Technical Information

Large Scale
V-RTU2000 System

System Configuration Manual

VEESTA WORLD

Author: Veesta World Co., Engineering Department

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NOTICE

DOCUMENT HISTORY

Version	Date	Comment
1.0	2009/09/01	First issue
1.1	2009/10/01	Added some diagrams
1.2	2010/08/12	Added some modules
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Chapter 1 - Introduction

1.1 General Information

This is a system configuration manual that describe all thing about large scale configuration of V-RTU2000 System. The term “Large Scale RTU” approached on the remote terminal systems with high capacity of IO points or to be used in area operating centers or regional dispatch centers that control substations like 400kV, 230kV, 132kv and 63kV operating voltage. Therefore to prepare system with a lot of IO counts also called Large Scale RTU system.

1.2 Veesta World Co

Veesta World Co is a leading company in automation field in Iran and specialized in design and installation of IT Network of wide area and local area, Automation control units, control rooms, DCS design, PLC and SCADA application installation and system integration. The main advantage of Veesta World's products is complying international standards and do customs basic design.

Veesta World Co is a dynamic company located in the Tehran, IRAN, whose main commitment is the customer’s satisfaction. Business vision and its future evolution together with the proper combination of new and existing technologies are the main aspects considered in the solutions proposed by Veesta World Co. Owing to this, key issues like Scalability, the Return of Investment or the Total Cost of Ownership are carefully considered. Consequently, the solutions offered by Veesta World Co are able to cope with the requirements of a sustainable growth. Veesta World Co is a service-oriented company and the customer perspective is its action guide. An added value of the offer is the evaluation and Management of the risk. This issue is getting a major relevance in the changing environment in which new technologies have to be applied, particularly when profitability is a major concern.

The objective of Veesta World Co is focused on the creation of value for the customer through the proper business strategy alignment and the right combination of technologies. These principles, developed under the Total Quality Management practice, allow Veesta World Co to offer, in a seamless approach, consultancy, engineering and training services.

The founders of Veesta World Co are professionals with a large experience in the Telecommunication and Networking and Industrial fields.

Veesta World Co is formed by a balanced team of professionals that gather knowledge in a wide range of technologies and specific know-how on how to apply these technologies in mission-critical control networks.

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Figure 1-1: Veesta World Co Logo and sign

Chapter 2 - Design Principals

2.1 System General Requirements

The main goals to be implemented with the RTU system are defined in the following:

- To provide for the operational personnel user friendly, effective, safe and reliable facilities for controlling the power system.
- To produce power system status data, alarms and measurements for system monitoring and reports as well as for fast recovery from disturbances.
- To speed up disturbance clearance and power system restoration.
- Through the above facilities to improve the availability and overall quality of electricity supply to the customers.

To achieve for above goals we proposed the best solution based on V-RTU2000 RTU system of Veesta World Company assure reliable monitoring facilities.

2.2 RTU Platform

The V-RTU2000 series (Veesta Remote Terminal Unit) is a distributive Data Acquisition and Control System based on microprocessor. In common SCADA (Supervisory Control and Data Acquisition) System, it performs the work of the Terminal processing unit in most utility stations. RTU acquires station data, both of analog and digital signals with information management and DTU also meets the command from host in master station : to transmit back the acquired data ; to perform the function "check before execution" for station facilities to ensure a safe and reliable execution in system control.

2.3 Documentation

All of Technical documents such as User's Manuals, User's Guides, Helps and repair or maintenance manuals will submitted in CD and Hard copy.

If installation be in the contract, after installation As-Built diagrams for Installed RTU will be provide and cover following items in the as-built diagrams:

a) Internal Circuit Diagrams of cubicle.
b) Circuit Diagrams of connection system to the marshalling rack (for example +YV Cubicle)
c) Terminal Strip and Device list diagram with name of point and signals
d) Cable list diagrams to show start and end connection of each cable.
e) Connection list diagrams to show each wire internally or externally connections in whole of delivered project.

To see example diagram you can see Figure 2-1.

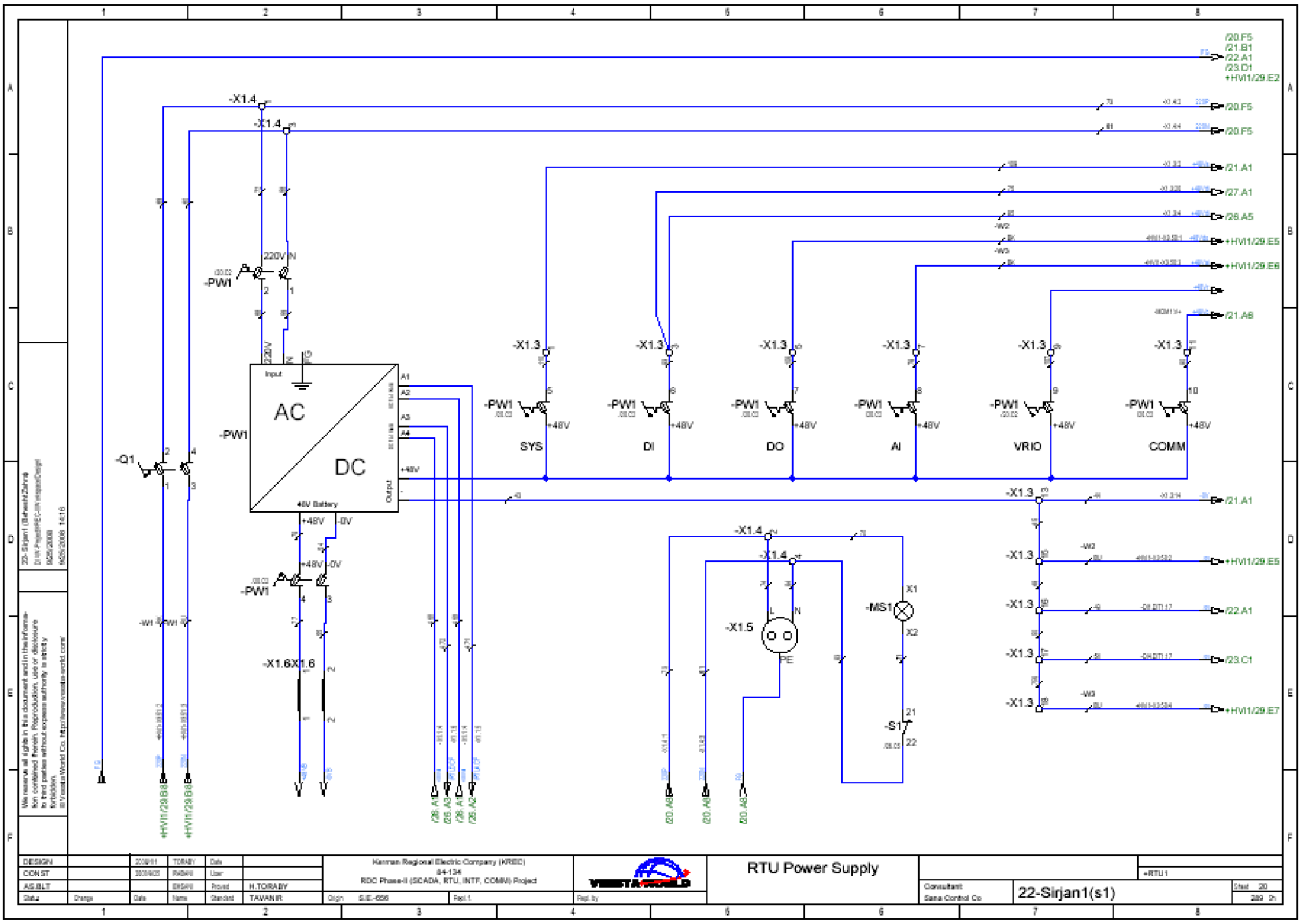


Figure 2-1: As-Built Diagram sample

Chapter 3 - RTU System Configuration

3.1 General

In this chapter the composing principle, technical features and technical parameters of **Veesta-RTU 2000 Series** as a **Large Scale Remote Terminal Unit** in the conjunction of the Enhanced Distributed Remote Terminal Unit is described. You can make a clear understanding of this system. In this chapter we will show about RTU configuration structure.

3.2 V-RTU2000 System Structure

To achieve an idea RTU design, V-RTU2000 series is fully modularized in all I/O units, intelligent processing in system operation and powerful in communication ability. RTU design endeavor to pursue long-term stability, high reliability, convenience in maintenance and wiring connection, flexible in extension to be an aesthetic product as a well-being quality unit. V-RTU2000 provides flexible, cost effective answers to many challenges that face the engineering, operations, and maintenance departments of today's power utility.

The V-RTU2000 series offers a single RTU family meeting the entire range of requirements, from small distribution and cogeneration sites to large substations and generating stations, using the same components in a modular, building block approach. The V-RTU2000 Series introduces an open architecture permitting the addition of new processing modules, each linked by fully protected high-speed I/O LAN (Local Area Network). Nothing becomes obsolete in the course of expanding a V-RTU2000 from the smallest to the largest, most complex configuration.

The V-RTU2000 Series including two other key functional equipments of the Communication Server and the Intelligent Electronic Device equipments as Communication Server and IED.

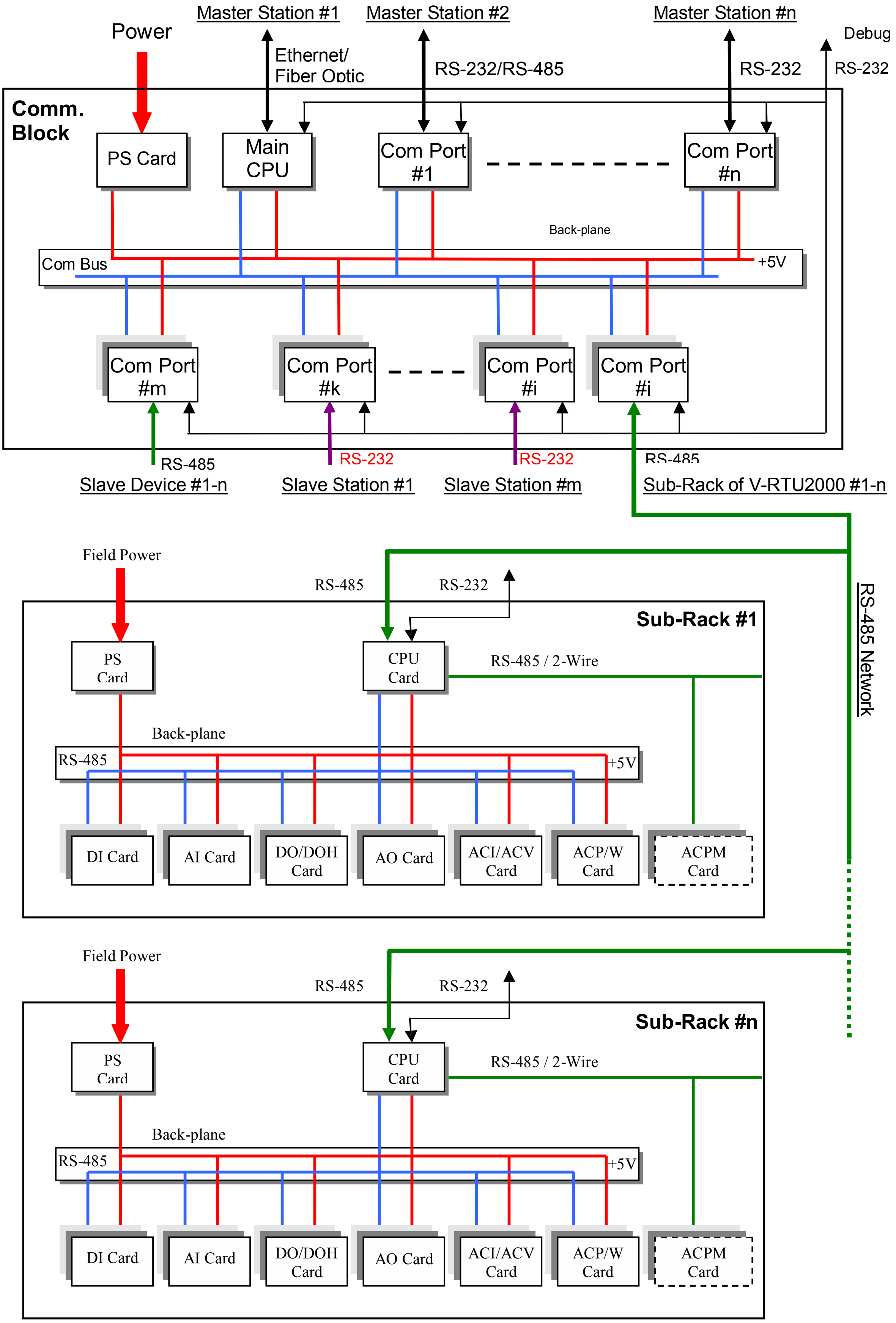


Figure 3-1: V-RTU2000 Series as Distributed RTU Structure Diagram

3.2.1 Communication Server and Gateway

Show as per Figure 3-2, the Communication Server is consisted of one Communication block device, several communications I/O. Communication block is a portion of V-RTU2000, but in regards of its large ability formed as also Veesta-COM2000 Product Series model of VC-2DCU device.

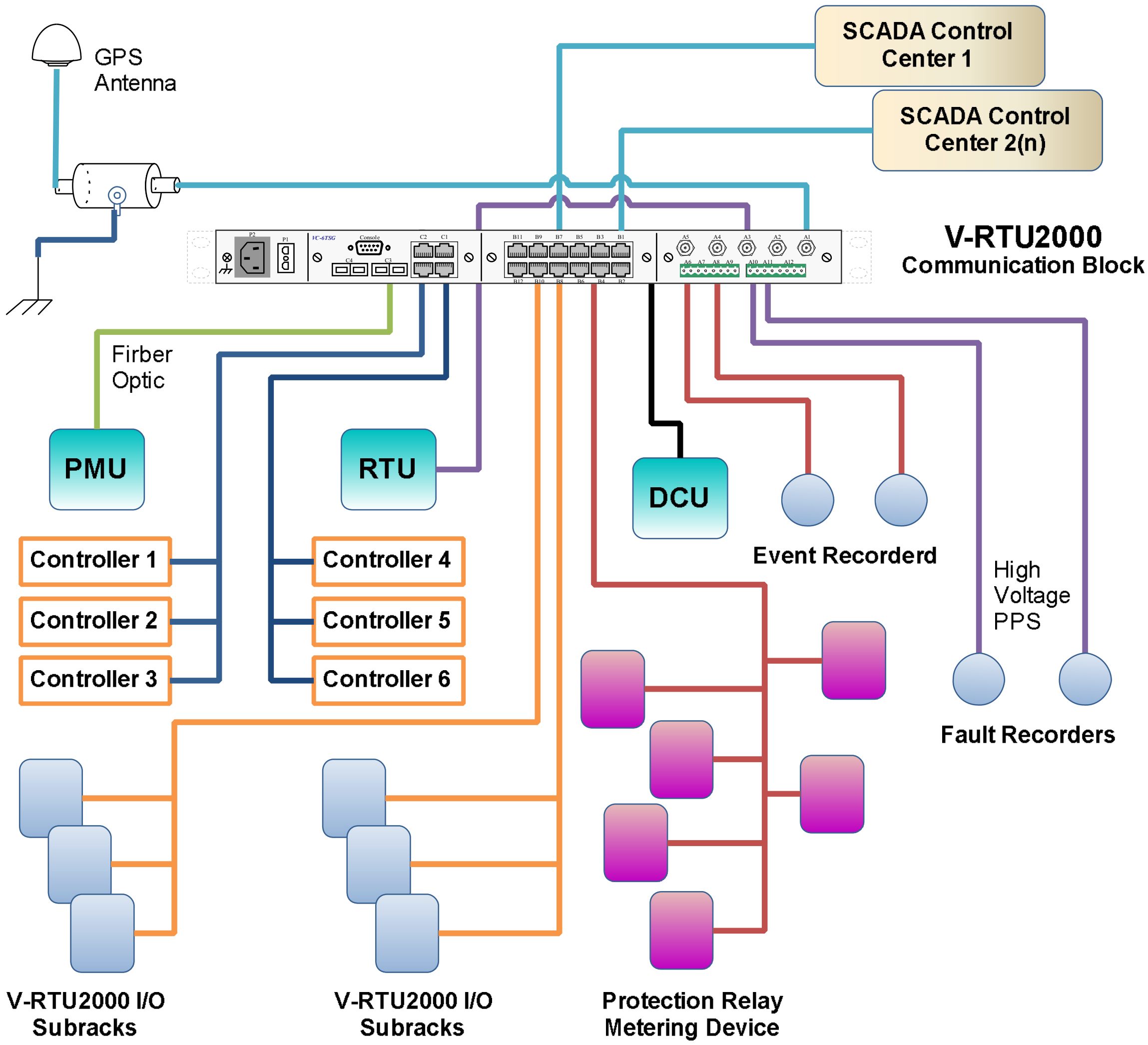


Figure 3-2: V-RTU2000 Series as Communication Server Structure Diagram

3.2.2 Intelligent Electronic Devices (IED)

Show in Figure 3-3 is of the IED structure diagram, using V-RTU2000 as well as the IED equipment. There are two independent communication channels are provided by V-RTU2000 CPU Card, of which, one links to the host computer. The other one links to the Power Meter or IEDs for obtaining I/O information for such equipment and also transferring the Output control command. In addition, the V-RTU2000 also provide I/O cards (AI, DI, AO, DO and etc.) to collect the field information and also carry out the Output of control command.

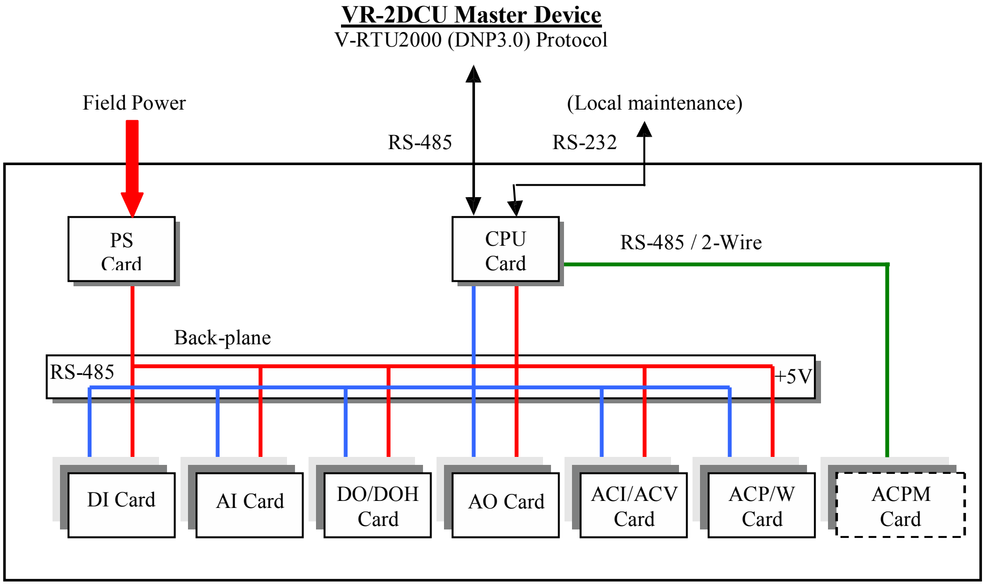


Figure 3-3: V-RTU2000 Series as IED Structure Diagram

3.3 Summary of Functions

3.3.1 RTU Sub-racks Unit

V-RTU2000 Series is generally installed at on-site power station, applied to signals monitoring and control performance. It is designed in multi-processor technique. Each I/O Card has its own processor which is responsible for the basic data acquisition function. The basic functions are as follows.

3.3.2 RTU Communication Unit

The Communication unit of large scale RTU system is consist of Data Concentrator Unit (DCU) product as a brand name of VC-2DCU is a communication system which is used to convey protocol signal information between power utility installations over the H.V. (400kv & 230kv & 132kv) Remote Terminal Unit systems and SCADA control centers,

Communication Unit provides not only protocol conversion in the level of signal information but also have ability to maintain, design, routing, specific information and controls to/from various substations with various electrical protocols to various control centers with difference protocols.

The VC-2DCU provides following functions to the large scale RTU system:

- **RTU as network switch** forwards commands to/from a particular RTU's, DCS's substation for information by various protocols.

- **RTU as network router** has some intelligence regarding the grouping and de-grouping (splitting) of substations information and various protocols.

- **RTU as smart component** has specific intelligent functionality on behalf of smart RTU substations and intelligent grids.

3.3.3 Data Acquisition Processing

V-RTU2000 Series acquires digital and analog signal from station and stores it in RTU memory. On the other band, RTU accepts host command to reflect and transmit back the required data to control center.

3.3.3.1 Analog Data Input

Measured Values, generally to receive signals from power transducers (Watt / Var / Voltage / Current / Temperature / Position / Resistance / etc), this is meant; RTU is to gather all physical signals of main facilities in station.

3.3.3.2 Accumulated Data Input

Energy Counters, accumulation and processing of pulses from external energy measurement devices are supported. A 16-Bit value is set aside in the local memory for each Pulse Accumulator point. The Pulse Accumulator will be incremented one count for each cycle of the input.

3.3.3.3 Digital Data Input

Indications, Status of facilities and the status of Momentary Change Detection (MCD) are acquired. Four basic indication types are supported: Single indication Double indication, Sequence Capturing, and Multiple Change detection. The de-bounce time for DC Digital Input Points can be 1 ms to 250 ms adjustable. The de-bounce time for AC Digital Input Points can be 48 ms to 250 ms adjustable.

- **Single indication (1-Bit Status):** involve only a single monitored external point and hence, have only two states: 0 or 1.

- **Double Indication (2-Bit Status)**: involve the monitoring of two physical external points and hence, can provide four states: 0/0, 0/1, 1/0, 1/1.

- **Sequence capturing (1-Bit MCD)**: is optimized for a multiple change detects technique which ensures that the critical information is not lost, but avoids sacrificing the efficiency of the communications process. This is accomplished using only a single bit for each monitored indication point in the protocol.

3.3.3.4 Sequence of Event Report

In order to monitor the status and sequence, changed of main equipments, RTU provides the SOE function (Sequence Of Event). An event is defined as a single change of state. Each time an event is detected, RTU will time-tag the event, and store a description of the event and the time-tag in a first in first out (FIFO) buffer. There is one 1024 events buffer in V-RTU2000 Series.

RTU will time-tag the first change of state, rather than the end of de-bounce period, and the de-bounce time for all SOE points can be 1ms to 250ms adjustable. The resolution is one millisecond. The time-tag recorded with each event is generated from a clock internal to the V-RTU2000 Series. The clock is 1 PPM accuracy TCXO.

V-RTU2000 Series have the capability to synchronize its internal clock with a system clock located at the master station. If the synchronization period is no more than 15 minutes, it can guarantee the time accuracy of SOE is within +/- 4ms to system clock (in Master Station).

3.3.4 Control Output

Two types of control command can be transmitted from the Master Station to devices in the Power System via the V-RTU2000 Series. One is Trip/Close command, the other is Direct Set-point command.

3.3.4.1 Trip/Close Command

There are two types of control output using Trip/Close command, one is ON/OFF operation output to control CBs, ABSs; the other is Regulation operation output (raise/lower) to control the position of transformer taps. Two distinct types of Trip/Close commands are supported:

- **Execute Immediate Command**: Direct Trip/Close Command, are executed as a single command message, and transmitted to the addressed RTU.

- **Select Before Operate (SBO) Command**: Select Trip/Close Command & Operate Command, are executed as two distinct commands to the addressed RTU; a select command followed by an execute command. The SBO controls are used when secure operation is required such as the Trip and Close operations of Power Circuit Breakers. RTU reset its control logic if the Operate Command is not received within the User defined time period maximum 60 sec, initially 20 sec, of the command message. The operating sequences for SBO command are:

  1. After received the Select Trip/Close Command, the RTU initialize its control logic, check and verify its control circuit, reassemble the command message, then transmit the reassembled message to the Master Station.
  2. If the Operate Command is received within the user defined time period and last command is Select Trip/Close Command, the RTU will operate the control point.

The result of Trip/Close command is the output of a pulse of fixed duration (determined by the Database Configuration) at the specifically addressed Digital Output (DO) point. Only one point can be controlled at a time.

3.3.4.2 Set-point Command

There are two types of control output using Direct Set-point command, one is Digital Direct Set-point, and the other is Analog Direct Set-point.

- **Digital Direct Set-point Command**: Raise/Lower command, can cause the addressed Digital Output (DO) point(s) to perform the Pulse Width control output for a Generator Controller. The time duration of output pulse is specified in the command message from Master Station. Multiple points can be controlled simultaneously.

- **Analog Direct Set-point Command**: cause the addressed Analog Output (AO) point to perform a current or voltage output for a Generator Controller. The output value is specified in the command message from Master Station.

3.3.5 Communication Function

The communication function of V-RTU2000 Series can be divided into Internal Communication and External Communication.

- **Internal Communication**: Means pointing to the inside communication between CPU Card and I/O Cards, which is linking with RS-485 interface, and using the Backplane connecting card without additional wires.

- **External Communication**: Providing RS-232 or RS-485 or Ethernet communication channels, supporting the multi-communication protocol to communication with external side. The supporting protocols are listed as below:

  1. *SCADA Master*: DNP3.0, IEC870-5-101. IEC870-5-104, Modbus RTU, Modbus TCP. Hitachi HC4300 HDLC, ABB Indactic 2033.
  2. *RTU Sub-Master*: ModBus RTU, DNP3.0, IEC870-5-101,IEC870-5-104, Hitachi HC4300 HDLC, ABB Indactic 2033.
  3. *IED*: ModBus RTU, DNP3.0.
  4. *User Specific Protocols*: Other protocols can be implement quickly in the firmware of V-RTU2000 Series by upon request.

3.3.6 Self-Diagnostic Function

V-RTU2000 Series has its well-equipped ability for self-diagnostic function. Every abnormal status of RTU is recorded down as System Event, or indicated by LED excitation on the panel. The System Event Record can be retrieval by Test Set and store in its hard disk, which very easy to find the fault portion in maintenance.

3.4 Hardware Structure

3.4.1 RTU Sub-racks

V-RTU2000 Series hardware structure is shown in Figure 3-2, designed as a Plug-In Type and set up in 19” Rack/Module enclosure. The ideal plug-in type configuration provides a very useful structure in maintenance. The size of Cards is following the Euro-Card standard, 100mm x 160mm for Card. In according to operation function, RTU hardware is for four main units.

3.4.2 RTU Communication Unit

Communication unit uses from VC-2DCU hardware structure that is designed as a Plug-In Type and set up in 19” Rack/Module enclosure with 1U height. The ideal plug-in type configuration provides a very useful structure in maintenance.

3.4.3 Power Supply of RTU Sub-racks

The power supply of V-RTU2000 Series contains the following cards:

3.4.3.1 DC 24V/DC 5V & 24V PS Card

Power supply card, designed in DC 24V~75V input and DC 5V (10W), DC 24V (3W) output. Connecting with the backplane is linking with 48-pin DIN connector, which provides 5V working power supply for the RTU and 24V driving power supply for DO/DOH Card.

3.4.3.2 AC 220V/DC 5V & 24V PS Card

Power supply card designed in AC 85V~265V or DC 65V~375V input and with DC 5V (10W), DC 24V (3W) output. Connecting with the backplane is linking with 48-pin DIN connector, which provides 5V working power supply for the DTU and 24V driving power supply for DO/DOH Card.

3.4.4 Power Supply of RTU communication Unit

The power supply of Communication unit contains four options the power supply type must be specified during purchase order:

- **Single Unit DC Power source** designed in DC 36V~75V input,
- **Single Unit AC Power source** designed in AC 110~280V input,
- **Dual Unit AC+AC Power source** designed in two AC source as redundant power supply source,
- **Dual Unit AC+DC Power source** designed in AC and DC power source as redundant power supply,

3.4.5 Main Unit of RTU Sub-racks

The main unit of V-RTU2000 Series consists of 1 Backplane and 1 Master CPU Card; if necessary several IO CPU Cards and several CM Cards.

3.4.5.1 Backplane

As a passive element, it is buffering the path of power supply, communications Bus and with plugging slots for all kinds of Circuit Cards. It is consisted of one power slot, one CPU slot and several I/O slots like 8/16 slots. It is provide pluggable type terminal blocks for external wire connection.

3.4.5.2 CPU Card / CM Card

Use Intel, 16-bit high speed microprocessor, with two isolated RS-232/485 ports for host communication, one RS-485 port for local IO communication, and one isolated RS-232 port for Test Set and one Ethernet 10/100Mbs at front panel.

3.4.6 Main Unit of RTU Communication

The main unit of communication Unit consists of 1 Backplane and 1 Master CPU module. It contains three slots to place some interface modules.

First slot only accept Ethernet modules and next two slots can be used for serial interface modules.

3.4.7 I/O Interface Unit of RTU Sub-racks

V-RTU2000 Series provides various types of I/O interface card which coincidently to the requirement of station. In order to monitor and study dynamic status of system operation and feature of facilities, I/O cards are defined by functions for different inputs and outputs as under description:

- **DI Card**: Digital Input Card, 8 Points / Card.
- **ACC Card**: Digital Accumulator Counter Card, 8 Points / Card.
- **DO Card**: Unlatch Digital Output Card, 8 Points / Card.
- **DOH Card**: Unlatch Digital Output Card, 4 Points Select Command + 1 Main Execution Command (ME) / Card.
- **AI Card**: Analog Input Card, 4 Differential Channels / Card.
- **AO Card**: Analog Output Card, 4 Differential Channels / Card.
- **ACI Card**: Analog AC Current Input Card. 4 Independent CT Current / Card.
- **ACV Card**: Analog AC Voltage Input Card. 4 Independent PT Voltage / Card.
- **ACP Card**: Analog AC Power Input Card. 1 Voltage & 3 Current / Card.
- **ACUP Card**: Universal Intelligent AC Power Meter Input Card. 4 AC Current & 4 AC Voltage Input / Card.

3.4.8 Interface Modules of RTU Communication Unit

Communication Unit of V-RTU2000 provides various types of I/O interface card which coincidently to the requirement of station. In order to have modularity and monitor and study dynamic status of system operation and feature of facilities, interface cards are defined by functions for different system inputs as under description:

- **VC-2DCUNM2 Card**: Network Module, 2 Ethernet ports.
- **VC-2DCUNM4 Card**: Network Module, 4 Ethernet ports, 2 Fibers.
- **VC-2DCU06S Card**: Sync-Serial Interface Module, 6 ports.
- **VC-2DCU12S Card**: Sync-Serial Interface Module, 12 ports.
- **VC-2DCU16A Card**: Async-Serial Interface Module, 16 ports.

3.4.9 GPS Time Module of Communication Unit

The communication unit of V-RTU2000 consists of one GPTS module that is a synchronization reference clock which uses the GPS system (Global Positioning System) as time base by means of an internal GPS receptor or by means of an IRIG-B input. Several different signal types are supplied by the VC-2DCUGT1, making it possible to synchronize the most diverse types of equipment and synchronize all equipment normally associated to power plants, transmission and distribution of electric energy.

3.5 V-RTU2000 Module Lists & Sub-racks & models

Table 3-1: V-RTU2000 Modules List

No.	VEESTA Model	Name	Specification
1	VC-2DCUMU1	Main Unit	Main Unit consist of bellow items: 1- 1U standard 19" rack mount case with rear wiring access 2- Front panel LED indicator & LCD with keypad 3- Parameter setting from keypad 4- All of software and options, included full protocols 5- 3 x user service slot 6- Power module DC36~72V, Over voltage protection 7- Power cord connector and other accessories space for AC220V/DC220V or AC220V/DC36~72V
2	VC-2DCUDP1	Dual Power Unit	1- 80~260VAC, 50-60Hz with redundant 36 ~ 72 VDC Input 2- Over voltage protection 3- Power cord connector accessories
3	VC-2DCUNM2	Network Module	1- Plug in module, auto negotiating with Main unit 2- Maintenance Serial port for configuration 3- 2 x 10/100M Ethernet Switch port auto negotiate 4- Full function and full application protocols 5- SNMP, TCP/IP, Telnet protocol
4	VC-2DCUNM4	Network Module	1- Plug in module, auto negotiating with Main unit 2- Maintenance Serial port for configuration 3- 4 x 10/100M Ethernet Switch port auto negotiate 4- Two Fiber Optic connection and port 5- Full function and full application protocols 6- SNMP, TCP/IP, Telnet protocol
5	VC-2DCU06S	6 Ports Sync Serial Module	Serial Port module consist of bellow items: 1- Plug in module, auto negotiating with Main unit 2- 6 x Serial Ports 3- Any configuration with any protocol per port 4- RS232/RS485 Configurable individually for each port 5- Baud rate configurable 300/600/1200/2400/4800/9600/19200/38400/57600 bps 6- Async mode RS232/RS485, Sync/Bisync(bit-oriented) mode RS232 configurable individually each port 7- In Async RS232, TXD/RXD/GND/RTS/CTS signals ready 8- In Async RS485, TX/RX/GND signals ready 9- In Sync RS232, TXD/RXD/GND/RTS/CTS/TXC/RXC signals ready 10- In Bisync RS232, TXD/RXD/GNS/RTS/CTS signals ready 11- RTS/CTS configurable. Timing mode configurable

No.	VEESTA Model	Name	Specification
6	VC-2DCU12S	12 Ports Sync Serial Module	Serial Port module consist of bellow items: 1- Plug in module, auto negotiating with Main unit 2- 12 x Serial Ports 3- Any configuration with any protocol per port 4- RS232/RS485 Configurable individually for each port 5- Baud rate configurable 300/600/1200/2400/4800/9600/19200/38400/57600 bps 6- Async mode RS232/RS485, Sync/Bisync(bit-oriented) mode RS232 configurable individually each port 7- In Async RS232, TXD/RXD/GND/RTS/CTS signals ready 8- In Async RS485, TX/RX/GND signals ready 9- In Sync RS232, TXD/RXD/GND/RTS/CTS/TXC/RXC signals ready 10- In Bisync RS232, TXD/RXD/GNS/RTS/CTS signals ready 11- RTS/CTS configurable. Timing mode configurable
7	VC-2DCU12A	12 Ports Async Serial Module	Serial Port module consist of bellow items: 1- Plug in module, auto negotiating with Main unit 2- 12 x Serial Ports 3- Any configuration with any protocol per port 4- RS232/RS485 Configurable individually for each port 5- Baud rate configurable 300/600/1200/2400/4800/9600/19200/38400/57600 bps 6- Async mode RS232, TXD/RXD/GND signals ready 7- Async mode RS485, TX/RX/GND signals ready
8	VC-2DCU16A	16 Ports Async Serial Module	Serial Port module consist of bellow items: 1- Plug in module, auto negotiating with Main unit 2- 16 x Serial Ports 3- Any configuration with any protocol per port 4- RS232/RS485 Configurable individually for each port 5- Baud rate configurable 300/600/1200/2400/4800/9600/19200/38400/57600 bps 6- Async mode RS232, TXD/RXD/GND signals ready 7- Async mode RS485, TX/RX/GND signals ready
9	VC-2DCUGT1	GPS Module	1- Plug in module, auto negotiating with Main unit 2- BNC1,BNC2: PPS/PPM/PPH Pulse output, TTL Level 3- BNC3: IRIG-B output, TTL Level 4- BNC4: IRIG-B input, TTL Level 5- BNC5: GPS Antenna input 6- Terminal A 1-2: Time Message Output, RS232, NMEA configurable message and bit rate Terminal A 3-4: Time Message Output, RS485/422, NMEA configurable message and bit rate 7- Terminal A 5-6: Time Message Output, RS232, NMEA configurable message and bit rate Terminal A 7-8: Time Message Output, RS485/RS422, NMEA configurable message and bit rate 8- Terminal B 1-2: IRIG-B Output, RS232 Level 9- Terminal B 3-4: IRIG-B Output, RS485 Level 10- Terminal B 5-6: IRIG-B Input, RS232 Level 11- Terminal B 7-8: IRIG-B Input, RS485 Level 12- 1x GPS Antenna with 30 meters antenna cable with connectors and fixing accessories. 13- Electrical serial port timing accuracy <200 μs to UTC 14- Demodulated IRIG-B timing accuracy < 2μs to UTC 15- GPS input Sensitivity for tracking better than -141 dBm 16- GPS input Sensitivity for acquisition better than -136 dBm 17- Internal Crystal Oscillator as last source of time sync (Accuracy <1x10-8s)

No.	VEESTA Model	Name	Specification
10	VR-2101A	RTU Rack	Dimension : 3U x 42T x 185mm (H*W*D) Slot : Power x 1, CPU x 1, IO x 5, PM x 1
11	VR-2101C	RTU Rack	Dimension : 3U x 84T x 185mm (H*W*D) Slot : Power x 1, CPU x 1, IO x 5, PM x 4
12	VR-2102	RTU Rack	Dimension : 3U x 42T x 185mm (H*W*D) Slot : Power x 1, CPU x 1, IO x 8
13	VR-2103	RTU Rack	Dimension : 3U x 84T x 185mm (H*W*D) Slot : Power x 1, CPU x 2, IO x 16
14	VR-2707B	L-PS Card	Input : DC 24V or 48V Output : 5V ±0.1V DC, 12W 24V ±1V DC (Internal Used), 3W
15	VR-2708B	H-PS Card	Input : 85Vrms to 260Vrms AC, or 85V to 375V DC Output : 5V ±0.1V DC, 12W 24V ±1V DC (Internal Used), 3W
16	VR-2717A	Control Card	1 LAN Port (10/100 Base-T Ethernet) (@ Panel) 1 RS-232 Port (for Master) (@ Backplane) 1 RS-485 Port (for Slave Device) (@ Backplane) 1 RS-232 Port (for Test Set) (@ Panel)
17	VR-2715A	Control Card	1x RS-485 Port (for Master) (@ Backplane) 1x RS-485 Port (for Slave Device) (@ Backplane) 1x RS-232 Port (for Test Set) (@ Panel)
18	VR-2424	Modem Card	Half/Full Duplex 2/4 wire Lease Line V.23, V22bis, V.29, Bell202 1200/2400/9600 bps rate, Asynchronous/Binary
19	VR-2444	Modem Card (Voice & Data)	Half/Full Duplex 4 wire Lease Line FSK with programmable option 300/600/1200 bps rate, Binary Voice Filter with programmable option
20	VR-2444T	Telephony Card	Dispatcher Telephony System Input: 4x wire, E&M telephony signaling Output: 2x wire FXS or FXO mode selection
21	VR-2722A	DI Card	Input : DC 125V Point : 8
22	VR-2723A	DI Card	Input : DC 24V or DC 48V Point : 8
23	VR-2726	ACC Card	Input : DC 24V or DC 48V Point : 8
24	VR-2735	HDO Card	Type : Unlatch Relay Contact : 10A (2000VA, 200W) Point : 5
25	VR-2736A	DO Card	Type : Unlatch Relay Contact : 5A (1000VA, 100W) Point : 8
26	VR-2737	HDO Card	Type : Unlatch Relay Contact : 10A (2000VA, 200W) Point : 4 + 1ME
27	VR-2741	AI Card	Input : +/- 1mA Point : 4 (Differential)
28	VR-2742	AI Card	Input : 4~20 mA Point : 4 (Differential)

No.	VEESTA Model	Name	Specification
29	VR-2742E	AI Card	Input : 0~20 mA Point : 4 (Differential)
30	VR-2743	AI Card	Input : +/-5V Point : 4 (Differential)
31	VR-2751	AO Card	Output : +/- 1mA Point : 4 (Differential)
32	VR-2752	AO Card	Output : 4~20 mA Point : 4 (Differential)
33	VR-2745	ACI Card	Input : 0 ~ 1A AC or 0 ~ 5A AC Point : 4
34	VR-2746	ACV Card	Input : 0 ~ 120 VAC or 0 ~ 300VAC Point : 4 / 6 / 8
35	VR-2760	ACUP Card	Power Meter Input Current: 4x 0 ~ 1/5/7A, Input Voltage: 4x 0 ~ 120/300VAC
36	VR-2425A	GPRS Modem	GPRS Modem Module Card Front panel Antenna connection

3.6 Standards (Type Test)

3.6.1 Power Supply Performance

1- IEC 60870-2-1:	Nominal Voltage
2- IEC 60870-2-1:	Operating Range
3- IEC 60870-4:	Power consumption
4- IEC 60870-2-1:	Grounding - Wrong Polarity

3.6.2 Digital Input Performance

5- IEC 60870-3:	Nominal Input Voltage
6- IEC 60870-3:	Input current at nominal input voltage
7- IEC 60870-3:	Minimum Input voltage
8- IEC 60870-3/4:	Correct Operation
9- IEC 60870-3/4:	Transition time
10- Functions:	Input Filter
	Sequence of Event
	Time Synchronization

3.6.3 Analog Input Performance

11- IEC 60870-3:	Nominal Input Voltage
12- IEC 60870-4:	Accuracy

3.6.4 Current & Voltage Input Performance

13- IEC 60870-3:	Transverse voltage rejection
14- IEC 60870-3:	Common mode rejection
15- Functions:	Full scale reference voltage
	Voltage drop across current shunt
	Input current at nominal input

3.6.5 Digital Output Performance

16- IEC 60870-3:	Operating Time
17- IEC 60870-3:	Transition Time
18- IEC 60870-3:	Output level
19- Functions:	Output supervision
	Select Before Operate

3.6.6 Electrical Insulation

20- IEC 60255-5:	Impulse voltage test
	Dielectric test
	Insulation resistance

3.6.7 Electromagnetic Compatibility (EMC)

21- IEC 61000-4-2:	Electrostatic discharge
22- IEC 61000-4-3:	Radiated Radio Frequency
23- IEC 61000-4-3:	Electromagnetic field
24- IEC 61000-4-4:	Fast Transient Burst 2kV IO, 4kV Power port
25- IEC 61000-4-5:	Surge 1.5/ 50ns
26- IEC 61000-4-6:	Conductive disturbance, induced by RF field
27- IEC 61000-4-8:	Power frequency magnetic field
28- IEC 61000-4-11:	Voltage dips
29- IEC 61000-4-29:	Voltage interruption
30- CISPR22:	Conducted and radiated emission

3.6.8 Environment Standards

32- IEC 60068-2-1:	Cold -35°C
33- IEC 60068-2-2:	Dry heat +70°C
34- IEC 60068-2-14:	Change of Temperature
35- IEC 60068-2-30:	Damp heat

3.6.9 Mechanical Standards

36- IEC 60068-2-6:	Vibration (sinusoidal)
37- IEC 60068-2-27:	Shock

3.7 RTU Cubicle

Concerning the harsh environment of control room the high quality of enclosure systems is most important. In this regards we proposed the enclosure system from famous company. All enclosures manufactured under strict guidelines of international quality, reliability, and safety/protection standards equal to IP54.

Figure bellow shows the Cubicle Rack with dust resistance doors. We have proposed the enclosure in width of 800mm and depth of 600mm and height of 2000mm.

Figure 3-4: Industrial enclosure racks

The size is reserved for computer server and future usage if necessary. The specifications are:

1- Fast assembly and stripping of inner components.
2- Total space utilization and easy conversion to 19" rack with slight modification.
3- Enclosures built from top quality steel metal sheets, surface dip coated and cured for lasting durability with the following features
4- Punched rails with square and round holes on a 25mm pitch pattern
5- Standard support and cross rails for easy assembly
6- Flexibility in retrofitting subassemblies
7- In glass door panel combinations
8- Swing door housings when applicable
9- 19" racks for electronics & communications applications

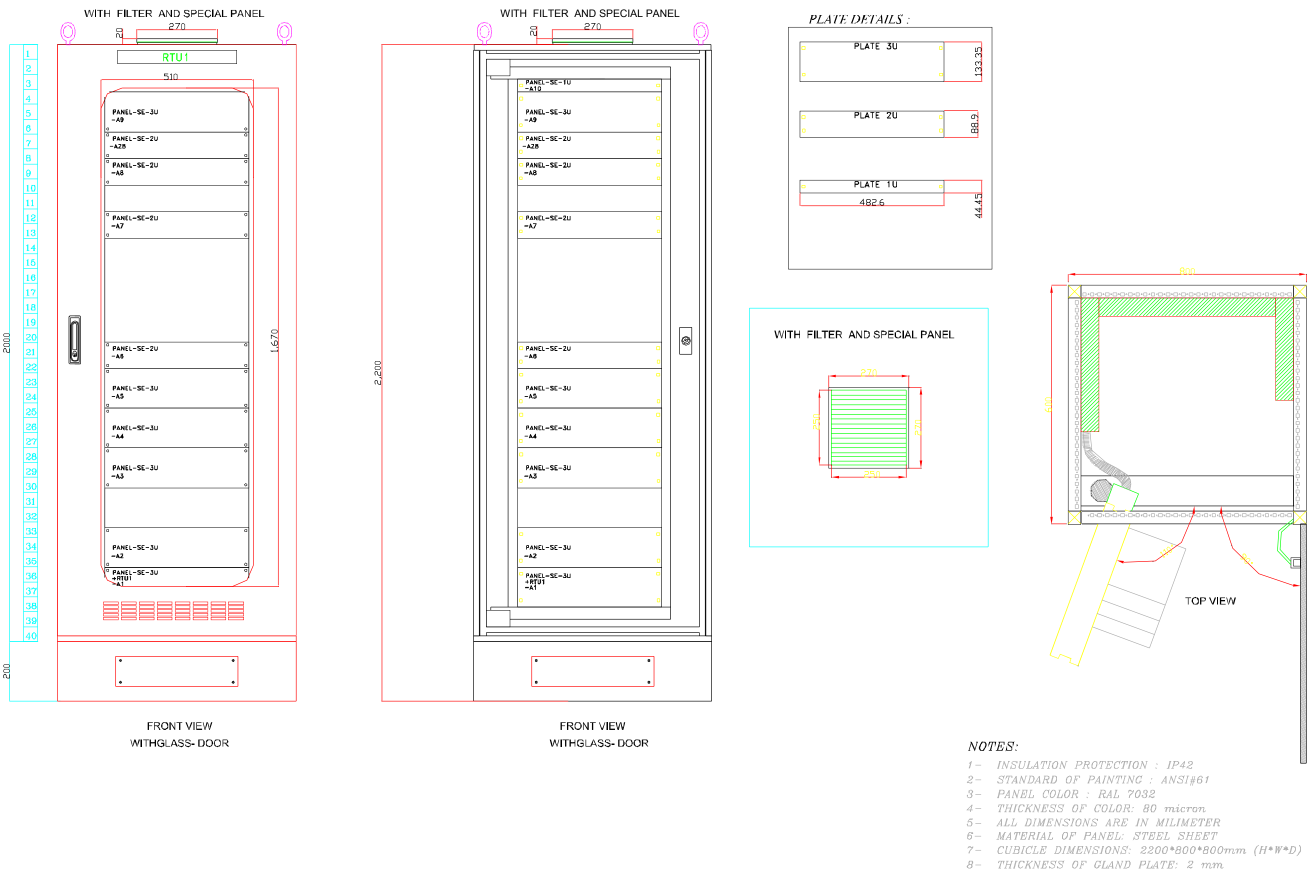


Figure 3-5: RTU Cubicle Drawing

Chapter 4 - Appendixes

4.1 General

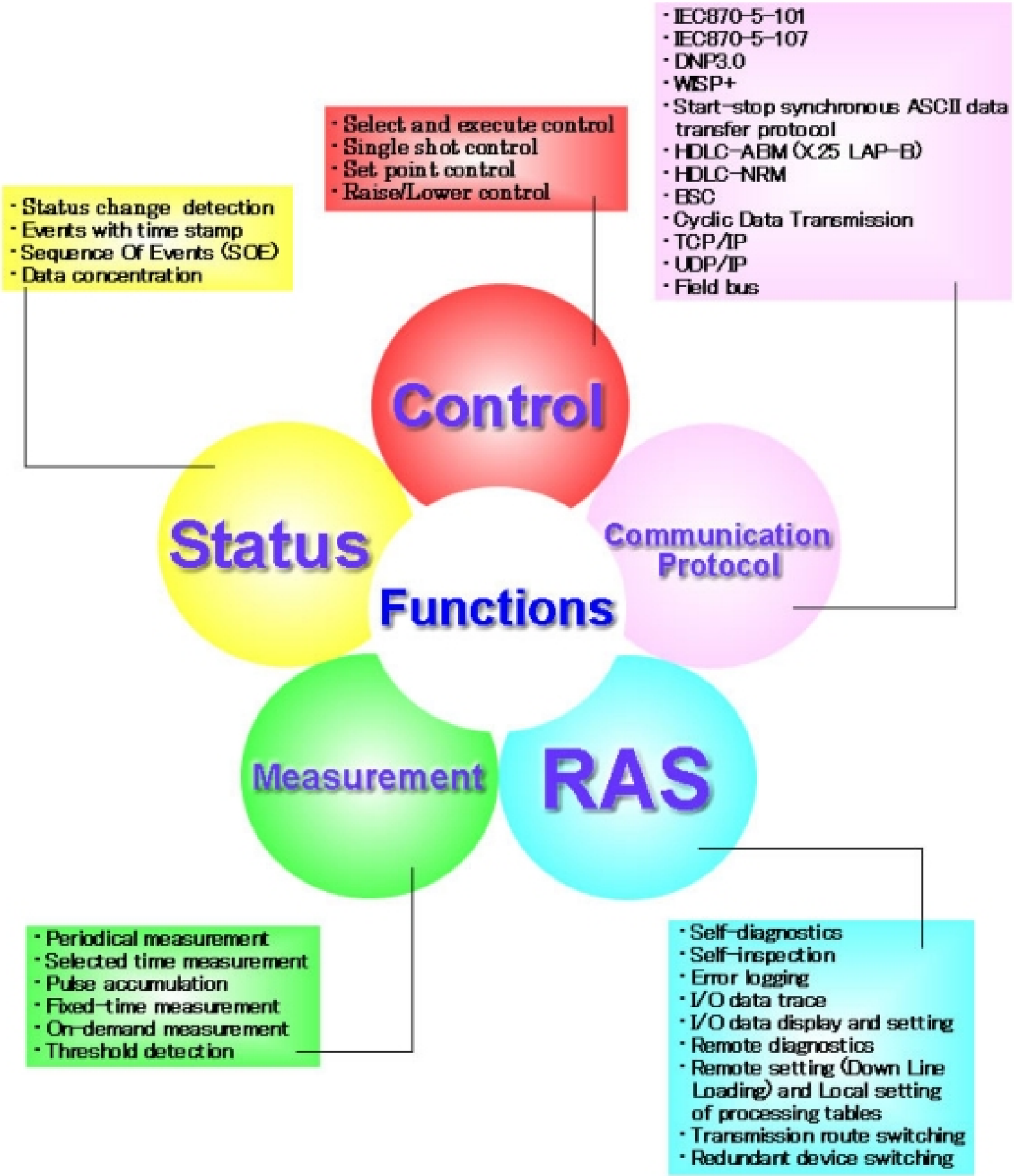
Please refer to related documents and detail information of Veesta Product Series with bellow orders.

4.2 A01- V-RTU2000 Technical Specification Manual

Technical Specification manual of V-RTU2000 Series

4.3 A02- V-RTU2000 Communication Unit Specification Manual

This is a technical specification of Data Concentrator Unit of RTU system device from V-COM2000 Product Series model.



Veesta World Co
World Wide Web: http://www.veesta-world.com/
E-Mail: info@veesta-world.com