IO
iPOS2401
v0.3B
I/O Board for
iPOS2401 MX
Intelligent
Servo Drives

TECHNOSOFT
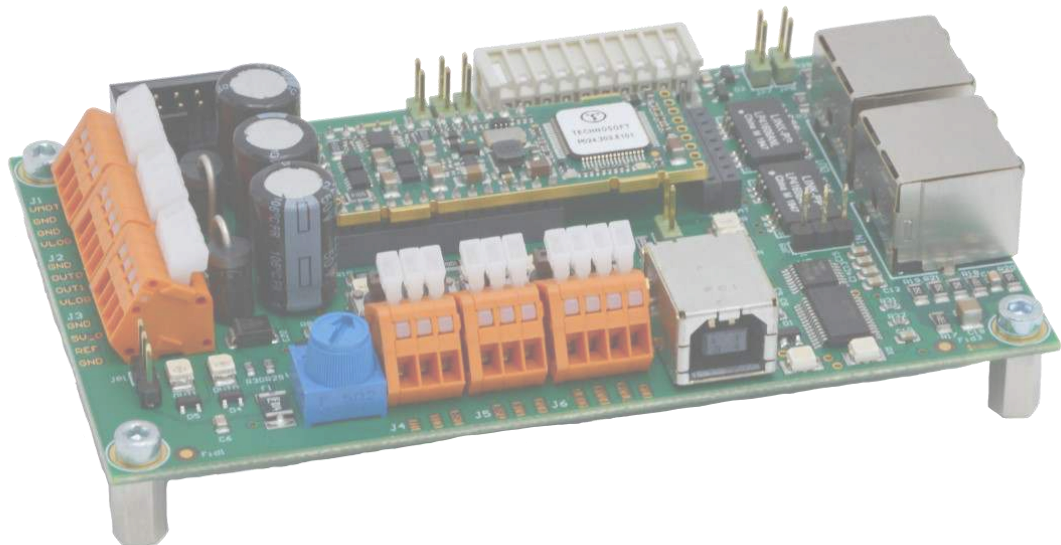
Technical
Reference

Read This First

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About This Manual

This book is a technical reference manual for the **IO-iPOS2401 MX** extension boards **version 0.3B** that are included in the **iPOS2401** intelligent servo drives starter kits.

The **IO iPOS2401** extension board is compatible with the following products:

Compatible Product Name	Part Number	Description
iPOS2401 MX-CAN	P024.300.E101	Drive with CAN
iPOS2401 MX-CAT-STO	P024.200.E121	Drive with EtherCAT

Paragraph 2.4 shows how to quickly identity the IO-iPOS2401 version.

Notational Conventions

This document uses the following conventions:

iPOS2401 – any iPOS2401 MX-CAN or CAT drive that can be connected to this I/O board

TML – Technosoft Motion Language

Related Documentation

iPOS2401 MX Technical Reference :

part no.   ***P024.300.E101.iPOS2401.DSH –*** *iPOS2401 MX-CAN Datasheet*

P024.300.E121.iPOS2401.DSH – *iPOS2401 MX-CAT Datasheet*

P091.024.iPOS2401.MX.CAN.CAT.UM – *iPOS2401 MX-CAN/CAT User Manual*

– describes the hardware connections of the iPOS2401 MX family of intelligent servo drives including the technical data and connectors.

Help of the EasySetUp software – describes how to use **EasySetUp** to quickly setup any Technosoft drive for your application using only 2 dialogues. The output of EasySetUp is a set of setup data that can be downloaded into the drive EEPROM or saved on a PC file. At power-on, the drive is initialized with the setup data read from its EEPROM. With EasySetUp it is also possible to retrieve the complete setup information from a drive previously programmed. EasySetUp includes a firmware programmer with allows you to update your drive firmware to the latest revision. **EasySetUp can be downloaded free of charge from Technosoft web page**

Motion Programming using EasyMotion Studio (part no. P091.034.ESM.UM.xxxx) – describes how to use the EasyMotion Studio to create motion programs using in Technosoft Motion Language (TML). EasyMotion Studio platform includes **EasySetUp** for the drive/motor setup, and a **Motion Wizard** for the motion programming. The Motion Wizard provides a simple, graphical way of creating motion programs and automatically generates all the TML instructions. *With EasyMotion Studio you can fully benefit from a key advantage of Technosoft drives – their capability to execute complex motions without requiring an external motion controller, thanks to their built-in motion controller.* **A demo version of EasyMotion Studio (with EasySetUp part fully functional) can be downloaded free of charge from Technosoft web page**

iPOS CANopen Programming **(part no. P091.063.iPOS.UM.xxxx)** – explains how to program the iPOS drives using **CANopen** protocol and describes the associated object dictionaries for the supported profiles.

CAN application layer over EtherCAT (CoE) Programming **(part no. P091.064.UM.xxxx)** – explains how to program the Technosoft intelligent drives using **CoE** protocol and describes the associated object dictionary.

TML_LIB v2.0 **(part no. P091.040.v20.UM.xxxx)** – explains how to program in **C, C++,C#, Visual Basic or Delphi Pascal** a motion application for the Technosoft intelligent drives using TML_LIB v2.0 motion control library for PCs. The TML_lib includes ready-to-run examples that can be executed on **Windows** or **Linux** (x86 and x64).

TML_LIB_LabVIEW v2.0 **(part no. P091.040.LABVIEW.v20.UM.xxxx)** – explains how to program in **LabVIEW** a motion application for the Technosoft intelligent drives using TML_LIB_Labview v2.0 motion control library for PCs. The TML_Lib_LabVIEW includes over 40 ready-to-run examples.

TML_LIB_S7 **(part no. P091.040.S7.UM.xxxx)** – explains how to program in a PLC **Siemens series S7-300 or S7-400** a motion application for the Technosoft intelligent drives using TML_LIB_S7 motion control library. The TML_LIB_S7 library is **IEC61131-3 compatible**.

TML_LIB_CJ1 **(part no. P091.040.CJ1.UM.xxxx)** – explains how to program in a PLC Omron series CJ1 a motion application for the Technosoft intelligent drives using TML_LIB_CJ1 motion control library for PCs. The TML_LIB_CJ1 library is **IEC61131-3 compatible**.

TML_LIB_X20 **(part no. P091.040.X20.UM.xxxx)** – explains how to program in a B&R PLC series X20 a motion application for the Technosoft intelligent drives using TML_LIB_X20 motion control library for PCs. The TML_LIB_X20 library is **IEC61131-3 compatible**

TechnoCAN **(part no. P091.063.TechnoCAN.UM.xxxx)** – presents TechnoCAN protocol – an extension of the CANopen communication profile used for TML commands

If you Need Assistance …

If you want to …	Contact Technosoft at …
Visit Technosoft online	World Wide Web: http://www.technosoftmotion.com/
Receive general information or assistance (see Note)	World Wide Web: http://www.technosoftmotion.com/ Email: sales@technosoftmotion.com
Ask questions about product operation or report suspected problems (see Note)	Tel: +41 (0)32 732 5500 Email: support@technosoftmotion.com
Make suggestions about, or report errors in documentation.	Mail: Technosoft SA Avenue des Alpes 20 CH-2000 Neuchatel, NE Switzerland

Contents

1 Safety information

Read carefully the information presented in this chapter before carrying out the drive installation and setup! It is imperative to implement the safety instructions listed hereunder.

This information is intended to protect you, the drive and the accompanying equipment during the product operation. Incorrect handling of the drive can lead to personal injury or material damage.

Only qualified personnel may install, setup, operate and maintain the drive. A "qualified person" has the knowledge and authorization to perform tasks such as transporting, assembling, installing, commissioning and operating drives.

The following safety symbols are used in this manual:

	WARNING!	*SIGNALS A DANGER TO THE OPERATOR WHICH MIGHT CAUSE BODILY INJURY. MAY INCLUDE INSTRUCTIONS TO PREVENT THIS SITUATION*
	CAUTION!	*SIGNALS A DANGER FOR THE DRIVE WHICH MIGHT DAMAGE THE PRODUCT OR OTHER EQUIPMENT. MAY INCLUDE INSTRUCTIONS TO AVOID THIS SITUATION*
	CAUTION!	*Indicates areas SENSITIVE TO electrostatic discharges (ESD) WHICH REQUIRE HANDLING IN AN ESD PROTECTED ENVIRONMENT*

1.1 Warnings

	WARNING!	*THE VOLTAGE USED IN THE DRIVE MIGHT CAUSE ELECTRICAL SHOCKS. DO NOT TOUCH LIVE PARTS WHILE THE POWER SUPPLIES ARE ON*
	WARNING!	*TO AVOID ELECTRIC ARCING AND HAZARDS, NEVER CONNECT / DISCONNECT WIRES FROM THE DRIVE WHILE THE POWER SUPPLIES ARE ON*
	WARNING!	*THE DRIVE MAY HAVE HOT SURFACES DURING OPERATION.*
	WARNING!	*DURING DRIVE OPERATION, THE CONTROLLED MOTOR WILL MOVE. KEEP AWAY FROM ALL MOVING PARTS TO AVOID INJURY*

1.2 Cautions

⚠	**CAUTION!**	*THE POWER SUPPLIES CONNECTED TO THE DRIVE MUST COMPLY WITH THE PARAMETERS SPECIFIED IN THIS DOCUMENT*
⚠	**CAUTION!**	*TROUBLESHOOTING AND SERVICING ARE PERMITTED ONLY FOR PERSONNEL AUTHORISED BY TECHNOSOFT*
⚠	**CAUTION!**	*THE DRIVE CONTAINS ELECTROSTATICALLY SENSITIVE COMPONENTS WHICH MAY BE DAMAGED BY INCORRECT HANDLING. THEREFORE THE DRIVE SHALL BE REMOVED FROM ITS ORIGINAL PACKAGE ONLY IN AN ESD PROTECTED ENVIRONMENT*

To prevent electrostatic damage, avoid contact with insulating materials, such as synthetic fabrics or plastic surfaces. In order to discharge static electricity build-up, place the drive on a grounded conductive surface and also ground yourself.

2 Product Overview

2.1 Introduction

The **IO-iPOS2401** extension board is an auxiliary module allowing rapid evaluation of the **iPOS2401 MX-CAN** or **iPOS2401 MX-CAT,** Intelligent Servo Drives.

2.2 Key Features

- Motor supply: +7…. +30 V_{DC}

- Logic supply: +7…. +40 V_{DC}

- Direct access to the following iPOS2401 I/O signals, via spring type terminals connectors:

  - 5 digital inputs, 5-24V (NPN):
    - 2 general – purpose inputs: IN0, IN1
    - 2 limit switch inputs: IN2/LSP (positive) and IN3/LSN (negative)
    - 1 Enable input: IN4/Ena
  - 2 digital outputs, 5-36V, 0.5A (NPN open-collector):
  - 1 analog input, 0-5V,12-bit used to read the analogue Reference or Feedback or general purpose

- Emulation of external NPN inputs commutation via 5 push-buttons connected to inputs: IN0/home, IN1, IN2/LSP, IN3/LSN, IN4/Enable

- Emulation of external analogue command via potentiometer VR1, connectable to REF/FDBK analogue input

- USB B connector for communication with the PC

- One spring type terminal block connector for CAN communication

- Two RJ 45 for EtherCAT communication[1]

- One 2x5 pin shrouded header, 2.54mm pitch for the Encoder connector

- One 10 socket pluggable connector for motor phases and digital hall inputs.

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[1] Usable only when the -CAT drive is present.

2.3 IO-iPOS2401 Board Dimensions

Figure 2.3.1 presents the IO-iPOS2401 board dimensions.

All dimensions are in mm.

Figure 2.3.1. IO-iPOS2401 board dimensions

2.4 IO-iPOS2401 Board Version Identification/ SJ1 location

Figure 2.4.1 shows how to identify the IO-iPOS2401 board version written on bottom side.
This manual refers to IO-iPOS2401 **version 0.3B**.

Figure 2.4.1. IO-iPOS2401 V0.3B board version identification

3 Hardware Installation

3.1 Mounting the iPOS2401 MX-CAN

Push down the iPOS2401 MX drive into the IO-iPOS2401 board. J1,2,4,5 and 33 of the MX into J1,2,4,5 and 33 of the IO.

iPOS2401 MX-CAN
drive
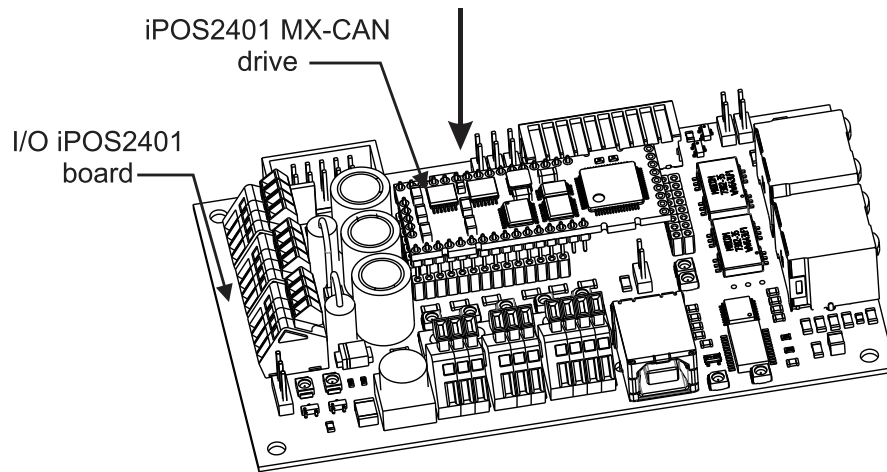
I/O iPOS2401
board

Figure 3.1.1 Installing an iPOS2401 MX-CAN drive in the IO-iPOS2401

3.2 Mounting the iPOS2401 MX-CAT

Push down the iPOS2401 MX drive into the IO-iPOS2401 board. J1,2,4,5 of the MX into J1,2,4,5 of the IO.

iPOS2401 MX-CAT
drive
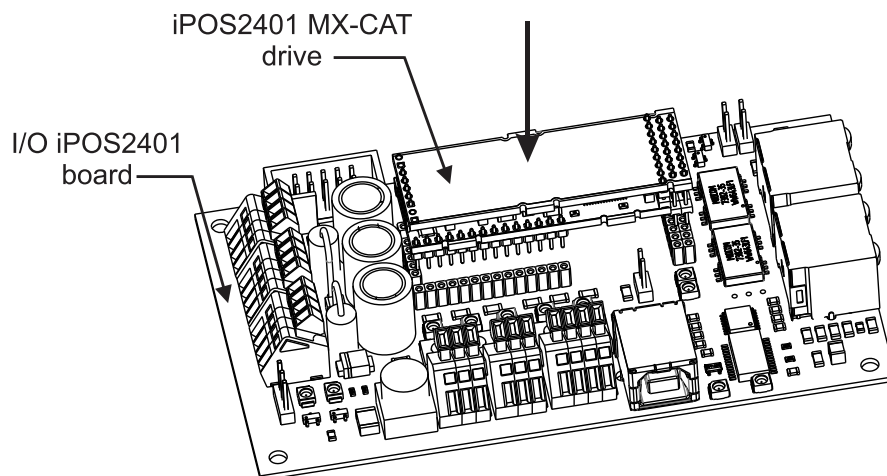
I/O iPOS2401
board

Figure 3.2.1 Installing an iPOS2401 MX-CAT drive in the IO-iPOS2401

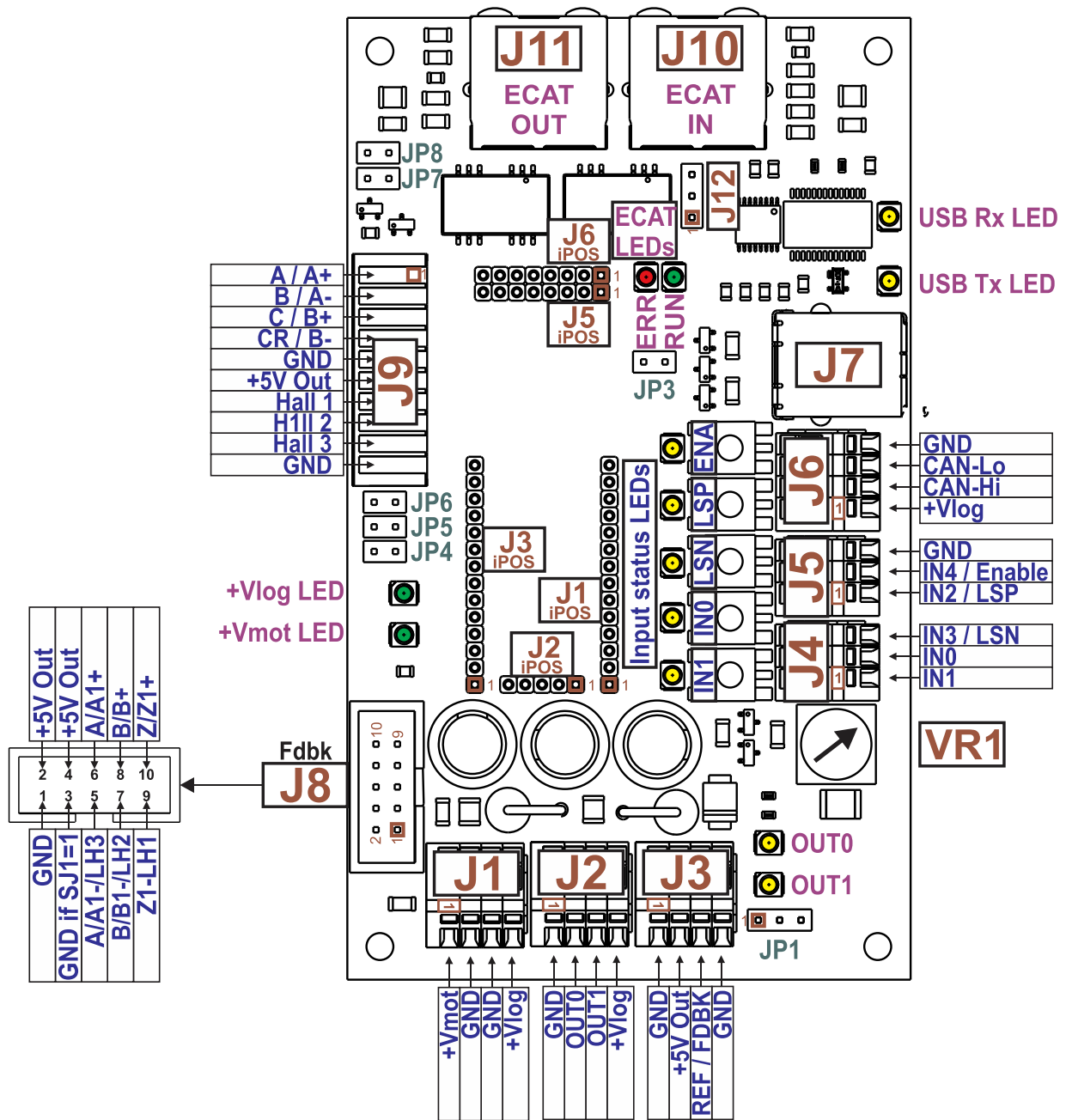## 3.3 Connectors

3.3.1 Connectors Layout and Description

Figure 3.3.1. Top view of the IO-iPOS2401 extension board

3.3.2 J1 – Power supply connector

Pin	Pin name	Type	Function
1	+V_{MOT}	I	Positive terminal of the motor supply +V_{MOT}: +7 to +30V_{DC}
2	GND	-	Ground for logic supply; internally connected to all GND pins
3	GND	-	Ground for motor supply; internally connected to all GND pins
4	+V_{LOG}	I	Logic supply input: +7 to +40V_{DC}; Internally connected to all +V_{LOG} pins

3.3.3 J2 – Digital outputs connector

Pin	Pin name	Type	Function
1	GND	-	Ground
2	OUT0	O	General-purpose/ digital output OUT0
3	OUT1	O	General-purpose/ digital output OUT1
4	+V_{LOG}	I	Logic supply: +7 to +40V_{DC}; Internally connected to all +V_{LOG} pins

3.3.4 J3 – Analog input connector

Pin	Pin name	Type	Function
1	GND	-	Ground
2	+5V Out	O	+5V_{OUT} output supply (generated by iPOS drive)
3	Ref/Fdbk 0-5V/±10V	I	External analogue reference/feedback signal; mono-polar 0 to +5V or bipolar ±10V (software selectable)
4	GND	-	Ground

3.3.5 J4 – Digital inputs connector

Pin	Pin name	Type	Function
1	IN1	I	General-purpose digital input IN1
2	IN0	I	General-purpose digital input IN0
3	LSN	I	Negative limit switch digital input IN3/LSN

3.3.6 J5 – Digital inputs connector

Pin	Pin name	Type	Function
1	IN2/ LSP	I	Positive limit switch or digital input IN2
2	IN4/ ENA	I	Drive Enable input or digital input IN4
3	GND	-	Ground

3.3.7 J6 – CAN connector

Pin	Pin name	Type	Function
1	+V$_{LOG}$	O	Logic supply: +7 to +40V$_{DC}$; Internally connected to all + V$_{LOG}$ pins
2	CAN-Hi	I/O	CAN-Bus positive line (positive during dominant bit)
3	CAN-Lo	I/O	CAN-Bus negative line (negative during dominant bit)
4	GND	-	Ground

Remark: *Connect the JP3 jumper to add an 120Ω terminal resistor in your CAN network. Leave JP3 open if the network already has terminal resistors.*

3.3.8 J8 – Feedback connector (2x5 pin)

Pin	Pin name	Type	Function
1	GND	-	Return ground for sensors supply
2	+5V Out	O	+5V$_{OUT}$ output supply (generated by iPOS drive)
3	GND	-	Return ground for sensors supply if SJ1 is soldered
4	+5V Out	O	+5V$_{OUT}$ output supply (generated by iPOS drive)
5	A1-/ LH3	I	Incr. encoder A- diff. input, or Linear Hall 3 analogue input
6	A/A1+	I	Incr. encoder A single-ended, or A+ diff. input
7	B1-/LH2	I	Incr. encoder B- diff. input, or Linear Hall 2 analogue input
8	B/B1+	I	Incr. encoder B single-ended, or B+ diff. input
9	Z1-/ LH1	I	Incr. encoder Z- diff. input, or Linear Hall 1 analogue input
10	Z/Z1+	I	Incr. encoder Z single-ended, or Z+ diff. input

3.3.9 J9 – Motor and Digital hall connector

Pin	Pin name	Type	Function
1	A	O	Phase A for 3-phase motors Phase A+ for 2-phase steppers Motor+ for DC brushed motors
2	B	O	Phase B for 3-phase motors Phase A- for 2-phase steppers Motor- for DC brushed motors
3	C	O	Phase C for 3-phase motors Phase B+ for 2-phase steppers
4	D	O	External brake resistor Phase B- for 2-phase steppers
5	GND	-	Ground
6	+5ViPOS	O	+5VOUT output supply (generated by iPOS drive)
7	HALL1	I	Hall 1 digital sensor input
8	HALL2	I	Hall 2 digital sensor input
9	HALL3	I	Hall 3 digital sensor input
10	GND	-	Ground

3.3.10 J10 and J11 – EtherCAT connectors

J10 and J11 are standard RJ45 Ethernet connectors, compatible with IEEE802.3 100BASE-T (100Mbit/s). Accept STP/UTP wiring.

J10 – EtherCAT IN connector

J11 – EtherCAT OUT connector

3.3.11 J7 – USB connector

J7 is a standard USB B connector, used for communication between the iPOS and PC.

An USB A - B cable type is required.

3.3.12 J12 – RS232 connector

Pin	Pin name	Type	Function
1	TX232	O	RS-232 Data Transmission
2	GND	-	Ground
3	RX232	I	RS-232 Data Reception

⚠	CAUTION!	*WHILE USING CONNECTOR J12, THE J7 USB CONNECTOR MUST REMAIN UNCONNECTED.*

3.4 Mating connectors

Connector	Description	Manufacturer	Part Number
J9	10 socket pluggable terminal connector	Wago	733-110
J8	2x5 pin wire to board connector	Harting	0918-510-6803
J10, J11	Standard 8P8C modular jack (RJ-45) male	-	-
J23	Standard USB B type connector	-	-

3.5 Jumper settings

0 = Jumper OFF; 1 = Jumper ON; 1-2 – pin 1 and 2 connected; 2-3 – pin 2 and 3 connected

Jumper Name	Jumper Function	Option	Default setting	Result
JP1	Ref/Fdbk source selection	OFF	2-3	The Ref/Fdbk signal is not connected
		1-2		The Ref/Fdbk signal is connected to J3 pin 3.
		2-3		The Ref/Fdbk signal is connected to VR1 which varies between 0 and +5V.
JP3	CAN termination	0	0	Do not connect a CAN terminator
		1		Connect a CAN terminator (120Ω resistor)
JP4	Enc Z1 termination	0	0	Do not connect a 120Ω resistor between Z1+ and Z1-
		1		Connect a 120Ω resistor between Z1+ and Z1-
JP5	Enc B1 termination	0	0	Do not connect a 120Ω resistor between B1+ and B1-
		1		Connect a 120Ω resistor between B1+ and B1-
JP6	Enc A1 termination	0	0	Do not connect a 120Ω resistor between A1+ and A1-
		1		Connect a 120Ω resistor between A1+ and A1-

| JP7 | AutoRun | 0 | 0 | Enable AutoRun (normal operation with TMLCAN) |
		1		Disable AutoRun (if TMLCAN); Disable Setup (if EtherCAT)
JP8	CAN operation mode	0	0	TMLCAN protocol
		1		CANopen protocol

3.6 Installing and configuring the USB drivers

3.6.1 Installing the USB drivers

Windows 7 and newer should find the drives automatically. In case your current version of Windows does not automatically detect the USB drivers, download the latest version from here **http://www.ftdichip.com/Drivers/VCP.htm**.

3.6.2 USB driver configuration

The FDTI drives are set by default with a latency of 16ms instead of 1. This leads to low communication rates. To decrease this latency, follow the steps below to configure the USB driver:
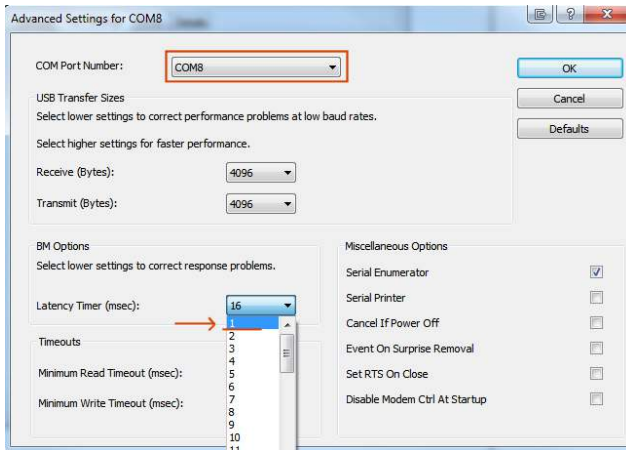
1. Open Computer Management tool and select Device Manager. Expand Ports (COM & LPT) and double click on the USB Serial Port (COMx).
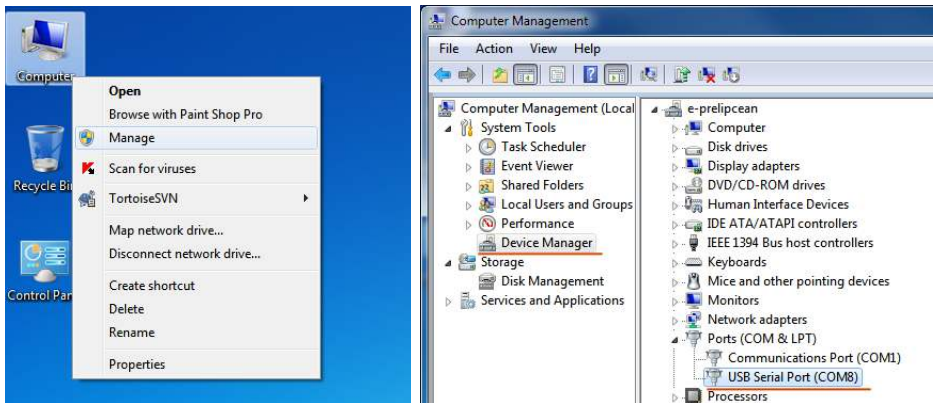
2. Click the Port Settings tab and then the Advanced button.
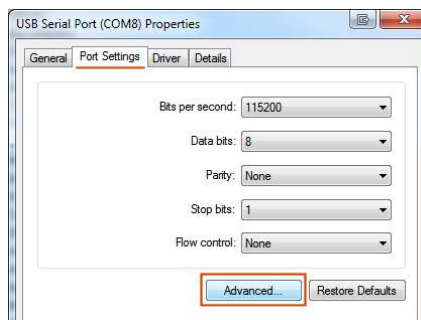
3. Set the Latency Time (ms) to 1 instead of the default value. This will ensure optimal communication with the drive.

Remark: The COM port number can be also changed from Advanced Settings dialog

4. Press OK button to complete the configuration of the COM port.

3.7   First Power Up

In order to setup the drive for your application you need to communicate with it. The easiest way is via an USB link between your PC and the drive.

Before the first power up, check the following:

1. **iPOS2401** mounting: it shall be fully inserted in the **IO-iPOS2401** board. J1 of drive to J1 of IO, J2 to J2, etc.
2. Motor connections
3. USB cable connections
4. **IO-iPOS2401** board jumpers settings.
5. Power on the **IO-iPOS2401** board, the **Green Ready** LED on the drive and the +Vlog LED should light up as green.

Appendix 1: *IO-iPOS2401 schematics*
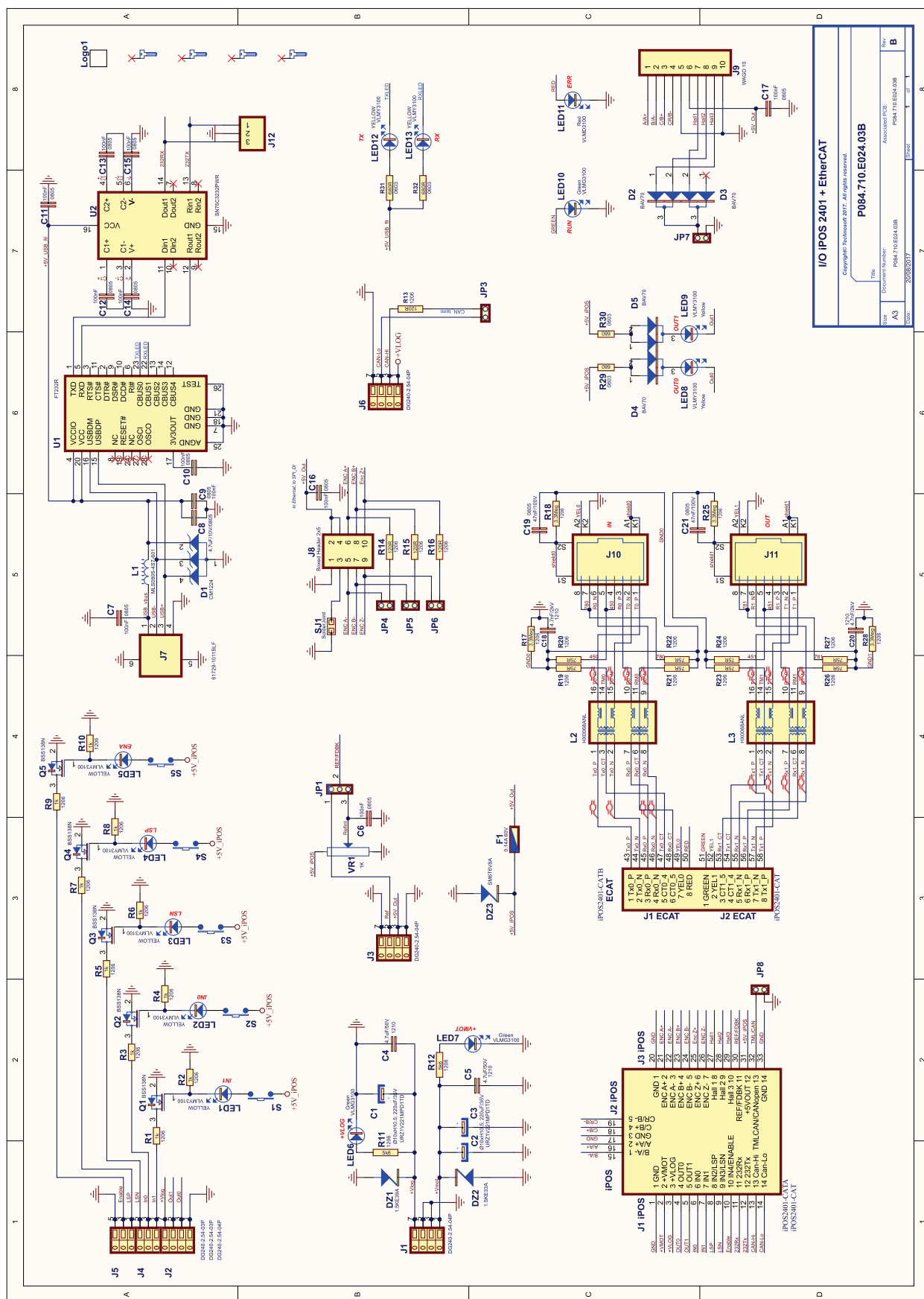
Appendix 2: *iPOS2401 MX Plug-in Connector Pin-out*

	Pin	Name	Type	Description
J1	1	GND	-	Return ground
	2	+V$_{MOT}$	I	Positive terminal of the motor supply: 7 to 30V$_{DC}$
	3	+V$_{LOG}$	I	Positive terminal of the logic supply: 7 to 40V$_{DC}$
	4	OUT0	O	5-24V 0.5A general-purpose digital output, NPN open-collector / TTL pull-up
	5	OUT1	O	5-24V 0.5A general-purpose digital output, NPN open-collector / TTL pull-up
	6	IN0	I	5-24V digital NPN input
	7	IN1	I	5-24V digital NPN input
	8	IN2 / LSP	I	5-24V digital NPN input Positive limit switch input
	9	IN3 / LSN	I	5-24V digital NPN input Negative limit switch input
	10	IN4 / Enable	I	5-24V digital NPN input Drive enable input
	11	232RX	I	RS-232 Data Reception
	12	232TX	O	RS-232 Data Transmission
	13	Can-Hi	I/O	CAN-Bus positive line (dominant high)
	14	Can-Lo	I/O	CAN-Bus negative line (dominant low)

	Pin	Name	Type	Description
J2	1	B / A-	O	Phase B for 3-ph motors, A- for 2-ph steppers, Motor- for DC brush motors
	2	A / A+	O	Phase A for 3-ph motors, A+ for 2-ph steppers, Motor+ for DC brush motors
	3	GND	-	Return ground
	4	C / B+	O	Phase C for 3-ph motors, B+ for 2-ph steppers
	5	CR / B-	O	Chopping Resistor output/ Phase B- for step motors

	Pin	Name	Type	Description
J3	1	GND	-	Return ground
	2	A / A+	I	Incr. encoder A single-ended, or A+ diff. input
	3	A-, LH3	I	Incr. encoder A- diff. input, or linear hall 3 input
	4	B / B+	I	Incr. encoder B single-ended, or B+ diff. input
	5	B-, LH2	I	Incr. encoder B- diff. input, or linear hall 2 input
	6	Z / Z+	I	Incr. encoder Z (index) single-ended, or Z+ diff. input
	7	Z-, LH1	I	Incr. encoder Z- differential input, or linear hall 1 input
	8	Hall 1	I	Digital input Hall 1 sensor
	9	Hall 2	I	Digital input Hall 2 sensor
	10	Hall 3	I	Digital input Hall 3 sensor
	11	REF/FDBK	I	Analogue input, 12-bit, 0-5V. Used to read an analog position, speed or torque reference or feedback; can be used as general purpose analogue input
	12	+5V$_{OUT}$	O	5V output supply
	13	TMLCAN/ CANopen	I	Connect to GND to enable CANopen protocol; Leave unconnected for TMLCAN protocol
	14	GND	-	Return ground

	Pin	Name	Type	Description
J5	1	TX0+	I/O	Transmit/Receive positive, IN port. Connect to magnetics primary. Magnetics secondary corresponds to pin 1 or RJ45.
	2	TX0-	I/O	Transmit/Receive negative, IN port. Connect to magnetics. After magnetics circuit, it corresponds to pin 2 or RJ45.
	3	RX0+	I/O	Receive/Transmit positive, IN port. Connect to magnetics primary. Magnetics secondary corresponds to pin 3 or RJ45.
	4	RX0-	I/O	Receive/Transmit negative, IN port. Connect to magnetics primary. Magnetics secondary corresponds to pin 6 or RJ45.
	5	CT0_Rx	I/O	Return for center tap of magnetics primary that is also connected to pins 3,4 of J5
	6	CT0_Tx	I/O	Return for center tap of magnetics primary that is also connected to pins 1,2 of J5
	7	ACT0	O	Anode of Link/Activity LED for port IN.
	8	ERR	O	Anode of Error LED (EtherCAT status machine).

	Pin	Name	Type	Description
J6	1	RUN	O	Anode of Run LED (EtherCAT status machine).
	2	ACT1	O	Anode of Link/Activity LED for port OUT.
	3	CT1_Tx	I/O	Return for center tap of magnetics primary that is also connected to pins 7,8 of J6
	4	CT1_Rx	I/O	Return for center tap of magnetics primary that is also connected to pins 5,6 of J6
	5	RX1-	I/O	Receive/Transmit negative, OUT port. Connect to magnetics. After magnetics circuit, it corresponds to pin 6 or RJ45.
	6	RX1+	I/O	Receive/Transmit positive, OUT port. Connect to magnetics. After magnetics circuit, it corresponds to pin 3 or RJ45.
	7	TX1-	I/O	Transmit/Receive negative, OUT port. Connect to magnetics. After magnetics circuit, it corresponds to pin 2 or RJ45.
	8	TX1+	I/O	Transmit/Receive positive, OUT port. Connect to magnetics. After magnetics circuit, it corresponds to pin 1 or RJ45.

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