

AdJet Controller 1A.20.099.26

Revision 6 - PLC integration and commissioning

The Andre AdJet Controller 1A.20.099.26 generates the complete internal pulse sequence required to operate Andre AdJet valves. The PLC only provides a trigger signal. (coming from laser sensor) The factory-fixed spike pulse protects the valve coil from excessive current and must not be changed. The hold time determines the normal valve opening time. The flush time is only used exclusively for flushing and cleaning the valve.

Key features:

- Precise, repeatable control of Andre AdJet valves.
- Protection against excessive current and prolonged energisation.
- Two independent valve channels with galvanically isolated trigger inputs.
- Terminal block connections for power, trigger inputs, valve outputs and RS-232 communication.
- Installation on a standard 35 mm DIN rail.
- Configuration of hold (valve opening time) and flush times via RS-232.



The above image shows the labels of the PCB screw connectors inside the housing with their markings. The function of the connectors are as follows:

CON2 Power supply

Label	Description
1	GND
2	VCC (24V)

CON3 RS232

CON3 pin	Controller signal	Connect to PLC
1	RXD - controller input	PLC TXD
2	TXD - controller output	PLC RXD
3	GND	PLC signal ground

CON1

Label	Description
1	CONTROL1-
2	CONTROL1+ (5-24V)
3	CONTROL2-
4	CONTROL2+ (5-24V)
5	VALVE1
6	VALVE1
7	VALVE2
8	VALVE2

CONTROL1 and CONTROL2 are the galvanically isolated trigger input pairs. (laser sensor signals)

Apply the PLC trigger voltage from laser sensor to CONTROL1+ for valve no 1. The trigger voltage range is 5-24 VDC. The external reference potential must be connected to the corresponding CONTROL- terminal.

The valve coil is non-polarized. Either wire may be connected to either terminal of the corresponding valve output pair.



Configuring the Board

Functional overview

The spike pulse is factory-fixed and cannot be configured by the user. It must not be changed because an excessive spike duration can damage the valve coil.

The hold output remains active for the configured hold time. The hold time defines the normal opening time of the AdJetvalve. After the hold time has elapsed, the valve output is switched off.

The default hold time is 5 ms (5000 μ s). The default flush time is 10 ms (10000 μ s).

A trigger received while the hold output of the corresponding channel is active is ignored.

The two channels operate independently.

Pulse sequence

Event	Normal trigger cycle	Flush cycle
Trigger	Rising edge at CONTROL1 or CONTROL2	RS-232 command \$q\r
Spike pulse	Factory-fixed internal pulse; not configurable	Factory-fixed internal pulse; not configurable
Hold output	Active for hold time h	Active for flush time f
Purpose	Normal valve opening and dispensing	Flushing and cleaning the valve

Communication with the board

The 3-pin connector CON3 provides an RS-232 interface for connection to a PC or PLC. Use a true RS-232 interface and connect the signals according to the pin table above.

The PLC can use RS-232 for configuration and for starting a flush cycle. The trigger inputs remain available for normal operation.

Communication parameters

Parameter	Value
Interface	RS-232
Baud rate	9600 baud
Data bits	8
Parity	None
Stop bits	1
Line termination	Carriage Return (CR, ASCII 13)

Command syntax

Commands start with a dollar sign \$ (ASCII 36). Commands end with a Carriage Return (CR, ASCII 13). Do not add spaces unless explicitly stated.

Commands and responses use ASCII characters. Letters are case-insensitive. All time values are positive decimal integers in microseconds (μ s).

For reliable PLC communication, read the complete response up to the terminating Carriage Return before sending the next configuration command.

The flush feature (only for valve cleaning)

The flush function starts a valve cycle through the RS-232 interface without using a trigger input.

The command \$q\r starts a flush cycle on the currently selected channel. During this cycle, the hold output remains active for the configured flush time.

The flush time is intended exclusively for flushing and cleaning the valve. It does not change the normal hold time and must not be used as a replacement for the normal trigger cycle.

List of commands

The following commands are available. The leading \$ sign and the terminating CR are shown in the examples below.

The commands h and f address the currently selected channel. The spike pulse is factory-fixed and is not available as a user parameter.

Command	Function	Example	Remarks
c	Show selected channel	\$c\r	Returns channel 0 or 1
c=<number>	Select channel	\$c=0\r	<number> must be 0 or 1
h	Show hold time	\$h\r	Normal valve opening time
h=<time>	Set hold time (valve opening time)	\$h=5000\r	Time in μ s (5000 = 5ms)
f	Show flush time	\$f\r	Flushing and cleaning
f=<time>	Set flush time	\$f=10000\r	Time in μ s
q	Start flush cycle	\$q\r	Uses the flush time f
v	Show firmware version	\$v\r	For identification and service

The controller returns a response after a command. Responses are useful for commissioning and should be checked by the PLC during configuration.

A response may contain a value, a confirmation message or an error message. The complete response must be read up to the terminating Carriage Return.

Do not ignore error responses during start-up or parameterisation. An error indicates that the command was not accepted.

Response identification:

- Error response: starts with a minus sign (-).
- Confirmation response: starts with a plus sign (+).

Example configuration sequence

Select channel 0, set the normal opening time to 5000 μ s (=5ms), set the cleaning time to 10000 μ s, and then read the firmware version:

`$c=0\r` `$h=5000\r` `$f=10000\r` `$v\r`

The actual response text and error codes are firmware-dependent and should be documented with the released firmware version.

LED indicators

LED	Meaning
green	Board is powered
blue	Firmware is running

PLC commissioning checklist

Before connecting the controller to the machine PLC:

- Confirm the 24 VDC supply polarity and connect the protective wiring according to the machine standard.
- Confirm that the PLC trigger output provides 5-24 VDC between CONTROL+ and the corresponding CONTROL- terminal.
- Confirm the valve is connected to the correct output pair: VALVE1 or VALVE2.
- Configure hold time h for the normal valve opening time; use flush time f only for flushing / cleaning.
- Never attempt to change the factory-fixed spike pulse.
- Check and process RS-232 error responses during initialisation.

PLC Integration Guide

This section is intended for the PLC programmer and commissioning engineer. The AdJet Controller generates the complete internal spike-and-hold pulse sequence. The PLC supplies the trigger signal for normal operation. RS-232 is used to select channels, set the hold time and flush time, read back parameters and identify communication errors.

Required Hardware

Item	Requirement
24 VDC supply	Regulated 24 VDC supply connected to CON2.
PLC trigger output	Digital output providing 5-24 VDC for CONTROL1 or CONTROL2. laser or light sensor signal
PLC RS-232 interface	True RS-232 port or PLC RS-232 communication module. Do not use an RS-485 port.
Valve	Andre AdJet valve connected to the matching VALVE1 or VALVE2 output pair.
Commissioning adapter	A USB-to-RS-232 adapter may be used for PC commissioning only. It is not required in the final machine.



USB-to-RS-232 commissioning adapter example. Select RS-232 mode.

Electrical Connections to the PLC

Controller terminal	Signal	PLC or supply connection	Purpose
CON2-1	GND	0 VDC	Controller supply return
CON2-2	VCC	+24 VDC	Controller supply
CON1-1	CONTROL1-	Trigger reference / 0 V	Reference for channel 1 trigger
CON1-2	CONTROL1+	PLC output Q for channel 1	5-24 VDC rising-edge trigger
CON1-3	CONTROL2-	Trigger reference / 0 V	Reference for channel 2 trigger
CON1-4	CONTROL2+	PLC output Q for channel 2	5-24 VDC rising-edge trigger
CON1-5 and 6	VALVE1	Two valve wires	Valve output channel 1
CON1-7 and 8	VALVE2	Two valve wires	Valve output channel 2

Controller terminal	Signal	PLC or supply connection	Purpose
CON3-1	RXD	PLC TXD	RS-232 data to controller
CON3-2	TXD	PLC RXD	RS-232 data from controller
CON3-3	GND	PLC signal ground	RS-232 reference

The trigger inputs are galvanically isolated. The external reference potential must be connected to the corresponding CONTROL- terminal. The table above shows the typical sourcing-output connection used with a PNP PLC output. For a sinking-output PLC, the programmer must use an approved interface or relay and verify the input polarity before energising the controller.

The valve coil is non-polarized. Either valve wire may be connected to either terminal of the corresponding valve output pair.

PLC Serial Communication Settings

Parameter	Required setting
Interface	RS-232
Baud rate	9600 baud
Data bits	8
Parity	None
Stop bits	1
Flow control	None
Command termination	CR, ASCII 13
Character encoding	ASCII

The characters \r shown in the examples represent one Carriage Return byte (ASCII 13). The PLC must not transmit the two printable characters backslash and r. Send one command at a time and read the complete response up to its terminating CR before sending the next command.

PLC Startup Parameterisation

The commands h and f apply to the currently selected channel. A robust PLC program should initialise the required parameters after power-up or after a recipe change and then read them back. The following example sets a 3 ms normal opening time for channel 0.

```
$c=0\r
$h=3000\r
$h\r
```

Expected result: the final read-back must return 3000, which equals 3000 microseconds or 3 ms. The hold time is the normal valve opening time. The flush time is a separate parameter and is only used for flushing and cleaning.

For channel 1, select the channel first and then set and verify its hold time:

```
$c=1\r
$h=3000\r
$h\r
```

The factory-fixed spike pulse is not a user parameter and must not be changed. Never send a command intended to modify the spike pulse.

Required PLC Response Handling

Step 1 - Open the serial port: Configure the PLC serial module for 9600 baud, 8 data bits, no parity, 1 stop bit and no flow control.

Step 2 - Identify the controller: Send \$v followed by CR and store or check the returned firmware version.

Step 3 - Select the channel: Send \$c=0 or \$c=1 followed by CR. The hold and flush parameters apply to this selected channel.

Step 4 - Set the hold time: Send \$h=<time> followed by CR. Use microseconds; for example, 3000 means 3 ms.

Step 5 - Read back the value: Send \$h followed by CR and compare the returned value with the requested value.

Step 6 - Process errors: An error response starts with a minus sign. Stop parameterisation, set a PLC diagnostic and do not start production until the error is cleared.

Step 7 - Trigger the valve: Use the rising edge of the appropriate CONTROL input for normal operation. Do not use \$q as a replacement for the normal trigger cycle.

Step-by-Step PLC Commissioning

Step 1 - Power off the machine: Switch off the 24 VDC supply before connecting or changing any wiring.

Step 2 - Connect the controller supply: Connect +24 VDC to CON2 VCC and 0 VDC to CON2 GND. Check polarity before switching on.

Step 3 - Connect one valve: Connect one AdJet valve to either the VALVE1 or VALVE2 pair. Keep the valve and process media in a safe commissioning condition.

Step 4 - Connect the trigger: Connect the PLC output to CONTROL1+ or CONTROL2+ and connect the corresponding CONTROL- terminal to the external 0 V reference.

Step 5 - Connect RS-232: Connect controller RXD to PLC TXD, controller TXD to PLC RXD and RS-232 GND to the PLC signal ground.

Step 6 - Power up and check LEDs: The green LED indicates board power. The blue LED indicates that the firmware is running.

Step 7 - Initialise communication: Open the RS-232 port and send \$v followed by CR. Confirm that the controller returns its firmware version.

Step 8 - Set and verify timing: Select the required channel, send the hold-time command in microseconds and read back the value. Do not change the factory-fixed spike pulse.

Step 9 - Trigger once: Generate one clean rising edge on the selected CONTROL input. Confirm the valve response before enabling automatic machine cycling.

Step 10 - Validate the process: Check the actual dispensing result and, if required, verify the electrical pulse with an oscilloscope. The programmed hold time is the electrical control time; mechanical valve response may add a delay.

Step 11 - Repeat for the second channel: If VALVE2 is used, select channel 1, initialise its parameters and perform the same single-cycle test.

Important Programming Rules

- Use the hold time h for normal valve opening and dispensing.
- Use the flush time f only for valve flushing and cleaning.
- The spike pulse is factory-fixed and must not be exposed as an HMI or PLC parameter.
- Do not send a new trigger while the hold output of the same channel is active; it will be ignored.
- Use a rising edge trigger and return the PLC output to its inactive state after the cycle.
- Read and evaluate every RS-232 response during start-up and parameterisation.

Firmware update - service procedure

The device firmware can be updated using the USB-C service port on the board. Firmware updates must only be performed by authorised service personnel using the released firmware package.

Disconnect the valve outputs, trigger signals and machine control wiring before starting a firmware update. Do not update the firmware while the controller is connected to an energized machine.

To start a firmware update:

- Disconnect the board from power.
- Connect the board to a PC via a USB-C cable, either to a USB-A port or a USB-C port on the PC side.
- Press and hold both the BOOT button and the RESET button on the board.
- Release the RESET button while keeping the BOOT button pressed.
Then release the BOOT button.
- The board should now be in update mode, and the green LED should light up while the blue LED is off.
- Run the DFU script supplied with the firmware release, for example:

```
dfu-util -d 0483:df11 --alt 0 -s 0x08000000:leave -D  
spikehold.bin
```