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## ROBO-DOME from Technical Innovations

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**"Hot new product of 1999" says Sky & Telescope, December '99 issue**

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Think of a dome that is

- robotic
- big enough for a telescope but not a person
- equipped with motors for rotation and shutter control, and with Digital Dome Works automation
- designed for remote use from your computer control room, network or internet site
- shipped with software for dome control and telescope control
- ready for your GOTO mount and telescope
- ready for CCD or video imaging
- fully assembled when it arrives at your site
- surprisingly affordable

Now, imagine a dome just the right size for your

- Meade LX200 8" to 10" scope
- Celestron 8" Ultima, or up to 11"
- small refractors such as AstroPhysics or Televue
- small Maksutov or Takahashi scopes
- or any similar scope that can be matched with a GOTO mount and equipped with CCD or video equipment

And envision a dome that is

- designed for the professional, priced for the amateur
- a pleasing oval shape
- easily installed by bolting the base to a space of just 14 square feet
- motorized for rotation, a full 360°

- open for viewing from horizon to beyond zenith when the one-piece shutter is up-and-over the dome
- built of fiberglass - light, strong, low maintenance
- weatherproof
- easy to service, install or remove observing equipment
- the right size for mounting on any small deck or flat roof
- the right size for a first observatory
- the right size for a second observatory

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You've just thought of **ROBO-DOME!**

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ROBO-DOME with 8" Meade LX200

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## ROBO-DOME Price

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\$4,750

Price includes:

- Dome and shutter
- Base
- Motors and all hardware for shutter and rotation
- Digital Dome Works automation hardware and software
- Full assembly - dome arrives ready for installation at your site

### Additional charges:

- Packing, \$190 - heavy cardboard carton on wooden pallet, packed weight approximately 150 lb.
- Freight - cost depends on destination and type of service (motor freight, air freight or ocean freight).
- If product is delivered in Maryland, add 6% Maryland sales tax.

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## More ROBO-DOME Photos

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ROBO-DOME with PD-10



ROBO-DOME with Thanh (who is 5'5" tall)



ROBO-DOME on roof of a classroom building

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## ROBO-DOME Specifications

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Dome Dimensions	Height = 25" from equator flange to top of shutter opening Shape is oval, with maximum dimensions 40" by 50"
Base Dimensions	Height = 25" (NOTE: shorter base available as special order) Shape is oval, with footprint dimensions 39" by 48" (approx. 14 sq.ft.) Perimeter = 142"
Material of construction	White gel coat exterior, back gelled for opacity, dark blue interior lamination is fiberglass reinforced isophthalic resin
Rotation	Rotates 360° on six 2" rollers. Rotation flange on base matches bottom flange of dome Diameter of rotation circle = 40"
Weight	105 pounds
Color	White exterior, dark blue interior
Shutter Opening	24 inches wide, extending 5" beyond zenith
Motors	12 VDC
Automation Hardware	Digital Dome Works - includes automated motors for open/close shutter, dome rotation, slaving to telescope, sensors for position of shutter and azimuth.
Automation Software	Dome control - Digital Dome Works Control Program Scope control - Astronomer's Control Panel software included (controls LX200 scopes)
Warranty	One year limited warranty against defects in material and workmanship

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## ROBO-DOME APPLICATIONS

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Put ROBO-DOME to work doing remote astronomy (CCD or video); watching birds or wild game; coastline surveillance; satellite tracking; sheltering non weatherproof video

equipment.

You can bolt a ROBO-DOME to any flat roof that is accessible for installation/service (academic building, office building, home, garage or even a remote out-building). You will need approximately 14 sq. ft. of space for the dome, plus space for the user to stand when installing or servicing equipment. You can also install this small dome on a concrete pad, raised deck, or tower. For mobile use, put it on a travel, cargo or equipment trailer.

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## ROBO-DOME ON DISPLAY

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You can see ROBO-DOME on display at Technical Innovations. Contact us for more information and free brochure.

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## Matching ROBO-DOME to your telescope

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If you want to do robotic observing but need the telescope, the computer controlled mount and the imaging equipment to go with it, we recommend that you contact Mike Fowler at Oceanside Photo and Telescope, Oceanside, CA. OPT has put together several "packages" of equipment suitable for the ROBO-DOME.

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# Frequently Asked Questions: ROBO-DOME™

1. How do I get into the ROBO-DOME?
2. How do I install the dome?
3. What if I want to mount the ROBO-DOME in the roof?
4. What do I do about a pier in the ROBO-DOME?
5. How do I set up (align) the scope?
6. How do I make equipment changes or adjustments in the ROBO-DOME?
7. Is dome control software included with the ROBO-DOME?
8. What computer connections do I need to the observatory?
9. I do lots of equipment changes ... is the ROBO-DOME for me?
10. What if I don't like the ROBO-DOME or if it doesn't work for my application?
11. Why does ROBO-DOME have the unusual oval shape?

## **1. How do I get into the ROBO-DOME?**

You don't. This structure is designed to shelter your telescope and be used for remote observing. It is not the right product if you want a dome for both visual and robotic observing. Please note that any of our other larger domes can be used with Digital Dome Works or our other automation products.

## **2. How do I install the dome?**

All of our domes (including the ROBO-DOME) have an inward flange all the way around the bottom edge of the base. You place the base onto your mounting surface and bolt it down (always with washers). You can use wood screws with our smaller domes, and lag bolts with our

larger domes. On concrete, it is easiest to drill anchor holes into the concrete, and then insert anchors that accept lag bolts or machine bolts. Our domes have no floor unless added as a special order; i.e., the base is open to your mounting platform.

The foundation under the dome should be strong and level and allow space for you to gain outside access to the dome. Small spaces under the flange are sealed with caulk. You can fill large gaps with expanding foam, which works very well. You can easily install a floor in your dome if you wish (e.g., 1/2 or 3/4 plywood.)

### **3. What if I want to mount the ROBO-DOME in the roof?**

Mounting the dome on a roof requires attention to water flow (flashing), and proper anchoring against the wind. It is also important to provide access to the roof and a secure place to stand while you install or change equipment in the dome.

If you cannot get to the outside of the ROBO-DOME to perform service, you will need to reach up from below. This requires that the telescope inside be mounted on some type of support that allows you to work up around it. Space around the scope will be limited. (A larger dome may make more sense for in-roof applications.)

### **4. What do I do about a pier in the ROBO-DOME?**

As always, “ it depends” ! The base of the ROBO-DOME is designed to accommodate scopes as large as a 10” LX200 on a wedge (the base of the ROBO-DOME is egg shaped, and the wedge will go into the “ rear” part of the base area). The 12” Meade LX200 in Alt-AZ configuration will fit (barely) in the ROBO-DOME, but we do not recommend it because there is not enough clearance for consistently reliable operations.

Recall that the base of the ROBO-DOME is 25” high. If you use an 8-inch S-C on a wedge, and your location is at 40° latitude, the top edge of the base will be about 7 inches above the declination axis of the scope, thus requiring a

short pier to get a clear horizon view. A 10-inch S-C would require about 4½ inches of pier to look at the horizon at that same latitude.

If you wish, we can manufacture a ROBO-DOME with a shorter base, or you can construct a simple short pier of plywood or metal to raise the base of the wedge. You would then anchor the pier to your ROBO-DOME mounting surface. Because you will not be moving around in the ROBO-DOME, the need for massive piers is greatly reduced.

You can also use a scope in alt-az. In most cases, this will lower the scope so that a pier (or shorter wall) is desirable.

Because of the small size of the ROBO-DOME, and the fact that there will not be people in it, you would not normally need a separate footing for the pier. However, if you are in a high wind area, and you wish to isolate the telescope pier from any vibration of the structure supporting the ROBO-DOME, then you might wish to have a separate pier footing.

Similarly, if you wish to install a German Equatorial Mount into the ROBO-DOME, please call us to check dimensions. Of course, such scopes and mounts will fit easily into an automated six-foot or larger dome!

### **5. How do I set up (align) the scope?**

In general, we recommend that you set up the scope once, and then leave it on (DDW will park an LX200). This will normally allow you to start observations without a complex synching process (just go to a star or planet, sync the scope to correct any drift, and then begin observing). A simple battery or Uninterruptible Power Supply will carry the scope through a power outage.

If you want to turn off the scope completely, you will probably need to go through the full alignment process each time you use the scope. This will likely require visual use of the scope, and is not very convenient for a ROBO-

DOME installation. If this is a requirement, you would probably be better off in a full size observatory.

## **6. How do I make equipment changes or adjustments in the ROBO-DOME?**

The shutter opening is 24 inches wide, so you can just reach in. If the scope is aimed at the shutter, and you want to get to the eyepiece or camera end, just rotate the dome, then reach in. If you need to have more access, you will remove the clips that retain the dome to the base (five wing nuts) and lift off the dome. The dome weighs about 40 LB and takes about two minutes to take off. This gives access to everything inside the base.

## **7. Is dome control software included with the ROBO-DOME?**

Yes. The standard ROBO-DOME uses our Digital Dome Works (DDW) remote control package (with a few minor modifications to fit the ROBO-DOME). DDW includes the observatory control software (PC WIN95, also runs on Windows NT). Our software is “ open source” , so you can modify it if you want to fit your own needs. For example, some of our customers link to the DDW Control Program via a software interface from their Linux or Mac operating systems.

The DDW package also includes the “ Astronomers Control Package” (ACP), a product by Robert Denny, which provides the full set of LX200 commands, as well as a trial use scripting and voice control package. For more information on this software, go to <http://acp.dc3.com>.

To slave the dome to the scope, the DDW processor can directly read the scope azimuth from an LX200.

Alternatively, the DDW software can interface with the ACP and TheSky© V.6 to obtain the telescope position. The software also will correct for the offset from a German Equatorial Mount.

## **8. What computer connections do I need to the observatory?**

We define nearby remote as an installation in which the

distance from the user computer to the dome is short enough for direct wiring. For purposes of the DDW, this distance is typically about 300-400 ft, which is the maximum distance for reasonably reliable RS232 operation. RS232 requires three conductors. For short runs (say, 100 ft) virtually any cable, including telephone cable, can be used. For the longer runs, we would recommend cables with larger conductors. We have used Romex #14 power cable for RS232 connections at 400 ft.

For distances of more than 400 ft, there are alternatives to RS232 connections. In practice, for distances greater than a few hundred feet, you will probably want to use a computer in or adjacent to the dome to handle the CCD camera, observatory, and scope (we call this long distance remote). You would then control the programs using PCAnywhere® or a similar program via a local network, phone line, or other communication means.

### **9. I do lots of equipment changes ...—is the ROBO-DOME for me?**

Probably not. The ROBO-DOME is great to use when the optical train and scope setups are not changed very frequently. If you make many changes, you will probably be happier in a full size observatory where you can easily get at equipment, change optical trains, make easy visual checks, etc. Remember that the remote control features of the ROBO-DOME are also available in our other observatories (or can even be put on roll-offs or domes made by others).

### **10. What if I don't like the ROBO-DOME or if it doesn't work for my application?**

Our standard return warranty will apply —ROBO-DOMES are guaranteed against defects in materials and workmanship for one year. If, within 60 days of shipping, if you are dissatisfied, you can request our agreement to send the dome back for a full refund, (less restocking fee and shipping costs.) Of course, the product must be returned in condition suitable for resale. (Special orders are not returnable.)

## **11. Why does ROBO-DOME have the unusual oval shape?**

One of our design goals was to have a one-piece shutter that allows a clear view of zenith. We accomplish this by making the radius of the shutter curve 25" , while the radius of rotation is 20" . The rotating surfaces of the dome are at the front of the oval, and your telescope sits at the center of this 20" radius circle.

The back part of the oval is open to hold your scope's wedge, or for equipment storage.

The height of the base matches the dome height, (25+25 for 50 overall height). The footprint of the base is approximately 40 by 50. When you order, we will send you a full-scale template of the oval base so you can plan your foundation structure.