
COMMUNICATION MANUAL
DIGITAL PID CONTROLLER

FU & FA series



March, 2009

F__COMM_EN_V1.1

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1 Set up of the controller

Press  +  key 3 seconds to configure parameters in Level 3

| Character | Name , Functions and Setting range | Default |
|------------------|--|----------------|
| <i>P5L</i> | Protocol Selection <i>r t U</i> : MODBUS RTU Protocol <i>A S C I</i> : MODBUS ASCII Protocol <i>t A I E</i> : TAIE Protocol | <i>r t U</i> |
| <i>b i t S</i> | Communication Bits <i>O _ B 1</i> : Odd parity , Data bits = 8 , Stop Bit = 1 <i>O _ B 2</i> : Odd parity , Data bits = 8 , Stop Bit = 2 <i>E _ B 1</i> : Even parity , Data bits = 8 , Stop Bit = 1 <i>E _ B 2</i> : Even parity , Data bits = 8 , Stop Bit = 2 | <i>O _ B 1</i> |
| <i>i d . n o</i> | ID Number Range : 0 ~ 255 | <i>1</i> |
| <i>b A U d</i> | Communication Baud rate <i>2 4</i> : 2400 bps <i>4 8</i> : 4800 bps <i>9 6</i> : 9600 bps <i>1 9 2</i> : 19200 bps <i>3 8 4</i> : 38400 bps | <i>3 8 4</i> |

- When parameter *b i t S* or *b A U d* was changed, always turn on the power again. Otherwise, no communication is performed by using the changed value.

2 System Configuration

2.1 RS485 Communication System

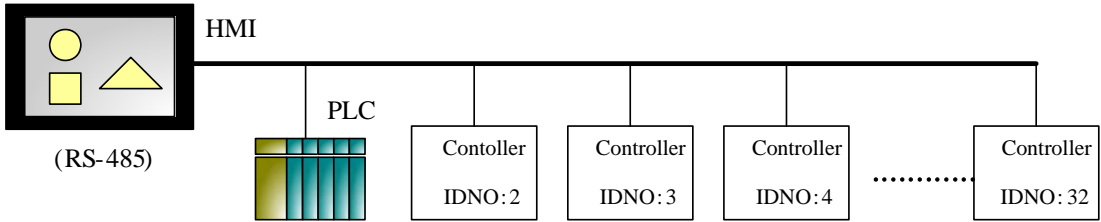


Figure: 2.1-1

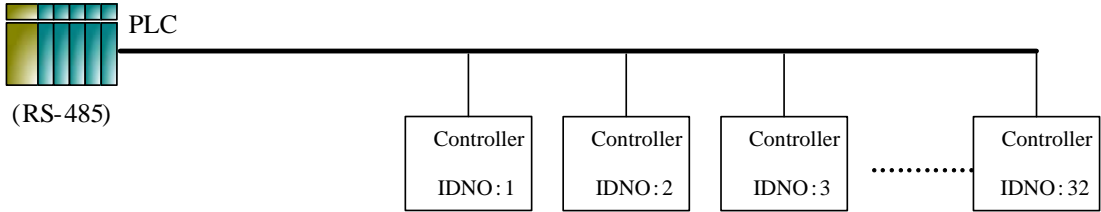


Figure: 2.1-2

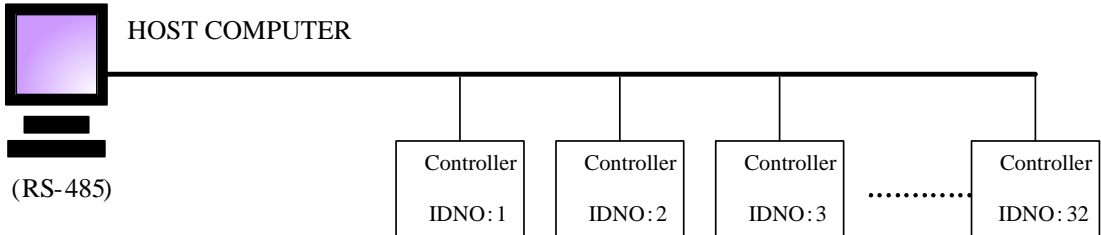


Figure: 2.1-3

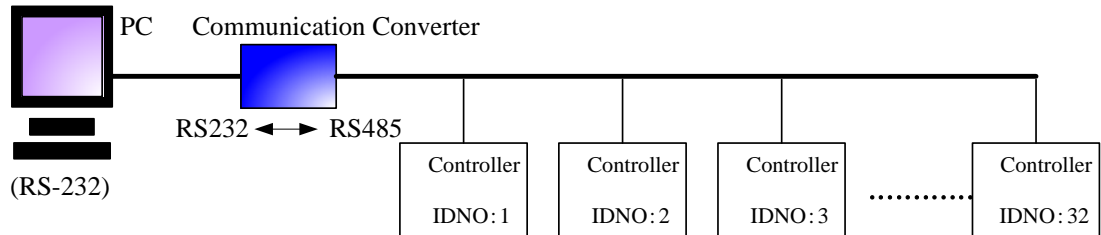


Figure: 2.1-4

2.2 RS232 Communication System

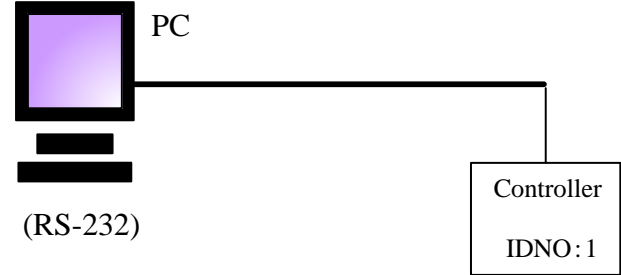


Figure: 2.2-1

3 Wiring Connection

3.1 RS485 Communication Wiring

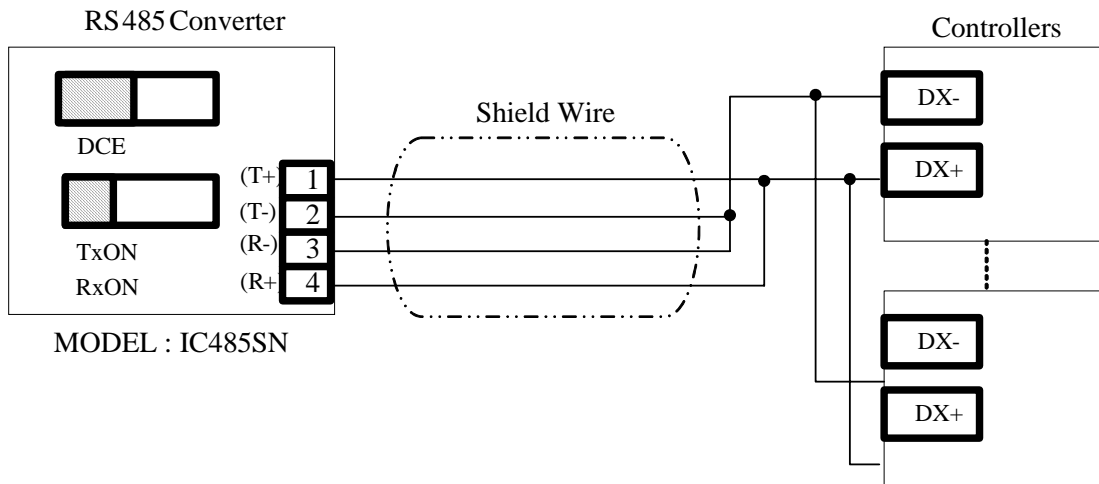


Figure: 3.1-1

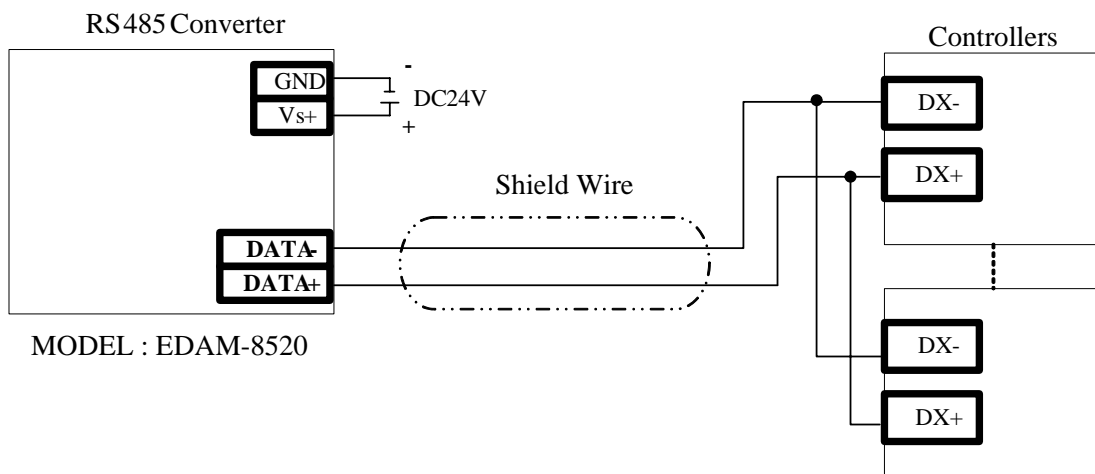
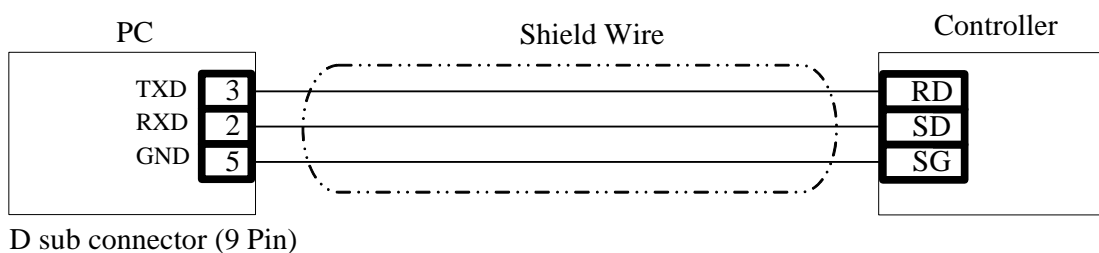


Figure: 3.1-2

- Note:
1. The length of shield wire should be less than 1200M.
 2. Controllers in RS485 parallel connection should be less than 32 units

3.2 RS232 Communication Wiring



- Note:
1. The length of shield wire should be less than 12M.
 2. There is only 1 unit of controller available in RS232 communication..

4 MODBUS RTU Protocol

4.1 Message Configuration

| | | | |
|---------------------|-------------------------|----------------|---------------|
| ID Number 1 Byte | Function Code 1 Byte | Data N Byte | CRC 2 Byte |
|---------------------|-------------------------|----------------|---------------|

4.2 ID Number (Slave Address)

Range: 1~255.

Master instrument identifies slave controllers by the ID Number of the requested message. ID Number should be configuring in individual slave controller by setting parameter "IDNO" in operation LEVEL 3.

4.3 Function Code

| Function Code | Contents |
|---------------|--|
| 03 (03H) | Reading multiple registers value from slave controller (Max register count : 8) |
| 06 (06H) | Setting 1 register value to slave controller |
| 16 (10H) | Setting multiple registers value to slave controller. (Max register count : 8) |

4.4 Data

Data depends on function code.

Request message from Master instrument is include "register address", "data count" and "setting data".

Response data from Slave controller is include "byte count", "data" and "abnormal code".

4.5 Error Check CRC

CRC16 generation polynomial: $X^{16} + X^{15} + X^2 + X^1$

CRC generation step is as below:

- ①. CRC is initialized as FFFFH
- ②. Calculate XOR with 1st data and the low byte of CRC. This is assumed as Y(16bit).
- ③. Shift Y one bit to the right. This assumed as Y.
- ④. If a carry is generated at step 3, then calculate XOR with Y and "A001H", else jump to step 5.
- ⑤. Repeat step 3 and 4, until Y is shifting right 8 times.
- ⑥. Calculate XOR with next data and the low byte of Y. This is assumed as Y.
- ⑦. Repeat step 3 ~5.
- ⑧. Repeat step 3~5, until last data is processed.
- ⑨. Swap the low byte and high byte of Y.
- ⑩. CRC=Y

4.6 Abnormal Code

| Abnormal Code | Contents |
|---------------|---|
| 01 (01H) | Illegal function code (Non-existent function code) |
| 02 (02H) | Illegal register address (Register address is out of range) |
| 03 (03H) | Illegal data value (Data value is out of setting range) |

4.7 Message example of RTU mode

4.7.1 Reading (Read PV from slave controller 1)

Request message from master instrument:

| ID Number | Function Code | Register Address | Data Count | CRC |
|-----------|---------------|------------------|------------|---------|
| (01H) | (03H) | (008AH) | (0001H) | (A5E0H) |

Response data from slave controller in normal status (Assumed PV=100.0)

| ID Number | Function Code | Byte Count | Data | CRC |
|-----------|---------------|------------|---------|---------|
| (01H) | (03H) | (02H) | (03E8H) | (B8FAH) |

Response from slave controller in abnormal status (Assumed as illegal data value)

| ID Number | Function Code | Error Code | CRC |
|-----------|---------------|------------|---------|
| (01H) | (83H) | (03H) | (0131H) |

1 is set to the MSB of function code in abnormal status (83H).

The abnormal code (03H) is returned as contents of error.

4.7.2 Setting (Set SV = 10.0 to slave controller 1)

Request message from master instrument:

| ID Number | Function Code | Register Address | Setting Data | CRC |
|-----------|---------------|------------------|--------------|---------|
| (01H) | (06H) | (0000H) | (0064H) | (8821H) |

Response message from slave controller in normal status (When SV = 10.0)

| ID Number | Function Code | Register Address | Setting Data | CRC |
|-----------|---------------|------------------|--------------|---------|
| (01H) | (06H) | (0000H) | (0064H) | (8821H) |

Response from slave controller in abnormal status (Assumed as illegal data value)

| | | | |
|--------------------|------------------------|---------------------|----------------|
| ID Number (01H) | Function Code (86H) | Error Code (03H) | CRC (0261H) |
|--------------------|------------------------|---------------------|----------------|

1 is set to the MSB of function code in abnormal status (86H).

The abnormal code (03H) is returned as contents of error.

4.7.3 Setting (Set SV = 10.0 and OUTL=100.0 to slave controller 1)

Request message from master instrument:

| | | | | | | | |
|--------------------|------------------------|-----------------------------|-----------------------|---------------------|------------------|------------------|----------------|
| ID Number (01H) | Function Code (10H) | Register Address (0000H) | Data Count (0002H) | Byte Count (04H) | Data1 (0064H) | Data2 (03E8H) | CRC (B2CEH) |
|--------------------|------------------------|-----------------------------|-----------------------|---------------------|------------------|------------------|----------------|

Response message from slave controller in normal status (When SV = 10.0 and OUTL=100.0)

| | | | | |
|--------------------|------------------------|-----------------------------|-----------------------|----------------|
| ID Number (01H) | Function Code (10H) | Register Address (0000H) | Data Count (0002H) | CRC (41C8H) |
|--------------------|------------------------|-----------------------------|-----------------------|----------------|

Response from slave controller in abnormal status (Assumed as illegal register address)

| | | | |
|--------------------|------------------------|---------------------|----------------|
| ID Number (01H) | Function Code (90H) | Error Code (02H) | CRC (C001H) |
|--------------------|------------------------|---------------------|----------------|

1 is set to the MSB of function code in abnormal status (90H).

The abnormal code (02H) is returned as contents of error.

5 MODBUS ASCII Protocol

5.1 Message Configuration

| | | | | | |
|-------------------------|---------------------|------------------------------|-----------------|---------------|--------------------------------|
| Header (:) 1 Byte | ID Number 2 Byte | (Function Code) 2 Byte | Data 2N Byte | LRC 2 Byte | Delimiter (CR+LF) 2 Byte |
|-------------------------|---------------------|------------------------------|-----------------|---------------|--------------------------------|

5.2 ID Number(Slave Address)

Range: 1~255

Master instrument identifies slave controllers by the ID Number of the requested message. ID Number should be configuring in individual slave controller by setting parameter "IDNO" in operation LEVEL 3.

5.3 Function Code

| Function Code | Contents |
|---------------|--|
| 03 (30H 33H) | Reading multiple registers value from slave controller (Max register count : 8) |
| 06 (30H 36H) | Setting 1 register value to slave controller |
| 16 (31H 30H) | Setting multiple registers value to slave controller. (Max register count : 8) |

5.4 Data

Data depends on function code.

Request message from Master instrument is include "register address", "data count" and "setting data".

Response data from Slave controller is include "byte count", "data" and "abnormal code".

5.5 Error Check LRC

LRC generation step is as below:

- ①. Convert all the messages to RTU mode (HEX code) ◦
- ②. Add all the values from "ID Number" to the end of "Data". This is assumed as Y(8Bit).
- ③. Calculate 2's complement with Y.
- ④. Convert Y to ASCII characters (16 bit)
- ⑤. LRC=Y

5.6 Abnormal Code

| Abnormal Code | Contents |
|---------------|---|
| 01 (30H 31H) | Illegal function code (Non-existent function code) |
| 02 (30H 32H) | Illegal register address (Register address is out of range) |
| 03 (30H 33H) | Illegal data value (Data value is out of setting range) |

5.7 Message example of ASCII mode

● Reading (Read PV from slave controller 1)

Request message from master instrument:

| Header | ID Number | Function Code | Register Address | Data Count | LRC | Delimiter |
|--------|-----------|---------------|----------------------|----------------------|----------|-----------|
| (3AH) | (30H 31H) | (30H 33H) | (30H 30H 38H 41H) | (30H 30H 30H 31H) | (37H31H) | (0DH 0AH) |

Response data from slave controller in normal status (Assumed PV=100.0)

| Header | ID Number | Function Code | Byte Count | Data | LRC | Delimiter |
|--------|-----------|---------------|------------|----------------------|-----------|-----------|
| (3AH) | (30H 31H) | (30H 33H) | (30H32H) | (30H 33H 45H 38H) | (30H 46H) | (0DH 0AH) |

Response from slave controller in abnormal status (Assumed as illegal data value)

| Header | ID Number | Function Code | Error Code | LRC | Delimiter |
|--------|-----------|---------------|------------|-----------|-----------|
| (3AH) | (30H 31H) | (38H 33H) | (30H 33H) | (37H 39H) | (0DH 0AH) |

5.7.1 Setting (Set SV = 10.0 to slave controller 1)

Request message from master instrument:

| Header | ID Number | Function Code | Register Address | Data | LRC | Delimiter |
|--------|-----------|---------------|----------------------|----------------------|----------|-----------|
| (3AH) | (30H 31H) | (30H 36H) | (30H 30H 30H 30H) | (30H 30H 36H 34H) | (39H35H) | (0DH 0AH) |

Response message from slave controller in normal status (When SV = 10.0)

| Header | ID Number | Function Code | Register Address | Data | LRC | Delimiter |
|--------|-----------|---------------|----------------------|----------------------|----------|-----------|
| (3AH) | (30H 31H) | (30H 36H) | (30H 30H 30H 30H) | (30H 30H 36H 34H) | (39H35H) | (0DH 0AH) |

Response from slave controller in abnormal status (Assumed as illegal data value)

| Header | ID Number | Function Code | Error Code | LRC | Delimiter |
|--------|-----------|---------------|------------|-----------|-----------|
| (3AH) | (30H 31H) | (38H 36H) | (30H 33H) | (37H 36H) | (0DH 0AH) |

1 is set to the MSB of function code in abnormal status (86H).
The abnormal code (03H) is returned as contents of error.

5.7.2 Setting (Set SV = 10.0 and OUTL=100.0 to slave controller 1)

Request message from master instrument:

| Header | ID Number | Function Code | Register Address | Data Count | BYTE Count | Data1 |
|--------|-----------|---------------|----------------------|----------------------|------------|----------------------|
| (3AH) | (30H 31H) | (31H 30H) | (30H 30H 30H 30H) | (30H 30H 30H 32H) | (30H 34H) | (30H 30H 36H 34H) |

| Data2 | LRC | Delimiter |
|-------------------|-----------|-----------|
| (30H 33H 45H 38H) | (39H 41H) | (0DH 0AH) |

Response message from slave controller in normal status (When SV = 10.0 and OUTL=100.0)

| Header | ID Number | Function Code | Register Address | Data Count | LRC | Delimiter |
|--------|-----------|---------------|----------------------|----------------------|-----------|-----------|
| (3AH) | (30H 31H) | (31H 30H) | (30H 30H 30H 30H) | (30H 30H 30H 32H) | (45H 44H) | (0DH 0AH) |

Response from slave controller in abnormal status (Assumed as illegal register address)

| Header | ID Number | Function Code | Error Code | LRC | Delimiter |
|--------|-----------|---------------|------------|-----------|-----------|
| (3AH) | (30H 31H) | (39H 30H) | (30H 32H) | (36H 44H) | (0DH 0AH) |

6 TAIE Protocol

6.1 Message Configuration

Master → Slave (7 Bytes):

| Command | ID Number | Register Address | Data | Check Sum |
|---------|-----------|------------------|--------|-----------|
| 1 Byte | 1 Byte | 2 Byte | 2 Byte | 1 Byte |

Master ← Slave (8 Bytes)

| Header (07H) | Command (4DH) | ID Number | Register Address | Data | Check Sum |
|--------------|---------------|-----------|------------------|--------|-----------|
| 1 Byte | 1 Byte | 1 Byte | 2 Byte | 2 Byte | 1 Byte |

6.2 Command

| Command | Contents |
|---------|---|
| R (52H) | Reading 1 register value from slave controller |
| M (4DH) | Modify 1 register value in RAM. (Data are not maintained after power off) |
| W (57H) | Write 1 register value in both RAM and EEPROM. (Data are maintained after power off) |

6.3 ID Number

Range: 1~255.

Master instrument identifies slave controllers by the ID Number of the requested message. ID Number should be configuring in individual slave controller by setting parameter "IDNO" in operation LEVEL 3.

6.4 Register Address

Register Address is including register address High byte and Low byte.

Totally, there are 2 bytes.

For detail, please check with Register Map(Page:12)

6.5 Data

Data is including setting data High byte and Low byte.

Totally, there are 2 bytes.

6.6 Check Sum

Add all the values from “Command” to the end of “Data”.

The result is Check Sum (1 byte).

EX : 52H + 01H + 00H +8AH +00H +00H = DDH

6.7 Message example of TAIE Protocol

6.7.1 Read (Read PV from slave controller 1)

Request message from master instrument:

| Command | ID Number | Register Address | Data | Check Sum |
|---------|-----------|------------------|---------|-----------|
| (52H) | (01H) | (008AH) | (0000H) | (DDH) |

Response data from slave controller (Assumed PV=100.0)

| Header | Command | ID Number | Register Address | Data | Check Sum |
|--------|---------|-----------|------------------|---------|-----------|
| (07H) | (4DH) | (01H) | (008AH) | (03E8H) | (C3H) |

6.7.2 Modify (Modify SV = 10.0 to slave controller 1)

Request message from master instrument:

| Command | ID Number | Register Address | Data | Check Sum |
|---------|-----------|------------------|---------|-----------|
| (4DH) | (01H) | (0000H) | (0064H) | (B2H) |

6.7.3 Write (Write SV = 100.0 to slave controller 1)

Request message from master instrument:

| Command | ID Number | Register Address | Data | Check Sum |
|---------|-----------|------------------|---------|-----------|
| (57H) | (01H) | (0000H) | (03E8H) | (43H) |

7 Register Map

| Parameters | Register Address | | MODBUS Function Code | Setting Range |
|---|------------------|---------|----------------------------|-----------------------|
| | HEX | DECIMAL | | |
| SV Set Point | 0000 | 000 | 03/06/10H | |
| OUTL Output Limit | 0001 | 001 | 03/06/10H | 0 ~ 1000 |
| AT Auto Tuning | 0002 | 002 | 03/06/10H | 0000H=NO 0001H=YES |
| AL1 Alarm 1 set value | 0003 | 003 | 03/06/10H | |
| AL2 Alarm 2 set value | 0004 | 004 | 03/06/10H | |
| AL3 Alarm 3 set value | 0005 | 005 | 03/06/10H | |
| PTN Program Pattern | 0006 | 006 | 03/06/10H | 0 ~ 2 |
| SEG Program Segment Display | 0007H | 007 | 03H | |
| TIMR Program Countdown Display | 0008 | 008 | 03H | |
| SV_1 Set Point of Seg.1 (Pattern 1) | 0009 | 009 | 03/06/10H | |
| TM_1 Run Time of Seg.1 (Pattern 1) | 000A | 010 | 03/06/10H | |
| OUT1 Output Limit of Seg.1 (Pattern 1) | 000B | 011 | 03/06/10H | |
| SV_2 Set Point of Seg.2 (Pattern 1) | 000C | 012 | 03/06/10H | |
| | | | | |

| Parameters | Register Address | | MODBUS Function Code | Setting Range |
|---|------------------|---------|----------------------------|------------------|
| | HEX | DECIMAL | | |
| TM_2 Run Time of Seg.2 (Pattern 1) | 000D | 013 | 03/06/10H | |
| OUT2 Output Limit of Seg.2 (Pattern 1) | 000E | 014 | 03/06/10H | |
| SV_3 Set Point of Seg.3 (Pattern 1) | 000F | 015 | 03/06/10H | |
| TM_3 Run Time of Seg.3 (Pattern 1) | 0010 | 016 | 03/06/10H | |
| OUT3 Output Limit of Seg.3 (Pattern 1) | 0011 | 017 | 03/06/10H | |
| SV_4 Set Point of Seg.4 (Pattern 1) | 0012 | 018 | 03/06/10H | |
| TM_4 Run Time of Seg.4 (Pattern 1) | 0013 | 019 | 03/06/10H | |
| OUT4 Output Limit of Seg.4 (Pattern 1) | 0014 | 020 | 03/06/10H | |
| SV_5 Set Point of Seg.5 (Pattern 1) | 0015 | 021 | 03/06/10H | |
| TM_5 Run Time of Seg.5 (Pattern 1) | 0016 | 022 | 03/06/10H | |
| OUT5 Output Limit of Seg.5 (Pattern 1) | 0017 | 023 | 03/06/10H | |
| SV_6 Set Point of Seg.6 (Pattern 1) | 0018 | 024 | 03/06/10H | |

| Parameters | Register Address | | MODBUS Function Code | Setting Range |
|--|------------------|---------|----------------------------|------------------|
| | HEX | DECIMAL | | |
| TM_6 Run Time of Seg.6 (Pattern 1) | 0019 | 025 | 03/06/10H | |
| OUT6 Output Limit of Seg.6 (Pattern 1) | 001A | 026 | 03/06/10H | |
| SV_7 Set Point of Seg.7 (Pattern 1) | 001B | 027 | 03/06/10H | |
| TM_7 Run Time of Seg.7 (Pattern 1) | 001C | 028 | 03/06/10H | |
| OUT7 Output Limit of Seg.7 (Pattern 1) | 001D | 029 | 03/06/10H | |
| SV_8 Set Point of Seg.8 (Pattern 1) | 001E | 030 | 03/06/10H | |
| TM_8 Run Time of Seg.8 (Pattern 1) | 001F | 031 | 03/06/10H | |
| OUT8 Output Limit of Seg.8 (Pattern 1) | 0020 | 032 | 03/06/10H | |
| SV_12 Set Point of Seg.1 (Pattern 2) | 0021 | 033 | 03/06/10H | |
| TM_12 Run Time of Seg.1 (Pattern 2) | 0022 | 034 | 03/06/10H | |
| OUT12 Output Limit of Seg.1 (Pattern 2) | 0023 | 035 | 03/06/10H | |
| SV_22 Set Point of Seg.2 (Pattern 2) | 0024 | 036 | 03/06/10H | |

| Parameters | Register Address | | MODBUS Function Code | Setting Range |
|--|------------------|---------|----------------------------|------------------|
| | HEX | DECIMAL | | |
| TM_22 Run Time of Seg.2 (Pattern 2) | 0025 | 037 | 03/06/10H | |
| OUT22 Output Limit of Seg.2 (Pattern 2) | 0026 | 038 | 03/06/10H | |
| SV_32 Set Point of Seg.3 (Pattern 2) | 0027 | 039 | 03/06/10H | |
| TM_32 Run Time of Seg.3 (Pattern 2) | 0028 | 040 | 03/06/10H | |
| OUT32 Output Limit of Seg.3 (Pattern 2) | 0029 | 041 | 03/06/10H | |
| SV_42 Set Point of Seg.4 (Pattern 2) | 002A | 042 | 03/06/10H | |
| TM_42 Run Time of Seg.4 (Pattern 2) | 002B | 043 | 03/06/10H | |
| OUT42 Output Limit of Seg.4 (Pattern 2) | 002C | 044 | 03/06/10H | |
| SV_52 Set Point of Seg.5 (Pattern 2) | 002D | 045 | 03/06/10H | |
| TM_52 Run Time of Seg.5 (Pattern 2) | 002E | 046 | 03/06/10H | |
| OUT52 Output Limit of Seg.5 (Pattern 2) | 002F | 047 | 03/06/10H | |
| SV_62 Set Point of Seg.6 (Pattern 2) | 0030 | 048 | 03/06/10H | |

| Parameters | Register Address | | MODBUS Function Code | Setting Range |
|--|------------------|---------|----------------------|---------------|
| | HEX | DECIMAL | | |
| TM_62 Run Time of Seg.6 (Pattern 2) | 0031 | 049 | 03/06/10H | |
| OUT62 Output Limit of Seg.6 (Pattern 2) | 0032 | 050 | 03/06/10H | |
| SV_72 Set Point of Seg.7 (Pattern 2) | 0033 | 051 | 03/06/10H | |
| TM_72 Run Time of Seg.7 (Pattern 2) | 0034 | 052 | 03/06/10H | |
| OUT72 Output Limit of Seg.7 (Pattern 2) | 0035 | 053 | 03/06/10H | |
| SV_82 Set Point of Seg.8 (Pattern 2) | 0036 | 054 | 03/06/10H | |
| TM_82 Run Time of Seg.8 (Pattern 2) | 0037 | 055 | 03/06/10H | |
| OUT82 Output Limit of Seg.8 (Pattern 2) | 0038 | 056 | 03/06/10H | |
| P1 OUT1 Proportional Band | 0039 | 057 | 03/06/10H | 0~2000 |
| I1 OUT1 Integral Time | 003A | 058 | 03/06/10H | 0~3600 |
| D1 OUT1 Derivative Time | 003B | 059 | 03/06/10H | 0~900 |
| DB1 Dead-band Time | 003C | 060 | 03/06/10H | 0~1000 |
| ATVL Auto Tuning Offset | 003D | 061 | 03/06/10H | |

| CYT1 OUT1 Cycle Time | 003E | 062 | 03/06/10H | 0~150 |
|--|------------------|---------|----------------------------|--|
| Parameters | Register Address | | MODBUS Function Code | Setting Range |
| | HEX | DECIMAL | | |
| HYS1 OUT1 Hysteresis | 003F | 063 | 03/06/10H | 0~1000 |
| P2 OUT2 Proportional Band | 0040 | 064 | 03/06/10H | 0~2000 |
| I2 OUT2 Integral Time | 0041 | 065 | 03/06/10H | 0~3600 |
| D2 OUT2 Derivative Time | 0042 | 066 | 03/06/10H | 0~900 |
| CYT2 OUT2 Cycle Time | 0043 | 067 | 03/06/10H | 0~150 |
| HYS2 OUT2 Hysteresis | 0044 | 068 | 03/06/10H | 0~1000 |
| GAP1 OUT1 Control Gap | 0045 | 069 | 03/06/10H | |
| GAP2 OUT2 Control Gap | 0046 | 070 | 03/06/10H | |
| LCK Function Lock | 0047 | 071 | 03/06/10H | 0000H = 0000 1111H = 1111 0100H = 0100 0110H = 0110 0001H = 0001 0101H = 0101 |
| INP1 Input Type Selection | 0048 | 072 | 03/06/10H | 0000H = K1 0001H = K2 0002H = K3 0003H = K4 0004H = K5 0005H = K6 0006H = J1 0007H = J2 0008H = J3 0009H = J4 000AH = J5 |

| | | | | 000BH = J6 000CH = R1 000DH = R2 |
|-------------------------------------|------------------|---------|----------------------------|--|
| Parameters | Register Address | | MODBUS Function Code | Setting Range |
| | HEX | DECIMAL | | |
| INP1 Input Type Selection | 0048 | 072 | 03/06/10H | 000EH = S1 000FH = S2 0010H = B1 0011H = E1 0012H = E2 0013H = N1 0014H = N2 0015H = T1 0016H = T2 0017H = T3 0018H = W1 0019H = W2 001AH = PL1 001BH = PL2 001CH = U1 001DH = U2 001EH = U3 001FH = L1 0020H = L2 0021H = JP1 0022H = JP2 0023H = JP3 0024H = JP4 0025H = JP5 0026H = JP6 0027H = DP1 0028H = DP2 0029H = DP3 002AH = DP4 002BH = DP5 002CH = DP6 002DH = JP.1 002EH = JP.2 |

| | | | | 002FH = JP.3 0030H = JP.4 0031H = JP.5 |
|---|------------------|---------|----------------------------|---|
| Parameters | Register Address | | MODBUS Function Code | Setting Range |
| | HEX | DECIMAL | | |
| INP1 Input Type Selection | 0048 | 072 | 03/06/10H | 0032H = JP.6 0033H = AN1 0034H = AN2 0035H = AN3 0036H = AN4 0037H = AN5 |
| ANL1 Linear Input Zero Calibration | 0049 | 073 | 03/06/10H | |
| ANH1 Linear Input Span Calibration | 004A | 074 | 03/06/10H | |
| DP Decimal Point Position | 004B | 075 | 03/06/10H | 0000H = 0000 0001H = 000.0 0002H = 00.00 0003H = 0.000 |
| LSPL Lower Set Point Limit | 004C | 076 | 03/06/10H | |
| USPL Upper Set Point Limit | 004D | 077 | 03/06/10H | |
| ANL2 Remote Input Zero Calibration | 004E | 078 | 03/06/10H | |
| ANH2 Linear Input Span Calibration | 004F | 079 | 03/06/10H | |
| ALD1 Alarm mode for AL1 | 0050 | 080 | 03/06/10H | 0~19 |
| ALT1 Alarm time for AL1 | 0051 | 081 | 03/06/10H | |
| ALD2 Alarm mode for AL2 | 0052 | 082 | 03/06/10H | 0~19 |

| ALT2 Alarm time for AL2 | 0053 | 083 | 03/06/10H | |
|---|-------------------------|----------------|-------------------------------------|--|
| ALD3 Alarm mode for AL3 | 0054 | 084 | 03/06/10H | 0~19 |
| Parameters | Register Address | | MODBUS Function Code | Setting Range |
| | HEX | DECIMAL | | |
| ALT3 Alarm time for AL3 | 0055 | 085 | 03/06/10H | |
| HYSA Hysteresis for all Alarms | 0056 | 086 | 03/06/10H | 0000H=0000 0001H=0000 0010H=0010 0011H=0011 0100H=0100 0101H=0101 0110H=0110 0111H=0111 1000H=1000 1001H=1001 1010H=1010 1011H=1011 1100H=1100 1101H=1101 1110H=1110 1111H=1111 |
| CLO1 OUT1 Lower Calibration | 0057 | 087 | 03/06/10H | |
| CHO1 OUT1 Upper Calibration | 0058 | 088 | 03/06/10H | |
| CLO2 OUT1 Lower Calibration | 0059 | 089 | 03/06/10H | |
| CHO2 OUT1 Upper Calibration | 005A | 090 | 03/06/10H | |
| CLO3 TRS Lower Calibration | 005B | 091 | 03/06/10H | |

| CHO3 TRS Upper Calibration | 005C | 092 | 03/06/10H | |
|--|------------------|---------|----------------------|-------------------------------|
| RUCY Full run time of motor valve | 005D | 093 | 03/06/10H | |
| WAIT Full run time of proportional motor valve | 005E | 094 | 03/06/10H | |
| Parameters | Register Address | | MODBUS Function Code | Setting Range |
| | HEX | DECIMAL | | |
| SETA | 005F | 095 | 03/06/10H | |
| PSL Protocol Selection | 0060 | 096 | 03H | 0~2 |
| BITS Communication Bits | 0061 | 097 | 03H | 0~3 |
| IDNO ID Number | 0062 | 098 | 03H | 0~255 |
| BAUD Baud rate | 0063 | 099 | 03H | 0~4 |
| SVOS SV Compensation | 0064 | 100 | 03/06/10H | |
| PVOS PV Compensation | 0065 | 101 | 03/06/10H | |
| UNIT Unit of PV and SV | 0066 | 102 | 03/06/10H | 0000H=C 0001H=F 0002H=A |
| PVFT PV Filter | 0067 | 103 | 03/06/10H | 0 ~ 1000 |
| CASC | 0068 | 104 | 03/06/10H | |
| ODU Heating / Cooling selection | 0069 | 105 | 03/06/10H | 0000H=HEAT 0001H=COOL |
| OPAD Control Algorithm | 006A | 106 | 03/06/10H | 0000H=PID 0001H=FUZZY |

| HZ Power Frequency | 006B | 107 | 03/06/10H | 0000H=60HZ 0001H=50HZ |
|---|------------------|---------|----------------------------|--|
| SET1 Hide/ Display parameter | 006C | 108 | 03/06/10H | 0000H=0000 0001H=0000 0010H=0010 0011H=0011 0100H=0100 0101H=0101 0110H=0110 0111H=0111 |
| Parameters | Register Address | | MODBUS Function Code | Setting Range |
| | HEX | DECIMAL | | |
| SET1 Hide/ Display parameter | 006C | 108 | 03/06/10H | 1000H=1000 1001H=1001 1010H=1010 1011H=1011 1100H=1100 1101H=1101 1110H=1110 1111H=1111 |
| SET2 Hide/ Display parameter | 006D | 109 | 03/06/10H | Same with SET1 |
| SET3 Hide/ Display parameter | 006E | 110 | 03/06/10H | Same with SET1 |
| SET4 Hide/ Display parameter | 006F | 111 | 03/06/10H | Same with SET1 |
| SET5 Hide/ Display parameter | 0070 | 112 | 03/06/10H | Same with SET1 |
| SET6 Hide/ Display parameter | 0071 | 113 | 03/06/10H | Same with SET1 |
| SET7 Hide/ Display parameter | 0072 | 114 | 03/06/10H | Same with SET1 |
| SET8 Hide/ Display parameter | 0073 | 115 | 03/06/10H | Same with SET1 |
| SET9 Hide/ Display parameter | 0074 | 116 | 03/06/10H | Same with SET1 |
| SET0 Hide/ Display parameter | 0075 | 117 | 03/06/10H | Same with SET1 |

| INP2 Hide/ Display parameter | 0076 | 118 | 03/06/10H | 0 ~ 2 |
|--|------------------|---------|----------------------------|---|
| OUTY Output mode selection | 0077 | 119 | 03/06/10H | 0 ~ 5 |
| Parameters | Register Address | | MODBUS Function Code | Setting Range |
| | HEX | DECIMAL | | |
| VER Firmware Version | 0086 | 134 | 03H | 104 |
| OUT% Output percentage | 0087 | 135 | 03H | 0~1000 |
| OBIT Controller Information Bit | 0088 | 136 | 03H | <u>0000 0000 0000 0000</u> 2^{15} ~ 2^0 2^{15} : Message nnn2 2^{14} : Message UUU2 2^{13} : Message nnn1 2^{12} : Message UUU1 2^{11} : Message IN2E 2^{10} : Message CJCE 2^9 : Message ADCF 2^8 : Message IN1E 2^7 : MAN LED 2^6 : PRO LED 2^5 : AL3 LED 2^4 : AL2 LED 2^3 : AL1 LED 2^2 : AT LED 2^1 : OUT2 LED 2^0 : OUT1 LED |
| CV CT Current Value | 0089 | 137 | 03H | 0~999 |
| PV Process Value | 008A | 138 | 03H | -1999~9999 |