
Power
Status
Fault
Indino 4.0
Connected Intelligence
RDL
www.rdltech.in

# Indino 4.0

## Contents

# 1. Introduction

Indino 4.0 series defines a new way of transforming factories into smart/intelligent factories for efficient and easy remote monitoring operational status of facilities such as on/off status, pressure and temperature. Indino 4.0 supporting for wide range of industrial protocols like Modbus, MQTT, JSON, RESTful,TCP/UDP , SNMP protocol ,which makes the monitoring and solution integration, easier than ever for IT engineers through open source APIs,.

The base board on Atmega2560 controller with BLE and WiFi having processor ESP32 -32-bit LX6 processor -200 MIPS supporting OTA, having on board capabilities like 8MByte Embedded Flash, 256KByte FRAM, SDcard -32GB, USB , RS232 , RS485 ,PWDT , 12 channel 24 V opto isolated IO supported for wet and dry connection ,RTC , RDL Expansion bus for add on modules expanding the IO needs and DC to DC converter support for 12 to 36V input DC supply .

## 2. Features

**Processor**: Tensilica Xtensa 32-bit LX6 microprocessor

- **Clock frequency:** up to 240 MHz ,up to 600 DMIPS
- **ROM:** 448 KB **SRAM:** 520 KB

**Co controller *:**
ATmega 2560, 16MHz, FLASH 256KB/STM32

**Digital IO**
24v 8x Isolated interrupt Enabled digital input
24v 4x Isolated Digital output / PWM
AC Isolation: 3750VRMS
Contacts supported: DRY / WET

**Wired Connectivity**
RS485 MODBUS , RS232 & USB
RDL expansion bus

**Memory**
FRAM 25KB , SD CARD 32GB

**RTC**
Built-in RTC for me stamped data logging

**Wireless connectivity:**

- **Wi-Fi:** 802.11 b/g/n/e/i (802.11n @ 2.4 GHz up to 150 Mbit/s)
- **Bluetooth:** v4.2 BR/EDR and Bluetooth Low Energy (BLE)

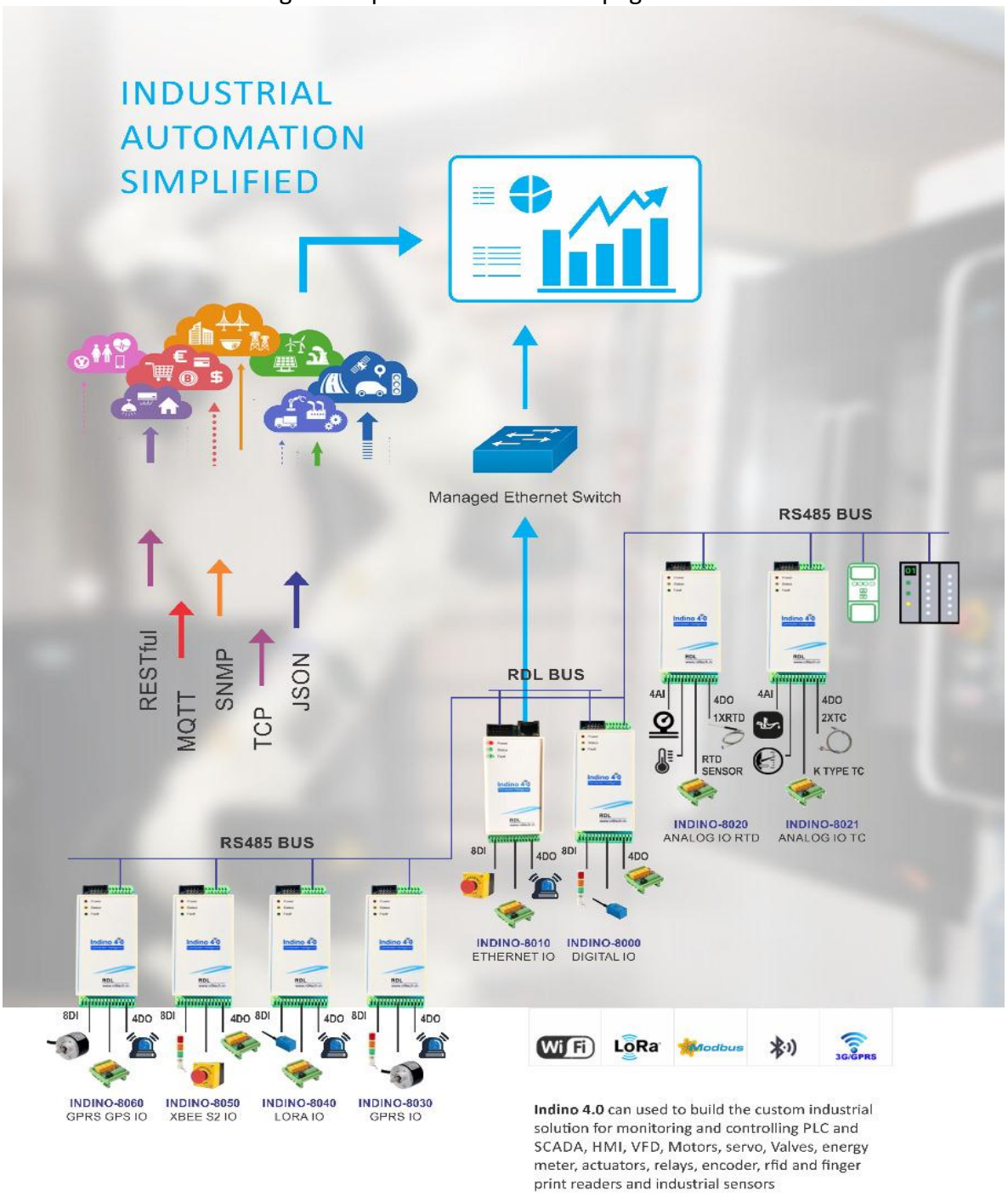
**Protocol**

- TCP-IP, UDP, SNMP, MODBUS, FTP, RESTFULL, JSON&MQTT

**Security:**

- IEEE 802.11 security features : WFA, WPA/WPA2 and WAPI
- Secure boot / Flash encryption
- 1024-bit OTP, up to 768-bit for customers
- Cryptographic hardware acceleration: AES, SHA-2, RSA, ECC & random number generator (RNG)
-

**Enclosure :**
IP 20
mounting :Wall / DIN Rail
Dimension :108 x 41.2 x 20
*Co Controller information is given in product information page




**Indino 4.0** can used to build the custom industrial solution for monitoring and controlling PLC and SCADA, HMI, VFD, Motors, servo, Valves, energy meter, actuators, relays, encoder, rfid and finger print readers and industrial sensors

## 3. Benefits

Indino 4.0 can used to build the custom industrial solution for monitoring and controlling PLC and SCADA , HMI , VFD , Motors , servo , Valves , energy meter , actuators , relays , encoder , rfid and finger print readers , industrial sensors and many more with below mentioned operational benefits .

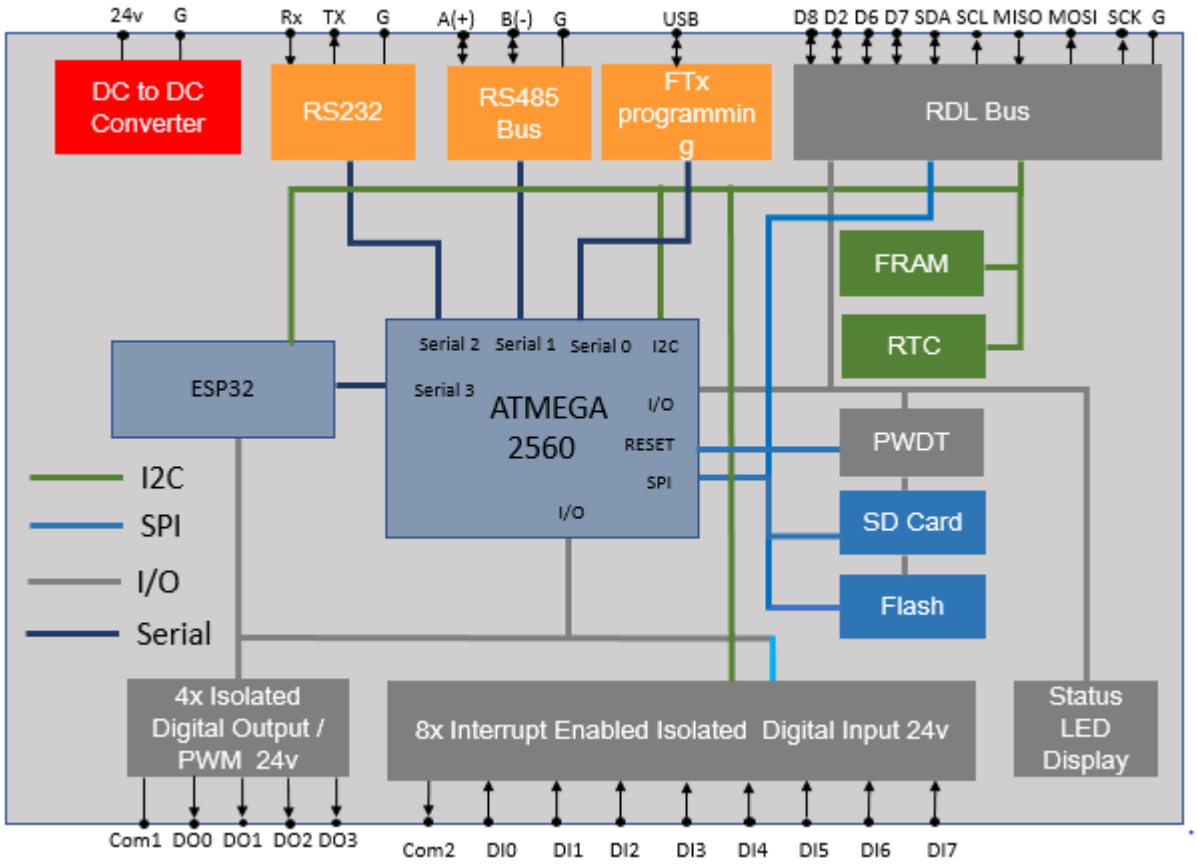
- Improved productivity.
- Reduced downtime.
- Maximized asset utilization.
- Tracking trends for real-time marketing.
- Enhanced situational awareness.
- Sensor-driven decision analytics.
- Instantaneous control and response in complex autonomous systems

## 4. Applications

This product used for many industrial applications like

- Production and process Management
- Utilities Management
- Condition Management
- Environment Management
- Industrial Smart grid
- Leakage detection
- Cold storage Management
- District metering
- Water treatment
- Generator Management
- Green House.
- Warning message in case of calamities.
- Remote system management

## 5. Block Diagram



## 6. Pin-out

Digital :

| Indino Digital Pinout | | | | |
|---|---|---|---|---|
| Digital IO | PIN NO | FUNCTION | FUNCTION | |
| D0 | 2 | RX0 | FTO | |
| D1 | 3 | TX0 | FTO | |
| D2 | 6 | INT | IO Expander Intrupt | |
| D3 | 7 | | | FRC pin 1 |
| D4 | 1 | PWM | Opto Output | |
| D5 | 5 | PWM | Opto Output | |
| D6 | 15 | | RS485 RE/DE | |
| D7 | 16 | PWM | Opto Output | |
| D8 | 17 | | | FRC pin 3 |
| D9 | 18 | | SD CS | |
| D10 | 23 | | | FRC pin 10 |
| D11 | 24 | | SRAM CS | |
| D12 | 25 | PWM | Opto Output | |
| D13 | 26 | | STAT LED | |
| D14 | 64 | TX3 | GSM/XBEE | |
| D15 | 63 | RX3 | GSM/XBEE | |
| D16 | 13 | TX2 | RS485 | |
| D17 | 12 | RX2 | RS485 | |
| D18 | 46 | TX1 | MAX232 | |
| D19 | 45 | RX1 | MAX232 | |
| D20 | 44 | SDA | RTC/FRAM/IO expander | FRC pin 5 |
| D21 | 43 | SCL | RTC/FRAM/IO expander | FRC pin 6 |
| D22 | 78 | | PIC | |
| D23 | 77 | | PIC | |
| D32 | 58 | | IO Expander RST | |
| D36 | 54 | | XBEE RST | |
| D37 | 53 | | XBEE SLEEP | |
| D40 | 52 | | DTR | |
| D41 | 51 | | PWR KEY | |
| D46 | 39 | | MIC P | |
| D49 | 35 | | FLT LED | |
| D50 | 22 | MISO | SD / FLASH | FRC pin |

| | | | | |
|---|---|---|---|---|
| | | | | 7 |
| D51 | 21 | MOSI | SD / FLASH | FRC pin 8 |
| D52 | 20 | SCK | SD / FLASH | FRC pin 9 |
| D53 | 19 | SS | | FRC pin 4 |

Analog:

| **Indino Analog Pinout** | | | | |
|---|---|---|---|---|
| Digital IO | PIN NO | FUNCTION | FUNCTION | |
| D0 | 2 | RX0 | FTO | |
| D1 | 3 | TX0 | FTO | |
| D2 | 6 | INT | External INT | |
| D3 | 7 | | | FRC pin 1 |
| D4 | 1 | PWM | Opto Output | |
| D5 | 5 | PWM | Opto Output | |
| D6 | 15 | PWM | Opto Output | |
| D7 | 16 | PWM | Opto Output | |
| D9 | 18 | | RS482 RE/DE | |
| D10 | 23 | | | FRC pin 10 |
| D11 | 24 | | SD CS | |
| D12 | 25 | | FLASH CS | |
| D13 | 26 | | STAT LED | |
| D14 | 64 | TX3 | | FRC pin 4 |
| D15 | 63 | RX3 | | FRC pin 3 |
| D16 | 13 | TX2 | RS485 | |
| D17 | 12 | RX2 | RS485 | |
| D18 | 46 | TX1 | MAX232 | |
| D19 | 45 | RX1 | MAX232 | |
| D20 | 44 | SDA | RTC/FRAM/IO expander | FRC pin 5 |
| D21 | 43 | SCL | RTC/FRAM/IO expander | FRC pin 6 |
| D22 | 78 | | PIC | |
| D23 | 77 | | PIC | |

| | | | | |
|---|---|---|---|---|
| D33 | 57 | | MAX31865 CS | |
| D34 | 56 | | MAX31855-IC4 CS | |
| D35 | 55 | | MAX31855-IC2 CS | |
| D36 | 54 | | MAX31865 DRDY | |
| D37 | 53 | | SELECT ADC/4-20mA | |
| D38 | 50 | | SELECT ADC/4-20mA | |
| D40 | 52 | | SELECT ADC/4-20mA | |
| D41 | 51 | | SELECT ADC/4-20mA | |
| D49 | 35 | | FLT LED | |
| D50 | 22 | MISO | SD / FLASH/RTD | FRC pin 7 |
| D51 | 21 | MOSI | SD / FLASH | FRC pin 8 |
| D52 | 20 | SCK | SD / FLASH | FRC pin 9 |

| Pins | Functionality |
|---|---|
| D0, D1 | Serial Pins. To which either FT232 can be connected or a MAX232 can be connected. |
| D2 | RDL Bus chip select Pin |
| D3 | RDL chip select or slave select pin |
| D4 | GSM power key (Software Switch). High-to-Low on this pin powers ON the GSM. |
| D5 | RS485 select (control) pin for serial communication. |
| D6 – D8, D30 – D35 | Left open to the user and can be configured either as an input or output. |
| D9 | Reset pin for Ethernet |
| D10 | Chip select or slave select pin for Ethernet |
| D12, D13 | LED pins which could be programmed for status indication as required. |
| TX3, RX3 | RS485 serial communication |
| TX2, RX2 | GSM serial communication |

| | |
|---|---|
| TX1, RX1 | Can either be connected to RD485 or XBEE for serial communication |
| SCL, SDA | Can be connected to I2C based RTC, FRAM, DAC and RDL bus |
| D22 – D29 | Control pins to select ADC as a 0-10V Voltage reading channel or 4-20mA Current reading channel. |
| D36 | XBEE reset pin |
| D37, D38 | Digital input pins |
| D39 | Chip select or slave select pin for Flash |
| D40 – D45 | Digital input pins |
| D46 – D49 | Digital Output pins |
| MISO, MOSI, SCK | SPI pins to where number of devices could be connected |
| SS | Chip select or slave select pin for SD Card |
| A0 – A2 | Analog Input Pins left open to the user |
| A8, A9, A10, A15 | Analog Input Pins which could be configured (using pins d22-d29) to read either voltage or current. |
| A11 – A14 | Analog Input Pins left open to the user |

## 7. Programming IDE

The hardware supports various Open Source Programming IDE including Arduino IDE, Atmel Studio and Arduino Compatible Compiler for LabView. For more information on this follow "**Open Source Programming IDE"** section of the following link.

https://rdltech.in/data-logger-iiot-4-0

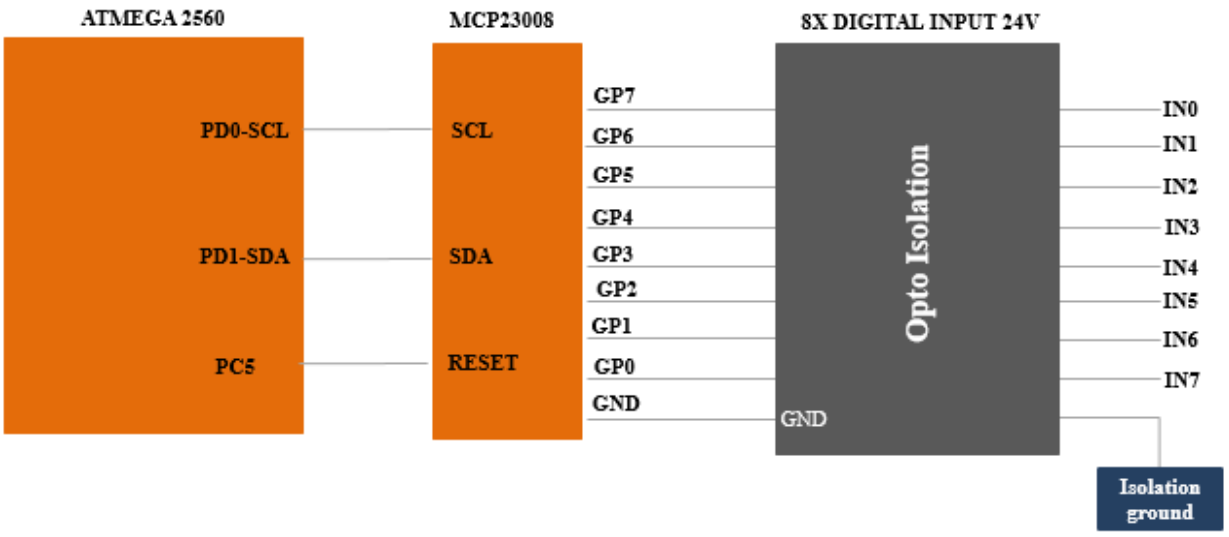
# 8. Product Specification

## 8.1. Digital Input

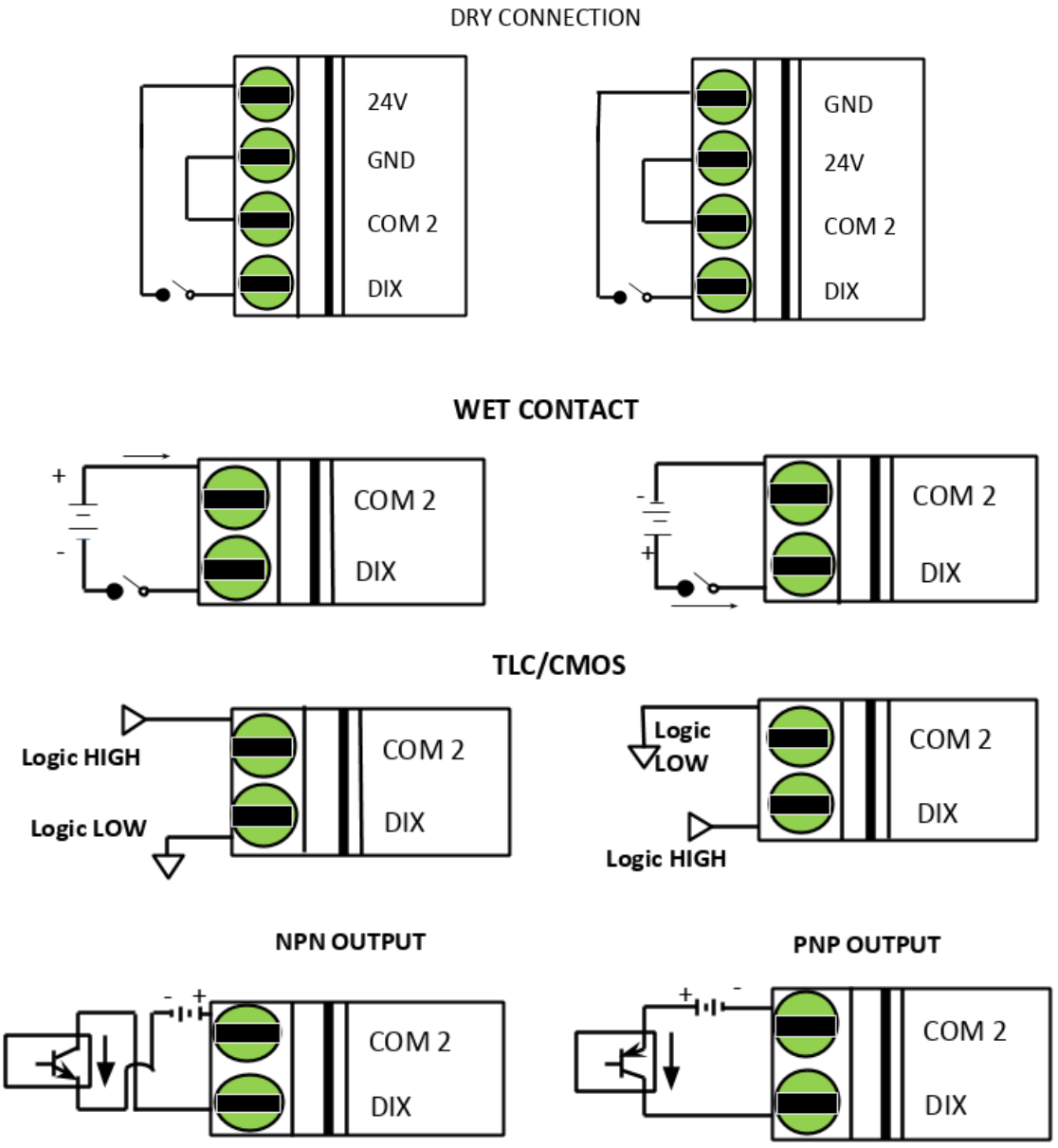
### Specification

- Channels: 8
- Input Voltage: 0-24V
  - Logic High: >11V
  - Logic Low: <3V
- Isolation : 3750 VRMS
- Supports Inverted DI Status
- Supported Connection: Dry and Wet both
- Maximum Frequency : 200Hz-38kHz

### Functional Diagram

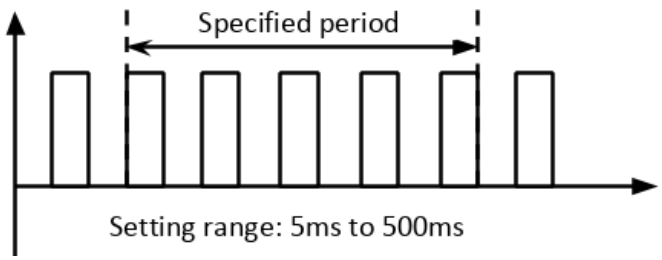


## Application Wiring




## Use Case

### 1. Measuring Frequency



### Example Code

You may look into the following link for example on reading a digital pin.

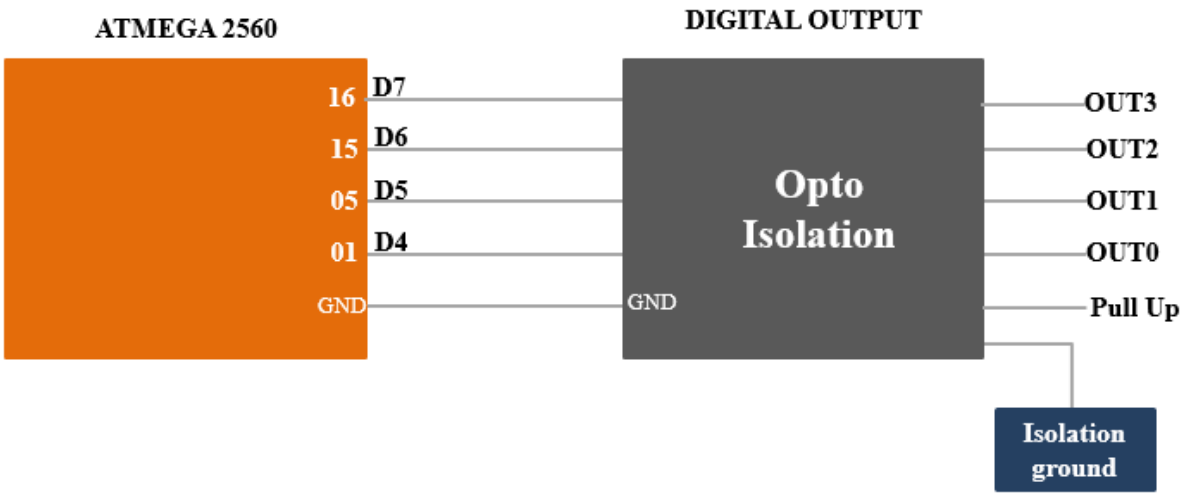
https://www.arduino.cc/reference/en/language/functions/digital-io/digitalread/

## 8.2. Digital Output

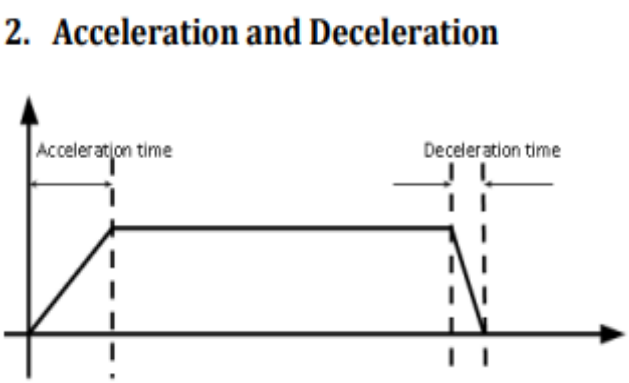
### Specification

- Channels: 3
- Open Collector
- Isolation : 3750 VRMS
- Absolute maximum voltage - 35V, Current - 100mA
- Cut-Off Frequency : 10KHz

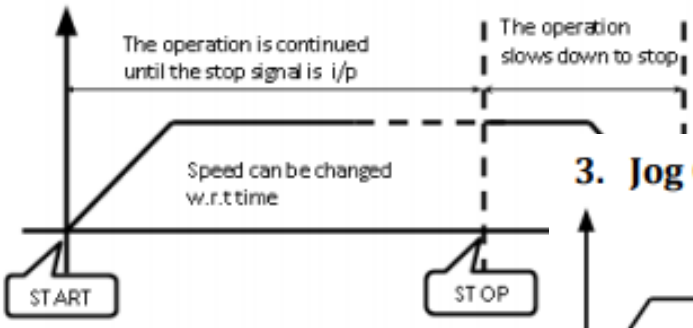
### Functional Diagram



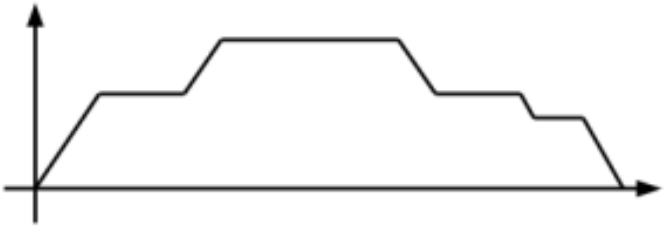

### Application:



## 1. Motion Control

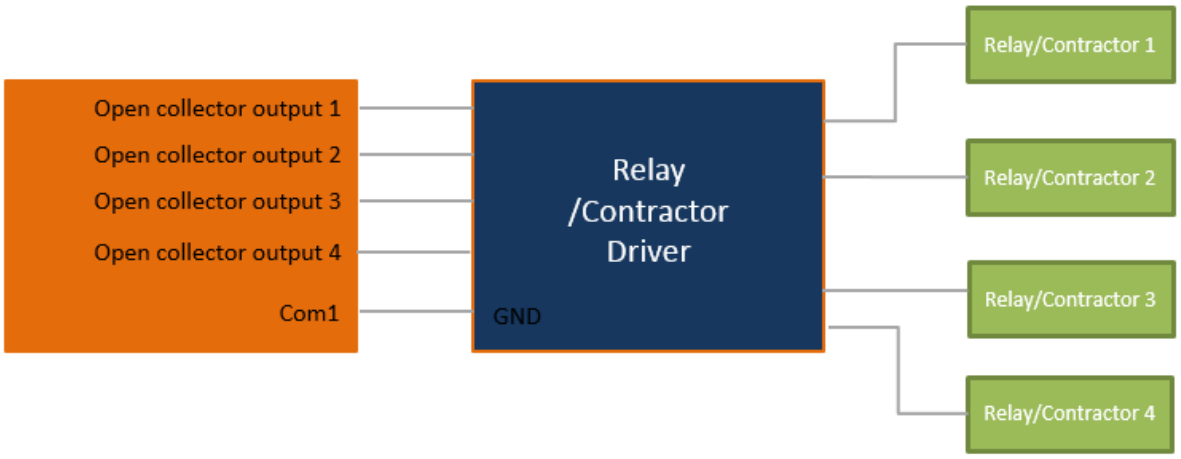



## 3. Jog Operation and Trapezoidal Control Operation



The speed can be freely changed until the operation starts to decelerate to stop

### Application Wiring




### Example Code

You may look into the following link for more details on writing to digital pin.

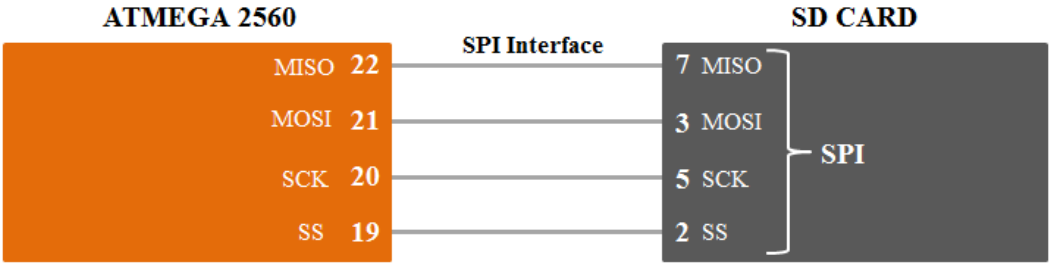
https://www.arduino.cc/en/Reference.digitalWrite

## 8.3. SD Card

### Specification

- SPI Serial Interface
- Supports Fat File system

### Functional Diagram




### Example Code

You may look into the following link for example on SD Card.

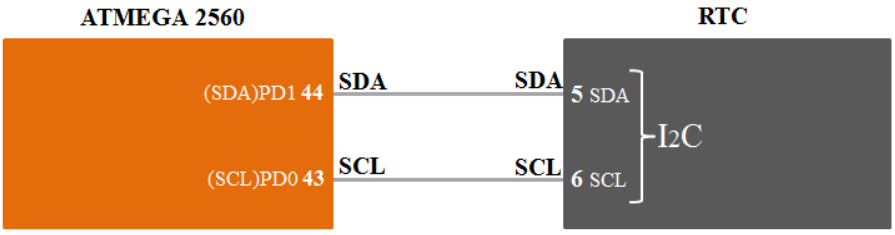
https://www.arduino.cc/en/Reference/SD

## 8.4. RTC

### Specification

- DS1307 with I2C Serial Interface
- Counts Seconds, Minutes, Hours, Date, Month, Day, and Year with Leap-Year Compensation.
- 56-Byte, Battery-Backed, NV RAM for Data Storage
- Consumes <500nA in Battery Backup Mode with Oscillator Running

### Functional Diagram




### Example Code

You may look into the following link for example code on RTC.

https://www.arduino.cc/en/Reference/RTC

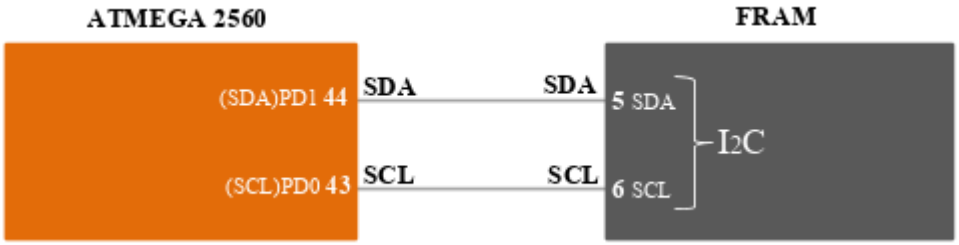
## 8.5. FRAM

FRAM is specifically used for applications such as production counting, production rejection where variable subjected to continuous write cycle

### Specification

- MB85RC256V, I2C compatible with Bit configuration : 32,768 words × 8 bits
- Operating frequency : 1 MHz (Max)
- Read/write endurance : 1012 times / byte
- Number of write cycles: 100 Trillion times
- Operating power supply voltage : 2.7V to 5.5V, current 200 µA
- Data Retention: 10 years (+85°C), 95 years (+55°C), over 200 years (+35°C).

### Functional Diagram




### Example Code

You may look into the following link for example on RTC

https://github.com/adafruit/Adafruit_FRAM_I2C/blob/master/examples/MB85RC256V/MB85RC256V.ino

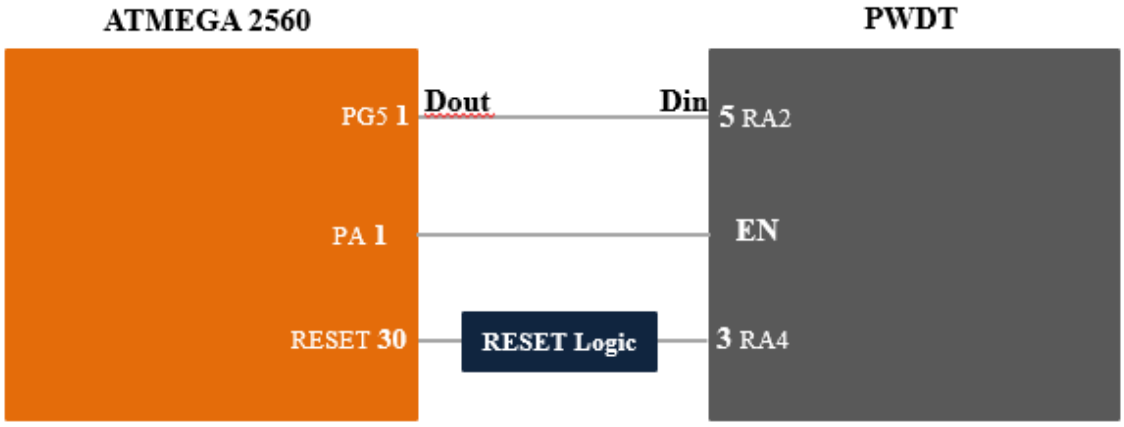
## 8.6 PWDT (Physical Watch Dog Timer)

External physical watchdog is connected along with inbuilt watchdog timer.
There are many instances where we need to set watch dog time for more than 8 seconds (typically bulk file upload takes in minutes). As inbuilt WDT is limited to maximum of 8Sec, we have gone a step further to support watch dog time up to 3 minutes.
If you do not required PWDT then we can disable it by disabling Enable pin
Note: User must program PWDT to refresh before the timer (3 min) expires.

### Specification

- PWDT supports up to 3minutes.
- PIC12F1840 used for PWDT
- Refresh time : 1 pulse in every 3 minutes
- Operating temperature range: –40 to 125 °C

### Functional Diagram



### Example Code

You may look into the following link for examples on watchdog timer.

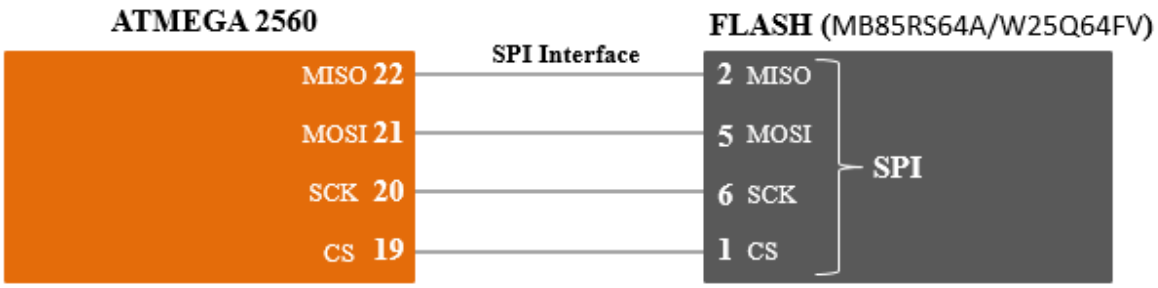
https://folk.uio.no/jeanra/Microelectronics/ArduinoWatchdog.html

## 8.6. Flash

Flash is specifically used for embedded server.

- Family of SpiFlash memories
- Highest performance serial flash
- Efficient “Continuous Read “ OPI mode
- Low power and wide Temperature range
- Flexible architecture with 4KB sectors
- Advanced security feature
- Space Efficient packaging

### Functional Diagram




### Example Code

You may look into the following link for example on how to use flash.

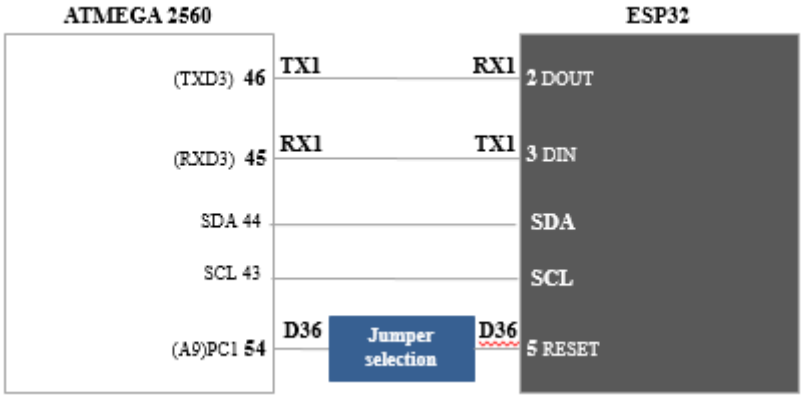
https://github.com/nullboundary/SST25VF

## 8.7. ESP32

This is Add-On pluggable module. One among ESP32 is comes with the product. For more details on this, look into Order Information Table.

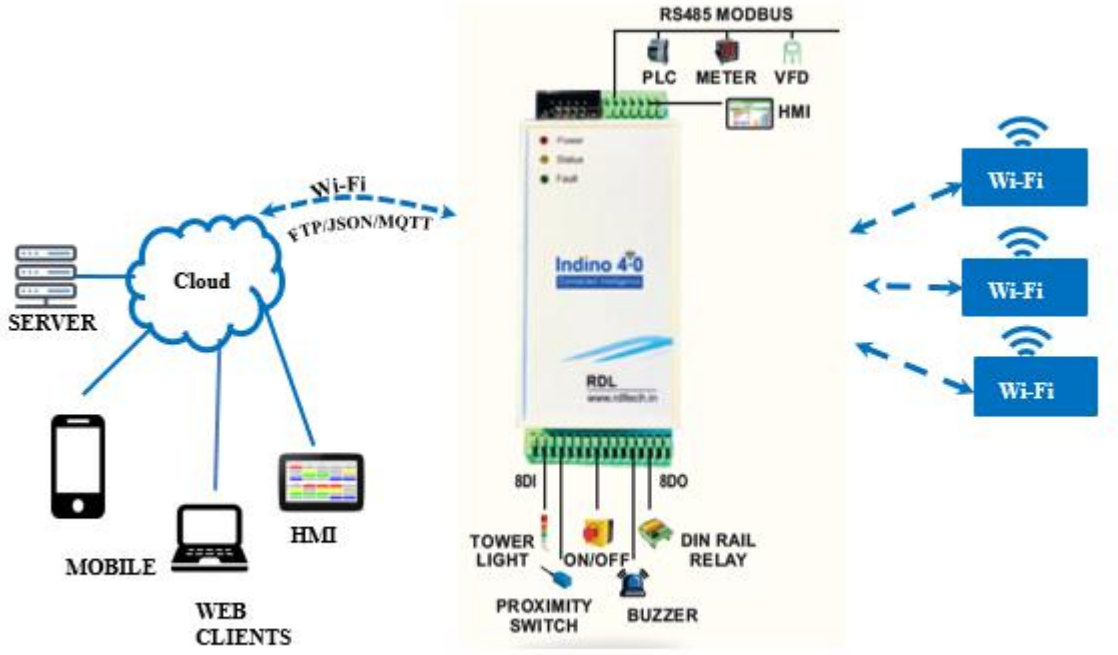
This is specifically used for wireless connectivity with existing infrastructure.

### Functional Diagram




### Use Case

**Interfacing Industrial Data Logger with Wi-Fi (ESP32)**



### Example Code

You may look into the following link for examples on esp8266.

https://www.arduino.cc/en/Reference/WiFiServer

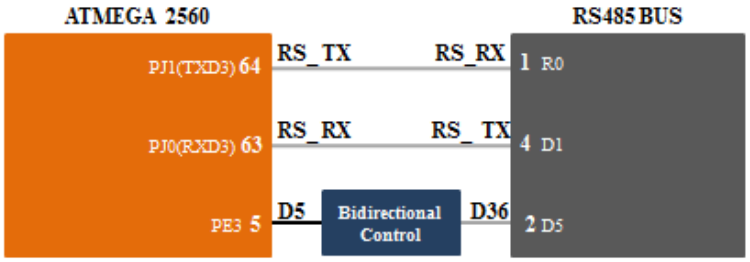
## 8.8. RS485 Modbus

- Modbus is an Industrial standard serial communication protocol.
- Open protocol
- Information is stored in the Slave device in four different tables.
  Two tables store on/off discrete values (coils) and two store numerical values (registers). The coils and registers each have a read-only table and read-write table.
- Each table has 9999 values.
  Each coil or contact is 1 bit and assigned a data address between 0000-270E.
  Each register is 1 word = 16 bits = 2 bytes and also has data address between 0000 and 270E.
- Supported Functions are
  - Coils
  - Discrete inputs
  - Input Registers
  - Holding Registers.

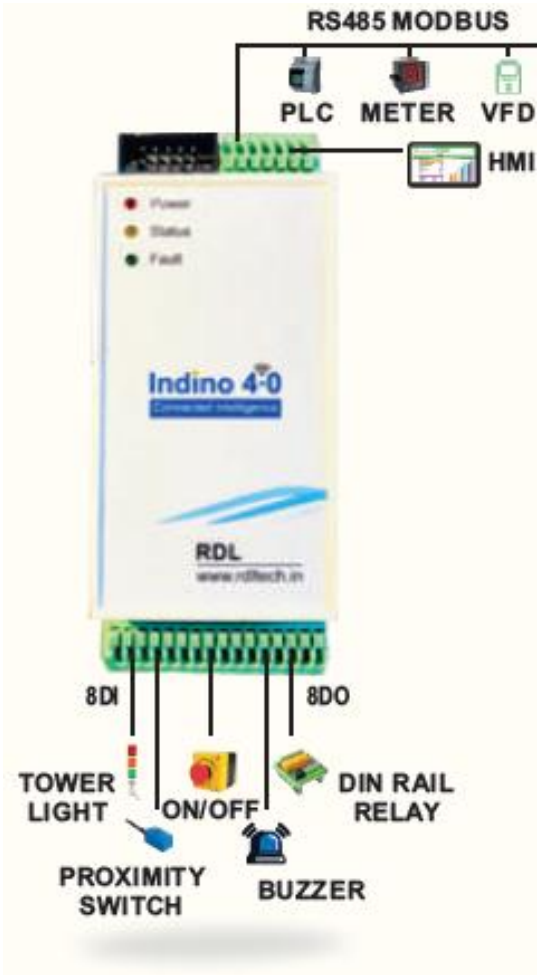
### Specification

- LTC485 IC.
- Supports slave address up to 32.
- Supports Modbus protocol with RTU and ASCII formats.
- Configurable baud rate from 4800 to 115200.
- Configurable packet format (data bits, parity bit, stop bits)

## Functional Diagram




## Use Case



### Example Code

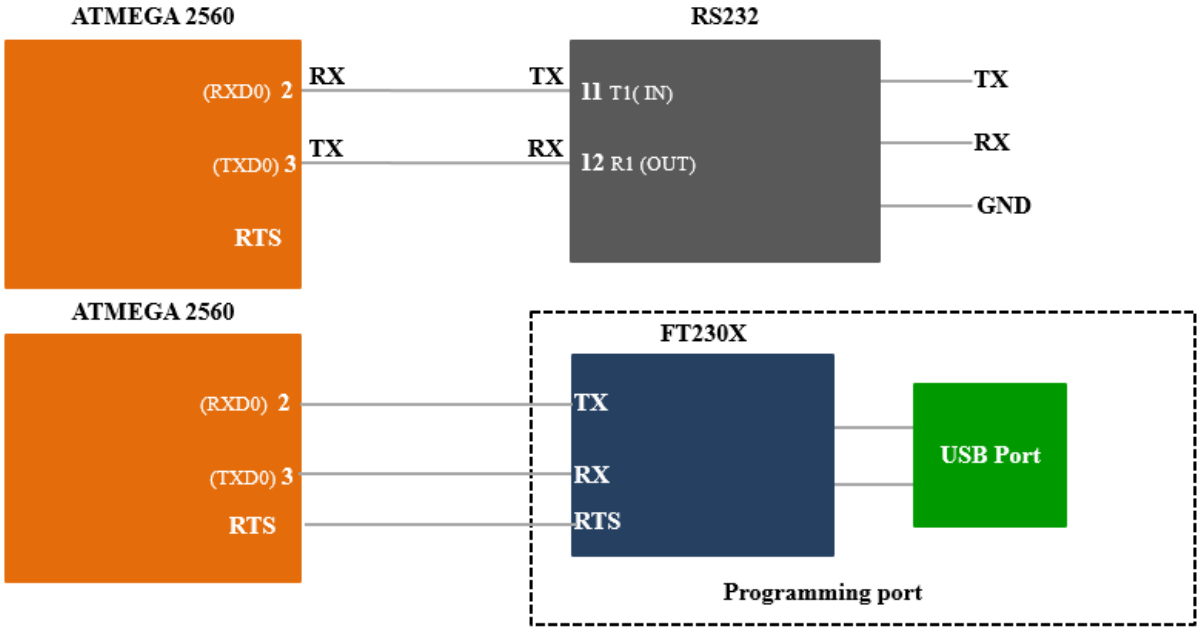
You may look into the following link for examples on Modbus examples.

https://playground.arduino.cc/Code/ModbusMaster

## 8.9. RS232/FT232/Program

Used for programming the board. When in user mode, the port could be used for data communication.

### Functional Diagram




### Example Code

You may look into the following link for examples on FT232/MAX232 serial communication.

https://www.arduino.cc/reference/en/language/functions/communication/serial/

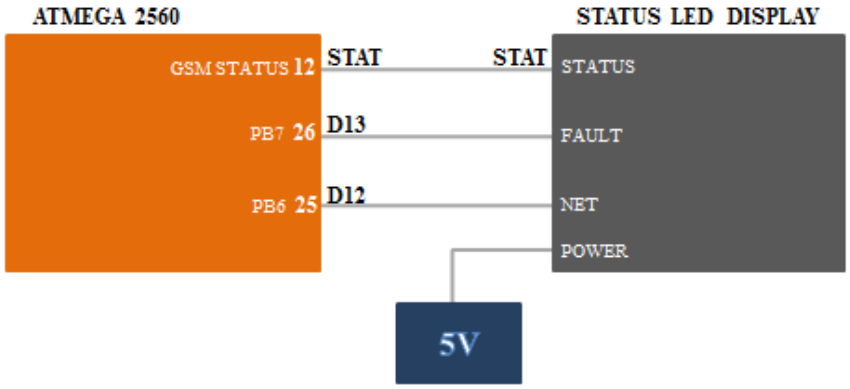
https://www.arduino.cc/en/Tutorial/SoftwareSerialExample

## 8.10. Status LED Display

Status LED's can be programmed as per used needs for visual indication of an event.

Refer Digital Output Section

### Functional Diagram




### Example Code

You may look into the following link for more details on programming LED pins.

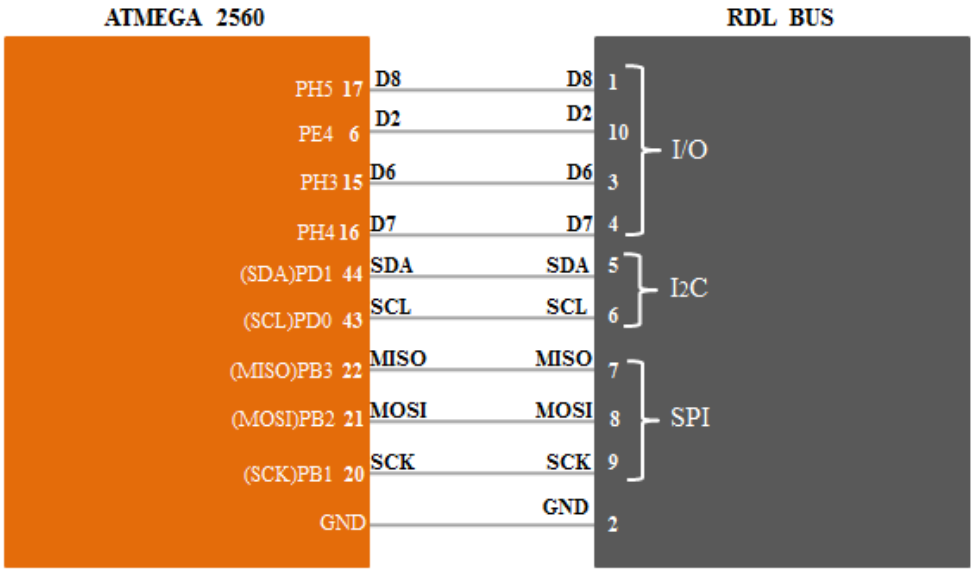
https://www.arduino.cc/en/Reference.digitalWrite

## 8.11. RDL Bus

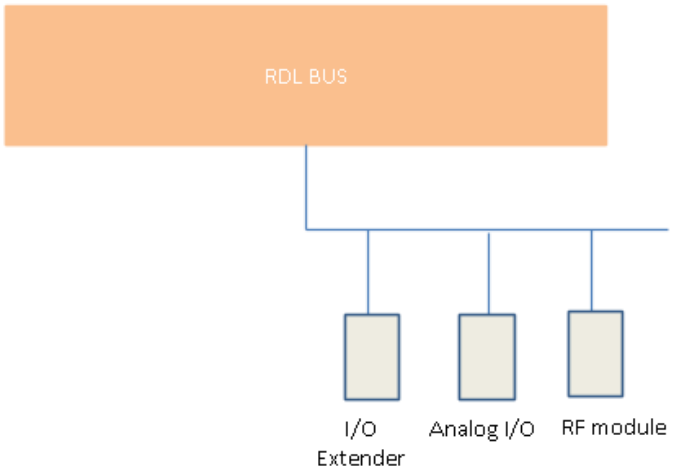
### Specification

- Extend I/O pins for communicating with external devices.
- Extends SPI pins, I2C pins, UART pins and Digital I/O pins.

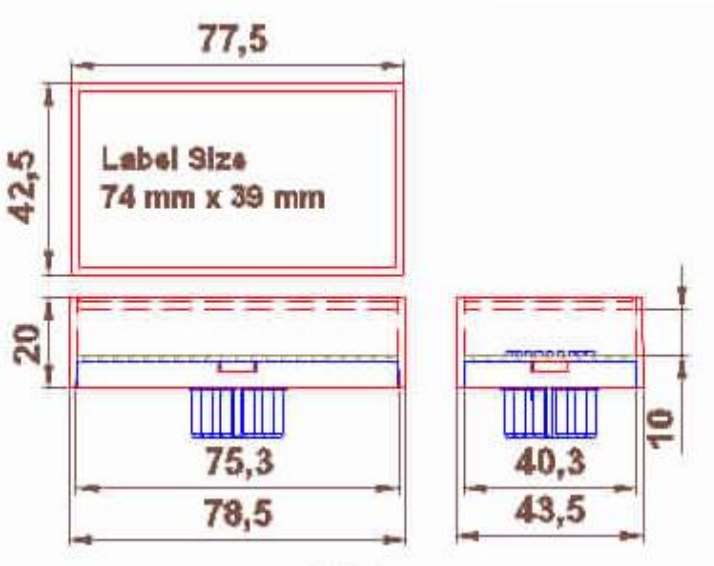
### Functional Diagram

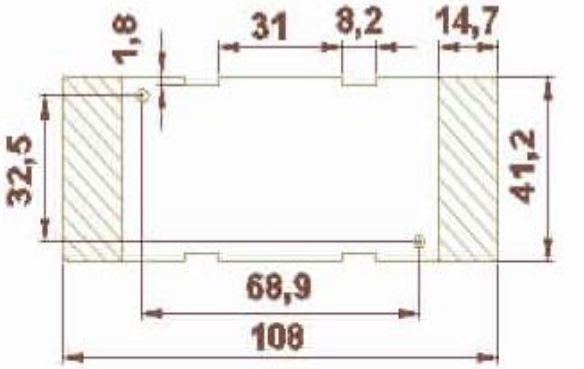



### Application Wiring

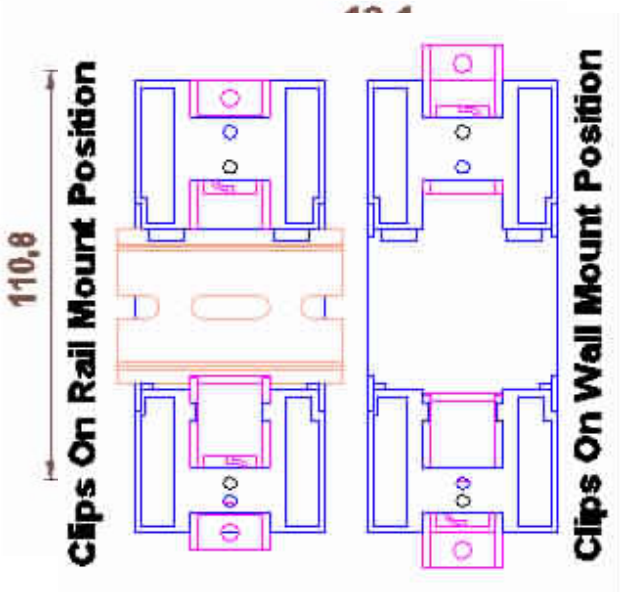


## 9. Mounting and Mechanical Dimensions




**Base PCB (For Terminal mounting - shaded portion )**




## 10.Order Information Table

| Model | INDINO-8000 | INDINO-8010 | INDINO-8020 | INDINO-8021 | IND 803 |
|---|---|---|---|---|---|
| | Digital IO | Ethernet IO | Analog IO RTD | Analog IO TC | GPF |
| DI | 8 | 6 | 1 | 1 | 8 |
| DO/PWM | 4 | 5 | 4 | 4 | 4 |
| ADC/4-20ma | x | x | 4 | 4 | x |
| GPRS | x | x | x | x | 1 |
| Ethernet 10/100mbps | x | 1 | x | x | x |
| RS485 | 1 | x | 1 | 1 | 1 |
| RS232 | 1 | x | 1 | 1 | 1 |
| RTD input | x | x | 1 | x | x |
| Thermo couple input | x | x | x | 2 | x |
| Wi-Fi | 1 | x | x | x | x |
| Bluetooth | 1 | x | x | x | x |
| LoRA | x | x | x | x | x |
| GPRS GPS | x | x | x | x | x |
| | | | | | |

Note: INDINO S800XX series comes with STM32 as a Co controller where as other series comes with Atmega 2560 as a co controller