

AUTO REGENERATION CONTROLLER
Model UK-2
Instruction Manual

Export Control Policy

We recommend that ALL UCI customers be sure to follow all rules and regulations such as Foreign Exchange and Foreign Trade Law when exporting or reexporting UCI products.

Introduction

Thank you for choosing our products. This instruction manual gives information and precautions on handling, installation, operation, and maintenance of the product.

This product is intended for use by qualified personnel who recognize shock hazards and are familiar with the safety precautions required to avoid possible injury. To ensure proper use of this product, read this instruction manual carefully and keep this manual close at hand so that you can use for reference during operation.

If you purchased our other products and/or optional devices with this product, read relevant instruction manuals carefully.

1. About the personnel who are involved in handling our products

All personnel involved in handling our products should take a general safety education and training that is officially accepted in the country where our product is used. The personnel are also required to have specialized knowledge/skills and qualification on the electricity, the machinery, the cargo handling, and the vacuum. Especially, the personnel should be familiar with handling a cryopump in order to use it safely. Since we offer a training session (which is subject to fees) as needed for people who use cryopumps for the first time, please do not hesitate to contact our Service Engineering Division to join the training session.

2. Warranty

2.1 Gratis warranty period and Warranty coverage

【Gratis warranty period】

Note that an installation period of less than one year after installation in your company or your customer's premises or a period of less than 18 months (counted from the date of production) after shipment from our company, which is shorter, is selected.

【Coverage】

(1) Failure diagnosis

As a general rule, diagnosis of failure should be done on site by customer.

However, ULVAC CRYOGENICS or our service network can perform this service for an agreed fee upon the customer's request. There will be no charge if the cause

of the breakdown is found to be a fault of ULVAC CRYOGENICS.

(2) Damage during transportation

When damage by delivery/transportation is admitted, the product will be repaired free of charge within the range of the guarantee expressed in the sales contract.

(3) Breakdown repairs

There will be a charge for breakdown repairs, replacements and on-site visits for the following seven conditions. In those cases the cost shall be your own expense even though the product is within the warranty period.

- ① Breakdowns due to improper storage or handling, careless accident, software or hardware design by the customer.
- ② Breakdowns due to modifications of the product without consent of the manufacturer.
- ③ Breakdowns due to maintenance of the product without authentic parts or breakdowns resulting from using the product outside the specified specifications of the product.
- ④ Breakdowns due to contamination or corrosion caused by user's use conditions.
- ⑤ Breakdowns due to natural disasters (such as fire, earthquake, flood, lightning, salt damage, and so on), environmental pollution, irregular voltage, and /or usage of undesignated power source.
- ⑥ Breakdowns that are outside the terms of warranty.
- ⑦ Consumables and/or replacement service.

Since the above services are limited to within Japan, diagnosis of failures, etc are not performed abroad. If you desire the after service abroad, please contact ULVAC CRYOGENICS and consult us for details in advance.

2.2 Exclusion of opportunity loss from warranty liability

Regardless of the gratis warranty term, compensation to opportunity losses incurred to your company or your customers by failures of ULVAC CRYOGENICS products and compensation for damages to products other than ULVAC CRYOGENICS products and other services are not covered under warranty.

2.3 Repair period after production is discontinued

ULVAC CRYOGENICS shall accept product repairs for seven years after production of the product is discontinued.

3. Service Form

After the products are delivered, please fill out the following information in the blanks. If you have any questions or technical problems, please feel free to contact the nearest Customer Support Center or headquarters. Please refer to “Service Network”.

Cryopump/Super trap Model	:	_____
Cryopump/Super trap Serial No.	:	_____
Refrigerator Model	:	_____
Refrigerator Serial No.	:	_____
Compressor Model	:	_____
Compressor Serial No.	:	_____
Temperature controller/Thermal display Model	:	_____
Temperature controller/Thermal display Serial No.	:	_____
Option Part Model	:	_____
Optional Part Serial No.	:	_____

4. Notes for repair and maintenance requests

We may decline your request for the repair or the maintenance of our products if you refuse to give us information about the presence of the hazardous substance and/or contaminant.

Also, please be aware that we do not accept liability for damages by the contaminant, which might be caused during transportation to our office or the nearest customer support center. To avoid such accident, please pay careful attention to packing of the product

5. In case of breakdown and accident

When breakdown or accident occurs, we may ask for keeping the product on site as it is or retrieving the product to investigate its cause. Also we may ask for reporting the detailed process and/or the operating condition. When unidentified malfunction was generated, please contact our Service Engineering Division or

the nearest customer support center with reference to the chapter of Service Network. We ask for cooperation about the above.

6. General Precautions

- (1) It is strictly prohibited to duplicate, open, and transfer this instruction manual or any of its parts to a third person without written permission from ULVAC CRYOGENICS.
- (2) Information in this document might be revised without a previous notice for the specification change and the improvement of the product.
- (3) If you have any questions or comments on this document, please do not hesitate to contact us. The phone numbers of local customer support centers are listed at the end of this manual.

Safety Considerations

Our products have been designed to provide extremely safe and dependable operation when properly used. Following safety precautions must be observed during normal operation and when servicing them.



WARNING

A warning describes safety hazards or unsafe practices which could result in severe injury or loss of life.



CAUTION

A caution describes safety hazards or unsafe practices which could result in personal injury or equipment damage.



Toxic gas or chemicals used.

There is a risk of severe injury upon contact.



Corrosive chemicals used.

There is a risk of severe injury upon contact.



Flammable gas used.

There is a danger of fire or burn injury.



Explosive gas used.

There is a risk of fire or explosion.



Hazardous voltage .

Electric shock may cause severe injury or loss of life.



Hot heating part present.

There is a risk of burn injury.

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Disposal Consideration

Regulations and the ordinance concerning industrial waste treatment are provided in the country and region to discard. When disposing our products, please process abandonment according to relevant regulations and ordinance, etc.

				WARNING
When it seems that the cryopump or refrigerator has been used to evacuate a toxic or dangerous material, you must contact a safety supervisor before discarding, and discard it after removing the poisonous material according to directions of the safety supervisor.				

We will offer you Material Safety Data Sheet (called MSDS) of our products upon your request. If you have any questions, please contact our Service Engineering Division or the nearest customer support center.

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1. Features

Regeneration controller UK-2 enables automatic cryopump regeneration in combination with devices listed below.

Code	Name		Note
A	CRYO METER MBS-C		
B	PIRANI GAUGE (WP-01) & G-TRAN(SP-1)		
C	N2 IN VALVE	PR UNIT	
D	N2 OUT VALVE		
E	ATM (Atmospheric Sensor)		
F	ROUGH VALVE		
G	BAND HEATER		Not necessary.
H	INNER HEATER		Not necessary.
I	COMPRESSOR UNIT		

Three regeneration modes below are available to operate UK-2.

Mode1 (FULL REGEN) : Cryopump warm up→Rough pumping→Cooldown (See Fig.8-1.)

Mode2 (WARM UP) : Cryopump warm up→Rough pumping (See Fig.8-2.)

Mode3 (COOL DOWN) : Cooldown only. (See Fig.8-3.)

The 1st and the 2nd stage temperatures and pressure of cryopump will be displayed on the 7 segment display of the front panel.

Figure 1-1 shows external view of UK-2.



Figure 1-1 UK-2 External view

2. Specifications

Dimensions	240mm(W) × 100mm(H) × 300mm(D) (See Appendix 1 UK-2 Dimensional Drawing for detail.)
Weight	Approx. 3.0kg
Input power	SOURCE INPUT : Single phase AC100 ~ 220V ±10% 50Hz/60Hz (AC100V when using INNER HEATER) BAND HEATER : Single phase AC200 ~ 220V ±10% 50Hz/60Hz



CAUTION

To connect our INNER HEATER (1st, 2nd HEATER), always input AC100V to the SOURCE INPUT or it may result in breakage of the HEATER.

(SOURCE INPUT double as INNER HEATER output power source and the capacity of the INNER HEATER is AC100V.)

Power consumption	MAX . 100W (Except for the power consumption of heater.)
Operation Environment	Temperature : - 10 ~ 50 (No freezing) Humidity : Below 80%RH (No condensing) Altitude : 1000m or lower
Input	1ST TEMP The 1st stage temperature of cryopump: K thermocouple input 2ND TEMP The 2ND stage temperature of cryopump: MBS-C ANALOG input:0 ~ 5V PIG CRYOPUMP inner pressure : PIRANI GAUGEinput:0 ~ 10V ATM , COMP I/F , SYSTEM I/F Photo coupler input : DC24V 20mA
Output	POWER OUT Supply power to MBS-C and PIRANI GAUGE : DC24V MAX 470mA HEATER BAND HEATER : AC200 ~ 220V MAX 15A INN HEATER : AC100V 1st 2nd total MAX 4A SYSTEM I/F Photo coupler output : DC24V MAX 8mA VALVE I/F , COMP I/F Relay output : AC240V MAX 2A

Communication	RS I/F RS-485 (RS-232C can be specified as optional)
Insulation Resistance	DC 500V 20M Ω or more
Withstand Voltage	Between power source terminal and earth terminal : AC 1000V/min
Display	1ST TEMP 3 digit Display range : 45K ~ 350K Display accuracy : 350K ~ 123K $\pm 0.5\%$ FS 123K ~ 73K $\pm 3\%$ FS <73K Out of K thermocouple accuracy range 2ND TEMP 4 digit Display range : 10.0K ~ 350.0K Display accuracy : $\pm 0.5\%$ FS PIG 4 digit Display range : 4.0E - 01 ~ 3.0E + 03 Pa

3. Part Names and Descriptions

3.1 Front panel Description

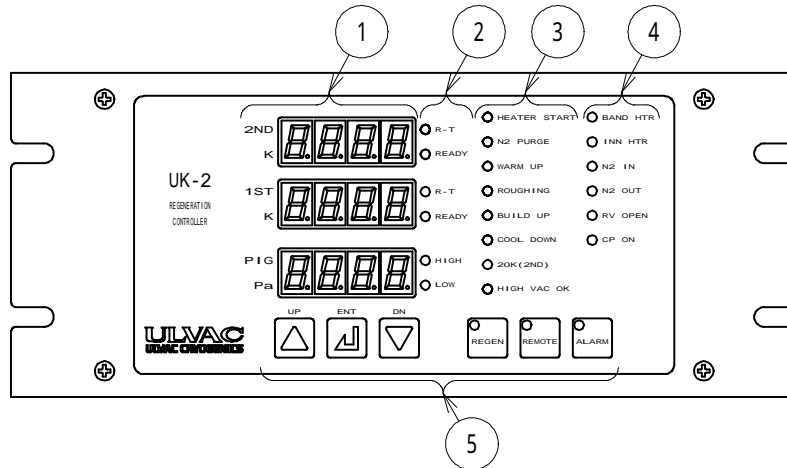


Table 3-1 Part Names and Descriptions (Front panel)

		Name	Description
	7 digit Display	2ND K	Displays the 2nd stage temperature of cryopump. (Parameter setting mode: Displays the set command) (See section 9.1)
		1ST K	Displays the 1st stage temperature of cryopump. (Parameter setting mode: Displays the set command) (See section 9.1)
		PIG Pa	Displays the pressure inside the cryopump (When Alarm is activated : Displays alarm code) (See section 10)
	Status Display LED	R-T	Lights up when the 2ND TEMP and/or 1ST TEMP exceed each 2rt and 1rt set value (300K).
		READY	Lights up when the 2ND TEMP and/or 1ST TEMP become lower than each 2rd and 1rd set value (300K).
		HIGH	Lights up when PIG pressure exceeds the hP set value (67Pa).
		LOW	Lights up when PIG pressure becomes lower than the hP set value (40Pa).

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		Name	Description
	Operation Step Display LED	HEATER START	Displays each operational step (See Fig. 8-1, 8-2, and 8-3.)
		N2 PURGE	
		WARM UP	
		ROUGHING	
		BUILD UP	
		COOL DOWN	
		20K(2ND)	
		HIGH VAC OK	
	Output Status Display LED	BAND HTR	Lights up when BAND HEATER is output
		INN HTR	Lights up when INNER HEATER (2ND HEATER and 1ST HEATER) are output.
		N2 IN	Lights up when N2 IN VALVE is OPEN.
		N2 OUT	Lights up when N2 OUT VALVE is OPEN.
		RV OPEN	Lights up when ROUGH VALVE is OPEN.
		CP ON	Lights up when Cryopump is ON.
	Local Switches	UP/DN	Use it for setting the parameters. (See section 9.1)
		ENT	
		REGEN	Use it when in Local operation mode. (See section 8.2)
		REMOTE	
		ALARM	Resets the alarm.

3.2 Rear Panel Description

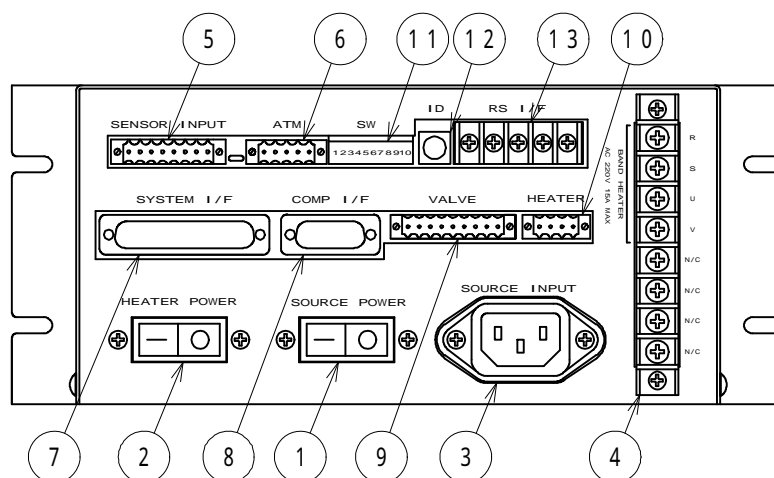



Table 3-2 Part Names and Descriptions (Rear Panel)

No.	Name	Description
	SOURCE POWER	Main circuit protector of UK-2. (5A)
	HEATER POWER	Circuit protector of BAND HEATER. (15A)
	SOURCE INPUT	<p>Power input of UK-2. AC100 ~ 220V±10% (Power input must be AC100V ±10% when using INNER HEATER)</p> <div style="border: 1px solid black; padding: 10px; margin: 10px 0;"> <p style="text-align: center;"> CAUTION</p> <p>To connect our INNER HEATER (1st, 2nd HEATER), always input AC100V to the SOURCE INPUT or it may result in breakage of the HEATER.</p> <p>(SOURCE INPUT double as INNER HEATER output power source and the capacity of the INNER HEATER is AC100V.)</p> </div>
	BAND HEATER	BAND HEATER input and output (AC200 ~ 220V±10% MAX15A).
	SENSOR INPUT	1ST TEMP and 2ND TEMP , PIRANI GAUGE input.
	ATM	DC24V output (For MBS-C, PIRANI GAUGE input power), ATM input.
	SYSTEM I/F	I/F for remote operation from the equipment.
	COMP I/F	I/F for the Compressor.
	VALVE	N2 IN/OUT VALVE, ROUGH VALVE control output.
	HEATER	<p>Power output of INNER HEATER.</p> <p>(Output the same voltage as it has input to SOURCE INPUT.)</p>
	SW	Function choosing Dip SW (See section.4)

Continued from previous page

No.	Name	Description
	ID	Communication ID number. (ID is not necessary for SYSTEM I/F remote operation or local operation.)
	RS I/F	For serial communication. Standard UK-2 is equipped with RS-485. (RS-232C can be specified as optional) Refer to Table 3-5.

UK-2 cable connectable plugs and pin descriptions are shown in Table 3-3.

Table 3-3 Connectable Plugs and Pin Descriptions

No.	Name	Type of connectable plug	Pin No.	Description
	SOURCE INPUT	VM0303B (HIRAKAWA HEWTECH CORP.)	L	AC100 ~ 220V Input (AC100V input when using INNER HEATER)
			N	
			E	
	BAND HEATER	Round crimping terminal φ4 (Terminal width MAX8.1mm)	R	AC200 ~ 220V input
			S	
			U	Band Heater output (AC200 ~ 220V MAX 15A)
			V	
	SENSOR INPUT	BL3.5/8F (Weidmuller)	1	K thermocouple input(+)
			2	K thermocouple input (-)
			3	MBS-C analog input(+)
			4	MBS-C analog input(-)
			5	PIRANI GAUGE analog input (+)
			6	PIRANI GAUGE analog input (-)
			7	N/C
			8	N/C
	ATM	BL3.5/5F (Weidmuller)	1	DC24V output(+) MAX 470mA
			2	DC24V output (-) MAX 470mA
			3	N/C
			4	Atmospheric Sensor input (Photo coupler input)
			5	
	SYSTEM I/F	17JE-13250-02(D8B) (DDK)	See Table 3-4	

Continued from previous page

No.	Name	Type of connectable plug	Pin No.	Description
	COMP I/F	17JE-13090-02(D8B) (DDK)	1	COMP ON
				(Relay contact output AC240V
				MAX 2A)
			2	
			3	COMP ON
			4	(Relay contact output AC240V
				MAX 2A)
			5	COMP ON ANS
			6	N/C
			7	COMP ALARM
			8	COM
			9	N/C
	VALVE	BL3.5/9F (Weidmuller)	1	N2 IN VALVE
			2	(Relay contact output AC240V
				MAX 2A))
			3	N2 OUT VALVE
			4	(Relay contact output AC240V
				MAX 2A)
			5	N/C
			6	ROUGH VALVE
			7	(Relay contact output AC240V
				MAX 2A))
			8	N/C
			9	N/C
	HEATER	BL3.5/4F (Weidmuller)	1	INNER HEATER (2ND) output
			2	(AC100V MAX2A)
			3	INNER HEATER (1ST) output
			4	(AC100V MAX2A)
	RS I/F	Round crimp terminal M3 (terminal width MAX6.2mm)	Refer to Table 3-5	

Table 3-4 SYSTEMI/F Connector Pin Description

Type	Pin No.	Signal Name	Description												
Output Signal (Open collector)	1	GND_EX	Open collector output common												
	2	READY	Changes to L level ¹ when 2ND TEMP < 2rd set value (20K) as well as 1ST TEMP < 1rd set value (130K)												
	3	ROOM TEMP(R-T)	Changes to L level ¹ when 2ND TEMP > 2rt set value (300K) as well as 1ST TEMP > 1rt set value (300K)												
	4	ROUGH PUMP ON	Signal to starts up ROUGH PUMP. Changes to L level at “ROUGH PUMP ON” and changes to H level ¹ at “ROUGH PUMP OFF” (See Fig. 8-1, 8-2, and 8-3 for timing)												
	5	RGN RESPONSE#1	During regeneration, each signal changes to L level or H level in each mode. <table><tr><td></td><td>#1</td><td>#2</td></tr><tr><td>Mode1 (FULL REGENE)</td><td>L</td><td>L</td></tr><tr><td>Mode2 (WARM UP)</td><td>L</td><td>H</td></tr><tr><td>Mode3 (COOL DOWN)</td><td>H</td><td>L</td></tr></table>		#1	#2	Mode1 (FULL REGENE)	L	L	Mode2 (WARM UP)	L	H	Mode3 (COOL DOWN)	H	L
		#1		#2											
	Mode1 (FULL REGENE)	L		L											
	Mode2 (WARM UP)	L	H												
	Mode3 (COOL DOWN)	H	L												
6	RGN RESPONSE#2														
7	CP ON ANS	L level ¹ when cryopump is in operation.													
8	HEATER ON ANS	L level ¹ when HEATER is ON.													
9	ALARM	L level when UK-2 is in normal operation. Changes to H level ¹ when alarm has been activated. Logic can be changed with Dip SW (No.6). (See the following page.) See section 10 for alarm detail information.													
Input Signal	10	COM	Contact input common.												
	11	REMOTE	Signal ON enables remote operation. (At this time, REMOTE LED on the front panel lights up.)												
	12	REGENE	Determine the MODE SELECT #1 and #2 described below. Turn the signal ON and regeneration will start.												

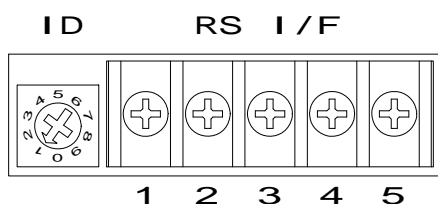
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Type	Pin No.	Signal Name	Description												
Input Signal	13	MODE SELECT#1	Choosing MODE SELECT												
	14	MODE SELECT#2	<table><tr><td></td><td>#1</td><td>#2</td></tr><tr><td>Mode1 (FULL REGENE)</td><td>ON</td><td>ON</td></tr><tr><td>Mode2 (WARM UP)</td><td>ON</td><td>OFF</td></tr><tr><td>Mode3 (COOL DOWN)</td><td>OFF</td><td>ON</td></tr></table>		#1	#2	Mode1 (FULL REGENE)	ON	ON	Mode2 (WARM UP)	ON	OFF	Mode3 (COOL DOWN)	OFF	ON
				#1	#2										
			Mode1 (FULL REGENE)	ON	ON										
	Mode2 (WARM UP)	ON	OFF												
Mode3 (COOL DOWN)	OFF	ON													
18	RESET	Reset the alarm output status. Turn this signal ON for more than 0.1 second and turn it OFF.													
15 ~ 17 19 ~ 25	N/C	Do not connect.													

¹ L level means that the transistor for open collector output is ON (establish electrical continuity).

H level means that the transistor for open collector output is OFF (break electrical continuity).

Table 3-5 Serial Communication RS I/F



Terminal No.	RS-485 (Standard)	RS-232C (Optional)
1	TXD(+)	TXD
2	TXD(-)	-
3	RXD(+)	RXD
4	RXD(-)	-
5	FG	FG

1 Standard UK-2 is equipped with RS-485.

Please contact our sales representative if RS-232C is preferred.

RS-232C can be installed instead of RS-485.

2 For the operation method by serial communication, refer to the instruction manual of communication interface.

4. DIP Switch Specifications

There are two types of UK-2 DIP switch: Previous Model and New Model.

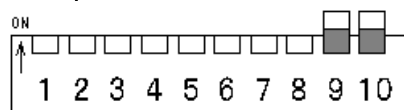
Previous Model: Push a lever UP to turn ON. The color of the levers is yellow.

(Previous models were sold until April, 2011.)

New Model: Push a lever DOWN to turn ON. The color of the levers is white.

(New model has been sold from May, 2011.)

Example: When No.9 and No.10 are ON.



[Previous Model]



[New Model]

Table 4-1 DIP Switch Descriptions

No.	Item	OFF	ON
1	Prohibit panel control	Operable	Prohibited
2	Prohibit parameter change	Operable	Prohibited
3	BAND HEATER connection	Connected	Not connected
4	Cheesing Compressor type	C10series 4 OFF	C15series OFF
5		5 ON	C30series OFF
6	ALARM Output (SYSTEM I/F No.9)	Negative logic (b contact) In normal status: ON In ALARM status: OFF	Positive logic (a contact) In normal status: OFF In ALARM status: ON
7	INN HEATER connection	Not connected	Connected
8	Not in use	Do not turn ON	
9 ⁽¹⁾	Termination resistance (TXD)	Not effective	Effective (RS485 only)
10 ⁽¹⁾	Termination resistance (RXD)	Not effective	Effective (RS485 only)

(1) No.9 and No.10 will not be used when serial communication is RS-232C.



CAUTION

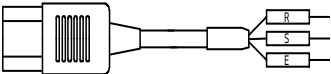
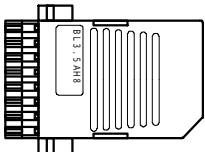
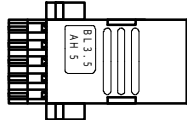
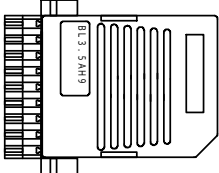
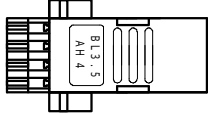
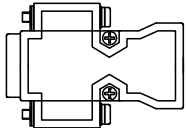
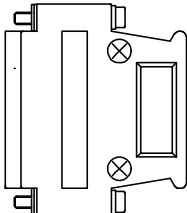
When the specifications of cryopump and/or compressor which will be connected to UK-2 has been decided, DIP switch will be set before shipment.

Do not make unnecessary change. Please contact us when the setting needs to be changed.

5. Accessories and optional cable

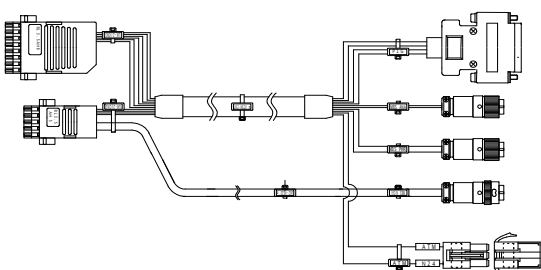
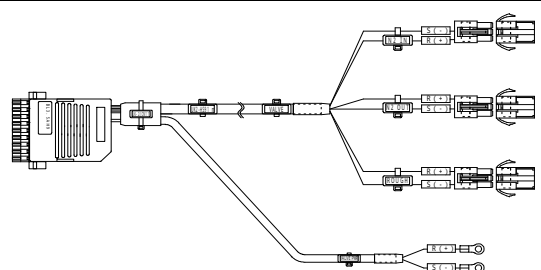
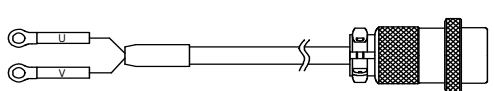
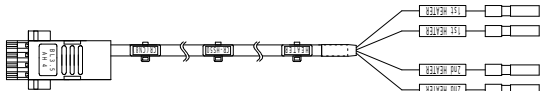
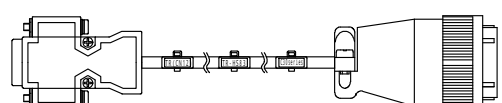
If the cable type is not specified by customers, connectors in Table 5-1 will be attached. In this case connection and wiring work need to be performed by customers.

Table 5-1 UK-2 Accessories

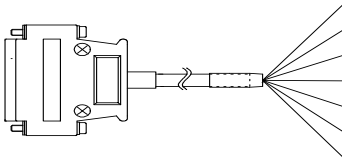
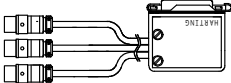
No	Device	Model	Appearance	Manufacturer	Application	Quantity
	Power cable	UK2-HS02		UIVAC CRYO	SOURCE INPUT	1
	Connector	BL3.5/8F BL3.5AH8SW		Weidmuller	SENSOR INPUT	1
	Connector	BL3.5/5F BL3.5AH5SW		Weidmuller	ATM	1
	Connector	BL3.5/9F BL3.5AH9SW		Weidmuller	VALVE	1
	Connector	BL3.5/4F BL3.5AH4SW		Weidmuller	HEATER	1
	Connector	17JE-13090-02(D8B)		DDK	COMP I/F	1
	Connector	17JE-13250-02(D8B)		DDK	SYSTEM I/F	1

When the UK-2 has been purchased as a part of the cryopump system, the cable can be specified as optional. Table 5-2 shows the optional cables. Please refer to section 7 for connecting method. When optional cable is specified, the content of accessories in Table 5-1 will be different.

Table 5-2 Optional cables

No	Name	Model	Appearance	Note
	SENSOR Cable	UK2-HS20		and in Table 5-1 will not be attached.
	VALVE Cable	UK2-HS91		in Table 5-1 will not be attached.
-1	BAND HEATER Cable	UK2-HS51 or UK2-HS52	UK2-HS51 : For RBH6 ~ 14 UK2-HS52 : For RBH16 ~ 30 	
-2	INNER HEATER Cable	CR-HS50		in Table 5-1 will not be attached.
	COMP I/F Cable	UK2-HS81 or UK2-HS82 or UK2-HS83	UK2-HS81 : For C10 series UK2-HS82 : For C15 series UK2-HS83 : For C30series 	in Table 5-1 will not be attached.

Continued from previous page

No	Name	Model	Appearance	Note
	SYSTEM I/F Cable	UK2-HS40		in Table 5-1 will not be attached.
	MBS-C Compatible Cable	GP-HM30		Necessary for MBS-C.

6. Installation

6.1 Installation site

Install UK-2 in the site under proper usage environment.



CAUTION

Avoid using UK-2 in these places :

Where flammable gas, corrosive gas, oil mist and particles that can deteriorate electrical insulation are generated, or are abundant.

Where the temperature is below -10°C or above 50°C .

Where the relative humidity is 80%RH or below dew point.

Where highly intense vibration or impact is generated or transferred.

Near high voltage power lines or where inductive interference can affect the operation of the product.

6.2 Installation method

Referring to panel cut dimensions of Figure 6-1, machine the mounting holes. Insert UK-2 firmly from the front panel, and then fix it with four screws (M4).

Note that if you cut taps from the panel, locking screw sites need to be M4, or if you fix the product with nuts on back side without cutting taps, locking screw sites need to be 5.

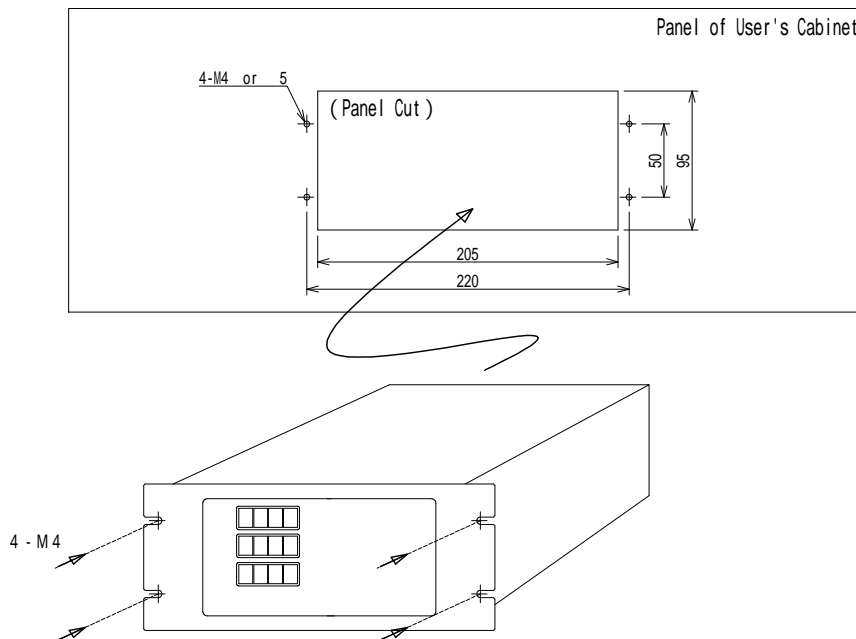


Figure 6-1 Panel cut dimensions and installation

7. Wiring

After installing UK-2 to the panel, perform wiring referring to Figure 7-1. Purchased optional cables must be connected as shown in Figure 7-2. Observe following warnings and cautions to perform wiring.



WARNING

Always disconnect this product from any power source during wiring operation to prevent electrical shock.

Avoid touching the wired terminal and charged devices while supplying power.



CAUTION

ANALOG signal and K Thermocouple

- ! For ANALOG signal and K Thermocouple input signal, use cables with shield. Especially for K thermocouple, use the compensation lead wire with shield which is effective for electric noise.
- ! Ensure to wire MBS-C POWER properly. If it is not wired correctly, it may result in the breakage of MBS-C.



CAUTION

Conduit Requirements for UK-2 wiring

To prevent interference during the operation, there should be a separate conduit for each signal line, control line, and AC power line. Especially the ANALOG signal line of MBS-C must be in separate conduit from other equipments or AC power lines or control lines for other equipments. Otherwise, UK-2 operation will be interfered.

If separate conduits cannot be supplied, keep enough distance (generally 300mm or more) between different wirings. It is effective to prevent interference.

**CAUTION**

After wiring, ensure to confirm that wiring has been done correctly. If difference signal has been connected, it may result in MBS-C failure. Also, ensure that the input power is within the allowable range.

**CAUTION**

For lead-free soldering, be sure to use soldering iron and tip that are lead-free use ONLY. Also, DO NOT mix the lead-free solder with the lead eutectic solder. It may decrease the lifetime of soldering connection.

**CAUTION**

It is recommended to indicate the type of soldering for appropriate maintenance. The character strings listed below are recommended indication for each soldering.

Lead eutectic solder	SnPb	or	SP
Lead-free solder (Sn-Ag)	SnAgCu	or	SAC
Lead-free solder (Sn-Cu)	SnCuNi	or	SCN

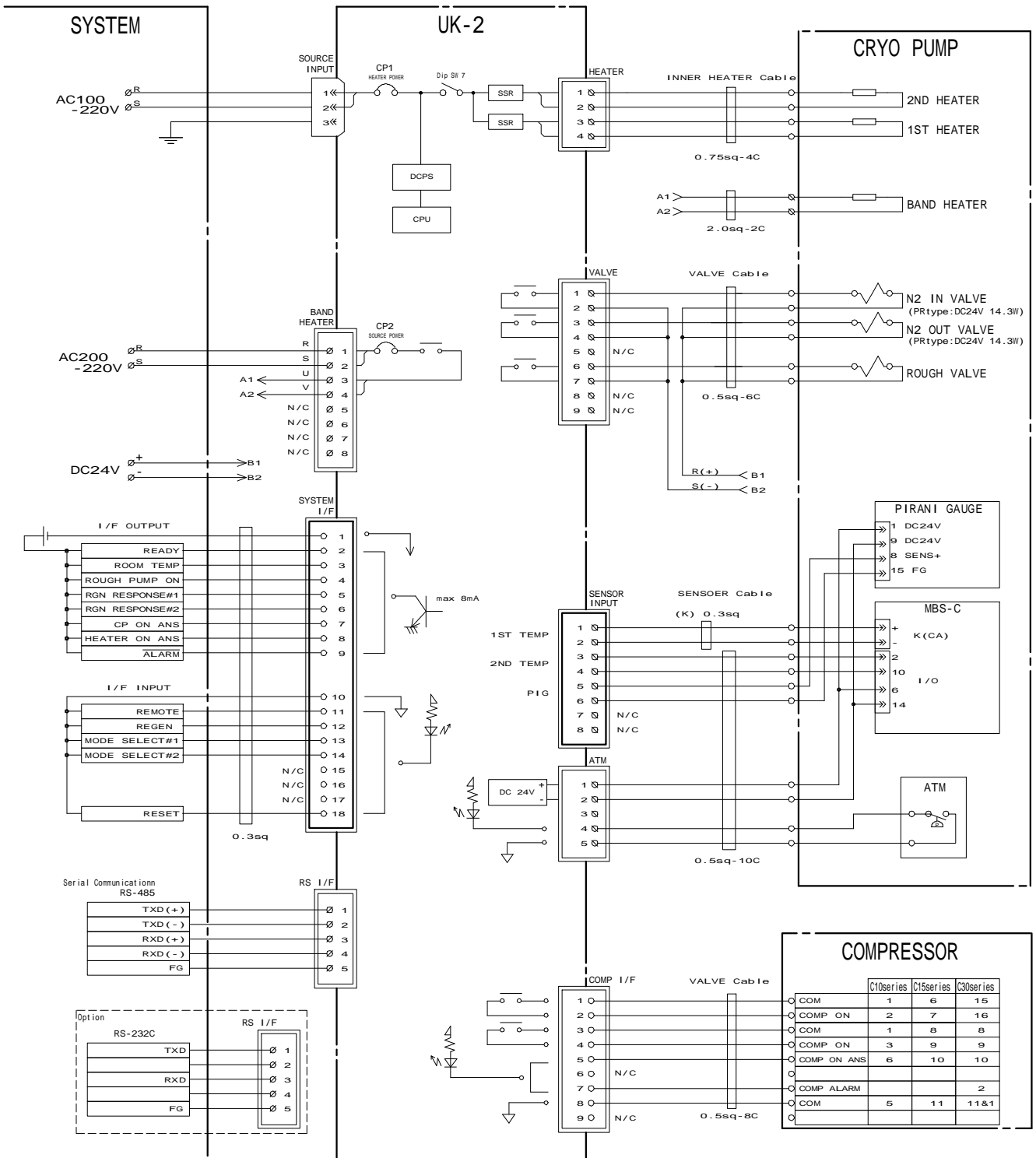
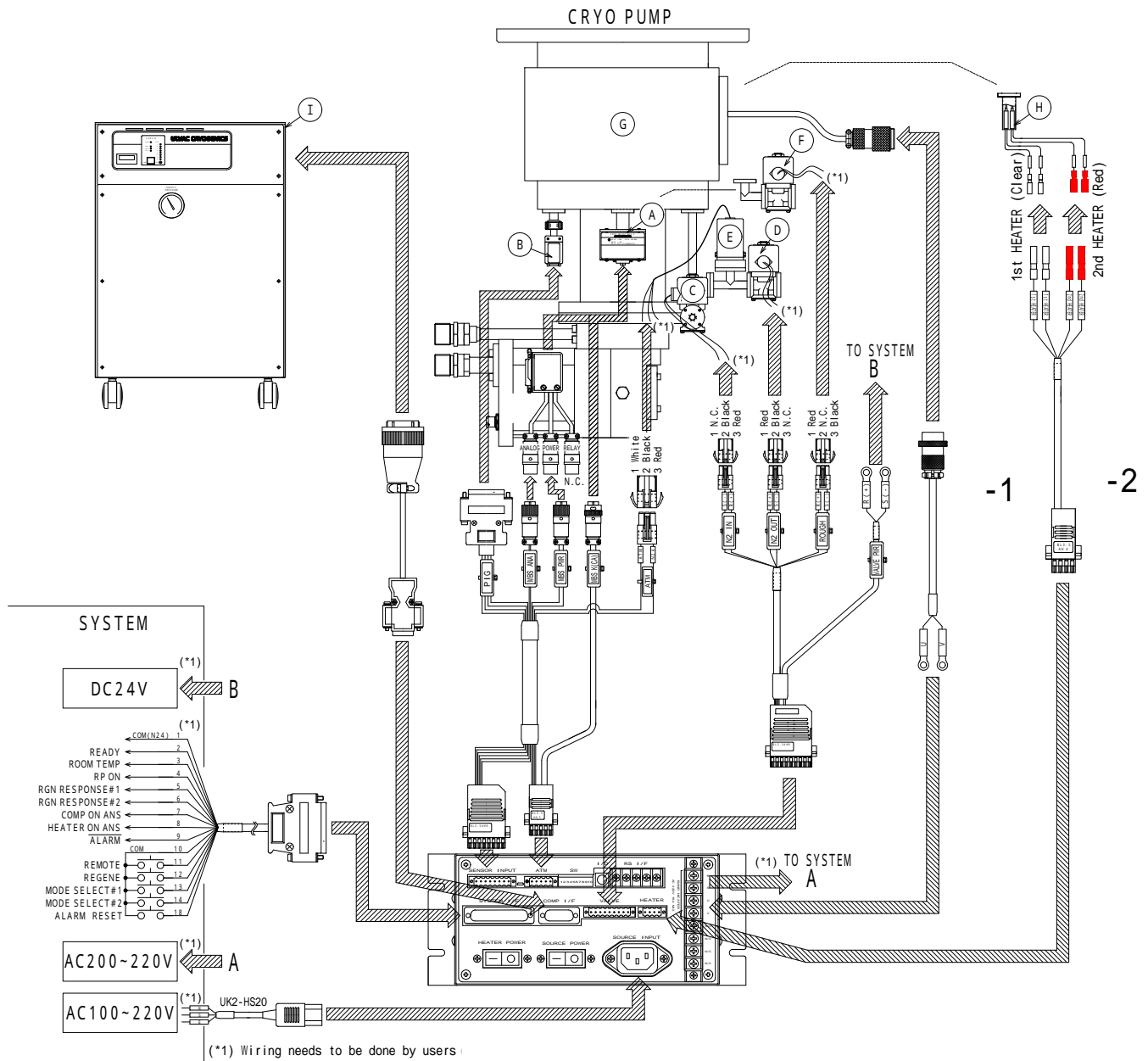


Figure 7-1 UK-2 Wiring Diagram



No.	Cable Name	Model
	SENSOR Cable	UK2-HS20
	VALVE Cable	UK2-HS91
-1	BAND HEATER Cable	UK2-HS51 or UK2-HS52
-2	INNER HEATER Cable	CR-HS50
	COMP I/F Cable	UK2-HS81 or UK2-HS82 or UK2-HS83
	SYSTEM I/F Cable	UK2-HS40
	MBS-C compatible Cable	GP-HS30

Code	Option Device name
(A)	CRYO METER
(B)	PIRANI GAUGE
(C)	N2 IN VALVE
(D)	N2 OUT VALVE
(E)	ATM(Atmospheric Sensor)
(F)	ROUGH VALVE
(G)	BAND HEATER
(H)	INNER HEATER
(I)	COMPRESSOR

Figure 7-2 UK-2 Optional Cable Wiring



- (1) The end of the wires of N2 IN VALVE, N2 OUT VALVE, ATM (Atmospheric Sensor), and ROUGH VALVE are not terminated. Follow the instruction below and conduct terminal treatment.

< The method of terminal treatment for VALVE and ATM >



- (1) Crimp a pin contact to the end of every wire.



Our optional cables are shipped with a pin contact and EL connector listed below.

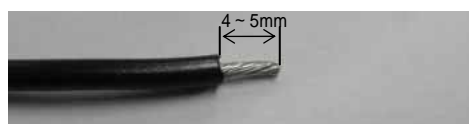
No	Part name	Image	Model or Specification	Manufacturer	Quantity	Note
1	Pin contact		LLM-01T-P1.3E	JST	9	Attached to UK2-HS91 UK2-HS20 optional cables.
2	EL Connector (Receptacle)		ELR-03V	JST	4	

【 Necessary tools 】

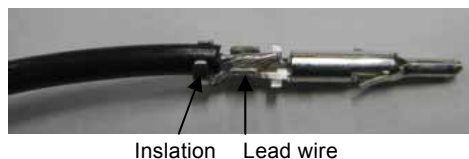
No	Tool name	Image	Model or Specification	Manufacturer	Quantity	Note
1	Crimping tool		YC-202 (or equivalent)	JST	1	
2	Wire stripper		For AWG20		1	

【 Crimping procedures 】

! Strip the electrical insulation from a wire for 4 or 5mm.



Set the wire in the pin contact.



Put the pin contact in the die of the crimping tool and crimp it.

Size of the die 「AWG20」



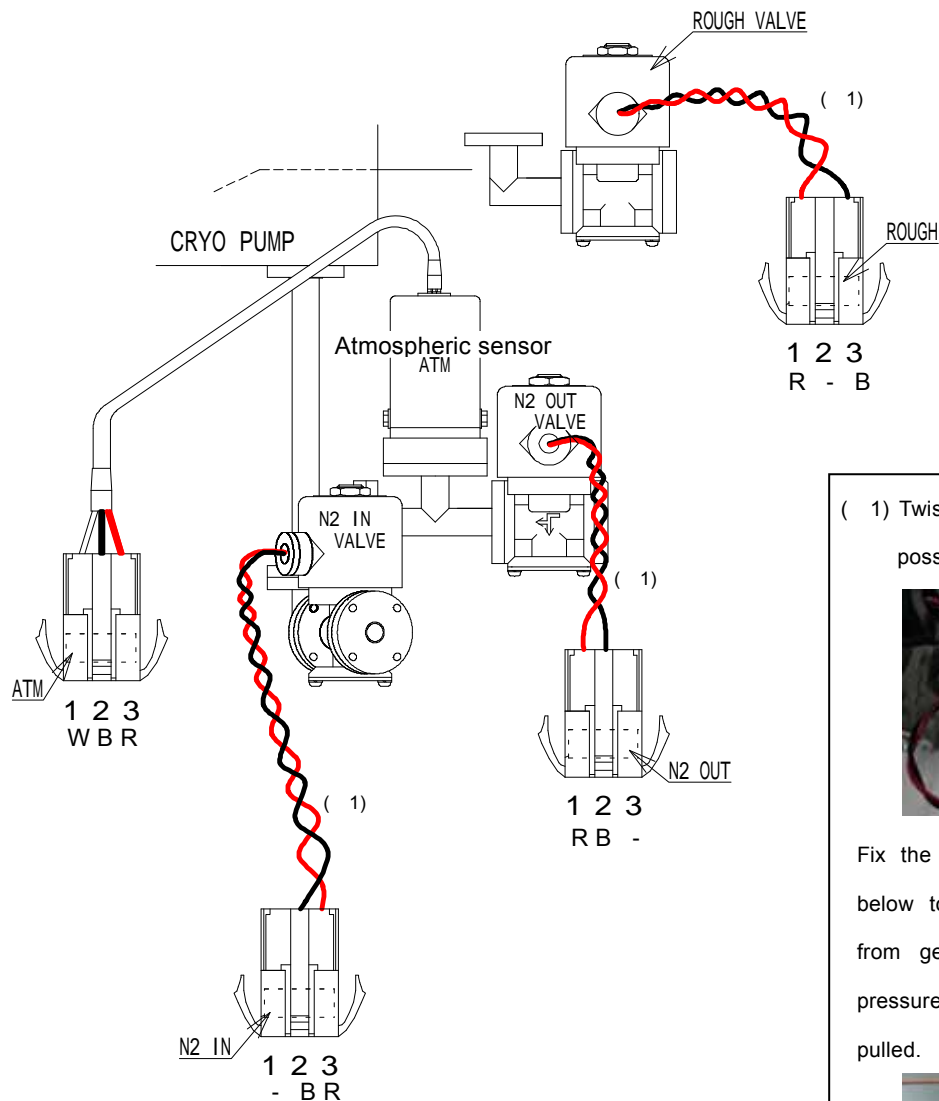
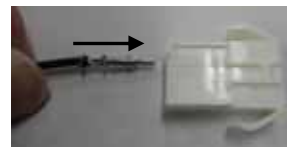
Make sure that the end of the insulation part and the lead wire are crimped properly as the figure on the right.



(2) Insert the crimped pin contact to the connector.

(See Figure 7-3 for pin assignment.)

Insert further until it makes a clicking sound.



B:Black R:Red W:White

(1) Twist the wires as much as possible.



Fix the cable as the image below to prevent wire ends from getting any stress or pressure when the cable is pulled.



Figure 7-3 Connector pin assignment of VALVE and ATM

8. Operation

8.1 Remote Operation

Turn ON the [REMOTE] signal of SYSTEM I/F.

Ensure that  key LED on the front panel is lit.

Determine the [MODE SELECT #1] and [MODE SELECT #2] signals of SYSTEM I/F.

	MODE SELECT #1	MODE SELECT #2
Mode1 (FULL REGEN)	ON	ON
Mode2 (WARM UP)	ON	OFF
Mode3 (COOL DOWN)	OFF	ON
Cancel	OFF	OFF

Turn ON the [REGEN] signal of SYSTEM I/F.

It starts operating in the mode that has been selected above.

8.2 Local Operation

Ensure that  key LED is light off.

If the LED is lit, hold down the  key for 1 second and turn the light off.

→ It will move to manual operation mode.

Hold down  key for 1 second.


→  key LED lights up.

Use   keys to select an operation mode referring the table below.

→ LEDs flash as described below in each mode.

Operation Mode	Mode 1	Mode 2	Mode 3	None
Flashing LED	<ul style="list-style-type: none"> ● HEATER START ● N2 PURGE ● WARM UP ● ROUGHING ● BUILD UP ● COOL DOWN ○ 20K (2ND) ○ HIGH VAC OK 	<ul style="list-style-type: none"> ● HEATER START ● N2 PURGE ● WARM UP ● ROUGHING ● BUILD UP ○ COOL DOWN ○ 20K (2ND) ○ HIGH VAC OK 	<ul style="list-style-type: none"> ○ HEATER START ○ N2 PURGE ○ WARM UP ○ ROUGHING ○ BUILD UP ● COOL DOWN ○ 20K (2ND) ○ HIGH VAC OK 	<ul style="list-style-type: none"> ○ HEATER START ○ N2 PURGE ○ WARM UP ○ ROUGHING ○ BUILD UP ○ COOL DOWN ○ 20K (2ND) ○ HIGH VAC OK
Operation	Operate warm up to cooldown.	Operate warm up to rough pumping.	Operate cooldown only.	Cancel

After selecting the mode, press  key to start the operation.

To stop the operation, hold down  key for 1 second.

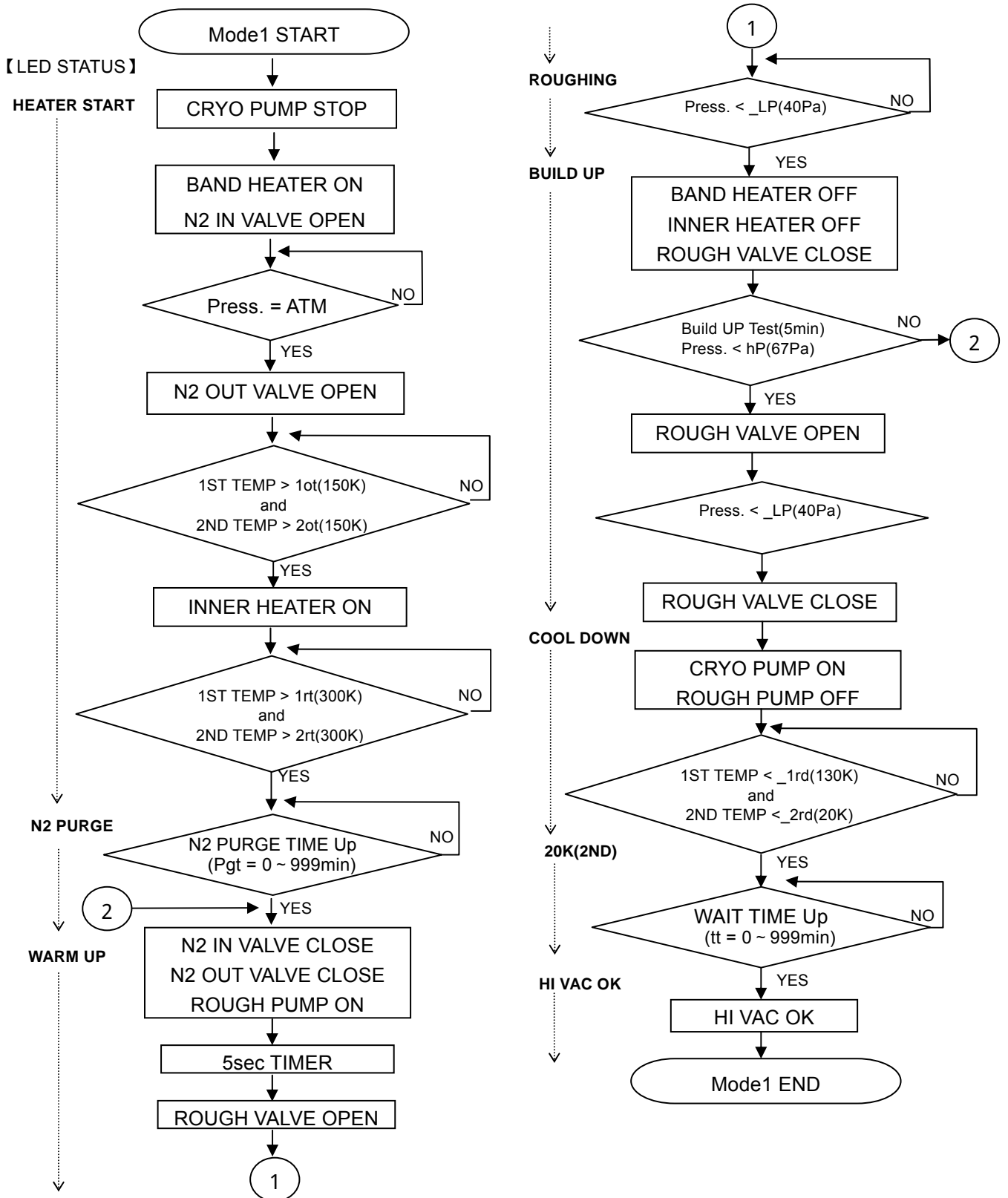


Figure 8-1 Mode 1 (FULL REGEN) Operation Flow Chart

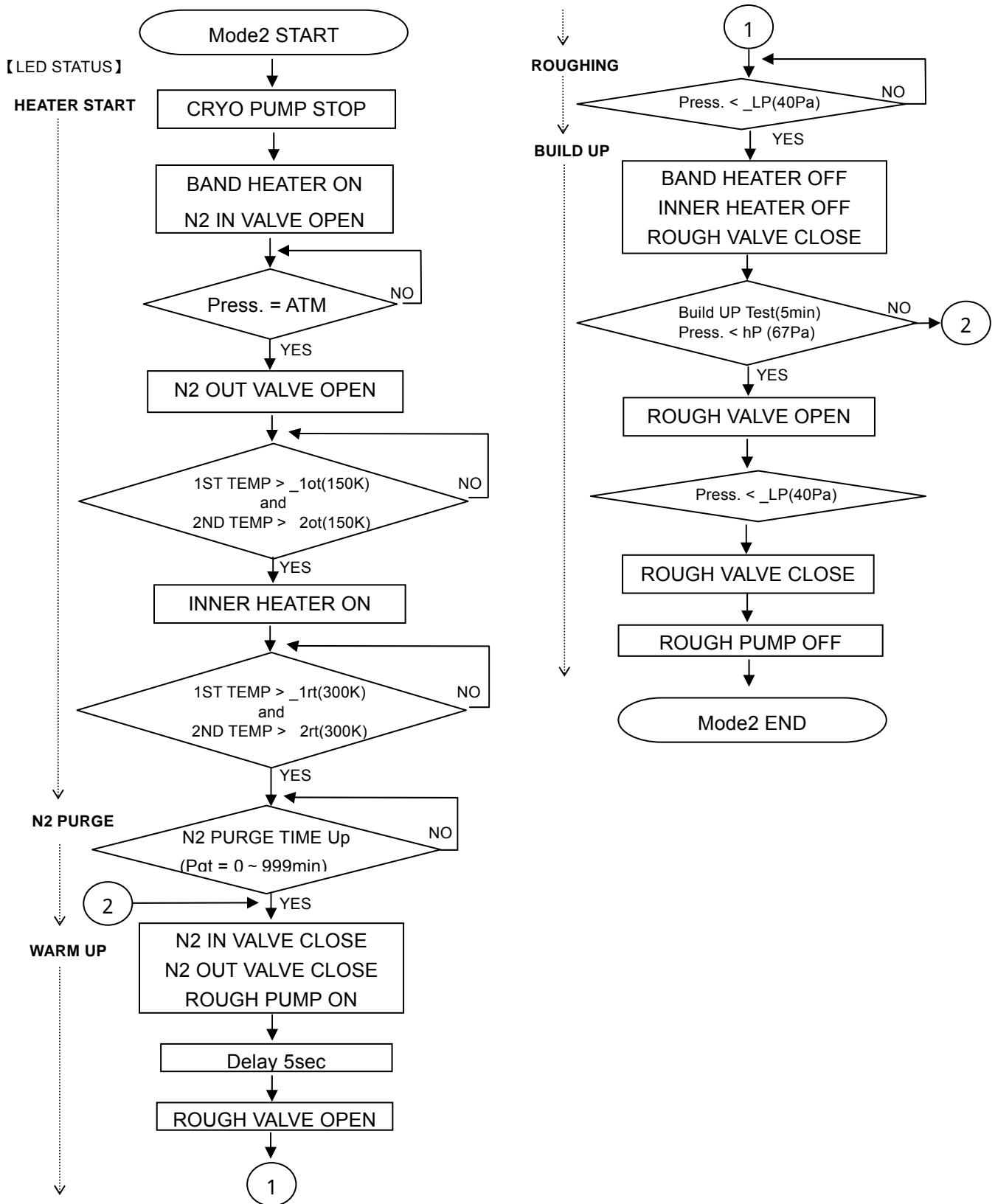


Figure 8-2

Mode 2 (WARM UP) Operation Flow Chart

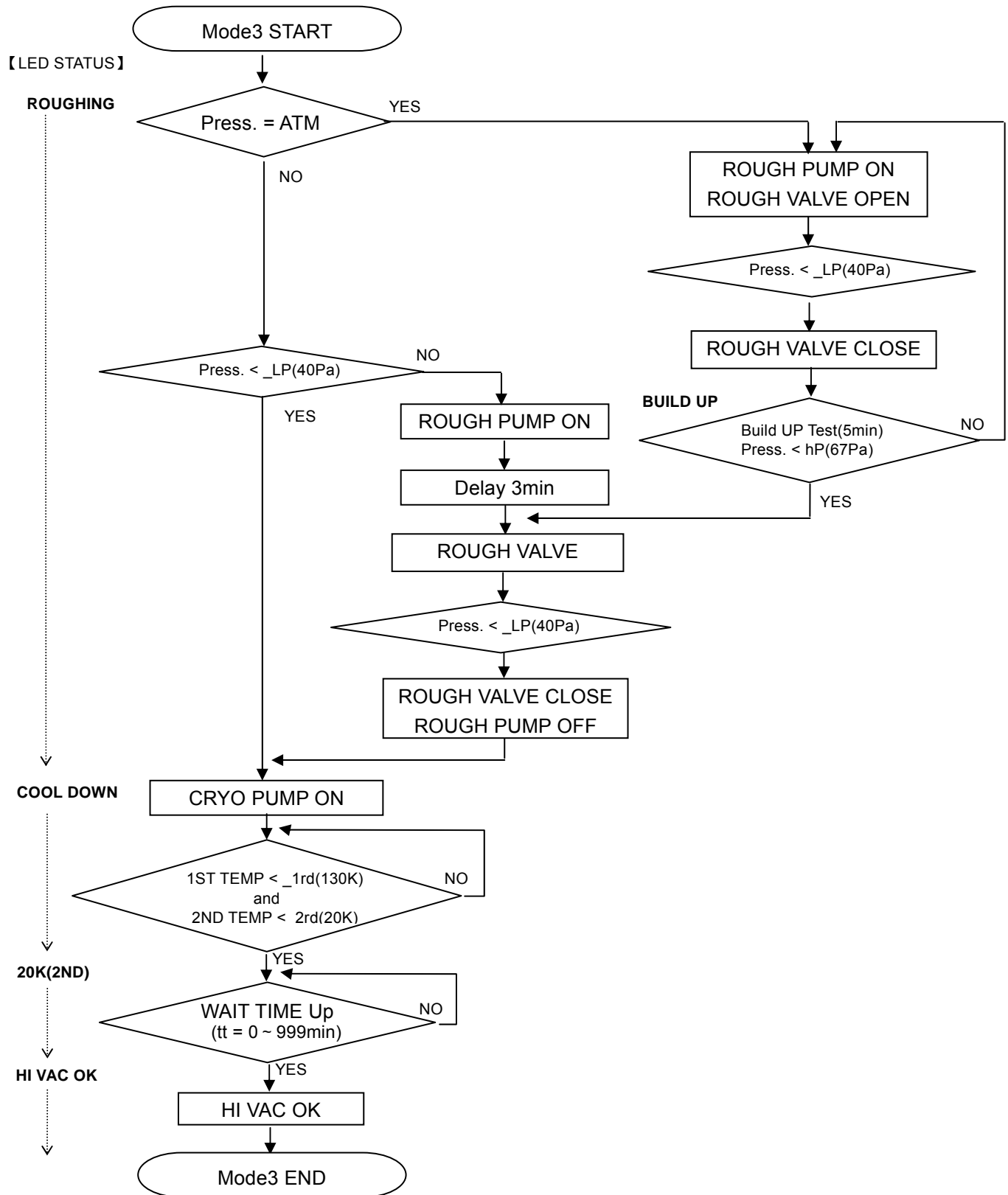






Figure 8-3 Mode 3 (COOL DOWN) Operation Flow Chart




9. Parameter Setting



9.1 Parameter setting method


Key	Description
	In parameter setting mode, it is used to increase the set value.
	Hold down the key for 1 second and it will take you to parameter setting mode. In parameter setting mode you can change the set value.
	In parameter setting mode, it is used to decrease the set value.


Parameter setting method

Hold down  key for 1 second to move to parameter setting mode.
 → 2ND cell : Display the set command. (Flashing)
 1ST cell : Display the set value.

Use   keys to select the parameter and press  key.
 → 1ST cell flashes.

Use   keys to change the set value.

Press  key to determine the set value. → 2ND cell flashes.

Hold down  key for 1 second to close the parameter setting mode.

9.2 Factory Setting

Table 9-1 shows the default setting of the parameter.

Table 9-1 Parameter factory setting

Set Command	Description	Setting Range	Initial Value
_2rt	2ND ROOM TEMP (Target value of 2nd heater control)	10 ~ 350	300K
_2rd	2ND READY TEMP (The temperature to which 2nd stage will be cooled down.)	10 ~ 350	20K
_2AL	2ND ALARM TEMP (Upper limit value during cooldown.)	10 ~ 350	20K
_1rt	1ST ROOM TEMP (Target value of 1st heater control)	45 ~ 350	300K
_1rd	1ST READY TEMP (The temperature to which 1st stage will be cooled down.)	45 ~ 350	130K
_1AL	1ST ALARM TEMP (Upper limit value during cooldown.)	45 ~ 350	150K
oh	OVER HEAT TEMP (The temperature at which an overheat protection alarm will be activated.)	45 ~ 350	340K
_Pgt	PURGE TIME (Time for purging N2 after warm up.)	0 ~ 999	5min
_tt	WAIT TIME (Wait timer after cooldown has been completed.)	0 ~ 999	10min
_hP	HI PRESS (The highest limit of pressure that a Cryopum can be started.)	1 ~ 99	67Pa
_LP	LOW PRESS (The lowest limit of pressure that a Cryopum can be started.)	1 ~ 99	40Pa
_2ot ¹	The temperature at which 2ND HEATER turns ON.	10 ~ 350	150K
_2Pb ¹	Proportional band of 2ND HEATER. ¹	1 ~ 100	2K
_2ti ¹	Integral time of 2ND HEATER.	0 ~ 999	150sec.
_2td ¹	Derivative time of 2ND HEATER.	0 ~ 300	24sec.
_2Pt ¹	Proportion-cycle of 2ND HEATER.	0.1 ~ 10.0	10.0sec.
_2Lt ¹	Maximum energizing time of 2ND HEATER. ²	0 ~ 300	45min
_1ot ¹	The temperature at which 1ST HEATER turns ON.	45 ~ 350	150K
_1Pb ¹	Proportional band of 1ST HEATER	1 ~ 100	2K
_1ti ¹	Integral time of 1ST HEATER.	0 ~ 999	150sec.
_1td ¹	Derivative time of 1ST HEATER.	0 ~ 300	24sec.
_1Pt ¹	Proportion-cycle of 1ST HEATER.	0.1 ~ 10.0	10.0sec.
_1Lt ¹	Maximum energizing time of 1ST HEATER. ²	0 ~ 300	45min

¹ It will not displayed when DIP SW is OFF (means inner heater is not used).

² Heater maximum energizing time

When heater is energized more than the set value, an alarm will be activated.

(Recommended set values)

Pump size	Set time
8 inch	45 min + Pgt
12 inch	80 min + Pgt
16 inch (U16P)	150 min + Pgt
16 inch other than above and larger size (U16HSP, U16HSPL)	240 min + Pgt

10. Troubleshooting

Table 10-1 Troubleshooting list (Error descriptions and corrective actions)

Display	Class	Description	Possible Cause	Corrective Action
_sb	A	Alarm will be output when K thermocouple (1st temperature) is disconnected.	Miswiring of K thermocouple. Disconnecting (breaking) of K thermocouple wire.	Check that the wiring has been done properly. The sensor must be replaced. Please contact our customer service.
_Pi	A	Alarm will be output when PIRANI GAUGE sensor is disconnected.	Miswiring of sensor. Disconnecting (breaking) of sensor.	Check that the wiring has been done properly. The sensor must be replaced. Please contact our customer service.
F_hb	A	Alarm will be output when 1st HEATER line is disconnected.	Miswiring of HEATER.	Check that the wiring has been done properly.
S_hb	A	Alarm will be output when 2nd HEATER line is disconnected.	Disconnecting (breaking) of HEATER.	The heater must be replaced. Please contact our customer service.
F_to	A	Alarm will be output when 1st HEATER energizing time (1Lt) exceeds the set time.	The set time is too short for energizing time.	Change energizing time in accordance with your cryopump specifications. 1
E-to	A	Alarm will be output when 2nd HEATER energizing time (2Lt) exceeds the set time.	The sensor of HEATER is not grounded properly. The HEATER and/or sensor of HEATER are not grounded properly.	There is a possibility that the refrigerator has been damaged. Please contact our customer service. There is a possibility that the heater has been damaged. Please contact our customer service.

Continued from previous page.

Display	Class	Description	Possible Cause	Corrective Action
_cP	A	Alarm output from compressor.	Compressor abnormal.	Please refer to the compressor manual.
	A	When there is no COMP ON ANS (for 5 seconds) during COMP ON, alarm will be activated.		
_ht	A	After cooldown has been completed (HI VAC OK) , it will be displayed if 1ST TEMP exceeds 1AL (150K) or 2ND TEMP exceeds 2AL (20K).		
oh	A	Alarm will be output when the temperature exceeds oh set temperature (340K).	Heat input from heater and/or other heat sources.	Cut off all heat sources immediately.

ALARM CLASS Description

S 1 : Requires repair	System stop	Requires adjustment service
S 2 : Requires resetting	System stop	Requires user setting
A : Severe failure	Stops full output	Outputs ALARM
B : Minor failure	Continues outputting	Outputs ALARM

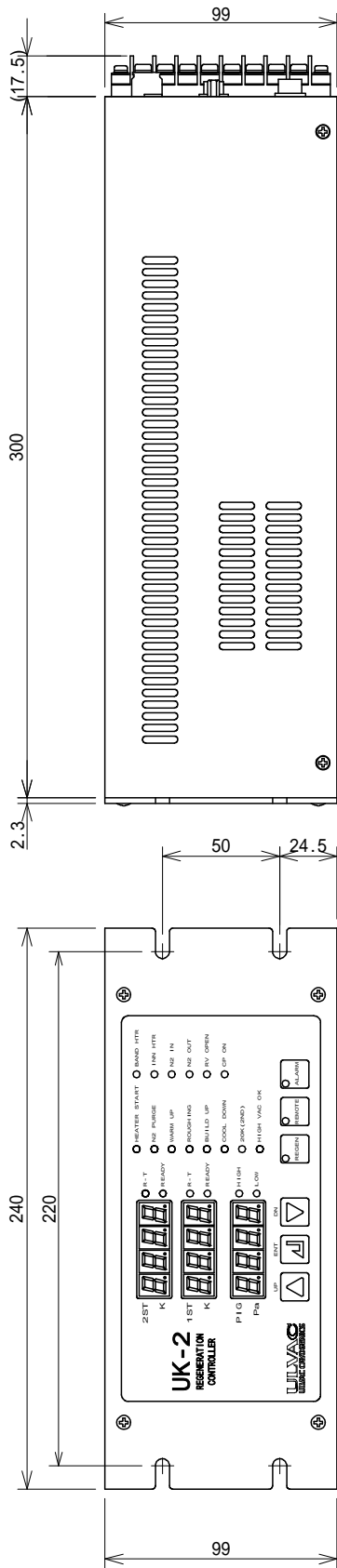
Table 10-2 Troubleshooting (other errors)

Display	Class	Description	Corrective Action
cPu1 cPu2	S1	EEPROM read error, ROM versionerror. EEPROM adjustment area check SUM error.	Please contact our customer service. Error code cannot be reset.
EPER	S2	EEPROM parameter area check SUMerror.	Go back to default setting by resetting error alarm.



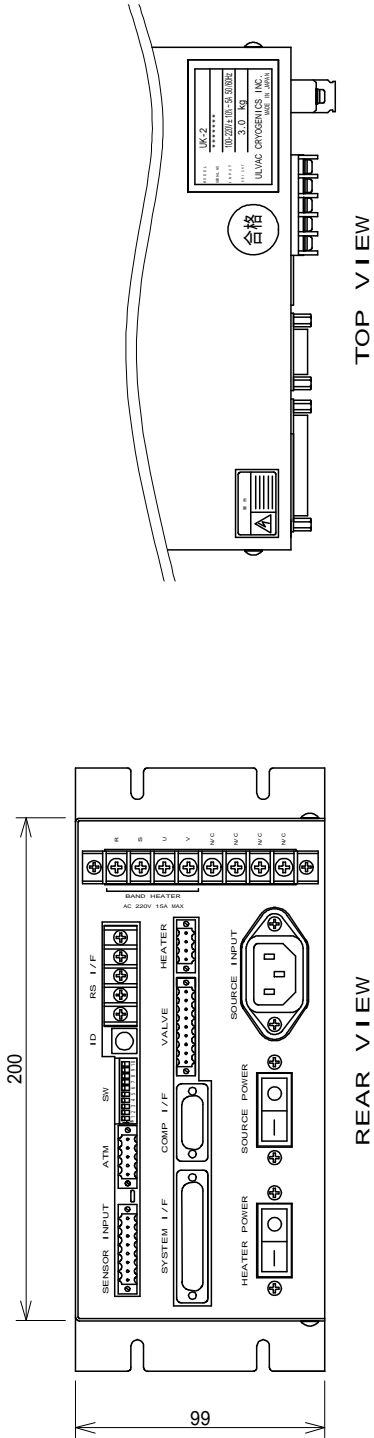
CAUTION

Maintenance and repair must be performed only by qualified maintenance personnel.
DO NOT remove the cover of the product.



SIDE VIEW

FRONT VIEW



TOP VIEW

REAR VIEW

Appendix 1 UK-2 External Drawing

SERVICE NETWORK

- For technical support, servicing or additional contact information, visit us at www.ulvac-cryo.com.

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Revision History

Date	Revision No.	Contents
2008-04-01	2008.04	First edition (New format) P.1 2.Specifications Correction of the voltage of input power source. P.15/16 The latest Wiring diagram.
2010-04-15	2010AL01	“Introduction” has been revised. “SERVICE NETWORK” has been revised.
2011-09-14	2011SR02	Full-fledged revision.
2012-05-22	2012MY03	Full-fledged revision.
2013-12-19	2013DR04	P. 13 Correction has been made on Table 5-2 “Optional cables”. “Introduction” has been revised. “SERVICE NETWORK” has been revised.
2018-06-14	2018JE05	“SERVICE NETWORK” has been revised.

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