

# CapCheck® II

SUBSTATION TYPE - Model CC-II/100

## Capacitor Checker

### Operating & Instruction Manual



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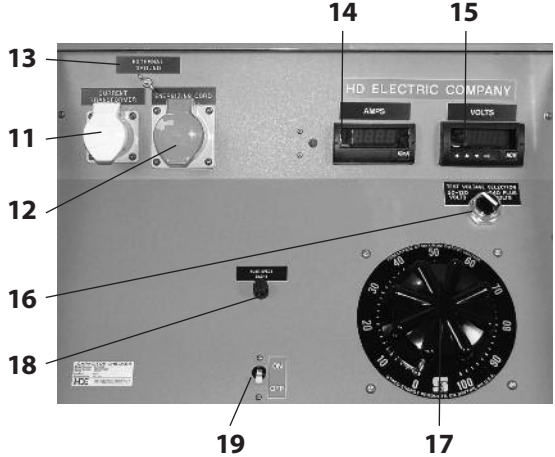
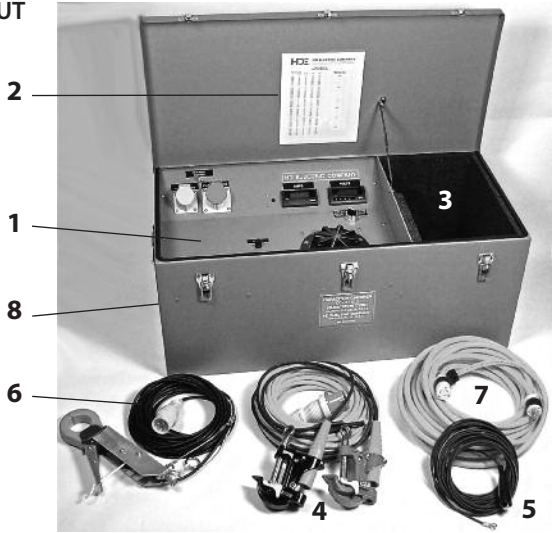
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# COMPONENT IDENTIFICATION

## CAP CHECK II Substation Type MODEL CC-II/100

### OPERATING COMPONENTS LAYOUT

1. Instrument Panel
2. Pass / Fail Limit Rating Chart
3. Cordage / Transformer Storage Area
4. Energizing Cord with Clamps
5. Grounding Cable
6. Current Transformer and Cordage
7. Power Cord
8. 110 Volt AC Adapter Cord – 3 prong straight type
9. Hotstick Carrying Bag
10. 4 Section Hotstick
11. Plug for the Current Transformer
12. Polarized plug for the energizing leads
13. Cabinet Ground Stud
14. AC Amps Digital Meter
15. AC Volts Digital Meter
16. Test Voltage Selection Switch
17. Variable Transformer (Variac)
18. Panel Meter Fuse
19. ON/OFF Switch





**CAUTION:** Make certain capacitors are shorted and de-energized **COMPLETELY** prior to testing. **ALWAYS** be certain capacitor bank to be tested is out of service. Allow at least 5 minutes for capacitors to fully discharge.



**CAUTION:** Make certain leads **NEVER** cross phases or drape across bushings, live transformers, etc. Cordage must remain free and clear of all objects, including the human body, **AT ALL TIMES**.



**CAUTION:** Make certain maximum capacitor KVAR and voltage do not exceed the Cap Check II testing limits. Maximum KVAR for the Cap Check II can be noted on the Pass/Fail Limit Rating Chart located at the end of the manual.



**CAUTION:** Make certain the Cap Check II voltage (Variac) is set to zero (0) prior to turning the instrument on and energizing capacitors.



**CAUTION:** Always turn the Variac to zero after testing capacitors and before turning the Cap Check II off. This action will discharge the capacitor.

**NOTE:** Familiarize yourself with the Cap Check II instrument panel layout as diagrammed on the previous pages, prior to conducting your first test.

### **ADDITIONAL SAFETY NOTES**

**Please note that your Company may have additional safety rules and procedures, which should be employed while using this equipment. You must check to make certain that all safety considerations are properly addressed when using this equipment. These are recommended safety rules and are to be used as guidelines in establishing and integrating your own safe procedures.**

## OPERATING PRINCIPLE

The Cap Check operates by measuring the current flowing through the capacitor under test. The operating convenience of this tester comes from the fact that a bank of paralleled capacitors is energized but currents are measured individually without opening any connections. Of course, the current drawn by the paralleled group must not exceed the capacity of the power supply.

## SET UP PROCEDURE

**IMPORTANT:** THE PROCEDURES DESCRIBED ARE GENERAL AND MUST BE REVIEWED AND MODIFIED AS NECESSARY TO CONFORM TO THE USER'S SAFETY RULES, STANDARDS AND REGULATIONS.

ALWAYS REMEMBER THAT THE DISTRIBUTION EQUIPMENT UNDER TEST OPERATES AT HIGH VOLTAGE. THE CAPACITOR BANKS MUST BE DE-ENERGIZED AND COMPLETELY DISCHARGED BEFORE THE TESTING AT THE RELATIVELY LOW VOLTAGE IS PERFORMED.

Every group of paralleled capacitors must be discharged. If these parallel groups are not equipped with shorting switches this must be accomplished in accordance with the user's standard safe operating procedures.

## SET UP AND TESTING

To obtain correct results it is necessary that the Cap Check energizing leads be connected across the single parallel group of capacitors being tested. If shorting switches are installed, these can limit the energized capacitors to those under test. If switches are not available it will be necessary to use jumpers. The energizing leads may then be attached to the phase lead and the neutral. It is also possible to attach the energizing leads to each of the paralleled sections, but this defeats the timesaving feature of the Cap Check.

Other arrangements of jumpers or switching can be devised to suit the network under test.

When the system consists of paralleled series-parallel groups it probably will not be necessary to switch or jumper the parallel leg – as a matter of fact, that leg must not be shorted or too much of it jumped to avoid drawing excessive power from the tester.

After the test of all parallel groups is completed the tester voltage should be turned down to minimum and the supply should be de-energized. This action will discharge the capacitors which were last tested.

## DESIGN OF THE PROCEDURE

The objectives to be considered when establishing a test procedure must put safety first and then consider the convenience and efficiency of the work crew. The basic consideration will be to minimize the number of jumper shifts during the course of testing.

## PROCEDURE REVIEW

HD Electric Company will be happy to discuss special problem networks or to review proposed test sequences, but the responsibility for the safe design of these procedures and the safe operation of the test set lies with the using authority.

## INTRODUCTION

This Substation Capacitor Checker applies a low AC, 60 Hz voltage to a group of parallel-connected capacitor units. Capacitors are measured individually with a clamp-type ammeter probe to determine if the capacitor units have a defect. The defect may be either a partial or complete short or an open pack. To test the entire capacitor bank, the test voltage energizing leads must be moved around the capacitor bank and connected to each group of parallel capacitors. The capacitors being tested remain connected to the bus through their individual fuses.

**EXCEPTION:** A capacitor which has its individual fuse blown will not be energized when voltage is applied to the main bus.

**STEP 1.** Verify that the capacitor bank is out of service and isolated from its source. If the capacitor bank is in service, open the source device and wait a full five (5) minutes for the capacitors to discharge. Then temporarily short circuit the capacitors with the bank shorting switch. Ground the bank according to the approved methods. **NOTE:** Capacitor structures and associated shorting and grounding devices vary between locations.

### FOR TESTING CAPACITORS WITH BLOWN FUSES

Capacitor units which have had their protective fuses blown must be temporarily shorted and grounded on an individual basis and test leads subsequently connected to each capacitor. To obtain the individual capacitor reading, clamp the Current Transformer around the ground lead from the capacitor under test. See the following instructions.

**STEP 2.** Disconnect and remove the following type capacitors from the bank:

1. Any visually bulged units.
2. Any unit which shows an insulating liquid leak. These leaks may occur at the phase bushings, the neutral attachment, the fill hole or a seam. Any loss in insulating liquid may result in an internal flashover to the case and possible case rupture. The packs and leads are very confined and a void in the insulating liquid can precipitate a failure.

A leaking capacitor may test OK because a pack hasn't completely shorted or open. However, the gas generated from a pack in the process of failing can cause tank swelling or force liquid out a weakened seal or seam.

**SAFETY PLEASE NOTE** A CAPACITOR MUST BE SHORT CIRCUITED AT THE TERMINALS BEFORE IT CAN BE CONSIDERED DE-ENERGIZED.

**STEP 3.** Suggested Cap Check Hookup Procedure

- A. Connect the Cap Check cabinet ground to the station ground.
- B. Plug the polarized plug of the Energizing Leads into the Cap Check. Connect the energizing leads via live line clamp to the section of bank to be checked (red clamp to phase bus, black to neutral bus). Use rigorous and approved hotstick work precautions.
- C. Verify that the Cap Check On/Off switch is in the **OFF** position and that the Variable Transformer is at **zero (0)**.
- D. Connect the Cap Check power supply cord to a 120-volt outlet (120 volt, 20-amp circuit required). Adapter pigtailed are provided for twist-lock and non-twist-lock connectors.

**STEP 4. A.** Outdoor Substation Racks

Attach the Current Transformer to the hotstick to permit measuring individual capacitors while the operator stands at ground level. The hotstick consists of four eight-foot sections. Also assemble the Actuating Rope.

**B.** Pad Mounted Enclosure Capacitor Rack

The Current Transformer may be operated without the hotstick, but rubber gloves are required because bare connections are energized at 120 volts. Hotsticks are still advised under all conditions.

**STEP 5.** Determine the rating of the capacitors under test and determine the test voltage to be applied by referencing the Pass/Fail Limit Rating Chart located at the end of the manual. Set the Test Voltage Selection Switch to the correct position for that voltage. **NOTE:** It is possible to attain the 50 and 120 Volt setting in the 240 Plus position. This action can yield incorrect readings and can cause serious damage to the internal components of this tester.

**STEP 6.** With the Variable Transformer at zero turn the Cap Check on. The digital meters will light and may flash at random for a few seconds. Slowly advance the Variable Transformer and observe the rate of voltage and current increase. If the input circuit breaker trips, an overload is indicated. This condition will rarely be found in banks with individually fused capacitors. It is a likely occurrence when testing isolated capacitors. A completely shorted capacitor is the extreme case of this type.

If this condition is found, try searching with a lower than listed voltage using the Current Transformer. The bad capacitor will have a very high current when compared to good capacitors. Do not attempt a long search unless some other clamp-on current meter is used to limit the search current to 8 amperes at 50 volts and even then, do not exceed 30 minutes.

When measuring suspected individual capacitors that are disconnected from the bank, place the Current Transformer on the bushing prior to applying the test voltage. Shorted capacitors will provide high current readings even with less than normal testing voltage.

**STEP 7.** Verify with the Current Transformer that each capacitor is within the range specified on the Pass/Fail Limit Rating Chart.

**NOTE:** Capacitors which have **LOW** readings may have open packs or corroded terminals, either on the capacitor or at the fuse connection to the bus. Corrosion results in an excessive voltage drop and an incorrect reading. Wire brush the connections and reconduct the test if this is observed. Values **ABOVE** the accepted range indicate one or more groups of packs are shorted. Replace the units not in the acceptable range indicated on the Pass/Fail Limit Rating Chart.

**STEP 8.** When the group check is complete, return the Variable Transformer to zero to short out the capacitors. Turn the Cap Check off.

**STEP 9.** Repeat Steps 1 – 8 for the remaining groups to be tested.

**STEP 10.** Upon completion of the test, store the leads in the appropriate storage area in the Cap Check.

**NOTE:** The unit is not weatherproof. Exercise care to prevent moisture damage.

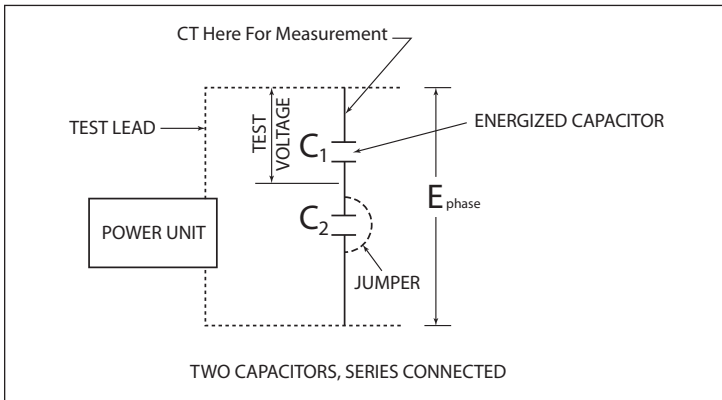


## SERIES-PARALLEL GROUP TESTS

The use of series-parallel capacitor groups is common to obtain the necessary voltage and capacity ratings for substation banks.

The Cap Check has been designed to test these capacitor groups without the need for disconnecting any leads. The series connection of parallel groups may require the use of some shorting jumpers or movement of the energizing lead connection points.

It is necessary that the energizing voltage appear directly across the capacitors under test. It is necessary to locate the leads or jumpers to accomplish this.



**Figure 1**

**FIGURE 1** shows a pair of series connected capacitors.

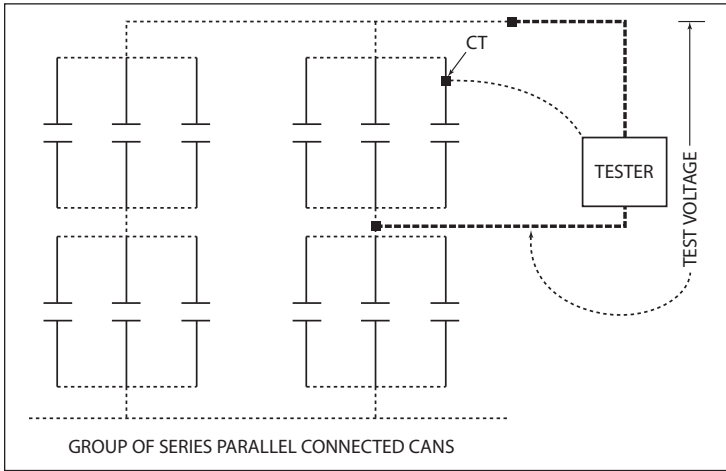
By definition,  $C = 1/(1/C1 + 1/C2)$  and  $KVAR = 2 \pi fC (kV)^2 \times 10^{-3}$ ; C in  $\mu Fd$ .

We may calculate the following for a selected case:

VOLTAGE	KVAR	CMFD
7960	100	4.19; two such units in series give:
15920	200*	2.10; * the 200 KVAR has been calculated for the 2.1 $\mu Fd$

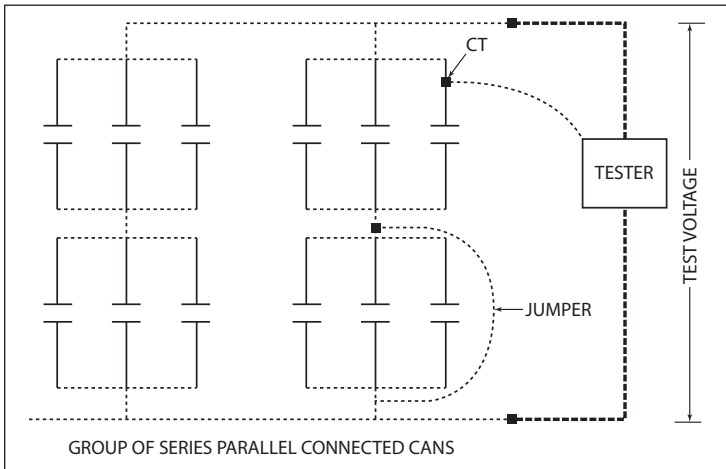
Therefore, when two identical capacitors are connected in series to permit operation at a doubled voltage, the KVAR value will be the sum of the total KVAR rating of the two units.

The energizing leads may be placed across the group of capacitors under test as shown in **FIGURE 2** below. This will place the balance of the groups in series and reduce the current load presented by them. The loading effect of these capacitors strung in series will be equal to  $1/n \times \text{group KVAR}$ ; where n is the number of groups in series loading the power unit. In the case shown in Figure 2, the loading effect would be  $1/4 \times \text{group KVAR}$ .



**Figure 2**

**FIGURE 3** below shows the same group of capacitors with a different energizing lead connection, which would require the use of a jumper. This would increase the effective load on the power unit. If the bank load does not exceed the capacity of the unit, any connection arrangement may be used.



**Figure 3**

The Pass/Fail Limit Rating Chart at the end of the manual provides a maximum load per phase for the Cap Check. These values are for continuous duty and some overload capacity is available.

HD Electric Company will be happy to review questions presented regarding jumper arrangements and the load capacity of the Cap Check, but cannot assume responsibility for safe operation and the design of operating procedures.

## CAP CHECK II PASS / FAIL LIMIT RATING

NAMEPLATE DATA			TEST CURRENT		MAXIMUM ENERGIZED BANK LOAD, KVAR
V	KVAR	V TEST	I MIN	I MAX	
2200	15	50	0.141	0.189	1050
2200	25	50	0.235	0.315	
2200	50	50	0.470	0.630	
2200	100	50	0.940	1.260	
2200	150	50	1.410	1.890	
2200	300	50	2.820	3.781	
2200	600	50	5.640	7.562	
2400	15	50	0.118	0.159	1250
2400	25	50	0.197	0.265	
2400	50	50	0.395	0.530	
2400	100	50	0.790	1.059	
2400	150	50	1.185	1.589	
2400	200	50	1.580	2.118	
2400	400	50	3.160	4.236	
2400	800	50	6.319	8.472	
2400	15	120	0.284	0.381	500
2400	25	120	0.474	0.635	
2400	50	120	0.948	1.271	
2400	100	120	1.896	2.542	
2400	200	120	3.792	5.083	
4000	50	50	0.142	0.191	3550
4000	100	50	0.284	0.381	
4000	150	50	0.427	0.572	
4000	200	50	0.569	0.763	
4000	400	50	1.138	1.525	
4000	800	50	2.275	3.050	
4000	15	120	0.102	0.137	1450
4000	25	120	0.171	0.229	
4000	50	120	0.341	0.458	
4000	100	120	0.683	0.915	
4000	200	120	1.365	1.830	
4000	400	120	2.730	3.660	

CAP CHECK II PASS / FAIL LIMIT RATING *continued*

V	NAMEPLATE DATA		TEST CURRENT		MAXIMUM ENERGIZED BANK LOAD, KVAR
	KVAR	V TEST	MIN	MAX	
4160	50	50	0.131	0.176	3850
4160	100	50	0.263	0.352	
4160	150	50	0.394	0.529	
4160	200	50	0.526	0.705	
4160	400	50	1.052	1.410	
4160	800	50	2.103	2.820	
4160	15	120	0.095	0.127	1600
4160	25	120	0.158	0.211	
4160	50	120	0.316	0.423	
4160	100	120	0.631	0.846	
4160	200	120	1.262	1.692	
4160	400	120	2.524	3.384	
4800	50	50	0.099	0.132	5150
4800	100	50	0.197	0.265	
4800	150	50	0.296	0.397	
4800	200	50	0.395	0.530	
4800	400	50	0.790	1.059	
4800	800	50	1.580	2.118	
4800	15	120	0.071	0.095	2100
4800	25	120	0.118	0.159	
4800	50	120	0.237	0.318	
4800	100	120	0.474	0.635	
4800	200	120	0.948	1.271	
4800	400	120	1.896	2.542	
6640	15	300	0.093	0.125	1600
6640	15	120	0.037	0.050	4100
6640	25	120	0.062	0.083	
6640	50	120	0.124	0.166	
6640	100	120	0.248	0.332	
6640	150	120	0.372	0.498	
6640	200	120	0.495	0.664	
6640	400	120	0.991	1.328	
6640	800	120	1.981	2.656	
7200	15	300	0.079	0.106	1900

CAP CHECK II PASS / FAIL LIMIT RATING *continued*

V	NAMEPLATE DATA		TEST CURRENT		MAXIMUM ENERGIZED BANK LOAD, KVAR
	KVAR	V TEST	MIN	MAX	
7200	25	120	0.053	0.071	4800
7200	50	120	0.105	0.141	
7200	100	120	0.211	0.282	
7200	150	120	0.316	0.424	
7200	200	120	0.421	0.565	
7200	300	120	0.632	0.847	
7200	600	120	1.264	1.694	
7200	1200	120	2.528	3.389	
7300	100	120	0.205	0.275	4950
7300	150	120	0.307	0.412	
7300	200	120	0.410	0.549	
7300	300	120	0.615	0.824	
7300	600	120	1.229	1.648	
7300	1200	120	2.459	3.297	
7620	15	300	0.071	0.095	2150
7620	25	300	0.118	0.158	
7620	50	120	0.094	0.126	5400
7620	100	120	0.188	0.252	
7620	150	120	0.282	0.378	
7620	200	120	0.376	0.504	
7620	300	120	0.564	0.756	
7620	600	120	1.128	1.513	
7620	1200	120	2.257	3.026	
7960	15	300	0.065	0.087	2350
7960	25	300	0.108	0.144	
7960	50	120	0.086	0.116	5900
7960	100	120	0.172	0.231	
7960	150	120	0.259	0.347	
7960	200	120	0.345	0.462	
7960	400	120	0.689	0.924	
7960	800	120	1.379	1.848	
8320	15	300	0.059	0.079	2550
8320	25	300	0.099	0.132	

CAP CHECK II PASS / FAIL LIMIT RATING *continued*

V	NAMEPLATE DATA		TEST CURRENT		MAXIMUM ENERGIZED BANK LOAD, KVAR
	KVAR	V TEST	MIN	MAX	
8320	50	120	0.079	0.106	6450
8320	100	120	0.158	0.211	
8320	150	120	0.237	0.317	
8320	200	120	0.316	0.423	
8320	400	120	0.631	0.846	
8320	800	120	1.262	1.692	
9960	200	50	0.092	0.123	22150
9960	300	50	0.138	0.184	
9960	100	120	0.110	0.148	9200
9960	150	120	0.165	0.221	
9960	200	120	0.220	0.295	
9960	300	120	0.330	0.443	
9960	600	120	0.660	0.885	
9960	1200	120	1.321	1.771	
10300	100	120	0.103	0.138	9850
10300	150	120	0.154	0.207	
10300	200	120	0.206	0.276	
10300	400	120	0.412	0.552	
10300	800	120	0.823	1.104	
10800	200	120	0.187	0.251	10850
13200	25	480	0.063	0.084	4050
13200	50	480	0.125	0.168	
13200	100	480	0.251	0.336	
13200	50	300	0.078	0.105	6450
13200	100	300	0.157	0.210	
13200	150	120	0.094	0.126	16200
13200	200	120	0.125	0.168	
13200	400	120	0.251	0.336	
13200	800	120	0.501	0.672	
13280	50	300	0.077	0.104	6550
13280	100	300	0.155	0.208	
13280	150	300	0.232	0.311	

CAP CHECK II PASS / FAIL LIMIT RATING *continued*

NAMEPLATE DATA			TEST CURRENT		MAXIMUM ENERGIZED BANK LOAD, KVAR
V	KVAR	V TEST	MIN	MAX	
13280	100	120	0.062	0.083	16400
13280	150	120	0.093	0.125	
13280	200	120	0.124	0.166	
13280	300	120	0.186	0.249	
13280	600	120	0.372	0.498	
13280	1200	120	0.743	0.996	
13800	25	480	0.057	0.077	4400
13800	50	480	0.115	0.154	
13800	50	300	0.072	0.096	7100
13800	100	300	0.143	0.192	
13800	100	120	0.057	0.077	17750
13800	150	120	0.086	0.115	
13800	200	120	0.115	0.154	
13800	400	120	0.229	0.307	
13800	800	120	0.459	0.615	
14400	25	480	0.053	0.071	4800
14400	50	480	0.105	0.141	
14400	100	480	0.211	0.282	
14400	50	300	0.066	0.088	7700
14400	100	300	0.132	0.177	
14400	100	120	0.053	0.071	19300
14400	150	120	0.079	0.106	
14400	200	120	0.105	0.141	
14400	300	120	0.158	0.212	
14400	600	120	0.316	0.424	
14400	1200	120	0.632	0.847	
15200	150	120	0.071	0.095	21500
16000	200	120	0.085	0.114	23850
17000	300	300	0.283	0.380	10750
19920	200	120	0.055	0.074	36950
19920	300	120	0.083	0.111	

CAP CHECK II PASS / FAIL LIMIT RATING *continued*

V	NAMEPLATE DATA		TEST CURRENT		MAXIMUM ENERGIZED BANK LOAD, KVAR
	KVAR	V TEST	MIN	MAX	
19920	50	480	0.055	0.074	9200
19920	100	480	0.110	0.148	
19920	150	300	0.103	0.138	14750
19920	200	300	0.138	0.184	
19920	300	300	0.206	0.277	
21600	150	300	0.088	0.118	17400
21600	200	300	0.117	0.157	
21600	50	480	0.047	0.063	10850
21600	100	480	0.094	0.126	
21600	150	480	0.140	0.188	
21600	200	480	0.187	0.251	
22130	100	480	0.089	0.120	11400
22130	150	480	0.134	0.179	
22130	200	480	0.178	0.239	
22500	50	480	0.043	0.058	11800
22500	100	480	0.086	0.116	
22500	150	480	0.129	0.174	
22500	200	480	0.173	0.231	
25000	100	480	0.070	0.094	14550
25000	150	480	0.105	0.141	
25000	200	480	0.140	0.187	

**NOTE:** Maximum Energized Bank Load, KVAR refers to the capacitors which the Cap Check II can energize as a group. The operating manual includes information on load calculations for series-parallel connected banks.

When more than one test voltage is listed for a capacitor nameplate rating, select the highest value while considering the Cap Check bank capacity rating.









## LIMITED WARRANTY AND LIMITATION OF LIABILITY

This warranty applies to all products sold by HD Electric Company (the "Products"); provided, however, that the term Products does not include any third party products purchased through HD Electric Company, for which no warranties are made (the "Third Party Products"). Third Party Products may be subject to a separate manufacturer's warranty; [should you have any question regarding whether a separate warranty applies, please contact HD Electric Company].

NOTICE: READ THIS LIMITATION OF WARRANTY AND LIABILITY BEFORE BUYING OR USING THE PRODUCTS CONTAINED HEREIN.

It is impossible to eliminate all risks associated with the use of the Products. Risks of serious injury or death, including risks associated with electrocution, arcing and thermal burns, are inherent in work in and around energized electrical systems. Such risks arise from the wide variety of electrical systems and equipment to which Products may be applied, the manner of use or application, weather and environmental conditions or other unknown factors, all of which are beyond the control of HD Electric Company.

HD Electric Company does not agree to be an insurer of these risks, and shall have no liability for any claims arising from such risks.

WHEN YOU BUY OR USE THESE PRODUCTS, YOU AGREE TO ACCEPT THESE RISKS.

HD Electric Company warrants to the original purchaser that the Products (excluding any third party products purchased through HD Electric Company, for which no warranties are made) will be free from defects in material and workmanship, under normal use and regular service, and preventative maintenance for a period of one (1) year (ten (10) years for HDE Capacitor Controls) from the date of shipment (the "Warranty Period"). Should any failure to conform with this warranty be found during the Warranty Period, you must notify HD Electric Company of your claim within thirty (30) days of discovery, and within the Warranty Period. Your failure to give notice of claims of breach of warranty within the Warranty Period shall be deemed an absolute and unconditional waiver of claims for such defects. HD Electric Company will have no responsibility to honor claims received after the date the applicable Warranty Period expires.

Upon notice of your claim, HD Electric Company will provide a return authorization number, and further instructions on how to return the product for service. You must follow HD Electric Company's instruction. You are responsible for all Product removal, handling, re-installation, and shipping (both to and from HD Electric Company). Products returned for repair, as well as repaired or replacement Products shall be sent postage / freight prepaid. After receipt of a product which HD Electric Company determines is defective, HD Electric will, at its option, either (1) repair (or authorize the repair of) the Product or (2) replace the Product, subject to the following: The Products are made using parts sourced from a variety of manufacturers. Due to the rapidly changing technology environment, parts may become obsolete / unavailable over time (end of life). In the event that a Product cannot be repaired or replaced due to unavailability of parts, HD Electric Company will use commercially reasonable efforts to obtain substitute parts or conduct work around design, but cannot guarantee its ability to do so.

Items not found defective will be returned at your expense, or failing receipt of instruction from you on return of such items within five (5) business days of our notice to you that the product is not defective, HD Electric may dispose of the product at its discretion and with no liability to you. HD Electric Company's determination of defects is final. Products repaired or replaced during the Warranty Period shall be covered by the foregoing warranties for the remainder of the original Warranty Period or ninety (90) days from the date of delivery of the repaired or replaced Products, whichever is longer.

### LIMITATIONS:

This warranty is void in the event of misuse, alteration, faulty installation, or misapplication of the product.

This warranty does not cover failure of product or components due to any ACT OF NATURE; lightning, floods, hurricanes, tornadoes or any other such catastrophic events.

HD Electric Company does not warrant any third party products or associated hardware or their performance or suitability for use and application. Such items are provided "as-is".

All repairs must be authorized by HD Electric Company. Unauthorized repairs will not be reimbursed under any circumstances.

HD Electric Company is not required to make replacement or loaner equipment available while Products are being repaired or replaced, or to compensate you for any in/out labor charges or expenses associated with removal, handling or re-installation of the Products.

TO THE MAXIMUM EXTENT PERMITTED BY LAW, THIS WARRANTY AND THE REMEDIES SET FORTH ABOVE ARE EXCLUSIVE AND IN LIEU OF ALL OTHER WARRANTIES, REMEDIES AND CONDITIONS, WHETHER ORAL OR WRITTEN, EXPRESS OR IMPLIED. HD ELECTRIC EXPRESSLY DISCLAIMS ALL OTHER WARRANTIES OF ANY KIND, EXPRESS OR IMPLIED, INCLUDING WITHOUT LIMITATION IMPLIED WARRANTIES OF FITNESS FOR A PARTICULAR PURPOSE, MERCHANTABILITY AND NON-INFRINGEMENT.

IN NO EVENT SHALL HD ELECTRIC COMPANY BE LIABLE FOR ANY INDIRECT, INCIDENTAL, CONSEQUENTIAL OR SPECIAL DAMAGES RESULTING FROM THE USE OR HANDLING OF THESE PRODUCTS. THIS SHALL INCLUDE BUT, NOT LIMITED TO, LOST PROFITS OR REVENUE, LOSS OF USE OF THE PRODUCTS, COST OF SUBSTITUTE PRODUCTS, FACILITIES OR SERVICES, OR DOWNTIME.

IN NO EVENT SHALL HD ELECTRIC COMPANY HAVE ANY LIABILITY FOR ANY THIRD PARTY PRODUCTS OR ASSOCIATED HARDWARE, OR CUSTOMER-OWNED SYSTEMS, EQUIPMENT OR SOFTWARE.

HD Electric Company must have prompt notice of any claim so that an immediate product inspection and investigation can be made. Buyer and all users shall promptly notify HD Electric Company of any claims, whether based on contract, negligence, strict liability, or other tort or otherwise be barred from any remedy.

HD Electric Company is committed to ongoing review and improvement of its product lines, and thus reserves the right to modify product design and specifications without notice.

HD Electric Company® products are available through HDE® sales representatives worldwide.

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