



5004-M-78 CHASSIS

## PREFERRED INSTRUMENTS 5004-M-78

### QUANTA-FLAME REPLACEMENT FLAME SAFEGUARD CONTROL REPLACES CB780 AND RM7800 FLAME SAFEGUARD CONTROL MICROPROCESSORS



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## PRODUCT DESCRIPTION

The 5004-M-78 flame safeguard replacement chassis is designed to be a direct replacement for the CB780 Cleaver Brooks and most Honeywell RM7800E and RM7800L series burner controls. The 5004-M-78 mounts directly into an existing Q7800A1005, Q7800B1003 or CB 780 (833-2725) wiring sub-base. Existing flame sensors and scanners can be reused or replaced with Preferred UV, IR or UV self-checking scanners. An auxiliary connector is used for interface with Modbus communication or to provide a remote reset function.

The 5004-M-78 controller is a state-of-the-art microcomputer based burner management system designed for a single burner boiler or process heat application. An LCD display provides real-time diagnostic and status messages for the operator. The 5004-M-78 accepts (up to two) any one of the 3 various sensors: FR,UV,IR.

Unlike other flame safeguard controllers that require a multitude of modules (programmers, flame amplifiers, purge times, etc.) the Preferred Quanta-Flame 5004-M-78 has just one processor with a built-in universal amplifier that accepts UV, UV self check scanner, IR scanner, and flame rod inputs.

## APPROVALS

Underwriters Laboratories, Inc.  
File Number E233069???



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## FEATURES

- Compatible to Cleaver Brooks model 780 and Honeywell 7800 controls & sensors
- Local LCD display for status and troubleshooting
- Optional remote display (5004-216RN)
- Sequence status lights
- Jacks for direct flame strength measurement 0-5 VDC
- Low profile
- Plug-in sub-base (compatible to CB 833-2725 & HW Q7800A)
- Field selectable by dipswitches- pre-purge time, response to a power failure, trial for ignition time, check for trip interlock short and jumper selectable FR/IR/UV Sensors.
- Early spark termination
- Pilot test mode
- Burner modulation actuator sequencing
- RS 485 Modbus communication
- Every unit interfaces to infrared, ultraviolet, ultraviolet self-check or flame rod sensors. Sensor specific plug-in amplifiers are not required.
- Remote/local reset from lockout state
- Optional 16 point annunciator (QA16)

### WARNING

*Before the 5004-M-78 control is installed as a replacement, the dipswitches and scanner jumper must be correctly configured to match the sequence and sensor type of the replaced control. Please refer to Installation, Configuration and Specification sections of this manual. No wiring changes to the control or existing connected compatible scanner is required. For a list of compatible sensors please refer to the Quanta-Flame 5004-M-78 Specifications section of this manual.*



## SPECIFICATIONS

Mechanical:	6.00L" by 5.00" W by 2.00" D
Weight:	2 Lbs
Operating Temperature:	-40°F to +140°F (-40°C to +60°C) UV scanners -20°C to 60°C,
Electrical:	Voltage: 120 VAC +10% - 15%, 50/60 Hz
Power consumption:	2 VA
Flame Failure Response Time:	2.5 to 3.5 seconds
Purge Time:	30, 60, 90, 150, 180, 300, 450, or 900 seconds (dipswitch selectable)
Pilot Trial for Ignition Time:	3, 5, or 10 seconds (dipswitch selectable)
Flame Sensor Inputs:	UV, IR or FR
Compatible Flame Sensors:	
Flame Rod	(S1-FR Jumper)
Model 5004-01	Ultraviolet, NSC (S1-UV Jumper)
Model 5002-01NC	Ultraviolet, NSC (S1-UV Jumper)
Model 5002-01	Ultraviolet, SC (S1-UV Jumper)
Model 5002-11NC	Infrared, (S1-IR Jumper)
Model C7027A	Ultraviolet, NSC-HW (S1-UV)
Model 817-1743	Ultraviolet, NSC-CB (S1-UV Jumper)
Model C7015A	IR Honeywell (Jumper S1-IR)
Model 817-1742	CB (Jumper S1-IR)

## TERMINAL RATINGS

Terminal Number	Description	Rating
3	Alarm Relay	2 Amps Resistive
5	Blower Relay	1/2 HP Inductive
8	Pilot Valves	10 Amps Resistive 1/4 HP Inductive
9	Main Fuel Valves	10 Amps Resistive 1/4 HP Inductive
10	Ignition Transformer	10 Amps Resistive 1/4 HP Inductive
12 – 15	Modulation Terminals	2 Amps Resistive

Total connected 120 VAC load must not exceed 15 Amps.



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## ACCESSORY SELECTION

### **Display Module**

The 5004-216 display module is included with the 5004-M-78 controller. It may be removed from the chassis without loss of functionality. Optional remote display 5004-21RN flush-mounts to an enclosure, is NEMA 4, and includes a 6' cable and a plug-in terminal adaptor.



### **Flame Scanners**

The scanner type to be used is selected by a jumper on back of the chassis. In addition to the Honeywell scanners detailed above, the 5004-M-78 is compatible with the following Preferred scanners.

#### Ultraviolet Model 5004-01C

The UV sensor detects light emitted from the flame within the ultraviolet light spectrum. Includes the basic UV scanner and cable.



#### Infrared Model 5004-11C

The IR sensor detects light emitted from the flame within the IR light spectrum. Includes the basic IR scanner and cable.



#### Ultraviolet Self-Check Model 5002-01

The UV self-check sensor detects light emitted from the flame within the ultraviolet light spectrum. This sensor is intended for applications where the burner operates continuously (24 hours). The self-check scanner interrupts the UV light from the burner every ten seconds to verify the proper operation of the sensing element and the internal components.



#### Ultraviolet Non Self-Check Model 5002-01NC

The UV sensor detects light emitted from the flame within the ultraviolet light spectrum. This sensor is intended for applications where a burner is cycled at least once every 24 hours.





#### Infrared Model 5002-11NC

The IR sensor detects light emitted from the flame within the infrared light spectrum. This sensor detects fluctuations of flame intensity.



#### Flame Rod

The flame rod works on the principle of flame rectification and senses a small direct current flowing through the flame between the flame rod and the burner ground.



### **WARNING**

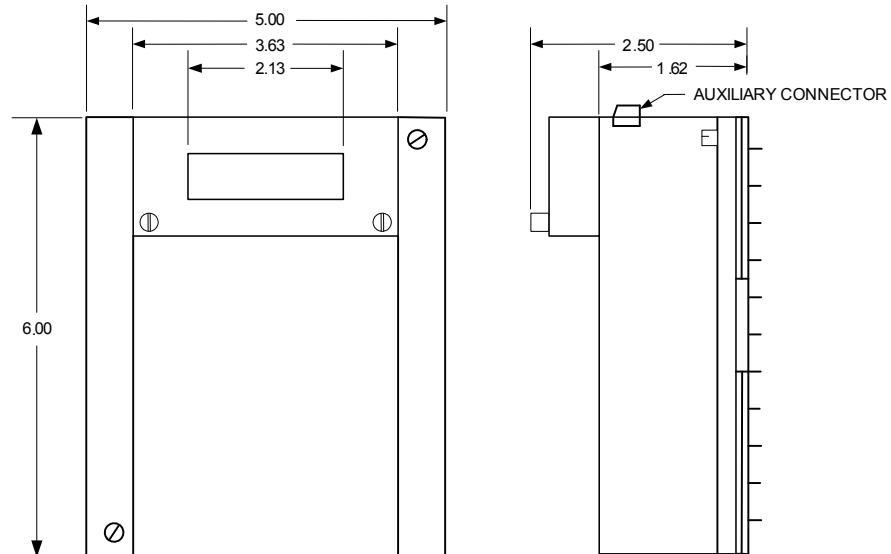
*The 5004-01C and 5002-01NC UV flame sensors are non-self checking UV detectors. These should only be applied to burners that cycle often in order to allow the control to perform a safety check on their operation. If the burner is not to be frequently cycled but run continuously, the 5002-01 self-checking UV, 5004-11C or the 5002-11NC infrared flame scanner must be used.*



## CHASSIS INSTALLATION

Mounting the Control Chassis:

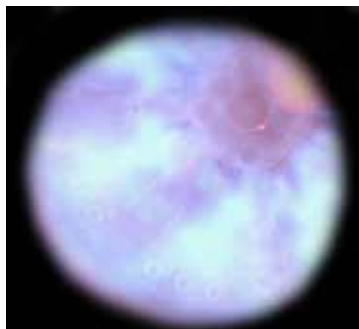
The 5004-M-78 is fully compatible with Honeywell Q7800A1005, Q7800B1003, and Cleaver-Brooks 833-2725 wiring bases.



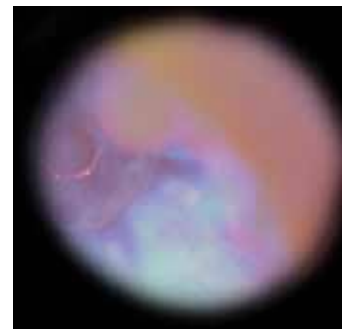
## FLAME SCANNER INSTALLATION

The scanner must be mounted so that it sights a point at the intersection of the main and pilot flames. For proper scanner sensing the following conditions must be present:

- A reliable and stable pilot flame.
- A reliable and stable main flame.
- The flame scanners must have an unobstructed view of the flame.



GOOD FLAME SIGHTING



POOR FLAME SIGHTING



A scanner monitoring a pilot flame should be positioned so that no flame will be detected if the pilot flame is too small to reliably and safely light the main flame. Choose a sighting angle with the best possible view of the flame. The sighting pipe should be inclined slightly downward so that un-combusted particles or moisture will not collect in the scanner cavity.



### Quanta-Flame 5004-01 Flame Scanners

Catalog Number	Description
5004-01-0-0	5004-01 UV Scanner with 90 degree angle mount, no cable included
5004-01-0-C	5004-01 UV Scanner with 90 degree angle mount, 5 feet of cable included
5004-11-0-C	5004-11 IR Scanner with straight mount, 5 feet of cable included
5004-01-S-0	5004-01 UV Scanner with straight mount, no cable included
5004-01-S-C	5004-01 UV Scanner with straight mount, 5 feet of cable included
5004-00	5 feet of cable with connector



### Quanta-Flame 5002 UV Self-Check Flame Scanners

Catalog Number	Description
5002-01-120-0-00	UV or Flame Rod output; 120 VAC input; 1" NPT Mount. Cable not included.



## Quanta-Flame 5002NC Non Self-Check Flame Scanners

### Ultraviolet Flame Detectors (cable not included)

Catalog Number	Description
5002-01-NC-120-R-00-00	Contact closure output only; ½" NPT. Aluminum alloy housing.
5002-01-NC-120-F-00-00	UV/Flame Rod signal only; ½" NPT. Aluminum alloy housing.
5002-01-NC-120-R-00-HS	Contact closure output only. High Sensitivity; ½" NPT. Aluminum alloy housing.
5002-01-NC-120-F-00-HS	UV/Flame Rod signal only. High Sensitivity; ½" NPT. Aluminum alloy housing.



### Infrared Flame Detectors (cable not included)

Catalog Number	Description
5002-11-NC-120-R-00-00	Contact closure output only; ½" NPT. Aluminum alloy housing.
5002-11-NC-120-F-00-00	UV/Flame Rod signal only; ½" NPT. Aluminum alloy housing.
5002-11-NC-120-R-00-HS	Contact closure output only. High Sensitivity; ½" NPT. Aluminum alloy housing.
5002-11-NC-120-F-00-HS	UV/Flame Rod signal only. High Sensitivity; ½" NPT. Aluminum alloy housing.





### Scanner Accessories

Catalog Number	Description
5002-EP	Heavy Duty Scanner Housing
5002-EPSS	Heavy Duty Scanner Housing-Stainless Steel
5002-EPC	5000 & 5002 Scanner Series Terminal Connector
5000-02-05	Scanner Cable 5 feet – with connector
5000-02-10	Scanner Cable 10 feet – with connector
5000-02	Scanner Cable – Specify Length – connector not included. Price per foot
5002-02/91	Adapter for 5602-91-7 cable (from a 5602-91 scanner to the 5002-01)
-wt	Water tight connector added to Scanner Cable



### Scanner Mounting Hardware

Catalog Number	Description
5000-01-00L	Replacement quartz lens for mtg nipple 5000-01-00.
5000-73/74-SS	Swivel mount, 2" NPT x 1" NPTF, Stainless steel.
5000-475	Single piece nipple, 1" NPT x 4" long with quartz lens and purge connection.
5000-01-00-SS	Mounting nipple for scanner - quartz lens, 1" NPT x 4" long. Stainless steel.
5000-11-00-SS	Mounting nipple for scanner - glass lens, 1" NPT x 4" long. Stainless steel.
5000-01-00A	Mounting nipple for scanner - insert quartz lens for higher pressure applications. Stainless Steel
5000-01-04-CT	Mounting nipple for scanner- 1" threads, carbon Teflon for 450 °F service. 1" NPT x 4" long.



### Mounting Nipples & Lenses for 5004-01 Scanners

The following parts are used in applications to reduce the heat transfer effects upon the flame scanner. In addition some of these components include magnifying lenses to improve flame signal detection.

Catalog Number	Description
7077-17-FP-0-200	Insulator with Flat Quartz Lens; no Purge connection; 200°F Rating
7077-17-FP-P-200	Insulator with Flat Quartz Lens; with Purge connection; 200°F Rating
7077-17-FP-0-450	Insulator with Flat Quartz Lens; no Purge connection; 450°F Rating
7077-17-FP-P-450	Insulator with Flat Quartz Lens; with Purge connection; 450°F Rating
7077-17-MP-0-200	Insulator with Magnifying Quartz Lens; no Purge connection; 200°F Rating
7077-17-MP-P-200	Insulator with Magnifying Quartz Lens; with Purge connection; 200°F Rating
7077-17-MP-0-450	Insulator with Magnifying Quartz Lens; no Purge connection; 450°F Rating
7077-17-MP-P-450	Insulator with Magnifying Quartz Lens; with Purge connection; 450°F Rating

### Additional scanner nipples without quartz lenses:

Catalog Number	Description
7077-17PN-200	Nipple, ½” NPT; with Purge connection; 200° F Rating
7077-17EN-200	Nipple, ½” NPT; no Purge connection; 200° F Rating
7077-17PN-450	Nipple, ½” NPT; with Purge connection; 450° F Rating
7077-17EN-450	Nipple, ½” NPT; no Purge connection; 450° F Rating



## WARNING

*Only qualified technicians with specific knowledge of the design of the burner and all applicable burner/boiler safety codes should install, configure and commission the 5004-M-78. Incorrect installation can result in equipment damage, injury, or death.*

## WIRING

All system wiring must be run in accordance with the National Electrical Code and all local code requirements.

- Always remove all power to the system before wiring.
- Control transformer neutral must be grounded.
- This product is designed to work in a variety of applications and conditions; however some applications may not be applicable due to the presence of high electrical noise, lack of adequate ground connections, floating neutrals or other known or unknown conditions. It is therefore important to ensure proper system environment before installing these devices.
- Do not subject the controller to excessive vibration.
- Flame sensor wiring must be run in a separate conduit, with no other wiring. Use shielded cable, terminate shield as shown, and insulate all exposed shielding. Route sensor wiring a sufficient distance away from any type of ignition or other wiring to avoid electrical noise interference. Each sensor wiring must be run separate from all other wires including other sensors. In some cases shielded cable or coax may be required for long distances or high electrical interference environments. Each pair of sensor leads should be in their own shielded or coaxial pair and terminated at the control.
- All wire near hot surfaces should be rated for 90°C (195°F) or at least 25°C (50°F) higher than the surface temperature.
- Route the ignition transformer high voltage wire away from the flame sensor wiring and all other 120 VAC wiring. Use only automotive style noise-suppression ignition wire. Mount the ignition transformer as close to the igniter as practical. Set spark gaps to the minimum setting. Ground the ignition transformer to metal that is connected to the igniter. Use star washers to cut through the paint.
- Keep VSD motor wiring away from the flame sensor wiring and all other 120 VAC wiring. Run motor wires in rigid metal conduit, or in EMT conduit with conducting compression fittings (set screw hub fittings not allowed), or use shielded motor power cable. Run a Ground wire from the motor frame to the VSD frame in the same conduit as the motor wires. Also run a ground wire from the VSD frame to the power source ground.
- Wiring from the VSD output to the motor must be run in a dedicated conduit separate from other wiring including the 3-phase power supply. This conduit should contain only the (3) phase power wires and a Ground wire. The Ground wire is connected at

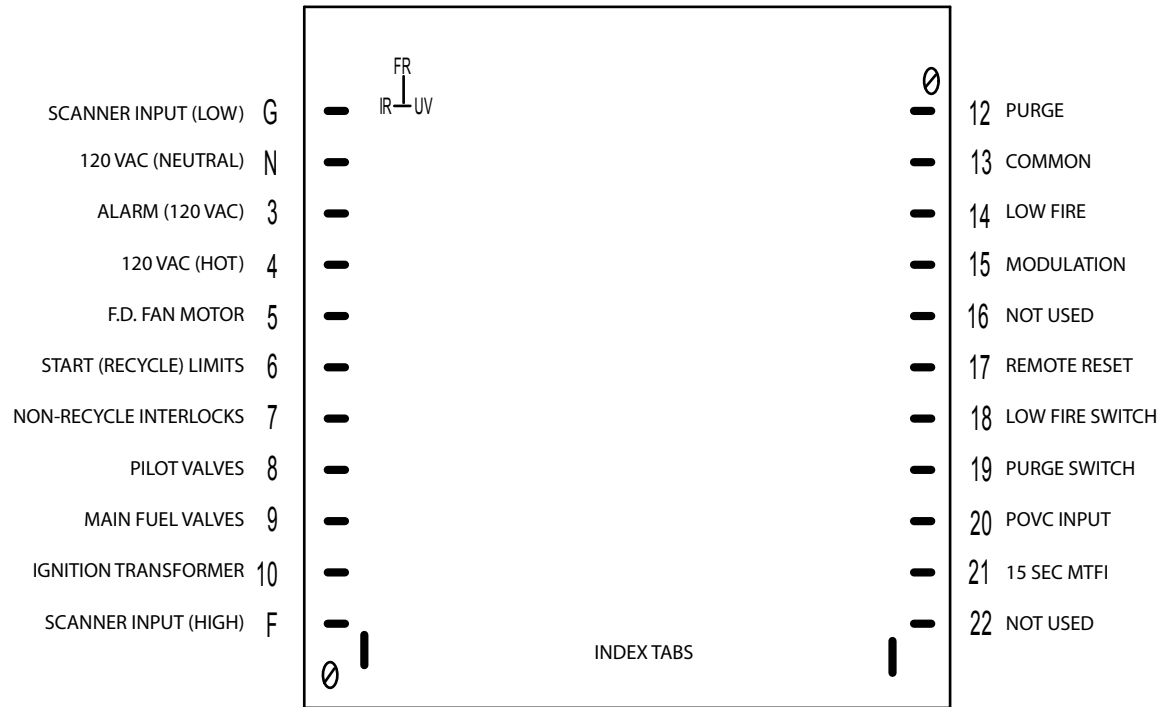


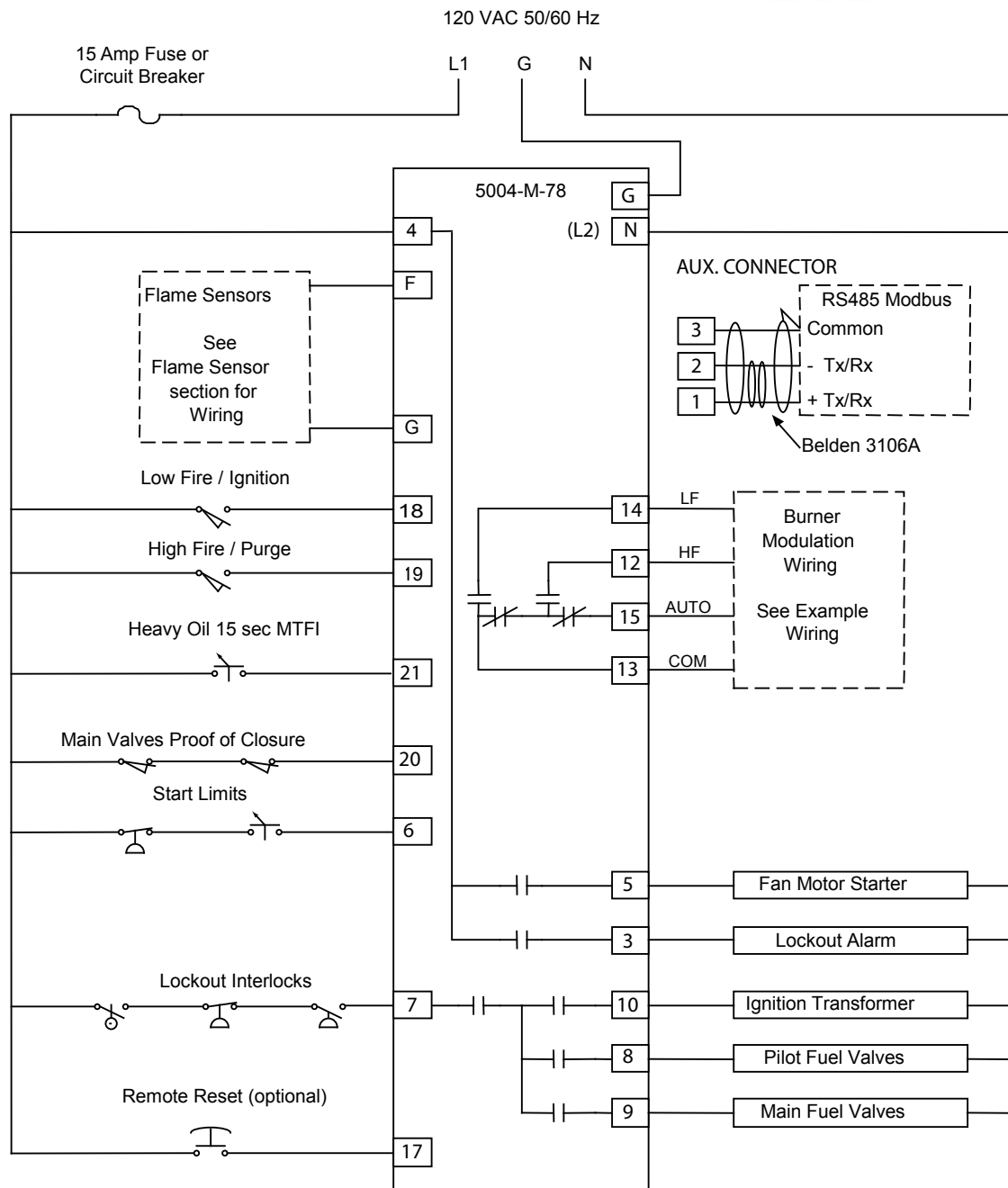
the VSD frame to the motor.

- Ensure a second ground wire is installed from the AC power source to the VSD frame for NEC safety grounding.
- Output wiring from VSD cannot be run through junction boxes that include other wiring.
- The VSD to motor conduit must be metal conduit and must have either threaded or non-insulating compression fittings. PVC conduit, BX, Greenfield or EMT set screw-style hubs connectors are not allowed.
- All DC signal wiring must be run in dedicated conduit and kept as far away from VSD to motor conduit as possible.
- AC power source to VSD must be run in dedicated conduit. Running AC supply to VSD and VSD to motor wiring in same conduit is not allowed.
- Cable shielding removed for wire termination should be kept to a minimum.
- Cable shield and drain wires are properly insulated to prevent accidental connection to earth ground.
- Provide a proper ground system to minimize the effects of line and other electrical quality issues. A properly designed ground system must meet all the safety requirements so that any wiring or radiated voltage quality issues, such as spikes, surges and impulses have no effect on the control or system operation. A low impedance path to ground is required to ensure that any currents involved with any surge voltages will not adversely affect components in the system.
- The control system, being microprocessor based, requires a ground system that provides a zero-voltage reference. The voltage measured from L2 to all other terminals except L1 should be 0 volts.
- The most effective ground is to run the ground wire in the same raceway as the hot and neutral from the main distribution service panel (not intermediate sub-panels) to the burner control panel and insure that this ground wire is well bonded to the control panel.
- The earth ground wire must be capable of conducting the current to blow the 20A fuse in event of an internal short circuit. A number 14 AWG copper conductor is adequate, wide straps or brackets are preferred rather than lead wires.
- The ground path needs to be low impedance (less than 1 ohm) to the equipment frame, which in turn needs low impedance to earth ground. For a ground path to be low impedance at RF frequencies, the connection must be made with minimum length conductors having maximum surface areas.
- All connections should be free of nonconductive coatings and protected against rust.
- Utilizing conduit as a means of providing a ground must be avoided.
- Installing ground rods at the burner control panel defeats the purpose of a single point ground as described above and could also present a safety hazard.
- RS485 wiring should not be run in conduits with 120 VAC wiring.



### 5004-M-78 TERMINAL LAYOUT





5004-M-78 WIRING SCHEMATIC

**NOTE**

*This is a typical wiring diagram. The required field devices, safety interlocks, and wiring of other devices will vary depending upon the specific burner design, local codes, and other requirements.*



### Input Terminals:

6	Start Limits	Operational switches (recycle type) used to start and stop the burner. If any of these switches open, the burner will perform a normal shutdown and remain in the Standby state until terminal 6 is again energized. 120 VAC = all start limits are made.
7	Lockout (non-recycle) Interlocks	Safety interlocks (non-recycle type) that are required or a lockout will result. Trip interlocks must be made no later than 10 seconds after the purge Switch input is made during the initial burner cycle and continuously thereafter. If any of these interlocks open, the burner will lockout. 120 VAC = all trip interlocks are made. Terminal 20 is also the 120 VAC power source for output terminals 8, 9 & 10 (ignition transformer, pilot and main fuel valves). The current rating of all the trip interlock switches must exceed the loads on output terminals 8, 9 & 10.
17	Remote Reset	An external 120VAC wired into a momentary N.O. pushbutton will reset the 5004-M-78 from a remote location. This also allows the user to reset the 5004-M-78 without opening the control panel door. This input is optional, as a Reset push button is mounted on the face of the 5004-M-78. The control will reset only after it is gone into a lockout state. Pushing the reset push button will not recycle the control.
18	Low Fire Switch	The low fire proving switch is connected as a permissive for PTFI and MTFI. 120 VAC = fuel control valve and the air damper is at the low fire start position.
19	Purge Position Switch	The high fire proving switch is connected as an interlock for purge. The input must be made before purge timer will start. 120 VAC = purge positions and/or flow is proven.
20	Proof-of-Valve Closure	POVC switches on the main fuel valves for both fuels are wired in series to this terminal. Lockout occurs if any of fuel valves are not closed during standby, purge and PTFI. A Lockout will also occur if the selected fuel valves momentarily close during the release to modulate state. 120 VAC = all main fuel valves are closed.
21	15 Second MTFI	The 5004-M-78 default is a 10 second MTFI. Applying 120 VAC to this input changes the 5004-M-78 MTFI to 15 seconds. Some heavy oil burners require a 15 sec MTFI. This input can be connected to an external gas/oil selector switch.
F	Flame Sensor Input (high)	Flame sensor input
G	Flame Sensor Input (low)	Flame sensor input

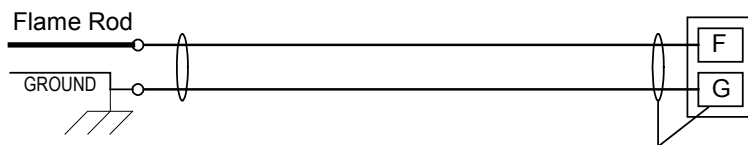


The flame scanner type to be used is selected by a jumper on back of the control. For a list of compatible scanners please refer to the Quanta-Flame 5004-M-78 Specifications section. The customer has the option of reusing the existing scanner as long as it is compatible with the 5004-M-78. Reusing the existing scanner requires no wiring changes to the sub-base.

In addition, Preferred Instruments offers numerous flame detectors and accessories for a variety of combustion applications. Wiring for these scanners is shown below.

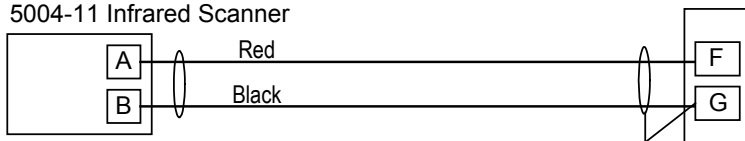
#### 5004-M-78 FLAME DETECTOR WIRING

##### Flame Sensor



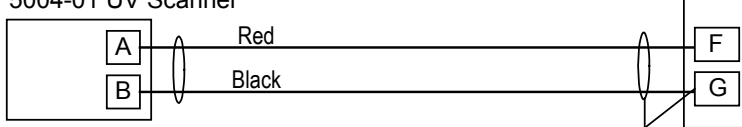
Scanner selection jumper must be in the FR position

##### 5004-11 Infrared Scanner



Scanner selection jumper must be in the IR position

##### 5004-01 UV Scanner

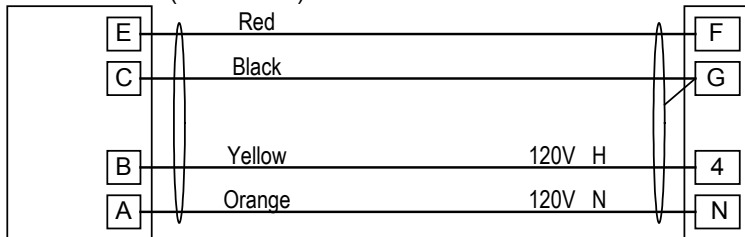


Scanner selection jumper must be in the UV position

##### 5002-11NC-120

##### 5002-01NC-120

##### 5002-01-120 (Self Check)



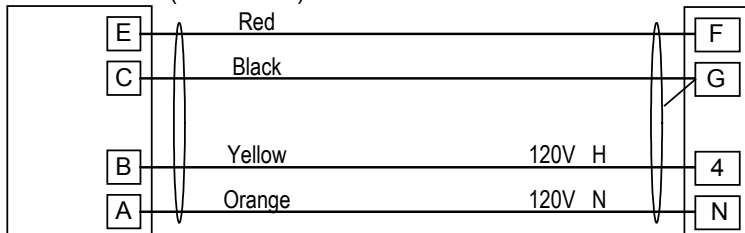
Scanner selection jumper must be in the UV position

(L2)

##### 5002-11NC-120

##### 5002-01NC-120

##### 5002-01-120 (Self Check)



Scanner selection jumper must be in the UV position

(L2)





## **WARNING**

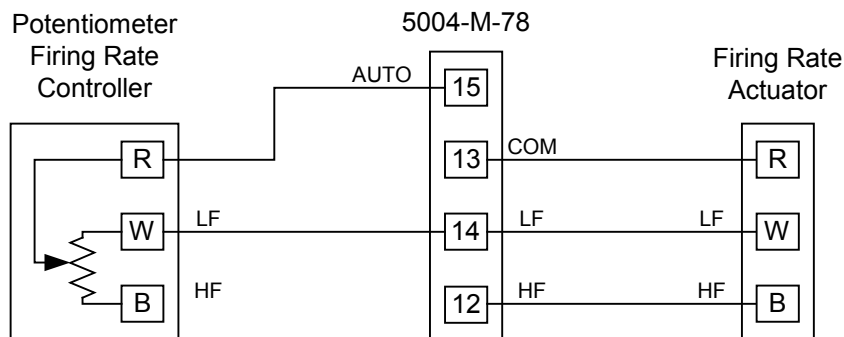
*To prevent electrical noise, flame sensor wiring must be run in a separate conduit, with no other wiring. Keep flame sensor wiring as far away as possible from: ignition transformer high voltage wires, and variable speed drive motor wiring. Use shielded cable. Connect shield to terminal G. Insulate all exposed shields to prevent unintended connections.*



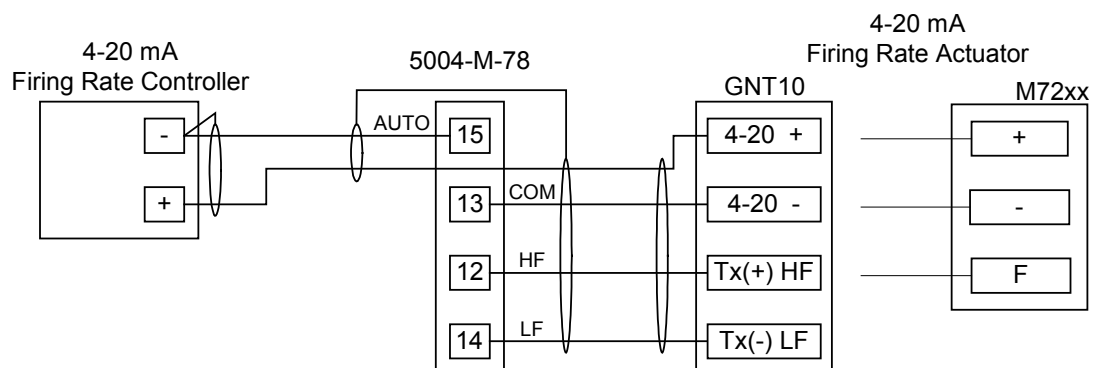
### Output Terminals:

3	Alarm Contacts	A dry contact output that closes to energize an external alarm horn or bell. Terminal 29 is typically the common, terminal 30 is typically wired to a local alarm horn or bell.
5	Fan Motor	A dry contact output that closes to start the combustion air fan or blower. Terminal 18 is typically the common, terminal 19 is typically wired to the fan motor starter coil.
8	Pilot	Output to energize the burner pilot valve
9	Main	Output to energize the burner main fuel valve
10	Ignition	Output to energize the ignition transformer
12 13 14 15	Modulation Contacts	Dry contacts that can be used to sequence the burner modulation actuator to high fire position for purge, to low fire position for ignition, and to release the burner for automatic modulation. The 5004-M-78 closes one set of contacts at a time, between common and one of the three other terminals.
13		Common
13-14		Closes to drive the burner to low fire
13-12		Closes to drive the burner to high fire/purge position
13-15		Closes to allow release to modulation (external control)

#### 5004-M-78 MODULATION CONTACTS (0-135 OHM ACTUATOR)



#### 5004-M-78 MODULATION CONTACTS (4-20 mA ACTUATOR)





## PROGRAMMER SET-UP

### LED Indicators:

LED	Color	Description
Start Limits	green	Indicates the presence of all the switches necessary to start the burner sequence.
Fan On	yellow	Indicates the 5004-M-78 has commanded the combustion fan to run.
Pilot	yellow	Indicates that the pilot valves are energized
Main	yellow	Indicates that the main fuel valves are energized
Flame Fail	red	Indicates that a Lockout occurred due to the Flame Sensor: Flame not detected during Pilot Trial, Main Flame Trial, or Automatic operation. False flame detected during Standby or Purge will cause this led to flash.
Safety Interlock	red	Indicates that a Lockout has occurred due to: Trip Interlocks, Proof of Valve Closure, High or Low Fire proving switch, or internal error. Trip Interlock Short will cause this led to flash (when S1-7 is ON)
Alarm	red	Indicates a Lockout condition has occurred
Power	red	Indicates that power is applied to the unit
Flame	red	Indicates the presence of a flame signal at the control. Led intensity indicates a relative flame strength.
Low Fire	green	Indicates that the control has commanded the burner to move to Low fire
High Fire	red	Indicates that the control has commanded the burner to move to High fire
Automatic	yellow	Indicates that the control has released the burner to Automatic modulation

### Function Descriptions:

#### False Flame Detection

The control will Lockout if flame is detected for over 30 seconds during Standby or Purge.

#### Safe Start Check

During every burner startup sequence, the 5004 performs hardware & software self-tests to verify it's internal circuitry is functioning properly and also verifies that the Safety relay, Ignition relay, Pilot relay, and the Main Fuel Valve relay are functioning properly. If Check for Power Failure is selected and power was interrupted during a firing cycle, upon power up the control will lockout. If Check for Trip Interlock Short is selected,



before the start of the Pre-purge, the trip interlock input terminal must be de-energized or after 60 seconds the control will Lockout.

#### Proof of Valve Closure (POVC)

The 5004-M-78 will Lockout if the Main Fuel Valves are not proven in the closed position during Standby, Purge and Pilot Trial for Ignition (PTFI) or if the selected fuel valves POVC switch momentarily closes while the burner is at the Release to Modulate state.

#### Proof of Purge

Proves that the high fire position switches and purge airflow interlocks are made before Purge timer can begin, and requires these interlocks to be made throughout the Purge period. If these interlocks open during the Purge period for more than 30 seconds (cumulative), the 5004-M-78 will Lockout. If the Purge interlocks are not made after 5 minutes, the control will Lockout.

#### Proof of Low Fire Position

Proves that all applicable low fire position switches are made prior to ignition and light off of the burner. If the low fire switches are not made within 5 minutes after the purge is complete, the control will lockout.

#### Selectable Pilot Trial for Ignition (PTFI) Time

Dipswitches allow for the selection of a 3, 5, or 10 second timing.

#### Early Spark Termination / Pilot Verification

The ignition transformer spark is de-energized at the end of PTFI while the pilot valve continues to be energized for 5 seconds before the main valve is energized. This ensures the sensor is not recognizing spark as a flame and that the pilot flame is stable before lighting the main burner.

#### Selectable Main Trial for Ignition (MTFI) Time

The default MTFI time is 10 seconds. Some #6 oil burners may require a 15 second MTFI to allow extra time for the cold oil to flow to the burner. Energizing terminal 21 changes the MTFI time from 10 seconds to 15 seconds.

#### Post Purge

After a burner shutdown (normal or lockout); the fan will continue to be energized for 15 seconds to purge the furnace with fresh air. A false flame will not cause a lockout for 45 seconds after a post purge timer starts.

#### Pilot Test Mode

After the completion of PTFI, the ignition transformer is de-energized, the pilot valves remain energized, and the control will not attempt to open the main valve. If the flame sensor stops detecting a flame during the test the control will lockout. This mode permits the technician to examine and adjust the pilot flame for a safe operation.



The Pilot Test Mode is activated as follows:

1. Power down the 5004-M-78. The start limits must be made before powering-up the control.
2. Pressing and holding the RESET button, power-up the control.
3. Wait until \*\*\*Test Mode\*\*\* is displayed (approx. 10 sec), and then release the RESET button.
4. If the START LIMITS light is blinking, the control is in pilot test mode. If not, the start limits input was probably not made when the control was powered-up, and the 5004-M-78 is NOT in pilot test mode, and the selected fuel valves will energize at the end of PTFI.
5. "Pilot On-Test" is displayed when the pilot is on and pilot test mode is active.
6. After the pilot test is done, open the start limits in order to exit pilot test mode.

#### Modulation Sequencing

Referencing terminals 12 – 15, this feature sequences the burner modulation actuator to standby, high fire purge, and low fire ignition positions. The modulation contacts sequence as follows:

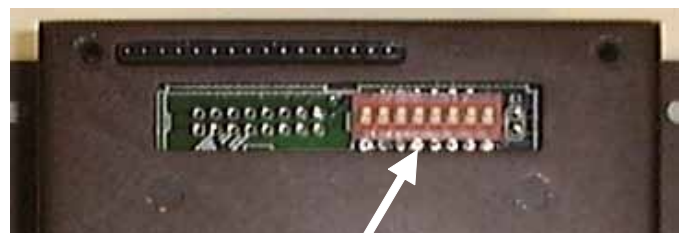
Control Status	Contacts Closed	Terminal #s
Control is not powered	COM to AUTO	13 to 15
Control is powered, limits are open	COM to LOW FIRE	13 to 14
High Fire Purge	COM to PURGE	13 to 12
Low Fire Start	COM to LOW FIRE	13 to 14
Control Releases to Automatic Modulation	COM to AUTO	13 to 15
Post Purge	COM to LOW FIRE	13 to 14
Lockout	COM to LOW FIRE	13 to 14

#### **Function Descriptions:**

### **WARNING**

*Only qualified technicians with specific knowledge of the design of the burner and all applicable burner/boiler safety codes should configure and install the 5004-M-78. Setting these switches incorrectly can result in equipment damage, injury, or death.*

The dipswitches under the LCD display are used to configure the 5004-M-78.





### Dipswitch 1

Determines the action of the control after a power fail. When dipswitch 1 is ON and power to the control is interrupted during a normal cycle, upon power up the display will indicate Lockout-Power Fail. When dipswitch 1 is OFF and power to the control is interrupted during a normal cycle, upon power up the control will start a normal cycle if it was not already in a lockout state.

### Dipswitches 2, 3, & 4

Set the purge time. The minimum purge time is 30 seconds. Dipswitch 2 is a “x 2” multiplier, dipswitch 3 is a ‘x3’ multiplier, and dipswitch 4 is a “x 5” multiplier. These switches can be used to vary the purge time as follows:

Switch 2	Switch 3	Switch 4	Purge Seconds	Explanation
ON	ON	ON	30	30 x 1 x 1 x 1
OFF	ON	ON	60	30 x 2 x 1 x 1
ON	OFF	ON	90	30 x 1 x 3 x 1
ON	ON	OFF	150	30 x 1 x 1 x 5
OFF	OFF	ON	180	30 x 2 x 3 x 1
OFF	ON	OFF	300	30 x 2 x 1 x 5
ON	OFF	OFF	450	30 x 1 x 3 x 5
OFF	OFF	OFF	900	30 x 2 x 3 x 5

### Dipswitches 5 and 6

Set the desired Pilot Trial for Ignition (PTFI) time. Note that the dipswitch timing is actually for the ignition transformer on time and the pilot gas valve is on 5 additional seconds to insure the flame scanner doesn't pick up the spark as a false flame. Having both switches 5 & 6 ON (10 seconds) will actually provide a 15 second PTFI total time.

Switch 5	Switch 6	Pilot Trial for Ignition (seconds)
OFF	OFF	3
ON	OFF	5
ON	ON	10

### Dipswitch 7

Sets the Hold-Trip Interlock Short functional safety check. One of the primary limits in the trip interlocks circuit is the Minimum Air Flow Switch (MAFS). With the fan off, the MAFS should open and therefore no power will be on the trip interlock input (Terminal 20). If power is on the trip interlock input the 5004-M-78 will assume that the MAFS is shorted or bypassed. When Dipswitch 7 is ON and the trip interlock input is powered before the start of a burner cycle, the control waits up to 60 seconds for the trip interlock input to de-energize. After 60 seconds the control will lockout.

When Dipswitch 7 is OFF, the control will ignore the trip interlock input status.



### Dipswitch 8

Used for configuring Modbus. During normal operation dipswitch 8 MUST be OFF. See Section H, “Modbus Communication”, for directions on how to use these dipswitches to configure the Modbus slave address and to reset the run time and cycle counters.

### **NOTE**

*After four hours of continuous power on the 5004-M-78 control, all current dipswitch settings will be recorded in non-volatile memory. Subsequent dipswitch changes will be ignored.*

### **Flame Scanner Type Jumper :**

Located on the back of the 5004-M-78 is a jumper that must be set to indicate the type of flame sensor being used. For flame rod jumper “FR”, for an infrared scanner jumper “IR” and for a UV scanner jumper “UV”.





## PROGRAMMER TIMING SEQUENCE


### 5004-M-78 Timing Sequence (normal shutdown)

		Burner Management System State										
FUNCTION		Standby	Drive to High Fire	Purge Cycle	Drive to Low Fire	Pilot Trial for Ignition	Check for Pilot	Main Trial for Ignition	Pilot Off	Release to Modulate	Post Purge	Standby
LED Status	START LIMITS		G	G	G	G	G	G	G	G	G	
	FAN ON		Y	Y	Y	Y	Y	Y	Y	Y	Y	
	PILOT					Y	Y	Y				
	MAIN							Y	Y	Y		
	FLAME FAIL											
	TRIP INTERLOCK											
	ALARM											
	POWER	R	R	R	R	R	R	R	R	R	R	R
	FLAME					R	R	R	R	R		
	LOW FIRE				G	G	G	G	G			
	HIGH FIRE			R								
AUTOMATIC									Y			
Input Status	Power	4	4	4	4	4	4	4	4	4	4	4
	Low Fire Switch	18	18	18	18	18	18	18	18	18	18	18
	Purge Switch	19	19	19	19	19	19	19	19	19	19	19
	Flame Proven					Y	Y	Y	Y	Y		
	Trip Interlocks	7	7	7	7	7	7	7	7	7	7	7
	POVC	20	20	20	20	20	20	20	20	20	20	20
	Start Limits	6	6	6	6	6	6	6	6	6	6	6
Output Status	Fan	5	5	5	5	5	5	5	5	5	5	5
	Ignition	10	10	10	10	10	10	10	10	10	10	10
	Pilot Valves	8	8	8	8	8	8	8	8	8	8	8
	Main Valves	9	9	9	9	9	9	9	9	9	9	9
Modulation Contacts	Drive to Low Fire	13-14	13-14				13-14				13-14	
	Drive to Purge		13-12									
	Release to Modulation									13-15		
	Firing Rate Motor Status		High Fire								Low Fire	





5004-M-78 Timing Sequence (lockout on flame fail or limit trip)

	FUNCTION	BMS STATE			
		Release to Modulate	Burner Trip	Post Purge	Lockout
LED Status	START LIMITS	G	G	G	
	FAN ON	Y	Y	Y	
	PILOT				
	MAIN	Y			
	FLAME FAIL*		R	R	R
	TRIP INTERLOCK*		R	R	R
	ALARM		R	R	R
	POWER	R	R	R	R
	FLAME	R			
	LOW FIRE		Y	Y	Y
	HIGH FIRE				
	AUTOMATIC	Y			
Input Status	Power	4	4	4	4
	Low Fire Switch	18	18	18	18
	Purge Switch	19	19	19	19
	Flame Proven	Y			
	Trip Interlocks	7	7	7	7
	POVC	20	20	20	20
	Start Limits	6	6	6	6
Output Status	Fan	5	5	5	5
	Ignition	10	10	10	10
	Pilot Valves	8	8	8	8
	Main Valves	9	9	9	9
	Alarm	3	3	3	3
Modulation Contacts	Drive to Low Fire		13-14		
	Drive to Purge				
	Release to Modulation	13-15			
	Firing Rate Motor Status Low Fire				

\* Either the FLAME FAIL or the TRIP INTERLOCK LED will energize, indicating the cause of the lockout.



## INSTALLATION TESTING

### **WARNING!**

*Only qualified technicians with specific knowledge of the design of the burner and all applicable burner/boiler safety codes should install, configure and commission the 5004-M-78. Incorrect installation can result in equipment damage, injury, or death.*

**The following tests must be performed after installation to ensure that the 5004-M-78 and the connected flame sensor are operating properly. These test are mandatory.**

Insert the positive probe of a 0-10 VDC digital voltmeter into the test point on the front cover of the 5004-M-78; insert the negative probe to ground point. Good flame signal strength will read between 2 and 5 VDC; anything below 1 VDC is inadequate. The red FLAME light illuminates when a flame signal is indicated.

#### Spark Sighting Test

1. Manually shut off the fuel supply to both the pilot and the main burner.
2. Start the system in pilot test mode. Measure the flame signal.
3. If a flame signal is greater than 1 VDC for more than three seconds during the Trial for Ignition, then the sensor is picking up a false flame signal from the electric spark. Re-sight the scanner or re-position the pilot assembly to correct this problem before resuming the start up.

#### Pilot Flame Failure Test

1. Manually shut off the fuel supply to both the pilot and the main burner.
2. Start the system in pilot test mode.
3. The controller should lockout after PTFI.
4. If the controller does not lockout, then the sensor is detecting a false flame signal. Find the problem and correct it before resuming the start up.

#### Main Flame Failure Test

1. Manually shut off the fuel supply to the main burner but not to the pilot.
2. Start the system normally. A normal burner cycle will start. After the MTFI the control will lockout as no main flame was detected.
3. If the controller does not lockout, then the controller is detecting a false flame signal. Find the problem and correct it before resuming the start up.



### Minimum Pilot Test

Run the following test procedures to ensure that the sensor will not detect a pilot flame that is too small to reliably light the main flame.

1. Manually shut off the fuel supply to the burner, but not to the pilot.
2. Start the system in pilot test mode.
3. The control will hold the operating sequence after the pilot trial for ignition is done. Measure signal strength as described above.
4. Reduce the pilot fuel until the FLAME light turns off, and then increase the pilot fuel until the flame signal is just above 1 VDC, and FLAME light is ON.
5. This is the minimum pilot. If you don't think this flame will safely light the main burner, re-align the sensor so that a larger pilot flame is required to obtain a minimum flame signal. Repeat steps 2 through 4.
6. Open the start limits interlock (Terminal 6) to exit pilot test mode. The burner will shutdown and then begin the normal start-up sequence again. Note that the RESET switch functions only when the control is in lockout mode and cannot be used to recycle the burner.
7. During purge, open the manual fuel shutoff valve for the main burner.
8. If the main flame does not light within five seconds from the time the main fuel valves are energized, immediately shut off the burner.
9. Because the main burner failed to light, a larger pilot flame maybe required. Repeat steps 1 through 8 until the main burner lights off smoothly and reliably.

#### **NOTE**

*Periodically check all interlock and limit switches by manually causing them to trip during burner operation to make sure they cause the burner to shut down.*

#### **WARNING!**

*Never operate a system that is improperly adjusted or has faulty interlocks or limit switches. Always replace faulty equipment with new equipment before resuming operation. Operating a system with defective safety equipment can cause explosions, injuries, and property damage.*

#### **WARNING!**

*If the system blows the 120 VAC power fuse due to field overloads (or shorts) in the igniter, pilot, or main valve output circuits, there may be internal damage to the 5004-M-78 output relay contacts that could be a safety hazard. The 5004-M-78 should be removed from the burner and replaced. The 5004-M-78 is not field repairable.*



### Technician Test Tool

Catalog Number	Description
5004-04FS	Current meter and Source (4 to 20 mA) and Flame Simulator for Ultraviolet and Flame Rod Controls
5004-85-TESTER	Tester for testing proper functioning of the Inputs and Outputs with FR/UV simulation

## TROUBLE-SHOOTING

### 5004-M-78 Status Messages

Diagnostic Message	Explanation	Troubleshooting Notes
**Test Mode**	The control is in pilot test mode which means that the pilot flame will remain on indefinitely and the main flame is prevented from igniting.	This is normal if the pilot test mode has been activated.
Burner ON	The main flame is on and the burner is in the operational phase of the sequence.	
False Flame Detected	A flame signal was detected by the sensor input when none should be present. If this is present for more than 30 seconds a lockout will occur.	False flame can be caused by residual gas or oil in the furnace, or by a failed UV flame scanner.
Main	The main gas valve output is energized (Terminal 9)	
Main + Pilot	The pilot valve output (Terminal 8) and the main valve output (Terminal 9) are both energized.	
Pilot	The Pilot valve is energized.	
Pilot + Ignition	The pilot valve output (Terminal 9) and the ignition output (Terminal 10) are both energized and flame is detected .	
Pilot On-Test	The pilot flame is ignited and in the pilot test mode.	
Post-Purge	The control is in the post purge phase of the sequence. This occurs after the main burner shuts down and lasts for 15 seconds.	



<b>Diagnostic Message</b>	<b>Explanation</b>	<b>Troubleshooting Notes</b>
POVC Closed When Firing	The proof of valve closure switch is made during the ignition phase of the sequence.(Terminal 20) This will result in a lockout.	Inspect the fuel valves for proper operation and switch action.
Purging at High Fire	The control is in the purge at high fire phase of the sequence. The time for this is selected by the DIP switches.	
Quanta-Flame-M785004M2_1 ID=	Indicated the software identification version and revision. Please note this when speaking to factory personnel (5004-M-78)	
Quanta-Flame-M785004M2_1 ID=	Indicated the software identification version and revision. Please note this when speaking to factory personnel (5004-M-78)	
S1= V	This message indicates the flame signal strength as a voltage range of 0 to 5 VDC (5004-M-78 only)	
S1= V S2= V	S1 and S2 indicate the flame sensors and V is the flame strength indication with a range of 0 to 5 VDC (5004-M-78 only)	
Start Ignition	The ignition output of the control has been energized. This is during the trial for pilot phase of the sequence.	
Start Limit Open	The control has completed its internal checks and is standing by for the start limits to close (Terminal 6)	"Operational switches (recycle type) used to start and stop the burner. If any of these switches open, the burner will perform a normal shutdown and remain in the Standby state until terminal 6 is again energized. 120 VAC = all Start Limits are made."
Start Modulating	The main flame is ignited and the control is releasing the actuator to modulation control from external temperature control	
Test	Used as part of other messages to indicated that control is sequencing up to the pilot test mode	



<b>Diagnostic Message</b>	<b>Explanation</b>	<b>Troubleshooting Notes</b>
Trip Interlock Made Self Check	Internal control self check when trip interlocks close (Terminal 7)	
Trip Interlock Open	All of the trip (safety) interlocks are not yet closed. This will result in a control not starting the sequence. (Terminal 7)	Trip interlocks must be made no later than 10 seconds after the high fire switch input is made during the initial burner cycle and continuously thereafter. If any of these interlocks open, the burner will Lockout. 120 VAC = all trip interlocks are made.
Trip Interlocks Check	Control is checking to verify the trip interlock input (Terminal 7) while the start interlocks are open (Terminal 6)	
Waiting for High Fire Switch	The control is in the purge phase of the sequence and waiting for the high fire switch input to energize (Terminal 19)	
Waiting for Low Fire Switch	The control has completed the purge phase of the sequence and waiting for the low fire switch input to energize (Terminal 18)	

#### 5004-M-78 Lockout Messages

<b>Diagnostic Message</b>	<b>Explanation</b>	<b>Troubleshooting Notes</b>
Clock Fail	The internal clock has failed. The control is in lockout.	If this fault does not reset; replace the control.
EEROM Erased Change Sw2&Reset	Reserved for use by manufacturer.	
EEROM FAILURE **Replace Unit**	Internal memory failure. Unit is in lockout.	If this fault does not reset; replace the control.
False Flame Detected-Lockout	A flame signal was detected by the sensor input when none should be present. It has been present for more than 30 seconds, therefore the control is in lockout mode.	Check flame sensor for proper operation. If flame sensor is operating properly. If problem persists check wiring for proper considerations regarding electrical noise interference.



<b>Diagnostic Message</b>	<b>Explanation</b>	<b>Troubleshooting Notes</b>
Flame Failure ** Push Reset **	A flame failure has occurred. The control is in lockout mode	Check flame sensor for proper operation. If flame sensor is operating properly, check burner for proper adjustments. If problem persists check wiring for proper considerations regarding electrical noise interference.
Instruction Fail	An internal software failure. The control is in lockout.	If this fault does not reset; replace the control.
Internal Failure** Push Reset **'	Internal hardware failure other than the relays resulting in control shutdown and lockout.	If this fault does not reset; replace the control.
LFS Fail Light Off Position	Low fire switch input failed to energize after 5 minutes.	Check the low fire start switch and actuator for proper operation. Replace if needed.
LFS Fail MTFI	The low fire start switch input has opened during the main flame trial for ignition resulting in a control lockout. (Terminal 18)	This indicates a faulty low fire start switch or an issue with the air actuator.
LFS Fail PTFI	The low fire start switch input has opened during the pilot flame trial for ignition resulting in a control lockout. (Terminal 18)	Check the low fire start switch and actuator for proper operation. Replace if needed.
Main Flame Fail ** Push Reset **	The main flame did not ignite or was lost resulting in a control shutdown and lockout.	Main flame may not have ignited due to improper adjustment, gas pressure or ignition failure. If pilot was detected and main flame ignited but was not detected, check sensor for proper placement and operation. Also check sensor wiring for proper installation.
Opto Short Test Fail	Internal check of opto isolators failed	If this fault does not reset; replace the control.
Pilot Flame Fail** Push Reset **	The Pilot flame did not ignite or was lost resulting in a control shutdown and lockout	Pilot flame may not have ignited due to improper adjustment, gas pressure or ignition failure. If pilot ignited and was not detected, check sensor for proper placement and operation. Also check sensor wiring for proper installation.



<b>Diagnostic Message</b>	<b>Explanation</b>	<b>Troubleshooting Notes</b>
POVC Open Before Firing	The proof of closure switch on the main valve is not closed indicating a main gas vale open. The control is in lockout.	Check the Main gas shutoff valves and the POVC switch for proper operation. Remove all jumper wires that could negate the operation and safety of any component in the system
Power Failure ** Push Reset **	A power failure has occurred during a firing cycle and was restored. The control is in lockout mode. Control must be reset to continue	Check power source for blown fuse or tripped circuit breaker. If either are discovered, check wiring for proper installation and load requirements
Proof of Purge Fail	High fire switch input failed to energize after 5 minutes	Check the high fire start switch and actuator for proper operation. Replace if needed.
Push Reset Switch	The Reset Button must be pushed to exit lockout and reset the control	
Relay Failure ** Push Reset **	Internal relay failure resulting in control shutdown and lockout	If this fault does not reset; replace the control
ROM Fail Rev: M2_1 ID=03	The internal memory has failed. The control is in lockout	If this fault does not reset; replace the control
Slave Address= **Reset SW1**	Internal switch check failure.	SW1-8 Switch is in the on position. It must be in the off position to clear this error
Timers + Counter = 0 Change SW2&Reset	Reserved for Manufacturer	
Trip Interlocks Fail	One of the Trip (Safety) Interlocks opened during operation. This will result in a control shutdown and lockout.(Terminal 7)	Check each trip interlock switch for proper operation. Remove all jumper wires that could negate the operation and safety of any component in the system
Trip Intlk Short** Push Reset **	Trip interlocks has been shorted out or jumpered. The control is in a lockout state.	Check each interlock switch for proper operation. Remove all jumper wires that could negate the operation and safety of any component in the system
Write Sw1 Failed Check EEROM	Internal check of dip switch settings failed. Control is in lockout.	If this fault does not reset; replace the control





## DIGITAL COMMUNICATION SETUP

### WARNING!

*Only qualified technicians with specific knowledge of the design of the burner and all applicable burner/boiler safety codes should install, configure and commission the 5004-M-78. Incorrect installation can result in equipment damage, injury, or death.*

The operation of the 5004-M-78 can be monitored through a RS485 Modbus communications link. Modbus also provides access to the Historical data in the 5004-M-85: The last 6 Lockouts, burner run hours, and burner start cycles.

#### Modbus Specification:

Electrical	2 Wire RS485 half-duplex, non-isolated
Protocol	RTU
Baud Rate	4800
Start Bits	1
Stop Bits	1
Data Bits	8
Parity	None
Modbus Point Type	Holding Register (400xx series)
Modbus Functions supported	Function 03: Read Multiple Holding Registers
Max. Registers Requested/Poll	6

#### Modbus Wiring Terminals

Terminal	Description
4	RS485 DC Common
5	RS485 (-)
6	RS485 (+)

The 5004-M-78 does not require an RS485 cable termination resistor, external or internal.

RS485 wiring should be kept separate from all 120 VAC wiring, the Ignition transformer wiring, and any VSD wiring to prevent electrical noise interference.

Belden 3106A shielded cable, or equivalent RS485 rated cabling, should be used for noise rejection and reliable communications.

The Modbus Master device that is being used to Poll the 5004-M-78 should include



an RS485 electrical interface with a 'Biasing' circuit to force the RS485 cable to logic 'High' in between transmissions.

### Configuring the 5004-M-78 Modbus Device Address

The 5004-M-78 is assigned a device address as follows:

1. Power down the control.
2. Remove the LCD display, or cover plate, to expose the dipswitches.
3. Write down the ON / OFF positions of dipswitches 1 – 6. These settings must be restored to the original settings at the end of this procedure.

### **WARNING!**

*Dipswitch positions 1 – 6 determine the Purge time and the Pilot Trial for Ignition time. Setting these switches to an incorrect value at the end of this procedure can result in equipment damage, injury, or death.*

4. Set dipswitches 1,2,3,4,5 & 6 to the desired slave address (1 to 63). Switches 1-6 are in Binary code. Switch ON = 1, switch OFF = 0. Examples: 000001 = 1, 000010 = 2, 000011 = 3, 000100 = 4, etc. An address of 8 = 001100
5. Set dipswitch 8 = ON position.
6. Re-install the LCD display on the control. Power up the control while holding down the RESET push button for 25 seconds.
7. The LCD will display **\*\* Test Mode \*\*** for the first 20 seconds and then display the following message:

**SLAVE ADDRESS=XX**  
**\*\*RESET SW1\*\***  
**xx – setting of the slave address**

8. The slave address is now recorded into the EEPROM.
9. Again remove power from the control.
10. Set dipswitch positions 1-6 to the settings written down in step 3 above. Set dipswitch position 8 to the OFF position.
11. Restore power the control and operate the burner normally.



### NOTES

1. *After 4 hours of continuous power to the control, ALL current dipswitch settings will be recorded in non-volatile memory. Subsequent dipswitch changes will be ignored.*
2. *The Modbus communications is not active if the controller had a power failure and is waiting to be reset.*

Table of Modbus Registers provided by the 5004-M-78

Message Register	Value	Description
40001=State/Status	1	Standby
	2	Waiting for interlock to make
	3	Moving to purge
	4	Purging
	5	Moving to ignition
	6	PTFI
	7	MTFI
	8	Released to modulate
	9	Post purge
	10	Lockout
	11	Waiting for interlock to release
40002=State/Status Bits (Bit format)	Bit 0	Standby
	Bit 1	Waiting for interlock to make
	Bit 2	Moving to purge
	Bit 3	Purging
	Bit 4	Moving to ignition
	Bit 5	PTFI
	Bit 6	MTFI
	Bit 7	Released to modulate
	Bit 8	Post purge
	Bit 9	Lockout
	Bit 10	Waiting for interlock to release
40003= Timer: Purge Minutes	0-15	Minutes
40004= Timer: Purge, PTFI, MTFI, Post Purge seconds	0-59	Seconds



Message Register	Value	Description
40005= Timer Reason (Bit format)	Bit 0	Purge
	Bit 1	PTFI
	Bit 2	MTFI
	Bit 3	Post Purge
40006=Flame Sensor S1 Intensity	0-50	(0.0V to 5.0V)
40007=Flame Sensor S2 Intensity	0-50	(0.0V to 5.0V)
40008=Current Lockout Reason	5	LFS Fail during MTFI
	8	Relay Fail
	9	Internal Fail
	11	POVC Switch Short
	16	Pilot Flame Fail (PTFI)
	17	Main Flame Fail (MTFI)
	20	Power Failure
	21	Main Flame Fail
	22	False Flame
	25	Trip Interlocks Short
	26	Rom Fail
	27	Clock Fail
	28	LFS Fail during PTFI
	35	Proof Purge Fail
	38	LFS Fail during Light Off
	40	Trip Interlock Fail
41	POVC Fail	
46	Opto Failed	
40009=Current Hold Reason	0	Not Holding
	1	Waiting for HF Switch
	2	Waiting for LF Switch
	3	Waiting for Trip Interlock
	4	Waiting for Trip Interlock Release
40010=State of Each Input (Bit format)	Bit 0	Trip Interlocks
	Bit 1	Start Limits
	Bit 2	POVC
	Bit 3	Reset
	Bit 4	LFS
	Bit 5	Sensor
	Bit 6	HFS
	Bit 7	15 sec MTFI



Message Register	Value	Description
40011=State of each Output (Bit format)	Bit 0	Low Fire
	Bit 1	Fan
	Bit 2	Alarm
	Bit 3	Auto
	Bit 4	Ignition
	Bit 5	Pilot
	Bit 6	Main
	Bit 7	High Fire
Historical Lockout Data		
Message Register	Value	
40012	1st Lockout Code (oldest)	
40013	2nd Lockout Code	
40014	3rd Lockout Code	
40015	4th Lockout Code	
40016	5th Lockout Code	
40017	6th Lockout Code (newest)	
Message Register	Value	Description
40018= Run Time	0-65535	Hours
40019= Run Time	0-59	Minutes
40020= Start	0-65535	Cycles
40021= Switches 1,2	Bit 0	S1-1
	Bit 7	S1-8
	Bit 8	S2-1
	Bit 15	S2-8
40022= Current Message Number	1	Trip Interlock Open
	2	Start Limit Open
	3	Trip Interlock Made Self Check
	4	S1= V
	5	LFS Fail MTFI
	6	Post-Purge
	7	Quanta-Flame-M785004M2_1 ID=
	8	Relay Failure ** Push Reset **
	9	Internal Failure** Push Reset **'
	10	**Test Mode**
	11	POVC Closed When Firing



Message Register	Value	Description
40022= Current Message Number (continued)	12	False Flame Detected
	13	Start Ignition
	14	Pilot + Ignition
	15	Main
	16	Pilot Flame Fail** Push Reset **
	17	Main Flame Fail ** Push Reset **
	18	Main + Pilot
	19	Burner ON
	20	Power Failure ** Push Reset **
	21	Flame Failure ** Push Reset **
	22	False Flame Detected-Lockout
	23	Test
	24	Trip Interlocks Check
	25	Trip Intlk Short** Push Reset **
	26	ROM Fail Rev: M2_1 ID=03
	27	Clock Fail
	28	LFS Fail PTFI
	29	Pilot
	30	Pilot On-Test
	31	Instruction Fail
	32	S1= V S2= V
	33	Push Reset Switch
	34	Waiting for High Fire Switch
	35	Proof of Purge Fail
	36	Purging at High Fire
	37	Waiting for Low Fire Switch
	38	LFS Fail Light Off Position
	39	Start Modulating
	40	Trip Interlocks Fail
	41	POVC Open Before Firing
	42	Write Sw1 Failed Check EEROM
	43	EEROM Erased Change Sw2&Reset
	44	EEROM FAILURE **Replace Unit**
45	Slave Address= **Reset SW1**	
46	Opto Short Test Fail	



Message Register	Value	Description
40022= Current Message Number (continued)	47	Timers + Counter = 0 Change SW2&Reset
	48	Quanta-Flame-M785004M2_1 ID=

## WARRANTY AND RETURNS

The 5004-M-78 is warranted for one (1) year from the date of shipment against manufacturing defects only. Preferred Instruments standards terms and conditions apply. Warranty does not cover any damage resulting from the use or misuse of the product either during shipment or customer use of the product. Products returned for warranty consideration must be sent prepaid in suitable packaging. Preferred Instruments will review the returned products. Whether a product's defects are covered by the warranty is solely the decision of Preferred Instruments, if warranty action is decided, Preferred Instruments reserves the right to repair and return or replace the product. All decisions relating to warranty, repair or replacement rests solely with Preferred Instruments. Every product returned must have a Return Material Authorization (RMA) number provided by Preferred Instruments.

### Products returned for credit:

Any product returned for credit must be returned in the original container and in unused condition. All products returned for credit will be subject to a minimum 25% restocking charge. Authorization to return for credit must be received from Preferred Instruments prior to the return. No equipment should be returned for credit except by the original buyer and then only after receiving a Return Material Authorization. Only unused, originally boxed items as currently manufactured, in active demand, which has been invoiced to the buyer within 60 days will be considered for credit upon its return.

### Liability:

Preferred Instruments' liability for its products, whether due to breach of warranty, negligence, strict liability, or otherwise, is limited to the furnishing of replacement parts and Preferred Instruments will not be liable for any other injury, loss, damage or expenses, whether direct or consequential, including but not limited to loss of use, income of, or damage to material arising in connection with the sale, installation, use of, inability to use or the repair or replacement of Preferred Instruments' products.

Defective units should be returned to Preferred Instruments. Controls should be well packed in a suitable container encased in appropriate stuffing.



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**WARNING!**

*These controls are factory assembled and are not internally serviceable. The main cover is not to be removed for any reason. To do so voids all warranties and liabilities from Preferred Instruments.*

All products should be shipped prepaid to:

**Preferred Instruments  
Div. of Preferred Utilities Manufacturing  
31-35 South Street  
Danbury, CT 06810**

**NOTE**

*All rights and privileges to the design of this product including the circuit layout and software are the exclusive property of Preferred Utilities Manufacturing Corporation. No part of which can be sold, used, or modified without the expressed written permission of Preferred Utilities Manufacturing Corporation.*