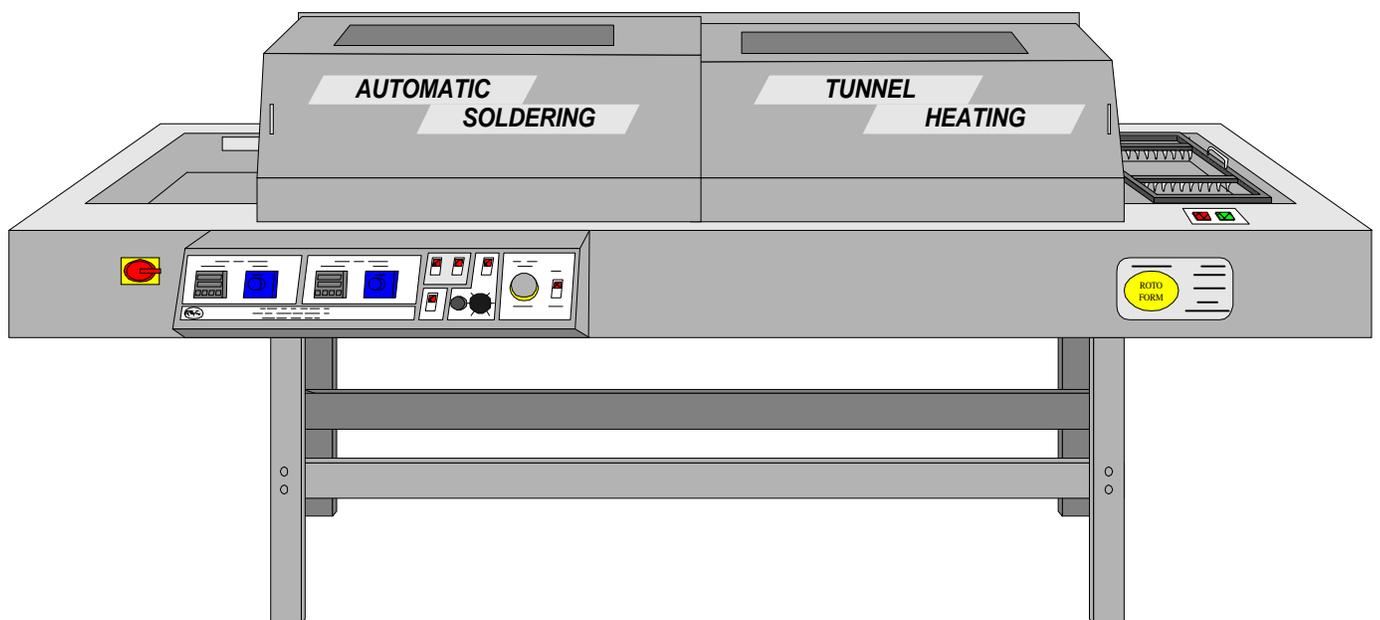


ROTO/SOLDER[®]

OWNER'S MANUAL

MODELS 1315, 1618, & 2024



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INTRODUCTION

Concept Overview

The ROTO/SOLDER is a fully automated, pallet-loaded, reversing-type drag soldering machine. The model 1618 is capable of soldering printed circuit boards of up to 16"x18", and the 1315, boards of up to 13"x15". Both models include the flexibility necessary to allow different dwell times in the preheat chamber and the solder pot. Standard features on both models include:

- Telescoping hoods with tempered glass windows enclosing the work area for safety, easy operator access and visibility.
- Interior cabinet lighting providing high visibility and operator safety.
- Chain-driven track system with Torque-Limiter drive to protect your investment.
- Operator's control panel containing all "snap-in" components for simplified maintenance. Microprocessors regulate temperatures in both the solder pot and the preheaters.
- Automated 24-hour timer.
- Stainless steel fluxer with *Flux Saver*® electronic feature to conserve flux consumption. Shop air required.
- Air knife included with volume controls.
- High capacity radiant preheaters - 5.0 kW output - Microprocessor controlled.
- Unique *Fast Heat*® electronics to provide quick initial heating and to conserve on electrical usage after operating temperatures are achieved.
- Operator & Maintenance Manual included.
- An RS-600 pallet, milled from heavy-gauge aluminum bar stock to prevent warpage, anodized for durability, and fitted with titanium fingers.
- Operates on either single phase or 3-Phase, 208-240 VAC, 30-40 amps.
- Solder Pot Capacity: Model 1315 (165 pounds); Model 1618 (201pounds)

About the Machine

The frame of the machine is constructed entirely of 11 gauge welded tubular steel. Stainless steel panels cover the frame for durable protection and are easy to remove for maintenance. A chain driven, pallet system supports circuit boards through the soldering cycle. Nickel chrome plated side rails run the length of the machine, on each side, and house the chain drive mechanism. The pallet loaded with printed circuit boards pass first through a foam blanket of flux, then secondly over an air-knife, thirdly into a preheat chamber, and finally into a bath of molten solder. An innovative pallet design pivots upwards when it reaches the end of the machine, elevating the board so it does not dip into the solder again as the pallet returns for another board.

The fluxing unit consists of a stainless steel tank and a 1 ½" diameter foaming element. A drain valve is conveniently located for easy access in draining and cleaning of the tank. The air knife is located next to the flux tank, and the controls for both of these components are together on the surface of the machine, near the back on the entry side.

The tunnel heating system consists of two totally enclosed radiant heaters, one mounted beneath the printed circuit board and one mounted above creating a "tunnel of even heating." The heaters are shock proof and shatter proof and can be wiped clean when cool. For multi-layer boards and boards with large ground plane areas or other heat-thieving devices, tunnel heating is particularly important. Boards are heated evenly, efficiently and with consistent precision due to the temperature microprocessor in control of the system.

The solder bath is heated with either eight 900-watt elements (Model 1315) or ten 900-watt elements (Model 1618). The heater system is controlled by a temperature microprocessor. The heaters operate in one of two different modes, either "Fast Heat" or "Normal Running". The "Fast Heat" cycle suspends all other machine functions, directing all available power to the solder pot to shorten the initial heat-up time. The "Normal Running" cycle uses a highly efficient, low amperage approach to maintain operating temperatures. A temperature microprocessor lends remarkable intelligence, consistency and precision to this process, maintaining temperatures with precise accuracy.

The "power center" is mounted beneath the unloading station. A stainless steel cover protects this important member. All relays and circuit breakers are located here, in a lidded box, for safety and easy access.

Beneath the loading station and another stainless steel cover, are the control valves for the fluxer and air knife, the solenoid valves, and the motor and clutch mechanism for the chain drive system.

Two micro-switches on the chain guide rails trigger the dwell controls for both the preheat and solder functions. A set of push button controls is located at each end of the machine, allowing the operator to start, stop, and reverse conveyor motion.

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I UNPACKING & SETTING UP THE MACHINE

Unpacking

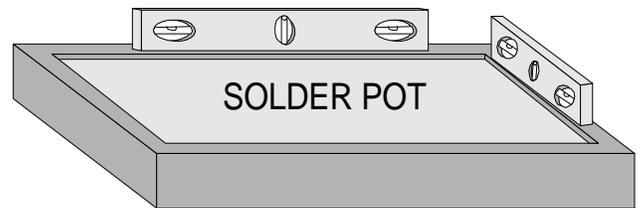
The ROTO/SOLDER is shipped on skids which are bolted to the bottom of the machine's frame with four ½" bolts. Remove these bolts, and the skids, and install the four leveling feet. The leveling feet are packed in a plastic bag during shipment. Thread the feet as far into the legs as possible before adjusting them to level the machine. This method provides maximum stability.

Place the ROTO/SOLDER on a flat, stable structure. If what supports the machine moves or vibrates the performance will be negatively affected. Roto Form offers a heavy-duty support stand/cabinet as an accessory (PN RS-670).

Leveling the Machine

(This step is extremely important! If the machine is not level, solder can spill over the top of the solder pot, as it becomes molten, creating a serious fire and personal injury hazard.)

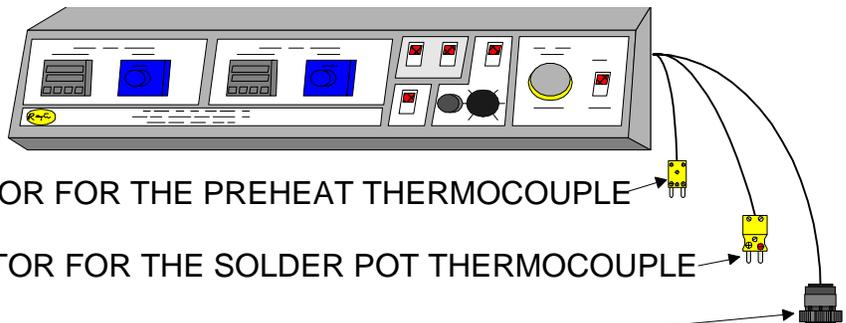
- a. Place a "spirit", bubble, or machine level on the machined edges of the solder pot, **not on the solder**. Adjust the four leveling feet as needed to make the solder pot level in both directions. The solder pot is level with respect to the machine, and should not be adjusted. All leveling should be accomplished using the adjustable feet on the bottom of the machine.



Connecting the Operator's Console

The Roto/Solder drag solder machine features easy access to the electronic controls in case service should become necessary. The operator's console is packed as a separate item, handle it with caution when unpacking the unit and during installation. Dropping this console could result in damage to the microprocessors and/or the paint finish.

Three connectors extend out the back of the console:



- A SMALL BAYONET CONNECTOR FOR THE PREHEAT THERMOCOUPLE

- A LARGE BAYONET CONNECTOR FOR THE SOLDER POT THERMOCOUPLE

- A LOCKING, 32 PIN COMMUNICATIONS CABLE

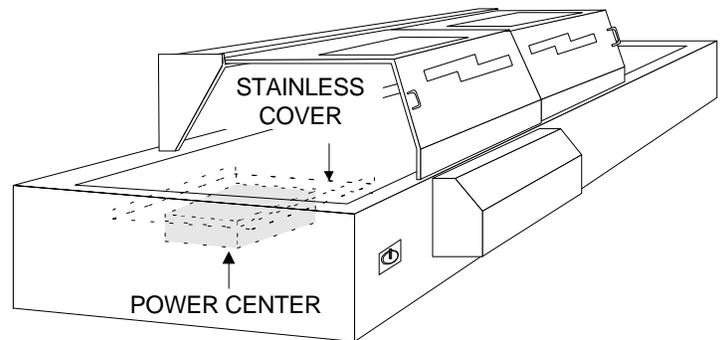
- a. Attach the communications cable to the matching connector located on the front of the machine; be sure to engage the locking mechanism built into the pin's housing.
- b. The matching thermocouple connectors coming from the machine chassis are located to the right of the communications cable connector. To protect these bayonet connectors from possible damage during shipment, both are pushed back into the access hole. Pull both out of the hole a few inches and match with their mating connectors.

The operator's console is now electronically installed. Hang the console on the stainless steel bracket.

Filling the Solder Pot

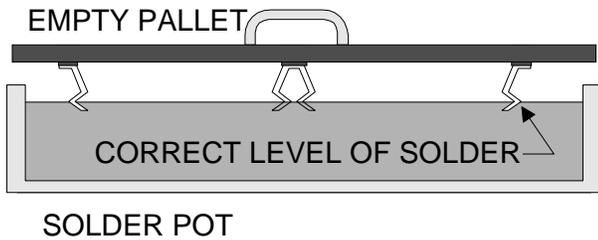
Please note: Your new solder machine has been tested at the factory, loaded with solder, aligned, and operated for a minimum of 6 hours to assure that all components operate as designed. The solder has been removed but traces of solder may remain in the Solder Pot. This does not mean that your new machine is "used."

- a. Load approximately 150 pounds of solder into the empty solder pot.
- b. Remove the stainless steel cover over the power center. Open the lid to the power center and switch all three circuit breakers (5 Amp, 20 Amp, 30 Amp) to their "ON" positions. Close the lid and replace the stainless cover.
- c. Switch the S1 Main ON/OFF to "ON". For a few seconds, power is supplied to the entire machine. A microprocessor then takes over and all operations except the heating of the solder pot, such as lighting, will shut off. This has two basic benefits:
 1. It speeds up the solder heating process (app. an hour)
 2. It prevents attempted soldering before the solder bath reaches the minimum operating temperature.
- d. The Microprocessors are programmed at the factory according to the following processing criteria. (These values may be adjusted. If this becomes necessary, refer to the enclosed Watlow Manual for instructions on how to do so.)



Maximum Solder Pot temperature -	500° F
Minimum Solder Pot temperature -	430° F

- e. Once the solder has become molten, continue to add 1 pound bars to the solder bath until the solder level is approximately 1/8" below the upper edge of the Solder Pot.



- f. The final check for proper solder level is accomplished by running an empty pallet through the machine and noting how far the titanium fingers dip into the molten solder. The proper level of solder is that which permits the notch on the fingers to be halfway submerged as shown in the illustration.

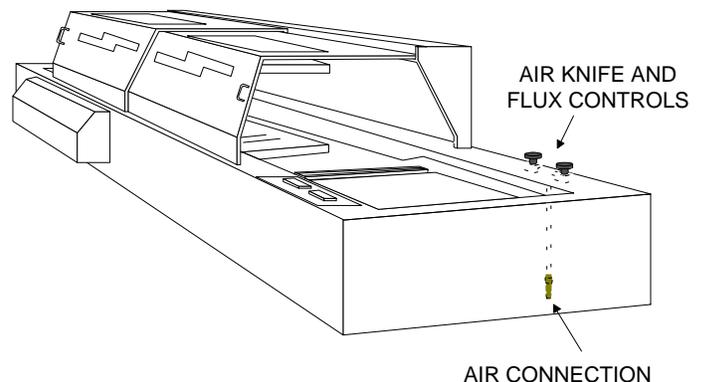
Installing the Sliding Doors and Light Assembly

- a. The sliding doors are packaged individually. Unwrap them **carefully**. The six bolts, which will be used to secure the hood, are already in place in the back of the machine. Back each of these out, and with a second person, fasten the hood to the machine. Do not force a bolt that does not thread in easily, keep the weight of the hood off of the bolt should eliminate this problem.
- b. Install the lighting fixture with the bolts provided. Slide the glass into its slot, between the hood and the light housing. The glass simply rests in this position.
- c. Plug the light fixture cord into the matching bayonet connector on the back of the machine. Be sure to engage the locking mechanism built into the plug housing.
- d. Set both of the hood panels in place. The hood telescopes to allow access to the work area, and to provide safety during operation. The hood also increases the efficiency of the heaters, allowing less heat to escape into the surrounding area.

Connecting the Air Supply

A standard 3/8" pipe connection is located on the rear of the machine, toward the entry end. An air pressure regulator must be attached to this pipe, supplying between 5 and 30 psi of dry, compressed air.

The ROTO/SOLDER provides flow regulators for both the air knife and flux tank. With the popularity of the new "low solids" fluxes, it is increasingly important that lower pressures and higher volumes of air be used to develop the desired foam blankets.



Attaching the Pallet Carrier and Pallet

The pallet carrier is the frame that is placed on the chain drive system and remains on the machine during normal operation. There are pairs of pins on certain links of the chain, on either side of the machine, extending toward each other. The pallet carrier simply straddles these four pins for support. When installed correctly, straddling all four pins, the carrier is secure. Removal of the pallet carrier from the machine for maintenance etc., is equally simple.

It is important to note that the pallet must be installed so the skimmer is on its leading edge, as the pallet begins the cycle. Its purpose is to skim the dross from the solder surface just **before** each PCB enters the bath.

Once the pallet reaches the end of the machine, it is bumped into its return position. The pallet actually rocks upward, elevating the PCB so it does not touch solder or flux on the return trip.

Important note: Do not attempt to operate the machine when the solder bath is not molten, contact with the solid solder can damage the fingers on the pallet.

Electrical Connections

Incorrect power connections can permanently damage the machine, particularly instrumentation in the operator's console. We strongly recommend the assistance of an electrician upon installation.

Please read this section carefully. Should questions arise, contact our technical service department before activating current to the machine.

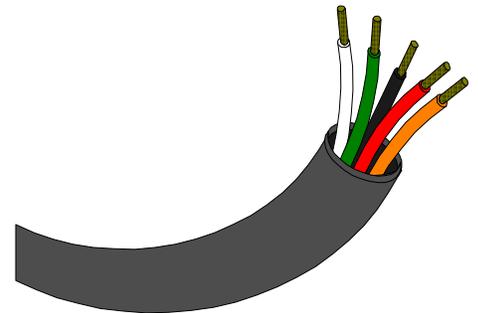
The ROTO/SOLDER is designed to operate on

- either 208-240 volt, 30 amp, 3-phase service,
- or 208-240 volt, 50 amp, single-phase service.

However, 3-phase service is preferred. Directions follow for each type; follow the applicable set. The Power cable is a flexible SO type, consisting of five, 10 gauge wires. It extends 6 feet from the machine. The color code is as follows:

White	Electrical Neutral
Green	Chassis Ground
Black	120 volt controls
Red	120 volt heater controls
Orange	120 volt heater controls

Do not combine the green and white wires, this design is intended to insure safety and should not be altered.



For 3-phase service: (preferred)

NOTE: Some 3-phase service has one power leg with a voltage higher than 120 volts. We will refer to this leg as a “stinger”. **For service with a stinger, it is extremely important that this leg not be connected to the black wire of the machine. Connecting a stinger to the black wire will damage components in the main console.**

- a. Connect electrical neutral to the white wire
- b. Connect the ground to the green wire

- c. Connect 120 volts to the black, orange and red wires, with the “stinger” (if one exists) **not** connected to the black wire.

For single phase service:

- a. Connect electrical neutral to the white wire
- b. Connect the ground to the green wire
- c. Connect 120 volts to the black, orange and red wires.

DO NOT connect more than 120 volts to the black wire.

II Calibration

The three components of the ROTO/SOLDER which are calibrated are:

1. The solder pot temperature control system
2. The preheat chamber temperature control system
3. The conveyor speed control system

All four components were calibrated and tested at the factory prior to shipment. However, due to varying electrical supply voltages, it is recommended that they be recalibrated once the machine is installed for production.

Solder Pot

The Watlow 965 microprocessor is calibrated prior to shipment, to maintain the solder at optimal operating temperature. These settings include a minimum operating temperature is 430°F, and will not allow the solder to exceed 500°F. If it becomes necessary to adjust these settings, refer to the Watlow manual for instructions.

Preheat Chamber

Utilization of temperature sensitive tape, placed on an actual board, has proven to be the most accurate way to calibrate the preheaters. The microprocessor receives temperature values read directly from the heater surface. This makes it necessary to use an offset value in the microprocessor, to include any difference between the actual heater temperature, and that on the board in the middle of the chamber. We have found this difference is roughly 10°F. This process is described in the Watlow manual.

Conveyor Speed

The chain driven system is powered with a DC gearmotor, which receives input from the speed control (PNRS203). The speed control unit converts alternating current into direct current. Final calibration of the speed control system is necessary upon installation. The machine has been calibrated for 220V AC, single-phase supply, at the factory.

III OPERATING THE MACHINE

Mode Selection

Automatic/Manual Return:

The operator selects from the console the desired method of pallet return: automatic or manual. When operated in the automatic mode, the pallet containing the circuit board will automatically reverse direction after soldering and return to the original starting position for off-loading. The board does not reenter the soldering pot.

When operated in the “manual return mode,” the pallet containing the circuit board will stop for “off-loading” at the end of the soldering operation. Once the circuit board is removed from the pallet, the operator then returns the pallet to the original starting position by pressing the start switch.

Conveyor Control

Conveyor motion is initiated by depressing the green START button, while the red STOP buttons halt conveyor motion. To restart the conveyor, simply release the STOP button.

The Fluxing System

- a. Adjust the height of the flux tank by rotating the four leveling screws on the bottom of the tank.
- b. Connect a compressor to the port in the back of the machine. The air pressure passed on to the machine is controlled by one of the black knobs on the rear surface, at the entry side, of the machine. The height of the fluxing foam is controlled by adjusting the knob labeled FLUX. The air pressure coming to the machine should be set between 20 and 40 psi.
- c. The level of the liquid flux should always be above the top of the foaming element to prevent splattering and large bubbles. The ideal foam blanket is a gentle, rolling wave comprised of small bubbles. Once the operative air pressure is obtained, the flux is turned ON and OFF with the illuminated switch on the main console labeled FLUX.

The Air Knife

Boards pass over the air knife immediately after leaving the flux tank. The line of holes on the air knife should aim upward to direct airflow at the bottom the board. The air knife has two functions:

1. To spread the wet foam evenly across the surface of the board
2. To remove excess flux from the board before it enters the preheat chamber

The air pressure in the air knife is adjusted with the black knob labeled KNIFE. The knob is located on the rear surface of the machine, at the entry side. The air knife is turned ON and OFF with the illuminated switch on the main console labeled KNIFE.

Automatic Start-Up

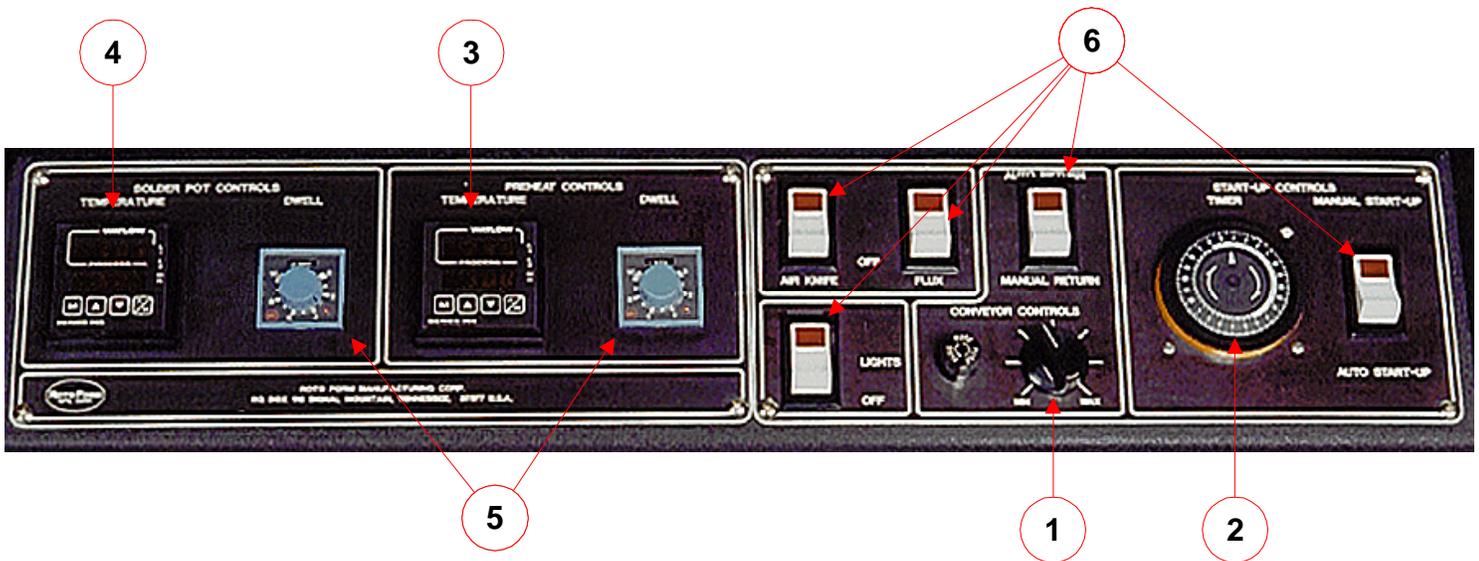
The 24-hour timer on the main console may be programmed to turn the machine ON and OFF. There are four steps in setting the timer:

1. Set the current time on the timer
2. Turn the timer's ON/OFF switch to the ON position
3. Turn the main power switch to the ON position
4. Set the desired ON and OFF times on the timer. Allow at least an hour for the solder to reach the minimum operating temperature.

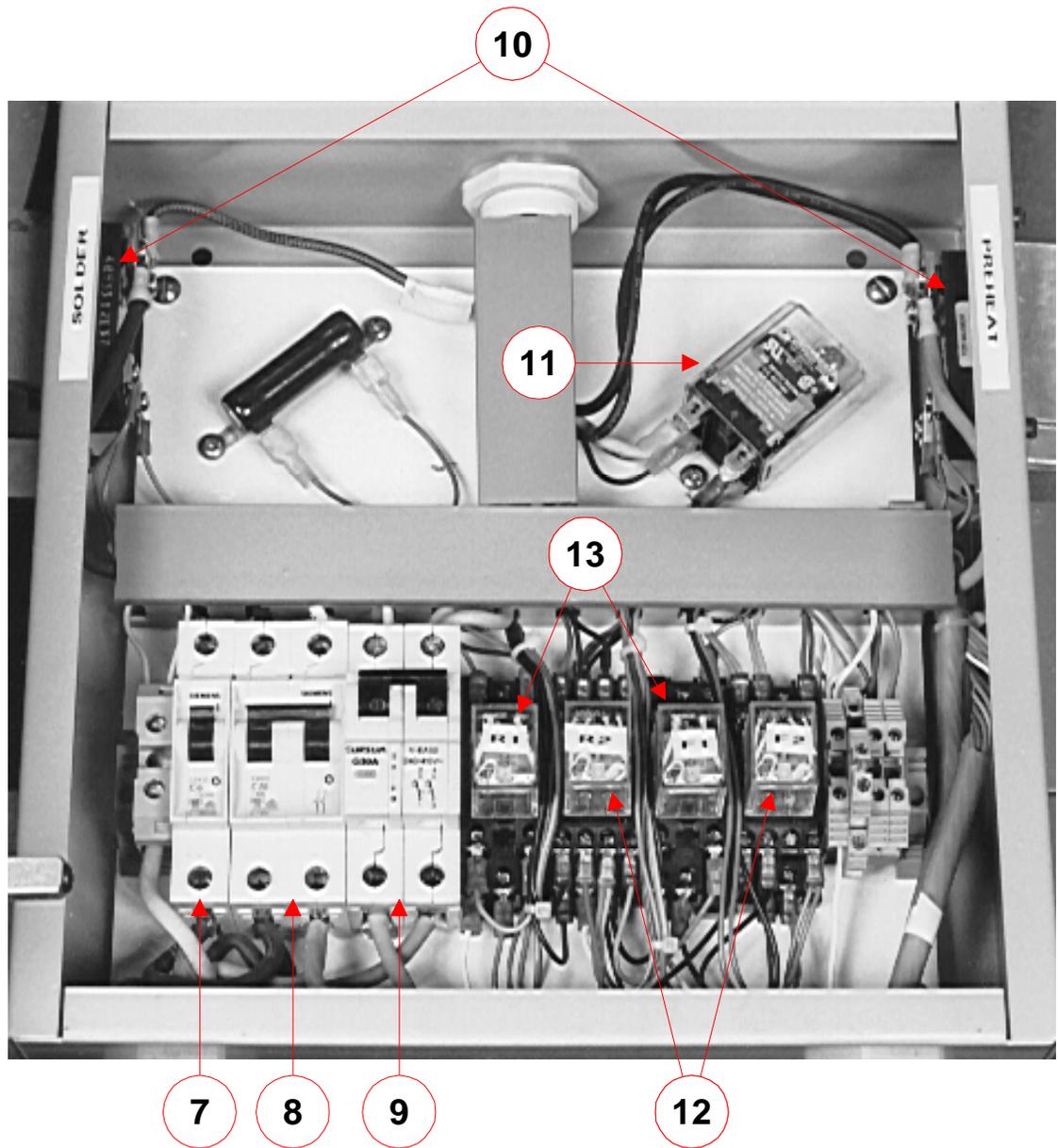
IV ILLUSTRATED PARTS LIST

Roto/Solder Models 1315, 1618, 2024

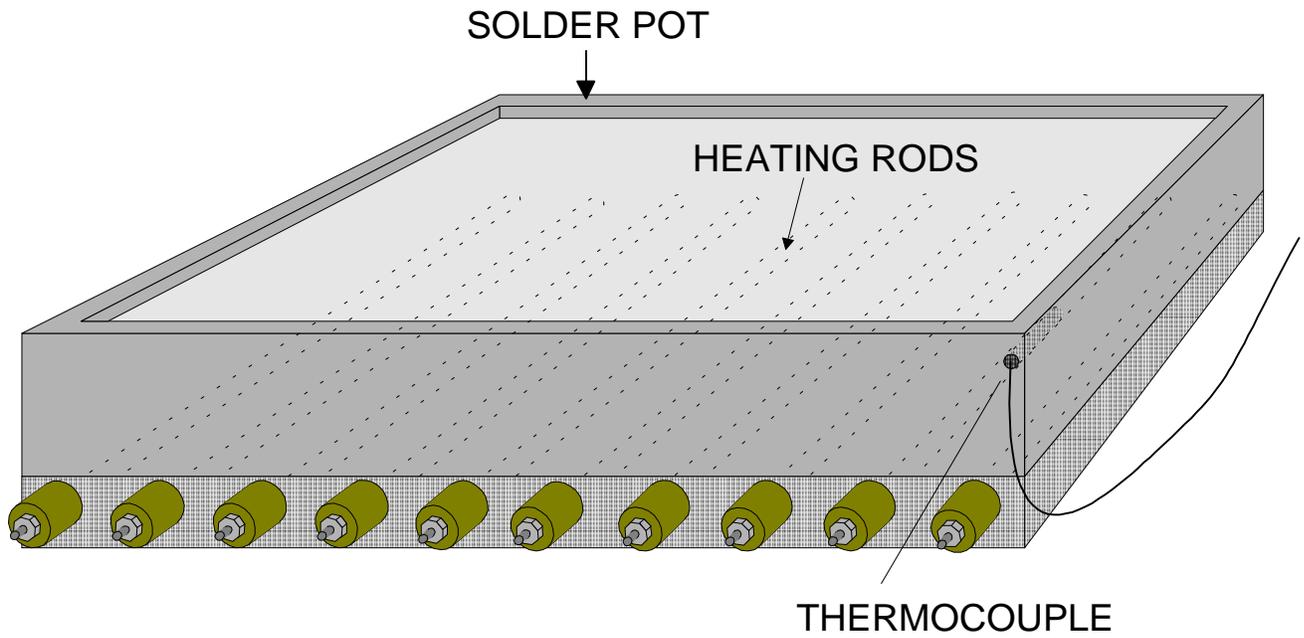
CONSOLE PARTS			
ITEM	DESCRIPTION	PART #	# REQ'D
1	Speed Control	RS 202	1
2	24 Hour Timer	RS 209	1
3	Microprocessor – Pot	RS 210	1
4	Microprocessor for Preheat	RS 211	1
5	ATC Dwell Controller	RS 212	2
6	ON / OFF Switch	RS 248	5



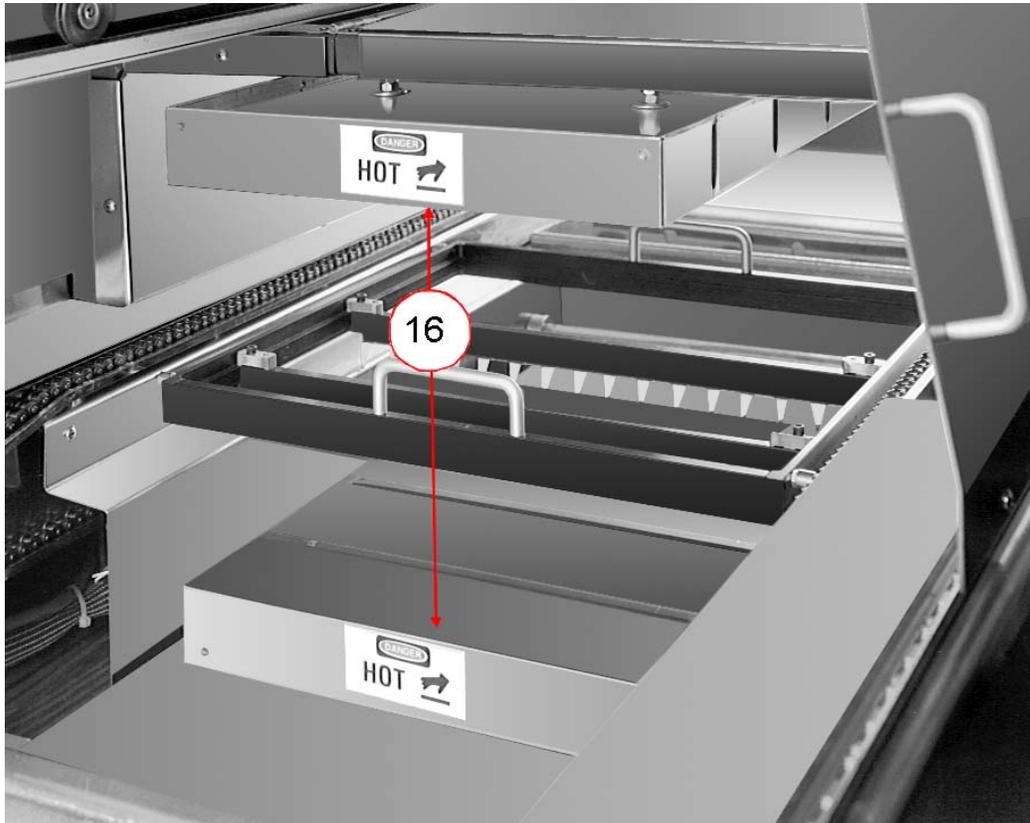
POWER CENTER COMPONENTS			
7	6 Amp Circuit Breaker	RS 222	1
8	20 Amp Circuit Breaker	RS 223	1
9	30 Amp Circuit Breaker	RS 224	1
10	Relay - Solid State Pot / Preheat	RS 225	2
11	Relay - Mechanical / Fast Heat	RS 226	1
12	Relay - Omron MY4N	RS 228	2
13	Relay - Omron LY4N	RS 230	2



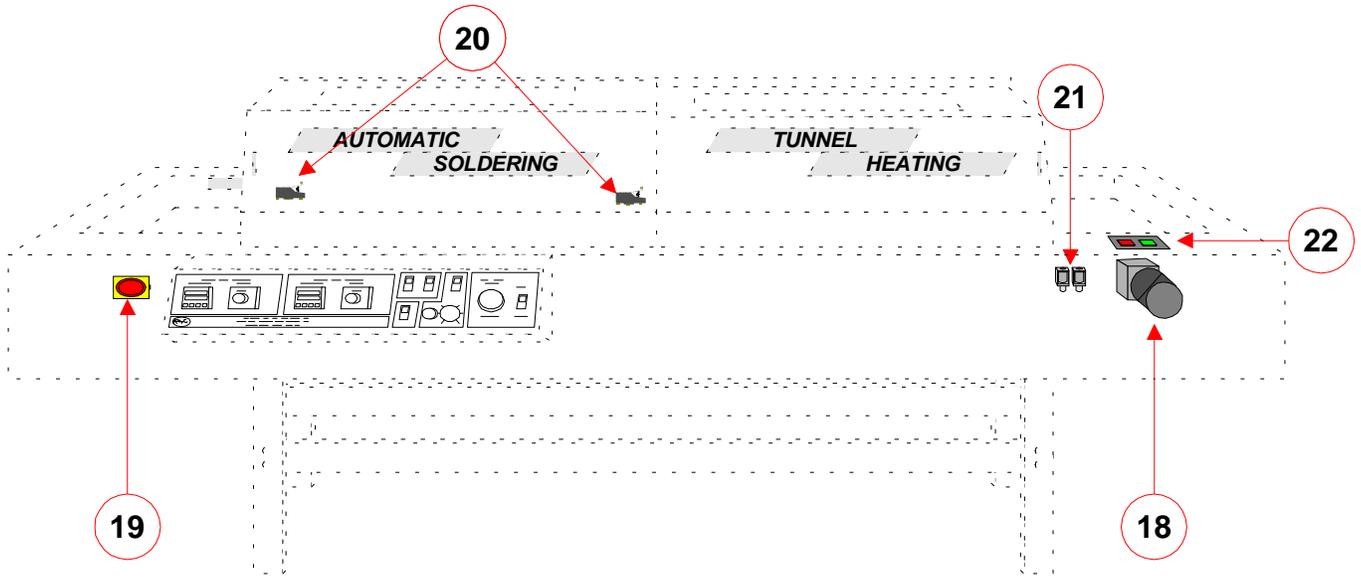
SOLDER POT ELECTRONICS			
	Heating Rods for 1315	RS 215-1315	8
	Heating Rods for 1618	RS 215-1618	10
	Thermocouple – Pot	RS 217	1



PREHEATER ELECTRONICS			
16	Enclosed Preheater – model 1315	RS 220-1315	2
16	Enclosed Preheater - model 1618	RS 220-1618	2
	Thermocouple with Connectors	RS 218	1



MAIN CHASSIS ELECTRONICS			
18	Drive Motor	RS 201	1
19	Main On/Off Switch	RS 205	1
20	Microswitch - Large style	RS 207	2
21	Solenoids	RS 250	2
22	Start Switch	RS 235	1
22	Stop Switch	RS 236	1



FLUXING ELEMENTS			
23	Flux Stone Assembly for 1315	RS 300-1315	1
23	Flux Stone Assembly for 1618	RS 300-1618	1
23	Flux Stone Assembly, custom	RS 300-999	NA
	Fluxing Element Special Size	RS 301	NA



SHEET METAL AND MACHINED PARTS			
	Pallet (Standard) for model 1315	RS 600-1315	1
	Pallet (Standard) for model 1618	RS 600-1618	1
	Pallet (Custom)	RS 600-999	NA
	Pallet Assembly – Crossways	RS 605-1618	NA
	Single Bar fingers, for 1315 (13" long)	RS 608-1315	NA
	Single Bar – 1618 (16" long)	RS 608-1618	NA
	Single Bar – custom	RS 608-999	NA
	Center Bar – 1315	RS 610-1315	NA
	Center Bar – 1618	RS 610-1618	NA

	Bar – custom	RS 610-999	NA
	Carrier Assembly with Skimmer-1315	RS 619 - 1315	1
	Carrier Assembly with Skimmer-1618	RS 619 - 1618	1
	Titanium Fingers – single sided	RS 630	NA
	Solder	RS 6337	NA
	Support Frame for 1315	RS 670 - 1315	1
	Support Frame for 1618	RS 670 - 1618	1
	Chain Pins	RS 736	6
	TDR Dwell Controller	RS 213	2

(PALLET/PARTS ILL. OR PICTURE)

V ACCESSORIES

The Roto/Solder™ is a complete machine requiring only the addition of solder, flux, electricity, and compressed air. Roto Form does, however, offer a few options and accessories for both your consideration and convenience.

1. **Solder: PN RS-6337**

Each new machine is loaded with new, high purity, solder (i.e. 63/37) at the factory. Each machine is also tested for operation, using the prospective new owner's printed circuit boards when possible. Our preference is to deliver the new machine to you with a full solder pot, offering the solder to you at competitive market pricing.

2. **Cabinet: PN RS-680**

A heavy-duty stand/cabinet system designed and built by Roto Form especially for the Roto/Solder™. Manufactured from 16-gauge steel and coated with a white non-conductive surface, this cabinet provides both non-vibrating support to the machine and secure storage for extra solder, flux, pallets, and Manuals.

3. **Pallets:** Roto Form offers several pallet options for your convenience in configuring the machine for optimum usage. Each pallet is described below.

- **RS-600 Standard Pallet Assembly**

One is provided with your new machine and comes complete with two standard single finger-bars (RS-620) which run parallel to the direction of conveyor movement, and are 16" long. The pallet is 18" wide and 16" long.

- **RS-605 Optional Pallet Assembly**

Similar to the standard assembly described above except the bars run perpendicular to the direction of conveyor movement, and are 18" long. The pallet is still 18" x 16".

- **RS 610 Standard Center Bar Assembly**
A 16" center bar with double-sided titanium fingers permits a greater holding capacity when working with smaller boards. Mounts parallel to the direction of movement.
- **RS 615 Optional Center Bar Assembly**
Same as above, only it is 18" long and mounts perpendicular to the direction of movement.
- **RS 620 Standard Single Bar Assembly**
A 16" finger bar assembly (mounts parallel to motion). Two are required to hold a circuit board and are provided with a new machine, included in the Standard Pallet Assembly.
- **RS 625 Optional Single Bar Assembly**
18" finger bar assembly (mounts perpendicular to motion). Two are required to hold a circuit board, and are included in the optional RS-605 pallet assembly.
- **RS 630 Titanium Finger Segments**
The finger segments are 3" long, and 4 segments are required per finger bar.

PART NUMBER	DESCRIPTION
RS-1315, 1618. 2024	SOLDER MACHINE
RS-6337	SOLDER
RS-600	STANDARD PALLET ASSY
RS-605	OPTIONAL PALLET ASSY
RS-610	STANDARD CENTER BAR ASSY
RS-615	OPTIONAL CENTER BAR ASSY
RS-620	STANDARD SINGLE BAR ASSY
RS-625	OPTIONAL SINGLE BAR ASSY
RS-630	TITANIUM FINGER SEGMENTS
RS-680	CABINET/SUPPORT SYSTEM

VI WARRANTY

Warranty:

The Roto/Solder Drag Solder Machine is warranted to be free of defects in material and workmanship for a period of 12 months after delivery to the first purchaser for use, providing that the unit has not been misapplied. Since Roto Form has no control over its use, and sometimes misuse, we cannot guarantee against failure. Roto Form's obligations hereunder, at Roto Form's option, are limited to replacement or repair of parts, which upon examination prove to be defective within the warranty period specified. This warranty does not apply to damage resulting from transportation, alteration, misuse, or abuse.