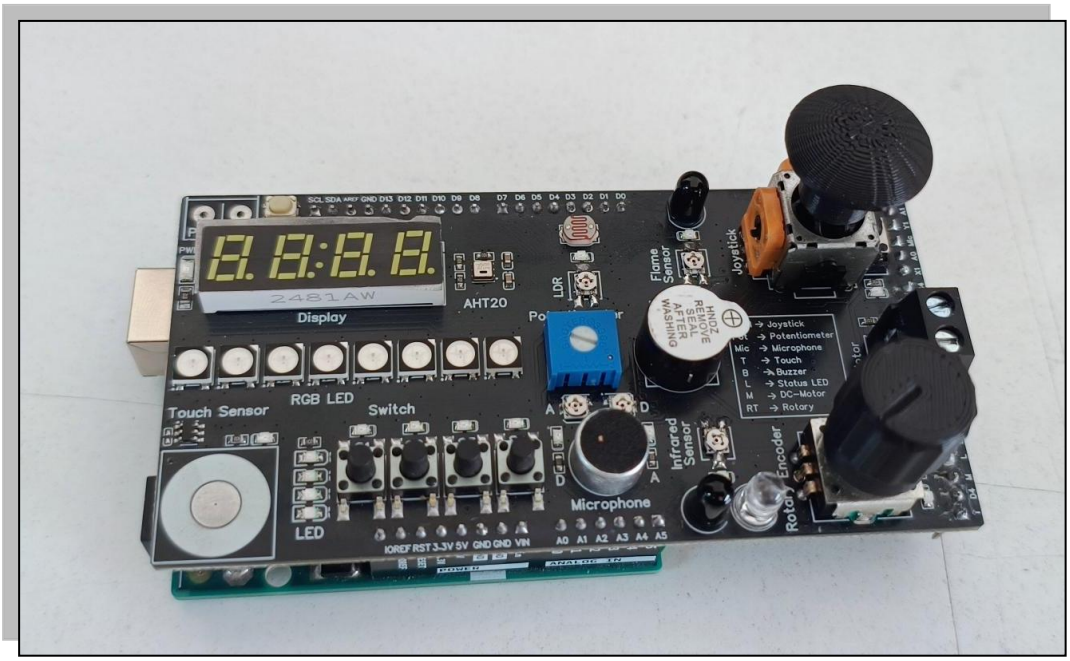
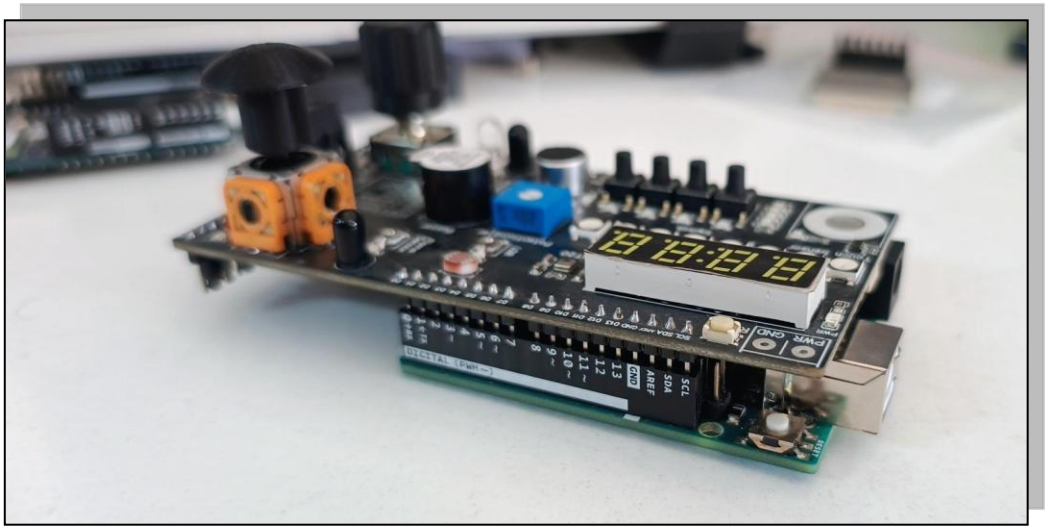
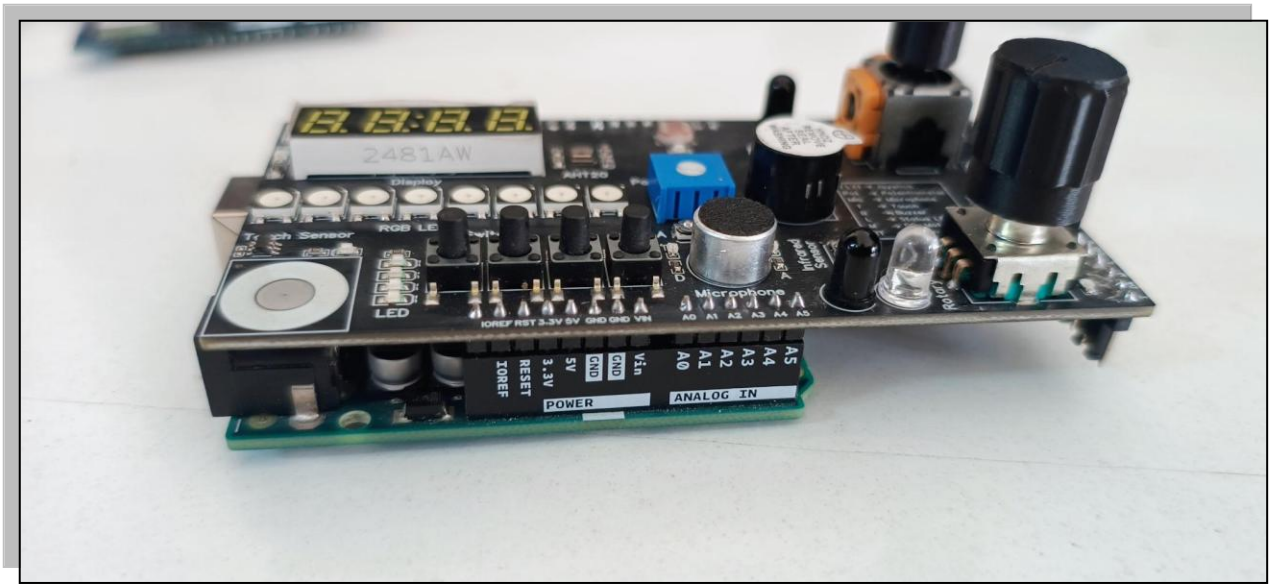
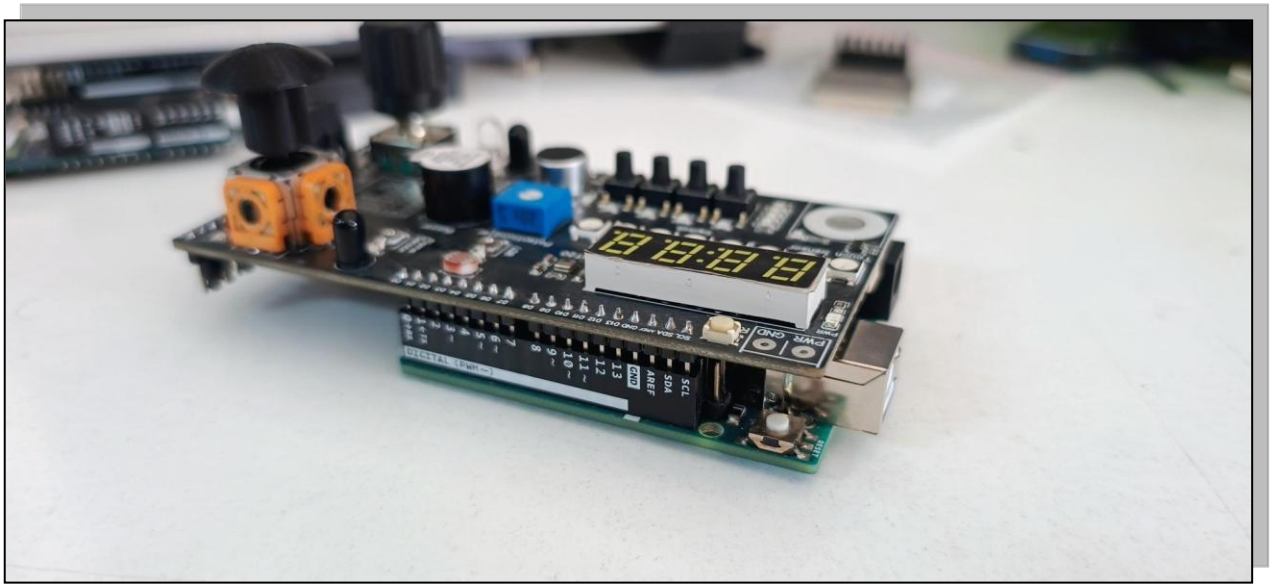
SmartElex Bharat Explorer Shield






2481AW
Display
RGB LED
LED
Microphone
IOREF RST 3.3V 5V GND GND VIN
A0 A1 A2 A3 A4 A5
IOREF
RESET
3.3V
5V
GND
GND
Vin
A0
A1
A2
A3
A4
A5
POWER
ANALOG IN


DIGITAL (PWM~)
GND
AREF
SDA
SCL

📘 **User Manual**

SmartElex Bharat Explorer Shield

Compatible With Arduino Uno R3,R4,Q

SKU: R258059

🔹 1. Introduction

The SmartElex Bharat Explorer Shield is an all-in-one embedded systems training and prototyping platform. It integrates multiple input sensors, output actuators, and communication interfaces, enabling users to quickly develop and test applications using Arduino,and STM32-based controllers.

🔹 2. Safety Instructions

- Avoid short circuits on GPIO headers
- Use proper power supply for motor load
- Disconnect power before wiring changes

🔹 3. Board Overview

🧩 Onboard Modules

Inputs

- Joystick (X/Y analog)
- Push Buttons (S1–S4)
- Touch Sensor
- Potentiometer
- Microphone
- Rotary Encoder
- Flame Sensor
- IR Sensor
- LDR

Outputs

- 4-digit 7-segment display
- RGB LED array
- Buzzer
- DC motor driver

Communication

- AHT20 (Temperature & Humidity – I2C)
- External I2C port

4. Powering the Board

- Supply via controller (Arduino/STM32)
- Operating Voltage:
    - 5V (STM32 / Arduino)

5. I2C Configuration

- Default I2C Pins:
    - SDA
    - SCL
- AHT20 Default Address: 0x38

7-Segment Display (4 Digit) – I2C Address Selection (HT16K33)

A2	A1	A0	I2C Address (HEX)
0	0	0	0x70
0	0	1	0x71
0	1	0	0x72
0	1	1	0x73
1	0	0	0x74
1	0	1	0x75
1	1	0	0x76
1	1	1	0x77

Note:

- **A0, A1, A2 = Address selection pins**
- **0 = Open (Not connected)**
- **1 = Short (Connected to VCC)**

6. Getting Started

Step 1: Connect Controller

- Mount compatible board (Arduino / STM32 Nucleo)
- Ensure correct pin alignment

Step 2: Upload Code

- Use Arduino IDE / STM32CubeIDE
- Select correct board

🔹 7. Basic Example Applications

🎮 **Joystick Control**

- Read X/Y → control motor or display value

📢 **Buzzer Alert**

- Button press → buzzer ON

🌡️ **Temperature Display**

- Read AHT20 → display on 7-segment

🌈 **RGB Control**

- Use potentiometer → change LED color

🔹 8. Motor Driver Usage

- Connect motor to screw terminal
- Use GPIO for direction
- Use PWM for speed control

🔹 9. Supported Boards

- Arduino Uno (R3 / R4)
- Arduino Mega 2560
- Arduino Leonardo
- STM32 Nucleo-64 (e.g., NUCLEO-F072RB)

⚠️ **Important Note**

Handle carefully while adjusting the sensor potentiometer.
Do not apply excessive force while rotating.

👉 If the potentiometer is damaged, the sensor will not function.
👉 We are not responsible for any damage caused due to improper handling.

10. Applications

- Embedded system learning
- IoT prototyping
- Robotics projects
- Industrial training kits

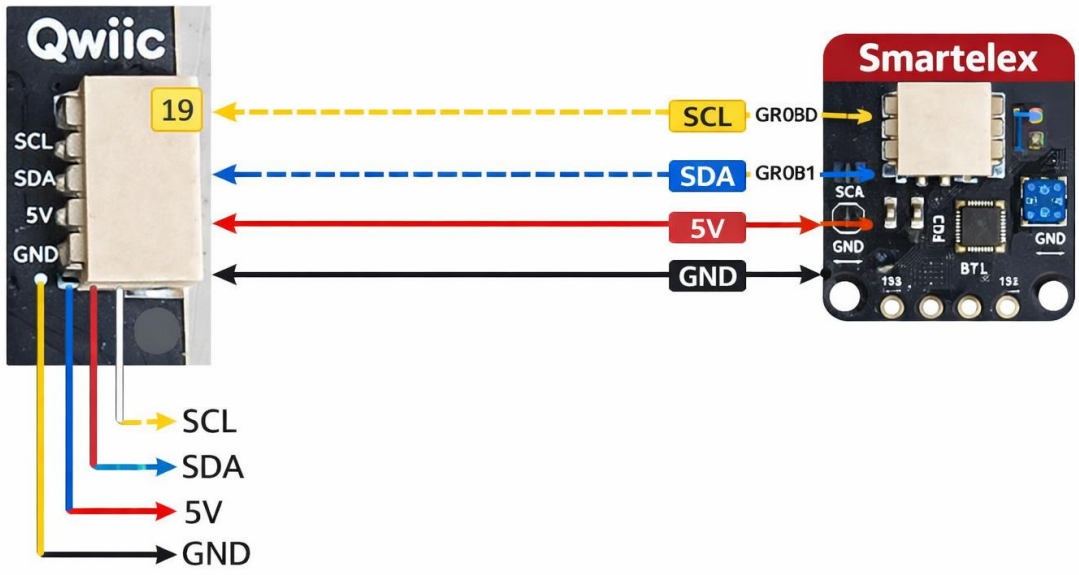
11. Maintenance

- Keep board clean and dry
- Avoid static discharge
- Store in anti-static packaging

1	External Power Supply (5V- 9V) Up to 1amp	External Power
2	Reset Switch	**Arduino Reset**
3	7 Segment Display (4 Digit)	**A4, A5(I2C) (Shared pin)**
4	AHT20	**A4, A5(I2C) (Shared pin)**
5	LDR	**A3**
6	Flame Sensor	**D2**
7	Joystick	**A0, A1**
8	Motor Driver	**D11, D4 (Shared pin)**
9	Rotary Encoder	**D5, D6 (Shared pin), D10**
10	IR Sensor	**A2**

11	Microphone	**A0 (Shared pin), D9**
12	Buttons S1–S4	**D8, D7, D6 (Shared pin), D12**
13	LED	**D13 (Shared pin)**
14	Touch Sensor	**D4**
15	RGB LED	**D3**
16	Peripheral indication LED	**------**
17	Potentiometer	**A1 (Shared pin)**
18	Buzzer	**D13 (Shared pin)**

I²C Wiring Diagram



19	External I2C Port	**A4, A5(I2C) (Shared pin)**

📌 Interface Connector Note

This module uses a **4-pin communication interface** for power and data connection.

Pin Configuration:

- **SCL** – Serial Clock Line (I^2C communication)
- **SDA** – Serial Data Line (I^2C communication)
- **5V** – Power Supply Input
- **GND** – Ground

Important Notes:

- Ensure correct orientation while connecting the connector to avoid damage.
- The interface operates on standard **I^2C protocol**, compatible with microcontrollers like ESP32, Arduino, etc.
- Always verify voltage compatibility before powering the module.
- Use proper pull-up resistors on SCL and SDA lines if not already present on the board.

Connector Reference:

- The highlighted pin (marked as **19**) indicates the reference point for correct alignment.
- Follow the shown wiring path to ensure proper connectivity.

T		**Touch Sensor**
D4	**(Shared pin)**	**----------**
M		**Motor Driver**
L		**LED**
D13	**(Shared pin)**	**----------**
B		**Buzzer**
RT		**Rotary Encoder**
D6	**(Shared pin)**	**----------**
S4		**Buttons S4**
X1		**Joystick - X**
A0	**(Shared pin)**	**----------**
MIC		**Microphone**
Y1		**Joystick - Y**
A1	**(Shared pin)**	**----------**
POT		**Potentiometer**

⚠️ Important Note (Jumper Selection)

- **Shared pins (D4, D6, D13, A0, A1)** are connected to multiple modules.
- ⚠️ **Use only ONE module at a time per shared pin.**
- Always **select the correct jumper position** before powering the board.
- Wrong jumper selection may cause:
  - Incorrect readings
  - Module malfunction
  - Possible damage in some cases

🚀 100 Project Ideas Using Your Board.

🟢 1. Beginner Level (1–20)

1. LED brightness control using POT
2. Buzzer alarm using button
3. Joystick-controlled LED direction
4. Touch sensor LED toggle
5. Clap detection using microphone
6. LDR-based automatic light
7. Flame sensor alarm
8. IR obstacle detector
9. Button-based counter on 7-seg display
10. Temperature display using AHT20
11. Humidity indicator (LOW/MED/HIGH)
12. Joystick value display
13. Rotary encoder counter
14. RGB LED color cycling
15. Potentiometer-based motor speed
16. Touch-based buzzer
17. Light intensity meter
18. Button reaction timer
19. IR sensor trigger buzzer
20. Simple digital thermometer

🔵 2. Intermediate Level (21–50)

21. Smart night lamp (LDR + LED)
22. Temperature-based fan (motor)
23. Clap ON/OFF system
24. Digital dice using 7-seg

25. Electronic voting machine
26. Password lock (buttons)
27. Smart doorbell (touch + buzzer)
28. RGB mood light controller
29. Joystick-controlled motor direction
30. IR-based intrusion alarm
31. Flame detection system
32. Smart humidity alert system
33. Multi-mode LED controller
34. Digital stopwatch
35. Reaction game with buzzer
36. Sound level meter
37. Light-controlled motor
38. Rotary encoder menu system
39. Multi-sensor dashboard
40. Temperature + humidity logger
41. Smart plant monitor
42. Auto brightness display
43. Smart switch system
44. Mini weather station
45. IR remote simulation
46. Safe temperature alert
47. Sensor calibration tool
48. Smart buzzer notifier
49. Touch-controlled RGB LED
50. Motor speed display system

🟡 3. Advanced Level (51–80)

51. Smart home control panel
52. IoT weather station (via ESP32 WiFi)

53. Fire alert + motor shutdown system
54. Smart agriculture monitor
55. Voice-triggered automation
56. Multi-sensor fusion dashboard
57. PID motor control using encoder
58. Gesture control system (IR + joystick)
59. Smart energy-saving lighting
60. Industrial safety alert system
61. Remote monitoring system (I2C expand)
62. Data logger with external memory
63. Smart parking detector
64. Environmental monitoring station
65. Smart fan with temp + humidity
66. Digital control panel UI
67. Security alarm with multiple sensors
68. Smart irrigation system
69. Home automation prototype
70. Touch-based menu interface
71. Smart classroom demo board
72. Interactive learning system
73. AI-like decision system (rule-based)
74. Sensor-based game console
75. Smart buzzer notification system
76. RGB visualization of sensor data
77. Multi-device I2C controller
78. Industrial monitoring prototype
79. Smart alert system with priority logic
80. Modular IoT hub

🔴 4. Expert / Innovation Level (81–100)

81. AI edge device (rule-based automation)
82. Smart disaster detection system
83. Industrial HMI panel prototype
84. Smart traffic signal system
85. Autonomous decision system
86. Multi-sensor predictive alert system
87. Smart robotics controller
88. Voice + sensor hybrid control system
89. Smart greenhouse automation
90. Advanced IoT dashboard with cloud
91. Edge computing sensor hub
92. Smart safety wearable prototype
93. Sensor fusion AI model demo
94. Smart building automation system
95. Industrial IoT gateway
96. Real-time monitoring + alert system
97. Smart grid demo system
98. Intelligent environmental controller
99. Multi-zone automation system
100. Fully integrated smart control panel

🚀 Top 10 Projects with Details

🔹 1. Smart Weather Station 🌡️

Used Modules:
AHT20, 7-Segment Display, RGB LED

Working:

- Reads temperature & humidity from AHT20
- Displays values on 7-seg display
- RGB LED shows status:
  - 🔵 Cold
  - 🟢 Normal
  - 🔴 Hot

Application: Home weather monitor / IoT system

🔹 2. Fire Detection & Alert System 🔥

Used Modules:
Flame Sensor, Buzzer, RGB LED, Motor

Working:

- Detects fire using flame sensor
- Activates buzzer + red LED
- Motor can act as fan/exhaust

Application: Safety system, industrial use

🔹 3. Smart Night Lamp 💡

Used Modules:
LDR, LED

Working:

- Detects ambient light
- Automatically turns ON LED in dark

- OFF during daylight

Application: Street light / home automation

🔹 4. Digital Voting Machine 🗳️

Used Modules:
Buttons (S1–S4), 7-Segment Display

Working:

- Each button = candidate
- Votes counted and displayed
- Lock after vote

Application: Educational EVM

🔹 5. Joystick Controlled Motor 🎮

Used Modules:
Joystick, Motor Driver

Working:

- Joystick direction controls motor
- Speed depends on movement

Application: Robotics / RC systems

🔹 6. Sound Controlled System 🎤

Used Modules:
Microphone, LED / Motor

Working:

- Detects clap or sound
- Toggles device ON/OFF

Application: Smart home

🔹 7. Smart Security System 🚨

Used Modules:
IR Sensor, Buzzer, LED

Working:

- Detects intrusion
- Triggers alarm

Application: Home security

🔹 8. Temperature Controlled Fan 🌬️

Used Modules:
AHT20, Motor

Working:

- Reads temperature
- Controls fan speed automatically

Application: Cooling systems

🔹 9. Reaction Timer Game ⏱️

Used Modules:
Buttons, Buzzer, Display

Working:

- LED/buzzer signal appears randomly
- User presses button fast
- Time displayed

Application: Fun + training

🔹 10. Smart Plant Monitoring System 🌱

Used Modules:
LDR, AHT20, Buzzer

Working:

- Monitors light, temp, humidity
- Alerts when conditions are bad

Application: Agriculture / gardening