
Morelia

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Thresa Kelly

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MORELIA PYTHON POD API PROJECT

1.1 Morelia package

1.1.1 Subpackages

1.1.1.1 Morelia.Commands package

Submodules

Morelia.Commands.PodCommands module

class Morelia.Commands.PodCommands.CommandSet

Bases: object

POD_Commands manages a dictionary containing available commands for a POD device.

__commands

Dictionary containing the available commands for a POD device. Each entry is formatted as { key(command number) : value([command name, number of argument ASCII bytes, number of return bytes, binary flag) }.

Type

dict[int,list[str|tuple[int]|bool]]

AddCommand(*commandNumber: int, commandName: str, argumentBytes: tuple[int], returnBytes: tuple[int], isBinary: bool, description: str*) → bool

Adds a command entry to the current commands dictionary (__commands) if the command does not exist.

Parameters

- **commandNumber** (*int*) – Integer of the command number.
- **commandName** (*str*) – String of the command's name.
- **argumentBytes** (*tuple[int]*) – Integer of the number of bytes in the argument.
- **returnBytes** (*tuple[int]*) – Integer of the number of bytes in the return.
- **isBinary** (*bool*) – Boolean flag to mark if the command is binary (True) or standard (False).
- **description** (*str*) – String description of the command.

Returns

True if the command was successfully added, False if the command could not be added because it already exists.

Return type

bool

ArgumentHexChar(*cmd: int | str*) → tuple[int] | None

Gets the tuple for the number of hex characters in the argument for a given command.

Parameters

cmd (*int | str*) – Integer command number or string command name.

Returns

Tuple representing the number of bytes in the argument for cmd. If the command could not be found, return None.

Return type

tuple[int]|None

CommandNumberFromName(*name: str*) → int | None

Gets the command number from the command dictionary using the command's name.

Parameters

name (*str*) – String of the command's name.

Returns

Integer representing the command number. If the command could not be found, return None.

Return type

int|None

Description(*cmd: int | str*) → str | None

Gets the description for a given command.

Parameters

cmd (*int | str*) – Integer command number or string command name.

Returns

String description for the command. If the command could not be found, return None.

Return type

str|None

DoesCommandExist(*cmd: int | str*) → bool

Checks if a command exists in the __commands dictionary.

Parameters

cmd (*int | str*) – Integer command number or string command name.

Returns

True if the command exists, false otherwise.

Return type

bool

static GetBasicCommands() → dict[int, list[str | tuple[int] | bool]]

Creates a dictionary containing the basic POD command set (0,1,2,3,4,5,6,7,8,9,10,11,12).

Returns

Dictionary containing the available commands for this POD device. Each entry is formatted as

{ key(command number) : value([command name, number of argument ASCII bytes, number of return bytes, binary flag, description) }.

Return type

dict[int, list[str|tuple[int]]|bool|str]]

GetCommands() → dict[int, list[str | tuple[int] | bool]]

Gets the contents of the current command dictionary (__commands).

Returns

Dictionary containing the available commands for a POD device. Each entry is formatted as { key(command number) : value([command name, number of argument ASCII bytes, number of return bytes, binary flag, description) }.

Return type

dict[int, list[str|tuple[int]]|bool|str]]

IsCommandBinary(cmd: int | str) → bool | None

Gets the binary flag for a given command.

Parameters

cmd (int | str) – Integer command number or string command name.

Returns

Boolean flag that is True if the command is binary and False if standard. If the command could not be found, return None.

Return type

bool|None

static NoValue() → int

Gets value of __NOVALUE.

Returns

Value of __NOVALUE.

Return type

int

RemoveCommand(cmd: int | str) → bool

Removes the entry for a given command in __commands dictionary.

Parameters

cmd (int | str) – Integer command number or string command name.

Returns

True if the command was successfully removed, False if the command does not exist.

Return type

bool

RestoreBasicCommands() → None

Sets the current commands (__commands) to the basic POD command set.

ReturnHexChar(cmd: int | str) → tuple[int] | None

Gets the tuple for the number of hex characters in the return for a given command.

Parameters

cmd (int | str) – Integer command number or string command name.

Returns

Tuple representing the number of hex characters in the return for cmd. If the command could not be found, return None.

Return type

tuple[int]|None

Search(cmd: int | str, idx: int | None = None) → str | tuple[int] | bool | None

Searches the __commands dictionary for the command.

Parameters

- **cmd** (int | str) – Integer command number or string command name.
- **idx** (int, optional) – Index for the desired value in the command information list. Defaults to None.

Returns

If an idx was given, this returns the idx value of the command information list if the command was found (None otherwise). If no idx is given, this returns true if the command is found (False otherwise).

Return type

str|tuple[int]|bool|str|None

static U16() → int

Gets value of __U16.

Returns

Value of __U16.

Return type

int

static U32() → int

Gets value of __U32.

Returns

Value of __U32.

Return type

int

static U8() → int

Gets value of __U8.

Returns

Value of __U8.

Return type

int

ValidateCommand(cmd: str | int, pld: int | bytes | tuple[int | bytes] | None = None)

Raises an exception if the command and its payload are invalid for this POD device.

Parameters

- **cmd** (str | int) – Command name or number.
- **pld** (int | bytes | tuple[int | bytes] | None, optional) – Standard command packet payload. Defaults to None.

Raises

- **Exception** – Command ‘+str(cmd)+’ does not exist.
- **Exception** – This command does not take a payload.
- **Exception** – This command requires a payload.
- **Exception** – Command needs more than one argument in the payload. Use a tuple of values.
- **Exception** – Payload must have ‘+str(sum(args))+’ bytes.
- **Exception** – Payload must have ‘+str(len(args))+’ integer items in the tuple.
- **Exception** – Bytes in the payload are the wrong sizes. The sizes must be ‘+str(args)+.’
- **Exception** – The payload tuple must only contain int or bytes items.
- **Exception** – Payload is of incorrect type. It must be an int, bytes, or tuple of int/bytes.

__ARGUMENTS: int = 1

Class-level integer representing the index key for the number of bytes in an argument for __commands list values.

__BINARY: int = 3

Class-level integer representing the index key for the binary flag for __commands list values.

__DESCRIPTION: int = 4

Class-level integer representing the index key for the description for __commands list values.

__NAME: int = 0

Class-level integer representing the index key for the command name for __commands list values.

__NOVALUE: int = -1

Class-level integer used to mark when a list item in __commands means ‘no value’ or is undefined.

__RETURNS: int = 2

Class-level integer representing the index key for the number of bytes in the return for __commands list values.

__U16: int = 4

Class-level integer representing the number of hexadecimal characters for an unsigned 16-bit value.

__U32: int = 8

Class-level integer representing the number of hexadecimal characters for an unsigned 32-bit value.

__U8: int = 2

Class-level integer representing the number of hexadecimal characters for an unsigned 8-bit value.

Module contents

1.1.1.2 Morelia.Devices package

Subpackages

Morelia.Devices.SerialPorts package

Submodules

Morelia.Devices.SerialPorts.PortAccess module**class** Morelia.Devices.SerialPorts.PortAccess.**FindPorts**

Bases: object

Contains methods for the user to view and select a serial port.

static **ChoosePort**(*forbidden: list[str] = []*) → str

Systems checks user's Operating System, and chooses ports accordingly.

Parameters**forbidden**(*list[str], optional*) – List of port names that the user should not use. This may be because these ports are already in use or that the port is not a POD device. Defaults to [].**Returns**

String name of the port.

Return type

str

static **GetAllPortNames**() → list[str]

Finds all the available COM ports on the user's computer and appends them to an accessible list.

Returns

List containing the names of available COM ports.

Return type

list[str]

static **GetSelectPortNames**(*forbidden: list[str] = []*) → list[str]

Gets the names of all available ports.

Parameters**forbidden**(*list[str], optional*) – List of port names that the user should not use. This may be because these ports are already in use or that the port is not a POD device. Defaults to [].**Returns**

List of port names.

Return type

list[str]

static **_ChoosePortLinux**(*forbidden: list[str] = []*) → str

User picks Serial port in Linux.

Parameters**forbidden**(*list[str], optional*) – List of port names that the user should not use. This may be because these ports are already in use or that the port is not a POD device. Defaults to [].**Returns**

String name of the port.

Return type

str

static **_ChoosePortWindows**(*forbidden: list[str] = []*) → str

User picks COM port in Windows.

Parameters

forbidden (*list[str], optional*) – List of port names that the user should not use. This may be because these ports are already in use or that the port is not a POD device. Defaults to [].

Returns

String name of the port.

Return type

str

Morelia.Devices.SerialPorts.SerialComm module

class Morelia.Devices.SerialPorts.SerialComm.**PortIO**(*port: str | int, baudrate: int = 9600*)

Bases: object

COM_io handles serial communication (read/write) using COM ports.

__serialInst

Instance-level serial COM port.

Type

Serial

CloseSerialPort() → None

Closes the instance serial port if it is open.

Flush() → bool

Reset the input and output serial buffer.

Returns

True of the buffers are flushed, False otherwise.

Return type

bool

GetPortName() → str | None

Gets the name of the open port.

Returns

If the serial port is open, it will return a string of the port's name. If the port is closed, it will return None.

Return type

str|None

IsSerialClosed() → bool

Returns False if the serial instance port is open, True otherwise.

Returns

True if the COM port is closed, False otherwise.

Return type

bool

IsSerialOpen() → bool

Returns True if the serial instance port is open, false otherwise.

Returns

True if the COM port is open, False otherwise.

Return type

bool

OpenSerialPort(*port: str | int, baudrate: int = 9600*) → None

First, it closes the serial port if it is open. Then, it opens a serial port with a set baud rate.

Parameters

- **port** (*str | int*) – String of the serial port to be opened.
- **baudrate** (*int, optional*) – Integer baud rate of the opened serial port. Defaults to 9600.

Raises

Exception – Port does not exist.

Read(*numBytes: int, timeout_sec: int | float = 5*) → bytes | None

Reads a specified number of bytes from the open serial port.

Parameters

- **numBytes** (*int*) – Integer number of bytes to read.
- **timeout_sec** (*int | float, optional*) – Time in seconds to wait for serial data. Defaults to 5.

Raises

Exception – Timeout for serial read.

Returns

If the serial port is open, it will return a set number of read bytes. If it is closed, it will return None.

Return type

bytes|None

ReadLine() → bytes | None

Reads until a new line is read from the open serial port.

Returns

If the serial port is open, it will return a complete read line. If closed, it will return None.

Return type

bytes|None

ReadUntil(*eol: bytes*) → bytes | None

Reads until a set character from the open serial port.

Parameters

eol (*bytes*) – end-of-line character.

Returns

If the serial port is open, it will return a read line ending in eol. If closed, it will return None.

Return type

bytes|None

SetBaudrate(*baudrate: int*) → bool

Sets the baud rate of the serial port

Parameters

baudrate (*int*) – Baud rate, or signals per second.

Returns

True if the baudrate was set, False otherwise.

Return type

bool

Write(*message: bytes*) → None

Write a set message to the open serial port.

Parameters

message (*bytes*) – byte string containing the message to write.

__BuildPortName(*port: str | int*) → str

Converts the port parameter into the “COM”+<number> format for Windows or “/dev/tty...”+<number> for Linux.

Parameters

port (*str | int*) – Name of a COM port. Can be an integer or string.

Returns

Name of the COM port.

Return type

str

Module contents

Submodules

Morelia.Devices.BasicPodProtocol module

class Morelia.Devices.BasicPodProtocol.**Pod**(*port: str | int, baudrate: int = 9600*)

Bases: object

POD_Basics handles basic communication with a generic POD device, including reading and writing packets and packet interpretation.

_port

Instance-level COM_io object, which handles the COM port

Type

COM_io

_commands

Instance-level POD_Commands object, which stores information about the commands available to this POD device.

Type

POD_Commands

static BuildPODpacket_Standard(*commandNumber: int, payload: bytes | None = None*) → bytes

Builds a standard POD packet as bytes: STX (1 byte) + command number (4 bytes) + optional packet (? bytes) + checksum (2 bytes)+ ETX (1 bytes).

Parameters

- **commandNumber** (*int*) – Integer representing the command number. This will be converted into a 4 byte long ASCII-encoded bytes string.

- **payload** (*bytes* | *None*, *optional*) – bytes string containing the payload. Defaults to *None*.

Returns

Bytes string of a complete standard POD packet.

Return type

bytes

static Checksum(*bytesIn: bytes*) → bytes

Calculates the checksum of a given bytes message. This is achieved by summing each byte in the message, inverting, and taking the last byte.

Parameters

bytesIn (*bytes*) – Bytes message containing POD packet data.

Returns

Two ASCII-encoded bytes containing the checksum for bytesIn.

Return type

bytes

static ChoosePort(*forbidden: list[str] = []*) → str

Systems checks user's Operating System, and chooses ports accordingly.

Parameters

forbidden (*list[str]*, *optional*) – List of port names that are already used. Defaults to [].

Returns

String name of the port.

Return type

str

FlushPort() → bool

Reset the input and output serial port buffer.

Returns

True if the buffers are flushed, False otherwise.

Return type

bool

GetDeviceCommands() → dict[int, list[str | tuple[int] | bool]]

Gets the dictionary containing the class instance's available POD commands.

Returns

Dictionary containing the available commands and their information. Formatted as key(command number) : value([command name, number of argument ASCII bytes, number of return bytes, binary flag])

Return type

dict[int, list[str | tuple[int] | bool]]

GetPODpacket(*cmd: str | int*, *payload: int | bytes | tuple[int | bytes] | None = None*) → bytes

Builds a POD packet and writes it to a POD device via COM port. If an integer payload is given, the method will convert it into a bytes string of the length expected by the command. If a bytes payload is given, it must be the correct length.

Parameters

- **cmd** (*str* | *int*) – Command number.
- **payload** (*int* | *bytes* | *tuple*[*int* | *bytes*], *optional*) – None when there is no payload. If there is a payload, set to an integer value, bytes string, or tuple. Defaults to None.

Raises

- **Exception** – POD command does not exist.
- **Exception** – POD command requires a payload.

Returns

Bytes string of the POD packet.

Return type

bytes

static **GetU**(*u: int*) → int

number of hexadecimal characters for an unsigned u-bit value.

Parameters

u (*int*) – 8, 16, or 32 bits. Enter any other number for NOVALUE.

Returns

number of hexadecimal characters for an unsigned u-bit value.

Return type

int

static **PayloadToBytes**(*payload: int* | *bytes* | *tuple*[*int* | *bytes*], *argSizes: tuple*[*int*]) → bytes

Converts a payload into a bytes string (assuming that the payload is for a valid command).

Parameters

- **payload** (*int* | *bytes* | *tuple*[*int* | *bytes*]) – Integer, bytes, or tuple containing the payload.
- **argSizes** (*tuple*[*int*]) – Tuple of the argument sizes.

Returns

Bytes string of the payload.

Return type

bytes

ReadPODpacket(*validateChecksum: bool = True*, *timeout_sec: int* | *float = 5*) → *Packet*

Reads a complete POD packet, either in standard or binary format, beginning with STX and ending with ETX. Reads first STX and then starts recursion.

Parameters

- **validateChecksum** (*bool*, *optional*) – Set to True to validate the checksum. Set to False to skip validation. Defaults to True.
- **timeout_sec** (*int* | *float*, *optional*) – Time in seconds to wait for serial data. Defaults to 5.

Returns

POD packet beginning with STX and ending with ETX. This may be a standard packet, binary packet, or an unformatted packet (STX+something+ETX).

Return type

Packet

SetBaudrateOfDevice(*baudrate: int*) → bool

If the port is open, it will change the baud rate to the parameter's value.

Parameters

baudrate (*int*) – Baud rate to set for the open serial port.

Returns

True if successful at setting the baud rate, false otherwise.

Return type

bool

TestConnection(*pingCmd: str | int = 'PING'*) → bool

Tests if a POD device can be read from or written. Sends a PING command.

Parameters

pingCmd (*str | int, optional*) – Command name or number to ping. Defaults to 'PING'.

Returns

True for successful connection, false otherwise.

Return type

bool

Raises

Exception – Ping command does not exist for this POD device.

WritePacket(*cmd: str | int, payload: int | bytes | tuple[int | bytes] | None = None*) → *PacketStandard*

Builds a POD packet and writes it to the POD device.

Parameters

- **cmd** (*str | int*) – Command number.
- **payload** (*int | bytes | tuple[int | bytes], optional*) – None when there is no payload. If there is a payload, set to an integer value, bytes string, or tuple. Defaults to None.

Returns

Packet that was written to the POD device.

Return type

Packet_Standard

WriteRead(*cmd: str | int, payload: int | bytes | tuple[int | bytes] | None = None, validateChecksum: bool = True*) → *Packet*

Writes a command with optional payload to POD device, then reads (once) the device response.

Parameters

- **cmd** (*str | int*) – Command number.
- **payload** (*int | bytes | tuple[int | bytes], optional*) – None when there is no payload. If there is a payload, set to an integer value or a bytes string. Defaults to None.
- **validateChecksum** (*bool, optional*) – Set to True to validate the checksum. Set to False to skip validation. Defaults to True.

Returns

POD packet beginning with STX and ending with ETX. This may be a standard packet, binary packet, or an unformatted packet (STX+something+ETX).

Return type*Packet***_ReadPODpacket_Recursive**(*validateChecksum: bool = True*) → *Packet*

Reads the command number. If the command number ends in ETX, the packet is returned. Next, it checks if the command is allowed. Then, it checks if the command is standard or binary and reads accordingly, then returns the packet.

Parameters

validateChecksum (*bool*, *optional*) – Set to True to validate the checksum. Set to False to skip validation. Defaults to True.

Raises

Exception – Cannot read an invalid command.

Returns

POD packet beginning with STX and ending with ETX. This may be a standard packet, binary packet, or an unformatted packet (STX+something+ETX).

Return type*Packet*|*Packet_Standard*|*Packet_BinaryStandard***_Read_Binary**(*prePacket: bytes*, *validateChecksum: bool = True*) → *PacketBinary*

Reads the remaining part of the variable-length binary packet. It first reads the standard packet (*prePacket*+payload+checksum+ETX). Then it determines how long the binary packet is from the payload of the standard POD packet and reads that many bytes. It then reads to ETX to get the checksum+ETX.

Parameters

- **prePacket** (*bytes*) – Bytes string containing the beginning of a POD packet: STX (1 byte) + command number (4 bytes)
- **validateChecksum** (*bool*, *optional*) – Set to True to validate the checksum. Set to False to skip validation. Defaults to True.

Raises

Exception – An exception is raised if the checksum is invalid (only if *validateChecksum=True*).

Returns

Variable-length binary POD packet.

Return type*PacketBinary***_Read_GetCommand**(*validateChecksum: bool = True*) → *bytes*

Reads one byte at a time up to 4 bytes to get the ASCII-encoded bytes command number. For each byte read, it can (1) start the recursion over if an STX is found, (2) returns if ETX is found, or (3) continue building the command number.

Parameters

validateChecksum (*bool*, *optional*) – Set to True to validate the checksum. Set to False to skip validation. Defaults to True.

Returns

4 byte long string containing the ASCII-encoded command number.

Return type*bytes*

`_Read_Standard`(*prePacket: bytes, validateChecksum: bool = True*) → *PacketStandard*

Reads the payload, checksum, and ETX. Then it builds the complete standard POD packet in bytes.

Parameters

- **`prePacket`** (*bytes*) – Bytes string containing the beginning of a POD packet: STX (1 byte) + command number (4 bytes).
- **`validateChecksum`** (*bool, optional*) – Set to True to validate the checksum. Set to False to skip validation. Defaults to True.

Raises

Exception – An exception is raised if the checksum is invalid (only if `validateChecksum=True`).

Returns

Complete standard POD packet.

Return type

`Packet_Standard`

`_Read_ToETX`(*validateChecksum: bool = True*) → *bytes*

Reads one byte at a time until an ETX is found. It will restart the recursive read if an STX is found anywhere.

Parameters

`validateChecksum` (*bool, optional*) – Set to True to validate the checksum. Set to False to skip validation. Defaults to True.

Returns

Bytes string ending with ETX.

Return type

`bytes`

`static _ValidateChecksum`(*msg: bytes*) → *bool*

Validates the checksum of a given POD packet. The checksum is valid if the calculated checksum from the data matches the checksum written in the packet.

Parameters

`msg` (*bytes*) – Bytes message containing a POD packet: STX (1 bytes) + data (? bytes) + checksum (2 bytes) + ETX (1 byte).

Returns

True if the checksum is correct, false otherwise.

Return type

`bool`

Raises

Exception – `msg` does not begin with STX or end with ETX.

Morelia.Devices.PodDevice_8206HR module

class Morelia.Devices.PodDevice_8206HR.**Pod8206HR**(port: str | int, preampGain: int, baudrate: int = 9600)

Bases: *Pod*

POD_8206HR handles communication using an 8206HR POD device.

_preampGain

Instance-level integer (10 or 100) preamplifier gain.

Type

int

ReadPODpacket(validateChecksum: bool = True, timeout_sec: int | float = 5) → *Packet*

Reads a complete POD packet, either in standard or binary format, beginning with STX and ending with ETX. Reads first STX and then starts recursion.

Parameters

- **validateChecksum** (bool, optional) – Set to True to validate the checksum. Set to False to skip validation. Defaults to True.
- **timeout_sec** (int | float, optional) – Time in seconds to wait for serial data. Defaults to 5.

Returns

POD packet beginning with STX and ending with ETX. This may be a standard packet, binary packet, or an unformatted packet (STX+something+ETX).

Return type

Packet

_Read_Binary(prePacket: bytes, validateChecksum: bool = True) → *PacketBinary4*

After receiving the prePacket, it reads the 8 bytes(TTL+channels) and then reads to ETX (checksum+ETX).

Parameters

- **prePacket** (bytes) – Bytes string containing the beginning of a POD packet: STX (1 byte) + command number (4 bytes).
- **validateChecksum** (bool, optional) – Set to True to validate the checksum. Set to False to skip validation. Defaults to True.

Raises

Exception – Bad checksum for binary POD packet read.

Returns

Binary4 POD packet.

Return type

Packet_Binary4

static _TranslateTTLbyte_ASCII(ttlByte: bytes) → dict[str, int]

Separates the bits of each TTL (0-3) from a ASCII encoded byte.

Parameters

ttlByte (bytes) – One byte string for the TTL (ASCII encoded).

Returns

Dictionary of the TTLs. Values are 1 when input, 0 when output.

Return type
dict[str,int]

Morelia.Devices.PodDevice_8229 module

class Morelia.Devices.PodDevice_8229.**Pod8229**(port: str | int, baudrate: int = 19200)

Bases: *Pod*

POD_8229 handles communication using an 8229 POD device.

static BuildSetDayScheduleArgument(day: str | int, hours: list | tuple[bool | int], speed: int | list | tuple[int]) → tuple[int]

Appends the day of the week code to the front of the encoded hourly schedule. this tuple is formatted to be used as the #141 'SET DAY SCHEDULE' argument.

Parameters

- **day** (str | int) – Day of the week. Can be either the name of the day (i.e. Sunday, Monday, etc.) or the 0-6 day code (0 for Sunday increasing to 6 for Saturday).
- **hours** (list | tuple[bool | int]) – Array of 24 items. The value is 1 for motor on and 0 for motor off.
- **speed** (int | list | tuple[int]) – Speed of the motor (0-100). This is an integer of all hours are the same speed. If there are multiple speeds, this should be an array of 24 items.

Returns

description

Return type

tuple[int]

static CodeDayOfWeek(day: str) → int

Converts the day of the week to an integer code understandable by the POD device. The day is determined by the first 1-2 characters of the string, which supports multiple abbreviations for days of the week.

Parameters

day (str) – Day of the week.

Raises

Exception – Invalid day of the week.

Returns

Code for the day of the week. Values are 0-6, with 0 for Saturday, 1 for Monday, ..., and 6 for Saturday.

Return type

int

static CodeDaySchedule(hours: list | tuple[bool | int], speed: int | list | tuple[int]) → list[int]

Bitmasks the day schedule to encode the motor on/off status and the motor speed. Use this for getting the command #141 'SET DAY SCHEDULE' U8x24 argument component.

Parameters

- **hours** (list | tuple[bool | int]) – Array of 24 items. The value is 1 for motor on and 0 for motor off.

- **speed** (*int* | *list* | *tuple[int]*) – Speed of the motor (0-100). This is an integer of all hours are the same speed. If there are multiple speeds, this should be an array of 24 items.

Returns

List of 24 integer items. The msb is the motor on/off flag and the remaining 7 bits are the speed.

Return type

`list[int]`

static DecodeDayAndSchedule(*dayschedule: bytes*)

static DecodeDayOfWeek(*day: int*) → `str`

Converts the integer code for a day of the week to a human-readable string.

Parameters

day (*int*) – Day of the week code must be 0-6.

Returns

Day of the week ('Sunday', 'Monday', etc.).

Return type

`str`

static DecodeDaySchedule(*schedule: bytes*) → `dict[str, int | tuple[int]]`

Interprets the return bytes from the command #142 'GET DAY SCHEDULE'.

Parameters

schedule (*bytes*) – 24 byte long bitstring with one U8 per hour in a day.

Returns

Dictionary with 'Hour' as a tuple of 24 0/1 values (0 is motor off and 1 is motor on) and 'Speed' as the motor speed (0-100). If the motor speed is the same every hour, 'Speed' will be an integer; otherwise, 'Speed' will be a tuple of 24 items.

Return type

`dict[str, int | tuple[int]]`

static DecodeLCDSchedule(*schedule: bytes*) → `dict[str, str | list[int]]`

Interprets the return bytes from the command #202 'LCD SET DAY SCHEDULE'.

Parameters

schedule (*bytes*) – 4 Byte long bitstring. Byte 3 is weekday, Byte 2 is hours 0-7, Byte 1 is hours 8-15, and byte 0 is hours 16-23.

Returns

Dictionary with Day as the day of the week, and Hours containing a list of 24 0/1 values (one for each hour). Each bit represents the motor state in that hour, 1 for on and 0 for off.

Return type

`dict[str, int | list[int]]`

static GetCurrentTime() → `tuple[int]`

Gets a tuple to use as the argument for command #140 SET TIME containing values for the current time.

Returns

Tuple of 7 integer values. The format is (Seconds, Minutes, Hours, Day, Month, Year (without century, so 23 for 2023), Weekday (0 for Sunday))

Return type

`tuple[int]`

ReadPODpacket(*validateChecksum: bool = True, timeout_sec: int | float = 5*) → *PacketStandard*

Reads a complete POD packet, either in standard or binary format, beginning with STX and ending with ETX. Reads first STX and then starts recursion.

Parameters

- **validateChecksum** (*bool, optional*) – Set to True to validate the checksum. Set to False to skip validation. Defaults to True.
- **timeout_sec** (*int | float, optional*) – Time in seconds to wait for serial data. Defaults to 5.

Returns

POD packet beginning with STX and ending with ETX. This may be a standard packet, binary packet, or an unformatted packet (STX+something+ETX).

Return type

Packet

WritePacket(*cmd: str | int, payload: int | bytes | tuple[int | bytes] | None = None*) → *PacketStandard*

Builds a POD packet and writes it to the POD device.

Parameters

- **cmd** (*str | int*) – Command number.
- **payload** (*int | bytes | tuple[int | bytes], optional*) – None when there is no payload. If there is a payload, set to an integer value, bytes string, or tuple. Defaults to None.

Returns

Packet that was written to the POD device.

Return type

PacketStandard

static _CodeDecimalAsHex(*val: int*) → int

Builds an integer that equals the val argument when converted into hexadecimal. All integers are converted to hexadecimal ASCII encoded bytes. Some commands (i.e. 8229 #140) need decimal ASCII encoded bytes; to do this, give the return value of _CodeDecimalAsHex() as the payload. Example: I want a number that is equal to 16 in hex. $1*16^1 + 6*16^0 = 22$. Calling _CodeDecimalAsHex(16) will return 22.

Parameters

val (*int*) – Unsigned integer number.

Returns

integer that equals the val argument when converted into hexadecimal.

Return type

int

static _Custom140SETTIME(*payload: tuple[int]*) → tuple[int]

Custom function to translate the payload for command #140 SET TIME.

Parameters

payload (*tuple[int]*) – Default translated payload.

Returns

Tuple of times.

Return type

tuple[int]

static `_DecodeDecimalAsHex`(*val*: *int*) → *int*

Interprets an integer that was converted to a hexadecimal representation of a decimal value. In other words, this method reverses `_CodeDecimalAsHex()`.

Parameters

val (*int*) – Unsigned integer that was converted to a hexadecimal representation of a decimal value.

Returns

Unsigned integer as a true decimal number.

Return type

int

static `_Validate_Day`(*day*: *str* | *int*) → *int*

Raises an exception if the day is incorrectly formatted. If the day is given as a string, it will be converted to its integer code.

Parameters

day (*str* | *int*) – String day of the week or its repsective integer code.

Raises

- **Exception** – The day integer argument must be 0-6.
- **Exception** – The day argument must be a str or int.

Returns

Integer code representing a day of the week.

Return type

int

static `_Validate_Hours`(*hours*: *list* | *tuple*[*bool* | *int*]) → *list*[*bool* | *int*]

Raises an exception if the hours is incorrectly formatted. Converts the hours into a list before returning it.

Parameters

hours (*list* | *tuple*[*bool* | *int*]) – Array with 24 items with values of 1/0 representing each hour

Raises

- **Exception** – The hours argument must be a list or tuple.
- **Exception** – The hours argument must have exactly 24 items.
- **Exception** – The hours items must be 0 or 1.

Returns

List with 24 items for each hour. The values are 1/0.

Return type

list[*bool*|*int*]

static `_Validate_Schedule`(*schedule*: *bytes*, *size*: *int*) → *bytes*

Raises an exception if the schedule is incorrectly formatted

Parameters

- **schedule** (*bytes*) – Bytes string containing the day schedule.
- **size** (*int*) – Number of U8 bytes.

Raises

- **Exception** – The schedule must be bytes.
- **Exception** – The schedule is the incorrect size

Returns

Same as the schedule argument.

Return type

bytes

static `_Validate_Speed(speed: int | list | tuple[int]) → list[int]`

Raises an exception if the speed is incorrectly formatted. If an integer speed is given, it will convert it to a list.

Parameters

speed (`int | list | tuple[int]`) – Motor speed (0-100). This can either be an integer or a tuple/list of 24 speeds.

Raises

- **Exception** – The speed argument must be an int, list, or tuple.
- **Exception** – The speed must be between 0 and 100.
- **Exception** – The speed argument must have exactly 24 items as a list/tuple.
- **Exception** – The speed must be between 0 and 100 for every list/tuple item.

Returns

List containing 24 motor speeds.

Return type

list[int]

Morelia.Devices.PodDevice_8274D module

class `Morelia.Devices.PodDevice_8274D.Pod8274D(port: str | int, baudrate: int = 921600)`

Bases: `Pod`

POD_8274D handles communication using an 8274D POD device.

WriteRead(`cmd: str | int, payload: int | bytes | tuple[int | bytes] | None = None, validateChecksum: bool = True`) → `Packet`

Writes a command with optional payload to POD device, then reads (once) the device response. 8274D works differently compared to other devices as it is bluetooth based. Some commands require a re-read from the Pod Device, in order to get the right payload back. Each Get and Set Command will generate a Procedure Complete (command 211) indicating a successful write/read.

Parameters

- **cmd** (`str | int`) – Command number.
- **payload** (`int | bytes | tuple[int | bytes]`, *optional*) – None when there is no payload. If there is a payload, set to an integer value or a bytes string. Defaults to None.
- **validateChecksum** (`bool`, *optional*) – Set to True to validate the checksum. Set to False to skip validation. Defaults to True.

Returns

POD packet beginning with STX and ending with ETX. This may be a standard packet, binary packet, or an unformatted packet (STX+something+ETX).

There are some conditions for some commands. For example, if cmd is Local Scan, it returns Payload[1:7] because that will be the bluetooth address that can be used to connect to the device.

Return type

Packet

Morelia.Devices.PodDevice_8401HR module

```
class Morelia.Devices.PodDevice_8401HR.Pod8401HR(port: str | int, ssGain: tuple | list | dict[str, int | None] = {'A': None, 'B': None, 'C': None, 'D': None}, preampGain: tuple | list | dict[str, int | None] = {'A': None, 'B': None, 'C': None, 'D': None}, baudrate: int = 9600)
```

Bases: *Pod*

POD_8401HR handles communication using an 8401-HR POD device.

_ssGain

Instance-level dictionary storing the second-stage gain for all four channels.

Type

dict[str,int|None]

_preampGain

Instance-level dictionary storing the pramplifier gain for all four channels.

Type

dict[str,int|None]

static CalculateBiasDAC_GetDACValue(*vout: int | float*) → int

Calculates the DAC value given the output voltage. Used for ‘GET/SET BIAS’ commands.

Parameters

vout (*int | float*) – Output voltage (+/- 2.048 V).

Returns

Integer of the DAC value (16 bit 2’s complement).

Return type

int

static CalculateBiasDAC_GetVout(*value: int*) → float

Calculates the output voltage given the DAC value. Used for ‘GET/SET BIAS’ commands.

Parameters

value (*int*) – DAC value (16 bit 2’s complement).

Returns

Float of the output bias voltage [V].

Return type

float

static DecodeChannelBitmask(*channels: bytes*) → dict[str, int]

Converts the channel bitmask byte to a dictionary with each channel value. Use for ‘GET INPUT GROUND’ command payloads.

Parameters

channels (*bytes*) – U8 byte containing the channel configuration.

Returns

Dictionary with the channels as keys and values as the state. 0=Grounded and 1=Connected to Preamp.

Return type

dict[str,int]

static DecodeSSConfigBitmask(*config: bytes*)

Converts the SS configuration byte to a dictionary with the high-pass and gain. Use for ‘GET SS CONFIG’ command payloads.

Parameters

config (*bytes*) – U8 byte containing the SS configuration. Bit 0 = 0 for 0.5Hz Highpass, 1 for DC Highpass. Bit 1 = 0 for 5x gain, 1 for 1x gain.

static DecodeTTLByte(*tTlByte: bytes*) → dict[str, int]

Converts the TTL bytes argument into a dictionary of integer TTL values.

Parameters

tTlByte (*bytes*) – U8 byte containing the TTL bitmask.

Returns

Dictinoary with TTL name keys and integer TTL values.

Return type

dict[str,int]

static DecodeTTLPayload(*payload: bytes*) → tuple[dict[str, int]]

Decodes a paylaod with the two TTL bytes.

Parameters

payload (*bytes*) – Bytes string of the POD packet payload.

Returns

Tuple with two TTL dictionaries.

Return type

tuple[dict[str, int]]

static GetChannelBitmask(*a: bool, b: bool, c: bool, d: bool*) → int

Gets a bitmask, represented by an unsigned integer, used for ‘SET INPUT GROUND’ command.

Parameters

- **a** (*bool*) – State for channel A, 0=Grounded and 1=Connected to Preamp.
- **b** (*bool*) – State for channel B, 0=Grounded and 1=Connected to Preamp.
- **c** (*bool*) – State for channel C, 0=Grounded and 1=Connected to Preamp.
- **d** (*bool*) – State for channel D, 0=Grounded and 1=Connected to Preamp.

Returns

Integer representing a bitmask.

Return type

int

static GetChannelMapForPreampDevice(*preampName: str*) → dict[str, str] | None

Get the channel mapping (channel labels for A,B,C,D) for a given device.

Parameters

preampName (*str*) – String for the device/sensor name.

Returns

Dictionary with keys A,B,C,D with values of the channel names. Returns None if the device name does not exist.

Return type

dict[str,str]|None

static GetSSConfigBitmask(*gain: int, highpass: float*) → int

Gets a bitmask, represented by an unsigned integer, used for 'SET SS CONFIG' command.

Parameters

- **gain** (*int*) – 1 for 1x gain. else for 5x gain.
- **highpass** (*float*) – 0 for DC highpass, else for 0.5Hz highpass.

Returns

Integer representing a bitmask.

Return type

int

static GetSupportedPreampDevices() → list[str]

Gets a list of device/sensor names used for channel mapping.

Returns

List of string names of all supported sensors.

Return type

list[str]

static GetTTLbitmask(*ext0: bool = 0, ext1: bool = 0, ttl4: bool = 0, ttl3: bool = 0, ttl2: bool = 0, ttl1: bool = 0*) → int

Builds an integer, which represents a binary mask, that can be used for TTL command arguments.

Parameters

- **ext0** (*bool, optional*) – boolean bit for ext0. Defaults to 0.
- **ext1** (*bool, optional*) – boolean bit for ext1. Defaults to 0.
- **ttl4** (*bool, optional*) – boolean bit for ttl4. Defaults to 0.
- **ttl3** (*bool, optional*) – boolean bit for ttl3. Defaults to 0.
- **ttl2** (*bool, optional*) – boolean bit for ttl2. Defaults to 0.
- **ttl1** (*bool, optional*) – boolean bit for ttl1. Defaults to 0.

Returns

Integer number to be used as a bit mask.

Return type

int

static IsPreampDeviceSupported(*name: str*) → bool

Checks if the argument exists in channel map for all preamp sensors.

Parameters

name (*str*) – name of the device

Returns

True if the name exists in `__CHANNELMAPALL`, false otherwise.

Return type

bool

ReadPODpacket(*validateChecksum: bool = True, timeout_sec: int | float = 5*) → *Packet*

Reads a complete POD packet, either in standard or binary format, beginning with STX and ending with ETX. Reads first STX and then starts recursion.

Parameters

- **validateChecksum** (*bool, optional*) – Set to True to validate the checksum. Set to False to skip validation. Defaults to True.
- **timeout_sec** (*int | float, optional*) – Time in seconds to wait for serial data. Defaults to 5.

Returns

POD packet beginning with STX and ending with ETX. This may be a standard packet, binary packet, or an unformatted packet (STX+something+ETX).

Return type

Packet

WritePacket(*cmd: str | int, payload: int | bytes | tuple[int | bytes] | None = None*) → *PacketStandard*

Builds a POD packet and writes it to the POD device.

Parameters

- **cmd** (*str | int*) – Command number.
- **payload** (*int | bytes | tuple[int | bytes], optional*) – None when there is no payload. If there is a payload, set to an integer value, bytes string, or tuple. Defaults to None.

Returns

Packet that was written to the POD device.

Return type

Packet_Standard

static _FixABCDtype(*info: tuple | list | dict, thisIs: str = ""*) → dict

Converts the info argument into a dictionary with A, B, C, and D as keys.

Parameters

- **info** (*tuple | list | dict*) – Variable to be converted into a dictionary.
- **thisIs** (*str, optional*) – Description of the info argument, which is used in Exception statements. Defaults to ‘’.

Raises

- **Exception** – The dictionary has improper keys; keys must be ['A','B','C','D'].
- **Exception** – The argument must have only four values.
- **Exception** – The argument must be a tuple, list, or dict.

Returns

The info argument converted to a dictionary with A, B, C, and D as keys.

Return type

dict

_Read_Binary(*prePacket: bytes, validateChecksum: bool = True*)

After receiving the prePacket, it reads the 23 bytes (binary data) and then reads to ETX.

Parameters

- **prePacket** (*bytes*) – Bytes string containing the beginning of a POD packet: STX (1 byte) + command number (4 bytes).
- **validateChecksum** (*bool, optional*) – Set to True to validate the checksum. Set to False to skip validation. Defaults to True.

Raises**Exception** – Bad checksum for binary POD packet read.**static _ValidatePreamplGain**(*preamplGain: dict*) → None

Checks that the preamplifier gain dictionary has proper values (10, 100, or None).

Parameters**preamplGain** (*dict*) – preamplifier gain dictionary.**Raises****Exception** – EEG/EMG preamplGain must be 10 or 100. For biosensors, the preamplGain is None.**static _ValidateSsGain**(*ssgain: dict*)

Checks that the second stage gain dictionary has proper values (1, 5, or None).

Parameters**ssgain** (*dict*) – Second stage gain dictionary.**Raises****Exception** – The ssGain must be 1 or 5; set ssGain to None if no-connect.

```
__CHANNELMAPALL: dict[str, dict[str, str]] = {'8406-2BIO': {'A': 'Bio1', 'B': 'Bio2', 'C': 'NC', 'D': 'NC'}, '8406-BIO': {'A': 'Bio', 'B': 'NC', 'C': 'NC', 'D': 'NC'}, '8406-EEG2BIO': {'A': 'Bio1', 'B': 'EEG1', 'C': 'EMG', 'D': 'Bio2'}, '8406-SE': {'A': 'Bio', 'B': 'EEG1', 'C': 'EMG', 'D': 'EEG2'}, '8406-SE3': {'A': 'Bio', 'B': 'EEG1', 'C': 'EEG3', 'D': 'EEG2'}, '8406-SE31M': {'A': 'EMG', 'B': 'EEG1', 'C': 'EEG3', 'D': 'EEG2'}, '8406-SE4': {'A': 'EEG4', 'B': 'EEG1', 'C': 'EEG3', 'D': 'EEG2'}, '8406-SL': {'A': 'Bio', 'B': 'EEG1', 'C': 'EMG', 'D': 'EEG2'}, '8407-SE': {'A': 'Bio', 'B': 'EEG1', 'C': 'EMG', 'D': 'EEG2'}, '8407-SE-2BIO': {'A': 'Bio1', 'B': 'Bio2', 'C': 'EMG', 'D': 'EEG2'}, '8407-SE3': {'A': 'Bio', 'B': 'EEG1', 'C': 'EEG3', 'D': 'EEG2'}, '8407-SE31M': {'A': 'EEG3', 'B': 'EEG1', 'C': 'EMG', 'D': 'EEG2'}, '8407-SE4': {'A': 'EEG4', 'B': 'EEG1', 'C': 'EEG3', 'D': 'EEG2'}, '8407-SL': {'A': 'Bio', 'B': 'EEG1', 'C': 'EMG', 'D': 'EEG2'}, '8407-SL-2BIO': {'A': 'Bio1', 'B': 'Bio2', 'C': 'EMG', 'D': 'EEG2'}}
```

Class-level dictionary containing the channel map for all preamplifier devices.

Morelia.Devices.PodDevice_8480SC module

class Morelia.Devices.PodDevice_8480SC.Pod8480SC(*port: str | int, baudrate: int = 9600*)

Bases: *Pod*

POD_8480SC handles communication using an 8480-SC POD device.

static DecodeStimulusConfigBits(*config: int*) → dict

Converts an integer into 3 values, representing 3 individual bits of the Stimulus Config Bits.

Parameters

config (*int*) – an integer is passed in, and it represents the Config Flag byte.

Returns

Keys as the names of the bits, the values representing values at each bit.

Return type

dict

static DecodeSyncConfigBits(*config: int*) → dict

Converts an integer into 3 values, representing 3 individual bits of the Sync Config Bits.

Parameters

config (*int*) – an integer is passed in, and it represents the Sync Config Flag byte.

Returns

Keys as the names of the bits, the values representing values at each bit.

Return type

dict

static DecodeTtlConfigBits(*config: int*) → dict

Converts an interger into 3 values, representing 3 individual bits of the TTL Config Bits.

Parameters

config (*int*) – an integer is passed in, and it represents the TTL Setup Config Flag Byte.

Returns

Keys as the names of the bits, the values representing values at each bit.

Return type

dict

ReadPODpacket(*validateChecksum: bool = True, timeout_sec: int | float = 5*) → *PacketStandard*

Reads a complete POD packet, either in standard or binary format, beginning with STX and ending with ETX. Reads first STX and then starts recursion.

Parameters

- **validateChecksum** (*bool, optional*) – Set to True to validate the checksum. Set to False to skip validation. Defaults to True.
- **timeout_sec** (*int | float, optional*) – Time in seconds to wait for serial data. Defaults to 5.

Returns

POD packet beginning with STX and ending with ETX. This may be a standard packet, binary packet, or an unformatted packet (STX+something+ETX).

Return type

Packet

static StimulusConfigBits(*optoElec: bool, monoBiphasic: bool, Simul: bool*) → int

Incoming inputs are bitmasked into an integer value. This value is later given as part of a payload to command #102 'SET STIMULUS'.

Parameters

- **optoElec** (*bool*) – Bit is Opto/Electrical.
- **monoBiphasic** (*bool*) – Bit 1 is Monophasic/Biphasic.
- **Simul** (*bool*) – Bit 2 is Simultaneous.

Returns

which represents the Config flag byte in the Stimulus Command. The return value is the seventh item in the payload for command 'SET STIMULUS'.

Return type

int

static SyncConfigBits(*sync_level: bool, sync_idle: bool, signal_trigger: bool*) → int

Incoming inputs are bitmasked into an integer value. This value is later given as the payload to command #127 'SET SYNC CONFIG'.

Parameters

- **sync_level** (*bool*) – Bit 0 is Sync Level.
- **sync_idle** (*bool*) – Bit 1 is Stimulus Triggering.
- **signal_trigger** (*bool*) – Bit 2 is Signal/Trigger.

Returns

which represents the Sync Config Bits format value.

Return type

int

static TtlConfigBits(*trigger: bool, stimtrig: bool, input_sync: bool*) → int

Incoming inputs are bitmasked into an integer value. This value is later given as part of the payload to command #109 'SET TTL SETUP'. This commands accepts 3 items in the payload, and the return value of this function is given as the second item.

Parameters

- **trigger** (*bool*) – Bit 0 is 0 for rising edge, 1 for falling edge.
- **stimtrig** (*bool*) – Bit 1 is 0 for TTL event notifications, 1 for TTL inputs as triggers.
- **input_sync** (*bool*) – Bit 7 is 0 for normal TTL operation, 1 for TTL pin operates as a sync output.

Returns

which represents the TTL Config Bits Format value.

Return type

int

WritePacket(*cmd: str | int, payload: int | bytes | tuple[int | bytes] | None = None*) → *PacketStandard*

Builds a POD packet and writes it to the POD device.

Parameters

- **cmd** (*str | int*) – Command number.

- **payload** (*int | bytes | tuple[int | bytes]*, *optional*) – None when there is no payload. If there is a payload, set to an integer value, bytes string, or tuple. Defaults to None.

Returns

Packet that was written to the POD device.

Return type

Packet_Standard

static **_Custom108GETTTLSETUP**(*payload: bytes*) → tuple[int | dict]

Custom function to translate the TTL setup for command #108 GET TTL SETUP.

Parameters

payload (*bytes*) – Bytes string of the POD packet payload.

Returns

Tuple of the TTL setup.

Return type

tuple[int|dict]

static **_Custom109SETTTLSETUP**(*payload: bytes*) → tuple[int | dict]

Custom function to translate the TTL setup for command #109 SET TTL SETUP.

Parameters

payload (*bytes*) – Bytes string of the POD packet payload.

Returns

Tuple of the TTL setup.

Return type

tuple[int|dict]

static **_CustomSTIMULUS**(*payload: bytes, defaultPayload: tuple*) → tuple
summary

Parameters

- **payload** (*bytes*) – Bytes string of the POD packet payload.
- **defaultPayload** (*tuple*) – Default translated payload.

Returns

Tuple of the translated stimulus payload.

Return type

tuple

static **_CustomSYNCONFIG**(*payload: bytes*) → dict

Custom function to translate the sync config.

Parameters

payload (*bytes*) – Bytes string of the POD packet payload.

Returns

Keys as the names of the bits, the values representing values at each bit.

Return type

dict

Module contents

1.1.1.3 Morelia.Packets package

Submodules

Morelia.Packets.Binary module

class Morelia.Packets.Binary.**PacketBinary**(*pkt: bytes, commands: CommandSet | None = None*)

Bases: *Packet*

Container class that stores a standard binary command packet for a POD device. The format is STX (1 byte) + command number (4 bytes) + length of binary (4 bytes) + checksum (2 bytes) + ETX (1 bytes) + binary (LENGTH bytes) + checksum (2 bytes) + ETX (1 bytes)

binaryLength

Number of bytes of binary data from the packet.

Type

bytes

binaryData

Variable length binary data from the packet.

Type

bytes

BinaryLength() → int

Translate the binary ASCII encoding of the binary data length into a readable integer

Returns

Integer of the binary data length.

Return type

int

static CheckIfPacketIsValid(*msg: bytes*)

Raises an Exception if the packet is incorrectly formatted.

Parameters

msg (*bytes*) – Bytes string containing a POD packet. Should begin with STX and end with ETX.

Raises

- **Exception** – Packet is too small to be a standard packet.
- **Exception** – A standard binary packet must have an ETX before the binary bytes.

static GetBinaryData(*pkt: bytes*) → bytes

Gets the binary data from a POD packet.

Parameters

pkt (*bytes*) – Bytes string containing a POD packet.

Returns

Bytes string containing binary data.

Return type

bytes

static GetBinaryLength(*pkt: bytes*) → bytes

Gets the length, or number of bytes, of the binary data in a POD packet.

Parameters

pkt (*bytes*) – Bytes string containing a POD packet.

Returns

Bytes string of the length of the binary data.

Return type

bytes

static GetMinimumLength() → int

Gets the number of bytes in the smallest possible packet.

Returns

integer representing the minimum length of a binary POD command packet. Format is STX (1 byte) + command number (4 bytes) + length of binary (4 bytes) + checksum (2 bytes) + ETX (1 bytes) + binary (LENGTH bytes) + checksum (2 bytes) + ETX (1 bytes)

Return type

int

TranslateAll() → dict[str, Any]

Builds a dictionary containing all parts of the POD packet in readable values.

Returns

Dictionary with the command number, binary packet length, and binary data.

Return type

dict[str,Any]

UnpackAll() → dict[str, bytes]

Builds a dictionary containing all parts of the POD packet in bytes.

Returns

Dictionary with the command number, binary packet length, and binary data.

Return type

dict[str,bytes]

Morelia.Packets.Binary4 module

class Morelia.Packets.Binary4.**PacketBinary4**(*pkt: bytes, preampGain: int, commands: CommandSet | None = None*)

Bases: [Packet](#)

Container class that stores a binary4 command packet for a POD device. The format is STX (1 byte) + command (4 bytes) + packet number (1 byte) + TTL (1 byte) + CH0 (2 bytes) + CH1 (2 bytes) + CH2 (2 bytes) + checksum (2 bytes) + ETX (1 byte).

_preampGain

Preamplifier gain. This should be 10 or 100 for an 8206-HR device.

Type

int

packetNumber

Packet number for this POD packet.

Type

bytes

t1

TTL data for this packet.

Type

bytes

ch0

channel 0 data for this packet.

Type

bytes

ch1

channel 1 data for this packet.

Type

bytes

ch2

channel 2 data for this packet.

Type

bytes

static BinaryBytesToVoltage(*value: bytes, preampGain: int*) → float

Converts a binary bytes value read from POD device and converts it to the real voltage value at the preamplifier input.

Parameters

value (*bytes*) – Bytes string containing voltage measurement.

Returns

A number containing the voltage in Volts [V].

Return type

float

Ch(*n: int*) → float

Translates the binary channel n bytes into a voltage.

Parameters

n (*int*) – Channel number. Should be 0, 1, or 2.

Raises

Exception – Channel does not exist.

Returns

Voltage of channel n in Volts.

Return type

float

static CheckIfPacketIsValid(*msg: bytes*)

Raises an Exception if the packet is incorrectly formatted.

Parameters

msg (*bytes*) – Bytes string containing a POD packet. Should begin with STX and end with ETX.

Raises

Exception – Packet the wrong size to be a binary4 packet.

static GetBinaryLength() → int

Gets the number of bytes of binary data in a binary4 packet.

Returns

Integer representing the number of binary encoded bytes in a binary4 packet.

Return type

int

static GetCh(*n: int, pkt: bytes*) → bytes

Gets the channel *n* bytes from a POD packet.

Parameters

- **n** (*int*) – Channel number. Should be 0, 1, or 2.
- **pkt** (*bytes*) – Bytes string containing a POD packet. Should begin with STX and end with ETX.

Returns

Bytes string of the channel 0 data.

Return type

bytes

Returns

Channel does not exist.

Return type

bytes

static GetMinimumLength() → int

Gets the number of bytes in the smallest possible binary4 packet; STX (1 byte) + command (4 bytes) + packet number (1 byte) + TTL (1 byte) + CH0 (2 bytes) + CH1 (2 bytes) + CH2 (2 bytes) + checksum (2 bytes) + ETX (1 byte).

Returns

Integer representing the minimum length of a binary4 POD packet.

Return type

int

static GetPacketNumber(*pkt: bytes*) → bytes

Gets the packet number in bytes from a POD packet.

Parameters

pkt (*bytes*) – Bytes string containing a POD packet. Should begin with STX and end with ETX.

Returns

Bytes string of the packet number.

Return type

bytes

static GetTTL(*pkt: bytes*) → bytes

Gets the TTL bytes from a POD packet

Parameters

pkt (*bytes*) – Bytes string containing a POD packet. Should begin with STX and end with ETX.

Returns

Bytes string of the TTL data.

Return type

bytes

PacketNumber() → int

Translates the binary packet number into a readable integer.

Returns

Integer of the packet number.

Return type

int

TranslateAll() → dict[str, Any]

Builds a dictionary containing all parts of the POD packet in readable values.

Returns

Dictionary with the command number, packet number, TTL and channels 0, 1, and 2.

Return type

dict[str, Any]

static TranslateBinaryTTLbyte(*tTlByte: bytes*) → dict[str, int]

Separates the bits of each TTL (0-3) from a binary encoded byte.

Parameters

tTlByte (*bytes*) – One byte string for the TTL (binary encoded).

Returns

Dictionary of the TTLs. Values are 1 when input, 0 when output.

Return type

dict[str,int]

Ttl() → dict[str, int]

Translates the binary TTL bytes into a dictionary containing each TTL value.

Returns

Dictionary with TTL name keys and TTL data as values.

Return type

dict[str,int]

UnpackAll() → dict[str, bytes]

Builds a dictionary containing all parts of the POD packet in bytes.

Returns

Dictionary with the command number, packet number, TTL and channels 0, 1, and 2.

Return type

dict[str,bytes]

Morelia.Packets.Binary5 module

```
class Morelia.Packets.Binary5.PacketBinary5(pkt: bytes, ssGain: dict[str, int | None] = {'A': None, 'B': None, 'C': None, 'D': None}, preampGain: dict[str, int | None] = {'A': None, 'B': None, 'C': None, 'D': None}, commands: CommandSet | None = None)
```

Bases: [Packet](#)

Container class that stores a binary5 command packet for a POD device. The format is STX (1 byte) + command (4 bytes) + packet number (1 byte) + status (1 byte) + channels (9 bytes) + AEXT0 (2 bytes) + AEXT1 (2 bytes) + ATTL1 (2 bytes) + ATTL2 (2 bytes) + ATTL3 (2 bytes) + ATTL4 (2 bytes) + checksum (2 bytes) + EXT (1 byte)

_ssGain

Dictionary with A, B, C, D keys and second stage gain values (1, 5, or None).

Type

dict[str,int|None]

_preampGain

Dictionary with A, B, C, D keys and preamplifier gain values (10, 100, or None).

Type

dict[str,int|None]

packetNumber

Packet number for this POD packet.

Type

bytes

status

Status for this POD packet.

Type

bytes

channels

channel A, B, C, and D data for this POD packet.

Type

bytes

aEXT0

Analog EXT0 data for this POD packet.

Type

bytes

aEXT1

Analog EXT1 data for this POD packet.

Type

bytes

aTTL1

Analog TTL1 data for this POD packet.

Type

bytes

aTTL2

Analog TTL2 data for this POD packet.

Type

bytes

aTTL3

Analog TTL3 data for this POD packet.

Type

bytes

aTTL4

Analog TTL4 data for this POD packet.

Type

bytes

AnalogEXT(*n: int*) → float

Translates the analog EXT value into a voltage.

Parameters

n (*int*) – Analog EXT number. Should be 0 or 1.

Raises

Exception – AEXT does not exist.

Returns

Analog EXT voltage in volts (V).

Return type

float

AnalogTTL(*n: int*) → float

Translates the analog TTL value into a voltage.

Parameters

n (*int*) – Analog TTL number. Should be 1, 2, 3, or 4.

Raises

Exception – ATTL does not exist.

Returns

Analog TTL voltage in volts (v).

Return type

float

Channel(*c: str*) → float

Translates the channel data into a voltage.

Parameters

c (*str*) – Channel character. Should be A, B, C, or D.

Raises

Exception – Channel does not exist.

Returns

Voltage of the channel in volts (V).

Return type

float

static `CheckIfPacketIsValid(msg: bytes)`

Raises an Exception if the packet is incorrectly formatted.

Parameters

msg (*bytes*) – Bytes string containing a POD packet. Should begin with STX and end with ETX.

Raises

Exception – Packet the wrong size to be a binary5 packet.

static `GetAnalogEXT(n: int, pkt: bytes) → bytes`

Gets the analog EXT from a POD packet.

Parameters

- **n** (*int*) – Analog EXT number. Should be 0 or 1.
- **pkt** (*bytes*) – Bytes string containing a POD packet. Should begin with STX and end with ETX.

Raises

Exception – AEXT does not exist.

Returns

Bytes string of the AEXT.

Return type

bytes

static `GetAnalogTTL(n: int, pkt: bytes) → bytes`

Gets the analog TTL from a POD packet.

Parameters

- **n** (*int*) – Analog TTL number. Should be 1, 2, 3, or 4.
- **pkt** (*bytes*) – Bytes string containing a POD packet. Should begin with STX and end with ETX.

Raises

Exception – ATTL does not exist.

Returns

Bytes string of the ATTL.

Return type

bytes

static `GetBinaryLength() → int`

Gets the number of bytes of binary data in a binary5 packet.

Returns

Integer representing the number of binary encoded bytes in a binary5 packet.

Return type

int

static `GetChannels(pkt: bytes) → bytes`

Gets the channel bytes for channels A, B, C, and D together from a POD packet.

Parameters

pkt (*bytes*) – Bytes string containing a POD packet. Should begin with STX and end with ETX.

Returns

Bytes string of the channels A, B, C, and D together.

Return type

bytes

static GetMinimumLength() → int

Gets the number of bytes in the smallest possible binary4 packet; STX (1 byte) + command (4 bytes) + packet number (1 byte) + status (1 byte) + channels (9 bytes) + AEXT0 (2 bytes) + AEXT1 (2 bytes) + ATTL1 (2 bytes) + ATTL2 (2 bytes) + ATTL3 (2 bytes) + ATTL4 (2 bytes) + checksum (2 bytes) + EXT (1 byte)

Returns

Integer representing the minimum length of a binary5 POD packet.

Return type

int

static GetPacketNumber(*pkt: bytes*) → bytes

Gets the packet number in bytes from a POD packet.

Parameters

pkt (*bytes*) – Bytes string containing a POD packet. Should begin with STX and end with ETX.

Returns

Bytes string of the packet number.

Return type

bytes

static GetStatus(*pkt: bytes*) → bytes

Gets the status value in bytes from a POD packet.

Parameters

pkt (*bytes*) – Bytes string containing a POD packet. Should begin with STX and end with ETX.

Returns

Bytes string of the status.

Return type

bytes

PacketNumber() → int

Translates the binary packet number into a readable integer.

Returns

Integer of the packet number.

Return type

int

Status() → int

Translates the binary status value into a readable integer

Returns

Integer status value.

Return type

int

TranslateAll() → dict[str, Any]

Builds a dictionary containing all parts of the POD packet in readable values.

Returns

Dictionary with the command number, packet number, status, channels, analog EXT, and analog TTL.

Return type

dict[str, bytes]

UnpackAll() → dict[str, bytes]

Builds a dictionary containing all parts of the POD packet in bytes.

Returns

Dictionary with the command number, packet number, status, channels, analog EXT, and analog TTL.

Return type

dict[str, bytes]

static _Voltage_PrimaryChannels(*value: int, ssGain: int | None = None, PreampGain: int | None = None*) → float

Converts a value to a voltage for a primary channel.

Parameters

- **value** (*int*) – Value to be converted to voltage.
- **ssGain** (*int | None, optional*) – Second stage gain. Defaults to None.
- **PreampGain** (*int | None, optional*) – Preamplifier gain. Defaults to None.

Returns

Number of the voltage in volts [V]. Returns value if no gain is given (no-connect).

Return type

float

static _Voltage_PrimaryChannels_Biosensor(*value: int, ssGain: int*) → float

Converts a value to a voltage for a biosensor primary channel.

Parameters

- **value** (*int*) – Value to be converted to voltage.
- **ssGain** (*int*) – Second stage gain.

Returns

Number of the voltage in volts [V].

Return type

float

static _Voltage_PrimaryChannels_EEGEMG(*value: int, ssGain: int, PreampGain: int*) → float

Converts a value to a voltage for an EEG/EMG primary channel.

Parameters

- **value** (*int*) – Value to be converted to voltage.
- **ssGain** (*int*) – Second stage gain.
- **PreampGain** (*int*) – Preamplifier gain.

Returns

Number of the voltage in volts [V].

Return type

float

static `_Voltage_SecondaryChannels`(*value: int*) → float

Converts a value to a voltage for a secondary channel.

Parameters

value (*int*) – Value to be converted to voltage.

Returns

Number of the voltage in volts [V].

Return type

float

Morelia.Packets.Packet module

class `Morelia.Packets.Packet.Packet`(*pkt: bytes, commands: CommandSet | None = None*)

Bases: object

Container class that stores a command packet for a POD device. The format is STX (1 byte) + command number (4 bytes) + data (? bytes) + ETX (1 byte). This class also has a collection of methods for creating and interpreting POD packets.

`_commands`

Available commands for a POD device.

Type

POD_Commands | None

`rawPacket`

Bytes string containing a POD packet. Should begin with STX and end with ETX.

Type

bytes

`commandNumber`

Command number from the Pod packet.

Type

bytes | None

static `ASCIIbytesToInt_Split`(*msg: bytes, keepTopBits: int, cutBottomBits: int*) → int

Converts a specific bit range in an ASCII-encoded bytes object to an integer.

Parameters

- **msg** (*bytes*) – Bytes message holding binary information to be converted into an integer.
- **keepTopBits** (*int*) – Integer position of the msb of desired bit range.
- **cutBottomBits** (*int*) – Integer number of lsb to remove.

Returns

Integer result from the ASCII-encoded bytes message in a given bit range.

Return type

int

static AsciiBytesToInt(*msg_b: bytes, signed: bool = False*) → int

Converts a ASCII-encoded bytes message into an integer. It does this using a base-16 conversion. If the message is signed and the msb is '1', the integer will be converted to it's negative 2's complement.

Parameters

- **msg_b** (*bytes*) – Bytes message to be converted to an integer. The bytes must be base-16 or the conversion will fail.
- **signed** (*bool, optional*) – True if the message is signed, false if unsigned. Defaults to False.

Returns

Integer result from the ASCII-encoded byte conversion.

Return type

int

static BinaryBytesToInt(*msg: bytes, byteorder: str = 'big', signed: bool = False*) → int

Converts binary-encoded bytes into an integer.

Parameters

- **msg** (*bytes*) – Bytes message holding binary information to be converted into an integer.
- **byteorder** (*str, optional*) – Ordering of bytes. 'big' for big endian and 'little' for little endian. Defaults to 'big'.
- **signed** (*bool, optional*) – Boolean flag to mark if the msg is signed (True) or unsigned (False). Defaults to False.

Returns

Integer result from the binary-encoded bytes message.

Return type

int

static BinaryBytesToInt_Split(*msg: bytes, keepTopBits: int, cutBottomBits: int, byteorder: str = 'big', signed: bool = False*) → int

Converts a specific bit range in a binary-encoded bytes object to an integer.

Parameters

- **msg** (*bytes*) – Bytes message holding binary information to be converted into an integer.
- **keepTopBits** (*int*) – Integer position of the msb of desired bit range.
- **cutBottomBits** (*int*) – Integer number of lsb to remove.
- **byteorder** (*str, optional*) – Ordering of bytes. 'big' for big endian and 'little' for little endian. Defaults to 'big'.
- **signed** (*bool, optional*) – Boolean flag to mark if the msg is signed (True) or unsigned (False). Defaults to False.

Returns

Integer result from the binary-encoded bytes message in a given bit range.

Return type

int

static CheckIfPacketIsValid(*msg: bytes*)

Raises an Exception if the packet is incorrectly formatted.

Parameters

msg (*bytes*) – Bytes string containing a POD packet. Should begin with STX and end with ETX.

Raises

- **Exception** – Packet must begin with STX.
- **Exception** – Packet must end in ETX

CommandNumber() → int

Translate the binary ASCII encoding into a readable integer

Returns

Integer of the command number.

Return type

int

static ETX() → bytes

Get end-of-transmission (ETX) character in bytes. ETX marks the end byte of a POD Packet.

Returns

Bytes for ETX(0x03).

Return type

bytes

static GetCommandNumber(pkt: bytes) → bytes | None

Gets the command number bytes from a POD packet.

Parameters

pkt (*bytes*) – Bytes string containing a POD packet. Should begin with STX and end with ETX.

Returns

Bytes string of the command number, if available.

Return type

bytes|None

static GetMinimumLength() → int

Gets the number of bytes in the smallest possible packet; STX (1 byte) + something + ETX (1 byte).

Returns

integer representing the minimum length of a generic bytes string.

Return type

int

HasCommandNumber() → bool

Checks if the packet has a command number.

Returns

True if the packet has a command number, False otherwise.

Return type

bool

HasCommands() → bool

Checks if the Packet instance has commands set.

Returns

True if the commands have been set, false otherwise.

Return type

bool

static IntToAsciiBytes(*value: int, numChars: int*) → bytes

Converts an integer value into ASCII-encoded bytes.

First, it converts the integer value into a usable uppercase hexadecimal string. Then it converts the ASCII code for each character into bytes. Lastly, it ensures that the final message is the desired length.

Example: if value=2 and numBytes=4, the returned ASCII will show b'0002', which is '0x30 0x30 0x30 0x32' in bytes. Uses the 2's complement if the val is negative.

Parameters

- **value** (*int*) – Integer value to be converted into ASCII-encoded bytes.
- **numChars** (*int*) – Number characters to be the length of the ASCII-encoded message.

Returns

Bytes that are ASCII-encoded conversions of the value parameter.

Return type

bytes

static STX() → bytes

Get start-of-transmission (STX) character in bytes. STX marks the starting byte of a POD Packet.

Returns

Bytes for STX (0x02).

Return type

bytes

TranslateAll() → dict[str, Any]

Builds a dictionary containing all parts of the POD packet in readable values.

Raises

Exception – Nothing to translate.

Returns

Dictionary with the command number.

Return type

dict[str,Any]

static TwosComplement(*val: int, nbits: int*) → int

Gets the 2's complement of the argument value (negative int).

Parameters

- **val** (*int*) – Negative value to be complemented.
- **nbits** (*int*) – Number of bits in the value.

Returns

Integer of the 2's complement for the val.

Return type

int

UnpackAll() → dict[str, bytes]

Builds a dictionary containing all parts of the POD packet in bytes.

Raises

Exception – Nothing to unpack.

Returns

Dictionary with the command number.

Return type

dict[str,bytes]

Morelia.Packets.Standard module

class Morelia.Packets.Standard.**PacketStandard**(*pkt: bytes, commands: CommandSet*)

Bases: *Packet*

Container class that stores a standard command packet for a POD device. The format is STX (1 byte) + command number (4 bytes) + optional payload (? bytes) + checksum (2 bytes) + ETX (1 bytes)

_customPayload

Optional function to translate the payload.

Type

Callable[[Any],tuple]|None

_customPayloadArgs

Optional arguments for the _customPayload.

Type

tuple[Any]|None

payload

Optional payload from the packet.

Type

bytes

static CheckIfPacketIsValid(*msg: bytes*)

Raises an Exception if the packet is incorrectly formatted.

Parameters

msg (*bytes*) – Bytes string containing a POD packet. Should begin with STX and end with ETX.

Raises

Exception – Packet is too small to be a standard packet.

DefaultPayload() → tuple[int]

Splits the payload up into its components and translates the binary ASCII encoding into a readable integer.

Returns

Tuple with integer values for each component of the payload.

Return type

tuple[int]

static GetMinimumLength() → int

Gets the number of bytes in the smallest possible packet.

Returns

integer representing the minimum length of a standard POD command packet. Format is STX (1 byte) + command number (4 bytes) + optional packet (? bytes) + checksum (2 bytes) + ETX (1 bytes)

Return type

int

static GetPayload(*pkt: bytes*) → bytes | None

Gets the payload from a POD packet, if available.

Parameters

pkt (*bytes*) – Bytes string containing a POD packet.

Returns

Bytes string of the payload, if available.

Return type

bytes|None

HasCustomPayload() → bool

Checks if a custom payload has been set.

Returns

True if there is a custom payload, False otherwise.

Return type

bool

HasPayload() → bool

Checks if this Packet_Standard instance has a payload.

Returns

True if there is a payload, false otherwise.

Return type

bool

Payload() → tuple | None

Gets the payload as a readable tuple of values.

Returns

Translated payload, if available.

Return type

tuple|None

SetCustomPayload(*func: Callable[[Any], tuple]*, *args: tuple[Any] | None = None*) → None

Sets a custom function with optional arguments to translate the payload.

Parameters

- **func** (*Callable[[Any], tuple]*) – Function to translate the payload.
- **args** (*tuple[Any], optional*) – Arguments . Defaults to None.

TranslateAll() → dict[str, Any]

Builds a dictionary containing all parts of the POD packet in readable values.

Returns

Dictionary with the command number and payload.

Return type

dict[str,Any]

UnpackAll() → dict[str, bytes]

Builds a dictionary containing all parts of the POD packet in bytes.

Returns

Dictionary with the command number and payload.

Return type

dict[str,bytes]

Module contents**1.1.1.4 Morelia.Parameters package****Submodules****Morelia.Parameters.Params8206HR module**

```
class Morelia.Parameters.Params8206HR.Params8206HR(port: str, sampleRate: int, preamplifierGain: int,
                                                    lowPass: tuple[int], checkForValidParams: bool
                                                    = True)
```

Bases: *Params*

Container class that stores parameters for an 8206-HR POD device.

port

Name of the COM port.

Type

str

sampleRate

Sample rate in 100-2000 Hz range.

Type

int

preamplifierGain

Preamplifier gain. Should be 10x or 100x.

Type

int

lowPass

Low-pass for EEG/EMG in 11-500 Hz range.

Type

tuple[int]

EEG1() → int

Gets the filter value of EEG1 in Hz from the low-pass.

Returns

EEG1 low-pass filter in Hz.

Return type

int

EEG2() → int

Gets the filter value of EEG2 in Hz from the low-pass.

Returns

EEG2 low-pass filter in Hz.

Return type

int

EEG3_EMG() → int

Gets the filter value of EEG3/EMG in Hz from the low-pass.

Returns

EEG3/EMG low-pass filter in Hz.

Return type

int

GetInit() → str

Builds a string that represents the Params_8206HR constructor with the arguments set to the values of this class instance.

Returns

String that represents the Params_8206HR constructor.

Return type

str

_CheckParams() → None

Throws an exception if Params_8206HR instance variable is an invalid value.

Raises

- **Exception** – Sample rate must be between 100-2000 Hz.
- **Exception** – Preamplifier gain must be 10x or 100x.
- **Exception** – Low-pass EEG/EMG must be between 11-500 Hz.

lowPassLabels: tuple[str] = ('EEG1', 'EEG2', 'EEG3/EMG')

Tuple describing the items in the lowPass.

Morelia.Parameters.Params8229 module

```
class Morelia.Parameters.Params8229.Params8229(port: str, systemID: int, motorDirection: bool,
        motorSpeed: int, randomReverse: bool, mode: int,
        reverseBaseTime: int | None = None, reverseVarTime:
        int | None = None, schedule: dict[str, tuple[bool]] |
        None = None, checkForValidParams: bool = True)
```

Bases: [Params](#)

Container class that stores parameters for an 8229 POD device.

port

Name of the COM port.

Type

str

systemID

ID of this 8229 POD system. Must be a positive integer.

Type

int

motorDirection

False for clockwise and true for counterclockwise.

Type

bool

motorSpeed

Motor speed as a percentage 0-100%.

Type

int

randomReverse

True to enable random reverse, False otherwise. The random reverse time will be reverseBaseTime + random value in reverseVarTime range.

Type

bool

reverseBaseTime

Base time for a random reverse in seconds. Must be a positive integer.

Type

int

reverseVarTime

Variable time for a random reverse in seconds. Must be a positive integer.

Type

int

mode

System mode; 0 = Manual, 1 = PC Control, and 2 = Internal Schedule.

Type

int

schedule

Schedule for a week. The keys are the weekdays (Sunday-Saturday). The values are a tuple of 24 bools that are either 1 for motor on or 0 for motor off

Type

dict[str, tuple[int]]

static BuildEmptySchedule() → dict[str, tuple[bool]]

Creates a schedule where the motor is off for all hours of every day.

Returns

Dictionary of the empty schedule. The keys are the days of the week. The values are tuples of 24 zeros.

Return type

dict[str, tuple[bool]]

GetInit() → str

Builds a string that represents the Params_8229 constructor with the arguments set to the values of this class instance.

Returns

String that represents the Params_Interface constructor.

Return type

str

_CheckParams() → None

Throws an exception if Params_8229 instance variable is an invalid value.

Raises

- **Exception** – The system ID must be a positive integer.
- **Exception** – The motor speed must be between 0-100%.
- **Exception** – The reverse base time (sec) must be a positive integer.
- **Exception** – The reverse variable time (sec) must be a positive integer.
- **Exception** – The mode must be 0, 1, or 2.
- **Exception** – The schedule must have exactly ('Sunday','Monday','Tuesday', 'Wednesday', 'Thursday', 'Friday', 'Saturday') as keys.
- **Exception** – There must be 24 items in the schedule for each day.

hoursPerDay: int = 24

Integer storing the number of hours in a day.

week: tuple[str] = ('Sunday', 'Monday', 'Tuesday', 'Wednesday', 'Thursday', 'Friday', 'Saturday')

Tuple containing strings of the 7 days of the week.

Morelia.Parameters.Params8274D module

class Morelia.Parameters.Params8274D.**Params8274D**(port: str, localScan: int, sampleRate: int, period: int, checkForValidParams: bool = True)

Bases: *Params*

GetInit() → str

Builds a string that represents the Params_8274D constructor with the arguments set to the values of this class instance.

Returns

String that represents the Params_8274D constructor.

Return type

str

_CheckParams() → None

Throws an exception if Params_8206HR instance variable is an invalid value.

Raises

- **Exception** – Sample rate must be between 100-2000 Hz.
- **Exception** – Preamplifier gain must be 10x or 100x.
- **Exception** – Low-pass EEG/EMG must be between 11-500 Hz.

Morelia.Parameters.Params8401HR module

```
class Morelia.Parameters.Params8401HR.Params8401HR(port: str, preampDevice: str, sampleRate: int,  
muxMode: bool, preampGain: tuple[int], ssGain:  
tuple[int], highPass: tuple[float], lowPass:  
tuple[int], bias: tuple[float], dcMode: tuple[str],  
checkForValidParams: bool = True)
```

Bases: [Params](#)

Container class that stores parameters for an 8401-HR POD device.

port

Name of the COM port.

Type

str

preampDevice

Name of the mouse/rat preamplifier device.

Type

str

sampleRate

Sample rate (2000-20000 Hz).

Type

int

muxMode

Using mux mode when True, false otherwise.

Type

bool

preampGain

Preamplifier gain (1, 10, or 100) for all channels.

Type

tuple[int]

ssGain

Second stage gain (1 or 5) for all channels.

Type

tuple[int]

highPass

High-pass filter (0, 0.5, 1, or 10 Hz) for all channels.

Type

tuple[float]

lowPass

Low-pass filter (21-15000 Hz) for all channels.

Type

tuple[int]

bias

Bias voltage (+/- 2.048 V) for all channels.

Type

tuple[float]

dcMode

DC mode (VBIAS or AGND) for all channels.

Type

tuple[str]

GetInit() → str

Builds a string that represents the Params_8401HR constructor with the arguments set to the values of this class instance.

Returns

String that represents the Params_8401HR constructor.

Return type

str

_CheckParams() → None

Throws an exception if Params_8401HR instance variable is an invalid value.

Raises

- **Exception** – Mouse/rat preamplifier does not exist.
- **Exception** – Sample rate must be between 2000-20000 Hz.
- **Exception** – EEG/EMG preamplifier gain must be 10x or 100x. For biosensors, the preampGain is None.
- **Exception** – The second stage gain must be 1x or 5x; set gain to None if no-connect.
- **Exception** – The high-pass filter must be 0.5, 1, or 10 Hz. If the channel is DC, input 0.
- **Exception** – The low-pass filter must be between 21-15000 Hz.
- **Exception** – The bias voltage must be +/- 2.048 V.
- **Exception** – The DC mode must be VBIAS or AGND.

channelLabels: tuple[str] = ('A', 'B', 'C', 'D')

Tuple listing the four channel characters in order.

Morelia.Parameters.Params8480SC module

```
class Morelia.Parameters.Params8480SC.Params8480SC(port: str, stimulus=tuple[int], preamp=<class
'int'>, ledCurrent=tuple[int], ttlPullups=<class
'int'>, estimCurrent=tuple[int],
syncConfig=<class 'int'>, ttlSetup=tuple[int],
checkForValidParams: bool = True)
```

Bases: *Params*

Container class that stores parameters for an 8401-HR POD device.

port

Name of the COM port.

Type

str

stimulus

Stimulus configuration on selected channel.

Type

tuple[int]

preamp

Preamplifier value (0-1023).

Type

int

ledCurrent

Led-Current (0-600 mA) for both channels.

Type

tuple[int]

ttlPullups

TTL Pullups disabled for value 0, pullups enabled for values that are non-zero.

Type

int

estimCurrent

Estim-Current (0-100 %) for both channels.

Type

tuple[int]

syncConfig

Sets Sync-Config byte.

Type

int

ttlSetup

TTL-Setup for selected channel.

Type

tuple[int]

GetInit() → str

Builds a string that represents the Params_8480SC constructor with the arguments set to the values of this class instance.

Returns

String that represents the Params_8480SC constructor.

Return type

str

_CheckParams() → None

Throws an exception if Params_8206HR member variable is an invalid value.

Raises

- **Exception** – The preamp must be between 0-1023.
- **Exception** – Led-Curent must be between 0-600.
- **Exception** – Estim-Current must be between 0-100.

estimCurrent_CH0() → int

Gets the estimCurrent value for Channel 0.

Returns

Channel 0 estimCurrent in percentage.

Return type

int

estimCurrent_CH1() → int

Gets the estimCurrent value for Channel 1.

Returns

Channel 1 estimCurrent in percentage.

Return type

int

ledCurrent_CH0() → int

Gets the ledCurrent value for Channel 0.

Returns

Channel 0 ledCurrent in mA.

Return type

int

ledCurrent_CH1() → int

Gets the ledCurrent value for Channel 1.

Returns

Channel 1 ledCurrent in mA.

Return type

int

Morelia.Parameters.ParamsBasic module

class Morelia.Parameters.ParamsBasic.**Params**(*port: str, checkForValidParams: bool = True*)

Bases: object

Interface for a container class that stores parameters for a POD device.

port

Name of the COM port.

Type

str

GetInit() → str

Builds a string that represents the Params constructor with the arguments set to the values of this class instance.

Returns

String that represents the Params constructor.

Return type

str

_CheckParams() → None

Throws an exception if Params instance variable is an invalid value.

Raises

Exception – The port name must begin with COM.

static **_FixTypeInTuple**(*arr: tuple, itemType: type*) → tuple['type']

Retypes each item of the arr arguemnt to itemType.

Parameters

- **arr** (*tuple*) – Tuple of items to be re-typed.
- **itemType** (*type*) – Type to be casted to each tuple item.

Returns

Tuple with values of all itemType types.

Return type

tuple[type]

Module contents**1.1.1.5 Morelia.Stream package****Subpackages****Morelia.Stream.Collect package****Submodules****Morelia.Stream.Collect.DataBucket module**

class Morelia.Stream.Collect.DataBucket.**Bucket** (*podDevice*: Pod8206HR | Pod8401HR | Pod8274D,
filterMethod: str = 'TakePast', *filterInsert*: float = nan)

Bases: object

Class to collect the data and timestamps when streaming from a POD device.

dataHose

Hose used to stream data from the POD device.

Type

Hose

drops

Queue of the drops (timestamps and data) collected from the Hose.

Type

Queue[tuple[list[float], list[*Packet*|None]]]

totalDropsCollected

Counts the total number of Drops collected from the Hose.

Type

int

isCollecting

True when collecting drops from the Hose, False otherwise.

Type

bool

DripDrop() → tuple[list[float], list[Morelia.Packets.Packet.Packet | None]]

Dequeues the first point (timestamp, data) in the drops queue.

Raises

Exception – No drops left to dequeue.

Returns

Tuple (x,y) with ~1 sec of timestamps (x) and data (y) .

Return type

tuple[list[float], list[*Packet*|None]]

EmptyBucket()

Resets the class.

GetVolumeOfDrops() → int

Get the number of data drops currently in the queue.

Returns

Size of the drops queue.

Return type

int

StartCollecting(*duration_sec*: float | None = None) → Thread

Start collecting stream data into the Bucket.

Parameters

duration_sec (float | None, optional) – How long to stream data in seconds. Defaults to None.

Returns

Started Thread for data collection.

Return type

Thread

StopCollecting()

Tells the POD device to stop streaming data.

_CollectDrop()

Adds a point to the drops queue. Each point is a tuple (x,y) of the timestamps list (x) and the data list (y) for one drop (values from ~1 sec of streaming, or the number of values approximatly equal to the sample rate).

_CollectForDuration(*duration_sec: float*)

Collect streaming data for a given duration.

Parameters

duration_sec (*float*) – How long to stream data in seconds.

_CollectWhileOpen()

Collect streaming data until the Hose is finished dripping.

_IsDropAvailableInHose() → bool

Checks if the Hose has any uncollected drops.

Returns

True if there is a drop to be collected, False otherwise.

Return type

bool

Morelia.Stream.Collect.DataHose module

```
class Morelia.Stream.Collect.DataHose.Hose(podDevice: Pod8206HR | Pod8401HR | Pod8274D,  
                                         filterMethod: str = 'TakePast', filterInsert: float = nan)
```

Bases: object

Collects streaming data from an 8206-HR or 8401-HR POD device. The data and timestamps are updated about every 1 second when streaming.

sampleRate

Sample rate of the POD device.

Type

int

deviceValve

To open or close the data stream.

Type

Valve

data

List of streaming binary data packets.

Type

list[*Packet*|None]

timestamps (list[float])

List of timestamps for each data packet.

numDrops

Number of drops, or number of times the data and timestamps have been updated.

Type

int

corruptedPointsRemoved

Total number of corrupted data points removed from the data and timestamps lists.

Type

int

filterMethod

Method used to filter out corrupted data.

Type

str

filterInsert

Value to replace corrupted data with if using the 'InsertValue' filter method. Defaults to np.nan.

Type

float

EmptyHose()

Empties the hose and resets the attributes.

static GetSampleRate(*podDevice*: Pod8206HR | Pod8401HR | Pod8274D) → int

Writes a command to the POD device to get its sample rate in Hz.

Parameters

podDevice (Pod8206HR / Pod8401HR / Pod8274D) – POD device to get the sample rate for.

Raises

- **Exception** – Cannot get the sample rate for this POD device.
- **Exception** – Could not connect to this POD device.

Returns

Sample rate in Hz.

Return type

int

PickFilterMethod(*filterMethod*: str)

Set the method used to filter corrupted data when streaming. The filter methods include 'RemoveEntry', 'InsertValue', 'TakePast', 'TakeFuture', or 'DoNothing'. The default method is 'DoNothing'.

Parameters

filterMethod (str) – Filter method, which can be 'RemoveEntry', 'InsertValue', 'TakePast', 'TakeFuture', or 'DoNothing'/other.

SetFilterInsertValue(*insert*: float)

Sets the value to insert in place of corrupted data. This is only used if the filter method is 'InsertValue'.

Parameters

insert (float) – Numerical value to insert.

StartStream()

Start a thread to start streaming data from the POD device.

StopStream()

Writes a command to the POD device to stop streaming data.

_Drop(*currentTime: float, ti: float, data: list[Morelia.Packets.Packet.Packet | None]*) → float

Updates the instance variables that store the streaming data. The data drops about every 1 second.

Parameters

- **currentTime** (*float*) – Current start time in seconds.
- **ti** (*float*) – Computer clock time at the start of the ~1 second drop.
- **data** (*list[Packet | None]*) – Packets recieved when streaming.

Returns

updated current time in seconds for the next drop.

Return type

float

_Filter(*data: list[Morelia.Packets.Packet.Packet | None], timestamps: list[float]*) → bool

Searches the data list for corrupted points, and deals with them according to the set filter method.

Parameters

- **data** (*list[Packet | None]*) – List of Packets read from the POD device.
- **timestamps** (*list[float]*) – List of timestamps in seconds for each Packet in the data list.

Returns

True when the corrupted data is filtered, False otherwise. A list containing only None cannot be filtered.

Return type

bool

_Filter_DoNothing(*i: int, data: list[Morelia.Packets.Packet.Packet | None], timestamps: list[float]*)

Does nothing to the data and timestamps lists.

Parameters

- **i** (*int*) – Index of corrupted data.
- **data** (*list[Packet | None]*) – List of Packets read from the POD device.
- **timestamps** (*list[float]*) – List of timestamps in seconds for each Packet in the data list.

_Filter_InsertValue(*i: int, timestamps: list[float], data: list[Morelia.Packets.Packet.Packet | None]*)

Replaces the data value at index i with a set value (class defaults to np.nan).

Parameters

- **i** (*int*) – Index of corrupted data.
- **data** (*list[Packet | None]*) – List of Packets read from the POD device.
- **timestamps** (*list[float]*) – List of timestamps in seconds for each Packet in the data list.

`_Filter_RemoveEntry`(*i: int, data: list[Morelia.Packets.Packet.Packet | None], timestamps: list[float]*)

Removes a datapoint at index *i* from the data and timestamps lists.

Parameters

- **`i`** (*int*) – Index of corrupted data.
- **`data`** (*list[Packet | None]*) – List of Packets read from the POD device.
- **`timestamps`** (*list[float]*) – List of timestamps in seconds for each Packet in the data list.

`_Filter_TakeFuture`(*i: int, data: list[Morelia.Packets.Packet.Packet | None], timestamps: list[float]*)

Replaces the data value at index *i* with the next Packet. If the index points to the last value in the data list, the data will be replaced with the previous Packet instead. If there are multiple corrupted points in a row (data value is None), then all points will be replaced with the same future Packet.

Parameters

- **`i`** (*int*) – Index of corrupted data.
- **`data`** (*list[Packet | None]*) – List of Packets read from the POD device.
- **`timestamps`** (*list[float]*) – List of timestamps in seconds for each Packet in the data list.

`_Filter_TakePast`(*i: int, data: list[Morelia.Packets.Packet.Packet | None], timestamps: list[float]*)

Replaces the data value at index *i* with the previous Packet. If the index points to the first value in the data list, the data will be replaced with the next Packet instead.

Parameters

- **`i`** (*int*) – Index of corrupted data.
- **`data`** (*list[Packet | None]*) – List of Packets read from the POD device.
- **`timestamps`** (*list[float]*) – List of timestamps in seconds for each Packet in the data list.

`_Flow`(*stopAfterXfails: int = 3*)

Streams data from the POD device. The data drops about every 1 second. Streaming will continue until a “stop streaming” packet is received.

Parameters

- **`stopAfterXfails`** (*int*) – The number of successive failed attempts of reading data before stopping the streaming.

Morelia.Stream.Collect.DeviceValve module

`class Morelia.Stream.Collect.DeviceValve.Valve`(*podDevice: Pod8206HR | Pod8401HR | Pod8274D*)

Bases: object

Simple class to start and stop streaming data from a POD device.

`podDevice`

POD device, such as an 8206-HR/8401-HR/8274D.

Type

Pod8206HR | Pod8401HR | Pod8274D

streamCmd

Command name/number for streaming data.

Type

str | int

streamPldStart

Payload to start streaming data.

Type

int | bytes | tuple[int | bytes]

streamPldStop

Payload to stop streaming data.

Type

int | bytes | tuple[int | bytes]

Close()

Write command to stop streaming

Drip() → *Packet*

Reads one packet from the POD device.

Returns

POD packet beginning with STX and ending with ETX. This may be a standard packet, binary packet, or an unformatted packet (STX+something+ETX).

Return type

Packet

EmptyValve()

Reset the serial port buffer.

GetStartBytes() → bytes

Gets the bytes string representing a “start streaming data” packet.

Returns

Bytes string for a self.streamCmd command and a self.streamPldStart payload.

Return type

bytes

GetStopBytes() → bytes

Gets the bytes string representing a “stop streaming data” packet.

Returns

Bytes string for a self.streamCmd command and a self.streamPldStop payload.

Return type

bytes

Open()

Write command to start streaming.

Raises

Exception – Could not connect to this POD device.

Morelia.Stream.Collect.DrainBucketToFile module

class Morelia.Stream.Collect.DrainBucketToFile.**DrainBucket**(*dataBucket*: [Bucket](#), *fileName*: *str*, *preampDevice*: *str* | *None* = *None*)

Bases: object

This class is used to save the streaming data from a POD device that was collected by a Bucket into a file.

self.drainToFile

Class to to drain the data drops collected by a Bucket into a text or EDF file.

Type

[DrainToTXT](#), [DrainToEDF](#)

DrainBucketToFile(*timeout_sec*: *float* = 10.0, *sleep*: *float* = 0.25) → Thread

Starts a thread that starts draining data drops into the save file.

Parameters

- **timeout_sec** (*float*, *optional*) – Quit saving data if no new data is recieved after timeout_sec time (in seconds). Defaults to 10.0.
- **sleep** (*float*, *optional*) – Time duration in seconds to wait for the Bucket to collect more data before checking agian. Defaults to 0.25.

Returns

Started thread where data is being saved to a file.

Return type

Thread

IsCollecting() → bool

Checks if the Bucket is collected data from the Hose.

Returns

True if the Bucket is collecting data, False otherwise.

Return type

bool

IsDataAvailable() → bool

Checks if data is available in the Bucket.

Returns

True if there are any drops in the Bucket, False otherwise.

Return type

bool

_DrainDropToFile(*timeoutTicker*: *float*, *timeout_sec*: *float* = 10.0, *sleep*: *float* = 0.25) → float

When data is available in the bucket, write one drop of data to the save file.

Parameters

- **timeoutTicker** (*float*) – Counts the amout of time passed since the last drop was recieved.
- **timeout_sec** (*float*, *optional*) – Quit saving data if no new data is recieved after timeout_sec time (in seconds). Defaults to 10.0.
- **sleep** (*float*, *optional*) – Time duration in seconds to wait for the Bucket to collect more data before checking agian. Defaults to 0.25.

Raises

Exception – Timeout: no data found to be saved to file.

Returns

Updated timeoutTicker.

Return type

float

_ThreadedDrainBucketToFile(*timeout_sec: float = 10.0, sleep: float = 0.25*)

Opens a save file and starts saving data to it. The file is updated about every 1 sec. After the POD device stops streaming data, the file will close.

Parameters

- **timeout_sec** (*float, optional*) – Quit saving data if no new data is recieved after timeout_sec time (in seconds). Defaults to 10.0.
- **sleep** (*float, optional*) – Time duration in seconds to wait for the Bucket to collect more data before checking agian. Defaults to 0.25.

Module contents**Morelia.Stream.Drain package****Submodules****Morelia.Stream.Drain.ToEDF module**

class Morelia.Stream.Drain.ToEDF.**DrainToEDF**(*dataBucket: [Bucket](#), fileName: str, preampDevice: str | None = None*)

Bases: [DrainToFile](#)

Class to to drain, or save, the data drops collected by a Bucket into an EDF file.

file

Text file where streaming data is saved to.

Type

EdfWriter|None

CloseFile()

Closes the file that data is saved to.

static **DigitalMax()** → Literal[32767]

static **DigitalMin()** → Literal[-32768]

DrainDropToFile()

Write one drop of data to the save file.

Raises

Exception – Can only save data to EDF if the hose is filtered with InsertValue, TakePast, or TakeFuture.

OpenFile()

Opens and initializes a file using the fileName to save data to.

static `PhysicalBound()` → Literal[2046]

Morelia.Stream.Drain.ToFile module

class `Morelia.Stream.Drain.ToFile.DrainToFile`(*dataBucket*: `Bucket`, *fileName*: `str`, *preampDevice*: `str` | `None` = `None`)

Bases: `object`

Interface class to to drain, or save, the data drops collected by a `Bucket` into a file.

dataBucket

Bucket to collect streaming data.

Type

`Bucket`

fileName

Name (with optional file path) of the file to save data to.

Type

`str`

preampDevice

Optional preamplifier for the 8401-HR.

Type

`str` | `None`

deviceHandler

Class to help handle different POD device types.

Type

`Drain8206HR` | `Drain8401HR` | `Drain8274D`

CloseFile()

Closes the file that data is saved to.

DrainDropToFile()

Write one drop of data to the save file.

static `GetExtension(fileName: str)` → `str`

Gets the extension from a file, such as `‘.txt’`, `‘.csv’`, or `‘.edf’`.

Parameters

fileName (`str`) – Name of the file with an extension.

Returns

File extension.

Return type

`str`

static `GetHandlerForBucket`(*bkt*: `Bucket`, *preampDevice*: `str` | `None` = `None`) → `Drain8206HR` | `Drain8401HR` | `Drain8274D`

Selects the proper POD device handler for a given `Bucket`.

Parameters

- **bkt** (`Bucket`) – Bucket to collect streaming data.

- **preampDevice**(*str* / *None*, *optional*) – Optional preamplifier for the 8401-HR. Defaults to *None*.

Raises

Exception – POD Device is not supported.

Returns

POD Device Handler.

Return type

Drain8206HR | *Drain8401HR* | *Drain8274D*

OpenFile()

Opens and initializes a file using the *fileName* to save data to.

Morelia.Stream.Drain.ToText module

class `Morelia.Stream.Drain.ToText.DrainToTXT`(*dataBucket*: *Bucket*, *fileName*: *str*, *preampDevice*: *str* | *None* = *None*)

Bases: *DrainToFile*

Class to to drain, or save, the data drops collected by a *Bucket* into a text file.

file

Text file where streaming data is saved to.

Type

TextIOWrapper|*None*

CloseFile()

Closes the file that data is saved to.

DrainDropToFile()

Write one drop of data to the save file.

OpenFile()

Opens and initializes a file using the *fileName* to save data to.

static `_GetTimeHeader()` → *str*

Builds a string containing the current date and time to be written to the text file header.

Returns

String containing the date and time. Each line begins with '#' and ends with a newline.

Return type

str

Module contents**Morelia.Stream.PodHandler package****Submodules****Morelia.Stream.PodHandler.Handle8206HR module**

class Morelia.Stream.PodHandler.Handle8206HR.Drain8206HR

Bases: [DrainDeviceHandler](#)

Class to help handle 8206-HR POD devices for the Drain classes.

DropToDf(*timestamps: list[float], data: list[Morelia.Packets.Packet.Packet | None]*) → DataFrame

Converts the timestamps and data into a Pandas DataFrame. The columns should match GetDeviceColNames().

Parameters

- **timestamps** (*list[float]*) – List of timestamps in seconds for each data packet.
- **data** (*list[Packet | None]*) – List of streaming binary data packets.

Returns

DataFrame containing the timestamps and packet data.

Return type

pd.DataFrame

DropToListOfArrays(*data: list[Morelia.Packets.Packet.Packet | float]*) → list[numpy.array]

Unpacks the data Packets into a list of np.arrays formatted to write to an EDF file.

Parameters

data (*list[Packet | float]*) – List of streaming binary data packets.

Returns

List of np.arrays for each Packet part.

Return type

list[np.array]

GetDeviceColNames() → str

Gets a string of the column names formatter for a text file.

Returns

String of the filenames separated by commas and ending in a newline.

Return type

str

GetDeviceColNamesList(*includeTime: bool = True*) → list[str]

Gets a list of all collumn titles.

Parameters

includeTime (*bool, optional*) – Flag to include ‘Time’ in the columns list. Defaults to True.

Returns

List of columns.

Return type

list[str]

Morelia.Stream.PodHandler.Handle8274D module**class** Morelia.Stream.PodHandler.Handle8274D.Drain8274DBases: *DrainDeviceHandler*

Class to help handle 8274D POD devices for the Drain classes.

DropToDf(*timestamps: list[float], data: list[Morelia.Packets.Packet.Packet | None]*) → DataFrame

Converts the timestamps and data into a Pandas DataFrame. The columns should match GetDeviceColNames().

Parameters

- **timestamps** (*list[float]*) – List of timestamps in seconds for each data packet.
- **data** (*list[Packet | None]*) – List of streaming binary data packets.

Returns

DataFrame containing the timestamps and packet data.

Return type

pd.DataFrame

DropToListOfArrays(*data: list[Morelia.Packets.Packet.Packet | float]*) → list[np.array]

Unpacks the data Packets into a list of np.arrays formatted to write to an EDF file.

Parameters**data** (*list[Packet | float]*) – List of streaming binary data packets.**Returns**

List of np.arrays for each Packet part.

Return type

list[np.array]

GetDeviceColNames() → str

Gets a string of the column names formatter for a text file.

Returns

String of the filenames separated by commas and ending in a newline.

Return type

str

GetDeviceColNamesList(*includeTime: bool = True*) → list[str]

Gets a list of all collumn titles.

Parameters**includeTime** (*bool, optional*) – Flag to include ‘Time’ in the columns list. Defaults to True.**Returns**

List of columns.

Return type

list[str]

Morelia.Stream.PodHandler.Handle8401HR module

class Morelia.Stream.PodHandler.Handle8401HR.**Drain8401HR**(*preampDevice: str | None = None*)

Bases: *DrainDeviceHandler*

Class to help handle 8206-HR POD devices for the Drain classes.

preampDevice

Optional preamplifier for the 8401-HR.

Type

str|None

DropToDf(*timestamps: list[float], data: list[Morelia.Packets.Packet.Packet | None]*) → DataFrame

Converts the timestamps and data into a Pandas DataFrame. The columns should match GetDeviceColNames().

Parameters

- **timestamps** (*list[float]*) – List of timestamps in seconds for each data packet.
- **data** (*list[Packet | None]*) – List of streaming binary data packets.

Returns

DataFrame containing the timestamps and packet data.

Return type

pd.DataFrame

DropToListOfArrays(*data: list[Morelia.Packets.Packet.Packet | float]*) → list[numpy.array]

Unpacks the data Packets into a list of np.arrays formatted to write to an EDF file.

Parameters

data (*list[Packet | float]*) – List of streaming binary data packets.

Returns

List of np.arrays for each Packet part.

Return type

list[np.array]

GetDeviceColNames() → str

Gets a string of the column names formatter for a text file.

Returns

String of the filenames separated by commas and ending in a newline.

Return type

str

GetDeviceColNamesList(*includeTime: bool = True*) → list[str]

Gets a list of all column titles.

Parameters

includeTime (*bool, optional*) – Flag to include ‘Time’ in the columns list. Defaults to True.

Returns

List of columns.

Return type

list[str]

Morelia.Stream.PodHandler.HandlerInterface module**class** Morelia.Stream.PodHandler.HandlerInterface.DrainDeviceHandler

Bases: object

Interface class for the POD device handlers used by the Drain classes.

DropToDf(*timestamps: list[float], data: list[Morelia.Packets.Packet.Packet | None]*) → DataFrame

Converts the timestamps and data into a Pandas DataFrame. The columns should match GetDeviceColNames().

Parameters

- **timestamps** (*list[float]*) – List of timestamps in seconds for each data packet.
- **data** (*list[Packet | None]*) – List of streaming binary data packets.

Returns

DataFrame containing the timestamps and packet data.

Return type

pd.DataFrame

DropToListOfArrays(*data: list[Morelia.Packets.Packet.Packet | float]*) → list[numpy.array]

Unpacks the data Packets into a list of np.arrays formatted to write to an EDF file.

Parameters**data** (*list[Packet | float]*) – List of streaming binary data packets.**Returns**

List of np.arrays for each Packet part.

Return type

list[np.array]

GetDeviceColNamesList(*includeTime: bool = True*) → list[str]

Gets a list of all column titles.

Parameters**includeTime** (*bool, optional*) – Flag to include ‘Time’ in the columns list. Defaults to True.**Returns**

List of columns.

Return type

list[str]

static GetPodFromBucket(*bkt: Bucket*) → Pod8206HR | Pod8401HR | Pod8274D

Gets the POD device contained in the Bucket.

Parameters**bkt** (*Bucket*) – Bucket to collect streaming data from a POD device.**Returns**

POD device connected to the Bucket.

Return type

Pod8206HR | Pod8401HR

static `_uV(voltage: float | int) → float`

Converts volts to microVolts, rounded to 6 decimal places.

Parameters

voltage (*float* | *int*) – number of volts.

Returns

voltage in of uV.

Return type

float

Module contents

Module contents

1.1.2 Module contents

1.2 Setup package

1.2.1 Subpackages

1.2.1.1 Setup.Inputs package

Submodules

Setup.Inputs.GetUserInput module

class `Setup.Inputs.GetUserInput.UserInput`

Bases: object

UserInput contains several methods for getting user input for POD device setup.

static `AskForBool(prompt: str) → bool`

Asks user for bool type input.

Parameters

prompt (*str*) – Statement requesting input from the user.

Returns

Boolean type input from user.

Return type

bool

static `AskForFloat(prompt: str) → float`

Asks user for float type input.

Parameters

prompt (*str*) – Statement requesting input from the user.

Returns

Float type input from user.

Return type

float

static AskForFloatInList(*prompt: str, goodInputs: list, badInputMessage: str | None = None*) → float

Asks the user for a float that exists in the list of valid options.

Parameters

- **prompt** (*str*) – Statement requesting input from the user.
- **goodInputs** (*list*) – List of valid input options.
- **badInputMessage** (*str | None, optional*) – Error message to be printed if invalid input is given. Defaults to None.

Returns

User's choice from the options list as a float.

Return type

float

static AskForFloatInRange(*prompt: str, minimum: float, maximum: float, thisIs: str = 'Input', unit: str = ''*) → float

Asks the user for an float value that falls in a given range.

Parameters

- **prompt** (*str*) – Statement requesting input from the user.
- **minimum** (*float*) – Minimum value of range.
- **maximum** (*float*) – Maximum value of range.
- **thisIs** (*str, optional*) – Description of the input/what is being asked for. Used when printing the error message. Defaults to 'Input'.
- **unit** (*str, optional*) – Unit of the requested value. Use when printing the error message. Defaults to ''.

Returns

Float value given by the user that falls in the given range.

Return type

float

static AskForInput(*prompt: str, append: str = ':'*) → str

Asks user for input given a prompt. Will append a colon ':' to the end of prompt by default

Parameters

- **prompt** (*str*) – Statement requesting input from the user
- **append** (*str, optional*) – Appended to the end of the prompt. Defaults to ':'.

Returns

String of the user input

Return type

str

static AskForInt(*prompt: str*) → int

Asks user for int type input.

Parameters

- **prompt** (*str*) – Statement requesting input from the user.

Returns

Integer type input from user.

Return type

int

static AskForIntInList(*prompt: str, goodInputs: list, badInputMessage: str | None = None*) → int

Asks the user for an integer that exists in the list of valid options.

Parameters

- **prompt** (*str*) – Statement requesting input from the user
- **goodInputs** (*list*) – List of valid input options.
- **badInputMessage** (*str | None, optional*) – Error message to be printed if invalid input is given. Defaults to None.

Returns

User's choice from the options list as an integer.

Return type

int

static AskForIntInRange(*prompt: str, minimum: int, maximum: int, thisIs: str = 'Input', unit: str = ''*) → int

Asks the user for an integer value that falls in a given range.

Parameters

- **prompt** (*str*) – Statement requesting input from the user.
- **minimum** (*int*) – Minimum value of range.
- **maximum** (*int*) – Maximum value of range.
- **thisIs** (*str, optional*) – Description of the input/what is being asked for. Used when printing the error message. Defaults to 'Input'.
- **unit** (*str, optional*) – Unit of the requested value. Use when printing the error message. Defaults to ''.

Returns

Integer value given by the user that falls in the given range.

Return type

int

static AskForStrInList(*prompt: str, goodInputs: list, badInputMessage: str | None = None*) → str

Asks the user for a string that exists in the list of valid options.

Parameters

- **prompt** (*str*) – Statement requesting input from the user.
- **goodInputs** (*list*) – List of valid input options
- **badInputMessage** (*str | None, optional*) – Error message to be printed if invalid input is given. Defaults to None.

Returns

User's choice from the options list as a string.

Return type

str

static AskForType(*typecast: function, prompt: str*) → int | float | str

Ask user for input of a specific data type. If invalid input is given, an error message will print and the user will be prompted again.

Parameters

- **typecast** (*function*) – Datatype to cast the user input (ex. `_CastInt`, `_CastFloat`, `_CastStr`)
- **prompt** (*str*) – Statement requesting input from the user

Returns

Input from user as the requested type.

Return type

int|float|str

static AskForTypeInList(*typecast: function, prompt: str, goodInputs: list, badInputMessage: str | None = None*) → int | float | str

Asks the user for a value of a given type that exists in the list of valid options. If invalid input is given, an error message will print and the user will be prompted again.

Parameters

- **typecast** (*function*) – Datatype to cast the user input (ex. `_CastInt`, `_CastFloat`, `_CastStr`).
- **prompt** (*str*) – Statement requesting input from the user.
- **goodInputs** (*list*) – List of valid input options.
- **badInputMessage** (*str | None, optional*) – Error message to be printed if invalid input is given. Defaults to `None`.

Returns

User's choice from the `goodInputs` list as the given datatype.

Return type

int|float|str

static AskForTypeInRange(*typecast: function, prompt: str, minimum: int | float, maximum: int | float, thisIs: str = 'Input', unit: str = ''*) → int | float

Asks user for a numerical value that falls between two numbers. If invalid input is given, an error message will print and the user will be prompted again.

Parameters

- **typecast** (*function*) – Datatype to cast the user input (ex. `_CastInt`, `_CastFloat`, `_CastStr`).
- **prompt** (*str*) – Statement requesting input from the user.
- **minimum** (*int | float*) – Minimum value of range.
- **maximum** (*int | float*) – Maximum value of range.
- **thisIs** (*str, optional*) – Description of the input/what is being asked for. Used when printing the error message. Defaults to `'Input'`.
- **unit** (*str, optional*) – Unit of the requested value. Use when printing the error message. Defaults to `''`.

Returns

Numerical value given by the user that falls in the given range.

Return type

int|float

static AskYN(*question: str, append: str = '(y/n): '*) → bool

Asks the user a yes or no question. If invalid input is given, an error message will print and the user will be prompted again.

Parameters

- **question** (*str*) – Statement requesting input from the user.
- **append** (*str, optional*) – Appended to the end of the question. Defaults to '(y/n): '.

Returns

True for yes, false for no.

Return type

bool

static CastFloat(*value*) → float

Casts the argument as an float.

Parameters**value** – Value to type casted.**Returns**

Value type casted as a float.

Return type

float

static CastInt(*value*) → int

Casts the argument as an integer.

Parameters**value** – Value to type casted.**Returns**

Value type casted as an integer.

Return type

int

static CastStr(*value*) → str

Casts the argument as an string.

Parameters**value** – Value to type casted.**Returns**

Value type casted as a string.

Return type

str

static CheckFileExt(*f: str, flsExt: bool = True, goodExt: list[str] = ['.txt'], printErr: bool = True*) → bool

Checks if a file name has a valid extension.

Parameters

- **f** (*str*) – file name or extension

- **fIsExt** (*bool*, *optional*) – Boolean flag that is true if *f* is an extension, false otherwise. Defaults to True.
- **goodExt** (*list[str]*, *optional*) – List of valid file extensions. Defaults to ['.txt',].
- **printErr** (*bool*, *optional*) – Boolean flag that, when true, will print an error statement. Defaults to True.

Returns

True if extension is in goodExt list, False otherwise.

Return type

bool

static GetFileName(*goodExt: list[str] = ['.txt']*) → str

Asks the user for a filename. :param goodExt: List of valid file extensions. Defaults to ['.txt']. :type goodExt: list[str], optional

Returns

String of the file name and extension.

Return type

str

static GetFilePath(*prompt: str | None = None*, *goodExt: list[str] = ['.txt']*) → str

Asks the user for a file path and file name.

Parameters

- **prompt** (*str | None*, *optional*) – Text to print to the user before requesting the path. Defaults to None.
- **goodExt** (*list[str]*, *optional*) – List of valid file extensions. Defaults to ['.txt'].

Returns

File path and name.

Return type

str

Module contents**1.2.1.2 Setup.SetupAllDevices package****Submodules****Setup.SetupAllDevices.Setup_PodDevices module**

```
class Setup.SetupAllDevices.Setup_PodDevices.SetupAll(saveFileDict: dict[str, str] | None = None,
                                                    podParametersDict: dict[str, dict[int,
                                                    Morelia.Parameters.ParamsBasic.Params] |
                                                    None] | None = None)
```

Bases: object

Setup_PodDevices allows a user to set up and stream from any number of POD devices. The streamed data is saved to a file.

REQUIRES FIRMWARE 1.0.2 OR HIGHER.

_Setup_PodDevices

Dictionary containing the Setup_Interface subclasses for each POD device.

Type

dict[str,dict[int,Params_Interface]

_options

Dictionary listing the different options for the user to complete.

Type

dict[int,str]

GetOptions() → dict[int, str]

Gets the dictionary of setup options.

Returns

Dictionary listing the different options for the user to complete (_options).

Return type

dict[int,str]

GetPODparametersInit() → str

Sets up each POD device type. Used in initialization. :returns: String representing a dictionary of all POD devices initialization. The keys are the device name and the entries are the initialization dictionaries. :rtype: str

GetSaveFileNames() → dict[str]

Gets a dictionary of the save files names for all connected POD devices.

Returns

Dictionary of the save file name and path for all devices.

Return type

dict[str]

Run() → None

Prints the options and asks the user what to do. Loops until ‘Quit’ is chosen.

SetupPODparameters(*podParametersDict: dict[str, dict[int, Morelia.Parameters.ParamsBasic.Params] | None*) → None

Sets up each POD device type. Used in initialization.

Parameters

podParametersDict (*dict[str,dict[int,Params_Interface] | None*) – Dictionary of all POD devices initialization. The keys are the device name and the entries are the initialization dictionaries.

SetupSaveFile(*saveFileDict: dict[str, str] | None = None*) → None

Gets the path/file name from the user and stores it. Used in initialization.

Parameters

saveFile (*dict[str,str|None] | None, optional*) – String of the save file, which includes the directory path, filename, and file extension. Defaults to None.

_AskOption() → int

Asks user which option to do.

Returns

Integer number representing an option key.

Return type

int

_AskToStopStream() → None

Asks user to press enter to stop streaming. The program will then prompt all POD devices to end stream.

static _AskUserForDevices()

Asks the user what POD devices they want to use.

_CheckForValidParams(*podParametersDict: dict[str, None | dict]*) → bool

Checks if the parameters are correctly formatted.

Parameters**podParametersDict** (*dict[str, None | dict]*) – Dictionary with keys as the device names and values as None or the respective parameter dictionary.**Raises**

- **Exception** – Parameters must be dictionary type.
- **Exception** – Parameters dictionary is empty.
- **Exception** – Invalid device name in paramater dictionary.

Returns

True if the parameters are correctly formatted.

Return type

bool

_ConnectNewDevice() → None

Asks the user for the POD device type, then it sets up that device.

_DoOption(*choice: int*) → None

Performs the methods associated with the user selected option.

Parameters**choice** (*int*) – Integer number representing an option key.**_EditCheckConnect()** → None

Displays the POD devices parameters, asks the user to edit the device, and then reconnects the device for each POD device type.

_EditSaveFilePath() → None

Asks the user for the POD device type, then asks the user for a new file name and path, then sets the value to the POD devices.

_GetChosenDeviceType(*question: str*) → str

Asks the user which type of POD device they want.

Parameters**question** (*str*) – Question to ask the user.**Returns**

String of the user input (may be invalid POD device type).

Return type

str

_GetParams(*podParametersDict: None | dict[str, None]*) → dict[str, dict | None]

If no parameters are give, this asks user which types of POD devices they want to use. Then it checks if the parameters are valid.

Parameters

podParametersDict (*None* / *dict[str, None]*) – Dictionary of all POD devices initialization. The keys are the device name and the entries are the initialization dictionaries.

Returns

Dictionary whose keys are the POD device name, and value the setup dictionary.

Return type

dict[str, dict[None]]

_PrintInitCode() → *None*

Prints code that can be used to initialize and run SetupPodDevices with the current parameters.

_PrintOptions() → *None*

Prints options available for user.

_Reconnect() → *bool*

Reconnects all POD devices.

Returns

Bool that is true if all devices were successfully connected. False otherwise.

Return type

bool

_RemoveDevice() → *None*

Displays the POD devices parameters, asks the user which device to remove, and then deletes that POD device.

_Set_Setup_PodDevices(*podParametersDict: dict[str, dict | None]*) → *None*

Sets the _Setup_PodDevices variable to have keys as the POD device name and values as the setup class.

Parameters

podParametersDict (*dict[str, dict | None]*) – Dictionary with keys as the device names and values as None or the respective parameter dictionary.

_ShowCurrentSettings() → *None*

Displays the POD device settings for all devices, and then prints the save file name.

_Stream() → *float*

Streams data from all POD devices and prints the execution time.

Returns

Float of the execution time in seconds.

Return type

float

_StreamAllDevices() → *None*

Streams data from all the devices. User is asked to click enter to stop streaming. Data is saved to file. Uses threading.

static _TimeFunc(*func: function*) → *float*

Runs a function and gets the calculated execution time.

Parameters

func (*function*) – Function/method name.

Returns

Float of the execution time in seconds rounded to 3 decimal places.

Return type
float

Module contents

1.2.1.3 Setup.SetupOneDevice package

Submodules

Setup.SetupOneDevice.Setup_8206HR module

class Setup.SetupOneDevice.Setup_8206HR.Setup8206HR

Bases: [SetupInterface](#)

Setup_8206HR provides the setup functions for an 8206-HR POD device.

_bucketAccess

Dictionary with device number keys and Bucket values. This is updated in `_StreamThreading()` and cleared in `StopStream()`.

Type
`dict[int, Bucket]`

static `GetDeviceName()` → str

Returns the name of the 8206-HR POD device.

Returns
8206-HR.

Return type
str

StopStream() → None

Write a command to stop streaming data to all POD devices.

static `_ChoosePreampGain()` → int

Asks user for the preamplifier gain of their POD device.

Returns
Integer 10 or 100 for the preamplifier gain.

Return type
int

_ConnectPODdevice(*deviceNum*: int, *deviceParams*: [Params8206HR](#)) → bool

Creates a `POD_8206HR` object and write the setup parameters to it.

Parameters

- **deviceNum** (int) – Integer of the device's number.
- **deviceParams** ([Params_8206HR](#)) – Device's parameters.

Returns
True if connection was successful, false otherwise.

Return type
bool

_GetPODdeviceParameterTable() → Texttable

Builds a table containing the parameters for all POD devices.

Returns

Texttable containing all parameters.

Return type

Texttable

_GetParam_onePODdevice(*forbiddenNames: list[str] = []*) → *Params8206HR*

Asks the user to input all the device parameters.

Parameters

forbiddenNames (*list[str]*) – List of port names already used by other devices.

Returns

Dictionary of device parameters.

Return type

dict[str,(str|int|dict[str,int])]

_PHYSICAL_BOUND_uV: int = 2046

Class-level integer representing the max/-min physical value in uV. Used for EDF files.

_StreamThreading() → tuple[dict[int, threading.Thread]]

Start streaming from each POD device and save each to a file.

Returns

Tuple of two items, the first is for the bucket and the second is the drain. Each item is a dictionary with device number keys and started Thread items.

Return type

tuple[dict[int,Thread]]

Setup.SetupOneDevice.Setup_8229 module

class Setup.SetupOneDevice.Setup_8229.**Setup8229**

Bases: *SetupInterface*

Setup_8229 provides the setup functions for an 8229 POD device.

_streamMode

True when the user wants to stream data from an 8229 POD device, False otherwise.

Type

bool

static **GetDeviceName()** → str

Returns the name of the POD device.

Returns

8229.

Return type

str

static **GetSupportedFileExtensions()** → list[str]

Returns a list containing valid file extensions.

Returns

List of string file extensions.

Return type

list[str]

StopStream() → None

Update the state flag to signal to stop streaming data.

_ConnectPODdevice(*deviceNum*: int, *deviceParams*: Params8229) → bool

Creates a 8229 POD device object and write the setup parameters to it.

Parameters

- **deviceNum** (int) – Integer of the device's number.
- **deviceParams** (Params_8229) – Device parameters.

Returns

True if connection was successful, false otherwise.

Return type

bool

_GetPODdeviceParameterTable() → Texttable

Builds a table containing the parameters for all POD devices.

Returns

Table containing all parameters.

Return type

Texttable

_GetParam_onePODdevice(*forbiddenNames*: list[str] = []) → Params8229

Asks the user to input all the device parameters.

Parameters

forbiddenNames (list[str], optional) – List of port names already used by other devices. Defaults to [].

Returns

Device parameters.

Return type

Params_8229

static _GetScheduleForWeek() → dict[str, tuple[int]]

Asks the user to input if the motor is on/off for each hour of each day of the week.

Returns

Dictionary with the schedule. The keys are the days of the week (Sunday, Monday, ...). The values are a tuple of 24 items for each hour; the items are 1 if the motor is on or 0 if the motor is off

Return type

dict[str, tuple[int]]

_OpenSaveFile_EDF(*fname*: str, *devNum*: int)

EDF files are not supported for 8229 POD devices. Overwrites the parent's method, which would open an EDF file and write the header.

Parameters

- **fname** (*str*) – String filename. Not used.
- **devNum** (*int*) – Integer device number. Not used.

Raises

Exception – EDF filetype is not supported for 8229 POD devices.

_OpenSaveFile_TXT(*fname: str*) → IOBase

Opens a text file and writes the column names. Writes the current date/time at the top of the txt file.

Parameters

fname (*str*) – String filename.

Returns

Opened file.

Return type

IOBase

_StreamThreading() → dict[int, threading.Thread]

Opens a save file, then creates a thread for each device to stream and write data from.

Returns

Dictionary with keys as the device number and values as the started Thread.

Return type

dict[int, Thread]

_StreamUntilStop(*pod: Pod8229, file: IOBase*) → None

Saves a log of all packets recieved from the 8229 POD device until the user decides to stop streaming.

Parameters

- **pod** (*Pod_8229*) – POD device to read from.
- **file** (*IOBase*) – Opened text file to save data to.

Setup.SetupOneDevice.Setup_8274D module

class Setup.SetupOneDevice.Setup_8274D.**Setup8274D**

Bases: [SetupInterface](#)

Setup_8480SC provides the setup functions for an 8480-SC POD device.

_streamMode

Set to True when the user wants to start streaming data from an 8480 POD device, False otherwise.

Type

bool

static **GetDeviceName**() → str

Returns the name of the POD device.

Returns

String of _NAME.

Return type

str

static GetSupportedFileExtensions() → list[str]

Returns a list containing valid file extensions.

Returns

List of string file extensions.

Return type

list[str]

static NameDecode(name: str) → str

Converts decimal valued name into more understandable ascii values.

Parameters

name (str) – This represents the name of the device(which is in decimal value.)

Returns

returns name of the device in ascii values.

Return type

str

StopStream() → None

Write a command to stop streaming data to all POD devices.

_ConnectPODdevice(deviceNum: int, deviceParams: Params8274D) → bool

Creates a POD_8274D object and write the setup parameters to it.

Parameters

- **deviceNum** (int) – Integer of the device's number.
- **deviceParams** (Params_8274D) – Device parameters.

Returns

True if connection was successful, false otherwise.

Return type

bool

_GetPODdeviceParameterTable() → Texttable

Builds a table containing the parameters for all POD devices.

Returns

Texttable containing all parameters.

Return type

Texttable

_GetParam_onePODdevice(forbiddenNames: list[str] = []) → Params8274D

Asks the user to input all the device parameters.

Parameters

forbiddenNames (list[str]) – List of port names already used by other devices.

Returns

Device parameters.

Return type

Params_8480SC

_OpenSaveFile_EDF(fname: str, devNum: int)

EDF files are not supported for 8480 POD devices. Overwrites the parent's method, which would open an EDF file and write the header.

Parameters

- **fname** (*str*) – String filename. Not used.
- **devNum** (*int*) – Integer device number. Not used.

Raises

Exception – EDF filetype is not supported for 8480 POD devices.

_OpenSaveFile_TXT(*fname: str*) → IOBase

Opens a text file and writes the column names. Writes the current date/time at the top of the txt file.

Parameters

fname (*str*) – String filename.

Returns

Opened file.

Return type

IOBase

_StreamThreading() → tuple[dict[int, threading.Thread]]

Start streaming from each POD device and save each to a file.

Returns

Tuple of two items, the first is for the bucket and the second is the drain. Each item is a dictionary with device number keys and started Thread items.

Return type

tuple[dict[int,Thread]]

Setup.SetupOneDevice.Setup_8401HR module

class Setup.SetupOneDevice.Setup_8401HR.**Setup8401HR**

Bases: [SetupInterface](#)

Setup_8401HR provides the setup functions for an 8206-HR POD device. REQUIRES FIRMWARE 1.0.2 OR HIGHER.

_bucketAccess

Dictionary with device number keys and Bucket values. This is updated in _StreamThreading() and cleared in StopStream().

Type

dict[int,[Bucket](#)]

static **GetDeviceName**() → str

returns the name of the 8401-HR POD device.

Returns

8401-HR.

Return type

str

StopStream() → None

Write a command to stop streaming data to all POD devices.

static `_CodeDCmode(dcMode: str) → int`

gets the integer payload to use for 'SET DC MODE' commands given the mode.

Parameters

dcMode (*str*) – DC mode VBIAS or AGND.

Raises

Exception – DC Mode value is not supported.

Returns

Integer code representing the DC mode.

Return type

int

static `_CodeHighpass(highpass: float) → int`

Gets the integer payload to use for 'SET HIGHPASS' given a highpass value.

Parameters

highpass (*float*) – Highpass value in Hz.

Raises

Exception – High-pass value is not supported.

Returns

Integer code representing the highpass value.

Return type

int

_ConnectPODdevice(deviceNum: int, deviceParams: [Params8401HR](#)) → bool

Creates a POD_8206HR object and write the setup parameters to it.

Parameters

- **deviceNum** (*int*) – Integer of the device's number.
- **deviceParams** (*Params_8401HR*) – Device parameters.

Returns

True if connection was successful, false otherwise.

Return type

bool

_GetPODdeviceParameterTable() → Texttable

Builds a table containing the parameters for all POD devices.

Returns

Texttable containing all parameters.

Return type

Texttable

_GetParam_onePODdevice(forbiddenNames: list[str] = []) → [Params8401HR](#)

Asks the user to input all the device parameters.

Parameters

forbiddenNames (*list[str]*) – List of port names already used by other devices.

Returns

Device parameters.

Return type

Params_8401HR

_GetPreampDeviceName() → str

Asks the user to select a mouse/rat preamplifier.

Returns

String of the chosen preamplifier.

Return type

str

_NiceABCDtableText(*abcdValues: list[int | str | None], channelMap: dict[str, str]*) → str

Builds a string that formats the channel values to be input into the parameter table.

Parameters

- **abcdValueDict** (*dict[str, int | str | None]*) – Dictionary with ABCD keys.
- **channelMap** (*dict[str, str]*) – Maps the ABCD channels to the sensor's channel name.

Returns

String with “channel name: value newline...” for each channel.

Return type

str

_PHYSICAL_BOUND_uV: int = 2046

Class-level integer representing the max/-min physical value in uV. Used for EDF files.

static _SetBias(*channelName: str*) → float

Asks the user for the bias voltage in V (+/-2.048V).

Parameters**channelName** (*str*) – Name of the channel.**Returns**

A float for the bias voltage in V.

Return type

float

static _SetDCMode(*channelName: str*) → str

Asks the user for the DC mode (VBIAS or AGND).

Parameters**channelName** (*str*) – Name of the channel.**Returns**

String for the DC mode.

Return type

str

_SetForMappedChannels(*message: str, channelMap: dict[str, str], func: function*) → tuple[int | None]

Asks the user to input values for all channels (excluding no-connects).

Parameters

- **message** (*str*) – Message to ask the user.
- **channelMap** (*dict[str, str]*) – Maps the ABCD channels to the sensor's channel name.

- **func** (*function*) – a function that asks the user for an input. takes one string parameter and returns one value.

Returns

Tuple with user inputs for values for the ABCD channels

Return type

tuple[int|None]

static **_SetHighpass**(*channelName: str*) → float | None

Asks the user for the high-pass in Hz (0.5,1,10Hz, or DC).

Parameters

channelName (*str*) – Name of the channel.

Returns

A float for the high-pass frequency in Hz, or None if DC.

Return type

float|None

static **_SetLowpass**(*channelName: str*) → int | None

Asks the user for the low-pass in Hz (21-15000Hz).

Parameters

channelName (*str*) – Name of the channel.

Returns

An integer for the low-pass frequency in Hz.

Return type

int|None

static **_SetPreampGain**(*channelName: str*) → int | None

Asks the user for the preamplifier gain.

Parameters

channelName (*str*) – Name of the channel.

Returns

An integer for the gain, or None if no gain.

Return type

int|None

static **_SetSSGain**(*channelName: str*) → int

Asks the user for the second stage gain.

Parameters

channelName (*str*) – Name of the channel.

Returns

An integer for the gain.

Return type

int

_StreamThreading() → tuple[dict[int, threading.Thread]]

Start streaming from each POD device and save each to a file.

Returns

Tuple of two items, the first is for the bucket and the second is the drain. Each item is a dictionary with device number keys and started Thread items.

Return type
tuple[dict[int,Thread]]

Setup.SetupOneDevice.Setup_8480SC module

class Setup.SetupOneDevice.Setup_8480SC.**Setup8480SC**

Bases: *SetupInterface*

Setup_8480SC provides the setup functions for an 8480-SC POD device.

_streamMode

Set to True when the user wants to start streaming data from an 8480 POD device, False otherwise.

Type
bool

static **GetDeviceName()** → str

Returns the name of the POD device.

Returns
String of _NAME.

Return type
str

static **GetSupportedFileExtensions()** → list[str]

Returns a list containing valid file extensions.

Returns
List of string file extensions.

Return type
list[str]

StopStream() → None

Update the state flag to signal to stop streaming data.

static **_ChoosePeriod()** → tuple[int]

Asks the user an input value for Stimulus Period, which is then seperated into Period_ms and Period_us. Seperation is required because the 'SET STIMULUS' requires 7 items in payload, and the second and third items is the Period_ms and Period_us.

Returns
Formatted period into millisecs and microsecs.

Return type
tuple[int]

static **_ChooseRepeat()** → int

Asks the user to input a value for the number of stimulus pulses to perform.

Returns
representing repeat count for command 'SET STIMULUS'.

Return type
int

static _ChooseStimulusConfig() → int

Asks the user to input values for Config format of Stimulus

Returns

Formatted Stimulus Config value.

Return type

(int)

static _ChooseSyncConfig() → int

Asks the user to input values for Sync Config bits.

Returns

Value calculated from the input bits, this value would be given as payload.

Return type

int

static _ChooseWidth() → tuple[int]

Asks the user an input value for Stimulus width, which is then separated into width_ms and width_us. Separation is required because the 'SET STIMULUS' requires 7 items in payload, and the fourth and fifth items is the width_ms and width_us.

Returns

Formatted given width into millisecs and microsecs

Return type

tuple[int]

_ConnectPODdevice(deviceNum: int, deviceParams: Params8480SC) → bool

Creates a POD_8206HR object and write the setup parameters to it.

Parameters

- **deviceNum** (int) – Integer of the device's number.
- **deviceParams** (Params_8480SC) – Device parameters.

Returns

True if connection was successful, false otherwise.

Return type

bool

_GetPODdeviceParameterTable() → Texttable

Builds a table containing the parameters for all POD devices.

Returns

Texttable containing all parameters.

Return type

Texttable

_GetParam_onePODdevice(forbiddenNames: list[str] = []) → Params8480SC

Asks the user to input all the device parameters.

Parameters

forbiddenNames (list[str]) – List of port names already used by other devices.

Returns

Device parameters.

Return type

Params_8480SC

_OpenSaveFile_EDF(*fname: str, devNum: int*)

EDF files are not supported for 8480 POD devices. Overwrites the parent's method, which would open an EDF file and write the header.

Parameters

- **fname** (*str*) – String filename. Not used.
- **devNum** (*int*) – Integer device number. Not used.

Raises

Exception – EDF filetype is not supported for 8480 POD devices.

_OpenSaveFile_TXT(*fname: str*) → IOBase

Opens a text file and writes the column names. Writes the current date/time at the top of the txt file.

Parameters

fname (*str*) – String filename.

Returns

Opened file.

Return type

IOBase

_StreamThreading() → dict[int, threading.Thread]

Opens a save file, then creates a thread for each device to stream and write data from.

Returns

Dictionary with keys as the device number and values as the started Thread.

Return type

dict[int, Thread]

_StreamUntilStop(*pod: Pod8480SC, file: IOBase*) → None

Saves a log of all packets recieved from the 8480 POD device until the user decides to stop streaming.

Parameters

- **pod** (*POD_8480*) – POD device to read from.
- **file** (*IOBase*) – Opened text file to save data to.

static _TtlSetup() → int

Asks the user to input values for Config format values of TTL Setup.

Returns

Formatted TTL Setup config value.

Setup.SetupOneDevice.Setup_PodInterface module

class Setup.SetupOneDevice.Setup_PodInterface.SetupInterface

Bases: object

Setup_Interface provides the basic interface of required methods for subclasses to implement. SetupPodDevices.py is designed to handle any of these children.

_podDevices

Instance-level dictionary of pod device objects. MUST have keys as device number.

Type

dict[int, POD_Basics]

_podParametersDict

Instance-level dictionary of device information. MUST have keys as device number.

Type

dict[int, Params_Interface]

_saveFileName

Instance-level string filename: <path>/file.ext. The device name and number will be appended to the filename.

Type

str

AddPODdevice() → None

Asks the user for the parameters for the new device. A new device number is generated.

AreDeviceParamsValid(*paramDict*: None | dict[int, Morelia.Parameters.ParamsBasic.Params/])

Checks if the parameters dictionary is valid.

Parameters

paramDict (None | dict[int, Params_Interface]) – Dictionary of parameters for all POD devices.

Raises

- **Exception** – Parameters must be contained in a dictionary.
- **Exception** – Device keys must be integer type.
- **Exception** – Device parameters must be dictionary type.
- **Exception** – Device parameters dictionary is empty.

ConnectAllPODdevices() → bool

Connects all setup POD devices.

Returns

True if all devices are successfully connected, false otherwise.

Return type

bool

DisplayPODdeviceParameters() → None

Display all the pod device parameters in a table.

static GetDeviceName() → str

returns the name of the POD device.

Returns

GENERIC.

Return type

str

GetPODparametersInit() → str

Gets a dictionary whose keys are the device number and the value is the device parameters dict. :returns: String representation of a dictionary of POD device parameters. The keys are the device number. :rtype: str

GetSaveFileName() → str

Gets the path and filename where streaming data is saved to.

Returns

String of the save file name and path (_saveFileName).

Return type

str

static GetSupportedFileExtensions() → list[str]

Returns a list containing valid file extensions.

Returns

List of string file extensions.

Return type

list[str]

PrintSaveFile() → None

Prints the file path and name that data is saved to. Note that the device name and number will be appended to the end of the filename.

SetupFileName(fileName: str | None = None) → None

Gets the file path and name to save streaming data to. Note that the device name and number will be appended to the end of the filename.

Parameters

fileName (str | None, optional) – Name and path of the file, if known. Defaults to None.

SetupPODparameters(podParametersDict: dict[int, Morelia.Parameters.ParamsBasic.Params] | None = None) → None

Sets the parameters for the POD devices.

Parameters

podParametersDict (dict[int, Params_Interface] | None, optional) – dictionary of the device parameters for all devices. Defaults to None.

StopStream() → None

Write a command to stop streaming data to all POD devices.

Stream() → tuple[dict[int, threading.Thread]] | dict[int, threading.Thread]

Tests that all devices are connected then starts streaming data.

Raises

Exception – Test connection failed.

Returns

Dictionary with keys as the device number and values as the started Thread. If a tuple, the first item is the Bucket and second is the BucketDrain Threads.

Return type

tuple[dict[int,Thread]] | dict[int,Thread]

ValidateParams() → None

Displays a table of the parameters of all devices, then asks the user if everything is correct. The user can then edit the parameters of a device.

_BuildFileName(devNum: int) → str

Appends the device name and number to the end of the file name.

Parameters

devNum (int) – Integer of the device number.

Returns

String file name.

Return type

str

static _ChoosePort(forbidden: list[str] = []) → str

Systems checks user's Operating System, and chooses ports accordingly.

Parameters

forbidden (list[str], optional) – List of port names that are already used. Defaults to [].

Returns

String name of the port.

Return type

str

_ConnectPODdevice(deviceNum: int, deviceParams: Params) → bool

Creates a POD device object and write the setup parameters to it.

Parameters

- **deviceNum** (int) – Integer of the device's number.
- **deviceParams** (Params_Interface) – Device parameters.

Returns

True if connection was successful, false otherwise.

Return type

bool

_DisconnectAllPODdevices() → None

Disconnects all POD devices by deleted all POD obejcts.

_EditParams() → None

Asks the user which device to edit, and then asks them to re-input the device parameters.

_GetForbiddenNames(exclude: str | None = None) → list[str]

Generates a list of port names used by the active pod devices. There is an option to exclude an additional name from the list.

Parameters

exclude (*str* / *None*, *optional*) – String port name to exclude from the returned list. Defaults to None.

Returns

List of string names of ports in use.

Return type

list[str]

_GetPODdeviceParameterTable() → Texttable

Builds a table containing the parameters for all POD devices.

Returns

Table containing all parameters.

Return type

Texttable

_GetParam_allPODdevices() → dict[int, *Morelia.Parameters.ParamsBasic.Params*]

First gets the number of POD devices, then asks the user for the information for each device.

Returns

Dictionary with device numbers for keys and parameters for values.

Return type

dict[int, Params_Interface]

_GetParam_onePODdevice(*forbiddenNames: list[str] = []*) → *Params*

Asks the user to input all the device parameters.

Parameters

forbiddenNames (*list[str]*) – List of port names already used by other devices. Defaults to [].

Returns

Device parameters.

Return type

Params_Interface

static _GetTimeHeader_forTXT() → str

Builds a string containing the current date and time to be written to the text file header.

Returns

String containing the date and time. Each line begins with ‘#’ and ends with a newline.

Return type

str

_OpenSaveFile(*devNum: int*) → IOBase | EdfWriter

Opens a save file for a given device.

Parameters

devNum (*int*) – Integer of the device number.

Returns

Opened file. IOBase for a text file, or EdfWriter for EDF file.

Return type

IOBase | EdfWriter

_OpenSaveFile_EDF(*fname: str, devNum: int*) → EdfWriter

Opens EDF file and write header.

Parameters

- **fname** (*str*) – String filename.
- **devNum** (*int*) – Integer device number.

Returns

Opened file.

Return type

EdfWriter

_OpenSaveFile_TXT(*fname: str*) → IOBase

Opens a text file and writes the column names. Writes the current date/time at the top of the txt file.

Parameters

fname (*str*) – String filename.

Returns

Opened file.

Return type

IOBase

static _PrintDeviceNumber(*num: int*) → None

Prints a title with the device number.

Parameters

num (*int*) – Integer of the device number.

_RemoveDevice() → None

Asks the user for a device number to remove, then deletes that device. This will only remove a device if there are more than one options.

_SelectDeviceFromDict(*action: str*) → int

Asks the user to select a valid device number. The input must be an integer number of an existing device.

Parameters

action (*str*) – Description of the action to be performed on the device.

Returns

Integer for the device number.

Return type

int

static _SetNumberOfDevices(*name: str*) → int

Asks the user for how many devices they want to setup.

Parameters

name (*str*) – Name of the POD device type.

Returns

Integer number of POD devices desired by the user.

Return type

int

_StreamThreading() → tuple[dict[int, threading.Thread]] | dict[int, threading.Thread]

Start streaming from each POD device and save each to a file.

Returns

Dictionary with keys as the device number and values as the started Thread. If a tuple, the first item is the Bucket and second is the BucketDrain Threads.

Return type

tuple[dict[int,Thread]] | dict[int,Thread]

static _TestDeviceConnection(*pod*: Pod) → bool

Tests if a POD device can be read from or written. Sends a PING command.

Parameters

pod (*POD_Basics*) – POD device to read to and write from.

Returns

True for successful connection, false otherwise.

Return type

bool

_TestDeviceConnection_All() → bool

Tests the connection of all setup POD devices.

Returns

True when all devices are successfully connected, false otherwise

Return type

bool

static _uV(*voltage*: float | int) → float

Converts volts to microVolts, rounded to 6 decimal places.

Parameters

voltage (*float* | *int*) – number of volts.

Returns

voltage in of uV.

Return type

float

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1.2.2 Module contents

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