

TEMP 2000S

Thermal Shock Tester

SERIES



Communication Manual

※ This manual applies to TEMP2300S, TEMP2500S and TEMP2700S
The model stated the manual content is TEMP2500S.

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1. Safety Precautions

Thank you for purchasing TEMP2500S, programmable controller.
This Communication Manual describes communication of the TEMP2500S controller.



음 SAFETY SYMBOL MARK 음

(A) Symbolizes 'Caution' and 'Warning'. The information with this symbol is especially important for preventing from user injury and protecting the product and system.



(1)Product : This symbol indicates an imminently hazardous situation which if not avoided, will result in serious injury or system damage.

(2)Communication Manual : This symbol indicates potential hazard that may cause personal injury by electrical shock.

(B) Symbolizes 'Protective Earth (PE) Terminal.'



This symbol indicates that the terminal must be connected to the Ground prior to operating.

(C) Symbolizes 'Supplementary Explanation.'



The information with this symbol describes additional explanation for features.

(D) Symbolizes 'Reference.'



This symbol indicates further information and page to refer.



음 Precautionary Remarks on this Communication Manual 음

- (A) This manual should be passed on the End- User and kept at a suitable place for easy review in time.
- (B) Read and understand this Communication Manual carefully before using the product.
- (C) This Communication Manual describes functions and features of the product in detail, and SAMWONTECH can not guarantee against over applications would suit a customer's particular purpose which is not described in this manual.
- (D) Unauthorized duplication and modification of this Communication Manual are strongly prohibited.
- (E) The contents of this manual may be modified without prior notice.
- (F) If any errors or omissions in this manual should come to the attention of the user, feel free to contact our sales representatives or our sales office.



Precautions for Safety and Unauthorized Modification

- (A) For protecting and ensuring the safety of this product and relevant system, all of the safety instructions and precautions should be well recognized and strictly observed by all users.
- (B) SAMWONTECH does not guarantee against damage resulting from unauthorized alteration, misuse, or abuse.
- (C) When using additional safety circuit or part such as Noise Filter to protect this product and relevant system, it is strongly required to install that to outside of this product. Additional installation and modification inside of this product are prohibited.
- (D) Do not try to disassemble, repair, or modify the product. It may become the cause of a trouble such as malfunction, electric shock, fire.
- (E) Contact our sales dept. for part replacement or consumables.
- (F) Keep the product away from water inflowing. This may become a critical cause of trouble.
- (G) External shock on the product may lead to damage and malfunction.



Limitation of Liability

- (A) SAMWONTECH does not guarantee or accept responsibility for this product other than the clauses stated in our warranty policy.
- (B) SAMWONTECH assumes no liability to any party for any loss or damage, direct or indirect, caused by the use or any unpredictable defect of the product.



Warranty Policy

- (A) Warranty term of this TEMP2500S is one year after delivery to the first purchaser for being free of defects in materials and faulty workmanship under the condition that the product has been applied according to this manual.
- (B) The repairing cost will be charged for defective product out of warranty period. This charge will be the actual cost estimated by SAMWONTECH.
- (C) Repairing cost may be charged even if within warranty period for following cases.
 - (1) Damage due to USER FAULT (Ex.: Product initialization by password loss).
 - (2) Damage due to natural disaster (Ex.: fire, flood).
 - (3) Damage due to additional removal and re-installation after the first one.
 - (4) Damage due to unauthorized disassembles modification and alternation.
 - (5) Damage due to unexpected power failure caused unstable power supply.
 - (6) Others
- (D) If any A/S is required, feel free to contact our sales office or a representative.

2. Communication Specification

The TEMP2500S controller provides Half-Duplex method support on RS232C and RS485 communication interface.

- RS232C interface supports 1:1 direct communication between host computer on network system and TEMP2500S .
- RS485 interface supports to connect upper level network system with up to 31 slave TEMP2500S controller.

■ Parameters for communication setting

| Parameter | Range | Description |
|---------------|------------|-------------------------------------------------|
| PROTOCOL | PCLINK | Default protocol |
| | PCLINK+SUM | Default protocol + CheckSum |
| | MODBUS ASC | MODBUS ASCII |
| | MODBUS RTU | MODBUS RTU |
| SPEED (BPS) | 9600 | 9600 bps |
| | 19200 | 19200 bps |
| | 38400 | 38400 bps |
| | 57600 | 57600 bps |
| | 115200 | 115200 bps |
| PARITY | NONE | None Parity |
| | EVEN | Even Parity |
| | ODD | Odd Parity |
| STOP BIT | 1 | 1 bit |
| | 2 | 2 bits |
| DATA LENGTH | 7 | 7 bits |
| | 8 | 8 bits |
| ADDRESS | 1~99 | Address |
| RESPONSE TIME | 0~10 | RESPONSE TIME(=PROCESS TIME+SPONSE TIME*10msec) |
| SYNC MASTER | OFF | OFF (Sync Operation Stop) |
| | ON | ON (Sync Operation Run) |

■ Factory default value

| | |
|-----------------|-----------------------------|
| • PROTOCOL | PCLINK+SUM(PCLINK+CheckSum) |
| • BPS | 9600 bps |
| • PARITY | NONE |
| • STOP BIT | 1 (1 bit) |
| • DATA LENGTH | 8 (8 bits) |
| • ADDRESS | 1 |
| • RESPONSE TIME | 0 (PROCESS TIME+10msec) |
| • SYNC MASTER | OFF |

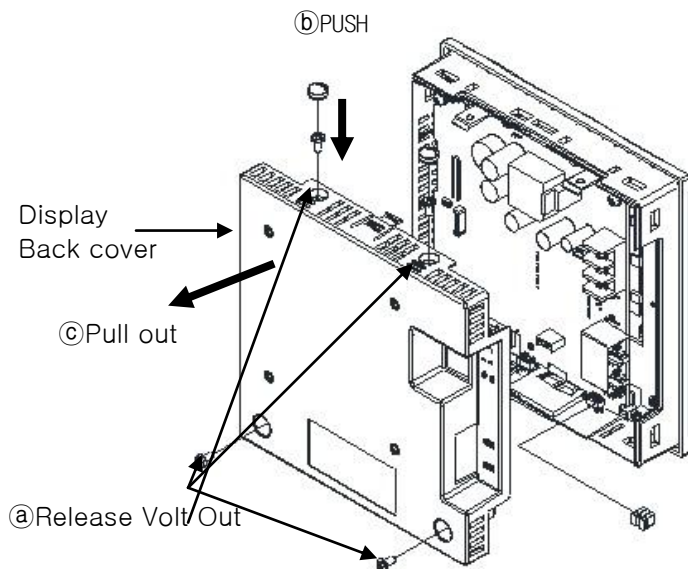
3. Communication setting

TEMP2500S provides flexible communication interface RS232C and RS485 from Control Unit directly.

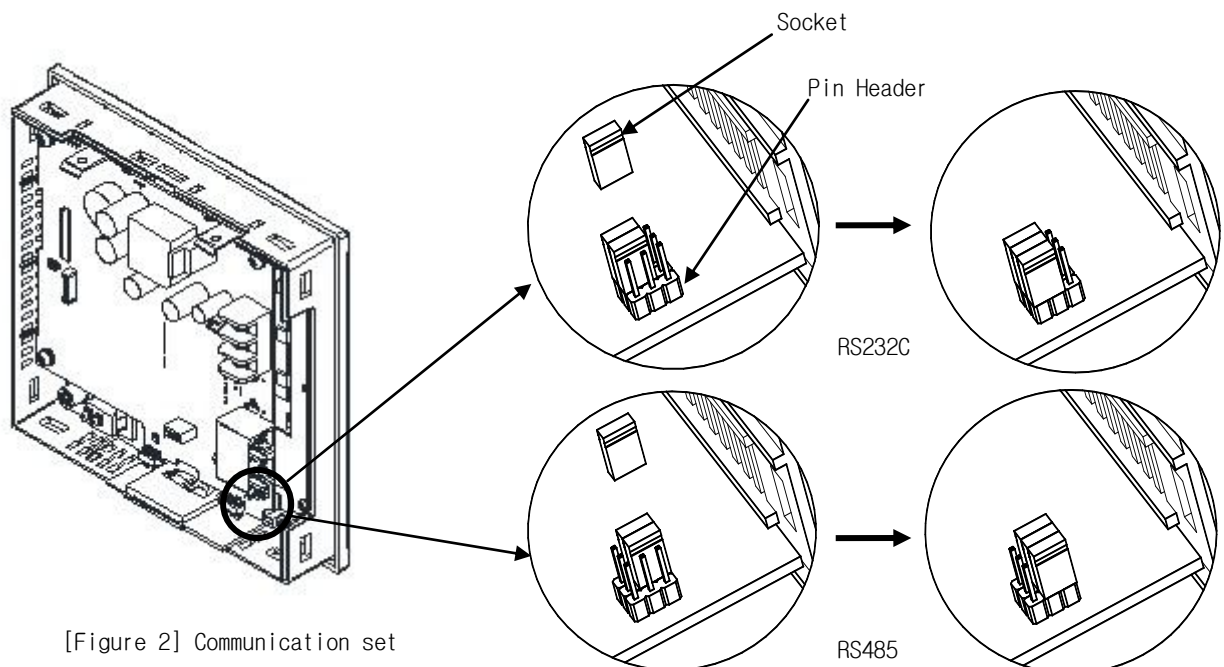
▶ After detaching BACK COVER from Control Unit shown as [Figure-1], communication interface between RS232C and RS485 can be selected with socket and pin-header on power board of Control Board.

▶ It is recommended to use tool like tweezers for setting socket to pin-header correctly.

👁️ Make sure setup completed correctly.



[Figure 1] DISPLAY



[Figure 2] Communication set

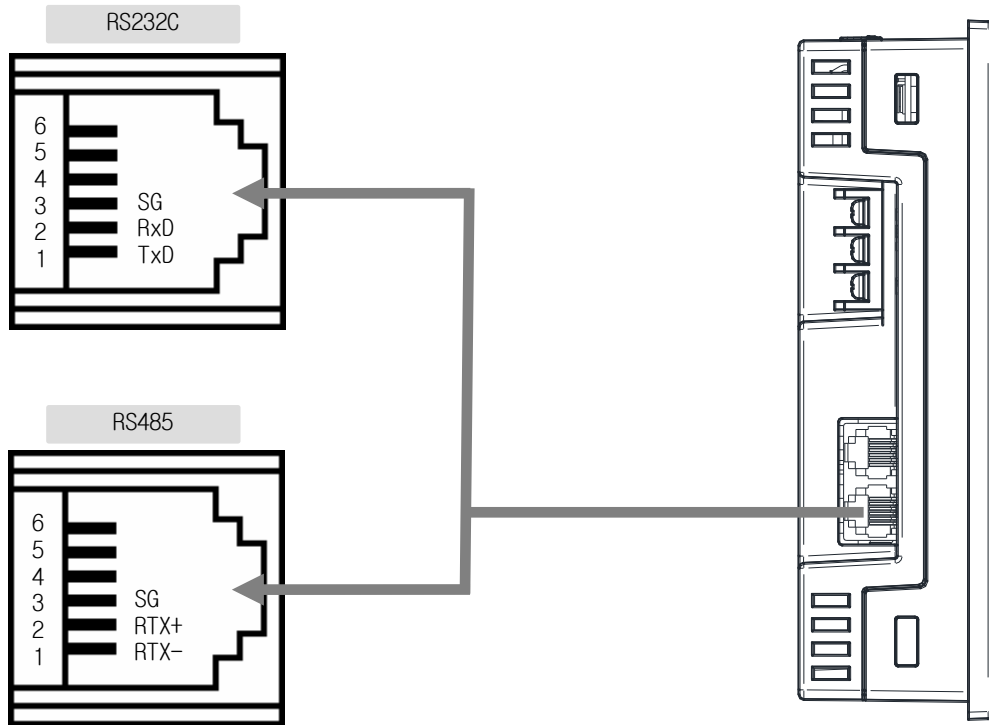


- ▶ Do not disassemble Power board from Control Unit case during setting comm. interface.
- ▶ It is recommended to use tool like tweezers for setting comm. interface.
- ▶ Make sure setup completed correctly.

4. Wiring for Communication

Connector wiring between TEMP2500S and upper network system depends on communication interface setting (RS485).

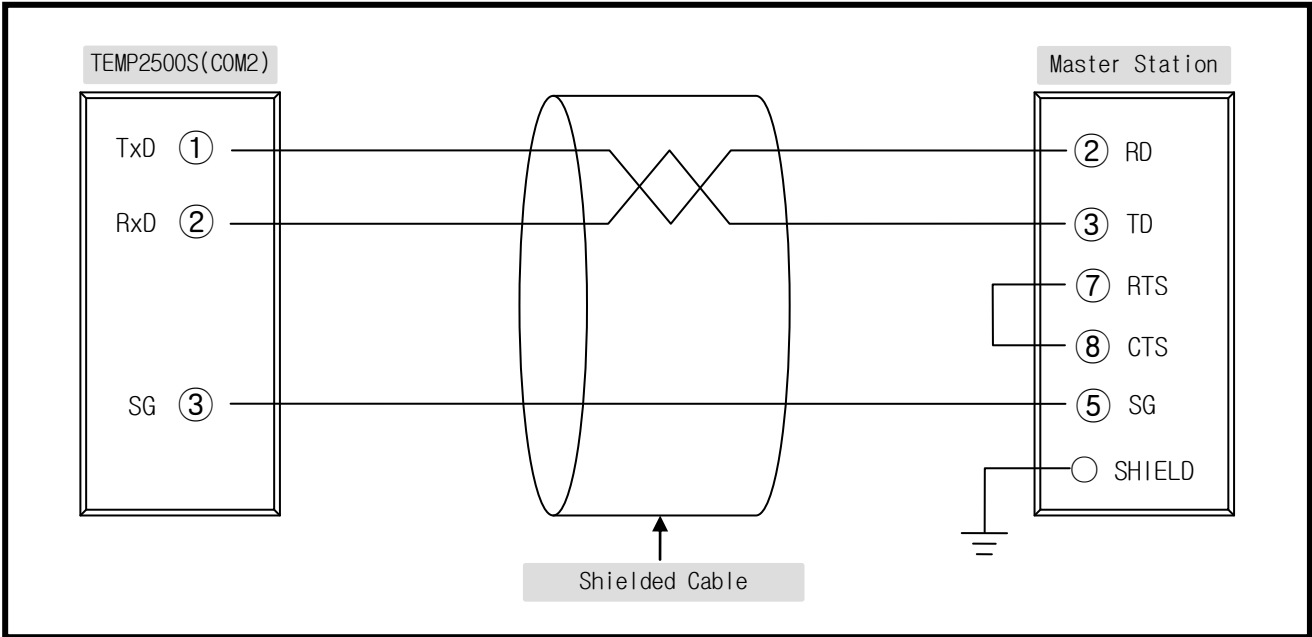
Modular Connector Pin-Mapping for COM2 port



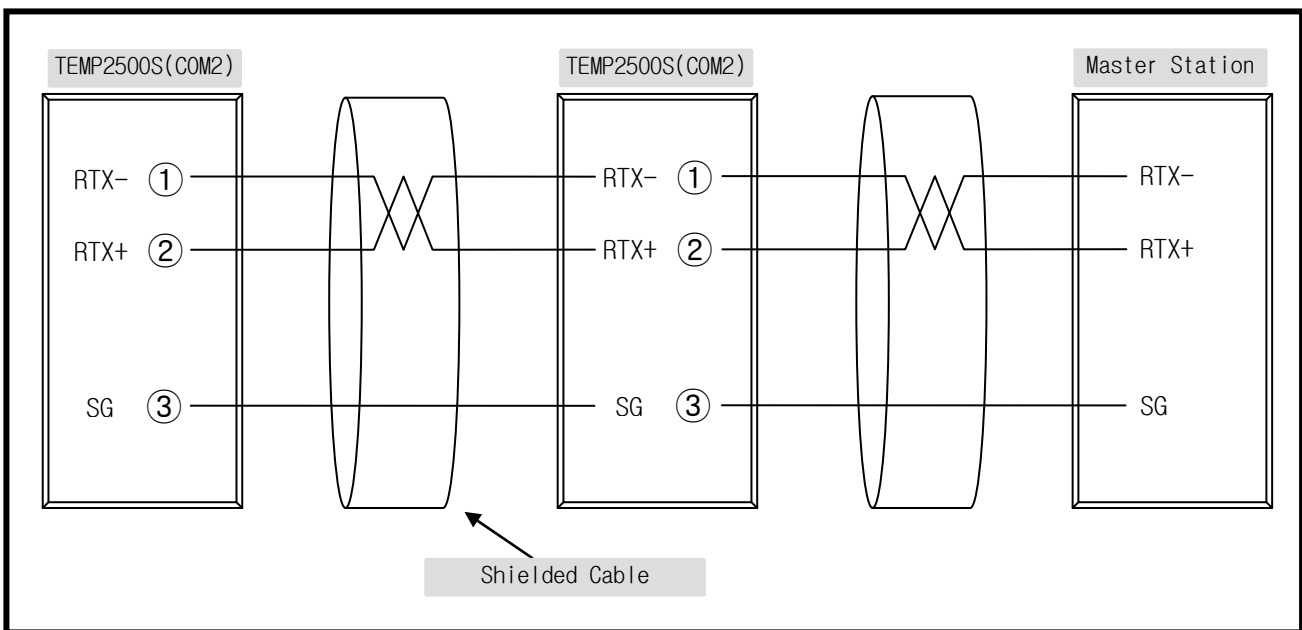
Description of Modular Connector Pin-Mapping for COM2 port

| PIN no. | RS232C | | RS485 | |
|---------|---------------|--------|-------------------------|--------|
| | Signal | Symbol | Signal | Symbol |
| 1 | Transmit Data | TxD | Receive/Transmit Data - | RTX- |
| 2 | Receive Data | RxD | Receive/Transmit Data + | RTX+ |
| 3 | Signal Ground | SG | Signal Ground | SG |
| 4 | - | - | - | - |
| 5 | - | - | - | - |
| 6 | - | - | - | - |

6 Pin connector wiring for RS232C interface



6 Pin connector wiring for RS485 interface



☞ Up to 31 slave TEMP2500S controllers can be connected to a master device by multi-drop networking.

☞ Make sure to install 200Ω (1/4W) resistor on Last Leg at both end of terminal Slave and Master(PC, PLC).

5. Communication Command

5.1 The Frame Structure of standard protocol

The frame structure of protocol transmitting upper-level network system to TEMP2500S

| ① | ② | ③ | ④ | ⑤ | ⑥ | ⑦ | ⑧ |
|-----|---------|---------|---|-------------------------|-----|----|----|
| STX | Address | Command | , | Data by rule of command | SUM | CR | LF |

① Protocol Header

Display a beginning of communication command with STX (Start of Text), ASCII string with 0x02.

② TEMP2500S Address

Unit address of TEMP2500S.

③ Command

Function Command for communication. (Refer to 5.2 ~ 5.10).

④ Delimiter

Symbolize to separate Command and Data by Comma. (',')

⑤ Data

Formal text strings regulated by communication command rule.

⑥ Sum

Add the ASCII code of characters from the character next to STX one by one up to the character prior to SUM
Represent the lowest one byte of the sum as a hexadecimal notation (2 characters).

⑦, ⑧ Protocol Tail

ASCII code to close communication command by indicating CR(0x0D) and LF(0x0A).

■ Example for SUM

◆ Example

To read the consecutively D-Register from EX_TEMP.NPV (D0001) to HI_TEMP.NSP (D0005)

- Transmit : [stx]01RSD,05,0001[cr][lf]
- Transmit (CheckSum Include) : [stx]01RSD,05,0001**C8**[cr][lf]

☞ As shown below, hexa decimal value adding each text at 01RSD,05,0001 by ASCII code is 2C8, and lower digit 2 characters **C8** will be used for CheckSum.

| | | | | | | | | | | | | | |
|-------------|----|----|----|----|----|----|----|----|----|----|----|----|----|
| Text | 0 | 1 | R | S | D | , | 0 | 5 | , | 0 | 0 | 0 | 1 |
| Ascii value | 30 | 31 | 52 | 53 | 44 | 2C | 30 | 35 | 2C | 30 | 30 | 30 | 31 |



■ ASCII Table

| High \ Low | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
|------------|-----|-----|-------|---|---|---|---|-----|
| 0 | NUL | DLE | SPACE | 0 | @ | P | ` | p |
| 1 | SOH | DC1 | ! | 1 | A | Q | a | q |
| 2 | STX | DC2 | " | 2 | B | R | b | r |
| 3 | ETX | DC3 | # | 3 | C | S | c | s |
| 4 | EOT | DC4 | \$ | 4 | D | T | d | t |
| 5 | ENQ | NAK | % | 5 | E | U | e | u |
| 6 | ACK | SYN | & | 6 | F | V | f | v |
| 7 | BEL | ETB | ' | 7 | G | W | g | w |
| 8 | BS | CAN | (| 8 | H | X | h | x |
| 9 | HT | EM |) | 9 | I | Y | i | y |
| A | LF | SUB | * | : | J | Z | j | z |
| B | VT | ESC | + | ; | K | [| k | { |
| C | FF | FS | , | < | L | ¥ | l | |
| D | CR | GS | - | = | M |] | m | } |
| E | SO | RS | . | > | N | ^ | n | ~ |
| F | SI | US | / | ? | O | _ | o | DEL |

5.2 Type of Communication Command

Two types of commands are provided on TEMP2500S . One is general READ/WRITE command to read and write information on D-Register, and the other is Reference command to read self-information of TEMP2500S .

■ Reference Command

| Command | Description |
|---------|-------------------------------------------------------|
| AMI | Displays model name and Version-Revision of TEMP2500S |

■ Read/Write Command

| Command | Description |
|---------|-----------------------------------------------------------------------------|
| RSD | Read data in consecutive D-Register in sequence (Read) |
| RRD | Read data in arbitrary single D-Register (Read) |
| WSD | Write data in consecutive D-Register in sequence (Write) |
| WRD | Write data in arbitrary single D-Register (Write) |
| STD | Register arbitrary single address to monitor (D-Register Monitoring Set) |
| CLD | Read data in address registered by STD command (D-Register Monitoring Call) |

☞ Each Command can read or write up to 64 D-Register and all of the STD/CLD data will be reset by power OFF, so the data should be registered again.

5.3 ERROR Response

When an Error occurs during communication, TEMP2500S transmits a frame as following.

| bytes | 1 | 2 | 2 | 2 | 2 | 1 | 1 |
|-------|-----|---------|----|------------|-----|----|----|
| Frame | STX | Address | NG | Error Code | SUM | CR | LF |

■ Description of Error Code

| Error Code | Description | Remarks |
|------------|----------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------|
| 01 | Invalid Command setting | |
| 02 | Invalid D-Register setting | |
| 04 | Data Setting Error | Invalid text data input (Available 0~9, A~F : hexadecimals) |
| 08 | Invalid Format c | <ul style="list-style-type: none"> ▪ Different designated and command format ▪ Differnet set number and designated number |
| 11 | Checksum Error | |
| 12 | Monitoring Command Error | No designated Monitoring Command |
| 00 | Other Errors | |

5.4 RSD Command

RSD Command is used to read data in a part of D-Register by consecutive address in sequence.

▣ TRANSMIT Message Frame

| bytes | 1 | 2 | 3 | 1 | 2 | 1 | 4 | 2 | 1 | 1 |
|-------|-----|---------|-----|---|--------------|---|--------|-----|----|----|
| Frame | STX | Address | RSD | , | Count Number | , | D-Reg. | SUM | CR | LF |

▣ Response Message Frame

| bytes | 1 | 2 | 3 | 1 | 2 | 1 | 4 | 1 | ... |
|-------|-----|---------|-----|---|----|---|----------|---|-----|
| Frame | STX | Address | RSD | , | OK | , | Data - 1 | , | ... |

| 1 | 4 | 2 | 1 | 1 |
|---|----------|-----|----|----|
| , | Data - n | SUM | CR | LF |

- Count Number : 1 ~ 64
- Data : 16 Hexa-decimal without decimal point

◆ Example

To read the D-Register FROM EX_TEMP.NPV (D0001) TO LO_TEMP.NPV (D0003)

- Transmit : [stx]01RSD,03,0001[cr][lf]
- Transmit (Checksum Include) : [stx]01RSD,03,0001C6[cr][lf]
([stx] = 0x02, [cr] = 0x0d, [lf] = 0x0a)

Response EX_TEMP (D0001) is 30.0 and HI_TEMP.NPV(D0002) is 50.0 and LO_TEMP.NPV(D0003) is 10.0

- Receive : [stx]01RSD,OK,012C,01F4,03EF[cr][lf]
- Receive (Checksum Include) : [stx]01RSD,OK,012C,01F4,03EF32[cr][lf]

※ Converting procedure that received 16 hexadecimal to display by PV value on screen

- ① Radix conversion (Decimalize) : 01F4(hexadecimal) → 500(decimal)
- ② Multiply point one on converted value : 500 * 0.1 → 50.0

5.5 RRD Command

RRD Command is used to read data in arbitrary single D-Register.

▣ TRANSMIT Message Frame

| bytes | 1 | 2 | 3 | 1 | 2 | 1 | 4 | 1 | ... |
|-------|-----|---------|-----|---|--------------|---|-----------|---|-----|
| Frame | STX | Address | RRD | , | Count Number | , | D-Reg.- 1 | , | ... |

| 1 | 4 | 2 | 1 | 1 |
|---|-----------|-----|----|----|
| , | D-Reg.- n | SUM | CR | LF |

▣ Receive Message Frame

| bytes | 1 | 2 | 3 | 1 | 2 | 1 | 4 | 1 | ... |
|-------|-----|---------|-----|---|----|---|----------|---|-----|
| Frame | STX | Address | RRD | , | OK | , | Data - 1 | , | ... |

| 1 | 4 | 2 | 1 | 1 |
|---|----------|-----|----|----|
| , | Data - n | SUM | CR | LF |

- Count Number : 1 ~ 64
- Data : 16 Hexa-decimal without decimal point

◆ Example

To read the D-Register of EX_TEMP.NPV (D0001), LO_TEMP.NPV (D0003)

- Transmit : [stx]01RRD,02,0001,0003[cr][lf]
- Transmit (CheckSum Include) : [stx]01RRD,02,0001,0003B3[cr][lf]

Receive EX_TEMP.NPV(D0001) is 50.0 and LO_TEMP.NPV (D0003) 30.0

- Receive : [stx]01RRD,OK,01F4,012C[cr][lf]
- Receive (INCLUDE CheckSum) : [stx]01RRD,OK,01F4,012C18[cr][lf]

5.6 WSD Command

WSD command is used to write data to a part of D-Register by consecutive address in sequence.

▣ TRANSMIT Message Frame

| bytes | 1 | 2 | 3 | 1 | 2 | 1 | 4 | 1 | 4 |
|-------|-----|---------|-----|---|--------------|---|--------|---|----------|
| Frame | STX | Address | WSD | , | Count Number | , | D-Reg. | , | Data - 1 |

| 1 | ... | 1 | 4 | 2 | 1 | 1 |
|---|-----|---|----------|-----|----|----|
| , | ... | , | Data - n | SUM | CR | LF |

▣ Receive Message Frame

| bytes | 1 | 2 | 3 | 1 | 2 | 2 | 1 | 1 |
|-------|-----|---------|-----|---|----|-----|----|----|
| Frame | STX | Address | WSD | , | OK | SUM | CR | LF |

- Count Number : 1 ~ 64
- Data : 16 Hexa-decimal without decimal point

◆ Example

To write data into R.HOUR(D0317)and R.MIN(D0318) on FIX mode operation

- Setting R.HOUR: 10Hour → 16 Hexadecimalize (0x000A)
- Setting R.MIN: 50Min → 16 Hexadecimalize (0x0032)
- TRANSMIT : [stx]01WSD,02,0317,000A,0032[cr][lf]
- TRANSMIT(INCLUDE CheckSum) : [stx]01WSD,02,0132,000A,003269[cr][lf]

5.7 WRD Command

WRD Command is used to write data in arbitrary single D-Register.

■ TRANSMIT Message Frame

| bytes | 1 | 2 | 3 | 1 | 2 | 1 | 4 | 1 | 4 |
|-------|-----|---------|-----|---|--------------|---|-----------|---|----------|
| Frame | STX | Address | WRD | , | Count Number | , | D-Reg.- 1 | , | Data - 1 |

| 1 | ... | 1 | 4 | 1 | 4 | 2 | 1 | 1 |
|---|-----|---|------------|---|----------|-----|----|----|
| , | ... | , | D-Reg. - n | , | Data - n | SUM | CR | LF |

■ Receive Message Frame

| bytes | 1 | 2 | 3 | 1 | 2 | 2 | 1 | 1 |
|-------|-----|---------|-----|---|----|-----|----|----|
| Frame | STX | Address | WRD | , | OK | SUM | CR | LF |

- Count Number : 1 ~ 64
- Data : 16 Hexa-decimal without decimal point

◆ Example

To write data into the HT.LIMIT_H(D1240) and the HT.LIMIT_L(D1241) on FIX mode operation.

- Setting HT.LIMIT_H: 50.0 °C → Remove decimal point (500) → Hexadecimalize (0x01F4)
- Setting HT.LIMIT_L: 0.5 °C → Remove decimal point (5) → Hexadecimalize (0x0005)
- TRANSMIT : [stx]01WRD,02,1240,01F4,1241,0005[cr][lf]
- TRANSMIT (INCLUDE CheckSum) : [stx]01WRD,02,1240,01F4,1241,000588[cr][lf]

5.8 STD Command

STD Command is used to list the D-Registers that is necessary to monitor frequently.

▣ TRANSMIT Message Frame

| bytes | 1 | 2 | 3 | 1 | 2 | 1 | 4 | 1 | 4 |
|-------|-----|---------|-----|---|--------------|---|------------|---|------------|
| Frame | STX | Address | STD | , | Count Number | , | D-Reg. - 1 | , | D-Reg. - 2 |

| 1 | ... | 1 | 4 | 1 | 4 | 2 | 1 | 1 |
|---|-----|---|----------------|---|------------|-----|----|----|
| , | ... | , | D-Reg. - (n-1) | , | D-Reg. - n | SUM | CR | LF |

▣ Receive Message Frame

| bytes | 1 | 2 | 3 | 1 | 2 | 2 | 1 | 1 |
|-------|-----|---------|-----|---|----|-----|----|----|
| Frame | STX | Address | STD | , | OK | SUM | CR | LF |

- Count Number : 1 ~ 64

◆ Example

To register D0001 (EX_TEMP.NPV), D0002 (HI_TEMP.NPV) and D0003 (LO_TEMP.NPV)

- TRANSMIT : [stx]01STD,03,0001,0002,0003[cr][lf]
- TRANSMIT (INCLUDE CheckSum) : [stx]01STD,03,0001,0002,0003A5[cr][lf]

5.9 CLD Command

CLD Command is used to read data in the address which had been registered by STD command.

▣ TRANSMIT Message Frame

| bytes | 1 | 2 | 3 | 2 | 1 | 1 |
|-------|-----|---------|-----|-----|----|----|
| Frame | STX | Address | CLD | SUM | CR | LF |

▣ Receive Message Frame

| byte 수 | 1 | 2 | 3 | 1 | 2 | 1 | 4 | 1 | 4 |
|--------|-----|---------|-----|---|----|---|----------|---|----------|
| Frame | STX | Address | CLD | , | OK | , | Data - 1 | , | Data - 2 |

| 1 | ... | 1 | 4 | 1 | 4 | 2 | 1 | 1 |
|---|-----|---|--------------|---|----------|-----|----|----|
| , | ... | , | Data - (n-1) | , | Data - n | SUM | CR | LF |

- Count Number : 16 hex character without Demical point

◆ Example

- TRANSMIT : [stx]01CLD[cr][lf]
- TRANSMIT (INCLUDE CheckSum) : [stx]01CLD34[cr][lf]

5.10 AMI Command

AMI Command is used to get the controller own-information.

▣ TRANSMIT Message Frame

| bytes | 1 | 2 | 3 | 2 | 1 | 1 |
|-------|-----|---------|-----|-----|----|----|
| Frame | STX | Address | AMI | SUM | CR | LF |

▣ Receive Message Frame

| bytes | 1 | 2 | 3 | 1 | 2 | 1 |
|-------|-----|---------|-----|---|----|---|
| Frame | STX | Address | AMI | , | OK | , |

| 9 | 2 | 7 | 2 | 1 | 1 |
|------------|-------|------------------|-----|----|----|
| Model Name | SPACE | Version-Revision | SUM | CR | LF |

◆ Example

To confirm controller own information

- TRANSMIT : [STX]01AMI[CR][LF]
- TRANSMIT (INCLUDE CheckSum) : [STX]01AMI38[CR][LF]
- Receive : STX]01AMI,OK,TEMP-2000S[sp][sp]V00-R00[cr][lf]
- Receive (INCLUDE CheckSum) : [stx]01AMI,OK,TEMP-2000S[sp][sp]V00-R000A[cr][lf]

6. MODBUS Protocol

6.1 The Frame Structure of MODBUS protocol

▣ Data Format

| Item | ASCII | RTU |
|--------------------|----------------------------------------|-------------------------------------|
| Protocol Header | :(Colon) | - |
| Protocol Tail | [CR][LF] | - |
| Data length | 7-bit(Fixed) | 8-bit(Fixed) |
| Data type | ASCII | Binary |
| Error detecting | LRC (Longitudinal Redundancy Check) | CRC-16 (Cyclic Redundancy Check) |
| Data time interval | Under 1sec. | Under 24-bit time |

▣ The Frame Structure of MODBUS protocol

▶ Modbus ASCII

| Protocol Header | Address | Function Code | Data | LRC Check | Protocol Tail |
|-----------------|-------------|---------------|-------------|-------------|------------------------|
| 1 character | 2 character | 2 character | N character | 2 character | 2 character (CR+LF) |

▶ Modbus RTU

| Protocol Header | Address | Function Code | Data | LRC Check | Protocol Tail |
|-----------------|---------|---------------|-----------|-----------|---------------|
| N/A | 8-Bit | 8-Bit | N * 8-Bit | 16-Bit | - |

- N : Number of Hexadecimal data

6.2 Function Code

TEMP2500S MODBUS protocol provides two function code subsets for READ/WRITE of D-Register and Loop-Back detecting test.

| Function Code | Description |
|---------------|--------------------------------------------------|
| 03 | Read data in consecutive D-Register in sequence |
| 06 | Write data to arbitrary single D-Register |
| 08 | Diagnostics(Loop-Back Test) |
| 16 | Write data to consecutive D-Register in sequence |



When using MODBUS, D-Register has to be subtracted '1' from the D-Register table we offer this manual, because it starts '0' D-Register address on MODBUS protocol.

6.3 Function code - 03

Function code-03 is used to read the data of consecutive D-Register block in sequence up to 64 registers.

■ TRANSMIT Message Frame

| Factor | ASCII | RTU |
|------------------|----------------------|--------|
| Protocol Header | :(Colon) | - |
| Address | 2 characters | 8-Bit |
| Function code-03 | 2 characters | 8-Bit |
| D-Register Hi | 2 characters | 8-Bit |
| D-Register Lo | 2 characters | 8-Bit |
| Address Count Hi | 2 characters | 8-Bit |
| Address Count Lo | 2 characters | 8-Bit |
| Error detecting | 2 characters | 16-Bit |
| Protocol Tail | 2 characters (CR+LF) | - |

◆ Exmaple

TRANSMIT message to read the D-Register **FROM** D0001 (EX_TEMP.NPV) **TO** D0003 (LO_TEMP.NPV) should be

- MODBUS ASCII : 010300000003F9[cr][lf]
- MODBUS RTU 01030000000305CB

☞ D-Register has to be subtracted '1' from the designated address number on D-Register table in this manual.

■ Receive Message Frame

| Factor | ASCII | RTU |
|------------------|----------------------|--------|
| Protocol Header | :(Colon) | - |
| Address | 2 characters | 8-Bit |
| Function code-03 | 2 characters | 8-Bit |
| Data byte count | 2 characters | 8-Bit |
| Data - 1 Hi | 2 characters | 8-Bit |
| Data - 1 Lo | 2 characters | 8-Bit |
| ... | ... | ... |
| Data - n Hi | 2 characters | 8-Bit |
| Data - n Lo | 2 characters | 8-Bit |
| Error detecting | 2 characters | 16-Bit |
| Protocol Tail | 2 characters (CR+LF) | - |

◆ Exmaple

When receive MCH.NPV (D0001) is 49.3 and MCH.MVOUT (D0003) is 10.8,

- MODBUS ASCII : 01030601ED0000006C9C[cr][lf]
- MODBUS RTU 01030601ED0000006C8C9E

6.4 Function code – 06

Function code-06 is used to write data in arbitrary single D-Register.

■ TRANSMIT Message Frame

| Factor | ASCII | RTU |
|------------------|----------------------|--------|
| Protocol Header | :(Colon) | - |
| Address | 2 characters | 8-Bit |
| Function code-06 | 2 characters | 8-Bit |
| D-Register Hi | 2 characters | 8-Bit |
| D-Register Lo | 2 characters | 8-Bit |
| Write Data Hi | 2 characters | 8-Bit |
| Write Data Lo | 2 characters | 8-Bit |
| Error detecting | 2 characters | 16-Bit |
| Protocol Tail | 2 characters (CR+LF) | - |

◆ Exmaple

TRANSMIT message to write '2' to D0100 (pattern number) should be

- MODBUS ASCII : 01060063000294[cr][lf]
- MODBUS RTU 010600630002F815

☞ D-Register has to be subtracted '1' from the designated address number on D-Register table in this manual.

■ Receive Message Frame

| Factor | ASCII | RTU |
|------------------|----------------------|--------|
| Protocol Header | :(Colon) | - |
| Address | 2 characters | 8-Bit |
| Function code-06 | 2 characters | 8-Bit |
| D-Register Hi | 2 characters | 8-Bit |
| D-Register Lo | 2 characters | 8-Bit |
| Write Data Hi | 2 characters | 8-Bit |
| Write Data Lo | 2 characters | 8-Bit |
| Error detecting | 2 characters | 16-Bit |
| Protocol Tail | 2 characters (CR+LF) | - |

◆ Exmaple

INCLUDE out any trouble, Receive message will be.

- MODBUS ASCII : 01060063000294[cr][lf]
- MODBUS RTU 010600630002F815

6.5 Function code - 08

Function code-08 is used to test loopback for self-diagnosis.

■ TRANSMIT Message Frame

| Factor | ASCII | RTU |
|-------------------|----------------------|--------|
| Protocol Header | :(Colon) | - |
| Slave Address | 2 characters | 8-Bit |
| Function code-08 | 2 characters | 8-Bit |
| Diagnosis code Hi | 2 characters | 8-Bit |
| Diagnosis code Lo | 2 characters | 8-Bit |
| Data Hi | 2 characters | 8-Bit |
| Data Lo | 2 characters | 8-Bit |
| Error detecting | 2 characters | 16-Bit |
| Protocol Tail | 2 characters (CR+LF) | - |

◆ Exmample

TRANSMIT message to test loopback for self-diagnosis should be

- MODBUS ASCII : 010800000002F5[cr][lf]
- MODBUS RTU 01080000000261CA

■ Receive Message Frame

| Factor | ASCII | RTU |
|-------------------|----------------------|--------|
| Protocol Header | :(Colon) | - |
| Address | 2 characters | 8-Bit |
| Function code-08 | 2 characters | 8-Bit |
| Diagnosis code Hi | 2 characters | 8-Bit |
| Diagnosis code Lo | 2 characters | 8-Bit |
| Data Hi | 2 characters | 8-Bit |
| Data Lo | 2 characters | 8-Bit |
| Error detecting | 2 characters | 16-Bit |
| Protocol Tail | 2 characters (CR+LF) | - |

◆ Exmample

INCLUDE out any trouble, Receive message will be.

- MODBUS ASCII : 010800000002F5[cr][lf]
- MODBUS RTU 01080000000261CA

6.6 Function code – 16

Function code-16 is used to write the data into consecutive D-Register block in sequence up to 64 registers.

■ TRANSMIT Message Frame

| Factor | ASCII | RTU |
|------------------|----------------------|--------|
| Protocol Header | :(Colon) | - |
| address | 2 characters | 8-Bit |
| Function code-16 | 2 characters | 8-Bit |
| D-Register Hi | 2 characters | 8-Bit |
| D-Register Lo | 2 characters | 8-Bit |
| Address Count Hi | 2 characters | 8-Bit |
| Address Count Lo | 2 characters | 8-Bit |
| Data byte Count | 2 characters | 8-Bit |
| Data – 1 Hi | 2 characters | 8-Bit |
| Data – 1 Lo | 2 characters | 8-Bit |
| ... | ... | ... |
| Data – n Hi | 2 characters | 8-Bit |
| Data – n Lo | 2 characters | 8-Bit |
| Error detecting | 2 characters | - |
| Protocol Tail | 2 characters (CR+LF) | 16-Bit |

◆ Example

to write '99' to the MCH.TIME_HOUR (D0132) and '50' to the MCH.TIME_MIN (D0133) on FIX mode operation should be set below

- MODBUS ASCII : 0110008300020400630032D1[cr][lf]
- MODBUS RTU 0110008300020400630032CA11

■ Receive Message Frame

| Factor | ASCII | RTU |
|------------------|----------------------|--------|
| Protocol Header | :(Colon) | - |
| Slave address | 2 characters | 8-Bit |
| Function code-16 | 2 characters | 8-Bit |
| D-Register Hi | 2 characters | 8-Bit |
| D-Register Lo | 2 characters | 8-Bit |
| Address Count Hi | 2 characters | 8-Bit |
| Address Count Lo | 2 characters | 8-Bit |
| Error detecting | 2 characters | 16-Bit |
| Protocol Tail | 2 characters (CR+LF) | - |

◆ Example

INCLUDE out any trouble, Receive message will be.

- MODBUS ASCII : 0110008300026A[cr][lf]
- MODBUS RTU 011000830002B020

7. D-REGISTER Description

D-Register is group of communication data to monitor and control all status of TEMP2000M.

D-Register is grouped by consecutive 100 addresses based on its concerned function as shown below.

| D-Register address | Group Name | Description | Read | Write |
|--------------------|---------------|----------------------------------------|------|-------|
| D0001~D0099 | PROCESS | General operation process information | ○ | ◆ |
| D0100~D0199 | FUNCTION | Operating information setting | ○ | △ |
| D0200~D0299 | GRAPH | Trends | ○ | ○ |
| D0300~D0399 | RESERVE | Time & Reserve operation setting | ○ | △ |
| D0400~D0499 | EQUIPMENT | Equipment circumstances setting | ○ | ○ |
| D0500~D0599 | INNER SIGNAL | INNER signal setting | ○ | ○ |
| D0600~D0699 | ALARM SIGNAL | ALARM signal setting | ○ | ○ |
| D0800~D0899 | TIME SIGNAL | TIME signal setting | ○ | ○ |
| D0900~D0999 | COMMUNICATION | Communication concerned information | ○ | △ |
| D1000~D1099 | PID | P.I.D setting-1 | ○ | ○ |
| D1200~D1299 | INPUT | Sensor Input setting | ○ | ○ |
| D1400~D1499 | OUTPUT | Control& retransmission Output setting | ○ | ○ |
| D1500~D1599 | DO CONFIG 1 | DO(Digital Output) Relay setting-1 | ○ | ○ |
| D1600~D1699 | DO CONFIG 2 | DO(Digital Output) Relay setting-2 | ○ | ○ |
| D1700~D1799 | DI CONFIG 1 | DI(Digital Input) setting | ○ | ○ |
| D1800~D1899 | DI CONFIG 2 | DI Error NAME input-1 | ○ | ○ |
| D1900~D1999 | DI CONFIG 3 | DI Error NAME input-2 | ○ | ○ |
| D2000~D2099 | INITIAL 1 | Initial system setting-1 | ○ | ○ |
| D2100~D2199 | INITIAL 2 | Initial system setting-2 | ○ | ○ |
| D2200~D2299 | PROGRAM | Program pattern profile setting | ○ | ○ |

☞ D-Register is composed of hexadecimal 4 digit (2-Byte).

- ○ : Available to read / write over all designated address range.
- △ : Available to read / write in part of designated address range.
- ◆ : Not available to read / write over all designated address range.

7.1 PROCESS

PROCESS group consists of fundamental parameter information concerned INCLUDE operation process and status. Below table describes the detail Bit Map information of some parameter that indicates its status by Bit.

■ Bit Map information of TEMP2500M

| BIT | NOWSTS | ISSTS | TSSTS | ALMSTS | DIDATA | DOSTS1 | DOSTS2 |
|-----|---------|-------|-------|--------|--------|--------|--------|
| | D0018 | D0019 | D0020 | D0021 | D0022 | D0023 | D0024 |
| 0 | RESET | IS1 | TS1 | ALM1 | D01 | D11 | D117 |
| 1 | RUN | IS2 | TS2 | ALM2 | D02 | D12 | D118 |
| 2 | HOLD | IS3 | TS3 | ALM3 | D03 | D13 | D119 |
| 3 | WAIT | IS4 | TS4 | ALM4 | D04 | D14 | D120 |
| 4 | AT | IS5 | | | D05 | D15 | D121 |
| 5 | | IS6 | | | D06 | D16 | D122 |
| 6 | DEFROST | IS7 | | | D07 | D17 | D123 |
| 7 | | IS8 | | | D08 | D18 | D124 |
| 8 | HT.RUN | | | | D09 | D19 | D125 |
| 9 | NT.RUN | | | | D010 | D110 | D126 |
| 10 | LT.RUN | | | | D011 | D111 | D127 |
| 11 | HT.DFR | | | | D012 | D112 | D128 |
| 12 | NT.DFR | | | | D013 | D113 | D129 |
| 13 | MAN.DFR | | | | D014 | D114 | D130 |
| 14 | LT.DFR | | | | D015 | D115 | D131 |
| 15 | | | | | D016 | D116 | D132 |

| BIT | NOW_OSTS | NOW_CSTS | SYSSTS | ADERRSTS_L | ADERRSTS_H | | |
|-----|----------|----------|-------------|------------|------------|--|--|
| | D0025 | D0026 | D0027 | D0028 | D0029 | | |
| 0 | H.ZONE | DEFROST | DISP.COMERR | HT_+OVER | EXT_+OVER | | |
| 1 | R.ZONE | RUN | IO.COMERR | HT_-OVER | EXT_-OVER | | |
| 2 | LZONE | END | SD.INSERT | HT_S.OPN | EXT_S.OPN | | |
| 3 | HZD.ON | H.WAIT | | | | | |
| 4 | HZD.OFF | L.WAIT | | | | | |
| 5 | RZD.ON | | | | | | |
| 6 | RZD.OFF | | | | | | |
| 7 | LZD.ON | | | | | | |
| 8 | LZD.OFF | | | LT_+OVER | | | |
| 9 | SOL | | | LT_-OVER | | | |
| 10 | 1.REF | | | LT_S.OPN | | | |
| 11 | 2.REF | | | | | | |
| 12 | H.FAN | | | | | | |
| 13 | R.FAN | | | | | | |
| 14 | L.FAN | | | | | | |
| 15 | N2GAS | | | | | | |

■ Bit Map status information D-Register

| D-Reg. | Symbol | Descriptions |
|--------|----------------|---------------------------------------------------------------------|
| D0018 | NOWSTS | Current operation status information.. |
| D0019 | IS.STATUS | INNER signal generating status information. |
| D0020 | TS.STATUS | TIME signal generating status information. |
| D0021 | AL.STATUS | ALARM signal generating status information. |
| D0022 | DI.DATA | DI Error outbreak status information. |
| D0023 | DOSTS1 | Display the output information of operation through I/O relay board |
| D0024 | DOSTS2 | |
| D0025 | NOW_OSTS | Other information related run |
| D0026 | NOW_CSTS | Basic information related run |
| D0027 | SYSSTS | System status information |
| D0028 | ADERR.STATUS_L | Error status out of control range. (hot house, cold chamber) |
| D0029 | ADERR.STATUS_H | Error status out of control range. (laboratory) |

■ Common process information D-Register

| D-Reg. | Symbol | Descriptions |
|--------|---------------|------------------------------------------|
| D0001 | EX_TEMP.NPV | Laboratory measured value |
| D0002 | HI_TEMP.NPV | Hot temperature room measured value |
| D0003 | LO_TEMP.NPV | Cold temperature room measured value |
| D0004 | EX_TEMP.NSP | Laboratory set point |
| D0005 | HI_TEMP.NSP | Hot temperature roomset point |
| D0006 | LO_TEMP.NSP | Cold temperature room set point |
| D0007 | EX_TEMP.MV | Laboratory control output |
| D0008 | HI_TEMP.MV | Hot temperature room control output |
| D0009 | LO_TEMP.MV | Cold temperature room control output |
| D0012 | HI_TEMP.PIDNO | PID number of hot house |
| D0013 | LO_TEMP.PIDNO | PID number of Cold temperature room |
| D0014 | HI_TEMP.WAIT | Hot temperature roomwait status output |
| D0015 | LO_TEMP.WAIT | Cold temperature room wait status output |
| D0032 | EX_TEMP.TSP | Laboratory SP |
| D0033 | HI_TEMP.TSP | Hot temperature roomSP |
| D0034 | LO_TEMP.TSP | Cold temperature room SP |
| D0035 | HI_TEMP.PSP | Hot temperature roomwarm up set point |
| D0036 | LO_TEMP.PSP | Cold temperature room warm up set point |

■ PROGRAM operation process information D-Register

| D-Reg. | Symbol | Descriptions |
|--------|-----------------|------------------------------------------|
| D0045 | RUNTIME_H | Currently running time (Hour) |
| D0046 | RUNTIME_M | Currently running time (Minute) |
| D0047 | RUNTIME_S | Currently running time (Second) |
| D0048 | RUN.PTNO | Cuttent running program pattern number |
| D0049 | RUN.SEGNO | Cuttent running program segment number |
| D0050 | NOW.PT_RPT | Total pattern count of Repeat op. |
| D0051 | TOTAL.PT_RPT | Total set up pattern count of Repeat op. |
| D0052 | NOWRUN.ZONETM_L | Current prograss time (Hour) |
| D0053 | NOWRUN.ZONETM_H | Current prograss time (Minute, Second) |
| D0054 | NOWSET.ZONETM_L | Current set up time (Hour) |
| D0055 | NOWSET.ZONETM_H | Current set up time Minute, Second) |
| D0056 | DFR.RUNTIME | Current defrosting run time |
| D0057 | DFR.SETTIME | Setted defrosting run time |

7.2 FUNCTION

FUNCTION group consists of D-register related INCLUDE operational function and process.

Common Operational Function setting D-Register

| D-Reg. | Symbol | Descriptions |
|--------|-------------|---------------------------------------------------------------|
| D0124 | FUZZY | Set FUZZY function (0:OFF, 1:ON) |
| D0134 | LIGHT.OFFTM | Set Display Elect. conservation mode (1: Elect. conservation) |
| D0135 | KEYLOCK | KEYLOCK Function (0:OFF, 1:ON) |
| D0136 | AUTO TUNING | Set AUTO-TUNNING function (0:OFF, 1:ON) |
| D0143 | USERKEY | User Key use (0: UNUSE, 1: USE) |
| D0144 | BUZ.ONOFF | Buzzer sound (0: UNUSE, 1: USE) |

PROGRAM Operation & Function setting D-Register

| D-Reg. | Symbol | Descriptions |
|--------|-------------|-----------------------------------------------------------------------|
| D0100 | SET_PTNO | Pattern Number to run program operation |
| D0190 | HWAIT.MODE | [Hot temperature room] Set wait mode function (0:UNUSE, 1:USE) |
| D0191 | HWAIT.BAND | [Hot temperature room] Set wait method (0:set point, 1:within scope) |
| D0192 | HWAIT.PONIT | [Hot temperature room] Set wait deviation |
| D0193 | LWAIT.MODE | [Cold temperature room] Set wait mode function (0:UNUSE, 1:USE) |
| D0194 | LWAIT.BAND | [Cold temperature room] Set wait method (0:set point, 1:within scope) |
| D0195 | LWAIT.POINT | [Cold temperature room] Set wait deviation |

Equipment movement setting D-Register

| D-Reg. | Symbol | Content of run | Set point | Descriptions |
|--------|------------|----------------|-----------|-----------------------------------------|
| D0101 | COM.OPMODE | RUN | 1 | RUN |
| | | HOLD | 2 | HOLD Use/Unuse |
| | | STEP | 3 | Segment step |
| | | STOP | 4 | stop |
| D0116 | POWER.MODE | STOP | 0 | When recover from blackout stop |
| | | COLD | 1 | When recover from blackout restart |
| | | HOT | 2 | When recover from blackout continuation |

7.3 GRAPH

GRAPH Group contented TEMP2500S' s D-Register: Graph save terms, save funcions, selection save device and Graph pen set

■ GRAPH D-Register

| D-Reg. | Symbol | Descriptions |
|--------|---------------|---------------------------------------------------------|
| D0200 | RECORD_PLACE | Save device select. (0:Inner memory, 1:SD card, 2:Both) |
| D0201 | RECORD_MODE | Save mode select. (0:Automatic, 1:Manual) |
| D0202 | SAMPLING_TIME | Graph save terms set |
| D0203 | PEN.TYPE | Pen1 type select. |

7.4 RESERVATION

TEMP2500S hours of group identification, and book set, PROGRAM driver's start time and end time of operation consists of related D-Register.

■ TIME setting and information D-Register

| D-Reg. | Symbol | Description | Read | Write |
|--------|-----------|--------------------------------------|------|-------|
| D0301 | NOW.YEAR | Current YEAR installed in TEMP2500S | ○ | × |
| D0302 | NOW.MONTH | Current MONTH installed in TEMP2500S | ○ | × |
| D0303 | NOW.DAY | Current DAY installed in TEMP2500S | ○ | × |
| D0304 | NOW.AMPM | Current AM/PM installed in TEMP2500S | ○ | × |
| D0305 | NOW.HOUR | Current HOUR installed in TEMP2500S | ○ | × |
| D0306 | NOW.MIN | Current MN. installed in TEMP2500S | ○ | × |
| D0307 | C.YEAR | Current YEAR setting in TEMP2500S | × | ○ |
| D0308 | C.MONTH | Current MONTH setting in TEMP2500S | × | ○ |
| D0309 | C.DAY | Current DAY setting in TEMP2500S | × | ○ |
| D0310 | C.AMPM | Current AM/PM setting in TEMP2500S | × | ○ |
| D0311 | C.HOUR | Current HOUR setting in TEMP2500S | × | ○ |
| D0312 | C.MIN | Current MN. setting in TEMP2500S | × | ○ |
| D0313 | R.YEAR | YEAR setting for RESERVE Operation | ○ | ○ |
| D0314 | R.MONTH | MONTH setting for RESERVE Operation | ○ | ○ |
| D0315 | R.DAY | DAY setting for RESERVE Operation | ○ | ○ |
| D0316 | R.AMPM | AM/PM setting for RESERVE Operation | ○ | ○ |
| D0317 | R.HOUR | HOUR setting for RESERVE Operation | ○ | ○ |
| D0318 | R.MIN | MIN. setting for RESERVE Operation | ○ | ○ |

■ RESERVE Operation ON/OFF

| D-Reg. | Symbol | Operation | Setting | Description |
|--------|---------|-----------|---------|------------------------|
| D0300 | RESERVE | OFF | 0 | Release RESERVE Oper . |
| | | ON | 1 | Set RESERVE Oper . |

7.5 EQUIPMENT

This setting parameter D-register group is related equipment

■ Related equipment D-Register

| D-Reg. | Symbol | Descriptions |
|--------|----------------|--------------------------------------------------------|
| D0401 | EQUIPMENT.TYPE | Set type of equipment |
| D0402 | DFR.METHOD | Set way of defrosting (0:HEAT1 1:HEAT2 2:HOTGAS) |
| D0403 | WAIT.AFTER_DFR | Set wait function after defrosting (0:Unuse, 1:Use) |
| D0404 | DFR.DISPLAY | Set related manual defrosting button (0:Hide, 1: Show) |
| D0405 | MAN.DFR_SP | Set temperature of manual defrosting |
| D0406 | MAN.DFR_TIME | Set hour of manual defrosting |
| D0407 | WAIT.DAMPEROFF | Set DAMPER function (0:Unuse, 1:Use) |

7.6 INNER SIGNAL

This setting parameter D-register group is used to establish 8 INNER SIGNALS.

INNER SIGNAL setting D-Register

| D-Reg. | Symbol | Descriptions |
|--------|------------|--------------------------------------------------------------------------------------|
| D0501 | IS1.TARGET | Area of Target of INNER SIGNAL1 (0:Laboratory, 1:Hot house, 2:Cold temperature room) |
| D0502 | IS1.TYPE | Object Type of Target of INNER SIGNAL1 (0:SP, 1:PV) |
| D0503 | IS1.BAND | Select conducting direction (0:IN / 1:OUT) |
| D0504 | IS1.RH | Range High of INNER SIGNAL1 |
| D0505 | IS1.RL | Range Low of INNER SIGNAL1 |
| D0506 | IS1.DYT | DELAY TIME of INNER SIGNAL1 |
| . | . | . |
| . | . | . |
| . | . | . |
| D0543 | IS8.TARGET | Area of Target of INNER SIGNAL1 (0:Laboratory, 1:Hot house, 2:Cold temperature room) |
| D0544 | IS8.TYPE | Object Type of Target of INNER SIGNAL1 (0:SP, 1:PV) |
| D0545 | IS8.BAND | Select conducting direction (0:IN / 1:OUT) |
| D0546 | IS8.RH | Range High of INNER SIGNAL1 |
| D0547 | IS8.RL | Range Low of INNER SIGNAL1 |
| D0548 | IS8.DYT | DELAY TIME of INNER SIGNAL1 |

7.6 ALARM SIGNAL Group

This setting parameter D-register group is used to establish 4 ALARM signals and HBA Signal

■ ALARM signal setting D-Register

| D-Reg. | Symbol | Descriptions |
|--------|--------------|-------------------------------------------------|
| D0601 | ALM.OP | Conditions of ALARM Operation (0:RUN, 1:ALWAYS) |
| D0602 | ALM1.TARGET | Set application target of alarm signal 1 |
| D0603 | ALM1.TYPE | Type of ALARM signal 1 |
| D0604 | ALM1.POINT | Target Point of ALARM signal 1 |
| D0605 | ALM1.H_POINT | Limit High point of ALARM signal 1 |
| D0606 | ALM1.L_POINT | Limit Low point of ALARM signal 1 |
| D0607 | ALM1.HYS | Hysteresis of ALARM signal 1 |
| D0608 | ALM1.DYT | DELAY TIME of ALARM signal 1 |
| . | . | . |
| . | . | . |
| . | . | . |
| D0623 | ALM4.TARGET | Set application target of alarm signal 4 |
| D0624 | ALM4.TYPE | Type of ALARM signal 4 |
| D0625 | ALM4.POINT | Target Point of ALARM signal 4 |
| D0626 | ALM4.H_POINT | Limit High point of ALARM signal 4 |
| D0627 | ALM4.L_POINT | Limit Low point of ALARM signal 4 |
| D0628 | ALM4.HYS | Hysteresis of ALARM signal 4 |
| D0629 | ALM4.DYT | DELAY TIME of ALARM signal 4 |

7.8 TIME SIGNAL

This setting parameter D-register group is used to set 8 Main channel segment alarm signal.

■ TIME SIGNAL setting D-Register

| D-Reg. | Symbol | Descriptions |
|--------|------------|------------------------------------------------------------|
| D0701 | TS2DYTM_H | DELAY TIME (HOUR) of generating TIME SIGNAL 2. |
| D0702 | TS2DYTM_L | DELAY TIME (MIN. & SEC.) of generating TIME SIGNAL 2. |
| D0703 | TS2KPTM_H | OPER.TIME (HOUR) to keep generating TIME SIGNAL 2. |
| D0704 | TS2KPTM_L | OPER.TIME (MIN. & SEC.) to keep generating TIME SIGNAL 2. |
| . | . | . |
| . | . | . |
| . | . | . |
| D0773 | TS20DYTM_H | DELAY TIME (HOUR) of generating TIME SIGNAL 20. |
| D0774 | TS20DYTM_L | DELAY TIME (MIN. & SEC.) of generating TIME SIGNAL 20. |
| D0775 | TS20KPTM_H | OPER.TIME (HOUR) to keep generating TIME SIGNAL 20. |
| D0776 | TS20KPTM_L | OPER.TIME (MIN. & SEC.) to keep generating TIME SIGNAL 20. |

7.9 COMMUNICATION

Check the Comm. Set harmony operation, plus, This group is used to Set related User' s screen show on/off and time.

Serial Communication D-Register

| D-Reg. | Symbol | Descriptions |
|--------|------------------|--------------------------------------------|
| D0901 | COM2.PROTOCOL | [COM2] Communication protocol set checking |
| D0902 | COM2.BPS | [COM2] Communication speed set checking |
| D0903 | COM2.PARITY | [COM2] Parity set checking |
| D0904 | COM2.STOP.BIT | [COM2] Stop Bit set checking |
| D0905 | COM2.DATA.LENGTH | [COM2] Data Length set checking |
| D0906 | COM2.ADDRESS | [COM2] Address set checking |
| D0907 | COM2.RESPONSE | [COM2] Respond delay time set checking |

Ethernet Communication D-Register

| D-Reg. | Symbol | Descriptions |
|-------------|---------------------------|---------------------------------------|
| D0930 | DHCP_USE | DHCP use mode Select (0:Unuse, 1:Use) |
| D0931~D0934 | IP_ADDRESS1~IP_ADDRESS4 | IP address Set |
| D0935~D0938 | SUBNET_MASK1~SUBNET_MASK4 | Subnet mask Set |
| D0939~D0942 | GATEWAY1~GATEWAY4 | Gateway Set |

User screen D-Register

| D-Reg. | Symbol | Descriptions |
|--------|-------------|----------------------------------------------------------------|
| D0970 | VIEW.ROTATE | User BMP Use/Unuse Select |
| D0971 | R.ST_TIME | Run screen, during the set time, No KEY input, Use mode start. |
| D0972 | R.INT_TIME | User BMP switch by set time |

7.11 PID

Set 6 Main Channel PID, Individual Sub Channel PID Set

■ Main Channel PID setting D-Register

| D-Reg. | Symbol | Descriptions |
|--------|------------|-----------------------------------------------------------------------------------|
| D1001 | RP1 | Set Boundary value to select PID zone |
| D1002 | RP2 | |
| D1003 | RHYS | Selects hysteresis when ZONE PID. |
| D1004 | H.RDEV | Set hot temperature room deviation when select PID deviation |
| D1005 | L.RDEV | Set Cold temperature room deviation when select PID deviation |
| D1006 | L.RDEV_HYS | Set hysteresis width of Cold temperature room deviation when select PID deviation |
| D1007 | CMOD | Select the control method. (0:D.PV, 1:D.DV) |
| D1008 | AT_POINT | Auto-tuning sets the reference value. |
| D1009 | AT_DISPLAY | Select to display or hide AT Tuning KEY. (0:HIDE, 1:DISPLAY) |
| D1013 | 1.P | Set proportional integer of PID1 |
| D1014 | 1.I | Set integral time of PID 1 |
| D1015 | 1.D | Set derivative action time of PID 1 |
| D1016 | 1.OH | Set upper value of control output working range of PID 1 |
| D1017 | 1.OL | Set lower value of control output working range of PID 1 |
| D1018 | 1.MR | Set integral time of PID 1 manually |
| D1019 | 1.HHYS | PID1 the ON / OFF control hysteresis High limit is set at. |
| D1020 | 1.LHYS | PID1 the ON / OFF control hysteresis at the Low setting. |
| . | . | . |
| . | . | . |
| . | . | . |
| D1037 | 4.P | Proportional band of PID6 |
| D1038 | 4.I | Integral time of PID6 |
| D1039 | 4.D | Derivative action time of PID6 |
| D1040 | 4.H | Set upper value of control output working range of PID 6 |
| D1041 | 4.OL | Set lower value of control output working range of PID 6 |
| D1042 | 4.MR | Set integral time of PID6 manually |
| D1043 | 4.HHYS | PID1 the ON / OFF control hysteresis High limit is set at. |
| D1044 | 4.LHYS | PID1 the ON / OFF control hysteresis at the Low setting. |

7.12 INPUT

Sensor Inout Setting and Zone Sensor Inout Calibration Setting

■ Main channel sensor INPUT setting D-Register

| D-Reg. | Symbol | Descriptions |
|-------------|-----------------|-----------------------------------------------------------|
| D1201 | SENGP | Select the sensor group. (0:T/C, 1:RTD, 2:DCV) |
| D1202 | UNIT | Sets the sensor unit. |
| D1203 | DP | Set decimal point position. |
| D1204 | TCSL | T/C select show (0:T/C, 1:T/C+RJC, 2:RJC) |
| D1205 | SOPN_SEL | Sensors-open, pv direction select (0:UNSET, 1:UP, 2:DOWN) |
| D1206 | INRH | Set Upper limit range of use. |
| D1207 | INRL | Set Lower limit range of use. |
| D1208 | INSH | Scale Upper limit set. |
| D1209 | INSL | Scale Lower limit set. |
| D1210 | HI.BIAS | [Hot temperature room] Set input of correction value |
| D1211 | LO.BIAS | [Cold temperature room] Set input of correction value |
| D1212 | EX.BIAS | [Lab.] Set input of correction value |
| D1213 | HI.FILTER | [Hot temperature room] Set sensor filter time |
| D1214 | LO.FILTER | Set sensor filter time |
| D1215 | EX.FILTER | Set sensor filter time |
| D1219~D1226 | BP1.DDV~BP8.DDV | Set calibration temperature on each standard temperature |
| D1227~D1234 | BP1.DPV~BP8.DPV | Set each standard temperature which need calibration. |
| D1240 | HT.LIMIT_H | [Hot temperature room] Set upper value |
| D1241 | HT.LIMIT_L | [Hot temperature room] Set lower value |
| D1242 | RT.LIMIT_H | [Present temperature room]Set upper value |
| D1243 | RT.LIMIT_L | [Present temperature room]Set lower value |
| D1244 | LT.LIMIT_H | [Cold temperature room] Set upper value |
| D1245 | LT.LIMIT_L | [Cold temperature room] Set lower value |
| D1246 | DFR.LIMIT_H | [Defrosting Operation] Set upper value |
| D1247 | DFR.LIMIT_L | [Defrosting Operation] Set lower value |

7.13 OUTPUT

ControlOutput and Transmit Output Set

■ Main Channel Control Output and Transmit Output D-Register

| D-Reg. | Symbol | Descriptions |
|--------|-----------|------------------------------------------------------------------------------------------------|
| D1401 | OUT1.MODE | OUT1 ControlOutput Types Select (0:SSR, 1:SCR) |
| D1402 | OUT2.MODE | OUT2 ControlOutput Types Select (0:SSR, 1:SCR) |
| D1403 | OUT3.MODE | OUT3 ControlOutput Types Select (0:SSR, 1:SCR) |
| D1404 | OUT4.MODE | OUT4 ControlOutput Types Select (0:SSR, 1:SCR) |
| D1405 | OUT1.TYPE | OUT1 Output Types Select |
| D1406 | OUT2.TYPE | OUT2 Output Types Select |
| D1407 | OUT3.TYPE | OUT3 Output Types Select |
| D1408 | OUT4.TYPE | OUT4 Output Types Select |
| D1411 | HI.DIR | [Hot temperature room] Run direction Select (0:Reverse, 1:Normal) |
| D1412 | LO.DIR | [Cold temperature room] Run direction Select (0:Reverse, 1:Normal) |
| D1413 | HI.CT | [Hot temperature room] Set output cycle |
| D1414 | LO.CT | [Cold temperature room] Set output cycle |
| D1415 | HI.PO | [Hot temperature room] Set output when emergency |
| D1416 | LO.PO | [Cold temperature room] Set output when emergency |
| D1417 | HI.ARW | [Hot temperature room] Prevention too much integral value Set |
| D1418 | LO.ARW | [Cold temperature room] Prevention too much integral value Set |
| D1419 | HI.ATGAIN | [Hot temperature room] Set GAIN value which controls PID value manually |
| D1420 | LO.ATGAIN | [Cold temperature room]Set GAIN value which controls PID value manually |
| D1421 | RET1.TYPE | [RET1] Transmit Output Types Select (0:Test PV, 1: high temperature PV, 2: low temperature PV) |
| D1422 | RET1.HIGH | [RET1] Transmit Output Range upper limit value Set |
| D1423 | RET1.LOW | [RET1] Transmit Output Range lower limit value Set |
| D1424 | RET2.TYPE | [RET2]Transmit Output Types Select (0:Test PV, 1: high temperature PV, 2: low temperature PV) |
| D1425 | RET2.HIGH | [RET2] Transmit Output Range upper limit value Set |
| D1426 | RET2.LOW | [RET2] Transmit Output Range lower limit value Set |

7.14 DO CONFIG

DO CONFIG group consists of setting and information parameter D-Register related to establish RELAY number on I/O board to generate signal and its sub setting for auxiliary Digital Output.

■ Related DO Relay setting D-Register

| D-Reg. | Symbol | Descriptions |
|-------------|---------------------------|----------------------------------------------------------------------------------------|
| D1501~D1508 | IS1.RLY~IS8.RLY | Set INNER SIGNAL output RELAY Number |
| D1509~D1516 | TS1.RLY~TS4.RLY | Set Time SIGNAL output RELAY Number |
| D1517~D1520 | ALM1.RLY~ALM4.RLY | Set Alram SIGNAL output RELAY Number |
| D1513 | HT_ZONE.RLY | [Hot temperature room] Set relay No. for signal |
| D1514 | RT_ZONE.RLY | [Lab.] Set relay No. for signal |
| D1515 | LT_ZONE.RLY | [Cold temperature room] Set relay No. for signal |
| D1516 | HT_FAN.RLY | [Hot temperature room] Set relay No. for fan signal |
| D1517 | RT_FAN.RLY | [Lab.] Set relay No. for fan signal |
| D1518 | LT_FAN.RLY | [Cold temperature room] Set relay No. for fan signal |
| DI1523~ | DI1.RLY ~ DI16.RLY | Set relay No. for DI signal |
| D1539,D1540 | USER.RLY1 ~ USER.RLY12 | Set relay No. for signal manually |
| D1551 | USER.RLY_ON/OFF | Check ON/OFF for signal manually |
| D1552 | LOG.OUTRLY1 | Set relay No. for calculation signal |
| D1553 | LOG.SRCRLYa1 | [a] Set relay for calculation |
| D1554 | LOG.SRCRLYb1 | [b] Set relay for calculation |
| D1555 | LOG.OPERAND1 | Select an operator (0:AND, 1:OR, 2:NAND, 3:NOR, 4:XOR) |
| . | . | . |
| D1560 | LOG.OUTRLY3 | Set relay No. for calculational signal 3 |
| D1561 | LOG.SRCRLYa3 | [a] Set relay for calculation |
| D1562 | LOG.SRCRLYb3 | [b] Set relay for calculation |
| D1563 | LOG.OPERAND3 | Select an operator (0:AND, 1:OR, 2:NAND, 3:NOR, 4:XOR) |
| D1543,D1544 | RUN.RLY, RUN.DYT | Set delay time and relay No. for running signal |
| D1545,D1547 | HZD_ON.RLY, HZD_ON.OPTN | [Hot temperature room]Set relay No. and operation time for damper On signal |
| D1548,D1550 | HZD_OFF.RLY, HZD_OFF.OPTN | [Hot temperature room] Set relay No. and operation time for Damper OFF signal |
| D1551,D1553 | RZD_ON.RLY, RZD_ON.OPTN | [Lab.] Set relay No. and operation time for Damper ON signal |
| D1554,D1555 | RZD_OFF.RLY, RZD_OFF.OPTN | [Lab.] Set relay No. and operation time for Damper OFF signal |
| D1556,D1558 | LZD_ON.RLY, LZD_ON.OPTN | [Cold temperature room] Set relay No. and operation time for Damper ON signal |
| D1559,D1560 | LZD_OFF.RLY, LZD_OFF.OPTN | [Cold temperature room] Set relay No. and operation time for Damper OFF signal |
| D1561,D1562 | HT_SOPN.RLY, HT_SOPN.KPT | [Hot temperature room] Set relay No. and operation time for sensor cut of wire signal |
| D1563,D1564 | LT_SOPN.RLY, LT_SOPN.KPT | [Cold temperature room] Set relay No. and operation time for sensor cut of wire signal |
| D1582,D1583 | EX_SOPN.RLY, EX_SOPN.KPT | [Lab.] Set relay No. and operation time for sensor cut of wire signal |

| D-Reg. | Symbol | Descriptions |
|-------------|--------------------------|-----------------------------------------------------------------------|
| D1584 | PTEND.RLY | Set relay No. for output run end signal |
| D1585 | PTEND.DLY | Set delay time of run end signal |
| D1586 | PTEND.KPT | Set operation time of run end signal |
| D1587~D1588 | ERROR.RLY, ERROR.KPT | Set relay No. and keeping time for error signal |
| D1589~D1590 | HT_WAIT.RLY, HT_WAIT.KPT | [Hot temperature room] Set relay No. and keeping time for wait signal |

| | | |
|-------------|--------------------------|------------------------------------------------------------------------|
| D1591,D1592 | LT_WAIT.RLY, LT_WAIT.KPT | [Cold temperature room] Set relay No. and keeping time for wait signal |
| D1593,D1594 | 1REF_RLY, 1REF_DYT | Set relay No. and keeping time for refrigerator signal 1 |
| D1595,D1596 | 2REF_RLY, 2REF_DYT | Set relay No. and keeping time for refrigerator signal 2 |
| D1597,D1598 | SOL.RLY, SOL.POINT | Set relay No. and keeping time for sol valve |
| D1601,D1602 | N2GAS.RLY, N2GAS.OPTM | Set relay No. and operating time for N2GAS signal |
| D1603 | DFR.RLY | Set relay No. for defrosting run |
| D1604 | UKEY.RLY | Set relay No. for UKEY signal |

7.15 DI CONFIG

DI CONFIG group consists of setting parameter D-Register for DI ERROR and its name.

■ DI CONFIG setting D-Register

| D-Reg. | Symbol | Descriptions |
|-------------|------------------------|------------------------------------------------------------------------|
| D1701 | DISP.METHOD | DISPLAY METHOD for DI ERROR. (0:TEXT, 1:PICTURE) |
| D1702 | BUZ.TIME | Sets time for DI Error buzzer. |
| D1703 | DIDEC.TIME | DETECT TIME to recognize DI ERROR from actual occurrence |
| D1704 | DI1.OP_MODE | Select OPERATION MODE when DI 1 ON. (0:ERROR, 1:RUN/STOP) |
| D1705 | DI2.OP_MODE | Select OPERATION MODE when DI 2 ON. (0:ERROR, 1:HOLD) |
| D1706 | DI3.OP_MODE | Select OPERATION MODE when DI 3 ON. (0:ERROR, 1:STEP) |
| D1707 | DI4.OP_MODE | Select OPERATION MODE when DI 4 ~ 8 ON (0:ERROR, 1:PATTERN SELECTION) |
| D1708 | DI9.OP_MODE | Select OPERATION MODE when DI 9 ~ 14 ON (0:ERROR, 1:PATTERN SELECTION) |
| D1709 | D9.OP_DLY | Set delay time when DI9~14 |
| D1708,D1709 | DI1.OP,DI1.DYT | Set DI 1 OPERATION after detecting and DELAY TIME |
| . | . | . |
| . | . | . |
| . | . | . |
| D1738,D1739 | DI16.OP,DI16.DYT | Set DI 16 OPERATION after detecting and DELAY TIME |
| D1652~D1667 | DI1.DETECT~DI16.DETECT | Select the way of DI perception (0:A-contact, 1:B-contact) |
| D1801~D1812 | DI1.NAME1~DI11.NAME12 | Set DI 1 ERROR NAME. |
| . | . | . |
| . | . | . |
| . | . | . |
| D1985~D1996 | DI16.NAME9~DI16.NAME12 | Set DI 16 ERROR NAME. |

7.16 INITIAL

INITIAL group consists of setting parameter D-Register for system initial configuration.

■ INITIAL setting D-Register

| D-Reg. | Symbol | Descriptions |
|-------------|----------------------------------|---------------------------------------------------------|
| D2001 | LANGUAGE | Language Select (0:English, 1:Korean, 2: Chinese) |
| D2002 | DISP.MODE | Select Display mode on initial screen (0:text, 1:image) |
| D2003 | UKEY.USE | select key use (0:Unuse, 1:Use) |
| D2006~D2018 | INFORM1.NAME1 ~INFORM1.NAME13 | Set Information 1 's name of initial screen |
| . | . | . |
| . | . | . |
| . | . | . |
| D2032~D2044 | INFORM3.NAME1 ~INFORM3.NAME13 | Set Information 3 's name of initial screen |
| D2100~D2150 | MCH.LAMP_IS1 ~MCH.LAMP_DI16 | [Main Channel] Status display ramp Set |

7.17 PROGRAM PATTERN Group and Setting

7.17.1 PROGRAM

PROGRAM group consists of parameter D-Register to arrange program PATTERN organized by each segment profile. Each segment should be established step by step.

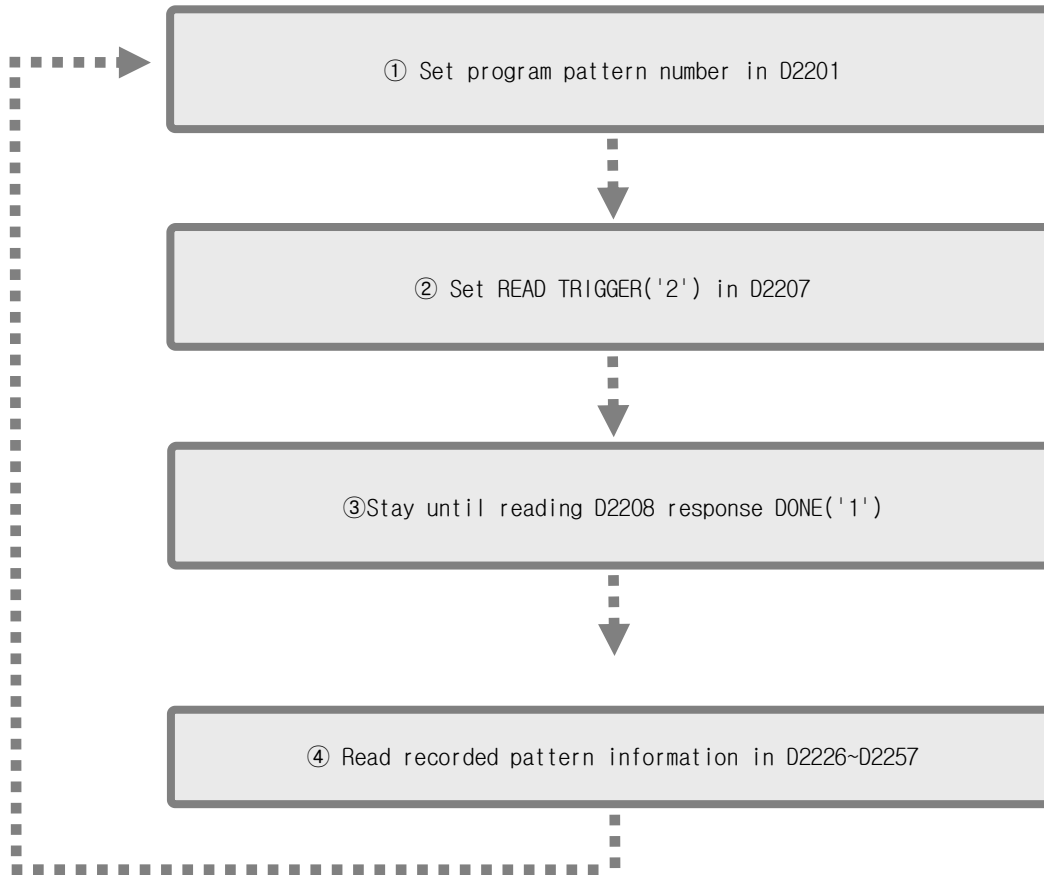
■ Program PATTERN setting D-Register

| D-Reg. | Symbol | Set point | Descriptions |
|-------------|------------------|-----------|-------------------------------------------------------------------------|
| D2201 | COM_PTNO | 1~40 | Set program PATTERN number to Read or Write |
| D2203 | PTCOPY_START | - | Start number to copied pattern |
| D2204 | PTCOPY_END | - | End number to copied pattern |
| D2205 | PTDEL_START | - | Start number to delated pattern |
| D2206 | PTDEL_END | - | End number to delated pattern |
| D2207 | TRIGGER | 1 | INIT : Initialize D2201~D2208 to '0' |
| | | 2 | READ : Read profiles in D2201 and D2202 |
| | | 3 | WRITE : Write profiles in D2201 and D2202 |
| | | 4 | PT COPY : Copy PTN in D2201 to PTN designated in D2203~D2204 |
| | | 5 | PT DEL : Delete PTN designated in D2205~D2206 |
| | | 6 | PT NAME READ : Read PTN NAME in D2201 |
| | | 7 | PT NAME WRITE : Write PTN NAME in D2201 |
| | | 8 | ALL PT : Write pattern profile at D2201 into below D2400 |
| D2208 | ANSWER | 0 | FULL : Excessive number of pattern or segment setting |
| | | 1 | DONE : Normally accessed of D2207(TRIGGER) command |
| | | 2 | PT EMPTY : No profile in designated pattern |
| | | 3 | SEG EMPTY : No profile in designated segment |
| | | 4 | PT RUN : Program RUN state of designated PTN |
| | | 5 | PARA ERROR : Program setting Error of D2201~D2207 |
| D2211~D2222 | PATTERN_NAME1~12 | - | Pattern NAME to Read or Write |
| D2226 | PT.TYPE | - | Pattern type to Read or Write |
| D2227 | PT.RPT | - | Pattern repeat Number to Read or Write |
| D2228 | PT.EMODE | - | Pattern end to Read or Write |
| D2229 | HT.TSP | - | [Hot temperature room] Target temperature to Read or Write |
| D2230 | HT.ZONETIME_H | - | [Hot temperature room]Operation time to Read or Write(Hour) |
| D2231 | HT.ZONETIME_L | - | [Hot temperature room]Operation time to Read or Write (Minute, second) |
| D2232 | HT.PSP | - | [Hot temperature room]Pre-heating temperature to Read or Write |
| D2233~D2236 | HT.TS1~HT.TS4 | - | [Hot temperature room]Time signal 1~4 Read or Write |
| D2237 | HT.WAIT | - | [Hot temperature room]Waiting time to Read or Write |
| D2238 | RT.TSP | - | [Lab.] Target temperature to Read or Write |
| D2239 | RT.ZONETIME_H | - | [Lab.] Zone operation time to Read or Write (Hour) |
| D2240 | RT.ZONETIME_L | - | [Lab.] Zone operation time to Read or Write (Minute, second) |
| D2233~D2236 | RT.TS1~RT.TS4 | - | [Lab.] Time signal 1~4 to Read or Write |
| D2237 | RT.WAIT | - | [Lab.] Waiting time to Read or Write |
| D2238 | LT.TSP | - | [Cold temperature room]Target temperature to Read or Write |
| D2239 | LT.ZONETIME_H | - | [Cold temperature room]Operation time to Read or Write (Hour) |
| D2240 | LT.ZONETIME_L | - | [Cold temperature room]Operation time to Read or Write (Minute, second) |
| D2241 | LT.PSP | - | [Cold temperature room]Pre-heating temperature to Read or Write |
| D2233~D2236 | LT.TS1~LT.TS4 | - | [Cold temperature room]Time signal 1~4 Read or Write |
| D2237 | LT.WAIT | - | [Cold temperature room]Waiting time to Read or Write |

| | | | |
|-------|-----------|--|---------------------------------------------------|
| D2255 | DFR.CYCLE | | Defrosting operation period to Read or Write |
| D2256 | DFR.SP | | Defrosting operation temperature to Read or Write |
| D2257 | DFR.TIME | | Defrosting operation time to Read or Write |

7.17.2 How to READ program PATTERN

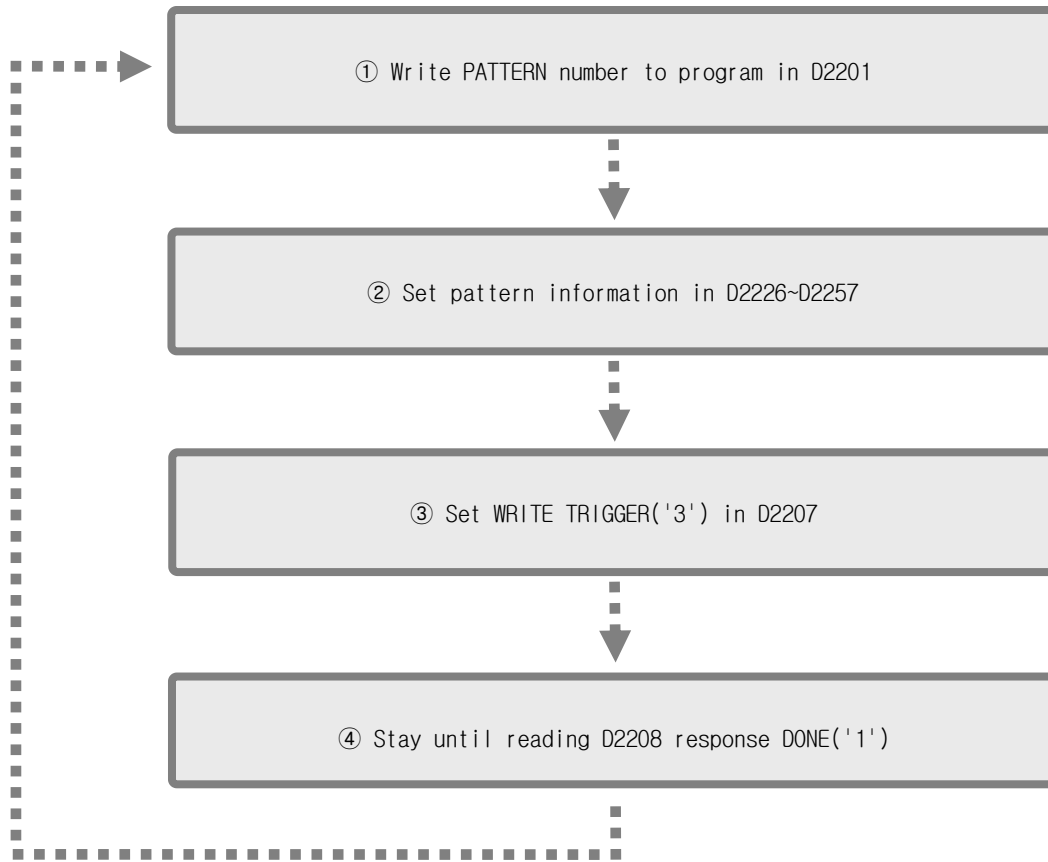
► Below describes process step to read programmed PATTERN profile in TEMP2000S.



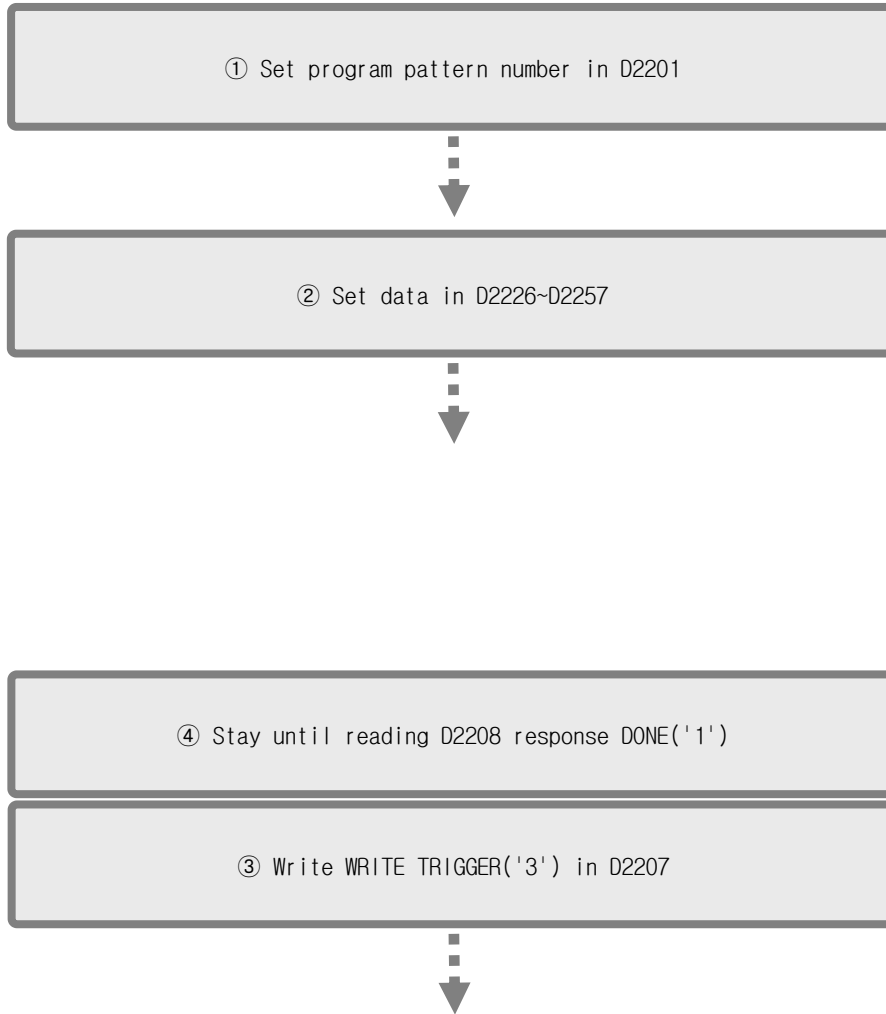
Above process step ① ~ ④ is used to read 'ONE SEGMENT' profile among all in programmed pattern. To read many segments, reiterate ① ~ ④ process step by changing segment number.

7.17.3 WRITE PROGRAM PATTERNS

► Below describes process step to write programming PATTERN profile in TEMP2500S.

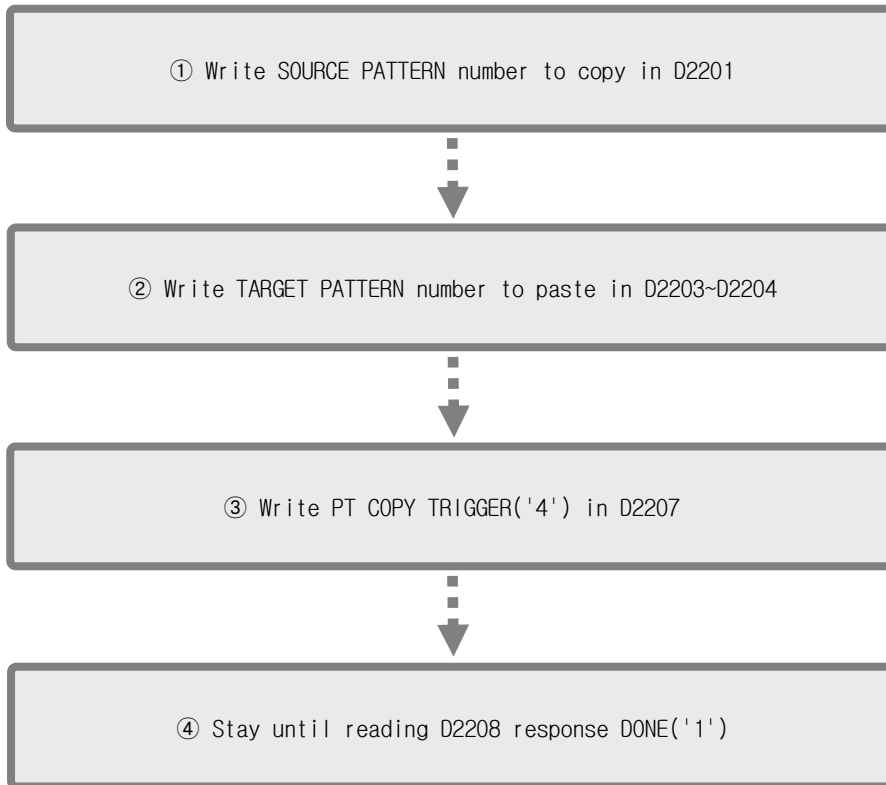


► Below describes process step to write program in D2226-D2257

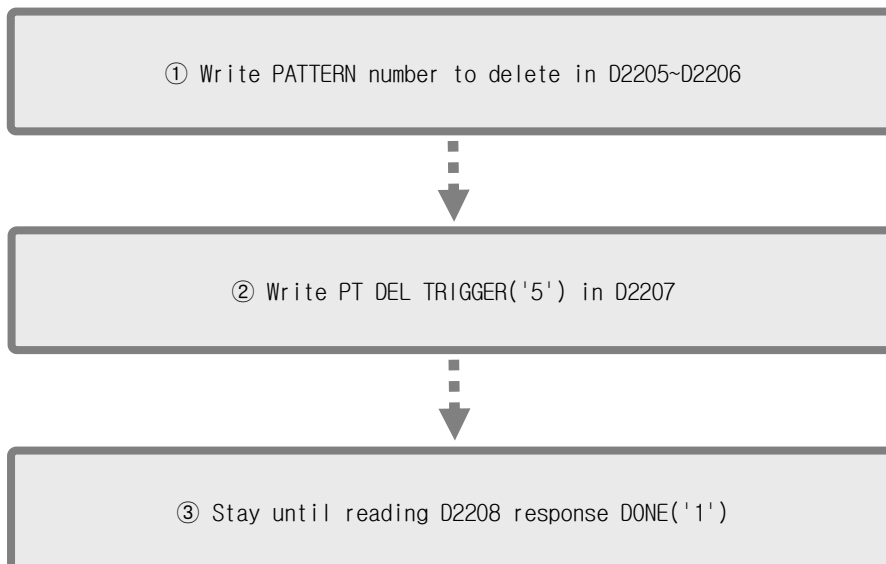


7.17.4 FILE EDIT (PATTERN COPY / DELETE)

► Below describes step to copy pattern.



► Below describes step to delete pattern.



D-Register 0000 ~ 0599 : Read Only

| D-Reg. | PROCESS | FUNCTION | GRAPH | RESERVE | EQUIPMENT | INNER SIGNAL |
|--------|----------------|-------------|---------------|-----------|----------------|--------------|
| | 0 | 100 | 200 | 300 | 400 | 500 |
| 0 | | SET_PTNO | RECORD_PLACE | RESERVE | | |
| 1 | EX_TEMP.NPV | COM_OPMODE | RECORD_MODE | NOW.YEAR | EQUIPMENT.TYPE | IS1.TARGET |
| 2 | HI_TEMP.NPV | | SAMPLING_TIME | NOW.MONTH | DFR.METHOD | IS1.TYPE |
| 3 | LO_TEMP.NPV | | PEN_TYPE | NOW.DAY | WAIT.AFTER_DFR | IS1.BAND |
| 4 | EX_TEMP.NSP | | | NOW.AMPM | DFR.DISPLAY | IS1.RH |
| 5 | HI_TEMP.NSP | | | NOW.HOUR | MAN.DFR_SP | IS1.RL |
| 6 | LO_TEMP.NSP | | | NOW.MIN | MAN.DFR_TIME | IS1.DYT |
| 7 | EX_TEMP.MV | | | C.YEAR | WAIT.DAMPEROFF | IS2.TARGET |
| 8 | HI_TEMP.MV | | | C.MONTH | | IS2.TYPE |
| 9 | LO_TEMP.MV | | | C.DAY | | IS2.BAND |
| 10 | | | | C.AMPM | | IS2.RH |
| 11 | | | | C.HOUR | | IS2.RL |
| 12 | HI_TEMP.PIDNO | | | C.MIN | | IS2.DYT |
| 13 | LO_TEMP.PIDNO | | | R.YEAR | | IS3.TARGET |
| 14 | HI_TEMP.WAIT | | | R.MONTH | | IS3.TYPE |
| 15 | LO_TEMP.WAIT | | | R.DAY | | IS3.BAND |
| 16 | | POWER.MODE | | R.AMPM | | IS3.RH |
| 17 | | | | R.HOUR | | IS3.RL |
| 18 | NOW.STATUS | | | R.MIN | | IS3.DYT |
| 19 | IS.STATUS | | | | | IS4.TARGET |
| 20 | TS.STATUS | | | | | IS4.TYPE |
| 21 | AL.STATUS | | | | | IS4.BAND |
| 22 | DI.DATA | | | | | IS4.RH |
| 23 | DO.STATUS1 | | | | | IS4.RL |
| 24 | DO.STATUS2 | FUZZY | | | | IS4.DYT |
| 25 | NOW.OTHERSTS | | | | | IS5.TARGET |
| 26 | NOW.CTRSTS | | | | | IS5.TYPE |
| 27 | SYS.STATUS | | | | | IS5.BAND |
| 28 | ADERR.STATUS_H | | | | | IS5.RH |
| 29 | ADERR.STATUS_L | | | | | IS5.RL |
| 30 | | | | | | IS5.DYT |
| 31 | | | | | | IS6.TARGET |
| 32 | EX_TEMP.TSP | | | | | IS6.TYPE |
| 33 | HI_TEMP.TSP | | | | | IS6.BAND |
| 34 | LO_TEMP.TSP | LIGHT.OFFTM | | | | IS6.RH |
| 35 | HI_TEMP.PSP | KEYLOCK | | | | IS6.RL |
| 36 | LO_TEMP.PSP | AUTO_TUNING | | | | IS6.DYT |
| 37 | | | | | | IS7.TARGET |
| 38 | | | | | | IS7.TYPE |
| 39 | | | | | | IS7.BAND |
| 40 | | | | | | IS7.RH |
| 41 | | | | | | IS7.RL |
| 42 | | | | | | IS7.DYT |
| 43 | | USERKEY | | | | IS8.TARGET |
| 44 | | BUZ.ONOFF | | | | IS8.TYPE |
| 45 | RUNTIME_H | | | | | IS8.BAND |
| 46 | RUNTIME_M | | | | | IS8.RH |
| 47 | RUNTIME_S | | | | | IS8.RL |
| 48 | RUN.PTNO | | | | | IS8.DYT |
| 49 | RUN.SEGNO | | | | | |

| D-Reg. | PROCESS | FUNCTION | GRAPH | RESERVE | ON/OFF SIGNAL | INNER SIGNAL |
|--------|-----------------|-------------|-------|---------|---------------|--------------|
| | 0 | 100 | 200 | 300 | 400 | 500 |
| 50 | NOW.PT_RPT | | | | | |
| 51 | TOTAL.PT_RPT | | | | | |
| 52 | NOWRUN.ZONETM_L | | | | | |
| 53 | NOWRUN.ZONETM_H | | | | | |
| 54 | NOWSET.ZONETM_L | | | | | |
| 55 | NOWSET.ZONETM_H | | | | | |
| 56 | DFR.RUNTIME | | | | | |
| 57 | DFR.SETTIME | | | | | |
| 58 | | | | | | |
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| 88 | | | | | | |
| 89 | | | | | | |
| 90 | | HWAIT.MODE | | | | |
| 91 | | HWAIT.BAND | | | | |
| 92 | | HWAIT.POINT | | | | |
| 93 | | LWAIT.MODE | | | | |
| 94 | | LWAIT.BAND | | | | |
| 95 | | LWAIT.POINT | | | | |
| 96 | | | | | | |
| 97 | | | | | | |
| 98 | | | | | | |
| 99 | | | | | | |

D-Register 0600 ~ 1199

| D-Reg. | ALARM SIGNAL | RESERVED | TIME SIGNAL | COMMUNICATION | PID 1 | RESERVED |
|--------|--------------|----------|-------------|----------------|------------|----------|
| | 600 | 700 | 800 | 900 | 1000 | 1100 |
| 0 | | | | | | |
| 1 | ALM.OP | | TS2DYTM_H | COM2.PROTOCOL | RP1 | |
| 2 | ALM1.TARGET | | TS2DYTM_L | COM2.BPS | RP2 | |
| 3 | ALM1.TYPE | | TS2KPTM_H | COM2.PARITY | RHYS | |
| 4 | ALM1.POINT | | TS2KPTM_L | COM2.STOP.BIT | H.RDEV | |
| 5 | ALM1.H.POINT | | TS3DYTM_H | COM2.DATA.LENG | L.RDEV | |
| 6 | ALM1.L.POINT | | TS3DYTM_L | COM2.ADDRESS | | |
| 7 | ALM1.HYS | | TS3KPTM_H | COM2.RESPONSE | CMOD | |
| 8 | ALM1.DYT | | TS3KPTM_L | | AT.POINT | |
| 9 | ALM2.TARGET | | TS4DYTM_H | | AT.DISPLAY | |
| 10 | ALM2.TYPE | | TS4DYTM_L | | | |
| 11 | ALM2.POINT | | TS4KPTM_H | | | |
| 12 | ALM2.H.POINT | | TS4KPTM_L | | | |
| 13 | ALM2.L.POINT | | TS5DYTM_H | | 1.P | |
| 14 | ALM2.HYS | | TS5DYTM_L | | 1.I | |
| 15 | ALM2.DYT | | TS5KPTM_H | | 1.D | |
| 16 | ALM3.TARGET | | TS5KPTM_L | | 1.OH | |
| 17 | ALM3.TYPE | | TS6DYTM_H | | 1.OL | |
| 18 | ALM3.POINT | | TS6DYTM_L | | 1.MR | |
| 19 | ALM3.H.POINT | | TS6KPTM_H | | 1.HHYS | |
| 20 | ALM3.L.POINT | | TS6KPTM_L | | 1.LHYS | |
| 21 | ALM3.HYS | | TS7DYTM_H | | 2.P | |
| 22 | ALM3.DYT | | TS7DYTM_L | | 2.I | |
| 23 | ALM4.TARGET | | TS7KPTM_H | | 2.D | |
| 24 | ALM4.TYPE | | TS7KPTM_L | | 2.OH | |
| 25 | ALM4.POINT | | TS8DYTM_H | | 2.OL | |
| 26 | ALM4.H.POINT | | TS8DYTM_L | | 2.MR | |
| 27 | ALM4.L.POINT | | TS8KPTM_H | | 2.HHYS | |
| 28 | ALM4.HYS | | TS8KPTM_L | | 2.LHYS | |
| 29 | ALM4.DYT | | TS9DYTM_H | | 3.P | |
| 30 | | | TS9DYTM_L | DHCP_USE | 3.I | |
| 31 | | | TS9KPTM_H | IP_ADDRES1 | 3.D | |
| 32 | | | TS9KPTM_L | IP_ADDRES2 | 3.OH | |
| 33 | | | TS10DYTM_H | IP_ADDRES3 | 3.OL | |
| 34 | | | TS10DYTM_L | IP_ADDRES4 | 3.MR | |
| 35 | | | TS10KPTM_H | SUBNET_MASK1 | 3.HHYS | |
| 36 | | | TS10KPTM_L | SUBNET_MASK2 | 3.LHYS | |
| 37 | | | TS11DYTM_H | SUBNET_MASK3 | 4.P | |
| 38 | | | TS11DYTM_L | SUBNET_MASK4 | 4.I | |
| 39 | | | TS11KPTM_H | GATEWAY1 | 4.D | |
| 40 | | | TS11KPTM_L | GATEWAY2 | 4.OH | |
| 41 | | | TS12DYTM_H | GATEWAY3 | 4.OL | |
| 42 | | | TS12DYTM_L | GATEWAY4 | 4.MR | |
| 43 | | | TS12KPTM_H | | 4.HHYS | |
| 44 | | | TS12KPTM_L | | 4.LHYS | |
| 45 | | | TS13DYTM_H | | 5.P | |
| 46 | | | TS13DYTM_L | | 5.I | |
| 47 | | | TS13KPTM_H | | 5.D | |

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|----|--|--|------------|--|--------|--|
| 48 | | | TS13KPTM_L | | 5.OH | |
| 49 | | | TS14DYTM_H | | 5.HHOL | |

| D-Reg. | ALARM SIGNAL | SEG ALARM | TIME SIGNAL | COMMUNICATION | PID 1 | RESERVED |
|--------|--------------|-----------|-------------|---------------|--------|----------|
| | 600 | 700 | 800 | 900 | 1000 | 1100 |
| 50 | | | TS14DYTM_L | | 5.MR | |
| 51 | | | TS14KPTM_H | | 5.HHYS | |
| 52 | | | TS14KPTM_L | | 5.LHYS | |
| 53 | | | TS15DYTM_H | | | |
| 54 | | | TS15DYTM_L | | | |
| 55 | | | TS15KPTM_H | | | |
| 56 | | | TS15KPTM_L | | | |
| 57 | | | TS16DYTM_H | | | |
| 58 | | | TS16DYTM_L | | | |
| 59 | | | TS16KPTM_H | | | |
| 60 | | | TS16KPTM_L | | | |
| 61 | | | TS17DYTM_H | | | |
| 62 | | | TS17DYTM_L | | | |
| 63 | | | TS17KPTM_H | | | |
| 64 | | | TS17KPTM_L | | | |
| 65 | | | TS18DYTM_H | | | |
| 66 | | | TS18DYTM_L | | | |
| 67 | | | TS18KPTM_H | | | |
| 68 | | | TS18KPTM_L | | | |
| 69 | | | TS19DYTM_H | | | |
| 70 | | | TS19DYTM_L | VIEW.ROTATE | | |
| 71 | | | TS19KPTM_H | R.ST_TIME | | |
| 72 | | | TS19KPTM_L | R.INT_TIME | | |
| 73 | | | TS20DYTM_H | | | |
| 74 | | | TS20DYTM_L | | | |
| 75 | | | TS20KPTM_H | | | |
| 76 | | | TS20KPTM_L | | | |
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D-Register 1200 ~ 1799

| D-Reg. | INPUT 1 | INPUT 2 | OUTPUT | DO CONFIG 1 | DO CONFIG 2 | DI CONFIG 1 |
|--------|------------|---------|-----------|-------------|-------------|--------------|
| | 1200 | 1300 | 1400 | 1500 | 1600 | 1700 |
| 0 | | | | | | |
| 1 | SENTP | | OUT1.MODE | IS1.RLY | N2GAS.RLY | DISP.METHOD |
| 2 | UNIT | | OUT2.MODE | IS2.RLY | N2GAS.OPTM | BUZ.TIME |
| 3 | DP | | OUT3.MODE | IS3.RLY | DFR.RLY | DI DET.TIME |
| 4 | TCSL | | OUT4.MODE | IS4.RLY | UKEY.RLY | DI1.OP_MODE |
| 5 | SOPN_SEL | | OUT1.TYPE | IS5.RLY | | DI2.OP_MODE |
| 6 | INRH | | OUT2.TYPE | IS6.RLY | | DI3.OP_MODE |
| 7 | INRL | | OUT3.TYPE | IS7.RLY | | DI4.OP_MODE |
| 8 | INSH | | OUT4.TYPE | IS8.RLY | | DI9.OP_MODE |
| 9 | INSL | | | TS1.RLY | | DI10.OP_MODE |
| 10 | HI.BIAS | | | TS2.RLY | | DI11.OP_MODE |
| 11 | LO.BIAS | | HI.DIR | TS3.RLY | | DI12.OP_MODE |
| 12 | EX.BIAS | | LO.DIR | TS4.RLY | | DI13.OP_MODE |
| 13 | HI.FILTER | | HI.CT | ALM1.RLY | | DI14.OP_MODE |
| 14 | LO.FILTER | | LO.CT | ALM2.RLY | | DI914.OP_DLY |
| 15 | EX.FILTER | | HI.PO | ALM3.RLY | | DI1.OP |
| 16 | | | LO.PO | ALM4.RLY | | DI1.DVT |
| 17 | | | HI.ARW | HT_ZONE.RLY | | DI2.OP |
| 18 | | | LO.ARW | RT_ZONE.RLY | | DI2.DVT |
| 19 | BP1.DDV | | HI.ATGAIN | LT_ZONE.RLY | | DI3.OP |
| 20 | BP2.DDV | | LO.ATGAIN | HT_FAN.RLY | | DI3.DVT |
| 21 | BP3.DDV | | RET1.TYPE | RT_FAN.RLY | | DI4.OP |
| 22 | BP4.DDV | | RET1.HIGH | LT_FAN.RLY | | DI4.DVT |
| 23 | BP5.DDV | | RET1.LOW | DI1.RLY | | DI5.OP |
| 24 | BP6.DDV | | RET2.TYPE | DI2.RLY | | DI5.DVT |
| 25 | BP7.DDV | | RET2.HIGH | DI3.RLY | | DI6.OP |
| 26 | BP8.DDV | | RET2.LOW | DI4.RLY | | DI6.DVT |
| 27 | BP1.DPV | | | DI5.RLY | | DI7.OP |
| 28 | BP2.DPV | | | DI6.RLY | | DI7.DVT |
| 29 | BP3.DPV | | | DI7.RLY | | DI8.OP |
| 30 | BP4.DPV | | | DI8.RLY | | DI8.DVT |
| 31 | BP5.DPV | | | DI9.RLY | | DI9.OP |
| 32 | BP6.DPV | | | DI10.RLY | | DI9.DVT |
| 33 | BP7.DPV | | | DI11.RLY | | DI10.OP |
| 34 | BP8.DPV | | | DI12.RLY | | DI10.DVT |
| 35 | | | | DI13.RLY | | DI11.OP |
| 36 | | | | DI14.RLY | | DI11.DVT |
| 37 | | | | DI15.RLY | | DI12.OP |
| 38 | | | | DI16.RLY | | DI12.DVT |
| 39 | | | | USER.RLY1 | | DI13.OP |
| 40 | HT.LIMIT_H | | | USER.RLY2 | | DI13.DVT |
| 41 | HT.LIMIT_L | | | USER.RLY3 | | DI14.OP |
| 42 | RT.LIMIT_H | | | USER.RLY4 | | DI14.DVT |

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|----|-------------|--|--|------------|--|------------|
| 43 | RT.LIMIT_L | | | USER.RLY5 | | D115.OP |
| 44 | LT.LIMIT_H | | | USER.RLY6 | | D115.DVT |
| 45 | LT.LIMIT_L | | | USER.RLY7 | | D116.OP |
| 46 | DFR.LIMIT_H | | | USER.RLY8 | | D116.DVT |
| 47 | DFR.LIMIT_L | | | USER.RLY9 | | D11.DETECT |
| 48 | | | | USER.RLY10 | | D12.DETECT |
| 49 | | | | USER.RLY11 | | D13.DETECT |

| D-Reg. | INPUT 1 | INPUT 2 | OUTPUT | DO CONFIG 1 | DO CONFIG 2 | DI CONFIG 1 |
|--------|---------|---------|--------|-----------------|-------------|-------------|
| | 1200 | 1300 | 1400 | 1500 | 1600 | 1700 |
| 50 | | | | USER.RLY12 | | D14.DETECT |
| 51 | | | | USER.RLY_ON/OFF | | D15.DETECT |
| 52 | | | | LOG. OUTRLY1 | | D16.DETECT |
| 53 | | | | LOG.SRCRLYa1 | | D17.DETECT |
| 54 | | | | LOG.SRCRLYb1 | | D18.DETECT |
| 55 | | | | LOG.OPERAND1 | | D19.DETECT |
| 56 | | | | LOG. OUTRLY2 | | D110.DETECT |
| 57 | | | | LOG.SRCRLYa2 | | D111.DETECT |
| 58 | | | | LOG.SRCRLYb2 | | D112.DETECT |
| 59 | | | | LOG.OPERAND2 | | D113.DETECT |
| 60 | | | | LOG. OUTRLY3 | | D114.DETECT |
| 61 | | | | LOG.SRCRLYa3 | | D115.DETECT |
| 62 | | | | LOG.SRCRLYb3 | | D116.DETECT |
| 63 | | | | LOG.OPERAND3 | | |
| 64 | | | | RUN.RLY | | |
| 65 | | | | RUN.DYT | | |
| 66 | | | | HZD_ON.RLY | | |
| 67 | | | | HZD_ON.OPTM | | |
| 68 | | | | HZD_OFF.RLY | | |
| 69 | | | | HZD_OFF.OPTM | | |
| 70 | | | | RZD_ON.RLY | | |
| 71 | | | | RZD_ON.OPTM | | |
| 72 | | | | RZD_OFF.RLY | | |
| 73 | | | | RZD_OFF.OPTM | | |
| 74 | | | | LZD_ON.RLY | | |
| 75 | | | | LZD_ON.OPTM | | |
| 76 | | | | LZD_OFF.RLY | | |
| 77 | | | | LZD_OFF.OPTM | | |
| 78 | | | | HT_SOPN.RLY | | |
| 79 | | | | HT_SOPN.KPT | | |
| 80 | | | | LT_SOPN.RLY | | |
| 81 | | | | LT_SOPN.KPT | | |
| 82 | | | | EX_SOPN.RLY | | |
| 83 | | | | EX_SOPN.KPT | | |
| 84 | | | | PTEND.RLY | | |
| 85 | | | | PTEND.DLY | | |
| 86 | | | | PTEND.KPT | | |
| 87 | | | | ERROR.RLY | | |
| 88 | | | | ERROR.KPT | | |
| 89 | | | | HT_WAIT.RLY | | |
| 90 | | | | HT_WAIT.KPT | | |
| 91 | | | | LT_WAIT.RLY | | |

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|----|--|--|--|-------------|--|--|
| 92 | | | | LT_WAIT.KPT | | |
| 93 | | | | 1REF_RLY | | |
| 94 | | | | 1REF_DYT | | |
| 95 | | | | 2REF_RLY | | |
| 96 | | | | 2REF_DYT | | |
| 97 | | | | SOL.RLY | | |
| 98 | | | | SOL.POINT | | |
| 99 | | | | | | |

D-Register 1800 ~ 2399

| D-Reg. | DI CONFIG 2 | DI CONFIG 3 | INITIAL 1 | INITIAL 2 | PROGRAM | RESERVED |
|--------|-------------|-------------|----------------|------------|----------------|----------|
| | 1800 | 1900 | 2000 | 2100 | 2200 | 2300 |
| 0 | | | | LAMP_IS1 | | |
| 1 | DI1.NAME1 | DI9.NAME1 | LANGUAGE | LAMP_IS2 | COM_PTNO | |
| 2 | DI1.NAME2 | DI9.NAME2 | DISP.MODE | LAMP_IS3 | COM_SEGNO | |
| 3 | DI1.NAME3 | DI9.NAME3 | UKEY.USE | LAMP_IS4 | PTCOPY_START | |
| 4 | DI1.NAME4 | DI9.NAME4 | | LAMP_IS5 | PTCOPY_END | |
| 5 | DI1.NAME5 | DI9.NAME5 | | LAMP_IS6 | PTDEL_START | |
| 6 | DI1.NAME6 | DI9.NAME6 | INFORM1.NAME1 | LAMP_IS7 | PTDEL_END | |
| 7 | DI1.NAME7 | DI9.NAME7 | INFORM1.NAME2 | LAMP_IS8 | TRIGGER | |
| 8 | DI1.NAME8 | DI9.NAME8 | INFORM1.NAME3 | LAMP_TS1 | ANSWER | |
| 9 | DI1.NAME9 | DI9.NAME9 | INFORM1.NAME4 | LAMP_TS2 | | |
| 10 | DI1.NAME10 | DI9.NAME10 | INFORM1.NAME5 | LAMP_TS3 | | |
| 11 | DI1.NAME11 | DI9.NAME11 | INFORM1.NAME6 | LAMP_TS4 | PATTERN_NAME1 | |
| 12 | DI1.NAME12 | DI9.NAME12 | INFORM1.NAME7 | LAMP_AL1 | PATTERN_NAME2 | |
| 13 | DI2.NAME1 | DI10.NAME1 | INFORM1.NAME8 | LAMP_AL2 | PATTERN_NAME3 | |
| 14 | DI2.NAME2 | DI10.NAME2 | INFORM1.NAME9 | LAMP_AL3 | PATTERN_NAME4 | |
| 15 | DI2.NAME3 | DI10.NAME3 | INFORM1.NAME10 | LAMP_AL4 | PATTERN_NAME5 | |
| 16 | DI2.NAME4 | DI10.NAME4 | INFORM1.NAME11 | LAMP_HDON | PATTERN_NAME6 | |
| 17 | DI2.NAME5 | DI10.NAME5 | INFORM1.NAME12 | LAMP_HDOFF | PATTERN_NAME7 | |
| 18 | DI2.NAME6 | DI10.NAME6 | INFORM1.NAME13 | LAMP_RDON | PATTERN_NAME8 | |
| 19 | DI2.NAME7 | DI10.NAME7 | INFORM2.NAME1 | LAMP_RDOFF | PATTERN_NAME9 | |
| 20 | DI2.NAME8 | DI10.NAME8 | INFORM2.NAME2 | LAMP_LDON | PATTERN_NAME10 | |
| 21 | DI2.NAME9 | DI10.NAME9 | INFORM2.NAME3 | LAMP_LDOFF | PATTERN_NAME11 | |
| 22 | DI2.NAME10 | DI10.NAME10 | INFORM2.NAME4 | LAMP_HFAN | PATTERN_NAME12 | |
| 23 | DI2.NAME11 | DI10.NAME11 | INFORM2.NAME5 | LAMP_RFAN | | |
| 24 | DI2.NAME12 | DI10.NAME12 | INFORM2.NAME6 | LAMP_LFAN | | |
| 25 | DI3.NAME1 | DI11.NAME1 | INFORM2.NAME7 | LAMP_RUN | | |
| 26 | DI3.NAME2 | DI11.NAME2 | INFORM2.NAME8 | LAMP_1REF | PT.TYPE | |
| 27 | DI3.NAME3 | DI11.NAME3 | INFORM2.NAME9 | LAMP_2REF | PT.RPT | |
| 28 | DI3.NAME4 | DI11.NAME4 | INFORM2.NAME10 | LAMP_DI1 | PT.EMODE | |
| 29 | DI3.NAME5 | DI11.NAME5 | INFORM2.NAME11 | LAMP_DI2 | HT.TSP | |
| 30 | DI3.NAME6 | DI11.NAME6 | INFORM2.NAME12 | LAMP_DI3 | HT.ZONETIME_H | |
| 31 | DI3.NAME7 | DI11.NAME7 | INFORM2.NAME13 | LAMP_DI4 | HT.ZONETIME_L | |
| 32 | DI3.NAME8 | DI11.NAME8 | INFORM3.NAME1 | LAMP_DI5 | HT.PSP | |
| 33 | DI3.NAME9 | DI11.NAME9 | INFORM3.NAME2 | LAMP_DI6 | HT.TS1 | |
| 34 | DI3.NAME10 | DI11.NAME10 | INFORM3.NAME3 | LAMP_DI7 | HT.TS2 | |
| 35 | DI3.NAME11 | DI11.NAME11 | INFORM3.NAME4 | LAMP_DI8 | HT.TS3 | |
| 36 | DI3.NAME12 | DI11.NAME12 | INFORM3.NAME5 | LAMP_DI9 | HT.TS4 | |

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| 37 | D14.NAME1 | D112.NAME1 | INFORM3.NAME6 | LAMP_D110 | HT.WAIT | |
| 38 | D14.NAME2 | D112.NAME2 | INFORM3.NAME7 | LAMP_D111 | RT.TSP | |
| 39 | D14.NAME3 | D112.NAME3 | INFORM3.NAME8 | LAMP_D112 | RT.ZONETIME_H | |
| 40 | D14.NAME4 | D112.NAME4 | INFORM3.NAME9 | LAMP_D113 | RT.ZONETIME_L | |
| 41 | D14.NAME5 | D112.NAME5 | INFORM3.NAME10 | LAMP_D114 | RT.PSP | |
| 42 | D14.NAME6 | D112.NAME6 | INFORM3.NAME11 | LAMP_D115 | RT.TS1 | |
| 43 | D14.NAME7 | D112.NAME7 | INFORM3.NAME12 | LAMP_D116 | RT.TS2 | |
| 44 | D14.NAME8 | D112.NAME8 | INFORM3.NAME13 | LAMP_SD | RT.TS3 | |
| 45 | D14.NAME9 | D112.NAME9 | | LAMP_N2GAS | RT.TS4 | |
| 46 | D14.NAME10 | D112.NAME10 | | LAMP_HZONE | LT.TSP | |
| 47 | D14.NAME11 | D112.NAME11 | | LAMP_RZONE | LT.ZONETIME_H | |
| 48 | D14.NAME12 | D112.NAME12 | | LAMP_LZONE | LT.ZONETIME_L | |
| 49 | D15.NAME1 | D113.NAME1 | | LAMP_DFR | LT.PSP | |

| D-Reg. | DI CONFIG 2 | DI CONFIG 3 | INITIAL 1 | INITIAL 2 | PROGRAM | RESERVED |
|--------|-------------|-------------|-----------|-----------|-----------|----------|
| | 1800 | 1900 | 2000 | 2100 | 2200 | 2300 |
| 50 | D15.NAME2 | D113.NAME2 | | | LT.TS1 | |
| 51 | D15.NAME3 | D113.NAME3 | | | LT.TS2 | |
| 52 | D15.NAME4 | D113.NAME4 | | | LT.TS3 | |
| 53 | D15.NAME5 | D113.NAME5 | | | LT.TS4 | |
| 54 | D15.NAME6 | D113.NAME6 | | | LT.WAIT | |
| 55 | D15.NAME7 | D113.NAME7 | | | DFR.CYCLE | |
| 56 | D15.NAME8 | D113.NAME8 | | | DFR.SP | |
| 57 | D15.NAME9 | D113.NAME9 | | | DFR.TIME | |
| 58 | D15.NAME10 | D113.NAME10 | | | | |
| 59 | D15.NAME11 | D113.NAME11 | | | | |
| 60 | D15.NAME12 | D113.NAME12 | | | | |
| 61 | D16.NAME1 | D114.NAME1 | | | | |
| 62 | D16.NAME2 | D114.NAME2 | | | | |
| 63 | D16.NAME3 | D114.NAME3 | | | | |
| 64 | D16.NAME4 | D114.NAME4 | | | | |
| 65 | D16.NAME5 | D114.NAME5 | | | | |
| 66 | D16.NAME6 | D114.NAME6 | | | | |
| 67 | D16.NAME7 | D114.NAME7 | | | | |
| 68 | D16.NAME8 | D114.NAME8 | | | | |
| 69 | D16.NAME9 | D114.NAME9 | | | | |
| 70 | D16.NAME10 | D114.NAME10 | | | | |
| 71 | D16.NAME11 | D114.NAME11 | | | | |
| 72 | D16.NAME12 | D114.NAME12 | | | | |
| 73 | D17.NAME1 | D115.NAME1 | | | | |
| 74 | D17.NAME2 | D115.NAME2 | | | | |
| 75 | D17.NAME3 | D115.NAME3 | | | | |
| 76 | D17.NAME4 | D115.NAME4 | | | | |
| 77 | D17.NAME5 | D115.NAME5 | | | | |
| 78 | D17.NAME6 | D115.NAME6 | | | | |
| 79 | D17.NAME7 | D115.NAME7 | | | | |
| 80 | D17.NAME8 | D115.NAME8 | | | | |
| 81 | D17.NAME9 | D115.NAME9 | | | | |
| 82 | D17.NAME10 | D115.NAME10 | | | | |
| 83 | D17.NAME11 | D115.NAME11 | | | | |
| 84 | D17.NAME12 | D115.NAME12 | | | | |
| 85 | D18.NAME1 | D116.NAME1 | | | | |

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|----|------------|-------------|--|--|--|--|
| 86 | D18.NAME2 | D116.NAME2 | | | | |
| 87 | D18.NAME3 | D116.NAME3 | | | | |
| 88 | D18.NAME4 | D116.NAME4 | | | | |
| 89 | D18.NAME5 | D116.NAME5 | | | | |
| 90 | D18.NAME6 | D116.NAME6 | | | | |
| 91 | D18.NAME7 | D116.NAME7 | | | | |
| 92 | D18.NAME8 | D116.NAME8 | | | | |
| 93 | D18.NAME9 | D116.NAME9 | | | | |
| 94 | D18.NAME10 | D116.NAME10 | | | | |
| 95 | D18.NAME11 | D116.NAME11 | | | | |
| 96 | D18.NAME12 | D116.NAME12 | | | | |
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