Honeywell

DIGITAL BURNER CONTROLLER

DBC1500 SERIES

INSTALLATION INSTRUCTIONS

1. APPLICATION

The Honeywell DBC1500 is a microprocessor-based integrated burner controller for automatically fired gas, oil or combination fuel industrial single burner applications. The DBC1500 system consists of the relay module and wiring sub base. The DBC1500 Standard Model provides the minimum requirements to control an industrial burner system, such as automatic burner sequencing, flame supervision, system status indication, system or self-diagnostics and troubleshooting.

The DBC1500 is programmed to provide a level of safety, functional capability and features beyond the capacity of conventional controls.

2. FEATURES

- Employs a plug-in mounting method
- Uses a microprocessor to improve performance
- Status and fault indication by indicator LEDs
- Safe start check before and during pre-purge
- Dual flame amplifier for UV, IR or flame rod sensor
- Automatic one time re-try function
- Frontal jack plug (Ø 3.5mm) to read the flame signal with a microampere meter.
- Safety shutdown occurs on
  - malfunction of the burner controller
  - failure to ignite the pilot burner or main burner
  - loss of flame during run period
  - opening of air flow switch during pre-purge, start-up and run period
  - flame signal detection during standby or pre-purge period

Important note:

Subject to changes without notice.

Contents

3. SPECIFICATIONS

Table 1: Model Selection Guide

Model	Description / Application	Supply voltage
DBC1500E1000	Standard model	115Vac, 50-60Hz
DBC1500E1018	Standard model	230Vac, 50-60Hz
DBC1500E1000-J	Standard model for Japan	100Vac, 50-60Hz
DBC1500E1018-J	Standard model for Japan	200Vac, 50-60Hz
DBC1500E1001-J	Re-try model for Japan	100Vac, 50-60Hz
DBC1500E1019-J	Re-try model for Japan	200Vac, 50-60Hz

Table 2: Sequence timing

Model type	Waiting for AFS	Pre-purge	Ignition	Pilot-only	Main trial	Safety lock	Flame failure response
Standard	300s (max)	35s[1)]	3s	5s	3s[2)]	20s	1s (max)
Re-try	300s (max)	35s[1)]	10s	10s	3s[2)]	20s	1s (max)

[1)] Default pre-purge time is 35s. Other timings on request, by OS number selection.
[2)] Set to 0s. when DBI function is enabled (terminal 22 jumpered to line voltage).
Sequence at flame failure: immediate lock out

Table 3: Contact ratings

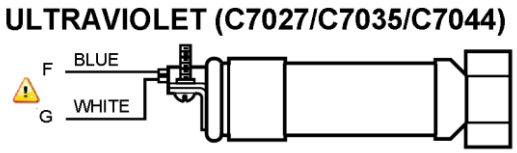
Terminal	Load	Contact rating
3	Blower / Fan	200VA
4	Ignition transformer	250VA
5	Intermittent pilot valve or main(DBI) valve	200VA
6	Interrupted pilot	200VA
7	Main valve	200VA
21	Alarm	100VA

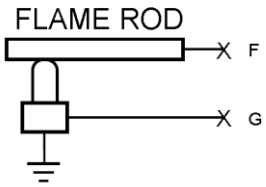
Total load : Max 4A (Internal Fuse : 10A)
Total load (based on terminal 4,5,6,7): Max 2.5A (Internal Fuse : 6.3A)

Table 4: Flame detection systems

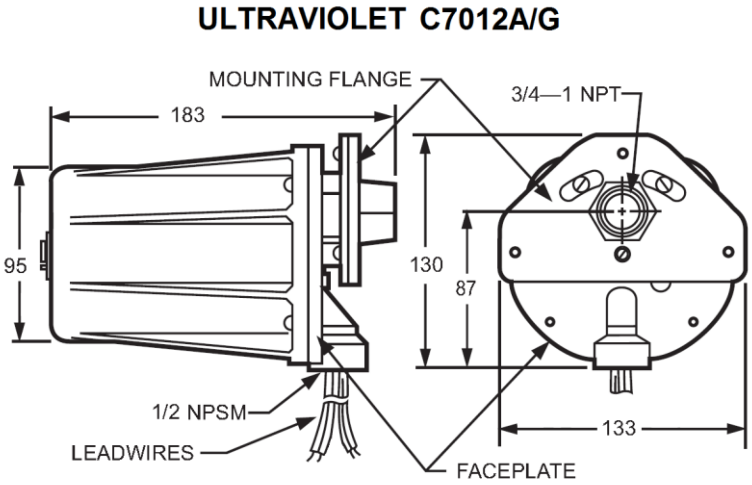
Detector type	Flame detector model no.	Max. lead wire lengths	Standard stable flame current on jack plug
UV detector	C7027A, C7035A, C7044A C7061A, C7061C	< 100m	4µA (min) 14µA (max)
Flame rod	Flame rod or rectifying optical sensors, C7012A,G (UV) or IRD1020.1 (IR)	< 15m	14µA (min)* 4µA (max)*

* When using a flame rod, the current on the flame jack plug is inverted. See also Fig 4-2.





Flame detector leads are colour coded. The blue lead wire must be connected to the F terminal (T23) and the white lead wire to the G terminal (T24). The UV sensing tube is polarity sensitive. Reversing the lead wires even momentarily will destroy the UV sensing tube.



Allowable power voltage
85 to 110% of the rated voltage

Allowable ambient Temperature & Humidity
-10 °C; +60°C
90% RH max. at 40°C (non-condensing)

Power consumption
9VA

Protection class
IP40

Mounting
Plug-in mounting method using sub-base

Dimensions
103mm x 103mm x 124mm (W x D x H) incl. sub base

Status indicator LEDs
- Flame On

- Alarm

The LEDs will shortly blink as soon as power is applied to the DBC1500 and then as soon as there is a heat demand, proceed the burner sequence.

The LEDs are also used to indicate faults. For example, if a loss of flame signal occurs during RUN, the LEDs for Alarm and Flame on will blink.

Jack plug
The flame signal can be measured using the jack plug (Ø 3.5mm) on the front, using a microampere meter. The measuring device must be capable of reading microamperes between 2 and 15~20 µA.

CAUTION

Although the voltage on the jack plug is of low voltage, it is not considered to be safe when touching the wires connected to the jack plug, in case of a malfunction of the device. Therefore avoid touching the lead wires to avoid an electrical shock.

Reset switch
When the DBC1500 is in Lockout condition* press the internal or remote reset button one time to reset the DBC1500 and stop the alarm. The reset button must be held for a minimum of 3 seconds.
If the heat demand is still present, the DBC1500 will perform the start sequence normally when the fault condition has been resolved. Otherwise the lockout will repeat.
If during the lockout condition the DBC1500 is de-energized and power is reapplied afterwards, the DBC1500 will remain in lock out (non-volatile lock out).
A remote reset push button switch can be connected between terminals 15 and 19. The functionality of the remote reset is the same as the red push button on the front of the device, with one exception; the remote reset may occur only 5 times during 15 minutes of operation, whilst the internal reset button is unlimited.

* Remark:
Lockout condition refers to the state the DBC1500 is in after a safety shut-down occurs and the lockout timing (20 Seconds) is completed. For safety reasons the reset button is disabled immediately after a safety shut-down until lockout timing is completed.
The lockout timing is fixed at 20 seconds, to allow time for the air dampers to return to the start position, and to allow a safety time between ignition attempts, for applications without pre-purge.

Note: The Alarm and LED's will indicate the fault immediately, but cannot be reset until the unit has progressed to the Lockout Condition.

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4. DIMENSIONS

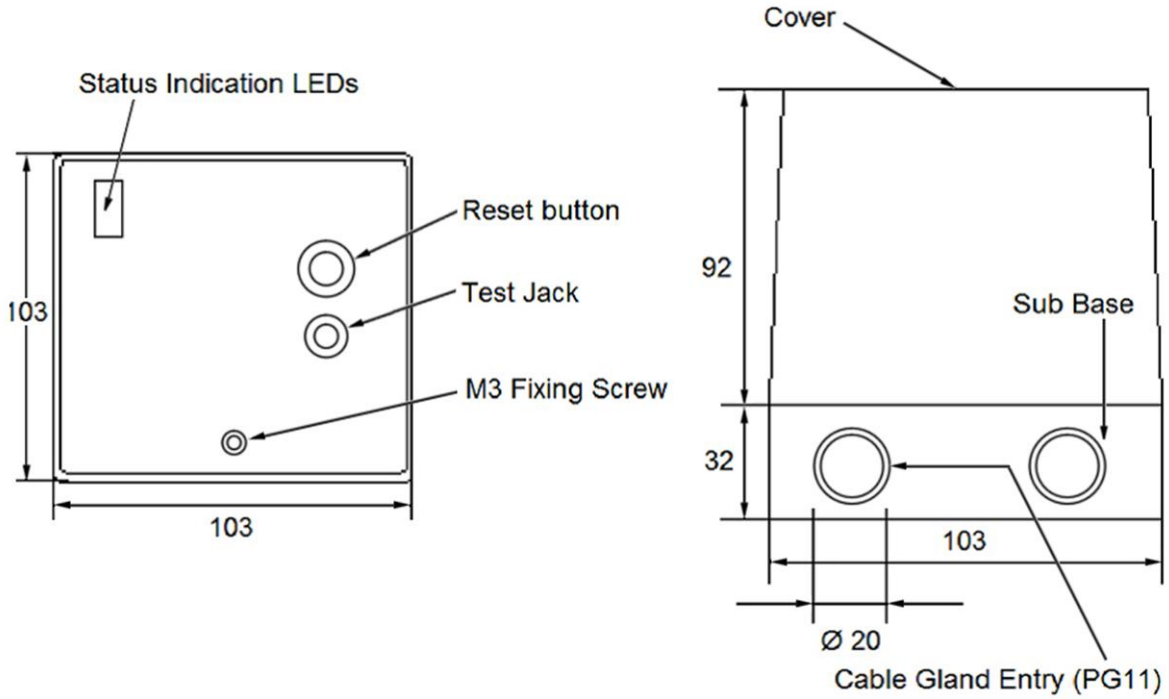


Fig. 1: External Dimensions (in mm)

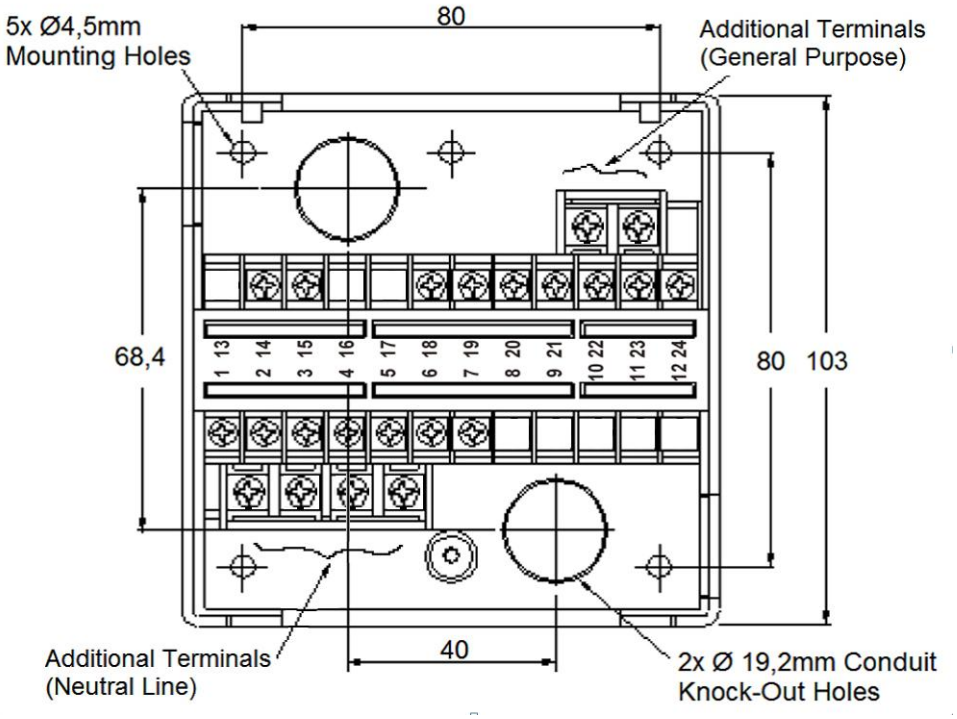


Fig. 2: Mounting dimensions of sub-base and terminal layout

5. INSTALLATION AND WIRING

CAUTION

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 marked on the product to make sure the product is suitable for the application.
3. Installer must be a trained, experienced, flame safeguard service technician.
4. After installation is completed, check out the product operation as provided in these instructions.

WARNING

Fire or Explosion Hazard.

Can cause property damage,

severe injury, or death.

Carefully follow safety requirements when installing a burner control.

CAUTION

Electrical Shock Hazard or Equipment/

Control Damage.

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

IMPORTANT

1. Wiring connections for the relay modules are unique; refer to Fig. 3-2 or the appropriate Specifications for individual subbase wiring.
2. Wiring must comply with all applicable codes, ordinances and regulations.
3. Wiring must comply with NEC Class 1 (Line Voltage) wiring.
4. Loads connected to the DBC1500E must not exceed those listed on the relay module label or the Specifications; see Table 3.
5. Limits and interlocks must be rated to simultaneously carry and break current to the ignition transformer and fuel valve(s).
6. All external timers must be listed or component recognized by authorities who have proper jurisdiction.
7. For on-off gas-fired systems, some authorities who have jurisdiction prohibit the wiring of any limit or operating contacts in series between the flame safeguard control and the main fuel valve(s).
8. Two UV flame detectors can be connected in parallel.
9. This equipment generates, uses and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, can cause interference with radio communications. It has been tested and found to comply with the limits for a Class B computing device of Part 15 of FCC rules, which are designed to provide reasonable protection against such interference when operated in an industrial or commercial environment. Operation of this equipment in a residential area can cause interference, in which case, the users, at their own expense, may be required to take whatever measures are required to correct this interference.
10. Do not install the Burner Controller under any circumstances in the following locations.
    ① Where chemicals or corrosive gases are present, such as ammonia, sulfur, chlorine, ethylene compounds, acids, etc.
    ② Install the relay module where the relative humidity never reaches the saturation point. The relay module is designed to operate in a maximum 85% relative humidity continuous, noncondensing, moisture environment. Condensing moisture can cause a safety shutdown or damage the device.
    ③ Where temperatures exceed the maximum specification for this device.
    ④ Where excessive continuous vibration exists.
11. Do not bundle power wiring and high voltage ignition cable with the flame detector wiring, or run them in parallel within the same conduit. High voltage cables must be kept separated at least 10 cm from the Burner Controller.
12. Use proper grounding work in accordance with the engineering standards for electrical equipment
13. Connect the high voltage cable of the ignition transformer properly to the ignition electrode. A poor connection can cause an electrical shock or damage the equipment. Additionally the ignition transformer must be properly grounded according the standards.

REMOVE THE RELAY MODULE FROM ITS SUB BASE AND FIX THE SUB BASE

1. Loosen the M3 fixing screw as shown in Fig. 1 by about eight turns using a Philips head screwdriver.
2. Take the subbase and cover with both hands and unfold them gently. Fold the relay module upwards, the turning point is on the top. Do not apply excessive force, otherwise damage may occur.
3. Punch out the needed conduit knockout holes for the wiring as shown in Figs 1 and 2, and install the wiring conduit(s).
4. Using the fixing screws, mount the subbase in the specified position.

Avoid to overtighten the fixation screw on the front of the device, to avoid damaging the (Phillips) head of the screw.

WIRING THE RELAY MODULE BOTTOM TERMINALS

For applications with a UV detector, remove the jumper terminal located at the terminal block on the bottom of the relay module.

WIRING THE SUB BASE

1. Fig. 2 shows the layout of the terminals on the subbase, and Figs. 3-1 to 3-3 show examples of connections to external equipment. Regarding the wiring to the flame detector, refer to Fig. 4.
2. When using Intermittent Pilot, connect the pilot valve to Terminal 5. Connect the main valves to Terminal 7.
3. When using Interrupted Pilot, connect the pilot valve to Terminal 6. Connect the main valves to Terminal 7.
4. When using direct ignition (DBI), jumper Terminals 15 and 22. And connect the Main(DBI) valves to Terminal 5.
5. Connect the safety switch circuit (lockout interlocks) between Terminals 15 and 18. The safety switch circuit must be closed always, otherwise a lockout occurs immediately.
6. For non-floating mains power grids (Neutral to Ground), connect the Line-L to Terminal 1 and the Line-N to Terminal 2. Use a correct fuse: 10A fast blow maximum.
7. Check all wiring circuits and assure that the correct fuse is installed. Check the correct voltage.
8. Finally plug the relay module on to its sub base and fix it with the M3 fixing screw. Do not overtight the screw.
9. When using a surge absorber, connect it between Terminal 2 and application ground.
10. Connect the mains supply voltage using 0.75mm^2 or larger lead wire.
11. Never connect blank stripped wires to the wiring sub base. Loose wire strands may cause short circuits to electrically safe contacts which may cause an electrical shock hazard.

Always use cable lugs to attach the wires to the sub base.

See Fig 2-1 for do’s and don’ts about wiring.

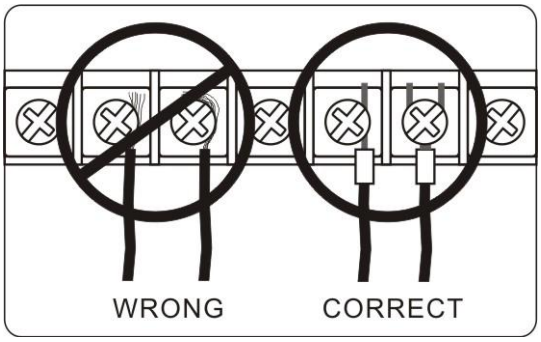


Fig. 2-1: Wiring the sub base terminals

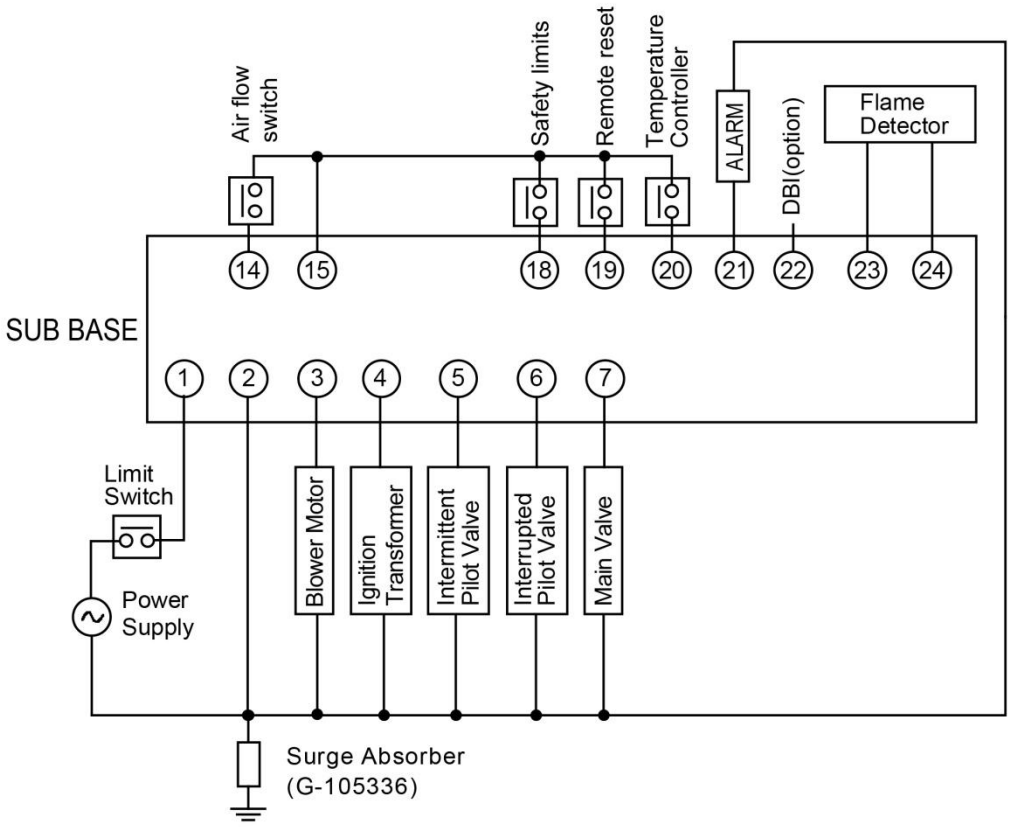


Fig. 3-1: Example of wiring to external equipment (see fig 3-2 for more)

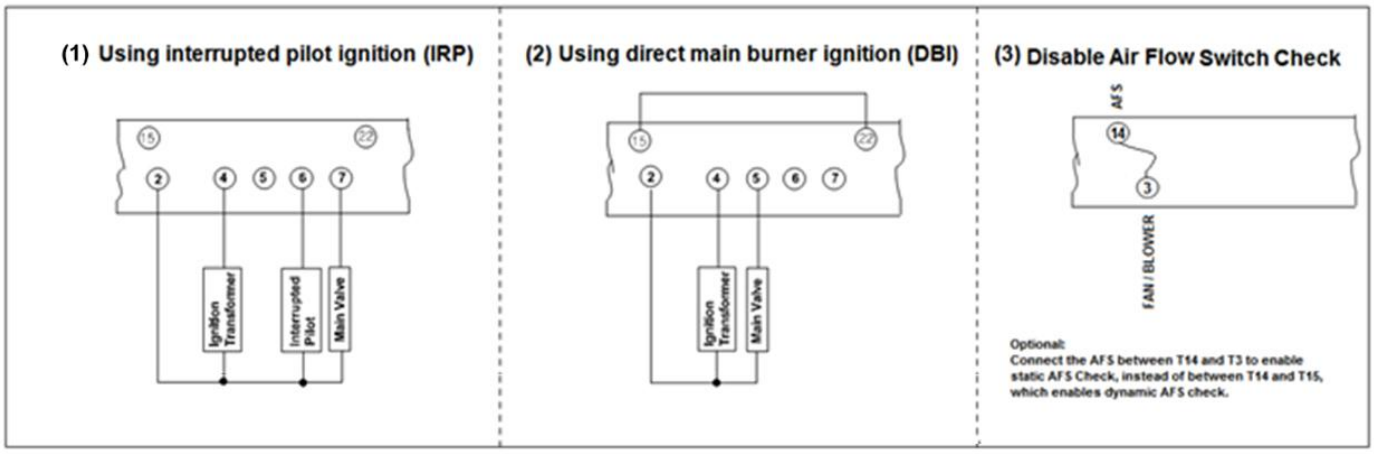


Fig. 3-2: More examples of wiring to external equipment

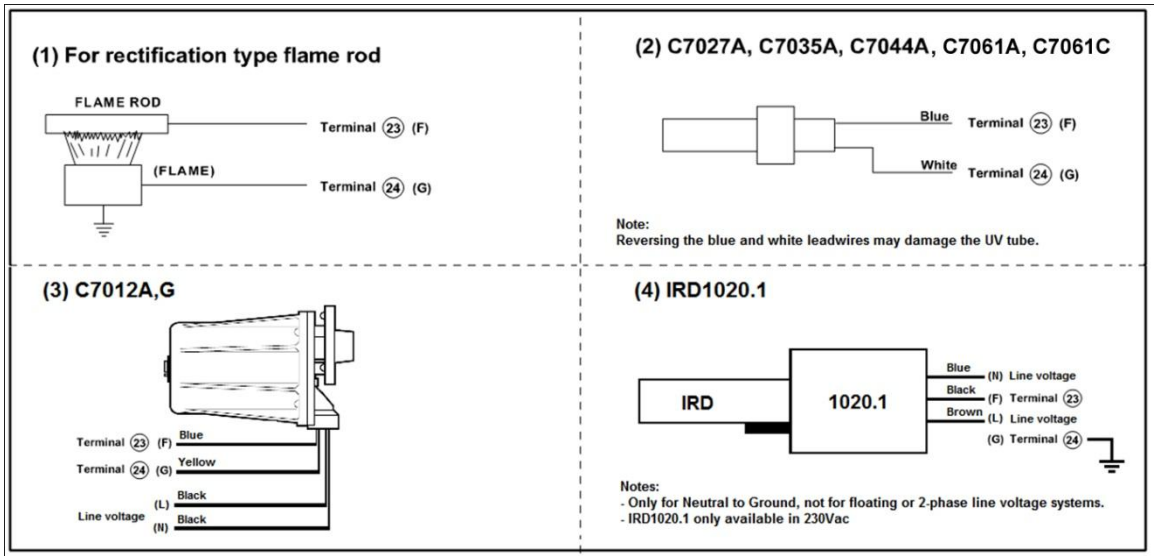


Fig. 4-1: Wiring a flame detector

⚠ CAUTION

There is line voltage on flame sensor inputs. Don't touch the lead wires of the UV detector or the flame sensing electrode to avoid an electrical shock.

Flame signal monitoring

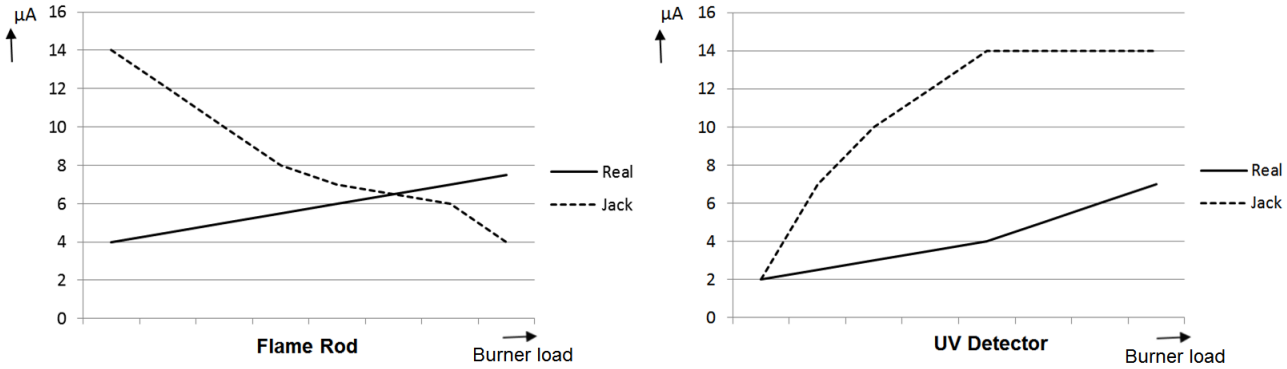


Fig. 4-2: Real flame current versus reading on frontal jack plug.

Note:
The flame signal strength on the flame current jack plug is only for reference and can vary between different DBC1500 devices.
When measuring the flame signal current directly in the flame sensor wiring whilst:

1. Using a flame rod, the (multi-)meter will show the real flame current in µA.
2. Using a UV sensor (C7027, C7035 or C7044), the current in the sensor lead wires will be in the range of 20…25mA (inverted values).

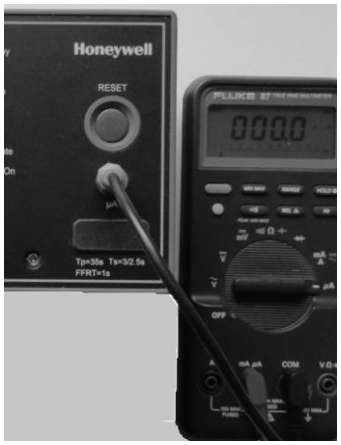


Fig. 4-3: Measuring flame signal with multi meter (µA range selection) using a jack plug.

Fig. 4-4: Position of flame sensor selection jumpers on the back of the DBC1500.

SETTING THE OPTIONAL FEATURES

Pilot Ignition (PI) or Direct main Burner Ignition (DBI)

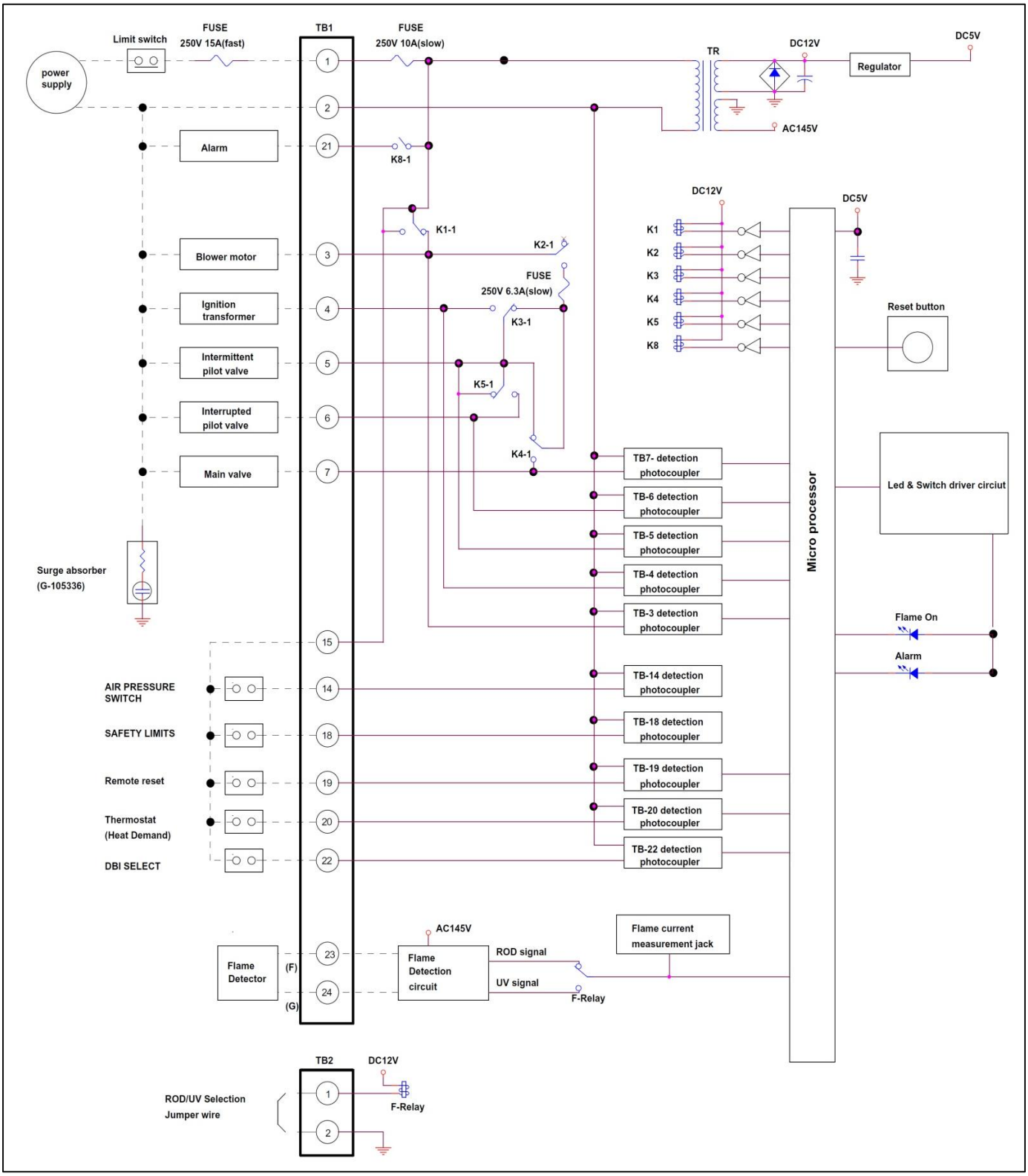
PI mode (default): the main burner is ignited indirectly by using an interrupted or intermittent pilot flame. After the pilot is ignited and stabilized, the DBC1500E goes for a second trial of ignition (2nd safety) to ignite the main burner.

DBI mode (selectable option): the intermittent pilot ignition cycle is used to ignite the main burner directly via the spark igniter. The second trial for ignition has become redundant in this mode. In DBI mode the 2nd safety is 0s and DBC1500E goes straight into running after pilot stabilization.

To enable DBI mode, apply line voltage to terminal 22 on the wiring base. Practically this means that a jumper is placed between terminals 15 or 1 (L) and 22.

6. OPERATION

Example of wiring to external equipment, and internal block diagram



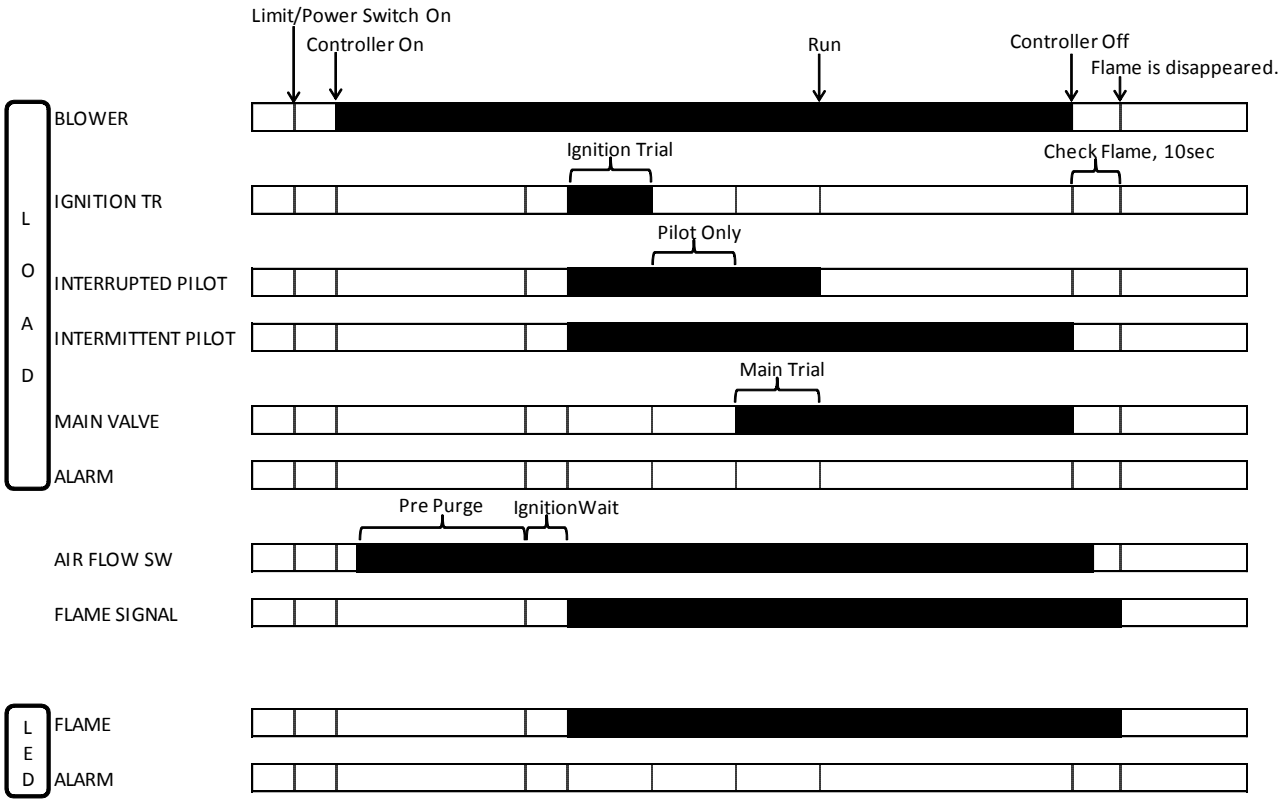
NORMAL OPERATION

Table 5: Normal operation sequence

Inputs	Operation of DBC1500 and device	Indicator LED *
CONTROLLER OFF AIR FLOW SW OFF SAFETY LIMIT SW ON	The power supply voltage is applied across Terminal 1 and 2. When no flame signal is present, the combustion airflow switch is opened (T14=OFF) and safety lockout circuit is closed (ON), it is possible to start.	○○
CONTROLLER ON	The blower is energized (T3). Air flow switch closes (T14=ON) as soon as air flow is present.	
AIR FLOW SW ON	The pre-purge timer starts counting. After the completion of pre-purge timing and the ignition wait timer starts counting(2sec).	○○
	After completion of the ignition wait timing, the Ignition sequence starts. The Ignition transformer is energized. The Intermittent and Interrupted pilot valve outputs are energized (T5 and T6).	○○ ●○
FLAME ON	When a flame is detected after the ignition trial has ended (Safety1), the pilot stabilization time starts.	●○
	After completion of the pilot-stabilization time, the Main valves are energized (T7=ON). The Main trial for ignition takes place (Safety2).	●○
	After completion of the main trial time, Interrupted pilot valve is deenergized (T6=OFF).	●○
CONTROLLER OFF	The intermittent pilot valve, main valves and blower are deenergized (T5=OFF and T7=OFF).	○○
FLAME OFF AIR FLOW SW OFF SAFETY LIMIT SW ON	After the air flow switch goes OFF, DBC1500E returns to the STANDBY condition, waiting for the next controller on.	○○

* For LED indication, ○ means ‘off’, ● means ‘illuminated’.
* The LEDs are arranged in the following order: Flame on and Alarm at the left front side of the DBC1500.

Fig. 5 Normal operation



7. TROUBLE SHOOTING

ERROR TYPES AND SAFE SHUTDOWN

If a critical error related to safety operation (such as a loss of flame, opening of the air flow switch during the ignition trial and run sequence) is detected, the DBC1500 instantly goes into lock-out and goes to pre-purge status.
If a non critical error is detected, DBC1500 holds the sequence during the lock-out time, allowing time for the error to rectify, and then goes into lock- out.
For all types of errors, the status LEDs indicate the status information to the operator.
Fig. 6 to Fig.13 show the sequence of DBC1500 in case of some error. And Table 8 shows the status of LEDs for each error.

Refer to the Product handbook (HWLKS-E-M-2107) to see the different scenarios for possible failures.

Table 8: Error condition and LED status

Sequence	Error condition	Indicator LED status (*1)
All	Safety limits opened at any time (no voltage present at T18)	○●
Standby (*2)	Air flow switch remains ON (closed) for more than 5 minutes.	○●
	Flame signal is present	●●
	Blower motor is energized	○●
Pre-purge	Air flow switch remains OFF for more than 5 minutes after the heat demand has started.	○●
	Air flow switch goes ON within 5 minutes after the heat demand started, but air flow switch goes OFF again.	○●
	Flame signal is present.	●●
Ignition Standby	Air flow switch goes OFF	○●
Pilot Ignition	Air flow switch goes OFF	○●
	Ignition failure (flame signal is not present after ignition-trial).	○●
Pilot only	Air flow switch goes OFF	○●
	No flame signal	●●
Main ignition	Air flow switch goes OFF	○●
	No flame signal	●●
Run	Air flow switch goes OFF	○●
	No flame signal	●●
	No power is supplied to Terminal 3 because of internal relay contact failure.	○●
	Flame signal is present for more than 10 seconds after heat demand has ended.	●●
	Air flow switch keeps ON more than 5 minutes after heat demand has ended.	○●
All	1. Line voltage out of specs for more than 2 seconds 2. Line frequency out of range for more than 2 seconds 3. Excessive noise on power line or in the area 4. Internal device problem: CPU clock out of sync	○●

*1 : For LED indication, ○ means ‘off’, ● means ‘illuminated’.
The LEDs are arranged in the following order: Flame and Alarm at the left front side of the DBC1500.

*2 : If an error occurs during Standby, the DBC1500 will not lock-out but LEDs indicate the current error status.
In this case, the DBC1500 cannot start before the error is resolved.

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