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Super SEL Controller
(Type A & B)

Operating Manual

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This publication was written to assist you in better understanding this part of your IA system. If you require further assistance, please contact IA Technical Support. For Central and East Coast Time Zones, please call our Elk Grove Village, IL office at 1-800-944-0333 or FAX 708-290-0351. For Mountain and Pacific Time Zones, please call our Torrance, CA office at 1-800-736-1712 or FAX 310-320-4553; Monday thru Friday from 8:00 AM to 5:00PM.



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Disclaimer

The information and technical data contained herein are subject to change without notice. IAI America, Inc. assumes no responsibility for any errors or omissions regarding the accuracy of the information contained in this publication.

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Chapter 1. Setting Up

Part 1 - Safety Precautions

The IA Super SEL Controller (Type A and B) was developed to perform tasks ranging from the very simple (single-axis system) to complex multi-axis systems. As any system becomes more extensive, the possibility of accidents also increases. Please take sufficient care when operating your system.

Please follow the following safety precautions when operating your IA System:

(1) Any operation not specifically addressed in this manual should not be attempted. If you have any questions, please contact your IA sales representative or contact IA Technical Support at: 1-800-736-1712.

(2) Use only IA cables when connecting IA actuators and controllers. IA Cables are matched for use with IA actuators and are specially designed to withstand repeated bending.

(3) Stand clear of your IA System when operating or preparing to operate. Surround your IA System with safety partitions if there is any possibility that someone may become injured by an operating IA System.

(4) Before assembling , adjusting, or performing maintenance on your IA System, please make sure that people around you are aware that the System is not to be powered up or turned on. You may want to disconnect the power cable completely, keep the power cable close to the operator, or use a safety plug to ensure that the power cable will not be plugged in inadvertently.

(5) When more than one person is working on your IA System, use signs to inform everyone of the operating status of the Equipment. Make sure that everyone stands clear prior to operation. Operate your system only after you are sure that everyone knows that you are initiating System start-up and that everyone is clear of the System.

(6) In situations where the cables must be lengthened, be sure to double check all connections before powering up your IA System.

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Part 2 - System Installation Environment

1. Installation Environment

(1) Do NOT block the air vents of your controller when installing your IA System..

(2) Your Super SEL Controller is NOT dust, water, or oil proof. Take steps to prevent foreign matter from getting into the controller air vents. Avoid using your IA System in environments subject to contamination by dust, oil mist, or cutting oil.

(3) Do not expose your IA System to direct sunlight or situate near a heat source.

(4) Avoid placing your IA System under conditions of extreme tempreratures above 50°C (120°F) or below 0°C (32°F). The area level of humidity should not be above 85%. Do NOT expose to corrosive or inflammable gasses.

(5) Avoid external vibration, or unnecessary impact, or excessive shocks to your IA System.

(6) Take steps to shield all cables and wires from electromagnetic noise.

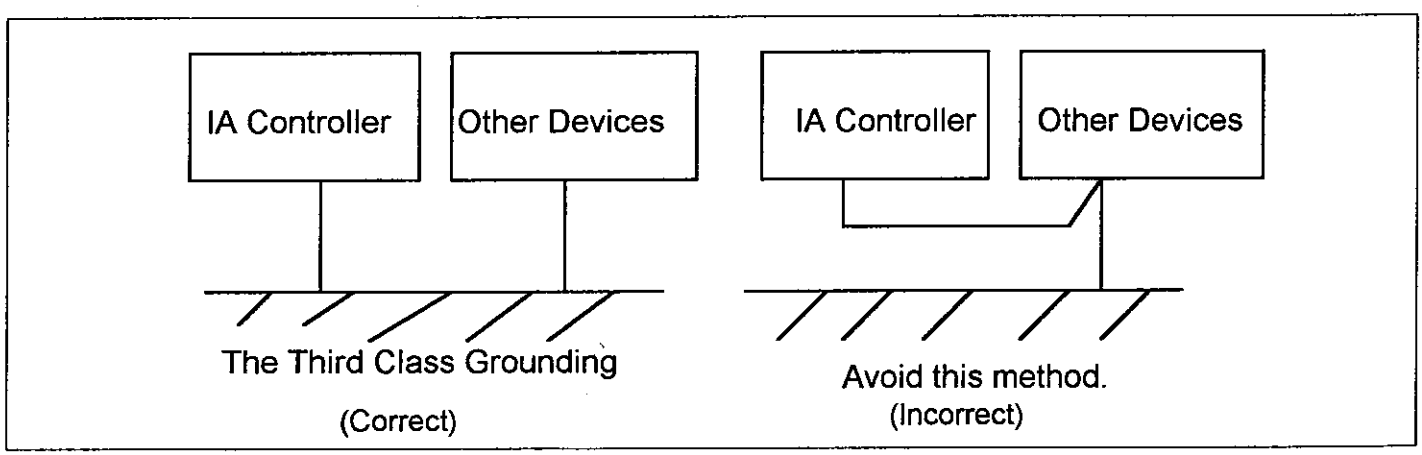
2. Power Source

Make certain that an AC line voltage of 117 +/- 10% is maintained. If the power supply tends to fluctuate substantially, use a constant-voltage transformer.

3. Electromagnetic Noise Supression

(1) Wiring and Power Supply

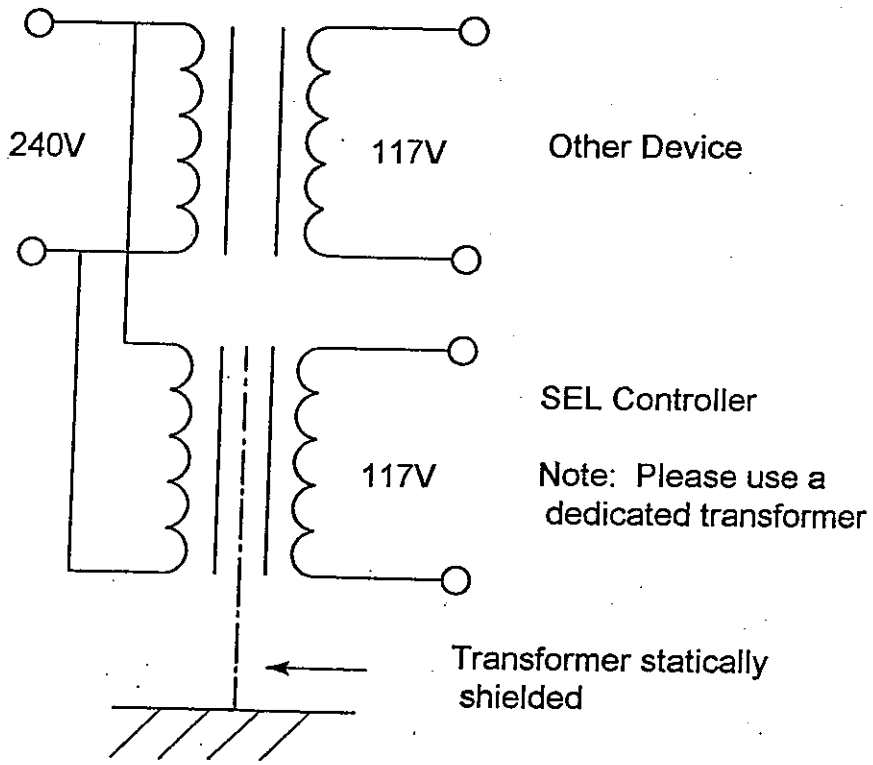
[1] Ground



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[2] 240V Power Source

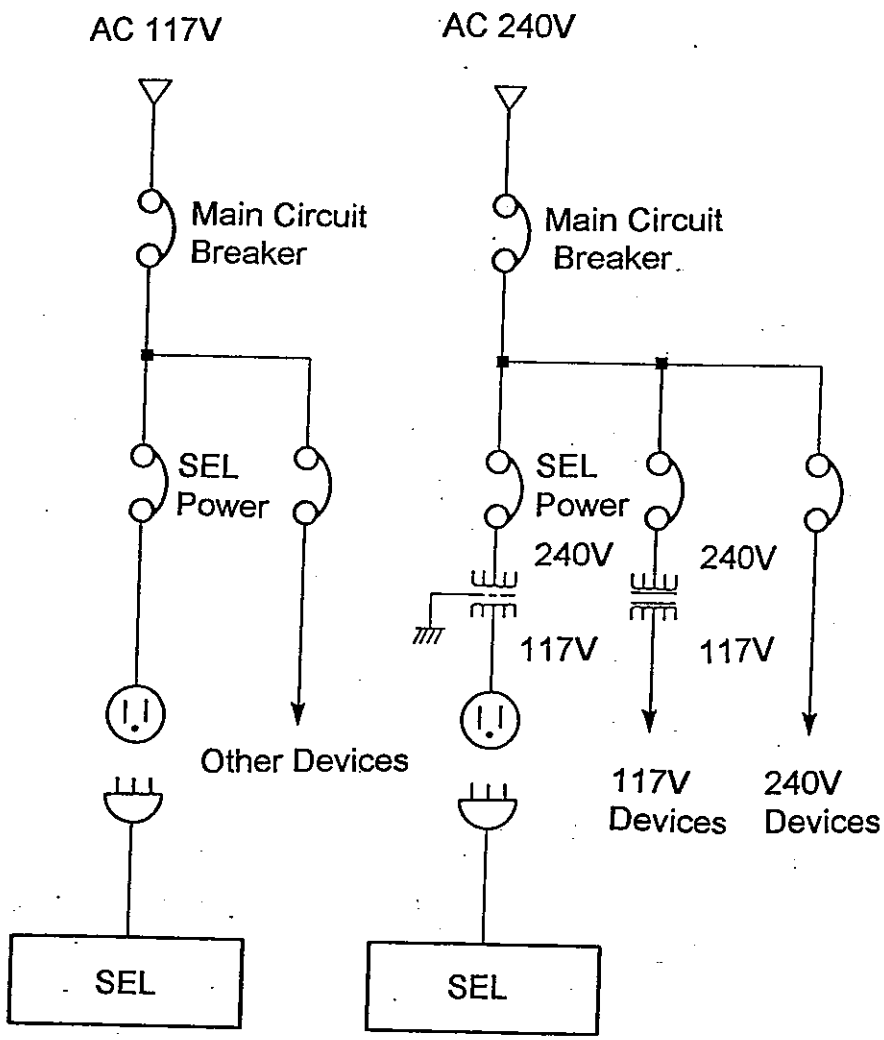
Plesae use a dedicated and insulated power transformer when the system has a 240V power source.



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[3] Separation of Power

Please use a dedicated and insulated power transformer when the system has a 240V power source.



[4] Wiring Notes

1. To reduce noise problems, the 117V and the 24V external power cable should be a twisted pair.
2. Isolate the SEL cables from the power line.
3. Isolate the encoder cable from the motor cable.
4. Consult with IAI when you extend the Motor and Encoder cables beyond the recommended maximum length of 10 meters.

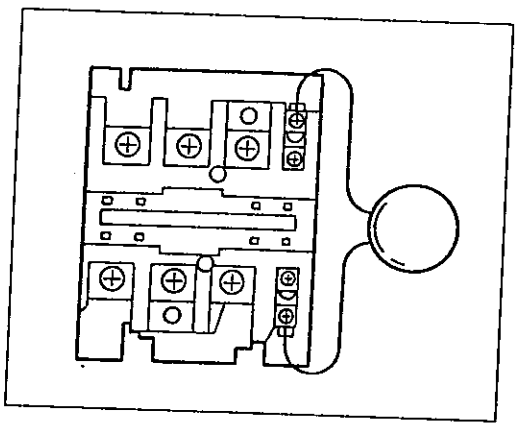
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(2) Noise Source and Noise Suppression

When using electrical components such as electromagnets, solenoids, or relays which create electromagnetic noise, some type of noise supression device should be used.

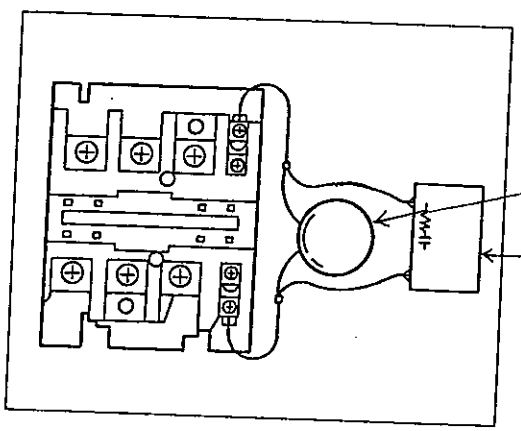
1) AC Load

- Install a surge absorber parallel to the reactance load (solenoid and relay coils).



Note Use the shortest possible wiring between the surge absorber and the noise-creating device as possible. Use of excessively long wiring will decrease the performance of the surge absorber.

- Install a surge absorber and surge killer parallel to the reactance load (solenoid and relay coils).



Note The most effective method of using a surge absorber and surge killer is in parallel. This will reduce noise in a wide band of frequencies.

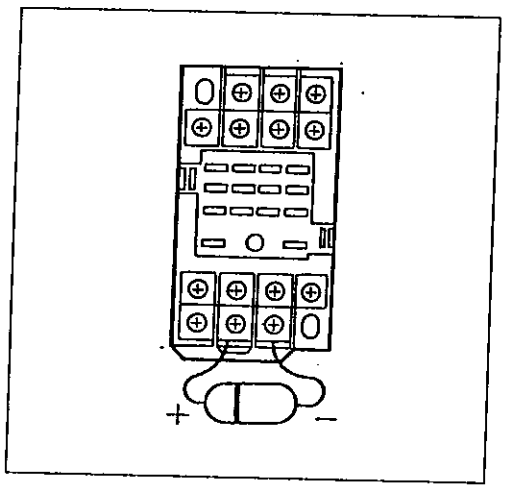
Surge Absorber (Metal Oxide Varistor or Transzorb).

Surge Killer (Resistor Capacitor Snubber)

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2) DC Load

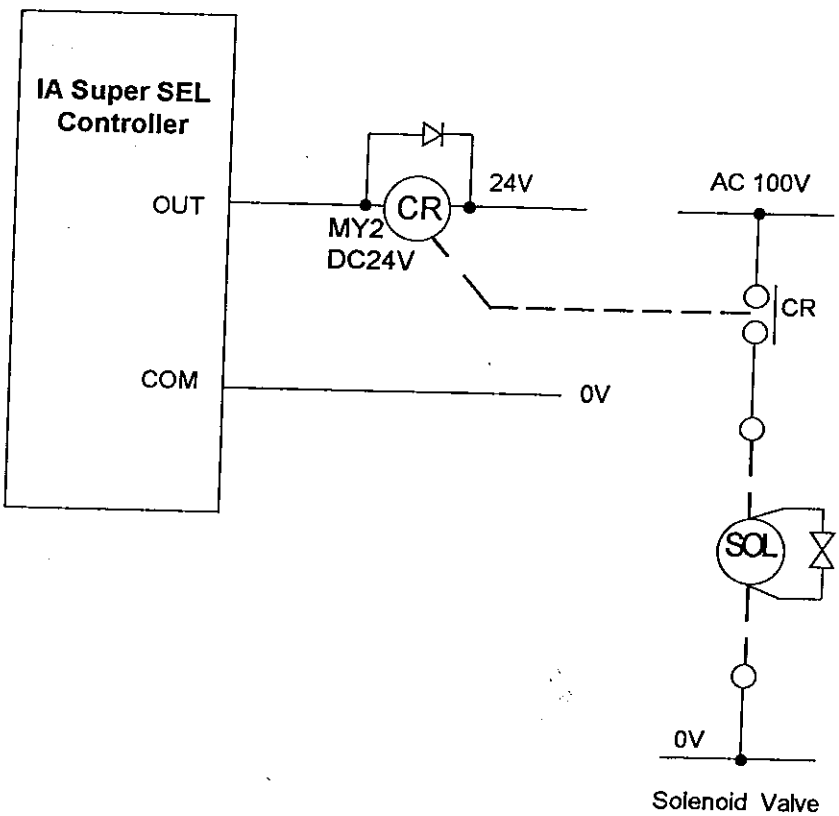
- Install a diode parallel with a reactive/inductive load.



Note

- Select a diode with the proper voltage rating. The voltage rating is determined by the loading capacity of the system.
- When installing the diode, pay careful attention to the polarity of the diode. A diode installed in reverse polarity could damage your IA System's internal circuitry.
- If the Controller output will be driving a 24V relay or a 120V solenoid valve, the diode must be installed to reduce any noise made by these devices.

Circuit Example

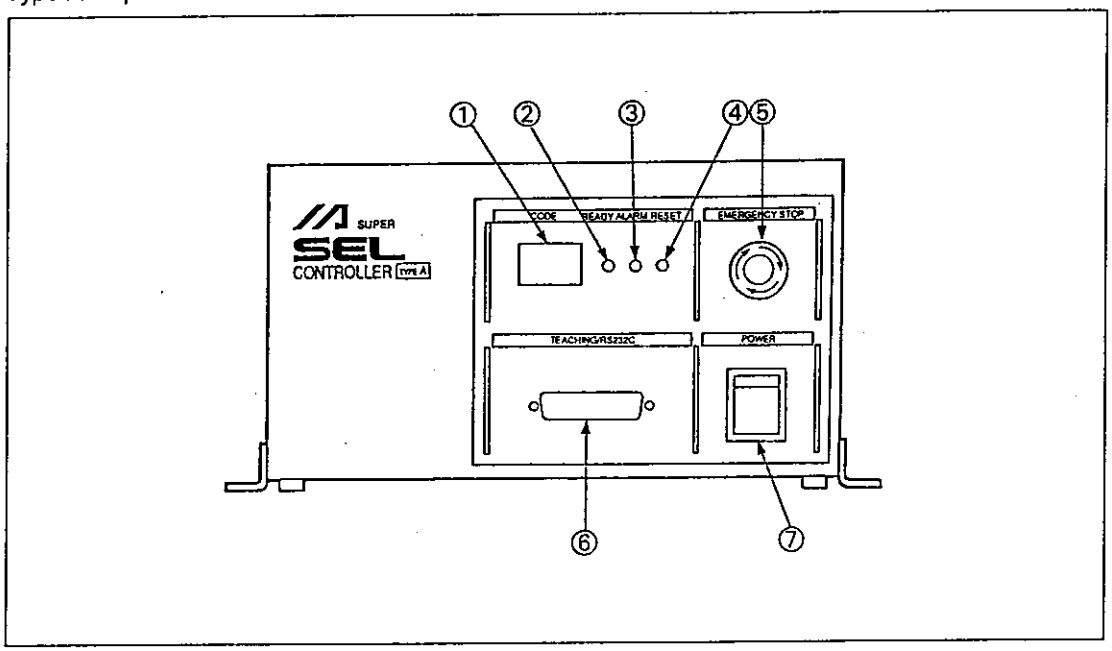


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Part 3 - Features and Functions

1. **Super SEL Controller Front Panel** (Features of the Type B model are the same as that of Type A below.)

Type A Super SEL Controller



[1] **Code** (Code Display)
Controller Operating Status Display (2 digit, 7 segment)

[2] **Ready** (Ready Display LED)
Indicates if the controller is operable.

[3] **Alarm** (Alarm Display LED)
Alerts the operator of any abnormality in the system.

[4] **Reset** (Reset switch)
Hardware reset switch. Resets CPU.
If the Reset switch is pressed while the main CPU is communicating with any sub-CPU, the display will show "SC" on the Code Display. To reset, turn the power switch OFF and then ON.

[5] **Emergency Stop**
When the Emergency Stop button is pressed, the alarm output turns ON, the servos are disengaged and all programmable outputs are turned OFF. To Reset Emergency Stop, Turn OFF the Power Switch, and then turn it back ON.

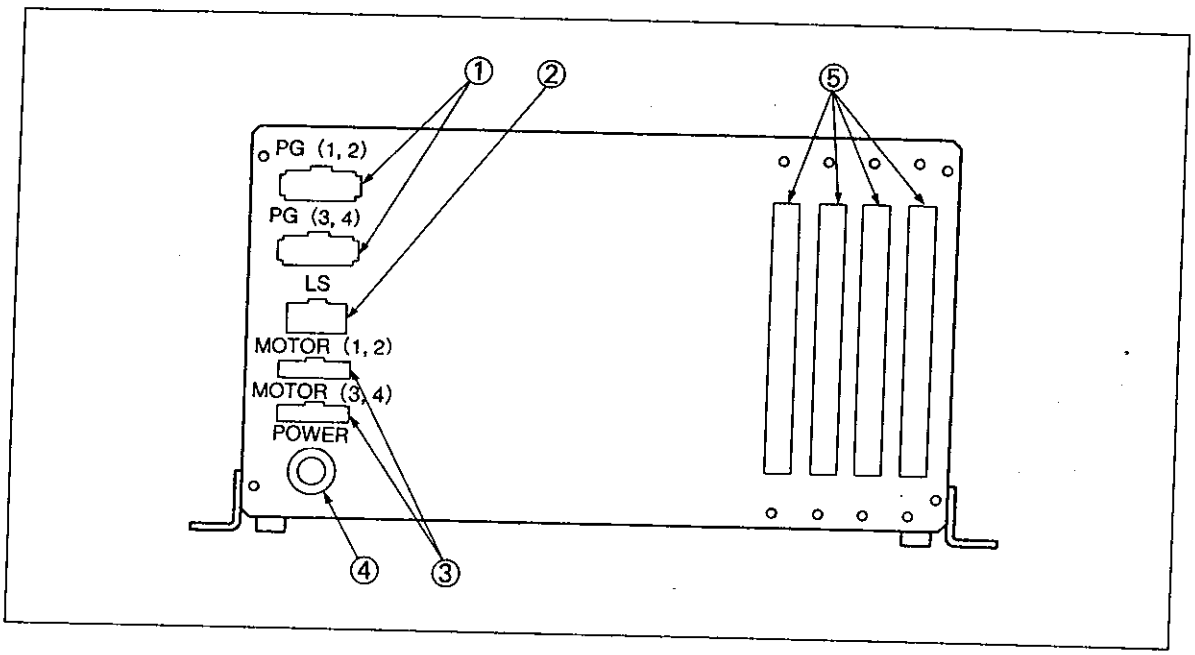
[6] **Teaching/RS232C Connector**
Connector for Teaching Pendant or PC.

[7] **Power ON/OFF**
Power Switch. After turning the power OFF, wait at least 10 seconds or more before turning the power back ON.

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2. Controller Rear Panel

(1) Type A Controller (4 Axis Specification)



[1] **PG** (1, 2) (3, 4) Encoder Cable Connector 1, 2, 3, 4 Axis Use)
18 pins, encoder cable connector (Model: Nichiatsu SMR-18V)

[2] **LS** (Limit Switch Cable Connector)
9 pins, limit switch cable connector (Model: Nichiatsu MLR-09)

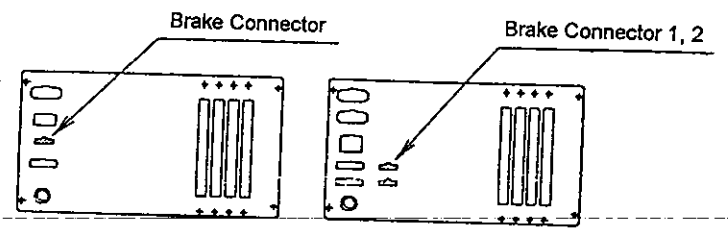
[3] **Motor** (1, 2) (3, 4) (Servo Motor Cable Connector 1, 2, 3, 4 Axis Use)
4 pins, servo motor cable connector (Model: Nichiatsu MLR-04)

[4] **Power** (Power Cable)
AC Power Cable

[5] **I/O Connector**
50 pins, external I/O connector (Model: Yamaichi FAP-50)

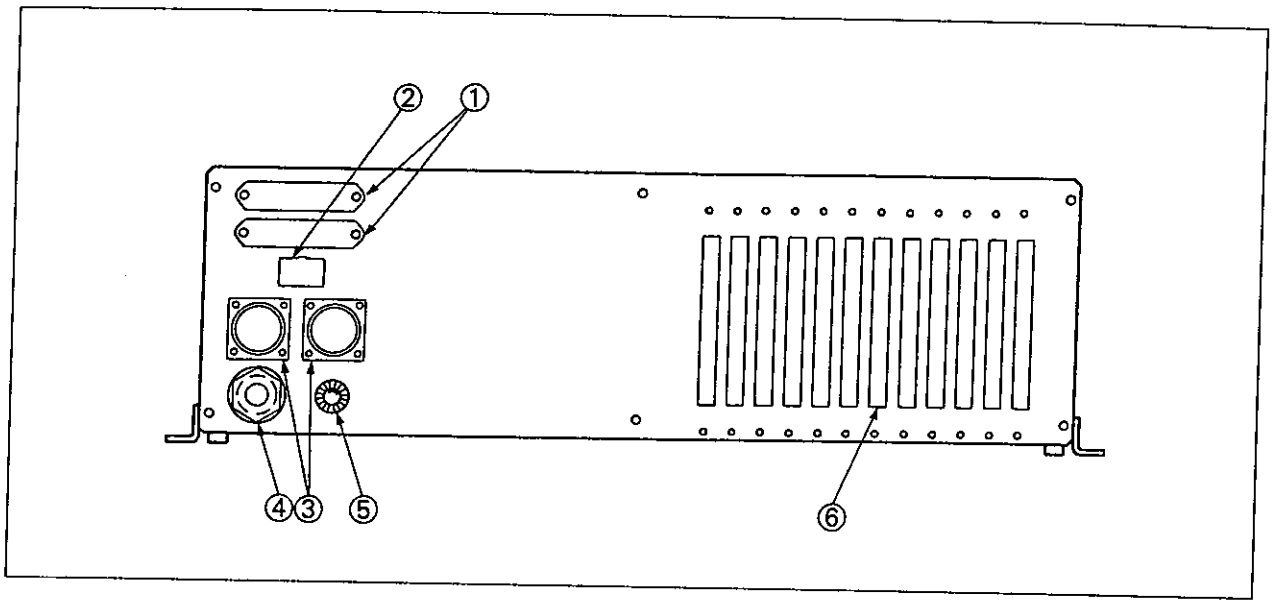
*Approximately 80mm spacing is necessary around a controller rear panel for connector attachments.

*The placement of the brake connector is shown below. (Model: Nichiatsu SMP-05V-BC)
Refer to the *Supplement in this manual for more details.



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(2) Type B Controller



[1] **PG** (1, 2, 3, 4) (5, 6, 7, 8) (Encoder Cable Connector 1 ~ 8 Axis Use)
36 pins, encoder cable connector (Model DDK 57FE-40360)

[2] **LS** (Limit Switch Cable Connector)
12 pins, limit switch cable connector (Model: Nichiatsu MLR-12)

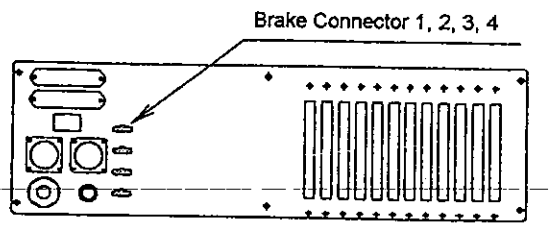
[3] **Motor** (1, 2, 3, 4) (5, 6, 7, 8) (Servo Motor Cable Connector 1 ~ 8 Axis Use)
10 pins, servo motor cable connector (Model: Hirose JRC21RG-10SC)

[4] **Power** (Power Cable)
AC Power Cable

[5] **Fuse**
Power fuse (differs depending on the number of axes and the power consumption)

[6] **I/O Connector**
50 pin external I/O Connector (Model: Yamaichi FAP-50)

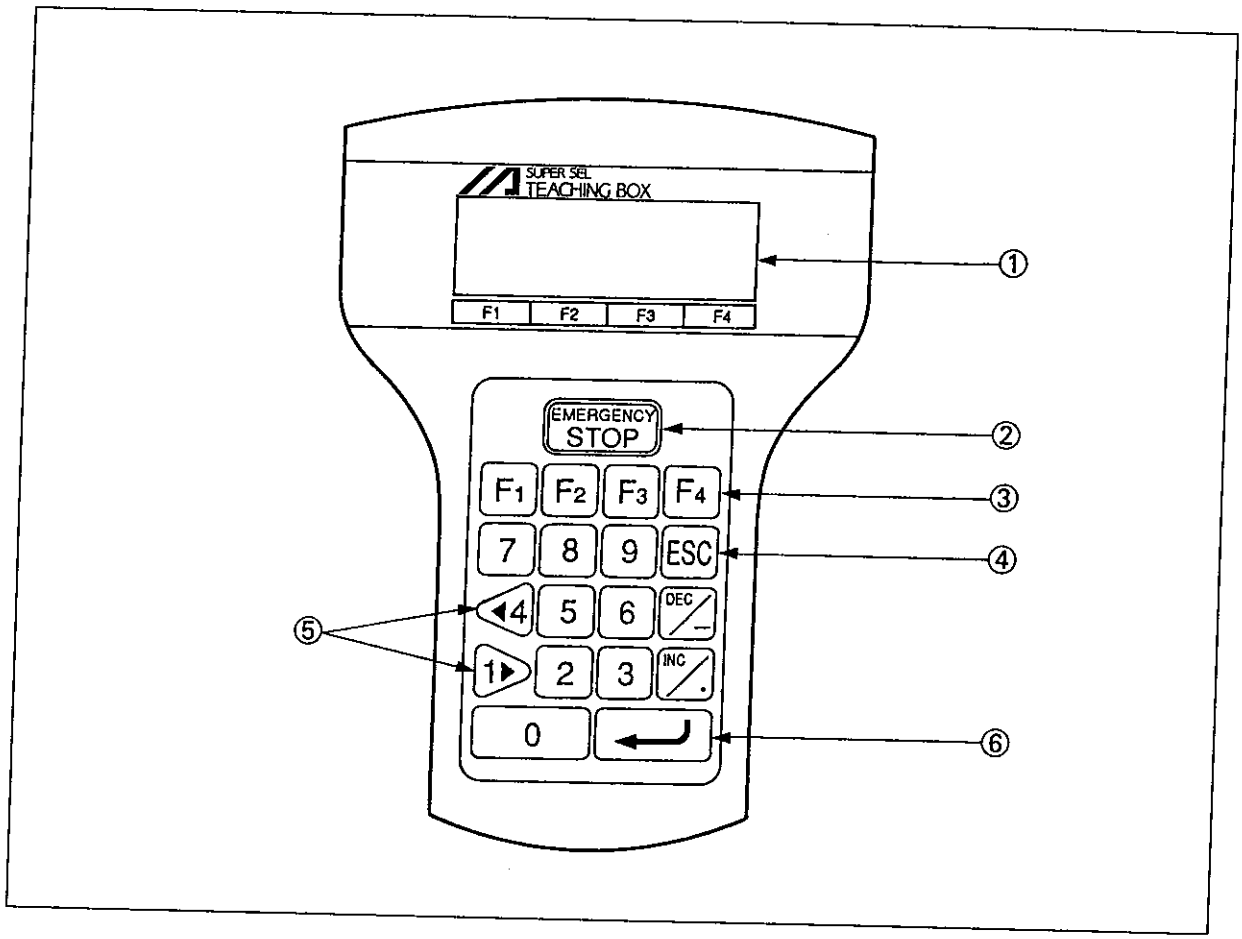
*The AC power cable for Type B 240W is somewhat different. Refer to the *Supplement in this manual for details.
*Approximately 80mm spacing is necessary around a controller rear panel for connector attachments.
*The placement of the brake connector is shown below. (Model: Nichiatsu SMP-05V-BC)
Refer to the *Supplement in this manual for details.



Type B (8 axes)

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3. Teaching Pendant (Option)



[1] **LCD Display**
4 lines with a 20 character per line capacity display. Shows program and Motion status.

[2] **Emergency Stop**
When the emergency stop button is pressed, servos will disengage and all programmable outputs will be turned OFF. To release the emergency stop, press Restart (F1) on the LCD Display.

[3] **F1, F2, F3, F4** (Function Key)
Multi-function keys which correspond with the LCD Display.

[4] **ESC** (Escape)
The escape key allows the operator to go backwards in one-step increments to previous displays to make corrections or to switch to different modes.

[5] ◀ ▶
Dual function keys for use in data input and axis Jog functions.

[6] ↵ (Return Key)
Return key is used to change operations and to move the cursor position.

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Part 4 - Specifications

1. (1) Type A Controller

Number of Axes	2-Axis (60W X 2)	3-Axis (60W X 3)	4-Axis (60W X 4)
Power Voltage	AC117V +/- 10%		
Power Frequency	50/60Hz		
Power Consumption	Approximately 280W	Approximately 390W	Approximately 500W
Ambient Temperature and Humidity	Temperature 0 ~ 50 degrees Centigrade, Humidity less than 85%RH		
Ambient Environment	No-Corrosive Gas, Minimal Dust		
Isolation Resistance	500V 10M Ω or more		
Noise Immunity	1500V 1 microsecond pulse by noise simulator (Controller Unit Test)		
Unit Weight	Approximately 4kg (8.82 lbs)	Approximately 5kg (11.1 lbs)	Approximately 5kg (11.1 lbs)
Protective Functions	Driver Humidity Check, Overload Check, Software Limit Check		
Motor Capacity	DC Servo Motor 20W ~ 200W		
Memory Capacity	Approximately 2,000 Steps and 1,000 Positions Total		
Number of Program	48 Programs 8 Multi-Tasking Programs		
Memory Device	CMOS RAM Battery Backup		
Input/Output (DC24V)	Dedicated Input: Emergency Stop, Limit Switch Standard I/O: 24 Inputs and 24 Outputs (including dedicated I/O) Extended I/O: 1 Module 24 Input, 24 Output. Maximum Expansion up to 3 Modules (Maximum of 95 Inputs / 96 Outputs) DC24V 0.5A Built-in. (An external supply is recommended) Output Maximum Loading Current: 100mA/1port (20mA/1port recommended)		
Data Input Method	Teaching Pendant or RS232C Communications		
Communications	EIA RS232C Asynchronous		

(2) Type B Controller

Number of Axes	4-Axis (60W X 2)	6-Axis (60W X 3)	8-Axis (60W X 4)
Power Voltage	AC117V +/- 10%		
Power Frequency	50/60Hz		
Power Consumption	Approximately 520W	Approximately 740W	Approximately 960W
Ambient Temperature and Humidity	Temperature 0 ~ 50 degrees Centigrade, Humidity less than 85%RH		
Ambient Environment	No-Corrosive Gas, Minimal Dust		
Isolation Resistance	500V 10M Ω or more		
Noise Immunity	1500V 1 microsecond pulse by noise simulator (Controller Unit Test)		
Unit Weight	Approximately 10kg	Approximately 11kg	Approximately 12kg
Protective Functions	Driver Humidity Check, Overload Check, Software Limit Check		
Motor Capacity	DC Servo Motor 20W ~ 200W		
Memory Capacity	Approximately 2,500 Steps and 1,500 Positions Total		
Number of Program	64 Programs 16 Multi-Tasking Programs		
Memory Device	CMOS RAM Battery Backup		
Input/Output (DC24V)	Dedicated Input: Emergency Stop, Limit Switch Standard I/O: 46 Inputs and 48 Outputs (including dedicated I/O) Extended I/O: 1 Module 24 Input, 24 Output. Maximum Expansion up to 10 Modules (Maximum of 286 Inputs / 288 Outputs) DC24V 0.5A Built-in. (An external supply is recommended) Output Maximum Loading Current: 100mA/1port (20mA/1port recommended)		
Data Input Method	Teaching Pendant or RS232C Communications		
Communications	EIA RS232C Asynchronous		

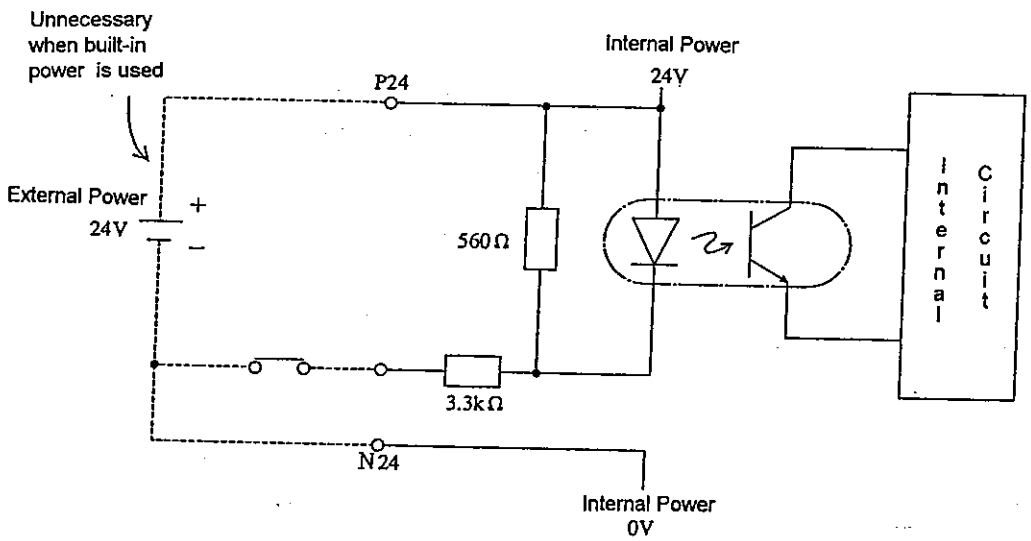
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2 External I/O Specifications

(1) Input

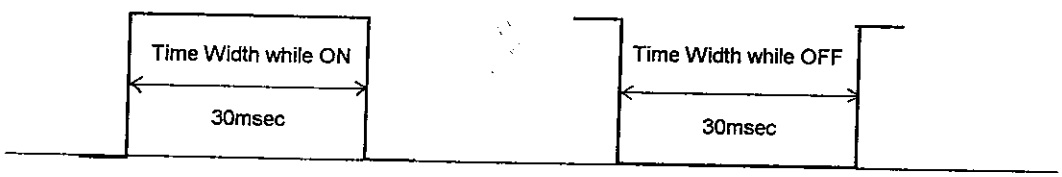
	Specifications
Input Point	Dedicated Input...2 Points (Type A, B) User Input....20 Points (Type A), 44 Points (Type B) Expansion Input (Option)....72 Points (Type A), 240 Points (Type B)
Input Power Voltage	DC24V +/-20%
Input Current	7mA/DC24V
ON/OFF Power Voltage	ON....Min DC16.0V OFF....Max DC5.0V
ON/OFF Response Time	ON....Max 20m sec OFF....Max 20m sec
Isolation Method	Photocoupler

Internal Circuit



1) Wiring to P24 is unnecessary when internal power supply is used for standard I/O board. External power supply is used for expansion I/O.
2) For external circuit connection (no contact point), leakage/1point must be lower than 1mA when switch is OFF.

Guaranteed Operation Width of the Super SEL Controller (A, B) Input Signal



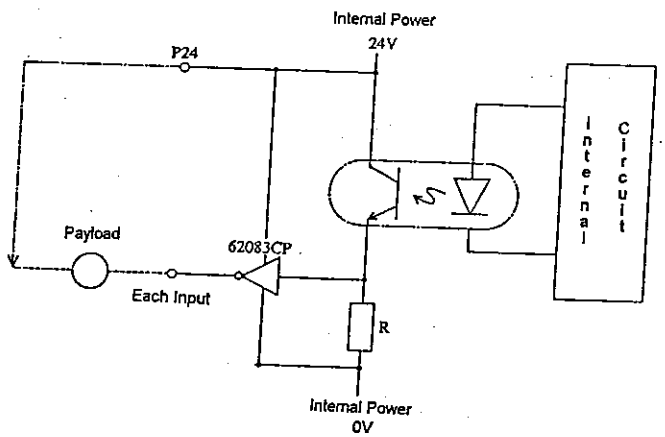
Generally, operation is within 25msec. The Guaranteed Operation Width is 30msec.

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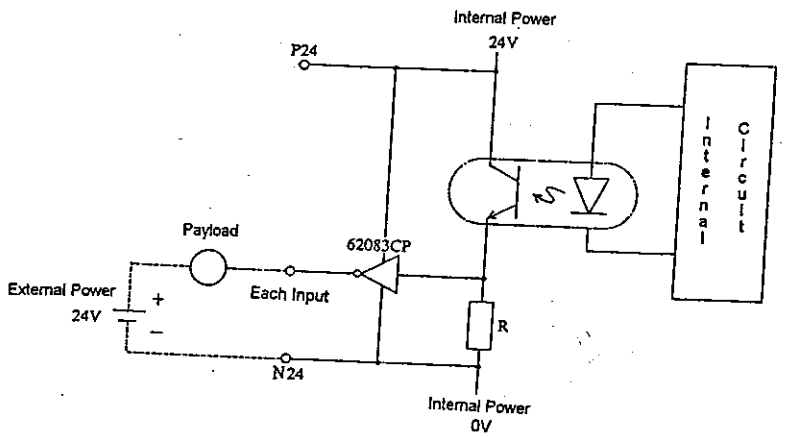
(2) Output

	Specifications
Output Point	Dedicated Output....2 Points (Type A, B) User Output....22 Points (Type A), 46 Points (Type B) Expansion Output (Option)....72 Points (Type A), 240 Points (Type B)
Rated Power	DC24V
Max Current	100mA/1Point
Recommended Current	20mA/1Point
Leakage	0.1mA (Max)
Residual Voltage	3.1V/40mA (Max)
Insulation Method	Photocoupler

Internal Power



External Power



When internal power supply is used for standard attachment I/O board, supply 24V from P24 to the load. External power supply is used for expansion I/O.

*This output element can be damaged by underload or overload. When it is damaged, the controller CPU will not turn ON.

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3 Servo

	Specifications
Control Method	Semiclosed Loop Control
Position Feedback	Rotary Encoder A, B, Z Phase
Accuracy	+/- 2 Pulse
Velocity	1m/sec ~ 1500m/sec*
Acceleration	0.01G ~ 1G

*Max velocity differs depending on actuator specifications.

4 Teaching Pendant Specifications

	Specifications
Ambient Temperature and Humidity	Temperature 0 ~ 40 degrees Centigrade Less than 85%RH
Ambient Environment	No-Corrosive Gas Minimal Dust
Weight	500g
Cable Length	2m
Display	20 X 4 LCD Display

5 Emergency Stop Output (Alarm Output)

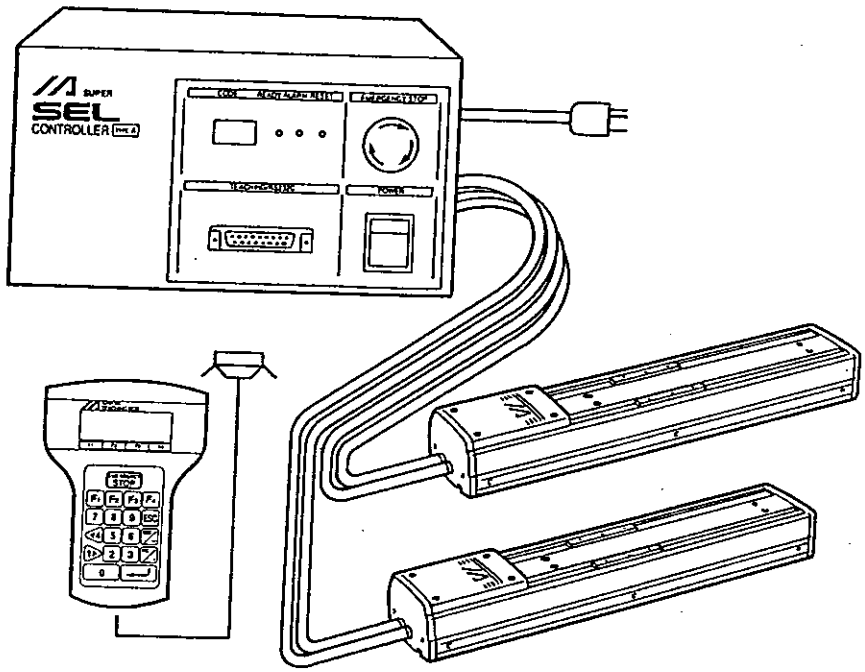
Pin No. 13B (Port No. 300) will be output by a servo related alarm A☐ besides the Emergency Stop.

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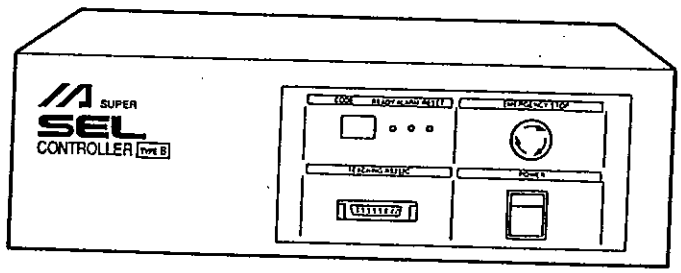
Part 5 - System Configurations

1. Connecting Your Super SEL Controller and Actuator

Type A



Type B



[1] Connect controller and actuator cables. Use only IA supplied cables. These cables include:
   a. Motor Cable
   b. Encoder Cable
   c. Teaching Pendant Cable
   d. Brake Cable (optional)
   e. Limit Switch Cable (optional)

[2] Connect the power cord to an AC117V outlet.

[3] Turn ON the power switch on the Super SEL Controller Front Panel. The Cord Display Window will show *oP, Su, SC, P5,* then *rd* in sequence. Your Super SEL Controller is now ready to operate. If the display stops at EG, release the Emergency Stop Input.

* An "E-Stop" input is provided on input pin 2B of the standard connector. Release of the "E-Stop" condition requires a closure from 2B to pin 25B (0V reference)

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2. Interface List

Standard I/O Connector (Type A & B Controllers)

Pin No.	Category	Port No.	Function	Cable
1A	P24	-	Built-In Power +24V	1-Brown
1B	Input	000	External Start Input	1-Red
2A		001	User Input	1-Orange
2B		002	Emergency Stop (Point b Input) *1	1-Yellow
3A		003	Unused (NC) *2	1-Green
3B		004	Unused (NC) *2	1-Blue
4A		005	User Input	1-Purple
4B		006	User Input	1-Gray
5A		007	User Input	1-White
5B		008	PRG No. 1 (User Input)	1-Black
6A		009	PRG No. 2 (User Input)	2-Brown
6B		010	PRG No. 4 (User Input)	2-Red
7A		011	PRG No. 8 (User Input)	2-Orange
7B		012	PRG No. 10 (User Input)	2-Yellow
8A		013	PRG No. 20 (User Input)	2-Green
8B		014	PRG No. 40 (User Input)	2-Blue
9A		015	User Input	2-Purple
9B		016	User Input	2-Gray
10A		017	User Input	2-White
10B		018	User Input	2-Black
11A		019	User Input	3-Brown
11B		020	User Input	3-Red
12A		021	User Input	3-Orange
12B		022	User Input	3-Yellow
13A		023	User Input	3-Green
13B	Output	300	Emergency Stop/Alarm Output	3-Blue
14A		301	Ready Output	3-Purple
14B		302	User Output	3-Gray
15A		303	User Output	3-White
15B		304	User Output	3-Black
16A		305	User Output	4-Brown
16B		306	User Output	4-Red
17A		307	User Output	4-Orange
17B		308	User Output	4-Yellow
18A		309	User Output	4-Green
18B		310	User Output	4-Blue
19A		311	User Output	4-Purple
19B		312	User Output	4-Gray
20A		313	User Output	4-White
20B		314	User Output	4-Black
21A		315	User Output	5-Brown
21B		316	User Output	5-Red
22A		317	User Output	5-Oange
22B		318	User Output	5-Yellow
23A		319	User Output	5-Green
23B		320	User Output	5-Blue
24A		321	User Output	5-Purple
24B		322	User Output	5-Gray
25A		323	User Output	5-White
25B	N24	-	Built-In Power 0V	5-Black

*1. Emergency Stop (normally closed). To release emergency Stop, connect Pin 2B and Pin 25B.

*2. Pin No. 3A (Port No. 003) and Pin No. 3B (Port No. 004) cannot be used as User Input.

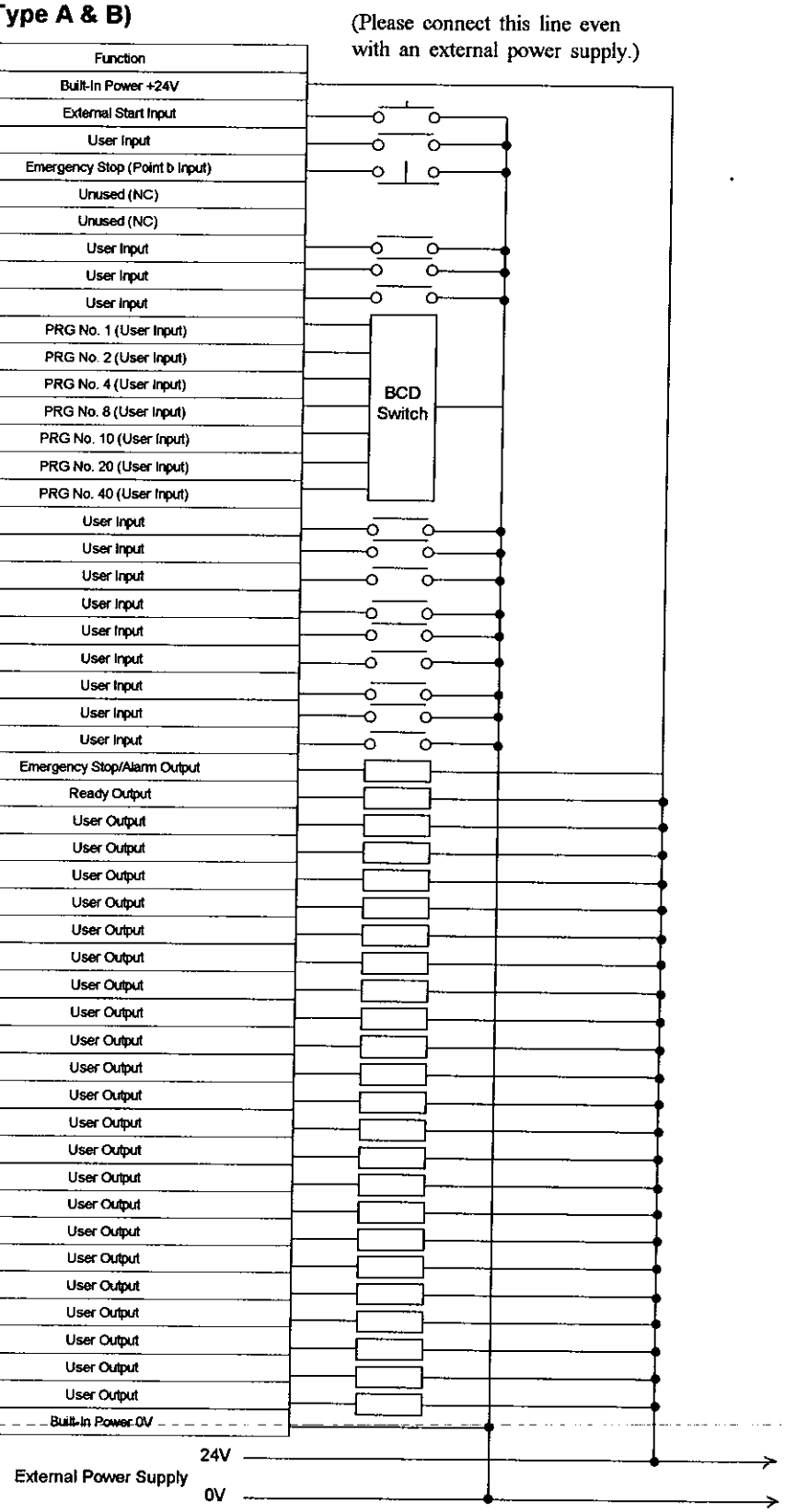
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3. Wiring Diagram

A. Standard I/O (1st Module for Type A & B)

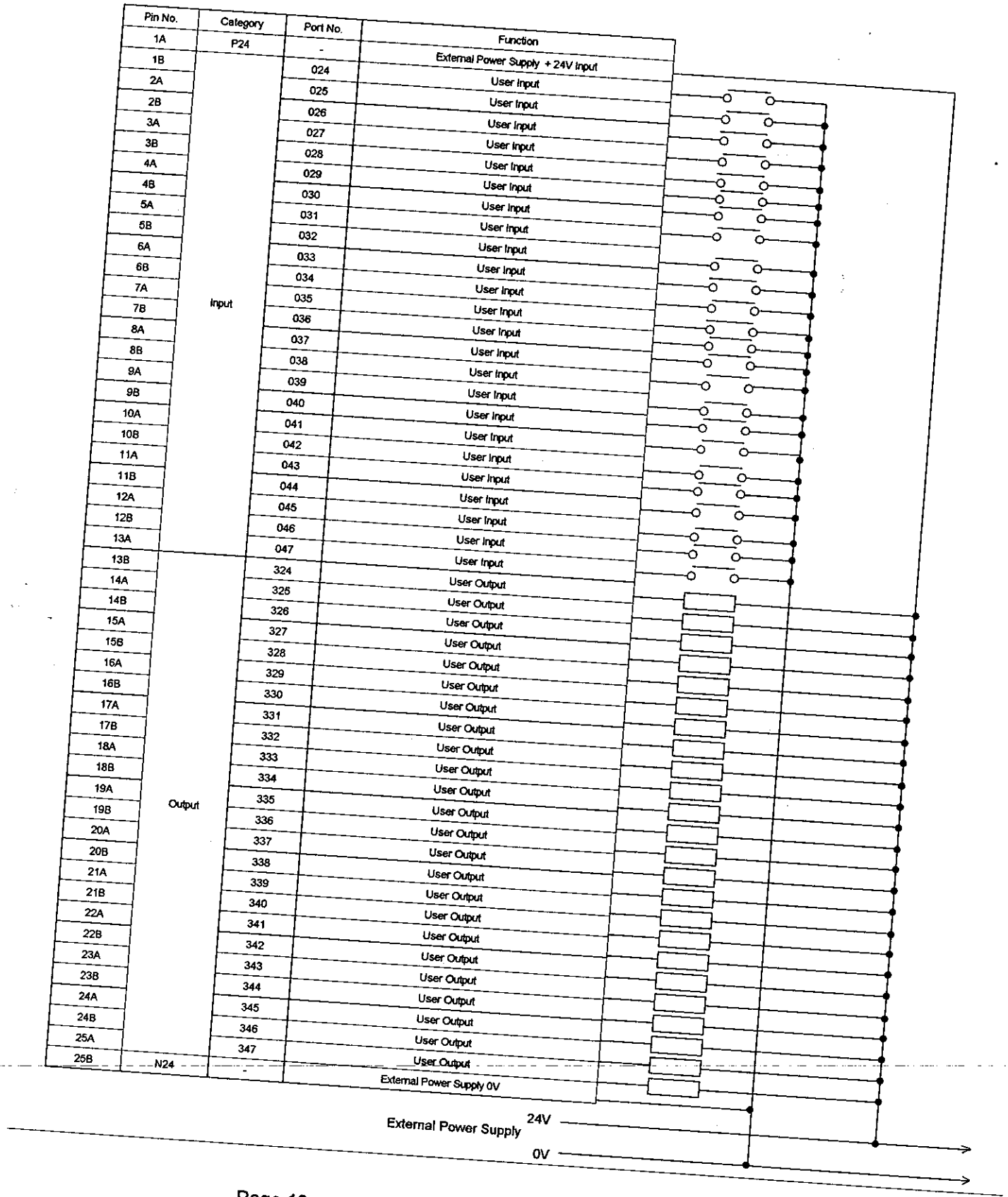
Pin No.	Category	Port No.	Function
1A	P24	-	Built-In Power +24V
1B	Input	000	External Start Input
2A		001	User Input
2B		002	Emergency Stop (Point b Input)
3A		003	Unused (NC)
3B		004	Unused (NC)
4A		005	User Input
4B		006	User Input
5A		007	User Input
5B		008	PRG No. 1 (User Input)
6A		009	PRG No. 2 (User Input)
6B		010	PRG No. 4 (User Input)
7A		011	PRG No. 8 (User Input)
7B		012	PRG No. 10 (User Input)
8A		013	PRG No. 20 (User Input)
8B		014	PRG No. 40 (User Input)
9A		015	User Input
9B		016	User Input
10A		017	User Input
10B		018	User Input
11A		019	User Input
11B		020	User Input
12A		021	User Input
12B		022	User Input
13A		023	User Input
13B	Output	300	Emergency Stop/Alarm Output
14A		301	Ready Output
14B		302	User Output
15A		303	User Output
15B		304	User Output
16A		305	User Output
16B		306	User Output
17A		307	User Output
17B		308	User Output
18A		309	User Output
18B		310	User Output
19A		311	User Output
19B		312	User Output
20A		313	User Output
20B		314	User Output
21A		315	User Output
21B		316	User Output
22A		317	User Output
22B		318	User Output
23A		319	User Output
23B		320	User Output
24A		321	User Output
24B		322	User Output
25A		323	User Output
25B	N24	-	Built-In Power 0V



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B. I/O Expansion (2nd Module for Type B)

Pin No.	Category	Port No.	Function
1A	P24	-	External Power Supply +24V Input
1B	Input	024	User Input
2A		025	User Input
2B		026	User Input
3A		027	User Input
3B		028	User Input
4A		029	User Input
4B		030	User Input
5A		031	User Input
5B		032	User Input
6A		033	User Input
6B		034	User Input
7A		035	User Input
7B		036	User Input
8A		037	User Input
8B		038	User Input
9A		039	User Input
9B		040	User Input
10A		041	User Input
10B		042	User Input
11A		043	User Input
11B		044	User Input
12A		045	User Input
12B		046	User Input
13A		047	User Input
13B	Output	324	User Output
14A		325	User Output
14B		326	User Output
15A		327	User Output
15B		328	User Output
16A		329	User Output
16B		330	User Output
17A		331	User Output
17B		332	User Output
18A		333	User Output
18B		334	User Output
19A		335	User Output
19B		336	User Output
20A		337	User Output
20B		338	User Output
21A		339	User Output
21B		340	User Output
22A		341	User Output
22B		342	User Output
23A		343	User Output
23B		344	User Output
24A		345	User Output
24B		346	User Output
25A		347	User Output
25B	N24	-	External Power Supply 0V



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4 I/O External I/O Connector

Type A & Type B

Pin No.	Category	Port No,	Function	Cable
1A	P24	-	Built-In Power +24V	1-Brown
1B	Input	000	External Start Input	1-Red
2A		001	User Input	1-Orange
2B		002	Emergency Stop (Point b Input)	1-Yellow
3A		003	Unused (NC)	1-Green
3B		004	Unused (NC)	1-Blue
4A		005	User Input	1-Purple
4B		006	User Input	1-Gray
5A		007	User Input	1-White
5B		008	PRG No. 1 (User Input)	1-Black
6A		009	PRG No. 2 (User Input)	2-Brown
6B		010	PRG No. 4 (User Input)	2-Red
7A		011	PRG No. 8 (User Input)	2-Orange
7B		012	PRG No. 10 (User Input)	2-Yellow
8A		013	PRG No. 20 (User Input)	2-Green
8B		014	PRG No. 40 (User Input)	2-Blue
9A		015	User Input	2-Purple
9B		016	User Input	2-Gray
10A		017	User Input	2-White
10B		018	User Input	2-Black
11A		019	User Input	3-Brown
11B		020	User Input	3-Red
12A		021	User Input	3-Orange
12B		022	User Input	3-Yellow
13A		023	User Input	3-Green
13B	Output	300	Emergency Stop/Alarm Output	3-Blue
14A		301	Ready Output	3-Purple
14B		302	User Output	3-Gray
15A		303	User Output	3-White
15B		304	User Output	3-Black
16A		305	User Output	4-Brown
16B		306	User Output	4-Red
17A		307	User Output	4-Orange
17B		308	User Output	4-Yellow
18A		309	User Output	4-Green
18B		310	User Output	4-Blue
19A		311	User Output	4-Purple
19B		312	User Output	4-Gray
20A		313	User Output	4-White
20B		314	User Output	4-Black
21A		315	User Output	5-Brown
21B		316	User Output	5-Red
22A		317	User Output	5-Oange
22B		318	User Output	5-Yellow
23A		319	User Output	5-Green
23B		320	User Output	5-Blue
24A		321	User Output	5-Purple
24B		322	User Output	5-Gray
25A		323	User Output	5-White
25B	N24	-	Built-In Power 0V	5-Black

I/O Expansion

Pin No.	Category	Port No,	Function	Cable
1A	P24	-	External Power +24V Output	1-Brown
1B	Input	024	User Input	1-Red
2A		025	User Input	1-Orange
2B		026	User Input	1-Yellow
3A		027	User Input	1-Green
3B		028	User Input	1-Blue
4A		029	User Input	1-Purple
4B		030	User Input	1-Gray
5A		031	User Input	1-White
5B		032	User Input	1-Black
6A		033	User Input	2-Brown
6B		034	User Input	2-Red
7A		035	User Input	2-Orange
7B		036	User Input	2-Yellow
8A		037	User Input	2-Green
8B		038	User Input	2-Blue
9A		039	User Input	2-Purple
9B		040	User Input	2-Gray
10A		041	User Input	2-White
10B		042	User Input	2-Black
11A		043	User Input	3-Brown
11B		044	User Input	3-Red
12A		045	User Input	3-Orange
12B		046	User Input	3-Yellow
13A		047	User Input	3-Green
13B	Output	324	User Output	3-Blue
14A		325	User Output	3-Purple
14B		326	User Output	3-Gray
15A		327	User Output	3-White
15B		328	User Output	3-Black
16A		329	User Output	4-Brown
16B		330	User Output	4-Red
17A		331	User Output	4-Orange
17B		332	User Output	4-Yellow
18A		333	User Output	4-Green
18B		334	User Output	4-Blue
19A		335	User Output	4-Purple
19B		336	User Output	4-Gray
20A		337	User Output	4-White
20B		338	User Output	4-Black
21A		339	User Output	5-Brown
21B		340	User Output	5-Red
22A		341	User Output	5-Oange
22B		342	User Output	5-Yellow
23A		343	User Output	5-Green
23B		344	User Output	5-Blue
24A		345	User Output	5-Purple
24B		346	User Output	5-Gray
25A		347	User Output	5-White
25B	N24	-	External Power 0V	5-Black

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5. Teaching/RS232C Connector (D-Sub 25 DTE Special *)

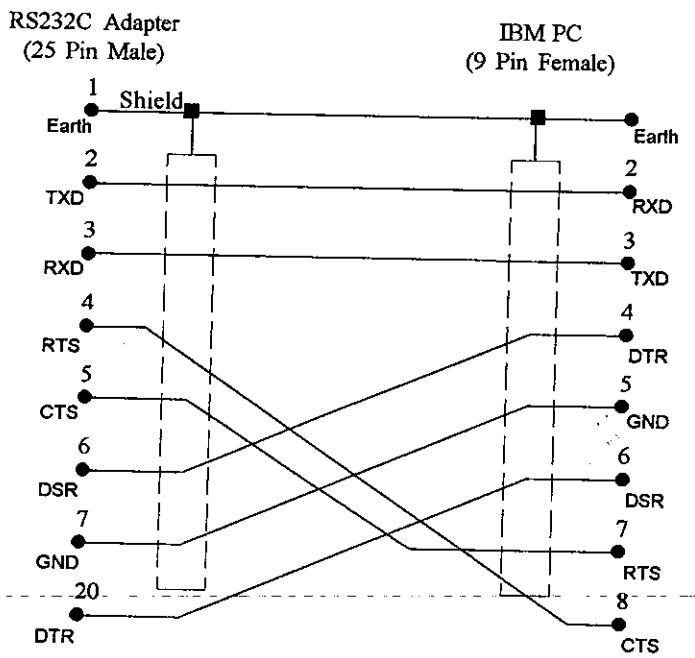
Pin No.	Signal
1	FG
2	TXD
3	RXD
4	(RTS)
5	(CTS)
6	DSR
7	SG
8	NC
9	NC
10	NC
11	NC
12	NC
13	NC

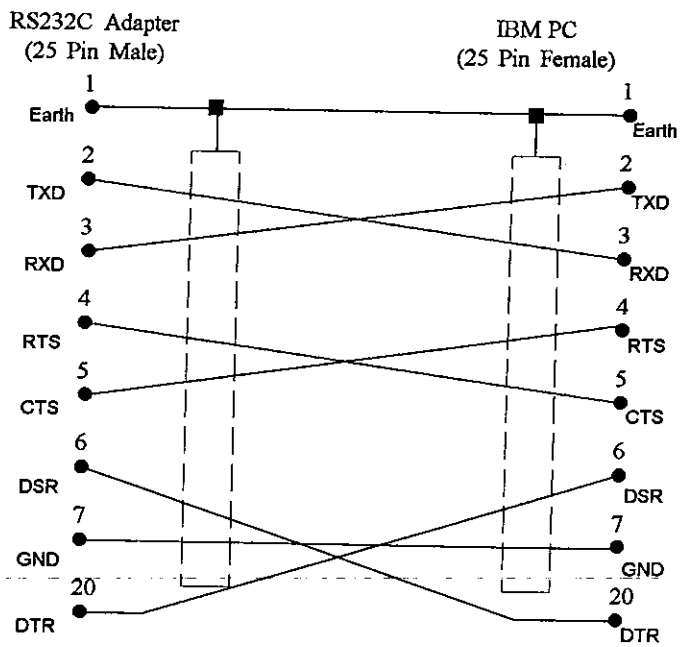
Pin No.	Signal	
14	NC	
15	NC	
16	NC	
17	NC	
18	+6.2V Output	*
19	NC	
20	DTR	
21	NC	
22	NC	
23	Emergency Stop Switch (EMG.SW)	*
24	NC	
25	0V (+6.2V)	*

- Pin numbers 18, 21, 23, 25 are for use with the Teaching Pendant signal. Do not connect these pins.
- Pin numbers 4 and 5 are short-circuited.

■ RS232C Cable

Use RS232C Cable Pin Configuration (Between Controller and Computer Serial Port)





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6 Servo Motor Motor Connector

(1) Type A (1, 2 Axis)

Pin No.	Signal
1	X Axis A
2	X Axis B
3	Y Axis A
4	Y Axis B

Type A (3, 4 Axis)

Pin No.	Signal
1	Z Axis A
2	Z Axis B
3	θ Axis A
4	θ Axis B

*Connecotr Nichiatsu Housing MLP-04
Socket Contact LLF-01 T-1.3

(2) Type B (1, 2, 3, 4 Axis)

Pin No.	Signal
1	1 Axis A
2	1 Axis B
3	2 Axis A
4	2 Axis B
5	3 Axis A
6	3 Axis B
7	4 Axis A
8	4 Axis B
9	NC
10	NC

Type B (5, 6, 7, 8 Axis)

Pin No.	Signal
1	5 Axis A
2	5 Axis B
3	6 Axis A
4	6 Axis B
5	7 Axis A
6	7 Axis B
7	8 Axis A
8	8 Axis B
9	NC
10	NC

*Connector Hirose JR21PK-10PC

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7 PG INPUT Encoder Connector

(1) Type A (1,2 Axis)

Pin No.	Signal	
1	X Axis	+ 5V
2	X Axis	GND
3	X Axis	A Phase
4	X Axis	$\overline{A}$ Phase
5	X Axis	B Phase
6	X Axis	$\overline{B}$ Phase
7	X Axis	Z Phase
8	X Axis	$\overline{Z}$ Phase
9	X Axis	FG (Shield)
10	Y Axis	+ 5V
11	Y Axis	GND
12	Y Axis	A Phase
13	Y Axis	$\overline{A}$ Phase
14	Y Axis	B Phase
15	Y Axis	$\overline{B}$ Phase
16	Y Axis	Z Phase
17	Y Axis	$\overline{Z}$ Phase
18	Y Axis	FG (Shield)

Type A (3,4 Axis)

Pin No.	Signal	
1	Z Axis	+ 5V
2	Z Axis	GND
3	Z Axis	A Phase
4	Z Axis	$\overline{A}$ Phase
5	Z Axis	B Phase
6	Z Axis	$\overline{B}$ Phase
7	Z Axis	Z Phase
8	Z Axis	$\overline{Z}$ Phase
9	Z Axis	FG (Shield)
10	θ Axis	+ 5V
11	θ Axis	GND
12	θ Axis	A Phase
13	θ Axis	$\overline{A}$ Phase
14	θ Axis	B Phase
15	θ Axis	$\overline{B}$ Phase
16	θ Axis	Z Phase
17	θ Axis	$\overline{Z}$ Phase
18	θ Axis	FG (Shield)

*Connector Nichiatsu Connector SMR-D5V-B
Contact BYM-001T-0.6A

*$\overline{A}$ Phase is A phase 0V, $\overline{B}$ Phase is B phase 0V, and $\overline{Z}$ Phase is Z phase 0V.

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(2) Type B (1, 2, 3, 4 Axis)

Pin No.	Signal	
1	1 Axis	+ 5V
2	1 Axis	A Phase
3	1 Axis	B Phase
4	1 Axis	Z Phase
5	2 Axis	+ 5V
6	2 Axis	A Phase
7	2 Axis	B Phase
8	2 Axis	Z Phase
9	3 Axis	+ 5 V
10	3 Axis	A Phase
11	3 Axis	B Phase
12	3 Axis	Z Phase
13	4 Axis	+ 5V
14	4 Axis	A Phase
15	4 Axis	B Phase
16	4 Axis	Z Phase
17		NC
18		NC

Pin No.	Signal	
19	1 Axis	FG
20	1 Axis	$\overline{A}$ Phase
21	1 Axis	$\overline{B}$ Phase
22	1 Axis	GND
23	2 Axis	FG
24	2 Axis	$\overline{A}$ Phase
25	2 Axis	$\overline{B}$ Phase
26	2 Axis	GND
27	3 Axis	FG
28	3 Axis	$\overline{A}$ Phase
29	3 Axis	$\overline{B}$ Phase
30	3 Axis	GND
31	4 Axis	FG
32	4 Axis	$\overline{A}$ Phase
33	4 Axis	$\overline{B}$ Phase
34	4 Axis	GND
35		NC
36		NC

Type B (5, 6, 7, 8 Axis)

Pin No.	Signal	
1	5 Axis	+ 5V
2	5 Axis	A Phase
3	5 Axis	B Phase
4	5 Axis	Z Phase
5	6 Axis	+ 5V
6	6 Axis	A Phase
7	6 Axis	B Phase
8	6 Axis	Z Phase
9	7 Axis	+ 5 V
10	7 Axis	A Phase
11	7 Axis	B Phase
12	7 Axis	Z Phase
13	8 Axis	+ 5V
14	8 Axis	A Phase
15	8 Axis	B Phase
16	8 Axis	Z Phase
17		NC
18		NC

Pin No.	Signal	
19	5 Axis	FG
20	5 Axis	$\overline{A}$ Phase
21	5 Axis	$\overline{B}$ Phase
22	5 Axis	GND
23	6 Axis	FG
24	6 Axis	$\overline{A}$ Phase
25	6 Axis	$\overline{B}$ Phase
26	6 Axis	GND
27	7 Axis	FG
28	7 Axis	$\overline{A}$ Phase
29	7 Axis	$\overline{B}$ Phase
30	7 Axis	GND
31	8 Axis	FG
32	8 Axis	$\overline{A}$ Phase
33	8 Axis	$\overline{B}$ Phase
34	8 Axis	GND
35		NC
36		NC

*Connector DDK 57E-30360
*$\overline{A}$ Phase is A phase 0V, and $\overline{B}$ Phase is B phase 0V.
*Do not connect pin No. 17, 18, 35, and 36.

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8 Limit Switch (LS) Connector

(1) Type A (1, 2 Axis)

Pin No.	Signal
1	X Axis LS
2	X Axis LS
3	Emergency Stop a
4	NC
5	24V
6	0V

*Connector Nichiatsu Housing MLP-06
Socket Contact LLF-01 T-1.3

Type A (1, 2, 3, 4 Axis)

Pin No.	Signal
1	X Axis LS
2	Y Axis LS
3	Z Axis LS
4	θ Axis LS
5	Emergency Stop a
6	NC
7	NC
8	24V
9	0V

*Connector Nichiatsu Housing MLP-09
Socket Contact LLF-01 T-1.3

(2) Type B (1 ~ 8 Axis)

Pin No.	Signal
1	1 Axis LS
2	2 Axis LS
3	3 Axis LS
4	4 Axis LS
5	5 Axis LS
6	6 Axis LS
7	7 Axis LS
8	8 Axis LS
9	Emergency Stop a
10	NC
11	24V
12	0V

*Connector Nichiatsu Housing MLP-12
Socket Contact LLF-01 T-1.3

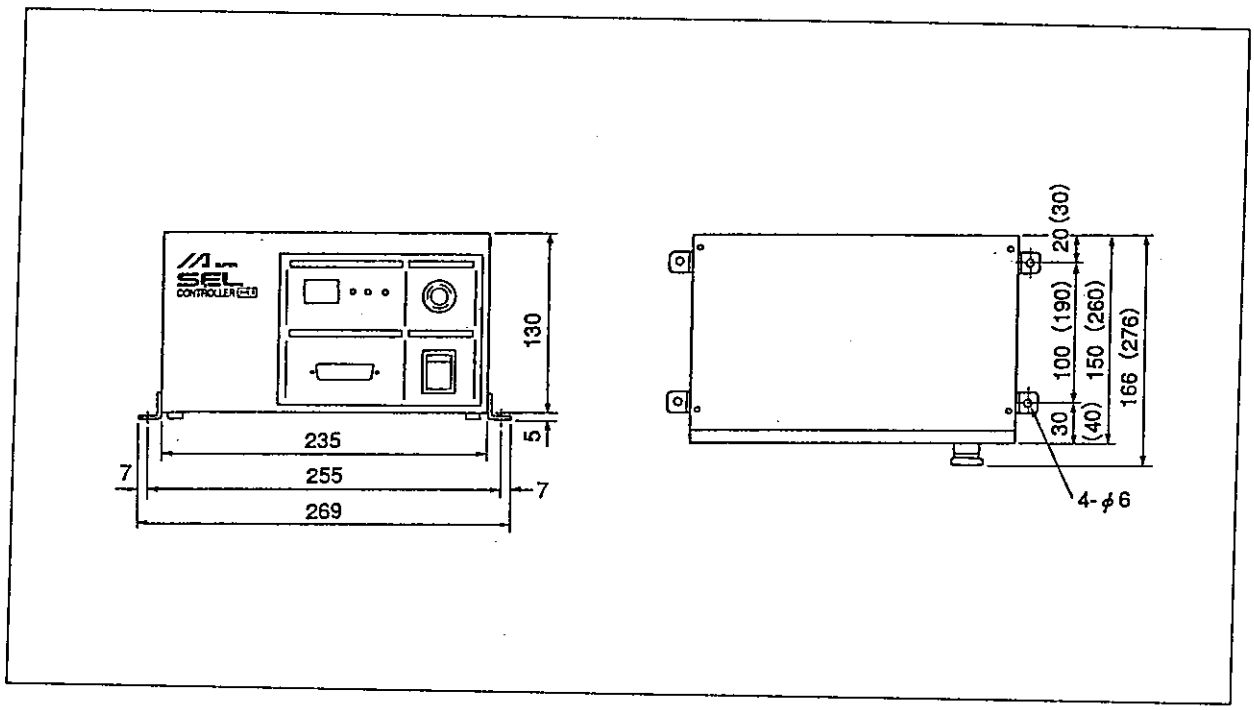
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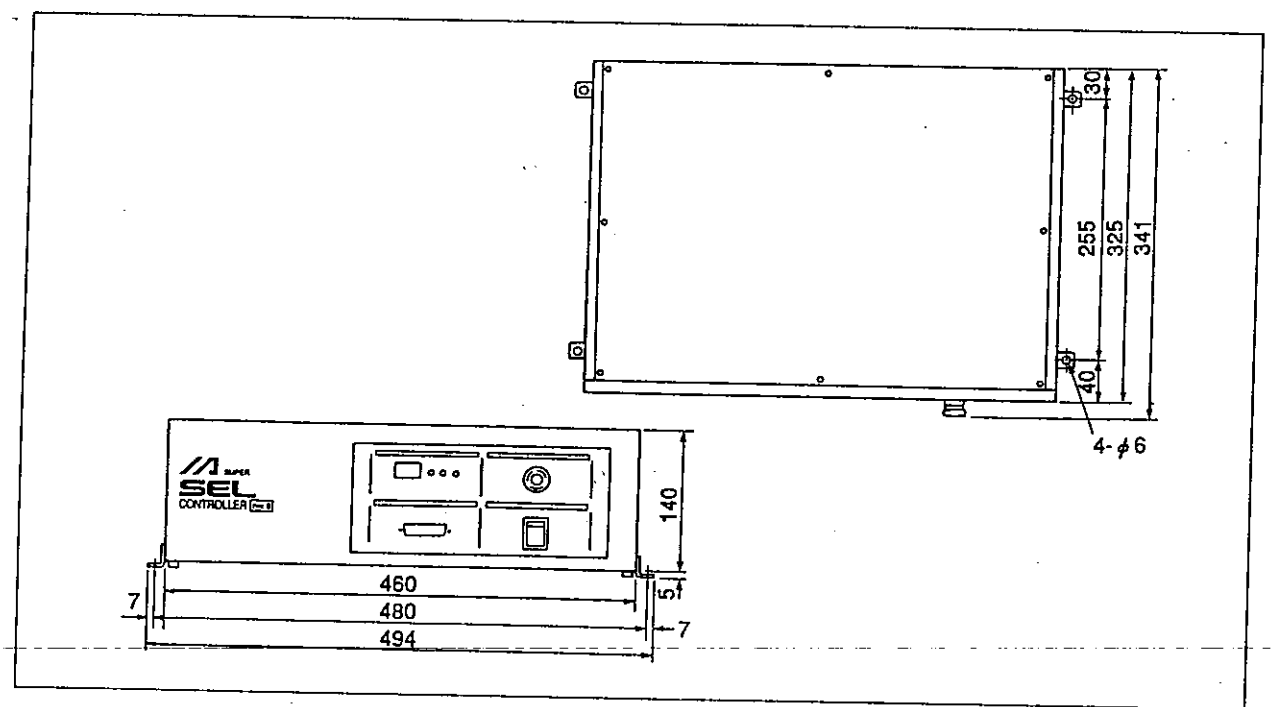
9 Controller Dimensions

Measurements in ( ) are for 3 and 4 axis system.

Type A



Type B



*There are some differences in 240W specifications. Please refer to the *Supplement in this manual.

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Part 6 - Super SEL Controller Maintenance

To ensure safe and trouble-free operation of your Super SEL System, a regular maintenance and inspection program should be implemented. Be sure to turn OFF the power before initiating any maintenance or inspection work. An inspection is recommended at least once every 6 to 12 months. However, depending on the environment, a more frequent inspection schedule may be advisable.

(1) Inspection Guidelines

- Check and make sure that the power supply to your Super SEL Controller is maintained at 117V +/-10%.
- Check for and clean any accumulated dust on the Controller vents.
- Check for loose screws. Tighten if necessary.
- Check each cable (Axis Cables, General I/O Cables, Power Supply Cable) Check for loose connections, damage, or excessive wear. Replace if necessary.

(2) Recommended Spare Parts

It is advisable to keep a small supply of spare parts. In critical applications, it may be advisable to keep an entire spare Super SEL Controller on hand. The following spare parts are recommended:

- Cables
- Batteries* (General shelf life of about 3 years)

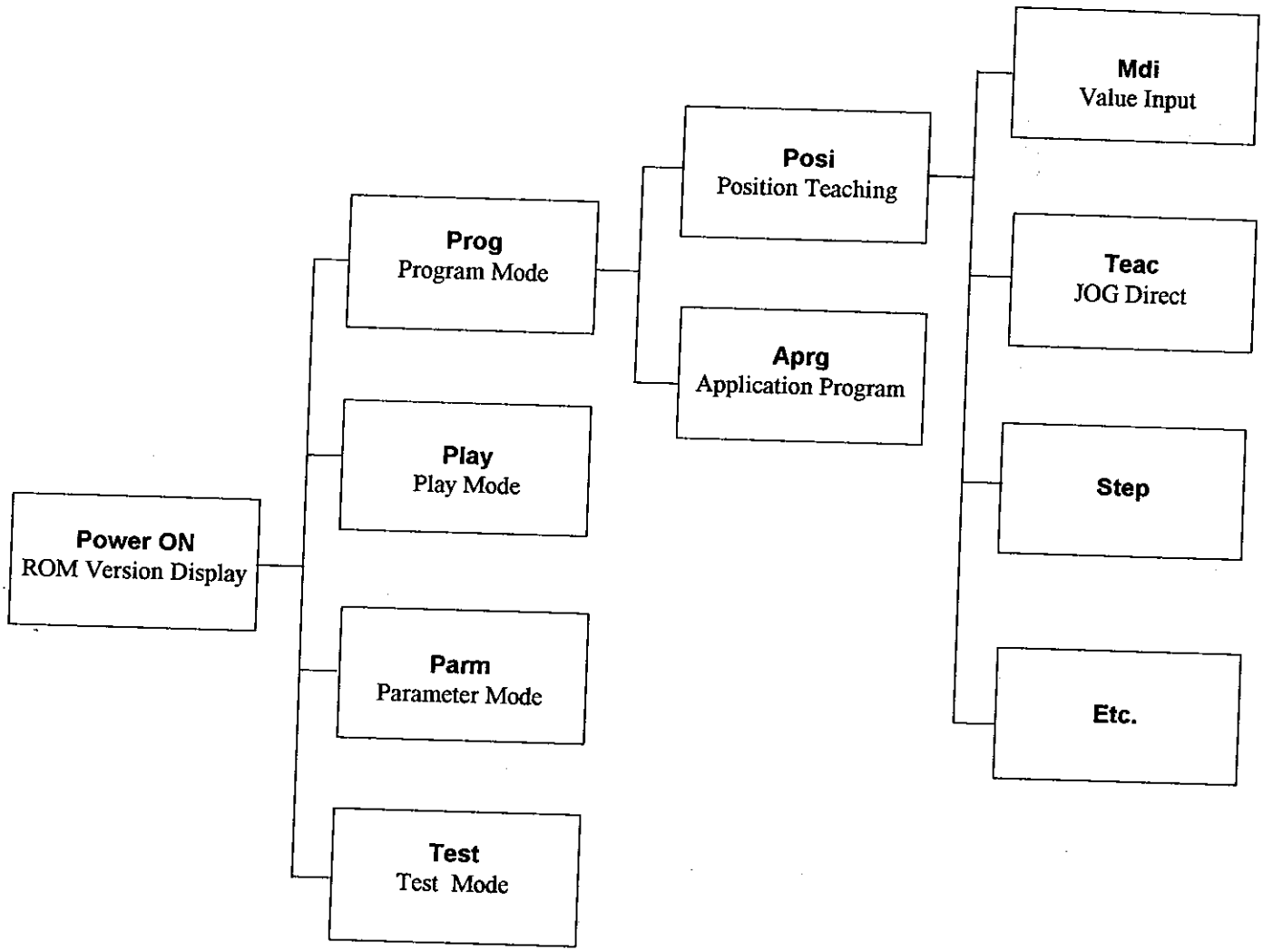
* Please refer to the *Supplement in this manual for exchanging batteries.

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Part 1 - Basics in Operating Your Super SEL Controller

1. Summary of Teaching Pendant Operation

The tree structure below illustrates the Teaching Pendant mode structure.



The basics of Teaching Pendant operation of your Super SEL Controller will display the above messages on the LCD display screen. Press F1 ~ F4 to move through the branch modes and press ESC to go back to the main branch.

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2. Teaching Pendant Key Functions

Teaching Pendant Key Functions are as follows:

01	**Cursor:**	Numbers can be changed when the cursor is positioned underneath.
"Inc"	**Increment:**	This key increases the Step Number or Point Number.
"Dec"	**Decrement:**	This key decreases the Step Number or Point Number.
"Esc"	**Escape:**	This key is used to go back to the previous display.
" . "	**Decimal Point Key:**	When creating an application program, the display will goes to the next command menu.
" - "	**Minus Key:**	When creating an application program, the display will return to the previous command menu.
"◀ ▶"	**Data Key, JOG Key:**	Dual function key for use in data input and axis Jog functions.
"↵"	**Return Key:**	This key registers the number with a cursor, and becomes active.

Note: If the main power is turned OFF, all programs and data will be stored for a guaranteed period of 3 weeks.

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Part 2 - Teaching Pendant Operation

(1) Mode Selection

(LCD Screen Display)

IA. Super. SEL TeachV1.00 07/18/94 Start (Blinking)			
F1	F2	F3	F4

(Operation)

1. Initial Display

   Press F1 (Start) (To P30. 2)

IA. Super SEL TeachV1.00 07/18/94 Main V1.00 06/30/94 Start (Blinking)			
F1	F2	F3	F4

2. Controller ROM Version Display

   Press F1 (Start) (To P30. 3)

Mode Select			
Prog	Play	Parm	Test
F1	F2	F3	F4

3. Mode Selection Display

   F1 - Prog (Program) Mode (P31. 4)
   F2 - Play (Play/Execution) Mode (P45. 22)
   F3 - Parm (Parameter) Mode (P39. 18)
   F4 - Test (Test) Mode (P43. 21)

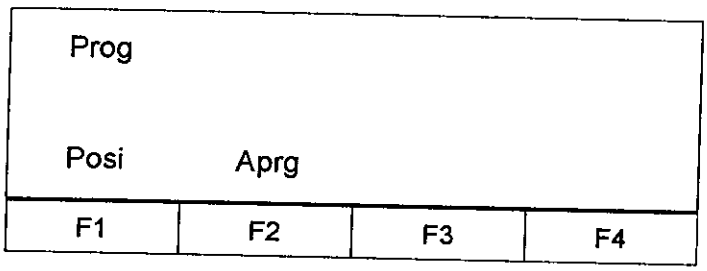
Note Pressing **ESC** key will bring the display back to this screen.

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(2) Program Mode

(LCD Screen Display)

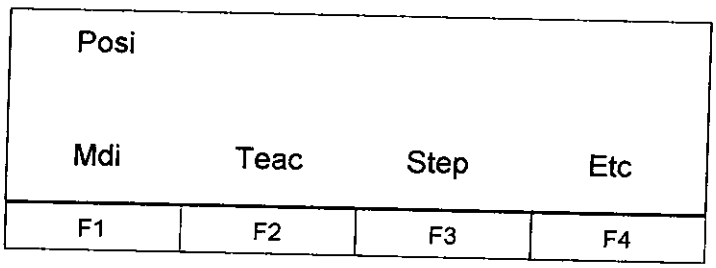
(Operation)



4. Program Mode (Press F1 at Step 3)

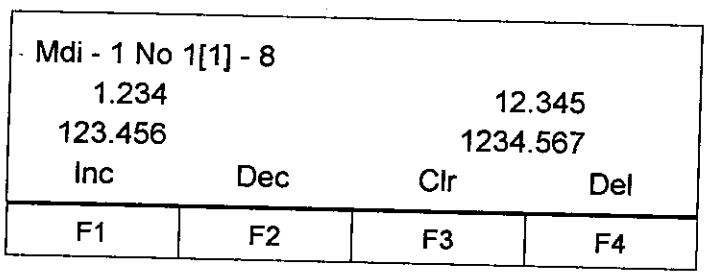
F1 - (Posi: Position) Position Data Input (P31. 5)
F2 - (Aprg: Application Program) Super SEL Programming Edit Display (P36. 15)
Esc - Return to Mode Selection Display (P30.3)

Point Data Input



5. Position (Position Data) Input Display (Step 4. Press F1)

F1 - Mdi Mode (Position Data Direct Input) (P31. 6)
F2 - Teac (Position Data Teaching) Mode (P34. 12)
F3 - Step (Position Data Step) Mode (P33. 10)
F4 - Posi (Position Data) Display 2 (P32. 6-2)
Esc - Return to Program Mode (P31. 4)



6. Mdi Mode

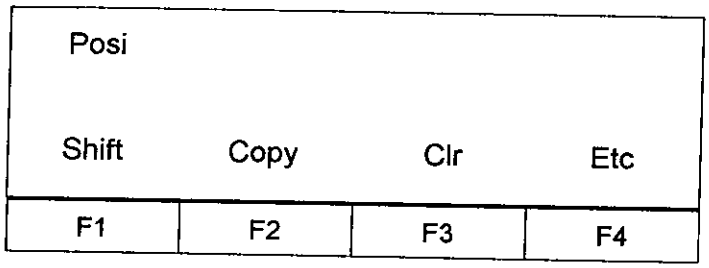
6-1. Position Number Input Mode (Step 5. Press F1)

Input 4-digit numbers.
F1 - (Inc: Increment) Increments the Position Number displayed by 1.
F2 - (Dec: Decrement) Decrement the Position Number displayed by 1.
F3 - (Clr: Clear) Clears all data (return to 0) for re-entry.
F4 - (Del: Delete) Deletes input data
Return - Position Data Input (P32. 7)
Esc - Returns to Position (Position Data) Input Display (P31. 5)

Note Mdi - 1 No 1 [1] - 8

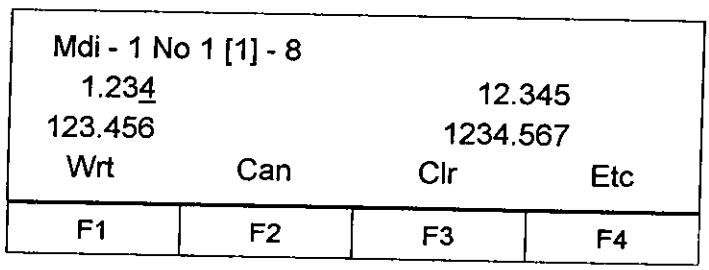
Cursor Position | Axis # | Axis Name | Total Axis Number

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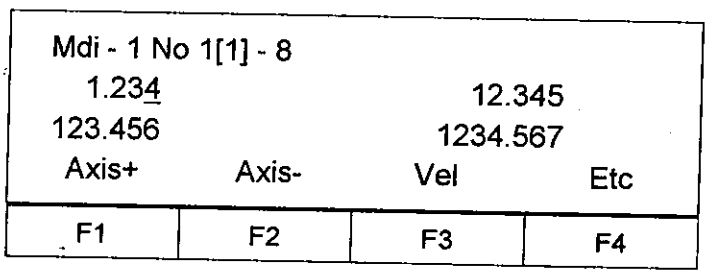
6-2 Position (Position Data) Input Display 2 (Go back to the display in Step 5. Press F4)

F1 - (Shift) Position Shift Mode (P33. 11-1)
F2 - (Copy) Position Data Copy (P33. 11-1)
F3 - (Clr: Clear) Position Data Clear (Deletion) (P33. 11-2)
F4 - Position (Position Data) Input Display (P31. 5)
Esc - Return to Program Mode (P31. 4)



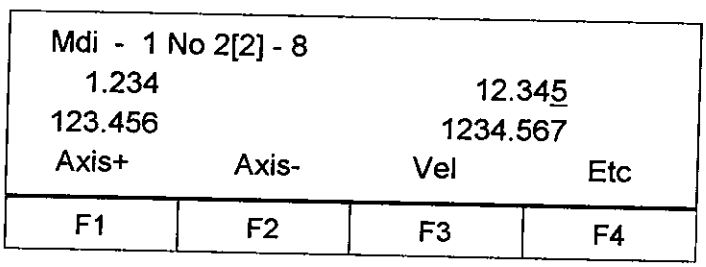
7. Position Data Input Mode (Step 6-1, Return Key)

Direct Input (5-digit integers before decimal point and 3-digits after the decimal point.)
F1 - (Wrt: Write) Writing in (Saving) Position Data
F2 - (Can: Cancel) displays xxxx.xxx.
F3 - (Clr: Clear) displays 0.000 for data re-entry.
F4 - Position Data Input Sub Menu. (P32. 8)

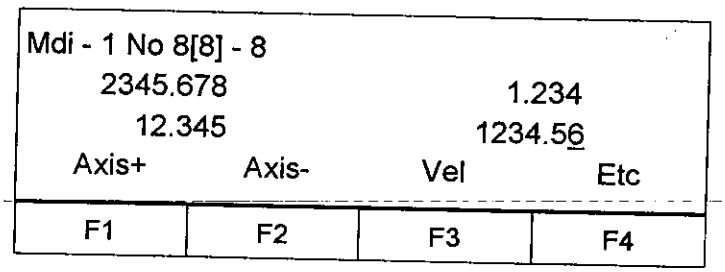


8. Position Data Input Sub Menu (Step 7. F4)

Direct Input (5-digit integers before decimal point and 3-digits after the decimal point)
F1 - (Axis+) Increments Axis Number by 1. (P32. 8-1)
F2 - (Axis-) Decrement Axis Number by 1. (P32- 8-2)
F3 - (Vel: Velocity) Set Velocity and Acceleration for the Position Number. (P33. 9)
F4 - (Etc) Returns to Position Data Input Mode (P32. 7)

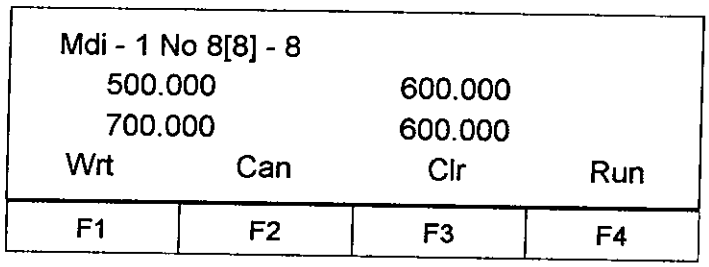


8-1 Increments Axis Number by 1. (Step 8, F1)



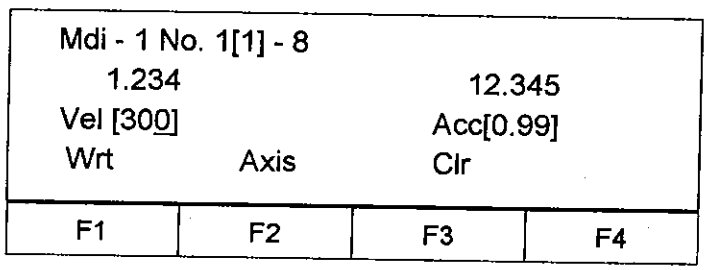
8-2. Decrements Axis Number by 1. (Step 8, F2)

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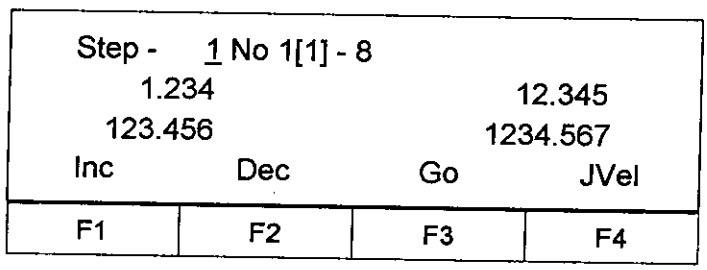


8-3 After input all 8-axis, save data by pressing the F1 key (Wrt).

If "Run" is blinking, data will not be saved because it means a program is being executed at that moment. In this case, press F4, and then switch to Test Mode or Play Mode and monitor the program being executed.
If "Wrt" (F1) is pressed while programming, "Run" (F4) starts to blink to alert the operator.
F1 - Wrt: Write F2 - Can: Cancel
F3 - Clr: Clear F4 - Run : Program Execution

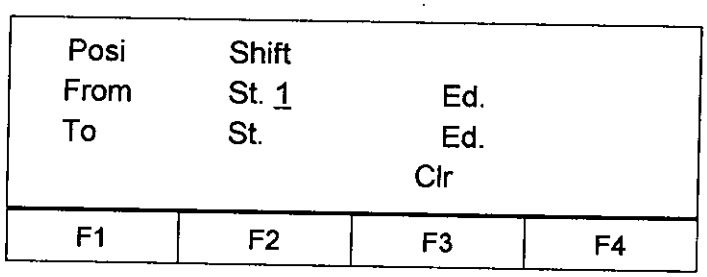


9. Position Data Velocity and Acceleration Setting (Step 8. F3)
(Velocity: 3-digits, Acceleration 9.99, 2-digits after decimal point.)



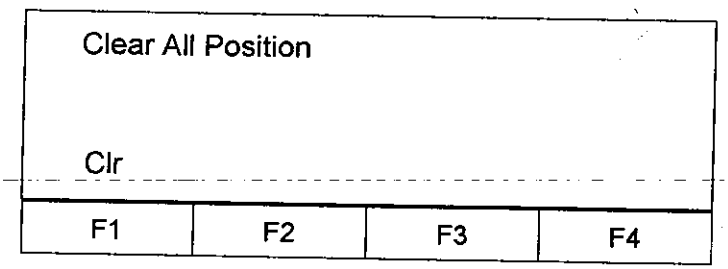
10. Point Step Mode (Go back to the display in Step Number 5, then press F3.)

F1 - Position No. +1
F2 - Position No. -1
F3 - Move to Designated Position
F4 - Designate Velocity



11-1 Position Shift (Move) Mode (6-2. F1 key)

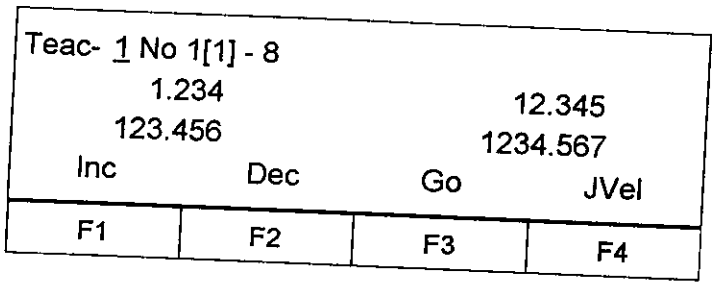
Moves the specified multiple position data. Input the beginning and the ending position No. of the original position (From), then input the beginning and the ending position No. of the target position (To).
*Position Copy Mode (6-2. F2 key) for duplication can be operated in the same manner.



11-2 Position Clear Mode (Go back to the display in the Step 6-2. Then, press F3.)

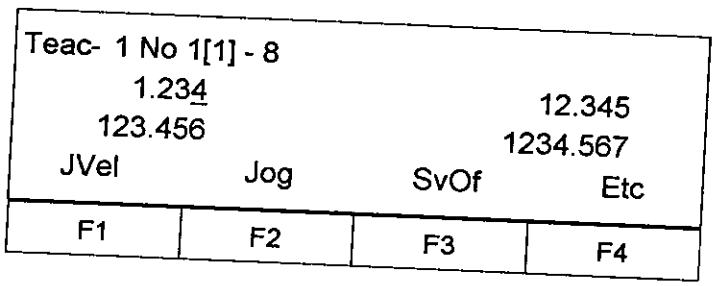
F3 - Clears all Position Numbers.
F1 - Execute

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12. Teaching Mode (Go back to the display in Step 5, then press F2.

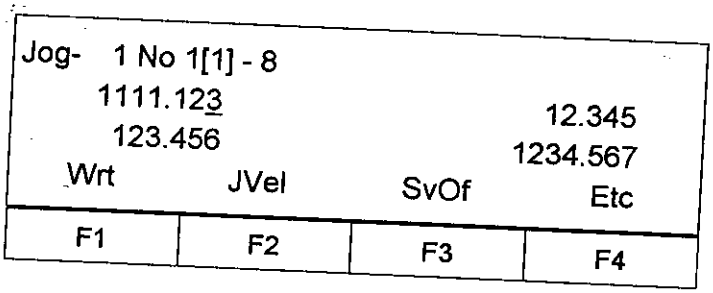
Position Number Input Mode (2-digit Number Input)
F1 - Increments Position Number by 1.
F2 - Decrements Position Number by 1.
F3 - Moves actuators from current position to the position designated in the display.
F4 - Sets Velocity,
Return - Performs teaching for each axis. (P34. 13)



13. Teaching Selection Mode (12. Return Key)

Select Jog or SvOf (Servo OFF, Manual)
The Cursor is located under Axis Number 1. Press Etc to switch to another axis.

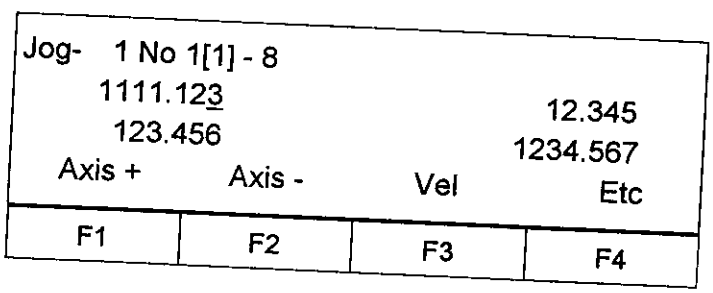
F1 - Select Jog Velocity
F2 - Set for Jog Movement (P34. 13-1)
F3 - Set for Manual (direct) Teaching. (P35. 14)
F4 - Velocity Setting and Axis Changing Mode (P34. 13-3)



13-1. Jog Mode (Step 13. F2)

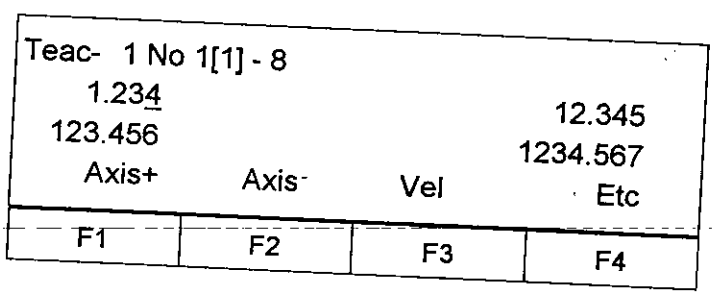
Turns ON all Servos and also indicates the present position. When Wrt is selected, the present position will be saved.

F4 - Velocity Setting and Axis Selection Mode (P34. 13-2)



13-2 Jog Mode (Step 13-1, F4)
Velocity, Axis Selection

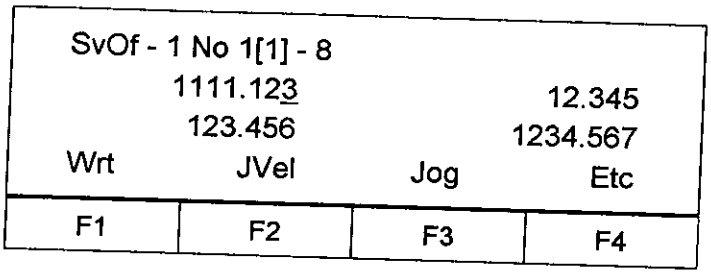
When selecting Axes to jog:
F1 - Axis+ moves cursor forward 1 Axis.
F2 - Axis- moves cursor backward 1 Axis.



13-3 Teaching Velocity Set, Axis Change Mode (Step 13. F4)

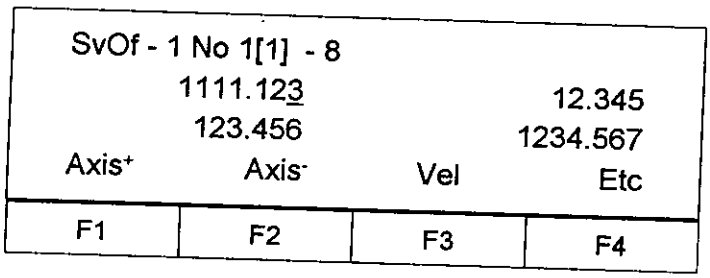
F1 - Teaching Axis No. + 1
F2 - Teaching Axis No. - 1
F3 - Set Velocity and Acceleration for Point Data.
F4 - Return to the display before selection.

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14. SvOf (Servo OFF, Manual • Direct Teaching) Mode (Go back to the display in Step 13, then press F3)

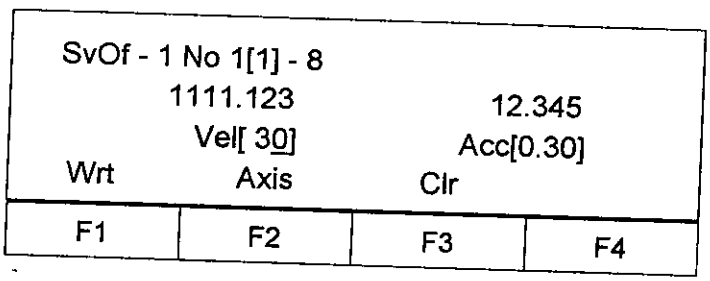
All connected axes Servo OFF
Moves axis position manually (Direct Teaching).
Wrt: Saves data
Return: Changes axis number.



14 -1. SvOF Mode (Step 14. F4)

Velocity Setting, Axis No. Selection
(Use to set Point Position Velocity or to change Axis No.)

F3 - → Velocity Setting Selection Display (P35. 14-2)

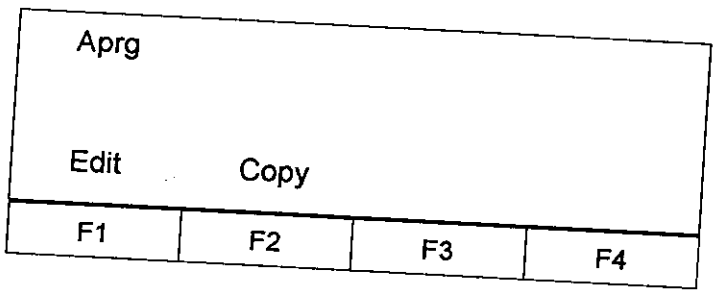


14-2. SvOf Mode (Step 14-1. F3)

Velocity Setting Selection
Input Velocity and Accerelation, then press Return (ENTER) key
F2 - Return to SvOf Mode (P36. 14)
F3 - Clr (Clear) clears input value, for re-entry.

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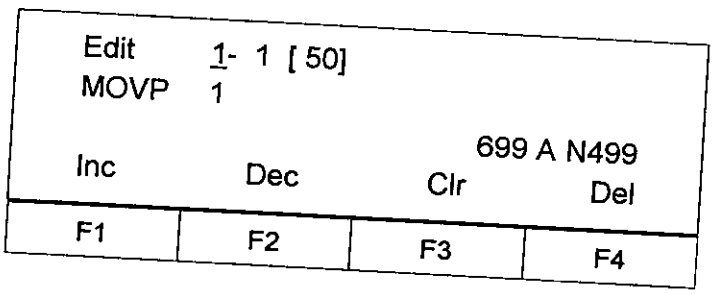
Application Programming



15. Super SEL Programming Edit Display (Go back to the display in Step 4, then press F2)

F1 - (Edit Mode) Perform SEL Programming, Editing, Addition, Insertion, and Deletion. (P36. 16)

F2 - (Copy Mode) Copies or overwrites programs. (P38. 17)



16. Super SEL Programming Edit Mode (15. F1)

16-1. Program Number Input Mode

F1 - Increments Program Number by 1.
F2 - Decrements Program Number by 1.
F3 - Clears input value for re-entry.
F4 - Deletes Program Number.
Return - Switches to Step Number Input Mode when the program number input is within the appropriate range. (P37. 16-2)

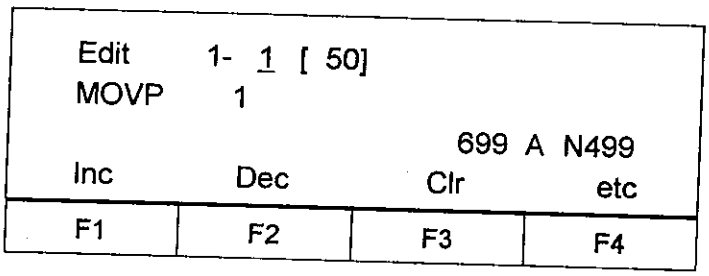
When a program number exists, the step number 1 will be displayed. When a program number does not exist, a space will be displayed.

(Edit 1- 1 [50])
Prog. No. Step No. Step Number

(MOVP 1)
Command Operation 1

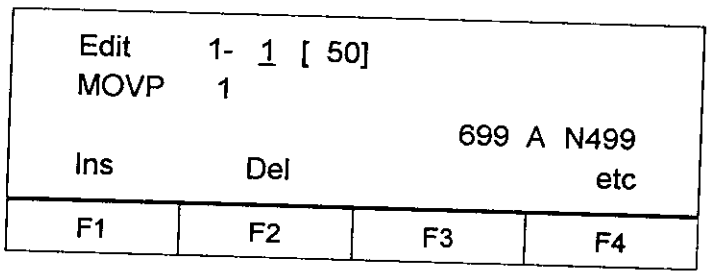
(699 A N499)
Operation 2 Result Continuous Condition

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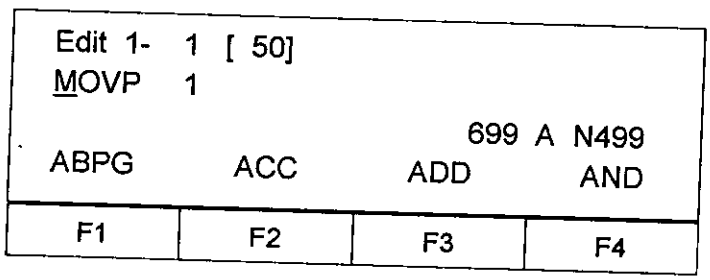
16-2. Step Number Input Mode (Step 16-1. Return Key)

F1 - (Inc) Increments Step Number by 1.
F2 - (Dec) Decrements Step Number by 1.
F3 - (Clr) Clears data for re-entry
F4 - Additional Mode (Insertion mode, deletion mode etc.) (P37. 16-2-1)



16-2-1. Step Number Input Mode 1 (Step 16-2. F4)

F1 - (Insertion) Add Steps.
F2 - (Delete) Delete Steps.



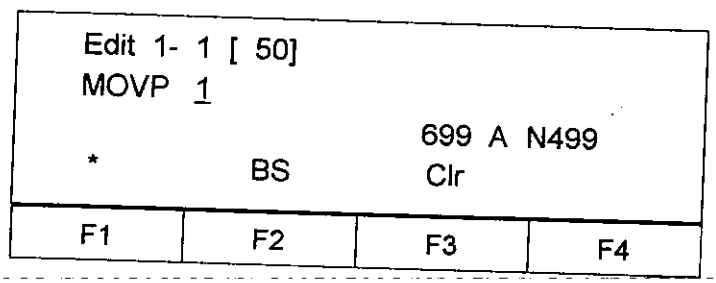
16-3. Edit Command Input Mode (Step 16-2. Return Key)
4 commands will be displayed from F1 to F4.

. (decimal point) - By pressing the decimal point, commands will be displayed in alphabetical order.

- (minus sign) - By pressing the minus sign, commands will go backwards in reverse alphabetical order.

Select a command by pressing F1 ~ F4, . (decimal point), or - (minus) sign.

Press CR (Return key). Operation 1 Input Mode (P37. 16.4) will be displayed.

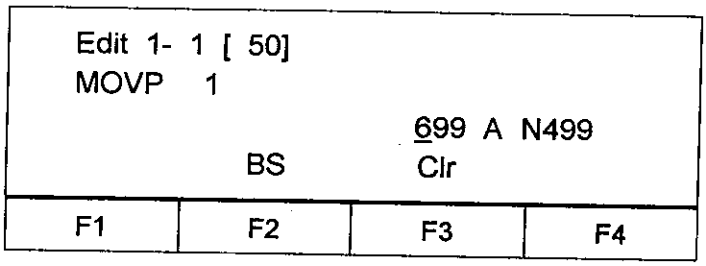


16-4. Operation 1 Input Mode (Step 16-3. Return key)

Input Operation 1 of the selected command.
F1 - (*) Designate variables indirectly.
F2 - (BS: Back Space) Clears last input value. Cursor will move backwards.
F3 - (Clr: Clear) Clears all the values input for new data entry.
Return - Input values will be saved, then Operation 2 Input Mode will be displayed. (P38. 16-5)
ESC - Command input mode

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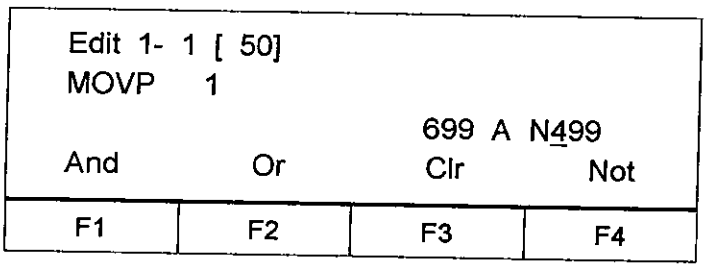


16-5. Operation 2 Input Mode (Step 16-4, Return key)

Same as 16-4

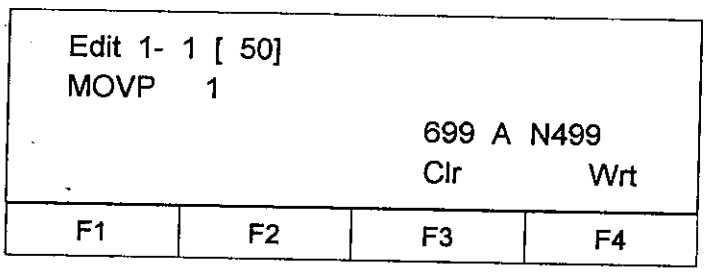
16-6. Result Input Mode (16-4. Return key)

Input result, output and flag.
F2 - Clears the last entry by BS (Back Space).
F3 - Clears all data
Return - Continuous Condition Input Mode (P38. 16-7)



16-7. Continuous Condition Input Mode (Step 16-6, Return key)

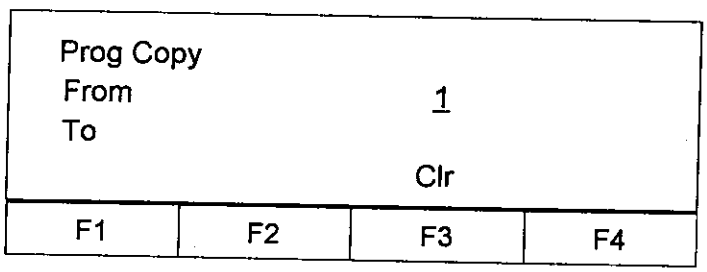
F1 - Select And
F2 - Select Or
F3 - Clears data entry.
F4 - Select Not
Return - Confirmation Mode (P38. 16-8)



16-8. Confirmation Mode (Step 16-7. Return key)

F3 - Re-input from command
F4 - Saves (Wrt) current Step No. After saving, Step Number will proceed to the next Step Number. (In the case of Insertion, Step Number will remain the same.)

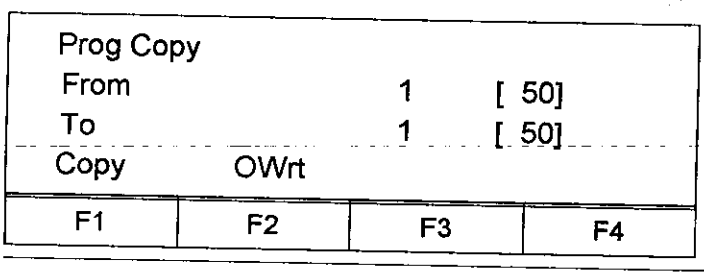
17. Copy Mode (Go back to the display in Step No. 15, then press F2.)



17-1. Copies program. (Step 15. F2)

Input program number to be copied after "From", then input a new program number after "To".

F3 - Clears data for data entry.
Return - Copy, Overwrite Selection Mode (P38. 17-2)



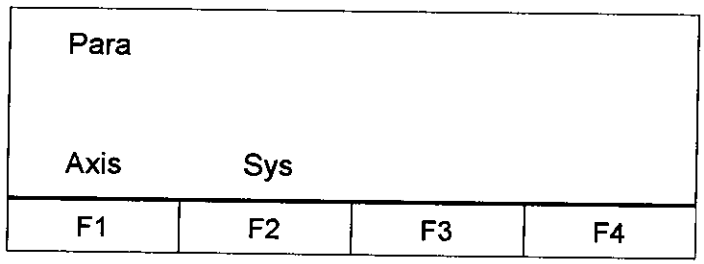
17-2. Copy, Overwrite Selection Mode (17-1. CR: return key)

F1 - Copies the program
F2 - Overwrites the program.

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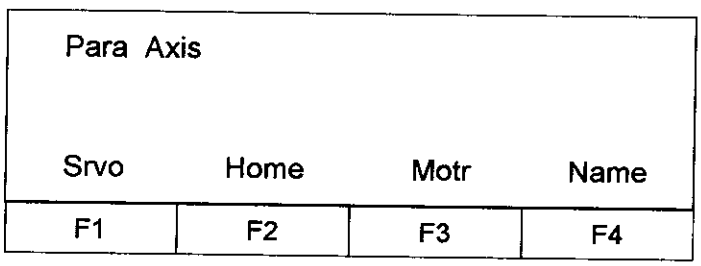
(3) Parameter Mode

Important Please contact your IA sales representative or IA Technical Support when the parameter mode must be changed by the user. We will not be responsible for any problem caused by changing parameters without consultation.



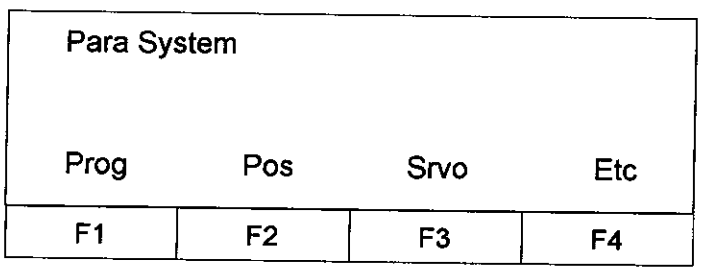
18. Parameter Mode (Step 3, F3)

F1 - Parameter Mode for each axis (P39. 18-1)
F2 - System Parameter Mode (P39. 18-2) (P41.20)



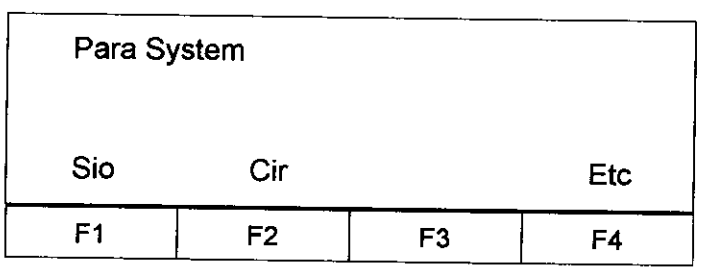
18-1. Parameter Mode for each axis (Step 18. F1)

F1 - Servo Parameter Mode for each axis (P39.19-1)
F2 - Home Parameter Mode for each axis (P40.19-2)
Axis Activation Mode
F3 - Motor Parameter Mode for each axis (P40. 19-3)
F4 - Axis Name Parameter Mode for each axis (P41. 19-4)



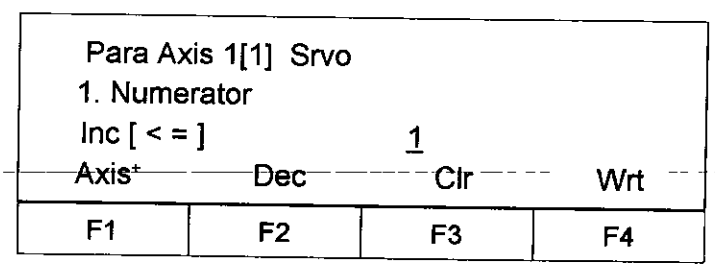
18-2 System Parameter Mode (Step 18. F2)

F1 - System program parameter mode
F2 - System point parameter mode
F3 - System servo parameter mode
F4 - Additional selection mode (P39. 18-3)



18-3. System parameter additional selections (Step 18-2. F4)

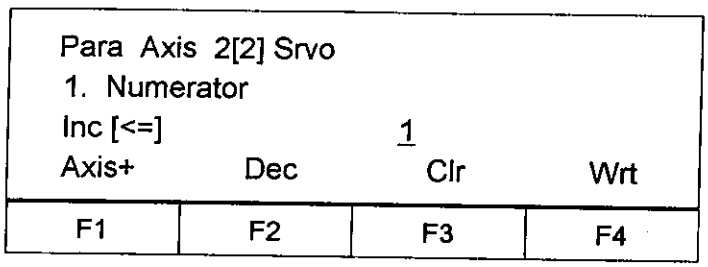
F1 - (Sio: Sirial I/O RS232C) System Sio parameter mode (P42. 20-4)
F2 - (Cir: Circle) System path/circular parameter mode (P42. 20-5)
F4 - (Etc) Returns to System Parameter Mode. (P39. 18-2)



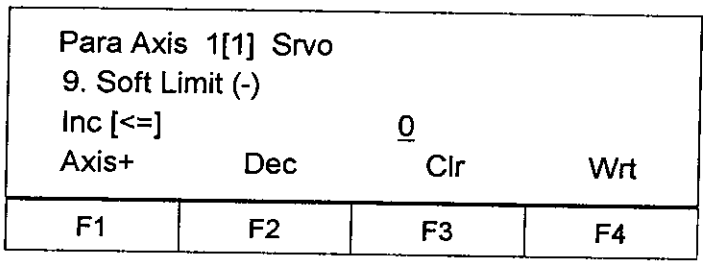
19-1. Servo Parameter Mode (18-1. F1)

F1 - Goes to next axis no. (+1) Axis name will also be changed. (P40. 19-1-1)
F2 - Goes backward -1 (P40. 19-1-2)
F3 - Clears data for data entry
F4 - Direct number input
Return - (Inc[<=]) adds +1

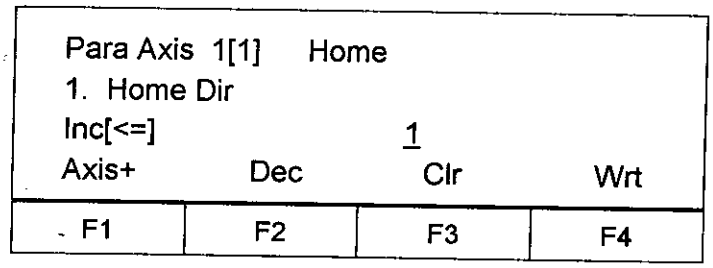
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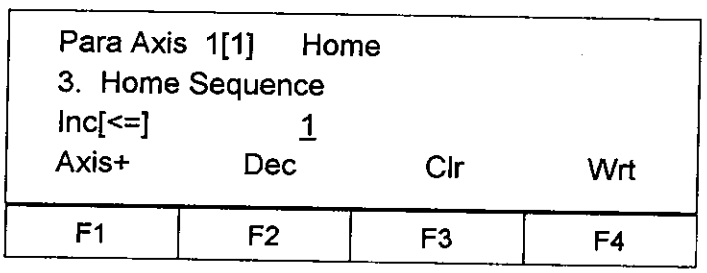
19-1-1. Press F1 to proceed to one axis number.



19-1-2. Press F2 to go back one axis number.



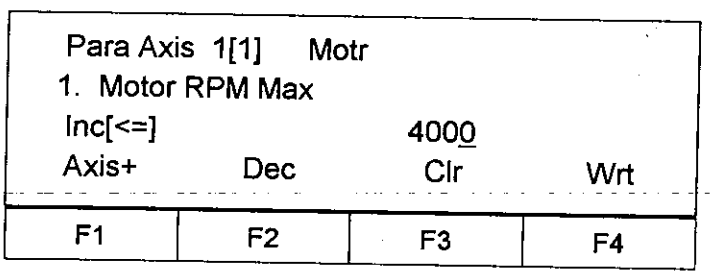
19-2. Home Parameter Mode for each axis, Axis Activation Mode (Step 18-1, F2)



19-2-1. Home Parameter Mode for each axis, Axis Activation Mode (Step 19-2, Press the RETURN key twice)

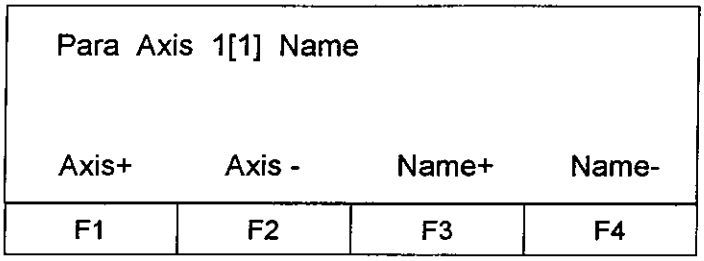
By inputting 0, the axis will be inactivated. Homing or Jog will not be performed. (Position indicator will display Δ)

By inputting a number (1 ~ 9), order of Homing of all activated axes can be designated.



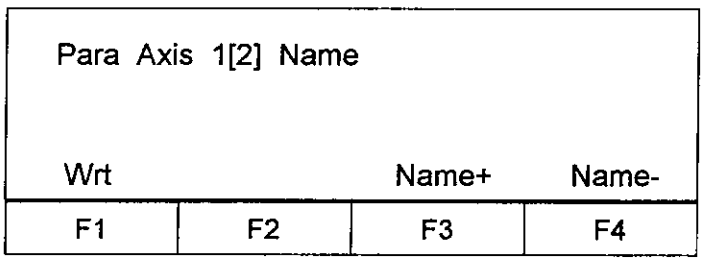
19-3. Motor Parameter Mode (Step 18-1. F3)

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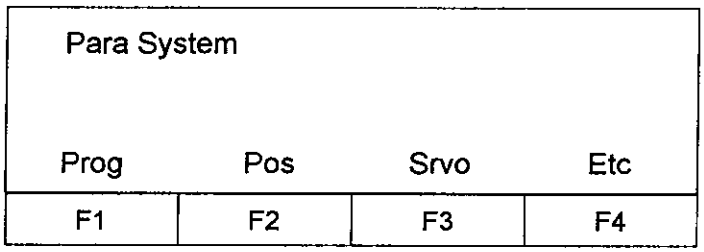
19-4. Parameter Name Mode for Each Axis (Step 18-1. F4 Key)

F1 - Increments axis number by 1.
F2 - Decrements axis number by 1.
F3 - Increments axis name by 1. (range: 1 ~ 9, A ~ Z) (P41. 19-4-1)
F4 - Decrements axis name by 1. (range: 1 ~ 9, A ~ Z)



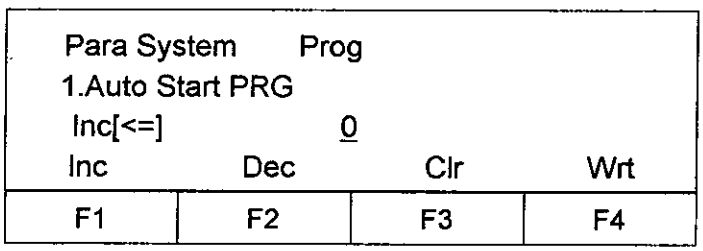
19-4-1. Axis Name Change (Step 19-4. F3)

F1 - (Wrt) Change axis name.



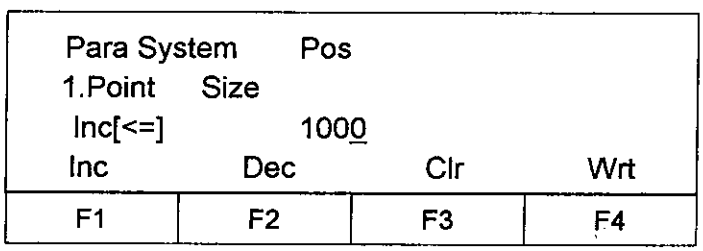
20. System Parameter Mode (Step 18. F2)

F1 - System Program Parameter Mode (P41. 20-1)
F2 - System Point Parameter Mode (P41. 20-2)
F3 - System Servo Parameter Mode (P42. 20-3)

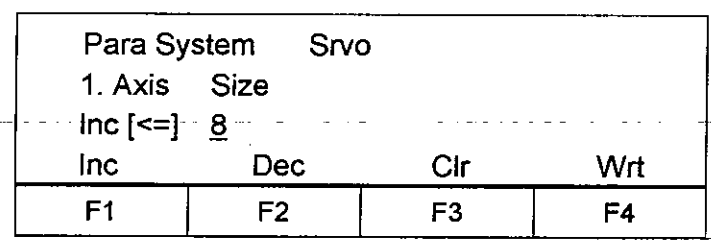


20-1. System Program Parameter Mode (Step 20. F1)

Press the RETURN key to increment the item. (Inc[<=])

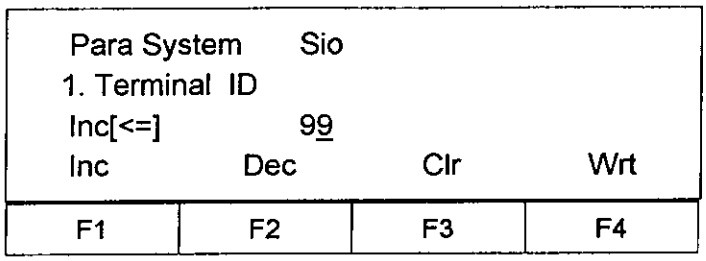


20-2. System Point Parameter Mode (Step 20. F2)

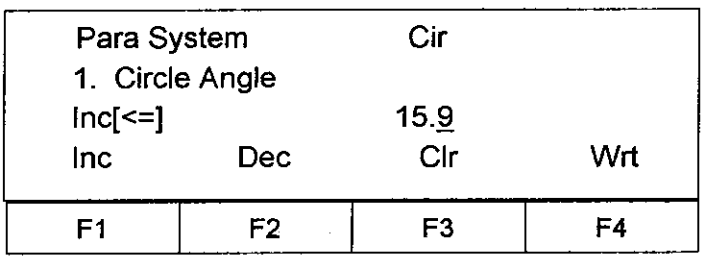


20-3. System Servo Parameter Mode (Step 20. F3)

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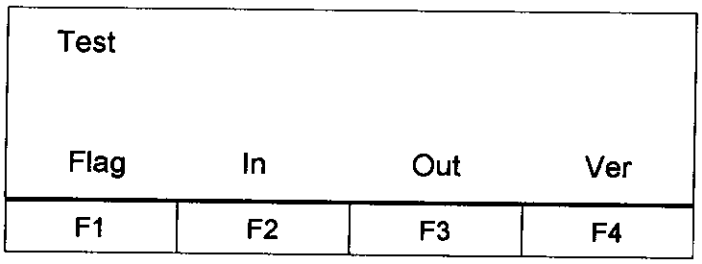
20-4. System Sio Parameter Mode (18-3. F1 Key))



20-5. System Circle, Arc, Parameter Mode (Step 18-3. F2)

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(4) Test Mode



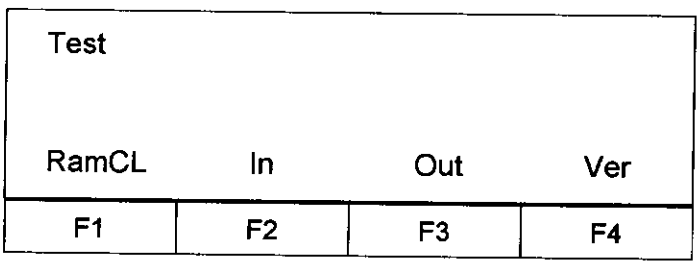
21. Test Mode (3. F4 Key)

F1 - (Flag) Flag displayed. Press F1 and "1" key simultaneously. RamCL (Ram Clear) Mode will appear on the display.

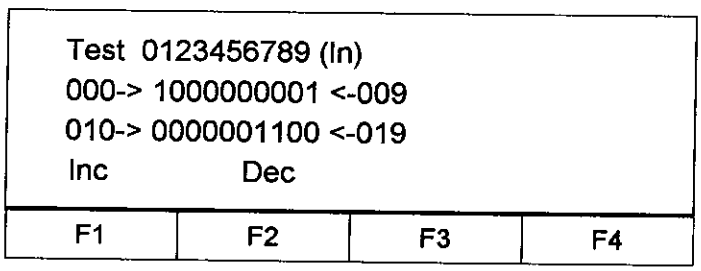
F2 - (In) Input Port Display. (P43. 21-2)

F3 - (Out) Output Port (P43. 21-3)

F4 - (Ver: Version) Displays current software version of Servo, Main and Teac (Teaching Pendant). (P44. 21-4)



21-1. While holding down both of the F1 and "1" keys, the display will remain the same as shown on the left. When the keys are released, Memory Clear Mode (RamCL) will appear. (P44. 21-5)

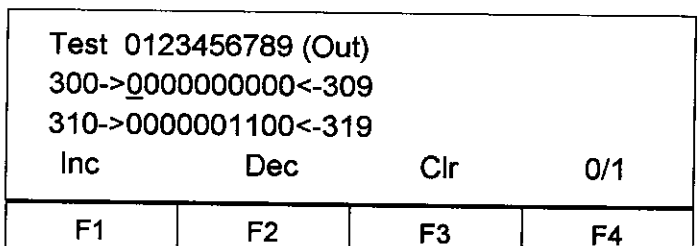


21-2. Test Input Port Display (Step 21. F2)

Displays input port status.

F1 - Port displayed. +10
F2 - Port displayed. -10

The Input Port can be monitored in real time.

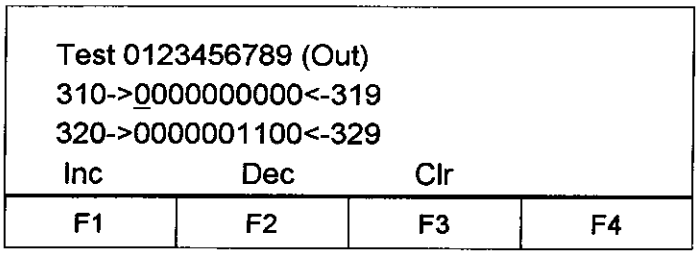


21-3. Test output Port Display (21. F3)

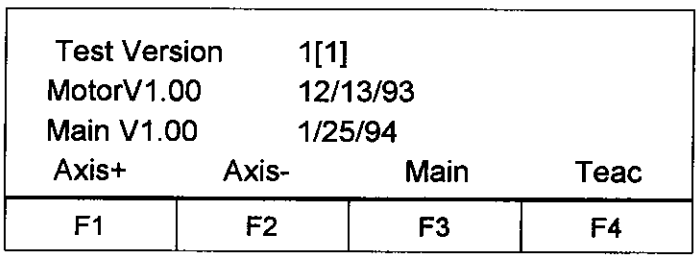
F1 - Output Port +10
F2 - Output Port -10
F3 - 0 Output of all the displayed Ports
F4 - Output 0 -->1, 1-->0
. (decimal point), CR (RETURN) key - cursor moves to the right.
- (minus key) - cursor moves to the left.
"0" - cursor position port 0 Output
"1" - cursor position port 1 Output.

The Output Port can be turned ON/OFF, however, the Output Port on the controller side cannot be monitored in real time.

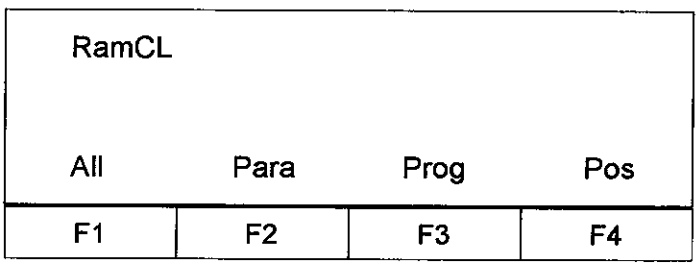
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21-3-1. F1 (output port +10)



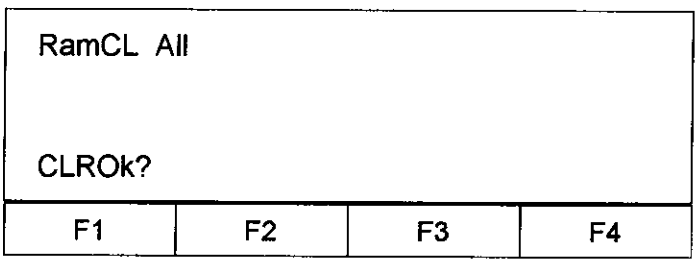
21-4. Test Version Mode (Step 21. F4)



21-5. Memory Clear (RamCL) Mode (Step 21. F1 + 1 key)

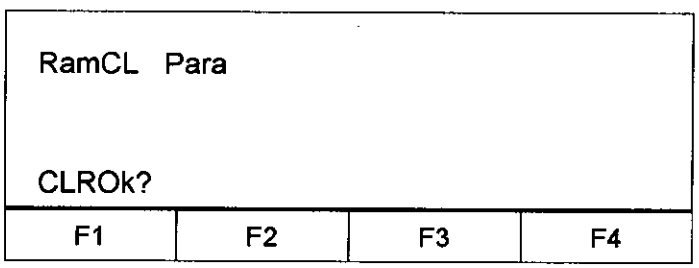
Warning This operation deletes all the data. Be sure to back up data beforehand.

- F1 - Clears system parameter, program, and position area (P44. 21-5-1)
- F2 - Clears system parameter (P44. 21-5-2)
- F3 - Clears application program area (P44. 21-5-3)
- F4 - Clears position data area (P45. 21-5-4)



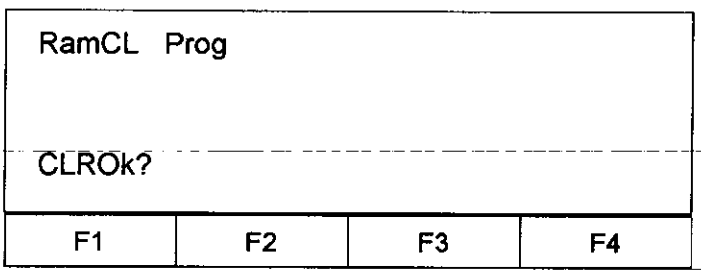
21-5-1. F1(All) is selected.

Press F1 (CLROk?: Clear OK?)
Note: This is the same as RESET.



21-5-2. F2 (Para) is selected.

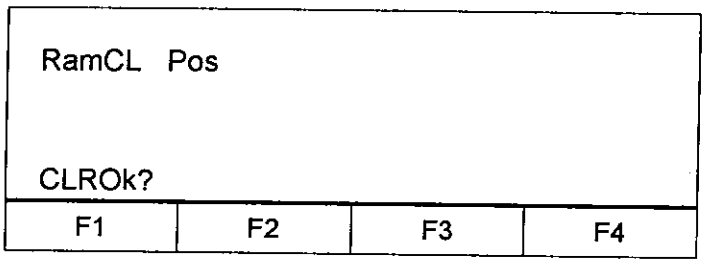
Press F1 (CLROk?) - same as Reset
Note: This is the same as RESET.



21-5-3. F3 (Prog) is selected.

Press F1
Clears all application programs.

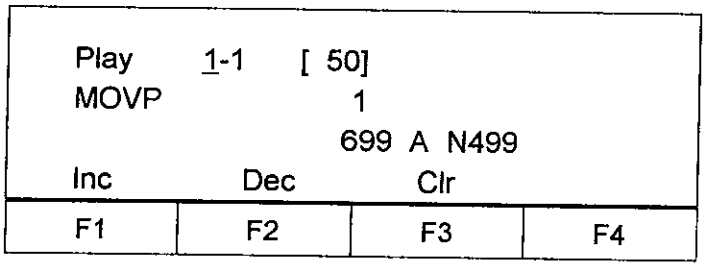
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21-5-4. F4 (Pos) is selected.

Press F1
Clears all position data.

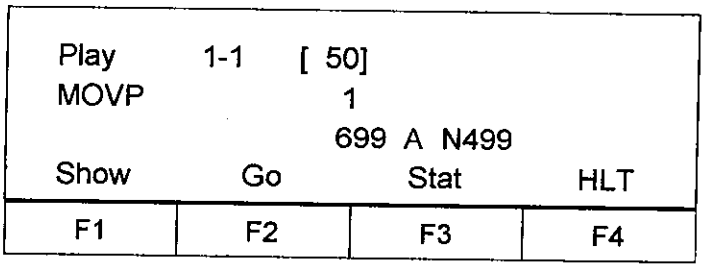
(5) Play Mode



22. Play (Play) Mode (3, F2 Key)

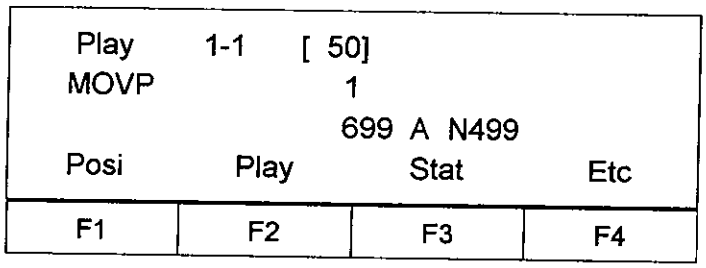
22-1. Play Program Input Mode

Input Program number to execute (or stop) Program status can be seen by pressing START then PROG.



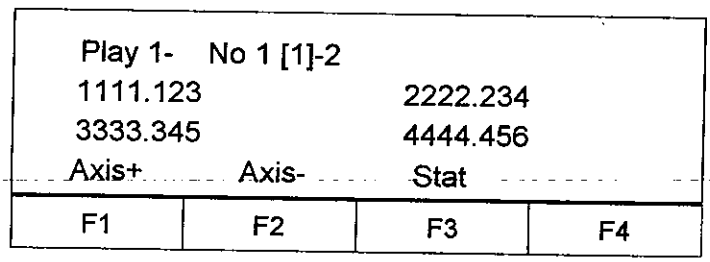
22-2. Program Execution/Stop Selection (22-1. CR: return key)

F1 - (Show) Monitoring (when the designated program is executing.) (P48. 23)
F2 - (Go) Program execution (P45. 22-3)
F3 - (Status) show status (after checking the status, select execution or stop)
F4 - (HLT) Stop (P45. 22-3)



22-3. Execution Status Selection (22-2. F2) (22-2. F4)

F1 - Axis status display (P45. 22-4)
F2 - Other program execution, or stops currently execut ing program. (P46. 22-5)
F3 - Shows program status (P46. 22-6)
F4 - Input port, Output port, Flags (P46. 22-7)

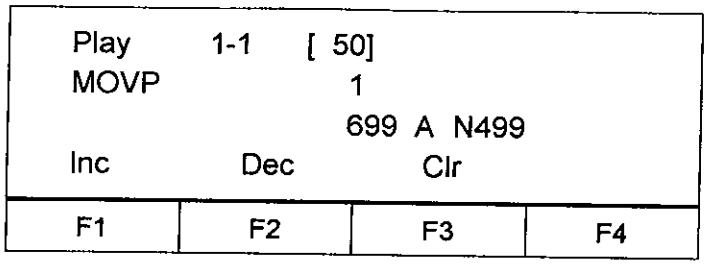


22-4. Axis Status Display Mode (22-3. F1)

F1 - Checks other axis status (+)
F2 - Checks other axis status (-)

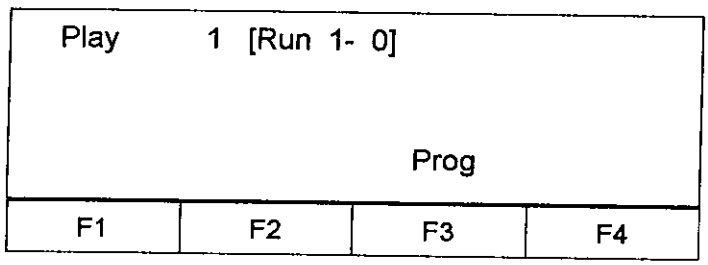
(Play 1- No 1 [2]-8)
|
Starting axis

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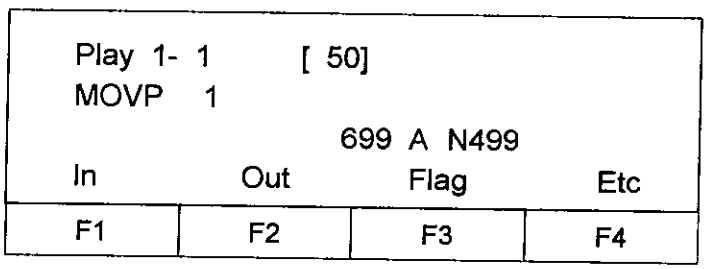


22-5. Execution, Stop Mode (22-3, F2)

Input program number to be executed or stopped.
Returns to 22-3.

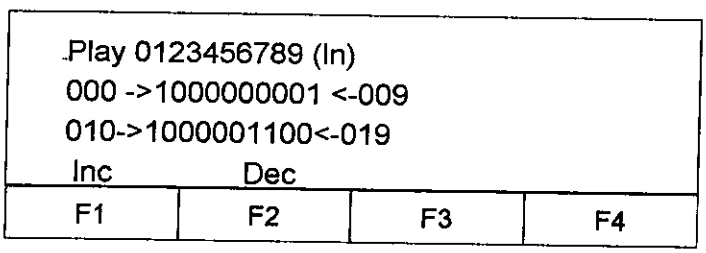


22-6. System movement and program number display (22-3, F3)



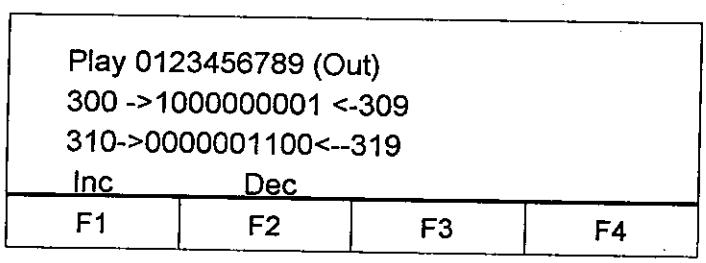
22-7. I/O port, Flag Status Selection Mode (22-3. F4)

F1 - Input port change display, select (P46. 22-8)
F2 - Ouput port change display, select (P46. 22-9)
F3 - Flag change display, select (P46. 22-10)
F4 - Execute, status selection screen (P47. 22-12)



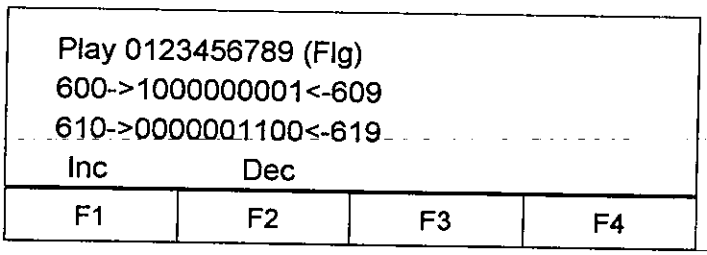
22-8. Play Input Port Display (22-7. F1)

F1 - Input Port +10
F2 - Input Port -10



22-9. Play Output Display (22-7. F2)

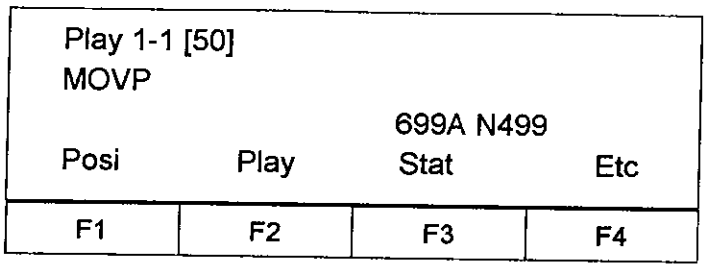
F1 - Output +10
F2 - Output -10



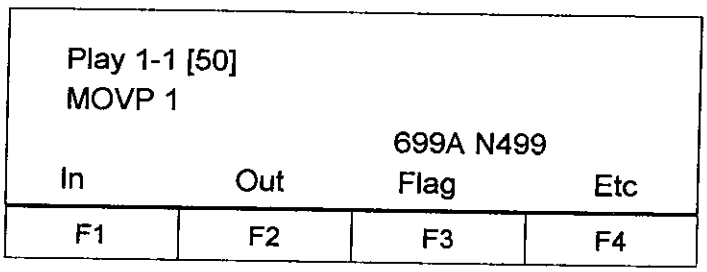
22-10. Play Flag Display (22-7. F3)

F1 - Flag +10
F2 - Flag -10

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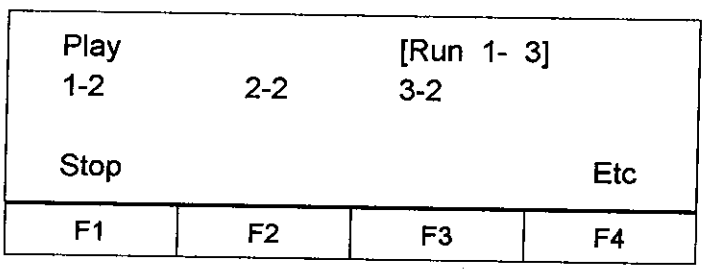


22-11-1. Select F1 (Show), F2 (GO), or F4 (HLT) from Program Execution/Stop Selection Display (P45. 22-2) to stop Play Mode (Program stops.). Execution Status Selec tion Display appears. Then press F4 (Etc). (P47. 22-11-2)



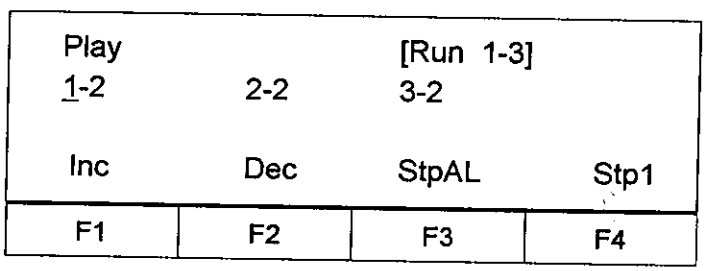
22-11-2. I/O Port, Flag Status Selection Mode(P46. 22-7)

Press F4 (Etc). (P47. 22-12)



22-12. Execute, Status Selection Screen (22-7. F4)

F1 - Goes to Program Stop Selection Mode. (P47. 22-13)

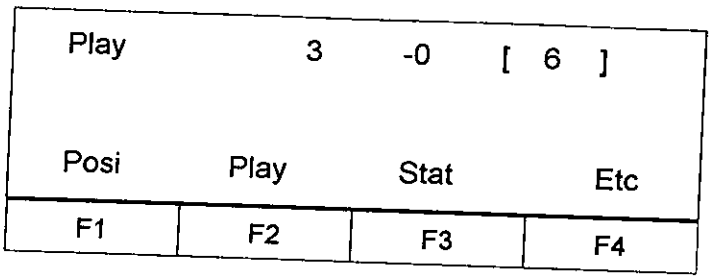


22-13. Program Stop Selection Mode (22-12. F1)

F1 - Chages program number to be stopped.
F2 - Chages program number to be stopped.
F3 - Stops all the programs being executed.
F4 - Stops program No. with cursor underneath.

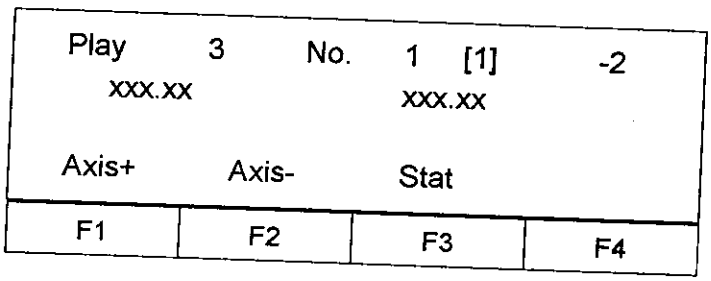
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(6) Show Mode



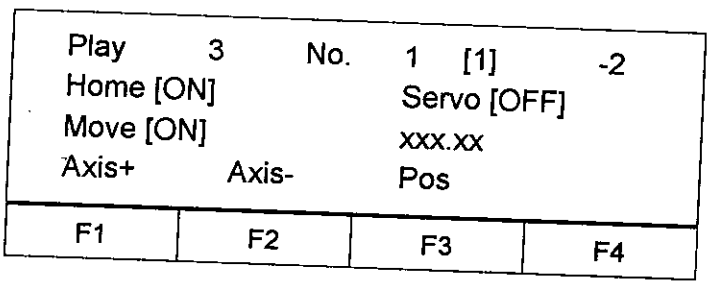
23. Show Mode (Step 22-2. F1)

F1 - Displays the position of each axis currently moving (P48. 23-1-1)
F2 - Execute other program (P49.23-2)
F3 - Shows program status (P49. 23-3-1)
F4 - Current Input/Output Status, Flag Status Mode (P50. 23-4)



23-1-1. Position Display Mode (Step 23. F1)

F1 - Checks other axis status (+)
F2 - Checks other axis status (-)
F3 - Shows program status (P48. 23-1-2)

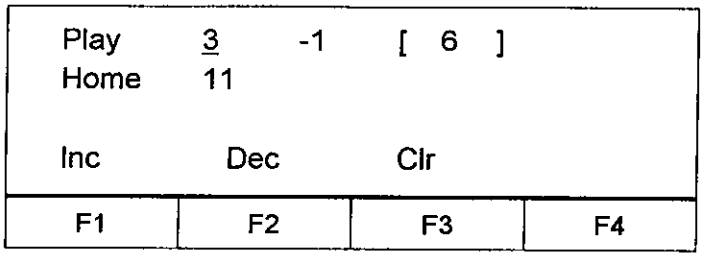


23-1-2. Status Display Mode (Step 23-1-1. F3)

Display homing incomplete (OFF)/complete (ON), servo ON/ OFF, moving incomplete (OFF)/complete (ON), and current value.

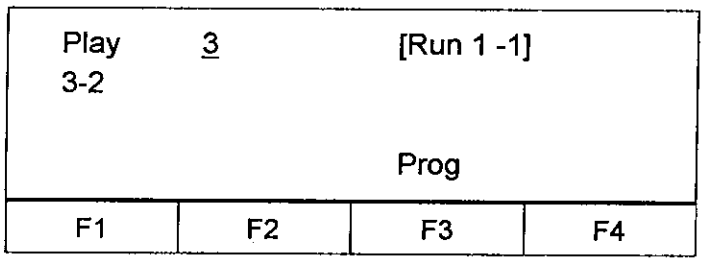
F3 - Return to Position Display Mode (P48. 23-1-1)

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23-2 Program Display Selection Mode (Step 23. F2)

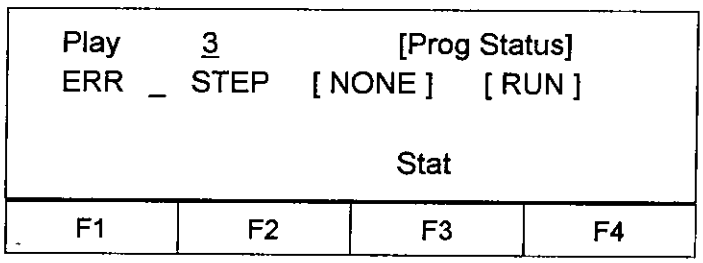
F1 - Increment Program No.
F2 - Decrement Program No.
F3 - Clear Program No.



23-3-1. Program Execution Status Mode (Step 23. F3)

3 -2
| |
| 2: Executable, 4: Wait for completion (Input)
Executing Program No.

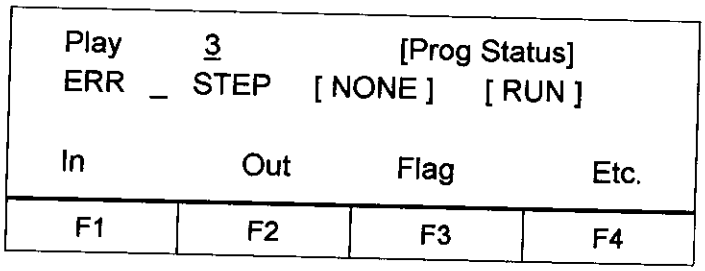
F3 - Program Execution Status (P49. 23-3-2)



23-3-2. Program Execution Status (Step 23-3-1. F3)

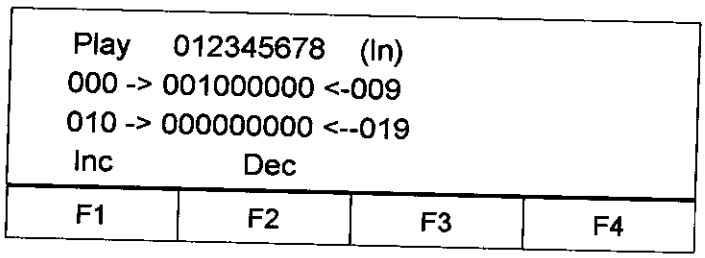
F3 - Return to Program Execution Status Mode (P49. 23-3-1).

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23-4. Input/Output, Flag Status Display Mode (Step 23. F4)

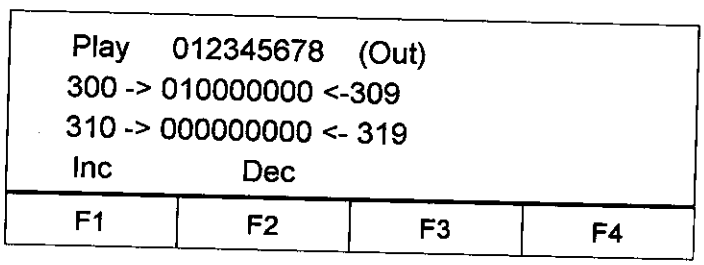
F1 - Input Status Display Mode (P50. 23-4-1)
F2 - Output Status Display Mode (P50. 23-4-2)
F3 - Flag Status Display Mode (P50. 23-4-3)
F4 - Execute, Status Selection Mode (P47. 22-12)



23-4-1. Input Status Display Mode (Step 23-4. F1)

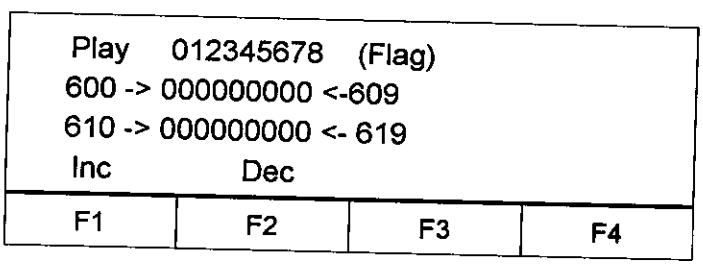
Display In 002 is ON.

0 0 1 0 0 0 0 0 0 0
000 001 002 009 Port No.



23-4-2. Output Status Display Mode (Step 23-4. F2)

Display Out 301 is ON.



23-4-3. Flag Status Display Mode (Step 23-4. F3)

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(6) Simple Application Program Example

2-Axes Actuators runs between point 1 and point 2, back and forth.

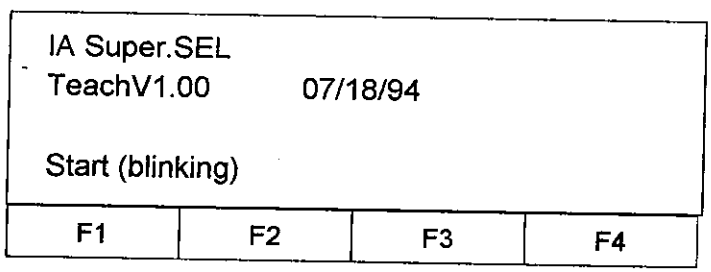
- Application Program

Command	Operand 1	Comment
HOME	11	X and Y Axis Homing (Servo ON)
VEL	100	Velocity Setting 100mm/sec
ACC	0.3	Acceleration Setting 0.3G
TAG	1	Assigns the target for GOTO Command
MOVL	1	Moves to position number 1
MOVL	2	Moves to position number 2
GOTO	1	Jumps to TAG1

- Position Data

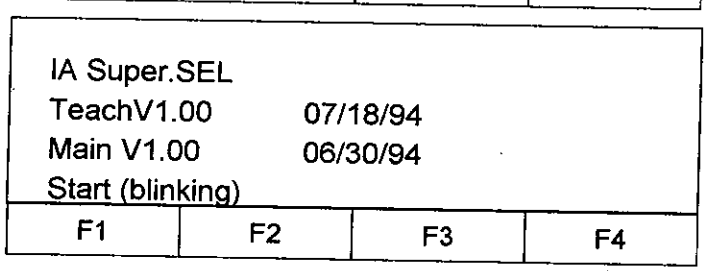
Position Number	X Axis	Y Axis
1	100.000	100.000
2	10.000	10.000

(LCD Display) *(Operation)*



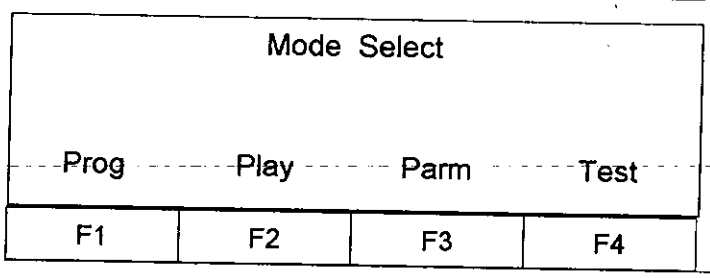
1. Initial Display

   Press F1 to start.



2. Controller ROM Version Display

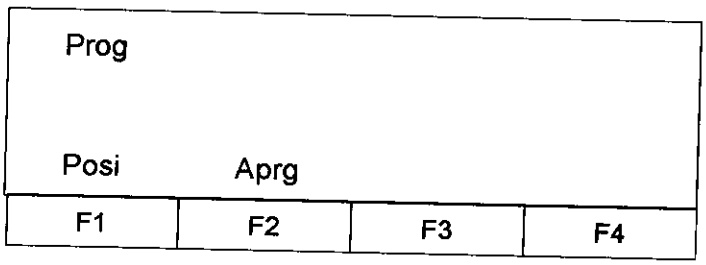
   Press F1 to start.



3. Mode Selection Display

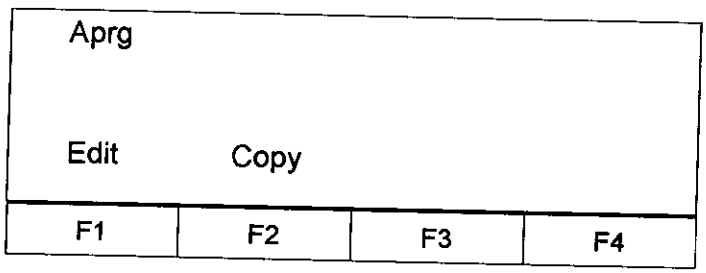
   Press F1 to select Prog Mode.

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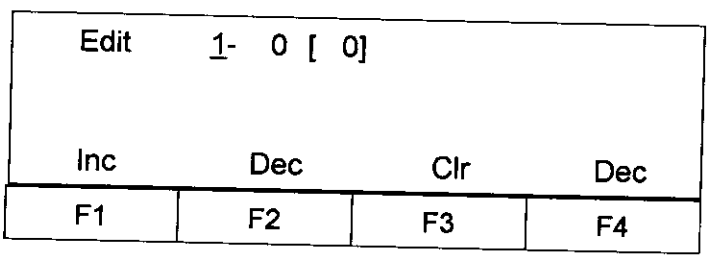
4. Program Mode Display

   Press F2 to select Aprg (Application Program).



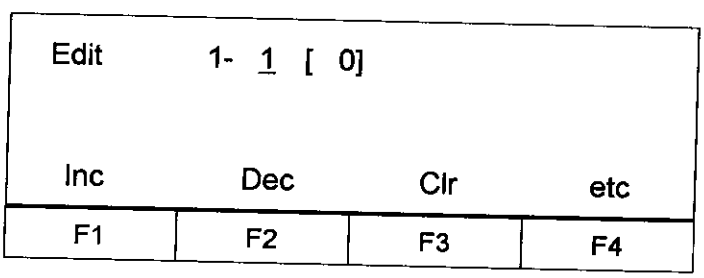
5. Super SEL Programming Display

   Press F1 to select Edit Mode to edit, modify, add, insert, or delete Super SEL programs.

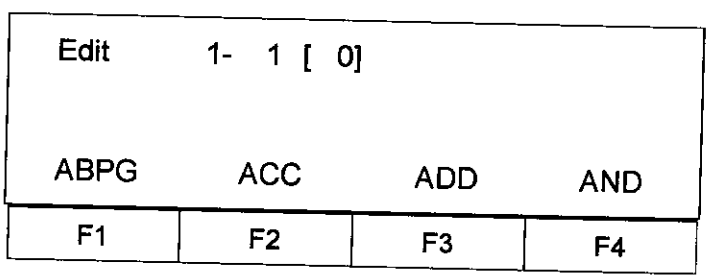


6. Super SEL Programming Edit Mode

   Press 1 (Program number 1), then press return key. When the program number selected exists, the display shows the first step number. If the program number selected does not exist, a space will appear.

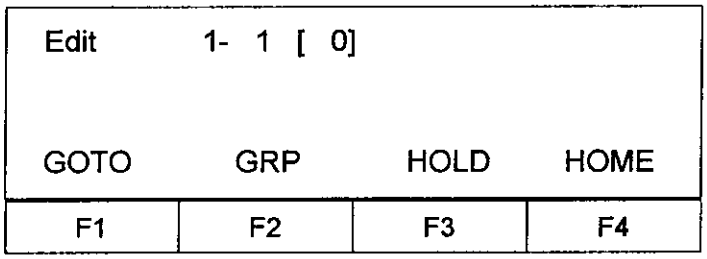


7. Press return key.

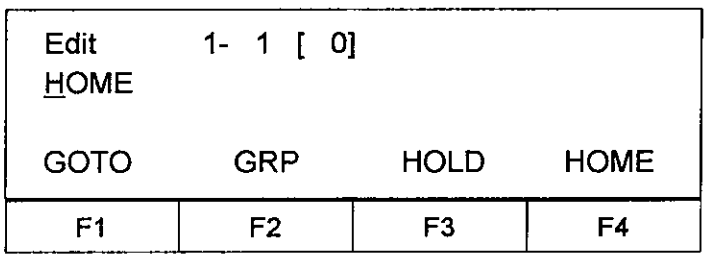


8. Press "." (decimal point) or "-" (minus) repeatedly until HOME appears.

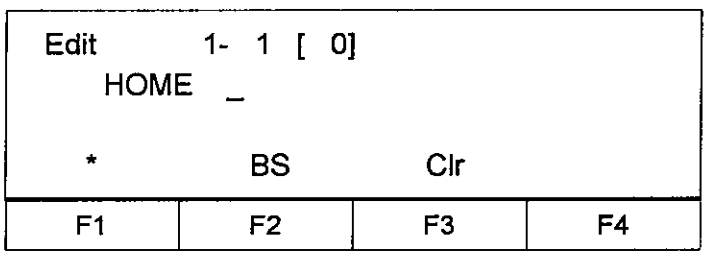
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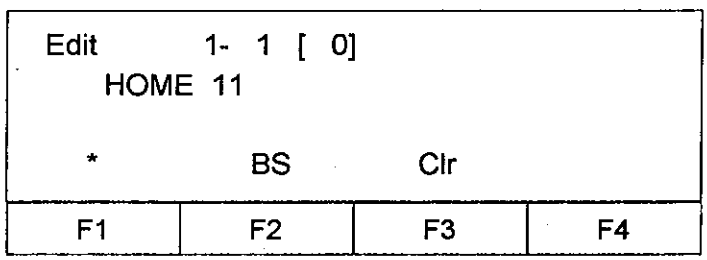
9. Press F4 to select HOME.



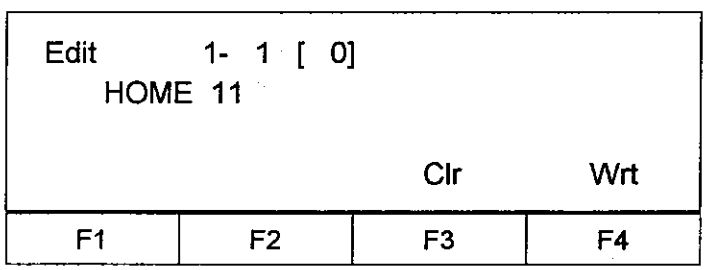
10. Press RETURN key.



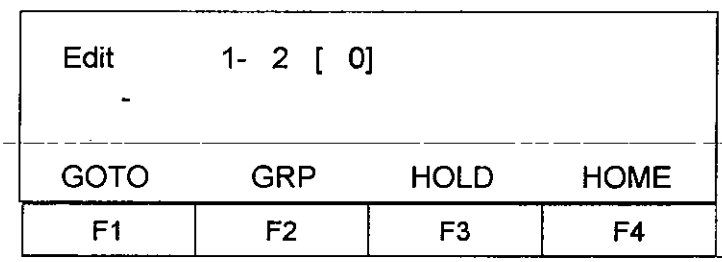
11. Press "1" two times to home X and Y axes simultaneously.



12. Press return key 3 times.



13. Press F4 (Wrt: Writing).

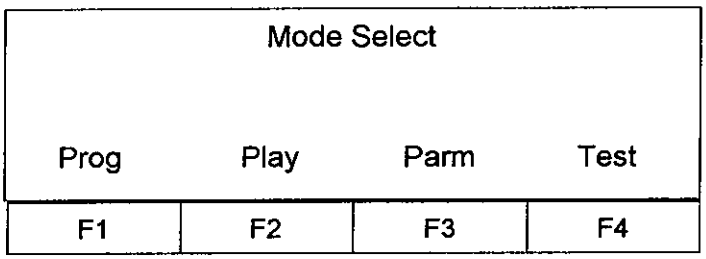


14. Press "." (decimal point) repeatedly until VEL appears on display.

Repeat the same process after step 9 to input commands.

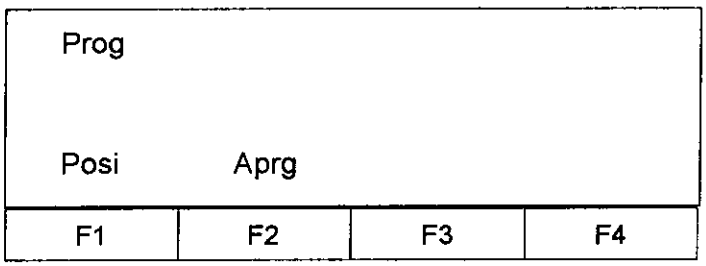
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When programming is completed, press ESC key repeatedly until Mode Selection Display appears.
Next, position data will be input.



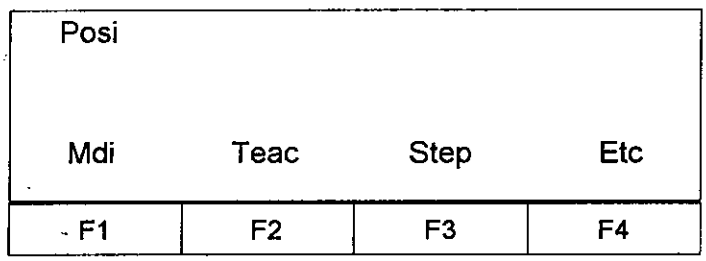
15. Mode Selection Display

    Press F1 to select Prog (Program) Mode



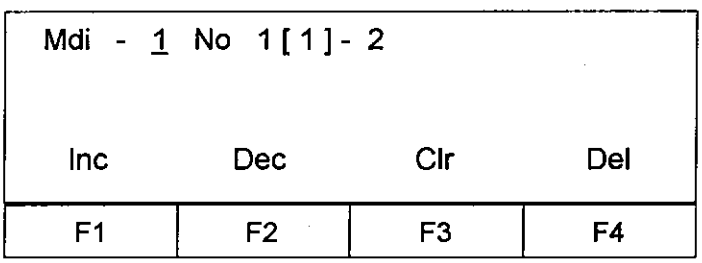
16. Program Mode

    Press F1 to select Position data.



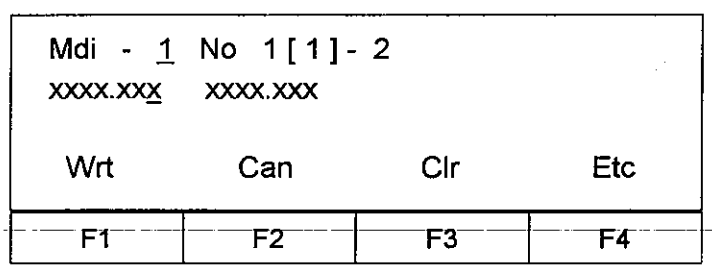
17. Position Data Editing (Go back to the display in Step 4, then press F1).

    Press F1 to select Mdi Mode (position data direct input).



18. Mdi Mode

    Press 1 for position data number 1, then press the RETURN key.



19. Press 100, then press RETURN key for X axis position data.
    Press 100, then press RETURN for Y axis position data.

    Press F1 (Wrt: Writing) to save position data number 1 (100,100).

* Repeat the same process to input position data number 2.

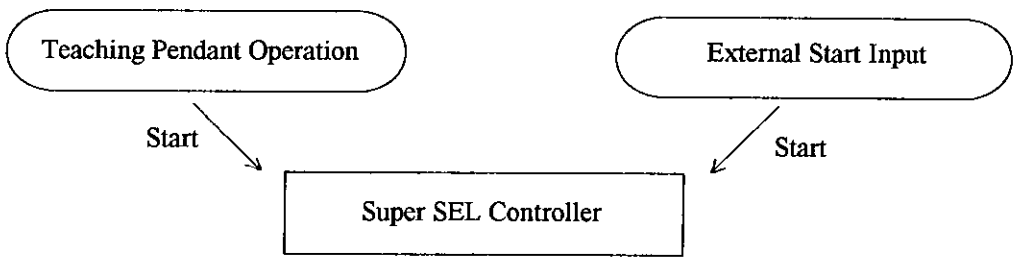
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Part 3 - System Operation

Operating Mode Summary

There are 2 types of operating modes in the Super SEL Controller System. They are as follows:

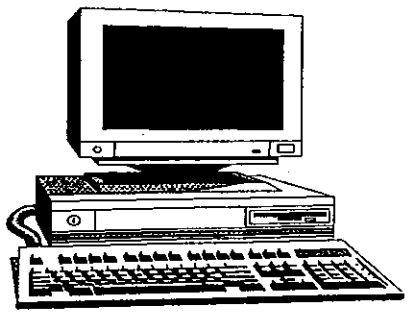
- Teaching Pendant Operation Mode for mainly program motion check
- External Start Operation Mode for main operation automatic drive



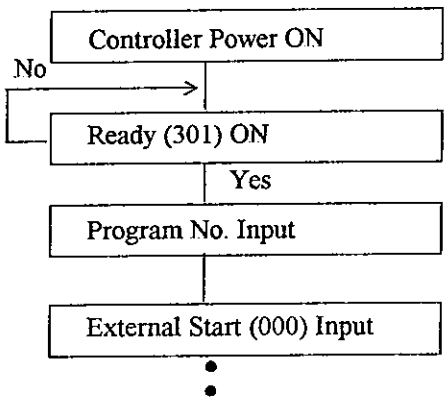
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1. External Start Operating Mode

Select Program No. from external unit, then input start signal.



(1) Flow Chart

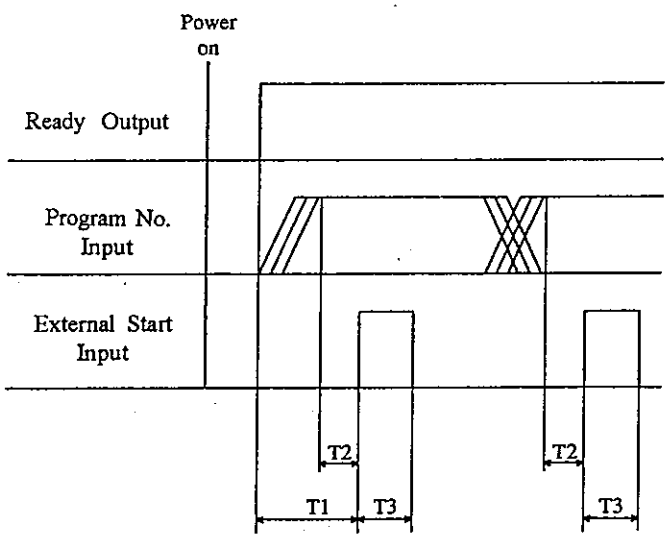


Program No. can be input before Ready prompt.

Selected Program No. will start.

Program No. will be displayed on the front panel of controller.

(2) Timing Chart



T1: Time between Ready Output ON and Start Input
Mimimum: 30 msec.

T2: Time between program No. Input and External Start Input
Minimum: 30 msec.

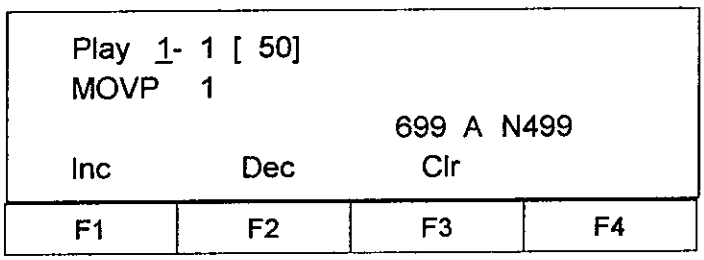
T3: External Start Input (Pulse Input)
Minimum: 30 msec.

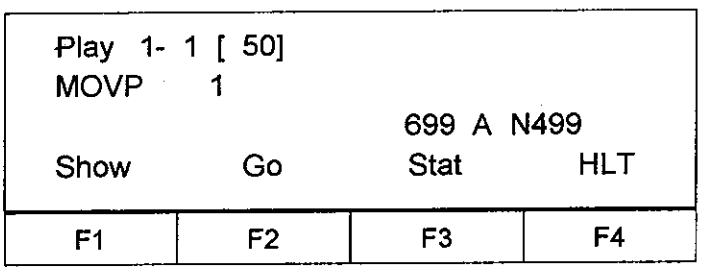
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2. Teaching Pendant Operating Mode

Program is executed via Teaching Pendant Play Mode.

Play Mode





Play Mode (Operation)

1. Play Program Input Mode

   Input the program to be executed (stopped).

2. Program Execution or Program Stop Selection

   Designate Program execution or stop.

   F1 - (Show) Supervise (when the designated program is already executing.)
   F2 - (Go) Execution
   F3 - (Status) Display status. (Program can be executed or stopped after checking the status.)
   F4 - (Hlt) Stop the program.
   (Press F2 to execute a designated program)

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3. Dedicated Input/Output Signal

(1) Dedicated Inputs

1. External Start	External Start Signal Reads the program number and starts the program.
2. Program Selection PRG 1~	Select program number for external start. External start signal will be input. It can be used as a user input after the program starts.
3. Emergency Stop	Emergency Stop Signal Servos and all user outputs will be turned OFF. Alarm output will be turned ON.
4. System Reserve	It should **never** be used as a user input

(2) Dedicated Outputs

1. Alarm Output	Turns ON in case of Emergency Stop input or alarm situation (Error Code A)
2. Ready Output	Turns ON after a few seconds Turns OFF when alarm output is ON.

Note: These 2-dedicated outputs can be turned ON and OFF in the program.

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Chapter 3. Multi-tasking

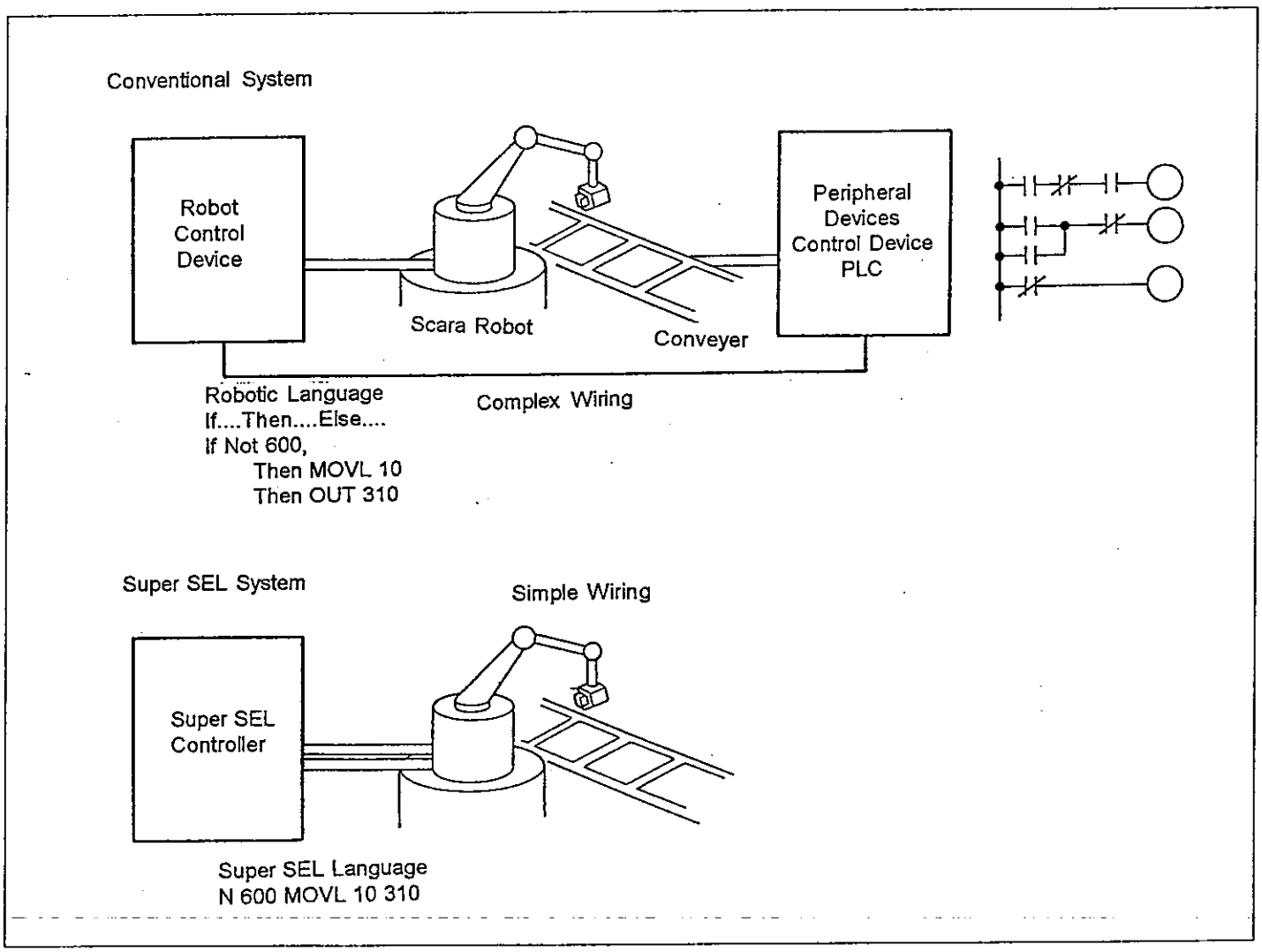
Part 1 - Real-time, Multi-tasking

1. Super SEL Programming Language

This part explains the special feature: "Multi Tasking".

The Super SEL employs a 32 bit RISC CPU operated by a high speed Operation System (OS).The Super SEL can control an entire system, including not only the actuators but also peripheral devices. The Super SEL enables the user to design an efficient automation system without learning various types of programming languages.

The original SEL's language has been improved to what is now the Super SEL's language. In particular, the "Multi Tasking" feature allows for high speed control of multi programs and I/O. Programming is so simple that even non-technical users can write a parallel processing program.

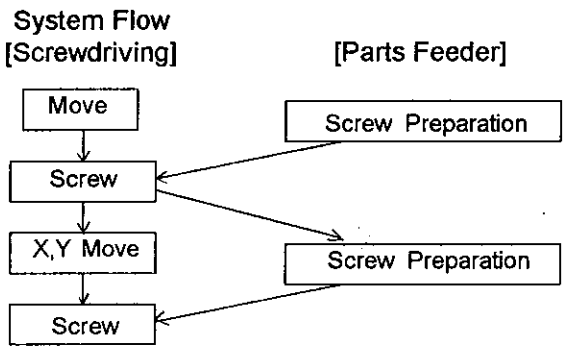


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2. Multi-tasking

"Multi Tasking" simply means running multiple programs concurrently.

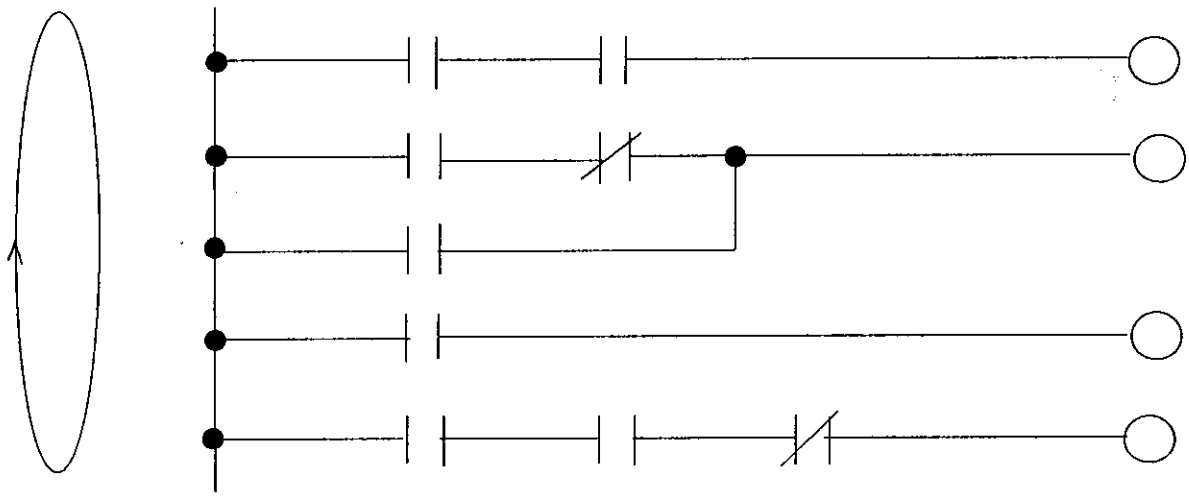
Let us consider a screwdriving robot system as an example. The following screwdriving system is composed of two actuators (X axis and Y axis) and a screwdriver with the part feeder.



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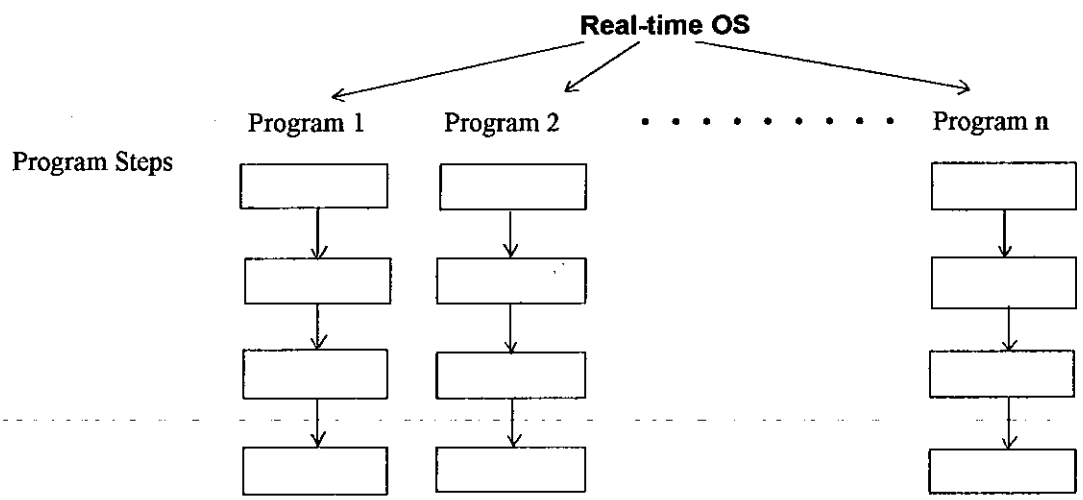
3. Difference from PLC Operation

In the past, parallel processing was accomplished by relay ladder circuitry. It was subsequently replaced by PLC which is equipped with micro processors. There is considerable scanning time involved in PLCs. The following shows that PLC sans the entire program, then sets the post if certain conditions are met.



The Super SEL Operating System (OS) handles programs at a high speed and executes programs only when a certain event occurs (Event Driven), without scanning. Also, each parallel processing program is composed of simple one-line steps. This makes programming and debugging easy.

With the Super SEL controller, the user will be able to develop a multi tasking program without thinking about parallel procesing, which is handled by the SEL Operating System (OS).

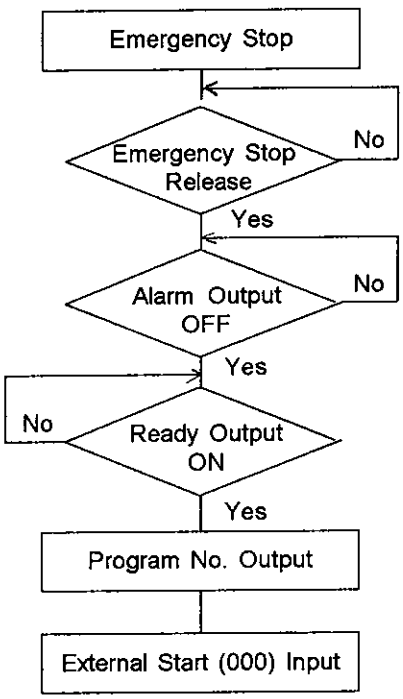


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4. Emergency Stop Release

Emergency stop is turned ON when emergency contact b is OFF, and emergency stop is released when ON.

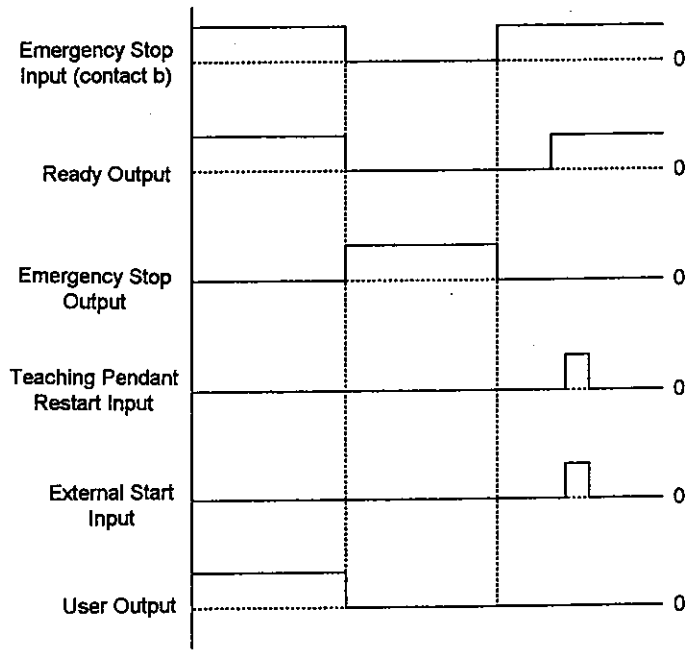
1. Flow chart



Execute from step 1 in selected program

2. Timing chart

Super SEL Controller Emergency Stop Release



- The status inside of the controller is:

  Program.....All stop
  Output port, local flag, local variable, home position .....Clear
  Global flag, global variable.....Maintain

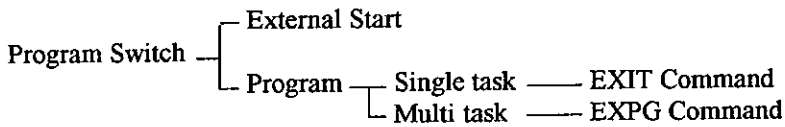
When peripheral devices are controlled by a program, the program must be ready beforehand. Control the peripheral devices by the program, and perform Executing Program (EXPG) and Aborting Program (ABPG) after checking the user input status..

* Emergency Stop Output (Alarm Output)
Pin No. 13B (Port No. 300) will be output by a servo related alarm A☐ besides the Emergency Stop.

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5. Program Switch

Program switch is mainly done by two ways: external start and application program



(1) External Start

Refer to Chapter 2 Part 3.
After the power is turned on, input a program No. and execute the designated program by external start input.
After the first program, another designated program can be executed by inputting the program No. and external start input.

(2) Program

A. Single task
By performing EXIT command (program end) after each program, complete programs and return to the original status (at the time of Power ON) However, Home position is maintained. Another program No. can be designated, and the program can be switched by external start input.

B. Multi-task
Programs are executed in parallel after EXPG command (program execution) within the management program.

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Chapter 3. Multi-tasking

Part 2 - Screwdriving Robot System

This chapter explains the Screwdriving Robot System operated by the Super SEL Controller.

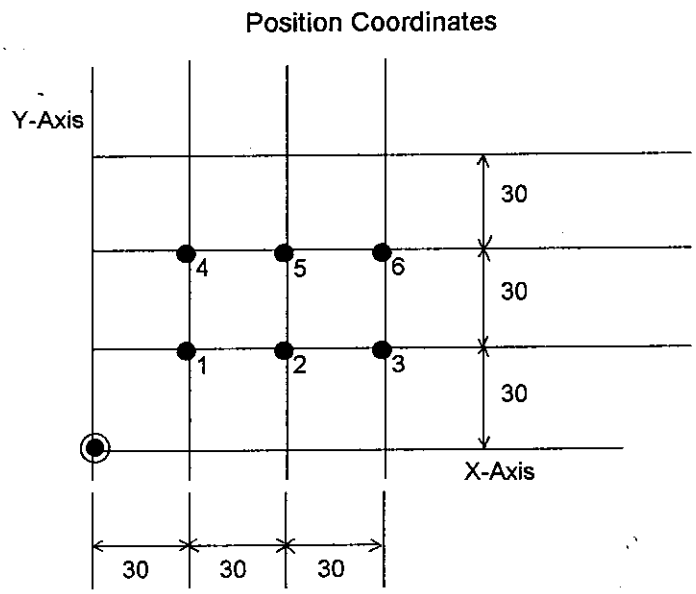
1. Components to be used:

Automatic Screwdriver with air cylinder (Z axis)
Screw feeder
X axis actuator: Intelligent Actuator 60W, 300mm model
Y axis actuator: Intelligent Actuator 60W, 300mm model
Controller: Super SEL (TypeA)

2. Operation:

Screwdriving six screws each 30mm apart on both X and Y axes

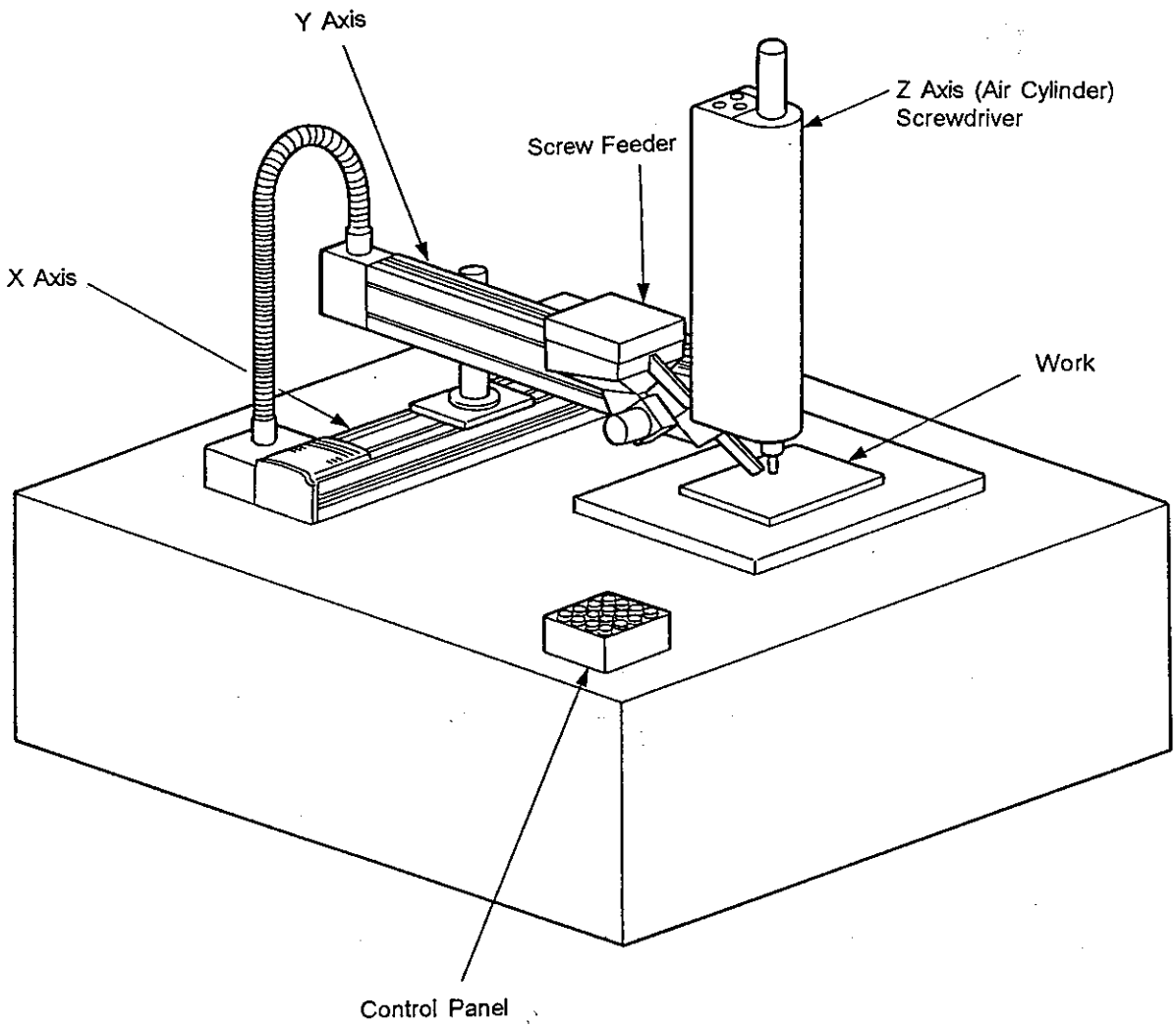
(1) X and Y axes move to a screwdriving position.
(2) Z axis (air cylinder) goes down.
(3) Begins screwdriving.
(4) Completes screwdriving, then Z axis goes up.
(5) X and Y axes move to the next position.
(6) Screw preparation is performed simultaneously along with the above operation.
  a. Screw feeder starts feeding when screws are depleted.
  b. Screw feeder stops feeding when screws are full.



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3. Screwdriving System Illustration

The system consists of the X and Y actuators, automatic screwdriver and screw feeder. The screwdriver is positioned by the actuators, and screws are supplied by the feeder.



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4. Hardware

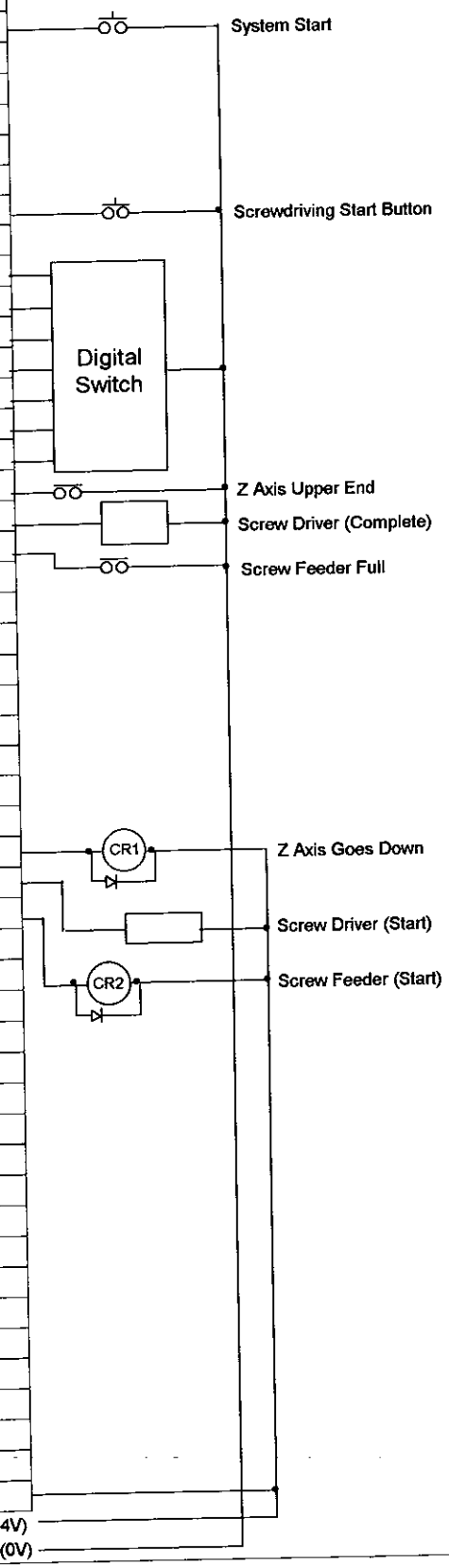
(1) I/O Assignment

Pin No.	Category	Port No.	Function	Cable
1A	P24	-	Built-In Power +24V Output	1-Brown
1B	Input	000	External Start Input	1-Red
2A		001	User Input	1-Orange
2B		002	Emergency Stop (Point b Input)	1-Yellow
3A		003	Unused (NC)	1-Green
3B		004	Unused (NC)	1-Blue
4A		005	User Input	1-Purple
4B		006	Screwdriving Start	1-Gray
5A		007	Screwdriving End	1-White
5B		008	PRG No. 1 (User Input)	1-Black
6A		009	PRG No. 2 (User Input)	2-Brown
6B		010	PRG No. 4 (User Input)	2-Red
7A		011	PRG No. 8 (User Input)	2-Orange
7B		012	PRG No. 10 (User Input)	2-Yellow
8A		013	PRG No. 20 (User Input)	2-Green
8B		014	PRG No. 40 (User Input)	2-Blue
9A		015	Z Axis Air Cylinder Up	2-Purple
9B		016	Screwdriving Complete	2-Gray
10A		017	Parts Feeder Full	2-White
10B		018	User Input	2-Black
11A		019	User Input	3-Brown
11B		020	User Input	3-Red
12A		021	User Input	3-Orange
12B		022	User Input	3-Yellow
13A		023	User Input	3-Green
13B	Output	300	Emergency Stop/Alarm Output	3-Blue
14A		301	Ready Output	3-Purple
14B		302	User Output	3-Gray
15A		303	Z Axis Air Cylinder Down	3-White
15B		304	Start Screwdriving	3-Black
16A		305	Start Feeding	4-Brown
16B		306	User Output	4-Red
17A		307	User Output	4-Orange
17B		308	User Output	4-Yellow
18A		309	User Output	4-Green
18B		310	User Output	4-Blue
19A		311	User Output	4-Purple
19B		312	User Output	4-Gray
20A		313	User Output	4-White
20B		314	User Output	4-Black
21A		315	User Output	5-Brown
21B		316	User Output	5-Red
22A		317	User Output	5-Oange
22B		318	User Output	5-Yellow
23A		319	User Output	5-Green
23B		320	User Output	5-Blue
24A		321	User Output	5-Purple
24B		322	User Output	5-Gray
25A		323	User Output	5-White
25B	N24	-	Built-In Power 0V	5-Black

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(2) Wiring

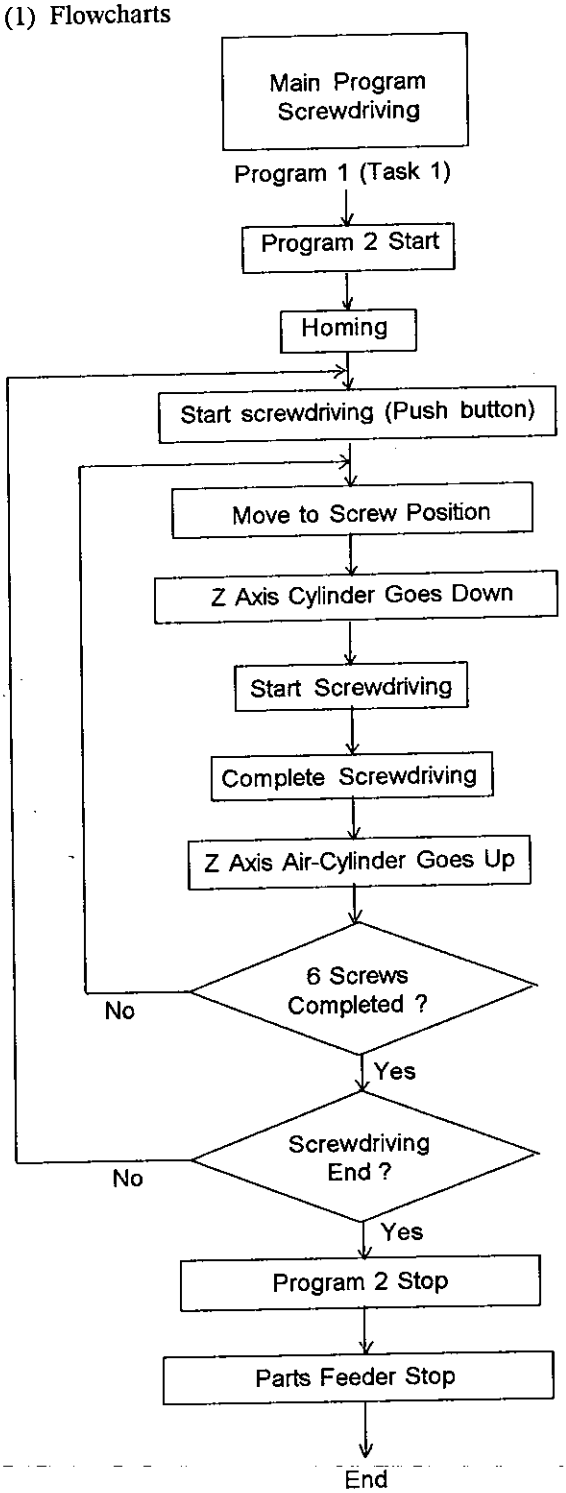
Pin No.	Category	Port No.	Function
1A	P24	-	Built-In Power +24V
1B	Input	000	External Start Input
2A		001	User Input
2B		002	Emergency Stop (Point b Input)
3A		003	Unused (NC)
3B		004	Unused (NC)
4A		005	User Input
4B		006	User Input
5A		007	User Input
5B		008	PRG No. 1 (User Input)
6A		009	PRG No. 2 (User Input)
6B		010	PRG No. 4 (User Input)
7A		011	PRG No. 8 (User Input)
7B		012	PRG No. 10 (User Input)
8A		013	PRG No. 20 (User Input)
8B		014	PRG No. 40 (User Input)
9A		015	User Input
9B		016	User Input
10A		017	User Input
10B		018	User Input
11A		019	User Input
11B		020	User Input
12A		021	User Input
12B		022	User Input
13A		023	User Input
13B	Output	300	Emergency Stop/Alarm Output
14A		301	Ready Output
14B		302	User Output
15A		303	User Output
15B		304	User Output
16A		305	User Output
16B		306	User Output
17A		307	User Output
17B		308	User Output
18A		309	User Output
18B		310	User Output
19A		311	User Output
19B		312	User Output
20A		313	User Output
20B		314	User Output
21A		315	User Output
21B		316	User Output
22A		317	User Output
22B		318	User Output
23A		319	User Output
23B		320	User Output
24A		321	User Output
24B		322	User Output
25A		323	User Output
25B	N24	-	Built-In Power 0V

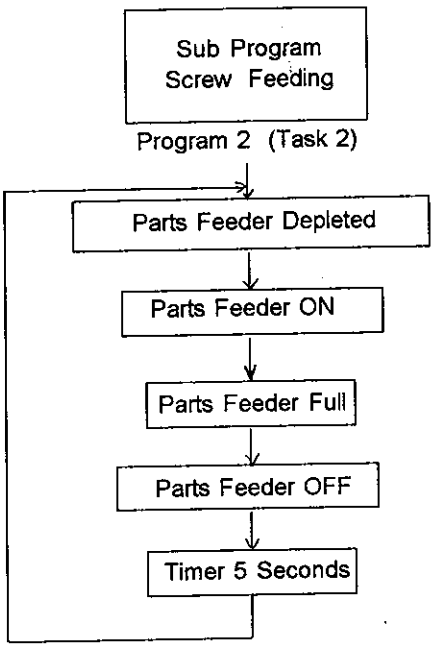


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5. Software

(1) Flowcharts





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