



**Ray-Tech Infrared Corp.**

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# **Tech 48**

## **Owners Manual**

# RAY-TECH TECH 48 MANUAL

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## 1. GENERAL:

This machine is designed to provide an infrared heating system capable of heating a 6' x 8' (48 ft. <sup>2</sup>) area (based on the standard chamber, larger size chamber available) without burning or damaging asphalt. The design, maneuverability and size of this equipment allows for infrared work on virtually any asphalt work area. The single axle trailer, with a 10" swivel caster wheel mounted on the bottom of the jack, allows for ease in positioning of the unit.

## 2. INFRARED PAVEMENT HEATER:

Infrared does not flame or alter the binding effect of the asphalt. The key to proper infrared heating is in the infrared light rays that are created by the pre-mixed gas and air delivered under pressure to a series of heating units. The heating units are composed of the following:

- A) The *converter* is composed of 30" and 36" segments of 16 gauge stainless steel and is formed in a way that creates a consistent, even flow of fuel-air mixture.
- B) The *orifice strip* feeds the air-gas mixture into the combustion area and is composed of ½" stainless steel ribbon. This ribbon is welded solidly to ensure uniformity and long-term durability under intensive use.
- C) The *assembly* of the converter and orifice strip is designed for rigidity and reliability throughout the repeated heating and cooling cycles that infrared equipment goes through.
- D) The *reflectors* are made of 16 gauge stainless steel in order to ensure the proper deflection of the infrared rays toward the asphalt pavement.
- E) The *inconel grids* are made of high-temperature alloy material and serve both to limit the combustion area and as the body which emits the infrared rays.

This heater unit is a dual system meaning each half of the chamber can be operated together or independently. It can be fired in any position, vertical or horizontal, as well.

Each 30" converter has a maximum fuel consumption of 2.727 lbs. per hour. Each 36" converter has a maximum fuel consumption of 3.273 lbs. per hour. *For this 6' x 8' chamber, the maximum fuel consumption will be approximately 36 lbs. per hour.*

## 3. REFLECTIVE CHAMBER:

The chamber is constructed of 16 gauge stainless steel, measures 8' wide x 6' long (standard chamber) and is properly vented. The standard chamber accommodates six (6) 30" converters and six (6) 36" converters. The chamber frame is primed and painted with a high heat aluminum paint.

## 4. FUEL:

Propane gas is delivered by four (4) 100 lb. propane cylinders (vapor withdrawal only, cylinders not supplied), two (2) cylinders per system, which are mounted on the unit, and are secured by heavy duty steel brackets. Fuel is delivered, via high pressure gas lines, through a strainer to a regulator, where the pressure is reduced to 11" water column, then through a 24 volt solenoid valve. After this, a limiting orifice valve reduces the volume, before being delivered to a 24 volt *long life* brushless motor/blower mixer system.

## 5. OPERATING CONTROLS/POWER:

Each individual system is powered by four (4) 6 volt batteries wired in series creating a 24 volt system, which in turn is charged by a 24 volt trickle charger located in the battery box. The controls are located on the outside end of the battery box. There are two (2) weatherproof switches #1 and #2 to control blower motors, and a weatherproof outside receptacle for plugging in the trickle chargers. Inside the battery box are located on/off switches that will cut power to the outside switches, to help eliminate tampering. Another safety feature is the pressure switch located by the motor/blower with 0.3"- 1.0" water column. This switch will not allow the gas solenoid to open until proper pressure has been obtained.

## 6. WINCH SPECIFICATION/OPERATION:

- A) The winch gearbox is an industrial duty right angle helical worm gear 60:1 ratio reducer. The ½ hp motor is heavy duty, maintenance free, powered by 24 volts, and runs at 1800 rpm continuous duty. Coupled with the 60:1 gear reducer, its output torque rating is 749 in-lbs. at 29.1 rpm. Running at this speed and torque ensures a very long life compared to off-the-shelf winches. The reducer gears are bathed in gear oil, to ensure very smooth and quiet operation.
- B) The Mini Combo is equipped with one (1) of these custom winches, a 60:1 gearbox and ½ hp motor, for raising and lowering the reflective chamber.
- C) Two (2) spring loaded momentary on-off-on switches are located one (1) each side of the battery box, for operation of the winch from either side of the vehicle.

## 7. CONSTRUCTION:

- A) **Chassis:** 5" x 3½" x ⅜" angle iron, front boxed. 4" x 5.4 channel cross members. One piece wrap-around industrial grade ⅜" nose plate, with a ten (10) hole channel welded to the front for a nine (9) position adjustable tow ring, or an optional ball coupler. The entire chassis, including attaching parts, is assembled by spray-arc welding.
- B) **Fuel/Power Deck:** The propane cylinder platform is 12 gauge sheet steel on 3" channel. The battery box is 12 gauge steel, reinforced with 2" angle iron corners. There is a reinforced 4" channel winch post, stranded core stainless steel winch cable and 2" angle iron frame for securing the reflector chamber.

## 8. MOUNTING:

A single round axle trailer, rated at 6,000 lbs., leaf spring suspension, with steel wheels. The two (2), per unit, tires are 8.00 x 14.5 heavy-duty tubeless tires. The unit also has 12 volt electric brakes, and 3/16" diamond plate fenders. In front of the unit is a heavy-duty nose leveling jack with a 10 swivel caster wheel, a 1⅝" tow ring with 3" ID, and two (2) high tensile ⅜" safety chains, with ⅜" heavy-duty clevis hooks.

## 9. ELECTRICAL SYSTEMS:

- A) **Lights/Connector:** Two (2) LED (Light Emitting Diode) *red brake/running /directional* light assemblies mounted at each bottom rear corner, with two (2) LED *amber hazard* lights at top rear center (winch hood), and license plate light. Hazard lights are switch selectable, on the trailer, for *tow vehicle/on-board battery 12 VDC* activation. Indicator light for reclaiming. 7 pole RV style Cole Hersee trailer connector with adequate length of connecting wires to allow for turning, spring held to protect wires.

## 10. SAFETY FEATURES:

- A) Lockable battery/controls box to protect from tampering.
- B) Safety controls.
- C) Electronically operated breakaway switch (w/electric brakes).
- D) Red reflectors – rear sides.
- E) Safety lights.

## 11. PAINT:

- A) Chassis and frame – Black.
- B) Battery box, winch hood – Ray-Tech Safety Lime Green.
- C) All parts prime coated with catalyzed etching primer, followed with two (2) coats of acrylic urethane finish colors.

## 12. DIMENSIONS:

|                 |        |
|-----------------|--------|
| Overall length: | 12' 6" |
| Overall width:  | 8' 0"  |
| Overall height: | 8' 7"  |

## 13. WEIGHT:

|               |           |
|---------------|-----------|
| Weight:       | 3,000 lbs |
| Gross Weight: | 4,000 lbs |

## 14. PERFORMANCE SPECIFICATION:

**While everyone has equipment warranties, Ray-Tech Infrared is unique in that we also have a performance specification that acts as a guarantee of our equipment's *performance* under proper working conditions and operation procedures.**

**Pavement Heater: The asphalt pavement will attain a 220°F minimum temperature at 2" depth, with 400°F maximum temperature at the surface, within 7-9 minutes of heating time, at a 50°F ambient temperature day and standard asphalt mix design.**

## 15. OPTIONAL EQUIPMENT:

- A. 12 Volt Lighting: to extend work period.
- B. Aluminum Wind Guards: 1' x 4' x 2" thick insulated wind guards; also protects concrete, grass, building and other uses.
- C. Brush Motors: Two (2) motors with brushes and armatures.

## GETTING ACQUAINTED WITH YOUR TECH 48 SYSTEM

All Ray-Tech infrared heating chambers are pressurized, not aspirated. The propane gas exits the vapor withdrawal cylinder and is passed through a strainer in order to remove impurities. The gas pressure is then reduced to 11" water column via a regulator and then passed through a 24V gas solenoid. When the main switch is turned on, the blowers begin to operate. This increases the pressure in the feed system, which closes a pressure switch. This opens the solenoid valve, which allows gas to pass to the mixing chamber of the blower. In this way, the pressure switch makes sure the unit is running before allowing gas to flow. After the solenoid, the needle valve controls the amount of gas for proper combustion. The air intake adjustment on the blower motor adjusts the proper quantity of air in order to achieve combustion. All these controls are preset at the factory. If there is any need for adjustment, first consult the factory for proper instructions.

There are several tools we strongly suggest having for proper operation of this equipment:

- Handheld torch (for lighting rows of converters)
- Iron rake (avoid garden rakes as they are often not rugged enough)
- Lute
- Shovel
- Wheelbarrow
- Push broom
- Putty knife (To scrape your tools clean afterwards)

## EQUIPMENT SETUP PROCEDURE AND OPERATION

### **BEFORE USING YOUR MACHINE, PLEASE READ THE FOLLOWING INSTRUCTIONS CAREFULLY:**

1. The heater unit, valves, pressure switches and motors have all been preset and tested at the factory. **No adjustments should be needed.**
2. After placing and securing the propane cylinders (vapor withdrawal only) in tank holders, connect hose fittings to cylinders (left hand thread) and tighten firmly. **Open cylinders very slowly** (if this is opened too fast, safety check valve will subsequently not permit propane flow).

### **THE FOLLOWING DIRECTIONS WILL INSTRUCT YOU ON PROPER OPERATION OF YOUR EQUIPMENT ON YOUR FIRST JOBSITE:**

1. Thoroughly sweep the area you will be working on. Remember, infrared rays will not penetrate the asphalt if any dirt, sand or puddle/running water is in the way.
2. To light the unit, raise chamber to 45° angle. Turn blower #1 switch to on. You will hear the first blower motor begin powering up. Turn blower #2 switch to on. When the blower motors reach their capacity, you will hear the 24 volt solenoid open with a **slight click**. This indicates the blower motor is up to proper speed and the gas-air mixture will begin being fed into the infrared converters. Using your torch, ignite the converters (touch the flame to each row of converters). This will allow each row to ignite properly. Allow 30 to 45 seconds for the grids to glow a bright orange color. You are now ready to operate.
3. Lower the chamber over the area where you will be working, leaving it approximately 4-6 inches above the surface you are heating. The age and color of the asphalt, type and size of the

aggregates, outside temperature and height of the chamber will determine time and depth of penetration. Average complete heating times are between 7-9 minutes.

4. Allow the unit to heat the area for about 4-6 minutes. After this time, use the corner of the rake to test if the asphalt is soft enough to work. **DO NOT** rake and loosen an area and attempt to reheat. Heating must be done on a solid surface. To reheat you would need to compact first. Care should be taken not to scorch the surface of the asphalt. (Scorching will turn the asphalt to a grayish color and you will not get penetration).

5. Leave the outermost 6" of the heated area untouched by the rake throughout the entire patching process. This will thermally bond the old material to the new. If disturbed, the edge will unravel over time.

6. Once the asphalt is completely heated, move the unit away from the area and onto the next work area if possible. Caution should be used when moving the unit as it reaches very high temperatures when in operation, and may not cool down quickly.

7. Without wasting time and letting the area cool, press the back of your rake into the asphalt all the way around the trouble spot. This is called "Picture framing" and it defines the area you need to work on. Remember to leave the 6" on each side untouched for thermal bonding. Rake the entire patch inside the picture framed area.

8. Patching usually requires some new material to be added and this can be done after raking the existing material loose. Once material is added, lute the surface so that you have a smooth area for compaction. Thickness differs but on the usual pothole, you should make the top of the now luted area stand about 1/2" to 1" above the outside, untouched area.

9. It is now time to begin compacting or rolling. **This is the most important step.** Begin by rolling or compacting a 1" wide strip down each side of the luted area. This is called "pinching" the edge and if you skip this, you might as well have not used infrared at all as the edges will ravel. Work your way into the patch an inch or so at a time and then as you get further into the patch, begin making broader passes. Once entirely compacted, go over it a few more times from different directions to ensure complete compaction. You now have a permanent infrared repair.

10. When transporting the unit after completion, make sure the valves on the propane cylinders are closed and the cylinders are securely in place.

### **GENERAL EQUIPMENT MAINTENANCE**

Ray-Tech Pavement Heater units are designed for minimal maintenance and long life, with the heater units, valves, pressure switches and motors all being preset and tested at the factory. **No adjustments should be needed.**

#### **Propane Supply System**

All hoses when connected should be firmly tightened and checked for leaks. You can check for gas leaks with a soap and water solution sprayed on the fittings. Equipment should NEVER be operated if there is a propane leak or if the odor of gas is present. Plastic caps should be placed on tank connectors when not in use.

## Heating Chamber

Ray-Tech heaters require minimal maintenance. Normal life under heavy use for the infrared converters is eight years and for the grids is two years. Therefore maintenance is not normally required for the first two years.

The stainless steel heating chamber should be kept clean and you should assure that the surface louvers do not get crushed or blocked, thereby restricting proper air flow. The grids are made of very soft material and should not be bumped, flattened, or pushed out of shape. If this happens, or if holes are visible, they should be removed and straightened or replaced. A visual inspection should be done at least daily to insure that all burners are properly lit.

## Converters

A standard Ray-Tech 6' x 8' chamber accommodates six (6) 30" and six (6) 36" infrared converters (part # 132100 & 132000 respectively) and twelve (12) 15" and twelve (12) 18" inconel grids (part # 132015 & 132018 respectively). The grids should NEVER be painted or have any foreign material placed on them. When the unit is fired these grids should have a bright orange color and no visible flames outside of the grids.

The angle at which reflector panels are placed is very important for proper infrared ray deflection. They must not be bent out of shape.

To prevent damage to the orifice ribbon in the converters, it is advisable to clean them periodically. The best method we have found is by spraying them with an oven cleaner type chemical and letting them sit overnight. The next day you should take a pressure washer or high powered hose and blow the cleaner out from the inside of the converter tube. This needs to be done by removing the converters from the chamber. If done on the unit, water will get into the motors and damage them. Periodic cleaning of the entire machine will undoubtedly prolong its lifespan.

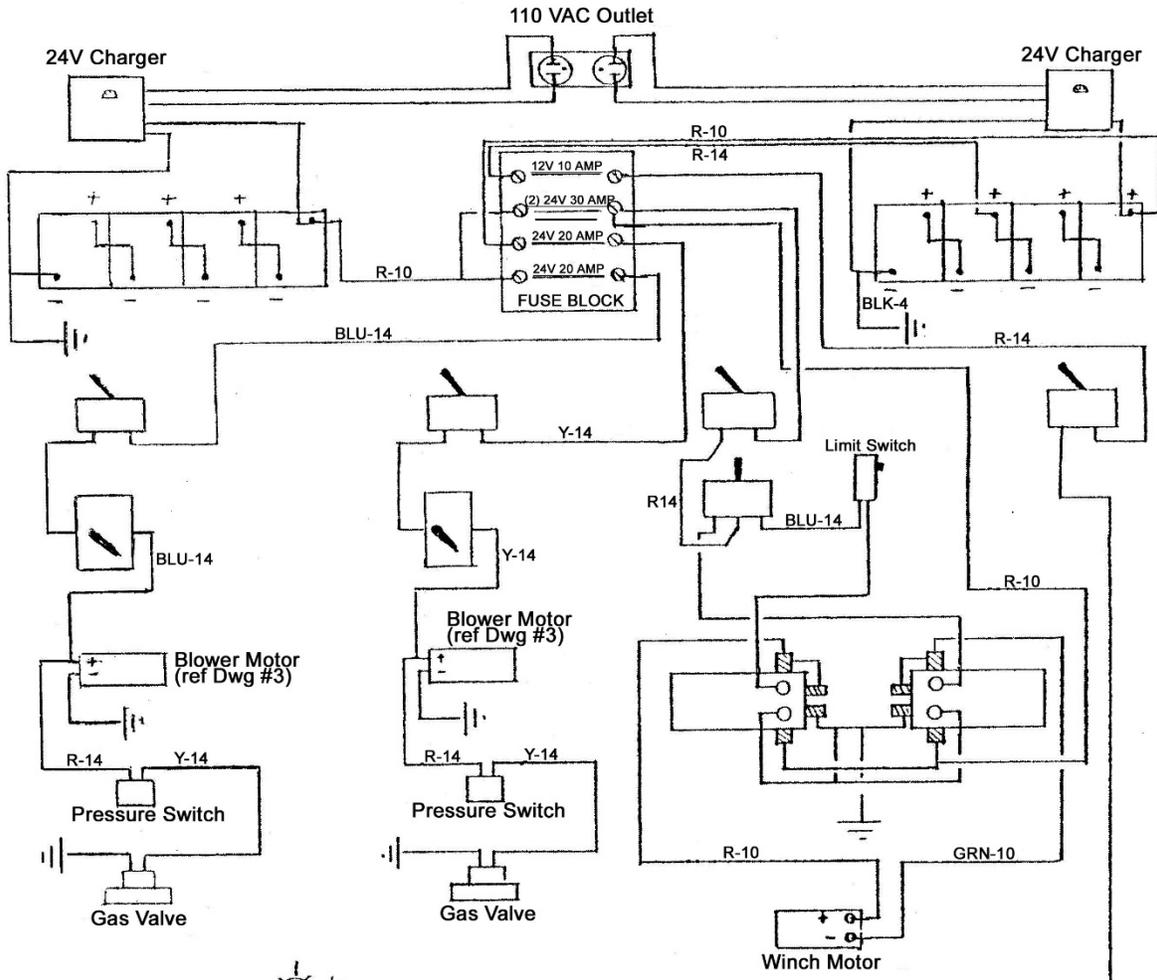
If the orifice ribbon does become damaged or deformed over time, one of two problems will occur. There will be excessive supply of gas supplied to a concentrated point causing either a blow torch effect and burning out the grid, or a blow back may occur causing combustion inside the converter. These problems can be detected by visual inspection. The unit will not be giving off an infrared glow. These orifice ribbons cannot be repaired and instead the entire converter with reflectors should be replaced by the manufacturer. The reflectors can be replaced, if lost, via heliarc welding.

## **RECOMMENDED SPARE PARTS**

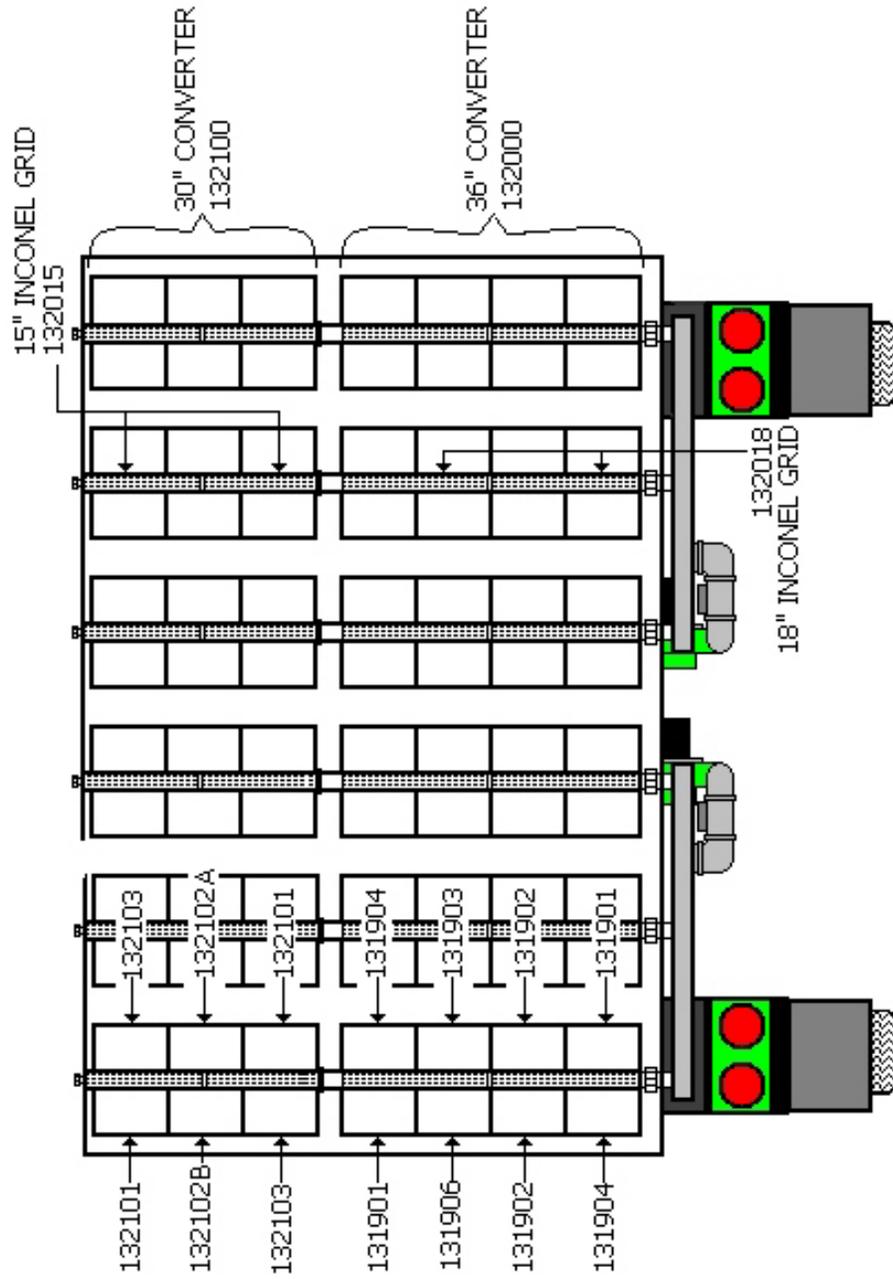
The list below are parts we recommend you keep in stock for quick repairs on the jobsite:

| <u>PART#</u> | <u>DESCRIPTION</u> | <u>QUANTITY</u> |
|--------------|--------------------|-----------------|
| 71800        | Pressure Switch    | 1               |
| 74031        | 24 Volt Gas Valve  | 1               |
| 52500-24     | 24 Volt Solenoid   | 1               |
| 132015       | 15" Grid           | 2               |
| 132018       | 18" Grid           | 2               |

# DRAWING #1



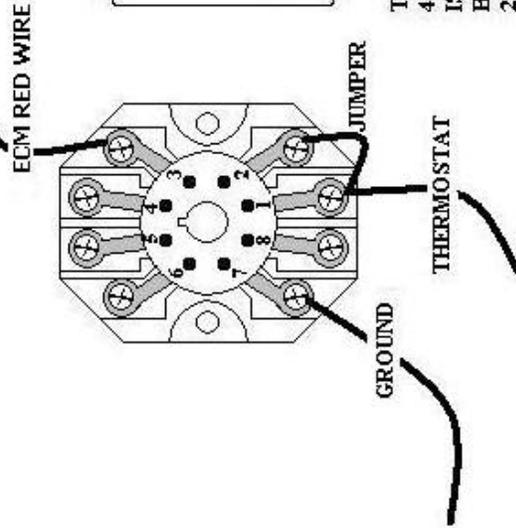
**DRAWING #2**



**CHAMBER COMPONENTS- REFLECTORS, GRIDS, AND CONVERTERS**  
RAY-TECH INFRARED CORP.

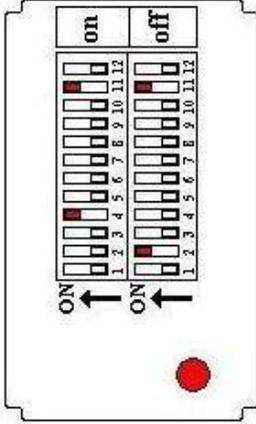
# DRAWING #3

## BASE WIRING



## TIMER SETTING

PRESET AT RAY-TECH FOR 9 ON/3 OFF

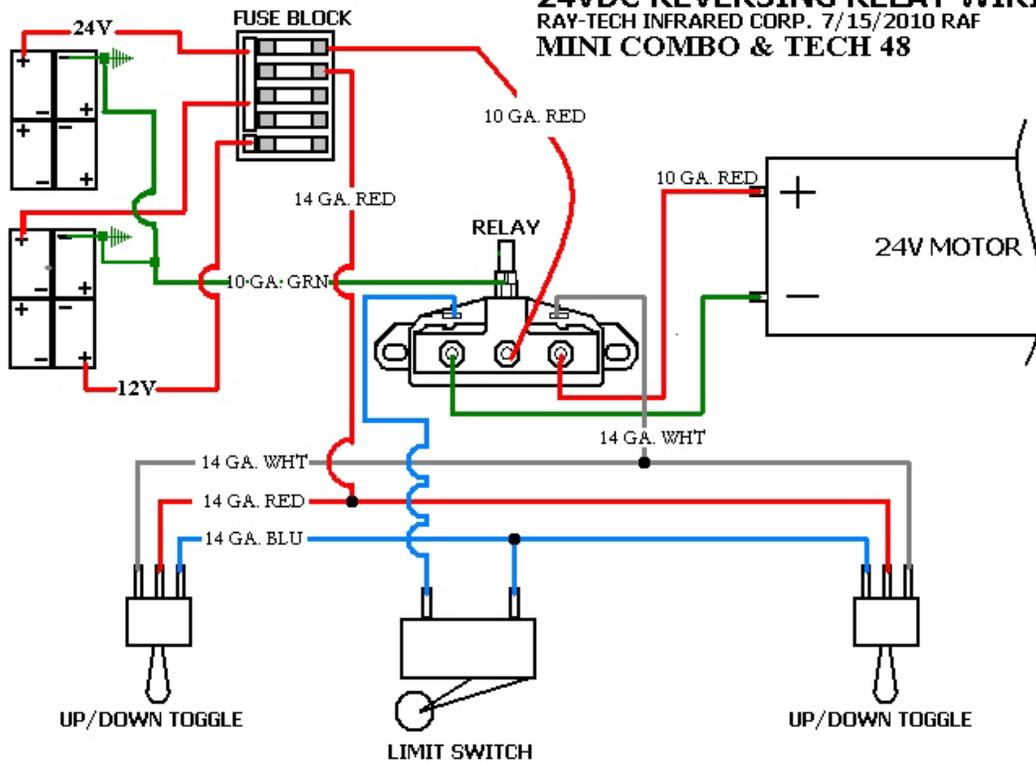


TOP ROW SET FOR 9 MINUTES ON.  
 4 SLOT INDICATES 8 MINUTES AND 1 MINUTE IS FACTORY LOADED TO EQUAL 9.  
 BOTTOM ROW SET FOR 3 MINUTES OFF.  
 2 SLOT INDICATES 2 MINUTES AND 1 MINUTE IS FACTORY LOADED TO EQUAL 3.  
 11 SLOT ON BOTH ROWS INDICATES TIMER IS WORKING IN MINUTE INTERVALS.



**DRAWING #4**

**24VDC REVERSING RELAY WIRING**  
RAY-TECH INFRARED CORP. 7/15/2010 RAF  
MINI COMBO & TECH 48



## **SAFETY PRECAUTIONS**

We include this section to point out situations that may lead to accidents before, during or after the use of your equipment. The following steps may be obvious but should be followed:

- 1) Become familiar with your machine. Identify all stickers and signage and contact us for replacements if needed. Know where all controls, valves and switches are and understand what each one does before operating the machine.
- 2) Perform a daily check of your machine. It is a good idea to do a visual check of the machine before operation. Make sure tank fittings are tightened and that tanks are secured tightly if they were removed to be filled. Check that handles, valves and switches are clear of obstructions and wipe them clean of oils or greases. Remove any items that may fall off during moving or towing such as rags, gloves, tools, etc. Check for fuel, hydraulic fluid or other leaks.
- 3) Avoid fire hazards. Allow your machine to cool down before refilling the tanks. Do not have any open flames or sparks nearby when refueling. Keep flames and sparks away from batteries as they can produce gases as well. Remove trash, oily rags or other flammable materials from machine before use.
- 4) Keep safety items on hand. In the event that an accident does occur, you should have certain items nearby the machine and ready. We recommend 10+ lb type ABC or CO2 fire extinguisher, a commercial grade first aid kit (with burn packs) or separate burn packs.
- 5) Dress appropriately. We recommend long pants, long sleeve shirts, heat resistant gloves, hard soled work boots, eye protection and safety vests during operation.

## **FIRST AID: BURNS**

In the event of an asphalt burn, cool the affected area immediately. Submerge area if possible in cool or cold water. We recommend bringing the victim to a physician or hospital soon afterward as they may require a physician's assistance with removing the asphalt from the burned area. For serious burns, proceed to a hospital or closest physician immediately. **DO NOT** attempt to remove asphalt with products containing solvents or ammonia. Natural separation will occur in 48 – 72 hours if not removed by a physician. If immediate removal is necessary, soak a bandage in mineral oil and place over the affected area for 2 – 3 hours.

## **AVOID EQUIPMENT DAMAGE**

When working on your machine, contact Ray-Tech with any questions about voiding parts warranties or damaging the equipment. Be especially careful when working with your blower motors and batteries. **When welding, disconnect all wires from battery terminals or batteries may be rendered useless or could explode. When working on blower motors, DO NOT open the cover of the motor itself. That will immediately void the warranty – no exceptions.**

## **Remember:**

**Ray-Tech cannot control the safe use of your machine. All of our equipment is manufactured with safety of the operator in mind and we incorporate safety precautions into every component.**



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## **Ray-Tech Infrared Equipment Warranty**

Ray-Tech Infrared Corp. warrants, to the original owner, all equipment of its own manufacture to be free from defects in material and workmanship for a period of **2 years** from the date of shipment. Parts not of Ray-Tech Infrared Corp. manufacture will carry the vendor or manufacturer's standard warranty.

### **Concurrently, Ray-Tech Infrared Corp. warrants specific parts for periods of time other than the two year term:**

- All reclaimer/storage box hoppers are warranted against burnout for **10 years**.
- All winches (mfg. by Ray-Tech Infrared Corp.) are warranted for **10 years**.
- All trailer frames (mfg. by Ray-Tech Infrared Corp.) are warranted for **5 years**.
- All heating converters (mfg. by Ray-Tech Infrared Corp.) are warranted for **5 years**.
- All inconel grids (manufactured by Ray-Tech Infrared Corp.) are warranted for **6 months**.
- All blower motors are warranted for **1 year**. Determination of repair or replacement of blower motors will be at the sole discretion of Ray-Tech, pending evaluation of maintenance and abnormal operating/environmental conditions. \* When working on blower motors DO NOT open the T-box on the motor itself. That will void the warranty. \*
- All batteries and tires will be **pro-rated**.
- All electrical parts carry a **limited 60 day** warranty.

During the warranty period, Ray-Tech Infrared Corp will repair or replace defective parts at its sole discretion. The seller's obligation under this warranty is limited to the above and does not apply to replacement or repairs which are required as the result of improper installation, misuse, maladjustment, abnormal operating conditions or lack of routine maintenance. Parts damaged by misuse, negligence or accidents are excluded from this warranty. This warranty does not include the furnishing of services for maintenance or any problems arising from the foregoing causes. No claims for labor or other expenses will be recognized.

All other warranties, whether express, implied or statutory (such as warranties of merchantability or fitness for a particular purpose) are hereby excluded and disclaimed to the extent that they exceed the warranties granted herein. In no event shall the seller be liable for consequential or incidental damages. No agreement extending this warranty shall be binding upon the seller unless in writing and signed by seller's duly authorized officer or representative.

To maintain this warranty, the purchaser must perform maintenance and inspections as prescribed in the routine maintenance chart on the following page. This shall include prompt replacement or repair of worn or consumable parts and other such necessary repairs as may be required, according to use of the equipment. Disassembly of parts, other than that covered in the owner's manual, may void this warranty.

## **Routine Maintenance Checklist**

| <b>Component</b> | <b>Part</b>      | <b>Action</b>                  | <b>Schedule</b>                            |
|------------------|------------------|--------------------------------|--|
| Heating Chamber  | Vents/Louvers    | Clean Out                      | Every Operating Day                        |
| Heating Chamber  | Grids            | Check For Burnouts             | Every Operating Day                        |
| Heating Chamber  | Grids            | Watch For Hot Spots            | Every Operating Day                        |
| Heating Chamber  | Converters       | Clean Ribbon At Hot Spots      | If Hot Spots Are Found                     |
| Heating Chamber  | Converters       | Tighten Connections            | Every 1 – 2 Weeks                          |
| Chamber Winch    | Cable            | Check For Breaks/Damage        | Every 1 – 2 Weeks                          |
| Chamber Winch    | Grease Fitting   | Check/Add Grease               | Every 1 – 2 Weeks                          |
| Reclaimer        | Vents/Louvers    | Clean Out                      | Every Operating Day                        |
| Reclaimer        | Top Door Hinges  | Clean                          | Every Time Box Is Filled                   |
| Reclaimer        | Burners          | Check Tiles/Mesh For Damage    | Weekly                                     |
| Reclaimer        | Burners          | Check For Orifice Obstructions | Weekly                                     |
| Batteries        | Batteries        | Top Off Battery Fluid          | Monthly                                    |
| Batteries        | Batteries        | Charge                         | Before Every Operating Day                 |
| Batteries        | Batteries        | Charge                         | Monthly<br>(If not being used over winter) |
| Propane Tanks    | Tank Connections | Tighten If Necessary           | Every Operating Day                        |