

Service Manual

CO₂ Incubator

MCO-17A

MCO-17AC

FILE No.



MCO-17AC

Effective models

This service manual is effective following models.

Model name	Product code	Voltage and Frequency	
MCO-17A	823 247 51	110-120V	60Hz
	823 247 52	220-240V	50/60Hz
	823 247 53	220-240V	50/60Hz
	823 247 54	110-120V	60Hz
	823 247 55	240V	50Hz
	823 247 56	220V	50Hz
	823 247 57	220-240V	50/60Hz
	823 247 58	110-120V	50/60Hz
	823 247 59	220V	50/60Hz
	823 247 60	220-240V	50/60Hz
	823 247 61	220-240V	50/60Hz
MCO-17AC	823 272 51	110-120V	60Hz
	823 272 53	220-240V	50/60Hz
	823 272 54	220-240V	50Hz
	823 272 56	110-120V	60Hz
	823 272 57	110-120V	60Hz

Features

- Note: Model name

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graph LR
    M[M] --- CO[CO]
    M --- ME[Medical equipment]
    CO --- 17[17]
    CO --- CO2[CO2 Incubator]
    17 --- A[A]
    17 --- CC[Chamber capacity 164L]
    A --- C[C]
    A --- AJ[Air jacket type]
    C --- CAS[Copper alloyed stainless steel]
  
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The diagram is a hierarchical tree structure. At the top level is the node 'M'. A vertical line descends from 'M' and splits into two horizontal branches. The left branch leads to 'CO₂ Incubator', and the right branch leads to 'Medical equipment'. From 'CO₂ Incubator', a vertical line descends and splits into two horizontal branches. The left branch leads to 'Chamber capacity 164L', and the right branch leads to '17'. From '17', a vertical line descends and splits into two horizontal branches. The left branch leads to 'Air jacket type', and the right branch leads to 'A'. From 'A', a vertical line descends and splits into two horizontal branches. The left branch leads to 'Copper alloyed stainless steel', and the right branch leads to 'C'.

NOTICE

In general, stainless steel is known that it is not easy (hard) to rust. However, depends on conditions, rust might generate. When you remove rust, we recommend the following agents. Besides, the surface may become foggy.

Recommended agent:

- 1.Cream creanser “Gif” (Unilever)
 - 2.Picasso #SUS300-W (Chemical YAMAMOTO)
- * Picasso has greater capability of clean for rust than “Gif”.

Specifications

<Structure>

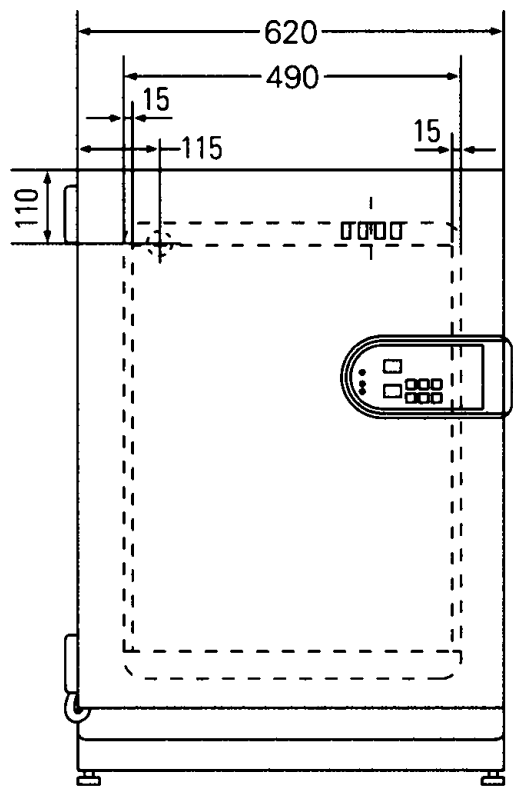
Name	CO ₂ incubator	
Model	MCO-17A	MCO-17AC
External dimensions	W620 x D605 x H900 (mm)	
Internal dimensions	W490 x D505 x H665 (mm)	
Interior volume	164 L	
Tray	Stainless steel containing copper 5 (standard), 17 (maximum)	
Exterior	Acrylic finish baked on galvanized steel	
Interior	Stainless steel (SUS-304)	Stainless steel containing copper
Outer door	Acrylic finish baked on galvanized steel	
Inner door	Tempered glass	
Insulation	Rigid polyurethane foam in place (CFC-FREE)	
Heating system	DHA (heater jacket + air jacket system)	
Humidifying system	Natural evaporation with humidifying pan	
Temperature controller	PID control	
CO ₂ controller	ON-OFF control system	
Air circulation	Stir up of breeze	
Air filter	0.3 μm, Efficiency 99.97%	
Alarm	Temperature alarm, CO ₂ density alarm, upper limit temperature alarm, door alarm	
Capacity of contact point for remote alarm	AC125V, 0.4A; DC30V, 2A	
Output of recorder terminal	0~100mV (temperature, CO ₂ density)	
CO ₂ connecting inlet	4~6 mm tube	
Weight	84kg	
Accessories	5trays, 5sets of tray support, 1gas tube, 1humidifying pan	
Optional component	CO ₂ pressure regulator (MCO-100L), stainless tray (MCO-46ST), Stack kit (MCO-18PS)	

<Performance>

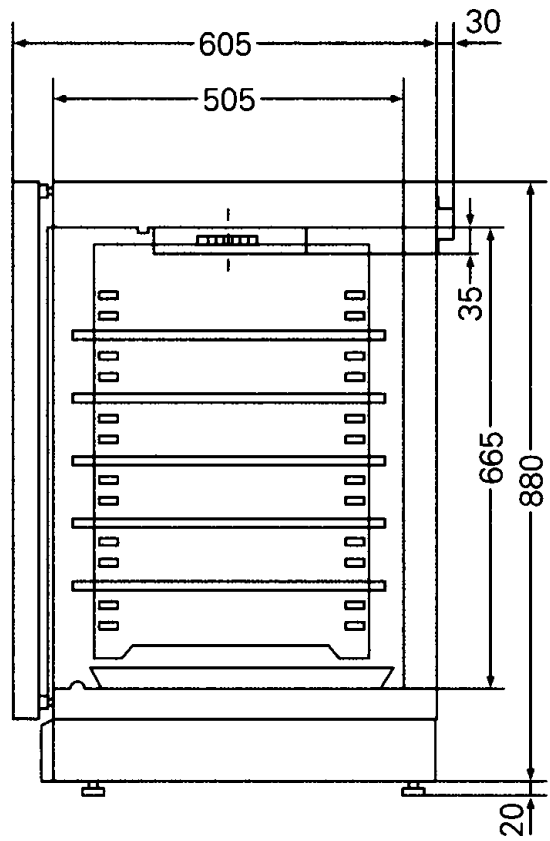
Usable environment condition	0~+35
Temperature control range	Ambient temperature +5 ~+50
Temperature variation	± 0.1
Temperature distribution	± 0.2 *
CO ₂ control range	0~20.0%
CO ₂ variation	± 0.15%*
Chamber humidity	95 ± 5%R.H.
CO ₂ secondary pressure	0.03MpaG (0.3kg/cm ² G)
Maximum power consumption	380W
Noise level	33dB (A scale)

* Value measured at 37 °C, CO₂ density of 5.0%, ambient temperature 20 °C. It is based on SANYO measuring method.

Dimensions



(Unit : mm)



Electrical Parts


MCO-17A,17AC		AC110 ~ 120V, 50/60Hz	AC220 ~ 240V, 50/60Hz
Power transformer	Type	ATR-HN231UT	ATR-HN235T
	Rating	115V 8.5/18.0V	230V 8.5/18.0V
Bottom heater	Type	14.0W (4pcs)	14.0W (4pcs)
	Rating	945 115V	377 115V
Side heater R	Type	22.0W (2pcs)	22.0W (2pcs)
	Rating	601 115V	2404 230V
Side heater L	Type	22.0W (2pcs)	22.0W (2pcs)
	Rating	601 115V	2404 230V
Flange heater	Type	45.0W	45.0W
	Rating	294 115V	1176 230V
Back heater	Type	23.0W	23.0W
	Rating	586 115V	2344 230V
Front heater	Type	35.0W	23.0W
	Rating	378 115V	1511 230V
Door heater	Type	120.0W	120.0W
	Rating	110 115V	441 230V
Door heater (sub2)	Type	17.0W	14.0W
	Rating	945 115V	3779 230V
Door heater (sub3)	Type	17.0W	14.0W
	Rating	945 115V	3779 230V
Fan motor	Type	FL2-011Y1M	FL2-011Y5M
	Rating	1 110V 50/60Hz	1 230V 50/60Hz
Power switch	Type	AJ921000B	AJ921000B
	Rating	AC250V 16A	AC250V 16A
Noise filter	Type	ZCE2203-11	ZCE2203-11
	Rating	AC250V 3A 50/60Hz	AC250V 3A 50/60Hz
Solenoid valve	Type	FAB11-X1528	FAB11-X1528
	Rating	Coil: DC24V 1.8W	Coil: DC24V 1.8W
Temperature control sensor (Thermistor sensor)	Type	103-AT1	103-AT1
	Rating	10k	10k
Overheat protect sensor (Thermistor sensor)	Type	103-AT1	103-AT1
	Rating	10k	10k
AT sensor (Thermistor sensor)	Type	103-AT1	103-AT1
	Rating	10k	10k
P.C.B.	Type	CO-17AI	CO-17AI
Door switch	Type	SS160-A15	SS160-A15
CO ₂ sensor	Type	HS-3C-S2	HS-3C-S2
	Rating	100% 100mV	100% 100mV


Control specifications

1. Key and switch

BUZZER: When number is flashing and the buzzer does not sound,
 Buzzer and remote alarm output —————> Forced ON
 When number is flashing and the buzzer sounds,
 Buzzer and remote alarm output —————> Forced OFF

SET : The first time you press SET the apparatus goes into temperature setting mode.
 The second time into CO₂ density setting mode, the third time into excessive temperature rise prevention/checking mode, and the forth time it reverts to internal temperature display mode.

 : When you press this key in setting mode the highlighted number changes from/to the tens place, one place and the tenths place. Also, holding this key down for about 5 seconds in internal temperature display mode activates key lock mode.



 : Press this key in setting mode to increase the flashing number.

CAL : Hold this key down for about 5 seconds in internal temperature display mode to switch into temperature calibration mode. Press it once again to switch to CO₂ calibration mode. Also keying in FXX in temperature calibration mode switches to function mode.

ENT : Press this key in setting mode, CAL mode and Function mode to memorize the number.

2. Temperature control

Setting range : 0 ~ +50

Setting method : Press SET key once, and set temperature using  key and  key. When you press ENT key, the temperature setting is memorized and the apparatus goes into CO₂ setting mode.



Outside permitted range: If you key in a temperature outside the setting range and press ENT, the buzzer sounds (for about 1second continuously) and it stays in temperature setting mode.

Control : PID control

Alarm : If the internal temperature is 1 higher/lower than setting, the number flashes and after a delay of 15minutes the buzzer comes on.

3. CO₂ control

Setting range : 0%~20%

Setting method : Press SET key twice to set CO₂ density with  key and  key. When you press ENT key to memorize the CO₂ setting and the apparatus goes into excessive temperature rise prevention/checking mode.

Out of permitted range: If you key in a figure outside the setting range and press ENT, the buzzer sounds (for about 1second continuously) and it stays in CO₂ setting mode.

- Control : ON-OFF type
(Valve is closed if the CO₂ density is setting –0.02% or higher, opens if it is setting –0.06% or lower)
- Control OFF : If you set it at 0.0%, the CO₂ density display vanishes and control is OFF.
- Alarm : If the CO₂ density is 1% higher/lower than the setting, the number flashes and after a delay of 15minutes the buzzer and remote output come on.

4. Excessive temperature rise prevention / checking

Setting range : +35 ~ +51

Setting method : Press SET key 3times to display excessive temperature rise prevention setting in temperature display and “HI” in CO₂ display. This setting value can be changed by tuning the volume.
When you press SET key again to revert the apparatus to internal temperature display mode.

5. Self-diagnostic function



In sensors are malfunctions or CO₂ cylinder is detected empty, an error code and the temperature are displayed alternately. Also the buzzer and remote alarm output come on.

<Error codes>

- E01: CO₂ cylinder empty
- E02: Internal temperature sensor wiring open-circuiting or short-circuiting
- E03: CO₂ sensor output abnormality
- E04: Ambient temperature sensor wiring open-circuiting or short-circuiting

Note) If 2 errors occur (2error codes are generated) simultaneously, only the code for the one with the bigger number is displayed.

6. Lock function

Key lock mode : To switch to lock mode, hold the  key (shift key) down for about 5 seconds when the current internal temperature is being displayed.
When lock mode is activated “L0” is displayed in the temperature display
Press  key to change the key lock status:
L1 Key lock ON
L0 Key lock OFF

Note) Press ENT to memorize the current condition and revert to internal display mode.

7. Door alarm

Display : When the door is open DOOR lamp ON
When the door is closed DOOR lamp OFF



Safety operation : When the door is open, the fan motor is turned off, the CO₂ valve is closed, and if it stays open for more than 60seconds the heater is also turned off.

8. Auto return function



If no keys are pressed for 90 seconds in setting mode, lock mode or function mode, the apparatus automatically exits these modes.

9. Calibration function

Temperature : Hold the CAL key down for about 5 seconds in internal temperature display mode to switch into temperature calibration mode.

When you input the correct temperature using the  and  keys and press ENT key, the temperature is memorized and the incubator reverts to internal temperature display mode.

CO₂ : To activate CO₂ calibration mode, hold the CAL key down for about 5 seconds in internal temperature display mode to switch to temperature calibration mode, and then press the CAL key once more.

<Zero adjustment> If you then key in 00.0 using the  and  key and press ENT key, the apparatus memorizes the current internal concentration detected, calls it 0.0%, and it reverts to internal temperature display mode.

 Alternatively, if you key in correct concentration when CO₂ control is operational and press ENT, it memorizes this as the span calibration value and reverts to internal temperature display mode.

10. Function mode

Function mode incorporates the following functions:

- F00: A ROM version display
- F01: Demo (demonstration) mode setting
- F02: Humidity heater degree of energizing set
- F03: Temperature analogue output calibration
- F04: CO₂ analogue output calibration
- F05: CO₂ sensor output voltage (A/D input) display
- F06: Ambient temperature display
- F09: Memory initialization

Direction for use: In internal temperature display mode, hold the CAL key down for about 5 seconds to switch to temperature calibration mode. Key in desired function code in temperature display section and press ENT key.

F00: Displays a ROM version in the CO₂ display.

F01: Sets demo mode.

Key in X1X in the CO₂ display and press ENT to go into demo mode.

In demo mode, the settings are displayed continuously, and energizing of the heater/valve stops. Also, all alarms are cancelled.

To exit demo mode, key in X0X and press ENT.

(X= any number)

F02: Sets degree of energizing for humidity heater's main heater

Key in a number between 0 and 9 after the decimal point in the CO₂ display and press ENT key. The bigger the number you key in, the greater the degree of energizing, the higher the internal humidity.

F03: Calibrates the temperature analogue output

Key in a number twice of actual temperature analogue output voltage in the CO₂ display and press ENT key.

- F04: Calibrates the CO₂ analogue output
Key in a number of actual CO₂ analogue output voltage in the CO₂ display and press ENT key.
- F05: Displays the CO₂ sensor input voltage (A/D input)
Displays the CO₂ sensor input voltage in the display. Unit = <V>
- F06: Displays ambient temperature
Indicates the present temperature sensor.
- F09: Initializes the CO₂ calibration value and the non-volatile memory
Key in XX5 in the CO₂ display and press ENT key to initialize the CO₂ zero adjustment value and the span adjustment value.
Key in XX9 in the CO₂ display and press ENT key to initialize all the data in the non-volatile memory.

The initial values in the non-volatile memory are as follows:

Temperature setting	37.0
CO ₂ setting	0.0%
Humidity heater balance	4
Temperature Zero Adjustment data	0.0
CO ₂ Zero adjustment data	0.0
CO ₂ span data	1.0
Temperature analogue calibration value	220
CO ₂ Analogue calibration value	110
Key lock data	Key lock OFF
Demo data	Demo OFF

This function is used when non-volatile data has been destroyed as a result, for example, of unavoidable noise, and cannot be repaired/recovered. Hence, it is not used in normal circumstances.

11. Humidifying heater control

The humidifying heater is energized, as described below, in order to reduce humidity recovery time. If the internal temperature is between SV-0.4 and SV-0.8 degrees, the humidifying heater is energized continuously for a maximum of 1 minute. In all other circumstances, it is energized according to the degree of energizing set using F02.

However, it is not energized continuously in the following circumstances:

- 1) After the power is switched on, until the internal temperature reaches the (-0.2 degrees) setting.
- 2) After the door has been open for more than 60 seconds, until the internal temperature reaches the (-0.2 degrees) setting.

12. Offset

In order to compensate for the difference between the temperature detected by the temperature control sensor and center of internal chamber temperature, the following offset is applied:

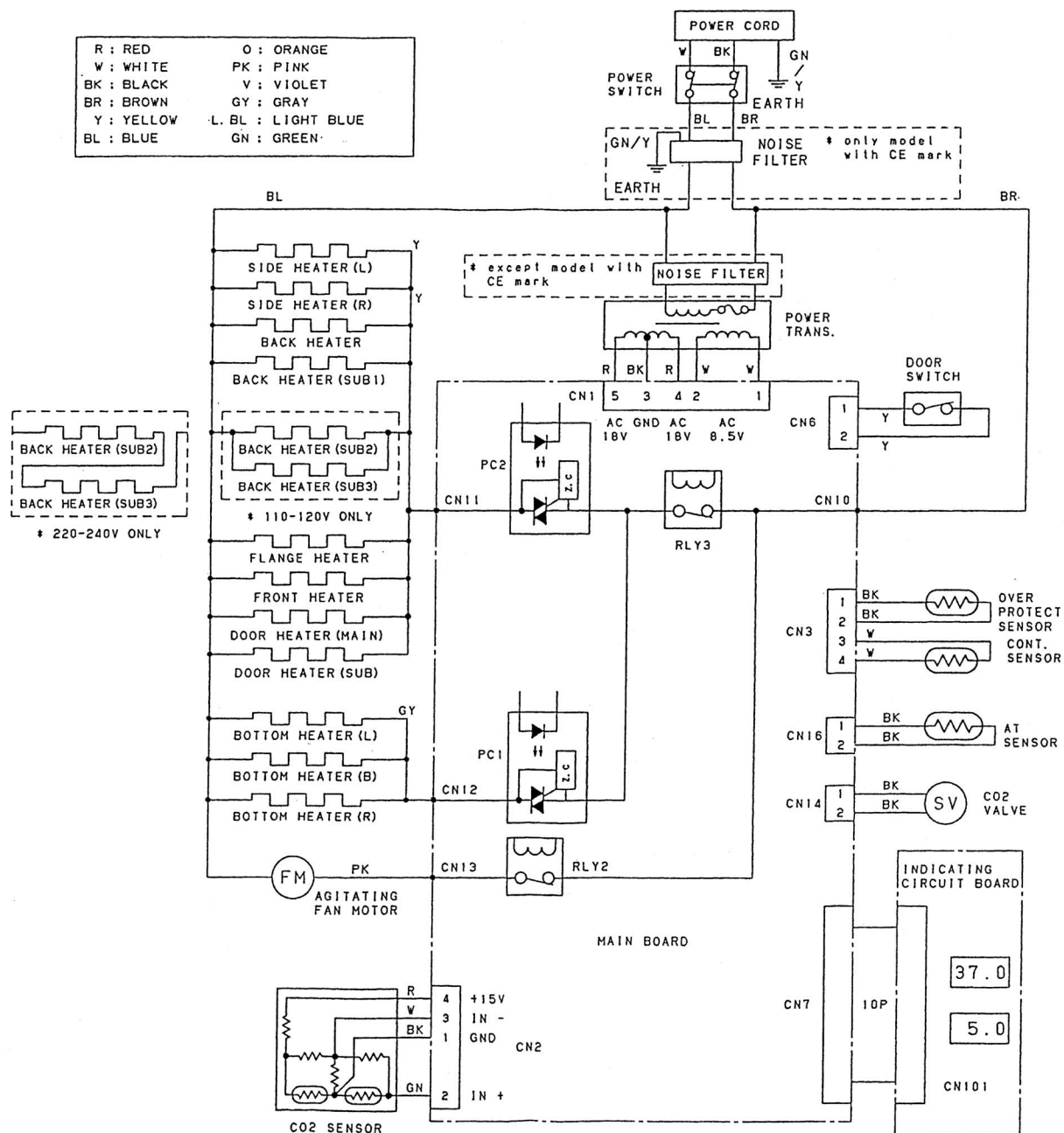
Detected temperature + 0.4 degrees

13. Remote alarm

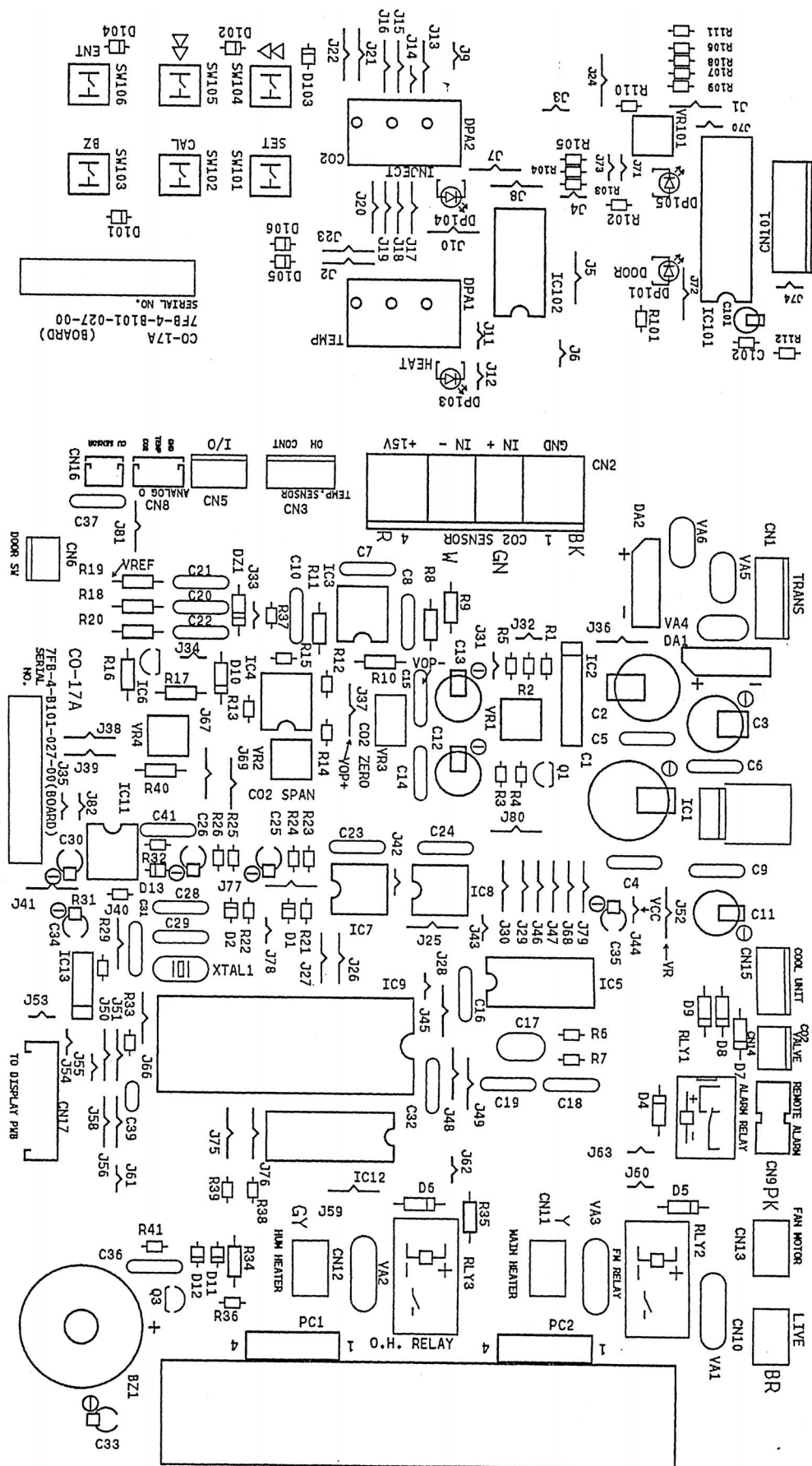
In normal circumstances Remote alarm contact is OPEN

In alarm or power failure Remote alarm contact is CLOSE

Circuit diagram



Components on PCB



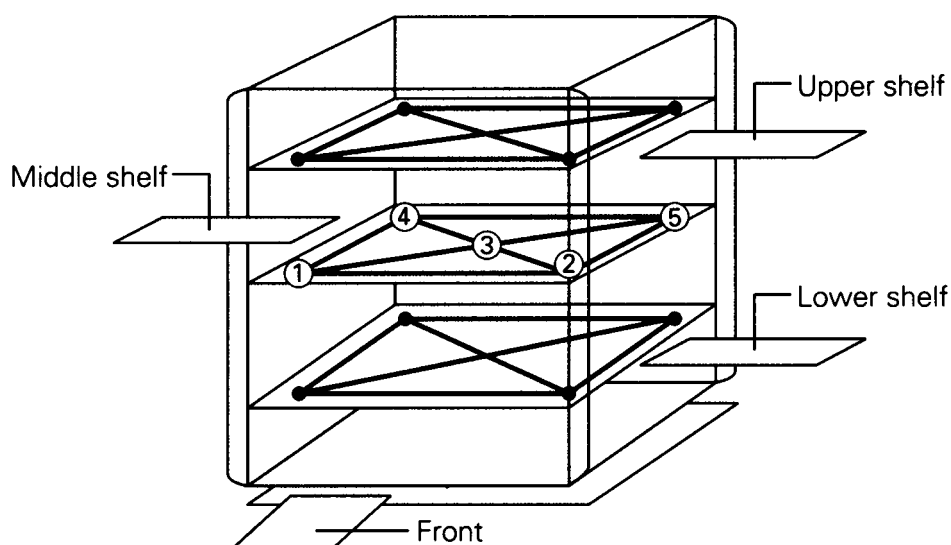
Specification of sensor

The following shows temperature and resistance characteristics on thermistor sensor 103AT-1.

Temperature ()	Resistance (k)	Temperature ()	Resistance (k)	Temperature ()	Resistance (k)
0	27.28	17	13.57	34	7.19
1	26.13	18	13.06	35	6.94
2	25.03	19	12.56	36	6.70
3	23.99	20	12.09	37	6.47
4	22.99	21	11.63	38	6.25
5	22.05	22	11.20	39	6.03
6	21.15	23	10.78	40	5.83
7	20.29	24	10.38	41	5.63
8	19.48	25	10.00	42	5.44
9	18.70	26	9.63	43	5.26
10	17.96	27	9.28	44	5.08
11	17.24	28	8.94	45	4.91
12	16.55	29	8.62	46	4.75
13	15.90	30	8.31	47	4.59
14	15.28	31	8.02	48	4.44
15	14.68	32	7.73	49	4.30
16	14.12	33	7.46	50	4.16

Test data

• Temperature uniformity



Test condition

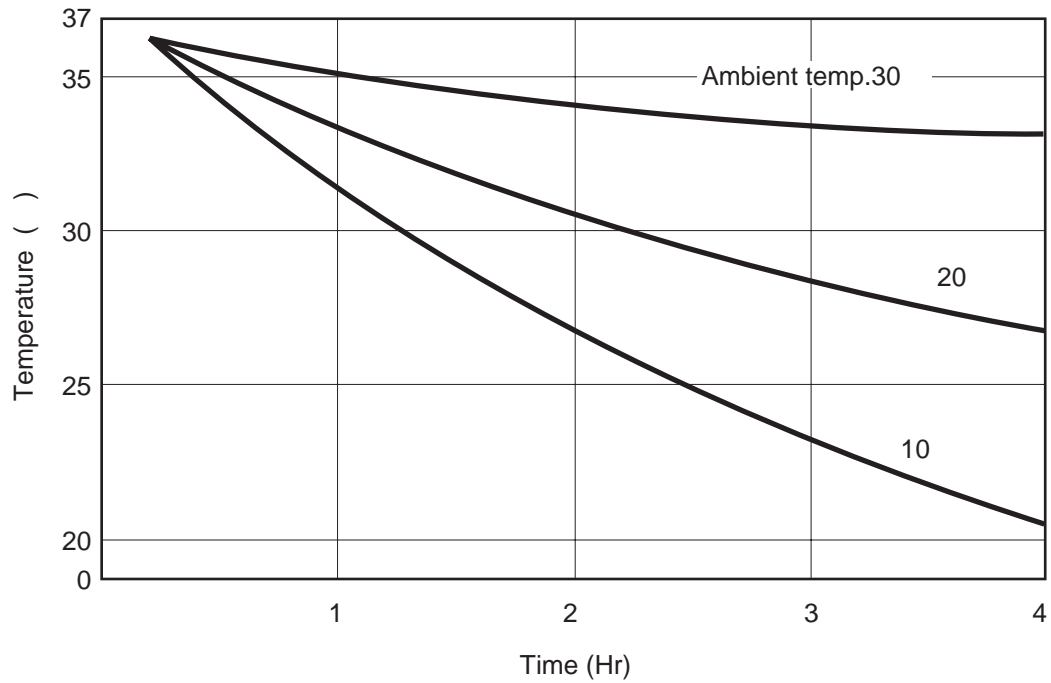
- Ambient temperature :20
- Ambient humidity :45%RH
- CO₂ level setting :5.0%
- Water in humidity pan :2 ▪

Measurewens Shelf position position					
Upper Shelf	+ 0.03	+ 0.14	0.00	- 0.15	+ 0.05
Middle Shelf			0.00		
Lower Shelf	- 0.15	- 0.13	- 0.18	- 0.13	+ 0.05

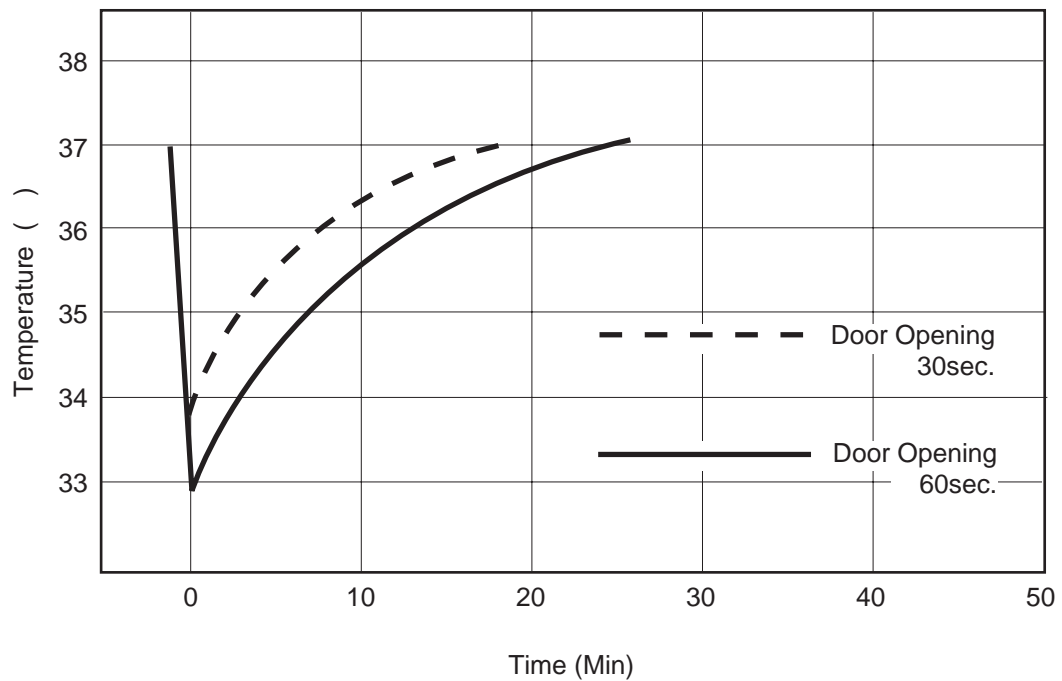
Note: This data does not represent a guarantee of product performance.

Test data

Temperature decrease characteristics when power failure occurs

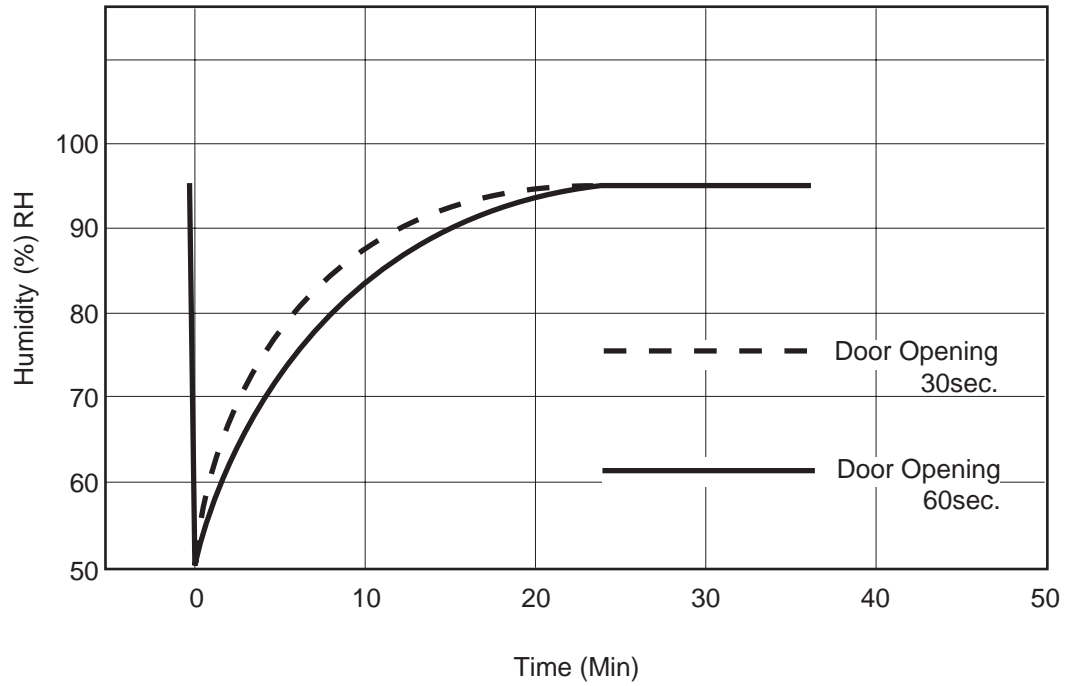


Temperature Recovery Characteristics

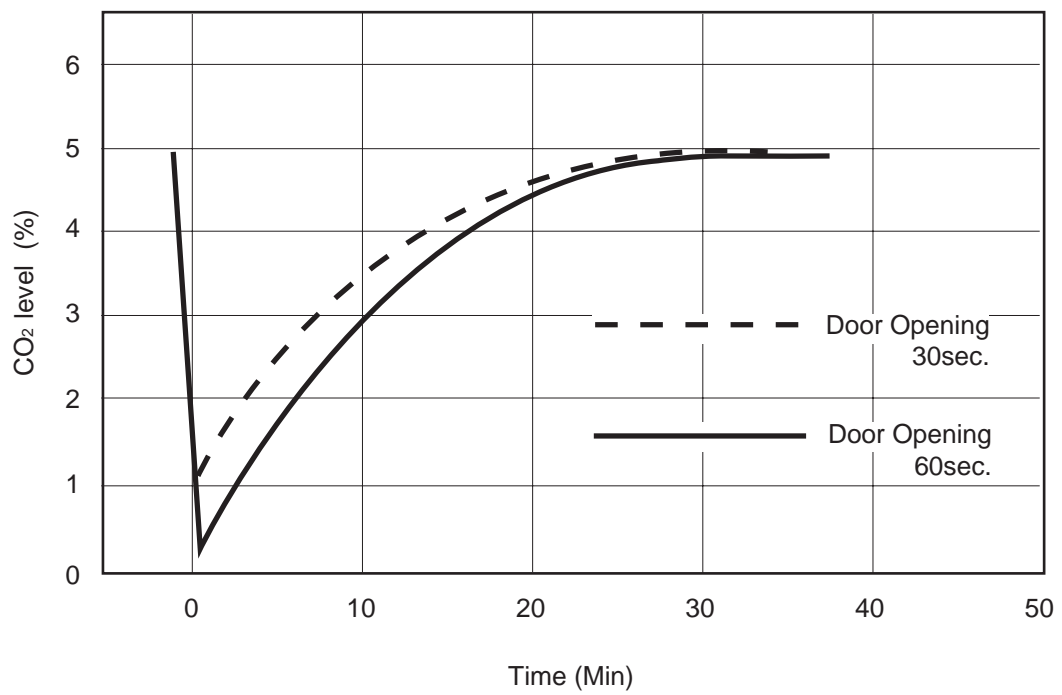


Test data

Humidity Recovery Characteristics



CO₂ level Recovery Characteristics



Instruction manual

- This section is extracted and printed from Instruction Manual.
- If you find out “Refer to page ” in them, this page means not page in service manual but page in the lower corner of each page in the extract from Instruction Manual.
This page number is not corresponded with serial number in Service Manual.