OmniTurn interface and documents for Yaskawa PC3 spindle inverter

INSTRUCTION MANUAL

PC3 Series

Adjustable Frequency Drive

0.13 Hp - 5 Hp

230 V and 460 V, Three-phase

EMS 606 PC3

⚠ DANGER
Do not inspect components unless inside "CHARGE" lamp is off

DSPL

DATA ENTER

RESET

DIGITAL OPERATOR   JVOP-114

EMS

Celebrating over 50 years in the motor and control business !

F6 12 | 8

F5 10 | 6

F4 9 | 5
2A   M08

COOLANT
PUMP

M

F7 12 | 8

F8 10 | 6
2A   BRK

B BRAKE
(Optional)

FOR SINGLE PHASE
CONNECT LINE TO
L1 AND L2.

220VAC   SW1
LINE

L1 2   F3   RED   L1   T1
L2 4   F2   RED   L2   T2   M SPINDLE MOTOR
L3 6   F1   RED   L3   T3
         25A

Misc
Plug   TB1

Sp.Sig BRN   2   8   1   M03
0-10V   10   RED 13 | 11 ORG

COM   11 BRN   1   11   2   M04
                                   YEL 4 | 6   ORG

Ctrl Rdy YEL 9   14 FLT 13 FB
(+12V) 9
                                   VID 23 | 24 BLU
SP.FLT   Spindle Reset
(Drv Cab)   3
INHIBIT 8 BRN 25   GRY 1 | 9   GRY
                   Closes   BRK
             FLT 9 on
12V COM 2 WHT 19 1 Fault FC   BLU & ORG & GRY

                    Opens   6
                    on
                    Fault

Parameters
00   03 pword
01   0000 DECEL to Stop
02   120 Max Hz
09   3 accel   B1
10   3 Decel   DBR
19   2hp - 8A
        5hp - 17A   B2
20   1000 DB resistor

YASKAWA PC3
(5HP)

DBR = 50 OHMS

AC SPINDLE DRIV
YASKAWA PC3
(5HP)

yas5sc.dwg   12-20-96

* Table 1.6 Status LED's

Drive Status	LED Display		Meaning
	DS1 (Green)	DS2 (Red)	
Normal	◑	●	Drive is ready for operation, but not yet running.
	☼	●	PC3 is running normally.
Alarm	●	◑	Either external base block command or low voltage. Unit is stopped.
Protective Function Operating	◑	◑	External fault command was input.
	☼	◑	Overload protection was activated (OH, OL, etc.).
	●	☼	Voltage protection was activated (OV, UV).
	◑	☼	Overcurrent protection was activated (GF, OC).
Inverter Fault Trip	☼	☼	Control memory fault.
	●	●	Hardware fault (watchdog, power supply, etc.).

☼ = Lit   ◑ = Blinking   ● = Off

1.5.5 Start-up of Units With Keypad

Table 1.8 below gives a simple start-up procedure. You should check for proper motor operation by observing the same indications given on the previous page.

* Table 1.8 Simple start-up procedure using keypad.

Action	Description	LED Display
Apply AC input power.	The Inverter's frequency reference display appears (denoted by "F" prefix).	F 0000
Use [>][V][∧] change data.	The cursor is denoted by the blinking digit. [V][∧] keys manipulate data. [>] key moves cursor one digit to the right.	F 0060
Use [DATA ENTER] to write new data into the PC3's memory.	The cursor will stop blinking for approx. 2 secs. to show data has been accepted. Afterwards, it will reappear.	F 0060
Press [DSPL] to change display mode to observe Fout.	Each time this key is depressed the display will advance to the next display cycle. If observing Fout the "F" prefix disappears.	0000
Press [○ RUN]	Motor ramps up to 6.0 Hz. LED in Run key turns on. [☼ RUN]	006.0
Press [DSPL] 3 times to change display mode to Fref.	Each time this key is depressed the display will advance to the next display mode.	F 0060
Use [>][V][∧] to change data. Use [DATA ENTER] to write new data.	The inverter will smoothly accel to 60 Hz.	F 060.0
Press [DSPL]	To observe output frequency.	060.0
Press [○ STOP]	Motor will gradually decel to rest. RUN LED stops blinking & STOP LED turns on.	0000

1.5.4. Start-up of Units Without Digital Keypad (2-wire Run command)

Table 1.7 below gives a simple start-up procedure. You should check for proper motor operation by observing the following points:
* Makes sure the motor rotates smoothly in the proper direction (if the direction is wrong simply remove the input power from the unit and reverse any two motor leads (T_1, T_2, or T_3). Switching the input power to the inverter will do no good.
* Acceleration and deceleration should occure smoothly.
* Excessive current does not flow (no OC trip).
* Status LED's display normally.
* Table 1.7 Simple start-up procedure.

☼ = Lit   ◑ = Blinking   ● = Off

Action	Description	LED Display	
		DS1 (Green)	DS2 (Red)
Set the speed ref to zero. Remove run fwd and run rev commands.	Preliminary.	-	-
Apply input power	Ready to Operate.	◑	●
Close either Fwd Run or Rev Run. Increase speed reference until motor begins to rotate.	Check direction of motor rotation.	☼	●
Slowly increase the reference to its maximum value.	Motor speed should track reference command input.	☼	●
Open Fwd Run and Rev Run input terminals.	Motor should smoothly decel to zero speed.	☼	●
	At zero speed.	◑	●

2.1 KEYPAD INTRODUCTION

The digital operator (p/n JVOP- 114) is mounted directly on the inverter, connected to the PC3's parallel data port . **This operator cannot be remote mounted !** For a remote keypad, you must apply a JVOP-112, Remote Operator Adapter and a JVOP-100 keypad (same as the one used with the G3 and VG3 units).

The JVOP-114 keypad can be used for unit programming or used as a digital operator's station. Once the program is entered, the keypad can be removed because the PC3 unit's parameter memory is resident on the logic card.

2.2 KEYPAD MOUNTING/ REMOVAL

This keypad can be removed anytime power is not applied to the PC3 unit. Note: you should also first verify the "Charge" lamp is extinguished, indicating the DC bus capacitors have discharged to a safe value before performing any service on the unit.

2.2.1 Mounting

*   Simply remove the inverter's blank front cover by depressing the ejector bar (found between the control terminal strip and the bottom of the blank cover). Then, carefully pry the blank cover off with a small screwdriver inserted in the notch found on the ejector.
*   Next, align the keypad and insert it into the vacated space.
*   Make sure the ejector bar is fully raised to secure the keypad.

2.2.2 Removal

*   Simply remove the inverter's keypad by depressing the ejector bar (found between the control terminal strip and the bottom of the keypad). Then, carefully pry the keypad off with a small screwdriver inserted in the notch found on the ejector.
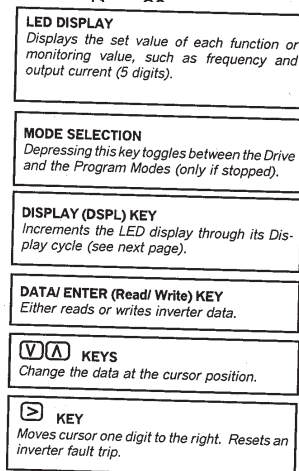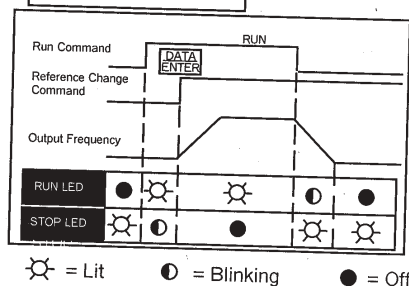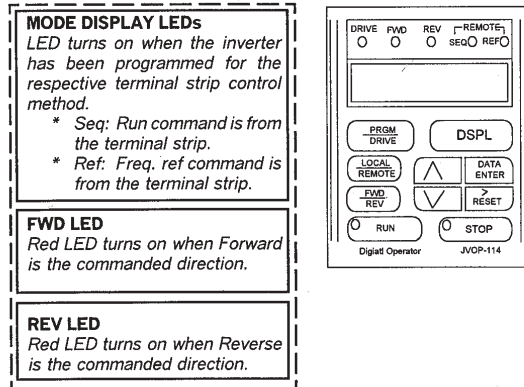
2.3 KEY FUNCTIONS

Figure 2.1 given below illustrates the keypad. Fig 2.2 on the facing page shows the function of the Run and Stop LED's.

* Figure 2.1 Keypad

MODE DISPLAY LEDs
LED turns on when the inverter has been programmed for the respective terminal strip control method.
   *   Seq: Run command is from the terminal strip.
   *   Ref: Freq. ref command is from the terminal strip.

FWD LED
Red LED turns on when Forward is the commanded direction.

REV LED
Red LED turns on when Reverse is the commanded direction.

RUN KEY
If keypad run is enabled, this key will start the unit.

LOCAL/REMOTE KEY
This key switches the inverter control between the keypad and programming parameter no. 1, digits 1 & 2.

FWD/ REV KEY
Switches the motor's direction of rotation.

STOP KEY
Stops the inverter.

LED DISPLAY
Displays the set value of each function or monitoring value, such as frequency and output current (5 digits).

MODE SELECTION
Depressing this key toggles between the Drive and the Program Modes (only if stopped).

DISPLAY (DSPL) KEY
Increments the LED display through its Display cycle (see next page).

DATA/ ENTER (Read/ Write) KEY
Either reads or writes inverter data.

∨ ∧ KEYS
Change the data at the cursor position.

⊃ KEY
Moves cursor one digit to the right. Resets an inverter fault trip.

* Figure 2.2 LED Functions

☼ = Lit   ◑ = Blinking   ● = Off

2.4 PROGRAMMING METHOD

2.4.1 Switching Between "Drive" and "Program" Modes

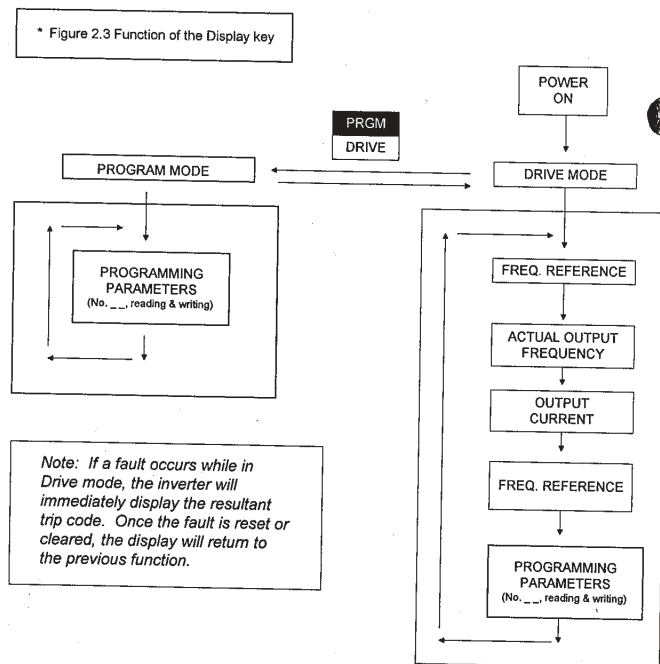This is easily accomplished by depressing the [PRGM DRIVE] key.

Each time this key is pushed the mode will change. Please note, the inverter must be stopped before this command will be accepted.

Figure 2.3 on the facing page shows the various display modes available in both the Drive Mode and the Programming Mode.

2.4.2 Function of Display (DSPL) Key   [DSPL]

This key is used to increment the display mode amongst the possibilities shown in Fig. 2.3.

* Figure 2.3 Function of the Display key

POWER ON

PRGM / DRIVE

PROGRAM MODE ← DRIVE MODE

PROGRAMMING PARAMETERS (No. __, reading & writing)

FREQ. REFERENCE

ACTUAL OUTPUT FREQUENCY

OUTPUT CURRENT

FREQ. REFERENCE

PROGRAMMING PARAMETERS (No. __, reading & writing)

Note: If a fault occurs while in Drive mode, the inverter will immediately display the resultant trip code. Once the fault is reset or cleared, the display will return to the previous function.

2.4.3 Reading & Writing to Programming Parameters

The PC3 inverter unit has many programming parameters available for a tremendous amount of flexibility in a single piece of hardware, without adding numerous, expensive option cards.

These programming parameters have been divided into 3 categories. Each category has been grouped within a limited range of parameters. The very first programming parameter (No. 00) functions as a password to restrict access to the various levels of parameters.

Level 1: Basic Motor Control Data
 * Accessed by setting No. 1= 01 (factory setting)
 * Parameters No. 00- 19 can be read or changed

Level 2: Basic Application Related Functions
 * Accessed by setting No. 1= 02
 * Parameters No. 00- 29 can be read or changed.

Level 3: Advanced Application Functions
 * Accessed by setting No. 1= 03
 * Parameter Nos. 00- 59 can be read or changed.

Figure 2.4 on the facing page gives a detailed step-by-step procedure for changing the programming parameters. This particular example deals with a change of acceleration time, but the same method is applicable for all of the programming functions.

2.4.3 Reading & Writing to Programming Parameters (Continued)

* The following example illustrates the programming method used to change the acceleration time (No. 09) from 10 secs. to 5 secs.

Fig. 2.4 Programming

ENTER PROGRAM MODE

SELECT THE APPROPRIATE PARAMETER (No. __)

DISPLAY EXISTING DATA

CHANGE TO NEW DATA

ENTER NEW DATA

RETURN TO DRIVE MODE

Press PRGM/DRIVE key.	no - 01
Change to No. 9 by using the V Λ keys.	no - 09
Read data by DATA ENTER	0100
Change data > V Λ	0050
Enter (write) DATA ENTER	End
After approx. 1 sec. data is displayed again.	0050
Press PRGM DRIVE key to return to Drive Mode.	
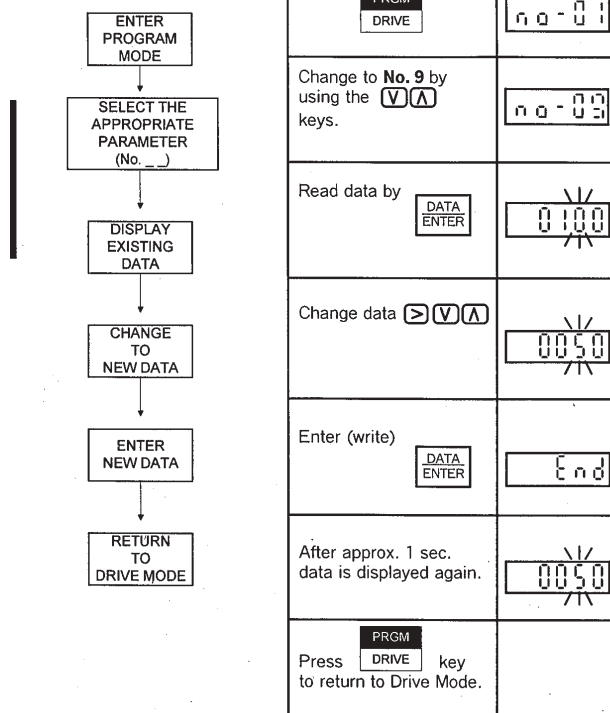
2.4.4 Programming precautions

 * Be careful when making programming changes. Improper settings may cause nuisance tripping or erratic operation.
 * Make a permanent record of the programming changes. The parameter list on pages 39- 47 has a column for user settings. **We recommend you make a permanent record of any field changes from factory values.**
 * Do not make unnecessarily large changes to any parameter. Instead, make smaller changes and observe the operation before making the next change. This is particularly important for such parameters as V/F pattern, maximum output frequency, etc.
 * There are several invalid parameter settings or combinations. These are listed below. In each case, an invalid setting will cause the display to blink for 3 seconds, after which, it will return to the last valid data.
 * When data exceeds the allowable range.
 * You cannot program the same data in the multi-function input parameters (Nos. 32, 33 and 34).
 * V/F pattern restrictions:
   a. max. output freq (No. 02) max. voltage frequency (No. 04)
   b. max voltage freq (No. 04) > breakpoint frequency (No. 05)
   c. breakpoint freq. (No. 05) min. output frequency (No. 07)
 * Frequency reference setting restriction:
   - digitally preset speeds (Nos. 13- 17) exceed the maximum frequency limitation imposed by the frequency reference upper limit (No. 24).
 * Frequency reference lower limit (No. 25) - frequency reference upper limit (No. 24)

2.5 PROGRAMMING PARAMETER LIST

Table 2.1 on the following pages lists the programming parameters available for the PC3 unit. It shows the parameter no., the applicable range, the factory setting and a page of this instruction manual which details the function of each parameter.
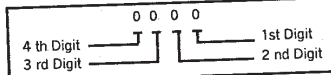
* Table 2.1.a Parameter List

Parameter No.	Digit		Setting Range	Initial Value	Page No.	User Data
00	-	**Password**	0- 9	1	49	
		0: First level (nos 01- 19) can only be read, not written (changed).				
		1: First level (nos 00- 19) can be read/ written (changed)				
		2: First & second level (00- 29) can be read/ written (changed).				
		3: First, second and third level (00-59) can be read/ written (changed).				
		6: Clears fault history.				
		8: 2-wire initialization procedure				
		9: 3-wire initialization procedure				
01	1	**Local/ remote frequency reference**	0000-1111	0011 (0000)	50	
		0: Terminal strip control				
		1: Keypad control				
	2	**Local/ remote run/ stop control**				
		0: Terminal strip control				
		1: Keypad control				

```
            0 0 0 0
4 th Digit ──┘ │ │ └── 1st Digit
3 rd Digit ────┘ └──── 2 nd Digit
```

* Table 2.1.b Parameter List (continued)

Parameter No.	Digit		Setting Range	Initial Value	Page No.	User Data
01	3	**Normal Stopping Method**	0000-1111	0011 (0000)	50	
		0: Deceleration to stop				
		1: Coast to stop				
	4	**Output voltage limiter**				
		0: Limiter is enabled				
		1: Limiter is not enabled				
02	-	**Maximum V/F output frequency**	50- 400 Hz	60 Hz		
03	*	**Maximum V/F output voltage**	0.1 to 255 V	230 V		
04	-	**V/F base frequency**	0.2 to 400 Hz	60 Hz	51	
05	-	**Breakpoint V/F frequency**	0.1 to 399.9 Hz	1.5 Hz		
06	*	**Breakpoint V/F voltage**	0.1 to 255 V	12 V		
07	-	**Minimum V/F frequency**	0.1 to 10 Hz	1.5 Hz		
08	*	**Minimum V/F voltage**	0.1 to 50 V	12 V		

* NOTE: voltage values are given for the 230 volt class units. The values are doubled for the 460 volt models.

```
            0 0 0 0
4 th Digit ──┘ │ │ └── 1st Digit
3 rd Digit ────┘ └──── 2 nd Digit
```

* Table 2.1.c Parameter List (continued)

Parameter No.	Digit		Setting Range	Initial Value	Page No.	User Data
09	-	**Acceleration Time No. 1**	0- 600 secs.	10.0 Secs.	53	
10	-	**Deceleration Time No. 1**				
11	-	**Acceleration Time No. 2**				
12	-	**Deceleration Time No. 2**				
13	-	**Preset Frequency No. 1**	0- 400.0 Hz	0.0 Hz	54	
14	-	**Preset Frequency No. 2**				
15	-	**Preset Frequency No. 3**				
16	-	**Preset Frequency No. 4**				
17	-	**Jog Frequency Reference**		6.0 Hz	55	
18	-	**Motor Electronic Overload**	0000-0011	0000	56	
	1	*0: Electronic MOL enabled*				
		1: Electronic MOL disabled				
	2	*0: TEFC or ODP motor housing*				
		1: TENV or TEBC motor housing				
	3	*Not Used*				
	4	*Not Used*				

* NOTE: voltage values are given for the 230 volt class units. The values are doubled for the 460 volt models.

```
            0 0 0 0
4 th Digit ──┘ │ │ └── 1st Digit
3 rd Digit ────┘ └──── 2 nd Digit
```

* Table 2.1.d Parameter List (continued)

Parameter No.	Digit		Setting Range	Initial Value	Page No.	User Data
19	-	**Motor rated current (in amps)**	10- 200 % inv rated	Hp dep	56	
20		**Reverse run enabled ?**	0000-1001	0000	57	
	1	*0: Enabled*				
		1: Disabled				
	2	**Not Used**				
	3	**Not Used**				
	4	**Stall prevention during decel (DBR ?)**				
		0: enabled (no DB resistor)				
		1: disabled (with DB resistor)				
21	1	**Not Used**	0000-0110	0000	58	
	2	**Analog monitor function**				
		0: proportional to Output Frequency				
		1: proportional to Output Current				
	3	**S-Curve Function**				
		0: Not provided				
		1: 0.2 sec. S-curve is provided				
	4	**Not Used**				

```
            0 0 0 0
4 th Digit ──┘ │ │ └── 1st Digit
3 rd Digit ────┘ └──── 2 nd Digit
```
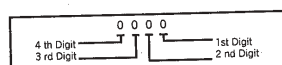
* Table 2.1.e Parameter List (continued)

Parameter No.	Digit		Setting Range	Initial Value	Page No.	User Data
22	-	Frequency reference gain	0.01-2.00	1.00	59	
23	-	Frequency reference bias	-1.00 to +1.00	0.00		
24	-	Maximum frequency (upper limit)	0- 110%	100%	61	
25	-	Minimum frequency (lower limit)	0- 110%	0%		
26	-	DC Injection braking current	0- 100% inv rated	50%	62	
27	-	DC injection time at stop	0.0- 5.0 secs.	0.0 secs.		
28	-	DC injection time at start				
29	-	Automatic torque compensation gain	0.0- 3.0	1.0	63	
30	-	Acceleration current limit level (200% = disabled)	30-200% of inverter rated	170%	64	
31	-	Running current limit level (200% = disabled)	30-200% of inverter rated	160%		

* Table 2.1.f Parameter List (continued)

Parameter No.	Digit		Setting Range	Initial Value	Page No.	User Data
32	-	Terminal no. 3 function	00- 13	13		
33	-	Terminal no. 4 function	01- 13	1	65	
34	-	Terminal no. 5 function		3		
35	-	Auxiliary analog input (JVOP-115) function	0- 4	0	67	
36	-	FLT output terminal function		5		
37	-	Terminal no. 13 function	0- 10	0	69	
38	-	Terminal no. 14 function		1		
39	-	Frequency comparator reference	0- 400.0 Hz	0 Hz	70	
40	1	Overtorque detection function 0: overtorque detection disabled 1: overtorque detection enabled	0000-0111	0000	71	
	2	When is overtorque detection enabled ? 0: Only while at set speed 1: Anytime while running				

* Table 2.1.g Parameter List (continued)

Parameter No.	Digit		Setting Range	Initial Value	Page No.	User Data
40	3	Reaction to overtorque condition 0: operation continues (with annunciation) 1: fault trip condition	0000-0111	0000	71	
	4	Not used				
41	-	Overtorque detection level	30- 200% inv rated	160%		
42	-	Overtorque detection time	0.1- 10.0 secs	0.1 sec.		
43	-	Carrier frequency setting (x 2.5 kHz)	1- 6	4	73	
44	-	Not used	-	-	-	
45	-	Analog monitor gain	0.01- 2.00	1.00	74	
46	1	Power loss ride-through function 0: not enabled 1: enabled	0000-0001	0000	75	
	2-4	Not used				

```
        0  0  0  0
4 th Digit ___|  |  |  |___ 1st Digit
3 rd Digit ____|  |____ 2 nd Digit
```

* Table 2.2 Multi-function inputs

DATA	DESCRIPTION
00	3-Wire run/stop control
01	External fault command (normally open contact input)
02	External fault command (normally closed contact input)
03	Multi-step speed reference no. 1
04	Multi-step speed reference no. 2
05	Jog command
06	Alternate accel/ decel time selection
07	External baseblock (transistor disable, normally open contact input)
08	External baseblock (transistor disable, normally closed contact input)
09	Speed search command- from maximum frequency
10	Speed search command- from set frequency
11	Accel/ decel hold command input
12	Local/ remote select
13	Fault reset command
14	Up/ down setter

* Table 2.3 Multi-function analog inputs

DATA	DESCRIPTION
00	Not used
01	Auxiliary frequency reference
02	Frequency reference gain
03	Frequency reference bias
04	Output voltage bias

* Table 2.4 Multi-function contact outputs

DATA	DESCRIPTION
00	Running
01	At speed
02	Zero speed
03	Output frequency ³ frequency comparator reference
04	Overtorque detection
05	Fault
06	Output frequency ² frequency comparator reference
07	During baseblock (transistor disable)
08	During undervoltage
09	During speed search
10	Local/ remote operation mode

* Table 2.1.h Parameter List (continued)

Parameter No.	Digit		Setting Range	Initial Value	Page No.	User Data
47	-	No. of automatic fault reset attempts	0- 10	0	77	
48	-	Fault history record	-	-		
49	-	PROM no.	-	-	79	
50	-	Prohibited frequency point	0.0- 400.0 Hz	0.0 Hz		
51	-	Prohibited frequency width (±)	0.0- 25.5 Hz	1.0 Hz		
52-5	-	Not used	-	-	-	

2.6 PROGRAMMING EXAMPLES

2.6.1 Factory Reset Procedure

Figure 2.5 shown below illustrates a step-by-step procedure to reset all programming parameters to their factory settings (set parameter **No. 00** to "08")

Fig. 2. 5 Factory Reset

DESCRIPTION	KEYPAD OPERATION	OPERATOR DISPLAY
* Enter the "Program" mode	PRGM DRIVE	no - 01
* Access parameter **No. 00** (password/ reset function)	(V)	no - 00
* Read existing data in parameter **No. 00** (happens to be= 01 in this example)	DATA ENTER	01
* Change the data to the desired value.	(>)(V)(Λ)	08
* Enter the new data into the inverter's memory. Display will show "End" for 1 second, then return to the display of the data value. Remember, the new data= 01 because this is the factory setting for parameter **No. 00**.	DATA ENTER	End ↓ 01
* Return to the "Drive" mode	PRGM DRIVE	

2.6.2 Lock-out Password

Figure 2.6 shown below illustrates a step-by-step procedure to lock-out field programming changes (set No. **00**= "00")

Fig. 2.6 Lock-out

DESCRIPTION	KEYPAD OPERATION	OPERATOR DISPLAY
* Enter the "Program" mode	PRGM DRIVE	no - 01
* Access parameter **No. 00** (password/ reset function)	(V)	no - 00
* Read existing data in parameter **No. 00** (happens to be= 01 in this example)	DATA ENTER	01
* Change the data to the desired value.	(>)(V)(Λ)	00
* Enter the new data into the inverter's memory. Display will show "End" for 1 second, then return to the display of the data value.	DATA ENTER	End then 00
* Return to the "Drive" mode	PRGM DRIVE	

2.7 PARAMETER FUNCTIONS

2.7.1 Parameter No. 00: Password

Factory Setting= 01

This programming parameter fulfills many "house-keeping" functions. Not only does it allow a complete reset to all factory default values, but it also restricts the access to the programming functions via 4 levels of password. The final function of this parameter is to clear the fault history, which is stored in parameter **No. 48**.

* Table 2.2 Functions of Parameter **No. 00**

Data	Function	Remarks/ Comments
00	Password #1	Only read nos. 1-19, no changes
01	Password #2	Read/ write Nos. 1-19
02	Password #3	Read/ write Nos. 00- 29
03	Password #4	Read/ write Nos. 00- 59
04	Not Used	-
05	Not Used	
06	Clear Fault History	Will then return to "01"
07	Not Used	
08	Factory Reset- 2-wire type	Returns all data to the factory settings; used for 2-wire run/ stop control (using maintained run fwd or run rev contact inputs)
09	Factory Reset- 3-wire type	Returns all data to the factory settings; used for 3-wire run/ stop control (using momentary start/ stop commands)

Fault	Display			Possible Problem
	Keypad	DS1 (Gr)	DS2 (Rd)	
Overcurrent: output current exceeded 200% of inv. rated.	OC	◐ (BLINKING)	☼ (ON)	1. Inverter output short circuit
				2. Excessive load inertia
				3. Accel/ Decel too short
				4. V/F set incorrectly
				5. Starting into spinning motor.
				6. Improper use of output contactor
				7. Magnetic noise.
Ground Fault	GF	◐ (BLINKING)	☼ (ON)	1. Inverter output is grounded.
				2. Motor is grounded.
Overvoltage: DC bus voltage has exceeded 410/ 820 Vdc (230/ 460 V units)	OU	● (OFF)	☼ (ON)	1. Decel time is too short
				2. Overhauling load
				3. Apply DB resistor

Fault	Display			Possible Problem
	Keypad	DS1 (Gr)	DS2 (Rd)	
Undervoltage; DC bus voltage has fallen below 210/ 420 Vdc (230 V, 3 φ / 460 V)	UU1	● (OFF)	☼ (ON)	1. Input power is too low.
				2. Momentary power loss has occurred.
				3. Make sure power terminals arre tightened.
				4. Check for loss of input phase (on 3 φ models).
Heatsink Overheat: temperature is exceeding 90° C	OH	☼ (ON)	◐ (BLINKING)	Inlet temperature is above 45° C (113°F). Lower ambient, install cooling equipment. Check fan.
Motor Overload: current has exceeded allowable levels as determined by electronic mol protection	OL1	☼ (ON)	◐ (BLINKING)	1. Make sure motor is not overloaded.
				2. Verify V/F pattern is ok
				3. Compare No. 19 with motor's nameplate current.
Inverter Overload	OL2	☼ (ON)	◐ (BLINKING)	1. Make sure inverter has been properly sized (inverter FLA ≥ motor FLA).
				2. Make sure V/F pattern is ok.

* Table 3.2 Fault Codes (continued)

Fault	Display			Possible Problem
	Keypad	DS1 (Gr)	DS2 (Rd)	
Overtorque Detection: motor current has exceeded user-programmed current threshold.	OL3	☼ (ON)	◐ (BLINKING)	1. make sure machine is not overloaded
				2. Verify programming of overtorque detection level (No. 41).
External Fault Input	EF_	◐ (BLINKING)	◐ (BLINKING)	Check the external wiring.
CPU Fault #0: Initial memory error	CPF00	● (OFF)	● (OFF)	Cycle the input power and see if the fault clears. If it does, problem was noise related. If not, replace the inverter.
CPU Fault #1: ROM error	CPF01	● (OFF)	● (OFF)	
CPU Fault #4: setting fault	CPF04	☼ (ON)	☼ (ON)	
CPU Fault #5: A/D converter fault	CPF05	☼ (ON)	☼ (ON)	
No logic power supply	BLANK	● (OFF)	● (OFF)	1. Make sure input power is within spec.
				2. Verify dc bus fuse is ok (on applicable units).
				3. Replace inverter.

3.2.2 Alarm/ Warning Codes

In addition to the fault codes mentioned in section 3.2.1, the PC3 unit will diagnose and display conditions which *could* eventually lead to a trip condition. By providing these warnings, we hope you can take the appropriate corrective actions to prevent costly downtime.

If you should encounter any further problems, please feel free to contact EMS for applications/ technical assistance at **513- 851- 4474 (fax no. 513-851-0808).**

● = OFF   ☼ = ON   ◐ = BLINKING

* Table 3.3 Alarm Codes

Alarm	Display			Corrective Action
	Keypad	LEDs		
		DS1 (Gr)	DS2 (Rd)	
Blinking External Fault: both Fwd Run and Rev Run have been commanded for more than 0.5 sec.	EF (blinks)	●	◐	check external control wiring
Inverter is base-blocked (transistors are disabled)	bb (blinks)	●	◐	check external control wiring
Undervoltage being detected	UU (blinks)	●	◐	1. check the main AC input voltage
				2. tighten screw terminals
Overtorque being detected	OL3 (blinks)	●	◐	overtorque detection has been activated, but not tripped the inverter
Overvoltage: main DC bus voltage is too high without giving the inverter a run command	OU (blinks)	●	◐	check ac input voltage to make sure it is within spec.
Overheat temperature	OH (blinks)	●	◐	inlet air to heatsink is too warm

● = OFF   ☼ = ON   ◐ = BLINKING