SAMWON
Promising the Best

SP790

INSTRUCTION MANUAL

PROGRAMMABLE CONTROLLER

Contents (I : User's Guide)

Contents (II : Communication User's Guide)

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.

(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.

(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.

CAUTION

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.

CAUTION

Environmental precautions for installation.

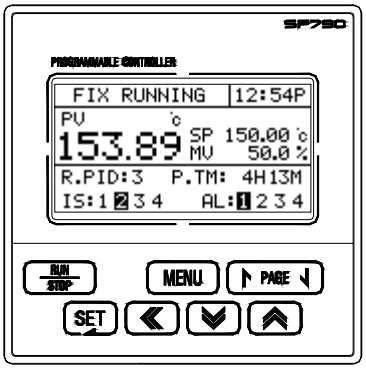
(1) Be sure to operate the controller installed on a panel to prevent electric shock.
(2) To install the controller, do select a location where;
- ■ No one may accidentally touch terminal.
- ■ Mechanical vibrations are minimal.
- ■ No corrosive gas is prevent.
- ■ Temperature fluctuation is minimal.
- ■ Temperature can be maintained. (50 ℃ below / 10 ℃ 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.

CAUTION

Precautions of Controller Mounting.

- ■ Keep the input circuit wiring as far as possible away from power and ground circuit.
- ■ Keep the controllers in 10℃ ~ 50℃/ 20 % ~ 90 % RH, Warming up needed to use controller when temperature is below 10℃ 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, 15VAmax 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, lightening 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.

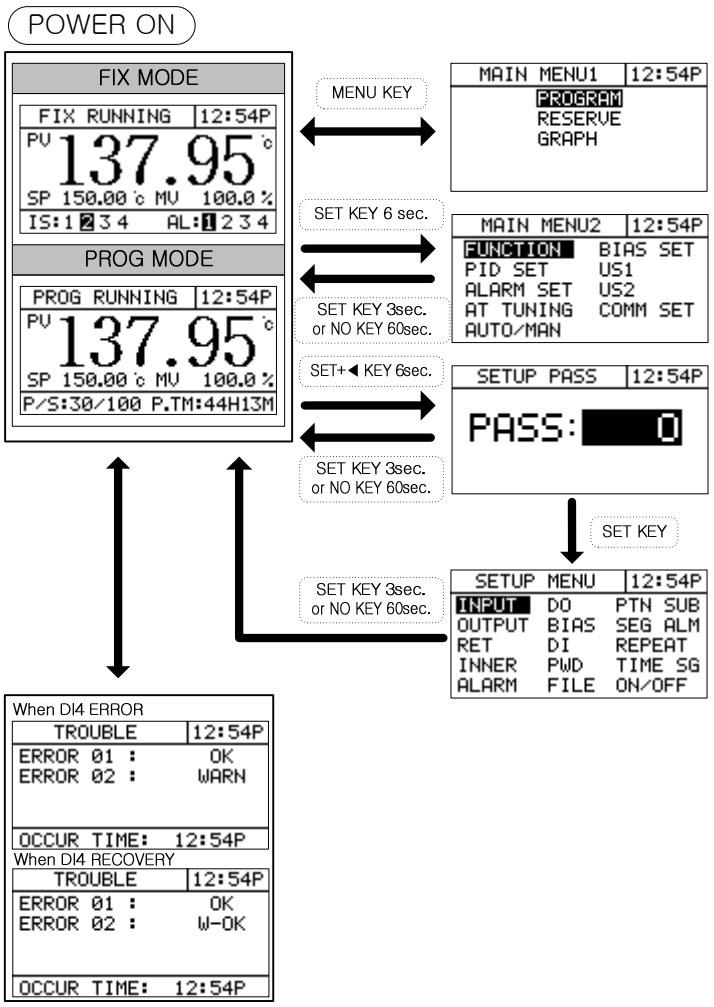
2. Control Keys and Display



⊙ Control Keys

KEY	DESCRIPTION
RUN / STOP	Run / Stop controller (Pressing the key at least 3 sec.)
MENU	Switching between running and main menu page Change the up level page on the parameter setting page
PAGE →	Switches to next page on the same level
PAGE ←	Switches to previous page on the same level
SET	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



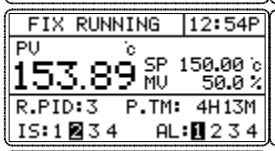
4. Setting Up Parameter in Each Group

4.1 NORMAL Operation

4.1.1 FIX AUTO MODE

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

FIX running 1st screen
PV : Process value of temperature
FIX RUNNING : Fix running state
IS : State of Inner Signal
AL : State of Alarm Signal

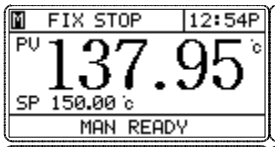


FIX running 2nd screen
MV : State of Output
R.PID(RUN PID NUMBER) : Running PID Number
P.TM(PROCESS TIME) : Running Time

FIX END : End of FIX Operation

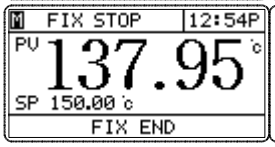
AUTO TUNING screen
It is same as Operation screen

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

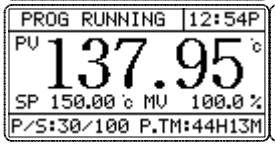


FIX END : End of FIX Operation

SYMBOL	PARAMETER	RANGE	DISPLAY	UNIT	DEFAULT	EDIT
SP	SET POINT	EU(0.0 ~ 100.0%)	Always	EU	EU(0.0%)	O
MV	MV	0.0 ~ 100.0%	MAN, Op.	%	×	O
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

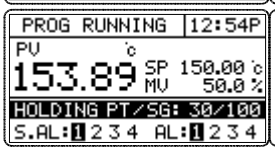
PROG Mode is controlling Temperature with programmed data.
PTNO : Set pattern No.(Set with "SET" key)
SEGNO : Start segment No.
READY : Ready to running
Start running by "RUN/STOP" key



PROG running 1st screen
PROG RUNNING : Prog running state
P/S : Running PATTERN & SEGMENT
P.TM(PROCESS TIME) : Running time

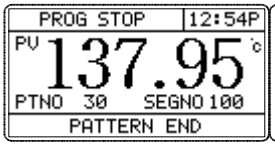
PROG running 2nd screen
R.PID : Running PID No.(Figure 12)
RM.TM : Remaind running time
TS : State of Time Signal
IS : State of Inner Signal

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

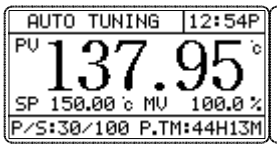


PROG running 3rd screen (HOLDING screen)
When HOLD ON, display held PT and SEG
When HOLD OFF, display running state
S.AL : State of Segment Alarm Signal
AL : State of Alarm Signal

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



PATTERN END : End of Pattern Operation



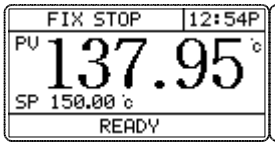
AUTO TUNING screen
It is same as Operation screen

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	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 : 4th Operation screen
*2 : STOP screen

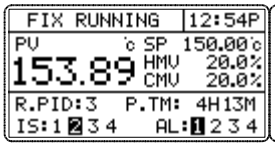
4.2 H/C OPERATION SCREEN

4.2.1 FIX AUTO MODE

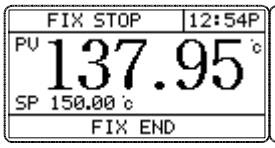


FIX Mode is controlling Temperature & Humidity with fixed SP.
FIX STOP : Stop state
SP : Set point
(Setting by "SET" key)
READY : Ready to running
Start running by "RUN/STOP" key for 3 sec.

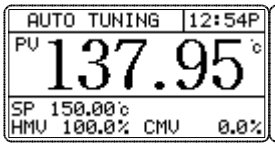
FIX running 1st screen (H/C Type)
PV : Process value of temperature
FIX RUNNING : Fix running state
HMV : State of HEAT Output
CMV : State of COOL Output



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



FIX END : End of Fix Operation

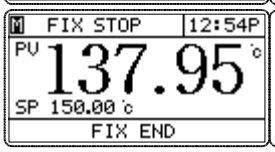


AUTO TUNING screen.
It is same as Operation screen

4.2.2 FIX MANUAL MODE

FIX STOP : Stop state
SP : Set point
(Setting by "SET" key)
READY : Ready to running
Start running by "RUN/STOP" key for 3 sec.

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

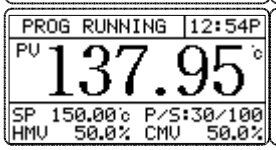


FIX END : End of Fix Operation

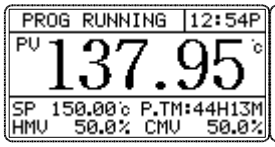
SYMBOL	PARAMETER	RANGE	DISPLAY	UNIT	DEFAULT	EDIT
SP	SET POINT	EU(0.0 ~ 100.0%)	Always	EU	EU(0.0%)	O
MV	MV	0.0 ~ 100.0%	MAN. Op.	%	×	O
HMV	HMV	0.0 ~ 100.0%	H/C Op.	%	0.0%	X
CMV	CMV	0.0 ~ 100.0%	H/C Op.	%	0.0%	X
R.PID	RUN PID NUMBER	1 ~ 4	Always	ABS	×	X
P.TM	PROCESS TIME	00H00M ~ 99H59M	Always	TIME	00H00M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

4.2.3 PROG MODE

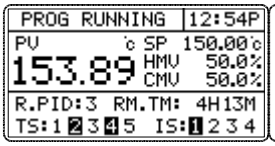
PROG Mode is controlling Temperature with programmed data.
PTNO : Set pattern No.(Set with "SET" key)
SEGNO : Start segment No.
READY : Ready to running
Start running by "RUN/STOP" key for 3 sec.



PROG running 1st screen
PROG RUNNING : Program running state
P/S : Running PATTERN & SEGMENT



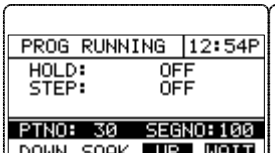
PROG running 2nd screen
PROG RUNNING : Prog running state
P.TM(PROCESS TIME) : Running time



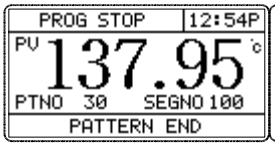
PROG running 3rd screen
R.PID : Running PID No.(Figure 12)
RM.TM : Remaind running time
TS : State of Time Signal
IS : State of Inner Signal

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

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



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



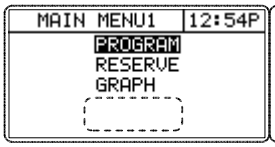
PATTERN END : End of Pattern Operation

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
HMV	HMV	0.0 ~ 100.0%	H/C type	%	0.0%	X
CMV	CMV	0.0 ~ 100.0%	H/C 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
S.AL	SEGMENT ALARM	1 ~ 4 (Display State)	H/C type	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

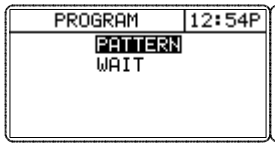
*1 : Operation 4th screen
*2 : STOP screen

4.3 MAIN MENU 1

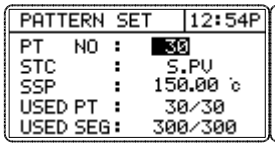
4.3.1 PROGRAM SETTING



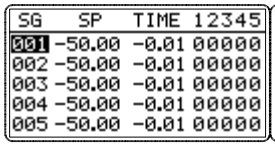
MAIN MENU 1 screen.
This screen will be displayed by MENU KEY on Operation screen.
And Operation screen will return by pushing MENU KEY again
When setting US 1,2 on MAIN MENU 2 to "NONE", USER SCREEN will not be displayed.
(For using US 1,2 screen, refer to the 4.3.4 USER SCREEN (US 1,2)



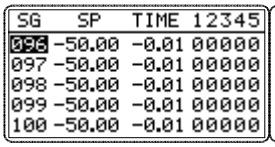
PROGRAM SET screen to enter PATTERN SET.
This screen will be displayed by SET KEY after selecting PROGRAM on MAIN MENU 1



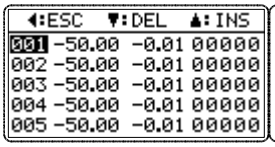
PATTERN SET screen to edit program pattern will be displayed by SET KEY after selecting PATTERN on PROGRAM SET screen.
PT NO : Number of PATTERN for set
STC : Set START CODE SSP, S.PV, T.PV
SSP : Set the value of START SET POINT (SSP)
USED PT/SEG : Number of used PATTERN and SEGMENT



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



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



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

SYMBOL	PARAMETER	RANGE	DISPLAY	UNIT	DEFAULT	EDIT
PT NO	PATTERN NUMBER	1~30	Always	ABS	0	O
STC	START CODE	SSP, S.PV, T.PV	Always	ABS	S.PV	O
SSP	START SET POINT	EU(0.0 ~ 100.0%)	Always	EU	EU(0.0%)	O
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%)	O
TIME	TIME(HH.MM, MM.SS)	-0.01(OFF)~99.59(TMU)	Always	TIME	-00.01(OFF)	O
1	TIME SIGNAL1	0~9	Always	ABS	0	O
2	TIME SIGNAL2	0~9	Always	ABS	0	O
3	TIME SIGNAL3	0~9	Always	ABS	0	O
4	TIME SIGNAL4	0~9	Always	ABS	0	O
5	TIME SIGNAL5	0~9	Always	ABS	0	O

PROGRAM SET screen to enter WAIT SET.
This screen will be displayed by SET KEY after selecting PROGRAM on MAIN MENU 1

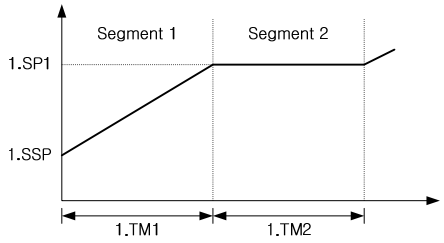
WAIT ZONE : Set the temperature during WAIT ZONE.
When setting 0.0 to this parameter, WAIT operation will not work.
WAIT TIME : Set the time for WAIT operation.
When setting 00.00 to this parameter, WAIT state will keep going on until this time will be in WAIT ZONE.

SYMBOL	PARAMETER	RANGE	DISPLAY	UNIT	DEFAULT	EDIT
WAIT ZONE	WAIT ZONE	EUS(0.0 ~ 100.0%)	Always	EUS	EUS(0.0%)	O
WAIT TIME	WAIT TIME	00.00 ~ 99.59 (TMU)	Always	TIME	00.00 H.M	O

※ 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).



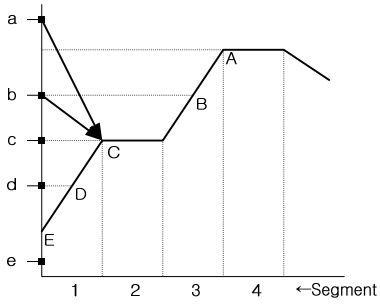
(Figure1 : Example of SSP START)

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.

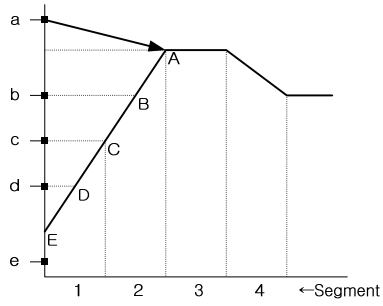
① SEGMENT2 is the first SOAK period



(Figure2 : Example of S.PV START ①)

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

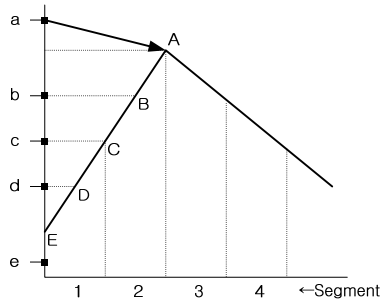
② SEGMENT3 is the first SOAK period



(Figure3 : Example of S.PV START ②)

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

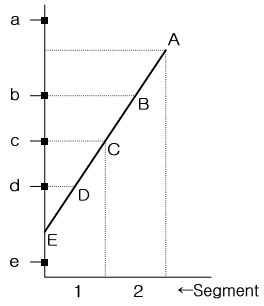
③ NO SOAK period



(Figure4 : Example of S.PV START ③)

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

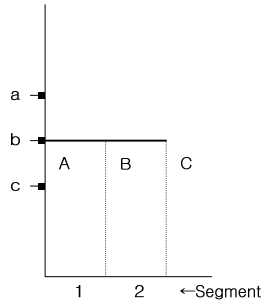
④ Only RAMP period (Ascending)without SOAK



(Figure5 : Example of S.PV START ④)

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)

⑤ 1SEGMENT SOAK

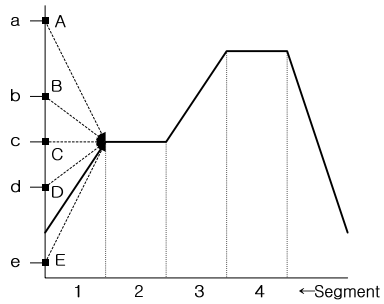


PV when starting PROG RUN	Start Point of PROG RUN
a	B
b	B
c	A(SSP)

(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.

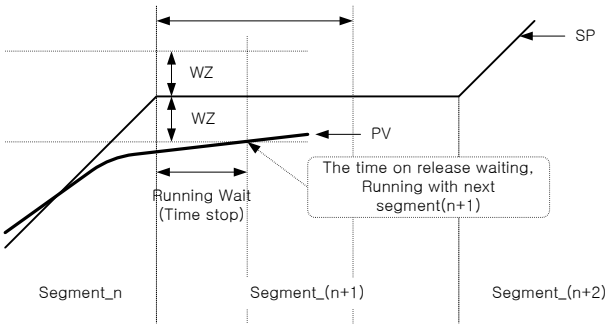


PV when starting PROG RUN	Start Point of PROG RUN
a	A
b	B
c	C
d	D
e	E

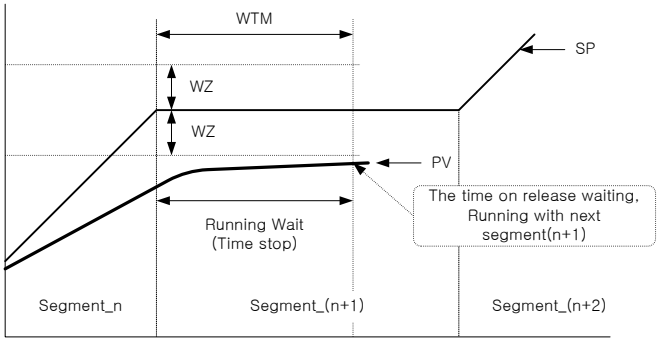
(Figure7 : Example of T.PV START ⑥)

※ 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.

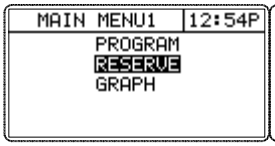


(Figure8 : WAIT - Ex. Wait Function Release Within WTM)



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

4.3.2 RESERVE SET

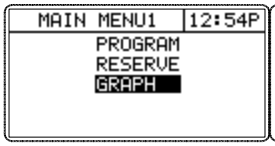


MAIN MENU 1 screen to enter RESERVE SET
This screen will be displayed by MENU KEY on Operation screen.
And Operation screen will return by pushing MENU KEY again
RESERVE SET screen will be displayed by SET KEY when cursor on RESERVE in MAIN MENU 1.

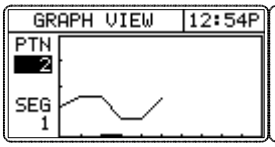
NOW : Display present year, month, date and time which is set on SET DATE area
RUN DATE : Set reserved starting year, month, date and time
SET DATE : Set present year, month, date and time
RESERVE : Use/Not use

SYMBOL	PARAMETER	RANGE	DISPLAY	UNIT	DEFAULT	EDIT
Y	YEAR	0 ~ 99	Always	ABS	0	O (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	O

4.3.3 GRAPH SET



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.



Display segment on pattern by graph
PTN : Set the pattern No. for wished see
SEG : Set the segment No. for display starting

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

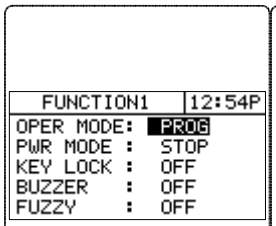
4.3.4 USER SCREEN (US1, US2)

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.

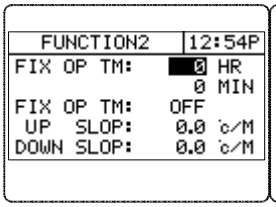
4.4 MAIN MENU 2

4.4.1 FUNCTION SET

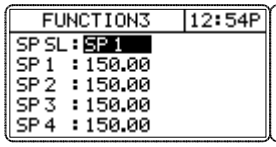
MAIN MENU 2 screen
This screen will be displayed by SET KEY on Operation screen for 6 sec. And Operation screen will return by pushing SET KEY again for 3 sec. or NO KEY input for 60 sec.



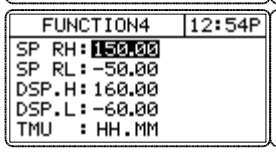
OPER MODE : Selectable Operation mode of FIX / PROG
PWR MODE : Selectable Operation mode after power failure that will be recognized over 3 sec. power failure.
If power on within 3 sec. It is automatically running with HOT mode
▶ STOP : After power failure, go to STOP state
▶ COLD : After power failure, go to RUN on fix running or go to SEG1 on program running.
▶ HOT : After power failure, running by previous data before power failure.
KEY LOCK : Set key in possible / impossible
▶ ON : Lock(Key in impossible)
▶ OFF : Unlock(Key in possible)
BUZZER : Set buzzer sound ON/OFF
FUZZY : Set FUZZY ON/Off(Fuzzy : Overshoot suppressing function)



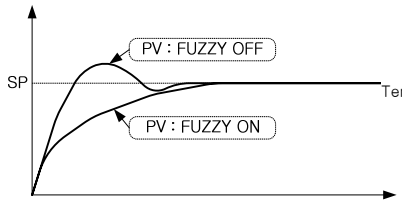
FIX OP TM : Set FIX Operation time ON/OFF
It is reserving function within 9999 hours and fix running is finishing after set the time
UP SLOP : In changing the rising zone of fixed goal, it changes the fixed value at a constant change rate without rapidly changing the fixed value (refer to the Figure 2)
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.



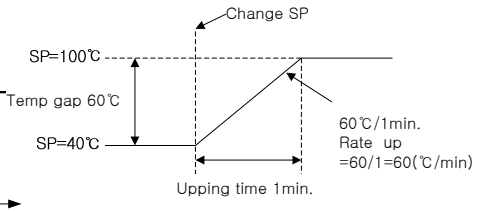
SP SL : There are 4 set points selectable, and one should be selected among them and be operated.
(possible to select by DI)



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)



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

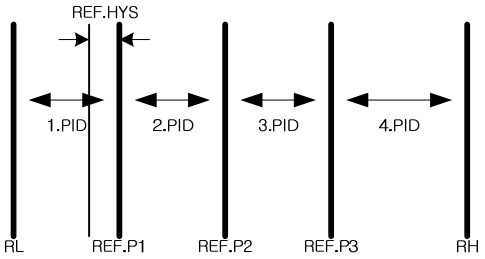
4.4.2 PID SET

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

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

PID SET screen
REF.P1(P2) : Set limit value for selecting ZONE PID on temperature SPAN.
REF.DEV : Set deviation when selecting deviation PID.
REF.HYS : Set the width of hysteresis when selecting PID group in Zone PID.
MODE As PID control mode, it divides D.PV from D.DV
CTR MODE : Set D.DV or D.PV as PROG mode in PID control
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.



(Figure12 : PID Group)

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%

Input values of P, I, D, Pc, Ic, Dc on PID 1~4(H/C Type)
OH : Set upper-limit of the range of operations of control output.
DB : Parameter for setting DEAD BAND of Heating/Cooling operations for H/C TYPE.
MR : Parameter for applying values manually setted to items on the integral time(I) of PID operations when the integral time(I) is '0' in controlling PID.

PID 1	12:54P		
P :	5.0%	MR:	50.0%
I :	120S		
D :	30S		
OH:	100.0%		
OL:	0.0%		

Input P,I,D value on PID1~4 (STD TYPE)
OH, OL : Set upper-limit and lower-limit of the range of operations of control output.
MR : Parameter for applying values manually setted to items on the integral hour of PID operation when the integral hour(I) is '0' in controlling PID.

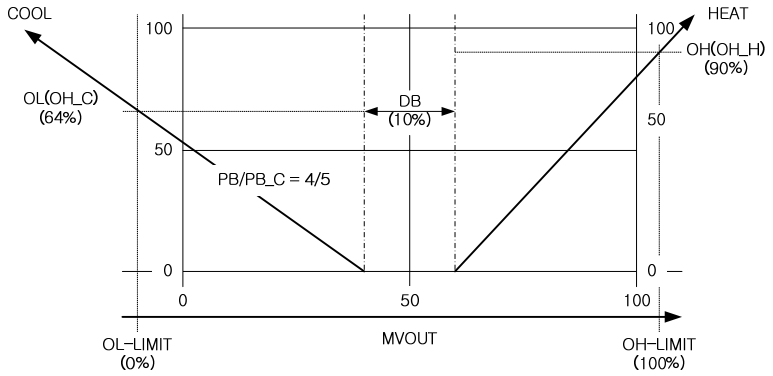


Figure13 : Ex. HEAT=PID, COOL=PID

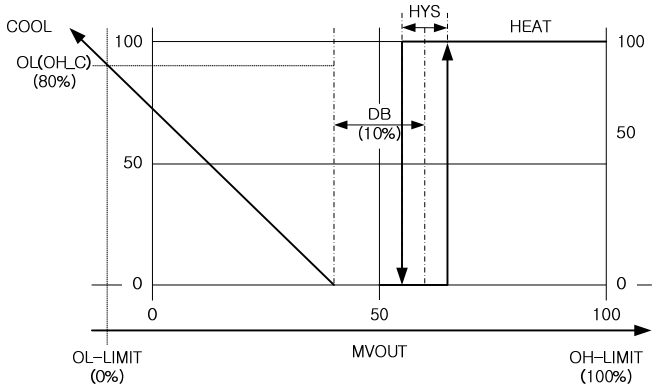


Figure14 : Ex. HEAT=ON/OFF, COOL=PID

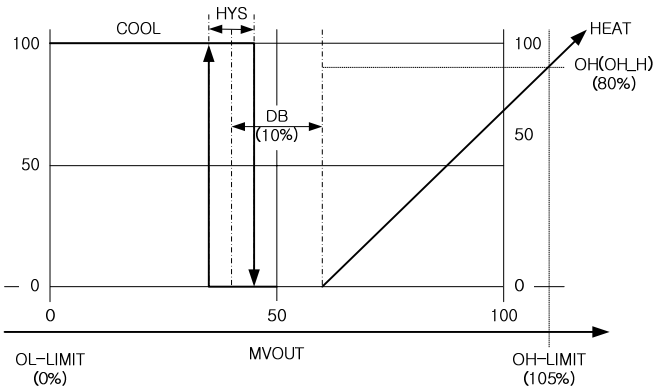


Figure15 : HEAT = PID, COOL = ON/OFF

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 (ONOFF HYS)/2.

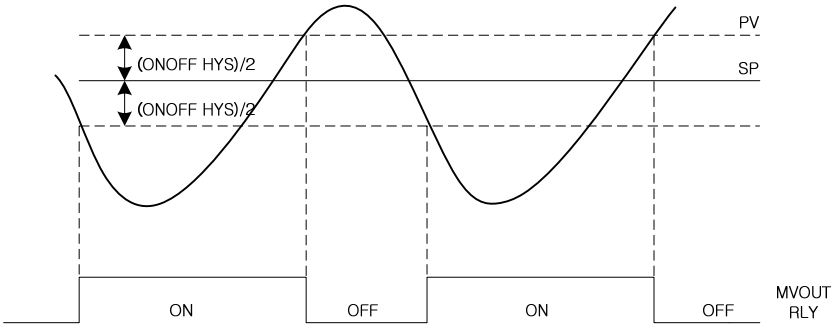
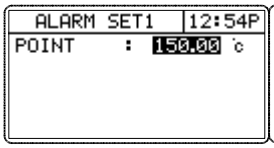


Figure16 : ON/OFF control

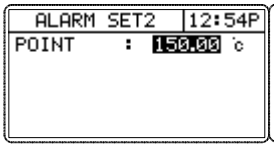
SYMBOL	PARAMETER	RANGE	DISPLAY	UNIT	DEFAULT	EDIT
REF.P1	REFERENCE POINT1	EU(0.0%)~EU(100.0%) REF.1≤REF.2≤REF.3	Always	EU	EU(100.0%)	O
REF.P2	REFERENCE POINT2		Always	EU	EU(100.0%)	O
REF.P3	REFERENCE POINT3		Always	EU	EU(100.0%)	O
REF.HYS	REFERENCE HYSTERESIS	EUS(0.0~10.0%)	Always	EUS	EUS(0.3%)	O
CTR.MODE	CONTROL MODE	D.DV, D.PV	Always	ABS	D.PV	O
P	HEAT PROPORTIONAL BAND	0.0 ~ 999.9% (0=ON/OFF)	Always	%	5.0%	O
I	HEAT TEMP INTEGRAL	0 ~ 6000s	Always	sec.	120 sec.	O
D	HEAT DERIVATIVE TIME	0 ~ 6000s	Always	sec.	30 sec.	O
Pc	COOL PROPORTIONAL BAND	0.0 ~ 999.9% (0=ON/OFF)	H/C type	%	5.0%	O
Ic	COOL TEMP INTEGRAL	0 ~ 6000s	H/C type	sec.	120 sec.	O
Dc	COOL DERIVATIVE TIME	0 ~ 6000s	H/C type	sec.	30 sec.	O
OH	HEAT OUTPUT LIMIT HIGH	OL+1digit ~ 100.0% 0.0 ~ 100.0% (H/C TYPE)	Always	%	100.0%	O
OL	HEAT OUTPUT LIMIT LOW	0.0% ~ OH-1digit	S'TD type	%	0.0%	O
OH	COOL OUTPUT LIMIT HIGH	0.0 ~ 100.0%	H/C type	%	100.0%	O
DB	DEAD BAND	-100.0%~15.0%	H/C type	%	3.0%	O
MR	MANUAL RESET	-5.0~105.0%	Always	%	50.0%	O

4.4.3 ALARM SET

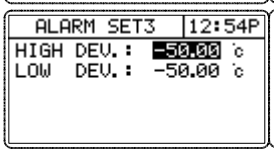
MAIN MENU 2 screen to enter PID SET



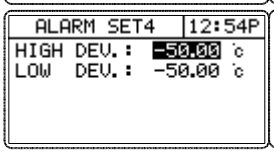
POINT : Set value for ALARM



POINT : Set value for ALARM



HIGH DEV : High Deviation for Deviation Operation.
LOW DEV : Low Deviation for Deviation Operation.



HIGH DEV : High Deviation for Deviation Operation.
LOW DEV : Low Deviation for Deviation Operation.

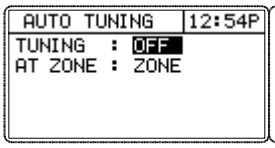
NOTE Alarm is working on even STOP state

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

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

4.4.4 AUTO TUNING SET

MAIN MENU 2 screen to enter AUTO TUNING SET



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	O
AT ZONE	AT ZONE	ZONE, SEG	Always	ABS	SEG	O

※ AT TUNING Operation
1. ZONE PID AUTO TUNING

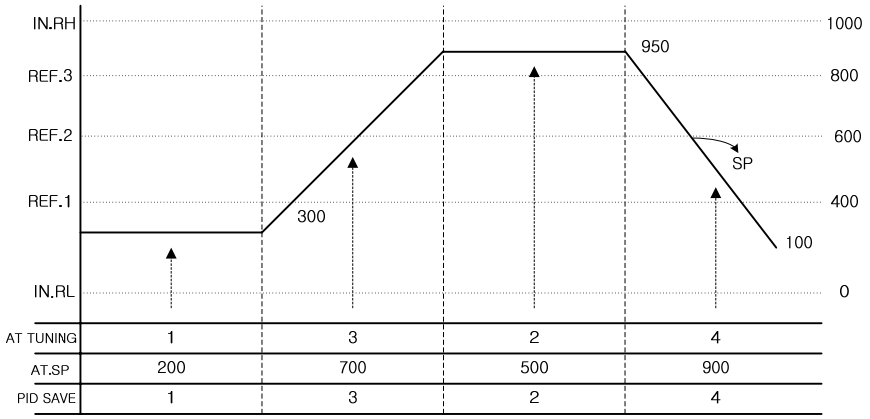
1.1 Set value of AT TUNING : OFF, 1~4, AUTO SET
1.2 Operation
- AT ZONE : When setting ZONE, it carries out ZONE PID AUTO TUNING process.
  1 : PID zone 1 AT.
  - When starting to carry out AT process, progress SEG keeps Holding and SP will be changed to TUNING SP.
  - PID1 AT.SP = IN.RL+(REF.P1-IN.RL)/2
  - 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.RH-REF.P3)/2
- After complete of AT, it starts to carry out hold SEG with the preceding SP before AT.

EX) ZONE PID AUTO TUNING



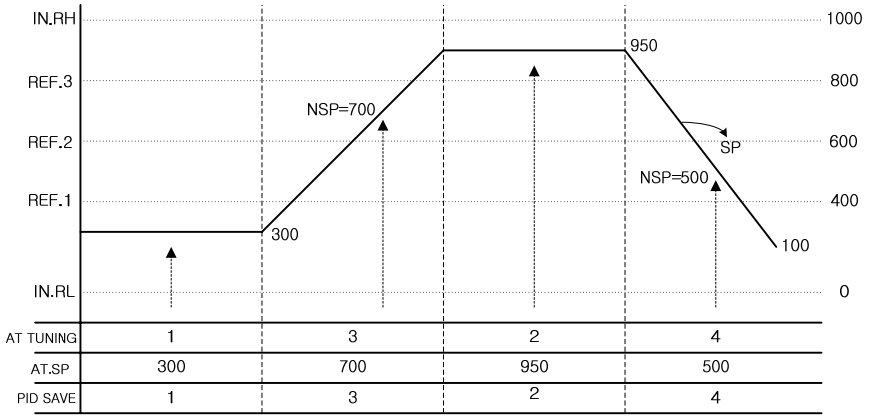
AT TUNING	1	3	2	4
AT.SP	200	700	500	900
PID SAVE	1	3	2	4

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.

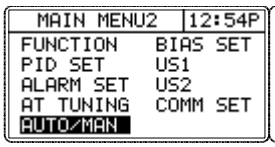
EX) SEG PID AUTO TUNING



AT TUNING	1	3	2	4
AT.SP	300	700	950	500
PID SAVE	1	3	2	4

Figure18 : Ex of SEG PID AUTO TUNING

4.4.5 A/M MODE

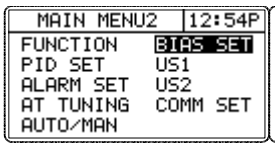


MAIN MENU 2 screen to enter AUTO/MAN SET.
It can be changed only when FIX MODE.
(During AT process, this parameter can not be changed)

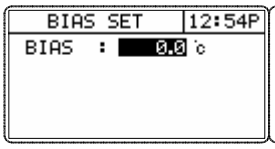
This parameter is to set control mode of AUTO or MANUAL.
MV can be set by key input on Operation screen.

SYMBOL	PARAMETER	RANGE	DISPLAY	UNIT	DEFAULT	EDIT
A/M. MODE	AUTO/MANUAL MODE	AUTO/MAN	Always (Selectable On FIX Mode)	ABS	AUTO	O

4.4.6 BIAS SET



MAIN MENU 2 screen to enter BIAS SET



BIAS : Collective INPUT BIAS

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

4.4.7 USER SCREEN SET (US1, US2)

MAIN MENU 2 screen to enter USER SCREEN1

Setting value of US1 will be applied to MAIN MENU 1

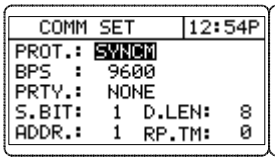
MAIN MENU 2 screen to enter USER SCREEN 2

Setting value of US2 will be applied to MAIN MENU 1

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

4.4.8 COMMUNICATION SET

MAIN MENU 2 screen to enter COMMUNICATION SET

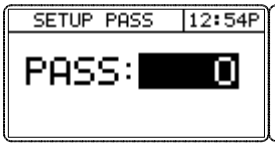


PROT : Protocol
BPS : Speed (Bit per sec)
PRTY : Parity
S.BIT : Stop bit
D.LEN : Data length
ADDR : Address
RP.TM : Response time

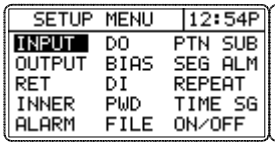
SYMBOL	PARAMETER	RANGE	DISPLAY	UNIT	DEFAULT	EDIT
PROT.	PROTOCOL	PCLK0, PCLK1, MDB.A, MDB.R, SYNCM	When Option	ABS	PCLK1	O
BPS	BAUD RATE	600, 1200, 2400, 4800, 9600, 19200	When Option	ABS	9600	O
PRTY.	PARITY	NONE, EVEN, ODD	When Option	ABS	NONE	O
S.BIT	STOP BIT	1, 2	When Option	ABS	1	O
D.LEN	DATA LENGTH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

4.5 SETUP MENU

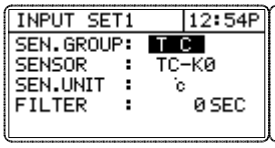
4.5.1 INPUT SET



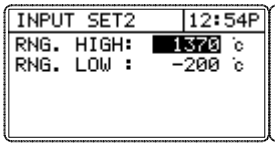
PASSWORD screen to enter SETUP MENU.
This screen will be displayed by SHIFT+SET KEY for 6 sec. on Operation screen.
After filling up password, SETUP MENU will be displayed.
And Operation screen will return by pushing SET KEY again for 3 sec. or NO KEY input for 60 sec.



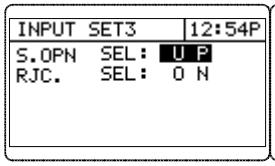
SETUP MENU screen to enter INPUT SET.
Operation screen will return by pushing SET KEY again for 3 sec. or NO KEY input for 60 sec.



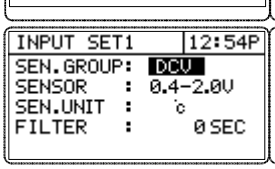
SEN.GROUP : Divide the type of input sensor by TC, RTD, and DCV.
SENSOR : Input sensor. (refer to table 2)
FILTER : Parameter fixed up for alleviating the shake of PV caused from unmeasured disturbance & noise.



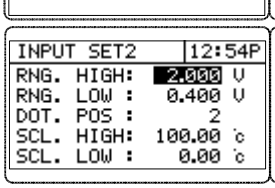
RNG.HIGH(LOW) : Set a range of use for each sensor.



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.



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.



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

Table 2 : Type of Input Sensor *※display range : -5% ~ +105%*

No.	TYPE	Temp.Range(℃)	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	O
SENSOR	SENSOR TYPE	Depending on SENSOR	Always	ABS	TC-K1	O
SEN. UNIT	SENSOR UNIT	℃, °F	T/C, RTD	ABS	℃	O
SEN. UNIT	SENSOR UNIT	℃, °F, SPACE, %, Pa, mV, V, %Rh, OHM	DCV	ABS	℃	O
FILTER	FILTER	120sec	Always	SEC	0 SEC	O
RNG.HIGH	RANGE HIGH	RL+1digit~EU(100.0%)	Always	EU	EU(100.0%)	O
RNG.LOW	RANGE LOW	EU(0.0%)~EH-1digit	Always	EU	EU(0.0%)	O
DOT.POS	DOT POSITION	0~3	DCV	ABS	2	O
SCL.HIGH	SCALE HIGH	SL+1digit~300.00	DCV	ABS	100.00	O
SCL.LOW	SCALE LOW	-19.99~SH-1digit	DCV	ABS	0.00	O
B.OUT SEL	BURN OUT SELECT	OFF, UP, DOWN	Always	ABS	UP	O
RJC.SEL	Reference Junction Compensation	ON, OFF	Always	ABS	ON	O
DISP FILT	DISPLAY FILTER	0 ~ 120sec	SP791	ABS	0sec	O
PWR. FREQ	POWER FREQUENCE	60, 50Hz	SP791	ABS	60Hz	O

4.5.2 OUTPUT SET

SETUP MENU 12:54P		
INPUT	DO	PTN SUB
OUTPUT	BIAS	SEG ALM
RET	DI	REPEAT
INNER	PWD	TIME SG
ALARM	FILE	ON/OFF

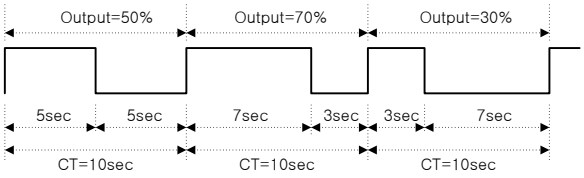
SETUP MENU screen to enter OUTPUT SET.
Operation screen will return by pushing SET KEY again for 3 sec. or NO KEY input for 60 sec.

OUTPUT SET1 12:54P	
OUT1:HEAT	OUT2:NONE
OUT3: RET	
SCR.RANGE: 4-20 mA	
OUT4:NONE	
SCR.RANGE: 4-20 mA	

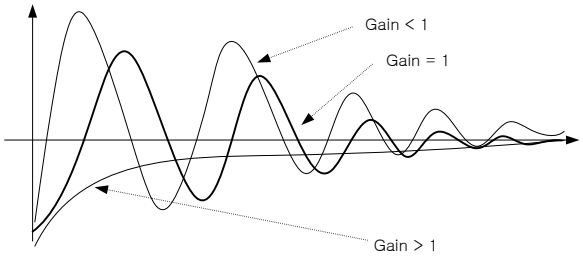
OUT1 : Set output type of OUTPUT1
OUT2 : Set output type of OUTPUT2
OUT3 : Set output type of OUTPUT3
OUT4 : Set output type of OUTPUT4
SCR.RANGE : Set output type of OUTPUT3,4(0–20, 4–20mA)

OUTPUT SET2 12:54P	
RELAY SEL: NONE	
CYCLE :	1 S
AT. GAIN :	1.0 %
DIRECTION: REVR.	

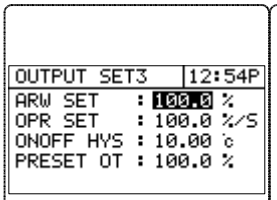
RELAY SEL : Set output type of RELAY
CYCLE : Set output cycle
DIRECT : Set reverse/forward for PID control
AT GAIN : The parameter to set proportional PID control by obtaining AUTO TUNING. Reduce AT–G, Cycle time became rapid. Increase AT–G, control status became more stable. Smaller value, will become more hunting.



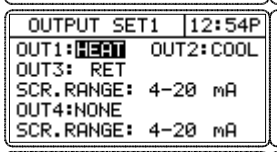
(Figure19 : Example of Control Output in CT = 10 Sec)



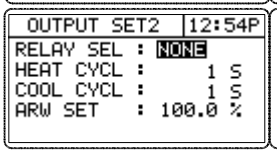
(Figure20 : AT GAIN)



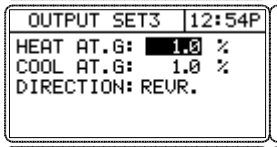
ARW SET: It is effective method for the control at the external shock, not running I=0. When use ARW Function, Overshoot occur little, PV is flattern quickly.
OPR SET : Control the variance rate of output
PRESET OT : Cut an output from the calculation of PID when in A/D ERROR or BURN OUT in AUTO MODE, 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%.)
Output MAN output value regardless of ERROR when in MAN MODE.



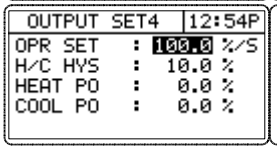
H/C TYPE
OUT1 : Set output type of HEAT OUTPUT1
OUT2 : Set output type of COOL OUTPUT2
OUT3 : Set output type of OUTPUT3
OUT4 : Set output type of OUTPUT4
SCR.RANGE : Set output type of OUTPUT3,4(0-20, 4-20mA)



H/C TYPE
RELAY SEL : Set type of RELAY OUTPUT.
HEAT CYCLE : Set HEAT OUTPUT CYCLE time.
COOL CYCLE : Set COOL OUTPUT CYCLE time..
ARW SET: It is effective method for the control at the external shock.



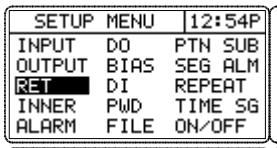
H/C TYPE
HEAT AT.G : GAIN value for HEAT
COOL AT.G : GAIN value for COOL
DIRECT : Set reverse/forward for PID control



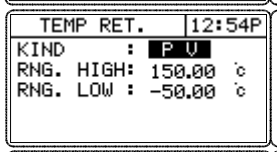
H/C TYPE
OPR SET : Control the variance rate of output
HEAT PO : HEAT PRESET OUTPUT
COOL PO : COOL PRESET OUTPUT

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

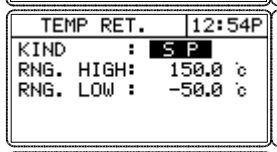
4.5.3 RETRANSMISSION SET



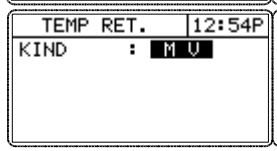
SETUP MENU screen to enter RETRANSMISSION SET.
Operation screen will return by pushing SET KEY again for 3 sec. or NO KEY input for 60 sec.



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



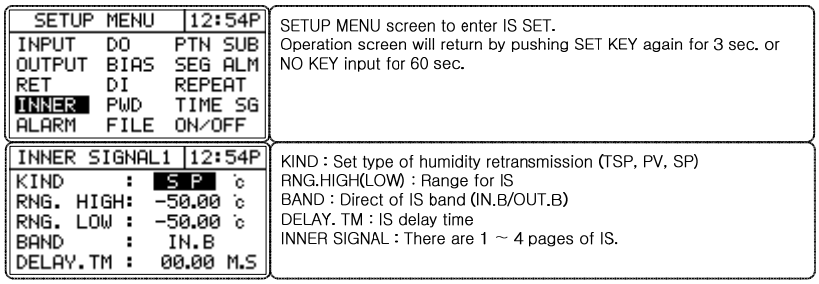
KIND : Indicates a type of RET output, and there are PV, SP, MV for Standard TYPE, and PV, SP, MV, HMV, CMV for H/C Type.
RNG.HIGH : Upper-limit of RET output
RNG.LOW : Lower-limit of RET output



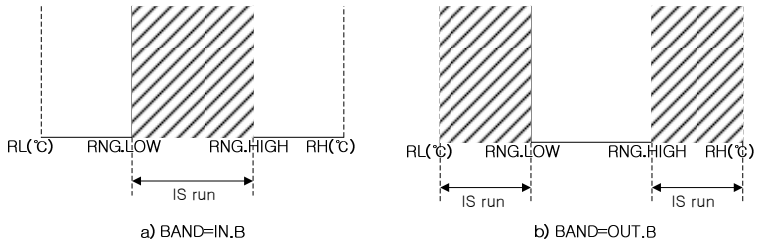
KIND : Indicates a type of RET output, and there are PV, SP, MV for Standard TYPE, and PV, SP, MV, HMV, CMV for H/C Type.
RNG.HIGH : Upper-limit of RET output
RNG.LOW : Lower-limit of RET output

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

4.5.4 INNER SIGNAL (IS) SET



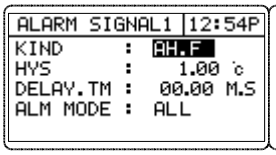
Symbol	Parameter	Range	Display	Unit	Default	EDIT
KIND	INNER SIGNAL KIND	TSP, PV, SP	Always	ABS	SP	O
RNG.HIGH	IS RANGE HIGH	EU(0.0~100.0%)	Always	EU	EU(0.0%)	O
RNG.LOW	IS RANGE LOW	RNG.LOW≤RNG.HIGH	Always	EU	EU(0.0%)	O
BAND	BAND DIRECT	IN.B, OUT.B	Always	ABS	IN.B	O
DELAY.TM	DELAY TIME	00.00~99.59 MM.SS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



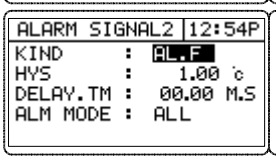
(Figure21 : Ex. Of INNER SIGNAL ZONE)

4.5.5 ALARM SET

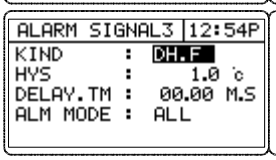
SETUP MENU screen to enter ALARM SET.
Operation screen will return by pushing SET KEY again for 3 sec. or NO KEY input for 60 sec.



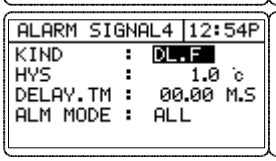
This is ALARM SIGNAL 1 screen.
KIND : Set type of ALARM. HYS : Set HYSTERESIS for ALARM.
DELAY.TM : Set the delay time for ALRAM output
ALM MODE : Set ALARM Operation mode.
ALL : Always ALARM works.
RUN/AM : When RUN(AUTO,MAN), ALARM works
RUN/A : When RUN(AUTO), ALARM works



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



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

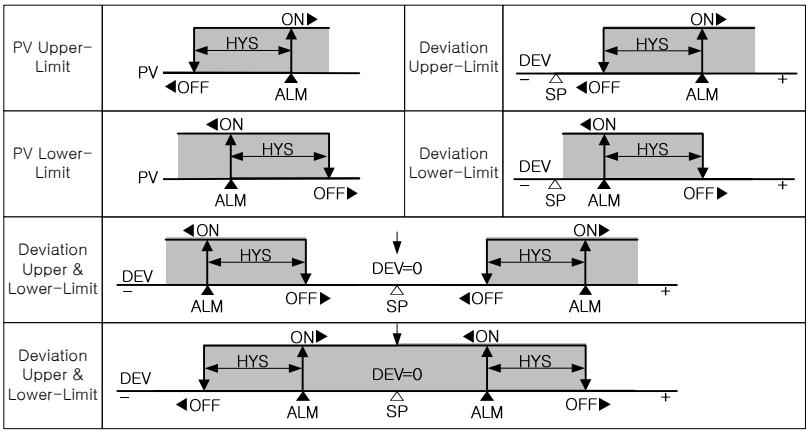


This is ALARM SIGNAL 4 screen.
KIND : Set type of ALARM. HYS : Set HYSTERESIS for ALARM.
DELAY.TM : Set the delay time for ALRAM output
ALM MODE : Set ALARM Operation mode.
ALL : Always ALARM works.
RUN/AM : When RUN(AUTO,MAN), ALARM works
RUN/A : When RUN(AUTO), ALARM works

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	O
HYS	ALARM HYSTERESIS	EUS(0.0~100.0%)	Always	EUS	EUS(0.5%)	O
DELAY.TM	DELAY TIME	00.00~99.59 MM.SS	Always	TIME	00.00 MM.SS	O
ALM MODE	ALARM MODE	ALL, RUN/AM, RUN/A	Always	ABS	ALL	O

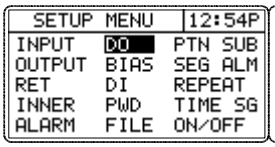
(TABLE 2 : ALARM TYPE)

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

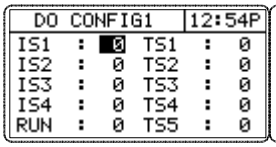


(Figure22 : ALRAM OPERATION)

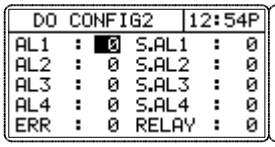
4.5.6 Digital Output SET (DO)



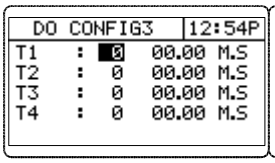
SETUP MENU screen to enter DO SET.
Operation screen will return by pushing SET KEY again for 3 sec. or NO KEY input for 60 sec.



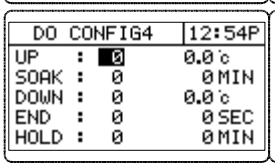
DO CONFIG set (1st page)
Set the relay number (0~12) for IS1~4, RUN and TS1~5



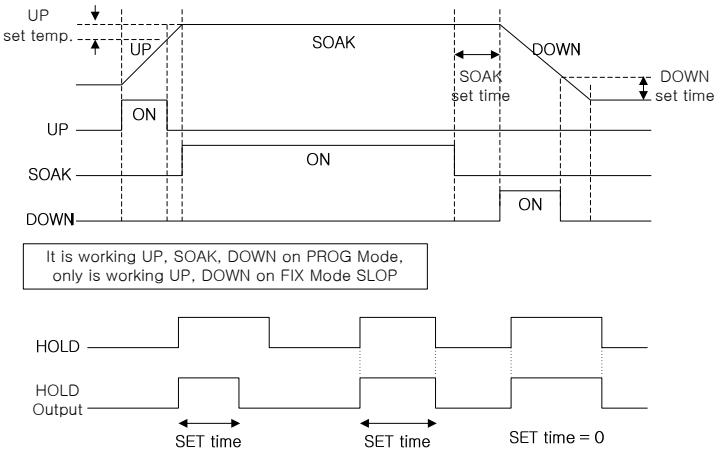
DO CONFIG set (2nd page)
Set the relay number (0~12) for ALARM1~4, WAIT and SEG ALARM1~4(0~12)
Set the relay number (0~8) for Relay Output



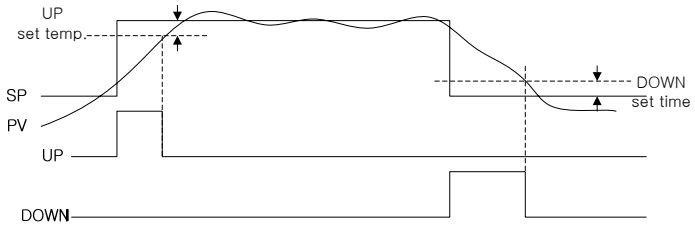
DO CONFIG set (3rd page)
Set the relay number (0~12) for T1~T4
In case that time set, Delay time applied at every ON case



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℃ [X=TSP – set temperture]
SOAK : Output until X min [X=SOAK zone time – set time]
DOWN : Output until X℃ [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



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

4.5.7 PIECE BIAS SET

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 BIAS SET.
Operation screen will return by pushing SET KEY again for 3 sec. or NO KEY input for 60 sec.

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 V :	57.02c	

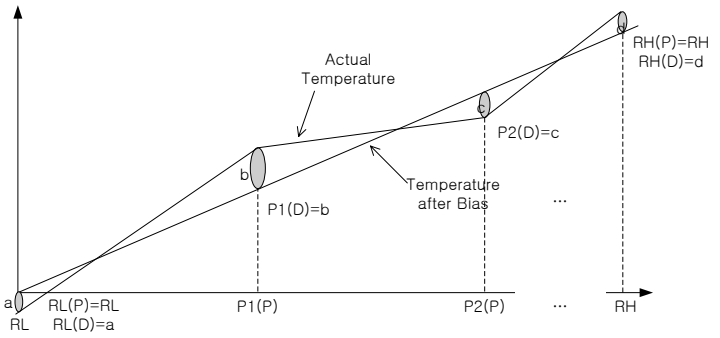
Set bias for piece
RL(P), P1(P), P2(P), P3(P) : Point (Boundary point)
RL(D), P1(D), P2(D), P3(D) : Bias value

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 V :	57.02c	

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

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 V :	57.02c	

Set bias for piece
P8(P), P9(P), RH(P) : Point (Boundary point)
P8(D), P9(D), RH(D) : Bias value

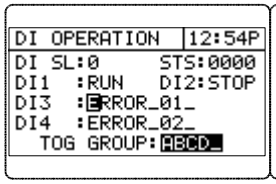


(Figure25 : Ex. Piece Bias Formula)

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

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.



DI SL : This parameter determines the operation mode of Digital Input external relay contact.
The Digital Input operating configurations are shown in TABLE3 : DI Operation.
STS : This parameter will display '1'(ON) when Digital Input activates.
Its default value is '0'(OFF)
DI3, DI4 : Error name on DI3 and DI4 can be defined by user
(SET KEY → UP or DOWN)

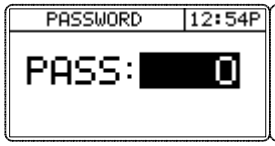
Symbol	Parameter	Range	Display	Unit	Default	Edit
DI SL	DI SELECT	0, 1	FIX MODE	ABS	0	O
		0, 1, 2, 3	PROG MODE	ABS	0	O
STS	DI STATUS	0000~1111	상시표시	ABS	0000	X
DI1 NAME	DI1 NAME	RUN	Always	ABS	RUN	X
DI2 NAME	DI2 NAME	STOP	Always	ABS	STOP	X
DI3 NAME	DI3 NAME	0 ~ 9, A ~ Z, Symbols	Always	ABS	ERROR 03	O
DI4 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

Symbol		DI1	DI2	DI3	DI4	Operation
FIX	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
PROG	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 menual
		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 menual
		–	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

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.



Set the new password
SET KEY → UP, DOWN, SHIFT key → SET KEY

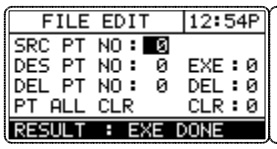
CAUTION

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	O

4.5.10 FILE EDIT

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.

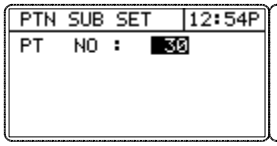


SRC PT NO : Number of PATTERN for copy
DES : Number of PATTERN to copy
EXE : Operate when fixed to 1
DEL PT NO : Number of PATTERN for delete
DEL : Deleted when fixed to 1
PT ALL CLR : All patterns are cleared when fixed to 1

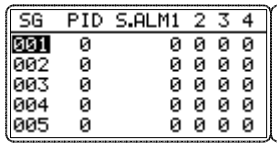
Symbol	Parameter	Range	Display	Unit	Default	EDIT
SRC PT NO	Source Pattern Number	0 ~ 30	Always	ABS	0	O
DES PT NO	Destination Pattern Number	0 ~ 30	Always	ABS	0	O
EXE	EXECUTE	0, 1	Always	ABS	0	O
DEL PT NO	DELETE PATTERN NUMBER	0 ~ 30	Always	ABS	0	O
DEL	DELETE	0, 1	Always	ABS	0	O
PT ALL CLR	PATTERN ALL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

4.5.11 PTN SUB

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.



PT NO : Set the PATTERN No..

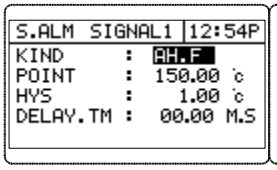


Set PID NO, SEG ALARM 1, 2, 3, 4 of each SEG
(when PID NO=0, ZONE PID work)

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

4.5.12 SEG ALM

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.

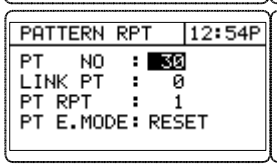


KIND : Set type of ALARM.
POINT : Set the value of ALARM
HYS : Set HYSTERESIS for ALARM.
DELAY.TM : Set the delay time for ALRAM output
SEG ALARM SIGNAL1~8 screen.
ALARM on PTN SUB will works only when PROG RUN

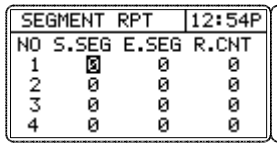
Symbol	Parameter	Range	Display	Unit	Default	EDIT
KIND	ALARM KIND	OFF, AH.F, AL.F, DH.F, DL.F, DH.R, DL.R, DO.F, DI.F, AH.R, AL.R	Always	ABS	AH.F	O
POINT	ALARM POINT	EU(-100.0~100.0%)	PV Upper-Limit	EU	EU(100.0%)	O
			PV Lower-Limit	EU	EU(0.0%)	O
HIGH DEV.	HIGH DEVIATION	EUS(-100.0%)~EUS(100.0%)	Deviation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

4.5.13 REPEAT

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.



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

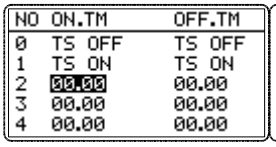


Set the repeat (number of time) and segment of the top/end.

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

4.5.14 TIME SIGNAL

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.

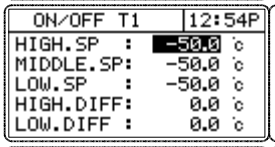


EDIT TIME SIGNAL set
NO. 0,1 means the state of time signal when it is both OFF and ON, and For NO.2~9, fix time to ON and OFF.
In this screen, designate the occurrence of ON/OFF on Time Signal, and designate on EDIT SEG of "MAIN MENU → PROGRAM → PATTERN" to output.

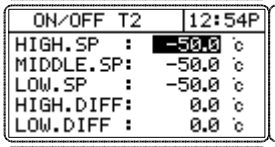
Symbol	Parameter	Range	Display	Unit	Default	EDIT
ON.TM	ON TIME	00.00~99.59 (TMU)	Always	TIME	00.00 H.M	O
OFF.TM	OFF TIME	00.00~99.59 (TMU)	Always	TIME	00.00 H.M	O

4.5.15 ON/OFF SET

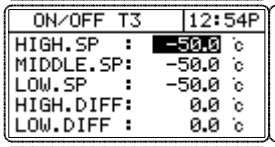
SETUP MENU screen to enter ON/OFF SET.
Operation screen will return by pushing SET KEY again for 3 sec. or NO KEY input for 60 sec.



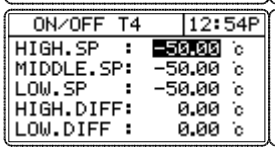
This is ON/OFF T1 MODE screen.
HIGH.SP : Set HIGH SP when ON/OFF mode.
HIGH.DIFF : Set operating POINT on HIGH zone.
MIDDLE.SP : Set MIDDLE SP when ON/OFF mode..
LOW.SP : Set LOW SP when ON/OFF mode..
LOW.DIFF : Set operating POINT on LOW zone..



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 T3 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..



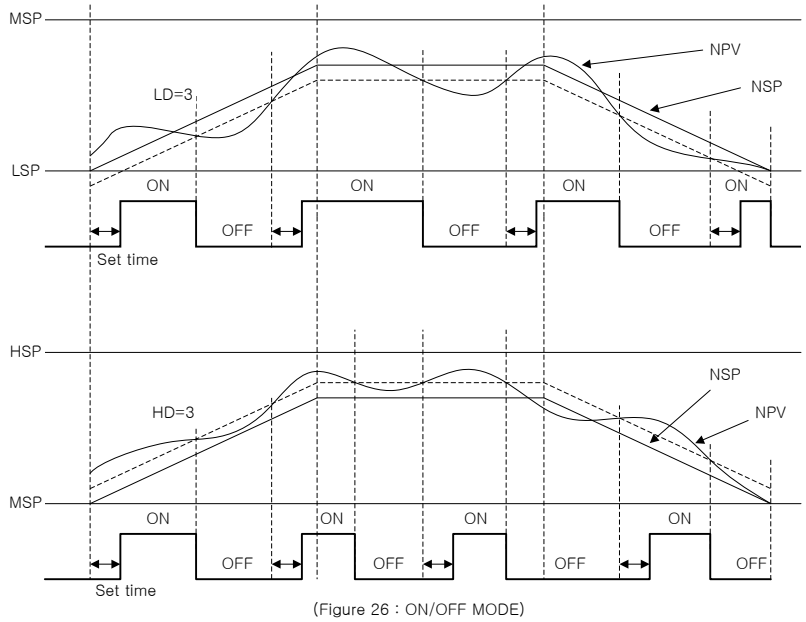
This is ON/OFF T4 MODE screen.
HIGH.SP : Set HIGH SP when ON/OFF mode.
HIGH.DIFF : Set operating POINT on HIGH zone.
MIDDLE.SP : Set MIDDLE SP when ON/OFF mode..
LOW.SP : Set LOW SP when ON/OFF mode..
LOW.DIFF : Set operating POINT on LOW zone..

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%) RL≤LOW.SP <MIDDLE.SP <HIGH.SP≤RH	Always	EU	EU(0.0%)	O
MIDDLE.SP	MIDDLE SP		Always	EU	EU(0.0%)	O
LOW.SP	LOW SP		Always	EU	EU(0.0%)	O
HIGH.DIFF	HIGH DIFFERENCE	EUS(0.0 ~ 10.0%)	Always	EUS	EUS(0.0%)	O
LOW.DIFF	LOW DIFFERENCE	EUS(0.0 ~ 10.0%)	Always	EUS	EUS(0.0%)	O

1. T1~T4 (ON after set time.)

① NPV < LSP(LOW.SP) → Output : OFF
② NPV > HSP(HIGH.SP) → Output : OFF
③ LSP ≤ NPV < MSP(MIDDLE.SP)
NPV ≥ NSP-LD(LOW.DIFF) → Output : ON
NPV < NSP-LD → Output : OFF
④ MSP < NPV < HSP,
NPV < NSP +HD(HIGH.DIFF) → Output : OFF
NPV ≥ NSP + HD → Output : ON



(Figure 26 : ON/OFF MODE)

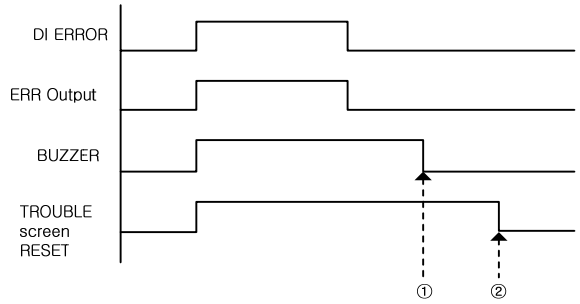
4.6 TROUBLE SHOOTING

TROUBLE	12:54P
ERROR 01 :	OK
ERROR 02 :	WARN
OCCUR TIME:	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.

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

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

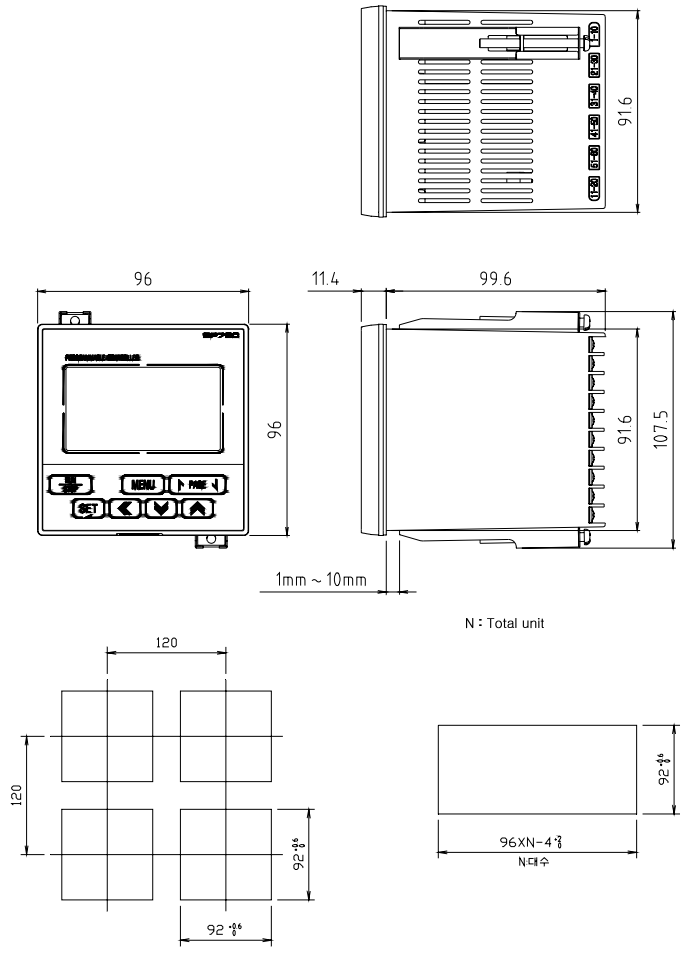


① BUZZER STOP by SET KEY

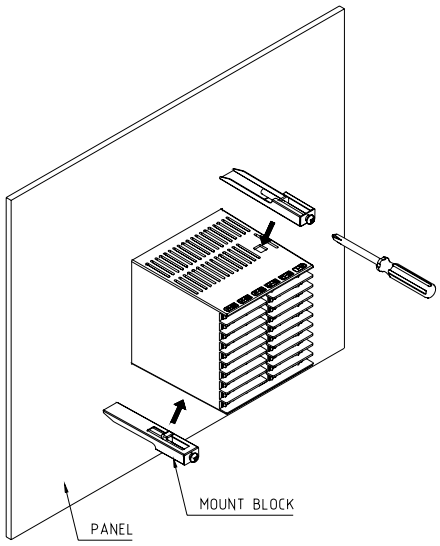
② TROUBLE screen will be RESET by other KEY except for SET KEY.

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)

CAUTION

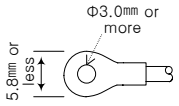
Do not tighten the mounting screw excessively, or the unit case or bracket may be damage.

5.3 Power Cable Specification

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

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.

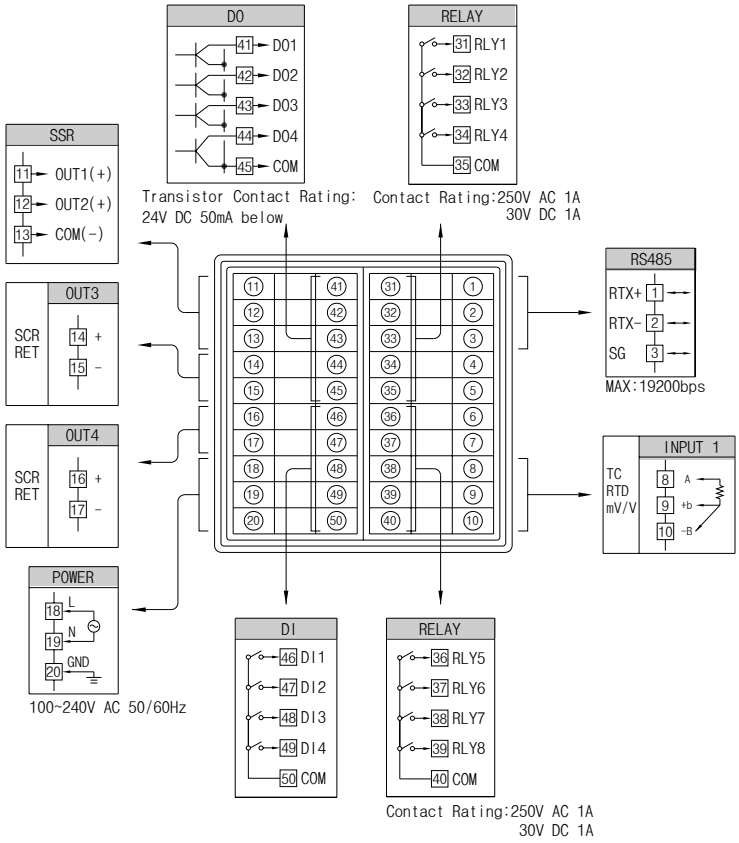
CAUTION

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.

CAUTION

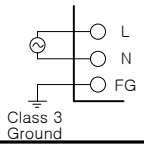
Avoid unused terminal for install, it might make damage to system or out of order.

5.5 Terminal Arrangement and External Wiring



5.6 Grounding and Power Cable Connection

■ Use a cable 2 ㎟ 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.



CAUTION

▶ 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.

CAUTION

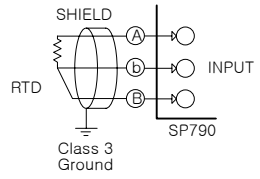
Before starting analog input wiring, be sure to turn off the system otherwise you might get an electrical shock.

CAUTION

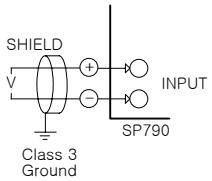
▶ When connection, do not mix up the input polarity.
▶ Connecting with the wrong polarity can cause the unit to malfunction.
▶ For input wiring, use a shielded cable.
▶ Ground the shield at one point and grounding circuits as possible.
▶ Sensor input line must have avoid power source cable for protect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

5.7 Analog Input Connection

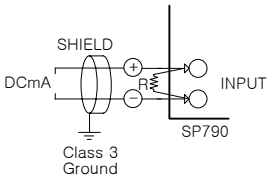
(A) RTD INPUT



(B) DC VOLTAGE INPUT



(C) DC CURRENT INPUT



5.8 Analog Output Connection

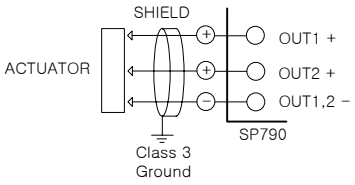
CAUTION

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

CAUTION

- ▶ 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

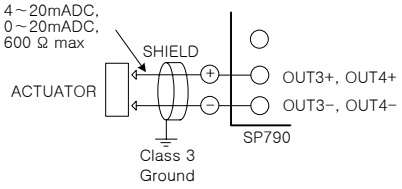


SSR : 12V DC min, 600 ohm min

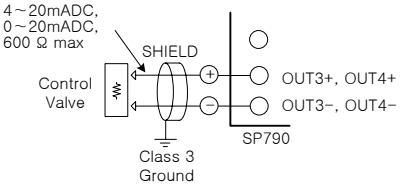
CAUTION

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

(B) RETRANSMISSION



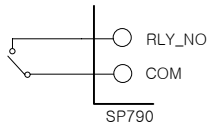
(C) RET



CAUTION

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

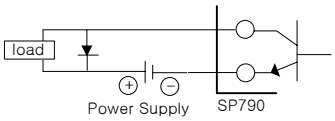
5.9 External Contact Output Connection (RELAY)



CAUTION

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)

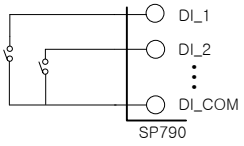


CAUTION

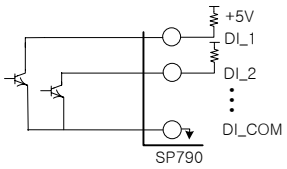
24V DC 50mA or less

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

CAUTION

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

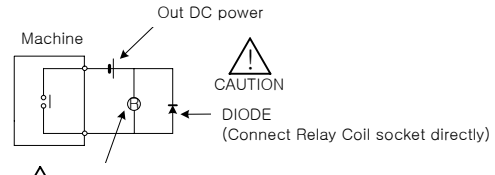
■ If you INDUCTANCE(L) load like as AUXILIARY RELAY or SOLENOIDE VALVE, it might make go to wrong or out of order relay, please make sure insert to parallel circuit with CR FILTER(AC) or DIODE(DC) by SURGE SUPPRESSOR of avoiding sparks.

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

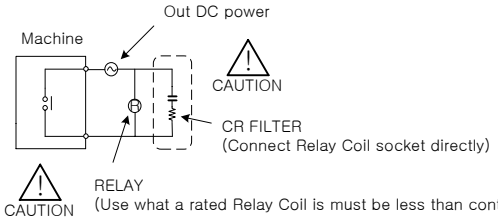
CAUTION

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

(A) DC RELAY

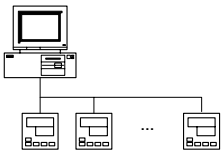


(B) AC RELAY



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

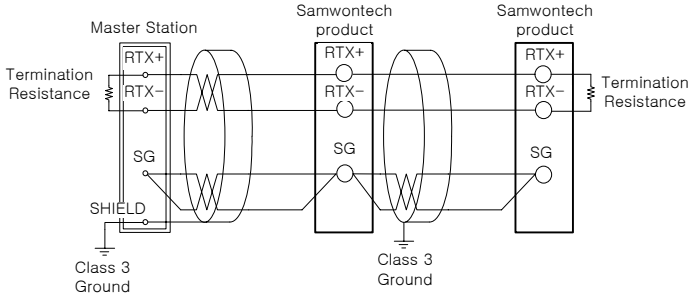
■ Default parameter of communication

- 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.

CAUTION

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	STX	Addr	RSD	,	Parameter Number	,	D-Reg.NO.	SUM	CR	LF

■ Response

Byte	1	2	3	1	2	1	4	1	4	1	. . .
Command element	STX	Addr	RSD	,	OK	,	dddd-1	,	dddd-2	,	. . .

1	4	1	4	2	1	1
,	dddd-(n-1)	,	dddd-(n)	SUM	CR	LF

- 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	STX	Addr	RRD	,	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	CR	LF

■ Response

Byte	1	2	3	1	2	1	4	1	4	1	. . .
Command element	STX	Addr	RRD	,	OK	,	dddd-1	,	dddd-2	,	. . .

1	4	1	4	2	1	1
,	dddd-(n-1)	,	dddd-(n)	SUM	CR	LF

- 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	STX	Addr	WSD	,	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	CR	LF

■ Response

Byte	1	2	3	1	2	2	1	1
Command element	STX	Addr	WSD	,	OK	SUM	CR	LF

- 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	STX	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	CR	LF

■ Response

Byte	1	2	3	1	2	2	1	1
Command element	STX	Addr	WRD	,	OK	SUM	CR	LF

- Parameter number : 1 ~ 32
- dddd : Indicates a character string in hexadecimal format

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

- SP1 set : 50.0℃ → Delete decimal point (500) → hexadecimal format(0x01F4)
- SP4 set : 0.5℃ → 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	STX	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	CR	LF

■ Response

Byte	1	2	3	1	2	2	1	1
Command element	STX	Addr	STD	,	OK	SUM	CR	LF

- 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	STX	Addr	CLD	SUM	CR	LF

■ Response

Byte	1	2	3	1	2	1	4	1	4	1	. . .
Command element	STX	Addr	CLD	,	OK	,	dddd-1	,	dddd-2	,	. . .

1	4	1	4	2	1	1
,	dddd-(n-1)	,	dddd-(n)	SUM	CR	LF

- 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 commends 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_I
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_I
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_I
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_I

* 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	SEG_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_SEG_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_Ic
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_Ic
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_Ic
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_Ic
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_SEG_S1		UP	T1 MID.SP
22		RETL	RJC_SEL	RPT_SEG_E1	RL(D)	UP_PARA	T1 LOW.SP
23		RETH		RPT_SEG_C1	P1(D)	SOAK	T1 HD
24				RPT_SEG_S2	P2(D)	SOAK_PARA	T1 LD
25				RPT_SEG_E2	P3(D)	DOWN	
26				RPT_SEG_C2	P4(D)	DOWN_PARA	T2 HIGH.SP
27				RPT_SEG_S3	P5(D)	PTEND	T2 MID.SP
28				RPT_SEG_E3	P6(D)	PTN_PARA	T2 LOW.SP
29				RPT_SEG_C3	P7(D)	HOLD	T2 HD
30				RPT_SEG_S4	P8(D)	HOLD_PARA	T2 LD
31				RPT_SEG_E4	P9(D)		
32				RPT_SEG_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	
58							
59							
60							
61							
62							
63							
64							
65							

* 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.	PTTN_INFO	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_TM80	C_TS180	C_TS280	C_TS380	C_TS480
80		C_TSP81	C_TM81	C_TS181	C_TS281	C_TS381	C_TS481
81		C_TSP82	C_TM82	C_TS182	C_TS282	C_TS382	C_TS482
82		C_TSP83	C_TM83	C_TS183	C_TS283	C_TS383	C_TS483
83		C_TSP84	C_TM84	C_TS184	C_TS284	C_TS384	C_TS484
84		C_TSP85	C_TM85	C_TS185	C_TS285	C_TS385	C_TS485
85		C_TSP86	C_TM86	C_TS186	C_TS286	C_TS386	C_TS486
86		C_TSP87	C_TM87	C_TS187	C_TS287	C_TS387	C_TS487
87		C_TSP88	C_TM88	C_TS188	C_TS288	C_TS388	C_TS488
88		C_TSP89	C_TM89	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	FILE8	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	FILE8	FILE9	FILE10	FILE11	FILE12	RESERVED
	2100	2200	2300	2400	2500	2600	2700
33	C_TS534	C_S.ALM134	C_S.ALM234	C_S.ALM334	C_S.ALM434	C_PID34	
34	C_TS535	C_S.ALM135	C_S.ALM235	C_S.ALM335	C_S.ALM435	C_PID35	
35	C_TS536	C_S.ALM136	C_S.ALM236	C_S.ALM336	C_S.ALM436	C_PID36	
36	C_TS537	C_S.ALM137	C_S.ALM237	C_S.ALM337	C_S.ALM437	C_PID37	
37	C_TS538	C_S.ALM138	C_S.ALM238	C_S.ALM338	C_S.ALM438	C_PID38	
38	C_TS539	C_S.ALM139	C_S.ALM239	C_S.ALM339	C_S.ALM439	C_PID39	
39	C_TS540	C_S.ALM140	C_S.ALM240	C_S.ALM340	C_S.ALM440	C_PID40	
40	C_TS541	C_S.ALM141	C_S.ALM241	C_S.ALM341	C_S.ALM441	C_PID41	
41	C_TS542	C_S.ALM142	C_S.ALM242	C_S.ALM342	C_S.ALM442	C_PID42	
42	C_TS543	C_S.ALM143	C_S.ALM243	C_S.ALM343	C_S.ALM443	C_PID43	
43	C_TS544	C_S.ALM144	C_S.ALM244	C_S.ALM344	C_S.ALM444	C_PID44	
44	C_TS545	C_S.ALM145	C_S.ALM245	C_S.ALM345	C_S.ALM445	C_PID45	
45	C_TS546	C_S.ALM146	C_S.ALM246	C_S.ALM346	C_S.ALM446	C_PID46	
46	C_TS547	C_S.ALM147	C_S.ALM247	C_S.ALM347	C_S.ALM447	C_PID47	
47	C_TS548	C_S.ALM148	C_S.ALM248	C_S.ALM348	C_S.ALM448	C_PID48	
48	C_TS549	C_S.ALM149	C_S.ALM249	C_S.ALM349	C_S.ALM449	C_PID49	
49	C_TS550	C_S.ALM150	C_S.ALM250	C_S.ALM350	C_S.ALM450	C_PID50	
50	C_TS551	C_S.ALM151	C_S.ALM251	C_S.ALM351	C_S.ALM451	C_PID51	
51	C_TS552	C_S.ALM152	C_S.ALM252	C_S.ALM352	C_S.ALM452	C_PID52	
52	C_TS553	C_S.ALM153	C_S.ALM253	C_S.ALM353	C_S.ALM453	C_PID53	
53	C_TS554	C_S.ALM154	C_S.ALM254	C_S.ALM354	C_S.ALM454	C_PID54	
54	C_TS555	C_S.ALM155	C_S.ALM255	C_S.ALM355	C_S.ALM455	C_PID55	
55	C_TS556	C_S.ALM156	C_S.ALM256	C_S.ALM356	C_S.ALM456	C_PID56	
56	C_TS557	C_S.ALM157	C_S.ALM257	C_S.ALM357	C_S.ALM457	C_PID57	
57	C_TS558	C_S.ALM158	C_S.ALM258	C_S.ALM358	C_S.ALM458	C_PID58	
58	C_TS559	C_S.ALM159	C_S.ALM259	C_S.ALM359	C_S.ALM459	C_PID59	
59	C_TS560	C_S.ALM160	C_S.ALM260	C_S.ALM360	C_S.ALM460	C_PID60	
60	C_TS561	C_S.ALM161	C_S.ALM261	C_S.ALM361	C_S.ALM461	C_PID61	
61	C_TS562	C_S.ALM162	C_S.ALM262	C_S.ALM362	C_S.ALM462	C_PID62	
62	C_TS563	C_S.ALM163	C_S.ALM263	C_S.ALM363	C_S.ALM463	C_PID63	
63	C_TS564	C_S.ALM164	C_S.ALM264	C_S.ALM364	C_S.ALM464	C_PID64	
64	C_TS565	C_S.ALM165	C_S.ALM265	C_S.ALM365	C_S.ALM465	C_PID65	
65	C_TS566	C_S.ALM166	C_S.ALM266	C_S.ALM366	C_S.ALM466	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_TS5100	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

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

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