

# FDC-320 with Arduino

## Manual

How to operate the FDC-320 with Arduino controller

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## QUICK START

### DOWNLOAD GIT

Run `winget install Git.Git` in cmd or powershell on Windows

Run `sudo apt install git` on Linux

### MAKE SURE IT'S BEEN INCLUDED IN THE PATH ENVIRONMENT VARIABLE

Sometimes on windows `winget` won't put the `git/julia` executable in the path variable. It seems to always put it in the start menu so you can find the executable there and add it's path to the `PATH` environment variable.

### DOWNLOAD THE GITHUB REPOSITORY

```
git clone https://github.com/AwesomeQuest/fdc-320.git
```

The repo also has a copy of this manual in case you need another copy. Feel free to open an issue or send me an email if you have any problems.

## INSTALL JULIA

### WINDOWS

Run the following command in powershell or cmd

```
winget install JuliaLang.Julia
```

### LINUX

Run the following command in your favorite shell

```
curl -fsSL https://install.julialang.org | sh
```

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## SETUP ENVIRONMENT

Then open a Julia REPL in the FDC-320 folder as follows

```
julia --project=.
```

And you should see something like this

```
      _
     _ _(_) _ | Documentation: https://docs.julialang.org
    (_ ) | (_ ) (_ ) |
   _ _ _ | | _ _ _ | Type "?" for help, "]"? for Pkg help.
  | | | | | | / _ ` | |
  | | | _ | | | ( _ | | Version 1.12.0-rc1 (2025-07-12)
 _ / | \ _ ' _ | _ | \ _ ' _ | Official https://julialang.org release
| _ / |
```

```
julia>
```

Install the required packages.

```
julia> ]
```

```
(fdc-320) pkg> instantiate
```

Then include the file FDC320lib.jl

```
julia> include("FDC320lib.jl")
```

## QUERYING THE FDC-320

### LIST AVAILABLE PORTS

Make sure the Arduino is plugged into your pc via USB. You check this with the following command.

```
julia> list_ports()
COM3
      Description:   Arduino Uno (COM3)
      Transport type: SP_TRANSPORT_USB
```

This command lists all the valid USB port names and their description. The example above is for a windows machine, on linux the name has a different format but is functionally equivalent.

## OPEN THE PORT

In order to use a USB port for serial communication you must “open” it first. This takes ownership of the port and makes sure no other processes can use it.

```
julia> port = LibSerialPort.open("COM3", 9600)
```

Here the first argument is the name of the port as shown by `list_ports()` and the second argument is the baud-rate. It is critical that the baud-rate be set the same as the Arduino, I have set it to 9600. The baud-rate of the FDC-320 is an internal setting and must be changed with the `setCommunicationBaudrate` function, then you must change the Arduino code to match.

## MAKE A REQUEST

Now you can use the public API (Julia) to make requests to the FDC-320. Here is an example:

```
julia> get_ReadFlowrateActualFlowrate(port)
0.0f0
```

You can reference the FDC-300 manual pages 16-17 for the names of the available functions, each function either reads or writes to a register. In that table each register is marked either “Read only”(R), “Write only”(W), or “Read and write”(RW).

Each register gets one or two functions in the file `FDC320lib.jl` corresponding to if the register is R, W, or RW. If the register is marked R it gets a function of the same name prefixed with “get”, if it is marked with W the function prefix is “set”. If the register is RW then it gets both a “get” and a “set” function.

When calling a “set” function it is important to call it with the right type. This type is annotated in the table in the FDC-300 manual as U16, U32, or Float, these correspond to `UInt16`, `UInt32`, and `Float32` in Julia.

On a success the “set” function will return a 0

Here are a few examples of dos and don’ts for a set function. (The function returning 0 means success)

```
julia> set_SetFlowrateActualFlowrate(port, 0.0f0)
0
```

```
julia> set_SetFlowrateActualFlowrate(port, 0.0e0)
ERROR: AssertionError: typeof(val) == regtypes[adr]
Stacktrace:
```

```

...

julia> set_SetFlowrateActualFlowrate(port, 0x01)
ERROR: AssertionError: typeof(val) == regtypes[adr]
Stacktrace:
...

julia> set_SetFlowrateActualFlowrate(port, Float32(0x01))
0

julia> set_SetFlowratePercentageMethod(port, 0x0001)
0

julia> set_SetFlowratePercentageMethod(port, 1)
ERROR: AssertionError: typeof(val) == regtypes[adr]
Stacktrace:
...

julia> set_SetFlowratePercentageMethod(port, 1.0)
ERROR: AssertionError: typeof(val) == regtypes[adr]
Stacktrace:
...

julia> set_SetFlowratePercentageMethod(port, UInt16(1.0))
0

```

As you can see, it is only valid to call the set function with that function's appropriate type as defined in the table.

## LOGGING DATA

In Julia it is most convenient to log data with the CSV.jl and DataFrames.jl packages. If you do not already have these installed you can do so as follows.

Go into Package mode by entering the ] character.

```

julia> ]

(fdc-320) pkg> add CSV, DataFrames

```

Then you include them in your namespace with a using statement.

```
julia> using CSV, DataFrames
```

The following is a simple example of logging and saving data

```
julia> using Dates
```

```
julia> times = []; datas = [];
```

```
julia> for _ in 1:100
    push!(datas, get_ReadFlowrateActualFlowrate(port))
    push!(times, now())
end
```

```
julia> CSV.write("test.csv", DataFrame(timescolumn=times,
datascolumn=datas))
"test.csv"
```

```
julia> CSV.read("test.csv", DataFrame)
```

```
100×2 DataFrame
```

Row	timescolumn DateTime	datascolumn Float64
1	2025-08-07T12:16:43.107	0.0
2	2025-08-07T12:16:43.328	0.0
⋮	⋮	⋮
99	2025-08-07T12:17:05.101	0.0
100	2025-08-07T12:17:05.316	0.0

96 rows omitted

## READING TEMPERATURE AND HUMIDITY

The file `FDC320lib.jl` also contains a function to read the Temperature and Humidity detected by a DHT22. It is used as follows.

```
julia> T,H = TH = readTandH(port)
(temperature = 24.1f0, humidity = 48.100002f0)
```

```
julia> T
24.1f0
```

```
julia> H
48.100002f0
```

```
julia> (T,H) == (TH.temperature, TH.humidity)
true
```

The function returns a `NamedTuple` which can either indexed into like an array or via field like a struct.

## ARDUINO CODE AND WIRING

The Arduino is running the file `reader/reader.ino` and can be uploaded directly to the Arduino via the ArduinoIDE.

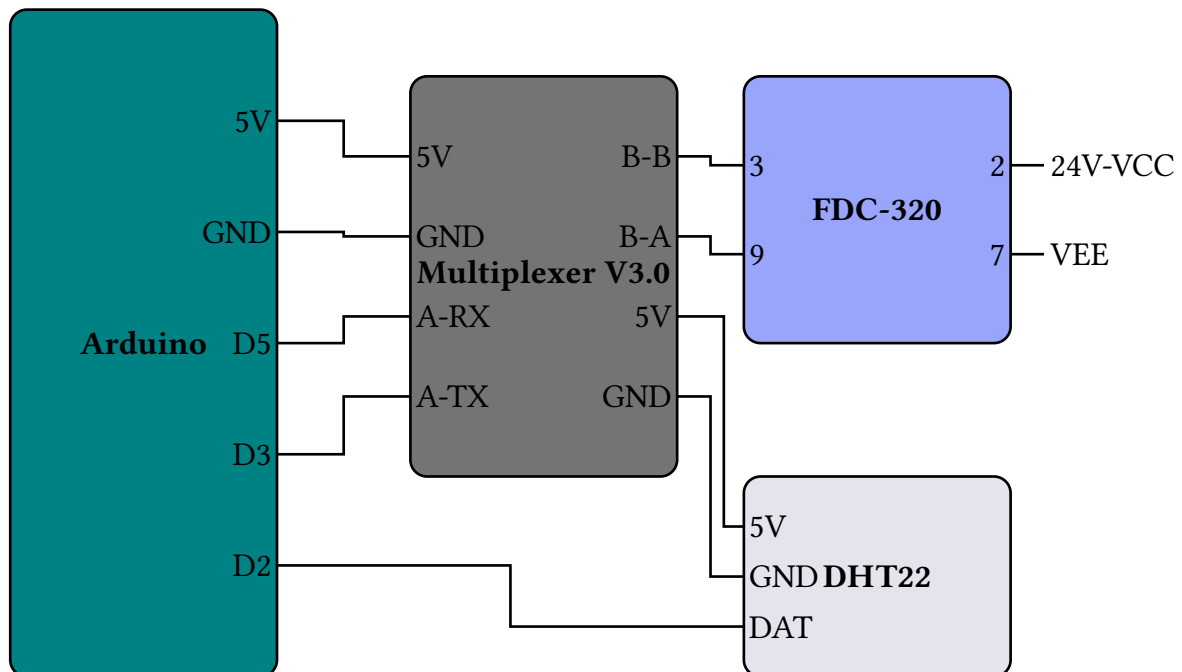


Figure 1: A wiring diagram of the Arduino, FDC, Multiplexer, and DHT22

If you need to replace the multiplexer board it is called “Multi USB RS232 RS485 TTL Converter SKU TEL0070”.