Interrupted Ignition Series Oil Primary Control

- Controls oil burner, oil valve (if desired) 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 to indicate system lockout
- Enclosed safety switch with external reset button
- Direct replacement for popular competitive models

Application Guide & Installation Instruction for ICM1511*, ICM1512*, ICM1513*, ICM1514*

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

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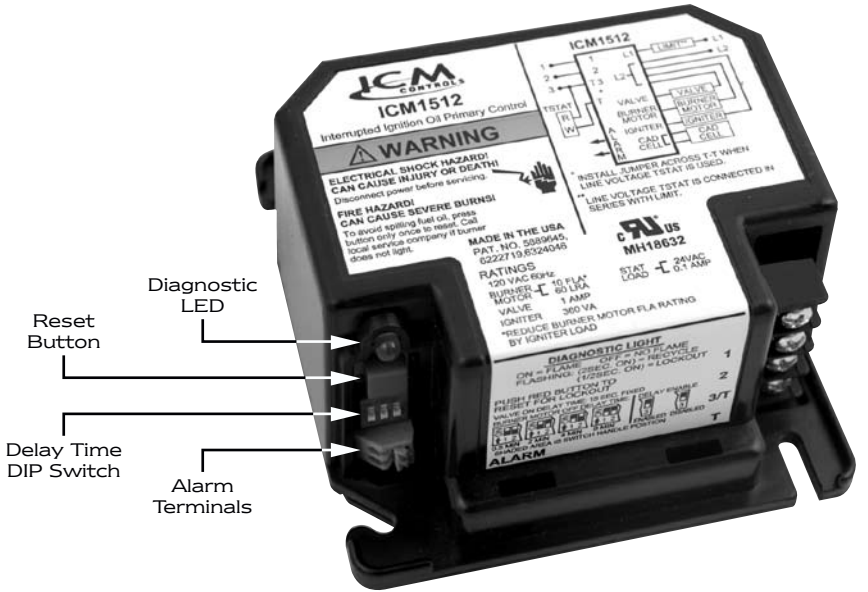

Figure 1: Terminals, connectors, LED, reset button and DIP switch locations.

Application

ICM's Interrupted Ignition Oil Primary Control is ideal for residential oil-fired burners used in boilers, forced air furnaces, and water heaters.

The oil primary:
- Controls fuel oil
- Senses the flame
- Commands ignition spark
- Triggers a remote alarm circuit when in lockout

The ICM Interrupted Ignition Oil Primary Control can be used with hydronic and forced air systems. Line voltage switching controllers typically control the start and stop of the combustion sequences when the oil primary control is used with hydronic systems. With forced air systems, low voltage mechanical and electronic thermostats control the start and stop of the combustion process.

The ICM Interrupted Ignition Oil Primary Control operates a valve to prevent oil flow when the burner motor runs prior to combustion (the valve-on delay) and when the burner motor runs after combustion (the burner motor-off delay).

The ICM Interrupted Ignition Oil Primary Control is intended for use only on oil burning appliances that do not require pre-purge and post-purge as a safety related function. The purposes of the valve-on and burner motor-off delays in the ICM Interrupted Ignition Oil Primary Control are to help establish draft and reduce the problems associated with oil after-drip.

Features

- Thermostat Compatibility
- Limited Recycle:
  - Number of recycle trials is limited to three per heat call
  - Lockout results when flame extinguishes three times without a successful heat call
- Pump Priming Cycle:
  - Place the oil primary control in purge cycle by pressing and releasing the unit's reset button when in delayed valve-on, safety check, ignition, or carry-over periods.
  - For this cycle only, lockout timing will extend to 4 minutes with ignition set in intermittent mode
  - To reset the unit for entry to pump priming cycle, press and hold the reset button until the LED flashes (approximately 30 seconds)
  - The oil primary control will revert to its labeled interrupted and safety switch timing conditions.
  - Pump priming cycle entrance can only occur if no lockouts have taken place since the most recent successful call for heat
- Disable Function:
  - Press and hold the reset button to disable all functions
  - Re-enable by releasing the reset button
  - Restart will occur at the start of the normal heat cycle on safety check
- Limited Reset (Restricted Mode):
  - Limit unburned oil accumulation in the combustion area by resetting the control up to three times

  - Every time there is a successful heat call, the count will return to zero
  - From restricted mode, reset by pressing and holding the reset button for 30 seconds. When the LED flashes twice, reset has been accomplished
- T-T Jumper: Remove a factory-installed T-T jumper resistor by cutting it with side-cutting pliers
- Lockout Mode: ICM's oil primary control will enter lockout mode when flame:
  - Is sensed in valve-on delay period
  - Is not established in ignition trial
  - Is lost three times in a single heat call
  - Is sensed during burner motor-off delay stage
- Four Diagnostic LED states:
  - On: Signals the presence of flame
  - Off: No flame present
  - Two seconds on, two seconds off: Recycle
  - ½ second on, ½ second off: Lockout
- Cad Cell Resistance:
  - Check cad cell resistance without an ohmmeter by pressing and releasing the reset button during run mode
  - Flashing indicates resistance (see Table 3, Page 14)
- Valve-on Delay/Blower Motor-off Delay:
  - Certain models have fixed or selective delays for valve open or blower motor off
  - During these delays, safety circuits check for flame and will switch to lockout if flame exists

Specifications

Models:

ICM P/N	Lockout Timing* (seconds)	Valve-on Delay (seconds)	Burner Motor-off Delay (minutes)	Alarm Contacts	Thermostat JW5	Limit JW1
ICM1511*	Factory Set 15, 30 or 45	Selectable 0 or 15	Selectable 0 or 0, 2, 4, 6 [b]	YES	NO	NO
ICM1512*		15	0, 2, 4, 6 [b] or 0.5, 2, 4, or 8	OPTIONAL	NO	NO
ICM1513*		15	NONE	NONE	YES[a]	YES
ICM1514*		NONE	NONE	NONE	YES	YES

Notes:
- Factory default is **15 seconds**.
- For **30 second** safety timing, add "**A**" to the end of the ICM part number (i.e.: ICM1511A)
- For **45 second** safety timing, add "**B**" to the end of the ICM part number (i.e.: ICM1511B)

Table 1

Timing:

- ***Safe start check:*** 5 seconds (approximate)
- ***Valve-on delay:*** Model dependent; see chart above
- ***Burner motor-off delay:*** Model dependent; see chart above
- ***Lockout:*** 15, 30 or 45 seconds (factory-programmed)
- ***Recycle:*** 60 seconds (fixed)
- ***Ignition carryover:*** 10 seconds (fixed)
- DIP switch positions 1 and 2 are to set burner motor-off delay timings
- DIP switch position 3 is to enable or disable valve on delay timing

Electrical Ratings:

Inputs:

- ***Voltage:*** 102 to 132 VAC, 120 VAC nominal
- ***Current:*** 100 mA plus burner motor, valve, and ignitor loads
- ***Frequency:*** 60 Hz.

Outputs:

Relay Contacts:

- ***Burner:*** 120 VAC, 10 full load amperes (FLA), 60 locked rotor amperes (LRA).
- ***Valve:*** 120 VAC, 1A.
- ***Ignitor:*** 120 VAC, 360 VA.
- ***Alarm:*** 30 VAC, 2A.
- ***Thermostat current available:*** 100 mA

⁂ **Note:** Reduce burner FLA rating by ignitor load. As an example, if the ignitor draws 3A (120 VAC, 360 VA), reduce burner motor FLA to 7A.

Typical Component Wire Color Code:

White: Neutral ***Orange:*** Blower/pump ***Violet:*** Valve
Black: Line ***Blue or Blue w/White Stripe:*** Ignitor ***Red:*** Limit

⁂ **Note:** The oil primary control is provided with ¼" (6 mm) quick disconnect terminals.

Environmental Ratings:

Operating Ambient Temperature: -40°F to +150°F (-40°C to +66°C)
Shipping Temperature: -20°F to +150°F (-29°C to +66°C)
Humidity: 90% relative humidity at 95°F (35°C), noncondensing.

Approvals:

Underwriters Laboratories Inc.: Recognized.
Canadian Underwriters Laboratories Inc.

Installation

When Installing This Product:

1. Carefully read these instructions. Failure to read and follow instructions may cause a hazardous condition or may damage the product.
2. Check these instructions for product ratings to ensure the product is proper for your intended application.
3. The ICM oil primary control should only be installed by trained, experienced technicians.
4. Check for proper product operation by using these instructions after installation.

Warning! Electrical Shock Hazard!

- **Can cause severe injury, death or property damage.**
- **Disconnect power supply before beginning installation to prevent electrical shock or equipment damage. More than one disconnect may be involved.**

Location:

1. Mount on a 4" X 4" j-box, directly on the main burner or inside the appliance cabinet. When replacing a unit, mount the new oil primary in the same location as the old control. Check to ensure the operating temperatures are within the ambient temperature range (see Environmental Ratings, Page 6).
2. Before mounting the ICM oil primary control, set line voltage connections (see Figures 3-6, Pages 17-20.
3. Splice lines with solderless connectors and be certain not to exceed load ratings shown on the device label.
4. If needed, use the control as a template to mark and drill new mounting holes.
5. Mount the device using No. 6 screws.

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- **Disconnect power supply before beginning installation to prevent electrical shock or equipment damage. More than one disconnect may be involved.**

Wiring:

1. Make sure all wiring complies with local codes and ordinances.
2. Be certain line voltage wiring is properly connected.
3. Refer to the oil primary control label and appliance wiring diagram for color codes.
4. After mounting, check low voltage connections to the screw terminals.
5. Strip leads 3/8" (10 mm) and insert under terminal screw.
6. Connect thermostat leads to T-T if required by installation.

Switch Settings

Figure 2 and Table 2 on the following page provide the switch settings for the units.

Switch Settings & Delays

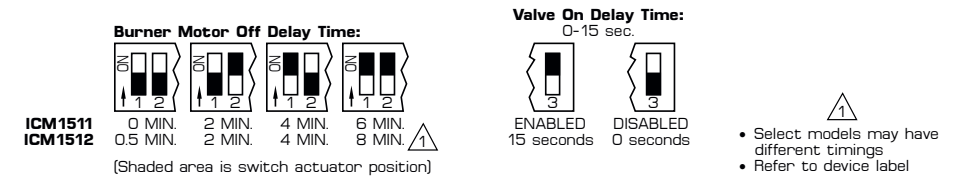

Figure 2: Switch settings for burner off-delay times

Delay Timings			DIP Switch Setting			
Valve-On Delay (seconds)	Burn Motor-Off Delay (minutes)				Valve on Delay Switch	
	ICM1511*	ICM1512*	S-1	S-2	ICM1511*	ICM1512*
0	0	—	x	x	OFF	b
15	0	0.5	OFF	OFF	ON	
	2	2	OFF	ON		
	4	4	ON	OFF		
	6	8	ON	ON		

Notes: (x) Does not matter.
(b) S-3 not provided on ICM1512* models.

Table 2

Testing

Warning!

- **Fire or Explosion Hazard.**
- **Can cause severe injury, death or property damage.**
- **Make sure the combustion chamber is free of oil and/or oil vapor before starting system.**

Start System

1. Open hand valve in oil supply line.
2. Make sure system is powered. Check circuit breaker or fuse and close system switch, if provided.
3. Set thermostat to call for heat.
4. Make sure burner lights and operates until call for heat ends.
5. Verify that burner turns off when thermostat call for heat is satisfied.

Check Safety Features

Safe Start

1. Place a jumper across cad cell terminals.
2. Follow procedure to turn on burner. Burner must not start, indicator light turns on and control remains in Idle Mode.

Simulate Flame Failure:

1. Follow procedure to turn on burner.
2. Close hand valve in oil supply line.
3. Device enters recycle mode.
4. Device tries to restart system after approximately 60 seconds.
5. Safety switch locks out approximately in safety switch timing indicated on label. Indicator light flashes 1/2 second on, 1/2 second off. Ignition and motor stop and oil valve closes.

Simulate Ignition Failure:

1. Follow starting procedure to turn on burner, but do not open oil supply hand valve.
2. Observe that safety switch locks out approximately within safety switch timing as indicated on the label. Indicator light flashes 1/2 second on, 1/2 second off. Ignition and motor stop and oil valve closes.

Operation

The ICM Interrupted Ignition Oil Primary Control is a microprocessor-based control. The indicator light provides diagnostic information for lockout, recycling and patented cad cell status. There is a manual reset button to exit the lockout mode and enter the idle mode (See Fig. 1, Page 1). Operation is as follows:

External Action	Oil Primary Control Action:
Power applied to control	Internal safety check conducted. If no light or flame is detected and all internal conditions are correct, control enters Idle Mode.
Thermostat calls for heat *(continued on next page)*	1. Shorts across T-T terminals (on a call for heat) in warm air system and/or provides power to limit terminals in hydronic system. Networked systems may receive a call for heat on network connections 1, 2, 3. 2. Safety Period (5 seconds) internal and external check for flame or light. If flame or light is detected, control remains in the Idle Mode. 3. When flame or light is not present: a. ICM1514* (if valve-on delay is enabled) will apply power to the burner motor and ignitor. b. ICM1511*, ICM1512*, ICM1513* (if valve-on delay is enabled) will apply power to the burner motor and ignitor, enter/complete valve-on delay period and then apply power to the valve. 4. Control enters Trial for Ignition period. a. Monitors burner for flame. b. When flame is not detected: (1) Enters lockout mode (after lockout time of 15, 30, or 45 seconds). (2) Shuts off valve, ignitor and burner motor. (3) Flashes indicator light at 1/2 second on, 1/2 second off. (4) Depress reset button to return to power-up sequence. c. When flame is detected, Carry-Over period begins:

(continued from previous page) Thermostat calls for heat	5. Control enters Ignition Carry-Over period (continues to spark for 10 to 30 seconds. a. Turns on indicator light. b. If flame is lost and lockout time has not expired, Oil Primary Control returns to Trial for Ignition period. c. If flame is lost and lockout time has expired, Oil Primary Control enters Recycle Mode. 6. Carry-Over time expires; ignitor turns off. 7. Enters Run Mode: a. Flame is monitored until call for heat ends or flame is lost. If flame is lost: (1) Control enters Recycle Mode. (2) Recycle time starts (60 seconds). (3) Burner and valve are turned off. (4) Indicator light flashes at 2 seconds on, 2 seconds off. (5) Returns to Idle Mode at end of Recycle Mode.
Call for heat is satisfied.	1. ICM1511*, ICM1514* (if burner motor-off delay is disabled): a. Burner motor and oil valve shut off. b. Indicator light turns off. 2. ICM1511*, ICM1512*, ICM1513* (if burner motor-off delay is enabled): a. Oil valve shuts off. b. Burner motor runs for selected burner motor-off delay time. c. Burner motor turns off. d. Device returns to Idle Mode.
Reset Button pushed two times without device completing a call for heat.	1. Oil Primary Control enters Restricted Mode. 2. Indicator light flashes and 1/2 second on, 1/2 second off. 3. Reset device by pressing and holding reset button for a minimum of 30 seconds.

Troubleshooting and Maintenance

Due to the potential hazard of line voltage, only a trained, experienced service technician should preform the troubleshooting procedures. This control contains no field-serviceable parts. Do not attempt to take it apart. Replace entire control if operation is not as described.

To completely troubleshoot an oil burner installation, check the burner and oil primary control for proper operation and condition. The indicator light on the oil primary control provides lockout, recycle and cad cell indications as follows:

1. Flashing at 1/2 second on, 1/2 second off: system is locked out or in restricted mode.
2. Flashing at 2 seconds on, 2 seconds off: control is in recycle mode.
3. On: cad cell is sensing flame.
4. Off: cad cell is not sensing flame.

Cad Cell Resistance Check

For proper operation, it is important that the cad cell resistance is below 1600 ohms. During a normal call for heat, once the control has entered the Run mode, press and release the reset button. For equivalent cad cell resistance, reference Table 3 below:

Flashes	Resistance Ohms	Flashes	Resistance Ohms
1	Less than 400	3	>800, but <1600
2	>400, but <800	4	>1600, but <5000

Table 3

Preliminary Steps

1. Check wiring connections and power supply.
2. Make sure power is on to controls.
3. Make sure limit control is closed.
4. Check contacts between ignitor and the electrodes.
5. Check the oil pump pressure.
6. Check the piping to the oil tank.
7. Check the oil nozzle, oil supply and oil filter.

Check Oil Primary Control

If the trouble is not in the burner or ignition hardware, check the oil primary control by using the following equipment:

1. Screwdriver.
2. Voltmeter (0 to 150 VAC range).
3. Insulated jumper wire with both ends stripped.

WARNING: Electrical Shock Hazard. Can cause severe injury, death or property damage. Troubleshoot with the system powered. Be careful to observe all precautions to prevent electrical shock or equipment damage.

Troubleshooting Tips

Condition	Check for:
Burner does not start with call for heat.	Check that the limit switches are closed and contacts clean. Check for 120 VAC line voltage; If indicator light is on, the Cad cell controller may be defective, sees external light, or connections are shorted.
Burner starts, then locks out on safety.	Check that limit switches are closed and contacts clean. Check for proper line voltage. Check to see if Cad cell or controller is seeing external light. Try resetting oil primary control. Verify that control is not in restricted mode. Check spark ignitor.

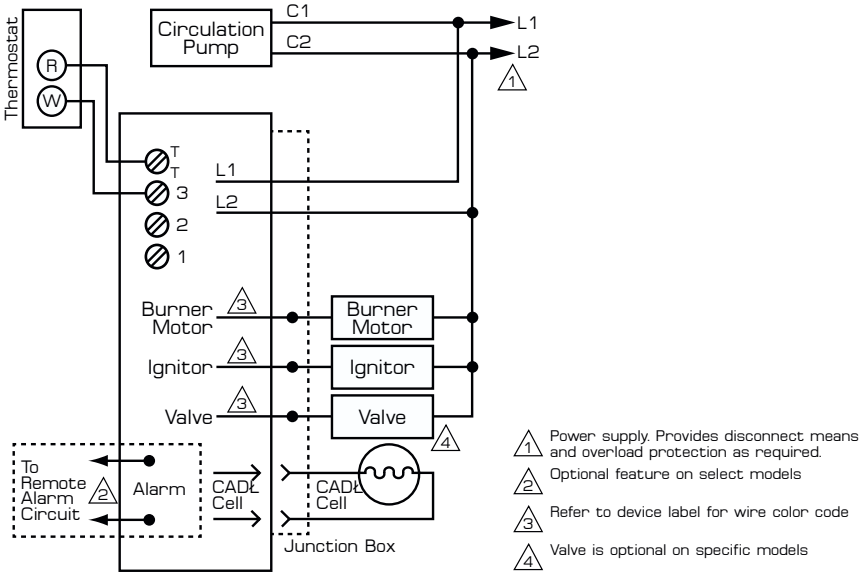

Figure 3: Wiring ICM1511*, ICM1512* for typical oil-fired boiler

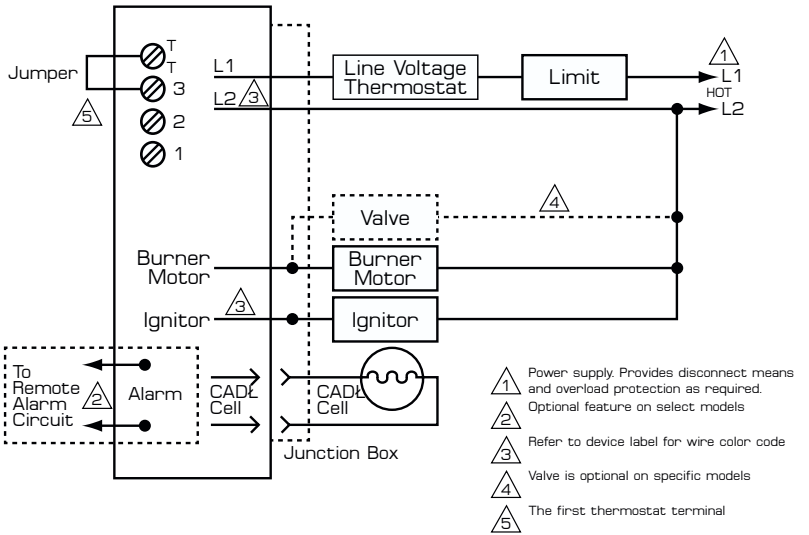

Figure 4: Typical wiring diagram for line voltage, and for an oil thermostat and ICM1513*, ICM1514* for an oil burner system.

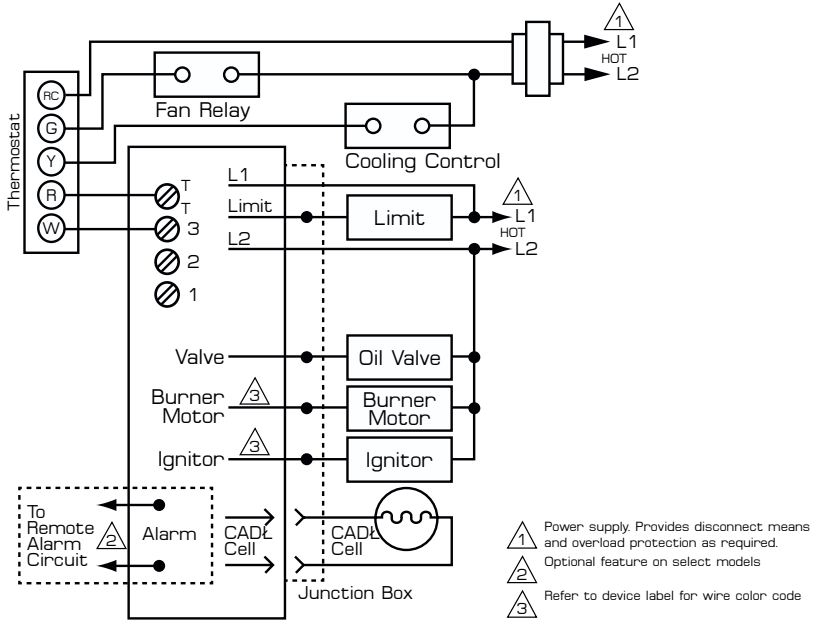

Figure 5: Typical wiring diagram for 24 VAC thermostat and ICM Oil Primary Control for valve-on delay/burner motor off oil burner system.

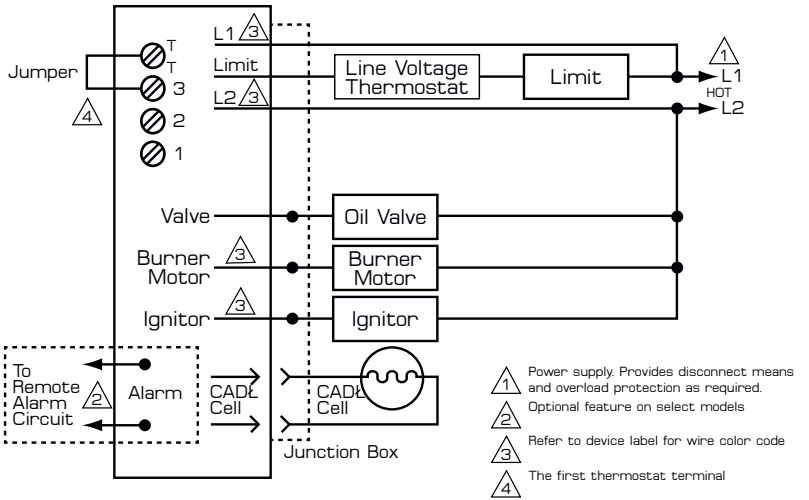

Figure 6: Typical wiring diagram line voltage thermostat and ICM1511*, ICM1512* for valve-on delay/burner motor-off delay oil burner.

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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.

ICM™ CONTROLS

Patent No. 424,953

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