this particular Timer Trigger. F : is the Timer Form designation code, as described above. Set to 0 to ignore the time and just do the Operation. 0: Ignore, 1: Real Time Clock 2: Repetitive H/M/S M/D/W : Month/Date/Week numerical binary designators. Any of these set to 0 has RAZN ignore the particular month, date, or day. H/M/S : Hours/Minutes/Seconds numerical designators. Which Hour of the day, Which Minute of the hour, Second of the minute is the time trigger.

The **N** timer code assigned to the timer can be set to 1-9, or A-Z. TOAA features can specify a version to use. RAZN systems that need different timer triggers, many different **AUTM** timers can be Setup with and Designate different timers in this **N** code.

The **M** value is the month bit mask numbers. 1=Jan, 2=Feb, 4=Mar, 8=Apr, 16=May,

Between the various parameters in this command put at least one space (" ") character. For example, after the command, after the **N**, after and before the date M/D/W.

To cancel or remove a *Timer*, enter **AUTM N CANCEL** The word **CANCEL** must be in upper case. This command would remove the specified *Timer N* from the list of timers.

AUOP Operation Command

AUOP is the command to set the *Operation* Analysis is: **AUOP N P RRR VVV T**

The Operation Analysis is executed when Timer Triggered. Operation Analysis can cause Alert.

Parameters	Description	Value Information
Code	N = Code, assigned to reference this Operation. ASCII character assigned.	1-9, A-Z, 0=Ignore this. if N set this designates the operation to always alert. TOAA features can specify this version
Process	P Event Type Process code. In this Operation process to perform,	0: None. No Event assigned 1: Force this Event to ALWAYS Trigger every time The Process codes below use the VVV Value shown below to see if an Alert will happen. Processes: 3: Read one bit/coil input. Alert when EQUAL to Value (0 or 1) 4: Read one bit/coil input. Alert when NOT EQUAL to Value (0 or 1) 5: Read a register. Alert: Register is LOWER than Value . 6: Read a register. Alert: Register is EQUAL to or LESS Than +++the Value . 7: Read a register. Alert: Register is only EQUAL to the Value . 8: Read a register. Alert: Register is GREATER than or EQUAL to the Value . 9: Read a register. Alert: Register is GREATER than the Value .
Register	RRR The register number used for this analysis. See the list of Registers.	Registers numbers are from 0 to 65525. The type of register you choose determines the type of Value to Enter. Registers hold all information.
Value	VVV The value that is used or read relative to this event when it is triggered.	Can be used as 1, 8, or 16 bit values or floating point integer values. Used for setting or reading. For coils: 1=ON, 0=OFF, Bitmasks, or integers. The type to enter is based on the register type using this value. Refer to the register list.

See *Operation* Parameters above for Parameter information. The AUOP command is:

AUOP Command	Description of Parameters to Setup Operation Analysis
AUOP <i>N</i> P RRR VVV T	<p>Setup a AUOP Operation command.</p> <p>N = Timer code to Designate to this particular Operation.</p> <p>P: Analysis Process code on how to process this Action. 0 means no Operation action to do. 1 Means always cause an alert to run the Action. Other processes are to read registers, bits, coils, voltages, ... and compare them to the Value you specify to trigger an Alert to run an Action, or not trigger an Alert as you desire.</p> <p>RRR: Register number used for this Operation Analysis. Registers hold all information. See the list of Register Numbers to specify the type of thing you want to Analyze.</p> <p>VVV: Value used to set the Operation Action Threshold Value.</p>

Between the various parameters in this command put at least one space (" ") character.

To cancel or remove an *Operation*, enter **AUOP N CANCEL** The word **CANCEL** must be in upper case. This command would remove the specified *Operation N* from the list of operations.

AUAK Autonomous Hardware Action Command

The *Action* to do when Triggered Alert happens. The Hardware *Action* to perform can control an IO pin, set registers, or use COMM actions to send messages. Each *TOAA* can have 1 to 4 *Actions* assigned to it. The duration of the *Action* is configurable if you want actions to run for a specific amount of time. If you utilize the same *Action* in various *TOAA* timer events, that works OK as long as they are at different times. The same temporary *Action* with a specified Duration should not take place at the same time *TOAA* time periods.

Feature Name	Description	Value Information
Code	Action Code assigned to reference this Action. ASCII character assigned.	0-9, A-Z NULL: Ignore
HWAC	Hardware action function code to specify what to do to hardware and output pins.	<p>List of Hardware Function Codes:</p> <p>3: Temporary set a coil/bit Output on/off/1/0 based on value. At the end of Action, after Duration, switch it to opposite value you specified.</p> <p>5: Set a coil/bit Output on/off/1/0</p> <p>6: Set a Register value</p> <p>7: Reset ALL input counters to 0</p> <p>9: Shut Down the RAZN now, to wake later.</p> <p>10: Enter Sleep Mode</p> <p>12: Wake Up and stay in Run Mode</p> <p>0: <i>Default value: 0</i> (no hardware action)</p>

COMCODE	When this Action is triggered, this code can specify communication action to trigger.	1-9, A-Z NULL: <i>Default value: 0</i> (no message sent)
Duration	How long will this Triggered event operate. H/M/S/m can set Hours, Minutes, Seconds, and or milliseconds. HWAC function codes that are Temporary (3), will use the Duration time.	H.M/S/m Operation Duration. During the duration time set in the DT parameters below, if Trigger logic stops, the Trigger goes away. Temporary Hardware actions use the Duration parameter. At the end of the Duration time for a Temporary <i>Action</i> , the hardware is reset as you choose.
DTHours	Number of Hours	The Duration for this TOAA Event is hours, plus minutes, plus seconds, plus mS. This is used when Hardware event is Temporary . Set any to 0 to ignore this setting or leave all out of command for no duration.
DTMinutes	Number of Minutes	
DTSec	Number of Seconds	
DTMsec	Number of Milliseconds	

See Timer Parameters above for Autonomous Action parameter information. The AUAK command (**AUAK N Hx,rrr,vvv Cx H/M/S/m**) is explained here:

AUAK Command	Description of Parameters to Setup and Action for and Alert
AUAK N Hx,rrr,vvv H/M/S/m	<p>Setup an AUAK Action command to do actions you want to do when an alert is triggered.</p> <p>N = Action code to designate to this particular Action. 0-9, A-Z.</p> <p>H: If you want to do a Hardware action, add the “H” section to the command. The H section x specifies the HWAC function code (see list above), the SCADA/hardware register number to use is rrr, and the comparison value is specified in vvv. For example: H5,4,1 will set coil 4 to 1(on). H6,6000,2340 will set register #6000 to 2300. H3,4,1 will set coil 4 to 1(on) and after the Duration coil 4 will be set to 0.</p> <p>H/M/S/m is the Duration time. Leave out to default to no duration timer, just run the Action once or enter 0/0/0/0 for no Duration but one run. Or for Hardware operation, set the duration to the time you want. 1/3/20/0 is one hour, 3 minutes and 20 seconds. 0/0/0/20 is 20mS duration. For 90 second duration, enter 0/1/30/0 or 0/1/30</p> <p>H can be set from 0 to 120 (Hours) M can be set from 0 to 120 (Minutes) S can be set from 0 to 120 (Seconds) m can be set from 0 to 1000 (milliseconds)</p>

The **N** value assigned to this Action can be set to 1-9, or A-Z. Between the various parameters in this command put at least one space (" ") character. For example, put a space after the command, after the **N**, after and before the date D/H/M/S.

To cancel or remove an Action, enter **AUAK N CANCEL** The word **CANCEL** must be in upper case. This command would remove the specified Action **N** from the action list.

Communication Methods to and from a RAZN

Ethernet Connect an Ethernet Cable or Wi-Fi adaptor to the RAZN's 10/100mbps Ethernet connector. This is a *Terminal Server* with 1-3 TCP/IP ports for 1-3 simultaneous client connections.

RS-485 Serial Connect an RS-485 serial cable to a RAZN or dozens of RAZNs that share this differential serial communications port connection.

Narrow Band RF The RAZN can have Raveon's RV-M6, or RV-M8 data radio modem installed inside for ultra long range RF data 1-50 miles in VHF or UHF RF bands.

LoRa RF The RAZN can have Raveon's RV-M50 LoRa data radio modem installed inside for long range license-free RF data 1-10 miles.

RS-232 Serial Connect an RS232 serial cable to a RAZN. This is an optional feature on all versions of the RV-N55 RAZN.

Wi-Fi The Ethernet connection can connect to a Wi-Fi modem to use Wi-Fi.

Raveon is always interested in adding features and options our customers need, and we are willing to adding any "linearizing software" for the thermocouple. And if you would like some additional Thermistor sensor to factor temperatures to your thermocouple, please contact Raveon customer support.

Or if you'd like the RAZN to wirelessly mimic the voltage from the thermocouple over a long distance, please contact Raveon customer support because this high accuracy 24bit ADC can wirelessly send voltage information to wherever you want it.

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