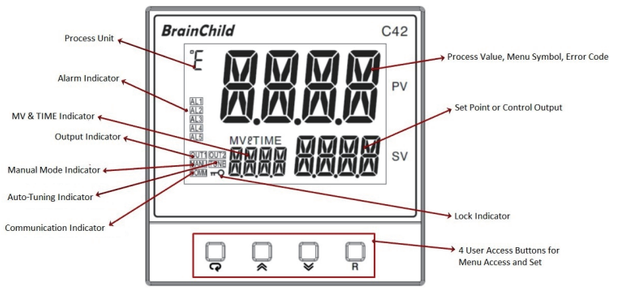
BrainChild

Quick Operation Manual

For PID + Fuzzy Logic Process Controller
Model: C22/C62/C82/C83/C72/C42/R22
Ver. UMQOC621C

1. DISPLAY AND KEYS



During power-up, the upper display will show PROG and the lower display will show the Firmware version for 6 seconds.

SCROLL/ENTER KEY: ⊡ to select a parameter to be viewed or adjusted. Press ⊡ for next parameter. Press ⊡ and ▲ key for return to previous parameter.

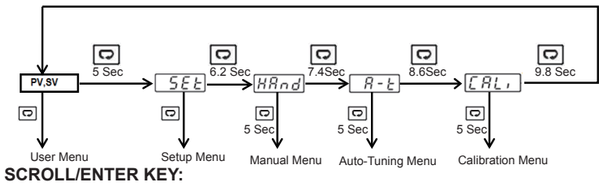
UP KEY: ▲ This key is used to increase the value of the selected parameter.

DOWN KEY: ▼ This key is used to decrease the value of the selected parameter.

RESET KEY: R This key is used to:

1. Revert the display to the home screen.
2. Reset a latching alarm once the alarm condition is removed.
3. Stop manual control mode, auto-tuning mode or calibration mode.
4. Clear an auto-tuning or communication error message.
5. Restart the dwell timer when the dwell timer has timed out.
6. Enter the manual control menu if failure mode occurs.

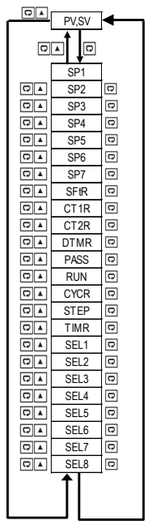
2. MENU FLOWCHART:



SCROLL/ENTER KEY:

1. Press and hold ⊡ for 5 seconds, display will show SEt. Press ⊡ to enter the Setup Menu.
2. Press and hold ⊡ for 6.2 seconds, display will show HAnd Press ⊡ and hold for 5 seconds to enter Manual Mode.
3. Press and hold ⊡ for 7.4 seconds, display will show A-t Press ⊡ and hold for 5 seconds to enter Auto-Tuning Mode.
4. Press and hold ⊡ for 8.6 seconds, display will show CAL. Press ⊡ and hold for 2~3 seconds to enter Calibration Mode.

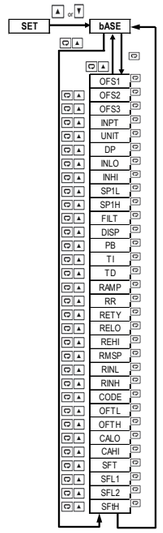
2.1 User Menu: The below user menu parameters are available depends on user's selection.



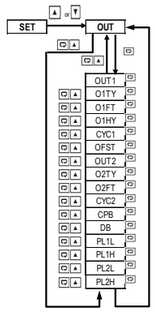
2.2 Setup Menu: The setup menu has been categorized into eight categories as below.

1. **bASE:** Basic Menu
2. **oUT:** Output Menu
3. **ALRM:** Alarm Menu
4. **EI:** Event Input Menu
5. **SEL:** User Select Menu
6. **CoMM:** Communication Menu
7. **Ct:** Current Transformer Input Menu
8. **PRoF:** Profile Menu

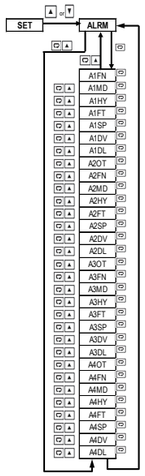
2.2.1 Basic Menu (bASE): Use ▲ or ▼ key to get bASE in the lower display, then use ⊡ key to enter basic menu parameters.



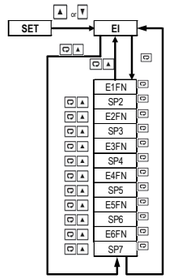
2.2.2 Output Menu (oUT): Use ▲ or ▼ key to get oUT in the lower display, then use ⊡ key to enter output menu parameters.



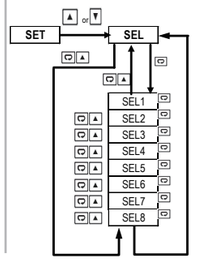
2.2.3 Alarm Menu (ALRM): Use ▲ or ▼ key to get ALRM in the lower display, then use ⊡ key to enter alarm menu parameters.



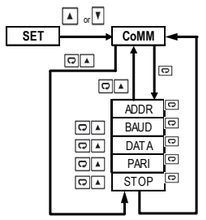
2.2.4 Event Input Menu (EI): Use ▲ or ▼ key to get EI in the lower display, then use ⊡ key to enter event input menu parameters.



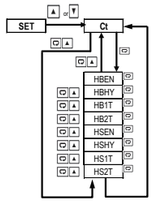
2.2.5 User Select Menu (SEL): Use ▲ or ▼ key to get SEL in the lower display, then use ⊡ key to enter user select menu parameters. Up to 8 parameters by selecting SEL1~SEL8 can be put in the User Menu.



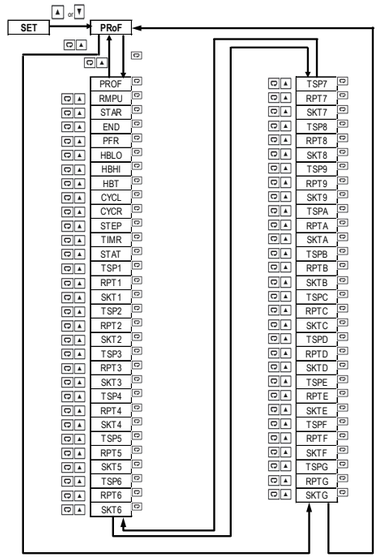
2.2.6 Communication Menu (CoMM): Use ▲ or ▼ key to get CoMM in the lower display, then use ⊡ key to enter communication menu parameters.



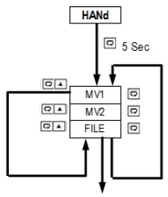
2.2.7 Current Transformer Input Menu (Ct): Use ▲ or ▼ key to get Ct in the lower display, then use ⊡ key to enter current transformer input menu parameters.



2.2.8 Profile Menu (PRoF): Use ▲ or ▼ key to get PRoF in the lower display, then use ⊡ key to enter profile menu parameters.

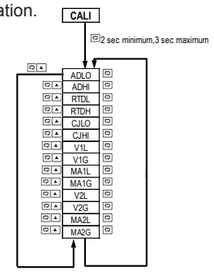


2.3 Manual Mode Menu: Press and hold ⊡ key for 5 seconds until MANU indicator flashes to enter manual mode menu.parameters.



2.4 Auto-Tuning Mode: Press and hold ⊡ key for 5 seconds until TUNE indicator flashes to activate auto-tuning mode.

2.5 Calibration Mode: Press and hold ⊡ key for 2~3 seconds, release it to enter calibration mode. Then press ⊡ Key for 5 seconds to perform calibration.



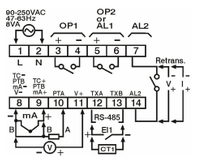
Note: Using Manual, Auto-Tuning, Calibration modes will break the control loop and change some of the previous setting data. Make sure that the system is allowable to apply these modes.

3. PARAMETERS DESCRIPTION:

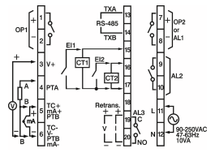
Modbus Register Address	Parameter Notation	Parameter Description	Range
0	SP1	Set Point 1	Low: SP1L High: SP1H
1	SP2	Set Point 2	Low: SP1L High: SP1H
2	SP3	Set Point 3	Low: SP1L High: SP1H
3	SP4	Set Point 4	Low: SP1L High: SP1H
4	SP5	Set Point 5	Low: SP1L High: SP1H
5	SP6	Set Point 6	Low: SP1L High: SP1H
6	SP7	Set Point 7	Low: SP1L High: SP1H
7	DTMR	Dwell timer output time (Minute: Seconds)	Low: 0.0 High: 4553.5
8	INPT	Input sensor selection	*J_tC*: J type Thermocouple *K_tC*: K type Thermocouple *T_tC*: T type Thermocouple *E_tC*: E type Thermocouple *B_tC*: B type Thermocouple *R_tC*: R type Thermocouple *S_tC*: S type Thermocouple *N_tC*: N type Thermocouple *L_tC*: L type Thermocouple *U_tC*: U type Thermocouple *P_tC*: P type Thermocouple *C_tC*: C type Thermocouple *D_tC*: D type Thermocouple *Pt.dN*: PT100 Ω DIN curve *Pt.JS*: PT100 Ω JIS curve *4-20*: 4-20mA linear current input *0-20*: 0-20mA linear current input *0-5V*: 0-5VDC linear voltage input *1-5V*: 1-5VDC linear voltage input *0-10*: 0-10VDC linear voltage input 0-50: 0-50mVDC linear voltage LJtC: Land and Jewel thermocouple(Not available for C22, C62 & R22)
9	UNIT	Input unit selection	*oC*: °C unit *oF*: °F unit *Pu*: Process unit
10	DP	Decimal point selection	*No.dP*: No decimal point *1-dP*: 1 decimal digit *2-dP*: 2 decimal digit *3-dP*: 3 decimal digit
11	INLO	Input low scale value	Low: -19999 High:45536
12	INHI	Input high scale value	Low:INLO+50 High:45536
13	SP1L	Low limit of set point value	Low: -19999 High :45536
14	SP1H	High limit of set point value	Low: SP1L High:45536
15	FILT	Filter damping time constant of PV	*0*: 0 second time constant *0.2*: 0.2 second time constant *0.5*: 0.5 second time constant *1*: 1 second time constant *2*: 2 second time constant *5*: 5 second time constant *10*: 10 second time constant *20*: 20 second time constant *30*: 30 second time constant *60*: 60 second time constant
16	DISP	MV/TIME display selection	*None*: No Display *MV1*: Display MV1 (66/130) *MV2*: Display MV2(67/131) *tIMR*: Display Time (68) *PRoF*: Display STAT(162) if have profile function
17	PB	Proportional band value	Low: 0.0 High: 500.0°C (900.0°F)
18	TI	Integral time value	Low: 0 High: 3600 sec
19	TD	Derivative time value	Low: 0.0 High: 360.0 sec
20	OUT1	Output 1 function	*REVR*: Reverse (heating) control action *dIRt* : Direct (cooling) control action
21	O1TY	Output 1 signal type	*RELY*: Relay output *SSrd*: Solid state relay drive output *4-20*: 4-20mA linear current *0-20*: 0-20mA linear current *0-5V*: 0-5VDClinear voltage *1-5V*: 1-5VDC linear voltage *0-10*: 0-10VDC linear voltage
22	O1FT	Output 1 failure transfer mode	Select BPLS (Bumpless transfer), or 0.0 ~ 100.0 % to continue output 1 control function if the sensor fails, or select OFF (0) or ON (1) for ON-OFF control
23	O1HY	Output 1 ON-OFF control hysteresis	Low:0.1°C(0.2°F) High: 50.0°C(90.0°F)
24	CYC1	Output 1 cycle time	Low: 0.1 High: 90.0 sec.
25	OFST	Offset value for P control	Low: 0 High: 100.0 %
26	RAMP	Ramp function selection	*NoNE*: No Ramp Function *MINR*: Use unit/minute as Ramp Rate *HRR*: Use unit/hour as Ramp Rate
27	RR	Ramp rate	Low: 0.0 High: 500.0°C(900.0°F)
28	OUT2	Output 2 function	*NoNE*:Output2 turned off *COOL*: Cooling PID Function *AL1*: Alarm 1 Function *rAL1*:Reverse Alarm 1 Function DCPS:DC Transmitter Power Supply
29	O2TY	Output 2 signal type	*RELY*: Relay output *SSrd*: Solid state relay drive output *4-20*: 4-20mA linear current *0-20*: 0-20mA linear current *0-5V*: 0-5VDClinear voltage *1-5V*: 1-5VDC linear voltage *0-10*: 0-10VDC linear voltage
30	O2FT	Output 2 failure transfer mode	Select BPLS (Bumpless transfer),or 0.0 ~ 100.0 % to continue output 2 control function if the sensor fails
31	CYC2	Output 2 cycle time	Low: 0.1 High: 90.0 sec.
32	CPB	Cooling proportional band value	Low: 50 High: 300 %
33	DB	Heating-cooling dead band (negative value= overlap)	Low: - 36.0 High: 36.0 %
34	A1FN	Alarm 1 function for alarm 1 output	*NoNE*: No alarm function *dtMR*: Dwell timer action *dE.HI*: Deviation high alarm *dE.Lo*: Deviation low alarm *db.HI*: Deviation band out of band alarm *db.Lo*: Deviation band in band alarm *PV.HI*: Process value high alarm *PV.Lo*: Process value low alarm *H.bK*: Heater break alarm *H.St*: Heater short alarm RG.HI: Range Hi alarm RG.Lo: Range Low alarm RG.H.L: RangeHi-Low alarm PF.Hb: Profile Holdback alarm PF.Ed: Profile End alarm
35	A1MD	Alarm 1 operation mode	*NoRM*: Normal alarm action *LtCH*: Latching alarm action *HoLd*: Hold alarm action *Lt.Ho*: Latching & Hold action *SP.Ho*: Set point holding alarm Lt.N.R: Latching None Reset action
36	A1HY	Hysteresiscontrol of alarm 1	Low: 0.1°C High: 50.0°C(90.0°F)
37	A1FT	Alarm 1 failure transfer mode	*OFF*: Alarm output OFF ifsensor fails *ON*: Alarm output ON if sensor fails
38	A1SP	Alarm 1 set point	Low: -19999 High: 45536
39	A1DV	Alarm 1 deviation value	Low: -19999 High: 45536
40	A2OT	Alarm 2 Output	*ALM*: Alarm 2 output 1 *RALM*: Reverse Alarm 2 Output
41	A2FN	Alarm 2 function for alarm 2 output	*NoNE*: No alarm function *dtMR*: Dwell timer action *dE.HI*: Deviation high alarm *dE.Lo*: Deviation low alarm *db.HI*: Deviation band out of band alarm *db.Lo*: Deviation band in band alarm *PV.HI*: Process value high alarm *PV.Lo*: Process value low alarm *H.bK*: Heater break alarm *H.St*: Heater short alarm *E1.C.o*: Event Input 1 Control Alarm Output *E2.C.o*: Event Input 2 Control Alarm Output *RG.HI*: Range Hi alarm *RG.Lo*: Range Low alarm *RG.H.L*: RangeHi-Low alarm *PF.Hb*: Profile Holdback alarm *PF.Ed*: Profile End alarm
42	A2MD	Alarm 2 operation mode	*NoRM*: Normal alarm action *LtCH*: Latching alarm action *HoLd*: Hold alarm action *Lt.Ho*: Latching & Hold action *SP.Ho*: Set point holding alarm Lt.N.R: Latching None Reset action
43	A2HY	Hysteresis control of alarm 2	Low: 0.1°C High: 50.0°C(90.0°F)
44	A2FT	Alarm 2 failure transfer mode	*OFF*: Alarm output OFF ifsensor fails *ON*: Alarm output ON ifsensor fails
45	A2SP	Alarm 2 set point	Low: -19999 High: 45536
46	A2DV	Alarm 2 deviation value	Low: -19999 High: 45536
47	A3OT	Alarm 3 output	*ALM*: Alarm 3 output *RALM*: Reverse Alarm3 Output
48	A3FN	Alarm 3 function for alarm 3 output	*NoNE*: No alarm function *dtMR*: Dwell timer action *dE.HI*: Deviation high alarm *dE.Lo*: Deviation low alarm *db.HI*: Deviation band out of band alarm *db.Lo*: Deviation band in band alarm *PV.HI*: Process value high alarm *PV.Lo*: Process value low alarm *H.bK*: Heater break alarm *H.St*: Heater short alarm *E1.C.o*: Event Input 1 Control Alarm Output *E2.C.o*: Event Input 2 Control Alarm Output *RG.HI*: Range Hi alarm *RG.Lo*: Range Low alarm *RG.H.L*: RangeHi-Low alarm *PF.Hb*: Profile Holdback alarm *PF.Ed*: Profile End alarm
49	A3MD	Alarm 3 operation mode	*NoRM*: Normal alarm action *LtCH*: Latching alarm action *HoLd*: Hold alarm action *Lt.Ho*: Latching & Hold action *SP.Ho*: Set point holding alarm *Lt.N.R*: Latching None Reset action
50	A3HY	Hysteresis control of alarm 3	Low: 0.1°C High: 50.0°C(90.0°F)
51	A3FT	Alarm 3 failure transfer mode	*OFF*: Alarm output OFF if sensor fails *ON*: Alarm output ON if sensor fails
52	A3SP	Alarm 3 set point	Low: -19999 High: 45536
53	A3DV	Alarm 3 deviation value	Low: -19999 High: 45536
54	A4OT	Alarm 4 output	*ALM*: Alarm 4 output *RALM*: Reverse Alarm 4 Output
55	A4FN	Alarm 4 function for alarm output	*NoNE*: No alarm function *dtMR*: Dwell timer action *dE.HI*: Deviation high alarm *dE.Lo*: Deviation low alarm *db.HI*: Deviation band out of band alarm *db.Lo*: Deviation band in band alarm *PV.HI*: Process value high alarm *PV.Lo*: Process value low alarm *H.bK*: Heater break alarm *H.St*: Heater short alarm *RG.HI*: Range Hi alarm *RG.Lo*: Range Low alarm *RG.H.L*: RangeHi-Low alarm *PF.Hb*: Profile Holdback alarm *PF.Ed*: Profile End alarm
56	A4MD	Alarm 4 operation mode	*NoRM*: Normal alarm action *LtCH*: Latching alarm action *HoLd*: Hold alarm action *Lt.Ho*: Latching & Hold action *SP.Ho*: Set point holding alarm *Lt.N.R*: Latching None Reset action
57	A4HY	Hysteresis control of alarm 4	Low: 0.1°C High:50.0°C(90.0°F)
58	A4FT	Alarm 4 failure transfer mode	*OFF*: Alarm output OFF if sensor fails *ON*: Alarm output ON if sensor fails
59	A4SP	Alarm 4 set point	Low: -19999 High: 45536
60	A4DV	Alarm 4 deviation value	Low: -19999 High: 45536
61	BPL1	Bumpless transfer value of MV1	Low: 0.00 High: 100.00
62	BPL2	Bumpless transfer value of MV2	Low: 0.00 High: 100.00
63	CJCL	Sense voltage during cold junction calibration low	Low: 0 High: 7552
64	PV64	Process value	Low: -19999 High:45536
65	SV65	Current set point value	Low: SP1L High:SP1H
66	MV1 66	Output 1 %Value(Heating)	Low: 0.00 High: 100.00 %
67	MV2 67	Output 2 %Value(Cooling)	Low: 0.00 High: 100.00 %
68	TIMER	Remaining time of dwell timer	Low: 0.0 High: 4553.6
69	EROR	Error code	Low: 0 High: 65535
70	MODE	Operation mode & alarm status	Low: 0 High: 65535
71	PROG71	Program code	C22:22.XX C62:62.XX C82:82.XX C83:83.XX C72:72.XX C42:42.XX R22:23.XX
72	CMND	Command code	Low: 0 High: 65535
73	JOB1	Job code	Low: 0 High: 65535
74	JOB2	Job code	Low: 0 High: 65535
75	JOB3	Job code	Low: 0 High: 65535
76	CJCT	Cold Junction Temperature	Low: -4000 High: 9000
77	ADLO	mV calibration low coefficient	Low: -1999 High: 1999
78	ADHI	mV calibration high coefficient	Low: -1999 High: 1999
79	RTDL	RTD calibration low coefficient	Low: -1999 High: 1999
80	RTDH	RTD calibration high coefficient	Low: -1999 High: 1999
81	CJLO	Cold junction calibration low coefficient	Low: -5.00 High: 40.00
82	CJHI	Cold junction calibration high coefficient	Low: -1999 High: 1999
83	V1L	V1 calibration low coefficient	Low: -1999 High: 1999
84	V1G	V1 calibration high coefficient	Low: -1999 High: 1999
85	MA1L	MA1 calibration low coefficient	Low: -1999 High: 1999
86	MA1G	MA1 calibration high coefficient	Low: -1999 High: 1999
87	V2L	V2 calibration low coefficient	Low: -1999 High: 1999
88	V2G	V2 calibration high coefficient	Low: -1999 High: 1999
89	MA2L	MA2 calibration low coefficient	Low: -1999 High: 1999
90	MA2G	MA2 calibration high coefficient	Low: -1999 High: 1999
91	PL1L	Power limit 1 low	Low: 0 High:PL1H or 50%
92	PL1H	Power limit 1 high	Low: PL1L High: 100 %
93	PL2L	Power limit 2 low	Low: 0 High: PL2H or 50%
94	PL2H	Power limit 2 high	Low: PL2L High: 100 %
95~102	SEL1~8	Select 1st~8th parameter for user menu	*0 NoNE: No Parameter* *1 dtMR: DTMR* *2 dISP: DISP* *3 Pb: PB* *4 tI: TI* *5 td: TD* *6 o1HY: O1HY* *7 RR: RR* *8 CPb: CPB* *9 db: DB* *10 A1HY: A1HY* *11 A1SP: A1SP* *12 A1dV: A1DV* *13 A2HY: A2HY* *14 A2SP: A2SP* *15 A2dV: A2DV* *16 A3HY: A3HY* *17 A3SP: A3SP* *18 A3dV: A3DV* *19 A4HY: A4HY* *20 A4SP: A4SP* *21 A4dV: A4DV* *22 PL1L: PL1L* *23 PL1H: PL1H* *24 PL2L: PL2L* *25 PL2H: PL2H* *26 OFTL: OFTL* *27 OFTH: OFTH* *28 CALO: CALO* *29 CAHI: CAHI* *30 A1DL: A1DL* *31 A2DL: A2DL* *32 A3DL: A3DL* *33 A4DL: A4DL* *34 UNIT: UNIT*
103	OFS1	Option function 1 selection	C82/C83/C72/C42: *NoNE*: Not selected *R485*: RS-485 and Remote SP C62: *NoNE*: Not selected *R485*: RS-485 C22/R22: *NoNE*: Not selected *R485*: RS-485 *EI1*: Event 1 input *CT1*: CT 1 input *4-20*: 4-20mA retransmission output *0-20*: 0-20mA retransmission output *0-5V*: 0-5VDC retransmission output *1-5V*: 1-5VDC retransmission output *0-10*: 0-10VDC retransmission output
104	OFS2	Option function 2 selection	C82/C83/C72/C42: *NoNE*: Not selected *CT1*: CT1 input and Remote SP *CT1.2*: CT1,CT2 inputs and Remote SP C62: *NoNE*:No selected *4-20*:4-20mA retransmission output *0-20*:0-20mA retransmission output *0-5V*: 0-5V retransmission output *1-5V*: 1-5V retransmission output *0-10*: 0-10 retransmission output *AL2*: Alarm 2 output
105	OFS3	Option function 3 selection	C82/C83/C42: *NoNE*: Not selected *4-20*: 4-20mA retransmission output & Remote SP *0-20*: 0-20mA retransmission output & Remote SP *0-5V*: 0-5VDC retransmission output & Remote SP 1-5V: 1-5VDC retransmission output & Remote SP *0-10*: 0-10VDC retransmission output & Remote SP *A.4.20*: Alarm 4, 4-20mA retransmission output & Remote SP *A.0.20*: Alarm 4, 0-20mA retransmission output & Remote SP *A.0.5V*: Alarm 4, 0-5V retransmission output & Remote SP *A.1.5V*: Alarm 4, 1-5V retransmission output & Remote SP R22: *NoNE*: No selected *4-20*: 4-20mA retransmission output *0-20*: 0-20mA retransmission output *0-5V*: 0-5V retransmission output *1-5V*: 1-5V retransmission output *0-10*: 0-10 retransmission output *AL2*: Alarm 2 output *EI2*: Event2 Input *CT2*: CT2 Input

Modbus Register Address	Parameter Notation	Parameter Description	Range
105	OFS3	Option function 3 selection	A.0.10: Alarm 4, 0-10V retransmission output & Remote SP C72: *NoNE:* Not selected *4-20:* 4-20mA retransmission output & Remote SP *0-20:* 0-20mA retransmission output & Remote SP *0-5V:* 0-5VDC retransmission output & Remote SP *1-5V:* 1-5VDC retransmission output & Remote SP *0-10V:* 0-10VDC retransmission output & Remote SP AL4: Alarm 4 Output C62: *NoNE:* Not selected *4-20:* 4-20mA retransmission output *0-20:* 0-20mA retransmission output *0-5V:* 0-5VDC retransmission output *1-5V:* 1-5VDC retransmission output *0-10:* 0-10VDC retransmission output *AL3:* Alarm 3 output
106	RETY	Retransmission type	*RE.PV:* Retransmit process value *RE.SP:* Retransmit set point value
107	RELO	Retransmission low scale value	Low: -19999 High: 45536
108	REHI	Retransmission high scale value	Low: -19999 High: 45536
109	ADDR	Address assignment of digital communication	Low: 1 High: 255
110	BAUD	Baud rate of digital communication	*2K4:* 2.4 Kbits/s baud rate *4K8:* 4.8 Kbits/s baud rate *9K6:* 9.6 Kbits/s baud rate *14K4:* 14.4 Kbits/s baud rate *19K2:* 19.2 Kbits/s baud rate *28K8:* 28.8 Kbits/s baud rate *38K4:* 38.4 Kbits/s baud rate *57K6:* 57.6 Kbits/s baud rate *115K:* 115.2 Kbits/s baud rate
111	DATA	Data bit count of digital communication	*7bIt:* 7 data bits *8bIt:*8 data bits
112	PARI	Parity bit of digital communication	*EVEN:* Even parity *Odd:* Odd parity *NoNE:* No parity bit
113	STOP	Stop bit count of digital communication	*1bIt:* One stop bit *2bIt:* Two stop bits
114	CT1R	Reading of CT 1	Low: 0.0 High: 150.0
115	CT2R	Reading of CT 2	Low: 0.0 High: 150.0
116	HBEN	Enable Heater break detection	*oFF:* Off 1 *oN:* On
117	HBHY	Heater break hysteresis	Low: 0.1 High: 50.0
118	HB1T	Triple point current for heater break 1	Low: 0.0 High: 120.0
119	HB2T	Triple point current for heater break 2	Low: 0.0 High: 120.0
120	HSEN	Enable Heater short detection	*oFF:* Off 1 *oN:* On
121	HSHY	Heater short hysteresis	Low: 0.1 High: 50.0
122	HS1T	Triple point current for heater short 1	Low: 0.0 High: 120.0
123	HS2T	Triple point current for heater short 2	Low: 0.0 High: 120.0
124	RMSP	Remote SP type	*None:* No Remote SP *4-20:* 4-20mA retransmission output *0-20:* 0-20mA retransmission output *0-5V:* 0-5VDC retransmission output *1-5V:* 1-5VDC retransmission output *0-10:* 0-10VDC retransmission output
125	RINL	Remote SP Input low scale value	Low: -19999 High:RINH-50
126	RINH	Remote SP Input high scale value	Low: RINL+50 High:45536
127	FILE	Default File Selection	*dFLt:* Default Menu *Ld.Us:* Load User Setting *St.Us:* Store User Setting
128	PV	Process value	Low: -19999 High: 45536
129	SV	Current set point value	Low: SP1L High: SP1H
130	MV1	Output 1 percentage value (Heating)	Low: 0.00 High: 100.00
131	MV2	Output 2 percentage value (Cooling)	Low: 0.00 High: 100.00
132	PASS	Password entry	Low: 0 High: 9999
133	CODE	Security code for parameter protection	Low: 0 High: 9999 Refer to full version user manual chapter 3.1 for more details
134	OFTL	Offset value for low point calibration	Low: -1999 High: 1999
135	OFTH	Offset value for high point calibration	Low: -1999 High: 1999
136	CALO	Input signal value during low point calibration	Low: -19999 High: CAHI-1
137	CAHI	Input signal value during high point calibration	Low: CALO+1 High: 45536
138~139	...	Reserved	...
140	PROG	Program code	Same as PROG71
141	E1FN	Event input 1 function	*NoNE:* none *SP2:* SP2 activated to replace SP1 *rS.A1:* Reset alarm 1 output *rS.A2:* Reset alarm 2 output *rS.A3:* Reset alarm 3 output *rS.A4:* Reset alarm 4 output *rS.Ao:* Reset all alarm outputs *CA.LH:* Cancel alarm latch *d.o1:* Disable output 1 *d.o2:* Disable output 2 *d.o12:* Disable output 1 and 2 *LoCK:* Lock all parameters and Read only communication *AU.MA:* Switch Auto and Manual control mode *F.tra:* Failure Transfer *AL.oN:* EI Control Alarm Output
142	E2FN	Event input 2 function	*SP3:* SP3 activated to replace SP1 *Others:* Same as E1FN
143	E3FN	Event input 3 function	*NoNE:* none *SP4:* SP4 activated to replace SP1 *rS.A1:* Reset alarm 1 output *rS.A2:* Reset alarm 2 output *rS.A3:* Reset alarm 3 output *rS.A4:* Reset alarm 4 output *rS.Ao:* Reset all alarm outputs *CA.LH:* Cancel alarm latch *d.o1:* Disable output 1 *d.o2:* Disable output 2 *d.o12:* Disable output 1 and 2 *LoCK:* Lock all parameters and Read only communication *AU.MA:* Switch Auto and Manual control mode *F.tra:* Failure Transfer *StAR:* Run profile as RUN=STAR *CoNt:* Run Profile as RUN=CONT *PV:* Run Profile as RUN=PV *HoLd:* Run Profile as RUN=HOLD *StoP:* Run Profile as RUN=STOP
144	E4FN	Event input 4 function	*SP5:* SP5 activated to replace SP1 *Others:* Same as E3FN
145	E5FN	Event input 5 function	*NoNE:* none *SP4:* SP4 activated to replace SP1 *rS.A1:* Reset alarm 1 output *rS.A2:* Reset alarm 2 output *rS.A3:* Reset alarm 3 output *rS.A4:* Reset alarm 4 output *rS.Ao:* Reset all alarm outputs *CA.LH:* Cancel alarm latch *d.o1:* Disable output 1 *d.o2:* Disable output 2 *d.o12:* Disable output 1 and 2 *LoCK:* Lock all parameters and Read only communication *AU.MA:* Switch Auto and Manual control mode *F.tra:* Failure Transfer
146	E6FN	Event input 6 function	*SP7:* SP7 activated to replace SP1 *Others:* Same as E5FN
147	A1DL	Alarm 1 Delay (Minutes: Seconds)	OFF: OFF ON: Low: 00.01 High: 99.59
148	A2DL	Alarm 2 Delay (Minutes: Seconds)	OFF: OFF ON: Low: 00.01 High: 99.59
149	A3DL	Alarm 3 Delay (Minutes: Seconds)	OFF: OFF ON: Low: 00.01 High: 99.59
150	A4DL	Alarm 4 Delay (Minutes: Seconds)	OFF: OFF ON: Low: 00.01 High: 99.59
151	SFT	Soft Start Time (Hours: Minutes)	Low: 00.00(OFF) High:99.59
152	SPL1	Soft Start Power Limit for Output 1	Low: PL1L High:PL1H
153	SPL2	Soft Start Power Limit for Output 2	Low: PL2L High:PL2H
154	SFTH	Soft Start Threshold	Low: -19999 High:45536
155	SFTR	Soft Start Timer (Hours: Minutes)	Low: 00.00 High:99.59
161~222	For Profiler parameters description, please refer to full version user manual		

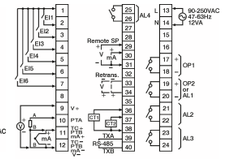
4. WIRING DIAGRAM



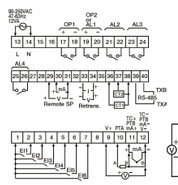
C22 Terminal Connection



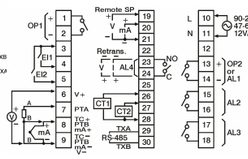
C62 Terminal Connection



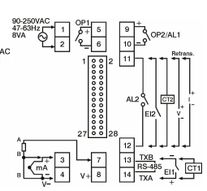
C82/C42 Terminal Connection



C83 Terminal Connection



C72 Terminal Connection



R22 Terminal Connection

5. PROGRAMMING

5.1 User Security: There are two parameters PASS (password) and CODE (security code) to control the data security function

CODE Value	PASS Value	Access Rights
0	Any Value	All parameters are changeable
500	=500	All parameters are changeable
	≠500	All parameters are changeable except calibration menu parameters
1000	=1000	All parameters are changeable
	≠1000	Only user menu parameters change
9999	= 9999	All parameters are changeable
	≠ 9999	Only SP1 to SP7 are changeable
Others	=CODE	All parameters are changeable
	≠CODE	No parameters can be changed

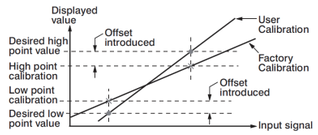
5.2 Control Output: There are 4 kinds of control modes can be configured.

Control Mode	OUT 1	OUT 2	O1HY	O2HY	CPB	DB
Heat Only	REVR	X	Δ	X	X	X
Cool Only	DIRT	X	Δ	X	X	X
Heat PID Cool ON-OFF	REVR	DE.HI	X	O	X	X
Heat PID Cool PID	REVR	COOL	X	X	O	O

X: Not applicable
O: Adjust to meet process Requirements
Δ: Required if ON-OFF Control is configured

5.3 Signal Input:
INPT: Select the sensor type or signal type for signal input.
Range: (Thermocouple) J_tC, K_tC, T_tC, E_tC, B_tC, R_tC, S_tC, N_tC, L_tC, U_tC, P_tC, C_tC, d_tC, LJtC, (RTD) PT.DN, PT.JS or (Linear) 4-20mA, 0-20mA, 0-5V, 1-5V, 0-10V, 0-50mV
UNIT: Select the process unit. Range: °C, °F, PU (Process unit). If the unit is neither °C nor °F, then select PU.
DP: Select the resolution of process value.
Range: For Thermocouple and RTD Signal NO.DP, 1-DP and for Linear Signal NO.DP, 1- DP, 2-DP, 3-DP.
INLO: Select the low scale value for the linear type input.
INHI: Select the high scale value for the linear type input.

5.4 Alarm: The controller has up to four alarm outputs depending on the controller model. There are 16 types of alarm functions and one dwell timer that can be selected. There are 4 kinds of alarmmodes (A1MD, A2MD, A3MD, and A4MD) available for each alarm function (A1FN, A2FN, A3FN, and A4FN). But output 2 has only provided 14 different alarm functions or dwell timer available.
5.5 Alarm Modes: There are six types of alarm modes available for each alarm function.
Normal Alarm (ALMD = NORM): When a normal alarm is selected, the alarm output is de-energized in the non-alarm condition and energized in an alarm condition.
Latching Alarm (ALMD = LTCH): If a latching alarm is selected, once the alarm output is energized, it will remain unchanged even if the alarm condition is cleared. The latching alarm can be reset by pressing the RESET key once the alarm condition is removed.
Holding Alarm (ALMD = HOLD): A holding alarm prevents an alarm condition during power up. This will ignore the alarm condition at first time after power on. Afterwards, the alarm performs the same function as normal alarm.
Latching / Holding Alarm (ALMD = LT.HO): A latching / holding alarm performs both holding and latching functions. The latching alarm is reset when the RESET key is pressed after the alarm condition is removed.
Set Point Holding Alarm (ALMD = SP.HO): A set point holding alarm prevents an alarm from power up and / or changing set point. The alarm output is de-energized whenever the set point is changed even if it is in an alarm condition. The alarm reverts to a normal alarm once the alarm condition is removed.
Latching None Reset Alarm =Lt.N.R: This mode is the same as Latching alarm. But the alarm can't be reset by the Reset Key on the controller. The alarm reset can be done only by using an event input alarm reset function.
5.6 Alarm Delay: In certain applications during startup, nuisance alarms will be generated before the process value reaches the set point. To avoid these kinds of nuisance alarms, a time delay for alarms is available. To enable the time delay for alarms, set the delay time using the A1DL, A2DL, A3DL, and A4DL parameters. These parameters will avoid the nuisance alarm during the process value reaches set point.
5.7 Ramp: The ramping function is performed during power up as well as any time the set point is changed. Choose MINR or HRR for the RAMP setting, and the controller will perform the ramping function. The ramp rate is programmed by adjusting the RR setting. The ramping function is disabled as soon as the Failure mode, the Manual control mode, the Auto-tuning mode or the Calibration mode occur.
5.8 Dwell Timer: The Dwell timer can be with or without a Ramp. Alarm outputs can be configured as dwell timers by selecting dtMR for A1FN. If A1FN is set to dtMR, Alarm 1 will act as a dwell timer. Similarly, Alarm 2, Alarm 3 and Alarm 4 will act as dwell timers if A2FN, A3FN, or A4FN is set to dtMR. When the dwell timer is configured, the parameter DTMR is used for dwell time adjustment. The dwell time is measured in minutes ranging from 0.0 to 4553.6 minutes. The Timer starts to count as soon as the Process Value (PV) reaches its set point (SV), and triggers an alarm output once the time has elapsed.
5.9 User Calibration: User calibration allows the user to offset the permanent factory calibration. There are two parameters: Offset Low (OFTL) and Offset High (OFTH) for adjustment to correct an error in the process value. There are two parameters for the sensor input. These two signal values are CALO and CAHI. The input signal low and high values are to be entered in the CALO and CAHI parameters respectively.
Connect the input with low scale operating temperature (For Example 0.0). Enter the low scale operating temperature in CALO. For example, 0.0. Then monitor the PV. If PV ≠ CALO, adjust the OFTL to make PV=CALO.
Connect the input with high scale operating temperature (For Example 700.0). Enter the high scale operating temperature in CAHI. For example, 700.0. Then monitor the PV. If PV ≠ CAHI adjusts the OFTH to make PV=CAHI.
As shown below, the two points OFTL and OFTH construct a straight line. For accuracy, it is best to calibrate with the two points as far apart as possible. After the user calibration is complete, the input type will be stored in the memory. If the input type is changed, a calibration error will occur and an error code CAER is displayed.



5.10 Digital Filter: In certain applications the process value is too unstable to be read. To improve this, a programmable low pass filter incorporated in the controller can be used. This is a first order filter with a time constant specified by the FILT parameter. A value of 0.5 seconds is used as a factory default. Adjust FILT to change the time constant from 0 to 60 seconds. 0 seconds represents no filter applied to the input signal.
5.11 Failure Transfer: The controller will enter failure mode if one of the following conditions occurs.
1. SBER error occurs due to an input sensor break, input current below 1mA for 4-20mA or input voltage below 0.25V for 1-5V.
2. ADER error occurs due to the A-D converter of the controller fails. Output 1 and Output 2 will perform the failure transfer (O1.ft & O2.ft) function as the controller enters failure mode.
3. Alarm Failure Transfer: An alarm failure transfer is activated as the controller enters failure mode. After that, the alarm output will transfer to the ON or OFF state which is determined by the set value of A1FT, A2FT, A3FT, and A4FT.
5.12 Soft-Start: The controller has soft start function to limit the control output on out1 and out2 for a programmable time SFT or up to a programmed threshold value SFTH. The first of two will terminate soft start function and the normal PID control begins. This function is useful for effects such as suppressing the heater output during equipment startup, or lightening the load.
Note: In Profile Version controllers If PFR is set to other than SP1 then the profile function will continue with the set parameter during power recovery. If PFR is set to SP1 then the profile will continue to run with soft start parameters during power recovery.
There are 5 parameters available for soft start function. They are as below.
1. SFt: Soft start time. If SFt ≠0, then the Soft start function will be enabled. The SFt can be set in the form of Hour: Minute. The range can be set is 00.00 to 99:59.
2. SFL1: Soft Start output limit for output 1. It can be set from PL1L to PL1H.
3. SFL2: Soft Start output limit for output 2. It can be set from PL2L to PL2H.
4. SFtH: Soft start threshold value. The Soft start will be aborted when the process value is greater than or equal to SFtH.
5. SFtR: Soft start time. It will show the remaining time of soft start when it is running.

6. AUTO-TUNING: Auto-Tuning Operation Steps:

1. The system has been installed normally.
2. Don't use zero value for PB or TI, otherwise the auto-tuning program will be disabled. The LOCK parameter should be set to NONE.
3. Set the set point to a normal operating value or a lower value if overshooting beyond the normal process value will cause damage.
4. Press and hold the key until A-t appears on the upper display, then let go.
5. Press and hold the key for at least 5 seconds. The TUNE indicator will begin to flash, and the auto-tuning process has begun.

NOTE: If the ramping function is used, it will be disabled once auto-tuning is started. The auto-tuning mode is disabled if either a failure mode or manual control mode occurs.
Auto-Tuning Error: If auto-tuning fails, an ATER AtEr message will appear on the upper display in any of the following cases.
* If PB exceeds 9000 (9000 PU, 900.0°F or 500.0°C)
* If TI exceeds 1000 seconds
* If the set point is changed during the auto-tuning process

7. MANUAL CONTROL:

To enable manual control, ensure the LOCK parameter is set to NONE. Press and hold for 6.2 seconds or until HAnd (Hand Control) appears on the display. Press and hold for 5 seconds or until the MANU indicator begins to flash. The lower display will show H.... The controller has now entered manual control mode. H.... Indicates the output control variable for output 1, and ..... indicates the control variable for output 2. The user can use the up-down keys to adjust the percentage values for the heating or cooling output. This % value is based on the CYC1 and CYC2 settings, where the associated output will stay on for the % of time the CYC1 & CYC2 values are set for. The controller performs open loop control as long as it stays in manual control mode. The manual mode menu can be reached by pressing keys also.
Exit Manual Control: Press the R key will revert the controller to its normal display mode.

8. DATA COMMUNICATION:

The controllers support RS-485 Modbus RTU protocol for data communication.
RS-485 Setup: Enters the setup menu. Set individual addresses for units connected to the same port. Set the Baud Rate (BAUD), Data Bit (DATA), Parity Bit (PARI) and Stop Bit (STOP) such that these values are accordant with PC setup conditions.

9. RETRANSMISSION:

The controller can output (retransmit) PV or SP via its retransmission terminals RE+ and RE- provided that the retransmission option is ordered. A correct signal type should be selected for option board to meet the retransmission option installed. RELO and REHI are adjusted to specify the low scale and high scale values of retransmission.

10. HEATER CURRENT MONITORING:

A current transformer (CT98-1) is required to measure the heater current. The CT input signal conditioner measures the heater current when the heater is powered (output 1 is on), and the current value will remain unchanged the heater is unpowered (output 1 is off). There are 1 or 2 CT inputs that can be connected to the controllers depending on the model. The CT1R & CT2R will indicate the heater current.
Heater break detection is enabled by enabling heater break detection setting HBEN. A **Heater break alarm (H.bK) alerts** the user when the current measured by CT1 in CT1R is lower than HB1T or CT2 in CT2R is lower than HB2T. When the current measured by CT1 in CT1R is higher than HB1T+HBHY and CT2 in CT2R is higher than HB2T+HBHY, the heater break alarm will be off. The Heater break alarm will be off when both CT values are in normal range. The Heater break alarm function will be enabled when OUT1 is in ON condition. Heater short detection is enabled by enabling heater short detection setting HSEN. A **Heater short alarm (H.St)** alerts the user when the current measured by CT1 in CT1R is higher than HS1T or CT2 in CT2R is higher than HS2T. When the current measured by CT1 in CT1R is lower than HS1T-HSHY and CT2 in CT2R is lower than HS2T-HSHY, the heater short alarm will be off. The Heater short alarm will be off when both CT values are in normal range. The Heater short alarm function will be enabled when OUT1 is in OFF condition.

11. EVENT INPUT:

There are 6, 2 or 1 Event Inputs that are available in this series of controllers depending on the size of the controller. Refer wiring section for wiring an event input. The Event input accepts a digital (on/off) type signal. One of the available functions can be chosen by using EIFN1 through EIFN6 contained in the setup menu. The same function cannot be set to more than one event input.

12. REMOTE SET POINT:

The set point will change proportionally with respect to the input given in the Remote Set point input terminals. The Remote Set point function needs RMSP, RINL, RINH parameters to be set properly.

13. RAMP AND SOAK PROGRAM:

The profiler option can be used in the application where the set point should be changed automatically with the time. It provides 1 program with 16 segment or 2 programs with each 8 segments or 4 programs with each 4 segments. Each segment has both ramp and soak function. PROF, RUN, RMPU, STAR, END, PFR, HBLO, HBHI, HBT, CYC parameters are used to configure the controller for ramp and soak programs. For more information of Profiler, please refer to full version user manual.

14. ERROR CODE:

Error Code	Display Symbol	Description & Reason	Corrective Action
4	ER04	**Illegal setup values used:** COOL is used for OUT2 when DIRT (cooling action) is used for OUT1, or when PID mode is not used for OUT1 (PB =0 and/or TI=0)	Check and correct setup values of OUT2, PB1, PB2, TI1, TI2 and OUT1. IF OUT2 is needed for cooling control, the controller should use PID mode (PB≠ 0 and TI≠0) and OUT1 should use reverse mode (heating action), otherwise, OUT2 cannot be used for cooling control.
10	ER10	**Communication error:** bad function code	Correct the communication software to meet the protocol requirements.
11	ER11	**Communication error:** register address out of range	Do not issue an over range address of register to the slave.
14	ER14	**Communication error:** attempt to write a read only data	Do not write a read only data or a protected data to the slave.
15	ER15	**Communication error:** write a value which is out of range to a register	Do not write an over range data to the slave register.
16	EIER	**Event Input Error:** Two or more event inputs are set to the same function	Do not set the same function in two or more Event Input Function parameters (E1FN through E6FN).
26	ATER	**Auto-Tuning Error:** Failed to perform auto-tuning function	
29	EEPR	EEPROM can't be written correctly	Return to factory for repair.
30	CJER	Cold junction compensation for Thermocouple malfunction	Return to factory for repair.
39	SBER	Input sensor break, or input current below 1mA if 4-20mA is used, or input voltage below 0.25V if 1-5V is used	Replace input sensor.
40	AAER	A to D converter or related component(s) malfunction	Return to factory for repair.