

RackSafe – Universal Remote Racking System

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PROBLEM: ARC FLASH

- NFPA 70E governs safety practices when working around potential electrical hazards
- Most commonly caused by electrical fault
- Produces some of the highest temperatures known to occur on Earth, reaching 35,000 °F.
- 5 to 10 arc flashes occur each day in the US.
- Occurs most frequently during the operation of high voltage industrial circuit breakers



Tripping and Closing

- The actions of disabling and enabling power flow through the breaker, respectively.
- Achieved through pushing a button on the breaker face.



Racking

- The process of physically installing or removing circuit breakers from their housings.
- Accomplished by turning a rotary screw a specific number of times based on breaker model.



CURRENT SOLUTIONS

inoLECT inoRAC 2

Pros:

- Remote tripping and racking
- Adaptable to work on most breakers
- Remote interface with procedure walk-through.

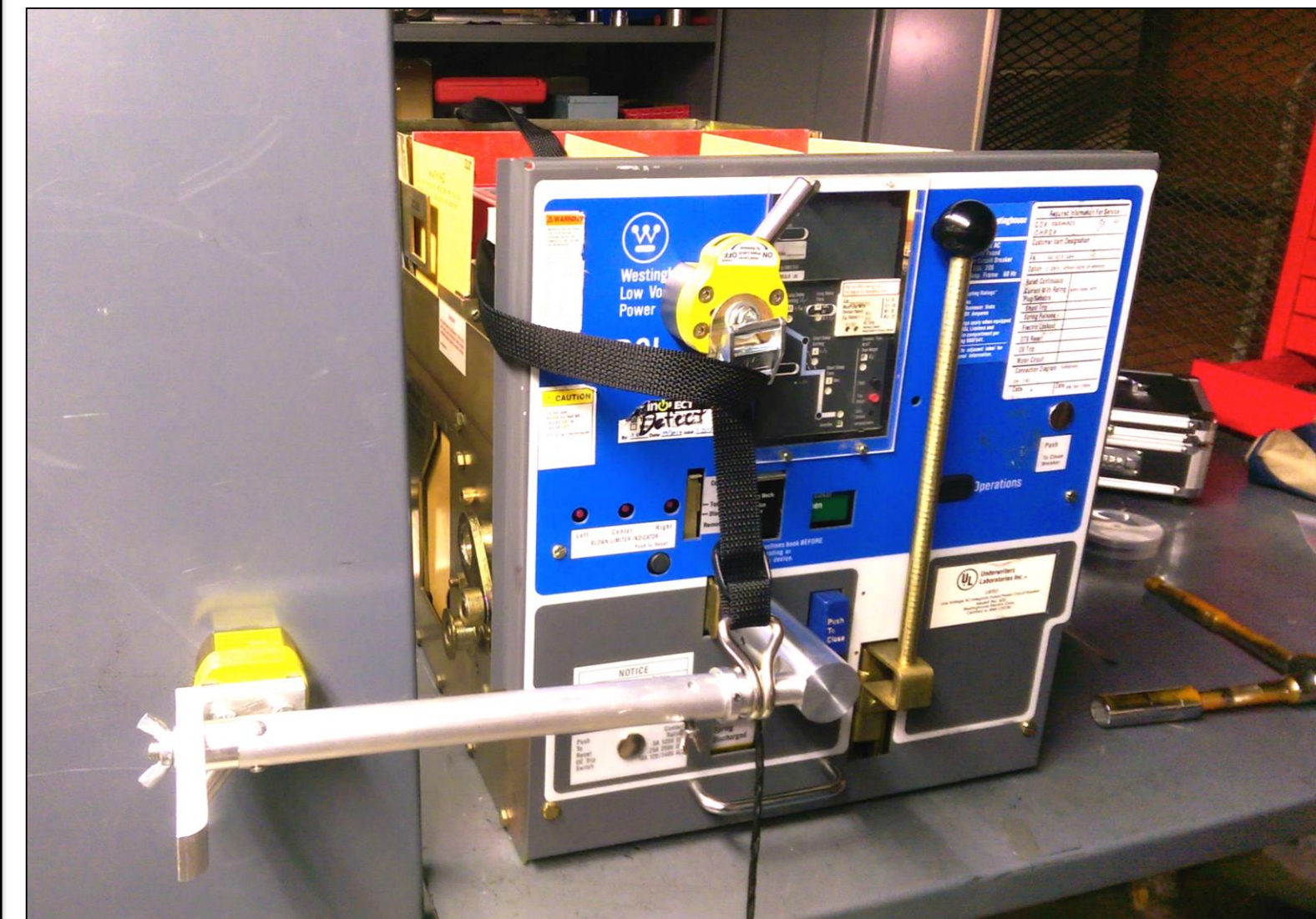
Cons:

- Heavy – 250 lbs total weight
- Large - 42" x 26" x 62"
- Instability when operating on highest row of breakers.
- Size limits breaker accessibility.
- Weight inhibits device mobility.

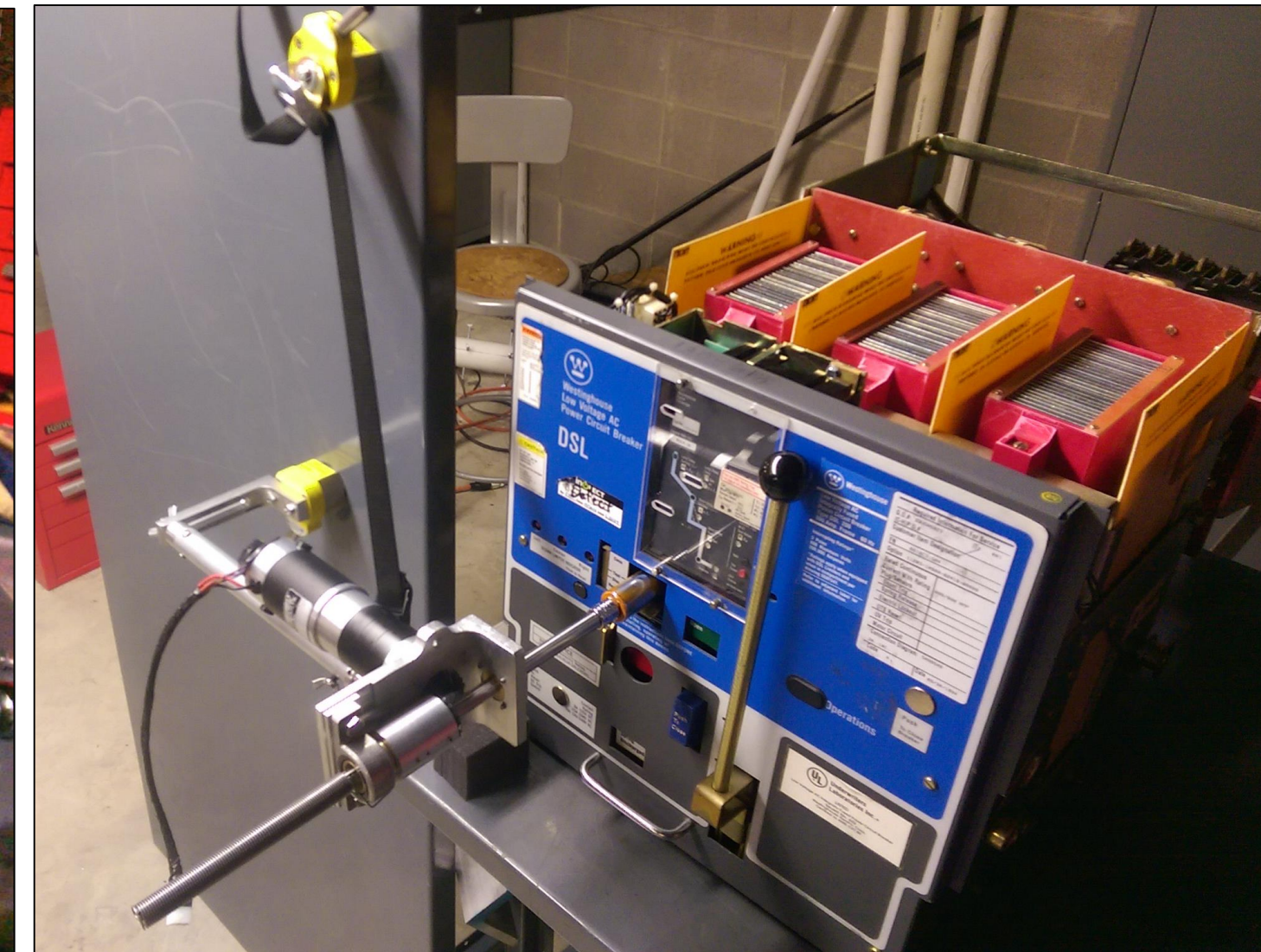


RackSafe CAPABILITIES

Push Button Tripping

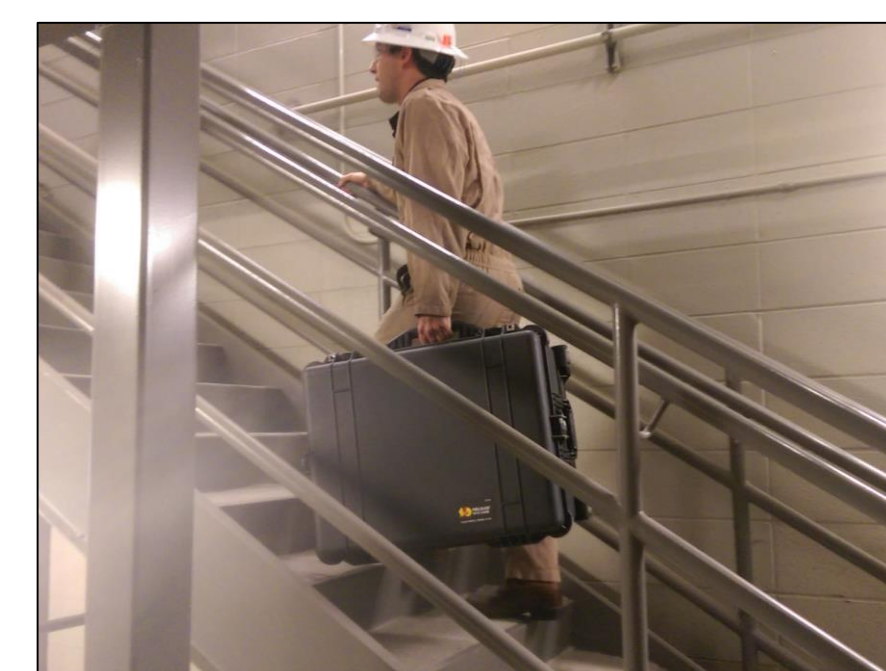


Unmanned Racking



Lightweight

- Racking Module Weight = 13 lbs
- Tripping Module Weight = 5 lbs
- Total Transport Weight = 44 lbs



Compact

- Transport Size = 25" x 20" x 12"
- Influenced by feedback from field electricians who would likely use the device.



Portable

- Handles on each side of Racksafe Case.
- Wheels and collapsible handle for effortless transport by single electrician.



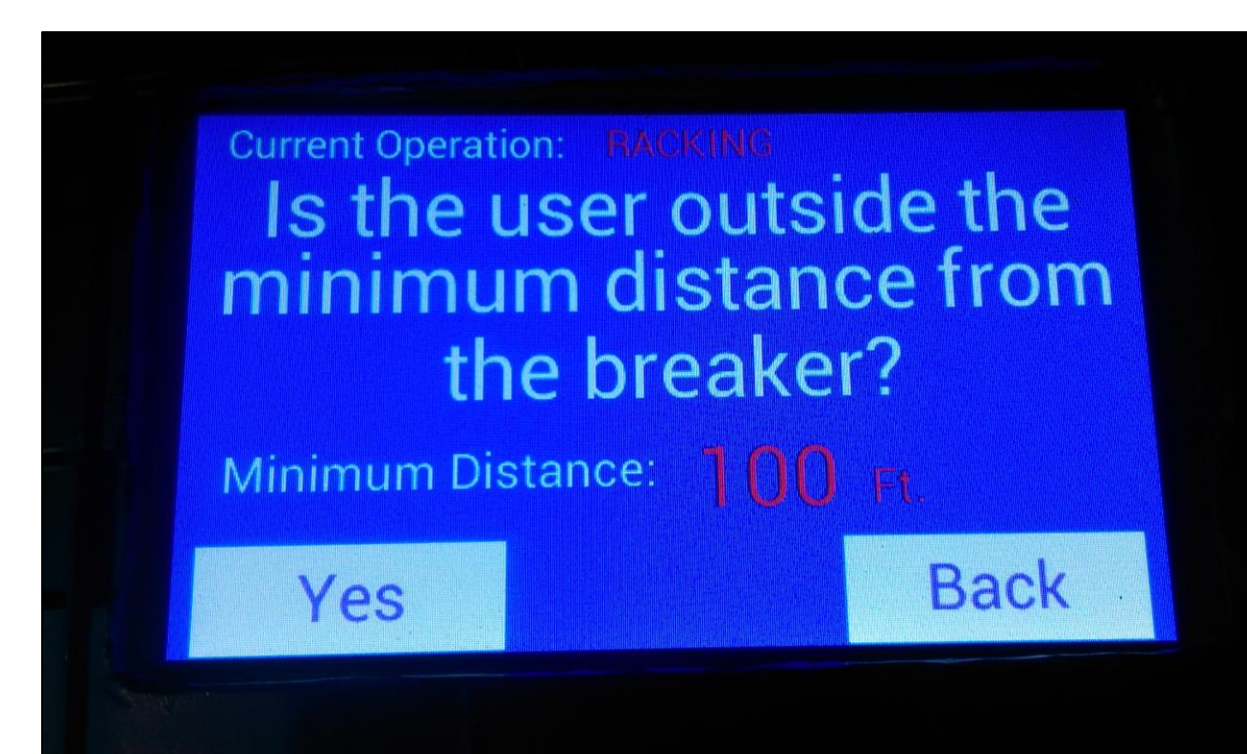
Adjustable

- 3 dimensional adjustability.
- Telescoping arm for adjusting horizontal length from magnetic mounting point.
- Support strap for adjusting vertical distance from magnetic mounting point.



Safety

- Capable of remote operation through touchscreen interface from up to 150 ft away.
- Safety prompts ensure that the operator is beyond the arc flash radius for the specific breaker being operated.



TESTING

Racking Configuration

- Pass/Fail racking test on Westinghouse breaker supplied by sponsor.
- Racking attempts: **25**
- Successful rack attempts: **25**

Tripping Configuration

- Pass/Fail trip and close test on Westinghouse breaker supplied by sponsor.
- Tripping attempts: **25**
- Successful trip attempts: **23**
- Failure occurred when the solenoid was positioned too close to the trip/rack buttons. Piston requires some momentum to trip.

COST

Category	Major Components	Cost
ELECTRICAL SYSTEMS	Power Supply	\$777.04
	Control Circuit	
RACKING CONFIGURATION	Raw Materials	\$1,457.85
	DC Gear Motor	
TRIPPING CONFIGURATION	Raw Materials	\$123.25
	Tubular Solenoid	
TOTAL		\$2,719.09

COMPETITIVE COMPARISON

Feature	INOLECT InoRac2	RackSafe
Remotely Operated	Yes	Yes
Push Button Tripping	Yes	Yes
Racking Operation	Yes	Yes
Procedure Walkthrough	Yes	Yes
Transport Weight	250 lbs.	44 lbs
Transport Dimensions (L x W x H)	42" x 26" x 62"	25" x 20" x 12"
Max Operating Height	84"	None
Max Operating Distance	75'	150'
Cost	\$25,000 - \$50,000	\$3,000