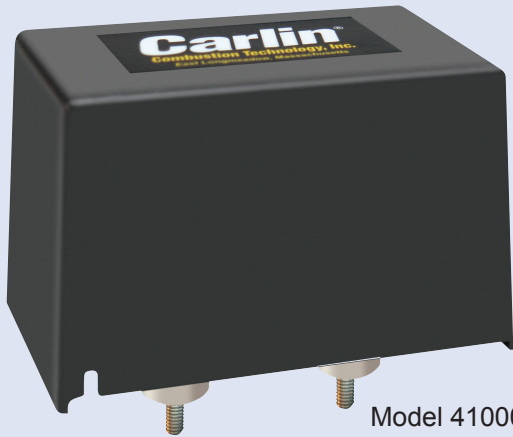


VENDER INSTRUCTIONS:

1. Carlin Ignitor Test Procedures
2. Carlin Primary 48245E (Newer)
3. Carlin Primary 40200
4. Carlin Primary 45000
5. Carlin Primary 50200
6. Carlin Primary 70200
7. Carlin Primary 48245E (Older)
8. Delta Pump (CV2RR)
9. Honeywell C554A Cad Cell Eye
10. Honeywell L4064 Fan & Limit
11. ICM Primary 1500 Series Install
12. Square D Breaker Box
13. Suntec A2RA Pump
14. Suntec J-Pump
15. Webster M Series Pump
16. Webster 1RR Series Pump



Model 41000



Model 45000

WARNING

Installer/Service – This supplement must be used only by a qualified service technician. Follow all guidelines in this manual. Failure to comply with this or other requirements in this manual could result in severe personal injury, death or substantial property damage.

NOTICE

FROZEN PIPES/WATER DAMAGE: This is not a freeze protection device. Suitable freeze protection monitoring or other precautions are recommended to protect against ruptured pipes/water damage caused by fuel outage, safety related fault conditions, or equipment failures.

CARLIN. THE TECHNOLOGY LEADER.

Models 41000 and 45000

Ignitor Test Procedure

This test procedure consists of three tests. The first is the ignitor spark test. The second test is a secondary coil resistance test. The third test consists of an input current test. The following is a step by step procedure to perform these tests. It is important that all three of these tests be performed in the order shown.

41000 and 45000 Ignitor Spark Test

1. Turn off the power to the burner/appliance.
2. Disconnect the ignitor wires in the burner junction box.
3. Release the ignitor hold down screws or clips.
4. Swing the ignitor plate fully open.
5. Adjust the copper ignitor clips until they are 1/2" apart (see figure 1). If spring style contacts are installed and cannot be replaced for this test, temporarily insert a length of wire into one of the spring contacts as shown in figure 2.
6. Connect a test power cord with a switch to the ignitor leads in the burner junction box.
7. Turn on the test power cord switch to power the ignitor.
8. Check for spark across the ignitor clip ends (see figure 1 or figure 2).
9. If spark occurs, proceed to the secondary coil test on the back of this page.
10. If spark does not jump the gap, or if the spark jumps intermittently, ignitor is defective and should be replaced.
11. Turn off power to the ignitor.
12. Remove the power cord from the ignitor leads.

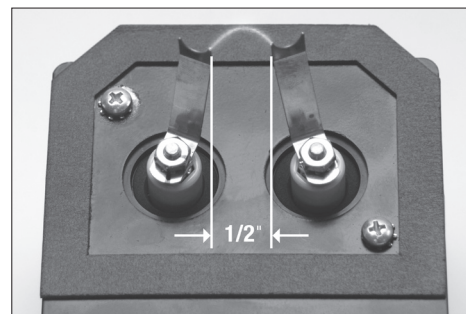
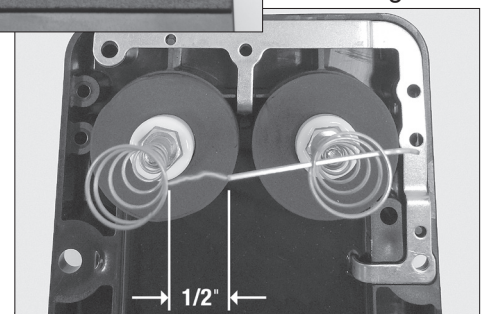


Figure 1

Figure 2



41000 and 45000 Secondary Coil Resistance Test

1. Use an ohmmeter to check the resistance from electrode to ground for each of the electrodes (Figure 3 and 4).
2. The secondary coils are good if the difference between the two readings is less than 10%.
3. If the difference in the electrode-to-ground resistance is more than 10%, the secondary coil may be failing. Replace the ignitor.
4. If the difference between electrode-to-ground is within 10%, proceed to the input current test.

Figure 3

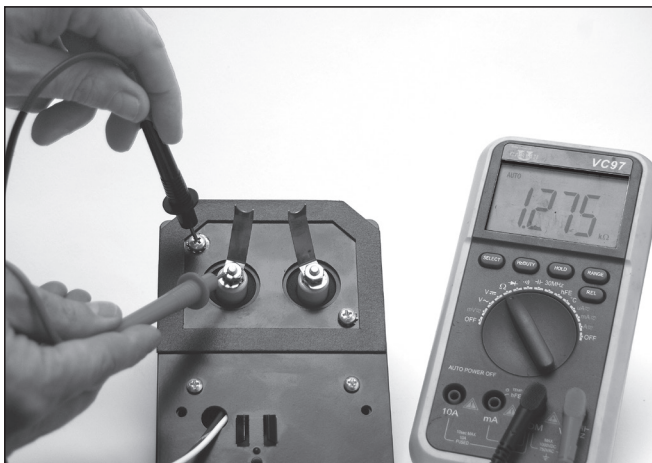
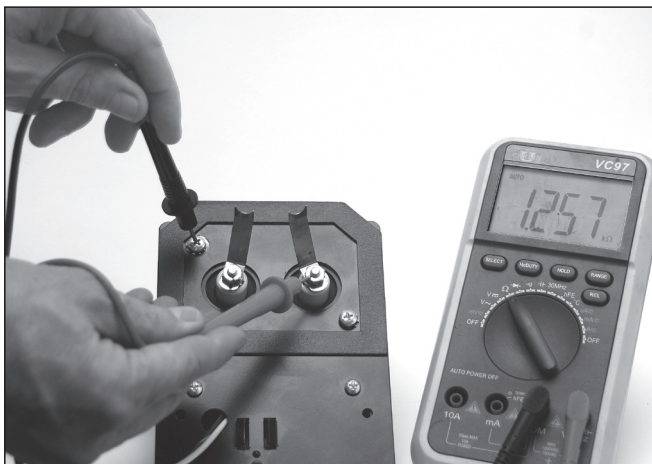


Figure 4



41000 and 45000 Input Current Test

1. Leave the ignitor clips still set to 1/2" apart.
2. Set a multimeter to read AC milliamps.
3. Using a test power cord with a switch, wire the ignitor blue lead to one of the multimeter leads. Wire the other lead of the multimeter to the hot side of the test cord. Wire the white ignitor wire to the neutral side of the test cord. (Figure 5)
4. Insure the multimeter is set for AC milliamps and turn on the test power cord switch to power the ignitor. If there is no spark, replace the ignitor.
5. Monitor the input current with the multimeter set on AC milliamps for 5 minutes.
6. If at any time the reading drops below 220 milliamps AC, the ignitor should be replaced. If you are using an auto range meter, the meter could read out of range (OL). This signifies the reading is above the range the meter is reading and is normal. Be sure your meter is set in the proper range.
7. Turn off the power to the ignitor.
8. Remove the power test cord.
9. Readjust ignitor clips to original spacing (1"). Remove wire from spring contact if used for these tests.
10. Wire the ignitor in its original condition (per burner wiring diagram).
11. Replace all components to normal condition.

Figure 5



TECH SUPPORT HOTLINE 800-989-2275



Carlin Combustion Technology

126 Bailey Road North Haven, CT 06473 Phone 203-680-9401 Fax 203-764-1714
 e-mail us at: info@carlincombustion.com visit our website: www.carlincombustion.com



Carlin®

Combustion Technology

Model 48245 with Smart Ignition – CAD Cell Oil Primary Control Data Sheet

- Intermittent Duty when you need it, Ignitor-saving Interrupted Duty when you don't
- Oil Pump Bleed Assist 60 seconds
- Recycle on Flame Failure
- Diagnostic LEDs
Status, lockout, flame

- 45 or 15 second TFI
- Increased Flame Accuracy
- Thermostat/Aquastat Compatible
- Improved SMC Technology
zero bleed voltage during standby
- Works Well with Generators
Insensitive to frequency changes

Power input (from limit circuit)	120 VAC, 60 HZ
Motor load	10 FLA / 60 LRA
Ignitor load	120 VAC, 60 HZ, 500 VA
Operating temperature limits	+32°F to +140°F

Storage temperature limits	-40°F to +185°F
Thermostat anticipator current	0.1 A, AC
CAD cell resistance (with flame)	R < 1500 OHMS
Agencies	UL recognized (US & Canada)

Smart Ignition

IMPORTANT: All four wires provided must be used to activate the Smart Ignition feature. The ignitor must be wired to the control's blue ignitor output terminal. **See Figure 1 for Smart Ignition Wiring diagram**

Smart Ignition runs in Intermittent Duty (aka "constant" duty) when needed to prevent loss of flame. But unlike any other primary control, Smart Ignition switches to Interrupted Duty when it can – to save wear and tear on the ignitor and electrodes.

How Smart Ignition Works

The control initially works as an Interrupted Duty control. Following the Trial-for-Ignition period and Flame Stabilization period, the ignitor output is turned off.

If flame is lost at any time after the Trial-for-Ignition period, the control will recycle (60 - 65 seconds). Following this recycle, the control will operate in Intermittent Duty mode for ten heat cycles. Following these ten cycles, the control will revert back to Interrupted Duty and will remain in Interrupted Duty until another recycle event occurs. Note: If control recycles and operates in Intermittent Duty three consecutive times, on a fourth consecutive recycle the control will lockout (solid red LED ON) due to hitting smart ignition limit (30 cycles)

The Best of All Worlds

The Model 48245 with Smart Ignition **ensures flame retention** by providing intermittent duty ignition when required to prevent flame loss and it **dramatically increases the ignitor and electrode life** and **saves energy** by switching to interrupted duty the remainder of the time.

To manually reset from Intermittent Mode: Open TT and depress the reset button until the amber LED turns on. Release the reset button; the control is reset from the intermittent mode.

Installing and Wiring

WARNING 48245 control must be installed and serviced only by a qualified service technician.

1. Always disconnect power source before wiring to avoid electrical shock or damage to the control. All wiring must comply with applicable codes and ordinances.
2. Thermostat terminals (T-T) provide a current source. Never apply external power to these terminals under any circumstances.

Mounting

- The control may be mounted on a 4" x 4" junction box in any convenient location on the burner, furnace or wall. The location must not exceed the ambient temperature limit, 140°F.

Wiring

- Wiring must comply with local and national electrical codes, and with the wiring diagram.
- Individual or bundled neutrals may be attached to any L2 terminal.

Continued on next page

Field checks

1. **Select preferred TFI** by 1) leave jumper in for 45 seconds or 2) remove jumper for 15 seconds. **IMPORTANT:** TFI change occurs on next call for heat.
2. **Safety timing (TFI) test** – Remove one CAD cell wire (F-F). Start burner. The control should lockout within the TFI time limit. Replace CAD cell wire.
3. **Flame failure test** – Start burner. After flame is established (after TFI period), close the oil supply hand valve. This will cause a flame failure sequence as described in the Startup & Operation section of this data sheet. Under recycle, please read “Smart Ignition” on page 4.
4. If control does not operate as described, check the wiring.

Wiring

Figure 1: 4-wire 48245 Oil Primary Control
(activates Smart Ignition – see page 4 for details)

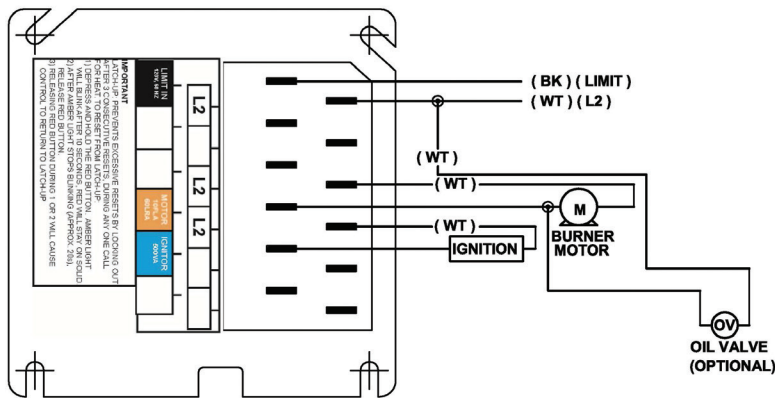
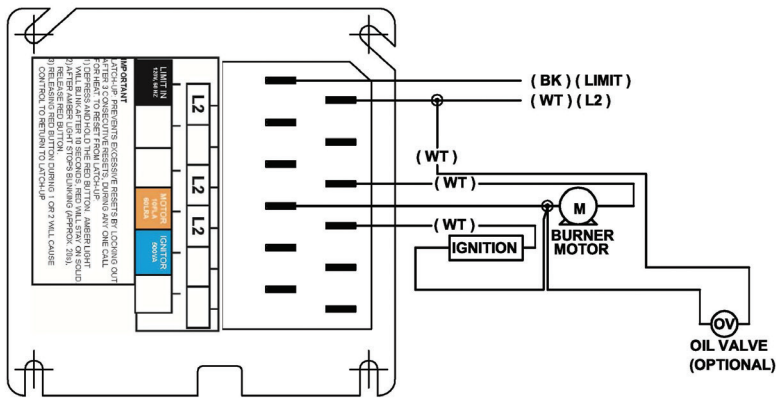


Figure 2: 3-wire 48245 Oil Primary Control
(does not activate Smart Ignition)












Startup & Operation


Three wire or four wire configuration







- See Figure 1 on page 2 for wiring diagram for 4-wire configuration (Smart Ignition)
- See Figure 2 on page 2 for wiring diagram for 3-wire configuration







Model 48245 Diagnostic LEDs

 – Amber OFF	 – Amber ON	 – Amber FLASHING
 – Green OFF	 – Green ON	 – Green FLASHING
 – Red OFF	 – Red ON	 – Red FLASHING

WARNING Do not start the burner if the combustion chamber contains oil or oil vapor.

NOTICE Per UL requirements, the control will not turn on if the CAD cell senses flame during the self-test. If the CAD cell sees light (flame) at the beginning of a cycle, the control will remain in self-test mode until the CAD cell no longer senses light (flame). The amber LED will blink momentarily  every 3 to 4 seconds and green LED will be on or flashing.

-  **Power ON** Open all manual oil line valves. Close the line switch. (If Red LED turn on constant , control is in lockout. See below to reset.)
-  **Self-test 1** The control performs a “boot-up” test to verify internal operation each time power is applied to the black (L1) wire. The amber LED turns on and the test continues for about 5 seconds. If the test fails, the control turns the amber LED off and repeats this test sequence until successful.
-  **Stand-by** (No call for heat) If Self-test 1 is successful, amber LED turns off and control waits for heat call.
- Call for heat** Set thermostat to call for heat. Thermostat circuit must be closed (and black wire must receive power from the limit circuit).
-  **Self-test 2** If a failure occurs in this self-check, the control won’t start and the amber LED blinks 1 second on, 4 seconds off, until serviced or the problem clears. These failures include CAD cell seeing light, internal failure, or line voltage <90V. See service section.
-  **Burner ON** After the self-test, amber LED turns off. The ignitor starts, followed 2 seconds later by the motor. Note: Wired as 3-wire, the ignitor and motor come on at the same time.
- Pump Prime** To enter pump prime: 1. Start a CFH cycle. During Pre-Ignition, press Reset until motor turns off (10 seconds), then release the button. When motor turns back on, within 5 seconds, press the Reset button until the amber LED starts to flash. You are in Pump Prime, release Reset button.

Optional Pump Prime notes: 1) If Pump Prime is lost, press Reset for 1 second and release, then if the control is not in Pump Prime, restart the sequence. 2) If Reset is released before end of first 10 seconds, the control returns to Standby and restarts another CFH cycle. 3) If reset is not pressed the second time, a normal CFH cycle will continue. 4) If motor and igniter are on and amber LED is flashing, the control is in Pump Prime. 5) Pump Prime will exit standby if flame is detected, or 60 seconds has elapsed, or loss of TT or Limit, or Reset button is pressed.
-  **TFI** The CAD cell must sense flame within the TFI time limit (trial for ignition). Insufficient flame puts control into lockout.
-  **Run** The burner continues firing during call for heat if the CAD cell is sensing flame. Only the green LED is on during normal running.
-  **Lockout** If CAD cell does not sense flame within the TFI time limit after the burner starts, **lockout** occurs. The control turns the red LED on constant and closes the alarm contact.
- To Reset** Push in and hold reset button for 2 seconds, then release.
- NOTICE** The 48245 control will retain lockout if power is interrupted.
-  **Recycle (Flame Failure)** If the CAD cell loses flame signal during operation (after the TFI), the Red LED flashes. Recycle: control waits for 65 seconds, Red LED goes off, then begins again at Self Test 2.
-  **NOTICE** If the green LED is blinking during a run, the flame is weak or unstable and may go into recycle.
-  **Stand-by** Control remains in stand-by mode until limit circuit sends power to the black wire and thermostat circuit closes (call for heat).

Service & Troubleshooting

Burner (control) will not come on

ⓐ ⓑ ⓓ No power to control

- Check limit circuit to the control (at least 102 VAC).
- Check all electrical connections.

ⓐ ⓑ ⓓ Control is in lockout

- Red LED will be on. Press the reset button for 2 seconds.

ⓐ ⓑ ⓓ CAD cell seeing light

- Green LED on, and amber LED blinking 1 second on, 4 seconds off. Remove one yellow lead from FF terminals. If the amber LED remains flashing, the control is defective.

If the amber LED goes OFF, the control is OK, and;

- light is leaking into the burner housing, or
- CAD cell is defective, or
- there is a problem with the CAD cell wiring or holder.
- If appliance was recently shut down, CAD cell may see residual hot spots in chamber.

To troubleshoot:

- Attach multimeter to monitor CAD cell resistance. Dark resistance should be over 50K ohms, and room light resistance (control flipped open) should be at most 10K ohms. Replace cell if necessary, or reinstall and close the burner housing.
- Check for stray light by measuring the CAD cell resistance looking into the inactive combustion chamber. It should read at least 50 kohms.

ⓐ ⓑ ⓓ Other no start problems

If the CAD cell is OK, and the amber LED still blinks 1 second on, 4 seconds off, the other possible failures include:

- Line voltage <90 VAC (amber LED flashes uniquely, 1 second on, 1/2 second off, 1 second on, 3 seconds off, then repeats). *Check line voltage.*
- Internal fault. If CAD cell and line voltage are OK, the issue may be an internal fault. *Replace the control.*

Repeated flame failures (ⓐ ⓑ ⓓ flashing red LED)

Check for:

- CAD cell is defective. *Replace.*
- Air leaking into oil line causing flame out. *Check oil line connections and filter gasket.*
- Defective nozzle causing flame to be erratic. *Change nozzle.*
- Excessive airflow or draft causing flame to leave burner head. *Check for proper air band setting and draft.*
- Excessive back pressure causing flame to be erratic. *Check appliance and flue for sooting/plugging.*

Control locks out at end of TFI (ⓐ ⓑ ⓓ red LED on)

Check for:

- No oil to burner. *Check oil supply, filters, lines.*
- Shorted electrodes. *Inspect for cracked porcelain and replace as needed.*
- Poor spark. Check electrode spacing and condition per burner manual. *Replace or realign if necessary.*
- Nozzle clogged. *Replace nozzle.*
- Airflow too high. *Check air band setting.*
- Ignitor module defective. *Replace if no spark.*
- CAD cell defective
- Oil valve (if used) stuck in closed position.
- Check wiring connections.
- Maxed out Smart Ignition cycles – check combustion, ohms, vacuum (oil supply), draft

ⓐ ⓑ ⓓ Blinking Green LED

- Weak or unstable flame.
- Check ohms.
- Check CO₂ level.

NOTICE

FROZEN PIPES/WATER DAMAGE: This is not a freeze protection device. Suitable freeze protection monitoring or other precautions are recommended to protect against ruptured pipes/water damage caused by fuel outage, safety related fault conditions, or equipment failures.



Carlin®

Combustion Technology, Inc.

Model 40200/42230 CAD Cell Oil Primary Control Data Sheet

- **Oil Pump Bleed Assist**
Up to 1 min.
- **Recycle on Flame Failure**
- **Serviceman Reset Protection**
Latch-up after 3 consecutive lockouts
- **Diagnostic LEDs**
Status, lockout, flame
- **15-second, 30-second TFI**
- **Increased Flame Accuracy**
- **Thermostat/Aquastat Compatible**
- **Improved SMC Technology**
Zero bleed voltage during standby
- **Works Well with Generators**
Insensitive to frequency changes
- **Flame Stabilize**

Power input (from limit circuit)	120 VAC, 60 HZ, 10 VA
Motor load	10 FLA / 60 LRA
Ignitor load	120 VAC, 60 HZ, 500 VA
Operating temperature limits	+32°F to +140°F

Storage temperature limits	-40°F to +185°F
Thermostat anticipator current	0.1 A, AC
CAD cell resistance (with flame)	R < 1500 OHMS
Agencies	UL recognized (US & Canada)

Installing and Wiring

WARNING 40200 and 42230 controls must be installed and serviced only by a qualified service technician.

1. Always disconnect power source before wiring to avoid electrical shock or damage to the control. All wiring must comply with applicable codes and ordinances.
2. Thermostat terminals (T-T) provide a current source. Never apply external power to these terminals under any circumstances.

Mounting

- The control may be mounted on a 4" x 4" junction box in any convenient location on the burner, furnace or wall. The location must not exceed the ambient temperature limit, 140°F.

Wiring

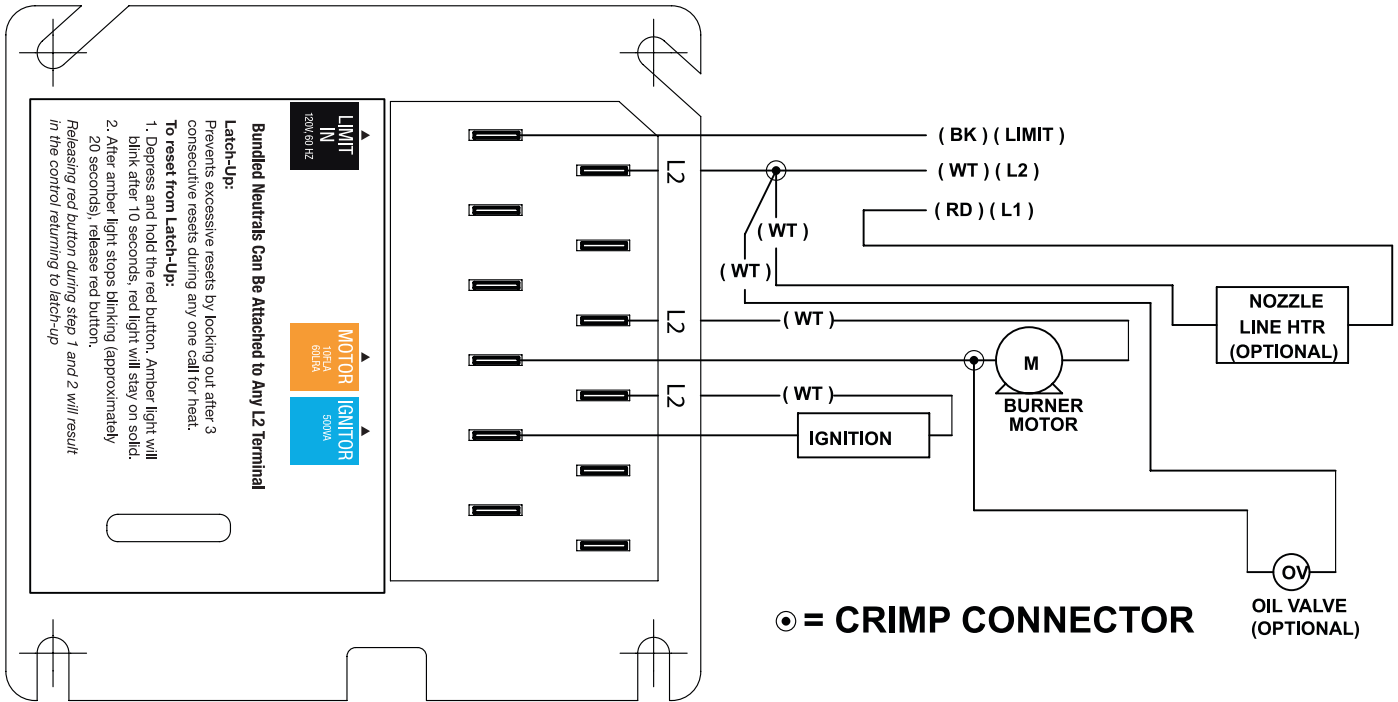
- Wiring must comply with local and national electrical codes, and with the wiring diagram.
- Individual or bundled neutrals may be attached to any L2 terminal.

Field checks

1. **Safety timing (TFI) test** – Remove one cad cell wire (F-F). Start burner. The control should lockout within the TFI time limit. Replace cad cell wire.
2. **Flame failure test** – Start burner. After flame is established (after TFI period), close the oil supply hand valve. This will cause a flame failure sequence as described in the Startup & Operation section of this Data sheet. The control should recycle (restart after 65 seconds).
3. If control does not operate as described, check the wiring.




SEE WIRING DIAGRAM ON NEXT PAGE










Wiring


















































Start-up & Operation

WARNING Do not start the burner if the combustion chamber contains oil or oil vapor.

NOTICE Per UL requirements, the control will not turn on if the CAD cell senses flame during the self-test. If the CAD cell sees light (flame) at the beginning of a cycle, the control will remain in self-test mode until the CAD cell no longer senses light (flame). The amber LED will blink momentarily  every 3 to 4 seconds and green LED will be on  or flashing .

Model 40200 & 42230 Diagnostic LEDs		
 – Amber OFF	 – Amber ON	 – Amber FLASHING
 – Green OFF	 – Green ON	 – Green FLASHING
 – Red OFF	 – Red ON	 – Red FLASHING

-    **Power ON** Open all manual oil line valves. Close the line switch.
-    **Self-test 1** The control performs a “boot-up” test to verify internal operation each time power is applied to the black wire. The amber LED turns on and the test continues for about 5 seconds. If the test fails, the control turns the amber LED off and repeats this test sequence until successful.
-    **Stand-by** (No call for heat) If Self-test 1 is successful, amber LED turns off and control waits for heat call.
-    **Call for heat** Set thermostat and limit to call for heat. Thermostat circuit must be closed and power coming to black wire from limit circuit.
- Self-test 2** If a failure occurs in this self-check, the control won't start and the amber LED blinks 1 second on, 4 seconds off, until serviced or the problem clears. These failures include CAD cell seeing light, internal fault, or line voltage <90V. See service section.
-    **Burner on** After the self-test, amber LED turns off. The ignitor starts, followed 2 seconds later by the motor.
-    **Pump Prime** To enter pump prime: 1. Start a CFH cycle. During Pre-Ignition, press Reset. Motor turns off (10 seconds), then release the button. When motor turns back on, within 5 seconds, press the Reset button until the amber LED starts to flash. You are in Pump Prime, release Reset button.
Optional Pump Prime notes: 1) If lost, press Reset for 1 second and release, then if the control is not in Pump Prime, restart the sequence. 2) If Reset is released before end of first 10 seconds, the control returns to Standby and restarts another CFH cycle. 3) If reset is not pressed the second time, a normal CFH cycle will continue. 4) If motor and ignitor are on and amber LED is flashing, the control is in Pump Prime. 5) Pump Prime will exit standby if flame is detected, or 60 seconds has elapsed, or loss of TT or Limit, or Reset button is pressed.
-    **TFI** The CAD cell must sense flame within the TFI time limit (trial for ignition). Insufficient flame puts control into lockout.
-    **Run** The burner continues firing during call for heat if the CAD cell is sensing flame. Only the green LED is on during normal running.
-    **Lockout** If CAD cell does not sense flame within the TFI time limit after the burner starts, lockout occurs. The control turns the red LED on constant, and closes the alarm contact.
- To Reset** Push in and hold reset button for 2 seconds, then release.
-    **Latch-up** If the control locks out 3 times during a single call for heat, latch-up occurs. The control turns on both the amber and red LEDs constant. You must use the special procedure below to reset the control after latch-up.
-  **Reset after latch-up:** Only a qualified service technician should attempt to reset the control after latchup. The problem that caused the repeated burner lockouts must be corrected before returning the burner to normal operation.
-    **To Reset** Push in and hold the reset button for 10 seconds. The amber LED will begin to flash.
-    After the LED begins flashing, continue holding the reset button for 20 seconds. The LEDs will turn off. Release the reset button and the control will restart (releasing the button before the LEDs turn off will cause the control to remain in latch-up).
- NOTICE** The 40200 & 42230 controls will retain lockout or latchup if power is interrupted.
-    **Flame Failure** If the CAD cell loses flame signal during operation (after the TFI), the red LED flashes. Recycle: Control waits for 65 seconds (with red LED flashing), then begins again at Self-test 2. Red LED goes off .
-    **NOTICE** If the green LED is blinking during a run, the flame is weak or unstable which may cause recycle.
-    **Stand-by** Control remains in stand-by mode until limit circuit sends power to the black wire and thermostat circuit closes (call for heat).

Service & Troubleshooting

Burner (control) will not come on

No power to control

- Check limit circuit to the control (at least 102 VAC).
- Check all electrical connections.

Control is in lockout

- Red LED will be on. Press the reset button for 2 seconds.

CAD cell seeing light

- Green LED on, and amber LED blinking 1 second on, 4 seconds off. Remove one yellow lead from FF terminals, and the flame test plug. If the amber LED remains flashing, the control is defective.

If the amber LED goes OFF, the control is OK, and;

- light is leaking into the burner housing, or
- CAD cell is defective, or
- there is a problem with the CAD cell wiring or holder.
- If appliance was recently shut down, CAD cell may see residual hot spots in chamber.

To troubleshoot:

- Attach multimeter to monitor CAD cell resistance. Dark resistance should be over 50K ohms, and room light resistance (control flipped open) should be at most 10K ohms. Replace cell if necessary, or reinstall and close the burner housing.
- Check for stray light by measuring the CAD cell resistance looking into the inactive combustion chamber. It should read at least 50 kohms.

Other no start problems

If the CAD cell is OK, and the amber LED still blinks 1 second on, 4 seconds off, the other possible failures include:

- Line voltage <90 VAC (amber LED flashes uniquely, 1 second on, 1/2 second off, 1 second on, 3 seconds off, then repeats). *Check line voltage.*
- Internal fault. CAD cell and line voltage OK. The issue may be an internal fault. *Replace the control.*

Repeated flame failures (flashing red LED)

Check for:

- CAD cell is defective. *Replace.*
- Air leaking into oil line causing flame out. *Check oil line connections and filter gasket.*
- Defective nozzle causing flame to be erratic. *Change nozzle.*
- Excessive airflow or draft causing flame to leave burner head. *Check for proper air band setting and draft.*
- Excessive back pressure causing flame to be erratic. *Check appliance and flue for sooting/plugging.*

Control locks out at end of TFI (red LED on)

Check for:

- No oil to burner. *Check oil supply, filters, lines.*
- Shorted electrodes. *Inspect for cracked porcelain and replace as needed.*
- Poor spark. Check electrode spacing and condition per burner manual. *Replace or realign if necessary.*
- Nozzle clogged. *Replace nozzle.*
- Airflow too high. *Check air band setting.*
- Ignitor module defective. *Replace if no spark.*
- CAD cell defective
- Oil valve (if used) stuck in closed position.
- Check wiring connections.

Blinking Green LED

- Weak or unstable flame.
- Check ohms.
- Check CO₂ level.

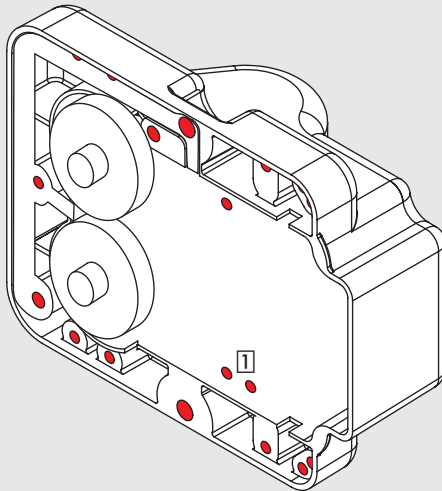
NOTICE

FROZEN PIPES/WATER DAMAGE: This is not a freeze protection device. Suitable freeze protection monitoring or other precautions are recommended to protect against ruptured pipes/water damage caused by fuel outage, safety related fault conditions, or equipment failures.



Universal Mounting

The precisely-engineered hole patterns on the bottom of the **Pro-X 45000** enables it to be mounted on virtually any manufacturer's existing ignitor base plate.



Ignitor Model	45000
Power Input	120 VAC, 60 HZ, 40 VA
Ignitor Output	19 KV, 35 mA RMS
Secondary Grounding	Midpoint
Operating Temperature Limits	+32°F to +140°F
Storage Temperature Limits	-40F to +185°F
Agencies	UL Recognized U.S. and Canada

WARNING Carlin ignitors and ignitor kits must be installed and serviced only by a qualified burner service technician. Always disconnect power source before wiring to avoid electrical shock or damage to electrical components.

Installing and Wiring

1. Carlin Pro-X 45000 universal ignitors can be mounted directly on top of the burner housing/baseplate in the same manner as existing ignitor.

NOTE: since the Pro-X 45000 Ignitor is universal, it can be mounted on virtually any burner without changing baseplates.

2. Disconnect electrical power to the burner. Disconnect wires from primary control to existing ignitor.
3. Remove any screws securing ignitor.
4. Observe the routing of electrical wiring from burner junction box to ignitor.
5. Remove existing ignitor.
6. Select and install the appropriate terminals/springs based on the burner application. If the appropriate terminals are not included, remove and reuse the terminals from the ignitor being replaced.

IMPORTANT: Make sure to align terminals so that they make good contact with the electrode rods. In some cases properly aligned terminals will not be parallel to each other.

7. When installing on most baseplates (except Allanson – see below) use supplied screws or reuse screws from ignitor being replaced. (Figure 1 on back)

IMPORTANT: If installing on an Allanson baseplate, you **MUST** use two (2) screws pre-installed in the ignitor [1]. Use of other screws with an Allanson baseplate could damage the ignitor. Simply remove the two (2) pre-installed screws and use them to attach the ignitor to baseplate (via the innermost plastic screw holes that align with the holes on the baseplate). Use the large flat head screw included to attach the ignitor to baseplate via front center hole.

8. Install new ignitor. Install, connect and route the ignitor wiring the same as the original ignitor wiring was installed.
9. Make sure the ignitor is firmly attached and that all electrical connections meet local codes before applying power.

TECH SUPPORT HOTLINE 800-989-2275

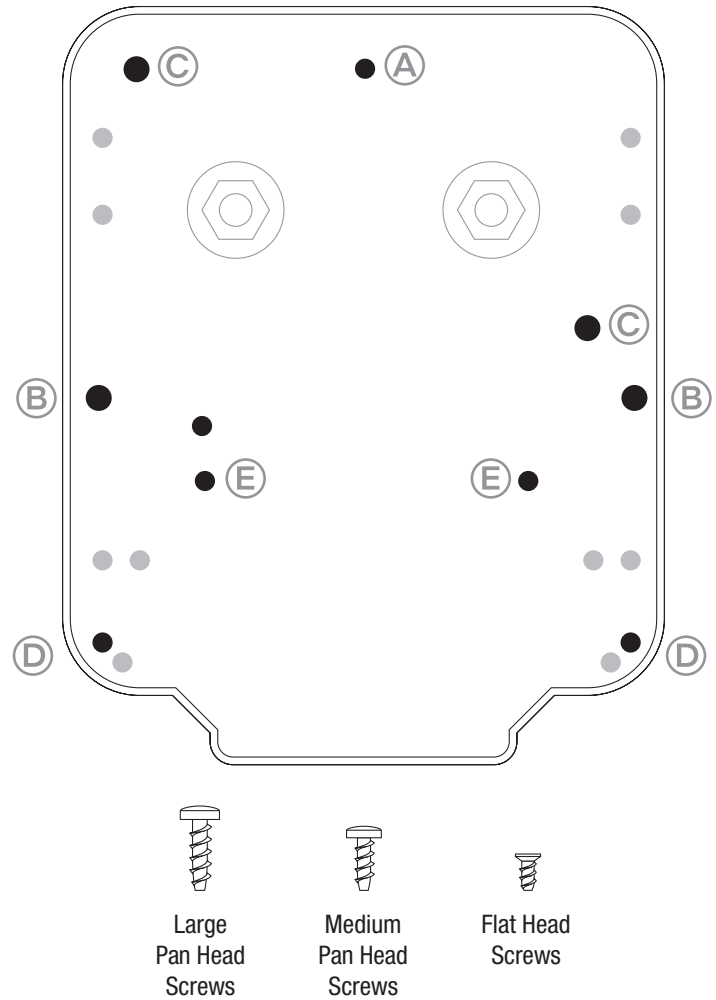
Figure 1

Mounting the Model 45000 Ignitor

Beckett – Reuse screws from old ignitor in (B) holes. Mount from top.

Carlin – Use two large pan head screws in (C) holes and two medium pan head screws in (D) holes.

Allanson – Use two small flat head screws (stored in ignitor) in (E) holes and one small flat head screw from polybag in hole (A).



Manufacturer	Replaces Models
CARLIN	41000S, 41000SOBK1, 41000SOBK2, 41000SOCAS, 41000SOLC, 41000SOSC, 41000SOWA1, 41000SOWA2, 41000SOWA3, 41000SOWM
ALLANSON	2275-456, 2275-605, 2275-619, 2275-620, 2275-628G, 2275-629, 2275-630, 2275-633, 2275-647, 2275-653, 2275-658, 2275U
BECKETT	51771U, 51805U, 51824U, 51825U, 51826U, 51827U, 51828, 51836U, 51837U, 51840U, 5188U
FRANCE	10SAY-03, 10SAY-04, 10SAY-05, 10SAY-15, 10SAY-16, 10SAY-30, 10SAY-31, 10SAY-32, 10SAY-56, 10SAYL-70
WEBSTER	12-8AB7, 313-24AB81, 313-25AB78, 313-28AB205, 313-28AB85, 313-28AB91, 3-24AB-AER, 3-28AB-BAFR, 3-28AB-BS, 3-32AB-BAF



Carlin[®]
Combustion Technology, Inc.

Model 50200 CAD Cell Oil Primary Control Data Sheet

- Interrupted Duty Ignition
- Recycle on Flame Failure
- Serviceman Reset Protection
Latch-up after 3 consecutive lockouts
- Diagnostic LEDs
Status, lockout, flame

- 15-second, 30-second TFI
- Thermostat/Aquastat Compatible
- SMC Technology
- Pump Prime
- Alarm Contacts



Power input (from limit circuit)	120 VAC, 60 HZ, 9VA
Motor load	10 FLA / 60 LRA
Ignitor load	120 VAC, 60 HZ, 500 VA
Alarm contacts	24 V, AC/DC, 2A
Operating temperature limits	+32°F to +140°F

Storage temperature limits	-40°F to +185°F
Thermostat anticipator current	0.1 A, AC
CAD cell resistance (with flame)	R < 1500 OHMS
Agencies	UL recognized (US & Canada)

Installing and Wiring

WARNING 50200 control must be installed and serviced only by a qualified service technician.

1. Always disconnect power source before wiring to avoid electrical shock or damage to the control. All wiring must comply with applicable codes and ordinances.
2. Thermostat terminals (T-T) provide a current source. Never apply external power to these terminals under any circumstances.
3. Alarm terminals provide a 24 VAC/VDC-rated dry contact, suitable for use with security/fire alarm systems.

Mounting

- The control may be mounted on a 4" x 4" junction box in any convenient location on the burner, furnace or wall. The location must not exceed the ambient temperature limit, 140°F.

Wiring

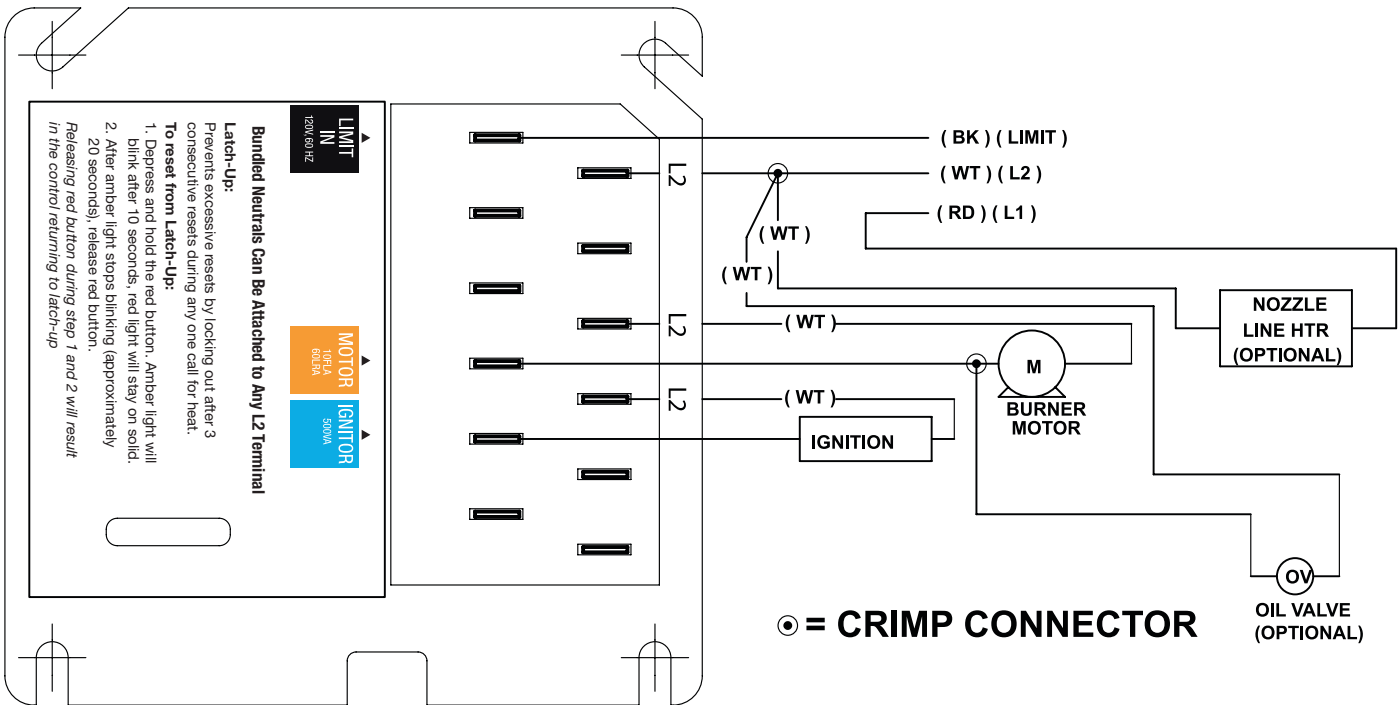
- Wiring must comply with local and national electrical codes, and with the wiring diagram.
- Individual or bundled neutrals may be attached to any L2 terminal.

Field checks

1. **Safety timing (TFI) test** – Remove one CAD cell wire (F-F). Start burner. The control should lockout within the TFI time limit. Replace CAD cell wire.
2. **Flame failure test** – Start burner. After flame is established (after TFI period), close the oil supply hand valve. This will cause a flame failure sequence as described in the Startup & Operation section of this Data sheet. The control should recycle (restart after 65 seconds).
3. If control does not operate as described, check the wiring.

SEE WIRING DIAGRAM ON NEXT PAGE

Wiring



Startup & Operation

WARNING Do not start the burner if the combustion chamber contains oil or oil vapor.

NOTICE Per UL requirements, the control will not turn on if the CAD cell senses flame during the self-test. If the CAD cell sees light (flame) at the beginning of a cycle, the control will remain in self-test mode until the CAD cell no longer senses light (flame). The amber LED will blink momentarily (A) every 3 to 4 seconds and green LED will be on or flashing.

Model 50200 Diagnostic LEDs		
(A) – Amber OFF	(A) – Amber ON	(A) – Amber FLASHING
(G) – Green OFF	(G) – Green ON	(G) – Green FLASHING
(R) – Red OFF	(R) – Red ON	(R) – Red FLASHING

- (A) (G) (R) **Power ON** Open all manual oil line valves. Close the line switch. (If Red LED turn on constant (R), control is in lockout. See below to reset.)
- (A) (G) (R) **Self-test 1** The control performs a “boot-up” test to verify internal operation each time power is applied to the black wire. The amber LED turns on and the test continues for about 5 seconds. If the test fails, the control turns the amber LED off and repeats this test sequence until successful.
- (A) (G) (R) **Stand-by** (Thermostat circuit open and/or limit circuit open) If Self-test 1 is successful, amber LED turns off and control waits for thermostat circuit to close and a limit input.
- Call for heat** Set thermostat to call for heat. Thermostat circuit must be closed and black wire must receive power from the limit circuit.
- (A) (G) (R) **Self-test 2** If a failure occurs in this self-check, the control won't start and the amber LED blinks 1 second on, 4 seconds off, until serviced or the problem clears. These failures include CAD cell seeing light, internal failure, or line voltage <90V. See service section.

Startup & Operation (continued)

- Ⓐ Ⓒ Ⓡ** **Burner ON** After the self-test, amber LED turns off. The ignitor starts, followed 2 seconds later by the motor.
- Ⓐ Ⓒ Ⓡ** **Pump Prime** To enter pump prime: 1. Start a CFH cycle. During Pre-Ignition, press Reset until motor turns off (10 seconds), then release the button. When motor turns back on, within 5 seconds, press the Reset button until the amber LED starts to flash. You are in Pump Prime, release Reset button.
- Optional Pump Prime notes:* 1) If lost, press Reset for 1 second and release, then if the control is not in Pump Prime, restart the sequence. 2) If Reset is released before end of first 10 seconds, the control returns to Standby and restarts another CFH cycle. 3) If reset is not pressed the second time, a normal CFH cycle will continue. 4) If motor and igniter are on and amber LED is flashing, the control is in Pump Prime. 5) Pump Prime will exit standby if flame is detected, or 60 seconds has elapsed, or loss of TT or Limit, or Reset button is pressed.
- Ⓐ Ⓒ Ⓡ** **TFI** The CAD cell must sense flame within the TFI time limit (trial for ignition). After CAD cell senses flame, the ignitor stays on another 10 seconds (flame stabilization period).
- Ⓐ Ⓒ Ⓡ** **Run** The burner continues firing during call for heat if the CAD cell is sensing flame. Only the green LED is on during normal running.
- Ⓐ Ⓒ Ⓡ** **Lockout** If CAD cell does not sense flame within the TFI time limit after the burner starts, **lockout** occurs. The control turns the red LED on constant and closes the alarm contact.
- Ⓐ Ⓒ Ⓡ** **To Reset** Push in and hold reset button for 1 second, then release.
- Ⓐ Ⓒ Ⓡ** **Latch-up** If the control locks out 3 times during a single call for heat, latch-up occurs. The control turns on both the amber and red LEDs constant. You must use the special procedure below to reset the control after latch-up.
- ⚠ WARNING** **Reset after latch-up:** only a qualified service technician should attempt to reset the control after latch-up. The problem that caused the repeated burner lockouts must be corrected before returning the burner to normal operation.
- Ⓐ Ⓒ Ⓡ** Push in and hold the reset button for 10 seconds. The amber LED will begin to flash.
- Ⓐ Ⓒ Ⓡ** After the LED begins flashing, continue holding the reset button for 20 seconds. The LEDs will turn off. Release the reset button and the control will restart (releasing the button before the LEDs turn off will cause the control to remain in latch-up).
- NOTICE** The 50200 control will not reset from lockout or latch-up if power is interrupted.
- Ⓐ Ⓒ Ⓡ** **Flame Failure** If the CAD cell loses flame signal during operation (after the TFI), the red LED flashes. The burner shuts off within 2 seconds.
- Recycle:** Control waits for 65 seconds (with red LED flashing), then begins again at Self-test 2. Red LED goes off.
- Ⓐ Ⓒ Ⓡ** **NOTICE** If the green LED is blinking during a run, the flame is weak or unstable and may go into recycle.
- Ⓐ Ⓒ Ⓡ** **End cycle** Set thermostat (or aquastat) to stop call for heat. The burner shuts off within 2 seconds after end of call for heat.
- Ⓐ Ⓒ Ⓡ** **Stand-by** Control remains in stand-by mode until limit circuit sends power to the black wire and thermostat circuit closes (call for heat).

Service & Troubleshooting

Burner (control) will not come on

No power to control

- Check limit circuit to the control (at least 102 VAC).
- Check all electrical connections.

Control is in lockout

- Red LED will be on. Press the reset button for 1 second.
- If the control returns immediately to lockout, the Safety Monitoring Circuit may have detected an internal control problem. Replace the control.

CAD cell seeing light

- Green LED on, and amber LED blinking 1 second on, 4 seconds off. Remove one yellow lead from FF terminals, and the flame test plug.

If the amber LED remains flashing and green LED on, the control is defective.

If the amber and green LEDs go OFF, the control is OK, and;

- light is leaking into the burner housing, *or*
- CAD cell is defective, *or*
- There is a problem with the CAD cell wiring or holder.
- If appliance was recently shut down, CAD cell may see residual hot spots in chamber.

To troubleshoot:

- Attach multimeter to monitor CAD cell resistance. Dark resistance should be over 50K ohms, and room light resistance (control flipped open) should be at most 10K ohms. Replace cell if necessary or reinstall and close the burner housing.
- Check for stray light by measuring the CAD cell resistance looking into the inactive combustion chamber. It should read at least 50 kohms.

Repeated flame failures (flashing red LED)

Check for:

- CAD cell is defective. *Replace.*
- Air leaking into oil line causing flame out. *Check oil line connections and filter gasket.*
- Defective nozzle causing flame to be erratic. *Change nozzle.*
- Excessive airflow or draft causing flame to leave burner head. *Check for proper air band setting and draft.*
- Excessive back pressure causing flame to be erratic. *Check appliance and flue for sooting/plugging.*

Control locks out after TFI (red LED on)

Check for:

- No oil to burner. *Check oil supply, filters, lines.*
- Shorted electrodes. *Inspect for cracked porcelain and replace as needed.*
- Poor spark. Check electrode spacing and condition per burner manual. *Replace or realign if necessary.*
- Nozzle clogged. *Replace nozzle.*
- Airflow too high. *Check air band setting.*
- Ignitor module defective. *Replace if no spark.*
- CAD cell defective
- Oil valve (if used) stuck in closed position.
- Check wiring connections.

Blinking Green LED

- Weak or unstable flame.
- Check ohms.
- Check CO₂ level.

NOTICE

FROZEN PIPES/WATER DAMAGE: This is not a freeze protection device. Suitable freeze protection monitoring or other precautions are recommended to protect against ruptured pipes/water damage caused by fuel outage, safety related fault conditions, or equipment failures.



Model 70200 Universal Oil Primary Control

Installation and Operating Instructions

For Use By Qualified Service Technicians Only

- **Universal Replacement – for Carlin, Beckett, Honeywell and ICM Controls**
- **On-Board LCD Screen – no special tool needed**
- **Fully Programmable Settings**
- **32 Cycle Fault History**
- **Alarm Contacts**
- **Communications Port**
- **Serviceman Reset Protection**
- **Blocked Vent Protection**
- **Built-in Pump Prime**
- **Recessed Spade Connectors**
- **Provides CAD Cell Reading in OHMS**

Power input (red/white wire).....	120 VAC, 60 HZ, 9 VA
Limit circuit input (black wire)	120 VAC, 60 HZ
Motor load (orange wire).....	10 FLA / 60 LRA (reduce by valve load)
Ignitor load (blue wire)	120 VAC, 60 HZ, 500 VA
Valve load (violet wire).....	120 VAC, 60 HZ, 2A
Vent load	0.1 amp
Line heater	1 amp
Alarm contacts (dry contacts).....	24V, AC/DC, 2A
Operating temperature limits	+32°F to +140°F
Storage temperature limits	-40°F to +185°F
Thermostat anticipator current	0.1 A, AC
Agencies	UL recognized (US & Canada)

It is important that the installation of the oil burner, piping and fittings, safety devices, controls, electrical wiring and equipment be done in accordance with national and/or local regulations of the authorities having jurisdiction over such installation.

Carlin Combustion Technology
126 Bailey Rd
Ph 203-680-9401
North Haven, CT 06473
Fx 203-680-9403

WARNINGS

1. **Warning** – Do not attempt to confirm combustion simply by inspecting the flame visually. You must use combustion test instruments. Failure to properly verify/adjust combustion could allow unsafe operation of the burner, resulting in severe personal injury, death or substantial property damage. Refer to the burner manual for proper setup instructions.
2. **Warning** – Never test an ignitor by placing a screwdriver (or other metallic object) across the high voltage clips. Check ignitors only by observing spark at appliance ignition electrodes, with fuel supply OFF. Using any other method could cause ignitor damage and severe personal injury.
3. **Danger – Fire, explosion, or carbon monoxide hazard.** Water damage can lead to unreliable operation or cause the control to malfunction which could lead to severe personal injury or death. Do not install the control module where it can get wet. Always replace the control if it gets wet or if it has any signs of water residue.
4. **Warning – Electrical shock hazard.** To prevent electrical shock, death, or equipment damage, disconnect power supply before installing or servicing control. Only qualified personnel may install or service this control in accordance with local codes and ordinances. Read instructions completely before proceeding.
5. **Warning – Electrical shock hazard.** The ignition circuit of the control can produce over 10,000 volts which can cause severe injury or death.
6. **Warning – Frozen pipes/water damage.** Central heating systems are prone to shut down as a result of power or fuel outages, safety related fault conditions or equipment failure. Installation of freeze protection monitoring or other precautions are recommended for unattended dwellings in climates subject to sustain below—freezing temperatures.
7. **Warning** – All work must be performed by a qualified and licensed professional in accordance with all applicable codes and ordinances.
8. **Notice** – Read these instructions completely before proceeding with the installation.
9. **Notice** – Retain these instructions for future reference.
10. **Notice** – All wiring must comply with the National Electric Code or any other state or local codes or regulations.

Hazard Definitions

The following defined terms are used throughout this manual to bring attention to the presence of hazards of various risk levels or to important information concerning the life of the product.

DANGER

Indicates presence of hazards that will cause severe personal injury, death or substantial property damage.

WARNING

Indicates presence of hazards that will cause severe personal injury, death or substantial property damage.

CAUTION

Indicates presence of hazards that will cause minor personal injury or property damage.

NOTICE

Indicates special instructions on installation, operation or maintenance that are important but not related to personal injury or property damage.

FROZEN PIPES/WATER DAMAGE

This is not a freeze protection device. Suitable freeze protection monitoring or other precautions are recommended to protect against ruptured pipes/water damage caused by fuel outage, safety related fault conditions or equipment failure.

Installing and Wiring

WARNING The 70200 control must be installed and serviced only by a qualified service technician.

WARNING Do not connect an external voltage to the thermostat terminals T1 and T2. This will damage the control and may result in a *dangerous* operating condition

Always disconnect power source before wiring to avoid electrical shock or damage to the control. All wiring must comply with applicable codes and ordinances.

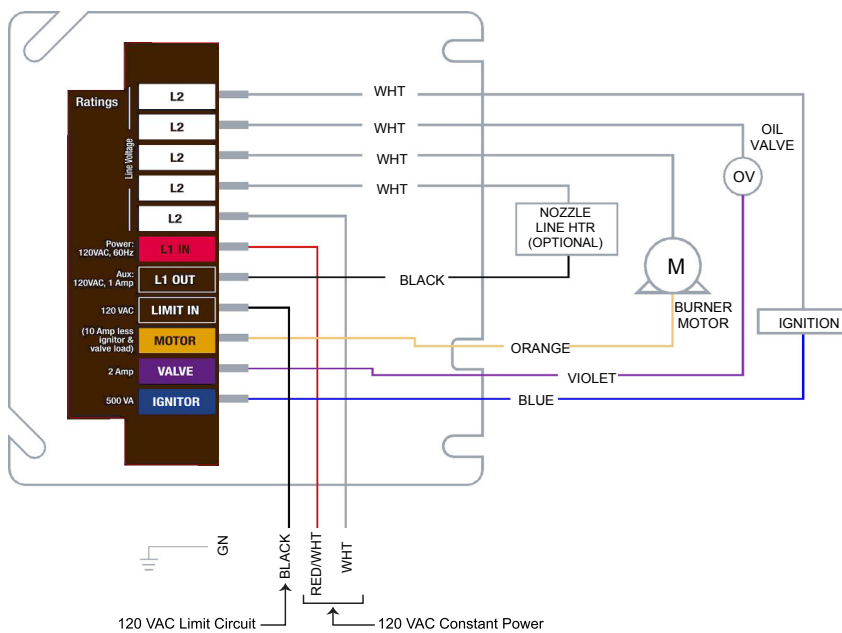
Mounting

The control may be mounted on a 4" x 4" junction box in any convenient location on the burner, furnace or wall. The location must not exceed the ambient temperature limit, 140°F.

Wiring

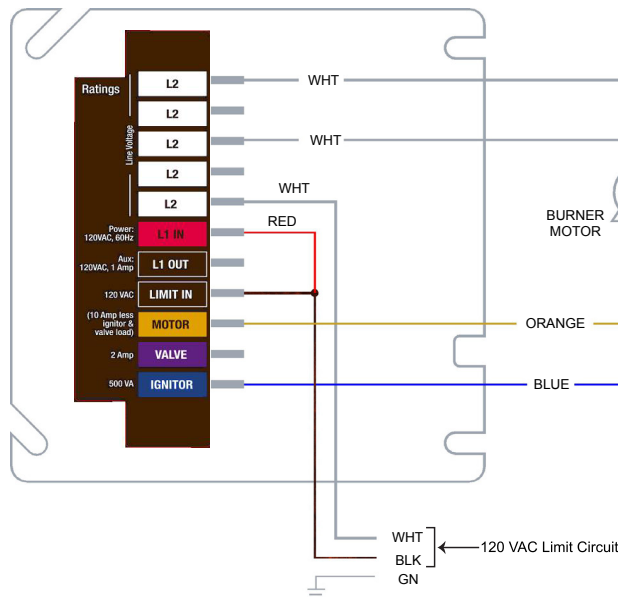
Wiring must comply with local and national electrical codes, and with the following wiring diagrams.

6-Wire Recommended Wiring

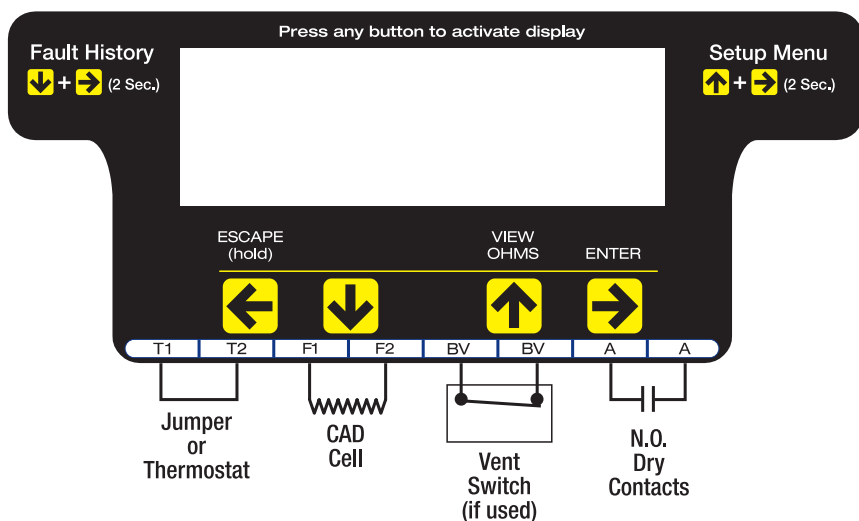


3-Wire Replacement Wiring

NOTICE When connecting to BLACK power harness wire, without constant L1 power, wire nut together L1 (RED) and Limit In (BLACK) from control.



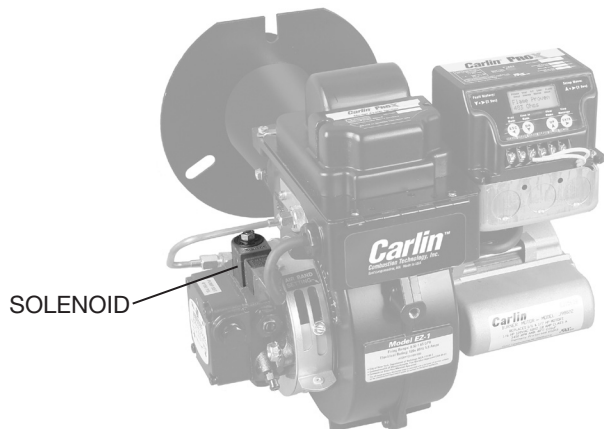
Low Voltage Wiring



WARNING Do not start the burner if the combustion chamber contains oil or oil vapor.

Initial Start-up/Power-up

When powered-up for the first time, the control will display a scrolling message “Does Burner Have A Solenoid Valve?”. Press **↑** for Yes or **↓** for No. This information is needed for proper operation of the control. **NOTE:** The control will not operate until this question is answered.



Does Burner...
Press **↓**=No **↑**=Yes

“Does Burner Have Solenoid Valve” will scroll on screen.

NOTE: This selection can be changed in the Settings Mode (see below for how to change settings)

View or Change Control Settings

NOTE: The settings mode cannot be accessed during a run cycle, the burner must be in standby mode (or lockout) to enter setup.

To enter the Settings Mode: Press the **↑** and **→** buttons simultaneously for 2 seconds. The display will show –

Settings Press **→**
To Exit Hold **←**

To View Current Settings: Press the **→** button to scroll through all Setting Modes (see table at the top of page 5 for Setting Mode options). The second line of the screen will display the current setting for each Setting Mode –

Valve Delay On
30 Seconds

Pressing the **→** button again will leave the setting as is and move to the next option –

Trial for Ign
15 Seconds

To Change a Setting: Scroll to the desired Setting Mode option using the **→** button (as described in table on page 5), then press the **↑** or **↓** button to scroll through the available Settings. When the desired setting is displayed on the screen press the **→** / **ENTER** button. The display will briefly indicate that the new setting has been “Entered” and the new setting will replace the previous setting on the second line of the screen. Continue pressing the **→** button to view the current setting for all options or **↓** button to make any desired changes.

Trial for Ign
30 Seconds

To Exit the Setup Menu: Press the **←** / **ESCAPE** button for 3 seconds. **NOTE:** The control will automatically exit the Setup menu after 30 seconds of inactivity or by a call for heat.

AVAILABLE SETTINGS

PRESS THE BUTTON TO VIEW DIFFERENT SETTING MODES

SETTING MODE OPTIONS	Valve Delay On*	Trial for Ignition	Motor Delay Off*	Flame Stabilize	CAD Ohms Max	Ignition Type	TT Jumpered Internally**	Vent Input	Allowed Recycles	Clear Fault History	Restore Factory Defaults
PRESS THE BUTTONS TO CHANGE SETTINGS	No Valve	10 Sec ^{††}	0 Sec	Off	Carlin 3300	Interrupted	Yes	Not Used	None	Yes	Yes
	0 Sec [†]	15 Sec	10 Sec	5 Sec	Other 5300	Smart Ign	No	Intake	3	No	No
	3 Sec [†]	30 Sec	15 Sec	10 Sec		Intermittent		Exhaust			
	10 Sec	45 Sec	30 Sec	15 Sec							
	15 Sec		2 min	30 Sec							
	30 Sec		5 min	45 Sec							
	60 Sec		15 min								
	2 min										

Shaded box = default setting; CAD Ohms Max default is application dependent.

*When selecting "No" valve during initial startup, "Valve Delay On" will be set to "No Valve" and "Motor Delay Off" will be set to "0 Sec".

**Changing this setting to 'Yes', with limits powered will exit Settings mode and result in immediate 'Call For Heat'.

† If flame is sensed during valve delay on, control will lockout immediately (except when Valve Delay On is set to 0 or 3 seconds).

†† A 10 second TFI is recommended for commercial burners 7GPH and larger.

Setup Menu Definitions

- **Valve Delay On:** Time period motor and ignitor are on prior to Trial for Ignition. This setting is often referred to as "pre-purge". **Note:** If flame is sensed during valve delay on, control will lockout immediately (except when Valve Delay On is set to 0 or 3 seconds).
- **Trial for Ignition:** Flame-establishing period during ignition.
 - 45 sec TFI up to 3 GPH
 - 15 sec TFI up to 19.9 GPH
- **Motor Delay Off:** Time period the motor is on after the Call for Heat is satisfied to allow for evacuation of combustion gases. This setting is often referred to as "post-purge". A call for heat during Motor Delay Off will result in a recycle. **Note:** If Valve Delay On is set to "0 Seconds" or "No Valve", Motor Delay Off can only be set to "0 Seconds".
- **Flame Stabilize:** The time period after Trial for Ignition that the ignitor remains on to stabilize flame.
- **CAD Ohms Max:** The maximum Ohms range that the control will allow the burner to operate.
- **Ignition Type**
 - Interrupted:** Spark is turned off after Flame Stabilization period.
 - Smart Ignition:** If flame is lost at any time after the Flame Stabilization period, the control will recycle (60 - 65 seconds). Following this recycle, the control will operate in Intermittent Duty mode (ignition on throughout the call for heat) for ten heat cycles. Following these ten cycles, the control will revert back to Interrupted Duty and will remain in Interrupted Duty until another recycle event occurs. If control recycles and operates in Intermittent Duty three consecutive times, on a fourth consecutive recycle the control will lockout, due to hitting smart ignition limit, displaying "30 max smart ign"
 - Intermittent:** Spark remains on during call for heat.
- **TT Jumpered:** Allows TT to be "jumpered" by software program.
- **Vent Input:** Applicable only to applications equipped with a combustion air proving switch (Intake) or a blocked vent switch (Exhaust):

Intake: When the burner is equipped with a combustion air proving switch, the "Intake" setting should be selected. At each burner startup, the control will check the air intake during pre-purge (Valve On Delay)*. If the air is blocked, the control will abort pre-purge and shutdown the burner. If the air intake is not

blocked during this startup test, but becomes blocked during normal burner operation, the burner will shut down if the air remains blocked for 20 seconds. Following any shutdown, the burner will be permitted to recycle 3 times following a 1 minute delay. Lockout occurs if the blockage persists throughout 3 recycles during any single call for heat.

"If "no valve" is selected in setup, the air intake cannot be checked prior to TFI. In this case, the burner will only shut down following the 20 second blockage described above. For all burners with valves, Valve Delay settings of less than 15 Seconds will be automatically changed to 15 Seconds to allow for the prepurge test.

Exhaust: When the appliance is equipped with a blocked vent switch, the "Exhaust" setting should be selected. If a blocked vent is detected during burner startup, the Pro X 70200 control will NOT respond to the blocked intake vent until 30 seconds after the ignition sequence is complete (following Flame Stabilization), if the vent remains blocked at that time, the burner will shutdown and lockout. If the vent is not blocked during this startup test, but becomes blocked during normal burner operation, the burner will shut down and recycle, depending on the Allowed Recycles selected. Lockout occurs if the blockage persists and the Allowed Recycles setting is reached during any call for heat.

NOTE: If the Pro-X 70200 is being connected to both a combustion air proving switch and blocked vent switch, call Carlin Technical Support for assistance.

- **Allowed Recycles:** Number of Recycles allowed during a single Call for Heat prior to lockout.
- **Clear Fault History:** Allows all prior burner fault conditions stored in control to be cleared.
- **Restore Factory Defaults:** Allows all factory defaults to be restored in control (refer to settings shaded in gray in the table above). Will reset and reboot control and require answer to "sole-noid valve" question at startup.

NOTICE Per UL requirements, the control will not turn on if the cad cell senses flame (light) during the self-test. If the cad cell sees flame, the control will remain in self-test mode until the cad cell no longer senses flame.

Operating Sequence

With power to the control and all manual oil line valves open, set thermostat (and limit) to call for heat. **NOTE:** The thermostat circuit must be closed and power must be coming to black wire from limit circuit.

Pre-Ignition
XX Sec

Following a 3 sec **Pre-Ignition**, the control advances to Valve Delay On –

Valve Delay On
XX Sec

During **Valve Delay On**, motor starts. After set timing, valve opens and the control advances to Trial for Ignition when the countdown clock expires. **NOTE:** For the Valve Delay to operate, the burner must be equipped with a solenoid valve that is wired to the violet terminal.

Trial for Ign
XX Sec

During **Trial for Ignition**, the CAD cell must sense flame or the control will go into lockout. When flame is detected, the screen will briefly display “Flame Detected” and then return to the “Trial for Ign”. When the countdown timer expires, the control advances to Flame Stabilization

NOTE: Push View Ohms button anytime during burner operation to view the CAD Ohms reading.

Flame Stabilize
XX Sec

When the **Flame Stabilize** timer expires, the ignitor will turn off and the burner will continue to fire until the Call for Heat ends or the limit string opens. The screen will display “Burner Running”. **Note:** If Smart Ignition is selected in the Setup Menu, the screen will alternate between “Burner Running” and “Smart Ign Active” at any time the ignitor is running in intermittent mode.

Burner Running
59 Sec

When the Call for Heat ends (or a limit control interrupts the burner circuit), the oil valve (if installed) will turn off within 2 seconds. The motor remains on for the Motor Delay Off period. When the Motor Delay Off timer expires, the control returns to Standby mode awaiting the next call for heat.

Motor Delay Off
XX Sec

Standby 59 Sec
No Call for Heat

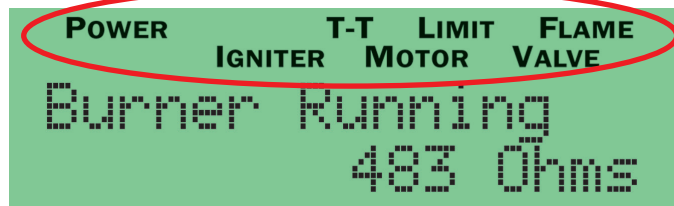
Pump Prime (Bleeding)

The 70200 control is equipped with a 120 second pump prime feature. To enter Pump Prime, there must be a Call for Heat. **NOTE:** If a flame is present, the control will not enter Pump Prime mode.

To bleed the oil line, with Limit icon on, push and hold red **Reset** button for 10 seconds. The display will read **Pump Prime**.

The motor, valve and ignitor remain on for up to 2 minutes while in Pump Prime mode. To end Pump Prime mode, press the red **Reset** button. **NOTE:** If flame is sensed, Pump Prime mode ends in 5 sec.

Pump prime cannot be entered when the control is in Lockout or Latch-up.





Status Icons



Status Icons will appear at the top of the 70200 display to indicate the control's current operating condition.

- POWER** Indicates that the control is powered (flashes if voltage is too low or too high)
- TT** Displayed when the TT terminals are physically jumpered, jumpered in the set-up menu, or when thermostat is calling for heat.
- LIMIT** Indicates that the burner limit circuit is powered.
- IGNITOR** Indicates that the ignitor is energized (flashes if ignitor not detected)
- MOTOR** Indicates that the motor is energized (flashes if motor not detected)
- VALVE** Indicates that the valve is energized (on entry to pump prime will flash if not detected)
- BV** Indicates vent input is active (when vent input is selected)
- FAULT** Flashes in unison with other status icons indicating a problem exists in that area
- FLAME** Indicates the CAD cell is sensing flame


Fault History

The 70200 stores information from the last 32 cycles in which a fault condition occurred. To Enter the Fault History , simultaneously press and hold the  and  buttons for 2 seconds. The display below will appear –




Press the  button to scroll through the history of fault conditions. Fault 1 is the most recent cycle in which a fault occurred. To view faults experienced in earlier run cycles, continue to press the  button. The control will display Fault 2 followed by Fault 3, etc.




To view the details of any fault (ex. Fault 1 in the screen above), press the  button to see the Fault Message.




Press the  button again to determine how many cycles ago the fault occurred.




Press the  button again to determine if the fault resulted in a lockout or a recycle.






Press the  button again to examine the Ohms at the time of the fault.





Continue pressing the  button to examine the following information recorded during the fault cycle.

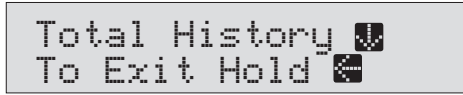
- Line Voltage
- Motor Amps (OK or Low)
- Ignitor Amps (OK or Low)
- Valve Amps (OK or Low)
- Recycle (Yes or No)
- Burn Time
- Flame Delay


On any fault detail screen listed above, the  button can be pressed to view the same data in the previous fault cycle. For example, if in Fault 1 (the most recent fault), the Ignitor Amps were low, by pressing the  button, the Ignitor Amps in Fault 2 (the previous fault cycle) will be displayed.

To Exit Fault History: Press and hold the  / **ESCAPE** button for 3 seconds at any time.

Total/Run History

In addition to the Fault History (left), the 70200 also logs the total run history of the control. To enter this menu, simultaneously press the  and  buttons for 3 seconds. The display below will appear.




To Exit Total History: Press and hold the  / **ESCAPE** button for 3 seconds at any time.

Press  button to scroll through the history which includes:

- Total On Time
- Total Burn Time
- Total Burner Run Cycles
- Faults Cleared (cycles ago)
- Max Line Volts
- Min Line Volts
- Total Recycles

FAULT HISTORY

NOTE: Fault information in chart is representation only.

PRESS THE  BUTTON TO VIEW NEXT FAULT						
	FAULT 1	FAULT 2	FAULT 3	FAULT 4	FAULT 5	
Message	No Flame ck vlv	No Flame ck mtr	No Flame ck ign	No Flame ck vlv	No Flame ck vlv	
Cycles Ago	2	3	4	5	6	
Result	Lockout	Lockout	Lockout	Lockout	Lockout	
CAD Ohms	999999	3300	2500	1500	1500	
Line Volts	114	114	114	114	114	
Motor Amps	OK	Low	OK	OK	OK	
Ignitor Amps	OK	OK	Low	OK	OK	
Valve Amps	Low	OK	OK	Low	Low	
Recycle Y/N	No	No	No	No	No	
Burn Time	16 sec	16 sec	16 sec	16 sec	16 sec	
Flame Delay	15 sec	15 sec	15 sec	15 sec	15 sec	

PRESS THE   BUTTONS TO VIEW FAULT DETAILS

Service and Troubleshooting

Last Fault Display: When the control is reset from a lockout condition, if the burner resumes normal operation, the screen will toggle the last fault and its cause for five days (longer duration if control is not wired for constant power). This feature is designed to allow the service technician to easily see what caused the condition in the event the homeowner reset the control prior to his arrival. The screen will alternate between displaying what the last fault was and displaying how to clear the message **hold ESC for 3 seconds**.





```
Last Fault
No Flame Chk Ign
```

Toggle



```
To Clear Message
Hold ESC 3 Sec
```

Display Voltage and Current: Press  +  for 3 seconds to display real time voltage and current.



```
Amps = 7 mA
Line = 115 VAC
```


Lockout: If lockout occurs, the screen turns on, the fault icon flashes and a fault message is displayed on the screen. **To Reset** Push in and hold the red **Reset** button for 1 second, then release. **NOTE:** Recycling power to the control will not reset it from a lockout condition.

Two fault conditions result in an immediate lockout. These include; Flame detected during pre-purge and flame failure during Trial for Ignition. All other faults will result in a Recycle (unless the Allowed Recycles is set to 'None' in the Set-up Menu). A **Recycle** results in the burner shutting down for 60 seconds then resuming operation in Standby (if there is no Call for Heat) or initiating the Operating Sequence above (if there is a Call for Heat).

Latch-up: If the control locks out 3 times during a single Call for Heat, Latch-Up will be displayed on screen.

To Reset the control after latch-up, press and hold the red Reset button for 30 seconds. **WARNING: Only a qualified service technician should attempt to reset the control after latch-up. The problem that caused the repeat lock-outs must be corrected before returning the burner to normal operation. NOTE:** Recycling power to the control will not reset it from a latch-up condition.

Burner will not fire

- Check line voltage to the control (at least 102 vac).
- Check all electrical connections.
- Is CAD cell seeing light?
- Light is leaking into the burner housing
- CAD cell is defective
- There is a problem with the CAD cell wiring or holder
- If appliance was recently shut down, CAD cell may see residual hot spots in chamber. To troubleshoot, press the  button to display cad cell Ohms. Dark resistance should be over 50,000 ohms and room light resistance (control flipped open) should be less than 10,000 ohms. Replace cell if necessary, or reinstall and close the burner housing. Check for stray light by measuring the CAD cell resistance looking into the inactive combustion chamber. It should read greater than 50,000 ohms.

Other no start problems:

- Valve lead voltage on too early. Correct bad connection.
- Motor relay welded. If valve has no voltage, and line voltage is okay (102 - 132 VAC), the issue is a welded motor relay. Replace the control.
- Motor current less than 0.2 Amps.

Blocked vent – not recycling:

- Recycle only works on non-manual reset vent switch

Repeated flame failures

- CAD cell is defective. Replace.
- Air leaking into oil line causing flame out – check oil line connections and filter gasket.
- Defective nozzle causing flame to be erratic – change nozzle.
- Excessive airflow or draft causing flame to leave burner head. Check for proper air band setting and draft.
- Excessive back pressure causing flame to be erratic – check appliance and flue for sooting/plugging.

Control locks out at end of TFI

- No oil to burner – check oil supply, filters, lines.
- Shorted electrodes – inspect for cracked porcelain and replace as needed.
- Poor spark – check electrode spacing and condition per burner manual. Replace or realign if necessary.
- Nozzle clogged – replace nozzle.
- Airflow too high – check air band setting.
- Ignitor module defective – replace if no spark.
- CAD cell defective.
- Oil valve (if used) stuck in closed position.
- Check wiring connections.
- Maxed out Smart Ignition cycles – check combustion ohms, vacuum (oil supply), draft

TECH SUPPORT HOTLINE 800-989-2275

Carlin[®]
Combustion Technology

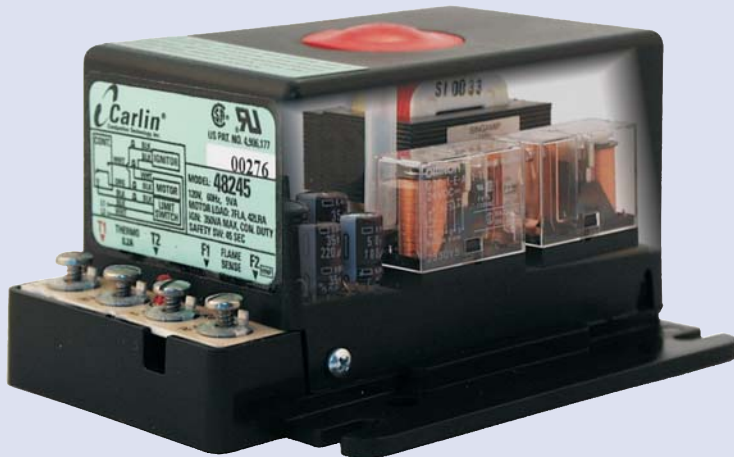
Carlin Combustion Technology

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e-mail us at: info@carlincombustion.com visit our website: www.carlincombustion.com



MODEL **48245**
CAD cell
Oil primary control

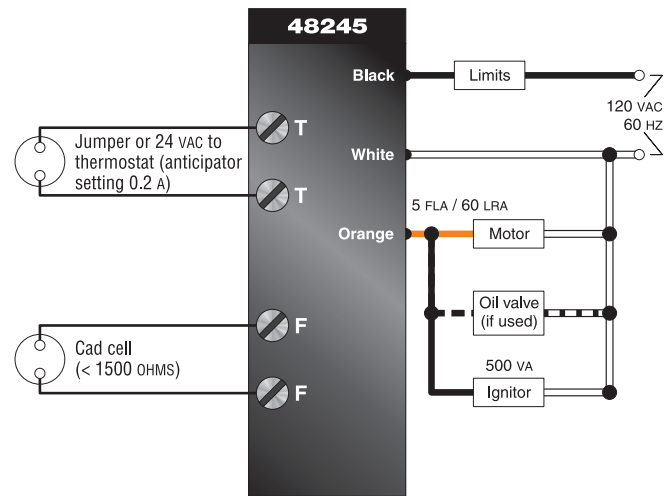
Data sheet



- Intermittent duty ignition
- 45-second trial for ignition
- Red LED lockout indicator
- Thermostat/aquastat compatible
- **SMC Technology**⁽¹⁾

Power input (from limit circuit)	120 VAC, 60 HZ, 10 VA
Motor load	5 FLA / 60 LRA
Ignitor load	120 VAC, 60 HZ, 500 VA
Operating temperature limits	+32°F to +140°F
Storage temperature limits	-40°F to +185°F
Thermostat anticipator current	0.2 A, AC
Cad cell resistance — WITH FLAME	R < 1500 OHMS
Agencies	UL recognized (US) CSA certified (Canada)

(1) The 48245 provides two motor relays. Carlin's patented SMC technology (Safety Monitoring Circuit) monitors the contacts of both motor relays. **Lockout** occurs if a motor relay contact is found closed when it should be open. The second motor relay ensures motor shutdown even if the first motor relay fails.



Installing and wiring

Warning — The 48245 control must be installed and serviced only by a qualified service technician.

- Always disconnect power source before wiring to avoid electrical shock or damage to the control. All wiring must comply with applicable codes and ordinances.
- Thermostat terminals (T-T) provide a current source. Never apply external power to these terminals under any circumstances.

Mounting

- The control may be mounted on a 4" x 4" junction box in any convenient location on the burner, furnace or wall. The location must not exceed the ambient temperature limit, 140°F.

Wiring

- Wiring must comply with local and national electrical codes, and in accordance with the wiring diagram above.

Field checks

- Safety timing (TFI) test** — Remove one cad cell wire (F-F). Start burner. The control should lockout within 45 seconds. Replace cad cell wire.
- Flame failure test** — Start burner. After flame is established (after TFI period), close the oil supply hand valve. This will cause a flame failure sequence as described on the reverse side of this Data sheet.
- If control does not operate as described, check the wiring.

Start-up & operation

WARNING	Do not start the burner if the combustion chamber contains oil or oil vapor.
NOTICE	Per UL requirements, the control will not turn on if the cad cell senses flame during the self-test. If the cad cell sees light (flame) at the beginning of a cycle, the control will wait until it no longer senses the problem.
Power ON	Open all manual oil line valves. Close the line switch.
Reset	Press and hold the reset button for 3 seconds, then release. This will reset the control at any time during its operation.
Stand-by	(No call for heat) Control waits for power to be applied to the black wire (from appliance limit circuit). The circuit across terminals T-T will also have to close for burner to start.
Call for heat	Set thermostat (or aquastat) to call for heat. The limit circuit must provide power to the black wire and the circuit between terminals T-T must be closed.
Burner on	The <i>ignitor</i> and <i>motor</i> start. (The ignitor remains on throughout the call for heat cycle.)
TFI	The cad cell must sense flame within the control's trial for ignition (TFI) timing — 45 seconds.
Run	The burner continues firing during call for heat if the cad cell senses flame.
Lockout	If cad cell does not sense flame within the TFI timing (45 seconds), lockout occurs. The red LED indicator turns on.
WARNING	Red LED fully on indicates lockout (approximately 20 seconds after motor and ignitor turn off). If power is interrupted to the control before the Red LED turns fully on, the control will reset without the reset button being pushed.
To Reset	To reset after lockout, push in and hold reset button for 3 seconds, then release. This will reset control at any time during operation.
Flame failure	If the cad cell loses flame signal during operation (after the TFI), control will lockout if flame is not established within 45 seconds.
Burner off	Set thermostat (or aquastat) to stop call for heat. The burner shuts off within 2 seconds after end of call for heat.
Stand-by	Control remains in stand-by mode until limit circuit sends power to the black wire and T-T circuit closes (call for heat).
Power loss	If power to control/burner is interrupted during a normal run cycle, the control will begin a normal cycle again after power is restored.

Service & Troubleshooting

Burner (control) will not come on

No power to control

- Check line voltage to the control (at least 102 vac).
- Check all electrical connections.

Control is in lockout (red LED on)

- Press the reset button for 3 seconds.

CAD cell seeing light

- Remove one lead from FF terminal on the control. Press and hold the reset button for 3 seconds. If voltmeter shows power between control white and black wires, and T-T circuit is closed, but control does not start, replace the control.

If control does not start when receiving power on the black wire and T-T circuit is closed, check for:

- light is leaking into the burner housing, *OR*
- CAD cell is defective, *OR*
- there is a problem with the CAD cell wiring or holder.
- If appliance was recently shut down, CAD cell may see residual hot spots in chamber.

To troubleshoot:

- **Check CAD cell** by unplugging it and measuring the resistance across its pins: dark resistance at least 50 KOHMS; room light resistance less than 10 KOHMS. Replace if necessary. If the CAD cell functions properly, reinstall the cell and close the burner housing.
- **Check for stray light** by measuring the CAD cell resistance looking into the inactive combustion chamber. It should read at least 50 KOHMS.

Control will not reset

- If the control will not reset, the Safety Monitoring Circuit may be detecting an internal control problem. Replace the control.

Repeated flame failures (burner lights, but shuts down)

Check for:

- CAD cell is defective.
- Air leaking into oil line causing flame out — Check oil line connections and filter gasket.
- Defective nozzle causing flame to be erratic — Change nozzle.

Check for proper air band setting and draft.

- Excessive back pressure causing flame to be erratic — Check appliance and flue for sooting/plugging.

Control locks out after TFI

Check for:

- No oil to burner — Check oil supply, filter, lines.
- Shorted electrodes — Inspect for cracked porcelain and replace as needed.
- Poor spark — Check electrode spacing and condition per burner manual. Replace or realign if necessary.
- Nozzle clogged — Replace nozzle.
- Airflow too high — Check air band setting.
- Ignitor module defective — Replace if no spark.
- CAD cell defective.
- Oil valve (if used) stuck in closed position.
- Check wiring connections.

Oil burners fuel unit with pressure regulating

Type CV, SV2

The DELTA fuel unit is an efficient modern oil burner pump with compact design and since its mounting flange, hub and shaft sizes are manufactured to international standard, it can be fitted to every oil burner. It has the following features:

1- Features

- High suction capability. (9" Hg - single pipe; 15" Hg - two pipe)
- Self priming (two pipe version).
- Reliable pressure and effective cut-off.
- Special shaft seal.
- Silent operation.
- Low power absorption.
- Easily installed and adjusted.
- Pressure and vacuum gauge ports.
- Easy air bleeder valve.
- High RPM cut-off (SV2 model).
- Clear bleeder tube provided.

2- Applications

- For pumping oil in high pressure oil burners and transfer pump applications.
- For use with kerosene, K1, #1 or #2 fuel oil.
- 3450 RPM and 1725 RPM operating speeds.
- For use with gravity feed or lift applications.
- Suitable for a one or two pipe system.
- For use with firing rates up to 32 gph at 100 psi.
- For use with nozzle pressures up to 300 psi.
- For hub or flange mounting.
- Must not be used to pump water or acid (voids warranty).

3- Operation

The fuel unit, consists of a pump, filter and pressure regulator/cut-off valve housed within one casting. The pumping action is obtained from two spur gears, one of which is connected to the drive shaft. The pump casting provides the various oil ways, for the supply and return ports.

Pressure and vacuum gauge ports are also provided. The unit is available in two pipe version (self priming) and in a single pipe version (manual priming).

On start up, the rotating gears purge the air from the suction chamber, through a vent groove in the piston to the return line in the two pipe version. In the single pipe version air must be bled at the bleeder port. Because a vacuum now exists oil, due to atmospheric pressure, enters the suction chamber through the filter.

On new installations, it is easier to bleed the air more quickly, through the air bleeder port.

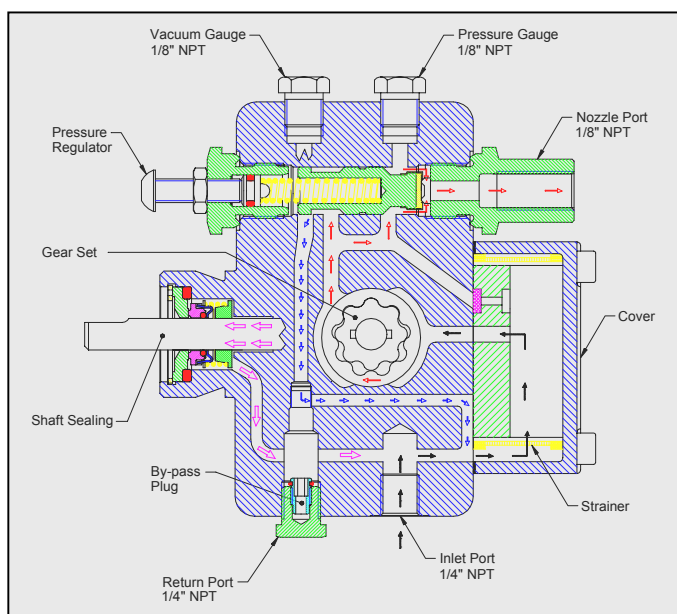


Fig. 1

From the suction side, the gears pass the oil to the pressure chamber, where it comes up against the head of the piston. Due to the build up of pressure, the piston is forced back against the pressure regulating spring. The outlet to the nozzle port, which so far has been sealed by the seat on the head of the piston, opens and allows oil to flow through to the nozzle while the excess oil discharges to the return side (or by-passes in the one pipe version). It should be noted that the spring tension, which is varied by the regulator screw, regulates the oil pressure.

On shut down, the oil pressure drops and the spring, which has been under pressure, pushes the piston forward onto its seat, thereby cutting off the flow of oil to the nozzle outlet.

The SV2 model is provided with an additional internal valve, which allows an efficient cut-off, because no oil reaches the piston when the motor's RPM drops.

4- Approvals

Listed by Underwriter's Laboratory
Standard UL343 - File nr. MH12779

5- Pump identification

CV 1 R R 2 4

Pump type

CV
SV

Nozzle capacity (see graphs)

Rotation (seen from shaft end)

R = clockwise
L = counter clockwise

Nozzle line (seen from shaft end)

R = right
L = left

Pipes system

1 = one pipe
2 = two pipe

Pressure ranges

3 = 30 ÷ 145 psi
4 = 58 ÷ 215 psi (Standard)
5 = 115 ÷ 285 psi

Factory setting

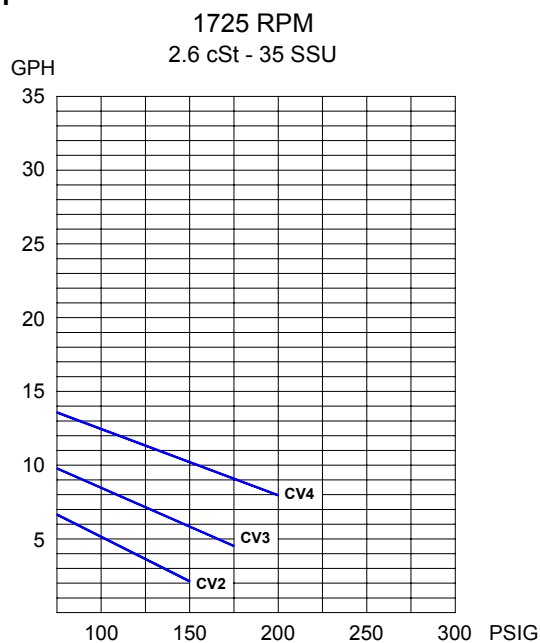
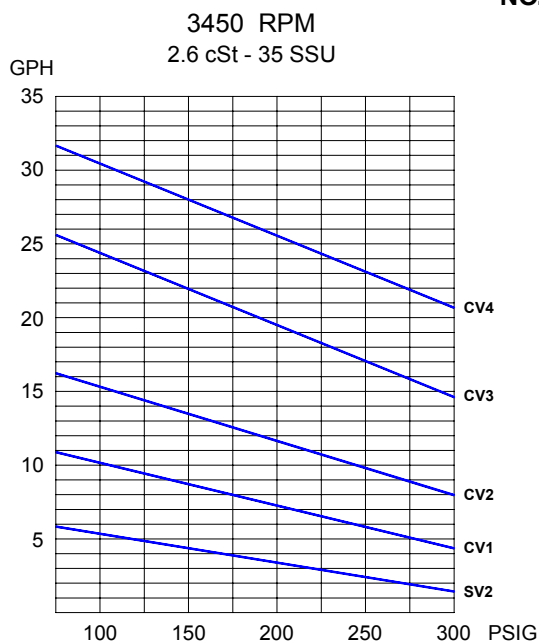
58 ±4 psi
100 ±4 psi
215 ±4 psi

6- Technical Specifications

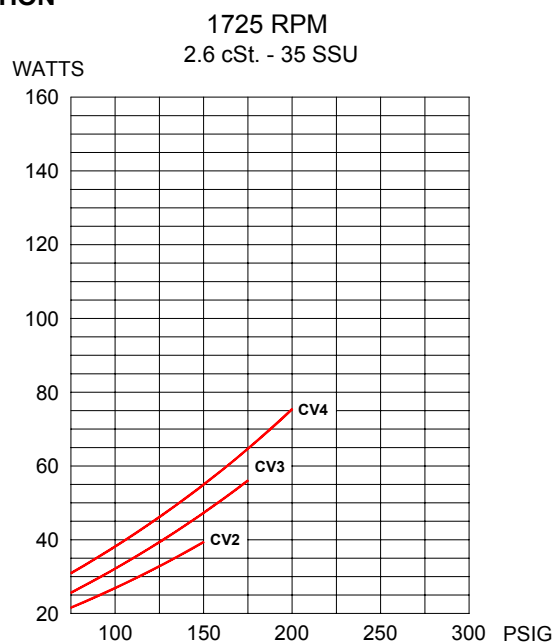
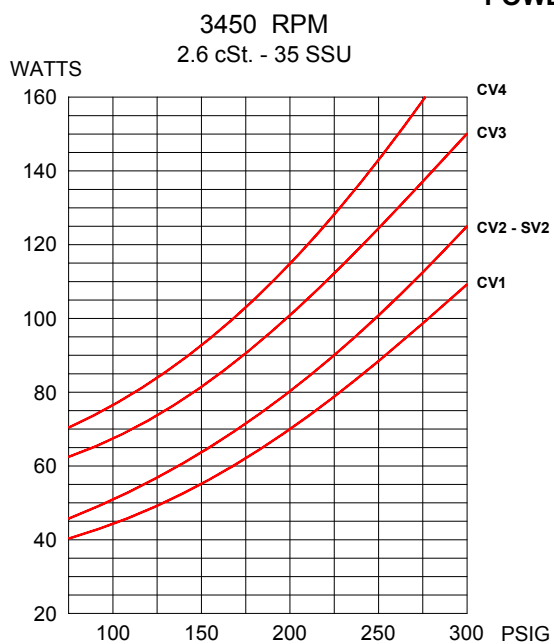
Oil viscosity	32 ÷ 225 SSU
Oil temperature	140°F max
Oil types	Suitable for kerosene, K1, #1 or #2 fuel oil and waste oil
Power consumption	See graphs
Nozzle capacity.....	See graphs
Suction line vacuum	4.40 psi (9 inHg) max for single-pipe installation 7.35 psi (15 inHg) max for two-pipe installation
Suction line pressure	10 psi max
Return line pressure	21 psi max
Rotation	Clockwise / Counter Clockwise 3450 RPM or 1725 RPM
Standard strainer.....	Stainless steel mesh 110 microns, 10 Sq.In.
Dimensions	Hub dia. 1"¼, shaft dia. 5/16" Flange hub dia. 2"1/8
Connections	Inlet – return port: 1/4"NPT Nozzle port : 1/8"NPT Pressure – vacuum gauge : 1/8"NPT
Weight	2.66 lb

7- Diagrams

NOZZLE CAPACITY



POWER CONSUMPTION



9- By-pass installation

To convert the DELTA fuel unit from the single pipe version to the two pipe version, do the following:

- Using a 9/16" wrench, remove the 1/4"NPT plug from return port (Fig. 2).
- Located inside the 9/16" return plug is the 5/32" by-pass plug. Remove it with an Allen wrench (Fig.3).
- Insert the 5/32" by-pass plug in the return port of the pump (Fig. 4).

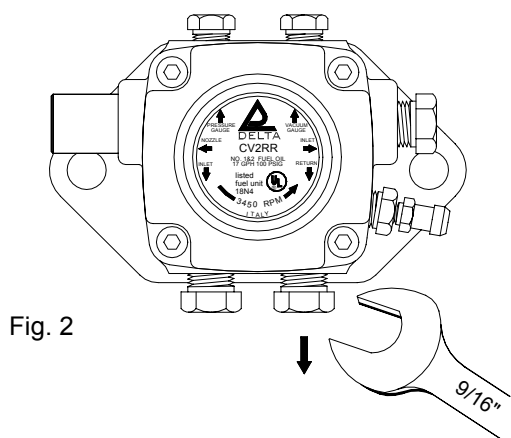


Fig. 2

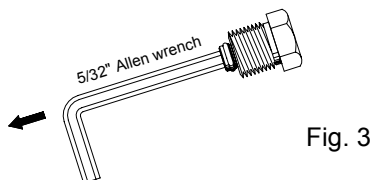


Fig. 3

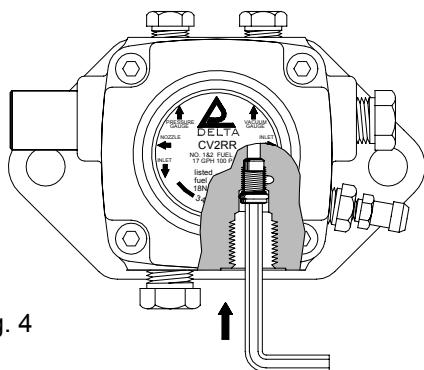


Fig. 4

CAUTION: In a single pipe installation, the pump is not self priming, and the air must be bled manually, through the bleeder port. When the pump is converted into a two pipe version, it becomes self-priming, because the air is bled back through the return port.

To convert the DELTA fuel unit from the two pipe version to the single pipe version, do the following:

- Using a 5/32" Allen wrench, unscrew the by-pass plug from the return port.
- Insert and screw a 1/4"NPT plug into the return port.

CAUTION: In a two pipe installation, the pump is self priming and the air is bled through the return port. When the pump is converted into a single pipe version, the air must be bled manually, through the bleeder port.

10- General information

- Make sure that the by-pass plug is not used in a single pipe installation, because the fuel unit will not function properly and damage to the pump and burner motor could result.
- All oil line connections must be air tight. Use only flare fittings or threaded connections. The use of compression fittings is not recommended.
- Keep the number of oil line fitting to a minimum. Each fitting is a potential source for leaks.
- Use only pipe thread compound approved for use with oil. The use of PTFE tape is not permitted. Teflon tape can cause fuel unit failure and will void its warranty.
- To comply with "NFPA Bulletin 31" the inlet line pressure must not exceed 3 psig. For gravity feed systems and systems which employ a pumping system upstream of the burner fuel unit, the inlet line pressure must be checked.
- Suitable for use with 3/8" or 1/2" lines.
- The DELTA fuel unit is equipped with an internal 110 micron strainer that requires periodic replacement. However, an external strainer must be installed upstream to the fuel unit.
- To service, use calibrated pressure and vacuum gauges.

Installation and Service Instructions

11- Installation and Maintenance

- Make sure that the by-pass plug is not used in a single pipe installation, because the fuel unit will not function properly and damage to the pump and burner motor could result.
- Do not use fuel with additives to avoid the possible formation over time of compounds which may deposit between the gear teeth, thus obstructing them.
- After filling the tank, wait before starting the burner. This will give any suspended impurities time to deposit on the bottom of the tank, thus avoiding the possibility that they might be sucked into the pump.
- On initial commissioning a dry operation is foreseen for a considerable length of time (for example, when there is a long suction line to bleed). To avoid damages inject some lubrication oil into the vacuum inlet.
- Care must be taken when installing the pump not to force the pump shaft along its axis or laterally to avoid excessive wear on the joint, noise and overloading the gears.
- Pipes should not contain air pockets. Rapid attachment joint should therefore be avoided and threaded or mechanical seal junctions preferred. Junction threads, elbow joints and couplings should be sealed with removable Loctite™. The number of junctions should be kept to a minimum as they are a possible source of leakage.
- Do not use PTFE tape on the suction and return line pipes to avoid the possibility that particles enter circulation. These could deposit on the pump filter or the nozzle, reducing efficiency. Always use O-Rings or mechanical seal (copper or aluminium gaskets) junctions if possible.
- To clean the filter remove the cover. It must be thoroughly cleaned at least once in a season to ensure correct working of the fuel unit. The filter must be mounted with the supporting legs leaned against the pump body. If the joint plate between cover and pump housing should be damaged, it must be replaced. An external filter should always be installed in the suction line upstream of the fuel unit.
- Make sure the combustion chamber is free of oil or oil vapor before operating the system.

CAUTION: Turn off all power before servicing any part of the system.

12- Nozzle Pressure Test

Most nozzles ratings are based upon 100 PSIG delivered oil pressure. The flow rate at the desired pressure must be estimated using the nozzle manufacturers data sheets.

To insure that oil is delivered to the burner nozzle at the desired pressure, do the following:

1. Remove the 1/8" plug from the port marked "P" and connect a pressure gauge to this port (use a gauge of 0 to 300 PSIG or greater). The "P" port (Pressure Gauge Test Port) has been provided specifically for the connection of the pressure gauge for measuring the nozzle pressure; however, when available, it is also permissible to use the vent port for measuring nozzle pressure.
2. Start the burner motor and vent all air from the fuel unit and connected suction line system.
3. Check the adjustable nozzle pressure range of the fuel unit, using a 4 mm Allen wrench, turning the adjusting screw counter clockwise to lower the nozzle pressure and clockwise to increase the nozzle pressure.

CAUTION: Adjust the nozzle pressure in accordance with the burner manufacturers specifications.

13- Nozzle Cut-Off Test

Fuel oil is not compressible but air is. Air trapped in the nozzle line, anywhere between the fuel units nozzle port and the nozzle itself, will compress during burner operation. Following burner shutdown, any trapped compressed air will expand displacing the oil in the nozzle line, forcing continued oil flow through the nozzle that will, in effect, falsely appear to be poor fuel unit Cut-Off. This occurrence is particularly common with low flow rate nozzles used in conjunction with long air tubes. Moreover, operating characteristics of burner motors may vary by manufacturer, model and operative speed. Some motors, especially older ones, take an exceptionally long time to wind down; and those that do, since the fuel unit turns with the motor, may falsely give the appearance of poor fuel unit Cut-Off.

To verify positive nozzle Cut-Off after burner shutdown, do the following:

1. Remove the nozzle line and fitting from the nozzle port of the fuel unit and connect a 1/8" pressure gauge to the nozzle port (a gauge of 300 PSIG or greater be used). It may be more convenient to use a gauge fitted out with an extension nipple or with a line and flare nut to connect directly to the fitting installed into the nozzle port. If any type of extension is used between the nozzle port and the gauge, it should be kept as short as possible to minimize the amount of trapped air.
2. Start the burner motor and vent all air from the fuel unit and connected suction line system.
3. Record the nozzle pressure reading on the gauge.
4. Shut off the burner motor. Initially the pressure will drop and then stabilize within a second or two. The pressure reading on the gauge should stabilize at 80% or greater of the adjusted pressure (the pressure recorded above) and hold for at least two minutes.

14- Vacuum Test

The vacuum test is necessary to verify the fuel unit's suction ability, to evaluate the leak tight integrity of the entire fuel unit and connected oil suction line piping system, to confirm that there are no abnormal restrictions in the oil suction line system, and, to confirm that the system vacuum is within the allowable specification limits of the unit. Please watch in any case the graphs for maximum suction line length depending on line diameter, viscosity, difference in height of suction line and pump or nozzle capacity. To perform the test, do the following:

1. Remove the 1/8" plug from the port marked "V" and connect a vacuum gauge to this port.
2. Start the burner motor and vent all air from the fuel unit and connected suction line system.
3. With the burner motor running, close the valve connected to the inlet port. You will note that the vacuum as measured by the vacuum gauge will increase. Allow the burner motor to continue to run until the highest vacuum reading is achieved. A fully primed fuel unit in good condition should be capable of pulling at least 20 InHg. If not, before condemning the fuel unit, be sure that all connections and plugs are tight, the cover gasket is in good condition and the valve is in good working order.
4. Shut off the burner motor. Initially, the vacuum reading will drop and then stabilize within a second or two. Once the vacuum reading stabilizes, record the reading. If the fuel unit is free of leaks, this reading should hold constant for at least 2 minutes. If the vacuum reading drops, there is a leak that must be located and corrected.
5. When each leakage is removed and the valve onto suction line is open, check to be sure that the actual operating vacuum does not exceed 15 InHg

C554A Cadmium Sulfide Flame Detector

INSTALLATION INSTRUCTIONS

APPLICATION

The C554A Cadmium Sulfide Flame Detector (cad cell) is a photoconductive flame detector (see Fig. 1) used with oil primary controls such as R4166, R4184, R8182, R8184, R8185, R8404 and R8991. It consists of a plug-in, light sensitive cell and a socket with factory-installed mounting bracket and leadwire. The detector is installed inside the air tube of the burner where the cell can view the flame. It is wired to the F-F terminals of the oil primary control.

The photocell is a ceramic disk coated with cadmium sulfide and overlaid with a conductive grid. Electrodes attached to the ceramic disk transmit an electrical signal to the primary control. In darkness, cadmium sulfide has a very high resistance to the passage of electrical current. In visible light, its resistance is very low and current is allowed to pass. The entire cell is hermetically sealed (glass to metal) to prevent cell deterioration.

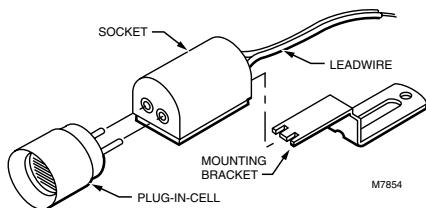


Fig. 1. C554A Cadmium Sulfide Flame Detector (cad cell).

INSTALLATION

When Installing this Product . . .

1. Read these instructions carefully. Failure to follow them could damage the product or cause a hazardous condition.
2. Check the ratings given in the instructions and on the product to make sure the product is suitable for your application.
3. Installer must be a trained, experienced service technician.
4. After installation is complete, check out product operation as provided in these instructions.



CAUTION

Disconnect power supply before beginning installation to prevent electrical shock or equipment damage.

Location

The burner manufacturer determines the cad cell location (see Fig. 2). If an alternate location must be used, make sure that:

- 1 The cell has a clear view of the flame.
- 2 Ambient light does not reach the cell.
- 3 Ambient temperature at the cell location is below 140°F (60°C).
- 4 Movement, shielding, or radiation of metal surfaces near the cell do not affect cell function.



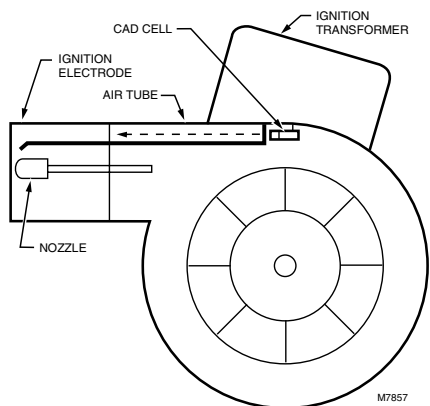


Fig. 2. Cad cell location.

The orifice (available on some models) reduces the amount of light available to the photocell minimizing the chance that the cell will respond to the glow from the hot refractory. See Fig. 3 for a cutaway view of the orifice.

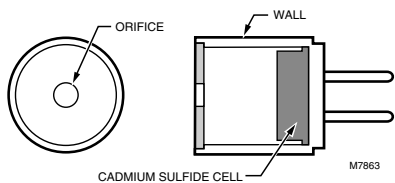


Fig. 3. Cutaway view of orifice.

Mounting

Mount the C554A at the rear of the burner. The mounting bracket can be bent to fit, if necessary.

Wiring

Disconnect power supply before beginning wiring to prevent electrical shock or equipment damage.

All wiring must comply with local electrical codes and ordinances. See Fig. 4 for a typical C554A hookup to the oil burner primary control.

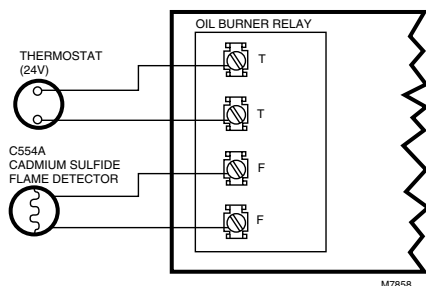


Fig. 4. Typical hookup for C554A to oil burner primary control.

CHECKOUT

To check cad cell operation, use the following procedure:

- 1 Disconnect cad cell leadwires; then start the burner. Shortly after the burner starts, place a temporary jumper between terminals F-F. Connect an ohmmeter across the cad cell leadwires; resistance should be less than 1600 ohms.
- 2 Stop burner and remove temporary jumper.
- 3 With the burner off, check the dark cell resistance across the cad cell leadwires. Resistance should be greater than 20,000 ohms.

NOTE: If cell resistances are different than specified, recheck the wiring and the location of the cell. If necessary, replace plug-in portion of cell, Honeywell part no. 130367 Replacement Cad Cell.

- 4 Reconnect cad cell leadwires. Check the Protectorelay[®] (burner sequencing relay) control according to the instructions packed with the control.

SERVICE AND REPLACEMENT

Under normal operating conditions, the C554A does not require cleaning. If a badly adjusted burner causes heavy accumulation of dirt and soot on the cell surface, carefully wipe the cell surface to restore full view of the oil flame.

If the C554A is damaged, replace the plug-in portion of the cell. Order Honeywell part no. 130367 Replacement Cad Cell.

Honeywell

Automation and Control Solutions

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SUPER TRADELINE L4064B Universal Combination Fan and Limit Controllers

PRODUCT DATA

APPLICATION

The L4064B controls the on and off operation of the heating unit's fan motor and provides high limit control of the main burner. It is suitable for all types of forced air heating systems.

The L4064B's bimetal sensing element turns fan on and off according to plenum temperature.

The L4064B has a manual switch to provide continuous fan operation, mounting adapters for replacing competitive devices, adapters for wiring convenience, and a strain relief bushing for protecting the wiring from damage due to field abuse.

Limit contacts are suitable for line voltage, low voltage or millivoltage circuits. The fan-on timing can vary depending on applied voltage and switch ambient.

INSTALLATION

When installing this product...

1. Read these instructions carefully. Failure to follow them could damage the product or cause a hazardous condition.
2. Check the ratings given in the instructions and on the product to make sure the product is suitable for your application.
3. Installer must be a trained, experienced service technician.
4. After installation is complete, check out product operation as provided in these instructions.



WARNING

Failure to remove brass jumper, if limit switch is in low voltage circuit, can cause electrical shock hazard or damage low voltage controls.



CAUTION

1. Disconnect power supply before connecting wiring to prevent electrical shock or equipment damage.
2. When connecting cable or conduit to control, avoid straining the control case.

Follow furnace or burner manufacturer's instructions, if available. The L4064B has a maximum switch temperature of 190°F (88°C), maximum element temperature of 350°F (177°C). Do not exceed these temperatures or the following electrical ratings (amperes):

	120 Vac		240 Vac	
	FAN	LIMIT	FAN	LIMIT
Full Load	14	8	7	4
Locked Rotor	84	48	42	54

Pilot Duty: 2 A at 24 Vac; 0.25 A at 0.25 to 12 Vdc.
Maximum Combined Connected Load: 2000 VA.
75°C (167°F) (min.) field wiring required. Wiring must conform to NEC Class 1 requirements.

LOCATION

If this is a replacement installation, locate the L4064 in the same location as the control being replaced. Sensing tube length should be same as old control. If this is a new installation, the element should be installed only by a trained, experienced service technician according to the furnace manufacturer's instructions. The element must not touch any internal part of the furnace.

NOTE:

The electrical rating is at maximum switch temperature of 190°F (88°C). If plenum surface temperature exceeds 190°F (88°C), heat insulating material or a mounting bracket must be used.

MOUNTING

The device may be mounted either on the plenum surface or with a bracket (rigid or swivel).

SURFACE MOUNTING

Hole in plenum should be just large enough to accommodate the 3/4 in. (19.1 mm) diameter element tube, Fig. 1. For adequate clearance, a 13/16 in. (20.6 mm) diameter hole is recommended.

1. Remove cover by squeezing sides and pulling off. Insert element in plenum and mark location of mounting holes. Make sure the case is snug against the plenum before marking the mounting screws.
2. Punch or drill holes for mounting screws.
3. Place insulation between plenum and case if necessary.
4. Fasten controller securely with mounting screws.

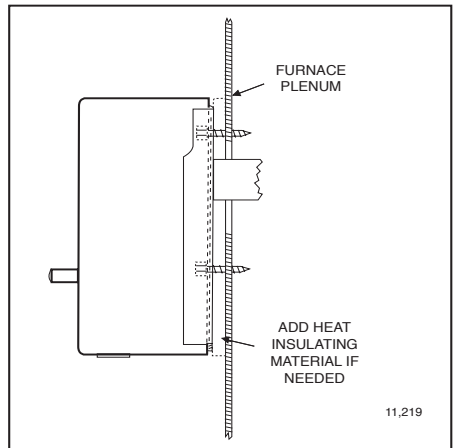


Fig. 1 - Surface mounting requires a hole 13/16 in. (20.6 mm) diameter for element insertion.

SWIVEL MOUNTING

L4064 may also be swivel-mounted. The swivel bracket requires a 1-9/16 in. (39.7 mm) hole in the plenum (Fig. 2).

1. Use bracket as a template to mark the location of mounting holes in plenum. Drill or punch holes for mounting screws.
2. Fasten the brackets in place with furnished screws. Start the screws but do not tighten.
3. Insert element tube through bracket, straighten controller and fasten. Tighten the mounting screws securely. It may be necessary to rotate the bracket to tighten all screws securely.

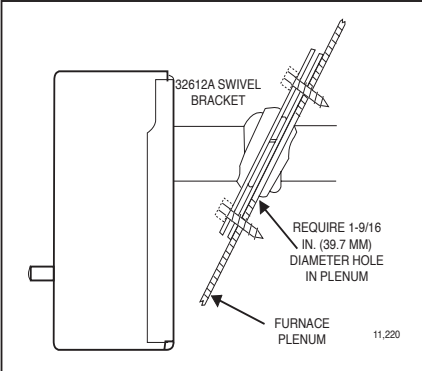


Fig. 2 - Swivel mounting requires a 1-9/16 in. (39.7 mm) diameter mounting hole for element insertion.

RIGID BRACKET MOUNTING



WARNING

When mounting control on bracket, setscrew must strike tube frame *not* sensing element to prevent bypassing the safety limit function.

L4064 may be mounted using a rigid bracket. The rigid bracket requires a hole 13/16 in. (20.6 mm) diameter for element insertion (Fig. 3).

1. Use bracket as a template to mark the location of mounting holes in plenum. Drill or punch holes for mounting screws.
2. Fasten bracket in place with furnished screws. Tighten the screws securely.
3. Insert element tube through bracket, straighten controller and fasten by tightening setscrew. Be sure screw strikes tube frame and does not strike sensing element.
4. For replacement installations with existing 1 in. (25.4 mm) diameter hole. SUPER TRADELINE models are supplied with split steel bushings and wire snap ring. Follow the instructions below for using the steel bushing adapter.

STEEL BUSHING ADAPTER

1. Insert one-half of the split steel bushing (Fig. 4), through the wire ring. It may be necessary to spread the ring slightly.
2. Insert the other half of the steel bushing into the ring making sure tabs and ears are at the same ends.
3. Place bushing assembly on element, ear end first.
4. Holding bushing at seams, push firmly to the control end of element.

5. Insert element tube with adapter through bracket, straighten controller and fasten. Tighten setscrew. Be sure screw strikes bushing not coiled bimetal sensing element.

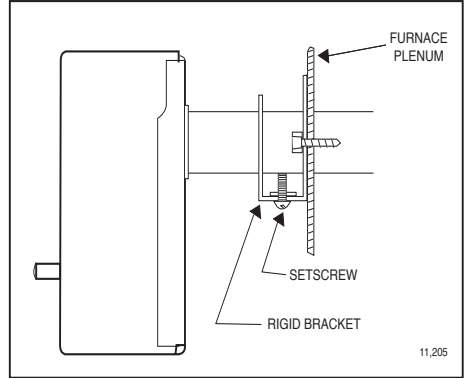


Fig. 3 - Rigid bracket mounting requires a hole 13/16 in. (20.6 mm) diameter for element insertion.

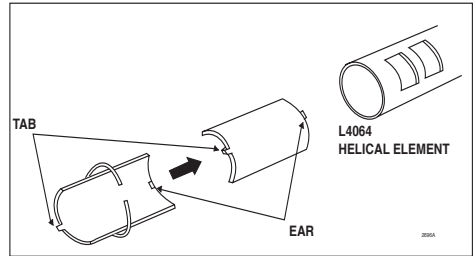


Fig. 4 - Using SUPER TRADELINE adapter.

WIRING

Disconnect power supply before beginning installation to prevent electrical shock or equipment damage.

All wiring must comply with local electrical codes and ordinances or in the absence of local codes with the National Electrical Code ANSI C1-1981-NFPA 70. Follow burner or furnace manufacturer's instructions if available; otherwise, see Fig. 10 and proceed as follows.

IMPORTANT

The brass jumper is the breakaway type. It must be removed when the limit is used in the low voltage circuit. To remove jumper, break with a needlenose pliers and remove completely. Once removed, it is not replaceable. See Fig. 8 for location.

The slotted knockouts on the bottom of the case and the strain relief bushing are provided to simplify the installation procedure and to protect the wires.

1. To remove the slotted knockout(s), use a needlenose pliers as shown in Fig. 5 and pull straight down.
2. If cable is used, we recommend using a strain relief bushing in the knockout (Fig. 6). Pass the wires through bushing before connecting.

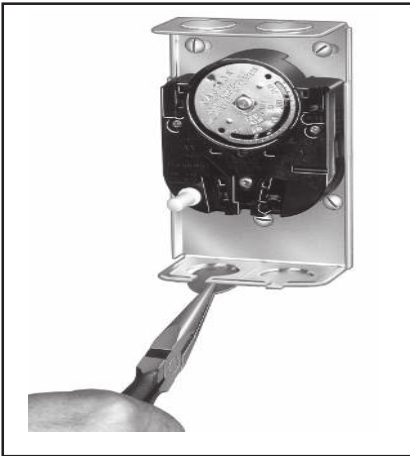


Fig. 5 - Removing slotted knockouts.

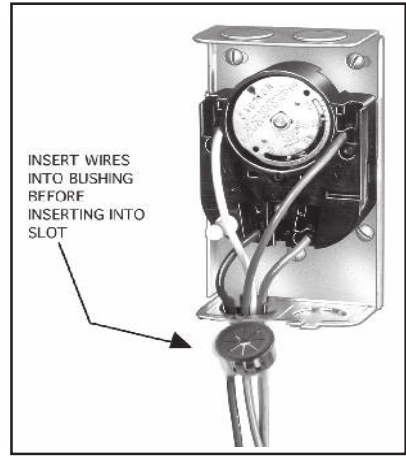


Fig. 7 - Closing the strain relief bushing.

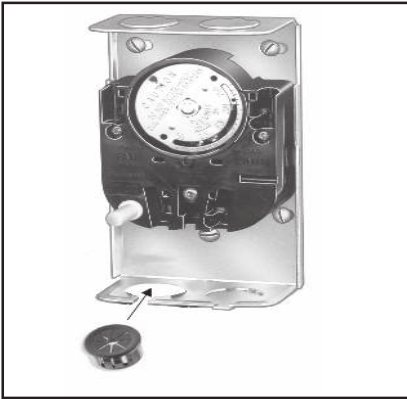


Fig. 6 - Insert strain relief bushing.

3. Refer to the following section for type of wiring connections (standard wire push-in terminals or female receptacle).

WIRING CONNECTIONS

When connecting cable or conduit to this controller, use care to avoid strain on the control case.

Connections can be made to standard wire push-in terminals or female receptacles for 1/4 in. (6.4 mm) male flag connectors on both the fan and limit switches (Fig. 8).

FOR STANDARD WIRE PUSH-IN TERMINALS

Connect wires to the terminals as follows:

1. Use Nos. 14, 16, or 18 solid wire or Nos. 14 or 16 stranded wire, depending on electrical requirement.
2. Strip insulation from wires the distance shown by the strip gauge on the controller.
3. Solid wire may be inserted directly into the terminal holes. If stranded wire is used, insert a small screwdriver into the slot next to the terminal. Push screwdriver in and hold while inserting wire into terminal (Fig. 8). Remove screwdriver. If stranded wire is solder-dipped, it can be pushed directly into terminal holes.

FOR FEMALE RECEPTACLES -

It is recommended that the female receptacles be used for wiring accessory equipment; i.e., electronic air cleaner, humidifier, etc.

Connect wires to the receptacles as follows:

1. Use Nos. 14 to 18 size wire, depending on electrical requirement.
2. Attach 1/4 in. (6.4 mm) male flag connector to each wire. Two male connectors with leadwires are supplied.
3. Push male flag connector directly into the female receptacle. Make sure that the flag is forced to the bottom of cavity and wire is in the channel (Fig. 8).

IMPORTANT

Make certain all wires are clear of rotating scaleplate.

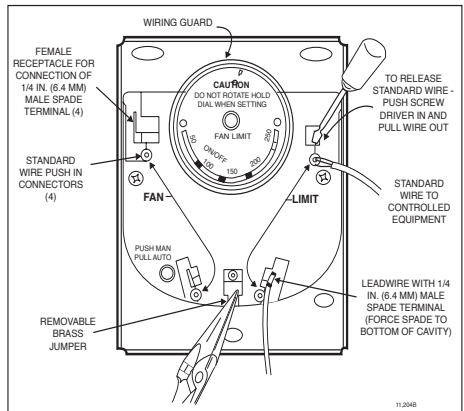


Fig. 8 - Location of wiring connections.

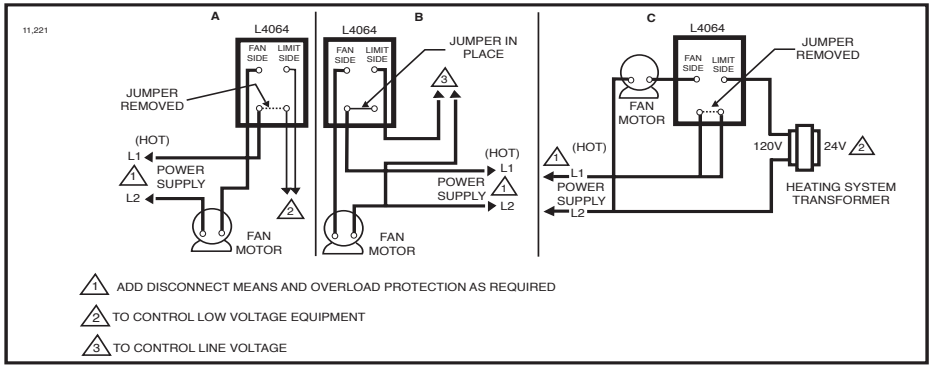


Fig. 9 - A: Limit in low voltage circuit.

B: Limit in line voltage circuit.

C: Limit in line voltage circuit without jumper.

SETTINGS AND ADJUSTMENTS

⚠️ CAUTION

When adjusting the fan and limit set point levers (Fig. 10), hold the scaleplate dial to keep it from turning and straining the sensing element.

Move each indicator lever to the control point recommended by the burner or furnace manufacturer. Use gentle finger pressure.

FAN SETTING ADJUSTMENT

1. Move the FAN OFF lever to the temperature at which the fan is to stop to prevent circulation of cool air.

2. L4064B - Move the FAN ON lever to the temperature at which the fan is to come on.

MANUAL FAN SWITCH

For constant fan operation, push the FAN switch button in. For fan to cycle automatically, pull button out.

LIMIT SETTING ADJUSTMENT

These controllers have a limit stop which prevents the limit indicator lever from being adjusted beyond the equipment manufacturer's specifications.

1. Push the small end of Limit Adjust Tool (196722) through hole in scaleplate (located at caution marking) to depress the stop disc not more than 1/16 in. (1.6 mm) to release stop lock (Fig. 10). Stop disc is on back of scaleplate.

2. While depressing the stop disc, insert the long end of Limit Adjust Tool next to limit stop (Fig. 10) and move the stop to desired setting. *If the L4064 is a replacement control, high limit stop setting should be the same as that of the control being replaced.*

(Move stop clockwise ↻ to lower the setting, counterclockwise ↻ to raise it.) Then remove the limit stop adjust tool.

3. Set the LIMIT OFF lever to the temperature at which the high limit switch is to open to stop the burner. If the high limit stop has been properly set, the LIMIT OFF lever should be as high as the stop permits.

Automation and Control Solutions

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OPERATION

As the plenum temperature rises, the bimetal sensing element of the control wraps and mechanically makes

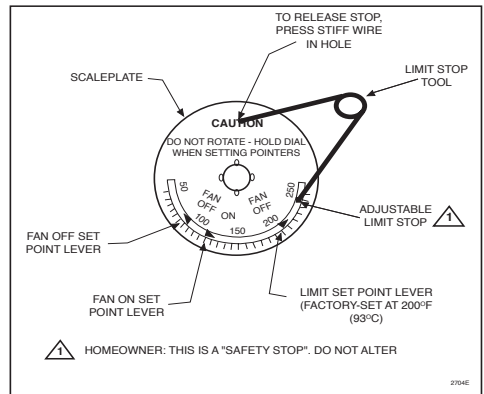


Fig. 10 - Changing the high limit stop.

the fan contacts (at the FAN ON temperature setting). During normal operation, the call for heat ends before the LIMIT setting is reached, and the fan contacts break as the plenum temperature falls and the FAN OFF setting is reached.

If the call for heat continues until the temperature in the plenum rises to the LIMIT setting, the bimetal element will mechanically break the limit contacts and de-energize the gas control circuit.

CHECKOUT

When installation is complete, disconnect the fan motor circuit at the L4064. Turn on power and set thermostat to call for heat. Burner should come on and limit controller should shut burner off when plenum temperature reaches the limit set point. Turn off power, reconnect the fan switch, turn on power and again set thermostat to call for heat. Fan should come on when plenum temperature has reached fan-on setting.

Honeywell



Intermittent Ignition Series Oil Primary Control



- Controls oil burner, oil valve (if required) and the ignition transformer in response to a call for heat.
- ICM patented energy transfer technology ensures fuel valve and pump will only be energized if the control is properly functioning
- LED aids in testing and troubleshooting
- Enclosed safety switch with external reset button
- Replacement for popular competitive models

Application Guide & Installation Instructions for ICM1501, ICM1502 and ICM1503

For more information on our complete range of American-made products – plus wiring diagrams, troubleshooting tips and more, visit us at www.icmcontrols.com



Application

ICM's Intermittent Ignition Oil Primary Control is ideal for residential oil-fired burners used in boilers, forced air furnaces, water heaters and other oil burning appliances where pre/post-purge is not a safety requirement. It uses a C554A Cadmium Sulfide (cad cell) Flame Detector to monitor the burner flame. In the event of flame failure or flame loss, the control will shut the system down. In the event of a lockout, pressing and holding in the red external reset button for three seconds will manually reset the safety switch. (For added safety, the button press is activated upon release to ensure that the button can not be permanently held in.)

A status indicator LED on the control board indicates the function of the control and can be used to aid in testing and/or troubleshooting the control. To initiate a manual lockout of the system, press and hold the reset button when the status LED is off.

There is a slight delay before the heat call is implemented. This is to verify the call is valid.

2. Make the line voltage connections as shown in Fig. 1.
3. Splice the leads with solderless connectors.
4. Feed the low voltage cad cell leads through the hole below the low voltage terminal strip.

Low Voltage Wiring Connections:

After mounting the control, make low voltage connections to screw terminals by connecting the cad cell leads to the F-F terminals and thermostat leads to the T-T terminals.

Starting the System



WARNING! IMPORTANT SAFETY INFORMATION!

Fire or Explosive Hazard! Be sure the combustion chamber is free of oil or oil vapor before starting the system. Failure to comply with this warning may cause damage to the control or other property, and could result in severe personal injury, or death.

Installation



WARNING! IMPORTANT SAFETY INFORMATION!

Electrical Shock Hazard! Turn off all power sources before servicing this control. Be sure to shut power off at the main service panel by removing the fuse or switching the appropriate circuit breaker to the off position. More than one disconnect may be involved. Failure to comply with this warning may cause damage to the control or other property, and could result in severe personal injury, or death.

1. Please read and follow these instructions carefully. Failure to do so can result in damage to the control, or could lead to severe personal injury.
2. Ensure the control is right for your application. Review all timings and specifications on the product label and packaging.
3. Only a trained, experienced service technician should attempt to install this control.
4. After installing control, thoroughly test it and verify it is operating correctly.

CAUTION: Be sure the combustion chamber is free of oil or oil vapor before starting the system.

Mounting Location:

This control is designed to mount on a 4" X 4" j-box, directly on the main burner housing, or inside the appliance cabinet. When replacing a unit, mount the new oil primary in the same location as the old control. If you need to mount the control in a different location, use the replacement control as a template to mark the new mounting holes and pre-drill the holes before wiring. Use #8 screws (not supplied).

Check to ensure the operating temperatures are within -40°F to +130°F (-40°C to +54°C).

Wiring:

CAUTION: Wiring MUST comply with all local/national codes and ordinances. **DO NOT** exceed the load ratings listed on the control.

1. Be sure that all line voltage connections are in a wiring enclosure such as a junction box or the appliance wiring compartment.

1. Make sure the system is powered. Check the circuit breaker or fuse and close the system switch, if provided.
2. Open the shut-off valve in the oil supply line.
3. Use the thermostat to initiate a call for heat
4. Press and hold the red reset button for three seconds and release. The burner should light and operate until a call for heat ends.

Checking Safety Features

Simulate Flame Failure

1. Start the system by following the steps under "Starting the System".
2. With the system running, close the shut-off valve in the oil supply line.
3. Lockout should occur within the safety timing specified on the unit label and packaging. The ignition and motor should stop and the oil valve close.
4. Restart the system by re-opening the oil shut-off valve and pushing in the red reset button (hold for 3-seconds) and releasing it.

Simulate Ignition Failure:

1. Start the system by following the steps under "Starting the System", but **DO NOT** open oil supply shut off valve.
2. The safety switch should lock out based on the safety switch timing indicated on the unit label and packaging. The ignition and motor should stop and the oil valve close.
3. Restart the system by re-opening the oil shut-off valve and pushing in the red reset button (hold for 3-seconds) and releasing it.

Simulate Power Failure:

1. Start the system by following the steps under "Starting the System".
2. With the burner running, turn off the power to the system by tripping the circuit breaker or removing the fuse. The burner should stop.
3. The burner should restart when power is restored.

Troubleshooting and Maintenance



WARNING! IMPORTANT SAFETY INFORMATION!

Electrical Shock Hazard! Only a trained, experienced service technician should attempt to install this control. Replace the control if operation is not as described in the safety features and checking section.

Status LED Indicator Conditions:

LED OFF - No power to the control, no call at T-T, or normal operation.

LED ON SOLID - CAD Cell indicates no flame or in lockout condition.

Initial Checks:

1. Ensure that the control is wired properly. Check all connections.
2. Make sure there is power to the control, burner motor and ignitor transformer.
3. The limit control should be closed.

Check Oil Primary Relay:

NOTE: You will need an insulated jumper wire with both ends stripped to perform the following tests.

1. Disconnect the cad cell leads from the F-F terminals.
2. Using the thermostat, initiate a call for heat and reset the safety switch. The burner should start.
3. Using the insulated jumper wire, jumper the F-F terminals. The burner should continue to run. (NOTE: The jumper connection must be made during the safety switch timing period indicated on the control label and/or packaging.)

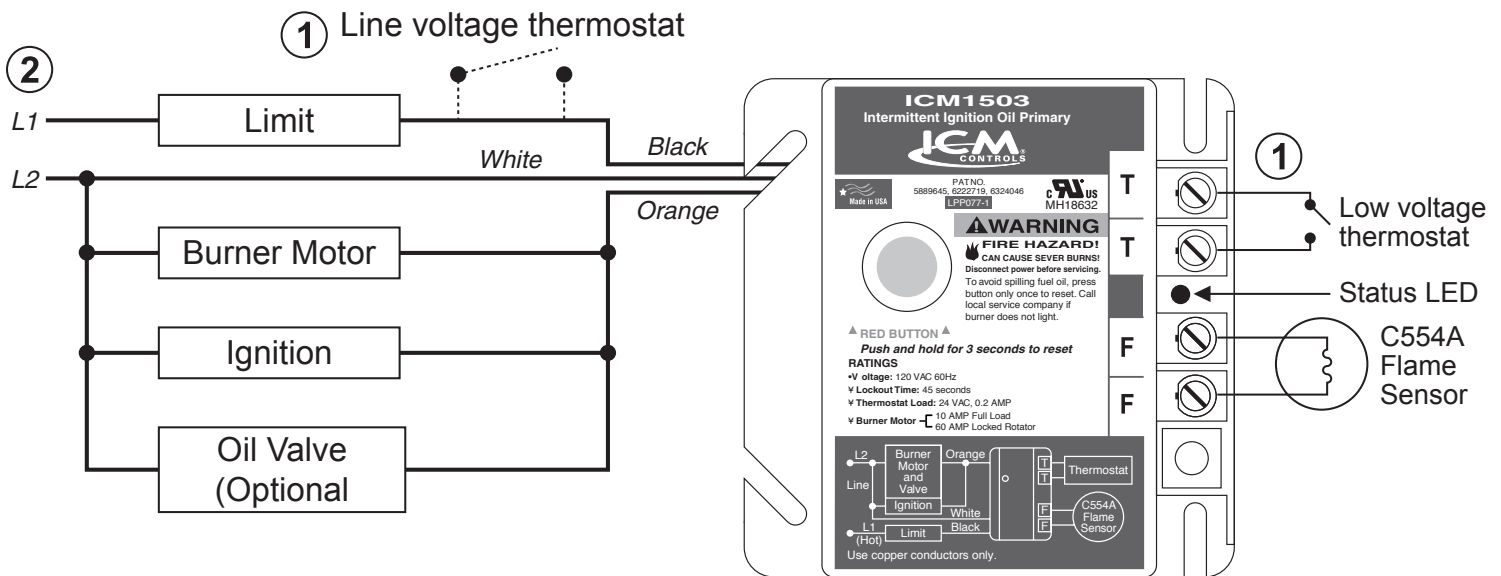
4. Following the safety switch timing period, remove the jumper wire. This should cause the burner to shut down.
5. If the oil primary control does not function as described in the above sequence, replace the control. Do not attempt to open or repair the control.

Check Cad Cell:

1. Disconnect the power to the control. You can verify the power is off using a voltmeter.
2. Disconnect the cad cell leads from the F-F terminals.
3. Wipe down the cad cell face with a clean, non-abrasive cloth.
4. Ensure that the cad cell is securely positioned in its socket. Do not disturb the position of the cad cell.
5. Reconnect the cad cell leads to the F-F terminals.
6. Reconnect the power to the control.
7. Using the thermostat, initiate a call for heat.
8. Press the red safety switch (hold for three seconds and release). The burner should turn on.
9. If the oil primary control does not turn on or if the safety switch trips, replace the cad cell with a C554A flame sensor.

Wiring Diagram - Figure 1

- ① For line voltage thermostats, jumper T-T terminals and install line voltage thermostat in series with Limit.
- ② Provide disconnect and overload protection in accordance with local and national codes.



ONE-YEAR LIMITED WARRANTY

The Seller warrants its products against defects in material or workmanship for a period of one (1) year from the date of manufacture. The liability of the Seller is limited, at its option, to repair, replace or issue a non-case credit for the purchase prices of the goods which are provided to be defective. The warranty and remedies set forth herein do not apply to any goods or parts thereof which have been subjected to misuse including any use or application in violation of the Seller's instructions, neglect, tampering, improper storage, incorrect installation or servicing not performed by the Seller. In order to permit the Seller to properly administer the warranty, the Buyer shall: 1) Notify the Seller promptly of any claim, submitting date code information or any other pertinent data as requested by the Seller. 2) Permit the Seller to inspect and test the product claimed to be defective. Items claimed to be defective and are determined by Seller to be non-defective are subject to a \$30.00 per hour inspection fee. This warranty constitutes the Seller's sole liability hereunder and is in lieu of any other warranty expressed, implied or statutory. Unless otherwise stated in writing, Seller makes no warranty that the goods depicted or described herein are fit for any particular purpose.

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QO™ and Homeline™ Load Centers

Installation Class 1100

Retain for future use.

Introduction

This bulletin contains instructions for the installation and operation of QO™ and Homeline™ load centers. It also includes installation instructions for standard and tandem branch circuit breakers. See separate instruction bulletins included with advanced function circuit breakers and accessories, when installed.

⚠ DANGER

HAZARD OF ELECTRIC SHOCK, EXPLOSION, OR ARC FLASH

- Apply appropriate personal protective equipment (PPE) and follow safe electrical work practices. See NFPA 70E.
- This equipment must only be installed and serviced by qualified electrical personnel.
- Turn off all power supplying this equipment before working on or inside equipment.
- Always use a properly rated voltage sensing device to confirm power is off.
- Replace all devices, doors and covers before turning on power to this equipment.
- Do not allow petroleum-based paints, solvents, or sprays to contact the nonmetallic parts of this product.
- Before starting a wiring installation or addition, consult a local building or electrical inspector for current National Electrical Code requirements. Local codes vary, but are adopted and enforced to promote safe electrical installations. A permit may be needed to do electrical work, and some codes may require an inspection of the electrical work.
- This equipment may not be suitable for use in corrosive environments present in agricultural buildings. See NEC 547.

Failure to follow these instructions will result in death or serious injury.

Preparation

1. Determine the wiring or conduit requirements for the main and branch circuits, as required by local electrical codes.
2. Select the proper cable clamp, or use other approved methods for securing the cable or conduit to the enclosure.
3. Remove the appropriate knockouts required for installation of cable clamps or conduit (Table 1). To remove the knockouts, see Figure 1.

Table 1: Bolt-On Conduit Hubs for Outdoor Load Centers

Conduit	Hub No.
3/4 in.	B-075
1 in.	B-100
1-1/4 in.	B-125
1-1/2 in.	B-150
2 in.	B-200
2-1/2 in.	B-250

Figure 1: Removing the Knockouts



Enclosure Mounting

Surface Mounting (Indoor or Outdoor)

Secure the enclosure to the wall with appropriate fasteners. Use all pre-cut holes in the back of the enclosure for mounting. See Figure 2.

Outdoor

1. Use the sealing gaskets provided if the mounting knockout locations shown in Figure 2 are used.
2. Use either one mounting hole at the top and two mounting holes at the bottom, or two mounting knockout holes at the top and two mounting holes at the bottom. See Figure 2.

Surface Mounting

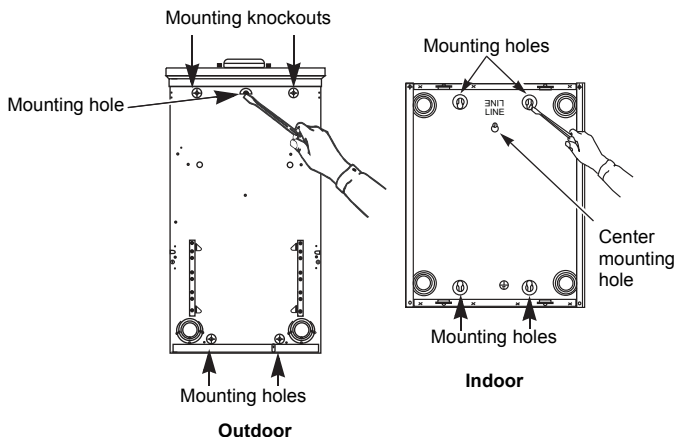
Temporarily position the enclosure with the centered tear drop hole. Secure the enclosure to the wall using the four mounting holes.

Flush Mounting (Indoor Enclosure Only)

1. Remove the four small mounting knockouts on the side walls for securing to sixteen in. stud walls. See Figure 3.
2. Position the enclosure so that the front edge is flush with the finished wall.
3. Secure the enclosure to the studs through the small knockouts. See Figure 3.

Figure 2: Surface Mounting

Figure 3: Flush Mounting



Main Circuit Breaker or Main Lug Wiring

1. Pull the conductors into the enclosure. Use approved wire clamps, conduit bushings, or other approved methods to secure the conductor to the enclosure and prevent damage to the conductor insulation.
2. Connect the main and neutral wires.
 - a. Install the main and neutral wires according to the wiring diagram on the load center.
 - b. Connect the service ground, equipment grounding wire, or both as required by the local electrical code.
 - c. Torque each connection to the value specified on the load center wiring diagram attached to the enclosure.
3. If required by the local code, install the enclosed green neutral bonding screw through the hole in the neutral bar. Thread the screw into the hole in the enclosure and torque to the value specified on the card shipped with the bonding screw.

Branch Circuit Breaker Installation and Removal

⚠ WARNING

HAZARD OF EQUIPMENT DAMAGE

This equipment is designed and tested by Schneider Electric™ to performance levels which exceed Underwriter's Laboratories® (UL®) standards and Mexican Official Standards (NOM) listing. Use only Square D™ brand circuit breakers and accessories.

Failure to follow these instructions can result in death or serious injury.

Standard and Tandem Branch Circuit Breakers—Installation

NOTE: Install QOT and HOMET tandem-type circuit breakers only in single-phase load centers marked for use with tandem circuit breakers. **Refer to the wiring diagram on the load center for the installation location.** **QOP type circuit breakers are only acceptable for use on QO plug-on neutral load centers.**

1. Determine the wiring or conduit requirements for the branch circuit.
2. Turn OFF (O) the circuit breaker.
3. **For QO tandem only**, hold the circuit breaker at 30–45° angle.
4. Install the wire terminal end of the circuit breaker into the mounting rail.
5. Rotate the circuit breaker inward until the plug-on jaw fully engages the bus bar connector. Keep the bottom of the circuit breaker's case against the mounting rail. Check the terminal end of the circuit breaker for engagement to the mounting rail.
6. Remove the wire insulation from the branch wire as required. Install the branch wire into the load terminal of the branch circuit breaker.
7. Torque each branch circuit breaker connection to the value specified on the circuit breaker.
8. Torque each neutral and ground connection to the value specified on the load center wiring diagram attached to the enclosure.

Figure 4: QO Standard Circuit Breaker

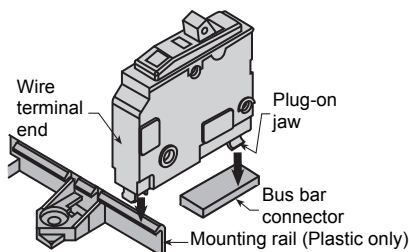
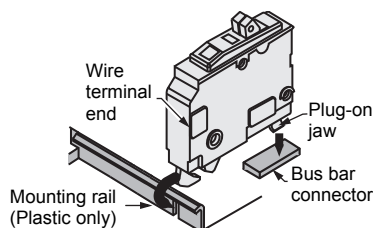


Figure 5: QO Tandem Circuit Breaker



NOTE: Class CTL tandem circuit breaker shown, not applicable for metal mounting rail only. Non-class CTL tandem circuit breaker does not have mounting cam.

Figure 6: Homeline Standard Circuit Breaker

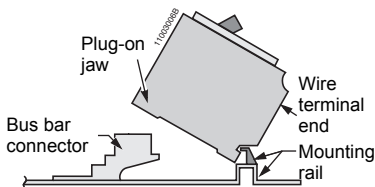
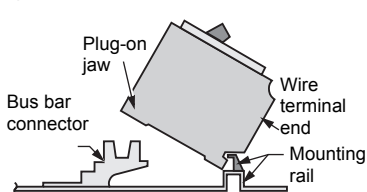


Figure 7: Homeline Tandem Circuit Breaker



Removal

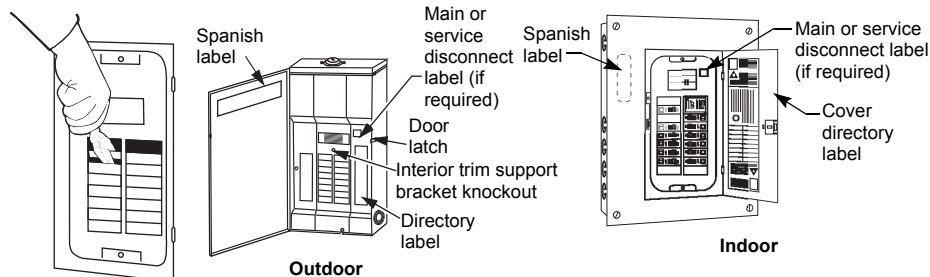
1. Turn OFF (O) the circuit breaker. Remove the wires.
2. To disconnect the plug-on jaw from the connector and mounting rail, lift the plug-on end of the circuit breaker until the circuit breaker jaw disconnects from the bus bar. Continue lifting until the terminal end disengages from the mounting rail. See Figure 4, 5 or 6 depending on circuit breaker type.

Installing the Cover / Trim

1. Remove the cover twistouts. Remove the appropriate twistouts to match the number of circuit breakers being installed. See Figure 8.
2. Attach the Spanish translation label, supplied with the load center, to the inside of the door or cover. See Figure 9.
3. Identify the circuit breakers on the directory label.
4. For service equipment, apply the “Service Disconnect” label(s) near the disconnect handle(s). If the main circuit breaker is installed and the device is used as a branch panel, apply the “Main” label to the trim near the main circuit breaker handle. See Figure 9.
5. Install the trim/cover using the screws provided and torque to 20 lb-in (2.3 N•m).
6. For QO outdoor load centers that are 150–225 A single-phase, main lug devices rated for 22,000 RMS symmetrical amperes short circuit systems, use four screws by removing the interior trim support bracket knockout.
7. Fill any unused circuit breaker openings with the filler plates.

Figure 8: Removing Twistouts

Figure 9: Label Locations



Energizing the Load Center

1. Before energizing the load center, turn off the main and all branch circuit breakers.
2. After power is turned on to the load center, first turn on the main circuit breaker and then turn on the branch circuit breakers.
3. Rotate the door latch counterclockwise to allow engagement through the door slot. (Outdoor only.)
4. Close the door until secured by the latch.

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Centros de carga QO™ y Homeline™

Instalación Clase 1100

Conservar para uso futuro.

Introducción

Este boletín proporciona las instrucciones de instalación y funcionamiento de los centros de carga QO™ y Homeline™. También incluye las instrucciones de instalación de interruptores automáticos derivados estándar en tándem.

⚠ PELIGRO

PELIGRO DE DESCARGA ELÉCTRICA, EXPLOSIÓN O DESTELLO POR ARQUEO

- Utilice equipo de protección personal (EPP) apropiado y siga las prácticas de seguridad en trabajos eléctricos establecidas por su Compañía, consulte la norma 70E de NFPA y NOM-029-STPS.
- Solamente el personal eléctrico especializado deberá instalar y prestar servicio de mantenimiento a este equipo.
- Desenergice el equipo antes de realizar cualquier trabajo dentro o fuera de él.
- Siempre utilice un dispositivo detector de tensión nominal adecuado para confirmar la desenergización del equipo.
- Vuelva a colocar todos los dispositivos, las puertas y las cubiertas antes de energizar este equipo.
- No permita que superficies no metálicas de este producto entren en contacto con pintura, solventes o rocíos basados en derivados del petróleo.
- Antes de realizar la instalación o adición de alambrado, consulte con un inspector eléctrico o de la construcción local para cumplir con los requisitos actuales del Código nacional eléctrico de EUA (NEC) o NOM-001-SEDE. Los códigos locales varían, se aceptan y hacen cumplir para fomentar la seguridad en instalaciones eléctricas. Es posible que necesite un permiso para realizar el trabajo eléctrico, y en algunos casos, algunos códigos pueden requerir una inspección del trabajo eléctrico efectuado.
- Es posible que este equipo no sea adecuado para usarse en entornos corrosivos tales como los que se encuentran en edificios de agricultura. Consulte la norma 547 del NEC.

El incumplimiento de estas instrucciones podrá causar la muerte o lesiones serias.

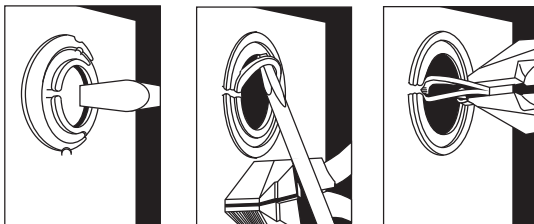
Preparación

1. Determine los requisitos de alambrado o tubo conduit para los circuitos principales y derivados, según lo requieren los códigos eléctricos locales.
2. Seleccione una abrazadera para cables apropiada, o emplee algún otro método aceptado para sujetar el cable o tubo conduit al gabinete.
3. Retire los discos desprendibles apropiados necesarios para la instalación de las abrazaderas para cables o el tubo conduit (tabla 1). Consulte la Fig. 1 para retirar los discos desprendibles.

Tabla 1: Receptáculos atornillados para tubo conduit para los centros de carga

Tubo conduit	Receptáculo modelo
3/4 pulg	B-075
1 pulg	B-100
1-1/4 pulg	B-125
1-1/2 pulg	B-150
2 pulg	B-200
2-1/2 pulg	B-250

Fig 2: Extracción de los discos desprendibles



Montaje del gabinete

Montaje para sobreponer (gabinete para uso en interiores o exteriores)

Sujete el gabinete a la pared con sujetadores apropiados. Emplee todos los agujeros precortados en la parte posterior del gabinete para el montaje. Vea la Fig. 2.

Para exteriores

1. Utilice los empaques de cierre hermético (incluidos) si se usan las ubicaciones de montaje (agujeros punzonados) que se muestran en la Fig. 2.
2. Utilice un agujero de montaje en la parte superior y dos agujeros de montaje en la parte inferior, o bien, dos agujeros de montaje punzonados en la parte superior y dos agujeros de montaje en la parte inferior. Vea la Fig. 2.

Montaje para sobreponer

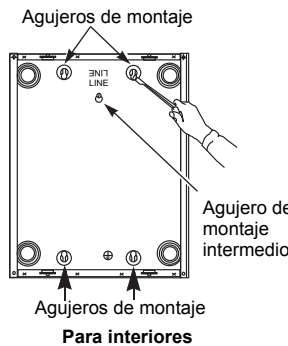
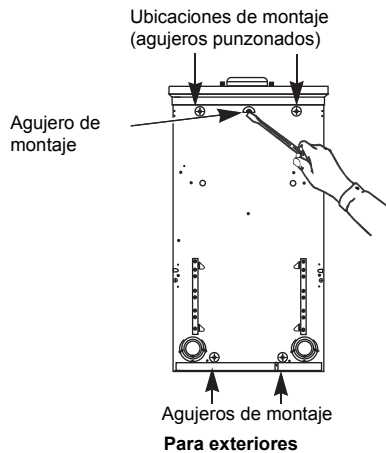
Coloque temporalmente el gabinete sosteniéndolo con el agujero en forma de gota intermedio. Sujete el gabinete a la pared utilizando los cuatro agujeros de montaje.

Montaje para empotrar (gabinete para uso en interiores solamente)

1. Retire los cuatro discos punzonados pequeños en las paredes laterales para fijar el gabinete a las vigas de madera de 16 pulgadas (en la pared). Vea la Fig. 3.
2. Coloque el gabinete de manera que el borde frontal esté al ras con la pared acabada.
3. Sujete el gabinete a las vigas de madera a través de los agujeros punzonados pequeños. Vea la Fig. 3.

Fig 2: Montaje para sobreponer

Fig 3: Montaje a ras



Alambrado del interruptor automático principal o zapata principal

1. Jale los conductores hacia el interior del gabinete. Utilice abrazaderas para cables aprobadas, pasamuros de tubo conduit u otros métodos aprobados para sujetar el conductor al gabinete y evitar daños al aislamiento de los conductores.
2. Conecte los cables de la línea principal y de neutro.
 - a. Instale los cables de la línea principal y de neutro según el diagrama de alambrado en el centro de carga.
 - b. Conecte el cable de puesta a tierra del equipo o de tierra de acometida, o ambos según lo requiera el código eléctrico local.
 - c. Apriete cada conexión en el valor especificado en el diagrama de alambrado del centro de carga adherido al gabinete.
3. Si lo requiere el código local, instale el tornillo de sujeción del neutro verde, incluido, insertándolo por el agujero en la barra del neutro. Rosque el tornillo por el agujero en el gabinete y apriételo en el valor especificado en la tarjeta incluida con el tornillo de sujeción.

Instalación y desmontaje del interruptor automático derivado

⚠ ADVERTENCIA

PELIGRO DE DAÑO AL EQUIPO

Este equipo ha sido diseñado y probado por Schneider Electric™ y supera las normas de nivel de rendimiento establecidas por Underwriters Laboratories® (UL®) y las certificaciones de NOM (Normas Oficiales Mexicanas). Utilice sólo interruptores automáticos y accesorios de marca Square D™.

El incumplimiento de estas instrucciones puede causar la muerte o lesiones serias.

Consulte los boletines de instrucciones independientes incluidos con los interruptores automáticos con funciones avanzadas y accesorios, si están instalados.

Interruptores automáticos derivados estándar y en tándem—Instalación

NOTA: Instale interruptores automáticos en tándem QOT y HOMT sólo en los centros de carga de una fase marcados para su uso con este tipo de interruptores. Consulte el diagrama de alambrado en el centro de carga para conocer la ubicación de instalación de los interruptores.

1. Determinar los requisitos del alambrado o tubo conduit para el circuito derivado.
2. Desconecte (O) el interruptor automático.
3. **Para los tipo QO en tándem solamente**, sostenga el interruptor automático en un ángulo de 30 a 45°.
4. Instale el extremo de terminal del cable del interruptor automático sobre el riel de montaje (vea la Fig. 4, A).
5. Gire el interruptor hacia dentro hasta que la mordaza enchufable encaje completamente en el conector de barras. Mantenga la parte inferior de la caja del interruptor automático apoyada contra el riel de montaje. Revise el extremo terminal del interruptor automático y asegúrese de que esté bien enganchado en el riel de montaje.
6. Quite aislamiento necesario del cable derivado. Instale el cable derivado en la terminal de carga del interruptor automático derivado.
7. Apriete las conexiones de cada interruptor automático derivado en el valor especificado en el interruptor.
8. Apriete cada conexión de neutro y tierra en el valor especificado en el diagrama de alambrado del centro de carga adherido al gabinete.

Fig 4: Interruptor automático QO estándar

Fig 5: Interruptor automático QO en tándem

A Interior de enchufe en neutro

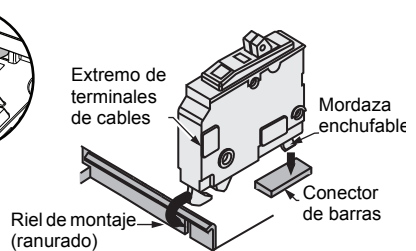
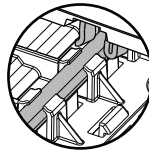
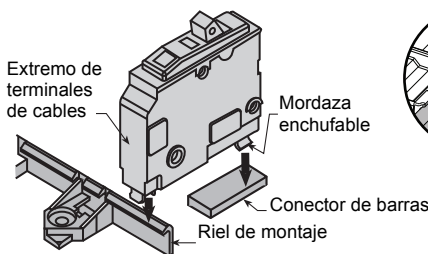
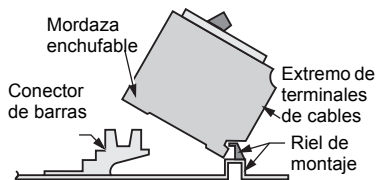
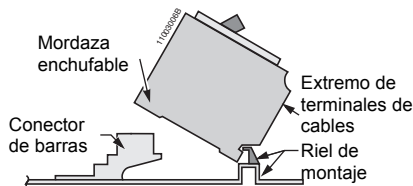


Fig 6: Interruptor automático Homeline estándar

Fig 7: Interruptor automático Homeline en tándem



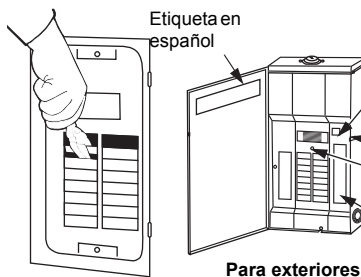
Desmontaje

1. Desconecte (O) el interruptor automático. Retire los cables.
2. Para desconectar la mordaza enchufable del conector y del riel de montaje, levante el extremo enchufable del interruptor automático hasta que su mordaza se desconecte de la barra. Continúe levantándolo hasta que el extremo de terminales se desenganche del riel de montaje. Vea la Fig. 4, 5 ó 6 dependiendo del tipo de interruptor automático.

Instalación de la cubierta / marco

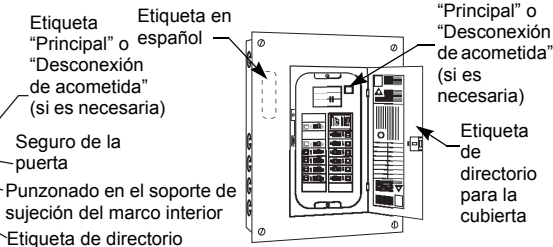
1. Retire los rectángulos desprendibles de la cubierta. Retire los rectángulos desprendibles apropiados correspondientes a la cantidad de interruptores automáticos que va a instalar. Vea la Fig. 8.
2. Adhiera la etiqueta con la traducción en español, provista con el centro de carga, en el interior en la puerta o en la cubierta. Vea la Fig. 9.
3. Identifique los interruptores automáticos en la etiqueta de directorio.
4. En el equipo de acometida, adhiera la(s) etiqueta(s) "Desconexión de acometida" cerca de la(s) palanca(s) del dispositivo de desconexión. Si está instalado el interruptor automático principal y el equipo se usa como un tablero derivado, adhiera la etiqueta "Principal" al marco cerca de la palanca del interruptor automático principal. Vea la Fig. 9.
5. Instale el marco/cubierta usando los tornillos proporcionados y apriételes en 2,3 N•m (20 lbs-pulg).
6. En los centros de carga QO para exteriores de 150–225 A, una fase y con zapatas principales, adecuados para sistemas de cortocircuito de 22 000 A simétricos rcm, utilice cuatro tornillos (utilice el agujero punzonado en el soporte de sujeción del marco interior).
7. Cubra con placas de relleno las aberturas sin usar para los interruptores automáticos.

Fig 8: Retire los rectángulos desprendibles



Para exteriores

Fig 9: Ubicación de las etiquetas



Para interiores

Cómo energizar el centro de carga

1. Antes de energizar el centro de carga, desconecte (O) los interruptores automáticos principal y derivados.
2. Una vez que el centro de carga ha sido energizado, primero conecte (I) el interruptor automático principal y luego los interruptores automáticos derivados.
3. Gire el seguro de la puerta en sentido contrario de las manecillas del reloj para poder enganchar la puerta por la ranura. (para exteriores solamente)
4. Cierre la puerta y asegúrese de que esté bien sujeta con el seguro.

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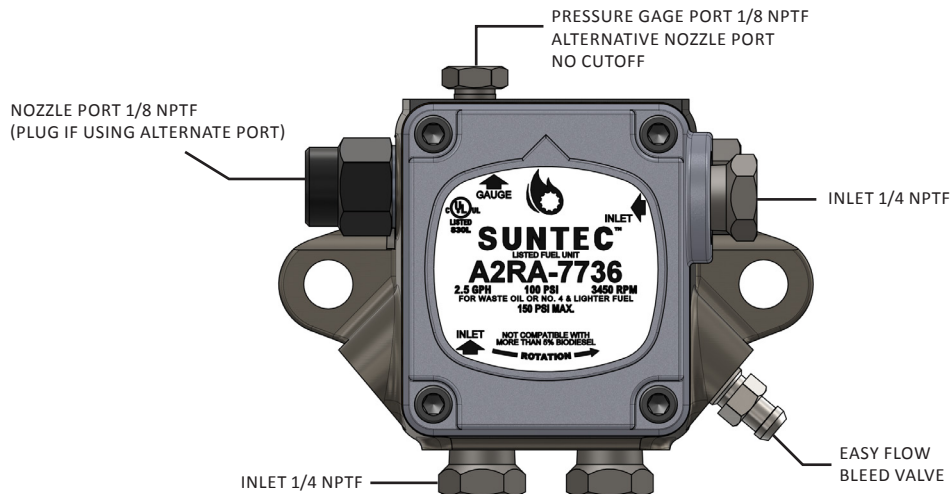
Col. Gpe. del Moral 09300 México, D.F.

Tel. 55-5804-5000

www.schneider-electric.com.mx

Solamente el personal especializado deberá instalar, hacer funcionar y prestar servicios de mantenimiento al equipo eléctrico. Schneider Electric no asume responsabilidad alguna por las consecuencias emergentes de la utilización de este material.

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PORT SIZE :	Inlet - 1/4-18 NPTF Nozzle - 1/8-27 NPTF		
FUEL:	Waste Oil, No. 4 & Lighter Fuel Oil This product is not compatible with fuel blends containing more than 5% biodiesel.		
LIFT	14' Maximum		
OPERATIONAL VACUUM:	20 in. Hg. Maximum - Waste Oil & Fuel Equivalent to No. 4 10 in. Hg. Maximum - No. 2 & Lighter Fuel Oil		
SPEED (RPM):	A2RA-7736 3450/1725	A2RA-7737 3450/1725	A1RA-7738 1725
TRANSFER RATING (GPH @PSI):	2.5 @110 / 2.5@30*	2.5 @20 / 2.5 @20	2.5 @105
PRESSURE RANGE (PSI) REGULATOR	100-150 /*	10-20 / 10-20	100-150
FACTORY SET	100 /*	10 / 10	100
ACTUAL DELIVERY	0-150 / 0-30+*	0-20 / 0-20	0-150
CUT OFF FUNCTION NOZZLE PORT	YES	NO	YES
ALTERNATIVE NOZZLE PORT:	NO	NO	NO

* Use alternate nozzle port for 1725 RPM. Actual pressure depends on discharge line restrictions but will not exceed 3450 RPM rating.

INSTALLATION INSTRUCTIONS

A. General:

Suntec's Model A2RA-7736 transfer pump should be installed in accordance with the National Board of Fire Underwriter's requirements and local ordinances where applicable.

B. Piping:

All waste oil pumps are to be connected one pipe. The system may return excess fluid to tank after the fluid goes to a reservoir or siphon pick-up per typical tank installation figure. 1/2" or 3/4" line may be used with the following restrictions applying to the horizontal run (H) allowed:

Inlet

Line Size	Lift	Length (Lift and Run)
1/2" I.D.	0'	41'
1/2" I.D.	14'	20'
3/4" I.D.	0'	90'
3/4" I.D.	14'	48'

Line lengths based on straight weight automotive oils maintained at 50°F minimum, multi-weight oils maintained at 32°F minimum.

A 30 mesh secondary strainer is supplied in the unit. An external primary strainer must be supplied by the burner/furnace manufacturer upstream of the fuel unit. The strainer must comply with U.L. requirements.

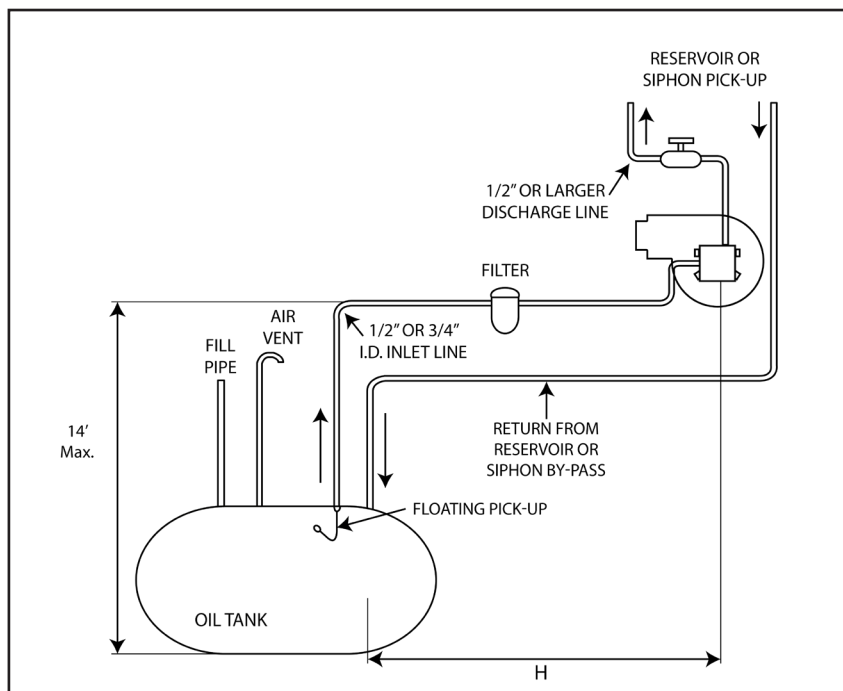
NOTE: Model A2RA-7737 requires external shut-off valve.

C. Pump Connections:

Install a vacuum gage in the inlet line close to the pump or in the unused inlet port. During operation, vacuum must not exceed the Operating Vacuum specified on the reverse under pump specifications.

D. Priming Procedure:

Fill pump with clean room temperature oil thru inlet port, start pump and open bleed valve. Bleed pump for several minutes or until air free oil is observed flowing from bleed port.

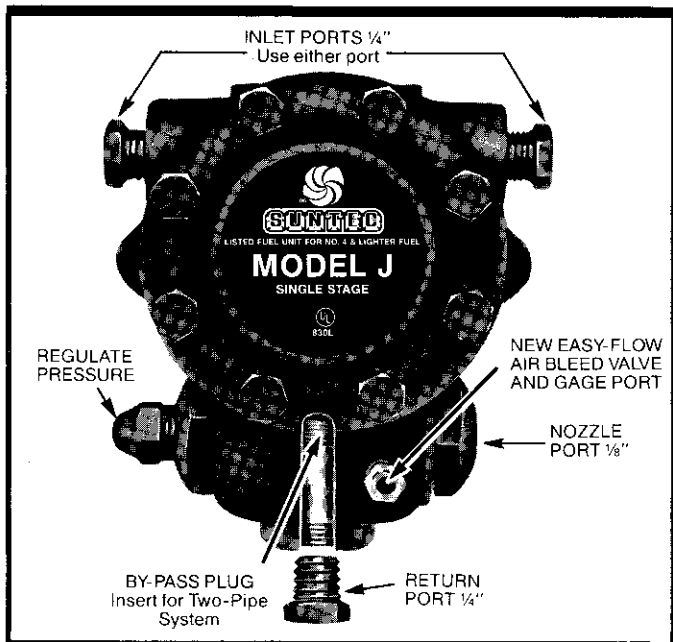


TYPICAL OUTSIDE TANK INSTALLATION

IMPORTANT... INSTALLATION INFORMATION



SUNTEC ROTA-ROLL® FUEL UNITS MODEL J SINGLE-STAGE AND MODEL H TWO-STAGE



ALL SYSTEMS • GENERAL INFORMATION

1. Oil lines should consist of not smaller than 1/2" O.D. copper tubing. See line size and installation data.
2. Oil lines must be absolutely airtight. Check all connections and joints. Note: Teflon tape should not be used on fittings.
3. During initial start-up or if the oil supply runs dry, prime the fuel unit with lubricating oil.
4. Return line and inlet pressures must not exceed 10 psi. Higher pressures may cause the seal to leak.

AIR BLEED PROCEDURE WITH NEW EASY-FLOW AIR BLEED VALVE

ONE-PIPE SYSTEM

START BURNER: Loosen easy-flow air bleed valve CCW one turn for fast purging.

For clean bleed in restricted spaces, an easily-attached hose can be used to direct bleed oil into a container. A 3/16" I.D. hose can be slipped directly over end of valve.

OPTIONAL PROCEDURE: Before starting burner on gravity-feed systems, loosen unused intake port plug until there is a flow of oil from the port.

TWO-PIPE SYSTEMS

Air bleeding is automatic. Opening easy-flow air bleed valve will allow oil to be pulled up faster.

MOUNTING POSITION: Model "J" may be mounted in any position.

NOTE: Direction of rotation and nozzle port location determined from shaft end with valve at bottom.

Model "H" may be mounted with the valve horizontal at either top or bottom.

Valve may be mounted vertical providing the adjusting screw is at the top of CW rotation-left nozzle and CCW rotation-right nozzle models, or adjusting screw at bottom on CW rotation-right nozzle and CCW rotation-left nozzle models.

ADDITIONAL INSTALLATION INFORMATION:

Piping of fuel lines for oil-fired
WATER HEATER Form No. 1335

Suntec boost pump—
SIMPLIFIED CIRCUIT Form No. 450012

ONE-PIPE SYSTEM • INLET LINE ONLY

Fuel units are shipped without by-pass plug installed. Verify that no one has installed the by-pass plug. For line lengths under 50 feet, use 3/8" O.D. copper tubing. For line lengths 50 to 100 feet, use 1/2" O.D. copper tubing. "J" and "H" models are not recommended for lift above two feet, max 2" Hg inlet vacuum, except for the J2-F (Fig. 2).

TWO-PIPE SYSTEM • INLET AND RETURN LINE

Remove internal by-pass plug from plastic bag and insert as shown in illustration. Tighten securely. For recommended line sizes, refer to charts on reverse side. Maximum operating vacuum at fuel unit for the "J" model is 12" Hg. The Model "H" should not be used where inlet vacuum exceeds 20" of Hg at 1725 and 17" of Hg at 3450 rpm.

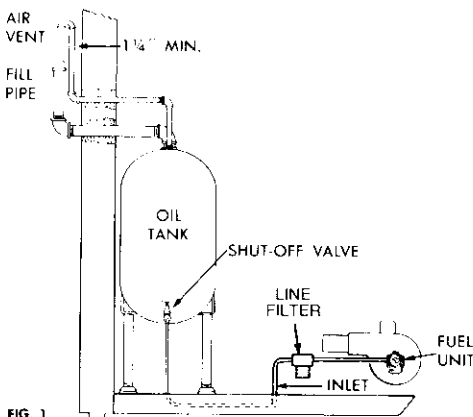


FIG. 1

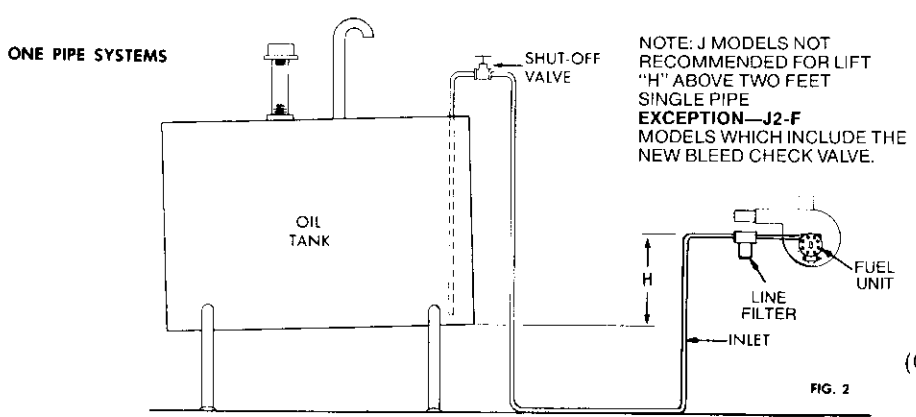


FIG. 2

(OVER)

INSTALLATION DATA

M Series units may be used in one-or two-pipe installations. They have vacuum capability up to 10" Hg on single-stage units, 15" Hg on two-stage units including piping and lift losses. They are rated for use with #1 and #2 fuel oil or kerosene.

IMPORTANT: Do not loosen or try to tighten any pump plugs not to be used in the installation. **NON HARDENING OIL PIPE DOPE IS RECOMMENDED** for use on the threads of all fittings. Teflon tapes or paste must be used with care to prevent depositing tape pieces or fibers into critical internal areas of the pump. Reduced torque must be used with teflon materials to avoid thread or casting damage. **EVIDENCE OF TEFLON MATERIAL IN INTERNAL AREAS OF THE FUEL UNIT WILL BE CAUSE TO VOID WARRANTY.**

Installation Notes:

Nozzle port pressure at cutoff is not less than 80% of set pressure on all except -15 models. -15 models do not have internal cutoff.

'Fuel unit inlet pressure should not exceed 3 psig in order to comply with National Fire Protection Association's Bulletin 31.'

M Series fuel units are available in standard C Style (counterclockwise rotation, nozzle port on left, as viewed from shaft end) or D Style models (clockwise rotation, nozzle port on right, as viewed from shaft end).

Important Rating Information

Recommended fire size (RFS) of pump decreases as pump operating pressure is increased above 100 psi nominal rated pressure, except M34DK-3, which is rated to 150 psi. For adequate service life, nozzle flow at set pressure must not exceed RFS figures in table below.

Max. UL listed operating press. = 135 psi ("K"-150 psi)

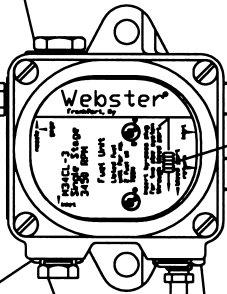
Pump Model	RFS at 100 psi	RFS at 135psi	RFS at 150 psi
M34-3, 2M34-3	3 gph	1 gph	—
M34-6, 2M34-6	6 gph	3 gph	—
M34-15, 2M34-15	15 gph	13 gph	—
M17-6, 2M17-6	6 gph	3 gph	—
M17-15	15 gph	13 gph	—
M34DK-3	3 gph	3 gph	3 gph

Body Style C
Counterclockwise Rotation (CCW)

To adjust pressure:
Insert standard screw driver. Turn counterclockwise to set below desired pressure. Then turn clockwise to set desired pressure.

Gauge Port:
1/8" pipe threads

Nozzle Port:
1/8" pipe thread



Cover Inlet Port:
1/4" pipe thread

Bleed Valve:
3/8" wrench
Flats

Bleed Port Plug
Assembly: 11/16"
thread (access to
bypass plug)

Return Port: 1/4"
pipe thread

Bypass Plug: 1/16"
pipe thread, 5/32"
Allen

Inlet Port: 1/4" pipe
thread

Bypass Plug: 1/16"
pipe thread, 5/32"
Allen

Return Port: 1/4"
pipe thread

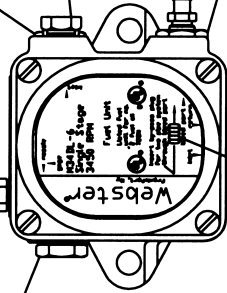
Body Style D
Clockwise Rotation (CW)

To adjust pressure:
Insert standard screw driver. Turn counterclockwise to set below desired pressure. Then turn clockwise to set desired pressure.

Cover Inlet Port:
1/4" pipe thread

Bleed Valve:
3/8" wrench
Flats

Bleed Port Plug
Assembly: 11/16"
thread (access to
bypass plug)



Color Of Printed Label Denotes Operating Speed:
Blue Background - 1725 rpm
Silver Background - 3450 rpm

Total Allowable Feet of Tubing

Figures in body of table are total allowable feet of line length (vertical + horizontal) given feet of vertical lift for M pumps set 2 pipe.

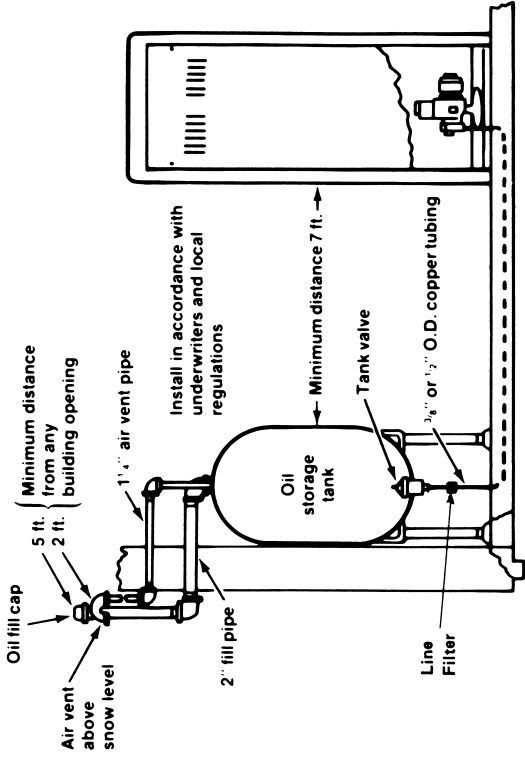
Feet Vertical Lift	1-Stage All Models Except "K"		1-Stage "K" Only	
	3/8" OD Tubing	1/2" OD Tubing	3/8" OD Tubing	1/2" OD Tubing
	0	50	100	100
1	46	100	93	100
2	42	100	85	100
3	39	100	78	100
4	35	100	70	100
5	31	95	63	100
6	27	83	55	100
7	24	72	48	100
8	20	60	40	100
9	16	49	33	99
10	12	38	25	76
11		27	18	53
12		15		31
13				
14				
15				
16				
17				
18				

Feet Vertical Lift	2-Stage All Models Except - 15		2M34-15 Only	
	3/8" OD Tubing	1/2" OD Tubing	3/8" OD Tubing	1/2" OD Tubing
	0	75	100	56
1	71	100	53	100
2	68	100	51	100
3	64	100	48	100
4	60	100	45	100
5	56	100	42	100
6	53	100	39	100
7	49	100	37	100
8	45	100	34	100
9	41	100	31	94
10	38	100	28	85
11	34	100	25	77
12	30	91	22	68
13	26	80	19	60
14	23	68	17	51
15	19	57		43
16		46		34
17		34		26
18		23		

One-Pipe Installation

Normally recommended for gravity feed only. Lift up to 8 feet max. is allowable if system is absolutely airtight. Even slight air leak can cause loss of prime with 1 pipe lift.

1. Remove **BYPASS PLUG** (if installed) through side **INLET PORT** in pump body.
2. Connect inlet line to preferred **INLET PORT**.
3. Connect nozzle outlet to nozzle line.
4. Plug all unused ports securely.
5. Start burner and bleed all air from the system by opening **VENT PLUG**. Close **VENT** securely when oil flow in tube is clear.



Two-Pipe Installation

Normally required when lifting oil from below pump. 2 pipe systems are self-venting. See table below for permissible line lengths.

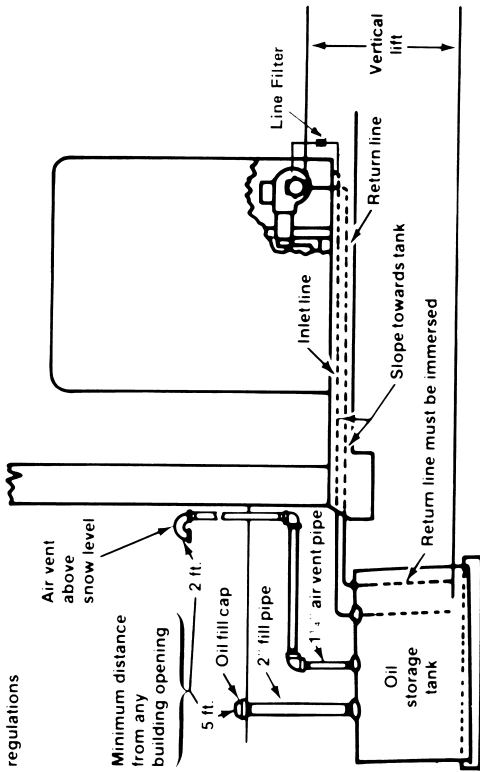
Maximum Inlet Vacuum:

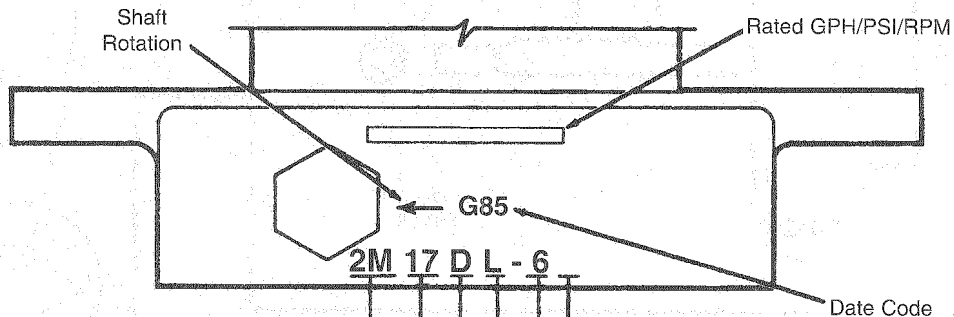
Single-stage M units—10" Hg

Two-stage 2M units—15" Hg

1. Insert BYPASS PLUG, if not installed, through side INLET PORT in pump body.
2. Connect supply line to preferred INLET PORT.
3. Connect return line to preferred RETURN PORT.
4. Connect nozzle outlet to nozzle line.
5. Plug all unused ports securely
6. Start burner. Unit will self vent.

Install in accordance with underwriters and local regulations





M	Single Stage
2M	Two Stage

Motor Speed

Code	RPM
17	1725
34	3450

Rated Pressure

All Except Design Series "K"	
No Digit	100 PSI Rated Pressure
Design Series "K"	
No Digit	150 PSI Rated Pressure

**Rotation and Nozzle Location
(From Shaft End)**

Code	Rotation	Nozzle
C	Counter Clockwise	Left
D	Clockwise	Right

Max. Recommended Fire Size at Rated Pressure

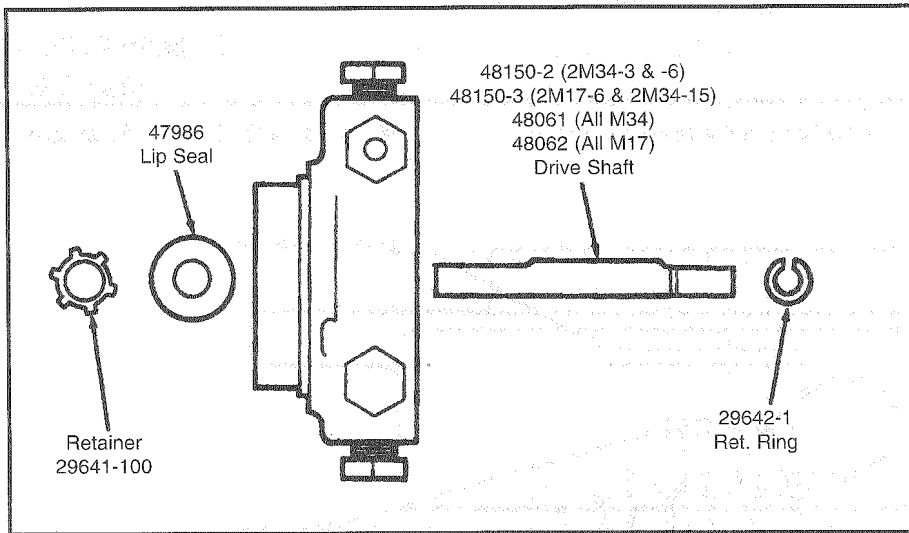
Code	Max. Fire
3	3 GPH
6	6 GPH
15	15 GPH

Design Series

Code	Design Change
None	Steel Cover & Key Drive (Obsolete)
A	Aluminum Cover & Key Drive (Obsolete)
B	"D" Gear Drive, Face Seal (Obsolete)
C	"D" Gear Drive with special Body & Piston, Face Seal (Obsolete)
D	"D" Gear Drive & Lip Seal (Obsolete)
E	"D" Gear Drive & Lip Seal with Special Body & Piston (Obsolete)
F	Same As "D" Except Revised Porting
H	Same As "F" Except O-Ring Press. Adjus.
J	Same As "H" Except Revised Internal Valving**
K	Same as "J" Except Relocation Of Vent And By Pass Plug
L	Same As "K" Except Revised Porting

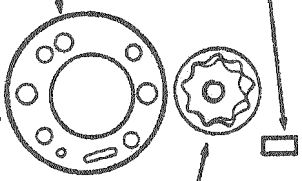
**On J body do not immerse in solvents so as to prevent damage to synthetic internal parts.

Lip Seal Units (Design Series "D" and Up)



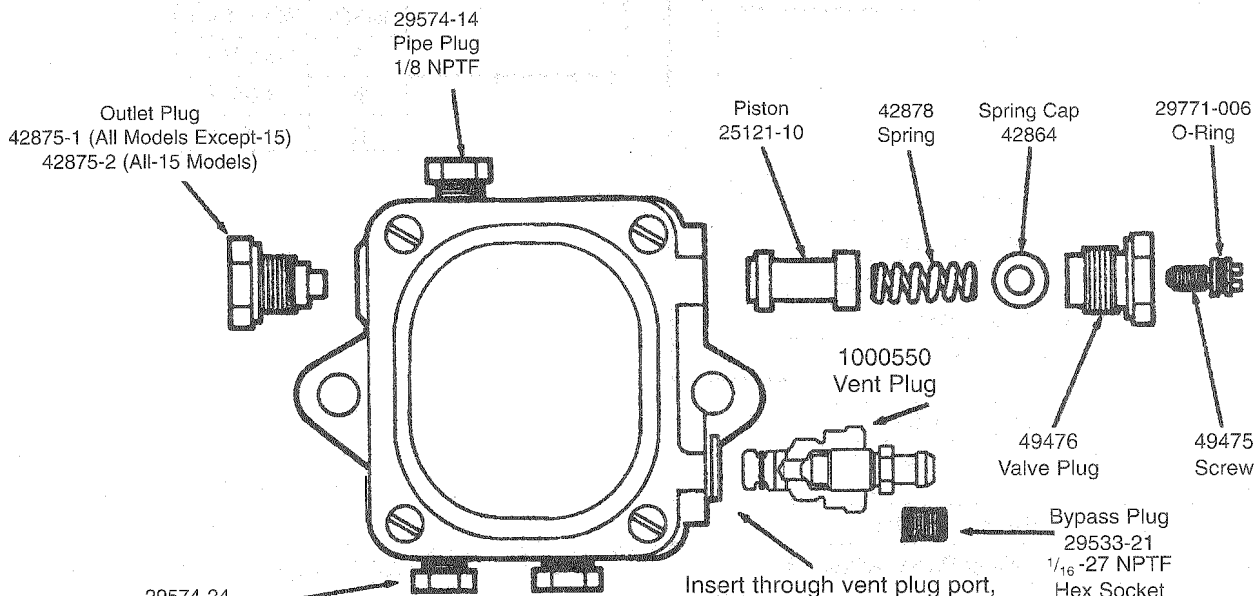
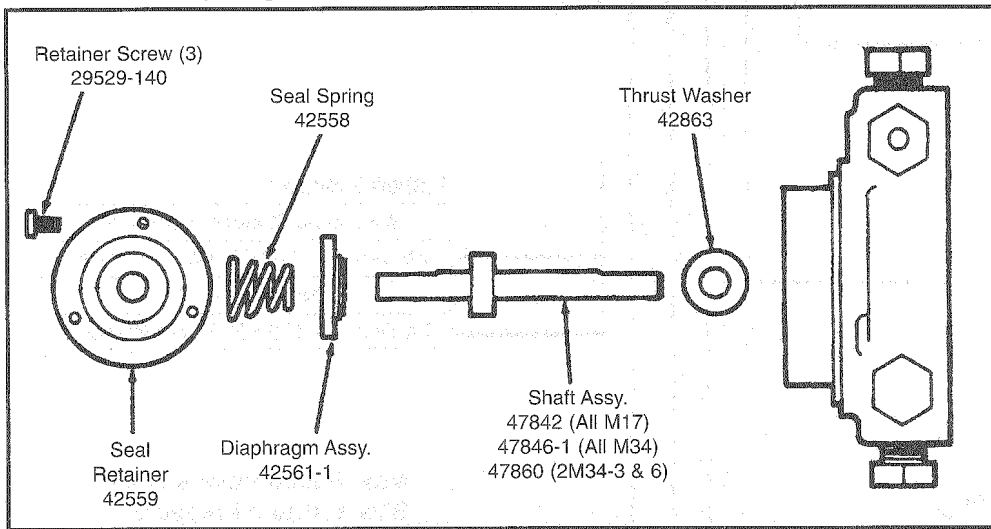
Pressure Gear Plate
 24818-3 (M17-6 & -15)
 19859-5 (M34-3-6-15 & 2M34-15)
 19859-3 (2M17-6)
 42639-1 (2M34-3 & -6)

Dowel Pins (2)
 19860-1 (M17-6 & 15)
 20149-1 (M34-3-6 & -15)
 20149-1 (2M17-6)
 20149-7 (2M34-15)
 20149-14 (2M34-3 & -6)

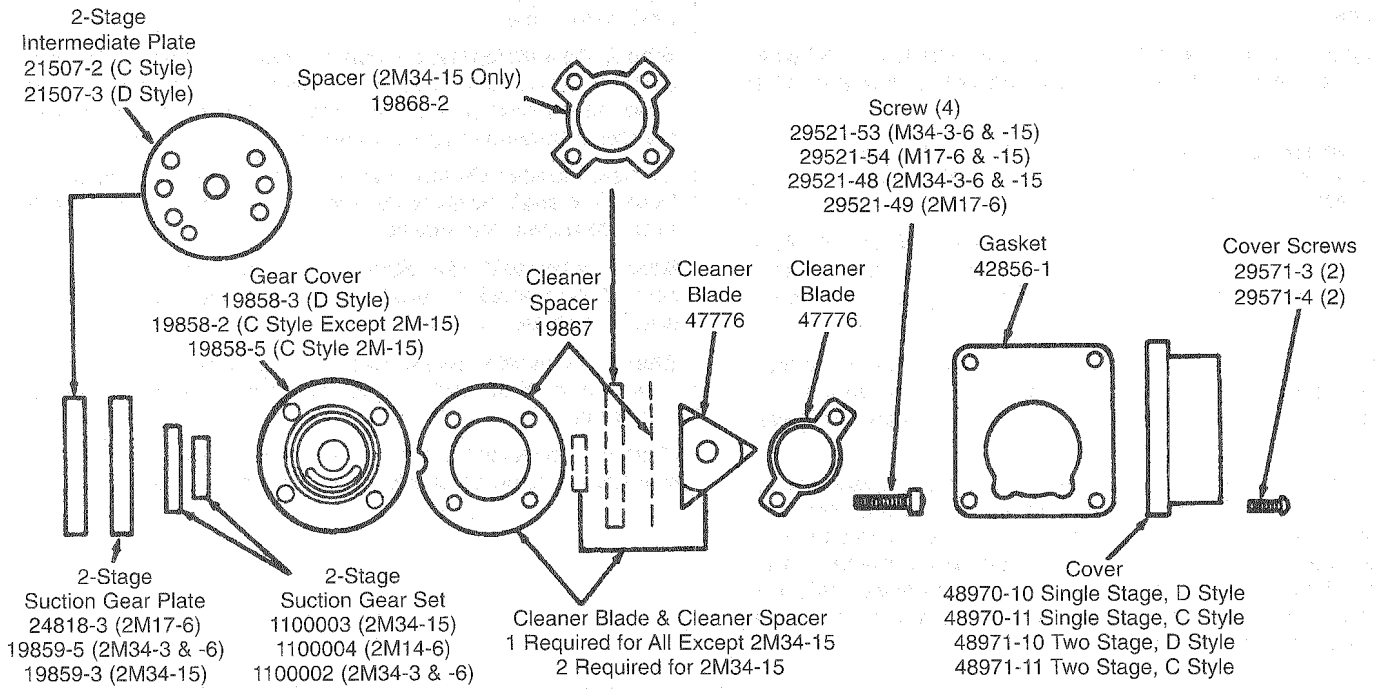


1100002 (All M34 & 2M34-15)
 1100003 (2M17-6)
 1100004 (M17-6 & -15)
 1100001 (2M3403 & -6)
 Pressure Gear Set

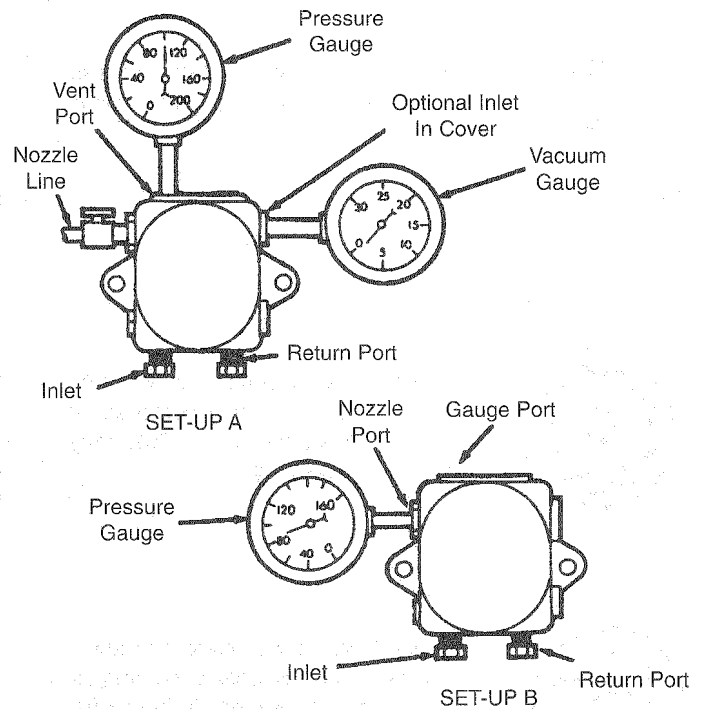
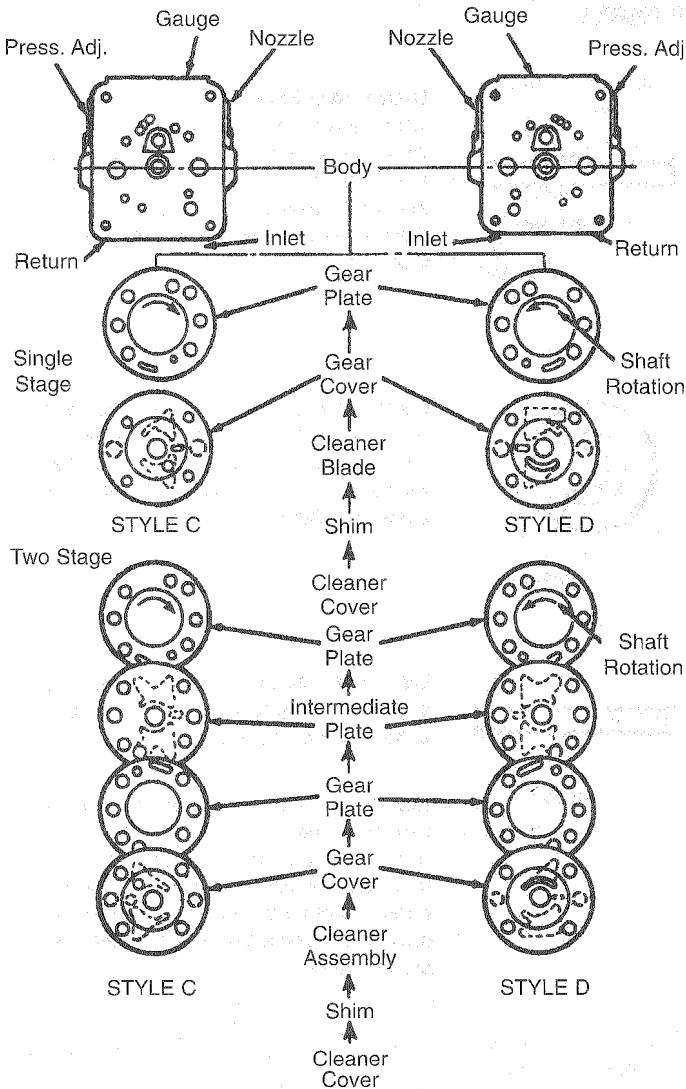
Face Seal Units (Design Series "B" & "C") "Old Style"



Insert through vent plug port, all 2 stage, and all units design series "K" and up, to set unit for 2 pipe operation.



SIMPLIFIED TEST SET-UP



“D” STYLE PUMPS SHOWN—“C” STYLE OPPOSITE

Test All Units with By-Pass Plug Installed for Two Pipe System

Delivery and Vacuum Test — Set-Up A Above

1. Set pressure adjusting screw to required pressure.
2. Measure nozzle delivery at set pressure.
3. Close inlet valve to check vacuum.

Cut-Off Test—Set-Up B Above

1. Set pressure at 100 PSI.
2. Shut off motor. Pressure should hold at 80% or above of rated pressure. If pressure drops to 0 PSI, cut off leaks.

DISASSEMBLY

Step 1: Plug all ports and wash exterior of pump with mineral spirits.

Step 2: Remove Valve Section (see page 2). Use $13/16$ box or open end wrench to remove valve adjusting plug and outlet plug.

Caution: Be sure to remove or loosen the adjusting plug to relieve spring pressure from the piston seat before loosening the outlet plug.

Step 3: Remove Gear Section (see pages 4 and 5). After removing cover screws tap the side of front cover with a plastic hammer as this cover has a tendency to adhere to the body.

Step 4: Remove Seal Section. After the three retainer screws have been removed all parts except the thrust washer will come out by pulling on the drive shaft on diaphragm seal units.

On lip seal units, shaft must be removed from inside pump (after disassembling the gear stack). With shaft removed, retainer and seal can be pried out with screwdriver if replacement is necessary. Care must be taken not to scratch the hub bore while prying out seal. Do not remove seal if it is performing satisfactorily. Once seal is removed, it will be distorted and must be replaced.

ASSEMBLY

Step 1: Wash all parts with mineral spirits and be sure your work area is clean

Step 2: Assemble Seal Section. Lubricate seal face with drop of clean light oil and install with seal face down against seal nose. Install seal spring with small end against seal. Install retainer with raised ring down against seal.

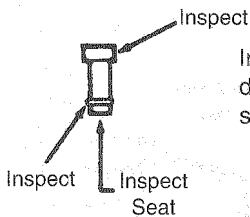
Lip seal models: Oil the seal lips before inserting the shaft. Rotate the shaft slowly while forcing shaft flat thru the seal to avoid damaging the seal lips.

Step 3: Assemble Gear Section. Refer to preceding page for correct plate position. Rotate drive shaft when tightening the gear coverplate screws to insure optimum alignment.

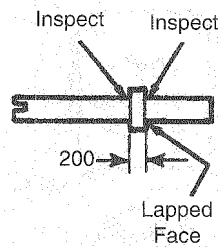
Step 4: Assemble Valve Section. D style outlet in right port as viewed from shaft end. C style outlet in left port as viewed from shaft end.

Step 5: Operationally test in accordance with normal test procedures. (See preceding page for simplified test set-up.)

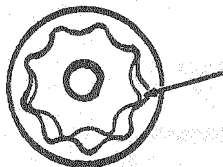
INSPECTION OF PARTS



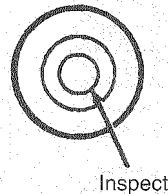
Inspect piston assembly for wear or damage to the seat and points shown.



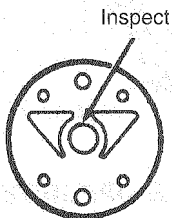
Diaphragm Seal Units: Inspect drive shaft assembly for wear on both sides of seal nose. Seal nose face must be relapped before assembling into unit. Use 25199-2 lapping tool. Replace shaft if seal nose worn more than .040.



Inspect gear assembly for wear by checking to see how well the gears mesh. Clearance over .002 may cause low delivery.



Inspect diaphragm assembly for damage to rubber part and wear on the lapped surface. If the slightest amount of wear appears on the lapped surface replace the part.



Inspect gear cover plate and intermediate plate for wear or scoring on face. Inspect cleaner blade tips for wear and flatness.



Lip Seal Units: Consider replacing shaft if there is wear in the area contacted by the seal lips.

Lip Seal: Replace if leaking. If seal rubber is swelled or softened, suspect chemical contaminants in fuel. If rubber is firm but lips are worn, check pumping system for excessive inlet pressure and/or abrasive contamination.

Webster®

Fuel Pumps & Valves

219 Hahn Drive • Frankfort, KY 40601
(502) 223-0025 • (800) 766-1233 • Fax (502) 223-4629

A Division of Capital City Tool, Inc

Specifications

Waste Oil Pump

Webster®
Fuel Pumps & Valves



Rotation: (As viewed from shaft end):
Clockwise (D Style).

Porting:

- 1/8" NPTF, side located nozzle port.
- 1/8" NPTF, top located gauge port.
- 1/4" NPTF, bottom and cover located inlet ports and bottom located return port.
- Bypass plug accessible through the side located bleed port plug assembly.
- 3/8" flow through bleed valve.

Elastomers:

VITON shaft seal.
All other seals are VITON.

Mounting:

2 bolt flange - see interface dimensions.

Weight:

4 lbs., 2 oz., shipped oil-filled.

Nozzle Location:

(As viewed from shaft end):
Clockwise (D Style) - Right side.

Shaft:

5/16" dia., 1.65" extension from mounting face, with keyless "D" drive.

NOTE: To assure compliance with National Fire Protection Association Bulletin 31, "Installation of Oil Burning Equipment", fuel unit inlet pressure should not exceed 3 psig.

Inlet Requirements:

10" Hg maximum vacuum (approx. 10' vertical lift - exact distance will vary with tubing diameter and length).
3 psig maximum inlet pressure.

Speed:

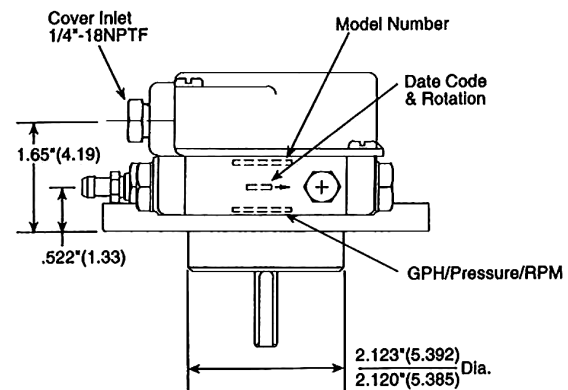
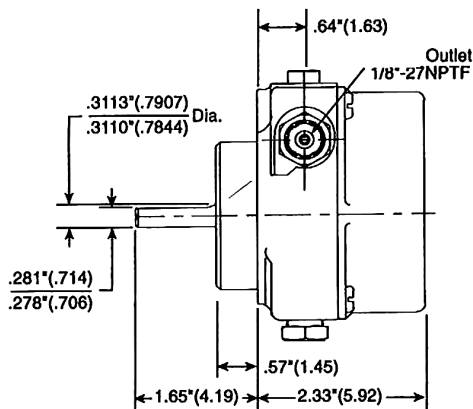
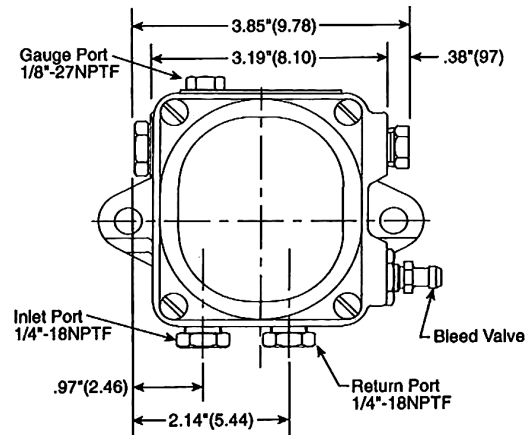
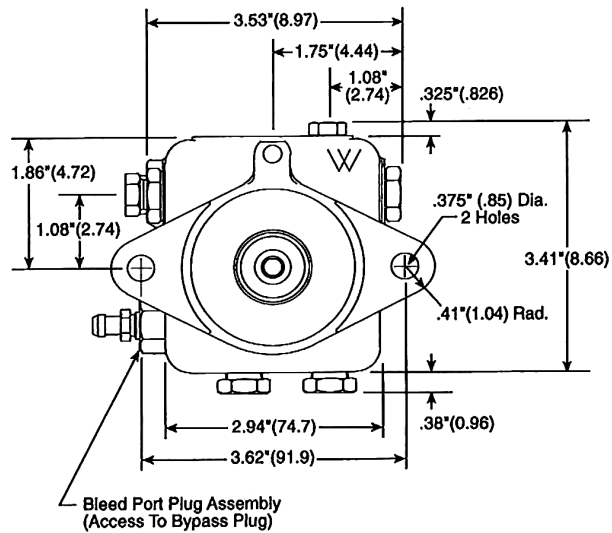
1725 and 3450 RPM

Webster now has available a Mini waste oil pump. Webster's waste oil pumps are available in single stage models, rated at 20 gph for the SK41906 (3450rpm) and 25 gph for the SK41982 (1725rpm). Operating pressure is factory set at 100 psi. These waste oil pumps are able to maintain its recommended flow rate throughout the 100 to 150 psi pressure range.

Single Stage	Location From Shaft End	RFS GPH	Rated PSI	Gear Set Capacity
M17DN-15	CW/R	15	40	35
M17DN-6	CW/R	6	40	35
M34DN-3	CW/R	3	40	31
M34DN-3H	CW/R	3	150	31
M34DN-15	CW/R	15	40	35
2M34DN-15-H	CW/R	15	150	35
SK41906R	CW/R	14	100	27
SK41982R	CW/R	14	100	27

Dimensions

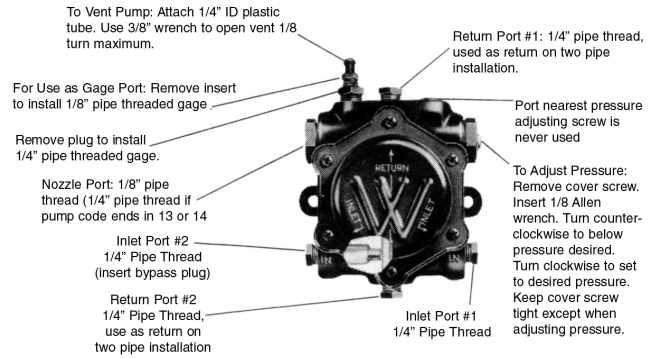
Dimensions in inches, () = cm



General Specifications

- Single Stage
- Single pipe operation only when used with thick oil.
- 1725 R.P.M.
- Operating pressure range 30-50 P.S.I.
- Viscosity range 34–7000 SUS (2.5-1500 Centistokes).
- Shaft seal and piston valve are Viton® material.
- Bypassing nozzle type.
- Power Requirements:
 - 1/4 H.P. for viscosity less than 1000 centistokes
 - 1/3 H.P. for viscosity greater than 1000 centistokes.
- Shaft Length is 3 1/8” long from mounting face to shaft end.
- Pump body has a flange and a hub.
- Maximum flow is 10-40 G.P.H. depending on model.

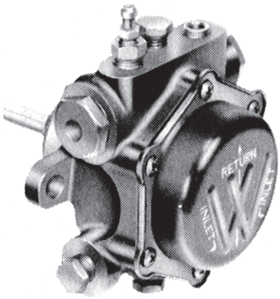
	H.P.	Voltage	RPM	Rotation	GPH	Rated PSI
SPM-25AT1RR140	¼	120	1725	CW	10	45
SPM-25AT1RR243	¼	120	1725	CW	20	45
SPM-25AT1RR244	¼	120	1725	CW	40	45



These units have the same characteristics as the 1RR models but incorporate a 120 volt, single phase, 1/4 hp motor.

IRR Pump Heads

IRR SERIES



	Rotation/Nozzle Location From Shaft End	RFS GPH	Rated PSI	Gear Set Capacity
Single Stage				
1RR140D-4EK13	CW/R	10	45	23
1RR243D-4EK13	CW/R	20	45	48
1RR244D-4EK13	CW/R	40	45	66

WASTE - BIO OIL SAFETY VALVE

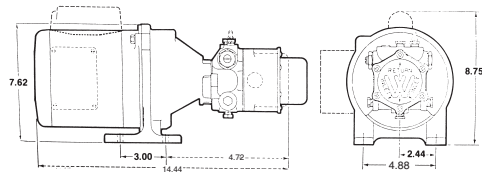
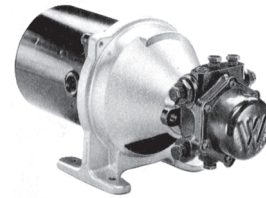
Oil Safety Valve for Bio applications. This valve is U/L listed for Bio Fuel and is compatible with a wide range of other fuels such as B20-B100, #1-#2 Fuel Oil, Diesel, Kerosene and Waste Oil. Temperature Range of -10 to 140 F.

Visit our Site...



Listed Webster Oil Safety Valve for Bio Fuel

WASTE OIL PUMP & MOTORS



These single stage waste oil pumps operate @1725 rpm. The operating pressure range is 30-50 psi. Maximum inlet vacuum 10” Hg. Viscosity range is 34-7000 SUS (2.5 Centistokes), temperature range 40 F (min) - 160 F (max). This unit can be hub or flange mounted. The pump can be used on one or two pipe installations. Double lip type Viton seals assure low starting torque and provide positive protection from leaks. For waste oil and #4 or lighter fuel oils.

Capital City Tool, Inc.
 219 Hahn Road, Frankfort, KY 40601
 Tele: 502.223.0025 or 800.766.1233 Fax: 502.223.4629

www.websterfuelpumps.com