CHAPTER 2:..... TABLE OF CONTENTS:

TABLE OF FIGURES:

2. Binary and Logic Operations.

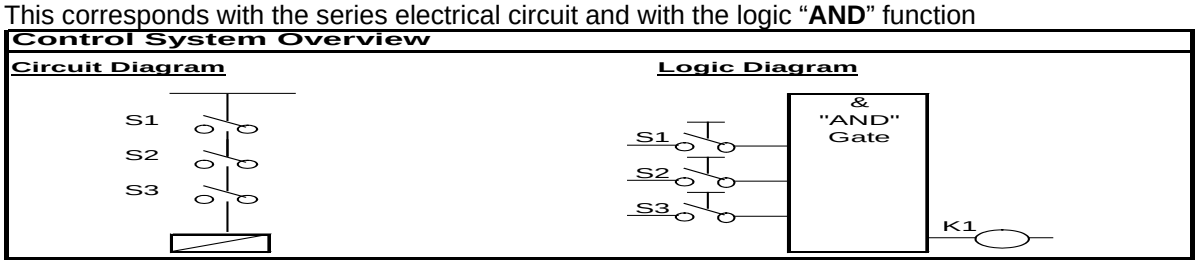
Complete the following exercises using the LOGO Function Block Diagram (**FBD**) Format to get familiar with the LOGO software. For each exercise complete the following:

- Save the Program in the Sub-folder LOGO.
- Test the Program using the LOGO Tools → Simulation.
- Use the following Addresses;, S1 = I1, S2 = I2, S3 = I2, K1 = Q1

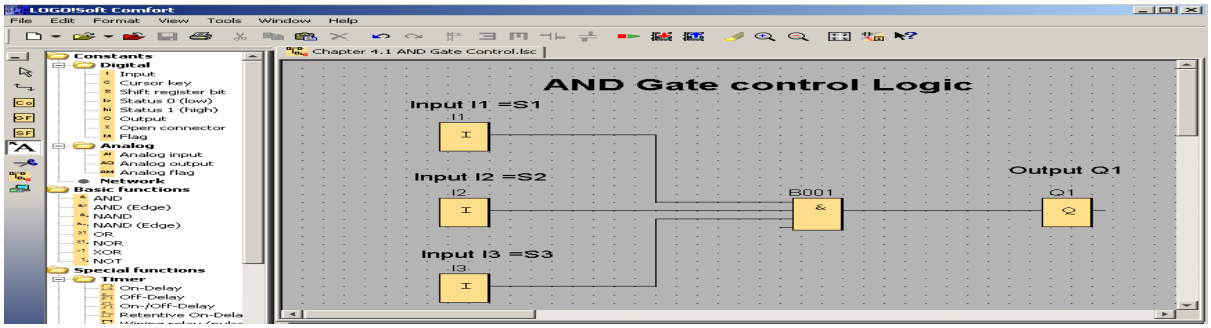
2.1 Exercise Create an AND Gate Program

- Create a User Program which energises K1 when the switches S1, S2 and S3 are energised.
- Name the Program as AND Gate Logic.

This corresponds with the series electrical circuit and with the logic "**AND**" function



ELECTRICAL SERIES CIRCUIT AND CONTROL SYSTEM OVERVIEW

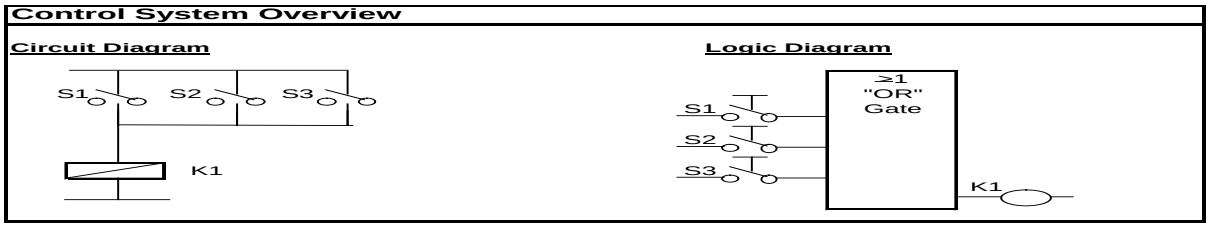


AND GATE CONTROL PROGRAM

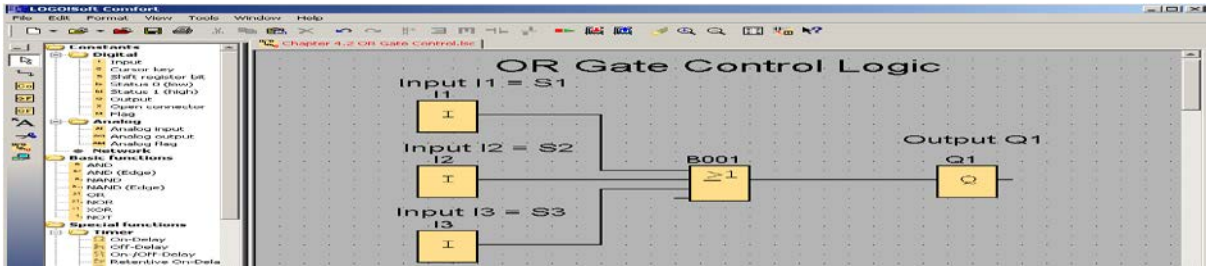
2.2 Exercise Create an OR Gate Program

- Create a User Program which energises K1 when switches S1 or S2 or S3 are energised.
- Name the Program as OR Gate Logic.

This corresponds with the Parallel electrical circuit and with the logic "**OR**" function



ELECTRICAL PARALLEL CIRCUIT AND CONTROL SYSTEM OVERVIEW



OR GATE CONTROL PROGRAM

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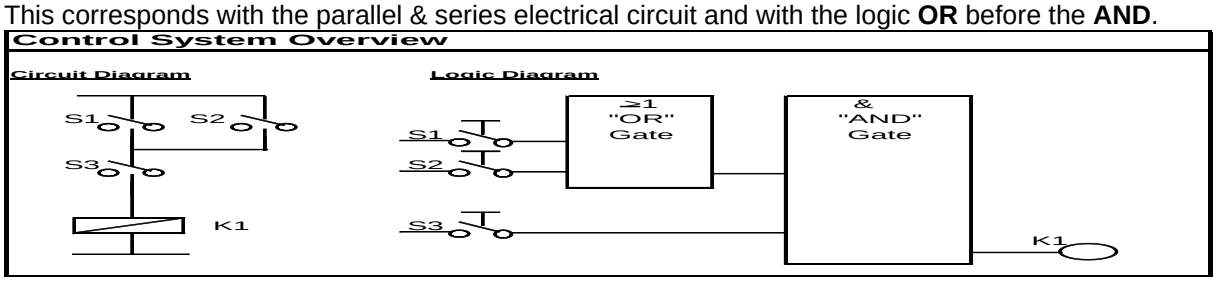
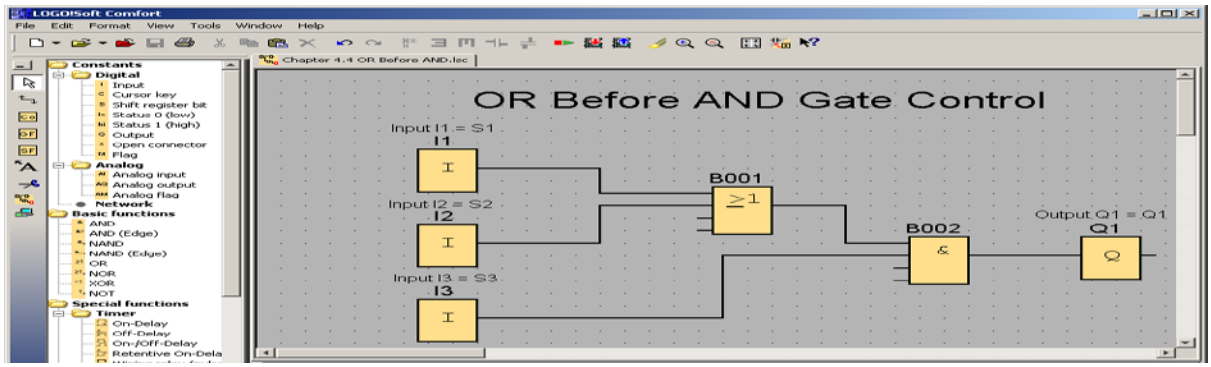
2.3 Exercise Create a OR Before AND Program

- Create a User Program which energises K1 when switches S1 or S2 and S3 are closed.
- Name the Program as OR Before AND.

This corresponds with the parallel & series electrical circuit and with the logic **OR** before the **AND**.



ELECTRICAL SERIES & PARALLEL CIRCUIT AND CONTROL SYSTEM OVERVIEW

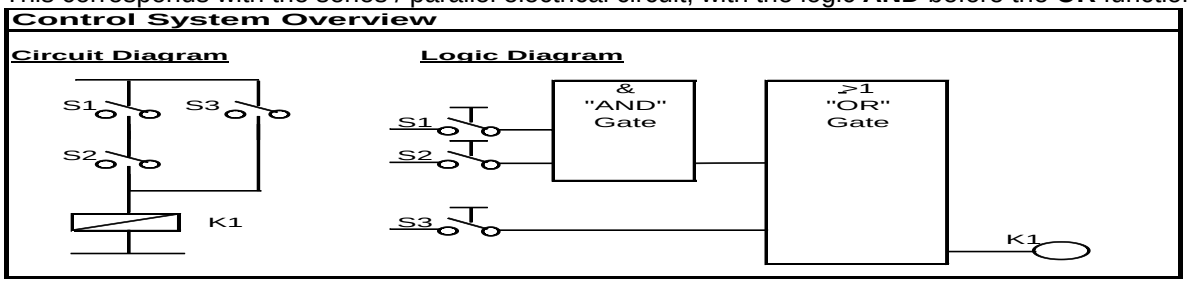


OR BEFORE AND GATE CONTROL PROGRAM

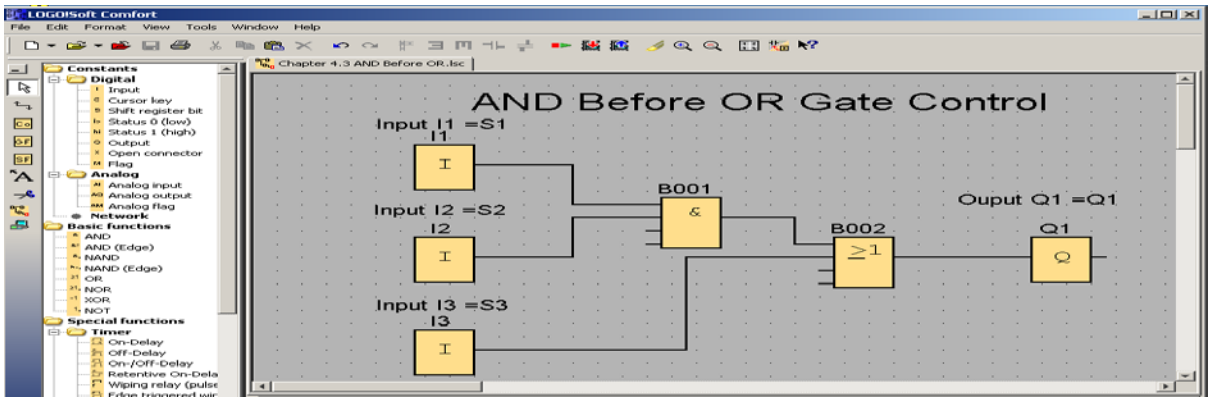
2.4 Exercise Create a AND Before OR Program

- Create a User Program which energises K1 when switches S1 and S2 or S3 are closed.
- Name the Program as AND Before OR.

This corresponds with the series / parallel electrical circuit, with the logic **AND** before the **OR** function.



ELECTRICAL SERIES & PARALLEL CIRCUIT AND CONTROL SYSTEM OVERVIEW

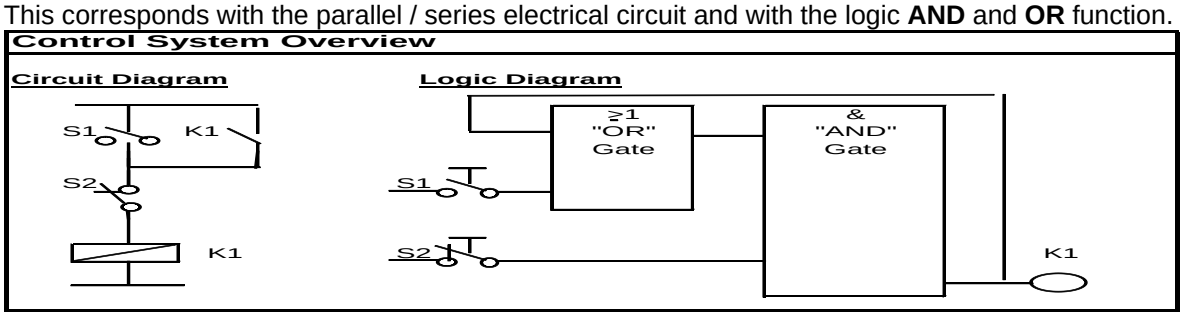


AND BEFORE OR GATE CONTROL PROGRAM

2.5 Exercise Create a START STOP Program

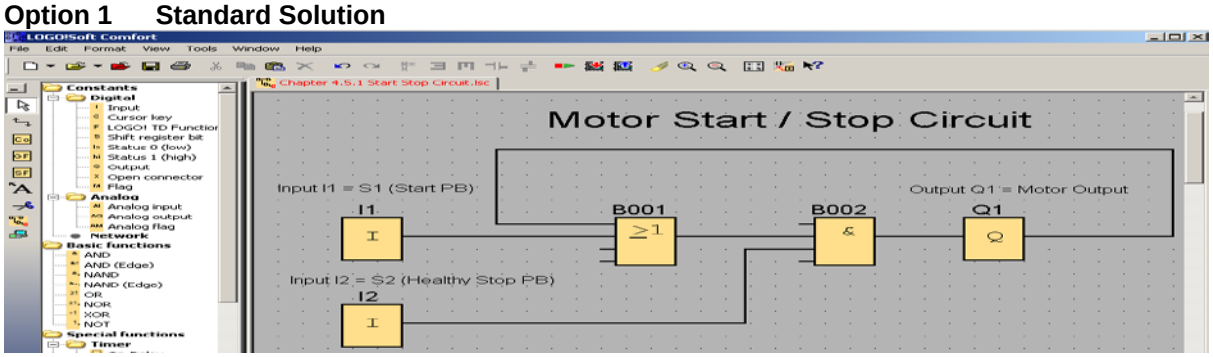
- Create a User Program which energises K1 when switch S1 (Start PB) is pressed, provided S2 (Healthy Stop) is healthy.
- Name the Program as AND Before OR.

This is a typical standard Start/Stop electrical circuit used for motor control whereby pushbuttons are used for starting S1 (**Normally Open Contact**) and pushbutton S2 (Normally Closed Contact) to stop the motor. This is often called a **LATCH On** or **HOLD On** circuit.
This corresponds with the parallel / series electrical circuit and with the logic **AND** and **OR** function.



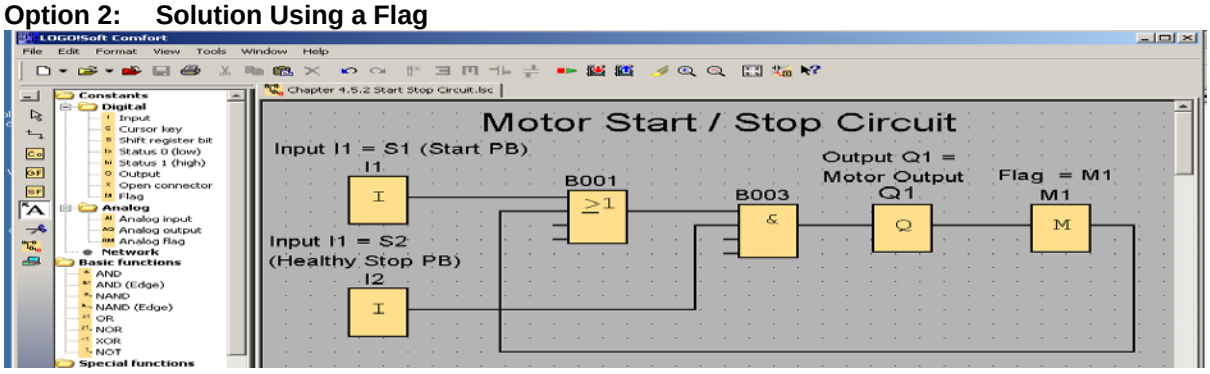
ELECTRICAL SERIES & PARALLEL CIRCUIT AND CONTROL SYSTEM OVERVIEW

Option 1 Standard Solution



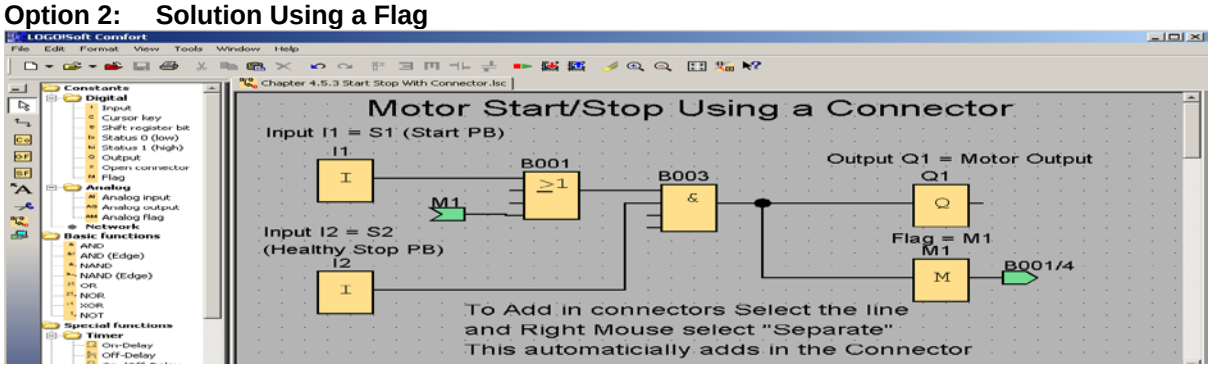
OPTION 1 MOTOR START / STOP CONTROL PROGRAM

Option 2: Solution Using a Flag



OPTION 2 MOTOR START / STOP USING A FLAG CONTROL PROGRAM

Option 2: Solution Using a Flag



OPTION 3 MOTOR START / STOP USING A CONNECTOR CONTROL PROGRAM

2.6 Exercise

Are we limited in the number of times we can test an input in a User Program ?,

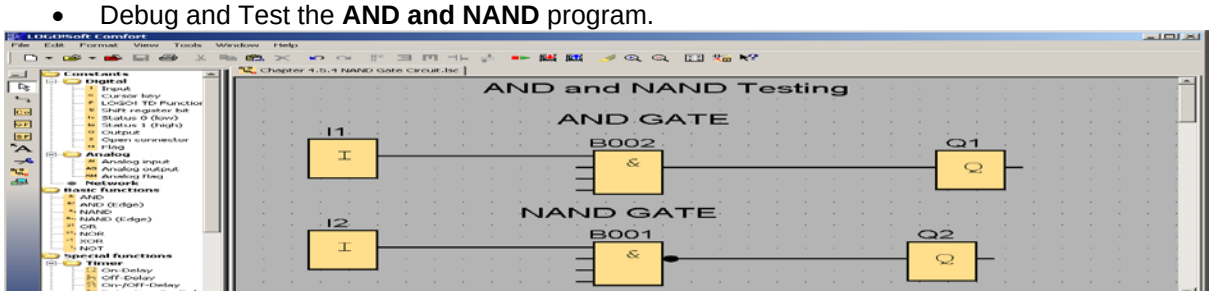
_____

A pushbutton type control switch has a break (Normally Closed) contact. Does it provide a signal (a) when it is depressed or (b) when it is untouched and explain ?,

_____

2.6.1 Exercise: Set-Up AND and NAND

- Complete the following as outlined below.
- Save the program as **AND and NAND Gate Control** and download it to the CPU.
- Debug and Test the **AND and NAND** program.



AND AND NAND CONTROL PROGRAM

when it is status of Q1 when S1 is not pressed and explain ?, _____
when it is status of Q2 when S2 is not pressed and explain ?, _____

2.6.2 Exercise: Set-Up a Garage Three Bay Shed.

Task:

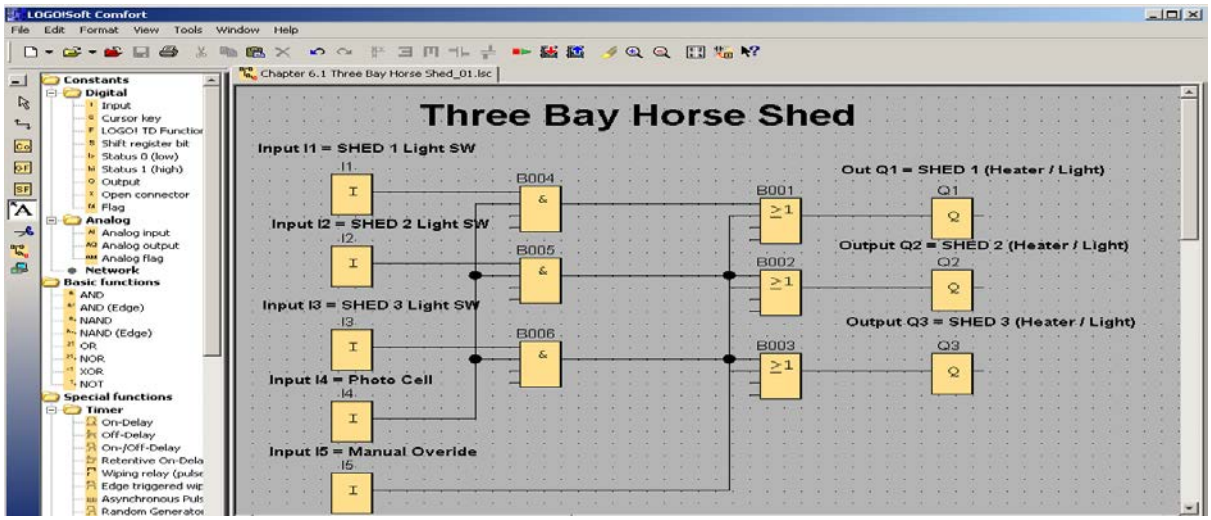
Set up a program for a **Three Bay Horse Shed**. Each of the Horse Sheds 1, 2 and 3 have an individual Manual Switch S1, S2 and S3 that turns on/off a Light/Heater within each shed, provided that the Photo Cell indicates that it is dark outside. A Manual override switch (S4) is used to Manually turn on all the Sheds Lights/Heaters irrespective if its Day or Night time.

Note the Result is provided below but one should try this without looking at the result.

What to Do:

- Design and Debug software for a Three Bay Horse Shed.
- Save the program as **Three Bay Horse Shed** and download it to the CPU.
- Debug and Test the **Three Bay Horse Shed** program.

Result:



THREE BAY HORSE SHED CONTROL PROGRAM

2.7 Check what you've learnt this Chapter

I Know:

⇒ How to Program a Siemens LOGO PLC using FBD Format.

⇒ What a normally open "NO" and normally closed "NC" contacts are used for.

⇒ I understand when to use "AND" or "OR" gate logic.

⇒ I understand when to use an "AND" before "OR" gate logic.

⇒ I understand when to use an "OR" before "AND" gate logic

⇒ How a Motor Start / Stop circuit operates and how it is programmed.

I Can:

⇒ Program a Siemens LOGO using FBD format.

⇒ Understand when to used a normally open "NO" or normally closed "NC" contacts in the User Software.

⇒ Understand when to use "AND" or "OR" gate logic.

⇒ Understand when to use an "AND" before "OR" gate logic.

⇒ Understand when to use an "OR" before "AND" gate logic

⇒ Understand how a Motor Start / Stop software is programmed.