Arduino Secret Pattern Lock

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1 Hierarchical Index

1.1 Class Hierarchy

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

Feedbacker **3**

LedFeedbacker **9**

KnockLock **5**

2 Class Index

2.1 Class List

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

Feedbacker
Arduino - ArduinoSecretPatternLock driver **3**

KnockLock **5**

LedFeedbacker 9

3 File Index

3.1 File List

Here is a list of all files with brief descriptions:

Feedbacker.cpp 10

Feedbacker.h 11

KnockLock.cpp 12

KnockLock.h 14

LedFeedbacker.cpp 17

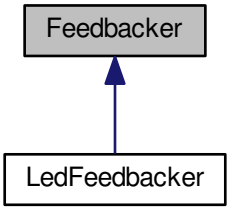
LedFeedbacker.h 18

4 Class Documentation

4.1 Feedbacker Class Reference

`#include <Feedbacker.h>`

Inheritance diagram for Feedbacker:



Public Types

- enum Feedback {
  ACCESS_DENIED = 0x00, ACCESS_GRANTED, INVALID_OPERATION, ENTER_PROGRAM_MODE,
  EXIT_PROGRAM_MODE, SUCCESSFULLY_SAVED }

Public Member Functions

- virtual void sendFeedback (Feedback feedback)=0

4.1.1 Detailed Description

Arduino - ArduinoSecretPatternLock driver.

Author

Dalmir da Silva dalmirdasilva@gmail.com

Definition at line 10 of file Feedbacker.h.

4.1.2 Member Enumeration Documentation

4.1.2.1 enum Feedbacker::Feedback

Enumerator

ACCESS_DENIED

ACCESS_GRANTED

INVALID_OPERATION

ENTER_PROGRAM_MODE

EXIT_PROGRAM_MODE

SUCCESSFULLY_SAVED

Definition at line 13 of file Feedbacker.h.

4.1.3 Member Function Documentation

4.1.3.1 virtual void Feedbacker::sendFeedback (Feedback *feedback*) [pure virtual]

Implemented in LedFeedbacker.

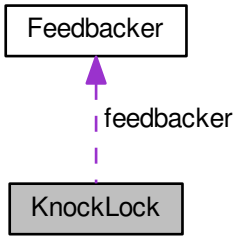
The documentation for this class was generated from the following file:

- Feedbacker.h

4.2 KnockLock Class Reference

`#include <KnockLock.h>`

Collaboration diagram for KnockLock:



Public Member Functions

- KnockLock (int knockPin, int programPin, int buzzerPin, Feedbacker *feedbacker, RandomAccess *storage)
- void initialize ()
- void playback ()
- bool listen (unsigned long timeout=0)

Private Types

- enum Feedback { ENTER_PROGRAM_MODE = 0x00, EXIT_PROGRAM_MODE, PATTERN_SAVED, KNOCKS_MISMATCH }

Private Member Functions

- void enterProgramMode ()
- void exitProgramMode ()
- bool isInProgramMode ()
- void processKnocks ()
- void knockDelay ()
- void normalizeKnocks ()
- bool validateKnocks ()
- bool doKnocksMatchPattern ()
- void loadPattern ()
- void savePattern ()

Private Attributes

- int knockPin
- int programPin
- int buzzerPin
- Feedbacker * feedbacker
- RandomAccess * storage
- int patternSize
- int knocksSize
- bool programMode
- unsigned char pattern [KNOCK_LOCK_MAX_KNOCKS]
- unsigned int knocks [KNOCK_LOCK_MAX_KNOCKS]

4.2.1 Detailed Description

Definition at line 16 of file KnockLock.h.

4.2.2 Member Enumeration Documentation

4.2.2.1 enum KnockLock::Feedback [private]

Enumerator

ENTER_PROGRAM_MODE

EXIT_PROGRAM_MODE

PATTERN_SAVED

KNOCKS_MISMATCH

Definition at line 38 of file KnockLock.h.

4.2.3 Constructor & Destructor Documentation

4.2.3.1 KnockLock::KnockLock (int *knockPin*, int *programPin*, int *buzzerPin*, Feedbacker * *feedbacker*, RandomAccess * *storage*)

Definition at line 4 of file KnockLock.cpp.

4.2.4 Member Function Documentation

4.2.4.1 bool KnockLock::doKnocksMatchPattern ( ) [private]

Definition at line 98 of file KnockLock.cpp.

4.2.4.2 void KnockLock::enterProgramMode ( ) [private]

Enter in the program mode.

Keep programPin in high impedance for KNOCK_LOCK_PROGRAM_BUTTON_MIN_TIME_PRESSED millis.

Definition at line 115 of file KnockLock.cpp.

4.2.4.3 void KnockLock::exitProgramMode ( ) [private]

Exits from program mode.

After record the patter.

Definition at line 129 of file KnockLock.cpp.

4.2.4.4 void KnockLock::initialize ( )

Definition at line 8 of file KnockLock.cpp.

4.2.4.5 bool KnockLock::isInProgramMode ( ) [private]

Definition at line 134 of file KnockLock.cpp.

4.2.4.6 void KnockLock::knockDelay ( ) [private]

Definition at line 138 of file KnockLock.cpp.

4.2.4.7 bool KnockLock::listen (unsigned long *timeout* = 0)

Definition at line 31 of file KnockLock.cpp.

4.2.4.8 void KnockLock::loadPattern ( ) [private]

Definition at line 147 of file KnockLock.cpp.

4.2.4.9 void KnockLock::normalizeKnocks ( ) [private]

Definition at line 71 of file KnockLock.cpp.

4.2.4.10 void KnockLock::playback ( )

Definition at line 15 of file KnockLock.cpp.

4.2.4.11 void KnockLock::processKnocks ( ) [private]

After the first knock it records the times between knocks.

Definition at line 53 of file KnockLock.cpp.

4.2.4.12 void KnockLock::savePattern ( ) [private]

Definition at line 161 of file KnockLock.cpp.

4.2.4.13 bool KnockLock::validateKnocks ( ) [private]

Definition at line 83 of file KnockLock.cpp.

4.2.5 Member Data Documentation

4.2.5.1 int KnockLock::buzzerPin [private]

Definition at line 22 of file KnockLock.h.

4.2.5.2 Feedbacker* KnockLock::feedbacker [private]

Definition at line 24 of file KnockLock.h.

4.2.5.3 int KnockLock::knockPin [private]

Definition at line 18 of file KnockLock.h.

4.2.5.4 unsigned int KnockLock::knocks[KNOCK_LOCK_MAX_KNOCKS] [private]

Definition at line 36 of file KnockLock.h.

4.2.5.5 int KnockLock::knocksSize [private]

Definition at line 30 of file KnockLock.h.

4.2.5.6 unsigned char KnockLock::pattern[KNOCK_LOCK_MAX_KNOCKS] [private]

Definition at line 34 of file KnockLock.h.

4.2.5.7 int KnockLock::patternSize [private]

Definition at line 28 of file KnockLock.h.

4.2.5.8 bool KnockLock::programMode [private]

Definition at line 32 of file KnockLock.h.

4.2.5.9 int KnockLock::programPin [private]

Definition at line 20 of file KnockLock.h.

4.2.5.10 RandomAccess* KnockLock::storage [private]

Definition at line 26 of file KnockLock.h.

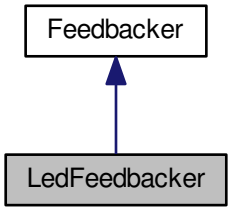
The documentation for this class was generated from the following files:

- KnockLock.h
- KnockLock.cpp

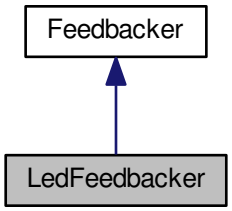
4.3 LedFeedbacker Class Reference

`#include <LedFeedbacker.h>`

Inheritance diagram for LedFeedbacker:



Collaboration diagram for LedFeedbacker:



Public Member Functions

- LedFeedbacker (int ledPin)
- void sendFeedback (Feedback feedback)

Private Attributes

- int ledPin

Additional Inherited Members

4.3.1 Detailed Description

Definition at line 3 of file LedFeedbacker.h.

4.3.2 Constructor & Destructor Documentation

4.3.2.1 LedFeedbacker::LedFeedbacker (int *ledPin*)

Definition at line 4 of file LedFeedbacker.cpp.

4.3.3 Member Function Documentation

4.3.3.1 void LedFeedbacker::sendFeedback (Feedback *feedback*) [virtual]

Implements Feedbacker.

Definition at line 8 of file LedFeedbacker.cpp.

4.3.4 Member Data Documentation

4.3.4.1 int LedFeedbacker::ledPin [private]

Definition at line 5 of file LedFeedbacker.h.

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

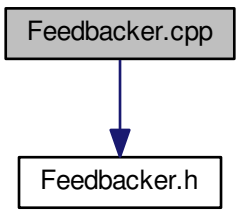
- LedFeedbacker.h
- LedFeedbacker.cpp

5 File Documentation

5.1 Feedbacker.cpp File Reference

```
#include "Feedbacker.h"
```

Include dependency graph for Feedbacker.cpp:

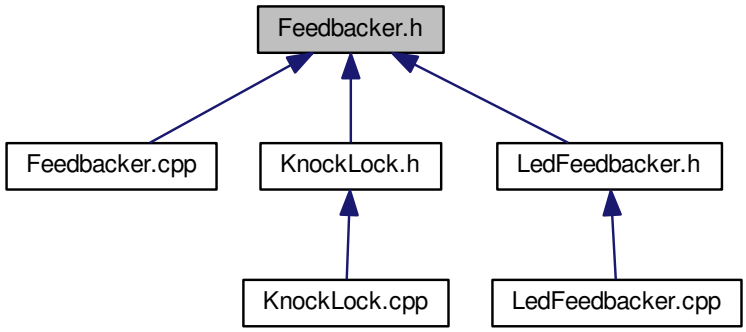


5.2 Feedbacker.cpp

```
00001 #include "Feedbacker.h"
```

5.3 Feedbacker.h File Reference

This graph shows which files directly or indirectly include this file:



Classes

- class Feedbacker

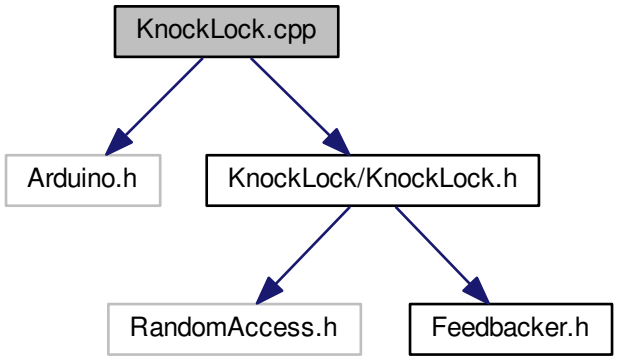
5.4 Feedbacker.h

```
00001
00007 #ifndef __ARDUINO_SECRET_PATTERN_LOCK_FEEDBACKER_H__
00008 #define __ARDUINO_SECRET_PATTERN_LOCK_FEEDBACKER_H__ 1
00009
00010 class Feedbacker {
00011 public:
00012
00013     enum Feedback {
00014         ACCESS_DENIED = 0x00,
00015         ACCESS_GRANTED,
00016         INVALID_OPERATION,
00017         ENTER_PROGRAM_MODE,
00018         EXIT_PROGRAM_MODE,
00019         SUCCESSFULLY_SAVED
00020     };
00021
00022     virtual void sendFeedback(Feedback feedback) = 0;
00023 };
00024
00025 #endif // __ARDUINO_SECRET_PATTERN_LOCK_FEEDBACKER_H__
```

5.5 KnockLock.cpp File Reference

```
#include <Arduino.h>
#include <KnockLock/KnockLock.h>
```

Include dependency graph for KnockLock.cpp:



5.6 KnockLock.cpp

```
00001 #include <Arduino.h>
00002 #include <KnockLock/KnockLock.h>
00003
00004 KnockLock::KnockLock(int knockPin, int programPin, int buzzerPin,
      Feedbacker *feedbacker, RandomAccess *storage)
00005         : knockPin(knockPin), programPin(programPin), buzzerPin(buzzerPin), feedbacker(feedbacker), storage
      (storage), patternSize(0), knocksSize(0), programMode(false) {
00006 }
00007
00008 void KnockLock::initialize() {
00009     pinMode(knockPin, INPUT);
00010     pinMode(programPin, INPUT);
00011     pinMode(buzzerPin, OUTPUT);
00012     loadPattern();
00013 }
00014
00015 void KnockLock::playback() {
00016     for (unsigned char i = 0; i < patternSize; i++) {
00017         for (unsigned int j = 0; j < 10; j++) {
00018             digitalWrite(buzzerPin, HIGH);
00019             delay(10);
00020             digitalWrite(buzzerPin, LOW);
00021         }
00022         delay(pattern[i] * 10);
00023     }
00024     for (unsigned int j = 0; j < 10; j++) {
00025         digitalWrite(buzzerPin, HIGH);
00026         delay(10);
00027         digitalWrite(buzzerPin, LOW);
00028     }
00029 }
00030
00031 bool KnockLock::listen(unsigned long timeout) {
00032     unsigned long startTime = millis();
00033     do {
00034         if (digitalRead(programPin) == HIGH) {
00035             enterProgramMode();
00036         }
00037         if (digitalRead(knockPin) == HIGH) {
00038             processKnocks();
00039             if (validateKnocks()) {
00040                 feedbacker->sendFeedback(
```

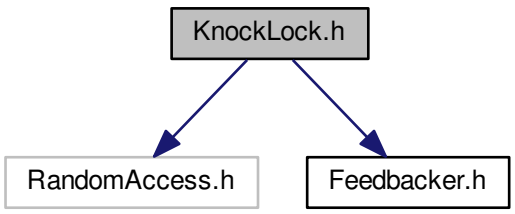
```
      Feedbacker::ACCESS_GRANTED);
00041                 return true;
00042             }
00043             if (isInProgramMode()) {
00044                 exitProgramMode();
00045             } else {
00046                 feedbacker->sendFeedback(
      Feedbacker::ACCESS_DENIED);
00047             }
00048         }
00049     } while (timeout == 0 || millis() - startTime < timeout);
00050     return false;
00051 }
00052
00053 void KnockLock::processKnocks() {
00054     unsigned long startTime, now;
00055     knocksSize = 0;
00056     now = millis();
00057     startTime = now;
00058     knockDelay();
00059     do {
00060         unsigned char knock = digitalRead(knockPin);
00061         if (knock == HIGH) {
00062             knocks[knocksSize] = now - startTime;
00063             knocksSize++;
00064             startTime = now;
00065             knockDelay();
00066         }
00067         now = millis();
00068     } while ((now - startTime < KNOCK_LOCK_MAX_TIME_BETWEEN_KNOCKS) && (
      knocksSize < KNOCK_LOCK_MAX_KNOCKS));
00069 }
00070
00071 void KnockLock::normalizeKnocks() {
00072     unsigned int maxPatternTime = 0;
00073     for (int i = 0; i < knocksSize; i++) {
00074         if (knocks[i] > maxPatternTime) {
00075             maxPatternTime = knocks[i];
00076         }
00077     }
00078     for (int i = 0; i < knocksSize; i++) {
00079         knocks[i] = map(knocks[i], 0, maxPatternTime, 0,
      KNOCK_LOCK_NORMALIZATION_LENGTH);
00080     }
00081 }
00082
00083 bool KnockLock::validateKnocks() {
00084     normalizeKnocks();
00085     if (knocksSize == 0) {
00086         return false;
00087     }
00088     if (isInProgramMode()) {
00089         savePattern();
00090         return false;
00091     }
00092     if (knocksSize != patternSize) {
00093         return false;
00094     }
00095     return doKnocksMatchPattern();
00096 }
00097
00098 bool KnockLock::doKnocksMatchPattern() {
00099     int totalTimeMissmatch = 0;
00100     int timeMissmatch = 0;
00101     for (int i = 0; i < patternSize; i++) {
00102         timeMissmatch = abs(((int)knocks[i]) - pattern[i]);
00103         Serial.println(timeMissmatch);
00104         if (timeMissmatch > KNOCK_LOCK_TIME_MISSMATCH_THRESHOLD) {
00105             return false;
00106         }
00107         totalTimeMissmatch += timeMissmatch;
00108     }
00109     if (totalTimeMissmatch / patternSize >
      KNOCK_LOCK_AVG_TIME_MISSMATCH_THRESHOLD) {
00110         return false;
00111     }
00112     return true;
00113 }
00114
00115 void KnockLock::enterProgramMode() {
00116     unsigned long startTime = millis();
00117     do {
00118         if (digitalRead(programPin) == LOW) {
00119             return;
00120         }
00121     } while ((millis() - startTime) < KNOCK_LOCK_PROGRAM_BUTTON_MIN_TIME_PRESSED
      );
```

```
00122     programMode = true;
00123     feedbacker->sendFeedback(
      Feedbacker::ENTER_PROGRAM_MODE);
00124     while (digitalRead(programPin) == HIGH) {
00125     }
00126     delay(KNOCK_LOCK_RELEASE_BUTTON_DEBOUNCE_TIME);
00127 }
00128
00129 void KnockLock::exitProgramMode() {
00130     programMode = false;
00131     feedbacker->sendFeedback(Feedbacker::EXIT_PROGRAM_MODE
      );
00132 }
00133
00134 bool KnockLock::isInProgramMode() {
00135     return programMode;
00136 }
00137
00138 void KnockLock::knockDelay() {
00139     int itterations = KNOCK_LOCK_DISSIPATE_KNOCK_DEBOUNCE_TIME / 20
      ;
00140     for (int i = 0; i < itterations; i++) {
00141         delay(10);
00142         analogRead(knockPin);
00143         delay(10);
00144     }
00145 }
00146
00147 void KnockLock::loadPattern() {
00148     storage->seek(0);
00149     patternSize = storage->readUnsignedChar();
00150     if (patternSize < 0) {
00151         patternSize = 0;
00152     }
00153     if (patternSize > KNOCK_LOCK_MAX_KNOCKS) {
00154         patternSize = KNOCK_LOCK_MAX_KNOCKS;
00155     }
00156     for (int i = 0; i < patternSize; i++) {
00157         pattern[i] = storage->readUnsignedChar();
00158     }
00159 }
00160
00161 void KnockLock::savePattern() {
00162     storage->seek(0);
00163     storage->writeUnsignedChar(knocksSize);
00164     for (int i = 0; i < knocksSize; i++) {
00165         storage->writeUnsignedChar(knocks[i]);
00166         pattern[i] = knocks[i];
00167     }
00168     patternSize = knocksSize;
00169     feedbacker->sendFeedback(
      Feedbacker::SUCCESSFULLY_SAVED);
00170     playback();
00171 }
```

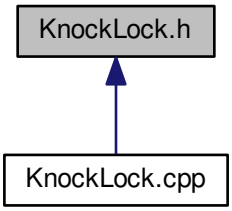
5.7 KnockLock.h File Reference

```
#include <RandomAccess.h>
#include <Feedbacker.h>
```

Include dependency graph for KnockLock.h:



This graph shows which files directly or indirectly include this file:



Classes

- class KnockLock

Macros

- #define KNOCK_LOCK_MAX_KNOCKS 16
- #define KNOCK_LOCK_MAX_TIME_BETWEEN_KNOCKS 1000
- #define KNOCK_LOCK_DISSIPATE_KNOCK_DEBOUNCE_TIME 100
- #define KNOCK_LOCK_RELEASE_BUTTON_DEBOUNCE_TIME 500
- #define KNOCK_LOCK_PROGRAM_BUTTON_MIN_TIME_PRESSED 1500
- #define KNOCK_LOCK_NORMALIZATION_LENGTH 100
- #define KNOCK_LOCK_PATTERN_SAVED_BLINKS 3
- #define KNOCK_LOCK_TIME_MISSMATCH_THRESHOLD 25
- #define KNOCK_LOCK_AVG_TIME_MISSMATCH_THRESHOLD 15

5.7.1 Macro Definition Documentation

5.7.1.1 #define KNOCK_LOCK_AVG_TIME_MISSMATCH_THRESHOLD 15

Definition at line 14 of file KnockLock.h.

5.7.1.2 #define KNOCK_LOCK_DISSIPATE_KNOCK_DEBOUNCE_TIME 100

Definition at line 6 of file KnockLock.h.

5.7.1.3 #define KNOCK_LOCK_MAX_KNOCKS 16

Definition at line 4 of file KnockLock.h.

5.7.1.4 #define KNOCK_LOCK_MAX_TIME_BETWEEN_KNOCKS 1000

Definition at line 5 of file KnockLock.h.

5.7.1.5 #define KNOCK_LOCK_NORMALIZATION_LENGTH 100

Definition at line 11 of file KnockLock.h.

5.7.1.6 #define KNOCK_LOCK_PATTERN_SAVED_BLINKS 3

Definition at line 12 of file KnockLock.h.

5.7.1.7 #define KNOCK_LOCK_PROGRAM_BUTTON_MIN_TIME_PRESSED 1500

Definition at line 8 of file KnockLock.h.

5.7.1.8 #define KNOCK_LOCK_RELEASE_BUTTON_DEBOUNCE_TIME 500

Definition at line 7 of file KnockLock.h.

5.7.1.9 #define KNOCK_LOCK_TIME_MISSMATCH_THRESHOLD 25

Definition at line 13 of file KnockLock.h.

5.8 KnockLock.h

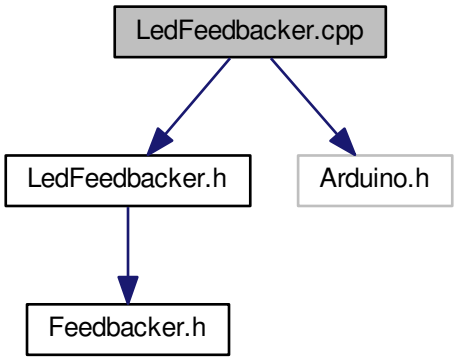
```
00001 #include <RandomAccess.h>
00002 #include <Feedbacker.h>
00003
00004 #define KNOCK_LOCK_MAX_KNOCKS                           16
00005 #define KNOCK_LOCK_MAX_TIME_BETWEEN_KNOCKS              1000
00006 #define KNOCK_LOCK_DISSIPATE_KNOCK_DEBOUNCE_TIME        100
00007 #define KNOCK_LOCK_RELEASE_BUTTON_DEBOUNCE_TIME         500
00008 #define KNOCK_LOCK_PROGRAM_BUTTON_MIN_TIME_PRESSED      1500
00009
00010 // Shuldn't be bigger than sizeof(char)
00011 #define KNOCK_LOCK_NORMALIZATION_LENGTH                 100
00012 #define KNOCK_LOCK_PATTERN_SAVED_BLINKS                 3
00013 #define KNOCK_LOCK_TIME_MISSMATCH_THRESHOLD             25
00014 #define KNOCK_LOCK_AVG_TIME_MISSMATCH_THRESHOLD         15
00015
00016 class KnockLock {
00017
00018     int knockPin;
00019
00020     int programPin;
00021
00022     int buzzerPin;
00023
00024     Feedbacker *feedbacker;
00025
00026     RandomAccess *storage;
00027
00028     int patternSize;
00029
00030     int knocksSize;
00031
00032     bool programMode;
00033
00034     unsigned char pattern[KNOCK_LOCK_MAX_KNOCKS];
00035
00036     unsigned int knocks[KNOCK_LOCK_MAX_KNOCKS];
00037
00038     enum Feedback {
00039         ENTER_PROGRAM_MODE = 0x00,
00040         EXIT_PROGRAM_MODE,
00041         PATTERN_SAVED,
00042         KNOCKS_MISMATCH
00043     };
00044 public:
00045
00046     KnockLock(int knockPin, int programPin, int buzzerPin, Feedbacker *feedbacker,
      RandomAccess *storage);
```

```
00047
00048     void initialize();
00049
00050     void playback();
00051
00052     bool listen(unsigned long timeout = 0);
00053
00054 private:
00055
00060     void enterProgramMode();
00061
00065     void exitProgramMode();
00066
00067     bool isInProgramMode();
00068
00072     void processKnocks();
00073
00074     void knockDelay();
00075
00076     void normalizeKnocks();
00077
00078     bool validateKnocks();
00079
00080     bool doKnocksMatchPattern();
00081
00082     void loadPattern();
00083
00084     void savePattern();
00085 };
```

5.9 LedFeedbacker.cpp File Reference

```
#include "LedFeedbacker.h"
#include <Arduino.h>
```

Include dependency graph for LedFeedbacker.cpp:



5.10 LedFeedbacker.cpp

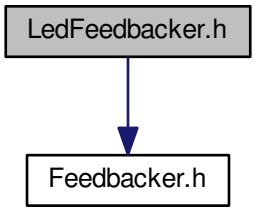
```
00001 #include "LedFeedbacker.h"
00002 #include <Arduino.h>
00003
00004 LedFeedbacker::LedFeedbacker(int ledPin) : ledPin(ledPin) {
00005     pinMode(ledPin, OUTPUT);
00006 }
00007
00008 void LedFeedbacker::sendFeedback(Feedback feedback) {
00009     unsigned char blinks = 0;
```

```
00010     switch (feedback) {
00011     case ENTER_PROGRAM_MODE:
00012         digitalWrite(ledPin, HIGH);
00013         break;
00014     case EXIT_PROGRAM_MODE:
00015         digitalWrite(ledPin, LOW);
00016         break;
00017     case ACCESS_GRANTED:
00018         blinks = 1;
00019         break;
00020     case ACCESS_DENIED:
00021         blinks = 2;
00022         break;
00023     case SUCCESSFULLY_SAVED:
00024         blinks = 4;
00025         break;
00026     case INVALID_OPERATION:
00027         break;
00028     }
00029     for (unsigned char i = 0; i < blinks; i++) {
00030         digitalWrite(ledPin, HIGH);
00031         delay(100);
00032         digitalWrite(ledPin, LOW);
00033         delay(100);
00034     }
00035 }
```

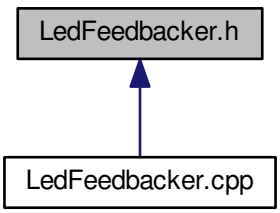
5.11 LedFeedbacker.h File Reference

`#include <Feedbacker.h>`

Include dependency graph for LedFeedbacker.h:



This graph shows which files directly or indirectly include this file:



Classes

- class LedFeedbacker

5.12 LedFeedbacker.h

```
00001 #include <Feedbacker.h>
00002
00003 class LedFeedbacker : public Feedbacker {
00004
00005     int ledPin;
00006 public:
00007
00008     LedFeedbacker(int ledPin);
00009
00010     void sendFeedback(Feedback feedback);
00011 };
```

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