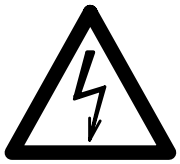
UNIVERSAL SERVO DRIVE
INSTRUCTION MANUAL

version: 1.0
software rel. V8.92



WARNING!

Attention to these warning signs on the drive or in this instruction book, they indicate **danger to human body** or **damage to the drive**.
Before installing and putting the drive into operation, please read the safety precautions and warnings following this page.

Safety precautions & warnings

Read carefully all the safety precautions included in these operating instructions and all the warning signs attached to the drive. Make sure that the warning signs are kept in a legible condition and replace missing or damaged signs.
Before starting, familiarize yourself with the operation of the drive. It may be too late if you start working with the drive before read this instruction manual.
Never permit unqualified personnel to operate the drive.

⚠ WARNING

This drive produces dangerous electrical voltages and controls rotating mechanical parts. Death, severe injury or substantial damage to property can occur if the instructions in this operating manual are not completed with.
Only personnel with appropriate qualifications should work with this drive. These personnel must be familiar with all the warning signs and precautions laid out in these operating instructions for the transport, installation and operation of this drive.
The successful and safe use of this drive depends on the correct installation, commissioning, operation and maintenance of the drive.
This drive operates at high voltages.

- The DC-link capacitors remain charged to dangerous voltages even the power is removed. For this reason it is not permissible to open the drive cover until five (5) minutes after the power has been turned off. When handling the open drive it should be noted that live parts are exposed. Do not touch these live parts.
- The terminals R, S, T, U, V, W, P, N, B can carry dangerous voltages even if the motor is inoperative:
- Only qualified personnel may connect, start the system up and repair faults. These personnel must be thoroughly acquainted with all the warnings and operating procedures contained with this manual.
- Certain parameter settings may cause the drive to start up automatically after power on or power recover.

DEFINITIONS

Qualified Person

For the purposes of this manual and product labels, a qualified person is one who is familiar with the installation, construction, operation and maintenance of this drive and with hazards involved. In addition, the person must be:

- Trained and authorized to energize, de-energize, clear, ground and tag circuits and equipment in accordance with established safety practices.
- Trained in the proper care and use of protective equipment in accordance with established safety practices.
- Trained in rendering first aid.

Danger

For the purposes of this manual and product labels, DANGER indicates that loss of life, severe personal injury or substantial property damage WILL result if proper precautions are not taken.

Warning

For the purposes of this manual and product labels, WARNING indicates that loss of life, severe personal injury or substantial property damage CAN result if proper precautions are not taken.

Caution

For the purpose of this manual and product labels, CAUTION indicates that minor personal injury or property damage CAN result if proper precautions are not taken.

Note

For the purpose of this manual and product labels, NOTES merely call attention to information that is especially significant in understanding and operating the drive.

⚠ DANGER and WARNING

Make sure that the location selected for installation is safe, protected from moisture and splash and drip-proof!
Children and the general public must be prevented from accessing or approaching the equipment!

The equipment may only be used for the purpose specified by the manufacturer.
Unauthorized modifications and the use of spare parts and accessories that are not sold or recommended by the manufacturer of the equipment can cause fires, electric shocks and injuries.

Keep these operating instructions within easy reach and give them to all users!

⚠ WARNING

This is a Class A product. In a domestic environment this product may cause radio interference in which case the user may be required to take adequate measures.

CONTENTS

1. Description of PDS Servo Drive

1.1 Brief Function Description

Drives Different Motor types

- Brushless Servo Motor
- Induction Servo Motor
- Open Loop Induction Motor
- Memorize Four Motor Parameter Groups

Varity Control Modes in Single Drive

- Open Loop V/F or Sensorless Speed Mode
- Close Loop Speed Mode
- Torque Control Mode
- Pulse Command Tracking Mode
- Auto Positioning Mode

Enhanced Communication

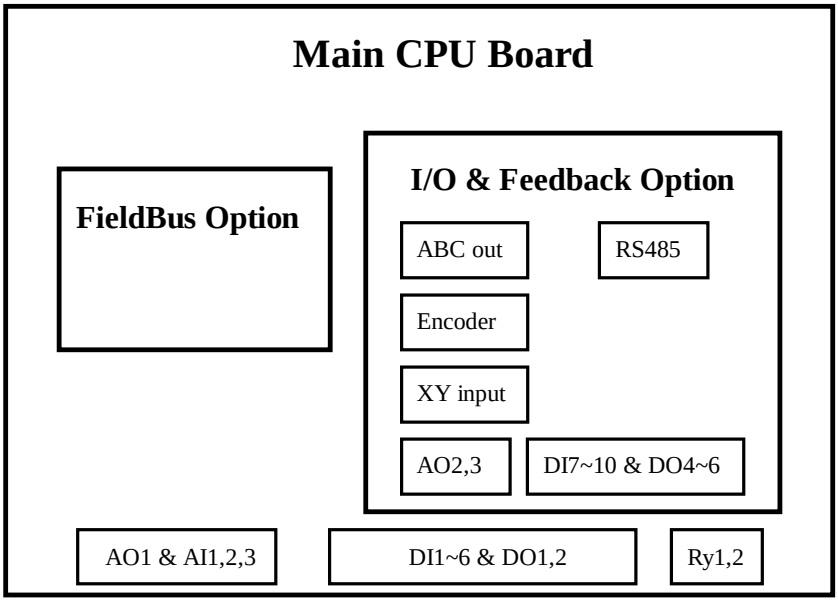
- Standard RS485 Communication Port
  Simple and direct protocol embedded for Computer/PLC control.
  Baud Rate up to 4800, 9600, 19200, 38400
- Option Field Bus Module
  Many commonly used Fieldbus option board can be selected, such as:
  - Modbus(RTU)
  - Profibus-DP
  - InterBus
  - DeviceNet
  - ControlNet
  - CANopen

  * Other systems planned

Multi-Functioned I/O

- 11 Digital Inputs (Sink or Source selectable)
- 7 Digital Outputs (Sink or Source selectable)
- 3 Analog Inputs (±10V, +10V, +5V or 20mAselectable)
- 3 Analog Output (±10V)
- Encoder Clock Input
- Pulse Command Clock Input
- Encoder Clock Buffered Output

1.2 Control input & output configuration



The control terminals on the Main CPU board are separated into three groups.
Basic Analog I/O signals:

AO1	AI1	AI2	AI3	5V	ACOM

Basic Digital I/O signals:

DI1	DI2	DI3	DI4	DI5	DI6	RST	DO1	DO2	24V	DCOM

RY1	RY2

＊RY1, RY2 is normal open Relay output (equivalent to DO3)

Additional control terminals on Feedback I/O board:

AO2	AO3	ACOM

DI7	DI8	DI9	DI10	DO4	DO5	DO6

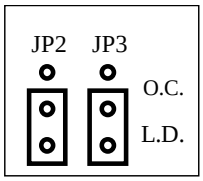
Connectors on Feedback I/O Board

CON3: Encoder Feedback from Motor. Equipped with accessory cable transforms into standard 15pin D-sub Male connector. The pin definition of D-sub connector is:

15pin D-sub Make connector		
Pin Number	Pin Name	Description
Pin1	A	● Pin1~Pin6 are used for both induction and brushless motor. ● Pin7~Pin12 used for brushless motor only. ● Encoder output should be Line Drive type. ● A, B are quadrature signals. ● Uf, Vf, Wf used for indicating the magnetic pole position of brushless motor.
Pin2	/A	
Pin3	B	
Pin4	/B	
Pin5	C	
Pin6	/C	
Pin7	Uf	
Pin8	/Uf	
Pin9	Vf	
Pin10	/Vf	
Pin11	Wf	
Pin12	/Wf	
Pin13	+5V	
Pin14	0V	
Pin15	0V	
Case	Shield	

Con5: XY pulse command input port. Equipped with accessory cable transforms into standard 9pin D-sub Female connector. The pin definition of the D-sub connector is:

9pin D-sub Female connector		
Pin Number	Pin Name	Description
Pin1	X	Refer to the following parameters: Pr.130: XY Clock type select Pr.131: XY Input pin status Pr.132: XY Direction change Pr.133~136: Multiply/Division rate Pr.137: XY counter value
Pin2	/X	
Pin3	Y	
Pin4	/Y	
Pin5	N.C.	
Pin6	N.C.	
Pin7	+5V	
Pin8	0V	
Pin9	N.C.	
Case	Shield	

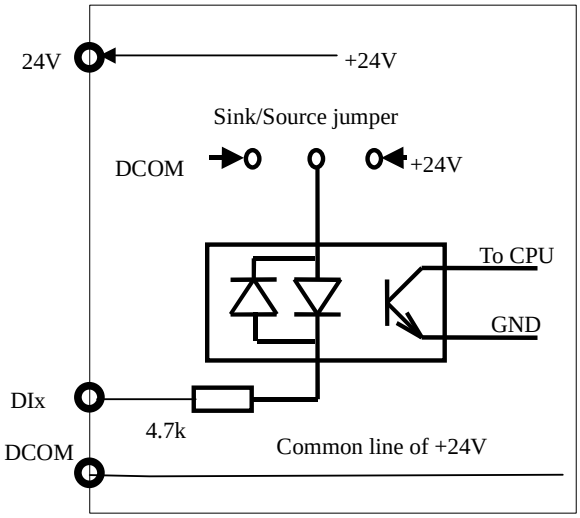


JP2 & JP3 on L.D. position, select Line Driver type.
JP2 & JP3 on O.C. position, select Open Collector type.
Note: When Open Collector type selected, XY signal inputs from X(Pin1) & Y(Pin3), /X(Pin2) & /Y(Pin4) should be N.C.

CON4: Buffered A, B, C output port. Equipped with accessory cable transforms into standard 9pin D-sub Male connector. The pin definition of the D-sub connector is:

9pin D-sub Male connector		
Pin Number	Pin Name	Description
Pin1	Aout	Buffered output of signal A
Pin2	/Aout	Buffered output of signal /A
Pin3	Bout	Buffered output of signal B
Pin4	/Bout	Buffered output of signal /B
Pin5	Cout	Buffered output of signal C
Pin6	/Cout	Buffered output of signal /C
Pin7	N.C.	The above outputs are Line Driver type
Pin8	0V	
Pin9	N.C.	
Case	Shield	

1.2.1 Digital Input (DI0~DI10)



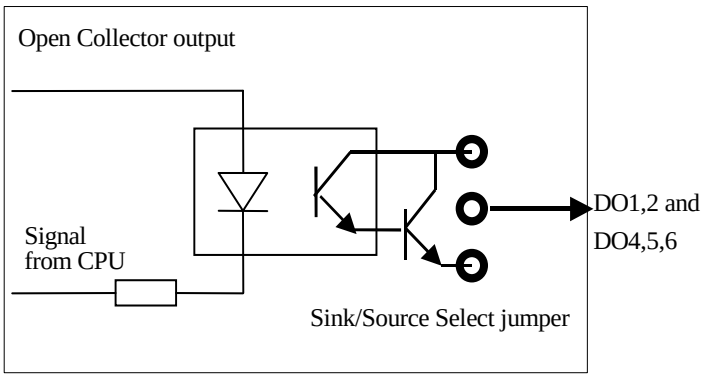
- DI1~DI10 are all identical Bi-directional digital inputs. DI1~DI6 located at Main CPU board
- DI7~DI10 located at Feedback I/O board.
- DI0 do not connect to the user control terminal, and only internal connected with DO0.
- +24V is common power supply for all DIx.
- DCOM is the command reference for these digital circuits.
- Each Digital Input can be configured individually by corresponding parameter Pr.140~Pr.150.
- User can select Sink (NPN) type or Source (PNP) type by jumper JP4.

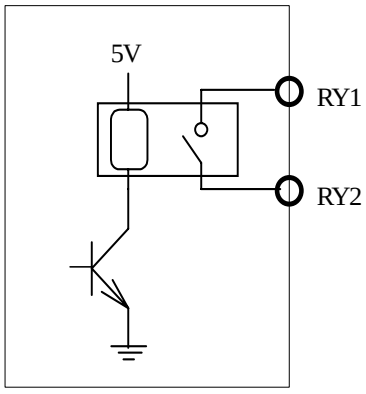
Note: The minimum input signal width is 5ms.

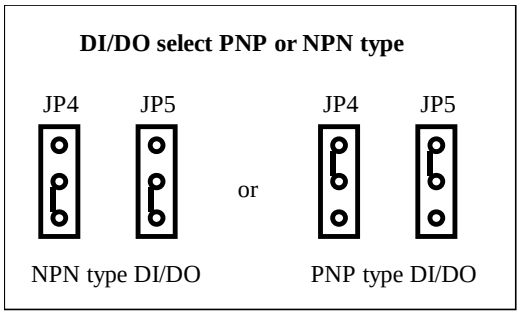
1.2.2 Digital Output (DO0~DO6)

- DO1, DO2, DO4~DO6 are open collector output,
- RY1, RY2 is voltage isolated "1a" contact of Relay output, RY1/RY2 named DO3 also.
- DO1, DO2, RY1/RY2 located at Main CPU board.
- DO4~DO6 located at Feedback I/O board.
- DO0 do not connect to the user control terminal, and only internal connected with DI0.
- Each Digital output can be configured individually by corresponding parameter Pr.160~Pr.166.
- User can select Sink (NPN) type or Source (PNP) type by jumper JP5.

Note: RY1, RY2 should drive 24V relay only



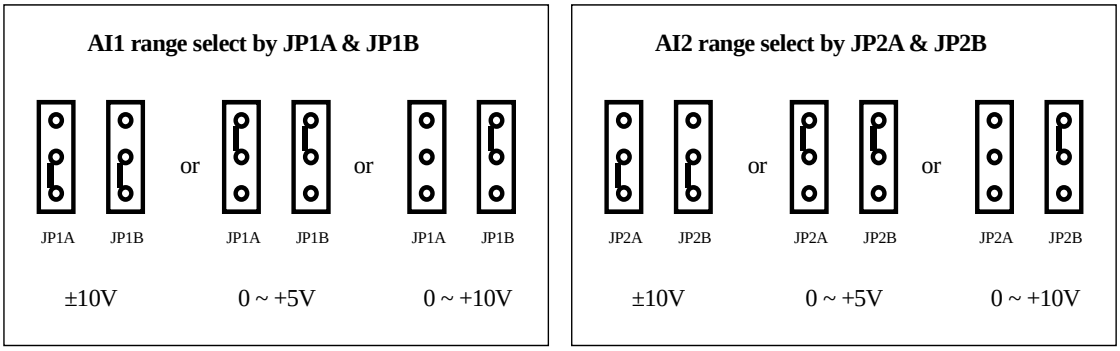




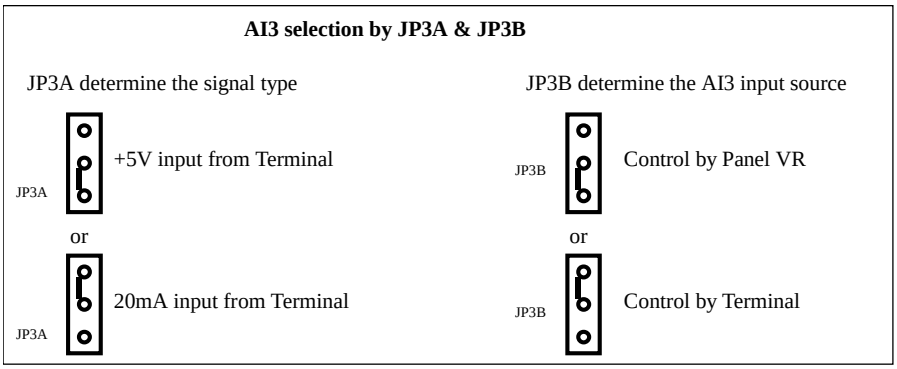
- JP4 upper position select Source input
- JP5 upper position select Source output
- JP4 lower position select Sink input
- JP5 lower position select Sink output

1.2.3 Analog input AI1, AI2 & AI3

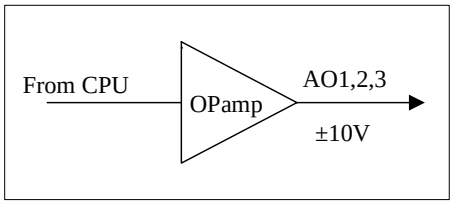
AI, AI2 signal must input from control terminal input, can select ±10V, +10Vor +5V of input signal range by Jumper.



AI3 signal may input from control terminal or by VR of control panel, can select +5Vor 20mA of input signal and input from control terminal or panel by Jumper.



1.2.4 Analog Output AO1, AO2 & AO3



AO1, Ao2 & AO3 are all identical analog outputs.
AO1 located at Main CPU board.
AO2, AO3 located at Feedback I/O board.
Each Analog Output can be configured individually by corresponding parameters. (Pr.210~213, 220~223, 230~233)

1.2.5 Hardware RESET (RST)

The hardware structure of RST terminal is similar to Digit Inputs description in Sec. 1.2.1.
Terminal **RST** is used for reset the servo drive. Under any circumstances, when **RST** terminal is activated, will force the drive execute **REST**, as if **Power on** again.

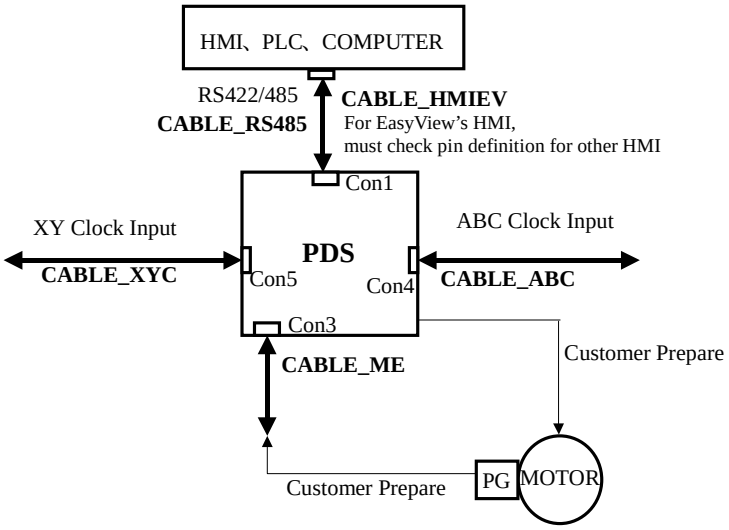
1.2.6 RS485 Communication Interface

- To use JPS protocol embedded for computer/ PLC control.
- To use Modbus(RTU) communication option, let drive simulate as Modicon PLC and can direct connect with HMI. The HMI can direct control and monitor the drive.

1.2.7 Standard Cables

The specification and application of standard cables describe as following:

Part No.	Application	Connector(1)	Connector(2)	Length(M)
CABLE_MEI	Encoder Input	D-sub 15Pin (Male)	JS091-16F	0.5
CABLE_ABCKO	A.B.C. Output	D-sub 9Pin (Male)	SC25-08HG	0.5
CABLE_XYCKI	X.Y. Input	D-sub 9Pin (Female)	SC25-07HG	0.5
CABLE_HMIEV	HMI	D-sub 9Pin (Male)	SC25-05HG	0.5
CABLE_RS485	RS485	SC25-05HG	SC25-05HG	2
CABLE_EXT2D9	Extension	D-sub 9Pin (Male)	D-sub 9Pin (Female)	2
CABLE_EXT2D15	Extension	D-sub 15Pin (Male)	D-sub 15Pin (Female)	2



1.2.8 Option Field Bus Interface

Many commonly used Fieldbus option board can be selected for complete data exchange with PLC or PC, such as:

- Profibus-DP
- InterBus
- DeviceNet
- ControlNet
- CANopen

Consult to our R&D department if needed.

⚠ CAUTION

All the input/output control signal lines and communication lines must be laid separately from the high current power/motor/brake lines. They must not be fed through the same cable conduit/trucking.

1.3 Electrical Rating Specifications

Model No.		2022	2037	2055	2075	2110	2150	2225	
PDS-		4022	4037	4055	4075	4110	4150	4225	4300
HP		3	5	7.5	10	15	20	30	40
KW		2.2	3.7	5.5	7.5	11	15	22.5	30
KVA		4.0	6.5	9.5	13	19	25	34	46
Amp rms	-2xxx	11	17	24	33	46	61	90	
	-4xxx	5.5	8.5	12	17	23	31	45	57

2. Installation

⚠ WARNING

To guarantee the safe operation of the equipment it must be installed and commissioned properly by qualified personnel in compliance with warnings laid down in these operating instructions.
Take particular note of the general and regional installation and safety regulations regarding work on high voltage regulations, as well as the relevant regulations regarding the correct use of tools and personal protective gear.
Make sure that the unobstructed clearance for each of the cooling inlets and outlets above and below the driver is at least 100mm.
Make sure that a space of 40mm is kept free at the sides of the driver to permit the cooling air to escape from the side slits.
Ensure that the temperature does not exceed the specified level when the driver is installed in cubicle.
Avoid excessive vibration and shaking of the equipment.

NOTE:
Please consider the possible use of options, such as RFI suppression filters at the planning stage.

⚠ WARNING

To prevent electrical shock, do not open cover for at least 5 minutes after removing AC power to allow capacitors to discharge.

2.1 Outline Dimensions

Model No. PDS-		2022 / 4022	2037 / 4037	2055 / 4055	2075 / 4075	2110 / 4110	2150 / 4150
Dimension	W X L X D	170 X 206 X 162		192 X 300 X 216		250 X 420 X 255	
Mounting Hole	W X L mm	157.6 X 193.6		178 X 286		226 X 405	
Mounting Screw		M5 X 4		M5 X 4		M6 X 4	
Enclosure		IP20					

2.2 Power Terminal

The upper cover must be removed in order to connect the electrical leads.
Basically, the Power terminals are divided into three portions:

1. The Power line input, (R, S, T) receives power for the operation of the driver.
2. The Motor line output, (U, V, W) delivers Variable Frequency output to motor leads.
3. Brake resistor connect to B, P terminals

NOTE: Must connect Earth properly.

⚠ WARNING: Never connect power line to U, V, W, P, N, B

2.3 Connect Power Line Input to Driver

⚠ WARNING and CAUTION

- **Between the power line and the driver, add NFB for system protection.**
- **There are static sensitive components inside the Printed Circuit Board. Avoid touching the boards or components with your hands or metal objects.**
- **Only the terminal screws may be touched with the insulated screwdrivers when connecting the leads.**
- **Make sure to connect the power terminals tight and correctly.**
- **Make sure that the power source supplies the correct voltage and is designed for the necessary current.**
- **Make sure the motor is configured to match the input voltage.**
- **Protective EARTH terminal marked with ⏚ must be connected properly.**
- **Take care that the appropriate circuit breakers with the specified current rating are connected between the power supply and the driver.**

2.4 Connect Driver Output to Motor

⚠ WARNING

Do not insert contactors between driver output and motor.

For every model, "U, V, W " are the three phase output terminals, they should be connected to motor leads directly.

2.5 Control Terminal Connection

⚠ CAUTION

All the input/output control signal lines, or remote panel lines and communication lines must be laid separately from the high current power/motor/brake lines. They must not be fed through the same cable conduit/trucking.

2.6 DC BUS Terminal (P, N) or Brake Terminal (B, P)

⚠ CAUTION

Some models with power terminal marked P and N, these models does not include Brake transistor inside the driver. Customer may use extra Brake Transistor Module for discharge brake function.
For models that include braking transistor, the power terminal will mark P and B. User can connect suitable resistor to the P & B terminals directly.
Here is the recommended table for discharge resistors:

Model	Resistance (Ohm)	Rating (Watt)
2022	60	250
2037	40	300
2055	30	500
2075	20	600
2110	15	1000
2150	10	1500
4022	250	250
4037	150	300
4055	100	500
4075	75	750
4110	50	1000
4150	40	1500
Discharge duty 10 %-		

⚠Warning: Never connect resistor to P & N terminal

If the terminals are P & N, must add external braking unit.

3. Control Panel

The control panel involves 4 digits 7-segment display and 4 Led-lamps, 8 keys and a potential meter (VR).
It has four possible operation modes: "CTL", "MON", "PAR" and "ALM modes, described below.

3.1 CTL Mode

VR input is equivalent to AI3 input, JP3B of CPU board determine the AI3 input source.
Push the "CTL/MON" key, will change the keypad operation between "CTL" and "MON" Mode. If both "HZ" and "I" Led are blank, it is under "CTL" Mode.
Under "CTL" Mode, user can control the driver running in either direction and may modify the desired running speed.
For normal run/stop control, use only the three keys:
FWD key is used for running the driver in forward direction.
REV key is used for running the driver in reverse direction.
STOP key is used to stop the driver.
If Pr.40 = 3 or 8, the running frequency shall be modified by keypad, then these keys are enabled:
RD/WT key is used to read out the internal Panel Speed Set value.
▲ key is used to increase the Panel Speed Set value
▼ key is used to decrease the Panel Speed Set value
STOP key is used for cursor shift

Procedure:

a. Under normal CTL mode, push RD/WT will enter **Panel Speed Set mode**, (if Pr.040=8, the display will show the value stored in Pr.000) and blinking the data.
b. Push ▲ or ▼, the display starts to show the cursor position.
c. Push ▲ or ▼, in order to modify the Panel set frequency.
d. Push CTL/MON key will go back to normal CTL mode.

Note: If Pr.40=8, the new modified Panel Speed Set value will rewrite into Pr.000 automatically.

3.2 MON mode

Push the "CTL/MON" key, will change the keypad operation between "CTL" and "MON" Mode.
Under "MON" Mode, user can control the driver running in either direction and may monitor any two internal status easily.
If "HZ" Led is on, it is under "MON" Mode and 7-segment shows the "HZ" data. **(Or the desired parameter assigned by Pr.099)**
If "I" Led is on, it is under "MON" Mode and 7-segment shows the "I" data. **(Or the desired parameter assigned by Pr.098)**
FWD key is used for running the driver in forward direction.
REV key is used for running the driver in reverse direction.
STOP key is used to STOP the driver.
▲ key is used to select "HZ" or "I" data shown on the 7-segment display.
▼ key is used to select "HZ" or "I" data shown on the 7-segment display.

3.3 PAR mode

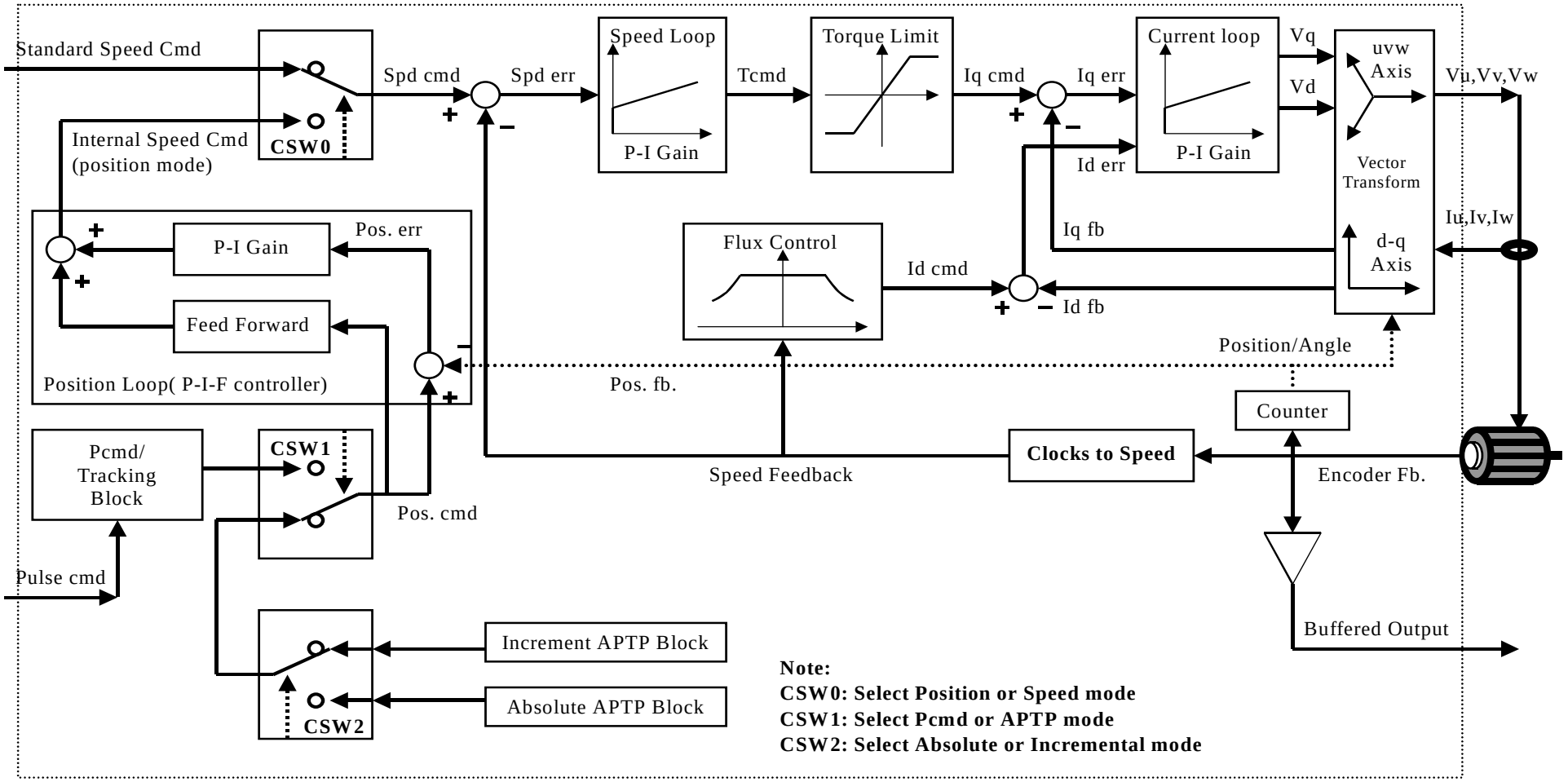
Push the "PAR/ALM" key, will change the keypad operation between "PAR" or "ALM" mode.
If push PAR/ALM key, 7-segment shows "Pr.xxx", it is under "PAR" Mode, the HZ and I lamps all ON, user can modify or monitor all the internal Parameters. To modify any parameter, follow the steps described below:
STEP 1: push "PAR/ALM" key, the 7-segment will show "Pr.nnn". (nnn is parameter number)
STEP 2: push ▲ or ▼ key to select desired parameter number, **and "STOP" key used as cursor shift**.
STEP 3: push "RD/WT" key to READ the content of the specified parameter. (The 7-segment now shows the value of this parameter.)
STEP 4: push ▲ or ▼ key to modify the displayed value, **and "STOP" key used as cursor shift**.
STEP 5: push "RD/WT" key to WRITE the new value into parameter memory.
STEP 6: push "PAR/ALM" repeat STEP 1 to modify next parameter.

3.4 ALM mode

Push the "PAR/ALM" key, will change the keypad operation between "PAR" or "ALM" mode.
If push PAR/ALM key, 7-segment shows "0.-xx", it is under "ALM" Mode.
Under "ALM" Mode, the user can execute RESET function or monitor ALARM STATUS.
STOP/RESET key, the driver will execute RESET function.
▲ **and** ▼ key are used to check ALARM History.

4. Start-Up Examples

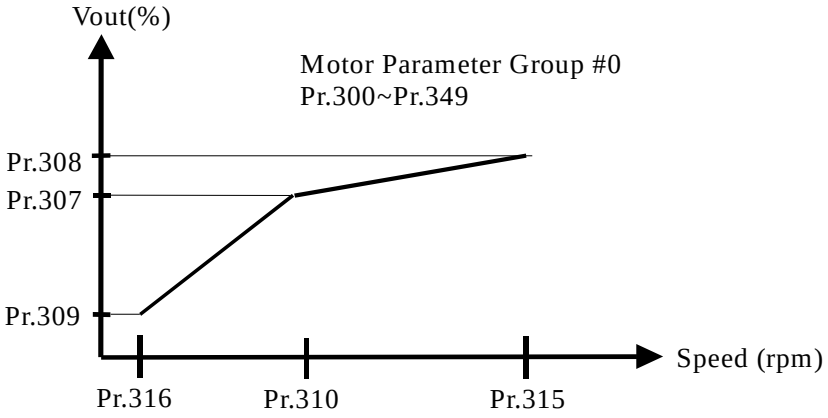
4.1 Basic Function Block



4.2 Setup Basic Motor Parameter

Refer to section 5.2.11 for detail description of motor parameter groups (Pr.300~499).
For example, if an induction motor running under V/F constant mode, user must set up the V/F curve parameters according to motor manufacturer's data.

- Select motor characteristic group#0, set Pr.188=0
- Select induction motor under V/F control mode, set Pr.300=0
- Set motor rated speed in Pr.310 (RPM)
- Set motor maximum speed in Pr.315 (RPM)
- Set motor minimum speed in Pr.316 (RPM)
- Set motor rated voltage in Pr.307 (% of Input Line Voltage)
- Set motor peak voltage in Pr.308 (% of Input Line Voltage)
- Set Boost voltage in Pr.309 (% of motor rated voltage)
- Set motor rated current in Pr.311=(MotorRatingCurrent/DriverRatingCurrent)*100%
- Set motor peak current in Pr.312=(MotorPeakCurrent/MotorRatingCurrent)*100%
- Set motor pole number in Pr.314



4.3 Default Setting of some simple Examples

For user convenience, some default setting for different application is embedded in the firmware.
Execute RESET operation after setting Pr.094 to specified value; the CPU will set related parameters to perform the desired operation mode.

Pr.094=201, simple V/F mode operation for induction motor
Pr.094=202, simple Induction Servo running under Speed mode
Pr.094=203, simple Induction Servo running under Pcmd mode
Pr.094=204, simple Induction Servo running under Auto Point-to-Point Positioning
Pr.094=205, Auto Tuning for Induction Servo Motor
Pr.094=232, simple Brushless Servo running under Speed mode
Pr.094=233, simple Brushless Servo running under Pcmd mode
Pr.094=234, simple Brushless Servo running under Auto Point-to-Point Positioning
Pr.094=235, Auto Tuning for Brushless Servo Motor

NOTE: Before above setting, select Pr.094=1, then execute RESET to initialize the R/W type parameters to default value. (Refer to section 5.2.3)

4.3.1 V/F Constant Mode for Induction Motor

Select Pr.094=201, then execute RESET to initialize the parameters. After initialization, the CPU loads following parameters, then the drive standby under **V/F** mode.

Pr.188=0	Choose pre-stored Group#0 motor parameters (Pr.300~Pr.349)
Pr.300=0	Let the motor operate under V/F constant mode
Pr.330~Pr.333=0	Always operate under open loop speed mode
Pr.141=102	DI1(102) Drive will Enable by DI1
Pr.145=73	DI5(73) FWD RUN (effective when control by terminal input)
Pr.146=74	DI6(74) REV RUN (effective when control by terminal input)
Pr.181=0 & Pr.039=0.2	FWD/REV command by LOCAL panel normally
Pr.040=0.25	Speed command by Pr.000 normally
Pr.000=500	Default speed = 500RPM
Pr.001=5.00	5 seconds ramp up from zero to maximum speed
Pr.002=5.00	5 seconds ramp down from maximum to zero speed

Procedure:

- Connect DI1 to DCOM (assume DI/DO is chosen to be SINK type) to enable the drive.
- Push FWD or REV key, then the motor speed will ramp up to 500RPM.
- Change Pr.039=2.2, transfer control to terminal input DI5 & DI6.
- Connect DI5 (or DI6) to DCOM; the motor will ramp up to 500RPM.

4.3.2 Speed Mode for Induction Servo Motor

Select Pr.094=202, then execute RESET to initialize the parameters. After initialization, the CPU loads following parameters, then the drive standby under **Speed** mode.

Pr.188=0	Choose pre-stored Group#0 motor parameters (Pr.300~Pr.349)
Pr.300=2	Select Induction servo motor for close loop control ***1**
Pr.330=0	Select Speed control mode
Pr.331~Pr.333=0	Always operate under speed mode, no torque control
Pr.141=102	DI1(102) Drive will Enable by DI1
Pr.145=73	DI5(73) FWD RUN (effective when control by terminal input)
Pr.146=74	DI6(74) REV RUN (effective when control by terminal input)
Pr.181=0 & Pr.039=0.2	FWD/REV command by LOCAL panel normally
Pr.040=0.25	Speed command by Pr.000 normally
Pr.000=500	Default speed = 500RPM
Pr.001=5.00	5 seconds ramp up from zero to maximum speed
Pr.002=5.00	5 seconds ramp down from maximum to zero speed

Procedure:

- Try operations similar to section 4.3.1.
- Modify Pgain and Igain if necessary.

***1: before operation start, verify following parameters (refer to section 5)**

Pr.302: PPR of Encoder
Pr.303: A/B clock Direction
Pr.313: Field Current%=(FieldCurrent/MotorRatedCurrent)*100%
Pr.317: Slip RPM
Pr.320: Pgain of Current loop
Pr.321: I gain of Current loop
Pr.323: P gain of Speed loop
Pr.324: I gain of Speed loop

4.3.3 Tracking Mode (Pcmd) for Induction Servo Motor

Select Pr.094=203, then execute RESET to initialize the parameters. After initialization, the CPU loads following parameters, then the drive standby under **tracking** mode.

Pr.188=0	Choose pre-stored Group#0 motor parameters (Pr.300~Pr.349)
Pr.300=2	Select Induction servo motor for close loop control
Pr.330=1	Position control ***2**
Pr.331=1	Tracking mode by Pulse Command input from XY port
Pr.332~Pr.333=0	No torque control
Pr.141=102	DI1(102) Drive will Enable by DI1
Pr.145=73	DI5(73) FWD RUN (effective when control by terminal input)
Pr.146=74	DI6(74) REV RUN (effective when control by terminal input)
Pr.181=0 & Pr.039=0.2	FWD/REV command by LOCAL panel normally
Pr.040=0.25	Speed command by Pr.000 normally
Pr.000=500	Default speed = 500RPM
Pr.130=0	select quadrature input clock to XY input
Pr.133=1000	XY multiply rate =1000
Pr.134=1000	XY division rate = 1000

***2**: before operation start, verify Pr.326 (Position loop P gain) and the parameters of *1 of section 4.3.2.

Procedure:

- Connect DI1 to DCOM
- Push FWD or REV key, then the drive is ready to accept clock input from XY port
- Change Pr.133 or Pr.134, and verify the effects.

4.3.4 Auto Point-to-Point control Mode for Induction Servo

Select Pr.094=204, then execute RESET to initialize the parameters. After initialization, the CPU loads following parameters, then the drive standby under **auto point-to-point** mode.

Pr.188=0	Choose pre-stored Group#0 motor parameters (Pr.300~Pr.349)
Pr.300=2	Select Induction servo motor for close loop control
Pr.330=1	Position control (Refer to section 4.3.3 *2)
Pr.331=0	Auto Point-to-Point control
Pr.332=0	Select **Incremental type APTP**
Pr.333=0	No torque control
Pr.141=102	DI1(102) Drive will Enable by DI1
Pr.142=128	DI2(128) Start Home search
Pr.143=129	DI3(129) End Home search and stop at the desired offset point
Pr.144=118	DI4(118) APTP start trigger
Pr.145=119	DI5(119) Direction control
Pr.146=120	DI6(120) Point selection Bit0
Pr.181=0 & Pr.039=0.0	FWD/REV command by LOCAL panel normally
Pr.040=0.00	Speed command by Pr.000 normally
Pr.000=500	Default speed = 500RPM
Pr.001=0.50	0.5 seconds ramp up from zero to maximum speed
Pr.002=0.50	0.5 seconds ramp down from maximum to zero speed
Pr.568/569=00000001	Offset one clock after index catch
Pr.500/501=4*PPR	One revolution when DL0 is selected
Pr.502/503=40*PPR	Ten revolutions when DL1 is selected

Procedure:

- Connect DI1 to DCOM
- Push FWD or REV key, then the drive is ready to accept Home Search Command
- Trigger DI2, the motor start run to 500RPM
- Trigger DI3 (assume DOG sensor input), the drive start search index then stop at desired offset
- Use DI5 and DI6 to select desired DLn (Destination Length) and direction
- Trigger DI4, the motor run and stop at DLn.
- Try to use DI7~DI10 and set other DLn parameters to select different length.
- If **Absolute type APTP is desired,** set Pr.332=1, execute RESET, then try again

4.3.5 Example for Brushless Servo Motor

If select Pr.094=232~234, the functions are similar to Pr.094=202~204, Except

- Pr.188=3, the motor characteristic parameters are default to group#3(Pr.450~Pr.499)
- Pr.450=3, select brushless servo motor.

***User has to prepare other parameters in group#3 to match the brushless motor in use.**

4.4 Auto Tuning for Servo Motors

4.4.1 Auto Tuning for Induction Servo Motor

If select Pr.094=205, only few parameters is necessary to set by user, then after execute RESET, this drive can detect the motor characteristic parameters itself.

For induction servo, use motor parameter group#0(Pr.300~Pr.349).

1. Set Pr.307=Rated motor Voltage=100%(Motor Rated Voltage/Line Voltage).
2. Set Pr.310=Rated motor Speed (RPM).
3. Set Pr.311=Rated motor Current=100%*(Motor Rated Current/Driver Rated Current).
4. Set Pr.094=205, inform the drive to execute Auto tuning after reset
5. Execute RESET to initiate Tuning Process.

After tuning process complete, the drive will set Pr.094=202, then reset again in order to preload the drive as speed controller. (Refer to sec.4.3.2). The following parameters will be changed after tuning process, user should verify again.

Pr.302- Encoder PPR, set to correct value
Pr.303- Encoder Direction, set to correct direction
Pr.308- Set equal to Pr.307
Pr.309- Boost Voltage (used when V/F control application)
Pr.312- Peak Current, set to 100%
Pr.313- Field Current, set to proper value (% of Motor Rated Current)
Pr.314- Pole, set to correct pole number
Pr.315- Maximum Speed, Set equal to Pr.310
Pr.316- Minimum Speed, set to 0RPM
Pr.317- SLIP RPM, set to 5% of Rated motor Speed(RPM)
Pr.320- ACR Pgain, Set to proper value
Pr.321- ACR I gain, Set to proper value
Pr.323- ASR Pgain, Set to proper value
Pr.324- ASR Igain, Set to proper value

4.4.2 Auto Tuning for Brushless Servo Motor

If select Pr.094=235, only few parameters is necessary to set by user, then after execute RESET, this drive can detect the motor characteristic parameters itself.

For brushless servo, use motor parameter group#3(Pr.450~Pr.499).

1. Set Pr.460=Rated motor Speed (RPM).
2. Set Pr.461=Rated motor Current=100%*(Motor Rated Current/Driver Rated Current).
3. Set Pr.094=235, inform the drive to execute Auto tuning after reset
4. Execute RESET to initiate Tuning Process.

After tuning process complete, the drive will set Pr.094=232, then reset again in order to preload the drive as speed controller. (Refer to sec.4.3.5). The following parameters will be changed after tuning process, user should verify again.

Pr.452- Encoder PPR, set to correct value
Pr.453- Encoder Direction, set to correct direction
Pr.457=Rated motor Voltage, set to proper value
Pr.458- Set equal to Pr.457
Pr.459- Boost Voltage=0
Pr.462- Peak Current, set to 100%
Pr.463- Field Current=0
Pr.464- Pole, set to correct pole number
Pr.465- Maximum Speed, Set equal to Pr.460
Pr.466- Minimum Speed, set to 0RPM
Pr.467- SLIP RPM=0
Pr.470- ACR Pgain, Set to proper value
Pr.471- ACR I gain, Set to proper value
Pr.473- ASR Pgain, Set to proper value
Pr.474- ASR Igain, Set to proper value

4.4.3 Auto Tuning Resolver BL Servo Motor

If the servo motors use resolver as feedback element, then user must select resolver option card (under development). After choosing correct feedback option card, then the drive will identify itself for controlling the resolver.

Auto tuning procedure and all parameters setting are the same as those described in section 4.4.2, except “Angle Shift”.

Pr.340/390/440/490 is defined as Resolver_Angle_Shift, indicates the angle shift between motor magnetic North direction and resolver North mark.

5. Parameters

5.1 Parameter List

Pr.xxx	Parameter Name	Default	Min.	Max.	Type	Reference
000	Main Speed Set	0 rpm	0	8000	R/W	5.2.4
001	Main Acceleration Time	5.00 sec	0.00	650.0	R/W	
002	Main Deceleration Time	5.00 sec	0.00	650.0	R/W	
005	Brake Speed	5	0	8000	R/W	5.2.5
012	PWM Carrier	8.0 KHz	8	8	R	5.2.7
013	Alarm Code	0	0	9	M	5.2.8
019	Jog Speed	10 rpm	0	8000	R/W	5.2.4
020	Jog Acceleration/Deceleration Time	10.0 sec	0.1	25.0	R/W	
021	SPD1 Speed Set	0 rpm	0	8000	R/W	5.2.4
022	SPD1 Acceleration Time	10.0 sec	0.1	6553.0	R/W	
023	SPD1 Deceleration Time	10.0 sec	0.1	6553.0	R/W	
024	SPD2 Speed Set	0 rpm	0	8000	R/W	5.2.4
025	SPD2 Acceleration Time	10.0 sec	0.1	6553.0	R/W	
026	SPD2 Deceleration Time	10.0 sec	0.1	6553.0	R/W	
027	SPD3 Speed Set	0 rpm	0	8000	R/W	5.2.4
028	SPD3 Acceleration Time	10.0 sec	0.1	6553.0	R/W	
029	SPD3 Deceleration Time	10.0 sec	0.1	6553.0	R/W	
031	Reverse Inhibit	0	0	1	R/W	5.2.5
033	Discharge Enable	0	0	2	R/W	5.2.5
034	UP/OP Restart Enable	0	0	1	R/W	5.2.5
039	Control Command Select	0.0	0.0	9.9	R/W	5.2.5
040	Speed Source Select	8.08	0.00	99.99	R/W	SEC. 6
049	Detect RPM	300 rpm	0	8000	FR/W	8.3.1
050	Detect Tolerance	30 rpm	0	8000	FR/W	
051	Thermal Trip Time	3 sec	0	120	R/W	5.2.5
053	Gear Ratio	100 %	0	100	R/W	5.2.8
054	Irms Select	0	0	27	R/W	5.2.8
057	HZ	Hz	0.0	166.6	M	5.2.8
058	RPM	rpm			M	
059	Vdc (Capacitor)	Volts DC			M	
060	Vout (r.m.s. output)	Volts AC			M	
061	Irms	Amp			M	
062	Temperature	˚C	0	100	M	
064	DI0~DI10 Input Status	0000 Hex	0000	07FF	M	5.2.8
065	DO0~DO6 Output Status	0000 Hex	0	007F	M	
066	DI Simulation	0	0	2047	RAM	5.2.5
067	Torque Set	0.00%	0.00	100.0	RAM	5.2.5
068	DO Simulation	0	0	2047	RAM	5.2.5
070	Analog Input Gain	50%	0	100	R/W	6.2.4
071	Timer(1) Time	5.0 sec	0.2	6553.0	R/W	7.3.3
072	Timer(2) Time	5.0 sec	0.2	25.0	R/W	
073	S-curve Time T1	0.00 sec	0.00	2.50	R/W	5.2.4
074	S-curve Time T2	0.00 sec	0.00	2.50	R/W	
075	S-curve Time T3	0.00 sec	0.00	2.50	R/W	
076	S-curve Time T4	0.00 sec	0.00	2.50	R/W	
077	DO1 Pulse Output Ratio	1	1	100	R/W	8.3.3
083	IGBT Guard Time	3.0μsec	2.0	25.5	FR/W	5.2.7
084	Line Voltage	Volts AC	40	1000	FR/W	5.2.7
085	Rated Current	Amp	0.5	3000.0	FR/W	5.2.7
086	Irms Adjust		70	140	FR/W	5.2.7
087	Vdc Adjust		70	140	FR/W	
089	AI1 Low	12	0	1023	FR/W	5.2.6
090	AI1 High	1012	0	1023	FR/W	
091	AI2 Low	12	0	1023	FR/W	5.2.6
092	AI2 High	1012	0	1023	FR/W	

Pr.xxx	Parameter Name	Default	Min.	Max.	Type	Reference
094	Reload Parameter	0	0	255	R/W	5.2.3
095	Memory Protect	0	0	2	R/W	5.2.2
096	Factory Write Enable	0	0	1	R/W	
097	Version				R	5.2.7
098	Monitor(I)	61	0	999	R/W	5.2.8
099	Monitor(HZ)	58	0	999	R/W	
108	Counter Value	0	0	65530	M	7.3.3
109	Counter Set	0	0	9999	R/W	DIx(28)
116	Speed Set	0 rpm	0	8000	RAM	5.2.4
120	Protocol Select	0	0	2	FR/W	SEC. 9
121	Baud Rate	2	0	3	FR/W	
122	Stop Bit	1	0	1	FR/W	
123	ID	1	1	250	FR/W	
124	Queue Status	0	0	31	M	
125	Parity	0	0	2	FR/W	
130	XY Clock Type Select	0	0	6	FR/W	5.2.9
131	XY Input Pin Status	0	0	3	M	
132	XY Direction Change	0	0	1	FR/W	
133	XY Multiply Rate 0	1	0	9999	FR/W	
134	XY Division Rate 0	1	0	9999	FR/W	
135	XY Multiply Rate 1	1	0	9999	FR/W	
136	XY Division Rate 1	1	0	9999	FR/W	
137	XY Counter Value	0000 Hex	0000	FFFF	M	
140	DI0 Select	0	0	250	R/W	SEC .7
141	DI1 Select	0	0	250	R/W	
142	DI2 Select	0	0	250	R/W	
143	DI3 Select	0	0	250	R/W	
144	DI4 Select	0	0	250	R/W	
145	DI5 Select	0	0	250	R/W	
146	DI6 Select	0	0	250	R/W	
147	DI7 Select	0	0	250	R/W	
148	DI8 Select	0	0	250	R/W	
149	DI9 Select	0	0	250	R/W	
150	DI10 Select	0	0	250	R/W	
157	Line Speed(1)	0	0	65530	M	5.2.8
158	Line Speed(2)	0.00	0	655.30	M	
159	Line Speed(3)	0.0	0	6553.0	M	
160	DO0 Select	0	0	250	R/W	SEC. 8
161	DO1 Select	0	0	250	R/W	
162	DO2 Select	0	0	250	R/W	
163	DO3 Select	0	0	250	R/W	
164	DO4 Select	0	0	250	R/W	
165	DO5 Select	0	0	250	R/W	
166	DO6 Select	0	0	250	R/W	
180	Fan Control	10.50 sec	5.00	99.99	FR/W	5.2.5
181	Panel Command Priority	0	0	1	FR/W	5.2.5
182	Panel Speed Priority	0	0	1	FR/W	
188	Motor Parameter Group Select	0	0	3	FR/W	5.2.5
189	PG Loss Check Enable	1	0	1	FR/W	5.2.5
191	AI3 Low	12	0	1023	FR/W	5.2.6
192	AI3 High	1012	0	1023	FR/W	
193	Home Direction	1	0	2	FR/W	5.2.12
194	Home Speed and Acc/Dec	0	0	1	FR/W	
195	Travel Limit	0	0	1	R/W	5.2.12
200	Iv A/D Value		0	1023	M	5.2.8
201	AI1 A/D Value		0	1023	M	
202	AI2 A/D Value		0	1023	M	
203	AI3 A/D Value		0	1023	M	
204	Iw A/D Value		0	1023	M	
205	Idc A/D Value		0	1023	M	

Pr.xxx	Parameter Name	Default	Min.	Max.	Type	Reference
206	Vcap A/D Value		0	1023	M	5.2.8
207	Temperature A/D Value		0	1023	M	
210	AO1 Select	0	0	250	FR/W	5.2.6
211	AO1 Zero	0.00	0	1.99	FR/W	
212	AO1 Span	100.0%	0	150.0	FR/W	
220	AO2 Select	0	0	250	FR/W	5.2.6
221	AO2 Zero	0.00	0	1.99	FR/W	
222	AO2 Span	100.0%	0	150.0	FR/W	
230	AO3 Select	0	0	250	FR/W	5.2.6
231	AO3 Zero	0.00	0	1.99	FR/W	
232	AO3 Span	100.0%	0	150.0	FR/W	
240	PID Input Select	0.00	0	99.99	FR/W	5.2.10
241	PID Default Configuration	0	0	63	FR/W	
242	PID Output Value	0	O	FFFF	M	
243	PID Pgain	0	0	9999	FR/W	
244	PID Igain	0	0	9999	FR/W	
245	PID Dgain	0	0	9999	FR/W	
246	PID FBgain	1.00	0	100.00	FR/W	
247	PID Constant Reference	0	0	1000	FR/W	
248	PID Limit	1000	0	1000	FR/W	
249	PID Dtime	0.00 sec	0.00	2.50	FR/W	
250	PID Set Value	0000 Hex	0000	FFFF	M	
251	PID FB Value	0000 Hex	0000	FFFF	M	
252	PID Error Value	0000 Hex	0000	FFFF	M	
253	PID Auto Gain Select	0	0	5	FR/W	
300、350、400、450	Motor Type Select	0	0	5	FR/W	5.2.11
301、351、401、451	ABC Status	0	0	7	FR/W	
302、352、402、452	Encoder PPR	1024	0	9999	FR/W	
303、353、403、453	A-Lead/Lag-B	0	0	1	FR/W	
304、354、404、454	AB Filter	2	0	5	FR/W	
305、355、405、455	AB Counter	0000 Hex	0000	FFFF	M	
306、356、406、456	UVW Status	000	000	111	M	
307、357、407、457	Motor Rated Voltage	100%	0	100	FR/W	
308、358、408、458	Motor Peak Voltage	100%	0	100	FR/W	
309、359、409、459	Boost Voltage	0.0%	0	25.0	FR/W	
310、360、410、460	Motor Rated RPM	1800	0	8000	FR/W	
311、361、411、461	Motor Rated Current	100%	10	100	FR/W	
312、362、412、462	Motor Peak Current	100%	0	300	FR/W	5.2.11
313、363、413、463	Field Current	20%	0	100	FR/W	
314、364、414、464	Pole	4	2	12	FR/W	
315、365、415、465	Maximum RPM	1800	100	8000	FR/W	
316、366、416、466	Minimum RPM	0	0	8000	FR/W	
317、367、417、467	Slip RPM	100	0	8000	FR/W	
320、370、420、470	P Gain (Current Loop)	100	0	2000	FR/W	
321、371、421、471	I Gain (Current Loop)	50	0	2000	FR/W	
323、373、423、473	P Gain (Speed Loop)	500	0	4000	FR/W	
324、374、424、474	I Gain (Speed Loop)	50	0	2000	FR/W	
326、376、426、476	P Gain (Position Loop)	200	0	2000	FR/W	
330、380、430、480	Position/Speed Select	0	0	1	FR/W	
331、381、431、481	Pcmd/APTP Select	0	0	1	FR/W	
332、382、432、482	Absolute/Increment Select	0	0	1	FR/W	
333、383、433、483	Torque Limit Source Select	0.0	0	9.9	FR/W	
334、384、434、484	Length Conversion	0	0	16	FR/W	
335、385、435、485	Length Compensation	0	0	1	FR/W	
336、386、436、486	Compensation Polarity	0	0	1	FR/W	
340、390、440、490	Resolver Shift Angle	0	0	4095	FR/W	

Pr.xxx	Parameter Name	Default	Min.	Max.	Type	Reference
341、391、441、491	Resolver Polarity	0	0	1	FR/W	5.2.11
500	DL0 (Low)	0	0	9999	FR/W	5.2.12
501	DL0 (High)	0	0	9999	FR/W	
502	DL1 (Low)	0	0	9999	FR/W	
503	DL1 (High)	0	0	9999	FR/W	
504	DL2 (Low)	0	0	9999	FR/W	
505	DL2 (High)	0	0	9999	FR/W	
⋮	⋮	⋮	⋮	⋮	⋮	
558	DL29 (Low)	0	0	9999	FR/W	
559	DL29 (High)	0	0	9999	FR/W	
560	DL30 (Low)	0	0	9999	FR/W	
561	DL30 (High) /AI1 Detect Level	0	0	9999	FR/W	
562	DL31 (Low) /AI2 Detect Level	0	0	9999	FR/W	
563	DL31 (High) /AI3 Detect Level	0	0	9999	FR/W	
564	Forward Travel Limit (Low)	0	0	9999	FR/W	5.2.12
565	Forward Travel Limit (High)	0	0	9999	FR/W	
566	Reverse Travel Limit (Low)	0	0	9999	FR/W	5.2.12
567	Reverse Travel Limit (High)	0	0	9999	FR/W	
568	Index Offset (Low)	0	0	9999	FR/W	5.2.12
569	Index Offset (High)	1	0	9999	FR/W	
570	Position Error Limit	1000	0	9999	FR/W	5.2.12
571	In Position Range	10	0	9999	FR/W	
574	μm Display BCD (Low)	0	0	9999	M	5.2.8
575	μm Display BCD (High)	0	0	9999	M	
576	μm Revolution (Low)	0	0	9999	FR/W	5.2.12
577	μm Revolution (High)	0	0	9999	FR/W	
578	Position BCD (Low)	0	0	9999	M	5.2.8
579	Position BCD (High)	0	0	9999	M	
580	Position Hex (Low)	0000 Hex	0000	FFFF	M	5.2.8
581	Position Hex (High)	0000 Hex	0000	FFFF	M	
582	μm Display Hex (Low)	0000 Hex	0000	FFFF	M	5.2.8
583	μm Display Hex (High)	0000 Hex	0000	FFFF	M	

5.2 Parameter Description

5.2.1 Parameter Type

Type	Description
R/W	Type R/W parameters are stored in EAROM. They can be read/write and story in the memory permanently.
FR/W	Type FR/W parameters are stored in EAROM. Generally, they are used for factory adjustment. Only authorized engineers should modify them.
RAM	Type RAM parameters are store in RAM; they will be changed to default after RESET or power off.
M	Type M is read only parameters for monitoring.
R	Type R is constant parameters.

5.2.2 Parameter Protection

Pr.nnn	Parameter Name	Description
095	Memory Protect	
096	Factory Write Enable	

Pr.095	Pr.096	說明
1	--	All parameters (except Pr.000 and Pr.095) are not allow to change.
0	1	Parameters with R/W and FR/W type can be changed.
0	0	Parameters with R/W type can be changed..

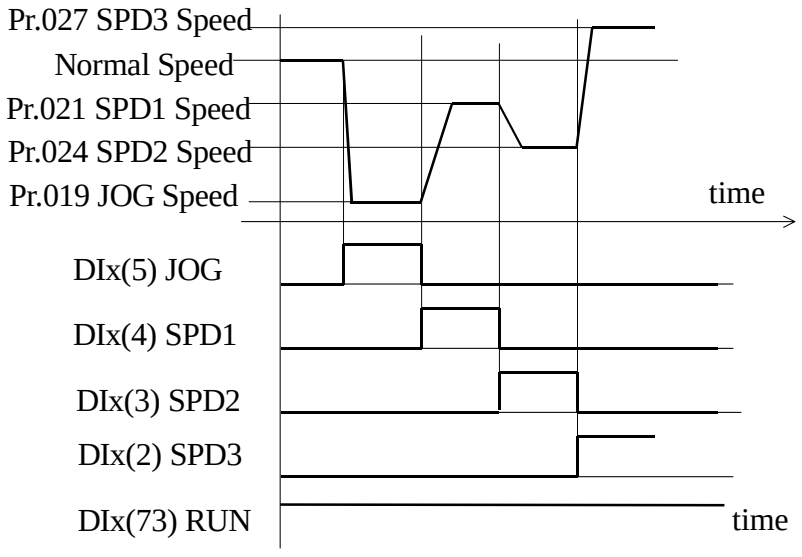
5.2.3 Parameter Initalization

Pr.nnn	Parameter Name	Description
094	Reload Parameter	Pr.094 is used to INITALIZE data into all parameters with R/W type. Follow the process to execute memory initalization: ● Write Pr.095 = 0, and Pr.094＝1. ● Execute “ALM” RESET (press STOP/RESET key under “ALM” mode, or Execute Hardware RESET, or Execute Power-On RESET After initialization process, the data of parameters with R/W type will change to DEFAULT value listed in the PARAMETER LIST table (section 5.1). Refer to section 4.2 for default setting of different application.

5.2.4 Speed & Acceleration/Deceleration Time

Pr.nnn	Parameter Name
000	Main Speed Set
001	Main Acceleration Time
002	Main Decel Time
019	Jog Speed
020	Jog Accel/Decel Time
021	SPD1 Speed
022	SPD1 Acceleration Time
023	SPD1 Deceleration Time
024	SPD2 Speed
025	SPD2 Acceleration Time
026	SPD2 Deceleration Time
027	SPD3 Speed
028	SPD3 Acceleration Time
029	SPD3 Deceleration Time

Description



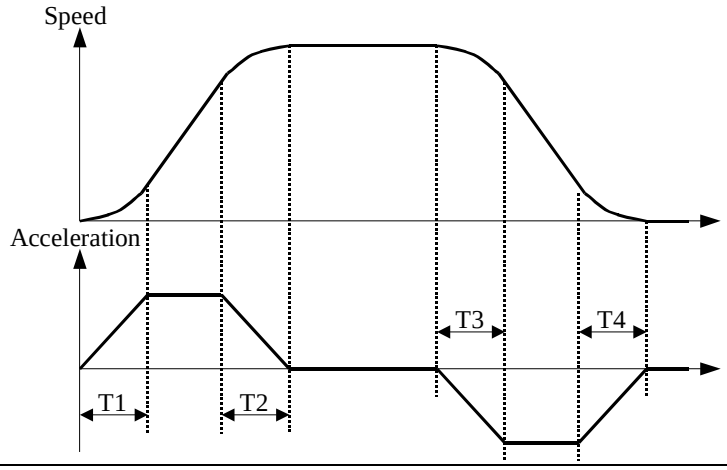
- Normal Speed: speed source defined in Pr.040.
- Acceleration Time: the period of time from 0 rpm ramp up to Maximum RPM.
- Deceleration Time: the period of time from Maximum RPM ramp down to 0rpm.
- The priority level for multi-speed operation is:
  JOG＞SPD1＞SPD2＞SPD3＞16 STEP＞NORMAL SPEED
- When normal speed selected, Pr.001/002 determines the acceleration and deceleration time.
- When JOG speed selected, Pr.020 determines the acceleration and deceleration time

<table>
<tr><td></td><td></td><td>

When SPD1 speed selected, Pr.022 determines the acceleration and Pr.023 determines the deceleration time.
When SPD2 speed selected, Pr.025 determines the acceleration and Pr.026 determines the deceleration time.
When SPD2 speed selected, Pr.028 determines the acceleration and Pr.029 determines the deceleration time.

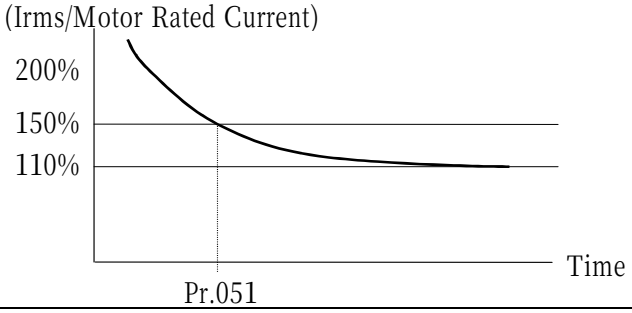
When DIX(2)~DIx(5) are all OFF (no JOG, SPD1, SPD2, SPD3 function), DIx(80)~DIx(83) are used to assign 16-STEP speed , DIx(84)~DIx(87) can be used to select acceleration and deceleration time.

If any of DIx(80)~DIx(83) is ON, then set speed is:
Set Speed = DIx(83)*Pr.027+DIx(82)*Pr.024+DIx(81)*Pr021+DIx(80)*Pr.019
When DIx(84) is ON, Pr.020 determines the acceleration and deceleration time
When DIx(85) is O, Pr.022 determines the acceleration and Pr.023 determines the deceleration time.
When DIx(86) is ON, Pr.025 determines the acceleration and Pr.026 determines the deceleration time
When DIx(87) is ON, Pr.028 determines the acceleration and Pr.029 determines the deceleration time.

</td></tr>
<tr><td>073</td><td>S-curve Time T1
(Begin Acceleration)</td><td rowspan="4">By setting an S-curve value, will smooth the motor transition at beginning and end of the acceleration and deceleration perido from current running speed to another operation speed.
 
</td></tr>
<tr><td>074</td><td>S-curve Time T2
(End Acceleration)</td></tr>
<tr><td>075</td><td>S-curve Time T3
(Begin Deceleration)</td></tr>
<tr><td>076</td><td>S-curve Time T4
(End Deceleration)</td></tr>
<tr><td>116</td><td>Speed Set</td><td>The Speed Set memorized in RAM, if Speed Source select Pr.040= 46, this parameter will be used as the desired speed source. Usually, use this for speed setting by communication and the application has to change speed often.</td></tr>
</table>

5.2.5 Control Function

<table>
<tr><th>Pr.nnn</th><th>Parameter Name</th><th>Description</th></tr>
<tr><td>005</td><td>Brake Speed</td><td>While deceleration to stop, if the output speed is lower than this parameter, the output speed change to 0 RPM directly.</td></tr>
<tr><td>031</td><td>Reverse Inhibit</td><td>
<table>
<tr><th>Pr.031</th><th>Description</th></tr>
<tr><td>0</td><td>Drive may run in both direction</td></tr>
<tr><td>1</td><td>Reverse run is inhibited.</td></tr>
</table>
</td></tr>
<tr><td>033</td><td>Discharge Enable</td><td>
<table>
<tr><th>Pr.033</th><th>Description</th></tr>
<tr><td>0</td><td>Discharge circuit is Disabled.</td></tr>
<tr><td>1</td><td>The discharge transistor will ON if the following conditions are met:
● Drive is Running
● Drive has no Alarm
● Vdc > Pr.084 * 1.414 * 117%
● Drive under deceleration</td></tr>
<tr><td>2</td><td>The discharge transistor will ON if the following conditions are met:
● Drive is Running
● Drive has no Alarm
● Vdc > Pr.084 * 1.414 * 117%</td></tr>
</table>
</td></tr>
<tr><td>034</td><td>UP/OP Restart Enable</td><td>
<table>
<tr><th>Pr.034</th><th>Description</th></tr>
<tr><td>0</td><td>UP/OP Restart function is Disabled.</td></tr>
<tr><td>1</td><td>After UP/OP alarm, when power comes back normal, the drive will restart automatically.</td></tr>
</table>
</td></tr>
</table>

<table>
<tr><td>039</td><td>Control Command Select</td><td>
This parameter is select the control command will come from panel or terminal.
If the control command come from terminal, then the terminals RUN DIx(73) and REV DIx(74) are used to control the drive.
● Any digital input terminal assigned as DIX(73) will function as RUN terminal input.
● Any digital input terminal assigned as DIX(74) will function as REV terminal input.
<table>
<tr><th>Pr.039</th><th>Description</th></tr>
<tr><td>0</td><td>Control command comes from the Control Panel.
● Push FWD key, the drive will run forward direction.
● Push REV key, the drive will run reverse direction.
● Push STOP key, the drive will stop.</td></tr>
<tr><td>1</td><td>The RUN terminal DIx(73) determines the drive running or stop.
The REV terminal DIx(74) determines the running direction.</td></tr>
<tr><td>2</td><td>The RUN terminal DIx(73) is equivalent to FORWARD-RUN
The REV terminal DIx(74) is equivalent to REVERSE-RUN</td></tr>
</table>
Control command come from digital input terminal:
<table>
<tr><th>Pr.039</th><th>RUN</th><th>REV</th><th>Function</th></tr>
<tr><td rowspan="3">1</td><td>OFF</td><td>---</td><td>STOP</td></tr>
<tr><td>ON</td><td>OFF</td><td>FORWARD RUN</td></tr>
<tr><td>ON</td><td>ON</td><td>REVERSE RUN</td></tr>
<tr><td rowspan="3">2</td><td>OFF</td><td>OFF</td><td>STOP</td></tr>
<tr><td>OFF</td><td>ON</td><td>REVERSE RUN</td></tr>
<tr><td>ON</td><td>---</td><td>FORWARD RUN</td></tr>
</table>
Control command select Pr.039 = a.b, it is composed of two selection of “a” and “b” in one parameter, if DIx(89)(Control Command SW) or DIx(90)(Speed & Control SW) is ON, then control command select = “b”, otherwise control command select = “a”.
</td></tr>
<tr><td>051</td><td>Thermal Trip Time</td><td>
This parameter defines the OVER LOAD trip time of Internal Thermal Relay.
If Pr.051=0, the Thermal Relay function is disabled.


</td></tr>
<tr><td>066</td><td>DI Simulation</td><td>
This parameter is used for simulating the digital input signal from DIx terminal.
The input value is in BCD format; it is converted into Binary form to simulate each digital input. For example:
If Pr.066=2(BCD)=00000000010(Binary), means DI1 ON.
If Pr.066=42(BCD)=00000101010(Binary), means DI1, DI3 and DI5 ON.
</td></tr>
<tr><td>067</td><td>Torque Set</td><td>
If Pr.333/383/433/483 (Torque Limit Source Select) =4, means the torque limit is controlled by this parameter.
</td></tr>
<tr><td>068</td><td>DO Simulation</td><td>
This Parameter is used for simulating the digital output status.
The input value is in BCD format; it converted into Binary form to simulate each digital output. For example:
Pr.068=2(BCD)= 0000010(Binary), means DO1 ON.
Pr.068=42(BCD)= 0101010(Binary), means DO1, DO3 and DO5 ON.
</td></tr>
<tr><td>180</td><td>Fan Control</td><td>
When temperature ≧ 45˚C, Fan always ON.
Pr.180 = aa.bb, it is composed of two selection of “aa” and “bb” in one parameter, when temperature < 45˚C, ON/OFF duty of fan is:
aa: ON time (seconds)
bb: OFF time (seconds)
</td></tr>
<tr><td>181</td><td>Panel Command Priority</td><td>
<table>
<tr><th>Pr.181</th><th>Control Command</th></tr>
<tr><td>0</td><td>From Control Panel</td></tr>
<tr><td>1</td><td>From RS485 communication port</td></tr>
</table>
</td></tr>
</table>

<table>
<tr><td>182</td><td>Panel Speed Priority</td><td>
<table>
<tr><th>Pr.182</th><th>Speed Command</th></tr>
<tr><td>0</td><td>From Control Panel</td></tr>
<tr><td>1</td><td>From RS485 communication port</td></tr>
</table>
</td></tr>
<tr><td>188</td><td>Motor Parameter Group Select</td><td>If none of all DIx select DIx(114)(MSB0) or DIx(115)(MSB1), then Motor Parameter Group is selected by Pr.188
<table>
<tr><th>Pr.188</th><th>Motor Parameter Group</th></tr>
<tr><td>0</td><td>Use motor parameter group #0 (Pr.300~349)</td></tr>
<tr><td>1</td><td>Use motor parameter group #1 (Pr.350~399)</td></tr>
<tr><td>2</td><td>Use motor parameter group #2 (Pr.400~449)</td></tr>
<tr><td>3</td><td>Use motor parameter group #3 (Pr.450~499)</td></tr>
</table>
If there exists any DIx(114)(MSB0) or DIx(115)(MSB1) selected, then Motor Parameter Group is selected by Digital Input Terminal.
<table>
<tr><th>DIx(114) MSB0</th><th>DIx(115) MSB1</th><th>Motor Parameter Group</th></tr>
<tr><td>OFF</td><td>OFF</td><td>Use motor parameter group #0 (Pr.300~349)</td></tr>
<tr><td>OFF</td><td>ON</td><td>Use motor parameter group #1 (Pr.350~399)</td></tr>
<tr><td>ON</td><td>OFF</td><td>Use motor parameter group #2 (Pr.400~449)</td></tr>
<tr><td>ON</td><td>ON</td><td>Use motor parameter group #3 (Pr.450~499)</td></tr>
</table>
NOTE: This function in checked only when power ON or after reset.</td></tr>
<tr><td>189</td><td>PG Loss Check Enable</td><td>
<table>
<tr><th>Pr.189</th><th>Description</th></tr>
<tr><td>0</td><td>No PG Loss check</td></tr>
<tr><td>1</td><td>PG Loss Check enabled.
When PG Loss, shown alarm message “PG” on control panel.</td></tr>
</table>
</td></tr>
</table>

5.2.6 Analog Input/Output Function

<table>
<tr><th>Pr.nnn</th><th>Parameter name</th><th>Description</th></tr>
<tr><td>089</td><td>AI1 Low</td><td>This parameter is used to record the A/D converter data read from Pr.201 when “AI1” input terminal is connected to “ACOM” terminal. (AI1 select 0~ +5)</td></tr>
<tr><td>090</td><td>AI1 High</td><td>This parameter is used to record the A/D converter data read from Pr.201 when “AI1” input terminal is connected to “+5V” voltage source. (AI1 select 0~ +5)</td></tr>
<tr><td>091</td><td>AI2 Low</td><td>This parameter is used to record the A/D converter data read from Pr.202 when “AI2” input terminal is connected to “ACOM” terminal. (AI2 select 0~ +5)</td></tr>
<tr><td>092</td><td>AI2 High</td><td>This parameter is used to record the A/D converter data read from Pr.202 when “AI2” input terminal is connected to “+5V” voltage source. (AI2 select 0~ +5)</td></tr>
<tr><td>191</td><td>AI3 Low</td><td>This parameter is used to record the A/D converter data read from Pr.203 when “AI3” input terminal is connected to “ACOM” terminal. (AI3 select 0~ +5)</td></tr>
<tr><td>192</td><td>AI3 High</td><td>This parameter is used to record the A/D converter data read from Pr.203 when “AI3” input terminal is connected to “+5V” voltage source. (AI3 select 0~ +5)</td></tr>
<tr><td>210</td><td>AO1 Select</td><td rowspan="3">
<table>
<tr><th>Setting</th><th>Analog Output Function</th></tr>
<tr><td>0</td><td>0V</td></tr>
<tr><td>1</td><td>Positive Maximum (about 10V)</td></tr>
<tr><td>2</td><td>Negative Maximum (about –10V)負</td></tr>
<tr><td>3</td><td>Speed (Full-scale=Maximum RPM)</td></tr>
<tr><td>4</td><td>abs(Speed) (Full-scale=Maximum RPM)</td></tr>
<tr><td>5</td><td>Output Current (Full-scale=200% of Drive Rated Current)</td></tr>
<tr><td>6</td><td>Output Current (Full-scale=300% of Motor Rated Current)</td></tr>
<tr><td>7</td><td>PID Output</td></tr>
<tr><td>8</td><td>Torque (Full-scale=Maximum Torque)</td></tr>
<tr><td>9</td><td>abs(Torque) (Full-scale=Maximum Torque)</td></tr>
</table>
</td></tr>
<tr><td>220</td><td>AO2 Select</td></tr>
<tr><td>230</td><td>AO3 Select</td></tr>
<tr><td>211</td><td>AO1 Zero</td><td rowspan="3">
<table>
<tr><th>Setting</th><th>Description</th></tr>
<tr><td>0.00~0.99</td><td>Positive Zero Compensation (resolution 0.01 volt)</td></tr>
<tr><td>1.00~1.99</td><td>Negative Zero Compensation (resolution 0.01 volt)</td></tr>
</table>
</td></tr>
<tr><td>221</td><td>AO2 Zero</td></tr>
<tr><td>231</td><td>AO3 Zero</td></tr>
<tr><td>212</td><td>AO1 Span</td><td rowspan="3">Analog output span adjustment</td></tr>
<tr><td>222</td><td>AO2 Span</td></tr>
<tr><td>232</td><td>AO3 Span</td></tr>
</table>

5.2.7 Factory Adjustment Parameters

NOTE: Only authorized engineers should modify these parameters.

Pr.nnn	Parameter Name	Description
012	PWM Carrier	Fixed frequency 8K Hz
083	IGBT Guard Time	This parameter defines the guard time for preventing IGBT short between upper and lower arm. Only factory can modify this parameter, consult factory if modification is necessary.
084	Line Voltage	This parameter defines the normal working voltage of the drive. According to this parameter, the drive calculates all voltage dependent values. ● OP Trip Voltage (Vdc) = 1.414 ＊ Pr.084 ＊ 130 ％ ● UP Trip Voltage (Vdc) = 1.414 * Pr.84 * 70% ● OP Recover Voltage (Vdc) = 1.414 * Pr.84 * 120% ● UP Recover Voltage (Vdc) = 1.414 * Pr.84 * 80% ● Contactor ON Voltage (Vdc)＝1.414＊Pr.84＊69％ ● Contactor OFF Voltage (Vdc)＝1.414＊ Pr.84＊65％ Note: The “contactor” means the device used to BY-PASS the charging resistor. It may a RELAY or a SCR instead. Discharge Start Voltage (Vdc)＝1.414＊Pr.84＊117％ (Refer to Pr.033)
085	Rated Current	This parameter defines the rated output current of the drive.
086	Irms Adjust	This parameter is used to adjust the Irms data reading.
087	Vdc Adjust	This parameter is used to adjust the reading of internal DC BUS.
097	Version	This parameter is indicating the software revision of this drive.

5.2.8 Monitor Function

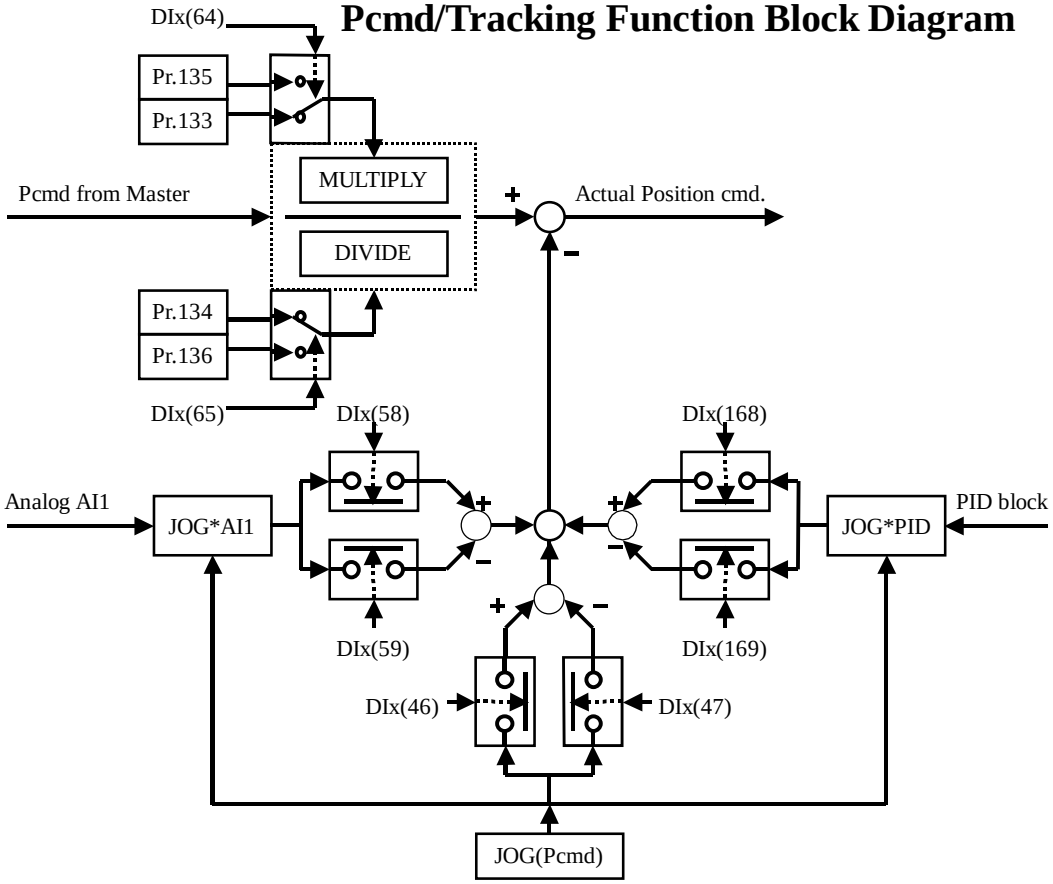
<table>
<tr><th>Pr.nnn</th><th>Parameter Name</th><th>Description</th></tr>
<tr><td>013</td><td>Alarm Code</td><td>Display the present alarm message.
<table>
<tr><th>Alarm Code</th><th>Control Panel shows</th><th>Message Description</th></tr>
<tr><td>0</td><td>no</td><td>Normal</td></tr>
<tr><td>1</td><td>PG</td><td>PG Loss</td></tr>
<tr><td>3</td><td>OC</td><td>Over Current</td></tr>
<tr><td>4</td><td>OH</td><td>Over Heat</td></tr>
<tr><td>5</td><td>OP</td><td>Over Voltage</td></tr>
<tr><td>6</td><td>UP</td><td>Under Voltage</td></tr>
<tr><td>7</td><td>OL</td><td>Over Load</td></tr>
</table></td></tr>
<tr><td>057</td><td>HZ</td><td>Monitors the output frequency of the drive.</td></tr>
<tr><td>058</td><td>RPM</td><td>For close loop control mode, monitors the motor rotating speed.
For V/F constant mode, RPM = 120 * Hz / POLE.</td></tr>
<tr><td>059</td><td>Vdc (Capacitor)</td><td>Monitors the internal DC BUS voltage of the drive, Vdc = 1.414 * Vac (line input)</td></tr>
<tr><td>060</td><td>Vout (r.m.s. output)</td><td>Monitors the output Vrms of the drive.</td></tr>
<tr><td>054</td><td>Irms Select</td><td rowspan="2">Use Pr.054 to select the data type displays in Pr.061.
<table>
<tr><th>Pr.054</th><th>Pr.061</th></tr>
<tr><td>0</td><td>Output Current Irms (Amp)</td></tr>
<tr><td>1</td><td>Output Current Irms (% of Drive rating)</td></tr>
<tr><td>2</td><td>Output Current Irms (% of motor rating)</td></tr>
<tr><td>11</td><td>OL accumulation level</td></tr>
<tr><td>28</td><td>abs(Output Torque) (% of Maximum Output Torque)</td></tr>
</table></td></tr>
<tr><td>061</td><td>Irms</td></tr>
<tr><td>062</td><td>Temperature</td><td>Monitors the temperature of internal heat sink. When the temperature exceeds 80 ˚C driver will STOP and show OH alarm.</td></tr>
<tr><td>064</td><td>DI0~DI10 Input Status</td><td>Monitors the DI0~DI10, expressed in Hex form.
It is converted into Binary form to show the status of DI0~DI10. For example:
If Pr.064=0062(Hex)=00001100010(Binary), means DI1, DI5 and DI6 is ON.</td></tr>
<tr><td>065</td><td>DO0~DO6 Output Status</td><td>Monitors the DO0~DO60, expressed in Hex form.
It is converted into Binary form to show the status of DO0~DO6. For example:
If Pr.065=0062(Hex)=1100010(Binary), means DO1, DO5 and DO6 is ON.</td></tr>
<tr><td>098</td><td>Monitor(I)</td><td rowspan="2">While control panel is under “MON” mode, user can select which two statuses are to be monitored.
Pr.098 is used to assign the parameter to be monitored when “I” LED is ON.
Pr.099 is used to assign the parameter to be monitored when “HZ” LED is ON.
For example, the default value in Pr.099=58 and Pr.098=61, that means, the panel will show the value of Pr.058 (rpm) while “HZ” LED is ON. And push ▲ or ▼ key to change to LED “I” ON, the panel will show the value of Pr.061 (Irms).</td></tr>
<tr><td>099</td><td>Monitor(HZ)</td></tr>
</table>

<table>
<tr><td>053</td><td>Gear Ratio</td><td>According to Pr.053, the drive calculates Line Speed show in Pr157~159.
<table>
<tr><th>Pr.xxx</th><th>Display</th><th>Data Range</th></tr>
<tr><td>157</td><td>RPM(Pr.058) * Gear Ratio(Pr.053)</td><td>0~65530</td></tr>
<tr><td>158</td><td>RPM(Pr.058) * Gear Ratio (Pr.053) / 100</td><td>0.00~655.30</td></tr>
<tr><td>159</td><td>RPM(Pr.058) * Gear Ratio(Pr.053) / 10</td><td>0.0~6553.0</td></tr>
</table></td></tr>
<tr><td>157</td><td>Line Speed(1)</td><td rowspan="3"></td></tr>
<tr><td>158</td><td>Line Speed(2)</td></tr>
<tr><td>159</td><td>Line Speed(3)</td></tr>
<tr><td>200</td><td>Iv A/D Value</td><td>Monitors A/D converted data of Iv.</td></tr>
<tr><td>201</td><td>AI1 A/D Value</td><td>Monitors A/D converted data of AI1.</td></tr>
<tr><td>202</td><td>AI2 A/D Value</td><td>Monitors A/D converted data of AI2.</td></tr>
<tr><td>203</td><td>AI3 A/D Value</td><td>Monitors A/D converted data of AI3.</td></tr>
<tr><td>204</td><td>Iw A/D Value</td><td>Monitors A/D converted data of Iw.</td></tr>
<tr><td>205</td><td>Idc A/D Value</td><td>Monitors A/D converted data of Idc.</td></tr>
<tr><td>206</td><td>Vcap A/D Value</td><td>Monitors A/D converted data of Vcap.</td></tr>
<tr><td>207</td><td>Temperature A/D Value</td><td>Monitors A/D converted data of Temperature.</td></tr>
<tr><td>574</td><td>μm Display BCD (Low)</td><td rowspan="2">Actual position expressed in μm (BCD format)</td></tr>
<tr><td>575</td><td>μm Display BCD (High)</td></tr>
<tr><td>578</td><td>Position BCD (Low)</td><td rowspan="2">Actual position expressed in clocks (BCD format)</td></tr>
<tr><td>579</td><td>Position BCD (High)</td></tr>
<tr><td>580</td><td>Position Hex (Low)</td><td rowspan="2">Actual position expressed in clocks (HEX format)</td></tr>
<tr><td>581</td><td>Position Hex (High)</td></tr>
<tr><td>582</td><td>μm Display Hex (Low)</td><td rowspan="2">Actual position expressed in μm (HEX format)</td></tr>
<tr><td>583</td><td>μm Display Hex (High)</td></tr>
</table>

5.2.9 XY Pulse Command Input Parameters

<table>
<tr><th>Pr.nnn</th><th>Parameter Name</th><th>Description</th><th>Remark</th></tr>
<tr><td>130</td><td>XY Clock Type Select</td><td>
<table>
<tr><th>Pr.130</th><th>XY Clock Type</th></tr>
<tr><td>0</td><td>Two phase input clocks and X4 rate.</td></tr>
<tr><td>1</td><td>CLOCK and DIRECTION signals</td></tr>
<tr><td>2</td><td>UP-clock and DOWN-clock pulses</td></tr>
<tr><td>3</td><td>Two phase input clocks and X2 rate.</td></tr>
</table></td><td rowspan="8">JP2 & JP3 select line-driver input or open-collector type</td></tr>
<tr><td>131</td><td>XY Input Pin Status</td><td>Monitors XY pulse input pins status.</td></tr>
<tr><td>132</td><td>XY Direction Change</td><td>Change XY counter direction.</td></tr>
<tr><td>133</td><td>XY Multiply Rate 0</td><td rowspan="4">Use DIx(64)(XY Multiply) and DIx(65)(XY Division) to select Multiply Rate and Division Rate, and input clock rate counts as following:
<table>
<tr><th>DIx(64)</th><th>DIx(65)</th><th>Clock Rate</th></tr>
<tr><td>OFF</td><td>OFF</td><td>Multiply Rate 0 / Division Rate 0</td></tr>
<tr><td>OFF</td><td>ON</td><td>Multiply Rate 0 / Division Rate 1</td></tr>
<tr><td>ON</td><td>OFF</td><td>Multiply Rate 1 / Division Rate 0</td></tr>
<tr><td>ON</td><td>ON</td><td>Multiply Rate 1 / Division Rate 1</td></tr>
</table>
Pr.134=0 and Pr.136=0 means Division Rate = 10000</td></tr>
<tr><td>134</td><td>XY Division Rate 0</td></tr>
<tr><td>135</td><td>XY Multiply Rate 1</td></tr>
<tr><td>136</td><td>XY Division Rate 1</td></tr>
<tr><td>137</td><td>XY Counter Value</td><td>Monitors the content of pulses input to XY counter, expressed in Hex form.
Pr.137=XY-input* (XY-Multiply / XY-Divide) * XY-Direction</td></tr>
</table>

Pcmd/Tracking Function Block Diagram



The following table lists the relative Digital Input function.

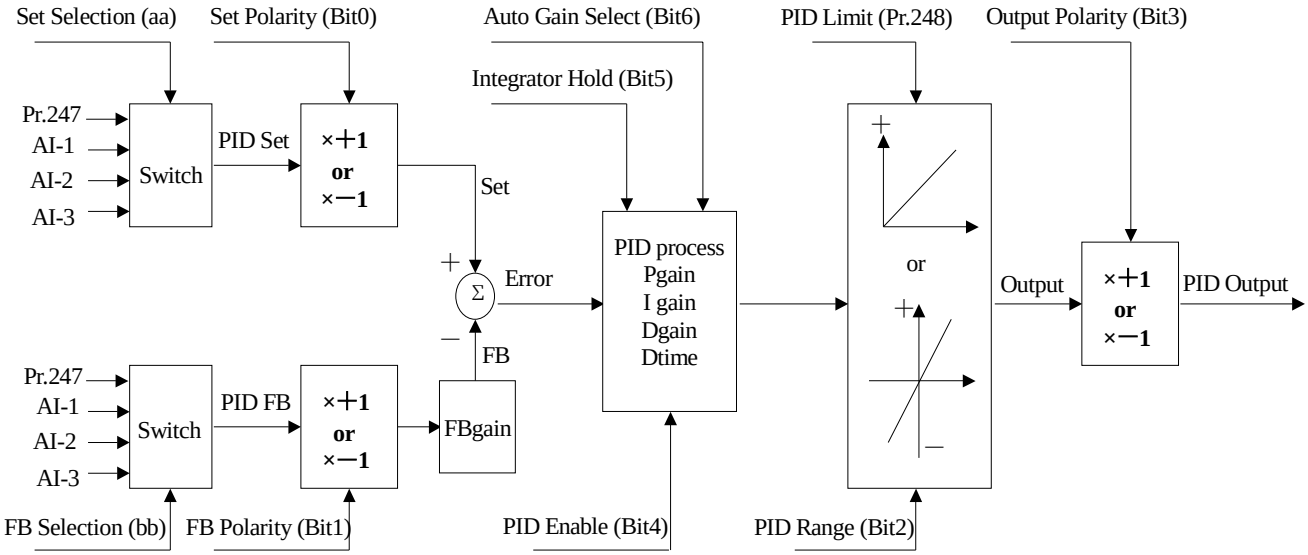
DIx	Function	Description
46	TRACK + JOG	DIx(46), DIx(47), DIx(58), DIx(59), DIx(168) and DIx(169) are used to assign the Set Speed under tracking mode, if the digital input terminal is ON, the Set Speed as following:
47	TRACK – JOG	
58	TRACK + (AI1 * JOG)	
59	TRACK – (AI1 * JOG)	
168	TRACK + (PID Output * JOG)	
169	TRACK – (PID Output * JOG)	

DIx	Set Speed
46	Tracking Speed + JOG Speed (Pr.019)
47	Tracking Speed – JOG Speed (Pr.019)
58	Tracking Speed + AI1 Input * JOG Speed (Pr.019)
59	Tracking Speed – AI1 Input * JOG Speed (Pr.019)
168	Tracking Speed + PID Output * JOG Speed (Pr.019)
169	Tracking Speed – PID Output * JOG Speed (Pr.019)

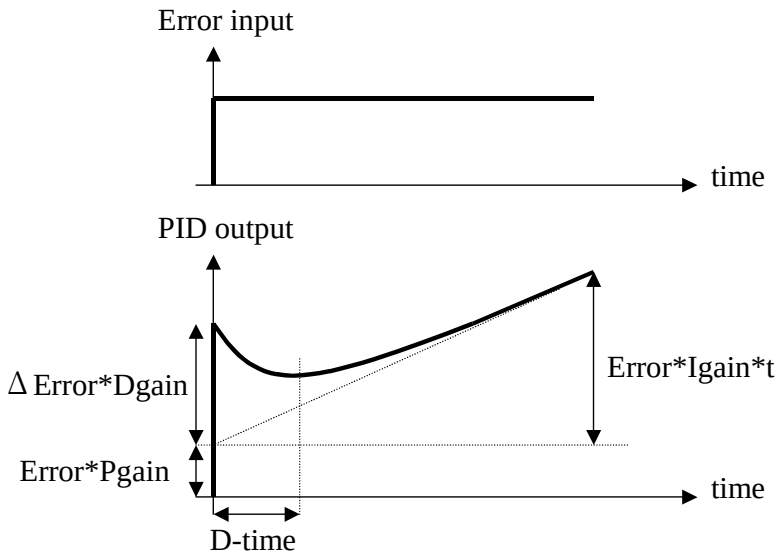
- Use these functions only under tracking mode.。
- AI1input range = +100% ~ –100%

5.2.10 PID Function

PID Function Block



Pr.nnn	Parameter Name	Description
240	PID Input Select	This parameter composed by “aa” & “bb” separated by decimal point. The aa value is used to select the PID Set signal source for PID block. The bb value is used to select the PID FB signal source for PID block. The equivalent source for selection value “aa” or “bb” is: Pr.240 / Description 0 / Constant value defined by Pr.247 (0~100%) 1 / Bipolar input from AI1 2 / Bipolar input from AI2 3 / Bipolar input from AI3 11 / Unipolar input from AI1 12 / Unipolar input from AI2 13 / Unipolar input from AI3
241	PID Default Configuration	Pr.241=N, the value N is composed of 7 different bit switches. While Power ON or after RESET, the 7 bit switches are used to configure the PID block. N = 64*Bit6 + 32*Bit5 + 16*Bit4 + 8*Bit3 + 4*Bit2 + 2*Bit1 + 1*Bit0 If any of these switches requires random change, use DIx(160)~DIx(165) for equivalent bits. Bit n / Name / Function / Equivalent DIx Bit0 / Set Polarity / =0, Set = (+1) * PID Set; =1, Set = (–1) * PID Set / DIx(160) Bit1 / FB Polarity / =0, FB = (+1) * PID FB; =1, FB = (–1) * PID FB / DIx(161) Bit2 / PID Range / =0, Output with Bipolar value; =1, Output with Unipolar value / DIx(162) Bit3 / Output Polarity / =0, PIDOutput = (+1) * Output; =1, PID Output= (–1) * Output / DIx(163) Bit4 / PID Enable / =0, PID block disabled; =1, PID block enabled / DIx(164) Bit5 / PID Hold / =0, PID Integrator normal; =1, PID Integrator Hold / DIx(165) Bit6 / Auto Gain / =0, Auto Gain disabled; =1, Auto Gain Enabled / DIx(166)
242	PID Output Value	Monitors Output value of PID block, expressed in Hex form.

<table>
<tr><td>243</td><td>PID Pgain</td><td rowspan="5"> 

$$PID\_out = Error * \frac{Pgain}{256} + (\Delta Error * e^{-\frac{t}{Dtime}}) * \frac{Dgain}{256} + Error * \frac{Igain * 500}{65536} * t$$
Note: the PID block is calculated every 2ms
Pr.253 used to select Auto Gain of PID block,
Pgain, Igain, Dgain = Set value * AutoGain-coefficient.
<table>
<tr><th>Pr.253</th><th>Auto Gain Source</th><th>Range</th></tr>
<tr><td>0</td><td>No Auto Gain</td><td>100%</td></tr>
<tr><td>1</td><td>AI1 Input</td><td>0~100%</td></tr>
<tr><td>2</td><td>AI2 Input</td><td>0~100%</td></tr>
<tr><td>3</td><td>AI3 Input</td><td>0~100%</td></tr>
<tr><td>4</td><td>Speed / Maximum RPM</td><td>(1/16)~100%</td></tr>
<tr><td>5</td><td>Average Speed / Maximum RPM
(Speed is average every 0.25 second))</td><td>(1/16)~100%</td></tr>
</table></td></tr>
<tr><td>244</td><td>PID Igain</td></tr>
<tr><td>245</td><td>PID Dgain</td></tr>
<tr><td>249</td><td>PID Dtime</td></tr>
<tr><td>253</td><td>PID Auto Gain Select</td></tr>
<tr><td>246</td><td>PID FBgain</td><td>PID Feedback Gain</td></tr>
<tr><td>247</td><td>PID Constant Reference</td><td>Constant value used as PID Set or PID FB reference.</td></tr>
<tr><td>248</td><td>PID Limit</td><td>Maximum output limit of PID block.</td></tr>
<tr><td>250</td><td>PID Set Value</td><td>Monitors Set value of PID block.</td></tr>
<tr><td>251</td><td>PID FB Value</td><td>Monitors Feedback value of PID block</td></tr>
<tr><td>252</td><td>PID Error Value</td><td>Monitors Error value of PID block</td></tr>
</table>

Other information:

- When Torque Limit select (Pr.333/383/433/483) = 5, PID Output becomes the torque limit source. (Refer to Pr.333)
- When Analog Output Source Select = 7, PID Output becomes the AOx Output value. (Refer to section 5.2.6)
- When Speed Source Select (Pr.040) = 40, PID Output becomes the Main Speed Source. (Refer to section 6.2.1)
- When DIx(168) is selected, Set Speed = Tracking Speed + PID Output * JOG Speed (Pr.019). (Refer to section 5.2.9)
- When DIx(169) is selected, Set Speed = Tracking Speed – PID Output * JOG Speed (Pr.019). (Refer to section 5.2.9)

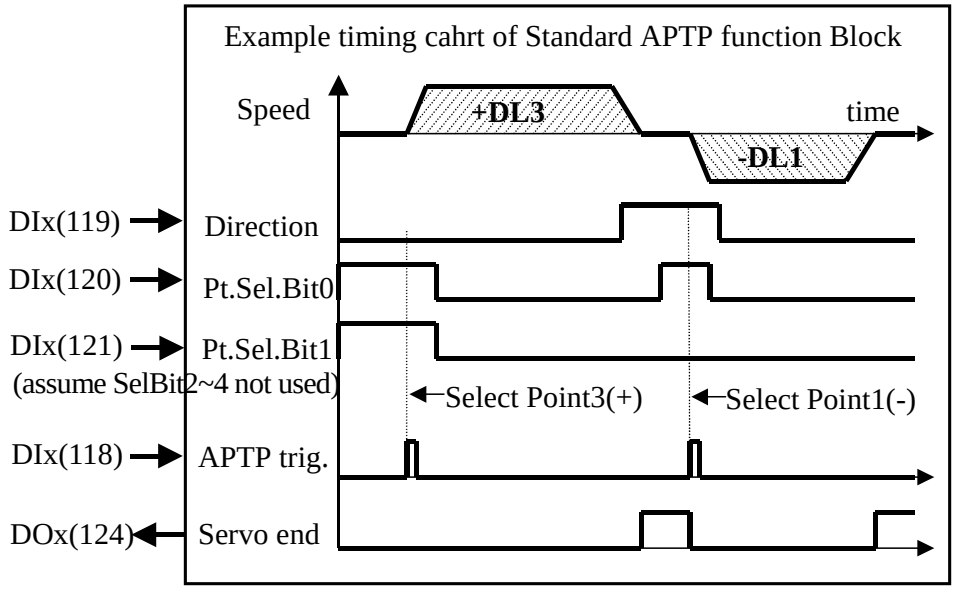
5.2.11 Motor Parameter Groups

<table>
<tr><th colspan="4">Pr.nnn</th><th rowspan="2">Parameter Name</th><th rowspan="2">Description</th></tr>
<tr><th>Group#0</th><th>Group#1</th><th>Group#2</th><th>Group#3</th></tr>
<tr><td>300</td><td>350</td><td>400</td><td>450</td><td>Motor Type Select</td><td><table><tr><th>Pr.300</th><th>Description</th></tr><tr><td>0</td><td>Induction motor V/F control</td></tr><tr><td>1</td><td>Induction motor Sensor-Less mode</td></tr><tr><td>2</td><td>Induction motor Servo mode</td></tr><tr><td>3</td><td>Brushless servo motor</td></tr></table></td></tr>
<tr><td>301</td><td>351</td><td>401</td><td>451</td><td>ABC Status</td><td>Monitors encoder status</td></tr>
<tr><td>302</td><td>352</td><td>402</td><td>452</td><td>Encoder PPR</td><td>Pulse per revolution of encoder</td></tr>
<tr><td>303</td><td>353</td><td>403</td><td>453</td><td>A-Lead/Lag-B</td><td>Determine encoder feedback direction</td></tr>
<tr><td>304</td><td>354</td><td>404</td><td>454</td><td>AB Filter</td><td>Determine sampling period of encoder</td></tr>
<tr><td>305</td><td>355</td><td>405</td><td>455</td><td>AB Counter</td><td>Monitors counter value of encoder (Hex form)</td></tr>
<tr><td>306</td><td>356</td><td>406</td><td>456</td><td>UVW Status</td><td>Monitors Brushless servo motor UVW status</td></tr>
<tr><td>307</td><td>357</td><td>407</td><td>457</td><td>Motor Rated Voltage</td><td>(Motor Rated Voltage / Line Voltage) * 100%</td></tr>
<tr><td>308</td><td>358</td><td>408</td><td>458</td><td>Motor Peak Voltage</td><td>(Motor Peak Voltage / Line Voltage) * 100%</td></tr>
<tr><td>309</td><td>359</td><td>409</td><td>459</td><td>Boost Voltage</td><td>Minimum voltage while output speed is low.
For induction motor V/F mode only.</td></tr>
<tr><td>310</td><td>360</td><td>410</td><td>460</td><td>Motor Rated RPM</td><td>Rated speed of motor</td></tr>
<tr><td>311</td><td>361</td><td>411</td><td>461</td><td>Motor Rated Current</td><td>(Motor Rated current / Drive Rated Current) * 100%</td></tr>
<tr><td>312</td><td>362</td><td>412</td><td>462</td><td>Motor Peak Current</td><td>(Motor Peak Current / Motor Rated Current) * 100%</td></tr>
<tr><td>313</td><td>363</td><td>413</td><td>463</td><td>Field Current</td><td>(Motor Field Current / Motor Rated current) * 100%</td></tr>
<tr><td>314</td><td>364</td><td>414</td><td>464</td><td>Pole</td><td>Pole number of motor</td></tr>
<tr><td>315</td><td>365</td><td>415</td><td>465</td><td>Maximum RPM</td><td>Maximum speed of motor (RPM)</td></tr>
<tr><td>316</td><td>366</td><td>416</td><td>466</td><td>Minimum RPM</td><td>Minimum speed of motor (RPM)</td></tr>
<tr><td>317</td><td>367</td><td>417</td><td>467</td><td>Slip RPM</td><td>Slip speed of induction motor (RPM)</td></tr>
<tr><td>320</td><td>370</td><td>420</td><td>470</td><td>P gain (Current Loop)</td><td>P gain constant for current loop</td></tr>
<tr><td>321</td><td>371</td><td>421</td><td>471</td><td>I gain (Current Loop)</td><td>I gain constant for current loop</td></tr>
<tr><td>323</td><td>373</td><td>423</td><td>473</td><td>P gain (Speed Loop)</td><td>P gain constant for speed loop</td></tr>
<tr><td>324</td><td>374</td><td>424</td><td>474</td><td>I gain (Speed Loop)</td><td>I gain constant for speed loop</td></tr>
<tr><td>326</td><td>376</td><td>426</td><td>476</td><td>P gain (Position Loop)</td><td>P gain constant for position loop</td></tr>
<tr><td>330</td><td>380</td><td>430</td><td>480</td><td>Position/Speed Select</td><td><table><tr><th>Setting</th><th>Mode</th></tr><tr><td>0</td><td>Speed Control Mode</td></tr><tr><td>1</td><td>Position Control Mode</td></tr></table>If there exists any DIx(106) or DIx(107) selected, then Position/Speed control mode is selected by Digital Input Terminal.<table><tr><th>DIx Status</th><th>Mode</th></tr><tr><td>DIx(106) ON or DIx(107) OFF</td><td>Speed Mode</td></tr><tr><td>DIx(106) OFF or DIx(107) ON</td><td>Position Mode</td></tr></table></td></tr>
<tr><td>331</td><td>381</td><td>431</td><td>481</td><td>Pcmd/APTP Select</td><td><table><tr><th>Setting</th><th>Mode</th></tr><tr><td>0</td><td>Auto Point to Point (APTP)</td></tr><tr><td>1</td><td>Pulse Command control (Pcmd)</td></tr></table>If there exists any DIx(126) or DIx(127) selected, then Pcmd/APTP control mode is selected by Digital Input Terminal.<table><tr><th>DIx Status</th><th>Mode</th></tr><tr><td>DIx(126) ON or DIx(127) OFF</td><td>Pcmd Mode</td></tr><tr><td>DIx(126) OFF or DIx(127) ON</td><td>APTP Mode</td></tr></table></td></tr>
</table>

<table>
<tr><td>332</td><td>382</td><td>432</td><td>482</td><td>Absolute/Increment Select</td><td><table><tr><th>Setting</th><th>Description</th></tr><tr><td>0</td><td>Increment Position control for APTP</td></tr><tr><td>1</td><td>Absolute Position control for APTP</td></tr></table></td></tr>
<tr><td>333</td><td>383</td><td>433</td><td>483</td><td>Torque Limit Source Select</td><td>Torque Limit Source Select = a.b, it is composed of two selection of “a” and “b” in one parameter, if DIx(108)(Torque Limit SW) is ON, then Torque Limit Source = “b”, otherwise Torque Limit Source = “a”.
DIx(109) is complementary function of DIx(108)<table><tr><th>“a” or “b”</th><th>Torque Limit Source</th></tr><tr><td>0</td><td>No torque limit</td></tr><tr><td>1</td><td>AI1</td></tr><tr><td>2</td><td>AI2</td></tr><tr><td>3</td><td>AI3</td></tr><tr><td>4</td><td>Pr.067</td></tr><tr><td>5</td><td>PID Output</td></tr></table></td></tr>
<tr><td>334</td><td>384</td><td>434</td><td>484</td><td>Length Conversion</td><td>If used micrometer as the unit of Destination Location/Length, this parameter defines the number of data to be converted micrometer into clocks. And Pr.576/577 defines the conversion rate.<table><tr><th>Setting</th><th>Conversion</th></tr><tr><td>0</td><td>No conversion</td></tr><tr><td>1~16</td><td>Select total “n” data for conversion.
Example:
n=1, then DL16 convert to DL0
n=2, DL16→DL0, DL17→DL1
n=16, DL16→DL0, DL17→DL1,
DL18→DL2,…..,DL31→DL15</td></tr></table></td></tr>
<tr><td>335</td><td>385</td><td>435</td><td>485</td><td>Length Compensation</td><td rowspan="2">When power ON, the desired length is:<table><tr><th>Length Compensation</th><th>Compensation Polarity</th><th>Desired Length</th></tr><tr><td>0</td><td>0 or 1</td><td>DLn</td></tr><tr><td>1</td><td>0</td><td>DLn+DL1</td></tr><tr><td>1</td><td>1</td><td>DLn-DL1</td></tr></table>After power ON, user can use DIx(147) and DIx(148) to change the desired length.<table><tr><th>DIx(147)</th><th>DIx(148)</th><th>Desired Length</th></tr><tr><td>OFF</td><td>ON or OFF</td><td>DLn</td></tr><tr><td>ON</td><td>OFF</td><td>DLn+DL1</td></tr><tr><td>ON</td><td>ON</td><td>DLn-DL1</td></tr></table></td></tr>
<tr><td>336</td><td>386</td><td>436</td><td>486</td><td>Compensation Polarity</td></tr>
<tr><td>337~339</td><td>387~389</td><td>437~439</td><td>487~489</td><td>Reserve</td><td>These parameters reserved for special use, and must set to 0 normally.</td></tr>
<tr><td>340</td><td>390</td><td>440</td><td>490</td><td>Resolver Shift Angle</td><td>This parameter defines the shift angle between motor and resolver.</td></tr>
<tr><td>341</td><td>391</td><td>441</td><td>491</td><td>Resolver Polarity</td><td>This parameter defines the polarity of Sine Cosine signal.</td></tr>
<tr><td>342~349</td><td>392~399</td><td>432~439</td><td>492~499</td><td>Reserve</td><td>These parameters reserved for special use, and must set to 0 normally.</td></tr>
</table>

5.2.12 Auto Point-to-Point Control

APTP Trapezoidal Speed Profile Generator



Pr.nnn	Parameter Name	Description
193	Home Direction	
194	Home Speed and Acc/Dec	

Pr.193	Home Search Direction
0	Forward
1	Reverse
2	DIx(119) OFF: Forward, DIx(119) ON: Reverse

Pr.194	Home Search Speed and Acc/Dec
0	Normal Speed and Main Acc/Dec
1	JOG Speed and JOG Acc/Dec

Home Search Process

DIx	Description
128 (Home Start) 129 (Home Stop(1)) 170 (Home Stop(2))	● For absolute position control mode, must execute Home Search process before execute APTP function. ● Pr.193 defines home search direction and Pr.194 defines Home search speed and Acc/Dec. ● If DIx(129) is OFF and DIx(128) is triggered, the drive will start Home Search process until DIx(129) is ON. After Dix(129) ON, the drive start to search encoder index, and automatically stop at the Index Offset (Pr.568/569) position. ● If DI1(170) is OFF and DIx(128) is triggered, the drive will start Home Search process until DI1(170) is ON. After DI1(170) ON, the drive automatically stop at the Index Offset (Pr.568/569) position from current position. ● The DOx(56) will ON immediately after start Home Search (DIx(128) is triggered). When Home Search complete, the DOx(56) will OFF automatically. ● DOx(57) is complement function of DOx(56). ● If DOx(128) ON, indicating Home Search already performed. DOx(128) will OFF after drive RESET or change to Speed Mode. ● DOx(129) is complement function of DOx(128). **NOTE:** 1. Only DI1 input can select DI1(170) function. 2. Cannot select DIx(129) and DI1(170) simultaneously.
138 (Return Home)	Under **Absolute APTP** mode, trigger DIx(138) will command the motor return to HOME position.

<table>
<tr><td>500</td><td>DL0 (Low)</td><td rowspan="15">

These parameters store 32 points data used in Auto Point-to-Point operation.
If select Incremental mode, these values mean the desired Destination Length.
If select Absolute Mode, these values mean the desired Destination Location.
Each Destination Location/Length is composed by two parameters forming an 8-digital value. Named as DL0、DL1、DL2……DL31。

DL0 = Pr.501 * 10000 + Pr.500
DL1 = Pr.503 * 10000 + Pr.502
⋮
DL30 = Pr.561 * 10000 + Pr.560
DL31 = Pr.563 * 10000 + Pr.562
Auto Point-to-Point Process
<table>
<tr><th>DIx</th><th>Description</th></tr>
<tr><td>118
(APTP Trigger)</td><td>After DLn (DIx(120)~DIx(124)) and its polarity (DIx(119)) selected, the drive will execute APTP function when DIx(118) is triggered.
DOx(126) APTP Busy, if DOx(126) is ON, indicating APTP is processing.
DOx(127) is complement function of DOx(126).</td></tr>
<tr><td>119
(Negative DLn)</td><td>After DLn (DIx(120)~DIx(124)) selected,
If DIX(119) OFF, the drive will execute APTP function using +DLn value.
If DIX(119) OFF, the drive will execute APTP function using -DLn value.</td></tr>
<tr><td>120~124
(PTS0~PTS4)</td><td>DIx(120)~DIx(124) are used for DLn selection.
DIx(120): PTS0 Point Selection Bit0
DIx(121): PTS1 Point Selection Bit1
DIx(122): PTS2 Point Selection Bit2
DIx(123): PTS3 Point Selection Bit3
DIx(124): PTS4 Point Selection Bit4
After PTS0~PTS4 are selected, then DLn is selected:
n = PTS4 * 16 + PTS3 * 8 + PTS2 * 4 + PTS1 * 2 + PTS0</td></tr>
<tr><td>135
(Clear Servo End Flag)</td><td>In APTP mode, after APTP process is completed the SERVO-END flag will set (DOx(124) will ON), and DIx(135) is used to clear SERVO-END flag.
DOx(125) is complement function of DOx(124).</td></tr>
</table>
</td></tr>
<tr><td>501</td><td>DL0 (High)</td></tr>
<tr><td>502</td><td>DL1 (Low)</td></tr>
<tr><td>503</td><td>DL1 (High)</td></tr>
<tr><td>504</td><td>DL2 (Low)</td></tr>
<tr><td>505</td><td>DL2 (High)</td></tr>
<tr><td>⋮</td><td>⋮</td></tr>
<tr><td>558</td><td>DL29 (Low)</td></tr>
<tr><td>559</td><td>DL29 (High)</td></tr>
<tr><td>560</td><td>DL30 (Low)</td></tr>
<tr><td>561</td><td>DL30 (High)</td></tr>
<tr><td>562</td><td>DL31 (Low)</td></tr>
<tr><td>563</td><td>DL31 (High)</td></tr>
<tr><td>195</td><td>Travel Limit</td><td rowspan="5">
<table>
<tr><th>Pr.195</th><th>Description</th></tr>
<tr><td>0</td><td>No software Travel Limit</td></tr>
<tr><td>1</td><td>Enable Forward/Reverse software Travel Limit.
Pr.564/565 defines Forward Travel Limit value.
Pr.566/567 defines Reverse Travel Limit value.</td></tr>
</table>

If DOx(130) ON, indicating present position already exceeds Forward or Reverse Travel Limit.
If DOx(131) ON, indicating present position already exceeds Forward Travel Limit.
If DOx(132) ON, indicating present position already exceeds Reverse Travel Limit.

The function of DOx(130)~DOx(132) is enabled if Pr.195=1 and Home Search already performed.
</td></tr>
<tr><td>564</td><td>Forward Travel Limit (Low)</td></tr>
<tr><td>565</td><td>Forward Travel Limit (High)</td></tr>
<tr><td>566</td><td>Reverse Travel Limit (Low)</td></tr>
<tr><td>567</td><td>Reverse Travel Limit (High)</td></tr>
<tr><td>568</td><td>Index Offset (Low)</td><td rowspan="2">Pr.568/569 defines index offset of Home position.</td></tr>
<tr><td>569</td><td>Index Offset (High)</td></tr>
<tr><td>570</td><td>Position Error Limit</td><td rowspan="2">While the drive is working under position mode (Tracking or APTP), with this function user can monitor the status of internal position control loop.
Pr.570 defines the warning clocks limitation.
Pr.571 defines the tolerance clocks of In-Position judgement.
Position Error = Position Desired – Position Feedback
DOx(52) will ON when ｜Position Error｜≦ In Position Range
DOx(53) will ON when ｜Position Error｜＞ In Position Range
DOx(54) will ON when ｜Position Error｜≧ Position Error Limit
DOx(55) will ON when ｜Position Error｜＜ Position Error Limit</td></tr>
<tr><td>571</td><td>In Position Range</td></tr>
<tr><td>576</td><td>μm Revolution (Low)</td><td rowspan="2">Pr.576/577 defines the actual physical length when motors on revolution.
Expressed in clocks.</td></tr>
<tr><td>577</td><td>μm Revolution (High)</td></tr>
</table>

6. Selection of Speed Source

Speed Source Select Pr040 is used for speed input source selection. Through Pr.040 setting, the speed input sources may come from Control Panel, Memory, Analog Input, Up/Down Counter, or the combination of the above sources.
Speed Source Select Pr.040=cc.dd is composed of two selection "cc" and "dd" in one parameter, if Speed command SW DIx(88) or Speed & Control SW DIx(90) is ON then Speed Source ="dd", otherwise Speed source="cc".

6.1 Speed Source Selection Table

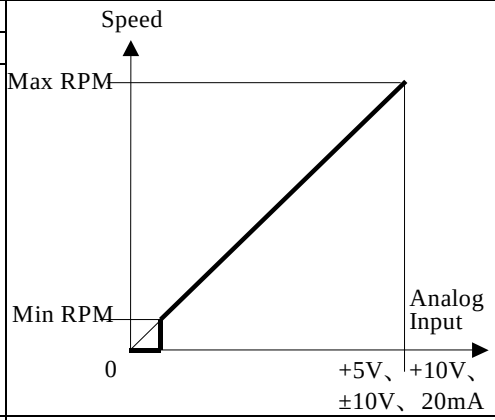
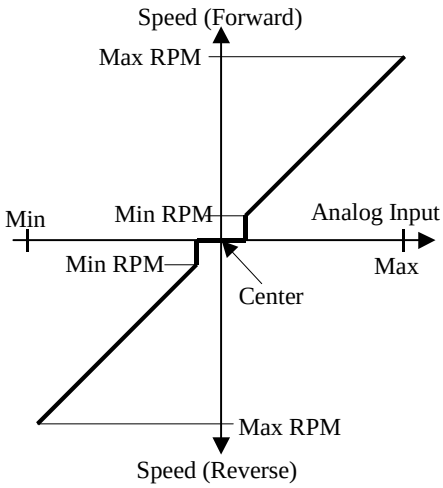
Pr.040	Speed Source	Reference
0	Set value in Pr.000	6.2.1
1	By AI1 Input	6.2.2
2	By AI2 Input	
3	Set value from Panel	6.2.1
4	Both the output Speed and direction determined by AI1	6.2.2
5	Both the output Speed and direction determined by AI2	
6	By internal Up/Down Counter	6.2.3
7	By internal Up/Down Counter, and will preload Up/Down counter from Pr.000 after RESET.	
8	Set value from Panel, with PRELOAD from & AUTO WRITE to Pr.000	6.2.1
9	Both the output Speed and direction determined by AI1, with Minimum RPM	6.2.2
10	Both the output Speed and direction determined by AI2, with Minimum RPM	
11	By internal Up/Down Counter	6.2.3
12	Speed Set = AI1* (1 ± (Pr.070*AI2)), with Minimum RPM	6.2.4
13	Speed Set = AI2 ± (Pr.015 * (Pr.070*AI1)), with Minimum RPM	6.2.4
17	By AI1 Input, with Minimum RPM	6.2.2
18	By AI2 Input, with Minimum RPM	
19	By internal Up/Down Counter, with PRELOAD from & AUTO WRITE to Pr.000	6.2.3
20	By AI2 Input, but with Reverse Slope and Minimum RPM	6.2.2
21	Speed Set = Panel (or Computer) Set * (1 ± (Pr.070*AI2)), with Minimum RPM	6.2.4
22	Speed Set = Panel (or Computer) Set ± (Maximum RPM * (Pr.070*AI1)), with Minimum RPM	6.2.2
25	By AI3 Input	6.2.2
26	Both the output Speed and direction determined by AI3.	6.2.2
27	Both the output Speed and direction determined by AI3, with Minimum RPM	6.2.2
28	Speed Set = AI1 * (1 ± (Pr.070*AI3)), with Minimum RPM	6.2.4
29	Speed Set = AI3 ± (Maximum RPM * (Pr.070*AI1)), with Minimum RPM	6.2.4
30	By AI3 Input, with Minimum RPM	6.2.2
31	By AI3 Input, but with Reverse Slope and Minimum RPM	6.2.2
32	By AI1 Input, but with Reverse Slope and Minimum RPM	
33	Speed Set = Panel (or Computer) Set * (1± (Pr0.70*AI1))	6.2.4
34	Speed Set = Panel (or Computer) Set * (1± (Pr.070*AI3))	
35	Speed Set = Panel (or Computer) Set ± (Maximum RPM * (Pr.070*AI2)), with Minimum RPM	6.2.4
36	Speed Set = Panel (or Computer) Set ± (Maximum RPM * (Pr.70*AI3), with Minimum RPM	
37	Forward by AI1, Reverse by AI2	6.2.2
38	Forward by AI2, Reverse by AI1	
39	Set value in Pr.000, with Minimum RPM	6.2.1
40	By PID Output	6.2.1
46	Set value in Pr.116	6.2.1

6.2 Description of Speed Source

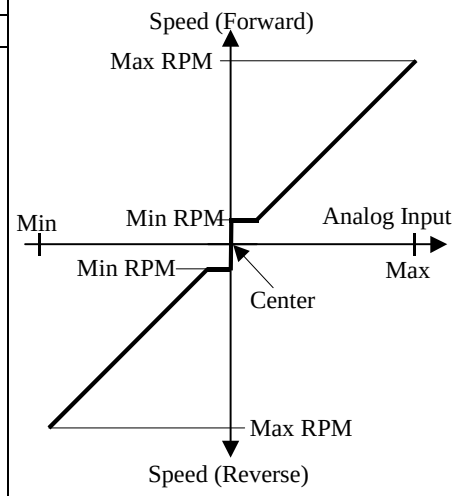
6.2.1 Speed Source from Memory & Panel

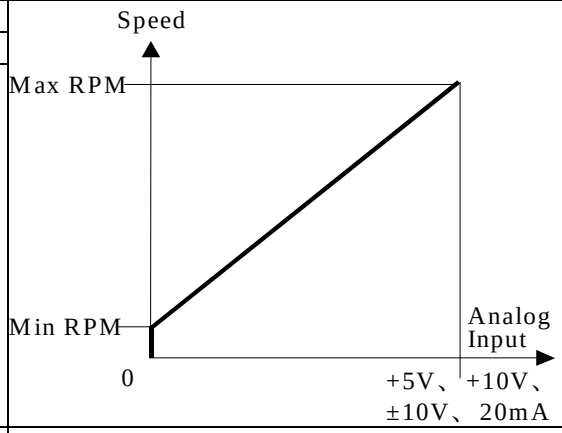
Pr.040	Speed Source	Description
0	Pr.000	● The speed value stored in Pr.000 determines the output speed of the drive while running. ● The direction of the output phase sequence determined by control command (Pr.039).
3	Panel	● If Pr.182=0, the set speed comes from Control Panel directly. ● If Pr.182=1, if communication option is used, the set speed comes from RS485 communication port. ● The direction of the output phase sequence determined by control command (Pr.039). ● While the desired output speed is lower than Minimum RPM (Pr.316/366/416/466), the actual output speed will maintain at the Minimum RPM.
8	Panel	This mode is similar to Pr.040=3, with only two differences: ● When power ON or after RESET, the data in Pr.000 will preload into internal set speed buffer ● When using Control Panel, after changing set speed, the value in set speed buffer will write back into Pr.000 automatically.
39	Pr.000	● The speed value stored in Pr.000 determines the output speed of the drive while running. ● The direction of the output phase sequence determined by control command (Pr.039). ● While the desired output speed is lower than Minimum RPM (Pr.316/366/416/466), the actual output speed will maintain at the Minimum RPM.
40	PID Output	The PID Output determines the output speed of the drive while running. Refer to section 5.2.10
46	Pr.116	● The speed value stored in Pr.116 determines the output speed of the drive while running. ● The direction of the output phase sequence determined by control command (Pr.039). This parameter stored in RAM instead of EAROM. Therefore, it can be modify randomly and quickly. Usually, it is used for computer control application.

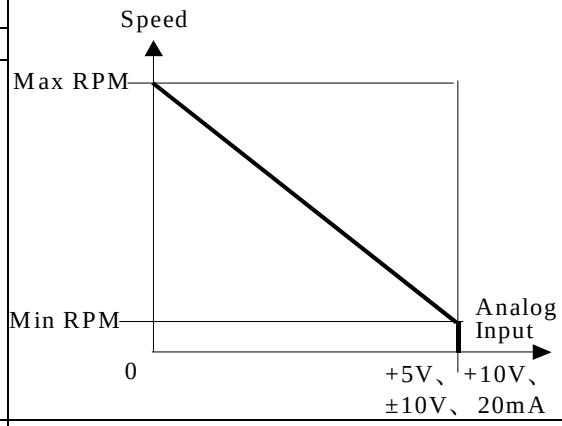
6.2.2 Speed Source from Analog Input

Pr.040	Speed Source	Description
1 2 25	AI1 AI2 AI3	 ● The voltage (or current) signal fed into Analog Input Terminal will be used to determine the output speed of the drive while running. ● The direction of the output phase sequence determined by control command (Pr.039). ● If the input signal reaches maximum level, the set speed is equal to Maximum RPM (Pr.315/365/415/465) ● If the desired set speed is lower than minimum RPM (Pr.316/366/416/466), the drive will stop.
4 5 26	AI1 AI2 AI3	 ● The voltage (or current) signal fed into Analog In used to determine the output speed and the directi sequence of the drive. ● If the input signal reaches maximum level, the set Maximum RPM (Pr.315/365/415/465) in forward ● If the input signal is Zero, the set speed is equal to reverse direction. ● If the input signal around center level, the drive w

Signal	Max	Center	Min
+5V	+5V	+2.5V	0V
+10V	+10V	+5V	0V
±10V	+10V	0V	-10V
20mA	20mA	10mA	0mA

<table>
<tr><td>9
10
27</td><td>AI1
AI2
AI3</td><td> 

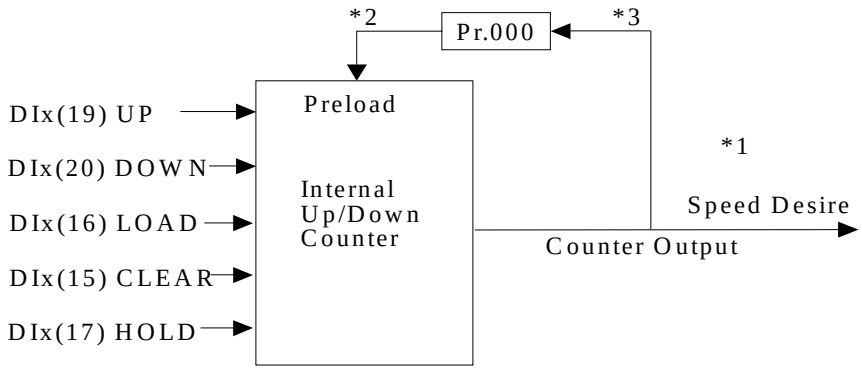
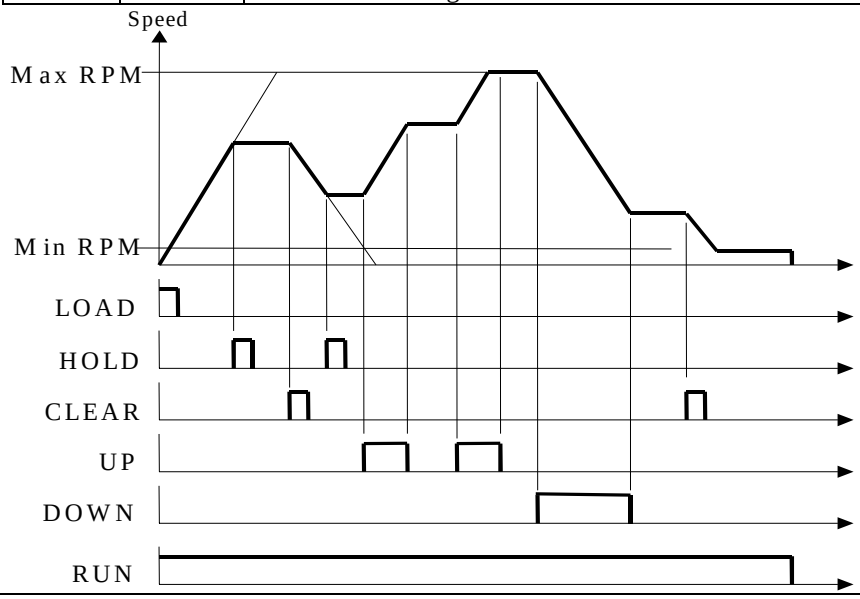
The voltage (or current) signal fed into Analog Input terminal will be used to determine the output speed and the direction of the output phase sequence of the drive.
If the input signal reaches maximum level, the set speed is equal to Maximum RPM (Pr.315/365/415/465) in forward direction.
If the input signal is Zero, the set speed is equal to Maximum RPM in reverse direction.
If the input signal around center level, the drive will run at Minimum RPM (Pr.316/366/416/466).
<table>
<tr><td>Signal</td><td>Max</td><td>Center</td><td>Min</td></tr>
<tr><td>+5V</td><td>+5V</td><td>+2.5V</td><td>0V</td></tr>
<tr><td>+10V</td><td>+10V</td><td>+5V</td><td>0V</td></tr>
<tr><td>±10V</td><td>+10V</td><td>0V</td><td>-10V</td></tr>
<tr><td>20mA</td><td>20mA</td><td>10mA</td><td>0mA</td></tr>
</table></td></tr>
<tr><td>17
18
30</td><td>AI1
AI2
AI3</td><td> 

The voltage (or current) signal fed into Analog Input Terminal will be used to determine the output speed of the drive while running.
The direction of the output phase sequence determined by control command (Pr.039).
If the input signal reaches maximum level, the set speed is equal to Maximum RPM (Pr.315/365/415/465)
If the desired set speed is lower than minimum RPM (Pr.316/366/416/466), the drive will run at Minimum RPM.</td></tr>
<tr><td>20
31
32</td><td>AI2
AI1
AI3</td><td> 

The voltage (or current) signal fed into Analog Input Terminal will be used to determine the output speed of the drive while running.
The direction of the output phase sequence determined by control command (Pr.039).
If the input signal is Zero, the set speed is equal to Maximum RPM (Pr.315/365/415/465)
If the input signal reaches maximum level, the drive will run at Minimum RPM (Pr.316/366/416/466).</td></tr>
<tr><td>37</td><td>AI1 & AI2</td><td>If the motor run in FORWARD direction, it is same as Pr.040=17, use AI1 as input source.
If the motor run in REVERSE direction, it is same as Pr.040=18, use AI2 as input source.</td></tr>
<tr><td>38</td><td>AI1 & AI2</td><td>If the motor run in FORWARD direction, it is same as Pr.040=18, use AI2 as input source.
If the motor run in REVERSE direction, it is same as Pr.040=17, use AI1 as input source.</td></tr>
</table>

- **Set Jumper to match the input signal type and range. (Refer to section 1.2.3)**
- **If necessary, use Pr.089/090/091/092/191/192 to modify the input range. (Refer to section 5.2.6)**

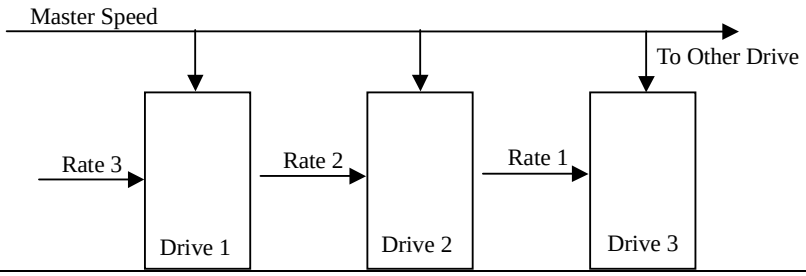
6.2.3 Speed Source from Internal Up/Down Counter

Pr.040	Speed Source	Description
6 7 11 19	Up/Down Counter	 1. If Pr.40=6,7,11or 19, the up/down counter is used to determined the output speed. 2. If Pr.40=7 or 19, the data in Pr.000 will preload into the Up/Down counter when Power ON or Reset. 3. If Pr.40=19, after Up/Down execution, the content of Up/Down counter will write into Pr.000 automatically. The signals come from Digital Input (DIx) terminal describe as following: **DIx** / **Function** / **Description** 15 / Clear / If DIx(15) is triggered, the content of the internal Up/Down Counter will be set to the value of Minimum RPM (Pr.316/366/416/466). 16 / Load / If DIx(16) is triggered, the content of the internal Up/Down Counter will be set to the value of Maximum RPM (Pr.315/365/415/465). 17 / Hold / If DIx(17) is triggered, the value of present output speed will be loaded into the internal Up/Down Counter. 19 / Up / If DIx(19) is ON, the content of the internal Up/Down Counter will increase according to the rate of Pr.001. 20 / Down / If DIx(20) is ON, the content of the internal Up/Down Counter will decrease according to the rate of Pr.002. 

6.2.4 Set Speed from Two Speed Sources Combination

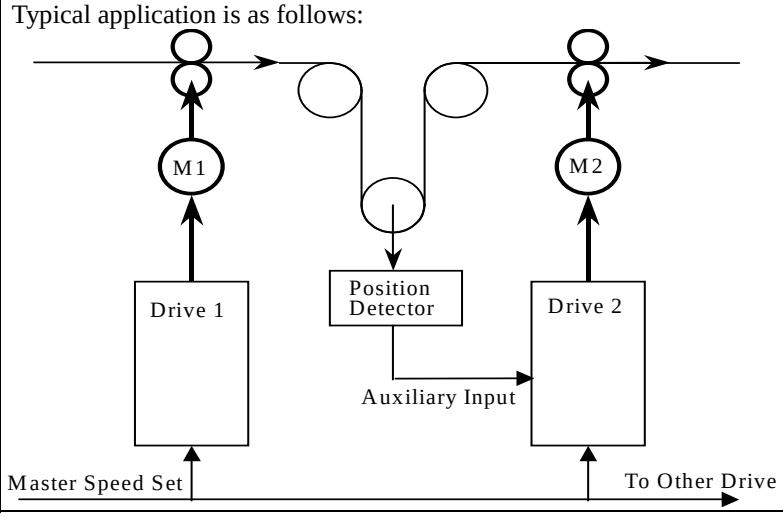
<table>
<tr><th>Set Speed</th><th>Description</th></tr>
<tr><td>Master Speed * (100% ± (Pr.070 * Proportional Rate))</td><td>
<table>
<tr><th>Pr.040</th><th>Master Speed Source</th><th>Proportional Rate Source</th></tr>
<tr><td>12</td><td>AI1</td><td>AI2</td></tr>
<tr><td>28</td><td>AI1</td><td>AI3</td></tr>
<tr><td>33</td><td>Control Panel or RS485 Port</td><td>AI1</td></tr>
<tr><td>21</td><td>Control Panel or RS485 Port</td><td>AI2</td></tr>
<tr><td>34</td><td>Control Panel or RS485 Port</td><td>AI3</td></tr>
</table>

Pr.070 (Analog Input Gain) defines the gain of Proportional Rate when set speed determine by the combination of two speed sources.
If the signal level of proportional rate is maximum, the modification rate is (100%+Pr.070).
If the signal level of proportional rate is minimum, the modification rate is (100%-Pr.070).
If the desired set speed is lower than minimum RPM (Pr.316/366/416/466), the drive will run at Minimum RPM.

Typical application is as follows:


</td></tr>
<tr><td>Master Speed ± (Max RPM * (Pr.070 * Auxiliary Input))</td><td>
<table>
<tr><th>Pr.040</th><th>Master Speed Source</th><th>Auxiliary Input</th></tr>
<tr><td>13</td><td>AI2</td><td>AI1</td></tr>
<tr><td>29</td><td>AI3</td><td>AI1</td></tr>
<tr><td>22</td><td>Control Panel or RS485 Port</td><td>AI1</td></tr>
<tr><td>35</td><td>Control Panel or RS485 Port</td><td>AI2</td></tr>
<tr><td>36</td><td>Control Panel or RS485 Port</td><td>AI3</td></tr>
</table>

Pr.070 (Analog Input Gain) defines the gain of Auxiliary Input when set speed determine by the combination of two speed sources.
If the signal level of Auxiliary Input is maximum, the modification quantity is +(Maximum RPM * Pr.70).
If the signal level of Auxiliary Input is minimum, the modification quantity is -(Maximum RPM * Pr.70).
If the desired set speed is lower than minimum RPM (Pr.316/366/416/466), the drive will run at Minimum RPM.

Typical application is as follows:


</td></tr>
</table>

7. Selection of Digital Input Function

7.1 Digital Input Function Related Parameters

Pr.nnn	Parameter Name	Description
140	DI0 Select	● The configuration of Digital Input refer to section 1.2.1 ● All Digital Input terminals are scanned every 2.0ms. ● Each Digital Input terminal can be configured individually by corresponding DIx Select parameters. ● DI0 is connected to the Digital Output DO0 internally.
141	DI1 Select	
142	DI2 Select	
143	DI3 Select	
144	DI4 Select	
145	DI5 Select	
146	DI6 Select	
147	DI7 Select	
148	DI8 Select	
149	DI9 Select	
150	DI10 Select	

7.2 Selection Table of Digital Input Function

DIx	Function	Comment	Reference
0	NULL	No function	
1	EMS	Emergency Stop	7.3.1
2	SPD3	SPD3 Speed Set	5.2.4
3	SPD2	SPD2 Speed Set	
4	SPD1	SPD1 Speed Set	
5	JOG	JOG Speed Set	
6	OH	Over Heat Alarm (Normal Open)	7.3.2
7	TMIA(1)	Timer(1) Input (OFF-Delay Type)	7.3.3
9	FJR	Forward JOG Run	7.3.1
10	RJR	Reverse JOG Run	
11	TMIB(1)	Timer(1) Input (ON-Delay Type)	7.3.3
15	U/D CLEAR	Set Up/Down Counter to Minimum RPM	6.2.3
16	U/D LOAD	Set Up/Down Counter to Maximum RPM	
17	U/D HOLD	Hold Output Speed to Up/Down Counter	
19	U/D UP	Increase Up/Down Counter	
20	U/D DOWN	Decrease Up/Down Counter	
21	ALARM CLEAR	Clear Alarm when Alarm Occur	7.3.1
22	SET1(FF1)	SET Input of Flip/Flop-1	7.3.4
23	CLR1(FF1)	CLEAR Input of Flip/Flop-1	
24	SET2(FF2)	SET Input of Flip/Flop-2	
25	CLR2(FF2)	CLEAR Input of Flip/Flop-2	
26	SET(FF1&FF2)	SET Input to both Flip/Flop-1 and Flip/Flop-2	
27	CLR(FF1&FF2)	CLEAR Input to both Flip/Flop-1 and Flip/Flop-2	
28	COUNTER INPUT	Clock Input of Timer/Counter Block	7.3.3
29	COUNTER CLEAR	Clear Input of Timer/Counter Block	
30	/OH	Over Heat (Normal Close)	7.3.2
36	TMIC(1)	Timer(1) Input (ON/OFF Type)	7.3.3
46	TRACK + JOG	Tracking Speed plus JOG Speed	5.2.9
47	TRACK – JOG	Tracking Speed minus JOG Speed	
58	TRACK + (AI1 * JOG)	Tracking Speed plus (AI1*JOG Speed)	
59	TRACK – (AI1 * JOG)	Tracking Speed minus (AI1*JOG Speed)	
64	XY MULTIPLY	Select Multiply Rate of XY Input Clock	5.2.9 (Pr.133~136)
65	XY DIVISION	Select Division Rate of XY Input Clock	
73	RUN FUNCTION	Select RUN Function	5.2.5 (Pr.039)
74	REV FUNCTION	Select REV Function	
80	SPEED SW 1	16 Step Speed Select	5.2.4
81	SPEED SW 2		
82	SPEED SW 3		
83	SPEED SW 4		

DIx	Function	Comment	Reference
84	JOG ACC/DEC TIME	Acceleration/Deceleration Time Select	5.2.4
85	SPD1 ACC/DEC TIME		
86	SPD2 ACC/DEC TIME		
87	SPD3 ACC/DEC TIME		
88	SPEED COMMAND SW	Speed Command Select Switch	Sec. 6
89	CONTROL COMMAND SW	Control Command Select Switch	5.2.5 (Pr.039)
90	SPEED & CONTROL SW	Speed and Control Command Select Switch	5.2.5、Sec.6
91	/TMIA(1)	Complement of Timer(1) Input (OFF-Delay Type)	7.3.3
92	/TMIB(1)	Complement of Timer(1) Input (ON-Delay Type)	
93	/TMIC(1)	Complement of Timer(1) Input (ON/OFF Cycle Type)	
94	TMIA(2)	Timer(2) Input (OFF-Delay Type)	
95	TMIB(2)	Timer(2) Input (ON-Delay Type)	
96	TMIC(2)	Timer(2) Input (ON/OFF Type)	
97	/TMIA(2)	Complement of Timer(2) Input (OFF-Delay Type)	
98	/TMIB(2)	Complement of Timer(2) Input (ON-Delay Type)	
99	/TMIC(2)	Complement of Timer(2) Input (ON/OFF Type)	
100	DRIVE ENABLE & RUN	Enable Drive and Assert RUN Command	7.3.1
101	/(DRIVE ENABLE & RUN)	Complement of DIx(100)	
102	DRIVE ENABLE	Enable Drive to Standby State	7.3.1
103	/(DRIVE ENABLE)	Complement of DIx(102)	
106	POSITION/SPEED MODE	Change between Position and Speed mode	5.2.11 (Pr.330)
107	/(POSITION/SPEED MODE)	Complement of DIx(106)	
108	TORQUE LIMIT SW	Select Torque Limit Source	5.2.11 (Pr.333)
109	/(TORQUE LIMIT SW)	Complement of DIx(108)	
114	MSB0	Motor Parameter Group Select	5.2.5 (Pr.188)
115	MSB1		
118	APTP TRIGGER	Trigger start Auto Point-to-Point Function	5.2.12
119	NEGATIVE DLn VALUE	Use Negative DLn for ATPT Position	5.2.12
120	PTS0	Point Select Bit0	5.2.12
121	PTS1	Point Select Bit1	
122	PTS2	Point Select Bit2	
123	PTS3	Point Select Bit3	
124	PTS4	Point Select Bit4	
126	TRACK/ATPT SW	Change between TRACK and APTP mode	5.2.11 (Pr.331)
127	/(TRACK/ATPT SW)	Complement of DIx(126)	
128	HOME START	Start Home Search Process	5.2.12
129	HOME STOP (1)	Stop Home Search Process Type 1	
135	CLEAR SERVO END FLAG	Clear SERVO END Flag in APTP mode	5.2.12
138	RETURN HOME	Command Motor return to Home Position	5.2.12
140	FWD TRAVEL LIMIT	Forward Travel Limit Switch (Normal Open)	7.3.2
141	/(FWD TRAVEL LIMIT)	Forward Travel Limit Switch (Normal Close)	
142	REV TRAVEL LIMIT	Reverse Travel Limit Switch (Normal Open)	7.3.2
143	/(REV TRAVEL LIMIT)	Reverse Travel Limit Switch (Normal Close)	
147	ENABLE DL1 COMPENSATION	Desired Length=DLn plus (or minus) DL1	5.2.11 (Pr.335)
148	SELECT DL1 POLARITY	Determine Plus or Minus DL1	
149	LATCH EMS	Emergency Stop and Latched until Drive Reset	7.3.1
160	PID SET POLARITY BIT	Select PID Set Polarity	5.2.10
161	PID FB POLARITY BIT	Select PID FB Polarity	
162	PID RANGE BIT	Select PID Range	
163	PID OUTPUT POLARITY BIT	Select PID Output Polarity	
164	PID ENABLE BIT	Enable PID Function	
165	PID HOLD BIT	Select PID Hold	
166	PID AUTO GAIN ENABLE BIT	Enable PID Auto Gain	
168	TRACK + (PID OUTPUT * JOG)	Tracking Speed plus (PID Output * JOG Speed)	5.2.9
169	TRACK – (PID OUTPUT * JOG)	Tracking Speed minus (PID Output * JOG Speed)	
170	HOME STOP (2)	Stop Home Search Process Type 2	5.2.12

7.3 Description of Digital Input function

7.3.1 Control Function

DIx	Function	Description
1	EMS	While drive running, if the DIx(1) is ON, then drive will stop the motor to ZERO Speed immediately. If DIx(1) OFF, the drive will run at original Set Speed.
149	LATCH EMS	While drive running, if the DIx(149) triggered, then drive will stop the motor to ZERO Speed until the drive RESET or Power OFF.
9	FJR	When DIx(9) is ON, the drive execute Forward-Jog-Run without RUN command.
10	RJR	When DIx(10) is ON, the drive execute Reverse-Jog-Run without RUN command.
21	ALARM CLEAR	If DIx(21) is ON, will RESET the drive only when ALARM had occurred. **Note: the RST terminal is used to RESET the drive no matter ALARM occurred or not.**
100	DRIVE ENABLE & RUN	If DIx(100) is ON, enabled the drive and assert RUN command.
101	/(DRIVE ENABLE & RUN)	DIx(101) is complement input of DIx(100).
102	DRIVE ENABLE	If DIx(102) is ON, enabled the drive. RUN command is separately controlled.
103	/(DRIVE ENABLE)	DIx(103) is complement input of DIx(102).

7.3.2 Protection Function

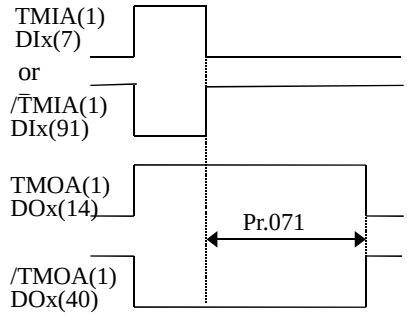
DIx	Function	Description
6	OH	If DIx(6) ON or DIx(30) OFF, the drive will disable the output transistors, and show OH alarm message on control panel.
30	/OH	
140	FWD TRAVEL LIMIT	Under **Absolute APTP** mode, DIx(140) can connect to Forward Travel Limit Switch, if DIx(140) is ON, then the motor will not rotate any further toward FORWARD direction. DIx(141) is complement input of DIx(140).
141	/(FWD TRAVEL LIMIT)	
142	REV TRAVEL LIMIT	Under **Absolute APTP** mode, DIx(142) can connect to Reverse Travel Limit Switch, if DIx(142) is ON, then the motor will not rotate any further toward REVERSE direction. DIx(143) is complement input of DIx(142).
143	/(REV TRAVEL LIMIT)	

7.3.3 Timer & Counter Function

DIx	Function	Description
7	TMIA(1)	The drive built in two general purpose TIMERs. For example of Timer(1):
91	/TMIA(1)	● Digital input DIx assigned to TMIA(1) function DIx(7), it serves as input of the OFF-DELAY timer.
94	TMIA(2)	● To assign a digital output DOx, which select TMOA(1) function DOx(14) to serve as output of this timer.
97	/TMIA(2)	● To define the timer time in Pr.071.

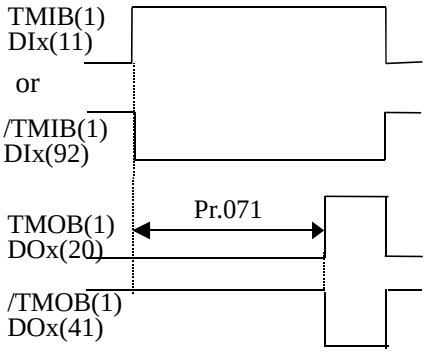
When the timer input TMIA(1) DIx(7) is ON, the timer output TMOA(1) DOx(14) will be ON immediately. If the timer input TMIA(1) DIx(7) become OFF, the timer will start counting time. After waiting the specified time period of Pr.071 then TMOA DOx(14) become OFF.

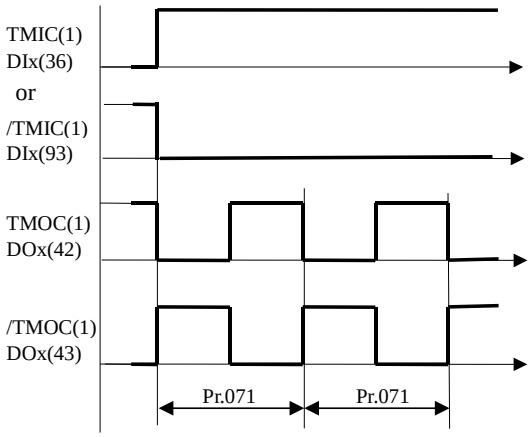
- DIx(91) /TMIA(1) is complement input of DIx(7) TMIA(1).
- DOx(40) /TMOA(1) is complement output of DOx(14) TMOA(1).



The function of Timer(2) is same as Timer(1)

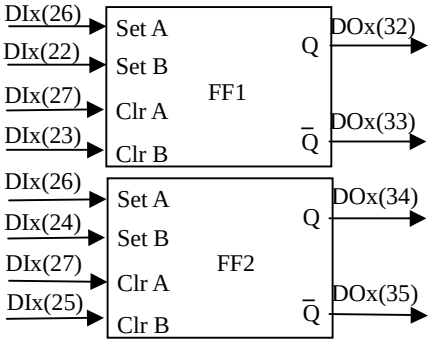
- Pr.072 defines the timer time for Timer(2).
- DIx(94) TMIA(2) is the input of Timer(2).
- DIx(97) /TMIA(2) is complement input of DIx(94) TMIA(2).
- DOx(94) TMOA(2) is the output of Timer(2).
- DOx(97) /TMOA(2) is complement output of DOx(94) TMOA(2).

<table>
<tr><td>11
92
95
98</td><td>TMIB(1)
/TMIB(1)
TMIB(2)
/TMIB(2)</td><td>The drive built in two general purpose TIMERs. For example of Timer(1):
● Digital input DIx assigned to TMIB(1) function DIx(11), it serves as input of the ON-DELAY timer.
● To assign a digital output DOx, which select TMOB(1) function DOx(20) to serve as output of this timer.
● To define the timer time in Pr.071.
When the timer input TMIB(1) DIx(11) is OFF, the timer output TMOB(1) DOx(20) will be OFF too. Until the timer input TMIB(1) DIx(20) is ON and continue ON for a specified time period of Pr.071 then TMOB DOx(14) become ON.
● DIx(92) /TMIB(1) is complement input of DIx(11) TMIB(1).
● DOx(41) /TMOB(1) is complement output of DOx(20) TMOB(1).
 

The function of Timer(2) is same as Timer(1)
● Pr.072 defines the timer time for Timer(2).
● DIx(95) TMIB(2) is the input of Timer(2).
● DIx(98) /TMIB(2) is complement input of DIx(95) TMIB(2).
● DOx(95) TMOB(2) is the output of Timer(2).
● DOx(98) /TMOB(2) is complement output of DOx(95) TMOB(2).</td></tr>
<tr><td>28
29</td><td>COUNTER INPUT
COUNTER CLEAR</td><td>Pr.108 (Counter Value) Monitors the value of clock input to counter.
Pr.109 (Counter Set) defines maximum clock input value of counter.
● Digital input DIx assigned to Counter Input DIx(28), it serves as input of Counter. If DIx(28) triggered, the content of Pr.108 (Counter Value) will increase of 1.
● Digital input DIx assigned to Counter Input DIx(29), it serves as clear of Counter. If DIx(29) triggered, the content of Pr.108 (Counter Value) will clear to zero.
● To assign a digital output DOx, which select Counter Over function DOx(140) to serve as output of this counter, if Pr108≧Pr.109, then DOx(140) become ON.
● The minimum width of trigger signal is 5ms.。
● DOx(141) is complement output of DOx(140).</td></tr>
<tr><td>36
93
96
99</td><td>TMIC(1)
/TMIC(1)
TMIC(2)
/TMIC(2)</td><td>The drive built in two general purpose TIMERs. For example of Timer(1):
● Digital input DIx assigned to TMIC(1) function DIx(36), it serves as input of the ON/OFF timer.
● To assign a digital output DOx, which select TMOC(1) function DOx(42) to serve as output of this timer.
● To define the period of time for one ON/OFF cycle in Pr.071.
When the timer input TMIC(1) DIx(36) is OFF, the timer output TMOC(1) DOx(42) is always under ON state. If the TMIC(1) DIx(36) is ON, then the TMOC DOx(42) will start the stable ON/OFF cycle.
● DIx(93) /TMIC(1) is complement input of DIx(36) TMIC(1).
● DOx(43) /TMOC(1) is complement output of DOx(42) TMOC(1).
 

The function of Timer(2) is same as Timer(1)
● Pr.072 defines the timer time for Timer(2).
● DIx(96) TMIC(2) is the input of Timer(2).
● DIx(99) /TMIC(2) is complement input of DIx(96) TMIC(2).
● DOx(96) TMOC(2) is the output of Timer(2).
● DOx(99) /TMOC(2) is complement output of DOx(96) TMOC(2).</td></tr>
</table>

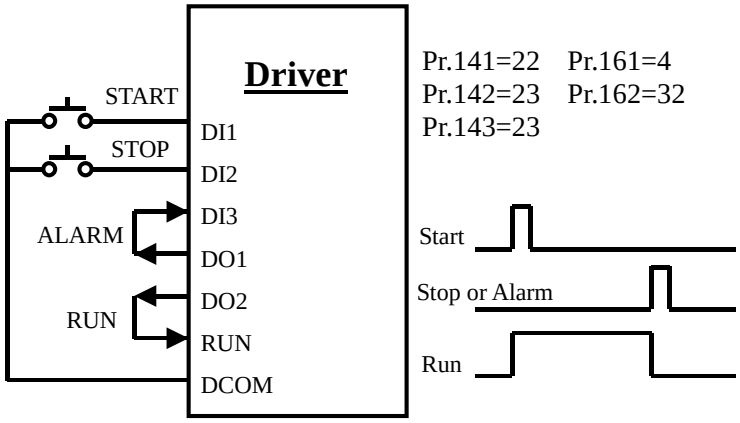
7.3.4 Flip/Flop Function

DIx	Function	Description
22	SET1(FF1)	
23	CLR1(FF1)	
24	SET2(FF2)	
25	CLR2(FF2)	
26	SET(FF1&FF2)	
27	CLR(FF1&FF2)	

The drive built in two general purpose Flip/Flops . Each Flip/Flop block has two SET inputs, two CLEAR inputs and two complementary outputs for free selection.

- If triggered Set A or Set B, will cause Q ON and /Q OFF.
- If triggered Clr A or Clr B, will cause Q OFF and /Q ON.

Application example: Use DI1, DI2, DO1 and DO2 as LATCH RELAY.



Pr.141=22 Pr.161=4
Pr.142=23 Pr.162=32
Pr.143=23

8. Selection of Digital Output Function

8.1 Digital Output Function Related Parameters

Pr.nnn	Function	Description
161	DO0 Select	● The configuration of Digital Output refer to section 1.2.2 ● Each Digital Output terminal can be configured individually by corresponding DOx Select parameters. ● DO0 is connected to the Digital Input DI0 internally. ● RY1 and RY2 pair terminals are NORMAL OPEN (1a) contacts of the output RELAY, and named DO3. Note: All of the Digital Outputs will go OFF for a short period when power ON or RESET.
161	DO1 Select	
162	DO2 Select	
163	DO3 Select	
164	DO4 Select	
165	DO5 Select	
166	DO6 Select	

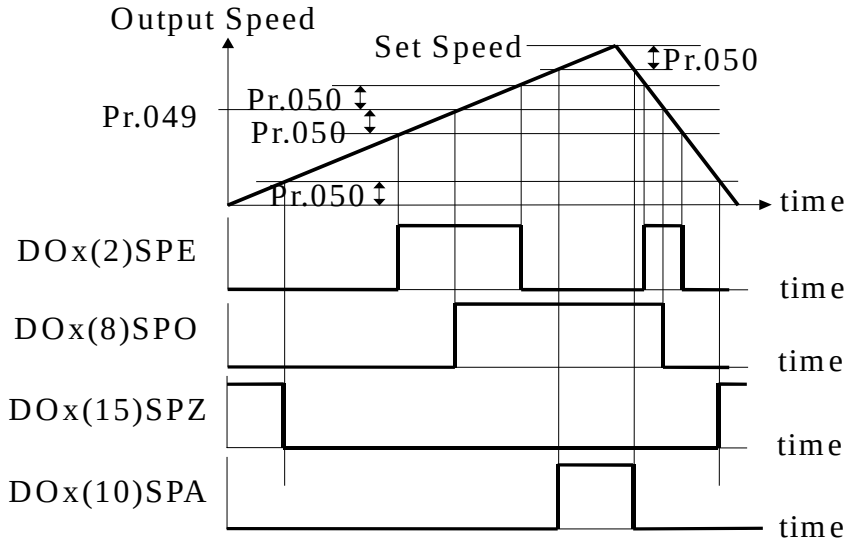
8.2 Selection Table of Digital Output Function

DOx	Function	Comment	Reference
0	OFF	Always OFF	8.3.2
1	/(ENABLE)	Not Enable	8.3.4
2	SPE	Speed Equal	8.3.1
3	SPNE	Speed Not Equal	
4	ALM	Alarm	8.3.4
5	NALM	No Alarm	
7	ENABLE	Drive Enabled	8.3.4
8	SPO	Speed Over	8.3.1
9	SPNO	Speed Not Over	
10	SPA	Speed Arrive	8.3.1
11	SPNA	Speed Not Arrive	
14	TMOA(1)	Timer(1) Output (OFF-Delay Type)	7.3.3 DIx(7)
15	SPZ	Zero Speed	8.3.1
16	SPNZ	Speed Not Zero	
20	TMOB(1)	Timer(1) Output (ON-Delay Type)	7.3.3 DIx(11)
32	Q1(FF1)	Output of Flip/Flop-1	7.3.4
33	/Q1(FF1)	Complement Output of Flip/Flop-1	
34	Q2(FF2)	Output of Flip/Flop-2	
35	/Q2(FF2)	Complement Output of Flip/Flop-2	
38	ON	Always ON	8.3.2
39	DO1 CLOCK	Clock output (for DO1 only)	8.3.3
40	/TMOA(1)	Complement of Timer(1) Output (OFF-Delay Type)	7.3.3 DIx(7)
41	/TMOB(1)	Complement of Timer(1) Output (ON-Delay Type)	7.3.3 DIx(11)
42	TMOC(1)	Timer(1) Output (ON/OFF Type)	7.3.3 DIx(36)
43	/TMOC(1)	Complement of Timer(1) Output (ON/OFF Type)	
52	IN POSITION	Position Error <= In Position Range	5.2.12 (Pr.570)
53	/(IN POSITION)	Position Error > In Position Range	
54	ERROR OVER	Position Error > Error Limit	
55	/(ERROR OVER)	Position Error <= Error Limit	
56	SEARCHING HOME	Drive is Searching Home Position	5.2.12 (DIx(128))
57	/(SEARCHING HOME)	Drive is Not Searching Home position	
70	(ENABLE) & (AI1>Pr.561)	Drive Enabled and AI1 Input Level > Pr.561	8.3.4
71	(ENABLE) & (AI1<Pr.561)	Drive Enabled and AI1 Input Level < Pr.561	
72	(ENABLE) & (AI2>Pr.562)	Drive Enabled and AI2 Input Level > Pr.562	
73	(ENABLE) & (AI2<Pr.562)	Drive is Enabled and AI2 Input Level < Pr.562	
74	(ENABLE) & (AI3>Pr.563)	Drive is Enabled and AI3 Input Level > Pr.563	
75	(ENABLE) & (AI3<Pr.563)	Drive is Enabled and AI3 Input Level < Pr.563	
78	OL WARNING	Over Load Level > 50%	8.3.4
79	/(OL WARNING)	Over Load Level < 50%	
80	AI1>Pr.561	AI1 Input Level > Pr.561	8.3.4
81	AI1<Pr.561	AI1 Input Level < Pr.561	
82	AI2>Pr.562	AI2 Input Level > Pr.562	
83	AI2<Pr.562	AI2 Input Level < Pr.562	
84	AI3>Pr.563	AI3 Input Level > Pr.563	
85	AI3<Pr.563	AI3 Input Level < Pr.563	

DOx	Function	Comment	Reference
86	ACCELERATING	Under Acceleration status for Speed mode	8.3.4
87	DECELERATING	Under Deceleration status for Speed mode	8.3.4
94	TMOA(2)	Timer(2) Output (OFF-Delay Type)	7.3.3 DIx(7)
95	TMOB(2)	Timer(2) Output (ON-Delay Type)	7.3.3 DIx(11)
96	TMOC(2)	Timer(2) Output (ON/OFF Type)	7.3.3 DIx(36)
97	/TMOA(2)	Complement of Timer(2) Output (OFF-Delay Type)	7.3.3 DIx(7)
98	/TMOB(2)	Complement of Timer(2) Output (ON-Delay Type)	7.3.3 DIx(11)
99	/TMOC(2)	Complement of Timer(2) Output (ON/OFF Type)	7.3.3 DIx(36)
123	ENCODER ZERO	Pass Through Encoder Zero Point	8.3.3
124	SERVO END	APTP Process is Completed	5.2.12 DIx(135)
125	/SERVO END	Complement Output of DOx(124)	
126	APTP BUSY	APTP is Processing	5.2.12 (DIx(118))
127	/APTP BUSY	Complement Output of DOx(126)	
128	HOME EXIST	Home Search is Completed	5.2.12 (DIx(128))
129	/HOME EXIST	Complement Output of DOx(128)	
130	TRAVEL LIMIT	Position Exceeds Limit in Both Direction	5.2.12 (Pr.565)
131	FWD TRAVEL LIMIT	Position Exceeds Forward Direction	
132	REV TRAVEL LIMIT	Position Exceeds Reverse Direction	
140	COUNT OVER	Counter Input Exceeds Counter Set Value	7.3.3 DIx(28)
141	/COUNT OVER	Complement Output of DOx(140)	

8.3 Description of Digital Output Function

8.3.1 Speed Monitor Function

DOx	Function	Description
2	SPE	Pr.049 (Detect RPM) defines the threshold level for Speed Detector module. Pr.050 (Detect Tolerance) defines the allowable tolerance for Speed Detector module. ● If abs(Output Speed – Pr.049) < Pr.050, DOx(2) will ON. ● DOx(3) is complement output of DOx(2). ● If Output Speed > Pr.049, DOx(8) will ON. ● DOx(9) is complement output of DOx(8). ● If (Set Speed - Output Speed) < Pr.050, DOx(10) will ON. ● DOx(11) is complement output of DOx(10). ● If Output Speed < Pr.050, DOx(15) will ON. ● DOx(16) is complement output of DOx(15). 
3	SPNE	
8	SPO	
9	SPNO	
10	SPA	
11	SPNA	
15	SPZ	
16	SPNZ	

8.3.2 ON/OFF Control Function

DOx	Function	Description
0	OFF	When Digital Output DOx assigned to ON function DOx(0), the output status of DOx will always OFF. When Digital Output DOx assigned to OFF function DOx(38), the output status of DOx will always ON. This function is useful to control these Digital Outputs for other peripheral, independent to the drive operation.
38	ON	

8.3.3 Pulse Output Function

DOx	Function	Description
39	DO1 CLOCK	Pr.077 (DO1 Pulse Output Ratio) defines DO1 Pulse Output ratio, it used for DO1 Clock frequency calculation. If Digital Output DOx assigned to DO1 CLOCK function DOx(39), it serves as CLOCK Generator. And Output Frequency = (Motor Speed (RPM)/60)*(POLE)/2)*(Pr.077) ● This function for DO1 only. ● Maximum output frequency is 1500Hz.
123	ENCODER ZERO	If Digital Output DOx assigned to ENCODER ZERO function DOx(123), when the motor rotates pass through Encoder Index, DOx(123) will be ON for 4ms, then change to OFF state automatically.

8.3.4 Running Status Monitor Function

<table>
<tr><th>DOx</th><th>Function</th><th>Description</th></tr>
<tr><td>1</td><td>/(ENABLE)</td><td rowspan="2">The output status of DOx(7) will be ON when the IGBT is triggered (drive is enabled), otherwise DOx(7) is OFF.
DOx(1) is complement output of DOx(7).</td></tr>
<tr><td>7</td><td>ENABLE</td></tr>
<tr><td>4</td><td>ALM</td><td rowspan="2">The output status of DOx(4) is normally OFF when the drive detects No Alarm. If Alarm occurs, the output DOx(4) will ON immediately.
DOx(5) is complement output of DOx(4).</td></tr>
<tr><td>5</td><td>NALM</td></tr>
<tr><td>70</td><td>(ENABLE) & (AI1>Pr.561)</td><td rowspan="15">If Digital Output DOx select DOx(70)~DOx(75) or DOx(80)~DOx(85), DOx are used to detect the input level of AIx respectively. If the comparison result is meet the condition of follows table, the output DOx will be ON, otherwise DOx is OFF.
<table>
<tr><th>DOx</th><th>Condition</th></tr>
<tr><td>70</td><td>AI1 > Pr.561 and drive is enabled</td></tr>
<tr><td>71</td><td>AI1 < Pr.561 and drive is enabled</td></tr>
<tr><td>72</td><td>AI2 > Pr.562 and drive is enabled</td></tr>
<tr><td>73</td><td>AI2 < Pr.562 and drive is enabled</td></tr>
<tr><td>74</td><td>AI3 > Pr.563 and drive is enabled</td></tr>
<tr><td>75</td><td>AI3 < Pr.563 and drive is enabled</td></tr>
<tr><td>80</td><td>AI1 > Pr.561</td></tr>
<tr><td>81</td><td>AI1 < Pr.561</td></tr>
<tr><td>82</td><td>AI2 > Pr.562</td></tr>
<tr><td>83</td><td>AI2 < Pr.562</td></tr>
<tr><td>84</td><td>AI3 > Pr.563</td></tr>
<tr><td>85</td><td>AI3 < Pr.563</td></tr>
</table>

AI1 input level can be monitored by Pr.201.
AI2 input level can be monitored by Pr.202.
AI3 input level can be monitored by Pr.203.
Under this application, the value of Pr.561~Pr.563 should set in the range of 0~1023.
</td></tr>
<tr><td>71</td><td>(ENABLE) & (AI1<Pr.561)</td></tr>
<tr><td>72</td><td>(ENABLE) & (AI2>Pr.562)</td></tr>
<tr><td>73</td><td>(ENABLE) & (AI2<Pr.562)</td></tr>
<tr><td>74</td><td>(ENABLE) & (AI3>Pr.563)</td></tr>
<tr><td>75</td><td>(ENABLE) & (AI3<Pr.563)</td></tr>
<tr><td>80</td><td>AI1 > Pr.561</td></tr>
<tr><td>81</td><td>AI1 < Pr.561</td></tr>
<tr><td>82</td><td>AI2 > Pr.562</td></tr>
<tr><td>83</td><td>AI2 < Pr.562</td></tr>
<tr><td>84</td><td>AI3 > Pr.563</td></tr>
<tr><td>85</td><td>AI3 < Pr.563</td></tr>
<tr><td>78</td><td>OL WARNING</td><td rowspan="2">When Pr.054 =11, the OL level can be monitored by Pr.061.
When DOx assigned to OL Warning function DOx(39), if OL level > 0%, then DOx(78) will ON.
DOx(79) is complement output of DOx(78).</td></tr>
<tr><td>79</td><td>/(OL WARNING)</td></tr>
<tr><td>86</td><td>ACCELERATING</td><td>When DOx assigned to ACCELERATING function DOx(86), if drive is increasing its output speed, then DOx(86) will ON.</td></tr>
<tr><td>87</td><td>DECELERATING</td><td>When DOx assigned to DECELERATING function DOx(87), if drive is decreasing its output speed, then DOx(87) will ON.</td></tr>
</table>

9. RS485 Communication

9.1 RS485 Communication Port Related Parameters

The following parameters must pre-assigned before use RS485 communication function.

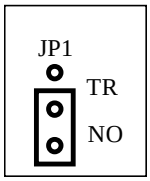
<table>
<tr><th>Pr.nnn</th><th>Parameter Name</th><th>Description</th></tr>
<tr><td>120</td><td>Protocol Select</td><td>
<table>
<tr><th>Pr.120</th><th>Protocol</th></tr>
<tr><td>0</td><td>JPS Protocol</td></tr>
<tr><td>1</td><td>Modbus(RTU)</td></tr>
<tr><td>2</td><td>Profibus-DP</td></tr>
<tr><td>x</td><td>Reserve</td></tr>
</table>
</td></tr>
<tr><td>121</td><td>Baud Rate</td><td>
<table>
<tr><th>Pr.121</th><th>Baud Rate</th></tr>
<tr><td>0</td><td>4800</td></tr>
<tr><td>1</td><td>9600</td></tr>
<tr><td>2</td><td>19200</td></tr>
<tr><td>3</td><td>38400</td></tr>
</table>
</td></tr>
<tr><td>122</td><td>Stop Bit</td><td>
<table>
<tr><th>Pr.122</th><th>Stop Bit</th></tr>
<tr><td>0</td><td>1</td></tr>
<tr><td>1</td><td>2</td></tr>
</table>
</td></tr>
<tr><td>123</td><td>ID</td><td>This parameter is used to assign the Communication Address while this drive controlled RS485 communication port. Computer may control any drive by select its corresponding ID.</td></tr>
<tr><td>124</td><td>Queue Status</td><td>Monitors the number of data is queue up to write into EAROM memory.</td></tr>
<tr><td>125</td><td>Parity</td><td>
<table>
<tr><th>Pr.125</th><th>Parity</th></tr>
<tr><td>0</td><td>Even</td></tr>
<tr><td>1</td><td>Odd</td></tr>
<tr><td>2</td><td>None</td></tr>
</table>
</td></tr>
</table>

9.2 RS485 Port Configuration

The drive has a build in RS485 communication port on CON1 of Feedback I/O board, the definition of the connector pins are:

CON1 (JAM-SC25-05WS)

Pin Number	Pin Definition
PIN1	+5V
PIN2	0V
PIN3	A(SIG+)
PIN4	B(SIG-)
PIN5	N.C.



JP1 jumper of Feedback I/O board is used to select With/Without Terminal Resistor.

- JP1 on TR position, select with Terminal Resistor.
- JP1 on NO position, select without Terminal Resistor.

- RS485 Port can use to control multiple drives by connect the signal pin in parallel.
- The option of standard cable (CABLE_RS485) is used to transform JAM connector (CON1) into standard 9 pin D-sub Male connector. The definition of the D-sub connector is:

9pin D-sub Male Connector	Definition	JAM Connector (CON1)
PIN1	N.C.	
PIN2	N.C.	
PIN3	N.C.	
PIN4	A(SIG+)	PIN3
PIN5	B(SIG-)	PIN4
PIN6	0V	PIN2
PIN7	N.C.	
PIN8	N.C.	
PIN9	N.C.	

9.3 JPS Protocol & Format

All code transfer between Computer and Drive are ASCII code, and the “CR” code (0x0D) must add to the end of each command string.

9.3.1 Computer to Drive

Computer may send three types of message to drive.

9.3.1.1 Control Command (No response will send back from drive)

Format: “**C,uu,cc,fffff**”

C : Head of COMMAND String.

uu : ID of drive, from 00 to 99.
If the “uu” code in command string is “00”, all drives can be controlled at the same time.

cc : Control command code, from 00 to 15.
The “cc” number is actually converted from four bits binary data.
cc= 8 * Bit-3(JOG) + 4 * Bit-2(Reverse) + 2 * Bit-1(RUN) + Bit-0(Reset)

Control Code	Function
cc=00	Stop
cc=01	Reset
cc=02	Forward Run
cc=06	Reverse Run
cc=10	Forward JOG Run
cc=14	Reverse JOG Run

fffff : Set speed, from 00000 to 08000.

9.3.1.2 Write Command (No response will send back from drive)

format: “**W,uu,nnn,ddddd**”

W : Head of WRITE String.

uu : ID of drive, from 00 to 99.
If the “uu” code in command string is “00”, all drives can be controlled at the same time.

nnn : Parameter number, from 000 to 999.

ddddd : data value, from 00000 to 65535.
If data exceed upper or lower limit (shown in parameter table) will be trimmed within boundary automatically.

9.3.1.3 Read Command (Drive will send back P-string after receive this string)

Format: “**R,uu,nnn**”

R : Head of READ String

uu : ID of drive, from 01 to 99.
Do not specify uu=00 for Read Command while multiple drives are under control.

nnn : Parameter number, from 000 to 999.

9.3.2 Drive to Computer

Drive will send back Parameter data and its Status after receive Read Command from computer.

Format: "**P,uu,nnn,tt,ddddd,s,aaaa**"

P : P stands for PARAMETER String

uu : ID of drive, from 00 to 99.
This number is defined in Pr.093 of each drive.

nnn : Parameter number, from 000 to 999.

tt : Data type of this parameter, from 00 to 22.

tt	Data Type	Data Range	Format
0	Read/Write, store in EAROM	00000~65535	999.99
1	Read/Write, store in EAROM	00000~65535	9999.9
2	Read/Write, store in EAROM	00000~65535	99999
3	Read/Write, store in EAROM	00000~00255	999.99
4	Read/Write, store in EAROM	00000~00255	9999.9
5	Read/Write, store in EAROM	00000~00255	99999
6	Read/Write, store in EAROM	00000~00001	99999
7	Read/Write, store in RAM	00000~65535	99999
8	Read only, store in RAM	00000~65535	999.99, if data >32767 which is -(65536-ddddd)
9	Read only, store in RAM	00000~65535	999.99
10	Read only, store in RAM	00000~65535	9999.9
11	Read only, store in RAM	00000~65535	99999
12	Read only, store in RAM	00000~00255	999.99
13	Read only, store in RAM	00000~00255	9999.9
14	Read only, store in RAM	00000~00255	99999
15	Read only, store in RAM	00000~00001	99999
16	Read only, store in RAM	00000~00015	99999, (Binary)
17	Read only, store in RAM	00000~00007	99999, (Binary)
18	Read only, store in RAM	00000~00003	99999, (Binary)
19	Read only, store in RAM	00000~01023	99999
20	Read only, store in RAM	00000~00001	99999, (Hex)
22	Read only, store in RAM	00000~00001	99999, (Hex)

ddddd : Data value, from 00000 to 65535.

s : Drive output status, from 0 to 9.
s = 1 : Drive Reverse Running
s = 2 : Drive Forward Running.
s = 3 : Drive Stop
else, undefined.

aaaa : Alarm history, from 0000 to 9999
The drive can record 4 Alarm messages.
Most significant digit stands for oldest Alarm message.
Least significant digit stands for present Alarm message.
Refer to section 5.2.8 (Pr.013) for Alarm code.

9.4 HMI Protocol (Modbus(RTU))

The option of Modbus(RTU) interface let drive simulate as Modicon PLC and can connect with HMI directly. Up to 8 drives can be controlled by one HMI for direct control and monitor.

9.4.1 Parameter Setting

9.4.1.1 HMI Setting

In fact, the drive simulate as Modicon PLC when connect with HMI, so communication protocol is similar to standard Modus(RTU).

- Select Modbus(RTU)
- HMI serves as Master, address select “0”
- Drive serves as Slave, address select “1”.
- Data Bit select 8 bit data.
- Select Baud, Stop Bit and Parity。(必選 8bit data)

9.4.1.2 Drive Setting

- Pr.120 = 1, select Modbus(RTU).
- Pr.121 = 0/1/2, select Baud Rate. 0 : 4800, 1 : 9600, 2 : 19200
- Pr.122 = 0/1, select Stop Bit. 0 : 1 stop bit, 1 : 2 stop bits
- Pr.123 = ID, ID selection as:
  Drive 1, select ID=01
  Drive 2, select ID=11
  Drive 3, select ID=21
  ⋮
  Drive 8, select ID=71
- Pr.125 = 0/1/2., select Parity. 0 : Even 1 : Odd, 2 : No Parity

NOTE: These parameters only effect after RESET.

9.4.2 Definition of Modbus(RTU) and Drive

When HMI communicate with Slave of Modbus(RTU), the address definition is:

- 0x 1 ~ 0x 10000, Bit for Read/Write
- 1x 1 ~ 1x 10000, Bit for Read only
- 3x 1 ~ 3x 10000, Word for Read only
- 4x 1 ~ 4x 10000, Word for Read/Write
- 4L 1 ~ 4L 10000, Long Word for Read/Write

9.4.2.1 Corresponding Table of Read/Write Bit

HMI Address	Digital Input	Description
0x 1	DI 0	● If HMI input Bit **(**0x 1 ~ 0x 11) = 1, means the corresponding DIx is ON. ● If HMI input Bit **(**0x 1 ~ 0x 11) = 0, means the corresponding DIx is OFF.
0x 2	DI 1	
0x 3	DI 2	
0x 4	DI 3	
0x 5	DI 4	
0x 6	DI 5	
0x 7	DI 6	
0x 8	DI 7	
0x 9	DI 8	
0x 10	DI 9	
0x 11	DI 10	
0x 12 ~ 0x 15	Reserve	
0x 16	RESET	0x 16 =1, drive execute RESET.

9.4.2.2 Corresponding Table of Read Only Bit

HMI Address	Status	Description
1x 1	DI 0	● If the reading of HMI Bit = 1, means the input states of corresponding DIx is ON. ● If the reading of HMI Bit = 0, means the input states of corresponding DIx is OFF.
1x 2	DI 1	
1x 3	DI 2	
1x 4	DI 3	
1x 5	DI 4	
1x 6	DI 5	
1x 7	DI 6	
1x 8	DI 7	
1x 9	DI 8	
1x 10	DI 9	
1x 11	DI 10	
1x 12 ~ 1x 16	Reserve	
1x 17	DO 0	● If the reading of HMI Bit = 1, means the Output states of corresponding DOx is ON. ● If the reading of HMI Bit = 0, means the Output states of corresponding DOx is OFF.
1x 18	DO 1	
1x 19	DO 2	
1x 20	DO 3	
1x 21	DO 4	
1x 22	DO 5	
1x 23	DO 6	
1x 24 ~ 1x 31	Reserve	
1x 32	Status	● 1x 32 =0, Drive is normal ● 1x 32 =1, Drive under Alarm

9.4.2.3 Corresponding Table of Read Only Word

HMI Address	Parameter number
3x1	Pr.000
3x 2	Pr.001
3x 3	Pr.002
⋮	⋮
3x998	Pr.997
3x999	Pr.998
3x1000	Pr.999

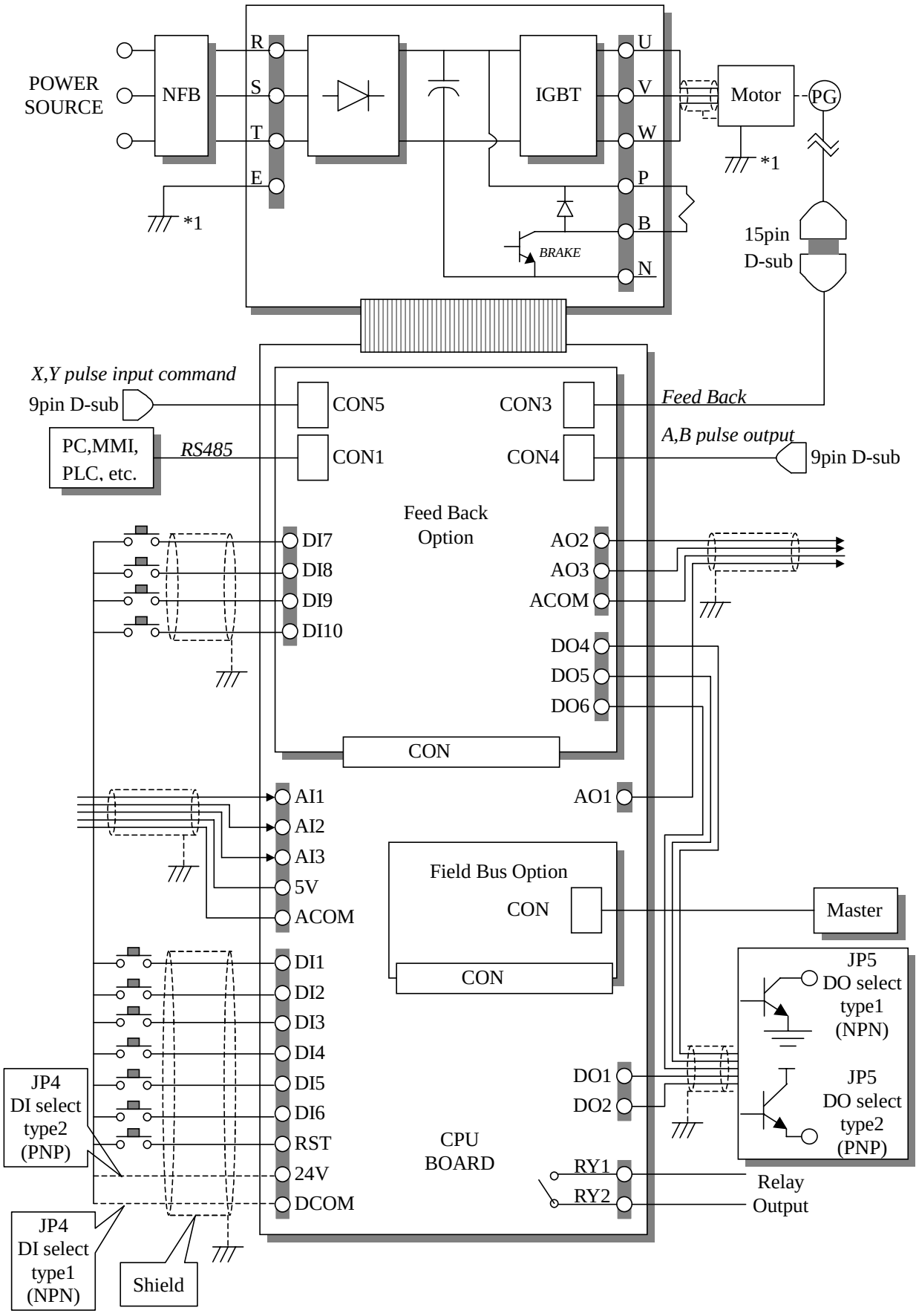
9.4.2.4 Corresponding Table of Read/Write Word

HMI Address	Parameter number
4x1	Pr.000
4x 2	Pr.001
4x 3	Pr.002
⋮	⋮
4x998	Pr.997
4x999	Pr.998
4x1000	Pr.999

9.4.2.5 Corresponding Table of Read/Write Long Word

HMI Address	Parameter number
4L1	Pr.001(H)/Pr.000(L)
4L 2	Pr.002(H)/Pr.001(L)
4L 3	Pr.003(H)/Pr.002(L)
⋮	⋮
4L998	Pr.998(H)/Pr.997(L)
4L999	Pr.999(H)/Pr.998(L)
4L1000	Not Allow

10. Block Diagram of PDS Drive



*1 Drive and Motor must connect Earth properly and separately.

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