



SP790

INSTRUCTION MANUAL

PROGRAMMABLE CONTROLLER

Contents (I : User's Guide)

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


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Contents (II : Communication User's Guide)

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1. Safety Guide

The following safety symbols are used in this manual.

- (A) If this symbol is marked on the product, the operator must investigate the explanation given in this manual to protect injury or death to personnel or damage to instrument.
-  CAUTION (1) For Production : It should be marked when operator must refer the explanation in the manual to avoid loss of life or damage to instrument.
(2) For Instruction Manual : It marks to avoid operator's loss of life and injury that may result comes from Electric Shock.
- (B) Protective Ground Terminal
 It marks the terminal must be connected to Ground prior to operating the equipment.
- (C) It marks additional Information on the operation and features of the product.
 NOTE
- (D) It marks for further information on the current topic and pages.




Precautions on this instruction Manual

- (1) This Manual should be passed on the end User and keep a suitable place for operator to study and check the function of the product.
- (2) Operator should carefully study, understand how to operate this product before.
- (3) This manual is describing the functions of the product. We, Samwontech, does not warrant that the functions will suit a particular purpose.
- (4) Under absolutely no circumstance may the contents of this manual in part or in whole be transcribed or copied without permission.
- (5) All contents of this manual has been made to ensure accuracy in the preparation. However, should any errors or omissions come to the attention of the user, feel free to contact our sales representatives or our sales office.



Regarding Safety and Unauthorized Modification

- (1) In order to protect this product and the system controlled by it against damage and ensure its safe use, make certain that all of the safety instructions and precautions in this manual are strictly adhered to.
- (2) We, Samwontech, are not guarantee safety if the products are not handled according to this instruction manuals.
- (3) If separate protection or safety circuits are to be installed for this product or the system which is controlled by this product, ensure that such circuits are installed external to the product.
- (4) Don't try to make modifications or additions internal to the product. It may becomes electric shock, burn or out of order.
- (5) In case of replacement parts or consumables of the product, must call to our sales office.
- (6) Protect this product from moisture. It may becomes out of order.
- (7) Protect any kind of shock and vibration to the product. It may becomes product defects and out of order.



Regarding an exemption from responsibility

- (1) Samwontech co., Ltd does not make any warranties regarding the product except Warranty conditions those mentioned in this manual.
- (2) We 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.



Regarding the production Quality Assurance.

- (1) The guaranteed period of the production quality assurance is one year after end user buy it and it will be free to fix defected product under regular usage described by this manual.
- (2) It will be charged to fix defected product after warranty period. This charge will announced by our actual cost to be calculated during the fixing time.
- (3) It will be charging even if within warranty period as following events.
 - (3.1) Defect by operator and user's default.(forget password, production initialize)
 - (3.2) Natural disaster.(fire, water flow etc)
 - (3.3) Additional shift after 1st installed.
 - (3.4) Improperly repaired, or altered, modified in anyway.
 - (3.5) Power failure in unstable power condition.
- (4) Feel free to contact our sales office whenever it need to make A/S.



Environmental precautions for installation.

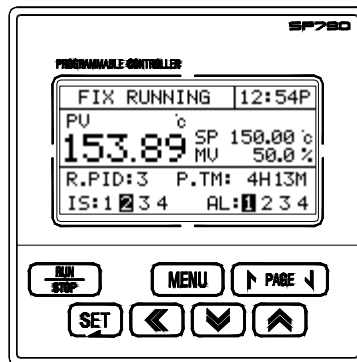
- (1) Be sure to operate the controller installed on a panel to prevent electric shock.
- (2) To install the controller, do select a location where:
 - No one may accidentally touch terminal.
 - Mechanical vibrations are minimal.
 - No corrosive gas is prevent.
 - Temperature fluctuation is minimal.
 - Temperature can be maintained. (50 °C below / 10 °C over)
 - No direct heat radiation is present.
 - No magnetic disturbances are caused.
 - No water is splashed.
 - No flammable materials are around.
 - No wind blows. (prevent Dust with salt)
 - No ultraviolet rays are present.
 - Pollution Degree 2
 - Installation Category II
 - Do not block openings
 - If the equipment is used in a manner not specified by the manufacturer, the protection provided by the equipment may be impaired.
 - A switch or circuit-breaker acting as the disconnect device shall be included in the application or the building installation.



Precautions of Controller Mounting.

- Keep the input circuit wiring as far as possible away from power and ground circuit.
- Keep the controllers in 10°C ~ 50°C/ 20 % ~ 90 % RH,
Warming up needed to use controller when temperature is below 10°C in advance.
- Do not mount front panel facing downward.
- To prevent electric shock, be sure to turn off and the source circuit breaker before wiring.
- The power consumptions are 100~240VAC, 50/60Hz, 15VAmx and operate without power switching in advance.
- No work in wet hands. (it caused electric shock)
- Follow operation by precaution in the manual to avoid fire, electric shock, loss of life etc.
- Requested to follow mounting and operation methods just indicated in this manual.
- Refer the way of grounding connection, however, keep away for grounding to Gas pipe, water pipe, lightning rod etc.
- Be sure not to power connection before finishing of wiring between each contact point.
- Not close and wrapping the heat hole in back case of controller.

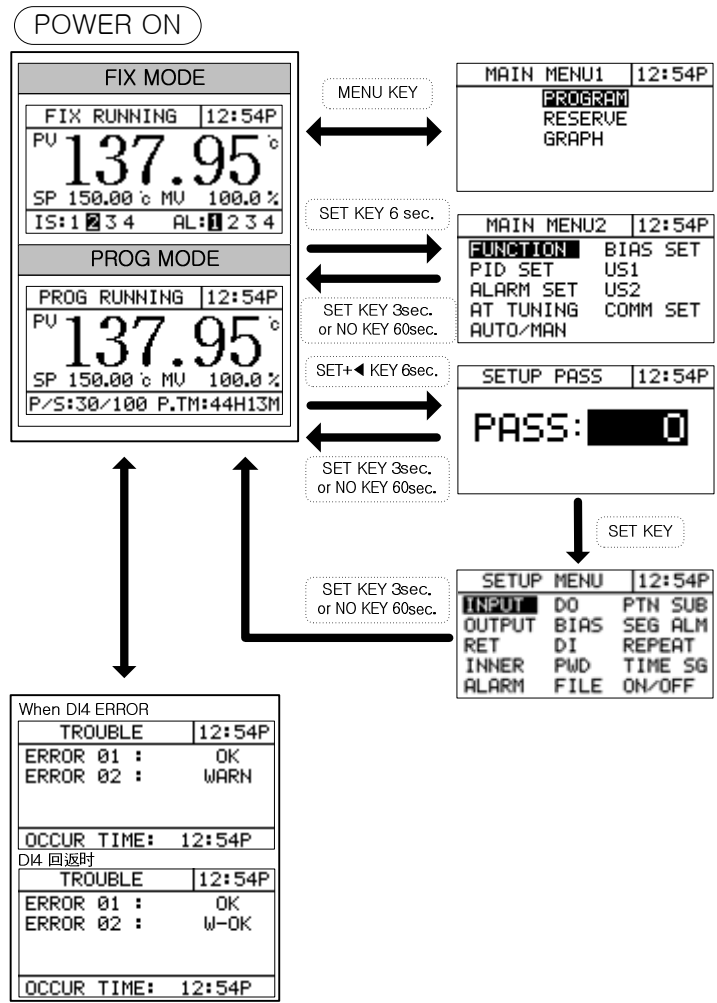
2. Control Keys and Display



Control Keys

| KEY | DESCRIPTION |
|-----|--|
| | Run / Stop controller (Pressing the key at least 3 sec.) |
| | Switching between running and main menu page Change the up level page on the parameter setting page |
| | Switches to next page on the same level |
| | Switches to previous page on the same level |
| | Change to page on the menu Switching between parameters or registering parameter settings |
| | Move left / right on the parameter setting page Shifting position to modify value |
| | Decrease the value of parameters Change to other available items Move between GROUP |
| | Increase the value of parameters Change to other available items Move between GROUP |

3. Basic Flow Map



4. Setting Up Parameter in Each Group

4.1 NORMAL Operation

4.1.1 FIX AUTO MODE

| | | | | | | | | | | | | | | | |
|---|-------------|--------|----|-----------|----|-----------|---------|---------|--|-------------|------|-------|---|-------|--|
| <table border="1"> <tr><td>FIX STOP</td><td>12:54P</td></tr> <tr><td>PV</td><td>137.95 °C</td></tr> <tr><td>SP</td><td>150.00 °C</td></tr> <tr><td colspan="2">READY</td></tr> </table> | FIX STOP | 12:54P | PV | 137.95 °C | SP | 150.00 °C | READY | | <p>FIX Mode is controlling Temperature & Humidity with fixed SP. FIX STOP : Stop state SP : Set point (Setting by "SET" key) READY : Ready to running Start running by "RUN/STOP" key</p> | | | | | | |
| FIX STOP | 12:54P | | | | | | | | | | | | | | |
| PV | 137.95 °C | | | | | | | | | | | | | | |
| SP | 150.00 °C | | | | | | | | | | | | | | |
| READY | | | | | | | | | | | | | | | |
| <table border="1"> <tr><td>FIX RUNNING</td><td>12:54P</td></tr> <tr><td>PV</td><td>137.95 °C</td></tr> <tr><td>SP</td><td>150.00 °C</td></tr> <tr><td>MV</td><td>100.0 %</td></tr> <tr><td>IS:1</td><td>2 3 4</td></tr> <tr><td>AL:</td><td>2 3 4</td></tr> </table> | FIX RUNNING | 12:54P | PV | 137.95 °C | SP | 150.00 °C | MV | 100.0 % | IS:1 | 2 3 4 | AL: | 2 3 4 | <p>FIX running 1st screen PV : Process value of temperature FIX RUNNING : Fix running state IS : State of Inner Signal AL : State of Alarm Signal</p> | | |
| FIX RUNNING | 12:54P | | | | | | | | | | | | | | |
| PV | 137.95 °C | | | | | | | | | | | | | | |
| SP | 150.00 °C | | | | | | | | | | | | | | |
| MV | 100.0 % | | | | | | | | | | | | | | |
| IS:1 | 2 3 4 | | | | | | | | | | | | | | |
| AL: | 2 3 4 | | | | | | | | | | | | | | |
| <table border="1"> <tr><td>FIX RUNNING</td><td>12:54P</td></tr> <tr><td>PV</td><td>153.89 °C</td></tr> <tr><td>SP</td><td>150.00 °C</td></tr> <tr><td>MV</td><td>50.0 %</td></tr> <tr><td>R.PID:3</td><td>P.TM: 4H13M</td></tr> <tr><td>IS:1</td><td>2 3 4</td></tr> <tr><td>AL:</td><td>2 3 4</td></tr> </table> | FIX RUNNING | 12:54P | PV | 153.89 °C | SP | 150.00 °C | MV | 50.0 % | R.PID:3 | P.TM: 4H13M | IS:1 | 2 3 4 | AL: | 2 3 4 | <p>FIX running 2nd screen MV : State of Output R.PID(RUN PID NUMBER) : Running PID Number P.TM(PROCESS TIME) : Running Time</p> |
| FIX RUNNING | 12:54P | | | | | | | | | | | | | | |
| PV | 153.89 °C | | | | | | | | | | | | | | |
| SP | 150.00 °C | | | | | | | | | | | | | | |
| MV | 50.0 % | | | | | | | | | | | | | | |
| R.PID:3 | P.TM: 4H13M | | | | | | | | | | | | | | |
| IS:1 | 2 3 4 | | | | | | | | | | | | | | |
| AL: | 2 3 4 | | | | | | | | | | | | | | |
| <table border="1"> <tr><td>FIX STOP</td><td>12:54P</td></tr> <tr><td>PV</td><td>137.95 °C</td></tr> <tr><td>SP</td><td>150.00 °C</td></tr> <tr><td colspan="2">FIX END</td></tr> </table> | FIX STOP | 12:54P | PV | 137.95 °C | SP | 150.00 °C | FIX END | | <p>FIX END : End of FIX Operation</p> | | | | | | |
| FIX STOP | 12:54P | | | | | | | | | | | | | | |
| PV | 137.95 °C | | | | | | | | | | | | | | |
| SP | 150.00 °C | | | | | | | | | | | | | | |
| FIX END | | | | | | | | | | | | | | | |
| <table border="1"> <tr><td>AUTO TUNING</td><td>12:54P</td></tr> <tr><td>PV</td><td>137.95 °C</td></tr> <tr><td>SP</td><td>150.00 °C</td></tr> <tr><td>MV</td><td>100.0 %</td></tr> <tr><td>IS:1</td><td>2 3 4</td></tr> <tr><td>AL:</td><td>2 3 4</td></tr> </table> | AUTO TUNING | 12:54P | PV | 137.95 °C | SP | 150.00 °C | MV | 100.0 % | IS:1 | 2 3 4 | AL: | 2 3 4 | <p>AUTO TUNING screen It is same as Operation screen</p> | | |
| AUTO TUNING | 12:54P | | | | | | | | | | | | | | |
| PV | 137.95 °C | | | | | | | | | | | | | | |
| SP | 150.00 °C | | | | | | | | | | | | | | |
| MV | 100.0 % | | | | | | | | | | | | | | |
| IS:1 | 2 3 4 | | | | | | | | | | | | | | |
| AL: | 2 3 4 | | | | | | | | | | | | | | |

4.1.2.FIX MANUAL MODE

| | |
|--|---|
| | FIX STOP : Stop state MAN READY : Ready to running Start running by "RUN/STOP" key for 3 sec. |
| | FIX running 1st screen (Standard Type) PV : Present Value of temperature IS : State of Inner Signal AL : State of Alarm Signal |
| | FIX END : End of FIX Operation |

| SYMBOL | PARAMETER | RANGE | DISPLAY | UNIT | DEFAULT | EDIT |
|--------|----------------|-----------------------|---------------|------|----------|------|
| SP | SET POINT | EU(0.0 ~ 100.0%) | Always | EU | EU(0.0%) | ○ |
| MV | MV | 0.0 ~ 100.0% | STD type | % | × | X |
| | | -50.0 ~ 107.5% | MAN Operation | % | × | ○ |
| R.PID | RUN PID NUMBER | 1 ~ 4 | Always | ABS | × | X |
| P.TM | PROCESS TIME | 00H00M ~ 99H59M | Always | TIME | 00H00M | X |
| IS | INNER SIGNAL | 1 ~ 4 (Display State) | Always | ABS | × | X |
| AL | ALARM | 1 ~ 4 (Display State) | Always | ABS | × | X |

4.1.3 PROG MODE

| | | | | | | | | | | | |
|---|--------------|--------|-------|-----------|--------------|------------|------------------------|--|---|--|--|
| <table border="1"> <tr><td>PROG STOP</td><td>12:54P</td></tr> <tr><td>PV</td><td>137.95 °C</td></tr> <tr><td>PTNO 30</td><td>SEGNO 100</td></tr> <tr><td colspan="2">READY</td></tr> </table> | PROG STOP | 12:54P | PV | 137.95 °C | PTNO 30 | SEGNO 100 | READY | | <p>PROG Mode is controlling Temperature with programmed data. PTNO : Set pattern No.(Set with "SET" key) SEGNO : Start segment No. READY : Ready to running Start running by "RUN/STOP" key</p> | | |
| PROG STOP | 12:54P | | | | | | | | | | |
| PV | 137.95 °C | | | | | | | | | | |
| PTNO 30 | SEGNO 100 | | | | | | | | | | |
| READY | | | | | | | | | | | |
| <table border="1"> <tr><td>PROG RUNNING</td><td>12:54P</td></tr> <tr><td>PV</td><td>137.95 °C</td></tr> <tr><td>SP 150.00 °C</td><td>MU 100.0 %</td></tr> <tr><td colspan="2">P/S:30/100 P.TM:44H13M</td></tr> </table> | PROG RUNNING | 12:54P | PV | 137.95 °C | SP 150.00 °C | MU 100.0 % | P/S:30/100 P.TM:44H13M | | <p>PROG running 1st screen PROG RUNNING : Prog running state P/S : Running PATTERN & SEGMENT P.TM(PROCESS TIME) : Running time</p> | | |
| PROG RUNNING | 12:54P | | | | | | | | | | |
| PV | 137.95 °C | | | | | | | | | | |
| SP 150.00 °C | MU 100.0 % | | | | | | | | | | |
| P/S:30/100 P.TM:44H13M | | | | | | | | | | | |
| <table border="1"> <tr><td>PROG RUNNING</td><td>12:54P</td></tr> <tr><td>PV</td><td>153.89 °C</td></tr> <tr><td>SP 150.00 °C</td><td>MU 50.0 %</td></tr> <tr><td colspan="2">R.PID:3 RM.TM: 4H13M</td></tr> <tr><td colspan="2">TS:1 2 3 4 5 IS:1 2 3 4</td></tr> </table> | PROG RUNNING | 12:54P | PV | 153.89 °C | SP 150.00 °C | MU 50.0 % | R.PID:3 RM.TM: 4H13M | | TS:1 2 3 4 5 IS:1 2 3 4 | | <p>PROG running 2nd screen R.PID : Running PID No.(Figure 12) RM.TM : Remaind running time TS : State of Time Signal IS : State of Inner Signal</p> |
| PROG RUNNING | 12:54P | | | | | | | | | | |
| PV | 153.89 °C | | | | | | | | | | |
| SP 150.00 °C | MU 50.0 % | | | | | | | | | | |
| R.PID:3 RM.TM: 4H13M | | | | | | | | | | | |
| TS:1 2 3 4 5 IS:1 2 3 4 | | | | | | | | | | | |
| <table border="1"> <tr><td>PROG RUNNING</td><td>12:54P</td></tr> <tr><td>PV</td><td>153.89 °C</td></tr> <tr><td>SP 150.00 °C</td><td>MU 50.0 %</td></tr> <tr><td colspan="2">RUNNING PT/SG: 30/100</td></tr> <tr><td colspan="2">S.AL:1 2 3 4 AL:1 2 3 4</td></tr> </table> | PROG RUNNING | 12:54P | PV | 153.89 °C | SP 150.00 °C | MU 50.0 % | RUNNING PT/SG: 30/100 | | S.AL:1 2 3 4 AL:1 2 3 4 | | <p>PROG running 3rd screen When HOLD ON, display held PT and SEG When HOLD OFF, display running state S.AL : State of Segment Alarm Signal AL : State of Alarm Signal</p> |
| PROG RUNNING | 12:54P | | | | | | | | | | |
| PV | 153.89 °C | | | | | | | | | | |
| SP 150.00 °C | MU 50.0 % | | | | | | | | | | |
| RUNNING PT/SG: 30/100 | | | | | | | | | | | |
| S.AL:1 2 3 4 AL:1 2 3 4 | | | | | | | | | | | |
| <table border="1"> <tr><td>PROG RUNNING</td><td>12:54P</td></tr> <tr><td>PV</td><td>153.89 °C</td></tr> <tr><td>SP 150.00 °C</td><td>MU 50.0 %</td></tr> <tr><td colspan="2">HOLDING PT/SG: 30/100</td></tr> <tr><td colspan="2">S.AL:1 2 3 4 AL:1 2 3 4</td></tr> </table> | PROG RUNNING | 12:54P | PV | 153.89 °C | SP 150.00 °C | MU 50.0 % | HOLDING PT/SG: 30/100 | | S.AL:1 2 3 4 AL:1 2 3 4 | | <p>PROG running 3rd screen (HOLDING screen) When HOLD ON, display held PT and SEG When HOLD OFF, display running state S.AL : State of Segment Alarm Signal AL : State of Alarm Signal</p> |
| PROG RUNNING | 12:54P | | | | | | | | | | |
| PV | 153.89 °C | | | | | | | | | | |
| SP 150.00 °C | MU 50.0 % | | | | | | | | | | |
| HOLDING PT/SG: 30/100 | | | | | | | | | | | |
| S.AL:1 2 3 4 AL:1 2 3 4 | | | | | | | | | | | |
| <table border="1"> <tr><td>PROG RUNNING</td><td>12:54P</td></tr> <tr><td>HOLD:</td><td>OFF</td></tr> <tr><td>STEP:</td><td>OFF</td></tr> <tr><td colspan="2">PTNO: 30 SEGNO:100</td></tr> <tr><td colspan="2">DOWN SOAK UP WAIT</td></tr> </table> | PROG RUNNING | 12:54P | HOLD: | OFF | STEP: | OFF | PTNO: 30 SEGNO:100 | | DOWN SOAK UP WAIT | | <p>PROG running 4th screen HOLD : "HOLD ON" or "HOLD OFF" with presents SP STEP : Stop to present segment then step to next segment DOWN : Going down zone SOAK : Gong stable zone UP : Going up zone WAIT : Going wait zone</p> |
| PROG RUNNING | 12:54P | | | | | | | | | | |
| HOLD: | OFF | | | | | | | | | | |
| STEP: | OFF | | | | | | | | | | |
| PTNO: 30 SEGNO:100 | | | | | | | | | | | |
| DOWN SOAK UP WAIT | | | | | | | | | | | |
| <table border="1"> <tr><td>PROG STOP</td><td>12:54P</td></tr> <tr><td>PV</td><td>137.95 °C</td></tr> <tr><td>PTNO 30</td><td>SEGNO 100</td></tr> <tr><td colspan="2">PATTERN END</td></tr> </table> | PROG STOP | 12:54P | PV | 137.95 °C | PTNO 30 | SEGNO 100 | PATTERN END | | <p>PATTERN END : End of Pattern Operation</p> | | |
| PROG STOP | 12:54P | | | | | | | | | | |
| PV | 137.95 °C | | | | | | | | | | |
| PTNO 30 | SEGNO 100 | | | | | | | | | | |
| PATTERN END | | | | | | | | | | | |

| | |
|---|--|
| AUTO TUNING 12:54P PU 137.95 °C SP 150.00 °C MV 100.0 % P/S:30/100 P.TM:44H13M | AUTO TUNING screen It is same as Operation screen |
|---|--|

| SYMBOL | PARAMETER | RANGE | DISPLAY | UNIT | DEFAULT | EDIT |
|----------------------|----------------------|-----------------------|-----------|------|---------|------|
| SP | SET POINT | EU(0.0 ~ 100.0%) | Always | EU | × | X |
| MV | MV | 0.0 ~ 100.0% | S`TD Type | % | 0.0% | X |
| P/S | PATTERN / SEGMENT | 1~30 / 1~100 | Always | ABS | 1 / 1 | X |
| P.TM | PROCESS TIME | 00H00M ~ 99H59M | Always | TIME | 00H00M | X |
| R.PID | RUN PID NUMBER | 1 ~ 4 | Always | ABS | × | X |
| RM.TM | REMAIN TIME | 00H00M~99H59M (TMU) | Always | TIME | × | X |
| TS | TIME SIGNAL | 1 ~ 5 (Display State) | Always | ABS | × | X |
| IS | INNER SIGNAL | 1 ~ 4 (Display State) | Always | ABS | × | X |
| RUNNING PT/SG | RUNNING PT/SG | 1~30 / 1~100 | Always | ABS | × | X |
| HOLDING PT/SG | HOLDING PT/SG | 1~30 / 1~100 | Always | ABS | × | X |
| AL | ALARM | 1 ~ 4 (Display State) | Always | ABS | × | X |
| HOLD | HOLD | OFF, ON | Always | ABS | OFF | ○ |
| STEP | STEP | OFF, ON | Always | ABS | OFF | ○ |
| PTNO *1 | PATTERN NUMBER | 1 ~ 30 | Always | ABS | × | X |
| PTNO *注2 | PATTERN NUMBER | 0 ~ 30 | Always | ABS | 0 | ○ |
| SEG NO | SEGMENT NUMBER | 1~100 | Always | ABS | × | X |
| DOWN, SOAK, UP, WAIT | DOWN, SOAK, UP, WAIT | Display State | Always | ABS | × | X |

*1 : 4th Operation screen



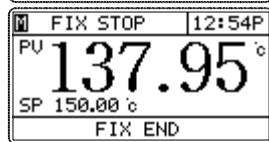
*2 : STOP screen

4.2 H/C OPERATION SCREEN

4.2.1 FIX AUTO MODE

| | | | | | | | | | | | | | | | |
|--|-----------------|--------|----|-----------|----|-----------|---------|-----------------|---|-------|---------|-------------|------------|-----------|---|
| <table border="1"> <tr> <td>FIX STOP</td> <td>12:54P</td> </tr> <tr> <td>PV</td> <td>137.95 °C</td> </tr> <tr> <td>SP</td> <td>150.00 °C</td> </tr> <tr> <td colspan="2">READY</td> </tr> </table> | FIX STOP | 12:54P | PV | 137.95 °C | SP | 150.00 °C | READY | | <p>FIX Mode is controlling Temperature & Humidity with fixed SP. FIX STOP : Stop state SP : Set point (Setting by "SET" key) READY : Ready to running Start running by "RUN/STOP" key for 3 sec.</p> | | | | | | |
| FIX STOP | 12:54P | | | | | | | | | | | | | | |
| PV | 137.95 °C | | | | | | | | | | | | | | |
| SP | 150.00 °C | | | | | | | | | | | | | | |
| READY | | | | | | | | | | | | | | | |
| <table border="1"> <tr> <td>FIX RUNNING</td> <td>12:54P</td> </tr> <tr> <td>PV</td> <td>137.95 °C</td> </tr> <tr> <td>SP</td> <td>150.00 °C</td> </tr> <tr> <td>HMU</td> <td>20.0% CMU 20.0%</td> </tr> </table> | FIX RUNNING | 12:54P | PV | 137.95 °C | SP | 150.00 °C | HMU | 20.0% CMU 20.0% | <p>FIX running 1st screen (H/C Type) PV : Process value of temperature FIX RUNNING : Fix running state HMV : State of HEAT Output CMV : State of COOL Output</p> | | | | | | |
| FIX RUNNING | 12:54P | | | | | | | | | | | | | | |
| PV | 137.95 °C | | | | | | | | | | | | | | |
| SP | 150.00 °C | | | | | | | | | | | | | | |
| HMU | 20.0% CMU 20.0% | | | | | | | | | | | | | | |
| <table border="1"> <tr> <td>FIX RUNNING</td> <td>12:54P</td> </tr> <tr> <td>PV</td> <td>153.89 °C</td> </tr> <tr> <td>SP</td> <td>150.00 °C</td> </tr> <tr> <td>HMU</td> <td>20.0%</td> </tr> <tr> <td>CMU</td> <td>20.0%</td> </tr> <tr> <td>R.PID:3</td> <td>P.TM: 4H13M</td> </tr> <tr> <td>IS:1 2 3 4</td> <td>AL: 2 3 4</td> </tr> </table> | FIX RUNNING | 12:54P | PV | 153.89 °C | SP | 150.00 °C | HMU | 20.0% | CMU | 20.0% | R.PID:3 | P.TM: 4H13M | IS:1 2 3 4 | AL: 2 3 4 | <p>FIX running 2nd screen (H/C Type) R.PID(RUN PID NUMBER) : Running PID Number P.TM(PROCESS TIME) : Running Time IS : State of Inner Signal AL : State of Alarm Signal</p> |
| FIX RUNNING | 12:54P | | | | | | | | | | | | | | |
| PV | 153.89 °C | | | | | | | | | | | | | | |
| SP | 150.00 °C | | | | | | | | | | | | | | |
| HMU | 20.0% | | | | | | | | | | | | | | |
| CMU | 20.0% | | | | | | | | | | | | | | |
| R.PID:3 | P.TM: 4H13M | | | | | | | | | | | | | | |
| IS:1 2 3 4 | AL: 2 3 4 | | | | | | | | | | | | | | |
| <table border="1"> <tr> <td>FIX STOP</td> <td>12:54P</td> </tr> <tr> <td>PV</td> <td>137.95 °C</td> </tr> <tr> <td>SP</td> <td>150.00 °C</td> </tr> <tr> <td colspan="2">FIX END</td> </tr> </table> | FIX STOP | 12:54P | PV | 137.95 °C | SP | 150.00 °C | FIX END | | <p>FIX END : End of Fix Operation</p> | | | | | | |
| FIX STOP | 12:54P | | | | | | | | | | | | | | |
| PV | 137.95 °C | | | | | | | | | | | | | | |
| SP | 150.00 °C | | | | | | | | | | | | | | |
| FIX END | | | | | | | | | | | | | | | |
| <table border="1"> <tr> <td>AUTO TUNING</td> <td>12:54P</td> </tr> <tr> <td>PV</td> <td>137.95 °C</td> </tr> <tr> <td>SP</td> <td>150.00 °C</td> </tr> <tr> <td>HMU</td> <td>100.0% CMU 0.0%</td> </tr> </table> | AUTO TUNING | 12:54P | PV | 137.95 °C | SP | 150.00 °C | HMU | 100.0% CMU 0.0% | <p>AUTO TUNING screen. It is same as Operation screen</p> | | | | | | |
| AUTO TUNING | 12:54P | | | | | | | | | | | | | | |
| PV | 137.95 °C | | | | | | | | | | | | | | |
| SP | 150.00 °C | | | | | | | | | | | | | | |
| HMU | 100.0% CMU 0.0% | | | | | | | | | | | | | | |

4.2.2 FIX MANUAL MODE

| | |
|--|--|
|  | <p>FIX STOP : Stop state SP : Set point (Setting by "SET" key) READY : Ready to running Start running by "RUN/STOP" key for 3 sec.</p> |
|  | <p>FIX running 1st screen (H/C Type) PV : Process value of temperature FIX RUNNING : Fix running state HMV : State of HEAT Output CMV : State of COOL Output</p> |
|  | <p>FIX END : End of Fix Operation</p> |

| SYMBOL | PARAMETER | RANGE | DISPLAY | UNIT | DEFAULT | EDIT |
|--------|----------------|------------------|-----------|------|----------|------|
| SP | SET POINT | EU(0.0 ~ 100.0%) | Always | EU | EU(0.0%) | O |
| MV | MV | 0.0 ~ 100.0% | S*TD type | % | x | X |
| | | -50.0 ~ 107.5% | MAN. Op. | % | x | O |
| HMV | HMV | 0.0 ~ 100.0% | H/C Op. | % | 0.0% | X |
| CMV | CMV | 0.0 ~ 100.0% | H/C Op. | % | 0.0% | X |
| R.PID | RUN PID NUMBER | 1 ~ 4 | Always | ABS | x | X |
| P.TM | PROCESS TIME | 00H00M ~ 99H59M | Always | TIME | 00H00M | X |
| IS | INNER SIGNAL | 1 ~ 4 | Always | ABS | x | X |
| AL | ALARM | 1 ~ 4 | Always | ABS | x | X |

4.2.3 PROG MODE

| | | | | | | | | | | | | | | | | | | | |
|---|--------------|--------|------|-----------|------|-----------|-------|--------|-------|-------|--|--------|---|---------|--|-----------|---|---------|---|
| <table border="1"> <tr><td>PROG STOP</td><td>12:54P</td></tr> <tr><td>PU</td><td>137.95 °C</td></tr> <tr><td>PTNO</td><td>30</td></tr> <tr><td>SEGNO</td><td>100</td></tr> <tr><td>READY</td><td></td></tr> </table> | PROG STOP | 12:54P | PU | 137.95 °C | PTNO | 30 | SEGNO | 100 | READY | | <p>PROG Mode is controlling Temperature with programmed data. PTNO : Set pattern No.(Set with "SET" key) SEGNO : Start segment No. READY : Ready to running Start running by "RUN/STOP" key for 3 sec.</p> | | | | | | | | |
| PROG STOP | 12:54P | | | | | | | | | | | | | | | | | | |
| PU | 137.95 °C | | | | | | | | | | | | | | | | | | |
| PTNO | 30 | | | | | | | | | | | | | | | | | | |
| SEGNO | 100 | | | | | | | | | | | | | | | | | | |
| READY | | | | | | | | | | | | | | | | | | | |
| <table border="1"> <tr><td>PROG RUNNING</td><td>12:54P</td></tr> <tr><td>PU</td><td>137.95 °C</td></tr> <tr><td>SP</td><td>150.00 °C</td></tr> <tr><td>P/S</td><td>30/100</td></tr> <tr><td>HMU</td><td>50.0%</td></tr> <tr><td>CMU</td><td>50.0%</td></tr> </table> | PROG RUNNING | 12:54P | PU | 137.95 °C | SP | 150.00 °C | P/S | 30/100 | HMU | 50.0% | CMU | 50.0% | <p>PROG running 1st screen PROG RUNNING : Program running state P/S : Running PATTERN & SEGMENT</p> | | | | | | |
| PROG RUNNING | 12:54P | | | | | | | | | | | | | | | | | | |
| PU | 137.95 °C | | | | | | | | | | | | | | | | | | |
| SP | 150.00 °C | | | | | | | | | | | | | | | | | | |
| P/S | 30/100 | | | | | | | | | | | | | | | | | | |
| HMU | 50.0% | | | | | | | | | | | | | | | | | | |
| CMU | 50.0% | | | | | | | | | | | | | | | | | | |
| <table border="1"> <tr><td>PROG RUNNING</td><td>12:54P</td></tr> <tr><td>PU</td><td>137.95 °C</td></tr> <tr><td>SP</td><td>150.00 °C</td></tr> <tr><td>P.TM</td><td>44H13M</td></tr> <tr><td>HMU</td><td>50.0%</td></tr> <tr><td>CMU</td><td>50.0%</td></tr> </table> | PROG RUNNING | 12:54P | PU | 137.95 °C | SP | 150.00 °C | P.TM | 44H13M | HMU | 50.0% | CMU | 50.0% | <p>PROG running 2nd screen PROG RUNNING : Prog running state P.TM(PROCESS TIME) : Running time</p> | | | | | | |
| PROG RUNNING | 12:54P | | | | | | | | | | | | | | | | | | |
| PU | 137.95 °C | | | | | | | | | | | | | | | | | | |
| SP | 150.00 °C | | | | | | | | | | | | | | | | | | |
| P.TM | 44H13M | | | | | | | | | | | | | | | | | | |
| HMU | 50.0% | | | | | | | | | | | | | | | | | | |
| CMU | 50.0% | | | | | | | | | | | | | | | | | | |
| <table border="1"> <tr><td>PROG RUNNING</td><td>12:54P</td></tr> <tr><td>PU</td><td>153.89 °C</td></tr> <tr><td>SP</td><td>150.00 °C</td></tr> <tr><td>HMU</td><td>50.0%</td></tr> <tr><td>CMU</td><td>50.0%</td></tr> <tr><td>R.PID</td><td>3</td></tr> <tr><td>RM.TM</td><td>4H13M</td></tr> <tr><td>TS</td><td>1 2 3 4 5</td></tr> <tr><td>IS</td><td>1 2 3 4</td></tr> </table> | PROG RUNNING | 12:54P | PU | 153.89 °C | SP | 150.00 °C | HMU | 50.0% | CMU | 50.0% | R.PID | 3 | RM.TM | 4H13M | TS | 1 2 3 4 5 | IS | 1 2 3 4 | <p>PROG running 3rd screen R.PID : Running PID No.(Figure 12) RM.TM : Remaind running time TS : State of Time Signal IS : State of Inner Signal</p> |
| PROG RUNNING | 12:54P | | | | | | | | | | | | | | | | | | |
| PU | 153.89 °C | | | | | | | | | | | | | | | | | | |
| SP | 150.00 °C | | | | | | | | | | | | | | | | | | |
| HMU | 50.0% | | | | | | | | | | | | | | | | | | |
| CMU | 50.0% | | | | | | | | | | | | | | | | | | |
| R.PID | 3 | | | | | | | | | | | | | | | | | | |
| RM.TM | 4H13M | | | | | | | | | | | | | | | | | | |
| TS | 1 2 3 4 5 | | | | | | | | | | | | | | | | | | |
| IS | 1 2 3 4 | | | | | | | | | | | | | | | | | | |
| <table border="1"> <tr><td>PROG RUNNING</td><td>12:54P</td></tr> <tr><td>PU</td><td>153.89 °C</td></tr> <tr><td>SP</td><td>150.00 °C</td></tr> <tr><td>HMU</td><td>50.0%</td></tr> <tr><td>CMU</td><td>50.0%</td></tr> <tr><td>RUNNING PT/SG</td><td>30/100</td></tr> <tr><td>S.AL</td><td>1 2 3 4</td></tr> <tr><td>AL</td><td>1 2 3 4</td></tr> </table> | PROG RUNNING | 12:54P | PU | 153.89 °C | SP | 150.00 °C | HMU | 50.0% | CMU | 50.0% | RUNNING PT/SG | 30/100 | S.AL | 1 2 3 4 | AL | 1 2 3 4 | <p>PROG running 4th screen When HOLD ON, display held PT and SEG When HOLD OFF, display running state S.AL : State of Segment Alarm Signal AL : State of Alarm Signal</p> | | |
| PROG RUNNING | 12:54P | | | | | | | | | | | | | | | | | | |
| PU | 153.89 °C | | | | | | | | | | | | | | | | | | |
| SP | 150.00 °C | | | | | | | | | | | | | | | | | | |
| HMU | 50.0% | | | | | | | | | | | | | | | | | | |
| CMU | 50.0% | | | | | | | | | | | | | | | | | | |
| RUNNING PT/SG | 30/100 | | | | | | | | | | | | | | | | | | |
| S.AL | 1 2 3 4 | | | | | | | | | | | | | | | | | | |
| AL | 1 2 3 4 | | | | | | | | | | | | | | | | | | |
| <table border="1"> <tr><td>PROG RUNNING</td><td>12:54P</td></tr> <tr><td>PU</td><td>153.89 °C</td></tr> <tr><td>SP</td><td>150.00 °C</td></tr> <tr><td>HMU</td><td>50.0%</td></tr> <tr><td>CMU</td><td>50.0%</td></tr> <tr><td>HOLDING PT/SG</td><td>30/100</td></tr> <tr><td>S.AL</td><td>1 2 3 4</td></tr> <tr><td>AL</td><td>1 2 3 4</td></tr> </table> | PROG RUNNING | 12:54P | PU | 153.89 °C | SP | 150.00 °C | HMU | 50.0% | CMU | 50.0% | HOLDING PT/SG | 30/100 | S.AL | 1 2 3 4 | AL | 1 2 3 4 | <p>PROG running 4th screen (Holding) When HOLD ON, display held PT and SEG When HOLD OFF, display running state S.AL : State of Segment Alarm Signal AL : State of Alarm Signal</p> | | |
| PROG RUNNING | 12:54P | | | | | | | | | | | | | | | | | | |
| PU | 153.89 °C | | | | | | | | | | | | | | | | | | |
| SP | 150.00 °C | | | | | | | | | | | | | | | | | | |
| HMU | 50.0% | | | | | | | | | | | | | | | | | | |
| CMU | 50.0% | | | | | | | | | | | | | | | | | | |
| HOLDING PT/SG | 30/100 | | | | | | | | | | | | | | | | | | |
| S.AL | 1 2 3 4 | | | | | | | | | | | | | | | | | | |
| AL | 1 2 3 4 | | | | | | | | | | | | | | | | | | |
| <table border="1"> <tr><td>PROG RUNNING</td><td>12:54P</td></tr> <tr><td>HOLD</td><td>OFF</td></tr> <tr><td>STEP</td><td>OFF</td></tr> <tr><td>PTNO</td><td>30</td></tr> <tr><td>SEGNO</td><td>100</td></tr> <tr><td>DOWN</td><td>SOAK</td></tr> <tr><td>UP</td><td>WAIT</td></tr> </table> | PROG RUNNING | 12:54P | HOLD | OFF | STEP | OFF | PTNO | 30 | SEGNO | 100 | DOWN | SOAK | UP | WAIT | <p>PROG running 5th screen HOLD : "HOLD ON" or "HOLD OFF" with presents SP STEP : Stop to present segment then step to next segment DOWN : Going down zone SOAK : Gong stable zone UP : Going up zone WAIT : Going wait zone</p> | | | | |
| PROG RUNNING | 12:54P | | | | | | | | | | | | | | | | | | |
| HOLD | OFF | | | | | | | | | | | | | | | | | | |
| STEP | OFF | | | | | | | | | | | | | | | | | | |
| PTNO | 30 | | | | | | | | | | | | | | | | | | |
| SEGNO | 100 | | | | | | | | | | | | | | | | | | |
| DOWN | SOAK | | | | | | | | | | | | | | | | | | |
| UP | WAIT | | | | | | | | | | | | | | | | | | |

| | | | | | | | | | |
|--|-----------|--------|----|-----------|---------|-----------|-------------|--|--|
| <table border="1"> <tr> <td>PROG STOP</td> <td>12:54P</td> </tr> <tr> <td>PU</td> <td>137.95 °C</td> </tr> <tr> <td>PTNO 30</td> <td>SEGNO 100</td> </tr> <tr> <td colspan="2">PATTERN END</td> </tr> </table> | PROG STOP | 12:54P | PU | 137.95 °C | PTNO 30 | SEGNO 100 | PATTERN END | | PATTERN END : End of Pattern Operation |
| PROG STOP | 12:54P | | | | | | | | |
| PU | 137.95 °C | | | | | | | | |
| PTNO 30 | SEGNO 100 | | | | | | | | |
| PATTERN END | | | | | | | | | |

| SYMBOL | PARAMETER | RANGE | DISPLAY | UNIT | DEFAULT | EDIT |
|-------------------------|-------------------------|-----------------------|---------------|------|---------|------|
| SP | SET POINT | EU(0.0 ~ 100.0%) | Always | EU | × | X |
| MV | MV | 0.0 ~ 100.0% | STD type | % | 0.0% | X |
| HMV | HMV | 0.0 ~ 100.0% | H/C Operation | % | 0.0% | X |
| CMV | CMV | 0.0 ~ 100.0% | H/C Operation | % | 0.0% | X |
| P/S | PATTERN / SEGMENT | 1~30 / 1~100 | Always | ABS | 1 / 1 | X |
| P.TM | PROCESS TIME | 00H00M ~ 99H59M | Always | TIME | 00H00M | X |
| R.PID | RUN PID NUMBER | 1 ~ 4 | Always | ABS | × | X |
| RM.TM | REMAIN TIME | 00H00M~99H59M (TMU) | Always | TIME | × | X |
| TS | TIME SIGNAL | 1 ~ 5 (Display State) | Always | ABS | × | X |
| IS | INNER SIGNAL | 1 ~ 4 (Display State) | Always | ABS | × | X |
| RUNNING PT/SG | RUNNING PT/SG | 1~30 / 1~100 | Always | ABS | × | X |
| HOLDING PT/SG | HOLDING PT/SG | 1~30 / 1~100 | Always | ABS | × | X |
| S.AL | SEGMENT ALARM | 1 ~ 4 (Display State) | H/C Operation | ABS | × | X |
| AL | ALARM | 1 ~ 4 (Display State) | Always | ABS | × | X |
| HOLD | HOLD | OFF, ON | Always | ABS | OFF | O |
| STEP | STEP | OFF, ON | Always | ABS | OFF | O |
| PTNO *1 | PATTERN NUMBER | 1 ~ 30 | Always | ABS | × | X |
| PTNO *2 | PATTERN NUMBER | 0 ~ 30 | Always | ABS | 0 | O |
| SEG NO | SEGMENT NUMBER | 1~100 | Always | ABS | × | X |
| DOWN, SOAK, UP, WAIT | DOWN, SOAK, UP, WAIT | Display State | Always | ABS | × | X |

*1 : Operation 4th screen


*2 : STOP screen

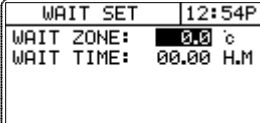
4.3 MAIN MENU 1

4.3.1 PROGRAM SETTING

| | |
|---|--|
| <pre> MAIN MENU1 12:54P PROGRAM RESERVE GRAPH </pre> | <p>MAIN MENU 1 screen. This screen will be displayed by MENU KEY on Operation screen. And Operation screen will return by pushing MENU KEY again When setting US 1,2 on MAIN MENU 2 to "NONE", USER SCREEN will not be displayed. (For using US 1,2 screen, refer to the 4.3.4 USER SCREEN (US 1,2))</p> |
| <pre> PROGRAM 12:54P PATTERN WAIT </pre> | <p>PROGRAM SET screen to enter PATTERN SET. This screen will be displayed by SET KEY after selecting PROGRAM on MAIN MENU 1</p> |
| <pre> PATTERN SET 12:54P PT NO : 30 STC : S,PU SSP : 150.00 USED PT : 30/30 USED SEG : 300/300 </pre> | <p>PATTERN SET screen to edit program pattern will be displayed by SET KEY after selecting PATTERN on PROGRAM SET screen. PT NO : Number of PATTERN for set STC : Set START CODE SSP, S,PV, T,PV SSP : Set the value of START SET POINT (SSP) USED PT/SEG : Number of used PATTERN and SEGMENT</p> |
| <pre> SG SP TIME 12345 001 -50.00 -0.01 00000 002 -50.00 -0.01 00000 003 -50.00 -0.01 00000 004 -50.00 -0.01 00000 005 -50.00 -0.01 00000 </pre> | <p>This screen is to set the SET POINT, TIME, TIME SIGNAL (TI) 1,2,3,4,5 of each SEGMENT. Screen to edit TIME SIGNAL (TI) will be displayed by SET KEY after selecting TIME SG on SETUP MENU screen</p> |
| <pre> SG SP TIME 12345 096 -50.00 -0.01 00000 097 -50.00 -0.01 00000 098 -50.00 -0.01 00000 099 -50.00 -0.01 00000 100 -50.00 -0.01 00000 </pre> | <p>This screen is to set the SET POINT, TIME, TIME SIGNAL (TI) 1,2,3,4,5 of each SEGMENT. Screen to edit TIME SIGNAL (TI) will be displayed by SET KEY after selecting TIME SG on SETUP MENU screen</p> |
| <pre> ←:ESC ↓:DEL ▲:INS 001 -50.00 -0.01 00000 002 -50.00 -0.01 00000 003 -50.00 -0.01 00000 004 -50.00 -0.01 00000 005 -50.00 -0.01 00000 </pre> | <p>This screen to edit SEGMENT will be displayed by SET KEY under the cursor on the SEGMENT number (001,002, ..) in SEGMENT SET screen Each SEGMENT can be copied, inserted or deleted by using UP, DOWN KEY. SHIFT KEY makes this screen back to previous</p> |

| SYMBOL | PARAMETER | RANGE | DISPLAY | UNIT | DEFAULT | EDIT |
|----------|--------------------|-----------------------|---------|------|-------------|------|
| PT NO | PATTERN NUMBER | 1~30 | Always | ABS | 0 | ○ |
| STC | START CODE | SSP, S.PV, T.PV | Always | ABS | S.PV | ○ |
| SSP | START SET POINT | EU(0.0 ~ 100.0%) | Always | EU | EU(0.0%) | ○ |
| UESD PT | USED PATTERN | 0~30 | Always | ABS | 0 | X |
| USED SEG | USED SEGMENT | 0~300 | Always | ABS | 0 | X |
| SG | SEGMENT NUMBER | 001~100 | Always | ABS | 001 | X |
| SP | SET POINT | EU(0.0 ~ 100.0%) | Always | EU | EU(0.0%) | ○ |
| TIME | TIME(HH.MM, MM.SS) | -0.01(OFF)~99.59(TMJ) | Always | TIME | -00.01(OFF) | ○ |
| 1 | TIME SIGNAL1 | 0~9 | Always | ABS | 0 | ○ |
| 2 | TIME SIGNAL2 | 0~9 | Always | ABS | 0 | ○ |
| 3 | TIME SIGNAL3 | 0~9 | Always | ABS | 0 | ○ |
| 4 | TIME SIGNAL4 | 0~9 | Always | ABS | 0 | ○ |
| 5 | TIME SIGNAL5 | 0~9 | Always | ABS | 0 | ○ |

| | |
|---|--|
|  | <p>PROGRAM SET screen to enter WAIT SET. This screen will be displayed by SET KEY after selecting PROGRAM on MAIN MENU 1</p> |
|---|--|

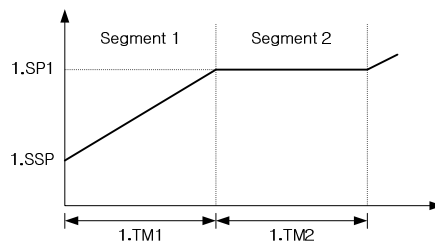
| | |
|---|--|
|  | <p>WAIT ZONE : Set the temperature during WAIT ZONE. When setting 0.0 to this parameter, WAIT operation will not work.</p> <p>WAIT TIME : Set the time for WAIT operation. When setting 00.00 to this parameter, WAIT state will keep going on until this time will be in WAIT ZONE.</p> |
|---|--|

| SYMBOL | PARAMETER | RANGE | DISPLAY | UNIT | DEFAULT | EDIT |
|-----------|-----------|---------------------|---------|------|-----------|------|
| WAIT ZONE | WAIT ZONE | EUS(0.0 ~ 100.0%) | always | EUS | EUS(0.0%) | ○ |
| WAIT TIME | WAIT TIME | 00.00 ~ 99.59 (TMU) | always | TIME | 00.00 H.M | ○ |

※ START CODE (STC) Operation

- SSP START(STC = SSP)

When starting program run, Initial SP is beginning from SSP.
 SP will be getting to change from initial SP to SP1 (Target SP) of SEGMENT1 during SEGMENT TIME1 (TM1).



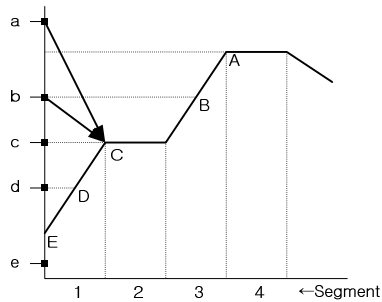
(Figure1 : Example of SSP START)

1) S,PV START(STC = S,PV)

When starting program run, Initial SP is beginning from PV (Present Value).
 SP will be getting to change from PV to Target SP of next SEGMENT. And its processing time can be variable depending on the calculated remaining time by referring to program pattern as of time passed to the first Target SP.

When using PV Start, the first SEGMENT for program running is the RAMP period SEGMENT that is preceding the first SOAK period.
 Followings explain how to operate depending on where the first SEGMENT.

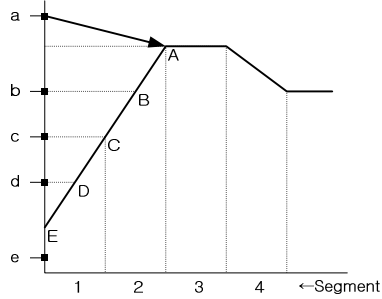
① SEGMENT2 is the first SOAK period



| PV when starting PROG RUN | Start Point of PROG RUN |
|---------------------------|-------------------------|
| a | C |
| b | C |
| c | C |
| d | D |
| e | E(SSP) |

(Figure2 : Example of S,PV START ①)

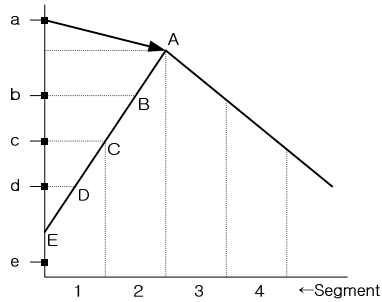
② SEGMENT3 is the first SOAK period



| PV when starting PROG RUN | Start Point of PROG RUN |
|---------------------------|-------------------------|
| a | A |
| b | B |
| c | C |
| d | D |
| e | E(SSP) |

(Figure3 : Example of S.PV START ②)

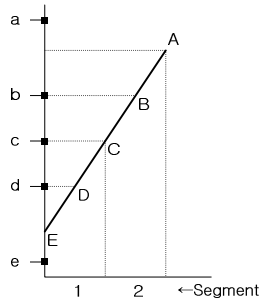
③ NO SOAK period



| PV when starting PROG RUN | Start Point of PROG RUN |
|---------------------------|-------------------------|
| a | A |
| b | B |
| c | C |
| d | D |
| e | E(SSP) |

(Figure4 : Example of S.PV START ③)

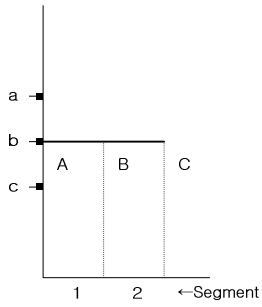
④ Only RAMP period (Ascending) without SOAK



| PV when starting PROG RUN | Start Point of PROG RUN |
|---------------------------|-----------------------------|
| a | PROG RUN can not be started |
| b | B |
| c | C |
| d | D |
| e | E(SSP) |

(Figure5 : Example of S.PV START ④)

⑤ 1SEGMENT SOAK

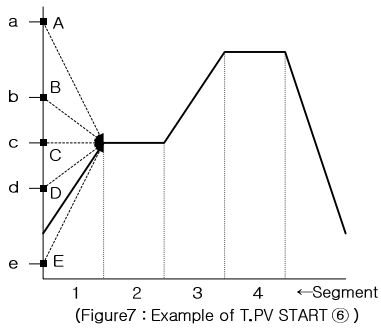


| PV when starting PROG RUN | Start Point of PROG RUN |
|------------------------------|----------------------------|
| a | B |
| b | B |
| c | A(SSP) |

(Figure6 : Example of S.PV START ⑤)

2) T.PV START

Priority when using T.PV is the time.
T.PV START operates according to a prefixed PROGRAM PATTERN from the PV regardless of slant.

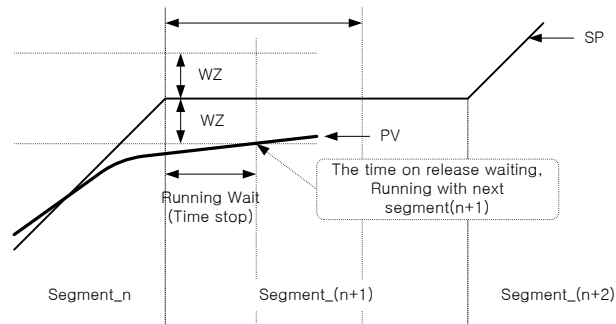


| PV when starting PROG RUN | Start Point of PROG RUN |
|------------------------------|----------------------------|
| a | A |
| b | B |
| c | C |
| d | D |
| e | E |

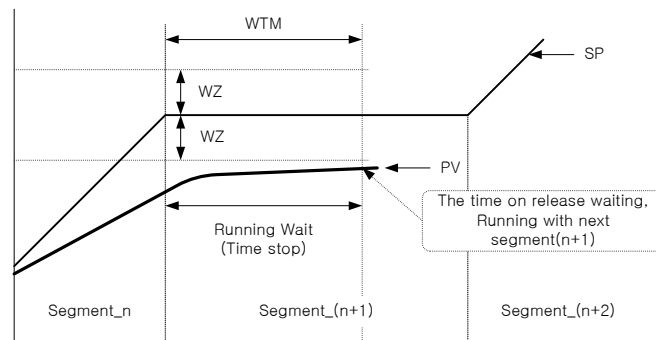
(Figure7 : Example of T.PV START ⑥)

※ WAIT Operation

The wait function holds off the transition of segment until deviation is cleared up. The use of this function is enabled by defining a wait zone that is a deviation range to determine the follow-up of PV data input, and a wait time, which is a period of waiting time until PV data enters the wait zone. When PV input enters the wait zone within the wait time, the operation shifts to the next. If not, the shift takes place as soon as the wait time is over, The WTM should be set for prevent to infinite waiting.



(Figure8 : WAIT - Ex. Wait Function Release Within WTM)



(Figure9 : WAIT - Ex. PV can't enter the wait zone within WTM)


4.3.2 RESERVE SET

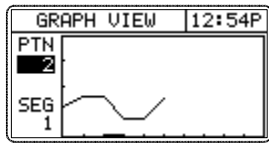
| | |
|--|---|
| <pre> MAIN MENU1 12:54P PROGRAM RESERVE GRAPH </pre> | <p>MAIN MENU 1 screen to enter RESERVE SET This screen will be displayed by MENU KEY on Operation screen. And Operation screen will return by pushing MENU KEY again RESERVE SET screen will be displayed by SET KEY when cursor on RESERVE in MAIN MENU 1.</p> |
|--|---|

| | |
|--|---|
| <pre> NOW: 3Y10M22D12H40M RUN DATE : Y 1M 1D 1H 0M SET DATE : 3Y 10M 22D 12H 40M RESERVE : OFF </pre> | <p>NOW : Display present year, month, date and time which is set on SET DATE area RUN DATE : Set reserved starting year, month, date and time SET DATE : Set present year, month, date and time RESERVE : Use/Not use</p> |
|--|---|

| SYMBOL | PARAMETER | RANGE | DISPLAY | UNIT | DEFAULT | EDIT |
|---------|-------------|---------|---------|------|---------|------------------------------|
| Y | YEAR | 0 ~ 99 | Always | ABS | 0 | ○ (Except NOW DATE) |
| M | MONTH | 1 ~ 12 | Always | ABS | 1 | |
| D | DAY | 1 ~ 31 | Always | ABS | 1 | |
| H | HOUR | 0 ~ 23 | Always | ABS | 0 | |
| M | MINUTE | 0 ~ 59 | Always | ABS | 0 | |
| RESERVE | RESERVE SET | OFF, ON | Always | ABS | OFF | ○ |

4.3.3 GRAPH SET

| | |
|---|--|
|  | <p>MAIN MENU 1 screen to enter GRAPH SET This screen will be displayed by MENU KEY on Operation screen. And Operation screen will return by pushing MENU KEY again GRAPH SET screen will be displayed by SET KEY when cursor on GRAPH in MAIN MENU 1.</p> |
|---|--|

| | |
|---|--|
|  | <p>Display segment on pattern by graph PTN : Set the pattern No. for wished see SEG : Set the segment No. for display starting</p> |
|---|--|

| SYMBOL | PARAMETER | RANGE | DISPLAY | UNIT | DAFAULT | EDIT |
|--------|----------------|----------------------------------|---------|------|----------------------|------|
| PTN | PATTERN NUMBER | 1 ~ 30 | Always | ABS | 1 | O |
| SEG | SEGMENT NUMBER | 1,11,21,31,41, 51,61,71,81,91 | Always | ABS | Start SEG on Display | X |

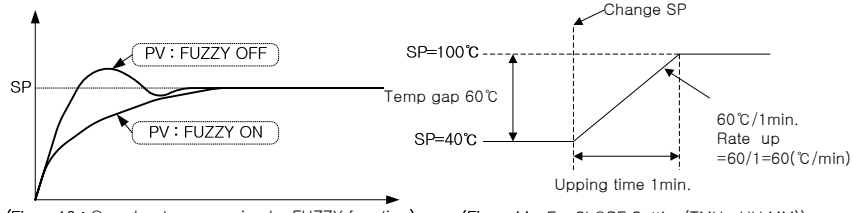
4.3.4 USER SCREEN (US1, US2)

| | | | | | | | | | | | | | |
|---|------------|--------|---------|--|---------|--|-------|--|-------|--|-----------|--|---|
| <table border="1"><tr><td>MAIN MENU1</td><td>12:54P</td></tr><tr><td>PROGRAM</td><td></td></tr><tr><td>RESERVE</td><td></td></tr><tr><td>GRAPH</td><td></td></tr><tr><td>ALARM</td><td></td></tr><tr><td>FILE EDIT</td><td></td></tr></table> | MAIN MENU1 | 12:54P | PROGRAM | | RESERVE | | GRAPH | | ALARM | | FILE EDIT | | <p>MAIN MENU 1 screen. This screen can be displayed when set US 1, 2 of MAIN MENU 2. USER SCREEN is helpful function to display frequently used parameters of MAIN MENU 2 or SETUP MENU to MAIN MENU 1. Ex) When setting US1 = ALARM, US2 = FILE EDIT, MAIN MENU 1 will be shown as right screen.</p> |
| MAIN MENU1 | 12:54P | | | | | | | | | | | | |
| PROGRAM | | | | | | | | | | | | | |
| RESERVE | | | | | | | | | | | | | |
| GRAPH | | | | | | | | | | | | | |
| ALARM | | | | | | | | | | | | | |
| FILE EDIT | | | | | | | | | | | | | |

4.4 MAIN MENU 2

4.4.1 FUNCTION SET

| | | | | | | | | | | | | | |
|--|---------------|--------|------------|---------------|------------|--------|------------|---------|------------|----------|--|--------|--|
| <table border="1"> <tr> <td>MAIN MENU2</td> <td>12:54P</td> </tr> <tr> <td>FUNCTION</td> <td>BIAS SET</td> </tr> <tr> <td>PID SET</td> <td>US1</td> </tr> <tr> <td>ALARM SET</td> <td>US2</td> </tr> <tr> <td>AT TUNING</td> <td>COMM SET</td> </tr> <tr> <td>AUTO/MAN</td> <td></td> </tr> </table> | MAIN MENU2 | 12:54P | FUNCTION | BIAS SET | PID SET | US1 | ALARM SET | US2 | AT TUNING | COMM SET | AUTO/MAN | | <p>MAIN MENU 2 screen This screen will be displayed by SET KEY on Operation screen for 6 sec. And Operation screen will return by pushing SET KEY again for 3 sec. or NO KEY input for 60 sec.</p> |
| MAIN MENU2 | 12:54P | | | | | | | | | | | | |
| FUNCTION | BIAS SET | | | | | | | | | | | | |
| PID SET | US1 | | | | | | | | | | | | |
| ALARM SET | US2 | | | | | | | | | | | | |
| AT TUNING | COMM SET | | | | | | | | | | | | |
| AUTO/MAN | | | | | | | | | | | | | |
| <table border="1"> <tr> <td>FUNCTION1</td> <td>12:54P</td> </tr> <tr> <td>OPER MODE:</td> <td>PROG</td> </tr> <tr> <td>PWR MODE :</td> <td>STOP</td> </tr> <tr> <td>KEY LOCK :</td> <td>OFF</td> </tr> <tr> <td>BUZZER :</td> <td>OFF</td> </tr> <tr> <td>FUZZY :</td> <td>OFF</td> </tr> </table> | FUNCTION1 | 12:54P | OPER MODE: | PROG | PWR MODE : | STOP | KEY LOCK : | OFF | BUZZER : | OFF | FUZZY : | OFF | <p>OPER MODE : Selectable Operation mode of FIX / PROG PWR MODE : Selectable Operation mode after power failure that will be recognized over 3 sec. power failure. If power on within 3 sec. It is automatically running with HOT mode</p> <ul style="list-style-type: none"> ▶ STOP : After power failure, go to STOP state ▶ COLD : After power failure, go to RUN on fix running or go to SEG1 on program running. ▶ HOT : After power failure, running by previous data before power failure. <p>KEY LOCK : Set key in possible / impossible</p> <ul style="list-style-type: none"> ▶ ON : Lock(Key in impossible) ▶ OFF : Unlock(Key in possible) <p>BUZZER : Set buzzer sound ON/OFF FUZZY : Set FUZZY ON/Off(Fuzzy : Overshoot suppressing function)</p> |
| FUNCTION1 | 12:54P | | | | | | | | | | | | |
| OPER MODE: | PROG | | | | | | | | | | | | |
| PWR MODE : | STOP | | | | | | | | | | | | |
| KEY LOCK : | OFF | | | | | | | | | | | | |
| BUZZER : | OFF | | | | | | | | | | | | |
| FUZZY : | OFF | | | | | | | | | | | | |
| <table border="1"> <tr> <td>FUNCTION2</td> <td>12:54P</td> </tr> <tr> <td>FIX OP TM:</td> <td>0 HR 0 MIN</td> </tr> <tr> <td>FIX OP TM:</td> <td>OFF</td> </tr> <tr> <td>UP SLOP:</td> <td>0.0 c/M</td> </tr> <tr> <td>DOWN SLOP:</td> <td>0.0 c/M</td> </tr> </table> | FUNCTION2 | 12:54P | FIX OP TM: | 0 HR 0 MIN | FIX OP TM: | OFF | UP SLOP: | 0.0 c/M | DOWN SLOP: | 0.0 c/M | <p>FIX OP TM : Set FIX Operation time ON/OFF It is reserving function within 9999 hours and fix running is finishing after set the time</p> <p>UP SLOP : In changing the rising zone of fixed goal, it changes the fixed value at a constant change rate without rapidly changing the fixed value (refer to the Figure 2)</p> <p>DOWN SLOP : In changing the fixation of the descending zone of fixed goal, it changes the fixed value at a constant change rate without rapidly changing the fixed value.</p> | | |
| FUNCTION2 | 12:54P | | | | | | | | | | | | |
| FIX OP TM: | 0 HR 0 MIN | | | | | | | | | | | | |
| FIX OP TM: | OFF | | | | | | | | | | | | |
| UP SLOP: | 0.0 c/M | | | | | | | | | | | | |
| DOWN SLOP: | 0.0 c/M | | | | | | | | | | | | |
| <table border="1"> <tr> <td>FUNCTION3</td> <td>12:54P</td> </tr> <tr> <td>SP SL :</td> <td>SP 1</td> </tr> <tr> <td>SP 1 :</td> <td>150.00</td> </tr> <tr> <td>SP 2 :</td> <td>150.00</td> </tr> <tr> <td>SP 3 :</td> <td>150.00</td> </tr> <tr> <td>SP 4 :</td> <td>150.00</td> </tr> </table> | FUNCTION3 | 12:54P | SP SL : | SP 1 | SP 1 : | 150.00 | SP 2 : | 150.00 | SP 3 : | 150.00 | SP 4 : | 150.00 | <p>SP SL : There are 4 set points selectable, and one should be selected among them and be operated. (possible to select by DI)</p> |
| FUNCTION3 | 12:54P | | | | | | | | | | | | |
| SP SL : | SP 1 | | | | | | | | | | | | |
| SP 1 : | 150.00 | | | | | | | | | | | | |
| SP 2 : | 150.00 | | | | | | | | | | | | |
| SP 3 : | 150.00 | | | | | | | | | | | | |
| SP 4 : | 150.00 | | | | | | | | | | | | |
| <table border="1"> <tr> <td>FUNCTION4</td> <td>12:54P</td> </tr> <tr> <td>SP RH:</td> <td>150.00</td> </tr> <tr> <td>SP RL:</td> <td>-50.00</td> </tr> <tr> <td>DSP.H:</td> <td>160.00</td> </tr> <tr> <td>DSP.L:</td> <td>-60.00</td> </tr> <tr> <td>TMU :</td> <td>HH.MM</td> </tr> </table> | FUNCTION4 | 12:54P | SP RH: | 150.00 | SP RL: | -50.00 | DSP.H: | 160.00 | DSP.L: | -60.00 | TMU : | HH.MM | <p>SP RH(RL) : RANGE HIGH(LOW) of SP DSP.H(L) : DISPLAY HIGH(LOW), upper/lower limit of numerical values shown on the screen TMU : Time unit which is applied when in operation DI SL : Settable to (0,1) when in FIX Mode and (0,1,2) when in PROG Mode (refer to table 1)</p> |
| FUNCTION4 | 12:54P | | | | | | | | | | | | |
| SP RH: | 150.00 | | | | | | | | | | | | |
| SP RL: | -50.00 | | | | | | | | | | | | |
| DSP.H: | 160.00 | | | | | | | | | | | | |
| DSP.L: | -60.00 | | | | | | | | | | | | |
| TMU : | HH.MM | | | | | | | | | | | | |



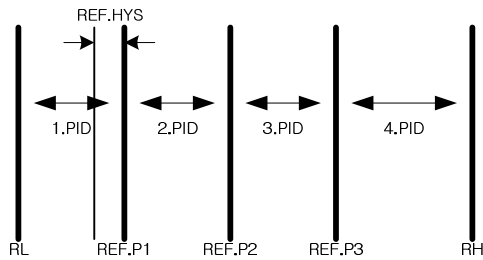
(Figure10 : Overshoot suppressing by FUZZY function)

(Figure11 : Ex. SLOPE Setting(TMU : HH.MM))

| SYMBOL | PARAMETER | RANGE | DISPLAY | UNIT | DEFAULT | EDIT |
|-----------|----------------------|----------------------------|---------|----------|----------------|------|
| OPER MODE | OPERATION MODE | PROG, FIX | Always | ABS | PROG | ○ |
| PWR MODE | POWER MODE | STOP, COLD, HOT | Always | ABS | STOP | ○ |
| KEY LOCK | KEY LOCK | OFF, ON | Always | ABS | OFF | ○ |
| BUZZER | BUZZER | OFF, ON | Always | ABS | ON | ○ |
| FUZZY | FUZZY | OFF, ON | Always | ABS | OFF | ○ |
| FIX OP TM | FIX OP TIME(HOUR) | 0 ~ 9999 HR | Always | HR | 0 HR | ○ |
| | FIX OP TIME(MIN) | 0 ~ 59 MIN | Always | MIN | 0 MIN | ○ |
| FIX OP TM | FIX OP TIME | OFF, ON | Always | ABS | OFF | ○ |
| UP SLOP | UP SLOP | EUS(0.0~100.0%) /MIN (TMU) | Always | EUS /MIN | EUS(0.0%) /MIN | ○ |
| DOWN SLOP | DOWN SLOP | EUS(0.0~100.0%) /MIN (TMU) | Always | EUS /MIN | EUS(0.0%) /MIN | ○ |
| SP SL | SET POINT SELECT | SP1, SP2, SP3, SP4 | Always | ABS | SP1 | ○ |
| SP1 | SET POINT1 | SP RL ~SP RH | Always | EU | SP RL | ○ |
| SP2 | SET POINT2 | SP RL ~SP RH | Always | EU | SP RL | ○ |
| SP3 | SET POINT3 | SP RL ~SP RH | Always | EU | SP RL | ○ |
| SP4 | SET POINT4 | SP RL ~SP RH | Always | EU | SP RL | ○ |
| SP RH | SET POINT RANGE HIGH | SP RL+1digit~EU(100.0%) | Always | EU | EU(100.0%) | ○ |
| SP RL | SET POINT RANGE LOW | EU(0.0%)~SP RH-1digit | Always | EU | EU(0.0%) | ○ |
| DSP.H | DISPLAY HIGH | DSP.L+1digit~EU(105.0%) | Always | EU | EU(105.0%) | ○ |
| DSP.L | DISPLAY LOW | EU(-5.0%)~DSP.H-1digit | Always | EU | EU(-5.0%) | ○ |
| TMU | TIME UNIT | HH:MM, MM:SS | Always | ABS | HH:MM | ○ |

4.4.2 PID SET

| | | | | | | | | | | | | | |
|--|-------------|--------|----------|-------------|---------|-------------|-----------|-------------|-----------|-----------|----------|--------|--|
| <table border="1" style="width: 100%; border-collapse: collapse;"> <tr><td style="text-align: right;">MAIN MENU2</td><td style="text-align: right;">12:54P</td></tr> <tr><td>FUNCTION</td><td>BIAS SET</td></tr> <tr><td>PID SET</td><td>US1</td></tr> <tr><td>ALARM SET</td><td>US2</td></tr> <tr><td>AT TUNING</td><td>COMM SET</td></tr> <tr><td>AUTO/MAN</td><td></td></tr> </table> | MAIN MENU2 | 12:54P | FUNCTION | BIAS SET | PID SET | US1 | ALARM SET | US2 | AT TUNING | COMM SET | AUTO/MAN | | MAIN MENU 2 screen to enter PID SET |
| MAIN MENU2 | 12:54P | | | | | | | | | | | | |
| FUNCTION | BIAS SET | | | | | | | | | | | | |
| PID SET | US1 | | | | | | | | | | | | |
| ALARM SET | US2 | | | | | | | | | | | | |
| AT TUNING | COMM SET | | | | | | | | | | | | |
| AUTO/MAN | | | | | | | | | | | | | |
| <table border="1" style="width: 100%; border-collapse: collapse;"> <tr><td style="text-align: right;">PID ZONE</td><td style="text-align: right;">12:54P</td></tr> <tr><td>REF.P1</td><td>: 150.00 °C</td></tr> <tr><td>REF.P2</td><td>: 150.00 °C</td></tr> <tr><td>REF.P3</td><td>: 150.00 °C</td></tr> <tr><td>REF.HYS</td><td>: 6.00 °C</td></tr> <tr><td>CTR.MODE</td><td>: D.PV</td></tr> </table> | PID ZONE | 12:54P | REF.P1 | : 150.00 °C | REF.P2 | : 150.00 °C | REF.P3 | : 150.00 °C | REF.HYS | : 6.00 °C | CTR.MODE | : D.PV | <p>PID SET screen</p> <p>REF.P1(P2) : Set limit value for selecting ZONE PID on temperature SPAN.</p> <p>REF.DEV : Set deviation when selecting deviation PID.</p> <p>REF.HYS : Set the width of hysteresis when selecting PID group in Zone PID.</p> <p>MODE As PID control mode, it divides D.PV from D.DV</p> <p>CTR MODE : Set D.DV or D.PV as PROG mode in PID control</p> <p>If you select the D.DV on the control mode, overshoot is small but it take a long time for reaching the TSP because the MV variation rate is low. Selecting the D.PV, overshoot is big but it is faster than the D.DV for reaching the TSP because the MV variation rate is high.</p> |
| PID ZONE | 12:54P | | | | | | | | | | | | |
| REF.P1 | : 150.00 °C | | | | | | | | | | | | |
| REF.P2 | : 150.00 °C | | | | | | | | | | | | |
| REF.P3 | : 150.00 °C | | | | | | | | | | | | |
| REF.HYS | : 6.00 °C | | | | | | | | | | | | |
| CTR.MODE | : D.PV | | | | | | | | | | | | |



(Figure12 : PID Group)

| | | | | | | | | | | | | | |
|--|------------|--------|----------|-----------|----------|----------|---------|---------|------------|------------|-----------|-----------|--|
| <table border="1" style="width: 100%; border-collapse: collapse;"> <tr><td style="text-align: right;">PID 1</td><td style="text-align: right;">12:54P</td></tr> <tr><td>P : 5.0%</td><td>PC: 5.0%</td></tr> <tr><td>I : 120S</td><td>IC: 120S</td></tr> <tr><td>D : 30S</td><td>DC: 30S</td></tr> <tr><td>OH: 100.0%</td><td>OH: 100.0%</td></tr> <tr><td>DB: 10.0%</td><td>MR: 50.0%</td></tr> </table> | PID 1 | 12:54P | P : 5.0% | PC: 5.0% | I : 120S | IC: 120S | D : 30S | DC: 30S | OH: 100.0% | OH: 100.0% | DB: 10.0% | MR: 50.0% | <p>Input values of P, I, D, Pc, Ic, Dc on PID 1~4(H/C Type)</p> <p>OH : Set upper-limit of the range of operations of control output.</p> <p>DB : Parameter for setting DEAD BAND of Heating/Cooling operations for H/C TYPE.</p> <p>MR : Parameter for applying values manually settled to items on the integral time(I) of PID operations when the integral time(I) is '0' in controlling PID.</p> |
| PID 1 | 12:54P | | | | | | | | | | | | |
| P : 5.0% | PC: 5.0% | | | | | | | | | | | | |
| I : 120S | IC: 120S | | | | | | | | | | | | |
| D : 30S | DC: 30S | | | | | | | | | | | | |
| OH: 100.0% | OH: 100.0% | | | | | | | | | | | | |
| DB: 10.0% | MR: 50.0% | | | | | | | | | | | | |
| <table border="1" style="width: 100%; border-collapse: collapse;"> <tr><td style="text-align: right;">PID 1</td><td style="text-align: right;">12:54P</td></tr> <tr><td>P : 5.0%</td><td>MR: 50.0%</td></tr> <tr><td>I : 120S</td><td></td></tr> <tr><td>D : 30S</td><td></td></tr> <tr><td>OH: 100.0%</td><td></td></tr> <tr><td>OL: 0.0%</td><td></td></tr> </table> | PID 1 | 12:54P | P : 5.0% | MR: 50.0% | I : 120S | | D : 30S | | OH: 100.0% | | OL: 0.0% | | <p>Input P,I,D value on PID1~4 (STD TYPE)</p> <p>OH, OL : Set upper-limit and lower-limit of the range of operations of control output.</p> <p>MR : Parameter for applying values manually settled to items on the integral hour of PID operation when the integral hour(I) is '0' in controlling PID.</p> |
| PID 1 | 12:54P | | | | | | | | | | | | |
| P : 5.0% | MR: 50.0% | | | | | | | | | | | | |
| I : 120S | | | | | | | | | | | | | |
| D : 30S | | | | | | | | | | | | | |
| OH: 100.0% | | | | | | | | | | | | | |
| OL: 0.0% | | | | | | | | | | | | | |

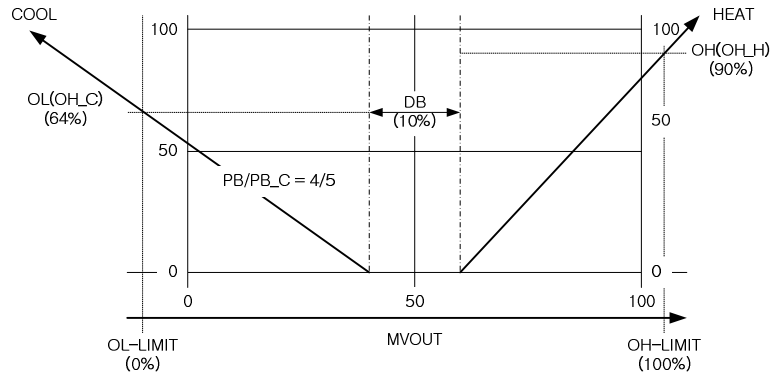


Figure13 : Ex. HEAT=PID, COOL=PID

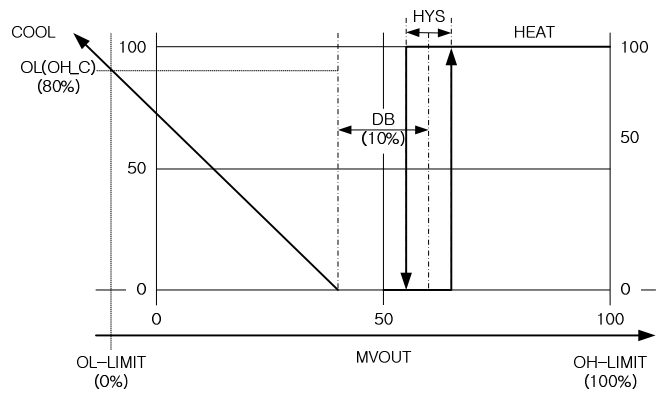


Figure14 : Ex. HEAT=ON/OFF, COOL=PID

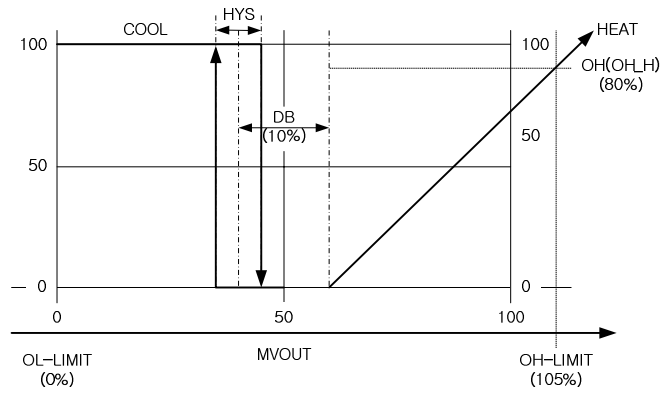


Figure15 : HEAT = PID, COOL = ON/OFF

1. ON/OFF MODE

- Use after fixing ON/OFF control when P=0 in PID group.
- MVOUT can be fixed by RELAY control output when in ON/OFF MODE operations, and be able to fix ONOFF HYS PARA.
- It is applied to OFF / ON zone by $(\text{ONOFF HYS})/2$.

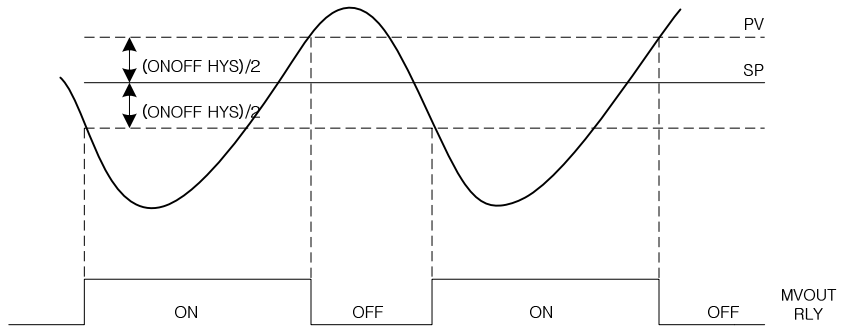


Figure16 : ON/OFF control

| SYMBOL | PARAMETER | RANGE | DISPLAY | UNIT | DEFAULT | EDIT |
|----------|------------------------|--|----------|------|------------|------|
| REF.P1 | REFERENCE POINT1 | EU(0.0%) ~ RP2 | Always | EU | EU(100.0%) | ○ |
| REF.P2 | REFERENCE POINT2 | RP1 ~ EU(100.0%) | Always | EU | EU(100.0%) | ○ |
| REF.P3 | REFERENCE POINT3 | RP2 ~ EU(100.0%) | Always | EU | EU(100.0%) | ○ |
| REF.HYS | REFERENCE HYSTERESIS | EUS(0.0~10.0%) | Always | EUS | EUS(0.3%) | ○ |
| CTR.MODE | CONTROL MODE | D.DV, D.PV | Always | ABS | D.PV | ○ |
| P | HEAT PROPORTIONAL BAND | 0.0 ~ 999.9% (0=ON/OFF) | Always | % | 5.0% | ○ |
| I | HEAT TEMP INTEGRAL | 0 ~ 6000s | Always | sec. | 120 sec. | ○ |
| D | HEAT DERIVATIVE TIME | 0 ~ 6000s | Always | sec. | 30 sec. | ○ |
| Pc | COOL PROPORTIONAL BAND | 0.0 ~ 999.9% (0=ON/OFF) | H/C type | % | 5.0% | ○ |
| Ic | COOL TEMP INTEGRAL | 0 ~ 6000s | H/C type | sec. | 120 sec. | ○ |
| Dc | COOL DERIVATIVE TIME | 0 ~ 6000s | H/C type | sec. | 30 sec. | ○ |
| OH | HEAT OUTPUT LIMIT HIGH | OL+1digit ~ 100.0% 0.0 ~ 100.0% (H/C TYPE) | Always | % | 100.0% | ○ |
| OL | HEAT OUTPUT LIMIT LOW | 0.0% ~ OH-1digit | STD type | % | 0.0% | ○ |
| OH | COOL OUTPUT LIMIT HIGH | 0.0 ~ 100.0% | H/C type | % | 100.0% | ○ |
| DB | DEAD BAND | -100.0%~15.0% | H/C type | % | 3.0% | ○ |
| MR | MANUAL RESET | -5.0~105.0% | Always | % | 50.0% | ○ |

4.4.3 ALARM SET

| | |
|--|--|
| MAIN MENU2 12:54P FUNCTION BIAS SET PID SET US1 ALARM SET US2 AT TUNING COMM SET AUTO/MAN | MAIN MENU 2 screen to enter PID SET |
| ALARM SET1 12:54P POINT : 150.00 °C | POINT : Set value for ALARM |
| ALARM SET2 12:54P POINT : 150.00 °C | POINT : Set value for ALARM |
| ALARM SET3 12:54P HIGH DEV. : -50.00 °C LOW DEV. : -50.00 °C | HIGH DEV : High Deviation for Deviation Operation. LOW DEV : Low Deviation for Deviation Operation. |
| ALARM SET4 12:54P HIGH DEV. : -50.00 °C LOW DEV. : -50.00 °C | HIGH DEV : High Deviation for Deviation Operation. LOW DEV : Low Deviation for Deviation Operation. |



Alarm is working on even STOP state

| SYMBOL | PARAMETER | RANGE | DISPLAY | UNIT | DEFAULT | EDIT |
|-----------|----------------|--------------------------|-----------------------|------|-------------|------|
| POINT | ALARM POINT | EU(-100.0~100.0%) | upper- limit of value | EU | EU(100.0%) | ○ |
| | | | lower- limit of value | EU | EU(0.0%) | ○ |
| HIGH DEV. | HIGH DEVIATION | EUS(-100.0~100.0%) *1 | Deviation Operation | EUS | EUS(100.0%) | ○ |
| LOW DEV. | LOW DEVIATION | EUS(-100.0~100.0%) *1 | Deviation Operation | EUS | EUS(0.0%) | ○ |

*1 : EUS(-100.0~100.0%) ~ EUS(-100.0%) is settable to Max -999.9

4.4.4 AUTO TUNING SET

| | |
|--|---|
| <pre> MAIN MENU2 12:54P FUNCTION BIAS SET PID SET US1 ALARM SET US2 AT TUNING COMM SET AUTO/MAN </pre> | MAIN MENU 2 screen to enter AUTO TUNING SET |
|--|---|

| | |
|---|---|
| <pre> AUTO TUNING 12:54P TUNING : OFF AT ZONE : ZONE </pre> | AUTO MODE Operation. TUNING : Depending on the AT setting value, calculated PID value will be saved in each relevant PID zone. AT ZONE : ZONE à It carries out ZONE PID AUTO TUNING SEG à It carries out SEG PID AUTO TUNING |
|---|---|

| SYMBOL | PARAMETER | RANGE | DISPLAY | UNIT | DEFAULT | EDIT |
|---------|-------------|-----------------------------------|---------|------|---------|------|
| TUNING | AUTO TUNING | OFF, 1~4, AUTO (0.1% of AT POINT) | Always | ABS | OFF | ○ |
| AT ZONE | AT ZONE | ZONE, SEG | Always | ABS | SEG | ○ |

※ AT TUNING Operation

1. ZONE PID AUTO TUNING

1.1 Set value of AT TUNING : OFF, 1~4, AUTO SET

1.2 Operation

– AT ZONE : When setting ZONE, it carries out ZONE PID AUTO TUNING process.

1 : PID zone 1 AT.

– When starting to carry out AT process, progress SEG keeps Holding and SP will be changed to TUNING SP.

$$- PID1 AT.SP = IN.RL + (REF.P1 - IN.RL) / 2$$

– After complete of AT, it starts to carry out hold SEG with the preceding SP before AT.

2 : PID zone 2 AT.

– When starting to carry out AT process, progress SEG keeps Holding and SP will be changed to TUNING SP.

$$- PID2 AT.SP = REF.P1 + (REF.P2 - REF.P1) / 2$$

– After complete of AT, it starts to carry out hold SEG with the preceding SP before AT.

3 : PID zone 3 AT.

– When starting to carry out AT process, progress SEG keeps Holding and SP will be changed to TUNING SP.

$$- PID3 AT.SP = REF.P2 + (REF.P3 - REF.P2) / 2$$

– After complete of AT, it starts to carry out hold SEG with the preceding SP before AT.

4 : PID zone 4 AT.

– When starting to carry out AT process, progress SEG keeps Holding and SP will be changed to TUNING SP.

$$- PID4 AT.SP = REF.P3 + (REF.P4 - REF.P3) / 2$$

– After complete of AT, it starts to carry out hold SEG with the preceding SP before AT.

AUTO : Carry out AUTO AT process PID zone 1 to 4 orderly.

– When starting to carry out AT process, progress SEG keeps Holding and SP will be changed to TUNING SP.

– Carry out AUTO AT process PID zone 1 to 4

$$- PID1 AT.SP = IN.RL + (REF.P1 - IN.RL) / 2$$

$$- PID2 AT.SP = REF.P1 + (REF.P2 - REF.P1) / 2$$

$$- PID3 AT.SP = REF.P2 + (REF.P3 - REF.P2) / 2$$

$$- PID4 AT.SP = REF.P3 + (IN.RL - REF.P3) / 2$$

– After complete of AT, it starts to carry out hold SEG with the preceding SP before AT.

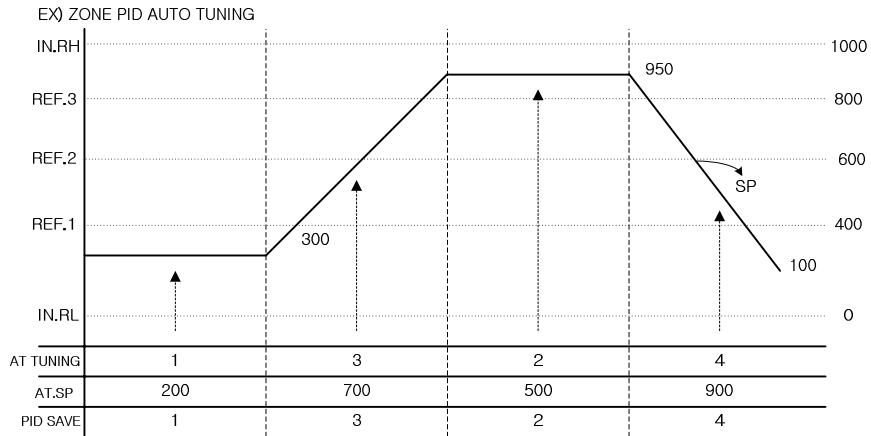


Figure17 : Ex. Of ZONE PID AUTO TUNING

2. SEG PID AUTO TUNING

2.1 Setting value of AT TUNING : OFF, 1~4

2.2 Operation

- AT ZONE : When setting SEG, it carries out SEG PID AUTO TUNING.
- 1~4 : Calculated PID value from AT with fixed NSP will be saved in each relevant PID zone.
- NSP will be fixed, if AT is started during PROG running.
- Carry out AT process with fixed NSP.
- After complete of AT process, carry out SEG process with former SP before AT.
- Depending on AT setting value, calculated PID value will be saved in each relevant PID zone.

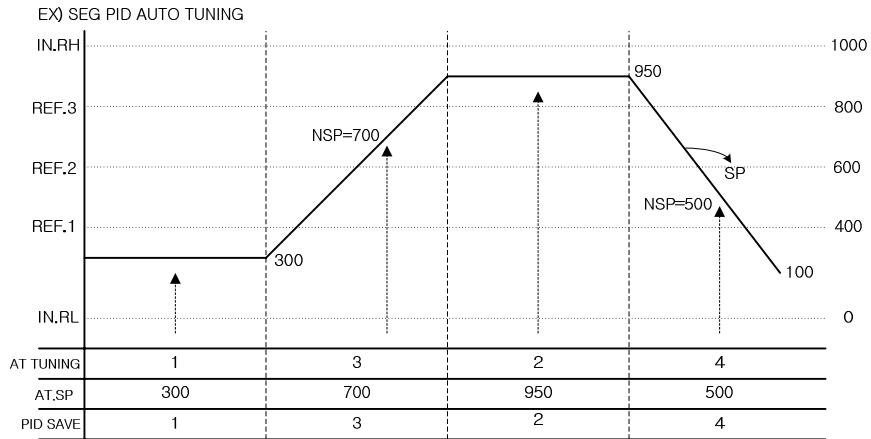


Figure18 : Ex of SEG PID AUTO TUNING

4.4.5 A/M MODE

| | |
|--|---|
| <pre> MAIN MENU2 12:54P FUNCTION BIAS SET PID SET US1 ALARM SET US2 AT TUNING COMM SET AUTO/MAN </pre> | <p>MAIN MENU 2 screen to enter AUTO/MAN SET. It can be changed only when FIX MODE. (During AT process, this parameter can not be changed)</p> |
| <pre> AUTO/MAN 12:54P A/M.MODE : AUTO </pre> | <p>This parameter is to set control mode of AUTO or MANUAL. MV can be set by key input on Operation screen.</p> |

| SYMBOL | PARAMETER | RANGE | DISPLAY | UNIT | DEFAULT | EDIT |
|-----------|------------------|----------|---------------------------------------|------|---------|------|
| A/M. MODE | AUTO/MANUAL MODE | AUTO/MAN | Always (Selectable Or FIX Mode) | ABS | AUTO | ○ |

4.4.6 BIAS SET

| | |
|---|--------------------------------------|
| <pre> MAIN MENU2 12:54P FUNCTION BIAS SET PID SET US1 ALARM SET US2 AT TUNING COMM SET AUTO/MAN </pre> | MAIN MENU 2 screen to enter BIAS SET |
| <pre> BIAS SET 12:54P BIAS : 0.0 % </pre> | BIAS : Collective INPUT BIAS |

| SYMBOL | PARAMETER | RANGE | DISPLAY | UNIT | DEFAULT | EDIT |
|--------|------------|--------------------|---------|------|-----------|------|
| BIAS | BIAS VALUE | EUS(-100.0~100.0%) | Always | EUS | EUS(0.0%) | ○ |

4.4.7 USER SCREEN SET (US1, US2)

| | |
|--|--|
| <pre> MAIN MENU2 12:54P FUNCTION BIAS SET PID SET US1 ALARM SET US2 AT TUNING COMM SET AUTO/MAN </pre> | <p>MAIN MENU 2 screen to enter USER SCREEN1</p> |
| <pre> US1:ALARM 12:54P NONE FILE EDIT FUNCTION PTN SUB A/M SEG ALM ALARM TIME SG REPEAT </pre> | <p>Setting value of US1 will be applied to MAIN MENU 1</p> |
| <pre> MAIN MENU2 12:54P FUNCTION BIAS SET PID SET US1 ALARM SET US2 AT TUNING COMM SET AUTO/MAN </pre> | <p>MAIN MENU 2 screen to enter USER SCREEN 2</p> |
| <pre> US2:FILE EDIT 12:54P NONE FILE EDIT FUNCTION PTN SUB A/M SEG ALM ALARM TIME SG REPEAT </pre> | <p>Setting value of US2 will be applied to MAIN MENU 1</p> |

| SYMBOL | PARAMETER | RANGE | DISPLAY | UNIT | DEFAULT | EDIT |
|--------|---------------|--|---------|------|---------|------|
| US1 | USER SCREEN 1 | NONE,FUNCTION,A/M, ALARM,REPEAT, FILE EDIT,PTN SUB, SEG ALM,TIME SG | Always | ABS | NONE | ○ |
| US2 | USER SCREEN 2 | NONE,FUNCTION,A/M, ALARM,REPEAT, FILE EDIT,PTN SUB, SEG ALM,TIME SG | Always | ABS | NONE | ○ |

4.4.8 COMMUNICATION SET

| | | | | | | | | | | | | | |
|--|------------|--------|----------|----------|---------|-----|-----------|-----|-----------|----------|----------|--|---|
| <table border="1"> <tr> <td>MAIN MENU2</td> <td>12:54P</td> </tr> <tr> <td>FUNCTION</td> <td>BIAS SET</td> </tr> <tr> <td>PID SET</td> <td>US1</td> </tr> <tr> <td>ALARM SET</td> <td>US2</td> </tr> <tr> <td>AT TUNING</td> <td>COMM SET</td> </tr> <tr> <td>AUTO/MAN</td> <td></td> </tr> </table> | MAIN MENU2 | 12:54P | FUNCTION | BIAS SET | PID SET | US1 | ALARM SET | US2 | AT TUNING | COMM SET | AUTO/MAN | | MAIN MENU 2 screen to enter COMMUNICATION SET |
| MAIN MENU2 | 12:54P | | | | | | | | | | | | |
| FUNCTION | BIAS SET | | | | | | | | | | | | |
| PID SET | US1 | | | | | | | | | | | | |
| ALARM SET | US2 | | | | | | | | | | | | |
| AT TUNING | COMM SET | | | | | | | | | | | | |
| AUTO/MAN | | | | | | | | | | | | | |

| | | | | | | | | | | | | | |
|---|------------|--------|--------|-------|-------|------|--------|------|--------|------------|--------|------------|---|
| <table border="1"> <tr> <td>COMM SET</td> <td>12:54P</td> </tr> <tr> <td>PROT.:</td> <td>SYNCR</td> </tr> <tr> <td>BPS :</td> <td>9600</td> </tr> <tr> <td>PRTY.:</td> <td>NONE</td> </tr> <tr> <td>S.BIT:</td> <td>1 D.LEN: 8</td> </tr> <tr> <td>ADDR.:</td> <td>1 RP.TM: 0</td> </tr> </table> | COMM SET | 12:54P | PROT.: | SYNCR | BPS : | 9600 | PRTY.: | NONE | S.BIT: | 1 D.LEN: 8 | ADDR.: | 1 RP.TM: 0 | PROT : Protocol BPS : Speed (Bit per sec) PRTY : Parity S.BIT : Stop bit D.LEN : Data length ADDR : Address RP.TM : Response time |
| COMM SET | 12:54P | | | | | | | | | | | | |
| PROT.: | SYNCR | | | | | | | | | | | | |
| BPS : | 9600 | | | | | | | | | | | | |
| PRTY.: | NONE | | | | | | | | | | | | |
| S.BIT: | 1 D.LEN: 8 | | | | | | | | | | | | |
| ADDR.: | 1 RP.TM: 0 | | | | | | | | | | | | |

| SYMBOL | PARAMETER | RANGE | DISPLAY | UNIT | DEFAULT | EDIT |
|--------|---------------|------------------------------------|-------------|------|---------|------|
| PROT. | PROTOCOL | PCLK0, PCLK1, MDB.A, MDB.R, SYNCR | When Option | ABS | PCLK1 | ○ |
| BPS | BAUD RATE | 600, 1200, 2400, 4800, 9600, 19200 | When Option | ABS | 9600 | ○ |
| PRTY. | PARITY | NONE, EVEN, ODD | When Option | ABS | NONE | ○ |
| S.BIT | STOP BIT | 1, 2 | When Option | ABS | 1 | ○ |
| D.LEN | DATA LENGTH | 7, 8 | When Option | ABS | 8 | ○ |
| ADDR. | ADDRESS | 1 ~ 99 (但, 最多31台) | When Option | ABS | 1 | ○ |
| RP.TM | RESPONSE TIME | 0 ~ 10 | When Option | ABS | 0 | ○ |

4.5 SETUP MENU

4.5.1 INPUT SET

| | |
|---|---|
| <p>SETUP PASS 12:54P PASS: 0</p> | <p>PASSWORD screen to enter SETUP MENU. This screen will be displayed by SHIFT+SET KEY for 6 sec. on Operation screen. After filling up password, SETUP MENU will be displayed. And Operation screen will return by pushing SET KEY again for 3 sec. or NO KEY input for 60 sec.</p> |
| <p>SETUP MENU 12:54P INPUT DO PTN SUB OUTPUT BIAS SEG ALM RET DI REPEAT INNER PWD TIME SG ALARM FILE ON/OFF</p> | <p>SETUP MENU screen to enter INPUT SET. Operation screen will return by pushing SET KEY again for 3 sec. or NO KEY input for 60 sec.</p> |
| <p>INPUT SET1 12:54P SEN.GROUP: TC SENSOR : TC-K0 SEN.UNIT : °C FILTER : 0 SEC</p> | <p>SEN.GROUP : Divide the type of input sensor by TC, RTD, and DCV. SENSOR : Input sensor. (refer to table 2) FILTER : Parameter fixed up for alleviating the shake of PV caused from unmeasured disturbance & noise.</p> |
| <p>INPUT SET2 12:54P RNG. HIGH: 1370 °C RNG. LOW : -200 °C</p> | <p>RNG.HIGH(LOW) : Set a range of use for each sensor.</p> |
| <p>INPUT SET3 12:54P S.OPN SEL: UP RJC. SEL: 0 N</p> | <p>S.OPN SEL : It is a parameter for selecting the direction of operations of PV when in Sensor-Open. When it is 'UP', PV operates to the upper direction of sensor input, and to the lower direction of sensor input when it is 'DOWN'. RJC. SEL : It is a parameter for setting whether to use Reference Junction Compensation.</p> |
| <p>INPUT SET1 12:54P SEN.GROUP: DCV SENSOR : 0.4-2.0U SEN.UNIT : °C FILTER : 0 SEC</p> | <p>SEN.GROUP : Divide the type of input sensor by TC, RTD, and DCV. SENSOR : Input sensor. (refer to table 2) FILTER : Parameter fixed up for alleviating the shake of PV caused from unmeasured disturbance & noise.</p> |
| <p>INPUT SET2 12:54P RNG. HIGH: 2.000 U RNG. LOW : 0.400 U DOT. POS : 2 SCL. HIGH: 100.00 °C SCL. LOW : 0.00 °C</p> | <p>RNG.HIGH(LOW) : Set a range of use for each sensor. DOT. POS : Is indicated when in DCV, and indicates a number below decimal points. SCL. HIGH(LOW) : When input is DCV, set scale on input range</p> |

Table 2 : Type of Input Sensor

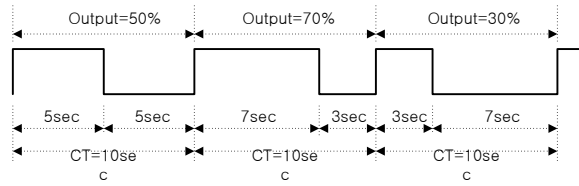
*display range : -5% ~ +105%

| No. | TYPE | Temp.Range(°C) | Temp.Range(°F) | Group | DISP |
|-----|-------------|----------------|----------------|-------|----------|
| 1 | K0 | -200~1370 | -300~2500 | T/C | TC-K0 |
| 2 | K1 | -200.0~1370.0 | -300.0~2500.0 | | TC-K1 |
| 3 | K2 | -200.0~1000.0 | 0.0~2300.0 | | TC-K2 |
| 4 | J | -200.0~1200.0 | -300.0~2300.0 | | TC-J |
| 5 | E | -200.0~1000.0 | -300.0~1800.0 | | TC-E |
| 6 | T | -200.0~400.0 | -300.0~750.0 | | TC-T |
| 7 | R | 0.0~1700.0 | 32~3100 | | TC-R |
| 8 | B | 0.0~1800.0 | 32~3300 | | TC-B |
| 9 | S | 0.0~1700.0 | 32~3100 | | TC-S |
| 10 | L | -200.0~900.0 | -300.0~1600.0 | | TC-L |
| 11 | N | -200.0~1300.0 | -300.0~2400.0 | | TC-N |
| 12 | U | -200.0~400.0 | -300.0~750.0 | | TC-U |
| 13 | W | 0.0~2300.0 | 32~4200 | | TC-W |
| 14 | Platinel II | 0.0~1390.0 | 32.0~2500.0 | | TC-P |
| 15 | PtA | -200.0~850.0 | -300.0~1560.0 | RTD | PT A |
| 16 | PtB | -200.0~500.0 | -300.0~1000.0 | | PT B |
| 17 | PtC | -50.00~150.00 | -148.0~300.0 | | PT C |
| 18 | JPtA | -200.0~500.0 | -300.0~1000.0 | | JPT A |
| 19 | JPtB | -50.00~150.00 | -148.0~300.0 | | JPT B |
| 20 | 0.4~2.0V | 0.400~2.000V | | DCV | 0.4~2.0V |
| 21 | 1~5V | 1.000~5.000V | | | 1~5V |
| 22 | 0~10V | 0.00~10.00V | | | 0~10V |
| 23 | -10~20mV | -10.00~20.00mV | | mV | -10~20mV |
| 24 | 0~100mV | 0.0~100.0mV | | | 0~100mV |

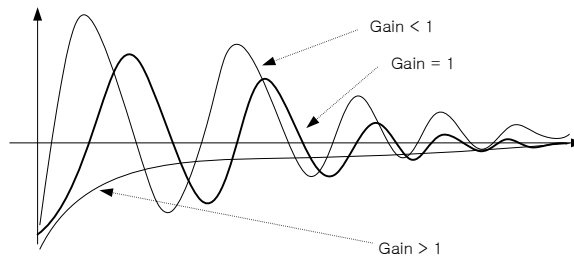
| Symbol | Parameter | Range | Diaplay | Unit | Default | EDIT |
|------------|---------------------------------|---------------------------------------|----------|------|------------|------|
| SEN. GROUP | SENSOR GROUP | T/C, RTD, DCV | Always | ABS | T/C | ○ |
| SENSOR | SENSOR TYPE | Depending on SENSOR | Always | ABS | TC-K1 | ○ |
| SEN. UNIT | SENSOR UNIT | °C, °F | T/C, RTD | ABS | °C | ○ |
| SEN. UNIT | SENSOR UNIT | °C, °F, SPACE, %, Pa, mV, V, %Rh, OHM | DCV | ABS | °C | ○ |
| FILTER | FILTER | 120sec | Always | SEC | 0 SEC | ○ |
| RNG.HIGH | RANGE HIGH | RL+1digit~EU(100.0%) | Always | EU | EU(100.0%) | ○ |
| RNG.LOW | RANGE LOW | EU(0.0%)~EH-1digit | Always | EU | EU(0.0%) | ○ |
| DOT.POS | DOT POSITION | 0~3 | DCV | ABS | 2 | ○ |
| SCL.HIGH | SCALE HIGH | SL+1digit~300.00 | DCV | ABS | 100.00 | ○ |
| SCL.LOW | SCALE LOW | -19.99~SH-1digit | DCV | ABS | 0.00 | ○ |
| B.OUT SEL | BURN OUT SELECT | OFF, UP, DOWN | Always | ABS | UP | ○ |
| RJC.SEL | Reference Junction Compensation | ON, OFF | Always | ABS | ON | ○ |
| DISP FILT | DISPLAY FILTER | 0 ~ 120sec | SP791 | ABS | 0sec | ○ |
| PWR. FREQ | POWER FREQUENCE | 60, 50Hz | SP791 | ABS | 60Hz | ○ |

4.5.2 OUTPUT SET

| | |
|---|--|
| <pre> SETUP MENU 12:54P INPUT DO PTN SUB OUTPUT BIAS SEG ALM RET DI REPEAT INNER PWD TIME SG ALARM FILE ON/OFF </pre> | <p>SETUP MENU screen to enter OUTPUT SET. Operation screen will return by pushing SET KEY again for 3 sec, or NO KEY input for 60 sec.</p> |
| <pre> OUTPUT SET1 12:54P OUT1:HEAT OUT2:NONE OUT3: RET SCR.RANGE: 4-20 mA OUT4:NONE SCR.RANGE: 4-20 mA </pre> | <p>OUT1 : Set output type of OUTPUT1 OUT2 : Set output type of OUTPUT2 OUT3 : Set output type of OUTPUT3 OUT4 : Set output type of OUTPUT4 SCR.RANGE : Set output type of OUTPUT3,4(0-20, 4-20mA)</p> |
| <pre> OUTPUT SET2 12:54P RELAY SEL: NONE CYCLE : 1 S AT. GAIN : 1.0 % DIRECTION: REVR. </pre> | <p>RELAY SEL : Set output type of RELAY CYCLE : Set output cycle DIRECT : Set reverse/forward for PID control AT GAIN : The parameter to set proportional PID control by obtaining AUTO TUNING. Reduce AT-G, Cycle time became rapid. Increase AT-G, control status became more stable. Smaller value, will become more hunting.</p> |



(Figure19 : Example of Control Output in CT = 10 Sec)



(Figure20 : AT GAIN)

| | | | | | | | | | | | | | |
|--|-------------|--------|------------|-------------|------------|-------------|------------|------------|---|-----------|---|---------|---|
| <table border="1"> <tr> <td>OUTPUT SET3</td> <td>12:54P</td> </tr> <tr> <td>ARW SET</td> <td>: 100.0 %</td> </tr> <tr> <td>OPR SET</td> <td>: 100.0 %/S</td> </tr> <tr> <td>ONOFF HYS</td> <td>: 10.00 °C</td> </tr> <tr> <td>PRESET OT</td> <td>: 100.0 %</td> </tr> </table> | OUTPUT SET3 | 12:54P | ARW SET | : 100.0 % | OPR SET | : 100.0 %/S | ONOFF HYS | : 10.00 °C | PRESET OT | : 100.0 % | <p>ARW SET: It is effective method for the control at the external shock, not running I=0. When use ARW Function, Overshoot occur little, PV is flattern quickly.</p> <p>OPR SET : Control the variance rate of output</p> <p>PRESET OT : Cut an output from the calculation of PID when in A/D ERROR or BURN OUT in AUTO MODE, and output PRESET OUT. (Except that you should output MVOUT=100% when it is over PRESET OUT=0%, and output MVOUT=0% when it is below PRESET OUT=0%.)</p> <p>Output MAN output value regardless of ERROR when in MAN MODE.</p> | | |
| OUTPUT SET3 | 12:54P | | | | | | | | | | | | |
| ARW SET | : 100.0 % | | | | | | | | | | | | |
| OPR SET | : 100.0 %/S | | | | | | | | | | | | |
| ONOFF HYS | : 10.00 °C | | | | | | | | | | | | |
| PRESET OT | : 100.0 % | | | | | | | | | | | | |
| <table border="1"> <tr> <td>OUTPUT SET1</td> <td>12:54P</td> </tr> <tr> <td>OUT1:HEAT</td> <td>OUT2:COOL</td> </tr> <tr> <td>OUT3: RET</td> <td></td> </tr> <tr> <td>SCR.RANGE:</td> <td>4-20 mA</td> </tr> <tr> <td>OUT4:NONE</td> <td></td> </tr> <tr> <td>SCR.RANGE:</td> <td>4-20 mA</td> </tr> </table> | OUTPUT SET1 | 12:54P | OUT1:HEAT | OUT2:COOL | OUT3: RET | | SCR.RANGE: | 4-20 mA | OUT4:NONE | | SCR.RANGE: | 4-20 mA | <p>H/C TYPE</p> <p>OUT1 : Set output type of HEAT OUTPUT1</p> <p>OUT2 : Set output type of COOL OUTPUT2</p> <p>OUT3 : Set output type of OUTPUT3</p> <p>OUT4 : Set output type of OUTPUT4</p> <p>SCR.RANGE : Set output type of OUTPUT3,4(0-20, 4-20mA)</p> |
| OUTPUT SET1 | 12:54P | | | | | | | | | | | | |
| OUT1:HEAT | OUT2:COOL | | | | | | | | | | | | |
| OUT3: RET | | | | | | | | | | | | | |
| SCR.RANGE: | 4-20 mA | | | | | | | | | | | | |
| OUT4:NONE | | | | | | | | | | | | | |
| SCR.RANGE: | 4-20 mA | | | | | | | | | | | | |
| <table border="1"> <tr> <td>OUTPUT SET2</td> <td>12:54P</td> </tr> <tr> <td>RELAY SEL</td> <td>: NONE</td> </tr> <tr> <td>HEAT CYCL</td> <td>: 1 S</td> </tr> <tr> <td>COOL CYCL</td> <td>: 1 S</td> </tr> <tr> <td>ARW SET</td> <td>: 100.0 %</td> </tr> </table> | OUTPUT SET2 | 12:54P | RELAY SEL | : NONE | HEAT CYCL | : 1 S | COOL CYCL | : 1 S | ARW SET | : 100.0 % | <p>H/C TYPE</p> <p>RELAY SEL : Set type of RELAY OUTPUT.</p> <p>HEAT CYCLE : Set HEAT OUTPUT CYCLE time.</p> <p>COOL CYCLE : Set COOL OUTPUT CYCLE time..</p> <p>ARW SET: It is effective method for the control at the external shock,</p> | | |
| OUTPUT SET2 | 12:54P | | | | | | | | | | | | |
| RELAY SEL | : NONE | | | | | | | | | | | | |
| HEAT CYCL | : 1 S | | | | | | | | | | | | |
| COOL CYCL | : 1 S | | | | | | | | | | | | |
| ARW SET | : 100.0 % | | | | | | | | | | | | |
| <table border="1"> <tr> <td>OUTPUT SET3</td> <td>12:54P</td> </tr> <tr> <td>HEAT AT.G:</td> <td>1.0 %</td> </tr> <tr> <td>COOL AT.G:</td> <td>1.0 %</td> </tr> <tr> <td>DIRECTION:</td> <td>REUR.</td> </tr> </table> | OUTPUT SET3 | 12:54P | HEAT AT.G: | 1.0 % | COOL AT.G: | 1.0 % | DIRECTION: | REUR. | <p>H/C TYPE</p> <p>HEAT AT.G : GAIN value for HEAT</p> <p>COOL AT.G : GAIN value for COOL</p> <p>DIRECT : Set reverse/forward for PID control</p> | | | | |
| OUTPUT SET3 | 12:54P | | | | | | | | | | | | |
| HEAT AT.G: | 1.0 % | | | | | | | | | | | | |
| COOL AT.G: | 1.0 % | | | | | | | | | | | | |
| DIRECTION: | REUR. | | | | | | | | | | | | |
| <table border="1"> <tr> <td>OUTPUT SET4</td> <td>12:54P</td> </tr> <tr> <td>OPR SET</td> <td>: 100.0 %/S</td> </tr> <tr> <td>H/C HYS</td> <td>: 10.0 %</td> </tr> <tr> <td>HEAT PO</td> <td>: 0.0 %</td> </tr> <tr> <td>COOL PO</td> <td>: 0.0 %</td> </tr> </table> | OUTPUT SET4 | 12:54P | OPR SET | : 100.0 %/S | H/C HYS | : 10.0 % | HEAT PO | : 0.0 % | COOL PO | : 0.0 % | <p>H/C TYPE</p> <p>OPR SET : Control the variance rate of output</p> <p>HEAT PO : HEAT PRESET OUTPUT</p> <p>COOL PO : COOL PRESET OUTPUT</p> | | |
| OUTPUT SET4 | 12:54P | | | | | | | | | | | | |
| OPR SET | : 100.0 %/S | | | | | | | | | | | | |
| H/C HYS | : 10.0 % | | | | | | | | | | | | |
| HEAT PO | : 0.0 % | | | | | | | | | | | | |
| COOL PO | : 0.0 % | | | | | | | | | | | | |

| Symbol | Parameter | Range | Display | Unit | Default | Edit |
|------------|------------------------|-----------------------|----------------------|------|-----------|------|
| OUT1 | OUTPUT 1 | HEAT, NONE | STD TYPE | ABS | HEAT | ○ |
| | | HEAT, COOL, NONE | H/C TYPE | ABS | HEAT | ○ |
| OUT2 | OUTPUT 2 | HEAT, NONE | STD TYPE | ABS | NONE | ○ |
| | | HEAT, COOL, NONE | H/C TYPE | ABS | COOL | ○ |
| OUT3 | OUTPUT 3 | HEAT, RET, NONE | STD TYPE | ABS | RET | ○ |
| | | HEAT, COOL, RET, NONE | H/C TYPE | ABS | RET | ○ |
| OUT4 | OUTPUT 4 | HEAT, RET, NONE | STD TYPE | ABS | NONE | ○ |
| | | HEAT, COOL, RET, NONE | H/C TYPE | ABS | NONE | ○ |
| SCR.RANGE | SCR.RANGE | 0~20mA, 4~20mA | Always | ABS | 4~20mA | ○ |
| RELAY SEL | RELAY SELECT | HEAT, NONE | STD TYPE | ABS | NONE | ○ |
| | | HEAT, COOL, NONE | H/C TYPE | ABS | NONE | ○ |
| CYCLE | CYCLE | 1 ~ 300s | STD TYPE | sec | 2 sec. | ○ |
| HEAT CYCL | HEAT CYCLE | 1 ~ 300s | H/C TYPE | sec | 2 sec. | ○ |
| COOL CYCL | COOL CYCLE | 1 ~ 300s | H/C TYPE | sec | 2 sec. | ○ |
| AT.GAIN | AUTO GAIN | 0.1 ~ 10.0% | STD TYPE | % | 1.0% | ○ |
| DIRECTION | DIRECTION | REVR, FORW | Always | ABS | REVR. | ○ |
| ARW SET | ANTI RESET Wind-Up SET | 0.0~200.0% | H/C TYPE STD TYPE | % | 100.0% | ○ |
| OPR SET | OUTPUT RATE SET | OFF, 0.1~100.0%/S | Always | %/S | OFF | ○ |
| ONOFF HYS | ON/OFF HYSTERESIS | EUS(0.0~10.0%) | STD TYPE | EUS | EUS(0.5%) | ○ |
| PRESET OUT | PRESET OUTPUT | -5.0~105.0% | STD TYPE | % | 0.0% | ○ |
| HEAT AT. | HEAT AUTO GAIN | 0.1~10.0% | H/C TYPE | % | 1.0% | ○ |
| COOL AT. | COOL AUTO GAIN | 0.1~10.0% | H/C TYPE | % | 1.0% | ○ |
| H/C HYS | H/C Type HYSTERESIS | 0.0~10.0% | H/C TYPE | % | 0.5% | ○ |
| HEAT PO | HEAT PRESET OUTPUT | -5.0~105.0% | H/C TYPE | % | 0.0% | ○ |
| COOL PO | COOL PRESET OUTPUT | -5.0~105.0% | H/C TYPE | % | 0.0% | ○ |

4.5.3 RETRANSMISSION SET

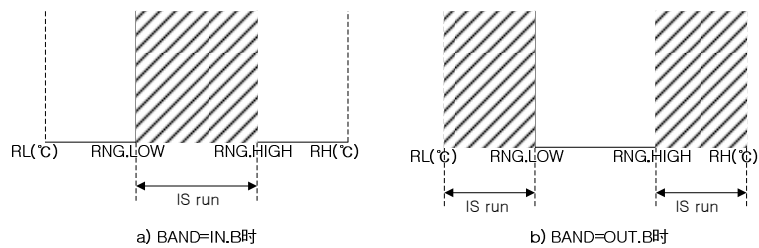
| | |
|---|---|
| <pre> SETUP MENU 12:54P INPUT DO PTN SUB OUTPUT BIAS SEG ALM RET DI REPEAT INNER PWD TIME SG ALARM FILE ON/OFF </pre> | <p>SETUP MENU screen to enter RETRANSMISSION SET. Operation screen will return by pushing SET KEY again for 3 sec. or NO KEY input for 60 sec.</p> |
| <pre> TEMP RET. 12:54P KIND : P U RNG. HIGH: 150.00 °C RNG. LOW : -50.00 °C </pre> | <p>KIND : Indicates a type of RET output, and there are PV, SP, MV for Standard TYPE, and PV, SP, MV, HMV, CMV for H/C Type. RNG.HIGH : Upper-limit of RET output RNG.LOW : Lower-limit of RET output</p> |
| <pre> TEMP RET. 12:54P KIND : S P RNG. HIGH: 150.0 °C RNG. LOW : -50.0 °C </pre> | <p>KIND : Indicates a type of RET output, and there are PV, SP, MV for Standard TYPE, and PV, SP, MV, HMV, CMV for H/C Type. RNG.HIGH : Upper-limit of RET output RNG.LOW : Lower-limit of RET output</p> |
| <pre> TEMP RET. 12:54P KIND : M U </pre> | <p>KIND : Indicates a type of RET output, and there are PV, SP, MV for Standard TYPE, and PV, SP, MV, HMV, CMV for H/C Type. RNG.HIGH : Upper-limit of RET output RNG.LOW : Lower-limit of RET output</p> |

| Symbol | Parameter | Range | Display | Unit | Default | Edit |
|----------|----------------|---------------------------|---------------|------|------------|------|
| KIND | RETRANSMISSION | PV, SP, MV | STD TYPE | ABS | PV | ○ |
| KIND | RETRANSMISSION | PV, SP, MV, HMV, CMV | H/C TYPE | ABS | PV | ○ |
| RNG.HIGH | RANGE HIGH | RNG.LOW+1digit~EU(100.0%) | Select PV, SP | EU | EU(100.0%) | ○ |
| RNG.LOW | RANGE LOW | EU(0.0%)~RNG.HIGH-1digit | Select PV, SP | EU | EU(0.0%) | ○ |

4.5.4 INNER SIGNAL (IS) SET

| | |
|---|--|
| <pre> SETUP MENU 12:54P INPUT DO PTN SUB OUTPUT BIAS SEG ALM RET DI REPEAT INNER PWD TIME SG ALARM FILE ON/OFF </pre> | SETUP MENU screen to enter IS SET. Operation screen will return by pushing SET KEY again for 3 sec. or NO KEY input for 60 sec. |
| <pre> INNER SIGNAL1 12:54P KIND : SP °C RNG. HIGH: -50.00 °C RNG. LOW : -50.00 °C BAND : IN.B DELAY.TM : 00.00 M.S </pre> | KIND : Set type of humidity retransmission (TSP, PV, SP) RNG.HIGH(LOW) : Range for IS BAND : Direct of IS band (IN.B/OUT.B) DELAY.TM : IS delay time INNER SIGNAL : There are 1 ~ 4 pages of IS. |

| Symbol | Parameter | Range | Display | Unit | Default | EDIT |
|----------|-------------------|-------------------|---------|------|-------------|------|
| KIND | INNER SIGNAL KIND | TSP, PV, SP | Always | ABS | SP | ○ |
| RNG.HIGH | IS RANGE HIGH | EU(0.0~100.0%) | Always | EU | EU(0.0%) | ○ |
| RNG.LOW | IS RANGE LOW | | Always | EU | EU(0.0%) | ○ |
| BAND | BAND DIRECT | IN.B, OUT.B | Always | ABS | IN.B | ○ |
| DELAY.TM | DELAY TIME | 00.00~99.59 MM.SS | Always | TIME | 00.00 MM.SS | ○ |



(Figure21 : Ex. Of INNER SIGNAL ZONE)

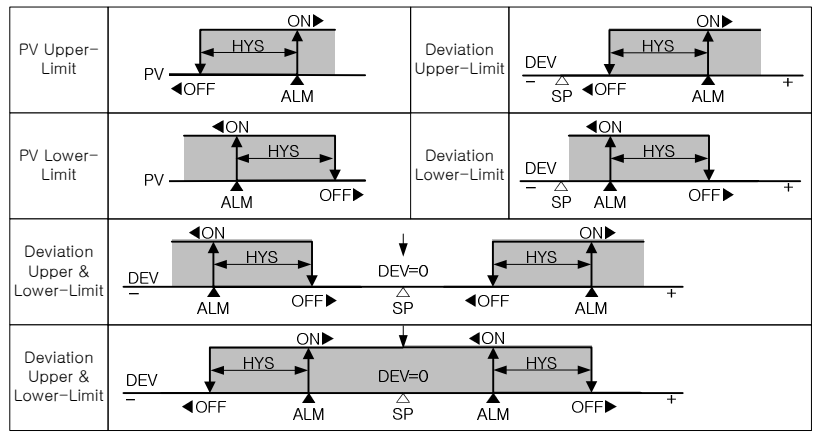
4.5.5 ALARM SET

| | |
|---|--|
| <pre> SETUP MENU 12:54P INPUT DO PTN SUB OUTPUT BIAS SEG ALM RET DI REPEAT INNER PWD TIME SG ALARM FILE ON/OFF </pre> | <p>SETUP MENU screen to enter ALARM SET. Operation screen will return by pushing SET KEY again for 3 sec. or NO KEY input for 60 sec.</p> |
| <pre> ALARM SIGNAL1 12:54P KIND : AH.F HYS : 1.00 % DELAY.TM : 00.00 M.S ALM MODE : ALL </pre> | <p>This is ALARM SIGNAL 1 screen. KIND : Set type of ALARM. HYS : Set HYSTERESIS for ALARM. DELAY.TM : Set the delay time for ALRAM output ALM MODE : Set ALARM Operation mode. ALL : Always ALARM works. RUN/AM : When RUN(AUTO,MAN), ALARM works RUN/A : When RUN(AUTO), ALARM works</p> |
| <pre> ALARM SIGNAL2 12:54P KIND : AL.F HYS : 1.00 % DELAY.TM : 00.00 M.S ALM MODE : ALL </pre> | <p>This is ALARM SIGNAL 2 screen. KIND : Set type of ALARM. HYS : Set HYSTERESIS for ALARM. DELAY.TM : Set the delay time for ALRAM output ALM MODE : Set ALARM Operation mode. ALL : Always ALARM works. RUN/AM : When RUN(AUTO,MAN), ALARM works RUN/A : When RUN(AUTO), ALARM works</p> |
| <pre> ALARM SIGNAL3 12:54P KIND : DH.F HYS : 1.0 % DELAY.TM : 00.00 M.S ALM MODE : ALL </pre> | <p>This is ALARM SIGNAL 3 screen. KIND : Set type of ALARM. HYS : Set HYSTERESIS for ALARM. DELAY.TM : Set the delay time for ALRAM output ALM MODE : Set ALARM Operation mode. ALL : Always ALARM works. RUN/AM : When RUN(AUTO,MAN), ALARM works RUN/A : When RUN(AUTO), ALARM works</p> |
| <pre> ALARM SIGNAL4 12:54P KIND : DL.F HYS : 1.0 % DELAY.TM : 00.00 M.S ALM MODE : ALL </pre> | <p>This is ALARM SIGNAL 4 screen. KIND : Set type of ALARM. HYS : Set HYSTERESIS for ALARM. DELAY.TM : Set the delay time for ALRAM output ALM MODE : Set ALARM Operation mode. ALL : Always ALARM works. RUN/AM : When RUN(AUTO,MAN), ALARM works RUN/A : When RUN(AUTO), ALARM works</p> |

| Symbol | Parameter | Range | Display | Unit | Default | EDIT |
|----------|------------------|--|---------|------|-------------|------|
| KIND | ALARM KIND | OFF, AH.F, AL.F, DH.F, DL.F, DH.R, DL.R, DO.F, DI.F, AH.R, AL.R, AH.FS, AL.FS, DH, FS, DL.FS, DH.RS, DL.RS, DO.FS, DI.FS, AH.RS, AL.RS | Always | ABS | AH.F | ○ |
| HYS | ALARM HYSTERESIS | EUS(0.0~100.0%) | Always | EUS | EUS(0.5%) | ○ |
| DELAY.TM | DELAY TIME | 00.00~99.59 MM.SS | Always | TIME | 00.00 MM.SS | ○ |
| ALM MODE | ALARM MODE | ALL, RUN/AM, RUN/A | Always | ABS | ALL | ○ |

(TABLE 2 : ALARM TYPE)

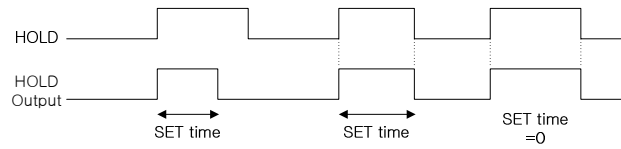
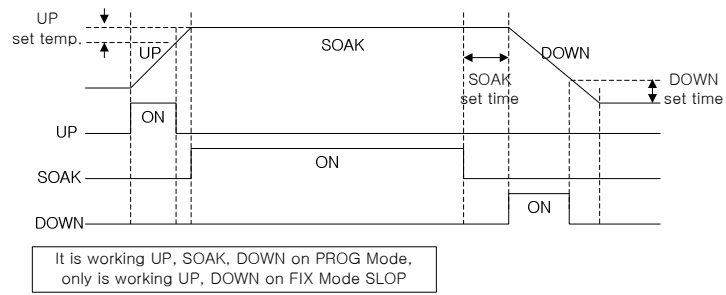
| No. | Alarm Type | Output Direct | | Standby | | Display Data |
|-----|-------------------------------------|---------------|-----|---------|-----|--------------|
| | | For | Rev | On | Off | |
| 1 | PV Upper-Limit | O | | O | | AH.F |
| 2 | PV Lower-Limit | O | | O | | AL.F |
| 3 | Deviation Upper-Limit | O | | O | | DH.F |
| 4 | Deviation Lower-Limit | O | | O | | DL.F |
| 5 | Deviation Upper-Limit | | O | O | | DH.R |
| 6 | Deviation Lower-Limit | | O | O | | DL.R |
| 7 | Deviation Upper & Lower-Limit | O | | O | | DO.F |
| 8 | Deviation Upper & Lower-Limit Range | O | | O | | DI.F |
| 9 | PV Upper-Limit | | O | O | | AH.R |
| 10 | PV Lower-Limit | | O | O | | AL.R |
| 11 | PV Upper-Limit | O | | | O | AH.FS |
| 12 | PV Lower-Limit | O | | | O | AL.FS |
| 13 | Deviation Upper-Limit | O | | | O | DH.FS |
| 14 | Deviation Lower-Limit | O | | | O | DL.FS |
| 15 | Deviation Upper-Limit | | O | | O | DH.RS |
| 16 | Deviation Lower-Limit | | O | | O | DL.RS |
| 17 | Deviation Upper & Lower-Limit | O | | | O | DO.FS |
| 18 | Deviation Upper & Lower-Limit Range | O | | | O | DI.FS |
| 19 | PV Upper-Limit | | O | | O | AH.RS |
| 20 | PV Lower-Limit | | O | | O | AL.RS |



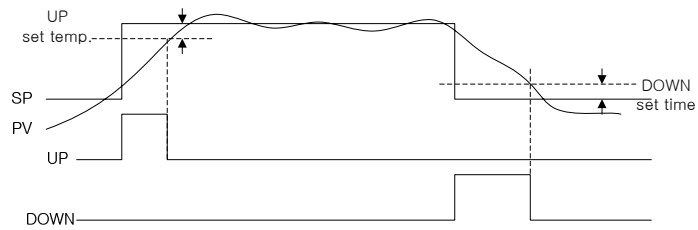
(Figure22 : ALRAM OPERATION)

4.5.6 Digital Output SET (DO)

| | | | | | | | | | | | | | |
|---|--------------|--------|---------|------------|----------|--------------|----------|-----------|-----------|-------------|---|-------------|--|
| <table border="1"> <tr> <td>SETUP MENU</td> <td>12:54P</td> </tr> <tr> <td>INPUT</td> <td>DO PTN SUB</td> </tr> <tr> <td>OUTPUT</td> <td>BIAS SEG ALM</td> </tr> <tr> <td>RET</td> <td>DI REPEAT</td> </tr> <tr> <td>INNER</td> <td>PWD TIME SG</td> </tr> <tr> <td>ALARM</td> <td>FILE ON/OFF</td> </tr> </table> | SETUP MENU | 12:54P | INPUT | DO PTN SUB | OUTPUT | BIAS SEG ALM | RET | DI REPEAT | INNER | PWD TIME SG | ALARM | FILE ON/OFF | <p>SETUP MENU screen to enter DO SET. Operation screen will return by pushing SET KEY again for 3 sec. or NO KEY input for 60 sec.</p> |
| SETUP MENU | 12:54P | | | | | | | | | | | | |
| INPUT | DO PTN SUB | | | | | | | | | | | | |
| OUTPUT | BIAS SEG ALM | | | | | | | | | | | | |
| RET | DI REPEAT | | | | | | | | | | | | |
| INNER | PWD TIME SG | | | | | | | | | | | | |
| ALARM | FILE ON/OFF | | | | | | | | | | | | |
| <table border="1"> <tr> <td>DO CONFIG1</td> <td>12:54P</td> </tr> <tr> <td>IS1 : 0</td> <td>TS1 : 0</td> </tr> <tr> <td>IS2 : 0</td> <td>TS2 : 0</td> </tr> <tr> <td>IS3 : 0</td> <td>TS3 : 0</td> </tr> <tr> <td>IS4 : 0</td> <td>TS4 : 0</td> </tr> <tr> <td>RUN : 0</td> <td>TS5 : 0</td> </tr> </table> | DO CONFIG1 | 12:54P | IS1 : 0 | TS1 : 0 | IS2 : 0 | TS2 : 0 | IS3 : 0 | TS3 : 0 | IS4 : 0 | TS4 : 0 | RUN : 0 | TS5 : 0 | <p>DO CONFIG set (1st page) Set the relay number (0~12) for IS1~4, RUN and TS1~5</p> |
| DO CONFIG1 | 12:54P | | | | | | | | | | | | |
| IS1 : 0 | TS1 : 0 | | | | | | | | | | | | |
| IS2 : 0 | TS2 : 0 | | | | | | | | | | | | |
| IS3 : 0 | TS3 : 0 | | | | | | | | | | | | |
| IS4 : 0 | TS4 : 0 | | | | | | | | | | | | |
| RUN : 0 | TS5 : 0 | | | | | | | | | | | | |
| <table border="1"> <tr> <td>DO CONFIG2</td> <td>12:54P</td> </tr> <tr> <td>AL1 : 0</td> <td>S.AL1 : 0</td> </tr> <tr> <td>AL2 : 0</td> <td>S.AL2 : 0</td> </tr> <tr> <td>AL3 : 0</td> <td>S.AL3 : 0</td> </tr> <tr> <td>AL4 : 0</td> <td>S.AL4 : 0</td> </tr> <tr> <td>ERR : 0</td> <td>RELAY : 0</td> </tr> </table> | DO CONFIG2 | 12:54P | AL1 : 0 | S.AL1 : 0 | AL2 : 0 | S.AL2 : 0 | AL3 : 0 | S.AL3 : 0 | AL4 : 0 | S.AL4 : 0 | ERR : 0 | RELAY : 0 | <p>DO CONFIG set (2nd page) Set the relay number (0~12) for ALARM1~4, WAIT and SEG ALARM1~4(0~12) Set the relay number (0~8) for Relay Output</p> |
| DO CONFIG2 | 12:54P | | | | | | | | | | | | |
| AL1 : 0 | S.AL1 : 0 | | | | | | | | | | | | |
| AL2 : 0 | S.AL2 : 0 | | | | | | | | | | | | |
| AL3 : 0 | S.AL3 : 0 | | | | | | | | | | | | |
| AL4 : 0 | S.AL4 : 0 | | | | | | | | | | | | |
| ERR : 0 | RELAY : 0 | | | | | | | | | | | | |
| <table border="1"> <tr> <td>DO CONFIG3</td> <td>12:54P</td> </tr> <tr> <td>T1 : 0</td> <td>00.00 M.S</td> </tr> <tr> <td>T2 : 0</td> <td>00.00 M.S</td> </tr> <tr> <td>T3 : 0</td> <td>00.00 M.S</td> </tr> <tr> <td>T4 : 0</td> <td>00.00 M.S</td> </tr> </table> | DO CONFIG3 | 12:54P | T1 : 0 | 00.00 M.S | T2 : 0 | 00.00 M.S | T3 : 0 | 00.00 M.S | T4 : 0 | 00.00 M.S | <p>DO CONFIG set (3rd page) Set the relay number (0~12) for T1~T4</p> | | |
| DO CONFIG3 | 12:54P | | | | | | | | | | | | |
| T1 : 0 | 00.00 M.S | | | | | | | | | | | | |
| T2 : 0 | 00.00 M.S | | | | | | | | | | | | |
| T3 : 0 | 00.00 M.S | | | | | | | | | | | | |
| T4 : 0 | 00.00 M.S | | | | | | | | | | | | |
| <table border="1"> <tr> <td>DO CONFIG4</td> <td>12:54P</td> </tr> <tr> <td>UP : 0</td> <td>0.0 °C</td> </tr> <tr> <td>SOAK : 0</td> <td>0 MIN</td> </tr> <tr> <td>DOWN : 0</td> <td>0.0 °C</td> </tr> <tr> <td>PTEND : 0</td> <td>0 SEC</td> </tr> <tr> <td>HOLD : 0</td> <td>0 MIN</td> </tr> </table> | DO CONFIG4 | 12:54P | UP : 0 | 0.0 °C | SOAK : 0 | 0 MIN | DOWN : 0 | 0.0 °C | PTEND : 0 | 0 SEC | HOLD : 0 | 0 MIN | <p>DO CONFIG set (4th page) Set the relay number (0~12) for UP, SOAK, T.DOWN and set temperature, operating time for each UP : Output until X°C [X=T.SP - set temperature] SOAK : Output until X min [X=SOAK zone time - set time] DOWN : Output until X°C [X=T.SP - set temperature] Set the relay number (0~12) for PTEND and set Output time Set the relay number (0~12) for HOLD and set Output time</p> |
| DO CONFIG4 | 12:54P | | | | | | | | | | | | |
| UP : 0 | 0.0 °C | | | | | | | | | | | | |
| SOAK : 0 | 0 MIN | | | | | | | | | | | | |
| DOWN : 0 | 0.0 °C | | | | | | | | | | | | |
| PTEND : 0 | 0 SEC | | | | | | | | | | | | |
| HOLD : 0 | 0 MIN | | | | | | | | | | | | |



(Figure23 : Ex. Of UP, SOAK, DOWN, HOLD)

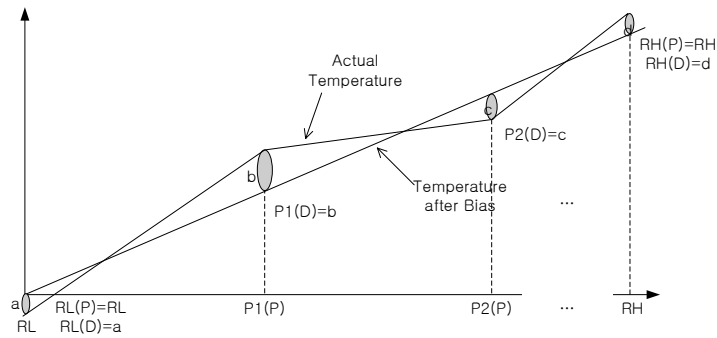


(Figure24 : Ex.of UP, DOWN output when changing FIX Mode SP)

| Symbol | Parameter | Range | Display | Unit | Default | EDIT |
|------------|-------------------|------------------|---------|------|-----------|------|
| IS1 | INNER SIGNAL1 | 0 ~ 12 | Always | ABS | 0 | ○ |
| IS2 | INNER SIGNAL2 | 0 ~ 12 | Always | ABS | 0 | ○ |
| IS3 | INNER SIGNAL3 | 0 ~ 12 | Always | ABS | 0 | ○ |
| IS4 | INNER SIGNAL4 | 0 ~ 12 | Always | ABS | 0 | ○ |
| RUN | RUN | 0 ~ 12 | Always | ABS | 0 | ○ |
| TS1 | TIME SIGNAL1 | 0 ~ 12 | Always | ABS | 0 | ○ |
| TS2 | TIME SIGNAL2 | 0 ~ 12 | Always | ABS | 0 | ○ |
| TS3 | TIME SIGNAL3 | 0 ~ 12 | Always | ABS | 0 | ○ |
| TS4 | TIME SIGNAL4 | 0 ~ 12 | Always | ABS | 0 | ○ |
| TS5 | TIME SIGNAL5 | 0 ~ 12 | Always | ABS | 0 | ○ |
| AL1 | ALARM SIGNAL1 | 0 ~ 12 | Always | ABS | 0 | ○ |
| AL2 | ALARM SIGNAL2 | 0 ~ 12 | Always | ABS | 0 | ○ |
| AL3 | ALARM SIGNAL3 | 0 ~ 12 | Always | ABS | 0 | ○ |
| AL4 | ALARM SIGNAL4 | 0 ~ 12 | Always | ABS | 0 | ○ |
| S.AL1 | SEG ALARM SIGNAL1 | 0 ~ 12 | Always | ABS | 0 | ○ |
| S.AL2 | SEG ALARM SIGNAL2 | 0 ~ 12 | Always | ABS | 0 | ○ |
| S.AL3 | SEG ALARM SIGNAL3 | 0 ~ 12 | Always | ABS | 0 | ○ |
| S.AL4 | SEG ALARM SIGNAL4 | 0 ~ 12 | Always | ABS | 0 | ○ |
| ERR | ERROR | 0 ~ 12 | Always | ABS | 0 | ○ |
| RELAY | RELAY | 0 ~ 8 | Always | ABS | 0 | ○ |
| T1 | T1 SIGNAL | 0 ~ 12 | Always | ABS | 0 | ○ |
| T1 PARA | T1 SIGNAL PARA | 0.00~99.59 MM.SS | Always | ABS | 00.00 | ○ |
| T2 | T2 SIGNAL | 0 ~ 12 | Always | ABS | 0 | ○ |
| T2 PARA | T2 SIGNAL PARA | 0.00~99.59 MM.SS | Always | ABS | 00.00 | ○ |
| T3 | T3 SIGNAL | 0 ~ 12 | Always | ABS | 0 | ○ |
| T3 PARA | T3 SIGNAL PARA | 0.00~99.59 MM.SS | Always | ABS | 00.00 | ○ |
| T4 | T4 SIGNAL | 0 ~ 12 | Always | ABS | 0 | ○ |
| T4 PARA | T4 SIGNAL PARA | 0.00~99.59 MM.SS | Always | ABS | 00.00 | ○ |
| UP | UP SIGNAL | 0 ~ 12 | Always | ABS | 0 | ○ |
| UP PARA | UP PARAMETER | EUS(0.0~10.0%) | Always | EUS | EUS(0.0%) | ○ |
| SOAK | SOAK SIGNAL | 0 ~ 12 | Always | ABS | 0 | ○ |
| SOAK PARA | SOAK PARAMETER | 0~999 (TMU) | Always | TIME | 0 MIN | ○ |
| DOWN | DOWN SIGNAL | 0 ~ 12 | Always | ABS | 0 | ○ |
| DOWN PARA | DOWN PARAMETER | EUS(0.0~10.0%) | Always | EUS | EUS(0.0%) | ○ |
| PTEND | PTEND SIGNAL | 0 ~ 12 | Always | ABS | 0 | ○ |
| PTEND PARA | PTEND PARAMETER | 0~999 SEC | Always | TIME | 0 SEC | ○ |
| HOLD | HOLD SIGNAL | 0 ~ 12 | Always | ABS | 0 | ○ |
| HOLD PARA | HOLD PARAMETER | 0~999 MIN | Always | TIME | 0 MIN | ○ |

4.5.7 PIECE BIAS SET

| | |
|--|--|
| <pre> SETUP MENU 12:54P INPUT DO PTN SUB OUTPUT BIAS SEG ALM RET DI REPEAT INNER PWD TIME SG ALARM FILE ON/OFF </pre> | <p>SETUP MENU screen to enter BIAS SET. Operation screen will return by pushing SET KEY again for 3 sec. or NO KEY input for 60 sec.</p> |
| <pre> PIECE BIAS1 12:54P RL(P/D) -50.00 0.00 P1(P/D) 150.00 0.00 P2(P/D) 150.00 0.00 P3(P/D) 150.00 0.00 P U : 57.02c </pre> | <p>Set bias for piece RL(P), P1(P), P2(P), P3(P) : Point (Boundary point) RL(D), P1(D), P2(D), P3(D) : Bias value</p> |
| <pre> PIECE BIAS2 12:54P P4(P/D) 150.00 0.00 P5(P/D) 150.00 0.00 P6(P/D) 150.00 0.00 P7(P/D) 150.00 0.00 P U : 57.02c </pre> | <p>Set bias for piece P4(P), P5(P), P6(P), P7(P) : Point (Boundary point) P4(D), P5(D), P6(D), P7(D) : Bias value</p> |
| <pre> PIECE BIAS3 12:54P P8(P/D) 150.00 0.00 P9(P/D) 150.00 0.00 RH(P/D) 150.00 0.00 P U : 57.02c </pre> | <p>Set bias for piece P8(P), P9(P), RH(P) : Point (Boundary point) P8(D), P9(D), RH(D) : Bias value</p> |



(Figure25 : Ex. Piece Bias Formula)

| Symbol | Parameter | Range | Display | Unit | Default | Edit |
|--------|-----------------------|---|---------|------|------------|------|
| RL(P) | REFERENCE BIAS RL | EU(0.0~100.0%) RL≤DP.RL≤DP.P1 ≤DP.P2≤DP.P3≤DP.P4 | Always | EU | EU(0.0%) | X |
| P1(P) | REFERENCE BIAS POINT1 | | Always | EU | EU(100.0%) | O |
| P2(P) | REFERENCE BIAS POINT2 | | Always | EU | EU(100.0%) | O |
| P3(P) | REFERENCE BIAS POINT3 | | Always | EU | EU(100.0%) | O |
| RL(D) | BIAS VALUE OF RL | EUS(-10.0~10.0%) | Always | EUS | EUS(0.0%) | O |
| P1(D) | BIAS VAUE OF POINT1 | | Always | EUS | EUS(0.0%) | O |
| P2(D) | BIAS VALUE OF POINT2 | | Always | EUS | EUS(0.0%) | O |
| P3(D) | BIAS VALUE OF POINT3 | | Always | EUS | EUS(0.0%) | O |
| P4(P) | REFERENCE BIAS POINT4 | EU(0.0~100.0%) DP.P3≤DP.P4≤DP.P5 ≤DP.P6≤DP.P7≤DP.P8 | Always | EU | EU(100.0%) | O |
| P5(P) | REFERENCE BIAS POINT5 | | Always | EU | EU(100.0%) | O |
| P6(P) | REFERENCE BIAS POINT6 | | Always | EU | EU(100.0%) | O |
| P7(P) | REFERENCE BIAS POINT7 | | Always | EU | EU(100.0%) | O |
| P4(D) | BIAS VAUE OF POINT4 | EUS(-10.0~10.0%) | Always | EUS | EUS(0.0%) | O |
| P5(D) | BIAS VAUE OF POINT5 | | Always | EUS | EUS(0.0%) | O |
| P6(D) | BIAS VALUE OF POINT6 | | Always | EUS | EUS(0.0%) | O |
| P7(D) | BIAS VALUE OF POINT7 | | Always | EUS | EUS(0.0%) | O |
| P8(P) | REFERENCE BIAS POINT8 | EU(0.0~100.0%) DP.P7≤DP.P8≤DP.P9 ≤RH | Always | EU | EU(100.0%) | O |
| P9(P) | REFERENCE BIAS POINT9 | | Always | EU | EU(100.0%) | O |
| RH(P) | REFERENCE BIAS RH | | Always | EU | EU(100.0%) | X |
| P8(D) | BIAS VAUE OF POINT8 | EUS(-10.0~10.0%) | Always | EUS | EUS(0.0%) | O |
| P9(D) | BIAS VAUE OF POINT9 | | Always | EUS | EUS(0.0%) | O |
| RH(D) | BIAS VALUE OF RH | | Always | EUS | EUS(0.0%) | O |

4.5.8 Digital Input (DI) SET

| | |
|--|--|
| <pre> SETUP MENU 12:54P INPUT DO PTN SUB OUTPUT BIAS SEG ALM RET DI REPEAT INNER PWD TIME SG ALARM FILE ON/OFF </pre> | SETUP MENU screen to enter DI SET. Operation screen will return by pushing SET KEY again for 3 sec. or NO KEY input for 60 sec. |
|--|--|

| | |
|---|--|
| <pre> DI OPERATION 12:54P DI SL:0 STS:0000 DI1 :RUN DI2:STOP DI3 :ERROR_01_ DI4 :ERROR_02_ TOG GROUP:ABCD </pre> | SETUP MENU screen to enter BIAS SET. Operation screen will return by pushing SET KEY again for 3 sec. or NO KEY input for 60 sec. |
|---|--|

| Symbol | Parameter | Range | Display | Unit | Default | Edit |
|-----------|-----------|------------------------|---------|------|----------|------|
| DI1 NAME | DI1 NAME | RUN/STOP | Always | ABS | RUN/STOP | X |
| DI2 NAME | DI2 NAME | 0 ~ 9, A ~ Z, Symbols | Always | ABS | ERROR 02 | O |
| DI3 NAME | DI3 NAME | 0 ~ 9, A ~ Z, Symbols | Always | ABS | ERROR 03 | O |
| DI4 NAME | DI4 NAME | 0 ~ 9, A ~ Z, Symbols | Always | ABS | ERROR 04 | O |
| TOG GROUP | TOG GROUP | A ~ Z, 0 ~ 9 , Symbols | Always | ABS | ABCD | X |

TABLE 3 : DI Operation

| 符号 | DI1 | DI2 | DI3 | DI4 | 动作 | |
|---------|-----|-----|-----|-----|------|-----------|
| F I X | 0 | ON | OFF | OFF | OFF | RUN |
| | | OFF | ON | OFF | OFF | STOP |
| | | - | - | ON | OFF | ERROR 1 |
| | | - | - | OFF | ON | ERROR 2 |
| | 1 | ON | OFF | - | - | RUN |
| | | OFF | ON | - | - | STOP |
| | | - | - | OFF | OFF | SP1 |
| | | - | - | ON | OFF | SP2 |
| | | - | - | OFF | ON | SP3 |
| | | - | - | ON | ON | SP4 |
| P R O G | 0 | ON | OFF | OFF | OFF | RUN |
| | | OFF | ON | OFF | OFF | STOP |
| | | - | - | ON | OFF | ERROR 1 |
| | | - | - | OFF | ON | ERROR 2 |
| | 1 | OFF | OFF | OFF | OFF | PT manual |
| | | ON | OFF | OFF | OFF | PT1 |
| | | OFF | ON | OFF | OFF | PT2 |
| | | ON | ON | OFF | OFF | PT3 |
| | | OFF | OFF | ON | OFF | PT4 |
| | | ON | OFF | ON | OFF | PT5 |
| | | OFF | ON | ON | OFF | PT6 |
| | | ON | ON | ON | OFF | PT7 |
| | | OFF | OFF | OFF | ON | PT8 |
| | | ON | OFF | OFF | ON | PT9 |
| | | OFF | ON | OFF | ON | PT10 |
| | | ON | ON | OFF | ON | PT11 |
| | | OFF | OFF | ON | ON | PT12 |
| | | ON | OFF | ON | ON | PT13 |
| | | OFF | ON | ON | ON | PT14 |
| | ON | ON | ON | ON | PT15 | |
| | 2 | ON | OFF | - | - | RUN |
| | | OFF | ON | - | - | STOP |
| | | - | - | ON | - | HOLD ON |
| | | - | - | OFF | - | HOLD OFF |
| | | - | - | - | ON | STEP ON |
| | 3 | ON | - | - | - | RUN |
| | | OFF | - | - | - | STOP |
| | | - | OFF | OFF | OFF | PT manual |
| | | - | ON | OFF | OFF | PT1 |
| | | - | OFF | ON | OFF | PT2 |
| - | | ON | ON | OFF | PT3 | |
| - | | OFF | OFF | ON | PT4 | |
| - | | ON | OFF | ON | PT5 | |
| - | OFF | ON | ON | PT6 | | |
| - | ON | ON | ON | PT7 | | |

4.5.9 PASSWORD SET

| | | | | | | | | | | | | | |
|---|------------|--------|------------------|--|---------------------|--|---------------|--|-------------------|--|-------------------|--|--|
| <table border="1"> <tr> <td>SETUP MENU</td> <td>12:54P</td> </tr> <tr> <td>INPUT DO PTN SUB</td> <td></td> </tr> <tr> <td>OUTPUT BIAS SEG ALM</td> <td></td> </tr> <tr> <td>RET DI REPEAT</td> <td></td> </tr> <tr> <td>INNER PWD TIME SG</td> <td></td> </tr> <tr> <td>ALARM FILE ON/OFF</td> <td></td> </tr> </table> | SETUP MENU | 12:54P | INPUT DO PTN SUB | | OUTPUT BIAS SEG ALM | | RET DI REPEAT | | INNER PWD TIME SG | | ALARM FILE ON/OFF | | SETUP MENU screen to enter PASSWORD SET. Operation screen will return by pushing SET KEY again for 3 sec. or NO KEY input for 60 sec. |
| SETUP MENU | 12:54P | | | | | | | | | | | | |
| INPUT DO PTN SUB | | | | | | | | | | | | | |
| OUTPUT BIAS SEG ALM | | | | | | | | | | | | | |
| RET DI REPEAT | | | | | | | | | | | | | |
| INNER PWD TIME SG | | | | | | | | | | | | | |
| ALARM FILE ON/OFF | | | | | | | | | | | | | |

| | | | | | |
|--|----------|--------|------------------|---|---|
| <table border="1"> <tr> <td>PASSWORD</td> <td>12:54P</td> </tr> <tr> <td>PASS: [REDACTED]</td> <td>0</td> </tr> </table> | PASSWORD | 12:54P | PASS: [REDACTED] | 0 | Set the new password SET KEY → UP, DOWN, SHIFT key → SET KEY |
| PASSWORD | 12:54P | | | | |
| PASS: [REDACTED] | 0 | | | | |



Default password is 0.(ZERO)
 After changing password, please confirm your new password.
 ▶ If you forget the password, connect Samwontech or our agency for reset service
 All of the data that you set before will be changed to default after reset.

| Symbol | Parameter | Range | Display | Unit | Default | EDIT |
|--------|------------------|-------------|---------|------|---------|------|
| PASS | PASSWORD SETTING | 0000 ~ 9999 | Always | ABS | 0000 | ○ |

4.5.10 FILE EDIT

| | | | | | | | | | | | | | |
|--|------------|--------|----------|---------|-------------|---------|--------|--------|-----------|---------|------------|--------|---|
| <table border="1"> <tr><td>SETUP MENU</td><td>12:54P</td></tr> <tr><td>INPUT DO</td><td>PTN SUB</td></tr> <tr><td>OUTPUT BIAS</td><td>SEG ALM</td></tr> <tr><td>RET DI</td><td>REPEAT</td></tr> <tr><td>INNER PWD</td><td>TIME SG</td></tr> <tr><td>ALARM FILE</td><td>ON/OFF</td></tr> </table> | SETUP MENU | 12:54P | INPUT DO | PTN SUB | OUTPUT BIAS | SEG ALM | RET DI | REPEAT | INNER PWD | TIME SG | ALARM FILE | ON/OFF | SETUP MENU screen to enter FILE EDIT SET. Operation screen will return by pushing SET KEY again for 3 sec. or NO KEY input for 60 sec. |
| SETUP MENU | 12:54P | | | | | | | | | | | | |
| INPUT DO | PTN SUB | | | | | | | | | | | | |
| OUTPUT BIAS | SEG ALM | | | | | | | | | | | | |
| RET DI | REPEAT | | | | | | | | | | | | |
| INNER PWD | TIME SG | | | | | | | | | | | | |
| ALARM FILE | ON/OFF | | | | | | | | | | | | |

| | | | | | | | | | | | | | |
|---|-----------|--------|---------------|--|---------------|---------|---------------|---------|------------|---------|-------------------|--|--|
| <table border="1"> <tr><td>FILE EDIT</td><td>12:54P</td></tr> <tr><td>SRC PT NO : 0</td><td></td></tr> <tr><td>DES PT NO : 0</td><td>EXE : 0</td></tr> <tr><td>DEL PT NO : 0</td><td>DEL : 0</td></tr> <tr><td>PT ALL CLR</td><td>CLR : 0</td></tr> <tr><td>RESULT : EXE DONE</td><td></td></tr> </table> | FILE EDIT | 12:54P | SRC PT NO : 0 | | DES PT NO : 0 | EXE : 0 | DEL PT NO : 0 | DEL : 0 | PT ALL CLR | CLR : 0 | RESULT : EXE DONE | | SRC PT NO : Number of PATTERN for copy DES : Number of PATTERN to copy EXE : Operate when fixed to 1 DEL PT NO : Number of PATTERN for delete DEL : Deleted when fixed to 1 PT ALL CLR : All patterns are cleared when fixed to 1 |
| FILE EDIT | 12:54P | | | | | | | | | | | | |
| SRC PT NO : 0 | | | | | | | | | | | | | |
| DES PT NO : 0 | EXE : 0 | | | | | | | | | | | | |
| DEL PT NO : 0 | DEL : 0 | | | | | | | | | | | | |
| PT ALL CLR | CLR : 0 | | | | | | | | | | | | |
| RESULT : EXE DONE | | | | | | | | | | | | | |

| Symbol | Parameter | Range | Display | Unit | Default | EDIT |
|------------|----------------------------|--|---------|------|---------|------|
| SRC PT NO | Source Pattern Number | 0 ~ 30 | Always | ABS | 0 | ○ |
| DES PT NO | Destination Pattern Number | 0 ~ 30 | Always | ABS | 0 | ○ |
| EXE | EXECUTE | 0, 1 | Always | ABS | 0 | ○ |
| DEL PT NO | DELETE PATTERN NUMBER | 0 ~ 30 | Always | ABS | 0 | ○ |
| DEL | DELETE | 0, 1 | Always | ABS | 0 | ○ |
| PT ALL CLR | PATTERN ALL CLEAR | 0, 1 | Always | ABS | 0 | ○ |
| RESULT | RESULT | PARA ERR, EXE DONE, PT EMPTY, NO SEG, PT USING | Always | ABS | × | × |

4.5.11 PTN SUB

| | |
|---|---|
| <pre> SETUP MENU 12:54P INPUT DO PTN SUB OUTPUT BIAS SEG ALM RET DI REPEAT INNER PWD TIME SG ALARM FILE ON/OFF </pre> | <p>SETUP MENU screen to enter PTN SUB SET. Operation screen will return by pushing SET KEY again for 3 sec. or NO KEY input for 60 sec.</p> |
| <pre> PTN SUB SET 12:54P PT NO : 30 </pre> | <p>PT NO : Set the PATTERN No..</p> |
| <pre> SG PID S.ALM1 2 3 4 001 0 0 0 0 0 002 0 0 0 0 0 003 0 0 0 0 0 004 0 0 0 0 0 005 0 0 0 0 0 </pre> | <p>Set PID NO, SEG ALARM 1, 2, 3, 4 of each SEG (when PID NO=0, ZONE PID work)</p> |

| Symbol | Parameter | Range | Display | Unit | Default | EDIT |
|--------|----------------|--------|---------|------|---------|------|
| PTNO | PATTERN NUMBER | 1 ~ 30 | Always | ABS | 0 | ○ |
| PID | PID NUMBER | 0~4 | Always | ABS | 0 | ○ |
| S.ALM1 | SEG ALARM 1 | 0~8 | Always | ABS | 0 | ○ |
| S.ALM2 | SEG ALARM 2 | 0~8 | Always | ABS | 0 | ○ |
| S.ALM3 | SEG ALARM 3 | 0~8 | Always | ABS | 0 | ○ |
| S.ALM4 | SEG ALARM 4 | 0~8 | Always | ABS | 0 | ○ |

4.5.12 SEG ALM

| | |
|--|--|
| <pre> SETUP MENU 12:54P INPUT DO PTN SUB OUTPUT BIAS SEG ALM RET DI REPEAT INNER PWD TIME SG ALARM FILE ON/OFF </pre> | SETUP MENU screen to enter SEG ALM SET. Operation screen will return by pushing SET KEY again for 3 sec. or NO KEY input for 60 sec. |
| <pre> S.AL1 SIGNAL1 12:54P KIND : AH.F POINT : 150.00 % HYS : 1.00 % DELAY.TM : 00.00 M.S </pre> | KIND : Set type of ALARM. POINT : Set the value of ALARM. HYS : Set HYSTERESIS for ALARM. DELAY.TM : Set the delay time for ALARM output SEG ALARM SIGNAL1~8 screen. ALARM on PTN SUB will works only when PROG RUN |

| Symbol | Parameter | Range | Display | Unit | Default | EDIT |
|-----------|------------------|-----------------------------|----------------|------|-------------|------|
| KIND | ALARM KIND | OFF, AH.F, AL.F, DH.F, DL.F | Always | ABS | AH.F | ○ |
| | | DH.R, DL.R, DO.F, DI.F, AHR | | | | |
| | | AL.R, AHL.FS, AL.FS, DHL.FS | | | | |
| | | DL.FS, DHL.RS, DL.RS | | | | |
| | | DO.FS, DI.FS, AHR.S, AL.RS | | | | |
| POINT | ALARM POINT | EUS(-100.0~100.0%) | PV Upper-Limit | EU | EU(100.0%) | ○ |
| | | | PV Lower-Limit | EU | EU(0.0%) | ○ |
| HIGH DEV. | HIGH DEVIATION | EUS(-100.0%)~EUS(100.0%) | Deviation | EUS | EU(100.0%) | ○ |
| LOW DEV. | LOW DEVIATION | EUS(-100.0%)~EUS(100.0%) | Deviation | EUS | EUS(0.0%) | ○ |
| HYS | ALARM HYSTERESIS | EUS(0.0~100.0%) | Always | EUS | EUS(0.5%) | ○ |
| DELAY.TM | DELAY TIME | 00.00~99.59 MM.SS | Always | TIME | 00.00 MM.SS | ○ |

4.5.13 REPEAT

| | |
|---|---|
| <pre> SETUP MENU 12:54P INPUT DO PTN SUB OUTPUT BIAS SEG ALM RET DI REPEAT INNER PWD TIME SG ALARM FILE ON/OFF </pre> | <p>SETUP MENU screen to enter REPEAT SET. Operation screen will return by pushing SET KEY again for 3 sec. or NO KEY input for 60 sec.</p> |
| <pre> PATTERN RPT 12:54P PT NO : 30 LINK PT : 0 PT RPT : 1 PT E.MODE: RESET </pre> | <p>Set the repeat (number of time) and link pattern. PT E.MODE : It is decide PROG MODE in case of PATTERN END. - RESET : PT END. - HOLD : HOLD in last SEG SP - FIX : FIX RUN after PATTERN END - LINK : Running as Pattern to set into LINK PATTERN after PATTERN END</p> |
| <pre> SEGMENT RPT 12:54P NO S.SEG E.SEG R.CNT 1 0 0 0 2 0 0 0 3 0 0 0 4 0 0 0 </pre> | <p>Set the repeat (number of time) and segment of the top/end.</p> |

| Symbol | Parameter | Range | Display | Unit | Default | EDIT |
|-----------|------------------|------------------------|---------|------|---------|------|
| PTNO | PATTERN NUMBER | 1 ~ 30 | Always | ABS | 1 | ○ |
| LINK PT | LINK PATTERN | 0 ~ 30 | Always | ABS | 0 | ○ |
| PT RPT | PATTERN RPT NO | 0 ~ 999 | Always | ABS | 1 | ○ |
| PT E.MODE | PATTERN END MODE | RESET, HOLD, FIX, LINK | Always | ABS | RESET | ○ |
| NO | REPEAT NUMBER | 1 ~ 4 | Always | ABS | × | × |
| S.SEG | START SEGMENT | 0 ~ 100 | Always | ABS | 0 | ○ |
| E.SEG | END SEGMENT | 0 ~ 100 | Always | ABS | 0 | ○ |
| R.CNT | REPEAT COUNT | 0 ~ 99 | Always | ABS | 0 | ○ |

4.5.14 TIME SIGNAL

| | | | | | | | | | | | | | | | | | | | |
|--|------------|--------|--------|----------|---------|--|-------------|---------|--|--------|--------|--|-----------|---------|--|------------|--------|--|---|
| <table style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 30%;">SETUP MENU</td> <td style="width: 20%;"></td> <td style="width: 50%; text-align: right;">12:54P</td> </tr> <tr> <td>INPUT DO</td> <td>PTN SUB</td> <td></td> </tr> <tr> <td>OUTPUT BIAS</td> <td>SEG ALM</td> <td></td> </tr> <tr> <td>RET DI</td> <td>REPEAT</td> <td></td> </tr> <tr> <td>INNER PWD</td> <td>TIME SG</td> <td></td> </tr> <tr> <td>ALARM FILE</td> <td>ON/OFF</td> <td></td> </tr> </table> | SETUP MENU | | 12:54P | INPUT DO | PTN SUB | | OUTPUT BIAS | SEG ALM | | RET DI | REPEAT | | INNER PWD | TIME SG | | ALARM FILE | ON/OFF | | SETUP MENU screen to enter PTN SUB SET. Operation screen will return by pushing SET KEY again for 3 sec. or NO KEY input for 60 sec. |
| SETUP MENU | | 12:54P | | | | | | | | | | | | | | | | | |
| INPUT DO | PTN SUB | | | | | | | | | | | | | | | | | | |
| OUTPUT BIAS | SEG ALM | | | | | | | | | | | | | | | | | | |
| RET DI | REPEAT | | | | | | | | | | | | | | | | | | |
| INNER PWD | TIME SG | | | | | | | | | | | | | | | | | | |
| ALARM FILE | ON/OFF | | | | | | | | | | | | | | | | | | |

| | | | | | | | | | | | | | | | | | | | |
|--|--------|--------|--------|---|--------|--------|---|-------|-------|---|-------|-------|---|-------|-------|---|-------|-------|--|
| <table style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 30%;">NO</td> <td style="width: 30%;">ON.TM</td> <td style="width: 30%;">OFF.TM</td> </tr> <tr> <td>0</td> <td>TS OFF</td> <td>TS OFF</td> </tr> <tr> <td>1</td> <td>TS ON</td> <td>TS ON</td> </tr> <tr> <td>2</td> <td>00.00</td> <td>00.00</td> </tr> <tr> <td>3</td> <td>00.00</td> <td>00.00</td> </tr> <tr> <td>4</td> <td>00.00</td> <td>00.00</td> </tr> </table> | NO | ON.TM | OFF.TM | 0 | TS OFF | TS OFF | 1 | TS ON | TS ON | 2 | 00.00 | 00.00 | 3 | 00.00 | 00.00 | 4 | 00.00 | 00.00 | EDIT TIME SIGNAL set NO. 0,1 means the state of time signal when it is both OFF and ON, and For NO.2~9, fix time to ON and OFF. In this screen, designate the occurrence of ON/OFF on Time Signal, and designate on EDIT SEG of "MAIN MENU → PROGRAM → PATTERN" to output. |
| NO | ON.TM | OFF.TM | | | | | | | | | | | | | | | | | |
| 0 | TS OFF | TS OFF | | | | | | | | | | | | | | | | | |
| 1 | TS ON | TS ON | | | | | | | | | | | | | | | | | |
| 2 | 00.00 | 00.00 | | | | | | | | | | | | | | | | | |
| 3 | 00.00 | 00.00 | | | | | | | | | | | | | | | | | |
| 4 | 00.00 | 00.00 | | | | | | | | | | | | | | | | | |

| Symbol | Parameter | Range | Display | Unit | Default | EDIT |
|--------|-----------|-------------------|---------|------|-----------|------|
| ON.TM | ON TIME | 00.00~99.59 (TMU) | Always | TIME | 00.00 H.M | ○ |
| OFF.TM | OFF TIME | 00.00~99.59 (TMU) | Always | TIME | 00.00 H.M | ○ |

4.5.15 ON/OFF SET

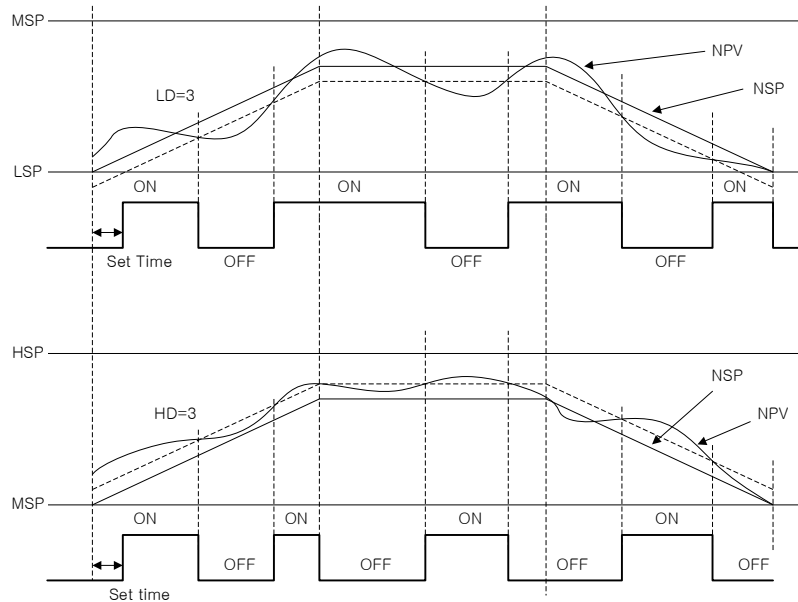
| | |
|--|--|
| | SETUP MENU screen to enter ON/OFF SET. Operation screen will return by pushing SET KEY again for 3 sec. or NO KEY input for 60 sec. |
| | This is ON/OFF T1 MODE screen. HIGH.SP : Set HIGH SP when ON/OFF mode. HIGH.DIFF : Set operating POINT on HIGH zone. MIDDLE.SP : Set MIDDLE SP when ON/OFF mode.. LOW.SP : Set LOW SP when ON/OFF mode.. LOW.DIFF : Set operating POINT on LOW zone.. |
| | This is ON/OFF T2 MODE screen. HIGH.SP : Set HIGH SP when ON/OFF mode. HIGH.DIFF : Set operating POINT on HIGH zone. MIDDLE.SP : Set MIDDLE SP when ON/OFF mode.. LOW.SP : Set LOW SP when ON/OFF mode.. LOW.DIFF : Set operating POINT on LOW zone.. |
| | This is ON/OFF T4 MODE screen. HIGH.SP : Set HIGH SP when ON/OFF mode. HIGH.DIFF : Set operating POINT on HIGH zone. MIDDLE.SP : Set MIDDLE SP when ON/OFF mode.. LOW.SP : Set LOW SP when ON/OFF mode.. LOW.DIFF : Set operating POINT on LOW zone.. |
| | This is ON/OFF T4 MODE screen. HIGH.SP : Set HIGH SP when ON/OFF mode. HIGH.DIFF : Set operating POINT on HIGH zone. MIDDLE.SP : Set MIDDLE SP when ON/OFF mode.. LOW.SP : Set LOW SP when ON/OFF mode.. LOW.DIFF : Set operating POINT on LOW zone.. |

NOTE It has to be kept the order HIGH first.

| Symbol | Parameter | Range | Display | Unit | Default | EDIT |
|-----------|-----------------|----------------------------|---------|------|-----------|------|
| HIGH.SP | HIGH SP | EU(0.0 ~ 100.0%) | Always | EU | EU(0.0%) | ○ |
| MIDDLE.SP | MIDDLE SP | RL ≤ LOW.SP < MIDDLE.SP | Always | EU | EU(0.0%) | ○ |
| LOW.SP | LOW SP | < HIGH.SP ≤ RH | Always | EU | EU(0.0%) | ○ |
| HIGH.DIFF | HIGH DIFFERENCE | EUS(0.0 ~ 10.0%) | Always | EUS | EUS(0.0%) | ○ |
| LOW.DIFF | LOW DIFFERENCE | EUS(0.0 ~ 10.0%) | Always | EUS | EUS(0.0%) | ○ |

1. T1~T4 (TS will be ON after set time. Set time will be applied only first ON of RUN)

- ① $NPV < LSP(LOW.SP) \rightarrow$ OUTPUT OFF
- ② $NPV > HSP(HIGH.SP) \rightarrow$ OUTPUT OFF
- ③ $LSP \leq NPV < MSP(MIDDLE.SP)$
 $NPV \geq NSP-LD(LOW.DIFF) \rightarrow$ OUTPUT ON
 $NPV < NSP-LD \rightarrow$ OUTPUT OFF
- ④ $MSP < NPV < HSP$
 $NPV < NSP+HD(HIGH.DIFF) \rightarrow$ OUTPUT OFF
 $NPV \geq NSP+HD \rightarrow$ OUTPUT ON



(Figure 26 : Ex of ON/OFF MODE Operation)

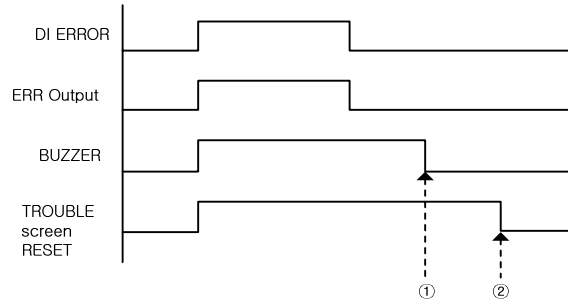
4.6 TROUBLE SHOOTING

| | | |
|--------------------|--------|---|
| TROUBLE | 12:54P | If the system, which this controller (SP790) adapted, has troubles (if you used DI3-DI4), the page appear also display WARN at the item state as picture. You must solve the error before reusing the controller, otherwise you are reach error again. The controller is being the STOP mode automatically when error occur. |
| ERROR 01 : | OK | |
| ERROR 02 : | WARN | |
| OCCUR TIME: 12:54P | | |



Ref 4.5.8 DI NAME for change TROUBLE(DI ERROR) NAME

※ RESET Operation on TROUBLE screen, when DI ERROR occurs.

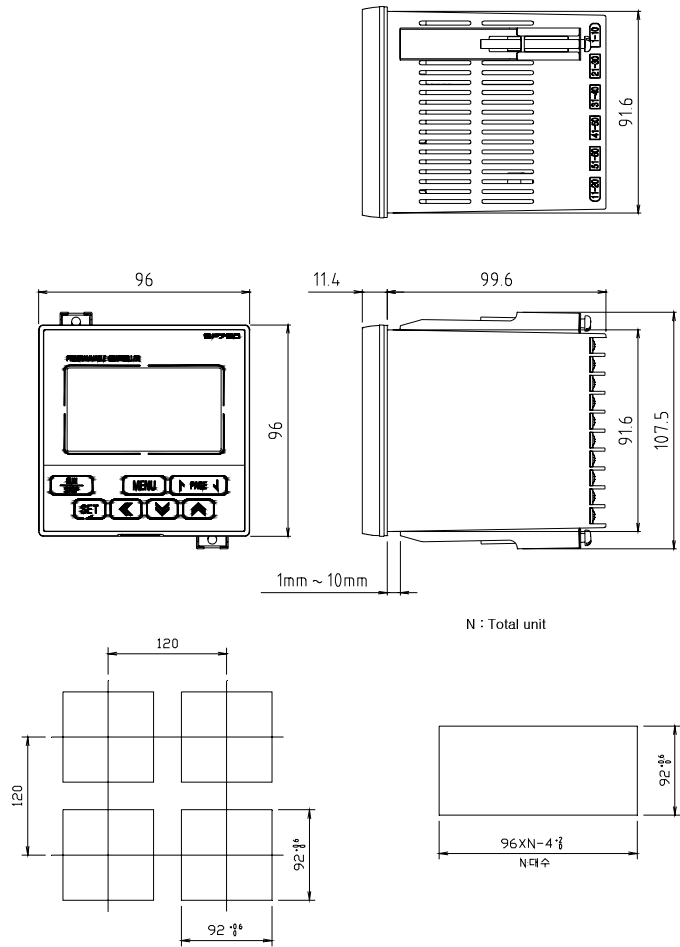


① BUZZER STOP by SET KEY

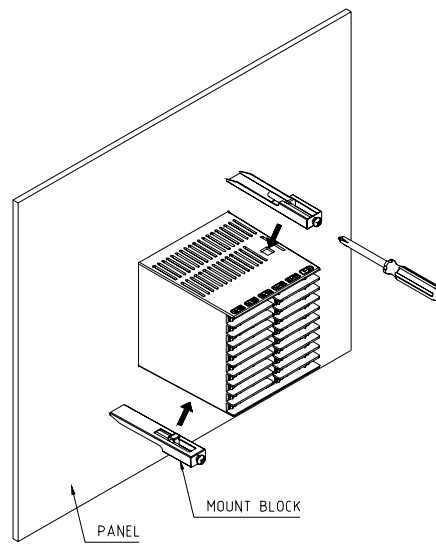
② TROUBLE screen will be RESET by other KEY except for SET KEY.

5. Installation

5.1 Dimension & Panel Cutting Size



5.2 How to install Mount



- 1) Cut the mounting panel as Section 5.1 PANEL CUTTING.
- 2) Insert the unit from its back terminal board side.
- 3) Attach the left and right brackets to the unit to fix the unit to the mounting panel. (Use screwdriver)



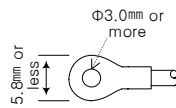
Do not tighten the mounting screw excessively, or the unit case or bracket may be damaged.

5.3 Power Cable Specification

Applicable power source cable : Vinyl insulation cable KSC 3304 0.9~2.0 mm².

5.4 Terminal Specification

Please use-tightening torque with insulating sleeve for M3.5 screws as shown in the following Figure:



Note: When the screw is connected, its torque does not exceed 0.8 N·m.



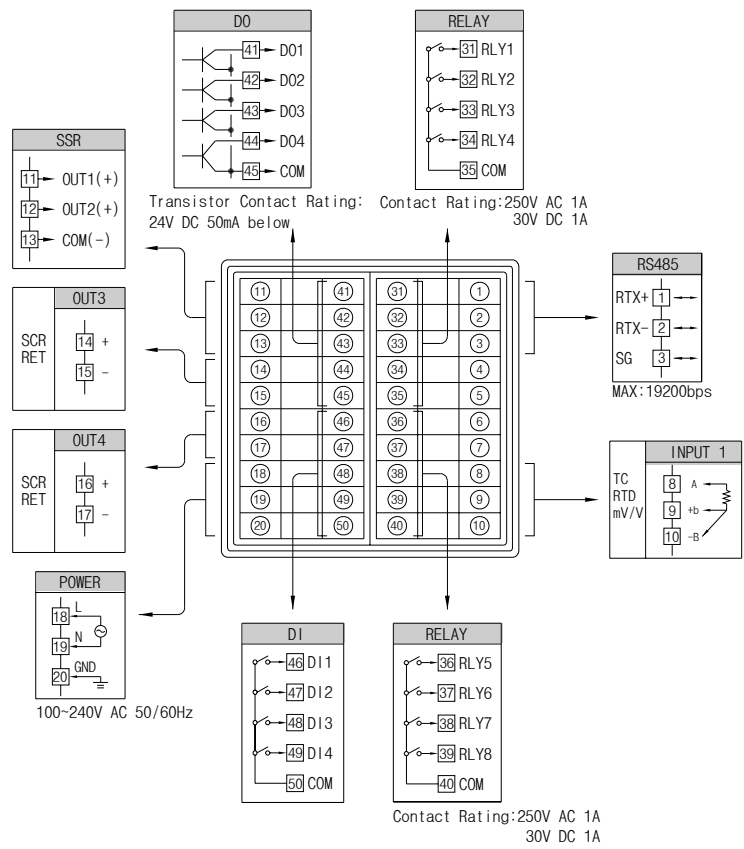
CAUTION

- ▶ Before carrying out wiring, turn off the power to the controller and check that the cables to be connected are not alive with a tester or the like because there is a possibility of electric shock.
- ▶ The controller must be wired directly from circuit breaker output on inside of temperature & humidity Chamber for avoid damage of controller or chamber.



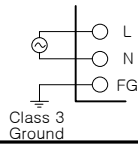
Avoid unused terminal for install, it might make damage to system or out of order.

5.5 Terminal Arrangement and External Wiring



5.6 Grounding and Power Cable Connection

- Use a cable 2 mm² or more thick for grounding with class 3 grounding (grounding resistance a 100Ω or less) or higher. Do not extend the grounding cable over 20m.
- Ground from the ground terminal with a one-point contact
Do not wire between ground terminals.
- Use appropriate cables equivalent to vinyl insulation cable(KSC 3304) or more.



- ▶ Ground FRAME GROUND (FG) exactly
- ▶ For power source wiring, keep the L, N correctly otherwise it might make damage to system or broken the controller.



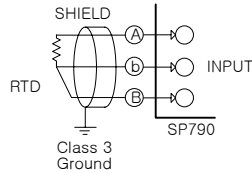
Before starting analog input wiring, be sure to turn off the system otherwise you might get an electrical shock.



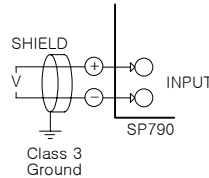
- ▶ When connection, do not mix up the input polarity.
- ▶ Connecting with the wrong polarity can cause the unit to malfunction.
- ▶ For input wiring, use a shielded cable.
- ▶ Ground the shield at one point and grounding circuits as possible.
- ▶ Sensor input line must have avoid power source cable for protect noise.
- ▶ Use the cable that does not have any resistance difference and cable resistance.

5.7 Analog Input Connection

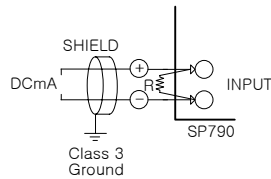
(A) RTD INPUT



(B) DC VOLTAGE INPUT



(C) DC CURRENT INPUT



5.8 Analog Output Connection

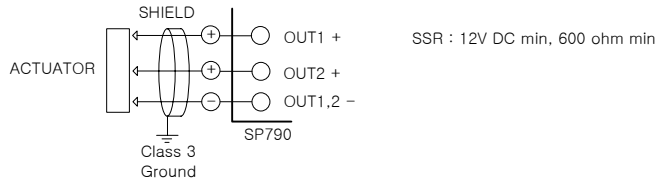


Before starting analog output wiring, be sure to turn off the system or else you will get an electrical shock.



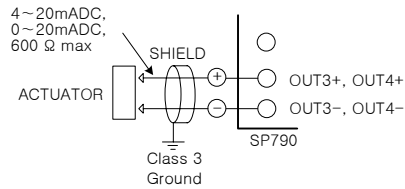
- ▶ When connection, do not mix up the input polarity.
- ▶ Connecting with the wrong polarity can cause the unit to malfunction.
- ▶ For input wiring, use a shielded cable.
- ▶ Ground the shield at one point and grounding circuits as possible.

(A) SSR

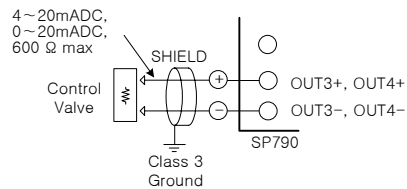


Before starting ACTUATOR install/uninstall wiring, be sure to turn off the SP790 or else you will get an electrical shock.

(B) RETRANSMISSION

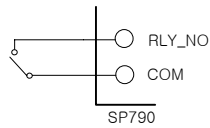


(C) RET



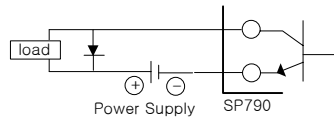
Before starting ACTUATOR install/uninstall wiring, be sure to turn off the SP790 or else you will get an electrical shock.

5.9 External Contact Output Connection (RELAY)



Before starting analog input wiring, be sure to turn off the system otherwise you might get an electrical shock.

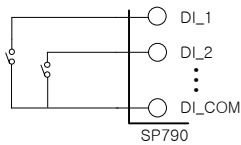
5.10 External Contact Output Connection(OPEN COLLECTOR : DO)



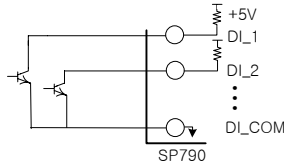
24V DC 50mA or less

5.11 External Contact Input Connection (DI)

- ▶ For the external contact, use a no-voltage contact (including relay contact) that can operate appropriately under the terminal voltage for a close contact(approximate.. 5V) and the current for a opened contact. (approximate 1mA)
- ▶ When using an open collector, select one with the 2V or less voltage for the closed contact, and 100μA or less leakage current for the open contact.



▲ RELAY contact input



▲ TRANSISTOR contact input



Before starting analog input wiring, be sure to turn off the system otherwise you might get an electrical shock.

5.12 Use an Auxiliary Relay

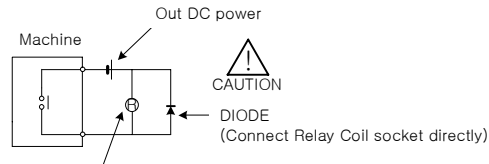
■ If you INDUCTANCE(L) load like as AUXILIARY RELAY or SOLENOIDE VALVE, it might make go to wrong or out of order relay, please make sure insert to parallel circuit with CR FILTER(AC) or DIODE(DC) by SURGE SUPPRESSOR of avoiding sparks.

- Recommend CR FILTER
- ▶ Sung Ho Electronics : BSE104R120 25V (0.1μ+120Ω)
- ▶ Hana Parts Co. : HN2EAC
- ▶ Songmi Electric Co., Ltd. : CR UNIT 953, 955 etc
- ▶ Jiwool Electric Co., Ltd. : SKV, SKVB etc
- ▶ Shinyoung Communication Co., Ltd. : CR-CFS, CR-U etc



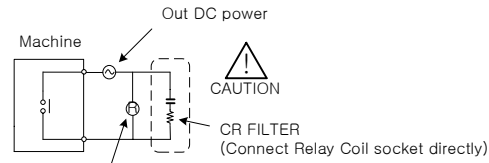
If contact capacity is over owns specification, use auxiliary relay for ON/OFF load.

(A) DC RELAY



RELAY
(Use what a rated Relay Coil is must be less than contact point capacity)

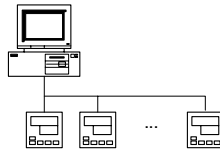
(B) AC RELAY



RELAY
(Use what a rated Relay Coil is must be less than contact point capacity)

1. Communication Overview

SP790 communication is made by 2 lines way of half-duplex way by RS485, and as for communication with upper computer including PC, it is possible to connect up to maximum 31 numbers by Protocol prepared in advance.



As below, there are some parameters when the SP790 communicates.

| Parameter | Value | Description |
|------------------------|--------|-----------------------------------|
| PROTOCOL | 0 | Basic Protocol |
| | 1 | Basic Protocol + Check Sum |
| | 2 | MODBUS ASCII |
| | 3 | MODBUS RTU |
| | 4 | SYNC MASTER |
| TRANSMISSION RATE(BPS) | 5 | 19200 bps |
| | 4 | 9600 bps |
| | 3 | 4800 bps |
| | 2 | 2400 bps |
| | 1 | 1200 bps |
| PARITY | 0 | None Parity |
| | 1 | Even Parity |
| | 2 | Odd Parity |
| DATA LENGTH | 8 | 8 bits |
| | 7 | 7 bits |
| ADDRESS | 1 ~ 99 | Address |
| RESPONSE TIME | 0 ~ 10 | Processing time + Response*10msec |

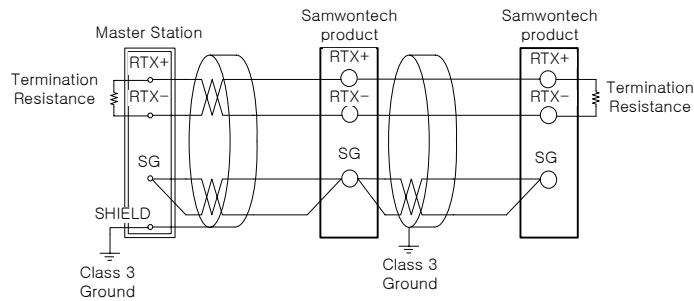
■ Default parameter of communication

- PROTOCOL : 1(Basic Protocol + Check Sum)
- BPS : 4(9600 bps)
- PARITY : 0(None Parity)
- DATA LENGTH : 8(8 bits)
- ADDRESS : 1
- RESPONSE : 0(Processing time + 10 msec)

2. Wiring for Communication

SP790 communication terminal arrangement is as below.

2.1 RS485 Interface Connection with SP790



- The slave SP790 could be connected up to 31set. (MULTIDROP)
- Termination (200Ω 1/4W) resistance must be connected on the both part of edge.



Before starting analog input wiring, be sure to turn off the system otherwise you might get an electrical shock.

3. Configuration of Command

3.1 Consist of Command

It is basic communication command structure between upper-level computer and SP790

| ① | ② | ③ | ④ | ⑤ | ⑥ | ⑦ | ⑧ |
|-------------|---------|---------|---|-----------------|-----|--------|--------|
| S T X | ADDRESS | COMMAND | , | DATA by COMMAND | SUM | C R | L F |

① Command start of text

This code indicates the start of a command string with 0x02.

② ADDRESS

SP790 communication address to identify the instruments.

③ COMMAND

Specify the command from an upper device. (See 3.2~3.9)

④ ',' (Separation character)

Character for separating command and data by ','

⑤ Data

Data by Command rule

⑥ Check Sum

Display bottom 2-byte by Hexadecimal what the Sum with Ascii code from the next character of STX to the before character of SUM and only used when the PROTOCOL is type 1 + Check Sum on the SP790.

⑦, ⑧ CR, LF

This control code indicates the end of a command.

3.2 Type of Command

There are two kinds of commands, Self-information and Read/Write commands in the SP790.

① Self-information command

| COMMAND | Process |
|---------|----------------------|
| AMI | Model name & Version |

② Read/Write Command

| COMMAND | Process |
|---------|--|
| RSD | Reading D-Register orderly |
| RRD | Reading D-Register Random |
| WSD | Writing D-Register orderly |
| WRD | Writing D-Register Random |
| STD | Registration Random data of D-Register |
| CLD | Call D-Register of STD |

Each command can read/write up to 32 D-Register and the all of the STD/CLD data will be reset when the power off, so the data should be resisted again.

3.3 Error Response

The message when the communication error with SP790.

| Byte | 1 | 2 | 2 | 2 | 2 | 1 | 1 |
|-----------------|-------------|---------|----|-------------------|-----|--------|--------|
| Command element | S T X | Address | NG | Number of word(2) | SUM | C R | L F |

※ SUM is only using when the PROTOCOL is '1'

3.4 RSD Command

This command for reading D-Register orderly.

■ Transmission Format

| Byte | 1 | 2 | 3 | 1 | 2 | 1 | 4 | 2 | 1 | 1 |
|-----------------|---|------|-----|---|------------------|---|-----------|-----|---|---|
| Command element | S | Addr | RSD | , | Parameter Number | , | D-Reg.NO. | SUM | C | L |
| | T | | | | | | | | | |
| | X | | | | | | | | | |

■ Response

| Byte | 1 | 2 | 3 | 1 | 2 | 1 | 4 | 1 | 4 | 1 | ... |
|-----------------|---|------|-----|---|----|---|--------|---|--------|---|-----|
| Command element | S | Addr | RSD | , | OK | , | dddd-1 | , | dddd-2 | , | ... |
| | T | | | | | | | | | | |
| | X | | | | | | | | | | |

| 1 | 4 | 1 | 4 | 2 | 1 | 1 |
|---|------------|---|----------|-----|---|---|
| , | dddd-(n-1) | , | dddd-(n) | SUM | C | L |
| | | | | | R | F |

- Parameter number : 1 ~ 32

- dddd : Indicates a character string in hexadecimal format

Ex) When reading the D-Register from Temp PV(D0001) to Temp SP(D0002)

- Transmission : [stx]01RSD,02,0001[cr][lf]

- Transmission (Include Check Sum) : [stx]01RSD,02,0001C5[cr][lf]

([stx] = 0x02, [cr] = 0x0d, [lf] = 0x0a)

Ex) The receiving data value are PV=50.0, SP=30.0, these data is receiving as blows,

- Transmission : [stx]01RSD,OK,01F4,012C[cr][lf]

- Transmission (Include Check Sum) : [stx]01RSD,OK,01F4,012C19[cr][lf]

※How to display and convert for receiving hexadecimal format PV data

① Convert decimal format : 01F4 (hexadecimal format) → 500 (decimal format)

② Result X 0.1 : 500 * 0.1 → 50.0

3.5 RRD Command

This command for reading D-Register random.

■ Transmission Format

| Byte | 1 | 2 | 3 | 1 | 2 | 1 | 4 | 1 | 4 | 1 | ... |
|-----------------|---|------|-----|---|------------------|---|-----------|---|-----------|---|-----|
| Command element | S | Addr | RRD | , | Parameter Number | , | D-Reg.No1 | , | D-Reg.No2 | , | ... |
| | X | | | | | | | | | | |

| 1 | 4 | 1 | 4 | 2 | 1 | 1 |
|---|---------------|---|-------------|-----|---|---|
| , | D-Reg.No(n-1) | , | D-Reg.No(n) | SUM | C | L |
| | | | | | R | F |

■ Response

| Byte | 1 | 2 | 3 | 1 | 2 | 1 | 4 | 1 | 4 | 1 | ... |
|-----------------|---|------|-----|---|----|---|--------|---|--------|---|-----|
| Command element | S | Addr | RRD | , | OK | , | dddd-1 | , | dddd-2 | , | ... |
| | X | | | | | | | | | | |

| 1 | 4 | 1 | 4 | 2 | 1 | 1 |
|---|------------|---|----------|-----|---|---|
| , | dddd-(n-1) | , | dddd-(n) | SUM | C | L |
| | | | | | R | F |

- Parameter number : 1 ~ 32

- dddd : Indicates a character string in hexadecimal format

Ex) When reading the D-Register from PV(D0001), SP(D0002)

- Transmission : [stx]01RRD,02,0001,0002[cr][lf]

- Transmission (Include Check Sum) : [stx]01RRD,02,0001,0002B2[cr][lf]

D0001 = 50.0, D0002 = 30.0

- Transmission : [stx]01RRD,OK,01F4,012C[cr][lf]

- Transmission (Include Check Sum) : [stx]01RRD,OK,01F4,012C18[cr][lf]

3.6 WSD Command

This command for writing D-Register orderly.

■ Transmission Format

| Byte | 1 | 2 | 3 | 1 | 2 | 1 | 4 | 1 | 4 | 1 | ... |
|-----------------|-------------|------|-----|---|-----------------------------|---|-----------|---|-----------|---|-----|
| Command element | S T X | Addr | WSD | , | Para meter Num ber | , | D-Reg.No1 | , | D-Reg.No2 | , | ... |

| 1 | 4 | 1 | 4 | 2 | 1 | 1 |
|---|---------------|---|-------------|-----|--------|--------|
| , | D-Reg.No(n-1) | , | D-Reg.No(n) | SUM | C R | L F |

■ Response

| Byte | 1 | 2 | 3 | 1 | 2 | 2 | 1 | 1 |
|-----------------|-------------|------|-----|---|----|-----|--------|--------|
| Command element | S T X | Addr | WSD | , | OK | SUM | C R | L F |

- Parameter number : 1 ~ 32

- dddd : Indicates a character string in hexadecimal format

Ex) When reading the D-Register from SP1(D0201), SP2(D0202)

- SP1 set : 50.0℃ → Delete decimal point (500) → hexadecimal format(0x01F4)

- SP2 set : 80.0℃ → Delete decimal point (800) → hexadecimal format(0x0320)

- Transmission : [stx]01WSD,02,0102,01F4,0320[cr][lf]

- Transmission (Include Check Sum) : [stx]01WSD,02,0102,01F4,0320C4[cr][lf]

3.7 WRD Command

This command for writing D-Register random.

■ Transmission Format

| Byte | 1 | 2 | 3 | 1 | 2 | 1 | 4 | 1 | 4 | 1 | ... |
|-----------------|---|------|-----|---|------------------|---|-----------|---|-----------|---|-----|
| Command element | S | Addr | WRD | , | Parameter Number | , | D-Reg.No1 | , | D-Reg.No2 | , | ... |

| 1 | 4 | 1 | 4 | 2 | 1 | 1 |
|---|---------------|---|-------------|-----|---|---|
| , | D-Reg.No(n-1) | , | D-Reg.No(n) | SUM | C | L |
| | | | | | R | F |

■ Response

| Byte | 1 | 2 | 3 | 1 | 2 | 2 | 1 | 1 |
|-----------------|---|------|-----|---|----|-----|---|---|
| Command element | S | Addr | WRD | , | OK | SUM | C | L |
| | X | | | | | | R | F |

- Parameter number : 1 ~ 32

- dddd : Indicates a character string in hexadecimal format

Ex) writing on SP1(D0201), SP4(D0204)

- SP1 set : 50.0°C → Delete decimal point (500) → hexadecimal format(0x01F4)

- SP4 set : 0.5°C → Delete decimal point (5) → hexadecimal format(0x0005)

- Transmission : [stx]01WRD,02,0201,01F4,0204,0005[cr][lf]

- Transmission (Include Check Sum) : [stx]01WRD,02,0201,01F4,0204,0005B5[cr][lf]

3.8 STD Command

This command is register D-register which you want to using at the SP790.

■ Transmission Format

| Byte | 1 | 2 | 3 | 1 | 2 | 1 | 4 | 1 | 4 | 1 | ... |
|-----------------|---|------|-----|---|------------------|---|-----------|---|-----------|---|-----|
| Command element | S | Addr | STD | , | Parameter Number | , | D-Reg.No1 | , | D-Reg.No2 | , | ... |

| 1 | 4 | 1 | 4 | 2 | 1 | 1 |
|---|---------------|---|-------------|-----|---|---|
| , | D-Reg.No(n-1) | , | D-Reg.No(n) | SUM | C | L |
| | | | | | R | F |

■ Response

| Byte | 1 | 2 | 3 | 1 | 2 | 2 | 1 | 1 |
|-----------------|---|------|-----|---|----|-----|---|---|
| Command element | S | Addr | STD | , | OK | SUM | C | L |
| | T | | | | | | R | F |
| | X | | | | | | | |

- Parameter number : 1 ~ 32

Ex) For Regist PV(D0001), SP(D0002)

- Transmission : [stx]01STD,02,0001,0002[cr][lf]

- Transmission (Include Check Sum) : [stx]01STD,02,0001,0002B5[cr][lf]

3.9 CLD Command

This command is reading D-register, which was resisted by STD Command at the SP790.

■ Transmission Format

| Byte | 1 | 2 | 3 | 2 | 1 | 1 |
|-----------------|---|------|-----|-----|---|---|
| Command element | S | Addr | CLD | SUM | C | L |
| | T | | | | R | F |
| | X | | | | | |

■ Response

| Byte | 1 | 2 | 3 | 1 | 2 | 1 | 4 | 1 | 4 | 1 | ... |
|-----------------|---|------|-----|---|----|---|--------|---|--------|---|-----|
| Command element | S | Addr | CLD | , | OK | , | dddd-1 | , | dddd-2 | , | ... |
| | T | | | | | | | | | | |
| | X | | | | | | | | | | |

| 1 | 4 | 1 | 4 | 2 | 1 | 1 |
|---|------------|---|----------|-----|---|---|
| , | dddd-(n-1) | , | dddd-(n) | SUM | C | L |
| | | | | | R | F |

- Parameter number : 1 ~ 32

- dddd : Indicates a character string in hexadecimal format

Ex) When the reading the D-Register that regist on STD Command

- Transmission : [stx]01CLD[cr][lf]

- Transmission (Include Check Sum) : [stx]01CLD34[cr][lf]

4. MODBUS Protocol

As for MODBUS communication of SP790, there are two modes of ASCII(COM.P = '3') and RTU(COM.P = '4').

① Data Format

| Content | ASCII | RTU |
|-----------------------------|--|-------------------------------------|
| communication start of text | :(colon) | None |
| communication end of text | CR+LF | None |
| Data Length | 7-bits(fixed) | 8-bits(fixed) |
| Data Type | ASCII | Binary |
| Error Detection | LRC (Longitudinal Redundancy Check) | CRC-16 (Cyclic Redundancy Check) |
| Data Time Interval | 1sec or less | 24-bits hour or less |

② Constitution of Frame

- Modbus ASCII

| Start of text | Address | Function Code | Data | CRC Check | End of text |
|---------------|---------|---------------|--------|-----------|---------------|
| 1 text | 2 text | 2 text | N text | 2 text | 2 text(CR+LF) |

- Modbus RTU

| Start of text | Address | Function Code | Data | CRC Check | End of text |
|---------------|---------|---------------|------------|-----------|-------------|
| None | 8-bits | 8-bits | n * 8-bits | 16-bits | None |

4.1 Function Code

In the function code of MODBUS communication of SP790, there are a function code to read/write the contents of D-Register, and a function code to detect Loop-Back.

| Function Code | Description |
|---------------|-----------------------------|
| 03 | Reading D-Register orderly |
| 06 | Single D-Register Write |
| 08 | Diagnostics(Loop-Back Test) |
| 16 | Writing D-Register orderly |

① Function Code – 03

Function code-03 can read up to maximum 32 contents of consecutive D-Register.

Frame Format

| Content | ASCII | RTU |
|-------------------|---------------|---------|
| Start of text | :(colon) | None |
| Address | 2 text | 8-bits |
| Function Code-03 | 2 text | 8-bits |
| D-Register Hi | 2 text | 8-bits |
| D-Register Lo | 2 text | 8-bits |
| Number to read Hi | 2 text | 8-bits |
| Number to read Lo | 2 text | 8-bits |
| Error Detection | 2 text | 16-bits |
| End of text | 2 text(CR+LF) | None |

Response Format

| Content | ASCII | RTU |
|------------------|---------------|---------|
| Start of text | :(colon) | None |
| Address | 2 text | 8-bits |
| Function Code-03 | 2 text | 8-bits |
| Data Byte | 2 text | 8-bits |
| Data-1 Hi | 2 text | 8-bits |
| Data-1 Lo | 2 text | 8-bits |
| . | . | . |
| . | . | . |
| Data-n Hi | 2 text | 8-bits |
| Data-n Lo | 2 text | 8-bits |
| Error Detection | 2 text | 16-bits |
| End of text | 2 text(CR+LF) | None |

② Function Code – 06

Function code-06 can write to 1 contents of consecutive D-Register.

Frame Format

| Content | ASCII | RTU |
|------------------|---------------|---------|
| Start of text | :(colon) | None |
| Address | 2 text | 8-bits |
| Function Code-06 | 2 text | 8-bits |
| D-Register Hi | 2 text | 8-bits |
| D-Register Lo | 2 text | 8-bits |
| Write Data Hi | 2 text | 8-bits |
| Write Data Lo | 2 text | 8-bits |
| Error Detection | 2 text | 16-bits |
| End of text | 2 text(CR+LF) | None |

Response Format

| Content | ASCII | RTU |
|------------------|---------------|---------|
| Start of text | :(colon) | None |
| Address | 2 text | 8-bits |
| Function Code-06 | 2 text | 8-bits |
| D-Register Hi | 2 text | 8-bits |
| D-Register Lo | 2 text | 8-bits |
| Write Data Hi | 2 text | 8-bits |
| Write Data Lo | 2 text | 8-bits |
| Error Detection | 2 text | 16-bits |
| End of text | 2 text(CR+LF) | None |

③ Function Code – 08

Function code-08 is used self-diagnosis.

Frame Format

| Content | ASCII | RTU |
|-------------------|---------------|---------|
| Start of text | :(colon) | None |
| Address | 2 text | 8-bits |
| Function Code-08 | 2 text | 8-bits |
| Diagnosis Code Hi | 2 text | 8-bits |
| Diagnosis Code Lo | 2 text | 8-bits |
| Data Hi | 2 text | 8-bits |
| Data Lo | 2 text | 8-bits |
| Error Detection | 2 text | 16-bits |
| End of text | 2 text(CR+LF) | None |

Response Format

| Content | ASCII | RTU |
|-------------------|---------------|---------|
| Start of text | :(colon) | None |
| Address | 2 text | 8-bits |
| Function Code-08 | 2 text | 8-bits |
| Diagnosis Code Hi | 2 text | 8-bits |
| Diagnosis Code Lo | 2 text | 8-bits |
| Data Hi | 2 text | 8-bits |
| Data Lo | 2 text | 8-bits |
| Error Detection | 2 text | 16-bits |
| End of text | 2 text(CR+LF) | None |

④ Function Code - 16

Function code-16 can write to maximum 32 contents of consecutive D-Register.

Frame Format

| Content | ASCII | RTU |
|------------------|---------------|---------|
| Start of text | :(colon) | None |
| Address | 2 text | 8-bits |
| Function Code-16 | 2 text | 8-bits |
| D-Register Hi | 2 text | 8-bits |
| D-Register Lo | 2 text | 8-bits |
| Write number Hi | 2 text | 8-bits |
| Write number Lo | 2 text | 8-bits |
| Data Byte | 2 text | 8-bits |
| Data-1 Hi | 2 text | 8-bits |
| Data-1 Lo | 2 text | 8-bits |
| . | . | . |
| . | . | . |
| . | . | . |
| Data-n Hi | 2 text | 8-bits |
| Data-n Lo | 2 text | 8-bits |
| Error Detection | 2 text | 16-bits |
| End of text | 2 text(CR+LF) | None |

Response Format

| Content | ASCII | RTU |
|--------------------|---------------|---------|
| Start of text | :(colon) | None |
| Address | 2 text | 8-bits |
| Function Code-16 | 2 text | 8-bits |
| D-Register Hi | 2 text | 8-bits |
| D-Register Lo | 2 text | 8-bits |
| Number of write Hi | 2 text | 8-bits |
| Number of write Lo | 2 text | 8-bits |
| Error Detection | 2 text | 16-bits |
| End of text | 2 text(CR+LF) | None |

5. SYNC Communication

As for SYNC communication, controller(COM.P='4') setted as master transmits RUN/STOP, SP to a controller(COM.P='5') setted as slave, and then it synchronizes operations of master and slave controller.

5.1 SYNC-Master

① SYNC-Master Model

SYNC-Master is SP790.

② Transmission Frame

SYNC,a,b,c[CR] [LF]

| Item | Description |
|------|---|
| a | STOP(0) / RUN(1) |
| b | Process value of SP (include when there is decimal points) |
| c | Check Sum |

5.2 SYNC-Slave

① SYNC-Slave Model

The models suitable for setting as SYNC-Slave are ST590, ST580, ST570, ST560, and ST540.

② Set SYNC-Slave

To set the state of SYNC-Slave, COM.P should be setted to '5' and then fix SPSL to 'C.SP'(5).

※ There is no response for received frame(No Response).

6. BROADCAST MODE

Broadcast Mode transmits the same commands to all SP790 connected to upper Computer, and makes them to do the same works at the same time. In the mean time, lower SP790 does not send response.

To communicate via Broadcast Mode, communication command to use should be made out by making address part of communication frame as '00'.

- ※ It is applied only to command concerning Write among standard Commands.
- ※ It is applied only to 'Standard Protocol', 'Standard Protocol+Check Sum', 'MODBUS ASCII', 'MODBUS RTU' among Protocol.

7. Set Program Pattern

7.1 PROGRAM

Program group is consisted of program pattern setting D-Registers.

How to set a program pattern is :
Set one by one with changing number of segment on SP790.

※ Program pattern setting D-Register

| D-Reg. | Symbol | Value | Description |
|--------|-----------|-------|--|
| D1000 | P_PTNO | 1~30 | Set program pattern number to read or write |
| D1001 | DEST_PTNO | 1~30 | Set pattern number to be copied |
| D1002 | P_SETNO | 0 | Set to read or write on D1018~D1034 |
| | | 1~100 | Set segment to read or write |
| D1003 | TRIGGER | 1 | INIT : D1000~D1004 value set '0' |
| | | 2 | READ : Reading value of D1000 and D1002 |
| | | 3 | WRITE : Writing value of D1000 and D1002 |
| | | 4 | PT COPY : Copy pattern D1000 to D1001 |
| | | 5 | PT DEL : Delete pattern on D1000 |
| | | 6 | SEG INSERT : Insert segment on D1000 and D1002 |
| | | 7 | SEG DELETE : Delete segment on D1000 and D1002 |
| | | 8 | ALL PT : Display pattern of D1000 to D1500 ... |
| D1004 | ANSWER | 0 | FULL : Full memory for pattern or segment |
| | | 1 | DONE : Complete D1003(TRIGGER)'s job |
| | | 2 | PT EMPTY : Empty pattern |
| | | 3 | SEG EMPTY : Empty segment |
| | | 4 | PT RUN : PROG RUN Status |
| | | 5 | PARA ERROR : Setting error on D1000~D1003 |
| | | 6 | PT USED : PROG RUN by pattern |
| D1010 | TEMP_TSP | - | Temp. TSP(Target Set Point) to read or write |
| D1011 | SEG_TIME | - | Segment time to read or write |
| D1012 | TS1 | - | Time signal 1 to read or write |
| D1013 | TS2 | - | Time signal 2 to read or write |
| D1014 | TS3 | - | Time signal 3 to read or write |
| D1015 | TS4 | - | Time signal 4 to read or write |
| D1016 | TS5 | - | Time signal 5 to read or write |
| D1040 | PID | - | PID to read or write |
| D1041 | SEG_ALM1 | - | Segment alarm 1 to read or write |
| D1042 | SEG_ALM2 | - | Segment alarm 2 to read or write |
| D1043 | SEG_ALM3 | - | Segment alarm 3 to read or write |
| D1044 | SEG_ALM4 | - | Segment alarm 4 to read or write |

7.2 Reading program pattern

There is how to read program pattern on SP790

1. Set program pattern number on D1000
2. Set segment number on D1002
3. Set READ TRIGGER('2') on D1003
4. Read D1004 data and then wait until DONE('1')
5. Read data on D1010~D1016 and D1040~D1044

This list(1 ~ 5) is shown that read only one segment which in the program patterns. Therefore, if you want to read several segments you should repeat above step with change the segment number.

You can read data on D1018~D1034 when set Zero('0') at D1002 at the step 2.

7.3 Writing program pattern

There is how to write program pattern on SP790

1. Set program pattern number on D1000
2. Set segment number on D1002
3. Set data on D1010~D1016 and D1040~D1044
4. Set WRITE TRIGGER('3') on D1003
5. Read D1004 data and then wait until DONE('1')

This list(1 ~ 5) is shown that write only one segment which in the program patterns. Therefore, if you want to write several segments you should repeat above step with change the segment number.

※ You can write data on D1018~D1034 using above step.

1. Set program pattern number on D1000
2. Set '0' on D1002
3. Set READ TRIGGER('2') on D1003
4. Set program pattern number on D1000
5. Set '0' on D1002
6. Set data on D1018~D1034
7. Set WRITE TRIGGER('3') on D1003
8. Read D1004 data and then wait until DONE('1')

7.4 Pattern copy/delete & Segment insert/delete

※ Program pattern copy

1. Set object pattern number on D1000
2. Set target pattern number on D1001
3. Set PT COPY TRIGGER('4') on D1003
4. Read D1004 data and then wait until DONE('1')

※ Program pattern delete

1. Set delete pattern number on D1000
2. Set PT DEL TRIGGER('5') on D1003
3. Read D1004 data and then wait until DONE('1')

※ insert segment

1. Set program pattern number on D1000
2. Set insert pattern number on D1002
3. Set data on D1010~D1016 and D1040~D1044
4. Set SEG INSERT TRIGGER('6') on D1003
5. Read D1004 data and then wait until DONE('1')

※ Delete segment

1. Set program pattern number on D1000
2. Set delete segment number on D1002
3. Set SEG DEL TRIGGER('7') on D1003
4. Read D1004 data and then wait until DONE('1')

* D-Register 0000~0699

| NO. | PROCESS | FUNCTION | SET POINT | RESERVATION | IS | ALARM | PID |
|-----|-------------|---------------|-----------|-------------|----------|------------|------|
| | 0 | 100 | 200 | 300 | 400 | 500 | 600 |
| 0 | | SET_PTNO | SPSL | RESERVE | | | |
| 1 | NPV | MODE | SP1 | N_YEAR | IS1_TYPE | AL1_KIND | 1_P |
| 2 | NSP | | SP2 | N_MONTH | IS1_HIGH | AL1_POINT | 1_J |
| 3 | | | SP3 | N_DAY | IS1_LOW | AL1_HIDEV | 1_D |
| 4 | | OPMODE | SP4 | N_HOUR | IS1_BAND | AL1_LOWDEV | 1_OH |
| 5 | | PWRMODE | | N_MIN | IS1_DTM | AL1_HYS | 1_OL |
| 6 | MVOUT | MVOUT | | RUN_YEAR | | AL1_DTM | 1_MR |
| 7 | HEAT_MVOUT | A/M | | RUN_MONTH | | AL1 MODE | |
| 8 | COOL_MVOUT | FUZZY | | RUN_DAY | | | |
| 9 | PIDNO | AT | | RUN_HOUR | | | |
| 10 | NOWSTS | AT ZONE | | RUN_MIN | | | |
| 11 | | FIX_OF_TIME_S | SPRH | SET_YEAR | IS2_TYPE | AL2_KIND | 2_P |
| 12 | ISSTS | FIX_OF_TIME_H | SPRL | SET_MONTH | IS2_HIGH | AL2_POINT | 2_J |
| 13 | TSSTS | FIX_OF_TIME_M | DISL | SET_DAY | IS2_LOW | AL2_HIDEV | 2_D |
| 14 | ALSTS | UP_SLOPE | DSP_H | SET_HOUR | IS2_BAND | AL2_LOWDEV | 2_OH |
| 15 | | DOWN_SLOPE | DSP_L | SET_MIN | IS2_DTM | AL2_HYS | 2_OL |
| 16 | DOSTS | | TMU | | | AL2_DTM | 2_MR |
| 17 | | HOLD.OFF/ON | | | | AL2 MODE | |
| 18 | DISTS | STEP.OFF/ON | | | | | |
| 19 | | | | | | | |
| 20 | PROC_TIME_H | WAITMD | | | | | |
| 21 | PROC_TIME_M | WZ | | | IS3_TYPE | AL3_KIND | 3_P |
| 22 | | WTM | | | IS3_HIGH | AL3_POINT | 3_J |
| 23 | S.ALSTS | | | | IS3_LOW | AL3_HIDEV | 3_D |
| 24 | | | | | IS3_BAND | AL3_LOWDEV | 3_OH |
| 25 | PTNO | | | | IS3_DTM | AL3_HYS | 3_OL |
| 26 | SEGNO | | | | | AL3_DTM | 3_MR |
| 27 | R_TIME_H | | | | | AL3 MODE | |
| 28 | R_TIME_M | | | | | | |
| 29 | WAIT_TIME_H | | | | | | |
| 30 | WAIT_TIME_M | | | | | | |
| 31 | N_PT_RPT | | | | IS4_KIND | AL4_TYPE | 4_P |
| 32 | PT_RPT | | | | IS4_HIGH | AL4_POINT | 4_J |

* D-Register 0000~0699

| NO. | PROCESS | FUNCTION | SET POINT | RESERVATION | IS | ALARM | PID |
|-----|------------|----------|-----------|-------------|----------|--------------|---------|
| | 0 | 100 | 200 | 300 | 400 | 500 | 600 |
| 33 | N_SEG_RPT | | | | IS4_LOW | AL4_HIDEV | 4_D |
| 34 | SEQ_RPT | | | | IS4_BAND | AL4_LOWDEV | 4_OH |
| 35 | P_TEMP_TSP | | | | IS4_DTM | AL4_HYS | 4_OL |
| 36 | N_TEMP_TSP | | | | | AL4_DTM | 4_MR |
| 37 | | | | | | AL4_MODE | |
| 38 | | | | | | | |
| 39 | N_SEQ_TIME | | | | | | |
| 40 | | | | | | S.AL1_KIND | |
| 41 | | | | | | S.AL1_POINT | |
| 42 | | | | | | S.AL1_HIDEV | |
| 43 | | | | | | S.AL1_LOWDEV | |
| 44 | | | | | | S.AL1_HYS | |
| 45 | | | | | | S.AL1_DTM | |
| 46 | | | | | | S.AL2_KIND | |
| 47 | | | | | | S.AL2_POINT | |
| 48 | | | | | | S.AL2_HIDEV | |
| 49 | | | | | | S.AL2_LOWDEV | |
| 50 | | | | | | S.AL2_HYS | |
| 51 | | | | | | S.AL2_DTM | REF_P1 |
| 52 | | | | | | S.AL3_KIND | REF_P2 |
| 53 | | | | | | S.AL3_POINT | REF_P3 |
| 54 | | | | | | S.AL3_HIDEV | |
| 55 | | | | | | S.AL3_LOWDEV | REF_HYS |
| 56 | | | | | | S.AL3_HYS | |
| 57 | | | | | | S.AL3_DTM | |
| 58 | | | | | | S.AL4_KIND | |
| 59 | | | | | | S.AL4_POINT | |
| 60 | | | | | | S.AL4_HIDEV | |
| 61 | | | | | | S.AL4_LOWDEV | 1_Pc |
| 62 | | | | | | S.AL4_HYS | 1_Jc |
| 63 | | | | | | S.AL4_DTM | 1_Dc |
| 64 | | | | | | S.AL5_KIND | 1_OHc |
| 65 | | | | | | S.AL5_POINT | 1_OLc |

* D-Register 0000~0699

| NO. | PROCESS | FUNCTION | SET POINT | RESERVATION | IS | ALARM | PID |
|-----|---------|----------|-----------|-------------|-----|--------------|-------|
| | 0 | 100 | 200 | 300 | 400 | 500 | 600 |
| 66 | | | | | | S.AL5_HIDEV | 1_DB |
| 67 | | | | | | S.AL5_LOWDEV | |
| 68 | | | | | | S.AL5_HYS | |
| 69 | | | | | | S.AL5_DTM | |
| 70 | | | | | | S.AL6_KIND | |
| 71 | | | | | | S.AL6_POINT | 2_Pc |
| 72 | | | | | | S.AL6_HIDEV | 2_Jc |
| 73 | | | | | | S.AL6_LOWDEV | 2_Dc |
| 74 | | | | | | S.AL6_HYS | 2_OHc |
| 75 | | | | | | S.AL6_DTM | 2_OLc |
| 76 | | | | | | S.AL7_KIND | 2_DB |
| 77 | | | | | | S.AL7_POINT | |
| 78 | | | | | | S.AL7_HIDEV | |
| 79 | | | | | | S.AL7_LOWDEV | |
| 80 | | | | | | S.AL7_HYS | |
| 81 | | | | | | S.AL7_DTM | 3_Pc |
| 82 | | | | | | S.AL8_KIND | 3_Jc |
| 83 | | | | | | S.AL8_POINT | 3_Dc |
| 84 | | | | | | S.AL8_HIDEV | 3_OHc |
| 85 | | | | | | S.AL8_LOWDEV | 3_OLc |
| 86 | | | | | | S.AL8_HYS | 3_DB |
| 87 | | | | | | S.AL8_DTM | |
| 88 | | | | | | | |
| 89 | | | | | | | |
| 90 | | | | | | | |
| 91 | | | | | | | 4_Pc |
| 92 | | | | | | | 4_Jc |
| 93 | | | | | | | 4_Dc |
| 94 | | | | | | | 4_OHc |
| 95 | | | | | | | 4_OLc |
| 96 | | | | | | | 4_DB |
| 97 | | | | | | | |
| 98 | | | | | | | |
| 99 | | | | | | | |

* D-Register 0700~1399

| NO. | COMM | OUTPUT | INPUT | PROGRAM | BIAS_SET | DO_CONFIG | TS |
|-----|-------|--------------|-----------|------------|----------|-----------|------------|
| | 700 | 800 | 900 | 1000 | 1100 | 1200 | 1300 |
| 0 | | | | P_PTNO | | | |
| 1 | COM.P | OT1SL | SEN_GROUP | DEST_PTNO | RL(P) | IS1 | TS2_ONTM |
| 2 | BAUD | OT2SL | SEN_TYPE | P_SEGNO | P1(P) | IS2 | TS2_OFFTM |
| 3 | PRTY | OT3SL | SEN_UNIT | TRIGGER | P2(P) | IS3 | TS3_ONTM |
| 4 | SBIT | OT4SL | BIAS | ANSWER | P3(P) | IS4 | TS3_OFFTM |
| 5 | DLEN | OT5SL(RELAY) | FILTER | | P4(P) | TS1 | TS4_ONTM |
| 6 | ADDR | SCR1_RNG_SEL | | | P5(P) | TS2 | TS4_OFFTM |
| 7 | RP.TM | SCR2_RNG_SEL | | | P6(P) | TS3 | TS5_ONTM |
| 8 | | | | | P7(P) | TS4 | TS5_OFFTM |
| 9 | | | | | P8(P) | TS5 | TS6_ONTM |
| 10 | | OPR | | TEMP_TSP | P9(P) | RUN | TS6_OFFTM |
| 11 | | HEAT_CYCLE | RNG_HIGH | SEG_TIME | RH(P) | AL1 | TS7_ONTM |
| 12 | | COOL_CYCLE | RNG_LOW | TS1 | | AL2 | TS7_OFFTM |
| 13 | | ARW | DOT_POS | TS2 | | AL3 | TS8_ONTM |
| 14 | | DIRECTION | SCL_HIGH | TS3 | | AL4 | TS8_OFFTM |
| 15 | | HYS | SCL_LOW | TS4 | | ERR | TS9_ONTM |
| 16 | | HYS(HC) | | TS5 | | S.AL1 | TS9_OFFTM |
| 17 | | HEAT_PO | | | | S.AL2 | |
| 18 | | COOL_PO | | PT E.MODE | | S.AL3 | |
| 19 | | HEAT_AT_GAIN | | LINK_PT | | S.AL4 | |
| 20 | | COOL_AT_GAIN | | PT_REPEAT | | RELAY | T1 HIGH.SP |
| 21 | | RET | BO_SEL | RPT_SEQ_S1 | | UP | T1 MID.SP |
| 22 | | RETL | RJC_SEL | RPT_SEQ_E1 | RL(D) | UP_PARA | T1 LOW.SP |
| 23 | | RETH | | RPT_SEQ_C1 | P1(D) | SOAK | T1 HD |
| 24 | | | | RPT_SEQ_S2 | P2(D) | SOAK_PARA | T1 LD |
| 25 | | | | RPT_SEQ_E2 | P3(D) | DOWN | |
| 26 | | | | RPT_SEQ_C2 | P4(D) | DOWN_PARA | T2 HIGH.SP |
| 27 | | | | RPT_SEQ_S3 | P5(D) | PTEND | T2 MID.SP |
| 28 | | | | RPT_SEQ_E3 | P6(D) | PTN_PARA | T2 LOW.SP |
| 29 | | | | RPT_SEQ_C3 | P7(D) | HOLD | T2 HD |
| 30 | | | | RPT_SEQ_S4 | P8(D) | HOLD_PARA | T2 LD |
| 31 | | | | RPT_SEQ_E4 | P9(D) | | |
| 32 | | | | RPT_SEQ_C4 | RH(D) | | T3 HIGH.SP |

* D-Register 0700~1399

| NO. | COMM | OUTPUT | INPUT | PROGRAM | BIAS_SET | DO_CONFIG | TS |
|-----|------|--------|-------|---------|----------|-----------|------------|
| | 700 | 800 | 900 | 1000 | 1100 | 1200 | 1300 |
| 33 | | | | SSP | | | T3 MID.SP |
| 34 | | | | STC | | | T3 LOW.SP |
| 35 | | | | | | | T31 HD |
| 36 | | | | | | | T3 LD |
| 37 | | | | | | | |
| 38 | | | | | | DI3_NAME1 | T4 HIGH.SP |
| 39 | | | | | | DI3_NAME2 | T4 MID.SP |
| 40 | | | | PID | | DI3_NAME3 | T4 LOW.SP |
| 41 | | | | S.ALM1 | | DI3_NAME4 | T4 HD |
| 42 | | | | S.ALM2 | | DI3_NAME5 | T4 LD |
| 43 | | | | S.ALM3 | | | |
| 44 | | | | S.ALM4 | | DI4_NAME1 | |
| 45 | | | | | | DI4_NAME2 | |
| 46 | | | | | | DI4_NAME3 | |
| 47 | | | | | | DI4_NAME4 | |
| 48 | | | | | | DI4_NAME5 | |
| 49 | | | | | | | |
| 50 | | | | | | T1 | |
| 51 | | | | | | T2 | |
| 52 | | | | | | T3 | |
| 53 | | | | | | T4 | |
| 54 | | | | | | T1 TM | |
| 55 | | | | | | T2 TM | |
| 56 | | | | | | T3 TM | |
| 57 | | | | | | T4 TM | |
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* D-Register 0700~1399

| NO. | COMM | OUTPUT | INPUT | PROGRAM | BIAS_SET | DO_CONFIG | TS |
|-----|------|--------|-------|---------|----------|-----------|------|
| | 700 | 800 | 900 | 1000 | 1100 | 1200 | 1300 |
| 66 | | | | | | | |
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* D-Register 1400~2099

| NO. | PTTNINFO | FILE1 | FILE2 | FILE3 | FILE4 | FILE5 | FILE6 |
|-----|----------|---------|--------|---------|---------|---------|---------|
| | 1400 | 1500 | 1600 | 1700 | 1800 | 1900 | 2000 |
| 0 | TUPT | C_TSP1 | C_TM1 | C_TS11 | C_TS21 | C_TS31 | C_TS41 |
| 1 | NPT1 | C_TSP2 | C_TM2 | C_TS12 | C_TS22 | C_TS32 | C_TS42 |
| 2 | NPT2 | C_TSP3 | C_TM3 | C_TS13 | C_TS23 | C_TS33 | C_TS43 |
| 3 | NPT3 | C_TSP4 | C_TM4 | C_TS14 | C_TS24 | C_TS34 | C_TS44 |
| 4 | NPT4 | C_TSP5 | C_TM5 | C_TS15 | C_TS25 | C_TS35 | C_TS45 |
| 5 | NPT5 | C_TSP6 | C_TM6 | C_TS16 | C_TS26 | C_TS36 | C_TS46 |
| 6 | NPT6 | C_TSP7 | C_TM7 | C_TS17 | C_TS27 | C_TS37 | C_TS47 |
| 7 | NPT7 | C_TSP8 | C_TM8 | C_TS18 | C_TS28 | C_TS38 | C_TS48 |
| 8 | NPT8 | C_TSP9 | C_TM9 | C_TS19 | C_TS29 | C_TS39 | C_TS49 |
| 9 | NPT9 | C_TSP10 | C_TM10 | C_TS110 | C_TS210 | C_TS310 | C_TS410 |
| 10 | NPT10 | C_TSP11 | C_TM11 | C_TS111 | C_TS211 | C_TS311 | C_TS411 |
| 11 | NPT11 | C_TSP12 | C_TM12 | C_TS112 | C_TS212 | C_TS312 | C_TS412 |
| 12 | NPT12 | C_TSP13 | C_TM13 | C_TS113 | C_TS213 | C_TS313 | C_TS413 |
| 13 | NPT13 | C_TSP14 | C_TM14 | C_TS114 | C_TS214 | C_TS314 | C_TS414 |
| 14 | NPT14 | C_TSP15 | C_TM15 | C_TS115 | C_TS215 | C_TS315 | C_TS415 |
| 15 | NPT15 | C_TSP16 | C_TM16 | C_TS116 | C_TS216 | C_TS316 | C_TS416 |
| 16 | NPT16 | C_TSP17 | C_TM17 | C_TS117 | C_TS217 | C_TS317 | C_TS417 |
| 17 | NPT17 | C_TSP18 | C_TM18 | C_TS118 | C_TS218 | C_TS318 | C_TS418 |
| 18 | NPT18 | C_TSP19 | C_TM19 | C_TS119 | C_TS219 | C_TS319 | C_TS419 |
| 19 | NPT19 | C_TSP20 | C_TM20 | C_TS120 | C_TS220 | C_TS320 | C_TS420 |
| 20 | NPT20 | C_TSP21 | C_TM21 | C_TS121 | C_TS221 | C_TS321 | C_TS421 |
| 21 | NPT21 | C_TSP22 | C_TM22 | C_TS122 | C_TS222 | C_TS322 | C_TS422 |
| 22 | NPT22 | C_TSP23 | C_TM23 | C_TS123 | C_TS223 | C_TS323 | C_TS423 |
| 23 | NPT23 | C_TSP24 | C_TM24 | C_TS124 | C_TS224 | C_TS324 | C_TS424 |
| 24 | NPT24 | C_TSP25 | C_TM25 | C_TS125 | C_TS225 | C_TS325 | C_TS425 |
| 25 | NPT25 | C_TSP26 | C_TM26 | C_TS126 | C_TS226 | C_TS326 | C_TS426 |
| 26 | NPT26 | C_TSP27 | C_TM27 | C_TS127 | C_TS227 | C_TS327 | C_TS427 |
| 27 | NPT27 | C_TSP28 | C_TM28 | C_TS128 | C_TS228 | C_TS328 | C_TS428 |
| 28 | NPT28 | C_TSP29 | C_TM29 | C_TS129 | C_TS229 | C_TS329 | C_TS429 |
| 29 | NPT29 | C_TSP30 | C_TM30 | C_TS130 | C_TS230 | C_TS330 | C_TS430 |
| 30 | NPT30 | C_TSP31 | C_TM31 | C_TS131 | C_TS231 | C_TS331 | C_TS431 |
| 31 | TUSEG | C_TSP32 | C_TM32 | C_TS132 | C_TS232 | C_TS332 | C_TS432 |
| 32 | | C_TSP33 | C_TM33 | C_TS133 | C_TS233 | C_TS333 | C_TS433 |

* D-Register 1400~2099

| NO. | PTTN\INFO | FILE1 | FILE2 | FILE3 | FILE4 | FILE5 | FILE6 |
|-----|-----------|---------|--------|---------|---------|---------|---------|
| | 1400 | 1500 | 1600 | 1700 | 1800 | 1900 | 2000 |
| 33 | | C_TSP34 | C_TM34 | C_TS134 | C_TS234 | C_TS334 | C_TS434 |
| 34 | | C_TSP35 | C_TM35 | C_TS135 | C_TS235 | C_TS335 | C_TS435 |
| 35 | | C_TSP36 | C_TM36 | C_TS136 | C_TS236 | C_TS336 | C_TS436 |
| 36 | | C_TSP37 | C_TM37 | C_TS137 | C_TS237 | C_TS337 | C_TS437 |
| 37 | | C_TSP38 | C_TM38 | C_TS138 | C_TS238 | C_TS338 | C_TS438 |
| 38 | | C_TSP39 | C_TM39 | C_TS139 | C_TS239 | C_TS339 | C_TS439 |
| 39 | | C_TSP40 | C_TM40 | C_TS140 | C_TS240 | C_TS340 | C_TS440 |
| 40 | | C_TSP41 | C_TM41 | C_TS141 | C_TS241 | C_TS341 | C_TS441 |
| 41 | | C_TSP42 | C_TM42 | C_TS142 | C_TS242 | C_TS342 | C_TS442 |
| 42 | | C_TSP43 | C_TM43 | C_TS143 | C_TS243 | C_TS343 | C_TS443 |
| 43 | | C_TSP44 | C_TM44 | C_TS144 | C_TS244 | C_TS344 | C_TS444 |
| 44 | | C_TSP45 | C_TM45 | C_TS145 | C_TS245 | C_TS345 | C_TS445 |
| 45 | | C_TSP46 | C_TM46 | C_TS146 | C_TS246 | C_TS346 | C_TS446 |
| 46 | | C_TSP47 | C_TM47 | C_TS147 | C_TS247 | C_TS347 | C_TS447 |
| 47 | | C_TSP48 | C_TM48 | C_TS148 | C_TS248 | C_TS348 | C_TS448 |
| 48 | | C_TSP49 | C_TM49 | C_TS149 | C_TS249 | C_TS349 | C_TS449 |
| 49 | | C_TSP50 | C_TM50 | C_TS150 | C_TS250 | C_TS350 | C_TS450 |
| 50 | | C_TSP51 | C_TM51 | C_TS151 | C_TS251 | C_TS351 | C_TS451 |
| 51 | | C_TSP52 | C_TM52 | C_TS152 | C_TS252 | C_TS352 | C_TS452 |
| 52 | | C_TSP53 | C_TM53 | C_TS153 | C_TS253 | C_TS353 | C_TS453 |
| 53 | | C_TSP54 | C_TM54 | C_TS154 | C_TS254 | C_TS354 | C_TS454 |
| 54 | | C_TSP55 | C_TM55 | C_TS155 | C_TS255 | C_TS355 | C_TS455 |
| 55 | | C_TSP56 | C_TM56 | C_TS156 | C_TS256 | C_TS356 | C_TS456 |
| 56 | | C_TSP57 | C_TM57 | C_TS157 | C_TS257 | C_TS357 | C_TS457 |
| 57 | | C_TSP58 | C_TM58 | C_TS158 | C_TS258 | C_TS358 | C_TS458 |
| 58 | | C_TSP59 | C_TM59 | C_TS159 | C_TS259 | C_TS359 | C_TS459 |
| 59 | | C_TSP60 | C_TM60 | C_TS160 | C_TS260 | C_TS360 | C_TS460 |
| 60 | | C_TSP61 | C_TM61 | C_TS161 | C_TS261 | C_TS361 | C_TS461 |
| 61 | | C_TSP62 | C_TM62 | C_TS162 | C_TS262 | C_TS362 | C_TS462 |
| 62 | | C_TSP63 | C_TM63 | C_TS163 | C_TS263 | C_TS363 | C_TS463 |
| 63 | | C_TSP64 | C_TM64 | C_TS164 | C_TS264 | C_TS364 | C_TS464 |
| 64 | | C_TSP65 | C_TM65 | C_TS165 | C_TS265 | C_TS365 | C_TS465 |
| 65 | | C_TSP66 | C_TM66 | C_TS166 | C_TS266 | C_TS366 | C_TS466 |

* D-Register 1400~2099

| NO. | PTTN\INFO | FILE1 | FILE2 | FILE3 | FILE4 | FILE5 | FILE6 |
|-----|-----------|----------|---------|----------|----------|----------|----------|
| | 1400 | 1500 | 1600 | 1700 | 1800 | 1900 | 2000 |
| 66 | | C_TSP67 | C_TM67 | C_TS167 | C_TS267 | C_TS367 | C_TS467 |
| 67 | | C_TSP68 | C_TM68 | C_TS168 | C_TS268 | C_TS368 | C_TS468 |
| 68 | | C_TSP69 | C_TM69 | C_TS169 | C_TS269 | C_TS369 | C_TS469 |
| 69 | | C_TSP70 | C_TM70 | C_TS170 | C_TS270 | C_TS370 | C_TS470 |
| 70 | | C_TSP71 | C_TM71 | C_TS171 | C_TS271 | C_TS371 | C_TS471 |
| 71 | | C_TSP72 | C_TM72 | C_TS172 | C_TS272 | C_TS372 | C_TS472 |
| 72 | | C_TSP73 | C_TM73 | C_TS173 | C_TS273 | C_TS373 | C_TS473 |
| 73 | | C_TSP74 | C_TM74 | C_TS174 | C_TS274 | C_TS374 | C_TS474 |
| 74 | | C_TSP75 | C_TM75 | C_TS175 | C_TS275 | C_TS375 | C_TS475 |
| 75 | | C_TSP76 | C_TM76 | C_TS176 | C_TS276 | C_TS376 | C_TS476 |
| 76 | | C_TSP77 | C_TM77 | C_TS177 | C_TS277 | C_TS377 | C_TS477 |
| 77 | | C_TSP78 | C_TM78 | C_TS178 | C_TS278 | C_TS378 | C_TS478 |
| 78 | | C_TSP79 | C_TM79 | C_TS179 | C_TS279 | C_TS379 | C_TS479 |
| 79 | | C_TSP80 | C_TMB0 | C_TS180 | C_TS280 | C_TS380 | C_TS480 |
| 80 | | C_TSP81 | C_TMB1 | C_TS181 | C_TS281 | C_TS381 | C_TS481 |
| 81 | | C_TSP82 | C_TMB2 | C_TS182 | C_TS282 | C_TS382 | C_TS482 |
| 82 | | C_TSP83 | C_TMB3 | C_TS183 | C_TS283 | C_TS383 | C_TS483 |
| 83 | | C_TSP84 | C_TMB4 | C_TS184 | C_TS284 | C_TS384 | C_TS484 |
| 84 | | C_TSP85 | C_TMB5 | C_TS185 | C_TS285 | C_TS385 | C_TS485 |
| 85 | | C_TSP86 | C_TMB6 | C_TS186 | C_TS286 | C_TS386 | C_TS486 |
| 86 | | C_TSP87 | C_TMB7 | C_TS187 | C_TS287 | C_TS387 | C_TS487 |
| 87 | | C_TSP88 | C_TMB8 | C_TS188 | C_TS288 | C_TS388 | C_TS488 |
| 88 | | C_TSP89 | C_TMB9 | C_TS189 | C_TS289 | C_TS389 | C_TS489 |
| 89 | | C_TSP90 | C_TM90 | C_TS190 | C_TS290 | C_TS390 | C_TS490 |
| 90 | | C_TSP91 | C_TM91 | C_TS191 | C_TS291 | C_TS391 | C_TS491 |
| 91 | | C_TSP92 | C_TM92 | C_TS192 | C_TS292 | C_TS392 | C_TS492 |
| 92 | | C_TSP93 | C_TM93 | C_TS193 | C_TS293 | C_TS393 | C_TS493 |
| 93 | | C_TSP94 | C_TM94 | C_TS194 | C_TS294 | C_TS394 | C_TS494 |
| 94 | | C_TSP95 | C_TM95 | C_TS195 | C_TS295 | C_TS395 | C_TS495 |
| 95 | | C_TSP96 | C_TM96 | C_TS196 | C_TS296 | C_TS396 | C_TS496 |
| 96 | | C_TSP97 | C_TM97 | C_TS197 | C_TS297 | C_TS397 | C_TS497 |
| 97 | | C_TSP98 | C_TM98 | C_TS198 | C_TS298 | C_TS398 | C_TS498 |
| 98 | | C_TSP99 | C_TM99 | C_TS199 | C_TS299 | C_TS399 | C_TS499 |
| 99 | | C_TSP100 | C_TM100 | C_TS1100 | C_TS2100 | C_TS3100 | C_TS4100 |

* D-Register 2100~2799

| NO. | FILE7 | FILEB | FILE9 | FILE10 | FILE11 | FILE12 | RESERVED |
|-----|---------|------------|------------|------------|------------|---------|----------|
| | 2100 | 2200 | 2300 | 2400 | 2500 | 2600 | 2700 |
| 0 | C_TS51 | C_S_ALM11 | C_S_ALM21 | C_S_ALM31 | C_S_ALM41 | C_PID1 | |
| 1 | C_TS52 | C_S_ALM12 | C_S_ALM22 | C_S_ALM32 | C_S_ALM42 | C_PID2 | |
| 2 | C_TS53 | C_S_ALM13 | C_S_ALM23 | C_S_ALM33 | C_S_ALM43 | C_PID3 | |
| 3 | C_TS54 | C_S_ALM14 | C_S_ALM24 | C_S_ALM34 | C_S_ALM44 | C_PID4 | |
| 4 | C_TS55 | C_S_ALM15 | C_S_ALM25 | C_S_ALM35 | C_S_ALM45 | C_PID5 | |
| 5 | C_TS56 | C_S_ALM16 | C_S_ALM26 | C_S_ALM36 | C_S_ALM46 | C_PID6 | |
| 6 | C_TS57 | C_S_ALM17 | C_S_ALM27 | C_S_ALM37 | C_S_ALM47 | C_PID7 | |
| 7 | C_TS58 | C_S_ALM18 | C_S_ALM28 | C_S_ALM38 | C_S_ALM48 | C_PID8 | |
| 8 | C_TS59 | C_S_ALM19 | C_S_ALM29 | C_S_ALM39 | C_S_ALM49 | C_PID9 | |
| 9 | C_TS510 | C_S_ALM110 | C_S_ALM210 | C_S_ALM310 | C_S_ALM410 | C_PID10 | |
| 10 | C_TS511 | C_S_ALM111 | C_S_ALM211 | C_S_ALM311 | C_S_ALM411 | C_PID11 | |
| 11 | C_TS512 | C_S_ALM112 | C_S_ALM212 | C_S_ALM312 | C_S_ALM412 | C_PID12 | |
| 12 | C_TS513 | C_S_ALM113 | C_S_ALM213 | C_S_ALM313 | C_S_ALM413 | C_PID13 | |
| 13 | C_TS514 | C_S_ALM114 | C_S_ALM214 | C_S_ALM314 | C_S_ALM414 | C_PID14 | |
| 14 | C_TS515 | C_S_ALM115 | C_S_ALM215 | C_S_ALM315 | C_S_ALM415 | C_PID15 | |
| 15 | C_TS516 | C_S_ALM116 | C_S_ALM216 | C_S_ALM316 | C_S_ALM416 | C_PID16 | |
| 16 | C_TS517 | C_S_ALM117 | C_S_ALM217 | C_S_ALM317 | C_S_ALM417 | C_PID17 | |
| 17 | C_TS518 | C_S_ALM118 | C_S_ALM218 | C_S_ALM318 | C_S_ALM418 | C_PID18 | |
| 18 | C_TS519 | C_S_ALM119 | C_S_ALM219 | C_S_ALM319 | C_S_ALM419 | C_PID19 | |
| 19 | C_TS520 | C_S_ALM120 | C_S_ALM220 | C_S_ALM320 | C_S_ALM420 | C_PID20 | |
| 20 | C_TS521 | C_S_ALM121 | C_S_ALM221 | C_S_ALM321 | C_S_ALM421 | C_PID21 | |
| 21 | C_TS522 | C_S_ALM122 | C_S_ALM222 | C_S_ALM322 | C_S_ALM422 | C_PID22 | |
| 22 | C_TS523 | C_S_ALM123 | C_S_ALM223 | C_S_ALM323 | C_S_ALM423 | C_PID23 | |
| 23 | C_TS524 | C_S_ALM124 | C_S_ALM224 | C_S_ALM324 | C_S_ALM424 | C_PID24 | |
| 24 | C_TS525 | C_S_ALM125 | C_S_ALM225 | C_S_ALM325 | C_S_ALM425 | C_PID25 | |
| 25 | C_TS526 | C_S_ALM126 | C_S_ALM226 | C_S_ALM326 | C_S_ALM426 | C_PID26 | |
| 26 | C_TS527 | C_S_ALM127 | C_S_ALM227 | C_S_ALM327 | C_S_ALM427 | C_PID27 | |
| 27 | C_TS528 | C_S_ALM128 | C_S_ALM228 | C_S_ALM328 | C_S_ALM428 | C_PID28 | |
| 28 | C_TS529 | C_S_ALM129 | C_S_ALM229 | C_S_ALM329 | C_S_ALM429 | C_PID29 | |
| 29 | C_TS530 | C_S_ALM130 | C_S_ALM230 | C_S_ALM330 | C_S_ALM430 | C_PID30 | |
| 30 | C_TS531 | C_S_ALM131 | C_S_ALM231 | C_S_ALM331 | C_S_ALM431 | C_PID31 | |
| 31 | C_TS532 | C_S_ALM132 | C_S_ALM232 | C_S_ALM332 | C_S_ALM432 | C_PID32 | |
| 32 | C_TS533 | C_S_ALM133 | C_S_ALM233 | C_S_ALM333 | C_S_ALM433 | C_PID33 | |

* D-Register 2100~2799

| NO. | FILE7 | FILEB | FILE9 | FILE10 | FILE11 | FILE12 | RESERVED |
|-----|---------|-----------|-----------|-----------|-----------|---------|----------|
| | 2100 | 2200 | 2300 | 2400 | 2500 | 2600 | 2700 |
| 33 | C_TS534 | C_SALM134 | C_SALM234 | C_SALM334 | C_SALM434 | C_PID34 | |
| 34 | C_TS535 | C_SALM135 | C_SALM235 | C_SALM335 | C_SALM435 | C_PID35 | |
| 35 | C_TS536 | C_SALM136 | C_SALM236 | C_SALM336 | C_SALM436 | C_PID36 | |
| 36 | C_TS537 | C_SALM137 | C_SALM237 | C_SALM337 | C_SALM437 | C_PID37 | |
| 37 | C_TS538 | C_SALM138 | C_SALM238 | C_SALM338 | C_SALM438 | C_PID38 | |
| 38 | C_TS539 | C_SALM139 | C_SALM239 | C_SALM339 | C_SALM439 | C_PID39 | |
| 39 | C_TS540 | C_SALM140 | C_SALM240 | C_SALM340 | C_SALM440 | C_PID40 | |
| 40 | C_TS541 | C_SALM141 | C_SALM241 | C_SALM341 | C_SALM441 | C_PID41 | |
| 41 | C_TS542 | C_SALM142 | C_SALM242 | C_SALM342 | C_SALM442 | C_PID42 | |
| 42 | C_TS543 | C_SALM143 | C_SALM243 | C_SALM343 | C_SALM443 | C_PID43 | |
| 43 | C_TS544 | C_SALM144 | C_SALM244 | C_SALM344 | C_SALM444 | C_PID44 | |
| 44 | C_TS545 | C_SALM145 | C_SALM245 | C_SALM345 | C_SALM445 | C_PID45 | |
| 45 | C_TS546 | C_SALM146 | C_SALM246 | C_SALM346 | C_SALM446 | C_PID46 | |
| 46 | C_TS547 | C_SALM147 | C_SALM247 | C_SALM347 | C_SALM447 | C_PID47 | |
| 47 | C_TS548 | C_SALM148 | C_SALM248 | C_SALM348 | C_SALM448 | C_PID48 | |
| 48 | C_TS549 | C_SALM149 | C_SALM249 | C_SALM349 | C_SALM449 | C_PID49 | |
| 49 | C_TS550 | C_SALM150 | C_SALM250 | C_SALM350 | C_SALM450 | C_PID50 | |
| 50 | C_TS551 | C_SALM151 | C_SALM251 | C_SALM351 | C_SALM451 | C_PID51 | |
| 51 | C_TS552 | C_SALM152 | C_SALM252 | C_SALM352 | C_SALM452 | C_PID52 | |
| 52 | C_TS553 | C_SALM153 | C_SALM253 | C_SALM353 | C_SALM453 | C_PID53 | |
| 53 | C_TS554 | C_SALM154 | C_SALM254 | C_SALM354 | C_SALM454 | C_PID54 | |
| 54 | C_TS555 | C_SALM155 | C_SALM255 | C_SALM355 | C_SALM455 | C_PID55 | |
| 55 | C_TS556 | C_SALM156 | C_SALM256 | C_SALM356 | C_SALM456 | C_PID56 | |
| 56 | C_TS557 | C_SALM157 | C_SALM257 | C_SALM357 | C_SALM457 | C_PID57 | |
| 57 | C_TS558 | C_SALM158 | C_SALM258 | C_SALM358 | C_SALM458 | C_PID58 | |
| 58 | C_TS559 | C_SALM159 | C_SALM259 | C_SALM359 | C_SALM459 | C_PID59 | |
| 59 | C_TS560 | C_SALM160 | C_SALM260 | C_SALM360 | C_SALM460 | C_PID60 | |
| 60 | C_TS561 | C_SALM161 | C_SALM261 | C_SALM361 | C_SALM461 | C_PID61 | |
| 61 | C_TS562 | C_SALM162 | C_SALM262 | C_SALM362 | C_SALM462 | C_PID62 | |
| 62 | C_TS563 | C_SALM163 | C_SALM263 | C_SALM363 | C_SALM463 | C_PID63 | |
| 63 | C_TS564 | C_SALM164 | C_SALM264 | C_SALM364 | C_SALM464 | C_PID64 | |
| 64 | C_TS565 | C_SALM165 | C_SALM265 | C_SALM365 | C_SALM465 | C_PID65 | |
| 65 | C_TS566 | C_SALM166 | C_SALM266 | C_SALM366 | C_SALM466 | C_PID66 | |

* D-Register 2100~2799

| NO. | FILE7 | FILE8 | FILE9 | FILE10 | FILE11 | FILE12 | RESERVED |
|-----|----------|-------------|-------------|-------------|-------------|----------|----------|
| | 2100 | 2200 | 2300 | 2400 | 2500 | 2600 | 2700 |
| 66 | C_TS567 | C_S.ALM167 | C_S.ALM267 | C_S.ALM367 | C_S.ALM467 | C_PID67 | |
| 67 | C_TS568 | C_S.ALM168 | C_S.ALM268 | C_S.ALM368 | C_S.ALM468 | C_PID68 | |
| 68 | C_TS569 | C_S.ALM169 | C_S.ALM269 | C_S.ALM369 | C_S.ALM469 | C_PID69 | |
| 69 | C_TS570 | C_S.ALM170 | C_S.ALM270 | C_S.ALM370 | C_S.ALM470 | C_PID70 | |
| 70 | C_TS571 | C_S.ALM171 | C_S.ALM271 | C_S.ALM371 | C_S.ALM471 | C_PID71 | |
| 71 | C_TS572 | C_S.ALM172 | C_S.ALM272 | C_S.ALM372 | C_S.ALM472 | C_PID72 | |
| 72 | C_TS573 | C_S.ALM173 | C_S.ALM273 | C_S.ALM373 | C_S.ALM473 | C_PID73 | |
| 73 | C_TS574 | C_S.ALM174 | C_S.ALM274 | C_S.ALM374 | C_S.ALM474 | C_PID74 | |
| 74 | C_TS575 | C_S.ALM175 | C_S.ALM275 | C_S.ALM375 | C_S.ALM475 | C_PID75 | |
| 75 | C_TS576 | C_S.ALM176 | C_S.ALM276 | C_S.ALM376 | C_S.ALM476 | C_PID76 | |
| 76 | C_TS577 | C_S.ALM177 | C_S.ALM277 | C_S.ALM377 | C_S.ALM477 | C_PID77 | |
| 77 | C_TS578 | C_S.ALM178 | C_S.ALM278 | C_S.ALM378 | C_S.ALM478 | C_PID78 | |
| 78 | C_TS579 | C_S.ALM179 | C_S.ALM279 | C_S.ALM379 | C_S.ALM479 | C_PID79 | |
| 79 | C_TS580 | C_S.ALM180 | C_S.ALM280 | C_S.ALM380 | C_S.ALM480 | C_PID80 | |
| 80 | C_TS581 | C_S.ALM181 | C_S.ALM281 | C_S.ALM381 | C_S.ALM481 | C_PID81 | |
| 81 | C_TS582 | C_S.ALM182 | C_S.ALM282 | C_S.ALM382 | C_S.ALM482 | C_PID82 | |
| 82 | C_TS583 | C_S.ALM183 | C_S.ALM283 | C_S.ALM383 | C_S.ALM483 | C_PID83 | |
| 83 | C_TS584 | C_S.ALM184 | C_S.ALM284 | C_S.ALM384 | C_S.ALM484 | C_PID84 | |
| 84 | C_TS585 | C_S.ALM185 | C_S.ALM285 | C_S.ALM385 | C_S.ALM485 | C_PID85 | |
| 85 | C_TS586 | C_S.ALM186 | C_S.ALM286 | C_S.ALM386 | C_S.ALM486 | C_PID86 | |
| 86 | C_TS587 | C_S.ALM187 | C_S.ALM287 | C_S.ALM387 | C_S.ALM487 | C_PID87 | |
| 87 | C_TS588 | C_S.ALM188 | C_S.ALM288 | C_S.ALM388 | C_S.ALM488 | C_PID88 | |
| 88 | C_TS589 | C_S.ALM189 | C_S.ALM289 | C_S.ALM389 | C_S.ALM489 | C_PID89 | |
| 89 | C_TS590 | C_S.ALM190 | C_S.ALM290 | C_S.ALM390 | C_S.ALM490 | C_PID90 | |
| 90 | C_TS591 | C_S.ALM191 | C_S.ALM291 | C_S.ALM391 | C_S.ALM491 | C_PID91 | |
| 91 | C_TS592 | C_S.ALM192 | C_S.ALM292 | C_S.ALM392 | C_S.ALM492 | C_PID92 | |
| 92 | C_TS593 | C_S.ALM193 | C_S.ALM293 | C_S.ALM393 | C_S.ALM493 | C_PID93 | |
| 93 | C_TS594 | C_S.ALM194 | C_S.ALM294 | C_S.ALM394 | C_S.ALM494 | C_PID94 | |
| 94 | C_TS595 | C_S.ALM195 | C_S.ALM295 | C_S.ALM395 | C_S.ALM495 | C_PID95 | |
| 95 | C_TS596 | C_S.ALM196 | C_S.ALM296 | C_S.ALM396 | C_S.ALM496 | C_PID96 | |
| 96 | C_TS597 | C_S.ALM197 | C_S.ALM297 | C_S.ALM397 | C_S.ALM497 | C_PID97 | |
| 97 | C_TS598 | C_S.ALM198 | C_S.ALM298 | C_S.ALM398 | C_S.ALM498 | C_PID98 | |
| 98 | C_TS599 | C_S.ALM199 | C_S.ALM299 | C_S.ALM399 | C_S.ALM499 | C_PID99 | |
| 99 | C_TS6100 | C_S.ALM1100 | C_S.ALM2100 | C_S.ALM3100 | C_S.ALM4100 | C_PID100 | |

* BIT-MAP information

| Bit | NOWSTS | ISSTS | TSSTS | ALSTS | ON/OFF STS |
|-----|----------|---------|---------|----------|------------|
| | (D0010) | (D0012) | (D0013) | (D0014) | (D0015) |
| 0 | STOP | IS1 | TS1 | AL1 | T1 |
| 1 | FIX RUN | IS2 | TS2 | AL2 | T2 |
| 2 | PROG RUN | IS3 | TS3 | AL3 | T3 |
| 3 | | IS4 | TS4 | AL4 | T4 |
| 4 | | | TS5 | | |
| 5 | AT | | | | |
| 6 | AUTO/MAN | | | | |
| 7 | | | | | |
| 8 | | | | | |
| 9 | | | | | |
| 10 | | | | | |
| 11 | | | | | |
| 12 | | | | | |
| 13 | | | | | |
| 14 | | | | | |
| 15 | | | | | |

* MODE(D0101) Operation information

| Bit | Operation information |
|-----|-----------------------|
| 1 | RUN |
| 2 | HOLD |
| 3 | STEP |
| 4 | RESET |
| 5 | MAN |
| 6 | AUTO |
| 7 | FIX |
| 8 | PROG |

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