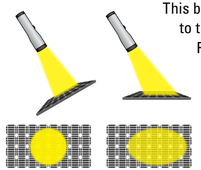
Why Trackers?

The angle at which the sun's rays illuminate a PV panel will determine how much energy is available to that panel. A surface that is perpendicular to the sun's rays will intercept the greatest amount of energy. As the sun's rays move away from being perpendicular, the energy intercepted by a PV panel surface will decrease.

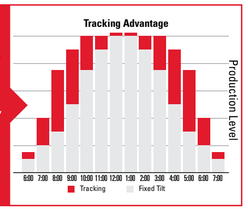


This behavior is better illustrated by the picture of the flashlight to the left. When the flashlight is held perpendicular to the PV panel, the intensity of the light beam is greatest. As the flashlight is inclined, the light beam spreads over a larger area thus reducing the energy per square inch available to the PV panel. By keeping the PV panels always perpendicular to the sun, the SF-40 single axis tracker will increase the energy production of a PV panel by up to 25% with respect to a fixed mounted one.

SF-40 Features

- **Utilizes OPEL Solar's Sequoia self ballasting system that does not require roof top penetration**
- **Reverse tracking feature eliminates inter-row shadowing, allowing the installation of more trackers (watts) in a given area.**
- **Modular design to accommodate any roof top geometry and to simplify dealing with roof turrets and other obstacles**
- **SF-40 System can be fully assembled by a two person team in less than 4 hours**
- **Precision control system for ±1° polar tracking accuracy**
- **Versatile design can be customized to fit most PV panel sizes**
- **The structure is capable of withstanding 90 m.p.h. winds**
  - **Higher wind speeds can be withstood when the tracker is driven to its stow away position through an external anemometer**
- **Installation does not require skilled labor such as field welding**
- **Distributed drive and control guarantees no single point of failure for more than 6kW**

Single axis tracking will increase the yield of PV panels by up to 25%



Distributed drive and control

Reverse Tracking Advantage

OPEL Solar's SF-40 programmable Tracking Control System incorporates a reverse tracking feature. This reverse tracking feature commands the tracker to reverse its functional motion during the beginning and end periods of the day in order to eliminate shadowing from one tracker to the adjacent one.

Reverse tracking allows for a closer layout of trackers, resulting in more kilowatts per unit of area, while maintaining maximized power generation that would otherwise be lost due to shadowing.

Advanced Tracking Control

The OPEL Solar SF-40 tracker advanced control system can achieve a tracking accuracy of ±1°. A proprietary astronomical tracking algorithm complemented with positioning feedback, ensure that the tracker follows the movements of the sun according to its location on the planet.

SF-40 installations can be supplemented with an optional Network Control Unit (NCU), which incorporates a GPS module that provides accurate time and pin-point location updates to all the trackers in a given installation. The NCU is also equipped with an anemometer to detect dangerous wind conditions. Upon detection of a strong wind situation, the NCU will send a command to all the Tracker Control Units (TCUs) to move the trackers to a stow away position (horizontal) to minimize the wind resistance area and avoid the possibility of wind damage under those severe wind conditions.

Each Tracker Control Unit (TCU) is capable of controlling the movements of two trackers, reducing installation time and costs. All TCUs are capable of operating independently, providing reliability and redundancy in case of a network communications failure.

The SF-40 is provided with 3 preset positions for maintenance, night position, and high wind stowing.

System Modularity

The SF-40 modular design and distributed drive control provides the ability to design and install a single axis tracking system on any roof top.

Each tracker has been designed to consist of four sections. Each section of the SF-40 is capable of accommodating up to 1.4 kWp, depending upon the panel wattage. The Tracker can be installed as four, three, two, or even one 1.4 kW section. This modularity allows the tracker to be laid out to fit any roof top geometry. The tracker can be design to fit into awkward building layouts, into tight spaces, and around roof to obstructions, such as ventilation turrets and sky lights.

The modularity of the tracker also makes it possible to disassemble just one section, instead of the full tracker, for access to the roof for maintenance, reducing maintenance costs.

Installation

1 2 3 4 5

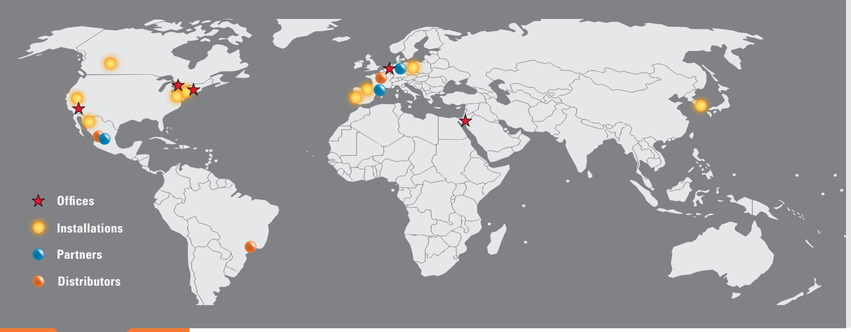
1 Prior to installation of the Tracker, the OPEL Sequoia mounting network is laid out on the roof. The network of C-Channels will be used to connect all of the trackers on the rooftop together. Once connected, the weight of the entire system acts as the hold down force for each individual tracker, creating a self ballasting system. Additional ballast can be added around the perimeter of the system if necessary.

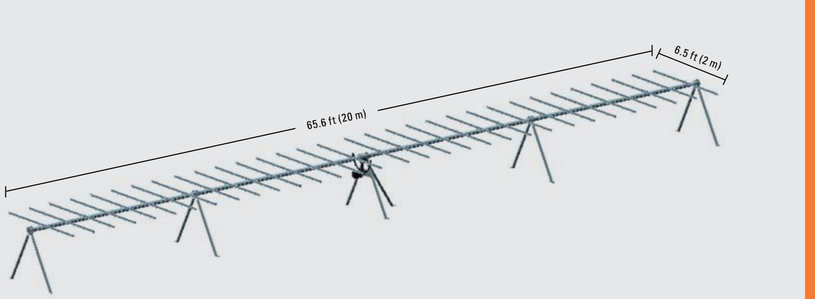
2 The A-frame footings are mounted onto the Sequoia network without penetrating the roof. The A-Frames have been designed to provide room for adjustment to account for the slight tilt of a flat roof for drainage.

3 After the main gear is attached to one end of the pivot shaft, the motor gear assembly is attached to the A-frame. These two components are easily attached using only the nuts and bolts included and can be installed in approximately ten minutes.
Once the assembly of the mechanism is completed, the gears are lubricated with automotive grease.

4 Next the five frame sections are assembled by lifting the pivot shafts onto the bearings and attaching Cross Channels to them. All of the components do not exceed 150lbs and can be lifted into place by one installer.
Finally the PV Panels are mounted using a simple clamping system that takes less than a minute per panel.

5 The final steps consist on mounting the Tracker Control Unit (TCU) on the inside of the A-Frame. Once the TCU is mounted, is ready to be wired to the AC power.
When power is applied to the TCU, it will initialize itself. Once the initialization is complete, the TCU will drive the tracker to the correct position, and begin its scheduled tracking movements.





Harnessing the sun through concentration

OPEL Solar

Offices:

- **Canada**
  Toronto, ON
- **U.S.A.**
  Shelton, CT
  Sacramento, CA
- **Europe**
  Brussels, Belgium
- **Middle East**
  Raanana, Israel

The SF-40 comes with a 10 Year Warranty.

OPEL Solar

OPEL Solar designs and manufactures high performance concentrating photovoltaic panels for use in utility scale solar farms. High concentration photovoltaic (HCPV) panels require the use of very accurate solar trackers. OPEL Solar is making the tracker technology developed for HCPV available to the multi-crystalline and thin film panel market to allow this type of PV panels to increase their energy generation in a very cost effective way, thus accelerating the payback time of solar investments and increasing the return on investment (ROI) of the same. OPEL Solar trackers have been developed in cooperation with engineering and construction firms to ensure a product whose quality and ease of installation will allow the implementation of reliable and cost effective solar plants. OPEL Solar trackers provide a better ROI in solar farms than fixed panel mounts.

The SF-40 Tracker

OPEL Solar's SF-40 is a highly reliable and cost effective single axis rooftop solar tracker. The 430 sq. ft. frame on the SF-40 is easily customized to accommodate the most popular PV panel sizes in the industry from different manufacturers. Rich in features to satisfy the needs of different applications, the SF-40 tracker employs a modular ballasted design that can accommodate any roof-top geometry without penetrating the roof. Also, the SF-40 can be fully assembled, or disassembled for roof maintenance, by a two person crew in less than 4 hours. Unlike other roof racking solutions–including fixed mount racks–no special tooling, cranes or welding is required to assemble and commission a SF-40 tracker.

Typical SF-40 configurations include the following common PV panel sizes:

- Up to 24 panels 65 in x 39 in (1.65 x 0.992 m)
- Up to 20 panels 77 in x 39 in (1.956 x .992 m)

Electrical Characteristics — SF-40

Operating voltage	12 V
Operating current	4.0 A
Consumption	10 Wh/day
Wind resistance	90 m.p.h.
Tracking accuracy [1] (open loop)	1°

1. Accuracy of east to west tracking

Shipping Dimensions

Volume	32 cu ft (1.9m³)	32 cu ft (1.9m³)
Length (max)	15 ft (4.6m)	15 ft (4.6m)
Weight	1,056 lbs (480 kg)	1,200 lbs (540 kg)
Number per container (40 ft)	30 approx.	30 approx.

Physical data — SF-40

Type	Single axis
Length	65.6 ft (20 m)
Width	6.5 ft (2 m)
Height when horizontal	5.3 ft (1.6 m)
Total weight	1,200 lbs (540 kg)
Wind resistance	90 mi/hr (145 km/hr)
Limited warranty	10 years

Hardware supplied

A-Frame supports	Five
Horizontal pivot shafts	Four
Main rotation bearing	Five
Tracker control unit	One (per 2 trackers)
Motor/gear assembly	One
Panel mounting rails	40
Panel mounting clamps	80 (4 per panel)

Capacities

Module area	425 ft² (40 m²)
Electrical yield (approx.)	5,600 W
Weight capacity	1,146 lbs (520 kg)
Rotation on axis	± 50°

SF-40
Roof Top Tracker

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