IMP-6000S-1/2
IMP-6AB
Hardware User Manual

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Chapter I Overview

The 6-Axis Intelligent Motion Control Platform, IMP-6000S, is an embedded motion control platform developed by the MSL of ITRI. In order to form a complete controller based on the motion control platform, the MSL of ITRI further provides adapters connectable with the platform.

IMP-6000S-1 is a universal adapter which allows flexible wiring according to the connector pin assignments of drives of various brands. IMP-6000S-2, on the other hand, is a dedicated adapter to be connected with drives of specific brands (Panasonic MINAS A4, Mitsubishi MR-J3-A, Delta ASDA-A2-U, and Yaskawa SGDV Σ-V) via dedicated adapter cables.

In addition, the MSL of ITRI provides the IMP-6AB analog/digital conversion adapter. If analog-to-digital conversion (ADC) or digital-to-analog conversion (DAC) is desired, this adapter can be used for the conversion.

In Fig. 1-1 and Fig. 1-2, which are diagrams showing how IMP-6000S can be used, the adapters are stacked on IMP-6000S to form a complete controller. The use, board layout, and pin assignments of each adapter are detailed below to facilitate wiring and use.

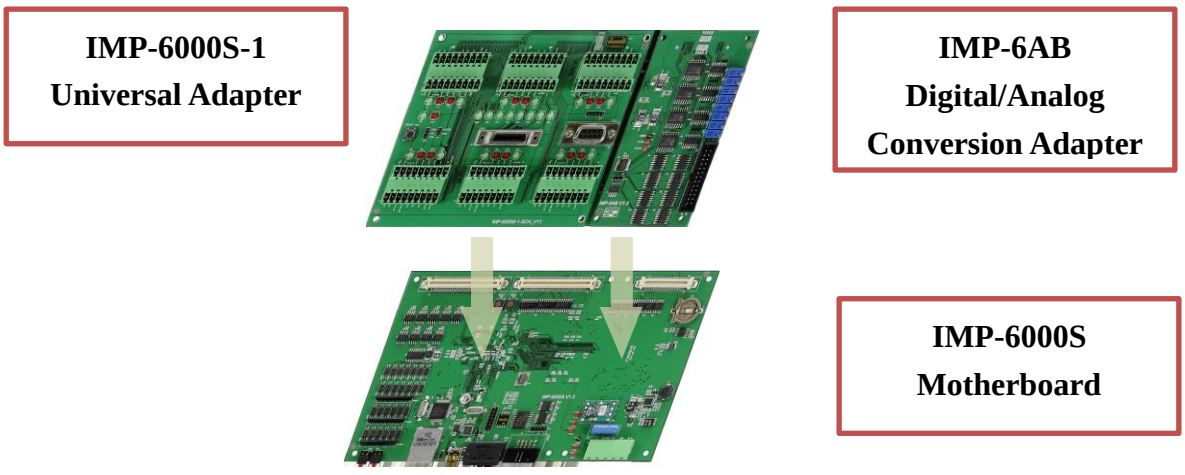


Fig. 1-1 IMP-6000S used in conjunction with IMP-6000S-1 and IMP-6AB

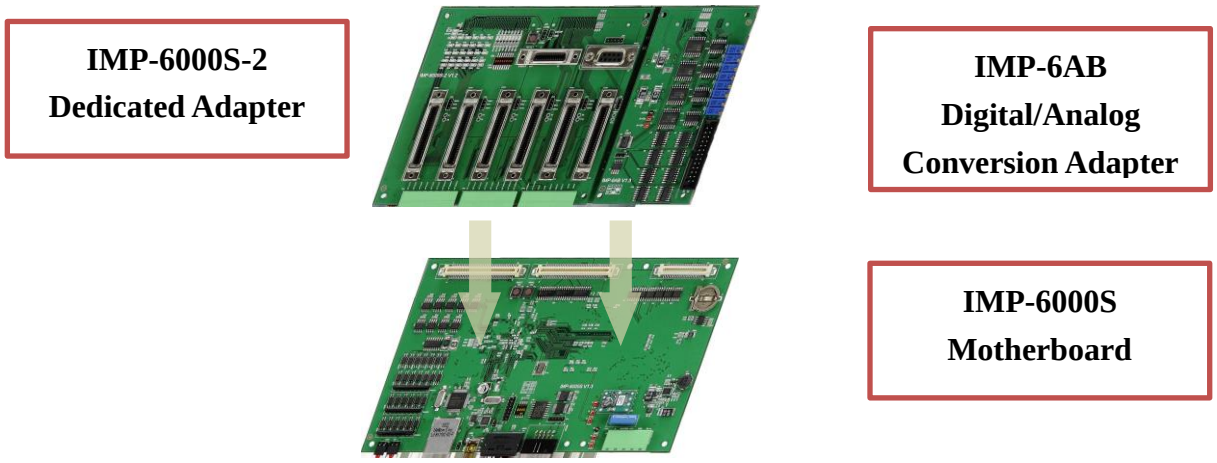


Fig. 1-2 IMP-6000S used in conjunction with IMP-6000S-2 and IMP-6AB

Chapter II Introduction to IMP-6000S-1

IMP-6000S-1 is a universal adapter. Referring to Fig. 2-1 for the IMP-6000S-1 board layout, J3~J8 are wiring terminal blocks for the first to the sixth axes respectively so that IMP-6000S-1 can connect to the drives through the terminal blocks.

2.1 Board Layout

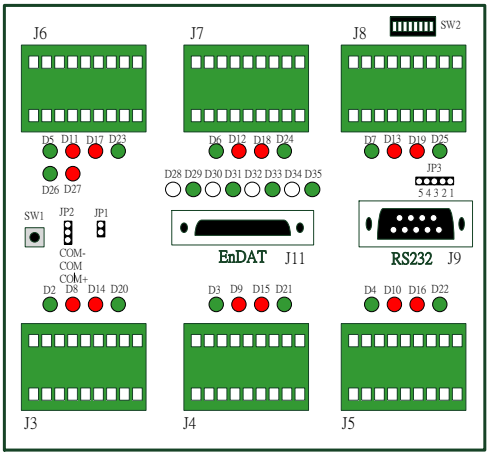


Fig. 2-1 IMP-6000S-1 board layout

(I) JP1—Emergency Stop mode setting

- Short-circuit the ESTOP of JP1 to disable the Emergency Stop function.
- JP1 is short-circuited as default. When the Emergency Stop circuit is connected, it is necessary to open-circuit JP1 (remove the jumper) to enable the Emergency Stop function.
- When ESTOP occurs, the hardware will disable pulse output, and the DAC output value is 0V.
- Default setting of JP1: Short circuit

(II) JP2—LIO mode setting

- For more information about the local input wiring, please refer to Section 2.3. COM and COM+ of JP2 must be short-circuited.
- Default setting of JP2: Short-circuit COM and COM+.

(III) JP3—RS232 device mode setting

- Short-circuit Pin2 and Pin3, and short-circuit Pin4 and Pin5: Standard mode (Pin2 of the RS232 connector is TX while Pin3 is RX)
- Short-circuit Pin1 and Pin2, and short-circuit Pin3 and Pin4:

Null modem mode (Pin2 of the RS232 connector is RX while Pin3 is TX)

- Default setting of JP3: Standard mode

(IV) SW1—System reset (RESET)

- System reset can be executed by the hardware switch SW1 on the IMP-6000S-1

(V) Default setting of each jumper and switch:

Jumper	Description	Default setting
JP1	ESTOP function setting	Short circuit
JP2	LIO mode setting	Short-circuit COM and COM+
JP3	For setting the RS232 device mode	Standard mode

SW	Description
SW1	System reset (RESET)
SW2	DIP switch reserved

2.2 Pin Assignments of Connectors and Definitions of Indicators

(I) J3~J8—Wiring terminal blocks

Wiring can be carried out through the wiring terminal blocks according to their pin assignments (shown in the following tables) and applicable drive user manuals.

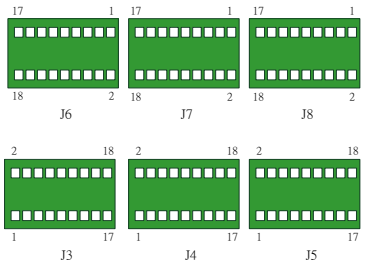


Fig. 2-2 Wring terminal blocks

Pin assignments of wiring terminal blocks:

J3			
Pin Assignment	**Pin**	**Pin**	**Pin Assignment**
PA0+	1	2	PA0-
PB0+	3	4	PB0-
OT0+	5	6	OT0-
HOME0	7	8	DAC0
EA0+	9	10	EA0
EB0+	11	12	EB0
EC0+	13	14	EC0
SERVO0	15	16	COM+
PRDY	17	18	ESTOP

J4			
Pin Assignment	**Pin**	**Pin**	**Pin Assignment**
PA1+	1	2	PA1-
PB1+	3	4	PB1-
OT1+	5	6	OT1-
HOME1	7	8	DAC1
EA1+	9	10	EA1-
EB1+	11	12	EB1-
EC1+	13	14	EC1-
SERVO1	15	16	COM-
NC	17	18	NC

J5			
Pin Assignment	**Pin**	**Pin**	**Pin Assignment**
PA2+	1	2	PA2-
PB2+	3	4	PB2-
OT2+	5	6	OT2-
HOME2	7	8	DAC2
EA2+	9	10	EA2-
EB2+	11	12	EB2-
EC2+	13	14	EC2-
SERVO2	15	16	AGND
NC	17	18	NC

J6			
Pin Assignment	**Pin**	**Pin**	**Pin Assignment**
PA3-	18	17	PA3+
PB3-	16	15	PB3+
OT3-	14	13	OT3+
DAC3	12	11	HOME3
EA3-	10	9	EA3+
EB3-	8	7	EB3+
EC3-	6	5	EC3+
COM+	4	3	SERVO3
DAC7	2	1	DAC6

J7			
Pin Assignment	**Pin**	**Pin**	**Pin Assignment**
PA4-	18	17	PA4+
PB4-	16	15	PB4+
OT4-	14	13	OT4+
DAC4	12	11	HOME4
EA4-	10	9	EA4+
EB4-	8	7	EB4+
EC4-	6	5	EC4+
COM-	4	3	SERVO4
NC	2	1	NC

J8			
Pin Assignment	**Pin**	**Pin**	**Pin Assignment**
PA5-	18	17	PA5+
PB5-	16	15	PB5+
OT5-	14	13	OT5+
DAC5	12	11	HOME5
EA5-	10	9	EA5+
EB5-	8	7	EB5+
EC5-	6	5	EC5+
AGND	4	3	SERVO5
NC	2	1	NC

Signal pin assignments of J3

Name	Description	Reference
PA0+ & PA0-	The Phase-A differential output signals of the 1st axis from PGE	GND
PB0+ & PB0-	The Phase-B differential output signals of the 1st axis from PGE	GND
OT0+ & OT0-	The Positive- and negative-travel limit input signals of the 1st axis	COM-
HOME0	The Home input signal of the 1st axis	COM-
DAC0	The DAC output voltage of the 1st axis	AGND
EA0+ & EA0-	The Phase-A differential input signals of the 1st axis encoder counter	GND
EB0+ & EB0-	The Phase-B differential input signals of the 1st axis encoder counter	GND
EC0+ & EC0-	The Phase-C differential input signals of the 1st axis encoder counter	GND
SERVO0	The Servo On output signal of the 1st axis	COM-
COM+	The Positive terminal of +24 V power output	COM-
PRDY	The Position Ready output signal	COM-
ESTOP	The Emergency Stop input signal	COM-

Signal pin assignments of J4

Name	Description	Reference
PA1+ & PA1-	The Phase-A differential output signals of the 2nd axis from PGE	GND
PB1+ & PB1-	The Phase-B differential output signals of the 2nd axis from PGE	GND

OT1+ & OT1-	The Positive- and negative-travel limit input signals of the 2nd axis	COM-
HOME1	The Home input signal of the 2nd axis	COM-
DAC1	The DAC output voltage of the 2nd axis	AGND
EA1+ & EA1-	The Phase-A differential input signals of the 2nd axis encoder counter	GND
EB1+ & EB1-	The Phase-B differential input signals of the 2nd axis encoder counter	GND
EC1+ & EC1-	The Phase-C differential input signals of the 2nd axis encoder counter	GND
SERVO1	The Servo On output signal of the 2nd axis	COM-
COM-	The Negative terminal of +24 V power output	
NC	Unused	

Signal pin assignments of J5

Name	Description	Reference
PA2+ & PA2-	The Phase-A differential output signals of the 3rd axis from PGE	GND
PB2+ & PB2-	The Phase-B differential output signals of the 3rd axis from PGE	GND
OT2+ & OT2-	The Positive- and negative-travel limit input signals of the 3rd axis	COM-
HOME2	The Home input signal of the 3rd axis	COM-
DAC2	The DAC output voltage of the 3rd axis	AGND
EA2+ & EA2-	The Phase-A differential input signals of the 3rd axis encoder counter	GND

EB2+ & EB2-	The Phase-B differential input signals of the 3rd axis encoder counter	GND
EC2+ & EC2-	The Phase-C differential input signals of the 3rd axis encoder counter	GND
SERVO2	The Servo On output signal of the 3rd axis	COM-
AGND	Analog reference ground	
NC	Unused	

Signal pin assignments of J6

Name	Description	Reference
PA3+ & PA3-	The Phase-A differential output signals of the 4th axis from PGE	GND
PB3+ & PB3-	The Phase-B differential output signals of the 4th axis from PGE	GND
OT3+ & OT3-	The Positive- and negative-travel limit input signals of the 4th axis	COM-
HOME3	The Home input signal of the 4th axis	COM-
DAC3	The DAC output voltage of the 4th axis	AGND
EA3+ & EA3-	The Phase-A differential input signals of the 4th axis encoder counter	GND
EB3+ & EB3-	The Phase-B differential input signals of the 4th axis encoder counter	GND
EC3+ & EC3-	The Phase-C differential input signals of the 4th axis encoder counter	GND
SERVO3	The Servo On output signal of the 4th axis	COM-
COM+	The Positive terminal of +24 V power output	COM-

DAC6	Group(1) expanded voltage output	AGND
DAC7	Group(2) expanded voltage output	AGND
NC	Unused	

Signal pin assignments of J7

Name	Description	Reference
PA4+ & PA4-	The Phase-A differential output signals of the 5th axis from PGE	GND
PB4+ & PB4-	The Phase-B differential output signals of the 5th axis from PGE	GND
OT4+ & OT4-	The Positive- and negative-travel limit input signals of the 5th axis	COM-
HOME4	The Home input signal of the 5th axis	COM-
DAC4	The DAC output voltage of the 5th axis	AGND
EA4+ & EA4-	The Phase-A differential input signals of the 5th axis encoder counter	GND
EB4+ & EB4-	The Phase-B differential input signals of the 5th axis encoder counter	GND
EC4+ & EC4-	The Phase-C differential input signals of the 5th axis encoder counter	GND
SERVO4	The Servo On output signal of the 5th axis	COM-
COM-	The Negative terminal of +24 V power output	
NC	Unused	

Signal pin assignments of J8

Name	Description	Reference
PA5+ & PA5-	The Phase-A differential output signals of the 6th axis from PGE	GND
PB5+ & PB5-	The Phase-B differential output signals of the 6th axis from PGE	GND
OT5+ & OT5-	The Positive- and negative-travel limit input signals of the 6th axis	COM-
HOME5	The Home input signal of the 6th axis	COM-
DAC5	The DAC output voltage of the 6th axis	AGND
EA5+ & EA5-	The Phase-A differential input signals of the 6th axis encoder counter	GND
EB5+ & EB5-	The Phase-B differential input signals of the 6th axis encoder counter	GND
EC5+ & EC5-	The Phase-C differential input signals of the 6th axis encoder counter	GND
SERVO5	The Servo On output signal of the 6th axis	COM-
AGND	Analog reference ground	
NC	Unused	

(II) J9－RS232 connector

The IMP-6000S-1 universal adapter is provided with an RS232 connector for transmitting and receiving data. The connector can work in a **Null modem mode** or a **Standard mode**, depending on the JP3 setting, as explained in more detail below.

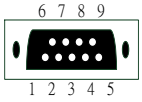
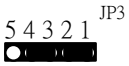


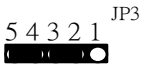
Fig.2-3 RS232 connector

Null modem mode: Short-circuit Pin1 and Pin2 in JP3, and so are Pin3 and Pin4.



Name	Pin number	Description	Reference
RX	2	Serial data received by IMP-6000S from a computer	GND
TX	3	Serial data transmitted from IMP-6000S to a computer	GND
GND	5	GND	

Standard mode: I Short-circuit Pin2 and Pin3 in JP3, and so are Pin4 and Pin5.



Name	Pin number	Description	Reference
TX	2	Serial data transmitted from IMP-6000S to a computer	GND
RX	3	Serial data received by IMP-6000S from a computer	GND
GND	5	GND	

(III) J11－EnDat2.2 connector

This is the connector for EnDat2.2 absolute encoders. The connector is connectable with three encoders (each for one axis) supporting the EnDat2.2 communication protocol. The user is required to make the adapter cable(s) according to the connector type and signal assignments of the encoder(s) to be used. A diagram and the pin assignments of J11 are as follows:

Fig. 2-4 EnDat2.2 connector

J11			
Pin Assignment	**Pin**	**Pin**	**Pin Assignment**
VCC	14	1	ENDAT_CLK0
GND	15	2	ENDAT_CLK/0
NC	16	3	ENDAT_DATA0
NC	17	4	ENDAT_DATA/0
VCC	18	5	ENDAT_CLK1
GND	19	6	ENDAT_CLK/1
NC	20	7	ENDAT_DATA1
NC	21	8	ENDAT_DATA/1
VCC	22	9	ENDAT_CLK2
GND	23	10	ENDAT_CLK/2
NC	24	11	ENDAT_DATA2
NC	25	12	ENDAT_DATA/2
NC	26	13	NC

Signal pin assignments of J11

Name	Description	Reference
ENDAT_CLK0+ & ENDAT_CLK0-	Group(1) differential clock signals	GND
ENDAT_ DATA0+ & ENDAT_ DATA0-	Group(1) differential data signals	GND
ENDAT_CLK1+ & ENDAT_CLK1-	Group(2) differential clock signals	GND
ENDAT_ DATA1+ & ENDAT_ DATA1-	Group(2) differential data signals	GND

ENDAT_CLK2+ & ENDAT_CLK2-	Group(3) differential clock signals	GND
ENDAT_ DATA2+ & ENDAT_ DATA2-	Group(3) differential data signals	GND

(IV) D2~D27－LIO indicators

- The LIO indicators indicate the current states of local inputs and outputs.
- All the indicators (except for the ESTOP indicator) are off at boot-up. When an I/O signal is activated, the corresponding indicator is lit.
- The ESTOP indicator remains lit if no Emergency Stop conditions occur, and goes out when an Emergency Stop condition takes place.

Axis 1			
D2	D8	D14	D20
HOME0	OT0+	OT0-	SERVO0
Axis 2			
D3	D9	D15	D21
HOME1	OT1+	OT1-	SERVO1
Axis 3			
D4	D10	D16	D22
HOME2	OT2+	OT2-	SERVO2

Axis 4			
D5	D11	D17	D23
HOME3	OT3+	OT3-	SERVO3
Axis 5			
D6	D12	D18	D24
HOME4	OT4+	OT4-	SERVO4
Axis 6			
D7	D13	D19	D25
HOME5	OT5+	OT5-	SERVO5

D26	D27
PREADY	ESTOP

(V) D28~D25－IMP-6000S system state indicators

- All the indicators are lit while firmware is loading at boot-up. Once the operating system is loaded, the indicators are lit/turned off as shown in the diagram to the right: 

2.3 Local Input Wiring

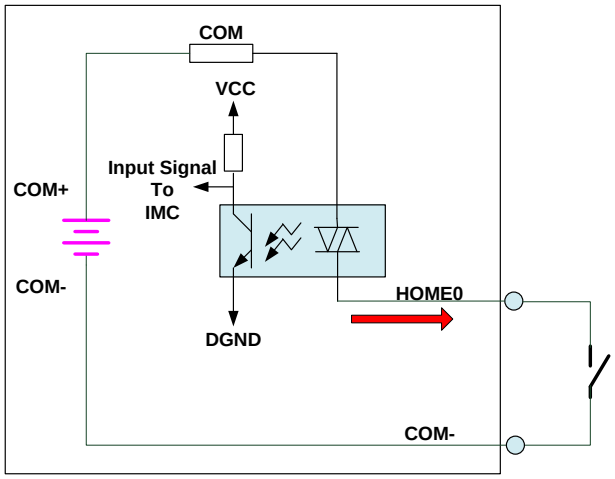


Fig. 2-5 Local input wiring

- The above diagram shows the HOME0 input connection of example. The other input connections can be wired in a similar way.
- COM and COM+ of JP2 must be short-circuited.
- When connecting an external switch, make sure the switch has one terminal connected to COM- of the terminal block and the other terminal connected to HOME0.
- When the switch is short, the reading of HOME0 is 0.
- When the switch is open, the reading of HOME0 is 1.
- **Caution**: Bouncing state

  At the instant when the mechanical switch in Fig. 2-5 is turned from open to close, the switch has a bouncing phenomenon. At this time the reading value of the IMP-6000S will oscillate between 0 and 1.When at the end of bouncing, the switch conducts and the reading value becomes 0. On the other hand, at the instant when the mechanical switch is turned from closed to open, there is only a very little of the bouncing phenomenon

Chapter III Introduction to IMP-6000S-2

IMP-6000S-2 is a dedicated adapter as shown in Fig. 3-1. With dedicated adapter cables provided by the MSL of ITRI, the adapter can connect with drives of specific brands (currently, the supported drive models are: Panasonic MINAS A4, Mitsubishi MR-J3-A, Delta ASDA-A2-U, and Yaskawa SGDV Σ-V).

3.1 Board Layout

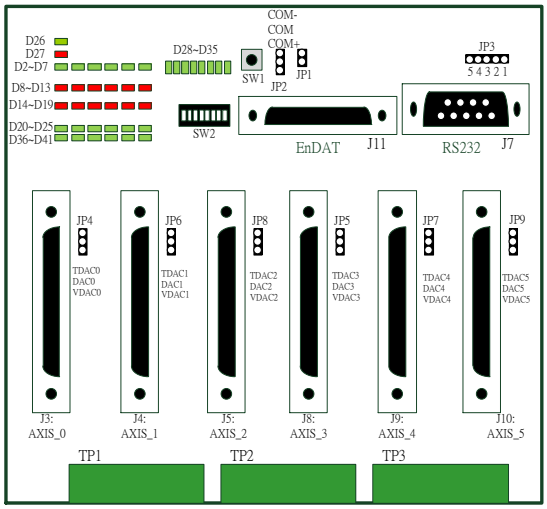


Fig. 3-1 IMP-6000S-2 board layout

(I) JP1—Emergency Stop mode setting

- Short-circuit the ESTOP of JP1 to disable the Emergency Stop function.
- JP1 is short-circuited as default. When the Emergency Stop circuit is connected, it is necessary to open-circuit JP1 (remove the jumper) to enable the Emergency Stop function.
- When ESTOP occurs, the hardware will disable pulse output, and the DAC output value is 0V.
- Default setting of JP1: Short circuit

(II) JP2—LIO mode setting

- For more information about the local input wiring, please refer to Section 2.3. COM and COM+ of JP2 must be short-circuited.
- Default setting of JP2: Short-circuit COM and COM+.

(III) JP3—RS232 device mode setting

- Short-circuit Pin2 and Pin3, and short-circuit Pin4 and Pin5: Standard mode (Pin2 of the RS232 connector is TX while Pin3 is RX)
- Short-circuit Pin1 and Pin2, and short-circuit Pin3 and Pin4:

Null modem mode (Pin2 of the RS232 connector is RX while Pin3 is TX)

- Default setting of JP3: Standard mode

(IV) JP4~JP9—Voltage output control setting

- Short-circuit DACn and VDACn (n=0~5): output voltage is configured as velocity mode
- Short-circui DACn and TDACn (n=0~5): output voltage is configured as torque mode
- Default setting of JP4~JP9: velocity mode
- The table below shows the axes respectively controlled by JP4~JP9.

JP4	JP5	JP6	JP7	JP8	JP9
Axis 1	Axis 2	Axis 3	Axis 4	Axis 5	Axis 6

(V) SW1—System reset (RESET)

- System reset can be executed by the hardware switch SW1 on the IMP-6000S-2

(VI) Default setting of each jumper and switch:

Jumper	Description	Default setting
JP1	ESTOP function setting	Short circuit
JP2	LIO mode setting	COM and COM+ short-circuited
JP3	RS232 device mode setting	Standard mode
JP4~JP9	Voltage output control setting	Velocity mode (DACn and VDACn short-circuited)

SW	Description
SW1	System reset (RESET)

3.2 Pin Assignments of Connectors and Definitions of Indicators

(I) J3, J4, J5, J6, J7, J8—drive adapters

These drive adapters are 50pin signal connectors. The tables below show the pin assignments for Panasonic Minas A4 drive. If drives of other specific brands are to be used, they can be connected to the adapter through adapter cables provided by ITRI. Currently, drives supported by the adapter are Panasonic MINAS A4, Mitsubishi MR-J3-A, Delta ASDA-A2-U, and Yaskawa SGDV Σ-V.

J3			
Pin Assignment	Pin	Pin	Pin Assignment
COM-	26	1	NC
NC	27	2	NC
NC	28	3	PA0+
SERVO0	29	4	PA0-
NC	30	5	PB0+
NC	31	6	PB0-
NC	32	7	COM+
COM-	33	8	COM-
COM-	34	9	COM-
SRDY0	35	10	COM-
COM-	36	11	NC
NC	37	12	NC
COM-	38	13	AGND
NC	39	14	VDAC0
NC	40	15	AGND
COM-	41	16	TDAC0
IM0	42	17	AGND
SP0	43	18	NC
NC	44	19	NC
NC	45	20	NC
NC	46	21	EA0+
NC	47	22	EA0-
EB0+	48	23	EC0+
EB0-	49	24	EC0-
FG	50	25	AGND

J4			
Pin Assignment	Pin	Pin	Pin Assignment
COM-	26	1	NC
NC	27	2	NC
NC	28	3	PA1+
SERVO1	29	4	PA1-
NC	30	5	PB1+
NC	31	6	PB1-
NC	32	7	COM+
COM-	33	8	COM-
COM-	34	9	COM-
SRDY1	35	10	COM-
COM-	36	11	NC
NC	37	12	NC
COM-	38	13	AGND
NC	39	14	VDAC1
NC	40	15	AGND
COM-	41	16	TDAC1
IM1	42	17	AGND
SP1	43	18	NC
NC	44	19	NC
NC	45	20	NC
NC	46	21	EA1+
NC	47	22	EA1-
EB1+	48	23	EC1+
EB1-	49	24	EC1-
FG	50	25	AGND

J5			
Pin Assignment	Pin	Pin	Pin Assignment
COM-	26	1	NC
NC	27	2	NC
NC	28	3	PA2+
SERVO0	29	4	PA2-
NC	30	5	PB2+
NC	31	6	PB2-
NC	32	7	COM+
COM-	33	8	COM-
COM-	34	9	COM-
SRDY2	35	10	COM-
COM-	36	11	NC
NC	37	12	NC
COM-	38	13	AGND
NC	39	14	VDAC2
NC	40	15	AGND
COM-	41	16	TDAC2
IM2	42	17	AGND
SP2	43	18	NC
NC	44	19	NC
NC	45	20	NC
NC	46	21	EA2+
NC	47	22	EA2-
EB2+	48	23	EC2+
EB2-	49	24	EC2-
FG	50	25	AGND

J6			
Pin Assignment	Pin	Pin	Pin Assignment
COM-	26	1	NC
NC	27	2	NC
NC	28	3	PA3+
SERVO3	29	4	PA3-
NC	30	5	PB3+
NC	31	6	PB3-
NC	32	7	COM+
COM-	33	8	COM-
COM-	34	9	COM-
SRDY3	35	10	COM-
COM-	36	11	NC
NC	37	12	NC
COM-	38	13	AGND
NC	39	14	VDAC3
NC	40	15	AGND
COM-	41	16	TDAC3
IM3	42	17	AGND
SP3	43	18	NC
NC	44	19	NC
NC	45	20	NC
NC	46	21	EA3+
NC	47	22	EA3-
EB3+	48	23	EC3+
EB3-	49	24	EC3-
FG	50	25	AGND

J7			
Pin Assignment	Pin	Pin	Pin Assignment
COM-	26	1	NC
NC	27	2	NC
NC	28	3	PA4+
SERVO4	29	4	PA4-
NC	30	5	PB4+
NC	31	6	PB4-
NC	32	7	COM+
COM-	33	8	COM-
COM-	34	9	COM-
SRDY4	35	10	COM-
COM-	36	11	NC
NC	37	12	NC
COM-	38	13	AGND
NC	39	14	VDAC4
NC	40	15	AGND
COM-	41	16	TDAC4
IM4	42	17	AGND
SP4	43	18	NC
NC	44	19	NC
NC	45	20	NC
NC	46	21	EA4+
NC	47	22	EA4-
EB4+	48	23	EC4+
EB4-	49	24	EC4-
FG	50	25	AGND

J8			
Pin Assignment	Pin	Pin	Pin Assignment
COM-	26	1	NC
NC	27	2	NC
NC	28	3	PA5+
SERVO5	29	4	PA5-
NC	30	5	PB5+
NC	31	6	PB5-
NC	32	7	COM+
COM-	33	8	COM-
COM-	34	9	COM-
SRDY5	35	10	COM-
COM-	36	11	NC
NC	37	12	NC
COM-	38	13	AGND
NC	39	14	VDAC5
NC	40	15	AGND
COM-	41	16	TDAC5
IM5	42	17	AGND
SP5	43	18	NC
NC	44	19	NC
NC	45	20	NC
NC	46	21	EA5+
NC	47	22	EA5-
EB5+	48	23	EC5+
EB5-	49	24	EC5-
FG	50	25	AGND

Signal pins of J3

Name	Description	Reference
PA0+ & PA0-	The Phase-A differential output signals of the 1st axis from PGE	GND
PB0+ & PB0-	The Phase-B differential output signals of the 1st axis from PGE	GND
EA0+ & EA0-	The Phase-A differential input signals of the 1st axis encoder counter	GND
EB0+ & EB0-	The Phase-B differential input signals of the 1st axis encoder counter	GND
EC0+ & EC0-	The Phase-C differential input signals of the 1st axis encoder counter	GND
SERVO0	The Servo On output signal of the 1st axis	COM-
VDAC0	The DAC output voltage of the 1st axis , for the velocity control input of the drive	AGND
TDAC0	The DAC output voltage of the 1st axis , for the torque control input of the drive	AGND
SRDY0	The servo ready input of the 1st axis from the drive	COM-
IM0	The torque monitor signal input of the 1st axis from drive	AGND
SP0	The speed monitor signal input of the 1st axis from drive	AGND
AGND	Analog reference ground	
COM+	The Positive terminal of +24 V power supply	COM-
COM-	The Negative terminal of +24 V power supply	
FG	Frame ground	

Signal pin assignments of J4

Name	Description	Reference
PA1+ & PA1-	The Phase-A differential output signals of the 2nd axis from PGE	GND
PB1+ & PB1-	The Phase-B differential output signals of the 2nd axis from PGE	GND
EA1+ & EA1-	The Phase-A differential input signals of the 2nd axis encoder counter	GND
EB1+ & EB1-	The Phase-B differential input signals of the 2nd axis encoder counter	GND
EC1+ & EC1-	The Phase-C differential input signals of the 2nd axis encoder counter	GND
SERVO1	The Servo On output signal of the 2nd axis	COM-
VDAC1	The DAC output voltage of the 2nd axis , for the velocity control input of the drive	AGND
TDAC1	The DAC output voltage of the 2nd axis , for the torque control input of the drive	AGND
SRDY1	The servo ready input of the 2nd axis from the drive	COM-
IM1	The torque monitor signal input of the 2nd axis from drive	AGND
SP1	The speed monitor signal input of the 2nd axis from drive	AGND
AGND	Analog reference ground	
COM+	The Positive terminal of +24 V power supply	COM-
COM-	The Negative terminal of +24 V power supply	
FG	Frame ground	

Signal pin assignments of J5

Name	Description	Reference
PA2+ & PA2-	The Phase-A differential output signals of the 3rd axis from PGE	GND
PB2+ & PB2-	The Phase-B differential output signals of the 3rd axis from PGE	GND
EA2+ & EA2-	The Phase-A differential input signals of the 3rd axis encoder counter	GND
EB2+ & EB2-	The Phase-B differential input signals of the 3rd axis encoder counter	GND
EC2+ & EC2-	The Phase-C differential input signals of the 3rd axis encoder counter	GND
SERVO2	The Servo On output signal of the 3rd axis	COM-
VDAC2	The DAC output voltage of the 3rd axis , for the velocity control input of the drive	AGND
TDAC2	The DAC output voltage of the 3rd axis , for the torque control input of the drive	AGND
SRDY2	The servo ready input of the 3rd axis from the drive	COM-
IM2	The torque monitor signal input of the 3rd axis from drive	AGND
SP2	The speed monitor signal input of the 3rd axis from drive	AGND
AGND	Analog reference ground	
COM+	The Positive terminal of +24 V power supply	COM-
COM-	The Negative terminal of +24 V power supply	
FG	Frame ground	

Signal pin assignments of J6

Name	Description	Reference
PA3+ & PA3-	The Phase-A differential output signals of the 4th axis from PGE	GND
PB3+ & PB3-	The Phase-B differential output signals of the 4th axis from PGE	GND
EA3+ & EA3-	The Phase-A differential input signals of the 4th axis encoder counter	GND
EB3+ & EB3-	The Phase-B differential input signals of the 4th axis encoder counter	GND
EC3+ & EC3-	The Phase-C differential input signals of the 4th axis encoder counter	GND
SERVO3	The Servo On output signal of the 4th axis	COM-
VDAC3	The DAC output voltage of the 4th axis , for the velocity control input of the drive	AGND
TDAC3	The DAC output voltage of the 4th axis , for the torque control input of the drive	AGND
SRDY3	The servo ready input of the 4th axis from the drive	COM-
IM3	The torque monitor signal input of the 4th axis from drive	AGND
SP3	The speed monitor signal input of the 4th axis from drive	AGND
AGND	Analog reference ground	
COM+	The Positive terminal of +24 V power supply	COM-
COM-	The Negative terminal of +24 V power supply	
FG	Frame ground	

Signal pin assignments of J7

Name	Description	Reference
PA4+ & PA4-	The Phase-A differential output signals of the 5th axis from PGE	GND
PB4+ & PB4-	The Phase-B differential output signals of the 5th axis from PGE	GND
EA4+ & EA4-	The Phase-A differential input signals of the 5th axis encoder counter	GND
EB4+ & EB4-	The Phase-B differential input signals of the 5th axis encoder counter	GND
EC4+ & EC4-	The Phase-C differential input signals of the 5th axis encoder counter	GND
SERVO4	The Servo On output signal of the 5th axis	COM-
VDAC4	The DAC output voltage of the 5th axis , for the velocity control input of the drive	AGND
TDAC4	The DAC output voltage of the 5th axis , for the torque control input of the drive	AGND
SRDY4	The servo ready input of the 5th axis from the drive	COM-
IM4	The torque monitor signal input of the 5th axis from drive	AGND
SP4	The speed monitor signal input of the 5th axis from drive	AGND
AGND	Analog reference ground	
COM+	The Positive terminal of +24 V power supply	COM-
COM-	The Negative terminal of +24 V power supply	
FG	Frame ground	

Signal pin assignments of J8

Name	Description	Reference
PA5+ & PA5-	The Phase-A differential output signals of the 6th axis from PGE	GND
PB5+ & PB5-	The Phase-B differential output signals of the 6th axis from PGE	GND
EA5+ & EA5-	The Phase-A differential input signals of the 6th axis encoder counter	GND
EB5+ & EB5-	The Phase-B differential input signals of the 6th axis encoder counter	GND
EC5+ & EC5-	The Phase-C differential input signals of the 6th axis encoder counter	GND
SERVO5	The Servo On output signal of the 6th axis	COM-
VDAC5	The DAC output voltage of the 6th axis , for the velocity control input of the drive	AGND
TDAC5	The DAC output voltage of the 6th axis , for the torque control input of the drive	AGND
SRDY5	The servo ready input of the 6th axis from the drive	COM-
IM5	The torque monitor signal input of the 6th axis from drive	AGND
SP5	The speed monitor signal input of the 6th axis from drive	AGND
AGND	Analog reference ground	
COM+	The Positive terminal of +24 V power supply	COM-
COM-	The Negative terminal of +24 V power supply	
FG	Frame ground	

(II) TP1~TP3—LIO wiring terminal blocks

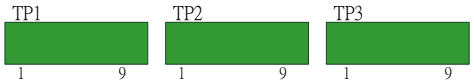


Fig. 3-2 Input/output wiring terminal blocks

TP1	
Pin	**Pin Assignment**
1	OT0+
2	OT0-
3	OT1+
4	OT1-
5	OT2+
6	OT2-
7	HOME0
8	HOME1
9	HOME2

TP2	
Pin	**Pin Assignment**
1	OT3+
2	OT3-
3	OT4+
4	OT4-
5	OT5+
6	OT5-
7	HOME3
8	HOME4
9	HOME5

TP3	
Pin	**Pin Assignment**
1	PRDY
2	ESTOP
3	DAC6
4	DAC7
5	COM-
6	COM-
7	COM-
8	AGND
9	AGND

Signal pin assignments of TP1

Name	Description	Reference
OT0+	The positive-travel limit input of the 1st axis	COM-
OT0-	The negative-travel limit input of the 1st axis	COM-
OT1+	The positive-travel limit input of the 2nd axis	COM-
OT1-	The negative-travel limit input of the 2nd axis	COM-
OT2+	The positive-travel limit input of the 3rd axis	COM-
OT2-	The negative-travel limit input of the 3rd axis	COM-
HOME0	The home input of the 1st axis	COM-
HOME1	The home input of the 2nd axis	COM-
HOME2	The home input of the 3rd axis	COM-

Signal pin assignments of TP2

Name	Description	Reference
OT3+	The positive-travel limit input of the 4th axis	COM-
OT3-	The negative-travel limit input of the 4th axis	COM-
OT4+	The positive-travel limit input of the 5th axis	COM-
OT4-	The negative-travel limit input of the 5th axis	COM-
OT5+	The positive-travel limit input of the 6th axis	COM-
OT5-	The negative-travel limit input of the 6th axis	COM-
HOME3	The home input of the 4th axis	COM-
HOME4	The home input of the 5th axis	COM-
HOME5	The home input of the 6th axis	COM-

Signal pin assignments of TP3

Name	Description	Reference
PRDY	The Position Ready output signal	COM-
ESTOP	The Emergency Stop input signal	COM-
DAC6	Group(1) expanded voltage output	AGND
DAC7	Group(2) expanded voltage output	AGND
COM-	The Negative terminal of +24 V power supply	
AGND	Analog reference ground	

(III) J7—RS232 connector

The IMP-6000S-2 dedicated adapter is provided with an RS232 connector for transmitting and receiving data. The connector can work in a **Null modem mode** or a **Standard mode**, depending on the JP3 setting, as explained in more detail below.

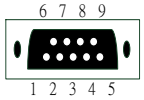


Fig.3-3 RS232 connector

Null modem mode: Short-circuit Pin1 and Pin2 in JP3, and so are Pin3 and Pin4.

Name	Pin number	Description	Reference
RX	2	Serial data received by IMP-6000S from a computer	GND
TX	3	Serial data transmitted from IMP-6000S to a computer	GND
GND	5	Reference ground potential for digital signals	

Standard mode: Short-circuit Pin2 and Pin3 in JP3, and so are Pin4 and Pin5.

Name	Pin number	Description	Reference
TX	2	Serial data transmitted from IMP-6000S to a computer	GND
RX	3	Serial data received by IMP-6000S from a computer	GND
GND	5	Reference ground potential for digital signals	

(IV) J11－EnDat2.2 connector

This is the connector for EnDat2.2 absolute encoders. The connector is connectable with three encoders (each for one axis) supporting the EnDat2.2 communication protocol. The user is required to make the adapter cable(s) according to the connector type and signal

assignments of the encoder(s) to be used. A diagram and the pin assignments of J11 are as follows:

Fig. 3-4 EnDat2.2 connector

J11			
Pin Assignment	**Pin**	**Pin**	**Pin Assignment**
VCC	14	1	ENDAT_CLK0+
GND	15	2	ENDAT_CLK0-
NC	16	3	ENDAT_DATA0+
NC	17	4	ENDAT_DATA0-
VCC	18	5	ENDAT_CLK1+
GND	19	6	ENDAT_CLK1-
NC	20	7	ENDAT_DATA1+
NC	21	8	ENDAT_DATA1-
VCC	22	9	ENDAT_CLK2+
GND	23	10	ENDAT_CLK2-
NC	24	11	ENDAT_DATA2+
NC	25	12	ENDAT_DATA2-
NC	26	13	NC

Signal pin assignments of J11

Name	Description	Reference
ENDAT_CLK0+ & ENDAT_CLK-0	Group(1) differential clock signals	GND
ENDAT_ DATA0+ & ENDAT_ DATA0-	Group(1) differential data signals	GND
ENDAT_CLK1+ & ENDAT_CLK1-	Group(2) differential clock signals	GND
ENDAT_ DATA1+ & ENDAT_ DATA1-	Group(2) differential data signals	GND
ENDAT_CLK2+ & ENDAT_CLK2-	Group(3) differential clock signals	GND

ENDAT_ DATA2+ & ENDAT_ DATA2-	Group(3) differential data signals	GND
VCC	+5V power output	GND
GND	Reference ground potential for digital signals	

(V) D2~D27－LIO indicators

- The LIO indicators indicate the current states of local inputs and outputs.
- All the indicators (except for the ESTOP indicator) are off at boot-up. When an I/O signal is activated, the corresponding indicator is lit.
- The ESTOP indicator remains lit if no Emergency Stop conditions occur, and goes out when an Emergency Stop condition takes place.

(VI) D28~D35－IMP-6000S system state indicators

- All the indicators are lit while firmware is loading at boot-up. Once the operating system is loaded, the indicators are lit/turned off as shown in the diagram to the right:

(VII) D36~D41－servo drive state indicators

- Upon boot-up, the indicators are lit, indicating that the servo drives have yet to enter the operable state. The lights go out when the servo drives can operate properly.
- The indicators work only when the drives in use provide drive state signals.

D26		D27
PRDY		ESTOP

Axis 1		Axis 2		Axis 3		Axis 4		Axis 5		Axis 6
D2		D3		D4		D5		D6		D7
HOME0		HOME1		HOME2		HOME3		HOME4		HOME5
D8		D9		D10		D11		D12		D13
OT0+		OT1+		OT2+		OT3+		OT4+		OT5+
D14		D15		D16		D17		D18		D19
OT0-		OT1-		OT2-		OT3-		OT4-		OT5-
D20		D21		D22		D23		D24		D25
SERVO0		SERVO1		SERVO2		SERVO3		SERVO4		SERVO5

D36		D37		D38		D39		D40		D41
SRDY0		SRDY1		SRDY2		SRDY3		SRDY4		SRDY5

D28	D29	D30	D31	D32	D33	D34	D35
LED0	LED1	LED2	LED3	LED4	LED5	LED6	LED7

Chapter IV Introduction to IMP-6AB

IMP-6AB is an analog/digital conversion adapter capable of supporting 8 ADC channels and 8 DAC channels. If ADC or DAC is desired, this adapter can be used.

For analog voltage output, IMP-6AB converts the voltage command into an analog voltage and outputs the analog voltage to IMP-6000S-1 or IMP-6000S-2.

As to analog voltage input, IMP-6AB can convert an analog voltage so that the value of the input voltage can be read.

4.1 Board Layout

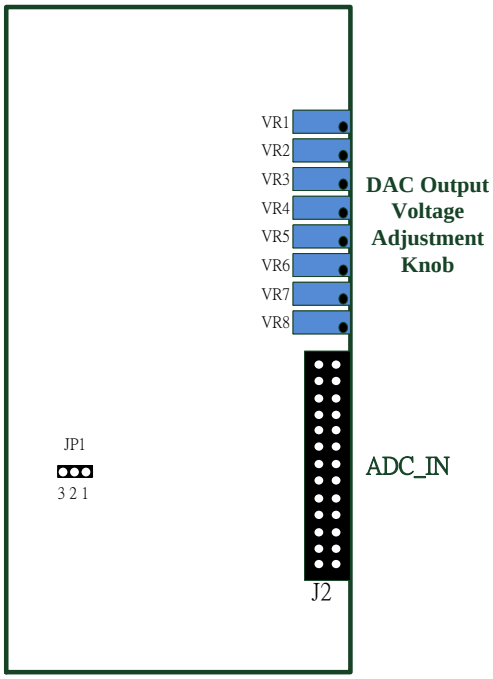


Fig. 4-1 IMP-6AB board layout

(I) VR1~VR8－Variable resistors

- By turning the adjustment knobs of the variable resistors, DAC output voltage offset values can be adjusted.
- In closed-loop voltage control, if an encoder feedback shows excessive offset in the Servo On state, the variable resistor of the corresponding axis can be adjusted to make the offset approach zero.
- When ESTOP occurs, DAC output should be 0V. If DAC output is not 0V, the corresponding variable resistor can be adjusted to bring the DAC output to 0V.

Note: From the top down: VR1 (DAC0), VR2 (DAC1), VR3 (DAC2), VR4 (DAC3), VR5 (DAC4), VR6 (DAC5), VR7 (DAC6), and VR8 (DAC7).

(II) JP1－ADC mode setting

- Short-circuit Pin2 and Pin3 of JP1: Bipolar mode (-5V~+5V)

- Short-circuit Pin1 and Pin2 of JP1: Unipolar mode (0V~+10V)

4.2 Pin Assignments of Connector:

(I) ADC connector

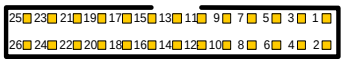


Fig.4-2 ADC connector

J2			
Pin Assignment	**Pin**	**Pin**	**Pin Assignment**
ADC0+	1	2	ADC4+
ADC0-	3	4	ADC4-
ADC1+	5	6	ADC5+
ADC1-	7	8	ADC5-
ADC2+	9	10	ADC6+
ADC2-	11	12	ADC6-
ADC3+	13	14	ADC7+
ADC3-	15	16	ADC7-
AGND	17	18	AGND
AGND	19	20	AGND
AGND	21	22	AGND
AGND	23	24	AGND
AGND	25	26	AGND

Signal pin assignments of J2

Name	Description	Reference
ADC0+	Positive terminal of group(1) analog differential input signal	AGND
ADC0-	Negative terminal of group(1) analog differential input signal	AGND
ADC1+	Positive terminal of group(2) analog differential input signal	AGND
ADC1-	Negative terminal of group(2) analog differential input signal	AGND

ADC2+	Positive terminal of group(3) analog differential input signal	AGND
ADC2-	Negative terminal of group(3) analog differential input signal	AGND
ADC3+	Positive terminal of group(4) analog differential input signal	AGND
ADC3-	Negative terminal of group(4) analog differential input signal	AGND
ADC4+	Positive terminal of group(5) analog differential input signal	AGND
ADC4-	Negative terminal of group(5) analog differential input signal	AGND
ADC5+	Positive terminal of group(6) analog differential input signal	AGND
ADC5-	Negative terminal of group(6) analog differential input signal	AGND
ADC6+	Positive terminal of group(7) analog differential input signal	AGND
ADC6-	Negative terminal of group(7) analog differential input signal	AGND
ADC7+	Positive terminal of group(8) analog differential input signal	AGND
ADC7-	Negative terminal of group(8) analog differential input signal	AGND
AGND	Analog reference ground	