INSTRUCTION BOOK

I.B. 33-255-1

AUGUST, 1968

DE-ION GRID
OIL CIRCUIT BREAKER

OUTDOOR TYPE GS

5-Cycle Interrupting Time

TYPE	KV	MVA	AMPS.
144GS1000	14.4	1000	1200
230GS1500	23	1500	1200
345GS1500	34.5	1500	1200

WESTINGHOUSE ELECTRIC CORPORATION
Power Circuit Breaker Division
Trafford, Pennsylvania 15085

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TYPE GS OIL CIRCUIT BREAKER

The oil circuit breaker is one of the most important units in the modern power transmission system, as the protection, stability and continuity of service of the entire system depend largely on the efficiency of its operation.

In the Type GS "De-ion" Grid Oil Circuit Breakers, Westinghouse offers a complete standard line of breakers from 14.4 to 34.5 kv. Circuit interruption is effected by use of the highly efficient "De-ion" Grid interrupter which gives interrupting time of 5 cycles. The use of this interrupter insures the highest degree of reliability of operation with a minimum of maintenance.

This instruction book applies to breakers of 1200-ampere rating in the voltage range stated above. Each breaker consists of three pole units contained in a single tank dome which is mounted on a supporting framework and connected mechanically to the operating mechanism. The stationary contacts and "De-ion" Grid interrupters are mounted on the lower ends of the bushings and the moving contact crossbars are carried on the lower end of a wood base Micarta lift rods. These lift rods are in turn suspended from the operating linkage which connects to a common horizontal pull rod. This pull rod is connected by a bell crank lever to the operating mechanism.

Bushing type current transformers, when ordered, are supported from the underside of the tank top, around each bushing.

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IMPORTANT. Proper installation and maintenance are necessary to insure continued satisfactory operation of the circuit breaker. It should not be installed in places where it will be called upon to operate at voltages or currents greater than those given on the nameplate. The short circuit conditions to be imposed upon the breaker must not exceed those specified at the time the breaker was purchased. In addition, certain physical conditions must be carefully surveyed and planned for as outlined under "Selecting the Location", Part Two of this book.

PART ONE

RECEIVING, HANDLING AND STORING

Receiving The Shipment

All Type GS breakers are assembled and given complete commercial tests at the factory, after which they are carefully inspected and prepared for shipment by workmen experienced in the proper handling and packing of electrical equipment. Breakers covered by this instruction book are normally shipped completely assembled.

IMPORTANT. Immediately upon receipt of a circuit breaker, an examination should be made for any damage sustained while in transit. If injury is evident, or indication of rough handling is visible, claim for damage should be filed at once with the carrier (Transportation Company) and the nearest Westinghouse Sales Office notified promptly.

Unpacking Parts and Accessories

The majority of the following instructions will apply only when the breaker is shipped disassembled.

Certain parts of the breaker are of insulating material and must be handled so that they are protected from moisture, dirt, and damage due to rough handling. Care should be exercised in the removal of crating and packing to prevent damage to the breaker by careless handling of crowbars or other tools.

If the breaker is to be installed immediately, the various parts should be removed from their crates and should be placed in proper position for mounting on the permanent foundation. In this connection it should be remembered that although like parts are interchangeable, assembly and final adjustment is expedited by reassembling parts in the exact location in which they were originally assembled. Parts which were removed from the breaker after factory tests are identified by markings which indicate the serial number of the breaker and the terminal or pole location. Terminals are numbered consecutively from left to right and progressively from front to rear as one faces the breaker at the mechanism end.

Detailed instructions for unpacking condenser bushings are not given in this instruction book. When bushings are shipped separate as spare parts or as breaker parts, follow the unpacking instructions included in the shipment of bushings.

Check all parts against the shipping list as they are unpacked and identified. Search the packing material carefully for bolts, nuts, screws, etc., which may have become loosened in transit. Instruction books, cards and leaflets shipped with the breaker should be kept with the breaker at all times.

Be sure to remove the blocks and wires which were used to hold moving parts, mechanism triggers and latches in place during transit.

Handling Procedure

The total weight of the breaker without oil is given on the nameplate located on the breaker frame. This information will serve as a guide to determine the lifting ability of the crane or other mechanism used to handle the breaker. Breakers may be lifted without oil by a crane, hooking the hoist sling onto lifting lugs on the breaker tank dome.

When using cable slings or chains for moving a breaker, care must be exercised to prevent such slings from striking or bearing against the condenser bushings, as any shock or strain on them may cause them to crack or break.

When transporting a breaker by car or truck, do not lash the breaker down by the condenser bushings. The skids on which the breaker is mounted for shipment should be kept under it until the breaker is installed. Care should be exercised at all times to prevent injury to the apparatus through shocks or jars due to rough handling.

CAUTION. These breakers have a high center of gravity and special precatuion should be taken while handling to prevent them from tipping over.

Storage of Breaker and Breaker Parts

After the breaker is unloaded and uncrated, immediate installation in its permanent location is recommended even though it may not be put into service for some time. If this is not practicable, it should be stored in a place where it can be protected from mechanical injury. In either case, the following precautions should be taken to prevent injury to and deterioration of the parts.

All internal insulating parts must be protected from moisture. This can best be accomplished by immediately filling the breaker tanks with insulating oil. If this cannot be done, the condenser bushings, lift rods and guides and "De-ion" Grid interrupters should be removed and stored in a dry place.

"De-ion"Grid Interrupters. The "De-ion" grid interrupters must not be exposed to moisture at any time. The fibre in these stacks may absorb enough moisture, either from direct contact with water or from a humid atmosphere, to expand and warp it out of shape. It is expressly recommended that the "De-ion" Grid stacks be stored under Wemco "C" oil.

Lift Rods and Guides. Store lift rods and guides (especially spare parts which may not be used for a long time) on a level surface or hang them in a vertical position to minimize the possibility of warping.

Condenser Bushings. For storage of condenser bushings over a short period of time, such as that which may elapse between the time a breaker is received and is installed, it is permissible to store the bushings in a vertical position in a warm, dry place. However, when it is contemplated that bushings may be stored over a long period of time, such as is the case with spare parts, it is recommended that they be stored with their lower ends immersed in Wemco "C" oil.

Operating Mechanism. Machined parts of the operating mechanism pinned joints, etc. should be protected against rust. This may be best accomplished by closing the mechanism housing and energizing the space heaters provided in it. This procedure is recommended even if it requires the use of a temporary wire circuit to the heaters. In case this is impracticable, all machined parts, including the pole unit operating mechanism, should be coated with grease or some rust inhibiting material. Additional protection may be obtained by use of silica gel, activiated alumina or similar dehydrating agents. Three one pound bags of the material should be hung on the lever system near the parts requiring protection. It should be remembered that complete protection may not be provided in spite of all of the above precautions and periodic inspections should be made to determine the condition of the apparatus.

PART TWO

INSTALLATION

Selecting the Location

The oil circuit breaker should be located so that it will be readily accessible for cleaning and inspecting. Sufficient space must be provided for opening the mechanism housing doors and operating the hand closing device. Space should also be provided for the installation and operation of the pneumatic tank lifter which is available as a breaker accessory.

The breaker foundation should be high enough to preclude the possibility of water entering the operating mechanism housing during flood conditions.

The breaker should not be installed where salt water spray sulphur steam or other corrosive elements are in the atmosphere.

Mounting the Assembly

All circuit breakers should be set reasonably level so that moving parts within the breaker can operate freely. Otherwise, friction may develop and undue strains may be imposed on the lift rods and other moving parts, leading to breakage and defective operation.

The foundation should be prepared prior to the arrival of the breaker. Consult the outline and drilling plan supplied for necessary clearance dimensions and foundation bolt locations.

Remove the breaker from its shipping skids and place on the permanent foundation. The precautions in handling the breaker previously described under "Handling Procedure" should be adhered to. Insert shims, if necessary, under the legs of the breaker frame to get it properly plumbed and levelled before tightening the nuts on the foundation bolts.

The sequence for assembling breakers which have been disassembled is as follows: (Refer to Part III for adjustments):

1. Check the lever assembly stop bolt clearance.
2. Mount condenser bushings in breaker tops.
3. Install stationary contacts and "De-ion" Grid interrupters.
4. Install moving contacts.

5. Check and adjust moving and stationary contacts and bushing alignment to obtain proper contact travel, alignment, and contact separation.

Line Connections

Line connections should be sufficiently flexible to prevent undue strains on the condenser bushings. Clamp type connectors are ordinarily used between the bushing stud and the line conductor. Cable conductors should be supported so that heavy loads will not be imposed upon the bushing. If tube conductors are used, they should be shaped and supported in such a way that heavy expansion strains are not placed on the bushings. Conductor and connector should be of adequate current carrying capacity to avoid heat being transmitted into the breaker bushing. All joints must be clean, bright, and free from burrs or surface roughness.

Do not connect an aluminum conductor to a copper alloy connector unless the latter has plating or, preferably, an insert suitable for such a connection. The galvanic action resulting from a joint of aluminum to copper will in time cause considerable corrosion.

Grounding Connections

A grounding pad is supplied on front left hand leg of the breaker frame. The grounding conductor should be capable of carrying the maximum line-to-ground current for the duration of the fault.

CAUTION. A permanent low resistance ground is essential for adequate protection. A poor ground may be worse than none, as it gives a false feeling of safety to those working around the equipment.

Connecting Current Transformers

Bushing type current transformers, supplied only when ordered, are mounted inside the tank dome around the condenser bushings (See Dwg. 382D762).

Transformers are usually of the multi-ratio type, having five leads to provide a wide range of ratios. These leads are carried into the mechanism housing through a gas-seal to terminal blocks. Each lead has an identification indicating the transformer tap to which it is connected lettered on the terminal block marking strips. By referring to the current transformer name

plate, which is mounted on the inside of the housing door, the transformer taps used to give the desired ratio may be determined. Care must be exercised so as not to confuse the polarity of the transformers. If there is any question as to the proper method of connection to the instruments, reference should be made to the polarity, ratio and connection diagrams.

CAUTION. Be sure the correct transformer connections are made and a burden or short circuit placed across the terminals at the blocks before the breaker is closed on the line. Otherwise, dangerous voltages may occur across the open secondary terminals.

Control Wiring

All control wires to the circuit breaker should be run in conduit when practicable. A control diagram located in the pocket on the inside of the mechanism housing door shows the proper connections for operating circuits and indicating lamps.

The control wiring should be so installed that trouble with one oil circuit breaker cannot be communicated to the control wiring on another breaker. The wire size should be selected to keep the voltage drop within reasonable limits. Excessive line drop will slow the tripping time, thereby causing a slowing of the interrupting time.

Operating Mechanism

Read carefully the Operating Mechanism Instruction Book which is supplied in conjunction with this book. It will describe the operation of the mechanism supplied with the breaker. If lost or misplaced, Operating Mechanism I.B. number may be found on the nameplate inside the housing.

Final Inspection and Tests

After the breaker has been installed and all mechanical and electrical connections completed and before energizing the power line the following inspection and tests should be made:

1. All insulation and parts within the tank including the inside surface of the tank, must be wiped carefully to remove any dirt and moisture which may have collected. Do not use cotton waste for this purpose because lint may be introduced into the oil. Tank liners should be examined for possible mechanical damage.

2. See that all bearings of the operating mechanism are free of dirt and packing materials and have been lubricated. (Excessive lubrication will pick up dirt.)

3. The latch faces should be coated with a thin film of rust inhibitor. This inhibitor should be carefully selected to be free flowing at all anticipated temperatures, should be non-hardening, and self-healing (so that it will not completely wipe off in one operation). A lubricant similar to Westinghouse 9921-4 or Beacon 325 is suggested.

4. Close the breaker slowly by hand, checking to see that the lift rods and contacts are properly adjusted for correct alignment and that proper stationary contact compression or overlap is obtained when the breaker is closed.

5. Open the breaker slowly by hand. The movement of the breaker on opening and closing should be free and without friction. See that binding does not occur in the movement of the lift rod through the guides or of the moving contact blades into the "De-ion" Interrupters.

6. See that the breaker is properly set up and levelled on its foundation.

7. Make a final check for tightness or hardware on stationary and moving contacts, shunts, lift rods, pole unit levers, etc.

8. Check to see that all gaskets are in place and have not been damaged. All bolts and nuts on bushing flanges, tank and connecting fittings must be evenly tightened so that moisture cannot enter the circuit breaker through any of these gasketed joints.

9. Check all pipe fittings and tighten any that may have become loose because of vibration or shock received during handling, lifting and transportation.

10. Inspect all insulated wiring to see that no damage has resulted from the process of installation. Test the wiring for possible grounds or short circuits.

11. Check to see that all control wiring is properly insulated in accordance with standard practice. See that all joints in the control circuits are made correctly.

12. Fill tank with clean, dry Wemco "C" oil and check dielectric breakdown of a sample taken from the bottom of the tank. (Follow detailed instructions under "Placing Oil in Service".)

13. Check electrical operation of the breaker a few times after the tank has been filled with oil and raised. It is recommended that the opening speed be checked by means of a cycle counter or a graphic recorder. See Typical Graphic Recorder Curves, pages 13 and 14 . (Since these curves were taken using the accelerating spring operating rod travel, a ratio of approximately 8.75 to 5 exists between the actual lift rod travel, and that shown by the curves. Note also that the "fully open" and "fully closed" lines shown on each curve are reversed with respect to the positions obtained on curves made for breakers allowing direct connection of a recorder to the lift rod.

NOTE: For operating a graphic recorder, a 10-32 tapped hole is provided in the end of the accelerating spring operating rod. Unscrew the cap covering the accelerating spring housing to obtain access to this hole. (A mounting bracket which may be screwed onto the housing, replacing the cap, and designed for use with the Cincinnati graphic recorder is, available as a breaker accessory.)

Opening times should not exceed 3 cycles from the time the trip coil is energized until the breaker contacts part. If this time is exceeded, it may be due to any of the following reasons:

A. Excessive line drop in control wiring to breaker.

B. Not enough accelerating spring compression.

C. Incorrect setting of the lever system.

The last two conditions may be corrected by the procedure outlined under Part Three, "Operation and Adjustments".

14. Make final inspection for tightness of tank bolts.

Placing Oil in Service

Precautions must be taken to insure absolute dryness and cleanliness of the apparatus before filling it with oil, and to prevent the entrance of water and dirt during the transfer of the oil to the apparatus.

When putting a new circuit breaker into service, see that the tank is free from moisture and foreign matter. This may be done by flushing with clean insulating oil and wiping with clean, dry cotton cloths. (Cotton waste is undesirable because of the lint which may be introduced into the oil.)

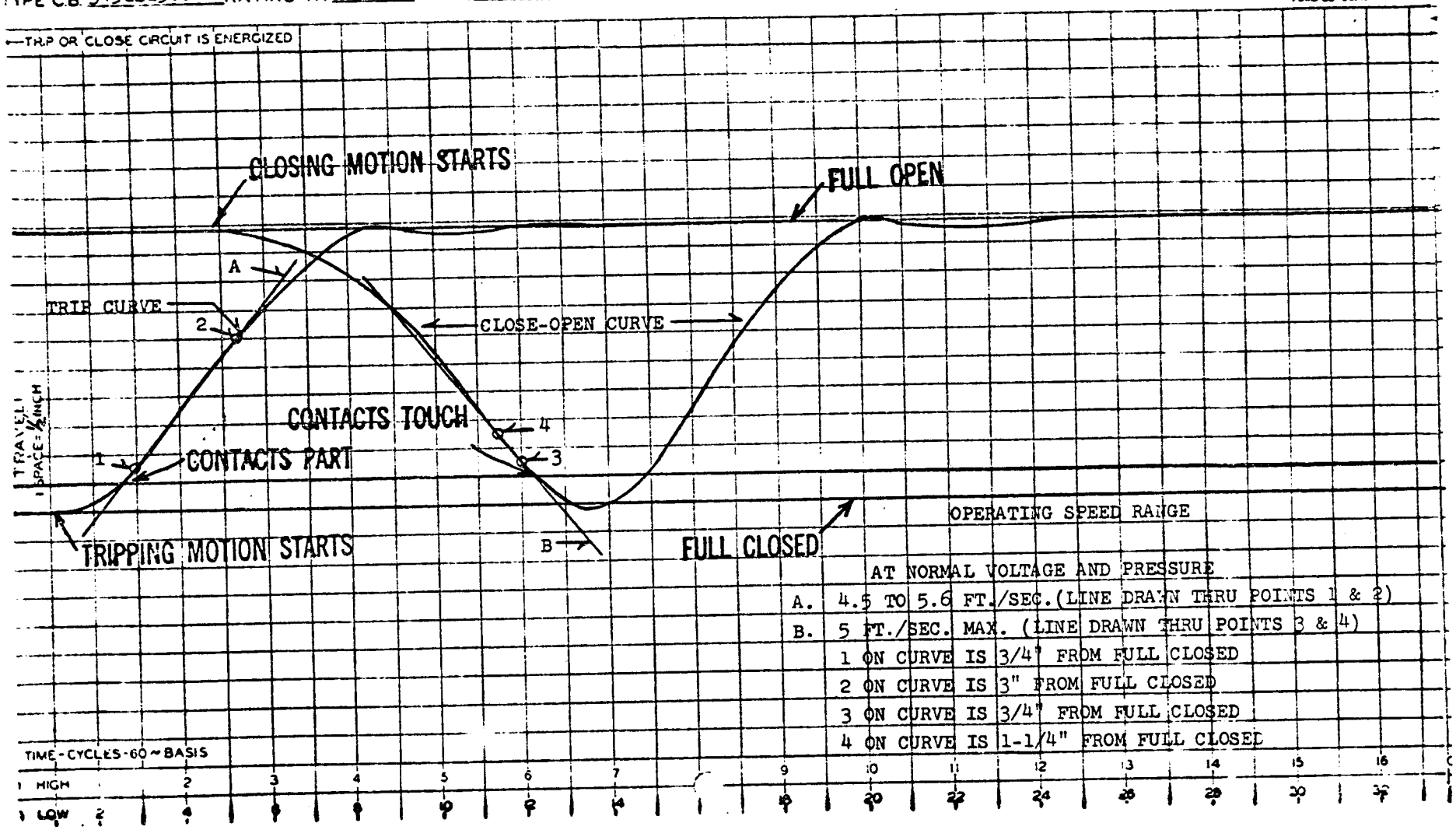
The preparation and filling of outdoor apparatus should be done preferably on a clear, dry day. If this is not feasible, protection against moisture must be provided.

Precaution should be taken against the handling of oil at a temperature different from the container into which the oil is being poured, as condensation will occur and moisture will be introduced into the oil. Extra care must be taken if oil drums are stored in locations open to the weather. Sufficient clearance from ground is essential to permit circulation of air to prevent condensation.

Fill the oil tank to the proper level with Wemco "C" oil. Oil which has a dielectric strength of less than 22,000 volts when tested by the usual methods should not be put into the circuit breakers. New oil may test considerably higher than this. However, unless tested under ideal conditions, the oil may appear to be worse than it really is, due to contamination of the sample when testing. (For proper methods of handling and testing the oil, see Instruction Book 45-063-100, "Wemco C Insulating Oil for Electrical Apparatus".)

RECORD NO. 1 SO NO. ____ SER.NO ____ DATE ____ TESTER ____ SPEED HIGH ☒ LOW ☐

TYPE C.B. 345GS1500 RATING KV 34.5 AMPS 1200 KVA AA-7 MECH. HEAD 214



OPERATING SPEED RANGE

AT NORMAL VOLTAGE AND PRESSURE

A. 4.5 TO 5.6 FT./SEC. (LINE DRAWN THRU POINTS 1 & 2)

B. 5 FT./SEC. MAX. (LINE DRAWN THRU POINTS 3 & 4)

1 ON CURVE IS 3/4" FROM FULL CLOSED

2 ON CURVE IS 3" FROM FULL CLOSED

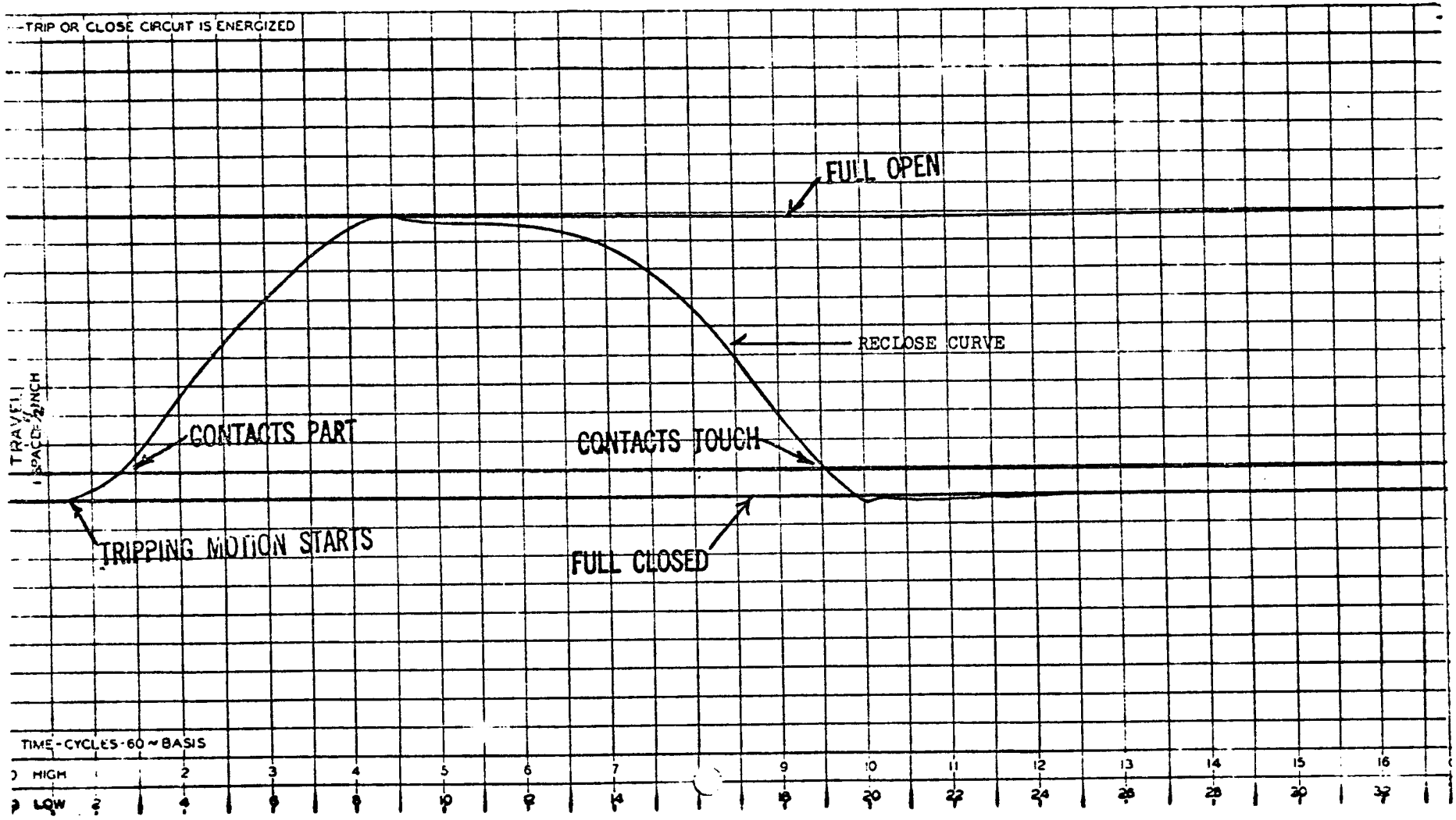
3 ON CURVE IS 3/4" FROM FULL CLOSED

4 ON CURVE IS 1-1/4" FROM FULL CLOSED

RECORD NO. 2 S.O NO _____ SER.NO _____ DATE _____ TESTER _____ SPEED HIGH ○ LOW XX

TYPE C.B. 345GS1500 RATING: KV 34.5 AMPS 1200 KVA AA-7 MECH. HEAD 214

Form CC-304 A



PART THREE

OPERATION AND ADJUSTMENTS

In case of trouble with any part of the circuit breaker, it is advantageous to understand the construction and adjustment of the individual parts. In general, it is advisable to work only on a part which needs attention and not to disturb the rest of the apparatus. The various parts and adjustments are described in the approximate order in which they are assembled at the factory.

The Westinghouse "De-ion" Grid Interrupter Unit

Function. The "De-ion" Grid interrupters used in these breakers are laminated structures made up of a number of units, the number and shape of which are determined by the voltage and current to be interrupted. Each unit consists of interrupting parts of various shapes, designed to trap oil and direct gases from the oil through the arc in an efficient manner, enclosed in a glass filament-wound tube. Circular openings in the individual plates provide, in the assembled unit, a path through which the moving contact passes to engage the stationary contacts in the closed position. One grid is assembled at the lower end of each condenser bushing below the stationary contacts.

When the breaker opens, the moving contacts move downward and an arc is formed in the chambers of the interrupter between the moving and stationary contacts. The heat of the arc causes the oil to disintegrate and the resulting gases pass through and around the arc in escaping through vents in the interrupter assembly. This gas generation is augmented by the disintegration of oil trapped in pockets located inside the interrupter. The efficient control of these gases results in a rapid deionization of the arc stream, especially at current zero, so that re-establishment of the arc on an ensuing half cycle is difficult. Interruption may take place at the first current zero after parting contacts, but if the rate of recovery voltage is sufficiently rapid, arcing may continue for several half cycles until contact separation is sufficient to withstand the recovery voltage.

Adjustments

Pole Unit Lever Mechanism and Operating Bell Crank. The vertical motion (of the moving part) of the operating mechanism is translated into the vertical motion of the pole unit lift rods through (and in the following succession):

1. The vertical pull rod joining the operating mechanism and the bell crank.

2. The bell crank. (See Dwg. 382D755)

3. A horizontal pull rod which connects the bell crank to the pole unit lever assembly.

4. The pole unit lever assembly. These levers are designed to transfer horizontal motion of the pull rod into straight-line vertical motion of the lift rods. (See Dwg. 382D756.)

The horizontal pull rod is a solid bar drilled at the proper places for connection of the lift rod operating levers. There is no adjustment of this assembly, and proper operation of the lever system with respect to the operating mechanism is obtained by positioning of the bell crank lever to the 1-3/8" dimension shown on Dwg. 382D755 with breaker closed and latched.

After the complete linkages have been assembled and properly adjusted, the breaker is closed and latched by manual operation and lever system stop bolt is set for 1/32" ±1/64" clearance and locked in position.

Since the breaker is equipped with finger contacts (see Dwg. 382D164), it may not show any clearance at the lift rod stops when closed electrically or pneumatically. This is because the friction of the finger contacts tends to hold the moving contacts and lift rod in the position of overtravel.

This complete assembly is made, adjusted and checked by operation at the factory and should require no further adjustment. If the stop bolt does not show the adjustment indicated in the preceding paragraph, it should not be changed until the complete linkage has been thoroughly checked and it is determined definitely that its position has changed and is improper.

Speed Regulator. A hydraulic speed regulator is connected to the lever system of the breaker to control the speed during the opening stroke and to cushion the shock at the end of the stroke. The regulator is adjusted to provide proper contact travel at the factory and is locked in position. It should not be changed in the field.

The speed regulator depends on the presence of oil in the circuit breaker tank for proper operation and is ineffective when the breaker is tripped with the tank lowered or when the tank is not filled to the proper oil level. Consequently, tripping the breaker under these conditions is not recommended as the resultant higher speed may damage the moving parts.

Condenser Bushings. If it is necessary to install or replace condenser bushings, refer to the instructions which are included with the replacing bushings. Extreme care should be taken to prevent damage to the Micarta insulation of the bushing, and also to prevent the bushing stud from striking the current transformer, damaging its insulation. Do not permit the metal flange of the bushing to touch the metal support which holds the transformer in place; this has the effect of a short circuiting turn around the transformer, and affects its ratio.

Make certain the weatherproofing gasket is in place between the bushing flange and the recessed seat on the breaker top, and the top of the gasket has been greased. After the moving and stationary contacts and "De-ion" interrupter structures are properly aligned with each other, check the bushing flange bolts to be sure they are tightened uniformly around the flange. While inspecting the bolts, check to be sure the gasket is properly located to insure a moisture-proof seal between the flange and the breaker top.

CAUTION. When working on a breaker which has just been in service, be sure the condenser bushing has been discharged by grounding the terminal end. The capacity of the larger bushings is sufficient to cause serious shock to a workman if accidentally discharged through him.

Stationary Contacts. The stationary contact assembly, including the "De-ion" Grid interrupter is attached to the bottom of the condenser bushing as shown on Dwg. 382D764. Assembly is best accomplished by first removing the contact foot from the grid before attempting to screw the foot onto the bushing. Care must be used in this latter operation to avoid cross-threading or other damage to the threads.

Moving Contacts. The crossarm is fastened to the bottom of the lift rod by four sets of nuts as shown on Dwg. 382D764. These should be set so that the crossarm is horizontal and the upright portions lie in a vertical plane. This can be done by adjustment of the various nuts on the studs with respect to each other. Clearance in bushing flange holes and contact feet permit necessary lateral adjustment to align the interrupters and the moving contacts. Vertical adjustment should be done by adjusting the height of the contact foot on their respective bushings.

The interrupter and stationary contact assemblies have been properly aligned at the factory and they should only be disassembled for inspection or maintenance.

Final Adjustment of the Breaker Contacts. After all parts are in place, operate the breaker slowly by hand and adjust the various parts with respect to each other until proper contact engagement is obtained. (See Dwg. 382D764.) Correct adjustment

must be made so that the moving contacts move freely in the opening of the interrupter and the lift rods move freely in the lift rod guides. After this is done, tighten all bushing flange bolts evenly and securely, tighten nut holding contact foot to bushing and check all nuts and bolts on the stationary and moving contacts for tightness.

Accelerating Spring. An accelerating spring is mounted in a housing extending from the rear of the tank top dome for the purpose of accelerating the opening stroke of the contacts. This spring is set at the proper compression at the factory and should not be disturbed.

PART FOUR

MAINTENANCE

It has become the practice of operating companies to establish a system of regular inspection of their apparatus. Oil circuit breakers especially, due to the nature of their function, should be operated on a planned maintenance program. It is recommended that each new breaker be given a one year "shake-down" period to prove the initial installation and to establish the duty to which it is likely to be subjected. After this one year period, the oil should be drained from the tanks, and a thorough inspection made as outlined under "General Inspection Procedure". It is our standard practice to recommend that each breaker be given such a general inspection once a year. It is recognized, however, that many breakers operate so seldom that such yearly inspections may not be necessary, and on the other hand that some breakers are subjected to severe duty which makes more frequent servicing necessary.

Many companies compile detailed operating data on individual breakers, and from such information and past experience on various types of breakers are able to set up an inspection and maintenance program which fits more closely the duty performed. Following are some of the factors to be considered in setting up such a "tailor made" inspection schedule:

1. Time.
2. Number of switching and testing operations.
3. Number of overload and fault operations.
4. Severity of fault operations.
5. Condition of oil.
6. Cleanliness of atmosphere surrounding breaker.
7. Accumulated experience of breaker characteristics and duty.

Where an inspection schedule other than the yearly General Inspection is set up, we recommend that each breaker be given a "routine" inspection once yearly and that it be given a "General" inspection at least once every three years. The significance of the two types of inspection are developed in the following paragraphs.

Regardless of what type maintenance program is adopted, it is further recommended that frequent visual inspections be made

by operators touring the switchyard in order to catch any obvious abnormal condition. It is also considered good practice to operate the breaker from the switchboard at regular intervals to insure the integrity of all electrical circuits, as well as proper mechanical functioning of the breaker.

CAUTION. Before working on a breaker that has just been disconnected from the line, make sure that the condenser bushings have been discharged by grounding the terminal end. The larger bushings have a rather high capacity which may cause serious shock to a workman.

Routine Inspection Procedure

The suggested Routine Inspection procedure is as follows:

1. Check mechanical operation of breaker. See operating mechanism instruction book for specific procedure on operating mechanism.

2. Check dielectric strength of oil.

3. Measure contact engagement.

It naturally follows that any abnormal condition found during the Routine Inspection should be cause for lowering the tanks and giving the breaker a thorough General Inspection.

General Inspection Procedure

General inspection of the breaker requires that the tank be lowered on the breaker. Before any parts are disturbed, the following adjustments should be checked to give an indication of the condition of the breaker as removed from service for the inspection.

CAUTION. Open the control circuit at the breaker before starting to inspect or work on the breaker parts, so that accidental breaker operation cannot occur. Also, take the additional precaution of closing the hand valve between compressor tank and mechanism.

1. Close the breaker by power with the operating mechanism before lowering the tanks.

2. Check clearance of the lever system stop bolt, see Dwg. 382D756.

3. Inspect the stationary contact assemblies to determine the condition of the contact surfaces and the contact engagement. (With the breaker in the open position, the stationary contact finger assembly may be inspected by first loosening the set screw (It. 14, Dwg. 382D764) which locks the filament tube, It. 6, in place; unscrewing the tube until it can be lowered gently down over the moving contact; and then loosening the two flat head screws, It. 18, and removing the two plates, Its. 16-17.)

A slight amount of burning on the contacts is not detrimental as long as the electrical conductivity and contact engagement (13/16 ±1/16) has not been materially changed. If the burning is severe, the assembly should be replaced.

4. Note the condition of the moving contacts, reconditioning or replacing them if necessary.

5. Close the breaker slowly by hand and check the contact engagement and alignment.

6. Note the condition of all parts now accessible. Check the bolts, nuts, spring cotters, etc., and tighten where necessary. Repair or replace any damaged parts.

7. Clean the lower ends of the bushings and the Micarta lift rods and guides with a clean cloth dampened with clean oil. Clean carbon from the interrupters.

8. Check the operating mechanism for loose nuts and bolts and for missing spring cotters. Lubricate bearings with a few drops of lubricating oil.

9. Check latches to see that faces are in good condition and are properly adjusted. (See Instruction Book for Operating Mechanism.) Apply rust inhibitor to latch faces. The inhibitor should be free flowing at all anticipated temperatures, non-hardening and self-healing (so that it will not wipe completely off in one operation). A light lubricant similar to Westinghouse 9921-4 or Beacon 325 is suggested.

10. Check air system on pneumatic mechanism for leaks.

11. Check control wiring for loose connections.

12. Check gasket joints, conduit and tank fittings to make sure no water can enter the breaker.

13. Check dielectric breakdown strength of the oil.

14. Check speed regular to insure it is operating properly. (Remove bottom plate and inspect piston, cylinder and valves).

15. Raise and secure tank after replacing oil if required. Check closing and tripping operations, using all usual relays and circuits involved in the operation of the breaker. Be sure all relay and pressure switch contacts are clean.

16. Check closing and tripping at reduced voltage to insure safety margin.

NOTE: If it is necessary to make any re-adjustments, it is recommended that a recheck of the operating speed be made.

Care of Oil

Wemco "C" oil is recommended for use in all circuit breakers. Westinghouse cannot assume responsibility for circuit breakers if an inferior grade of insulating oil is used, or if the dielectric strength of the oil is not properly maintained.

All oil used in circuit breakers is subject to deterioration in service due to carbonization and to the presence of water, even under the most favorable conditions. It is, therefore, essential to provide for periodic inspection and test, and to purify the oil whenever necessary to maintain it in good condition. The more handling the insulating oil receives, the greater are the chances for it to become contaminated, unless adequate precautions are taken.

It is recommended that operators prepare a schedule for inspection based on operating conditions. Reference to the station log of the operation of the circuit breakers, together with the record of dielectric tests of the oil, should determine the frequency of inspection and test. This period between successive inspections should never be longer than six months. When the dielectric strength of the oil drops to 20,000 volts, the oil should be looked upon with suspicion, and in no case should it be allowed to drop below 16,500 volts when tested in a standard test cup with electrodes spaced 0.1 in. apart. It is essential that the proper oil level be maintained in the circuit breakers. Considerable change may be caused by changing temperature or possible leakage of oil. Low oil levels may cause flashover of bushings or failure to handle heavy interruptions properly. Oil dashpots may be uncovered and fail to provide proper cushioning effect.

Attention is called to Westinghouse Instruction Book 45-063-100. This book covers the care and maintenance of oil and should be referred to before any attempt is made to test or purify the oil.

Condenser Bushings

Maintenance and power factor testing of condenser bushings should be given consideration during breaker inspection. Technical Data Section 33-360 (available on request) should be studied for complete recommendations on maintenance of bushings.

IMPORTANT. When placing bushings in breaker, do not permit the metal flange on the bushing to touch the metal support which holds the transformer in place. This has the effect of a short circuiting turn around the transformer, and affects the ratio.

Bushing Current Transformer

If it should be required to remove, replace, or add a current transformer, it will be necessary to remove the moving contact and stationary contact assemblies to enable slipping the transformer up or down over the condenser bushing. The moving contact is removed by unpinning the lift rod from the lever assembly (see View "A", Dwg. 382D756). When removing the stationary contact assembly, first mark the position of the contact foot on the bushing stud, then loosen locking bolt and unscrew the complete stationary contact assembly from the bushing stud.

The gas seal assembly, It. 10 of Dwg. 382D762, must be loosened to permit removal of the transformer leads. If the rearrangement of CT's is such that some of the holes previously occupied by leads are no longer in use, they should be suitably plugged to obtain proper sealing.

When mounting additional transformers, the lead seal may be reused by drilling out for each additional lead, one of the unused "blind" holes in the rubber bushing portion of the seal to 1/4" diameter.

Care should be taken to insure that the insulating washers at the top and bottom of the transformer are in place before securing the transformer.

Be sure to place the end of the transformer carrying the white polarity mark upward. Also, see that the transformer is not thrown off ratio by allowing the case to touch the metal grounding band on the condenser bushing.

CAUTION: Be sure that proper transformer connections are made and a burden or short circuit placed across the terminals at the blocks in the mechanism housing before the breaker is closed on the line. Otherwise dangerous voltage may appear across the open secondary terminals.

Oil Gauge

A float type oil gauge which screws into the tank top is provided. The gauge is marked for normal oil level at 25 degrees C. Fluctuations on either side of normal will be noted with temperature changes.

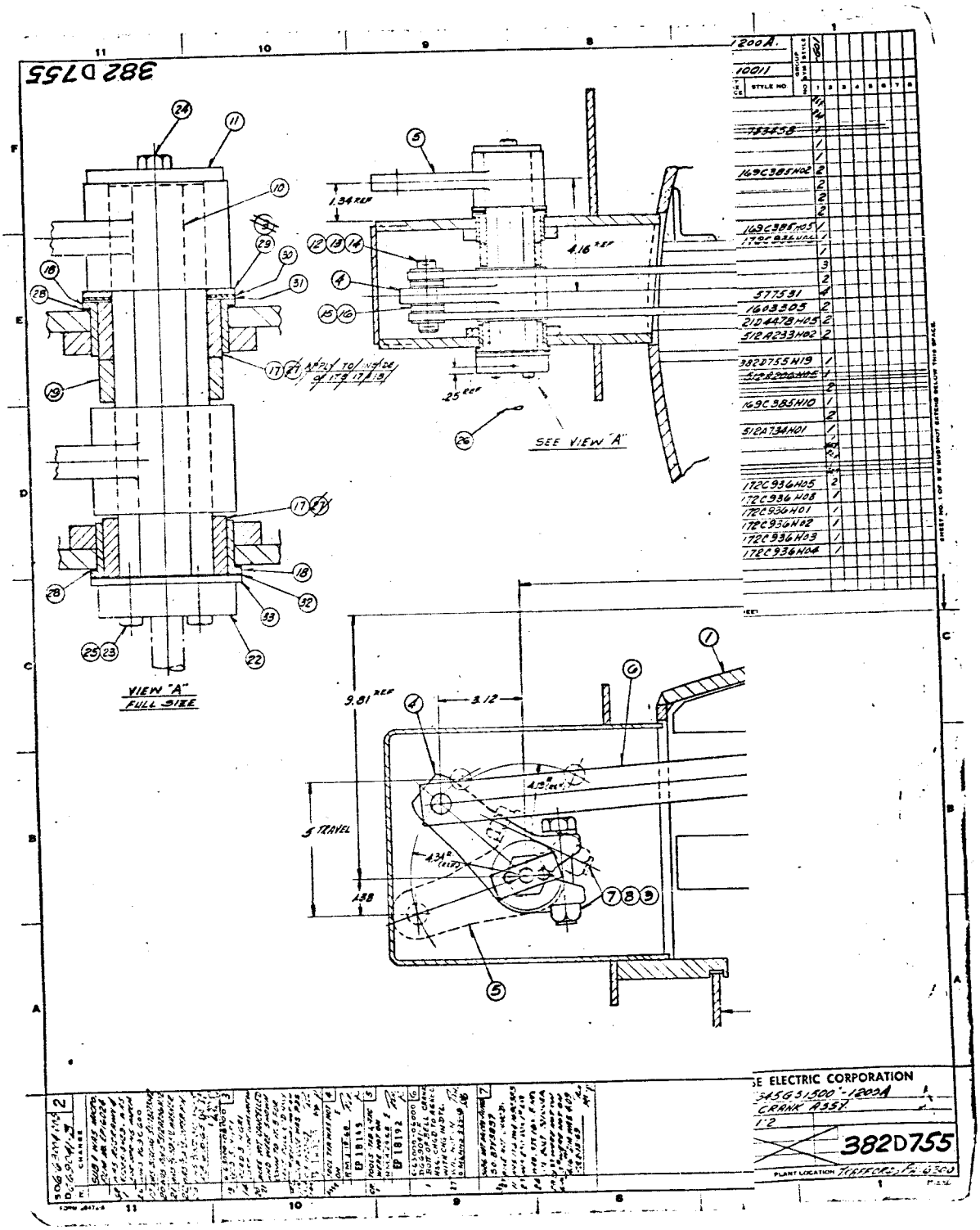
The gauge glass is gasketed to insure weather tightness. Should it be necessary to replace a gauge glass, remove the old glass, clean the guard thoroughly, assemble the gasket at top and bottom of the glass, and tighten cap so that the glass is held in proper position. Use Westinghouse Cement No. 672 or equivalent, on the threads when reassembling, so that water will not enter the tank at this point.

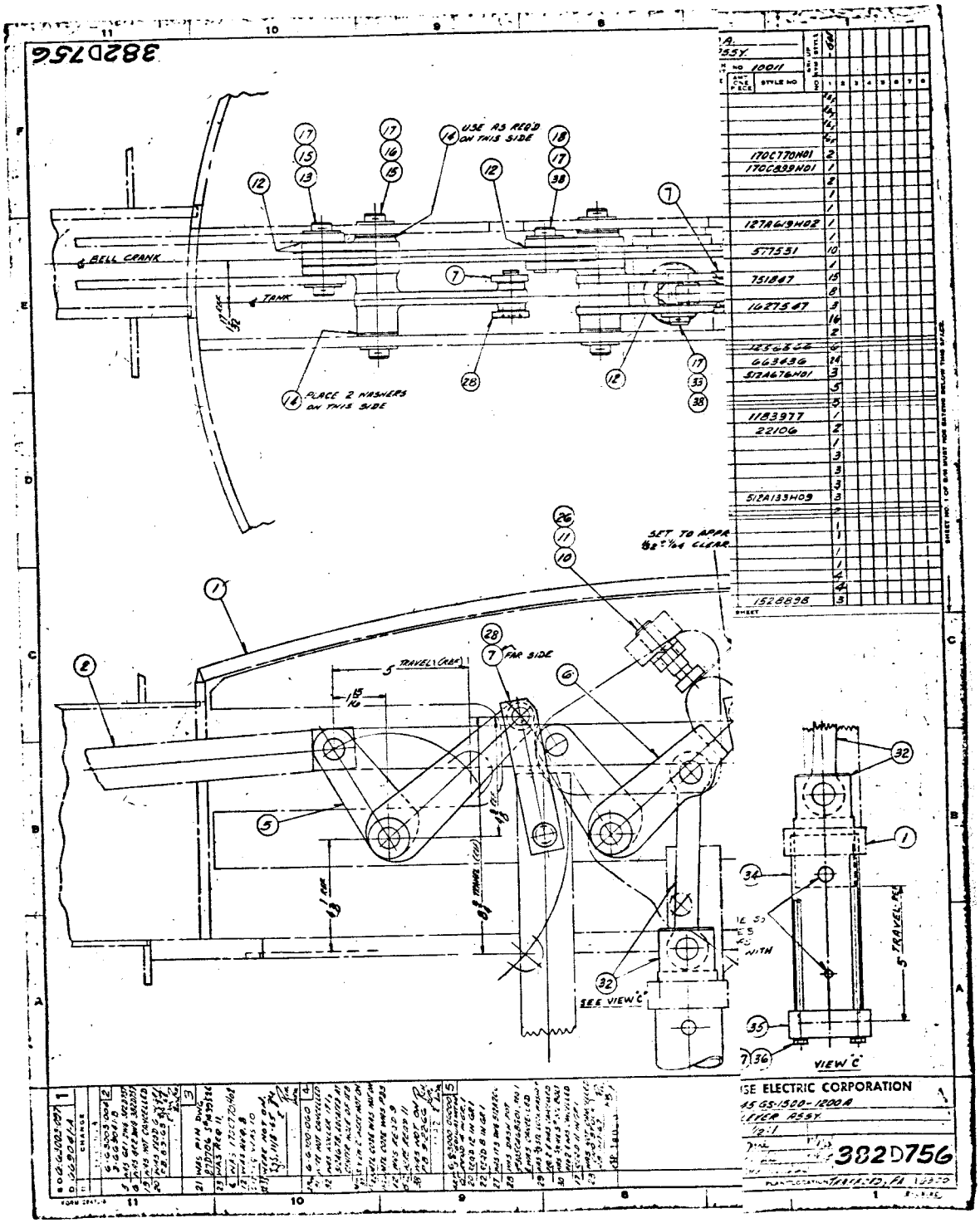
Operating Mechanism

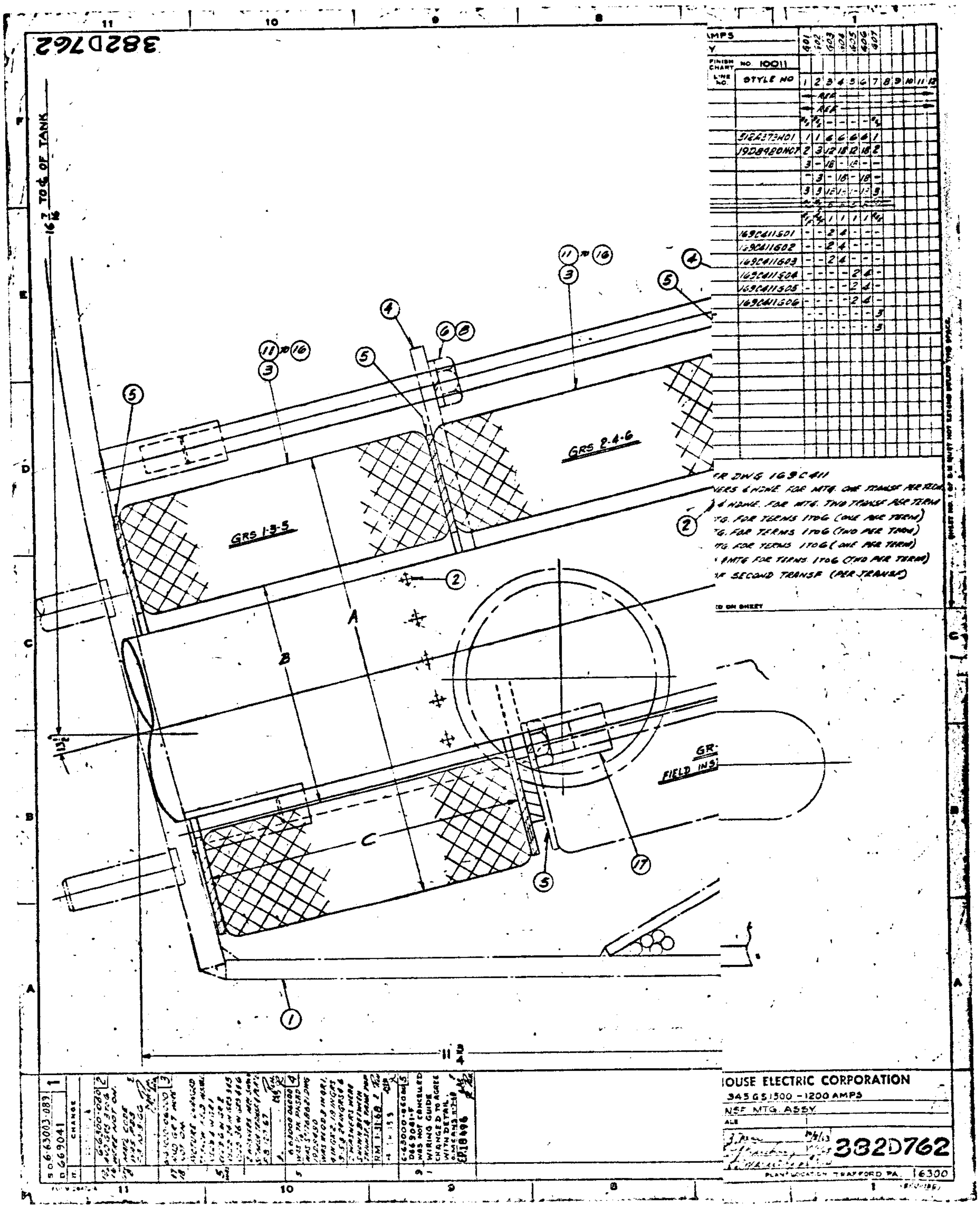
Complete instructions for operation and maintenance of the operating mechanism (either solenoid or pneumatic) are given in a separate instruction book which accompanies this book. If the Operating Mechanism Instruction Book is lost or misplaced, the I.B. number may be found on the nameplate inside the housing.

Renewal Parts

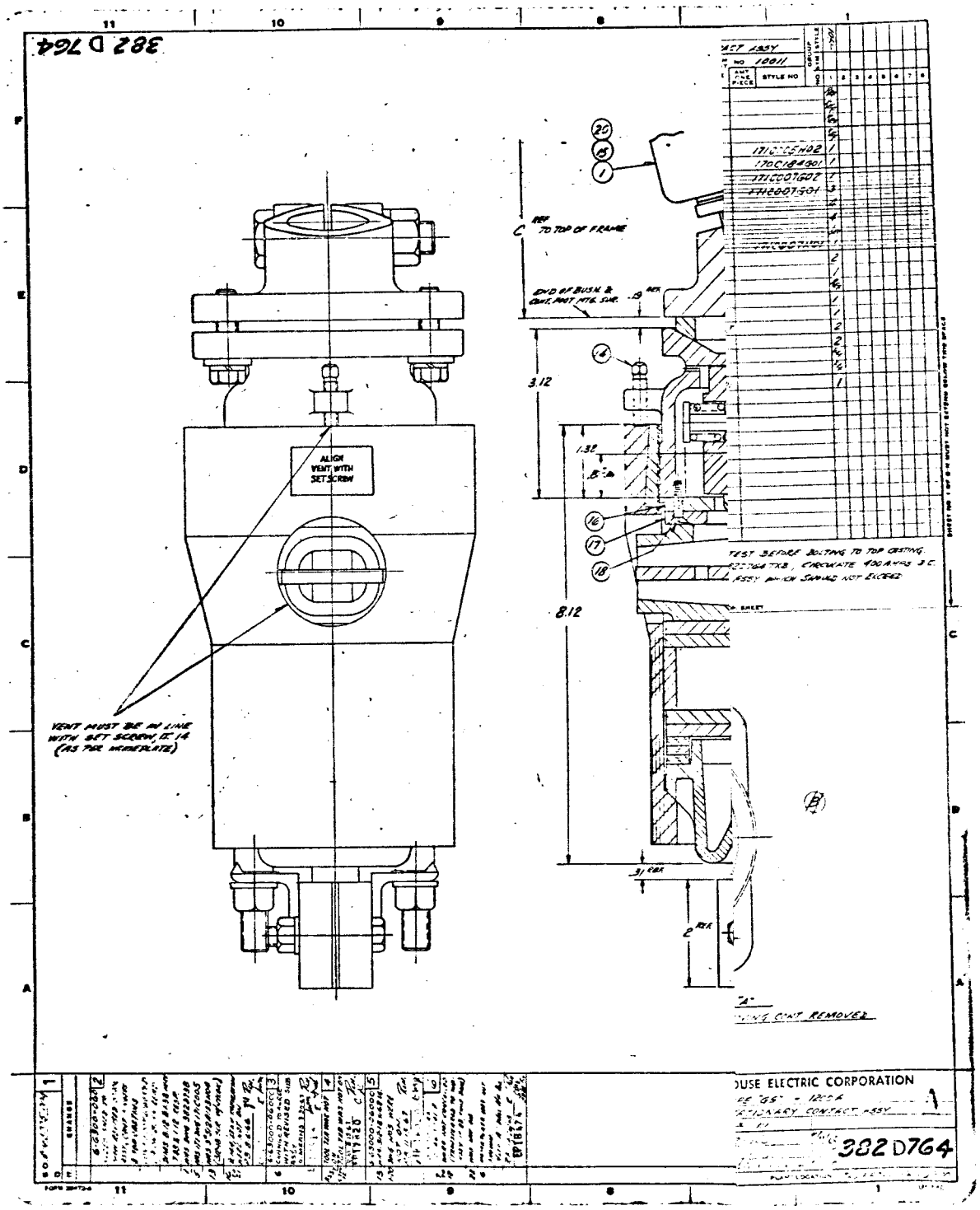
A list of renewal parts recommended to be maintained in stock will be furnished on request. When ordering renewal parts, specify the name of the part. Identify the breaker by including the type, amperes, volts and Shop Order (S.O.) Number, as engraved on the nameplate.


382D755
1200A.
10011
STYLE NO
SEE VIEW "A"
VIEW "A"
FULL SIZE
1.34 REF
4.16 REF
.25 REF
9.81 REF
3.12
5 TRAVEL
4.38
APPLY TO INSIDE OF 17 & 27
SE ELECTRIC CORPORATION
345G5 1500 - 1200A
CRANK ASSY
1:2
382D755
PLANT LOCATION


382D756
USE AS REQ'D ON THIS SIDE
BELL CRANK
TANK
PLACE 2 WASHERS ON THIS SIDE
SET TO APPR 52 5/64 CLEAR
5" TRAVEL (REF)
FAR SIDE
SEE VIEW C
VIEW C
5" TRAVEL (REF)
170C770H01
170C899H01
127A619H02
5177531
751847
1427547
125G852G2
663436
512A676H01
1183977
22106
512A133H09
1528898
382D756



382D762
16 7/16 TO ℄ OF TANK
GRS 1-3-5
GRS 2-4-6
A
B
C
11 3/4
FIELD INS
FINISH CHART NO 10011
STYLE NO
51A3724H01
19D8980H07
169C411G01
169C411G02
169C411G03
169C411G04
169C411G05
169C411G06
FR DWG 169C411
IERS & NONE FOR MTG. ONE TRANSF PER TERM
& NONE. FOR MTG. TWO TRANSF PER TERM
TG. FOR TERMS 1 TO 6 (ONE PER TERM)
TG. FOR TERMS 1 TO 6 (TWO PER TERM)
TG. FOR TERMS 1 TO 6 (ONE PER TERM)
MTG FOR TERMS 1 TO 6 (TWO PER TERM)
R SECOND TRANSF (PER TRANSF)
D ON SHEET
HOUSE ELECTRIC CORPORATION
345 GS 1500 - 1200 AMPS
NSF MTG. ASSY
382D762
PLANT LOCATION TRAFFORD PA.
16300


382 D 764
ALIGN VENT WITH SET SCREW
VENT MUST BE IN LINE WITH SET SCREW, SEE 1A (FAS TAR MATERIAL)
C REF TO TOP OF FRAME
3.12
1.32
8.12
2 REF
TEST BEFORE BOLTING TO TOP CASTING
"A"
382D764