atim cloud wireless™
PRODUCT LINE

ATIM Cloud Wireless®

Digital Inputs/Outputs and Metering

DIND21

User Guide

Concerned models:

ACW/LW8-DIND21

ACW/SF8-DIND21

LoRaWAN™

sigfox ready

Table of contents

Software version

Product reference	Product version
ACW/SF8-DIND21	B.1
ACW/LW8-DIND21	B.1

Document version history

Version	Date	Description	Author
1.0	05/05/2020	First version	AC
1.1	27/08/2020	Output calendar (downlink and command) + configuration of shock alarm + update configuration manual + mirror mode	AC
1.2	22/09/2020	Corrections	AC
1.3	09/10/2020	Mirror mode description addition	AC
1.4	26/04/2021	Corrections	MD
1.5	08/10/2021	Modification des commandes Positives Pulse et Négative pulse pour les versions $\geq$ v1.5.0	YL

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ATIM_ACW-DIND21_UG_EN_V1.5

Declaration of compliance

All ACW Atim Cloud Wireless® products comply with the regulatory requirements of the R&TTE Directive (1999/5/EC), article 3:

$$\mathsf{C}\,\mathsf{E}$$

1 SAFETY (Article 3.1a of the 1999/5/EC Directive)

NF EN60950-1 Ed. 2006/A1:2010/A11:2009/A12:2011 (health)

EN62479: 2010 (power <20mW) or EN62311:2008 (power > 20mW)

2 Electromagnetic Compatibility (Article 3.1b of the 1999/5/EC Directive)

EN 301489-3 v1.4.1, EN 301489-1 V1.9.2

3 Efficient use of the radio frequency spectrum (Art.3.2 of the 1999/5/EC Directive)

ETSI EN300 220-2 v2.4.1 and EN300 220-1 v2.4.1

Environmental recommendations
a. Environment

Respect the temperature ranges for storage and operation of all products. Failing to respect these guidelines could disrupt device operation or damage the equipment.

Follow the instructions and warnings provided below to ensure your own safety and that of the environment and to protect your device from any potential damage.

General hazard *– Failure to follow the instructions presents a risk of equipment damage.*

Electrical hazard *– Failure to follow the instructions presents a risk of electrocution and physical injury.*

WARNING*: do not install this equipment near any source of heat or any source of humidity.*

WARNING*: for your safety, it is essential that this equipment be switched off and disconnected from mains power before carrying out any technical operation on it.*

WARNING*: the safe operation of this product is ensured only when it is operated in accordance with its intended use. Maintenance may only be performed by qualified personnel.*

Waste disposal by users in private households within the European Union. This symbol appears on a product or its packaging to indicate that the product may not be discarded with other household waste. Rather, it is your responsibility to dispose of this product by bringing it to a designated collection point for the recycling of electrical and electronic devices. Collection and recycling waste separately at the time you dispose of it helps to conserve natural resources and ensure a recycling process that respects human health and the environment. For more information on the recycling center closest to your home, contact your closest local government office, your local waste management service, or the business from which you purchased the product.

b. Radio

Modems in the ACW line are radio-communication modems that use the ISM (industrial, scientific and medical) bands, which may be used freely (at no cost and with no authorization required) for industrial, scientific and medical applications.

Prelude

This guide describes the functionality of the ACW-DIND21 product. It describes the characteristics of the product, explains its commissioning, its configuration, and its operation.

The ACW-DIND21 is intended to report digital input states (dry contacts) on an IoT network (LPWAN: Low Power Wide Area Network), such as Sigfox or LoRaWAN. Its inputs are configurable and can be activated / deactivated as single inputs or as counter inputs. Versions with dry contacts outputs are also available, allowing remote control of various equipment.

An optional temperature sensor can be connected. The product also has a shock sensor for issuing an alert in the event of the unit being torn off.

Identification

The IDs of the device are shown on the outside label:

Product reference

ID of the device

ACW/LW8-DIN21
Rev.: X.X
ID: XXXXXXXXXXXXXXX
ATIM – Chemin des Guillets
38250 Villard de Lans - France

Product revision N° (hardware and firmware technical state)

0101171116000001

Datamatrix: Sigfox ID or LoRaWAN DevEUI

Product serial N°
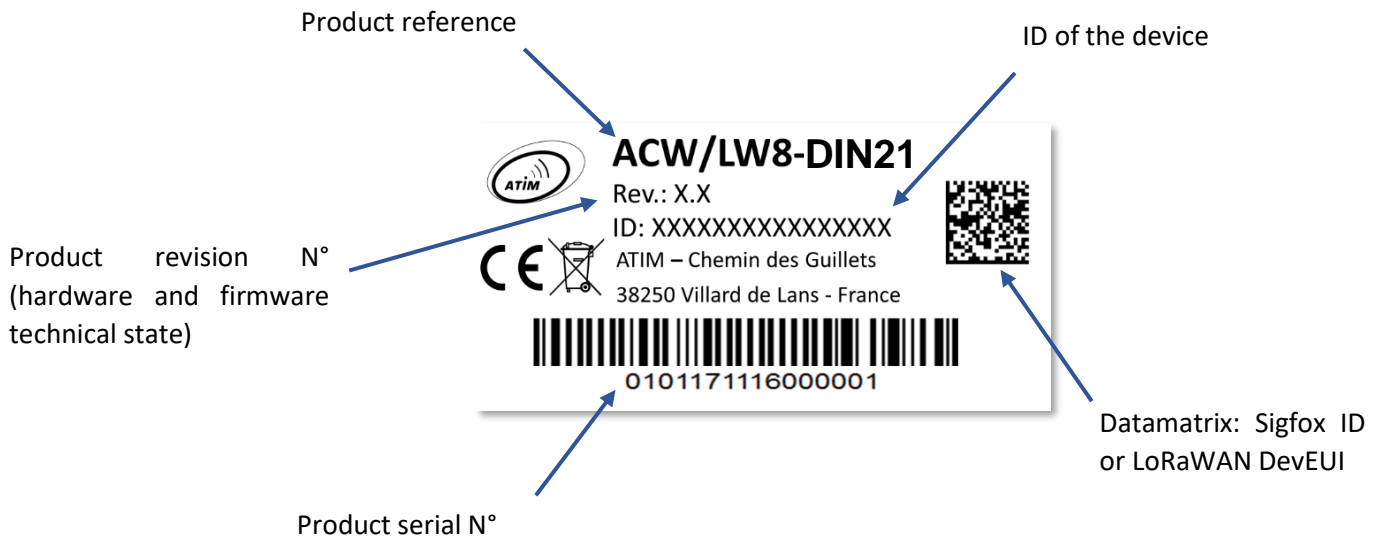
Each product in the ATIM ACW range has a QR Code label visible either on the side or on the front of the product. This QR Code can be easily read with any 2D barcode reader application on a smartphone.

Reading the QR Code indicates the following information:

ATIM|ACW/LW8-DIND21|B.1|190925|1|1.0|1.5.0|70B3D59BA0009030

Interpretation

ATIM	ACW/LW8-DIN21	B.1	190925	1	1.0	1.5.0	70B3D59BA0009030
Manufacturer name	Product reference	Revision version	Manufacturing date	Manufacuring site	Hardware version	Application firmware version	Sigfox ID or LoRaWAN DevEUI

Technical features

a. Product

Dimensions	17,70 x 95 x 57 mm
Antenna	External via SMA connector
Temperature	-20°C to +55°C (operation) -40°C to +70°C (storage)
Mounts to	DIN rail
Power supply	1x power supply, 10-30 V DC
Consumption	100 mA
Digital input	- 2 configurable inputs - Change of states alerts - 2 metering inputs configurable on input
Digital output	1 digital output with downlink command available
Configuration	Via USB or downlink command
Alarm	Breakout / Shock
Frequency	865 – 870 MHz
Power	25 mW (14 dBm)
Transfer rate	Sigfox: 100 bps LoRaWAN: 300 bit/s to 10 kbit/s
LoRaWAN	Class C

ATIM_ACW-DIND21_UG_EN_V1.5

b. Electrical features

	Min.	Type	Max.
Power Supply (Vcc)	10V		30V
Emission consumption (mA)		Condition: -Power supply 12V -All outputs shut down	60mA – Sigfox 60mA – LoRaWAN
		Condition: -Power Supply 24V -All outputs shut down	35 mA – Sigfox 30mA – LoRaWAN
Reception consumption (mA)		Condition: -Power supply 12V -All outputs shut down	50 mA – Sigfox 30mA – LoRaWAN
		Condition: -Power Supply 24V -All outputs shut down	30 mA – Sigfox 20mA – LoRaWAN
Standby consumption (mA) **Digital input**		Condition: -Power supply 12V -All outputs shut down	20 mA – Sigfox N/A – LoRaWAN
		Condition: -Power Supply 24V -All outputs shut down	15 mA – Sigfox N/A – LoRaWAN
Dry contact inputs higher threshold tension	2.8V	With Pull-Down	
	2.3V	With Pull-Up	
Dry contact inputs lower threshold tension		With Pull-Down	1.3V
		With Pull-Up	0.15V
Dry contact output tensions (V)	-	Power supply tension	60 V
Dry contact output current (mA)			500 mA

ATIM_ACW-DIND21_UG_EN_V1.5

c. Inputs and metering characteristics

	Min.	Type	Max.
Inputs or Meters frequency (Hz)		Condition: - Cyclic Report to 50% - Filtering time 1 ms	400Hz
Bounce filter time	1 ms	Note: Configurable value.	255 ms
Rebound filter time accuracy	-1ms	Note: to guarantee at least 1ms of filtering time, you must configure the filtering time to 2ms.	0ms
Meters size		4 bytes	

d. Temperature sensor characteristics

Optionally, a temperature sensor can be connected to the ACW-DIND21. The following ranges refer to the sensor used. Attention, the product has a reduced operating range than that of the sensor (see above).

	Range	-55°C / +125°C
Temperature	Resolution	0,1°C
	Precision between -10°C and 85°C	+/- 0,5°C
	Precision between -55°C and 125°C	+/- 2°C

e. Meter index back up save

Since version **V1.2.0** the counters are saved in the ACW memory during several events:

- When writing the meters via the USB configurator
- When writing via a Downlink command
- During a power cut

f. Outputs calendar

From **1.4.0** firmware version, it is possible to program outputs state depending weekday and a time window.

The possible configurable parameters are:

- The start time (1 minute increment)
- The stop time (1 minute increment)
- The weekdays when the program is effective
- Outputs to set
- Outputs to reset

You can configure from 1 to seven programs and several programs can be used the same day.

Once a program is configured, it is automatically enabled but a command is provided to disable it later on (several programs can be disabled at once). It will remain disabled while the same command is sent once again.

In addition, this command can disable the program(s) for the next day only. The program(s) will be automatically enabled the day after.

Once a program's time slot is done, the outputs affected by the program will be driven at the opposite state (ex: an output to "1" during the program will be at "0" at the end).

WARNING: It is not a good practice to configure several programs at the same time if these ones drive the same outputs.

g. Mirror mode

From version 1.3.3, a mirror mode has been implemented allowing the copying of the state of one of the inputs to output.

To do this, you must configure the product so that one of the two inputs is in mirror mode (in the configurator, the "Event mode" = mirror field). The product will then have the following behaviour: when the input is high (voltage presence), the output terminals will be connected to each other and when the input is low, the output terminals will be isolated.

Reminder: The product output is dry contact type (no voltage present). The two output terminals are either connected to each other or isolated. To have an output voltage, you will need to connect a power supply (external or the product) to one of the output terminals to have this voltage on the other terminal when the contact is closed.

Notes : An input cannot combine several functions at the same time.

Space requirements and mounting
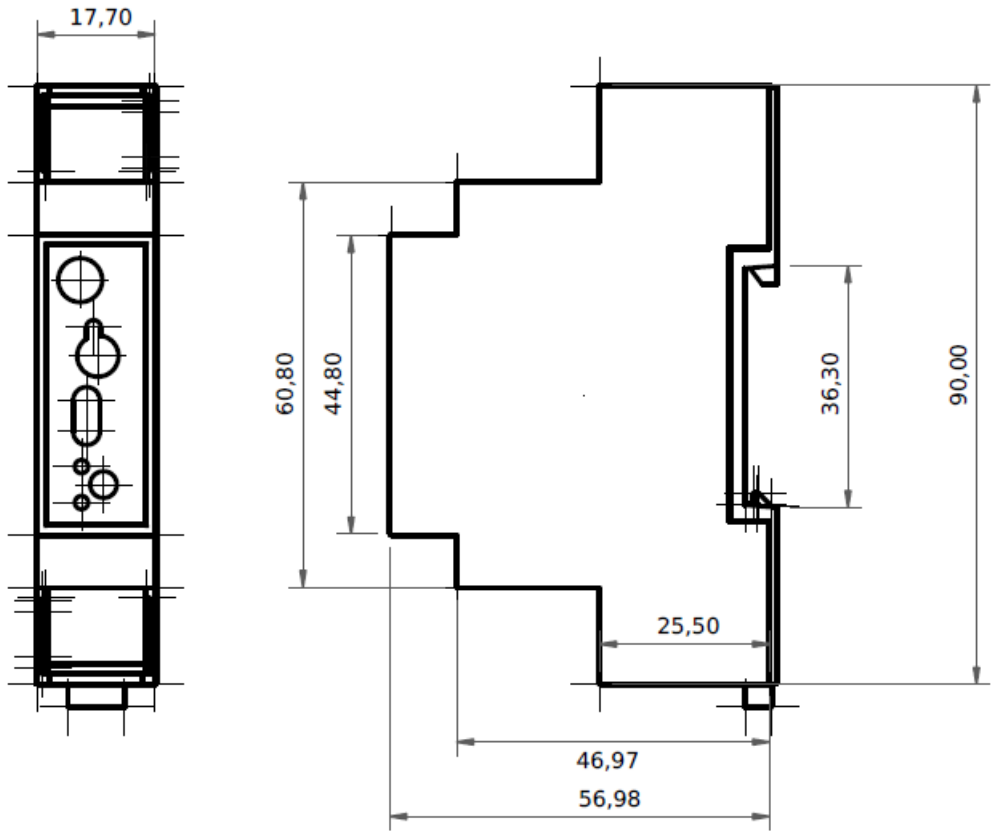
Dimensions indicated in mm.

ACW DIN modems are thought to be mounted on a DIN rail.

ATIM_ACW-DIND21_UG_EN_V1.5

Commissioning

a. Positioning of the antenna

This version has been designed for installation in a cabinet. If it is made of non-metallic insulating material (PVC, ABS, fiberglass), it is possible to simply use a small ½ wave whip antenna (Ref: ANT868-12FSC). This antenna must be correctly screwed on the SMA connector and positioned vertically, preferably upwards.

In the case of a metal box, it is imperative to move the antenna outside to have good results on the radio (avoid the Faraday cage). You can use for example a ¼ wave antenna for roof or metal box (Ref: ANT868-14S).

For optimal results, it is advisable to move the antenna high, clear of any metal obstacle within a radius of one meter.

b. Radio modem connection

Antenna (SMA connector)

Before powering the product, a 50Ω / 868MHz antenna must be connected, either directly to the SMA connector or via a 50Ω cable in case of antenna offset.

Power supply (Bottom terminal block)

The ACW-DIND21 module must be supplied with a DC power supply between 10V and 30V which can provide a current of 100mA minimum. The "10 / 30V" pin corresponds to the + terminal and the GND pin to the - **(0V)** terminal.

Jack connector

This connector is used to connect an optional temperature probe (supplied with a 2m cable).

Micro USB

This connector is used for product configuration via a USB interface on a PC.

Note: Configuration via USB can directly power the ACW-DIND21 and does not require an external power supply (10 / 30V). But an external power supply can also be present.

c. Terminal block connection

Below you will find a table describing the different connection pins:

Nom	Designation	Input / Output
IN1	Digital input ALERT 1	Input
IN2	Digital input ALERT 2	Input
OUTA	First terminal of the output (dry contact type)	Output
GND	Ground (-)	Ground
POWER	Power supply between +10V and +30V	Input (Alim +)
OUTB	Second terminal of the output (dry contact type)	Output

d. Push button

The push button located on the front of the box allows you to send a test frame to validate the installation on site by checking the arrival of the message on the ATIM Cloud Wireless® platform.

e. Meaning of the indicator lights

The indicator lights are used to characterize the correct functioning or not of the ACW-DIND21. The green LED indicates correct operation, and the red LED indicates a critical, non-critical error, an alarm, or a loss of power.

- Failure or success of an operation

Behavior:

The red or green light flashes quickly for about half a second.

A failure is characterized by the red light and a success is characterized by the green light.

Event:

- On power-up (after a moment after power-up), to attest to a good start
- After passing a configuration or command (USB or Downlink)
- When sending a radio message over the network.

- Radio activity

When a radio message is transmitted over the network, the green LED flashes every half-second during the sending time. In Sigfox, it can last up to a minute, but usually it only lasts about ten seconds

- Alarm

When a shock is detected, the red-light flashes quickly for one second.

- Power cut

From version V1.2.0, a small reserve of energy is embedded in the product. When the power is lost, the red light stays on until the energy reserve is used up.

- Noncritical error

Behavior: the red LED flashes briefly every ten seconds.

of error: the previous radio message could not be transmitted.

- Critical error

Behavior: the red LED flashes briefly every second.

Source of error: The product could not start correctly.

Normal start-up behavior

When the power is turned on, after a moment, the green LED flashes rapidly for about half a second, to confirm that the engine has started properly.

One minute after power-up, 3 frames are sent:

- 1 test frame
- 1 keep-alive frame
- 1 input frame emitting the state of each input

Then, 4 other test frames are sent successively on the network at the rate of one frame per minute for 4 minutes. During this transmission, the green LED flashes.

Parameter setting and configuration

a. Setting

Input settings

All the inputs are configurable and can be assigned to different operating modes. Each entry can be disabled or assigned to an event among four different available events. For each event, a trigger mode is associated among three different modes available, as well as the type of entry draw.

Available events

- Deactivation (by default)
- Sending a state change alert frame
- Increment of counter 1
- Increment of counter 2
- Mirror mode (copies the state of the input on the output)

Types of prints (from version 1.2.0)

- Pull-up: suitable for dry contacts connecting the input and the ground (0V). It is this default configuration which is used in versions lower than V1.2.0
- Pull-down: suitable for dry contacts connecting the input and the 10 / 30V.

Trigger modes

- At the change of state of a contact, from "closed" to "open" (rising edge)
- At the change of state of a contact, from "open" to "closed" (falling edge)
- At the change of state on rising and falling edge (default).

Bounce time setting

All inputs are affected by a bounce time which corresponds to the wait, following a change in the level of the input before this change is effective.

This parameter, named **"Bounce time"** on the configurator, can be adjusted between 1 and 250 ms depending on the type of dry contact used.

Setting the periodic frame

The periodic frames allow the status of the inputs / counters to be regularly updated. This periodicity is set by default to 1 hour but can be configured from 10 minutes to 10 days and 15 hours. Depending on the setting chosen, it is possible that several frames are sent (see: Periodic or alert frame for more details). In this case and only in the Sigfox version, the minimum periodicity can be affected:

- If two frames are to be sent, the minimum frequency is 20 minutes
- If three frames are to be sent, the minimum frequency is 30 minutes
- If four frames are to be sent, the minimum frequency is 40 minutes
- If five frames are to be sent, the minimum frequency is 50 minutes

Life frame setting

A life frame can be sent periodically. This frame will raise the supply voltage of the product.

Available periods

- Disabled
- Every hour
- Every two hours
- Every four hours
- Every eight hours
- Every day
- Every two days
- Every three days
- Every four days (by default)
- Every week
- Every month (30 days)

Temperature setting (offset)

If a temperature sensor is connected, it is possible to assign an offset value allowing calibration of the sensor. By default, a value of 0 ° C is assigned and the possible values go from -10 to +10 ° C in steps of 0.1 ° C.

Setting the pairing method

In the LoRaWAN version it is possible to choose the pairing method between OTAA (Over The Air Activation) and ABP (Activation By Personalization).

Note: The default LoRaWAN operating class is class C. This is compatible with a network configured for class A.

Note: Class C requires a first uplink transmission before being able to receive downlinks. When getting started, it will take a minute before you can send downlinks.

Setting the shock alarm

The DIND-21 embed a shock sensor to notify via a radio frame that the device has been subject to a shock. A configuration parameter is provided to enable/disable the radio notification (the parameter is disabled by default).

b. USB configuration

Download and install the "ACW Configurator" software, which you can find at the following address:

http://www.atim.com/docs/downloadcheck.php?ID=3536

Note: The configurator is compatible with ACW-DIND21 from version **4.5.14**

Connect the ACW to your computer using a micro-USB cable, then launch the software if you have not already done so. When you connect the DIND21, the software window changes to allow you to access the product configuration. Automatically, the current configuration is retrieved and displayed.

You can see a window appearing like the one below:
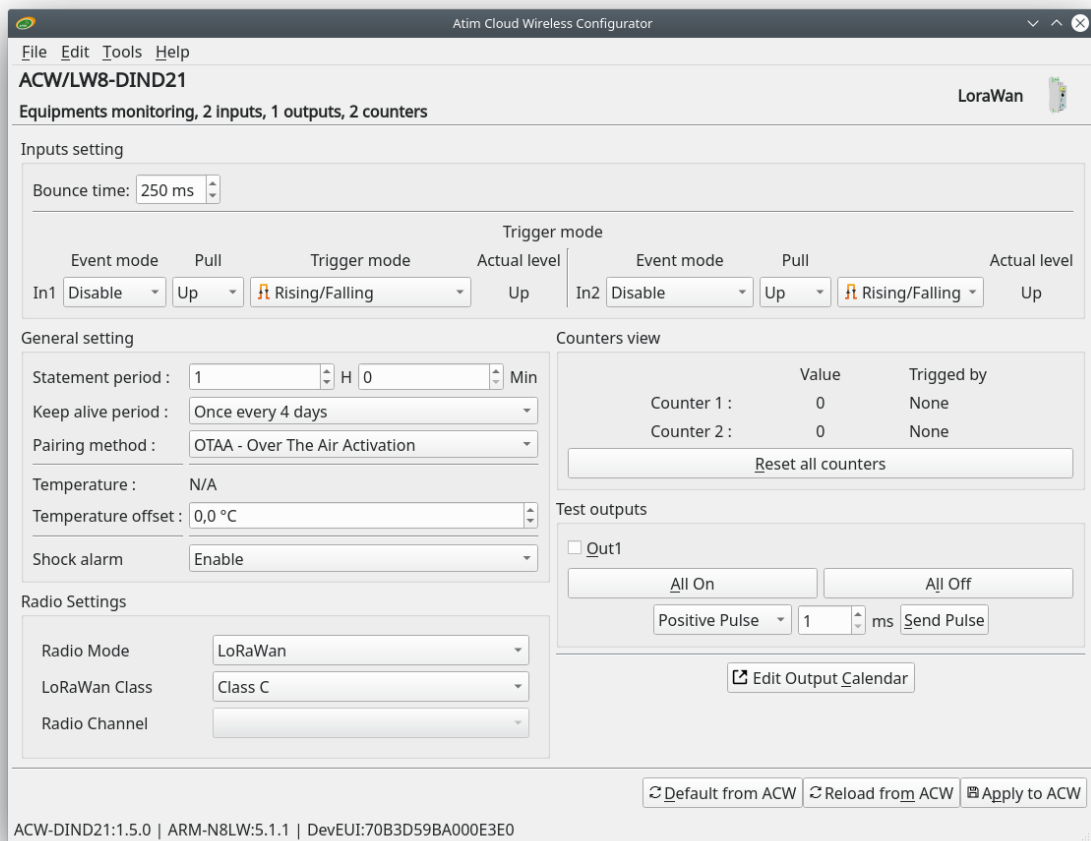
In the upper left corner, there is the product reference and a functional description.

In the upper right corner, the radio technology of the product is indicated.

In the "input settings" tab, you will have the choice to configure the inputs mode, pull setting and trigger edge as well as input bounce time.

In the "General settings" tab, you can configure:

- The statement period (when a periodical radio frame is sent) and the keep alive period.

- Visualize in real time the temperature measured from temperature sensor (if connected) and apply a temperature offset to the measure.
- Enable/disable the shock alarm

In the "Counters view" tab, you can visualize the counters indexes and the associated input. In addition, the "Reset all counters" button set the value of all the counters to "0".

In the lower right corner, there is three buttons to set to default parameter the product configuration, apply the configuration from the application to the device and load the configuration from the device to the application.

"Test outputs" tab allow to set or reset outputs separately or all the outputs at once.

Finally, the button [Edit Output Calendar] give an access to the output calendar configuration tools.
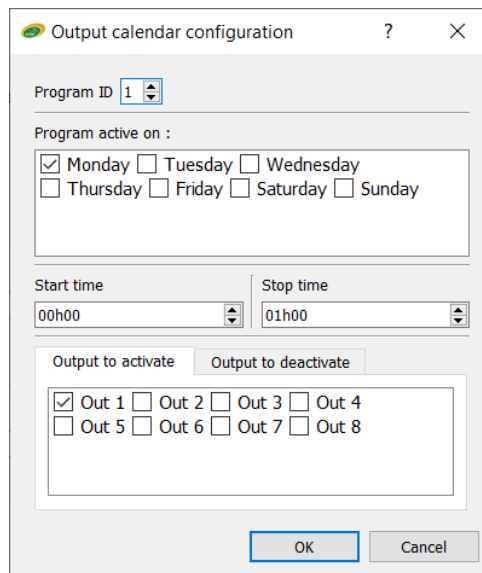
In addition to having access to all the parameters described in the "Parameterization" section, you have access to a visualization of the status of the inputs, meters and temperature (if the sensor is connected). The display of all these parameters is refreshed every 2 to 3 seconds. There is also the possibility of controlling the outputs.

Note: You must apply the configuration to be able to increment and view the counters.

Note: It is possible during the first connection that the values of the counters are random. In this case, you will need to click on the "Reset all counters" button to reset all counters to 0.

Uplinks to IoT network (Sigfox/LoRaWAN)

a. Frames table

Type	Description	Frame format										
		byte 0 (hex)	byte 1 (hex)	byte 2 (hex)	byte 3 (hex)	byte 4 (hex)	byte 5 (hex)	byte 6 (hex)	byte 7 (hex)	byte 8 (hex)	byte 9 (hex)	byte 10 (hex)
Keep Alive	Keep alive frame	01	Power Supply (mV)		Power supply (mV)		64					
Test	Test frame	05	Meter									
Meters	Meters 1 and 2 frames	50	Meter 1				Meter 2					
Shocks	Alarm or shocks frame	43	Meter									
Inputs / Outputs	Digital inputs/outputs frame	62	State of digital inputs	State of digital outputs								
Inputs/outputs + Temperature	Digital inputs/outputs and temperature frame	61	State of digital inputs	State of digital outputs	Temperature (1/10 of °C)							
Inputs/outputs + Temperature + Meters	Digital inputs/outputs, temperature, and meter 1 frame	6E	State of digital inputs	State of digital outputs	Temperature (1/10 of °C)		Meter 1					
Inputs/outputs + Meters	Digital inputs/outputs, meter 1 and meter 2 frame	6F	State of digital inputs	State of digital outputs	Meter 1				Meter 2			
Inputs/outputs + Meter	Digital inputs/outputs and meter 1 frame	72	State of digital inputs	State of digital outputs	Meter 1							
Inputs/outputs + Temperature + Meters	Digital inputs/outputs, temperature and counters frame	7D	State of digital inputs	State of digital outputs	Temperature (1/10 of °C)		Meter 1				Meters… n	
Inputs/outputs + Meter	Digital inputs and counters frame	7E	State of digital inputs	State of digital outputs	Meter 1				Meters… n			

b. Test frame

This frame is sent to the network every minute for five minutes when the product starts. It is also possible to trigger it via the push button located on the front of the ACW-DIND21. Each time this frame is sent, a counter is incremented and inserted into the frame.

Frame format:

Byte	0	1
Data	0x05	Cpt

« Cpt » deals with the meter value.

c. Keep alive frame

This frame is sent to the network periodically (configurable) and after transmission of the first five test frames.

Frame format:

Byte	0	1	2	3	4	5
Data	0x01	Power supply (millivolt)		Power supply (millivolt)		0x64

d. State frames

The status of the inputs and counters, as well as the temperature (if connected) are sent either periodically or on a change of state of a previously configured input.

To report the status of all the inputs and all the counters, it is possible that several frames are sent.

The frames below will be sent depending on the configuration.

Note: Disabled pins ("Disable" in the configurator) are replaced by 1 in the bytes reporting the status of the inputs (bytes 1).

Note: **The logic state sent in the input data byte (byte 1) is reversed from the actual logic state.** For example for an input configured as a pull-up and a dry contact connected between the input and the GND, the bit of this input will be at 1 when the dry contact is closed and it will be at 0 when the dry contact is open. For a pull-down and a dry contact connected between the input and the power supply, the opposite is true, the input will be at 1 when the dry contact is open and it will be at 0 when the dry contact is closed.

Digital frames

If the temperature probe is disconnected and counter 1 and counter 2 are deactivated.

Byte	0	1	2
Data	0x62	State of digital inputs	State of digital outputs

Digital Inputs/Outputs and temperature frame

In case the temperature sensor is connected, and all the counters are deactivated.

Byte	0	1	2	3	4
Data	0x61	State of digital inputs	State of digital outputs	Temperature in 1/10 of °C	

Digital Inputs/Outputs, temperature, and meter 1 frame

In case only counter 1 is activated and the temperature probe is connected.

Byte	0	1	2	3	4	5	6	7	8
Data	0x6e	State of digital inputs	State of digital outputs	Temperature in 1/10 of °C		Meter 1			

Digital Inputs/Outputs, meter 1 and meter 2 frame

In case counter 1 or / and 2 is / are activated and the temperature sensor is disconnected.

Byte	0	1	2	3	4	5	6	7	8	9	10
Data	0x6f	State of digital inputs	State of digital outputs	Meter 1				Meter 2			

Digital Inputs/Outputs and meter 1 frame

In case only counter 1 is activated and the temperature probe is disconnected.

Byte	0	1	2	3	4	5	6
Data	0x72	State of digital inputs	State of digital outputs	Meter 1			

Meter 1 and meter 2 frame

In case counter 2 is activated.

Byte	0	1	2	3	4	5	6	7	8
Data	0x50	Meter 1				Meter 2			

If counters are activated, and the temperature sensor is connected.

Byte	0	1	2	3	4	5	6	7	8	...
Data	0x7d	State of digital inputs	State of digital outputs	Temperature in 1/10 of °C		Meter 1				Meter 2 to n

e. Alarm and shock frame

This frame is sent to the network when a shock is detected on the box. This feature is disabled for 10 minutes after the transmission of this frame.

Byte	0	1
Data	0x43	Cnt

« Cnt » deals with the value of a meter that increments every uplink of this frame.

f. Data/frame format/decoding

Digital inputs/outputs state

The arrangement of digital inputs / outputs in bytes 1 and 2 for frames 0x61, 0x62, 0x6e, 0x6f, 0x7d, 0x7e and 0x72 are described in the table below:

Bit	7	6	5	4	3	2	1	0
Byte 1	N/A	N/A	N/A	N/A	N/A	N/A	Input 2	Input 1
Byte 2	N/A	N/A	N/A	N/A	N/A	N/A	N/A	Output 1

N/A: not applicable

Meters

All counters are in 32-bit unsigned (**UINT32**) or 4 bytes, they are sent with the most significant byte (**MSB - Big Endian**) first. The conversion into physical value according to the pulse weight of the meter must be carried out on the platform side.

Temperature in 1/10 of °C

The temperature is sent in 10ths of degrees Celsius on two signed bytes (**INT16**) coded in complement to two. The most significant byte (**MSB - Big Endian**) is sent first.

Power supply (in millivolts)

The supply voltage is sent in millivolts on two signed bytes (**INT16**), the most significant byte (**MSB - Big Endian**) is sent first.

Frame examples

For a digital input frame with temperature and the counter having the following values:

- Digital inputs = 0xFD01 (Input 1 to « 0 »; input 2 to « 1 »; Output to « 1 »)
- Temperature 55.8°C => 558 tenths de °C = 0x022E
- Meter value = 97510 = 0x 00017CE6

Frame will be the one below:

Byte 0	Byte 1	Byte 2	Byte 3	Byte 4	Byte 5	Byte 6	Byte 7	Byte 8
Header	State of Inputs		Temperature (1/10°C)		Meter 1			
0x6E	0xFD	0x01	0x02	0x2E	0x00	0x01	0x7C	0xE6

For a digital input / output frame and two counters of one having the following values:

- Digital inputs = 0xFD01 (Input 1 to « 0 »; input 2 to « 1 »; output to « 1 »)
- Meter 1 = 25478 = 0x00006386
- Meter 2 = 873556 = 0x000D5454

Frame will be the one below:

Byte 0	Byte 1	Byte 2	Byte 3	Byte 4	Byte 5	Byte 6	Byte 7	Byte 8	Byte 9	Byte 10
Header	State of Inputs/Outputs		Meter 1				Meter 2			
0x6F	0xFD	0x01	0x00	0x00	0x63	0x86	0x00	0x0D	0x54	0x54

Downlinks to IoT network (Sigfox or LoRaWAN)

If your product has a compatible radio version, you can take advantage of this feature.

Sigfox radio Firmware: Version **5931** or later

LoRaWAN radio Firmware: Version **5.1.1** or later

The operation of the exchange frames of this function is explained in the document "ATIM_ACW-DLConfig_UG_EN_Vx.x.pdf" This document is available for download on the website https://www.atim.com/en/downloading/

a. Settings

Below is a description of all parameters that can be changed in downlink:

Keep alive frame settings (Code 03)

Size and Code (Byte 0)	Value (Byte 1)
0x00|03=0x03	0x00 = Disabled. 0x05 = Every hour. 0x0a = Every two hours. 0x0b = Every four hours. 0x0c = Every eight hours. 0x06 = Every day. 0x0d = Every two days. 0x0e = Every three days. 0x0f = Every four days. 0x07 = Every week. 0x08 = Every month (30 days).

Inputs configuration (Code 10 to 11)

Size and Code (Byte 0)	Value (Byte 1)
Input 1: 0x00|10=0x0a **Input 2: 0x00|11=0x0b**	0xYY

The value (0xYY) is broken down into an event, a trigger mode, and a type of draw.

The value (0xYY) is therefore divided into three concatenated parts.

Events – bits 0 to 4

The possible values in the byte for these bits are:

- 0x00 = Disabled
- 0x02 = Sending a state change alert frame
- 0x03 = Counter increment 1
- 0x04 = Counter increment 2
- 0x16 = Mirror mode

Print types – bits 5 (from version V1.2.0)

The possible values in the byte for these bits are:

- 0x00 = Draw up (by default in versions lower than V1.2.0)
- 0x20 = Draw down

Trigger modes - bits 6 to 7

The possible values in the byte for these bits are:

- 0x40 = At the change of state, from the low state to the high state (rising edge)
- 0x80 = the change of state, from the high state to the low state (falling edge)
- 0xc0 = At the change of state (rising and falling edge)

Example:

If you want to configure input 10 (code 19) on counter 3 (0x05) on rising edge only (0x40) and a draw up (0x00), the following configuration must be generated:

Size and Code (Byte 0)	Value (Byte 1)
0x00|19=0x13	0x02|0x00|0x40 =0x45

Bounce time configuration (Code 30)

Size and Code (Byte 0)	Value (Byte 1)
0x00|30=0x1e	0xYY

The value (0xYY) is coded in milliseconds. From 5 (for 5 milliseconds) to 255 (for 255 milliseconds).

Periodic frame configuration (Code 31)

Size and Code (Byte 0)	Value (Byte 1)	Value (Byte 2)
0x40|31=0x5f	0xYY	0xZZ

The value (0xZZYY) is coded in minutes. From 10 (for 10 minutes) to 15300 (for 45 days, 12 hours and 15 minutes). The least significant byte (0xYY) is first in the frame.

Note: In versions less than or equal to V1.2.3, the maximum value is 255min (for 0 days, 4 hours and 15 minutes). This bug has been fixed from version V1.3.0.

<div align="center">Temperature configuration - Offset (Code 32)</div>

Size and Code (Byte 0)	Value (Byte 1)
0x00|32=0x20	0xYY

The value (0xYY) is coded in addition to two and tenths of ° C. From -100 (for -10 ° C) to 100 (for + 10 ° C).

<div align="center">Output calendar configuration (code 34 to 40)</div>

Size and Code (Byte 0)	Frame size (Byte 1)	Start time / stop time (byte 2 -4)			Week day (byte 5)	Output to set (byte 6)	Output to reset (byte 7)
Program 1: 0xc0|0x22 (34) = 0xE2 **Program 2: 0xC0|0x23 (35) = 0xE3** **Program 3: 0xC0|0x24 (36) = 0xE4** **Program 4: 0xC0|0x25 (37) = 0xE5** **Program 5: 0xC0|0x26 (38) = 0xE6** **Program 6: 0xC0|0x27 (39) = 0xE7** **Program 7: 0xC0|0x28 (40) = 0xE8**	0x06	0xAA	0xAB	0xBB	0xCC	-	-

Bytes 2 to 4 contains the start and stop time. Both times are coded on 12 bits (12 most significant bits for start time and 12 least significant bits for stop time) as the time in minutes from midnight. The formula to calculate this value is :

<div align="center">***(Hour x 60) + minute***</div>

For example, with a start time at 12h30 and a stop time at 13h24, the start time in minutes is 12*60 + 30 = 750, the stop time in minutes is 13*60 + 24 = 804.

So 0xAAA = 2EE and 0xBBB = 324 (byte 2 = 0x2E, byte 3 = 0xE3, byte 4 = 0x24).

Byte 5 represent the weekday during which the program is active. Each bit stands for one day of the week as follows:

Byte 5							
Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
-	Sunday	Saturday	Friday	Thursday	Wednesday	Tuesday	Monday

If the bit is set to "0", the program is inactive for the corresponding day and vice versa.

WARNING: At least, one bit should be set to 1 to enable the program.

The last two bytes contains the output to set or reset during the program.

Each output corresponds to a bit in these bytes as follows:

Byte 6/7							
Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
Output 8	Output 7	Output 6	Output 5	Output 4	Output 3	Output 2	Output 1

To drive an output, the corresponding bit should be set to "1" in the corresponding byte (whether the output should be set or reset).

For example, if outputs 1,3,5,7 should be reset and outputs 2,4,6,8 should be set, the value of byte 6 will be 0xAA (0b10101010) and byte 7 will be 0x55 (0b01010101).

Note: To let output undriven during a program, the corresponding bit in byte 6 and 7 should be set to "0".

Shock alarm configuration (code 41)

Size and Code (Byte 0)	Value (Octet 1)
0x00|0x29 = 0x29	0xYY

Byte 1 possible values are :

- 0x00 => shock alarm radio frame disabled
- 0x01 => shock alarm radio frame enabled

b. Commands

Command	Frame format							
	Byte 0 (hex)	Byte 1 (hex)	Byte 2 (hex)	Byte 3 (hex)	Byte 4 (hex)	Byte 5 (hex)	Byte 6 (hex)	Byte 7 (hex)
Restart	0x01	0x01						
About	0x01	0x02						
Reconfiguration with default settings	0x01	0x03						
Get configuration	0x01	0x04						
Get the protocol version	0x01	0x07						
Apply a value to meters	0xC1	0x06	0x0A	Meter Index	Meter(s) value			
Assign a state to the outputs	0x41	0x10	States of outputs					
Recovery of output status	0x01	0x20						
Assign a state to an output group	0xC1	0x03	0x11	Mask / Group	States of outputs			
Generate a positive impulse to a group of outputs (Version < V1.5.0)	0xC1	0x03	0x12	Mask / Group	Pulse duration			
Generate a positive impulse to a group of outputs (Version ≥ V1.5.0)	0x81	0x12	Masque / Groupe	Durée de l'impulsion (LSB)	Durée de l'impulsion (MSB)			
Generate a negative impulse to a group of outputs (Version < V1.5.0)	0xC1	0x03	0x13	Mask / Group	Pulse duration			
Generate a negative impulse to a group of outputs (Version ≥ V1.5.0)	0x81	0x13	Masque / Groupe	Durée de l'impulsion (LSB)	Durée de l'impulsion (MSB)			
Enable/Disable output calendar	0x41	0x0B	Output calendar state					
Get output calendar state	0x01	0x0C						

ATIM_ACW-DIND21_UG_EN_V1.5

Restart (Command 0x01)

To start an ACW-DIND reboot remotely, send the following command:

Byte 0	Byte 1
0x01	0x01

The ACW will restart and will not send a confirmation.

About (Command 0x02)

To obtain information about the product, send the following command:

Byte 0	Byte 1
0x01	0x02

The ACW will return the information in the following format:

	Description and Value
Byte 0	Response to command frames: 0x07
Byte 1	"About" command: 0x02
Byte 2	ACW type: ● DIN D21 - 17
Byte 3	ACW version (LSB – Little Endian)
Byte 4	ACW version (MSB – Big Endian)
Byte 5	Radio type: 1. Sigfox only uplink - 0x03 2. Sigfox uplink/downlink - 0x04 3. LoRaWan - 0x05
Byte 6	Radio version (LSB – Little Endian)
Byte 7	Radio version (MSB – Big Endian)
Byte 8 à n	Serial number (devEUI|sfx) (MSB first).

Reconfiguration with default parameters (Command 0x03)

To reconfigure the parameters to the default values, send the following command:

Byte 0	Byte 1
0x01	0x03

ACW will return a confirmation in the following format

	Description and value
Byte 0	Response to command frames: 0x07
Byte 1	"Default configuration" command: 0x03
Byte 2	Indicates if the reconfiguration went well: ● Resend 0x00 to show that the configuration has proceed successfully. ● Resend a different value from 0x00 to show that he configuration has failed.

To obtain the complete configuration (Command 0x04)

To obtain the complete configuration, send the following command:

Byte 0	Byte 1
0x01	0x04

The ACW will return several frames with all its parameters:

	Description and value
Byte 0	Response to command frames: 0x07
Byte 1	"Obtain the configuration" command: 0x04
Byte 2, n	The parameters are encapsulated in the configuration frames.

Obtain the used protocol version (Command 0x07)

To obtain the version of the ATIM Downlink protocol implemented in the product, the following command must be sent:

Byte 0	Byte 1
0x01	0x07

The ACW will return the version in the following format:

	Description and value
Byte 0	Response to command frames: 0x07
Byte 1	"Protocol version" command: 0x07
Byte 2	Protocol version (LSB – Little Endian)
Byte 3	Protocol version (MSB – Big Endian)

Set a value to meters (Command 0x0A)

To write the value of one or more counter (s), send the following command:

Byte 0	Byte 1	Byte 2	Byte 3	Byte 4-7
0xC1	Frame size - 0x06	0x0A	Meter index	Meter value(s)

The value of one or more counters is defined in bytes 4 to 7. The value is 32 bits with the least significant byte (**LSB - Little Endian**) first (byte 5).

Byte 3 is the counter index where the value is to be applied. For example, 1 for counter 1, 2 for counter 2, etc. An index of 255 (0xff) will affect all counters. For example, to set all counters to 256, the following frame should be sent:

Byte 0	Byte 1	Byte 2	Byte 3	Byte 4	Byte 5	Byte 6	Byte 7
0xC1	0x06	0x0A	0xff	0x00	0x01	0x00	0x00

If the counter (s) have been affected by the value, the ACW will store the value in its memory and return the following confirmation frame:

	Description and value
Byte 0	Response to command frames: 0x07
Byte 1	"Meter" command: 0x0A

Note: From version V1.3.0, if the index is not between 1 and 2, an error frame will be returned, and the counters will remain unchanged.

Output management

It is possible to control the status of the outputs via downlink in different ways. Either by affecting the state of each output, or by affecting the state of a group of outputs or by generating a positive or negative pulse on a group of outputs.

Assign a state to the outputs (Command 0x10)

To assign the state of all outputs to a value, send the following command:

Byte 0	Byte 1	Byte 2
0x41	0x10	State of outputs

Each output is represented by a bit in byte 2. Bit 0 of byte 2 corresponds to output 1, bit 7 of byte 2 corresponds to output 8.

In the version of ACW-DIND21, the 7 most significant bits must be at 0. Or, in other words, the outputs (which do not exist) 2, 3, 4, 5, 6, 7 and 8 must be controlled at 0. Otherwise (if at least one of the 7 most significant bits is at 1) an error will be returned by the ACW and none of the outputs will be controlled. See response frames below.

Following this command, the ACW will return a response in the following format:

	Description and value
Byte 0	Response to command frames: 0x07
Byte 1	"Assign a state of outputs" command: 0x10
Byte 2	State of the outputs after the execution of the command.
Byte 3	State of the outputs to control incompatible (N.C.)

Byte 3 indicates an error if the one if it is not zero. If byte 3 is zero, byte 2 should have the same value as the state requested when sending the command (byte 2 in the command frame). If byte 3 is non-zero, this indicates which output cannot be controlled because it does not exist. For example, if the value 0xFF is sent (byte 2 of the control frame 0x10) the value 0xF0 will be returned and none of the outputs will be controlled by the ACW.

ATIM_ACW-DIND21_UG_EN_V1.5

Example 1 (OK)

For example, for control at 1 of the output, the following command must be sent:

Byte 0	Byte 1	Byte 2
0x41	0x10	0x01

The answer of the ACW will therefore be:

Byte 0	Byte 1	Byte 2	Byte 3
0x07	0x10	0x01	0x00

Example 2 (KO)

If you want to control output 8 at 1 and this output does not exist on this product, the DINDIO will return an error message.

Writing frame in the digital outputs, Output 8 = 1 :

Byte 0	Byte 1	Byte 2
0x41	0x10	0x80

The answer of the ACW will therefore be:

Byte 0	Byte 1	Byte 2	Byte 3
0x07	0x10	State of the outputs	0x80

⚠️ Byte 3 being different from 0, this indicates a control error and raises the bit of the invalid output (in this case output 8). **The command is therefore ignored, and no output will be controlled!**

Retrieving the state of the outputs (Command 0x20)

In the same way as for assigning the state of the outputs, it is possible to recover their current state. To do this, send the following command:

Byte 0	Byte 1
0x01	0x20

Following this command, the ACW will return a response in the following format:

	Description and value
Byte 0	Response to command frames: 0x07
Byte 1	"State of outputs" command: 0x20
Byte 2	Current state of outputs

It is possible to assign the state of a group of outputs to a value without affecting the state of the other outputs, the following command must be sent:

Byte 0	Byte 1	Byte 2	Byte 3	Byte 4
0xc1	3	0x11	Mask/Group	State of outputs

Each output is represented by a bit in byte 3 and byte 4. Bit 0 of these bytes corresponds to output 1, ..., bit 7 corresponds to output 8.

Byte 4 has the same role as byte 2 of the command 0x10, only difference, the outputs specified in byte 3 will be controlled by the ACW.

Following this command, the ACW will return a response in the following format:

	Description and value
Byte 0	Response to command frames: 0x07
Byte 1	"Assign a state to outputs" command: 0x11
Byte 2	State of the outputs after the execution of the command.
Byte 3	State of the outputs to control incompatible (N.C.)

The constituted frame has the same behavior as with the command 0x10. The difference is that the errors are based on byte 3 of the frame (command) 0x11. Outputs 2 to 8 cannot be controlled, bits 1 to 7 of byte 3 of frame 0x11 must therefore be at 0 to have no error. In the event of an error, none of the outputs will be controlled.

Generate a positive pulse to an outputs group (Command 0x12)
It is possible to generate a positive pulse (0-> 1-> 0), for this, you will have to send the following command:

For Version < V1.5.0

Byte 0	Byte 1	Byte 2	Byte 3	Byte 4
0xc1	3	0x12	Mask/Group	Pulse time

Each output which will have to be controlled is represented by a bit in byte 3. Bit 0 of byte 3 corresponds to output 1, ..., bit 7 corresponds to output 8.

Byte 4 corresponds to the pulse time in milliseconds with a ratio of 4. The minimum value is therefore 4 ms and the maximum value is 1020ms.

Byte 0	Byte 1	Byte 2	Byte 3	Byte 4
0x81	0x12	Mask/Group	Pulse time (LSB)	Pulse time (MSB)

Each output which will have to be controlled is represented by a bit in byte 2. Bit 0 of byte 2 corresponds to output 1, ..., bit 7 corresponds to output 8.

Bytes 4 and 5 correspond to the pulse time in milliseconds. The minimum value is therefore 1 ms and the maximum value is limited to 5sec. If Pulse time exceeds 5sec in command, it will be truncated to 5sec by product

Following this command, the ACW will return a response in the following format:

	Description and value
Byte 0	Response to command frames: 0x07
Byte 1	"State of outputs" command: 0x12
Byte 2	Current state of outputs
Byte 3	State of the outputs to control incompatible (N.C.)

The constituted frame has the same behavior as with the response of the command 0x11. In the event of an error, none of the outputs will be controlled.

Generate a negative pulse to an outputs group (Command 0x13)

It is possible to generate a negative pulse (1-> 0-> 1), for this you will have to send the following command:

For Version < V1.5.0

Byte 0	Byte 1	Byte 2	Byte 3	Byte 4
0xc1	3	0x13	Mask/Group	Pulse time

Each output which will have to be controlled is represented by a bit in byte 3. Bit 0 of byte 3 corresponds to output 1, ..., bit 7 corresponds to output 8.

Byte 4 corresponds to the pulse time in milliseconds with a ratio of 4. The minimum value is therefore 4 ms and the maximum value is 1020 ms.

For Version ≥ V1.5.0

Byte 0	Byte 1	Byte 2	Byte 3	Byte 4
0x81	0x13	Mask/Group	Pulse time (LSB)	Pulse time (MSB)

Each output which will have to be controlled is represented by a bit in byte 2. Bit 0 of byte 2 corresponds to output 1, ..., bit 7 corresponds to output 8.

Bytes 4 and 5 correspond to the pulse time in milliseconds. The minimum value is therefore 1 ms and the maximum value is limited to 5sec. If Pulse time exceeds 5sec in command, it will be truncated to 5sec by product

Following this command, the ACW will return a response in the following format:

	Description and value
Byte 0	Response to command frames: 0x07
Byte 1	"State of outputs" command: 0x13
Byte 2	Current state of outputs
Byte 3	State of the outputs to control incompatible (N.C.)

The constituted frame has the same behavior as with the response of the command 0x13. In the event of an error, none of the outputs will be controlled.

Enable/Disable Output calendar (0x0B)

At any time, it is possible to turn one or more programs at once on/off with the following command:

Byte 0	Byte 1	Byte 2
0x41	0x0B	Output calendar state

Each program is represented in byte 2 as follows:

Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
Next day off only	Program 7 state	Program 6 state	Program 5 state	Program 4 state	Program 3 state	Program 2 state	Program 1 state

If the state bit of a program is at "1," the program will be activated, if the state bit is at "0," the program will be disabled.

In addition, by forcing bit 7 to "1," all activated programs will be inactive the next day and will become active again the following day.

For example, if the 0x410B83 command is sent on a Tuesday, programs 1 and 2 will only be activated from Thursday (programs 3,4,5.6 and 7 will be deactivated on right after the command).

Get output calendar state (0x0C)

The following command allows to get the output calendar state at any time:

Byte 0	Byte 1
0x01	0x0C

Following this command, the ACW will return a response in the following format:

	Description and value
Byte 0	Response to command frames: 0x07
Byte 1	"State of output calendars" command: 0x0C
Byte 2	Output calendar states

The byte 2 in the response frame has the same format as byte 2 In the command frame.

Technical support

For any information or technical question, you can contact our technical support on this page: https://www.atim.com/en/technical-support/