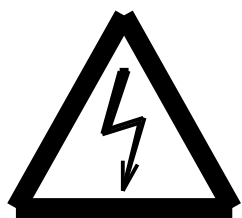




PD - Series  
IGBT INVERTER  
INSTRUCTION MANUAL



WARNING !



Attention to these warning signs on the inverter or in this instruction book.

They indicate **danger to human body or damage to the inverter.**

Before installing and putting the inverter 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 inverter. 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 inverter. It may be too late if you start working with the inverter before read this instruction manual.

Never permit unqualified personnel to operate the inverter.

## WARNING

This inverter 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 complied with.

Only personnel with appropriate qualifications should work with this inverter. 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 inverter.

The successful and safe use of this inverter depends on the correct installation, commissioning, operation and maintenance of the inverter.

\*\* The PD inverter operates at high voltages.

\*\* The DC-link capacitor remain charged to dangerous voltages even the power is removed. For this reason it is not permissible to open the inverter cover until ten minutes after the power has been turned off. When handling the open inverter it should be noted that live parts are exposed. Do not touch these live parts.

\*\* The following terminals can carry dangerous voltages even if the motor is inoperative:

The power supply terminal L1,L2/N (or R,S,T)

The motor terminal U,V,W

The DC-link terminal P,N

The brake resistor terminal Br+,Br-

\*\* 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 inverter to start up automatically after an input power failure.

## 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 inverter and with hazards involved. In addition, the person must be:

- (1) Trained and authorised to energize, de-energize, clear, ground and tag circuits and equipment in accordance with established safety practices.
- (2) Trained in the proper care and use of protective equipment in accordance with established safety practices.
- (3) 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.**

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# 1. Description of PD Series inverter

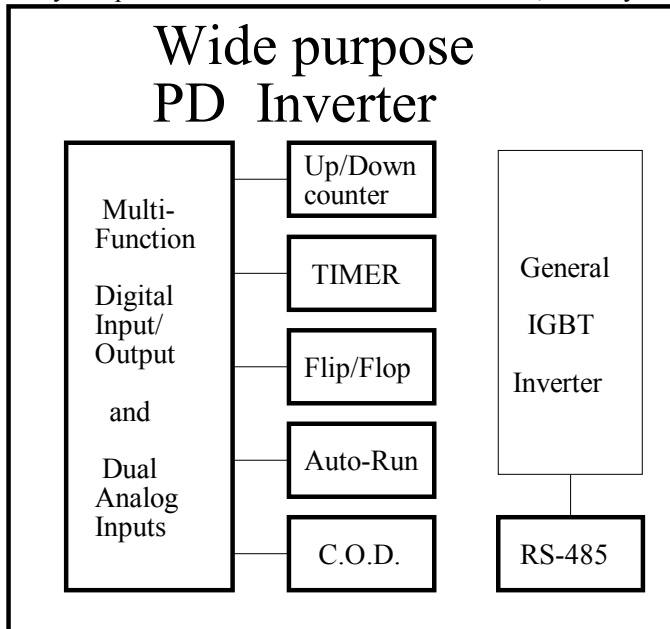
## 1.1 General description and Design philosophy

The PD Series inverter is a POWER CONVERTER for variable-speed AC drives.

It applies the Pulse Width Modulation method to control the output voltage and frequency to the motor. The design of hardware and firmware are based on advanced microprocessor technology.

Power Device "IGBT" is used to increase switching carrier frequency for eliminating the motor operation noise.

Many unique functions built in this Inverter series, are very useful to customers for all kinds of application.



Built-in standard **UP/DOWN Counter** Module, **Timer/Counter** Module and **Flip/Flop** Module which are very often used in actual application system.

Output current waveform is trimmed to run the motor smoothly even if under low running frequency.

Special **C.O.D.(Current Over Detector)** Module can monitor output current and generate warning signal for sophisticate control.

Four digital inputs and three digital outputs are all programmable to meet all kinds of applications.

Two analog inputs **AI1 & AI2** are provided for voltage, current control. Moreover, the two inputs can serve as **AI1\*AI2** or **AI2+AI1** or other combinations out of your imagination.

**RS485 serial communication** port is built in to the inverter as standard. It is very useful when inverter or many inverters would like to be dynamical controlled by master computer. With repeater one serial port can address up to 99 inverters.

(Standard RS485 driver can drive up to 31 inverters

only.)

Two types of panel **LOCAL** and **REMOTE** are designed for PD Series. Refer to **Section 3** for detail description.

The PD Series inverter is composed by three major parts : **PANEL , CONTROL BOARD & POWER CONVERSION UNIT.**

## 1.2 Hardware input & output configuration

The terminal of the control board is:

CHB	PG+	AI1	ACOM	AI2	DI1	DI2	REV	24V	DO1	DO2
-----	-----	-----	------	-----	-----	-----	-----	-----	-----	-----

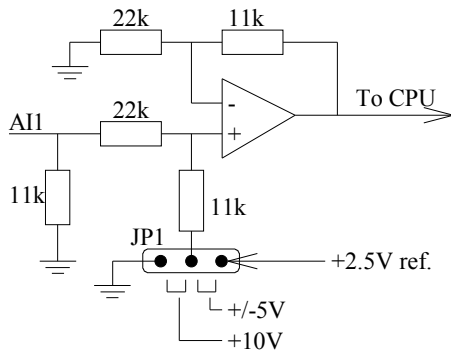
CHA	PG-	AM	5V	DI3	DI4	RST	RUN	DCOM	RY1	RY2
-----	-----	----	----	-----	-----	-----	-----	------	-----	-----

Note: Four terminals "PG+", "PG-", "CHA" and "CHB" are not used in standard PD Series, they are reserved for **PDF/PDV Series** for accurate speed feed back.

## 1.2.1 Analog input blocks (Refer to Sec. 7)

**AI1** and **AI2** are analog input terminals. **AM** terminal is used for analog signal output. **ACOM** is the common terminal for analog circuit. The **5V** terminal supply analog +5 volt. Inside the control board, there are two jumpers **JP1** and **JP2**.

### 1.2.1.a Analog input AI1 module

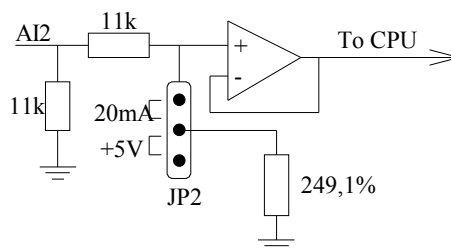


**JP1** is used to define the characteristic of the input terminals **AI1**.

If you are using external analog voltage 0 ~ +10V input, please use **AI1** and select **JP1** to **+10V** position.

If you are using external analog voltage -5V ~ +5V input, please use **AI1** and select **JP1** to **+/-5V** position.

### 1.2.1.b Analog input AI2 module

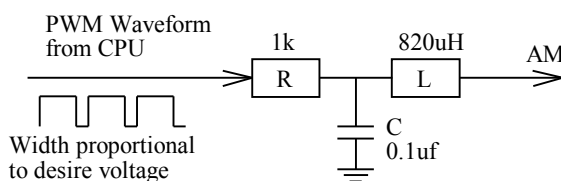


**JP2** is used to define the characteristic of the input terminal **AI2**.

If you are using 0 ~ +5V input (external or internal voltage reference), please use **AI2** and select **JP2** to **+5V** position.

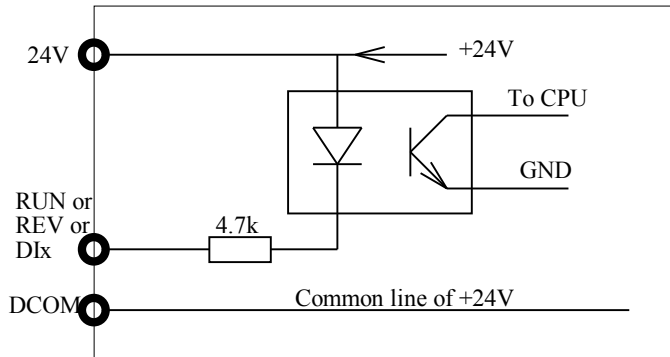
If you are using external 20mA current input, please select **AI2** and select **JP2** to **20mA** position.

## 1.2.2 AM the Analog output module (Refer to Sec.10)



The output voltage of AM terminal comes from CPU in PWM waveform. Its duty cycle is proportional to the desired analog amplitude. And the signal is filtered by internal resistor R and capacitor C.

## 1.2.3 Digital input modules ( DI1 ~ DI4 ) and Control Command inputs ( RUN & REV )



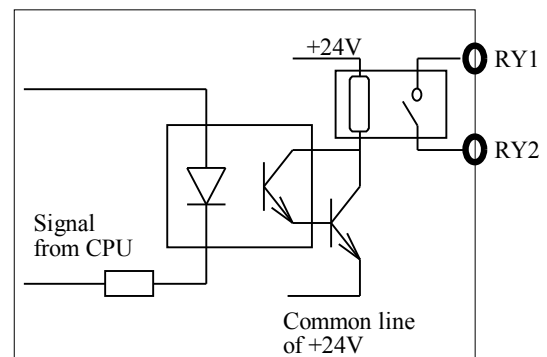
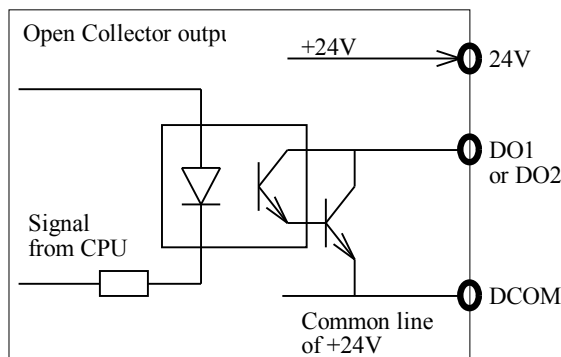
**DI1, DI2, DI3 and DI4** are identical four programmable digital input terminals. **DCOM** is the common point for the digital circuits. User should use dry contact or Open collector output between DIx and DCOM to drive these digital inputs. **RUN** and **REV** inputs have same structure as DIx.

## 1.2.4 Digital output terminals (Refer to Sec. 9)

There are three digital output signals available to the user. Two of them are designed as **open collector** output, another is voltage isolated "1a" contact of relay output.

**Open collector outputs** are named as **DO1** and **DO2**, **DCOM** is the common point.

The relay output is terminals **RY1, RY2** (Note RY1, RY2 should drive 24V relay only.)



## 1.2.5 Hardware RESET terminal ( RST )

The input hardware structure is similar to DIx.

Terminal **RST** is used for reset the inverter. Under any circumstances, **RST** and **DCOM** shorted together will force the inverter execute **RESET**, as if **Power On** again.



## **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 inverter is at least 100mm.

Make sure that a space of 40mm is kept free at the sides of the inverter to permit the cooling air to escape from the side slits.

Ensure that the temperature does not exceed the specified level when the inverter is installed in cubicle.

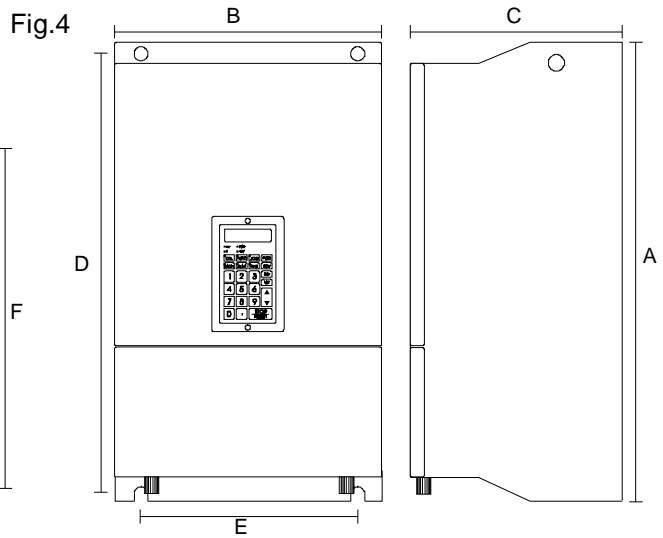
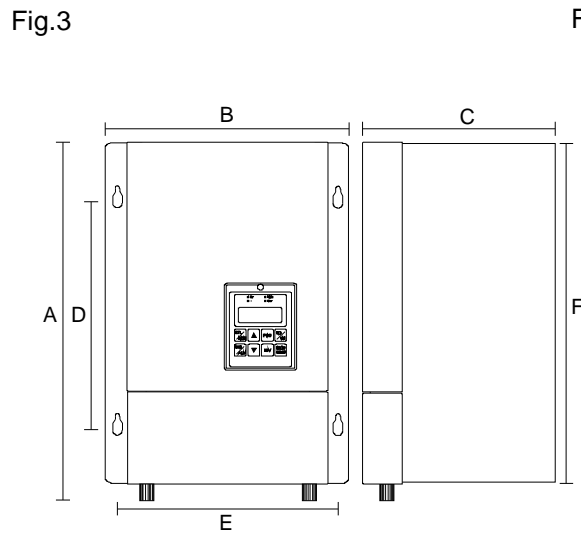
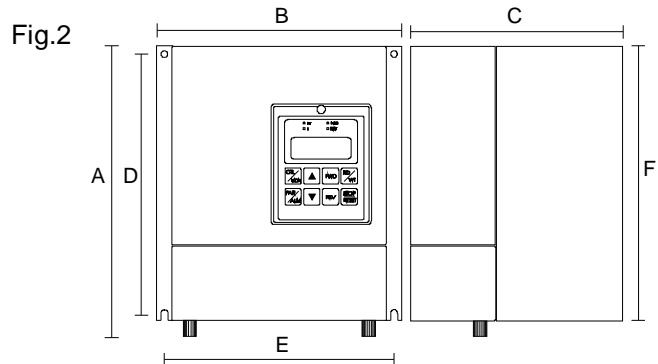
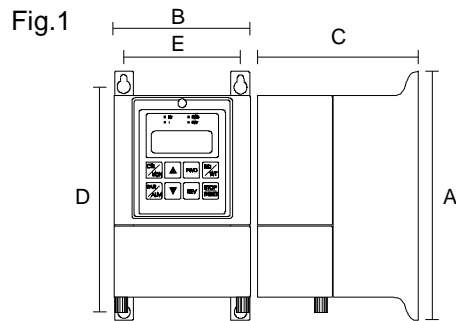
Avoid excessive vibration and shaking of the equipment.

### **NOTE**

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

## 2.1 Outline Dimensions

### Outline Drawing



### Dimension Table

Model	Drawing	A	B	C	D	E	F	Mounting Screw
2007	Fig.1	204	113.5	156.8	182	98.3	-	M4
2007N	Fig.2	227	176.6	120.5	195	164.6	215	M4
2015N	Fig.2	227	176.4	140.5	195	164.4	215	M4
2022 2037 4007 4015 4022 4037	Fig.2	270	214	179	236	202	258	M4
2055 2075 4055 4075	Fig.3	385	240	218.2	270	223	373	M5
2110 2150 4110 4150	Fig.4	584	295	201.2	555.4	240	-	M8
2225 2300 4225 4300	Fig.4	729	313	234	691	249	-	M8

## 2.2 Power Terminal

The lower cover must be removed to connect the electrical leads.

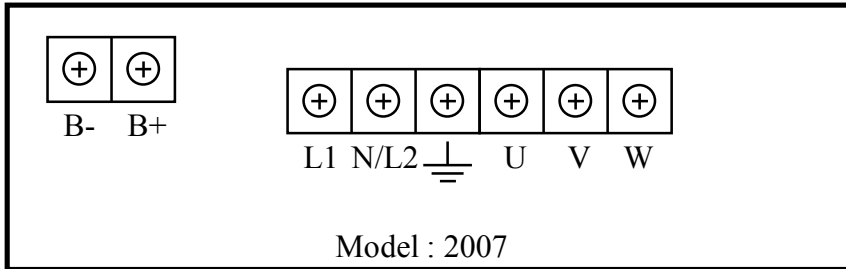
Basically, the Power terminals are divided into three portions:

- The Power line input, (R,S,T or L1,L2) receives power for the operation of the inverter.
- The Motor line output, (U,V,W) delivers Variable Frequency output to motor leads.
- the DC bus (P,N)or Discharge transistor output BR terminals.

**⚠ WARNING: Never connect power line to U,V,W.**

For different models, the power terminals may have different configurations as below:

**Type 1:**

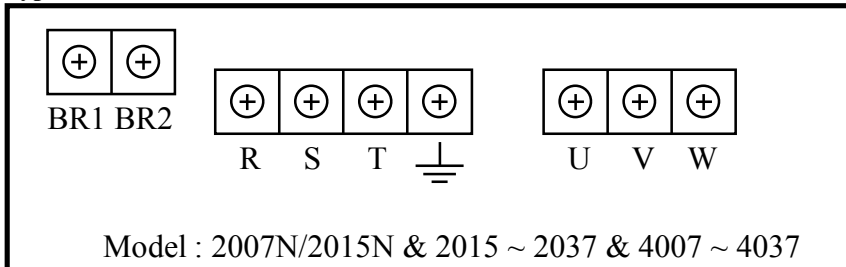


\* L1, L2 are used for 220VAC single phase power line input.

\* U,V,W are for Motor.

\* B+, B- connect to brake resistor.

**Type 2:**



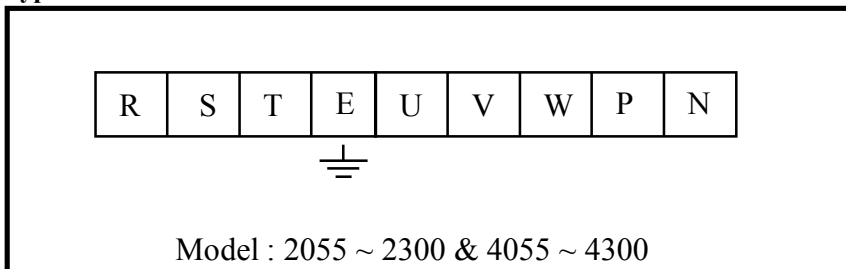
\* For 2xxx Series , R,S,T are 220VAC three phase power line input.

\* For 4xxx Series, user must specify exact power line input voltage. Either 380 or 440VAC.

\* BR1, BR2 connect to brake resistor.

\* Must connect to R & T for only single phase input.

**Type 3:**



\* For 2xxx Series , R,S,T are 220VAC three phase power line input.

\* For 4xxx Series, user must specify exact power line input voltage. Either 380 or 440VAC.

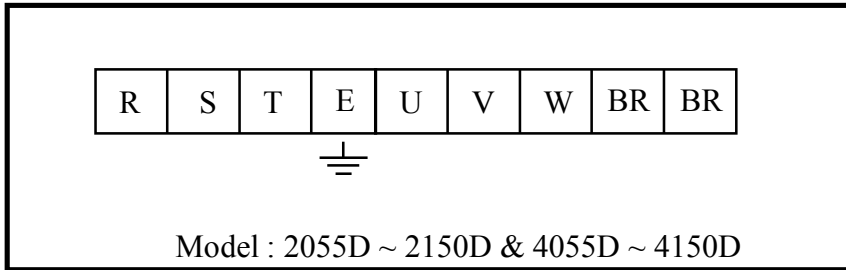
\* U,V,W connect to Motor.

\* P, N terminals direct connect to internal condensor.

User can connect a **STANDARD BRAKE MODULE** through P, N terminals.

\* Must connect to R & T for only single phase input.

#### Type 4:



- \* For 2xxx Series , R,S,T are 220VAC three phase power line input.
- \* For 4xxx Series, user must specify exact power line input voltage. Either 380 or 440VAC.
- \* U,V,W connect to Motor.
- \* BR terminals can connect to BRAKE RESISTOR
- \* Must connect to R & T for only single phase input.

## 2.3 Connect Power line input to Inverter



### WARNING and CAUTION

Between the power line and the inverter, add NFB for system protection.

In PD series, the power input terminal is (L1, L2/N) or (R,S,T).


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 inverter.

## 2.4 Connect inverter output to Motor



### WARNING :

Do not insert contactors between inverter 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 DC Bus or Brake Discharge terminal



### CAUTION:

Some smaller power rating models, the discharge transistor is built in as standard. For these models, the **BR** terminals are assigned for connecting to the external resistor.

For models without built in discharge transistor, two terminal points **P** and **N** is reserved for customer to use **Brake Discharge Unit**.

For models that have **BR** terminal, the recommended resistor is shown in the list.

However, in case the inertia is large or discharge duty cycle is high, user may increase the Wattage of the resistor.

Model	Resistor(OHM)	Watt
PD-2007	200	80
PD-2015	100	150
PD-2022	60	250
PD-2037	40	300
PD-2055-D	30	500
PD-2075-D	20	600
PD-2110-D	15	1000
PD-2150-D	10	1500
-	-	-
PD-4007	750	80
PD-4015	400	150
PD-4022	250	250
PD-4037	150	300
PD-4055-D	100	500
PD-4075-D	75	700
PD-4110-D	50	1000
PD-4150-D	40	1500
Discharge rate duty 10%.		



## **WARNING: Do not connect resistor to the P,N terminals directly.**

For models with P, N terminal only, means no discharge transistor is inside the inverter.

If discharge function is necessary customer must use separate **Brake Discharge UNIT**.

Terminal **P** is connected to the positive point of internal **DC- bus**, and **N** is connected to the negative point.

## **2.6 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/trunking.

## 3. CONTROL PANEL

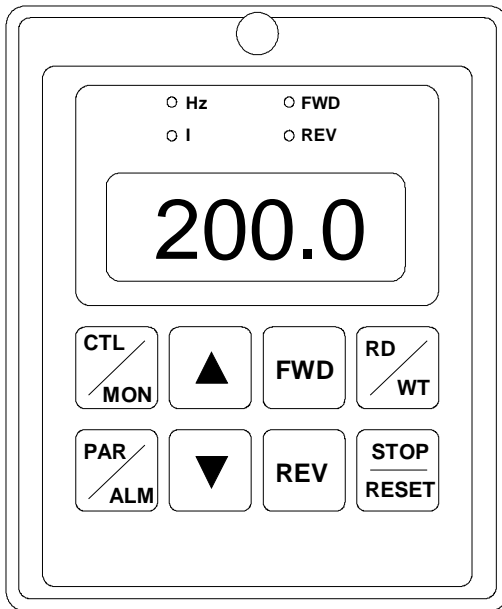
This inverter supports two types of control panel. One is called **Local Panel**, the other is **Remote Panel**. User may use both Panels one the same inverter at the same time.

Note: While both panels are used, the **Local panel** can only operate under **MON**itor mode

**Local panel** can mount on the upper cover directly and connect to the control board through an IDC-40 pins flat cable.

**Remote panel** is connected to the inverter through a 5-pin connector using RS485 serial communication signal lines.

### 3.1 LOCAL PANEL



On LOCAL Panel there are four digit 7-segment data display and four indication led's and eight membrane keys. Four possible operation modes: "CTL", "MON", "PAR" and "ALM" are described follows :

#### 3.1.1 CTL mode

Push the "CTL/MON" key, will toggle between "CTL" or "MON" Mode.

If both "HZ" and "I" Led are blank, it is under "CTL" Mode.

Under "CTL" Mode, user can control the inverter running in either direction and may modify the desired running speed.

The key's functions are:

**FWD** key is used for running the inverter in forward direction.

**REV** key is used for running the inverter in reverse direction.

**STOP** key is used to stop the inverter.

**RD/WT** key has two functions: READ from or WRITE to Pr.00.

▲ key is used to increase the set frequency or the data read from Pr.00.

▼ key is used to decrease the set frequency or the data read from Pr.00.

#### 3.1.2 MON mode

Push the "CTL/MON" key, will toggle the inverter between "CTL" and "MON" Mode.

Under "MON" Mode, user can control the inverter running in either direction and may monitor any two internal status easily.(Refer to Sec.13)

If "HZ" Led is on, it is under "MON" Mode and 7-segment shows the "HZ" data.(Or the desired parameter assigned by Pr.99)

If "I" Led is on, it is under "MON"Mode and 7-segment shows the "I" data.(Or the desired parameter assigned by Pr.98)

**FWD** key is used for running the inverter in forward direction.

**REV** key is used for running the inverter in reverse direction.

**STOP** key is used to STOP the inverter.

▲ 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.

#### 3.1.3 PAR mode

Push the "PAR/ALM" key, will toggle between "PAR" or "ALM" mode.

If push PAR/ALM key, 7-segment shows "Pr.xx", it is under "PAR" Mode.

If push PAR/ALM key, 7-segment shows "0.-xx", it is under "ALM" Mode.

Under "PAR" Mode, user can modify or monitor all the internal PARAMETERS.

To modify a parameter, follow the steps described below:

STEP 1: push "PAR/ALM" key, the 7-segment will show "Pr.nn". (nn is parameter number)

STEP 2: push ▲ or ▼ key to select desired parameter number.

STEP 3: push "RD/WT" key to READ the content of the specified parameter.

The 7-segment now shows the value of the parameter.

STEP 4: push ▲ or ▼ key to modify the displayed value.

STEP 5: push "RD/WT" key to WRITE the value into EAROM memory.

STEP 6: push "PAR/ALM" repeat STEP 1.

### 3.1.4 ALM mode

Push the "PAR/ALM" key, will toggle the inverter between "PAR" or "ALM" mode.

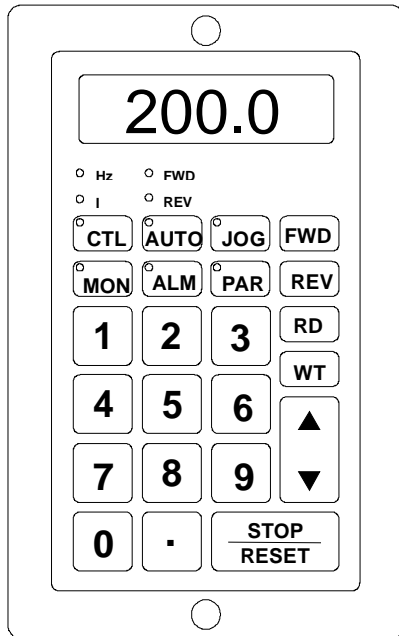
If push PAR/ALM key, 7-segment shows "0.-xx", it is under "ALM" Mode.

Under "ALM" Mode, the user can execute RESET function or monitor ALARM STATUS.

STOP/RESET key, the inverter will execute RESET function.

▲ and ▼ key are used to check ALARM History.

## 3.2 REMOTE PANEL



On REMOTE Panel there are four digit 7-segment data display, ten indication LED's and twenty-four membrane keys.

It will operate under five possible modes: "CTL", "MON", "PAR", "JOG", and "ALM" modes.

**Note :** The "AUTO" key on REMOTE PANEL has no effect in PD-Series.

### 3.2.1 CTL mode

Push "CTL" key, the Remote Panel enters CONTROL mode immediately.

Under "CTL" Mode, user can control the inverter running in either direction and may modify the desired running speed.

**Example:** If Pr.40=8, Just push "6", "0" & "FWD" will cause the inverter run at 60Hz.

If Pr.40=0, and Pr.00=50.00, Just push "FWD" will cause the inverter run at 50Hz.

The key's functions are:

**FWD** key is used for running the inverter in forward direction.

**REV** key is used for running the inverter in reverse direction.

**STOP** key is used to stop the inverter.

**RD** key is used to READ the preset speed stored in Pr.00.

**WT** key is used to WRITE new desired speed into Pr.00.

Number & Decimal keys are used for modify the desired speed.

### 3.2.2 MON mode

Push "MON" key, the Remote Panel enters MONITOR mode immediately.

Under "MON" Mode, user can control the inverter running in either direction and may monitor any two internal status easily. (Refer to Sec. 13)

If "HZ" Led is on, 7-segment shows the "HZ" data (**Or the desired parameter assigned by Pr.99**)

If "I" Led is on, 7-segment shows the "I" data (**Or the desired parameter assigned by Pr.98**)

**FWD** key is used for running the inverter in forward direction.

**REV** key is used for running the inverter in reverse direction.

**STOP** key is used to stop the inverter.

▲ & ▼ keys are used to select "HZ" or "I" data shown on the 7-segment display.

### 3.2.3 PAR mode

Push the "PAR" key, the Remote Panel enters PARAMETER mode immediately.

Under "PAR" Mode, user can modify or monitor all the internal PARAMETERS.

To modify a parameter, follow the steps described below:

**STEP 1:** Select Parameter & READ.

For example, to read Pr.19, operate as follows:

push "PAR", push "1", push "9", push "RD".

Then the content of Pr.19 will show on the 7-Segment display.

**STEP 2:** Modify parameter & WRITE.

Follow the example to write the value 15 into Pr.19.

Select Pr.19 as explained in STEP 1.

Push "1", push "5", push "WT".

Then the Pr.19 contains the value 15.

### **3.2.4 JOG mode**

**Push the "JOG" key, the Remote Panel enters JOG mode immediately.**

**FWD**key is used to run the inverter in forward direction.

**REV** key is used to run the inverter in reverse direction.

**If the FWD , REV key released, the inverter STOP.**

### **3.2.5 ALM mode**

**Push the "ALM" key, the Remote Panel enters ALARM mode immediately.**

**STOP/RESET** key is used to execute software RESET function.

**▲ & ▼** keys are used to check ALARM History .



## **4. SYSTEM START-UP**

Many operation methods were designed into the PD Series inverter. Here in this section, teaching you how to start running the inverter by simplest operation method.

### **4.1 Reset & Initialize the inverter**

If the inverter is new, and you are not sure of the parameter value in the inverter, please execute **Memory Initialization**. The initialization sequence is first set **Pr.94=1**(refer to section 3 and 5.3) , then change to **ALM** mode until display show **0. xx**. Then push **STOP/RESET** key to start execute **software reset** and **memory initialization**. Or, connect **RST** terminal to **DGND**, then Inverter will execute hardware RESET immediately. After memory initialized, all parameters will be preload according to default values listed in Section 5.

### **4.2 Simple Start-up & Run by key-pad**

- a. Set Pr.00=60.00Hz
- b. Set Pr.39=0
- c. Set Pr.40=0
- d. Execute Reset

Just push **FWD** or **REV** key on the key-pad, the motor will run at frequency 60.00Hz which is assigned by Pr.00.

### **4.3 Monitor the inverter running status**

**Enter MONITOR mode using LOCAL Panel:**

Select **MON** mode by push **CTL/MON** key. Continuous pushing the CTL/MON will change the mode between **CTL** and **MON** mode. It is easy to distinguish that when **any of Hz or I** lamp is ON, the inverter is under **MON** mode.

**Enter MONITOR mode using REMOTE Panel:**

Just push "MON" key the led on the "MON"key will light up.

Under **MON** mode, two parameter values can be easily selected and monitored.

Parameter **Pr.99** and **Pr.98** are used to select the most important parameters for monitoring.

In general, for example, we like to monitor the output frequency (stored in Pr.57) and the output current (stored in Pr.61). Therefore, the default values **Pr.99=57** and **Pr.98=61** means selecting the output **Hz** and **I** for monitoring.

The ▲ and ▼ key is used to select the desired variable for monitoring on 7-segment display.

### **4.4 Apply inverter to your system**

Real application system is not as simple as described above. Usually, it will require some interface signals using DIX, DOx , or AIX, ...

Further studying all the functions described follows, will help you design your application system more efficiently than before.

# **5. PARAMETERS**

## **5.1 PARAMETERS LIST**

There are total 100 parameters in PD series inverter.

Pr.xx	PARAMETER NAME	DEFAULT	Minimum	Maximum	TYPE
Pr.00	MAIN SPEED SET	0.00 HZ	0	200.00	R/W
Pr.01	MAIN SPEED ACC	10.0 SEC	0.1	6553.0	R/W
Pr.02	MAIN SPEED DEC	10.0 SEC	0.1	6553.0	R/W
Pr.03	S_CURVE ENABLE	0	0	1	R/W
Pr.04	START HZ	1.50 HZ	0.50	30.00	R/W
Pr.05	BRAKE HZ	5.00 HZ	0.50	200.00	R/W
Pr.06	BRAKE VOLT%	3 %	0	30	R/W
Pr.07	BRAKE TIME	1.0 SEC	0.0	25.0	R/W
Pr.08	VOLTAGE DROP RATE	0.5 SEC	0.1	2.5	R/W
Pr.09	BOOST VOLTAGE	3 %	0	30	R/W
Pr.10	BASE HZ	60.00 HZ	0.50	200.00	R/W
Pr.11	V/F PATTERN	0	0	250	R/W
Pr.12	CARRIER	16.0 KHZ	2.0	16.0	FR/W
Pr.13	START CARRIER	2.0 KHZ	2.0	16.0	FR/W
Pr.14	TRANSFER POINT	10.00 HZ	0.00	200.00	FR/W
Pr.15	UPPER LIMIT	80.00 HZ	0.50	200.00	R/W
Pr.16	LOWER LIMIT	1.50 HZ	0.50	200.00	R/W
Pr.17	SKIP HZ	0.00 HZ	0.00	200.00	R/W
Pr.18	SKIP WIDTH	0.00 HZ	0.00	5.00	R/W
Pr.19	JOG SPEED	10.00 HZ	0.50	200.00	R/W
Pr.20	JOG ACC/DEC	10.0 SEC	0.1	25.0	R/W
Pr.21	SPD1 SPEED SET	0.00 HZ	0.00	200.00	R/W
Pr.22	SPD1 ACC TIME	10.0 SEC	0.1	6553.0	R/W
Pr.23	SPD1 DEC TIME	10.0 SEC	0.1	6553.0	R/W
Pr.24	SPD2 SPEED SET	0.00 HZ	0.00	200.00	R/W
Pr.25	SPD2 ACC TIME	10.0 SEC	0.1	6553.0	R/W
Pr.26	SPD2 DEC TIME	10.0 SEC	0.1	6553.0	R/W
Pr.27	SPD3 SPEED SET	0.00 HZ	0.00	200.00	R/W
Pr.28	SPD3 ACC TIME	10.0 SEC	0.1	6553.0	R/W
Pr.29	SPD3 DEC TIME	10.0 SEC	0.1	6553.0	R/W
Pr.30	FREE RUN STOP	0	0	1	R/W
Pr.31	REVERSE INHIBIT	0	0	1	R/W
Pr.32	AVR ENABLE	0	0	1	R/W
Pr.33	DISCHARGE ENABLE	0	0	2	R/W
Pr.34	UP/OP RESTART ENABLE	0	0	1	R/W
Pr.35	STALL LEVEL	160 %	10	200	R/W
Pr.36	BASE BLOCK TIME	0.5 SEC	0.1	5.0	R/W
Pr.37	AM SELECT	0	0	5	R/W
Pr.38	AM GAIN	255	0	255	R/W
Pr.39	CONTROL CMD SELECT	0	0	4	R/W
Pr.40	SET SPEED INPUT SELECT	8	0	22	R/W
Pr.41	DI1 SELECT	0	0	31	R/W
Pr.42	DI2 SELECT	0	0	31	R/W
Pr.43	DI3 SELECT	0	0	31	R/W
Pr.44	DI4 SELECT	0	0	31	R/W
Pr.45	DO1 SELECT	0	0	41	R/W
Pr.46	DO2 SELECT	0	0	41	R/W
Pr.47	RELAY SELECT	4	0	41	R/W
Pr.48	IRMS Detector LEVEL	100 %	10	150	R/W
Pr.49	HZ Detector LEVEL	30.00 HZ	0.00	200.00	R/W

Pr.xx	PARAMETER NAME	DEFAULT	Minimum	Maximum	TYPE
Pr.50	HZ Detector TOLERANCE	5.0 HZ	0.00	25.0	R/W
Pr.51	THERMAL TIME	60 SEC	0	120	R/W
Pr.52	POLE	4	2	12	R/W
Pr.53	GEAR RATIO	100 %	0	100	R/W
Pr.54	IRMS SELECT	0	0	1	R/W
Pr.55	A/D CHANNEL SELECT	0	0	4	R/W
Pr.56	A/D DATA				M
Pr.57	HZ				M
Pr.58	RPM				M
Pr.59	VDC INPUT				M
Pr.60	VRMS				M
Pr.61	IRMS				M
Pr.62	DI1 INPUT STATUS		0	1	M
Pr.63	DI2 INPUT STATUS		0	1	M
Pr.64	DI3 INPUT STATUS		0	1	M
Pr.65	DI4 INPUT STATUS		0	1	M
Pr.66	RUN INPUT STATUS		0	1	M
Pr.67	REV INPUT STATUS		0	1	M
Pr.68	DO1 OUTPUT STATUS		0	1	M
Pr.69	DO2 OUTPUT STATUS		0	1	M
Pr.70	RELAY OUTPUT STATUS		0	1	M
Pr.71	TIMER TIME	5.0 SEC	0.2	6553.0	R/W
Pr.72	AUTO MODE SELECT	0	0	6	R/W
Pr.73	AUTO STEP1(6) PERIOD	15.0 SEC	0.1	6553.0	R/W
Pr.74	AUTO STEP2(7)PERIOD	15.0 SEC	0.1	6553.0	R/W
Pr.75	AUTO STEP3(8) PERIOD	15.0 SEC	0.1	6553.0	R/W
Pr.76	AUTO STEP4(9) PERIOD	15.0 SEC	0.1	6553.0	R/W
Pr.77	AUTO STEP5(10) PERIOD	15.0 SEC	0.1	6553.0	R/W
Pr.78	MOTOR RATING	100 %	10	100	R/W
Pr.79	RESTART TYPE SELECT	0	0	3	R/W
Pr.80	RESTART STALL LEVEL	100%	10	200	R/W
Pr.81	SPEED SEARCH DEC TIME	2.0 SEC	0.1	25.0	R/W
Pr.82	VOLTAGE RECOVER TIME	0.5 SEC	0.1	5.0	R/W
Pr.83	IGBT GUARD TIME	3.0us	1.5	25.5	FR/W
Pr.84	LINE VOLTAGE		40	1000	FR/W
Pr.85	RATED CURRENT		0.5	3000.0	FR/W
Pr.86	IRMS ADJUST		70	140	FR/W
Pr.87	VDC ADJUST		70	140	FR/W
Pr.88	RESERVE	0	0	0	
Pr.89	AI1 LOW	12	0	1023	FR/W
Pr.90	AI1 HIGH	1012	0	1023	FR/W
Pr.91	AI2 LOW	12	0	1023	FR/W
Pr.92	AI2 HIGH	1012	0	1023	FR/W
Pr.93	UNIT NUMBER	1	1	99	FR/W
Pr.94	RELOAD	0	0	1	R/W
Pr.95	MEMORY PROTECT	0	0	1	R/W
Pr.96	FACTORY WRITE ENABLE	0	0	1	R/W
Pr.97	VERSION		4.00	4.99	R
Pr.98	MONITOR(I)	61	0	99	R/W
Pr.99	MONITOR(HZ)	57	0	99	R/W

Note :

1. The second column is the function name of parameters.
2. The third column is the default value after memory initialization.
3. Fourth column is the Minimum possible value of the parameter.
4. Fifth column is the Maximum possible value of the parameter.

5. Parameter type is shown in the TYPE column.
  - a. Type **R/W** means the parameter is stored in EAROM memory and may be Read or Write.
  - b. Type **FR/W** means the parameter is stored in EAROM memory by factory control.  
**Unless by authorized engineer, this parameter is not allowed to change.**
  - c. Type **M** means the parameter is used for monitoring the status of inverter.  
 Value will change from time to time to reflect the inverter status.  
 Write to this parameter has no effect.
  - d. Type **R** means the parameter is a fixed constant.

## 5.2 PARAMETER PROTECTION

Pr.95 -- MEMORY PROTECT

Pr.96 -- FACTORY WRITE ENABLE

**If set Pr.95=1, all parameters (except Pr.95 itself) are not allow to change.**

**If set Pr.95=0, parameters with R/W type are allowed to change.**

**If set Pr.95=0 and Pr.96=1, all parameters include FR/W type may be changed.**

## 5.3 PARAMETERS INITIALIZATION

**Pr.94 is used to INITIALIZE data into all parameters with R/W type.**

**Note : parameters with FR/W type will not be initialized by this method.**

Follow the process to execute memory initialization

- Step 1: Write Pr.95 = 0, and Pr.94 = 1
- Step 2: Execute "ALM" RESET
- or Step 2: Execute Hardware RESET
- or Step 2: Execute Power-On RESET

After initialization process, the data in EAROM memory will change to the DEFAULT values listed in the PARAMETERS LIST Table.

## 5.4 Description of all parameters

Pr.00 MAIN\_SPEED\_SET

Pr.00 is the Main Speed memorized in EAROM.

If SPD\_SELECT(Pr.40)=0, this MAIN\_SPEED\_SET parameter will be used as the desired frequency source.

Note: while the Panel is in "CTL" mode, READ or WRITE will always points to this parameter.

Pr.01 MAIN\_ACC\_TIME

Pr.02 MAIN\_DEC\_TIME

Pr.01 & Pr.02 are the preset ACC & DEC time while inverter running.

The definition of the Pr.01(ACC) is "the period of time from 0.0Hz ramp up to 60.0Hz" .

The definition of the Pr.02(DEC) is "the period of time from 60.0Hz ramp down to 0.0Hz" .

Pr.03 S\_CURVE ENABLE

S\_CURVE parameter is used for applications requiring more soft acceleration and deceleration.

Time constant for S\_CURVE is 0.64 second.

Pr.04 START\_FREQUENCY

Inverter will start if the input speed command is greater than this parameter and Pr.16 .

Pr.05 BRAKE FREQUENCY

While deceleration to stop, if the output frequency is lower than this parameter, then DC injection braking starts.

Pr.06 BRAKE VOLTAGE

While braking starts, this parameter defines the DC injection level.

This parameter is defined as percent of input voltage.

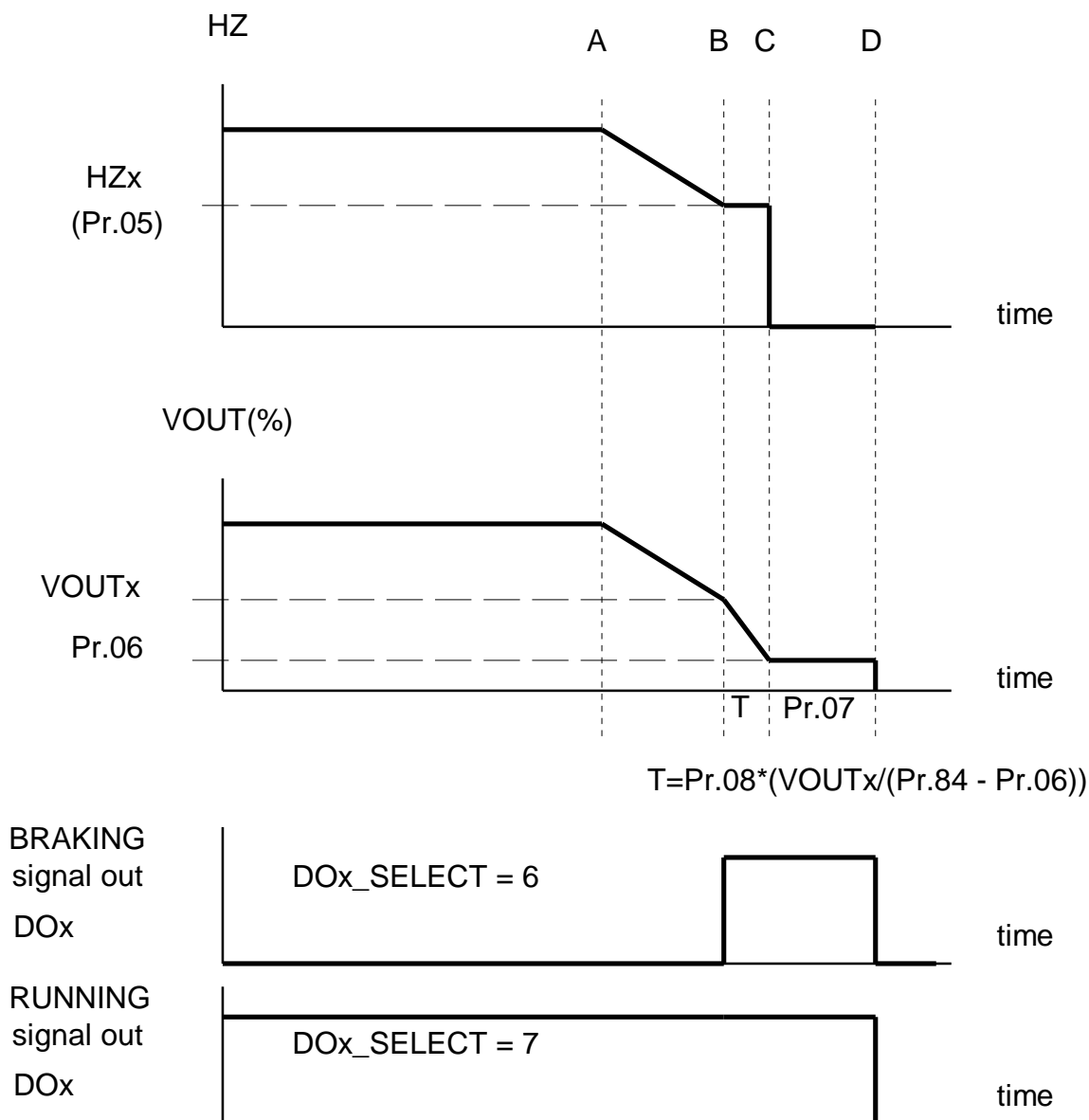
Pr.07 BRAKE TIME

This parameter defines the DC injection braking time.

Pr.08 VOLTAGE DROP RATE

While deceleration, if output frequency is lower than braking frequency(Pr.05), the output frequency remains and output voltage will gradually drop down to the brake voltage(Pr.06) then start DC injection brake process.

This parameter is defined as the drop time required from rated voltage down to zero.



### TIMING RELATIONSHIP BETWEEN HZ & VOUT WHILE BRAKING STOP

Note :

**Point-A** is the time when STOP signal input.

**Point-B** is the time when output HZ = Pr.05, or when EMS is active.

**Point-C** is the time when VOUT equal Pr.06.

**Point-D** is the time when injection brake period of Pr.07 is complete.

**Time-T** is the time executing "Output Voltage Drop Down to Pr.06" .

#### Pr.09 BOOST

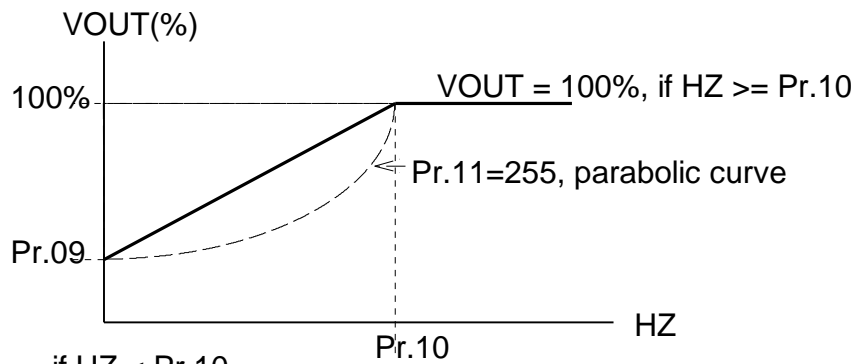
This parameter determines the minimum voltage while output frequency is low.

#### Pr.10 BASE\_FREQUENCY

This parameter determines the exact frequency when output voltage is 100%.

#### Pr.11 V/F PATTERN

This parameter defines the curvature for parabolic curve.



if  $HZ < Pr.10$ ,  
 $VOUT = (a + b * X + c * X * X) * \text{Input-voltage}$   
 where :  $a = Pr.09(\%)$   
 $b = (1 - Pr.11 / 255) * (100\% - Pr.09)$   
 $c = (Pr.11 / 255) * (100\% - Pr.09)$   
 $X = HZ / Pr.10$

#### Pr.12 PWM\_CARRIER

Defines the maximum carrier frequency.

Normally, the maximum carrier frequency is 16Khz. However, when the carrier is high, the IGBT switching loss will also increase and cause inverter trip by **OH(Over Heat)** protection.

This is very important especially for high capacity inverters.

Default value for this parameter is 16Khz for 5HP and below.

Default value for this parameter is 12Khz for 7.5 & 10HP.

Default value for this parameter is 10Khz for 15 & 20HP.

Default value for this parameter is 8Khz for 30 & 40HP.

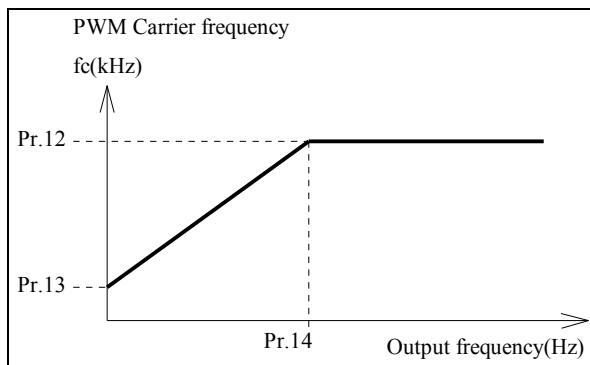
#### Pr.13 MINIMUM\_CARRIER

Defines the minimum carrier frequency.

#### Pr.14 CARRIER\_TRANSFER\_POINT

Defines the transfer point of output frequency, when carrier frequency reaches Pr.12.

**Note : Select lower carrier frequency while inverter is running at low output frequency(Hz) can decrease vibration effect.**



#### Pr.15 UPPER\_FREQUENCY\_LIMIT

Defines maximum possible output frequency(Hz) while running.

#### Pr.16 LOWER\_FREQUENCY\_LIMIT

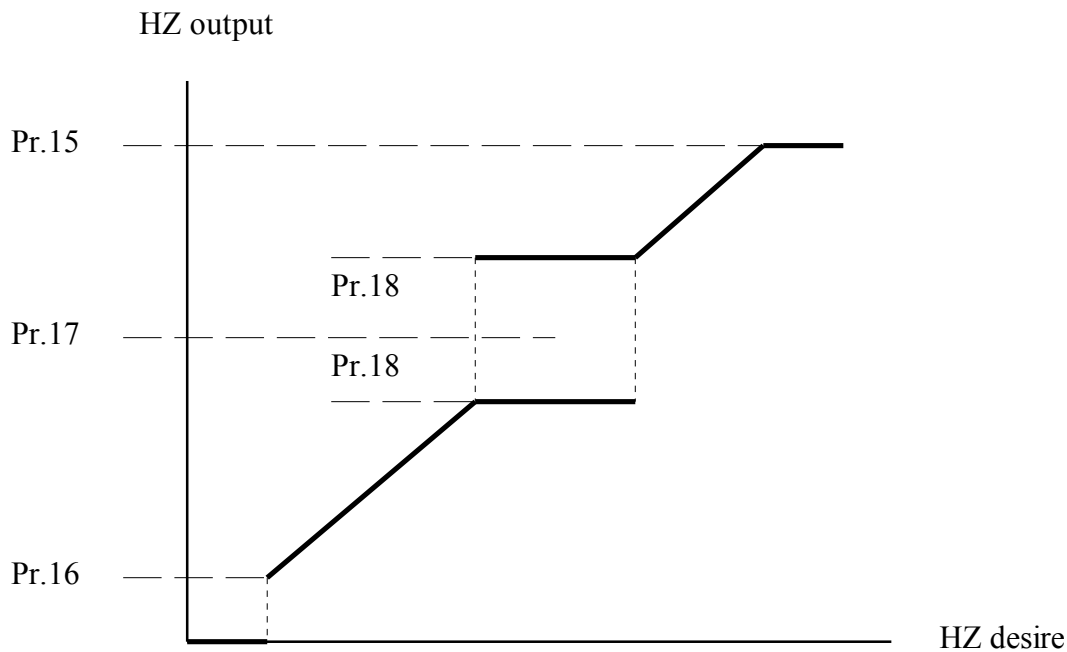
Defines minimum possible output frequency(Hz) while running.

#### Pr.17 SKIP\_FREQUENCY

This parameter can prevent the inverter running at the resonant point of mechanical system.

#### Pr.18 SKIP\_BAND

This parameter defines the skip range.



Pr.19 JOG SPEED(Refer to Section 8.2~8.5 & 12)

This parameter determines the running frequency when JOG speed is required.

Pr.20 JOG ACC/DEC

Defines the acceleration and deceleration rate when JOG command is in execution.

Pr.21 SPD1 SPEED SET(Refer to Section 8.2~8.5 & 12)

This parameter determines the running frequency when SPD1 speed is required.

Pr.22 SPD1 ACC TIME

Defines the acceleration rate when SPD1 command is in execution.

Pr.23 SPD1 DEC TIME

Defines the deceleration rate when SPD1 command is in execution.

Pr.24 SPD2 SPEED SET(Refer to Section 8.2~8.5 & 12)

This parameter determines the running frequency when SPD2 speed is required.

Pr.25 SPD2 ACC TIME

Defines the acceleration rate when SPD2 command is in execution.

Pr.26 SPD2 DEC TIME

Defines the deceleration rate when SPD2 command is in execution.

Pr.27 SPD3 SPEED SET(Refer to Section 8.2~8.5 & 12)

This parameter determines the running frequency when SPD3 speed is required.

Pr.28 SPD3 ACC TIME

Defines the acceleration rate when SPD3 command is in execution.

Pr.29 SPD3 DEC TIME

Defines the deceleration rate when SPD3 command is in execution.

Pr.30 FREE RUN STOP

If Pr.30 = 0, when stop, inverter gradually decreasing its output frequency.

If Pr.30 = 1, when stop, inverter disables output immediately, the motor free run.

Pr.31 REVERSE INHIBIT

If Pr.31 = 0, Inverter may run in both direction.

If Pr.31 = 1, Reverse Run is inhibited.

Pr.32 AVR\_ENABLE

Pr.32 = 1, Select "Automatic Voltage Regulation" of the inverter output voltage.

Pr.33 DISCHARGE\_CONTROL

If Pr.33 = 0, Discharge circuit is Disabled.

If Pr.33 = 1, Discharge circuit is Enabled.

The discharge transistor will ON if the following conditions are met :

- a. Inverter is Running , and
- b. Inverter has no alarm , and
- c. Inverter checks the VDC>117% , and
- d. Only when Inverter is Deceleration .**

If Pr.33 = 2, Discharge circuit is Enabled.(V4.82~)

The discharge transistor will ON if the following conditions are met :

- a. Inverter is Running , and
- b. Inverter has no alarm , and
- c. Inverter checks the  $VDC > 117\%$

**no matter the inverter is deceleration or not.**

Pr.34 UP/OP RESTART\_ENABLE (Refer to Section 11)

If Pr.34 = 1, Inverter will restart automatically, after power come back normal.

Pr.35 STALL\_LEVEL

This parameter defines the current limit level(%) while STALL process.

Pr.36 BASE BLOCK TIME (Refer to Section 11)

This parameter defines the minimum stop time while executing BASE BLOCK function or when ALARM occurs.

Pr.37 AM SELECT (Refer to Section 10 )

Select desired variables to appear at analog output terminal.

Pr.38 AM GAIN (Refer to Section 10 )

Select desired gain ratio for analog output terminal.

Pr.39 CONTROL COMMAND SELECT (Refer to Section 6 )

**This parameter determines the type of RUN/STOP control method.**

Pr.40 SET SPEED INPUT SELECT (Refer to Section 7 )

**This parameter defines the source and type for determining the running frequency.**

Pr.41 DI1 FUNCTION SELECT (Refer to Section 8 )

Defines the function for input terminal DI1.

Pr.42 DI2 FUNCTION SELECT (Refer to Section 8 )

Defines the function for input terminal DI2.

Pr.43 DI3 FUNCTION SELECT (Refer to Section 8 )

Defines the function for input terminal DI3.

Pr.44 DI4 FUNCTION SELECT (Refer to Section 8 )

Defines the function for input terminal DI4.

Pr.45 DO1 FUNCTION SELECT (Refer to Section 9 )

Defines the function for output terminal DO1.

Pr.46 DO2 FUNCTION SELECT (Refer to Section 9 )

Defines the function for output terminal DO2.

Pr.47 RELAY FUNCTION SELECT (Refer to Section 9 )

Defines the function for output RELAY terminal RY1&RY2.

Pr.48 IRMS DETECTOR THRESHOLD LEVEL (Refer to Section 9.13)

This parameter is used to define the threshold level for **Current Over Detector** module.

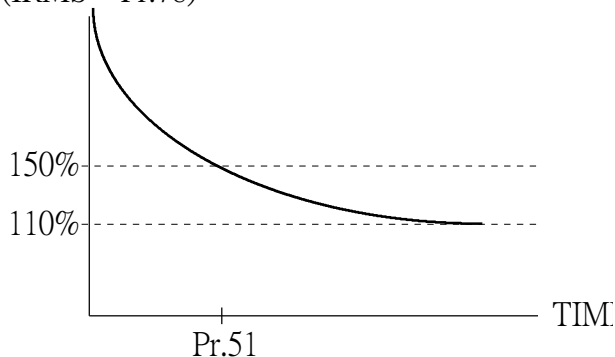
Pr.49 HZ DETECTOR THRESHOLD LEVEL (Refer to Section 9.2)

Pr.50 HZ DETECTOR TOLERANCE (Refer to Section 9.2)

Pr.49 and Pr.50 are used for **SPE, SPNE, SPO and SPNO** output functions.

Pr.51 THERMAL RELAY TRIP TIME

(IRMS \* Pr.78)



This parameter defines the OVER LOAD trip time of the INTERNAL THERMAL RELAY.

**If Pr.51=0, the THERMAL RELAY function is disabled.**

#### Pr.78 MOTOR RATING

If the inverter's rating capacity is larger than the motor in use, this parameter can be adjusted to protect the motor.

This parameter is defined as the percentage level of the inverter rating.

Pr.52 POLE (Refer to Section 13.1 )

This parameter is determined by the Pole number of motor in used.

Pr.53 GEAR\_RATIO (Refer to Section 13.1 )

Pole & Gear\_Ratio parameters will be used for RPM(Pr.58) calculation.

$RPM = (120 * HZ / POLE) * GEAR\_RATIO\%$



Pr.54 IRMS\_SELECT

If Pr.54 = 0, IRMS(Pr.61) is expressed in AMPERE

If Pr.54 = 1, IRMS(Pr.61) is expressed in PERCENTAGE of inverter rated current.

Pr.55 A/D CONVERTER CHANNEL SELECT (Refer to Section 13.3)

Pr.56 A/D CONVERSION DATA (Refer to Section 13.3)

Pr.57 HZ (Refer to Section 13.1)

Pr.58 RPM (Refer to Section 13.1)

Pr.59 VDC (Refer to Section 13.1)

Pr.60 VOUT (Refer to Section 13.1)

Pr.61 IRMS (Refer to Section 13.1)

Pr.62 DI1 STATUS (Refer to Section 13.2)

Pr.63 DI2 STATUS (Refer to Section 13.2)

Pr.64 DI3 STATUS (Refer to Section 13.2)

Pr.65 DI4 STATUS (Refer to Section 13.2)

Pr.66 RUN STATUS (Refer to Section 13.2)

Pr.67 REV STATUS (Refer to Section 13.2)

Pr.68 DO1 STATUS (Refer to Section 13.2)

Pr.69 DO2 STATUS (Refer to Section 13.2)

Pr.70 RELAY STATUS (Refer to Section 13.2)

Pr.71 TIMER TIME (Refer to Section 8.7)

Pr.72 AUTO RUN MODE SELECT (Refer to Section 12)

Pr.73 TIME FOR AUTO RUN STEP1&6 (Refer to Section 12)

Pr.74 TIME FOR AUTO RUN STEP2&7 (Refer to Section 12)

Pr.75 TIME FOR AUTO RUN STEP3&8 (Refer to Section 12)

Pr.76 TIME FOR AUTO RUN STEP4&9 (Refer to Section 12)

Pr.77 TIME FOR AUTO RUN STEP5&10 (Refer to Section 12)

Pr.78 MOTOR RATING

Refer to the description of Pr.51.

Pr.79 RESTART TYPE SELECT (Refer to Section 11)

Pr.80 RESTART STALL LEVEL (Refer to Section 11)

Pr.81 SPEED SEARCH DEC TIME (Refer to Section 11)

Pr.82 VOLTAGE RECOVER TIME (Refer to Section 11)

Pr.83 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.**

Pr.84 LINE\_VOLTAGE

This parameter defines the normal working voltage of the inverter.

According to this parameter, the inverter calculates all voltage dependent values.

a. OP Trip Voltage (VDC) =  $1.414 * \text{Pr.84} * 130\%$

b. UP trip Voltage (VDC) =  $1.414 * \text{Pr.84} * 70\%$

c. OP Recover Voltage (VDC) =  $1.414 * \text{Pr.84} * 120\%$

d. UP Recover Voltage (VDC) =  $1.414 * \text{Pr.84} * 80\%$

e. Contact On Voltage (VDC) =  $1.414 * \text{Pr.84} * 69\%$

f. Contact Off Voltage (VDC) =  $1.414 * \text{Pr.84} * 65\%$

Note: The "Contact" means the device used to BY-PASS the Charging Resistor.

It may be a RELAY or a SCR instead.

g. Discharge Start Voltage (VDC) =  $1.414 * \text{Pr.84} * 117\%$

Pr.85 INVERTER RATED CURRENT

This parameter defines the rated output current of the inverter.

Pr.86 IRMS ADJUST

This parameter is used to adjust the IRMS data reading.

Pr.87 VDC ADJUST

This parameter is used to adjust the VDC data reading.

Pr.88 RESERVE (or IGBT\_COMPENSATION for versions below V4.33)

For versions below V4.33, this parameter is used to compensate IGBT timing.

For versions higher than V4.33, compensation is done automatically.

Pr.89 AI1\_LOW

This parameter is used to record the A/D converter data when "AI1" input terminal is connected to "ACOM" terminal.(JP1 select +10V)

Pr.90 AI1\_HIGH

This parameter is used to record the A/D converter data when "AI1" input terminal is connected to "+10V" voltage source.(JP1 select +10V)

Pr.91 AI2\_LOW

This parameter is used to record the A/D converter data when "AI2" input terminal is connected to "ACOM" terminal.(JP2 select +5V)

Pr.92 AI2\_HIGH

This parameter is used to record the A/D converter data when "AI2" input terminal is connected to "+5V" terminal.(JP2 select +5V)

Pr.93 UNIT\_NUMBER

This parameter is used to assign the ADDRESS NUMBER of this INVERTER UNIT while controlled by master computer through RS485 interface.

Pr.94 PARAMETER RELOAD (Refer to Section 5.3)

Pr.95 MEMORY PROTECT (Refer to Section 5.2)

Pr.96 FACTORY WRITE ENABLE (Refer to Section 5.2)

Pr.97 VERSION

This parameter indicates the software revision of this inverter.

Pr.98 MONITOR(I) (Refer to Section 13)

Pr.99 MONITOR(HZ) (Refer to Section 13)

## **6. Selection of RUN/STOP/FWD/REV control command**

Before start running the inverter, the most important step is to select the **Control Command Source**. You can choose whether the control command will **come from panel or terminal**.

If the control command should come from terminal, then the two input terminals **RUN** and **REV** are used for controlling the inverter.

These two input terminals are **inactive** when left open and will be **active** when connected to **DCOM** terminal.

Parameter **Pr.39** is used to select the source of Control Command.

**Pr.39 -- CMD\_SELECT**

if **Pr.39=0**

The RUN and REV terminals are disabled.

Control Command will come from the **keypad panel**.

Just push **FWD key**, the inverter will run forward direction.

Push **REV key**, the inverter will run forward direction.

if **Pr.39=1**

The **RUN** terminal will start the inverter running, and **REV** terminal controls the running direction.

if **Pr.39=2**

The **RUN** terminal is equivalent to **FORWARD-RUN**.

The **REV** terminal is equivalent to **REVERSE-RUN**.

if **Pr.39=3 (V4.87~)**

Similar to mode-1, but will check **RUN terminal at OFF** position while power on.

if **Pr.39=4 (V4.87~)**

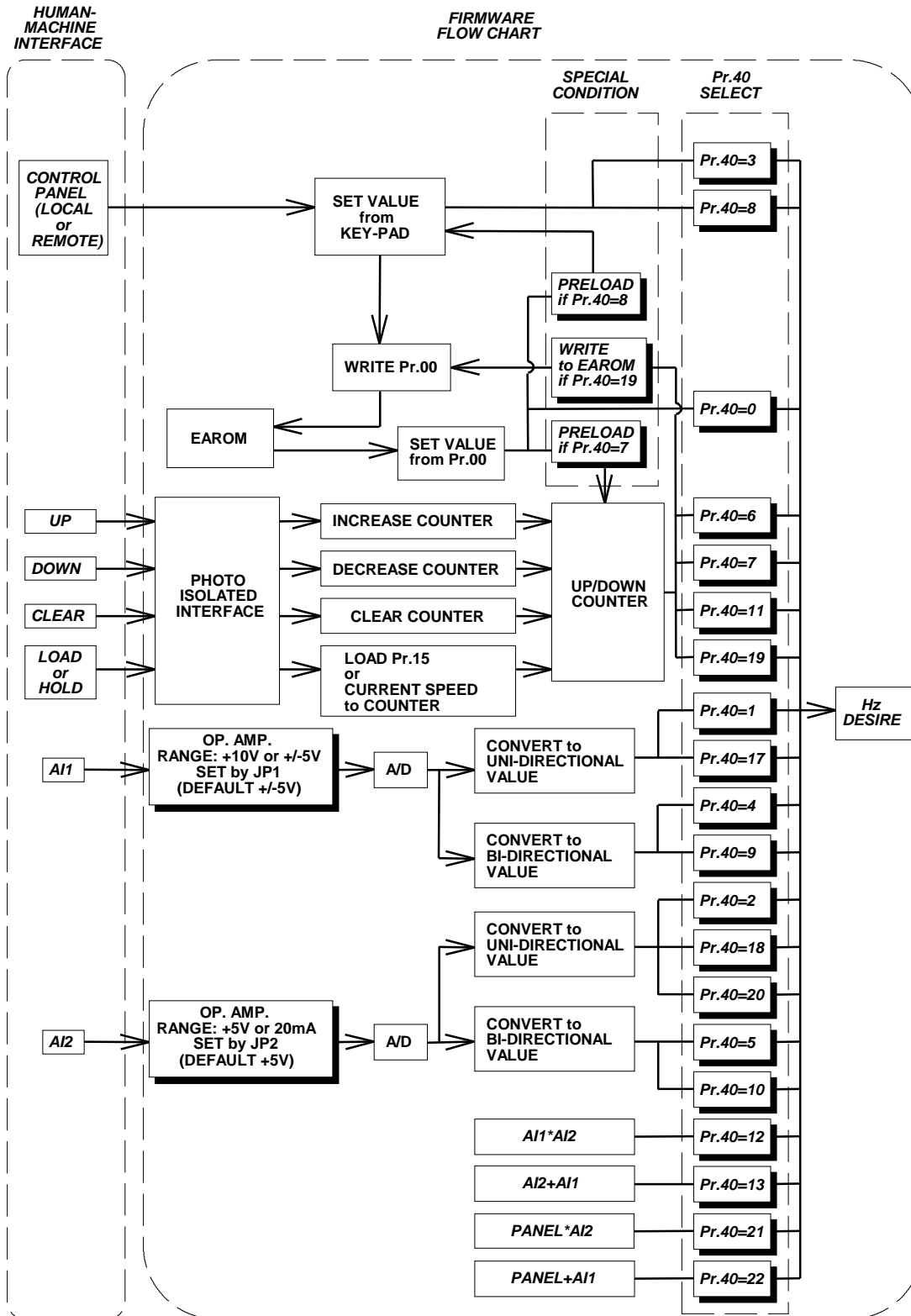
Similar to mode-2, but will check **RUN & REV at OFF** position while power on.

**Note : Refer to Sec.7 to determine the running frequency.**

Pr.39	"RUN" Terminal	"REV" Terminal	FUNCTION
0	don't care	don't care	Command from PANEL
1	OFF	don't care	STOP
	OFF	don't care	STOP
	ON	OFF	FORWARD RUN
	ON	ON	REVERSE RUN
2	OFF	OFF	STOP
	OFF	ON	REVERSE RUN
	ON	don't care	FORWARD RUN
3	Similar to Mode-1, When after RESET, if RUN terminal is not in OFF position, the inverter will execute <b>AutoReset</b> repeatedly.(V4.87~) If you are using Remote Panel, it will show E-SP error. Just set RUN in Off position and push any key to restart.		
4	Similar to Mode-1, When after RESET, if RUN and REV terminals are not in OFF position, the inverter will execute <b>AutoReset</b> repeatedly.(V4.87~) If you are using Remote Panel, it will show E-SP error. Just set RUN and REV in Off position and push any key to restart.		

# 7. Selection of Set Frequency input source

## 7.1 SELECTION CHART



NOTE:

- IS FUNCTION BLOCK
- IS HARDWARE SELECT SETTING or SOFTWARE SELECT SWITCH

## 7.2 SPEED SOURCE DESCRIPTION

This section describes how to select desired input Frequency Source.

Parameter **Pr.40**, is the **speed input source selection** parameter.

The speed input sources may come from **Panel** , **Memory** , **Analog input** , **Up/Down counter** , or the combinations of the above sources.

Please refer to the following table first.

Pr.40	JP1	JP2	SPEED source	DIRECTION Source
0	don't care	don't care	Value in Pr.00	From Command
1	+ 10V	don't care	AI1 Uni-directional	From Command
2	don't care	+ 5V(or 20mA)	AI2 Uni-directional	From Command
3	don't care	don't care	Set value from Panel	From Command
4	+/- 5V	don't care	AI1 Bi-directional	By AI1 input value
5	don't care	+ 5V(or 20mA)	AI2 Bi-directional	By AI2 input value
6	don't care	don't care	By U/D counter	From Command
7	Similar to Pr.40=6, but will preload U/D counter from Pr.00 after RESET.			
8	Similar to Pr.40=3, with PRELOAD from & AUTO WRITE to Pr.00			
9	Similar to Pr.40=4, but will not STOP while desired frequency is low			
10	Similar to Pr.40=5, but will not STOP while desired frequency is low			
11	Similar to Pr.40=6, While running will only down to Low Limit.			
12	Frequency Set = AI1 * AI2			
13	Frequency Set = AI2 + AI1			
14	Reserve			
15	Reserve			
16	Reserve			
17	Similar to Pr.40=1, With Minimum = Low limit			
18	Similar to Pr.40=2, With Minimum = Low limit			
19	Similar to Pr.40=11, With Auto Reload from and Auto Write to Pr.00			
20	Reverse to Pr.40=18, +5V(or 20mA)---> Lower , 0V---> Upper Frequency			
21	Frequency Set = Panel Set * AI2 (V4.87~)			
22	Frequency Set = Panel Set + AI1 (V4.87~)			

Note: JP1 is used for changing the configuration of analog input AI1.

It may select +/- 5V(default) or 0~+10V.

JP2 is used for changing the configuration of analog input AI2.

It may select 0~+5V(default) or 0~20mA.

### 7.2.0 Pr.40 = 0, Speed input come from Pr.00

Parameter Pr.00 is the **MAIN\_SPEED\_SET** parameter stored in **EAROM memory**.

The value once written into Pr.00 will never be altered, unless you re-write a new value again.

In this mode, the Hz value stored in Pr.00 will be used to determine the output frequency of the inverter while running.

The direction of the output phase sequence must be determined by control command.

It is possible to protect the value in Pr.00 by setting Pr.95=1..

**Note: Changing the content in Pr.00 will immediately change the output frequency even if the inverter is running.**

### 7.2.1 Pr.40 = 1, Speed input come from AI1

In this mode, the voltage signal fed into AI1 terminal will be used to determine the output frequency of the inverter while running.

The direction of the output phase sequence must be determined by control command.

If the input signal reaches maximum level, the set frequency is equal to Pr.15 (UPPER LIMIT).

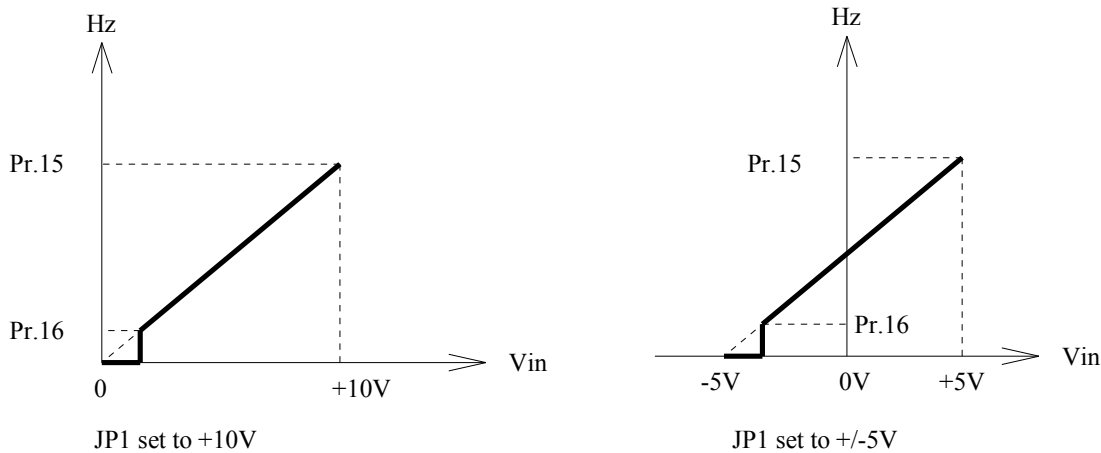
If the desired set frequency is lower than Pr.16 (LOWER LIMIT), the inverter will stop.

**Note: Set jumper JP1 to match with the input voltage range.**

**If set to +10V position, input range is 0V ~ +10V.**

**If set to +/-5V position, input range is -5V ~ +5V. (Default)**

**If necessary, use Pr.89 and Pr.90 to modify the input range.**



### 7.2.2 Pr.40 = 2, Speed input come from AI2

In this mode, the voltage signal fed into AI2 terminal will be used to determine the output frequency of the inverter while running.

The direction of the output phase sequence must be determined by control command.

If the input signal reaches maximum level, the set frequency is equal to Pr.15 (UPPER LIMIT).

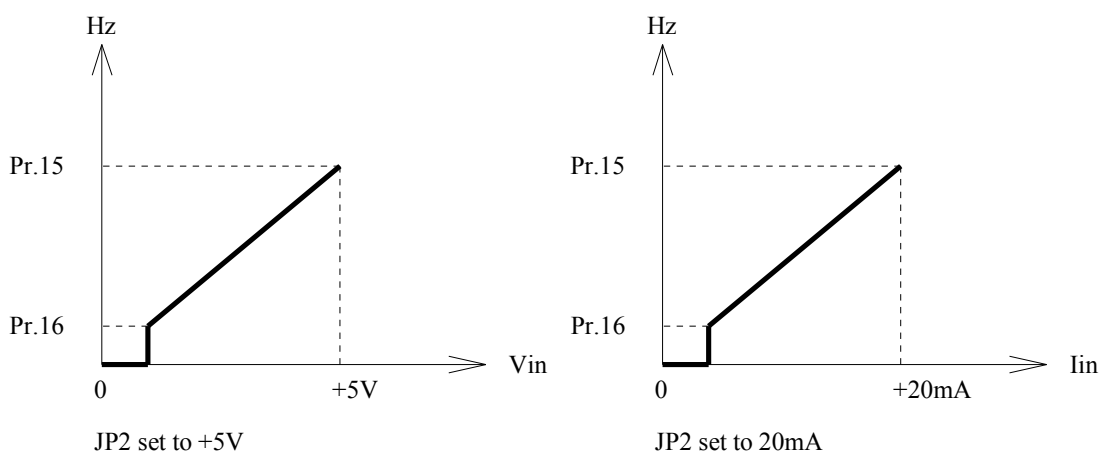
If the desired set frequency is lower than Pr.16 (LOWER LIMIT), the inverter will stop.

**Note: Set jumper JP2 to match with the input signal type and range.**

**If set to +5V position, input signal type and range is 0V ~ +5V. (Default)**

**If set to 20mA position, input signal type and range is 0mA ~ 20mA.**

**If necessary, use Pr.91 and Pr.92 to modify the input range.**



### 7.2.3 Pr.40 = 3, Speed input come from Key-pad setting

For **LOCAL** panel, change to **CTL(control) Mode** by push **CTL/MON** key .( If Hz or I lamp is on, push again until they are all off.) Then, push **UP** or **DOWN** key to modify the desired set frequency.

For **REMOTE** panel, change to **CTL Mode** by push **CTL** key. Then, modify the desired set frequency by pushing the **Number keys followed by FWD or REV key**. Or , modify it by UP and DOWN keys just like LOCAL panel.

The direction of the output phase sequence must be determined by control command.

#### 7.2.4 Pr.40 = 4 , Speed input come from AI1 with Bi-direction control

In this mode , the voltage signal fed into AI1 terminal will be used to determine the output frequency of the inverter while running.

The direction of the output phase sequence is determined by the input signal level.

If the input signal is positive maximum level, the set frequency is equal to Pr.15 (UPPER LIMIT)

in forward direction; and if the input signal is most negative(or zero, depend on JP1), the set frequency is equal to Pr.15 in reverse direction.

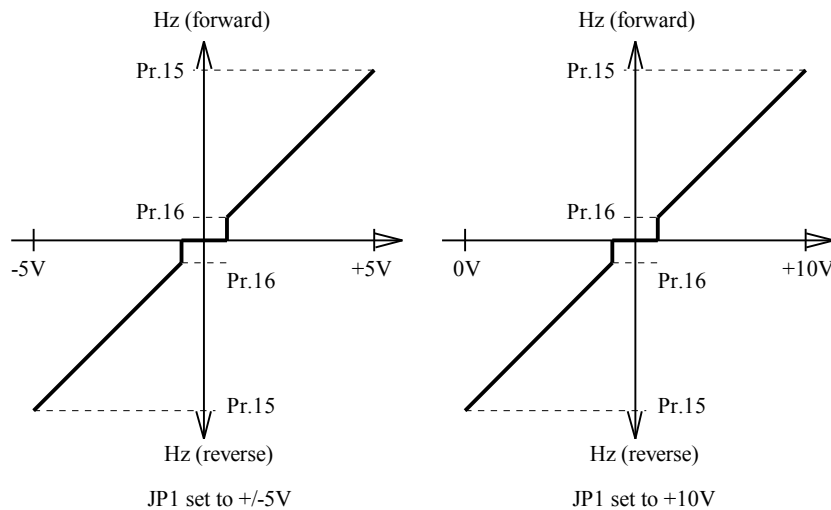
If the desired set frequency is lower than Pr.16 (LOWER LIMIT), the inverter will stop.

**Note: Set jumper JP1 to match with the input voltage range.**

**If set to +10V position, input range is 0V ~ +10V.**

**If set to +/-5V position, input range is -5V ~ +5V. (Default)**

**If necessary, use Pr.89 and Pr.90 to modify the input range.**



#### 7.2.5 Pr.40 = 5, Speed input come from AI2 with Bi-direction control

In this mode, the voltage signal fed into AI2 terminal will be used to determine the output frequency of the inverter while running.

The direction of the output phase sequence is determined by the input signal level.

If the input signal is positive maximum level, the set frequency is equal to Pr.15(UPPER LIMIT)

in forward direction; and if the input signal is zero, the set frequency is equal to Pr.15 in reverse direction.

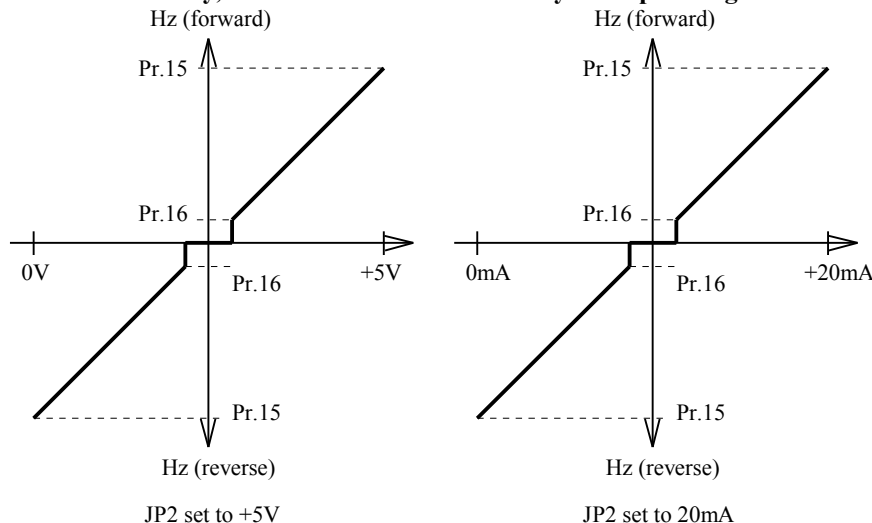
If the desired set frequency is lower than Pr.16(LOWER LIMIT), the inverter will stop.

**Note : Set jumper JP2 to match with the input signal type and range.**

**If set to +5V position, input signal type and range is 0V ~ +5V.(Default)**

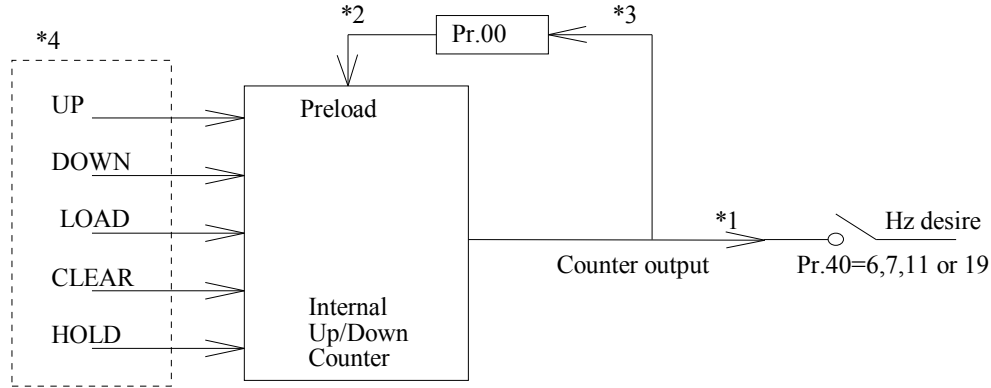
**If set to 20mA position, input signal type and range is 0mA ~ 20mA.**

**If necessary, use Pr.91 and Pr.92 to modify the input range .**



7.2.6 **Pr.40 = 6** , Speed input come from **Internal Up/Down Counter**

7.2.7 **Pr.40 = 7** , Speed input come from **Internal Up/Down Counter with Preload from Pr.00**



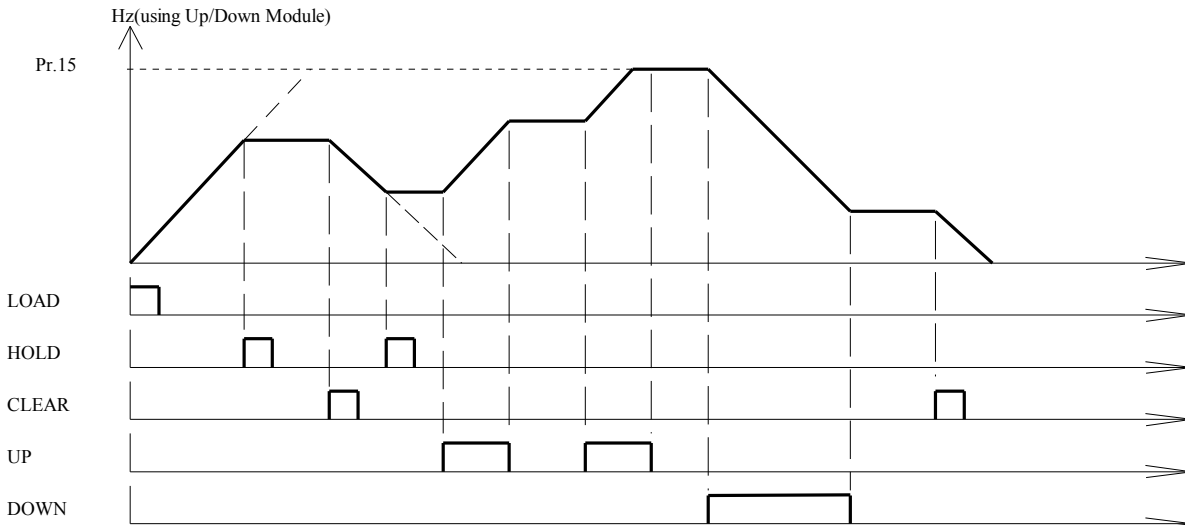
Functional Block Diagram of the Internal UP/DOWN Counter

\*1. If Pr.40=6, 7, 11, or 19, the counter output is used to determine the output frequency.

\*2. If Pr.40=7 or 19, Data in Pr.00 will preload into the counter when Power On or after Reset.

\*3. If Pr.40=19, after Up/Down execution, the content of counter will write into Pr.00 automatically.

\*4. These signals come from Digital Input(DIx) terminal. Refer to Sec.8 for detail description .



UP/DOWN COUNTER OPERATION EXAMPLE

7.2.8 **Pr.40 = 8** , Similar to mode 3, with **Preload from Pr.00** (and **Auto Write to Pr.00,V4.69~**)

This function is similar to Pr.40=3, with only two differences :

- When Power On or after Reset, the data in Pr.00 will preload into set frequency buffer.
- For CPU version V4.69~, when using LOCAL panel, the buffer value will write back into Pr.00 automatically.

7.2.9 **Pr.40 = 9** , Similar to mode 4, with **minimum running speed**

In this mode , the voltage signal fed into AI1 terminal will be used to determine the output frequency of the inverter while running.

The direction of the output phase sequence is determined by the input signal level.

If the input signal is positive maximum level, the set frequency is equal to Pr.15(UPPER LIMIT)

in forward direction; and if the input signal is most negative(or zero, depend on JP1), the set frequency is equal to Pr.15 in reverse direction.

While the desired output frequency is lower than Pr.16(LOWER LIMIT), the actual output frequency will maintain at the lower frequency limit .

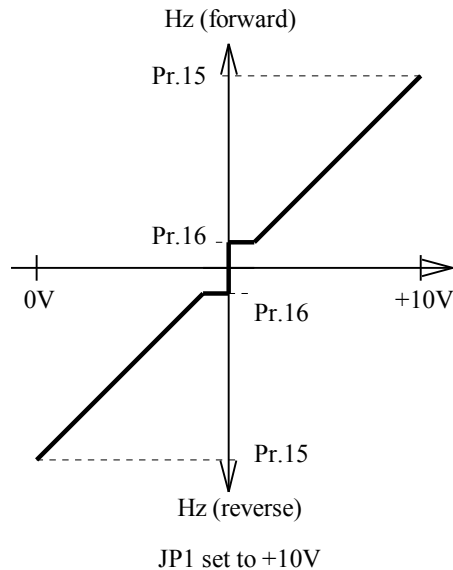
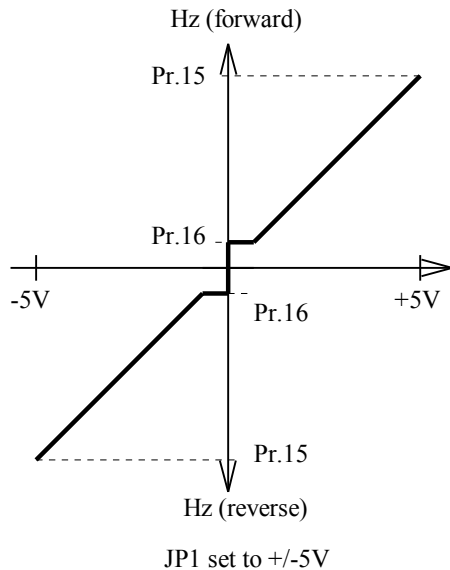
**Note : Set jumper JP1 to match with the input voltage range.**

**If set to +10V position, input range is 0V ~ +10V.**

**If set to +/-5V position, input range is -5V ~ +5V. (Default)**

**If necessary, use Pr.89 and Pr.90 to modify the input range .**





#### 7.2.10 Pr.40 = 10, Similar to mode 5, with **minimum running speed**

In this mode, the voltage signal fed into AI2 terminal will be used to determine the output frequency of the inverter while running.

The direction of the output phase sequence is determined by the input signal level.

If the input signal is positive maximum level, the set frequency is equal to Pr.15 (UPPER LIMIT)

in forward direction; and if the input signal is zero, the set frequency is equal to Pr.15 in reverse direction.

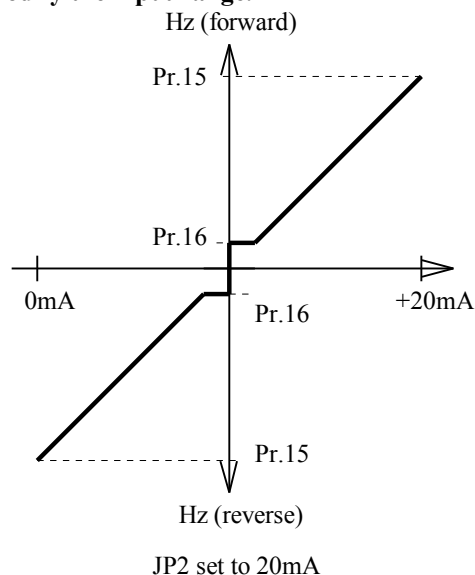
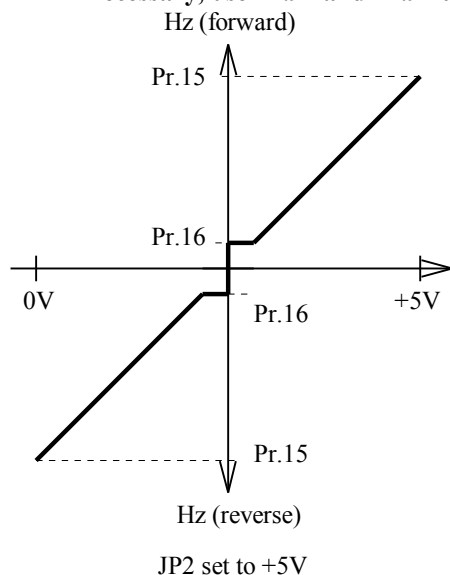
While the desired output frequency is lower than Pr.16 (LOWER LIMIT), the actual output frequency will maintain at the lower frequency limit.

**Note: Set jumper JP2 to match with the input signal type and range.**

**If set to +5V position, input signal type and range is 0V ~ +5V.(Default)**

**If set to 20mA position, input signal type and range is 0mA ~ 20mA.**

**If necessary, use Pr.91 and Pr.92 to modify the input range.**



#### 7.2.11 Pr.40 = 11, Similar to mode 6, with **minimum running speed(V4.67~)**

This function is very similar to mode-6, except :

After Up/Down execution, the minimum frequency will only go Down to Pr.16(Lower Limit).

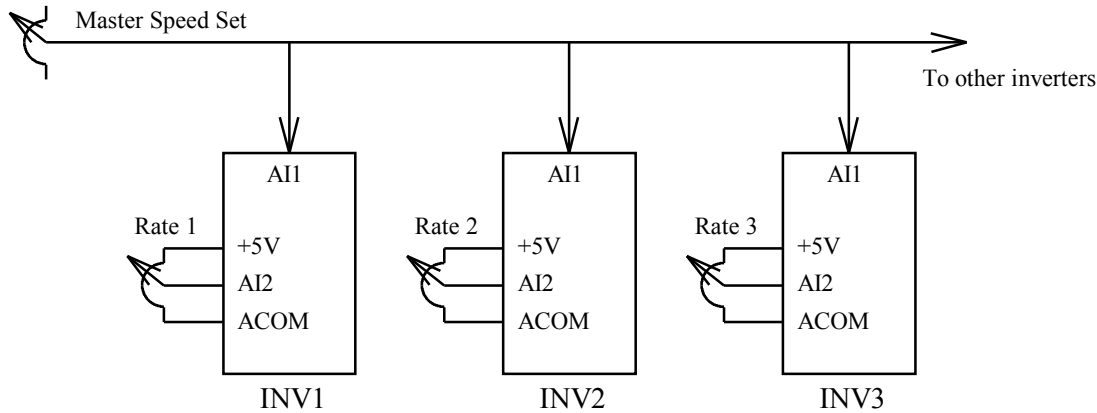
#### 7.2.12 Pr.40 = 12, Speed input is the combination of AI1 \* AI2(V4.68~)

In this mode, the desired set frequency is the combination of AI1 and AI2.

Analog signal from AI1 is selected to be the master set frequency; and signal from AI2 is the proportional rate input.

When signal level of AI2 is maximum, the rate equal 100%; if AI2 is minimum, the rate is 0%.

Typical application is as follows :



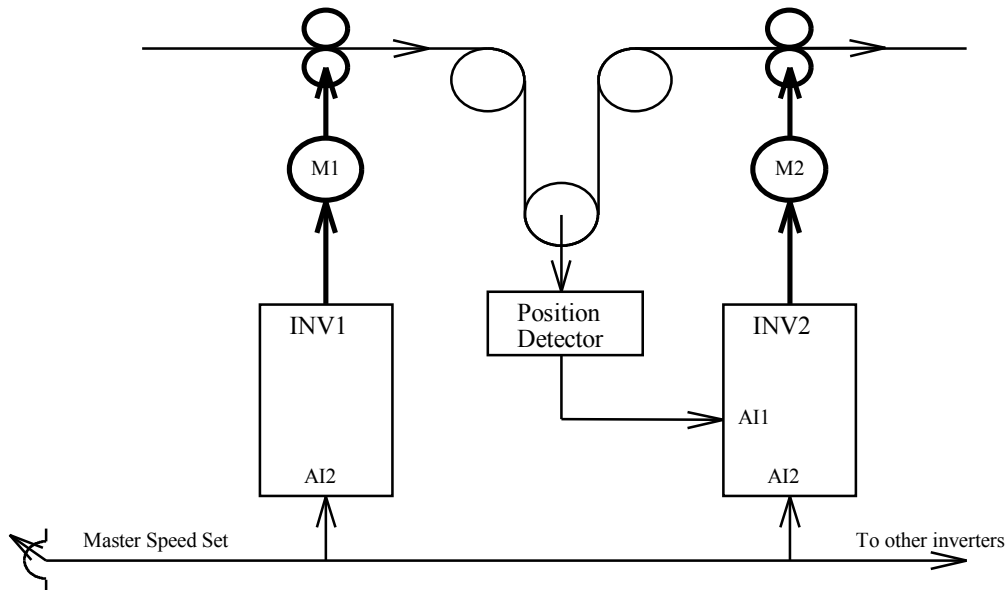
7.2.13 **Pr.40 = 13**, Speed input is the combination of **AI2 + AI1(V4.68~)**

In this mode, the desired set frequency is the combination of AI1 and AI2.

Analog signal from **AI2 is selected to be the major set frequency**; and signal from **AI1 is the auxiliary input**.

Set JP1 at +/-5V position, if the signal level of AI1 is positive, then the output frequency will increase accordingly; and if AI1 is negative, then the output frequency will decrease.

Typical application is as follows:



7.2.14 Pr.40 = 14, **Reserved** for factory use

7.2.15 Pr.40 = 15, **Reserved** for factory use

7.2.16 Pr.40 = 16, **Reserved** for factory use

7.2.17 **Pr.40 = 17**, Similar to mode 1, with **minimum running speed(V4.77~)**

In this mode, the voltage signal fed into AI1 terminal will be used to determine the output frequency of the inverter while running.

The direction of the output phase sequence must be determined by control command.

If the input signal reaches maximum level, the set frequency is equal to Pr.15 (UPPER LIMIT).

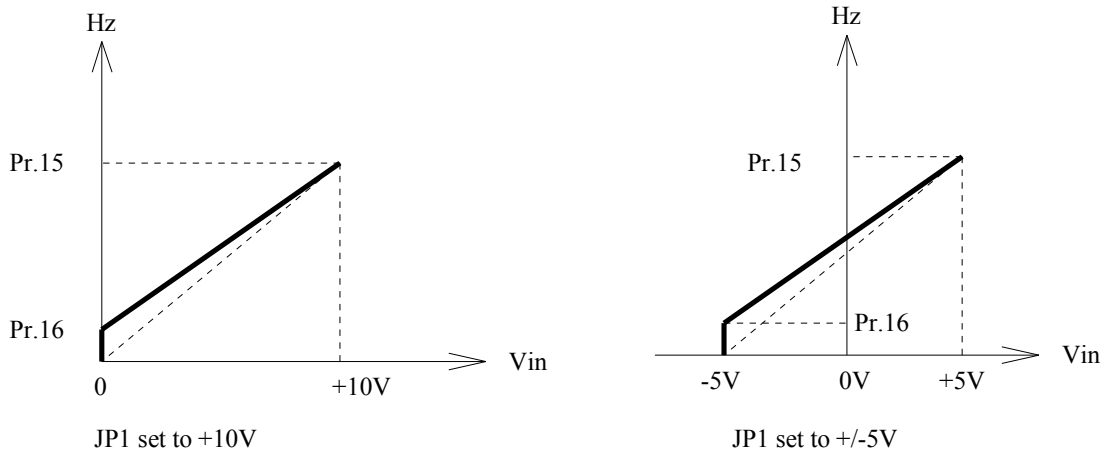
While the desired output frequency is lower than Pr.16 (LOWER LIMIT), the actual output frequency will maintain at the lower frequency limit.

**Note: Set jumper JP1 to match with the input voltage range.**

**If set to +10V position, input range is 0V ~ +10V.**

**If set to +/-5V position, input range is -5V ~ +5V. (Default)**

**If necessary, use Pr.89 and Pr.90 to modify the input range.**



**7.2.18 Pr.40 = 18, Similar to mode 2, with minimum running speed(V4.77~)**

In this mode, the voltage signal fed into AI2 terminal will be used to determine the output frequency of the inverter while running.

The direction of the output phase sequence must be determined by control command.

If the input signal reaches maximum level, the set frequency is equal to Pr.15 (UPPER LIMIT).

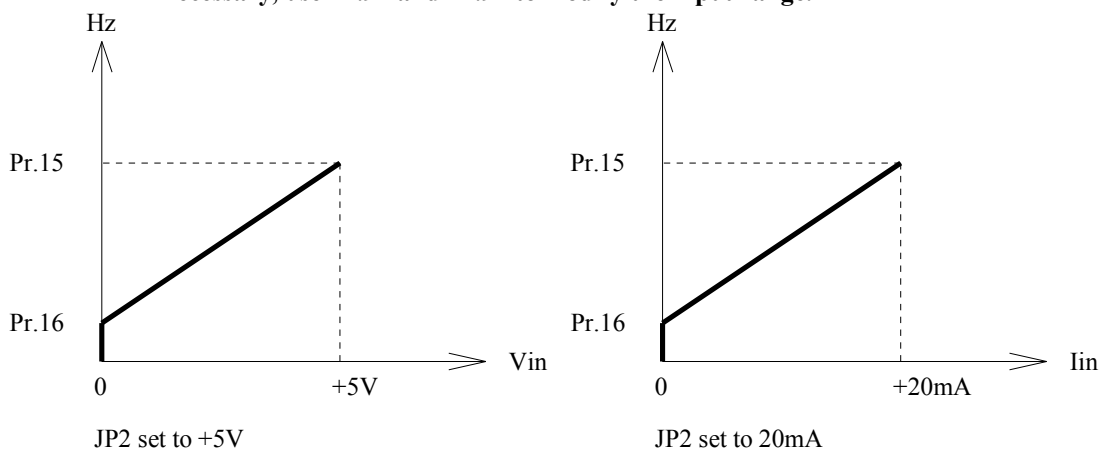
While the desired output frequency is lower than Pr.16 (LOWER LIMIT), the actual output frequency will maintain at the lower frequency limit.

**Note: Set jumper JP2 to match with the input signal type and range.**

**If set to +5V position, input signal type and range is 0V ~ +5V.(Default)**

**If set to 20mA position, input signal type and range is 0mA ~ 20mA.**

**If necessary, use Pr.91 and Pr.92 to modify the input range.**



**7.2.19 Pr.40 = 19, Similar to mode 11, with Preload and Auto Write(V4.77~)**

Refer to Sec.7.2.6, Sec.7.2.7.

**Note:** Using this mode, the Computer Control function will be affected.

**7.2.20 Pr.40 = 20, Similar to mode 18, with Reverse Slope(V4.80~)**

In this mode, the voltage signal fed into AI2 terminal will be used to determine the output frequency of the inverter while running.

The direction of the output phase sequence must be determined by control command.

If the input signal reaches maximum level, the set frequency is equal to Pr.16 (LOWER LIMIT).

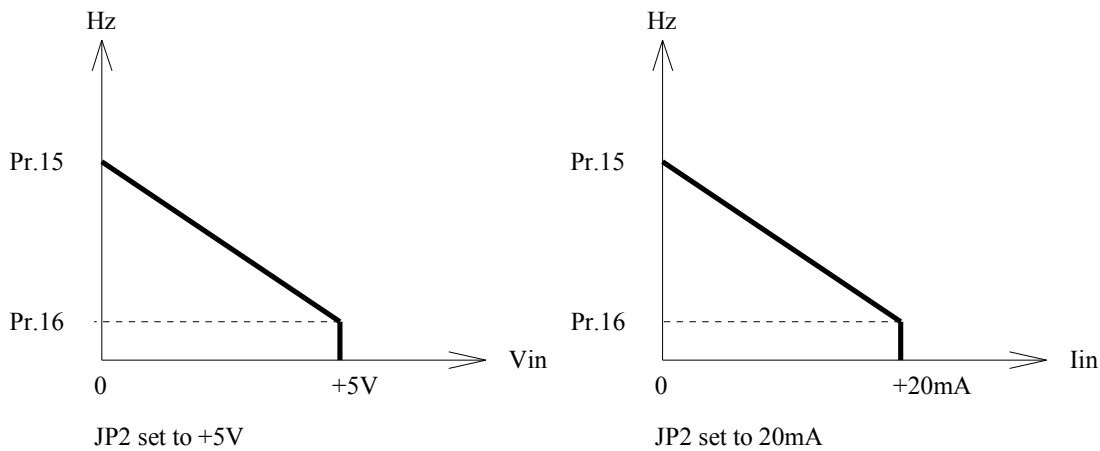
If the input signal is zero, the set frequency is equal to Pr.15 (UPPER LIMIT).

**Note: Set jumper JP2 to match with the input signal type and range.**

**If set to +5V position, input signal type and range is 0V ~ +5V.(Default)**

**If set to 20mA position, input signal type and range is 0mA ~ 20mA.**

**If necessary, use Pr.91 and Pr.92 to modify the input range.**



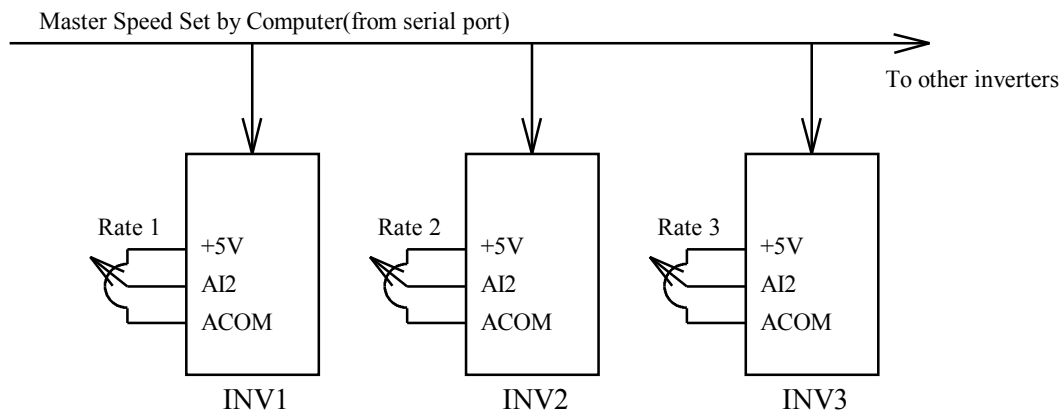
#### 7.2.21 Pr.40=21(V4.87~), Set frequency = Panel set frequency \* AI2

This mode is similar to mode-3.

However, the output frequency will be modified by the input signal from AI2.

AI2 is treated as percentage input. +5V is 100%, and 0V equal to 0%.

This function is useful when multiple inverters are controlled by master computer.



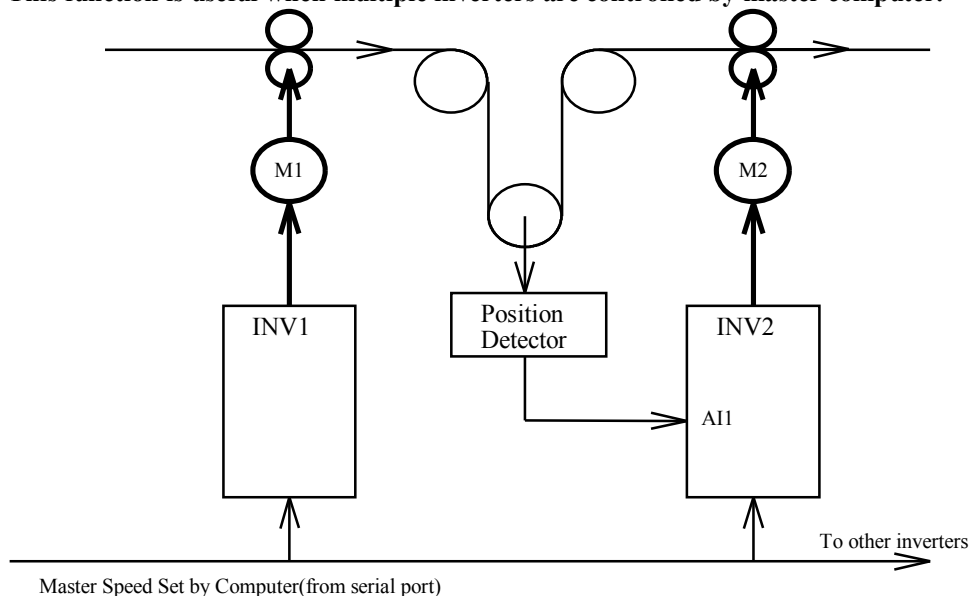
#### 7.2.22 Pr.40=22(V4.87~), Set frequency = Panel set frequency + AI1

This mode is similar to mode-3.

However, the output frequency will be modified by the input signal from AI1.

Set JP1 to +/-5V position. If AI1 > 0, the ourput frequency will increase; and if AI1 < 0, the output frequency will decrease.

This function is useful when multiple inverters are controlled by master computer.



## 8. Selection of Digital input function

The terminals **DI1**, **DI2**, **DI3**, & **DI4** are **multi-functioned Digital Input** terminals.

【Note】 All the DIx terminals are scanned once every 2.5ms.

These four terminals are exactly identical in its hardware/software configurations.

When left open, they are **inactive**, and will become **active** when connected to **DCOM**.

Each input terminal can be configured individually by corresponding DIx\_SELECT parameters.

The four DIx\_SELECT parameters are :

**Pr.41 -- DI1\_SELECT, used for DI1**

**Pr.42 -- DI2\_SELECT, used for DI2**

**Pr.43 -- DI3\_SELECT, used for DI3**

**Pr.44 -- DI4\_SELECT, used for DI4**

Any digital input can select one of the following special functions individually.

Pr.41,42,43,44	FUNCTION	COMMENT
0	NULL	NO FUNCTION
1	EMS	EMERGENCY STOP
2	SPD3	SPEED SET
3	SPD2	SPEED SET
4	SPD1	SPEED SET
5	JOG	JOG SPEED SET
6	OH	OVER HEAT ERROR, (if input closed)
7	TMIA	TIMER INPUT TYPE A
8	ON_BB	BASE BLOCK if DIx is ON
9	FJR	FORWARD JOG RUN
10	RJR	REVERSE JOG RUN
11	TMIB	TIMER INPUT TYPE B
12	SAVE	SAVE ENERGY
13	UP(fix rate)	INCREASE UP/DOWN COUNTER(fix rate)
14	DOWN(fix rate)	DECREASE UP/ DOWN COUNTER(fix rate)
15	U/D CLEAR	CLEAR UP/DOWN COUNTER
16	U/D LOAD	LOAD Pr.15 to UP/DOWN COUNTER
17	U/D HOLD	HOLD "Output HZ" to UP/DOWN COUNTER
18	OFF_BB	BASE BLOCK if DIx is OFF
19	UP	INCREASE UP/DOWN COUNTER
20	DOWN	DECREASE UP/DOWN COUNTER
21	ALARM CLEAR	CLEAR ALARM WHEN ALARM OCCUR
22	SET1(FF1)	SET input of Flip/Flop-1
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 FF1 & FF2
27	CLR(FF1&FF2)	CLEAR input to both FF1& FF2
28	CLK Input	Input CLOCK to Timer/Counter Block
29	Reserve	
30	/OH	OVER HEAT ERROR, (if input open)
31	Normal/Auto SW	Change Over Switch for Normal or Auto Run

### 8.0 DIx\_Select = 0, NULL function

The input terminal is disabled into **inactive** state when select NULL function.

### 8.1 DIx\_Select = 1, EMS Emergency Stop function(Refer to Section 5.4, Pr.05~Pr.08)

While inverter running, if the input terminal is active, then inverter will start delivering DC voltage instead of AC voltage to motor. The DC voltage level is assigned by Pr.06, and will remain a period of time determined by Pr.07.

8.2 **DIx\_Select = 2, SPD3** (Also refer to Section 12)

8.3 **DIx\_Select = 3, SPD2**

8.4 **DIx\_Select = 4, SPD1**

8.5 **DIx\_Select = 5, JOG**

In addition to Pr.00 Main\_Speed\_Set, there are other four presettable speeds: JOG Speed, SPD1, SPD2, and SPD3.

The following table list the corresponding parameters:

PARAMETER	FUNCTION	COMMENT
Pr.00	MAIN SPD SET	Main preset speed
Pr.01	MAIN SPD ACC	ACC rate for Main speed
Pr.02	MAIN SPD DEC	DEC rate for Main speed
Pr.19	JOG FREQUENCY	Desired JOG Frequency
Pr.20	JOG ACC/DEC TIME	ACC/DEC rate when select JOG
Pr.21	SPD1 FREQUENCY	Desire SPD1 Frequency
Pr.22	SPD1 ACC TIME	ACC rate when select SPD1
Pr.23	SPD1 DEC TIME	DEC rate when select SPD1
Pr.24	SPD2 FREQUENCY	Desire SPD2 Frequency
Pr.25	SPD2 ACC TIME	ACC rate when select SPD2
Pr.26	SPD2 DEC TIME	DEC rate when select SPD2
Pr.27	SPD3 FREQUENCY	Desire SPD3 Frequency
Pr.28	SPD3 ACC TIME	ACC rate when select SPD3
Pr.29	SPD3 DEC TIME	DEC rate when select SPD3

While using REMOTE PANEL, it is possible to JOG-RUN the inverter through the "JOG", "FWD" & "REV" keys. When applications use only LOCAL PANEL & Terminals to control the inverter, only multi-function inputs DIx may serve the JOG function.

**The priority level for multi-speed operation is:**

**JOG > SPD1 > SPD2 > SPD3 > NORMAL\_SPEED\_REQUEST.**

**NORMAL\_SPEED\_REQUEST** stands for the speed set from Pr.00, or Panel, or UP/DOWN counter, or AIx, according to the user's selection defined in Pr.40 .

Normally the JOG, SPD1, SPD2, & SPD3 functions must be combined with RUN Command.

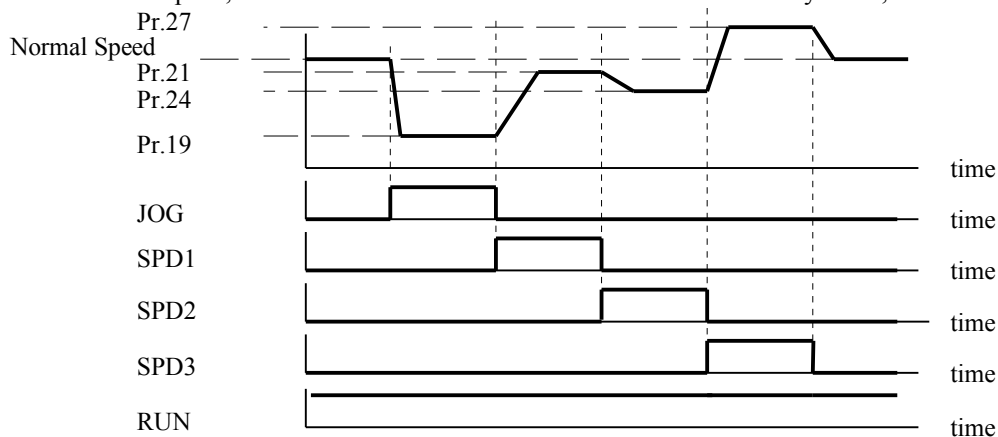
Refer to DIx mode 9 and 10, for JOG run without RUN command.

When inverter selects JOG speed, the acceleration and deceleration rate is determined by Pr.20 .

When inverter selects SPD1 speed, the acceleration and deceleration rate is determined by Pr.22,23 .

When inverter selects SPD2 speed, the acceleration and deceleration rate is determined by Pr.25,26 .

When inverter selects SPD3 speed, the acceleration and deceleration rate is determined by Pr.28,29 .

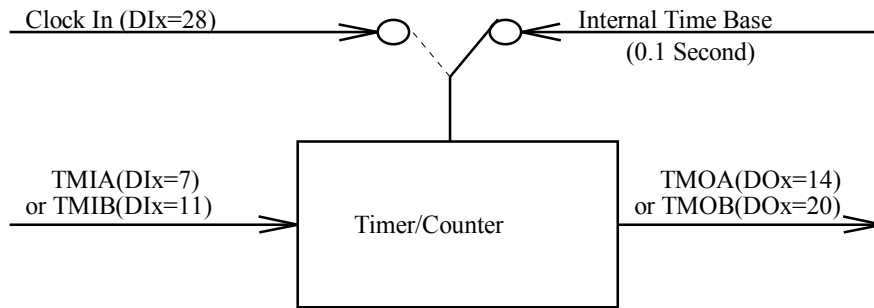


8.6 **DIx\_Select = 6, OH(Over Heat) function** ( Also refer to Section 8.30 )

When the input terminal is activated, the inverter will disable the output transistors, and show **OH** alarm message on the display.

Refer to mode-30, for complementary function.

### 8.7 DIx\_Select = 7, TMIA



Functional block diagram of Timer/Counter module

**Note:** When any of the four DIx digital inputs select mode-28, the Timer/Counter Module will be configured as Counter Module. Otherwise, it is configured as Timer Module.

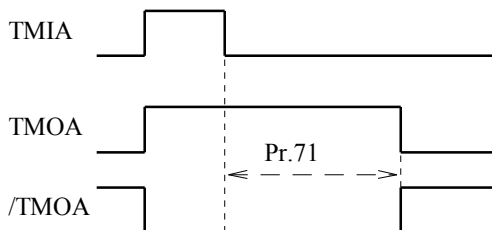
When configured as a Timer, the Internal 0.1 Second time base signal is selected to be the clock input of the Timer/Counter Module.

If configured as a Counter, the DIx terminal which was assigned to mode-28 will become the clock input of the Timer/Counter Module.

When digital input DIx is assigned to TMIA function, it serves as **Input of the OFF-DELAY** timer. User must assign a digital output DOx, which select TMOA function to serve as the output of this timer. And the **timer time** will be defined in Pr.71.

When the **timer input TMIA** is active, the **timer output TMOA** will be active immediately.

If the TMIA become inactive, the timer will start counting time. After waiting the specified time period of Pr.71, then the TMOA become inactive too.



After V4.33, the timer block is modified to "Timer/Counter Block".

If counter function is desired, just select any digital input( DIx) to serve as the clock input terminal, and let the corresponding parameter(DIx\_Select) set to 28.

**Note :**

**The maximum clock input rate is 100Hz.**

**There is only one internal Timer/Counter Block, you can use only one Timer/Counter, either TYPE A or TYPE B.**

**Output function /TMOA is available after V4.90~.**

### 8.8 DIx\_Select = 8, ON-BB

When any DIx selecting this function, activate the input DIx will **BLOCK the BASE** signal to all transistors immediately in order to disable the inverter output. When the input is inactive again, the inverter will execute **Speed Search process**.

Refer to Sec.11, the special function for **Speed Search process**.

Also Refer to Sec.8.18 for complement function.

### 8.9 DIx\_Select = 9, FJR

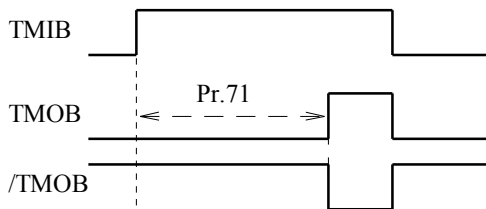
When selected DIx is active, it will force the inverter execute **Forward-Jog-Run** without RUN Command.

### 8.10 DIx\_Select = 10, RJR

When selected DIx is active, it will force the inverter execute **Reverse-Jog-Run** without RUN Command.

### 8.11 DIx\_Select = 11, TMIB

Refer to the **Functional block diagram of Timer/Counter module** in Sec.8.7 .



When digital input DIx is assigned to **TMIB** function, it serves as **Input of the ON-DELAY timer**. User must assign a digital output DOx, which select **TMOB** function to serve as the output of this timer. And the **timer time** will be defined in Pr.71.

When the **timer input TMIB is inactive**, the **timer output TMOB will be inactive too**.

Until the input TMIB is active and **continue active for a specified time period of Pr.71**, then the TMOB will become active.

Output function /TMOB is available after V4.90~

### 8.12 DIx\_Select = 12, SAVE-ENERGY

When any input select this function, the output voltage of inverter will decrease 20% when the input is active.

It is useful when the load condition is light, decreasing the output voltage will **increase the Power Factor and efficiency**.

### 8.13 DIx\_Select = 13, UP the content of UP/DOWN COUNTER

### 8.14 DIx\_Select = 14, DOWN the content of UP/DOWN COUNTER

### 8.15 DIx\_Select = 15, CLEAR the content of UP/DOWN COUNTER

### 8.16 DIx\_Select = 16, LOAD the content of UP/DOWN COUNTER

### 8.17 DIx\_Select = 17, HOLD output HZ to UP/DOWN COUNTER

Refer to **Sec.7.6 Functional Block Diagram of Internal UP/DOWN counter**.

Note: These digital function may be selected as the input terminals when Pr.40=6, 7, 11, and 19, using the content of the UP/DOWN counter as the **NORMAL\_SPEED\_REQUEST**.

When activate the DIx terminal, which is assigned as UP function (mode-13), the content of the internal UP/DOWN COUNTER will increase at 4.00Hz/Second rate. Let the DIx inactive again will stop the UP function.

When activate the DIx terminal, which is assigned as DOWN function (mode-14), the content of the internal UP/DOWN COUNTER will decrease at 4.00Hz/Second rate. Let the DIx inactive again will stop the DOWN function.

Once activating the DIx terminal which is assigned as CLEAR function, the content of the internal UP/DOWN COUNTER will be cleared to zero immediately.

Once activating the DIx terminal which is assigned as LOAD function, the content of the internal UP/DOWN COUNTER will be set to the value of Pr.15 (Upper Limit).

**Once activating the DIx terminal which is assigned as HOLD function, the value of present output frequency will be loaded to the internal UP/DOWN COUNTER.**

### 8.18 DIx\_Select = 18, OFF-BB

When any DIx selecting this function, the input terminal must remain in activate state for normal operation. If the input terminal is left open to inactive state, it will **BLOCK the BASE** signal to all transistors immediately in order to disable the inverter output. When the input is active again, the inverter will execute **Speed Search process**.

Refer to Sec.11, the special function for **Speed Search process**.

Also Refer to Sec.8.8 for complement function.

### 8.19 DIx\_Select = 19, UP (V4.22~)

**This function is similar to mode 13. However, the acceleration and deceleration rate will follow the time specified in Pr.01 and Pr.02 respectively.**

### 8.20 DIx\_Select = 20, DOWN (V4.22~)

**This function is similar to mode 13. However, the acceleration and deceleration rate will follow the time specified in Pr.01 and Pr.02 respectively.**

### 8.21 DIx\_Select = 21, ALARM CLEAR (V4.18~)

If user choose this function, then activate the DIx terminal will reset the inverter only when alarm had occurred.

Note: The **RST terminal** is used to **RESET** the whole inverter no matter alarm occurred or not.



- 8.22 **DIx\_Select = 22, SET Flip/Flop-1(V4.29~)**  
 8.23 **DIx\_Select = 23, CLEAR Flip/Flop-1(V4.29~)**  
 8.24 **DIx\_Select = 24, SET Flip/Flop-2(V4.29~)**  
 8.25 **DIx\_Select = 25, CLEAR Flip/Flop-2(V4.29~)**

Two general purpose Flip/Flops were built in for many applications in order to minimize the necessary external components. Each Flip/Flop block has two SET inputs, two CLEAR inputs and two complementary outputs for free selection.

For example, Let DI1\_Select(Pr.41) = 22 , select DI1 to be the SET input of FF1

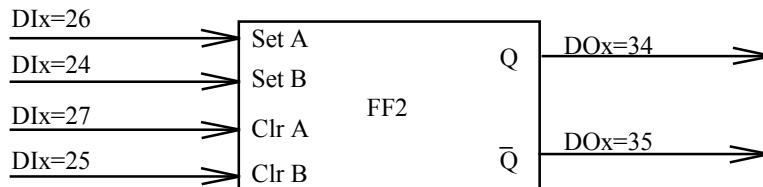
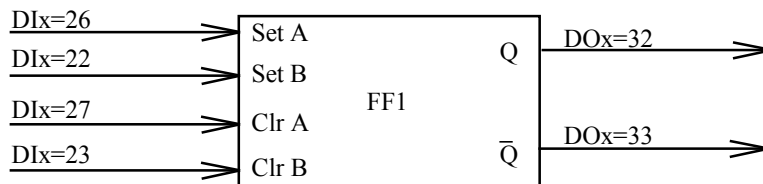
DI2\_Select(Pr.42) = 23 , select DI2 to be the CLEAR input of FF1

DO1\_Select(Pr.45)=32 , select DO1 to be the output Q of FF1

then, **the combination of inputs DI1,DI2 and output DO1 will serve as a Latch Relay.**

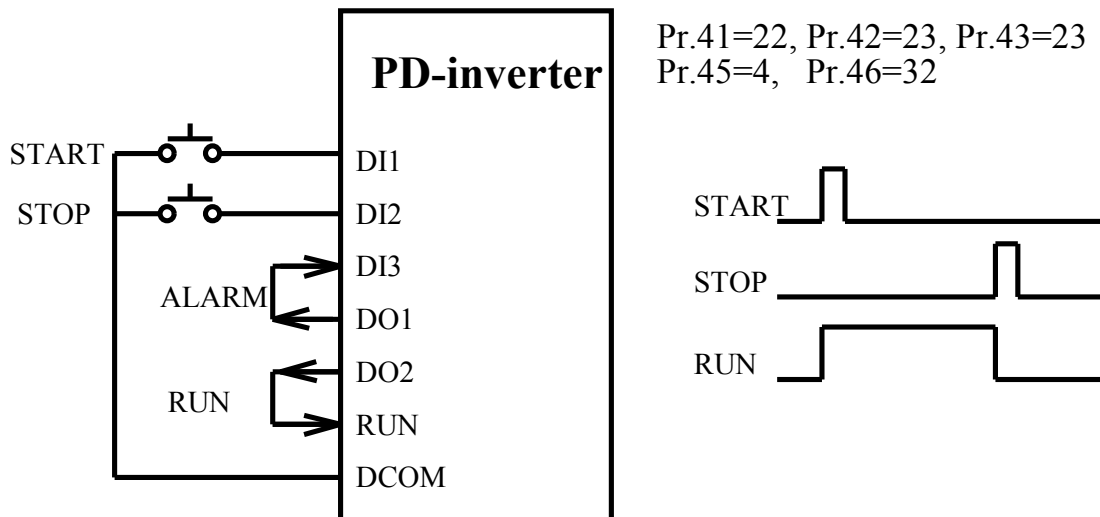
Momentary active signal apply to DI1 will cause DO1 enter active state. On the contrary, active signal apply to DI2 will cause DO1 back to inactive state again.

**Note : Multiple assignment to the same input function is acceptable.**



Functional Block diagram of Internal Flip/Flop Modules

Application example : Use **DI1, DI2, DO1** as a **LATCH RELAY**.



- 8.26 **DIx\_Select = 26, SET both Flip/Flop-1& Flip/Flop-2 (V4.29~)**

- 8.27 **DIx\_Select = 27, CLEAR both Flip/Flop-1 & Flip/Flop-2(V4.29~)**

Refer to the Functional Block diagram of internal Flip/Flop Modules in Sec.8.22.

If digital input function select is DIx\_select=26, then active input to DIx will SET both FF1 & FF2.

If digital input function select is DIx\_select=27, then active input to DIx will CLEAR both FF1 & FF2.

**8.28 DIx\_Select = 28, CLOCK input of Timer/Counter (V4.30~)**

**Refer to Sec.8.7, the Functional Block Diagram of the Internal Timer/Counter Module.**

**Note: When any of the four DIx terminals select this mode, the Timer/Counter Module will become Counter Module.**

If this function is used, the Counter Module will advance one count when the input status of DIx changes from inactive to active.

The maximum input clock rate is limited to 100 Transitions/Second .

**8.29 DIx\_Select = 29, NULL function**

**8.30 DIx\_Select = 30, /OH function (V4.77~)**

When any digital input terminal select this function, it must remain in **active state for normal operation**.

Else if the input is **inactive**, the inverter will disable the output transistors, and show **OH** alarm message on the display.

Refer to mode-6, for complementary function.

**8.31 DIx\_Select = 31, Normal/Auto Switch(V4.83~)**

Refer to Sec.12, the description of AUTO RUN Function.

Parameter Pr.72 determines the Auto Run Mode of the inverter.

This Digital Input function provides an easy way to change between Normal or Auto Run mode.

When the selected DIx input is inactive, then the inverter running mode is determined by Pr.72.

If the input is active, then it will force the inverter to run under Normal mode(equal to Pr.72=0).

**Note: a. If Pr.72=0, selects Normal Run Mode.**

**b. The status change of the DIx will be effective only when the inverter is stop.**

## **9. Selection of Digital output and Relay function**

The **DO1, DO2, RY1 and RY2** terminals are defined as multi-functional **DIGITAL OUTPUTS**.

The output circuit structure of **DO1 & DO2** are Transistor **OPEN COLLECTOR** outputs.

The **RY1 and RY2** pair terminals are **NORMAL OPEN(1a)** contacts of the output **RELAY** .

The parameters for configuring the digital outputs are :

**Pr.45 -- DO1\_SELECT, used for DO1 output function select**

**Pr.46 -- DO2\_SELECT, used for DO2 output function select**

**Pr.47 -- RELAY\_SELECT, used for Relay output function select**

Each of the three digital outputs may select any of the following output functions:

Pr.45,46,47	FUNCTION	COMMENT
0	NULL	NO FUNCTION
1	NOT RUN	NOT RUNNING
2	SPE	SPEED EQUAL
3	SPNE	SPEED NOT EQUAL
4	ALM	ALARM
5	NALM	NO ALARM
6	BRAKING	UNDER BRAKING
7	RUNNING	UNDER RUNNING
8	SPO	SPEED OVER
9	SPNO	SPEED NOT OVER
10	SPA	SPEED ARRIVE
11	SPNA	SPEED NOT ARRIVE
12	DIR	OUTPUT DIRECTION
13	COD	CURRENT OVER DETECT
14	TMOA	TIMER OUTPUT TYPE A
15	SPZ	ZERO SPEED
16	SPNZ	NOT ZERO SPEED
17	STALLING	OUTPUT WHILE STALLING
18	SLOW ACC	ACC TIME EXTENSION
19	SLOW DEC	DEC TIME EXTENSION
20	TMOB	TIMER OUTPUT TYPE B
21	STEP1	AUTO RUNNING AT STEP 1
22	STEP2	AUTO RUNNING AT STEP 2
23	STEP3	AUTO RUNNING AT STEP 3
24	STEP4	AUTO RUNNING AT STEP 4
25	STEP5	AUTO RUNNING AT STEP 5
26	STEP6	AUTO RUNNING AT STEP 6
27	STEP7	AUTO RUNNING AT STEP 7
28	STEP8	AUTO RUNNING AT STEP 8
29	STEP9	AUTO RUNNING AT STEP 9
30	STEP10	AUTO RUNNING AT STEP 10
31	RESERVE	
32	Q1(FF1)	Output of Flip/Flop-1
33	/Q1(FF1)	Complement Output of FF1
34	Q2(FF2)	Output of Flip/Flop-2
35	/Q2(FF2)	Complement Output of FF2
36	RESERVE	
Pr.45,46,47	FUNCTION	COMMENT
37	RESERVE	
38	Output ON	The Output terminal always ON
39	Clock Output	Clock rate is 10 times output Hz
40	/TMOA	Complement of TMOA
41	/TMOB	Complement of TMOB

**Note:** When power on, or the inverter will executing INITIALIZE function, all of the outputs will go inactive for a short period of time about 1 second.

## 9.0 NULL function

The output status of DOx will always under **inactive state** when selecting this mode.

This function is complement function of **Always ON** function. Refer to Sec.9.38.

This function is useful when the inverter is controlled by a master computer. The master computer can control these digital outputs for other peripheral, independent to the inverter operation.

## 9.1 NOT RUNNING function (complement of Sec.9.7)

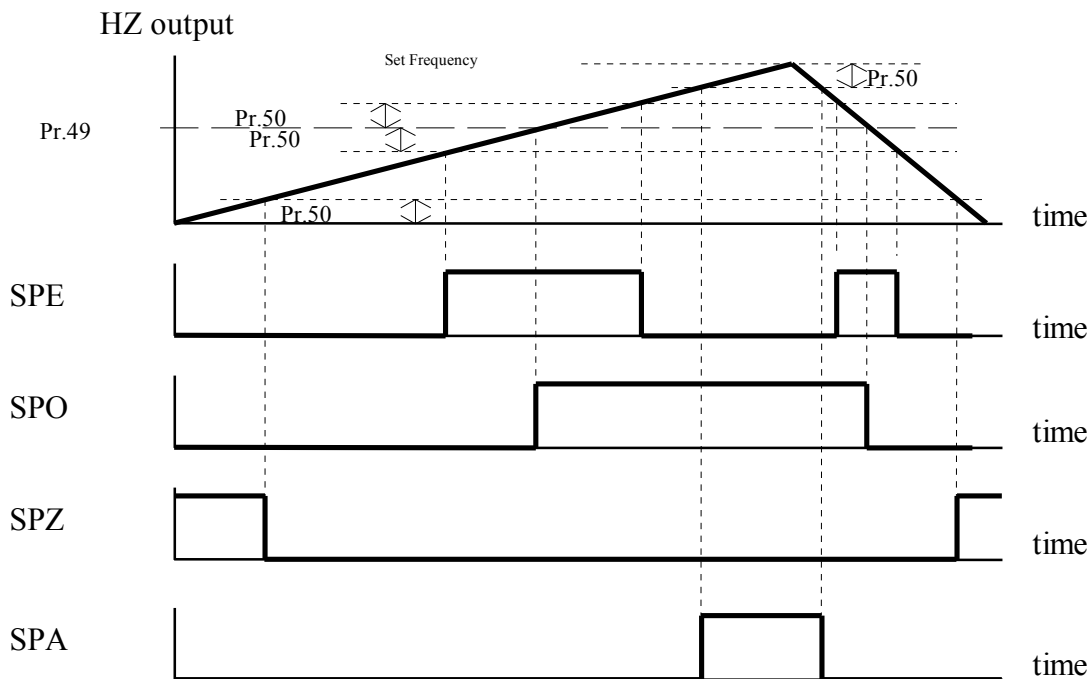
The output status of DOx will be **active** when the inverter is under **standby** mode.

Inverter under standby mode means the output transistors are all OFF.

If the inverter start **running** or under **DC injection braking** mode, the output status will be **inactive**.

## 9.2 SPE Speed Equal function

## 9.3 SPNE Speed Not Equal function(complement of Sec.9.2)



The output status of DOx will be **active**, if the output frequency is **EQUAL** to the preset frequency defined in Pr.49 .

**Definition of EQUAL** means: Difference is within the allowable tolerance defined in Pr.50.

\* Relative functions are SPO, SPZ, and SPA.

## 9.4 ALARM output function (complement of Sec.9.5)

The output status of DOx is normally **inactive** when the inverter detects **no error**.

If **error occurs**, the output will be **active** immediately.

## 9.5 NOT ALARM output function (complement of Sec.9.4)

The output status of DOx is normally **active** when the inverter detects **no error**.

If **error occurs**, the output will be **inactive** immediately.

## 9.6 BRAKING function (Refer to Section 5.4, Pr.05~Pr.08)

The output status of DOx will be **active** when the inverter is under **DC injection braking** mode.

## 9.7 RUNNING function (Refer to Section 5.4, Pr.05~Pr.08)

The output status of DOx will be **inactive** when the inverter is under **standby** mode.

Inverter under standby mode means the output transistors are all OFF.

If the inverter start running or under DC injection braking mode, the output status will be **active**.

### 9.8 SPO Speed Over function (Refer to Section 9.2)

The output status of DOx will be **active**, if the absolute value of output frequency is **OVER** the preset frequency defined in Pr.49.

### 9.9 SPNO Speed Not Over function (complement of Sec.9.8)

### 9.10 SPA Speed Arrive function (Refer to Section 9.2)

The output status of DOx will be **active**, if the output frequency is **EQUAL** to the Set frequency.

**Definition of EQUAL means: Difference between output Hz and desired frequency is within the allowable tolerance defined in Pr.50.**

V4.89~, the SPA signal is always inactive if inverter is not running or is under DC injection braking.

On the contrary, the SPNA is always active if inverter is not running or is under DC injection braking.

### 9.11 SPNA Speed Not Arrive function (complement of Sec.9.10)

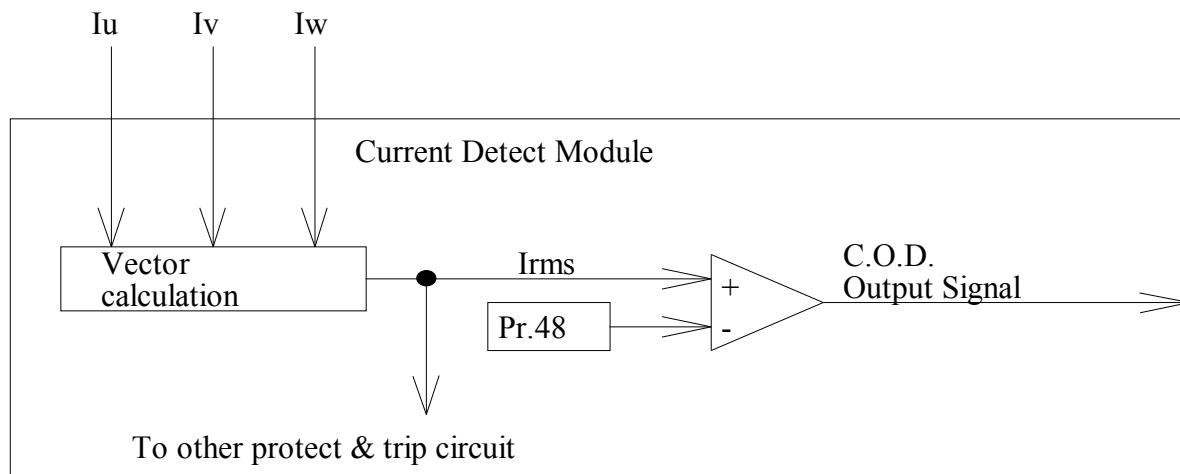
### 9.12 DIRECTION output function

The output status of DOx will be **active**, if the output frequency is in **forward** direction.

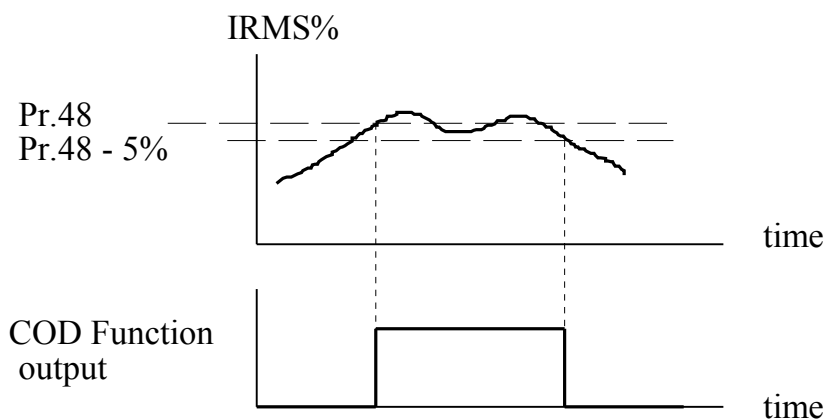
The output status of DOx will be **inactive**, if the output frequency is in **reverse** direction.

When inverter stop, the output status of DIx is **active**.

### 9.13 COD Current Over Detection function



Note :  $I_{rms} = \sqrt{I_u^2 + I_v^2 + I_w^2}$



The output status of DOx will be **active** when the output current is greater than the threshold value defined in Pr.48 . And it will **keep on active** until the output current falls under Pr.48-5% . The parameter **Pr.48** is expressed in % value of rated current.

### 9.14 TMOA Timer Output A-type function (Refer to Section 8.7)

Refer to the **functional block diagram of Timer/Counter module** in Sec.8.7 and the related descriptions.

### 9.15 SPZ Speed Zero function (Refer to Section 9.2)

The output status of DOx will be **active**, if the output frequency is **EQUAL** to Zero.

**Definition of EQUAL means: Difference is within the allowable tolerance defined in Pr.50.**

### 9.16 SPNZ Speed Not Zero function (complement of Sec.9.15)

### 9.17 STALLING function

While inverter running, if the output current exceeds hardware limit or the level specified in Pr.35, the output frequency will decrease automatically to reduce the output current. Inverter running under such condition is called Stalling, and output status DOx will be active to indicate this situation.

### 9.18 SLOW ACC, indication of executing Acceleration Extension

While acceleration, if the output current exceeds hardware limit or the level specified in Pr.35, the inverter will decrease the acceleration rate automatically. In the mean time, the output status DOx will be **active indicating the acceleration extension status**.

### 9.19 SLOW DEC, indication of executing Deceleration Extension

While deceleration, if the capacitor voltage is over 115%, the inverter will decrease the deceleration rate automatically. In the mean time, the output status DOx will be **active indicating the deceleration extension status**.

### 9.20 TMOB Timer Output B-type function(Refer to Section 8.7)

Refer to the **Functional block diagram of Timer/Counter module** in Sec.8.7 and the related descriptions in Sec.8.11.

### 9.21 STEP1 output indicating Auto running at step1(Refer to Section 12.2)

### 9.22 STEP2 output indicating Auto running at step2(Refer to Section 12.2)

### 9.23 STEP3 output indicating Auto running at step3(Refer to Section 12.2)

### 9.24 STEP4 output indicating Auto running at step4(Refer to Section 12.2)

### 9.25 STEP5 output indicating Auto running at step5(Refer to Section 12.2)

### 9.26 STEP6 output indicating Auto running at step6(Refer to Section 12.2)

### 9.27 STEP7 output indicating Auto running at step7(Refer to Section 12.2)

### 9.28 STEP8 output indicating Auto running at step8(Refer to Section 12.2)

### 9.29 STEP9 output indicating Auto running at step9(Refer to Section 12.2)

### 9.30 STEP10 output indicating Auto running at step10(Refer to Section 12.2)

### 9.31 Reserve

### 9.32 Q1 output of Flip/Flop-1(Refer to Section 8.22)

### 9.33 /Q1 output of Flip/Flop-1(Refer to Section 8.22)

### 9.34 Q2 output of Flip/Flop-2(Refer to Section 8.22)

### 9.35 /Q2 output of Flip/Flop-2(Refer to Section 8.22)

Outputs of internal Flip/Flops.

### 9.36 Reserve

### 9.37 Reserve

### 9.38 Always ON (V4.71~)

The output status of DOx will always under **active state** when selecting this mode.

This function is complement function of **NULL** function. Refer to Sec.9.0.

This function is useful when the inverter is controlled by a master computer. The master computer can control these digital outputs for other peripheral, independent to the inverter operation.

### 9.39 10X Hz Clock output (V4.88~)

When select this function, the output will become a digital clock signal output.

The clock rate is equal to output frequency multiply by 10.

【Note】 This function is available only for DO1.

### 9.40 /TMOA Complement function of TMOA (V4.90~)

Refer to 9.14.

### 9.41 /TMOB Complement function of TMOB (V4.90~)

Refer to 9.20.

# 10. Selection of Analog output function

This section describes the definition of analog output voltage between "AM" & "ACOM".  
Refer to Section-1.2.2 for the internal circuit structure.

Relative parameter

**Pr.37 -- AM\_SELECT**

**Pr.38 -- AM\_GAIN**

Auxiliary Analog Output Terminal "AM" is provided for analog meter display, or other applications requiring the analog output signal.

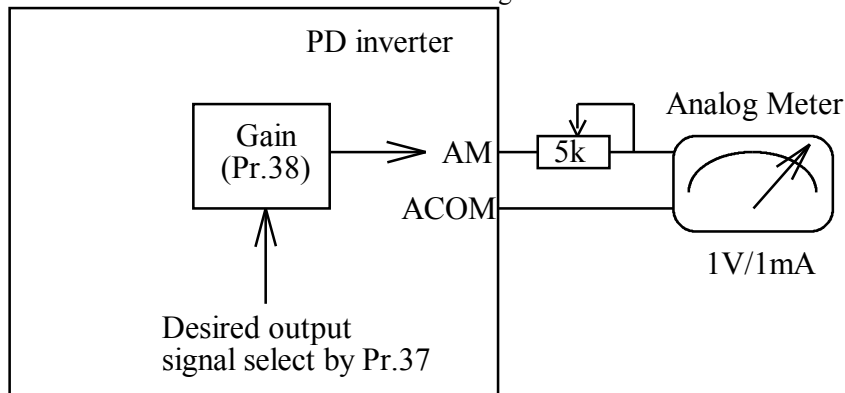
"AM\_SELECT" is used to select desired signal which will output to AM terminal.

"AM\_GAIN" is used to fine tuning the output voltage level.

User may select any of the four signals in the Table for output to the "AM" terminal.

Pr.37	AM Terminal Function	Output Ratio
0	HZ_Signal	Output Hz / ( Pr.15 )
1	IRMS_Signal	Output Irms / ( 2 * Pr.85 )
2	VDC_Signal	Vcap / 1000 V
3	VOUT_Signal	Vout / ( 2 * Pr.84 )
4	Reserve	
5	Internal UP/DOWN Counter(V4.82~)	Counter Value / (Pr.15)

Recommend interface circuit to external analog meter :



First use Pr.37 to select desired output signal.

And let Pr.38=250.

Then adjust variable resistor for trimming to correct position.

If necessary, modify Pr.38 for fine tuning.

Refer to Sec.1.2 for hardware structure.

# 11. Speed search and Base Block function

Pr.79 to Pr.82 are used to define the inverter's speed searching characteristics for restart process.

The Speed Search function may be initiated by two methods:

## 1. By Digital Input to initiate the speed search process

LET DIx\_SELECT=8, selects "Base Block" input function.

If terminal DIx is active, then the inverter will disable IGBT output causing the motor **FREE RUN** to stop.

When DIx inactive again, the inverter will still remain in the BLOCK state for a period of time defined in the parameter **BASE BLOCK TIME(Pr.36)**.

After the period of BASE BLOCK TIME, Then the restart process begins.

## 2. Power come back normal after UP/OP alarm to initiate the speed search process

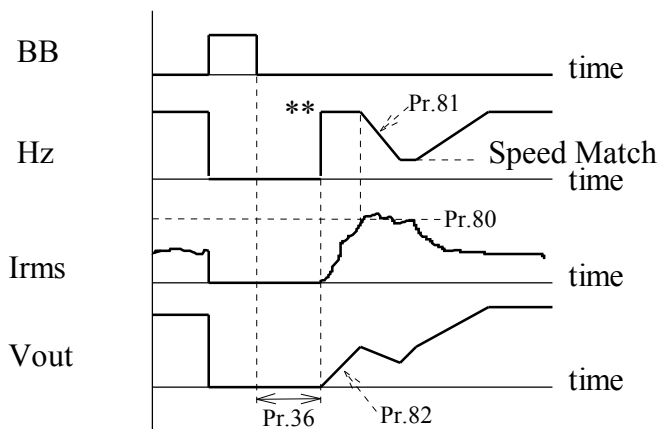
LET Pr.34 = 1, enables UP/OP restart function.

If "UP" or "OP" alarm appear while inverter running, Then the inverter will disable IGBT output causing the motor **FREE RUN**.

When Power come back to normal again, the inverter will still remain in the BLOCK state for a period of time defined in the parameter **BASE BLOCK TIME(Pr.36)**.

After the period of BASE BLOCK TIME, Then the restart process begins.

PARAMETER	FUNCTION	DESCRIPTION
Pr.79	RESTART TYPE	SELECT RESTART TYPE
Pr.80	RESTART STALL LEVEL	STALL LEVEL WHILE RESTARTING
Pr.81	RESTART DEC TIME	DEC TIME WHILE SPEED SEARCH
Pr.82	VOLTAGE RECOVER TIME	VOLTAGE INCREASING RATE WHILE RESTARTING



**\*\*Note: The search start frequency is selected by Pr.79 .**

**Pr.79=0: No restart speed search process. Inverter will start from Pr.04.**

**Pr.79=1: Speed search begins from previous running frequency.**

**Pr.79=2: Speed search begins from UPPER LIMIT frequency(Pr.15).**

**Pr.79=3: Speed search begins from SET SPEED.**

After BASE BLOCK TIME, the speed search process can be analyzed by the following steps :

STEP 1: **Send out a frequency Hz which is selected by Pr.79, and Let Vout is zero.**

STEP 2: **Maintain the initial frequency, and increase the output voltage Vout according to the rate defined by Pr.82 .**

**During this period, monitor the current until it reaches the level defined in Pr.81.**

STEP 3: **Decrease output frequency Hz and output voltage Vout. Wait until Irms is less than Pr.81, that means now the inverter output frequency matches the motor speed.**

STEP 4: **Now the inverter output frequency can start ramp to desired target frequency.**



# 12. AUTO RUN Function

## 12.1 AUTO MODE SELECTION & RUNNING

TABLE OF PARAMETERS USED FOR AUTO MODE.

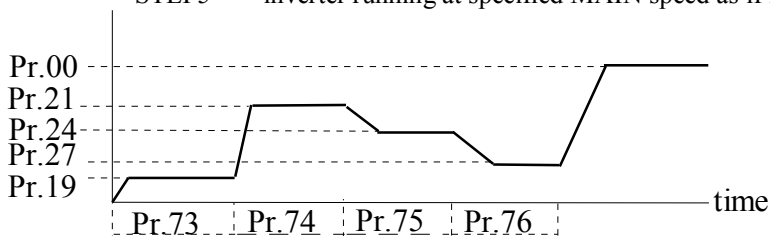
PARAMETER	FUNCTION
Pr.72	AUTO MODE SELECT
Pr.73	JOG PERIOD TIME
Pr.74	SPD1 PERIOD TIME
Pr.75	SPD2 PERIOD TIME
Pr.76	SPD3 PERIOD TIME
Pr.77	HALT PERIOD TIME

TABLE OF AUTO MODE FUNCTIONS

Pr.72	AUTO FUNCTION DESCRIPTION
0	NO AUTO FUNCTION
1	STEP RUN & MAINTAIN SPEED
2	STEP RUN , STOP & REPEAT
3	STEP RUN , STOP & CHANGE DIRECTION REPEAT
4	STEP RUN , & REPEAT
5	STEP RUN , & CHANGE DIRECTION REPEAT
6	SIMILAR TO MODE 4, BUT REPEAT FROM STEP2

### Pr.72 = 1 STEP RUN & MAINTAIN

- STEP1 inverter running as if JOG command is applied.  
time is determined by Pr.73(JOG\_PERIOD).
- STEP2 inverter running as if SPD1 command is applied.  
time is determined by Pr.74( SPD1\_PERIOD).
- STEP3 inverter running as if SPD2 command is applied.  
time is determined by Pr.75( SPD2\_PERIOD).
- STEP4 inverter running as if SPD3 command is applied.  
time is determined by Pr.76( SPD3\_PERIOD).
- STEP5 inverter running at specified MAIN speed as if it is in normal mode.

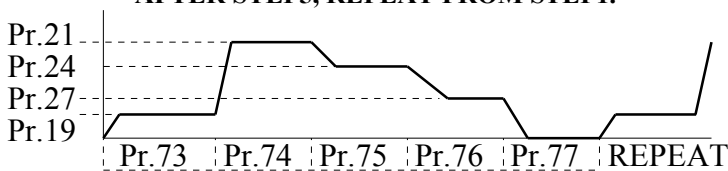


Example speed pattern of AUTO STEP RUN Type 1

### Pr.72 = 2 STEP RUN , STOP & REPEAT

- STEP1 inverter running as if JOG command is applied.  
time is determined by Pr.73(JOG\_PERIOD).
- STEP2 inverter running as if SPD1 command is applied.  
time is determined by Pr.74( SPD1\_PERIOD).
- STEP3 inverter running as if SPD2 command is applied.  
time is determined by Pr.75( SPD2\_PERIOD).
- STEP4 inverter running as if SPD3 command is applied.  
time is determined by Pr.76( SPD3\_PERIOD).
- STEP5 inverter running as if STOP command is applied.  
time is determined by Pr.77( HALT\_PERIOD).

#### AFTER STEPS, REPEAT FROM STEP1.



Example speed pattern of AUTO STEP RUN Type 2

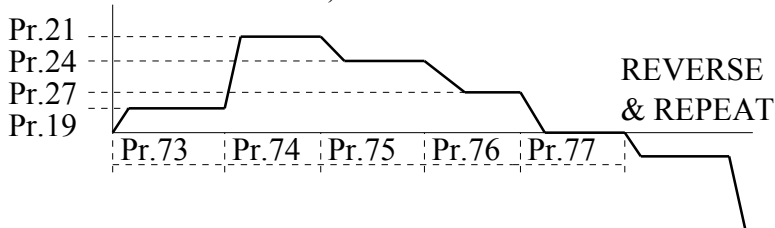
**Pr.72 = 3 STEP RUN , STOP & CHANGE DIRECTION REPEAT**

- STEP1 inverter running as if JOG command is applied.  
time is determined by Pr.73(JOG\_PERIOD).  
STEP2 inverter running as if SPD1 command is applied.  
time is determined by Pr.74( SPD1\_PERIOD).  
STEP3 inverter running as if SPD2 command is applied.  
time is determined by Pr.75( SPD2\_PERIOD).  
STEP4 inverter running as if SPD3 command is applied.  
time is determined by Pr.76( SPD3\_PERIOD).  
STEP5 inverter running as if STOP command is applied.  
time is determined by Pr.77( HALT\_PERIOD).

**AFTER STEP5, CHANGE DIRECTION**

- STEP6 inverter running as if JOG command is applied.  
time is determined by Pr.73(JOG\_PERIOD).  
STEP7 inverter running as if SPD1 command is applied.  
time is determined by Pr.74( SPD1\_PERIOD).  
STEP8 inverter running as if SPD2 command is applied.  
time is determined by Pr.75( SPD2\_PERIOD).  
STEP9 inverter running as if SPD3 command is applied.  
time is determined by Pr.76( SPD3\_PERIOD).  
STEP10 inverter running as if STOP command is applied.  
time is determined by Pr.77( HALT\_PERIOD).

**AFTER STEP10, REPEAT FROM STEP1.**



Example speed pattern of AUTO STEP RUN Type 3

**Pr.72 = 4 STEP RUN & REPEAT**

This mode is similar to mode2.

From STEP1 to STEP4, its operation is exactly the same as mode2.

Under STEP5 period, the inverter will run at MAIN speed instead of STOP command.

**AFTER STEP5, REPEAT FROM STEP1.**

**Pr.72 = 5 STEP RUN & CHANGE DIRECTION REPEAT**

This mode is similar to mode3.

From STEP1 to STEP4, its operation is exactly the same as mode3.

Under STEP5 period, the inverter will run at MAIN speed instead of STOP command.

From STEP6 to STEP9, its operation is exactly the same as mode3.

Under STEP10 period, the inverter will run at MAIN speed instead of STOP command.

**AFTER STEP10, REPEAT FROM STEP1.**

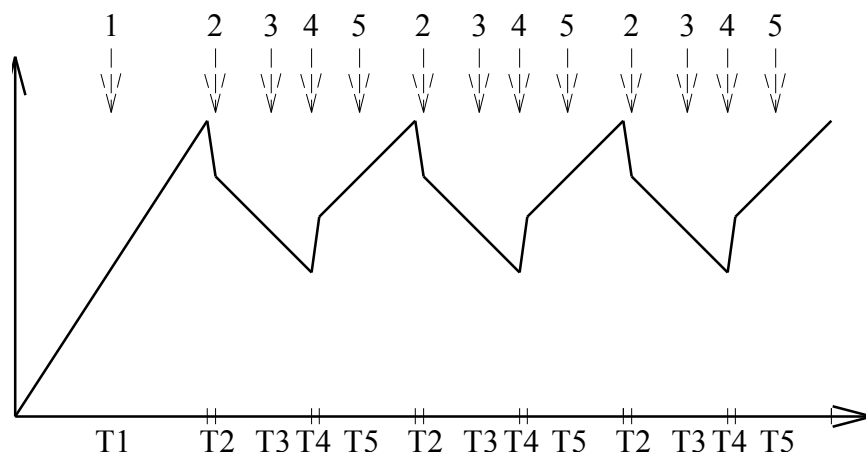
### Pr.72 = 6 STEP RUN & REPEAT from STEP-2 (V4.88~)

This mode is similar to mode4.

From STEP1 to STEP5, its operation is exactly the same as mode4.

**After STEP5, the procedure jump to STEP2 and repeat.**

**START : SETP1-->STEP2 ~-->STEP5-->STEP2 ~-->STEP5-->STEP2 ~-->STEP5.....**



## 12.2 AUTO STEP EQUAL OUTPUT

**During AUTO RUNNING, there are special DOx functions reserved for AUTO STEP EQUAL application.(Refer to Section 9.21~9.30)**

EXAMPLE:

If user wishes to activate the DOx outputs when inverter is auto running,

if LET DO1\_SELECT (Pr.45) = 22, select STEP2

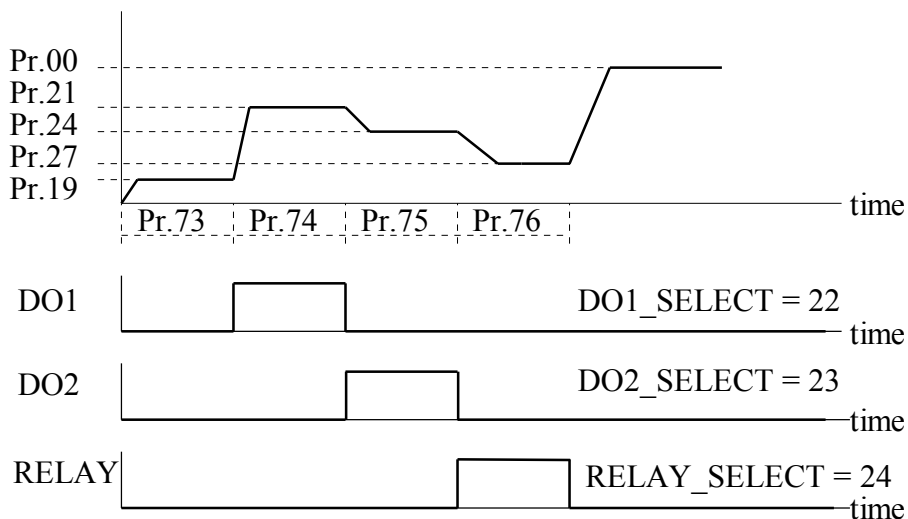
DO2\_SELECT (Pr.46) = 23, select STEP3

RELAY\_SELECT (Pr.47) = 24, select STEP4

THEN DO1 terminal will become active, while the inverter is running at STEP2

DO2 terminal will become active, while the inverter is running at STEP3

RELAY terminals will become active, while the inverter is running at STEP4



EXAMPLE Timing Relationship waveform of "STEP EQUAL OUTPUT " Function.

## **13. MONITOR function**

While Panel is in MON mode, user can select which two status are to be monitored.

**Pr.98 is used to assign the parameter to be monitored, when "I" LED is on.**

**Pr.99 is used to assign the parameter to be monitored, when "HZ" LED is on.**

For example, the default value in Pr.99 is 57. That means, 7-segment will display the value of Pr.57 while "HZ" LED is on.

**Note: Under CTL mode, the display will show the paramter assigned by Pr.99 .**

### **13.1 OPERATING STATUS CHECK**

Parameters from Pr.57 ~ Pr.61 are inverter running status for user monitoring purpose.

**Pr.57 HZ** HZ status shows the running frequency.

**Pr.58 RPM** RPM status is calculated by HZ status.

$$\text{RPM} = (120 * \text{HZ} / \text{POLE}) * \text{GEAR\_RATIO}\%$$

Refer to Section 5.4, description of Pr.52 & Pr.53.

**Pr.59 VDC** VDC is the DC voltage measured from internal Smoothing Capacitor.

$$\text{VDC} = \text{Pr.87}(\%) * \text{Pr.56}(\text{when Pr.55}=0)$$

**Pr.60 VOUT** VOUT is the Root-Mean-Square value of inverter output voltage.

**Pr.61 IRMS** IRMS is the Root-Mean-Square value of inverter output current.

### **13.2 TERMINAL STATUS CHECK**

User can easily check the input or output terminal status from following parameters :

TERMINAL STATUS is easily verified by select the corresponding parameter number.

PARAMETER	TERMINAL STATUS
Pr.62	DI1 INPUT TERMINAL STATUS
Pr.63	DI2 INPUT TERMINAL STATUS
Pr.64	DI3 INPUT TERMINAL STATUS
Pr.65	DI4 INPUT TERMINAL STATUS
Pr.66	RUN INPUT TERMINAL STATUS
Pr.67	REV INPUT TERMINAL STATUS
Pr.68	DO1 OUTPUT TERMINAL STATUS
Pr.69	DO2 OUTPUT TERMINAL STATUS
Pr.70	RELAY OUTPUT STATUS

### **13.3 A/D CONVERTER CHECK**

**Pr.55 A/D CHANNEL SELECT**

**Pr.56 A/D CONVERSION DATA**

The PD Series inverter can monitor 5 analog input signals.

**Use Pr.55 to select the desired channel for monitoring, then the 10-bits A/D converter of CPU will execute Analog to Digital conversion and put the conversion result in Pr.56.**

The range of the converted data is between 0 to 1023 corresponding to full range input.

Pr.55	Pr.56 (A/D DATA)
0	VDC channel A/D value
1	IU channel A/D value
2	IV channel A/D value
3	AI1 channel A/D value
4	AI2 channel A/D value

# **14. MAINTENANCE & ERROR MESSAGE**

## **Monthly maintenance**

- a. Inverter running  
Monitor and record the running status (ex. output current). Compare the data with the previous recorded .
- b. Inverter power off  
Check and Ensure all ventilation Fans are un-obstructed.  
Examine the input and output power terminals for signs of overheating.

## **Three-Monthly maintenance**

- Perform monthly maintenance as described above.
- Remove any accumulated dust from the equipment . Using a suction type cleaner with a non-conducting nozzle.

## **Error Messages :**

ERROR CODE	MESSAGE DESCRIPTION
n. --	NO ALARM
n. OP	OVER VOLTAGE
n. UP	UNDER VOLTAGE
n. OL	OVER LOAD
n. OH	OVER HEAT
n. OC	OVER CURRENT when normal run
n. CA	OC when acceleration
n. CD	OC when deceleration
n. CB	OC when braking
n. CS	OC detect by Software
E-SP	Serial Port communication Error ( REMOTE PANEL only)

Note: n=0, present alarm type.  
n=1, alarm type before.  
n=2, alarm type twice before.  
n=3, alarm type three times before.

## **Counter Measure**

- OP : Check input voltage or modify deceleration rate
- UP : Check input voltage
- OL : Check load current
- OH : If the OH is caused by external Digital Input, check external input source. Otherwise, check load current or decrease carrier frequency.
- OC : Check motor wiring, or check inverter itself.
- CA : Decrease acceleration rate.
- CD : Decrease deceleration rate.
- CB : Modify Pr.05, Pr.06, Pr.07, Pr.08 .
- CS : Check inverter by qualified engineer.
- E-SP : Push any key will retry again. Or Power off the inverter, Check the cable for remote panel.  
Avoid noise interference by otherpower cable

# **15. COMPUTER CONTROL**

The PD Series Inverter has a build in RS-485 communication port on CON3 of CPU-Board.  
CON3 is a 5-pin connector. The definition of all the connector pins are:

- Pin 1: +5V
- Pin 2: 0V
- Pin 3: SIG+
- Pin 4: SIG-
- Pin 5: RESET OUTPUT(NOT USED BY COMPUTER)

## **15.1 PROTOCOL & FORMAT**

**Baud Rate: 4800, 7 Bit data, Even parity, 2 Stop Bit.**

Each PD-Series inverter has a pre-assigned **UNIT ADDRESS in Pr.93**. Computer may control any Inverter unit by select its corresponding UNIT ADDRESS.

Furthermore, the Computer may control all Inverter units at the same time if the "uu" code in command string is "00".

**NOTE: All code transfer between Computer and Inverter are ASCII code.**

## **15.2 Computer to Inverter**

Computer may send three types of message to Inverter

**15.2.1 Control Command: (No response will send back from Inverter)**

"C,uu,cc,ffff"

- C** : Head of COMMAND String
- uu** : unit number, from 00 to 99  
When uu = 00, all inverter unit must accept.
- cc** : control command code, from 00 to 15  
The "cc" number is actually converted from four bits binary data,  
 $cc = 8 * \text{Bit-3} + 4 * \text{Bit-2} + 2 * \text{Bit-1} + \text{Bit-0}$ 
  - Bit-0 : RESET INVERTER
  - Bit-1 : RUN
  - Bit-2 : REVERSE
  - Bit-3 : JOG
- ffff** : set frequency, from 00000 to 20000, representing desired Hz = 0.00 to 200.00Hz.

**15.2.2 Write Command : (No response will send back from Inverter)**

"W,uu,nn,dddd"

- W** : Head of WRITE String
- uu** : unit number, from 00 to 99  
When uu = 00, all inverter unit must accept.
- nn** : parameter number, from 00 to 99
- dddd** : data value, from 00000 to 65535, if data exceed upper and lower limits  
(shown in parameter table) will be trimmed within boundary automatically.

**15.2.3 Read Command : (Inverter will send back P-String after receive this string)**

"R,uu,nn"

- R** : Head of READ String
- uu** : unit number, from 00 to 99  
When uu = 00, all inverter unit must accept.  
Do not specify uu=00 for R-String while multiple inverters are under control.
- nn** : parameter number, from 00 to 99

## 15.3 Inverter to Computer

Parameter & Status Response( Response to Computer for R-string)

"P,uu,nn,tt,dddd,s,aaaa"

**P** : P stands for PARAMETER String

**uu** : unit number, from 00 to 99.  
This number is defined in Pr.93 of each inverter.

**nn** : parameter number, from 00 to 99

**tt** : data type of this parameter, from 00 to 15  
 tt = 00 : data WORD from EAROM, format 999.99.  
 tt = 01 : data WORD from EAROM, format 9999.9  
 tt = 02 : data WORD from EAROM, format 99999  
 tt = 03 : data BYTE from EAROM, format 999.99  
 tt = 04 : data BYTE from EAROM, format 9999.9  
 tt = 05 : data BYTE from EAROM, format 99999  
 tt = 06 : data BIT from EAROM, format 99999  
 tt = 07 : data from CPU memory, format 99999  
 tt = 08 : signed data from CPU memory. format +/-999.99  
     If followed data <32768, the data is valid and positive.  
     Else the data is negative, which is -(65536-ddddd).  
 tt = 09 : data WORD from CPU memory, format 999.99  
 tt = 10 : data WORD from CPU memory, format 9999.9  
 tt = 11 : data WORD from CPU memory, format 99999  
 tt = 12 : data BYTE from CPU memory, format 999.99  
 tt = 13 : data BYTE from CPU memory, format 9999.9  
 tt = 14 : data BYTE from CPU memory, format 99999  
 tt = 15 : data BIT from CPU memory, format 99999

Note : Only those parameters with type 00~07 may be written by Host Computer.

**dddd** : data value, from 00000 to 65535

**s** : inverter output status, from 0 to 9  
 s = 1 : INVERTER REVERSE RUNNING  
 s = 2 : INVERTER FORWARD RUNNING  
 s = 3 : INVERTER STOP  
 else , undefined

**aaaa** : alarm history, from 0000 to 9999  
 The PD-Series inverter may record 4 Error messages.  
 Most significant digit stands for oldest error message.  
 Least significant digit stands for present error message.  
 a = 0 : No alarm  
 a = 1 : CA Over Current when acceleration  
 a = 2 : CD Over Current when deceleration  
 a = 3 : OC Over Current when not acceleration or deceleration.  
 a = 4 : OH Over Heat  
 a = 5 : OP Over Potential  
 a = 6 : UP Under Potential  
 a = 7 : OL Over Load  
 a = 8 : CB Over Current when DC Braking  
 a = 9 : CS 200% Over Current detected by Software

## 15.4 Sample program

### 15.4.1 Simple control example using BASIC

Here is a very simple example controlling one inverter by Personal Computer using BASIC program.

Before linking together by computer control, the parameter **UNIT ADDRESS(Pr.93)** of each inverter must be assigned manually. The default value of parameter is Pr.93=1 .

This example shows how to write parameters into inverter; how to command the inverter running; and how to read informations from inverter.

```
1000 CLS
1005 OPEN "COM1:4800,E,7,2" FOR RANDOM AS #1
1010 PRINT #1, "W,01,39,00000"
1020 BEEP:BEEP:BEEP:BEEP
1030 PRINT #1, "W,01,40,00003"
1040 BEEP:BEEP:BEEP:BEEP
1050 PRINT #1, "C,01,02,01234"
1060 FOR I=0 TO 20
1070 PRINT #1, "R,01,57"
1080 LINE INPUT #1, Pstring$
1090 PRINT I,Pstring$ : BEEP
1100 NEXT I
1105 CLS
1110 PRINT #1, "C,01,00,00000"
1120 FOR I=0 TO 99
1130 PRINT #1, "R,01,"+RIGHT$("00" + LTRIM$(STR$(I)), 2)
1140 INPUT #1, Phead$, unit%, Pr%, tt%, DDDDD&, S%, AAAAS$
1150 PRINT USING "Pr## = #####" ; I; DDDDD&
1160 NEXT I
1170 CLOSE #1
1180 END
```

#### REMARKS :

1. Line #1000 is used to direct the serial port to COM1 .
2. Line #1010 to 1040 is used to set Pr.39=0 and Pr.40=3 ; Beeps are inserted to wait until the new value is written into EAROM memory of inverter.
3. Line #1050 will start the inverter running at 12.34Hz in forward direction.
4. Line #1060 to 1100 will read Pr.57 for 20 times, and print the return message string on the screen.
5. Line #1110 stop the inverter.
6. Line #1120 to 1160 will read all parameters and show on the screen.



#### 15.4.2 Advanced example monitoring 6 inverter units

The following program can monitor the running status up to six inverters simultaneously.

UNIT ADDRESS of all inverters were preassigned from 1 to 6 .

The computer will show the picture on the screen :

J O I N T   P E E R   S Y S T E C   C O R P .																				
<table border="1" style="width: 100%; text-align: center;"><tr><td>NIT NO.</td></tr><tr><td>RE   ENCY</td></tr><tr><td>RP</td></tr><tr><td>C RRENT</td></tr><tr><td>O T E</td></tr></table>		NIT NO.	RE   ENCY	RP	C RRENT	O T E	<table border="1" style="width: 100%; text-align: center;"><tr><td>NIT NO.</td></tr><tr><td>RE   ENCY</td></tr><tr><td>RP</td></tr><tr><td>C RRENT</td></tr><tr><td>O T E</td></tr></table>		NIT NO.	RE   ENCY	RP	C RRENT	O T E	<table border="1" style="width: 100%; text-align: center;"><tr><td>NIT NO.</td></tr><tr><td>RE   ENCY</td></tr><tr><td>RP</td></tr><tr><td>C RRENT</td></tr><tr><td>O T E</td></tr></table>		NIT NO.	RE   ENCY	RP	C RRENT	O T E
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<table border="1" style="width: 100%; text-align: center;"><tr><td>NIT NO.</td></tr><tr><td>RE   ENCY</td></tr><tr><td>RP</td></tr><tr><td>C RRENT</td></tr><tr><td>O T E</td></tr></table>		NIT NO.	RE   ENCY	RP	C RRENT	O T E	<table border="1" style="width: 100%; text-align: center;"><tr><td>NIT NO.</td></tr><tr><td>RE   ENCY</td></tr><tr><td>RP</td></tr><tr><td>C RRENT</td></tr><tr><td>O T E</td></tr></table>		NIT NO.	RE   ENCY	RP	C RRENT	O T E	<table border="1" style="width: 100%; text-align: center;"><tr><td>NIT NO.</td></tr><tr><td>RE   ENCY</td></tr><tr><td>RP</td></tr><tr><td>C RRENT</td></tr><tr><td>O T E</td></tr></table>		NIT NO.	RE   ENCY	RP	C RRENT	O T E
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#### REMARKS :

1. Line #1000 to #1320 for set up the screen
2. Line #1510 start all inverters.
3. Line #1700 to #1960 will read Pr.57, Pr.58, Pr.60 & Pr.61 from corresponding inverter selected by uu%.
4. Line #1970 to #1980 change unit number to select next inverter.
5. Line #1990 program will terminate when push ESC key.
- 6.. Line #2000 will RESET the inverter.

1000 SCREEN 12

1010 PALETTE 0, 2621440        'BLUE COLOR

1020 PALETTE 2, 16128         'GREEN COLOR

1030 CLS

1040 LINE (9, 22)-(629, 440), , B

1050 LINE (11, 24)-(627, 438), , B

1060 LINE (11, 84)-(627, 84)

1070 LINE (11, 86)-(627, 86)

1080 LOCATE 4, 18

1090 PRINT "J O I N T   P E E R   S Y S T E C   C O R P ."

1100 NO = 1

1110 FOR J = 0 TO 1

1120     FOR i = 0 TO 2

1130         x = 8 + J \* 10

1140         y = 5 + i \* 25

1150         LINE (8 \* y, 16 \* x - 8)-(8 \* (y + 20), 16 \* (x + 7) - 8), 2, B

1160         LINE (8 \* y + 1, 16 \* x - 7)-(8 \* (y + 20) - 1, 16 \* (x + 7) - 9), 2, B

1170         LINE (8 \* y, 16 \* (x + 2) - 10)-(8 \* (y + 20), 16 \* (x + 2) - 9), 2, B

1180         LOCATE x + 1, y + 5

1190         PRINT "UNIT NO.: 0"

1200         LOCATE x + 1, y + 16

1210         PRINT RIGHT\$(STR\$(NO), 1)

1220         NO = NO + 1

1230         LOCATE x + 3, y + 3

```

1240      PRINT "FREQUENCY:"
1250      LOCATE x + 4, y + 3
1260      PRINT "      RPM:"
1270      LOCATE x + 5, y + 3
1280      PRINT "  CURRENT:"
1290      LOCATE x + 6, y + 3
1300      PRINT "  VOLTAGE:"
1310      NEXT i
1320 NEXT J

1400 uu% = 1
1410 MaxUnit% = 1
1420 nn% = 57

1500 OPEN "COM1:4800,E,7,2" FOR RANDOM AS #1
1510 PRINT #1, "C,00,02,00000"

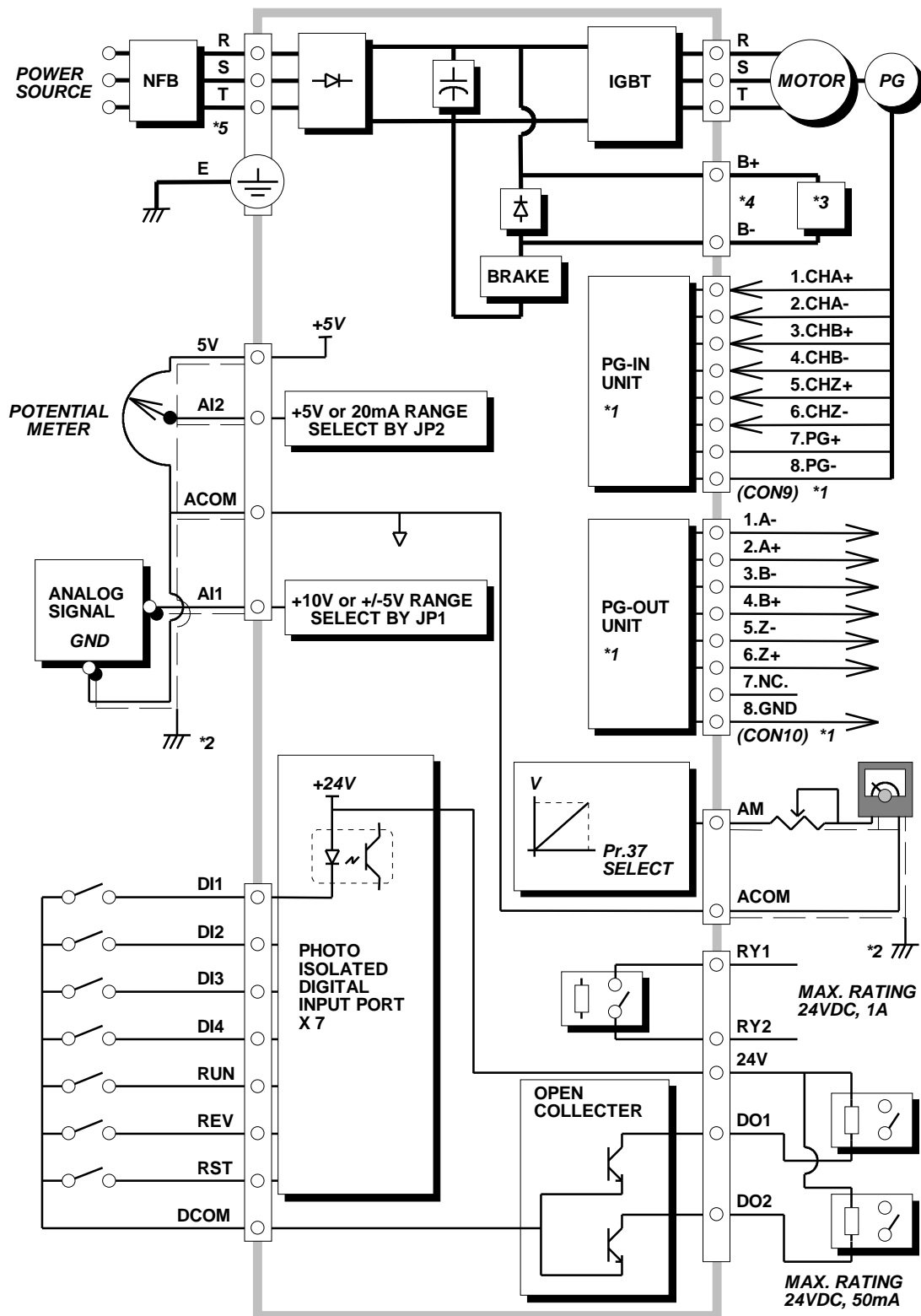
1600 DO
1610      IF uu% < 4 THEN
1620          x = 11
1630      ELSE
1640          x = 21
1650      END IF
1660      y = 19 + 25 * ((uu% - 1) MOD 3)

1700      DO
1710          RSTRING$ = "R," + RIGHT$("00" + LTRIM$(STR$(uu%)), 2) + ","
1720          RSTRING$ = RSTRING$ + RIGHT$("00" + LTRIM$(STR$(nn%)), 2)
1730          PRINT #1, RSTRING$
1740          INPUT #1, P$, unit%, Pr%, tt%, DDDDD&, S%, AAAA$
1750          SELECT CASE nn%
1760              CASE 57
1770                  LOCATE x, y-1
1780                  IF DDDDD& > 32767 THEN DDDDD& = DDDDD& - 65536
1790                  PRINT USING "###.##"; DDDDD& / 100
1800                  nn% = 58
1810              CASE 58
1820                  LOCATE x + 1, y
1830                  PRINT USING "#####"; DDDDD&
1840                  nn% = 61
1850              CASE 61
1860                  LOCATE x + 2, y
1870                  PRINT USING "####.#"; DDDDD& / 10
1880                  nn% = 60
1890              CASE 60
1900                  LOCATE x + 3, y
1910                  PRINT USING "#####"; DDDDD&
1920                  nn% = 57
1930              CASE ELSE
1940                  nn% = 57
1950          END SELECT
1960      LOOP UNTIL nn% = 57
1970      uu% = uu% + 1
1980      IF uu% > MaxUnit% THEN uu% = 1
1990 LOOP UNTIL INKEY$ = CHR$(27)
2000 PRINT #1, "C,00,01,00000"

3000 PALETTE
3010 CLOSE #1
3020 END

```

# 16. BLOCK DIAGRAM OF PD-INVERTER



## Note:

- \*1. Only for PDF/PDV series inverter have PG feed back terminal.
- \*2. The analog signal wires should be shielded & connected to the Earth.
- \*3. Refer to the section 2.5 to select proper discharge resistor.
- \*4. For the models with P, N terminal, must use separate **Brake Discharge Unit** and do not connect resistor to the P, N terminals directly.

**JPS** **JOINT PEER SYSTEC CORP.**  
(222) 6F., No. 266, Sec 3, Pei Shen Road,  
Shen Keng Shiang, Taipei Hsien, Taiwan  
TEL: 886-2-26646866 FAX: 886-2-26644889  
<http://www.jps.com.tw>  
E-mail: [service@jps.com.tw](mailto:service@jps.com.tw)