KGP 50

KGP 50 is a prototype industrial robot with all features of a manipulator with modular controllers and control technology.

Specifications:

- 6- Axes, continues path control
- 50 kg payload
- 1.8 m reach
- 1.5 m/s max. speed
- < 1 mm repeatability

1) Manipulator

Six degrees of freedom with 50 – 200 kg class payload capacity,parallel linkage with re-circulating ball screws, precision low backlash in-line planetary gear boxes are used in the manipulator to obtain required repeatability. Diagram of robot is shown in figure 1.

2) List of Components

- 3- Phase AC digital servo motors ---- 6 nos.

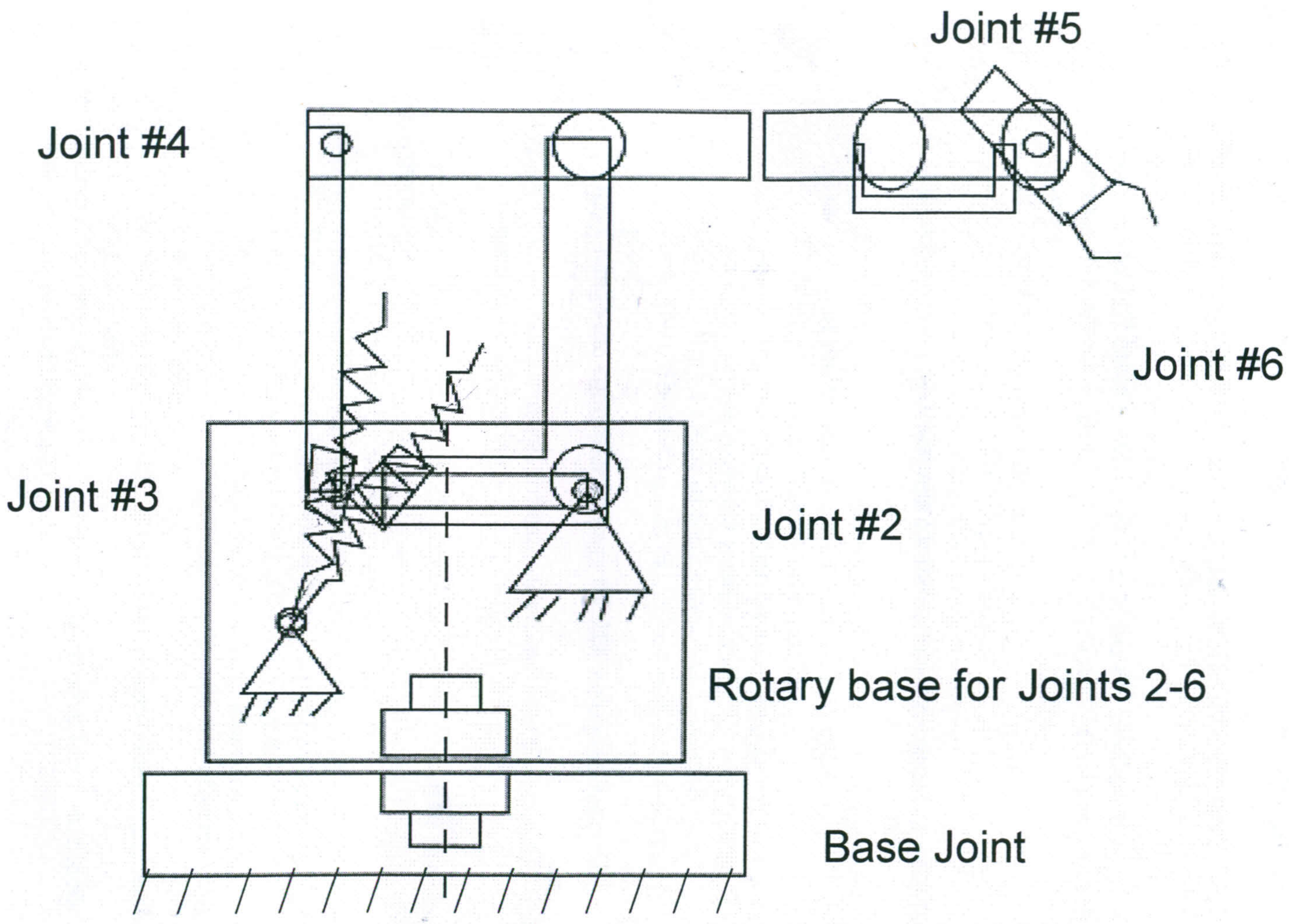
Specifications of motors:

	No. of motors		
	4 nos. **BSM 80A-350BA** **DBSC 2025**	**2 nos.** **BSM 80A-250BA** **DBSC 1115**	**Units**
Torque Cont. Stall	4.52	3.20	Nm
Current Cont. Stall	8.99	6.17	A rms
Rated Speed	4000	4000	rpm
Rated Bus Voltage	200	200	volts
Peak Current	36	25	A rms

- Inline planetary gear boxes ---- 4 nos.
- Re – circulating Ball-screws ---- 2 nos.
- DSP based motion controllers ---- 1 nos.

Joints	Motor / Drive	Gear box & Backlash	Model No
1.	BSM 80A – 250 BA DBSC 1115	1:50	PG 142-050
2.	BSM 80A – 250 BA DBSC 1115	Re-circulating ball- screw (no gear box)	
3.	BSM 80A – 250 BA DBSC 1115	Re-circulating ball-screw (no gear box)	
4.	BSM 80A – 250 BA DBSC 1115	1:50	PG 90-050
5.	BSM 80A – 350 BA DBSC 2025	1:50	PG 90-050
6.	BSM 80A – 350 BA DBSC 2025	1:50	

Bayside PG 90-050

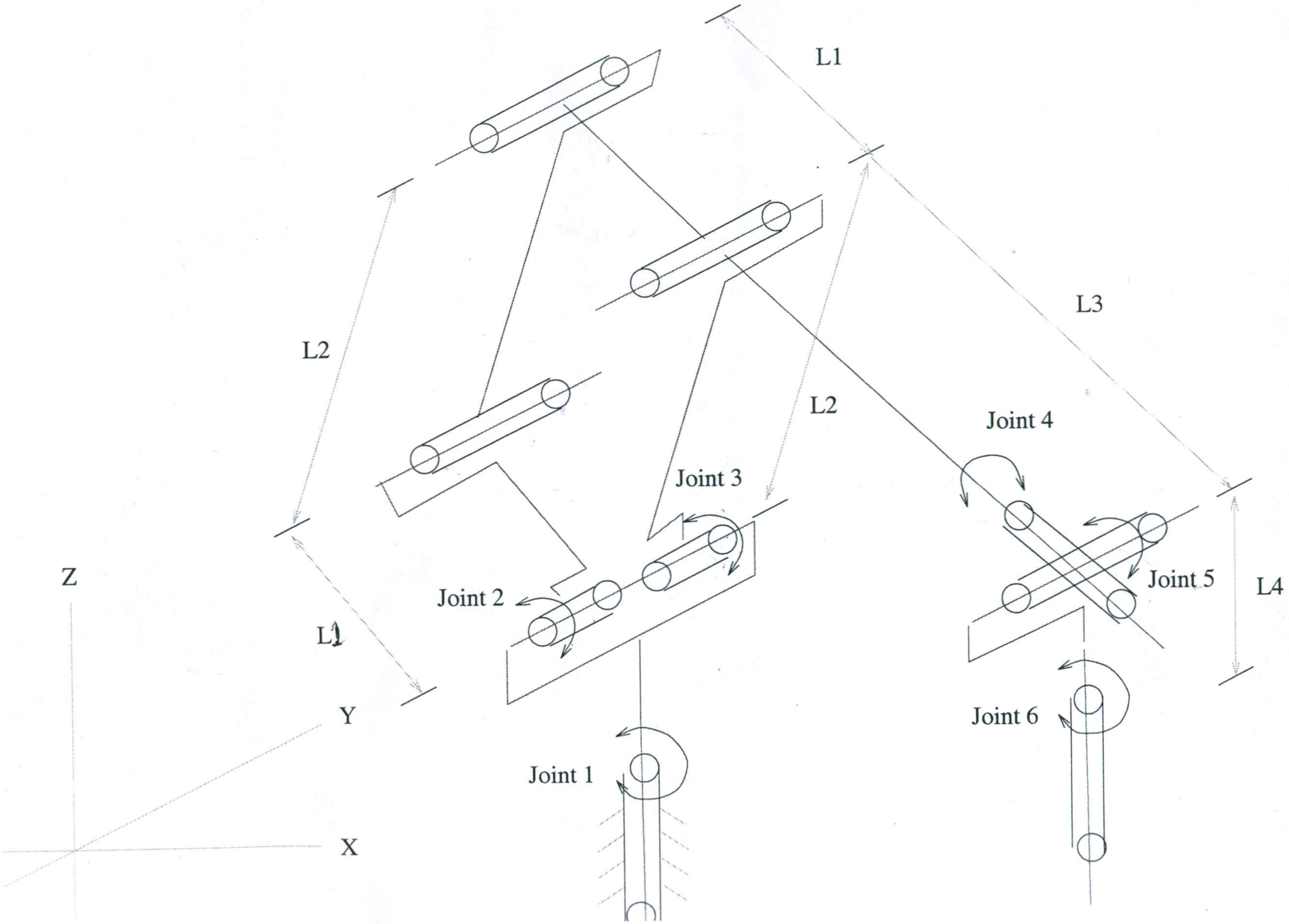

Joint #5
Joint #4
Joint #6
Joint #3
Joint #2
Rotary base for Joints 2-6
Base Joint

Procedure for KGP 50 operation in Lab.

1. Make sure all motor controllers have switch 8 in off (left) position.
2. Make sure the 3-phase motor start switch is put on.
3. Make sure single phase power switch is on. Fan sounds start.
4. Put on all brake switches. Corresponding Red LEDs will glow. Motor drives will still be disabled and the links can move.
5. Put the RS232C cable in X6 connector to the PC serial port.
6. Starting with Motor 1 (Base) till Motor 6 (End-effector) carry out the following procedure.
    a. Put serial cable to X6 connector
    b. At PC side run the DBSC programme
    c. Load the corresponding drive control settings.
    d. Check the Drive settings for the following – speed of each Motor after reduction shouldn't exceed 1 rpm (for the lab use / demo)
    e. Set the drive in a) Jog mode and move the link to a position in between the two joint limits (approximately) by visual observation.
    f. Set Control mode as Velocity mode.
    g. Change the position of the joint by varying the velocity from min to a max of 5 rpm (for manipulator) motions and upto 10 rpm (for wrist motions). Observe the variation of joint motion as against the setting for PID controllers. The setting can be noticed with step commands and graphical plots.
    h. Change the controller settings for PD, Pole placement and re-record the joint motion.
    i. Repeat for 3 settings for each drive and note the response time, settling error for each setting.

7. For each drive and the setting chose determines what will be the likely joint errors.
8. Prepare the Lab record for the following
    a. Kinematical representation of each joint motion in the robot
    b. Write the forward kinematical output in Cartesian coordinates.
    c. Estimate of the joint / drive inertias for each drive
    d. Estimate the error in the joint positioning against each controller setting
    e. Using Cartesian coordinates determine the end effector error against each controller settings.
    f. Determine the best setting out of the observations made and explain why it's the best.
9. Home Assignment: Describe and derive the inverse kinematic model of the robot from the considerations made earlier.

Kinematic Structure of the Robotic Manipulator



Kgp-50 robot lab experiments:

Objective:
A.familiarige with robot structure &kinematics
B.purpase/usageof robot to be mapped to above.
C.Indentify control of each axes.
D.Assess the load, drive and performance characteristics of each axes.

Work to be done
Sec page 4

Reporting to be done an
1. Robot structure &kinematics.
2. Control system of a typical drive.
3. Kinematics decompiles (a) Forward.
   (b) Inverse.

4.Write on (a) Applications.
   (b)Similar robot configurations.

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