

## X10 KIT - Assembly Instructions (Revision 1)

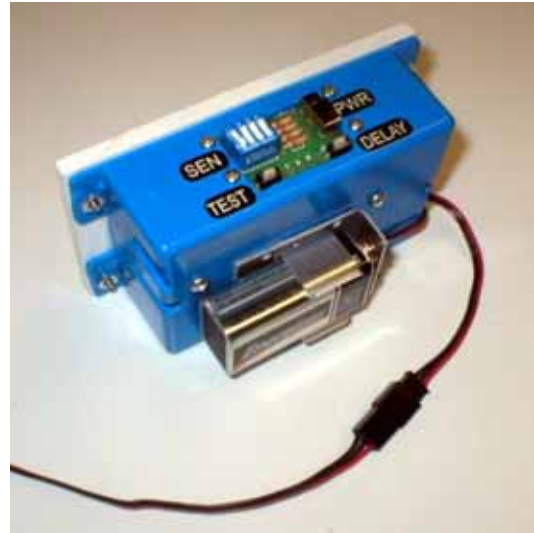
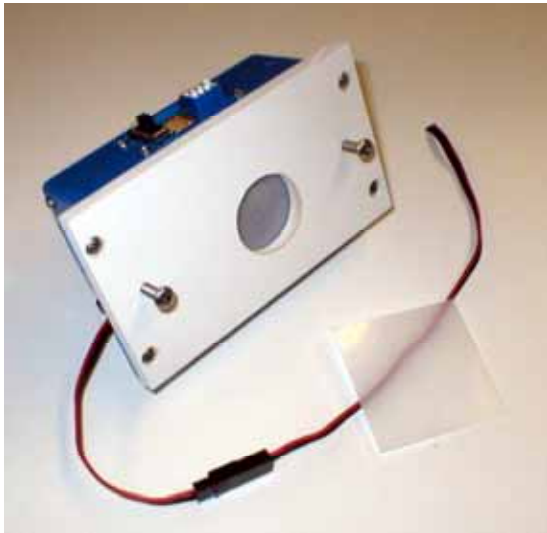
Revised 1/20/04

The X10 Kit is a “do it yourself” homemade trail camera sensor kit, which requires assembly of the electronic components and parts to produce the sensor. The completed kit is an all-inclusive trail camera sensor once it’s assembled.

The finished X10 Kit features:

- 9 selectable time delays w/ delay check.
- Double picture mode in all time delays.
- Automatic return to normal mode from test mode.
- LED signal in test mode when sensor is triggered.
- DIP switch sensitivity adjusts from 20 to 70 feet.
- Day / night / both selectable settings.
- Power supply control switch.
- Delay and test function push button switches.
- 3 wire servo camera connector.
- 9-volt battery holder.
- Idle current power drain measured at 60uA.
- Pre-aligned Fresnel lens with poly IR material for the enclosure hole.
- Completely enclosed electronics after assembly.
- Choice of PIC chips to run different cameras.
  - [HT629 \(X10\) PIC Chip](#)
  - [629/P32 \(X10/P32\) PIC Chip](#)

Single 9-volt battery will power the X10 Kit for 6 months +



Finish size: 4 1/4" (L) by 2 1/2" (H) by 2 1/2" (D)

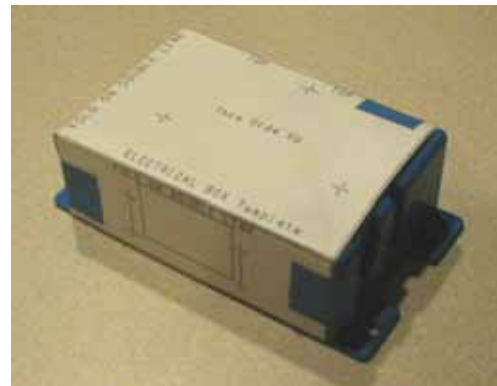
X10 Kit Assembly Instructions: (Items in **Red** are not included within the X10 Kit.)

**Electrical Box Modification:**

1. Locate the ELECTRICAL BOX drilling template and cut out the template along the single borderline.



2. Fold the template along the double lines and **tape** the corner to form the 3D Electrical Box drilling template.



3. Position the template over the electrical box and **tape** the template securely.

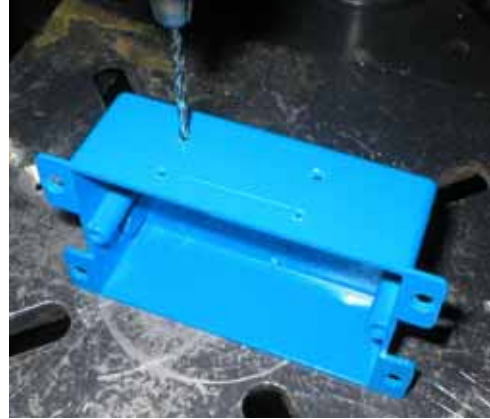


4. **Center punch** the 9 holes marked by a cross with a small circle.

5. Scribe the rectangle outline for the control panel.



6. Remove the template and **drill** the side panel punch marks to  $3/32$ " diameter holes.

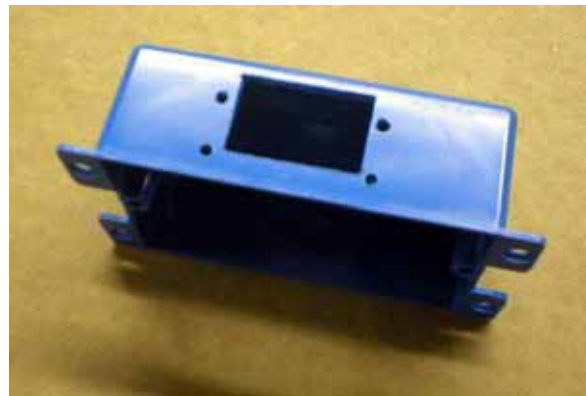


7. **Drill** the bottom punch marks to  $1/8$ " diameter holes.



8. **Drill** the electrical box cover screw holes to  $9/64$ " diameter holes

9. Carefully cut out the control panel rectangle within the scribed outline.



## Fresnel Lens Cover Modification:

1. Locate the FRESNEL COVER drilling template and cut out the template along the single borderline.
2. Position the template over the white Sintra board Fresnel lens cover and **tape** the template securely.



3. **Center punch** the 7 holes marked by a cross with a small circle.



4. Remove and **SAVE** the template and **drill** the 4 corner punch marks to **1/8"** diameter holes

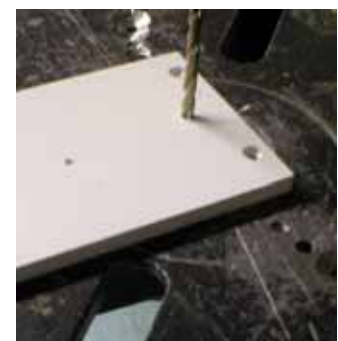


Countersunk Hole

5. Countersink these 4 holes with a **7/32"** drill bit to approx. 1/3 the thickness of the Sintra board.



6. **Drill** the 2 outside center punch marks to **9/64"** diameter holes.



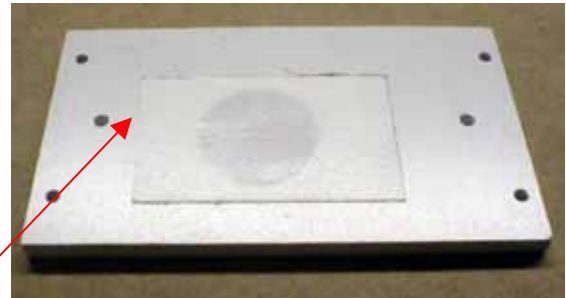
7. **Drill** the 1 center punch mark to 1" diameter hole.

\*(Sintra board can be drilled with conventional wood working drill bits.)



8. Locate the 6" piece of double sided carpet tape and the LODIFF pattern Fresnel lens.  
9. Cut the carpet tape into (3) 2" pieces and proceed with one piece.  
10. Center the carpet tape over the 1" hole on the **BACKSIDE** of the Sintra board Fresnel lens cover.

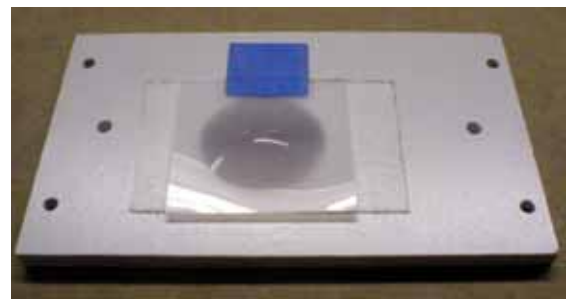
\*(Make sure the tape is on the opposite side from the side that was center punched)



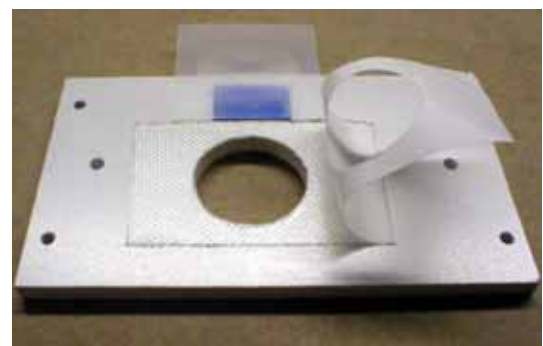
11. Cutout the tape that covers the circle on the Sintra board Fresnel lens cover.



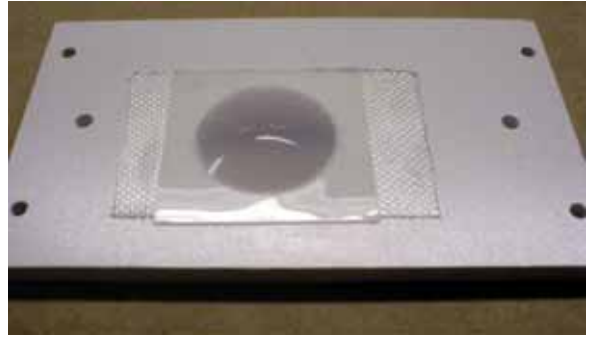
12. **Hinge tape** the Fresnel lens with the circular pattern aligned to the edge of the 1" hole. Smooth side of the Fresnel lens is down.



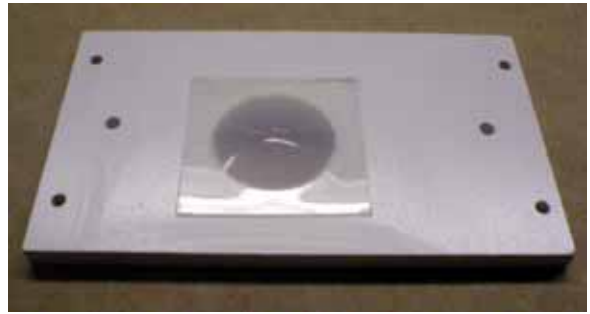
13. Hinge the Fresnel lens and remove the carpet tape backing to expose the second adhesive side of the tape.



14. Hinge the Fresnel lens back into the adhesive and remove the hinge tape.



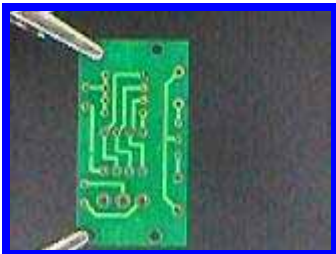
15. Cut along the edge of the Fresnel lens to remove the excess carpet tape.



\*(The following 5 sections will require tinning of wires and soldering/desoldering of components to complete the assembly of the X10 Kit.)

- Use a **low watt soldering iron**, preferably 15 watt. [Radio Shack #64-2005](#)
- **Rosin core electronic solder** with a low melting point. [Radio Shack # 64-005](#)
- Use a **desoldering iron** for removal of components. [Radio Shack #64-2060](#)

### Soldering and Tinning Videos:



[How to Solder Video](#)



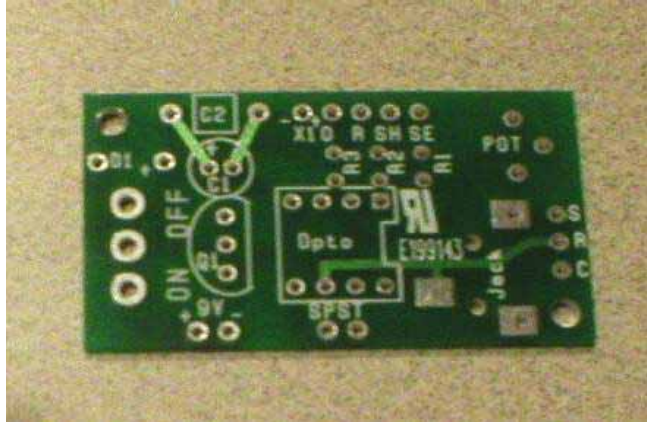
[How to Tin Wires Video](#)

## X10 Opto Board Modification:

1. Locate the silver static protection bag and remove components.

\*(Use caution when handling static sensitive parts.... make sure your grounded.)

2. Locate the X10 opto pc board and note the printed symbols on the topside of the board.



3. Locate the TO-92 voltage regulator \*(static sensitive) and position the regulator in the same direction as the printed symbol Q1 with the leads pointed down.
4. Slightly spread the leads and insert and solder the regulator into the three holes marked Q1 on the X10 opto board.
5. Locate, insert and solder the blue 10V100uF electrolytic capacitor into the two holes marked C1 on the X10 opto board.

\*(The long capacitor lead goes in the hole next to the + sign)

6. Locate, insert and solder the green 50V.1uF polyester film capacitor into the two holes marked C2 on the X10 opto board.

\*(Orientation of the capacitor leads is not critical.)

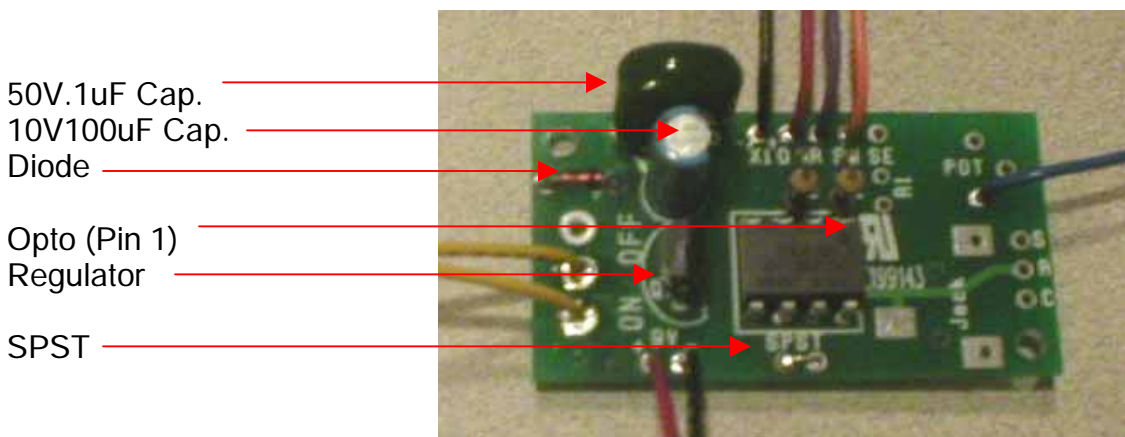
7. Locate the 8 pin dual optocoupler #PS2501-2\*(static sensitive) and note the small dot on top the optocoupler that denotes pin 1.
8. Insert and solder the optocoupler into the 8 holes marked Opto on the X10 opto board.

\*(Make sure pin 1 is in the upper right hand corner - see photo below.)

9. Locate the single junction diode \*(static sensitive) and note the black collar on one end of the diode.
10. Bend the diode leads to 90 degrees and insert and solder the diode into the holes marked D1 on the X10 opto board.

\*(The lead on the black collar end of the diode goes in the right diode hole next to the + sign - see photo below.)

11. Locate the (2) 1K resistors and bend one lead of each resistor to 180 degrees.
12. Insert and **solder** the resistors into the holes marked R2 and R3 on the X10 opto board.
13. Clip the leads from all the components after soldering.
14. Strip and tin the two **yellow wires** and **solder** them into the two large lower holes beside the ON/OFF on the X10 opto board.
15. Strip and tin one each of the **red** and **black wires** and **solder** the red wire into the 9V (+) hole and the black wire into the 9V (-) hole on the X10 opto board.
16. Strip and tin one each of the **red** and **black wires** and **solder** the red wire into the X10 (+) hole and the black wire into the X10 (-) hole on the X10 opto board.
17. Strip and tin the **purple** wire and **solder** it into the R hole on the X10 opto board.
18. Strip and tin the **orange** wire and **solder** it into the SH hole on the X10 opto board.
19. Strip and tin the **blue** wire and **solder** it into the POT lower hole on the X10 opto board



#### SPST solder pad options:

1. If the finished sensor is to be used for a digital trail camera, bend one of the components clipped leads from step 13 to 180 degrees and **solder** into the SPST holes on the X10 opto board.
2. If the finished sensor is to be used for a 35mm trail camera, **solder two wires** into the SPST holes on the X10 opto board. These two wires are connected to a **remote SPST switch** and allow the end user to turn off the 35mm camera when checking the trail camera. The switch is designed to disarm the camera and not waste film when checking the trail camera.

20. Locate the (4) 2-56 by 3/8" machine screws and the (2) 1/4" hex aluminum standoffs.
21. Secure the standoffs to the underside of the X10 opto board with 2 of the machine screws.



22. Locate the 3-wire servo extension and cut the extension in half.

23. Pass the extension through the slot in the side of the electrical box, starting from outside the enclosure.



24. Separate, strip and tin the three wires on the end of the servo extension.

25. **Solder** the three wires into the (s) shutter, (r) refresh, and (c) common holes on the X10 opto board.

26. Use the other half of the servo extension as the wiring harness for the camera.

27. Match the wire colors to the same shutter, refresh and common solder points within the selected camera's modifications. [\\*See Note Below](#)

[\\*\(Review the different Camera Modification instructions for proper wiring of selected camera.\)](#)

28. Pass the black and red wires from the 9V(+) and 9V(-) solder pads out the same slot in the side of the electrical box, starting from inside the enclosure.

29. Mount the completed X10 opto board to the inside of the electrical box with the 2 remaining machine screws.



## X10 Sensor Modification:

1. Locate the X10 Eagle Eye sensor and open the enclosure and remove the X10 pc board.
2. **Desolder** and discard the battery springs from the board.
3. **Desolder** and discard the R3 resistor from the board.
4. **Desolder** and discard the R15 resistor from the board.
5. **Desolder** and discard the U1 PIC chip from the board.
6. **Desolder** and discard the green LED from the board.
7. **Desolder** and discard the red LED from the board.
8. **Desolder** and **SAVE** the (2) N.O. Push Button switches from the board.

Red LED

R15 Resistor

Green LED

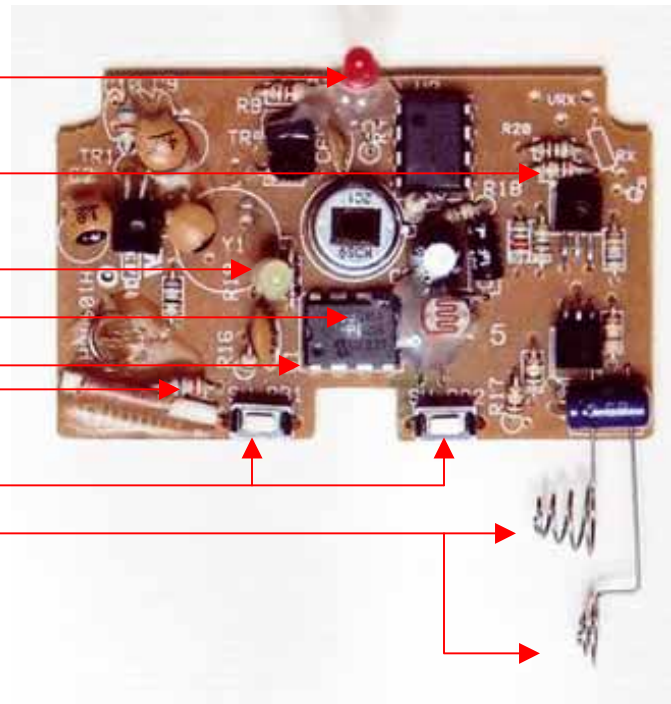
U1 PIC Chip

(Pin 1 Dot)

R3 Resistor

N.O. Push Button Switch

Battery Springs



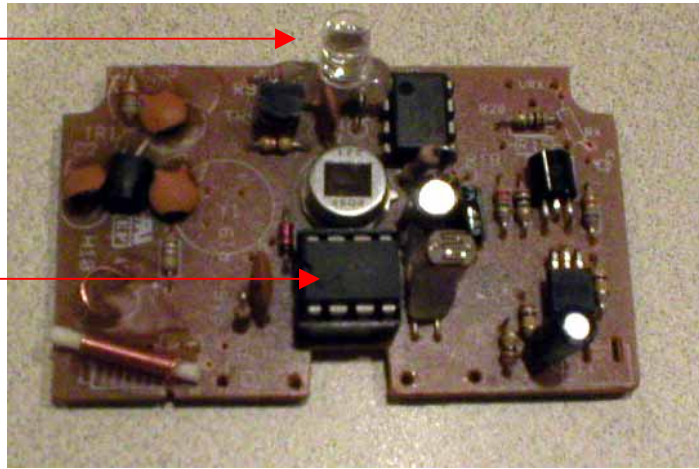
9. Locate, insert and **solder** the Ultra Bright Clear LED into the same holes the red LED was removed from.

\*(The long lead of the Ultra Bright LED goes in the right hole.)

10. Locate, insert and **solder** the 8 pin IC socket into the same holes the U1 PIC chip was removed from.
11. Locate the selected 8 pin X10 PIC chip #12F629 \*(static sensitive) and note the small dot on top the chip which denotes pin 1.
12. Insert the selected X10 PIC chip into the 8 pin IC socket.

Clear LED

X10 PIC Chip



\*(Make sure pin 1 is in the lower left hand corner - see photo below.)

13. Locate and **cut** the bottom half of the original X10 sensor enclosure removing the battery compartment.

14. Remove the enclosure nut from the bottom center hole of the X10 sensor enclosure.

15. **Drill** the bottom center hole to **1/8"** diameter.



16. Locate the (3) 4-40 by 3/4" machine screws, (3) 1/4" spacers and (3) 4-40 nuts.

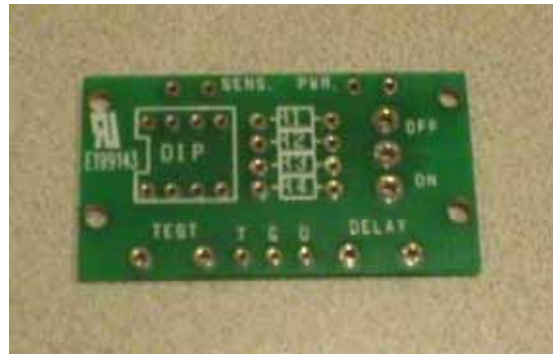
17. Mount the X10 sensor enclosure inside the electrical box with the (1) center machine screw starting at the X10 sensor enclosure's bottom center hole, thru a 1/4" spacer and secured on the outside of the electrical box with a 4-40 nut.

18. Insert the (2) corner machine screws the opposite way with the screws starting outside the electrical box, thru the (2) 1/4" spacers and the threaded ends protruding from the two corner holes on the X10 sensor enclosure. Do not secure with the (2) 4-40 nuts at this time.



### Control Panel Modification:

1. Locate the clear plastic bag with the control panel pc board and remove components.
2. Locate the control panel pc board and note the printed symbols on the topside of the board.



3. Locate the (4) 270K resistors and bend the leads to 90 degrees.
4. Insert and **solder** the four resistors in R1, R2, R3 and R4.
5. Locate, insert and **solder** the 4-position DIP switch into the 8 holes marked DIP on the control panel.
6. Locate, insert and **solder** the SPDT slide switch into the three large holes marked ON/OFF on the control panel.
7. Locate the (2) N.O. Push Button switches from step 8 above.
8. Insert and **solder** the N.O. Push Button switches in the holes marked TEST and DELAY on the control panel.



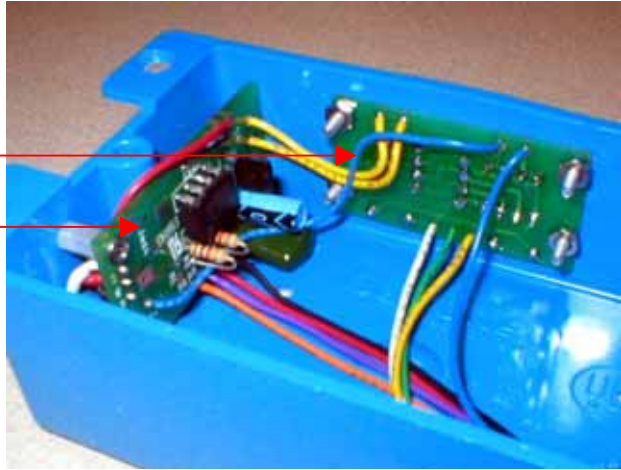
\*(Solder all wires in steps 9 thru 15 so they hang from the bottom of the control panel.)\*

9. Strip and tin the green wire and **solder** it into the G hole on the control panel.
10. Strip and tin the white wire and **solder** it into the D hole on the control panel.
11. Strip and tin the yellow wire and **solder** it into the T hole on the control panel.
12. Strip and tin the blue wire and **solder** it into the left SENS. hole on the control panel.
13. Collect the (2) yellow wires and the blue wire from the X10 opto board.
14. Strip and tin the (2) yellow wires and **solder** them into the (2) PWR. holes on the control panel.
15. Strip and tin the blue wire and **solder** it into the right SENS. hole on the control panel.
16. Locate the (4) 2-56 by 1/2" machine screws and (4) 2-56 nuts.
17. Mount the control panel inside the electrical box with the machine screws and nuts.

Inside View:

Control Panel

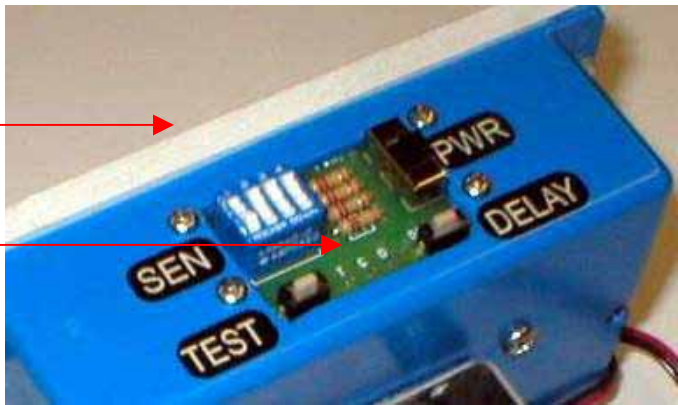
X10 Opto Board



Top View:

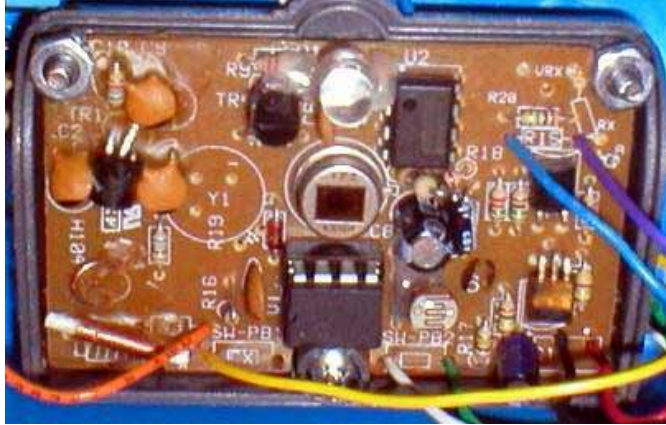
Sintra Board  
Fresnel Lens Cover

Control Panel



### X10 Sensor Finish Wiring:

1. Collect the purple (R), orange (SH), red (X10 +), and black (X10-) wires from the X10 opto board.
2. Collect the blue (SENS.), green (G), white (D), and yellow (T) wires from the control panel pc board.
3. Strip and tin the blue wire (SENS.) and **solder** it into the left hole of R15 on the X10 sensor.
4. Strip and tin the purple wire (R) and **solder** it into the right hole of R15 on the X10 sensor.
5. Strip and tin the orange wire (SH) and **solder** it into the right hole of R3 on the X10 sensor.
6. Strip and tin the black wire (X10-) and **solder** it into the left battery spring hole on the X10 sensor.
7. Strip and tin the red wire (X10+) and **solder** it into the right battery spring hole on the X10 sensor.
8. Strip and tin the green wire (G) and **solder** it into the right hole of SW-PB2 on the X10 sensor.
9. Strip and tin the white wire (D) and **solder** it into the left hole of SW-PB2 on the X10 sensor.
10. Strip and tin the yellow wire (T) and **solder** it into the left hole of SW-PB1 on the X10 sensor.
11. Position the X10 sensor in the X10 sensor enclosure within the electrical box.
12. Locate the (2) 4-40 nuts and secure the X10 sensor on the protruding 4-40 by 3/4" machine screws in the corners of the X10 sensor enclosure. DO NOT OVERTIGHTEN.



## X10 Kit Finish Assembly:

1. Locate one of the 2" pieces of carpet tape.
2. Apply the tape to the back of the 9V battery holder and **trim** excess.
3. Remove the top liner on the tape and apply the battery holder to the back of the electrical box.

\*(Position the battery holder so the solder tabs are on the same end as the red (9V+) and black (9V-) wires from the electrical box.)

4. Strip and tin the red wire (9V+) and **solder** it to the bottom solder tab on the 9V battery holder.
5. Strip and tin the black wire (9V-) and **solder** it to the top solder tab on the 9V battery holder.
6. Locate the Sintra board Fresnel lens cover, (2) 6-32 by 2" machine screws and (2) 6-32 knurled nuts.
7. Position the Sintra board Fresnel lens cover over the electrical enclosure with the fresnel lens on the inside and the 1" fresnel lens hole over the IR element of the X10 sensor.



\*(The IR element is the round component with the rectangle glass window in the middle)

8. Insert the (2) 6-32 by 2" machine screws thru the Sintra board Fresnel lens cover and into the cover screw holes on the side of the electrical box. Secure with the (2) 6-32 knurled nuts.
9. Locate the (4) 4-40 by 3/8" machine screws and (4) 4-40 nuts.
10. Insert the (4) 4-40 machine screws in the four counter sunk holes on the Sintra board Fresnel lens cover and secure the cover to the electrical box with the (4) 4-40 nuts.
11. Remove the (2) 6-32 knurled nuts and (2) 6-32 by 2" machine screws.



\*(These are used later to mount the completed X10 kit to the trail camera)

12. Locate sheet of labels and apply labels to electrical box near control panel.



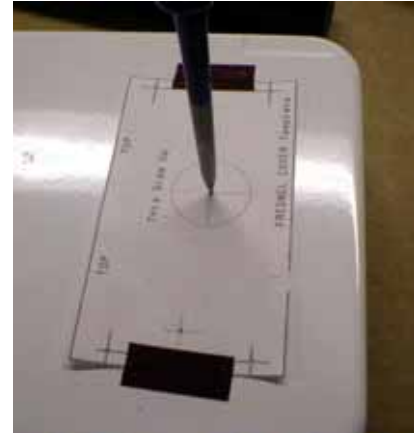
**CONGRATULATIONS YOU COMPLETED ASSEMBLY OF THE X10 KIT.**

Proceed to the [selected PIC chip operating instructions](#) to test the completed assembly.

Once testing is complete:

**Trail Camera Assembly:**

1. Relocate the FRESNEL COVER drilling template.
2. With the writing up on the template, **tape** the template on the outside of the trail camera enclosure.
3. **Center punch** the Fresnel lens hole and the (2) outside center holes on template.



4. Remove the template and **drill** the center hole to **1"** diameter and the (2) outside center holes to **9/64"** diameter holes.



5. Locate the last piece of 2" carpet tape.
6. Position the tape over the 1" Fresnel lens hole on the inside of the trail camera enclosure.
7. **Cut** out the tape that covers the 1" hole.



8. Remove the top liner of the tape and position the 2" by 2" poly IR Square over the tape.
9. Press the poly IR Square firmly into the adhesive.
10. Seal the edge of the Poly IR Square with **silicone sealant**.





11. Position the complete X10 Kit inside the trail camera enclosure with the Sintra board Fresnel lens cover 1" circle lined up with the trail camera enclosure 1" circle.
12. Locate the (2) 6-32 by 2" machine screws and (2) 6-32 knurled nuts.
13. Secure the X10 Kit to the trail camera enclosure by passing the (2) 6-32 by 2" machine screws thru the trail camera enclosure, thru the Sintra board Fresnel lens cover, thru the cover screw holes of the electrical box and secured with the (2) 6-32 knurled nuts.



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Additional Notes: