

# Remote Monitoring System



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## Company Overview

Artibraino Private Limited (ARTIBRAINO) is a dynamic deep-tech start-up based in Bangalore, founded in 2019 with the aim of revolutionizing the world with cutting-edge technology. Our core focus is on developing innovative products, solutions, and services that leverage the power of machine intelligence and IoT to solve real-world problems and create tangible value for our clients.

As a recognized Start-up by DPIIT, Govt of India, and selected for incubation in the IoT Open lab by Software Technology Parks of India, we have access to world-class IoT labs, expandable office space, and mentoring from internationally renowned experts in industry and academia. Our expertise in IoT, machine learning, computer vision, natural language processing, and other emerging technologies allows us to constantly push the boundaries of what is possible and stay at the forefront of technological advancements.

At Artibraino, we are committed to delivering game-changing solutions that help our clients stay ahead of the curve. Whether you are a start-up, an established enterprise, or a government agency, we can help you leverage the power of machine intelligence and IoT to solve your most pressing challenge. So, join us on our journey to transform the world with intelligent technology and unlock limitless potential for your business.

## Remote Monitoring System

In an era where sustainable energy solutions are at the forefront of global initiatives, solar power has emerged as a key player in the transition to cleaner, renewable energy sources. To ensure the optimal performance and efficiency of solar energy systems, a reliable and advanced monitoring solution is imperative. This is where the Solar Remote Monitoring System comes into play.

Our Solar Remote Monitoring System is a cutting-edge solution designed to enhance the efficiency, reliability, and overall performance of solar installations. Whether you're managing a small-scale residential solar array or overseeing a vast solar farm, this system provides real-time insights and control over your solar energy assets.

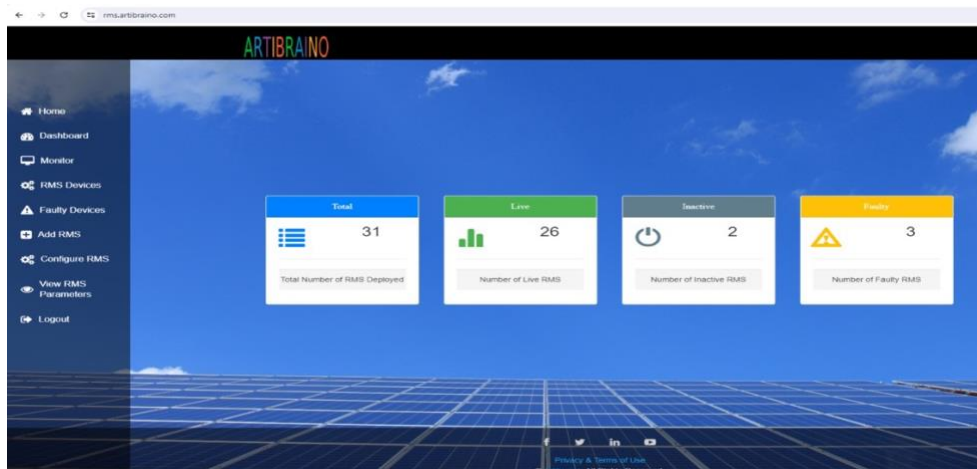
Our platform stands out for its complete compatibility with the Pradhan Mantri Kisan Urja Suraksha evam Utthan Mahabhiyaan (PM KUSUM) project requirements. Specifically designed to seamlessly integrate with various components essential to the PM KUSUM initiative, our platform ensures a hassle-free experience for users involved in Pump Control, Energy Meter, Inverter, String Combiner Box (SJB), and other relevant systems.

This compatibility eliminates the complexities traditionally associated with integrating different devices into a cohesive system. With our platform, it's a straightforward "plug and play" scenario with your existing equipment and devices. The user-friendly interface and intuitive design make the integration process smooth, allowing users to harness the benefits of PM KUSUM without the need for intricate configurations or technical expertise.

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Whether you are managing agricultural pump control, monitoring energy consumption, or optimizing the performance of inverters and combiner boxes, our platform's compatibility ensures that you can seamlessly incorporate it into your existing infrastructure. This feature not only streamlines the implementation process but also enhances the overall efficiency and effectiveness of your operations, aligning perfectly with the goals and requirements of the PM KUSUM project.

## Key Features : Software



**Real-Time Monitoring:** Gain instant visibility into the performance of each solar panel and the overall energy production of your system. Our monitoring system delivers real-time data on energy generation, ensuring you can promptly identify and address any issues.

**Fault Detection and Alerts:** Receive immediate alerts for any anomalies or faults within your solar infrastructure. Whether it's a malfunctioning panel or a drop in energy output, our system notifies you, allowing for swift response and minimizing downtime.

**Performance Analytics:** Dive deep into the performance analytics of your solar array. Track energy production trends, assess the impact of external factors, and identify opportunities for optimization, all through comprehensive analytics and reporting tools.

**Remote Diagnostics:** Troubleshoot issues remotely with our advanced diagnostic features. Minimize the need for on-site visits by accessing detailed diagnostics, reducing operational costs, and improving the overall maintenance efficiency of your solar assets.

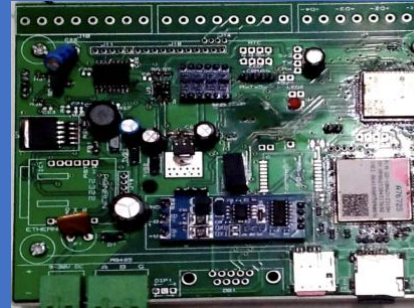
**Environmental Monitoring:** Beyond energy production, our system monitors environmental conditions, such as temperature and weather patterns, providing valuable insights into the impact of external factors on solar performance.

**APP Based Control :** Artibraino Remote Monitoring System (RMS) takes a leap forward in user accessibility and control by incorporating an intuitive and feature-rich app-based interface. This innovative approach to control enhances the overall user experience, making the management of your solar energy system more convenient and efficient

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## Features : Hardware

- ESP32 32 bit WiFi Controller
- SIMCOM A7672S 4G LTE Module
- W5500 Ethernet Module
- RS485/RS232 with optional isolation
- Micro SD Card and Nano SIM slot
- Serial Port for code upload and monitoring
- On-board RTC and 32k EEPROM
- 4 Digital Isolated Inputs
- 2 Digital Outputs
- Protocols: MQTT(s), HTTP(s), DHCP, FTP, Modbus, SPI, I2C, etc
- FOTA (Firmware Update) support
- PCB Header for mounting RA-08 LoRa-WAN module
- Compact PCB size 130x105mm



The Remote Monitoring System (RMS) have a multitude of benefits with its comprehensive set of features, providing an unparalleled level of control and efficiency. The inclusion of the ESP32 32-bit WiFi Controller ensures seamless and reliable wireless communication, offering a robust foundation for data transmission. The SIMCOM A7672 4G LTE Module further extends connectivity options, ensuring the RMS remains connected in diverse environments.

Equipped with the W5500 Ethernet Module, the RMS excels in both wired and wireless networking scenarios. The integration of RS485/RS232 with optional isolation enhances flexibility, allowing for versatile communication setups. The inclusion of a Micro SD Card and Nano SIM slot facilitates local data storage and supports cellular network functionality.

Supporting a range of protocols such as MQTT(s), HTTP(s), DHCP, FTP, Modbus, SPI, I2C, etc., the RMS ensures compatibility with diverse industrial applications.

The system's FOTA (Firmware Update) support ensures hassle-free and remote firmware upgrades, promoting longevity and adaptability. The inclusion of a PCB Header for mounting the RA-08 LoRa-WAN module expands the RMS's capabilities, allowing for seamless integration into LoRa networks. The RMS combines versatility and efficiency, making it an ideal choice for a wide array of remote monitoring and control applications.

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## Precautions for Module Handling and Operation

### Supply:

- Ensure that the module is powered using a stable and appropriate power supply within the specified voltage range (9v to 30v).
- Take necessary precautions to prevent electrostatic discharge (ESD) when handling the module to avoid damage.
- Follow the pinout and connection guidelines provided in the user manual diagram to prevent incorrect wiring, which may lead to malfunction or damage.
- Ensure proper grounding to minimize the risk of electrical noise and interference, which can affect the module's performance.

### Environment and Handling:

- Avoid exposing the module to extreme temperatures, humidity, or other adverse environmental conditions that could affect its performance and longevity.

### Security and Integration:

- Implement appropriate security measures to protect the module's firmware from unauthorized access or tampering.
- When integrating the module into a larger system, ensure compatibility and proper communication protocols between the module and other components.

### Technical Support:

- In case of any issues or difficulties, consult the manufacturer's technical support ([contact@artibraino.com](mailto:contact@artibraino.com)) for prompt assistance and resolution.

By adhering to these precautions, you not only ensure the reliable performance of the module but also contribute to its longevity and the overall stability of your system.

## Compliance with PM- KUSUM Requirements

S. N.	Requirement	Compliance Status	Remarks
1.	Solar System Performance: DC Voltage, DC current, AC output Current, Power, Drive frequency, Energy, etc.	Yes	Underlying system controller motor, etc need to support reading this over Modbus or other supported protocol.
2.	Pump Performance: Running Hours, Water Discharge (Output), etc.	Yes	Underlying system controller motor, etc need to support reading this over Modbus or other supported protocol.
3.	RMS Performance: % of Device Connectivity, % of Data Availability, etc.	Yes	
4.	Geo Location: Real time latitude and longitude should be captured with an accuracy of less than 10m horizontal. This is required to ensure that system is not moved from its original location.	Yes	GPS tracking provided with extendible antenna.
5.	Events and Notifications: Faults related to Pump Operation, Solar generation, Controller/Drive faults like overload, dry run, short circuit, etc.	Yes	Underlying system controller motor, etc need to support reading this over Modbus or other supported protocol.
6.	Consumer Management: Name, Agriculture details, Service No. Contact Details, etc.	Yes	System can capture and provide the same.
7.	Asset Management: Ratings, Serial Number, Make, Model Number of Pump, SPV Module and Controller, Geo Location, IMEI number (of communication module) and ICCID (of SIM).	Yes	
8.	Complaint and Ticket Management: Complaint management system is a part of centralized monitoring software platform.	Yes	Online complain system available.
9.	Consumer Mobile Application: Generation, Running Hours, Water Discharge, Complaint logging, etc.	Yes	Underlying system controller motor, etc need to support reading this over Modbus or

	Communication Architecture of the RMS should be as mentioned below:		other supported protocol
10.	Pump Controller Connectivity: Communication between RMS and Pump Controller should be on UART/RS485 MODBUS RTU protocol to ensure interoperability irrespective of make and manufacturer.	Yes	
11.	Remote Connectivity: RMS of SWPS should use GSM/GPRS/2G/3G/4G cellular connectivity.	Yes	This is 4G RMS with fallback option to 2G , and GPS.
12.	Local Connectivity: Ethernet/Bluetooth/Wi-Fi connectivity to configure parameters, notifications, communication interval, set points etc. or to retrieve locally stored data	Yes	But board can be totally configured remotely using POTA.
13.	Sensor Connectivity: RMS should have provision for at least two Analog and Digital inputs with 0.1% accuracy to address the requirement of local sensors connectivity if required by SIA/Consumer for applications such as irradiation, flow meter for water discharge, moisture sensor for micro-irrigation, etc. As mentioned in specifications, Analog and digital sensor inputs will be required for integration of flow meter for water discharge, moisture sensor for micro irrigation, level sensor for overhead tank etc.	Yes	Yes inputs available in RMS, underlying system controller motor, etc need to support reading this over Modbus or other supported protocol.
14.	RMS should have provision to give various modes of operations which are as follows: <ul style="list-style-type: none"> <li>Remote Mode: - Pump can be made ON/Off using the Mobile App or in case, farmer do not have a smart phone, farmer shall be able to on-off pump through SMS/missed call.</li> <li>Auto Mode: - Pump can ON/Off automatically using the sensor data which are installed in the field by the beneficiary. (Cost of sensors will be worn by the beneficiary)</li> <li>Timer Mode: - Pump controller shall operate pump as per configured schedule using mobile application</li> </ul>	Yes.	Yes inputs available in RMS, underlying system controller motor, etc need to support on//off through Modbus.  Apart from mobile t2iot platform is also integrated with Alexa platform and can optionally enable Alexa voice based control.

	<p>i.e., daily start time and running hours of pump.</p> <ul style="list-style-type: none"> <li>• Mode: - Pump can be made to run into manual mode from field. To save ground water, provision for remote operation is required so that farmer can switch on and off remotely.</li> </ul>		
<b>15.</b>	<p>Communication Modes:</p> <ul style="list-style-type: none"> <li>• Push Data on Event/Notification: such as pump on, pump off, protection operated, etc</li> <li>• Push Data Periodically: important parameters of solar pump (as mentioned above) should be pushed to central server on a configurable interval. Default interval should be of 15 minutes. However, if required, it should be possible to configure the periodic interval in multiples of 1 minute starting from 1 minute and up to 15 minutes. Further, in case of any abnormalities or events, RMS should push on event immediately.</li> <li>• Command on Demand: It should be possible to send commands via GSM or GPRS to RMS either to control pump operations or to update configuration.</li> </ul>	Yes	
<b>16.</b>	<p>Communication Protocol: RMS should provide data on MQTT protocol to establish communication with thousands of system.</p>	Yes,	<p>Powered with Artibraino t2iot platform, system is capable of pushing data to both Govt portal for compliance and provider portal for business intelligence and predictive maintenance.</p>
<b>17.</b>	<p>Security: Communication between RMS and Server should be secured and encrypted using TLS/SSL/X.509 certificate etc.</p>	Yes	<p>All communication is encrypted.</p> <p>Yes Authentication and Authorization is available , Industry</p>



	As a part of IoT protocol, Authentication and Authorization should be implemented using a token/password mechanism		standard Oauth2 protocol support.
18.	Message Format: RMS should provide data in a JSON message format as per requirement of implementing agency.	Yes	JSON supported , fully compliant JSON with KUSUM JSON.
19.	. Data Storage: In case of unavailability of cellular network, RMS should store data locally and on availability of network it should push data to the central Server. Local data storage should be possible for one year in case of unavailability of a cellular network. RMUs should have configuration updates over the Air of multiple parameters such as IP, APN, Data logging Interval, Set Points etc. is essential. Software updating should be possible with 2G and even without the presence of SD card. Software updating process and/or failure to update software shouldn't disrupt pumping operations. RMS should be connected to the Solar Energy Data Management Platform of the implementing Agency.	Yes	Mini SD card available to store up to 16 GB data.  In 4G SIM APN not required , however we can optionally configure it.
20.	RMUs should have configuration updates over the Air of multiple parameters such as IP, APN, Data logging Interval, Set Points etc. is essential. Software to be updated through "Programming over the air" on SIA server. Software updating process and/or failure to update software shouldn't disrupt pumping operations. Manufacturer should consider Programming Over the Air (POTA) instead of Firmware Over the Air (FOTA) to update configurable parameters such as server IP, URL, Port, APN, Periodic Interval etc.	Yes	FOTA/POTA supported.

Visit <https://rms.artibraino.com> for details.  
Call us +91 988 626 7311 for free demo .