MotorStart Example

The MotorStart example shows how an AmbiLogique PLC can be used in conjunction with non-software solutions to solve tricky safety issues.

Disclaimer

This example is provided as an illustration of AmbiLogique PLC functions only. No representation is made which suggests that this example will meet the technical requirements of any specific Health and Safety Authority. It is the responsibility of the user or applications engineer to determine whether a PLC system of this type will meet these technical requirements, and to design the system to meet all the provisions of such requirements.

This example shows how to connect an AmbiLogique PLC into a safety circuit where there is a requirement that the safety circuits must be duplicated, and at least one safety path must be independent of any software-based device.

The first diagram sheet is an AmbiLogique diagram which has been constructed to show the electrical connections. It has no active components in it and does not generate any program elements for uploading into the PLC.

The second sheet shows the program for the PLC.

A classic cause of accidents involving motorised machinery is when the machine is being worked on with the motor stopped, and the safety fence open. It sometimes happens that the mechanic has inadvertently pressed the Start button with clothing or tools in pockets whilst leaning over the machine, and closes or defeats the fence. Under these conditions, an unexpected motor start can occur.

With the arrangement shown in this example, an unexpected start will not occur. It is necessary to close the fence, reset all the emergency stops, then actively press the Start button (i.e. change it from not-pressed to pressed) before the motor will start.
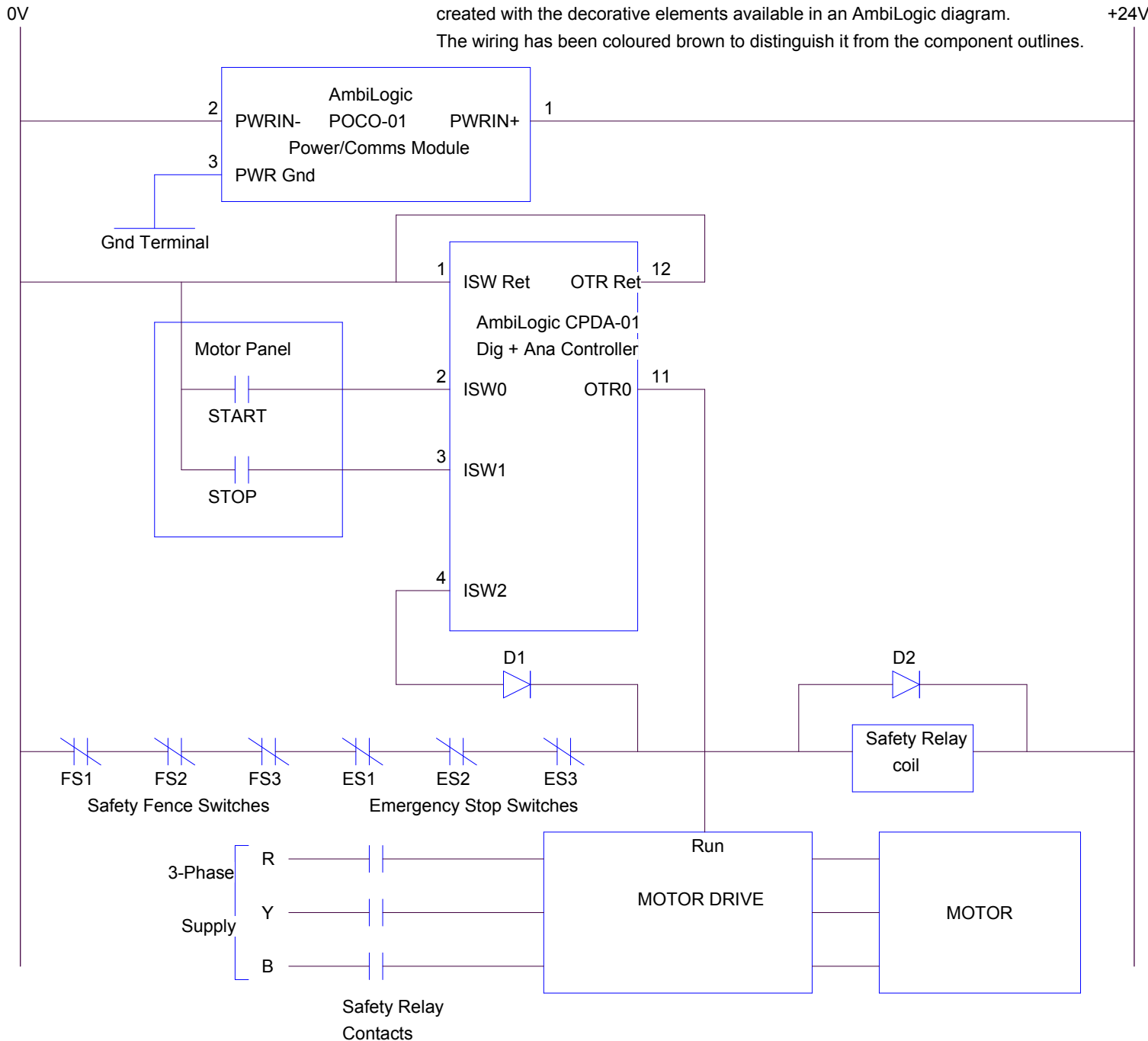
0V

Note that there is no active element in this diagram - it is a pure illustration
created with the decorative elements available in an AmbiLogic diagram.
The wiring has been coloured brown to distinguish it from the component outlines.

+24V

Even though there are no active elements on this sheet,
it still needs to be wire-checked before the
entire diagram can be compiled.

AmbiLogic
PWRIN- POCO-01 PWRIN+
Power/Comms Module
PWR Gnd

2
3
1

Gnd Terminal

ISW Ret OTR Ret
1 12

AmbiLogic CPDA-01
Dig + Ana Controller

Motor Panel

START

STOP

ISW0 OTR0
2 11

ISW1
3

ISW2
4

D1

D2

This shows how to connect an AmbiLogic PLC into a safety
circuit where there is a requirement that the safety circuits
must be duplicated, and at least one safety path must be
independent of any software-based device.

WARNING: Before implementing high-powered motorised
systems in accordance with this example,
IT IS ESSENTIAL to CHECK THE PROPOSED DESIGN
WITH YOUR HEALTH AND SAFETY AUTHORITY.
AMBILOGIC PTY LTD OFFERS NO GUARANTEE THAT
THIS EXAMPLE WILL MEET ALL REQUIREMENTS OF
EVERY AUTHORITY.

The independent circuit is wired so that any fence or ES switch
will release the safety relay and cause the power supply to the
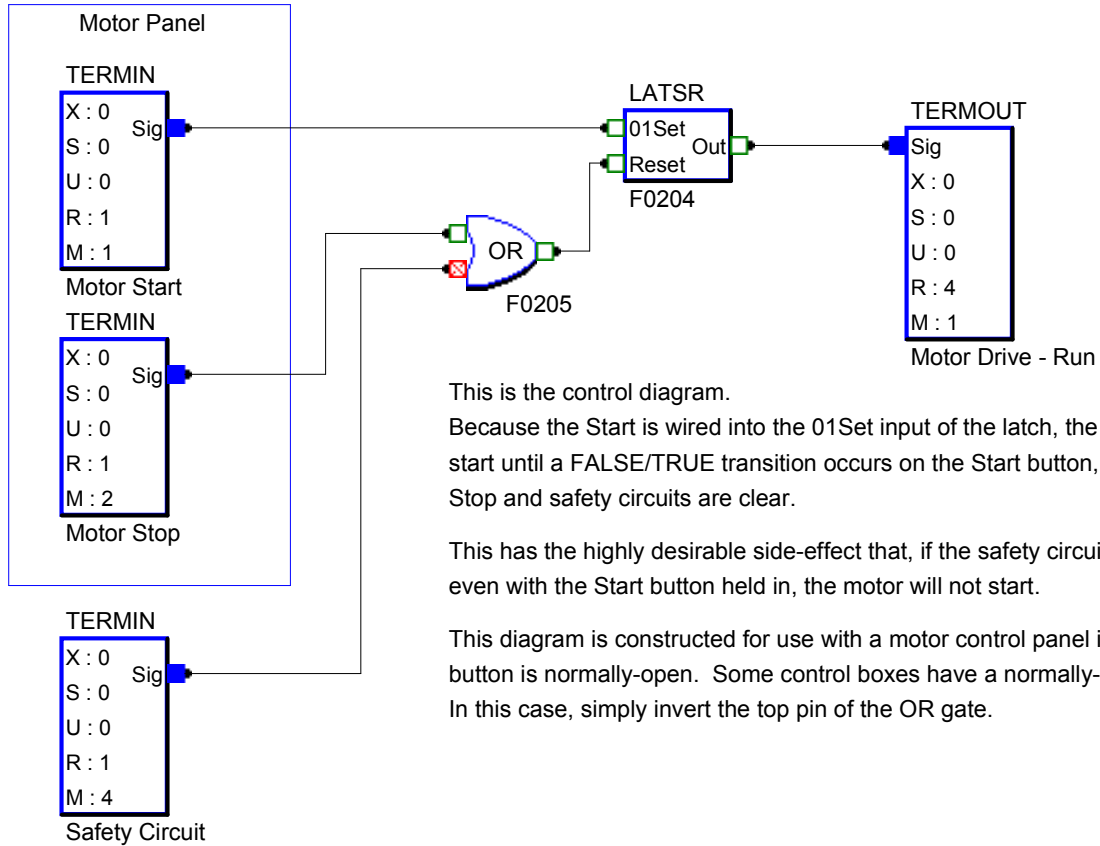motor drive to be cut off.

D1 ensures that if there is a ground fault on the input terminal
ISW2 this will not lock in the safety relay.

D2 catches the flyback transient on the relay coil when it is
switched off.

The next sheet shows the AmbiLogic diagram which carries out
the Start/Stop interlocking and the auxiliary emergency stop
function.

FS1 FS2 FS3 ES1 ES2 ES3
Safety Fence Switches Emergency Stop Switches

Safety Relay
coil

3-Phase

Supply

R

Y

B

Run

MOTOR DRIVE

MOTOR

Safety Relay
Contacts

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MOTOR CONTROL

Sheet 1 of 2

Motor Panel

TERMIN

X : 0	
S : 0	Sig
U : 0	
R : 1	
M : 1	

Motor Start

TERMIN

X : 0	
S : 0	Sig
U : 0	
R : 1	
M : 2	

Motor Stop

TERMIN

X : 0	
S : 0	Sig
U : 0	
R : 1	
M : 4	

Safety Circuit

LATSR

01Set
Reset
Out

F0204

OR

F0205

TERMOUT

Sig	
X : 0	
S : 0	
U : 0	
R : 4	
M : 1	

Motor Drive - Run

This is the control diagram.
Because the Start is wired into the 01Set input of the latch, the motor will not
start until a FALSE/TRUE transition occurs on the Start button, when the
Stop and safety circuits are clear.

This has the highly desirable side-effect that, if the safety circuit is restored,
even with the Start button held in, the motor will not start.

This diagram is constructed for use with a motor control panel in which the Stop
button is normally-open. Some control boxes have a normally-closed Stop switch.
In this case, simply invert the top pin of the OR gate.

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MOTOR CONTROL