LOGIC STAT STABILIZER

INSTRUCTION MANUAL

DESIGN FEATURES

Servo Controlled Automatic Voltage Stabilizers introduced by 'LOGICSTAT' are specially designed for customer's exclusive requirements, conforming to various IS or BS or IRS or any other International Specification to the extent wherever applicable and it can be used for supplying a stabilized voltage to any precision equipment which is operated from the AC mains single phase or three phase subject to the offered type. These units, through a variable auto transformer feeding a buck or boost series transformer, inject a suitable voltage into the supply line to correct the output voltage the output voltage to the requisite level of late Double Wound varlacs are used in place of a vafiac and buck/boost transformer.

BASIC COMPONENTS

The complete voltage regulator consists of the following

(i) Low voltage Relay (LVTR)
(ii) High voltage Relay (HVR) or Triac Control
(iii) Motorised Variac or Double wound variac
(iv) Series Transformer
(v) Precision type meters
(vi) Indicating pilot lamps
(vii) Auto manual control switch

Logic stat ESM Stabilizers are available using the latest technology any its technique consists of a series transformer and continuously variable auto-transformer called Dimmer stat operated by a reversible burnt proof AC Geared Motor or Step Synchronous Motor controlled by transistorized voltage sensitive relays.

SENSITIVE RELAY

For a certain input voltage an output voltage appears which is sensed by a highly sensitive transistorized sensitive circuit, which switches on a particular Relay (LVR or HVR) or Triac Control which ultimately rotates the servo motor in a definite direction to adjust the voltage the required level. The motor actually drives the auto-variac which corrects the voltage. It is only the output voltage which is sensed and the input to transformer is corrected, with the result that the output is also corrected.

(a) LOW VOLTAGE RELAY (LVR)

This relay is connected to the output of the voltage regulator and senses the output voltage this relay will remain OFF! For voltage over 218 volts and will switch 'ON' at 218 volts. The point of adjustment is a small potentiometer provided on the lower side of the control box. This relay when in ON position rotates the motor in the anti-clock-wise direction 'OFF' when the output reaches at 230 volts thus stopping the motor.

(b) HIGH VOLTAGE RELAY (HVR)

This relay in normally 'OFF' condition when the voltage is below 222 volts and switches 'ON' when the output voltage exceeds 222 volts. When the relay goes 'ON' it rotates the motor in clock-wise direction till the output voltage reaches 220 volts and the relay switches 'OFF'. The point of adjustment is similar to the LVR and HVR are mounted together on the control card. The Voltage Sensing Circuit is solid state one and it mainly consists of two voltage level detector circuits and a highly stable zener voltage reference. The output of the Stabilizer is stepped down to 24 volt A.C for control circuit through a step down transformer. This is further rectified and fed to the level detector circuits. Depending upon the signal from the output voltage either of the relay operates emerging the drive motor in the required direction so that error is corrected.

TRIAC CONTROL FOR THE MOTOR

This control whenever provided will replace the LVR and the HVR circuits, is simple in construction and is more accurate as compared to LVR and HVR. The two voltage sensing elements which normally operate the LVR and HVR now trigger the respective Triacs. Whichever triac is triggered, the current flows in the particular winding of the motor and rotates the motor to a particular direction. When the other triac is triggered a phase shifting of 180^0

occurs. This makes the direction of rotation of the motor reverse and the motorized variac starts rotating in the reverse direction. At the null, which is fixed with the help of two potentiometers fitted in the control box, both the triacs are in operative and as such the motor is at stand-still.

A.C GEARED DRIVE MOTOR

The burnt proof A.C Geared Motor forms a sort of coupling between the power circuit and control circuit of the Stabilizer. The Dimmerstat called variac brush arm is coupled mechanically by a gear wheel to the pinion cut on the motor shaft and the motor is electrically connected to the control circuit. The motor supply is provided through the output of the stabilizer. The motor along with variac is also mounted in the main Cabinet. The direction of rotation is selected through LVR and HVR or Triac Control as explained above. The motor is used is low speed high torque servo motor having a supply of 50 Hz and runs at 60 r.p.m and shall be capable of operating between a wide range of 120 to 260 volts of any other range subject to the design of the stabilizer. The starting current is same as its running current at no load as well as at full load. This required a very light duty relay contacts and also in the event motor getting stalled there is no danger of winding getting burnt. With a shaft extension on the other end, hand operation of the motor is possible by a knob fixed to it.

PHASE SHIFT NET WORK

The phase shift network is for supplying to a second phase to the drive-motor. It consists of an oil-filled paper capacitor of 0.67 mfd and a 1000 ohms 1.2 W wire would resistance. Both these components are mounted on a bakelite moulded plate from a sub-assembly which can be replaced easily by removing 2 screws.

LIMIT SWITCH ASSEMBLY

This is to prevent the over travel of the brush arm if the input voltage exceeds the limits of the input voltage range. The micro-switches mounted on a bakelite plate are used limit switches. The aluminum cast ‘L’ brackets is fixed at one end free to rotate about its axis. A Lever fitted on the Variac shaft moves this bracket to operate the micro-switches. All the components of control circuit are accessible for easy operation.

MOTORISED VARIAC

The motorized variac consists of an auto-transformer coupled to an AC geared motor. The motor supply provided through the output of the stabilizer. The motor along with variac is also mounted on a bakelite sheet inside main cabinet. The direction of motor rotation is selected through LVR/HVR or Triac control as explained above.

SERIES TRANSFORMER

The secondary winding of the double wound transformer is connected in series with the supply line going to the load. The primary is fed a variable voltage and the voltage induced in the secondary gets added to subtract from the mains voltage, depending upon its polarity with respect to line voltage. This variable voltage of the motorized variac is connected across the input terminals. The boosting and bucking of voltage is achieved by taking a tap in the variac. When the variac brush is on tap, the voltage fed to the transformer primary is zero and hence no buck will take place. When the input voltage is minimum the boost required its maximum. When the input is at its minimum level or maximum level the variac brush reaches either end of its traverse and no further correction is possible. If the input voltage goes further lower or higher, there will be a proportional change in the output voltage also, giving a signal to drive motor for further correction. But if the drive motor is allowed to run in these circumstances it will forcibly drive the brush arm, breaking the mechanical stopper and damaging the carbon brush. To avoid this two limit switches have been placed at the end of Variac brush track. These limit switches cut out the supply to the drive motor when the brush arm reaches either end and thus avoid the damage to the carbon brush. Input voltage higher than 260 volts will saturate the Variac core, resulting in excessive magnetizing current. This may cause damage to the Variac by over heating. If sustained for long periods when the input voltage returns to a value within the range the automatic correction is restored.

CIRCUIT FOR ADJUSTMENT VOLTAGE ON THE OUTPUT:

Sometimes, it is so desired that the output should be adjustable within certain limits and the percentage of stability remain constant. This is achieved by a very simple circuit. Two voltage sensors have a certain fixed bias voltage and when the input signal is sufficient to overcome bias, only then the respective relay or triac triggers. A separate potentiometer is provided on the front panel so as to change the bias voltage of the sensing element and accordingly operating voltage of the LVR/HVR or the Triac is changed. This change appears correspondingly the output AC voltage and thus function of changed output voltage is achieved. The accuracy of output voltage remains constant because no other shift or change in the circuit or the voltage sensing element is provided and as such the original sensitivity is kept constant throughout this range. For single phase unit, only one potentiometer is provided whereas in the three phase unit where sensing is being done separately on individual phase 3 potentiometers are provided. With the help of a screw driver these potentiometer can be adjusted for the required output voltage.

CAUTION

(a) The potentiometers P_1 P_2 fitted on the control card inside the unit should never be tempered with, because this requires a very close checking up on individual phases and they are calibrated at our factory.

(b) No fuses are provided by us and as such the voltage stabilizers must be connected through suitable switchgear for necessary protection.

METERING

Generally a Voltmeter of 4" dial is provided on the front panel. Sometime 'Ammeter' of suitable capacity with current transformer is also provided on customer's request. The meters provided will conform to the relevant IS Specification. We shall also provide precision meters having a least count of 2 volts with suppressed scale of 160 volts and expanded scale from 160-260 volts for special application. For 3 phase units are Voltmeter and one Ammeter with separate selector switches will be provided.

TERMINALS

All the components are mounted in a suitable sheet steel cabinet for air cooled application for suitable sheet steel tank together with panel for oil cooled version. All the terminals are marked for easy connection. The terminals are marked 'INPUT' and 'OUTPUT' on single phase units whereas in 3 phase units there are 3 wires 'R, Y, B' (Red, Yellow, and Blue) supposes to be connected to the mains of a 3 phase and the Green wire provided is the neutral. Care should be taken while connecting the terminals and it should also be made sure that the terminals are connected as explained above and the connections are tight.

OPERATIONAL GUIDANCE

a. SINGLE PHASE UNITS:

Connect a 230 volts input supply for single phase units or through a proper switch fuse unit. Keep the AUTO/MANUAL switch in AUTO position and switch ON the unit. The pilot lamp provided in the front of the cabinet indicates the supply position. If the input voltage is indicated on the Voltmeter, mounted on the main cabinet. Auto/Manual switch is provided for emergency use. Put the switch in Manual position and see that by pushing the 'RAISE' and 'LOWER' push buttons the output voltage increases and decreases. Absolute manual operation is also possible in case necessity arises by a knob provided on the motor shaft. This knob is accessible by removing the top panel. Switch 'OFF' the unit and connect the load through suitable switchgear. Check up the load current by an Ammeter to confirm that the unit is not over loaded. Short term overloads upto 20% of the rated capacity will be of no harm but continuous over loading should be avoided.

Install the stabilizer in a cool and dry. These stabilizers are meant for INDOOR use only

b. THREE PHASE UNITS

In the case of three phase circuits with balanced input voltage and balanced load, output three phase stabilizers with voltage sensing relay connected to only one phase are recommended.

If the input voltage or the load are not balanced, stabilizers suitable for unbalanced load should used. The load may be 3 phase 3 wire such as delta connected motor 3 phase 4 wire star connected. The way of connecting these types unit shown in our Circuit Diagram Care should be taken not over load any one phase and loads should be quall distributed on all the three phases avoid to unequal loading.

APPENDIX

1. Disconnect the voltage regulator from the mains and connect input through 4 amps variac (0 –270) Volts.
2. Bring the voltage control knob on the front panel to the extreme left condition (If provided).
3. Move variac and bring input voltage to 175.V.
4. Move LVR potentiometer (P_1) in such a manner that the motor rotates in the antilock wise direction.
5. When the output voltage reaches 220 V move potentiometer, (P_1) such that the relay just goes off.
6. Move the HVR potentiometer (P_2) if necessary to increase the voltage to 228 V in case the P_1 potentiometer cannot increase voltage
7. Increase voltage on the variac by about 5 volts and output shall become 230 V
8. Move P_2 so that motor starts moving in the clock wise direction and switch off HVR as soon as voltage reaches 230 V.
9. Move variac slightly backward by 5 Volts and the motor must move in the anti-clock-wise direction to bring the output voltage to 215 V.
10. Seal both the potentiometers at this setting.
11. Now with the help of voltage control potentiometers, the full range from 215 to 240 V can be obtained.

In case of any trouble, please consult the trouble-shooting chart.

SERVO STABILISER

MCB TRIPS ON SWITCHING

A possible short in Servo

Replace the unit

GIVES NO OUTPUT

IF THE STABILIZER IS PROVIDED WITH H/L TRIP

1.Check the output voltage. If it is beyond(200-240) i.e. 220+/-10%. The H/L Trip has worked i.e. the stabilizer Is okay Normal operation shall resume Once the voltage comes within range.
2.If the above condition. does check.
(a)The Auto/Manual Switch Should be put on “Auto”.

(b) The voltmeter switch on ‘Output’ the servo should show the rated voltage If not, the control is defective.

3.Put the switch on ‘Manual’ and Change the output voltage by the Two Push button if voltage changes as Per ‘Raise’ or ’ Lower’ the motor is Okay. If not check the motor capacitor.

IF NOT PROVIDED WITH H/L TRIP

1.Output socket is broken.
2.There may be a snapped wire in the socket.
3.The carbon is Broken & is not making a contact.
4.In Case of 3 the Servo will show input Voltage but no output voltage.
5. The voltmeter is defective Check by putting the switch to input . If it shows the reading. It is okay.

4.Change capacitor and again repeat the third step. If motor does not rotate, the motor is defective. (though this is rare)

5. Assuming motor is okay and is operating in ‘Manual’ mode but does not operate in ‘Auto’ mode Check for control circuit. Follow as per control circuit description :-The control circuit consists of a Control card and 2 No. control transformers. The two transformers are identical and their voltage rating Is 240/12-0-12 rating 10VA. Both these transformers are connected to the output of the Servo. Their connections are show as per diagram.
Check the following : (1) Input to the control transformer in auto mode should be 220v. (2) The output should be 20V on one of them and 10-0-10 on the second transformer. These voltage appear at terminal 1-2(20V) 3-4-5 (10-0-10). (3) The fine adjustment PGT is connected at 5& 6 terminals. Incase the pot is defective and the above two conditions are ok the two relays R-1 and R-2 shall not function, short 5 & 6 and see the operation, incase the Servo functions change fine adjustment pot and remove the short between 5&6. (4) The card may be okay but the motor does not run. This is rare fault that relay contacts may be burned. Change the card.

FUNCTIONS PERFECTLY

1. Gives correct output

2. Light is on

3. Voltmeter indicates input / output voltage as per switch positions.

4.Manual operation okay, i. e .raise voltage with raise button and the same with lower.

5.Fine adjustment working okay in Auto Mode.

GIVE OUTPUT BUT CHATTERING SOUND IS HEARD AND/OR OUTPUT VOLTAGE FLUCTUATING CONSTANTLY

Input may be fluctuating constantly. Observe this by putting the input/output Switch to Input & Check the Voltmeter needle fluctuation. If so there is no fault with the Servo connect the Servo to same other socket because it may be due to loose connection in socket. This fault may also on Generator Voltage. Do not change any setting in Servo if such a ault occurs on Generator voltage. Preferably work the Servo on Manual Mode.

NOTHING HAPPENS WHEN CONNECTED TO INPUT

1.MCB may be off or Defective. Do as required

2. Check the socket as there May not be supply in there

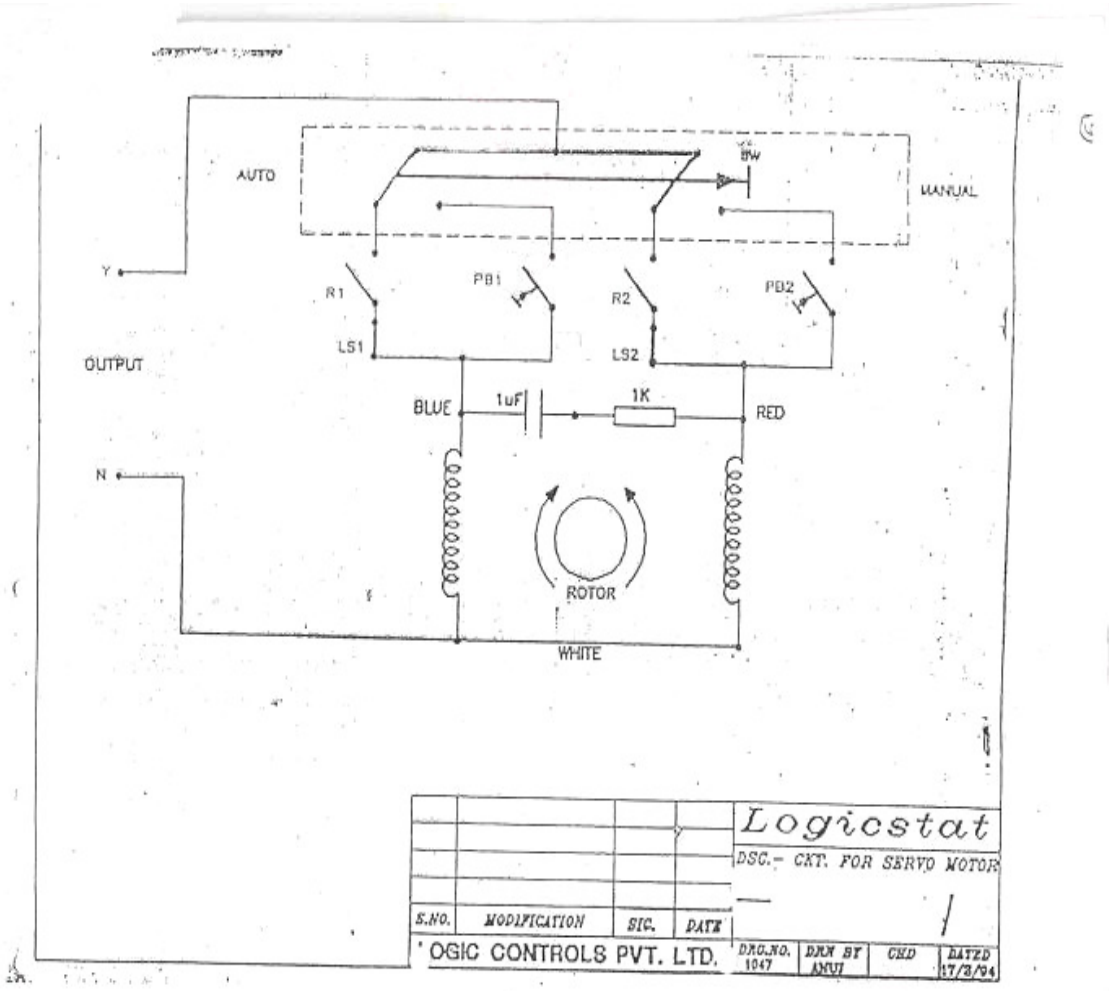
3. Check the plug of the servo same wire may be loose in Plug or the write is not connected properly, Ie. Phase, Neutral or Earth.

1.Adjust P3 clockwise on Servo Control till fluctuations stop. This can be done only on Auto Mode.
2.The Carbon may be worn out & is causing sparking on the track during movement. Change the Carbon.
3.Carbon may be okay but the Carbon spring may be damaged. Change the Carbon spring.

4.There may be Carbon /Dust deposit on the Variac Track. Clean the track with a dry cloth & blower.

5. A loose connection on the input or output points. There can be a loose connection on the control Transformer Motor capacitor assembly or any other soldered connection correct the same (This fault is rare).

Logicstat
Trouble Shooting Chart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RED
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Logicstat
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DRG.NO. 1047
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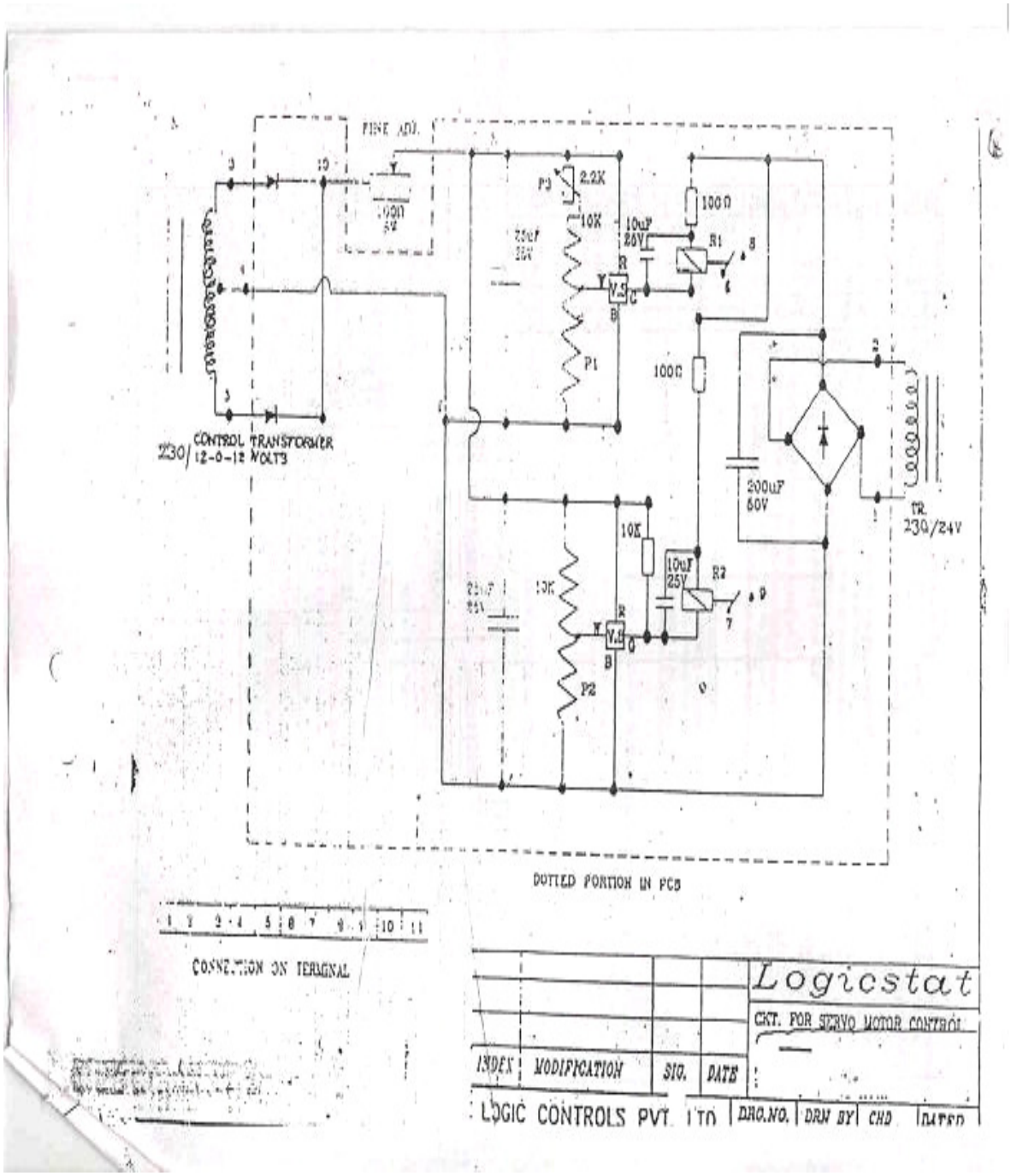
DATED 17/3/94


FUSE ADJ.
P3
2.2K
10K
100Ω
10uF
25V
R1
100Ω
P1
200uF
60V
TR
230/24V
CONTROL TRANSFORMER
230/ 12-0-12 VOLTS
10K
10uF
25V
R2
P2
DOTTED PORTION IN PCB
CONNECTION DIAGRAM
Logicstat
CKT. FOR SERVO MOTOR CONTROL
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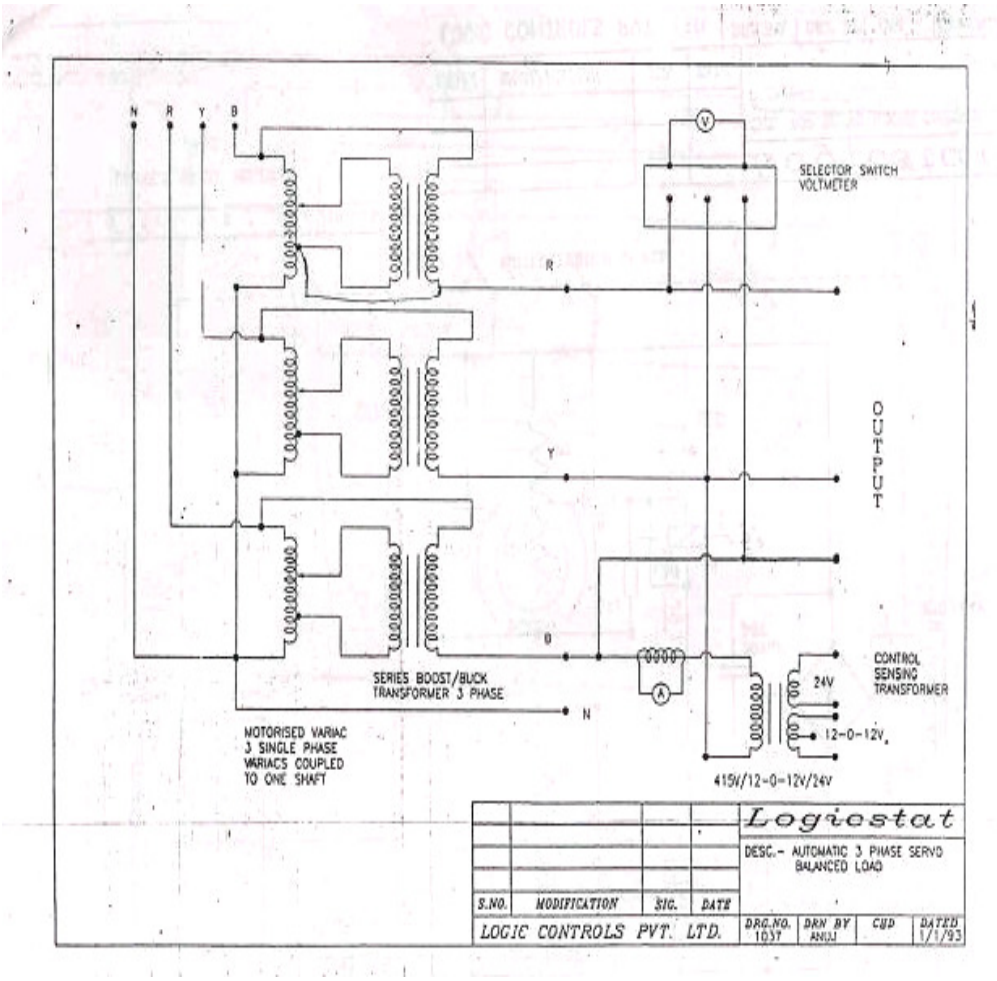
N
R
Y
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V
SELECTOR SWITCH
VOLTMETER
R
Y
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OUTPUT
A
CONTROL
SENSING
TRANSFORMER
24V
12-0-12V
SERIES BOOST/BUCK
TRANSFORMER 3 PHASE
N
MOTORISED VARIAC
3 SINGLE PHASE
VARIACS COUPLED
TO ONE SHAFT
415V/12-0-12V/24V
Logicstat
DESC.- AUTOMATIC 3 PHASE SERVO
BALANCED LOAD
S.NO.
MODIFICATION
SIG.
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DATED 1/1/93