

Roller Oven with Enhanced Technology Instruction Manual



Manual No. D00913878, Revision D
Model 704ET, P/N 102365469
Model 705ET, P/N 102365354

Roller Oven with Enhanced Technology Instruction Manual

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Houston, Texas, USA

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1 Introduction

Fann Enhanced Technology Roller Ovens, Model 704ET and 705ET are insulated, temperature-controlled ovens with stainless steel exterior and interior. Operators use these roller ovens to test, heat, and agitate drilling fluids and samples.

The Model 704ET and 705ET roller ovens are primarily designed for laboratory use. The 704ET has four rollers and can handle nine jars or sample cells. The 705ET has five rollers and can handle sixteen jars or sample cells.

1.1 Drilling Fluids Investigation

Fann roller ovens provide an excellent method of simulating the heating and agitation that the drilling fluid experiences when it is circulated through the hole.

Roller ovens are used primarily in drilling fluid investigations as follows:

1. To simulate down-hole conditions, particularly the slow flow rate in the annulus.
2. To simulate the chemical reactions taking place in freshly prepared drilling fluids, and to determine the time for these reactions to reach equilibrium under temperatures of interest.

The sample is moderately heated and agitated on power-driven rollers. At temperatures less than 180°F (82°C), the sample may be contained in a glass jar. At temperatures greater than 180°F (82°C), the sample must be contained in a high-temperature aging cell or a standard HPHT filter press cell. This technique, called hot rolling, is valuable for:

- Investigating drilling fluids in which a base exchange reaction occurs (e.g., lime-treated drilling fluids).
- Determining the stability of drilling fluids additives, like thinners and organic colloids.
- Determining the stability of drilling fluids, such as oil emulsion drilling fluids and oil-base drilling fluids.

1.2 General Use

Fann roller ovens provide heating and agitating, simultaneously or separately. Its applications are as follows:

- Heating and Rolling
- Heating only
 - Drying oven
 - Aging oven
- Rolling only
 - Ball mill roller
 - Homogenous mixing
 - Mixing chemicals
 - De-aerating fluids

1.3 Document Conventions

The following icons are used as necessary in this instruction manual.



NOTE. Notes emphasize additional information that may be useful to the reader.



CAUTION. Describes a situation or practice that requires operator awareness or action in order to avoid undesirable consequences.



MANDATORY ACTION. Gives directions that, if not observed, could result in loss of data or in damage to equipment.



WARNING! Describes an unsafe condition or practice that if not corrected, could result in personal injury or threat to health.



ELECTRICITY WARNING! Alerts the operator that there is risk of electric shock.



HOT SURFACE! Alerts the operator that there is a hot surface and that there is risk of getting burned if the surface is touched.

2 Safety

To safely operate all roller ovens, the operator must understand and practice correct use. Misusing the roller oven or using defective parts and sample cells could result in cell leakage, cell failure, and eventual serious injury or damage.

The rollers on these ovens are driven by a gear-motor through a chain and sprocket drive on the back of the oven. If repairing or servicing this area, be cautious not to get your fingers or clothing caught in this mechanism.

Maintain the electrical wiring in good condition. If the wiring is faulty, electrical shorts can occur, causing damage to the oven and possible injury to the operator. These ovens should always be used on a grounded circuit.

2.1 Safe Heating

The Model 704ET and 705ET ovens can be heated to 500°F (260°C).

There are two ways to load the sample cells into the oven: before preheating (cold oven) or after preheating (hot). If you load the samples into a hot oven, you must use insulating gloves and other suitable protection to prevent burns. When the oven is in use at high temperatures for 24 hours or more, the outer surface, especially the door, may get hot. Be aware of these hot areas and avoid contact; touching hot surfaces could result in burns.



Caution should be exercised when the roller ovens are in operation to avoid accidental burns.

After the test has ended, safeguard the oven and sample test cells until they are cool.

Removing a hot sample test cell and cooling it under water is dangerous; this practice is not recommended. Severe burns may occur from touching or dropping the hot cell, or being exposed to the hot steam generated when the water hits the cell.

Fann Enhanced Technology roller ovens are equipped with a fail-safe, over-temperature system. See Section 2.3 Enhanced Safety Shut-down System.

2.2 Safe Electrical Operation



These ovens have built-in supplemental circuit protection. Always use an outlet that has branch-rated circuit protection.



Always disconnect the power cable before attempting any repair.

Make sure that the electrical source is the correct capacity. See Table 3-1.

Verify that the power cord is in good condition and has the proper ground connection.

The oven has manually resettable circuit breakers. If the roller oven trips a breaker, the circuit breaker can be reset by pressing the push button circuit breaker. If the breakers continuously trips, this could indicate a problem with the internal circuitry. A qualified technician must service the oven.

If heating time seems too long, or the temperature controller does not work properly, there may be problems in the heating circuit. Contact Fann Instrument Company for assistance.

2.3 Enhanced Safety Shut-down System



Disconnect the power cable after the Safety Shut-down System activates and before proceeding to troubleshoot or repair.

These roller ovens are equipped with a fail-safe, over-temperature system. This system, located on the oven back panel, opens an electrical contact and shuts off power to the oven heaters when the internal oven temperature exceeds $525^{\circ}\text{F} \pm 1^{\circ}\text{F}$ ($274^{\circ}\text{C} \pm 0.5^{\circ}\text{C}$).

When the Safety Shut-down System activates, it indicates that the heating or electrical circuit has potential problems.

When the over-temperature system is tripped, the user must reset the system for temperature to be applied again. Before resetting the over-temperature controller, thoroughly investigate all potential causes of over-temperature activation and system shut-down. After investigating and eliminating all potential hazards, reactivate the safety system.

See Section 5 for operating instructions.

3 Features and Specifications

Model 704ET and Model 705ET roller ovens are commonly used in drilling fluid aging tests at static, dynamic, ambient, or heated conditions. The stainless steel ovens have power-driven rollers and a digital electronic temperature controller. An internal circulation fan assures uniform temperature distribution throughout the oven. See Figure 5-1, a picture of the Model 704ET Roller Oven.



Figure 3-1 Model 704ET Roller Oven

3.1 Control Display Features

Front Control Panel	
Oven Temp	Temperature Controller for setting oven temperature. Display shows current temperature and set point
Timer	Program modes to control oven— delayed start, delayed stop, and immediate start
J Type Thermocouple/ Temp Data Log Output	Temperature Data Logger Port for connecting to a Type J Thermocouple and monitoring temperature. (Temperature Data Logger not included.)
Roller ON/OFF	Press ON to activate the rollers. This control switch lights in ON position.
Heater ON/OFF	This control switch works with the temperature controller and timer.
Power ON/OFF	Press to control power to the oven.
Rear Control Panel	
Over Temperature Controller	Enhanced Safety Shutdown System (ESS). Shuts off power to oven heaters at > 525°F ± 1°F (274°C ± 0.5°C)
Voltage Selector	Set to voltage available—115VAC or 230VAC
Push Button Circuit Breakers	Press button, 5A or 10A, to reset circuit breaker.
Power Inlet	Main Power Input



Refer to Section 5 for detailed operating instructions.

3.2 Temperature and Electrical Power Specifications

Table 3-1 Model 704ET and 705ET Roller Oven Specifications

Model No.	Part No.	Electrical	Power (watts)	Temperature Range
704ET	102365469	110-230V,50/60 Hz	1000	Ambient to 500°F (200°C)
705ET	102365354	110-230V,50/60 Hz	1000	Ambient to 500°F (260°C)

3.3 Mechanical Specifications

Table 3-2 Roller Oven Sizes

Model No.	No. of Rollers	Dimensions (LxDxH)	Weight
704ET	4	22x24x25.5 in. 59x61x65 cm	155 lb 70.5 kg
705ET	5	26x30x25.5 in. 66x76x65 cm	170 lb 77.3 kg

Table 3-3 Aging Cell Capacity

Model No.	Part No.	260 ml Cell w/o Valve Stem	260 ml Cell w/ Valve Stem	500 ml Cell w/o Valve Stem	500 ml Cell w/ Valve Stem
704ET	102365469	9	6	6	3
705ET	102365354	16	12	8	8

3.4 Environmental Operating Specifications

Table 3-4 Environmental Operating Specifications

Maximum Altitude	6562 ft (2000 m)
Temperature Range	39°F to 122°F (4°C to 50°C)
Maximum Relative Humidity (RH)	80% RH at 87.8°F (31°C) or less 50% RH at 104°F (40°C)

4 Installation



The roller oven is heavy (maximum weight of 170 pounds) and may require two people to move it.

The roller ovens are shipped completely assembled.

Choose the location for the instrument using the following considerations:

Counter or Floor Space	Ovens should be placed where the operator can easily reach the controls and load or unload sample cells.
Clearance	Ovens should be located with adequate space above and on all sides to allow inspection and maintenance.
Power Source	The electrical outlet should be within reach.
Ventilation	Make sure that there is sufficient room ventilation to prevent accumulation of vapors.

5 Operation

Refer to Figure 5-1 and Figure 5-2.

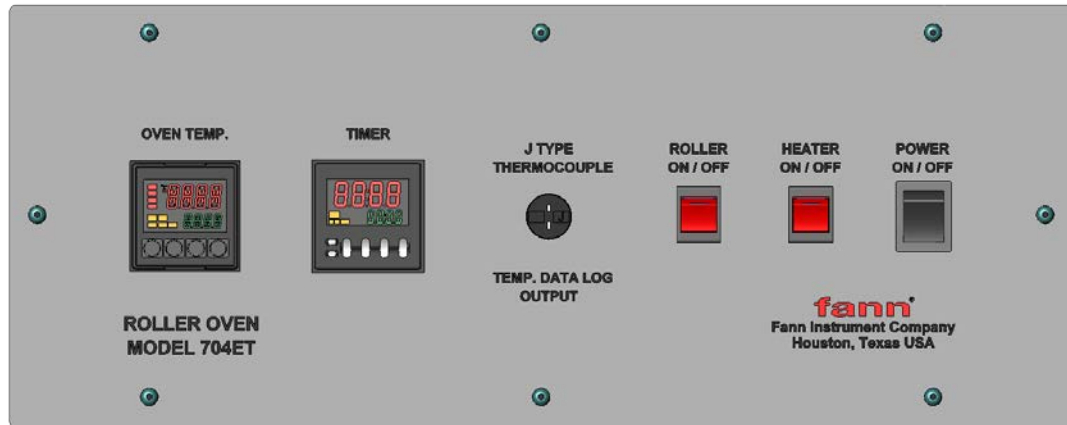


Figure 5-1 Front Control Panel

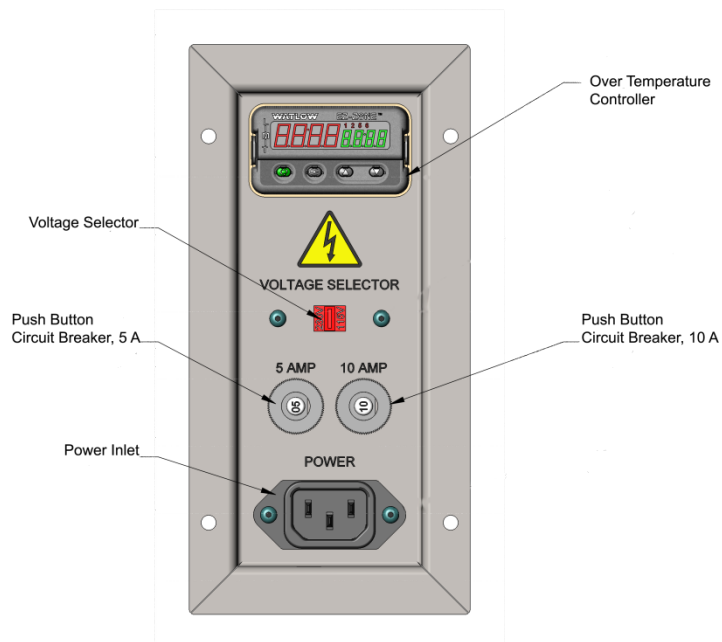


Figure 5-2 Rear Control Panel

5.1 Power Connection

1. Make sure that all switches on the front panel are in the OFF position.
2. Make sure the voltage selector switch (Figure 5-2) is set to the correct voltage based on the available power. The options are 115V and 230V AC.
3. Connect the roller oven to the proper voltage as indicated on the nameplate. Verify the power outlet selected is rated to carry the wattage of the oven.

5.2 Control Panel

1. Two switches are located on the front:
 - a. **ROLLER ON/OFF** – activates rollers and lights when in the ON position
 - b. **HEATER ON/OFF** – activates heater and lights when in the ON position
2. The **HEATER ON/OFF** switch controls the heaters through a temperature controller and uses a PID algorithm to maintain the oven temperature at setpoint.
3. The digital temperature controller (**OVEN TEMP**) controls the oven temperature and displays the set point and oven temperature.
4. The timer (**TIMER**) controls the way the oven operates. The oven settings modes are delayed start, delayed stop, and immediate start. Programming instructions for these modes are provided in Section 5.3.



To start the timer, the **HEATER ON/OFF** switch must be in the **ON** position.

5. The Temperature Data Logger port (**TEMP DATA LOG OUTPUT**) can accept a Type J Thermocouple Data Logger.



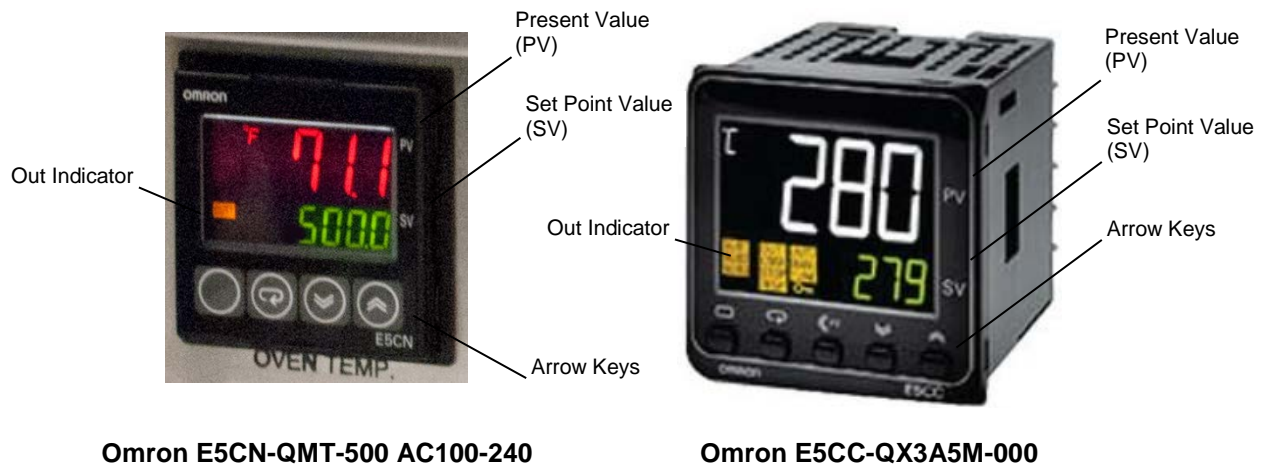
This data logger port accepts a Type J Thermocouple Data Logger. A temperature data logger is not included. Review manufacturer's instructions for your data logger before testing.



A data logger measures various electrical signals, converts them to digital data, and stores data in its internal memory for later download to a computer. With a temperature data logger, real-time oven temperature data can be collected at a set logging rate and start time.

5.3 Oven Temperature Controller

The temperature controller is a full PID controller with an auto-tune feature that varies the cycle time with the demands of the oven. The unit will arrive tuned and ready for set point operation. One of two temperature controllers will be used in the manufacture of the Models 704ET and 705ET, which have comparable display and controls:



1. Use the arrow up and arrow down keys to increase or decrease the set point temperature.
2. When the arrow keys are pressed and then released, the temperature is set.



The temperature setpoint should be set before setting the delayed start or delayed stop functions.

3. The out indicator will light when the heater is on.



The heaters receive power only when the **HEATER ON/OFF** switch is in the **ON** position, and the timer is setup to allow power to be applied to the heaters.

4. The current temperature is displayed on the PV section.
5. The desired temperature is displayed on the SV section.

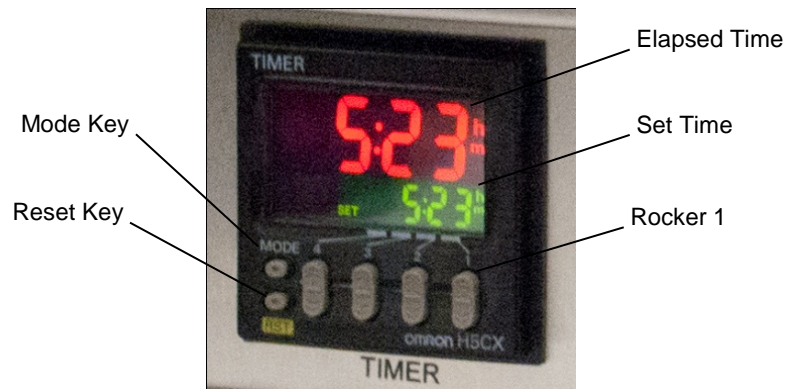
5.4 Timer

The timer has several output modes, but for this application you only need to use modes A-1 and E.

Mode A-1 is for delayed start operation. Mode E is for delayed stop.



This timer cannot be programmed for both delayed start and delayed stop at the same time.



Make sure that the oven temperature controller is set to the desired temperature. The timer starts when the **HEATER ON/OFF** switch is in the **ON** position. The elapsed time shows the countdown (hours and minutes) to the set time. When the elapsed time display is green, the oven is heating. When the elapsed time display is red, the oven is not heating.

5.4.1 Delayed Start Mode



The timer default setting is immediate start. To change to delayed start, follow the steps below.

The Delayed Start Mode allows you to delay turning on the heaters. After the timer counts down the hours and minutes, the heaters will turn on.

1. Turn the power switch on.
2. Press and hold the **MODE** key for approximately 3 seconds. The display will change to the time range mode.



3. In the time range mode, press the rocker button 1, either up or down, to choose time units:
 - hours (h)
 - hour and minutes (h:m)
 - minutes (m)
 - minutes and seconds (m:s)
 - seconds (s)
4. Press the **MODE** key until the display changes to time mode. Press rocker button 1 until down is selected. This setting puts the timer in countdown mode to start the heater.



5. Press the **MODE** key again until the display changes to output mode.



6. Press the rocker button 1, either up or down, until **Mode A-1** is selected.
7. Then press and hold **MODE** to return to run mode. In the run mode, you can now use the rocker buttons to preset the timer.



8. Use the rocker buttons (4, 3, 2, or 1) to preset the timer in hours, minutes, and seconds.
9. Then set **HEATER ON/OFF** to **ON** to start the timer. When heating is enabled, the Oven Temperature Controller display will change from red to green and the **Out Indicator** will be orange.



The reset key (**RST**) on the timer, restarts the timer. It does not activate immediate start mode.

5.4.2 Immediate Start

With the timer set to 0 (zero) in Delayed Start Mode, the oven will immediately heat when heater switch is on

Press and hold the **MODE** key for approximately 3 seconds. The display will change to the time range mode.



Press and hold **MODE** to return to run mode. Use the rocker buttons to set the timer to 0 (zero).



5.4.3 Delayed Stop Mode

The Delayed Stop Mode allows you to turn the heaters off after a specified time.

1. Turn the power switch on.
2. Press and hold the timer **MODE** key for approximately 3 seconds. The display will change to the time range mode.



3. In the time range mode, press the rocker button 1, either up or down, to choose
 - hours (h)
 - hour and minutes (h:min)
 - minutes (m)
 - minutes and seconds (m:s)
 - seconds (s)
4. Press the **MODE** key until the display changes to time mode. Press rocker button 1 until down is selected. This setting puts the timer in countdown mode to stop the heater.



5. Press the **MODE** key again until the display changes to output mode.



6. Press the rocker button 1, either up or down, until **Mode E** is selected. The delayed stop **Mode E**, the timer must be counting down for the oven to heat. If the display shows red, then heating is not enabled.
7. Then press and hold **MODE** to return to run mode. In the run mode, you can now use the rocker buttons to preset the timer



8. Use rocker buttons (4, 3, 2 or 1) to preset the timer for heating time in hours and minutes.
9. Then set **HEATER ON/OFF** to **ON** to start the timer. When heating is enabled, the Oven Temperature Controller display will change from red to green and the **Out Indicator** will be orange.



The reset key (**RST**) on the timer, restarts the timer. It does not activate immediate start mode.

5.5 Over Temperature Control

The Over Temperature Controller settings are preset and cannot be changed by the user.

If the over-temperature system is tripped, the power to the heaters will shut down and the oven will stop heating.

To resume heating, turn the power switch to the **OFF** position and then to the **ON** position

5.6 Circulating Fans

These roller ovens use three fans - one fan to circulate the air inside the oven, and the remaining fans to cool the controls and roller drive motor.

The fan inside the oven operates when the heater switch is **ON**, and the other fans operate whenever the unit is operating. For accurate temperature control, the air temperature in the oven must be uniform. For this reason, the fan inside the oven is essential.

5.7 Cell Protector O-rings

To prevent excessive wear and reduce noise, O-rings should be used on the outside of the sample cells to be rolled.

- For temperatures up to ~ 300°F (149°C) : O-ring, P/N 205660
- For temperatures above 300°F (149°C) : Teflon[®] O-ring, P/N 205661

6 Troubleshooting and Maintenance

This section provides procedures for lubricating the roller oven chains and replacing bearings. For service or extensive repair, contact your Fann representative.



Always disconnect the power cable before attempting any repair.

6.1 Lubrication

- Add a small amount of grease on the chain and sprockets every 90 days.
- Do not lubricate the bearings.

6.2 Bearing Replacement

1. Using a 3/16-in. Allen wrench, loosen 5 (704ET roller oven) or 6 (705ET roller oven) socket head cap screws holding the front top member to the bottom member of the roller frame.
2. Block the rollers for support.
3. Using a flat blade screw driver, remove 4 flat head screws attaching the front member to the side members of the roller oven.
4. Pull the top and bottom members together off the roller shafts.
5. Separate the two frame members. (The graphite bearings are pinned to the top member.)
6. Replace the graphite bearings as required.
7. Reassemble the frame if the rear bearings are not being replaced.
8. Remove the lower (solid) panel on the rear of the oven, exposing the chain and sprockets.
9. Using an Allen wrench, loosen the set screws that hold the sprockets on the shafts. Remove the sprockets from the shafts.
10. From the oven front, carefully remove each roller and shaft from the oven.

11. Using a flat blade screwdriver, remove 4 flat screws securing the side frame member to the oven walls.
12. Remove the frame assembly (side members and rear member) from the oven.
13. Using a 3/16-in. Allen wrench, loosen 5 (four roller oven) or 6 (five roller oven) socket head cap screws holding the rear top member to the bottom member of the roller frame.
14. Separate the top frame member from the assembly.
15. Replace graphite bearings as required.
16. Assemble the frame members in reversed order and reinstall them in the oven.

7 Parts List

Table 7-1 Model 704ET, P/N 102365469

Item No.	Part No.	Quantity	Description
0001	210242 / L	1.000	CASE, 4 ROLLER OVEN
0002	102374204 / C	1.000	SHEET METAL, ELECTRONICS BOX, 704ET/705ET, ROLLER OVEN
0003	102374205 / B	1.000	FRONT PANEL, ELECTRONICS BOX, 704ET
0004	102365493 / A	1.000	MOTOR, 24A-D SERIES PARALLEL SHAFT DC GEARMOTOR, 42 RPM, 1.8 AMPS, 1/29 HP
0005	210229 / B	4.000	SHAFT ROLLER MODEL 700 ROLLER
0006	210225 / C	4.000	ROLLER f/4 ROLLER OVEN
0007	210238 / B	1.000	MOUNT MOTR MODEL 700 ROLLER OVEN
0008	210230 / A	10.000	CHAIN ROLLER OVEN
0009	210227 / A	3.000	CHAIN CONNECTOR LINKS, NO. 25, 1/4 PITCH
0010	101862874 / A	1.000	BRACKET MOTOR ROLLER OVEN 230 VOLT MOTOR
0011	101862877 / C	1.000	SHAFT EXTENSION ROLLER OVEN MOTOR 230 V
0012	205060 / D	1.000	FRAME MEMBER SET 4 ROLLER OVEN
0013	210231 / 03	8.000	BEARING GRAPHITE f/LAB ROLLER OVEN
0014	204642 / A	8.000	PIN ROLL 3/32 X 5/16 STAINLESS
0015	205679 / A	7.000	SPROCKET 18 TOOTH 1/2in. BORE
0016	101863280 / B	1.000	COUPLING, RIGID 5/16 BORE, NO KEY, PLATED STEEL Overall Length 1 Inch, OD 5/8 Inch, Set Screw Size 10-32 x 3/16 Inch
0017	101862875 / A	1.000	FAN PROPELLER 6IN X 5/16 BORE 5 BLADE CCWSE ROTATION, ALUMINUM
0018	102366196 / B	1.000	MOTOR, 24V DC, BODINE 24A SERIES, 2500 RPM, 1.2A, 1/50 HP
0020	102471209 / A	1.000	FAN GUARD, 7 INCH DIA STAINLESS STEEL
2000	102365947 / A	1.000	THERMOCOUPLE, DUAL TYPE J FOR ROLLER OVEN
2001	210236 / C	1.000	THERMOCOUPLE J FOR ROLLER OVEN INDUSTRONICS
2002	205382 / A	1.000	HEAT SINK SSR CRYDOM HS-1
2003	210233 / A	4.000	SPACER HEATER STRIP

Item No.	Part No.	Quantity	Description
2004	205143 / A	1.000	SWITCH ROCKER ILLUMINATED DPST
2005	101631169 / A	2.000	GUARD, FAN, 60 MM, STEEL CHROME 0.2 INCH, CSA CERTIFIED
2006	102461076 / A	2.000	HEATER STRIP 704ET OVEN 500 WATT 115 VOLT
2007	102415257 / A	2.000	FAN, 60 X 60 X 20MM, 24 VOLT DC, 27.5 CFM
2008	208438 / B	1.000	PLUG INTL ELECT CODE TYPE
2009	204290 / A	14.000	SLEEVING FIBERGLASS SIZE 6 CLASS R GRADE A 1200F 0.166 ID 125 FT PER PACKAGE
2010	101761371 / A	1.000	POWER SUPPLY, 24V, 5 AMP, LED DISPLAY, DIN RAIL MOUNT
2011	102091322 / A	1.000	TEMPERATURE CONTROLLER, 1/16 DIN, TC OR PT INPUT, 1 VOLTAGE OUT, 100-240VAC
2012	101443927 / A	1.000	RELAY, MULTIFUNCTION TIME, UNIVERSAL SUPPLY VOLTAGE AC/DC 12 - 240 V, OUTPUT CONTACT SPDT OR DPDT 16 A, DIN RAIL MOUNTED
2013	102091321 / A	1.000	DIGITAL TIMER, RELAY, E-MECH, MULTI-FUNCTION, CUR-RTG 5A, CONTROL-V 100-240AC, RPEL:H5CX-AAC1002
2014	101391619 / A	4.000	CLAMP, END, UNIVERSAL, FOR 35 MM X 7.5 MM MOUNTING RAIL, E/NS 35 N
2015	101462159 / A	7.000	COVER, 2.2MM X 48.5 MM PHOENIX CONTACT 3030417
2016	101483688 / A	21.000	Feed-through terminal blocks with spring-cage connection, cross section: 0.2 - 2.5 mm, width: 5.2 mm, color: gray
2017	101483689 / A	13.000	Plug-in bridge for cross-connections in the terminal center, 2-pos., color: Red 12-28AWG
2018	101443937 / A	1.000	PANEL THERMOCOUPLE JACK, ROUND HOLE, RMJ MINIATURE
2019	102091257 / A	2.000	SWITCH, ROCKER DPDT, 5A, 125V, 28V ISOLATED LAMP CIRCUIT FOR INCANDESCENT
2020	101948879 / A	1.000	PM EZ-ZONE PM controller,1/32DIN,Limit controller,100 to 240V(ac) 60-50HZ additional 2 Digital I/O inputs, Mechanical relay 5A, -18 to 65C Operation temp, +/-0.1C accuracy,12 to 22AWG connectors,
2021	101959461 / A	1.000	CIRCUIT BREAKER, 5 AMP, PUSH BUTTON, 125-250 VAC/32 VDC
2022	101752942 / A	1.000	CIRCUIT BREAKER, 10 AMP, PUSH BUTTON, 125-250 VAC/32 VDC
2023	101984629 / A	1.000	SWITCH DPDT, POWER AND SELECT, SLIDE, 10.1A AT 125 VAC, 4A AT 28VDC, 5A AT 250VAC
2024	102172207 / B	1.000	SOLID STATE RELAY, DUAL OUTPUT, 25 A, OUTPUT 24-280 V AC, INPUT 4-15 V DC WITH LOCKING CONNECTOR
2026	101988218 / A	1.000	RELAY, DPDT, 15A, 24DC, VOL-RTG 300V, PLUG-IN
2027	101988217 / A	1.000	SOCKET, RELAY, 16A, 300V, 8-PIN, DIN/PANEL MOUNT
2028	101988812 / A	1.000	HOLD DOWN CLIP, 782 HERMETIC RELAYS IN FINGER SAFE SOCKET

Item No.	Part No.	Quantity	Description
2029	101834950 / A	3.000	GROUND TERMINAL BLOCK, SPRING CAGE, AWG 20 TO 10, YELLOW GREEN
2030	101834949 / A	1.000	COVER, TERMINAL BLOCK, 2.2MM X 56MM
2031	100033128 / C	13.000	RAIL, MOUNTING, 35MM, X 2 METER, DIN, 46277, SYMMETRICAL
3001	207607 / A	16.000	10-32 X 3/8 BHMS STAINLESS
3002	207759 / A	4.000	8-32 X 1/4 BHMS STAINLESS
3003	207948 / A	4.000	4-40 X 3/8 BHMS STAINLESS
3004	203403 / A	8.000	10-32 X 3/4 BHMS STAINLESS
3005	100029067 / NW	4.000	SCREW, BIND HEAD, #8-32 NC X 3/8, STAINLESS STEEL
3006	100029867 / NW	3.000	WASHER, FLAT, #6, STAINLESS STEEL
3007	207605 / A	4.000	10-32 X 1/2 BHMS STAINLESS
3008	208672 / A	4.000	WASHER INTERNAL TOOTH 8 STAINLESS
3009	207949 / A	5.000	6-32 X 5/8 BHMS STAINLESS
3010	207634 / A	1.000	NUT 4-40 HEX REGULAR STAINLESS
3011	207947 / A	6.000	WASHER SPLIT 8 STAINLESS STEEL
3012	207895 / A	6.000	WASHER FLAT 8
3013	207871 / A	8.000	WASHER FLAT 10 STAINLESS STEEL
3014	207763 / A	4.000	WASHER FLAT 1/4 STEEL
3015	207753 / A	4.000	WASHER SPLIT 1/4 STAINLESS STEEL
3016	207635 / A	4.000	WASHER INTERNAL TOOTH 10 STAINLESS
3017	207631 / A	6.000	NUT 8-32 HEX REGULAR STAINLESS
3018	207842 / A	13.000	6-32 X 1/4 THMS STAINLESS
3019	207617 / A	6.000	6-32 X 3/4 THMS STAINLESS
3020	207623 / A	4.000	10-32 X 3/8 SHCS BOPL
3022	203379 / A	4.000	1/4-20 X 3/4 SHMS STAINLESS

Item No.	Part No.	Quantity	Description
3023	203402 / A	12.000	1/4-20 X 2 SHCS STAINLESS
3024	203401 / A	8.000	1/4-20 X 1-1/4 FHMS STAINLESS
3025	207835 / A	4.000	10-32 X 2 BHMS STAINLESS
3026	102092974 / A	2.000	NUT, ELASTIC STOP, 4-40 UNC, 18-8 STAINLESS STEEL
3027	101262214 / A	8.000	SCREW, THREADED, BUTTON HEAD SCS (US) - NO. 6 -32 UNC x 1.25 - 18-8 SS
3028	100026493 / NW	8.000	NUT, ELASTIC STOP, 6-32 NC, HEAVY, PLATED, SPEC 70.32769 22NM-62
3029	101265328 / A	4.000	SCREW, THREADED, CAP, SOC HEAD (US) - NO. 8 -32 UNC x 0.75 - 18-8 SS
3033	101260665 / A	2.000	SCREW, MACHINE, PAN HEAD, PHILLIPS, 8-32 UNC x 0.375, STAINLESS STEEL, 18-8
3034	101262246 / A	8.000	SCREW, THREADED, BUTTON HEAD SCS (US) - NO. 8 -32 UNC x 0.375 - 18-8 SS
3035	207489 / A	4.000	6-32 X 1/2 BHMS STAINLESS
4000	204299 / A	15.000	TERMINAL FEMALE Q.C .25X.032 1
4003	204359 / A	6.000	TERMINAL, DISCONNECT, 16-14AWG, FULLY INSULATED FEMALE FOR .187X.020 BLADE
4004	204287 / A	4.000	TERMINAL RING 6 18-14 AWG BLU
4005	204276 / A	4.000	TERMINAL RING NO. 10 16-14 AWG HIGH TEMP 900 F, NICKEL PLATED
4006	205772 / A	12.000	WIRE 18 AWG HIGH TEMP, 600V, 450F
4014	207996 / A	6.000	GROMMET RUBBER 3/8in. ID X 1/2in.
4017	204285 / A	6.000	TIE WRAP 6in. LONG WITH 8 MTG
4018	207861 / A	2.000	CLAMP CABLE 1/4 X 1/2
4019	102142213 / A	1.000	ACCESSORY, NON-ADHESIVE THERMAL PAD FOR SOLID STATE RELAY
4020	100024575 / NW	4.000	TERMINAL, CRIMP, FEMALE, 22-24 AWG, 0.064 MAX. INSULATION OD, 15 U GOLD PLATE, LOOSE, 70058 SERIES
4021	120159754 / A	1.000	CONN INLINE 4 POS FEMALE MOLEX
4022	203522 / A	1.000	CABLE POWER 115V 14 AWG M&F PLUG
4023	208865 / A	1.000	CABLE POWER 230V 18 AWG M&F PLUG
4024	101825519 / A	15.000	TERMINAL, 22-18AWG BLOCK FORK VINYL INSULATED SIZE 8 STUD RED
4025	206254 / A	21.000	WIRE 16 AWG PVC STRANDED BROWN

Item No.	Part No.	Quantity	Description
4026	206253 / A	20.000	WIRE 16 AWG PVC STRANDED BLUE
4027	208523 / A	12.000	WIRE 18 AWG PVC STRANDED RED
4028	208522 / A	17.000	WIRE 18 AWG PVC STRANDED BLACK
4029	208517 / A	6.000	WIRE 22 AWG PVC STRANDED RED
4030	206250 / A	2.300	WIRE 22AWG PVC STRANDED BLACK PVC INSULATION BLACK STRANDED 22 AWG 7/30 300 V 80 DEG C
4031	208526 / A	2.500	WIRE 18 AWG PVC STRANDED GREEN
4032	206212 / A	16.000	WIRE 16 AWG PVC STRANDED GREEN
4033	208529 / A	2.000	WIRE 18 AWG PVC STRANDED WHITE
4040	205296 / A	1.000	TIE WRAP ADHESIVE PAD
9998	368927 / D	1.000	MANUAL, ROLLER OVEN MODELS 704 - 705

Table 7-2 Model 705ET, P/N 102365354

Item No.	Part No.	Quantity	Description
0001	210252 / M	1.000	CASE, 5 ROLLER OVEN
0002	102374204 / C	1.000	SHEET METAL, ELECTRONICS BOX, 704ET/705ET, ROLLER OVEN
0003	102377982 / A	1.000	FRONT PANEL, ELECTRONICS BOX, 705ET
0004	102365493 / A	1.000	MOTOR, 24A-D SERIES PARALLEL SHAFT DC GEARMOTOR, 42 RPM, 1.8 AMPS, 1/29 HP
0005	210249 / A	5.000	SHAFT ROLLER MODEL 701 ROLLER
0006	210248 / C	5.000	ROLLER f/5 ROLLER OVEN
0007	210238 / B	1.000	MOUNT MOTR MODEL 700 ROLLER OVEN
0008	210230 / A	10.000	CHAIN ROLLER OVEN
0009	210227 / A	4.000	CHAIN CONNECTOR LINKS, NO. 25, 1/4 PITCH
0010	101862874 / A	1.000	BRACKET MOTOR ROLLER OVEN 230 VOLT MOTOR
0011	101862877 / C	1.000	SHAFT EXTENSION ROLLER OVEN MOTOR 230 V
0012	205063 / C	1.000	FRAME MEMBER SET 5 ROLLER OVEN
0013	210231 / 03	10.000	BEARING GRAPHITE f/LAB ROLLER OVEN
0014	204642 / A	10.000	PIN ROLL 3/32 X 5/16 STAINLESS
0015	205679 / A	9.000	SPROCKET 18 TOOTH 1/2in. BORE
0016	101863280 / B	1.000	COUPLING, RIGID 5/16 BORE, NO KEY, PLATED STEEL Overall Length 1 Inch, OD 5/8 Inch, Set Screw Size 10-32 x 3/16 Inch
0017	101862875 / A	1.000	FAN PROPELLER 6IN X 5/16 BORE 5 BLADE CCWSE ROTATION, ALUMINUM
0018	102366196 / B	1.000	MOTOR, 24V DC, BODINE 24A SERIES, 2500 RPM, 1.2A, 1/50 HP
0020	102471209 / A	1.000	FAN GUARD, 7 INCH DIA STAINLESS STEEL
2000	102365947 / A	1.000	THERMOCOUPLE, DUAL TYPE J FOR ROLLER OVEN INDUSTRONICS SERVICE CO. CONTACT: ANDY MONSEES T1486 P/N AD-J-125-U-A-TF-16-36-0-SE-2-DX WATLOW ELECTRIC MFG.CO. (GORDEN XACTPAK) P/N AFGA0TA160WJ030 1.5 INCH STRIPPED END TYPE J THERMOCOUPLE UNGROUNDED SHEATH 304 STN STL 16 X 1/8 SPRING TRANSITION LEADS 20 AWG SYN YARN 36 INCH LONG WITH 1.5 INCH STRIPPED END
2001	210236 / C	1.000	THERMOCOUPLE J FOR ROLLER OVEN INDUSTRONICS

Item No.	Part No.	Quantity	Description
2002	205382 / A	1.000	HEAT SINK SSR CRYDOM HS-1
2003	210233 / A	4.000	SPACER HEATER STRIP
2004	205143 / A	1.000	SWITCH ROCKER ILLUMINATED DPST
2005	101631169 / A	2.000	GUARD, FAN, 60 MM, STEEL CHROME 0.2 INCH, CSA CERTIFIED
2006	205733 / A	2.000	HEATER STRIP 701 OVEN 500 WATT 115
2007	102415257 / A	2.000	FAN, 60 X 60 X 20MM, 24 VOLT DC, 27.5 CFM
2008	208438 / B	1.000	PLUG INTL ELECT CODE TYPE
2009	204290 / A	14.000	SLEEVING FIBERGLASS SIZE 6 CLASS R GRADE A 1200F 0.166 ID 125 FT PER PACKAGE
2010	101761371 / A	1.000	POWER SUPPLY, 24V, 5 AMP, LED DISPLAY, DIN RAIL MOUNT
2011	102091322 / A	1.000	TEMPERATURE CONTROLLER, 1/16 DIN, TC OR PT INPUT, 1 VOLTAGE OUT, 100-240VAC
2012	101443927 / A	1.000	RELAY, MULTIFUNCTION TIME, UNIVERSAL SUPPLY VOLTAGE AC/DC 12 - 240 V, OUTPUT CONTACT SPDT OR DPDT 16 A, DIN RAIL MOUNTED
2013	102091321 / A	1.000	DIGITAL TIMER, RELAY, E-MECH, MULTI-FUNCTION, CUR-RTG 5A, CONTROL-V 100-240AC, RPEL:H5CX-AAC1002
2014	101391619 / A	4.000	CLAMP, END, UNIVERSAL, FOR 35 MM X 7.5 MM MOUNTING RAIL, E/NS 35 N
2015	101462159 / A	7.000	COVER, 2.2MM X 48.5 MM PHOENIX CONTACT 3030417
2016	101483688 / A	21.000	Feed-through terminal blocks with spring-cage connection, cross section: 0.2 - 2.5 mm, width: 5.2 mm, color: gray
2017	101483689 / A	13.000	Plug-in bridge for cross-connections in the terminal center, 2-pos., color: Red 12-28AWG
2018	101443937 / A	1.000	PANEL THERMOCOUPLE JACK, ROUND HOLE, RMJ MINIATURE
2019	102091257 / A	2.000	SWITCH, ROCKER DPDT, 5A, 125V, 28V ISOLATED LAMP CIRCUIT FOR INCANDESCENT
2020	101948879 / A	1.000	PM EZ-ZONE PM controller,1/32DIN,Limit controller,100 to 240V(ac) 60-50HZ additional 2 Digital I/O inputs, Mechanical relay 5A, -18 to 65C Operation temp, +/-0.1C accuracy,12 to 22AWG connectors,
2021	101959461 / A	1.000	CIRCUIT BREAKER, 5 AMP, PUSH BUTTON, 125-250 VAC/32 VDC
2022	101752942 / A	1.000	CIRCUIT BREAKER, 10 AMP, PUSH BUTTON, 125-250 VAC/32 VDC
2023	101984629 / A	1.000	SWITCH DPDT, POWER AND SELECT, SLIDE, 10.1A AT 125 VAC, 4A AT 28VDC, 5A AT 250VAC
2024	102172207 / B	1.000	SOLID STATE RELAY, DUAL OUTPUT, 25 A, OUTPUT 24-280 V AC, INPUT 4-15 V DC WITH LOCKING CONNECTOR
2026	101988218 / A	1.000	RELAY, DPDT, 15A, 24DC, VOL-RTG 300V, PLUG-IN

Item No.	Part No.	Quantity	Description
2027	101988217 / A	1.000	SOCKET, RELAY, 16A, 300V, 8-PIN, DIN/PANEL MOUNT
2028	101988812 / A	1.000	HOLD DOWN CLIP, 782 HERMETIC RELAYS IN FINGER SAFE SOCKET
2029	101834950 / A	3.000	GROUND TERMINAL BLOCK, SPRING CAGE, AWG 20 TO 10, YELLOW GREEN
2030	101834949 / A	1.000	COVER, TERMINAL BLOCK, 2.2MM X 56MM
2031	100033128 / C	13.000	RAIL, MOUNTING, 35MM, X 2 METER, DIN, 46277, SYMMETRICAL
3001	207607 / A	16.000	10-32 X 3/8 BHMS STAINLESS
3002	207759 / A	4.000	8-32 X 1/4 BHMS STAINLESS
3003	207948 / A	2.000	4-40 X 3/8 BHMS STAINLESS
3004	203403 / A	8.000	10-32 X 3/4 BHMS STAINLESS
3005	100029067 / NW	4.000	SCREW, BIND HEAD, #8-32 NC X 3/8, STAINLESS STEEL
3006	100029867 / NW	3.000	WASHER, FLAT, #6, STAINLESS STEEL
3007	207605 / A	4.000	10-32 X 1/2 BHMS STAINLESS
3008	208672 / A	4.000	WASHER INTERNAL TOOTH 8 STAINLESS
3009	207949 / A	5.000	6-32 X 5/8 BHMS STAINLESS
3010	207634 / A	1.000	NUT 4-40 HEX REGULAR STAINLESS
3011	207947 / A	6.000	WASHER SPLIT 8 STAINLESS STEEL
3012	207895 / A	6.000	WASHER FLAT 8
3013	207871 / A	8.000	WASHER FLAT 10 STAINLESS STEEL
3014	207763 / A	4.000	WASHER FLAT 1/4 STEEL
3015	207753 / A	4.000	WASHER SPLIT 1/4 STAINLESS STEEL
3016	207635 / A	4.000	WASHER INTERNAL TOOTH 10 STAINLESS
3017	207631 / A	6.000	NUT 8-32 HEX REGULAR STAINLESS
3018	207842 / A	13.000	6-32 X 1/4 THMS STAINLESS
3019	207617 / A	6.000	6-32 X 3/4 THMS STAINLESS
3020	207623 / A	4.000	10-32 X 3/8 SHCS BOPL
3022	203379 / A	4.000	1/4-20 X 3/4 SHMS STAINLESS

Item No.	Part No.	Quantity	Description
3023	203402 / A	12.000	1/4-20 X 2 SHCS STAINLESS
3024	203401 / A	8.000	1/4-20 X 1-1/4 FHMS STAINLESS
3025	207835 / A	4.000	10-32 X 2 BHMS STAINLESS
3026	102092974 / A	2.000	NUT, ELASTIC STOP, 4-40 UNC, 18-8 STAINLESS STEEL
3027	101262214 / A	8.000	SCREW, THREADED, BUTTON HEAD SCS (US) - NO. 6 -32 UNC x 1.25 - 18-8 SS
3028	100026493 / NW	8.000	NUT, ELASTIC STOP, 6-32 NC, HEAVY, PLATED, SPEC 70.32769 22NM-62
3029	101265328 / A	4.000	SCREW, THREADED, CAP, SOC HEAD (US) - NO. 8 -32 UNC x 0.75 - 18-8 SS
3033	101260665 / A	2.000	SCREW, MACHINE, PAN HEAD, PHILLIPS, 8-32 UNC x 0.375, STAINLESS STEEL, 18-8
3034	101262246 / A	8.000	SCREW, THREADED, BUTTON HEAD SCS (US) - NO. 8 -32 UNC x 0.375 - 18-8 SS
3035	207489 / A	4.000	6-32 X 1/2 BHMS STAINLESS
4000	204299 / A	15.000	TERMINAL FEMALE Q.C .25X.032 1
4003	204359 / A	6.000	TERMINAL, DISCONNECT, 16-14AWG, FULLY INSULATED FEMALE FOR .187X.020 BLADE
4004	204287 / A	4.000	TERMINAL RING 6 18-14 AWG BLU
4005	204276 / A	4.000	TERMINAL RING NO. 10 16-14 AWG HIGH TEMP 900 F, NICKEL PLATED
4006	205772 / A	12.000	WIRE 18 AWG HIGH TEMP, 600V, 450F
4008	101825519 / A	15.000	TERMINAL, 22-18AWG BLOCK FORK VINYL INSULATED SIZE 8 STUD RED
4014	207996 / A	6.000	GROMMET RUBBER 3/8in. ID X 1/2in.
4017	204285 / A	6.000	TIE WRAP 6in. LONG WITH 8 MTG
4018	207861 / A	2.000	CLAMP CABLE 1/4 X 1/2
4019	102142213 / A	1.000	ACCESSORY, NON-ADHESIVE THERMAL PAD FOR SOLID STATE RELAY
4020	100024575 / NW	4.000	TERMINAL, CRIMP, FEMALE, 22-24 AWG, 0.064 MAX. INSULATION OD, 15 U GOLD PLATE, LOOSE, 70058 SERIES
4021	120159754 / A	1.000	CONN INLINE 4 POS FEMALE MOLEX
4022	203522 / A	1.000	CABLE POWER 115V 14 AWG M&F PLUG
4023	208865 / A	1.000	CABLE POWER 230V 18 AWG M&F PLUG
4024	206254 / A	21.000	WIRE 16 AWG PVC STRANDED BROWN
4025	206253 / A	20.000	WIRE 16 AWG PVC STRANDED BLUE

Item No.	Part No.	Quantity	Description
4026	208523 / A	12.000	WIRE 18 AWG PVC STRANDED RED
4027	208522 / A	17.000	WIRE 18 AWG PVC STRANDED BLACK
4028	208517 / A	6.000	WIRE 22 AWG PVC STRANDED RED
4029	206250 / A	2.300	WIRE 22AWG PVC STRANDED BLACK PVC INSULATION BLACK STRANDED 22 AWG 7/30 300 V 80 DEG C
4030	208526 / A	2.500	WIRE 18 AWG PVC STRANDED GREEN
4031	206212 / A	16.000	WIRE 16 AWG PVC STRANDED GREEN
4032	208529 / A	2.000	WIRE 18 AWG PVC STRANDED WHITE
4040	205296 / A	1.000	TIE WRAP ADHESIVE PAD
9998	368927 / D	1.000	MANUAL, ROLLER OVEN MODELS 704 - 705

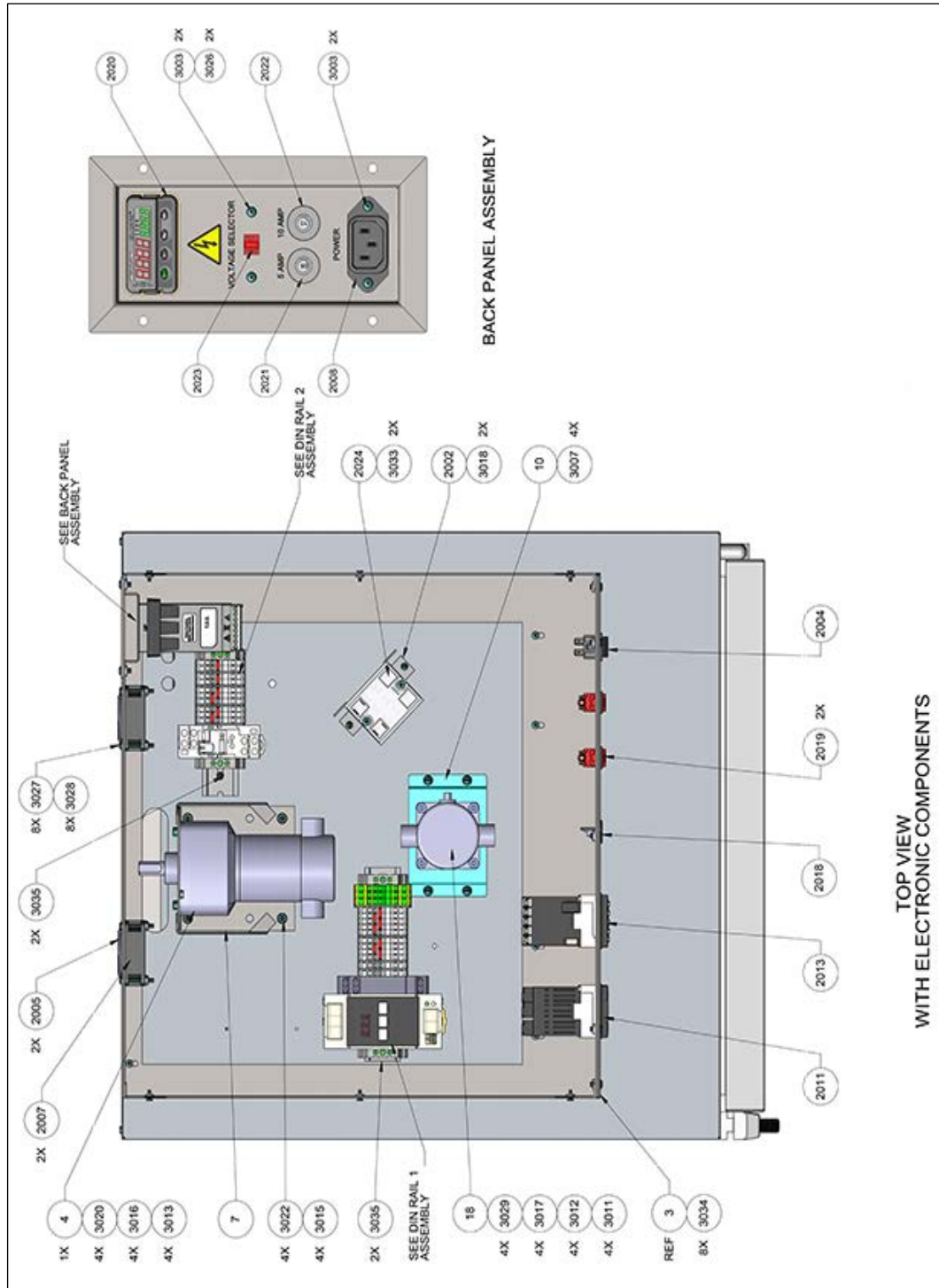


Figure 7-1 Electronics Box Assembly, Enhanced Technology Ovens

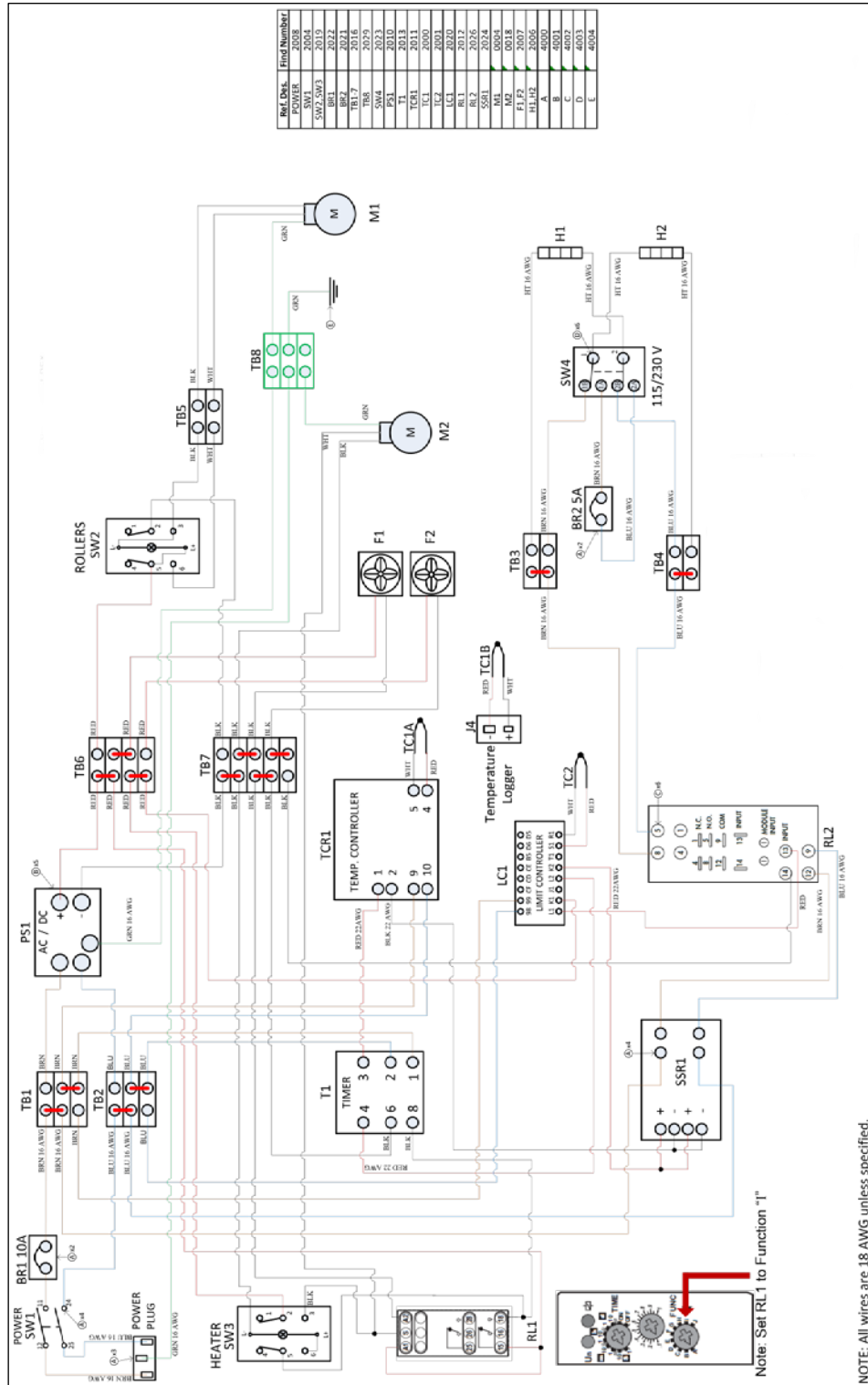


Figure 7-2 Wiring Diagram for Enhanced Technology Ovens*

* Temperature Controller Omron E5CN-QMT-500 AC100-240

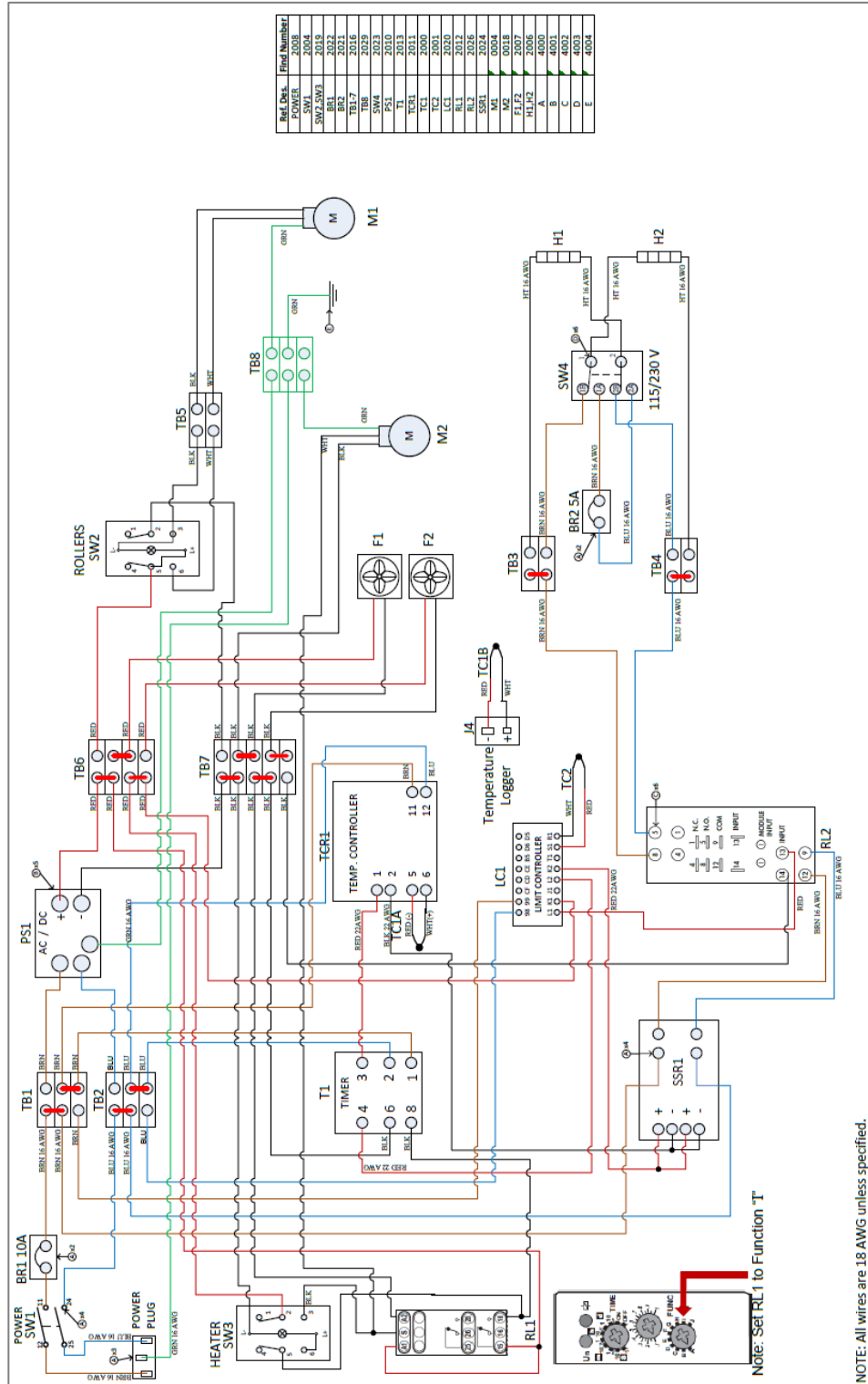


Figure 7-3 Wiring Diagram for Enhanced Technology Ovens*

* Temperature Controller Omron E5CC-QX3A5M-000

8 Warranty and Returns

8.1 Warranty

Fann Instrument Company warrants only title to the equipment, products and materials supplied and that the same are free from defects in workmanship and materials for one year from date of delivery. **THERE ARE NO WARRANTIES, EXPRESS OR IMPLIED OF MERCHANTABILITY, FITNESS OR OTHERWISE BEYOND THOSE STATED IN THE IMMEDIATELY PRECEDING SENTENCE.** Fann's sole liability and Customer's exclusive remedy in any cause of action (whether in contract, tort, breach of warranty or otherwise) arising out of the sale, lease or use of any equipment, products or materials is expressly limited to the replacement of such on their return to Fann or, at Fann's option, to the allowance to Customer of credit for the cost of such items. In no event shall Fann be liable for special, incidental, indirect, consequential or punitive damages. Notwithstanding any specification or description in its catalogs, literature or brochures of materials used in the manufacture of its products, Fann reserves the right to substitute other materials without notice. Fann does not warrant in any way equipment, products, and material not manufactured by Fann, and such will be sold only with the warranties, if any, that are given by the manufacturer thereof. Fann will only pass through to Customer the warranty granted to it by the manufacturer of such items.

8.2 Returns

For your protection, items being returned must be carefully packed to prevent damage in shipment and insured against possible damage or loss. Fann will not be responsible for damage resulting from careless or insufficient packing.

Before returning items for any reason, authorization must be obtained from Fann Instrument Company. When applying for authorization, please include information regarding the reason the items are to be returned.

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Toll Free: 800-347-0450

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