AUTOMATIC TRANSFER SWITCH (ATS) ONE OUT OF TWO

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Abstract— **Electrical loads can be classified according to its importance as; normal loads, important loads & emergency loads. Normal loads are the loads from which the power can be switched off for a period of time; this period may be short or long depending on the case itself. Important loads are the loads which can be switched off for a very short time. Emergency loads are the loads which cannot be switched off at all such as hospitals. Normal and emergency loads are out of the scope but important loads will be discussed in some details. Important loads are usually supplied using two sources of power. The two sources are usually the transformer of the utility and a stand by generator used in case of the power of transformer is gone. If the main power has been activated again, the generator will be switched off and the load will be supplied from the transformer. This process is organized and performed using a device (Circuit) called Automatic Transfer Switch (ATS).**

Index Terms— **Automatic Transfer Switch, one out of two, classic control circuit diagram & circuit simulation.**

I. INTRODUCTION

It is very important to provide reliability during the process of feeding loads. This can be achieved using many different ways. One of these methods is the parallel operation of two generators or transformers after satisfying the parallel operation conditions in each case. Another method is to use a stand by generator. During the normal operation the transformer feeds the loads and the generator is out. If the main supply is gone, the generator is built up-manually or automatically- and feeds the loads. In case that the main supply has been came back,, the generator is switched off and the transformer feeds the loads. The operation of connecting and disconnecting the generator and transformed can be scheduled using a system (control circuit) called ATS which stands for Automatic Transfer Switch.

II. REPORT BODY

ATS one out of two shall be discussed below. A control circuit diagram is provided too. This diagram is simulated using Automation Studio software.

ATS classification:
ATS may be classified according to the number of switches (open contacts) it can control. This discussion will mention some of these types and focus on the one out of two.

Some of ATS types:
- One out of two (1 out of 2).
- Two out of three (2 out of 3).

One out of two:
The figure below; fig (1) illustrates the one out of two ATS. The shown single line diagram consists of two generators and some loads. Only one generator can supply these loads. The second generator is a stand by one, it will be switched on and supply the load only when the first generator fails to supply them. An ATS is set between the two generators to arrange the operation of connecting and disconnecting of the generators.
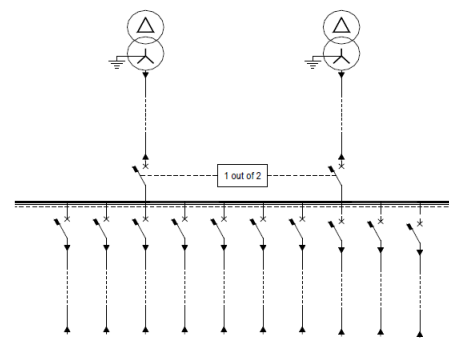

Figure 1: one out of two ATS single line diagram

Two out of three:
In this type, the ATS consists of three circuit breakers and only two circuit breakers are switched on. Fig (2) shows the single line diagram of an ATS two out of three.
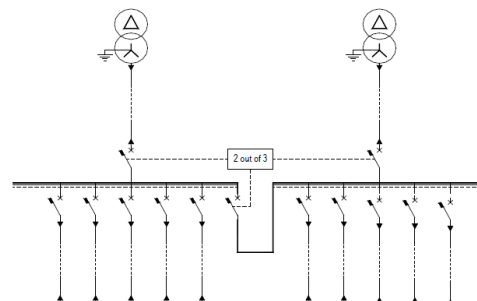

Figure 2: two out of three ATS single line diagram

One out of two ATS:

In this section a full schematic diagram of a classic control circuit designed to perform the ATS (1 out of 2) operation to control the power circuit. A software simulation for the control circuit is also provided. The power circuit consists of a three phase induction motor. The motor can be supplied from two sources, the first is the transformer, and the second is a stand by generator in case that the power from transformer has been gone.

This situation may be concluded as following; there are two cases:

The normal case.

The emergency case.

It may be noted that the transformer has the highest priority which means; if the generator was supplying the motor while the power from the transformer was off then the power came again, the control circuit must shut the generator off and connect the transformer to supply the motor.

The normal case:

In this case the motor is supplied from the transformer and the generator is out.

The emergency case:

In this case the power from transformer is switched off. The generator must be built up and connected to the motor to supply it.

The following table illustrates the truth table for both transformer and generator which shows the state of each one during operation the both cases.

Table 1: the truth table of the two cases

	Normal	**Emergency**
Transformer	**On**	**Off**
Generator	**Off**	**On**

Control circuit diagram:
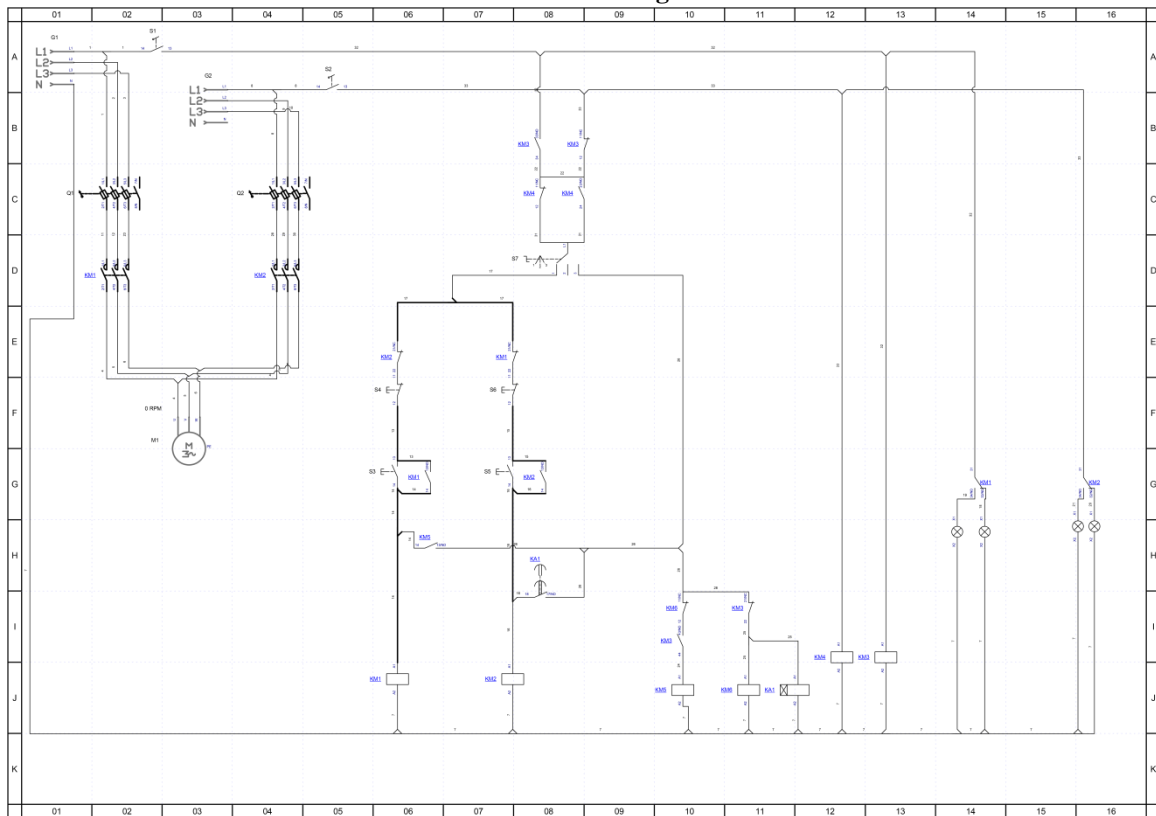
Figure 3: Classic Control Circuit Diagram of ATS

Bill of materials (BOM):

Item	Number	Label
Contactor	6	KM to KM6
Timer	1	KA1
Switch	2	Power 1 & power 2
Selector switch	1	Auto/off/Manual
Fused switch	2	NO LABEL
Push button (NO)	2	ON
Push button (NC)	2	OFF
Indicating lamps	4	ON & OFF
Change over	2	NO LABEL

- The two switches (Power 1 & Power 2) are an alternative choice of simulation the sudden connection and disconnection of supply main.
- The selector switch is to give the option to choose between manual and automatic operation.
- Indicating lamps are to show the state of each source whether it is on or off.

III. REFERENCES

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