

G8R

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Chapter 1

Hierarchical Index

1.1 Class Hierarchy

This inheritance list is sorted roughly, but not completely, alphabetically:

AppState	??
ClockState	??
Debug	??
Encoder	??
EurorackClock	??
GateChannelNote	??
GateDivision	??
Gates	??
InputHandler	??
LEDController	??
LEDs	??
Mode	??
ModeDivisions	??
ModeMidiLearn	??
ModeDivisionsState	??
ModeMidiLearnState	??
ModeSelector	??
Pin	??
InputPin	??
AnalogInputPin	??
OutputPin	??
Gate	??
LED	??
PWMPin	??
ResetButton	??
StateManager	??

Chapter 2

Class Index

2.1 Class List

Here are the classes, structs, unions and interfaces with brief descriptions:

AnalogInputPin	This class represents an analog input pin on the microcontroller	??
AppState	??
ClockState	The ClockState struct is used to store the current state of the clock	??
Debug	Helper class for debugging. This makes it easier to enable/disable debug messages. It is used in conjunction with the <code>DEBUG_PRINT</code> macro. Which adds the file, line, and function name to the debug message so that the developer can easily find where the message is coming from	??
Encoder	This class is used to read the encoder and button inputs	??
EurorackClock	Used to handle the clock and tempo of the device. It utilizes an interrupt to handle the clock ticks, and can be set to an external tempo	??
Gate	This class defines what a gate is and how it should behave. It inherits from the OutputPin class, which provides the basic functionality for a pin including setting state to HIGH or LOW, getting the current state, etc	??
GateChannelNote	??
GateDivision	This is a global struct that holds the state of the application. It mainly holds items that need to persist after a power cycle. The object is initialized managed by the StateManager class	??
Gates	This is a collection of gates and thus the main thing we are working with in this project. Very rarely will you need to interact with the Gate class directly, as most of the functionality is handled by the Gates class	??
InputHandler	This class is used to read the CV inputs. It is a simple class that uses the AnalogInputPin class to read the CV inputs. Alias the reset and clock inputs to cvC and cvD respectively. cvC is the reset input and cvD is the clock input	??
InputPin	This class represents an input pin on the microcontroller	??
LED	This class defines what an LED is and how it should behave	??
LEDController	This class is used as the main interface for controlling the LEDs	??

LEDs	This is a collection of LEDs and mainly used by the LEDController class. Use that if you need to interact with the LEDs	??
Mode	This class is the base for our application modes	??
ModeDivisions	This class uses the eurorack clock to provide us pulses with selectable division. It can be synced to a clock too, internal and external	??
ModeDivisionsState	??
ModeMidiLearn	This is a MIDI to Trigger class for Note On but it only cares about the channel number	??
ModeMidiLearnState	??
ModeSelector	Mode Selector Singleton. This class is responsible for managing the different modes of the device. It provides methods to add modes, set the current mode, and handle mode selection	??
OutputPin	This class represents an output pin on the microcontroller	??
Pin	This class represents a pin on the microcontroller	??
PWMPin	This class represents a PWM output pin on the microcontroller	??
ResetButton	This class is used to read the reset button input	??
StateManager	Used to manage the application state. It is used to save and read the application state from EEPROM. It uses the AppState struct to hold the state of the application while the application is running. The state is saved to EEPROM when the app is in mode selection mode	??

Chapter 3

File Index

3.1 File List

Here is a list of all files with brief descriptions:

include/ AppState.h	??
include/ Constants.h This file contains the constants used throughout the application. I adopted this approach to make the main.cpp file cleaner and easier to read. This file is included in main.cpp and MIDIHandler.cpp among others. There are probably other items to add here, but I'm starting with the musical intervals and PPQN. These are meant to be constants, so they are declared as extern here and defined in Constants.cpp	??
include/ Debug.h	??
include/ Encoder.h This file contains the Encoder class which manages the physical encoder and button inputs . .	??
include/ EurorackClock.h This file contains the EurorackClock class, which is used to handle the clock and tempo of the device. This is one of the first classes I wrote for the project, and it has been refactored a few times. It probably could use with a bit more refactoring love, but it works well enough for now . .	??
include/ Gate.h This file contains the Gate class, which is used to control the gates	??
include/ Gates.h This file contains the Gates class, which is used to control the gates in the system	??
include/ InputHandler.h This file contains the InputHandler class, which is used to read the CV inputs. Right now it only reads the CV inputs but it could be expanded to handle other inputs in the future	??
include/ LED.h This file contains the LED class, which is used to control the LEDs associated with the gates. This of this like a UI matrix as well. The LEDs are used to indicate the state of the gates, as well as, to provide feedback when selecting modes, gates, etc	??
include/ LEDController.h I originally had the LEDs class handling the LED control, but I ran into issues making coding difficult all the modes needed to interact with the LEDs and maintain some sort of state. To help facilitate state and management of the leds I created this class to handle the LED control and to provide a more user-friendly interface	??
include/ LEDs.h This is a collection of LEDs whicle you could interact with this class directly, it is recommended to use the LEDController class to interact with the LEDs	??
include/ Mode.h This is the base class for the various modes that the module can be in. It defines the interface that all modes must implement	??

include/ModeDivisions.h	This mode is the main mode for the Eurorack Clock module	??
include/ModeMidiLearn.h		??
include/ModeSelector.h		??
include/Pin.h	This file contains the pin base class and its derived classes for input, output, and PWM pins . .	??
include/ResetButton.h	This file contains the ResetButton class which manages the physical reset button input	??
include/StateManager.h	This file contains the StateManager class, which is used to manage the application state. It is used to save and read the application state from EEPROM	??
src/Debug.cpp	Helper class for debugging	??
src/Encoder.cpp	This file contains the implementation of the Encoder class which manages the physical encoder and button inputs	??
src/EurorackClock.cpp	This file contains the implementation of the EurorackClock class, which is used to manage the clock and gates of the Eurorack module	??
src/Gate.cpp	This file contains the implementation of the Gate class, which is used to manage the gates of the Eurorack module	??
src/Gates.cpp	This file contains the implementation of the Gates class, which is used to manage the gates of the Eurorack module	??
src/InputHandler.cpp	This file contains the implementation of the InputHandler class, which is used to manage the CV inputs of the Eurorack module	??
src/LED.cpp	This file contains the implementation of the LED class, which is used to manage the LEDs of the Eurorack module	??
src/LEDController.cpp	This file contains the implementation of the LEDController class, which is used to manage the LEDs of the Eurorack module	??
src/LEDs.cpp	This is the implementation file for the LEDs class, which is used to manage the LEDs of the Eurorack module	??
src/main.cpp	This is the main entrypoint of the G8R application. I'm trying to keep this file as clean as possible, so most of the logic is in the Mode classes	??
src/ModeDivisions.cpp	Implementation file for ModeDivisions , Please see ModeDivisions.h for more information . . .	??
src/ModeMidiLearn.cpp	This file contains the implementation of the ModeMidiLearn class, which is used to manage the second mode of the Eurorack module	??
src/ModeSelector.cpp	This file contains the implementation of the ModeSelector class, which is used to manage the different modes of the Eurorack module. ModeSelector is a singleton class that is used to manage the different modes of the Eurorack module. It is responsible for handling the mode selection state, button presses, and encoder rotation	??
src/Pin.cpp	This file contains the implementation of the Pin class and its derived classes	??
src/ResetButton.cpp	This file contains the implementation of the ResetButton class, which is used to manage the reset button of the Eurorack module	??
src/StateManager.cpp	"This class manages reading and writing state to the EEPROM memory."	??

Chapter 4

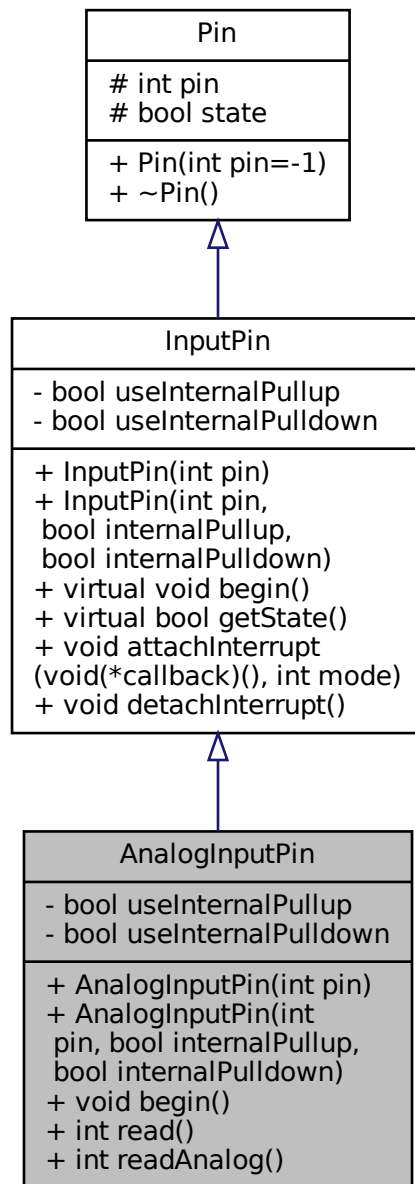
Class Documentation

4.1 AnalogInputPin Class Reference

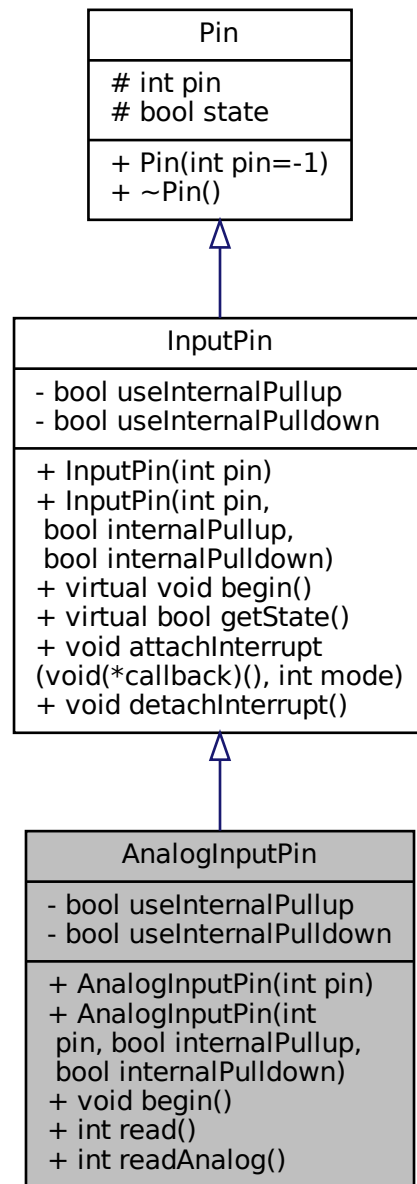
This class represents an analog input pin on the microcontroller.

```
#include <Pin.h>
```

Inheritance diagram for AnalogInputPin:



Collaboration diagram for AnalogInputPin:



Public Member Functions

- [AnalogInputPin](#) (int [pin](#))
Construct a new Analog Input [Pin](#):: Analog Input [Pin](#) object.
- [AnalogInputPin](#) (int [pin](#), bool internalPullup, bool internalPulldown)
Construct a new Analog Input [Pin](#):: Analog Input [Pin](#) object This constructor initializes the pin and sets the internal pullup and pulldown flags to the specified values. Use this constructor if you want to use the internal pullup or pulldown resistors.
- void [begin](#) ()

This function is used to initialize the analog input pin. It is intended to be called in the [setup\(\)](#) function of the main sketch.

- int [read](#) ()
- int [readAnalog](#) ()

This function is used to read the value of the analog input pin.

Private Attributes

- bool [useInternalPullup](#)
- bool [useInternalPulldown](#)

Additional Inherited Members

4.1.1 Detailed Description

This class represents an analog input pin on the microcontroller.

4.1.2 Constructor & Destructor Documentation

4.1.2.1 AnalogInputPin() [1/2]

```
AnalogInputPin::AnalogInputPin (
    int pin )
```

Construct a new Analog Input [Pin](#):: Analog Input [Pin](#) object.

Parameters

<i>pin</i>	
------------	--

4.1.2.2 AnalogInputPin() [2/2]

```
AnalogInputPin::AnalogInputPin (
    int pin,
    bool internalPullup,
    bool internalPulldown )
```

Construct a new Analog Input [Pin](#):: Analog Input [Pin](#) object This constructor initializes the pin and sets the internal pullup and pulldown flags to the specified values. Use this constructor if you want to use the internal pullup or pulldown resistors.

4.1.3 Member Function Documentation

4.1.3.1 begin()

```
void AnalogInputPin::begin ( ) [virtual]
```

This function is used to initialize the analog input pin. It is intended to be called in the [setup\(\)](#) function of the main sketch.

Reimplemented from [InputPin](#).

4.1.3.2 read()

```
int AnalogInputPin::read ( )
```

4.1.3.3 readAnalog()

```
int AnalogInputPin::readAnalog ( )
```

This function is used to read the value of the analog input pin.

Returns

int

4.1.4 Member Data Documentation

4.1.4.1 useInternalPulldown

```
bool AnalogInputPin::useInternalPulldown [private]
```

4.1.4.2 useInternalPullup

```
bool AnalogInputPin::useInternalPullup [private]
```

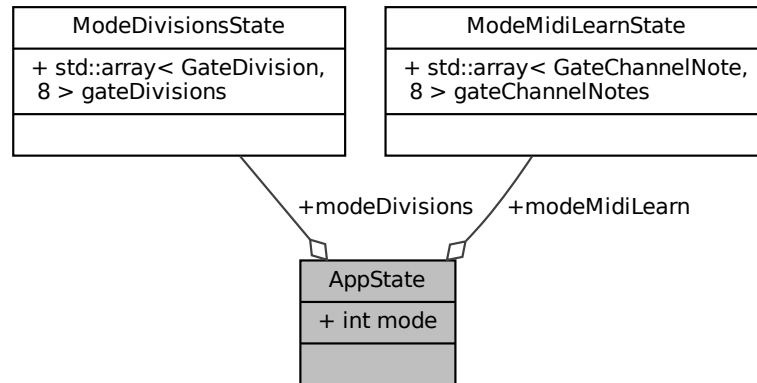
The documentation for this class was generated from the following files:

- include/[Pin.h](#)
- src/[Pin.cpp](#)

4.2 AppState Struct Reference

```
#include <AppState.h>
```

Collaboration diagram for AppState:



Public Attributes

- `int mode`
- `ModeDivisionsState modeDivisions`
- `ModeMidiLearnState modeMidiLearn`

4.2.1 Member Data Documentation

4.2.1.1 mode

```
int AppState::mode
```

4.2.1.2 modeDivisions

```
ModeDivisionsState AppState::modeDivisions
```

4.2.1.3 modeMidiLearn

`ModeMidiLearnState` `AppState::modeMidiLearn`

The documentation for this struct was generated from the following file:

- `include/AppState.h`

4.3 ClockState Struct Reference

The `ClockState` struct is used to store the current state of the clock.

```
#include <EurorackClock.h>
```

Collaboration diagram for ClockState:

ClockState
+ unsigned long lastTickTime + unsigned long tickInterval + bool isRunning
+ ClockState()

Public Member Functions

- `ClockState ()`

Public Attributes

- unsigned long `lastTickTime`
- unsigned long `tickInterval`
- bool `isRunning`

4.3.1 Detailed Description

The `ClockState` struct is used to store the current state of the clock.

4.3.2 Constructor & Destructor Documentation

4.3.2.1 ClockState()

```
ClockState::ClockState ( ) [inline]
```

4.3.3 Member Data Documentation

4.3.3.1 isRunning

```
bool ClockState::isRunning
```

4.3.3.2 lastTickTime

```
unsigned long ClockState::lastTickTime
```

4.3.3.3 tickInterval

```
unsigned long ClockState::tickInterval
```

The documentation for this struct was generated from the following file:

- [include/EurorackClock.h](#)

4.4 Debug Class Reference

Helper class for debugging. This makes it easier to enable/disable debug messages. It is used in conjunction with the `DEBUG_PRINT` macro. Which adds the file, line, and function name to the debug message so that the developer can easily find where the message is coming from.

```
#include <Debug.h>
```

Collaboration diagram for Debug:

Debug
+ static bool isEnabled + static bool resetEEPROM
+ static void print(const char *file, int line, const char *func, const String &message)

Static Public Member Functions

- static void [print](#) (const char *file, int line, const char *func, const String &message)

Static Public Attributes

- static bool [isEnabled](#) = false
- static bool [resetEEPROM](#) = false

4.4.1 Detailed Description

Helper class for debugging. This makes it easier to enable/disable debug messages. It is used in conjunction with the `DEBUG_PRINT` macro. Which adds the file, line, and function name to the debug message so that the developer can easily find where the message is coming from.

4.4.2 Member Function Documentation

4.4.2.1 `print()`

```
void Debug::print (
    const char * file,
    int line,
    const char * func,
    const String & message ) [static]
```

4.4.3 Member Data Documentation

4.4.3.1 `isEnabled`

```
bool Debug::isEnabled = false [static]
```

4.4.3.2 `resetEEPROM`

```
bool Debug::resetEEPROM = false [static]
```

The documentation for this class was generated from the following files:

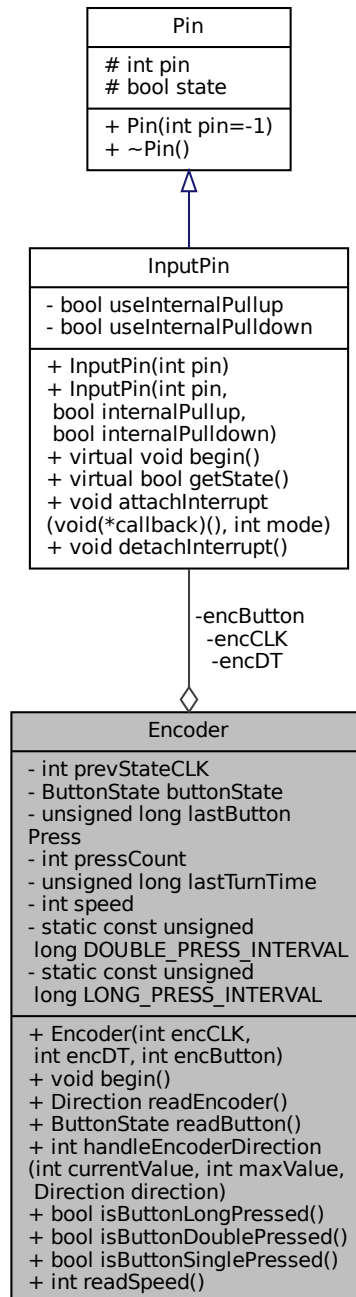
- include/[Debug.h](#)
- src/[Debug.cpp](#)

4.5 Encoder Class Reference

This class is used to read the encoder and button inputs.

```
#include <Encoder.h>
```

Collaboration diagram for Encoder:



Public Types

- enum [Direction](#) { [NONE](#) , [CW](#) , [CCW](#) }
- enum [ButtonState](#) { [OPEN](#) , [PRESSED](#) }

Public Member Functions

- [Encoder](#) (int [encCLK](#), int [encDT](#), int [encButton](#))
- void [begin](#) ()
This is intended to be called in the [setup\(\)](#) function of the main sketch.
- [Direction](#) [readEncoder](#) ()
Read the encoder and return the direction of the turn. It uses some constants to determine the speed of the turn.
- [ButtonState](#) [readButton](#) ()
This is used to read the state of the button. It also handles debouncing and double-click detection.
- int [handleEncoderDirection](#) (int currentValue, int maxValue, [Direction](#) direction)
This is a helper function to handle the encoder direction.
- bool [isButtonLongPressed](#) ()
Check if the button has been long pressed.
- bool [isButtonDoublePressed](#) ()
Check if the button has been double pressed.
- bool [isButtonSinglePressed](#) ()
Check if the button has been single pressed.
- int [readSpeed](#) ()
Read the speed of the encoder turn.

Private Attributes

- [InputPin](#) [encCLK](#)
- [InputPin](#) [encDT](#)
- [InputPin](#) [encButton](#)
- int [prevStateCLK](#)
- [ButtonState](#) [buttonState](#)
- unsigned long [lastButtonPress](#)
- int [pressCount](#)
- unsigned long [lastTurnTime](#)
- int [speed](#)

Static Private Attributes

- static const unsigned long [DOUBLE_PRESS_INTERVAL](#) = 500
- static const unsigned long [LONG_PRESS_INTERVAL](#) = 1000

4.5.1 Detailed Description

This class is used to read the encoder and button inputs.

4.5.2 Member Enumeration Documentation

4.5.2.1 ButtonState

```
enum Encoder::ButtonState
```

Enumerator

OPEN	
PRESSED	

4.5.2.2 Direction

```
enum Encoder::Direction
```

Enumerator

NONE	
CW	
CCW	

4.5.3 Constructor & Destructor Documentation**4.5.3.1 Encoder()**

```
Encoder::Encoder (
    int encCLK,
    int encDT,
    int encButton )
```

4.5.4 Member Function Documentation**4.5.4.1 begin()**

```
void Encoder::begin ( )
```

This is intended to be called in the [setup\(\)](#) function of the main sketch.

4.5.4.2 handleEncoderDirection()

```
int Encoder::handleEncoderDirection (
    int currentValue,
    int maxValue,
    Direction direction )
```

This is a helper function to handle the encoder direction.

Parameters

<i>currentValue</i>	
<i>maxValue</i>	
<i>direction</i>	

Returns

int

4.5.4.3 isButtonDoublePressed()

```
bool Encoder::isButtonDoublePressed ( )
```

Check if the button has been double pressed.

Returns

true

false

4.5.4.4 isButtonLongPressed()

```
bool Encoder::isButtonLongPressed ( )
```

Check if the button has been long pressed.

Returns

true

false

4.5.4.5 isButtonSinglePressed()

```
bool Encoder::isButtonSinglePressed ( )
```

Check if the button has been single pressed.

Returns

true

false

4.5.4.6 readButton()

```
Encoder::ButtonState Encoder::readButton ( )
```

This is used to read the state of the button. It also handles debouncing and double-click detection.

Returns

[Encoder::ButtonState](#)

4.5.4.7 readEncoder()

```
Encoder::Direction Encoder::readEncoder ( )
```

Read the encoder and return the direction of the turn. It uses some constants to determine the speed of the turn.

TODO: I should probably move the constants to the constructor and make them configurable.

Returns

[Encoder::Direction](#)

4.5.4.8 readSpeed()

```
int Encoder::readSpeed ( )
```

Read the speed of the encoder turn.

Returns

int

4.5.5 Member Data Documentation

4.5.5.1 buttonState

```
ButtonState Encoder::buttonState [private]
```

4.5.5.2 DOUBLE_PRESS_INTERVAL

```
const unsigned long Encoder::DOUBLE_PRESS_INTERVAL = 500 [static], [private]
```

4.5.5.3 encButton

```
InputPin Encoder::encButton [private]
```

4.5.5.4 encCLK

```
InputPin Encoder::encCLK [private]
```

4.5.5.5 encDT

```
InputPin Encoder::encDT [private]
```

4.5.5.6 lastButtonPress

```
unsigned long Encoder::lastButtonPress [private]
```

4.5.5.7 lastTurnTime

```
unsigned long Encoder::lastTurnTime [private]
```

4.5.5.8 LONG_PRESS_INTERVAL

```
const unsigned long Encoder::LONG_PRESS_INTERVAL = 1000 [static], [private]
```

4.5.5.9 pressCount

```
int Encoder::pressCount [private]
```

4.5.5.10 prevStateCLK

```
int Encoder::prevStateCLK [private]
```

4.5.5.11 speed

```
int Encoder::speed [private]
```

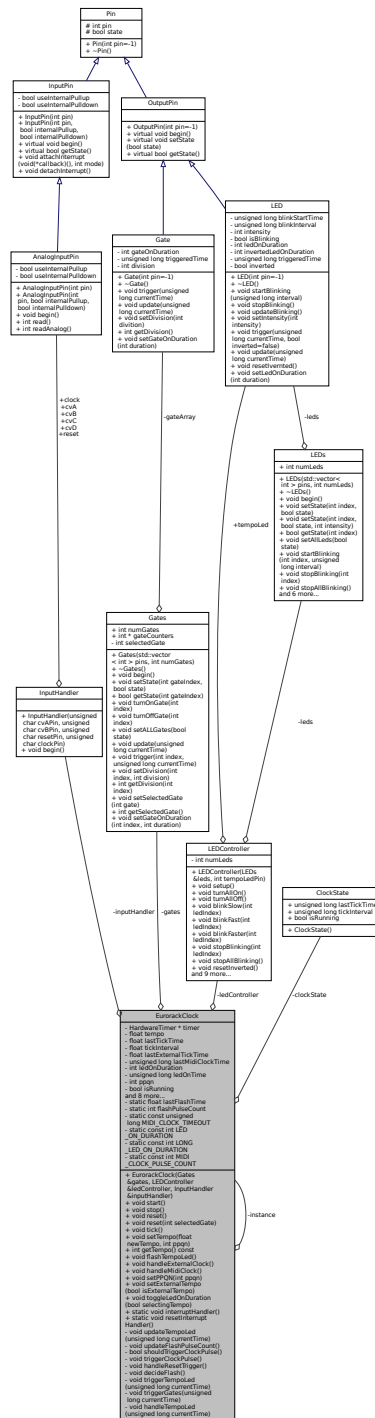
The documentation for this class was generated from the following files:

- [include/Encoder.h](#)
- [src/Encoder.cpp](#)

4.6 EurorackClock Class Reference

The [EurorackClock](#) class is used to handle the clock and tempo of the device. It utilizes an interrupt to handle the clock ticks, and can be set to an external tempo.

```
#include <EurorackClock.h>
```

Public Member Functions

- `EurorackClock (Gates &gates, LEDController &ledController, InputHandler &inputHandler)`
Constructor.
- `void start ()`
This function is used to start the clock.
- `void stop ()`

- This function is used to stop the clock.*

 - void `reset` ()

Reset the clock and gates.
- void `reset` (int selectedGate)

Reset the selected gate. Useful for syncing the gates.
- void `tick` ()

This is the main `tick()` function, which is used to update the clock and its components. Don't confuse this with the `pulse()` function, which is used to trigger a clock pulse.
- void `setTempo` (float newTempo, int ppqn)

This function is used to set the tempo of the clock.
- int `getTempo` () const

This function is used to toggle the clock.
- void `flashTempoLed` ()
- void `handleExternalClock` ()

This function is used to handle the external clock.
- void `handleMidiClock` ()

This function is used to handle the MIDI clock.
- void `setPPQN` (int ppqn)

Update the local ppqn value.
- void `setExternalTempo` (bool isExternalTempo)

sets the external tempo mode when the external clock is used.
- void `toggleLedOnDuration` (bool selectingTempo)

This function is used to toggle how long the `LED` flashes for.

Static Public Member Functions

- static void `interruptHandler` ()
- static void `resetInterruptHandler` ()

Private Member Functions

- void `updateTempoLed` (unsigned long currentTime)

This function is used to flash the tempo `LED` at the correct interval.
- void `updateFlashPulseCount` ()

This function determines if we need to send a trigger or reset them.
- bool `shouldTriggerClockPulse` ()

Evaluate if a clock pulse should be triggered.
- void `triggerClockPulse` ()

This triggers on clock pulses. Not to be confused with the `tick()` function.
- void `handleResetTrigger` ()

Handle the trigger signal from a reset pin.
- void `decideFlash` ()

Check if it's time to flash the `LED`.
- void `triggerTempoLed` (unsigned long currentTime)

Responsible for flashing the tempo `LED`.
- void `triggerGates` (unsigned long currentTime)

tigger the gates and `LEDs`.
- void `handleTempoLed` (unsigned long currentTime)

Used to determine if the tempo `LED` should be flashed according to the clock pulse and defined PPQN.

Private Attributes

- [ClockState](#) clockState
- `HardwareTimer * timer`
- [Gates](#) & [gates](#)
- [LEDController](#) & [ledController](#)
- [InputHandler](#) & [inputHandler](#)
- `float tempo`
- `float lastTickTime`
- `float tickInterval`
- `float lastExternalTickTime`
- `unsigned long lastMidiClockTime`
- `int ledOnDuration = LONG_LED_ON_DURATION`
- `unsigned long ledOnTime = 0`
- `int ppqn`
- `bool isRunning`
- `bool isExternalTempo`
- `bool isMidiClock`
- `bool timeToFlash`
- `bool resetTriggered`
- `float externalTempo`
- `int lastClockState`
- `unsigned long lastClockTime`
- `int tickCount`

Static Private Attributes

- `static EurorackClock * instance = nullptr`
- `static float lastFlashTime = 0`
Static variables initialization.
- `static int flashPulseCount = 0`
- `static const unsigned long MIDI_CLOCK_TIMEOUT = 1000`
- `static const int LED_ON_DURATION = 10`
- `static const int LONG_LED_ON_DURATION = 50`
- `static const int MIDI_CLOCK_PULSE_COUNT = 24`

4.6.1 Detailed Description

The [EurorackClock](#) class is used to handle the clock and tempo of the device. It utilizes an interrupt to handle the clock ticks, and can be set to an external tempo.

4.6.2 Constructor & Destructor Documentation

4.6.2.1 EurorackClock()

```
EurorackClock::EurorackClock (
    Gates & gates,
    LEDController & ledController,
    InputHandler & inputHandler )
```

Constructor.

4.6.3 Member Function Documentation

4.6.3.1 decideFlash()

```
void EurorackClock::decideFlash ( ) [private]
```

Check if it's time to flash the [LED](#).

4.6.3.2 flashTempoLed()

```
void EurorackClock::flashTempoLed ( )
```

4.6.3.3 getTempo()

```
int EurorackClock::getTempo ( ) const
```

This function is used to toggle the clock.

4.6.3.4 handleExternalClock()

```
void EurorackClock::handleExternalClock ( )
```

This function is used to handle the external clock.

4.6.3.5 handleMidiClock()

```
void EurorackClock::handleMidiClock ( )
```

This function is used to handle the MIDI clock.

4.6.3.6 handleResetTrigger()

```
void EurorackClock::handleResetTrigger ( ) [private]
```

Handle the trigger signal from a reset pin.

4.6.3.7 handleTempoLed()

```
void EurorackClock::handleTempoLed (
    unsigned long currentTime ) [private]
```

Used to determine if the tempo LED should be flashed according to the clock pulse and defined PPQN.

4.6.3.8 interruptHandler()

```
static void EurorackClock::interruptHandler ( ) [inline], [static]
```

4.6.3.9 reset() [1/2]

```
void EurorackClock::reset ( )
```

Reset the clock and gates.

4.6.3.10 reset() [2/2]

```
void EurorackClock::reset (
    int selectedGate )
```

Reset the selected gate. Useful for syncing the gates.

Parameters

<i>selectedGate</i>	
---------------------	--

4.6.3.11 resetInterruptHandler()

```
static void EurorackClock::resetInterruptHandler ( ) [inline], [static]
```

4.6.3.12 setExternalTempo()

```
void EurorackClock::setExternalTempo (
    bool isExternalTempo )
```

sets the external tempo mode when the external clock is used.

Parameters

<i>isExternalTempo</i>	
------------------------	--

4.6.3.13 setPPQN()

```
void EurorackClock::setPPQN (
    int ppqn )
```

Update the local ppqn value.

4.6.3.14 setTempo()

```
void EurorackClock::setTempo (
    float newTempo,
    int ppqn )
```

This function is used to set the tempo of the clock.

Parameters

<i>newTempo</i>	The new tempo to set.
<i>ppqn</i>	The PPQN (Pulses Per Quarter Note) to set.

4.6.3.15 shouldTriggerClockPulse()

```
bool EurorackClock::shouldTriggerClockPulse ( ) [private]
```

Evaluate if a clock pulse should be triggered.

Returns

bool shouldTrigger

4.6.3.16 start()

```
void EurorackClock::start ( )
```

This function is used to start the clock.

4.6.3.17 stop()

```
void EurorackClock::stop ( )
```

This function is used to stop the clock.

4.6.3.18 tick()

```
void EurorackClock::tick ( )
```

This is the main [tick\(\)](#) function, which is used to update the clock and its components. Don't confuse this with the [pulse\(\)](#) function, which is used to trigger a clock pulse.

4.6.3.19 toggleLedOnDuration()

```
void EurorackClock::toggleLedOnDuration (
    bool selectingTempo )
```

This function is used to toggle how long the [LED](#) flashes for.

4.6.3.20 triggerClockPulse()

```
void EurorackClock::triggerClockPulse ( ) [private]
```

This triggers on clock pulses. Not to be confused with the [tick\(\)](#) function.

4.6.3.21 triggerGates()

```
void EurorackClock::triggerGates (
    unsigned long currentTime ) [private]
```

tigger the gates and [LEDs](#).

Parameters

<i>currentTime</i>	
--------------------	--

4.6.3.22 triggerTempoLed()

```
void EurorackClock::triggerTempoLed (
    unsigned long currentTime ) [private]
```

Responsible for flashing the tempo [LED](#).

4.6.3.23 updateFlashPulseCount()

```
void EurorackClock::updateFlashPulseCount ( ) [private]
```

This function determines if we need to send a trigger or reset them.

4.6.3.24 updateTempoLed()

```
void EurorackClock::updateTempoLed (
    unsigned long currentTime ) [private]
```

This function is used to flash the tempo [LED](#) at the correct interval.

4.6.4 Member Data Documentation

4.6.4.1 clockState

```
ClockState EurorackClock::clockState [private]
```

4.6.4.2 externalTempo

```
float EurorackClock::externalTempo [private]
```

4.6.4.3 flashPulseCount

```
int EurorackClock::flashPulseCount = 0 [static], [private]
```


4.6.4.4 gates

```
Gates& EurorackClock::gates [private]
```

4.6.4.5 inputHandler

```
InputHandler& EurorackClock::inputHandler [private]
```

4.6.4.6 instance

```
EurorackClock * EurorackClock::instance = nullptr [static], [private]
```

4.6.4.7 isExternalTempo

```
bool EurorackClock::isExternalTempo [private]
```

4.6.4.8 isMidiClock

```
bool EurorackClock::isMidiClock [private]
```

4.6.4.9 isRunning

```
bool EurorackClock::isRunning [private]
```

4.6.4.10 lastClockState

```
int EurorackClock::lastClockState [private]
```

4.6.4.11 lastClockTime

```
unsigned long EurorackClock::lastClockTime [private]
```

4.6.4.12 lastExternalTickTime

```
float EurorackClock::lastExternalTickTime [private]
```

4.6.4.13 lastFlashTime

```
float EurorackClock::lastFlashTime = 0 [static], [private]
```

Static variables initialization.

4.6.4.14 lastMidiClockTime

```
unsigned long EurorackClock::lastMidiClockTime [private]
```

4.6.4.15 lastTickTime

```
float EurorackClock::lastTickTime [private]
```

4.6.4.16 LED_ON_DURATION

```
const int EurorackClock::LED_ON_DURATION = 10 [static], [private]
```

4.6.4.17 ledController

```
LEDController& EurorackClock::ledController [private]
```

4.6.4.18 ledOnDuration

```
int EurorackClock::ledOnDuration = LONG_LED_ON_DURATION [private]
```

4.6.4.19 ledOnTime

```
unsigned long EurorackClock::ledOnTime = 0 [private]
```

4.6.4.20 LONG_LED_ON_DURATION

```
const int EurorackClock::LONG_LED_ON_DURATION = 50 [static], [private]
```

4.6.4.21 MIDI_CLOCK_PULSE_COUNT

```
const int EurorackClock::MIDI_CLOCK_PULSE_COUNT = 24 [static], [private]
```

4.6.4.22 MIDI_CLOCK_TIMEOUT

```
const unsigned long EurorackClock::MIDI_CLOCK_TIMEOUT = 1000 [static], [private]
```

4.6.4.23 ppqn

```
int EurorackClock::ppqn [private]
```

4.6.4.24 resetTriggered

```
bool EurorackClock::resetTriggered [private]
```

4.6.4.25 tempo

```
float EurorackClock::tempo [private]
```

4.6.4.26 tickCount

```
int EurorackClock::tickCount [private]
```

4.6.4.27 tickInterval

```
float EurorackClock::tickInterval [private]
```

4.6.4.28 timer

```
HardwareTimer* EurorackClock::timer [private]
```

4.6.4.29 timeToFlash

```
bool EurorackClock::timeToFlash [private]
```

The documentation for this class was generated from the following files:

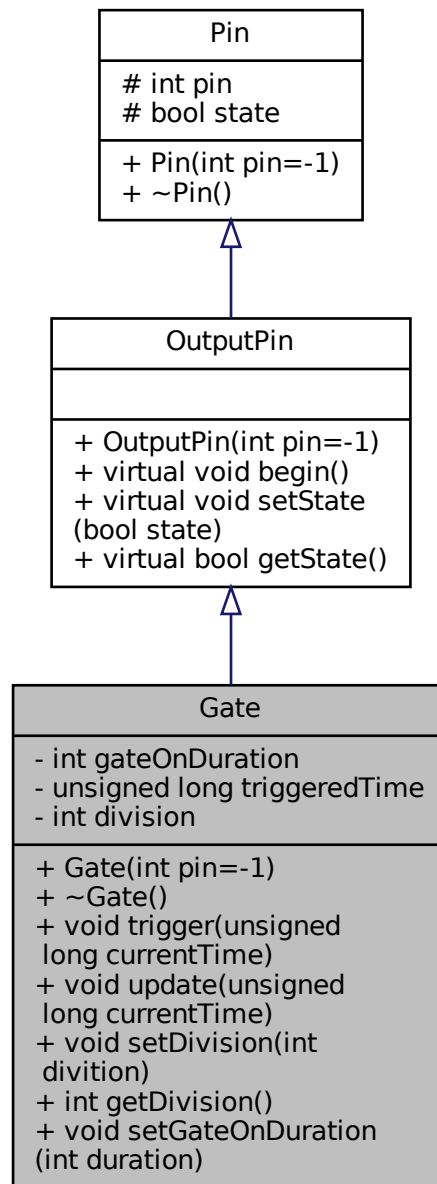
- [include/EurorackClock.h](#)
- [src/EurorackClock.cpp](#)

4.7 Gate Class Reference

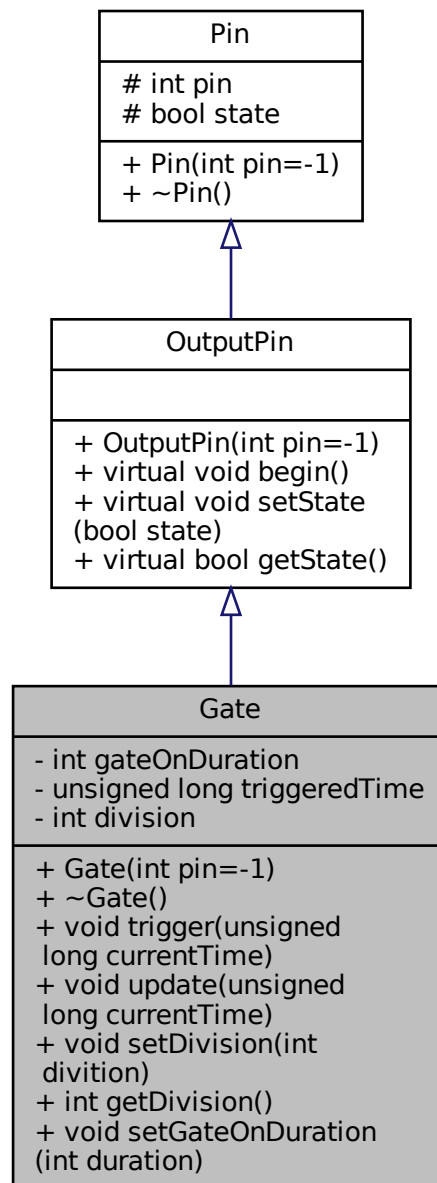
This class defines what a gate is and how it should behave. It inherits from the [OutputPin](#) class, which provides the basic functionality for a pin including setting state to HIGH or LOW, getting the current state, etc.

```
#include <Gate.h>
```

Inheritance diagram for Gate:



Collaboration diagram for Gate:



Public Member Functions

- [Gate](#) (int [pin](#)=-1)

Constructor.

- [~Gate](#) ()

Destructor.

- void [trigger](#) (unsigned long [currentTime](#))

This function is used to execute a trigger signal. It sets the state of the gate to HIGH and records the time of the trigger. Then, the gate will automatically turn off after the `gateOnDuration` has passed.

- void [update](#) (unsigned long currentTime)

This function is used to update the state of the gate. If the gate is currently HIGH and the gateOnDuration has passed, the gate will be turned off. It is meant to be called in every loop iteration.

- void [setDivision](#) (int division)

This function is used to set the division of the gate.

- int [getDivision](#) ()

Returns the division configured for the gate.

- void [setGateOnDuration](#) (int duration)

This function is used to set the duration of the gate being on.

Private Attributes

- int [gateOnDuration](#) = 10
- unsigned long [triggeredTime](#) = 0
- int [division](#) = [internalPPQN](#)

Additional Inherited Members

4.7.1 Detailed Description

This class defines what a gate is and how it should behave. It inherits from the [OutputPin](#) class, which provides the basic functionality for a pin including setting state to HIGH or LOW, getting the current state, etc.

4.7.2 Constructor & Destructor Documentation

4.7.2.1 Gate()

```
Gate::Gate (
    int pin = -1 )
```

Constructor.

4.7.2.2 ~Gate()

```
Gate::~~Gate ( )
```

Destructor.

4.7.3 Member Function Documentation

4.7.3.1 getDivision()

```
int Gate::getDivision ( )
```

Returns the division configured for the gate.

Returns

int

4.7.3.2 setDivision()

```
void Gate::setDivision (
    int newDivision )
```

This function is used to set the division of the gate.

Parameters

<i>newDivision</i>	
--------------------	--

4.7.3.3 setGateOnDuration()

```
void Gate::setGateOnDuration (
    int duration )
```

This function is used to set the duration of the gate being on.

Parameters

<i>duration</i>	
-----------------	--

4.7.3.4 trigger()

```
void Gate::trigger (
    unsigned long currentTime )
```

This function is used to execute a trigger signal. It sets the state of the gate to HIGH and records the time of the trigger. Then, the gate will automatically turn off after the gateOnDuration has passed.

Parameters

<i>currentTime</i>	
--------------------	--

4.7.3.5 update()

```
void Gate::update (
    unsigned long currentTime )
```

This function is used to update the state of the gate. If the gate is currently HIGH and the `gateOnDuration` has passed, the gate will be turned off. It is meant to be called in every loop iteration.

Parameters

<i>currentTime</i>	
--------------------	--

4.7.4 Member Data Documentation

4.7.4.1 division

```
int Gate::division = internalPPQN [private]
```

4.7.4.2 gateOnDuration

```
int Gate::gateOnDuration = 10 [private]
```

4.7.4.3 triggeredTime

```
unsigned long Gate::triggeredTime = 0 [private]
```

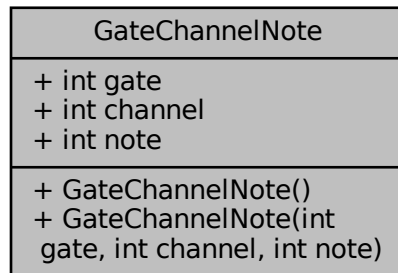
The documentation for this class was generated from the following files:

- [include/Gate.h](#)
- [src/Gate.cpp](#)

4.8 GateChannelNote Struct Reference

```
#include <AppState.h>
```

Collaboration diagram for GateChannelNote:



Public Member Functions

- [GateChannelNote](#) ()
- [GateChannelNote](#) (int [gate](#), int [channel](#), int [note](#))

Public Attributes

- int [gate](#)
- int [channel](#)
- int [note](#)

4.8.1 Constructor & Destructor Documentation

4.8.1.1 GateChannelNote() [1/2]

```
GateChannelNote::GateChannelNote ( ) [inline]
```

4.8.1.2 GateChannelNote() [2/2]

```
GateChannelNote::GateChannelNote (
    int gate,
    int channel,
    int note ) [inline]
```

4.8.2 Member Data Documentation

4.8.2.1 channel

```
int GateChannelNote::channel
```

4.8.2.2 gate

```
int GateChannelNote::gate
```

4.8.2.3 note

```
int GateChannelNote::note
```

The documentation for this struct was generated from the following file:

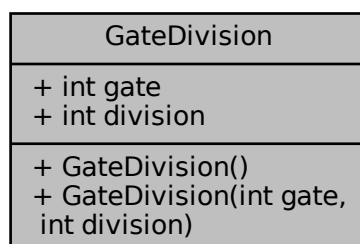
- include/[AppState.h](#)

4.9 GateDivision Struct Reference

This is a global struct that holds the state of the application. It mainly holds items that need to persist after a power cycle. The object is initialized managed by the [StateManager](#) class.

```
#include <AppState.h>
```

Collaboration diagram for GateDivision:



Public Member Functions

- [GateDivision](#) ()
- [GateDivision](#) (int [gate](#), int [division](#))

Public Attributes

- int [gate](#)
- int [division](#)

4.9.1 Detailed Description

This is a global struct that holds the state of the application. It mainly holds items that need to persist after a power cycle. The object is initialized managed by the [StateManager](#) class.

The default values are set in the [StateManager](#) class, in the `initializeEEPROM()` function. To avoid issues with the EEPROM memory, make sure you initialize all values in the [StateManager](#) class.

This object is updated through out the app, however saving to EEPROM is only done when the app is in mode selection mode. It saves when long pressing and also when the mode is successfully changed.

4.9.2 Constructor & Destructor Documentation

4.9.2.1 GateDivision() [1/2]

```
GateDivision::GateDivision ( ) [inline]
```

4.9.2.2 GateDivision() [2/2]

```
GateDivision::GateDivision (
    int gate,
    int division ) [inline]
```

4.9.3 Member Data Documentation

4.9.3.1 division

```
int GateDivision::division
```

4.9.3.2 gate

```
int GateDivision::gate
```

The documentation for this struct was generated from the following file:

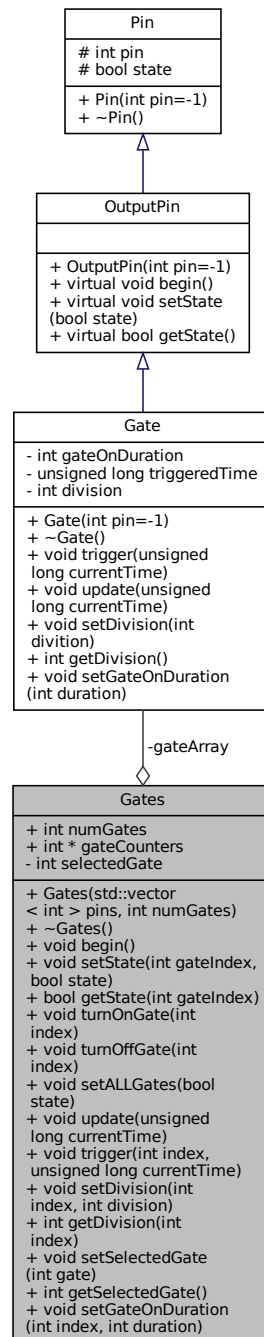
- include/[AppState.h](#)

4.10 Gates Class Reference

This is a collection of gates and thus the main thing we are working with in this project. Very rarely will you need to interact with the [Gate](#) class directly, as most of the functionality is handled by the [Gates](#) class.

```
#include <Gates.h>
```

Collaboration diagram for Gates:



Public Member Functions

- **Gates** (std::vector< int > pins, int numGates)
Construct a new **Gates:: Gates** object.
- **~Gates** ()
Destroy the **Gates:: Gates** object.
- void **begin** ()

This is intended to be called in the [setup\(\)](#) function of the main sketch. It mainly initializes the pins for the gates as outputs.

- void [setState](#) (int gateIndex, bool state)

This function is used to set the state of a specific gate. State is either HIGH or LOW.

- bool [getState](#) (int gateIndex)

This function is used to get the state of a specific gate.

- void [turnOnGate](#) (int index)

This function is used to turn on a specific gate.

- void [turnOffGate](#) (int index)

This function is used to turn off a specific gate.

- void [setALLGates](#) (bool state)

This function is sets the state of all gates.

- void [update](#) (unsigned long currentTime)

This is used to update the state of the gates. It is meant to be called in every loop iteration. It is needed in order to evaluate if the gate should be turned off.

- void [trigger](#) (int index, unsigned long currentTime)

This function is used to start a trigger signal on a specific gate. The gate will automatically turn off after the gateOnDuration has passed. Which is why the currentTime is needed.

- void [setDivision](#) (int index, int division)

This method is used to set the division of a specific gate.

- int [getDivision](#) (int index)

This function returns the division of a specific gate.

- void [setSelectedGate](#) (int gate)

This is a helper function used when working with a specific gate.

- int [getSelectedGate](#) ()

returns the selected gate.

- void [setGateOnDuration](#) (int index, int duration)

Sets the duration of the gate being on when sending trigger signals.

Public Attributes

- int [numGates](#)
- int * [gateCounters](#)

Private Attributes

- [Gate](#) * [gateArray](#)
- int [selectedGate](#)

4.10.1 Detailed Description

This is a collection of gates and thus the main thing we are working with in this project. Very rarely will you need to interact with the [Gate](#) class directly, as most of the functionality is handled by the [Gates](#) class.

4.10.2 Constructor & Destructor Documentation

4.10.2.1 Gates()

```
Gates::Gates (
    std::vector< int > pins,
    int numGates )
```

Construct a new [Gates:: Gates](#) object.

Parameters

<i>pins</i>	
<i>numGates</i>	

4.10.2.2 ~Gates()

```
Gates::~~Gates ( )
```

Destroy the [Gates::Gates](#) object.

4.10.3 Member Function Documentation**4.10.3.1 begin()**

```
void Gates::begin ( )
```

This is intended to be called in the [setup\(\)](#) function of the main sketch. It mainly initializes the pins for the gates as outputs.

4.10.3.2 getDivision()

```
int Gates::getDivision (
    int index )
```

This function returns the division of a specific gate.

Parameters

<i>index</i>	
--------------	--

Returns

int

4.10.3.3 getSelectedGate()

```
int Gates::getSelectedGate ( )
```

returns the selected gate.

Returns

int

4.10.3.4 getState()

```
bool Gates::getState (
    int gateIndex )
```

This function is used to get the state of a specific gate.

Parameters

<i>gateIndex</i>	
------------------	--

Returns

state of the gate as a boolean

4.10.3.5 setALLGates()

```
void Gates::setALLGates (
    bool state )
```

This function is sets the satet of all gates.

Parameters

<i>state</i>	
--------------	--

4.10.3.6 setDivision()

```
void Gates::setDivision (
    int index,
    int division )
```

This method is used to se the division of a specific gate.

Parameters

<i>index</i>	
<i>division</i>	

4.10.3.7 setGateOnDuration()

```
void Gates::setGateOnDuration (
    int index,
    int duration )
```

Sets the duration of the gate being on when sending trigger signals.

Parameters

<i>index</i>	
<i>duration</i>	

4.10.3.8 setSelectedGate()

```
void Gates::setSelectedGate (
    int index )
```

This is a helper function used when working with a specific gate.

Parameters

<i>index</i>	
--------------	--

4.10.3.9 setState()

```
void Gates::setState (
    int gateIndex,
    bool state )
```

This function is used to set the state of a specific gate. State is either HIGH or LOW.

Parameters

<i>gateIndex</i>	
<i>state</i>	

4.10.3.10 trigger()

```
void Gates::trigger (
```

```
int index,  
unsigned long currentTime )
```

This function is used to start a trigger signal on a specific gate. The gate will automatically turn off after the gate↔ OnDuration has passed. Which is why the currentTime is needed.

Parameters

<i>index</i>	
<i>currentTime</i>	

4.10.3.11 turnOffGate()

```
void Gates::turnOffGate (  
    int index )
```

This function is used to turn off a specific gate.

Parameters

<i>index</i>	
--------------	--

4.10.3.12 turnOnGate()

```
void Gates::turnOnGate (  
    int index )
```

This function is used to turn on a specific gate.

Parameters

<i>index</i>	
--------------	--

4.10.3.13 update()

```
void Gates::update (  
    unsigned long currentTime )
```

This is used to update the state of the gates. It is meant to be called in every loop iteration. It is needed in order to evaluate if the gate should be turned off.

Parameters

<i>currentTime</i>	
--------------------	--

4.10.4 Member Data Documentation

4.10.4.1 gateArray

```
Gate* Gates::gateArray [private]
```

4.10.4.2 gateCounters

```
int* Gates::gateCounters
```

4.10.4.3 numGates

```
int Gates::numGates
```

4.10.4.4 selectedGate

```
int Gates::selectedGate [private]
```

The documentation for this class was generated from the following files:

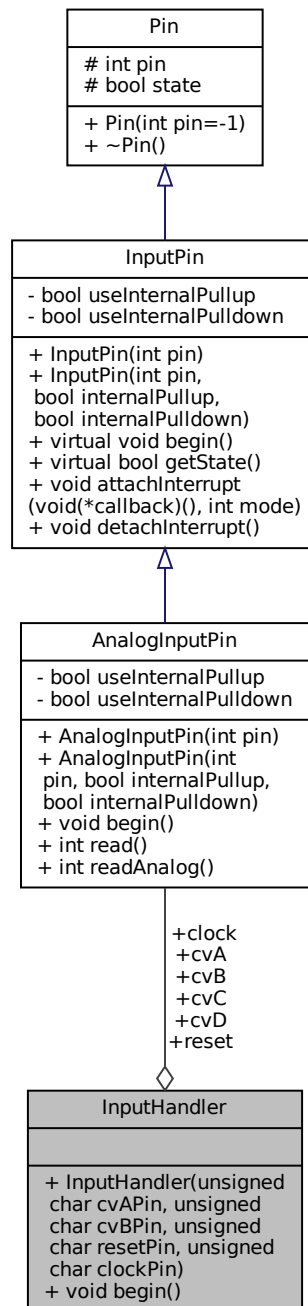
- [include/Gates.h](#)
- [src/Gates.cpp](#)

4.11 InputHandler Class Reference

This class is used to read the CV inputs. It is a simple class that uses the [AnalogInputPin](#) class to read the CV inputs. Alias the reset and clock inputs to cvC and cvD respectively. cvC is the reset input and cvD is the clock input.

```
#include <InputHandler.h>
```

Collaboration diagram for InputHandler:



Public Member Functions

- [InputHandler](#) (unsigned char cvAPin, unsigned char cvBPin, unsigned char resetPin, unsigned char clockPin)
Construct a new Input Handler:: Input Handler object.
- void [begin](#) ()
This is intended to be called in the [setup\(\)](#) function of the main sketch. It initializes the CV inputs.

Public Attributes

- [AnalogInputPin](#) cvA
- [AnalogInputPin](#) cvB
- [AnalogInputPin](#) cvC
- [AnalogInputPin](#) cvD
- [AnalogInputPin](#) & reset = cvC
- [AnalogInputPin](#) & clock = cvD

4.11.1 Detailed Description

This class is used to read the CV inputs. It is a simple class that uses the [AnalogInputPin](#) class to read the CV inputs. Alias the reset and clock inputs to cvC and cvD respectively. cvC is the reset input and cvD is the clock input.

4.11.2 Constructor & Destructor Documentation

4.11.2.1 InputHandler()

```
InputHandler::InputHandler (
    unsigned char cvAPin,
    unsigned char cvBPin,
    unsigned char resetPin,
    unsigned char clockPin )
```

Construct a new Input Handler:: Input Handler object.

Parameters

<i>cvAPin</i>	
<i>cvBPin</i>	

4.11.3 Member Function Documentation

4.11.3.1 begin()

```
void InputHandler::begin ( )
```

This is intended to be called in the [setup\(\)](#) function of the main sketch. It initializes the CV inputs.

4.11.4 Member Data Documentation

4.11.4.1 clock

```
AnalogInputPin& InputHandler::clock = cvD
```

4.11.4.2 cvA

```
AnalogInputPin InputHandler::cvA
```

4.11.4.3 cvB

```
AnalogInputPin InputHandler::cvB
```

4.11.4.4 cvC

```
AnalogInputPin InputHandler::cvC
```

4.11.4.5 cvD

```
AnalogInputPin InputHandler::cvD
```

4.11.4.6 reset

```
AnalogInputPin& InputHandler::reset = cvC
```

The documentation for this class was generated from the following files:

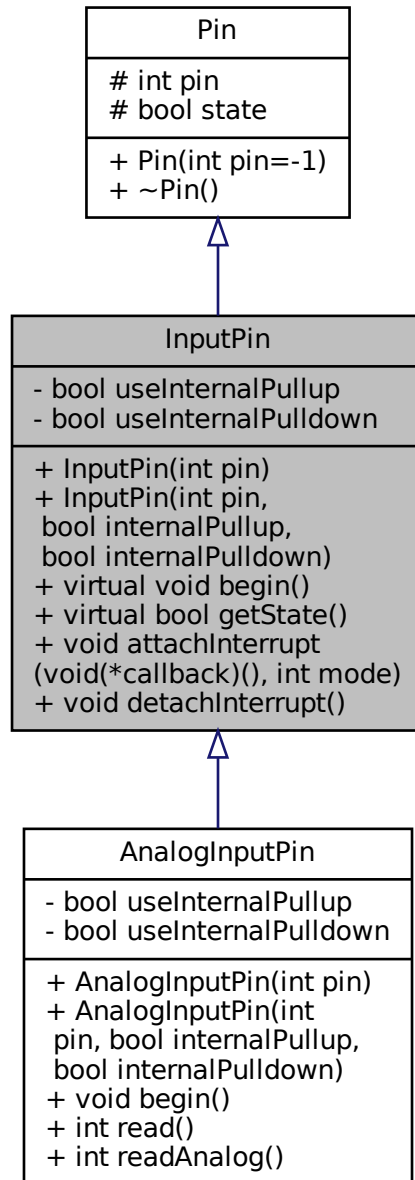
- [include/InputHandler.h](#)
- [src/InputHandler.cpp](#)

4.12 InputPin Class Reference

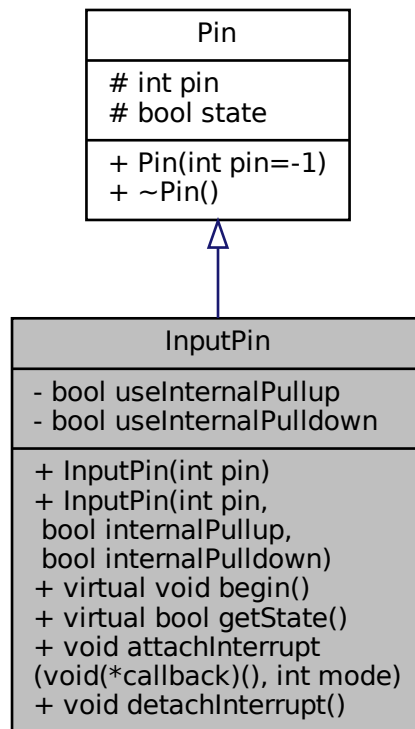
This class represents an input pin on the microcontroller.

```
#include <Pin.h>
```

Inheritance diagram for InputPin:



Collaboration diagram for InputPin:



Public Member Functions

- [InputPin](#) (int [pin](#))
Construct a new [Input Pin](#):: [Input Pin](#) object This constructor initializes the pin and sets the internal pullup and pulldown flags to false. Use this constructor if you do not want to use the internal pullup or pulldown resistors.
- [InputPin](#) (int [pin](#), bool internalPullup, bool internalPulldown)
Construct a new [Input Pin](#):: [Input Pin](#) object This constructor initializes the pin and sets the internal pullup and pulldown flags to the specified values. Use this constructor if you want to use the internal pullup or pulldown resistors.
- virtual void [begin](#) ()
This function is used to initialize the input pin. It is intended to be called in the [setup\(\)](#) function of the main sketch. However, we don't call it directly, instead we use the [begin\(\)](#) function of the derived classes.
- virtual bool [getState](#) ()
This function is used to read the state of the input pin.
- void [attachInterrupt](#) (void(*callback)(), int mode)
This function is used to attach an interrupt to the input pin.
- void [detachInterrupt](#) ()
This function is used to detach an interrupt from the input pin.

Private Attributes

- bool [useInternalPullup](#)
- bool [useInternalPulldown](#)

Additional Inherited Members

4.12.1 Detailed Description

This class represents an input pin on the microcontroller.

4.12.2 Constructor & Destructor Documentation

4.12.2.1 InputPin() [1/2]

```
InputPin::InputPin (
    int pin )
```

Construct a new Input [Pin](#):: Input [Pin](#) object This constructor initializes the pin and sets the internal pullup and pulldown flags to false. Use this constructor if you do not want to use the internal pullup or pulldown resistors.

Parameters

<i>pin</i>	
------------	--

4.12.2.2 InputPin() [2/2]

```
InputPin::InputPin (
    int pin,
    bool internalPullup,
    bool internalPulldown )
```

Construct a new Input [Pin](#):: Input [Pin](#) object This constructor initializes the pin and sets the internal pullup and pulldown flags to the specified values. Use this constructor if you want to use the internal pullup or pulldown resistors.

Parameters

<i>pin</i>	
<i>internalPullup</i>	
<i>internalPulldown</i>	

4.12.3 Member Function Documentation

4.12.3.1 attachInterrupt()

```
void InputPin::attachInterrupt (
    void(*)() callback,
    int mode )
```

This function is used to attach an interrupt to the input pin.

Parameters

<i>callback</i>	
<i>mode</i>	

4.12.3.2 begin()

```
void InputPin::begin ( ) [virtual]
```

This function is used to initialize the input pin. It is intended to be called in the [setup\(\)](#) function of the main sketch. However, we don't call it directly, instead we use the [begin\(\)](#) function of the derived classes.

Reimplemented in [AnalogInputPin](#).

4.12.3.3 detachInterrupt()

```
void InputPin::detachInterrupt ( )
```

This function is used to detach an interrupt from the input pin.

4.12.3.4 getState()

```
bool InputPin::getState ( ) [virtual]
```

This function is used to read the state of the input pin.

Returns

bool

4.12.4 Member Data Documentation

4.12.4.1 useInternalPulldown

```
bool InputPin::useInternalPulldown [private]
```

4.12.4.2 useInternalPullup

```
bool InputPin::useInternalPullup [private]
```

The documentation for this class was generated from the following files:

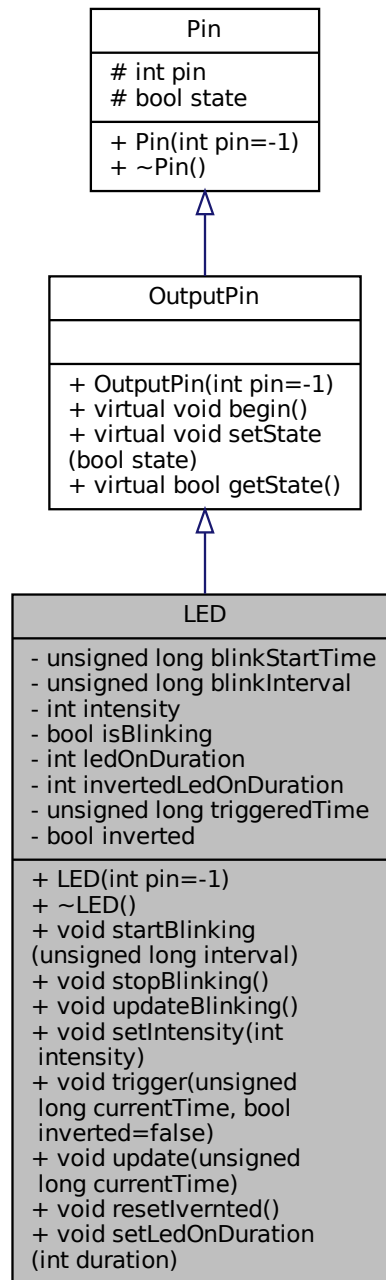
- include/[Pin.h](#)
- src/[Pin.cpp](#)

4.13 LED Class Reference

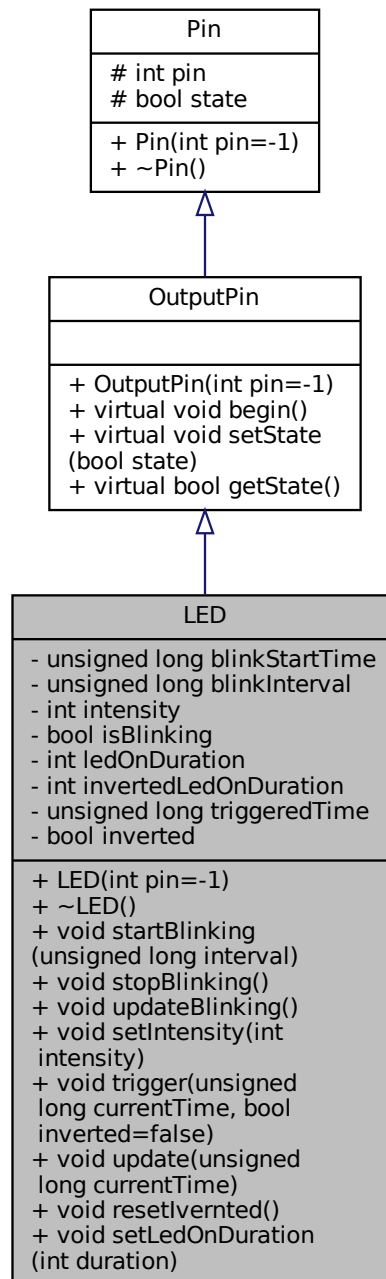
This class defines what an [LED](#) is and how it should behave.

```
#include <LED.h>
```

Inheritance diagram for LED:



Collaboration diagram for LED:



Public Member Functions

- `LED (int pin=-1)`
Constructor.
- `~LED ()`
Destructor.
- `void startBlinking (unsigned long interval)`

This function is used to start blinking the [LED](#). The [LED](#)'s blink based on the interval provided. The blinking is then updated in the [updateBlinking\(\)](#) function.

- void [stopBlinking](#) ()

This function is used to stop the [LED](#) from blinking.

- void [updateBlinking](#) ()

This function is used to update the blinking of the [LED](#). It is meant to be called in every loop iteration.

- void [setIntensity](#) (int [intensity](#))

Set the intensity of the [LED](#). I'm 99% sure I'm not actually using this but it is here for future use.

- void [trigger](#) (unsigned long [currentTime](#), bool [inverted](#)=false)

This function is used to trigger the [LED](#). The [LED](#) will stay on for [ledOnDuration](#) milliseconds.

- void [update](#) (unsigned long [currentTime](#))

This function is used to update the state of the [LED](#). It is meant to be called in every loop iteration.

- void [resetInverted](#) ()

This function is used to reset the inverted state of the [LED](#). The inverted state is used to determine is used to provide a visual feedback when the gate/LED is selected.

- void [setLedOnDuration](#) (int [duration](#))

This function is used to set the duration that the [LED](#) should stay on.

Private Attributes

- unsigned long [blinkStartTime](#)
- unsigned long [blinkInterval](#)
- int [intensity](#) = 255
- bool [isBlinking](#)
- int [ledOnDuration](#) = 25
- int [invertedLedOnDuration](#) = 40
- unsigned long [triggeredTime](#) = 0
- bool [inverted](#) = false

Additional Inherited Members

4.13.1 Detailed Description

This class defines what an [LED](#) is and how it should behave.

4.13.2 Constructor & Destructor Documentation

4.13.2.1 LED()

```
LED::LED (
    int pin = -1 )
```

Constructor.

4.13.2.2 ~LED()

```
LED::~~LED ( )
```

Destructor.

4.13.3 Member Function Documentation

4.13.3.1 resetIvernted()

```
void LED::resetIvernted ( )
```

This function is used to reset the inverted state of the [LED](#). The inverted state is used to determine is used to provide a visual feedback when the gate/LED is selected.

4.13.3.2 setIntensity()

```
void LED::setIntensity (
    int intensity )
```

Set the intensity of the [LED](#). I'm 99% sure I'm not actually using this but it is here for future use.

Parameters

<i>intensity</i>	
------------------	--

4.13.3.3 setLedOnDuration()

```
void LED::setLedOnDuration (
    int duration )
```

This function is used to set the duration that the [LED](#) should stay on.

Parameters

<i>duration</i>	
-----------------	--

4.13.3.4 startBlinking()

```
void LED::startBlinking (
    unsigned long interval )
```

This function is used to start blinking the [LED](#). The [LED](#)'s blink based on the interval provided. The blinking is then updated in the [updateBlinking\(\)](#) function.

Parameters

<i>interval</i>	
-----------------	--

4.13.3.5 stopBlinking()

```
void LED::stopBlinking ( )
```

This function is used to stop the [LED](#) from blinking.

4.13.3.6 trigger()

```
void LED::trigger (
    unsigned long currentTime,
    bool inverted = false )
```

This function is used to trigger the [LED](#). The [LED](#) will stay on for `ledOnDuration` milliseconds.

Parameters

<i>currentTime</i>	
<i>inverted</i>	

4.13.3.7 update()

```
void LED::update (
    unsigned long currentTime )
```

This function is used to update the state of the [LED](#). It is meant to be called in every loop iteration.

Parameters

<i>currentTime</i>	
--------------------	--

4.13.3.8 updateBlinking()

```
void LED::updateBlinking ( )
```

This function is used to update the blinking of the [LED](#). It is meant to be called in every loop iteration.

4.13.4 Member Data Documentation

4.13.4.1 blinkInterval

```
unsigned long LED::blinkInterval [private]
```

4.13.4.2 blinkStartTime

```
unsigned long LED::blinkStartTime [private]
```

4.13.4.3 intensity

```
int LED::intensity = 255 [private]
```

4.13.4.4 inverted

```
bool LED::inverted = false [private]
```

4.13.4.5 invertedLedOnDuration

```
int LED::invertedLedOnDuration = 40 [private]
```

4.13.4.6 isBlinking

```
bool LED::isBlinking [private]
```

4.13.4.7 ledOnDuration

```
int LED::ledOnDuration = 25 [private]
```

4.13.4.8 triggeredTime

```
unsigned long LED::triggeredTime = 0 [private]
```

The documentation for this class was generated from the following files:

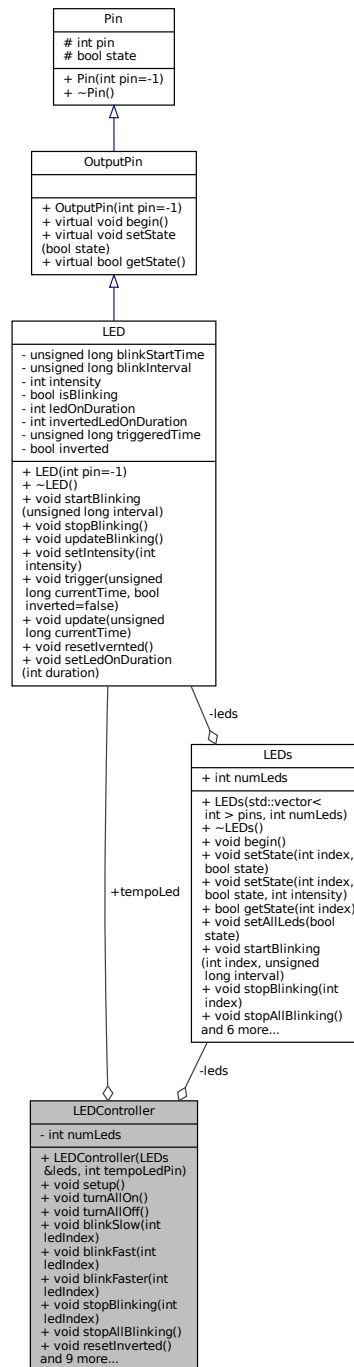
- include/[LED.h](#)
- src/[LED.cpp](#)

4.14 LEDController Class Reference

This class is used as the main interface for controlling the [LEDs](#).

```
#include <LEDController.h>
```

Collaboration diagram for LEDController:



Public Member Functions

- `LEDController(LEDs &leds, int tempoLedPin)`

Construct a new `LED` Controller:: `LED` Controller object. By default, all `LEDs` are turned off.

- `void setup()`

This function is used to setup the `LED` controller. It is meant to be called in the `setup()` function of the main sketch.

- `void turnAllOn()`

- This function is used to turn all [LEDs](#) on.*

 - void [turnAllOff](#) ()
- This function is used to turn all [LEDs](#) off.*

 - void [blinkSlow](#) (int ledIndex)
- This function is used to start blinking an [LED](#) at a slow rate.*

 - void [blinkFast](#) (int ledIndex)
- This function is used to start blinking an [LED](#) at a fast rate.*

 - void [blinkFaster](#) (int ledIndex)
- This function is used to start blinking an [LED](#) at a faster rate.*

 - void [stopBlinking](#) (int ledIndex)
- This function is used to stop blinking an [LED](#).*

 - void [stopAllBlinking](#) ()
- This function is used to stop all [LEDs](#) from blinking.*

 - void [resetInverted](#) ()
- This function is used to reset the inverted state of all [LEDs](#).*

 - void [resetInverted](#) (int ledIndex)
- This function is used to reset the inverted state of a specific [LED](#).*

 - int [getNumLeds](#) ()
- returns the total number of [LEDs](#) in the [LED](#) array.*

 - void [update](#) ()
- This function updates the [LEDs](#). It is meant to be called in every loop iteration.*

 - void [update](#) (unsigned long currentTime)
- This function updates the [LEDs](#). It is meant to be called in every loop iteration.*

 - void [clearAndResetLEDs](#) ()
- Helper function to clear and reset all [LEDs](#).*

 - void [clearLEDs](#) ()
- Helper function to clear all [LEDs](#).*

 - void [updateBlinking](#) ()
- This function is used to update the blinking of the [LED](#). It is meant to be called in every loop iteration.*

 - void [setState](#) (int ledIndex, bool state)
- This function is used to set the state of an [LED](#).*

 - void [trigger](#) (int index, unsigned long currentTime, bool inverted=false)
- This function is used to trigger an [LED](#). The [LED](#) will stay on for ledOnDuration milliseconds.*

Public Attributes

- [LED tempoLed](#)

Private Attributes

- [LEDs & leds](#)
- int [numLeds](#)

4.14.1 Detailed Description

This class is used as the main interface for controlling the [LEDs](#).

4.14.2 Constructor & Destructor Documentation

4.14.2.1 LEDController()

```
LEDController::LEDController (
    LEDs & leds,
    int tempoLedPin )
```

Construct a new LED Controller:: LED Controller object. By default, all LEDs are turned off.

Parameters

<i>leds</i>	
-------------	--

4.14.3 Member Function Documentation

4.14.3.1 blinkFast()

```
void LEDController::blinkFast (
    int ledIndex )
```

This function is used to start blinking an LED at a fast rate.

Parameters

<i>ledIndex</i>	
-----------------	--

4.14.3.2 blinkFaster()

```
void LEDController::blinkFaster (
    int ledIndex )
```

This function is used to start blinking an LED at a faster rate.

Parameters

<i>ledIndex</i>	
-----------------	--

4.14.3.3 blinkSlow()

```
void LEDController::blinkSlow (
    int ledIndex )
```

This function is used to start blinking an [LED](#) at a slow rate.

Parameters

<i>ledIndex</i>	
-----------------	--

4.14.3.4 clearAndResetLEDs()

```
void LEDController::clearAndResetLEDs ( )
```

Helper function to clear and reset all [LEDs](#).

4.14.3.5 clearLEDs()

```
void LEDController::clearLEDs ( )
```

Helper function to clear all [LEDs](#).

4.14.3.6 getNumLeds()

```
int LEDController::getNumLeds ( )
```

returns the total number of [LEDs](#) in the [LED](#) array.

Returns

int

4.14.3.7 resetInverted() [1/2]

```
void LEDController::resetInverted ( )
```

This function is used to reset the inverted state of all [LEDs](#).

4.14.3.8 resetInverted() [2/2]

```
void LEDController::resetInverted (
    int ledIndex )
```

This function is used to reset the inverted state of a specific [LED](#).

Parameters

<i>ledIndex</i>	
-----------------	--

4.14.3.9 setState()

```
void LEDController::setState (
    int ledIndex,
    bool state )
```

This function is used to set the state of an [LED](#).

Parameters

<i>ledIndex</i>	
<i>state</i>	

4.14.3.10 setup()

```
void LEDController::setup ( )
```

This function is used to setup the [LED](#) controller. It is meant to be called in the [setup\(\)](#) function of the main sketch.

4.14.3.11 stopAllBlinking()

```
void LEDController::stopAllBlinking ( )
```

This function is used to stop all [LEDs](#) from blinking.

4.14.3.12 stopBlinking()

```
void LEDController::stopBlinking (
    int ledIndex )
```

This function is used to stop blinking an [LED](#).

Parameters

<i>ledIndex</i>	
-----------------	--

4.14.3.13 trigger()

```
void LEDController::trigger (
    int index,
    unsigned long currentTime,
    bool inverted = false )
```

This function is used to trigger an LED. The LED will stay on for ledOnDuration milliseconds.

Parameters

<i>index</i>	
<i>currentTime</i>	
<i>inverted</i>	

4.14.3.14 turnAllOff()

```
void LEDController::turnAllOff ( )
```

This function is used to turn all LEDs off.

4.14.3.15 turnAllOn()

```
void LEDController::turnAllOn ( )
```

This function is used to turn all LEDs on.

4.14.3.16 update() [1/2]

```
void LEDController::update ( )
```

This function updates the LEDs. It is meant to be called in every loop iteration.

4.14.3.17 update() [2/2]

```
void LEDController::update (
    unsigned long currentTime )
```

This function updates the LEDs. It is meant to be called in every loop iteration.

Parameters

<i>currentTime</i>	
--------------------	--

4.14.3.18 updateBlinking()

```
void LEDController::updateBlinking ( )
```

This function is used to update the blinking of the [LED](#). It is meant to be called in every loop iteration.

4.14.4 Member Data Documentation**4.14.4.1 leds**

```
LEDs& LEDController::leds [private]
```

4.14.4.2 numLeds

```
int LEDController::numLeds [private]
```

4.14.4.3 tempoLed

```
LED LEDController::tempoLed
```

The documentation for this class was generated from the following files:

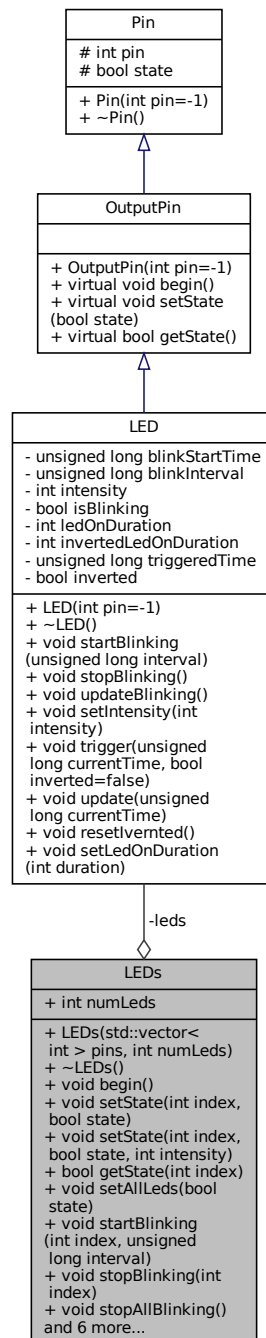
- include/[LEDController.h](#)
- src/[LEDController.cpp](#)

4.15 LEDs Class Reference

This is a collection of [LEDs](#) and mainly used by the [LEDController](#) class. Use that if you need to interact with the [LEDs](#).

```
#include <LEDs.h>
```

Collaboration diagram for LEDs:



Public Member Functions

- [LEDs](#) (std::vector< int > [pins](#), int [numLeds](#))

Constructor.

- [~LEDs](#) ()

Destructor.

- void [begin](#) ()

This function is used to initialize the pins for the [LEDs](#) as outputs. It is intended to be called in the [setup\(\)](#) function of the main sketch.

- void [setState](#) (int index, bool state)

This function is used to set the state of a specific [LED](#). Possible states are HIGH or LOW.

- void [setState](#) (int index, bool state, int intensity)

- bool [getState](#) (int index)

This function is used to get the state of a specific [LED](#).

- void [setAllLeds](#) (bool state)

This function is used to set the state of all the [LEDs](#). Possible states are HIGH or LOW.

- void [startBlinking](#) (int index, unsigned long interval)

This function is used to start blinking an [LED](#). The [LED](#)'s blink based on the interval provided.

- void [stopBlinking](#) (int index)

This function is used stop the [LED](#) from blinking.

- void [stopAllBlinking](#) ()

This function is used to stop all [LEDs](#) from blinking.

- void [updateBlinking](#) ()

This function is used to update the blinking of the [LEDs](#). It is meant to be called in every loop iteration.

- void [setIntensity](#) (int index, int intensity)

This function is used to set the intensity of a specific [LED](#).

- void [setAllintensity](#) (int intensity)

This function is used to set the intensity of all [LEDs](#).

- void [update](#) (unsigned long currentTime)

This function is used to update the state of the [LEDs](#). It is meant to be called in every loop iteration.

- void [trigger](#) (int index, unsigned long currentTime, bool inverted=false)

This function is used to trigger the [LED](#). The [LED](#) will stay on for [ledOnDuration](#) milliseconds.

- void [resetInverted](#) (int index)

This function is used to reset the inverted state of all [LEDs](#).

Public Attributes

- int [numLeds](#)

Private Attributes

- [LED](#) * [leds](#)

4.15.1 Detailed Description

This is a collection of [LEDs](#) and mainly used by the [LEDController](#) class. Use that if you need to interact with the [LEDs](#).

4.15.2 Constructor & Destructor Documentation

4.15.2.1 LEDs()

```
LEDs::LEDs (
    std::vector< int > pins,
    int numLeds )
```

Constructor.

4.15.2.2 ~LEDs()

```
LEDs::~~LEDs ( )
```

Destructor.

4.15.3 Member Function Documentation

4.15.3.1 begin()

```
void LEDs::begin ( )
```

This function is used to initialize the pins for the [LEDs](#) as outputs. It is intended to be called in the [setup\(\)](#) function of the main sketch.

4.15.3.2 getState()

```
bool LEDs::getState (
    int index )
```

This function is used to get the state of a specific [LED](#).

Parameters

<i>index</i>	
--------------	--

Returns

state of the [LED](#) as a boolean

4.15.3.3 resetInverted()

```
void LEDs::resetInverted (
    int index )
```

This function is used to reset the inverted state of all [LEDs](#).

4.15.3.4 setAllintensity()

```
void LEDs::setAllintensity (
    int intensity )
```

This function is used to set the intensity of all [LEDs](#).

Parameters

<i>intensity</i>	
------------------	--

4.15.3.5 setAllLeds()

```
void LEDs::setAllLeds (
    bool state )
```

This function is used to set the state of all the [LEDs](#). Possible states are HIGH or LOW.

Parameters

<i>state</i>	
--------------	--

4.15.3.6 setIntensity()

```
void LEDs::setIntensity (
    int index,
    int intensity )
```

This function is used to set the intensity of a specific [LED](#).

Parameters

<i>index</i>	
<i>intensity</i>	

4.15.3.7 setState() [1/2]

```
void LEDs::setState (
    int index,
    bool state )
```

This function is used to set the state of a specific [LED](#). Possible states are HIGH or LOW.

Parameters

<i>index</i>	
<i>state</i>	

4.15.3.8 setState() [2/2]

```
void LEDs::setState (
    int index,
    bool state,
    int intensity )
```

4.15.3.9 startBlinking()

```
void LEDs::startBlinking (
    int index,
    unsigned long interval )
```

This function is used to start blinking an [LED](#). The [LED](#)'s blink based on the interval provided.

Parameters

<i>index</i>	
<i>interval</i>	

4.15.3.10 stopAllBlinking()

```
void LEDs::stopAllBlinking ( )
```

This function is used to stop all [LEDs](#) from blinking.

4.15.3.11 stopBlinking()

```
void LEDs::stopBlinking (
    int index )
```

This function is used stop the [LED](#) from blinking.

Parameters

<i>index</i>	
--------------	--

4.15.3.12 trigger()

```
void LEDs::trigger (
    int index,
    unsigned long currentTime,
    bool inverted = false )
```

This function is used to trigger the [LED](#). The [LED](#) will stay on for ledOnDuration milliseconds.

Parameters

<i>index</i>	
<i>currentTime</i>	
<i>inverted</i>	

4.15.3.13 update()

```
void LEDs::update (
    unsigned long currentTime )
```

This function is used to update the state of the [LEDs](#). It is meant to be called in every loop iteration.

Parameters

<i>currentTime</i>	
--------------------	--

4.15.3.14 updateBlinking()

```
void LEDs::updateBlinking ( )
```

This function is used to update the blinking of the [LEDs](#). It is meant to be called in every loop iteration.

4.15.4 Member Data Documentation

4.15.4.1 leds

```
LED* LEDs::leds [private]
```

4.15.4.2 numLeds

```
int LEDs::numLeds
```

The documentation for this class was generated from the following files:

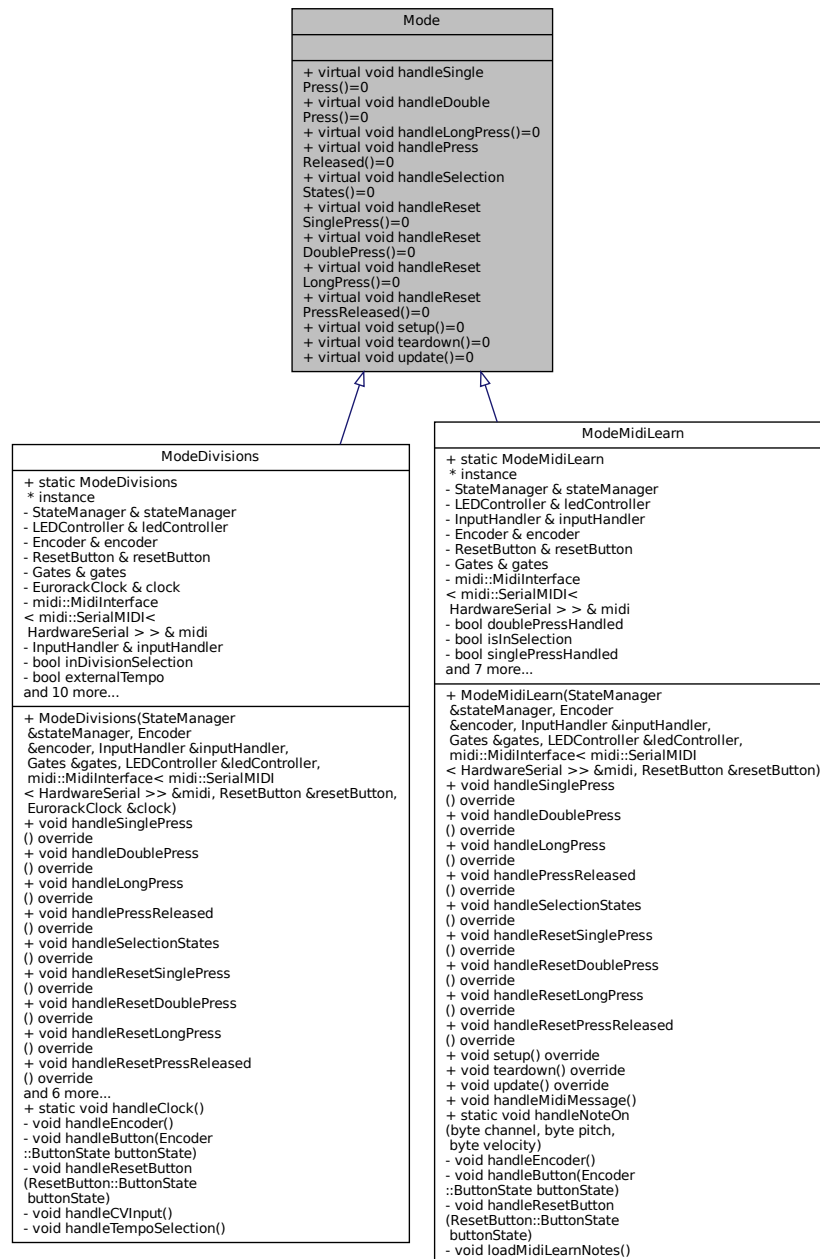
- [include/LEDs.h](#)
- [src/LEDs.cpp](#)

4.16 Mode Class Reference

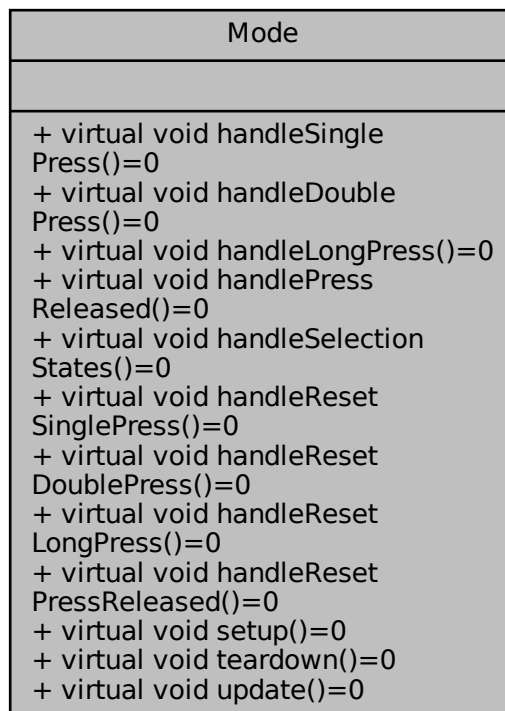
This class is the base for our application modes.

```
#include <Mode.h>
```

Inheritance diagram for Mode:



Collaboration diagram for Mode:



Public Member Functions

- virtual void [handleSinglePress](#) ()=0
- virtual void [handleDoublePress](#) ()=0
- virtual void [handleLongPress](#) ()=0
- virtual void [handlePressReleased](#) ()=0
- virtual void [handleSelectionStates](#) ()=0
- virtual void [handleResetSinglePress](#) ()=0
- virtual void [handleResetDoublePress](#) ()=0
- virtual void [handleResetLongPress](#) ()=0
- virtual void [handleResetPressReleased](#) ()=0
- virtual void [setup](#) ()=0
- virtual void [teardown](#) ()=0
- virtual void [update](#) ()=0

4.16.1 Detailed Description

This class is the base for our application modes.

4.16.2 Member Function Documentation

4.16.2.1 handleDoublePress()

```
virtual void Mode::handleDoublePress ( ) [pure virtual]
```

Implemented in [ModeMidiLearn](#), and [ModeDivisions](#).

4.16.2.2 handleLongPress()

```
virtual void Mode::handleLongPress ( ) [pure virtual]
```

Implemented in [ModeMidiLearn](#), and [ModeDivisions](#).

4.16.2.3 handlePressReleased()

```
virtual void Mode::handlePressReleased ( ) [pure virtual]
```

Implemented in [ModeMidiLearn](#), and [ModeDivisions](#).

4.16.2.4 handleResetDoublePress()

```
virtual void Mode::handleResetDoublePress ( ) [pure virtual]
```

Implemented in [ModeMidiLearn](#), and [ModeDivisions](#).

4.16.2.5 handleResetLongPress()

```
virtual void Mode::handleResetLongPress ( ) [pure virtual]
```

Implemented in [ModeMidiLearn](#), and [ModeDivisions](#).

4.16.2.6 `handleResetPressReleased()`

```
virtual void Mode::handleResetPressReleased ( ) [pure virtual]
```

Implemented in [ModeMidiLearn](#), and [ModeDivisions](#).

4.16.2.7 `handleResetSinglePress()`

```
virtual void Mode::handleResetSinglePress ( ) [pure virtual]
```

Implemented in [ModeMidiLearn](#), and [ModeDivisions](#).

4.16.2.8 `handleSelectionStates()`

```
virtual void Mode::handleSelectionStates ( ) [pure virtual]
```

Implemented in [ModeMidiLearn](#), and [ModeDivisions](#).

4.16.2.9 `handleSinglePress()`

```
virtual void Mode::handleSinglePress ( ) [pure virtual]
```

Implemented in [ModeMidiLearn](#), and [ModeDivisions](#).

4.16.2.10 `setup()`

```
virtual void Mode::setup ( ) [pure virtual]
```

Implemented in [ModeMidiLearn](#), and [ModeDivisions](#).

4.16.2.11 `teardown()`

```
virtual void Mode::teardown ( ) [pure virtual]
```

Implemented in [ModeMidiLearn](#), and [ModeDivisions](#).

4.16.2.12 update()

```
virtual void Mode::update ( ) [pure virtual]
```

Implemented in [ModeMidiLearn](#), and [ModeDivisions](#).

The documentation for this class was generated from the following file:

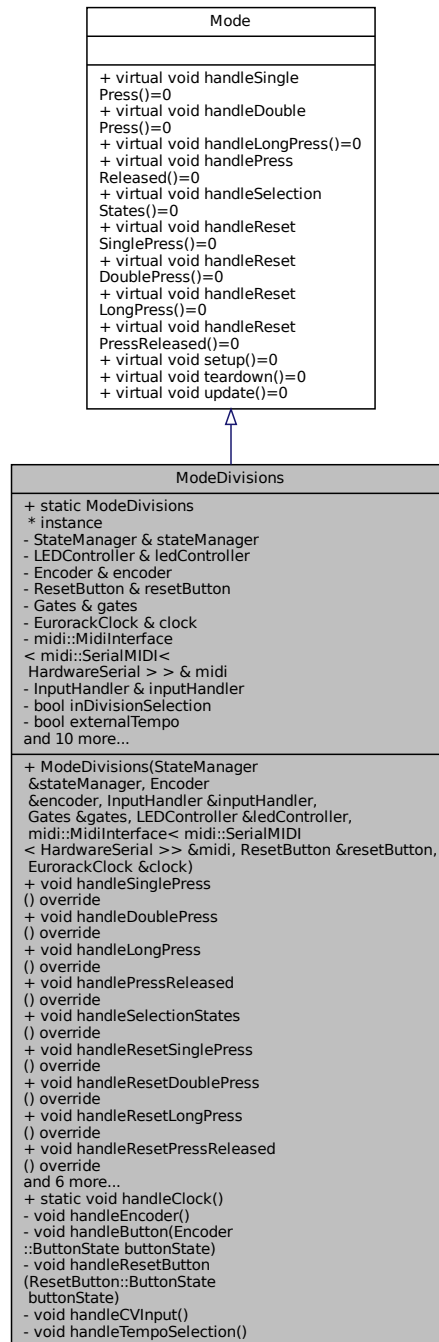
- include/[Mode.h](#)

4.17 ModeDivisions Class Reference

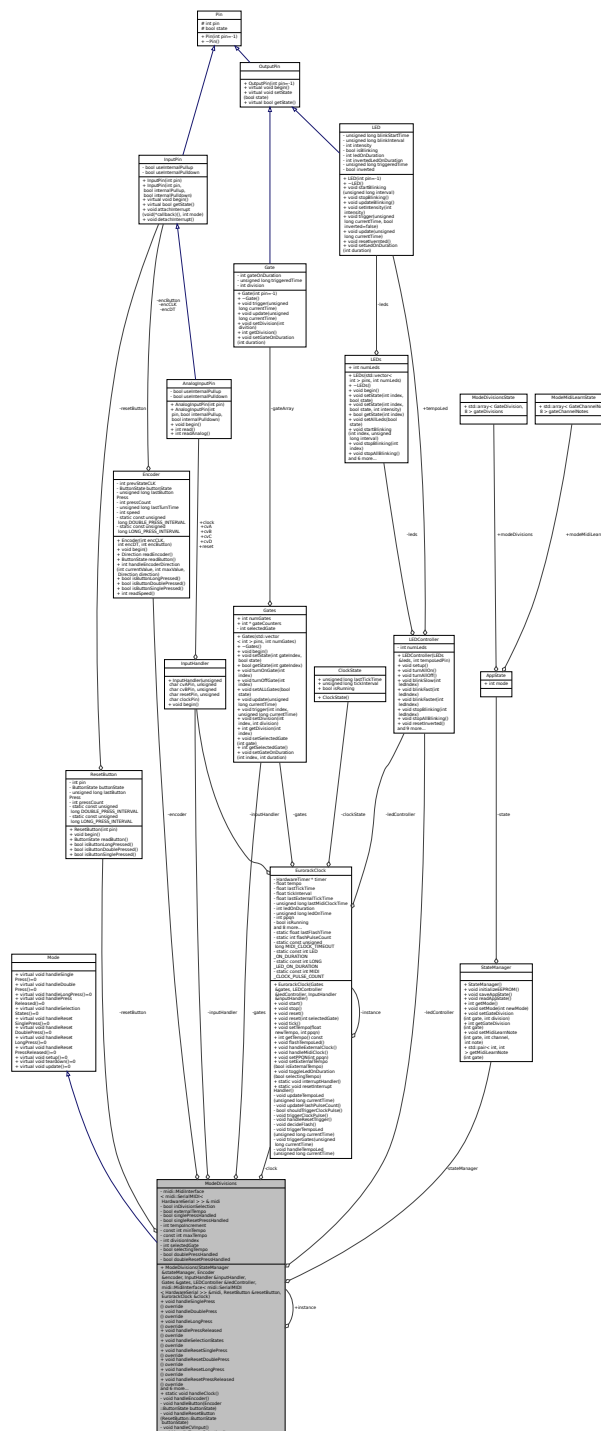
This class uses the eurorack clock to provide us pulls with selectable division. It can be synced to a clock too, internal and external.

```
#include <ModeDivisions.h>
```

Inheritance diagram for ModeDivisions:



Collaboration diagram for ModeDivisions:



Public Member Functions

- [ModeDivisions](#) ([StateManager](#) &[stateManager](#), [Encoder](#) &[encoder](#), [InputHandler](#) &[inputHandler](#), [Gates](#) &[gates](#), [LEDController](#) &[ledController](#), [midi::MidiInterface](#)< [midi::SerialMIDI](#)< [HardwareSerial](#) >> &[midi](#), [ResetButton](#) &[resetButton](#), [EuroClock](#) &[clock](#))

Construct a new *Mode 0*: *Mode 0* object.

- void [handleSinglePress](#) () override

- Handle single press. Default behavior is to toggle between division selection and gate selection.*

 - void `handleDoublePress` () override
- Handle double press. Default behavior is to enter or exit tempo selection mode.*

 - void `handleLongPress` () override
- This function is used to handle long press of the button. However, it doesn't do anything yet.*

 - void `handlePressReleased` () override
- Handle press released. Default behavior is to do nothing.*

 - void `handleSelectionStates` () override
- Handle selection states. Default behavior is to handle tempo selection.*

 - void `handleResetSinglePress` () override
- Handle reset single press. Default behavior is to reset the selected gate so it can be synced with the clock.*

 - void `handleResetDoublePress` () override
- Handle reset double press. Default behavior is to reset the clock so it can be synced with an external clock.*

 - void `handleResetLongPress` () override
- This function is used to handle long press of the reset button. However, it doesn't do anything yet.*

 - void `handleResetPressReleased` () override
- This function is used to handle reset press released. However, it doesn't do anything yet.*

 - void `setup` () override
- Setup and teardown methods are meant to be called when `Mode` selector switches modes. This is where you can put code that should only run once when the mode is switched to. It is configured to run once when the mode is switched to and once when the mode is switched from.*

 - void `teardown` () override
- This block of code is executed once whenever we switch modes. The code here is intended to be cleanup code. This is where you can put code that should only run once when the mode is switched from.*

 - void `update` () override
- The update method is meant to be called every loop iteration. This is where you can put code that should run every loop iteration.*

 - void `setDivisionPPQN` (int ppqn)
 - void `setDefaultDivisionIndex` ()
- Set the default division index based on the internal PPQN value, only used by the constructor to avoid compile errors.*

 - void `handleMidiMessage` ()
- Handle MIDI messages. This function is called by the update method.*

Static Public Member Functions

- static void `handleClock` ()
- This function is used to handle MIDI clock messages.*

Static Public Attributes

- static `ModeDivisions` * `instance` = nullptr
- This is the instance of the `ModeDivisions` class. We need this in order to work with the MIDI library. The library requires a static function to be called when a MIDI message is received.*

Private Member Functions

- void `handleEncoder` ()
Detects the direction of the encoder and updates the selected gate or division based on the direction.
- void `handleButton` (`Encoder::ButtonState` buttonState)
This block of code is used to handle button presses. It is called by the update method.
- void `handleResetButton` (`ResetButton::ButtonState` buttonState)
This block of code is used to handle reset button presses. It is called by the update method.
- void `handleCVInput` ()
block of code is here to handle inputs from the CV Input Jacks. It doesn't do anything now but is here for future use.
- void `handleTempoSelection` ()
Handle tempo selection. Default behavior is to increase or decrease the tempo based on the encoder direction.

Private Attributes

- `StateManager` & `stateManager`
- `LEDController` & `ledController`
- `Encoder` & `encoder`
- `ResetButton` & `resetButton`
- `Gates` & `gates`
- `EurorackClock` & `clock`
- `midi::MidiInterface`< `midi::SerialMIDI`< `HardwareSerial` > > & `midi`
- `InputHandler` & `inputHandler`
- bool `inDivisionSelection` = false
- bool `externalTempo` = false
- bool `singlePressHandled` = false
- bool `singleResetPressHandled` = false
- int `tempoIncrement` = 1
- const int `minTempo` = 20
- const int `maxTempo` = 340
- int `divisionIndex` = 24
- int `selectedGate` = 0
- bool `selectingTempo` = false
- bool `doublePressHandled` = false
- bool `doubleResetPressHandled` = false

4.17.1 Detailed Description

This class uses the eurorack clock to provide us pulls with selectable division. It can be synced to a clock too, internal and external.

4.17.2 Constructor & Destructor Documentation

4.17.2.1 ModeDivisions()

```
ModeDivisions::ModeDivisions (
    StateManager & stateManager,
    Encoder & encoder,
    InputHandler & inputHandler,
    Gates & gates,
    LEDController & ledController,
    midi::MidiInterface< midi::SerialMIDI< HardwareSerial >> & midi,
    ResetButton & resetButton,
    EurorackClock & clock )
```

Construct a new `Mode 0:: Mode 0` object.

Parameters

<i>stateManager</i>	
<i>encoder</i>	
<i>inputHandler</i>	
<i>gates</i>	
<i>ledController</i>	
<i>midi</i>	
<i>resetButton</i>	
<i>clock</i>	

4.17.3 Member Function Documentation

4.17.3.1 handleButton()

```
void ModeDivisions::handleButton (
    Encoder::ButtonState buttonState ) [private]
```

This block of code is used to handle button presses. It is called by the update method.

Parameters

<i>buttonState</i>	
--------------------	--

4.17.3.2 handleClock()

```
void ModeDivisions::handleClock ( ) [static]
```

This function is used to handle MIDI clock messages.

4.17.3.3 handleCVInput()

```
void ModeDivisions::handleCVInput ( ) [private]
```

block of code is here to handle inputs from the CV Input Jacks. It doesn't do anything now but is here for future use.

4.17.3.4 handleDoublePress()

```
void ModeDivisions::handleDoublePress ( ) [override], [virtual]
```

Handle double press. Default behavior is to enter or exit tempo selection mode.

Implements [Mode](#).

4.17.3.5 handleEncoder()

```
void ModeDivisions::handleEncoder ( ) [private]
```

Detects the direction of the encoder and updates the selected gate or division based on the direction.

4.17.3.6 handleLongPress()

```
void ModeDivisions::handleLongPress ( ) [override], [virtual]
```

This function is used to handle long press of the button. However, it doesn't do anything yet.

Long press is used by modeSelector, so don't use that here.

Implements [Mode](#).

4.17.3.7 handleMidiMessage()

```
void ModeDivisions::handleMidiMessage ( )
```

Handle MIDI messages. This function is called by the update method.

4.17.3.8 handlePressReleased()

```
void ModeDivisions::handlePressReleased ( ) [override], [virtual]
```

Handle press released. Default behavior is to do nothing.

[Mode](#) 0 specific press released handling

Implements [Mode](#).

4.17.3.9 handleResetButton()

```
void ModeDivisions::handleResetButton (
    ResetButton::ButtonState buttonState ) [private]
```

This block of code is used to handle reset button presses. It is called by the update method.

Parameters

<i>buttonState</i>	
--------------------	--

4.17.3.10 handleResetDoublePress()

```
void ModeDivisions::handleResetDoublePress ( ) [override], [virtual]
```

Handle reset double press. Default behavior is to reset the clock so it can be synced with an external clock.

Implements [Mode](#).

4.17.3.11 handleResetLongPress()

```
void ModeDivisions::handleResetLongPress ( ) [override], [virtual]
```

This function is used to handle long press of the reset button. However, it doesn't do anything yet.

Does nothing yet but it could. :)

Implements [Mode](#).

4.17.3.12 handleResetPressReleased()

```
void ModeDivisions::handleResetPressReleased ( ) [override], [virtual]
```

This function is used to handle reset press released. However, it doesn't do anything yet.

Does nothing yet but it could. :)

Implements [Mode](#).

4.17.3.13 handleResetSinglePress()

```
void ModeDivisions::handleResetSinglePress ( ) [override], [virtual]
```

Handle reset single press. Default behavior is to reset the selected gate so it can be synced with the clock.

Implements [Mode](#).

4.17.3.14 handleSelectionStates()

```
void ModeDivisions::handleSelectionStates ( ) [override], [virtual]
```

Handle selection states. Default behavior is to handle tempo selection.

Implements [Mode](#).

4.17.3.15 handleSinglePress()

```
void ModeDivisions::handleSinglePress ( ) [override], [virtual]
```

Handle single press. Default behavior is to toggle between division selection and gate selection.

If in division selection update the division for the selected gate

Toggle between division selection and gate selection

Implements [Mode](#).

4.17.3.16 handleTempoSelection()

```
void ModeDivisions::handleTempoSelection ( ) [private]
```

Handle tempo selection. Default behavior is to increase or decrease the tempo based on the encoder direction.

If externalTempo, exit external tempo mode and increase the tempo

Enter external tempo mode when the tempo reaches the minimum

4.17.3.17 setDefaultDivisionIndex()

```
void ModeDivisions::setDefaultDivisionIndex ( )
```

Set the default division index based on the internal PPQN value, only used by the constructor to avoid compile errors.

4.17.3.18 setDivisionPPQN()

```
void ModeDivisions::setDivisionPPQN (
    int ppqn )
```

4.17.3.19 setup()

```
void ModeDivisions::setup ( ) [override], [virtual]
```

Setup and teardown methods are meant to be called when [Mode](#) selector switches modes. This is where you can put code that should only run once when the mode is switched to. It is configured to run once when the mode is switched to and once when the mode is switched from.

Implements [Mode](#).

4.17.3.20 teardown()

```
void ModeDivisions::teardown ( ) [override], [virtual]
```

This block of code is executed once whenever we switch modes. The code here is intended to be cleanup code. This is where you can put code that should only run once when the mode is switched from.

Implements [Mode](#).

4.17.3.21 update()

```
void ModeDivisions::update ( ) [override], [virtual]
```

The update method is meant to be called every loop iteration. This is where you can put code that should run every loop iteration.

Implements [Mode](#).

4.17.4 Member Data Documentation

4.17.4.1 clock

```
EurorackClock& ModeDivisions::clock [private]
```

4.17.4.2 divisionIndex

```
int ModeDivisions::divisionIndex = 24 [private]
```


4.17.4.3 doublePressHandled

```
bool ModeDivisions::doublePressHandled = false [private]
```

4.17.4.4 doubleResetPressHandled

```
bool ModeDivisions::doubleResetPressHandled = false [private]
```

4.17.4.5 encoder

```
Encoder& ModeDivisions::encoder [private]
```

4.17.4.6 externalTempo

```
bool ModeDivisions::externalTempo = false [private]
```

4.17.4.7 gates

```
Gates& ModeDivisions::gates [private]
```

4.17.4.8 inDivisionSelection

```
bool ModeDivisions::inDivisionSelection = false [private]
```

4.17.4.9 inputHandler

```
InputHandler& ModeDivisions::inputHandler [private]
```

4.17.4.10 instance

```
ModeDivisions * ModeDivisions::instance = nullptr [static]
```

This is the instance of the [ModeDivisions](#) class. We need this in order to work with the MIDI library. The library requires a static function to be called when a MIDI message is received.

4.17.4.11 ledController

```
LEDController& ModeDivisions::ledController [private]
```

4.17.4.12 maxTempo

```
const int ModeDivisions::maxTempo = 340 [private]
```

4.17.4.13 midi

```
midi::MidiInterface<midi::SerialMIDI<HardwareSerial> >& ModeDivisions::midi [private]
```

4.17.4.14 minTempo

```
const int ModeDivisions::minTempo = 20 [private]
```

4.17.4.15 resetButton

```
ResetButton& ModeDivisions::resetButton [private]
```

4.17.4.16 selectedGate

```
int ModeDivisions::selectedGate = 0 [private]
```

4.17.4.17 selectingTempo

```
bool ModeDivisions::selectingTempo = false [private]
```

4.17.4.18 singlePressHandled

```
bool ModeDivisions::singlePressHandled = false [private]
```

4.17.4.19 singleResetPressHandled

```
bool ModeDivisions::singleResetPressHandled = false [private]
```

4.17.4.20 stateManager

```
StateManager& ModeDivisions::stateManager [private]
```

4.17.4.21 tempoIncrement

```
int ModeDivisions::tempoIncrement = 1 [private]
```

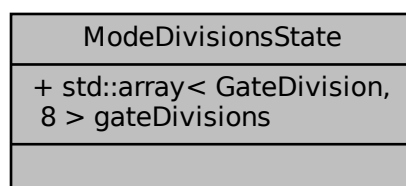
The documentation for this class was generated from the following files:

- [include/ModeDivisions.h](#)
- [src/ModeDivisions.cpp](#)

4.18 ModeDivisionsState Struct Reference

```
#include <AppState.h>
```

Collaboration diagram for ModeDivisionsState:



Public Attributes

- `std::array< GateDivision, 8 > gateDivisions`

4.18.1 Member Data Documentation

4.18.1.1 `gateDivisions`

```
std::array<GateDivision, 8> ModeDivisionsState::gateDivisions
```

The documentation for this struct was generated from the following file:

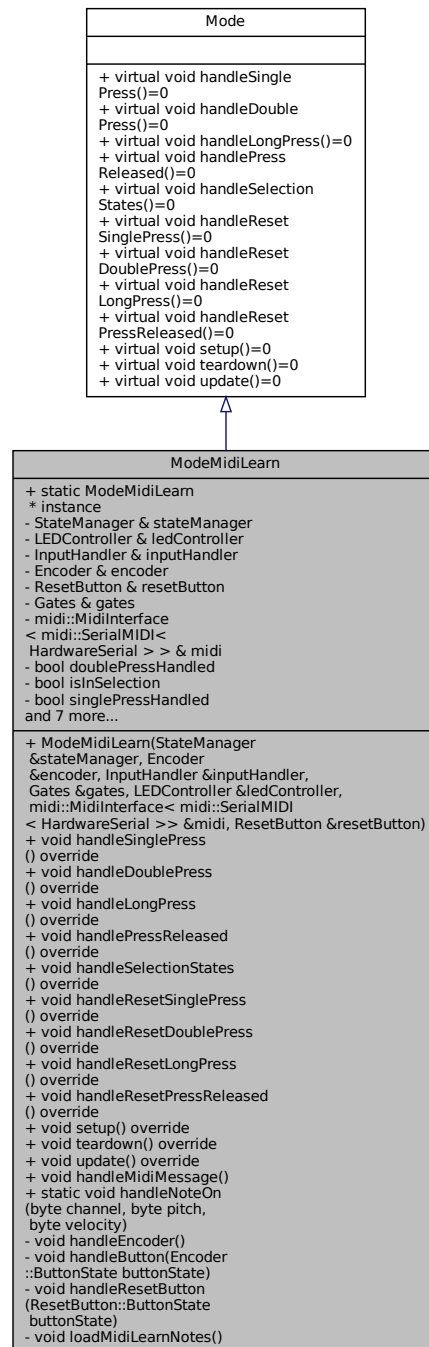
- `include/AppState.h`

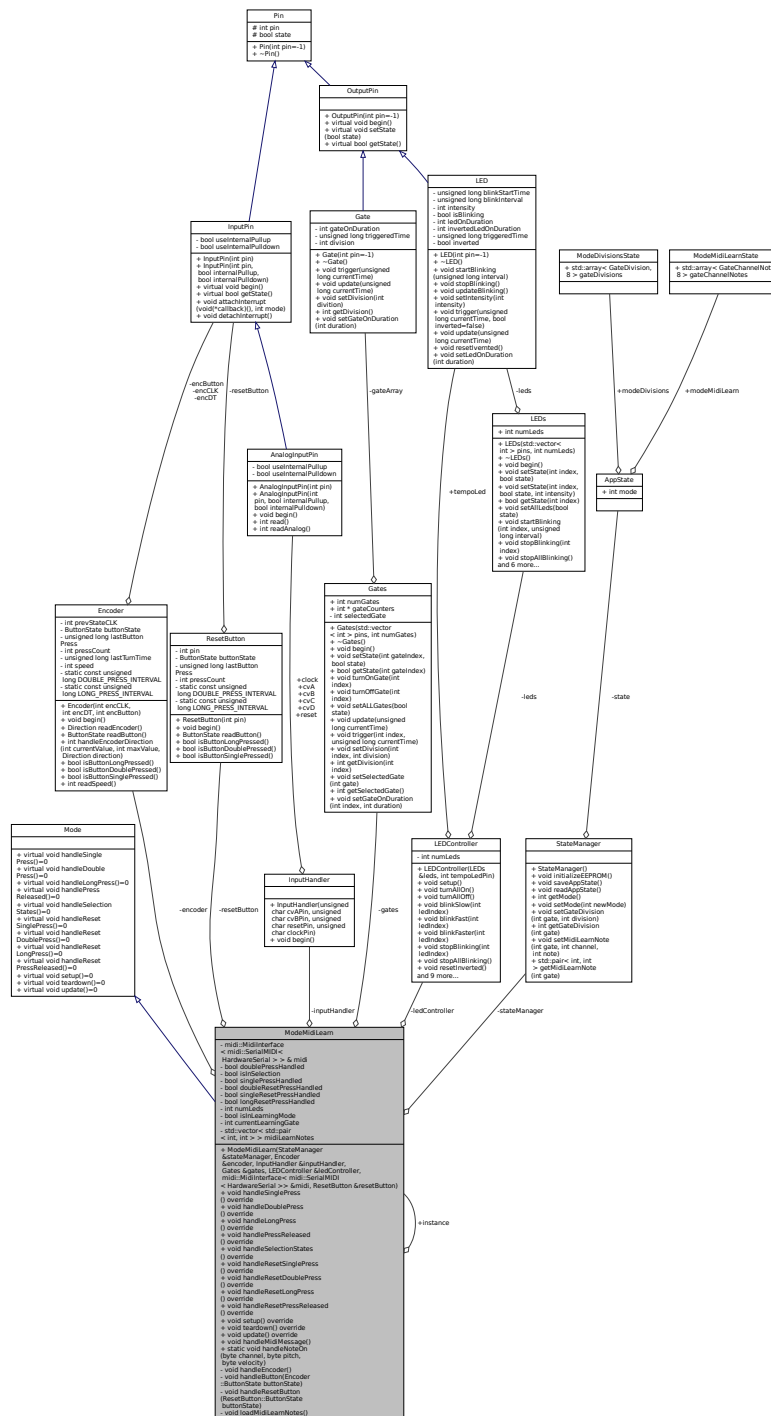
4.19 ModeMidiLearn Class Reference

This is a MIDI to Trigger class for Note On but it only cares about the channel number.

```
#include <ModeMidiLearn.h>
```

Inheritance diagram for ModeMidiLearn:





Public Member Functions

- `ModeMidiLearn (StateManager &stateManager, Encoder &encoder, InputHandler &inputHandler, Gates &gates, LEDController &ledController, midi::MidiInterface< midi::SerialMIDI< HardwareSerial >> &midi, ResetButton &resetButton)`
- `void handleSinglePress ()` override

Handle the single press event. How in this mode we don't use it.

- void `handleDoublePress` () override
This function is used to handle the double press event. How in this mode we don't use it.
- void `handleLongPress` () override
This function is used to handle the long press event. How in this mode we don't use it.
- void `handlePressReleased` () override
This function is used to handle the press released event. How in this mode we don't use it.
- void `handleSelectionStates` () override
This function is used to handle the encoder rotation event. How in this mode we don't use it.
- void `handleResetSinglePress` () override
This function is used to handle the reset single press event. How in this mode we don't use it.
- void `handleResetDoublePress` () override
This function is used to handle the reset double press event. How in this mode we don't use it.
- void `handleResetLongPress` () override
This function is used to handle the reset long press event. How in this mode we don't use it.
- void `handleResetPressReleased` () override
This function is used to handle the reset press released event. How in this mode we don't use it.
- void `setup` () override
This function is used to setup the current mode object. Setup and teardown methods are meant to be called when `Mode` selector switches modes. This is where you can put code that should only run once when the mode is switched to.
- void `teardown` () override
Like the setup method, this function is used to teardown the current mode object.
- void `update` () override
This function is used to update the current mode object. The update method is meant to be called every loop iteration. This is where you can put code that should run every loop iteration.
- void `handleMidiMessage` ()
Handle MIDI messages. This function is called by the update method.

Static Public Member Functions

- static void `handleNoteOn` (byte channel, byte pitch, byte velocity)
Static callback function for handling MIDI Note On messages.

Static Public Attributes

- static `ModeMidiLearn * instance` = nullptr
This is the instance of the `ModeMidiLearn` class. It is used to access the `ModeMidiLearn` class from the static MIDI callback function.

Private Member Functions

- void `handleEncoder` ()
- void `handleButton` (`Encoder::ButtonState` buttonState)
This block of code is used to handle button presses. It is called by the update method.
- void `handleResetButton` (`ResetButton::ButtonState` buttonState)
This block of code is used to handle reset button presses. It is called by the update method.
- void `loadMidiLearnNotes` ()
Update midiLearnNotes from stateManager.

Private Attributes

- [StateManager](#) & *stateManager*
- [LEDController](#) & *ledController*
- [InputHandler](#) & *inputHandler*
- [Encoder](#) & *encoder*
- [ResetButton](#) & *resetButton*
- [Gates](#) & *gates*
- [midi::MidiInterface](#)< [midi::SerialMIDI](#)< [HardwareSerial](#) > > & *midi*
- bool [doublePressHandled](#) = false
- bool [isInSelection](#) = false
- bool [singlePressHandled](#) = false
- bool [doubleResetPressHandled](#) = false
- bool [singleResetPressHandled](#) = false
- bool [longResetPressHandled](#) = false
- int [numLeds](#) = 8
- bool [isInLearningMode](#) = false
- int [currentLearningGate](#) = 0
- [std::vector](#)< [std::pair](#)< int, int > > *midiLearnNotes*

4.19.1 Detailed Description

This is a MIDI to Trigger class for Note On but it only cares about the channel number.

4.19.2 Constructor & Destructor Documentation

4.19.2.1 ModeMidiLearn()

```
ModeMidiLearn::ModeMidiLearn (
    StateManager & stateManager,
    Encoder & encoder,
    InputHandler & inputHandler,
    Gates & gates,
    LEDController & ledController,
    midi::MidiInterface< midi::SerialMIDI< HardwareSerial >> & midi,
    ResetButton & resetButton )
```

4.19.3 Member Function Documentation

4.19.3.1 handleButton()

```
void ModeMidiLearn::handleButton (
    Encoder::ButtonState buttonState ) [private]
```

This block of code is used to handle button presses. It is called by the update method.

Parameters

<i>buttonState</i>	
--------------------	--

4.19.3.2 handleDoublePress()

```
void ModeMidiLearn::handleDoublePress ( ) [override], [virtual]
```

This function is used to handle the double press event. How in this mode we don't use it.

Implements [Mode](#).

4.19.3.3 handleEncoder()

```
void ModeMidiLearn::handleEncoder ( ) [private]
```

4.19.3.4 handleLongPress()

```
void ModeMidiLearn::handleLongPress ( ) [override], [virtual]
```

This function is used to handle the long press event. How in this mode we don't use it.

Implements [Mode](#).

4.19.3.5 handleMidiMessage()

```
void ModeMidiLearn::handleMidiMessage ( )
```

Handle MIDI messages. This function is called by the update method.

4.19.3.6 handleNoteOn()

```
void ModeMidiLearn::handleNoteOn (
    byte channel,
    byte pitch,
    byte velocity ) [static]
```

Static callback function for handling MIDI Note On messages.

Parameters

<i>channel</i>	
<i>pitch</i>	
<i>velocity</i>	

4.19.3.7 handlePressReleased()

```
void ModeMidiLearn::handlePressReleased ( ) [override], [virtual]
```

This function is used to handle the press released event. How in this mode we don't use it.

Implements [Mode](#).

4.19.3.8 handleResetButton()

```
void ModeMidiLearn::handleResetButton (
    ResetButton::ButtonState buttonState ) [private]
```

This block of code is used to handle reset button presses. It is called by the update method.

Parameters

<i>buttonState</i>	
--------------------	--

4.19.3.9 handleResetDoublePress()

```
void ModeMidiLearn::handleResetDoublePress ( ) [override], [virtual]
```

This function is used to handle the reset double press event. How in this mode we don't use it.

Implements [Mode](#).

4.19.3.10 handleResetLongPress()

```
void ModeMidiLearn::handleResetLongPress ( ) [override], [virtual]
```

This function is used to handle the reset long press event. How in this mode we don't use it.

Implements [Mode](#).

4.19.3.11 handleResetPressReleased()

```
void ModeMidiLearn::handleResetPressReleased ( ) [override], [virtual]
```

This function is used to handle the reset press released event. How in this mode we don't use it.

Implements [Mode](#).

4.19.3.12 handleResetSinglePress()

```
void ModeMidiLearn::handleResetSinglePress ( ) [override], [virtual]
```

This function is used to handle the reset single press event. How in this mode we don't use it.

Implements [Mode](#).

4.19.3.13 handleSelectionStates()

```
void ModeMidiLearn::handleSelectionStates ( ) [override], [virtual]
```

This function is used to handle the encoder rotation event. How in this mode we don't use it.

Implements [Mode](#).

4.19.3.14 handleSinglePress()

```
void ModeMidiLearn::handleSinglePress ( ) [override], [virtual]
```

Handle the single press event. How in this mode we don't use it.

Implements [Mode](#).

4.19.3.15 loadMidiLearnNotes()

```
void ModeMidiLearn::loadMidiLearnNotes ( ) [private]
```

Update midiLearnNotes from stateManager.

4.19.3.16 setup()

```
void ModeMidiLearn::setup ( ) [override], [virtual]
```

This function is used to setup the current mode object. Setup and teardown methods are meant to be called when [Mode](#) selector switches modes. This is where you can put code that should only run once when the mode is switched to.

This is where you'd read the eeprom for the [ModeMidiLearn](#) settings. However, we don't have any settings for [ModeMidiLearn](#) yet.

Implements [Mode](#).

4.19.3.17 teardown()

```
void ModeMidiLearn::teardown ( ) [override], [virtual]
```

Like the setup method, this function is used to teardown the current mode object.

Implements [Mode](#).

4.19.3.18 update()

```
void ModeMidiLearn::update ( ) [override], [virtual]
```

This function is used to update the current mode object. The update method is meant to be called every loop iteration. This is where you can put code that should run every loop iteration.

Implements [Mode](#).

4.19.4 Member Data Documentation

4.19.4.1 currentLearningGate

```
int ModeMidiLearn::currentLearningGate = 0 [private]
```

4.19.4.2 doublePressHandled

```
bool ModeMidiLearn::doublePressHandled = false [private]
```

4.19.4.3 doubleResetPressHandled

```
bool ModeMidiLearn::doubleResetPressHandled = false [private]
```

4.19.4.4 encoder

```
Encoder& ModeMidiLearn::encoder [private]
```

4.19.4.5 gates

```
Gates& ModeMidiLearn::gates [private]
```

4.19.4.6 inputHandler

```
InputHandler& ModeMidiLearn::inputHandler [private]
```

4.19.4.7 instance

```
ModeMidiLearn * ModeMidiLearn::instance = nullptr [static]
```

This is the instance of the [ModeMidiLearn](#) class. It is used to access the [ModeMidiLearn](#) class from the static MIDI callback function.

4.19.4.8 isInLearningMode

```
bool ModeMidiLearn::isInLearningMode = false [private]
```

4.19.4.9 isInSelection

```
bool ModeMidiLearn::isInSelection = false [private]
```

4.19.4.10 ledController

```
LEDController& ModeMidiLearn::ledController [private]
```

4.19.4.11 longResetPressHandled

```
bool ModeMidiLearn::longResetPressHandled = false [private]
```

4.19.4.12 midi

```
midi::MidiInterface<midi::SerialMIDI<HardwareSerial> >& ModeMidiLearn::midi [private]
```

4.19.4.13 midiLearnNotes

```
std::vector<std::pair<int, int> > ModeMidiLearn::midiLearnNotes [private]
```

4.19.4.14 numLeds

```
int ModeMidiLearn::numLeds = 8 [private]
```

4.19.4.15 resetButton

```
ResetButton& ModeMidiLearn::resetButton [private]
```

4.19.4.16 singlePressHandled

```
bool ModeMidiLearn::singlePressHandled = false [private]
```

4.19.4.17 singleResetPressHandled

```
bool ModeMidiLearn::singleResetPressHandled = false [private]
```

4.19.4.18 stateManager

[StateManager](#)& ModeMidiLearn::stateManager [private]

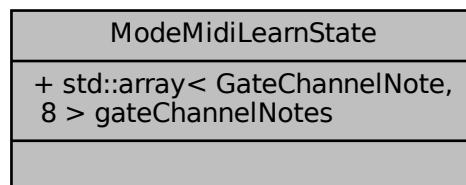
The documentation for this class was generated from the following files:

- include/[ModeMidiLearn.h](#)
- src/[ModeMidiLearn.cpp](#)

4.20 ModeMidiLearnState Struct Reference

```
#include <AppState.h>
```

Collaboration diagram for ModeMidiLearnState:



Public Attributes

- std::array< [GateChannelNote](#), 8 > [gateChannelNotes](#)

4.20.1 Member Data Documentation

4.20.1.1 gateChannelNotes

std::array<[GateChannelNote](#), 8> ModeMidiLearnState::gateChannelNotes

The documentation for this struct was generated from the following file:

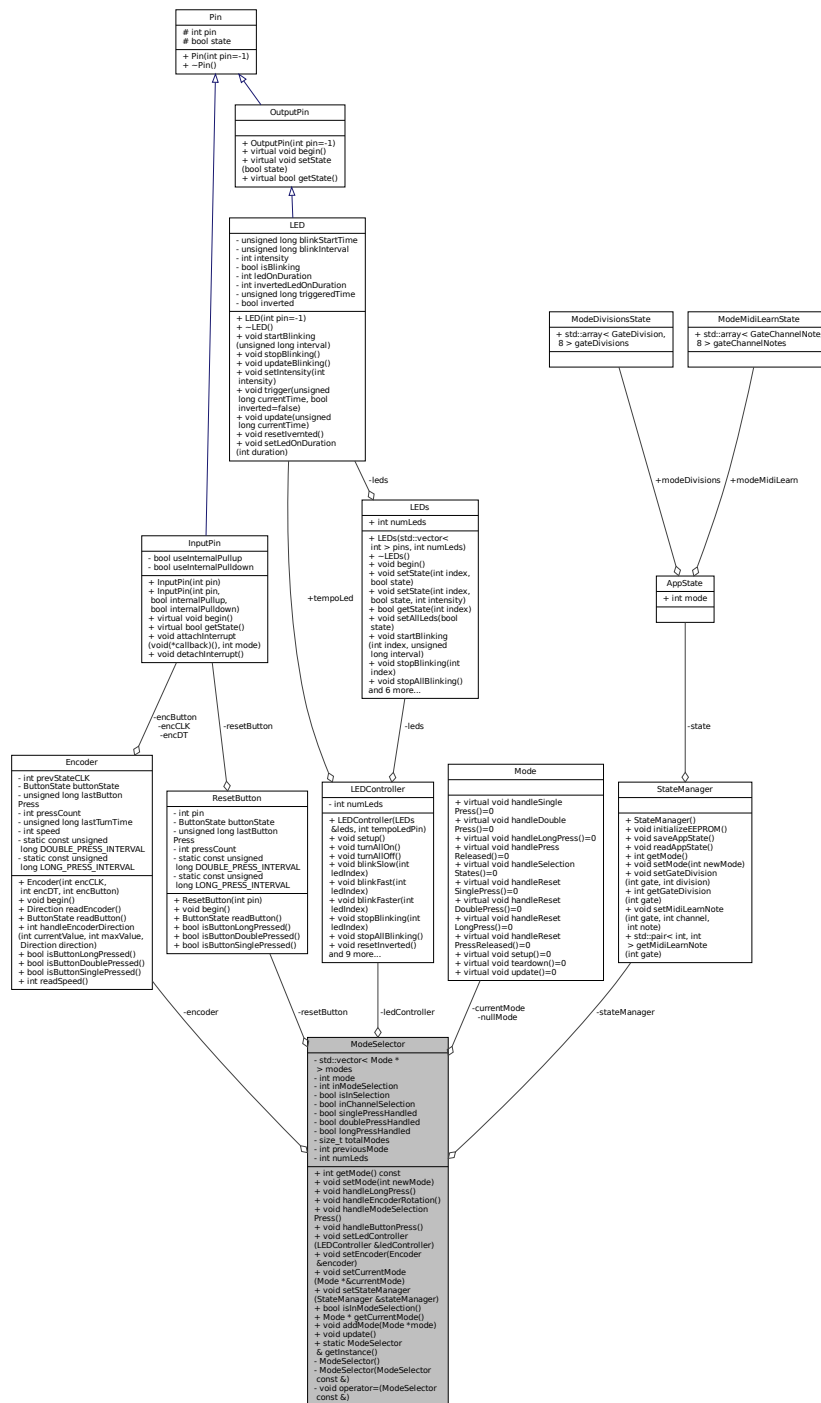
- include/[AppState.h](#)

4.21 ModeSelector Class Reference

Mode Selector Singleton. This class is responsible for managing the different modes of the device. It provides methods to add modes, set the current mode, and handle mode selection.

```
#include <ModeSelector.h>
```

Collaboration diagram for ModeSelector:



Public Member Functions

- int [getMode](#) () const
Returns the current mode as an integer.
- void [setMode](#) (int newMode)
This function is used to set the current mode. IMPORTANT: The order of the modes in the vector matters. The index of the mode in the vector is the mode number.
- void [handleLongPress](#) ()
Handles the long press of the encoder button. This is how the user enters the mode selection state. IMPORTANT: It is best to avoid using long press for other purposes. I've considered removing long press from the individual modes, if this becomes a problem we can remove it from the modes and make sure it is only used for mode selection.
- void [handleEncoderRotation](#) ()
This function is used to handle the encoder rotation. It reads the encoder and handles the rotation. The encoder is used to cycle through the different modes displaying the corresponding [LED](#).
- void [handleModeSelectionPress](#) ()
This function is used to handle the mode selection press. It clars the [LEDs](#) and gets them ready for the next mode selection.
- void [handleButtonPress](#) ()
This function is used to handle the button press. It reads the encoder and handles button presses.
- void [setLedController](#) ([LEDController](#) &[ledController](#))
This function is used to set the [LED](#) controller for the [ModeSelector](#). It is meant to be called by the main sketch to set the [LED](#) controller for the [ModeSelector](#) in the [setup\(\)](#) function.
- void [setEncoder](#) ([Encoder](#) &[encoder](#))
This function is used to set the encoder for the [ModeSelector](#). It is meant to be called by the main sketch to set the encoder for the [ModeSelector](#) in the [setup\(\)](#) function.
- void [setCurrentMode](#) ([Mode](#) *&[currentMode](#))
This function is used to set the current mode.
- void [setStateManager](#) ([StateManager](#) &[stateManager](#))
Configures the [StateManager](#) for the [ModeSelector](#) which is used to save the current mode to EEPROM.
- bool [isInModeSelection](#) ()
Helper function to check if the mode selection state is active.
- [Mode](#) * [getCurrentMode](#) ()
This function is used to get the current mode.
- void [addMode](#) ([Mode](#) *[mode](#))
This function is used to add a mode to the [ModeSelector](#). This is why the order of the modes in the vector matters.
- void [update](#) ()
This function is used to update the mode selector. It is intended to be called in the [loop\(\)](#) function of the main sketch.

Static Public Member Functions

- static [ModeSelector](#) & [getInstance](#) ()
Sets the instance of the [ModeSelector](#) class.

Private Member Functions

- [ModeSelector](#) ()
Constructor is private.
- [ModeSelector](#) ([ModeSelector](#) const &)
- void [operator=](#) ([ModeSelector](#) const &)

Private Attributes

- `std::vector< Mode * > modes`
- `Mode * nullMode = nullptr`
- `Mode *& currentMode`
- `int mode`
- `int inModeSelection = false`
- `LEDController * ledController`
- `Encoder * encoder`
- `StateManager * stateManager`
- `ResetButton * resetButton`
- `bool isInSelection`
- `bool inChannelSelection`
- `bool singlePressHandled`
- `bool doublePressHandled`
- `bool longPressHandled`
- `size_t totalModes = modes.size()`
- `int previousMode = -1`
- `int numLeds`

4.21.1 Detailed Description

[Mode](#) Selector Singleton. This class is responsible for managing the different modes of the device. It provides methods to add modes, set the current mode, and handle mode selection.

4.21.2 Constructor & Destructor Documentation

4.21.2.1 ModeSelector() [1/2]

```
ModeSelector::ModeSelector ( ) [private]
```

Constructor is private.

Construct a new [Mode](#) Selector:: [Mode](#) Selector object.

4.21.2.2 ModeSelector() [2/2]

```
ModeSelector::ModeSelector (
    ModeSelector const & ) [private]
```

4.21.3 Member Function Documentation

4.21.3.1 addMode()

```
void ModeSelector::addMode (
    Mode * mode )
```

This function is used to add a mode to the [ModeSelector](#). This is why the order of the modes in the vector matters.

Parameters

<i>mode</i>	
-------------	--

4.21.3.2 getCurrentMode()

```
Mode * ModeSelector::getCurrentMode ( )
```

This function is used to get the current mode.

Returns

Mode*

4.21.3.3 getInstance()

```
ModeSelector & ModeSelector::getInstance ( ) [static]
```

Sets the instance of the [ModeSelector](#) class.

Returns

[ModeSelector](#)&

4.21.3.4 getMode()

```
int ModeSelector::getMode ( ) const
```

Returns the current mode as an integer.

Returns

int

4.21.3.5 handleButtonPress()

```
void ModeSelector::handleButtonPress ( )
```

This function is used to handle the button press. It reads the encoder and handles button presses.

4.21.3.6 handleEncoderRotation()

```
void ModeSelector::handleEncoderRotation ( )
```

This function is used to handle the encoder rotation. It reads the encoder and handles the rotation. The encoder is used to cycle through the different modes displaying the corresponding [LED](#).

4.21.3.7 handleLongPress()

```
void ModeSelector::handleLongPress ( )
```

Handles the long press of the encoder button. This is how the user enters the mode selection state. IMPORTANT: It is best to avoid using long press for other purposes. I've considered removing long press from the individual modes, if this becomes a problem we can remove it from the modes and make sure it is only used for mode selection.

4.21.3.8 handleModeSelectionPress()

```
void ModeSelector::handleModeSelectionPress ( )
```

This function is used to handle the mode selection press. It clars the [LEDs](#) and gets them ready for the next mode selection.

4.21.3.9 isInModeSelection()

```
bool ModeSelector::isInModeSelection ( )
```

Helper function to check if the mode selection state is active.

Returns

bool

4.21.3.10 operator=()

```
void ModeSelector::operator= (
    ModeSelector const & ) [private]
```

4.21.3.11 setCurrentMode()

```
void ModeSelector::setCurrentMode (
    Mode * & currentMode )
```

This function is used to set the current mode.

Parameters

<i>currentMode</i>	
--------------------	--

4.21.3.12 setEncoder()

```
void ModeSelector::setEncoder (
    Encoder & encoder )
```

This function is used to set the encoder for the [ModeSelector](#). It is meant to be called by the main sketch to set the encoder for the [ModeSelector](#) in the [setup\(\)](#) function.

Parameters

<i>encoder</i>	
----------------	--

4.21.3.13 setLedController()

```
void ModeSelector::setLedController (
    LEDController & ledController )
```

This function is used to set the [LED](#) controller for the [ModeSelector](#). It is meant to be called by the main sketch to set the [LED](#) controller for the [ModeSelector](#) in the [setup\(\)](#) function.

Parameters

<i>ledController</i>	
----------------------	--

4.21.3.14 setMode()

```
void ModeSelector::setMode (
    int newMode )
```

This function is used to set the current mode. **IMPORTANT:** The order of the modes in the vector matters. The index of the mode in the vector is the mode number.

Parameters

<i>newMode</i>	
----------------	--

4.21.3.15 setStateManager()

```
void ModeSelector::setStateManager (
    StateManager & stateManager )
```

Configures the [StateManager](#) for the [ModeSelector](#) which is used to save the current mode to EEPROM.

Parameters

<i>stateManager</i>	
---------------------	--

4.21.3.16 update()

```
void ModeSelector::update ( )
```

This function is used to update the mode selector. It is intended to be called in the [loop\(\)](#) function of the main sketch.

4.21.4 Member Data Documentation

4.21.4.1 currentMode

```
Mode*& ModeSelector::currentMode [private]
```

4.21.4.2 doublePressHandled

```
bool ModeSelector::doublePressHandled [private]
```

4.21.4.3 encoder

```
Encoder* ModeSelector::encoder [private]
```

4.21.4.4 inChannelSelection

```
bool ModeSelector::inChannelSelection [private]
```

4.21.4.5 inModeSelection

```
int ModeSelector::inModeSelection = false [private]
```

4.21.4.6 isInSelection

```
bool ModeSelector::isInSelection [private]
```

4.21.4.7 ledController

```
LEDController* ModeSelector::ledController [private]
```

4.21.4.8 longPressHandled

```
bool ModeSelector::longPressHandled [private]
```

4.21.4.9 mode

```
int ModeSelector::mode [private]
```

4.21.4.10 modes

```
std::vector<Mode*> ModeSelector::modes [private]
```

4.21.4.11 nullMode

```
Mode* ModeSelector::nullMode = nullptr [private]
```

4.21.4.12 numLeds

```
int ModeSelector::numLeds [private]
```

4.21.4.13 previousMode

```
int ModeSelector::previousMode = -1 [private]
```

4.21.4.14 resetButton

```
ResetButton* ModeSelector::resetButton [private]
```

4.21.4.15 singlePressHandled

```
bool ModeSelector::singlePressHandled [private]
```

4.21.4.16 stateManager

```
StateManager* ModeSelector::stateManager [private]
```

4.21.4.17 totalModes

```
size_t ModeSelector::totalModes = modes.size() [private]
```

The documentation for this class was generated from the following files:

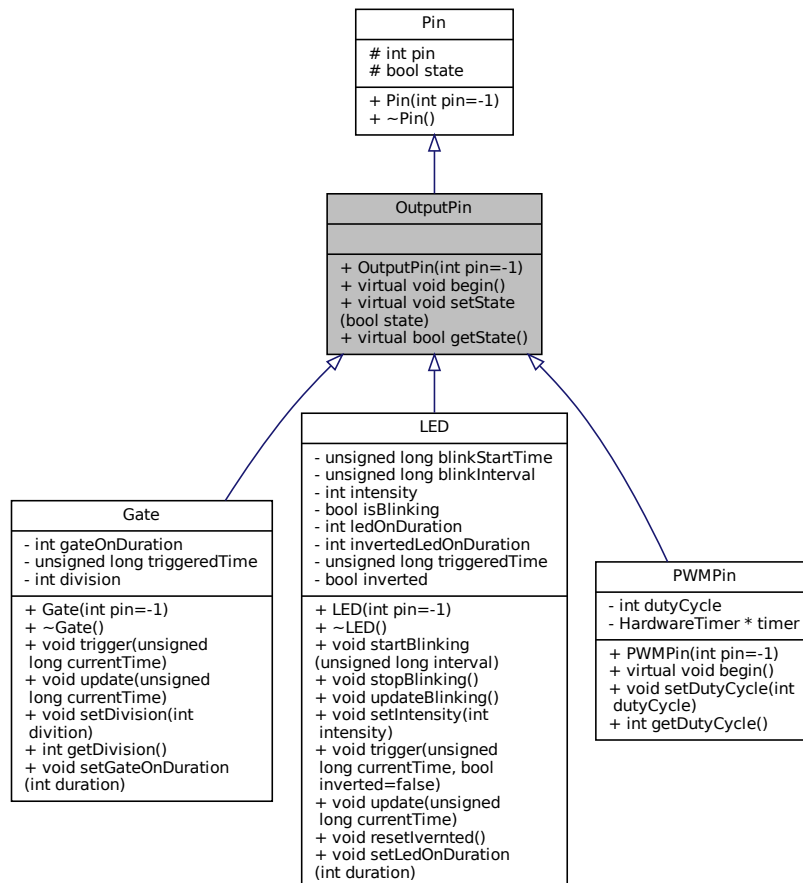
- [include/ModeSelector.h](#)
- [src/ModeSelector.cpp](#)

4.22 OutputPin Class Reference

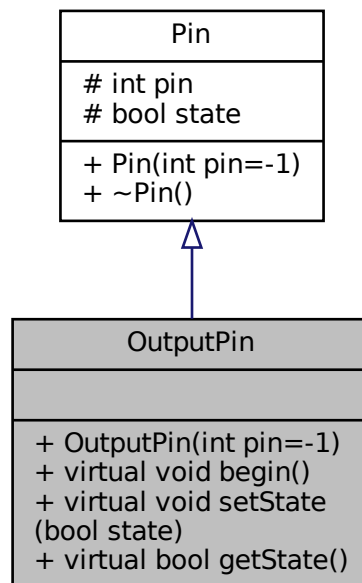
This class represents an output pin on the microcontroller.

```
#include <Pin.h>
```

Inheritance diagram for OutputPin:



Collaboration diagram for OutputPin:



Public Member Functions

- [OutputPin](#) (int [pin](#)=-1)
Construct a new Output [Pin](#):: Output [Pin](#) object.
- virtual void [begin](#) ()
This function is used to initialize the output pin. It is intended to be called in the [setup\(\)](#) function of the main sketch.
- virtual void [setState](#) (bool [state](#))
This function is used to set the state of the output pin. Possible states are HIGH or LOW.
- virtual bool [getState](#) ()
This function is used to get the state of the output pin.

Additional Inherited Members

4.22.1 Detailed Description

This class represents an output pin on the microcontroller.

4.22.2 Constructor & Destructor Documentation

4.22.2.1 OutputPin()

```
OutputPin::OutputPin (
    int pin = -1 )
```

Construct a new Output [Pin](#):: Output [Pin](#) object.

Parameters

<i>pin</i>	
------------	--

4.22.3 Member Function Documentation

4.22.3.1 begin()

```
void OutputPin::begin ( ) [virtual]
```

This function is used to initialize the output pin. It is intended to be called in the [setup\(\)](#) function of the main sketch.

Reimplemented in [PWMPin](#).

4.22.3.2 getState()

```
bool OutputPin::getState ( ) [virtual]
```

This function is used to get the state of the output pin.

Returns

bool

4.22.3.3 setState()

```
void OutputPin::setState (
    bool newState ) [virtual]
```

This function is used to set the state of the output pin. Possible states are HIGH or LOW.

Parameters

<i>newState</i>	
-----------------	--

The documentation for this class was generated from the following files:

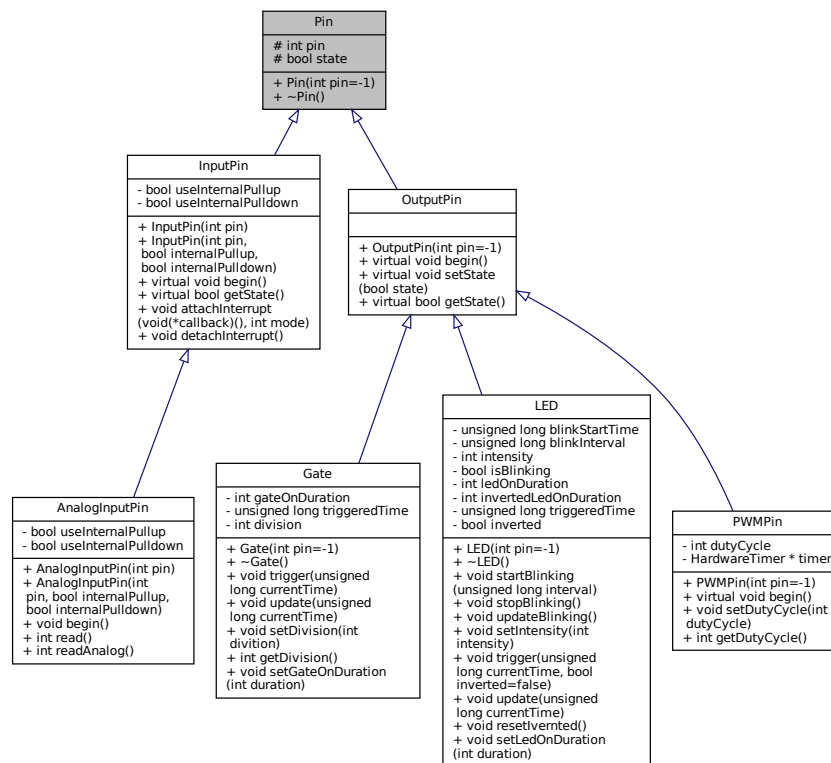
- include/[Pin.h](#)
- src/[Pin.cpp](#)

4.23 Pin Class Reference

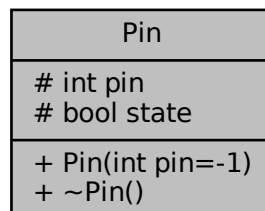
This class represents a pin on the microcontroller.

```
#include <Pin.h>
```

Inheritance diagram for Pin:



Collaboration diagram for Pin:



Public Member Functions

- `Pin (int pin=-1)`
Construct a new `Pin::Pin` object, which is the base class for all pin.
- `~Pin ()`
Destroy the `Pin::Pin` object.

Protected Attributes

- int `pin`
- bool `state`

4.23.1 Detailed Description

This class represents a pin on the microcontroller.

4.23.2 Constructor & Destructor Documentation

4.23.2.1 Pin()

```
Pin::Pin (
    int pin = -1 )
```

Construct a new `Pin::Pin` object, which is the base class for all pin.

Parameters

<i>pin</i>	
------------	--

4.23.2.2 ~Pin()

```
Pin::~Pin ( )
```

Destroy the `Pin::Pin` object.

4.23.3 Member Data Documentation

4.23.3.1 pin

```
int Pin::pin [protected]
```

4.23.3.2 state

```
bool Pin::state [protected]
```

The documentation for this class was generated from the following files:

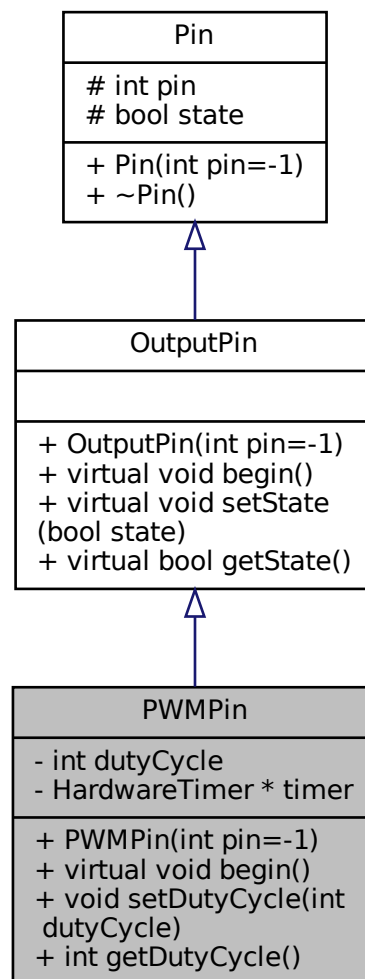
- [include/Pin.h](#)
- [src/Pin.cpp](#)

4.24 PWMPin Class Reference

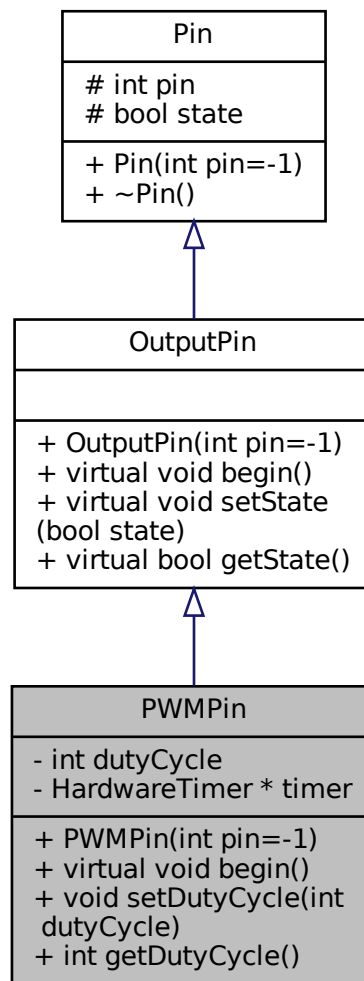
This class represents a PWM output pin on the microcontroller.

```
#include <Pin.h>
```

Inheritance diagram for PWMPin:



Collaboration diagram for PWMPin:



Public Member Functions

- **PWMPin** (int `pin`=-1)
Construct a new **PWMPin::PWMPin** object. We are using the `HardwareTimer` library for STM32 boards.
- virtual void **begin** ()
This function is used to initialize the PWM pin. It is intended to be called in the `setup()` function of the main sketch.
- void **setDutyCycle** (int `dutyCycle`)
This function is used to set the duty cycle of the PWM pin.
- int **getDutyCycle** ()
This function is used to get the duty cycle of the PWM pin.

Private Attributes

- int `dutyCycle`
- `HardwareTimer * timer`

Additional Inherited Members

4.24.1 Detailed Description

This class represents a PWM output pin on the microcontroller.

4.24.2 Constructor & Destructor Documentation

4.24.2.1 PWMPin()

```
PWMPin::PWMPin (
    int pin = -1 )
```

Construct a new [PWMPin::PWMPin](#) object. We are using the `HardwareTimer` library for STM32 boards.

Parameters

<i>pin</i>	
------------	--

4.24.3 Member Function Documentation

4.24.3.1 begin()

```
void PWMPin::begin ( ) [virtual]
```

This function is used to initialize the PWM pin. It is intended to be called in the [setup\(\)](#) function of the main sketch. Reimplemented from [OutputPin](#).

4.24.3.2 getDutyCycle()

```
int PWMPin::getDutyCycle ( )
```

This function is used to get the duty cycle of the PWM pin.

Returns

int

4.24.3.3 setDutyCycle()

```
void PWMPin::setDutyCycle (
    int dutyCycle )
```

This function is used to set the duty cycle of the PWM pin.

Parameters

<i>dutyCycle</i>	
------------------	--

4.24.4 Member Data Documentation

4.24.4.1 `dutyCycle`

```
int PWMPin::dutyCycle [private]
```

4.24.4.2 `timer`

```
HardwareTimer* PWMPin::timer [private]
```

The documentation for this class was generated from the following files:

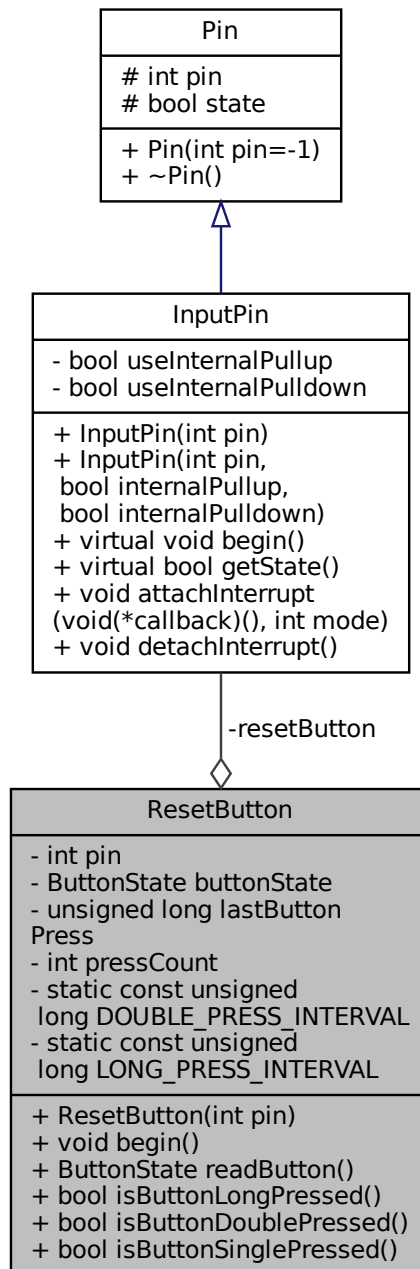
- include/[Pin.h](#)
- src/[Pin.cpp](#)

4.25 ResetButton Class Reference

This class is used to read the reset button input.

```
#include <ResetButton.h>
```

Collaboration diagram for ResetButton:



Public Types

- enum [ButtonState](#) { [OPEN](#) , [PRESSED](#) }

Public Member Functions

- [ResetButton](#) (int [pin](#))

Construct a new `Reset Button`:: `Reset Button` object.

- void `begin` ()

This function is used to initialize the reset button. This is intended to be called in the `setup()` function of the main sketch. TODO: `ResetButton` should probably inherit from `Pin`. When I first wrote this class I had issues with the order of operation of the various objects and the order of initialization. I think I have resolved those issues but I never went back and refactored this class. This is a good candidate for refactoring, but it also works fine so I have not bothered to do it.

- `ButtonState` `readButton` ()

This function is used to read the state of the reset button.

- bool `isButtonLongPressed` ()

This function is used to check if the button has been long pressed.

- bool `isButtonDoublePressed` ()

This function is used to check if the button has been double pressed.

- bool `isButtonSinglePressed` ()

This function is used to check if the button has been single pressed.

Private Attributes

- int `pin`
- `InputPin` `resetButton`
- `ButtonState` `buttonState`
- unsigned long `lastButtonPress`
- int `pressCount`

Static Private Attributes

- static const unsigned long `DOUBLE_PRESS_INTERVAL` = 500
- static const unsigned long `LONG_PRESS_INTERVAL` = 1000

4.25.1 Detailed Description

This class is used to read the reset button input.

4.25.2 Member Enumeration Documentation

4.25.2.1 `ButtonState`

enum `ResetButton::ButtonState`

Enumerator

OPEN	
PRESSED	

4.25.3 Constructor & Destructor Documentation

4.25.3.1 ResetButton()

```
ResetButton::ResetButton (
    int pin )
```

Construct a new Reset Button:: Reset Button object.

Parameters

<i>pin</i>	
------------	--

4.25.4 Member Function Documentation

4.25.4.1 begin()

```
void ResetButton::begin ( )
```

This function is used to initialize the reset button. This is intended to be called in the [setup\(\)](#) function of the main sketch. TODO: [ResetButton](#) should probably inherit from [Pin](#). When I first wrote this class I had issues with the order of operation of the various objects and the order of initialization. I think I have resolved those issues but I never went back and refactored this class. This is a good candidate for refactoring, but it also works fine so I have not bothered to do it.

4.25.4.2 isButtonDoublePressed()

```
bool ResetButton::isButtonDoublePressed ( )
```

This function is used to check if the button has been double pressed.

Returns

bool

4.25.4.3 isButtonLongPressed()

```
bool ResetButton::isButtonLongPressed ( )
```

This function is used to check if the button has been long pressed.

Returns

bool

4.25.4.4 isButtonSinglePressed()

```
bool ResetButton::isButtonSinglePressed ( )
```

This function is used to check if the button has been single pressed.

Returns

bool

4.25.4.5 readButton()

```
ResetButton::ButtonState ResetButton::readButton ( )
```

This function is used to read the state of the reset button.

Returns

ResetButton::ButtonState

4.25.5 Member Data Documentation

4.25.5.1 buttonState

```
ButtonState ResetButton::buttonState [private]
```

4.25.5.2 DOUBLE_PRESS_INTERVAL

```
const unsigned long ResetButton::DOUBLE_PRESS_INTERVAL = 500 [static], [private]
```

4.25.5.3 lastButtonPress

```
unsigned long ResetButton::lastButtonPress [private]
```

4.25.5.4 LONG_PRESS_INTERVAL

```
const unsigned long ResetButton::LONG_PRESS_INTERVAL = 1000 [static], [private]
```

4.25.5.5 pin

```
int ResetButton::pin [private]
```

4.25.5.6 pressCount

```
int ResetButton::pressCount [private]
```

4.25.5.7 resetButton

```
InputPin ResetButton::resetButton [private]
```

The documentation for this class was generated from the following files:

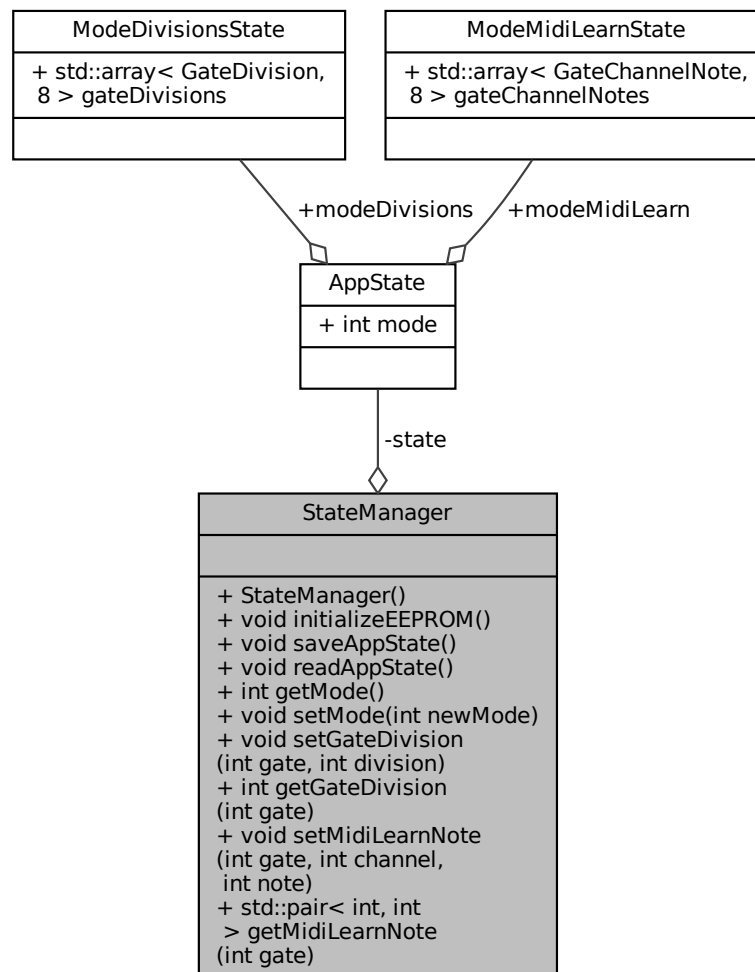
- [include/ResetButton.h](#)
- [src/ResetButton.cpp](#)

4.26 StateManager Class Reference

The [StateManager](#) class is used to manage the application state. It is used to save and read the application state from EEPROM. It uses the [AppState](#) struct to hold the state of the application while the application is running. The state is saved to EEPROM when the app is in mode selection mode.

```
#include <StateManager.h>
```

Collaboration diagram for StateManager:



Public Member Functions

- [StateManager](#) ()
- void [initializeEEPROM](#) ()
Initializes the EEPROM memory with the default [AppState](#) values if the EEPROM has not been initialized.
- void [saveAppState](#) ()
Saves the current [AppState](#) object 'state' to the EEPROM memory.
- void [readAppState](#) ()

- Reads the [AppState](#) object 'state' from the EEPROM memory.*
 - int [getMode](#) ()
- Returns the current mode stored in the [AppState](#) object 'state'.*
 - void [setMode](#) (int newMode)
- Sets the current mode in the [AppState](#) object 'state'.*
 - void [setGateDivision](#) (int gate, int division)
- Sets the gate division for a specific gate in the [AppState](#) object 'state'.*
 - int [getGateDivision](#) (int gate)
- Returns the gate division for a specific gate from the [AppState](#) object 'state'.*
 - void [setMidiLearnNote](#) (int gate, int channel, int note)
- Sets the MIDI learn note and channel for a specific gate in the [AppState](#) object 'state'.*
 - std::pair< int, int > [getMidiLearnNote](#) (int gate)
- Returns the MIDI learn note and channel for a specific gate from the [AppState](#) object 'state'.*

Private Attributes

- [AppState](#) state

4.26.1 Detailed Description

The [StateManager](#) class is used to manage the application state. It is used to save and read the application state from EEPROM. It uses the [AppState](#) struct to hold the state of the application while the application is running. The state is saved to EEPROM when the app is in mode selection mode.

4.26.2 Constructor & Destructor Documentation

4.26.2.1 StateManager()

```
StateManager::StateManager ( )
```

Parameters

<i>state</i>	- The AppState object to be saved to the EEPROM
--------------	---

Empty constructor - we will initialize the [AppState](#) object in the [setup\(\)](#) function this way we can print debug messages.

4.26.3 Member Function Documentation

4.26.3.1 getGateDivision()

```
int StateManager::getGateDivision (
    int gate )
```

Returns the gate division for a specific gate from the [AppState](#) object 'state'.

Parameters

<i>gate</i>	- The gate to get the division for
-------------	------------------------------------

Returns

int - The division for the gate

4.26.3.2 getMidiLearnNote()

```
std::pair< int, int > StateManager::getMidiLearnNote (
    int gate )
```

Returns the MIDI learn note and channel for a specific gate from the [AppState](#) object 'state'.

Parameters

<i>gate</i>	- The gate to get the note and channel for
-------------	--

Returns

std::pair<int, int> - The note and channel for the gate

4.26.3.3 getMode()

```
int StateManager::getMode ( )
```

Returns the current mode stored in the [AppState](#) object 'state'.

Returns

int - The current mode

4.26.3.4 initializeEEPROM()

```
void StateManager::initializeEEPROM ( )
```

Initializes the EEPROM memory with the default [AppState](#) values if the EEPROM has not been initialized.

Read the current state from the EEPROM

Initialize the EEPROM with the default state

Set the mode to 0 by default. This is the first item in the vector.

Initialize [Mode](#) Divisions

Initialize mode1 MIDI channel

Save the default state to the EEPROM

4.26.3.5 readAppState()

```
void StateManager::readAppState ( )
```

Reads the [AppState](#) object 'state' from the EEPROM memory.

By using get we don't have to read each byte individually

4.26.3.6 saveAppState()

```
void StateManager::saveAppState ( )
```

Saves the current [AppState](#) object 'state' to the EEPROM memory.

By using put we don't have to write each byte individually

4.26.3.7 setGateDivision()

```
void StateManager::setGateDivision (
    int gate,
    int division )
```

Sets the gate division for a specific gate in the [AppState](#) object 'state'.

Parameters

<i>gate</i>	- The gate to set the division for
<i>division</i>	- The division to set

4.26.3.8 setMidiLearnNote()

```
void StateManager::setMidiLearnNote (
    int gate,
    int note,
    int channel )
```

Sets the MIDI learn note and channel for a specific gate in the [AppState](#) object 'state'.

Parameters

<i>gate</i>	- The gate to set the note and channel for
<i>note</i>	- The note to set
<i>channel</i>	- The channel to set

4.26.3.9 setMode()

```
void StateManager::setMode (
    int newMode )
```

Sets the current mode in the [AppState](#) object 'state'.

Parameters

<i>newMode</i>	- The new mode to set
----------------	-----------------------

Save the new mode to the EEPROM

4.26.4 Member Data Documentation

4.26.4.1 state

```
AppState StateManager::state [private]
```

The documentation for this class was generated from the following files:

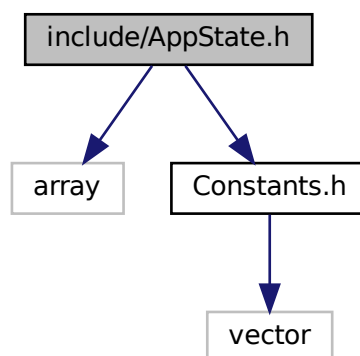
- include/[StateManager.h](#)
- src/[StateManager.cpp](#)

Chapter 5

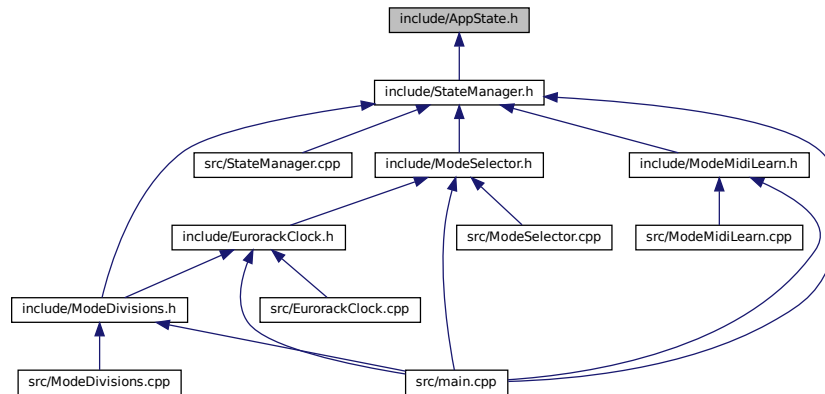
File Documentation

5.1 include/AppState.h File Reference

```
#include <array>
#include "Constants.h"
Include dependency graph for AppState.h:
```



This graph shows which files directly or indirectly include this file:



Classes

- struct [GateDivision](#)

This is a global struct that holds the state of the application. It mainly holds items that need to persist after a power cycle. The object is initialized managed by the [StateManager](#) class.

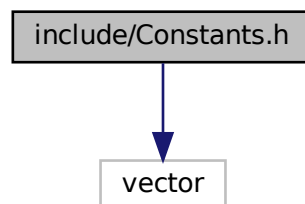
- struct [GateChannelNote](#)
- struct [ModeDivisionsState](#)
- struct [ModeMidiLearnState](#)
- struct [AppState](#)

5.2 include/Constants.h File Reference

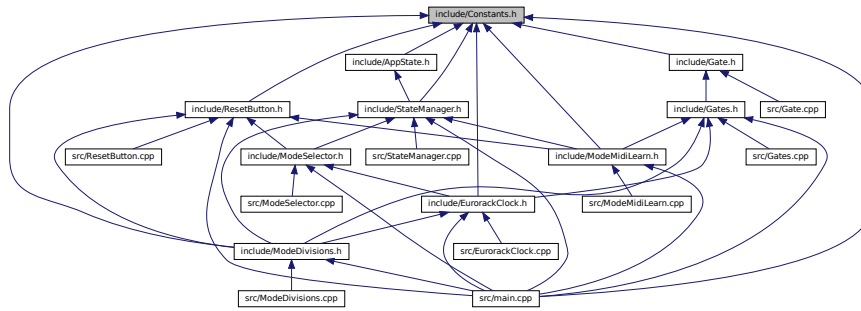
This file contains the constants used throughout the application. I adopted this approach to make the [main.cpp](#) file cleaner and easier to read. This file is included in [main.cpp](#) and [MIDIHandler.cpp](#) among others. There are probably other items to add here, but I'm starting with the musical intervals and PPQN. These are meant to be constants, so they are declared as extern here and defined in [Constants.cpp](#).

```
#include <vector>
```

Include dependency graph for [Constants.h](#):



This graph shows which files directly or indirectly include this file:



Variables

- `std::vector< int >` [musicalIntervals](#)
- `const int` [musicalIntervalsSize](#)
- `unsigned char` [internalPPQN](#)

5.2.1 Detailed Description

This file contains the constants used throughout the application. I adopted this approach to make the [main.cpp](#) file cleaner and easier to read. This file is included in [main.cpp](#) and [MIDIHandler.cpp](#) among others. There are probably other items to add here, but I'm starting with the musical intervals and PPQN. These are meant to be constants, so they are declared as extern here and defined in [Constants.cpp](#).

5.2.2 Variable Documentation

5.2.2.1 internalPPQN

```
unsigned char internalPPQN [extern]
```

5.2.2.2 musicalIntervals

```
std::vector<int> musicalIntervals [extern]
```

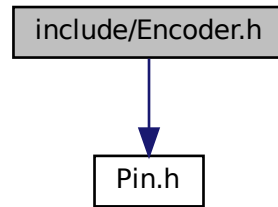
5.2.2.3 musicalIntervalsSize

```
const int musicalIntervalsSize [extern]
```

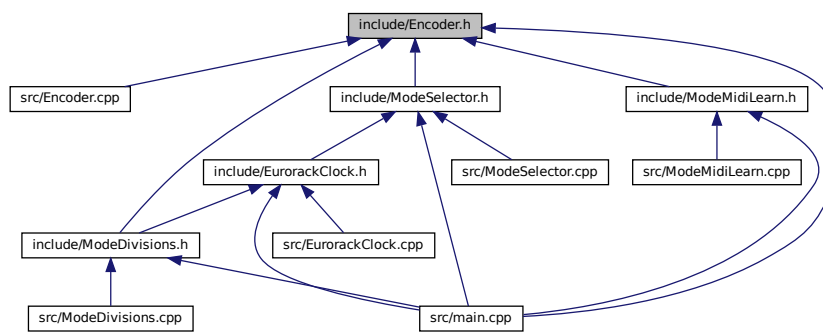


```
#include "Pin.h"
```

Include dependency graph for Encoder.h:



This graph shows which files directly or indirectly include this file:



Classes

- class [Encoder](#)

This class is used to read the encoder and button inputs.

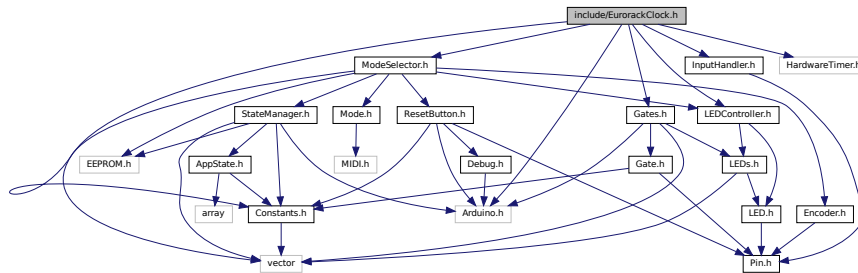
5.4.1 Detailed Description

This file contains the [Encoder](#) class which manages the physical encoder and button inputs.

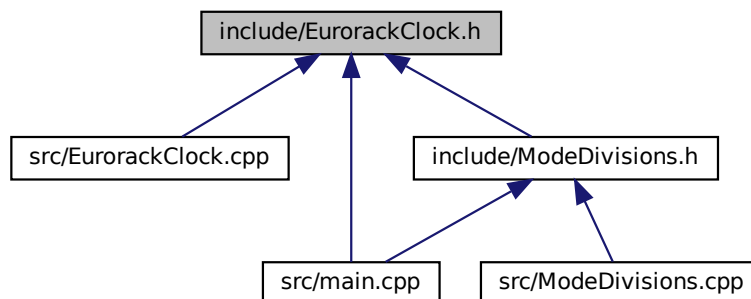
5.5 include/EurorackClock.h File Reference

This file contains the [EurorackClock](#) class, which is used to handle the clock and tempo of the device. This is one of the first classes I wrote for the project, and it has been refactored a few times. It probably could use with a bit more refactoring love, but it works well enough for now.

```
#include <Arduino.h>
#include <HardwareTimer.h>
#include "Gates.h"
#include "LEDController.h"
#include "Constants.h"
#include "InputHandler.h"
#include "ModeSelector.h"
Include dependency graph for EurorackClock.h:
```



This graph shows which files directly or indirectly include this file:



Classes

- struct [ClockState](#)

The [ClockState](#) struct is used to store the current state of the clock.

- class [EurorackClock](#)

The [EurorackClock](#) class is used to handle the clock and tempo of the device. It utilizes an interrupt to handle the clock ticks, and can be set to an external tempo.

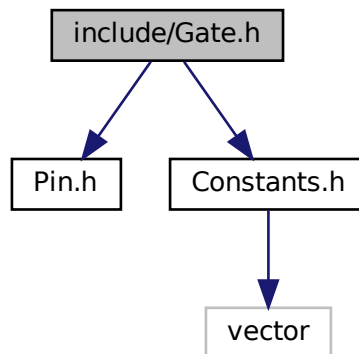
5.5.1 Detailed Description

This file contains the [EurorackClock](#) class, which is used to handle the clock and tempo of the device. This is one of the first classes I wrote for the project, and it has been refactored a few times. It probably could use with a bit more refactoring love, but it works well enough for now.

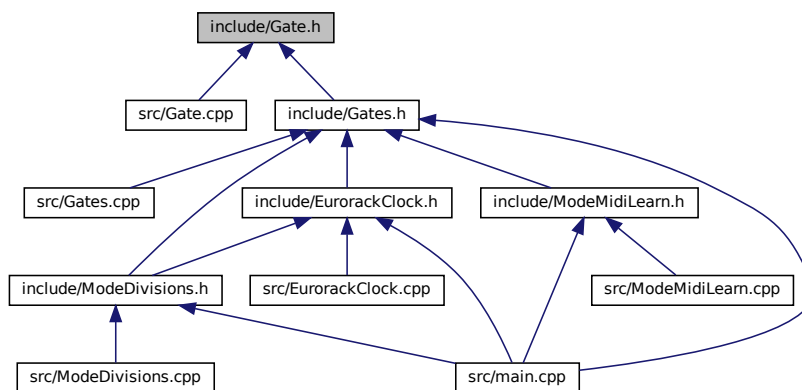
5.6 include/Gate.h File Reference

This file contains the [Gate](#) class, which is used to control the gates.

```
#include "Pin.h"  
#include "Constants.h"  
Include dependency graph for Gate.h:
```



This graph shows which files directly or indirectly include this file:



Classes

- class [Gate](#)

This class defines what a gate is and how it should behave. It inherits from the [OutputPin](#) class, which provides the basic functionality for a pin including setting state to HIGH or LOW, getting the current state, etc.

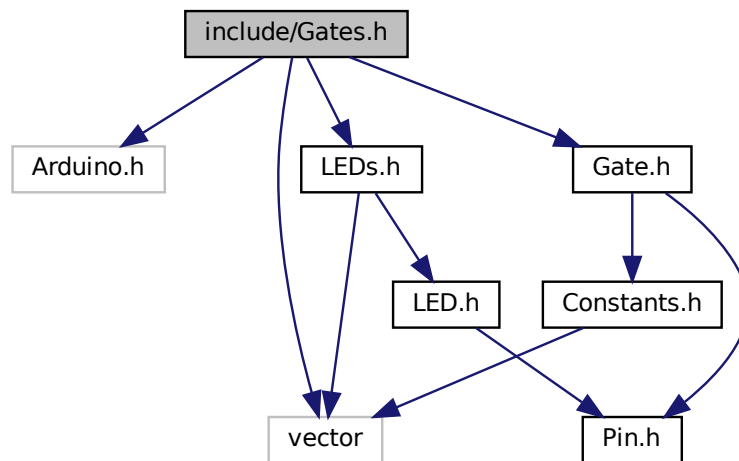
5.6.1 Detailed Description

This file contains the [Gate](#) class, which is used to control the gates.

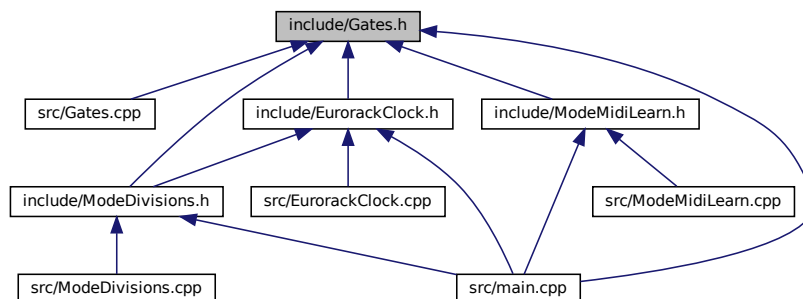
5.7 include/Gates.h File Reference

This file contains the [Gates](#) class, which is used to control the gates in the system.

```
#include <Arduino.h>
#include "Gate.h"
#include "LEDs.h"
#include <vector>
Include dependency graph for Gates.h:
```



This graph shows which files directly or indirectly include this file:



Classes

- class [Gates](#)

This is a collection of gates and thus the main thing we are working with in this project. Very rarely will you need to interact with the [Gate](#) class directly, as most of the functionality is handled by the [Gates](#) class.

5.7.1 Detailed Description

This file contains the [Gates](#) class, which is used to control the gates in the system.

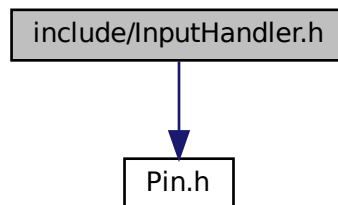
This is also an early class, and could use some refactoring love. But again, this works so it's fine for now. TODO: We could probably move the division logic out of this, but it doesn't interfere with the other modes so it's fine for now.

5.8 include/InputHandler.h File Reference

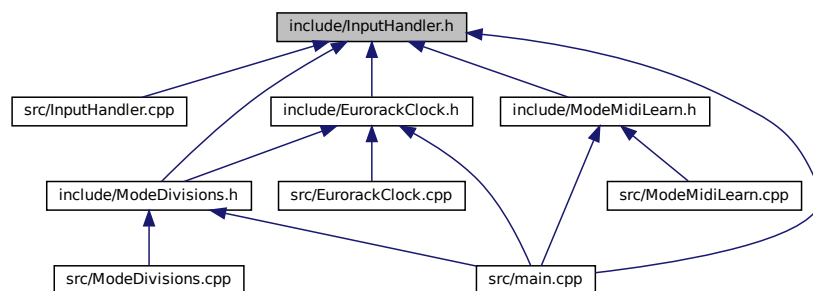
This file contains the [InputHandler](#) class, which is used to read the CV inputs. Right now it only reads the CV inputs but it could be expanded to handle other inputs in the future.

```
#include "Pin.h"
```

Include dependency graph for InputHandler.h:



This graph shows which files directly or indirectly include this file:



Classes

- class [InputHandler](#)

This class is used to read the CV inputs. It is a simple class that uses the [AnalogInputPin](#) class to read the CV inputs. Alias the reset and clock inputs to cvC and cvD respectively. cvC is the reset input and cvD is the clock input.

5.8.1 Detailed Description

This file contains the [InputHandler](#) class, which is used to read the CV inputs. Right now it only reads the CV inputs but it could be expanded to handle other inputs in the future.

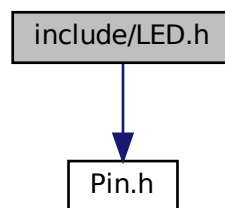
TODO: This is one of the last classes I created and would probably be a better home for the Clock and Reset input handling. I might refactor this in the future to include those features, but again the code works now so it's fine for now.

5.9 include/LED.h File Reference

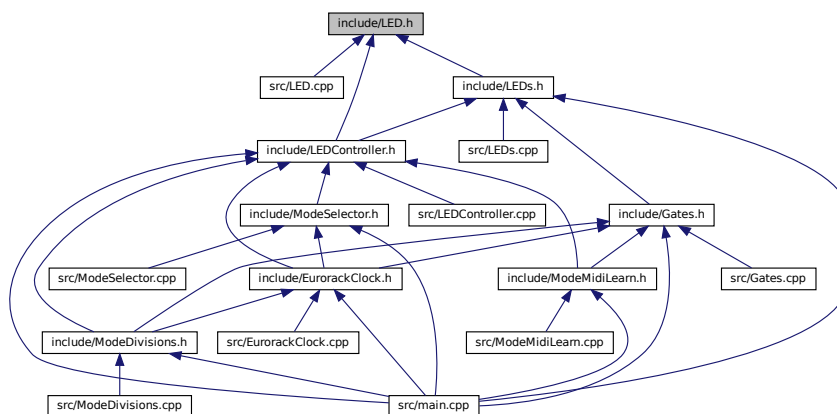
This file contains the [LED](#) class, which is used to control the [LEDs](#) associated with the gates. This of this like a UI matrix as well. The [LEDs](#) are used to indicate the state of the gates, as well as, to provide feedback when selecting modes, gates, etc.

```
#include "Pin.h"
```

Include dependency graph for LED.h:



This graph shows which files directly or indirectly include this file:



Classes

- class [LED](#)

This class defines what an [LED](#) is and how it should behave.

5.9.1 Detailed Description

This file contains the [LED](#) class, which is used to control the [LEDs](#) associated with the gates. This of this like a UI matrix as well. The [LEDs](#) are used to indicate the state of the gates, as well as, to provide feedback when selecting modes, gates, etc.

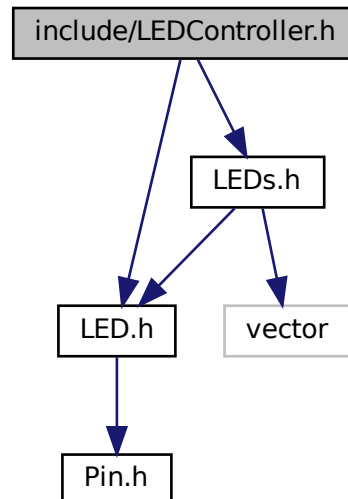
Like the [Gate](#) and [Gates](#) classes, you should not really interact with this clas directly, but rather through the [LEDController](#) class.

5.10 include/LEDController.h File Reference

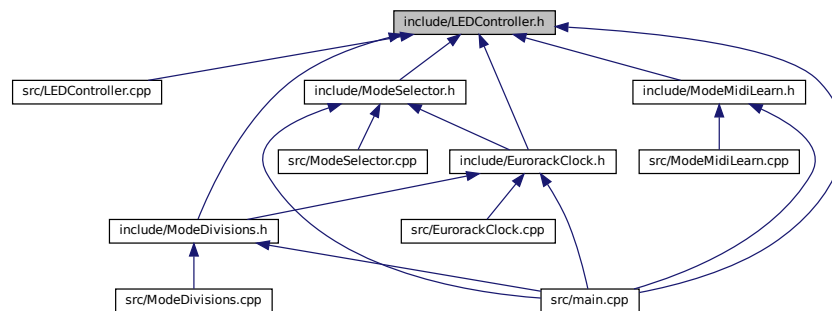
I originally had the [LEDs](#) class handling the [LED](#) control, but I ran into issues making coding difficult all the modes needed to interact with the [LEDs](#) and maintain some sort of state. To help facilityate state and management of the leds I created this class to handle the [LED](#) control and to provide a more user-friendly interface.

```
#include "LED.h"  
#include "LEDs.h"
```

Include dependency graph for LEDController.h:



This graph shows which files directly or indirectly include this file:



Classes

- class [LEDController](#)

This class is used as the main interface for controlling the [LEDs](#).

5.10.1 Detailed Description

I originally had the [LEDs](#) class handling the [LED](#) control, but I ran into issues making coding difficult all the modes needed to interact with the [LEDs](#) and maintain some sort of state. To help facilitate state and management of the leds I created this class to handle the [LED](#) control and to provide a more user-friendly interface.

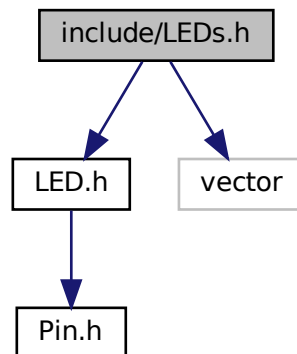
TODO: The tempo [LED](#) is still handled by the [EurorackClock](#) class, which is a bit of a mess. I should move that to this class and refactor the [EurorackClock](#) class to be more of a clock manager. But again, it works so it's fine for now.

5.11 include/LEDs.h File Reference

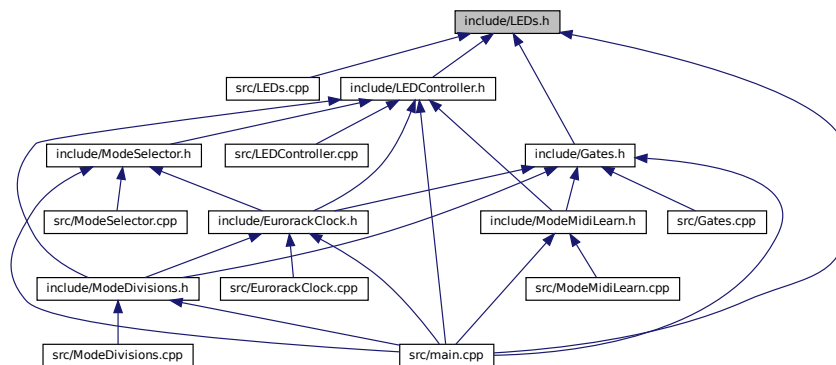
This is a collection of [LEDs](#) which you could interact with this class directly, it is recommended to use the [LEDController](#) class to interact with the [LEDs](#).

```
#include "LED.h"
#include <vector>
```


Include dependency graph for LEDs.h:



This graph shows which files directly or indirectly include this file:



Classes

- class [LEDs](#)

This is a collection of [LEDs](#) and mainly used by the [LEDController](#) class. Use that if you need to interact with the [LEDs](#).

5.11.1 Detailed Description

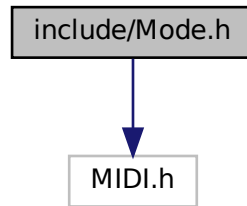
This is a collection of [LEDs](#) which you could interact with this class directly, it is recommended to use the [LEDController](#) class to interact with the [LEDs](#).

5.12 include/Mode.h File Reference

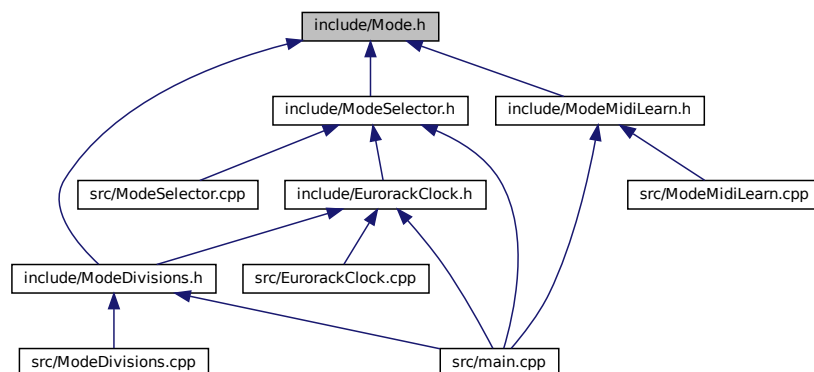
This is the base class for the various modes that the module can be in. It defines the interface that all modes must implement.

```
#include <MIDI.h>
```

Include dependency graph for Mode.h:



This graph shows which files directly or indirectly include this file:



Classes

- class [Mode](#)

This class is the base for our application modes.

5.12.1 Detailed Description

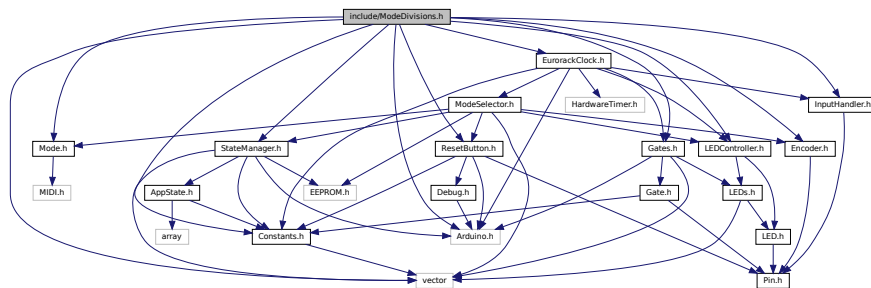
This is the base class for the various modes that the module can be in. It defines the interface that all modes must implement.

5.13 include/ModeDivisions.h File Reference

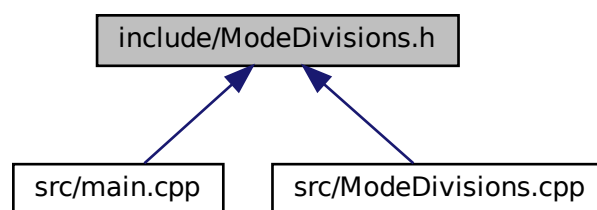
This mode is the main mode for the Eurorack Clock module.

```
#include "Mode.h"
#include "Encoder.h"
#include "Gates.h"
#include "LEDController.h"
#include "EurorackClock.h"
#include "Constants.h"
#include "ResetButton.h"
#include "InputHandler.h"
#include <vector>
#include <Arduino.h>
#include "StateManager.h"
```

Include dependency graph for ModeDivisions.h:



This graph shows which files directly or indirectly include this file:



Classes

- class [ModeDivisions](#)

This class uses the eurorack clock to provide us pulses with selectable division. It can be synced to a clock too, internal and external.

5.13.1 Detailed Description

This mode is the main mode for the Eurorack Clock module.

In this mode, the user can set the tempo, select the division of the clock signal, and select the gate output. It works with the [Encoder](#), [Gates](#), [LEDController](#), [MIDIHandler](#), [ResetButton](#), and [EurorackClock](#) classes.

This mode utilizes an internal clock and can be synchronized with an external clock signal as well as MIDI clock. When the mode is active, the user can set the tempo by turning the encoder knob. The tempo can be set between 20 and 340 BPM. This is done by turning the encoder knob to the left to decrease the tempo or to the right to increase the tempo when in tempo selection mode.

Tempo selection mode is activated by pressing the encoder knob twice in quick succession. Then to exit this mode the user can press the encoder knob twice again.

The user can also select the division of the clock signal for each gate output. The division can be set to 1, 2, 3, 4, 6, 8, 12, 16, 24, 32, 48, 64, 96, 128, 192, or 256 PPQN. This is done by first selecting the gate output by rotating the encoder. The selected gate output will be indicated by the [LED](#) corresponding to the gate output. Then the user can press the encoder knob to enter the division selection mode. The division can be set by rotating the encoder knob. Press the encoder knob again to exit the division selection mode.

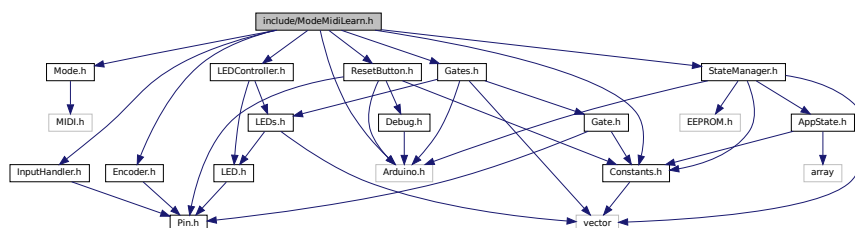
The internal clock is done by using the [EurorackClock](#) class. The clock signal is sent to the gate outputs using the [Gates](#) class. It's all complicated stuff but I'm working on making it easier to understand. The [MIDIHandler](#) class is used to handle MIDI clock signals. The [LEDController](#) class is used to control the [LEDs](#) on the module.

TODO: The internal clock works with a PPQN of 24 by default. This can be changed by pressing the reset button and rotating the encoder knob to select the desired PPQN.

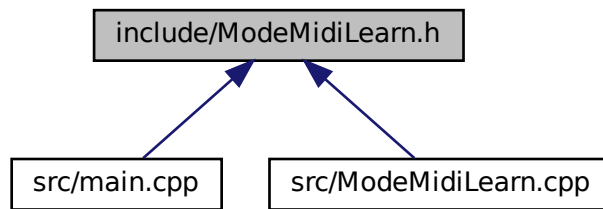
5.14 include/ModeMidiLearn.h File Reference

```
#include "Mode.h"
#include <Arduino.h>
#include "LEDController.h"
#include "Encoder.h"
#include "Gates.h"
#include "Constants.h"
#include "InputHandler.h"
#include "ResetButton.h"
#include "StateManager.h"
```

Include dependency graph for ModeMidiLearn.h:



This graph shows which files directly or indirectly include this file:



Classes

- class [ModeMidiLearn](#)

This is a MIDI to Trigger class for Note On but it only cares about the channel number.

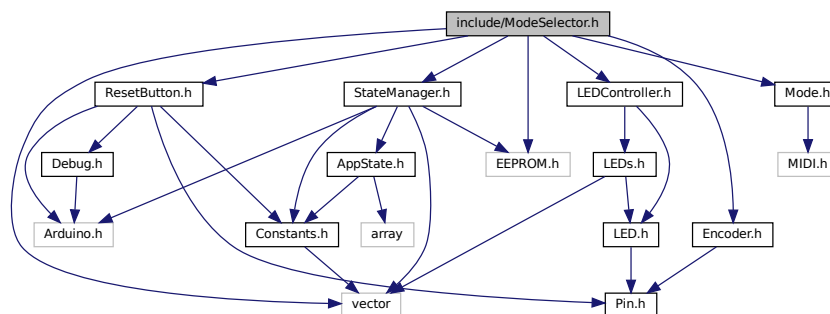
5.15 include/ModeSelector.h File Reference

```

#include <vector>
#include <EEPROM.h>
#include "LEDController.h"
#include "Encoder.h"
#include "Mode.h"
#include "ResetButton.h"
#include "StateManager.h"

```

Include dependency graph for ModeSelector.h:



- class [AnalogInputPin](#)
This class represents an analog input pin on the microcontroller.
- class [OutputPin](#)
This class represents an output pin on the microcontroller.
- class [PWMPin](#)
This class represents a PWM output pin on the microcontroller.

5.16.1 Detailed Description

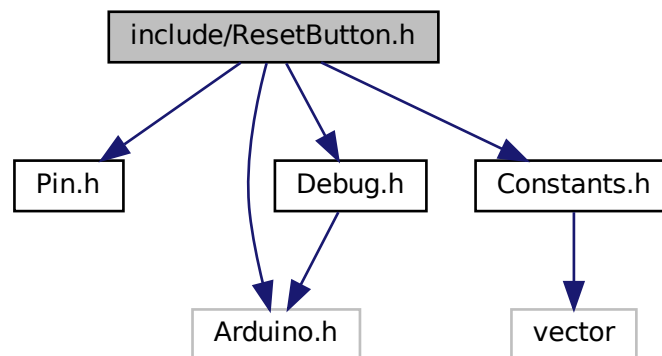
This file contains the pin base class and its derived classes for input, output, and PWM pins.

5.17 include/ResetButton.h File Reference

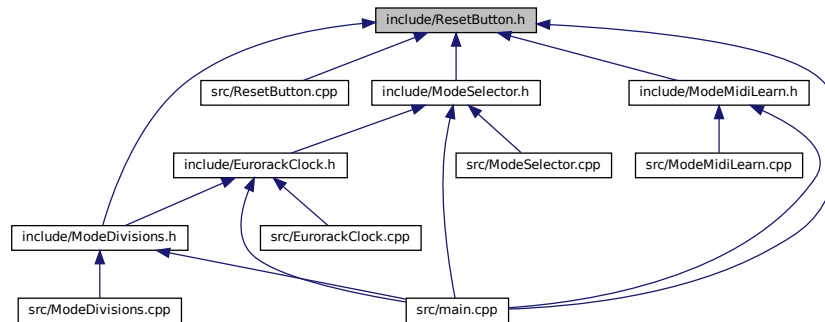
This file contains the [ResetButton](#) class which manages the physical reset button input.

```
#include "Pin.h"  
#include <Arduino.h>  
#include "Debug.h"  
#include "Constants.h"
```

Include dependency graph for ResetButton.h:



This graph shows which files directly or indirectly include this file:



Classes

- class [ResetButton](#)

This class is used to read the reset button input.

5.17.1 Detailed Description

This file contains the [ResetButton](#) class which manages the physical reset button input.

TODO: This class could probably be combined with the [Encoder](#) class to create a more generic Button class as the functionality is very similar. But it works now so it's fine for now.

5.18 include/StateManager.h File Reference

This file contains the [StateManager](#) class, which is used to manage the application state. It is used to save and read the application state from EEPROM.

```

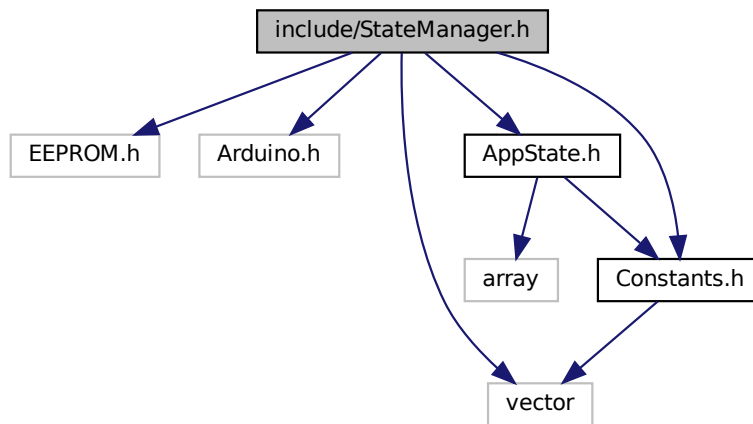
#include <EEPROM.h>
#include <Arduino.h>
#include <vector>
#include "AppState.h"

```

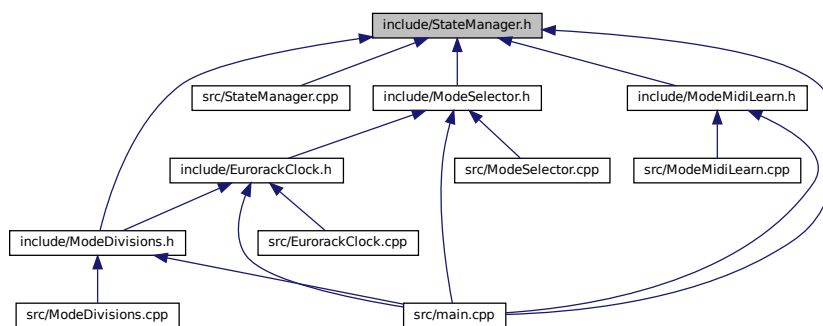


```
#include "Constants.h"
```

Include dependency graph for StateManager.h:



This graph shows which files directly or indirectly include this file:



Classes

- class [StateManager](#)

The [StateManager](#) class is used to manage the application state. It is used to save and read the application state from EEPROM. It uses the [AppState](#) struct to hold the state of the application while the application is running. The state is saved to EEPROM when the app is in mode selection mode.

5.18.1 Detailed Description

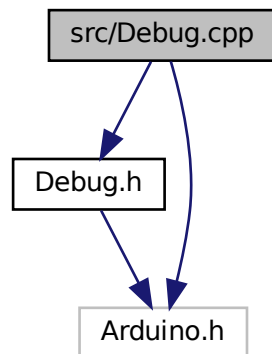
This file contains the [StateManager](#) class, which is used to manage the application state. It is used to save and read the application state from EEPROM.

5.19 src/Debug.cpp File Reference

helper class for debugging

```
#include "Debug.h"  
#include <Arduino.h>
```

Include dependency graph for Debug.cpp:



5.19.1 Detailed Description

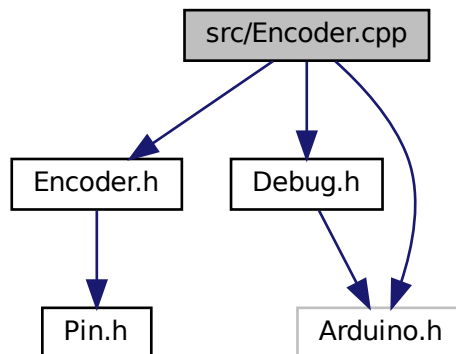
helper class for debugging

5.20 src/Encoder.cpp File Reference

This file contains the implementation of the [Encoder](#) class which manages the physical encoder and button inputs.

```
#include "Encoder.h"  
#include "Debug.h"  
#include <Arduino.h>
```

Include dependency graph for Encoder.cpp:



Macros

- `#define DEBUG_PRINT(message) Debug::print(__FILE__, __LINE__, __func__, String(message))`

5.20.1 Detailed Description

This file contains the implementation of the [Encoder](#) class which manages the physical encoder and button inputs.

5.20.2 Macro Definition Documentation

5.20.2.1 DEBUG_PRINT

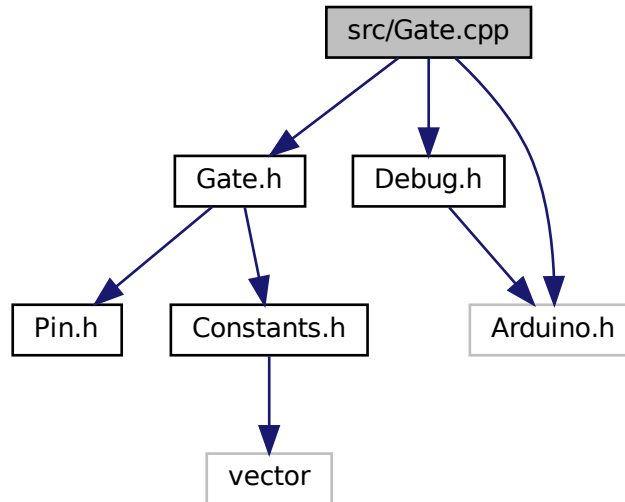
```
#define DEBUG_PRINT(  
    message ) Debug::print(__FILE__, __LINE__, __func__, String(message))
```

5.21 src/EurorackClock.cpp File Reference

This file contains the implementation of the [EurorackClock](#) class, which is used to manage the clock and gates of the Eurorack module.


```
#include <Arduino.h>
```

Include dependency graph for Gate.cpp:



Macros

- `#define DEBUG_PRINT(message) Debug::print(__FILE__, __LINE__, __func__, String(message))`

5.22.1 Detailed Description

This file contains the implementation of the [Gate](#) class, which is used to manage the gates of the Eurorack module.

5.22.2 Macro Definition Documentation

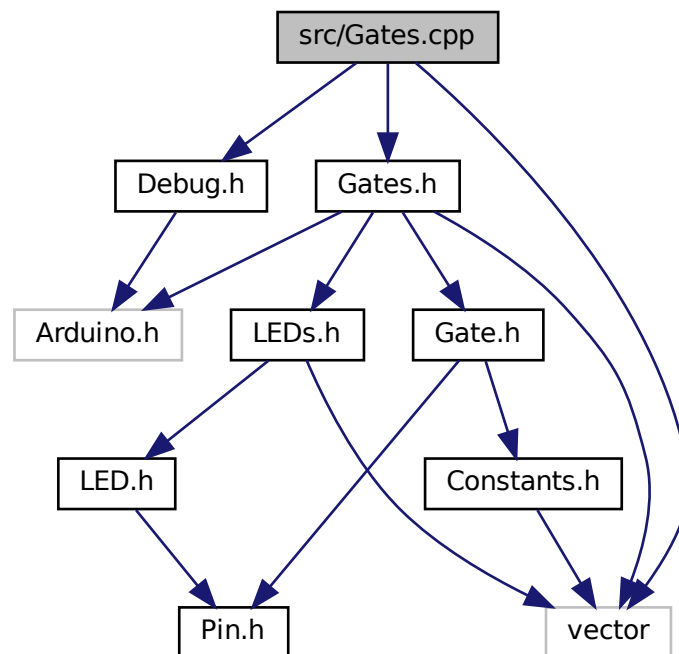
5.22.2.1 `DEBUG_PRINT`

```
#define DEBUG_PRINT(  
    message ) Debug::print(__FILE__, __LINE__, __func__, String(message))
```

5.23 src/Gates.cpp File Reference

This file contains the implementation of the [Gates](#) class, which is used to manage the gates of the Eurorack module.

```
#include "Gates.h"
#include "Debug.h"
#include <vector>
Include dependency graph for Gates.cpp:
```



Macros

- `#define DEBUG_PRINT(message) Debug::print(__FILE__, __LINE__, __func__, String(message))`

5.23.1 Detailed Description

This file contains the implementation of the [Gates](#) class, which is used to manage the gates of the Eurorack module.

5.23.2 Macro Definition Documentation

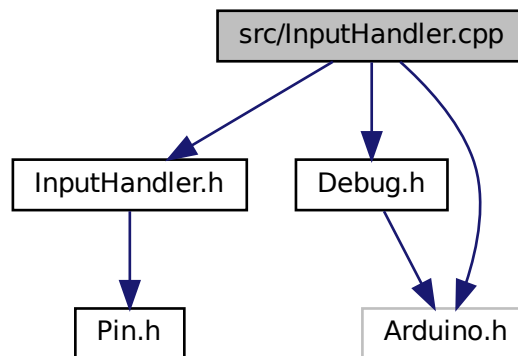
5.23.2.1 DEBUG_PRINT

```
#define DEBUG_PRINT(
    message ) Debug::print(__FILE__, __LINE__, __func__, String(message))
```

5.24 src/InputHandler.cpp File Reference

This file contains the implementation of the [InputHandler](#) class, which is used to manage the CV inputs of the Eurorack module.

```
#include "InputHandler.h"
#include "Debug.h"
#include <Arduino.h>
Include dependency graph for InputHandler.cpp:
```



Macros

- #define `DEBUG_PRINT`(message) `Debug::print(__FILE__, __LINE__, __func__, String(message))`

5.24.1 Detailed Description

This file contains the implementation of the [InputHandler](#) class, which is used to manage the CV inputs of the Eurorack module.

5.24.2 Macro Definition Documentation

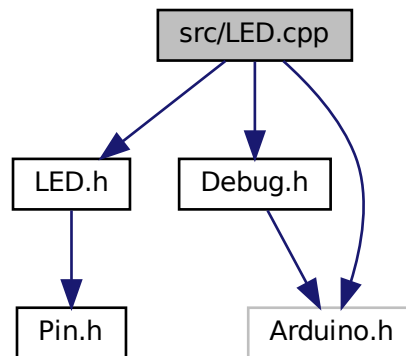
5.24.2.1 DEBUG_PRINT

```
#define DEBUG_PRINT(
    message ) Debug::print(__FILE__, __LINE__, __func__, String(message))
```

5.25 src/LED.cpp File Reference

This file contains the implementation of the [LED](#) class, which is used to manage the [LEDs](#) of the Eurorack module.

```
#include "LED.h"
#include "Debug.h"
#include <Arduino.h>
Include dependency graph for LED.cpp:
```



Macros

- #define [DEBUG_PRINT](#)(message) [Debug::print](#)(__FILE__, __LINE__, __func__, String(message))

5.25.1 Detailed Description

This file contains the implementation of the [LED](#) class, which is used to manage the [LEDs](#) of the Eurorack module.

5.25.2 Macro Definition Documentation

5.25.2.1 DEBUG_PRINT

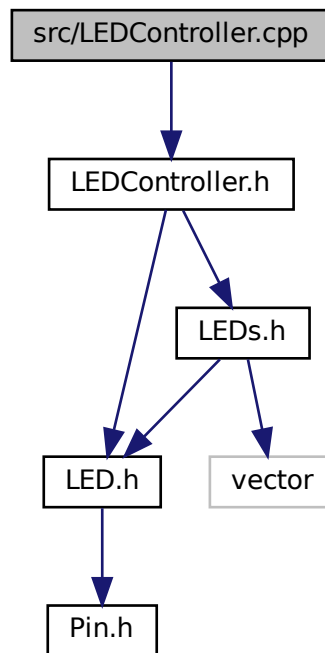
```
#define DEBUG_PRINT(
    message ) Debug::print(__FILE__, __LINE__, __func__, String(message))
```


5.26 src/LEDController.cpp File Reference

This file contains the implementation of the [LEDController](#) class, which is used to manage the [LEDs](#) of the Eurorack module.

```
#include "LEDController.h"
```

Include dependency graph for LEDController.cpp:



5.26.1 Detailed Description

This file contains the implementation of the [LEDController](#) class, which is used to manage the [LEDs](#) of the Eurorack module.

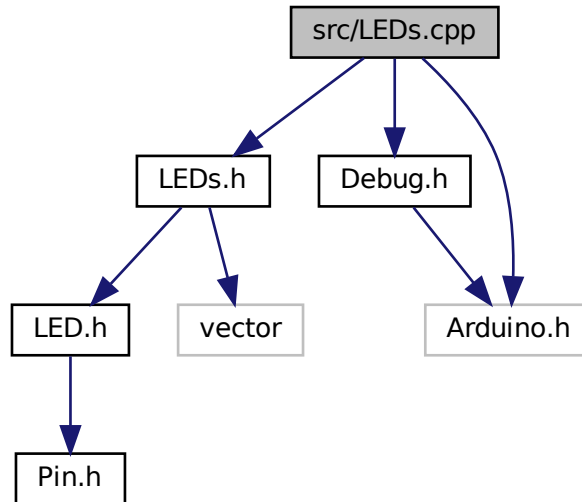
5.27 src/LEDs.cpp File Reference

This is the implementation file for the [LEDs](#) class, which is used to manage the [LEDs](#) of the Eurorack module.

```
#include "LEDs.h"  
#include "Debug.h"
```

```
#include <Arduino.h>
```

Include dependency graph for LEDs.cpp:



Macros

- `#define DEBUG_PRINT(message) Debug::print(__FILE__, __LINE__, __func__, String(message))`

5.27.1 Detailed Description

This is the implementation file for the [LEDs](#) class, which is used to manage the [LEDs](#) of the Eurorack module.

5.27.2 Macro Definition Documentation

5.27.2.1 `DEBUG_PRINT`

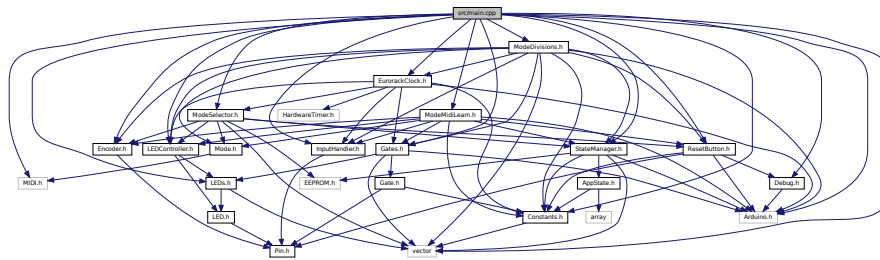
```
#define DEBUG_PRINT(
    message ) Debug::print(__FILE__, __LINE__, __func__, String(message))
```

5.28 src/main.cpp File Reference

This is the main entrypoint of the G8R application. I'm trying to keep this file as clean as possible, so most of the logic is in the [Mode](#) classes.

```
#include <Arduino.h>
#include <vector>
#include <MIDI.h>
#include "Gates.h"
#include "ModeSelector.h"
#include "LEDs.h"
#include "Debug.h"
#include "Encoder.h"
#include "EurorackClock.h"
#include "Constants.h"
#include "LEDController.h"
#include "ResetButton.h"
#include "InputHandler.h"
#include "StateManager.h"
#include "ModeDivisions.h"
#include "ModeMidiLearn.h"
```

Include dependency graph for main.cpp:



Macros

- #define [DEBUG_PRINT](#)(message) [Debug::print](#)(__FILE__, __LINE__, __func__, String(message))
Debug print macro, used to make debugging easier.
- #define [RX_PIN](#) PA3
- #define [TX_PIN](#) PA2
- #define [ENCODER_PINA](#) PB13
- #define [ENCODER_PINB](#) PB14
- #define [ENCODER_BUTTON](#) PB12
- #define [CLOCK_PIN](#) PB10
- #define [RESET_PIN](#) PB11
- #define [RESET_BUTTON](#) PB15
- #define [TEMPO_LED](#) PA8
- #define [CV_A_PIN](#) PA4
- #define [CV_B_PIN](#) PA5

Functions

- `midi::SerialMIDI< HardwareSerial > midiSerial (Serial2)`
Instance of the [EurorackClock](#) class.
- `midi::MidiInterface< midi::SerialMIDI< HardwareSerial > > midiInterface (midiSerial)`
- `void midiSetup ()`
Instance of [Mode2](#) class.
- `void setup ()`
Setup function for the Arduino sketch.
- `void loop ()`
Main loop function for the Arduino sketch.

Variables

- `std::vector< int > pins = {PA15, PB3, PB4, PB5, PB6, PB7, PB8, PB9}`
- `const int numPins = pins.size()`
- `std::vector< int > ledPins = {PA12, PA11, PB1, PB0, PA7, PA6, PA1, PA0}`
- `int numLedPins = ledPins.size()`
- `bool inModeSelection = false`
- `bool isInSelection = false`
- `unsigned char internalPPQN = 24`
- `std::vector< int > musicalIntervals = {1, 2, 3, 4, 6, 8, 12, 16, 24, 32, 48, 64, 72, 96, 128, 144, 192, 288, 384, 576, 768, 1152, 1536}`
- `const int musicalIntervalsSize = musicalIntervals.size()`
- `Gates gates = Gates(pins, numPins)`
- `LEDs leds = LEDs(ledPins, numLedPins)`
- `StateManager stateManager = StateManager()`
- `Encoder encoder = Encoder(ENCODER_PINA, ENCODER_PINB, ENCODER_BUTTON)`
Instance of the [StateManager](#) class used to manage state of the device in EEPROM.
- `ResetButton resetButton = ResetButton(RESET_BUTTON)`
Instance of the [Encoder](#) class.
- `LEDController ledController (leds, TEMPO_LED)`
Instance of the [ResetButton](#) class.
- `InputHandler inputHandler = InputHandler(CV_A_PIN, CV_B_PIN, RESET_PIN, CLOCK_PIN)`
Instance of the [LEDController](#) class.
- `EurorackClock clock (gates, ledController, inputHandler)`
Instance of the [InputHandler](#) class.
- `ModeSelector & modeSelector = ModeSelector::getInstance()`
- `Mode * currentMode = nullptr`
Instance of the [ModeSelector](#) class.
- `Mode * previousMode = nullptr`
Pointer to the current mode.
- `ModeDivisions modeDivisions (stateManager, encoder, inputHandler, gates, ledController, midiInterface, resetButton, clock)`
Pointer to the previous mode.
- `ModeMidiLearn modeMidiLearn (stateManager, encoder, inputHandler, gates, ledController, midiInterface, resetButton)`
Instance of [ModeDivisions](#) class.

5.28.1 Detailed Description

This is the main entrypoint of the G8R application. I'm trying to keep this file as clean as possible, so most of the logic is in the [Mode](#) classes.

5.28.2 Macro Definition Documentation

5.28.2.1 CLOCK_PIN

```
#define CLOCK_PIN PB10
```

5.28.2.2 CV_A_PIN

```
#define CV_A_PIN PA4
```

5.28.2.3 CV_B_PIN

```
#define CV_B_PIN PA5
```

5.28.2.4 DEBUG_PRINT

```
#define DEBUG_PRINT(  
    message ) Debug::print(__FILE__, __LINE__, __func__, String(message))
```

[Debug](#) print macro, used to make debugging easier.

5.28.2.5 ENCODER_BUTTON

```
#define ENCODER_BUTTON PB12
```

5.28.2.6 ENCODER_PINA

```
#define ENCODER_PINA PB13
```

5.28.2.7 ENCODER_PINB

```
#define ENCODER_PINB PB14
```

5.28.2.8 RESET_BUTTON

```
#define RESET_BUTTON PB15
```

5.28.2.9 RESET_PIN

```
#define RESET_PIN PB11
```

5.28.2.10 RX_PIN

```
#define RX_PIN PA3
```

5.28.2.11 TEMPO_LED

```
#define TEMPO_LED PA8
```

5.28.2.12 TX_PIN

```
#define TX_PIN PA2
```

5.28.3 Function Documentation

5.28.3.1 loop()

```
void loop ( )
```

Main loop function for the Arduino sketch.

This function is called repeatedly as long as the Arduino is powered on. It contains the main logic of the sketch.

5.28.3.2 midiInterface()

```
midi::MidiInterface<midi::SerialMIDI<HardwareSerial> > midiInterface (
    midiSerial )
```

5.28.3.3 midiSerial()

```
midi::SerialMIDI<HardwareSerial> midiSerial (
    Serial2 )
```

Instance of the [EurorackClock](#) class.

5.28.3.4 midiSetup()

```
void midiSetup ( )
```

Instance of Mode2 class.

This function is used to setup the MIDI interface. It is intended to be called in the [setup\(\)](#) function of the main sketch. We'll set the actual callback functions in the mode classes [setup\(\)](#) and [teardown\(\)](#) methods.

5.28.3.5 setup()

```
void setup ( )
```

Setup function for the Arduino sketch.

This function is called once when the sketch starts. It is used to initialize variables, input and output pin modes, and start using libraries. Initialize the debug settings

Add the modes to the [ModeSelector](#). IMPORTANT: Add the modes in the order you want them to be selected via the encoder.

This gets the current mode from the [ModeSelector](#) and sets it as the current mode. It then updates the pointer to the current mode. This way we can switch modes easily at runtime by changing the the pointer to the current mode. Basically a State Pattern.

5.28.4 Variable Documentation

5.28.4.1 clock

```
EurorackClock clock(gates, ledController, inputHandler) (  
    gates ,  
    ledController ,  
    inputHandler )
```

Instance of the [InputHandler](#) class.

5.28.4.2 currentMode

```
Mode* currentMode = nullptr
```

Instance of the [ModeSelector](#) class.

5.28.4.3 encoder

```
Encoder encoder = Encoder(ENCODER_PINA, ENCODER_PINB, ENCODER_BUTTON)
```

Instance of the [StateManager](#) class used to manage state of the device in EEPROM.

5.28.4.4 gates

```
Gates gates = Gates(pins, numPins)
```

5.28.4.5 inModeSelection

```
bool inModeSelection = false
```

5.28.4.6 inputHandler

```
InputHandler inputHandler = InputHandler(CV_A_PIN, CV_B_PIN, RESET_PIN, CLOCK_PIN)
```

Instance of the [LEDController](#) class.

5.28.4.7 internalPPQN

```
unsigned char internalPPQN = 24
```

5.28.4.8 isInSelection

```
bool isInSelection = false
```

5.28.4.9 ledController

```
LEDController ledController(leds, TEMPO_LED) (  
    leds ,  
    TEMPO_LED )
```

Instance of the [ResetButton](#) class.

5.28.4.10 ledPins

```
std::vector<int> ledPins = {PA12, PA11, PB1, PB0, PA7, PA6, PA1, PA0}
```

5.28.4.11 leds

```
LEDs leds = LEDs(ledPins, numLedPins)
```

5.28.4.12 modeDivisions

```
ModeDivisions modeDivisions(stateManager, encoder, inputHandler, gates, ledController, midiInterface,  
resetButton, clock) (  
    stateManager ,  
    encoder ,  
    inputHandler ,  
    gates ,  
    ledController ,  
    midiInterface ,  
    resetButton ,  
    clock )
```

Pointer to the previous mode.

5.28.4.13 modeMidiLearn

```
ModeMidiLearn modeMidiLearn(stateManager, encoder, inputHandler, gates, ledController, midiInterface,
resetButton) (
    stateManager ,
    encoder ,
    inputHandler ,
    gates ,
    ledController ,
    midiInterface ,
    resetButton )
```

Instance of [ModeDivisions](#) class.

5.28.4.14 modeSelector

```
ModeSelector& modeSelector = ModeSelector::getInstance()
```

5.28.4.15 musicalIntervals

```
std::vector<int> musicalIntervals = {1, 2, 3, 4, 6, 8, 12, 16, 24, 32, 48, 64, 72, 96, 128,
144, 192, 288, 384, 576, 768, 1152, 1536}
```

5.28.4.16 musicalIntervalsSize

```
const int musicalIntervalsSize = musicalIntervals.size()
```

5.28.4.17 numLedPins

```
int numLedPins = ledPins.size()
```

5.28.4.18 numPins

```
const int numPins = pins.size()
```

5.28.4.19 pins

```
std::vector<int> pins = {PA15, PB3, PB4, PB5, PB6, PB7, PB8, PB9}
```

5.28.4.20 previousMode

```
Mode* previousMode = nullptr
```

Pointer to the current mode.

5.28.4.21 resetButton

```
ResetButton resetButton = ResetButton(RESET_BUTTON)
```

Instance of the [Encoder](#) class.

5.28.4.22 stateManager

```
StateManager stateManager = StateManager()
```

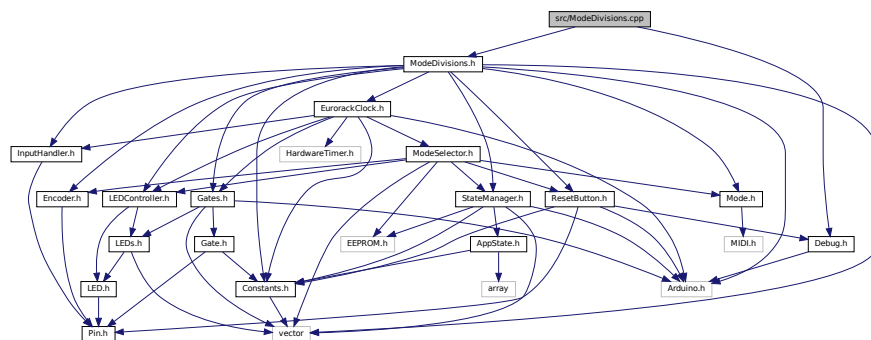
5.29 src/ModeDivisions.cpp File Reference

Implementation file for [ModeDivisions](#), Please see [ModeDivisions.h](#) for more information.

```
#include "ModeDivisions.h"
```

```
#include "Debug.h"
```

Include dependency graph for ModeDivisions.cpp:



5.30.2 Macro Definition Documentation

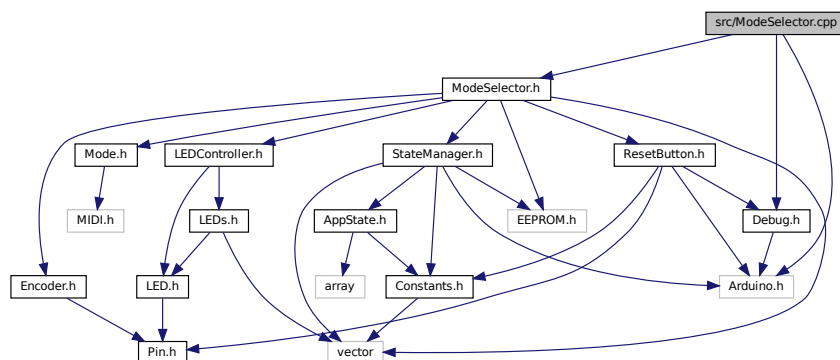
5.30.2.1 DEBUG_PRINT

```
#define DEBUG_PRINT(
    message ) Debug::print(__FILE__, __LINE__, __func__, String(message))
```

5.31 src/ModeSelector.cpp File Reference

This file contains the implementation of the [ModeSelector](#) class, which is used to manage the different modes of the Eurorack module. [ModeSelector](#) is a singleton class that is used to manage the different modes of the Eurorack module. It is responsible for handling the mode selection state, button presses, and encoder rotation.

```
#include "ModeSelector.h"
#include <Arduino.h>
#include "Debug.h"
Include dependency graph for ModeSelector.cpp:
```



Macros

- #define [DEBUG_PRINT](#)(message) [Debug::print](#)(__FILE__, __LINE__, __func__, String(message))

5.31.1 Detailed Description

This file contains the implementation of the [ModeSelector](#) class, which is used to manage the different modes of the Eurorack module. [ModeSelector](#) is a singleton class that is used to manage the different modes of the Eurorack module. It is responsible for handling the mode selection state, button presses, and encoder rotation.

5.31.2 Macro Definition Documentation

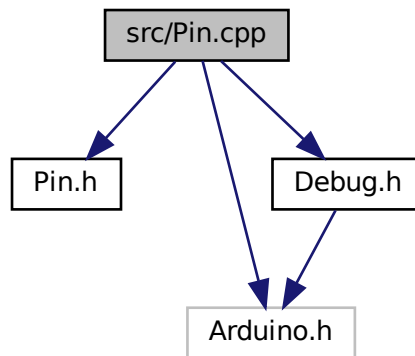
5.31.2.1 DEBUG_PRINT

```
#define DEBUG_PRINT(
    message ) Debug::print(__FILE__, __LINE__, __func__, String(message))
```

5.32 src/Pin.cpp File Reference

This file contains the implementation of the [Pin](#) class and its derived classes.

```
#include "Pin.h"
#include <Arduino.h>
#include "Debug.h"
Include dependency graph for Pin.cpp:
```



Macros

- #define [DEBUG_PRINT](#)(message) [Debug::print](#)(__FILE__, __LINE__, __func__, String(message))

5.32.1 Detailed Description

This file contains the implementation of the [Pin](#) class and its derived classes.

5.32.2 Macro Definition Documentation

5.32.2.1 DEBUG_PRINT

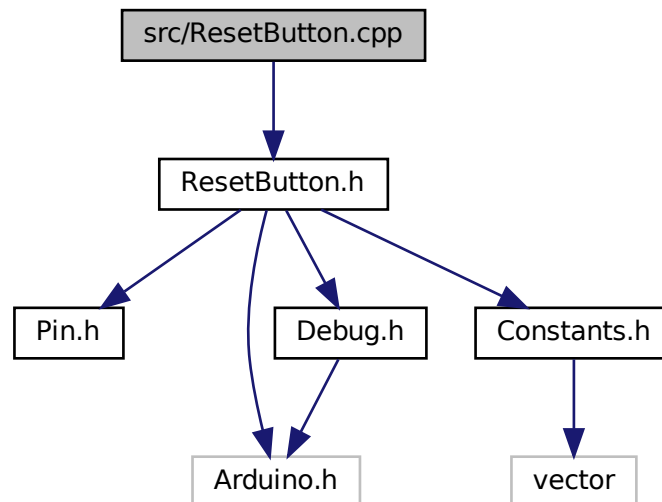
```
#define DEBUG_PRINT(
    message ) Debug::print(__FILE__, __LINE__, __func__, String(message))
```

5.33 src/ResetButton.cpp File Reference

This file contains the implementation of the [ResetButton](#) class, which is used to manage the reset button of the Eurorack module.

```
#include "ResetButton.h"
```

Include dependency graph for ResetButton.cpp:



5.33.1 Detailed Description

This file contains the implementation of the [ResetButton](#) class, which is used to manage the reset button of the Eurorack module.

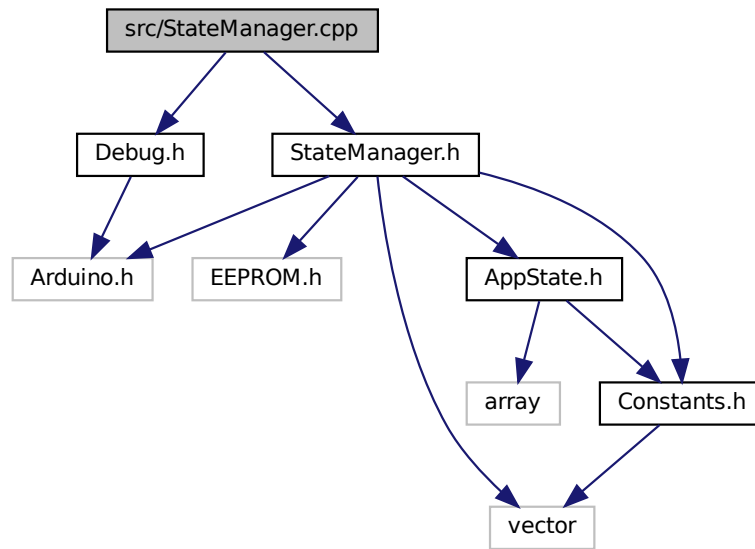
5.34 src/StateManager.cpp File Reference

"This class manages reading and writing state to the EEPROM memory."

```
#include "StateManager.h"
```

```
#include "Debug.h"
```

Include dependency graph for StateManager.cpp:



Macros

- `#define DEBUG_PRINT(message) Debug::print(__FILE__, __LINE__, __func__, String(message))`

5.34.1 Detailed Description

"This class manages reading and writing state to the EEPROM memory."

5.34.2 Macro Definition Documentation

5.34.2.1 `DEBUG_PRINT`

```
#define DEBUG_PRINT(
    message ) Debug::print(__FILE__, __LINE__, __func__, String(message))
```

[Debug](#) macro