



Wildland Fire Remote Monitor

For years, fire department administrators have struggled to find an alternative to having firefighters ride on the outside of a moving vehicle to spray wild fires. Using a remote control nozzle is one alternative.

Following research and design, the Kansas Forest Service Fire Shop has produced the first Kansas Forest Service remote wildland fire monitor. Its pieces are readily available and inexpensive.

The monitor is made from standard galvanized pipe and elbows. Two, 1-inch swivel joints for booster reels are also used. A straight swivel allows the nozzle to sweep horizontally, and a 90-degree swivel provides vertical motion. To top it off, a standard twist type nozzle is used.

As seen in Figure 1, the parts of the monitor that provide its utility are two actuators. The actuators represent more than 50 percent of the price to complete the project, and substantial repair bill if damaged. Both actuators have exposed wiring, which could be a concern. However, they produce approximately 45 degrees of vertical and 105 degrees of horizontal travel, allowing the operator to direct a water stream to both

sides of the truck or up in the air for distance. Attaching the actuators to the monitor and the monitor to the truck involves some fabrication of brackets. Standard welding, cutting, and filing tools, are needed for construction. (See included diagrams and photos.)

Easily obtained, inexpensive pieces are used to control the motion of the monitor. The control box can be purchased at a retailer, such as Radio Shack, and mounted in a convenient location in the cab.

The location for the control box must be accessible to either the driver or passenger. At a minimum, two switches are needed to control horizontal and vertical movement, and the type of control switch depends on availability and personal preference.

The Kansas Forest Service demo control box also has a third switch to operate an air-actuated valve to control water flow. It is not necessary, but it takes advantage of the existing air systems in most



Figure 1. Mounted remote monitor

military vehicles. While the pump is running, the operator can turn the water on or off, as needed, from inside the cab. If a truck doesn't have an air system, a standard in-line valve with "through the floor" controls can also be used. The plumbing should have a bypass line built into the system to keep the pump cool if it runs for extended periods without water flowing through the lines.

The Parts

The parts needed to build the remote monitor are listed below, with part/model numbers, sources of supply, and the approximate cost of the major pieces (number needed in parenthesis).

Local hardware store:

- 1-inch × 12-inch nipples (2)
- 1-inch 90-degree elbows (2)
- 1-inch street elbows (2)
- 1-inch × 2-inch (maximum) close nipple (1)
- 1-inch × 3-inch nipple (1)
- 1-inch × 1½-inch nipple (1)
- 1-inch hose barb (1)

- 1-inch floor flanges (2)
- Gaskets (2 - sheet rubber)
- Thread tape or thread dope

Various vendors:

1-inch NPT Hannay straight swivel joint, Cascade Fire Equipment, part number 11673, \$80 (1)

1-inch NPT Hannay 90-degree swivel joint, Cascade Fire Equipment, part number 11672, \$80 (1)

1-inch adjustable pattern aluminum “KK” nozzle [(10 to 25 GPM, NPSH (pipe) threads)], various suppliers; may be ordered through The Kansas Forest Service (1)

8-inch actuators, Duff-Norton model number TMD01-1906-8, Grainger, item number 5ZC46 (12-volt, also available in 24-volt), \$190 each (2)

Hobby box (control box), various sizes available, Radio Shack part number 270-1807, \$5.99 (1)

DPDT self-centering switches, Radio Shack part no. 275-709, \$4.49 (2)

SpeedAire ¾-inch bore, 6-inch stroke air cylinder Grainger, model no. 6W129, \$25 (1 - optional)

Figure 2.

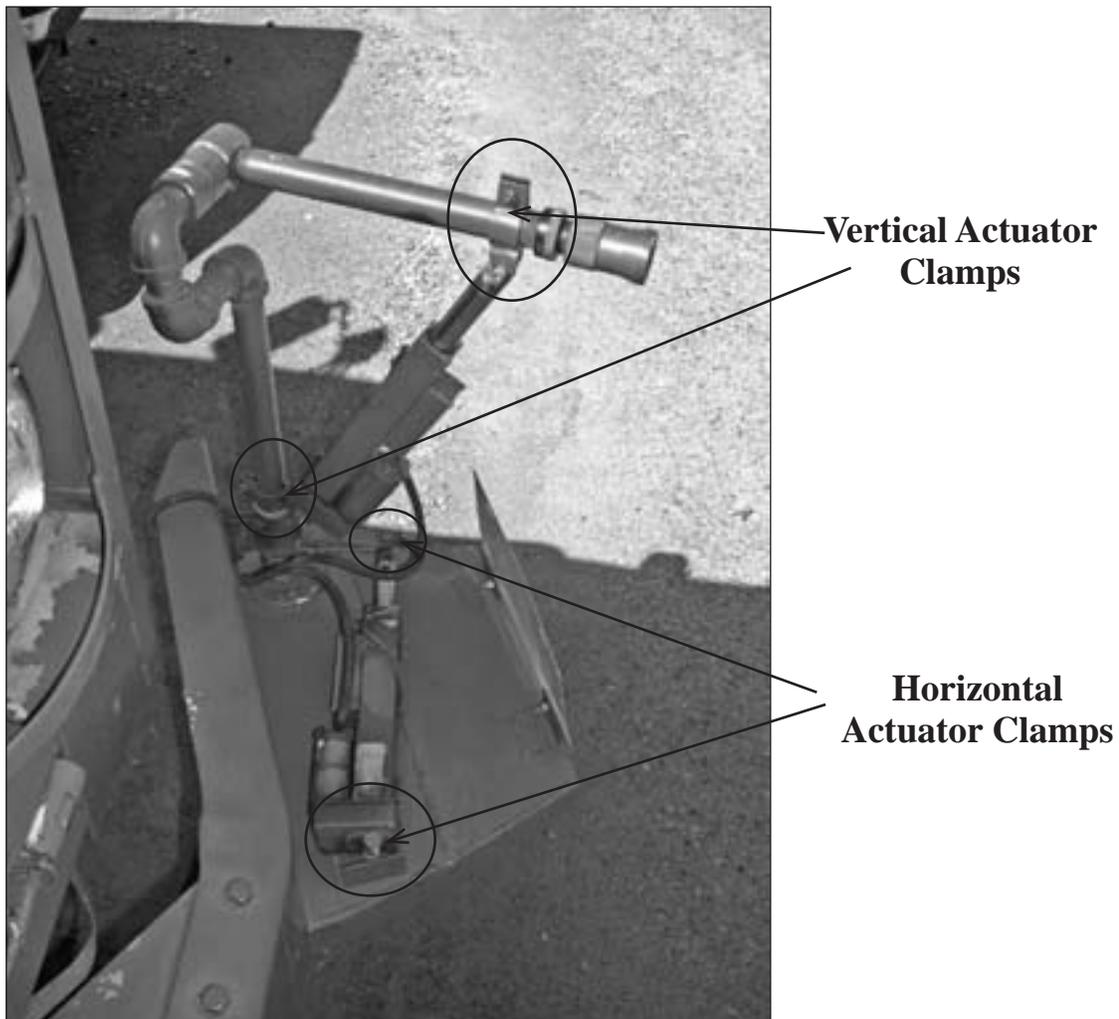
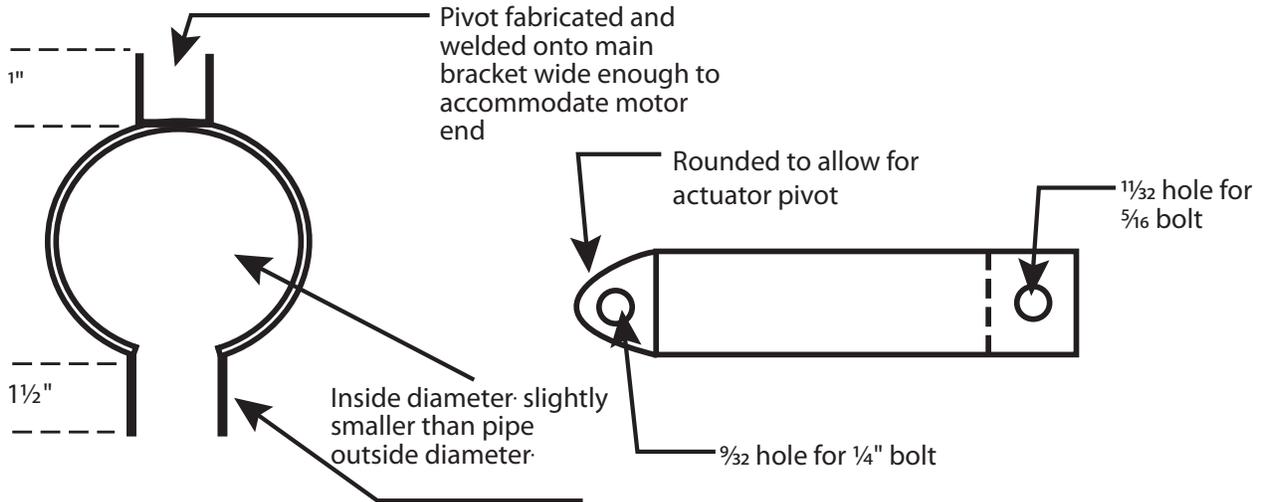


Figure 3. Vertical actuator clamps

Vertical Actuator Clamps



Actuator clamps to be fabricated from 1/8" x 1" flat stock

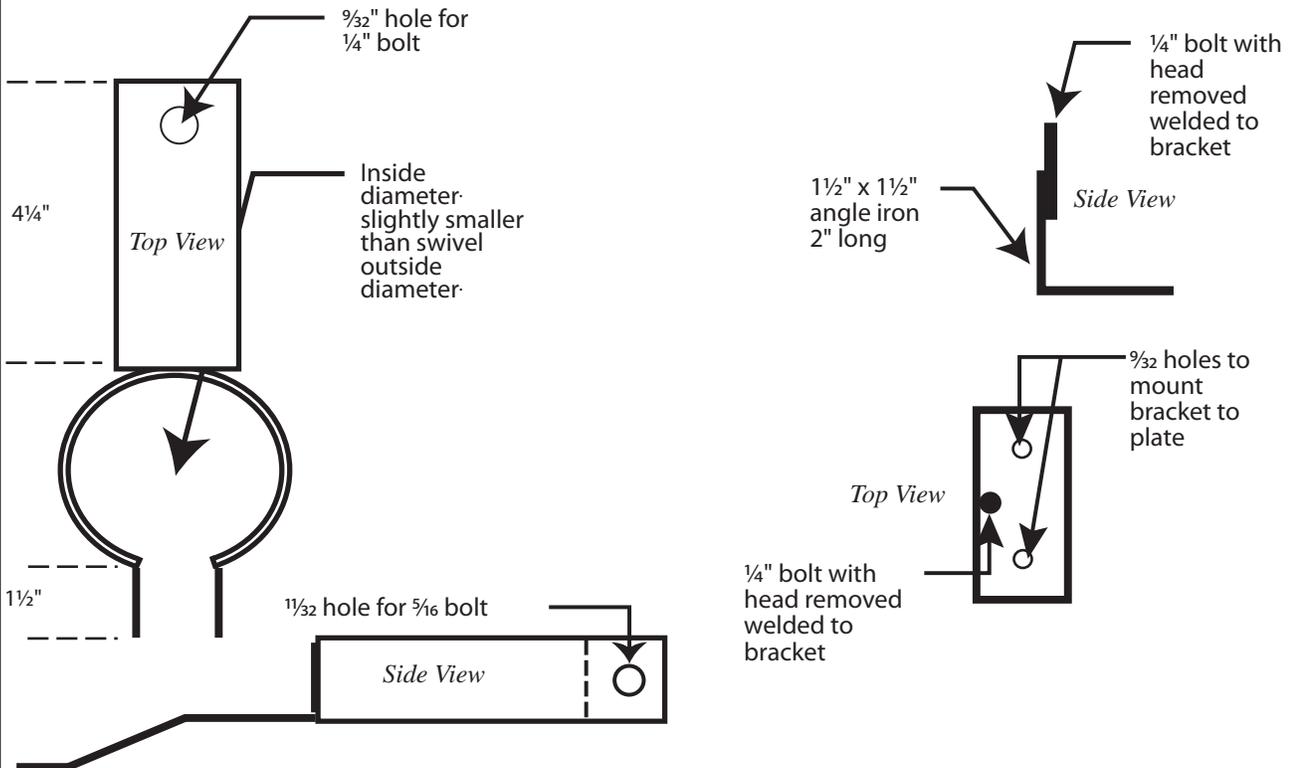
Assembly Instructions

Note: A letter following a figure number in the assembly instructions refers to the part in that figure.

1. Fabricate horizontal and vertical linear actuator clamps. (Figures 3 and 4)
2. Insert close nipple into one floor flange. NOTE: All threaded connections should use pipe tape or pipe dope. (Figure 5 G)
3. Install straight reel swivel joint onto nipple installed into floor flange, short side toward flange. (Figure 5 F)
4. Slide horizontal actuator clamp onto swivel, leave loose. (Figure 5 E)
5. Install one 12-inch nipple into straight reel swivel. (Figure 5 B)
6. Slide vertical actuator clamp onto 12-inch nipple, leave loose. (Figure 5 J)
7. Install one 90-degree elbow onto the 12-inch nipple. (Figure 6 D)
8. Install the 3-inch nipple into the elbow. (Figure 6 E)
9. Install a second 90-degree elbow onto the 3-inch nipple, ensure that the two elbows are perpendicular to each other. (Figure 6 D)
10. Install 1/2-inch nipple into the elbow. (Figure 6 C)
11. Install the street elbow onto the 1/2-inch nipple; the threaded end of the nipple should be parallel to the lower elbow (the threaded end should point back to the 12-inch nipple). (Figure 6 B)
12. Install 90-degree reel swivel onto the threaded end of the street elbow, short end on the elbow. (Figure 6 A)

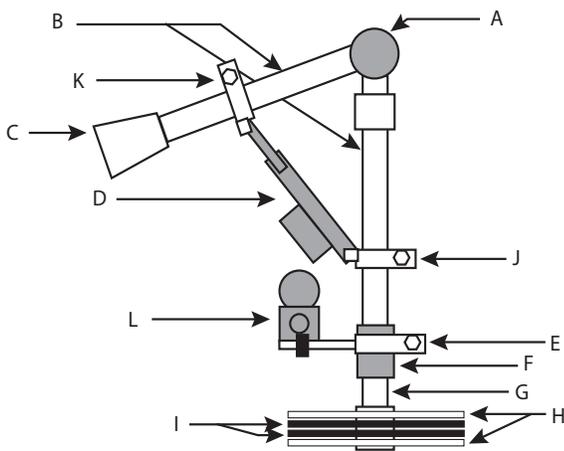
Figure 4. Horizontal actuator clamps

Horizontal Actuator Clamps



13. Install remaining 12-inch nipple into the swivel. (Figure 5 B)
14. Install vertical actuator clamp onto 12-inch nipple, leave loose. (Figure 5 K)
15. Install KK nozzle onto the end of the 12-inch nipple. (Figure 5 C)
16. Determine mounting location on truck. Try to place in a location where the driver can see the monitor and the monitor will not interfere with normal truck operations (tilt hood, etc.)
17. Fabricate a mounting plate that will fit the chosen location. The base plate should be at least $\frac{1}{4}$ -inch thick material and be long enough to mount the monitor and the horizontal actuator. Mounting plate design and location will vary depending on the truck design.
18. Attach the mounting plate to the truck.
19. Attach the monitor assembly to the mounting plate. Place fabri-

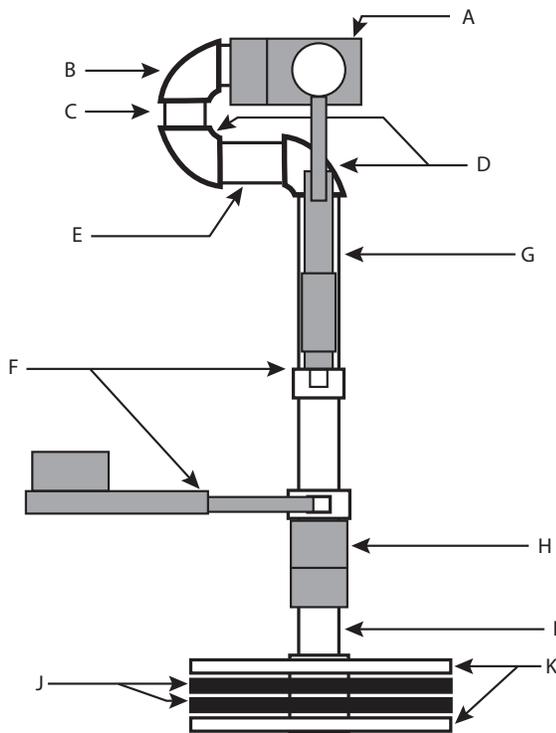
Figure 5. Side view of remote monitor assembly



- A - 1" 90 Degree Hannay reel swivel
 - B - 2 ea. 1" x 12" nipples
 - C - 1" KK nozzle W/NPSH thread
 - D - Vertical actuator
 - E - Horizontal actuator clamp
 - F - Straight Hannay reel swivel
 - G - 1" x 2" close nipple
 - H - 2 ea. floor flanges
 - I - 2 ea. gaskets (fabricate from sheet rubber)
 - J - Vertical actuator clamp
 - K - Upper vertical actuator clamp
 - L - Horizontal actuator
- Note: All pipe parts are galvanized pipe



Figure 6. Front view of remote monitor assembly



- A - 1" 90 degree Hannay reel swivel (Not Shown 1" x 12" pipe nipple, 1" KK Nozzle)
 - B - 90 degree street elbow
 - C - 1" x 1 1/2" nipple
 - D - 2 ea. 1" 90 degree elbows
 - E - 1" x 3" nipple
 - F - 2 ea. linear actuators
 - G - 1" x 12" nipple
 - H - Straight Hannay reel swivel
 - I - 1" x 2" close nipple
 - J - 2 ea. gaskets (fabricated from sheet rubber)
 - K - 2 ea. floor flanges
- Note: All pipe parts are galvanized pipe



cated gaskets between mount and floor flanges. (Figure 6 J)

20. Mount the vertical actuator to the actuator clamps; adjust the clamps to achieve approximately a 45-degree down angle at the monitor with the actuator fully retracted. (Figure 5 D)
21. Mount the horizontal actuator to the clamps. (Figure 5 L) The

ram part of the actuator will attach under the pivot bracket. The pivot bracket should line up with the nozzle. It will need to have a spacer installed to allow free movement. Extend actuator all the way out and adjust the clamps until the nozzle is as far toward the outside of the truck as possible without the actuator hitting the vertical standpipe.

Locate and mark the mounting angle for the rear of the actuator, drill and attach horizontal actuator clamp. At this point, the nozzle should look similar to Figure 7.

22. Route electrical harness from inside of the truck to the actuators and connect as shown. (Figure 8)

23. Route water supply to monitor.
The water supply to the monitor can be plumbed in various ways depending on the fire department and the truck.
24. Test actuators to ensure freedom of movement.
25. Test and adjust monitor for desired pattern and water flow.

Potential Limitations

The Kansas Forest Service version lacks one feature most commercial models have – the ability to remotely adjust the water stream. Changing the water pattern is needed rarely enough that it could be eliminated. A narrow fog setting provide distances and penetrating power but at the same time saves water and covers more ground.

The monitor does not exclude the need to have additional equipment and personnel to back it up. Firefighters walking the line on a

second and/or third engine to make sure the fire is out are still necessary. The purpose of this remote nozzle is to allow the truck to travel quickly and knock the fire down, making it easier for personnel on the ground to get closer to the fire and put it out completely.

As mentioned earlier, the durability of the linear actuators and their exposed wiring – plus the fact that the entire piece is mounted in a position that exposes it to limbs and brush – is also a concern.

Figure 7.

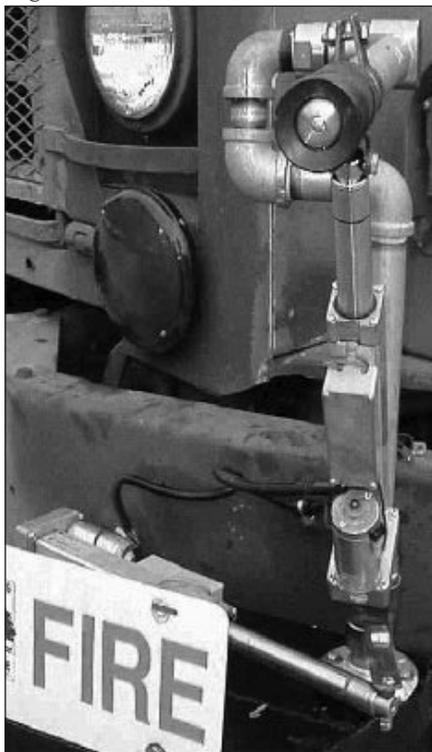
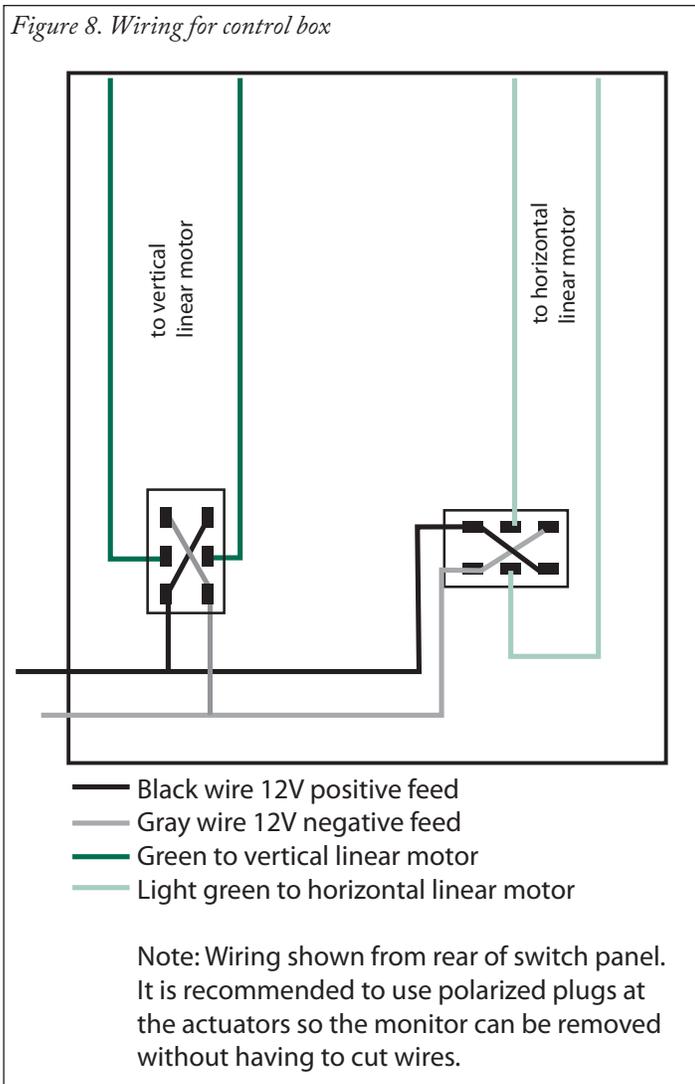


Figure 8. Wiring for control box



Conclusion

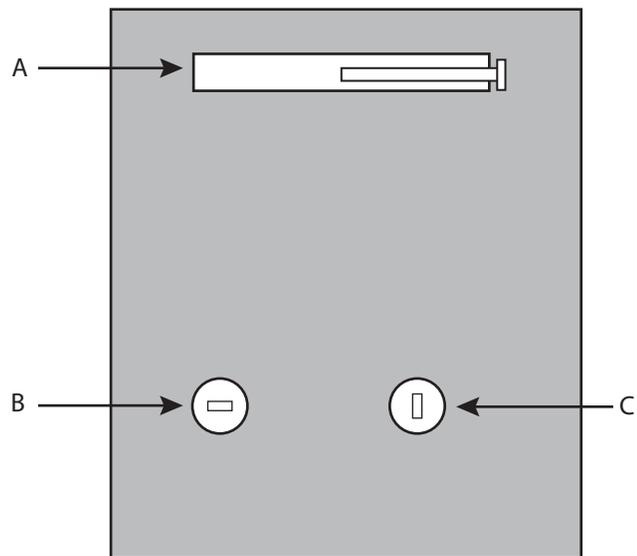
With this system, or any other type of remote monitor or spray bar system, the truck is capable of being operated by a single firefighter. It also allows for more rapid movement and repositioning of the truck. No time is lost getting everyone back in the cab to refill, move to another area, or escape sudden extreme fire behavior.

For specific information on prices, part numbers, clamp fabrication, etc., contact the Kansas Forest Service Fire Shop at 785-532-3319.

Online references

1. Kansas Forest Service,
www.kansasforests.org
2. Roscommon Equipment Center,
www.roscommonequipmentcenter.com
3. Grainger,
www.grainger.com
4. Cascade Fire Equipment,
www.cascadefire.com
5. Radio Shack,
www.radioshack.com

Figure 9. Control box



- A = Air switch used to control the water valve to the front nozzle
B = Toggle switch used to control the up/down motion of the remote nozzle
C = Toggle switch used to control the left/right motion of the remote nozzle

Note: Pump pressure should be set to approximately 50 to 60 PSI prior to operating nozzle. Air switch purchased at Carquest auto parts (air switch only needed for air actuated valve)

Ross Hauck
Kansas Forest Service
2610 Clafflin Road
Manhattan, KS 66502
(785) 532-3300
www.kansasforests.org



*This publication is made available
in cooperation with the
USDA Forest Service.*

Brand names or product suppliers appearing in this publication are for product identification purposes only. No endorsement is intended, nor is criticism implied of similar products not mentioned.

Publications from Kansas State University are available on the World Wide Web at: www.oznet.ksu.edu

Contents of this publication may be freely reproduced for educational purposes. All other rights reserved. In each case, credit Ross Hauck, *Wildland Fire Remote Monitor*, Kansas State University, September 2007.

Kansas State University Agricultural Experiment Station and Cooperative Extension Service

MF-2774

September 2007

K-State Research and Extension is an equal opportunity provider and employer. Issued in furtherance of Cooperative Extension Work, Acts of May 8 and June 30, 1914, as amended. Kansas State University, County Extension Councils, Extension Districts, and United States Department of Agriculture Cooperating, Fred A. Cholick, Director.