

Amerex Instruments, Inc.

IncuMax™ Refrigerated Incubator

Model IC150R

Operation/Service Manual

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IncuMax™ Refrigerated Incubator

Model IC150R

With

PFY 700 Microprocessor Temperature Controller

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1. INTRODUCTION

Thank you for purchasing an incubator from Amerex Instruments, Inc. Please read this manual carefully before using the instrument.



IncuMax™ IC150R refrigerated incubator from Amerex features a PID microprocessor controller (PFY 700 allows for 8 programmable segments) and an efficient forced-air circulation system that provides both exceptional temperature uniformity and rapid heat recovery throughout its stainless steel chamber. It is suitable for applications above or below the ambient temperature. An electrical outlet enables small laboratory equipment to be operated inside the chamber.

The 1.5" double-paned glass window has an opaque sliding panel to block light from entering the chamber for applications involving light-sensitive materials. Two adjustable shelves are included.

2. INSTRUMENT CONTROL PANEL

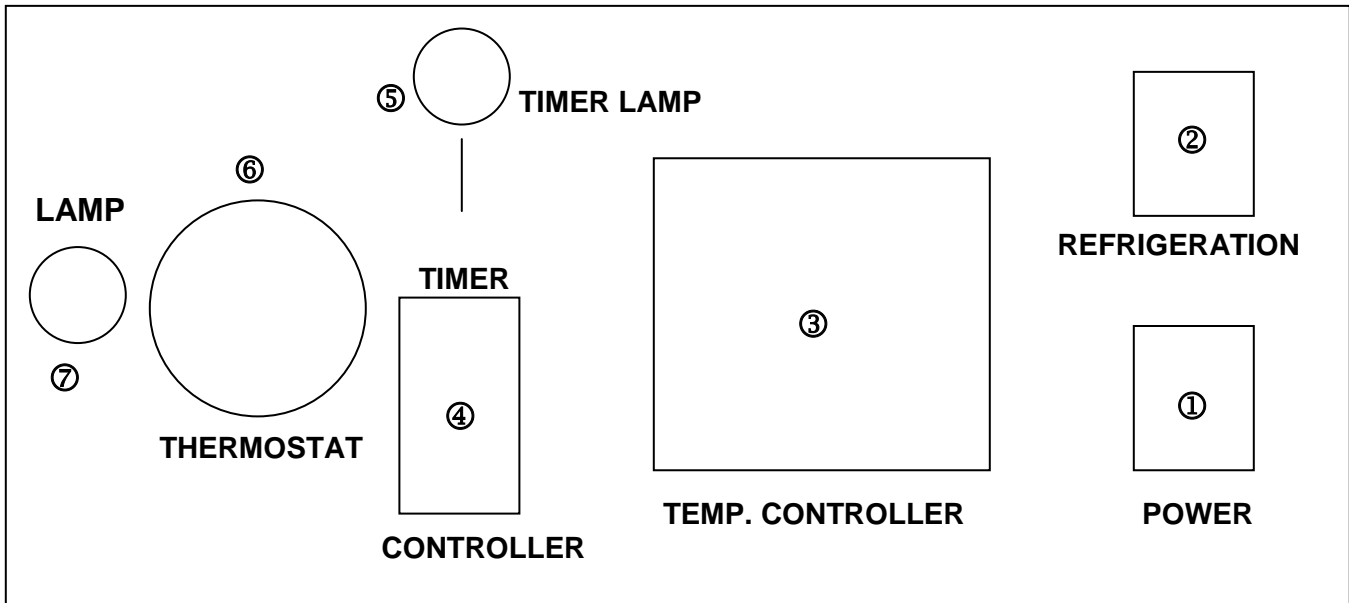


Figure 1. Control Panel

- ① Power switch
- ② Refrigeration switch
- ③ Microprocessor controller
- ④ Switch for selecting continuous mode or the timer mode
- ⑤ Timer lamp lights up when the set time for heating has elapsed
- ⑥ Thermostat for setting upper limit of the chamber temperature
- ⑦ Thermostat lamp – turns on when the chamber temperature exceeds the temperature set by the thermostat

2. INSTRUMENT CONTROL PANEL–CONT'D

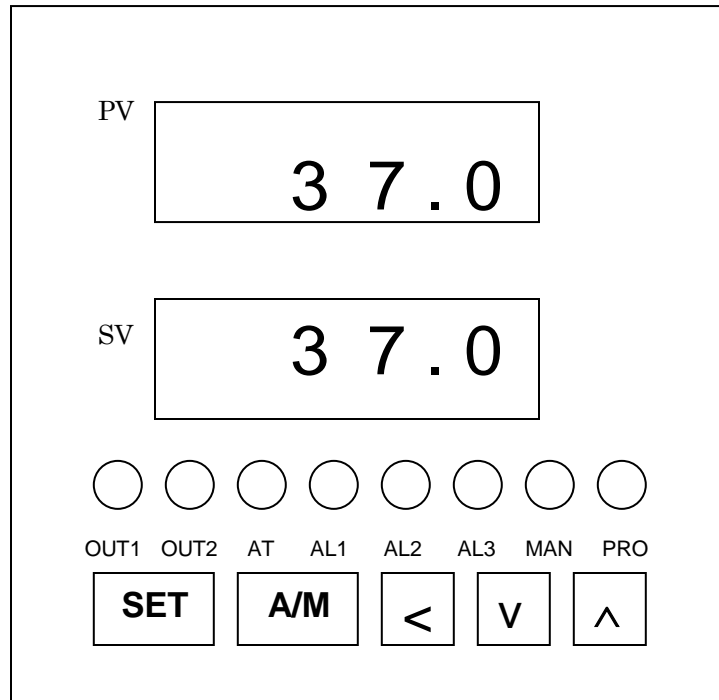


Figure 2. Microprocessor Temperature Controller

- PV Measured process value display. Also displays various parameter symbols depending on the instrument.
- SV Set value display. Also displays various set parameter values depending on the instrument.
- OUT1 Control output lamp. Lights when control output heater is turned on.
- OUT2 Control output lamp – may not be used.
- AT Autotuning lamp flashes during autotuning.
- AL1 Alarm output lamp. Lights when the compressor is ready to turn on, but this may be delayed by the setting on the delay timer.
- AL2 Alarm output lamp. When the compressor switch is off, lights when temperature has reached the AL2 set point. When the compressor switch and the compressor is on, lights the temperature has reached the AL2 set point and the compressor turns off.
- AL3 Alarm output lamp – may not be present.
- MAN Ignore
- PRO Programming lamp flashes when a program is running and lights up when program pauses.
- SET Set key. To lock or store parameters. Also, used to access parameters.
- A/M Ignore.
- < Shift key. To shift the digit when a parameter is changed or to access parameters.
- v DOWN key. To decrease the value of digits. Also used to PAUSE a program. When v + SET are pressed at the same time, program will stop and RESET (PRO will be off).
- ^ UP key. To increase the value of digits. Also used to START a program or continue a program that has been previously paused (PRO will start to flash).

3. INSTALLATION

- 3.1 Before plugging power cord into an electric outlet, make sure all switches are off. Plug the power cord into a 120V, 10A (or higher) grounded electric outlet (220V, 5A or higher for international models).
- 3.2 Place the incubator on a firm and level ground or benchtop, and at least several inches away from the wall.
- 3.3 Two shelves are included with the incubator. Place the shelf supports into the appropriate slots on the four shelf support strips on the left and the right sides of the chamber. Each shelf is supported by shelf support. Then, put the shelves on the shelf supports.

4. OPERATION

4.1 Setting the Temperature

4.1.1 The temperature can be set using the 8 programmable segments of the temperature controller. Each segment consists of two steps – one for RAMP (changing the temperature up or down) and the other for SOAK (holding the temperature when it has reached the set point). Thus, there are a total of 4 linked RAMP and SOAK temperatures that can be programmed. The eight segments are linked and executed sequentially, but can be programmed to terminate at any given point.

Figure 3. Programming Temperature Controller Parameters:

PV/SV	Chamber temperature/Set temperature
AL2	Defined on page 5, Figure 2
Ptn	1 – Pattern #1
SEG	Current segment (1_1 through 1_8, 1_0 after reset)
timr	Programmed time or time left remaining in current running segment
SU_1	Temperature for segment 1/ RAMP #1
tm_1	Duration for segment 1/ RAMP #1
Out_1	Stop program or run segment 1/ RAMP #1 , Input 0.0 to stop and 100.0 to run or continue for all Out_x.
SU_2	Temperature for segment 2/ SOAK #1
tm_2	Duration for segment 2/ SOAK #1
Out_2	Stop program or run segment 2/ SOAK #1
SU_3	Temperature for segment 3/ RAMP #2
tm_3	Duration for segment 3/ RAMP #2
Out_3	Stop program or run segment 3/ RAMP #2
SU_4	Temperature for segment 4/ SOAK #2
tm_4	Duration for segment 4/ SOAK #2
Out_4	Stop program or run segment 4/ SOAK #2
SU_5	Temperature for segment 5/ RAMP #3
tm_5	Duration for segment 5/ RAMP #3
Out_5	Stop program or run segment 5/ RAMP #3
SU_6	Temperature for segment 6/ SOAK #3
tm_6	Duration for segment 6/ SOAK #3
Out_6	Stop program or run segment 6/ SOAK #3
SU_7	Temperature for segment 7/ RAMP #4
tm_7	Duration for segment 7/ RAMP #4
Out_7	Stop program or run segment 7/ RAMP #4
SU_8	Temperature for segment 8/ SOAK #4
tm_8	Duration for segment 8/ SOAK #4
Out_8	Stop program or run segment 8/ SOAK #4

4.2 Setting a Single Temperature Run at 37°C (without using refrigeration)

- 4.2.1 Press **v** to pause any running program. Press and hold **v** and then SET together to reset (PRO will turn off). Make sure the refrigeration switch is OFF.
- 4.2.2 To begin programming each segment, press SET. The display will change to AL2.
- 4.2.3 Press SET to scroll through Ptn, SEG, and timr to SU_1.
- 4.2.4 Input 37.0 for SU_1 and press SET.
- 4.2.5 Input 00.05 for tm_1 (same for tm_3, tm_5 and tm_7).
- 4.2.6 Input 100.0 for Out_1 to continue.
- 4.2.7 Input 37.0 for SU_2. This is your set point for the run.
- 4.2.8 Input tm_2 for the duration of your set point of 37.0. The maximum is 99 hours and 59 minutes.
- 4.2.9 Input 100.0 for Out_2 to continue and execute 4.2.7 and 4.2.8.
- 4.2.10 Scroll through SU_3 and tm_3 to Out_3. Input 0.0 to stop the program after completion of 4.2.7 and 4.2.8. **Note:** To link additional RAMP and SOAK segments, see 4.4.
- 4.2.11 Press SET to scroll through the rest of the parameters and return to the home display (chamber and set temperatures in PV/SV).
- 4.2.12 Finally, press **^** to start the program (PRO will flash).
- 4.2.13 SV will begin to count from 0 and then display the SU_1 or RAMP #1 temperature of 37.0. PV will display "Wait" until the chamber temperature is within 1°C of the set temperature. At 36°C, "Wait" will disappear and segment 2 or SOAK #1 will begin.
- 4.2.14 When the time in tm_2 has elapsed, PV will display "End" in the home display. The single temperature run is completed. The heater will turn off and the chamber temperature will naturally cool to room temperature.

Example 1: A programmed run at 37°C for 23 hours and 59 minutes.

Perform steps 4.2.1 to 4.2.3 and then input:

SU_1	37.0
tm_1	00:05
Out_1	100.0
SU_2	37.0
tm_2	23:59
Out_2	100.0
SU_3	37.0 (arbitrary as the program will end after segment 2)
tm_3	01:00 (arbitrary as the program will end after segment 2)
Out_3	0.0 (stops the program after segment 2 is finished)

Perform 4.2.11 and 4.212 to start.

Example 2: A programmed run at 37°C for 129 hours and 59 minutes.

Perform steps 4.2.1 to 4.2.3 and then input:

SU_1	37.0
tm_1	00:05
Out_1	100.0
SU_2	37.0
tm_2	99:59
Out_2	100.0
SU_3	37.0
tm_3	00:05
Out_3	100.0
SU_4	37.0
tm_4	30:00
Out_4	100.0
SU_5	37.0 (arbitrary as the program will end after segment 4)
tm_5	30:00 (arbitrary as the program will end after segment 4)
Out_5	0.0 (stops the program after segment 2 is finished)

Perform 4.2.11 and 4.212 to start.

4.3 Setting a Single Temperature Run at 28°C (using refrigeration)

Example 3: A programmed run at 28°C for 48 hours

Perform steps 4.2.1 to 4.2.3, but with the refrigeration switch turned ON, and then input:

SU_1	28.0
tm_1	00:05
Out_1	100.0
SU_2	28.0
tm_2	48:00
Out_2	100.0
SU_3	28.0 (arbitrary as the program will end after segment 2)
tm_3	01:00 (arbitrary as the program will end after segment 2)
Out_3	0.0 (stops the program after segment 2 is finished)

Perform 4.2.11 and 4.2.12 to start.

When the programmed run has been completed, “End” will flash in the PV display along with the chamber temperature. Because the last segment run is a temperature using the compressor, the heater will turn off but the compressor will remain on. Thus, the temperature will go down below 28°C (actually below -5°C when nnn1 will be displayed), and samples may freeze. Turn the refrigeration switch OFF. Whenever a cooled chamber warms up to room temperature, condensation will form inside the chamber. If the incubator will not be used subsequently, to dry out the condensation, set a single run for at least 4 hours by pressing **v** first and then holding **SET** at the same time to first reset. Then set a single temperature run at 37°C as in Example 1 for 4 hours to dry out the condensation.

4.4 Setting a Linked Temperature Run

To program a linked temperature run up to 4 different temperatures, enter the values as in 4.2. Enter 0.0 in the Out segment after the last segment you want run. If you want to run all 8 programmable segments, enter 100.0 in Out_8, and the 8th segment will be completed after which the program will end. Press \wedge key to start the run.

Example 4: A programmed run at 37°C for 24 hours and then 4°C for 99 hours.

SU_1	37.0
tm_1	00:05
Out_1	100.0
SU_2	37.0
tm_2	24:00
Out_2	100.0
SU_3	4.0
tm_3	00:05
Out_3	100.0
SU_4	4.0
tm_4	99:00
Out_4	100.0
SU_5	4.0 (arbitrary as the program will end after segment 4)
tm_5	99:00 (arbitrary as the program will end after segment 4)
Out_5	0.0 (stops the program after segment 2 is finished)

When the programmed run has been completed, “End” will flash in the PV display along with the chamber temperature. Because the last segment run is a temperature using the compressor, the heater will turn off but the compressor will remain on. Thus, the temperature will go down below 4°C (actually below -5°C when nnn1 will be displayed) Thus, the temperature will go down below 28°C (actually below -5°C when nnn1 will be displayed), and samples may freeze. Turn the refrigeration switch OFF. Whenever a cooled chamber warms up to room temperature, condensation will form inside the chamber. If the incubator will not be used subsequently, to dry out the condensation, set a single run for at least 4 hours by pressing \vee first and then holding SET at the same time to first reset. Then set a single temperature run at 37°C as in Example 1 for 4 hours to dry out the condensation.

4.5 Setting the Thermostat

- 4.5.1 In case of a failure of the microprocessor controller or the temperature sensor, the chamber could over-heat. The thermostat and its independent temperature sensor is a safety device to ensure that the chamber temperature never exceeds the set temperature by more than a desired several degrees above the set temperature. In other words, it functions as a backup electronic controller if the primary controller fails, thereby preventing overheating and loss of the sample.
- 4.5.2 To set the thermostat, turn the thermostat knob to about 20°C above the temperature set by the controller. For example, if the set temperature is 37.0°C, turn the thermostat up to about 57°C. The thermostat lamp is off because the thermostat is set at a temperature higher than 37°C.
- 4.5.3 When the chamber temperature has stabilized and is equal to the controller set temperature, slowly turn the thermostat knob anti-clockwise until the thermostat lamp lights up. At this position of the knob, the thermostat temperature setting is at just under 37°C. **Note:** It is necessary to do this because the temperature indicated by the markings on the knob may not be accurate.
- 4.5.4 Next, turn the thermostat knob clockwise and increase the temperature by about 3°C. The lamp goes off and the thermostat is now set at about 40°C, and this is the maximum temperature for the chamber because the heater will turn off if this temperature is exceeded in case the controller or its associated sensor fails.

5. GENERAL MAINTENANCE

5.1 Cleaning

- 5.1.1 Remove the power cord from the electric outlet before cleaning the chamber or if the shaker will not be used for a prolonged period of time.
- 5.1.2 Clean the exterior cabinet with soap and water, or with any non-abrasive spray cleaner. Do not press too heavily on the window pane. Clean it with a soft paper towel.
- 5.1.3 Clean the chamber and accessories inside with a neutral cleaner.
- 5.1.4 If spillage occurs, clean it immediately as described above. **CAUTION:** If a volatile or flammable solvent is used in the cleaning or decontamination, let the incubator air out overnight or at least 12 hours with the door opened before using it.
- 5.1.5 Once a year, remove the front grille and vacuum or blow off the dust that has accumulated on the condenser.

6. CALIBRATION OF TEMPERATURE DISPLAY

The set and display temperature of the temperature controller should be the same. If the measured temperature differs from the set temperature, you can make them to be equal by doing a calibration which involves changing a controller off-set parameter.

- 6.1 Set the temperature at 37.0°C and wait for at least 30 minutes for the temperature to stabilize. Compare the display temperature with the chamber temperature you measured.
- 6.2 Press SET, hold it for several seconds until the display changes to P1.
- 6.3 Press SET several times to scroll down to the parameter LCK. If this parameter is not 0000, use the appropriate <, v, and ^ keys, to change the value of LCK to 0000. Then press SET to lock it in. The value of 0000 for LCK means that you can now change the other Level 1 parameters, and you can do so by scrolling through each parameter and using the appropriate <, v, and ^ keys.
- 6.4 Press SET after changing each parameter to lock it in.
- 6.5 Press SET and < and hold them simultaneously for 5 seconds or longer until the display changes.
- 6.6 Press SET several times to scroll down to PUOS. Using <, v, and ^, change the value of PUOS to the desired calibration value as follows: If set temperature is 37.0°C, and the actual (measured) chamber temperature is 37.2°C, then increase the value of PUOS by 0.2°C. For example, if the PUOS value is initially at 0.7°C, increase it to by 0.2°C to 0.9°C. If it is initially at -0.5°C, increase it by 0.2°C to -0.3°C. Similarly, if set temperature is 37.0°C, and the actual (measured) chamber temperature is 36.5°C, decrease the value of PUOS by 0.5°C. Press SET to lock in the value after the change. (Mnemonic: HIGHER chamber temperature, INCREASE value of PUOS, LOWER chamber temperature, decrease value of PUOS). Exit by pressing SET and < simultaneously for 5 seconds or more.
- 6.7 Change LCK back to its original value. Then press and hold SET for a few seconds to exit, or turn the power switch OFF and ON to return to the normal temperature display. (**Note:** Do not turn off the power switch if the compressor is on).

7. TROUBLESHOOTING GUIDE

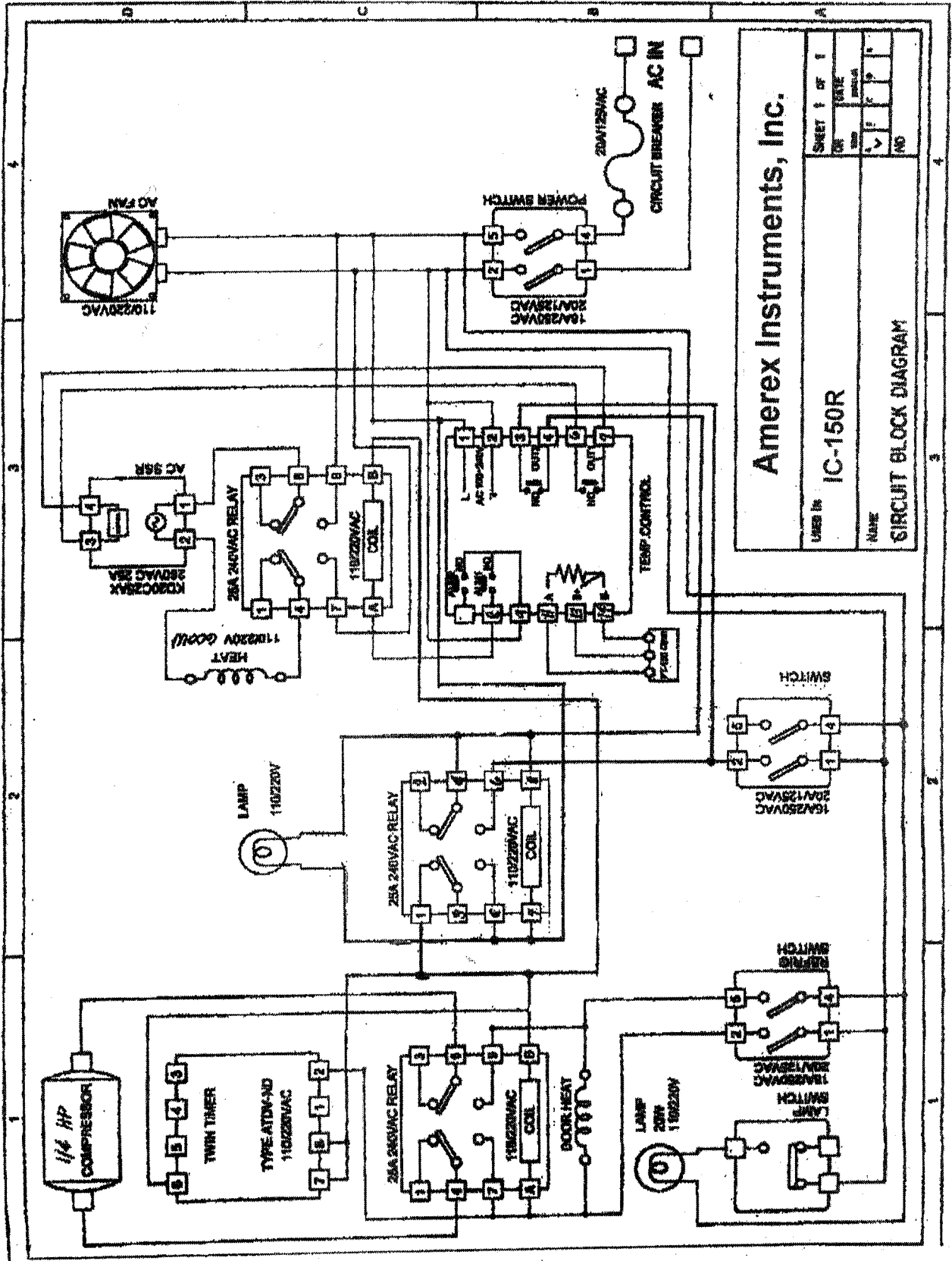
<u>Problem</u>	<u>Possible Cause</u>	<u>Remedy</u>
Power switch is on, but display temperature shows zeros or a value that is clearly not the ambient temperature.	Temperature controller or temperature sensor is defective.	Replace the temperature controller or sensor.
Power switch is on, but lamp does not light.	Defective switch.	Replace.
	Switch connection is bad.	Push switch repeatedly.
	No power to switch.	Check wiring to switch and cable plug connection.
	Insufficient voltage.	Check voltage outlet.
	Fuse has jumped.	Check voltage, reset fuse.
Heater signal lamp does not light after setting temperature with selector.	Chamber temperature is higher than set temperature.	Open door to cool.
	Signal lamp is shorted.	Repair and change lamp.
	Temperature controller is defective.	Replace.
Heater signal lamp lights, but temperature does not rise.	Heater is disconnected or burned out.	Check and replace heater.
	Problem with heater circuit.	Repair.
	Problem with temperature control circuit.	Repair.
	Solid state relay is defective.	Replace.
Temperature continues to rise above set point.	Temperature controller is defective.	Replace.
	Solid state relay is defective.	Replace.

7.1 Temperature Control–Cont’d

<u>Problem</u>	<u>Possible Cause</u>	<u>Remedy</u>
Temperature does not decrease when the refrigeration switch is on	Compressor is not turning on.	Check compressor and the starter.
	Compressor is on, but there is no cooling.	Check refrigerant and recharge. Replace the compressor.
Temperature fluctuates too much.	Temperature sensor is defective.	Replace.
	Temperature is set too close to the ambient temperature.	Operate at higher temperature, or turn on the compressor.
	Temperature controller is defective.	Replace.
	Circulating fan doesn't turn.	Replace fan motor.
	Controller needs auto-tuning.	Perform auto-tuning.

IF THERE ARE OTHER PROBLEMS, CONTACT AMEREX INSTRUMENTS AT (925) 299-0743/(888) 263-7392, FAX: (925) 299-0745, E-MAIL: marketing@amerexinst.com, OR YOUR MANUFACTURER'S REPRESENTATIVE.

8. CIRCUITRY



Amerex Instruments, Inc.

IC-150R

SHEET 1 OF 1

DATE	REV.	NO.	NO.

NAME

CIRCUIT BLOCK DIAGRAM

9. SPARE PARTS LIST (*specify voltage)

CATALOG NO.	DESCRIPTION
ICA-CM	*Circulation motor
ICA-CFT	Circulation fan, top
ICA-CFB	Circulation fan, bottom
ICA-150HA	*Heater assembly for IC150R
ICA-HR	*Relay for heater
ICA-TR	*Relay for timer
ICA-SSR	Solid state relay
ICA-TC-PFY700	Temperature controller, model PFY 700
ICA-TS	Temperature sensor
ICA-150S	Extra shelf of IC150R, two supplied with incubator