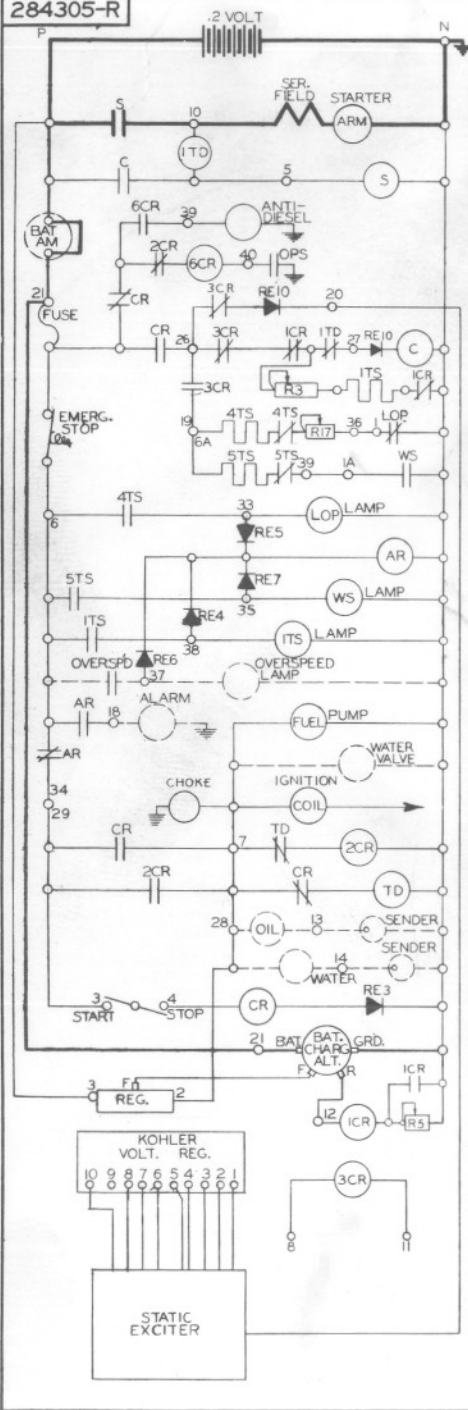
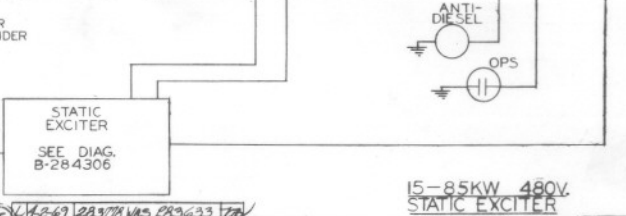
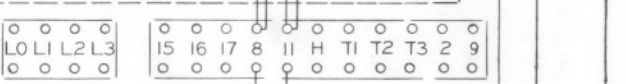
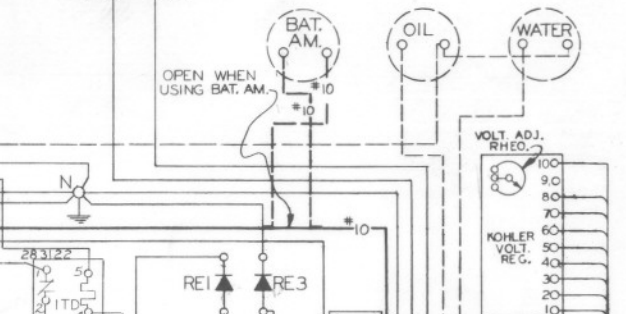
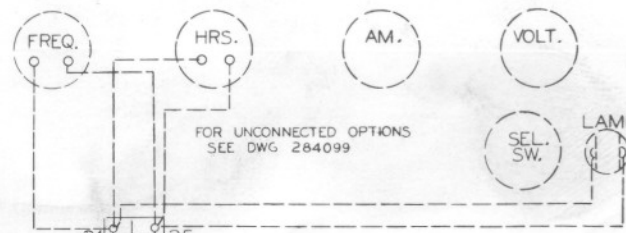
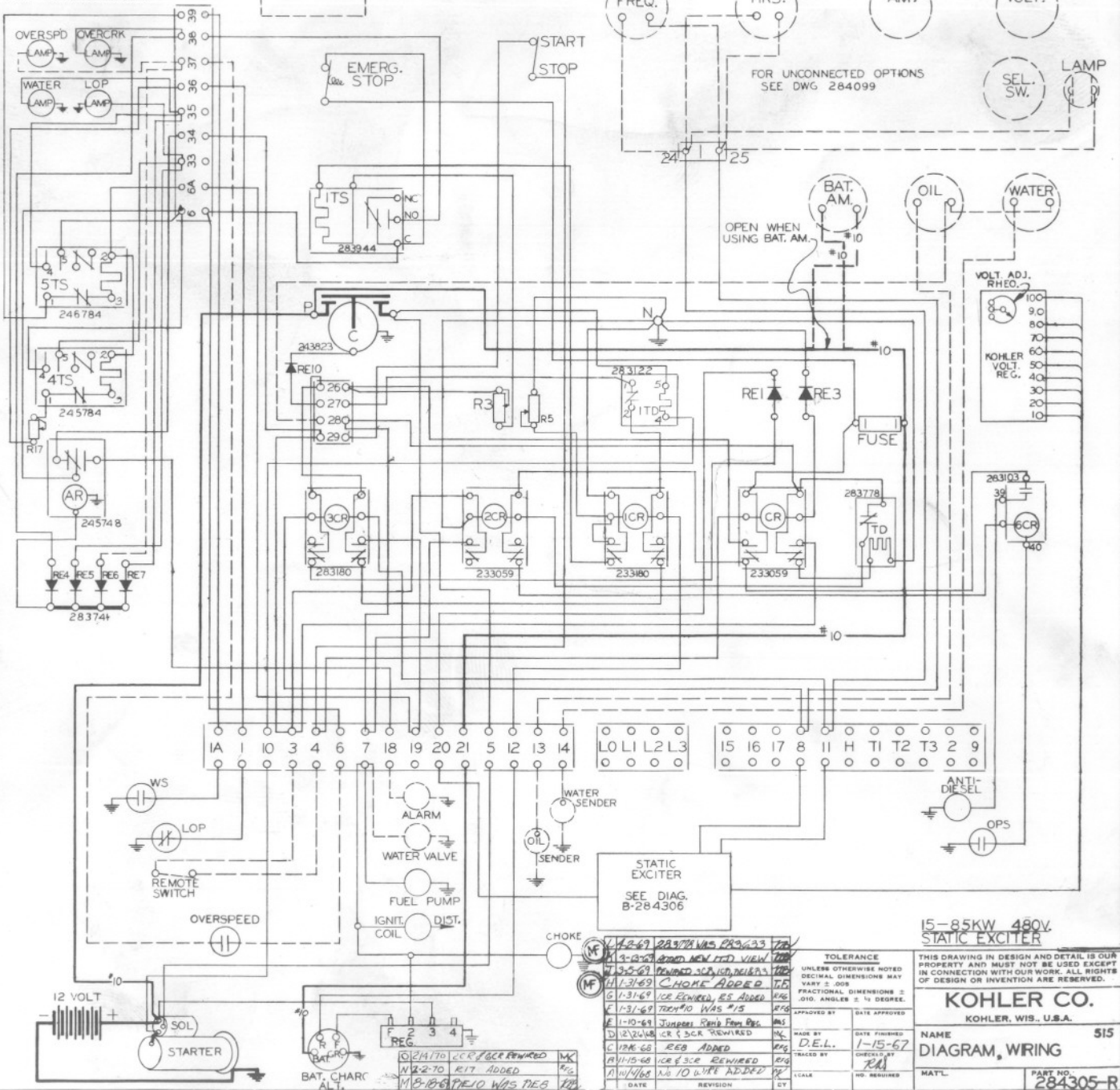


284305-R



WHEN OVERSPEED IS REQD.
WIRE REG AND LAMP
PER DOTTED LINES

CIRCUIT BREAKER



<p>15-85KW 480V STATIC EXCITER</p>		<p>TOLERANCE UNLESS OTHERWISE NOTED DECIMAL DIMENSIONS MAY VARY ± .005 FRACTIONAL DIMENSIONS ± .010. ANGLES ± 1/4 DEGREE.</p>		<p>THIS DRAWING IN DESIGN AND DETAIL IS OUR PROPERTY AND MUST NOT BE USED EXCEPT IN CONNECTION WITH OUR WORK. ALL RIGHTS OF DESIGN OR INVENTION ARE RESERVED.</p>	
<p>1-2-67 284305 WAS 284333 1-3-67 ADD NEW LTD VIEW 1-3-67 REVISED 3CR, ICR, DELTA 1-3-67 CHOKE ADDED 1-31-69 ICE ENGINE, ES ADDED 1-31-69 TCH TO WAS #15</p>		<p>APPROVED BY DATE APPROVED</p>		<p>MADE BY DATE FINISHED D.E.L. 1-15-67 TRACED BY CHECKED BY SCALE NO. REQUIRED</p>	
<p>DATE REVISION</p>		<p>DATE APPROVED</p>		<p>NAME DATE FINISHED DIAGRAM, WIRING 1-15-67</p>	
<p>DATE REVISION</p>		<p>DATE APPROVED</p>		<p>MATERIAL PART NO. 284305-R</p>	

WIRING DIAGRAM EXPLANATION

The purpose of this controller is to start the plant from any point by means of a switch or control contact. The engine is cranked by means of an automotive starter and a 12 volt battery. The negative side of the battery and starter is grounded.

The sequence of operation may be briefly outlined as follows;

1. Close engine control switch.
2. Control relay CR closes.
3. Cranking relay C and control relay 2CR close.
4. Cranking solenoid S closes.
5. Engine cranks and runs and AC generator and battery charging alternator build up voltage.
6. Control relays 1CR and 3CR close.
7. Cranking relay C opens.
8. AC generator furnishes power to the load.
9. Open engine control switch.
10. Control relay CR opens.
11. After two minutes time delay relay TD closes and control relay 2CR opens.
12. Control relay 2CR opens.
13. Control relays 3CR and 1CR open.

Battery charging is provided by an automotive type battery charging alternator and regulator. If the engine should fail to start within approximately 60 seconds, thermal relay ITS will open to disconnect the cranking circuit and thereby prevent battery exhaustion.

The voltage regulator and static exciter maintain constant voltage output at varying loads.

Paths of current flow in the various steps of the operational sequence may be traced as follows. Important elements in each step are underlined.

1. Close engine control switch - Battery current flows from battery terminal P through battery charging ammeter if supplied, terminal 21, fuse, emergency stop switch, terminal 6, normally closed contacts of AR relay, terminal 3, control switch, terminal 4, coil of control relay CR, reverse polarity blocking diode RE3, to ground and back to the battery.
2. Control relay CR closed - Battery current flows from terminal P, battery charging ammeter, terminal 21, fuse, normally open contacts of control relay CR, terminal 26, normally closed contacts of control relay 3CR, normally closed contacts of relay 1CR, normally closed contacts of time delay relay 1TD, terminal 27, blocking diode RE8, coil of cranking relay C, to ground and back to the battery. Another path of current flow from terminal 26 is through resistor R3, heater coil of thermal switch ITS, normally closed contact of relay 1CR, to ground and back to the battery. Still another path of current flow after passing through the fuse is through the normally closed emergency stop switch, terminal 6, normally closed contacts of AR relay, terminal 3, terminal 29, normally closed contacts of relay CR, terminal 7, then to a parallel path of the ignition coil and through normally closed contacts of time delay relay TD, coil of relay 2CR, to ground and back to the battery.

Overcranking Failure - Sequence of Operation

1. Overcranking switch ITS closes.
2. Overcranking lamp lights and AR relay closes.
3. Alarm sounds.

Overspeed Failure - Sequence of Operation

1. Overspeed trips.
2. Overspeed lamp lights and AR relay closes.
3. Alarm sounds

Paths of current flow in the various steps of the operational sequence due to a failure may be traced as follows. Important elements in each step are underlined.

Low Oil Pressure Failure.

1. Low Oil Pressure Switch LOP closes - Battery current flows from terminal P, battery charging ammeter, fuse, normally open contacts of relay CR, terminal 26, normally open contacts of relay 3CR, terminals 19 and 6A, heater of thermal switch 4TS, terminal 36, terminal 1, normally closed contact of switch LOP, to ground and back to the battery.
2. Thermal switch 4TS tripped - Battery current flows from terminal P, fuse, emergency stop switch, normally open contacts of 4TS, terminal 33, LOP lamp, to ground and back to the battery. From terminal 33 there is a parallel path through rectifier RE5, coil of alarm relay AR, to ground and back to the battery.
3. Alarm relay AR closes - The closing of this relay opens the normally closed contact which de-energizes relays CR and 2CR and stops the plant. One contact of AR leads to terminal 18.
4. An audible alarm if connected to terminal 18 and ground can be used to signal a failure.

NOTE: 4TS must be manually reset to shut off alarm after fault has been corrected.

High Water Temperature.

1. High Water Temperature Switch WS closes - Battery current flows from terminal P, battery charging ammeter, fuse, normally open contacts of relay CR, terminal 26, normally open contacts of relay 3CR, terminals 19 and 6A, heater of thermal switch 5TS, terminal 39, normally closed contact of switch WS, to ground and back to the battery.
2. Thermal switch 5TS tripped - Battery current flows from terminal P, fuse, emergency stop switch, normally open contacts of 5TS, terminal 35, Water Temp. lamp, to ground and back to the battery. From terminal 35 there is a parallel path through rectifier RE7, coil of alarm relay AR, to ground and back to the battery.
3. Alarm relay AR closes - The closing of this relay opens the normally closed contact which de-energizes relay CR and 2CR and stops the plant. One contact of AR leads to terminal 18.

CONTROLLER TROUBLE SHOOTING

SYMPTOM	CHECK	POSSIBLE FAULT
<p>A. Does not crank</p>	<ol style="list-style-type: none"> 1. If remotely controlled try switch (on-off) on plant. 2. Check whether relay CR operates. 3. On automatic plants if CR does not operate, disconnect rectifier RE1. 4. Check whether cranking contactor C closes by holding finger on contactor and closing switch. 5. If C closes, check battery condition of charge and cable connections. 	<p>External circuit</p> <p>Circuit of sequence No. 2</p> <p>Circuit of sequence</p> <p>Circuit of sequence No. 3</p> <p>Undercharged battery, defective battery, poor cable connections.</p>
<p>B. Cranks poorly</p>	<ol style="list-style-type: none"> 1. Check battery condition of charge and cable connections. 2. Check brushes. 3. Check for tight engine (2TS should trip) 	<p>Undercharged battery defective battery, poor cable connections.</p> <p>Short brushes, loose brush pigtails, brushes sticking in holders.</p> <p>Rust in engine cylinder bore.</p>
<p>C. Cranks but does not run.</p>	<ol style="list-style-type: none"> 1. Check ignition circuit and check for spark. 2. Check choker operation. 3. Check for fuel, etc. 	<p>Faulty ignition circuit faulty magneto or distributor.</p> <p>Sticky or poorly adjusted choker.</p>