I/O board 2.0
Option

For Emotron VFX/FDU 2.0 AC drive and
Emotron TSA softstarter

Instruction manual
English
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Instruction manual - English

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Safety

Instruction manual
Read this instruction manual first!

This option is a supplementary part of the Emotron FDU/Emotron VFX AC drives and Emotron TSA softstarters, hereinafter in this manual referred to as the “main product” and the user must be acquainted with the original instruction manual of the main product. All safety instructions, warnings, etc. as mentioned in this instruction manual must be known to the user.

Safety instructions
Read the safety instructions in the instruction manual for the main product.

Installation
Installation, commissioning, dismounting, making measurements, etc. on the main product may only be carried out by personnel who are technically qualified for the task. Installation must also be carried out in accordance with the local standards. Ensure that all necessary safety measures are taken.

WARNING!
Take all necessary safety precautions during installation and commissioning to prevent personal injuries, e.g. by an uncontrolled load.

Opening the main product

WARNING!
Always switch off the mains supply before opening the main product.
For AC drives, wait at least 7 minutes to allow the buffer capacitors to discharge.

Always take adequate precautions before opening the main product, even though the connections for the control signals and jumpers are isolated from the mains voltage.
Contents

Safety ...................................................................................................................... 1

Contents .............................................................................................................. 3

1 Introduction .................................................................................................... 5
  1.1 Description ................................................................................................. 5

2 Connections and functions .............................................................................. 7
  2.1 Board layout ............................................................................................... 7
  2.2 User connections ....................................................................................... 8
  2.3 LEDs .......................................................................................................... 9
  2.4 Internal connectors .................................................................................... 10

3 Use of the inputs .............................................................................................. 11
  3.1 Threshold limits for digital inputs .............................................................. 11

4 Functions ........................................................................................................ 13
  4.1 Menus and parameter settings .................................................................. 13

5 Installation ...................................................................................................... 15
  5.1 Polarisation of flat cables (AC drive) ........................................................ 16
  5.2 Mechanical mounting on AC drives ........................................................... 17
  5.3 Mechanical mounting on Emotron TSA ..................................................... 21
1 Introduction

The I/O board is an option board for Emotron FDU/VFX AC drives and Emotron TSA softstarters, which hereinafter on in this manual referred to as the “main product”. The I/O board offers three additional galvanic isolated digital inputs and three additional programmable relay outputs. The digital inputs and relay outputs are named as follows.

Bx DigInX or RelayZ, where B stands for option board and DigIn for digital input. X and Z can be 1, 2 or 3 (1 or 2 in Emotron TSA). The board number is 1 if the option board is mounted on the first slot on the mounting plate. Maximum 3 option boards can be mounted on Emotron FDU/VFX and maximum 2 boards on Emotron TSA.

Example

```
B2 DigIn3
```

Digital input number 3
Board number 2; the option board is mounted in slot 2

After the I/O board is installed, the software automatically detects the presence of the board and the related menus will subsequently appear and become active in the setup menus of the main product.

1.1 Description

This instruction manual describes the installation and use of the I/O board option which can be built into the following products:

- Emotron FDU 2.0 AC drive
- Emotron VFX 2.0 AC drive
- Emotron TSA softstarter

Delivery and unpacking

Check the delivery. The shipment should contain:

- I/O board
- Mounting material as described in the Installation chapter on page 117.
- This manual
Check for visible signs of damage. Do not install if damage is found. If damage is found or something is missing from the package, please contact your supplier.
2 Connections and functions

2.1 Board layout

Fig. 1 I/O board layout
### 2.2 User connections

Table 1  
*Function of terminal strip X1, X2 and X4.*

<table>
<thead>
<tr>
<th></th>
<th>Name</th>
<th>Function (default)</th>
<th>Signal</th>
<th>Type</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>X1</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>N/C</td>
<td>Relay B1 (2,3) R1 programmable output</td>
<td>Potential free change over 2 A/250 VAC/AC1</td>
<td>Relay output</td>
</tr>
<tr>
<td>2</td>
<td>COM</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>N/O</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>X2</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>N/C</td>
<td>Relay B1 (2,3) R2 programmable output</td>
<td>Potential free change over 2 A/250 VAC/AC1</td>
<td>Relay output</td>
</tr>
<tr>
<td>2</td>
<td>COM</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>N/O</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>X3</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>N/C</td>
<td>Relay B1 (2,3) R3 programmable output</td>
<td>Potential free change over 2 A/250 VAC/AC1</td>
<td>Relay output</td>
</tr>
<tr>
<td>2</td>
<td>COM</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>N/O</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>X4</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>DigIn1 +</td>
<td>Board 1 (2,3) Digital input 1</td>
<td>0-24 VDC or 0-24 VAC, imp. 3.2 kΩ</td>
<td>Differential digital input</td>
</tr>
<tr>
<td>2</td>
<td>DigIn1 -</td>
<td></td>
<td>See CAUTION below table.</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>DigIn2 +</td>
<td>Board 1 (2,3) Digital input 2</td>
<td>0-24 VDC or 0-24 VAC, imp. 3.2 kΩ</td>
<td>Differential digital input</td>
</tr>
<tr>
<td>4</td>
<td>DigIn2 -</td>
<td></td>
<td>See CAUTION below table.</td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>DigIn3 +</td>
<td>Board 1 (2,3) Digital input 3</td>
<td>0-24 VDC or 0-24 VAC, imp. 3.2 kΩ</td>
<td>Differential digital input</td>
</tr>
<tr>
<td>6</td>
<td>DigIn3 -</td>
<td></td>
<td>See CAUTION below table.</td>
<td></td>
</tr>
</tbody>
</table>

---

**CAUTION!**

Galvanic isolation between digital inputs is limited. Maximum allowed voltage difference between digital inputs: 50 VDC or 50 VAC.

---

Note: Recommended minimum switching current at low voltages for the relays is 10 mA.
2.3 LEDs

The LEDs on the I/O board indicate the following functions:

Table 2  Cable specification

<table>
<thead>
<tr>
<th>Signal type</th>
<th>Maximum wire size</th>
<th>Tightening torque</th>
<th>Cable type</th>
</tr>
</thead>
<tbody>
<tr>
<td>Digital</td>
<td>Solid wire: 0.14 to 2.5 mm²</td>
<td>0.5 Nm</td>
<td>Screened</td>
</tr>
<tr>
<td></td>
<td>Flexible wire: 0.14 to 1.5 mm²</td>
<td></td>
<td>Not screened</td>
</tr>
<tr>
<td></td>
<td>Wire with ferrule: 0.25 to 1.5 mm²</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Relay</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Table 3  LED description

<table>
<thead>
<tr>
<th>LED</th>
<th>Description</th>
</tr>
</thead>
</table>
| Status | Flashing slowly (1 Hz) = OK  
       | Flashing fast = Communication Error  
       | Off = no power supply  |
| D1  | Relay 1 active when lit, X1:2 connected to X1:3  |
| D2  | Relay 2 active when lit, X2:2 connected to X2:3  |
| D3  | Relay 3 active when lit, X3:2 connected to X3:3  |
| D4  | DigIn 1 “ON” (high) when lit *                |
| D5  | DigIn 2 “ON” (high) when lit *                |
| D6  | DigIn 3 “ON” (high) when lit *                |

* See threshold limits for digital inputs in § 3.1, page 11.
### 2.4 Internal connectors

<table>
<thead>
<tr>
<th>Connector</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>X5a</td>
<td>First option slot: 16-pole flat cable connected to the control board option connector X5 on AC drives or X4 on Emotron TSA. Second or third option slot: 16-pole flat cable from the previous option board.</td>
</tr>
<tr>
<td>X5b</td>
<td>Connection to the next option board.</td>
</tr>
</tbody>
</table>
3 Use of the inputs

All digital inputs are isolated differential inputs. Isolation means that the common of the signal is not connected to the common of the main product, nor with the common of any other input or output. One of the advantages of this is that control signals from different PLCs with a different common potential can be connected without any problem.

Another advantage of using differential inputs is that the input is less sensitive to external interference.

Sometimes it can be convenient to use the same source (0 V reference) for both the I/O and control board for signals. This is fully possible. The 24 V power supply capacity of the control board is limited, please see the note below.

--

**NOTE:** The maximum load of +24 V DC supply for the main product is limited. Please refer to the manual for the main product. The impedance of each digital input on the I/O board is 3.2 kOhm (7.5 mA).

---

3.1 Threshold limits for digital inputs

The input is considered high when the voltage difference exceeds 8 V DC/AC and the input is considered low when voltage difference is below 5 V DC/AC.
4 Functions

After the I/O board is installed, the software automatically detects the presence of the board and the related menus will subsequently appear and become active in the Setup Menu of the main product.

4.1 Menus and parameter settings

For a description of menus and parameter settings please refer to the manual for the main product.
5. Installation

This chapter describes how to mount the option board in the main product.

On AC drives up to three different option boards and one communication board can be mounted.
On Emotron TSA softstarters up to two option boards and one communication option can be mounted.

The option kit includes

- option board.
- Four screws.
- One 16-pole flat cable, approx. 75 mm long. This cable is used to connect the first option board on AC-drives only.
- One 16-pole flat cable approx. 32 mm long, for connection between two option boards. This cable is also used to connect the first option board on Emotron TSA softstarter.

Insulating sheet - only for use on AC drives. For Emotron TSA the insulation sheet is integrated with the product.

Fig. 2 Option kit contents
5.1 Polarisation of flat cables (AC drive)

The flat cable is marked with a colour on one side and has a pin on the micromatch male contact. This side must be matched to the female micromatch contact on the control board and option board respectively, where a small hole in the board is located.

Fig. 3 Polarisation of flat cables (Example on AC drive)

---

CAUTION!
Incorrect connection might cause damage to both the option and to the control board/external equipment.
5.2 Mechanical mounting on AC drives

Make sure that the AC drive has been switched off for at least seven minutes to ensure that the capacitor bank is discharged before continuing with installation! Also make sure that no external equipment connected to the drive's interface is powered on.

NOTE: Correct installation is essential for fulfilling the EMC requirements and for proper operation of the module.

5.2.1 Mounting the first option board

The first option board is always mounted on the slot marked 1 on the mounting plate. In this example we assume that no other option board is installed.

1. Connect the 16-pole flat cable (75 mm) to the X5 connector on the control board with the cable downwards as in Fig. 4.

NOTE: For polarisation of the flat cable, see section 5.1 on page 16.

Fig. 4 Flat cable connected to the control board
2. Place the insulating sheet over the short spacers on the slot marked 1 on the mounting plate. Make sure the flap bent upwards is mounted towards the control board interface as in the figure below.

Fig. 5 Mounted insulating sheet

3. Connect the other end of the 16-pole flat cable to the X5A connector on the option board. Make sure that the polarisation is correct as in section 5.1 on page 16.

**NOTE:** Connect the micro match male contact to the option in the same manner as on the control board, i.e. the pin on the micro match contact must be fitted into the hole in the PCB.
4. Put the option board on the spacers.
5. Fasten the board using the four screws.
5.2.2 Mounting another option board

1. Place the insulating sheet on the spacers on the option board slot marked 2 or 3. It is necessary to select the slot closest to the already mounted option board.

**NOTE:** Place the insulating sheet with the turned up flap facing the interface of the control board to achieve proper insulation between the option boards.

2. Put the option board on the spacers.
3. Fasten the option board on the spacers using the four screws.
4. Connect the short flat cable between the X5B connector on the first option board and the X5A connector on the option board you have just mounted.

*Fig. 8 Two option boards mounted on the mounting plate*
5.3 Mechanical mounting on Emotron TSA

Make sure that all power to the softstarter has been switched off before continuing with installation! Also make sure that no external equipment connected to the softstarters interface is switched on.

NOTE: Correct installation is essential for fulfilling the EMC requirements and for proper operation of the module.

5.3.1 Mounting the first option board

The first option board is always mounted on the slot marked 1 on the insulating sheet. In this example we assume that no other option board is installed.

1. Connect the short 16-pole flat cable (32 mm) to the X5A connector on the option board as in Fig. 16.

![Diagram](image)

*Fig. 9 Connect the flat cable to X5A connector on the option board.*

2. Place the option board on the spacers at the option board slot marked 1.
3. Fasten the board using the four screws.

![Diagram showing four screws](image)

*Fig. 10 Place the option board on the spacers and fasten it with the four screws.*

4. Connect the other end of the 16-pole flat cable to the X4 connector on the control board.
5.3.2 Mounting a second option board

1. Place the option board on the spacers at the option board slot marked 2.
2. Fasten the option board using the four screws.
3. Connect the short flat cable between the X5B connector on the first option board and the X5A connector on the option board just mounted.

Fig. 11 Two option boards mounted and interconnected with a flat cable.