Control EC_board for Air Handling Units

Introduction

EC_board has two functions:

1) Converts digital inputs to analog input 0-10V – it is used to control EC motor by analog signal or modbus signal. In this configuration Modbus communication is in Master function. EC_board can send command by bus to control speed motor drive. One EC_board is sending commands for 10 motors on address 1-10, every motors have the same speed.

2) Expansion I/O board for PLC controller. In this configuration EC_board is in Slave function. External PLC controller send to EC_board commands to control I/O.

Operation parameters

- Power Supply +24VDC or 24AC - only config. I
- Digital Input 24VDC or 10-30V AC (optoisolation) 2 input
- Analog Input 0-10V DC 1
- For configuration I (EC_Board = Modbus Master DIP 8 = OFF)
  - Reference 10V DC 1
  - Analog Output 0-10V DC 1
- For configuration II (EC_Board = Modbus Slave DIP 8 = ON)
  - Analog Output 2
- Modbus communication RS-485 1
Change configuration

To change configuration you must set DIP switch to:

1) DIP 1-8=OFF

Configuration I - EC_board is Modbus Master, can without outside plc help control EC motor speed. Change speed by change digital output. Set speed by 0-10V analog output or modbus communication.

2) DIP 1-7=OFF, DIP8=ON

Configuration II - EC_board is Modbus Slave, can not work without outside plc. Change outputs and read inputs by commands from external PLC controller. Warning! Applies to PCB-EC boards, which after switching the position 8 switch do not change the logic of the program for cooperation with switchboards – please switch the DIP switch 7 to “On” position. Dip-switch 7 is redundant, in this case its switching increases the accuracy of microcontroller reading.

Functions in configurations

Configuration I DIP8=OFF

The potentiometers set the voltage value for speed 1 and 2. Activation of IN1 and IN2 inputs - the green LEDs 1 and 2 for speed 1 and 2 will light up respectively. The value on the output matches the set ranges on the potentiometers.

It is possibly to work with 3 speeds. Speed 3 through the 0-10V input. Signal above 5V = speed 3 activation. Speed 3 gives a maximum signal 10V - no adjustment possible. After activating gear 3, the green LED3 blinks.

The signal for run speed 1 is also a work permit. No signal - there is no voltage on the 0-10V output = 0V, despite activating gears 2 and 3.

Setting the value with a smaller potentiometer for speed 2 than for speed 1 causes an alarm (the red LED 4 blinks) and the 0-10V output is set to 0V.

The 0-10V output1 is permanently set to 10V DC and marked as 10V on pcb.

The modbus communication connector - used to control the speed of EC VTS engines, can be used instead of a 0-10V signal. He is the Modbus Master on the RS-485 line. It should not be connected to another RS-485 bus. The system simultaneously issues a 0-10V signal and a value after modbus. The motor must be activated by modbus (instead of 0-10V) - standard for VSS005s engines. Controls motors with addresses from 1-10.

Configuration II DIP8=ON

The system is used to extend the I / O of the connected PLC. Orders and data are sent on the modbus bus.

Potentiometers can be used to set analog outputs in a specific state in the event of communication loss between PLC and Ec_board. The settings are controlled by the DIP switch 7, according to the values shown in the diagram.

Configuration I and II (both)

Turning on the power - the green LED3 is on.

Parameters of communication DIP 1 = OFF speed 9600 8/N/1. DIP1 = ON speed 19200 8/N/1. The speed can be switched during the module operation.
Diagrams

Configuration I - Converts digital inputs to analog input - 2 speed

Connection to motor with 0-10V control signal

Connection to motor with MODBUS control signal for VVS005s EC072/25E3G01-B190

For MOTOR EC072/25E3G01-B190
Cable1 (power): Brown - L, Blue - N, Green/Yellow - PE
Cable2 (communication): Yellow- A+, White- B+, Blue - GND

VTS reserves the right to implement changes without prior notice
Configuration I - Converts digital inputs to analog input - 3 speed

Connection to motor with 0-10V control signal

Connection to motor with MODBUS control signal for VVS005s EC072/25E3G01-B190

For MOTOR EC072/25E3G01-B190
Cable1 (power): Brown - L, Blue - N, Green/Yellow - PE
Cable2 (communication): Yellow- A+, White- B+, Blue - GND
Configuration II - Configuration with external I/O (Modbus slave)

Connection to PLC Modbus Master to controls boards I/O
2 analog outputs
1 analog input
2 digital input

Table I/O

<table>
<thead>
<tr>
<th>EC_board / with PLC *</th>
<th>EC_board / with PLC *</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Supply – AOUT</strong></td>
<td><strong>Analog IN/OUT – AIN</strong></td>
</tr>
<tr>
<td>G</td>
<td>GND</td>
</tr>
<tr>
<td>+24V DC</td>
<td>Reference Ground (0V)</td>
</tr>
<tr>
<td>G0</td>
<td>0-10V</td>
</tr>
<tr>
<td>-24V DC</td>
<td>Input 0-10V</td>
</tr>
<tr>
<td><strong>Digital Inputs</strong></td>
<td></td>
</tr>
<tr>
<td>IN1</td>
<td>10V</td>
</tr>
<tr>
<td>Digital Input 1 - (Speed 1) / (Supply Filer*)</td>
<td>Reference 10V / Output1 0-10V (Recovery*)</td>
</tr>
<tr>
<td>IN2</td>
<td>GND</td>
</tr>
<tr>
<td>Digital Input 2 - (Speed 2) / (Return Filer*)</td>
<td>Reference Ground (0V)</td>
</tr>
<tr>
<td>DI3</td>
<td>0-10V</td>
</tr>
<tr>
<td>Common (Reference Ground)</td>
<td>Output2 0-10V (Mixing*)</td>
</tr>
</tbody>
</table>

**Modbus communication**

| A+       | Txd/Rxd (positive) |
| B-       | Txd/Rxd (negative) |
| GND      | Common (Reference Ground) |

*Symbol for function input/output EC_board when is used with PLC

Table LEDs

<table>
<thead>
<tr>
<th><strong>Modbus communication</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>LED3 (green) ON</td>
</tr>
<tr>
<td>LED1 (green) ON</td>
</tr>
<tr>
<td>LED2 (green) ON</td>
</tr>
<tr>
<td>LED3 (green) Blink</td>
</tr>
<tr>
<td>LED4 (red) Blink</td>
</tr>
<tr>
<td>LED4 (red) ON</td>
</tr>
</tbody>
</table>

Power is on, system is working
IN1 Speed1 active signal
IN2 Speed2 active signal
AIN 0-10V Speed3 active signal
Error set for speed 2 is smaller than for speed 1 (config. I)
Communication timeout (60sec.) (config. II)