

FP-08 Programming Panel

User's Manual

V1.1

Fatek Automation Corp.

14/07/2009

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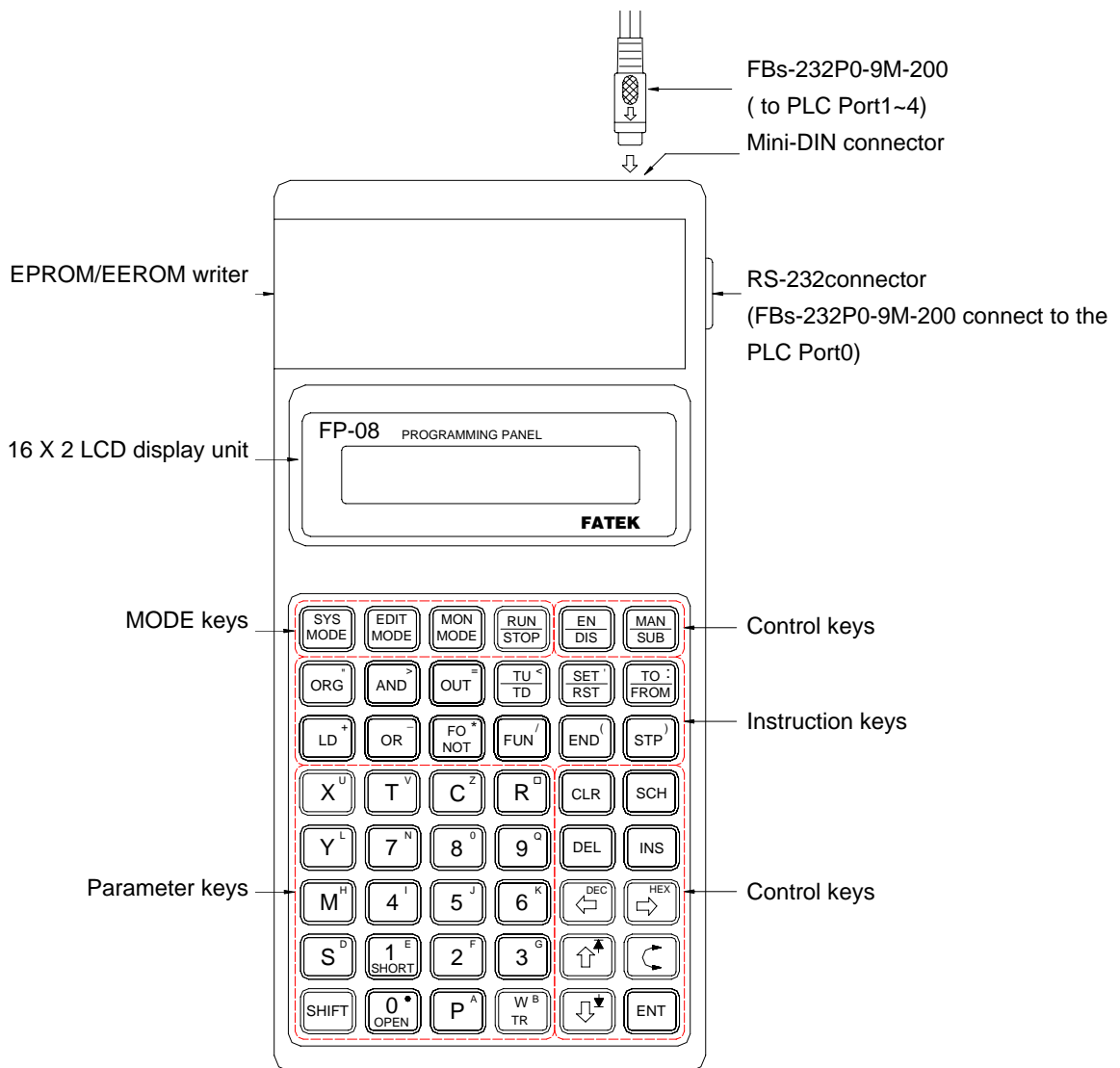
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FP-08 Programming Panel

FP-08 Programmer for FBs series PLC can be used to edit PLC mnemonics, high-speed pulse instructions, and LINK instructions. The programmer also features: monitoring and setup of timer, counter, register and contact; in addition to the program memory pack (FBs-PACK), system setup and information, and user update of OS version on FP-08 etc.





1 Introduction to FP-08



1.1 Appearance



















1.2 Keypads Arrangement


The keypads of FP-08 console is functionally divided into four groups:





- **Mode keys**: Four mode keys,     , are used for selecting operation mode of FP-08.
- **Control keys**: Control keys are used for mode operations (all the blue keys on FP-08 except mode keys).

- Instruction keys: Instruction keys are used for entering FBs-PLC instructions with parameters or data. All the black keys in the top two rows and the two keys,   at the fourth row of FP-08 (refer to the description of special keys below) are the instruction keys.
- Parameter keys: Parameter keys are used for entering the operand's numbers or contents. All black keys, except instruction keys, are parameter keys.

In order to obtain optimum convenience and maximum input capability under a limited number of available keys, four groups of keys are designed as multi-purpose as described below:

- Alternation keys: Alternation keys are those with a horizontal line marked in the middle to separate two distinct functions (a total of six keys,      ). By pressing the key ( as an example) for the first time, the function above the horizontal line (RUN) will be displayed on the LCD display unit. By pressing the key again, the function below the horizontal line (STOP) will be displayed. If the key is pressed for the third time, the LCD screen will display the function above the horizontal line (RUN) again. The process will repeat if the key is pressed repeatedly. By pressing  (at the lower rightmost corner of the keypads), the function last shown on the LCD screen will take effect.
- Shift Key: After pressing this orange key (at the lower leftmost corner of the keypads), an S letter will first appear on the LCD display unit. If now any key at the upper rightmost corner with a small orange letter printed is pressed, the small orange letter (the "shift key letter") will be entered or the function described by the orange letter (such as  or ) will be executed and the letter S on the LCD will disappear.
- Compound keys: There are two rows of white letters on each of the four keys,     , those are neither shift keys nor alternation keys but keys that can perform the two functions represented by the two rows of white letters. Under special arrangement when one of these keys is pressed, FP-08 will carry out the function described by either the upper or the lower row in accordance with the current operation mode automatically without any further instruction given by the user.
- Double-definition keys: Two keys,  and  , represent Timer and Counter, respectively and also the letters T and C. Similar to the compound keys, the two functions cannot be operated simultaneously. FP-08 will make necessary judgment itself automatically.

Remark 1: Pressing two or more keys at the same time is prohibited while operating the FP-08 programming panel. For example, after the key  being pressed, it must wait until it is released before the next key can be pressed.

Remark 2 :     keys are used for moving the cursor by one position to the direction of the arrow whenever one of these four keys is pressed. The cursor will move rapidly if one of these keys is pressed for more than 0.7 second without being released.

1.3 Memory Pack (FBs-PACK) Programmer

The memory pack FBs-PACK is a 1M bits FLASH ROM for storing the FBs program and register data. The memory pack can also be write-protected. We can put FBs-PACK on FP-08 or PLC main unit to write/read it.

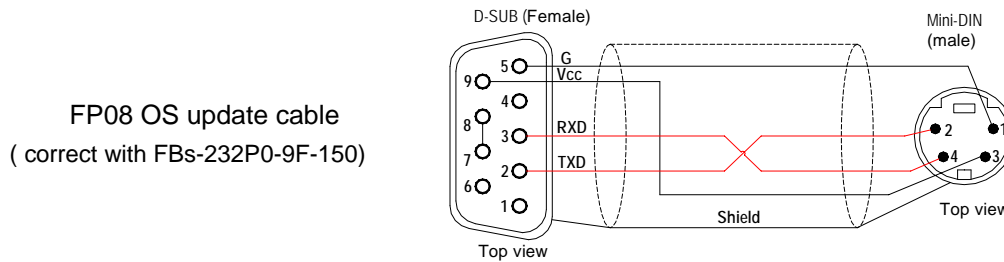
1.4 RS-232 COM Port and FP-08 OS Update

RS-232 COM port currently supports updating the OS version of FP-08.

FP-08 OS update procedure:

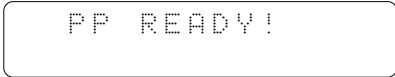
1. Download "PP Boot" software and the latest FP-08 OS version from the "Technical Support" section of the FATEK website <http://www.fatek.com>
2. Open the cover of the FP-08 Programmer and align the 3 pins at the left to the 2 pins position along the bottom. Connect to a PLC Port 0 until the message "FP-08 OS UPDATE" is shown.

3. Use FBs-232P0-9F-150 with different packaging (where the pin 2 and 3 of the RS232 port must be switched around, shown in bellow) and connect to the RS-232 port on the PC. (If a RS232 port is not readily available, please use the "USB to RS232 adaptor")
4. Launch the FATEK "PP Boot" software and follow the procedures:
 - (1) Go to "File" and select the latest OS version.
 - (2) Choose the RS232 [Com Port] connection, press **Open Com Port** button and **OS Update Start** button will be highlighted, indicating the COM Port is correct.
 - (3) Press **OS Update Start** button to begin updating the OS version.



1.5 Interface Connection between FP-08 and PLC

Since FP-08 does not have its own power supply, therefore all of its operations can only be carried out after the connection between FP-08 and the PLC main unit is completed by using a unique FP-08 communication cable (FBs-232p0-9M-150) . If all operations are functioning normally , FP-08 will display the PP initiating screen as shown below. It indicates that the connection has been established and is ready for operation.



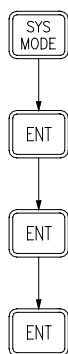
2 Program Edit, Run, Monitor, Forced Set/Reset and Enable/Disable

A simple example program is illustrated in this section to show how to edit (input) the control programs, to run or stop the PLC, to use the monitor mode to examine the program execution results while the PLC is running, to forced set/reset the status of digital point or set the value of register, to enable/disable the digital points by using the FP-08 with a fast and efficient way.

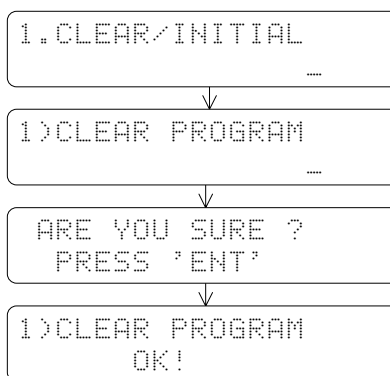
2.1 Program Edit


Please ensure that the program area in the PLC is empty (i.e. no program remained) before program editing for this example. The following keys can be used to clear the program area (This step can be omitted for a newly purchased PLC since the "CLEAR" operation has been performed before the shipment from the factory)

【Key Sequence】



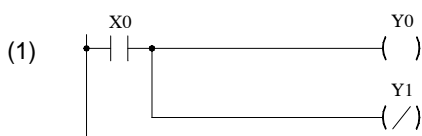

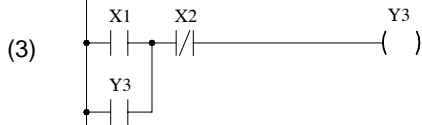
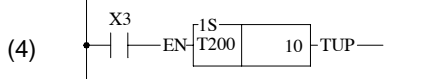
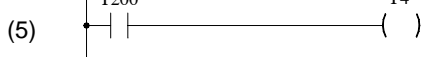
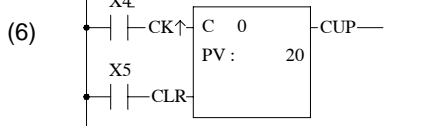

【LCD Display】



After verifying that the program area is empty, press the  key to enter the edit mode.








The above LCD display, "0000" indicates the current address in a program, and "M" indicates the main program area. 0000M means now we are at the beginning of the main program area. Following input instructions will occupy the areas 0001M, 0002M, 0003M and so on. When you enter the edit mode for the first time, FP-08 will enter the main program area automatically.

(1)		<pre>ORG X 0 OUT Y 0 OUT NOT Y 1</pre>
(2)		<pre>ORG M1922 OUT Y 2</pre>
(3)		<pre>ORG X 1 OR Y 3 AND NOT X 2 OUT Y 3</pre>
(4)		<pre>ORG X 3 T200 PV: 10 OUT Y 4</pre>
(5)		<pre>ORG T 200 OUT Y 4</pre>
(6)		<pre>ORG X 4 LD X 5 C0 PV: 20 OUT Y 5</pre>
(7)		<pre>ORG C 0 OUT Y 5</pre>

- (1)~(7) indicate the starting points of the network.
- X0~X5, Y0~Y5, M1922 etc. Please refer to Chapter 3.
- Please refer to Chapter 5 through Chapter 8 for detail description of functionality of instruction used above.

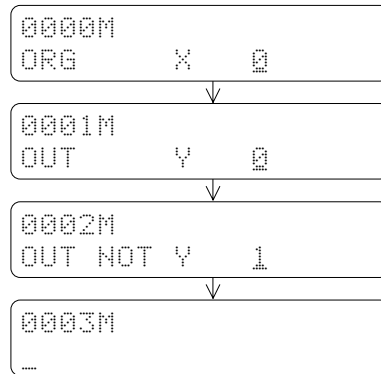
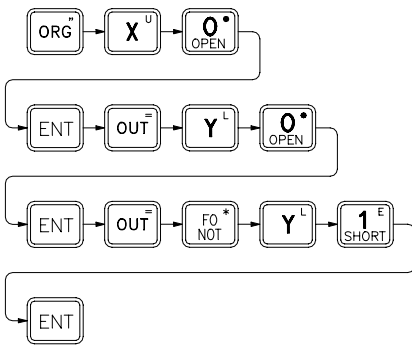
※the characters in are the directive string shown by FP-08 which are not entered by the user.

The following demonstration illustrates the programming procedures of the sample program shown above. The instructions are displayed on the LCD screen. If typing error occurs during the programming process before pressing the  key, simply press the  key to clear the incorrect instruction. If a typing error is detected after pressing the  key, you must find the incorrect instruction first then press the  key to delete the incorrect instruction or key in the correct instruction directly and press the  key to replace the incorrect one.

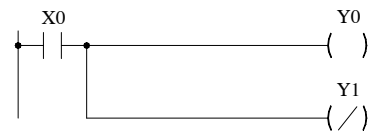
【Key Sequence】

【LCD Display】

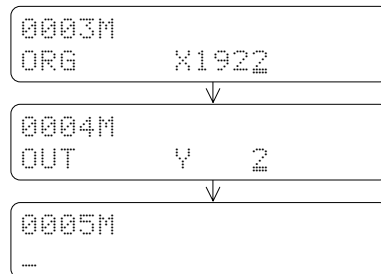
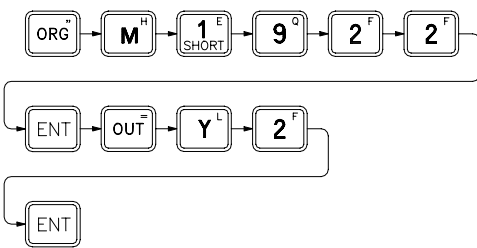
(1)



(1)



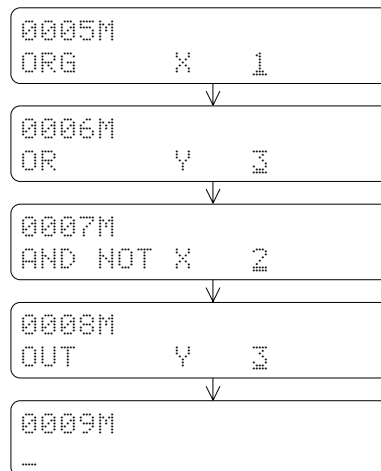
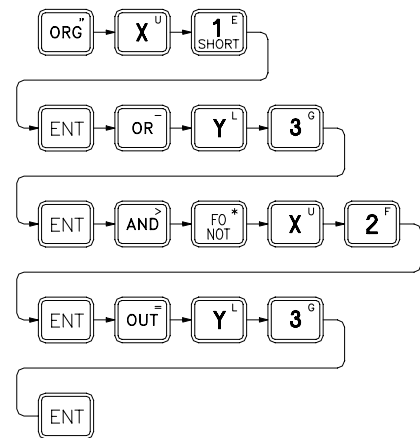
(2)



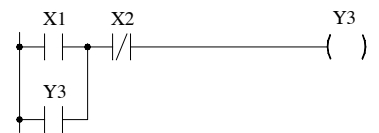
(2)



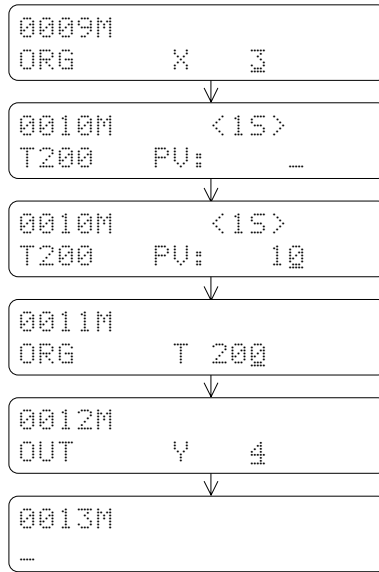
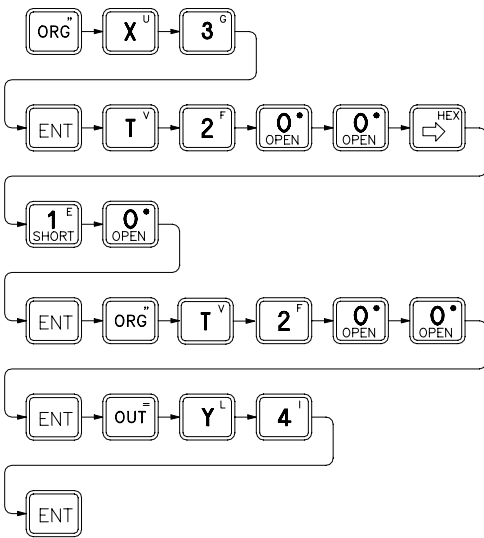
(3)



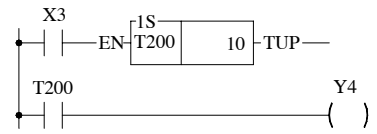
(3)



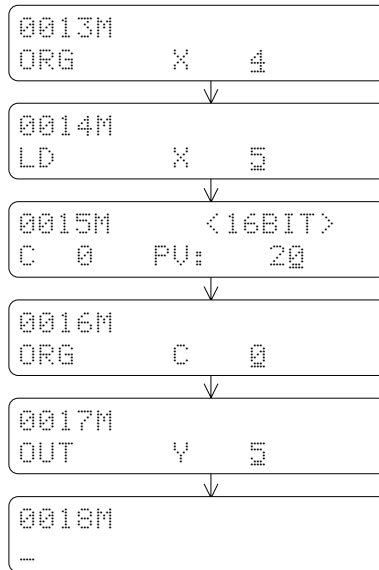
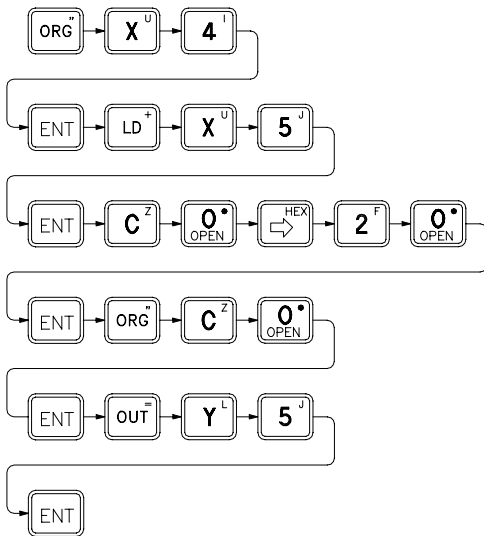
(4)(5)



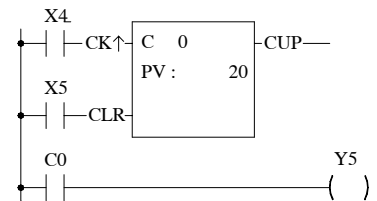
(4)(5)



(6)(7)



(6)(7)



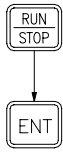
After entering all the instructions of a program, can continuously depress or press to let the edit point back to the start of ladder program (Similarly can either continuously press or press keys to get to the end point of the ladder program) then depress successively to check if the mnemonic codes are correct or not. If everything is correct, then it is the time to run the program.

2.2 Program RUN

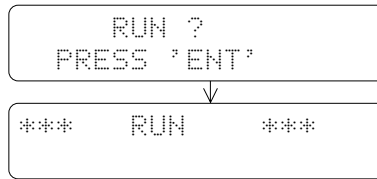
After pressing , there will be a message displayed on LCD asking you whether you want to change to RUN (if the PLC is currently at STOP state) or to STOP (if the PLC is at RUN state). Press to execute your choice as shown below:

(1) Changing PLC from STOP to RUN:

【Key Sequence】

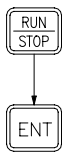


【LCD Display】

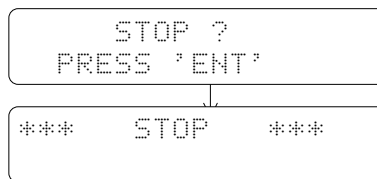


(2) Changing PLC from RUN to STOP:

【Key Sequence】



【LCD Display】



If you want to monitor the program execution of the example program, you must let the PLC in RUN state. So please first repeat the step(1) as shown above. After the PLC turns to RUN state, you can examine the program execution results by entering the monitor mode which will be described in the next section.

2.3 Program Execution Monitoring


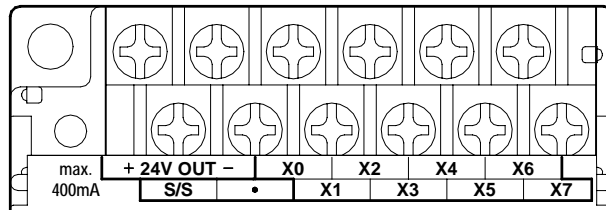
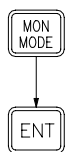
To monitor the execution status of this application, please first connect the S/S port to the 24V+ with a wire. Then use another wire (C-wire) to connect the 24V- to the input of X0~X5 – utilizing the analog switching as shown in Figure <1> below. (The other way to do this is to disable the input of X0~X5 first and then use  to SET/RST the state of X0~X5. Please refer to the last section of Section 2.4)

Figure <1>

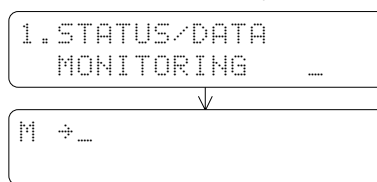


If you want to monitor the program execution results (the digital status or the data registers), you need to use function item 1 of the monitor mode which is called "STATUS/DATA MONITORING". Following key operations shows a way to enter the "STATUS/DATA MONITORING" of the monitor mode.


【Key Sequence】

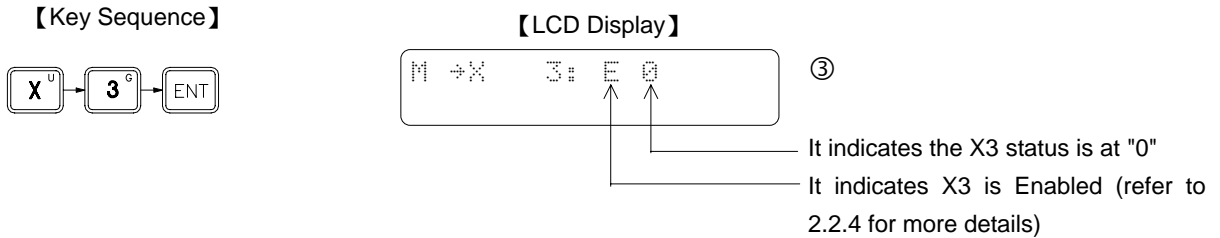







【LCD Display】

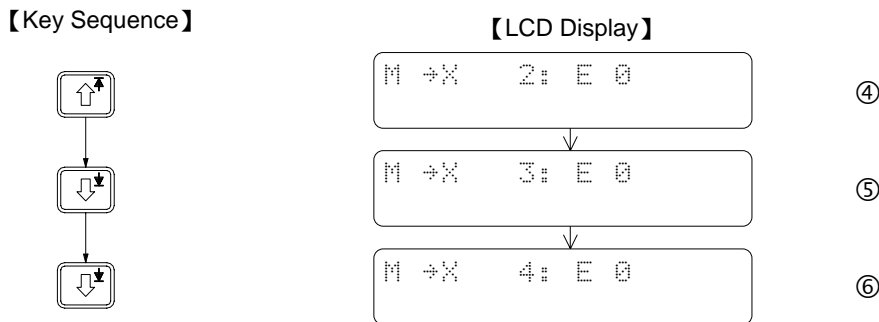



M indicates the Monitor mode status

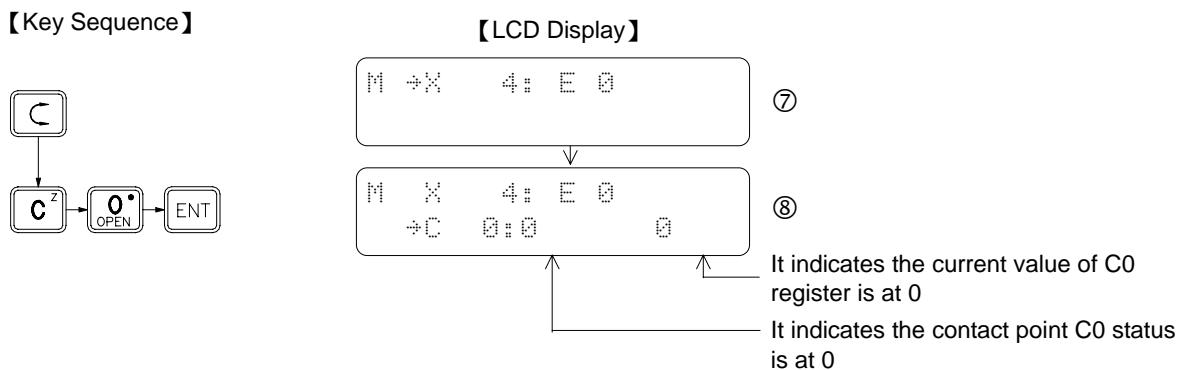
Under the Status/Data monitoring mode, LCD screen can monitor two rows of data at the same time. But only one row of data that pointed by cursor can be entered at a time. Using the Row Change , can move the cursor between these two rows. In the following key operations, the first row shown in the LCD screen is for monitoring the digital status and the second row shown in the LCD screen is for monitoring the register data.



After X3 status appears on the LCD screen, can use   to monitor the preceding or the succeeding contact points. Starting with the message shown in LCD display ③, if you press  once, X2 status appears on the LCD screen. X1 status will display on the LCD screen if you press  one more time. If you want to monitor the status of X4, X5 and so on, press  to get this.







After pressing , the cursor now will move to the second row (the LCD display of first row remains unchanged). The rest of the input and operations will all be taken place at the second row.

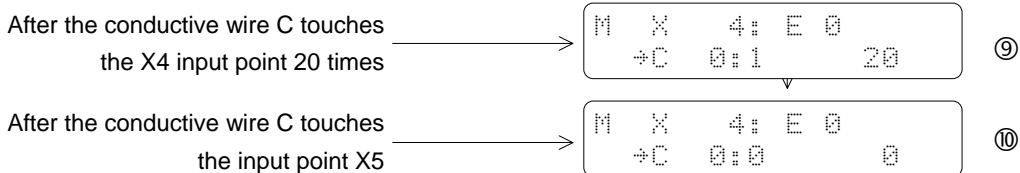


In the above LCD display, the second row shows an example of monitoring register data. The message shown in this row indicates the C0 contact point status (the status is at "1" if the counter value is equal to the preset value), and the current value (counter value) of the C0 register.


When the LCD display shown above appears, can use the conducting wire C to touch the external input point X0~X5 to test this program. The operating results can be seen from PLC's output points (Y0~Y5). Furthermore, can use this monitoring display to examine the data that the output points (Led indicators) unable to show, such as the status of internal contact points, the current value and contents of T and C registers. The description of the functionality of the example program and the relationship of corresponding I/O points are listed in the table below. You can conduct your own experiments according to this table and observe the operating results

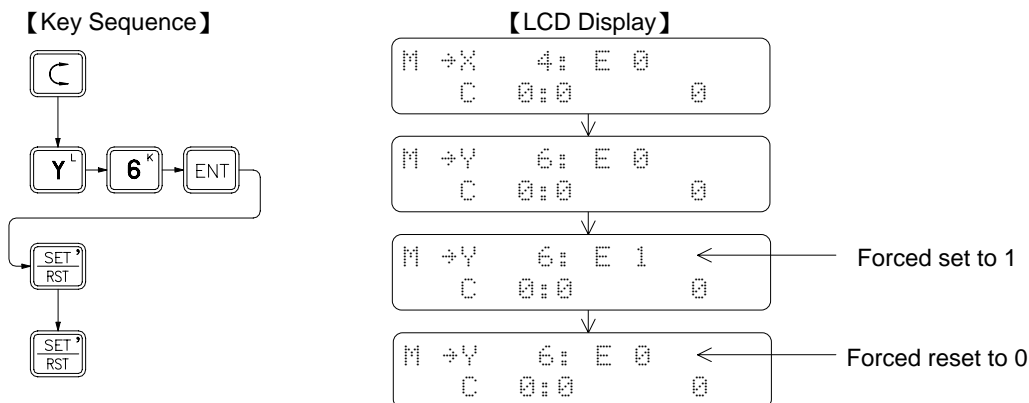
Network Number	Description of the circuit functions	Relationships between input (Xn) and Output (Yn)
(1)	This network sends the X0 status to Y0 and then inverts the X0 status and sends the results to Y1.	X0=1 then Y0=1, Y1=0 X0=0 then Y0=0, Y1=1
(2)	Sends the internal contact M1922 status (1 second) to Y2.	Y2 switches ON/OFF once every second (not input related)
(3)	Latch Circuit : X1 is the starting contact, as soon as X1 turns "ON", Y3 turns "ON" and retains the statuses. X2 is a reset contact. As soon as X2 turns " ON", Y3 turns "OFF" and retains the status.	If X1"ON" then Y3"ON" If X2"ON" then Y3"OFF"
(4) (5)	10 seconds Timer	If X3"ON", after 10 seconds, Y4"ON" If X3"OFF", Y4"OFF" immediately
(6) (7)	20 times Counter (counts 20 times)	Register C0 increments 1 for every X4 switching from OFF to ON until C0=20, Y5=1 If X5"ON", then register C0 clears to 0 and contact C0 is also at 0, therefore Y5=0


As shown in Display ⑧, every time the conducting wire C as shown in Figure <1> touches the input point X4, the current value of the register C0 will automatically increment by 1. (Remark: the current value of the register C0 may increment by more than one because several pulses may have been generated for each touch due to bouncing) The status of contact C0 switches to 1 when register C0 value reaches 20 as shown in Display ⑨. If the conducting wire C touches input point X5, then the status of contact returns C0 to 0 as shown in Display ⑩. Every time turn-on the PLC, the display format of current value of register C0 is in decimal number. If you want to display the value in hexadecimal number, press  . To return to the decimal number, press  .



2.4 Forced Set/Reset and Enable/Disable of Digital Status

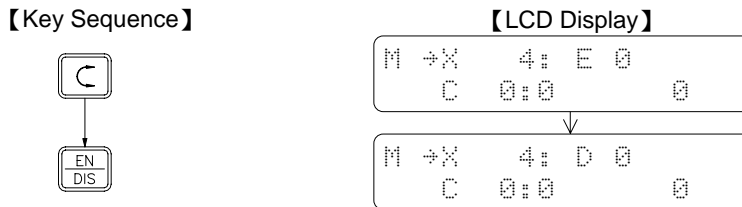
While in the monitor mode, for digital points, not only can monitoring its status, but also can force its status by using the keypad  of FP-08. In general, forced set/reset is often used for the diagnosis and program testing purpose. The following key sequence continues the operation shown in Display ⑩. It demonstrates a key operation procedure of forced set/reset while monitoring the Y6 status. Y6 status is forced set to 1 first, and then is forced reset to 0.





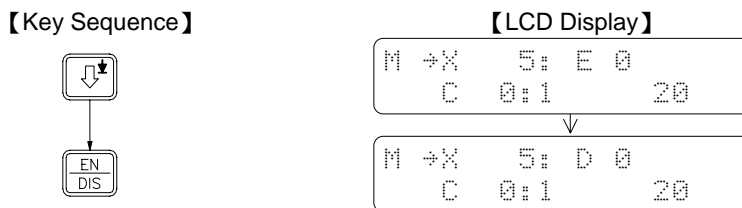
For input contacts with coils driven by an OUT instruction, the forced set/reset status can only be retained for a very short period of time (less than one scan time). Very soon the forced  status will be replaced by the new status of input or program output following an OUT instruction. PLC I/O status and OUT instructions are refreshed after each scan therefore the forced set/reset status can only be retained for a very short period which is the time between status forced and new replaced status taking place. The reason of the forced set status can retain in previous example is because Y6 is not driven by any ladder code in example program, that is, after the status is being written-in, there is no programmed operation to change the Y6 status again. But Y0~Y5 in the example program are controlled by the PLC program meaning any forced set/reset status will be overwritten by the new data generated from further program executions.


In order to forced set the statuses of input contacts (X0~X255) and coils of programs which are driven by OUT instructions, you must perform the “Disable” function first to temporarily allow the data out of the control of ladder diagram program and I/O refresh process. In this way, you will be able to retain the data while performing the data change. To return to the normal operation condition and put the data again under the control of the program, you must use the “Enable” function.

Using network (6) as an example, continuous from the display ⑩, first disable the X4 by using the “Disable” function and then using “Forced” function to control the ON/OFF state of X4 input contact instead of using the C wire. The key in sequence is shown below.



Following the above key sequence, as soon as press , C0 value changes to 1 instantly. C0 value will increment by 1 every time press  twice until this value reaches 20. When C0 reaches 20, “Count Up” is done and the contact status changes to 1 (same as the status shown in Display ⑨). Please follow the key sequence shown below to perform the “Clear” operation using the X5 input point.

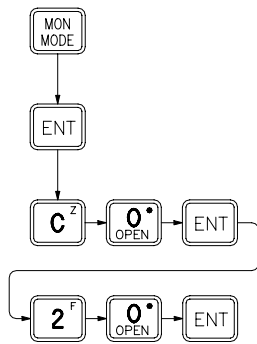


Following the above key sequence, X5 will switch to 1. The value and status of C0 will all clear to 0 if you press .

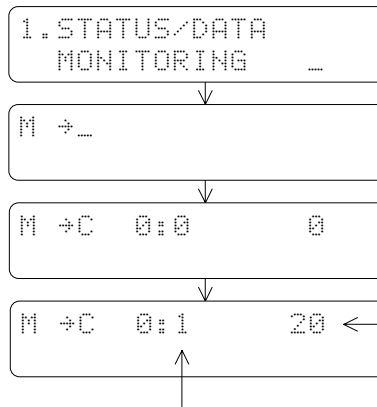
2.5 Set the Register Data

Similar to the digital status, the register data can also be monitored and changed (forced set) in the Monitor Mode. But the enable and disable operations cannot perform to register. The input registers (R3840~3903) or the registers which are written by the application instructions, can be set to certain value, but in a very short period of time those registers will be replaced by the new input register data or data generated from the operations of function instructions. The input registers data are refreshed each scan, while the data generated from the operations of function instructions changes only when function instruction is executed. The following key operations uses Network (6) as an example. First touch the input point X5 once with conductive wire C to clear register, then enter the monitor mode and set C0 value to 20 which cause C0 to “Count Up” and consequently change the C0 contact status to 1.

【Key Sequence】



【LCD Display】



The current value of C0 is forced set to 20

The current value of C0 is forced set to 20. The contact status of contact C0 changes to 1 because the current value of C0 now is equal to the preset value (i.e. count-up) is done.

3 The Functions of FP-08



3.1 Function List

There are four operating modes for FP-08, which are System Mode, Edit Mode, Monitor Mode and RUN/STOP Mode. The function descriptions for each mode are listed at below.

● System Mode

⊙ indicates the operable items when the password has not been closed.

Function	Descriptions
1. CLEAR/INITIAL	
1) CLEAR PROGRAM 2) CLEAR REGISTER 3) CLEAR COIL STATUS 4) ENABLE ALL DIGITAL (contact and coil) 5) SYSTEM INITIAL 6) DISABLE ALL DIGITAL (contact and coil)	<ul style="list-style-type: none"> Including Documents, Password, Program ID, Configuration, ROR (Read Only Register) data Enables all contacts Clears all data, returns PLC to its initial factory settings
2. MEMORY PACK OPERATION	
⊙ 1) LOAD LAD/REG WHEN POWER ON ⊙ 2) MEMORY PACK ON PLC ⊙ 3) MEMORY PACK ON FP-08	<ul style="list-style-type: none"> Set special register R4052 and R4046, please refer to appendix 3 "FBs-PACK Operation Instruction" from FBs manual. Memory pack(FBs-PACK) operation include copy, load, compare, system backup, and system restore.

Function	Descriptions
3. PASSWORD/ID	
<ul style="list-style-type: none"> ⊙ 1) PASSWORD OPEN ⊙ 2) PASSWORD CLOSE ⊙ 3) PASSWORD (ALL) SETTING ⊙ 4) PASSWORD (SUB) SETTING ⊙ 5) PROGRAM ID SETTING ⊙ 6) PLC ID SETTING 	<ul style="list-style-type: none"> • } These two functions are only applicable after the • } password has been set
4. CONFIGURATION	
<ul style="list-style-type: none"> ⊙ 1) INTERNAL COIL PARTITION ⊙ 2) STEP COIL PARTITION ⊙ 3) 0.01S~1S TIMER PARTITION ⊙ 4) 16-BIT COUNTER PARTITION ⊙ 5) 32-BIT COUNTER PARTITION ⊙ 6) DATA REGISTER PARTITION ⊙ 7) READ-ONLY REGISTER PARTITION ⊙ 8) HSC/HST/INT ASSIGNMENT ⊙ 9) DEFINE NORMAL POLAR. 	Please refer to "Default Configuration"
5. SYSTEM MESSAGE	Once in this mode, will be able to observe PLC and PP versions, memory usage, password setting and system configurations and more by pressing  or 
6. SETTING	
<ul style="list-style-type: none"> ⊙ 1) PLC No. Setup 2) PORT Baud Rate 3) FP-08 Volume 	

● Edit Mode

Functions	Descriptions
<ul style="list-style-type: none"> ⊙ 1 .EDIT PROGRAM 2 .EDIT REGISTER DATA 3 .SYNTAX CHECK 4 .MOVE HR→ROR 5 .CHECK DOUBLE COIL/T/C 6 .EDIT HPSO INSTRUCTION 7 .EDIT LINK INSTRUCTION 8 .EDIT DOCUMENT 	

● Monitor Mode

Functions	Descriptions
1. STATUS/DATA MONITORING	
⊙ 2 .PROGRAM MONITORING	Can monitor the program with the contact status display while PLC is in RUN state


● RUN/STOP Mode

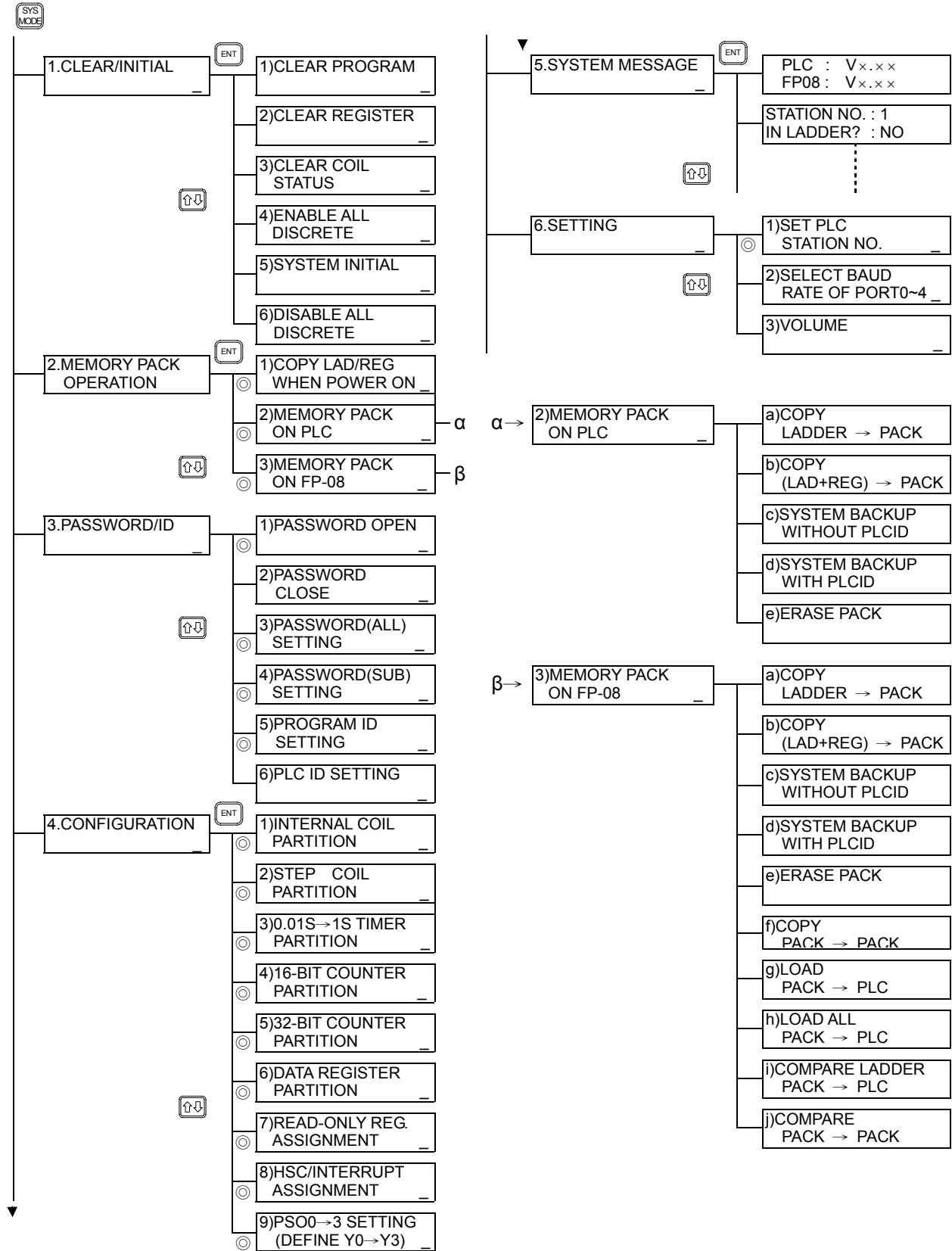
Functions	Descriptions
PLC RUN/STOP Control	

3.2 Operation Flowchart

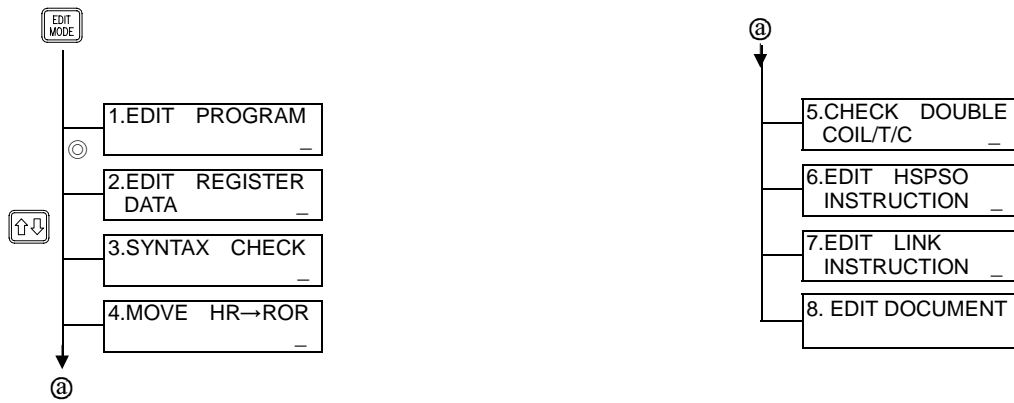
The diagram shown at below is the operation flowchart for System Mode, Edit Mode, Monitor Mode and RUN/STOP Mode.

A. SYS MODE

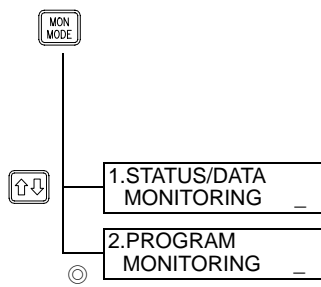
Note: Items prefix with  symbol can operate only when the password has not been closed.



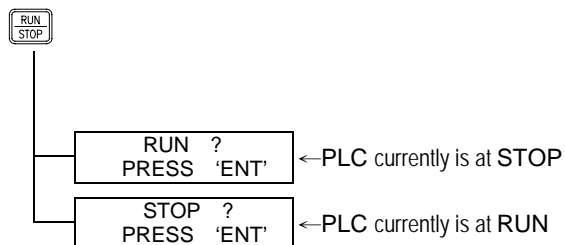
B. EDIT MODE



C. MONITOR MODE

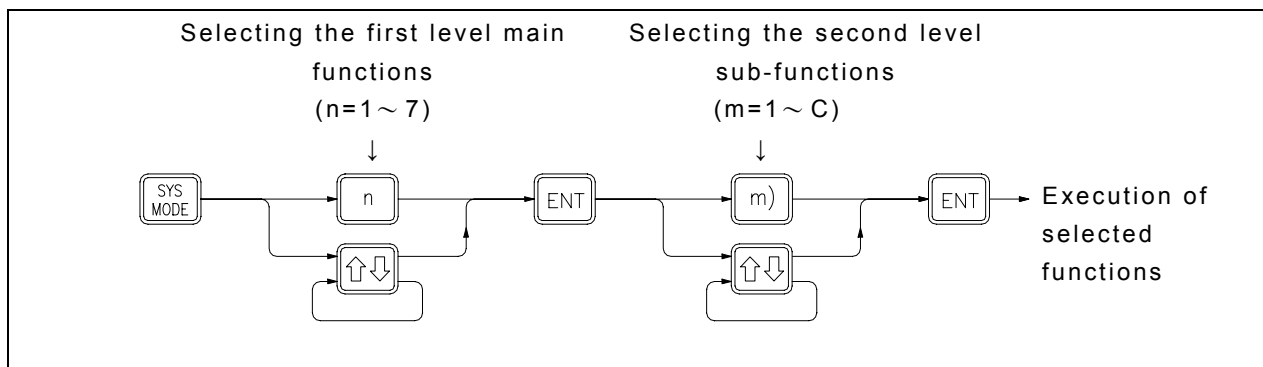


D. RUN/STOP MODE



4 Introduction to SYSTEM MODE Operation

Fundamental key operations of System Mode:



- System Mode includes eight main operation functions. **N** indicates the *n*th main function. Every main function also has *n* numbers of sub-functions. **m** indicates the *m*th sub-function within the *n*th main function.
- When you enter either the first or second level of function for the first time, you will be automatically prompted into main function 1 or sub-function 1 [*n*=1 or *m*=1]. If this is not the function you needed, you can either directly input the function number (*n*) or using or to search for the specific function you are looking for and then press to execute the function which you have just selected.

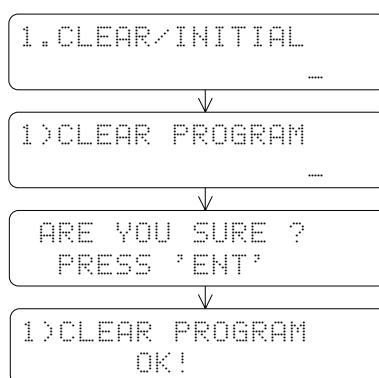
4.1 CLEAR/INITIAL

4.1.1 CLEAR PROGRAM

【 Key Sequence 】



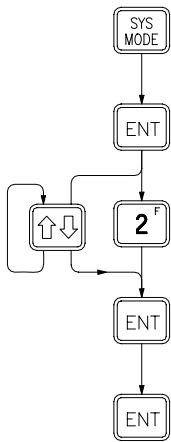
【 LCD Display 】



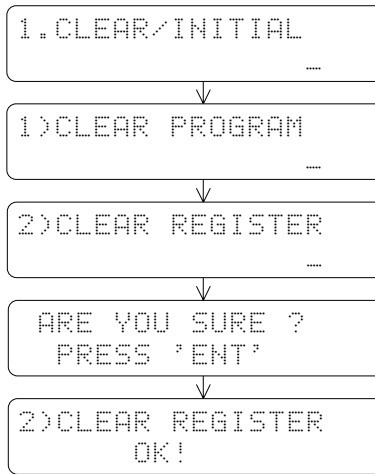
- Any keys except will cancel the function


4.1.2 CLEAR REGISTER

【 Key Sequence 】



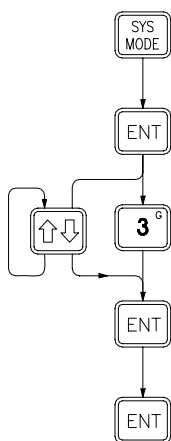
【 LCD Display 】



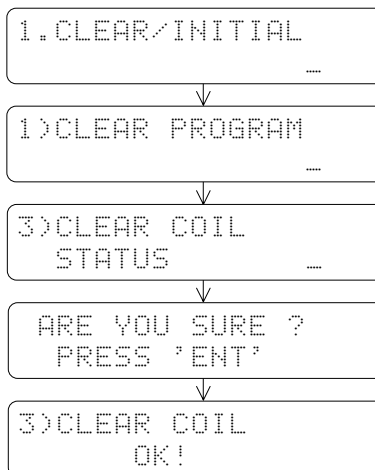
• Any keys except  will cancel the function


4.1.3 CLEAR COIL STATUS

【 Key Sequence 】



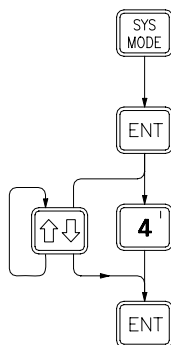
【 LCD Display 】



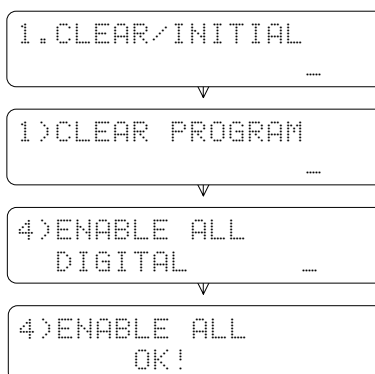
• Any keys except  will cancel the function

4.1.4 ENABLE ALL DIGITAL

【 Key Sequence 】

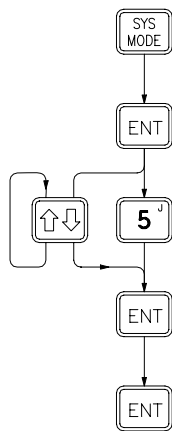


【 LCD Display 】

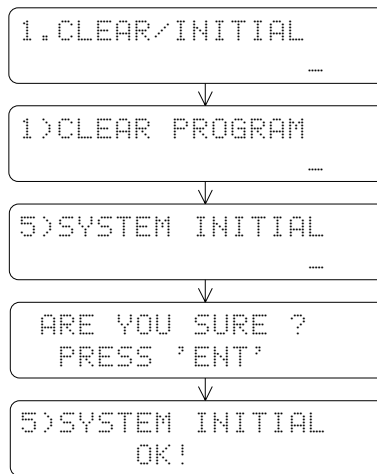



4.1.5 SYSTEM INITIAL

【 Key Sequence 】



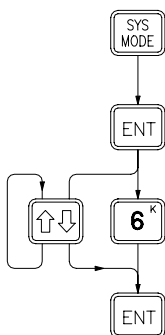
【 LCD Display 】



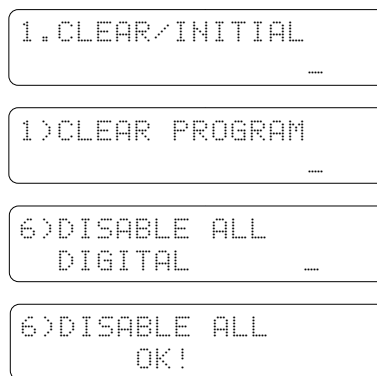
• Any keys except  will cancel the function

4.1.6 DISABLE ALL DIGITAL

【 Key Sequence 】



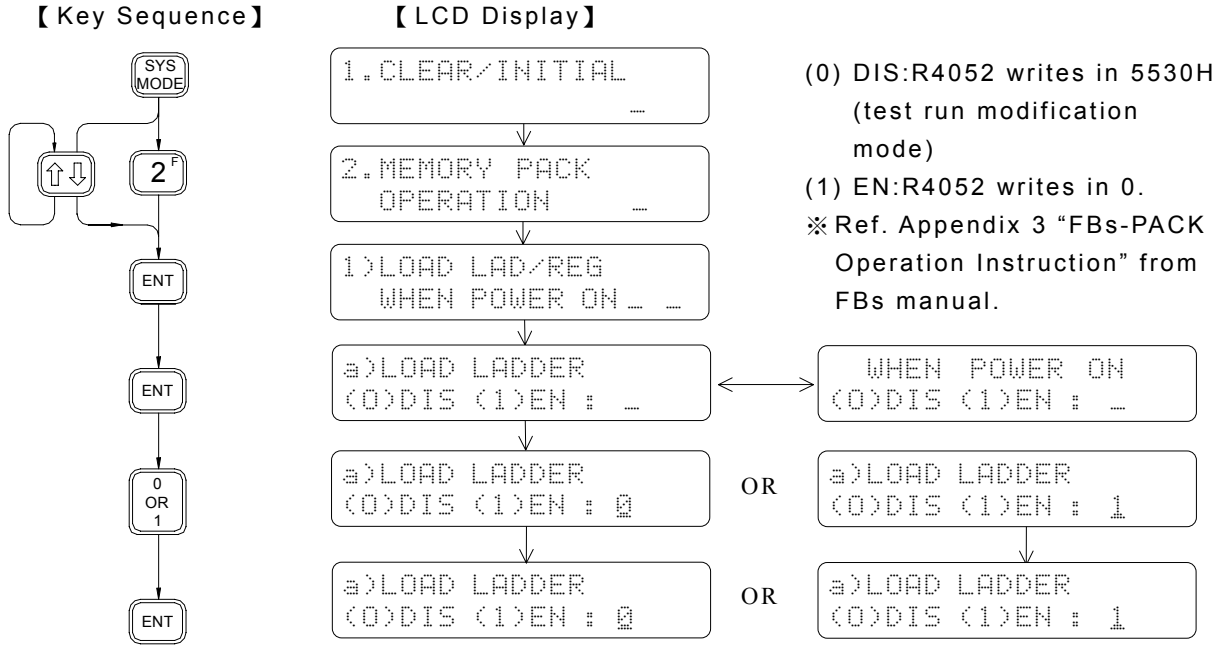
【 LCD Display 】



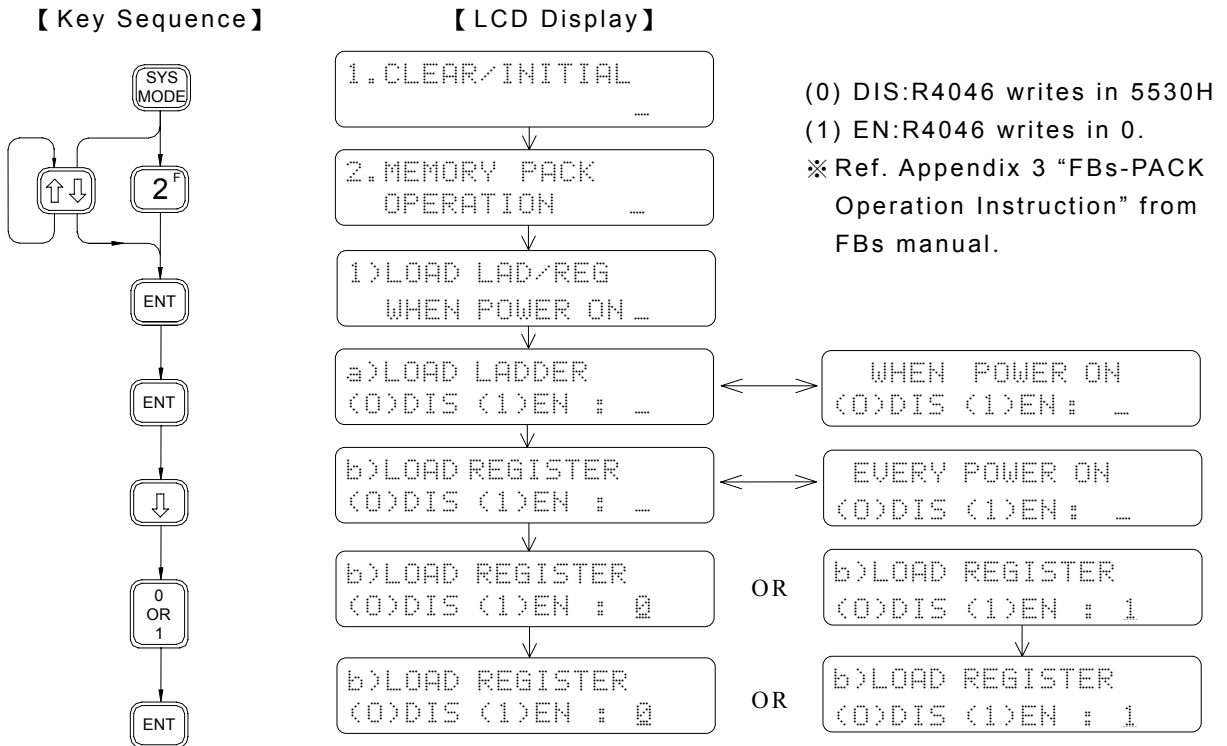
4.2 MEMORY PACK OPERATION

4.2.1 LOAD LAD/REG WHEN POWER ON

a) LOAD LADDER WHEN POWER ON

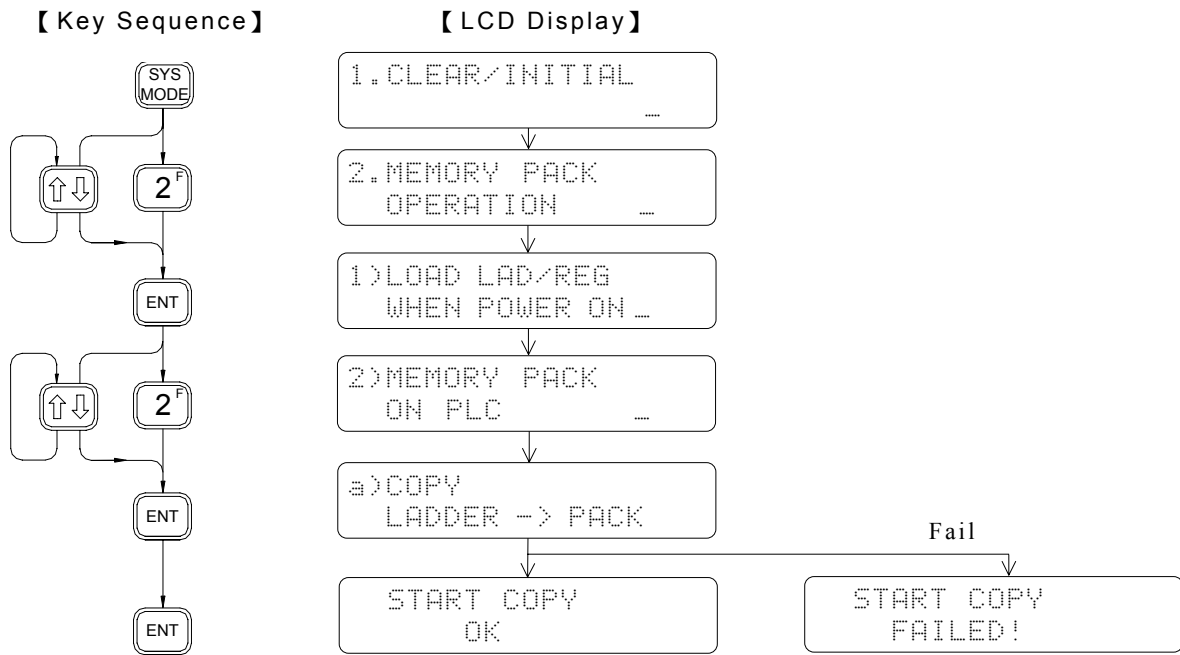


b) LOAD REGISTER EVERY POWER ON



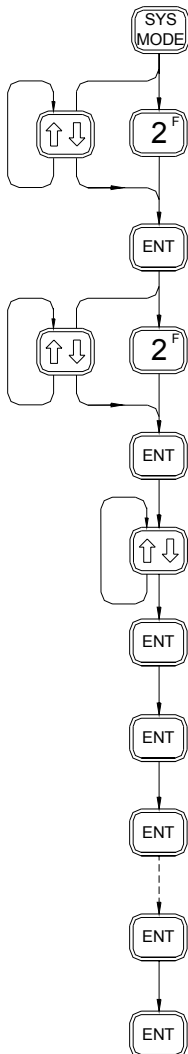
© 4.2.2 MEMORY PACK ON PLC

a) COPY (LADDER→PACK)

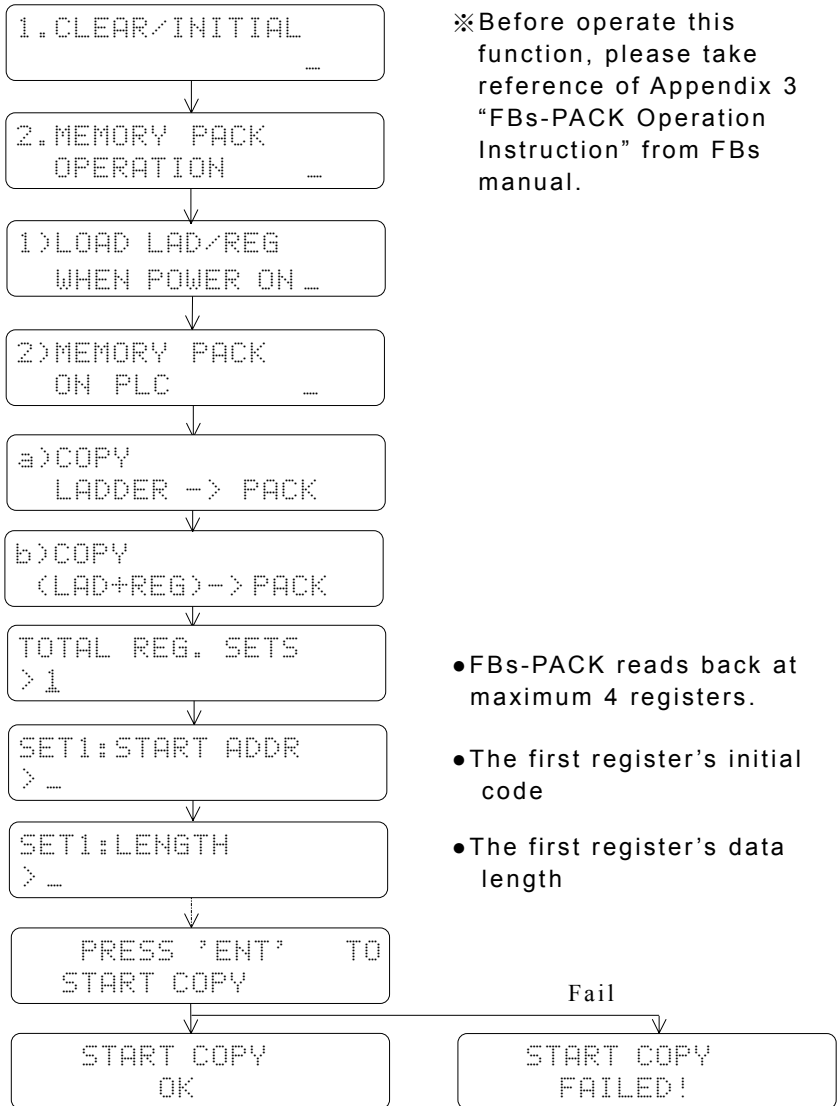


b)COPY (LAD+REG→PACK)

【 Key Sequence 】



【 LCD Display 】

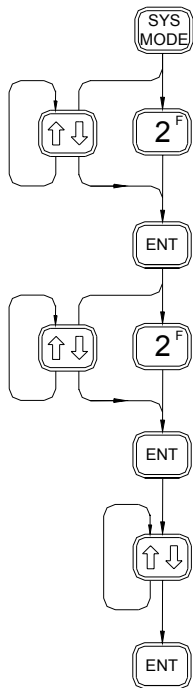


※Before operate this function, please take reference of Appendix 3 “FBs-PACK Operation Instruction” from FBs manual.

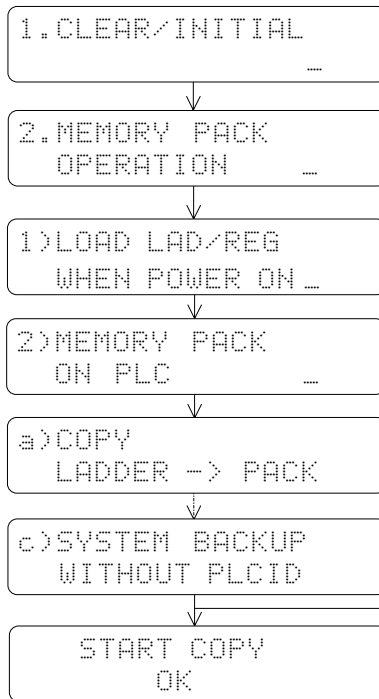
- FBs-PACK reads back at maximum 4 registers.
- The first register’s initial code
- The first register’s data length

c)SYSTEM BACKUP WITHOUT PLC ID

【 Key Sequence 】



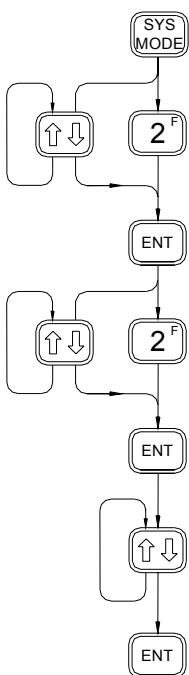
【 LCD Display 】



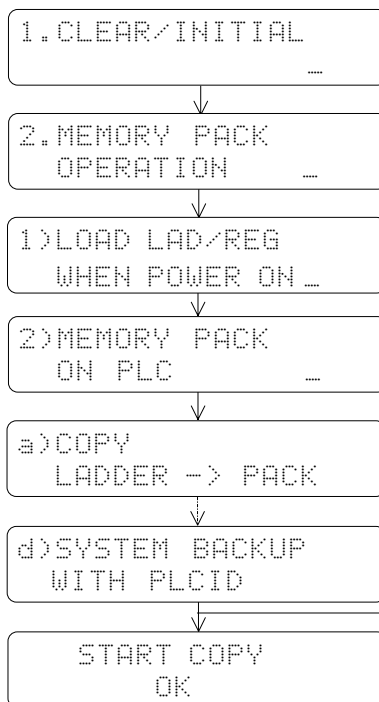
※The function of system backup includes ladder、register、digital and system data, but PLC ID excluded.

d)SYSTEM BACKUP WITH PLC ID

【 Key Sequence 】

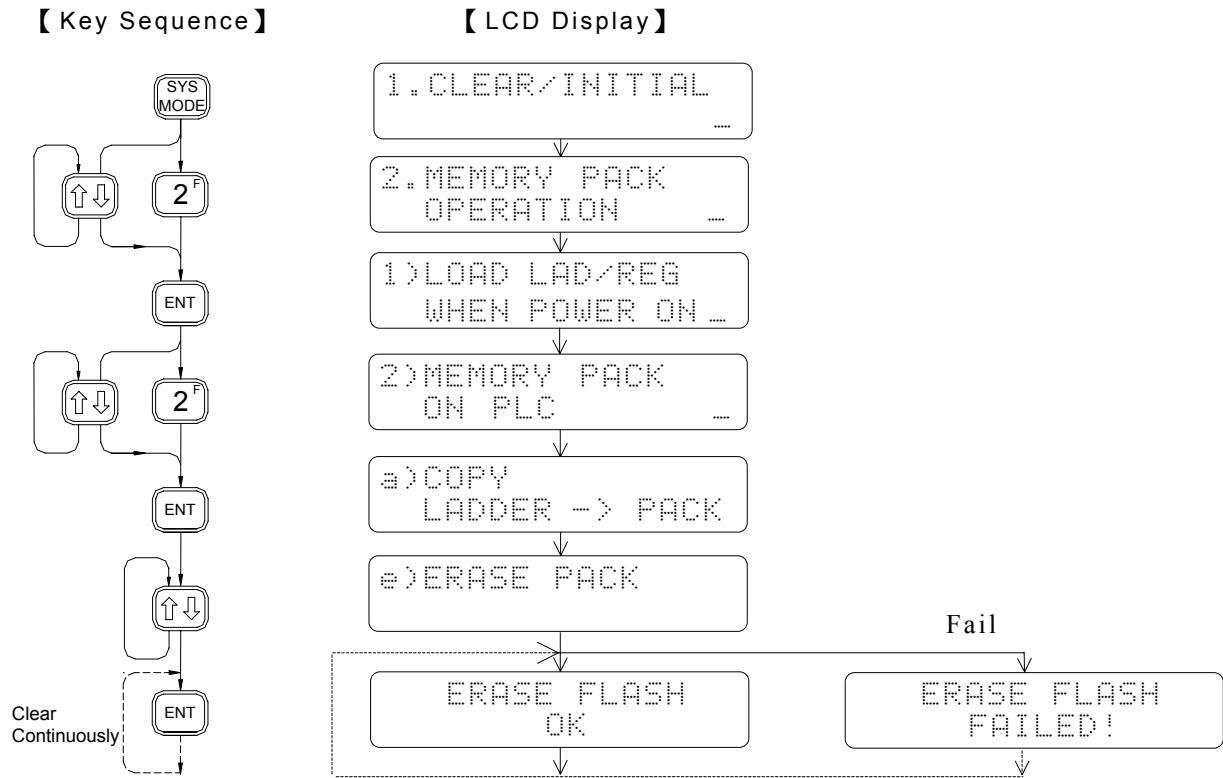


【 LCD Display 】



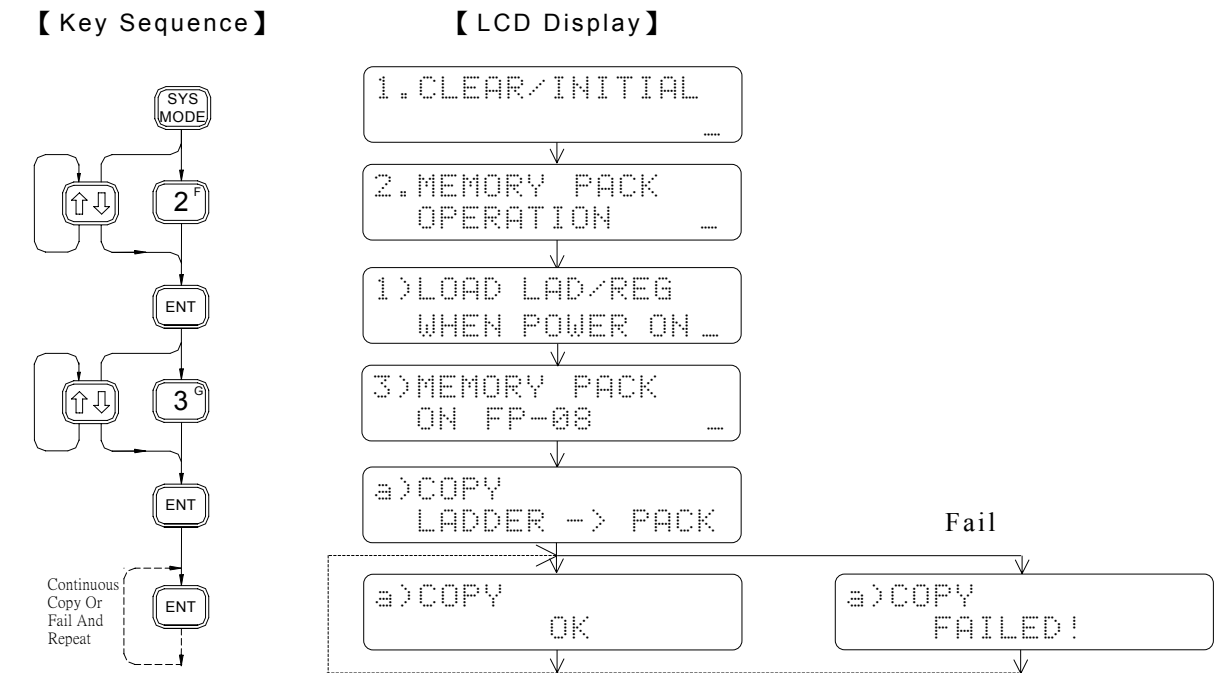
※The function of system backup includes ladder、register、digital and system data.

e)ERASE PACK



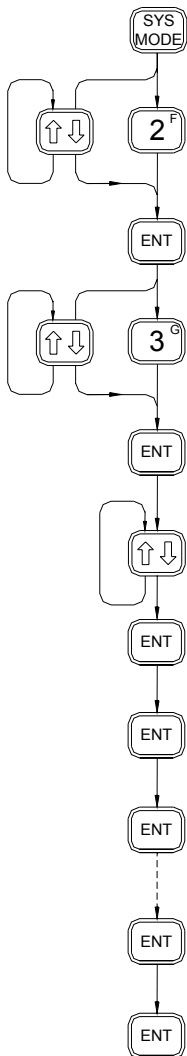
◎ **4.2.3 MEMORY PACK ON FP-08**

a)COPY (LADDER→PACK)

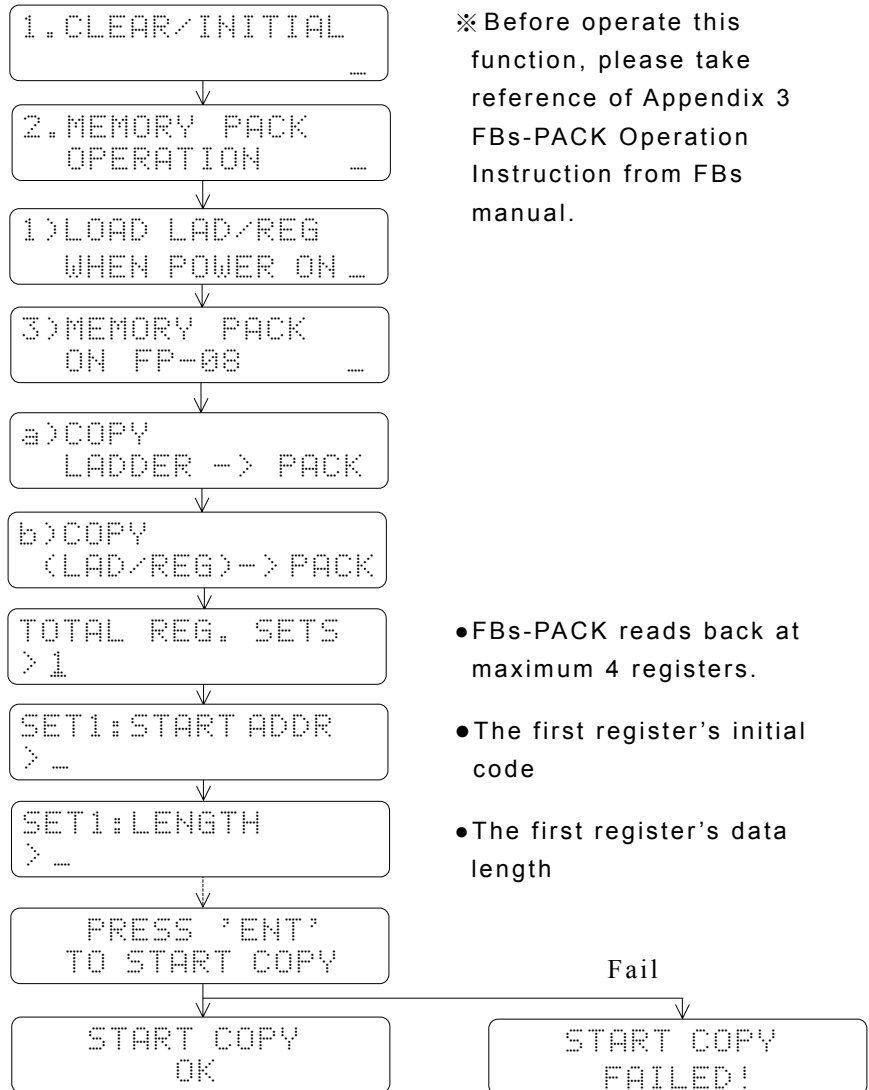


b)COPY (LAD+REG→PACK)

【 Key Sequence 】



【 LCD Display 】

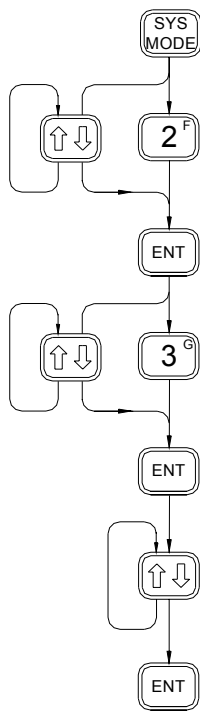


※ Before operate this function, please take reference of Appendix 3 FBs-PACK Operation Instruction from FBs manual.

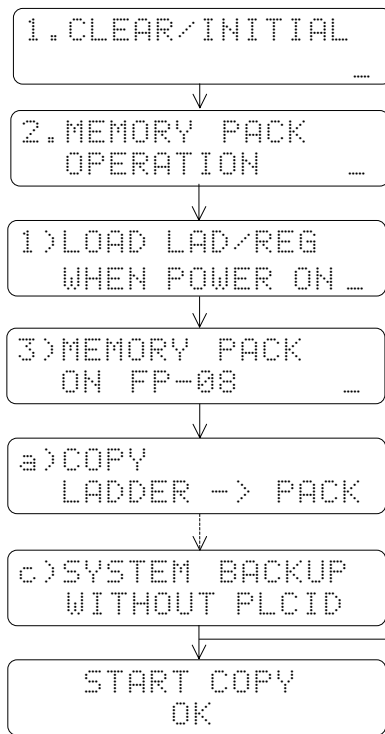
- FBs-PACK reads back at maximum 4 registers.
- The first register's initial code
- The first register's data length

c)SYSTEM BACKUP WITHOUT PLC ID

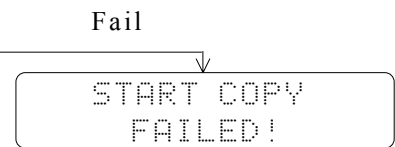
【 Key Sequence 】



【 LCD Display 】

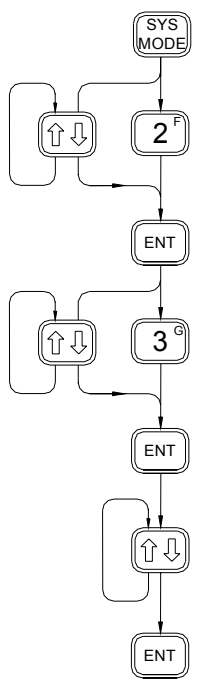


※ The function of system backup includes ladder、register、digital and system data, but PLC ID excluded.

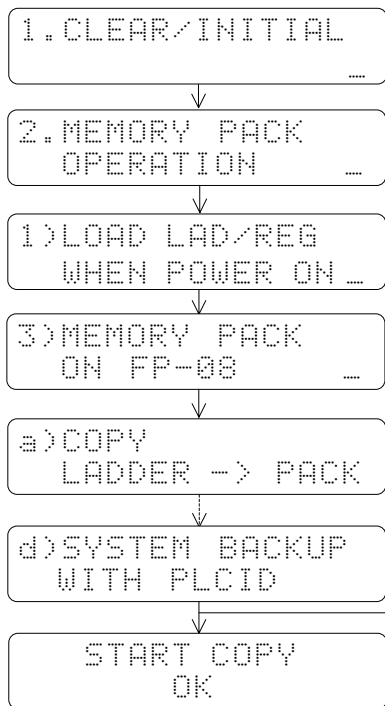


d)SYSTEM BACKUP WITH PLC ID

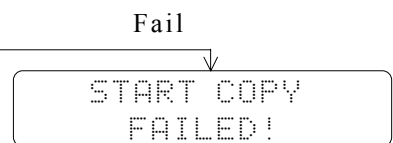
【 Key Sequence 】



【 LCD Display 】

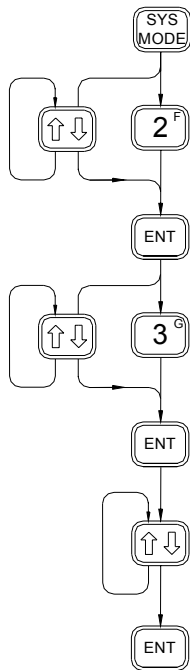


※ The function of system backup includes ladder、register、digital and system data.

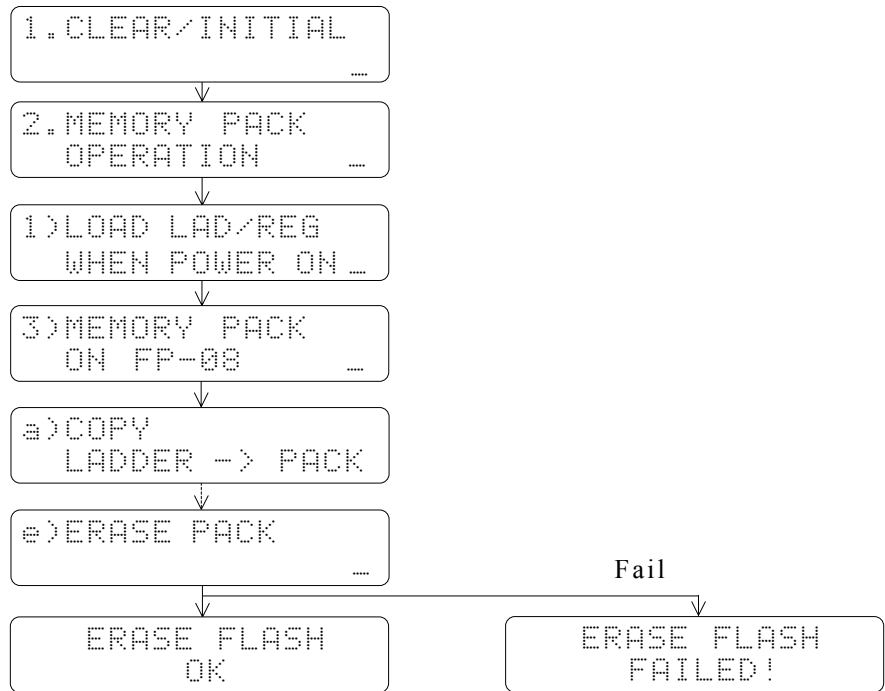


e)ERASE PACK

【 Key Sequence 】

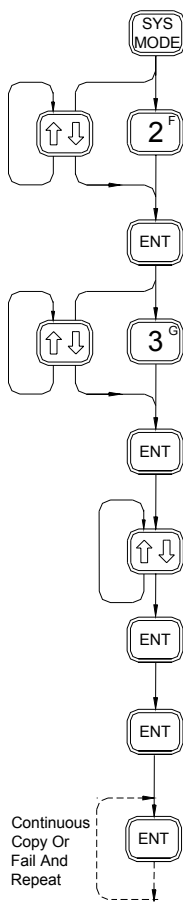


【 LCD Display 】

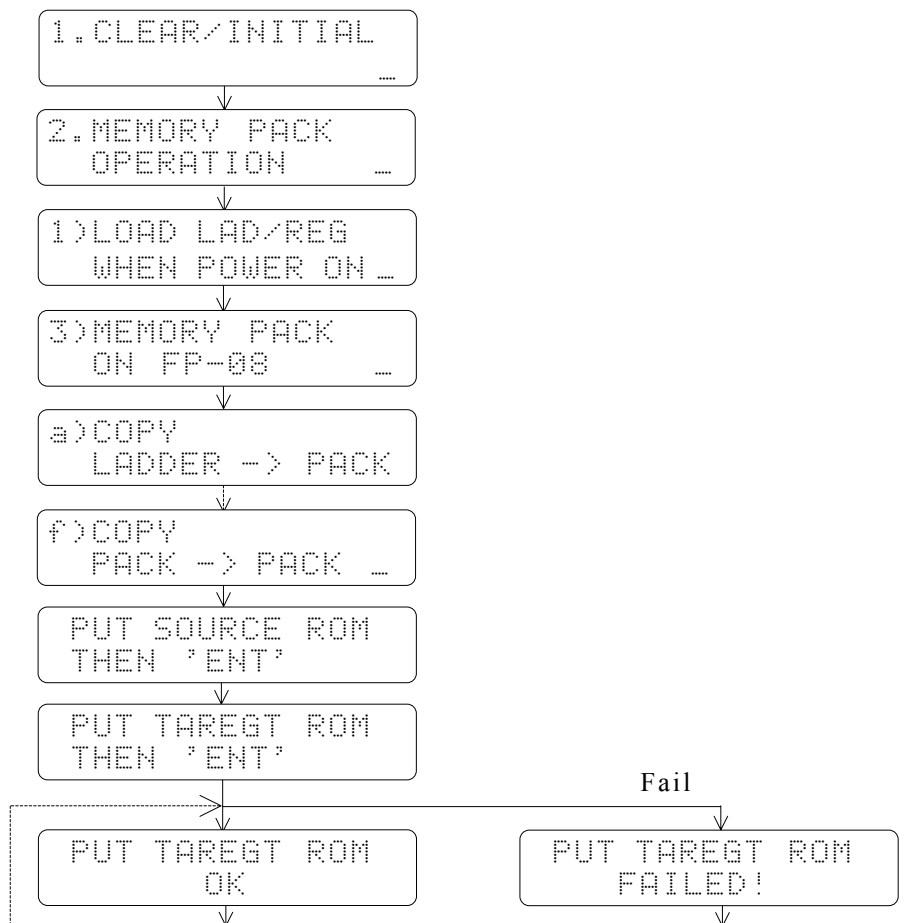


f)COPY (PACK→PACK)

【 Key Sequence 】

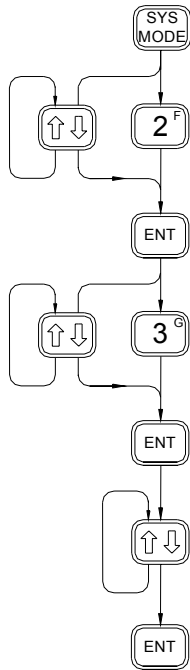


【 LCD Display 】

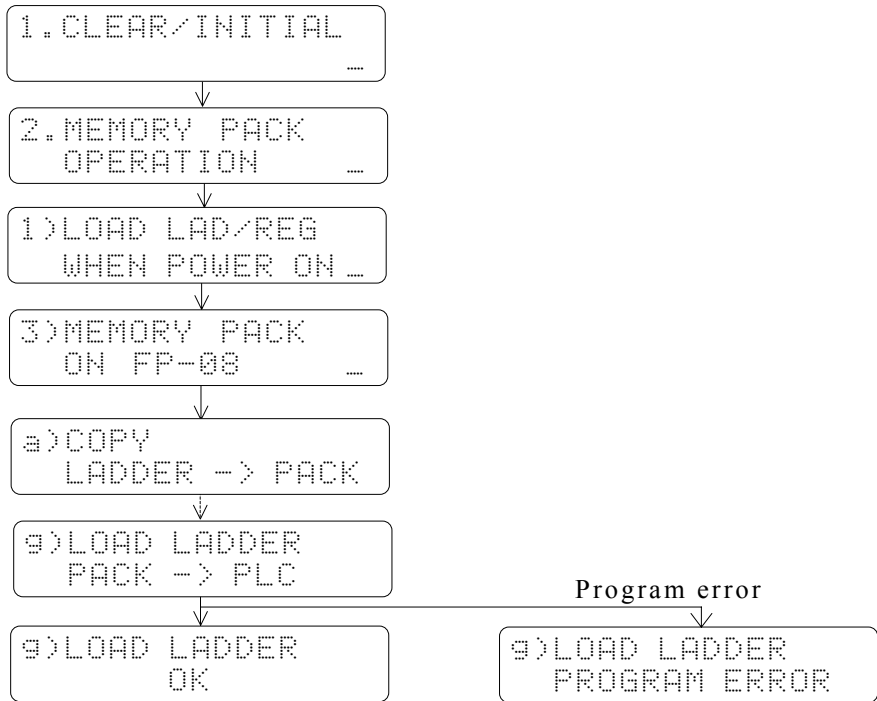


g)LOAD LADDER (PACK→PLC)

【 Key Sequence 】

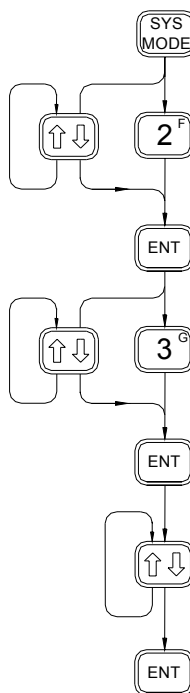


【 LCD Display 】

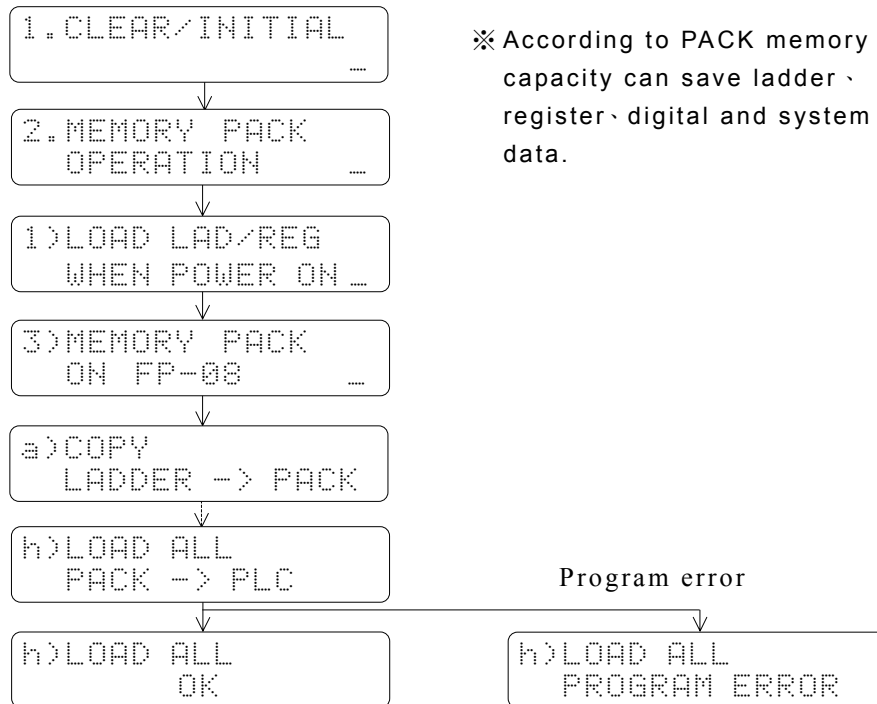


h)LOAD ALL (PACK→PLC)

【 Key Sequence 】



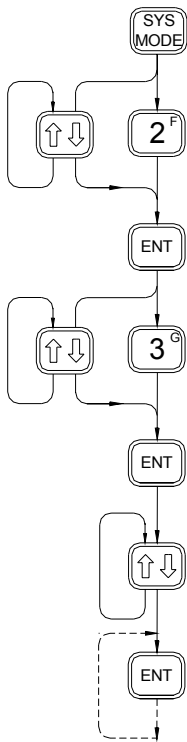
【 LCD Display 】



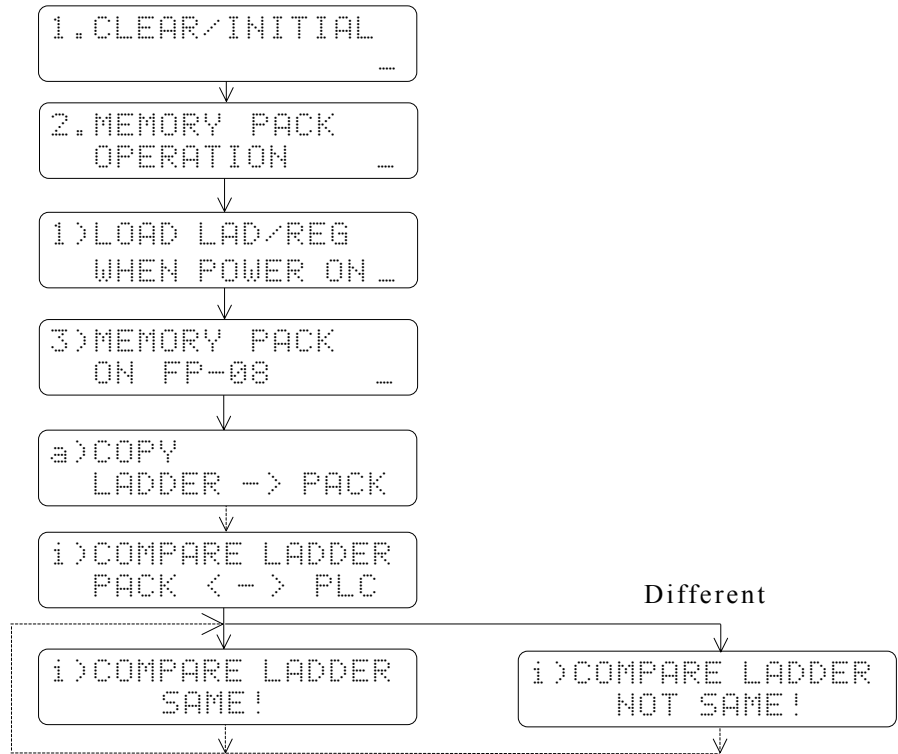
※ According to PACK memory capacity can save ladder · register · digital and system data.

i) COMPARE LADDER (PACK ↔ PLC)

【 Key Sequence 】

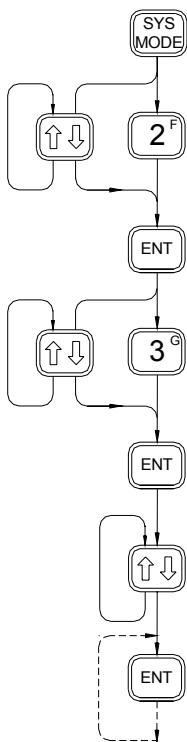


【 LCD Display 】

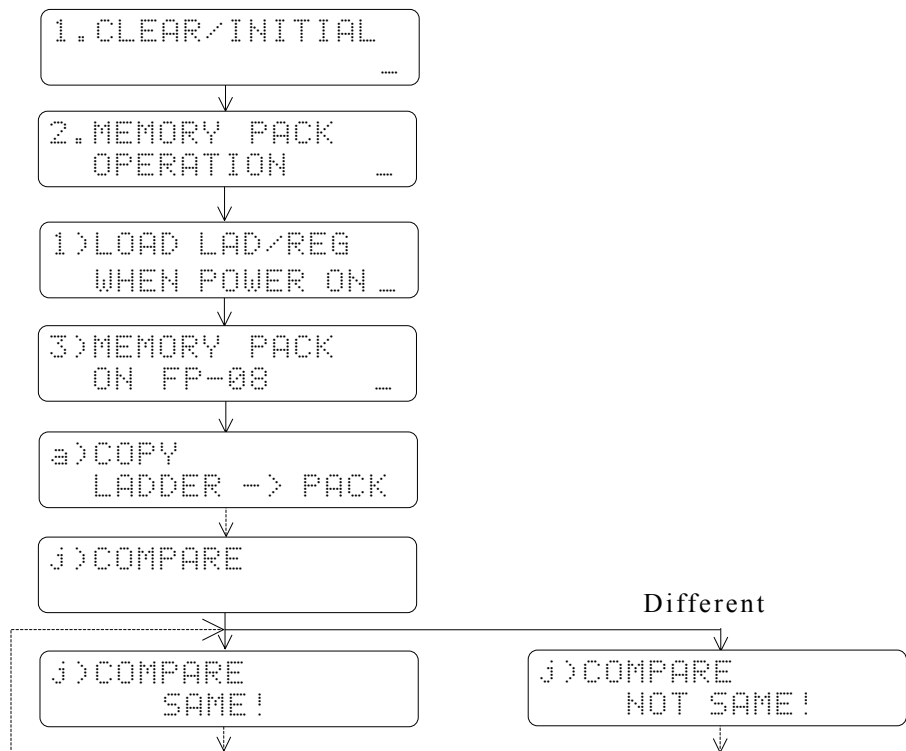


j) COMPARE (PACK ↔ PACK)

【 Key Sequence 】



【 LCD Display 】



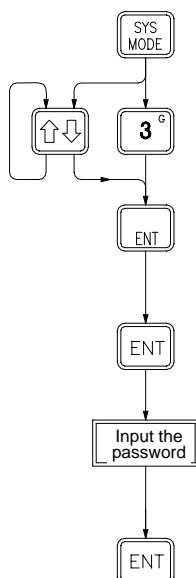
4.3 PASSWORD/ID

- **PASSWORD** : The password prevents unauthorized access to the program. In order to edit, read and copy the program, you have to open the password first if it has been set. Otherwise the FP-08 will prohibit the user from executing such operations. Even you have opened the password, the PLC will automatically return to the password close mode if the power is turned off. Users can freely execute all FP-08 operations without any restrictions if the password has not been set.
- **ID** : The FBs series PLC is designed with a program ID stored in the PLC program and PLC system sections. The PLC, while running, will check for the program ID, and if available, compare it to the system ID. If the ID does not match, then the PLC will not RUN. FBs-PACK can only store the ladder, comments, password, configuration, register and program ID data etc.; the PLC system ID cannot be saved to the memory pack

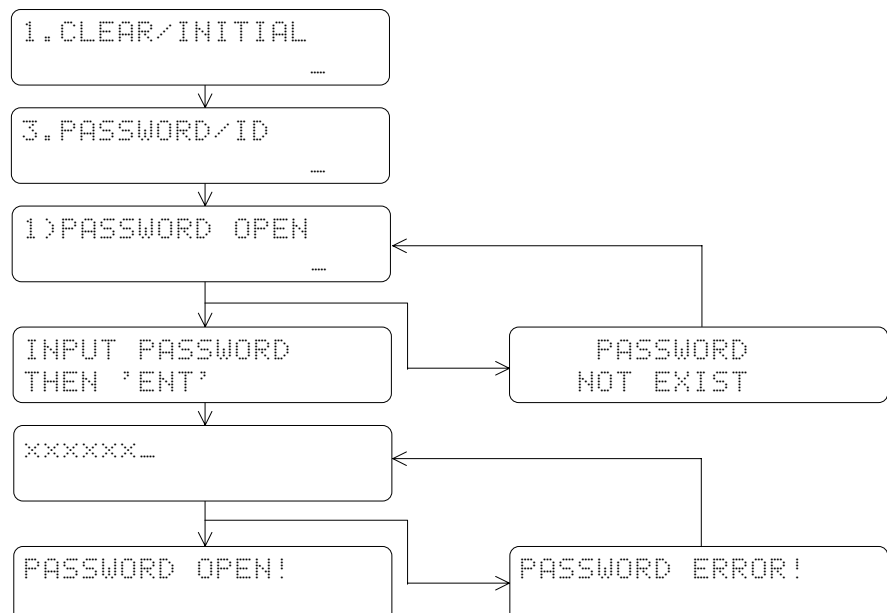
Remarks: If you set the ID without the password, it only prevents the Hard Copy of the ROM PACK, and the program can still be read out freely thus enabling an identical program without a specified ID code to be reproduced, and the reproduced program may operate normally upon downloading it into the PLC. Therefore, if you store the program using the FBs-PACK, it is also necessary to set a password. If you store the program using the RAM inside the PLC instead of an external ROM, then the password protection is adequate enough.

4.3.1 PASSWORD OPEN

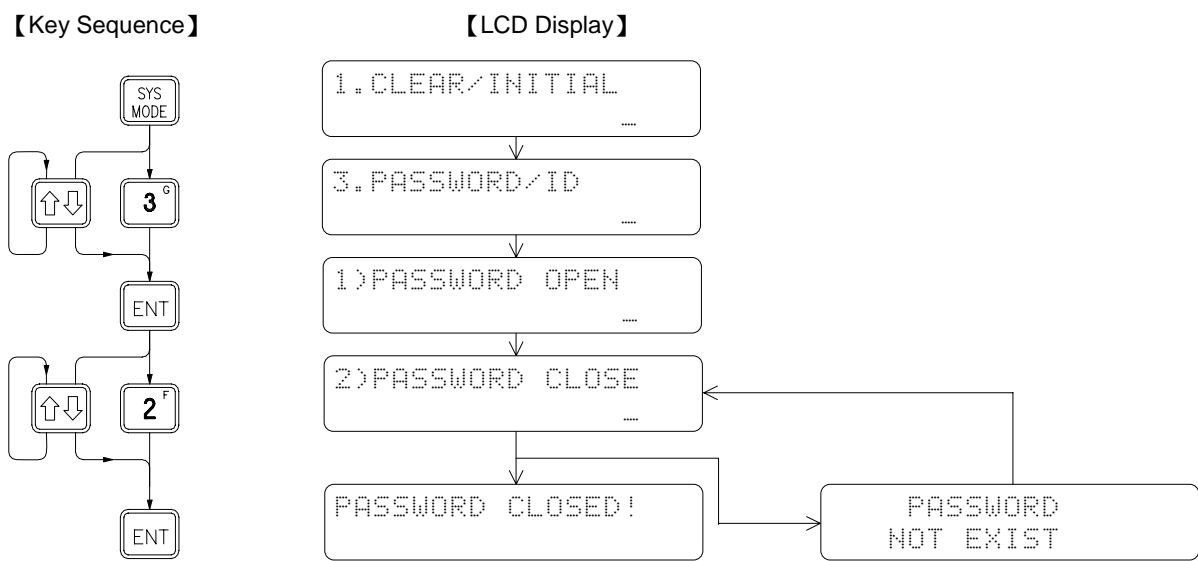
【Key Sequence】



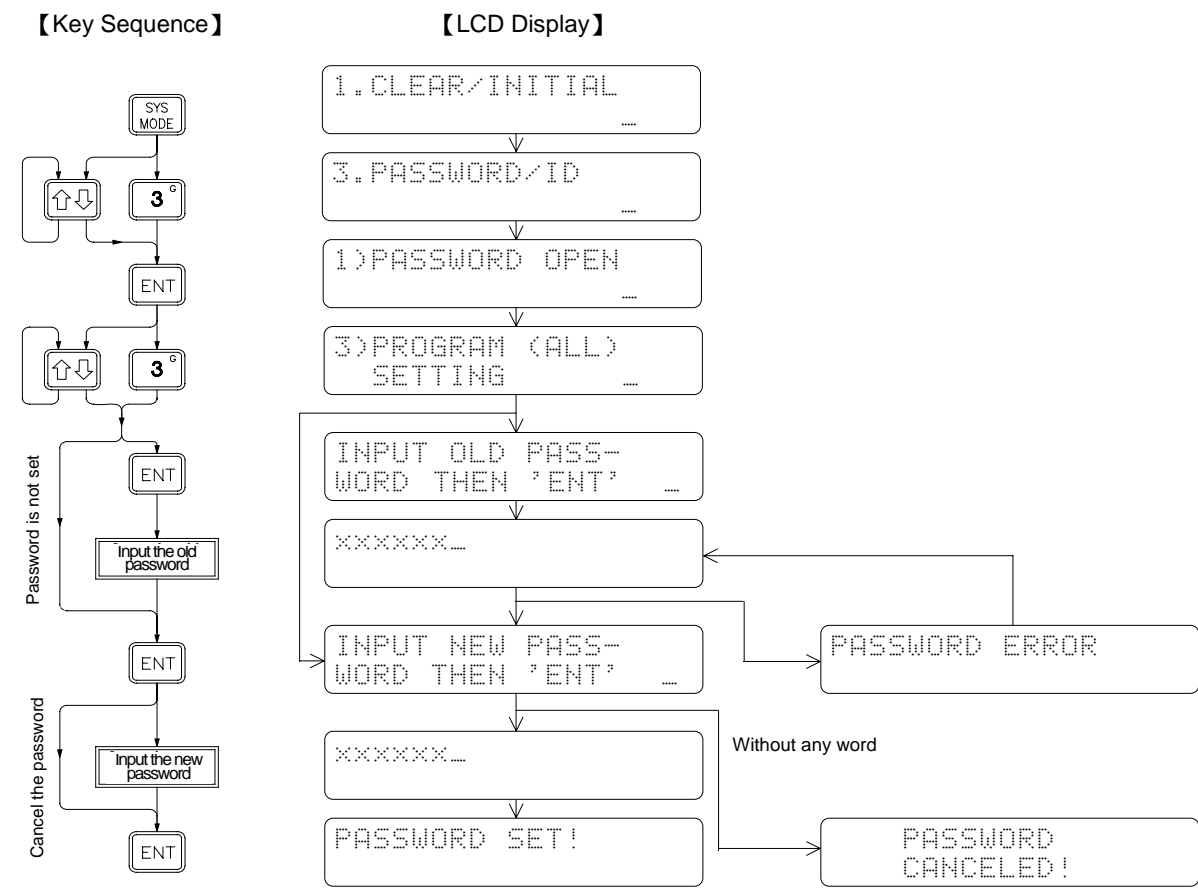
【LCD Display】



4.3.2 PASSWORD CLOSE

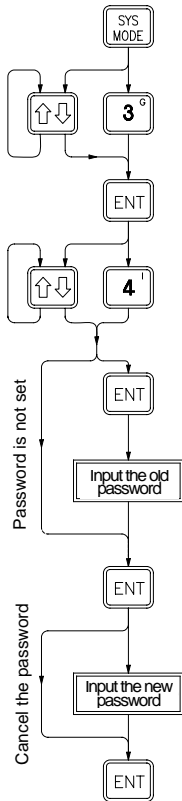


4.3.3 PASSWORD (ALL) SETTING

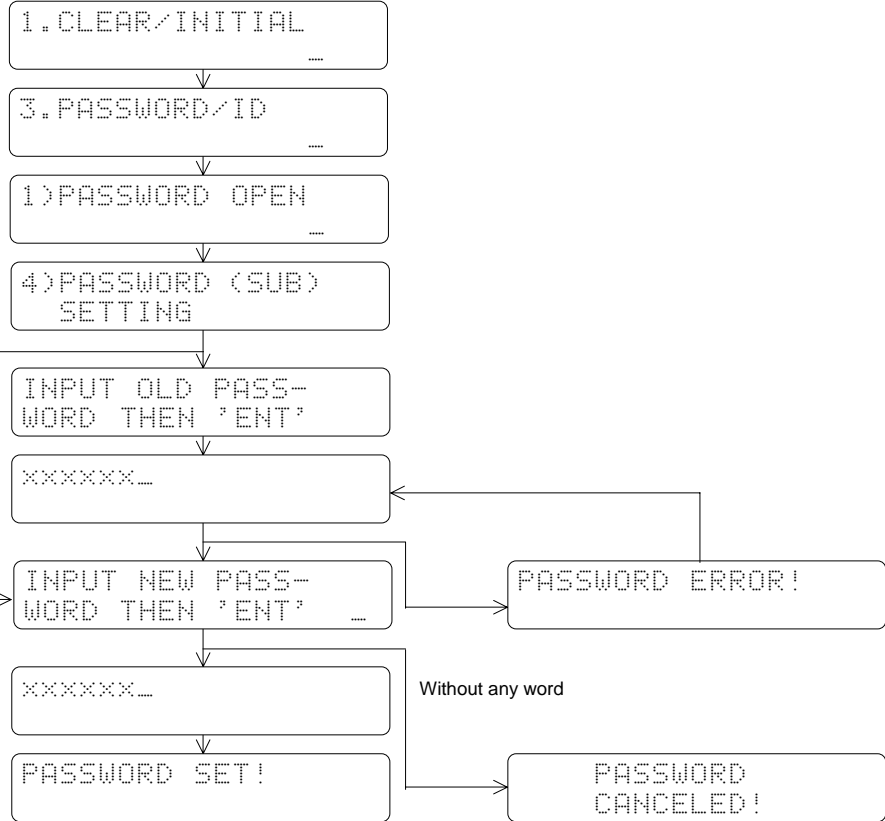


4.3.4 PASSWORD (SUB) SETTING

【Key Sequence】

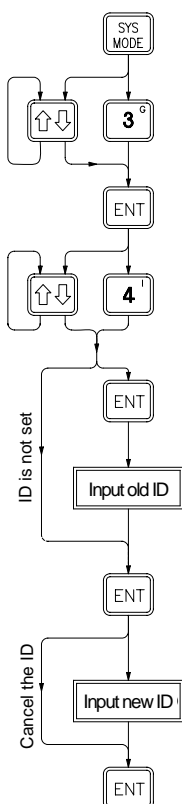


【LCD Display】

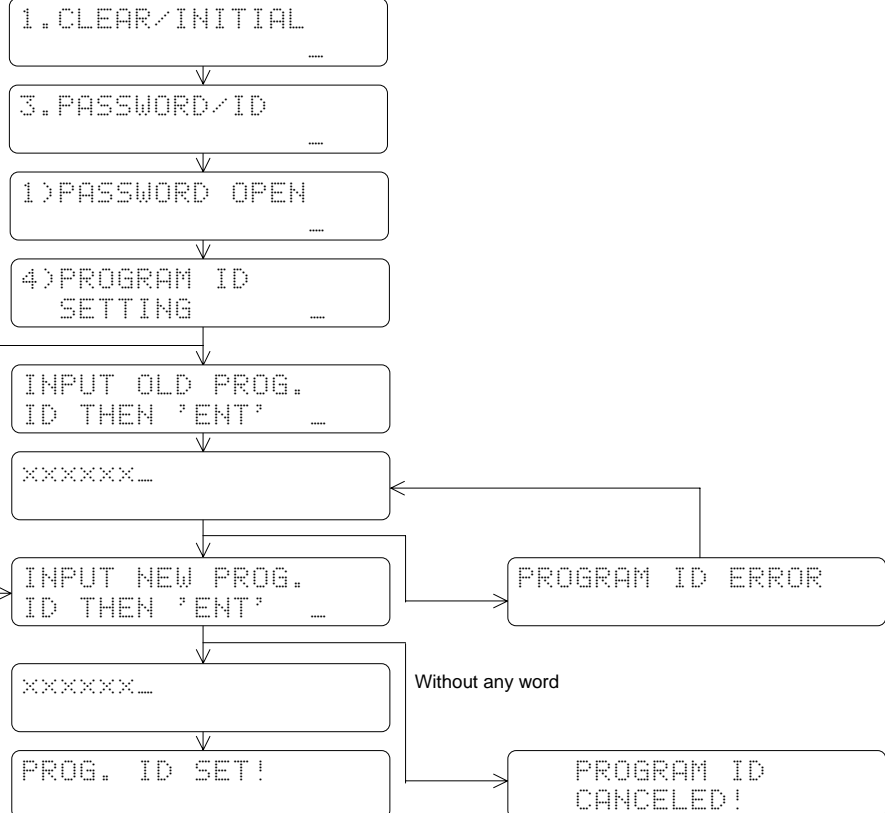


4.3.5 PROGRAM ID SETTING

【Key Sequence】

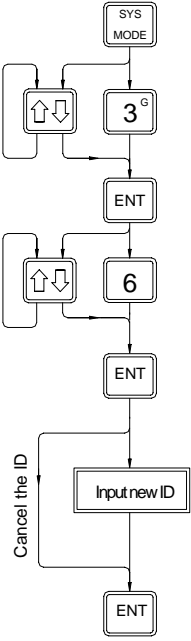


【LCD Display】

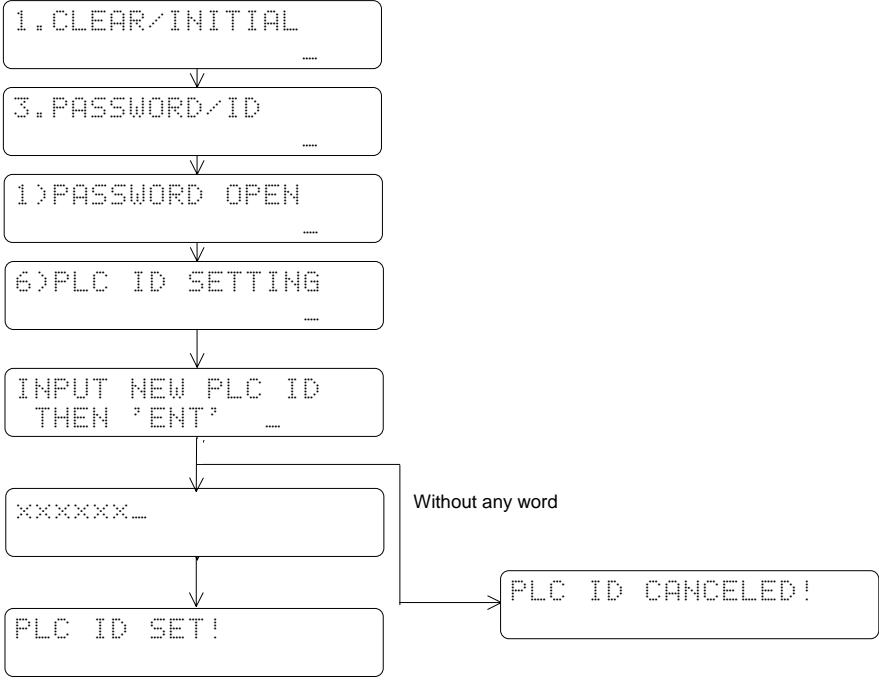


4.3.6 PLC ID SETTING

【Key Sequence】



【LCD Display】



4.4 CONFIGURATION

(For beginners, please skip this function)

The initial system configurations of FBs-PLC, such as the Retentive/Non Retentive coils and registers partition and ROR assignment have already been set and adjusted for the best device performance. We call this initial setting as "Default Configuration". It is not necessary to reset or to readjust the default configurations for most applications. In order for the system to handle other special operations, a Configuration Setting function is provided for the users to readjust the configurations according to their needs.

Listed below are the "Default Configurations" and adjustable ranges by the "configuration" function:

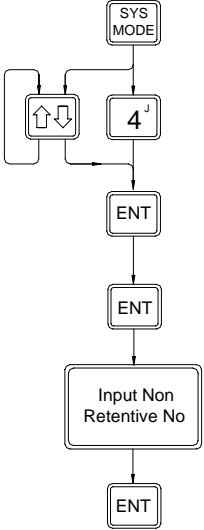
Configuration items		Default configuration	Valid range	Remarks
Internal Coil	Non Retentive	M0~M799	M0~M1399	M1400~M2001 are non retentive
	Retentive	M800~M1399	M0~M1399	
Step Coil	Non Retentive	S0~S499	S20~S999	Step points S0~S19 are fixed for non retentive
	Retentive	S500~S999	S20~S999	
Timer*	0.01S	T0~T49	T0~T255	
	0.1S	T50~T199	T0~T255	
	1S	T200~T255	T0~T255	
16-Bit Counter	Retentive	C0~C139	C0~C199	
	Non Retentive	C140~C199	C0~C199	
32-Bit Counter	Retentive	C200~C239	C200~C255	
	Non Retentive	C240~C255	C200~C255	
Data Register	Retentive	R0~R2999	R0~R3839	D0~D3171 are always retentive
	Non Retentive	R3000~R3839	R0~R3839	
Read-Only Register		0	R5000~R8071	
High Speed Timer (0.1ms)		R4152~R4154	Unchangeable	
High Speed Counter		0	HSC0~HSC7	
External Interrupt		0	INT0~INT15	
Station number		No.1	No.1~No.255	

Remark 1: For the items marked with "*", can only be modified while PLC is at initial state. After the program had written to the PLC, changing of these two items is prohibited. The only way to change configurations after had written a program into the PLC is to perform the system initial operation, which means you will lose all the programs and get a defaulted configuration again. Please pay more attention on this.

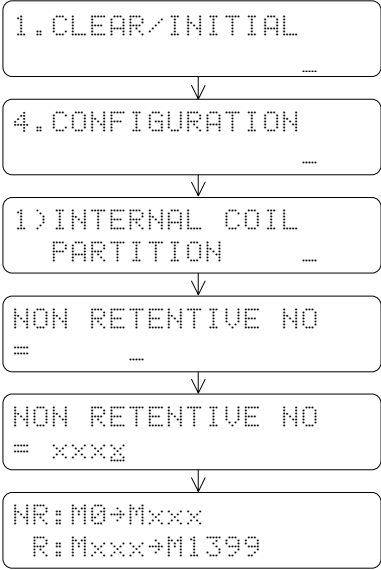
Remark 2: The registers in the range of R5000~R8071 if not used for Read-Only registers, could be used as normal read and write registers.

4.4.1 INTERNAL COIL PARTITION

【Key Sequence】

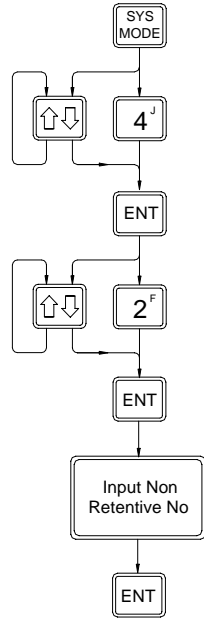


【LCD Display】

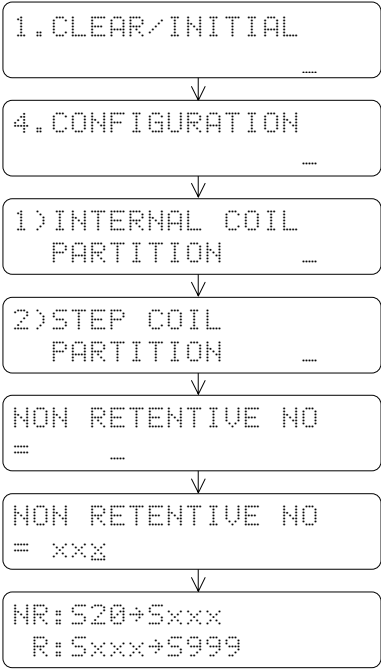


4.4.2 STEP COIL PARTITION

【Key Sequence】

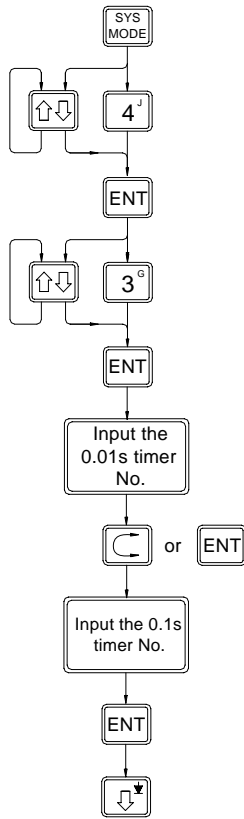


【LCD Display】

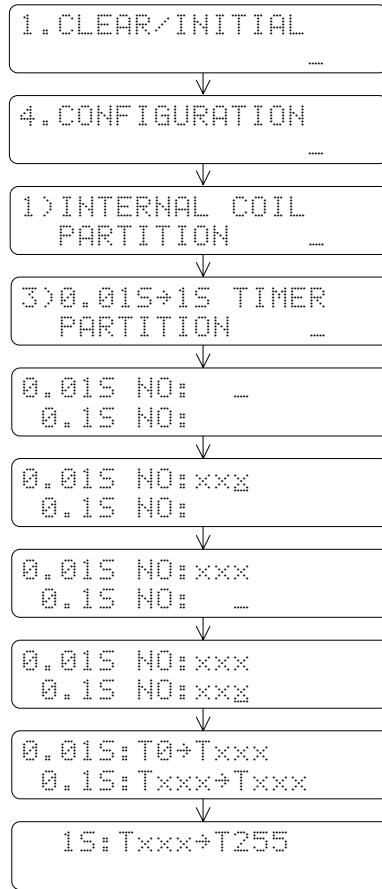


4.4.3 0.01S~1S TIMER PARTITION

【Key Sequence】



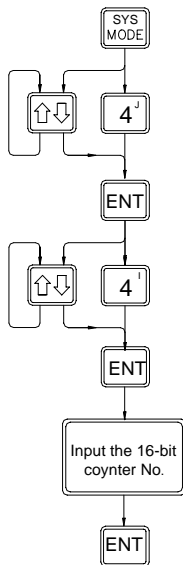
【LCD Display】



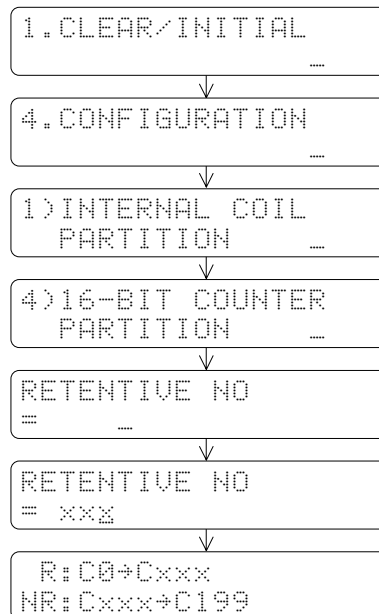
- After setting the 0.01S and 0.1S timer number, it is not necessary to set 1S timer number

4.4.4 16-BIT COUNTER PARTITION

【Key Sequence】

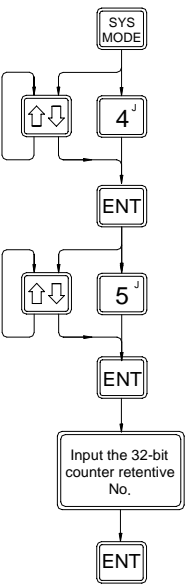


【LCD Display】

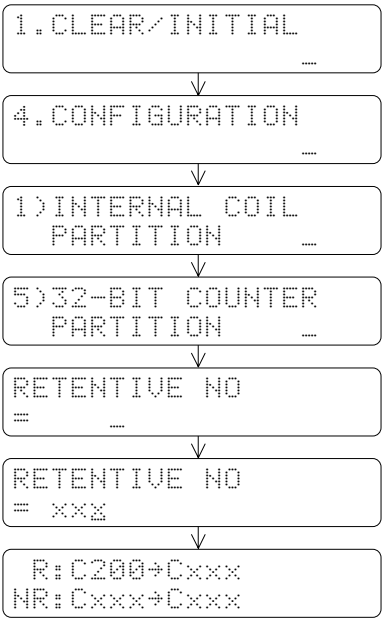


4.4.5 32-BIT COUNTER PARTITION

【Key Sequence】

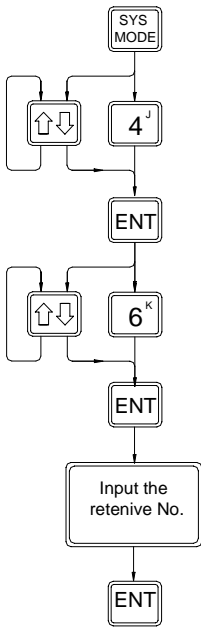


【LCD Display】

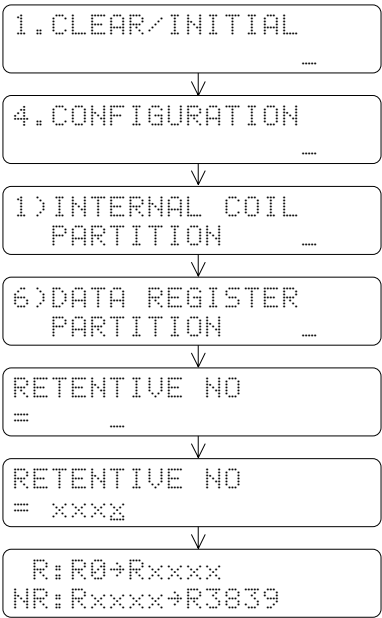


4.4.6 DATA REGISTER PARTITION

【Key Sequence】

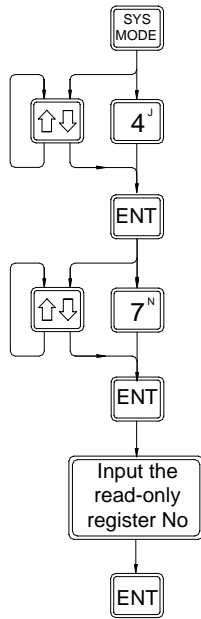


【LCD Display】

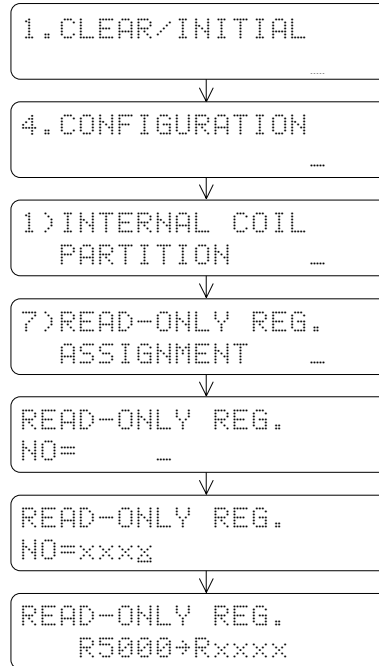


4.4.7 READ-ONLY REGISTER ASSIGNMENT

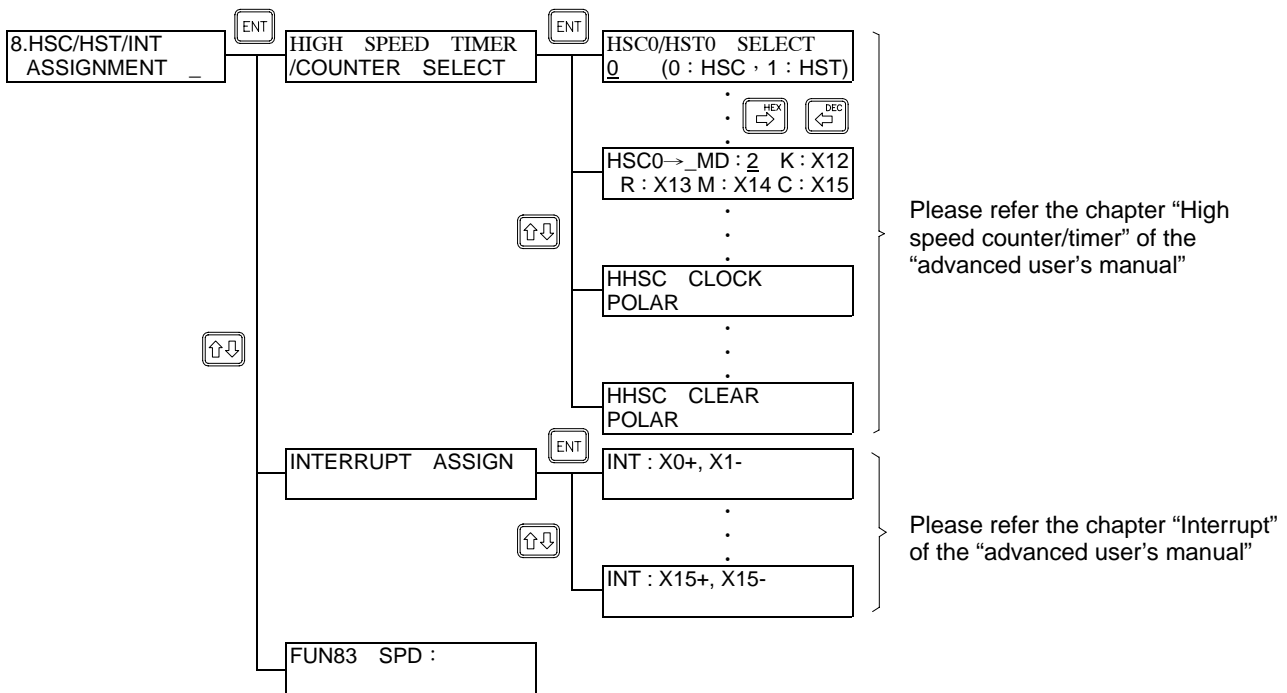
【Key Sequence】



【LCD Display】



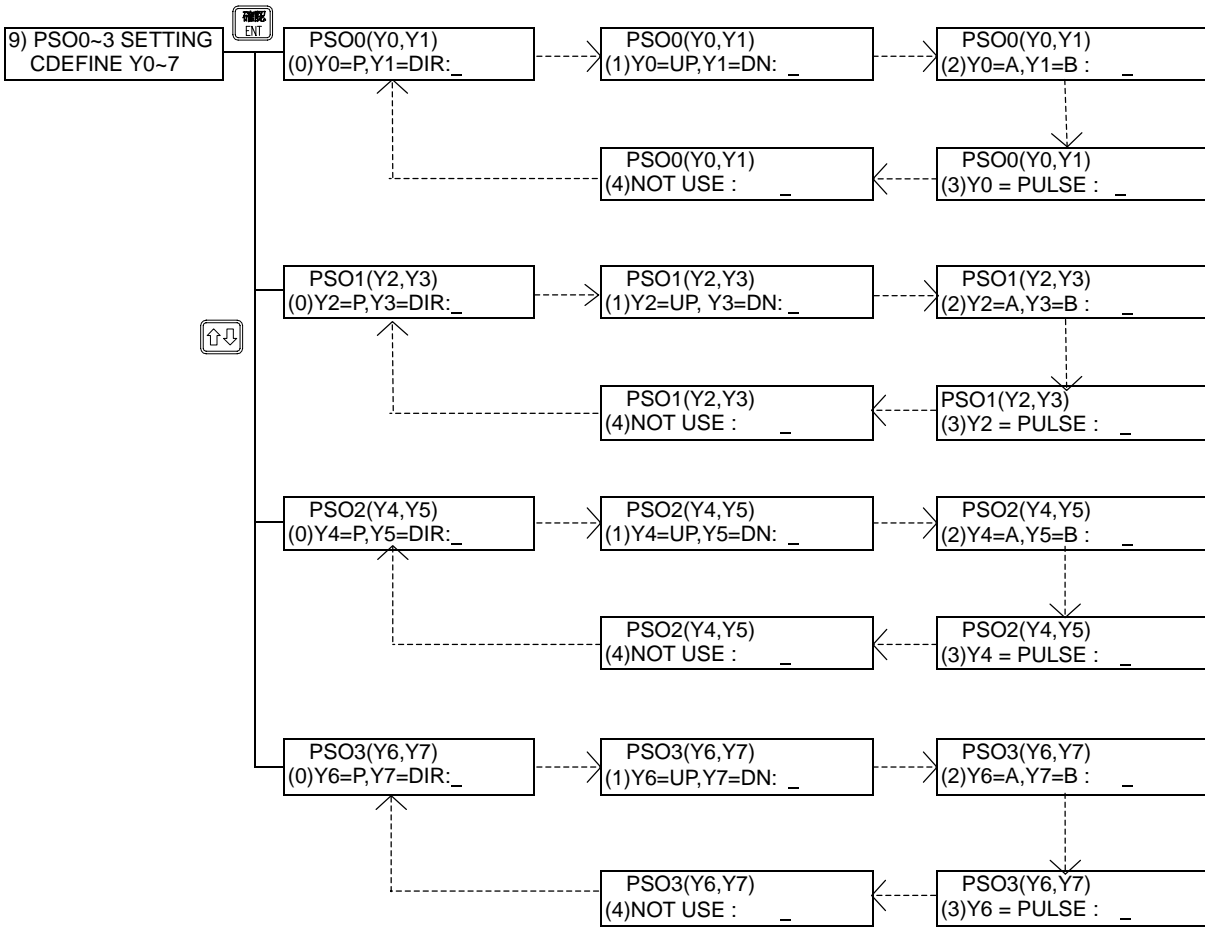
4.4.8 HSC/HST/INT ASSIGNMENT



Remarks 1: There are 4 sets of hardware HSC0~3, and 4 sets of software HSC4~7 in FBs MC and MN models, but only 2 sets of software HSC4 and HSC7 in MA model.

2: Counter MODE (MD) setting : 0 means U/D, 1 means U/D × 2 times precision, 2 means K/R, 3 means K/R × 2 times precision, 4 means A/B phase, 5 means A/B phase × 2 times precision, 6 means A/B phase × 3 times precision, 7 means A/B phase × 4 times precision.

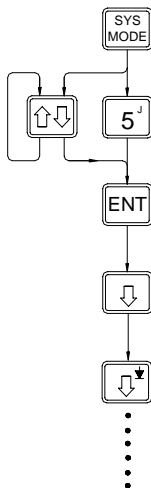
4.4.9 PSO0~3 SETTING



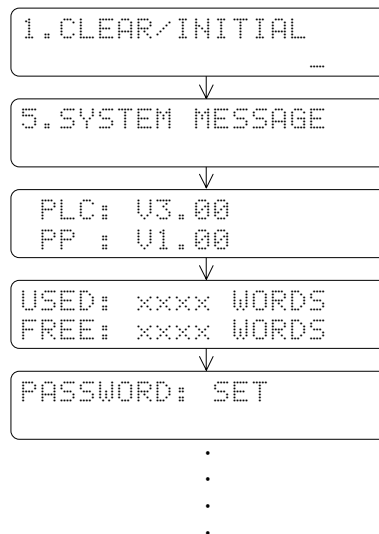
※ Screens with a dotted line will be automatically cycled through

4.5 SYSTEM MESSAGE

【Key Sequence】

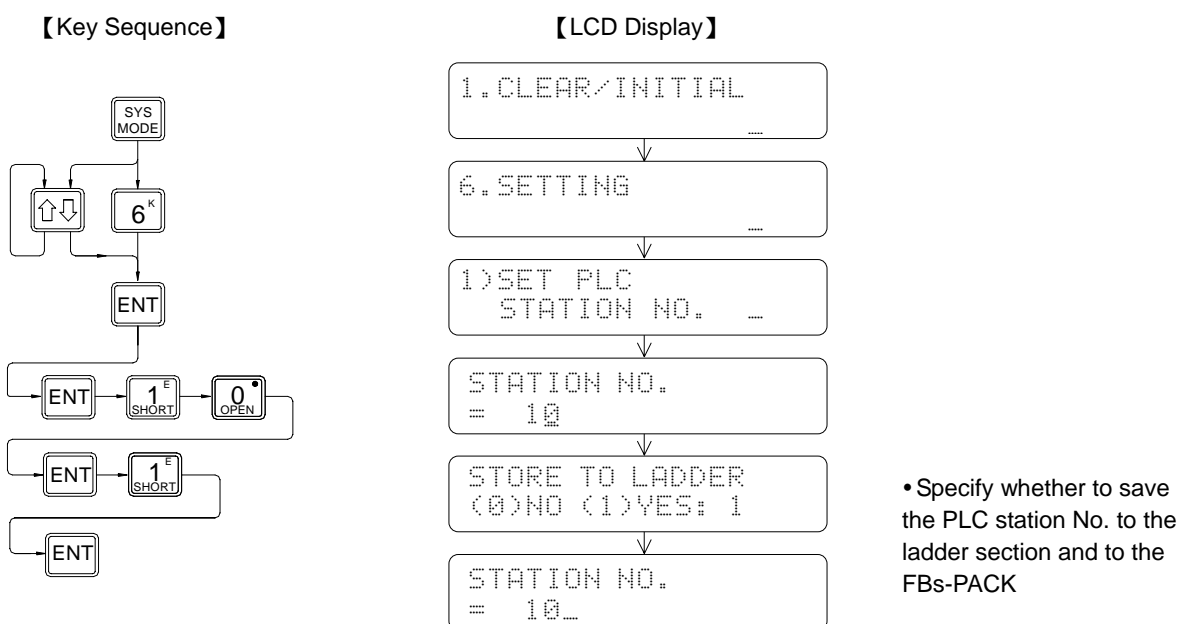


【LCD Display】



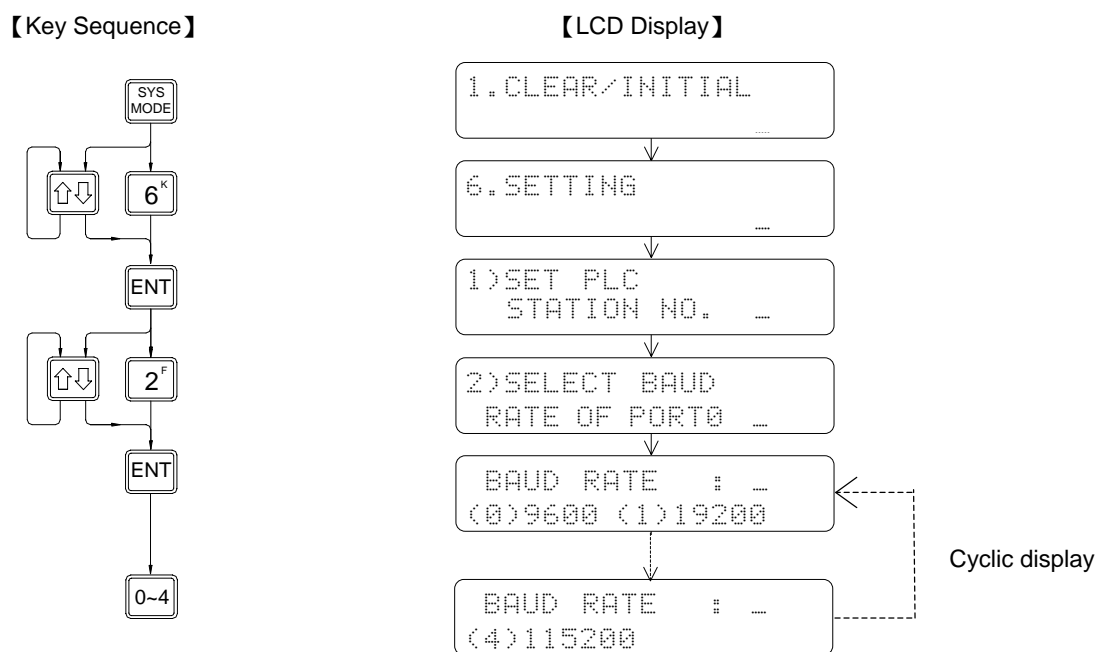
4.6 SETTING

4.6.1 SET PLC STATION NO.



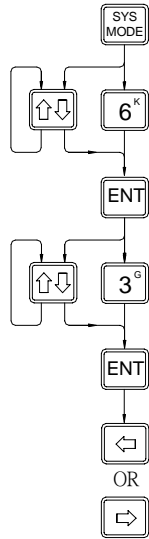
The FBs is factory default to 1, you can use this function to change the No. to between 1~255.

4.6.2 SELECT BAUD RATE OF PORT0~4

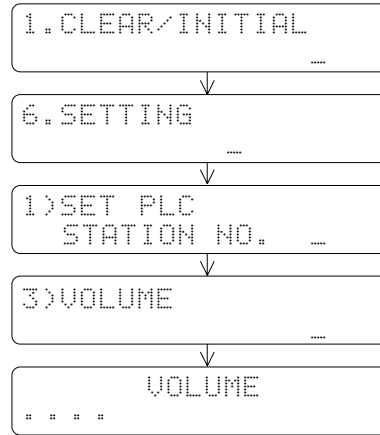


4.6.3 VOLUME

【Key Sequence】

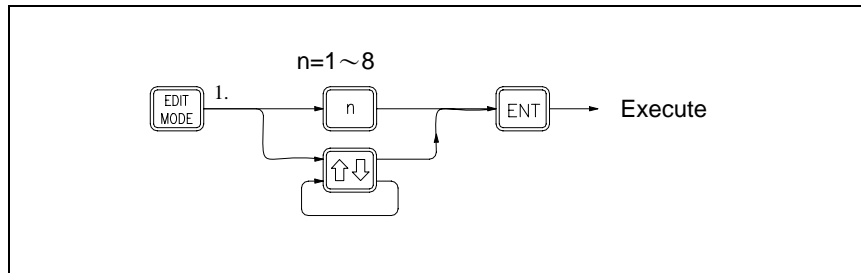


【LCD Display】



5 Operation of EDIT MODE

Fundamental key operations of edit mode:



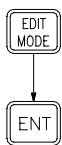
- System mode has a total 7 functions:
 1. EDIT PROGRAM
 2. EDIT REGISTER DATA
 3. SYNTAX CHECK
 4. MOVE HR→ROR
 5. CHECK DOUBLE COIL/T/C
 6. EDIT HPSO INSTRUCTION
 7. EDIT LINK INSTRUCTION
 8. EDIT DOCUMENT
- When the first time enter the Edit Mode, the LCD screen will be automatically prompted with main function 1 which is the “EDIT PROGRAM”. If it is not the desired function can either directly input the function number (n) or use to search for the desired function and then press to execute the function.

5.1 EDIT PROGRAM

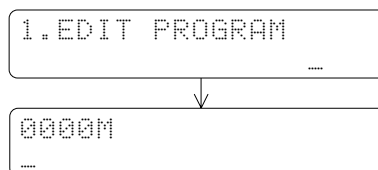
Before start working on the following example, please perform the “CLEAR” operation shown in section 2.2.1 first.

- Enter the edit mode

【Key Sequence】

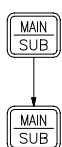


【LCD Display】

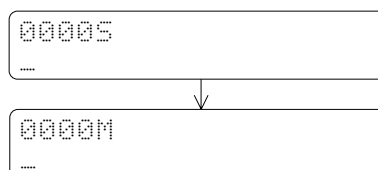


(If want to enter the sub-program area, press . Press again will return to the main-program area.)

【Key Sequence】





【LCD Display】









S: indicates the sub-program area





M: indicates the main program area

- Instruction keys, parameter keys and  key are the basic keys used in the program Edit Mode. Besides that other keys are also provided for searching, writing and correcting the programs.


: This key is used to select the main-program or sub-program area because the main-program and sub-program are stored in different areas.

: This key is used to select the first or second row displayed on LCD. Using this key can move the cursor to the row to be edited. In the program Edit Mode, this key is used to select the editing of the instructions (second row on display) or their documents (first row on display).



: In the Edit Mode, edited information will not be saved in PLC until  is pressed. Before pressing , data are stored in a temporary editing area for subsequent checking and correcting.  can be used to clear this temporary editing area. Once pressing this key, LCD screen will be cleared. With this key, the wrong data or instruction in edit process can be cleared if  has not been pressed.



: After pressing , instructions or data will be stored in the PLC program area. In this case,  can not be used to clear them. Instead  is required to delete them from the program area of the PLC.



: This key is used to insert instructions in a program.

 or : These keys are used for program address increment or decrement.

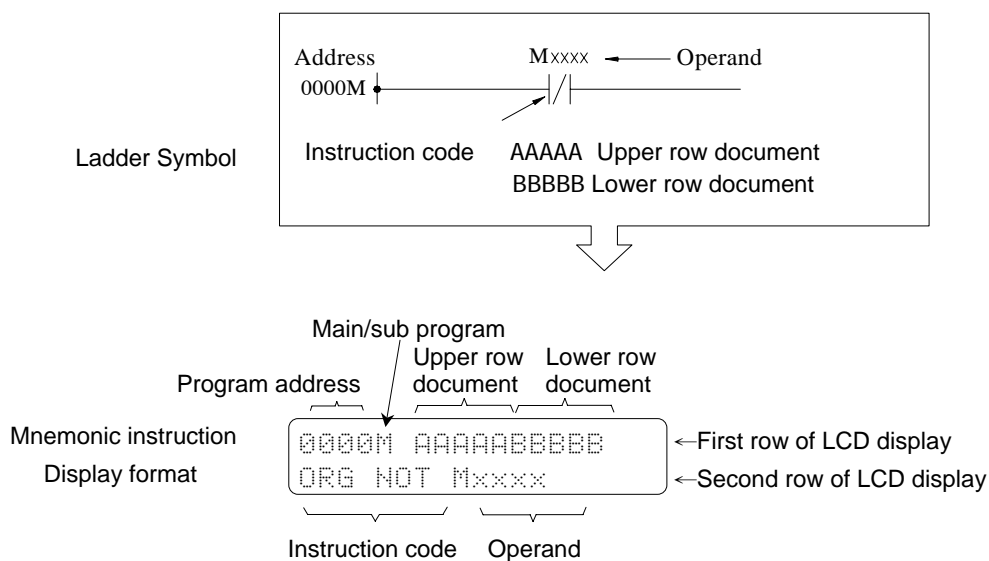
 : Move the cursor to the top (address:0000M or 0000S) of the main-program or sub-program.

 : Move the cursor to the bottom ("BOTTOM" will be displayed on LCD) of the main-program or sub-program.

 : To choose the display or input in decimal format. (When enter EDIT mode for the first time, the display will be in decimal).

 : To choose the display or input in hexadecimal format.

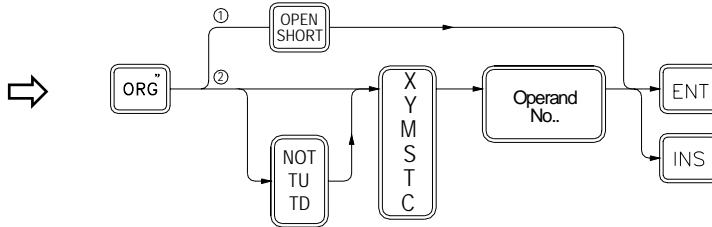
- The display format of mnemonic instruction



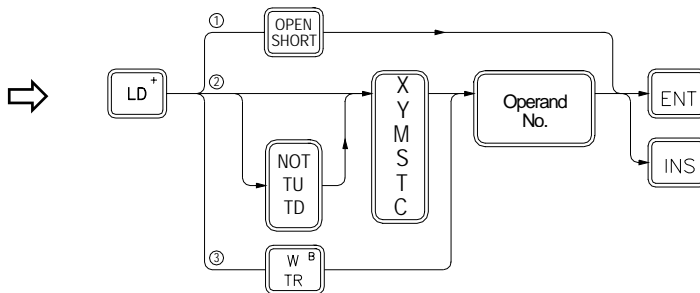
5.1.1 Sequential Instruction Editing

a) Fundamental Key Operations of Sequential Instruction

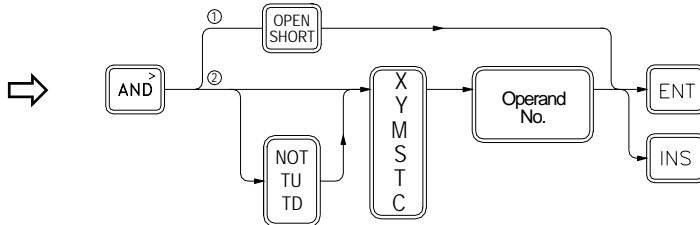
- ORG instruction



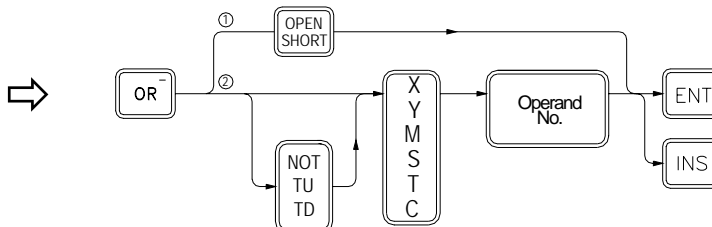
- LD instruction



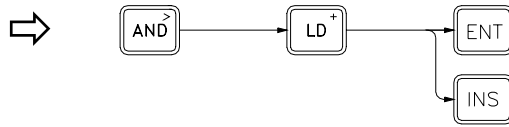
- AND instruction



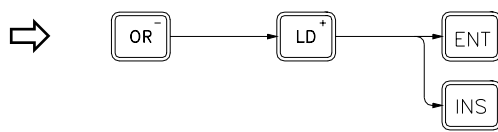
- OR instruction



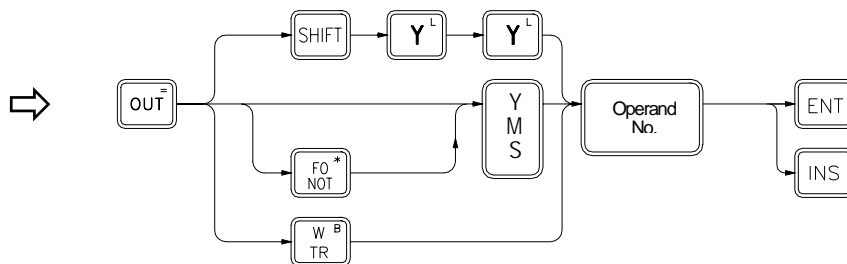
● ANDLD instruction



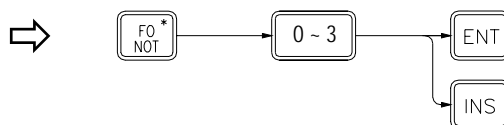
● ORLD instruction



● OUT instruction



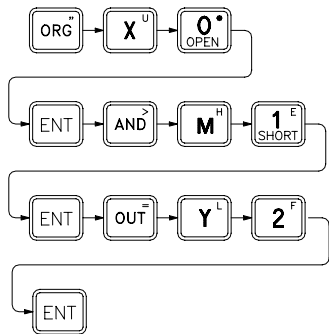
● FO instruction



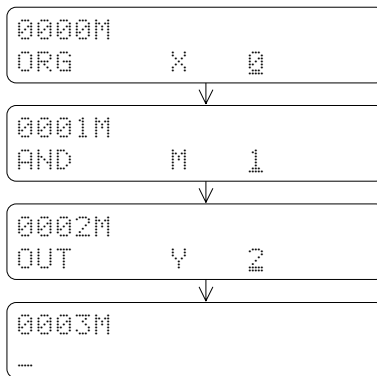
b) Input the Instruction



【Key Sequence】



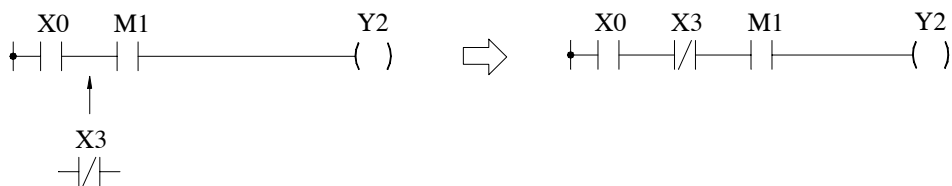
【LCD Display】



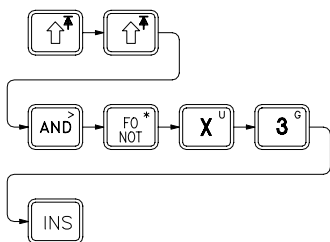
On pressing **ENT**, If the input is correct, the instruction will be written into the memory and the address shown on the LCD display will change to the next location.

c) Insert the Instruction

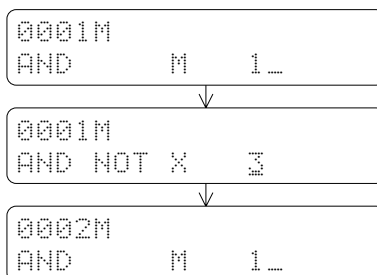
If want to insert a new instruction before an old instruction, first find the old instruction then type the new instruction at the address of the old instruction and press **INS**. The address of old instruction will move to the new location right after the new instruction which means all the step number of the old instructions after the one inserted will be increased by one. Continuing the example shown above, before inserting a B contact of X3 between the A contact X0 and A contact M1, use **↑** **↓** to find the step before which a new instruction is to be inserted (in this case AND M 1 at step 0001M) and key in the instruction to be inserted then press **INS** to complete the insert operation.






【Key Sequence】

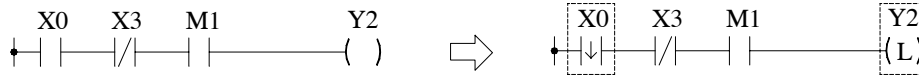




【LCD Display】




d) Change Instruction

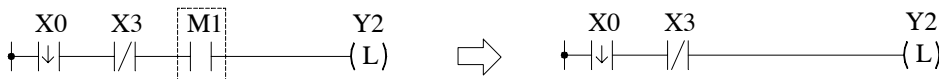
First find the old instruction to be changed (if it is a function instruction, should step to the address which show FUNXX of the instruction) then key in the new instruction and press ENT key to overwrite the old instruction. For example, if you want to change Y2 to a retentive output coil and A contact X0 to TD down differential contact X1, find the old instructions to be changed using  , then key in the new instruction or modify the instruction and press  to complete the change as shown below.



【Key Sequence】	【LCD Display】	
	0003M OUT Y 2	• Find out the instruction to be changed (OUT Y2)
↓	0003M OUT L Y 2	• Change OUT to OUT L
↓	0004M —	
↓	0000M ORG X 0	• Repeatedly pressing  4 times will do the same thing
↓	0000M ORG TD X 1	• Change A contact to TD contact and change X0 to X1
↓	0001M AND NOT X 3	

e) Delete Instruction

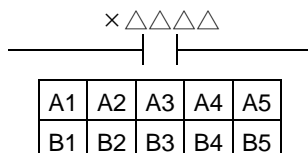
Find the instruction to be deleted. On pressing the  key, the instruction under display is deleted. The example shown in below demonstrates how to delete the A contact M1.



【Key Sequence】	【LCD Display】
	0002M AND M 1
↓	0002M OUT L Y 2

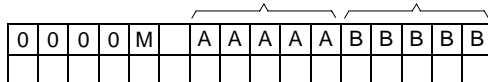
f) Edit the Element Documents

The element documents are the same for the instructions with identical operand number. For example, the element comments of AND X0 and OR NOT X0 are actually the same as shown in the diagram below. The documents consist of two rows of strings (5 characters for each row and a total of 10 characters) and place directly underneath the element.

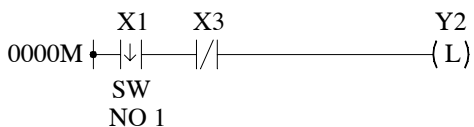


A and B rows shown in the diagram above occupy 10 characters space of the first row on the right side corner of FP-08 LCD display.

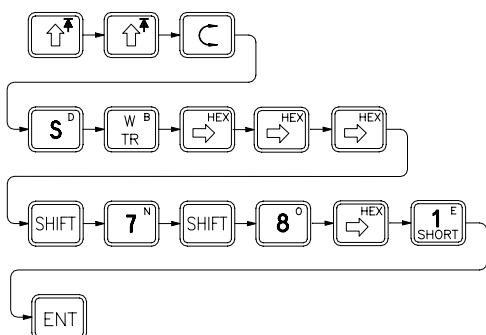
A (upper) row document B (lower) row document



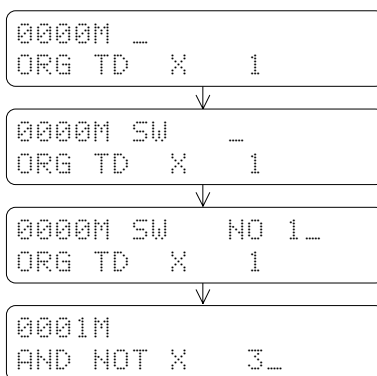
Example : Following the key operations shown in below to add the documents to TD contact X1.



【Key Sequence】



【LCD Display】



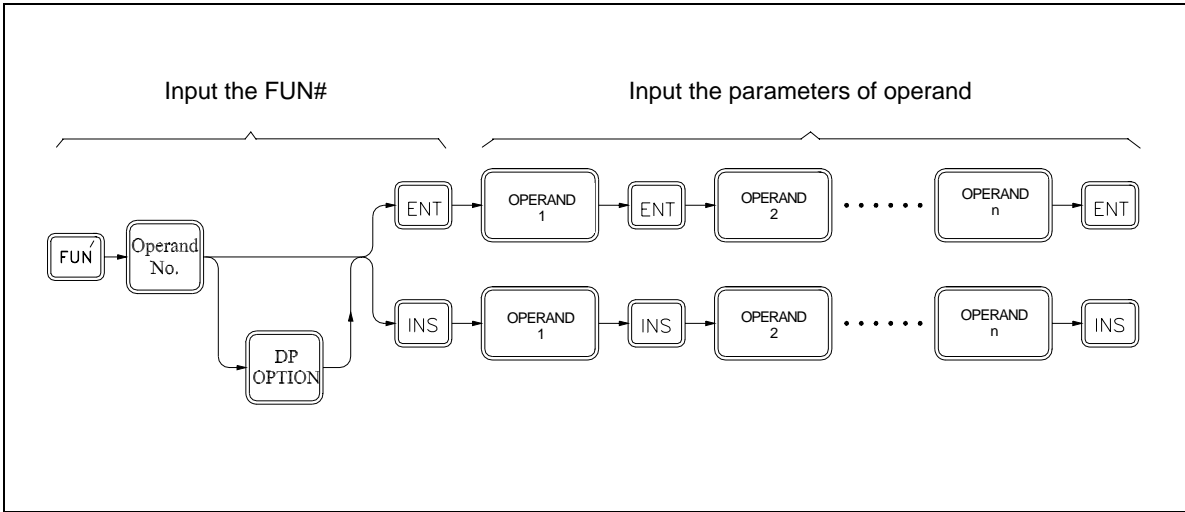
- key moves the cursor to the upper document area
- Cursor moves three characters horizontally on pressing the three times

5.1.2 Edit Function Instruction

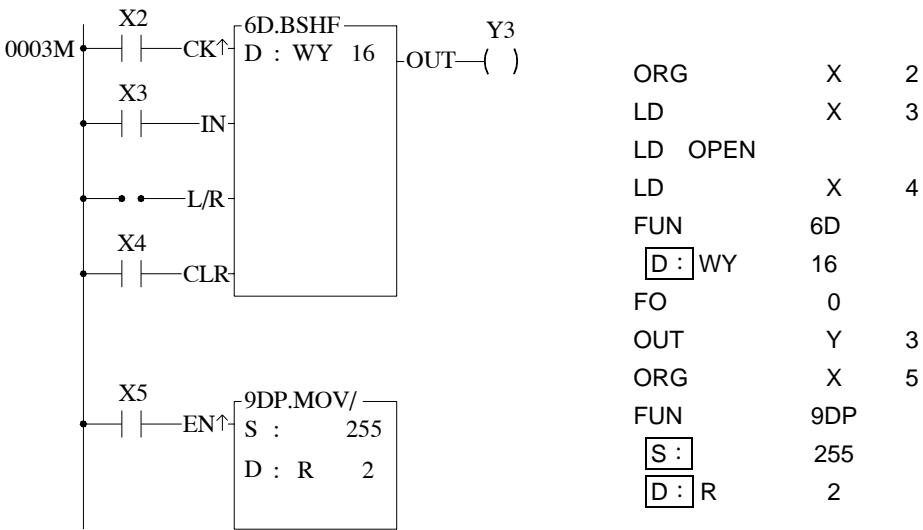
In this section, we only concentrate on the key operations of editing the function instructions. For explanations of function instructions, please refer to Chapter 6, "Introduction to function Instructions".

Each function instruction consists of an instruction name (Mnemonic) and a reference number except nine special instructions keys such as T, C, SET etc.. Besides those nine special instructions, other function instructions must be entered with their function number (FUNXXX). It is possible to add a postfix character D and P after the FUNXX on certain function instructions to produce sub-instructions. The key operations of function instructions are shown below.

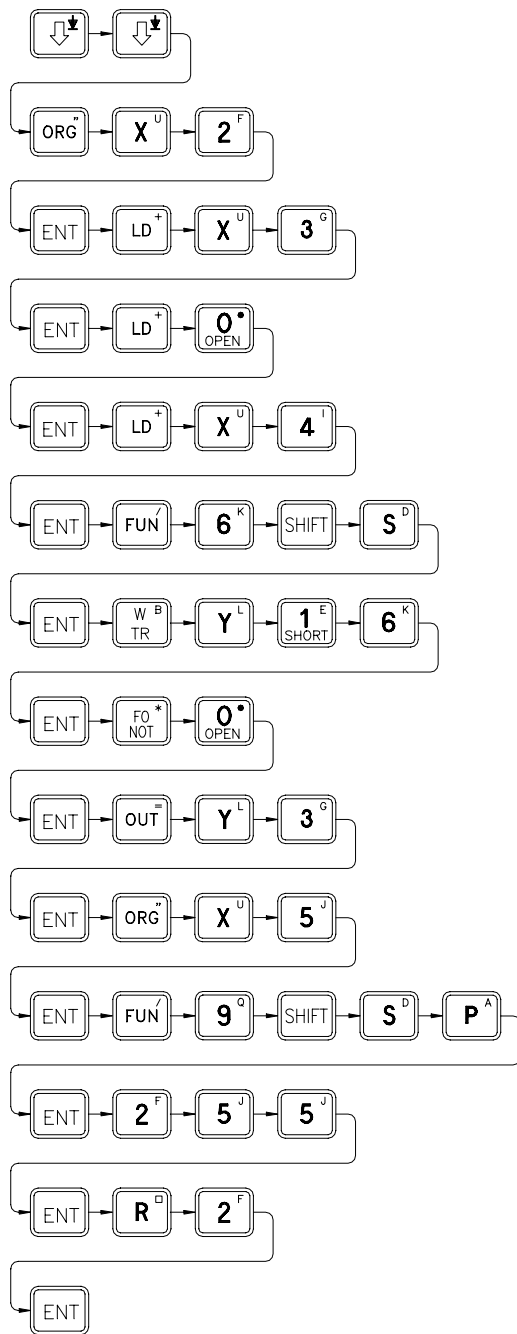
Fundamental key operations of the function instructions



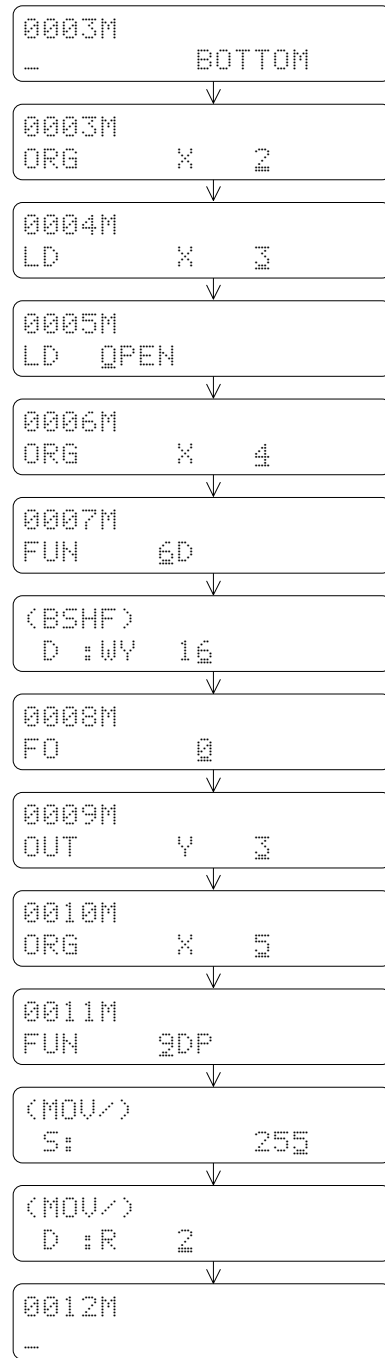
Continuing from the previous LCD display, input the function instructions listed below:



【Key Sequence】






【LCD Display】



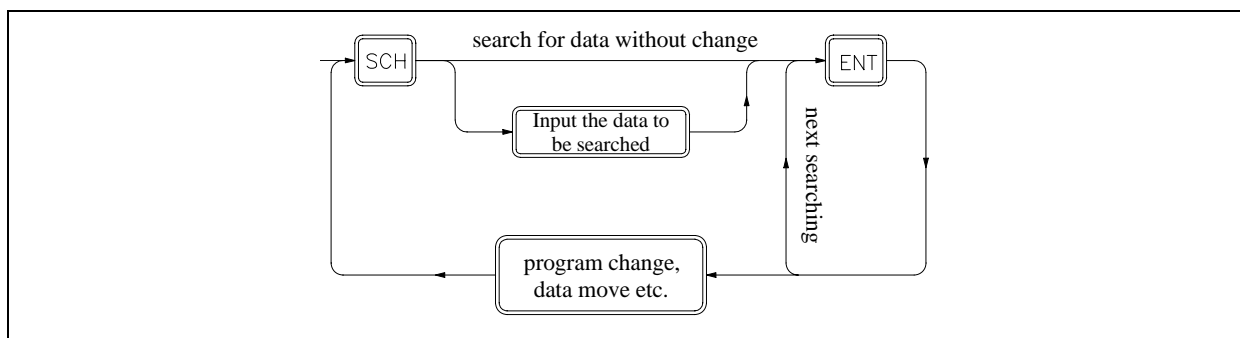
Description: In case an error occurs during editing, press **CLR** to clear the incorrect instruction or parameters, then key in the correct one and press **ENT**.


5.1.3 Search Program

In the process of editing, monitoring and searching the PLC program, it is very time consuming to search for the address of a specific instruction using   if the size of the program is very large. FBs-PLC provides a program search operation using  that gives you a convenient way to search through a long program for a specific instruction, address, operand, comment or parameter.

Type	Items can be searched	Examples
Address search	Main-program (△△△△M)	0001M , 0047M ,
	Sub-program (△△△△S)	0007S , 1234S ,
Instruction search	Instructions (either sequential instructions or application instructions)	ORG X0 , OUT LY2 , FUN 20P ,
	Parameters of function instructions	R100 , WX0 , T50 ,
	Element + Operand	TU X10 , NOT M200 ,
	Operand	X0 , M1000 ,
Document search	Instruction document	SW1 , AUTO STOP ,

Syntax chart of key operation of the program search

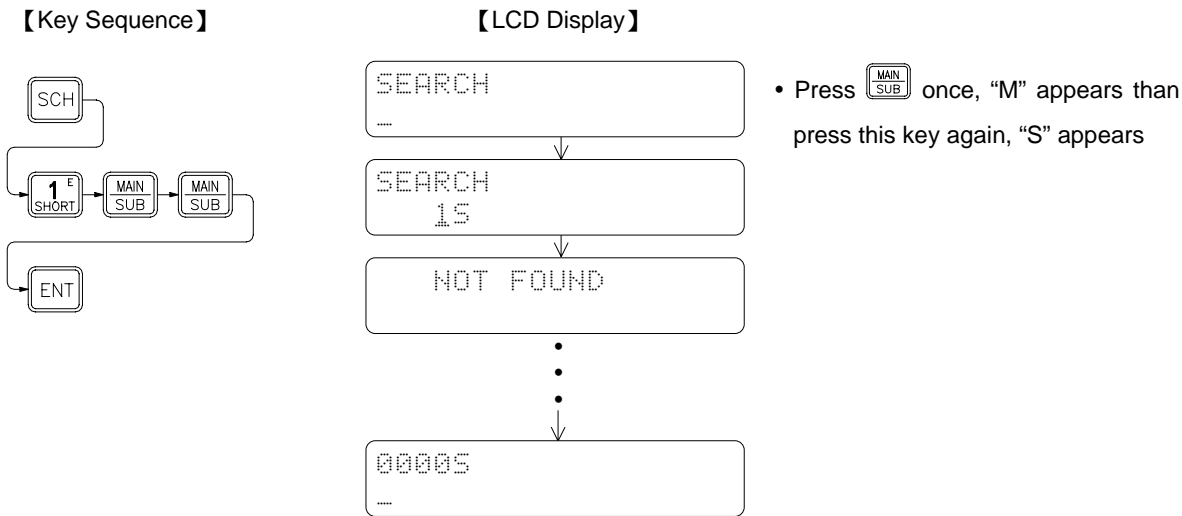


To search for a specific data in program memory, first require to input the data to be searched. The data have just entered are stored in a search buffer. After pressing , FP-08 will begin to search in the program memory of the PLC for the specific data stored in the search buffer. The data stored in search buffer are retained even after completion of the search operation. This means the consecutive data search and data change are possible. The data stored in search buffer will be cleared in case of power failure or mode (Edit, Monitor, System, RUN/STOP etc.) change.

5.1.3.1 Search Address

To search for a specific address in program memory, input the address you wish to search first. The system will search for that particular address in either main-program or sub-program area according to the input specification such as M (main-program area) or S (sub-program area). Which means you can search for a particular address in the sub-program area while working in the main-program area or vice versa. If found, the address will be displayed on LCD otherwise the search will stop at the last address of the program area and "NOT FOUND" will be displayed.

Continuing from the preceding LCD display, if want to search for a particular address (0001S) in the sub-program area while working in the main-program area (0011M), can perform the key operations shown below.



The address is not found because the programs are not exist in the sub-program area. LCD display shows the search is stopped at the last address (000S) of the sub-program area. If want to return to the main-program area, perform the following key operations.



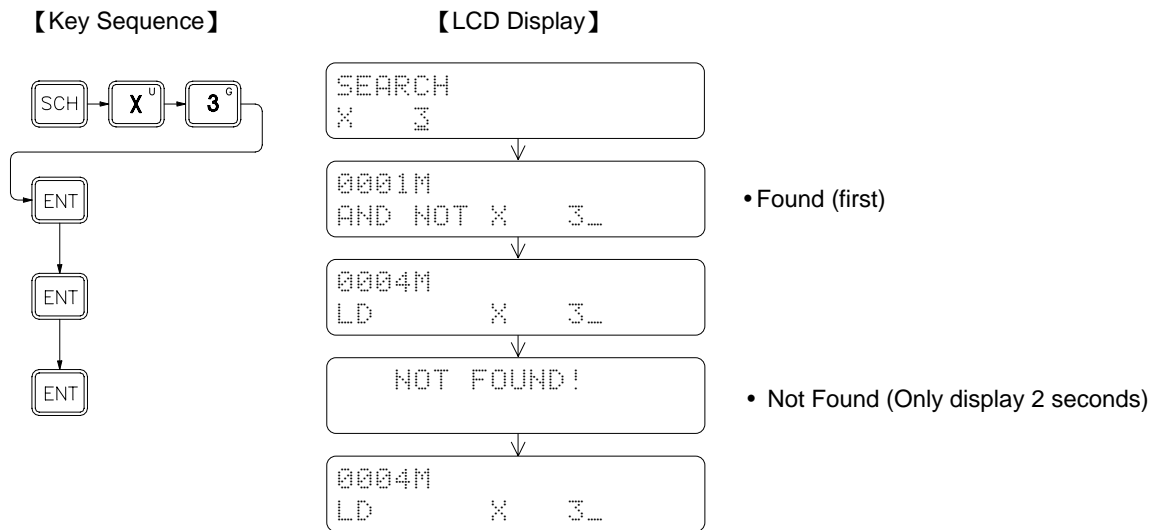
5.1.3.2 Search Instruction

Instruction search is used to search for the specific instruction in the main/sub-program area. There are two ways can be used to do the instruction search.

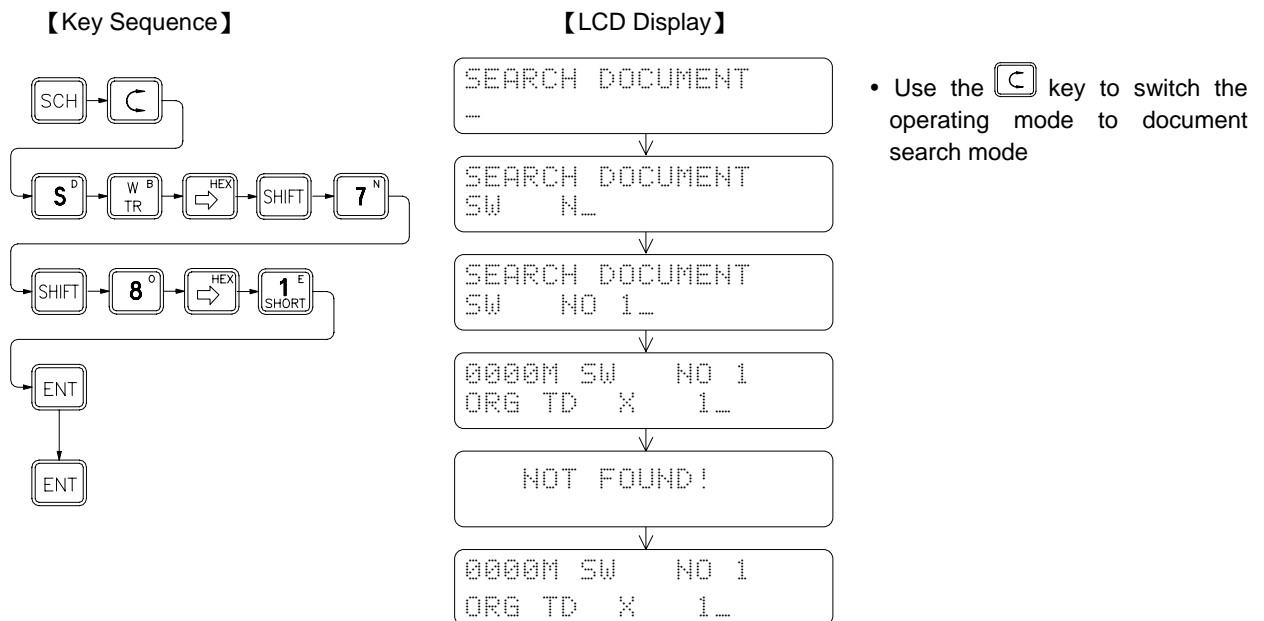
1. Input(or change)the instruction to be searched: FP-08 searches the data from the top of the program (0000M)to the last address of the program including the sub-program area.
2. Using the data retained in the Search Buffer to perform the search operation: FP-08 searches the data starting from the address next to the one displayed on LCD. Sub-program area is also been searched.

Input the instruction to be searched first, then press . FP-08 will perform the search operation starting from the top of the program. If found, the instruction will be displayed on LCD. To continuously search for the same instruction, press to resume the instruction search starting from the address next to the one of displayed. If is pressed continuously, all the addresses having the specified instruction are successively displayed until the address with “NOT FOUND” is displayed. After the message “NOT FOUND” is displayed for 2 seconds, the address last found in the program is displayed. In addition, it is also possible to use the search instruction to search the instruction with partial specified (please refer to the table shown above to know the available specifies for instruction search).

● Using the operand to search for “X3”



● Using the document to search for “SW NO1”

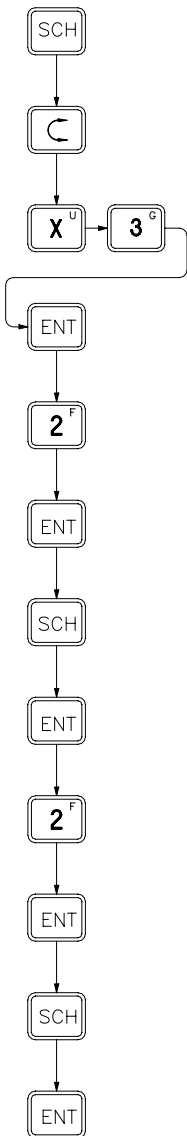


Remark: The difference of the display between instruction/address search and document search is that a message “DOCUMENT” is displayed on the right corner of the LCD screen when the document search is performed. key can be used to select one of the two search methods.

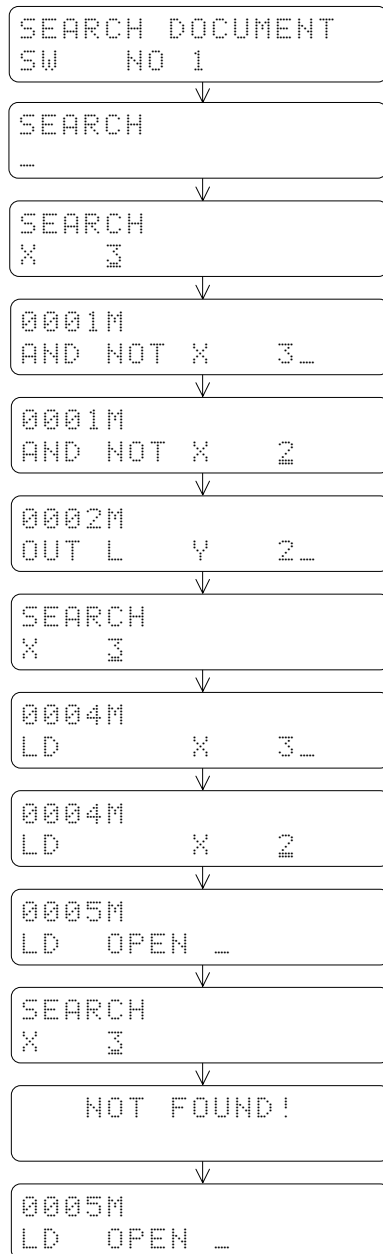
● Successive search and change

Following the preceding LCD display, search for all the instructions containing an operand X3 and then change the operand X3 to X2.

【Key Sequence】



【LCD Display】




- Search buffer contains the old data from last search operation (Document search)
- key switches the mode from document search to address/instruction search
- Key in the new data to be search (Operand X3)
- Found the first instruction containing an operand X3
- Change operand X3 of the first found instruction to X2
- Found the second instruction containing an operand X3
- Change operand X3 of the found second instruction X2

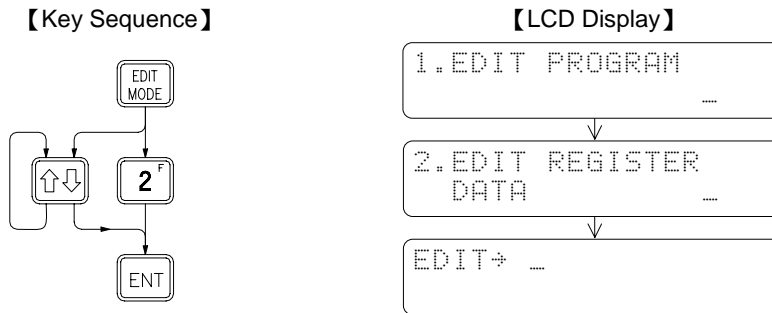
Remark 1: In the process of successive search, if other keys other than the key is pressed, such as pressing the parameter keys to change the operand data, you must press key again to resume the search process.

Remark 2: As we have mentioned in above, a key must be pressed to resume the search process after a data changing process. Users should keep in mind that the data stored in search buffer are retained during the whole process. The resumed search will start from the current address displayed on LCD. But if you input a new data to be searched at this time, search will automatically start from the top that means 0000M or 0000S.

5.2 EDIT REGISTER DATA

This function is provided mainly for editing (input) the data of the registers which number are consecutive. You must use this function to edit the ROR data. It is possible to use the register editing function of monitor mode to change the register's value, but you need to repeatedly press  key for successive editing (please refer to the section 2.2.5). In comparison, the method we provided in this section is more convenient to do so.

- Key operations for entering the register data Edit Mode:



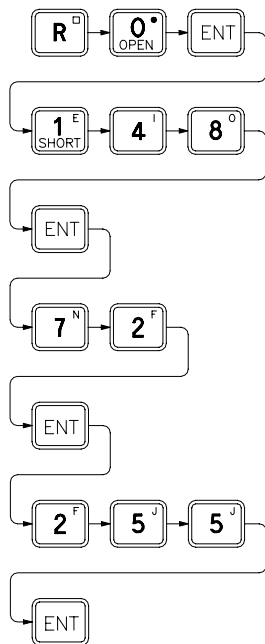
After entering the register data edit mode, you can directly select the number of the registers (R△△△△,DR△△△△ or the registers consist of 16 or 32 coils, such as WY△△△ and DWM△△△△ etc.) which you wish to edit. The table shown in below listed the names of the registers which can be edited and the ranges of the corresponding register numbers.

Register type		Number range	Remark	
16 bits	R△△△△	Data Registers	R0~R3839	
		Output Registers	R3904~R3967	
		HSC Registers	R4096~R4127	
		Calendar Registers	R4128~R4135	
		Special Registers*	R4136~R4167 及 R3967~R4095	
		Read-Only Registers	R5000~R8071	
	D△△△△	D Registers	D0~D3071	
	WY△△△	Output Coils	WY0 , WY8 ,WY144	△△△△ or △△△ must be the multiples of 8
	WM△△△△	Internal Coils	WM0 , WM8 ,WM1368	
	WS△△△	Step Coils	WS0 , WS8 ,WS984	
32 bits	DR△△△△	Data Registers	DR0~DR3838	
		Output Registers	DR3904~DR3966	
		HSC Registers	DR4096~DR4126	
		Calendar Registers	DR4128~DR4134	
		Special Registers*	DR4136~DR4166 and DR3968~DR4094	
		Read-Only Registers	DR5000~DR8070	
	DD△△△△	D Register	DD0~DD3070	
	DWY△△△	Output Coils	DWY0 , DWY8 ,DWY128	△△△△ or △△△ must be the multiples of 8
	DWM△△△△	Internal Coils	DWM0 , DWM8 ,DWM1368	
	DWS△△△	Step Coils	DWS0 , DWS8 ,DWS968	

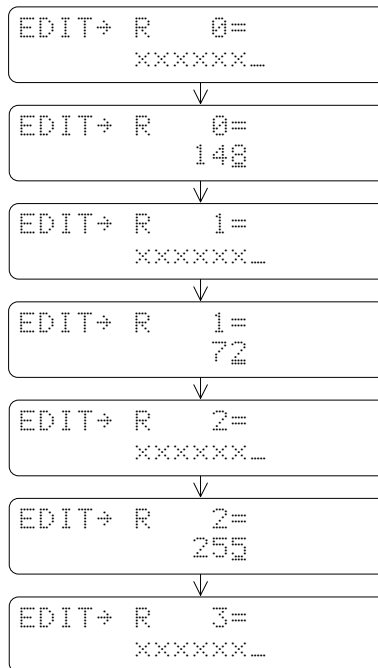
Example 1 16-Bit register editing (assuming already in the register data Edit Mode)

R0=148
 R1=72
 R2=255 (or FFH)

【Key Sequence】



【LCD Display】



• x x x x x x is the current value (before edit) of R0

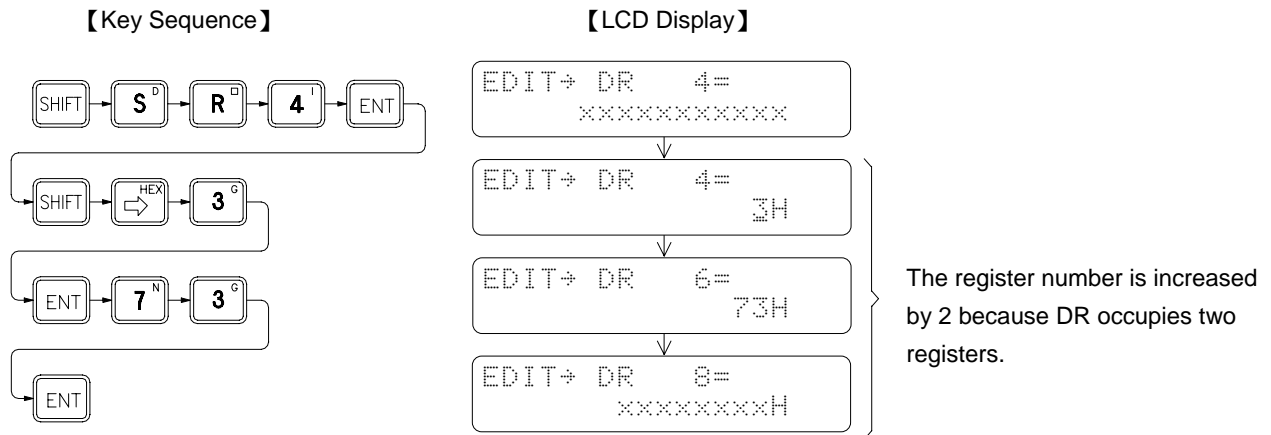
• After input a new value, the displayed register number will be increased successively.

● After you entering the EDIT MODE of FP-08, the current value for registers starting with an R (R△△△△△ or DR△△△△△) are displayed in decimal format, while for the registers starting with an W (W□△△△△△ or DW□△△△△△), are displayed in hexadecimal format. Pressing keys or keys can change the format as you desired.

● If you want to change the current value of a register, key in the new value directly and then press key to complete the change. If not simply press key to display the next register.

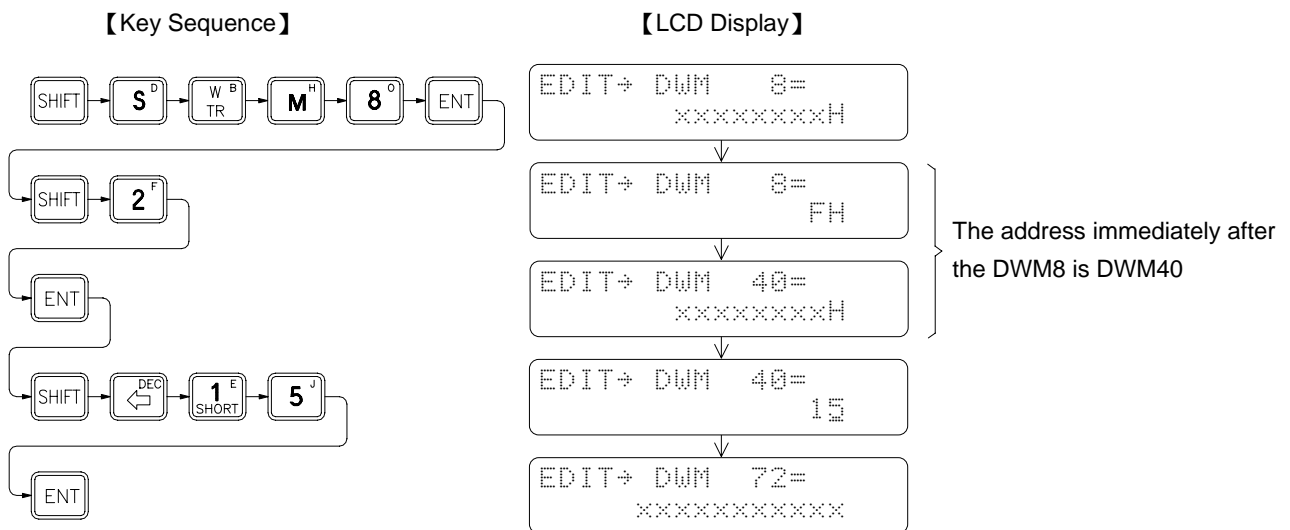
Example 2 32-Bit register edit

Continues from the Example 1, input 3H for registers R4~R5 and 73H for registers R6~R7.



Example 3 The editing of 32-Bit register composed by coils

Continues from the Example 2, input FH for register DWM8 (M8~M39) and 15 for register DWM40 (The value of FH is equal to 15 while their input format are different) .

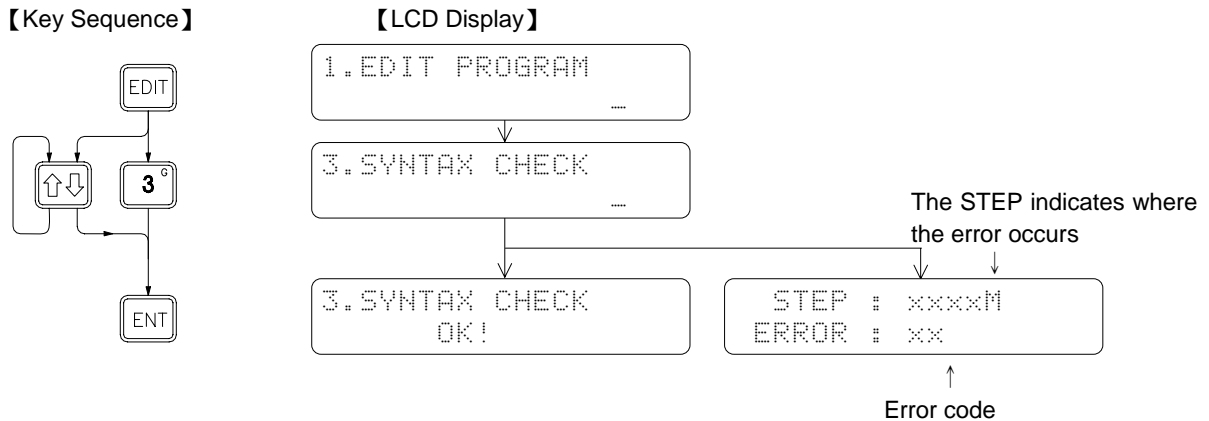


5.3 SYNTAX CHECK

Every computer language has its own syntax rules to follow, otherwise the computer will not execute the instructions if there is a syntax error existed in the program. Ladder Diagram program used by the PLC has its syntax rules as well. Besides the syntax rules on designing of the Ladder Diagram program shown in Chapter 1, other syntax rules of FBs-PLC are listed as follows.

1. The maximum permissible element size in a Ladder Diagram network is 16 rows \times 11 columns. But this size can be expanded to 16 rows \times 22 columns according to the specific needs (please refer to Figure 1 in page 1-5).
2. Contacts such as A, B, TU, TD, SHORT and OPEN can be located on any columns except the last column (column 11 or column 22).
3. Coils can only be located on the last column of the network (column 11 or column 22)
4. The width of all application instructions in the Ladder Diagram occupies 3 columns and the length is variable between 1~4 rows. Except the instructions listed in rule No.5 shown in below, the rest of the application instructions must be located on column 2, 3 and 4 counting from the end (column 8, 9, 10 or column 19, 20, 21)
5. Each of the six instructions, such as FUN 1(MCE), FUN 3(SKPE), FUN 65(LBL), FUN 68(RTS), FUN 69(RTI), FUN 70(FOR), and FUN 71(NEXT), forms its own network. No other elements can be serially connected in front of these instructions; that is, these instructions are connected directly to the original line and occupy the first three columns (column 1, 2, 3). These instructions do not have the output function either and the instruction FUN68 and FUN69 can only be used in the sub-program area.
6. For each multiple-input instructions, every input point needs a serially connected element; that is, every FUN instructions with n inputs must have n numbers of network rows connecting to each input point.
7. Instructions FO# can only be used with the application instructions containing the function output (FO). Following every FO# instruction, there must be a corresponding OUT instruction.
8. Six instructions such as FUN 0(MC), FUN 2(SKP), FUN 66(JMP), FUN 67(CALL), FUN 70(FOR) and FUN 71(NEXT) which are used for controlling the program flow can only be located on the first column of the network and can not be connected to OUT or any other application instructions in parallel starting from row 2.
9. The ladder diagram is illegal if it has following condition.
 - (1) Cross a line
 - (2) FUNs with input overlap
10. The instructing combinations, which can not form the diagram, are not permissible.
 - (1) The contact element occupies the location of the coils and application instructions.
 - (2) If there are several OUT TR# instructions in a single network, when you want to get the TR statuses (LD TR#) from the memory, you should first get the TR# contact which stored at the last.
11. The name of LBL must be unique in the program.
12. The # of MC or SKP instruction can not be duplicated.
13. The # of TR can not be duplicated in the same network.
14. The number of the instructions in a network can not exceed 64 Words.
15. The number of instructions resulted from subtracting the total number of ORLD and ANDLD instructions from the total number of LD instructions can not exceed 8 for any combination of the instructions in a network. If the network including the OUT or application instructions, then the subtraction between number of the LD instructions and number of the ORLD+ANDLD instructions need to be recalculated.

5.3.1 Key Operations of Syntax Check



5.3.2 Syntax Error List

ERROR 1 : Instruction ORG is missing

ERROR 2 : AND, OR, LD, ORLD, ANDLD, OUT TR, FUN, C and T instructions can not be connected directly after the FUN and C instructions.

ERROR 3 : OR, ORLD, ANDLD and OUT TR instructions can not be connected directly after the OUT and T instruction.

ERROR 4 : OR, ORLD, ANDLD and OUT TR instructions can not be connected directly after the OUT TR instruction.

ERROR 5 : OR, ORLD, ANDLD and OUT TR instructions can not be connected directly after the LD TR instruction.

ERROR 6 : FUN instruction does not exist before the FO# instruction.

ERROR 7 : The # of FO# exceeds the limit.

ERROR 8 : The # of FO# can not be duplicated.

ERROR 9 : FO instruction can only connect one OUT instruction.

ERROR 10: FO instruction does not exist before the OUT instruction.

ERROR 11: In a network, OUT, FUN, T and C instructions can not be used after the MC, SKP, JMP, CALL, FOR and NEXT instructions.

ERROR 12: In a network, the # of OUT TR# has been repeatedly used.

ERROR 13: In a network, LD TR# is used without the OUT TR#.

ERROR 14: In a network, the number of the instructions resulted from LD+LD TR – ORLD – ANDLD is greater than 8 (If FUN or C instructions are appeared, the number need to be recalculated).

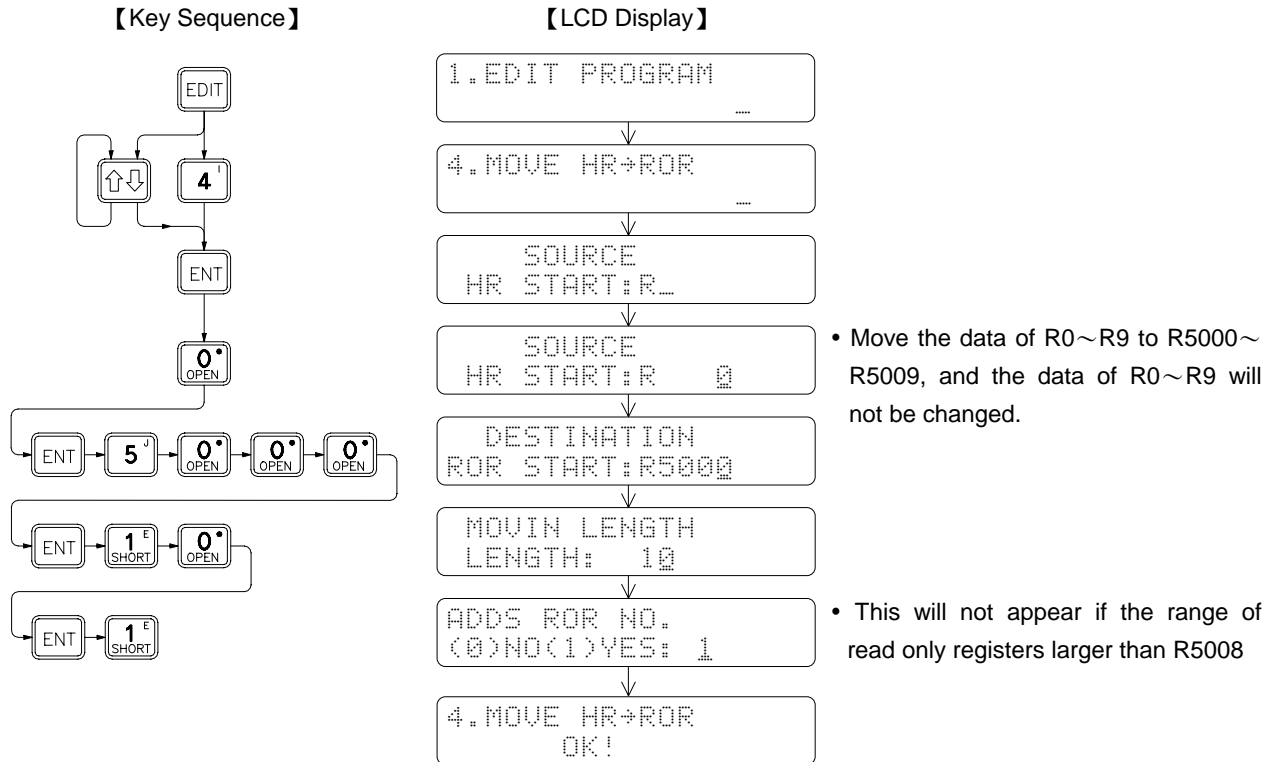
ERROR 15: After the LD instruction, its pairing instructions of ORLD and ANDLD can not be found.

ERROR 16: ANDLD instruction can not be used in pairs following a LD TR instruction.

- ERROR 17: Before the ORLD instruction, its pairing instructions of LD and LD TR can not be found.
- ERROR 18: Before the ANDLD instruction, its pairing instruction of LD can not be found.
- ERROR 19: OUT, OUT TR and LD TR instructions are used prior the completion of the block editing.
- ERROR 20: There are not enough LD or LD TR instructions available to match the input numbers of the FUN and C instructions.
- ERROR 21: In forming the Ladder Diagram, the network exceeds 16 rows.
- ERROR 22: In forming the Ladder Diagram, the contacts occupy the coil location.
- ERROR 23: In forming the Ladder Diagram, the contacts occupy the location of application instruction.
- ERROR 24: In forming the Ladder Diagram, MC, SKP, JMP, CALL, FOR and NEXT are not located on the first row.
- ERROR 25: In forming the Ladder Diagram, the input contact location of FUN and C exceeds the limit of allowable input contact paths.
- ERROR 26: In forming the Ladder Diagram, either two of the FUN and C input contact paths are touching or stacking to each other.
- ERROR 27: In forming the Ladder Diagram, there is a vertical short circuit line contacting the edges of the application instruction.
- ERROR 28: In forming the Ladder Diagram, you must use the ORLD and OR instructions to connect the contacts in the preset OUT TR# diagram.
- ERROR 29: In forming the Ladder Diagram, ORLD instruction can not form a reasonable diagram.
- ERROR 30: In forming the Ladder Diagram, LD TR instruction can only be used to form the diagram in forward direction.
- ERROR 31: In forming the Ladder Diagram, LD TR instruction can cause the line-cross problem.
- ERROR 32: In a program, the # of MC# and MCE# are duplicated.
- ERROR 33: In a program, the # of SKP# and SKPE# are duplicated.
- ERROR 34: In a program, the # of T# is duplicated.
- ERROR 35: In a program, the # of C# is duplicated.
- ERROR 36: The number of the instructions in a network exceeds 64 words.

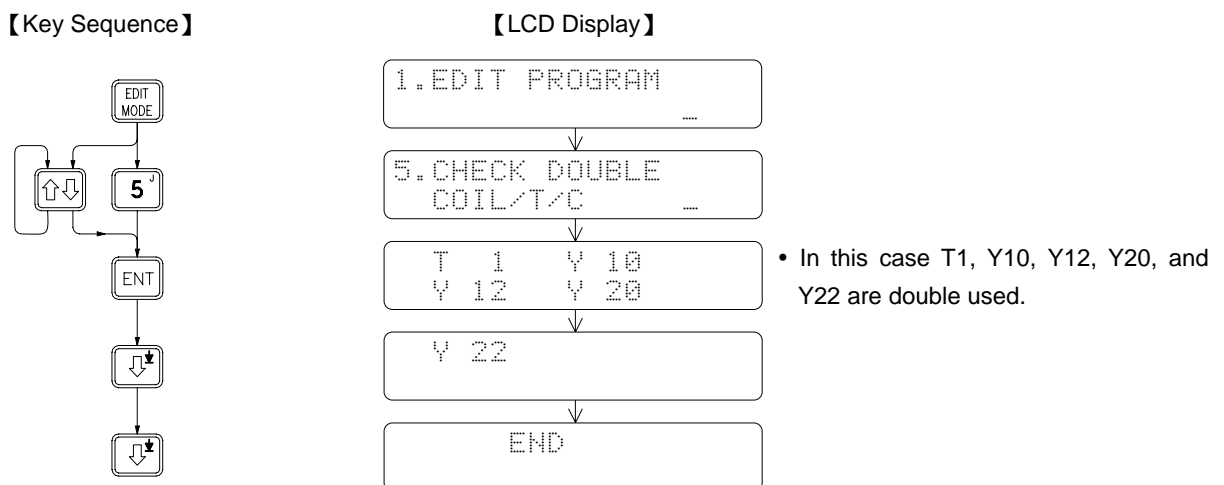
5.4 MOVE (HR→ROR)

This function is provided mainly for moving the contents of the data registers (HR) to read-only registers (ROR) area so that it can be burned into EPROM or EEPROM.



5.5 CHECK DOUBLE COIL/T/C

This function is provided mainly for checking Coil, Timer, Counter, if they are used more than once in the program. After executing, if it found, will display the double coil number.

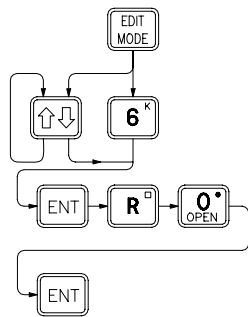


5.6 EDIT HSPSO INSTRUCTION

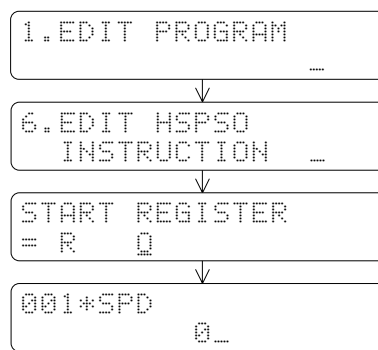
There are some unique control instructions especially provided by FBs-PLC for NC positioning. The users need only to choose the starting register (R0~R3828, R5000~R8060, D0~D3060) where these instructions are stored, then FP-08 will judge automatically on whether the number selected is a new or an old HSPSO instruction area. The basic unit of HSPSO instructions is a command. A complete command consists of 3-4 instructions. Press **INS** or **DEL** key to increase or decrease the number of command. Press one of **SYS MODE**, **EDIT MODE**, **MON MODE** or **RUN STOP** key to leave and save the editing, then follow the guide displayed on FP-08.

● Start HSPSO instruction editing

【Key Sequence】



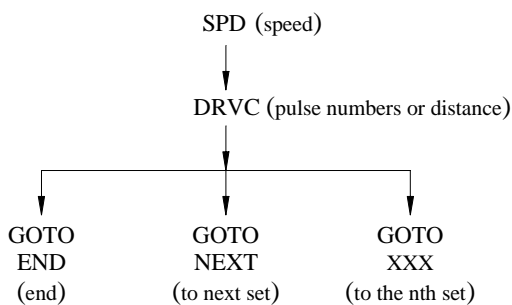
【LCD Display】



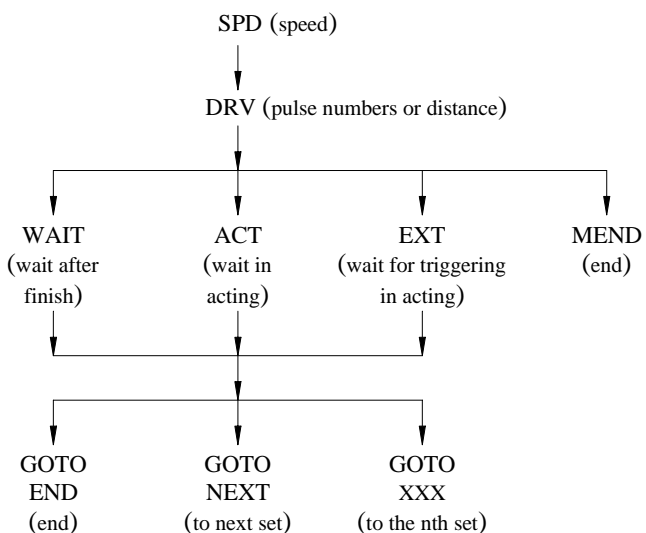
※Press **SHIFT** and **EDIT MODE** keys may also start HSPSO instruction editing when "FUN 140" is displayed in the editing ladder instruction area. Press **SHIFT** and **EDIT MODE** keys again to return to "FUN 140" for instruction editing.

● Formation of a NC command

1. Continuous multi-zone speed



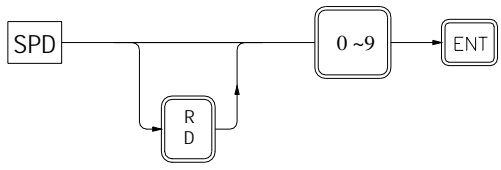
2. Last or single zone speed



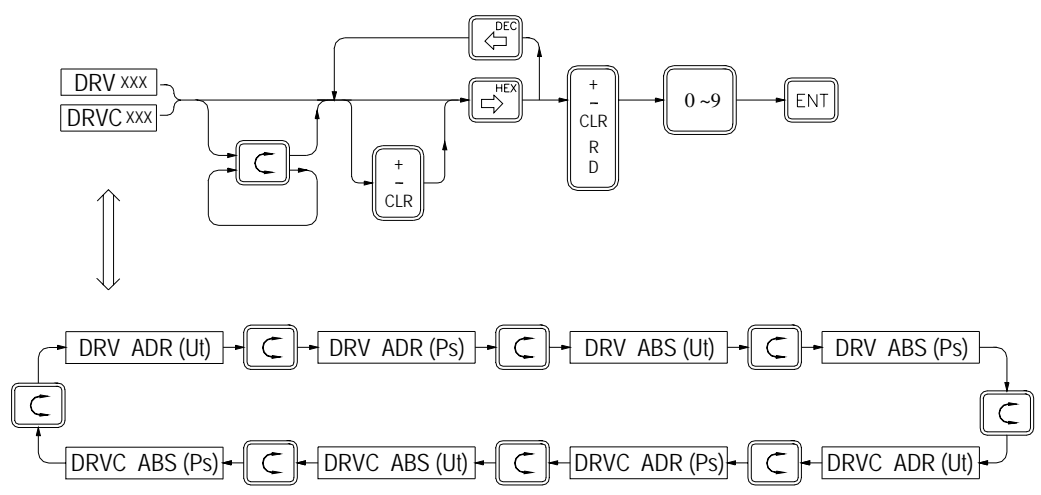
Remark: DRVC is used for performing continuous multi-zone speed changing control (up to 8 commands) and the last command must apply DRV instruction.

5.6.1 Fundamental Key Process of HPSO Instruction

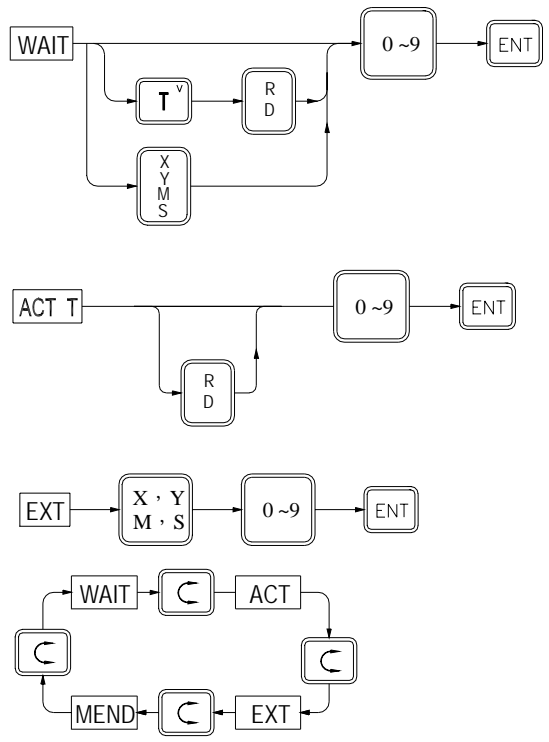
● SPD instruction



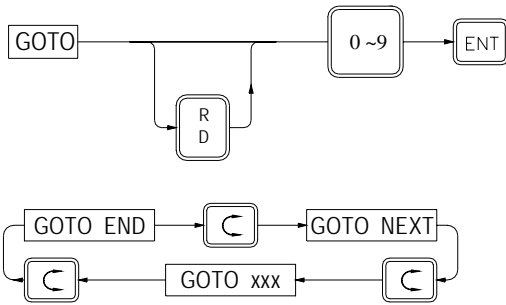
● DRVC · DRV instruction




● WAIT · ACT · EXT · MEND instruction





● GOTO instruction




5.6.2 Supplementary Editing Keys for NC Program Editing



 : To switch different instructions on the same level.



 : To insert an empty command in front of the current command.



 : To delete the current command.





 : To reset the parameters of current command displayed.

 ,  : To move between DRV or DRVC instruction parameters.

 or  : To move up or down by one instruction.

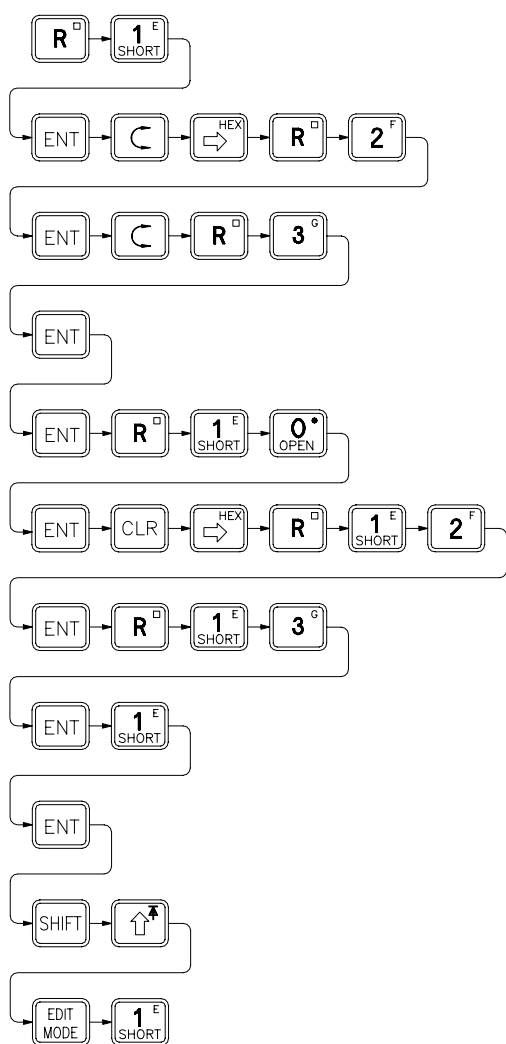
  : To move up to the SPD of the first command.

  : To move up to the SPD of the last command (a new empty command). ◦

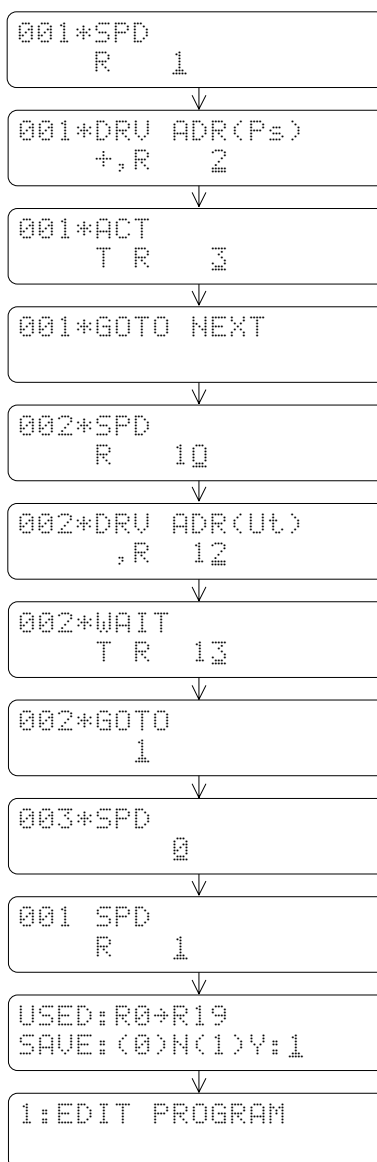
    : To leave HSPSO instruction editing. Then, FP-08 will display the range in the register being used by the whole commands and the user will be asked whether to save or not.

5.6.3 Editing Example

【Key Sequence】



【LCD Display】



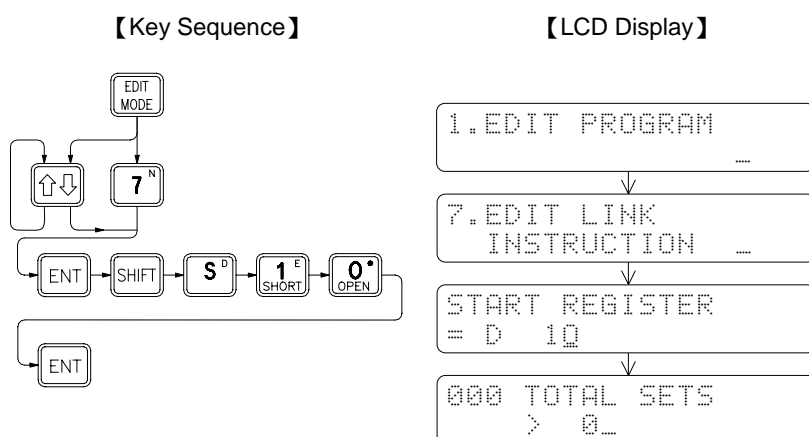
- "001" : Indicating the first set.
- "*" : Indicating the set has not been input completely.

- Save the edited command to (R0~R19)

5.7 EDIT LINK INSTRUCTION

There are two unique LINK functions provided by FBs-PLC for PLC networking. The LINK function is driven by the LINK instructions which are stored in the data registers. The users need only to input the starting register of the area which used to store the instructions for the link function, and then FP-08 can automatically distinguish if this area is for new entry or for editing. A LINK instruction consists of 4-5 fields of data. Once a new instruction is complete, FP-08 will store this instruction with 1 set of communication data into the data area. Press **INS** or **DEL** to insert or delete 1 set of LINK instruction. Press one of **SYS MODE**, **EDIT MODE**, **MON MODE** or **RUN STOP** to leave and save the editing, then follow the guide displayed on FP-08.

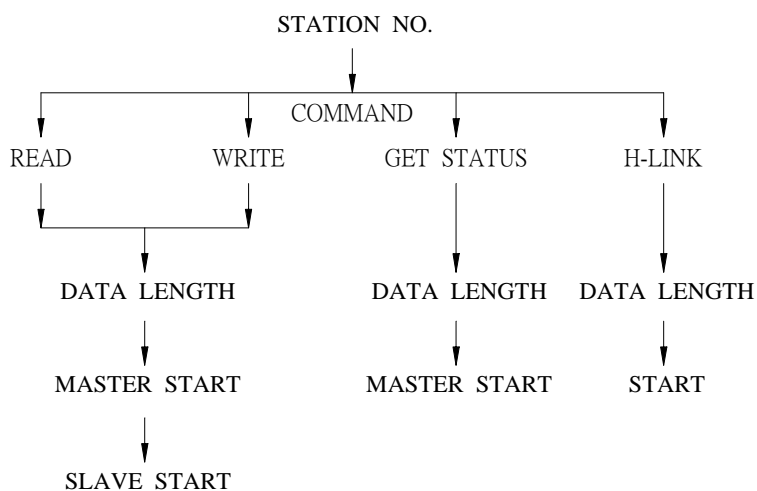
● LINK Instruction Editing



※ Press **SHIFT** **EDIT MODE** may also start LINK instruction editing when "FUN 96/97" is displayed in the editing ladder instruction area. Press **SHIFT** **EDIT MODE** again to return to "FUN 96/97" for ladder instruction editing.

- Unless for testing, the TOTAL SETS input need not to enter since FP-08 will automatically update this number according to the total set of instructions being entered.

● The construction of the LINK instruction



Remark 1: Use **C** to select one of the four types link COMMAND.

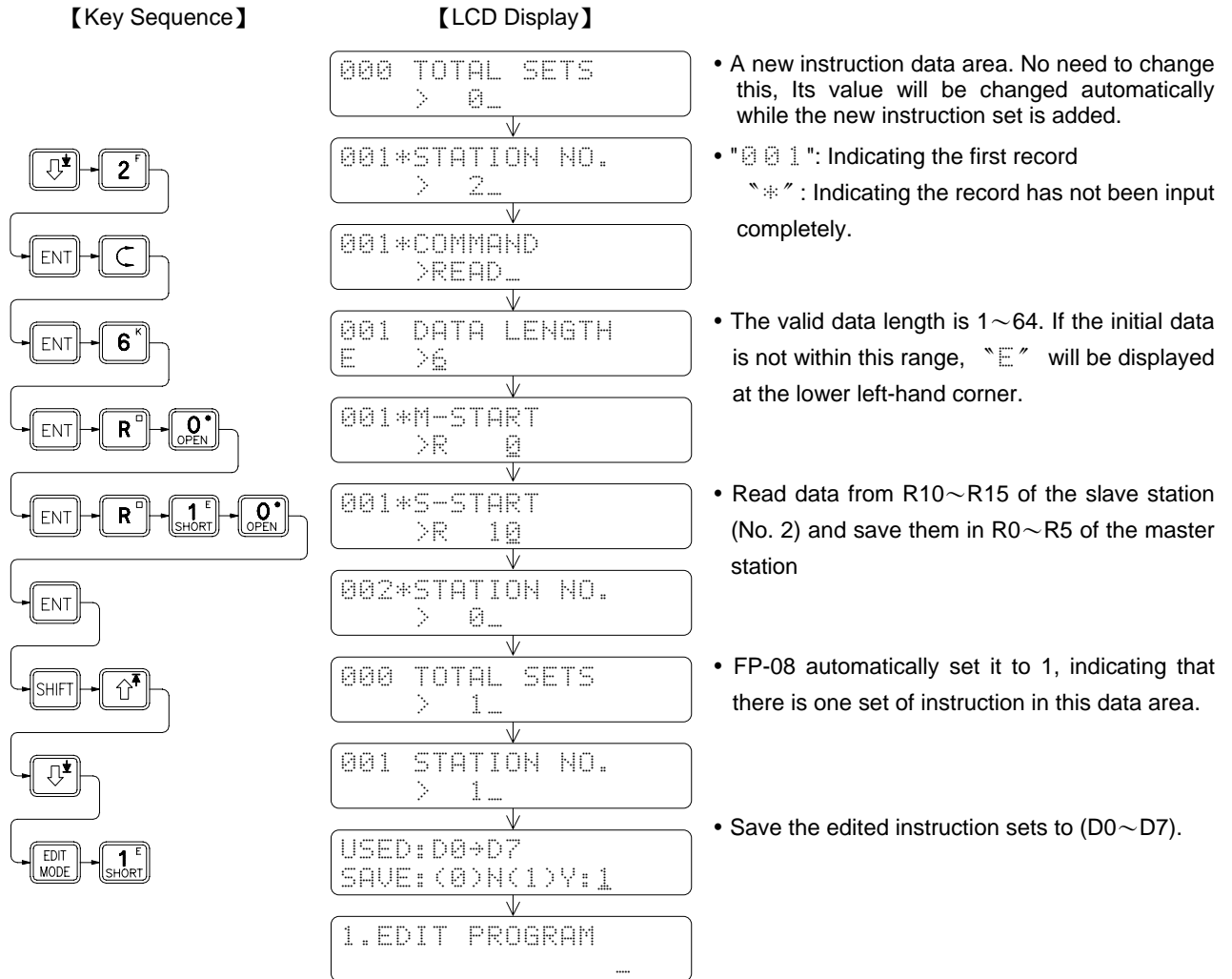
Remark 2: DATA LENGTH: 1~64

Remark 3: The available parameters for MASTER/SLAVE START include X, Y, M, S, T, C, MX, WY, WS, TR, CR, R and D.

5.7.1 Supplementary Editing Keys

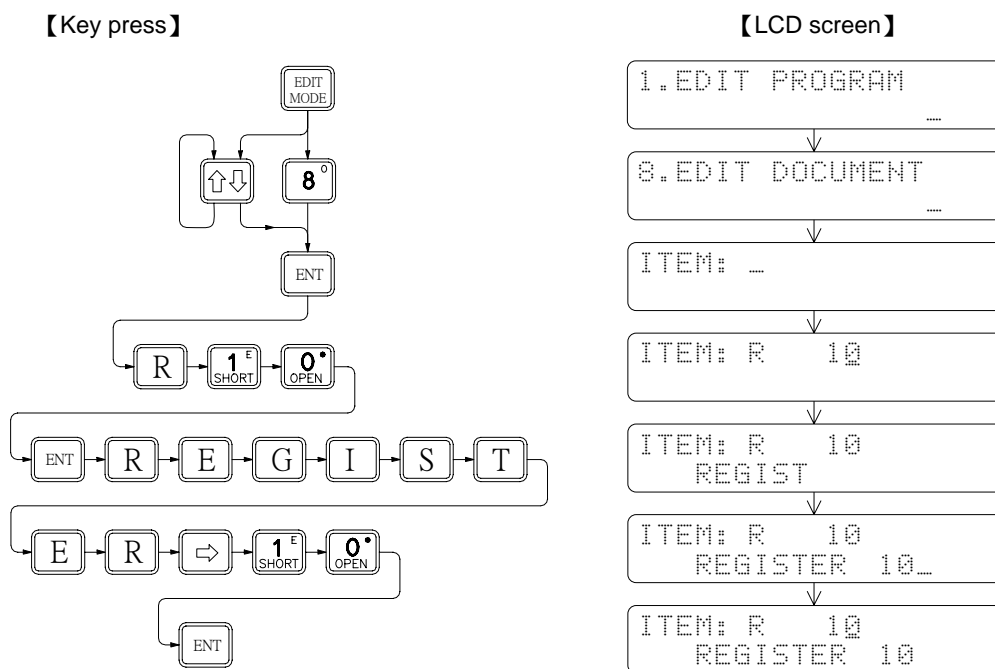
Please refer to the supplementary editing keys for HSPSO in section 2.5.6.2.

5.7.2 Editing Example



5.8 EDIT DOCUMENT

This function provides the opportunity to add document for digital (X · Y · M · S · T · C) and register (R · D · WX · WY · WM · WS) with 16 characters (Only support 10 characters while at instruction edit mode). Instead of showing reference number, all documented reference numbers will be shown by its document when displayed in FP-08 or WinProladder. If properly use this function, will increase the readability of your ladder program.



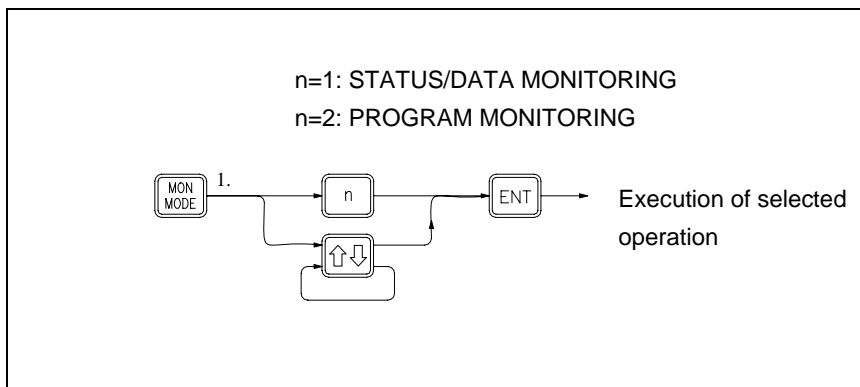
- ※ Key : Clear document while edit the document
- Key : Move the cursor between first and second row
- Key : Move the cursor right or left one character position while edit the document

6 The Operation of MONITOR MODE

There are two main operation functions available for MONITOR MODE.

1. STATUS/DATA MONITORING
2. PROGRAM MONITORING

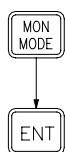
Fundamental key operations of MONITOR MODE



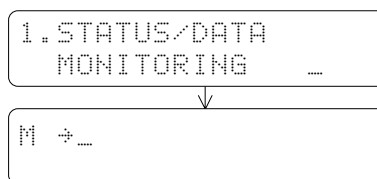
6.1 STATUS/DATA MONITORING

This operation is used to monitor the digital status and register data. Forcing operation can be used in this mode to change the digital status and register data. In addition, digital element enable and disable control are also possible. The key operations for entering the "STATUS/DATA MONITORING" function and the corresponding LCD display is shown below.

【Key Sequence】



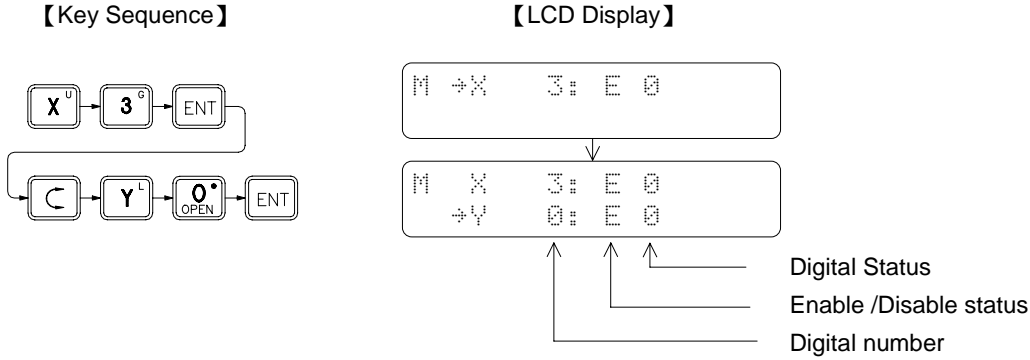
【LCD display】



- "M" letter on the LCD screen indicates current operation mode is STATUS/DATA MONITORING mode.
- The arrow "⇄" on the LCD screen prompts user to enter the digital or register reference number and then the status will be displayed on the row where the arrow is stay. Using the key to switch the arrow between these two rows.

6.1.1 Digital Status Monitoring

This function allows you to monitor the statuses of all digital points, such as X $\Delta\Delta\Delta$, Y $\Delta\Delta\Delta$, M $\Delta\Delta\Delta\Delta$ and S $\Delta\Delta\Delta$. If you want to monitor the status of a digital point after entering the STATUS/DATA MONITORING mode, follow the key operations shown below.



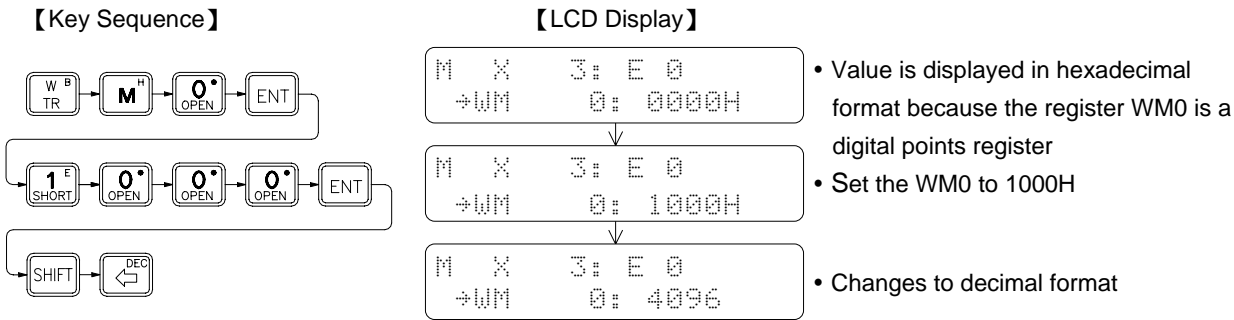
The ability of forcing or enable/disable the digital status is the auxiliary function of the digital status monitor function. Therefore if you want to execute the force or enable/disable functions, it is required to monitor the digital status first. As shown in the above diagram, the enable/disable status is displayed as well while you are monitoring the digital status. At this time, you can enable or disable the digital by pressing the **EN DIS** key. A specific function (Enable or Disable) can be selected by pressing the key alternately. The digital status can be forced to 1 or 0 by pressing the **SET RST** key. Please refer to section 2.2.4 for detailed descriptions on force and enable/disable of the digital status.

6.1.2 Register Data Monitoring

While monitoring the register data, the display data can be in decimal or hexadecimal format. FP-08 base on the register type will automatically arrange the display format. Registers consisting of 16 or 32 bits (W $\square\Delta\Delta\Delta\Delta$, DW $\square\Delta\Delta\Delta\Delta$) are displayed in hexadecimal format, with this format can easily to know the status of individual bits of register's data. Since those registers are bit oriented in application. The other register's data are displayed in decimal format. Also can use the **SHIFT** **HEX** or **SHIFT** **DEC** keys to change the display format as desired. After change the display format of certain type of register, all the register of that type will all display with the same format unless the monitoring register type is changed such as changing R $\Delta\Delta\Delta\Delta$ to W $\square\Delta\Delta\Delta\Delta$ or vice versa, or simply use the keys described above to change the display format.

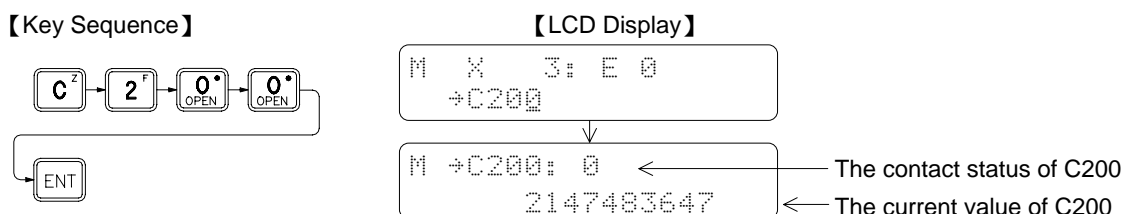
In the following example, we use the R registers and digital register to demonstrate the operation of register data monitor.

Example 1 16-Bit digital points register data monitoring



Example 2 32-bit register status monitoring

The data of the 32-bit registers (DR△△△△, C200~C255 and DW□△△△△) may be up to 11 digits including the sign. Therefore a single LCD screen can only display one register data at a time. While display a 32-bit register, after pressing the **ENT** key, FP-08 will automatically display the register number and contact status (if it is a counter register) at first row, and the register data will be displayed in second row as shown in the below.

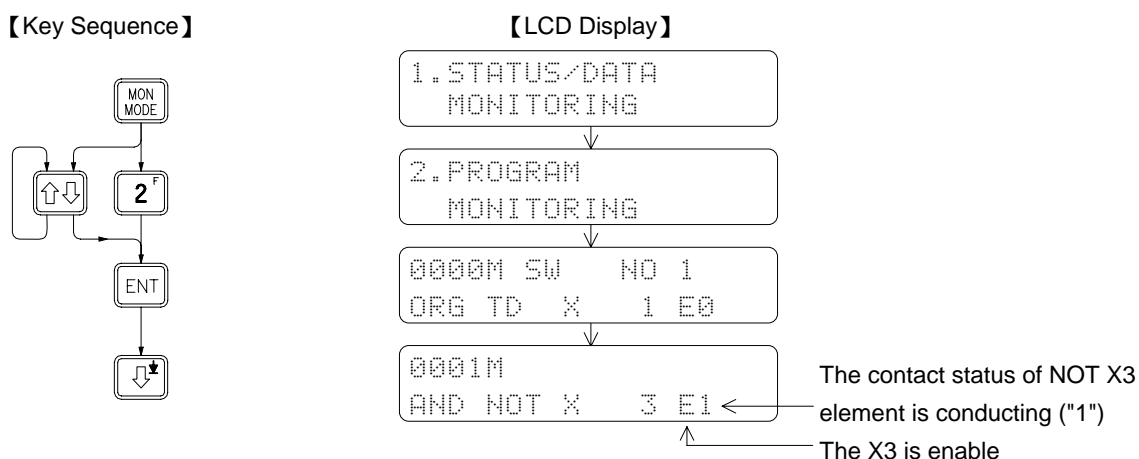


6.1.3 Change the Register Data

The register data displayed on the LCD screen can be changed as shown in example 1 where the data of WM0 is set to 1000H. However, the disable operation on register does not provide. Please refer to section 2.2.5 for more detailed explanations. To change the register data, besides by entering the register data monitor mode, using the register data edit function is a more convenient way. Please refer to section 2.5.2 for more explanations.

6.2 PROGRAM MONITORING

The PROGRAM MONITORING function can observe and check the program instructions either the PLC is at RUN or STOP state. If the displayed instruction is a contact element, then FP-08 will display the conducting status and enable/disable status of corresponding element. At the same time it can also perform the forcing or enable/disable operation on that digital element. The key operations are similar to the ones shown in the status monitor function. Under the PROGRAM MONITORING mode can also use the search function to find the desired instruction for monitoring. Key operations of entering the PROGRAM MONITORING mode and the LCD displays are shown below.

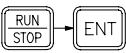


Remark: The digital status shown in the STATUS/DATA MONITORING function is the status of the digital numbers such as X0, Y0 etc, while the digital status shown in the PROGRAM MONITORING function is the conducting state of the digital elements such as NOT X0, TU Y0 etc. The status of X3 in the data monitor mode is 0 as shown in the example 1. But the status of the element NOT X3 in the program monitor mode is 1 as shown in the example above. This is due to the fact that X3 status is 0, but the conducting status of B contact of X3 is 1. The conducting status can only be retained for a single scan time for differential up and differential down contacts. For that contacts the conducting status may not be observed unless at the same moment the data is happen to read and displayed.

- After entering the PROGRAM MONITORING mode, can also to perform the force and enable/disable operation directly on relay and contact instructions. Please refer to section 2.2.4 for key operations.
- The operation procedures for functions such as program browse and program search in the MONITOR MODE are similar to those operation procedures in the EDIT MODE. The only difference is that the data can only be observed in the MONITOR MODE while it can be edited in the EDIT MODE.

7 PLC Run/Stop Control

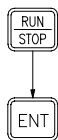
Fundamental key operations



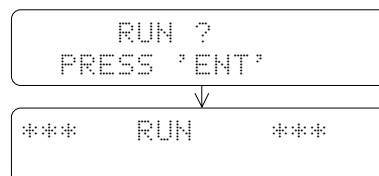
After pressing the keystrokes as shown at left, will toggle the executing state of the PLC. Which means if the PLC is at STOP state then it will change to RUN state, and vice versa.

- The key operations for the case of changing the PLC from STOP to RUN.

【Key Sequence】



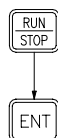
【LCD Display】



Message "RUN" blinks which indicates the PLC is running.

- The key operations for the case of changing the PLC from RUN to STOP.

【Key Sequence】



【LCD Display】

