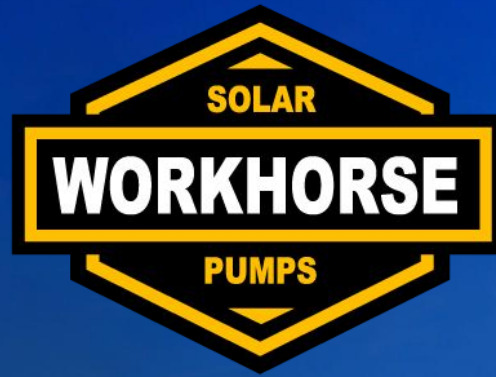


W3DC



WORKHORSE

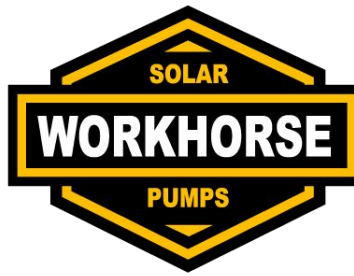
Owner's Manual

W3DC Series



**WORKHORSE. Hard working
Solar Pumps for hard
working Americans**

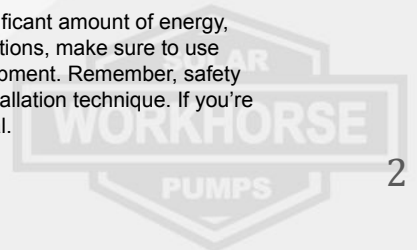




Congratulations on your **WORKHORSE** Solar Pump and a new era of harvesting sunlight for water on your land - for years and years to come! Our company feels blessed with the support from great customers - the families, the plants, and the animals **WORKHORSE** pumps support. Our engineers have invested millions in making it the best solar water pump you can buy with your hard earned dollars. But we also know it doesn't stop there. Industry leading warranties and USA-based technical support engineers will keep your pump performing at its best for years to come. We hope you enjoy your solar pump, and feel free to reach out to us at any time for support... or for more solar pumps!



Warning: Risk of Electric Shock. Solar panels and batteries can produce a significant amount of energy, which can cause electric shock. Whenever you're working with wiring or connections, make sure to use caution. Be sure to ground the system for safety and to prevent damage to equipment. Remember, safety first! Workhorse is not liable for damage or injuries that result from improper installation technique. If you're unsure about the safety of any step in this manual, please consult a professional.



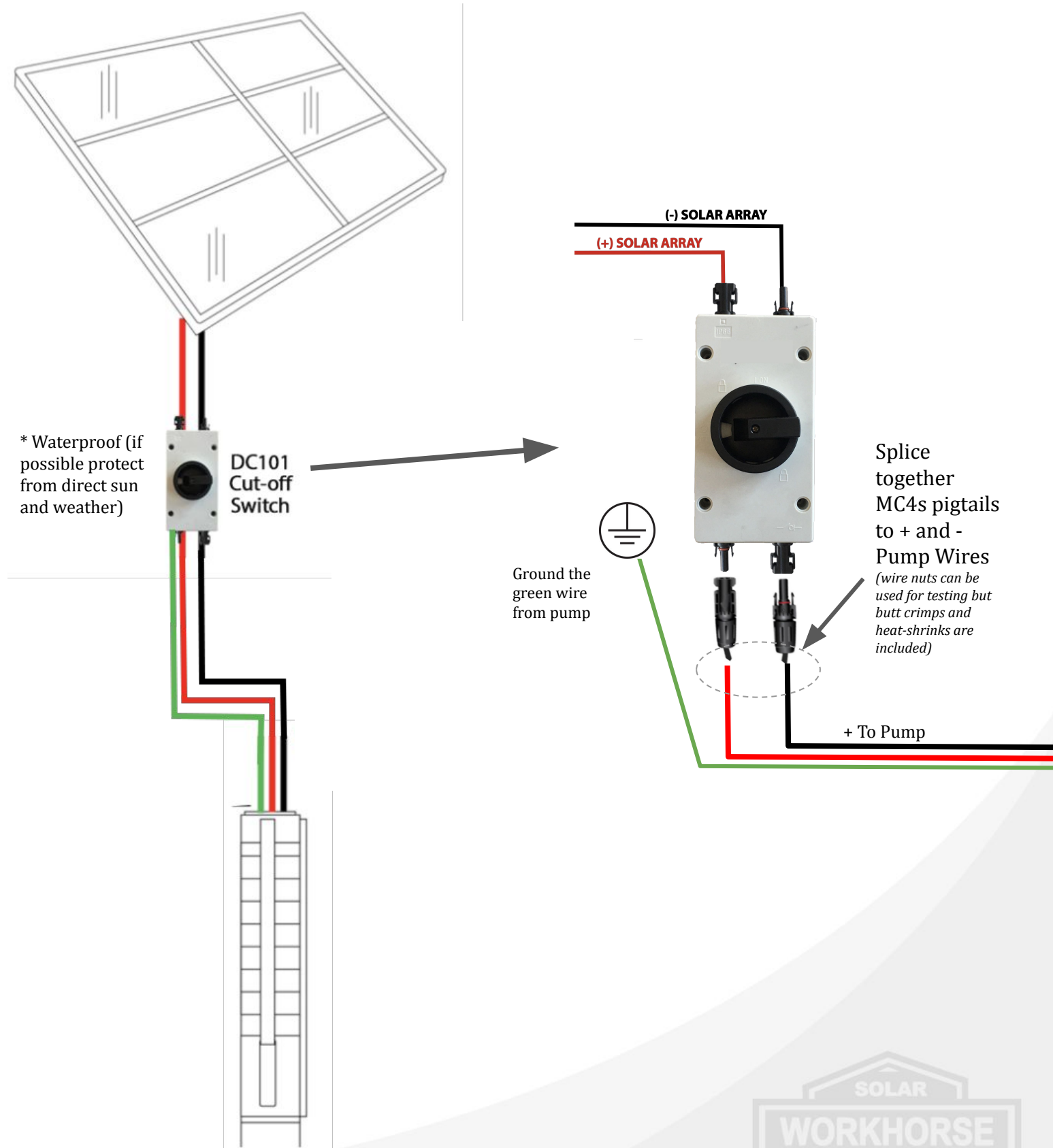
System Components

1. **PUMP MOTOR** — Heavy duty permanent magnet DC motor with laser welded stainless steel housing. The motor has a built in, state of the art controller and can operate from Solar Panels DC power directly. Motors have two conductors, two for power and one for ground. **** This series of pumps cannot run on AC Power**
2. **PUMP END** — Pump ends are stainless steel and designed for years of pumping. Outlet size is 1-¼” for each model. Female NPT thread. See specification table for exact outlet sizes, diameters and lengths.
3. **DC101 DISCONNECT SWITCH** — All systems come with a DC101 Cut-off switch for safely shutting down the system. The DC disconnect switch should only be turned on once all electrical connections have been made. Whenever connecting or disconnecting solar panels or pump connections, make sure the DC disconnect switch is turned off. Even when using a PSC50 controller (optional) the DC disconnect switch should be installed between the solar array and the PSC50.
4. **SOLAR PANELS & WIRE**— Each solar panel, each one has a Positive (male) and Negative MC4 Connector which will wire to the DC101 switch. 20’ of extension wire is included allowing for quick connection.
5. **PSC50 CONTROLLER (optional)** — The controller is optional, it adds the functionality to use a Tank sensor or pressure switch to shut the pump off.
6. **FLOATS / SENSORS (optional)** — Depending on usage, systems with PSC50 Controllers may include a float switch. Low water sensors not required for W3DC models.



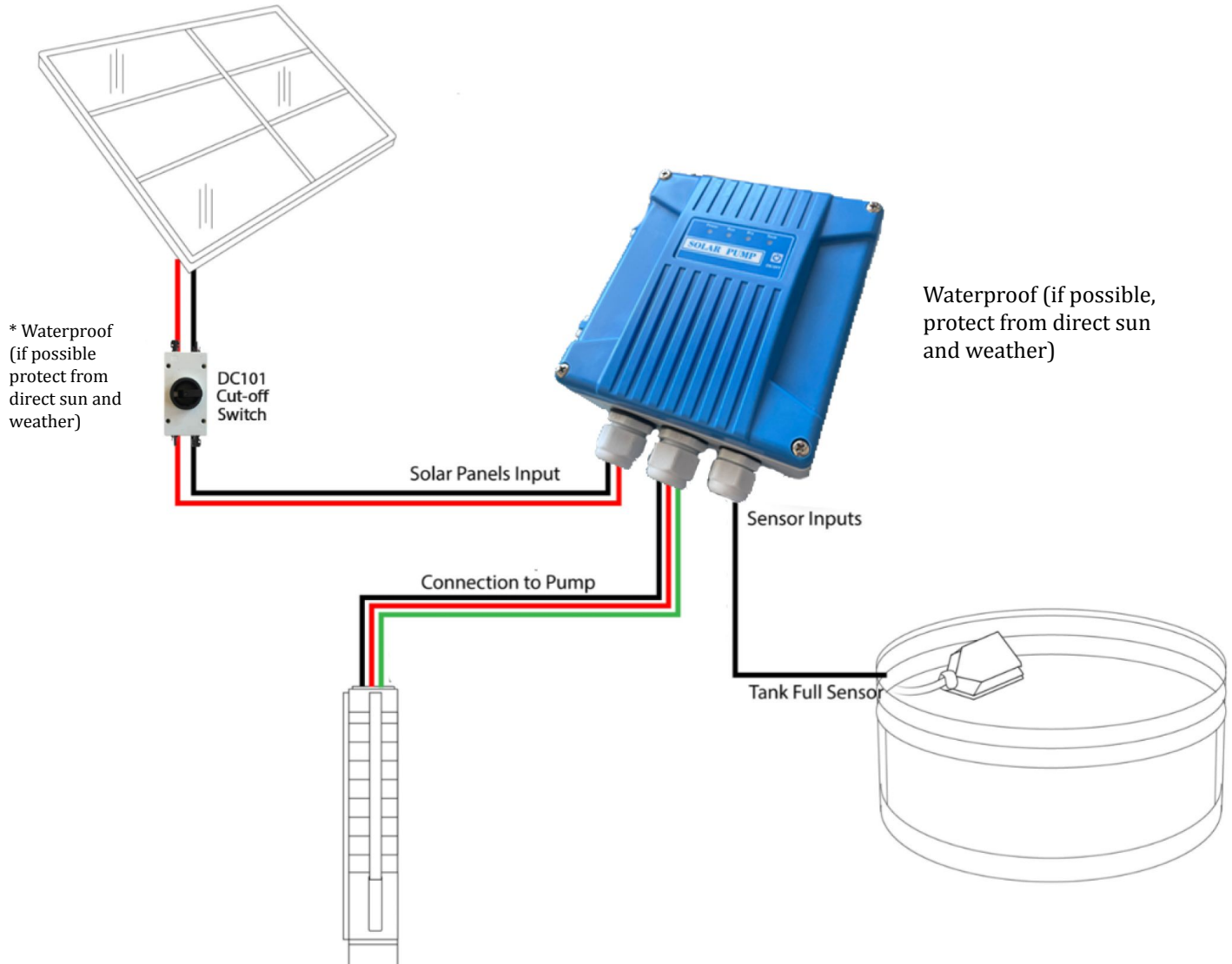
Overview Diagram

Solar Panels with DC101 Cut-off Switch



(Optional) Overview Diagram

With Optional PSC50 and Tank Float Sensor



PSC50 Wiring Details

Your PSC50 allows you to:

- Connect a tank float switch or pressure switch for shut-off
- If needed, use a low water sensor for shut-off

SOLAR INPUT

Connects to solar array through DC Cut-off Switch
Ensure Proper Grounding and Polarity

WELL WATER LOW

When low water sensor does not come pre-wired to W4H pumps, use WWL terminals and included 2 wire low water sensor

OPEN CIRCUIT - Pump On
CLOSED - Pump Off



PUMP WIRES - To extend pump wire, splice on two strand + ground (three total strands), submersible pump cable. 10 or 12 AWG are most common depending on length. Label wires + and - from the pump to ensure proper polarity! Ground wire must be in the Ground terminal.

TANK WATER LEVEL

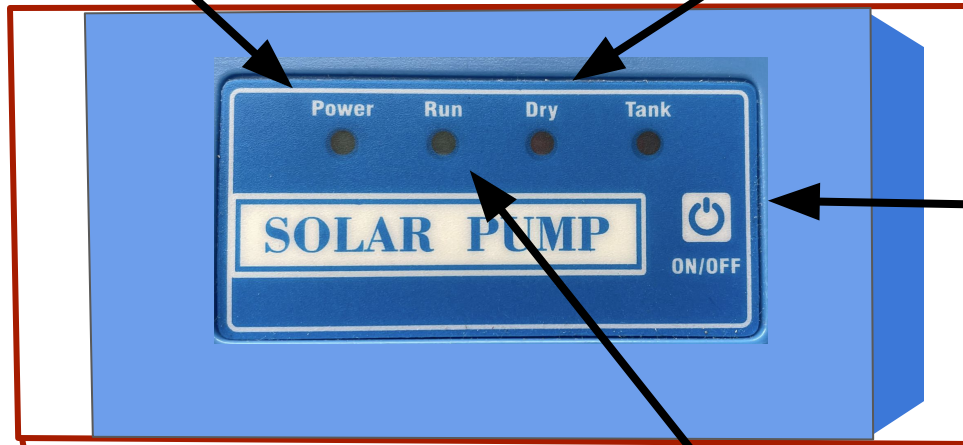
For 'tank full' shutoff, use TWL terminals for use with tank float or regular action pressure switch. Connect with *jumper wire if not using sensor or pressure switch*

OPEN CIRCUIT - Pump Off
CLOSED - Pump On

PSC50 Indicator Lights

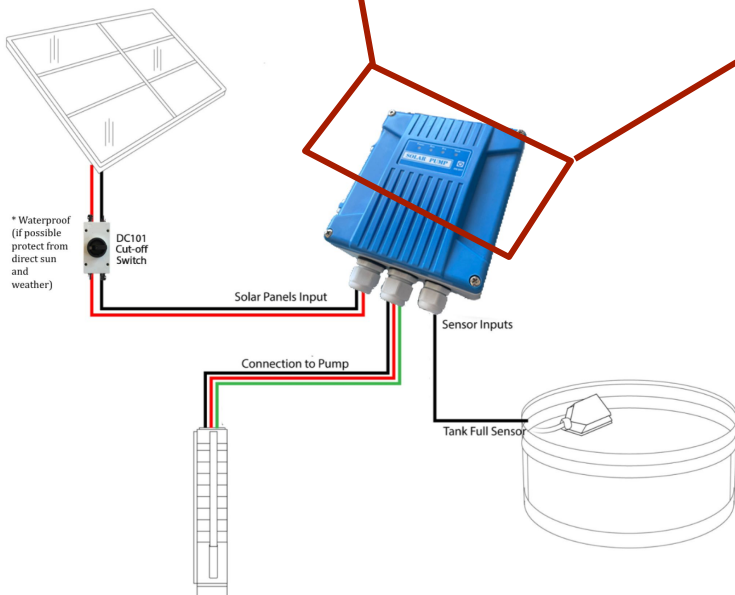
POWER LIGHT
ON / OFF

Sensor Indicator Lights
TANK = Tank Full
DRY = Well Level Low



POWER
Button
Toggle Pump
On & Off

Pump Light
SOLID Light when
running
BLINKING during
two minute
warm-up!

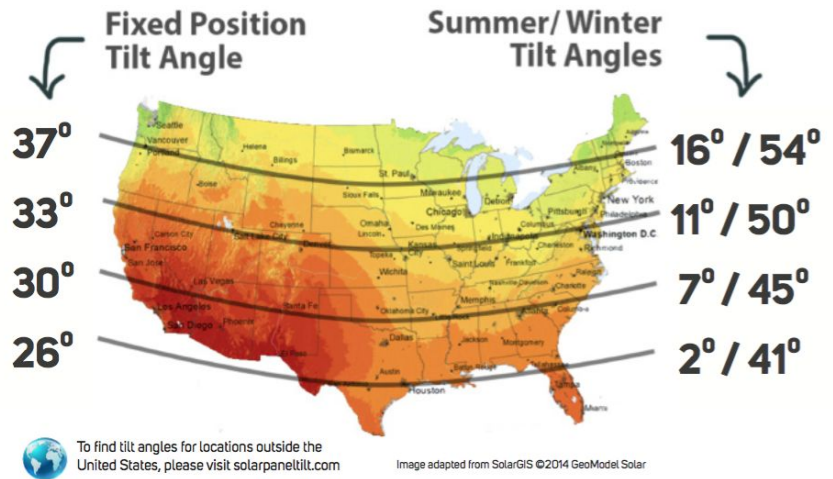


Site Planning

✓ **PANEL LOCATION-** Solar panels should be mounted on a secure structure, ground mount or top of pole mount. Panels should face true South and at an angle appropriate for your latitude. If you are mounting your panels on an already existing structure, try to get as close to the correct angle as possible.

✓ **GROUNDING-** It is important to ground the entire solar well pump system to ensure proper safety and to prevent damage in the event of a lightning strike but also to prevent static buildup. In lightning prone areas, this is especially important and a long dedicated copper ground rod should be installed near the solar panels and controller. If the well casing is metal and local code allows, it can be used for an Earth ground, instead of dedicated ground rod. Do not connect the sensors or the solar panel returns (-) to Earth ground.

✓ **No AC POWER-** Without an external converter box that converts AC to DC for the W3DC pumps, AC power cannot be used.



✓ **AVOID SHADOWS-** Choose a location for the panels that gets plenty of sun and is free from daily shadows. One of the most common issues with low performing systems is shadows on the solar arrays. Even a small shadow on one part of a panel can restrict current for all of the panels, significantly affecting system performance.

KEY POINTS

- Mount the solar panels facing south at an angle appropriate for your latitude.
- Avoid all shadows on the solar array. Even a small shadow on one part of a panel can restrict current for all of the panels, significantly affecting system performance.



Solar Panel Configurations

Using 100W Solar Panels and Adjustable Tilt Top-of-Pole Racking



200 Watts
2P - 2 Panels

Mounts to 2"
ID, 2-3/8" OD
Steel Post

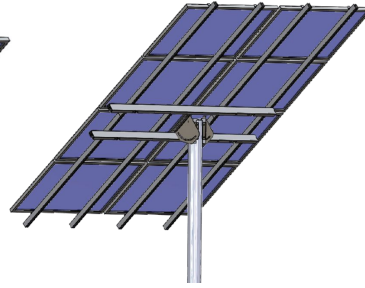
Wire Panels
in Series



400 Watts
4P - 4 Panels

Mounts to 4"
ID, 4-1/2" OD
Steel Post

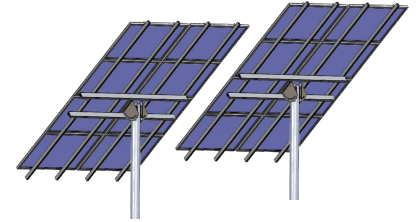
Wire Panels
in Series



800 Watts
8P - 8 Panels

Mounts to 4"
ID, 4-1/2" OD
Steel Post

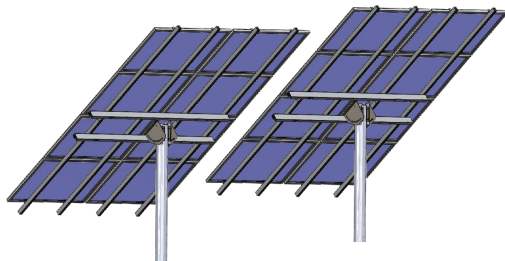
Wire Panels in
Series/Parallel (4x2)



1000 Watts
2x 8P - 10 Panels
5 panels on each

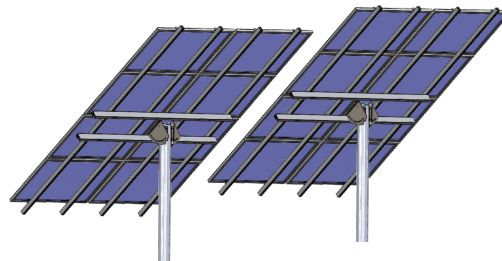
Mounts to 2x 4"
ID, 4-1/2" OD
Steel Post

Wire Panels in
Series/Parallel (5x2)



1200 Watts, 2x 8P - 12 Panels
2x 4" ID, 4-1/2" OD Steel Posts

Wire Panels in
Series/Parallel (6x2)



1600 Watts, 2x 8P - 16 Panels
2x 4" ID, 4-1/2" OD Steel Posts

Wire Panels in
Series/Parallel (8x2)

Solar Panel Specs



B40-M100-38L 100W Mono Solar Panel

Maximum Power	Pm	100 W
Open-Circuit Voltage	Voc	23.4V
Short-Circuit Current	Isc	5.35A
Maximum Power Voltage	Vmp	19.8V
Maximum Power Current	Imp	5.06A
Power Tolerance		0~+3%
All technical data at standard test condition (E=1000W/m ² Tc=25°C AM=1.5)		
Maximum System Voltage	DC	1000V
Module Application	Class	A
Nom Operating Cell Temp (NOCT)		47±2°C
Temperature Cycling Range		-40°C to +85°C
Weight		6kg / 13.2lbs
Dimensions		980×530×30 mm 38.6"×20.9"×1.18"
Cell Technology		Mono-Si
Company Name		Back40 Solar
ETL Certified to		UL 1703
	Made in	Malaysia

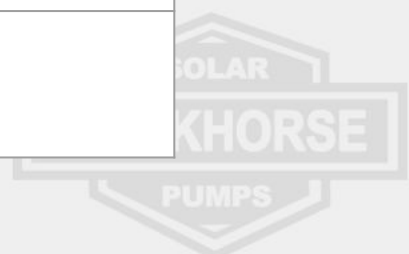
Tested to Hail, Wind
Requirements,
IEC 612512 / IEC 61646

UL1703 Standards comply fully
with NRCS

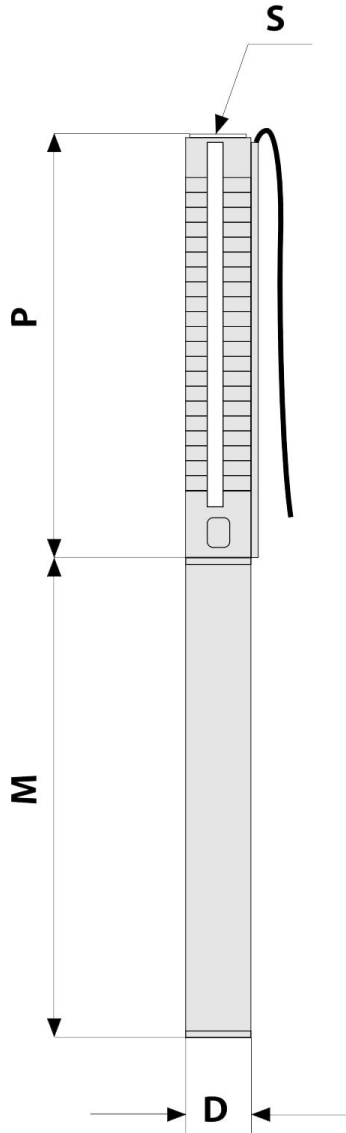


You will link your solar panels together and connect to the controller by clipping **MC4 connectors** together. Each MC4 connector is either a male end or female end (see image). They simply snap together to make safe and easy connections.

Model	Low Power	High Power ** Wired with Y Connectors
W3DC03	2x 100w In Series	Add 2x 100w In Parallel to the first 2x Panels
W3DC05	3x 100w In Series	Add 3x 100w In Parallel to the first 3x Panels
W3DC07	4x 100w In Series	Add 4x 100w In Parallel to the first 4x Panels
W3DC10	6x 100w In Series	Add 6x 100w In Parallel to the first 6x Panels
W3DC15	8x 100w In Series	Add 8x 100w In Parallel to the first 8x Panels

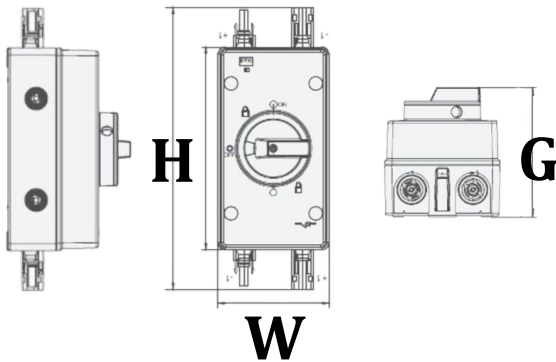


Dimensions



	W3DC03	W3DC05	W3DC07	W3DC10	W3DC15
S	1.25" FNPT	1.25" FNPT	1.25" FNPT	1.25" FNPT	1.25" FNPT
P	7.7"	9.7"	10.8"	13.4"	13.8"
M	12"	12"	14"	15"	17"
T	19.7"	21.7"	24.8"	28.4"	30.8"
D	3 25"	3 25"	3 25"	3 25"	3 25"

DC101



	DC101 Switch
H	7" / 10"
W	3.75"
G	4.5"

Parts & Tools for Install

Tools to bring

- Wire stripper/crimper
- Screwdrivers (flat and Phillips head)
- Electrical tape (for wrapping around wire to drop pipe)
- Teflon tape or thread sealant for tight thread connections (recommended)
- Adjustable wrenches
- Heat gun or torch for heat-shrink sleeves
- Multimeter (highly recommended)

Other Equipment

Drop Wire

Most use 12 gauge 3-strand wire (3 conductors, no ground OR 2 conductors with ground) to extend the pump wire to your desired depth. Deeper wells consider thicker gauge wire.

Drop Pipe

PVC, Steel, Black poly pipe. For solar, more guys are moving to black poly pipe that is at least 160psi. For shallower wells the 1- $\frac{1}{4}$ " Female thread outlet can usually be reduced down to a 1" barb and pipe without significant frictional loss.

Plumbing Parts

Proper couplers and thread tape to attach pump's female thread to your drop pipe, and at the top of the well casing.

Safety Rope / Line

The drop pipe will hold the pump, but the rope will support the pump in case the drop pipe breaks or is damaged.

Grounding

Grounding rod and bare copper wire to ground your pump system

Well Seal

A cap or seal and plumbing for the top of your well casing

Torque Arrestors & Spacers

With slow-start and slow-stop pumps like WORKHORSE, torque arrestors are far less commonplace and are usually omitted during installation. There is no sudden starting and stopping of the motor.

Solar Panel Racking

Hardware to mount solar panels unless using WORKHORSE racking.

Mounting Posts

For WORKHORSE racking, you'll need 8' to 10' of 2" ID, 2-3/8"OD (for the 2-panel mount) or 4" ID, 4-1/2"OD (for each 4P and 8P mount system) Schedule 40 Steel Pipe



System Troubleshooting

TEST 1: CHECK SOLAR PANELS

By far the number one issue with systems are the solar panels being incorrectly setup or located. Make sure testing is performed on a sunny day and there are no shadows on the solar array. Even a very small shadows on one panel will impact output of all panels. Adjust your panel angles for the season and make sure they are facing south. Avoid testing on cloudy days.

TEST 2: SOLAR CONNECTORS

Second most common issue are the solar panel connectors not making contact. Either the connectors are not fully seated, or the internal pins are not fully seated in the connector housing. Check all connectors and make sure the wire is fully seated and locked into the housing. Check for DC voltage at the output of the DC disconnect.

TEST 3: CURRENT CHECK

Use a clamp on amp meter to check for current flowing through the solar panel wires or pump wires. Current is an indication the motor is running but there might not be enough power for the water to reach the surface. Record this current and compare against I_{mp} on the backside of the panels. Current output is directly proportional to amount of sunlight on the panels.

TEST 4: HARD RESET

If the controller/pump is getting power but not operating perform a hard reset. Turn off DC Cut-off switch to disconnect all power from the controller, allow the system to power down for about a minute and power back up. Once powered up, you'll have to wait a full 120 seconds before the system will begin pumping.

TEST 5: WIRE RESISTANCE

Unlike single and 3 phase pumps, testing wire resistance does not provide us any usable information for troubleshooting, other than differentiating wires if they get mixed up after splicing. Sometimes you can catch a bad splice as resistance between + and - is usually in the low MOhms, and + / - and ground will be open circuit.



System Troubleshooting

Issue	Possible Causes	Test/Fix
No Water	Solar power not reaching pump Failed Underwater Splice Startup initialization countdown	Check all MC4 connections TEST 2, TEST 3
Vibration, but No Water	Still ramping up speed	Wait for 120 seconds
Pumped, then Stopped	Safety shutdown	Open the valve on your plumbing outlet slowly on first startup. Soft or Hard reset to override timer and reset to 120s startup countdown.
Low Flow Rate	Not enough power is reaching the pump Too late / early in the day for sufficient current from solar panels	-Most common low flow or no flow is low power due to evening, clouds or shadows on the array. -Eliminate any shade from the solar panels -Ensure proper panel angle and full sun exposure TEST 1, TEST 3
Surging / Decreased Flow Rate	Pumping dirty / sandy water	Check water pumped to ensure it is free of any particles, rust, sand etc

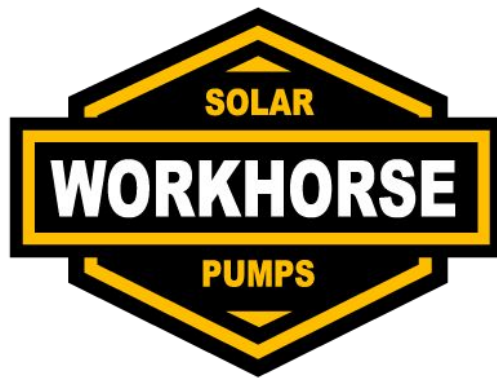
MAINTENANCE

- We recommend wiping down the surface of your solar panels every 3–6 months (more often if you're in a dusty area)

WARRANTY

- WORKHORSE extends a comprehensive warranty discussed fully in the attached documents. Work with a Certified Installer for more information or to submit a claim.





WorkhorsePumps.com

916-623-4621