

École Normale Supérieure
61, avenue du Président Wilson
94230 CACHAN
LABORATOIRE DE PHYSIQUE

ENSC 411

SYBRON | Thermolyne

LT211X3

**OPERATING INSTRUCTIONS
AND
PARTS LIST FOR
F-21100
TUBE FURNACE**

MODEL F-21110	SERIES 211	240 VOLT	50/60 HZ
MODEL F-21115	SERIES 211	120 VOLT	50/60 HZ
MODEL F-21120	SERIES 211	240 VOLT	50/60 HZ
MODEL F-21125	SERIES 211	120 VOLT	50/60 HZ

The care you take in reading and following these instructions will very probably determine the satisfaction and service you receive from your furnace.

INSTALLATION:

INSTALL YOUR THERMOLYNE TUBE FURNACE BY PLUGGING IT INTO AN OUTLET OF THE PROPER VOLTAGE. LOOK ON THE SPEC PLATE FOR CORRECT POWER RATINGS.

The furnace may be set on any sturdy bench or table top. Allow at least twelve inches clearance from any vertical surface from the open end/ends of the heated chamber. Keep the area around the base free from material which might shut off ventilation of the bottom section. Your furnace is shipped with a three wire cord and three prong plug to conform to modern electrical practice.

OPERATION:

The power is turned ON or OFF by means of the Control Switch. The furnace is energized at any setting of the Control Switch except in the "OFF" position. The PILOT LIGHT remains lighted as long as power is applied and does not cycle ON-OFF with the control. The pyrometer indicates chamber temperature and performs no control functions.

The furnace chamber may be heated up at a rapid rate or a controlled slower rate. For rapid heating set the Control on "HI" or RED ZONE. For controlled slower heating set the Control at a desired PERCENT POWER input (e.g. 4 for 40% time input). Once operating temperature has been reached, as indicated by the pyrometer, adjust the Control to the corresponding input setting. Experience in furnace operation using the PERCENT TIME input controller will allow you to log exact control settings for easier repeatability in subsequent operations.

The reserve power needed to heat fast, heat large loads, and recover quickly when loads are changed or the door is opened is much larger than that needed to hold temperatures in a hot furnace. Therefore, the furnace should not be left unattended with an input rate higher than 40%. The furnace may overheat and burn out the elements or thermocouple.

Care should be taken not to damage either the heating element, insulating materials or instrumentation. When operating this furnace, IT IS IMPERATIVE TO MONITOR THE PYROMETER CLOSELY TO PREVENT OVERHEATING OF LOAD AND FURNACE (PARTICULARLY WHEN CONTROL IS SET ON "HI" OR IN RED ZONE).

Always disconnect power cord before any maintenance or repair.

NOTE:

There is a time lag between application of energy to the elements and the reading on the pyrometer. Input adjustments must be made with this lag factor in mind. Always allow furnace to operate at the new control setting for a time to allow the temperature to stabilize.

THE PYROMETER:

THE PYROMETER WITH A THERMOCOUPLE INDICATES THE CHAMBER TEMPERATURE . . . It does not control the furnace in any manner. It is provided to enable the operator to judge his setting of the control. There is a mark at 70°F on the pyrometer dial.

When the furnace is at room temperature (usually about 70°F) the pointer should rest on this mark. If it does not, adjust the needle by turning the screw in the pyrometer cover. (This adjustment should seldom be necessary.)

When taking readings, tap pyrometer cover lightly with finger nail to relieve static friction from pivot for precise reading. The cover of the pyrometer is styrene. It may be cleaned with a damp cloth; do not use laboratory solvents! The cover may pick up a static electric charge and cause erratic readings. To dispel this charge, breathe on the cover as you would to clean your glasses. If the charge persists, wiping the cover with a cloth moistened with a household detergent will usually have a residual anti-static effect.

THE ACCURACY OF THE PYROMETER DEPENDS UPON THE THERMOCOUPLE IN THE CHAMBER AND THE PROPER LOADING OF THE FURNACE. USE THERMOCOUPLES IN GOOD CONDITION, AND MAKE SURE THE LOAD DOES NOT SHIELD THE THERMOCOUPLE FROM HEAT.

The chromel/alumel thermocouple installed at the factory is 14 gauge wire, and should serve well for a long time. However, thermocouples deteriorate as they are heated, and tend to lose their efficiency. If your thermocouple oxidizes, or shows signs of damage it should be replaced. Certain chemicals including sulphur, halogens, and like materials tend to attack thermocouples, especially at high temperatures. Examine your thermocouple frequently for corrosion damage.

POWER/CONTROL SWITCH:

The Power/Control Switch in the tube furnace is a manually operated percentage input controller. Unlike automatic thermocouple feedback controllers, the Percentage Time Input Control does not react to changes in chamber temperature. It merely applies power to the furnace at a predetermined time interval corresponding to the chosen setting (e.g. at a setting of 3, power is applied 30% of the total ON-OFF cycle time.)

The dial marks indicate the percent of time power is applied to the heating elements. An increase in percent time ON (Higher numerical control setting) results in a higher chamber temperature.

The Power/Control switch will not cycle ON-OFF or "CONTROL" when adjusted to "HI" or to any portion of the RED ZONE; power is on continuously and if unattended chamber temperature may exceed desired levels.

Your furnace will stabilize at the chamber temperature where heat losses through the insulation will balance the heat supplied by the heating element. This temperature is different for each input setting of the control. The operator controls temperature by selecting an input that will match his desired operating temperature. The pyrometer tells the operator when this setting is correct or when the setting should be adjusted. When an input rate has been set, the control functions to hold that rate steady; it automatically compensates for ambient temperature changes, line voltage variations, etc. to hold chamber temperatures at a constant level after equilibrium has been reached.

OPERATING TEMPERATURES:

YOUR THERMOLYNE TUBE FURNACE IS DESIGNED TO OPERATE SATISFACTORILY AT TEMPERATURES NOT TO EXCEED 2000°F (1093°C). IF THIS TEMPERATURE IS NOT EXCEEDED THE FURNACE WILL GIVE LONG AND DEPENDABLE SERVICE.

If the maximum rated temperature is exceeded the heating elements and thermocouple deteriorate rapidly and may burn out in a short time.

All heating elements must be considered expendable, and replacement be expected; however, reasonable care in their use will greatly extend the service they will give. As the manufacturer has no control over the use or care of the elements, no specific service guarantee can be made.

REPAIR:

AS WITH ALL MANUFACTURED PRODUCTS, SOME PARTS OF YOUR FURNACE MAY BREAK DOWN AFTER CONSIDERABLE USE. ALWAYS USE GENUINE FACTORY PARTS TO REPLACE A WORN OUT PART, AND REPLACE ALL UNSERVICEABLE PARTS AS SOON AS POSSIBLE. A LIST OF THE PARTS MOST OFTEN REPLACED IS INCLUDED IN THESE INSTRUCTIONS. ALWAYS ORDER PARTS BY PART NUMBER, AND SUPPLY THE MODEL NUMBER, SERIES NUMBER, AND SERIAL NUMBER OF THE FURNACE IT WILL BE USED TO REPAIR. PARTS MAY BE ORDERED FROM THE DEALER FROM WHOM YOU BOUGHT YOUR FURNACE OR FROM THE FACTORY.

TO REPLACE A THERMOCOUPLE:

1. Remove the chamber from the stand and remove the back cover from the chamber.
2. Disconnect the thermocouple from the terminal block by removing the two screws. Pull out the thermocouple and discard it.

3. Insert the new thermocouple into the furnace until the tip extends approximately 1/4 inch into the chamber, and replace the two screws.
4. Replace the back cover and mount the chamber onto the stand.

INSTRUCTIONS FOR CHANGING VESTIBULES:

1. Remove the two screws holding on the metal end cap and pull off the cap.
2. Take out the existing vestibule and insert the new vestibule. Align the two holes in the vestibule with the nuts on the brackets.
3. Before pushing the metal end caps back onto the chamber, insert the two screws through the holes in the metal end cap and vestibule. Then start the two screws into the nuts two or three turns, push the metal end cap onto the chamber and finish tightening the two screws.
4. Repeat the process for the other end.

REPLACEMENT PARTS COMMON TO ALL MODELS OF TYPE F-21100 TUBE FURNACE

REF. KEY NO.	PART NUMBER	DESCRIPTION
1		Heating Element Tube (See Specific Model below)
2	JC211X1	End Cap, 1" dia. hole (For Model F-21100 & F-21115)
	JC211X2	End Cap, 2" dia. hole (For Model F-21120 & F-21125)
3	JC211X3	Insulator block, base
4	CV211X4B	Cover Plate bracket with screw
5	BC211X5	Bracket, vertical tube assembly support
6	KBX34	Knob, assembly locking device
7	MEX127	Pyrometer
8		Pilot Light (See specific model below)
9		Control Unit (See specific model below)
10	KBX23	Knob, control
11	DL211X1	Dial Plate
12		Connector, electrical receptacle (See specific model below)
13	FTX1	Feet, plastic (4 required)
14		Cord Set, for control cabinet (See specific model below)
15		Cord Set, for tube assembly (See specific model below)
16	SRX16	Strain Relief

PARTS FOR MODEL F-21115 and F-21125 (120 volt)

1	EL211X1A	Heating Element Assembly
8	PLX56	Pilot Light
9	CNX60	Control Unit
12	CEX71	Connector, electrical receptacle
14	CR178X1	Cord Set, for control cabinet
15	CR211X1	Cord Set, for tube assembly

PARTS FOR MODEL F-21110 and F-21120 (240 volt)

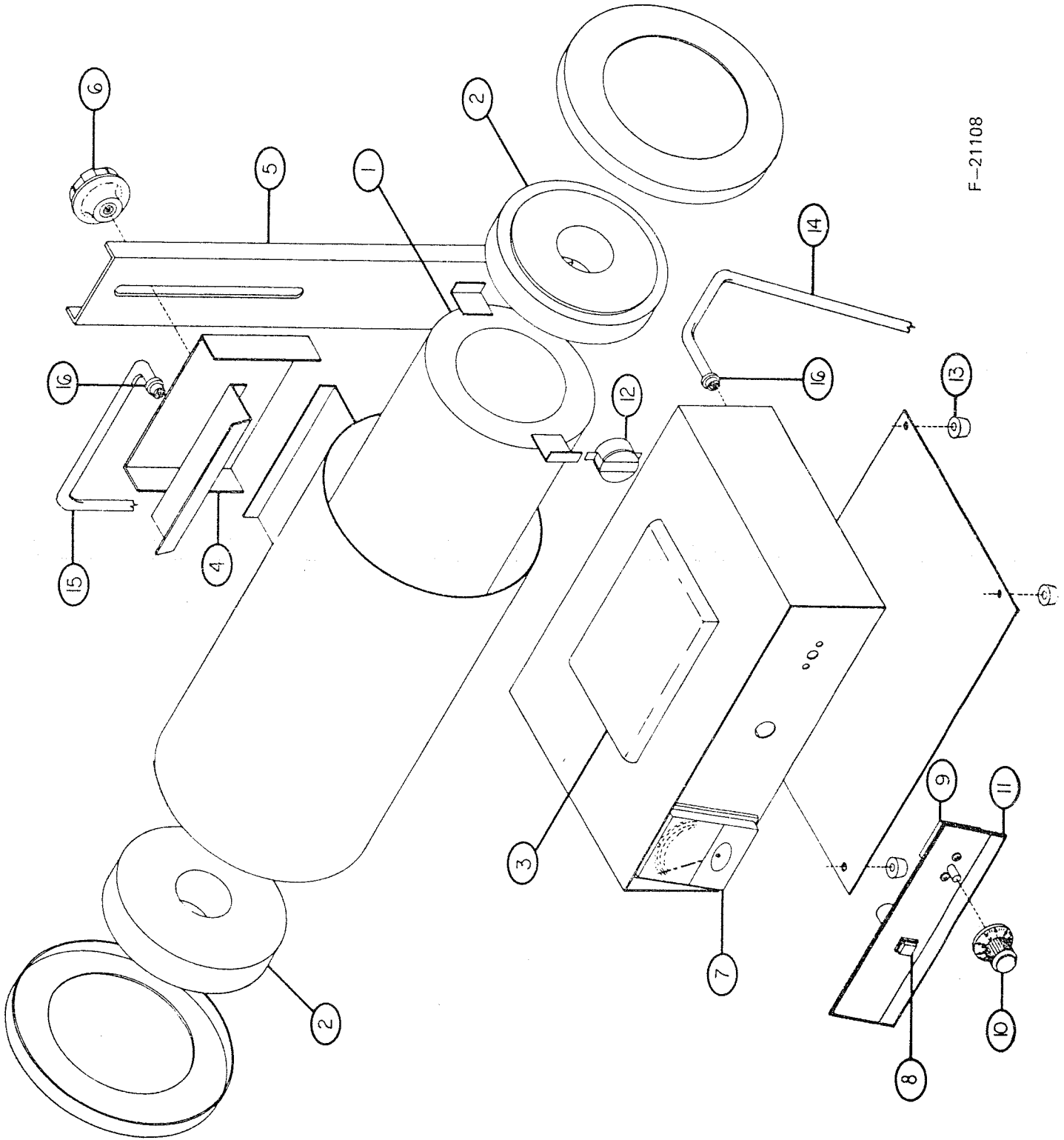
1	EL211X2A	Heating Element Assembly
8	PLX57	Pilot Light
9	CNX61	Control Unit
12	CEX72	Connector, electrical receptacle
14	CR64X1A	Cord Set, for control cabinet
15	CR211X2	Cord Set, for tube assembly

Parts should be ordered from dealer where furnace was purchased. If part is not in dealer's stock, it may be ordered from the manufacturer. When ordering, please give Model numbers, Series number, and Serial number.

SYBRON | Thermolyne

THERMOLYNE CORPORATION
SUBSIDIARY OF SYBRON CORPORATION
2555 KERPER BOULEVARD
DUBUQUE, IOWA 52001
PHONE 319 556-2241

F-21108



(Order by part number only, not by key reference number)