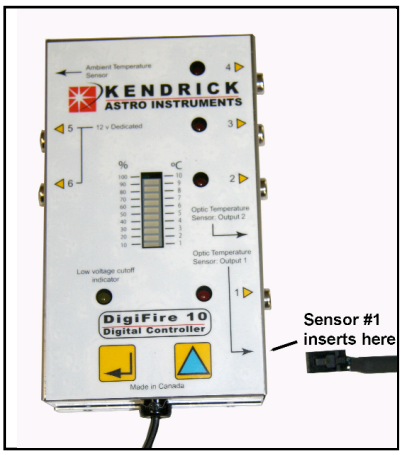
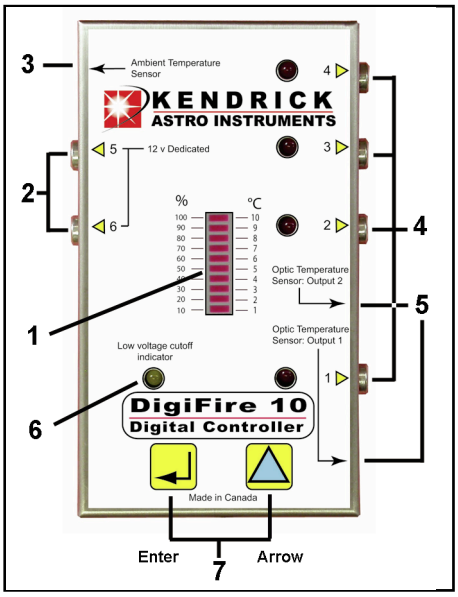
The Kendrick *DigiFire 10* Controller





#1.Bar Graph LED.
#2. 12VDC constant outputs.
#3. Built in ambient temperature sensor input.
#4. Programmable outputs.
#5. Optic Sensor inputs.
#6. Low Voltage Cut-off indicator.
#7. Programming Keys

Included with this controller:
- 1 x Optic temperature sensor (4')
- 1 x Velcro attachment
  Included sensor has been factory calibrated.

Specifications:
- Operating voltage: 12 VDC.
- Supplied fuse: 5 amps
- Maximum amperage output: 8 amps. (requires 8 amp fuse upgrade, owner supplied)
- Low voltage cut-off: 11.6 volts.
- Variable Power Control (**Duty cycle**): 0 to 100% (in 10 % increments). Outputs 1 through 4 only.
- Temperature sensing: Outputs 1 & 2 only.
- Programmable temperature variance: up to 10°C
- Temperature sensing accuracy: <1/2° @ 25°C
- Outputs 5 & 6: 12vdc constant.
- Adjustable temperature variance: 1° to 10° C
- No RFI (radio frequency interference).
- Firmware upgradeable.

OPERATING INSTRUCTIONS

Power up: Plug into a cigarette lighter plug on any 12VDC power source.
There will be no LED indication that the controller is actually on at this point.
The default settings for the outputs 1 through 4 on first time power up are 50%.
Outputs 5 & 6 will provide 12 vdc at power up.
Future power ups will default to the previous programmed settings and the LEDs will light up accordingly.

IMPORTANT PROGRAMMING NOTE:

Variable power control, known from here on as Duty Cycle, must be programmed into outputs 1 to 4 prior to entering in the temperature variance settings. If you are planning to only use outputs 1 & 2 for temperature sensing, we still recommend programming in the duty cycle presets for all 4 outputs because if there is an optical sensor fault, the output will default to duty cycle. Without a duty cycle preset, if you have a sensor failure, you will have no heat to your optic at all. Once this has been done, the programming of outputs 1 & 2 for temperature variance can be undertaken. The programming loop is as follows: Duty cycle for outputs 1, 2, 3, 4, then temperature variance for outputs for 1 and 2, then press the enter key to set the presets.
Note that your controller has been factory callibrated for the included sensors only. If additional or replacement sensors are obtained, you will need to refer to the **CALIBRATION** notes at the end of these instructions.

PROGRAMMING OUTPUTS (Duty Cycle)

Outputs 1 through 4 are programmable. In duty cycle, these outputs can be programmed to operate from 0% to 100% of duty cycle in 10% increments. In temperature variance , outputs 1 & 2 can be programmed to sense temperature and function in degrees above ambient air temperature.

Outputs 5 and 6 are non-programmable and are 12 volts constant. These can be used to power any 12 vdc accessories that do not exceed 10 amps (total amperage requirements of all the heaters and other accessories being operated from the controller must be taken into account).

Program output 1 (Duty Cycle)

To enter programming mode, press the Enter and Arrow keys simultaneously. Output #1 LED will come on. All other LEDs, will be off.

Press the arrow key. The LED bar graph will show the default setting for that output. Each press of the arrow key will increase duty cycle 10% and the bar graph will illuminate 1 segment per 10% increase in duty cycle. When you have reached the desired duty cycle % for this output, press the enter key to set output #1. This will also take you to output #2 and output #2 LED will light up.

Program output 2 (Duty Cycle)

Press the arrow key. Each press of the arrow key will increase duty cycle 10% and the bar graph will illuminate 1 segment per 10% increase in duty cycle. When you have reached the desired duty cycle % for this output, press the enter key to set output #2. This will also take you to output #3 and output #3 LED will light up.

Program output 3 (Duty Cycle)

Press the arrow key. Each press of the arrow key will increase duty cycle 10% and the bar graph will illuminate 1 segment per 10% increase in duty cycle. When you have reached the desired duty cycle % for this output, press the enter key to set output #3. This will also take you to output #4 and output #4 LED will light up.

Program output 4 (Duty Cycle)

Press the arrow key. Each press of the arrow key will increase duty cycle 10% and the bar graph will illuminate 1 segment per 10% increase in duty cycle. When you have reached the desired duty cycle % for this output, press the enter key to set output #4. This will take into the temperature programming mode for output #1. Output #1 LED will light up.

PROGRAMMING OUTPUTS (Temperature Sensing)

Important Note!

*Your controller and sensors have been factory calibrated. If at any time you purchase additional or replacement sensors, your controller and sensors will need re-calibration. This is a very simple process and information on how to do this is included in the "**CALIBRATION**" section of these instructions.*

Remember, only outputs 1 and 2 can be used to sense temperature. For this controller, we use the worldwide scientific standard of Celsius for our temperature calculations. A degree of Celsius is equal to 1.8 degrees Fahrenheit.
The controller can be programmed for an optic to ambient air temperature variance up to 10°C (= to 18°F). Typically, we recommend about 5° to 6° difference, depending on the size of your optic and site conditions. Your requirements may vary.

Program output 1 (Temperature Sensing)

After doing the final duty cycle programming for output 4 and pressing the enter key, you will now be in the Temperature Sensing programming mode for output #1. Output #1 LED will come on. Press the arrow key once for each degree of temperature variance you want between the optic being heated and the ambient air temperature. The LED bar graph will increment 1 segment for each increase of 1 degree. When you have reached the desired temperature variance for this output, press the enter key to set output #1. This will also take you to output #2 and output #2 LED will light up.

Program output 2 (Temperature Sensing)

Press the arrow key once for each degree of temperature variance you want between the optic being heated and the ambient air temperature. The LED bar graph will increment 1 segment for each increase of 1 degree. When you have reached the desired temperature variance for this output, press the enter key to exit programming mode and to save all the programming (duty cycle and temper-

Very important note:

If you do not plan to use a sensor in output 2 for temperature sensing, the temperature variance must be set to 0. Failure to do this will generate a sensor fault, the output will default to the duty cycle function and the red LED will flash indicating that you will need to set the temperature variance to 0. It will function in duty cycle with the LED flashing though.

The LEDs for outputs 1 through 4 will now be on. Note that the LEDs do not flash to correspond to the duty cycle and/or temperature presets. They only illuminate to indicate that their corresponding output is functioning. If an output has been set to "0", its' LED will be off.

TO REVIEW YOUR SETTINGS

Enter the programming mode by pressing both programming keys simultaneously. Press the enter key to review each output. Changes may be made to each output accordingly by pressing the arrow and enter keys as per the programming process. When reviewing settings you will need to go through the complete programming loop of 6 output settings. That is, outputs 1 through 4 (duty cycle) then outputs 1 and 2 (temperature sensing). To exit the review and run the controller, press the enter key once more.

Once set, the controller will remember your programming presets until you decide to change them.

SOME RECOMMENDED SETTINGS (DUTY CYCLE)

- For eyepieces and telescopes up to 90mm in optical diameter, we recommend a setting of about 20% to 30%.
- For optics from 90mm to 155mm, we recommend a setting of about 30% to 50%.
- For optics from 155mm and up, we recommend a setting of about 40% to 60%.
- Please note that these settings are only suggested settings based on our experience for observing on a moderately humid summer night with air temperatures about 15° to 24° C (60° to 75° F). You will need to adjust for your conditions, site and equipment accordingly.

LOW VOLTAGE CUT-OFF

This function will turn off the controller when your battery reaches 11.6 volts. The LED flashes on and off when the battery voltage has reached 11.8 volts. The length of time from when the LED starts to flash and then goes solid will vary, depending on how much current is being drawn from your battery. When the cut-off voltage has been reached the low voltage cut-off LED indicator will stop flashing and be on solid.

TROUBLESHOOTING

Outputs 1 & 2 LEDs are flashing.

Indicates a faulty ambient temperature sensor. Contact Kendrick.

Output 1 OR 2 LED is flashing.

Indicates a faulty optic temperature sensor. Make sure the sensor is properly seated into the controller or contact Kendrick.

No LEDs are on.

1. May indicate a blown fuse. See "Changing Fuses" below.

A blown fuse does indicate a problem somewhere, most likely with one of the heaters or accessories being run by the controller. Unplug all items from the controller, change the fuse, power up the controller and then plug the heaters and accessories in one at a time until the fuse blows again. This will be the defective item. If it is a Kendrick product that is blowing fuses, call us for further instructions.

2. Your power source may be dead. Check the viability of your power sources.

Changing Fuses

The fuse is located in the cigarette lighter plug of the controller.

To access the fuse, push in the center tip of the plug, turn counter-clockwise 1/2 turn and pull out the tip. The fuse will be now be visible. Replace with an appropriate 7 or 8 amp automotive fuse.

CALIBRATION

Your controller has been factory calibrated. You will only need to calibrate if you have obtained additional or replacement sensors. Please note that the optic sensor included with your controller has a number " 1" written on the velcro tab. For optimum performance, it should only be used on output 1. It can be used on output 2 if you wish but the accuracy of the sensor will be off by up to 2 or 3 degrees.

Calibration must be done in temperatures between 16°C and 25°C. Do not attempt otherwise. To recalibrate your controller, make sure you inserted all the sensors into their appropriate outputs, press and hold both programming keys and THEN plug the controller into a power supply

Calibration continued

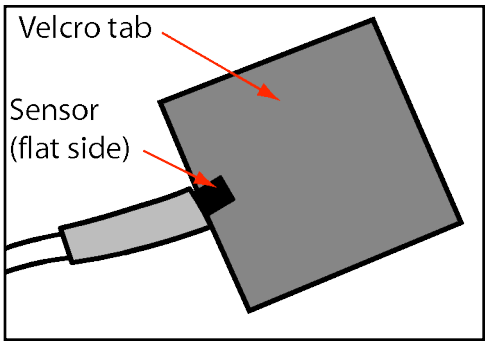
The LED bar graph will show the bottom bar lit up as well as outputs 1 & 2. The bottom bar on the bar graph represents the calibration base line of 16°C. Press the arrow key for every degree above 16°C that the actual air temperature is. In otherwords, if your room temperature is 20°C, you will need to move the bar up 4 increments. Pressing the enter key will set the calibration and move you to output 2. Follow the same procedure for output 1 to calibrate output 2. Press the enter key to exit. If you do not wish to calibrate output 2 then pressing the enter key will exit you from calibration mode.

Calibrating in Fahrenheit

If you only have access to a Fahrenheit thermometer, you may use Fahrenheit degrees to calibrate but you have to do some math. Your base line constant will be 60.8°F. You must callibrate between 60.8° and 77°F. Each bar on the LED graph will represent 1.8°F.

PLACEMENT OF SENSORS

The sensor (the small black device at the end of the cable) is sandwiched between the heater and the telescope, midway from either edge of the heater. The sensor is placed so that the flat side of the sensor is in contact with the telescope and not the heater. The velcro tab is then flipped back onto the back side of the heater. This will hold the sensor securely in place.



As shown above, slip the sensor under the heater. The sensor should be underneath the heater and located about midway from either edge of the heater. The flat side of the sensor must be facing the telescope, not the heater.

Then, flip the velcro over onto the back of the heater. This will securely hold the sensor in place.