NRG INSTRUCTIONS

Solar Tower Installation | Ground Mount

Standard Baseplate Configuration

Authors:
Technical Services

SolarTower_StandardBaseplate_Instructions
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INTRODUCTION

Overview

The Solar Tower from NRG Systems is designed for the solar PV professional looking for quick and repeatable deployments as well as reliable autonomous operation. This tower is available in two configurations:

- A temporary, guyed configuration for pre-construction Solar Resource Assessment (SRA) campaigns. This document discusses this tower type.
- With a permanent, pad-mount configuration for post-construction Solar Resource Monitoring (SRM) campaigns. For instructions on installing this tower, see the SolarTower_PadMount_Instructions.pdf.

An array of accessories are available to tailor the system to these different applications. Please see our website or contact the NRG Sales Team for more information.

About These Instructions

These instructions deal with the assembly of the NRG Solar Tower using the standard ground mount. This baseplate is designed to be used on almost any flat, level, and firm surface. Guy wires and ground anchors are utilized to provide stability for the tower, especially after all equipment, sensors, and accessories are affixed to it.

Typographic Conventions

Notes throughout the document.

Warnings throughout the document.

Technical Support

NRG Systems offers a variety of support options to help you get the most from your NRG Systems products. If you have questions, first look in the published product documentation. The best places to find information and documents are on the respective product pages of the NRG Systems website.

If you cannot find the answer, contact your Salesperson or NRG Systems Technical Support for assistance using the information below. Customer support is available 8:30 AM to 5:00 PM EST, Monday through Friday.

Telephone: 802-482-2255
Email: support@nrgsystems.com

Safety Considerations

	**READ ALL INSTRUCTIONS AND WARNINGS BEFORE BEGINNING ANY TOWER INSTALLATION.** EVERY INSTALLATION CREW MEMBER SHOULD CAREFULLY READ AND UNDERSTAND ALL WARNINGS, INSTRUCTIONS AND OTHER INFORMATION IN ALL RELATED AND RELEVANT DOCUMENTATION.
	**USE ONLY SUITABLE TOWER ANCHORS FOR THE SOIL TYPE AT THE INSTALLATION SITE.** THE LIMIT LOADS OF THE COMPLETED TOWER UNDER VARYING CONDITIONS (*E.G.*, HIGH WINDS AND ICE), AND THE STRENGTH DURING INSTALLATION DEPENDS ON THE USE OF PROPER ANCHORS FOR THE SOIL TYPE AT THE INSTALLATION SITE. FAILURE TO USE PROPER ANCHORS COULD CAUSE THE TOWER TO FALL RESULTING IN INJURY OR PROPERTY DAMAGE. THE SOLAR TOWER INCLUDES DUCKBILL ANCHORS. IT IS YOUR RESPONSIBILITY TO DERMINE IF ANOTHER TYPE OF ANCHOR IS NECESSARY FOR A SAFE TOWER INSTALLATION.
	**DO NOT INSTALL TOWER NEAR ELECTRICAL POWER LINES.** METAL TOWER COMPONENTS EFFICIENTLY CONDUCT ELECTRICAL CURRENT AND CAN RESULT IN SERIOUS INJURY OR DEATH IF THEY COME IN CONTACT WITH HIGH VOLTAGE ELECTRICAL LINES. SURVEY THE PROPOSED INSTALLATION SITE AND DO NOT BEGIN ANY TOWER INSTALLATION IF ANY ELECTRICAL LINES ARE PRESENT. MAINTAIN A DISTANCE OF AT LEAST 100 FEET (30 METERS) BETWEEN THE TOWER AND ANY POWER LINES.
	**DO NOT BEGIN OR CONTINUE TOWER INSTALLATION DURING AN ELECTRICAL STORM.** IF LIGHTNING STRIKES A TOWER OR ITS METAL COMPONENTS, SERIOUS INJURY OR DEATH COULD OCCUR TO THOSE WORKING WITH OR AROUND IT. DO NOT BEGIN AN INSTALLATION, OR CONTINUE ONE, DURING AN ELECTRICAL STORM OR IF ONE IS IMMINENT.

MATERIALS & TOOLS

The materials & tools for this manual pertain to the assembly and setup of a complete Solar Monitoring System (SMS). This includes a SymphoniePRO Data Logger and commonly-used sensors, booms, and wiring.

For complete parts listing and BOM, see Appendix A | Solar Tower Parts List/BOM.

Exact system contents vary depending on customer requirements and requests. Please visit our website or contact our Sales Team with any questions about sensors, SRA System packages, or SRM System accessories.

Personal Protective Equipment

- Gloves
- Safety Glasses
- Safety toe boots
- Hard hat
- Sunscreen

Recommended Additional Documentation

- SymphoniePRO manual
- Individual sensor & accessory manuals, depending on configuration
- (For BGAN/iPackACCESS communication) BGAN M2M Instructions from NRG

Required Tools

Item	Use
Tools	
Ratchet & SAE socket set	Tower & boom assembly
Wrench set - SAE	Tower & boom assembly
Large adjustable wrench (1 1/8" opening capacity)	
Small adjustable wrench	
Needlenose pliers	
Wire strippers	Sensor wiring (if needed)
Diagonal cutters	Trimming hose clamps, zip ties, etc
Hex key set - Metric	Mounting pyranometers
5/16" Nut driver or driver bit	Tightening hose clamps
7/16" Nut driver or driver bit	Tightening wire rope clips
Cordless drill or impact driver	Tightening hose clamps
Small flathead screwdriver	Sensor wiring connections
Utility knife	Tape cutting, general purpose
Sledgehammer (5 lb)	Grounding rod & anchors
Tape measure	Site & sensor setup
Torpedo level	Sensor & boom leveling, Tower plumbing
Stepladder (or tall human)	Attaching sensors & booms
Fold-up table or workbench	Clean, flat workspace
Digital voltmeter	General electrical troubleshooting
Compass or GPS	Site orientation
Permanent marker	Labeling (as needed)
Notepad & pen	Notes
Laptop with the latest SymphoniePRO Desktop App installed	Logger & iPack programming
USB-A to USB-B cable	Connecting to SymphoniePRO logger
Consumables	
Electrical tape	Cable management
Cable ties	Cable management
Plumber's putty	Covering shelter box cable holes

SITE PLANNING

Pre-Installation Preparation

Planning your solar measurement system prior to field deployment is an important part of the installation process and will help move the process along smoothly. Several aspects of the planning process that are highlighted below.

Logger & iPack

Learn and understand the features and functions of the SymphoniePRO logger and accompanying SymphoniePRO Desktop Application software before deployment. To make the installation process go more smoothly, pre-configure your logger and iPack and test that they work properly.

Soil Type & Anchors

Before ordering your system, research the site soil and be sure to know what soil types exist at your site as part of your pre-installation planning process. If necessary, consult an expert.

Depending on the soil type, anchoring can take varying levels of planning, effort, and time. It is *your* responsibility to determine which type of anchor is appropriate for your specific site.

This configuration of the NRG Solar Tower ships with (3) Duckbill Model 68 anchors. Other anchors may be acceptable for use with the tower and will vary depending on the characteristics of individual sites.

Site Security

Securing your tower and equipment is important. It is up to you to determine the best security measures to employ. Fencing, cameras, and frequent site visits are all recommended ways to help protect the site.

Site Layout

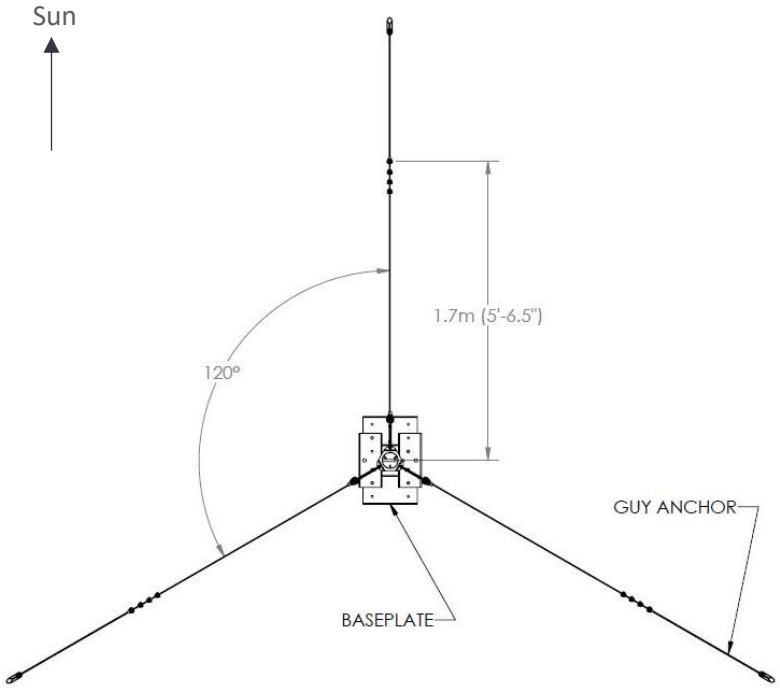
Anchor Installation Considerations

The Solar Tower utilizes three Duckbill anchors, equally spaced 120 degrees apart around the tower (example layout on the following page). Orient the tower as shown below, with a single guy wire pointed towards the direction of the sun.

When installing the anchors, ensure that the anchors are properly embedded into the ground and equidistant from the tower and each other. Other anchors may be required to secure the tower in some cases.

NOTICE

Note: Once driven into the ground, Duckbill Anchors are extremely difficult or impossible to remove. Double check all anchor locations and soil before beginning to drive the anchors into the ground.



Example layout map; exact distances may vary slightly.

Using larger PV panels and/or the NRG Auxiliary RPS Kit

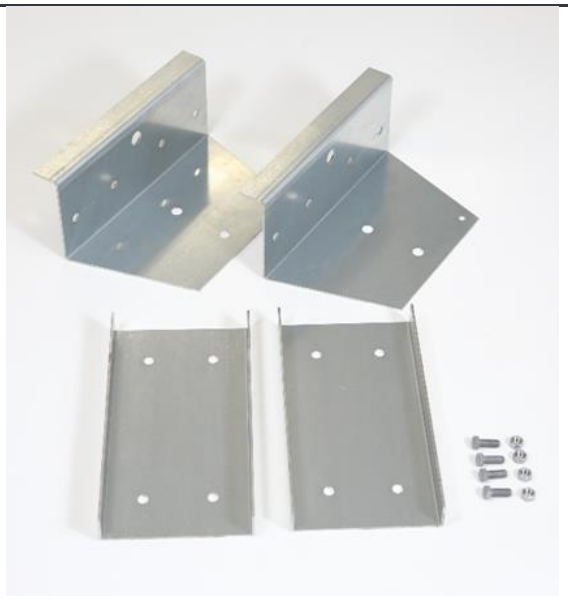
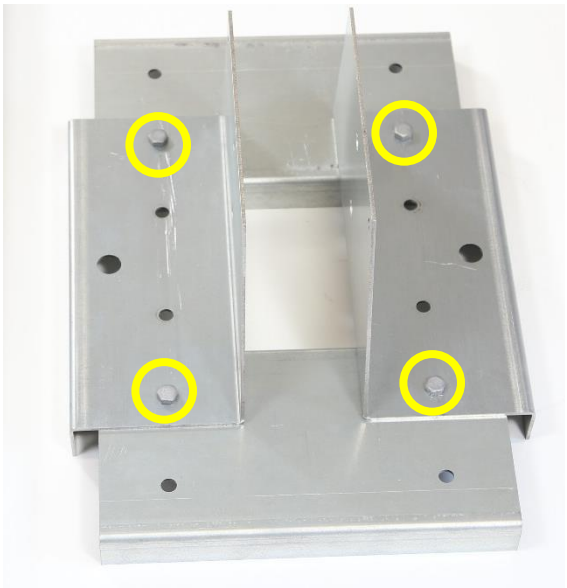
Anchor orientation becomes extremely important when mounting larger PV panels to the tower, as is the case when using the NRG Auxiliary RPS. **Ensure that one guy wire is positioned in the same direction that the PV panels will be oriented.** This means that the shelter box(es) is(are) able to open adequately and that the PV panels do not interfere with the guy wires.

TOWER ASSEMBLY

Solar Tower Tube Heights

The Solar Tower is available in multiple heights. Unless otherwise noted, this procedure applies to all 1-piece NRG Solar Tower models that have 3.5” diameter tube and use the standard ground mount.

Procedure

1	Unpack & sort all components. Verify that they are present and undamaged.
2	**Assemble the tower baseplate.** Use the following parts: (2) Horizontal baseplate pieces (2) Vertical baseplate pieces (4) 3/8-16 x 1” bolts (4) 3/8-16 nuts  Use the 3/8-16 bolts & nuts to attach the baseplate pieces together. Tighten with 9/16” wrench and socket/ratchet Refer to the image to the right for the exact assembly. 

3 **Attach the tower tube to the baseplate.**

The tower tube has two 1/2” holes drilled near one end. Place this end in between the vertical portions of the assembled baseplate.

With the tower on the ground, line the lower hole on each vertical baseplate with the end hole on the tower tube.

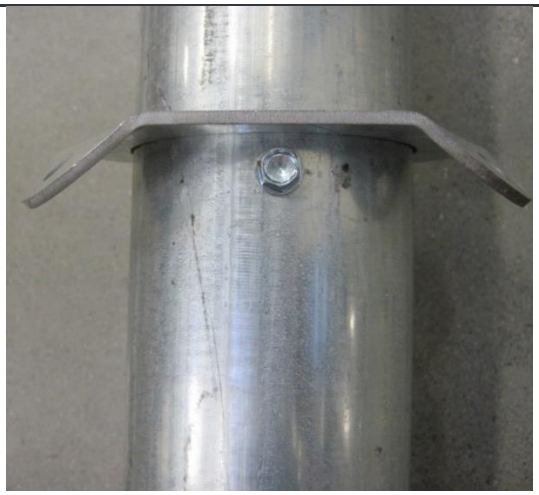
Slide (1) 1/2-13x5” bolt through the holes and thread (1) 1/2-13 nut on the end to secure the tower and the baseplate together.

Hand-tighten only.

4 **Add guy ring to tower tube.**

The guy ring is easier to attach to the tower prior to raising it. While not difficult to attach later, we recommend doing so at this point.

Slide the guy ring around the top of the tower with the tabs angled downwards and slide it down the tube until it rests on the preinstalled hex head screws.

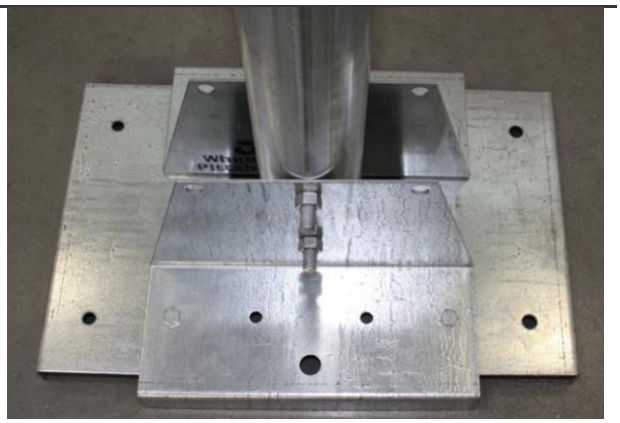


5 **Raise the tower & secure with second bolt.**

Pivot the tower to vertical and secure with the second 1/2-13x5” bolt & nut.

Tighten both sets of bolts/nuts with 3/4" wrench & socket/ratchet.

Do not overtighten hardware. Overtightening may cause the tower tube to deform.



6 **Install anchors into the ground.**

The Solar Tower comes with Duckbill 68 anchors. If other anchors are used for your tower, please refer to their individual instructions for installation information.

Determine suitable locations for each anchor.

- 120° spacing around the tower
- 67.5” distance from wire rope thimble to tower tube

Actual anchor location may vary in order to achieve the conditions above.

Put the end of the copper-clad ground rod into the hollow cavity of the Duckbill anchor.

Place the tip of the anchor into the ground, hold the wire taut, and pound the other end of the ground rod with the small sledge hammer to drive the anchor into the ground.

7 **Lock anchors into place.**

Remove the copper-clad ground rod from the ground. Place it through the wire rope thimble and pull back in the opposite direction that the anchor was installed.

This will rotate the Duckbill anchor 90° and lock it into place.

8 **Attach the guy wires to the tower.**

Loosen the turnbuckles to their maximum length.

Attach the turnbuckles to the swaged end of the guy wires and to the holes in the guy ring.

9 **Secure guy wires to the anchors.**

Feed the empty end of a guy wire through the thimble at the end of the corresponding anchor wire.

Pull the guy wire tight and secure with two wire rope clips, using the 7/16” nut driver, socket, or impact driver.

Begin by making the guy wires moderately tight, then readjust once all three have been attached to their corresponding anchors. Make final tension adjustments with the turnbuckles.

Proper wire rope clip operation
Place the wire rope clip on the wire so the saddle (the forged, grooved part) cradles the wire coming from the tower and the "U" bolt part clamps down on the dead end of the guy wire ("Never saddle a dead horse" may help you to remember how to secure the wire rope clips).

Do not pull excessively on the guy wires to tighten them, especially when first connecting the guys to the anchors. Doing so may cause the tower to fall on you or others nearby.

10 Plumb the tower.

Place a magnetic angle finder or a torpedo level against the tower tube.

Hand-tighten the guy wire turnbuckles until the tower is plumb.

Final guy wire tension should be sufficient to prevent substantial movement of the tower, but overtightening the wires can damage the turnbuckles.

11 Install the ground rod.

Drive the ground rod through the hole in the center of the vertical baseplate piece.

There are holes on both sides of the baseplate; either is acceptable.

12 **Connect the ground rod to the tower.**

Attach one end of the 8 AWG grounding wire to the grounding lug and tighten the threaded stud with a flathead screwdriver to secure.

Attach the wire and lug to the vertical baseplate piece at one of the top holes. Tighten the bolt to secure.

Feed the other end of the grounding wire through the brass acorn clamp to the desired location, then attach to the ground rod and tighten the clamp to secure.

Tuck excess cable out of the way or trim the cable with diagonal cutters.

The tower is now erect and ready to accept instruments, booms, sensors, and other accessories. Please refer to each individual instruction sheet or manual for more information about these.

APPENDIX A | SOLAR TOWER PARTS LIST/BOM

NRG Part Number	Description	Qty
11143	Anchor | Duckbill Model 68	3
5270	Turnbuckle for guy wires	3
9053	Guy wire assembly (multiple part numbers apply)	3
1247	Wire rope clip | 3/16”	13
1277	Grounding nut | Stainless steel | 1/4-20 threaded	1
1330	Grounding washer | Stainless steel	1
1339	Grounding screw | Stainless steel | 1/4-20 threaded | 3/4 inch length| Pan head	1
1444	Grounding wire | Bare copper | 8 AWG	1
1525	Grounding acorn | Copper	1
1533	Grounding rod | Copper-clad | 4’ length	1
4261	Grounding lug | Copper	1
9080	Tower tube assembly | 3.5 inch diameter | 2.2m length	1*
8980	Guy Ring	1
9012	Tower baseplate side piece	2
9018	Tower baseplate bottom piece	2
1518	Baseplate assembly bolt & nut | 3/8-16 threaded | 1 inch length	4
1547	Tower mounting bolt & nut | 1/2-13 threaded | 5 inch length	2

*Kit #9015 contains a 2.2m tower tube.