

Functional Range

E-GEN+

AMF Engine Controller Relay



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1. Introduction and Application

eGen+ is designed for the control of emergency and standby power systems. It integrates the functions of engine start relay, engine and alternator supervision and annunciation.

eGen+ measures and displays various parameters like voltages, currents, power factors, active power consumed in all the three phases. It also measures the energy consumed by the load. The display of month-wise energy consumption is also available in its non volatile memory.

eGen+ provides overload protection and the permissible overload limit can be selected on the relay. The actual load current is displayed by setting the CT ratio

The relay has excellent communication features including GPRS/GSM and SMS connectivity through modem and any fault event can be immediately conveyed to the base station or to the concerned persons.

2. Features & Characteristics

2.1 General Features

- Numeric Digital controller technology
- Wide auxiliary supply: 7 V to 35VDC.
- Withstands a dip to 0V of auxiliary supply for 0.5 second.
- Alphanumeric LCD displays with keypad for ease of operation.
- 24 - LED for annunciation of status of various faults/ inputs. 10 LEDs are user programmable.
- Provision for operating 12 Auxiliary relays [externally mounted] for control, annunciation and protection purpose. 6 relays are user programmable.
- 16- Opto-Isolated Digital Inputs, 10 inputs are user Programmable.
- **Last 50 Event record** with non volatile memory backup.
- All fault/event status with Real Time Clock stamp
- **Last 10 fault record** in non volatile memory backup.
- To avoid misuse, Locking of 5 Command keys
- Compact Flush Mounting Unit

2.2 AMF Function Features

- Continuous supervision of mains & D.G breaker status - ensures human /equipment safety
- MCB gets open on mains failure and remains open till GCB gets close.

- Internal interlock for EB & DG breaker for fail safe operation.
- DG starting process supervision
- Wide array of time circuits for start delay, stop delay, mains restoration, re-cooling etc.
- **Best Phase Selection** especially for PIU interface.
- **Thermal Management** Scheme based on state of available batteries.
- **Last 5 DG Start-Stop record with run duration** with non volatile memory backup.
- Month-wise energy consumption record in non volatile memory.
- Three Phase or Single Phase operation

2.3 Measurement, Display & Supervision Features

- Measures and displays different electrical parameters of mains and generator for all phases including Current, Voltage, Frequency, Power Factor, Active Power and Energy.
- Supervision of three phase mains/DG voltages for UV& OV.
- Supervision of mains & D.G for Over/Under frequency.
- Supervision of four Battery voltages.
- Fuel level monitoring at two different levels.
- **4- Analog Inputs** for Battery voltage
- **1-Thermistor** interface for room temperature measurement.
- **1-Analog** interface for Fuel level measurement.

2.4 Protection Features

- Over/under frequency/speed indication / shutdown.
- Internal fault annunciation for fail to start, over speed & low battery.
- Overload current protection with selectable overload setting.
- Protection against undesired conditions monitored via Digital inputs.
- Protection against Engine faults like LLOP, HCT, Overspeed etc.

2.5 Communication Features

- Connectivity through **GSM** Modem on **GPRS** for transfer of complete information to base station.
- **SMS** alert on events/ faults to maximum 5 user programmable mobile nos.
- Records monthly energy consumed by Generator

and Mains and communicates Gen Energy to base station.

- Records and communicates the five Logs of Generator start and stop times to base station to monitor run hours of the DG.
- eGen+ gives first priority to Base station communication via TCP/IP through GPRS. In case of unavailability of GPRS, eGen+ update its status to Monitoring base station via GSM communication (if enabled).
- Data communication occurs through TCP/IP protocol. IP address of monitoring base station is configurable in eGen+.
- LIVELINK front end software interface gives the complete data base management for AMF controller at base station. Front end monitoring interface s/w, gathers all the information of eGen+ like running energy, voltages, load currents, PF, Run hours, DG/Mains Fault status in Excel format. One base station can handle unlimited eGen+ simultaneously via GSM/GPRS
- eGen+ communication record at base station is distinguished through unique user programmable Site Name and Site No.
- All the data downloading at base station in excel format.
- Automatic daily status report logging at base station via GPRS.

3. Operating Modes

eGen+ operates in one of the four modes as described below. The operating mode can be selected from front keypad. The four modes are:

1. Automatic
2. Manual
3. Test
4. Remote

The four operating modes are described below:

3.1 Automatic Mode

In Automatic mode starting and stopping of the engine and on/off control of circuit breakers is governed by six conditions: Availability of healthy mains supply, the room temperature (analog i/p), room temperature (digital i/p), BTS1, BTS2 and BTS3 voltage. If mains supply is unhealthy, then BTS1 voltage or BTS2 voltage or BTS3 voltage are low as compared to lower set value or a low room temperature (digital i/p) is not active or room temperature (analog i/p) is high as compared to set value will start genset and will be stopped when mains recovered.

3.2 Manual Mode

In this mode eGen+ ignores mains voltage. It only responds to **START** and **STOP** commands from the keypad. Similarly generator and mains CBs are also operated from the keypad.

Precaution: Before giving Start command to generator, one must ensure that the generator CB is open.

Start key should be held down until the engine reaches threshold speed. The generator CB may now be switched on from keypad provided that the Mains CB is off.

When stop key is pressed, the generator CB is switched off and then the generator is stopped.

The mains CB can also be activated from the keypad. Interlocking of mains and generator CBs is built into the firmware.

3.3 Test mode

In this mode no-load and load test run of the Gen-set is possible. In TEST mode, the engine is automatically started and supervised and it is checked whether the generator has reached its rated voltage. Should a mains failure occur during test mode operation, the mains emergency operation is initiated automatically.

Mains CB open/close switches are active. Similarly generator CB open/close switches are also active.

3.4 Remote mode

This is same as auto mode except that if mains fail or mains parameters go beyond operating limits, Gen-set 6 conditions for starting (as mentioned in auto mode) are checked only after getting a command / pulse to the remote start terminal.

Generator parameters are continuously monitored. If any parameter goes beyond the set value, generator is stopped after a set time delay.

During running of the generator, the generator is normally stopped either after getting a command / pulse to the remote stop terminal or when mains is restored. The generator CB opens and mains CB closes after the preset value of mains restoration time. Then the Gen-set is shut down after re-cooling time.

4. Thermal Management

Thermal management scheme is available in eGen+ to avoid unnecessary start of DG in absence of mains. eGen+ will not start the generator even when mains fail, If BTS1, BTS2 and BTS3 voltages exceeds set value and room temperature (analog i/p) is less than set value and low room temp (digital i/p) is active when all these above conditions satisfies eGen+ will not issue start command and is recorded as event by **DG_ON_HOLD**. When any of this condition gets violated and mains voltage is not present generator will get the start command.

5. Outputs

The eGen+ has **12** output potential contacts to controls twelve relays. Six relays are predefined & other six are user programmable on different faults and status.

6. Inputs

There are total **16** Digital inputs. Six are predefined & other ten are user programmable for different type of status update.

7. Leds

There are **24** LEDs provided in the front panel of the relay eGen+ **14** LEDs are predefined and **10** LEDs are user programmable on different faults/events.

8. Front HMI Interface

Display: 20characters x 4Line LCD is provided for HMI and display of measurements.

Front panel Keypad:

5- keys for MMI Scroll/Editing

2- keys for DG start Stop in manual Mode

2- keys for Mains CB operation in manual mode

2- keys for DG CB operation in manual mode

9. Editable AMF Settings

S.NO	MAINS PARAMETERS	MIN	MAX	STEP	UNIT	EXIT	DEFAULT SETTING
1	MainsRatedVolt	0	999	1	V	NO	230
2	MainsUnderVolt	0	999	1	V	NO	90
3	MainsOverVolt	0	999	1	V	NO	300
4	MainsUnderFreq	40.0	99.9	0.1	Hz	NO	45
5	MainsOverFreq	40.0	99.9	0.1	Hz	NO	55
6	MFreqBlkVolt	0	999	1	V	NO	85
7	MainRestoreTime	0	999	1	SEC	NO	5
8	MUnbalanceVolt	1	999	1	%	NO	25

S.NO	GEN PARAMETERS	MIN	MAX	STEP	UNIT	EXIT	DEFAULT SETTING
9	GenRatedVolt	0	999	1	V	NO	230
10	GenOverVolt	0	999	1	V	NO	260
11	GenUnderVolt	0	999	1	V	NO	190
12	GenUnderFreq	40.0	99.9	0.1	Hz	NO	47
13	GenOverFreq	40.0	99.9	0.1	Hz	NO	53
14	GFreqBlkVolt	0	999	1	V	NO	100
15	OverSpeed	40.0	99.9	0.1	Hz	YES	55
16	IgnitionVolt	0	999	1	V	NO	65
17	GenCbOnDelay	0	999	1	SEC	NO	5
18	GenRecoolTime	0	999	1	SEC	NO	30
19	GenCrkWaitTime	0	999	1	SEC	NO	10
20	GenStartDelay	0	30000	1	SEC	NO	10
21	GenOffDelay	0	999	1	SEC	NO	10
22	GenTripDelay	0	999	1	SEC	NO	25
23	DelaySuperTime	0	999	1	SEC	NO	15
24	NoOfGenCrank	1	9	1	NONE	NO	3
25	GenCrankPeriod	0	999	1	SEC	NO	5
26	StopperTime	1	999	1	SEC	NO	20
27	BattLowIndicatr	6.0	99.9	0.1	V	NO	10

S.NO	DG PARAMETERS	MIN	MAX	STEP	UNIT	EXIT	DEFAULT SETTING
28	PeriodicTstTime	0	999	1	Hr	NO	0
29	TestModeDuratn	0	99	1	MIN	NO	0
30	Analog_Fuel_level	10	80	10	%	YES	20
31	Overload_I	50% In	200% In	5%	%	YES	120
32	OverloadTrpTime	10	60	1	SEC	NO	20
33	Run_Time	1.0	10.0	0.1	Hr	YES	8
34	Rest_Time	1.0	10.0	0.1	Hr	NO	2
35	BattWeakSet	3.0	30.0	0.1	V	NO	4
36	LlopCheck	DISABLE	ENABLE	1	NONE	NO	DISABLE
37	LoadRecheckTime	1.0	10.0	0.1	Hr	NO	1

S.NO	OTHERS PARAMETERS	MIN	MAX	STEP	UNIT	EXIT	DEFAULT SETTING
38	CT_Ratio	1	250	1	NONE	NO	20
39	RmTmpLevel	0	120	1	degC	YES	20
40	RmTmCorrectnFctr	10	5000	1	NONE	NO	305
41	DiRoomTmpchk	DISABLE	ENABLE	1	NONE	NO	ENABLE
42	BTS1 Volt Setting	20.0	60.0	2.5	Volt	YES	45
43	BTS2 Volt Setting	20.0	60.0	2.5	Volt	YES	45
44	BTS3 Volt Setting	20.0	60.0	2.5	Volt	YES	45
45	HooterRstTime	0	999	1	SEC	NO	10
46	SinglePhase	DISABLE	ENABLE	1	NONE	NO	DISABLE
47	Alternator_Protection	DISABLE	ENABLE	1	NONE	NO	ENABLE
48	AlternatrFltTimer	3	600	1	SEC	NO	25
49	Ther.Mgment_Feature	DISABLE	ENABLE	1	NONE	NO	ENABLE
50	GsmDataUpdationTime	1	60	1	MIN	NO	15
51	LoadRunTime	1.0	24	0.1	Hr	YES	8
52	LampOnHr	1	24	1	Hr	NO	19
53	LampOnMin	1	59	1	MIN	NO	5
54	LampOFFHr	1	24	1	Hr	NO	6
55	LampOFFMin	1	59	1	MIN	NO	5

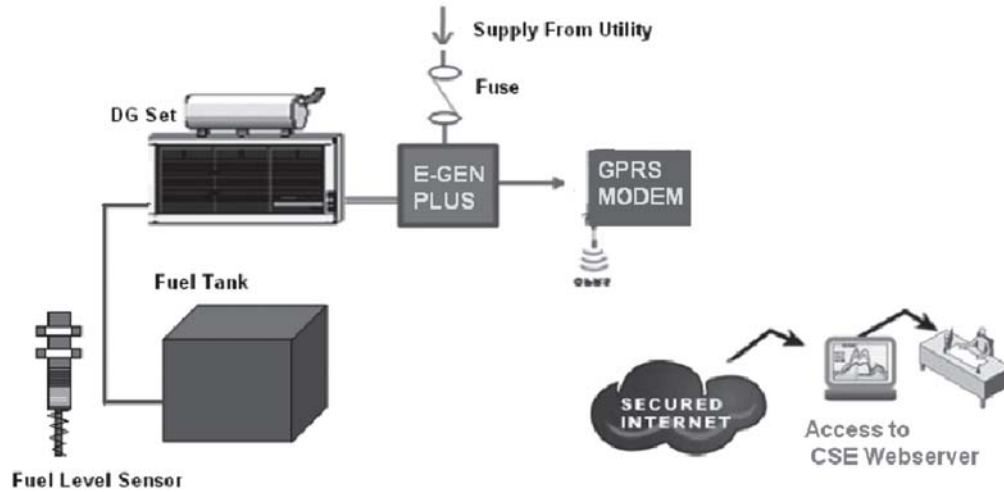
10. Web Server solution for eGen+

A web based solution that allows eGen+ users to MEASURE, VISUALIZE, ANALYZE, CONTROL AND SAVE electricity and process parameters Anywhere, Anytime – across the Enterprise.

This web server is the platform that will make possible an era of energy efficiency where better energy /fuel management is institutionalized and sustained among different customers.

At the heart of **web server** solution are the eGen+ units, which are installed on customer's existing network, interfaced with GPRS/GSM modem, which communicates

with central data server over the GPRS/GSM. Then, depending on the business requirement, geographical / administrative entities or equipment to be monitored at different locations, areas or by individual consuming points. GPRS/GSM enables remote control and access of metered data and allows the customer to remotely manage the relay. The web server maintains various fault records, DG star stop reports, DG set fuel consumption on hourly/daily/weekly basis, DG/ Mains energy consumption reports, DG specific Energy Generation Ratio (SEGR) for performance assessment & DG running hours report.



11 Performance Specifications

S.No	Parameter	Specification
1	Aux supply	7 – 35 V DC:
2	Aux supply Interruption Time	Half second sustains battery dip down to zero volts without requiring external capacitor bank.
3	Aux supply burden	<3 W @24 V DC
4	Generator voltage	50 to 300V AC(Ph-N)
5	Mains voltage	50 to 300 V AC(Ph-N)
6	Rated frequency	50 / 60 Hz
7	Voltage measuring tolerance	+/- 3%
8	Freq. measuring tolerance	+/- 0.5%
9	VBatt supervision	9.0 – 35.0 V (DC)
10	Tolerance of VBatt measurement	+/- 1%
11	Current measurement tolerance	+/- 3%
12	BTS1/BTS2/BTS3 supervision:	30V-60V (DC) / Tolerance: +1%
13	Room Temperature analog Resistive Interface Range	100 ohm [Min 0.0°C] to 146 ohm [Max: 120.0°C]
14	Fuel Level analog Resistive Interface Range	7.5 ohm [Min:10%] to 183 ohm [Max: 80%]

12 Hardware Specifications

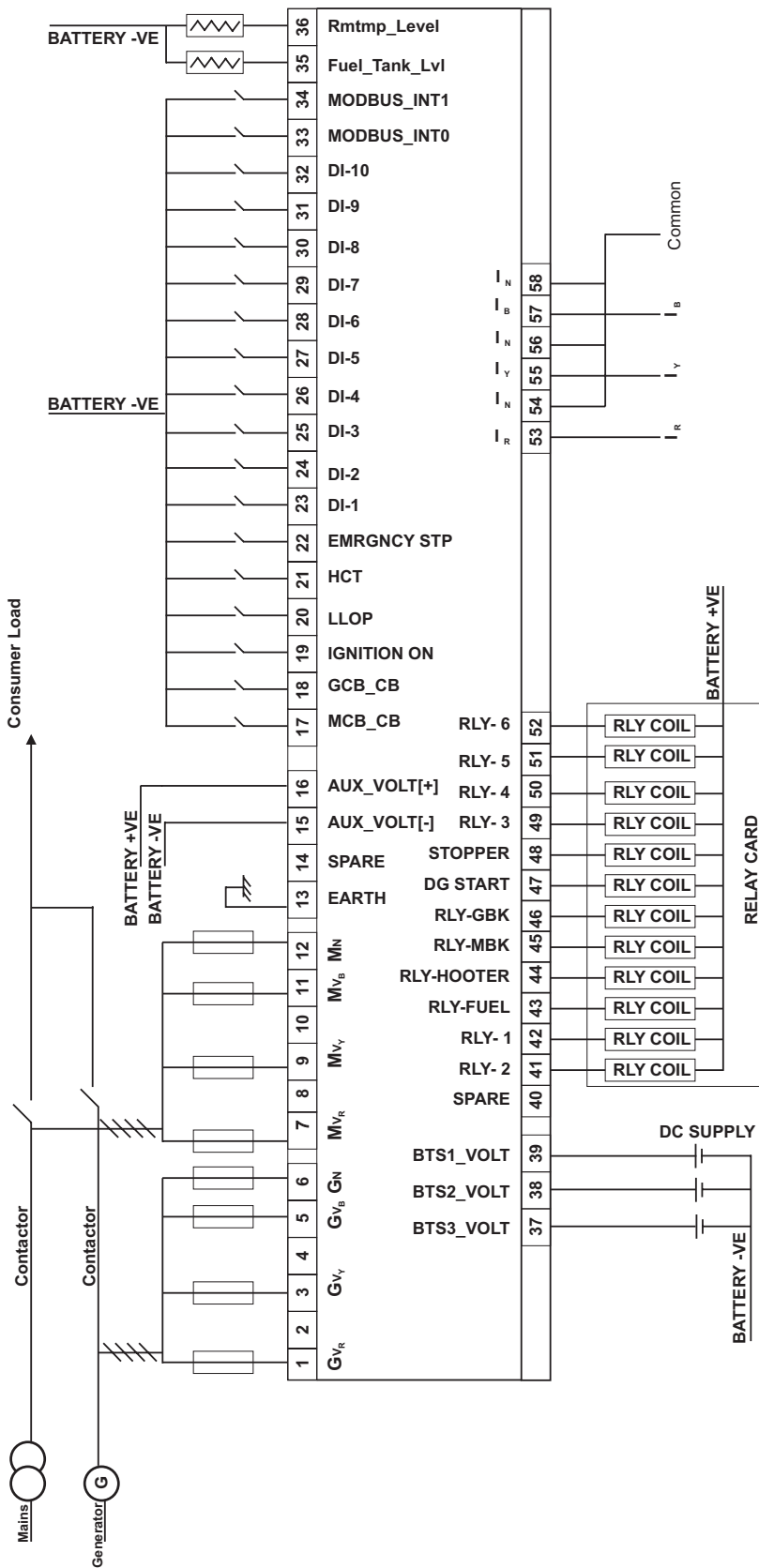
S.No	Parameter	Specification
1.	Digital Inputs: 16 nos	Opto-isolated I/Ps
2.	O/P Potential outputs 12 nos.	Solid State – MOSFET Rating 1.2A DC @12/ 24VDC
3.	Communication	Serial full duplex : RS232: TCP/IP interface Compatible with CSE make Pro GM100 _Modem
4.	Serial connector	9-pin subminiature DB9-connector
5.	Storage temp.	0°C - +70°C
6.	Operating Temp	0°C - +70°C
7.	Connecting terminals	max 2.5 mm ² / Recommended 2.5 mm ² conductor
8.	Enclosure	1. Flush mounting 2. Weight: 0.8 Kg approx.

13. Terminal Arrangement

Terminal No.	Description
1	Generator Voltage V_R
2	X
3	Generator Voltage V_Y
4	X
5	Generator Voltage V_B
6	Generator Neutral V_N
7	Mains Voltage V_R
8	X
9	Mains Voltage V_Y
10	X
11	Mains Voltage V_B
12	Mains Neutral V_N
13	Auxiliary Earth
14	SPARE [Not for User]
15	Auxiliary Voltage [Negative]
16	Auxiliary Voltage [Positive]
17	MCB Check back Digital Input
18	GCB Check back Digital Input
19	Ignition On Digital Input
20	LLOP Digital Input
21	HCT Digital Input
22	Emergency Stop Digital Input
23	DI-1 (User Programmable)
24	DI-2 (User Programmable)
25	DI-3 (User Programmable)
26	DI-4 (User Programmable)
27	DI-5 (User Programmable)
28	DI-6 (User Programmable)
29	DI-7 (User Programmable)
30	DI-8 (User Programmable)
31	DI-9 (User Programmable)

Terminal No.	Description
32	DI-10 (User Programmable)
33	MODBUS_INT0 (Model Dependent)
34	MODBUS_INT1 (Model Dependent)
35	FUEL_TANK_LVL (Analog Input)
36	RMTMP_LEVEL (Analog Input)
37	BTS3_Voltage
38	BTS2_Voltage
39	BTS1_Voltage
40	SPARE [Not for User]
41	Relay- 2 Potential O/P (User Programmable)
42	Relay- 1 Potential O/P (User Programmable)
43	Relay- DG FUEL Potential O/P
44	Relay- HOOPER Potential O/P
45	Relay- MCB Potential O/P
46	Relay- GCB Potential O/P
47	Relay- DGSTART Potential O/P
48	Relay- STOPPER Potential O/P
49	Relay- 3 Potential O/P (User Programmable)
50	Relay- 4 Potential O/P (User Programmable)
51	Relay- 5 Potential O/P (User Programmable)
52	Relay- 6 Potential O/P (User Programmable)
53	Load Current I_R
54	Load Current I_N
55	Load Current I_Y
56	Load Current I_N
57	Load Current I_B
58	Load Current I_N

14. Connection Diagram



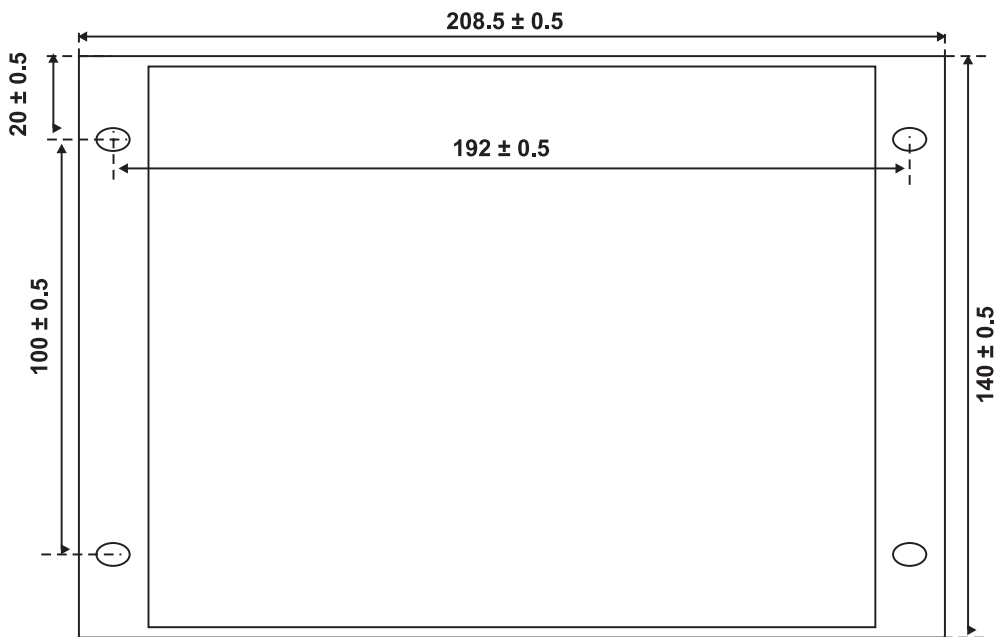
SPECIAL NOTE:

- * DG Body (Battery-Ve) should be earth properly.
- * Use separate +Ve & -Ve supply from DG battery terminal for eGen+. Do not loop these wires to any other wires in the control panel.
- * Use RC snubber networks across contactor coil.
- * Use RC filter across Start & Stop relay contacts.
- * Use separate trays for AC & DC wirings.
- * Please make sure that all above conditions are fulfilled properly for trouble-free operations of the eGen+.
- * Put free-wheeling diodes across relay coil.
- * DG Battery Ground and BTS Battery Ground should be common.

15. Version Details

S.No.	Version	Production status
1	Version 1.00: Release: 12/07/09	Discontinued
2	Version 1.10: Release 08/10/09	Discontinued
3	Version 1.11 : Release 04/11/09	In production

16. Cut-Out Dimension



Panel Cut-out: 183mm x 141mm

Installation Depth: 85

All dimensions in mm



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