

A) Engine Mounted Computerized Modular Control Panel with built – in Automatic Paralleling:

Set mounted in a separate cubicle IP40. (The Only controller in the world having all features of protection, start/stop, monitoring, history file, synchronizing, load sharing, load shedding and load management built-in)
The complete modular controller will consist of the following:

I) Central Unit:

The central unit is an integrated controller for engine control in manual, automatic and remote start applications, featuring full genset monitoring and protection.
It is equipped with a powerful graphic LCD display showing icons, symbols and bar graphs for intuitive operation together with high functionality set new standards in genset control.

a) Features:

To facilitate the operator job supervision and intervention, the controller is equipped with the following:

1-Push Buttons for:

- *OFF/AUTO/MANUAL Mode Selection
- *HORN RESET
- *FAULT RESET
- *MANUAL START
- *MANUAL STOP
- *MANUAL OPEN/CLOSE (Synchronizer) of generator circuit breaker.

2-Leds For:

- * Bus voltage present
- *Bus failure
- *Generator voltage present
- *Flashing led for genset failure
- *Generator circuit breaker on

3-Display Menus:

At least 3 principal displays menus are available for:
Measurements, Adjustment and History.

3.1) Measurements screens description:

Different screens selected by push buttons to display the following:



α) Main measure screen:

- *Operation mode
- *Indication of active alarm
- *Status of the genset
- *Actual condition
- *RPM of the genset
- *Active power
- *Power factor
- *Timer-event counting time (e.g. prestart, cooling, transfer etc...)

β) Generator screen:

- *Generator frequency
- *Engine speed (single barograph)
- *Gen V1, V2 and V3 (triple barograph)
- *Gen I1, I2 and I3 (triple barograph)

γ) Bus-screen:

- *Earth fault current
- *Bus frequency
- *Bus (Voltage) Vb1, Vb2, Vb3 (triple barograph)

δ) Analogue inputs screen:

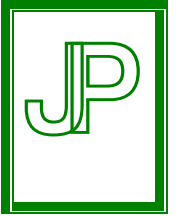
- *Oil pressure (Single barograph)
- *Water temperature (Single barograph)
- *Fuel level (Single barograph)
- *Battery voltage (Single barograph)

ϵ) Genset power screen:

- *Active power (total and per phase)
- *Power factor (total and per phase)
- *Reactive power KVAh (total and per phase)
- *Apparent power (total and per phase)

ζ) Statistic screen:

- *Kilowatt-hours KWh (active energy)
- *Reactive power hours KVAh (reactive energy)
- *Run hours
- *Number of starts
- *Next service time



η) Synchronoscope screen:

The synchronoscope will measure and display:

- *The angle between the generator and bus voltage.
- *The slip frequency.
- *The genset and bus voltage.

ι) Power Management screen:

- *Engine priority
- *Total available power
- *Total run power
- *Active reserve

μ) Alarm list screen:

To display the following alarms when they come up:

- GCB failure
- Overload
- Over current
- Short circuit (3 phases)
- Current unbalance
- Generator voltage unbalance
- Generator over/under voltage (3phases)
- Generator over/under frequency (3phases)
- Reverse power
- Earth fault
- Bus measurement error
- Over speed
- Under speed
- Start fail
- Wrong phase sequence
- Inverted phase polarity
- GCB fails detection
- Sensor failure
- Load sharing module failure
- Bus voltage error detection

3.2) Adjustment:

To allow:

*The setting and adjustment of all electrical and mechanical parameters of the genset and bus bars including all possible delay timers.

* The above listed alarm configuration with one of the following possibilities:

- Sensor fail
- Warning
- Unload



- Slow stop
- Shut down
- History record

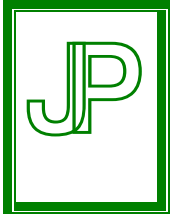
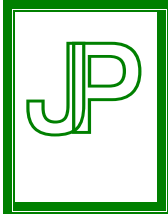
*The configuration of the following parameters:

- Nominal power
- Nominal current
- Current ratio
- Earth fault current
- Nominal voltage
- Nominal RPM
- Nominal frequency
- Gear teeth
- Prestart delay timer
- Max crank timer
- Crank pause timer
- Number of crank attempts
- Cooling timer
- Next service timer
- Horn timer
- Over speed
- Protection delay
- Oil pressure alarm
- Water temperature alarm
- Fuel level alarm
- Over/under battery charger
- Generator overload
- Current short circuit
- Generator current unbalance
- Generator over/under voltage
- Generator unbalance voltage
- Generator over/under frequency
- Reverse power
- Voltage window between generator & bus
- Phase window between generator & bus
- Level of speed governor voltage output
- Synchro time out
- Load shedding

c) History file:

The history file will store the record of each important event indicating at least:

- The event specification
- Time and date of the historical event
- Generator power, $\cos\phi$, voltage, frequency, current, speed
- Bus voltage and frequency
- Oil pressure
- Water temperature



II-Power control load sharing module:

Connected directly to the central unit to allow:

- *Automatic synchronizing
- *Reverse synchronizing
- *Load control including ramping
- *Power factor, import/export control
- *Earth fault protection
- *Analogue outputs for AVR and electronic speed governor
- *Analogue isochronous load sharing line between gensets

III-Power management:

Connected by can bus interface for:

- Interconnection of central unit gensets controllers
- Optimizing the number of running engines
- Interface to supervision system

IV-Communication:

RS232 is incorporated in the controller and connected to modem extension unit for multiple engine control and PC communication.

The controller is able to support all kind of remote communications such as telephone line (Analogue modem), mobile phone (GSM modem), Internet or Ethernet (Internet Bridge).

V-Automatic Voltage Regulator interface:

The AVR interface selected module is adapted to the AVR inputs to control synchronizing voltage as well as power factor and Var sharing.

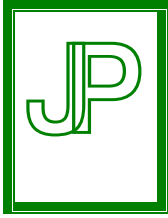
VI-Motorized circuit breaker Or Electric Contactor:

Option1:

Set mounted molded case or air circuit breaker including electric motor, shunt trip and auxiliaries.

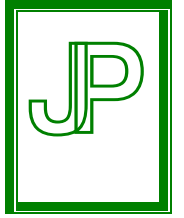
Option2:

Electric Contactor with MDCB(mounted separately or in the same cubicle)



JABBOUR POWER SARL

جـبـور بـاور شـ.م.م.



MODE OF OPERATION:

a) In Auto mode:

Upon mains failure the both generator sets will start up and after pre-adjustable time delay will be connected to the bus bar (supplied by others or as option) through their motorized circuit breaker or electric contactor after synchronization.

The load will be connected by step (contactors delay timers provided in ATS panel) to the synchronized generator sets.

(►)The generator sets share the load according to their capacity.

If the total load will decrease below 30% (adjustable) of the total prime rating, one generator (automatically selected according to load available on the bus bars) will carry the entire load after soft unloading of the second generator. Then the second generator will stop automatically after cool down.

If the load will exceed 70% (adjustable) of the prime rating output of the generator on load, the second generator will start up automatically and be connected to the bus bars after synchronization.

Consequently, the above sequence (►) will be repeated and performed automatically.

Once the mains return, the entire load will be automatically transferred (ATS supplied by others or as option) to the mains and the generator sets will stop after cool down.

Each procedure will be performed after a pre-adjustable time delay.

Shedding outputs (with automatic or manual preset selection) are provided to shut down secondary loads upon overload.

b) In man mode:

The generator will start-up by pressing the start push button.


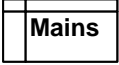













When the generator is in synchronization with the bus, pressing the open/close push button will close the motorized C.B or electric contactor.

The generator will stop by pressing the stop push button after opening the circuit breaker or electric contactor.

C) In OFF mode:

All operation functions are disabled.

Legend

Symbols	Description
MSS	Master Selector Switch
PCLSM	Power Control&Load Sharing Module
CU	Central Unit
COM	Com&Power Management Module (CAN)
Governor	Speed Control Unit (electronic governor)
AVR	Automatic Voltage Regulator
AVRi	Automatic Voltage Regulator Interface
G1	Generatorset 1
G2	Generatorset 2
CT	Current Transformer
GCB	Generator Circuit Breaker (motorized)
MU	Modem Extension Unit (multiplexer)
PC	Potable Computer (supplied by customer)
MC	Mains Contactor
GC	Generator Contactor
CB	Circuit Breaker
	Negative DC Voltage (battery minus)
	Mains KWHr Counter
	LCD Display Monitor
	Manual Start Push Button
	Manual Stop Push Button
	Mode Operation Selection Push Button
	Horn Reset Push Button
	Fault Reset Push Button
	Manual Open/Close GCB
	Page Selection Push Button
	Enter (Confirm Setpoints Value)
	Select the set points, The screen or Increase or Decrease Setpoints Value
	Increase or Decrease Setpoints Value
	Contactor Mechanical Interlock
	Motorized Circuit Breaker
ATS	ATS Panel (supplied by others or as option)

AVR & AVRi will be supplied at extra cost if droop kit not fitted in the alternator

Engine should be fitted with electronic governor

Alternator with droop kit and suitable AVR

GCB can be electric contactor

MODE OF OPERATION:

a) In Auto mode:

Upon mains failure the master selected generator set will start up and after pre-adjustable time delay will be connected to the bus bar through its motorized circuit breaker or electric contactor.

The load will be connected by step (contactors delay timers provided in ATS panel) to the master generator set.

If the load will exceed 75% of master prime rating output the slave will start up automatically and be connected to the load after synchronization.

The generator sets share the load according to their capacity.

If the total load will decrease below 30% of the total prime rating, the slave will stop automatically and the master will take the entire load.

Once the mains return, the entire load will be automatically transferred to the mains and the generator sets will stop after cool down.

Each procedure will be performed after a pre-adjustable time delay.

Shedding outputs is provided to shut down secondary loads upon overload.

b) In man mode:

The generators will start-up by pressing the start push button.

When the generator is in synchronization with the bus, pressing the open/close push button will close the motorized C.B or contactor.

The generator will stop by pressing the stop push button after opening the circuit breaker.

c) In OFF mode:

All operation functions are disabled.

Option:

In Auto Mode the pre-selected requested generator sets will start upon mains failure, will be connected together after synchronisation.

Depending on load demand, the numbers of generator sets will automatically start (and be connected to the load after synchronisation) and stop after soft unloading .



JABBOUR POWER SARL



جـبـور بـاور شـ.م.م.

Option Wall Mounted

Wall Mounted Synchro Panel with motorized circuit breakers, totalizing bus bars and indicating lamps as option. Circuit breaker could be replaced by contactor (panel for two generator sets 300KVA each). All Switchgears are 3 poles. ATS panel not included. Subject to modification without prior notice during production. Pictures for indication only.



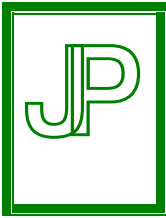
Control Systems Product

- GEN-SET CONTROLLERS
- ENGINE CONTROLLERS
- PC TOOLS
- LOAD PROTECTION
- ELECTRONIC POTENTIOMETERS
- ACCESSORIES



Control Systems Product

- GEN-SET CONTROLLERS
- ENGINE CONTROLLERS
- PC TOOLS
- LOAD PROTECTION
- ELECTRONIC POTENTIOMETERS
- ACCESSORIES



Option Set Mounted

Set Mounted Synchro Panel with motorized circuit breakers, without totalizing bus bars. Electronic governor as option. Circuit breaker could be replaced by contactor (panel for two generator sets 350KVA each). All Switchgears are 3 poles. Totalizing and ATS panels not included. Subject to modification without prior notice during production. Pictures for indication only.



Option Electric Contactor and Totalizing Bus Bars



Electronic - Hydraulic - Systems