EPCIO-601-1
Hardware User Manual

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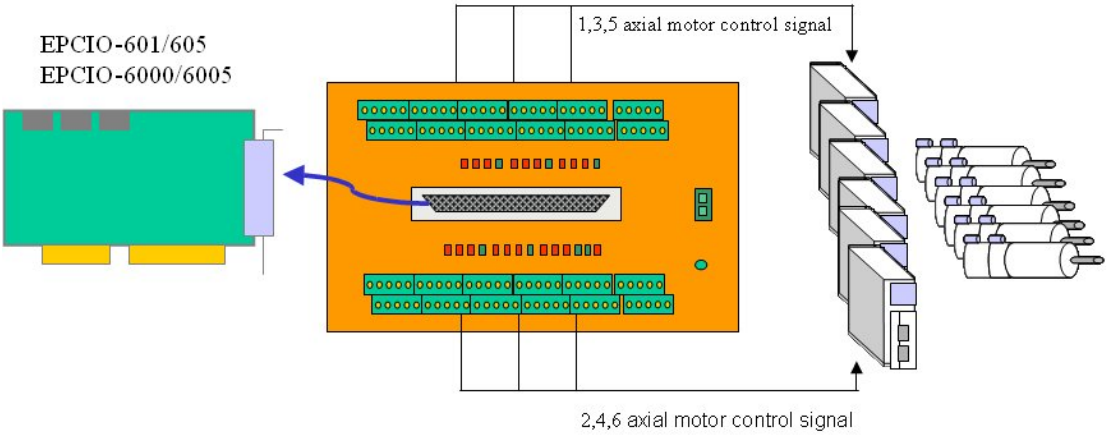
Chapter 1 Overview

1.1 Introduction

The EPCIO-601-1 is a six-axis universal adapter card developed by the Mechanical and Systems Research Laboratories (MSL) that can connect the EPCIO-601/605, or the EPCIO-6000/6005 six-axis motion control card, and the servo driver (or stepper motor), simplifying the adaption between peripheral devices during the wiring process. With the proper wiring, the EPCIO-601-1 can operate with various motor drives.

1.2 System Connection Diagram



System Connection Diagram

1.3 Parts List

The EPCIO-601-1 package includes:

- An EPCIO-601-1 Universal Adapter Card
- The Users Manual
- An SCSI-II 100 Pin Adapter Cable
- 2-Pin Terminal Female Socket (Pitch 5 mm, connects externally to 24 volt electrical sources)

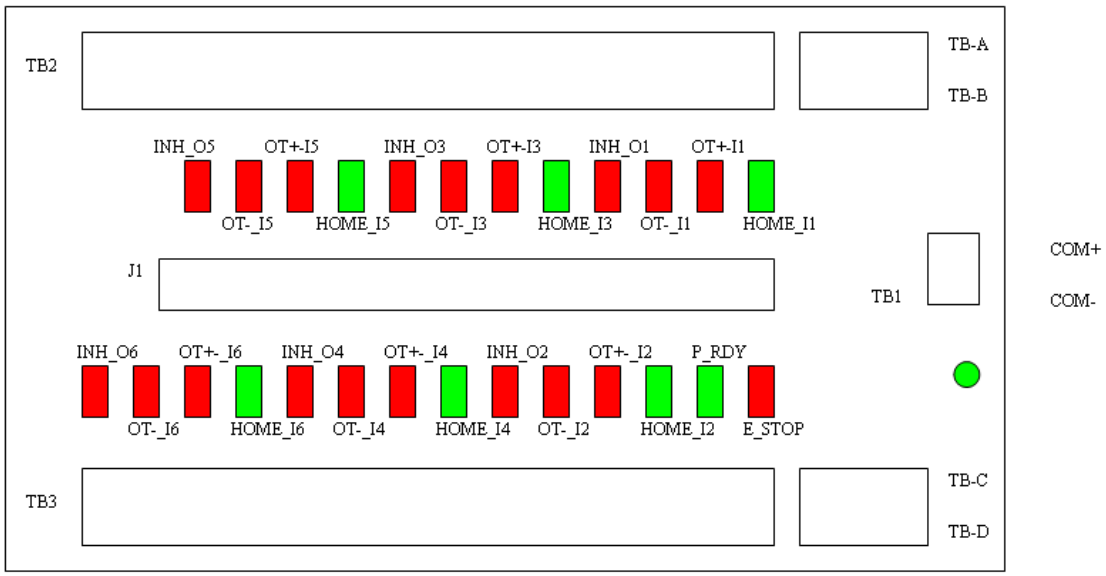
Before removing the EPCIO-601-1 Universal Adapter Card from the anti-static bag, please execute the following steps to avoid electrostatic damage:

- Rid your body of static electricity (wear a grounded wrist strap or lightly touch the metal exterior of a computer with your hand)
- Prior to opening the anti-static bag, lightly touch the anti-static bag to the metal exterior of a computer
- When removing the EPCIO-601-1 Universal Adapter Card, avoid touching the circuits or components on top

After removing the EPCIO-601-1 from its package, please examine the adapter card for any obvious damage caused by external force (i.e. lost, deformed, or damaged parts). If such damage is discovered, please stop the installation process, return the EPCIO-601-1 to the anti-static bag and immediately contact customer service or the retailer.

Chapter 2 Internal Components

2.1 EPCIO-601-1 Component Positioning



2.2 Primary Connector (J1-SCSI II)

(1) Pin Definitions

SCSI II-100PIN CONNECTOR			
PIN Definitions	**PIN No.**	**PIN No.**	**PIN Definitions**
AGND	1	51	AGND
DAC1	2	52	DAC4
DAC2	3	53	DAC5
DAC3	4	54	DAC6
+5 V	5	55	COM-
COM+	6	56	COM-
COM (internal 24 V)	7	57	ESTP
COM (internal 24 V)	8	58	PRDY
HOM1	9	59	HOM2
OT1+	10	60	OT2+
OT1-	11	61	OT2-
SVON1	12	62	SVON2
HOM3	13	63	HOM4
OT3+	14	64	OT4+
OT3-	15	65	OT4-
SVON3	16	66	SVON4
HOM5	17	67	HOM6
OT5+	18	68	OT6+
OT5-	19	69	OT6-
SVON5	20	70	SVON6
EA1+	21	71	EA2+
EA1-	22	72	EA2-
EB1+	23	73	EB2+
EB1-	24	74	EB2-
EC1+	25	75	EC2+
EC1-	26	76	EC2-
EA3+	27	77	EA4+
EA3-	28	78	EA4-
EB3+	29	79	EB4+
EB3-	30	80	EB4-
EC3+	31	81	EC4+
EC3-	32	82	EC4-
EA5+	33	83	EA6+
EA5-	34	84	EA6-
EB5+	35	85	EB6+
EB5-	36	86	EB6-
EC5+	37	87	EC6+
EC5-	38	88	EC6-
PA1+	39	89	PA2+
PA1-	40	90	PA2-
PB1+	41	91	PB2+
PB1-	42	92	PB2-
PA3+	43	93	PA4+
PA3-	44	94	PA4-
PB3+	45	95	PB4+
PB3-	46	96	PB4-
PA5+	47	97	PA6+
PA5-	48	98	PA6-
PB5+	49	99	PB6+
PB5-	50	100	PB6-

Note: COM is already connected internally in the adapter card to COM+, 24 V. COM+ connects to a 24 V electrical source, and COM- connects to a 24 V ground. Additionally, AGND is independent from COM-.

(2) Functions

The primary connector (J1) must pass through an SCSI-II 100 pin cable to connect to an SCSI-II 100 pin connector on the six-axis control card such as the EPCIO-601/605 or the EPCIO-6000/6005. For the connection method, please refer to the diagram in section 1.2 - System Connection Diagram.

2.3 Terminal Blocks -TB2,TB3

(1) Pin Definitions

TB2

Definitions	Printed Text	Pin No.	Pin No.	Printed Text	Definitions
PB5+	DB5	49	50	-DB5	PB5-
PA5+	DA5	47	48	-DA5	PA5-
PB3+	DB3	45	46	-DB3	PB3-
PA3+	DA3	43	44	-DA3	PA3-
PB1+	DB1	41	42	-DB1	PB1-
PA1+	DA1	39	40	-DA1	PA1-
EC5+	EC5	37	38	-EC5	EC5-
EB5+	EB5	35	36	-EB5	EB5-
EA5+	EA5	33	34	-EA5	EA5-
EC3+	EC3	31	32	-EC3	EC3-
EB3+	EB3	29	30	-EB3	EB3-
EA3+	EA3	27	28	-EA3	EA3-
EC1+	EC1	25	26	-EC1	EC1-
EB1+	EB1	23	24	-EB1	EB1-
EA1+	EA1	21	22	-EA1	EA1-
OT5-	OT-5	19	20	INH5	SVON5
HOM5	HOM5	17	18	OT+5	OT5+
OT3-	OT-3	15	16	INH3	SVON3
HOM3	HOM3	13	14	OT+3	OT3+
OT1-	OT-1	11	12	INH1	SVON1
HOM1	HOM1	9	10	OT+1	OT1+
COM (internal 24 V)	COM	7	8	COM	COM (internal 24 V)
+5 V	VCC	5	6	COM+	COM+ (internal 24 V)
DAC2	DAC2	3	4	DAC3	DAC3
AGND	AG	1	2	DAC1	DAC1

TB3

Definitions	Printed Text	Pin No.	Pin No.	Printed Text	Definitions
PB6+	DB6	99	100	-DB6	PB6-
PA6+	DA6	97	98	-DA6	PA6-
PB4+	DB4	95	96	-DB4	PB4-
PA4+	DA4	93	94	-DA4	PA4-
PB2+	DB2	91	92	-DB2	PB2-
PA2+	DA2	89	90	-DA2	PA2-
EC6+	EC6	87	88	-EC6	EC6-
EB6+	EB6	85	86	-EB6	EB6-
EA6+	EA6	83	84	-EA6	EA6-
EC4+	EC4	81	82	-EC4	EC4-
EB4+	EB4	79	80	-EB4	EB4-
EA4+	EA4	77	78	-EA4	EA4-
EC2+	EC2	75	76	-EC2	EC2-
EB2+	EB2	73	74	-EB2	EB2-
EA2+	EA2	71	72	-EA2	EA2-
OT6-	OT-6	69	70	INH6	SVON6
HOM6	HOM6	67	68	OT+6	OT6+
OT4-	OT-4	65	66	INH4	SVON4
HOM4	HOM4	63	64	OT+4	OT4+
OT2-	OT-2	61	62	INH2	SVON2
HOM2	HOM2	59	60	OT+2	OT2+
ESTP	STOP	57	58	RDY	PRDY
COM- Internal negative terminal of 24V	COM-	55	56	COM-	COM Internal negative terminal of 24V
DAC5	DAC5	53	54	DAC6	DAC6
AGND	AG	51	52	DAC4	DAC4

(2) TB2 Functions

Pin No.	Definitions	Reference Points	Functions
1	AGND	--	Pulse and DAC output voltage reference terminal
2	DAC1	AGND	Group 1 analog output contact
3	DAC2	AGND	Group 2 analog output contact
4	DAC3	AGND	Group 3 analog output contact
5	+5 V	AGND	+5 V output
6	COM+	COM-	The positive terminal of the 24 V electrical supply input
7	COM	COM-	Internal connection to COM+ (+24 V)
8	COM	COM-	Internal connection to COM+ (+24 V)
9	HOM1	COM-	Group 1 home switch input
10	OT1+	COM-	Group 1 positive over-travel limit switch input
11	OT1-	COM-	Group 1 negative over-travel limit switch input
12	SVON1	COM-	Group 1 servo-on output
13	HOM3	COM-	Group 3 home switch input
14	OT3+	COM-	Group 3 positive over-travel limit switch input
15	OT3-	COM-	Group 3 negative over-travel limit switch input
16	SVON3	COM-	Group 3 servo-on output
17	HOM5	COM-	Group 5 home switch input
18	OT5+	COM-	Group 5 positive over-travel limit switch input
19	OT5-	COM-	Group 5 negative over-travel limit switch input
20	SVON5	COM-	Group 5 servo-on output
21	EA1+	--	Group 1 encoder input. Positive terminal of A phase differential signals
22	EA1-	--	Group 1 encoder input. Negative terminal of A phase differential signals
23	EB1+	--	Group 1 encoder input. Positive terminal of B phase differential signals
24	EB1-	--	Group 1 encoder input. Negative terminal of B phase differential signals
25	EC1+	--	Group 1 encoder input. Positive terminal of Z phase differential signals
26	EC1-	--	Group 1 encoder input. Negative terminal of Z phase differential signals
27	EA3+	--	Group 3 encoder input. Positive terminal of A phase differential signals
28	EA3-	--	Group 3 encoder input. Negative terminal of A phase differential signals
29	EB3+	--	Group 3 encoder input. Positive terminal of B phase differential signals
30	EB3-	--	Group 3 encoder input. Negative terminal of B phase differential signals
31	EC3+	--	Group 3 encoder input. Positive terminal of Z phase differential signals
32	EC3-	--	Group 3 encoder input. Negative terminal of Z phase differential signals
33	EA5+	--	Group 5 encoder input. Positive terminal of A phase differential signals
34	EA5-	--	Group 5 encoder input. Negative terminal of A phase differential signals
35	EB5+	--	Group 5 encoder input. Positive terminal of B phase differential signals
36	EB5-	--	Group 5 encoder input. Negative terminal of B phase differential signals
37	EC5+	--	Group 5 encoder input. Positive terminal of Z phase differential signals
38	EC5-	--	Group 5 encoder input. Negative terminal of Z phase differential signals
39	PA1+	AGND	Group 1 pulse output. Positive terminal of A phase differential signals
40	PA1-	AGND	Group 1 pulse output. Negative terminal of A phase differential signals
41	PB1+	AGND	Group 1 pulse output. Positive terminal of B phase differential signals
42	PB1-	AGND	Group 1 pulse output. Negative terminal of B phase differential signals
43	PA3+	AGND	Group 3 pulse output. Positive terminal of A phase differential signals
44	PA3-	AGND	Group 3 pulse output. Negative terminal of A phase differential signals
45	PB3+	AGND	Group 3 pulse output. Positive terminal of B phase differential signals
46	PB3-	AGND	Group 3 pulse output. Negative terminal of B phase differential signals
47	PA5+	AGND	Group 5 pulse output. Positive terminal of A phase differential signals
48	PA5-	AGND	Group 5 pulse output. Negative terminal of A phase differential signals
49	PB5+	AGND	Group 5 pulse output. Positive terminal of B phase differential signals
50	PB5-	AGND	Group 5 pulse output. Negative terminal of B phase differential signals

(3) TB3 Functions

Pin No.	Definitions	Reference Points	Functions
51	AGND	--	Pulse and DAC output voltage reference terminal
52	DAC4	AGND	Group 4 analog output contact
53	DAC5	AGND	Group 5 analog output contact
54	DAC6	AGND	Group 6 analog output contact
55	COM-	--	The negative terminal of the 24 V electrical supply input
56	COM-	--	The negative terminal of the 24 V electrical supply input
57	ESTP	COM-	Emergency stop input contact
58	PRDY	COM-	Position Ready output contact
59	HOM2	COM-	Group 2 home switch input
60	OT2+	COM-	Group 2 positive over-travel limit switch input
61	OT2-	COM-	Group 2 negative over-travel limit switch input
62	SVON2	COM-	Group 2 servo-on output
63	HOM4	COM-	Group 4 home switch input
64	OT4+	COM-	Group 4 positive over-travel limit switch input
65	OT4-	COM-	Group 4 negative over-travel limit switch input
66	SVON4	COM-	Group 4 servo-on output
67	HOM6	COM-	Group 6 home switch input
68	OT6+	COM-	Group 6 positive over-travel limit switch input
69	OT6-	COM-	Group 6 negative over-travel limit switch input
70	SVON6	COM-	Group 6 servo-on output
71	EA2+	--	Group 2 encoder input. Positive terminal of A phase differential signals
72	EA2-	--	Group 2 encoder input. Negative terminal of A phase differential signals
73	EB2+	--	Group 2 encoder input. Positive terminalof B phase differential signals
74	EB2-	--	Group 2 encoder input. Negative terminal of B phase differential signals
75	EC2+	--	Group 2 encoder input . Positive terminal of Z phase differential signals
76	EC2-	--	Group 2 encoder input. Negative terminal of Z phase differential signals
77	EA4+	--	Group 4 encoder input. Positive terminal of A phase differential signals
78	EA4-	--	Group 4 encoder input. Negative terminal of A phase differential signals
79	EB4+	--	Group 4 encoder input. Positive terminal of B phase differential signals
80	EB4-	--	Group 4 encoder input. Negative terminal of B phase differential signals
81	EC4+	--	Group 4 encoder input. Positive terminal of Z phase differential signals
82	EC4-	--	Group 4 encoder input. Negative terminal of Z phase differential signals
83	EA6+	--	Group 6 encoder input. Positive terminal of A phase differential signals
84	EA6-	--	Group 6 encoder input. Negative terminal of A phase differential signals
85	EB6+	--	Group 6 encoder input. Positive terminal of B phase differential signals
86	EB6-	--	Group 6 encoder input. Negative terminal of B phase differential signals
87	EC6+	--	Group 6 encoder input. Positive terminal of Z phase differential signals
88	EC6-	--	Group 6 encoder input. Negative terminal of Z phase differential signals
89	PA2+	AGND	Group 2 pulse output. Positive terminal of A phase differential signals
90	PA2-	AGND	Group 2 pulse output. Negative terminal of A phase differential signals
91	PB2+	AGND	Group 2 pulse output. Positive terminal of B phase differential signals
92	PB2-	AGND	Group 2 pulse output. Negative terminal of B phase differential signals
93	PA4+	AGND	Group 4 pulse output. Positive terminal of A phase differential signals
94	PA4-	AGND	Group 4 pulse output. Negative terminal of A phase differential signals
95	PB4+	AGND	Group 4 pulse output. Positive terminal of B phase differential signals
96	PB4-	AGND	Group 4 pulse output. Negative terminal of B phase differential signals
97	PA6+	AGND	Group 6 pulse output. Positive terminal of A phase differential signals
98	PA6-	AGND	Group 6 pulse output. Negative terminalof A phase differential signals
99	PB6+	AGND	Group 6 pulse output. Positive terminal of B phase differential signals
100	PB6-	AGND	Group 6 pulse output. Negative terminal of B phase differential signals

2.4 Terminal Blocks -TB-A, TB-B, TB-C, TB-D

(1) Pin Definitions

TB-D **TB-C**

Definitions	Printed Text	Pin No.	Pin No.	Printed Text	Definition
AGND	AG	D1	C1	AG	AGND
AGND	AG	D2	C2	AG	AGND
AGND	AG	D3	C3	AG	AGND
NC	NC	D4	C4	NC	NC
NC	NC	D5	C5	NC	NC

TB-B **TB-A**

Definitions	Printed Text	Pin No.	Pin No.	Printed Text	Definition
AGND	AG	B1	A1	AG	AGND
AGND	AG	B2	A2	AG	AGND
AGND	AG	B3	A3	AG	AGND
NC	NC	B4	A4	NC	NC
NC	NC	B5	A5	NC	NC

(2) TB-A, TB-B, TB-C, TB-D Functions

To facilitate wiring, more AGND pins were added to TB-A, TB-B, TB-C, and TB-D by connecting these pins with the first pin in TB2 (AGND) and the fifty-first pin in TB3 (AGND).

2.5 Terminal Block - TB1

(1) Pin Definitions

1	COM+ (24 V)
2	COM- (Negative Terminal of 24 V)

(2) Explanation of Definitions

The external plug uses a +24 V electrical source. COM+ and COM- are connected to the positive and negative terminals of the electrical source, respectively. Furthermore, the +24 V electrical source is internally connected to COM. **The input plug for this electrical source is the same input contact as COM+ in TB2 and COM- in TB3. When using the electrical source, please do not use the TB2 and TB3 contacts for any other purpose other than to the EPCIO-601-1.**

Pin No.	Name	Ref. Point	Description
1	COM+	COM-	The positive terminal of the external 24 V electrical supply input
2	COM-	--	The negative terminal of the external 24 V electrical supply input

2.6 Indicator Lights

(1) Indicator Light Definitions

LED	Definition (Printed Text)	Color
D28	COM+ (24 V electrical source indicator light)	Green

LED	Definitions	Colors	LED	Definitions	Colors
INH_O6	SVON6	Red			
OT-_I6	OT6-	Red			
OT+_I6	OT6+	Red	INH_O5	SVON5	Red
HOME_I6	HOM6	Green	OT-_I5	OT5-	Red
INH_O4	SVON4	Red	OT+_I5	OT5+	Red
OT-_I4	OT4-	Red	HOME_I5	HOM5	Green
OT+_I4	OT4+	Red	INH_O3	SVON3	Red
HOME_I4	HOM4	Green	OT-_I3	OT3-	Red
INH_O2	SVON2	Red	OT+_I3	OT3+	Red
OT-_I2	OT2-	Red	HOME_I3	HOM3	Green
OT+_I2	OT2+	Red	INH_O1	SVON1	Red
HOME_I2	HOM2	Green	OT-_I1	OT1-	Red
P_RDY	PRDY	Green	OT+_I1	OT1+	Red
E_STOP	ESTP	Red	HOME_I1	HOM1	Green

Explanation of Definitions

COM+: This light indicates that the Local Digital Input Output (LIO) +24 V electrical input supply is normal.

HOM1: This light indicates that the HOME switch for the first axis is activated (HOM2, HOM3, HOM4, HOM5, and HOM6 each indicate the HOME switch statuses of their respective axes).

OT1+: This light indicates that the positive travel limit switch for the first axis is activated (OT2+, OT3+, OT4+, OT5+, and OT6+ each indicate the positive travel limit switch statuses of their respective axes).

OT1-: This light indicates that the negative travel limit switch for the first axis is activated (OT2-, OT3-, OT4-, OT5-, and OT6- each indicate the negative travel limit switch statuses of their respective axes).

SVON1: This light indicates that the servo-on signal for the first axis has already been ouput from the motion control card (SVON2, SVON3, SVON4, SVON5, and SVON6 each indicate the servo-on statuses of their respective axes).

PRDY: This light indicates that the Position Ready signal has already been output from the motion control card.

ESTP: This light indicates an Emergency Stop signal input.