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USER MANUAL OF LIGHTING ENERGY MANAGEMENT   CONSOLE (LEMC)

CATALOG NUMBER : 19ML001_16
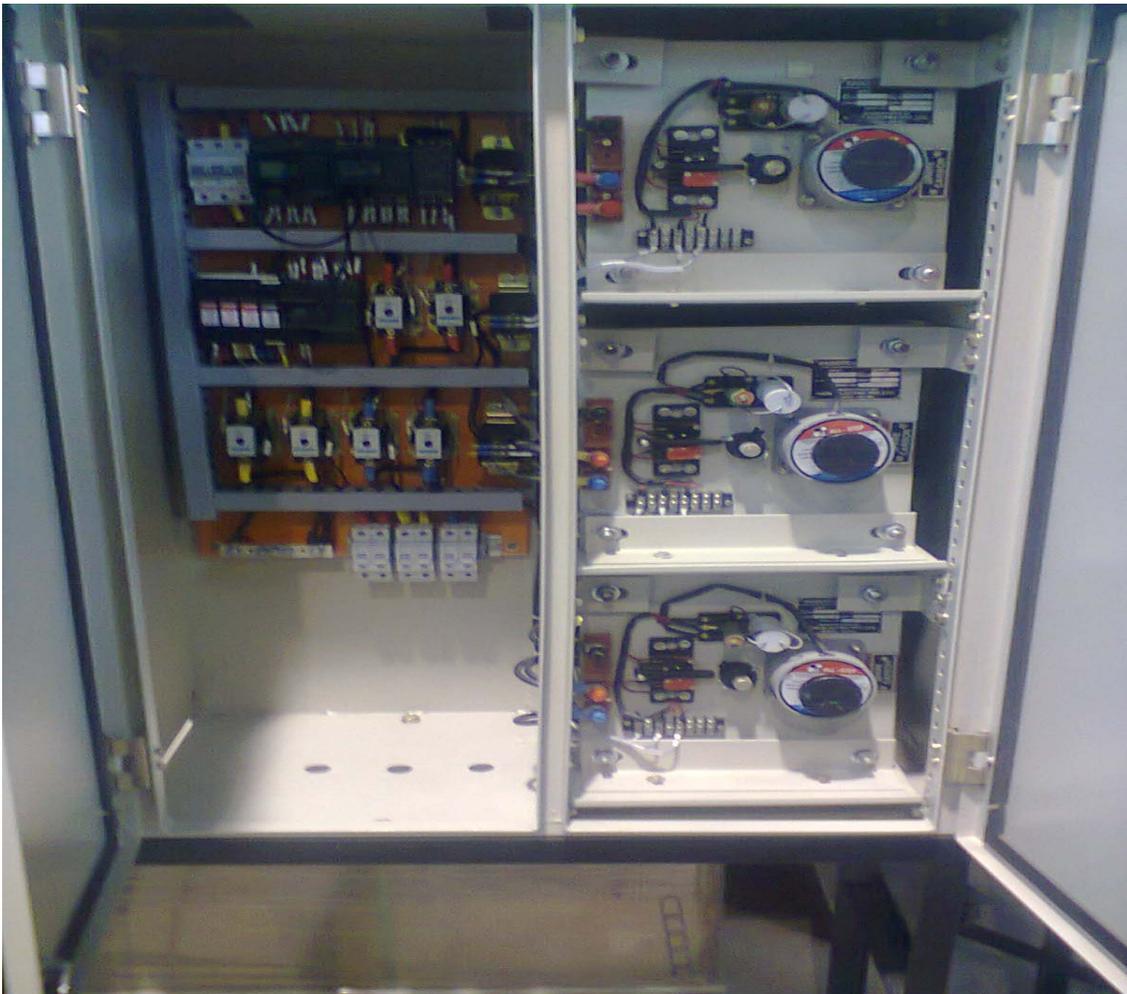
This user manual describes the functionality of the Lighting Energy Management Console (LEMC). It guide for wiring of panel by providing Wiring Diagram of panel. It also guide for Maintenance & troubleshooting of panel. It provides Safety Guidelines & Warranty Norms of LEMC panel.

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1. Introduction

1.1 Why LEMC

"Saving electricity doesn't just save money; it also saves our planet Earth."
Lighting is the single largest use of Electricity in residential or commercial buildings. Over the years it has evolved to be one of the major contributors to electricity consumption. It is estimated that indoor and outdoor lighting together comprises 19% of the total electricity consumed. With the cost of electricity rising as demand outstrips supply, energy saving is the most critical issue today. Frequent line voltage fluctuations & over voltages that are generally common after midnight due to low demand result in reduced lamp life and increased energy consumption. To make matters worse, inaccurate switching of the lamps & unavailability of energy saving features increase the energy wastage further. Saving lighting energy requires that you either reduce the lighting wattage or reduce the run-time. Thus, there is a need for a system that protects the existing lighting installations, enhances the life of the lamps used, and at the same time reduces the overall energy consumption of these installations.

Run time can be reduced by employing the following strategies:

Scheduling: Energy can be effectively saved by scheduling lighting by area function or time. For e.g. in residential buildings, after midnight every alternate street lamp can be switched 'OFF' resulting in energy savings.

Effective Daylight Utilization: Instead of switching 'ON' the lights at a fixed time, they can be switched ON at sunset to make effective use of daylight or they can be switched ON after twilight* to make maximum utilization of daylight.
Moreover, lighting lamps should be powered with a voltage that is around 5% of its nominal value. Consequences of voltage fluctuations considerably reduce lamp life. Street lighting systems particularly have this disadvantage due to over voltages that are common during the night leading to reduced lamp life and increased power loss. Other disadvantages of the existing systems include, inaccurate switching of Street lights earlier than sunset and later than sunrise along with unavailability of features like OFF-hours or Alternate pattern in lighting so as to save energy during thin traffic conditions prevailing during the night. To overcome these problems, GIC offers a unique cost-effective solution.

1.2 Lighting Energy Management Console (LEMC)

Lighting Management Console (LMC) from GIC is a unique technologically advanced solution for:

1. It is used to address 3 phase lighting loads. Accurate switching of the lamps at sun rise/set or twilight rise/set.

2. It stabilizing the system voltage of the lamps to a preset value using servo- based stabilizers throughout the lamp ignition and run cycle. It uses extremely reliable, accurate and fast voltage stabilization technique which is suitable for all kinds of lamps. Due to high efficiency of the system, besides voltage stabilization, LMC helps in reducing the expenditure on electricity up to 44% which will achieve a payback within 6 to 36 months based on the lighting load, and average cost of energy per kilowatt hour.

3. It extending lamp life by eliminating voltage fluctuations, over / under voltages and harmonics.

4. By sending the SMS query, it is possible to set SV, Dimming, SMS Offset, Auto SMS frequency. Also we will get information about relay status, astro configuration, supply parameters like voltage, current etc.

5. Dim hours feature reduces the energy consumption during switching of the lamps at sun rise/set or twilight rise/set.

6. If one or two Phase of system is failed then load will transfer to respective phase such that Lamp load will Continuous ON. Hence even though failure of TWO phases "Load Transfer" features enable to ON Lamp load continuously. This feature is enabling at the time of event only.

7. It is possible to make the system "Manually Bypass" using Rotary Switch.

8. Power ON SMS will be automatically sent to the user.

9. Door Open/close sensing feature will send the SMS of Door Open/close automatically to the user in case of door open/close. This feature is very important from Security point of view.

10. It provides "Data Logger Utility" for reading all logs data of GSM(global system for mobile communication) Device and write those logs into a file.

11. When any interruption comes at site then device does not reset and some of lamps gets off. But LEMC panel provides "Dip/Interruption detection feature" so that LAMP will get reignited & ON continuously.

1.3 Salient Features

- Substantial Energy savings through precise and accurate astronomical switching control.
- Continuous mode of operation with steady correction of voltages through servo-stabilization.
- Servo based system ensures low harmonics.
- Protection against extreme current/voltage conditions to increase lamp life.
- Energy measurement & optional parameter transfer to remote location through GSM.
- Best suitable for lighting automation with HPSV or MV lamps.
- User friendly application software for easy configuration.

2. Technical Specifications

Parameter	Description
System Configuration	Boost Enabled
System Ratings	3 Phase 15 k VA
Input Supply	165 -277 VAC
Input Frequency	47 – 50 Hz
Lamp Ignition Voltage	220V ± 4V
Regulated Output Voltage after ignition cycle (SV) [Set SV parameter in Astro Range : 180 to 240]	Variable as per SV settings in Astro in the range of 180 V to 240V AC +/- 4V. Factory Default is 200V.
DIM Voltage	180 – 220 VAC, Factory Default is 200V. Begin Time : 00:00 – 23:59, Factory Default is 23:00 End Time : 00:00 – 23:59, Factory Default is 04:00
Voltage Measurement Accuracy	± 2%
Voltage Regulation Speed when voltage is going up (from min to max)	2V/second for 5KvA system (3.5kg-cm)
Voltage Regulation Speed when voltage is going down.	If the output voltage is greater than desired SV then system will move fastly uptill +/- 10V.
Max Lamp Load Current allowed	For Three Phase :- 20A on each phase output
Max Overload Current Capacity for duration of 5 minutes	20 A (120% of Overload current setting)
Full Load Efficiency	92 to 98%
Harmonic Distortion induced by the system	
Protections (Protection related settings need to be done in Astro)	Protections (Protection related settings need to be done in Astro)
A] Overload [Default set value:- 20A] [Default Trip Time- 5 min]	Monitors the input current is above the set limit (120% of Set value) for Trip time & if overload persists then bypass the system i.e. output to load follows the supply voltage. When device is switched to Bypass mode because of overload, it will be recover by three ways: a) If current comes in Normal range (Below 90% of Overload settings) b) Under voltage c) Reset the system by switching OFF/ON the input MCB for that phase Trip Current Range: 5.0 to 30.0 A Trip Time: 1 minute to 5 minutes. B] Monitors the input current is above the set limit (150% of Set value) Hence It is required to trip the Mains relay immediately and Switch the system in Bypass mode because of overload, it will be recover by three ways: 1.If current comes in Normal range (Below 90% of Overload settings) 2.Under voltage 3.Reset the system by switching OFF/ON the input MCB for that phase Trip Current Range: 5.0 to 30.0 A Trip Time: 8 seconds to 14 seconds
B] Under Voltage	Switches off the load if input voltage reduces below the UV set limit. Restores the normal condition if input voltage rises above the (UV set limit + the 15V Hysteresis)

Parameter	Description
[Default set value:- 160V]	UV Range: 160V to 190V Trip Time: 2-4 seconds Recover or On delay Time: 10-20 seconds
C] Over Voltage [Default set value:- 280V]	Switches off the load if input voltage increases above the OV set limit. Restores the normal condition if input voltage reduces below the (OV set limit - the 15V Hysteresis) OV Range: 240 to 290V Trip Time: 2-5 seconds Recover Time: 10-20 seconds
D] Hysteresis for Under Voltage & Over Voltage	15 V
E] Short Circuit Protection	Input & Output MCBs of Class C32, Hager make
F] Lightening Protection	Class 'A+B' Surge Protection Device
G] Communication Failure between Control Modules	Bypass the system
H] Mains – Bypass Interlocking	There is Interlocking for Mains-Bypass conversion on the basis of current sensing to protect the panel in case of contactor failure.
I] Phase fail & load transfer	If R-PH fail, then load will transfer Y PH. Similarly Y-PH to B-PH & B-pH to R-PH. Hence Lamp load is ON in presence of Single Phase also. Load Transfer time : 9 Sec.

K] Manual Bypass Switch	The system is Manually Bypassed through Rotary Switch.
	Switch Position is given below :
	      1 : System ON in Auto ON event of Astro.
	      0 : System OFF
	      2 : System ON in Bypass.

L] Door open	Limit Switch is Provided for Door Open sensing.
M] ON Delay Timer	
CT Ratio Setting [Default set value:- 10]	Set this parameter as per the CT is used. For example, if CT (50A: 5A) to be used, set CT ratio as 10. CT Ratio Range: 1 to 40
LED Indications	**LED Indications**
ASTRO™ GSM Module [GSM-ERT5/GSM-ERT1/GSM-RT]	ON (Green LED): Power ON Indication. TX (Green LED): This LED indicates data or command transfer from controller to GSM Module. RX (Green LED): This LED indicates data receive from GSM Module to controller in remote Module. Network (Green LED): Its blinking speed indicates network status as follows: 64ms On/ 800ms Off : No network 64ms On/ 3000ms Off :Network present - Pulse (Red LED): Accuracy class validation. GSM Modem – Quad band, works on GSM frequencies 850MHZ,900MHz,1800MHz, 1900MHz Here we used SIM900B with firmware no : 1137B09SIM900B32_ST GSM Module comes with an inbuilt SIM tray, a RF antenna If communication between GSM Module & Astro fails, then both TX & Rx LED remain ON.
ASTRO™ Stabilizer Module	a) Power ON - Green [Indicates healthy status] b) Phase Status R - Red [Indicates out of correction status of R-Phase] c) Phase Status Y - Red [Indicates out of correction status of Y-Phase] d) Phase Status B - Red [Indicates out of correction status of B-Phase]

Parameter	Description
	path/Stabcon/Device/Documents/Design Documents/Specifications
Operating Temperature	-10 to 55ºC
Storage Temperature	-20 to +60ºC
Adaptive Lighting Loads	a) High Pressure/Low Pressure Sodium Vapour Lamps b) Metal Halide Lamps c) Mercury Vapour Lamp d) Incandescent/Halogen Lamps
Dimensions (W x H x D) mm	1185 x 390 x 1750 (mm) (including bottom frame)
Mounting	Base
Casing	Panel with 1.6 mm CRCA Sheet

3. Factory Default Settings For LEMC

3.1 Default Settings

Sr. No	Parameters	Value Limits	Default Value
Configuration Parameters			
1	Module Pin. Set for GSM modem	0000 to 9999	1234
2	SV (Stabilized Voltage)	180V - 240V	200V
3	DIMMING EN/DI	Enable - Disable	Disable
4	DIM Voltage	180V - 220V	200V
5	Dim Voltage Begin Time (In 24 hours)	00:00 – 23:59	23:00
6	Dim Voltage End Time (In 24 hours)	00:00 – 23:59	04:00
8	AECU (Auto Error Code Update) Mode	Enable - Disable	Enable
9	CT (Current Transfer) Ratio :	1-40	10
Electrical Parameters			
1	Under Voltage Limit	160V - 190 V	160 VAC
2	Over Voltage limit	240V - 290V	280 VAC
3	OC (Over Current) limit	5.0 to 30.0 A	20 A
4	OC (Over Current) Trip time	1 min - 5 min	5 min
5	Creep Current	-	30mA
6	Lower Threshold Voltage	-	50 VAC
7	Input Supply Voltage Range for (For Stabilizer in Correction Mode)	85 – 290 VAC	-
8	Output Voltage	SV +/- 10%	-
9	SMS Frequency (Schedule to generate ALLDATA response SMS)	0-12 hour	0
10	SMS Offset (Time delay after event to generate SMS)	0-15 min	0 (30 sec)

3.2 Fault Timing Durations

Parameter	Default Value
Minimum time for which **Rly** SMS query will not be processed by GSM after Power On.	2 minutes **Note**: "RLY" queries or relay actuating SMS received to GSM at Power On during first 2 min. will be deleted.
Time after which **First** Modbus query **(Power On)** is sent to Astro/ Stabcon by GSM.	After 2 seconds
Time required to set Network Time at Power on	18 sec.
GSM Module parameter initialization time	30 sec.
Maximum GSM Modem initialization time	30 + 18 = 48 sec
Astro Relay start-up time (with GSM)	40 sec.
Load transfer time in case of Phase Fail (In Auto	9 Sec.

ON event only)

3.3 CT Details

Sr. No.	Item Catalog Number	Item Description
1	19JC004	CT, Type AC, Ratio 50/5A, VA -2.5, Freq. 50Hz, Cat. No NM5B312, "C" clamp/Screw, Class 1 (NEWTEK Make)

RTC is set by using :

1.   Sending SetClk SMS to Astro.

2.   Keyboard.

3.   Time is updated automatically if service provider supports automatic network time at power ON.

4. Block Diagram

1.   19D332GA (With Door Lock & Without Active Phase Transfer)
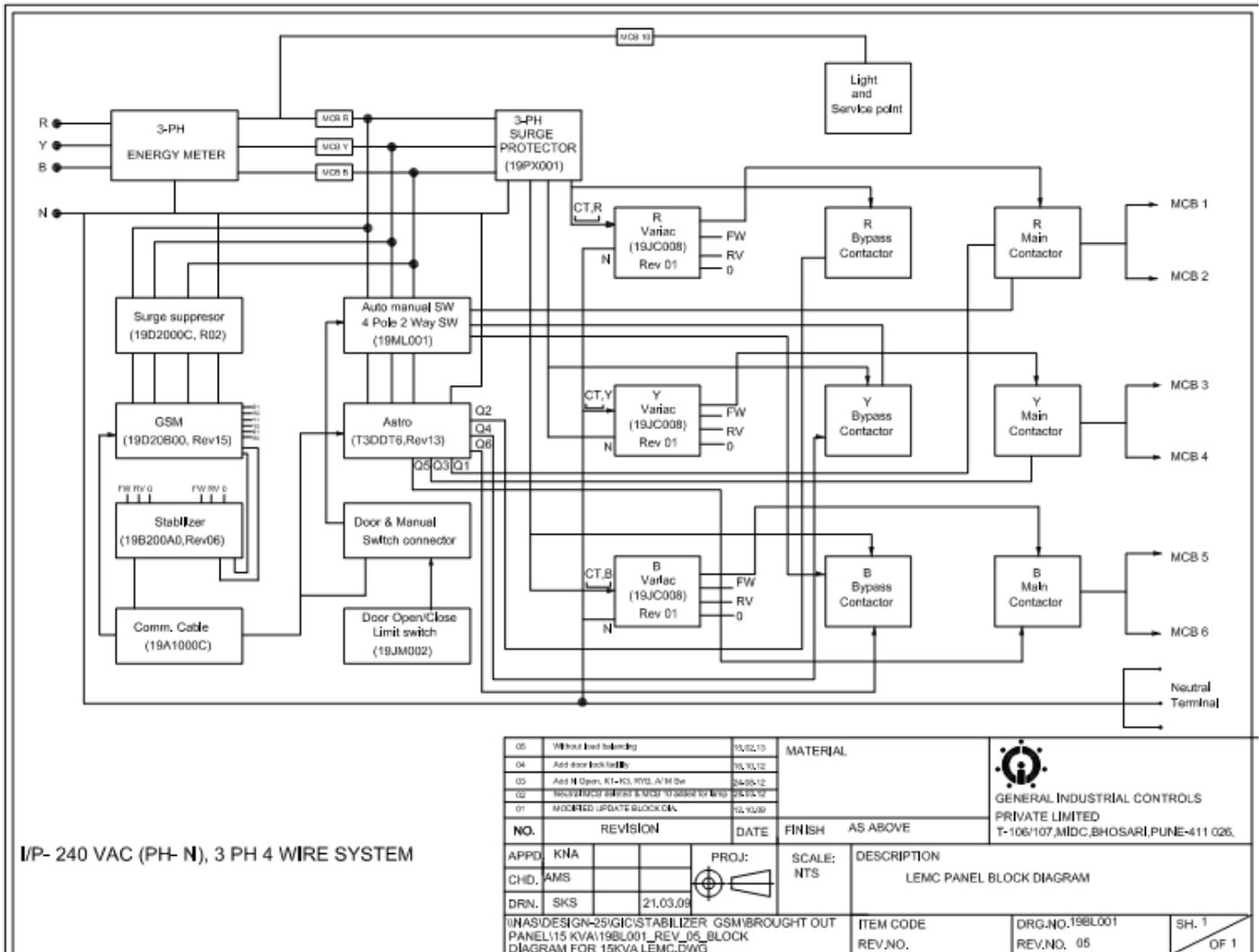
2. 19D332FA (With Door Lock & With Active Phase Transfer)
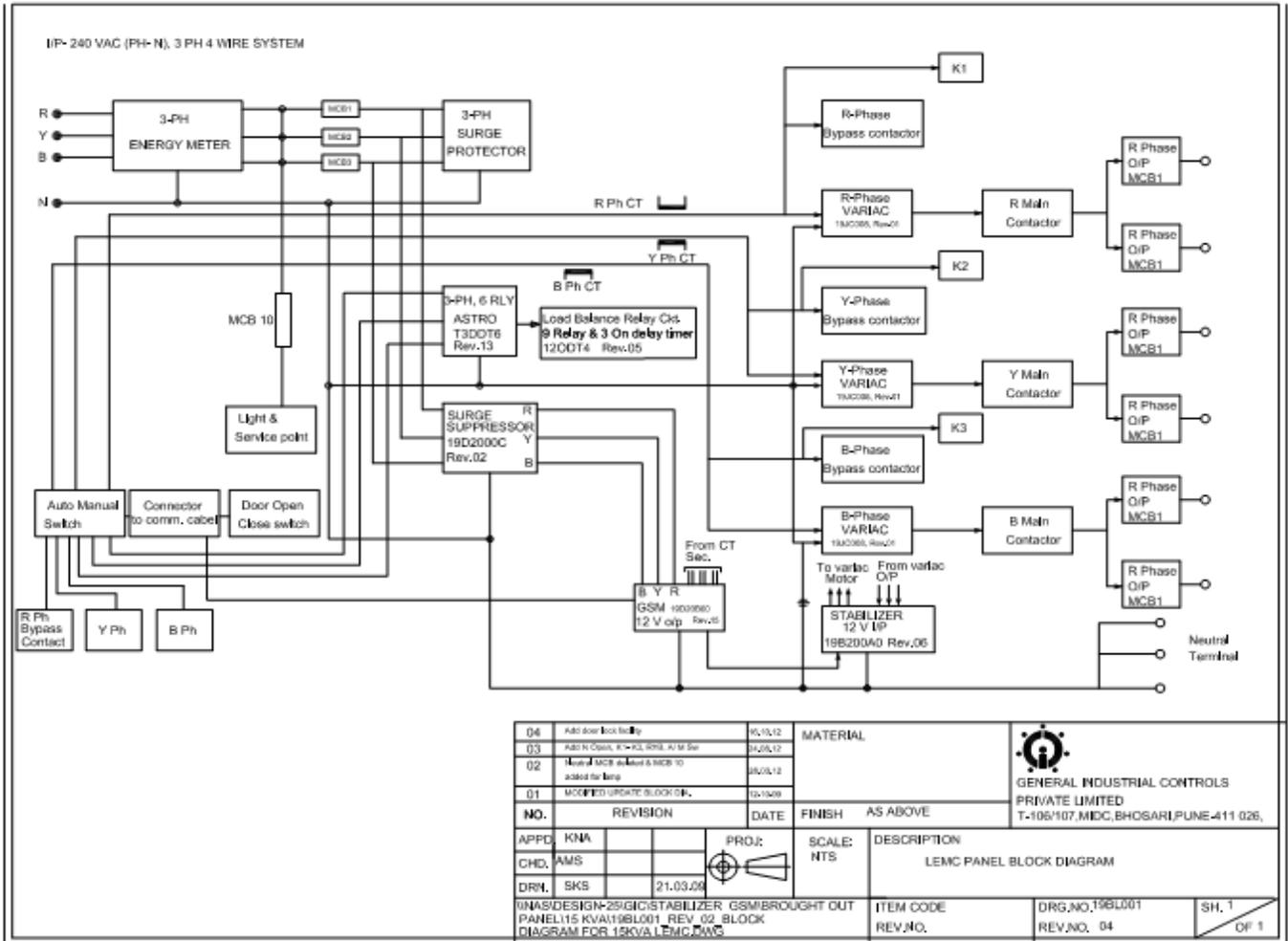
It consist of following parts..

Energy Meter

Input-Output MCB'sCurrent

Current Transformer (CT)

Astronomical Time Switch (Astro)

GSM Modem

Servo Stabilizer

Variac

Surge Supressor

Output Contractors – Mains / Bypass

Auto Manual Switch

Connector to communication cable

Load Balance Relay & ON Delay timer

4.1 Energy Meter

e) LMC provides a separate compartment for connecting Energy Meter. Energy meter is not provided by GIC, user has to connect his own energy meter in this section.

4.2 Input-Output MCB's

a) Here We selected MCB of class C32 for protection against inductive load.
b) Each device is protected against overloads/short circuit by means of a breaker switch (MCB) at the input as well as at the output.

4.3 Current Transformer (CT)

a) The current requirement of our system is 20A.
b) So we choose the metering CT of ratio 50/5 A with accuracy class 1.
c) Hence select CT ratio as 10 in Astro.

4.4 Astronomical Time Switch (Astro)

e) The Astronomical Time Switch provides accurate switching of the lamps based on astronomical time at sunset/sunrise or twilight rise/set.
f) It provides Communication with GSM module and stabcon.
g) During the Overload & communication fail, It switches the system from Main to Bypass.
h) Using other features such as Offset hours, Midnight Off, Weekly Off and Alternate mode available in the Astronomical Time Switch (Astro), more energy savings can be achieved.
i) Active phase selection & Auto load changeover feature ensures that the lights are not switched OFF even if one or two phases fail.
j) It provides under-voltage/over-voltage protection to the lamps which can be set over a wide range.
k) It also supports Modbus RTU communication protocol to communicate with compatible SCADA software. The device can communicate with PC through a serial or a USB cable, and can be programmed through Windows® based software.
l) It provides the Dim Hours feature given below :

DIM Hours :
1. When DIM Hr feature is enabled then device continuously monitor for DIM Hr event time period. If current RTC time is in between dim hour begin and end time, then it sends the o/p voltage as DIM voltage to GSM instead of SV.
2. If current RTC time is not in between DIM Hr Begin and End time, then it sends o/p voltage as SV voltage to GSM using same query.
3. When DIM Hr feature is Disable then device does not compare the system time to DIM Hr time. It simply send the set SV value to GSM.

m) For more details please refer Astronomical Time Switch Manual.
n) There are five operating modes of Astro as given below:

1. Auto OFF

This mode can be used to turn off the output channel forcefully. But in this mode the off condition will not be forever. The device will change the operating mode to AUTO on next auto event. For example, user selects Auto OFF at 4:00 A.M. and device has ON event at 6:00 A.M. The device will remain OFF from 4:00 A.M. to 6:00 A.M. and become ON at 6:00 A.M. Because device will automatically shift to AUTO mode at 6:00 A.M. which is next auto event.

2. Auto ON

This mode can be used to turn on the output channel forcefully. But in this mode the on condition will not be forever. The device will change the operating mode to AUTO on next auto event. For example, user selects Auto ON at 4:00 P.M. and device has OFF event at 6:00 P.M. The device will remain ON from 4:00 P.M. to 6:00 P.M. and become OFF at 6:00 P.M. Because device will automatically shift to AUTO mode at 6:00 P.M. which is next auto event.

3. Auto

This mode the status of output channel is decided automatically according to the settings made in the device, the present clock, and the sunrise/sunset time.

4.5 GSM Module

a) Main functions of GSM module are as follows
    4.5.1. GSM communication - To control and monitor feeder panel from remote location.
    4.5.2. Energy monitoring
    4.5.3. Communication with Astro and Stabilizer

4.5.1 GSM Communication

a) User can feed up to 5 mobile phone numbers in phone book. GSM Module will respond to these 5 mobile numbers only.
b) Using GSM communication user can
    1. Control and Monitor the lamps (Relays)
    2. Configure the Astro parameters
    3. Monitor the energy consumption and supply parameters,
    4. Monitor the error status
c) SMS frequency & SMS offset are settable using SMS. SMS Frequency is Schedule to generate ALLDATA response SMS. It is generated automatically after every 1 hour.
    SMS Offset is Time delay after event to generate SMS. When any event occurs, SMS will be generated After offset duration to manage the SMS traffic.
d) Auto SMS of ALLDATA response will be generated at the time of Dimming & SV changed.

4.5.2 Energy Meter Function

a) Inherent class 0.5 based 3Phase energy measurement .
b) It monitors following supply parameters :
1. Active Energy of R-Y-B Phase
2. Reactive Energy of R-Y-B Phase
3. Active Power of R-Y-B Phase
4. Reactive Power of R-Y-B Phase
5. Apparent Power of R-Y-B Phase
6. Error Code of R-Y-B Phase

4.5.3 Communication with Astro & stabilizer.

It is used for communication with Astro & Stabilizer.

4.6 Servo Stabilizer

a) Stabilizes the system voltage of the lamps to a preset value using servo-based stabilizers through variac.
b) The start-up conditions are maintained during the programmed ignition time for each phase in order to guarantee smooth lamp start-up/ignition by reducing the peak current at switch ON. After completion of programmed ignition time, output to the lighting installation will be switched to reduced mode, slowly reducing the voltage until the set voltage level is reached.
c) In sleep mode, it doesn't do any correction of voltages.
d) Due to the high efficiency of the system besides voltage stabilization, LEMC achieves high energy saving by reducing power consumption of discharge lighting like Sodium Vapor (High/Low pressure), Mercury vapor lamps.

4.7 Variac

a) It is an auto-transformer. Each variac is of 5kVA.
b) It is used for buck(70V) & boost(50V) purpose.

4.8 Surge Arrester

a) It is used for protection against lighting surges.
b) The arrester Class C type (as per VDE classification) are single, high capacity varistor based surge voltage arresters that are available with at least one time surge arresting capacity of 40 kA, 8/20 µs pulse and a repeated capacity for 20 kA, 8/20 µs pulses. The technology used is the MOV with an indication to check its proper functioning.

4.9 Contactors

a) It is an electrical control switch, used for switching power circuit with higher current range.
b) It provides protection against high inrush current.
c) It is of series MR 13 & MR 63 from L&T.

4.10 Auto Manual Switch

d) Rotary Cam Switches are freely programmable, hand-operated switchgear for main and auxiliary circuits.

e) It is possible to Bypass the system manually through rotary Switch. When Switch is at position 1- system ON/OFF according to Auto event of Astro (main relay ON) at position 0- System OFF & at position 2- System ON in Bypass (bypass relay On)

4.11 Connector to communication cable

a) Connector is connected to communication cable to make communication with Auto manual Switch & door open close switch.

b) When Power is ON , "Power ON" SMS automatically send to the valid mobile numbers.

c) When LEMC panel Door is open, "Door open" SMS send to the valid mobile numbers. Similarly when Door is closed, "Door closed" SMS send to the valid mobile numbers.

d) When switch is at position-1 i.e. in Automode. "Automode" SMS send to valid mobile numbers.

e) When switch is at position-2 i.e. in manually bypassed. "Manual Bypass" SMS send to valid mobile numbers.

4.12 Load Balance Relay & ON Delay Timer

a) Load balance relay enable to make the load ON in case of phase fail condition.
b) If R-Phase fail during Auto ON event, then load of R-Phase will transfer Y Phase. Hence Lamp load of R-Phase is ON through Y-Phase. Similarly Y-Phase to B-Phase & B-phase to R-Phase.
c) Here ON Delay Timer is used. It means that timer is ON after some delay. Hence at the time when load is transferred from R-PH to Y-PH delay is provided by using ON Delay Timer to avoid the short circuit of the
d) R & Y phase.
e) After recovery of R-Phase, Lamp load will get On through Mains contactor.
f) Hence Lamp load is ON in presence of Single Phase also.

5. Wiring Diagram

1. 19D332GA (With Door Lock & Without Active Phase Transfer)
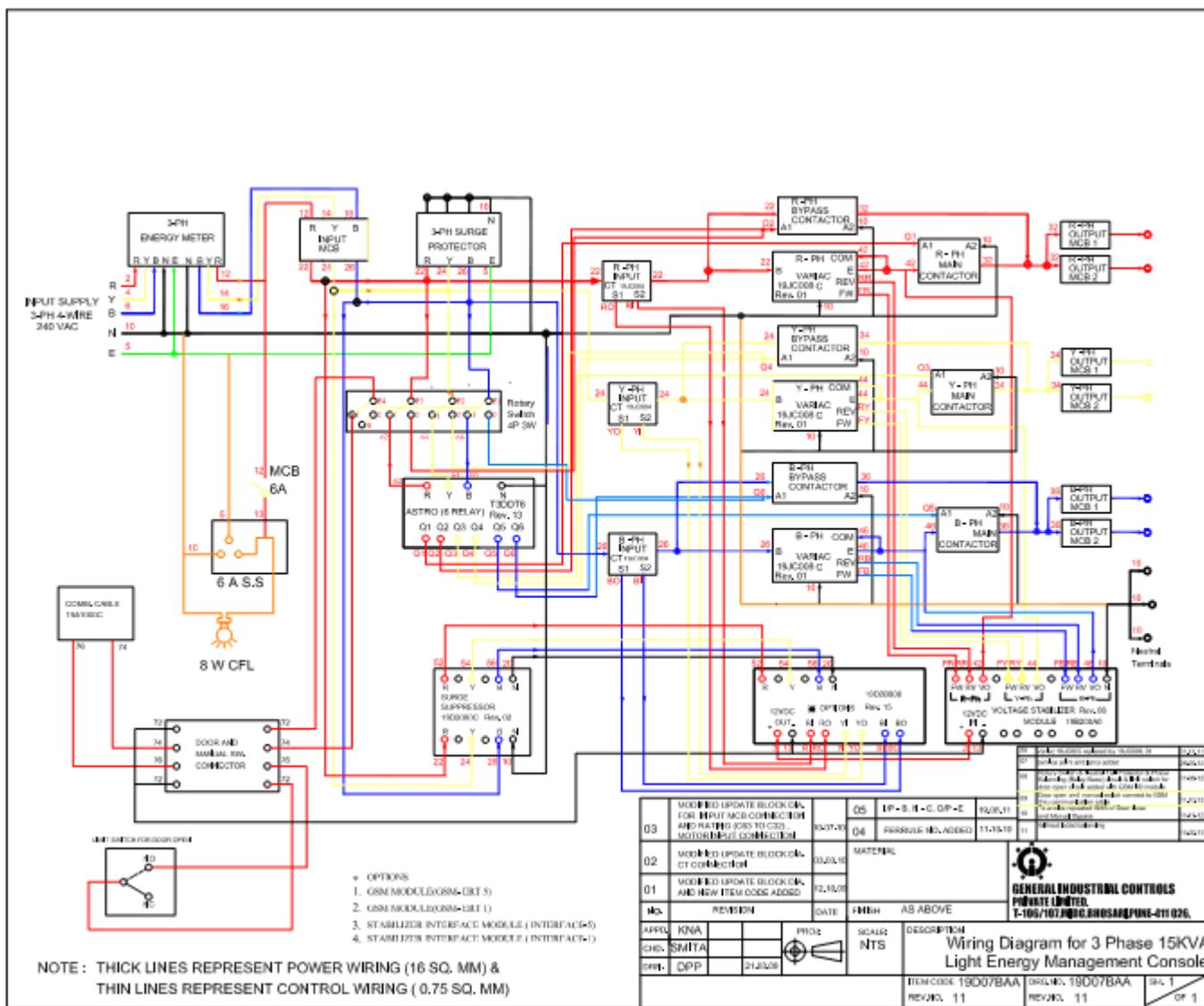
2. 19D332FA (With Door Lock & With Active Phase Transfer)
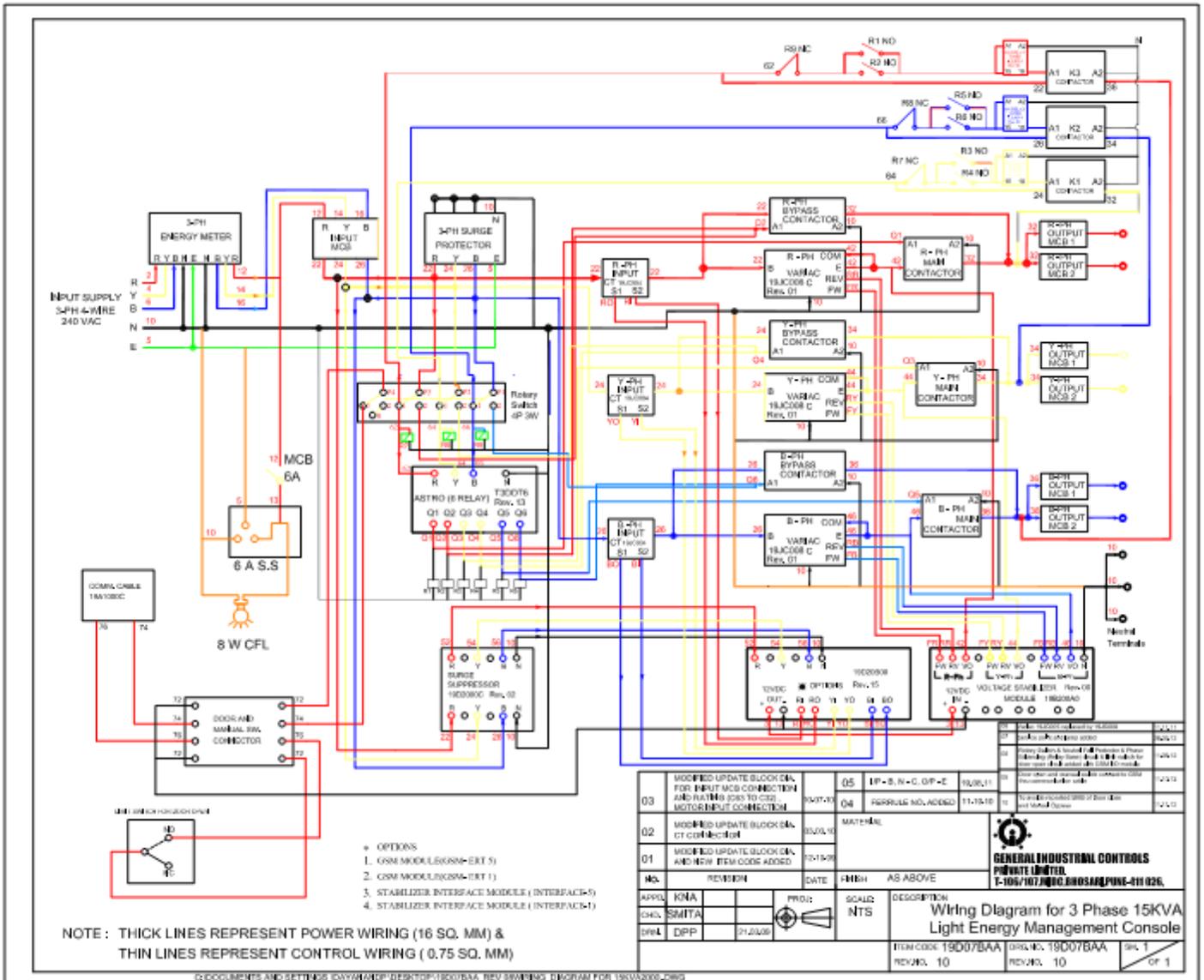
6. System Operation

1. Once the input and output MCB's are switched ON, the lamps will be switched ON at sunset or twilight set & switched OFF at sunrise or twilight rise as per the settings in the astronomical time switch.
2. In Astronomical time switch, if power is fail during Auto ON event then after power recovery
3. Auto ON event will be there till next event occurs.
4. If R-Phase fail during Auto ON event, then load of R-Phase will transfer Y Phase till the R-Phase recover. Similarly Y-Phase to B-Phase & B-phase to R-Phase. Hence Lamp load is ON in presence of Single Phase also.
5. After lamps are switched ON, within a few (40 sec) seconds the output voltage of each phase will be stabilized to the set ignition voltage (i.e. 220V) by Soft start in order to guarantee smooth lamp start-up/ignition by reducing the peak current at switch ON.(i.e. Variac rotates in step of 500ms ON & 3sec OFF to reduce the inrush current at power ON) for the ignition cycle of 7 minutes.
6. After 7 minutes of the ignition cycle, output voltage of each phase will be stabilized to the regulated output voltage (i.e. SV 180-240V).
7. If Dim Hour feature is enable, SV is set as Dim voltage for Dim hour duration.
8. It is possible to Bypass the system manually through rotary Switch. When Switch is at position 1- system ON in Auto event of Astro (main relay ON) at position 0- System OFF & at position 2- System ON in Bypass (bypass relay On)
9. If the load current exceeds the Set Overload limit (20A factory set) for the set time (5 minute factory set), then the main output contactor of that particular phase will be switched OFF & output bypass contactor of that phase will be switched ON. Now the overload fault will get reset by two methods after removing the fault cause.
   a. By switching OFF & then ON the input MCB of that particular phase.
   b. If current comes in Normal range.
10. When recovered from UV-OV condition.
11. During the ON hours of the lamp load, if input voltage is reduced below the set limit of under voltage (160V factory set), after the sensing delay, the system will trip by switching the main and bypass contactors for that particular phase & will remain OFF till the fault is not reset. Under voltage fault will get reset if input voltage increases above the [set UV limit + set Hysteresis] i.e. the main contactor of that phase switches ON after its ON delay. Similar action will take place if the input voltage increases above the set Over Voltage (285V factory set) level after the sensing delay.
12. During the ON hours of the lamp load, if the communication fails between the control modules, all the main contactors will be switched OFF & all the bypass contactors will be switched ON. Now unless the communication between these control modules recovers, the bypass contactor will remain ON. After recovery, the bypass contactors will get first switched OFF & then main contactors will be switched ON.

7. Operating Procedure

1. Switch ON the mains supply.
2. Check whether the energy meter is switched ON & showing the voltage of all the three phases.
3. Switch ON all the three MCB's in the input.
4. Set the CT Ratio as per the connected CT.
5. Set over current limit & over current trip time as per the load requirement.
6. Set SV, Dim voltage & Dim time as per requirement.
7. Press OK key on Astro time switch to check the voltages.
8. Change the other default settings if needed (as per the system is loaded) through Astro.
9. For system check, press the Astro keys Z1, Z2 & Z3 to manually override and switch ON the outputs till the √ sign is displayed in front of Q1, Q3, and Q5 on the display.
10. The main contactors for each phase will be ON. Now switch ON the output MCB's of each phase one by one.
11. Check whether all the lamps connected have their ignition cycles ON. This can be assessed by their faint glow.
12. After 7 minutes, check that all the lamps are ON with sufficient intensity.
13. Current on each phase can be observed on Astro Display Screen with voltages.
14. To check whether the system switches to bypass mode or not disconnect one end of the communication cable from any one of the control module. Check whether the main contactors become OFF & bypass contactors come ON.
15. Reconnect the communication cable from where it is removed i.e. between ERT 5 and Astro.
16. Restore the auto settings of the relays by pressing again the Z1, Z2 & Z3 keys of the Astro until the marks (√, X) in front of Q1 A, Q3 A, Q5 A disappear.
17. Complete the ON/OFF Time settings for each phase Contactor as per the requirement so that optimum energy savings can be achieved by keeping the lamps ON that are really needed to be ON at night hours.

8.Data Logger

a) This utility is basically developed for reading all logs data of GSM(global system for mobile communication)

Device and write those logs into a file. By default that file will get saved in GSM_Datalogs folder which will be the same folder in which exe is placed. This folder will get created by the application when it will run for the first time on any system,and for subsequent times Log file will be created and stored at same location.

b) If user wants to upload all logs once again he need to switch the device into debug mode by restarting the device. This application can save the log file in three different format:
        1) Comma(,) Separated
        2) Space Separated
        3) Tab Separated.

c) User can change the default location for saving files by clicking on browse button. And final path at which log-file will saved is displayed in text box on form.

d) If because of any reasons communication fails in between,then user should restart the device to switch it into debug mode. Once all logs would get uploaded successfully then the log file will get saved at location shown in text-box.

e) It supports the operating systems Windows XP, Windows Vista or Windows 7.

f) It is possible to use Serial Cable or USB Cable for communication between the GSM module & PC.

g) The following parameters log saved in Datalogger:

Sr. No.
Device ID
Log no
Active Energy of R,Y,B Phase (E_R, E_Y, E_B)
Reactive Energy of R,Y,B Phase (Q_R, Q_Y, Q_B)
Voltage of R,Y,B Phase (V_R, V_Y, V_B)
Power Factor of R,Y,B Phase (PF_R, PF_Y, PF_B)
Current of R,Y,B Phase (I_R, I_Y, I_B)
Relay Status of R,Y,B Phase (RS_R, RS_Y, RS_B)
Output Voltage of R,Y,B Phase (OV_R, OV_Y, OV_B)
Active Power of R,Y,B Phase (AP_R, AP_Y, AP_B)
Error Code of R,Y,B Phase (EC_R, EC_Y, EC_B)
Communication Error
Timestamp

Working with DataLogger
Steps to upload the logs and create logfile.
Make all initial setting that is connecting GSM Device to PC and then run the GSMDeviceDataLogger.exe.

Step1:
Select proper communication port as shown below:
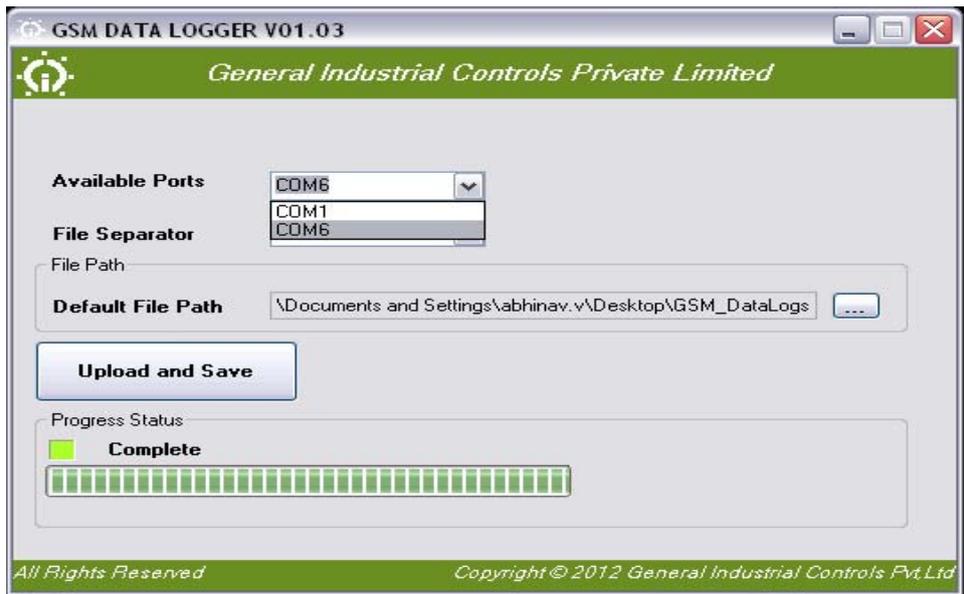
Fig:Step1

Step 2:
Select one of the file separators as shown below , if user don't select any separators the default would be comma.
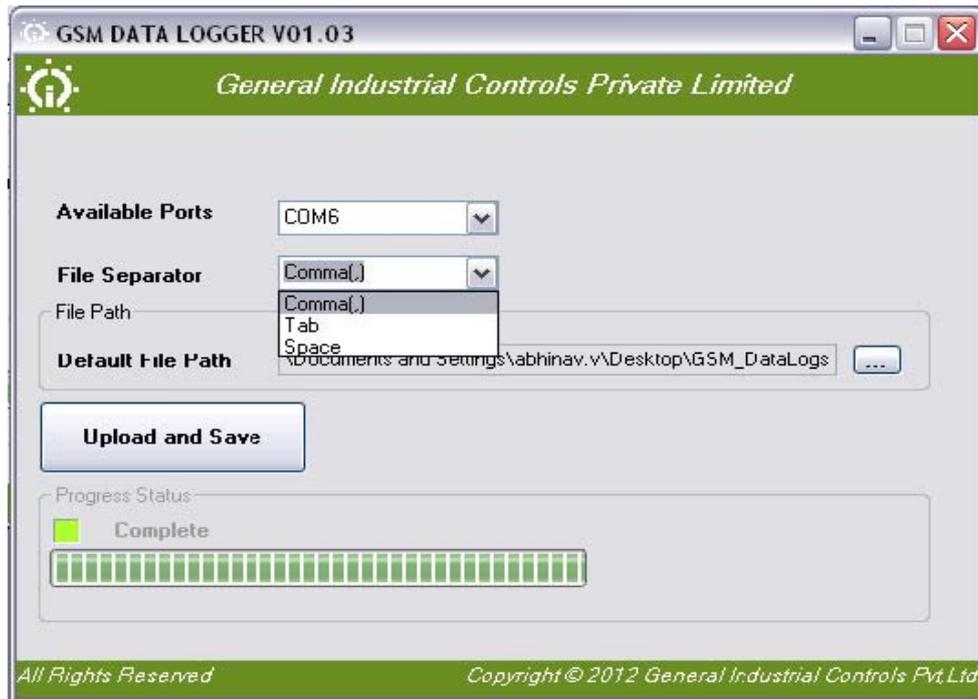
Fig:Step2

Step 3:

This step is optional,user may skip this step but if user wants to save the log file at any specific location then he/she needs to click on browse button and choose the location as shown below,but if user skip this step then log file will get saved at default location.

Fig:Step3

Step 4:

For uploading the logs from device to PC user needs click on "Upload and Save" button,after clicking on upload button communication get start and on progress user can see how many logs are received.

Fig:Step4

Step 5:

After all logs are uploaded, log file will be created and saved at location(Path) as shown in text-box and message will shown to user as follows:
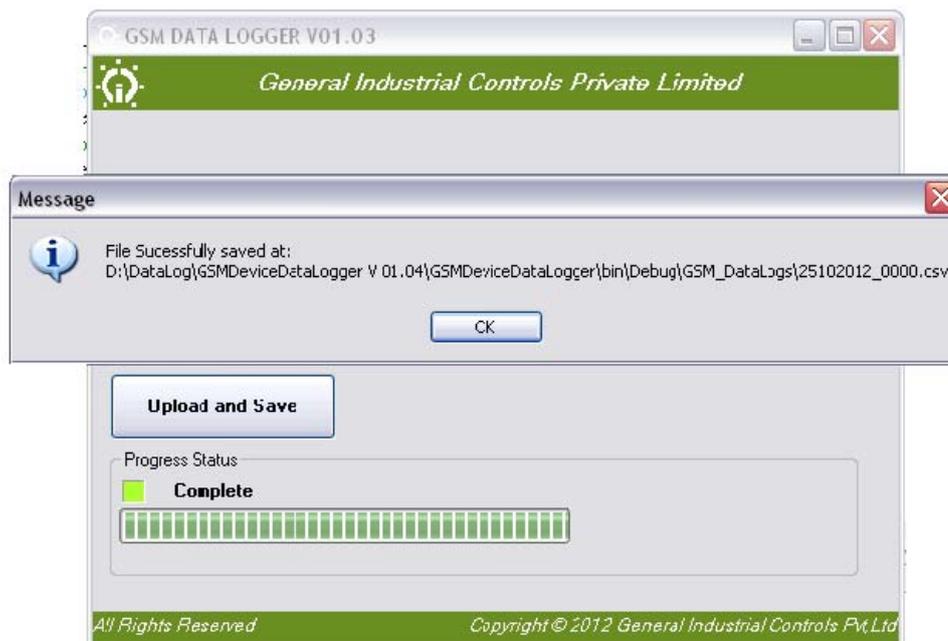
Fig:Step5

9.Maintenance & Troubleshooting

8.1 Periodic Maintenance Check

Company recommends carrying out periodic maintenance of the LMC by authorized company service engineer. Guidelines for the same are listed below.

- Ensure the ventilation & cleanliness surrounding the system.
- Check if all electrical power connections are secure.
- Periodic inspection of the carbon brush of the Motorized Dimmer stat/ Variac is must. Replace if it is damaged/ broken /worn.
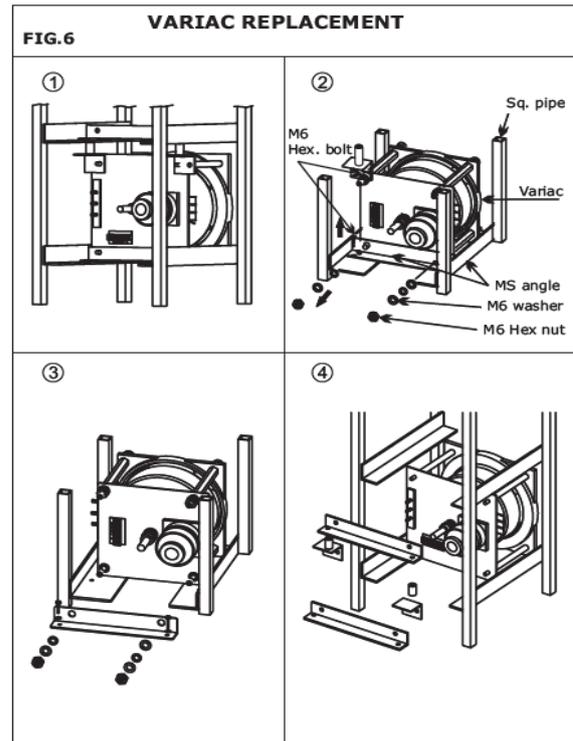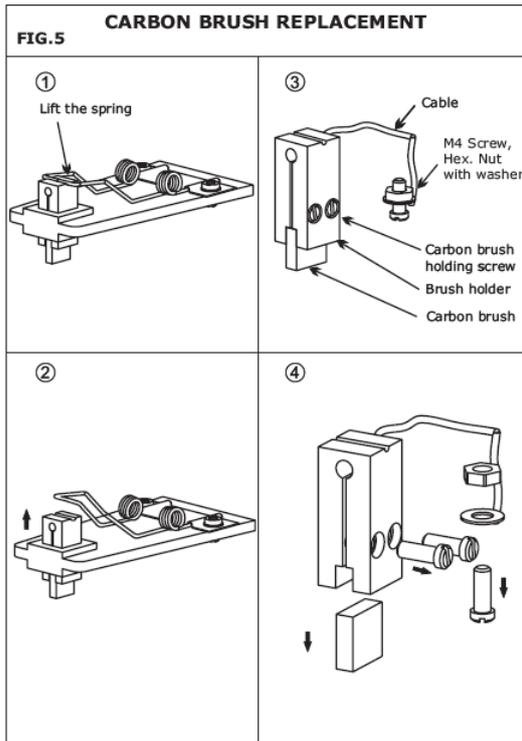
- Check if the cartridge for surge protection device is damaged (this is indicated by the flag on the surge protector turning red). If damaged, replace it.
- Verify the input, output, bypass, control cabling & its terminations for loose connections, if any. If found so, tighten it.
- Clean any dust accumulated on moving surface of the brush contact & also inside the panel.
- Check the functionality of the control devices.
- If variac is damaged replace it. Follow the procedure shown in figure 7 for replacement.

procedure to replace the carbon brush

1. Lift up the spring and loosen clamping screw.
2. Remove Carbon brush holding screw from brush holder. The Carbon Brush will get removed from the housing. (Refer Figure 6.1 to 6.4).
3. Insert housing with new brush and pre-assemble clamping screw.
4. Clean contact surface and tighten screw carefully.

8.2 Trouble Shooting

PROBLEM OBSERVED	POSSIBLE CAUSE	REMEDY
Lamp load is not switching ON either in Normal Mode or in bypass mode	Check Astro LCD	If LCD is OFF, check Input MCB. It should be ON. Also.
	Check the Input Supply	If No incoming supply, check the terminals of the Energy Meter, the Insulated Terminals for supply cable termination & the input MCBs for loose connection. If yes, secure the connections. Input supply should be within specified range.
	Connections are loosely held at the Astro supply input terminals	Check and secure the connections.
	Check O/p MCBs	If O/p MCBs are OFF, Switch ON output MCBs.
	Check the Event & clock in Astro.	Check clock displayed on Run Screen of Astro. For checking event refer *Figure 5* (Run Screen/VIEW/ Q TODAY).
	Incoming supply of that particular phase is unhealthy OR not present (Under Voltage or Over Voltage fault is present) OR incorrect UV & OV limits are set	Auto recovery will be there after the phase voltage becomes healthy OR after the mains supply of that phase is ON OR after setting the correct set limits
	Input / Output MCB has tripped after switching ON	There is short circuit in the wiring connections of lamps. Identify and correct this condition.
	Contactor coil connections are removed (or the connections are loosely held) from either contactor or Astro terminal end.	Connect the contactor coil of that particular phase properly.
	Main/bypass contactor is faulty	Replace the contactor
	Input MCB is faulty	Replace the input MCB of the specific phase
	Variac brush is broken or the brush is worn.	Replace the brush (Refer the Figure 6 for procedure of replacement)
	Power Connections to Variac/Transformer are loose	Tighten the wires of the terminals of the Variac/ Transformer properly.
	There is no visible cause	In an emergency, remove one end of the communication cable & check whether the bypass contactor gets ON. If it does not, contact our sales/service department for problem rectification
All the control devices are dead, Display & LED's are OFF.	Check I/P supply	Input MCB should be ON. I/P supply of Energy meter should be ON. Supply should be within specified range.
	Loose connections at the control devices	Check for any loose connections & tighten the terminals if necessary
	Input MCBs faulty	Replace the input MCBs
	Check the floating Neutral condition	Check if neutral is floating, if so, replace the control modules which are dead
Variac is damaged	Due to high voltage in Neutral Open condition, variac winding short & damaged	Secure the neutral connections & replace the variac. Refer Figure 7 for variac replacement.
	Heavy current flown through variac due to continuous extra lamp load current pull than specified & wrong overload set limit.	Check the lamp load current whether it is crossing the max current specified. Correct the Overload limit & CT ratio if wrong setting is done.
Bypass contactors are getting ON after every ON event through Astro	Check LED's of Stabilizer	If the LED's are ON, stabilizer is in out of correction mode.
	Overload fault message on Astro screen.	Check the OC limit set is OK. If not, set it correctly in Astro [Refer 6th topic of this Manual for details].
	Check Load on each phase	May be load is faulty
	Communication cable Open/Faulty/wrong connection	Check and secure the connections. If faulty replace it.
	Loose connection at the input & output terminals of surge suppressor	Check and secure the connections.

Flag on Surge protection device becomes Red.	Due to high induced current (lightening) , cartridges are damaged	Replace the cartridges.
GSM module / Stabilizer Interface Module [Interface 1/5] is dead (ON LED indication is OFF)	Loose connection at the input of module	Check the voltages of terminals at input & output. If supply is at input terminals & not present at output terminals then replace the surge suppressor
	Surge suppressor is faulty	
	Module is faulty	Replace the module
	Loose connection on supply terminals.	Check and secure the connections
Stabilizer Module is dead (Power ON LED indication is OFF)	Reverse polarity connections at module supply terminals	Check and secure the connections
	Module is faulty	Replace the module
	Loose connections at the input terminals	Check and secure the connections
Astro is dead (LCD Off)	Astro is faulty	Replace the Astro
	Loose connections at the input terminals	Check and secure the connections
Output voltages are not stabilized.	Check that Event is present	If Astro outputs (Q) are OFF then Stabilizer is in sleep mode.
	Check the movement of variac	Movement of variac should be smooth.
	Neutral of Stabilizer is not connected	Check and secure the connections
	Stabilizer Module motor connection terminals or output voltage sensing terminals are loose/open	
	Loose connections on variac motor terminals	
	Cross connection between forward & reverse connections from Stabilizer Module to motor.	
	Check the O/P voltage of Variac	It should be SV +/- 4 V.
	Variac brush is damaged	Replace the brush
	Motor damaged/locked	Replace the motor
If Problem is not solved by following above mentioned Remedies		Contact our sales/service department for problem rectification

10. Safety Guidelines

- The Panel should be mounted on a horizontal plane even if it is to be mounted across steep slopes.
- There should not be any heating device nearby the panel.
- Panel should be properly earthed in accordance with the Local as well as National Electrical codes.
- The system settings should be changed by skilled/trained authorized personnel only.
- Lock the system doors every time after closing.
- During the time of installation or replacement of Energy Meter, Surge Protection Device, & Input MCBs ensure that the mains 3 Phase supply from the nearby feeder line is switched OFF.
- Switch OFF all the Input & Output MCBs during maintenance or replacement of energy meter or lamps.
- After Replacement of the faulty device/s, check the wiring terminals are tightened properly & connections are ok. Refer Wiring Diagram [figure 4]).
- Do not touch the incoming wire terminals, directly.
- Do not touch the terminals of the Energy meter even after switching the input MCBs OFF as the incoming supply is directly connected to Energy Meter before input MCBs.
- While replacing/maintenance of any of the lamps ensure that the output MCBs inside the panel should be OFF.
- Connect the number of lamp loads on each phase by referring the below chart. Do not connect extra lamps than mentioned in the chart.

Lamps recommendated for a system

-TYPE	HPSV 150 W	HPSV 250W	MV 125 W	MV 250W
Recommended Lamps for one system	66	40	82	42

Lamps recommended for a system

⚠️Recommended for 15 KVA systems.

- Strictly follow the colour codes for the cable connections.
- Always Refer wiring diagram [figure 4] while doing replacement of any device or component.

11. System Overview Diagram
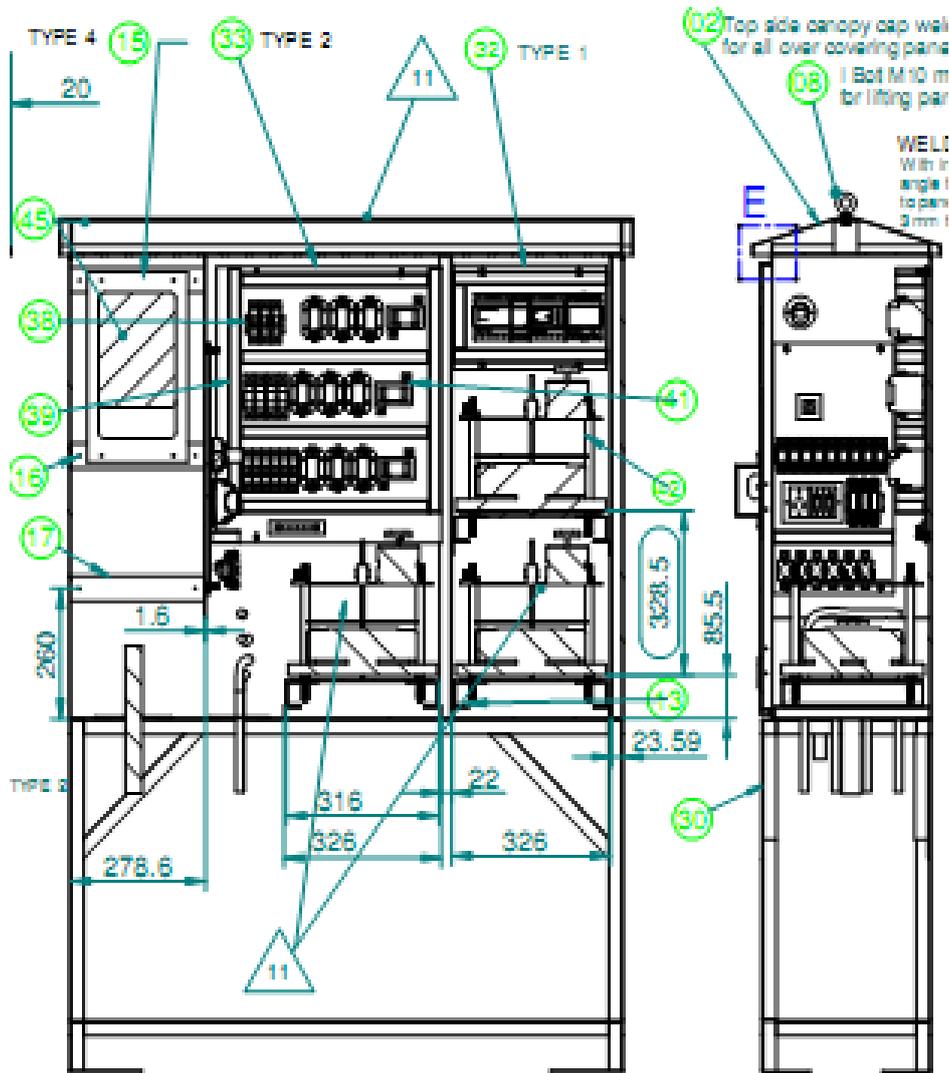
The entire panel is divided into 6 major parts:
Astronomical Time Switch
GSM Modem
Servo Stabilizers
Variac
Input / Output MCB's
Energy Meter

12. Unpacking & Installation Procedure
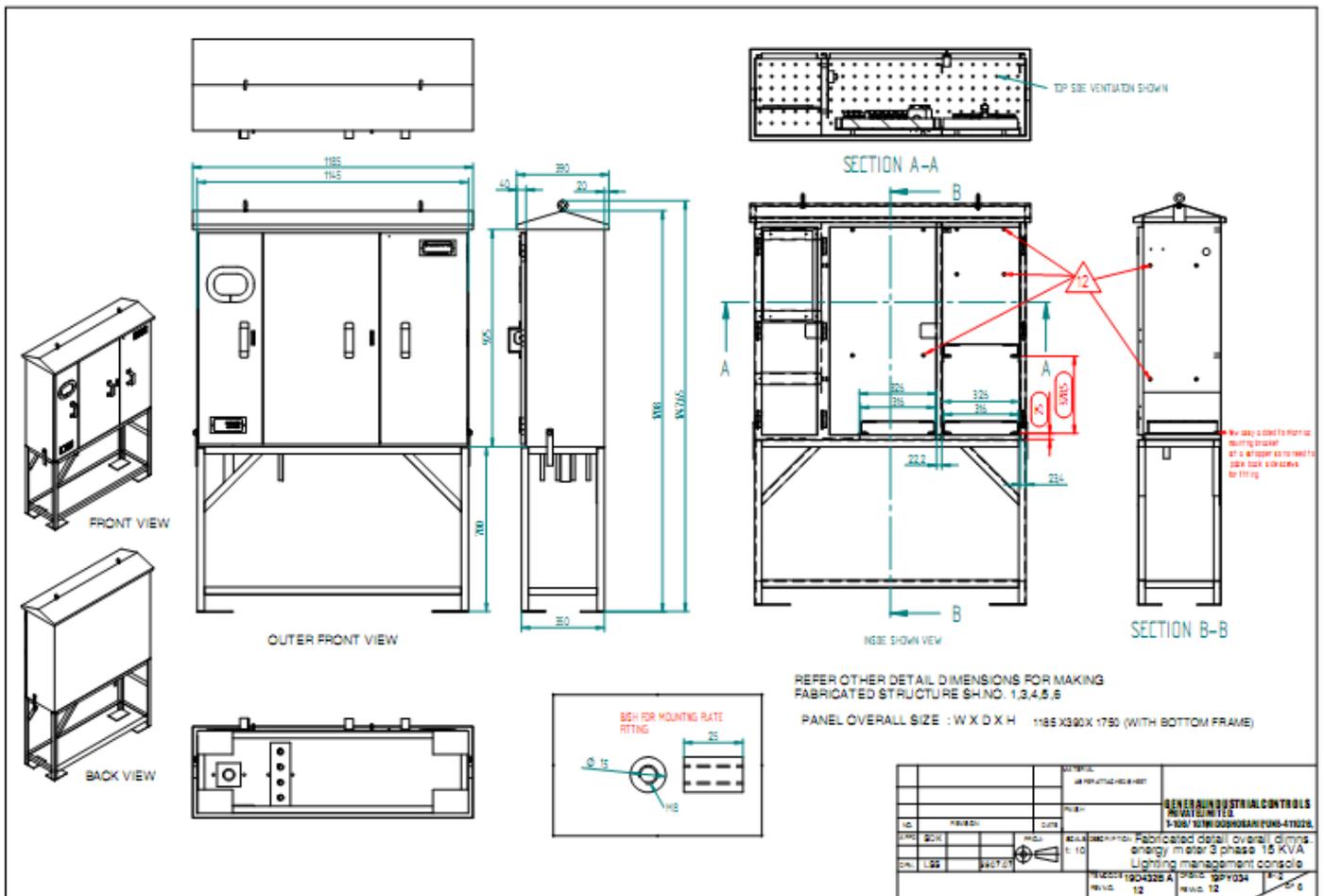
- Unpacking & Installation should be done as per *Figure 2 & Figure 3.* For installation of the panel, prepare a concrete base with supporting stand as per the diagram shown above.
- Lift the panel with I-bolts & mount it onto the mounting stand. Tighten the nut-bolts to fix the panel to the mounting stand.
- Ensure that all the input and output MCB's are switched OFF.
- Distribute the load equally to all phases for proper load balancing.
- Ensure proper earthing of the panel body through the '*earthing nut bolt*' provided on the left and the right side of the panel.
- Install the Energy Meter in the compartment provided on the left.
- Connect the incoming supply cable to the energy meter.
- Connect the energy meter output cables to the insulated terminals R, Y, B, & N. [Insulated Terminals should be labelled accordingly]
- Connect the load cables on each output MCB such that both the MCB's on each phase are equally loaded.

13. Frequently Asked Questions

1. What is LMC? Where it is used? How is it beneficial?

Ans: Lighting Management Console (LMC) is a unique technologically advanced solution for switching of outdoor and street lights. It is beneficial because of substantial energy savings achieved through:
- Precise & accurate switching of the lamps
- Reduced energy losses by stabilizing the system voltage of the lamps to a preset value using servo-based stabilizers through continuous mode of operation & steady correction of voltages and
- Also extending lamp life by eliminating voltage fluctuations, over / under voltages and harmonics.

2. On what basis are the lamps switched ON/OFF?

Ans: The lamps are switched ON/OFF based on Sunrise/Sunset or Twilight rise/set which are dynamically calculated every day based on the Latitude and Longitude of the place where the device is installed.
Which protections are provided by the system?
The following protections are provided by the system:
- Under Voltage Protection
- Over Voltage Protection
- Over Load (Over Current) Protection

3. How does Under Voltage and Over Voltage protection work?

Ans: Under Voltage: If input voltage reduces below the UV set limit, system will switch OFF the load. If input voltage rises above the (UV set limit + Hysteresis), system will restore the normal condition.
Over Voltage: If input voltage increases above the OV set limit, system will switch off the load. If input voltage reduces below the (OV set limit - Hysteresis), system will restore the normal condition. For Under Voltage & Over Voltage, the Hysteresis band is 15 V.

4. How does the Over Load protection work?

Ans: Over Load protection monitors the output current above the set limit for set time duration. If the overload persists beyond the set time limit then it bypasses the system by switching ON the bypass relay. System can be brought to normal conditions by the following 2 methods:
- By switching OFF & then ON the input MCB of that particular phase.
- If current comes within the Normal range.

5. What is the maximum load this system can drive?

Ans: The maximum load that the system can drive is 20 A per phase
What is 'Bypass Mode'? When does the system switchover from 'Main' to 'Bypass Mode'?
Bypass mode is the mode in which the output to load follows the supply voltage. In this mode the stabilizer does not perform any correction of voltages. At the time of Relay switching from Main to Bypass, change over delay of 500ms between switching is applied to protect the variac. The system switches over from the 'Main' to 'Bypass' mode under the following conditions:
- Overload condition
- When Supply voltage is out of correction band of Stabilizer (160 V-285 V).
- When communication between Astro-GSM-Stabilizer fails.
Note - There is Interlocking for Mains to Bypass conversion on the basis of current sensing to protect the panel in case of contactor failure.

6. How is 'Sleep Mode' useful?

Ans: Sleep Mode is useful in increasing the Variac life. Stabilizer module keeps Variac in sleep mode when load is OFF. Only when the load is ON, the stabilizer operates in a continuous mode with steady correction of voltages. When the load is OFF the variac does not perform any correction of voltages thus increasing variac life.

7. I am sending queries to my GSM modem but I am not receiving any messages, what should I do?

Ans: You will not be able to receive messages in following conditions:

- If GSM is not powered ON
- If the SIM is not properly inserted.
- If SIM memory of the PC side modem is full.
- The remote side SIM does not have sufficient balance to send a message
- If the number is not registered as 'valid number' in the remote side GSM.
- There is no or poor network coverage at your place or the place where the system is installed

8. What do you mean by Auto correction band of Stabilizer? How does the Stabilizer behave when out of auto correction band?

Ans: Auto correction band is the voltage band for which Stabilizer performs voltage correction. For Boost Enable, this band is from 160 VAC to 285 VAC. Hysteresis band is of 7V at both sides. If Input voltage goes out of this range for any phase, Stabilizer will switches on respective phase error LED and trips Main Relay and switch ON Bypass Relay.

9. Astro's output (Load) is not switching ON, what might be the problem?

Ans: First check that you have entered the correct latitude & longitude for that location. and selected the appropriate time-zone as well and all the other parameters such as Offset, OFF-Hours, Weekly Off, Midnight Off etc. are properly set. Also check the under voltage & over voltage levels make sure that none of the phases has fallen below the under voltage or exceeded the over voltage level.

10. Which are different Operating Modes in Astro?

Ans: There are three different operating modes of Astro

- Auto:

    In this mode the system will perform its operation according to its settings.

- Auto OFF:

    This mode is used to switch OFF the output channel instantaneously. But the OFF condition will not be forever. The device will automatically change the operating mode from 'Auto OFF' to 'AUTO' on next auto event. For example, user selects Auto OFF at 4:00 A.M. and device has OFF event at 7:00 A.M. The device will switch OFF from 4:00 A.M. to 7:00 A.M. Device will automatically shift to AUTO mode at 7:00 A.M. which is next auto event and remain OFF till next ON event.

- Auto ON:

    This mode is used to switch ON the output channel instantaneously. But the ON condition will not be forever. The device will automatically change the operating mode from AUTO ON to AUTO on next auto event. For example, user selects Auto ON at 4:00 P.M. and the device has OFF event at 6:00 P.M. The device will switch ON from 4:00 P.M. to 6:00 P.M. and switch OFF at 6:00 P.M because device will automatically shift to AUTO mode at 6:00 P.M. which is next auto event.

11. What are the special characteristics of Astronomical Time Switch used in LMC?

Ans: The Astro (T3DDT6) used in LMC has 6 output relays out of which 3 act as Main Relays & other 3 act as Bypass relays with the following nomenclature:Q1: (Main Relay), Q2: (Bypass Relay) corresponds to R phase. Q3: (Main Relay), Q4: (Bypass Relay) corresponds to Y Phase. Q5: (Main Relay), Q6: (Bypass Relay) corresponds to B phase.

12. How is the energy rollover represented?

Ans: It is represented as shown in the below examples:
For Ex: 0.225 Kwh
        102.456 Kwh
        9998.8 Kwh
Decimal point will shift to right to manage the resolution. Rollover will occur after the energy consumption is equal to 999999 KWh. After further 1 KWh addition, it will rollover and again start accumulating from 00.000 Kwh.

13. Can I know the relay status remotely? Is it possible to change the relay STATUS?

Ans: Yes, you can know the remote status remotely by sending "rly" query to remote GSM. The response to this query will be as follows:

RLY\n
RS: \n
<Relay Status R Phase>\n
<Relay Status Y Phase>\n   [Relay Status= '0' for Relay OFF, '1' for Main Relay
<Relay Status B Phase>\n   ON, '2' for Bypass Relay
MODE: \n
<Relay Mode R Phase>\n
<Relay Mode Y Phase>\n   Relay Mode= 'A' for Auto, 'A ON' for Auto ON, 'A
<Relay Mode B Phase>\n   OFF' for Auto OFF]
EC: \n
<Error Code R Phase>\n
<Error Code Y Phase>\n   [Refer the GSM Booklet for this]
<Error Code B Phase>\n
<Comm. Fault Error Code>\n
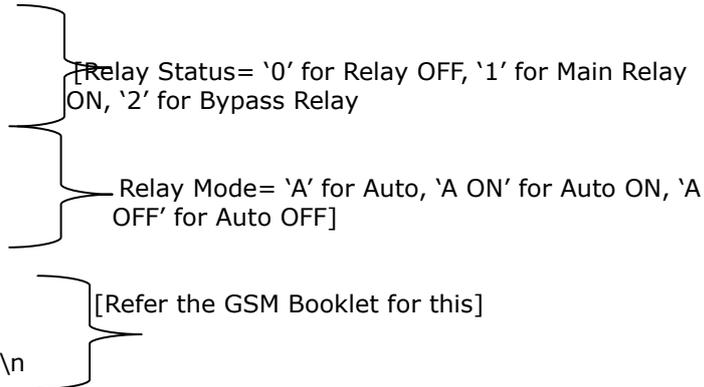
It is possible to change the relay status by sending the below query:
Rly=<Rly 1Status>,<Rly 2 Status>,<Rly 3 Status>;
Whether Rly 1Status,Rly 2 Status, Rly 3 Status can be
0: OFF or 1:ON

14. Ordering Code

Sr. No.	Ordering Code	Description
1	**19D332BA**	**19** – Light Energy management System **D** - Three phase, 4 wire, 240V, 50/60Hz **3** - Three Door / **2** – Two Door / **4** – Four Door **3** - Base Mount on Angle **2** - 15 KVA LEMS, 3 phase boost enabled

Details of the Code -

19 D 3 3 2 B A

O	NA
A	Voltage Stabilizer, Stabcon, Supply Volt: +12V DC, -15% to 15%, Solid State Drive:- 240V AC, -30% to 25%, O/P Volt Sensing:- 240V AC, -30% to 25%]

O	NA
A	GSM Module,GSM-ERT1, Supply Volt:- 240V AC, -30% to 25%, 3-Ph, 4 Wire, [Controller + Energy Measurement (1A Current) + GSM Engine + Power Supply for (Stab + GSM)]
B	GSM Module,GSM-ERT5, Supply Volt:- 240V AC, -30% to 25%, 3-Ph, 4 Wire [Controller + Energy Measurement (5A Current) + GSM Engine + Power Supply for (Stab + GSM)]
C	GSM Module, GSM-RT, Supply Volt: 240V AC, -30% to 25%, 1-Ph, [Controller + GSM Engine + Power Supply for GSM]
D	Voltage Stabilizer, Interface-5, Supply Volt:- 240V AC, -30% to 25%, 3-Ph, 4 Wire, [Controller + Energy Measurement (5A Current)+ Power Supply fo (Stab + GSM)]
E	Voltage Stabilizer, Interface-1, Supply Volt:- 240V AC, -30% to 25%, 3-Ph, 4 Wire, [Controller + Energy Measurement (1A Current)+ Power Supply fo (Stab + GSM)]
F	GSM Module,GSM-ERT5, Supply Volt:- 240V AC, -30% to 25%, 3-Ph, 4 Wire [Controller + Energy Measurement (5A Current) + GSM Engine + Power Supply for (Stab + GSM)+ON Delay Timer (Load transfer)+ 4pole rotary switch (Auto-manual bypass)+Limit switch (Door open/close)+Communication cable for GSM with doo lock wire
G	GSM Module,GSM-ERT5, Supply Volt:- 240V AC, -30% to 25%, 3-Ph, 4 Wire [Controller + Energy Measurement (5A Current) + GSM Engine + Power Supply for (Stab + GSM)]+4pole rotary switch (Auto-manual bypass)+Limit switch (Door open/close)+Communication cable for GSM with doo

15. Panel Accessories

Sr. No.	Catalogue No./ Ordering Code	Accessory
1.	T3DDT6	Astro 3P6R
2.	19D20B00	GSM
3.	19B200A0	Stabcon
4.	19D2000C	Surge Suppressor
5.	19JC008_01	Variac
6.	19JX001	Carbon Brush 5 mm
7.	19PX001	Surge Protector
8.	12ODT4_05	On Delay Timer
9.	19A1000A	Communication Cable (TTL-TTL)
10	19A1000C_00	Communication Cable (TTL-TTL) (For Door open/Manual Bypass sensing)
11.	19JC004	CT
12	19JM001	4 pole,2way switch (Auto/Manual bypass sensing)
13	19JM002	Limit switch (Door open/close sensing)
14	LGDDT0	Software CD for LEMC

16. Warranty Norms

- Warranty covers situations in which the products are properly handled, stored, installed and maintained and not subject to contamination, abuse, misuse, or inappropriate modification or repair.
- Warranty does not cover situations of damage due to act of God, War, and Natural Calamities.
- Warranty is void if installation instructions are not followed correctly.
- Warranty date is effective from the date of dispatch and not from the date of installation.
- Warranty does not cover situations where any device or component used is not recommended by the Manufacturer.
- Contact our sales/service department immediately for any help or guidance.
- Operator/User should always use adequate protection while operating the system to avoid any shock/high voltage hazards.
- Company will not be responsible for any injury or death of the personnel while handling, operating the system.