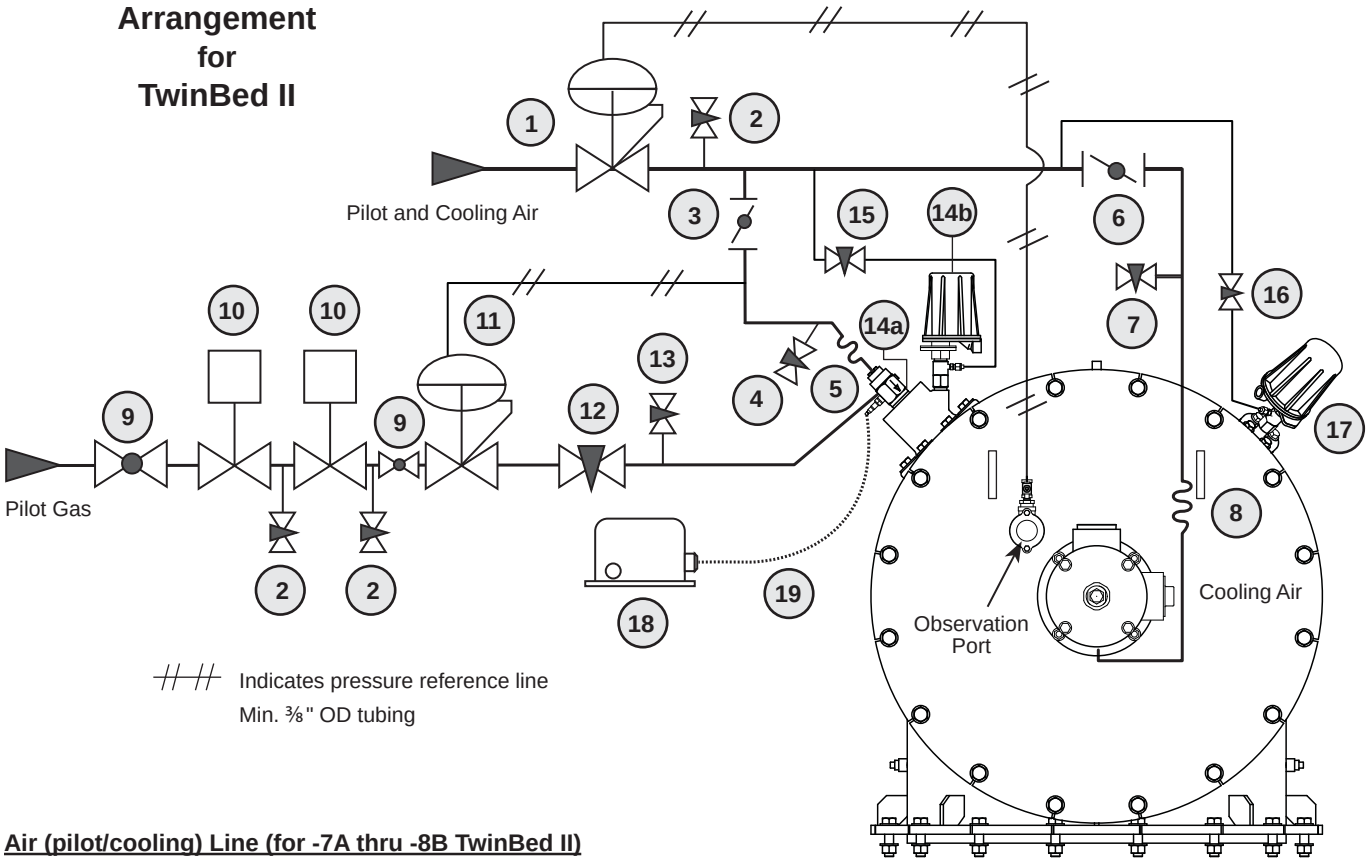
Typical Pilot Arrangement for TwinBed II



Air (pilot/cooling) Line (for -7A thru -8B TwinBed II)

1)	7349-3-G	1½" pressure reducing regulator, green spring (7-16 osi)
2)	1836-03	¼" needle valve, cooling air pressure measurement
3)	1122-3	1½" pilot air butterfly valve
4)	1836-03	¼" needle valve, pilot air pressure measurement
5)	8777-3	1½" flexible nipple
6)	1122-2	1¼" cooling air butterfly valve
7)	1836-03	¼" needle valve, cooling air pressure
8)	8777-2	1¼" flexible nipple

Air (pilot/cooling) Line (-9 thru -12B TwinBed II)

1)	7349-4-G	2" pressure reducing regulator, green spring (7-16 osi)
2)	1836-03	¼" needle valve, air pressure measurement
3)	1122-3	1½" pilot air butterfly valve
4)	1836-03	¼" needle valve, pilot air pressure measurement
5)	8777-3	1½" flexible nipple
6)	1122-3	1½" cooling air butterfly valve
7)	1836-03	¼" needle valve, cooling air pressure
8)	8777-3	1½" flexible nipple

Gas Line (all burner sizes)

9)	1821-02	⅜" ball valve
10)	1486A-02	⅜" solenoid valve
11)	7350-02-A	⅜" regulator
12)	R930-6055	⅜" needle valve
13)	1836-03	¼" needle valve, pilot gas pressure measurement

Pilot/Flame Scanners (all burner sizes)

14a)	4020-3-CB	nozzle mix pilot tip for -9 thru -12B burner sizes
	4020-3A-CB	nozzle mix pilot tip for -7A thru -8B burner sizes
14b)	see page 3	pilot flame scanner assembly and adapter with cooling air connection.
15)	1836-03	¼" needle valve (cooling air, pilot UV)
16)	1836-03	¼" needle valve (cooling air, main UV)
17)	see page 3	main flame scanner assembly and adapter with cooling air connection.

Ignition (all burner sizes)

18)	4065-6NI-6A	ignition transformer
19)	4085-5	ignition cable, 5'

TwinBed® II Firing/Flame Scanning Sequence

Burner "A"	Burner(s) Off	Stop Cycle (low fire)	Conventional Firing (main flame in the tile)				Stop Cycle (low fire)	LNI Firing (furnace above 1450 F [788 C])			
Main Scanner	on										
Main Flame	off		on		on			on		on	
Pilot Scanner	on		off		off						
Pilot Flame	off	on.....loss of pilot flame will result in a shutdown of all burner fuel									
Burner "B"			time →					time →			
Main Scanner	on										
Main Flame	off			on		on			on		on
Pilot Scanner	on			off		off					
Pilot Flame	off	on.....loss of pilot flame will result in a shutdown of all burner fuel									
	(pre-start check)	(pilots only)	"A" fires	"B" fires	"A" fires	"B" fires	transitions to and from LNI	"A" fires	"B" fires	"A" fires	"B" fires
	note ***1***	note ***2***	note ***3***					note ***4***			

The above diagram shows the relationship between the flame scanners and introduction of main fuel. Each TwinBed II burner uses two flame scanners. One to monitor the pilot flame and one to monitor the main flame. The main flame scanner mounting is such that it can not "see" the pilot flame.

NOTES:

1. Prior to the pilots being ignited, both the pilot and main flame scanners are "switched" on (electrically connected to the flame controller) so the flame controller can perform a diagnostic check of both scanners.
2. In the "Stop Cycle" mode, all air, exhaust, and fuel "cycle valves" are closed. The flame monitoring is of the pilot flame only.
3. When the burners are firing "conventionally", with main fuel being introduced through the "burner fuel" connection, the pilot scanner is "switched" off. In this "state", the flame monitoring system will be maintained by the main scanner "seeing" the main flame even though the pilot is still burning. The "exhausting" burners flame monitoring system is maintained by detection of its pilot flame.
4. When the burners are firing in the "injector mode" (LNI), the flame monitoring system is maintained by the pilot scanner in both the firing and exhausting burners. The primary safety limit for the introduction of main fuel, in addition to all other required limits, is proving the furnace and by-pass flue are above "auto ignition" temperature.

INFORMATION ON PAGE 1 SCHEMATIC

Air Pressure Regulation

Because of the wide swings in backpressure that occur when TwinBed II cycles between firing and exhausting, a regulator (item 1) is used to maintain constant pressure drop across the pilot and fuel tube cooling passage. Constant pressure drop translates into constant flow.

Flame Scanners:

Flame scanners other than Honeywell C7061 or Fireye 45UV5 require different adapters than listed. Contact FivesNA for information. Page 3 lists scanner assembly details, items 14 and 17.

Pressure Reference Lines

Pressure reference lines (lines with hash marks) to regulator diaphragm chambers may be ⅜" or ½" stainless steel or copper tubing. Do not use steel tubing which will rust and may eventually block the passage.

Pilot Location

The TwinBed in the schematic has the pilot located on the left side and main UV on the right (4343-BL1). Locations of pilot and main UV can be reversed (4343-BR1). See "Order 4343" or "Dimensions 4343."

Typical Pilot Adjustments

CAUTION! Standards-compliant functioning of the Flame Detection System can be compromised if the pilot system is not configured and adjusted strictly in accordance with the information outlined in Sheet 4343-3.

Set pilot with zero main burner air pressure.

Pilot Gases	**Nat. Gas**	**Air**
Adjust Item	#12	#3
4020-3A-CB Flow (scfh)	30	232
4020-3-CB Flow (scfh)	47	360
Pressure (P)	2½ osi (4.3"wc)	2½ osi (4.3"wc)
Measure P. at Item	#13 (pilot gas)	#4 (pilot air)

Pilot operation is best when slightly fuel rich as in above air flows.

Cooling Air Flow and Pressure Drop Across Fuel Tube

Adjustments should be made in stop cycle mode so that backpressure is constant. Adjust #6 cooling air butterfly valve.

TB-II Size	**-7A thru -8B**	**-9 thru -12-B**
Flow (scfh)	700	1000
Pressure (P) "wc	1"	1"
Measure P at item	#7	#7

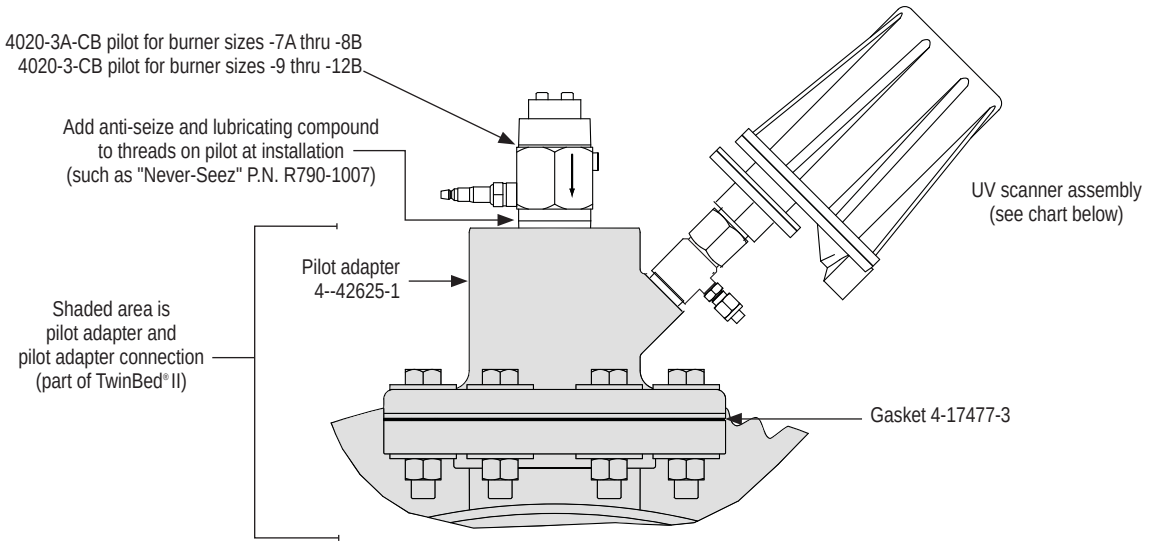
Air Supply to Pilot/Cooling Air Regulator

The 7349-3 regulator requires 20.5"wc (11.8 osi) inlet pressure and the 7349-4 regulator requires 18.0"wc (10.4 osi) inlet pressure. The maximum pressure drops that make up total air required are listed in the table below.

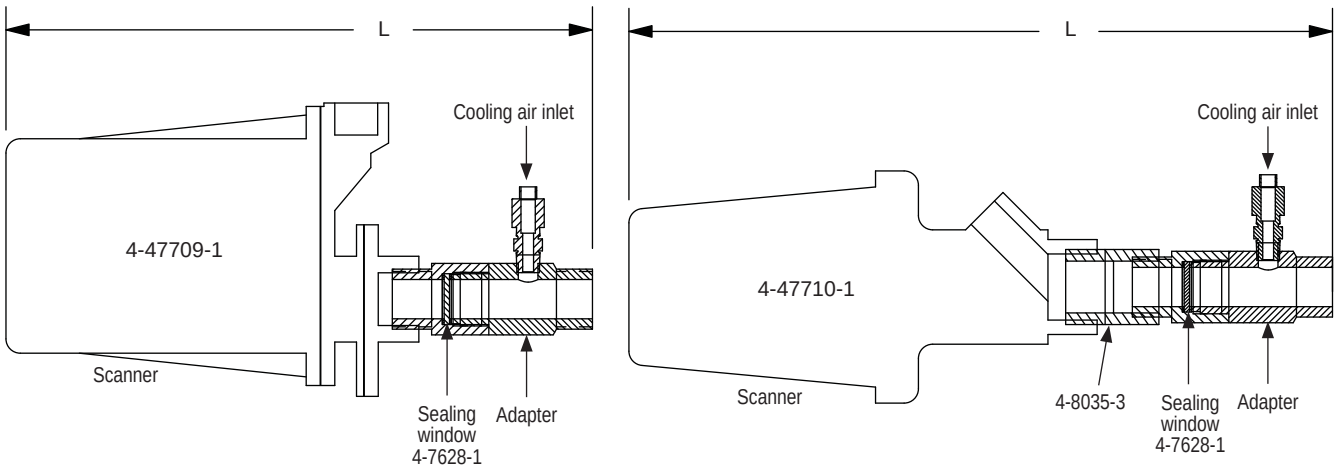
TB-II Size **Regulator size**	**-7A thru -8B** **7349-3**	**-9 thru -12-B** **7349-4**
Reg. Capacity Drop	5"	2.6"
TB-II Backpressure	11"	11"
Pilot Pressure	4.3"	4.3"
Total Air Pressure Req'd.	20.5"wc	18.0"wc

Flame Scanner Assemblies for Pilot and Main Flames

UV Scanner Assembly / Pilot Assembly



Typical UV Scanner Assembly



UV Scanner Assemblies for Main Flame and Pilot

(two assemblies required per burner)

Assembly number	UV Scanner	Scanner part number	Adapter	L
4-47709-1	Honeywell C7061	R-130-5851	8835-R	10.25"
4-47710-1	Fireye 45UV5	R-130-2151	8839-R	12.30"

TwinBed® II Pilot Setup and Trouble-Shooting

GENERAL SETUP — 4343 BURNER PILOT SYSTEM

Warning: Startup and adjustment of combustion equipment should only be done by trained personnel familiar with combustion technology, combustion equipment, and with the particular burner system, equipment, and controls.

CAUTION! Standards-compliant functioning of the Flame Detection System can be compromised if the pilot system is not configured and adjusted strictly in accordance with the information outlined in Sheet 4343-3.

Refer to pilot schematic on page one for item numbers.

1. All fuel valves to furnace should have been closed during shutdown (both main and pilot valves).
2. Purge the furnace in accordance with local standards requirements.
3. Adjust the main burner air flow to its lowest operating condition (for instance, with air flow conditions of a hot regenerator at light-off).
4. Open manual gas shutoff valves (not shown on schematic) to get gas pressure to inlet of closed pilot manual valve (9). Set gas supply pressure to pilot system between 12 and 16 osi. **Note:** Gas pressure must be set when gas is flowing. Make final adjustments to gas supply pressure once pilot is burning.
5. Turn open six turns the adjustment plug of the pilot gas limiting orifice valve (12).
6. Place the 4343 Burner in stop cycle mode (main burners off, blower running).
7. Set the pilot air regulator (1) for a 4 osi (7"wc) pressure measured at the cooling air needle valve (2). Refer to "Air Supply to Pilot/ Cooling Air Regulator" on page 2 for air pressure information.
8. Set fuel-tube cooling-air pressure at item (7) to 1"wc.
9. Make sure UV cooling air valves (15) and (16) are open and air is flowing to UV mounting adapters.
10. Run trial for pilot ignition (power ignition transformer (18) and open pilot gas solenoid valve (10)). Slowly open pilot gas shutoff valve (9). Adjust pilot gas limiting orifice valve (12) until 4.3"wc is measured at the pilot gas pressure tap (13). The pilot should ignite.
11. CAUTION! Verify that the pilot flame cannot be sensed by the main flame scanner, as this could permit a hazard to persist, and is indicative of a pilot setup issue. If the main flame scanner senses the pilot flame, confirm settings, readjust pilot and burner settings and retest until the main flame scanner does not sense the pilot flame.
12. If pilot does not ignite, see page 5.

TwinBed® II Pilot Setup and Trouble-Shooting

TROUBLE-SHOOTING 4343 PILOT SYSTEM

Problem Possible Cause	→	Possible Correction
A. Pilot does not light		
1. No spark.	→	Check spark plug (14a) for carbon or no gap; ignition transformer (18); and ignition wire (19) for electrical continuity, short or failed/burned insulation.
2. Pilot tip (14a) dirty or plugged.	→	Clean.
3. Pilot air pressure is not correct.	→	Measure with a manometer when the main burner is in stop cycle mode. If not correct, adjust pilot air regulator (1) accordingly.
4. Pilot gas pressure is not correct.	→	Measure with a manometer when the main burner is in stop cycle mode. If not correct, adjust pilot gas needle valve (12) accordingly.
5. Pilot gas solenoid valve (10) not opening.	→	Check for power to gas solenoid valve.
6. Pilot manual gas valve (9) closed.	→	Open.
B. Pilot goes out after lighting:		
1. Pilot tip (14a) dirty or plugged.	→	Clean.
2. Pilot UV (14b) not seeing flame.	→	Clean or replace UV cell (14b), clean window in adapter (see drawing, page 3).
3. Incorrect pilot air pressure.	→	Adjust air butterfly valve (3).
4. Incorrect pilot gas pressure	→	Adjust gas needle valve (12).
5. Incorrect upstream pressure to ratio regulator (11).	→	See setup instructions (above) and adjust.

TwinBed® II Combustion Air Bypass

Purpose

The purpose of the TwinBed II combustion air bypass system is to prevent overheating of the regenerator bed and support structure while the burner pair is in pilot-only mode.

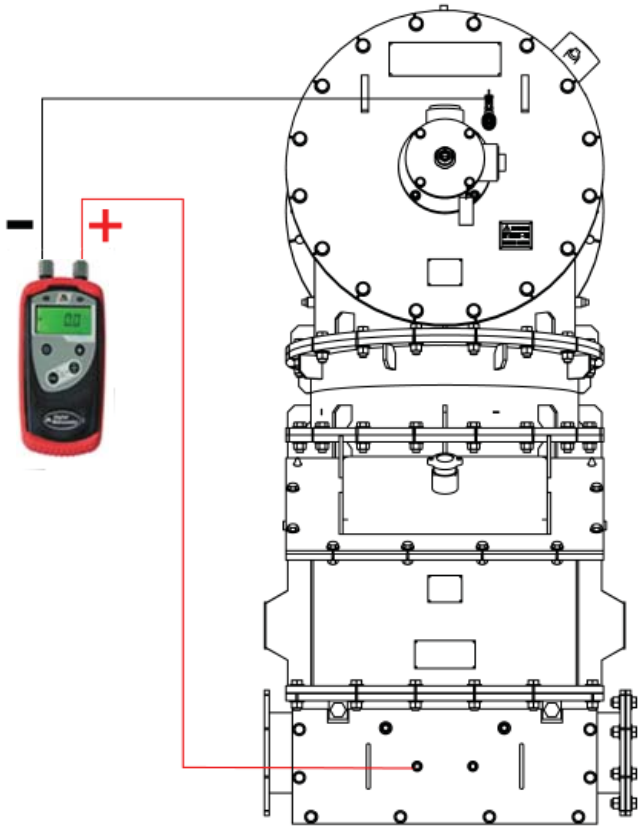
While in pilot-only mode, both the combustion air and the exhaust air cycle valve are in the closed position. As the valves have metal-to-metal seats (not intended as tight shut-off) there is a potential for leakage depending on the differential pressure across the valve. Typically a TwinBed II system's deadhead exhaust fan suction is greater than the deadhead air fan pressure. Accordingly the exhaust valve natural leakage is greater than that of the combustion air valve, creating a negative pressure in the regenerator plenum which pulls hot gases from the furnace chamber into the regenerator bed. As a result while in pilot-only mode for extended periods of time, the depth of the hot zone in the regenerator media bed will increase and will potentially overheat the plenum.

Prevention

To prevent the bed from overheating while in pilot-only mode, a controlled volume of air is by-passed around the combustion air cycle valve. This air flow is adjusted to satisfy the rate of exhaust valve leakage and achieve a neutral-to-slightly-positive regenerator plenum pressure relative to the furnace chamber, eliminating the outward flow of hot gases.

Adjustment

While the burner pair is in pilot-only mode and at operating temperature, connect the positive side of a differential pressure gauge onto the pressure tap located on the rear of the TwinBed plenum. Connect the negative side of the pressure gauge onto the pressure tap located on the rear of the TwinBed burner head. Adjust the bypass valve until a slightly positive differential pressure is achieved to cause flow in the desired direction. This pressure is expected to be approximately + .02"w.c to + .04"w.c.



WARNING: Situations dangerous to personnel and property may exist with the operation and maintenance of any combustion equipment. The presence of fuels, oxidants, hot and cold combustion products, hot surfaces, electrical power in control and ignition circuits, etc., are inherent with any combustion application. Parts of this product may exceed 160F in operation and present a contact hazard. Fives North American Combustion, Inc. urges compliance with National Safety Standards and Insurance Underwriters recommendations, and care in operation.

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