

Introducing the SGC

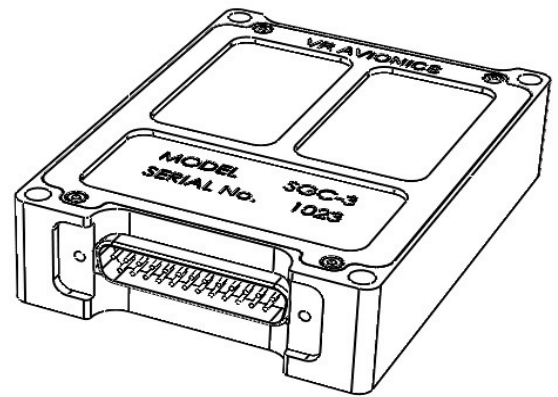
SGC starter-generator controllers are advanced 28 volt dc generator control units (GCU's) with various levels of integrated auto-start control included and using microprocessors at their core.

There are four SGC models: The dash-1 for generator control only, the dash-2 adds auto-starter functionality, the dash-3 further adds automated parallel-to-series battery contactor switching, while the dash-4 adds auto-ignition control to the dash-2 SGC unit's auto-starting abilities.

As a start controller a SGC provides auto-starting functionality such as automatic starter termination. It starts both series-shunt (with the C terminal) and shunt-only starter-generators (by way of field weakening). The SGC further allows parallel-to-series (24 to 48 volt) battery switched starting.

As a generator controller a SGC will drive a generator to power the aircraft electrical bus and charge the onboard batteries with control and efficiency. The SGC is able to not only limit the current the generator delivers to the bus, but the battery charging current, addressing concerns surrounding the use of Lithium batteries in conjunction with generators capable of delivering more charging current than such batteries can safely accept. The SGC unit's ability to control the charging current not only benefits Lithium batteries, but it enables traditional lead-acid batteries to last longer.

The SGC will bring a generator online smoothly due to its ability to gradually increase generator voltage over time. The smooth application of the generator's mechanical load (torque) on the turbine also prevents sudden ITT/EGT surges or N1 upsets, especially just after a start when the starter disengages with batteries somewhat drained.



Features

- ✓ Microprocessor based digital control
- ✓ Provides auto-starting functionality
- ✓ Shunt-field start control (field weakening)
- ✓ Gradual ramping up of generator voltage prevents sudden ITT/EGT surges or N1 upsets when engaging generator
- ✓ Generator load current and remote current limitation
- ✓ Addresses Lithium battery charging concerns by implementation of bulk, absorption and float phases of battery charging profile
- ✓ Protection against over-voltage, under-voltage, over-load, reverse current, and more
- ✓ Critical protective functions are implemented in hardware independent of microprocessor operation
- ✓ Will bring a generator to life using only its residual magnetism (no bus or battery power required)
- ✓ Flexible to work with different starter-generators, different batteries, and different electrical configurations
- ✓ Can be directed thru switches or CAN bus interface
- ✓ All models share the same form factor and pin-out
- ✓ Compact size for easy fitment within MCU boxes
- ✓ Fully solid-state design (no moving parts)

Model functionality matrix

Functionality	SGC-1	SGC-2	SGC-3	SGC-4
Generator control	X	X	X	X
Start control		X	X	X
Parallel-to-series control			X	
Start / motor ignition control				X
Tachometer-generator speed sense		X	X	X
Remote shunt current sense	X	X	X	X
Shunt start field weakening	X	X	X	X

Generator control

- Ensuring generator is turning above the necessary speed before allowing it to be manually or automatically engaged,
- soft generator engagement for gradual loading of generator by way of configurable voltage ramp,
- load current limitation to prevent over-stressing of the generator,
- implementation of bulk, absorption and float phases to realize a configurable battery charging profile,
- remote current limitation for constant current (bulk phase) battery charging to lengthen battery life,
- protection against over-voltage, under-voltage, over-current and reverse current conditions,
- ability to bring a generator to life using only its residual magnetism without use of any non solid-state components.

Start control

- Various circuits using momentary or non-momentary switches to initiate (and abort) a start sequence,
- starter is terminated manually by operator, or automatically at idle speed (after a successful start),
- where speed of starter-generator can be sensed directly via tachometer-generator input or indirectly derived from starter current and/or field-volt ratio measurements.

Parallel-to-series control

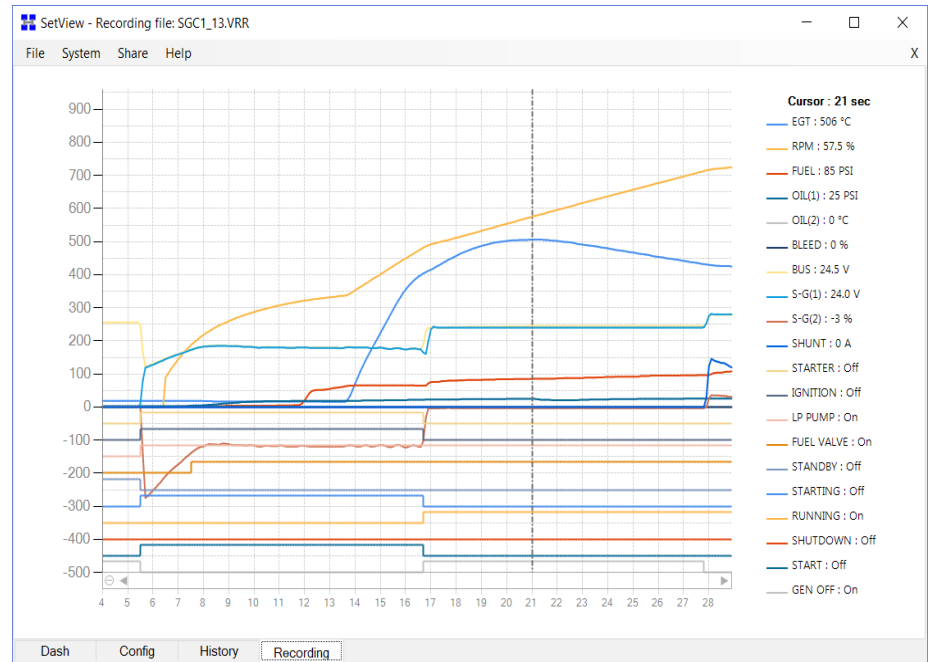
- Allows parallel to series and back to parallel switching of two 24 volt batteries using an arrangement of contactors,
- transition from parallel to series is done manually by operator, or automatically via tachometer-generator speed being reached,
- transition from series to parallel is done manually by operator, or automatically at idle speed (successful start) coinciding with automatic starter termination.

Start / motor ignition control

- Introduces two separate distinct actions for initiating an engine start and initiating a dry motoring / run,
- operator must deliberately select either a start or a motor operation from the outset which then dictates whether ignition is activated or not,
- this reduces risk of confusion resulting in hot-start worst-case scenario.

Maintenance interface

The SGC maintenance (serial) interface allows direct connection to a Windows laptop running our SetView program. This allows non-intrusive real-time parameter information (gauges), with the ability to record events of interest, adjust settings, and perform diagnostic tests.



Pin-outs (male 25-pin d-sub)

PIN	DIR	FUNCTION	DESCRIPTION
1	IN	BUS-PWR	BUS POWER INPUT (BUS SENSE)
2***	OUT	IGN-OUT	IGNITION OUTPUT
3 **	OUT	BAT2-C	SECOND BATTERY CONTACTOR
4 **	OUT	PAR2-C	PARALLEL SWITCHING CONTACTOR
5	IN	SHUNT-	REMOTE CURRENT SENSE SHUNT NEGATIVE INPUT
6	IN	SHUNT+	REMOTE CURRENT SENSE SHUNT POSITIVE INPUT
7	IN	START-PWR	START POWER INPUT
8 **	OUT	SER2-C	SERIES SWITCHING CONTACTOR
9 *	OUT	START-C	STARTER CONTACTOR
10	OUT	GEN-C	GENERATOR CONTACTOR
11	IN	D-SENSE	D SENSE INPUT (WIRED TO TERMINAL D ON S/G)
12	OUT	FIELD	FIELD OUTPUT (WIRED TO TERMINAL A ON S/G)
13	IN	GEN-PWR	GENERATOR CONTROL POWER INPUT
14	IN	SIG-GND	SIGNAL GROUND
15	IN	TRIG	TRIGGER INPUT
16***	IN	MOTOR	MOTORING INITIATION INPUT
17 *	IN	TACH	STARTER-GENERATOR SPEED INPUT (WIRED TO TACH-GEN)
18	I/O	CAN-L	CAN BUS INTERFACE LOW
19	I/O	CAN-H	CAN BUS INTERFACE HIGH
20	IN	RX232	RS232 INTERFACE INPUT
21	OUT	TX232	RS232 INTERFACE OUTPUT
22	OUT	START-LT	START LIGHT INDICATOR
23	OUT	GEN-LT	GEN FAIL LIGHT INDICATOR
24	IN	POR	POINT OF REGULATION (GEN SENSE)
25	OUT	PWR-GND	POWER GROUND

* used by SGC-2, SGC-3 and SGC-4

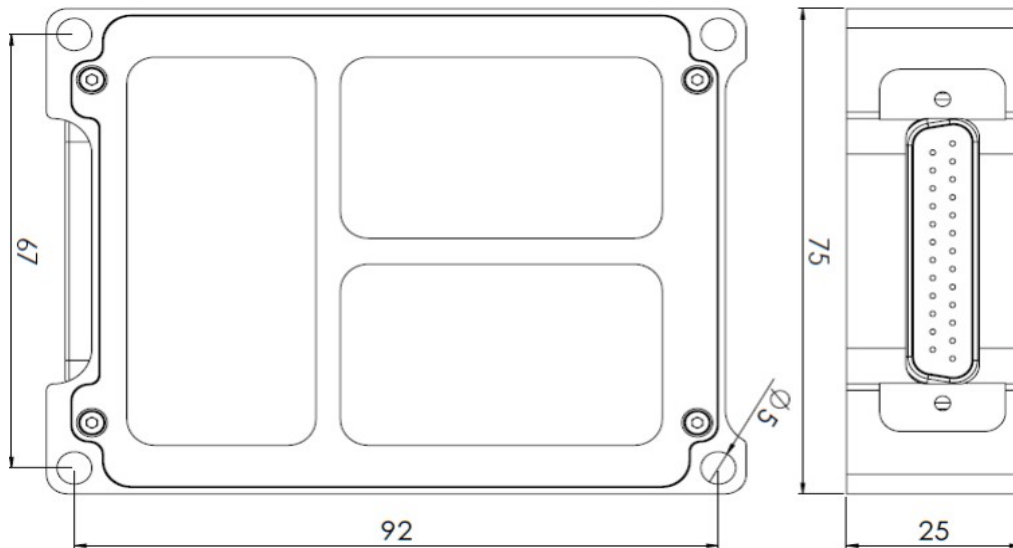
** used by SGC-3

*** used by SGC-4

General specifications

1	Generator Over-voltage Trip Point (highest of pin 24 or 13 relative to pin 14)	32.5 ± 0.5 V
2	Generator Over-voltage Trip Time	0.03 – 0.05 sec
3	Operating Temperature Range	-40 to +85 °C
4	Max. Operating Altitude	55,000 feet
5	Dimensions	100 x 75 x 25mm
6	Weight	180 g (0.4 lb)

Unit outline



1. The SGC uses a 25-pin DSUB (M24308 series) male connector. The recommended mating receptacle (female) for it is the M24308/2-3
2. The unit is secured through four 5mm holes on each corner accepting AN3 bolts