From Forest Nursery Notes, Winter 2009

6. Staying straight with rotary lasers at the Coeur d'Alene Nursery. Kees, G. USDA Forest Service, Technology and Development Program, Reforestation and Nurseries Tech Tips. 0824-2330-MTDC. 8 p. 2008.

Reforestation and Nurseries
Tech Tips

United States Department of Agriculture
Forest Service
Technology & Development Program
8 pages
June 2008
2400
0824-2330-MTDC

Staying Straight With Rotary Lasers at the Coeur d'Alene Nursery

Gary Kees, Project Leader

Highlights...

- It's best to lay out irrigation pipe and form nursery beds in long, straight lines.
- One way to establish, long straight lines is with a rotary self-leveling laser that can be used vertically.
- This tech tip explains how the Forest Service's Coeur d'Alene Nursery uses the Spectra Precision Laser HV401 when laying out irrigation pipe and forming nursery beds.

When rotary survey levels first hit the market, they were used for surveying or leveling objects in a horizontal plane. Newer self-leveling rotary lasers can be used vertically (figure 1) as well as horizontally and can project a beam for more than 1,000 feet, making them useful for a wide variety of Forest Service projects. These lasers are helping field personnel lay out straight irrigation pipelines and nursery beds (figure 2) at the Forest Service, U.S. Department of Agriculture's Coeur d'Alene Nursery in Idaho.

The nursery was looking for a more efficient and accurate way to lay out their nursery beds. In the past, two people used a standard scoped survey level and a target to set

Figure 1—A rotary laser used vertically projects a beam of light to help field personnel lay out straight irrigation pipelines and nursery beds.

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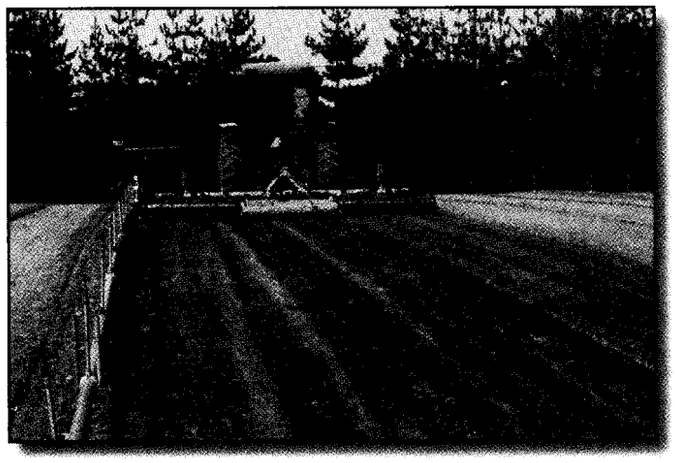


Figure 2—The operator is being guided by a receiver that tracks a beam of light from a rotary laser while forming nursery beds at the Coeur d'Alene Nursery in Idaho.

irrigation pipeline in a straight line. Tractor operators used the pipeline as a guide when forming seedbeds. The rotary laser simplifies the pipeline's alignment, which now can be handled by one person, or allows the tractor operator to form beds without a pipeline in place.

The Spectra Precision Laser HV401 has a range of more than 1,000 feet (figure 3) allowing it to work within a 2,000-foot diameter circle. The laser levels itself automatically when it's set up either vertically or horizontally. Because the laser's beam is difficult to see against objects in broad daylight, a receiver is used to locate the laser beam. A remote controller allows the operator to adjust the rotary level from up to 650 feet away. Rechargeable batteries in the laser are good for 55 hours of operation; alkaline batteries have a 90-hour life.

If you're using a rotary laser, do not look directly at the laser beam. Read and follow all safety warnings and operating recommendations from the vendor before turning the laser on for the first time. Because the laser rotates, the beam is cast for 360 degrees, whether the laser is vertical or horizontal. Ensure that the laser's beam will not affect other people in the area and is not aligned with a roadway or air traffic. Some of the laser's windows can be blocked off with a small card or foam pad (figure 4) to prevent casting the beam in unwanted directions.

Figure 3—The Spectra Precision Laser HV401 by Trimble can be used vertically as well as horizontally, is self-leveling, and has a range of more than 1,000 feet.

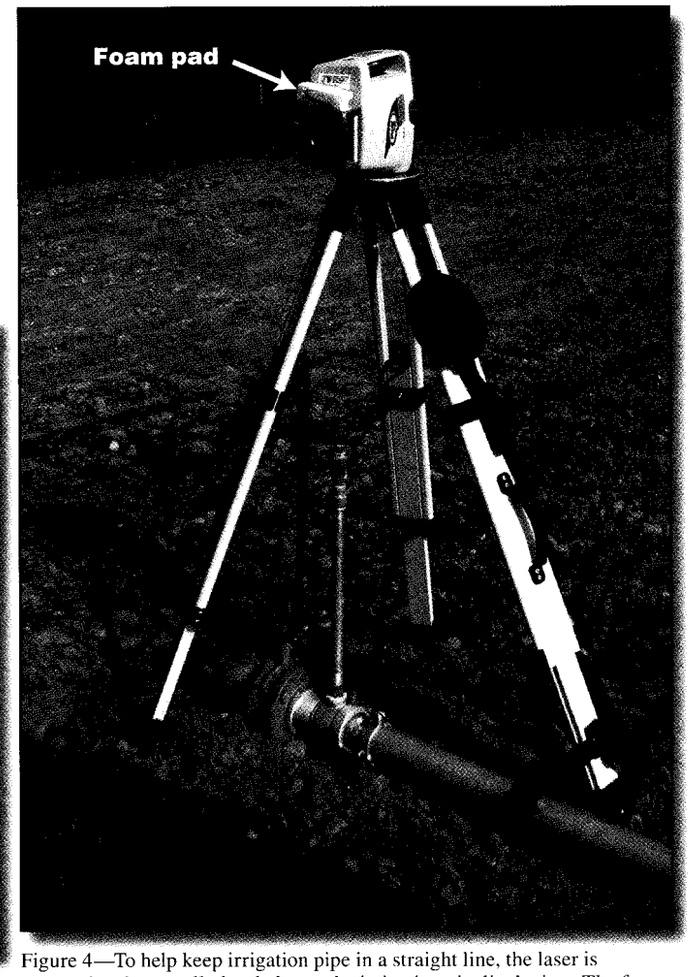


Figure 4—To help keep irrigation pipe in a straight line, the laser is centered and manually leveled over the irrigation pipeline's riser. The foam pad prevents the rotary laser's beam from being projected straight up where it could cause problems for aircraft pilots.

Using the Rotary Laser To Lay Out Irrigation Pipe

To lay out irrigation pipelines, center and level a tripod over the pipe riser or valve at one end of the irrigation line (see figure 4). Attach the rotary laser in the vertical position to the head of the tripod with the standard $\frac{5}{8}$ inch by 11 thread mount. The laser must be manually leveled to within ± 5 degrees.

The Coeur d'Alene Nursery uses both the AGL MR360R and Spectra CR600 laser receivers to intercept the beam of light from the rotary lasers (figure 5). Both receivers were able to pick up the laser beam from farther than 1,250 feet in broad daylight.

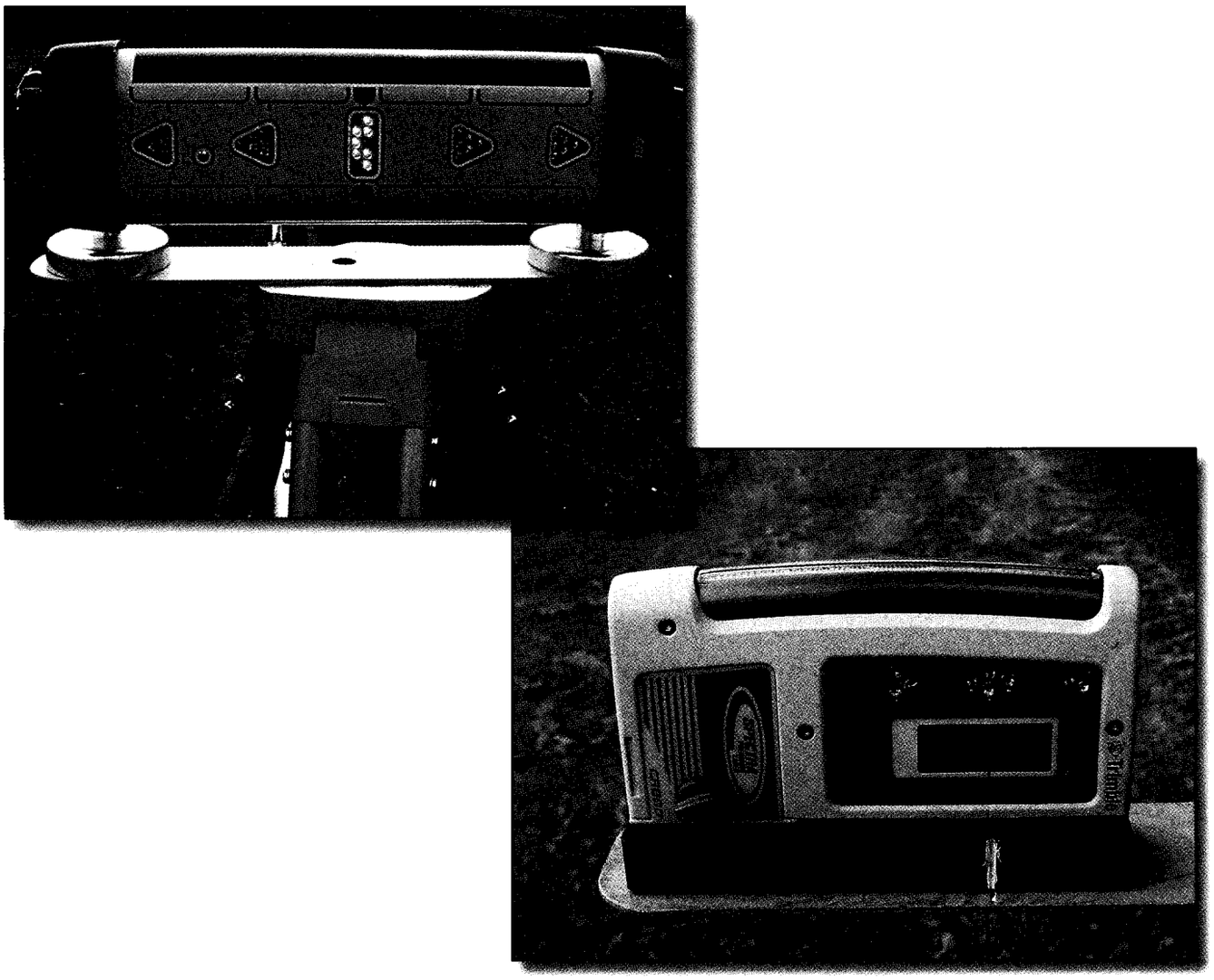


Figure 5—Both the AGL Laser Receiver MR360R (left) and the Spectra Precision Laser Receiver CR600 (right) can intercept a laser beam from more than 1,000 feet. Bright LED lights allow the display to be seen even in bright daylight.

The AGL Laser Receiver MR360R is mounted horizontally and leveled on a tripod at the far end of the field where the pipeline ends (figure 6). MTDC fabricated a piece of ⅛-inch plate with a ⅝-inch by 11 thread nut centered and welded to the bottom so the receiver could be magnetically mounted to the tripod. Turn on the receiver before moving back to adjust the laser.

Next, adjust the laser so that the beam lines up with the center of the receiver at the far end of the field. With the laser turned off, slightly loosen the mount on the tripod and rotate the laser until the sights on the housing visually line up with the receiver. Tighten the mount to lock the laser to the tripod. Turn on the laser and make sure it is in the auto-leveling mode. Once the laser levels itself, switch the laser to the manual-leveling mode.

The slope control buttons on top of the laser housing or remote control move the laser beam left and right until the beam aligns with the receiver at the other end of the field. Bright light-emitting diode (LED) lights on the receiver help the operator align the laser beam with the centerline of the receiver. The LEDs are color coded so it is easy to know whether the laser beam is aligned to the left or right of the centerline. When the green LEDs in the middle of receiver are lit, the beam is centered. Although the receiver's display is visible at 1,000 feet in bright daylight, a spotting scope is useful for reading the LEDs at a distance.

After the laser is aligned, the irrigation pipe can be laid out using several methods. In figure 7, the Spectra Precision Laser Receiver CR600 is mounted on a special pole. The

Figure 6—The AGL Laser Receiver MR360R is set up at the end of the irrigation pipeline.

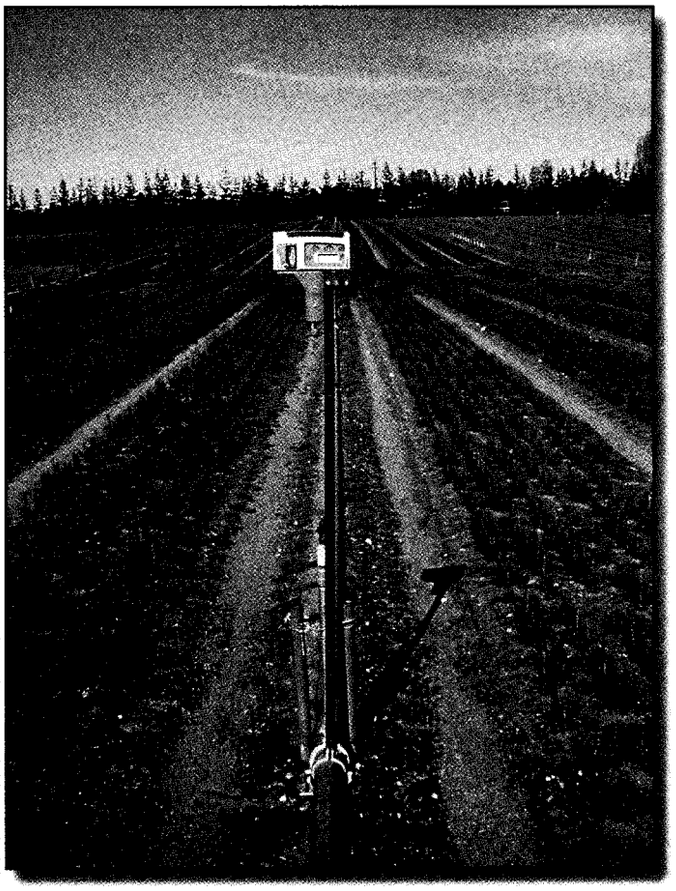


Figure 7—The Spectra Precision Laser Receiver CR600 is mounted to a special pole to help align irrigation piping with the laser beam from the Spectra Precision Laser HV401.

pole, designed to sit on top of the irrigation pipe, has a small bubble level to help the operator keep the pole plumb. The pipeline is pulled into place until the receiver aligns with the laser beam. At Coeur d'Alene, we scratched a small line in the dirt with the pole, then dragged the pipe to that location.

At other times, the Spectra Precision Laser Receiver CR600 was mounted to a Kawasaki Mule UTV (utility vehicle). As the operator steers the UTV to keep the receiver in alignment with the laser beam, an agricultural spring tooth attached to a pivot arm on the UTV scribes a line in the soil (figure 8). The irrigation pipe is pulled by hand into position on top of the line. This method assures accuracy.

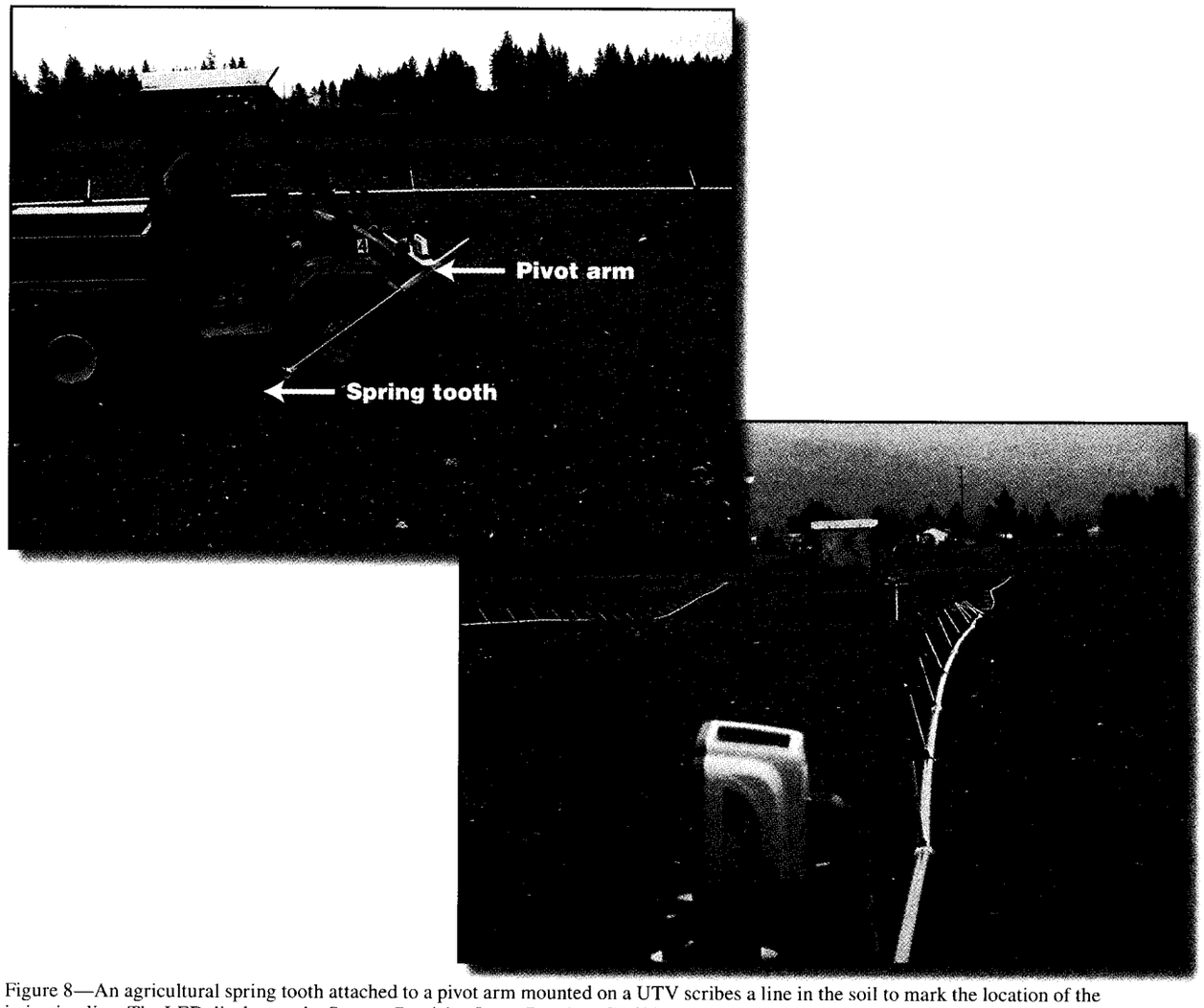


Figure 8—An agricultural spring tooth attached to a pivot arm mounted on a UTV scribes a line in the soil to mark the location of the irrigation line. The LED display on the Spectra Precision Laser Receiver CR600 helps the operator steer in a straight line.

Later, the Spectra Precision Laser Receiver CR600 was attached to a horizontal mount on the front of one of the nursery's tractors (figure 9). This setup allows the operator to form raised nursery beds in a straight line without using pipe or presurveyed lines as a guide. The operator steers the tractor to keep the laser beam aligned with the receiver.

Figure 9—The Spectra Precision Laser Receiver CR600 is mounted to a horizontal arm on the front of the tractor.

Discussion

There must be a clear line of sight between the laser and the receivers. Both the AGL and Spectra receivers picked up the laser beam at 1,250 feet during testing. It takes a little patience to align the vertical beam when a receiver is 1,000 feet away. The long detection window on the AGL receiver makes alignment easier.

Having two receivers, one at the far end of the plot to align the laser and one on the tractor to follow the beam, is convenient, saves time, and allows continuous verification that the laser beam is aligned. If a single receiver was used, it could be removed after the laser had been aligned. Then the receiver could be used to align the pipeline or be mounted to the UTV or tractor.

The magnetic mount on the AGL receiver is strong and is designed to stick tightly to equipment on the go. A thin sheet of cardboard between the magnet and steel mounting plate makes the receiver easier to remove.

Automatic self-leveling rotary lasers could also be used in other applications. The large, bright LED displays on the AGL receiver make it easier to see in the dusty environment around a tractor. The AGL receiver also offers a wireless display that can be mounted nearby, for instance in the cab of the tractor (figure 10). These lasers and receivers work great for leveling ground, building ditches, constructing roads, setting posts, and many other indoor or outdoor construction projects.

Figure 10—The AGL Precision Laser Receiver MR360R's wireless display mounts inside the cab of the tractor where it is easy for the operator to see.

Equipment Information

Lasers

Spectra Precision Laser HV401

Trimble Construction Division
5475 Kellenburger Rd.
Dayton, OH 45424
Phone: 800–538–7800
Web site: *http://www.trimble.com/spectra/*
Technical Information:
http://www.trimble.com/hv401gc.shtml
Cost:
$1,771 (from Montana Laser, Kalispell, MT)

Tripods

Crane, Tri-Max fiberglass tripod, flat-head, 5/8-inch by 11 thread mount

Web site: *http://www.forestry-suppliers.com/*
Cost:
$305 (from Forestry Suppliers Inc., Item No. 37561)

Sokkia, wide-frame aluminum tripod, flat-head, 5/8-inch by 11 thread mount

Web site: *http://www.sokkia.com*
Cost:
$150 (from Selby's, Missoula, MT)

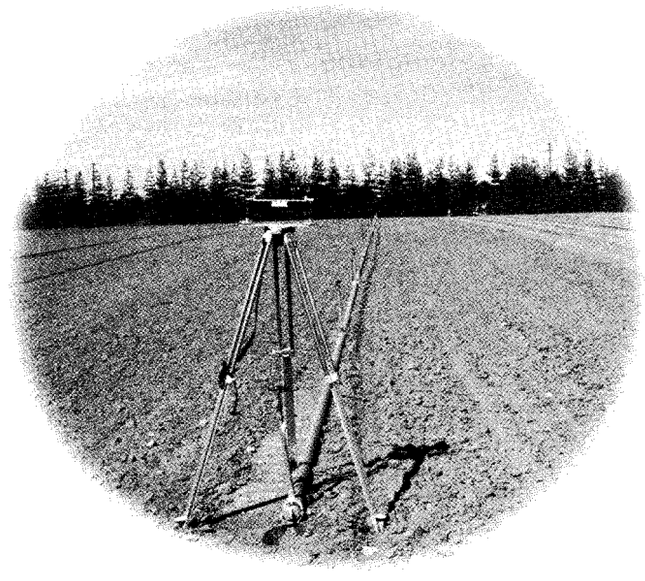
Laser Receivers

Spectra Precision Laser Receiver CR600

Trimble Construction Division
5475 Kellenburger Rd.
Dayton, OH 45424
Phone: 800–538–7800
Web Site: *http://www.trimble.com/spectra/*
Technical Information:
http://www.trimble.com/cr600.shtml
Cost:
$640 (from Montana Laser, Kalispell, MT)

AGL Laser Receiver MR360R

AGL Corp.
2202 Redmond Rd.
Jacksonville, AR 72076
Phone: 800–643–9696
Web site: *http://www.agl-lasers.com/*
Technical Information:
http://www.agl-lasers.com/pdf/literature/AGATEC_MR360R_data_sheet.pdf
Cost:
MR360R laser receiver $1,395
(from Selby's, Missoula, MT)
MD360R remote display, $540
(from Selby's, Missoula, MT)



About the Author

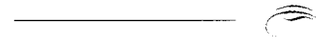
Gary Kees joined MTDC in 2002 as a project leader. He works in the reforestation and nursery, forest health, and GPS programs. His current projects involve laser guidance systems, ATV and backpack sprayers, nursery seeders, and remote weather stations. Gary has a degree in mechanical engineering from the University of Idaho and worked for 10 years as a mechanical and structural engineer and project manager for the Monsanto Co. in Soda Springs, ID.

Library Card

Kees, Gary. 2008. Staying straight with rotary lasers at the Coeur d'Alene Nursery. Tech Tip 0824–2330–MTDC. Missoula, MT: U.S. Department of Agriculture Forest Service, Missoula Technology and Development Center. 8 p.

Self-leveling rotary lasers can be used to help lay out irrigation pipe and nursery beds in a straight line. This tech tip describes the use of a Spectra Precision HV401 laser and Spectra CR600 and AGL MR360R receivers by the Forest Service's Coeur d'Alene Nursery in Idaho.

Keywords: AGL, Coeur d'Alene Nursery, how to, irrigation, nurseries, Spectra, surveying



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http://fsweb.mtdc.wo.fs.fed.us/search/