Verticross India Pvt. Ltd.

Feeder Remote Terminal Unit

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INTRODUCTION

The Feeder remote Terminal unit (FTRU) monitors all sub-station equipment and acquires data from all incoming and outgoing feeders on a real time basis. It captures status signals of devices and conduct automatic data logging to provide substation level control. In-addition, it monitors entire sub-station equipment, Viz, Transformers, Feeders, Batteries, Transducers Breakers, energy, meter, etc.

This facelifting, energy management, load forecasting and scheduling, and eventually leading to sub-station automation. Feeder Remote Terminal Units (FRTUs) are essential devices in the automation and management of electrical distribution networks. They serve as a critical interface between field devices, such as sensors and circuit breakers, central control systems, like Supervisory Control and Data Acquisition (SCADA) systems.

The primary role of FRTUs is to acquire data from the field, enable real-time monitoring, and facilitate remote control of various equipment, enhancing the overall efficiency and reliability of power distribution. Using Real Time Data Acquisition System (RTDAS) software, FRTU works as full-fledged SCADA system. It can communicate with the master control stations through LAN or GPRS/ 4G.

Major modules in FRTU are:

- Central Processing Unit
- Digital Input
- Digital output
- Analog Input
- Analog Output
- Power Supply
- Communication

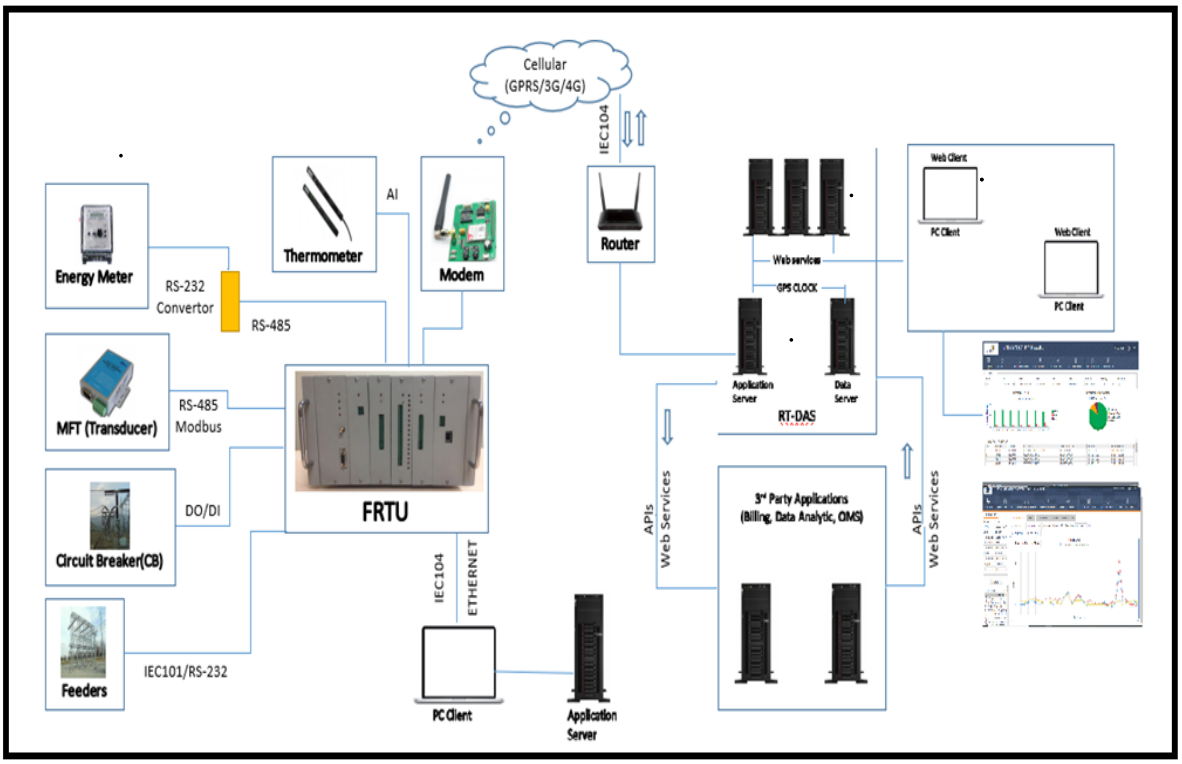
Distribution Automation: Enhancing the reliability and efficiency of power distribution.

Fault Detection and Isolation: Identifying faults and enabling automatic reconfiguration of the network.

Load Management: Monitoring load conditions and facilitating demand-side management.

Integration with Smart Grid: Supporting the transition to a smarter, more interconnected energy network.

ARCHITECTURE



The FRTU is essential for monitoring and controlling electrical feeders, ensuring reliability and efficiency in power distribution It integrates field devices, processing units, communication interfaces, and user interfaces to provide a comprehensive solution

FRTUs serve as intermediary devices that collect data from various sensors and devices in the field and transmit it to a central control system. They play a crucial role in enhancing the reliability, efficiency, and automation of power distribution / transmission systems.

FRTUs are vital for modern electrical transmission distribution systems, offering enhanced monitoring, control, and automation capabilities. Their architecture is designed to ensure reliability, scalability, and security, making them an integral part of smart grid initiatives. Understanding their components and functions is essential for effective deployment and operation in the field.

FEATURES & FUNCTIONALITIES

Control Processor Module (CPM)

The USP-020i control processor module (cpm) provides a range of communication options including Ethernet, RS232 and RS485. It supports multiple industry standard protocols including IEC 60870-104 salve 60870-103 Master and MODBUS-RTU Master.

The CPM also includes a Local/Remote switch & OLED display which is provided for status indication. The power supply required varies from 18V to 52VDC.

Digital Input (DI)

- Digital input refers to signals that are represented in discrete values, typically binary (0s and 1s). These inputs are used to read the state of a device or sensor.
- Push buttons, switches, and digital sensors (like a temperature sensor that outputs a digital signal).
- **Characteristics:**
  Discrete Levels: Only two states (high/low, on/off).
  Noise Immunity: More resistant to noise compared to analog signals.
- 16 channel opto-isolated inputs
- Monitors feeder status, switch positions, etc.

Digital Output (DO)

- Digital output refers to signals that are sent out in discrete values, typically to control devices or indicate a state.
- LEDs, relays, and digital displays.
- **Characteristics**:
  Binary Control: Can only be in one of two states (on/off).
  Simplicity: Easier to design and implement in digital circuits.
  Power Consumption: Generally lower power consumption when in a low state.
- 8 channel Digital output with 2Amps current carrying capacity potential free contacts.
- Controls (On/Off) feeders, relays, alarms, etc.

Analog Input (AI)

- Analog input refers to signals that can take on a continuous range of values. These inputs are used to read varying signals from sensors.
- Potentiometers, thermocouples, and microphones.

- **Characteristics**:
  Continuous Levels: Can represent an infinite number of values within a range.
  Sensitivity: Can detect small changes in the input signal.

- 8 channel analog inputs with 24-bit ADC resolution
- Reads voltages, currents, power factors, and other data from transducers.

Analog Outputs (A0)

- Analog input refers to signals that can take on a continuous range of values. These inputs are used to read varying signals from sensors.
- Potentiometers, thermocouples, and microphones.
- **Characteristics:**
  Continuous Levels: Can represent an infinite number of values within a range.
  Sensitivity: Can detect small changes in the input signal.
- 8 channel analog outputs with 16-bit DAC resolution
- Analog output values are updated for every transmission.

Power Supply

The auxiliary supply ranges for FRTU 18.52 VDC. The green colored POWERLED glows when the unit is switched ON. An adequate protection against reverse polarity, overcurrent and under voltage conditions is present to prevent the module from being damaged in an event of external effects.

- 48V DC input power supply.
- 220V AC power optional.

Supplies required voltages to all equipment.

Communication (2G/4G Modem)

- GPRS/4G Module and its circuitry is communicated through processor card by UART interface.

Central Processing Unit (CPU)

• IEC 60870-5-101 and IEC 60870-5-104 protocols used to transmit data from substations to master control centers

• Diagnostic software for continuous monitoring of the FRTU and reporting of hardware errors to the connected master stations

• 1GHz ARM Cortex -A8 32-Bit RISC Processor Manages input, output, energy meter data and sends all this data to the server.

• Database configuration and maintenance software tool for database modification,

configuration, and data downloads

- GPRS/GSM/4G used to transmit data
- Generates custom reports for aggregation, analysis and creation of MIS reports
- Auto detects devices and performs device checks using the required baud rate and protocol stack
- Reads data from different device makes/models with varying standards of communication protocols
- 0.5 to 1.0 m sec digital data scanning resolution and time stamping
- User friendly configuration tool for ease of configuration and management
- Devices that can interface with FRTU include sub-station batteries, transducers, breakers, switches, transformers, isolators, feeder meters and sensors
- Data can be integrated with the sub-station monitoring system (SCADA)

DATESHEET

Main Processing Unit (MPU)

- CPU: - 32-bit ARM Coryex-A8,1.0GHz
- DDRAM: -256MB
- SPI Flash: -8MB

Communication Interface

- Description: -RS-232
- Connector: -DB-9 Female
- Type: -Serial Port
- Bit rate: -100 bit/s – 9600 bit/s
- Signal lines: - TXD PIN 2
  RXD PIN 3
  GND PIN 5
- Level: - typical: ± 10V DC

Ethernet Interface

- Type: - IEEE 802.3,10/100BaseT
- Connector: -RJ 45

Physical Attributes

- Dimensions: -335 mm x 190 mm x 170 mm
- Housing type: - Metal housing (IP51)
- Mounting: -Tabletop
- Weight: -Less than 1500 gms

Environmental Conditions

- Nominal operating: - -25 °C to +60 °C
- temperature range: - -25 °C to +60 °C
- Max. operating temperature: - -40 °C to +65 °C
- Relative humidity: -5% to 95 % (non-condensing)

Power Supply

- Input Voltage: -36V to 52V DC
- Output Voltage: -5.0V DC
- Output Current: -2.5 Amps max
- Protections: - Short circuit and overload
- Surge handling capacity: -4KV / 6KV as per IEC 61000-4-5
- Connection type: -Single phase 2 wire

Immunity Test

- Surge: - 4 KV/6KV
- IEC 61000-4-5, 2005: - Performance criteria A
- Conducted Emission: -150 KHz to 30 MHz
- CISPR 22: -Performance criteria A
- Radiated Emission: -30 MHz to 1000 MHz
- CISPER 22: -Performance criteria A
- Electrostatic Discharge 6 KV in Contact Discharge
- IEC 61000-4-2, 2008: -8 KV in Air Discharge
- Radiated Susceptibility: -80 MHz to 1000 MHz (3 V/m)
- IEC 61000-4-3, 2010: -Performance criteria A
- Electrical Fast Transient: -4KV
- IEC 61000-4-4, 2011: -Performance criteria A
- RS-485 ports of FRTU at port 1
- First pin is RX/D-/B and
- second pin is TX/D+/A.

To connect with FRTU over LAN Network configuration assigned to FRTU is

- IP: - 192.168.0.230
- Subnet: - 255.255.255.0
- Default Gateway: - 192.168.0.1

FRTU Digital Input is configured for

- Single point DI: - 16 SPST.
- Double point DI: - 8 DPDT.

IEC104 configuration

- Port no: - 2404
- ASDU address: - 1
- IOA of Single points DI from “1001” to “1016”.
- IOA of Double points DI from “2001” to “2008”.
- IOA of Analog points (MFT values) from “3001” to “3022”.
  MFT -1 values: - 3001 - 3011.
  MFT -2 values: - 30012 - 3022.

BENEFITS

- No manual interference in reading energy meters
- Avert misuse or tamper of meters due to periodic monitoring
- Accurate and validated data
- Read data remotely without visiting the location
- Improves billing
- This data can be used for data analytics and proper forecasting
- Maintenance of electrical equipment’s.
- Reducing distribution losses
- Enhance customer service