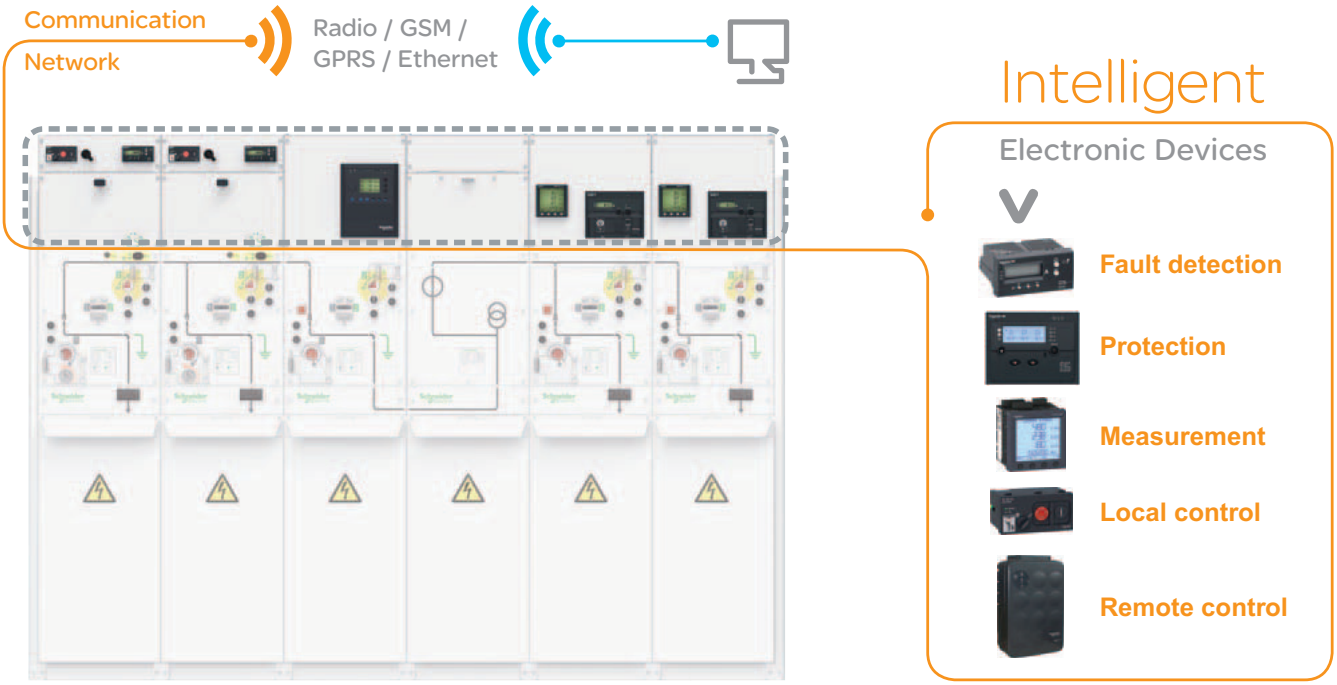
Easergy range

C&M System

MV Substation Control&Monitoring Distributed System

Getting Started



Schneider Electric

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Discovering Easergy C&M

Discovering easergy C&M system

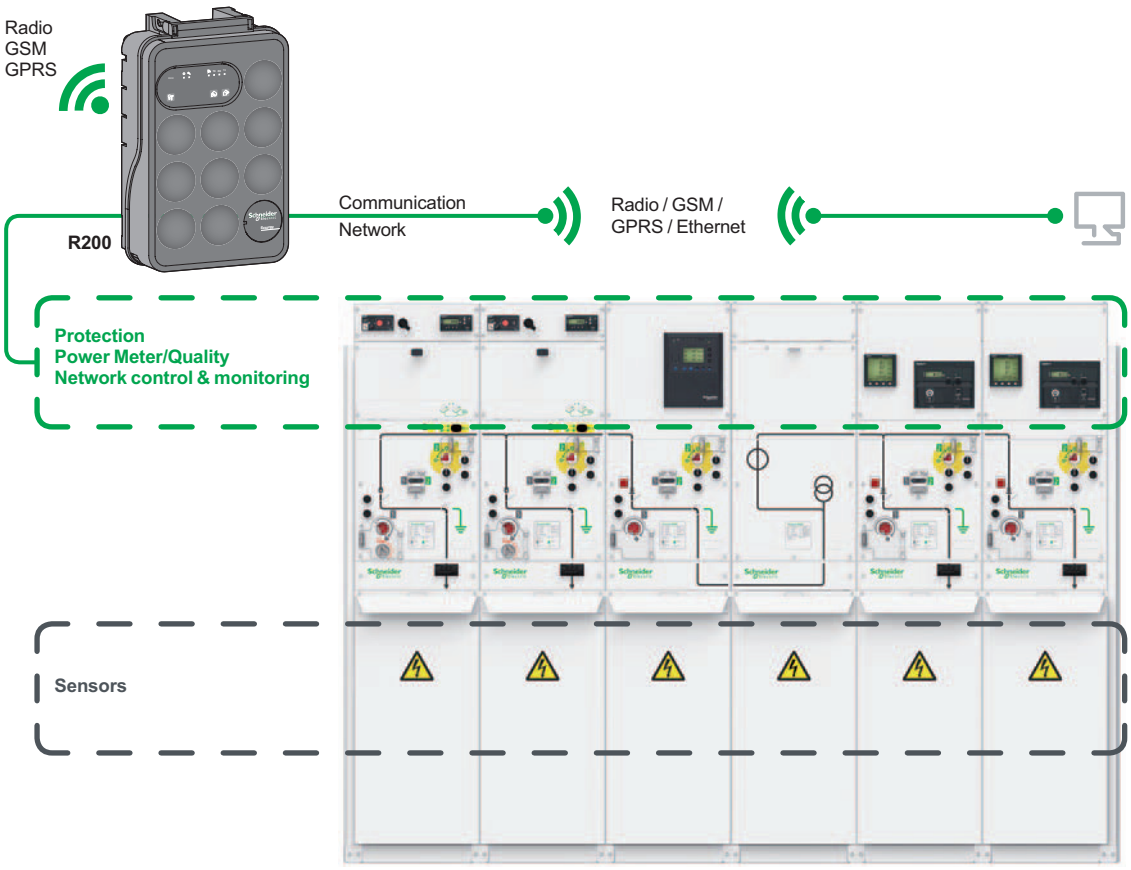
Easergy Control&Monitoring distributed System provides a fully consistent solution for MV Substation automation in secondary distribution.
System is mainly illustrated in this manual when embedded within Premset MV Equipment, but will also apply for other equipments like FBX, SM6, …

With Premset, intelligence can be added to functional units by integrating protection, control and monitoring IEDs (Intelligent Electrical Devices).

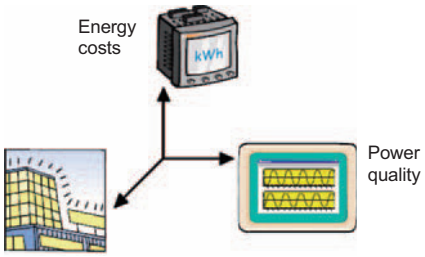
The IEDs have dedicated locations and are daisy-chained throughout the various functional units using RJ45 connectors and Modbus protocol.

A gateway can be used to connect the IEDs to supervision systems via Ethernet, GSM/GPRS and/or radio-frequency communication.

Premset is Web-enabled to let you access information on your electrical installation via a PC with a standard Web browser.



Discovering Easergy C&M



Energy quality applications

Premset switchboards are designed to integrate distributed intelligence for feeder automation, protection and energy quality applications.

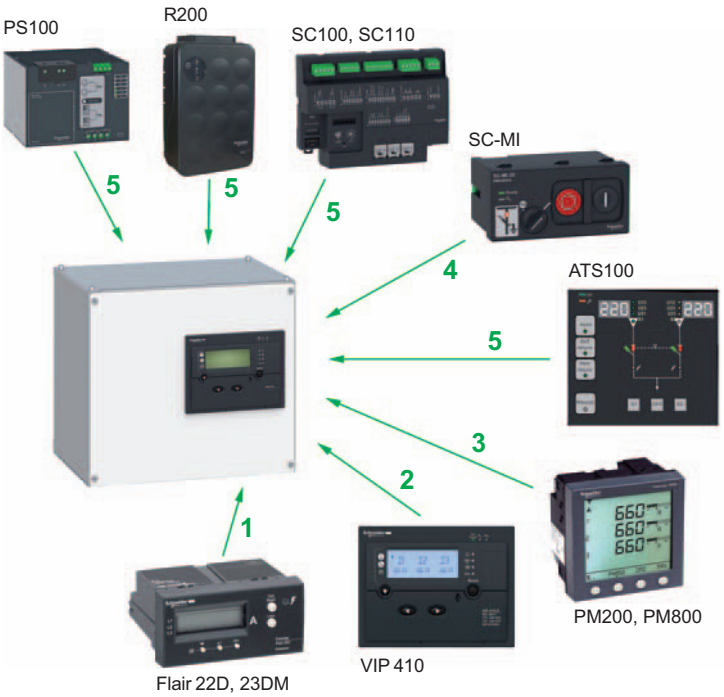
Fault detection
- Fault Passage Indicators: **Flair 21D/22D, Flair 23DM**
- Voltage indicators: **VPIS, VDS**
- Voltage relay: **VD23**

Protection
- Self-powered: **VIP 40 and VIP 45, VIP 400 and VIP 410**
- Auxiliary powered: **Sepam series 20 and series 40**

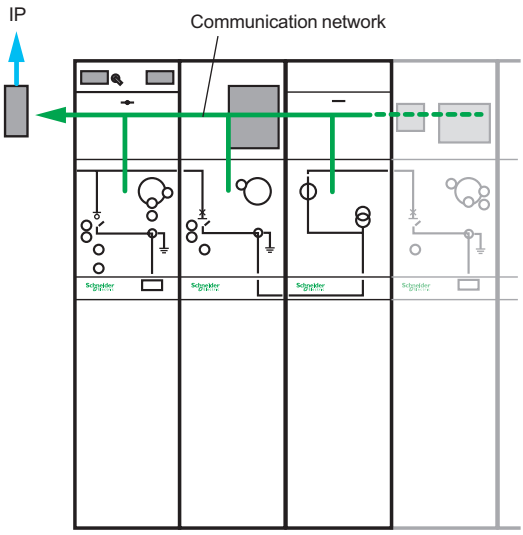
Measurement
- Ammeter: **AMP21D**
- Power Meter: **PM200**
- Power/Quality Meter: **PM800**

Local control
- Motor control: **SC100**
- Control panel: **SC-MI**
- Earth Switch Locking: **ESL**

Remote control
- Communicating switchgear control: **SC110**
- Local communication network (Field Bus): **Modbus SL**
- Remote communication (GSM/GPRS/Ethernet/Radio): **R200**
- Automatic Transfer of Source: **ATS100**
- Backup power supply: **PS100**.



Discovering Easergy C&M



Distributed architecture for easy installation, operation and scalability

The IEDs (Intelligent Electrical Devices) used in the Easergy C&M system have been designed **to optimise substation performance and compactness**. They can be used to build a robust distributed architecture suited to harsh environments.

- **Modular architecture** for scalable solutions from local control up to complex feeder automation, optimising cost and performance by letting you choose only what you need
- Each IED is **fully integrated in a functional unit** with a dedicated location and cabling
- **Pre-engineered, pre-tested and cost effective**, the system includes the necessary sensors, switchgear interfaces, power supplies, communication solutions and HMIs
- **Easy integration** based on field bus communication between IEDs with a plug and play system that scans and configures the system
- The field bus uses standard Modbus protocol open to third-part devices
- Each IED has a json compatible description file. This allows easy configuration to communicate with RTU (Remote Terminal Unit) and configure if for remote communication with SCADA (Supervisory Control and Data Acquisition) system.

System architecture for remote control is based on a Modbus Serial Line communication between IEDs and RTU (Core System Bus). It may be extended by a Modbus TCP over Ethernet bus to interface miscellaneous devices (Interface Bus).

Dimensioning

Feature	Max
Nb of slaves on Core system bus	32
Nb of slaves on Ethernet interface bus (including slaves behind EGX gateways)	10
Nb of slaves (total)	42
Nb of slaves behind an EGX	8
Nb of cubicles	29
Nb of breakers	8

Refer to PS100 or other Power Supply documentation for Power and Autonomy capacity.

System operation principles

- Easergy C&M system is based on following principles:
  - Protection is fully separated from Control&Monitoring
  - Each cubicle function is operating locally, whatever the system status
  - Architecture is fully modular, allowing addition of new modules when required
  - Separation between local and remote actions is ensured through local/remote selectors
  - Remote communication is ensured through RTU as single interface
  - Quick access is provided to latest data cached in RTU and refreshed periodically
  - System provides numerous embedded diagnosis features
  - Autoconfiguration provides a default operation within a few clicks
  - Monitor, diagnose & configure is straightforward through embedded webserver

- Supported object types for RTU operation:
  - SPS, SPC, DPS, DPC, MV, INC, APC, Settings, Date&time, Identification
  - Supported object types on remote communication to SCADA and associated formats are protocol specific, see Easergy Communication protocol manuals.

Devices classification

Following types of devices are identified:

■ **Embedded Devices (not communicating):** These devices are integrated physically within MV Equipment. They interface through hardwired electrical signals

■ **Embedded IEDs**: An easy connectivity is provided, with a minimum of configuration of the communication settings and a preconfigured data base. These IEDs are compliant with all system features (time synchronization, automatic Cubicle recognition, etc.)

■ **Pre-configured IEDs**: These IEDs are existing ones, which are not developed specifically for Easergy C&M System. Nevertheless, they are fully part of the solution and a preconfigured description file may be loaded in RTU in order to facilitate the connectivity.

■ **Linked IEDs**: These IEDs are existing ones, which are not developed specifically for Easergy C&M System. Link to these devices has been specifically checked.

■ **Miscellaneous IEDs**: Manually configurable modules. They shall be fully Modbus SL compliant, support 38,400 kbits/s baudrate and ensure maximal response time of 50ms.

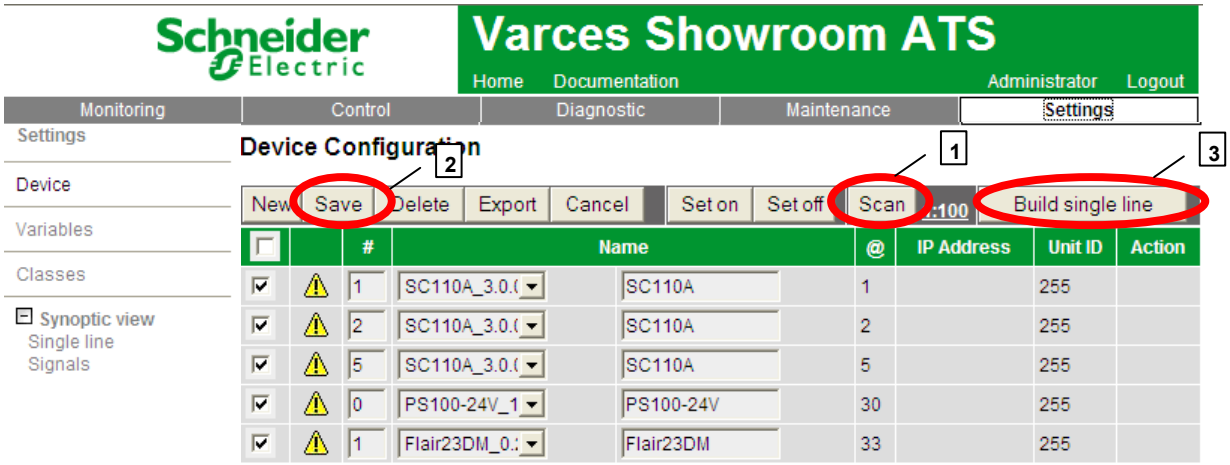
■ **Remote Terminal Unit**: RTUs take profit of the system functionalities to optimise operation and configuration with present IEDs

Type	Device
Embedded devices (not communicating)	VIP40/45, VIP400, Flair21D, Flair22D, AMP21, VPIS, VDS, VD23, SC100 SC-MI10, SC-MI20 PM200 ESL
Embedded IEDs	PS100 FLAIR 23DM VIP410 SC110
Preconfigured IEDs	PM800
Linked IEDs	SEPAM20 SEPAM40
Miscellaneous IEDs	SEPAM80 PM9 ION Meter Miscellaneous
RTU	R200, ATS100

Quickstart

Once devices have been installed according to their installation manual, communicating system may be set into operation in a few minutes as follows:

- ■ Connect power supply according to switchboard electrical drawing
- ■ Connect communicating devices according to switchboard electrical drawing
- ■ Set Cubicle number on SC110 devices
- ■ Connect other cross_cubicle signal if any according to switchboard electrical drawing
- ■ Set Power ON, Cubicle per Cubicle, ensuring stable state before going to next cubicle
- ■ Set Cubicle number on other devices
- ■ Connect to RTU webserver
- ■ Launch device discovery (Scan)
- ■ Confirm autoconfiguration (Save)
- □ Then you may monitor&control your MV substation through webserver
- ■ Ask for singlelineview creation (Build Singlelineview)
- ■ Configure RTU communication port and prepare your SCADA
- □ Then you may monitor&control your MV substation from SCADA through remote com



⚠ **Warning:** Before connecting MV Equipment to Medium Voltage, make sure that protection devices are preconfigured with valid settings (using adequate powering means for each kind of protection relay : refer to each device user manual)

Note: Preceding process is valid for fully integrated devices (SC110, VIP410, Flair23DM)
For PM800, Sepam or miscellaneous devices, it is necessary in addition to define Modbus transmission parameters:

- ■ Baudrate = 38400 bits/s,
- ■ Transmission format = 8 bits data, Even parity, 1 stop bit
- ■ Modbus slave address : according to rules defined in section "Configuration"

In any case, refer to each device user's manual for exact way to enter these parameters

⚠ **Warning:** For further System power ON, whole System may be powered on at same time if and only if ensuring before that all Cubicles are in stable state (especially that OCO/CI2/RI Cubicles are charged)

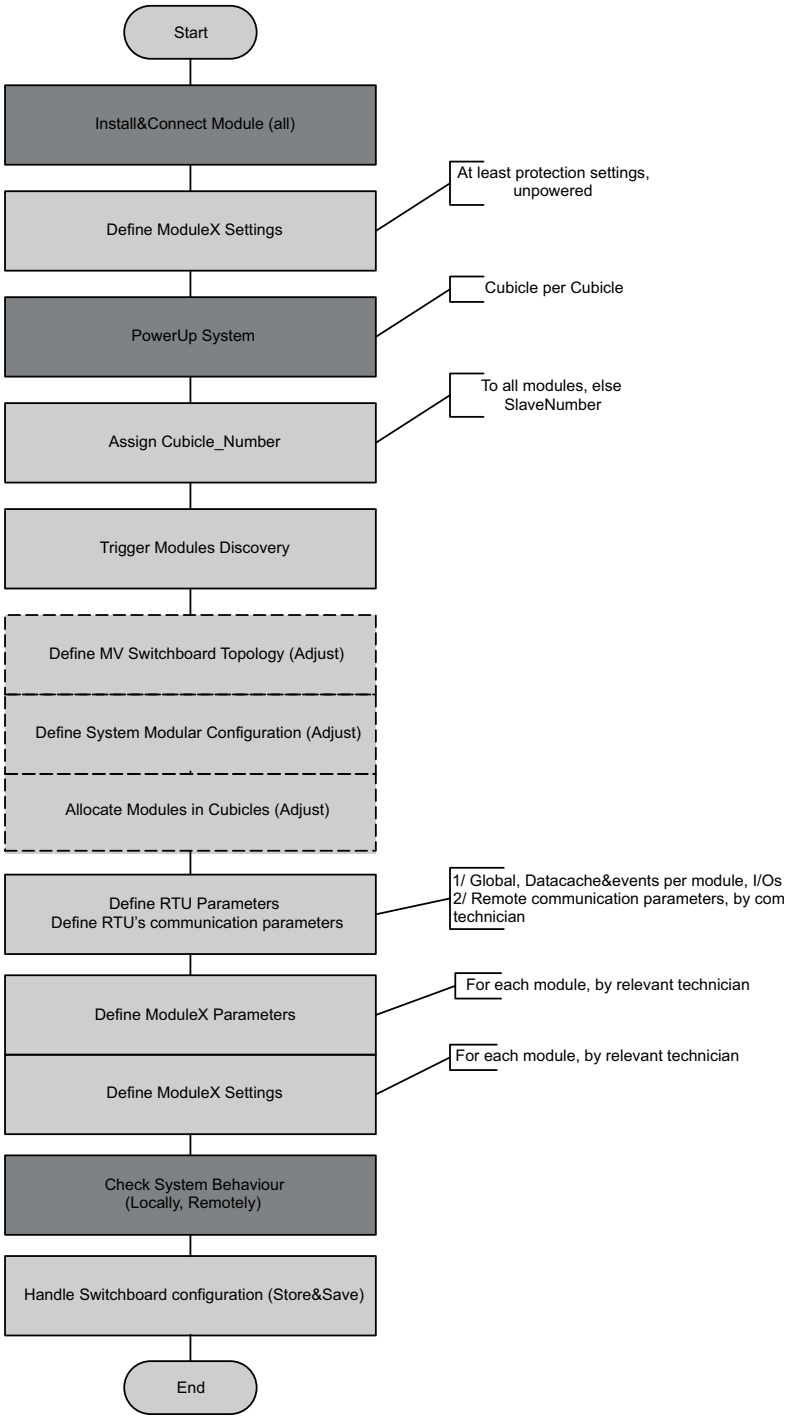
Setting into operation

Setting into operation

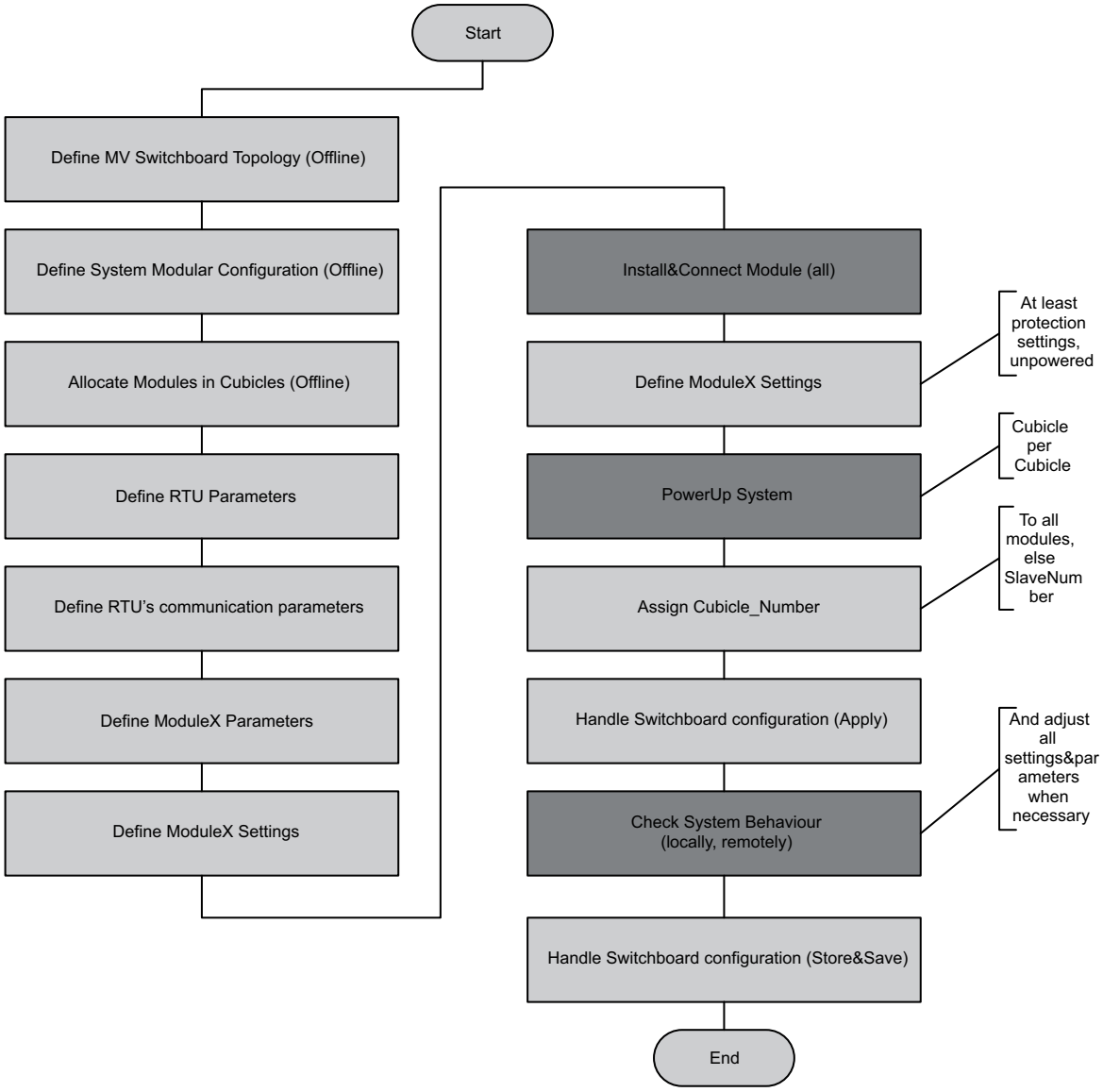
Two main approaches are possible to configure the System:

■ In-the-field bottom up sequence (install and configure on site, commission, retrieve and archive configuration)

■ Offline preparation then installation in the fiel



On the field « Bottom-up » Sequence



Top-Down » Sequence (Offline configuration + local installation&test)

Both of these two approaches are addressed in following sections.

Setting into operation

Installing

This section details generic aspects of installation.

- Install devices and attached sensors & actuators
- Distribute power
- Cable communication
- Tune key settings on each device
- Set Cubicle numbers on SC110
- Check (compliance to design&BOM, earthing, power supply wiring)

Please refer to each MV Equipment specification guide for specificities and detailed mechanical arrangement.

Install devices and attached sensors & actuators

Refer to each device user manual

Distribute power

Power distribution principles

Easergy C&M system is based on multiple supplies distribution as follows:

- Motor supply voltage shall be consistent with motor and actuators.

SC100A, SC110A, VIP400A, VIP410A and Flair23DM support indifferently 24V or 48V dc
SC100E, SC110E, VIP400E & VIP410E support indifferently 110 to 230V, ac or dc

- PS100 24V or 48V output is used for motorization and for powering devices which should be backed up.
- Select PS100 model according to Motor supply voltage
- PM are directly powered with LV mains
- R200 should be connected to 12V output. So in case of Motorization power failure, communication to SCADA is still possible.
- VIP protection is self supplied from MV electrical current. Therefore only their communication part is supplied externally, allowing to wire them on same network than other devices
- PS100 is powered with LV mains
- LV mains may come from a local LV installation or directly from a Voltage transformer

Alternatively User may have a dedicated secure power supply, e.g. for protection relays (e.g. 110V DC). Then:

- Protection relays are supplied directly by customer secure power supply
- Motorization is powered also from this power supply, or from PS100 24V/48V output, depending on customer requirements for actuators voltage
- Devices with low voltage range (e.g. Flair23DM) are supplied from PS100 24/48V output
- R200 should be connected to 12V output.
- PM are directly powered with mains or from customer secure power supply.
- If motorization is supplied by customer secure power supply, PS100 may be replaced by an AC/DC converter, with relevant insulation characteristics.

Easergy Power supply System is self protected as follows:

- SC110 protects it self against faults on actuators or mechanical motor locking by stopping ongoing Cubicle operations
- 1 LV protection CB enables to insulate faults within each Cubicle for motorization power.
- Additional protections shall be added in each cubicle if distributing 230V for PM or dedicated supply for protection relays.
- In case of electrical fault at upper level, PS100 will directly protect its outputs by cutting them down.

Cabling shall be done by daisy chaining cubicles at LV circuit breakers level.

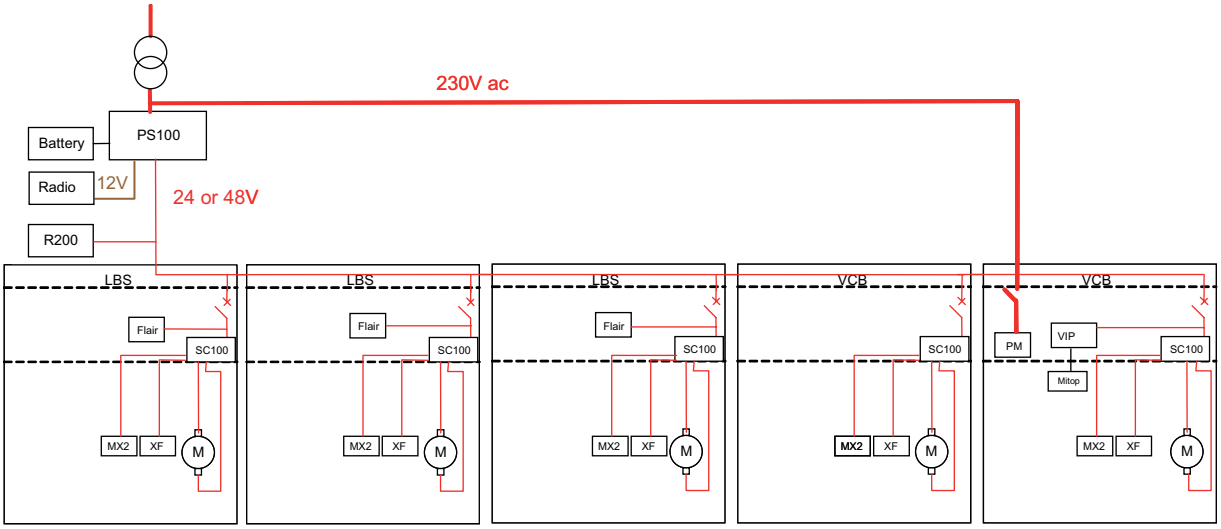
Cabling internal to cubicles is achieved within Schneider Factories. Relate to specific MV Equipment documentation in case of late modification or extensions.

When installing MV equipment on site, connect power supply of each cubicle to preceding ones according to switchboard electrical drawing.

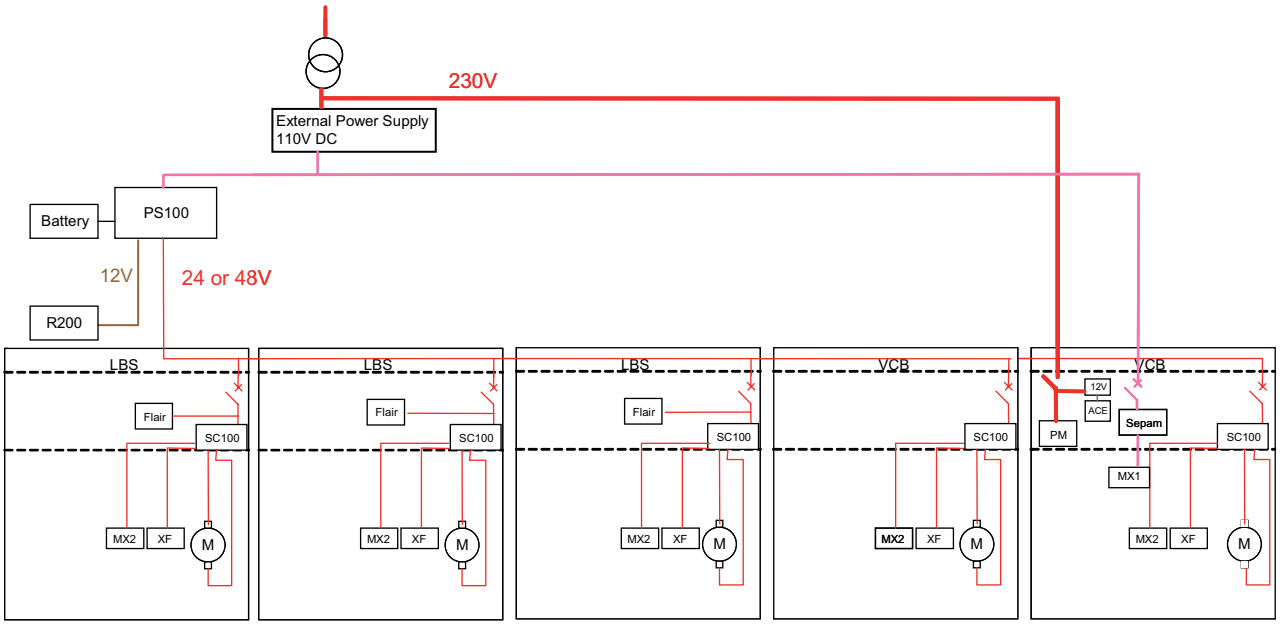
Setting into operation

Specific cases
ACE949 communication modules for Sepam relay shall be supplied by a dedicated 12V power supply, with 0V floating from ground. This 0V is connected inside the ACE949 to “0V Modbus common”.

If RTU is communicating to SCADA through radio modem, then 12V output is dedicated to Radio modem. RTU is then supplied as other IEDS by 24V or 48V supply.



Power supply Topology: with radio modem



Power supply Topology: with Customer Secure Power Supply and no radio modem

Maximal length for power supply distribution between PS100 and farthest device

Supply voltage	Derivation line in each section with 2,5mm² cable	Main line between sections with 2,5mm² cable	Main line in the special case of a part of the installation in a remote switchboard
12V	Not applicable	10m	To RTU or radio modem
24V	1,2 m max	6m	12m of 10mm² between switchboards + 3m of 2,5mm² inside second switchboard
48V	1,5 m max	20m	15m of 2,5mm² or 24m of 4mm² between switchboards, + 5m of 2,5mm² inside the 2nd switchboard

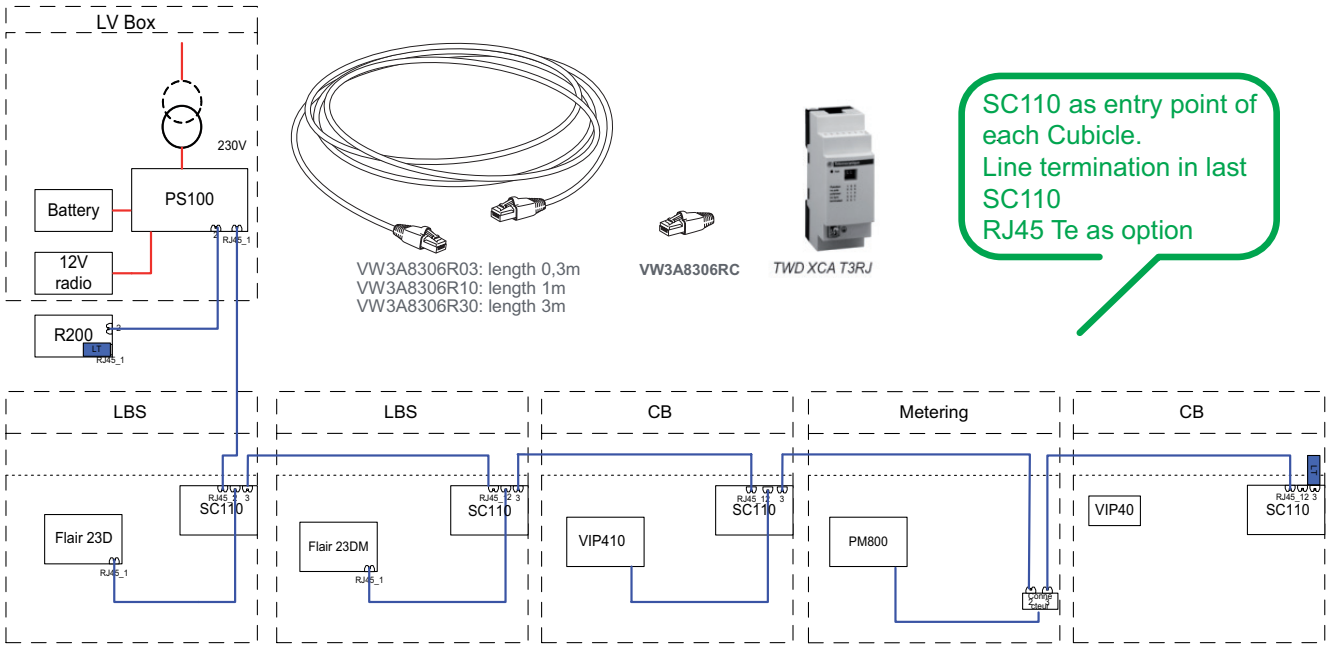
Setting into operation

Cabling communication
Communication between devices on Modbus SL System Bus shall be cabled as follows:

■ R200 (Modbus master) is always at the beginning of the Modbus line. It integrates a line termination, and offers one RJ45 socket. Use one RJ45 cable to connect it to PS100.

■ PS100 implements 2 RJ45 sockets, for daisy-chain. Use second RJ45 to connect PS100 to first MV Cubicle.
Connection to first MVCubicle may be done:
□ directly on SC110
□ or inserting an RJ45 coupler or “T” to ease maintenance

■ Then each motorized MV Cubicle of the switchboard implements a SC110” device (signalisation and control of the MV switchgear). This “SC110” device implements 3 RJ45 connectors in parallel:
□ Use 2 to achieve daisy-chaining of the trunk Modbus cable, from the previous MV Cubicle and to the following MV Cubicle;
□ Use third one to connect a derivation cable, towards other Modbus devices of the same MV Cubicle.



■ If the only communicating device of the MV Cubicle is the SC110, the derivation connector is left empty.

■ If the MV Cubicle implements only one other communicating device, equipped with a RJ45 connector (ex: Flair 23DM), a RJ45 cable is connected directly between the “SC110 RJ45 derivation connector” and the complementary device.

■ If the MV Cubicle implements 2 other communicating devices, both equipped with a RJ45 connector (ex: Flair23DM + VIP 410), then
□ a “T” accessory with 3RJ45 (TWDXCAT3RJ) is connected to the SC110
□ each of the 2 communicating devices is connected to the “T” through an RJ45 cable.

■ If the MV Cubicle implements a Modbus device with a screw terminal connection (ex: PM800), a dedicated cable shall be used by cutting a standard 2 RJ45 cable to relevant length and adding termination tips . A “T” accessory (TWDXCAT3RJ) may be added if another RJ45 device is present (e.g. PM800 + VIP410).

■ In a MV Cubicle without SC110 (as the MV Cubicle “metering” represented above), the daisy-chain of RJ45 cables (from the previous MV Cubicle and towards the following MV Cubicle) is achieved by inserting a “T” (TWDXCAT3RJ).

■ In the last MV Cubicle, the second line termination shall be connected.

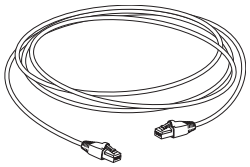
■ If the MV Cubicles are shared between 2 switchboards separated by several meters or tens of meters (too much for a pre-fabricated RJ45 cord length), the link between the 2 switchboards can be done by insert a RJ45 coupler with 2 RJ45 sockets, in each switchboard, and a long RJ45 cable (or use a repeater and a cable of free length between the screw terminal connectors). If length is higher than 10 meters, use fiber optical repeaters. Alternatively “T” accessories with 3 RJ45 may be used to provide a free RJ45 connector for maintenance.

Synthesis of Modbus SL System Bus cabling rules

Designation	Value
Max number of Modbus devices on one Bus	32
Max trunk line length (cable length on the direct way between the 2 termination lines	Shall remain within substation room (and <500 m in any case)
Max cumulated derivation line length (sum of cable length not involved in the trunk line)	40 m
Type of Bus cables	Shielded (1)
Composition of RJ45 cords	1 twisted pair + 1 third wire
Min wires section in RJ45 cords (copper wires)	0,15 mm²
Composition of Bus cable for connection on screw terminals	2 twisted pairs + 1 shield drain wire
Wires section in Bus cable for connection on screw terminals (copper wires)	0,25mm² … 0,5 mm²
Characteristic impedance of twisted pairs	100 or 120 ohms (+- 15%)

(1) In RJ45 cables, shield must be connected to the metallic cover of the RJ45 shielded connector.

Setting into operation



Cabling accessories
Pre-fabricated RJ45 cords:
- VW3A8306R03: length 0,3m
- VW3A8306R10: length 1m
- VW3A8306R30: length 3m

In addition, some accessories are used to facilitate cabling in some cases:
- VW3A8306RC: line termination with a RJ45 connector

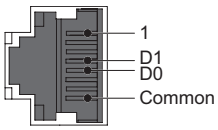
- TWD XCA T3RJ: derivation accessory offering 3 connectors in parallel ("T" function), 3 RJ45 female sockets

Make sure dip switches are well set to disable line termination and polarization

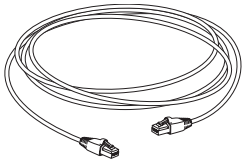
- TRV00870 : RJ45 Coupler providing 2 RJ45 female sockets

Using other cables

For specific case, characteristics of cable shall comply following requirements
- Cable:
  - Shielded cable with one twisted pair of min 0,15mm² (AWG 26), plus one third wire of the same section (a RJ45 cable with all the 8 wires, as an Ethernet category 5 cable, is usable, but it is not recommended for EMC, as unused wires would be floating and so would act as receiving antennas for perturbations);
  - Characteristic impedance of the twisted pair 100 or 120 ohms;
  - Rated insulation voltage of external sheath: min 300V; recommended dielectric rigidity 2500V rms 1mn, and assigned impulse voltage (1,2/50µs wave) 4000V
  - Recommended dielectric insulation between internal wires and shield: dielectric rigidity 1500V rms 1mn and assigned impulse voltage (1,2/50µs wave) 2500V;
  - Preferred sheath colour: black



- Connector
  - Shielded RJ45 male connector at both ends, according to EIA/TIA 568-A and IEC 60603-7-1; cable shield linked to RJ45 cover.
  - Pin-out as represented hereafter for socket female connector; twisted pair on pins 4 and 5 and third wire on pin 8; parallel link without crossing within the cable.

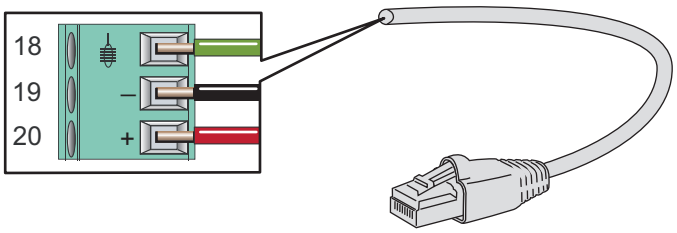


Connecting devices with screw terminal connector (PM800, Sepam, …)
- Cable: cut one of following reference to relevant length and add end termination for minimum 24 AWG
  - VW3A8306R03: length 0,3m
  - VW3A8306R10: length 1m
  - VW3A8306R30: length 3m

Signal	Color if using above cable	Connection pin on RJ45
D1	Red	4
D0	Black	5
Common	Green	8

Setting into operation

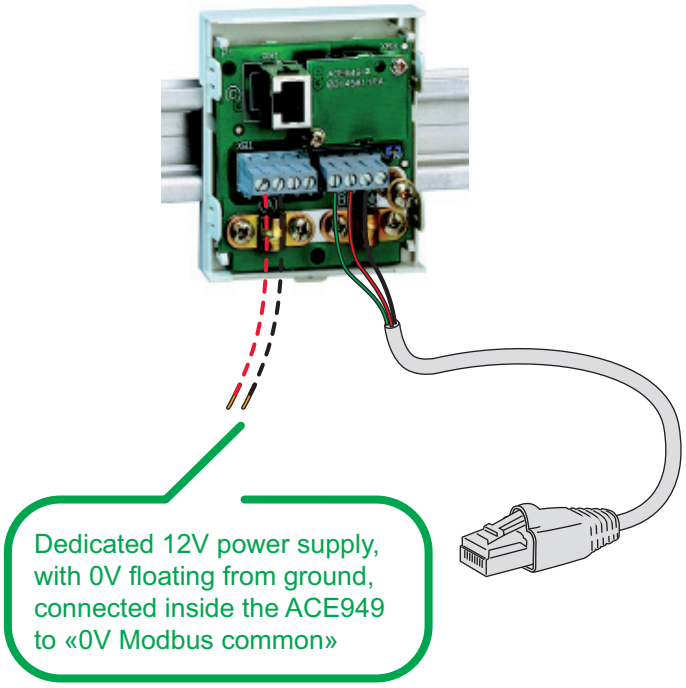
Connecting a PM800
Note: within Easergy System , “Modbus common” shall not be linked to the shield. Therefore cabling is as follows :



Signal	Designation on PM800	Connection pin on RJ45
D1	+	4
D0	-	5
Common	0	8

Cable shield shall not be connected to PM. The closest shield connection to local ground is made by the “T accessory”.

Connecting 1 Sepam (20, 40, 80)



Signal	Designation on ACE949-2	Connection pin on RJ45
D1	BL-	4
D0	BL+	5
Common	BV-	8
12V+	AV+	AV+
12V-	AV-	AV-

Screw cable fixing on cable screen. Make sure jumper is well set to disable line termination.

Setting into operation

Grounding and Insulation rules

Devices shall be grounded as follows :

■ Premset equipment is delivered with internal grouding to MV equipment metallic masses already achieved. MV Equipment shall be connected to local earth according to Premset Installation Manual.

■ If installed within MV Equipement, PS100 is connected to MV Equipment metallic mass, else it shall be grounded to local earth.

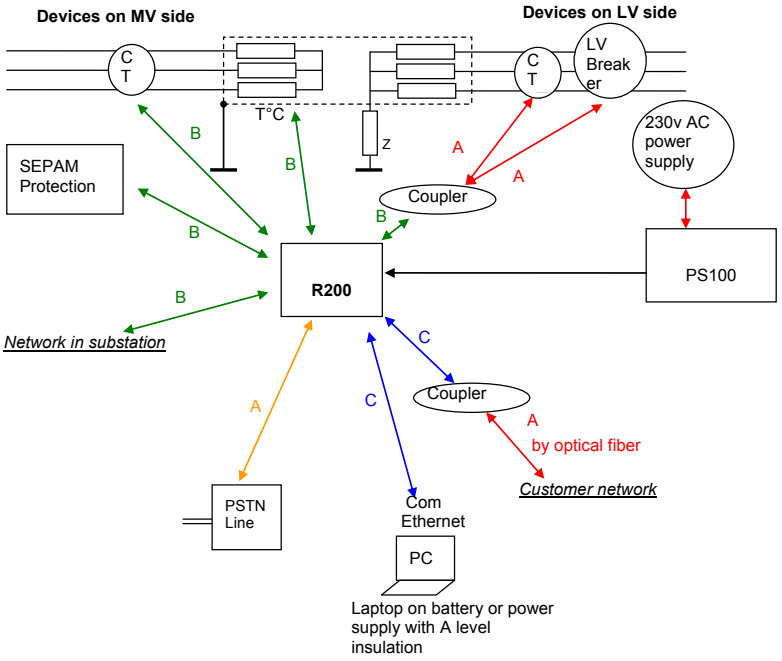
■ R200 shall be installed within substation room and grounded to local earth

24/48V supply lines, and Bus lines, are “Protective Extra Low Voltage” (PELV) lines :

⚠ **Warning:** Low voltage devices out of MV equipment may be connected to Easergy C&M System under following conditions:

■ If it is sure that MediumVoltage and Low voltage are sharing same grounding to earth, low voltage devices out of MV equipment may be connected to Easergy C&M system

■ If any doubt, low voltage devices out of MV equipment shall not be connected to Easergy C&M system, or else through some coupling interface ensuring required level of insulation. Communication network shall not exit directly the local room. Connection to building Ethernet infrastructure shall be done using optical fiber couplers.



Level	Insulation voltage at nominal frequency	Pulse insulation voltage
A	According to local regulations	According to local regulations
B	2,5kV	5kV
C	1,5kV	2,5kV

“A” insulation level depends on local regulations and habits. It shall consider voltage rise of local ground in case of current circulation to earth, which may generate dielectric issue in case of conductors circulating outside of local room, and possibly referenced to a remote earth.

Setting into operation

Tune key settings on each device

Key settings should be tuned before powering up whole system, at least to ensure current setting values will be safe for starting.

■ This applies especially to:
□ SC110 dip switches as they depend on cubicle type and low voltage level
□ VD23/Flair23DM dip switches for voltage detection settings

Refer to each device user's manual

Set Cubicle numbers on SC110

Cubicle number shall be set on each SC110 device from 1 to 29.

It may be changed later at any time. However after first power on, a power cycle is necessary to take new settings into account.

Checking installation

Installation shall be checked against switchboard electrical drawing before first power on.

■ Especially following keypoints shall be checked:
□ compliance to design&BOM
□ compliance of all I/O cabling (connection to sensors, actuators)
□ earthing
□ power supply wiring
□ communication wiring
□ cubicle number settings on SC110
□ presence of 1 single physical line termination at end of Core System bus opposite to RTU
■ In principle RTU is configured with line polarization and line termination active
□ to be rechecked if communication is not running well at first LV power ON

Setting LV power on

Followings steps have to be followed for first power on:

■ In each Cubicle, ensure auxiliary supply breakers are open. Lock Motor power supply in each cubicle.(*)
■ Connect Battery to PS100
■ Switch mains ON
□ Check PS100 status
□ Check RTU status

■ Cubicle per cubicle:
□ switch auxiliary supply on (Motorization, PM, Sepam)
□ unlock motor power supply
□ ensure cubicle is in a stable state before going to next one

■ Check all devices are alive and provide realistic measurements (refer to each product user manual)
■ Check all communication led are blinking

⚠ **Warning:** don't power up several cubicles at same time

For further System power ON, whole System may be powered on at same time if and only if assuring before that all Cubicles are in stable state (especially that OCO/CI2/RI Cubicles are charged)
If necessary to run a full power cycle of the whole LV network, ensure before that all Cubicles are armed or open

⚠ **Warning:** Before Power on, make sure that protection devices are preconfigured with valid settings (using adequate powering means for each kind of protection relay: refer to each device user manual)

(*) If option installed

Setting into operation

Defining Protection Settings

Electrical expert shall configure protection settings before connection of MV Equipment to MV Network.
Refer to Protection Relay User manual.

Setting MV Power ON

See relevant MV Equipment user guides.
In any case, check protection settings have been configured by relevant personal.

Configuring

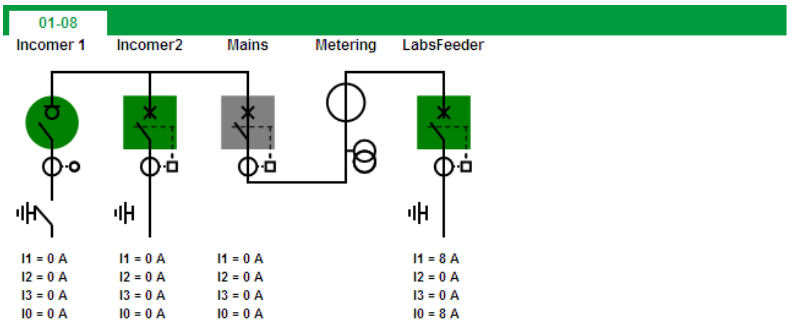
- ■ Configuration embraces following aspects:
- □ Configuring the System
- □ Configuring communication to SCADA
- □ Tuning functional settings
- □ Offline configuration and loading into RTU
- □ Handling configuration files

Main Principles

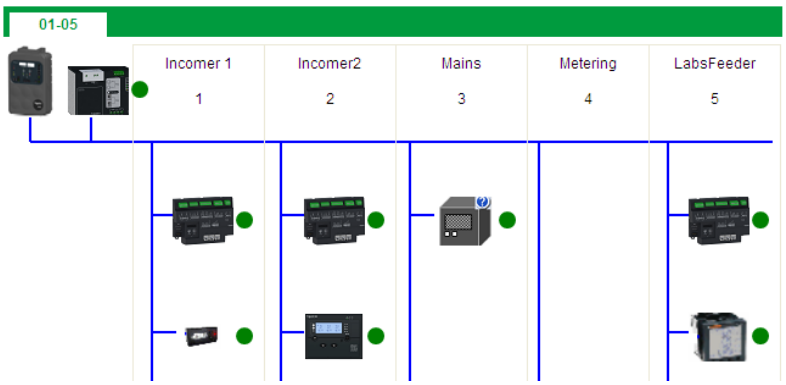
System is structured around **MV Cubicles**. All configuration and operational information will be sorted according to this structure. Each Cubicle is identified by a Cubicle Number

For global devices (e.g. RTU, Secure Power Supply) or miscellaneous devices external to MV Equipment, information is sorted separately in additional “Classes”.

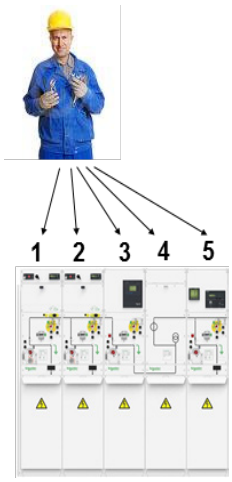
Single line view



Physical view



Setting into operation



Devices belonging to the System are identified by the **Cubicle_Number** of Cubicle they belong to, by a **Modbus slave address** and by a **Device_Type**.

Cubicle numbering:

Assign cubiclenumber to each communicating device supporting this feature

Cubicle_number: 1 to 29

Recommandation:
Assign a Cubicle number to each actual Cubicle, even if there is no communicating device in it: this will enable to have a global view of whole MV equipment in the web server.
Start numbering opposite to the side where Equipment extension is possible

Device type belongs to following list:

Id	Device_Type
0	Switchgear Control or No assigned device_type
1	FaultPassageIndication
2	Protection
3	Measurement
4	Reserved
5	Reserved

Modbus Slave addressing

■ Addressing slots:
□ Addressing space is split in slots per Cubicle
□ A slot is reserved for switchgear controllers, at bottom of range
□ Two slots are reserved for free allocation to miscellaneous devices or additional power supply
□ Slave number is derivated from Cubicle_Number through a simple calculation rule

Reserved	255 … 248
Reserved for future	247 … 200
Free range	199 … 178
29*5 for allocation per cubicle	177 … 33
Free range	32 … 31
PS100	30
SC110 Or 3rd party if necessary	29 … 1
Broadcast	0

■ Addressing Rule:
Modbus slave address is linked to Cubicle Number according to following rule:

Integrated Module type	Rule
Switchgear Controller	Slave_Nb = Cubicle_Nb
Power Supply	Slave_Nb = 30
Other module types	Slave_Nb = 33 + 5*(Cubicle_Nb-1) +Device_Type Setting Cubicle number sets automatically slave address according calculation rule. Setting Slave number automatically sets Cubicle_Number to UNUSED .

Example : FPI in Cubicle5 => Slave_Number = 33+ 5(5-1) + 1-1 = 53*

Whenever possible, Modbus slave address is directly derived from Cubicle Number. This is valid for SC110, Flair23DM and VIP410 products, enabling automatic configuration from Cubicle_Number.

Same rule may be applied for PM800 and Sepam products, then having to calculate address and enter it in device.

Defining the Modbus address mapping for other modules shall respect these rules, in order to ensure unicity of addresses.

Setting into operation

There shall be only 1 device on a given type in 1 given Cubicle
In case of redundancy of devices in same Cubicle, assign a Slave address from free range with manual assignment on slave device.

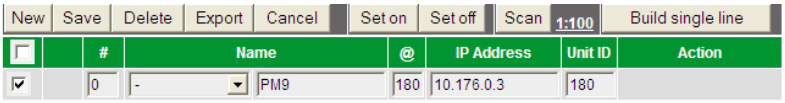
Nevertheless it is always possible to define a fully customized addressing plan, by disabling Cubicle numbers in Flair23DM and VIP410 products. SC110 will then always have a Slave address in [1 .. 29] range.

Modbus Slave addressing on Modbus TCP
Same addressing rule applies when slave device is on Modbus TCP, usually using address in free area as the device is then mostly outside of MV Equipment.
■ In addition following attributes have to be set:
□ IP address: IP address of the slave PLC if defined on the Ethernet port.

Note: If the IP address is different from 0.0.0.0, the R200 tries to access the slave via the Ethernet port
□ Unit ID: Used only when slave is defined on the Ethernet port.
This field is used in the Modbus TCP frame sent by the R200 for intrasystem routing. Set to 255 (0xFF) by default in the Modbus protocol, this Unit ID can be changed in order to forward the message downstream to another slave via a Modbus TCP-> Modbus RTU gateway. Then Unit_ID= Modbus SlaveAddress

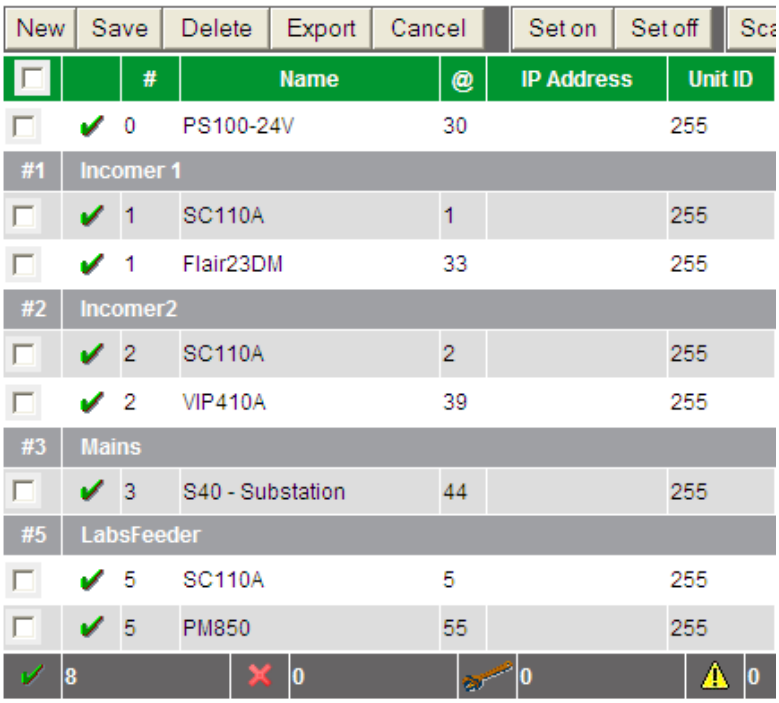
e.g. a PM9 behind an EGX at IP address x.x.x.x could be set at address 180

Device configuration



Rule: Modbus TCP slaves shall have an IP address in same range than R200 Ethernet port (same first three nibbles, e.g. typically 172.16.0.x per default)

Hint:
Accessing to the webserver page “Device Setting” in Settings menu provides a global view of Modbus Slave address plan.



Setting into operation

Identification and Description files

Devices are identified automatically, (assuming they comply to Modbus identification services)
Integrated devices (Flair23DM, SC110, VIP410, PS100, PM800) are described internally within R200 through dedicated description files.
Based on device identification, R200 associate each Integrated device to device description file.
Thanks to description file, R200 then automatically configures to supported mechanisms and key available data.

- Description files
  - Provide identification and versioning information
  - Indicate Device_Type and related objects
  - Indicate how to access data and settings of a given module (Data identification and description, Settings, supported com services)
  - Indicate supported communication mechanisms (NM, Event management, …)
  - May be loaded into R200 and saved back on PC (see Maintenance section)

Modbus Autoadaptation

Presentation
- Modbus autoadaptation enables SC110, Flair23DM, VIP410 and PS100 to automatically detect R200 transmission parameters.
- User should stick to default parameters, which corresponds to best performances:
  - Baudrate = 38400 bits/s,
  - Transmission format = 8 bits data, Even parity, 1 stop bit

After changing transmission parameters on R200, power down then power up again all devices to trigger autoadaptation mechanism.
At restart R200 will then generate sufficient traffic to enable devices to detect new parameters.

Other devices not supporting this feature shall be configured manually.

Detectable Configurations
- The configurations supported by the algorithm are as follows:
  - “Even” parity, 1 stop bit
  - “Odd” parity, 1 stop bit

- associated with the following transmission speeds:
  - 9,600 Baud
  - 19,200 Baud
  - 38,400 Baud

Note: It is recommended to avoid the format "no parity" for legacy reasons. Some legacy devices may detect wrong number of stop bits.

Setting into operation

Configuring the System (bottom-up)

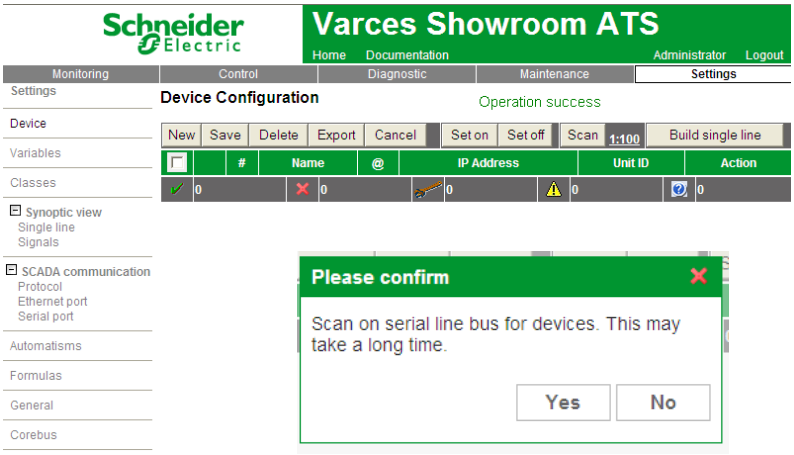
■ **Main action principle for bottom-up approach**
□ Installer enters a Cubicle_Number on each module, for each Cubicle
□ Installer enters a Slave_Number on each other device if any
□ Installer asks for system discovery on Core System bus
□ System builds automatically a default configuration based on identified modules and their device description
□ Installer asks building the default singlelineview
□ Installer may then adjust and customize configuration.

■ Detailed Procedure:
□ Assign Cubicle Number to each core device (and reset)
□ Assign Slave Address and transmission parameters to PM800, Sepam and miscellaneous devices
□ For PM800, Sepam and miscellaneous devices, it is necessary in addition to define Modbus transmission parameters:
- Baudrate = 38400 bits/s,
- Transmission format = 8 bits data, Even parity, 1 stop bit
- Modbus slave address : according to rules defined in section2.5.1.1
  In any case, refer to each device user's manual for exact way to enter these parameters

□ Connect to R200 Webserver

Setting into operation

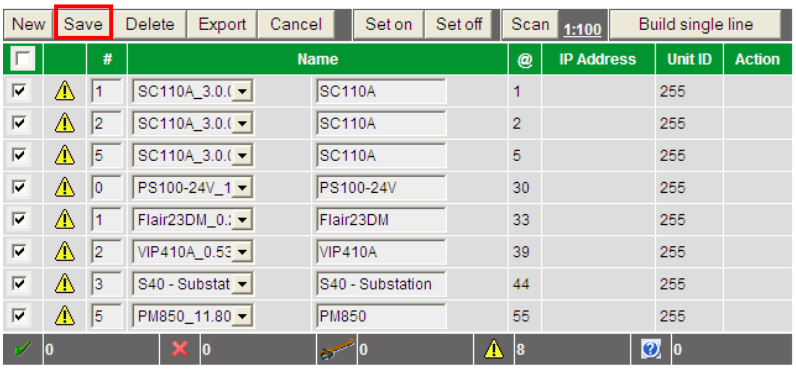
Start device discovery on Core bus : SCAN function (Settings menu)



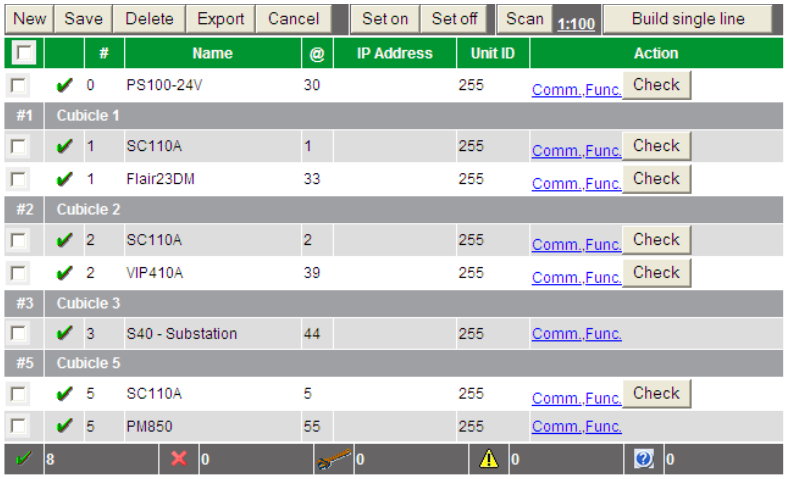
Wait for end of discovery

Start autoconfiguration:

- For each new device detected, check proposed Device Description
- Then click on SAVE



- Devices are then automatically sorted



Per default, English language is proposed for labels associated to a given device
Else if another language is wished

- Load Device description files with wished language from Schneider Electric Website
- Download these files into RTU
- Select appropriate Device Description in proposed list

⚠ **Warning:** Saving a device will create default configuration based on selected description file content. This will impact variable list, singlelineview, class list. A new Cubicle will be created if device is declared in a not-yet-existing cubicle. If device was declared before, this will overwrite corresponding part of previous configuration.

Specific case:
In case of error or specific requirement, unselect devices before SAVE
In case of version conflict:

- Check device identification then Delete proposed device,
- Check if more suitable version on Schneider Electric Website, if yes download it into RTU and relaunch scan
- Else consider risk level. If acceptable
  - then create device manually, select most appropriate description file

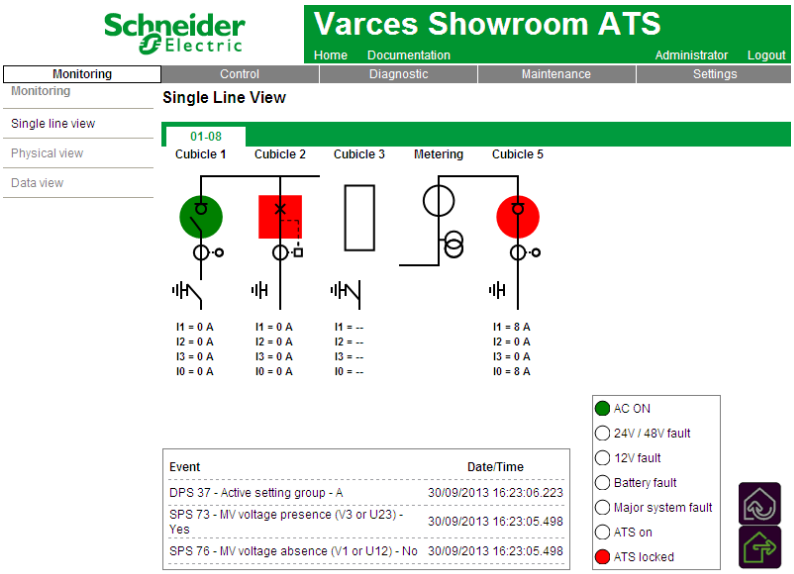
Two versions are considered, coded as X.Y.Z

- PPID version if available: this identifies a given version of the device protocol interface
- Else firmware version

Error Case	Behaviour
Switchgear Same version but Device newer or older revision (Z) compared to description file X.Y, X.Ydevice = X.Ydescription	No compatibility issue
Power Device new version compared to description file X.Y, Ydevice > Ydescription	Impact : Some new features may remain hidden - Possibly missing mechanisms or options in mechanisms list - Possibly missing data or parameters Update of description file if possible, else accept User may declare new data manually
Device old version compared to Description file X.Y, Ydevice < Ydescription	Impact : RTU may propose features which are not supported by device - Possibly new mechanisms or options in mechanisms list not supported by device - Possibly new data or settings not supported by device
Device major version different than registered device in configuration X.Y, Xdevice <> Xconfig	Not compatible. Avoid use of automatic configuration. Load description file corresponding to device major version else select "-" to force device creation, then create variables and adjust device mechanism list manually

Build single line view (Settings menu)

Default singlelineview is then available in monitoring menu



Customizing System configuration

After creating default configuration, User may customize configuration as follows:

- ■ Adjust System Modular Configuration
  - □ Add device manually
  - □ Remove Device
  - □ Tune device communication settings

- ■ Adjusting singlelineview
  - □ Adjust MV switchboard topology
  - □ Allocate devices to Cubicles
  - □ Adjust associated signals

- ■ Add/Modify variables
- ■ Add/Modify external addresses
- ■ Adjust grouping of information per class

Adjusting System Modular Configuration

Devices may be added or removed manually

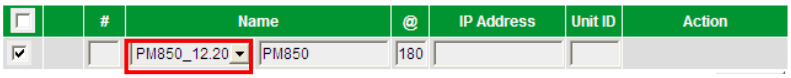
Adding device manually

On DeviceConfiguration page, click on “New”

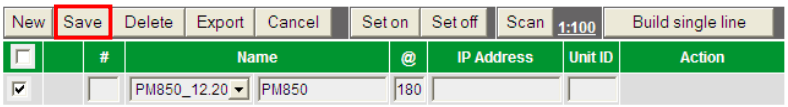
■ Enter CubicleNumber, DeviceName, and if necessary Modbus@slave, IP address, UnitID

⚠ **Warning:** these information may not be changed after saving. Delete and recreate device if needed to change information later on.

■ Select a device description if one is available for the new device



■ Save

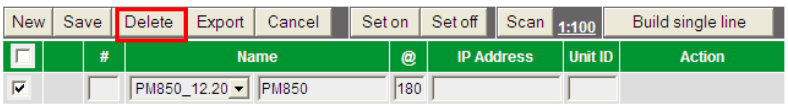


For Sepam and miscellaneous devices, tune device communication settings (see section "Tuning device communication settings").
In case of address conflict (slave address already in use), new device creation will be cancelled

Removing a Device

For removing a device
■ Go to webserver Settings/Configuration page
■ Select device to be deleted
■ Click Delete button

All variables and configuration data attached to the device will be deleted

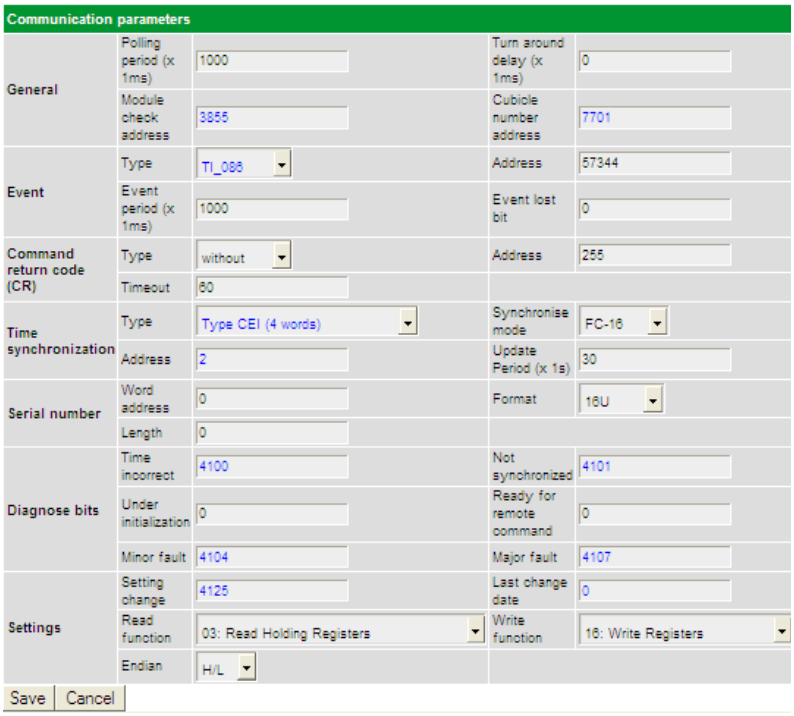


Setting into operation

Tuning device communication settings

It may be necessary, especially for miscellaneous devices, to tune Modbus Protocol mechanisms for a given device.

On DeviceConfiguration page, Click on “Comm” link



⚠ **Warning:** Once new device is saved, Cubicle_Number may not be changed by direct operation afterwards. Some devices may miss requests from R200 if these requests are transmitted just after another slave’s answer. In this case use the “TurnAroundDelay” setting.

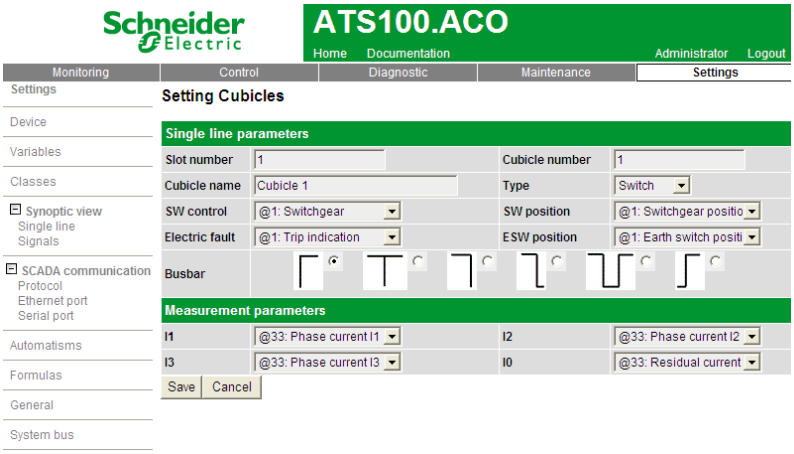
For Sepam20&40, make sure TurnAroundDelay is set at least to 25ms

Parameter Group	Parameter	Configuration range	Comments
General	Polling period (ms)	0 .. 60000	Period used to poll device data cyclically
	Tunr around delay (ms)	0 .. 60000	Minimal silence time of master after end of last frame on bus. Usually set at 0. 25ms for Sepam range
	Module Check address	0 .. 65535	Address of command which will ake device highlight during 30s
	Cubicle number address	0 .. 65535	Address of Cubicle_Number data giving the Number of the cubicle the device belongs to. 0 if not available.
Event	Type	Without; TI86; Legacy	TI86 : standard event management protocol within Schneider Electric products enabling multiclient. Legacy : event management protocol within Schneider Electric products, used mainly by Sepam and Easergy product ranges. See Modbus communication document. Both event management protocols provide timestamped events with timestamp respecting IEC date&time format on 4 words. Set to “without” if none of these event management is available
	Address	0 .. 65535	Address of the Event table or Event exchange table where master may retrieve events If available. Else shall be set to “0”.
	Event period (ms)	0 .. 60000	Polling period of event table by RTU. Set to 0 to deactivate Event Table polling by RTU
	Event lost bit	0 .. 65535	For Legacy protocol only : address of bit signaling some events have been overwritten by device since last event retrieval.
Command Return Code (CR)	Type	Without Event watch	Indicates if device supports CR code for DPC controls, and if yes if it may be read through events or has to be polled
	Address	0 .. 65535	Address of Command return code if available. Else shall be set to “0”.
	Timeout (s)	0 .. 65535	Defines timeout for Master before considering a DPC control has failed if no CR Code value change on device has been detected
Time synchronization	Type	Without Type STD (2 words) Type CEI (4 words)	Enables to select date&time format to synchronize device “Type CEI” refers to I**EC870-5-4, *CP56Time2a***
	Synchronise mode	FC16 FC43-16	Defines which Modbus function code shall be used for synchronizing device If FC16 is selected, then register address has to be filled in
	Address	0 .. 65535	Address of date&time registers in device. Relevant only if FC16 is selected
	Update period (in s)	0 .. 65535 15s per default	Defines period at which synchro will be sent to device in peer to per with selected date&time format
			To be set to 0 to deactivate peer to peer time synchro to device, especially when synchronization per broadcast applies (see Settings/Corebus/TimeBroadcast parameters)
Serial Number	Word address	0 .. 65535	Address of serial number if available through Modbus registers. Else shall be set to “0”.
	Format	16U; String	Serial number format as 16bit integer or character string
	Length	0 .. 16	Number of 16bits registers.
Diagnose bits	Time incorrect	0 .. 65535	Address of Time_Incorrect bit if available. Else shall be set to “0”
	Not synchronized	0 .. 65535	Address of not_synchronized bit. if available. Else shall be set to “0”. May be set to “0” to deactivate ogging of synchronization loss events in System log
	Under initialization	0 .. 65535	Address of Under_Initialization bit if available. Else shall be set to “0”
	Ready for remote command	0 .. 65535	Address of Ready for remote command. if available. Else shall be set to “0” Indicates a command initiated by RTU should succeed. Applicable only for switchgear controllers
	Minor fault	0 .. 65535	Address of Minor Fault indication on device, if available. Else shall be set to “0”
	Major fault	0 .. 65535	Address of Major Fault indication on device, if available. Else shall be set to “0”
Settings	Setting change	0 .. 65535	Address of Setting Change if available. Else shall be set to “0” Event generated each time a setting is changed on device
	Last change date	0 .. 65535	Address of LastChangeDate if available. Else shall be set to “0”. This date is updated each time a setting is changed on device
	Read function	FC03, FC04	Modbus function code used for reading settings from device
	Write function	FC06; FC16	Modbus function code used for writing settings to device
	Endian	H/L; L/H	Default order of encoding for 32 bits values H/L = Most Significant Byte first L/H = Least significant word first

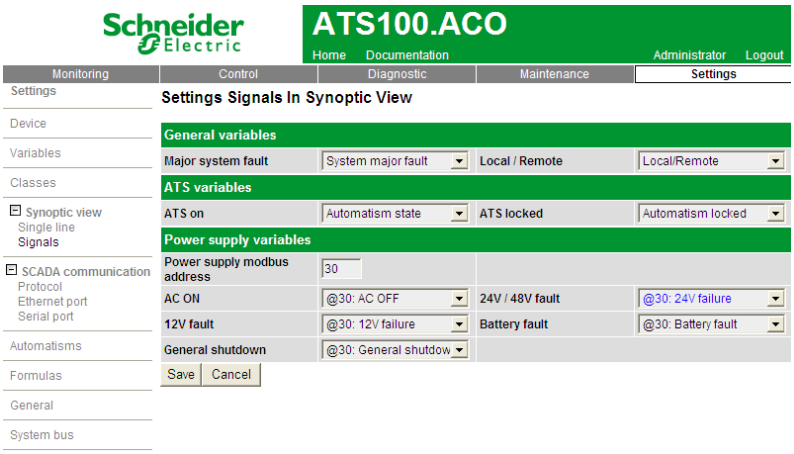
Setting into operation

Adjusting singlelineview

Singleline view may be adjusted through Settings/Singleline to fully reflect MV equipment structure
- By inserting empty cubicles for which no communicating device has been detected
- By adjusting cubicle names
- By adjusting display order (rank)
- By selecting busbar

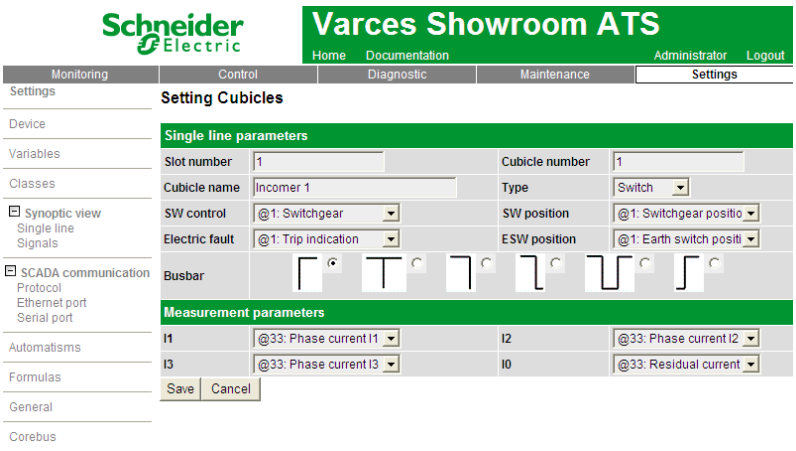


If necessary source of Cubicle key information may be adjusted (e.g. to select alternate source for measurement if several devices providing measurement are present in Cubicle)



Adjust MV switchboard topology

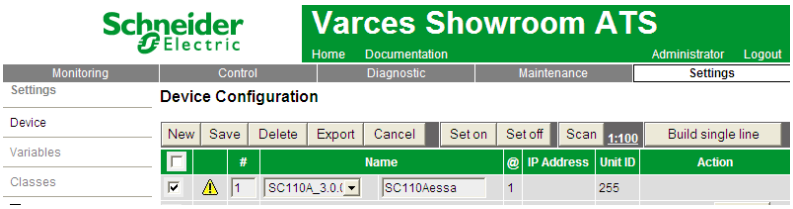
It is possible to adjust MV Switchboard topology to match actual one by :
- Inserting cubicles with no communicating devices
- Adjusting name of each cubicle
- Precising cubicle type (Switch, breaker, metering, …)
- Adjusting busbar
- Adjusting display rank for each cubicle for specific cases (by default display rank = cubicle_number)



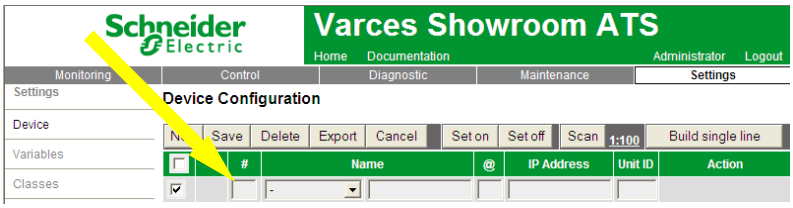
For customizing Cubicles:
- Go to webserver Settings/Singlelineview page
- Access existing Cubicle to customize them
- Create New Cubicles
- Delete cubicle when necessary

Allocate devices to Cubicles

Integrated devices are directly allocated to Cubicles at discovery time by checking their “Cubicle_Number” information.



For devices added manually, Cubicle_Number has to be entered when declaring the device



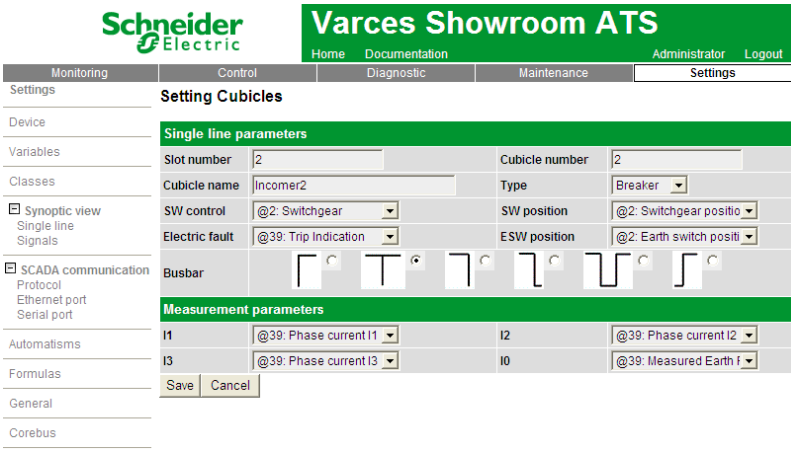
Then automatically all information from the device is attached to corresponding cubicle for display

⚠ **Warning:** peration afterwards. If required, delete device and add it again with relevant cubicle number

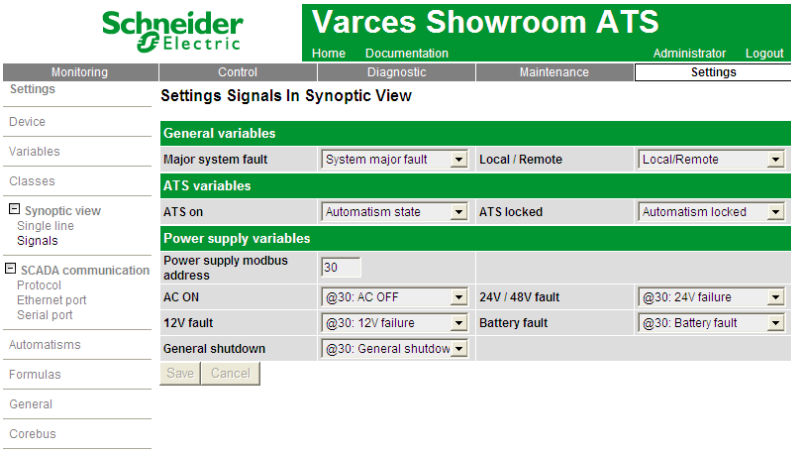
Adjust signals associated to singlelineview
Key signals displayed on singlelineview are automatically initiated when singleline view is built.

However it is possible to adjust them:

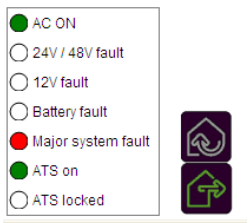
Signals related to a given Cubicle may be tuned through Settings/SynopticView/ SingleLine page, selecting cubicle to edit



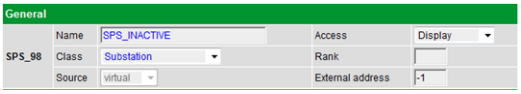
Global signals may be tuned through Settings/SynopticView/Signals page



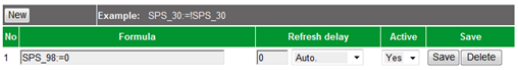
These signals are automatically initiated when singleline view is built and don't have to be changed usually.



Setting into operation



Formulas



However it may be relevant especially to :
- Adjust Power supply Modbus address if PS100 is not configured at its default address
- Link all supply failure signals to a fake SPS always “Inactive” (to be created using calculation formula) if no communicating power supply is connected
- Link supply failure signals to relevant SPS if another Modbus communicating power supply is used.

Warning: To be as flexible as possible, web server proposes all variables of corresponding type for each information. This means it includes data which makes no sense regarding actual purpose.

Therefore it is recommended to stick to default configuration.

Nevertheless it is typically possible to select the most relevant source of information when several are available, e.g. Phase current if there are several devices providing measurement information.

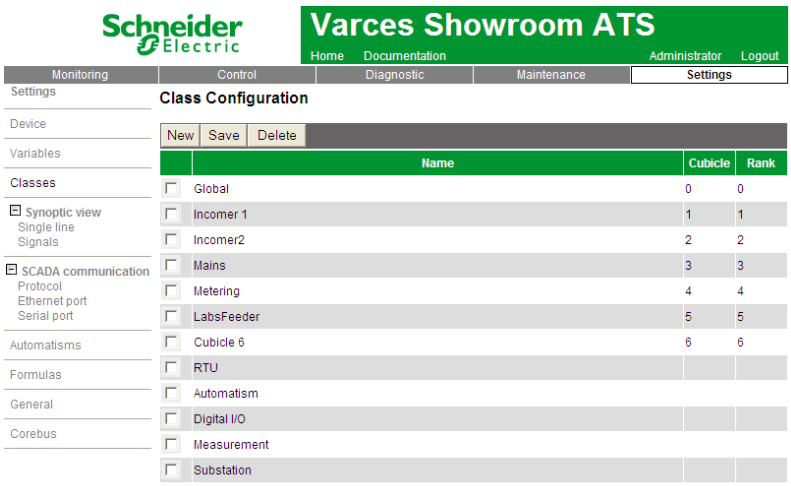
Global signals normally never need adjustment.

Adjust grouping of information per class

All configuration and operational information will be sorted according to a set of display classes.

By default 1 class is created for each MV Cubicle
For global devices (e.g. RTU, Secure Power Supply), dedicated classes exist:
- Global (e.g. power supply)
- RTU (RTU device information)
- Automatism
- Digital I/O (RTU native I/Os)
- Measurement (RTU native measurement)
- Substation (operational data at substation level, e.g. local/remote, system fault, …)

For miscellaneous devices external to MV Equipment, associated variables are located by default in “Global” class. However additional Classes may be created easily.

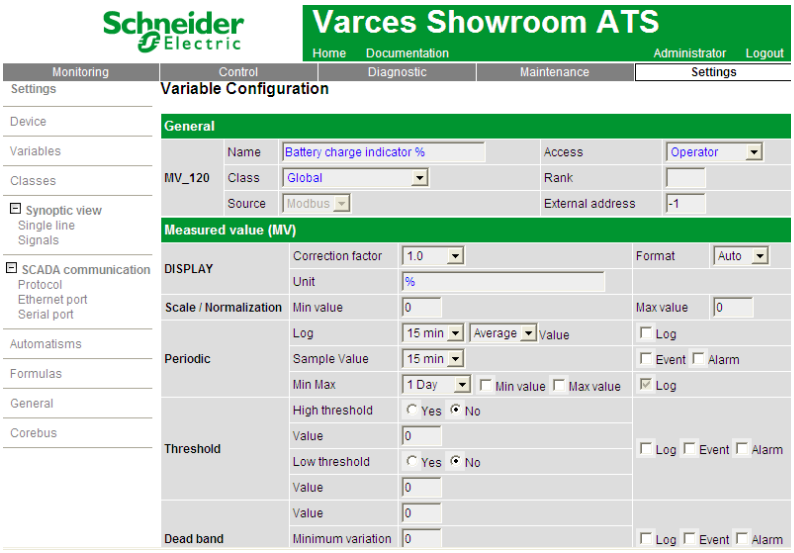


Variable values are by default displayed in class corresponding to source device (Global, Cubicles)
They may be switched to any other class by changing variable attribute (see Modifying a variable)
See R200 User manual for more details on class definition and customization.

Add/Modify variables

It is possible to add or suppress manually a given variable.
Then several attributes have to be defined manually depending on object type, including:

- Label
- Name&colors of possible states
- Associated access rights
- Event&Alarm management conditions
- Information needed to retieve value from slave device producing it
- Information for displaying variable value
- External address and scaling for transmission to SCADA (see next section)



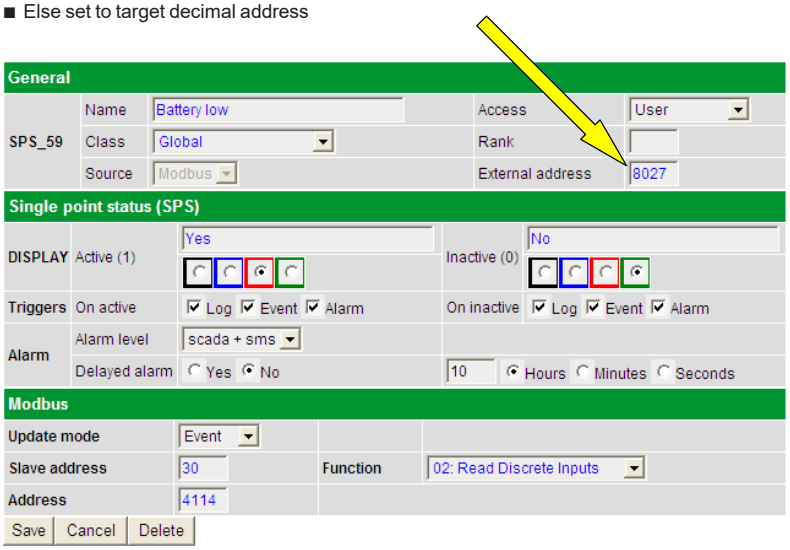
Refer to R200 User Manual for detail of each field.

In the same way it is possible to tune all the attributes described hereabove of an existing variable, especially labels, colors, attached event&alarms management. Order of appearance of variables may be adjusted using ranking information.

Add/Modify external addresses

User may
- adjust the list of variables accessible to SCADA
- adjust external addresses
- change whole mapping to SCADA

This is achieved by adjusting external address of each variable on RTU webserver
- Set to “-1” to disable external access
- Else set to target decimal address



Please refer to "appendix "Generic data mapping" for understanding of addressing spaces and recommended mapping.
If changing whole mapping, please pay attention to strictly reserved areas.

Reading and tuning functional settings

System provides embedded features to manage functional settings of core devices. This comes in addition to classical means provided at product level for any device.

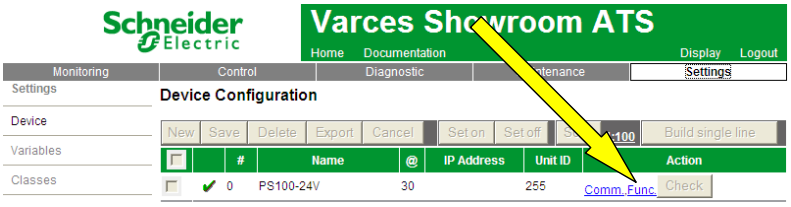
Access to functional settings is possible:

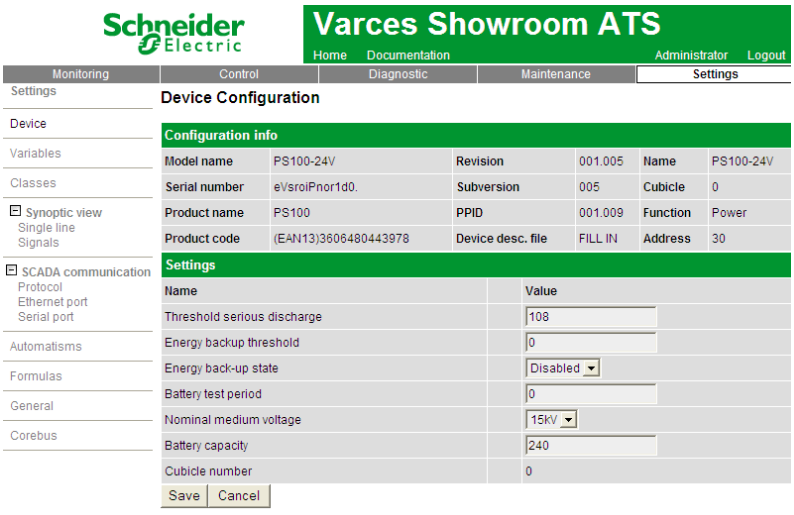
- Through device local HMI : refer to each device User Manual
- Through dedicated tool (Sepam & SFT) : refer to device User Manual
- Through Web server for Core devices
  Read current functional settings by accessing to Settings/Device/"Func" link
  Tune functional settings on same page by changing authorized values and pressing SAVE. Be careful then on settings consistency

□ Values are controlled ultimately by devices themselves. Inconsistent values may be saved but then rejected by devices. In such case displayed values are updated back to actual device values and setting line is highlighted

- Through SCADA communication

Not foreseen per default. For devices accepting simple settings through direct register access, it is possible to create SPC or APC variables (values will not be saved in configuration file)





Example : access to PS100 functional settings

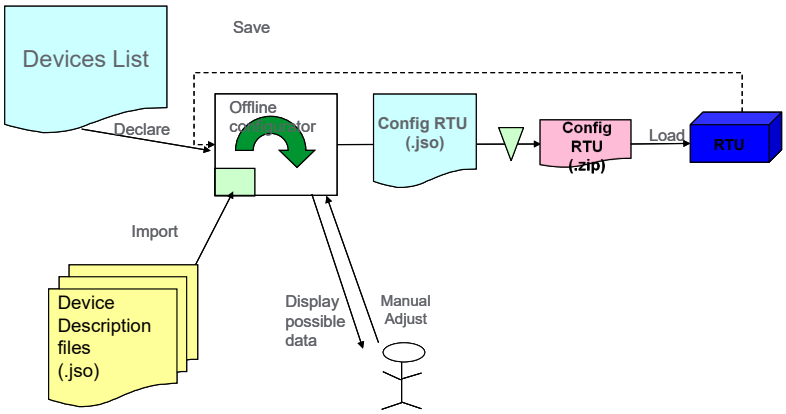
Refer in any case to device user manual for detailed description of each parameter.

Setting into operation

Offline configuration and loading into RTU

Offline configuration tool enables to prepare/adjust configuration before really installing the actual System.

Top down (Offline System) configuration



First step is to declare type of RTU used:
- By entering commercial reference or
- By selecting options (ATS type if any, embedded modem board, …)

Then by declaring MV Equipment topology and list of present devices, offline tool proposes a default configuration, based on device description files.

User may then adjust proposed configuration as in online configuration directly on R200 Web server, with fully similar user Interface.

Resulting configuration may be compressed as zip file for later loading into R200.

External configurations (e.g. saved from R200) may also be edited for display or change.

Tool may also be used to derive custom device description files from the one delivered with the tool.

See R200 Offline Configurator user manual for detailed usage. Following sections provide main principles for typical use cases.

Both configuration and description files are coded using json language, making it easy to edit/display/integrate in further tools through free available software utilities.

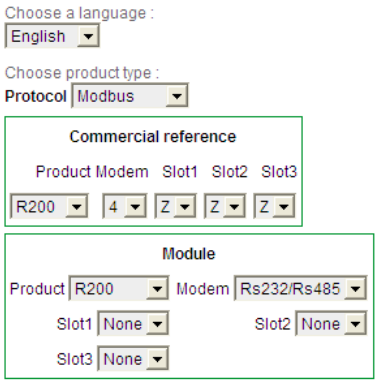
Setting into operation

Creating a new configuration

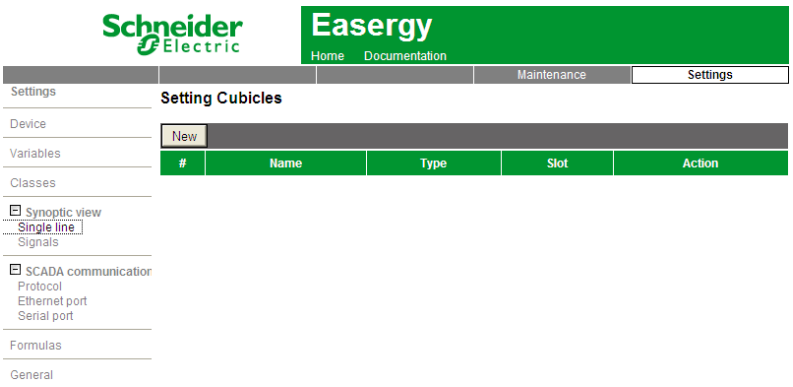
Step1: declaring type of RTU

- By entering commercial reference or
- By selecting options (ATS type if any, embedded modem board, …)

Then select also language to be used for all web pages, and protocol to SCADA.

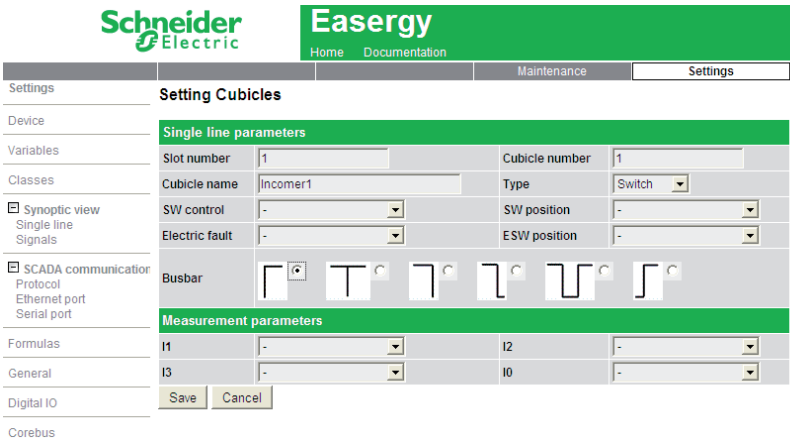


Step2: declaring MV Equipment topology



Setting into operation

In settings/singlelineview, create and define each cubicle of MV Equipment,



Please follow recommendations:

- Create cubicle for each existing one, even if no communication device in it, in order to reflect the physical arrangement of cubicles within MV Equipment
- Start numbering having in mind possible extensions in future
- Slot number is usually identical to cubicle number but could be used later if necessary (e.g. if inserting a cubicle between two existing one without reconfiguring all devices)
- Measurement and trip indication data will be defined later, after declaration of present devices
- All these information may be adjusted later. Most structuring one is the definition of the cubicle number, as it will define the Modbus slave addresses of communicating devices, and may not be changed later for a given device without deleting/recreating the device

Alternatively you may first define devices, ask for default singline view, then adjust it as in Bottom-Up configuration approach.

Step 3: declaring present devices

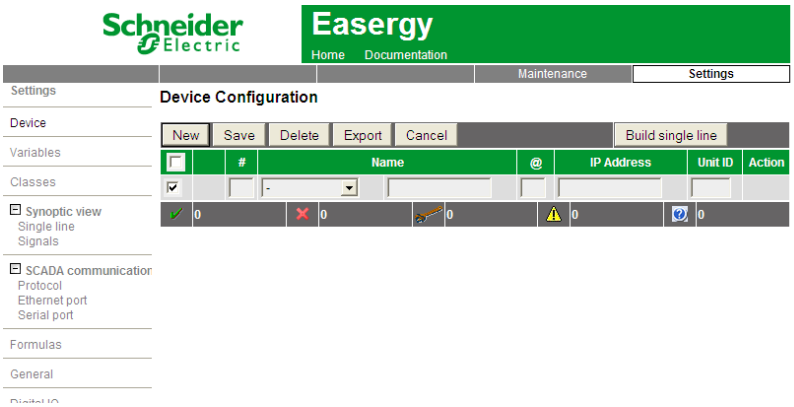
Add devices as if directly on web server (see section …), respecting slave addressing policy

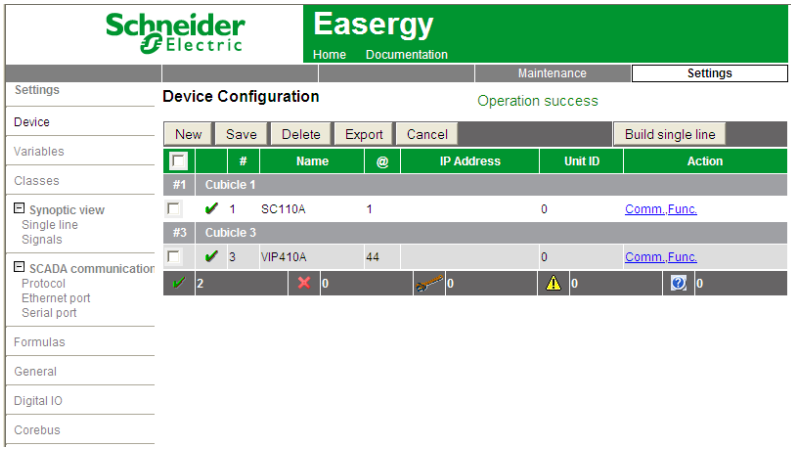
For devices supporting Cubicle_Number, easiest is to enter first cubicle number and select device description file, then slave address is calculated automatically.

Please follow recommendations:

- Choose carefully for each device the associated cubicle number as it will define the Modbus slave addresses of communicating devices, and may not be changed later for a given device without deleting/recreating the device
- Choose carefully for each device the device name as it will be used to identify the device in physical and setting views, and may not be changed later for a given device without deleting/recreating the device
- Select most appropriate device description file within existing list (see section "Adding device manually").

Setting into operation





When saving each device
- Corresponding data are created by default
- Corresponding cubicle is created if not existing before

Thereby, offline tool builds step by step default configuration, based on device description files.

Step 4: adjusting proposed configuration

This is done as in online configuration directly on R200 Web server, with fully similar User Interface.

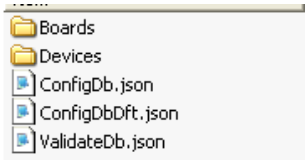
Refer to section "Customizing system configuration"

Beware especially of source of information for singlelineview (measurement, trip indication), as it may depend on the order of declaration of devices.

Step5 : Compress and archive resulting configuration for download into actual RTU

Resulting configuration may be compressed as zip file for later loading into R200.

Configuration file may be found in offline tool installation folder as “configdb.json”
Subfolder : “R200_Offline/json”



- Compress this file in zip format using your preferred software utilities : this file is then ready for download into actual RTU through RTU web server
- Name and classify compressed configuration files along your own policy

Displaying or adjusting an existing configuration

An existing compressed configuration file saved from actual RTU or generated offline may be displayed/edited as follows:

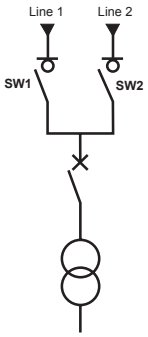
- Uncompress external configuration file
- Copy it into “R200_Offline/json” subfolder
- Erase previous configdb.json file
- Rename file to edit as “configdb.json”
- Open Offline configuration tool

Then external file is open and may be edited as at creation time.

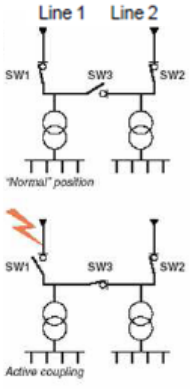
Apply only specific parts of configuration (e.g. scada protocol settings)

Ask Schneider services in case of more specific needs.

Setting into operation



MV source changeover diagram



MV source Bus tie automation diagram

Installing & Configuring ATS

Same basic principles apply when installing an RTU with Automatic Source Transfer Algorithm (ATS100). A few additional actions have to be taken as described hereafter

- Select architecture
- Install devices as with standard RTU
- Wire electrical interlocking between incomers
- Wire VD23 to SC110 input if relevant
- Wire ATS100 dedicated inputs
- Wire ATS100 dedicated outputs
- Configure ATS settings

Select architecture

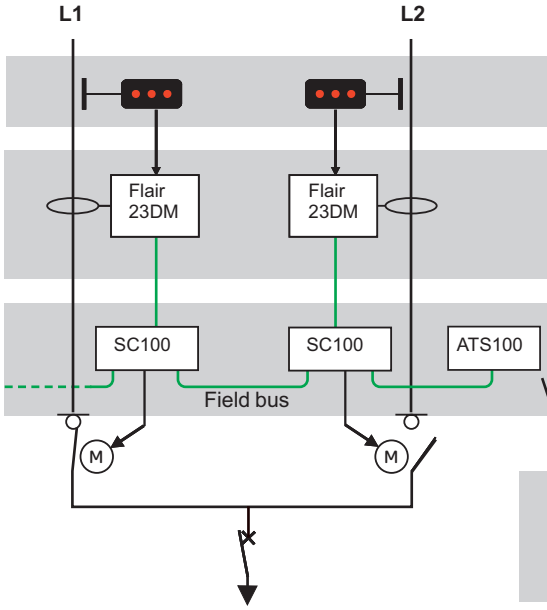
Several architectures are possible when using ATS function, leaving different choices for

- Type of automatism (ACO/BTA)
- Type of incomer cubicles (switches or as well breakers)
- Location of incomers and bus tie
- Source of Medium Voltage Presence information
- Locking or not on electrical fault
- Allowing or not closed transitions
- Electrical interlocking between incomers (optional)

Item	Description	Comment
Type of Automatism	ACO : Automatic Change Over (1/2)	Select ATS100-ACO product reference
	BTA : Bus Tie Automation (2/3)	Select ATS100-BTA product reference
Type of incomer cubicles	Switches with CIT mechanism	If switching time of several seconds is acceptable.
	Switches with OCO mechanism	
Location of incomers and bus tie (BTA)	Incomer cubicles don't need to be adjacent	Main constraint will be ease of wiring of electrical interlocking between the two incomers if required
Source of Medium voltage Presence information	Flair23DM on switches	Recommended through communication to ease wiring. Possibly directly connected to ATS100 input if necessary
	VD23 connected to SC110 input for breakers	Recommended through communication to ease wiring. Possibly directly connected from VD23 to ATS100 input if necessary
Locking on electrical fault	From Flair23DM on switches	
	From Protection relay on breakers	
	Possibly from any source by direct wiring to ATS100 locking input	
Closed transition	Allowed or not in automatic mode Allowed or not in manual mode	To select depending on customer requirements. If enabling closed transitions, make sure both sources will be synchronous
Electrical Interlocking	If no closed transition is allowed, an electrical interlocking between the 2 incomers may be added to ensure the 2 MV sources will never be active in parallel	Make sure operator will not close the 2 cubicles manually, acting directly on cubicle mechanisms

Setting into operation

Typical diagram for ATS ACO



2 VPIS-VOs	Voltage sensor: dedicated version of VPIS with Voltage Output signal.
2 Flair 23DMs	Voltage detector + Fault Passage Indicator: a relay is activated when a loss of voltage is detected from the VPIS voltage output signal. If a fault current is detected, the Automatic Transfer System is locked out in order to avoid closing the healthy line on the fault.
1 ATS100 + switch or CB function	Based on inputs coming from the Flair 23DMs, the decision is made to switch from one line to the other.
SCADA, BMS	Communication facilities may be added. Communication to SCADA or BMS (optional) Web Server: configuration, diagnostics, alarms, logs.

Refer to application notes for more examples of possible architectures

Install devices as with standard RTU

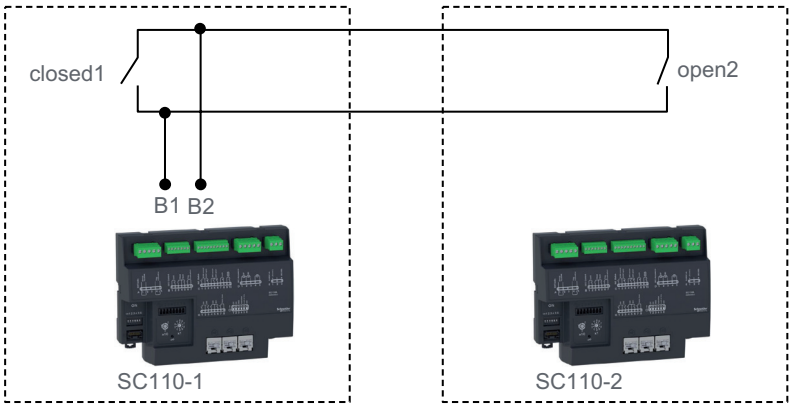
See previous sections

Wire electrical interlocking between incomers

Electrical interlocking may be realized by connecting incomer switch states information to each SC110 external lock input

- Incomer1_Locked = Incomer1_Open & Incomer2_Closed
- Incomer2_Locked = Incomer2_Open & Incomer1_Closed

Note that ExternalLock is a normally closed input, leading to following wiring for locking incomer1



Same scheme then is applied for Incomer2

Wire VD23 to SC110 input if relevant

VD23 MV voltage presence output relay is connected to SC110 Digital Input1

(if SC110 DI1 is already in use, any other input may be selected : see 2.6.7 for associating corresponding communication object to automatism)

Wire ATS100 dedicated inputs

ATS100 dedicated DI	Wiring cases
DI5 **S1_Voltage_presence**	To be wired to Flair23DM or VD23 MV Voltage Presence Output relay only if quick transfer performance is required.
DI6 **S2_Voltage_presence**	To be wired to Flair23DM or VD23 MV Voltage Presence Output relay only if quick transfer performance is required.
DI7 **Parallel_connection_authorized**	Not wired if closed transition not used. Then any parallelism of the two incomers is forbidden. Else if using closed transitions: - To be wired to external synchronisation source if any - May be strapped if no external authorization needed
DI8 **Transfer_locking**	May be optionnally wired to any external locking source

Refer to ATS100 product user manual

Wire ATS100 dedicated outputs

ATS100 dedicated DO	Wiring cases
DO3 **Transfer in progress**	On customer requirement
DO4 **S1_OR_S2_ Available**	On customer requirement, e.g to reduce transfer waiting time of another downstream ATS

Refer to ATS100 product user manual

Configure ATS settings

Please refer to ATS100 User Manual

⚠ **Warning1 :** If no PS100, map power supply failure variables to a fake one always at “inactive“ value (to be created using calculation formula)

⚠ **Warning2:** There is no control of product variant and active protocol when loading configuration

Setting into operation

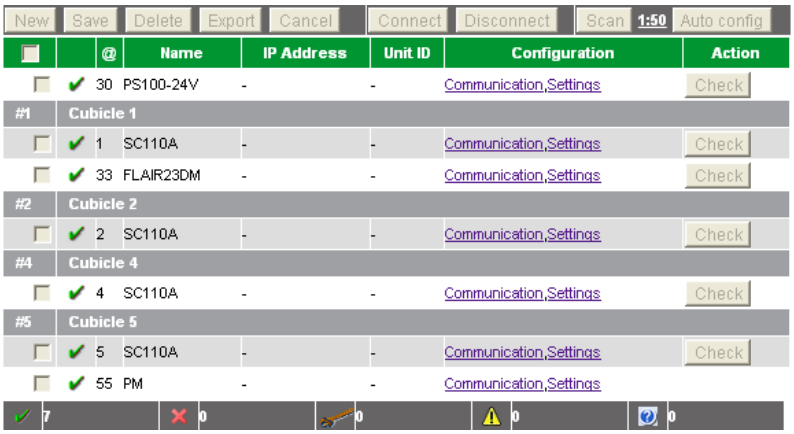
Connecting to remote clients

- Set communication ports & protocols (see R200 User manual)
- Set datamapping in SCADA

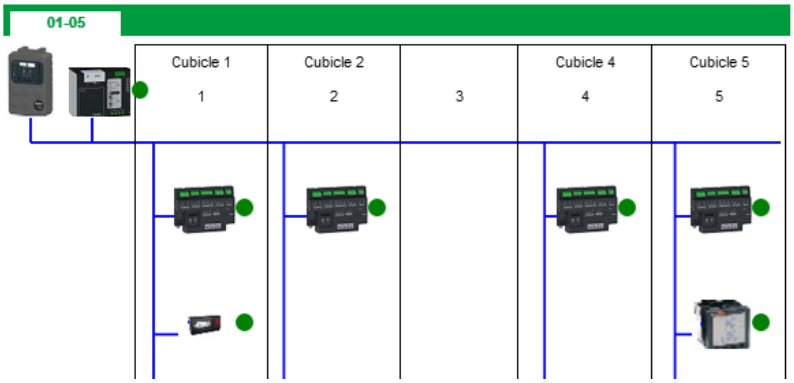
First level Checking

- All devices com LEDs are blinking
- All devices present on Device Page and Physical view. No major error
- Use check buttons on Device setting page to ensure relevant device is connected in relevant cubicle
- Single line view consistent, with realistic values.
- No data address conflict in System log
- Consistent values in Dataview
- Controls are operational
- No transmission error after end of configuration, especially no response counter = 0 (reset it once scan is completed)

Device setting



Physical view



See troubleshooting section for more details in case of issue.

Checking SCADA communication

See RTU User manual

- Check on SCADA that monitored data have consistent states&values compared to current states&values
- Use R200 “Check SCADA communication” variable
- Simulate commands to Easergy system to check that each SCADA control will activate the expected Cubicle

Managing configuration files

A system Configuration is the set of Device Configuration of all devices belonging to the System, including RTU.

Definitions:

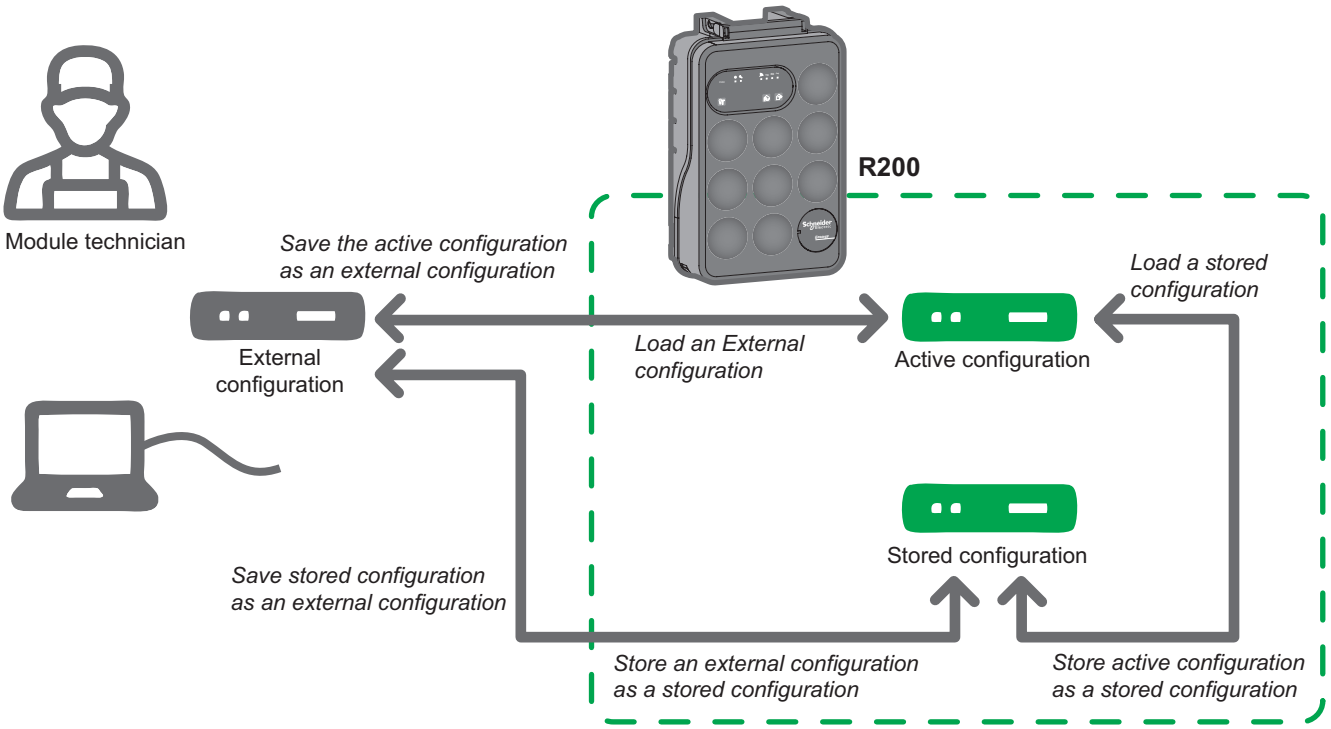
Name	Definition	Usage
Active Configuration	Set of active parameters&settings. Also called "System Current State"	System Operation. Changeable through setting menu Detect and analyse any change on the flow
Stored Configuration	Configuration stored within the System in non volatile memory, with a given identification	Local backup for easy restoring in case of error or issue Local reference to signal existence of changes to administrator
External Configuration	Configuration external to the System	Backup and archiving Offline preparation then loading into System

R200 supports 1 stored configuration, whatever its origin (active or external)

Note: Active parameters&settings of a Device may be hosted both in Device itself and a copy in RTU. We will consider that image in RTU is systematically synchronized with actual values in Device after any change (not considering transitory phases). At any reconnection between RTU and Devices, RTU copy is updated with Device actual values.

Therefore “Device Active Configuration” refers to the active parameters&settings, independently of their physical location.

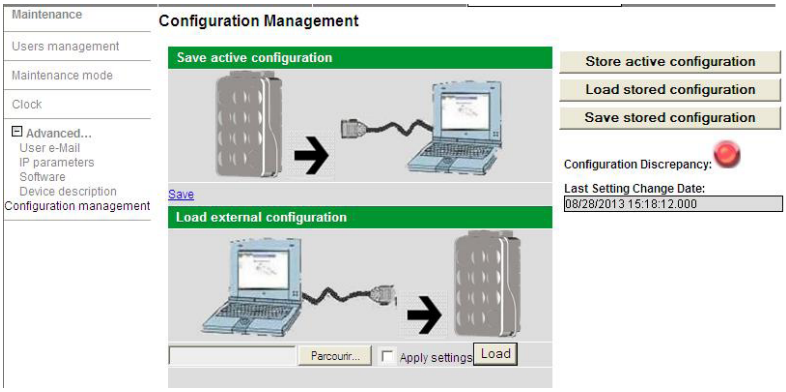
Setting into operation



System Administrator may

- Store active configuration permanently on R200
- Store external configuration permanently on R200
- Load stored configuration as active configuration
- Load an external configuration as active configuration
- Save stored configuration as external configuration
- Save active configuration as external configuration

Goto webserver Maitenance/Configuration view



Refer to R200 user manual for detailed for more detailed information

When loading a configuration, RTU will check consistency with actual devices present in active configuration

Discrepancy case	Behaviour
Missing device	Device is displayed as absent on Physical view and DeviceList
Additional device not in loaded configuration	Active configuration overwritten. Device disappears from new configuration
Device at a given address with unexpected device_type	Device is displayed at start of device list with warning, no polling User shall change device address or confirm, selecting a description file. Data related to previous device type is erased.
Device at a given address with expected device_type but different identification	display warning & propose to confirm replacement by selecting a new description file, no polling (probably different mapping)
Device with same version, no serial number in configuration file	RTU starts polling, and registers serial number
Device with different serial number than expected but same version	RTU starts polling, and updates serial number
Device with different version than expected, no version in configuration file	See below

When R200 connects a slave, it will check the actual identification with what has been configured
* If the version information is compatible (product code, PPID and revision), R200 willl update the identification (in case of serial number or minor revision change) in configuration file without user confirmation. Other parameter such as device communication, function and variables will not be modified.
* If there is a conflict in identification checks, R200 will not poll the slave but wait for user to resolve it in Web HMI.

When resolving the conflict, user could choose to apply a new description file or keep current configuration. (R200 proposes selection among list of description files with matching product code)

* If applying a new description file, all existing configuration (communication settings, functional settings, variable) will be replaced by the content of description file
* If keeping current configuration (select “-”), only the identification will be updated (to get out of the conflict situation) and everything else is kept.

Troubleshooting

For individual function (e.g. Fault Passage indication, Protection, Measurement, Voltage Detection, Metering, …) refer to relevant product documentation and to Premset general documentation (protection chain, measurement chain, …)

This section deals on issues addressing some system aspects.

Communication with slave devices

Symptom	Potential RootCause	Guideline	Refer to …
No com with PM800	"Common" not wired, or Data signals inverted (as documented in System guide, in contradiction to PM guide)	Check wiring on PM side and when changing from RJ45 to open style Check baudrate and transmission parameters	Section “Setting Into Operation” + PM800 installation manuals
No com with Sepam through ACE949	"Common" not wired or Data signals inverted (as documented in System guide and ACE)	Check wiring on ACE side and when changing from RJ45 to open style Check baudrate and transmission parameters	Section “Setting Into Operation” + Sepam installation manuals
No com with some devices	Termination and polarization	Check Line Termination and Line polarization are activated on R200 Check second line termination Check there is no more than 2 line terminations (including R200)	Section “Setting Into Operation” + Device installation manuals
	Cabling error	Check daisy chain cabling Check com LEDs Disconnect part of the System to locate fault	Section “Setting Into Operation” + Device installation manuals
	Transmission parameters have changed	Check parameters on PM & Sepam Shutdown SC110, VIP, PS100 then on again Check autogo is activated on VIP & Flair23DM	Section “Setting Into Operation” + Device installation manuals
	Transmission parameters not supported by all devices : no parity	Stick to default parameters Avoid using “no parity” setting	Section Setting Into Operation
	Device not supplied	Check device is ON	Device manual
No com with any device (no com LED blinking on devices)	Cabling error	Check Modbus cable is well connected on R200 Check with only 1 slave	Section Setting Into Operation
2 devices absent or not detected during scan (LED com blinking)	Two devices at same address	Scan again Recheck cubicle number and slave address	Device manual
Error rate		Check R200 counter. Check slaves state table. Check EventManagement characteristics for each slave (else reading event table leads to exception messages. Use Modbus traces to detect device involved	R200&device user manual
Exception message2 at init time	2 attempts to identify PM in regular then basic mode	Normal behavior Check counter is not incrementing once initialization phase is completed	
Exception message2 at init time	Addressing error	Identify involved slave in Modbus traces Adjust configuration	Device manual
Exception message3 at init time	attempt to identify PM in extended mode	Normal behavior Check counter is not incrementing once initialization phase is completed	
Exception message1	Configuration error	Identify involved slave in Modbus traces Adjust configuration	R200&device user manual
Exception message2 (periodical)	Slave with wrong event management protocol declared	Adjust event management protocol in setting/device/ communication page	R200&device user manual
Exception message2	Slave with time synchro activated when not supported, or at another address	Adjust time synchro protocol in setting/device/ communication page	R200&device user manual
No more communication with a device	Device deactivated (set OFF)	Check device status on device list	
	Device in failure	Replace device	
	Device disconnected or not supplied anymore	Check if device is ON and communication LED active. If issue, recheck cables	

⚠ **Warning:** Embedded IEDs support Autogo mechanism and don’t need change of transmission parameters. Taking into account new parameters require a power cycle, and sufficient traffic on bus. This is ensured by R200. However if trying to connect to a device outside the system with another master, make sure there is enough traffic to enable device to detect new parameters (refer to each device documentation)

Symptom	Potential RootCause	Guideline	Refer to …
Data not in line with actual position or measurements in dataview	Configuration error, Slave not in expected cubicle	Use Module Check	
	Configuration error for some variables created/adjusted manually	Recheck variable definition	
Data not in line with actual position or measurements in singlelineview	Configuration error, singlelineview signals not linked to intended variable	Check also Dataview. If failure also, see above. Else check Singlelineview settings	

Cubicle control at cubicle level

Symptom	Potential RootCause	Guideline	Refer to …
SC110 signalling control failure	Some contact not connected (locks)	Check all contacts cabled, add straps if necessary	SC110 manual
	Motor wrong connection	Move connector at motor level and check if LED status changing check detailed status information on com version	SC110 & MV equipment
	Coil wrong connection	Move connector at coil level and check if LED status changing check detailed status information on com version	SC110 & MV equipment
	No motor power supply connected or motor supply disabled	Check connection Check position of motor supply selector if any	SC110 & MV equipment
Not possible to open or close, SC110 signalling switchgear not ready	Remote position	Check local/remote	SC110 & R200 user manuals
	Cubicle is earthed	Check earth switch position	MV Equipment
	Switchgear not ready (external locked)	If some external lock condition is wired, check if it is active. Else make sure contact is strapped	SC110 & MV equipment
	Switchgear not ready (internal lock)	Check if cubicle is in-line (Premset) Check if Cable compartment is closed	SC110 & MV equipment
No rearming of OCO/CI2 Cubicle	Motor Failure	Replace Motor	SC110 & MV equipment
	SpringCharge Contact failure	Contact =S= Services	SC110 & MV equipment
SC110 Maintenance key lit at power up, cubicle state change long to display on HMI, com ok	Bad setting for Voltage range	Make sure to raise the last SC110 setting switch when supplying with 48V or 230V	SC110 user manual

Cubicle control at system level

Symptom	Potential RootCause	Guideline	Refer to …
Not possible to open or close, switchgear not ready for remote command	Local position	Check local/remote position at system and cubicle level	MV Equipment R200 user manual
	Cubicle is earthed	Check earth switch position	MV Equipment
	Switchgear not ready (external locked)	If some external lock condition is wired, check if it is active. Else make sure contact is strapped	SC110 manual
	Switchgear not ready (internal lock)	Check if cubicle is in-line (Premset) Check if Cable compartment is closed	SC100 & MV equipment
	SpringCharge Contact failure	Contact =S= Services	
SC110 signalling control failure	See Cubicle control at Cubicle level	See Cubicle control at Cubicle level	
Control successful but no visible result	Configuration error	Check singlelineview configuration	R200 user manual
	Control not significant in current conditions	Refer to device documentation	Target device manual

Troubleshooting

ATS

Symptom	Potential RootCause	Guideline	Refer to …
Automatism always locked	Singlelineview "24/48V failure" not linked	Connect signal to PS100 xV Failure signal. If no PS100, link signal to a virtual "Inactive" data	R200 user manual
Automatism always locked (Major fault & battery fault signalled)	Battery Fault Ongoing	Connect Battery	PS100 manual
Automatism always locked	Configuration error	Check Automatism settings especially Right switchgear data for each switchgear Right Voltage presence sources	ATS user manual
Automatism locked	"24/48V failure"	Clear fault condition, reset PS100	PS100 Manual
	Electrical Fault	Clear Fault on Flair or protection relay or CB if fault condition is over	FPI, Relay or MV equipment
	Both voltages lost if configured to lock	Check operating conditions	ATS user manual
	Both incomers open	Switch to 1 of the 2 incomers manually	ATS user manual
	Behaviour = "no return", loss of normal source	Normal behavior : ATS locks itself after transfer to backup	ATS user manual
	Switchgear not ready for remote command	Check operating conditions : switchgear earthed or no in line, front door open, motor supply cut, cubicle in local mode	Premset and SC110 manual
	Digital input "transfer lock" active	Check operating conditions	User manual
	Changeover aborted	Reset ATS after clearing failing cause	User manual
Manual commands on HMI not operational	ATS in REMOTE mode	Set ATS in LOCAL mode	User manual
	ATS automatism is ON	Set Automatism OFF	User manual
Manual commands to select ATS behavior not operational	HMI behavior change is disabled	Enable or disable HMI behavior change depending on Customer requirement	User manual
Return to normal position with power loss	Closed transition not enabled	Enable or disable closed transitions depending on Customer requirement	User manual
	Closed transition not allowed by enabling input	Normal if input not connected neither strapped Check Event log if input is connected to external circuitry (e.g. synchro check) : verify DI status changes at transfer time	User manual

Communication with SCADA

See R200 User manual and protocol documentation

Symptom	Potential RootCause	Guideline	Refer to …
Read requests rejected	External address control activated on R200 results in strict control	If optimizing polling by reading undeclared objects, disable external address control	R200 Protocol documentation
Write request rejected	Other command ongoing	Check log to confirm root cause. Retry command after end of ongoing command.	R200 Protocol documentation
R200 IP address unknown	Change not memorized by user	Default address out of factory is 172.16.0.5 If IP address has been assigned previously, establish USB connection to retrieve it	R200 user Manual

Data update

Symptom	Potential RootCause	Guideline	Refer to …
Unexpected data value	Configuration error	Beware on variable format (16/32 bits) For 32 bits values, PM800 provides data LSB first	R200 user manual
Data not refreshed when it should change	Modbus slave address configuration error	Check R200 traces Check Variable definition	R200 user manual
	Variable address configuration error	Check R200 traces Check Variable definition Some Modbus devices document register tables with register identifier instead of variable address, starting at 1 => then withdraw 1 to set corresponding variable address in RTU.	R200 user manual
How to capture data addresses ?		Data addresses shall be captured in decimal. When value is changed, resulting hexadecimal address is displayed	R200 user manual
Which register addresses to use for PM800, which difference between JBUS and Modbus protocol setting?	PM800 proposes two modes	Use MBUS mode	PM800 user manual

Troubleshooting

Event Management

Symptom	Potential RootCause	Guideline	Refer to …
Event loss event	RTU has lost connection to a slave device, and a lot of events occurred inbetween	Be aware that some events have been lost	
Event loss event using "legacy" protocol	SCADA has not communicated with RTU for a very long time, and a lot of events occurred inbetween	Be aware that some events have been lost	R200 protocol documentation

Web server

See R200- ATS100 user manual

User & access control Management

See R200- ATS100 user manual

Power Supply

Symptom	Potential RootCause	Guideline	Refer to …
How to supply ACE949. May I use PS100-12V	Sepam requires a floating power supply for communication	No, use a dedicated floating power supply.	Sepam installation manual
ACE949 shortcircuit	ACE949 does not support 48V	No, use a dedicated floating power supply, 12V or 24V.	Sepam installation manual
PS100 24/48V led blank, 12V ON	Overload on Motor supply output	Max PS100 capacity exceeded, add another PS100	PS100 manual
PS100 24/48V led blank + maintenance LED blinking on	ACE949 shortcircuit	Check if 24/48V output is in shortcircuit	
AC fault error on PS100, all PM down	230V input is down	Check 230V incomer CB	

Technical features

Features

Supported cubicle functions

Following functions are supported and automatically configured per default at system level:

Function	Associated device
Protection	VIP410
Measurement	VIP410, PM800, Flair23DM
Switchgear Control	SC110
Fault Passage indication	Flair23DM
Voltage detection	Flair23DM, VD23

Additional functions may be supported by interfacing and declaring devices providing the relevant variables, e.g Energy Metering (ION Meter, any pulse counter), higher protection level using SEPAM protection relays …

Supported object types

Easergy C&M System supports following object types for applicative variables:

Object type	Designation	Comment
SPS	Single Point Status	
DPS	Double Point Status	
SPC	Single Point Control	Possibly associated to an SPS
DPC	Double Point Control	Possibly associated to a DPS
MV	Measured Value	On 16 and 32 bits
APC	Analogue Point Control	
INC	Integer Control	(used for presettable counters)

In addition, System supports following object types for applicative settings of integrated devices:

Object type	Designation	Comment
Setting16	16 bits setting	Used for analogue, integer, enumerated or Boolean settings
Setting32	32 bits setting	Used for large range analogue settings

Mapping of these objects to remote communication is protocol dependent. Refer to specific protocol appendixes.

Technical Features

Supported communication features to SCADA

Protocols supported:
- IEC870-5-101
- IEC870-5-104
- Modbus
- Modbus/IP
- DNP3
- DNP3/IP

Media supported:
- GSM/GPRS, 2G/3G
- PSTN
- Radio
- RS485/RS232
- RS232

Refer to R200 user manual for more details

Supported Web communication features

Easergy C&M System supports following Web communication features:
- Clock synchronization through SNTP
- SMS on GSM
- Web pages and Emails on media with IP protocols
- File exchange on media with IP protocols (http, https)

Supported slave devices

Embedded IEDs: PS100, SC110, VIP410, Flair23DM, PM800
Linked IEDs : Sepam range

Miscellaneous IEDs : Modbus SL conformant devices supporting 38400 bits/s baudrate and ensuring max response time < 25ms.
Interfacing other conformant devices by reducing bus speed or with higher response time is not recommended and would significantly decrease system performance.

Check in any case following points:
- Minimal Master interframe time if any
- Consumption
- Clock&event management
- Supported Modbus Slave Address range
- No impact on reception of write request at Modbus@ 2 to 5 (used for broadcast)

Embedded description files

RTU embeds a version of description file for main variants of devices listed as “integrated devices” in English UK language

Additional files may be loaded into RTU (other languages, most recent versions, …)

Most recent ones may be found on www.schneider-electric.com.

Technical Features

Supported languages

Default language is English UK.

In addition following languages are supported by main system devices

- French
- Chinese
- Spanish

More languages may be available for a given device (refer to relevant user manuals)

Contact =S= Services for description files in different languages

Web User access control

Feature	Value
Number of access levels	Provides 3 access levels : Administrator, Operator, Monitoring
Authentication protocol	PAP, CHAP, MSCHAP, MSCHAPV2

Dimensioning

Feature	Max
Nb of slaves on core system bus	32
Nb of slaves on Ethernet interface bus (including slaves behind EGX gateways)	10
Nb of slaves (total)	42
Nb of slaves behind an EGX	8
Nb of cubicles	29
Nb of breakers	8
Nb of variables	2000
Nb of description files	30
Logfiles size (max number of events)	
Event Log	10000
Alarm Log	2000
Measurement log	50000
System Log	6000

Performances

Time performances

Time performances are only warranted for the standard architecture (see Chapter “Communication Architectures”).
The standard architecture is constituted by one RTU, one Core Bus Equipment and several Modbus modules.

Time performances are warranted when the Modbus modules present on the Core System bus belong to Integrated Communicating Module type.

Table, hereafter, gives the maximum standard architectures (by type and number) for which C&M System shall comply with time requirements:

N°	Modules	Type of Substation
1	16SC110 + 16 Flair23DM (*)	SWL
2	16SC110 + 8 Flair23DM+ 8 VIP410 Protection relays (*)	SWL
3	8 Flair23DM + 4 PM800 + 4VIP410 + 12SC110 + PS100	SWL
4	ATS-ACO 2 LBS, 1 CB => 3 SC110, 2 Flair23DM, 1 VIP, 1 PS100	ATS1/2 DRM
5	ATS-BTA 3 LBS 4 CB => 7 SC110, 2 Flair23, 4 VIP410, 1 PS100	ATS2/3 DRL

(*) It is assumed that such large configuration will use more powerful power supply so no PS100 is included. If user wants to use 2 PS100, then number of cubicles will be reduced to 15.

For respecting the ATS functionality requirements, the RTU only manages SC110, Flair 23DM, VIP410 and PS100 on the Core System bus.

Functionality	Item	Typical time	Max Time	Comment
Install & Configure	☑ Scan present Modules over whole address range	30s	<60s	With Default settings
Ensure Automatic Source Transfer	☑ Delay before permutation, checking stable conditions	100ms to 2mn	100ms to 2mn	Adjustable, default value 1s
	☑ Execute first Open/Close command : From end of permutation delay up to motor start.	< 100ms	< 300ms	OCO cubicle
	☑ Whole changeover time on an MV Equipment limited to 2 cubicles, with 40ms opening/closing duration : Voltage presence hardwired (case of Building)	500 ms	Mean value < 500ms	OCO cubicle
	☑ Whole changeover time on an MV Equipment limited to 2 cubicles, with 40ms opening/closing duration : Voltage presence by bus (case of Utilities)	1s	< 2s	OCO cubicle
Control MV Equipment	☑ From command reception on RTU up to motor start or coil supply (Not applicable when antireflex is activated : in this case, 4s min time between close and open)	< 100 ms	< 1s	
	☑ Execute a state change order :	< 20ms	< 100ms	
	Time between Electrical command through binary input (change of state of SC110 input signal) and motor start			
	☑ Anti reflex : Minimum time between end of execution of Close Command and reception of Open Command	> 4s	> 4s	normative for switches
	☑ Miscellaneous commands from Web or remote communication From reception of order to feedback Reset Trip or Fault passage indication, Set/Reset Counters, Enable/Disable function, Activate/deactivate output…	< 1s	< 1s	

Technical Features

Functionality	Item	Typical time	Max Time	Comment
Local HMI commands	☑ Reset Fault passage indication ☑ Reset Trip indication ☑ Enable/Disable automatisms From user action to feedback	500ms	< 1s	
Manage Events & Alarms	☑ Granularity for Event Timestamping	1ms	1ms	
	☑ Clock synchronization period for C&M Modules	30s	30s±2s	
	☑ Drift on one module, between 2 synchronizations by RTU	< 1ms	< 5ms	
	☑ Detect Trip information (SDE) and record it in the module	< 10ms	< 10ms	Timestamped event generated
	☑ Discrepancy capability for most critical events (Trip Event, Fault Passage Indication)	50 ms	< 100ms	
	☑ Detect Switchgear state change (poles positions) and record it in the module	< 10ms	< 20ms	Timestamped event generated
	Collects 20 events distributed on 5 modules within 1 mn without event loss	<5s	< 1mn	
	Bus occupancy rate	variable	<80%	Max conf
Provide Database	☑ Period for measurement and I/O cyclical reading	2s	<10s	
	☑ Time between an effective state of change up to updated state :			
	□ on RTU	< 1s	< 1s	
	□ on Web server (when no other event in the System)	< 3s	< 3s	
Ensure System Maintainability	☑ System initialization time at power-up (from power-up to signalling to local user)	60s	60s	
	☑ Time to detect 1 single absent module	5s	10s	
	☑ Time to detect reappearing modules	30s	3mn	

Maximum consumption

When supplied by PS100:
■ Total system consumption remains under PS100 max capability. See PS100 specification

POWER SUPPLY		PS100-24 V ⎓	PS100-48 V ⎓
Input ∿ voltage	Rated	110 to V ∿, +10%, -15% 110 ⎓, +20%, -20%	
	Limits	380 V ∿ ⎓	
	Protection	By electronic against reversal polarity and over voltage. Automatic restart after fault.	
Output ⎓ voltage	Voltage	24 V⎓ +10%	48 V⎓ +10%
	Current	4 A rated 16 A for 15s, 25 A peak for 50 ms	2 A rated 8 A for 15s, 17 A peak for 50 ms
	Power	90 W rated with/without battery 300 W (1 mn) with battery only	90 W rated with/without battery 300 W (1 mn) with battery only
	Protection	By electronic against overloads and short cicuits. Automatic restart after external fault.	
	Limits	Without battery total ouputs are limited to 90 W.	
	Redundancy	2 units may be connected in parallel to increase availabillity.	
Output12 V⎓ radio	Voltage	12 V⎓ -10%, + 25%	
	Current	1.5 A rated 8 A 20 s	
	Power	18 W / 100 W 20 s	
	Protection	By electronic against overloads and short cicuits. Automatic restart after external fault.	
	Limits	A limitation, dedicated for radio units, is set up to avoid the battery discharge: 3 A in emitting mode for 3 mn.	

Max power consumption per module:

Module	Low power mode	Max power	Assumptions for low power mode
VIP410	3 W	3 W	1 active relay only (watchdog). External inputs active open. Backlight Off. Modbus com active at 38.4kbits/s
Flair23DM	1 W	1 W	1 relay active (voltage presence) Modbus com active at 38.4kbits/s
VD23	1 W	1 W	1 relay active (voltage presence)
SC110	1,5 W	1,5 W	1 relay active Modbus com active at 38.4kbits/s HMI module connected
R200&ATS	4 W	6 W	I/O active, GSM modem (max when looking for network)
Cubicle motorisation	0w	300 W	1 at a time, during 15s max
ESL&associated coil	1 W	1 W	

Autonomy (typical)

Substation type	Equipment type (motorized cubicles)	Typical Autonomy with 38Ah battery, at 25°C
Utility (RMU)	4LBS => 4 SC110, 4 Flair23DM, 1 PS100, 1 R200	16h
Utility (Delivery on MV Loop)	4LBS, 1CB => 5 SC110,4 Flair23DM, 1VIP410, 1 PS100, 1 R200	12h
Utility (Large Switching Substation)	8 LBS, 4 CB => 8 Flair23DM, 4 PM800, 4VIP410, 12SC110, 1 PS100, 1 R200	8h
ATS ACO 1/2 (Normal/Backup)	2 LBS, 1 CB => 3 SC110, 2 Flair23DM, 1 VIP, 1 PS100, 1 ATS-ACO	16h
ATS BTA 2/3 (Bus Tie Automation)	3 LBS, 4 CB Feeder => 7 SC110, 2 Flair23DM, 4 VIP410, 1 PS100, 1 ATS-BTA	10h

RMU : Ring Main Unit; LBS : Load Breaking Switch; CB : Circuit Breaker

[2] Excluding devices powered directly through an other source, e.g. PM supplied by 230V

Environmental

All integrated devices of Easergy C&M System achieve minimal requirements as follows :
Please note that some requirements depend on physical location of device (e.g. RTU out of MV Equipment)
However
- stronger requirements may be supported in practice for a given device
- some requirements are lower for some devices in specific cases

=> Refer to each device user manual for accurate data, following data is purely indicative only

ElectroMagnetic Compatibility

Emission			
Requirements characteristics	**requirement standard**	**level**	**Value / Comment**
radiated disturbances	CISPR22	A	
	CISPR16	(2)	For IACS requirement
conducted disturbances	CISPR22	A	
	CISPR16	(2)	For IACS requirement
	IEC61000-3-2		For PS100 only - Harmonic emission
	IEC61000-3-3		For PS100 only - flicker emission

Immunity			
Requirements characteristics	**requirement standard**	**level**	**Value / Comment**
radiated radio frequency fields	IEC 61000-4-3	3	10V/m; 80 MHz-2,7GHz
	IEC 60255-22-3 (1)		10V/m; 80 MHz-1 GHz; 1,4 GHz-2,7GHz
	IACS – E10		10V/m; 80 MHz-2 GHz
electrostatic discharges	IEC 61000-4-2	3	8kV air, 6 kV contact
	IEC 60255-22-2 (1)		
	IACS – E10		8kV air, 6 kV contact
magnetic field at power frequency	IEC 61000-4-8	4	30A/m continuous; 300 A/m 1 - 3s
conducted RF disturbances	IEC 61000-4-6	3	10V CM; 0,15-80 MHz
	IEC 60255-22-6 (1)		10V CM; 0,15-80 MHz
	IACS – E10		3V CM; 0,15-80 MHz
conducted low frequency	IACS – E10		**AC:** Frequency range: rated frequency to 200th harmonic; Test voltage (rms): 10% of supply to 15th harmonic reducing to 1% at 100th harmonic and maintain this level to the 200th harmonic, min 3 V r.m.s, max 2 W. DC: Frequency range: 50 Hz - 10 kHz; Test voltage (rms): 10% of supply max. 2 W
fast transients bursts	IEC 61000-4-4 (3)	4	4KV CM; 5kHz , 100kHZ
	IEC 60255-22-4 (1)		
	IACS - E10		2kV on power, 1kV on I/O - 5kHz - 5mn
slow damped oscillatory waves	IEC 61000-4-18	3	2,5 kV CM, 1 kV DM, 100kHz & 1MHz
	IEC 60255-22-1 (1)		
fast damped oscillatory waves	IEC 61000-4-18	3	3MHz, 10MHz, 30MHz, 2kV CM
ring waves	IEC 61000-4-12	3	100kHz, 2kV CM, 1kV DM
immunity to power frequency (logic inputs)	IEC61000-4-16		300V CM, 150 V DM
surges	IEC 61000-4-5		See "Application examples"
	IEC 60255-22-5 (1)		
	IACS – E10		1kV MC, 0,5kV MD

(1) standard required only for protection relay.
(2) For equipment installed in the general power distribution zone
(3) For RTU, 4kV on mains, 2kV on RS485&Ethernet and logical I/Os, 1kV on GSM/GPRS antenna

Appendixes

Climatic

Requirements characteristics	requirement standard	level	Value / Comment
In operation			
exposure to cold	IEC 60068-2-1	Ad	- 40°C; 96h
exposure to dry heat	IEC 60068-2-2	Bd	+70°C; 96h
exposure to damp heat	IEC 60068-2-78	Cab	93% RH, 40°C, 56 days , without condensation
temperature variation	IEC 60068-2-14	Nc	Temperature in operation -40°C +70°C 96 hrs of operation Starting at -40°C
damp heat cyclic test	IEC 60068-2-30	Db	2x12h (25°C-55°C), 6 cycles, 93-95%RH, with condensation
In storage			
exposure to cold	IEC 60068-2-1	Ab	- 40°C; 96h
exposure to dry heat	IEC 60068-2-2	Bb	+70°C; 96h
exposure to damp heat	IEC 60068-2-78	Cab	93% RH, 40°C, 56 days without condensation
temperature variation	IEC 60068-2-14	Nc	–40°+70°C, transfer time 10°C/mn
Corrosive atmosphere			
salt mist	IEC 60068-2-52	Kb / 1	4 cycles: spray period of 2 hours with 7 days storage
2 gas test	IEC 60068-2-60	Ke	method 1; 0,5 ppm H2S; 1 ppm SO2

For condensating environments within MV Equipment, insert a warming resistor to avoid any water drop along cables.

Mechanical

Requirements characteristics	requirement standard	level	Value / Comment
In operation			
vibrations	IEC 60255-21-1	2	1Gn; 9-200Hz ; 1 cycle
	IACS – E10		According to IEC60068-2-6 test Fc
shocks	IEC 60255-21-2	2	10Gn; 11ms; 3 pulses
earthquakes	IEC 60255-21-3	2	2Gn horizontal, 1Gn vertical
vibration	IEC 60255-21-1	2	2 Gn; 10-150Hz; 20 cycles
shocks	IEC 60255-21-2	2	30Gn; 11ms; 3 pulses
jolts	IEC 60255-21-2	2	20Gn; 16 ms; 1000 pulses

Enclosure protection		**level**	
protection against penetration of foreign objects	IEC 60529		Front plate : IP41
			Inside the cubicle : IP30
front plate robustness	IEC 62262	IK7	2 joules
packaging			
fall Inside packaging	IEC68000-2-32		1m / 6 faces / 4 angles

Safety

Requirements characteristics	requirement standard	level	Value / Comment
general	IEC61010		
dielectric withstand at power frequency (3)	IEC61010		Voltage level is module dependent 10kVrms for PS100
	IACS-E10		2kV 50Hz or 60Hz
impulse wave (3)			20kV for PS100
insulation resistance	IACS-E10		500V CM & DM / R>100MΩ B; R>10MΩ A
protective bounding continuity			12V , <12Ω, 60sec
thermal short time			25kA/1s and 1,1In perm. for VIP410
fire resistance - Extinguibility	IEC 60695-2-11 IEC 60695-2-10		850°C

(3) standard IEC61010 require only one of the two tests, dielectric withstand or impulse wave.

Power supply

<table>
<tr><th>Power supply</th><th>Standard</th><th></th><th>value</th></tr>
<tr><td>ripple on DC</td><td>IEC 61000-4-17</td><td></td><td>15%; 100-120Hz;
criteria A</td></tr>
<tr><td>voltage dips</td><td>IEC 61000-4-11
IEC 61000-4-29</td><td></td><td>100ms; 0% criteria must be detail in the verification plan according to the product (example : criteria A for protection relay and criteria B for SC110)</td></tr>
<tr><td>reversal of DC</td><td>IEC60255-11 (1)
IEC61010</td><td></td><td>Test method according to IEC60255-11 standard can be apply for all products</td></tr>
<tr><td>Power supply variation</td><td>IACS – E10</td><td></td><td>AC SUPPLY
<table><tr><td>Combination</td><td>Voltage variation permanent %</td><td>Frequency variation permanent %</td></tr><tr><td>1
2
3
4</td><td>+6
+6
-10
-10</td><td>+5
-5
-5
+5</td></tr><tr><td></td><td>Voltage transient 1,5 s %</td><td>Frequency transient 5 s %</td></tr><tr><td>5
6</td><td>+20
-20</td><td>+10
-10</td></tr></table>
DC SUPPLY
<table><tr><td>Voltage tolerance continuous</td><td>± 10%</td></tr><tr><td>Voltage cyclic variation</td><td>5%</td></tr><tr><td>Voltage ripple</td><td>10%</td></tr></table>
Electric battery supply:
- +30% to –25% for equipment connected to charging battery or as determined by the charging/discharging characteristics, including ripple voltage from the charging device;

- +20% to –25% for equipment not connected to the battery during charging.</td></tr>
<tr><td>External power supply failure</td><td>IACS-E10</td><td></td><td>3 interruptions during 5 minutes
Switching-off time 30s each case</td></tr>
</table>

(1) standard require only for protection relay.

Appendixes

Generic Data mapping

This section provides generic list of variables, as built per default when using automatic configuration based on identified devices.

List of objects appears as displayed on Webserver

This section also defines addressing spaces for recommended mapping. Same principles apply for IEC101, IEC104, DNP3 and Modbus protocols. Refer to specific protocol appendixes for more details.

If changing whole mapping, please pay attention to strictly reserved areas

Easergy C&M System supports following generic object types for applicative variables

Object type	Designation	Comment
SPS	Single Point Status	
DPS	Double Point Status	
SPC	Single Point Control	Possibly associated to an SPS
DPC	Double Point Control	Possibly associated to a DPS
MV	Measured Value	On 16 and 32 bits
APC	Analogue Point Control	On 16 and 32 bits
INC	Integer Control	On 16 and 32 bits (used for presettable counters)

Data coding

Format used

Apart from exceptions mentioned in the text, data is coded in one of the formats below:

- 32S: signed value, coded on 32 bits
- 16S: signed value, coded on 16 bits
- B: bit or set of bits

32S Format

Flair 2xD does not support 32-bit measurements. This format is only valid for the counters.

In 32S format, the first word is the most significant.

An incalculable value, whether invalid or outside the authorized range, is fixed at 2147483648 (80000000h).

16S Format

An incalculable value, whether invalid or outside the authorized range, is fixed at 32768 (8000h).

MSOI ▸ LSOI ▾	3072	C00h
0	49152	C000h
1	49153	C001h
2	49154	C002h
3	49155	C003h
4	49156	C004h
5	49157	C005h
6	49158	C006h
7	49159	C007h
8	49160	C008h
9	49161	C009h
10	49162	C00Ah
11	49163	C00Bh
12	49164	C00Ch
13	49165	C00Dh
14	49166	C00Eh
15	49167	C00Fh

OI correspondance example, in decimal and hexadecimal notation

Access to data through remote communication

Depending on protocol, addressing is organised by object type, object class (e.g. DNP3, IEC101/104) or register organization (e.g. Modbus).

When organized by type/class, addressing space is specific to each type/class, and usually may accept a 32 bit coding

So default mapping has been organized around using 1 single 64k addressing space coded on 32 bits.

Gaps are ensured to reserve address space corresponding to datasize for register oriented protocol.

First 4k part of this space is itself expanded to a 64k addressing space used for binary information
This makes no difference for type/class oriented protocols as binary information corresponds to different object types/or classes.
This enables bit or word access for register oriented protocol.

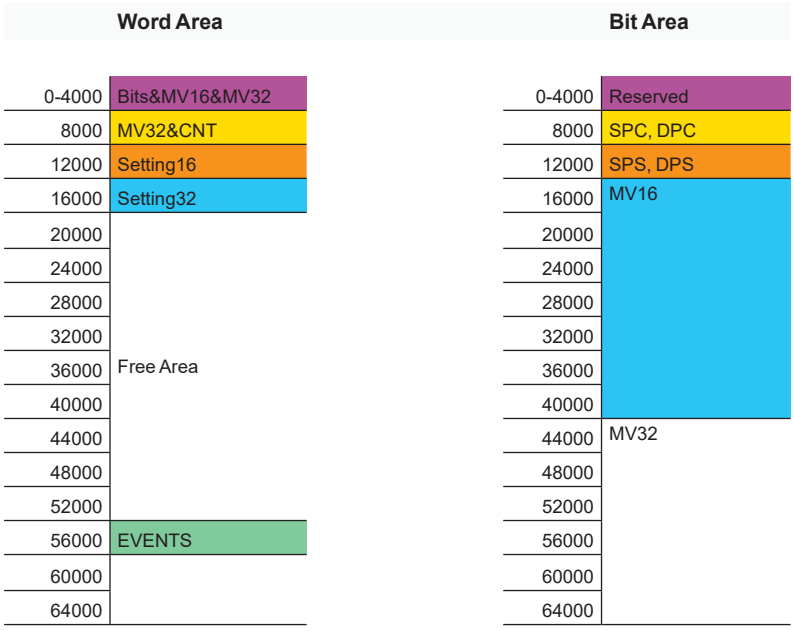
Identifying any object
Each object is identified by a 16 bit Object_Identifier (OI) coded on 16 bits, i.e. from 0 to 65535 (FFFFh).

In case of Binary objects, ObjectIdentifier is built of
- MostSignificantObjectIdentifier (MSOI) coded on 12 bits, from 0 to 4095
- LeastSignificantObjectIdentifeir (LSOI) coded on 4 bits, from 0 to 15

OI = MSOIx16 + LSOI

Only OI has to be considered for object oriented protocols
On Register oriented protocol:
- OI corresponds to bit address
- MSOI corresponds to word address
- Therefore when describing generic datalist, both OI&MSOI are indicated for binary information. MSOI is mainly indicated in decimal, as MSOI from OI in hexadecimal is obvious

Global mapping structure (register oriented protocols)



External mapping global overview (decimal)

Appendixes

Address areas	Object Type	Word Address Range (Decimal) MSOI	Word Address Range (Hexadecimal) MSOI	Bit Address Range (Decimal) OI if bit
RTU control information		**0 to 14**	**0000h to 000Eh**	
RTU SW version (numeric)	INS	0	0000h	
RTU Control Word	INS	1	0001h	16 to 31
Time Synchronization	Date&Time IEC	2 to 5	0002h to 0005h	
Reserved area		6 to 14	0006h to 000Eh	
Com SCADA protocol	**Configurable**	**15 to 399**	**000Fh to 018Fh**	
Event table for Modbus Legacy protocol (default)		15 to 47	000Fh to 002Eh	
Free area for comscadaprotocol		48 to 54	002Fh to 0036h	
CR code		55	0037h	
		56 to 254	0038h to 00FEh	
Selection word		255	00FFh	
…		256 to 399	0100h to 018Fh	
“Remote Control” area		**400 to 499**	**0190h to 01F3h**	**6400 to 7999**
Remote Control : assigned	SPC	400 to 429	0190h to 01ADh	6400 to 6879
Remote Control : User	SPC	430 to 449	01A0h to 01C1h	6880 to 7199
Remote Control : assigned	DPC	450 to 480	01C2h to 01F3h	7200 to 7695
Remote Control : User	DPC	481 to 499	01E1h to 01F3h	7696 to 7999
“Remote Informations” area		**500 to 799**		**8000 to 12799**
Remote Information : assigned	SPS	500 to 560	01F4h to 0230h	8000 to 8975
Remote Information : User	SPS	561 to 579	0231h to 0243h	8976 to 9279
Remote Information : assigned	DPS	580 to 610	0244h to 0262h	9280 to 9775
Remote Information : User	DPS	611 to 799	0263h to 031Fh	9776 to 12799
“Remote Metering” area		**800 to 6799**		
Remote Metering : assigned	MV16	800 to 2599	0320h to 0A27h	
Remote Metering : user	MV16	2600 to 2799	0A28h to 0AEFh	
Remote Metering : assigned	MV32	2800 to 6399	0AF0h to 18FFh	
Remote Metering : user	MV32	6400 to 6799	1900h to 1A8Fh	
“Counters” area		**6800 to 12399**		
Counters : assigned	INC32	6800 to 10411	1A90h to 28ABh	
Counters : User	INC32	10412 to 10799	28ACh to 2A2Fh	
Counters : assigned	INC64	10800 to 11999	2A30h to 2EDBh	
Counters : User	INC64	12000 to 12399	2EDCh to 306Fh	
“Settings” area		**12400 to 17199**		
Settings : assigned	SETTING16	12400 to 15309	3070h to 3BCDh	
Settings : User	SETTING16	15310 to 15599	3BCEh to 3CEFh	
Settings : assigned	SETTING32	15600 to 16527	3CF0h to 408Fh	
Settings : User	SETTING32	16528 to 17199	4090h to 432Fh	
“User” area				
Free area		17200 to 57343	4330h to DFFFh	
“Event Table” area according TI86				
Event Table (Default, 100 events)		57344 to 58545	E000h to E4B1h	
Reserved for event table extension		58546 to 61439	E4B2h to EFFFh	
Reserved – Manufacturer area		**61440 to 65535**	**F000h to FFFFh**	
Reserved area		61440 to 65535	4330h to DFFFh	

Never use these areas for remapping of user or applicative data.
Com Scada protocol information may be remapped within the dedicated area

Global mapping structure (object type oriented protocols)

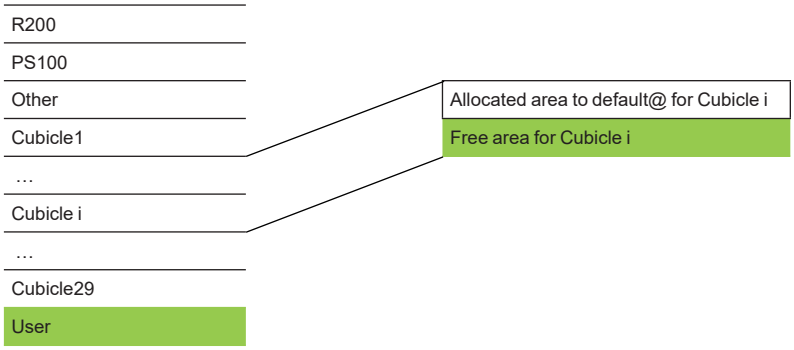
Mapping is then structured per object type. There is no relationship between addressing areas of different types

Address areas	Object Type	Word Address Range (Decimal)	Word Address Range (Hexadecimal)
RTU control information		**0 to 14**	**0000h to 000Eh**
RTU SW version (numeric)	INS	0	0000h
RTU Control Word	INS	1	0001h
Time Synchronization	Date&Time IEC	2 to 5	0002h to 0005h
Reserved area		6 to 14	0006h to 000Eh
Com SCADA protocol	**Configurable**	**15 to 399**	**000Fh to 018Fh**
Event table for Modbus Legacy protocol (default)		15 to 47	000Fh to 002Eh
Free area for comscadaprotocol		48 to 54	002Fh to 0036h
CR code		55	0037h
		56 to 254	0038h to 00FEh
Selection word		255	00FFh
…		256 to 399	0100h to 018Fh
“Remote Control” area		**6400 to 7999**	**1900h to 1F3h**
Remote Control : assigned	SPC	6400 to 6879	1900h to 1ADh
Remote Control : User	SPC	6880 to 7199	1A0h to 1C1Fh
Remote Control : assigned	DPC	7200 to 7695	1C2h to 1F3Fh
Remote Control : User	DPC	7696 to 7999	1E1h to 1F3Fh
“Remote Informations” area		**8000 to 12799**	**1F40h to 31FFh**
Remote Information : assigned	SPS	8000 to 8975	1F40h to 230Fh
Remote Information : User	SPS	8976 to 9279	2310h to 243Fh
Remote Information : assigned	DPS	9280 to 9775	2440h to 262Fh
Remote Information : User	DPS	9776 to 12799	2630h to 31FFh
“Remote Metering” area		**800 to 6799**	**0320h to 1A8Fh**
Remote Metering : assigned	MV16	800 to 2599	0320h to 0A27h
Remote Metering : user	MV16	2600 to 2799	0A28h to 0AEFh
Remote Metering : assigned	MV32	2800 to 6399	0AF0h to 18FFh
Remote Metering : user	MV32	6400 to 6799	1900h to 1A8Fh
“Counters” area		**6800 to 12399**	**1A90h to 306Fh**
Counters : assigned	INC32	6800 to 10411	1A90h to 28ABh
Counters : User	INC32	10412 to 10799	28ACh to 2A2Fh
Counters : assigned	INC64	10800 to 11999	2A30h to 2EDBh
Counters : User	INC64	12000 to 12399	2EDCh to 306Fh
“Settings” area		**12400 to 17199**	**3070h to 432Fh**
Settings : assigned	SETTING16	12400 to 15309	3070h to 3BCDh
Settings : User	SETTING16	15310 to 15599	3BCEh to 3CEFh
Settings : assigned	SETTING32	15600 to 16527	3CF0h to 408Fh
Settings : User	SETTING32	16528 to 17199	4090h to 432Fh
“User” area			
Free area		17200 to 57343	4330h to DFFFh
“Event Table” area according TI86			
Event Table (Default, 100 events)		57344 to 58545	E000h to E4B1h
Reserved for event table extension		58546 to 61439	E4B2h to EFFFh
Reserved – Manufacturer area		**61440 to 65535**	**F000h to FFFFh**
Reserved area		61440 to 65535	4330h to DFFFh

Never use these areas for remapping of user or applicative data.
Com Scada protocol information may be remapped within the dedicated area

Global mapping structure: subareas

For each object type, reserved space if split as follows:



Here is the base address of first user area object index for each object type:

Object type	1st User object			Last User object		
	OI (dec)	OI (hex)	MOI (dec)	OI (dec)	OI (hex)	MOI (dec)
SPC	6880	1AE0h	430	7199	1C1Fh	449
DPC	7696	1E10h	481	7999	1F3Fh	499
SPS	8976	2310h	561	9279	243Fh	579
DPS	9776	2630h	611	12799	31FFh	799
MV16	2600	0A28h		2799	0AEFh	
MV32	6400	1900h		6799	1A8Fh	
INC32	10412	28Ach		10799	2A2Fh	
Energies	12000	2EDCh		12399	3069h	

Appendixes

Global data

Description	Source	Access	Object Type	OI (dec)	OI (hex)	MOI (dec)	Format	Unit	Range	R/W
Single Point Control (SPC)										
Restart 24/48V	PS100	O	SPC	n/a	n/a	n/a	B		1 = Restart	W
Single Point Status (SPS)										
AC OFF	PS100	D	SPS	8025	1F59h	501	B		0 = No 1 = Yes	R
General Shutdown	PS100	D	SPS	8026	1F5Ah	501	B		0 = No 1 = Yes	R
Battery Low	PS100	D	SPS	8027	1F5Bh	501	B		0 = No 1 = Yes	R
Battery Fault	PS100	D	SPS	8028	1F5Ch	501	B		0 = No 1 = Yes	R
Charger Fault	PS100	D	SPS	8029	1F5Dh	501	B		0 = No 1 = Yes	R
12V failure	PS100	D	SPS	8030	1F5Eh	501	B		0 = No 1 = Yes	R
24/48V failure	PS100	D	SPS	8031	1F5Fh	501	B		0 = No 1 = Yes	R
Measurement Values (MV)										
Battery Charge Indicator	PS100	O	MV16	n/a	n/a	n/a	16S	1%	0-100	R

Cubicle1 data

Description	Source	Access	Object Type	OI (dec)	OI (hex)	MOI (dec)	Format	Unit	Range	R/W
Double Point Control	(DPC)									
Switchgear position	SC110	O	DPC	7232	1C40h	452	2 bits		01 = Open 10 = Close	W
Simulated position	SC110	A	DPC	7234	1C42h	452	2 bits		01 = Open 10 = Close	W
Spring charge locking	SC110	A	DPC	n/a	n/a	n/a	2 bits		01 = Lock 10 = Unlock	W
Protection setting group	VIP410	O	DPC	7236	1C44h	452	2 bits		01 = “=> A” 10 = “=> B”	W
Double Point Status	(DPS)									
Switchgear position	SC110	D	DPS	9312	2460h	582	2 bits		00 = Undefined 01 = Open 10 = Closed 11 = Invalid	R
Earth switch position	SC110	D	DPS	9314	2462h	582	2 bits		00 = Undefined 01 = Open 10 = Closed 11 = Invalid	R
Simulated position	SC110	A	DPS	9316	2464h	582	2 bits		00 = Undefined 01 = Open 10 = Closed 11 = Invalid	R
Spring charge locking	SC110	A	DPS	n/a	n/a	n/a	2 bits		00 = Undefined 01 = Locked 10 = Unlocked 11 = Invalid	R
Active setting group	VIP410	D	DPS	9318	2466h	582	2 bits		01 = A 10 = B	R
Single Point Control	(SPC)									
Current Maximeters	Flair23DM	O	SPC	n/a	n/a	n/a	B		1 = Reset	W
Fault passage indication	Flair23DM	O	SPC	6416	1910h	401	B		1 = Reset	W
Trip indication	VIP410	O	SPC	6417	1911h	401	B		1 = Reset	W
Phase peak demand values	VIP410	O	SPC	n/a	n/a	n/a	B		1 = Reset	W
Single Point Status	(SPS)									
Switchgear control failure	SC110	O	SPS	n/a	n/a	n/a	B		0 = No 1 = Yes	R
Trip indication	SC110	D	SPS	8048	1F70h	503	B		0 = No 1 = Yes	R

Single Point Status	(SPS)									
Ready to operate	SC110	A	SPS	n/a	n/a	n/a	B		0 = No 1 = Yes	R
Ready for remote command	SC110	O	SPS	n/a	n/a	n/a	B		0 = No 1 = Yes	R
Local/Remote switch state	SC110	D	SPS	n/a	n/a	n/a	B		0 = Remote 1 = Local	R
Phase fault	Flair23DM	D	SPS	8049	1F71h	503	B		0 = No 1 = Yes	R
Earth fault	Flair23DM	D	SPS	8050	1F72h	503	B		0 = No 1 = Yes	R
Transient phase fault	Flair23DM	D	SPS	n/a	n/a	n/a	B		0 = No 1 = Yes	R
Transient earth fault	Flair23DM	D	SPS	n/a	n/a	n/a	B		0 = No 1 = Yes	R
Fault by test action	Flair23DM	D	SPS	8051	1F73h	503	B		0 = No 1 = Yes	R
Phase or earth fault	Flair23DM	D	SPS	n/a	n/a	n/a	B		0 = No 1 = Yes	R
MV voltage presence	Flair23DM	D	SPS	8052	1F74h	503	B		0 = No 1 = Yes	R
MV voltage presence (V1 or U12)	Flair23DM	A	SPS	8053	1F75h	503	B		0 = No 1 = Yes	R
MV voltage presence (V2 or U13)	Flair23DM	A	SPS	8054	1F76h	503	B		0 = No 1 = Yes	R
MV voltage presence (V3 or U23)	Flair23DM	A	SPS	8055	1F77h	503	B		0 = No 1 = Yes	R
Residual voltage presence	Flair23DM	D	SPS	8056	1F78h	503	B		0 = No 1 = Yes	R
MV voltage absence	Flair23DM	D	SPS	8057	1F78h	503	B		0 = No 1 = Yes	R
MV voltage absence (V1 or U12)	Flair23DM	A	SPS	8058	1F78h	503	B		0 = No 1 = Yes	R
MV voltage absence (V2 or U13)	Flair23DM	A	SPS	8059	1F78h	503	B		0 = No 1 = Yes	R
MV voltage absence (V3 or U23)	Flair23DM	A	SPS	8060	1F78h	503	B		0 = No 1 = Yes	R
Max Current Reset Indication	Flair23DM	O	SPS	n/a	n/a	n/a	B		1 = Executed	R
Protection 50-51 I>, delayed	VIP410	O	SPS	n/a	n/a	n/a	B		0 = No 1 = Yes	R
Protection 50-51 I>>, delayed	VIP410	O	SPS	n/a	n/a	n/a	B		0 = No 1 = Yes	R
Protection 50-51 I>>>, delayed	VIP410	O	SPS	n/a	n/a	n/a	B		0 = No 1 = Yes	R
Protection 50-51 I>, pick-up	VIP410	O	SPS	n/a	n/a	n/a	B		0 = No 1 = Yes	R
Protection 50-51 I>>, pick-up	VIP410	O	SPS	n/a	n/a	n/a	B		0 = No 1 = Yes	R
Protection 50-51 I>>>, pick-up	VIP410	O	SPS	n/a	n/a	n/a	B		0 = No 1 = Yes	R
Protection 50N-51N Io>, delayed	VIP410	O	SPS	n/a	n/a	n/a	B		0 = No 1 = Yes	R
Protection 50N-51N Io>>, delayed	VIP410	O	SPS	n/a	n/a	n/a	B		0 = No 1 = Yes	R
Protection 50N-51N Io>, pick-up	VIP410	O	SPS	n/a	n/a	n/a	B		0 = No 1 = Yes	R
Protection 50N-51N Io>>, pick-up	VIP410	O	SPS	n/a	n/a	n/a	B		0 = No 1 = Yes	R
Protection 49 RMS thermal alarm	VIP410	O	SPS	n/a	n/a	n/a	B		0 = No 1 = Yes	R
Protection 49 RMS thermal tripping	VIP410	O	SPS	n/a	n/a	n/a	B		0 = No 1 = Yes	R
Protection 49 RMS thermal tripping	VIP410	O	SPS	n/a	n/a	n/a	B		0 = No 1 = Yes	R
External trip by external input	VIP410	O	SPS	8061	1F7Dh	503	B		0 = No 1 = Yes	R
Tripping	VIP410	D	SPS	8062	1F7Eh	503	B		0 = No 1 = Yes	R
Trip by test menu	VIP410	O	SPS	8063	1F7Fh	503	B		0 = No 1 = Yes	R
Trip Indication	VIP410	D	SPS	8064	1F80h	504	B		0 = No 1 = Yes	R
Phase peak demand values reset indication	VIP410	A	SPS	n/a	n/a	n/a	B		1 = Executed	R

Appendixes

Presettable Counters	Controllable	Integers	(INC)							
Operation counter	SC110	O	INC32	n/a	n/a	n/a	32S			R/W
Trip counter	SC110	D	INC32	n/a	n/a	n/a	32S			R/W
Phase + earth fault counter	Flair23DM	D	INC32	n/a	n/a	n/a	32S			R/W
Phase fault counter	Flair23DM	D	INC32	n/a	n/a	n/a	32S			R/W
Earth fault counter	Flair23DM	D	INC32	n/a	n/a	n/a	32S			R/W
Number of trip : phase fault	VIP410	D	INC32	n/a	n/a	n/a	32S		0 - 10000	R
Number of trip : earth fault	VIP410	D	INC32	n/a	n/a	n/a	32S		0 - 10000	R
Number of trip : thermal overload	VIP410	D	INC32	n/a	n/a	n/a	32S		0 - 10000	R
Number of trip : external trip	VIP410	D	INC32	n/a	n/a	n/a	32S		0 - 10000	R
Energies : Large Presettable Counters	Controllable	Integers	(INC)					(to be accessed as 64bits objects)		
Energy, active total MSB	PM800	D	INC32	10840	2A58h		32NSlsbfirst mod 10000	*100 MWH	0 – 99999999	R
Energy, active total LSB	PM800	D	INC32	10842	2A5Ah		32NSlsbfirst mod 10000	1 WH	0 – 99999999	R
Energy, reactive total MSB	PM800	D	INC32	10844	2A5Ch		32NSlsbfirst mod 10000	*100 MVArH	0 – 99999999	R
Energy, reactive total LSB	PM800	D	INC32	10846	2A5Eh		32NSlsbfirst mod 10000	1 VArH	0 – 99999999	R
Energy, apparent MSB	PM800	A	INC32	10848	2A60h		32NSlsbfirst mod 10000	*100 MVAH	0 – 99999999	R
Energy, apparent MSB	PM800	A	INC32	10850	2A62h		32NSlsbfirst mod 10000	1 VAH	0 – 99999999	R
Measurement Values	(MV)									
Phase current I1	Flair23DM	D	MV16	860	035Ch		16S	A	0 - 800	R
Phase current I2	Flair23DM	D	MV16	861	035Dh		16S	A	0 - 800	R
Phase current I3	Flair23DM	D	MV16	862	035Eh		16S	A	0 - 800	R
Residual current I0	Flair23DM	D	MV16	863	035Fh		16S	A	0 - 800	R
I1 max	Flair23DM	O	MV16	n/a	n/a	n/a	16S	A	0 - 800	R
I2 max	Flair23DM	O	MV16	n/a	n/a	n/a	16S	A	0 - 800	R
I3 max	Flair23DM	O	MV16	n/a	n/a	n/a	16S	A	0 - 800	R
Phase current I1	VIP410	D	MV16	864	0360h		16S	1 A	0 – 32.767	R
Phase current I2	VIP410	D	MV16	865	0361h		16S	1 A	0 – 32.767	R
Phase current I3	VIP410	D	MV16	866	0362h		16S	1 A	0 – 32.767	R
Measured Earth Fault Current I0	VIP410	D	MV16	867	0363h		16S	1 A	0 – 32.767	R
Phase peak demand current Im1 (mean current)	VIP410	O	MV16	n/a	n/a	n/a	16S	1 A	0 – 32.767	R
Phase peak demand current Im2 (mean current)	VIP410	O	MV16	n/a	n/a	n/a	16S	1 A	0 – 32.767	R
Phase peak demand current Im3 (mean current)	VIP410	O	MV16	n/a	n/a	n/a	16S	1 A	0 – 32.767	R
Phase current I1	PM800	D	MV16	868	0364h		16S	1 A	0 – 32,767	R
Phase current I2	PM800	D	MV16	869	0365h		16S	1 A	0 – 32,767	R
Phase current I3	PM800	D	MV16	870	0366h		16S	1 A	0 – 32,767	R
Residual current I0	PM800	D	MV16	871	0367h		16S	1 A	0 – 32,767	R
Voltage U12	PM800	A	MV16	872	0368h		16S	1 V	0 – 32,767	R
Voltage U23	PM800	A	MV16	873	0369h		16S	1 V	0 – 32,767	R
Voltage U31	PM800	A	MV16	874	036Ah		16S	1 V	0 – 32,767	R
Mean voltage between phases	PM800	A	MV16	875	036Bh		16S	1 V	0 – 32,767	R
Voltage V1	PM800	A	MV16	876	036Ch		16S	1 V	0 – 32,767	R
Voltage V2	PM800	A	MV16	877	036Dh		16S	1 V	0 – 32,767	R
Voltage V3	PM800	A	MV16	878	036Eh		16S	1V	0 – 32,767	R
Voltage NR	PM800	A	MV16	879	036Fh		16S	0.1 V	0 – 32,767	R
Mean voltage phase-N	PM800	A	MV16	880	0370h		16S	1V	0 – 32,767	R
Frequency	PM800	A	MV16	881	0371h		16S	0.01Hz	2300-6700	R
Real power, total	PM800	A	MV16	882	0372h		16S	1 kW	-32767 - + 32767	R
Reactive power, total	PM800	A	MV16	883	0373h		16S	1 kVAr	-32767 - + 32767	R
Apparent power, total	PM800	A	MV16	884	0374h		16S	1 kVA	-32767 - + 32767	R
True power factor, total	PM800	A	MV16	885	0375h		16S	0,001	-0.002 to 1.000 to +0.002	R

Cubiclexxx data

Same principles apply for further cubicles, with same default variables and default external address. Just add an offset for default external address as follows:

Object type	OI Decimal Offset per cubicle	OI dec depending on cubicle number
		Base + Dec Offset*(Cub_Nb-1)
DPC	16	Base + 16*(Cub_Nb-1)
DPS	16	Base + 16*(Cub_Nb-1)
SPC	16	Base + 16*(Cub_Nb-1)
SPS	32	Base + 32*(Cub_Nb-1)
INC32	120	Base + 120*(Cub_Nb-1)
Energies	40	Base + 40*(Cub_Nb-1)
MV16	60	Base + 60*(Cub_Nb-1)
MV32	120	Base + 120*(Cub_Nb-1)

Where “base” is the default decimal OI of corresponding object in Cubicle1 e.g.

Object type	Object description	Cubicle1 OI decimal	Cubicle 11 object ID calculation (decimal)	Cubicle11 object ID (decimal)
DPS	Switchgear position	9312	9312 + 16*(11-1)	9472
SPS	MV Voltage Absence	8057	8057 + 32*(11-1)	8377

For memory, here is the base address of first object of first cubicle for each object type:

Object type	Base for Cubicle1 (1st object)		
	OI (dec)	OI (hex)	MOI (dec)
DPC	7232	1C40h	452
DPS	9312	2460h	582
SPC	6416	1910h	401
SPS	8048	1F70h	503
INC32	6932	1B14h	
Energies	10840	2A54h	
MV16	860	035Ch	
MV32	2920	0B68h	

For memory, here is the base address of first reserved area object index of first cubicle for each object type:

Object type	Base for Cubicle1 (1st object)		
	OI (dec)	OI (hex)	MOI (dec)
DPC	7238	1C46h	452
DPS	9320	2468h	582
SPC	6418	1912h	401
SPS	8065	1F81h	504
INC32	6932	1B14h	
Energies	10852	2A60h	
MV16	886	0376h	
MV32	2920	0B68h	

For memory, here is the base address of first user area object index for each object type:

Object type	Base for Cubicle1 (1st object)		
	OI (dec)	OI (hex)	MOI (dec)
DPC	7696	1E10h	481
DPS	9776	2630h	611
SPC	6880	1AE0h	430
SPS	8976	2310h	561
INC32	10412	28ACh	
Energies	12000	2EDCh	
MV16	2600	0A28h	
MV32	6400	1900h	

RTU specific Data

Description	Source	Access	Object Type	OI (dec)	OI (hex)	MOI (dec)	Format	Unit	Range	R/W
Single Point Status (SPS)										
Equipment start	R200, ATS100	A	SPS	n/a	n/a	n/a	B		0 = In Progress 1 = Yes	R

Automatism data

Description	Source	Access	Object Type	OI (dec)	OI (hex)	MOI (dec)	Format	Unit	Range	R/W
Double Point Control (DPC)										
Automatism	ATS100	O	DPC	7212	1C2Ch	450	2 bits		01 = Set Off 10 = Set On	W
Go to parallel	ATS100 (ACO/BTA)	O	DPC	7216	1C30h	451	2 bits		01 = # 10 = Execute	W
Go to S1	ATS100	O	DPC	7218	1C32h	451	2 bits		01 = # 10 = Execute	W
Go to Off	ATS100	O	DPC	7220	1C34h	451	2 bits		01 = # 10 = Execute	W
Go to S2	ATS100	O	DPC	7222	1C36h	451	2 bits		01 = # 10 = Execute	W
Go to S1 & S2	ATS100 (BTA)	O	DPC	7224	1C38h	451	2 bits		01 = # 10 = Execute	W
Double Point Status (DPS)										
Automatism state	ATS100	D	DPS	9292	244Ch	580	2 bits		00 = Undefined 01 = Off 10 = On 11 = Invalid	R
Single Point Status (SPS)										
Automatism has started	ATS100	D	SPS	8015	1F4Fh	500	2 bits		0 = Inactive 1 = Active	R
Automatism locked	ATS100	D	SPS	8016	1F50h	501	2 bits		0 = Inactive 1 = Active	R

RTU Digital I/O data

Description	Source	Access	Object Type	OI (dec)	OI (hex)	MOI (dec)	Format	Unit	Range	R/W
Double Point Control (DPC)										
Digital output 1	R200	O	DPC	7200	1C20h	450	2 bits		01 = Deactivate 10 = Activate	W
Digital output 2	R200	O	DPC	7202	1C22h	450	2 bits		01 = Deactivate 10 = Activate	W
Digital output 3	R200	O	DPC	7204	1C24h	450	2 bits		01 = Deactivate 10 = Activate	W
Digital output 4	R200	O	DPC	7206	1C26h	450	2 bits		01 = Deactivate 10 = Activate	W
Double digital output 1-2	R200	O	DPC	7208	1C28h	450	2 bits		01 = Deactivate 10 = Activate	W
Double digital output 3-4	R200	O	DPC	7210	1C2Ah	451	2 bits		01 = Deactivate 10 = Activate	W
Digital output 1	ATS100 (BTA)	O	DPC	7200	1C20h	450	2 bits		01 = Deactivate 10 = Activate	W
Digital output 2	ATS100 (BTA)	O	DPC	7202	1C22h	450	2 bits		01 = Deactivate 10 = Activate	W
Double Point Status (DPS)										
Digital output 1	R200	D	DPS	9280	2440h	580	2 bits		00 = Undefined 01 = Off 10 = On 11 = Invalid	R
Digital output 2	R200	D	DPS	9282	2442h	580	2 bits		00 = Undefined 01 = Off 10 = On 11 = Invalid	R
Digital output 3	R200	D	DPS	9284	2444h	580	2 bits		00 = Undefined 01 = Off 10 = On 11 = Invalid	R

Double Point Status (DPS)										
Digital output 4	R200	D	DPS	9286	2448h	580	2 bits		00 = Undefined 01 = Off 10 = On 11 = Invalid	R
Double digital output 1-2	R200	D	DPS	9288	244Ah	580	2 bits		00 = Undefined 01 = Off 10 = On 11 = Invalid	R
Double digital output 3-4	R200	D	DPS	9290	244Ch	580	2 bits		00 = Undefined 01 = Off 10 = On 11 = Invalid	R
Double digital input 1-2	R200	D	DPS	-		-	2 bits		00 = Undefined 01 = Off 10 = On 11 = Invalid	R
Double digital input 3-4	R200	D	DPS	-		-	2 bits		00 = Undefined 01 = Off 10 = On 11 = Invalid	R
Digital output 1	ATS100 (BTA)	D	DPC	9280	2440h	580	2 bits		00 = Undefined 01 = Off 10 = On 11 = Invalid	R
Digital output 2	ATS100 (BTA)	D	DPC	9282	2442h	580	2 bits		00 = Undefined 01 = Off 10 = On 11 = Invalid	R
Source transfer in progress	ATS100 (BTA)	D	DPC	9284	2444h	580	2 bits		00 = Undefined 01 = Off 10 = On 11 = Invalid	R
S1 or S2 available	ATS100 (BTA)	D	DPC	9286	2448h	580	2 bits		00 = Undefined 01 = Off 10 = On 11 = Invalid	R
Single Point Status (SPS)										
Digital input 1	R200	D	SPS	8001	1F41h	500	B		0 = Inactive 1 = Active	R
Digital input 2	R200	D	SPS	8002	1F42h	580	B		0 = Inactive 1 = Active	R
Digital input 3	R200	D	SPS	8003	1F43h	580	B		0 = Inactive 1 = Active	R
Digital input 4	R200	D	SPS	8004	1F44h	500	B		0 = Inactive 1 = Active	R
Digital input 5	R200	D	SPS	8005	1F45h	580	B		0 = Inactive 1 = Active	R
Digital input 6	R200	D	SPS	8006	1F46h	580	B		0 = Inactive 1 = Active	R
Digital input 7	R200	D	SPS	8007	1F47h	580	B		0 = Inactive 1 = Active	R
Digital input 8	R200	D	SPS	8008	1F48h	580	B		0 = Inactive 1 = Active	R
Digital input 1	ATS100 (BTA)	D	SPS	8001	1F41h	500	B		0 = Inactive 1 = Active	R
Digital input 2	ATS100 (BTA)	D	SPS	8002	1F42h	580	B		0 = Inactive 1 = Active	R
Digital input 3	ATS100 (BTA)	D	SPS	8003	1F43h	580	B		0 = Inactive 1 = Active	R
Digital input 4	ATS100 (BTA)	D	SPS	8004	1F44h	500	B		0 = Inactive 1 = Active	R
Voltage presence S1	ATS100 (BTA)	D	SPS	8005	1F45h	580	B		0 = Inactive 1 = Active	R
Voltage presence S2	ATS100 (BTA)	D	SPS	8006	1F46h	580	B		0 = Inactive 1 = Active	R
Transfer locking	ATS100 (BTA)	D	SPS	8007	1F47h	580	B		0 = Inactive 1 = Active	R
Parallel transfer enable	ATS100 (BTA)	D	SPS	8008	1F48h	580	B		0 = Inactive 1 = Active	R

RTU Measurement data

Description	Source	Access	Object Type	OI (dec)	OI (hex)	MOI (dec)	Format	Unit	Range	R/W
Measurement Values (MV)										
Internal temperature	R200, ATS100	D	MV16	800	320		16S	0,1 °C		R

Substation global data

Description	Source	Access	Object Type	OI (dec)	OI (hex)	MOI (dec)	Format	Unit	Range	R/W
Single Point Status (SPS)										
Local/Remote	R200, ATS100	D	SPS	8000	1F40h	500	B		0 = Remote 1 = Local	R
System minor fault	R200, ATS100	D	SPS	8009	1F49h	500	B		0 = No 1 = Yes	R
System major fault	R200, ATS100	D	SPS	8010	1F4Ah	500	B		0 = No 1 = Yes	R
Maintainance mode	R200, ATS100	D	SPS	8011	1F4Bh	500	B		0 = No 1 = Yes	R
Test SCADA com	R200, ATS100	A	SPS	8012	1F4Ch	500	B		0 = No 1 = Yes	R
System event loss	R200, ATS100	A	SPS	8017	1F51h	501	B		0 = No 1 = Yes	R

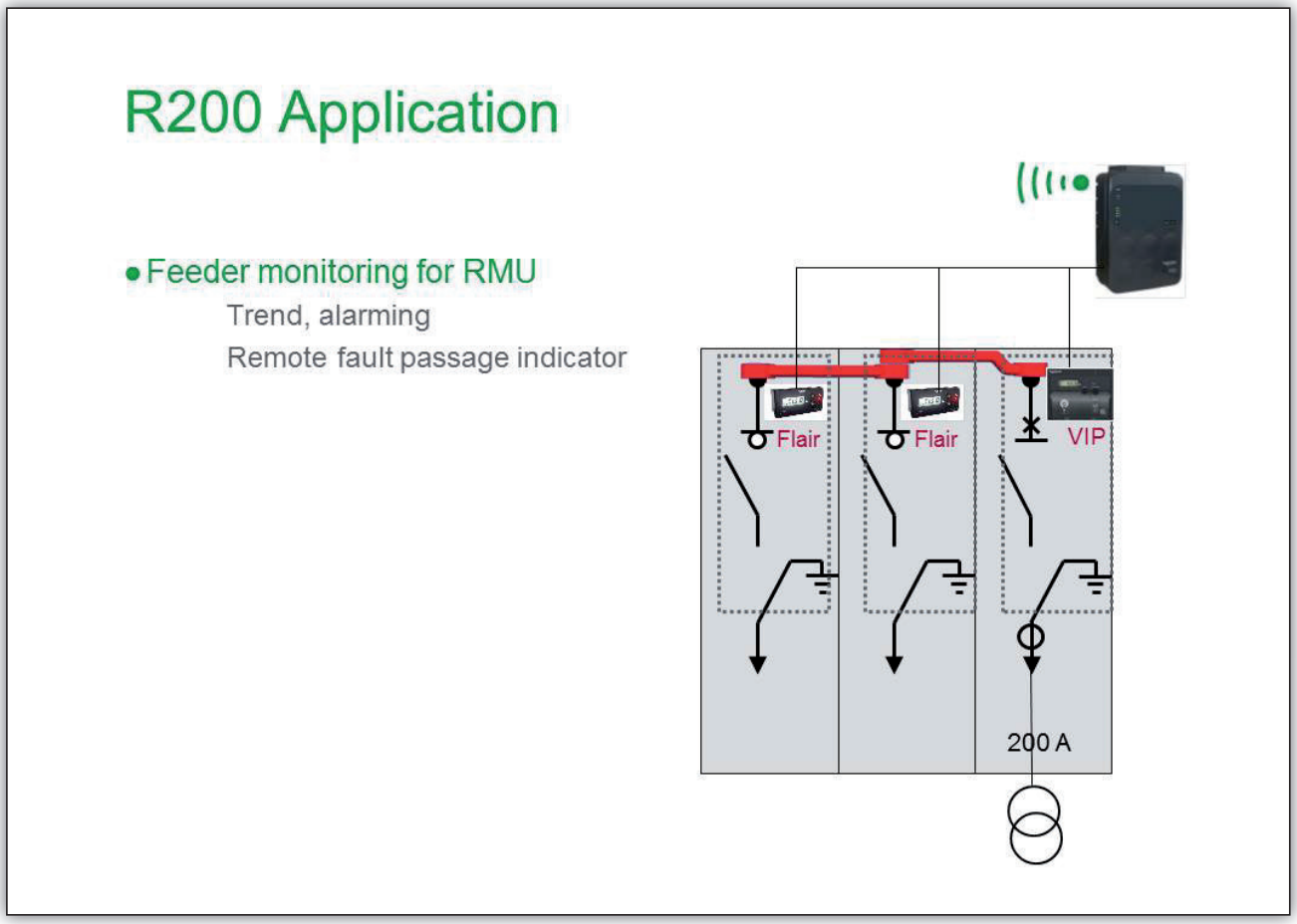
Alternative for Energy coming from PM800 (to be created manually) : use 16bits integer e.g; for apparent Energy

Energy, apparent Reg3	PM800	A	INC16	10848			16NS mod 10000	1 TVAH	0 - 9999	R
Energy, apparent Reg2	PM800	A	INC16	10849			16NS mod 10000	*100 MVAH	0 - 9999	R
Energy, apparent Reg1	PM800	A	INC16	10850			16NSmod 10000	*10 kVAH	0 - 9999	R
Energy, apparent Reg0	PM800	A	INC16	10851			16 NS mod 10000	1 VAH	0 - 9999	R

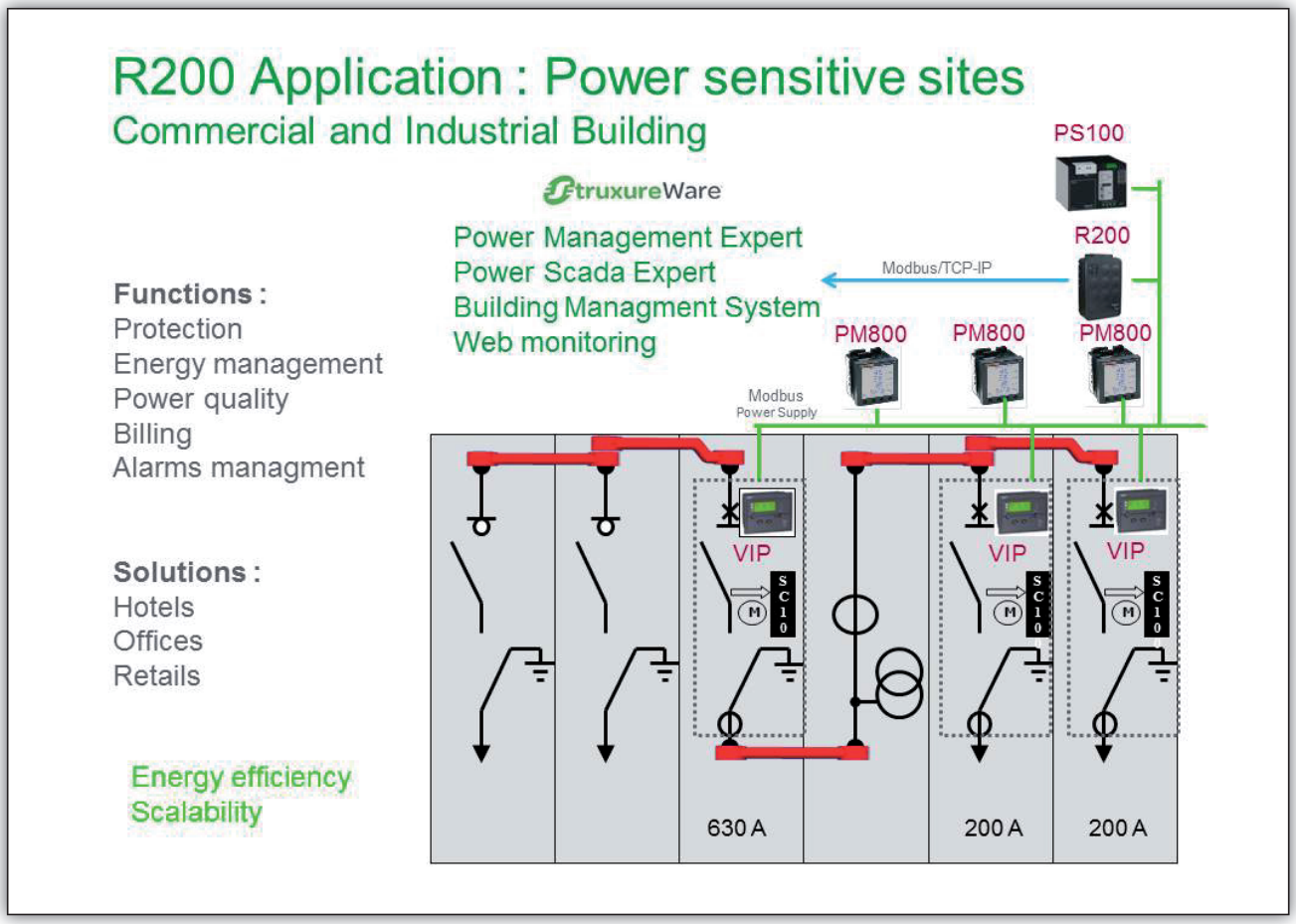
Appendixes

Application examples

RingMainUnit (RMU)



Power sensitive Customer&Industrial building delivery substation



Large Switching Substation

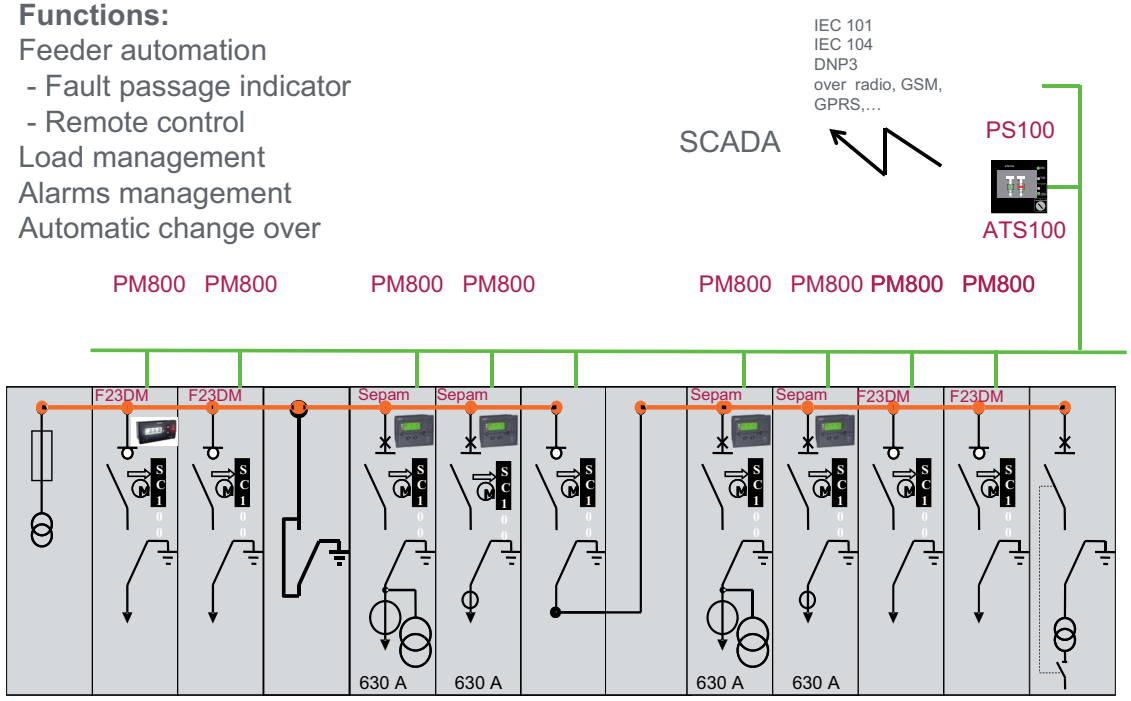
R200 application: Full feeder automation

Large switching substation

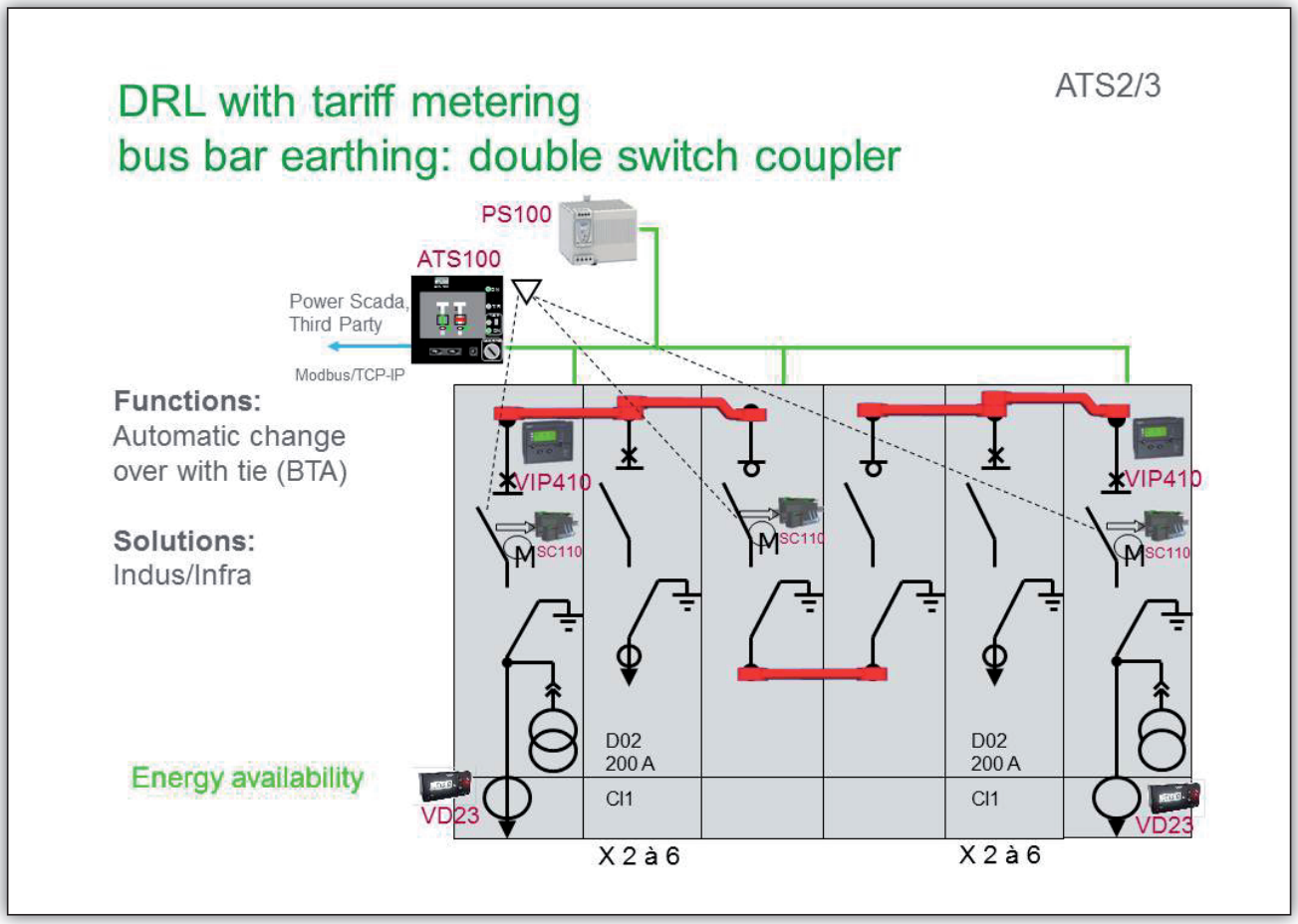
Functions:

Feeder automation
- Fault passage indicator
- Remote control

Load management
Alarms management
Automatic change over



Double Radial fed MV consumer Substation with Bus Tie Automation



Double Radial fed MV consumer Substation with Normal/ Backup sources

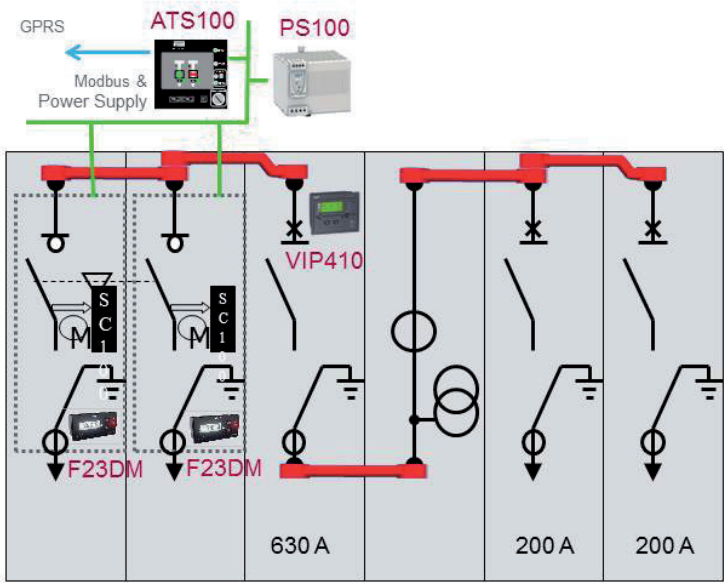
Commercial and Industrial Building

Power sensitive sites, with critical loads: DRM

Functions:
Automatic change over

Solutions:
Hospitals
Data center
Office
Hotel

Energy availability



Collecting data to program SCADA

Bottom-Up approach, default configuration
External Mapping is built by default. Refer to System User Manual to get the list of addresses to be used for SCADA

Fully customized external mapping
Customer may define its fully specific addressing rules, to be applied on SCADA and RTU
Then external address has to be entered manually for each variable, online or offline

List of variables and associated address is directly available in Settings/Variables page. Addresses may be edited directly on this page.

ATS event log

Note:
During successful ATS sequences, ATS event log may report a transitory Automatism lock, as switchgear may not be immediately operational to change state again. “Automatism Lock Inactive” event will then occur within 500ms.

Appendixes

Glossary

Term	Semantics
Alarm	An Alarm is a specific Event which is recorded in a specific Alarm Log generates an explicit notification to User possibly requires protocol acknowledgment before disappearing No applicative acknowledgement is associated to alarms within C&M System An alarm should be used for events which - shall be highlighted to user - must be signalled rapidly to SCADA, without waiting for interrogation by Supervisor. Alarms may be attached to evolution of states, measurements, counters…
Alarm log	Logfile collecting Alarms
AMP	=S= Product : Current Indicator optimized with MV sensors
ATS	Automatic Transfert of Source
BMS	Building Management System
CB	Circuit Breaker
C&M	Control&Monitoring
CFx	Cubicle Function x
CI1, CI2, CIT, RI, OCO	Type of switchgear command (see SM6 catalogue) CIT : tumbler. Rearm&Act automatically once armed to change position CI1 : Rearm&Make automatically once armed; Open immediately by Coil CI2 : Rearm manually or by motor after Opening. Independent immediate Open/Close commands by coil. Ready for CO Cycle after rearming OCO : Rearm manually or by motor after Closing. Independent immediate Open/Close commands by coil. Ready for OCO Cycle after rearming, typically for Recloser application RI : OCO type, used in SM6 for Evolis breakers. Accept Mitop as trigger for breaking
CIB	Commercial&Industrial Buildings
Clock Accuracy	It's the maximal difference (maximal shift) between local date & time, and "absolute" date & time. Typical influence factors are: Intrinsic shift (local clock stability) Synchronization way (and synchronization period)
Core System Bus	Com bus providing internal communication between modules inside an C&M Substation system
Cubicle	See MV Cubicle
Cubicle View	See MV Cubicle View
Devices at equipment level	Any device directly connected to Core System Bus Also called IED (Intelligent Electronic Device)
Device Description file	Compact file describing a given device type, under a format which may be embedded in RTU and interpreted (json language).
DMS	Distribution Management System
EMCS	Energy Monitoring&Control System
ESW	Earth Switch (= MALT / Mise à la Terre, in french)
Event	An Event relates to specific information generated when some specific condition occurs. It is not persistent. Event occurring condition may be related to state changes, algorithm outputs, analogue value threshold crossing, queues being full, diagnosis information… Events are timestamped and recorded in events containers, for remote communication with SCADA, and in Logfiles (for events historic, which can be saved into Excel-compatible CSV file, on PC connected locally to RTU)
Event Log	Logfile collecting Events related to operation
Fault passage indication	It's a detection function which indicates a fault has been seen. It has no direct effect except signaling. Fault passage is often confirmed by medium voltage loss
Fault passage indication Chain	Whole set of components contributing in sequence to the Fault passage indication function, from sensor to indicator.
Flair	=S= Product range for Fault Passage Indicators for underground distribution
FPI	Fault Passage Indicator (generic name)
Gateway	Communication interface module used to connect the C&M to a given network
General Shutdown	Warning generated before shutdown due to loss of LV Energy source and empty batteries
LBS	Load Break Switch
Log (Logfile)	A Log(Logfile) is an internal file, stored internally, dedicated to give the history on specific facts (events). See Events Log, Alarms Log, Measurements Log, System Log.

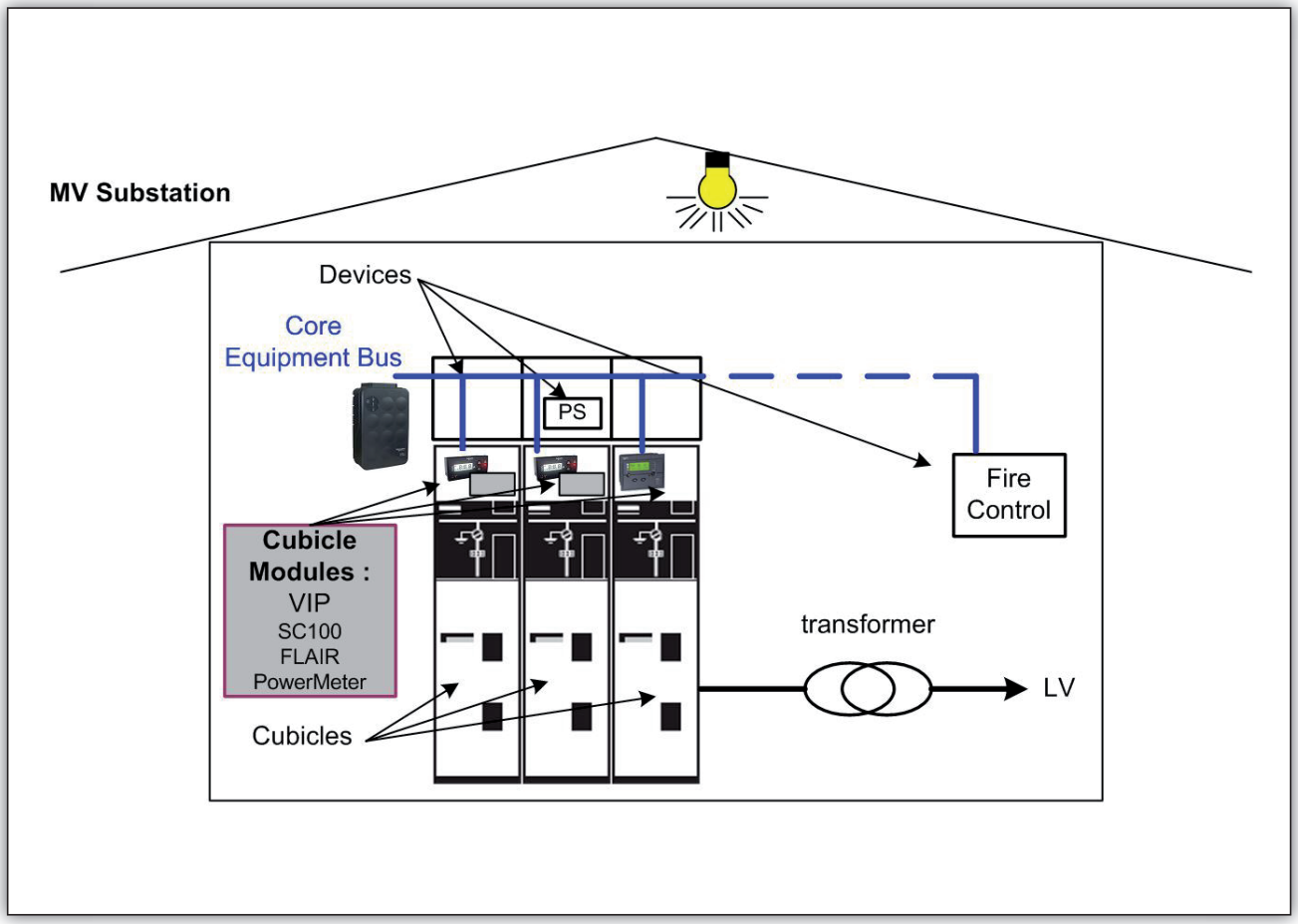
Appendixes

Term	Semantics
LV Cabinet	Box which may be optionally added on top of MV Cubicle to host LV functions Depending on MV Equipment, may be put in place of LV Compartment or above it
LV Compartment	Compartment on top of MV Cubicle to host LV functions, being part of standard Cubicle Height Depending on MV Equipment, may be replaced by an LV Cabinet
Measurement Log	Logfile storing measurement value on identified conditions (periodic, crossing of threshold, deadband, …)
MN	Coil used for triggering opening of switchgear. Activated in case of voltage loss
MV Cubicle	Concept which groups all services which may be provided to User on one given “Electrical Flow” : Protection, Measure, Control Subsystem of C&M System
MV Cubicle View	External view of a given Cubicle as visible on RTU, i.e. set of RTU communication data attached to Cubicle RTU web page representing Cubicle Screen on RTU HMI representing Cubicle
MV Equipment view	External view of the whole MV Equipment presented on RTU
MX1	Main Coil used for triggering opening of switchgear
MX2	Auxiliary Coil used for triggering opening of switchgear
PM	Power Monitor. Range of =S= Products for Power monitoring
Protection	It’s a detection which also generates a trip of the breaker when it detects the measurement signature.
Protection Chain	Whole set of components contributing in sequence to the Protection function, from Protection sensor to actuator on breaker.
PS100	=S= Product : Backup Secure Power Supply
R200	=S= Product : Substation Controller (RTU)
RMU	Ring Main Unit
RTU	Remote Terminal Unit
SEPAM10 SEPAM20 SEPAM40 SEPAM80	=S= Product : Protection Relay Sepam serie10, 20, 40, 80
SC100 SC110	=S= Product : Switchgear Controller (Switch or Breaker) : status and control module used to give information from the switchgear (position, trip, …) and to remote control the switchgear "SC110" is used as generic name for this whole product range
SCADA	Supervisory Control And Data Acquisition (supervision device)
SST	(MV) Substation
Substation	The building hosting MV Equipment and possibly other devices (Transformers, LV Equipment, Fire alarm Center, …)
Substation Interface Bus	COM bus enabling to interface miscellaneous devices to C&M System within a Substation. Information of these devices then becomes accessible through remote communication
Switchgear Control Chain	Whole set of components contributing in sequence to the Switchgear Control of a given Cubicle, from User request capture (local or remote) until actuator on Switchgear
System Event	A System Event is a specific event generated when some specific conditions are detected on the system, in order to facilitate operation and maintenance, as : indication of transmission errors (such as CRC error, collision, …) indication of system state change (RTU start-up, RTU reset, configuration change, battery fault, charger fault, modem fault, …) System events are events which concern a change in the system, and which are not linked to the process.
System Log	Logfile collecting System Events
Time discrepancy capability	The discrepancy capability is the minimum delay needed between two time stamped events to ensure that the event time stamping is consistent with respect to actual chronology.
Time granularity	It’s the minor increment of time, which is visible by user (it’s the elementary time unit, used to express a date & time in a time stamped event). Granularity must be adapted to required performances.
Time stamping	Mechanism which allows to associate a precise date & time to events, in order to be able to classify events in chronological sequence
Time stamp accuracy	It’s the maximal difference (maximal shift) between date & time used to time stamp an event, and its « absolute » date & time appearance. Typical influence factors are: Information acquirement mode Clock accuracy

Appendixes

Term	Semantics
Variable	Atomic Object whose main value is accessible through remote communication A variable has a set of attributes like : - variable name - RTU class (view to which it belongs) - type (SPC, DPC, SPS, DPS, MV, CNT) - unit (for MV) - external address - access : visibility depending on access level - associated events and corresponding parameters ….
VD23	=S= Product : Voltage Detection Relay
VDS	Voltage Detection System according IEC61243-5 This is also the name of 3rd party products implementing this voltage detection system
VIP400/410, VIP40/45	=S= Product : C&M-compliant version of embedded protection relay for =S= MV Circuit Breakers
VPIS	Voltage Presence Indicator according IEC61958 Also name of =S= product
XF	Coil used for triggering closing of switchgear

Appendixes



View of MV Substation, Devices, Cubicles, and Cubicle modules

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