AN ELECTRICAL METHOD OF MOVING A GENERATOR ROTOR
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It is sometimes desirable to rotate a large generator rotor a small amount to accomplish several maintenance tasks such as the four-wire rotation check during unit alignment, matching up couplings, working on particular turbine runner. It is extremely difficult to move a rotor physically, especially vertical machines not equipped with high pressure thrust-bear lubrication. This method uses the electrical characteristics of the generator operated as a motor, which can be accomplished by using external excitation current (fig. 1 and 2). This excitation current can be provided from a spare exciter set, or any source of direct current other than the directly connected exciter of the machine itself. An ordinary d-c welder should be sufficient to move the rotor of medium size generators as only one sixth of the normal field current of the generator will usually be necessary.

The rotor must be restrained horizontally to prevent it from being pulled into the stator iron as current is applied. Adequate thrust bearing lubrication must be provided at all times during rotation.

If the unit cannot be raised with iacks to provide lubrication, the thrust bearings should be coated with a mixture of petroleum jelly and lubricating oil. If the work continues for several days, applications may have to be repeated. If there is a field contactor with discharge resistor available, connections should be made as shown (fig. 1 and 2). If not, the spare exciter set, or d-c welder field contactor may be used to deenergize the circuit. In some cases the welder must be stopped to safely deenergize the circuit.

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**Figure 1 - External excitation current source connected to generator with neutral brought out.**
A generator designed with the neutral brought out (fig. 1), provides the easiest connecting arrangement; however, it does not allow the full torque available when connections are made directly to the terminals (fig. 2). When the neutral is available (fig. 1), leads are extended from the terminals T1, T2, and T3 to the disconnecting switches. The other switch terminals are connected together, and extended to the other side of the source of excitation. If the inductance of the stator winding is not too great, it is possible to rotate the rotor to the required position 60 electrical degrees at a time, by operating the disconnecting switches alone, without at any time opening the field contactor, then close phase 2, open phase 1, close phase 3, open phase 2, close phase 1, open phase 3, and continue until the rotor moves around to the proper location. The circuit is then completely deenergized by means of the field contactor.

**DO NOT INTERRUPT THE FIELD WITH ANY CONTACT EXCEPT THE FIELD CONTACTOR**

This method enables positioning the rotor to within plus or minus 30 electrical degrees of its required position. This is usually close enough, but if not, a movement of 30 electrical degrees in either direction may be obtained by shifting the field cable from the neutral to one or the other of the phases which is not closed through the disconnecting switches. Thus, if phase 3 is closed shifting the field cable from the neutral to T1 or T2 will produce the smaller final movement. By following this procedure, the field circuit is not opened and it is usually possible to operate the disconnecting switches without particularly bad sparking if it is done slowly. If the arcing starts to damage the disconnecting switches, use the field contactor or otherwise deenergize the d-c source. Connections can be made consecutively to phases 1, 2, and 3, closing and opening the circuit by the field contactor, thus bringing the rotor around 120 electrical degrees at a time. In the older installations, this method may not involve any special switches. It is sometimes possible to open the generator breaker and the generator.

If the generator neutral is not available, or the ampere turns in one leg of the stator winding are not sufficient to pull the rotor around, another method (fig. 7b) can be used. However, this method requires double-throw disconnect switches, which may not be as readily available as the single throw disconnect switches. This connection permits...
rotation of the rotor, 30 electrical degrees at a
time by operating the switches without opening
the field circuit. Starting with 1-F, close 1-E,
open 3-E, close 3-F, open 2-F, close 2-E, open
1-E, close 1-F, open 3-F, and continue this
sequence until the rotor is at the required
location, and then open the field contactor. If
this operation causes too much arcing at the
switches, an alternate switching sequence can
be used which is similar to the previous system:
Throw the disconnect switches consecutively to
positions 1-E, 2-F, 2-E, 3-F, 3-E, and 1-F, while
closing and Interrupting the circuit through the
field contactor. With this method it is possible to
come within plus or minus 15-electrical degrees.
The last few degrees may have to be obtained
physically with a hydraulic jack, or block and
tackle. Some generator circuit breakers are the
draw-out type where no disconnecting switches
are provided. At this type of installation,
connections have been made by making up plug
terminals to the welding cables to fit the
generator terminal sockets in the switchgear.
(When this is done a barrier is recommended to
cover the bus-side sockets in the circuit breaker
cubicle.) Switching among the phases is then
done by moving the plugs and deenergizing the
d-c source each time.

Rotors as large as 300-ton for a 50,000-kW
generator have been rotated within an hour with
two men, which had required 6 men about 12
hours to rotate mechanically. Because the static
friction of the bearings is much greater than the
running friction, it is possible to advance the
rotor several pole pitches at a time by changing
the connections for a 120-degree advance and
closing and quickly opening the field contactor.
If the field is left connected, the rotor will usually
oscillate in its new position several times before
coming to rest, but sometimes with a 120-
degree advance, it will jump two pole pitches
before coming to rest. Therefore, if the field is
interrupted just as the rotor starts to move, it
may be possible to make use of the stored
energy in the rotor to move it several pole
pitches. Small movements may be obtained if
the d-c source is quickly deenergized and its
polarity changed.