



TOTAL COMBUSTION INC.

**Model: TCI 10000
Rental Operation Manual**



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DESCRIPTION

The TCI 10,000 is a patented engineered product designed to burn waste gas from onshore oil and gas wells when they are being tested. The unit operates at 99.9% combustion efficiencies with no smoke, odor or visible flame. It will accept waste gas from several different sources and is equipped with valves to control waste streams that vary over time. The unit is self contained, skid mounted for easy transport and requires no guy wires. It is robust, easy to operate and maintain and has a product life of approximately 15 years.

CAUTIONS AND WARNINGS

The TCI 10,000 Unit should be operated in accordance with these instructions and your company's regulations; failure to do so may cause a safety hazard to personnel and damage the unit and other equipment in the area.

- Some surfaces on the unit will become hot during operation. Do not allow any part of your body or other flammable materials to come in contact with these hot surfaces.
- During operation there will be open flames within the unit. These open flames will act as source of ignition. Place the unit away from areas that may contain flammable or explosive atmospheres.
- The hot surfaces of the unit may cause heating of adjacent surfaces. Do not operate the unit on or near flammable or heat sensitive materials.
- Parts of the unit operate under pressure. Ensure that all pressure connections are tight before introducing any gas to the unit. Follow safe operating procedure for pressurized equipment.
- This unit should only be operated by personnel that have been trained by TCI, or equivalent, in the proper operation of the unit.
- Abnormal operation of the unit may cause damage to the unit which may not be immediately obvious. The unit should be inspected after any abnormal operation to ensure continued safe operation.

GENERAL INFORMATION

The TCI 10,000 unit has 3 waste gas inlets. The Main Waste Gas inlet has a 4 inch NPT tapped adapter flange located at the front end of the unit. The Tank Vapor Line has a 2 inch class 300 inlet flange fitted with a 2 inch NPT tapped adapter flange located at the side of the skid. The PSV line has a 6 inch class 150 flange located at the side of the skid, see FIG. # 6.

The Main Waste Gas inlet manifold is diverted into one of four Main Waste Gas Burner Trains, see FIG. #2. Each burner train is equipped with a valve so that an operator can maintain an optimal pressure to the burners under varying gas flow rates.

The Tank Vapor Line is designed to burn tank vapors from storage tanks. This line works independently from all other burners.

The PSV line is an open-ended nozzle designed to flare gases from pressure safety valves on pressurized tanks. The PSV nozzle operates independently from all other burners.

A Pilot Gas Inlet Connection is located near the main gas manifold. This is a ½ inch NPT connection. The pilot gas should be clean and dry with minimum 10 psig of propane. See FIG. # 3 for location of Pilot Gas Inlet Connection.

SET-UP

Position the unit away from flammable areas, tanks, and other equipment in accordance with local regulations. The unit should be set on stable ground and leveled. The ground under and around the unit must be nonflammable. The flue gas discharge, at top of unit, should be directed away from any flammable or heat sensitive materials. Ensure that all gas connections are tight and made in accordance with local regulations.

Any liquid carryover, water or hydrocarbon, into the unit should be avoided, layout equipment and piping accordingly. Liquid carryover may cause excessive heating and damage to the unit.

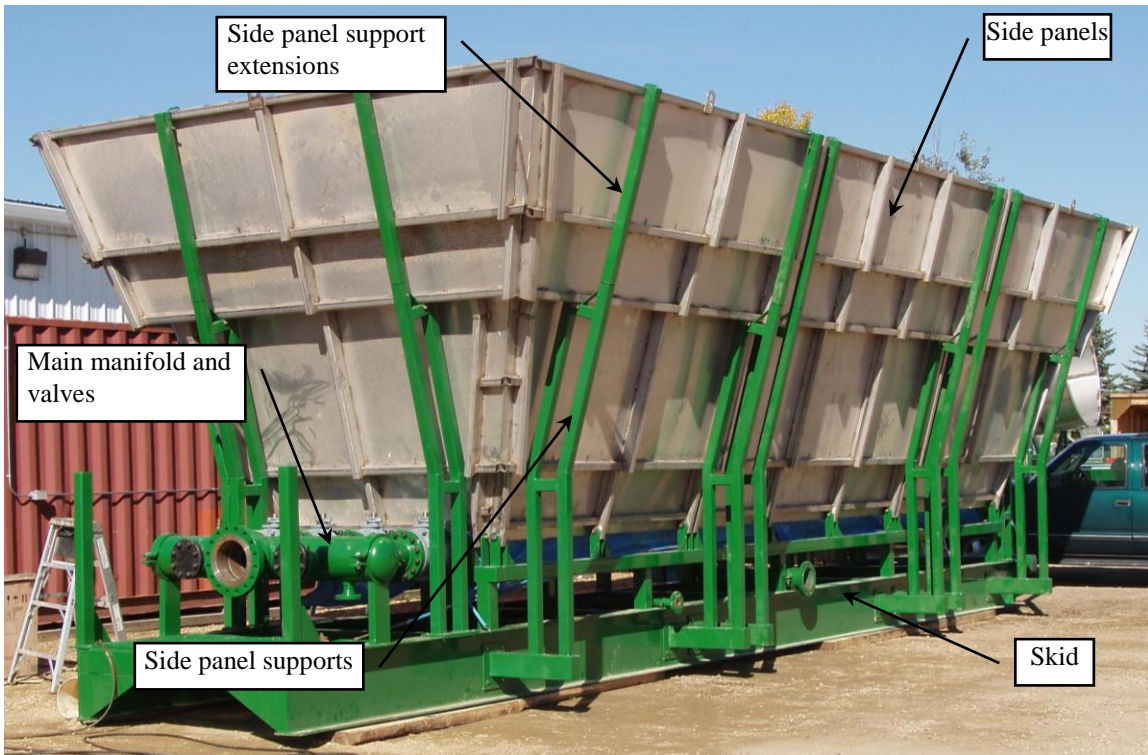


FIG. # 1 TCI 10000 UNIT CONFIGURATION AND MAJOR COMPONENTS

START-UP AND OPERATION OF MAIN WASTE

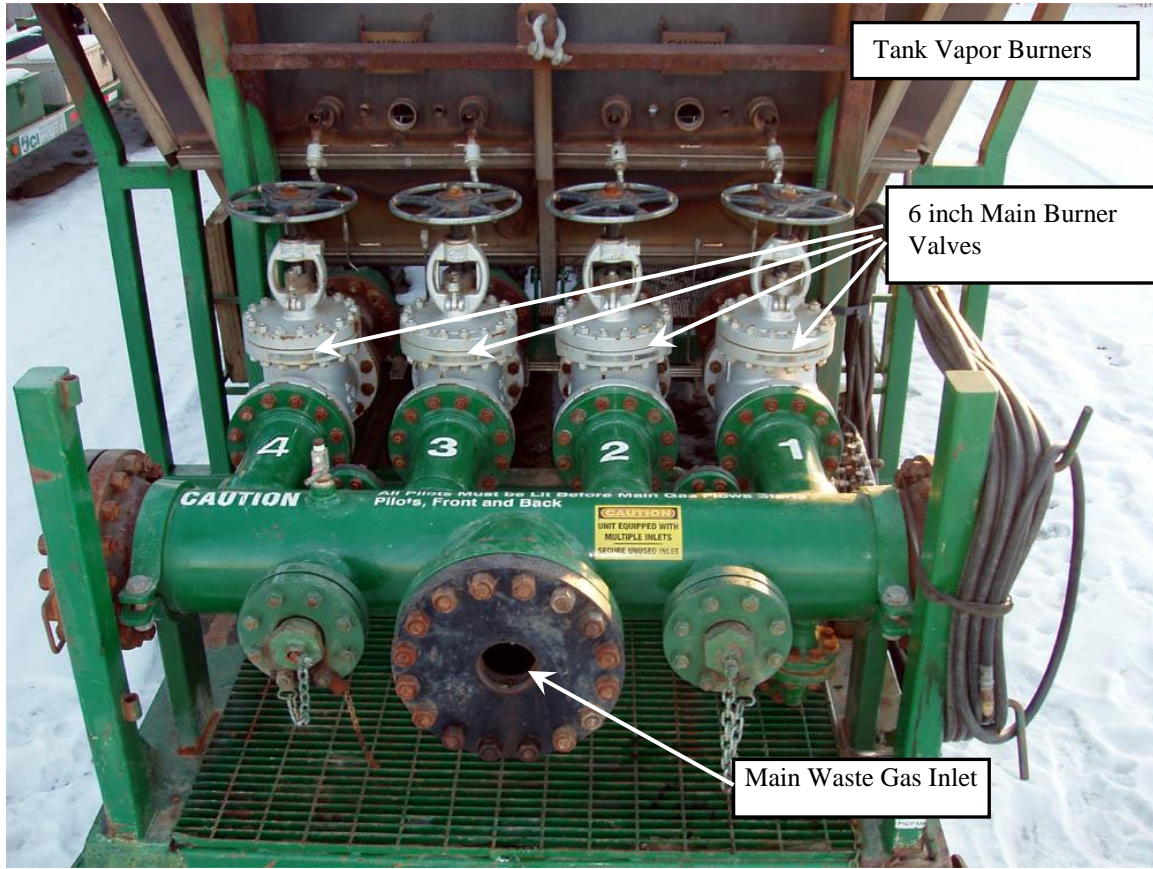


FIG. #2 MAIN WASTE GAS MANIFOLD BURNER AND VALVE LAYOUT

- 1) Before introducing any gas to the unit the lines connected to the unit should be purged of air. Follow your company's safety practice. Any air in the line may cause flashback into the line.
- 2) Close all gas valves on the unit.
- 3) Connect the waste gas line and pilot gas lines
- 4) Light the pilots on the four Main Waste Gas Burner Trains, see FIG. # 4 for location. Note that the Main Waste Gas Burner Trains have a pilot at both ends.
To do this on each pilot:
 - a. Open the pilot gas valve to the pilot burner.
 - b. Lit the pilot burner with a handheld torch.
 - c. Repeat for each pilot burner.

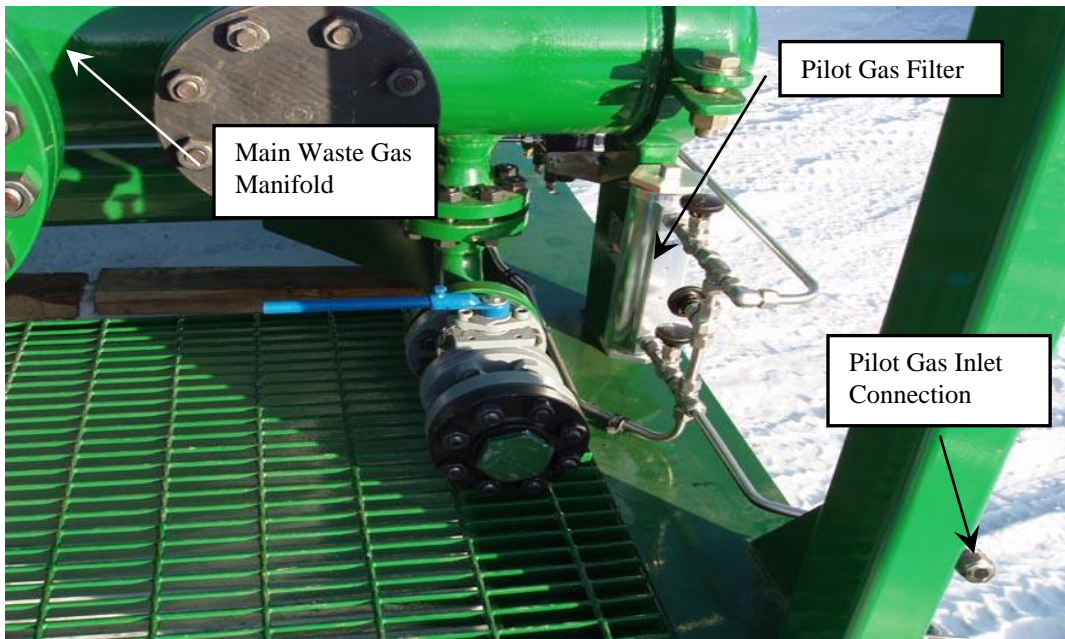


FIG. # 3 PILOT GAS INLET AND FILTER

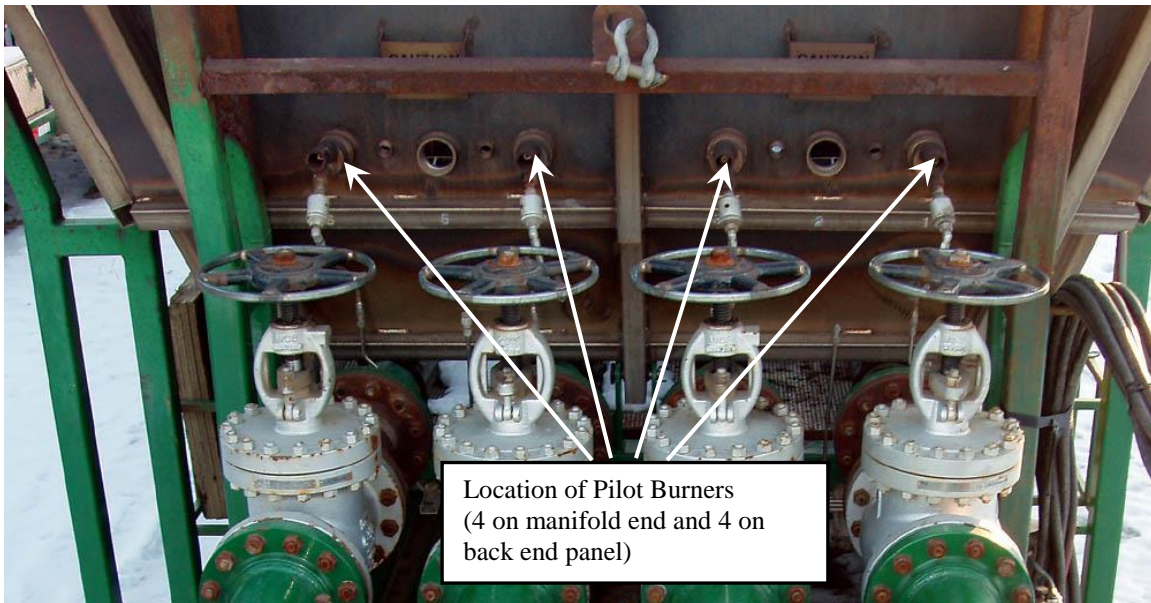


FIG. # 4 PILOT BURNER LOCATIONS

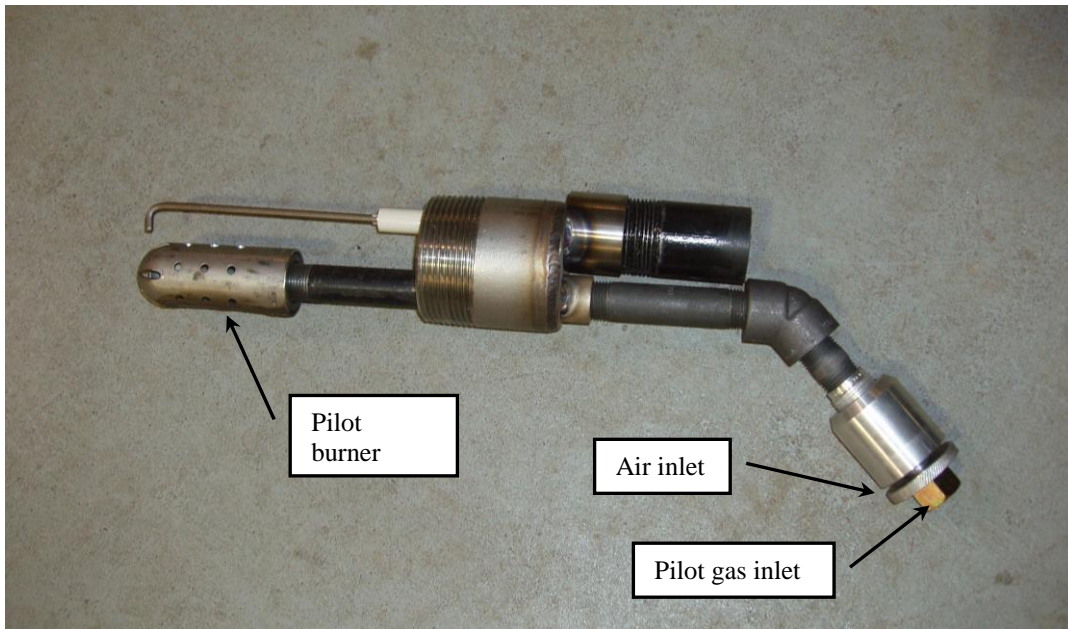


FIG. # 5 PILOT BURNER PARTS

- 5) Open all four 6 inch Main Burner Valves numbered 1 to 4.
- 6) Then slowly introduce waste gas into the manifold. Ensure that all four main burner trains light.
- 7) If there is not sufficient flow to maintain at least 3 psig in the manifold close the 6 inch valve on line number 1.
- 8) If the pressure is still below 3 psig with the valve on line number 1 closed, then the next step is to close the valve on line number 4 at the manifold.
- 9) If the pressure is still below 3 psig with valves on line number 1 and 4 closed, then the next step is to close the valve on line number 3 at the manifold.
- 10) If the flow increases causing the manifold pressure to rise above 10 psig, open one or more of the 6 inch Main Burner valves. The 6 inch valves should be opened in the following order; line number 2, line number 3, line number 1, and line number 4.
- 11) If the pressure rises above 14 psig with all four 6 inch Main Burner valves open, then throttle the flow using the 8 inch globe valve.
- 12) Do not allow the manifold pressure to rise above 14.9 psig.

NOTE ON BURNER OPERATION:

The burners will operate most effectively if the manifold pressure is maintained between 4 and 10 psig. However, the burners can be operated at any pressure between 0.5 and 14.9 psig. Open or close the four 6 inch Main Burner Train valves accordingly. The outside Main Burner Trains, line numbers 1 and 4, should only be operated once both inside Main Burner Trains, line numbers 2 and 3, are operating.



FIG. # 6 LOCATIONS OF TANK VAPOR AND PSV INLETS

START-UP AND OPERATION OF TANK VAPOR BURNERS

- 1) Before introducing any gas to the unit the lines connected to the unit should be purged of air. Follow your company's safety practice. Any air in the line may cause flashback into the line.
- 2) Close all gas valves to the Tank Vapor Burners.
- 3) Connect the Tank Vapor line and pilot gas line.
- 4) Start flow of tank vapors into the Tank Burner line. Ensure that the burners light.
- 5) The pressure in the tank vapor line should be maintained between 0.5 and 14.9 psig.

START-UP AND OPERATION OF PSV LINE

- 1) Connect the PSV line and pilot gas line.
- 2) Ensure that the flame on the pilot burner burns steadily.
- 3) The PSV line is now ready for operation.
- 4) Ensure that the pilot burner continues to burn at all times while the PSV line is connected.

SHUT DOWN

- 1) Ensure that well is shut in and all lines from vessels are blocked in.
- 2) Close all four 6 inch Main Burner Valves.
- 3) Shut off all waste gas valves to the unit.
- 4) Shut off Tank Vapor and PSV line flows if used.
- 5) Wait until burners are extinguished.
- 6) Then close all pilot burner valves.
- 7) Wait until all pilot burners are extinguished.
- 8) Allow unit to cool down.
- 9) Drained all liquids from piping.

TROUBLE SHOOTING GUIDE

PROBLEM	POSSIBLE CAUSES AND SUGGESTED ACTIONS
Excessive back pressure	Open more burner valves. Check that waste gas flows are within operation range, see specifications.
Flames are visible above stack	NOTE: This is normal if there is flow into the PSV line. Open more burner valves. Check to ensure that no liquid carryover is entering the unit. Check that waste gas flows are within operation range, see specifications.
Flames are visible below main burners	A liquid carryover may be occurring, shutdown operation. Inspect unit as per maintenance section of this manual. Alter piping or equipment layout to prevent carryovers.
Sidewalls are turning brown	This is normal oxidation of the stainless steel and will not affect the performance of the unit.

Unit is very noisy	Pressure in the burner trains is too high. Open more burner valves. Check that waste gas flows are within operation range, see specifications.
Flammable gas is detected at the unit	Inspect all piping connections for leakage.
Pilot burners do not stay on or burn poorly	Low pilot gas pressure or incorrect pilot gas composition. Adjust pressure regulator to maintain 7 to 10 psig to the pilot burner. Inspect, and replace if necessary, the pilot gas filter. Ensure that clean gas is supplied to the pilot burners

SPECIFICATIONS

For a complete technical specification contact TCI.

Total Weight	30,000 lbs (13 600 kg)
Height to top of stack	153 in (3.89m)
Stack top discharge size (rectangular)	432 in by 162 in (10.97m by 4.11m)
Stack discharge area	486 ft ² (45.5m ²)
Height at top of burners	60 in (1.52m)
Main Waste Gas Burner Capacity	530 to 11000 MSCFD (14.9 to 309.9 E+3m ³ /day) methane gas equivalent
Tank Vapor Burner Capacity	37 to 190 MSCFD (1.04 to 5.3 E+3 m ³ /day) methane gas equivalent
PSV Capacity	0 to 20,000 MSCFD (563 E+3 m ³ /day) methane gas equivalent

NOTE: All specification subject to change without notice

CONTACT INFORMATION

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